Amateur Radio General Class License Exam Study Aid

July 1, 2023 to June 30, 2027

Prepared for the Mount Vernon Amateur Radio Club, 2024

SUBELEMENT G1 – COMMISSION'S RULES

[5 Exam Questions – 5 Groups]

G1A – General class control operator frequency privileges; primary and secondary allocations

Points of Discussion

General class licensees cannot transmit on portions of the 80-, 40-, 20-, and 15-meter bands.

Phone operation is prohibited on the 30-meter band.

Image transmission is prohibited on the 30-meter band.

On the 60-meter band, communication is restricted to specific channels and not frequency ranges.

General class licensees are prohibited from operating as a control operator on 7.125 MHz to 7.175 MHz.

Amateur stations must not cause harmful interference to primary users on frequencies where the amateur service is designated as a secondary user. Amateurs must accept interference from primary users on these frequencies.

A General class control operator may transmit Morse Code (CW) on any frequency in the 10-meter band.

The Amateur Extra licensees have exclusive segments allocated on the 80-, 40-, 20-, and 15-meter bands.

21.300 MHz is within the General class portion of the 15-meter band.

The portion of the 10-meter band above 29.5 MHz is available for repeater use.

Only the upper frequency portion of a band is available to General class licensees, who are not permitted to use the entire voice portion of a band.

Questions?

G1A01 [97.301(d)]

On which HF and/or MF amateur bands are there portions where General class licensees cannot transmit?

A. 60 meters, 30 meters, 17 meters, and 12 meters

B. 160 meters, 60 meters, 15 meters, and 12 meters

C. 80 meters, 40 meters, 20 meters, and 15 meters

D. 80 meters, 20 meters, 15 meters, and 10 meters

G1A01 [97.301(d)]

On which HF and/or MF amateur bands are there portions where General class licensees cannot transmit?

A. 60 meters, 30 meters, 17 meters, and 12 meters

B. 160 meters, 60 meters, 15 meters, and 12 meters

C. 80 meters, 40 meters, 20 meters, and 15 meters

D. 80 meters, 20 meters, 15 meters, and 10 meters

G1A02 [97.305]

On which of the following bands is phone operation prohibited?

A. 160 meters

B. 30 meters

C. 17 meters

D. 12 meters

G1A02 [97.305]

On which of the following bands is phone operation prohibited?

A. 160 meters

B. 30 meters

C. 17 meters

D. 12 meters

G1A03 [97.305]

On which of the following bands is image transmission prohibited?

A. 160 meters

B. 30 meters

C. 20 meters

D. 12 meters

G1A03 [97.305]

On which of the following bands is image transmission prohibited?

A. 160 meters

B. 30 meters

C. 20 meters

D. 12 meters

G1A04 [97.303(h)]

Which of the following amateur bands is restricted to communication only on specific channels, rather than frequency ranges?

A. 11 meters

B. 12 meters

C. 30 meters

D. 60 meters

G1A04 [97.303(h)]

Which of the following amateur bands is restricted to communication only on specific channels, rather than frequency ranges?

A. 11 meters

B. 12 meters

C. 30 meters

D. 60 meters

G1A05 [97.301(d)]

On which of the following frequencies are General class licensees prohibited from operating as control operator?

A. 7.125 MHz to 7.175 MHz

B. 28.000 MHz to 28.025 MHz

C. 21.275 MHz to 21.300 MHz

D. All of the above

G1A05 [97.301(d)]

On which of the following frequencies are General class licensees prohibited from operating as control operator?

A. 7.125 MHz to 7.175 MHz

B. 28.000 MHz to 28.025 MHz

C. 21.275 MHz to 21.300 MHz

D. All of the above

G1A06 [97.303]

Which of the following applies when the FCC rules designate the amateur service as a secondary user on a band?

A. Amateur stations must record the call sign of the primary service station before operating on a frequency assigned to that station

B. Amateur stations may use the band only during emergencies

C. Amateur stations must not cause harmful interference to primary users and must accept interference from primary users

D. Amateur stations may only operate during specific hours of the day, while primary users are permitted 24-hour use of the band

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G1A07 [97.305(a)]

On which amateur frequencies in the 10-meter band may stations with a General class control operator transmit CW emissions?

A. 28.000 MHz to 28.025 MHz only

B. 28.000 MHz to 28.300 MHz only

C. 28.025 MHz to 28.300 MHz only

D. The entire band

G1A07 [97.305(a)]

On which amateur frequencies in the 10-meter band may stations with a General class control operator transmit CW emissions?

A. 28.000 MHz to 28.025 MHz only

B. 28.000 MHz to 28.300 MHz only

C. 28.025 MHz to 28.300 MHz only

D. The entire band

G1A08 [97.301(b)]

Which HF bands have segments exclusively allocated to Amateur Extra licensees?

A. All HF bands

B. 80 meters, 40 meters, 20 meters, and 15 meters

C. All HF bands except 160 meters and 10 meters

D. 60 meters, 30 meters, 17 meters, and 12 meters

G1A08 [97.301(b)]

Which HF bands have segments exclusively allocated to Amateur Extra licensees?

A. All HF bands

B. 80 meters, 40 meters, 20 meters, and 15 meters

C. All HF bands except 160 meters and 10 meters

D. 60 meters, 30 meters, 17 meters, and 12 meters

G1A09 [97.301(d)]

Which of the following frequencies is within the General class portion of the 15-meter band?

A. 14250 kHz

B. 18155 kHz

C. 21300 kHz

D. 24900 kHz

G1A09 [97.301(d)]

Which of the following frequencies is within the General class portion of the 15-meter band?

A. 14250 kHz

B. 18155 kHz

C. 21300 kHz

D. 24900 kHz

G1A10 [97.205(b)]

What portion of the 10-meter band is available for repeater use?

A. The entire band

B. The portion between 28.1 MHz and 28.2 MHz

C. The portion between 28.3 MHz and 28.5 MHz

D. The portion above 29.5 MHz

G1A10 [97.205(b)]

What portion of the 10-meter band is available for repeater use?

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B. The portion between 28.1 MHz and 28.2 MHz

C. The portion between 28.3 MHz and 28.5 MHz

D. The portion above 29.5 MHz

G1A11 [97.301]

When General class licensees are not permitted to use the entire voice portion of a band, which portion of the voice segment is available to them?

A. The lower frequency portion

B. The upper frequency portion

C. The lower frequency portion on frequencies below 7.3 MHz, and the upper portion on frequencies above 14.150 MHz

D. The upper frequency portion on frequencies below 7.3 MHz, and the lower portion on frequencies above 14.150 MHz

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D. The upper frequency portion on frequencies below 7.3 MHz, and the lower portion on frequencies above 14.150 MHz

G1B – Antenna structure limitations; good engineering and good amateur practice; beacon operation; prohibited transmissions; retransmitting radio signals

Points of Discussion

The maximum height above ground for an antenna structure not near a public use airport without requiring notification to the FAA and registration with the FCC is 200 ft.

No more than one Beacon station may transmit in the same band from the same station location.

One of the purposes of a Beacon station as identified in the FCC rules is the observation of propagation and reception.

Occasional retransmission of weather and propagation forecast information from United States government stations is permitted for all amateur stations.

One-way transmissions are permitted to assist with learning the international Morse Code.

State and local governments must reasonably accommodate amateur service communications and regulations must constitute the minimum practical to accommodate a legitimate purpose of the state or local entity.

The use of abbreviations or procedural signals in the amateur service may be used if they do not obscure the meaning of a message.

It is not permissible to communicate with amateur stations in countries outside of the areas administered by the FCC when the country in which the amateur resides has notified the ITU that they object to such communications.

Automatically controlled Beacons are permitted to operate between 28.200 MHz and 28.300 MHz.

The power limit for Beacon stations is 100 watts peak envelope power (PEP) output.

The FCC determines “good engineering and good amateur practice” as applied to the operation of an amateur station in all respects not covered by the Part 97 rules.

Questions?

G1B01 [97.15(a)]

What is the maximum height above ground for an antenna structure not near a public use airport without requiring notification to the FAA and registration with the FCC?

A. 50 feet

B. 100 feet

C. 200 feet

D. 250 feet

G1B01 [97.15(a)]

What is the maximum height above ground for an antenna structure not near a public use airport without requiring notification to the FAA and registration with the FCC?

A. 50 feet

B. 100 feet

C. 200 feet

D. 250 feet

G1B02 [97.203(b)]

With which of the following conditions must beacon stations comply?

A. No more than one beacon station may transmit in the same band from the same station location

B. The frequency must be coordinated with the National Beacon Organization

C. The frequency must be posted on the internet or published in a national periodical

D. All these choices are correct

G1B02 [97.203(b)]

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G1B03 [97.3(a)(9)]

Which of the following is a purpose of a beacon station as identified in the FCC rules?

A. Observation of propagation and reception

B. Automatic identification of repeaters

C. Transmission of bulletins of general interest to amateur radio licensees

D. All these choices are correct

G1B03 [97.3(a)(9)]

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A. Observation of propagation and reception

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D. All these choices are correct

G1B04 [97.113(c)]

Which of the following transmissions is permitted for all amateur stations?

A. Unidentified transmissions of less than 10 seconds duration for test purposes only

B. Automatic retransmission of other amateur signals by any amateur station

C. Occasional retransmission of weather and propagation forecast information from US government stations

D. Encrypted messages, if not intended to facilitate a criminal act

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G1B05 [97.111((5)(b)]

Which of the following one-way transmissions are permitted?

A. Unidentified test transmissions of less than 10 seconds in duration

B. Transmissions to assist with learning the International Morse code

C. Regular transmissions offering equipment for sale, if intended for amateur radio use

D. All these choices are correct

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G1B06 [97.15(b), PRB-1, 101 FCC 2d 952 (1985)]

Under what conditions are state and local governments permitted to regulate amateur radio antenna structures?

A. Under no circumstances, FCC rules take priority

B. At any time and to any extent necessary to accomplish a legitimate purpose of the state or local entity, provided that proper filings are made with the FCC

C. Only when such structures exceed 50 feet in height and are clearly visible 1,000 feet from the structure

D. Amateur Service communications must be reasonably accommodated, and regulations must constitute the minimum practical to accommodate a legitimate purpose of the state or local entity

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D. Amateur Service communications must be reasonably accommodated, and regulations must constitute the minimum practical to accommodate a legitimate purpose of the state or local entity

G1B07 [97.113(a)(4)]

What are the restrictions on the use of abbreviations or procedural signals in the amateur service?

A. Only “Q” signals are permitted

B. They may be used if they do not obscure the meaning of a message

C. They are not permitted

D. They are limited to those expressly listed in Part 97 of the FCC rules

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B. They may be used if they do not obscure the meaning of a message

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D. They are limited to those expressly listed in Part 97 of the FCC rules

G1B08 [97.111(a)(1)]

When is it permissible to communicate with amateur stations in countries outside the areas administered by the Federal Communications Commission?

A. Only when the foreign country has a formal third-party agreement filed with the FCC

B. When the contact is with amateurs in any country except those whose administrations have notified the ITU that they object to such communications

C. Only when the contact is with amateurs licensed by a country which is a member of the United Nations, or by a territory possessed by such a country

D. Only when the contact is with amateurs licensed by a country which is a member of the International Amateur Radio Union, or by a territory possessed by such a country

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G1B09 [97.203(d)]

On what HF frequencies are automatically controlled beacons permitted?

A. On any frequency if power is less than 1 watt

B. On any frequency if transmissions are in Morse code

C. 21.08 MHz to 21.09 MHz

D. 28.20 MHz to 28.30 MHz

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C. 21.08 MHz to 21.09 MHz

D. 28.20 MHz to 28.30 MHz

G1B10 [97.203(c)]

What is the power limit for beacon stations?

A. 10 watts PEP output

B. 20 watts PEP output

C. 100 watts PEP output

D. 200 watts PEP output

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A. 10 watts PEP output

B. 20 watts PEP output

C. 100 watts PEP output

D. 200 watts PEP output

G1B11 [97.101(a)]

Who or what determines “good engineering and good amateur practice,” as applied to the operation of an amateur station in all respects not covered by the Part 97 rules?

A. The FCC

B. The control operator

C. The IEEE

D. The ITU

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B. The control operator

C. The IEEE

D. The ITU

G1C – Transmitter power regulations; data emission standards; 60-meter operation requirements

Points of Discussion

The maximum transmitter power an amateur station may use on 10.140 MHz is 200 watts peak envelope power (PEP).

The maximum transmitter power an amateur station may use on the 2-meter band is 1500 watts peak envelope power (PEP).

The maximum bandwidth permitted by the FCC rules for amateur stations transmitting on USB frequencies in the 60-meter band is 2.8 kHz.

You must keep a record of the gain of your antenna when operating on the 60-meter band. This is a requirement of the FCC.

The maximum transmitter power a General class control operator may use on the 28 MHz band is 1500 watts peak envelope power (PEP).

The maximum transmitter power an amateur station may use on the 1.8 MHz band is 1500 watts peak envelope power (PEP).

Before using a new digital protocol on the air, the technical characteristics of the protocol must be publicly documented.

The maximum symbol rate permitted for radio teletype (RTTY) or data emission transmitted at frequencies below 28 MHz is 300 baud (bits per second).

The maximum power limit on the 60-meter band is an effective radiated power (ERP) of 100 watts peak envelope power (PEP) with respect to a dipole.

The maximum symbol rate permitted for radio teletype (RTTY) or data emission transmitted on the 10m band is 1200 baud (bits per second).

The peak envelope power (PEP) output from the transmitter is used by the FCC to regulate maximum power output.

Questions?

G1C01 [97.313(c)(1)]

What is the maximum transmitter power an amateur station may use on 10.140 MHz?

A. 200 watts PEP output

B. 1000 watts PEP output

C. 1500 watts PEP output

D. 2000 watts PEP output

G1C01 [97.313(c)(1)]

What is the maximum transmitter power an amateur station may use on 10.140 MHz?

A. 200 watts PEP output

B. 1000 watts PEP output

C. 1500 watts PEP output

D. 2000 watts PEP output

G1C02 [97.313]

What is the maximum transmitter power an amateur station may use on the 12-meter band?

A. 50 watts PEP output

B. 200 watts PEP output

C. 1500 watts PEP output

D. An effective radiated power equivalent to 100 watts from a half-wave dipole

G1C02 [97.313]

What is the maximum transmitter power an amateur station may use on the 12-meter band?

A. 50 watts PEP output

B. 200 watts PEP output

C. 1500 watts PEP output

D. An effective radiated power equivalent to 100 watts from a half-wave dipole

G1C03 [97.303(h)(1)]

What is the maximum bandwidth permitted by FCC rules for amateur radio stations transmitting on USB frequencies in the 60-meter band?

A. 2.8 kHz

B. 5.6 kHz

C. 1.8 kHz

D. 3 kHz

G1C03 [97.303(h)(1)]

What is the maximum bandwidth permitted by FCC rules for amateur radio stations transmitting on USB frequencies in the 60-meter band?

A. 2.8 kHz

B. 5.6 kHz

C. 1.8 kHz

D. 3 kHz

G1C04 [97.303(i)]

Which of the following is required by the FCC rules when operating in the 60-meter band?

A. If you are using an antenna other than a dipole, you must keep a record of the gain of your antenna

B. You must keep a record of the date, time, frequency, power level, and stations worked

C. You must keep a record of all third-party traffic

D. You must keep a record of the manufacturer of your equipment and the antenna used

G1C04 [97.303(i)]

Which of the following is required by the FCC rules when operating in the 60-meter band?

A. If you are using an antenna other than a dipole, you must keep a record of the gain of your antenna

B. You must keep a record of the date, time, frequency, power level, and stations worked

C. You must keep a record of all third-party traffic

D. You must keep a record of the manufacturer of your equipment and the antenna used

G1C05 [97.313]

What is the limit for transmitter power on the 28 MHz band for a General Class control operator?

A. 100 watts PEP output

B. 1000 watts PEP output

C. 1500 watts PEP output

D. 2000 watts PEP output

G1C05 [97.313]

What is the limit for transmitter power on the 28 MHz band for a General Class control operator?

A. 100 watts PEP output

B. 1000 watts PEP output

C. 1500 watts PEP output

D. 2000 watts PEP output

G1C06 [97.313]

What is the limit for transmitter power on the 1.8 MHz band?

A. 200 watts PEP output

B. 1000 watts PEP output

C. 1200 watts PEP output

D. 1500 watts PEP output

G1C06 [97.313]

What is the limit for transmitter power on the 1.8 MHz band?

A. 200 watts PEP output

B. 1000 watts PEP output

C. 1200 watts PEP output

D. 1500 watts PEP output

G1C07 [97.309(a)(4)]

What must be done before using a new digital protocol on the air?

A. Type-certify equipment to FCC standards

B. Obtain an experimental license from the FCC

C. Publicly document the technical characteristics of the protocol

D. Submit a rule-making proposal to the FCC describing the codes and methods of the technique

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C. Publicly document the technical characteristics of the protocol

D. Submit a rule-making proposal to the FCC describing the codes and methods of the technique

G1C08 [97.307(f)(3)]

What is the maximum symbol rate permitted for RTTY or data emission transmitted at frequencies below 28 MHz?

A. 56 kilobaud

B. 19.6 kilobaud

C. 1200 baud

D. 300 baud

G1C08 [97.307(f)(3)]

What is the maximum symbol rate permitted for RTTY or data emission transmitted at frequencies below 28 MHz?

A. 56 kilobaud

B. 19.6 kilobaud

C. 1200 baud

D. 300 baud

G1C09 [97.313(i)]

What is the maximum power limit on the 60-meter band?

A. 1500 watts PEP

B. 10 watts RMS

C. ERP of 100 watts PEP with respect to a dipole

D. ERP of 100 watts PEP with respect to an isotropic antenna

G1C09 [97.313(i)]

What is the maximum power limit on the 60-meter band?

A. 1500 watts PEP

B. 10 watts RMS

C. ERP of 100 watts PEP with respect to a dipole

D. ERP of 100 watts PEP with respect to an isotropic antenna

G1C10 [97.305(c) and 97.307(f)(4)]

What is the maximum symbol rate permitted for RTTY or data emission transmissions on the 10-meter band?

A. 56 kilobaud

B. 19.6 kilobaud

C. 1200 baud

D. 300 baud

G1C10 [97.305(c) and 97.307(f)(4)]

What is the maximum symbol rate permitted for RTTY or data emission transmissions on the 10-meter band?

A. 56 kilobaud

B. 19.6 kilobaud

C. 1200 baud

D. 300 baud

G1C11 [97.313]

What measurement is specified by FCC rules that regulate maximum power?

A. RMS output from the transmitter

B. RMS input to the antenna

C. PEP input to the antenna

D. PEP output from the transmitter

G1C11 [97.313]

What measurement is specified by FCC rules that regulate maximum power?

A. RMS output from the transmitter

B. RMS input to the antenna

C. PEP input to the antenna

D. PEP output from the transmitter

G1D – Volunteer Examiners and Volunteer Examiner Coordinators; temporary identification; element credit; remote operation

Points of Discussion

Any person who can demonstrate that they once held an FCC issued General, Advanced, or Amateur Extra class license that was not revoked by the FCC may receive partial credit for those elements represented by an expired amateur radio license.

A Volunteer Examiner holding a General class license may administer an exam for Technician class only.

If you are a Technician class operator and have an unexpired Certificate of Successful Completion of Examination (CSCE) for General class privileges you may operate on any General or Technician class band segment.

At least three Volunteer Examiners of General class or higher must observe the administration of a Technician class license examination.

When operating a US station by remote control from outside of the country, only a US operator/primary station license is required.

Until an upgrade to General class is shown in the FCC database, a Technician licensee must identify with “AG” after their call sign whenever they operate using general class frequency privileges.

Volunteer Examiners are accredited by a Volunteer Examiner Coordinator.

For a non-US citizen to be accredited as a Volunteer Examiner, the person must hold an FCC-granted amateur radio license of General class or above.

A Certificate of Successful Completion of Examination (CSCE) is valid for 365 days.

The minimum age that one must be to qualify as an accredited Volunteer Examiner is 18 years.

To obtain a new General class license after a previously held license has expired and the two-year grace period has passed, the applicant must show proof of the appropriate expired license grant and past the current element 2 (Technician class) exam.

When operating a station in South America by remote control over the internet from the United States, only the regulations of the remote stations country apply.

Questions?

G1D01 [97.501, 97.505(a)]

Who may receive partial credit for the elements represented by an expired amateur radio license?

A. Any person who can demonstrate that they once held an FCC-issued General, Advanced, or Amateur Extra class license that was not revoked by the FCC

B. Anyone who held an FCC-issued amateur radio license that expired not less than 5 and not more than 15 years ago

C. Any person who previously held an amateur license issued by another country, but only if that country has a current reciprocal licensing agreement with the FCC

D. Only persons who once held an FCC issued Novice, Technician, or Technician Plus license

G1D01 [97.501, 97.505(a)]

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B. Anyone who held an FCC-issued amateur radio license that expired not less than 5 and not more than 15 years ago

C. Any person who previously held an amateur license issued by another country, but only if that country has a current reciprocal licensing agreement with the FCC

D. Only persons who once held an FCC issued Novice, Technician, or Technician Plus license

G1D02 [97.509(b)(3)(i)]

What license examinations may you administer as an accredited Volunteer Examiner holding a General class operator license?

A. General and Technician

B. None, only Amateur Extra class licensees may be accredited

C. Technician only

D. Amateur Extra, General, and Technician

G1D02 [97.509(b)(3)(i)]

What license examinations may you administer as an accredited Volunteer Examiner holding a General class operator license?

A. General and Technician

B. None, only Amateur Extra class licensees may be accredited

C. Technician only

D. Amateur Extra, General, and Technician

G1D03 [97.9(b)]

On which of the following band segments may you operate if you are a Technician class operator and have an unexpired Certificate of Successful Completion of Examination (CSCE) for General class privileges?

A. Only the Technician band segments until your upgrade is posted in the FCC database

B. Only on the Technician band segments until you have a receipt for the FCC application fee payment

C. On any General or Technician class band segment

D. On any General or Technician class band segment except 30 meters and 60 meters

G1D03 [97.9(b)]

On which of the following band segments may you operate if you are a Technician class operator and have an unexpired Certificate of Successful Completion of Examination (CSCE) for General class privileges?

A. Only the Technician band segments until your upgrade is posted in the FCC database

B. Only on the Technician band segments until you have a receipt for the FCC application fee payment

C. On any General or Technician class band segment

D. On any General or Technician class band segment except 30 meters and 60 meters

G1D04 [97.509(3)(i)(c)]

Who must observe the administration of a Technician class license examination?

A. At least three Volunteer Examiners of General class or higher

B. At least two Volunteer Examiners of General class or higher

C. At least two Volunteer Examiners of Technician class or higher

D. At least three Volunteer Examiners of Technician class

G1D04 [97.509(3)(i)(c)]

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A. At least three Volunteer Examiners of General class or higher

B. At least two Volunteer Examiners of General class or higher

C. At least two Volunteer Examiners of Technician class or higher

D. At least three Volunteer Examiners of Technician class

G1D05 [97.7]

When operating a US station by remote control from outside the country, what license is required of the control operator?

A. A US operator/primary station license

B. Only an appropriate US operator/primary license and a special remote station permit from the FCC

C. Only a license from the foreign country, as long as the call sign includes identification of portable operation in the US

D. A license from the foreign country and a special remote station permit from the FCC

G1D05 [97.7]

When operating a US station by remote control from outside the country, what license is required of the control operator?

A. A US operator/primary station license

B. Only an appropriate US operator/primary license and a special remote station permit from the FCC

C. Only a license from the foreign country, as long as the call sign includes identification of portable operation in the US

D. A license from the foreign country and a special remote station permit from the FCC

G1D06 [97.119(f)(2)]

Until an upgrade to General class is shown in the FCC database, when must a Technician licensee identify with "AG" after their call sign?

A. Whenever they operate using General class frequency privileges

B. Whenever they operate on any amateur frequency

C. Whenever they operate using Technician frequency privileges

D. A special identifier is not required if their General class license application has been filed with the FCC

G1D06 [97.119(f)(2)]

Until an upgrade to General class is shown in the FCC database, when must a Technician licensee identify with “AG” after their call sign?

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C. Whenever they operate using Technician frequency privileges

D. A special identifier is not required if their General class license application has been filed with the FCC

G1D07 [97.509(b)(1)]

Volunteer Examiners are accredited by what organization?

A. The Federal Communications Commission

B. The Universal Licensing System

C. A Volunteer Examiner Coordinator

D. The Wireless Telecommunications Bureau

G1D07 [97.509(b)(1)]

Volunteer Examiners are accredited by what organization?

A. The Federal Communications Commission

B. The Universal Licensing System

C. A Volunteer Examiner Coordinator

D. The Wireless Telecommunications Bureau

G1D08 [97.509(b)(3)]

Which of the following criteria must be met for a non-US citizen to be an accredited Volunteer Examiner?

A. The person must be a resident of the US for a minimum of 5 years

B. The person must hold an FCC granted amateur radio license of General class or above

C. The person's home citizenship must be in ITU region 2

D. None of these choices is correct; a non-US citizen cannot be a Volunteer Examiner

G1D08 [97.509(b)(3)]

Which of the following criteria must be met for a non-US citizen to be an accredited Volunteer Examiner?

A. The person must be a resident of the US for a minimum of 5 years

B. The person must hold an FCC granted amateur radio license of General class or above

C. The person's home citizenship must be in ITU region 2

D. None of these choices is correct; a non-US citizen cannot be a Volunteer Examiner

G1D09 [97.9(b)]

How long is a Certificate of Successful Completion of Examination (CSCE) valid for exam element credit?

A. 30 days

B. 180 days

C. 365 days

D. For as long as your current license is valid

G1D09 [97.9(b)]

How long is a Certificate of Successful Completion of Examination (CSCE) valid for exam element credit?

A. 30 days

B. 180 days

C. 365 days

D. For as long as your current license is valid

G1D10 [97.509(b)(2)]

What is the minimum age that one must be to qualify as an accredited Volunteer Examiner?

A. 16 years

B. 18 years

C. 21 years

D. There is no age limit

G1D10 [97.509(b)(2)]

What is the minimum age that one must be to qualify as an accredited Volunteer Examiner?

A. 16 years

B. 18 years

C. 21 years

D. There is no age limit

G1D11 [97.505]

What action is required to obtain a new General class license after a previously held license has expired and the two-year grace period has passed?

A. They must have a letter from the FCC showing they once held an amateur or commercial license

B. There are no requirements other than being able to show a copy of the expired license

C. Contact the FCC to have the license reinstated

D. The applicant must show proof of the appropriate expired license grant and pass the current Element 2 exam

G1D11 [97.505]

What action is required to obtain a new General class license after a previously held license has expired and the two-year grace period has passed?

A. They must have a letter from the FCC showing they once held an amateur or commercial license

B. There are no requirements other than being able to show a copy of the expired license

C. Contact the FCC to have the license reinstated

D. The applicant must show proof of the appropriate expired license grant and pass the current Element 2 exam

G1D12 [97.507]

When operating a station in South America by remote control over the internet from the US, what regulations apply?

A. Those of both the remote station's country and the FCC

B. Those of the remote station's country and the FCC's third-party regulations

C. Only those of the remote station's country

D. Only those of the FCC

G1D12 [97.507]

When operating a station in South America by remote control over the internet from the US, what regulations apply?

A. Those of both the remote station's country and the FCC

B. Those of the remote station's country and the FCC's third-party regulations

C. Only those of the remote station's country

D. Only those of the FCC

G1E – Control categories; repeater regulations; third-party rules; ITU regions; automatically controlled digital station

Points of Discussion

A third party may not participate in sending a message via an amateur station if the third party's amateur license has been revoked and not reinstated.

A 10-meter repeater may retransmit a 2-meter signal from a station that has a technician class control operator only if the 10-meter repeater control operator holds at least a General class license.

When working with a digital station that is operating under automatic control outside of the automatic control band segments, the station initiating the contact must be under local or remote control.

All of the following conditions require a licensed amateur radio operator to take specific steps to avoid harmful interference to other users or facilities: when operating within one mile of an FCC monitoring station, when transmitting Spread Spectrum (or "SS") emissions, and when using a band where the amateur service is secondary.

Messages sent to a third party in a country with which there is a third party agreement must relate to amateur radio or remarks of a personal character or messages relating to emergencies or disaster relief.

The frequency allocations of ITU Region 2 apply to radio amateurs operating in North and South America.

The 2.4 GHz band may not be used by an amateur station to communicate with non-licensed Wi-Fi stations.

The maximum peak envelope power (PEP) output allowed for Spread Spectrum (SS) transmissions is 10 watts.

Message that are sent via digital modes are not exempt to the Part 97 third-party rules that apply other modes of communication.

Amateur operators should normally avoid transmitting on 14.100 MHz, 18.110 MHz, 21.150 MHz, 224.930 MHz, and 28.200 MHz because a system of propagation Beacon stations operate on those frequencies.

Automatically controlled stations that retransmit RTTY (radio teletype) or date emissions may communicate with other automatically controlled digital stations anywhere in the 6-meter or shorter wavelength bands, and in limited segments of some of the HF bands.

A third-party message maybe transmitted via remote control under any circumstances in which third-party messages are permitted by FCC rules.

Questions?

G1E01 [97.115(b)(2)]

Which of the following would disqualify a third party from participating in sending a message via an amateur station?

A. The third party's amateur license has been revoked and not reinstated

B. The third party is not a US citizen

C. The third party is speaking in a language other than English

D. All these choices are correct

G1E01 [97.115(b)(2)]

Which of the following would disqualify a third party from participating in sending a message via an amateur station?

A. The third party's amateur license has been revoked and not reinstated

B. The third party is not a US citizen

C. The third party is speaking in a language other than English

D. All these choices are correct

G1E02 [97.205(b)]

When may a 10-meter repeater retransmit the 2-meter signal from a station that has a Technician class control operator?

A. Under no circumstances

B. Only if the station on 10-meters is operating under a Special Temporary Authorization allowing such retransmission

C. Only during an FCC-declared general state of communications emergency

D. Only if the 10-meter repeater control operator holds at least a General class license

G1E02 [97.205(b)]

When may a 10-meter repeater retransmit the 2-meter signal from a station that has a Technician class control operator?

A. Under no circumstances

B. Only if the station on 10-meters is operating under a Special Temporary Authorization allowing such retransmission

C. Only during an FCC-declared general state of communications emergency

D. Only if the 10-meter repeater control operator holds at least a General class license

G1E03 [97.221]

What is required to conduct communications with a digital station operating under automatic control outside the automatic control band segments?

A. The station initiating the contact must be under local or remote control

B. The interrogating transmission must be made by another automatically controlled station

C. No third-party traffic may be transmitted

D. The control operator of the interrogating station must hold an Amateur Extra class license

G1E03 [97.221]

What is required to conduct communications with a digital station operating under automatic control outside the automatic control band segments?

A. The station initiating the contact must be under local or remote control

B. The interrogating transmission must be made by another automatically controlled station

C. No third-party traffic may be transmitted

D. The control operator of the interrogating station must hold an Amateur Extra class license

G1E04 [97.13(b), 97.303, 97.311(b)]

Which of the following conditions require a licensed amateur radio operator to take specific steps to avoid harmful interference to other users or facilities?

A. When operating within one mile of an FCC Monitoring Station

B. When using a band where the Amateur Service is secondary

C. When a station is transmitting spread spectrum emissions

D. All these choices are correct

G1E04 [97.13(b), 97.303, 97.311(b)]

Which of the following conditions require a licensed amateur radio operator to take specific steps to avoid harmful interference to other users or facilities?

A. When operating within one mile of an FCC Monitoring Station

B. When using a band where the Amateur Service is secondary

C. When a station is transmitting spread spectrum emissions

D. All these choices are correct

G1E05 [97.115(a)(2), 97.117]

What are the restrictions on messages sent to a third party in a country with which there is a Third-Party Agreement?

A. They must relate to emergencies or disaster relief

B. They must be for other licensed amateurs

C. They must relate to amateur radio, or remarks of a personal character, or messages relating to emergencies or disaster relief

D. The message must be limited to no longer than 1 minute in duration and the name of the third party must be recorded in the station log

G1E05 [97.115(a)(2), 97.117]

What are the restrictions on messages sent to a third party in a country with which there is a Third-Party Agreement?

A. They must relate to emergencies or disaster relief

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C. They must relate to amateur radio, or remarks of a personal character, or messages relating to emergencies or disaster relief

D. The message must be limited to no longer than 1 minute in duration and the name of the third party must be recorded in the station log

G1E06 [97.301, ITU Radio Regulations]

The frequency allocations of which ITU region apply to radio amateurs operating in North and South America?

A. Region 4

B. Region 3

C. Region 2

D. Region 1

G1E06 [97.301, ITU Radio Regulations]

The frequency allocations of which ITU region apply to radio amateurs operating in North and South America?

A. Region 4

B. Region 3

C. Region 2

D. Region 1

G1E07 [97.111]

In what part of the 2.4 GHz band may an amateur station communicate with non-licensed Wi-Fi stations?

A. Anywhere in the band

B. Channels 1 through 4

C. Channels 42 through 45

D. No part

G1E07 [97.111]

In what part of the 2.4 GHz band may an amateur station communicate with non-licensed Wi-Fi stations?

A. Anywhere in the band

B. Channels 1 through 4

C. Channels 42 through 45

D. No part

G1E08 [97.313(j)]

What is the maximum PEP output allowed for spread spectrum transmissions?

A. 100 milliwatts

B. 10 watts

C. 100 watts

D. 1500 watts

G1E08 [97.313(j)]

What is the maximum PEP output allowed for spread spectrum transmissions?

A. 100 milliwatts

B. 10 watts

C. 100 watts

D. 1500 watts

G1E09 [97.115]

Under what circumstances are messages that are sent via digital modes exempt from Part 97 third-party rules that apply to other modes of communication?

A. Under no circumstances

B. When messages are encrypted

C. When messages are not encrypted

D. When under automatic control

G1E09 [97.115]

Under what circumstances are messages that are sent via digital modes exempt from Part 97 third-party rules that apply to other modes of communication?

A. Under no circumstances

B. When messages are encrypted

C. When messages are not encrypted

D. When under automatic control

G1E10 [97.101]

Why should an amateur operator normally avoid transmitting on 14.100, 18.110, 21.150, 24.930 and 28.200 MHz?

A. A system of propagation beacon stations operates on those frequencies

B. A system of automatic digital stations operates on those frequencies.

C. These frequencies are set aside for emergency operations

D. These frequencies are set aside for bulletins from the FCC

G1E10 [97.101]

Why should an amateur operator normally avoid transmitting on 14.100, 18.110, 21.150, 24.930 and 28.200 MHz?

A. A system of propagation beacon stations operates on those frequencies

B. A system of automatic digital stations operates on those frequencies.

C. These frequencies are set aside for emergency operations

D. These frequencies are set aside for bulletins from the FCC

G1E11 [97.221, 97.305]

On what bands may automatically controlled stations transmitting RTTY or data emissions communicate with other automatically controlled digital stations?

A. On any band segment where digital operation is permitted

B. Anywhere in the non-phone segments of the 10-meter or shorter wavelength bands

C. Only in the non-phone Extra Class segments of the bands

D. Anywhere in the 6-meter or shorter wavelength bands, and in limited segments of some of the HF bands

G1E11 [97.221, 97.305]

On what bands may automatically controlled stations transmitting RTTY or data emissions communicate with other automatically controlled digital stations?

A. On any band segment where digital operation is permitted

B. Anywhere in the non-phone segments of the 10-meter or shorter wavelength bands

C. Only in the non-phone Extra Class segments of the bands

D. Anywhere in the 6-meter or shorter wavelength bands, and in limited segments of some of the HF bands

G1E12 [97.115]

When may third-party messages be transmitted via remote control?

A. Under any circumstances in which third party messages are permitted by FCC rules

B. Under no circumstances except for emergencies

C. Only when the message is intended for licensed radio amateurs

D. Only when the message is intended for third parties in areas where licensing is controlled by the FCC

G1E12 [97.115]

When may third-party messages be transmitted via remote control?

A. Under any circumstances in which third party messages are permitted by FCC rules

B. Under no circumstances except for emergencies

C. Only when the message is intended for licensed radio amateurs

D. Only when the message is intended for third parties in areas where licensing is controlled by the FCC

SUBELEMENT G2 – OPERATING PROCEDURES

[5 Exam Questions – 5 Groups]

G2A – Phone operating procedures: USB/LSB conventions, breaking into a contact, transmitter setup for voice operation; answering DX stations

Points of Discussion

Upper sideband (USB) is most commonly used for voice communications on frequencies of 14 MHz and higher.

Lower sideband (LSB) is most commonly used for voice communications on the 160-, 75-, and 40-meter bands.

Upper sideband (USB) is most commonly used for Single sideband (SSB) voice communications in the VHF and UHF bands.

Upper sideband is most commonly used for voice communications on the 17- and 12-meter bands.

Single sideband is the mode of voice communication most commonly used on the HF amateur bands.

An advantage of using Single sideband (SSB) as compared to other analog voice modes on the HF amateur bands is less bandwidth is used and there is greater power efficiency.

In Single sideband (SSB), only one side band is transmitted; the other sideband and carrier are suppressed.

The recommended way to break into a phone (voice) contact is to say your call sign once.

It is commonly accepted amateur practice to use Lower sideband (LSB) on the 160-, 75-, and 40-meter bands.

When comparing VOX operation to PTT operation, VOX allows hands-free operation.

Generally the only people who should be responding to a “CQDX” call being made from the 48 contiguous states are those who live outside the lower 48 state.

Transmit audio or microphone gain control is typically adjusted for proper ALC (automatic level control) setting on a single sideband (SSB) transceiver.

Questions?

G2A01

Which mode is most commonly used for voice communications on frequencies of 14 MHz or higher?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A01

Which mode is most commonly used for voice communications on frequencies of 14 MHz or higher?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A02

Which mode is most commonly used for voice communications on the 160-, 75-, and 40-meter bands?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A02

Which mode is most commonly used for voice communications on the 160-, 75-, and 40-meter bands?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A03

Which mode is most commonly used for SSB voice communications in the VHF and UHF bands?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A03

Which mode is most commonly used for SSB voice communications in the VHF and UHF bands?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A04

Which mode is most commonly used for voice communications on the 17- and 12-meter bands?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A04

Which mode is most commonly used for voice communications on the 17- and 12-meter bands?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

D. Double sideband

G2A05

Which mode of voice communication is most commonly used on the HF amateur bands?

A. Frequency modulation

B. Double sideband

C. Single sideband

D. Single phase modulation

G2A05

Which mode of voice communication is most commonly used on the HF amateur bands?

A. Frequency modulation

B. Double sideband

C. Single sideband

D. Single phase modulation

G2A06

Which of the following is an advantage of using single sideband, as compared to other analog voice modes on the HF amateur bands?

A. Very high-fidelity voice modulation

B. Less subject to interference from atmospheric static crashes

C. Ease of tuning on receive and immunity to impulse noise

D. Less bandwidth used and greater power efficiency

G2A06

Which of the following is an advantage of using single sideband, as compared to other analog voice modes on the HF amateur bands?

A. Very high-fidelity voice modulation

B. Less subject to interference from atmospheric static crashes

C. Ease of tuning on receive and immunity to impulse noise

D. Less bandwidth used and greater power efficiency

G2A07

Which of the following statements is true of single sideband (SSB)?

A. Only one sideband and the carrier are transmitted; the other sideband is suppressed

B. Only one sideband is transmitted; the other sideband and carrier are suppressed

C. SSB is the only voice mode authorized on the 20-, 15-, and 10-meter amateur bands

D. SSB is the only voice mode authorized on the 160-, 75-, and 40-meter amateur bands

G2A07

Which of the following statements is true of single sideband (SSB)?

A. Only one sideband and the carrier are transmitted; the other sideband is suppressed

B. Only one sideband is transmitted; the other sideband and carrier are suppressed

C. SSB is the only voice mode authorized on the 20-, 15-, and 10-meter amateur bands

D. SSB is the only voice mode authorized on the 160-, 75-, and 40-meter amateur bands

G2A08

What is the recommended way to break into a phone contact?

A. Say “QRZ” several times, followed by your call sign

B. Say your call sign once

C. Say “Breaker Breaker”

D. Say “CQ” followed by the call sign of either station

G2A08

What is the recommended way to break into a phone contact?

A. Say “QRZ” several times, followed by your call sign

B. Say your call sign once

C. Say “Breaker Breaker”

D. Say “CQ” followed by the call sign of either station

G2A09

Why do most amateur stations use lower sideband on the 160-, 75-, and 40-meter bands?

A. Lower sideband is more efficient than upper sideband at these frequencies

B. Lower sideband is the only sideband legal on these frequency bands

C. Because it is fully compatible with an AM detector

D. It is commonly accepted amateur practice

G2A09

Why do most amateur stations use lower sideband on the 160-, 75-, and 40-meter bands?

A. Lower sideband is more efficient than upper sideband at these frequencies

B. Lower sideband is the only sideband legal on these frequency bands

C. Because it is fully compatible with an AM detector

D. It is commonly accepted amateur practice

G2A10

Which of the following statements is true of VOX operation versus PTT operation?

A. The received signal is more natural sounding

B. It allows “hands free” operation

C. It occupies less bandwidth

D. It provides more power output

G2A10

Which of the following statements is true of VOX operation versus PTT operation?

A. The received signal is more natural sounding

B. It allows "hands free" operation

C. It occupies less bandwidth

D. It provides more power output

G2A11

Generally, who should respond to a station in the contiguous 48 states calling “CQ DX”?

A. Any caller is welcome to respond

B. Only stations in Germany

C. Any stations outside the lower 48 states

D. Only contest stations

G2A11

Generally, who should respond to a station in the contiguous 48 states calling “CQ DX”?

A. Any caller is welcome to respond

B. Only stations in Germany

C. Any stations outside the lower 48 states

D. Only contest stations

G2A12

What control is typically adjusted for proper ALC setting on a single sideband transceiver?

A. RF clipping level

B. Transmit audio or microphone gain

C. Antenna inductance or capacitance

D. Attenuator level

G2A12

What control is typically adjusted for proper ALC setting on a single sideband transceiver?

A. RF clipping level

B. Transmit audio or microphone gain

C. Antenna inductance or capacitance

D. Attenuator level

G2B – Operating effectively; band plans; drills and emergencies; RACES operation

Points of Discussion

Except during emergencies no amateur station has priority access to any frequency.

If you are communicating with another amateur station and you hear a station in distress break in, you should immediately acknowledge the station in distress and determine what assistance may be needed.

Attempt to resolve the interference problem with the other stations and a mutually acceptable manner. This is good amateur practice if propagation changes during a contact creating interference from other stations using the frequency.

When selecting a Morse Code (CW) transmitting frequency, the minimum separation from other stations should be at least 150 Hz to 500 Hz.

When selecting a Single sideband (SSB) transmitting frequency the minimum separation used to minimize interference on adjacent frequencies is 2 kHz to 3 kHz.

You can avoid harmful interference on an apparently clear frequency by sending “QRL” followed by your call sign or ask if the frequency is in use followed by your call sign.

Following the voluntary band plan complies with commonly accepted amateur practice when choosing a frequency on which to initiate a call.

According to the Voluntary Band Plan restriction for US stations transmitting within the 48 contiguous states only contacts with stations not within the 48 continuous states are to take place between 50.1 MHz to 50.125 MHz

Only a person holding an FCC-issued amateur operator license may be the control operator of an amateur station transmitting in RACES to assist relief operations during a disaster.

Having a backup frequency in case of interference or poor conditions is considered to be good amateur practice for net management.

RACES training drills and tests may be routinely conducted without special authorization no more than one hour per week.

Questions?

G2B01 [97.101(b),]

Which of the following is true concerning access to frequencies?

A. Nets have priority

B. QSOs in progress have priority

C. Except during emergencies, no amateur station has priority access to any frequency

D. Contest operations should yield to non-contest use of frequencies

G2B01 [97.101(b),]

Which of the following is true concerning access to frequencies?

A. Nets have priority

B. QSOs in progress have priority

C. Except during emergencies, no amateur station has priority access to any frequency

D. Contest operations should yield to non-contest use of frequencies

G2B02

What is the first thing you should do if you are communicating with another amateur station and hear a station in distress break in?

A. Inform your local emergency coordinator

B. Acknowledge the station in distress and determine what assistance may be needed

C. Immediately decrease power to avoid interfering with the station in distress

D. Immediately cease all transmissions

G2B02

What is the first thing you should do if you are communicating with another amateur station and hear a station in distress break in?

A. Inform your local emergency coordinator

B. Acknowledge the station in distress and determine what assistance may be needed

C. Immediately decrease power to avoid interfering with the station in distress

D. Immediately cease all transmissions

G2B03

What is good amateur practice if propagation changes during a contact creating interference from other stations using the frequency?

A. Advise the interfering stations that you are on the frequency and that you have priority

B. Decrease power and continue to transmit

C. Attempt to resolve the interference problem with the other stations in a mutually acceptable manner

D. Switch to the opposite sideband

G2B03

What is good amateur practice if propagation changes during a contact creating interference from other stations using the frequency?

A. Advise the interfering stations that you are on the frequency and that you have priority

B. Decrease power and continue to transmit

C. Attempt to resolve the interference problem with the other stations in a mutually acceptable manner

D. Switch to the opposite sideband

G2B04

When selecting a CW transmitting frequency, what minimum separation from other stations should be used to minimize interference to stations on adjacent frequencies?

A. 5 Hz to 50 Hz

B. 150 Hz to 500 Hz

C. 1 kHz to 3 kHz

D. 3 kHz to 6 kHz

G2B04

When selecting a CW transmitting frequency, what minimum separation from other stations should be used to minimize interference to stations on adjacent frequencies?

A. 5 Hz to 50 Hz

B. 150 Hz to 500 Hz

C. 1 kHz to 3 kHz

D. 3 kHz to 6 kHz

G2B05

When selecting an SSB transmitting frequency, what minimum separation should be used to minimize interference to stations on adjacent frequencies?

A. 5 Hz to 50 Hz

B. 150 Hz to 500 Hz

C. 2 kHz to 3 kHz

D. Approximately 6 kHz

G2B05

When selecting an SSB transmitting frequency, what minimum separation should be used to minimize interference to stations on adjacent frequencies?

A. 5 Hz to 50 Hz

B. 150 Hz to 500 Hz

C. 2 kHz to 3 kHz

D. Approximately 6 kHz

G2B06

How can you avoid harmful interference on an apparently clear frequency before calling CQ on CW or phone?

A. Send “QRL?” on CW, followed by your call sign; or, if using phone, ask if the frequency is in use, followed by your call sign

B. Listen for 2 minutes before calling CQ

C. Send the letter “V” in Morse code several times and listen for a response, or say “test” several times and listen for a response

D. Send “QSY” on CW or if using phone, announce “the frequency is in use,” then give your call sign and listen for a response

G2B06

How can you avoid harmful interference on an apparently clear frequency before calling CQ on CW or phone?

A. Send “QRL?” on CW, followed by your call sign; or, if using phone, ask if the frequency is in use, followed by your call sign

B. Listen for 2 minutes before calling CQ

C. Send the letter “V” in Morse code several times and listen for a response, or say “test” several times and listen for a response

D. Send “QSY” on CW or if using phone, announce “the frequency is in use,” then give your call sign and listen for a response

G2B07

Which of the following complies with commonly accepted amateur practice when choosing a frequency on which to initiate a call?

A. Listen on the frequency for at least two minutes to be sure it is clear

B. Identify your station by transmitting your call sign at least 3 times

C. Follow the voluntary band plan

D. All these choices are correct

G2B07

Which of the following complies with commonly accepted amateur practice when choosing a frequency on which to initiate a call?

A. Listen on the frequency for at least two minutes to be sure it is clear

B. Identify your station by transmitting your call sign at least 3 times

C. Follow the voluntary band plan

D. All these choices are correct

G2B08

What is the voluntary band plan restriction for US stations transmitting within the 48 contiguous states in the 50.1 MHz to 50.125 MHz band segment?

A. Only contacts with stations not within the 48 contiguous states

B. Only contacts with other stations within the 48 contiguous states

C. Only digital contacts

D. Only SSTV contacts

G2B08

What is the voluntary band plan restriction for US stations transmitting within the 48 contiguous states in the 50.1 MHz to 50.125 MHz band segment?

A. Only contacts with stations not within the 48 contiguous states

B. Only contacts with other stations within the 48 contiguous states

C. Only digital contacts

D. Only SSTV contacts

G2B09 [97.407(a)]

Who may be the control operator of an amateur station transmitting in RACES to assist relief operations during a disaster?

A. Only a person holding an FCC-issued amateur operator license

B. Only a RACES net control operator

C. A person holding an FCC-issued amateur operator license or an appropriate government official

D. Any control operator when normal communication systems are operational

G2B09 [97.407(a)]

Who may be the control operator of an amateur station transmitting in RACES to assist relief operations during a disaster?

A. Only a person holding an FCC-issued amateur operator license

B. Only a RACES net control operator

C. A person holding an FCC-issued amateur operator license or an appropriate government official

D. Any control operator when normal communication systems are operational

G2B10

Which of the following is good amateur practice for net management?

A. Always use multiple sets of phonetics during check-in

B. Have a backup frequency in case of interference or poor conditions

C. Transmit the full net roster at the beginning of every session

D. All these choices are correct

G2B10

Which of the following is good amateur practice for net management?

A. Always use multiple sets of phonetics during check-in

B. Have a backup frequency in case of interference or poor conditions

C. Transmit the full net roster at the beginning of every session

D. All these choices are correct

G2B11 [97.407(d)(4)]

How often may RACES training drills and tests be routinely conducted without special authorization?

A. No more than 1 hour per month

B. No more than 2 hours per month

C. No more than 1 hour per week

D. No more than 2 hours per week

G2B11 [97.407(d)(4)]

How often may RACES training drills and tests be routinely conducted without special authorization?

A. No more than 1 hour per month

B. No more than 2 hours per month

C. No more than 1 hour per week

D. No more than 2 hours per week

G2C – CW operating procedures and procedural signals; Q signals; full break-in

Points of Discussion

Full break-in CW operation, or “QSK,” means transmitting stations can receive between code characters and elements.

If a Morse Code station sends “QRS,” they are asking you to send slower.

When a Morse Code (CW) operator sends “KN” at the end of the transmission, it means that they are listening only for a specific station or stations.

The Q-signal “QRL” means are you busy or is this frequency in use.

The best speed to use when answering a code “CQ” call is the fastest speed at which you are comfortable copying, but do not exceed the speed of the call that you are answering.

The term “zero beat” in Morse Code (CW) operation means matching the transmit frequency to the frequency of a received signal.

When sending Morse Code (CW), if “C” is included in the RST report, it indicates a chirpy or unstable signal.

The prosign “AR” is sent to indicate the end of a formal message when using Morse Code.

The Q-signal “QSL” means “I have received and understood.”

The Q-signal “QRN” means “I am troubled by Static.”

The Q-signal “QRV” means “I am ready to receive.”

Questions?

G2C01

Which of the following describes full break-in CW operation (QSK)?

A. Breaking stations send the Morse code prosign “BK”

B. Automatic keyers, instead of hand keys, are used to send Morse code

C. An operator must activate a manual send/receive switch before and after every transmission

D. Transmitting stations can receive between code characters and elements

G2C01

Which of the following describes full break-in CW operation (QSK)?

A. Breaking stations send the Morse code prosign "BK"

B. Automatic keyers, instead of hand keys, are used to send Morse code

C. An operator must activate a manual send/receive switch before and after every transmission

D. Transmitting stations can receive between code characters and elements

G2C02

What should you do if a CW station sends “QRS?”

A. Send slower

B. Change frequency

C. Increase your power

D. Repeat everything twice

G2C02

What should you do if a CW station sends "QRS?"

A. Send slower

B. Change frequency

C. Increase your power

D. Repeat everything twice

G2C03

What does it mean when a CW operator sends “KN” at the end of a transmission?

A. No US stations should call

B. Operating full break-in

C. Listening only for a specific station or stations

D. Closing station now

G2C03

What does it mean when a CW operator sends “KN” at the end of a transmission?

A. No US stations should call

B. Operating full break-in

C. Listening only for a specific station or stations

D. Closing station now

G2C04

What does the Q signal "QRL?" mean?

A. "Will you keep the frequency clear?"

B. "Are you operating full break-in?" or "Can you operate full break-in?"

C. "Are you listening only for a specific station?"

D. "Are you busy?" or "Is this frequency in use?"

G2C04

What does the Q signal "QRL?" mean?

A. "Will you keep the frequency clear?"

B. "Are you operating full break-in?" or "Can you operate full break-in?"

C. "Are you listening only for a specific station?"

D. "Are you busy?" or "Is this frequency in use?"

G2C05

What is the best speed to use when answering a CQ in Morse code?

A. The fastest speed at which you are comfortable copying, but no slower than the CQ

B. The fastest speed at which you are comfortable copying, but no faster than the CQ

C. At the standard calling speed of 10 wpm

D. At the standard calling speed of 5 wpm

G2C05

What is the best speed to use when answering a CQ in Morse code?

A. The fastest speed at which you are comfortable copying, but no slower than the CQ

B. The fastest speed at which you are comfortable copying, but no faster than the CQ

C. At the standard calling speed of 10 wpm

D. At the standard calling speed of 5 wpm

G2C06

What does the term “zero beat” mean in CW operation?

A. Matching the speed of the transmitting station

B. Operating split to avoid interference on frequency

C. Sending without error

D. Matching the transmit frequency to the frequency of a received signal

G2C06

What does the term “zero beat” mean in CW operation?

A. Matching the speed of the transmitting station

B. Operating split to avoid interference on frequency

C. Sending without error

D. Matching the transmit frequency to the frequency of a received signal

G2C07

When sending CW, what does a "C" mean when added to the RST report?

A. Chirpy or unstable signal

B. Report was read from an S meter rather than estimated

C. 100 percent copy

D. Key clicks

G2C07

When sending CW, what does a “C” mean when added to the RST report?

A. Chirpy or unstable signal

B. Report was read from an S meter rather than estimated

C. 100 percent copy

D. Key clicks

G2C08

What prosign is sent to indicate the end of a formal message when using CW?

A. SK

B. BK

C. AR

D. KN

G2C08

What prosign is sent to indicate the end of a formal message when using CW?

A. SK

B. BK

C. AR

D. KN

G2C09

What does the Q signal “QSL” mean?

A. Send slower

B. We have already confirmed the contact

C. I have received and understood

D. We have worked before

G2C09

What does the Q signal “QSL” mean?

A. Send slower

B. We have already confirmed the contact

C. I have received and understood

D. We have worked before

G2C10

What does the Q signal "QRN" mean?

A. Send more slowly

B. Stop sending

C. Zero beat my signal

D. I am troubled by static

G2C10

What does the Q signal “QRN” mean?

A. Send more slowly

B. Stop sending

C. Zero beat my signal

D. I am troubled by static

G2C11

What does the Q signal “QRV” mean?

A. You are sending too fast

B. There is interference on the frequency

C. I am quitting for the day

D. I am ready to receive

G2C11

What does the Q signal "QRV" mean?

A. You are sending too fast

B. There is interference on the frequency

C. I am quitting for the day

D. I am ready to receive

G2D – Volunteer Monitor Program; HF operations

Points of Discussion

The Volunteer Monitor Program involves amateur volunteers who are formally enlisted to monitor the airwaves for rule violations.

The objective of the Volunteer Monitor Program is to encourage amateur radio operators to self-regulate and comply with the rules.

Comparing beam headings on the repeater input from their home locations with that of other Volunteer Monitors is a good way for volunteer monitors to localize a station who's continuous carrier is holding a repeater on in their area.

A map that shows true bearings and distances from a specific location is called an azimuthal projection map.

To indicate that you are looking for an HF contact with any station, repeat “CQ” a few times followed by “This is” and then your call sign a few times then pause to listen and repeat as necessary.

When making a “long-path” contact with another station, your directional antenna is pointed 180 degrees from the “short-path” heading to the contact.

The following are examples of the NATO phonetic alphabet: Alpha, Bravo, Charlie, Delta.

Amateurs keep a station log to help reply if the FCC requests information about your station,

Identifying your station according to normal FCC regulations is required when participating in a contest on HF frequencies.

QRP operation is Low-power transmit operation.

Signal reports are typically exchanged at the beginning of an HF contact to allow each station to operate according to conditions.

Questions?

G2D01

What is the Volunteer Monitor Program?

A. Amateur volunteers who are formally enlisted to monitor the airwaves for rules violations

B. Amateur volunteers who conduct amateur licensing examinations

C. Amateur volunteers who conduct frequency coordination for amateur VHF repeaters

D. Amateur volunteers who use their station equipment to help civil defense organizations in times of emergency

G2D01

What is the Volunteer Monitor Program?

A. Amateur volunteers who are formally enlisted to monitor the airwaves for rules violations

B. Amateur volunteers who conduct amateur licensing examinations

C. Amateur volunteers who conduct frequency coordination for amateur VHF repeaters

D. Amateur volunteers who use their station equipment to help civil defense organizations in times of emergency

G2D02

Which of the following are objectives of the Volunteer Monitor Program?

A. To conduct efficient and orderly amateur licensing examinations

B. To provide emergency and public safety communications

C. To coordinate repeaters for efficient and orderly spectrum usage

D. To encourage amateur radio operators to self-regulate and comply with the rules

G2D02

Which of the following are objectives of the Volunteer Monitor Program?

A. To conduct efficient and orderly amateur licensing examinations

B. To provide emergency and public safety communications

C. To coordinate repeaters for efficient and orderly spectrum usage

D. To encourage amateur radio operators to self-regulate and comply with the rules

G2D03

What procedure may be used by Volunteer Monitors to localize a station whose continuous carrier is holding a repeater on in their area?

A. Compare vertical and horizontal signal strengths on the input frequency

B. Compare beam headings on the repeater input from their home locations with that of other Volunteer Monitors

C. Compare signal strengths between the input and output of the repeater

D. All these choices are correct

G2D03

What procedure may be used by Volunteer Monitors to localize a station whose continuous carrier is holding a repeater on in their area?

A. Compare vertical and horizontal signal strengths on the input frequency

B. Compare beam headings on the repeater input from their home locations with that of other Volunteer Monitors

C. Compare signal strengths between the input and output of the repeater

D. All these choices are correct

G2D04

Which of the following describes an azimuthal projection map?

A. A map that shows accurate land masses

B. A map that shows true bearings and distances from a specific location

C. A map that shows the angle at which an amateur satellite crosses the equator

D. A map that shows the number of degrees longitude that an amateur satellite appears to move westward at the equator with each orbit

G2D04

Which of the following describes an azimuthal projection map?

A. A map that shows accurate land masses

B. A map that shows true bearings and distances from a specific location

C. A map that shows the angle at which an amateur satellite crosses the equator

D. A map that shows the number of degrees longitude that an amateur satellite appears to move westward at the equator with each orbit

G2D05

Which of the following indicates that you are looking for an HF contact with any station?

A. Sign your call sign once, followed by the words “listening for a call” -- if no answer, change frequency and repeat

B. Say “QTC” followed by “this is” and your call sign -- if no answer, change frequency and repeat

C. Repeat “CQ” a few times, followed by “this is,” then your call sign a few times, then pause to listen, repeat as necessary

D. Transmit an unmodulated carried for approximately 10 seconds, followed by “this is” and your call sign, and pause to listen -- repeat as necessary

G2D05

Which of the following indicates that you are looking for an HF contact with any station?

A. Sign your call sign once, followed by the words “listening for a call” -- if no answer, change frequency and repeat

B. Say “QTC” followed by “this is” and your call sign -- if no answer, change frequency and repeat

C. Repeat “CQ” a few times, followed by “this is,” then your call sign a few times, then pause to listen, repeat as necessary

D. Transmit an unmodulated carried for approximately 10 seconds, followed by “this is” and your call sign, and pause to listen -- repeat as necessary

G2D06

How is a directional antenna pointed when making a “long-path” contact with another station?

A. Toward the rising sun

B. Along the gray line

C. 180 degrees from the station’s short-path heading

D. Toward the north

G2D06

How is a directional antenna pointed when making a “long-path” contact with another station?

A. Toward the rising sun

B. Along the gray line

C. 180 degrees from the station’s short-path heading

D. Toward the north

G2D07

Which of the following are examples of the NATO Phonetic Alphabet?

A. Able, Baker, Charlie, Dog

B. Adam, Boy, Charles, David

C. America, Boston, Canada, Denmark

D. Alpha, Bravo, Charlie, Delta

G2D07

Which of the following are examples of the NATO Phonetic Alphabet?

A. Able, Baker, Charlie, Dog

B. Adam, Boy, Charles, David

C. America, Boston, Canada, Denmark

D. Alpha, Bravo, Charlie, Delta

G2D08

Why do many amateurs keep a station log?

A. The FCC requires a log of all international contacts

B. The FCC requires a log of all international third-party traffic

C. The log provides evidence of operation needed to renew a license without retest

D. To help with a reply if the FCC requests information about your station

G2D08

Why do many amateurs keep a station log?

A. The FCC requires a log of all international contacts

B. The FCC requires a log of all international third-party traffic

C. The log provides evidence of operation needed to renew a license without retest

D. To help with a reply if the FCC requests information about your station

G2D09

Which of the following is required when participating in a contest on HF frequencies?

A. Submit a log to the contest sponsor

B. Send a QSL card to the stations worked, or QSL via Logbook of The World

C. Identify your station according to normal FCC regulations

D. All these choices are correct

G2D09

Which of the following is required when participating in a contest on HF frequencies?

A. Submit a log to the contest sponsor

B. Send a QSL card to the stations worked, or QSL via Logbook of The World

C. Identify your station according to normal FCC regulations

D. All these choices are correct

G2D10

What is QRP operation?

A. Remote piloted model control

B. Low-power transmit operation

C. Transmission using Quick Response Protocol

D. Traffic relay procedure net operation

G2D10

What is QRP operation?

A. Remote piloted model control

B. Low-power transmit operation

C. Transmission using Quick Response Protocol

D. Traffic relay procedure net operation

G2D11

Why are signal reports typically exchanged at the beginning of an HF contact?

A. To allow each station to operate according to conditions

B. To be sure the contact will count for award programs

C. To follow standard radiogram structure

D. To allow each station to calibrate their frequency display

G2D11

Why are signal reports typically exchanged at the beginning of an HF contact?

A. To allow each station to operate according to conditions

B. To be sure the contact will count for award programs

C. To follow standard radiogram structure

D. To allow each station to calibrate their frequency display

G2E – Digital mode operating procedures

Points of Discussion

LSB (lower sideband) mode is normally used when sending RTTY (radio teletype) signals via AFSK with an SSB (single sideband) transmitter.

VARA: a digital protocol used with Winlink

Frequent retries or timeouts, long pauses in message retransmission, or failure to establish a connection between stations can all be the result of other signals interfering with PACTOR or VARA transmissions.

Finding a clear frequency during the alternate time slot to the calling station is a good practice when choosing a transmitting frequency to answer a station calling “CQ” using FT8.

The standard sideband for JT65, JT9, FT4, or FT8 digital signals when using AFSK is the USB (upper sideband).

170 Hz is the most common frequency shift for RTTY (Radioteletype) emissions in the amateur HF bands.

Computer time accurate to within approximately 1 second is required when using FT8.

14.070 MHz to 14.100 MHz is the segment of the 20-meter band on which most digital mode operations are commonly found.

PACTOR connections are limited to 2 stations, so joining an existing PACTOR contact is not possible.

To establish contact with a digital messaging system gatewey station, transmit a connect message on the station's published frequency.

The primary purpose of an Amateur Radio Emergency Data Network (AREDN) is to provide high-speed data services during an emergency or community event.

Winlink is a form of Packet Radio that uses an amateur radio wireless network to send and receive email on the internet. It is also capable of both VHF and HF band operations.

Winlink Remote Message Server is also known as “Gateway.”

If you cannot decode an RTTY (radio teletype) or other FSK (Frequency Shift Keying) signal, even when it is apparently tuned in properly, check the following: the mark and space frequencies may be reversed, the wrong baud rate may have been selected, or you could be listening to the wrong sideband.

FT8 transmissions can commonly be found between 14.074 MHz to 14.077 MHz.

Questions?

G2E01

Which mode is normally used when sending RTTY signals via AFSK with an SSB transmitter?

A. USB

B. DSB

C. CW

D. LSB

G2E01

Which mode is normally used when sending RTTY signals via AFSK with an SSB transmitter?

A. USB

B. DSB

C. CW

D. LSB

G2E02

What is VARA?

A. A low signal-to-noise digital mode used for EME (moonbounce)

B. A digital protocol used with Winlink

C. A radio direction finding system used on VHF and UHF

D.A DX spotting system using a network of software defined radios

G2E02

What is VARA?

A. A low signal-to-noise digital mode used for EME (moonbounce)

B. A digital protocol used with Winlink

C. A radio direction finding system used on VHF and UHF

D.A DX spotting system using a network of software defined radios

G2E03

What symptoms may result from other signals interfering with a PACTOR or VARA transmission?

A. Frequent retries or timeouts

B. Long pauses in message transmission

C. Failure to establish a connection between stations

D. All these choices are correct

G2E03

What symptoms may result from other signals interfering with a PACTOR or VARA transmission?

A. Frequent retries or timeouts

B. Long pauses in message transmission

C. Failure to establish a connection between stations

D. All these choices are correct

G2E04

Which of the following is good practice when choosing a transmitting frequency to answer a station calling CQ using FT8?

A. Always call on the station’s frequency

B. Call on any frequency in the waterfall except the station’s frequency

C. Find a clear frequency during the same time slot as the calling station

D. Find a clear frequency during the alternate time slot to the calling station

G2E04

Which of the following is good practice when choosing a transmitting frequency to answer a station calling CQ using FT8?

A. Always call on the station’s frequency

B. Call on any frequency in the waterfall except the station’s frequency

C. Find a clear frequency during the same time slot as the calling station

D. Find a clear frequency during the alternate time slot to the calling station

G2E05

What is the standard sideband for JT65, JT9, FT4, or FT8 digital signal when using AFSK?

A. LSB

B. USB

C. DSB

D. SSB

G2E05

What is the standard sideband for JT65, JT9, FT4, or FT8 digital signal when using AFSK?

A. LSB

B. USB

C. DSB

D. SSB

G2E06

What is the most common frequency shift for RTTY emissions in the amateur HF bands?

A. 85 Hz

B. 170 Hz

C. 425 Hz

D. 850 Hz

G2E06

What is the most common frequency shift for RTTY emissions in the amateur HF bands?

A. 85 Hz

B. 170 Hz

C. 425 Hz

D. 850 Hz

G2E07

Which of the following is required when using FT8?

A. A special hardware modem

B. Computer time accurate to within approximately 1 second

C. Receiver attenuator set to -12 dB

D. A vertically polarized antenna

G2E07

Which of the following is required when using FT8?

A. A special hardware modem

B. Computer time accurate to within approximately 1 second

C. Receiver attenuator set to -12 dB

D. A vertically polarized antenna

G2E08

In what segment of the 20-meter band are most digital mode operations commonly found?

A. At the bottom of the slow-scan TV segment, near 14.230 MHz

B. At the top of the SSB phone segment, near 14.325 MHz

C. In the middle of the CW segment, near 14.100 MHz

D. Between 14.070 MHz and 14.100 MHz

G2E08

In what segment of the 20-meter band are most digital mode operations commonly found?

A. At the bottom of the slow-scan TV segment, near 14.230 MHz

B. At the top of the SSB phone segment, near 14.325 MHz

C. In the middle of the CW segment, near 14.100 MHz

D. Between 14.070 MHz and 14.100 MHz

G2E09

How do you join a contact between two stations using the PACTOR protocol?

A. Send broadcast packets containing your call sign while in MONITOR mode

B. Transmit a steady carrier until the PACTOR protocol times out and disconnects

C. Joining an existing contact is not possible, PACTOR connections are limited to two stations

D. Send a NAK code

G2E09

How do you join a contact between two stations using the PACTOR protocol?

A. Send broadcast packets containing your call sign while in MONITOR mode

B. Transmit a steady carrier until the PACTOR protocol times out and disconnects

C. Joining an existing contact is not possible, PACTOR connections are limited to two stations

D. Send a NAK code

G2E10

Which of the following is a way to establish contact with a digital messaging system gateway station?

A. Send an email to the system control operator

B. Send QRL in Morse code

C. Respond when the station broadcasts its SSID

D. Transmit a connect message on the station’s published frequency

G2E10

Which of the following is a way to establish contact with a digital messaging system gateway station?

A. Send an email to the system control operator

B. Send QRL in Morse code

C. Respond when the station broadcasts its SSID

D. Transmit a connect message on the station's published frequency

G2E11

What is the primary purpose of an Amateur Radio Emergency Data Network (AREDN) mesh network?

A. To provide FM repeater coverage in remote areas

B. To provide real time propagation data by monitoring amateur radio transmissions worldwide

C. To provide high-speed data services during an emergency or community event

D. To provide DX spotting reports to aid contesters and DXers

G2E11

What is the primary purpose of an Amateur Radio Emergency Data Network (AREDN) mesh network?

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B. To provide real time propagation data by monitoring amateur radio transmissions worldwide

C. To provide high-speed data services during an emergency or community event

D. To provide DX spotting reports to aid contesters and DXers

G2E12

Which of the following describes Winlink?

A. An amateur radio wireless network to send and receive email on the internet

B. A form of Packet Radio

C. A wireless network capable of both VHF and HF band operation

D. All of the above

G2E12

Which of the following describes Winlink?

A. An amateur radio wireless network to send and receive email on the internet

B. A form of Packet Radio

C. A wireless network capable of both VHF and HF band operation

D. All of the above

G2E13

What is another name for a Winlink Remote Message Server?

A. Terminal Node Controller

B. Gateway

C. RJ-45

D. Printer/Server

G2E13

What is another name for a Winlink Remote Message Server?

A. Terminal Node Controller

B. Gateway

C. RJ-45

D. Printer/Server

G2E14

What could be wrong if you cannot decode an RTTY or other FSK signal even though it is apparently tuned in properly?

A. The mark and space frequencies may be reversed

B. You may have selected the wrong baud rate

C. You may be listening on the wrong sideband

D. All these choices are correct

G2E14

What could be wrong if you cannot decode an RTTY or other FSK signal even though it is apparently tuned in properly?

A. The mark and space frequencies may be reversed

B. You may have selected the wrong baud rate

C. You may be listening on the wrong sideband

D. All these choices are correct

G2E15

Which of the following is a common location for FT8?

A. Anywhere in the voice portion of the band

B. Anywhere in the CW portion of the band

C. Approximately 14.074 MHz to 14.077 MHz

D. Approximately 14.110 MHz to 14.113 MHz

G2E15

Which of the following is a common location for FT8?

A. Anywhere in the voice portion of the band

B. Anywhere in the CW portion of the band

C. Approximately 14.074 MHz to 14.077 MHz

D. Approximately 14.110 MHz to 14.113 MHz

SUBELEMENT G3 – RADIO WAVE PROPAGATION

[3 Exam Questions – 3 Groups]

G3A – Sunspots and solar radiation; geomagnetic field and stability indices

Points of Discussion

High sunspot numbers generally indicate a greater probability of good propagation at higher frequencies.

A sudden ionospheric disturbance (SID) affects daytime ionospheric propagation on the lower frequencies more than it does those on the higher frequencies.

It takes increased ultraviolet (UV) and X-ray radiation from a solar flare about 8 minutes to affect radio propagation on the Earth.

During periods of low sunspot activity, 10-, 12-, and 15-meter bands are the least reliable for long-distance communications.

Solar Flux Index: a measure of solar radiation with a wavelength of 10.7 centimeters.

Geomagnetic Storm: a temporary disturbance in the Earth's geomagnetic field.

The 20-meter band usually supports worldwide propagation during daylight hours at any point during the solar cycle.

A geomagnetic storm can degrade high-latitude HF propagation.

High geomagnetic activity can create auroras that can reflect VHF signals.

The rotation of the Sun's surface layers around its axis can cause HF propagation conditions to vary periodically in a 26- to 28-day cycle.

A coronal mass ejection can take anywhere from 15 hours to several days to affect radio propagation on the Earth.

K-Index: a measure of the short-term stability of the Earth's geomagnetic field.

A-Index: a measure of the long-term stability of the Earth's geomagnetic field.

HF communications can be disturbed by the charged particles that reach the Earth from solar coronal holes.

Questions?

G3A01

How does a higher sunspot number affect HF propagation?

A. Higher sunspot numbers generally indicate a greater probability of good propagation at higher frequencies

B. Lower sunspot numbers generally indicate greater probability of sporadic E propagation

C. A zero sunspot number indicates that radio propagation is not possible on any band

D. A zero sunspot number indicates undisturbed conditions

G3A01

How does a higher sunspot number affect HF propagation?

A. Higher sunspot numbers generally indicate a greater probability of good propagation at higher frequencies

B. Lower sunspot numbers generally indicate greater probability of sporadic E propagation

C. A zero sunspot number indicates that radio propagation is not possible on any band

D. A zero sunspot number indicates undisturbed conditions

G3A02

What effect does a sudden ionospheric disturbance have on the daytime ionospheric propagation?

A. It enhances propagation on all HF frequencies

B. It disrupts signals on lower frequencies more than those on higher frequencies

C. It disrupts communications via satellite more than direct communications

D. None, because only areas on the night side of the Earth are affected

G3A02

What effect does a sudden ionospheric disturbance have on the daytime ionospheric propagation?

A. It enhances propagation on all HF frequencies

B. It disrupts signals on lower frequencies more than those on higher frequencies

C. It disrupts communications via satellite more than direct communications

D. None, because only areas on the night side of the Earth are affected

G3A03

Approximately how long does it take the increased ultraviolet and X-ray radiation from a solar flare to affect radio propagation on Earth?

A. 28 days

B. 1 to 2 hours

C. 8 minutes

D. 20 to 40 hours

G3A03

Approximately how long does it take the increased ultraviolet and X-ray radiation from a solar flare to affect radio propagation on Earth?

A. 28 days

B. 1 to 2 hours

C. 8 minutes

D. 20 to 40 hours

G3A04

Which of the following are the least reliable bands for long-distance communications during periods of low solar activity?

A. 80 meters and 160 meters

B. 60 meters and 40 meters

C. 30 meters and 20 meters

D. 15 meters, 12 meters, and 10 meters

G3A04

Which of the following are the least reliable bands for long-distance communications during periods of low solar activity?

A. 80 meters and 160 meters

B. 60 meters and 40 meters

C. 30 meters and 20 meters

D. 15 meters, 12 meters, and 10 meters

G3A05

What is the solar flux index?

A. A measure of the highest frequency that is useful for ionospheric propagation between two points on Earth

B. A count of sunspots that is adjusted for solar emissions

C. Another name for the American sunspot number

D. A measure of solar radiation with a wavelength of 10.7 centimeters

G3A05

What is the solar flux index?

A. A measure of the highest frequency that is useful for ionospheric propagation between two points on Earth

B. A count of sunspots that is adjusted for solar emissions

C. Another name for the American sunspot number

D. A measure of solar radiation with a wavelength of 10.7 centimeters

G3A06

What is a geomagnetic storm?

A. A sudden drop in the solar flux index

B. A thunderstorm that affects radio propagation

C. Ripples in the geomagnetic force

D. A temporary disturbance in Earth’s geomagnetic field

G3A06

What is a geomagnetic storm?

A. A sudden drop in the solar flux index

B. A thunderstorm that affects radio propagation

C. Ripples in the geomagnetic force

D. A temporary disturbance in Earth’s geomagnetic field

G3A07

At what point in the solar cycle does the 20-meter band usually support worldwide propagation during daylight hours?

A. At the summer solstice

B. Only at the maximum point

C. Only at the minimum point

D. At any point

G3A07

At what point in the solar cycle does the 20-meter band usually support worldwide propagation during daylight hours?

A. At the summer solstice

B. Only at the maximum point

C. Only at the minimum point

D. At any point

G3A08

How can a geomagnetic storm affect HF propagation?

A. Improve high-latitude HF propagation

B. Degrade ground wave propagation

C. Improve ground wave propagation

D. Degrade high-latitude HF propagation

G3A08

How can a geomagnetic storm affect HF propagation?

A. Improve high-latitude HF propagation

B. Degrade ground wave propagation

C. Improve ground wave propagation

D. Degrade high-latitude HF propagation

G3A09

How can high geomagnetic activity benefit radio communications?

A. Creates auroras that can reflect VHF signals

B. Increases signal strength for HF signals passing through the polar regions

C. Improve HF long path propagation

D. Reduce long delayed echoes

G3A09

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D. Reduce long delayed echoes

G3A10

What causes HF propagation conditions to vary periodically in a 26- to 28-day cycle?

A. Long term oscillations in the upper atmosphere

B. Cyclic variation in Earth’s radiation belts

C. Rotation of the Sun’s surface layers around its axis

D. The position of the Moon in its orbit

G3A10

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B. Cyclic variation in Earth’s radiation belts

C. Rotation of the Sun’s surface layers around its axis

D. The position of the Moon in its orbit

G3A11

How long does it take a coronal mass ejection to affect radio propagation on Earth?

A. 28 days

B. 14 days

C. 4 to 8 minutes

D. 15 hours to several days

G3A11

How long does it take a coronal mass ejection to affect radio propagation on Earth?

A. 28 days

B. 14 days

C. 4 to 8 minutes

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G3A12

What does the K-index measure?

A. The relative position of sunspots on the surface of the Sun

B. The short-term stability of Earth’s geomagnetic field

C. The short-term stability of the Sun’s magnetic field

D. The solar radio flux at Boulder, Colorado

G3A12

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B. The short-term stability of Earth’s geomagnetic field

C. The short-term stability of the Sun’s magnetic field

D. The solar radio flux at Boulder, Colorado

G3A13

What does the A-index measure?

A. The relative position of sunspots on the surface of the Sun

B. The amount of polarization of the Sun’s electric field

C. The long-term stability of Earth’s geomagnetic field

D. The solar radio flux at Boulder, Colorado

G3A13

What does the A-index measure?

A. The relative position of sunspots on the surface of the Sun

B. The amount of polarization of the Sun's electric field

C. The long-term stability of Earth's geomagnetic field

D. The solar radio flux at Boulder, Colorado

G3A14

How is long distance radio communication usually affected by the charged particles that reach Earth from solar coronal holes?

A. HF communication is improved

B. HF communication is disturbed

C. VHF/UHF ducting is improved

D. VHF/UHF ducting is disturbed

G3A14

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C. VHF/UHF ducting is improved

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G3B – Maximum Usable Frequency; Lowest Usable Frequency; short path and long path propagation; determining propagation conditions; ionospheric refraction

Points of Discussion

A characteristic of signals arriving at your location by both long-path and short-path propagation is a slightly delayed echo.

Transmission path and location, time of day and season, and solar radiation and ionospheric disturbances all affect MUF (maximum usable frequency).

Frequencies just below the MUF (maximum usable frequency) will have the least attenuation for long-distance skip propagation.

You can determine current propagation from your station on a desired band by using a network of automated receiving stations on the internet to see where your transmissions are being received.

The ionosphere will refract radio waves back to the Earth that are below the MUF (maximum usable frequency) and above the LUF (lowest usable frequency).

Radio waves with frequencies below the LUF (lowest usable frequency) are attenuated before reaching their destination.

LUF: the Lowest Usable Frequency for communications between two specific points.

MUF: the Maximum Usable Frequency for communications between two specific points.

The approximate maximum distance of a single "hop" using the F2 region of the ionosphere is 2500 miles.

The approximate maximum distance of a single "hop" using the E region of the ionosphere is 1200 miles.

If the LUF (lowest usable frequency) exceeds the MUF (maximum usable frequency), propagation via ordinary skywave communications is not possible over that path.

During the summer, the lower HF frequencies typically experience higher levels of atmospheric noise or static.

Questions?

G3B01

What is a characteristic of skywave signals arriving at your location by both short-path and long-path propagation?

A. Periodic fading approximately every 10 seconds

B. Signal strength increased by 3 dB

C. The signal might be canceled causing severe attenuation

D. A slightly delayed echo might be heard

G3B01

What is a characteristic of skywave signals arriving at your location by both short-path and long-path propagation?

A. Periodic fading approximately every 10 seconds

B. Signal strength increased by 3 dB

C. The signal might be canceled causing severe attenuation

D. A slightly delayed echo might be heard

G3B02

What factors affect the MUF?

A. Path distance and location

B. Time of day and season

C. Solar radiation and ionospheric disturbances

D. All these choices are correct

G3B02

What factors affect the MUF?

A. Path distance and location

B. Time of day and season

C. Solar radiation and ionospheric disturbances

D. All these choices are correct

G3B03

Which frequency will have the least attenuation for long-distance skip propagation?

A. Just below the MUF

B. Just above the LUF

C. Just below the critical frequency

D. Just above the critical frequency

G3B03

Which frequency will have the least attenuation for long-distance skip propagation?

A. Just below the MUF

B. Just above the LUF

C. Just below the critical frequency

D. Just above the critical frequency

G3B04

Which of the following is a way to determine current propagation on a desired band from your station?

A. Use a network of automated receiving stations on the internet to see where your transmissions are being received

B. Check the A-index

C. Send a series of dots and listen for echoes

D. All these choices are correct

G3B04

Which of the following is a way to determine current propagation on a desired band from your station?

A. Use a network of automated receiving stations on the internet to see where your transmissions are being received

B. Check the A-index

C. Send a series of dots and listen for echoes

D. All these choices are correct

G3B05

How does the ionosphere affect radio waves with frequencies below the MUF and above the LUF?

A. They are refracted back to Earth

B. They pass through the ionosphere

C. They are amplified by interaction with the ionosphere

D. They are refracted and trapped in the ionosphere to circle Earth

G3B05

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B. They pass through the ionosphere

C. They are amplified by interaction with the ionosphere

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G3B06

What usually happens to radio waves with frequencies below the LUF?

A. They are refracted back to Earth

B. They pass through the ionosphere

C. They are attenuated before reaching the destination

D. They are refracted and trapped in the ionosphere to circle Earth

G3B06

What usually happens to radio waves with frequencies below the LUF?

A. They are refracted back to Earth

B. They pass through the ionosphere

C. They are attenuated before reaching the destination

D. They are refracted and trapped in the ionosphere to circle Earth

G3B07

What does LUF stand for?

A. The Lowest Usable Frequency for communications between two specific points

B. Lowest Usable Frequency for communications to any point outside a 100-mile radius

C. The Lowest Usable Frequency during a 24-hour period

D. Lowest Usable Frequency during the past 60 minutes

G3B07

What does LUF stand for?

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B. Lowest Usable Frequency for communications to any point outside a 100-mile radius

C. The Lowest Usable Frequency during a 24-hour period

D. Lowest Usable Frequency during the past 60 minutes

G3B08

What does MUF stand for?

A. The Minimum Usable Frequency for communications between two points

B. The Maximum Usable Frequency for communications between two points

C. The Minimum Usable Frequency during a 24-hour period

D. The Maximum Usable Frequency during a 24-hour period

G3B08

What does MUF stand for?

A. The Minimum Usable Frequency for communications between two points

B. The Maximum Usable Frequency for communications between two points

C. The Minimum Usable Frequency during a 24-hour period

D. The Maximum Usable Frequency during a 24-hour period

G3B09

What is the approximate maximum distance along the Earth's surface normally covered in one hop using the F2 region?

A. 180 miles

B. 1,200 miles

C. 2,500 miles

D. 12,000 miles

G3B09

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A. 180 miles

B. 1,200 miles

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D. 12,000 miles

G3B10

What is the approximate maximum distance along the Earth's surface normally covered in one hop using the E region?

A. 180 miles

B. 1,200 miles

C. 2,500 miles

D. 12,000 miles

G3B10

What is the approximate maximum distance along the Earth's surface normally covered in one hop using the E region?

A. 180 miles

B. 1,200 miles

C. 2,500 miles

D. 12,000 miles

G3B11

What happens to HF propagation when the LUF exceeds the MUF?

A. Propagation via ordinary skywave communications is not possible over that path

B. HF communications over the path are enhanced

C. Double-hop propagation along the path is more common

D. Propagation over the path on all HF frequencies is enhanced

G3B11

What happens to HF propagation when the LUF exceeds the MUF?

A. Propagation via ordinary skywave communications is not possible over that path

B. HF communications over the path are enhanced

C. Double-hop propagation along the path is more common

D. Propagation over the path on all HF frequencies is enhanced

G3B12

Which of the following is typical of the lower HF frequencies during the summer?

A. Poor propagation at any time of day

B. World-wide propagation during daylight hours

C. Heavy distortion on signals due to photon absorption

D. High levels of atmospheric noise or static

G3B12

Which of the following is typical of the lower HF frequencies during the summer?

A. Poor propagation at any time of day

B. World-wide propagation during daylight hours

C. Heavy distortion on signals due to photon absorption

D. High levels of atmospheric noise or static

G3C – Ionospheric regions; critical angle and frequency; HF scatter; near vertical incidence skywave (NVIS)

Points of Discussion

The D region of the ionosphere is closest to the Earth's surface.

Critical Frequency: the highest frequency which is refracted back to the Earth when operating at a given incidence angle.

The skip propagation of the F2 region of the ionosphere is the longest because it is the layer that is the highest above the Earth's surface.

Critical Angle: the highest takeoff angle that will return a radio wave to the Earth under specific ionospheric conditions.

Long-distance communications on the 40-, 60-, 80-, and 160-meter bands are more difficult during daylight hours as the D region of the ionosphere absorbs signals in those frequencies.

HF scatter signals have a fluttering sound.

HF scatter signals often sound distorted because energy is scattered into the skip zone through several paths.

HF scatter signals in the skip zone are usually weak because only a small part of the signal energy is scattered into the skip zone.

Scatter propagation allows signals to be heard in the transmitting station's skip zone.

Near Vertical Incident Skywave (NVIS) propagation is short distance MF or HF propagation at high elevation angles.

The D region of the ionosphere is the most absorbent of signals below 10 MHz during daylight hours.

Questions?

G3C01

Which ionospheric region is closest to the surface of Earth?

A. The D region

B. The E region

C. The F1 region

D. The F2 region

G3C01

Which ionospheric region is closest to the surface of Earth?

A. The D region

B. The E region

C. The F1 region

D. The F2 region

G3C02

What is meant by the term “critical frequency” at a given incidence angle?

A. The highest frequency which is refracted back to Earth

B. The lowest frequency which is refracted back to Earth

C. The frequency at which the signal-to-noise ratio approaches unity

D. The frequency at which the signal-to-noise ratio is 6 dB

G3C02

What is meant by the term “critical frequency” at a given incidence angle?

A. The highest frequency which is refracted back to Earth

B. The lowest frequency which is refracted back to Earth

C. The frequency at which the signal-to-noise ratio approaches unity

D. The frequency at which the signal-to-noise ratio is 6 dB

G3C03

Why is skip propagation via the F2 region longer than that via the other ionospheric regions?

A. Because it is the densest

B. Because of the Doppler effect

C. Because it is the highest

D. Because of temperature inversions

G3C03

Why is skip propagation via the F2 region longer than that via the other ionospheric regions?

A. Because it is the densest

B. Because of the Doppler effect

C. Because it is the highest

D. Because of temperature inversions

G3C04

What does the term “critical angle” mean, as applied to radio wave propagation?

A. The long path azimuth of a distant station

B. The short path azimuth of a distant station

C. The lowest takeoff angle that will return a radio wave to Earth under specific ionospheric conditions

D. The highest takeoff angle that will return a radio wave to Earth under specific ionospheric conditions

G3C04

What does the term “critical angle” mean, as applied to radio wave propagation?

A. The long path azimuth of a distant station

B. The short path azimuth of a distant station

C. The lowest takeoff angle that will return a radio wave to Earth under specific ionospheric conditions

D. The highest takeoff angle that will return a radio wave to Earth under specific ionospheric conditions

G3C05

Why is long-distance communication on the 40-, 60-, 80-, and 160-meter bands more difficult during the day?

A. The F region absorbs signals at these frequencies during daylight hours

B. The F region is unstable during daylight hours

C. The D region absorbs signals at these frequencies during daylight hours

D. The E region is unstable during daylight hours

G3C05

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C. The D region absorbs signals at these frequencies during daylight hours

D. The E region is unstable during daylight hours

G3C06

What is a characteristic of HF scatter?

A. Phone signals have high intelligibility

B. Signals have a fluttering sound

C. There are very large, sudden swings in signal strength

D. Scatter propagation occurs only at night

G3C06

What is a characteristic of HF scatter?

A. Phone signals have high intelligibility

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G3C07

What makes HF scatter signals often sound distorted?

A. The ionospheric region involved is unstable

B. Ground waves are absorbing much of the signal

C. The E region is not present

D. Energy is scattered into the skip zone through several different paths

G3C07

What makes HF scatter signals often sound distorted?

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C. The E region is not present

D. Energy is scattered into the skip zone through several different paths

G3C08

Why are HF scatter signals in the skip zone usually weak?

A. Only a small part of the signal energy is scattered into the skip zone

B. Signals are scattered from the magnetosphere, which is not a good reflector

C. Propagation is via ground waves, which absorb most of the signal energy

D. Propagation is via ducts in the F region, which absorb most of the energy

G3C08

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G3C09

What type of propagation allows signals to be heard in the transmitting station's skip zone?

A. Faraday rotation

B. Scatter

C. Chordal hop

D. Short-path

G3C09

What type of propagation allows signals to be heard in the transmitting station's skip zone?

A. Faraday rotation

B. Scatter

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D. Short-path

G3C10

What is near vertical incidence skywave (NVIS) propagation?

A. Propagation near the MUF

B. Short distance MF or HF propagation at high elevation angles

C. Long path HF propagation at sunrise and sunset

D. Double hop propagation near the LUF

G3C10

What is near vertical incidence skywave (NVIS) propagation?

A. Propagation near the MUF

B. Short distance MF or HF propagation at high elevation angles

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D. Double hop propagation near the LUF

G3C11

Which ionospheric region is the most absorbent of signals below 10 MHz during daylight hours?

A. The F2 region

B. The F1 region

C. The E region

D. The D region

G3C11

Which ionospheric region is the most absorbent of signals below 10 MHz during daylight hours?

A. The F2 region

B. The F1 region

C. The E region

D. The D region

SUBELEMENT G4 – AMATEUR RADIO PRACTICES

[5 Exam Questions – 5 groups]

G4A – Station configuration and operation

Points of Discussion

A notch filter is used to reduce interference from carriers in the receiver passband.

Using the opposite or “reverse” sideband when receiving CW can help to reduce or eliminate interference from other signals.

A noise blanker works by reducing receiver gain during a noise pulse.

The correct setting of a vacuum-tube RF power amplifier's TUNE control causes a pronounced dip in the plate current.

Automatic Level Control (ALC) is used with an RF power amplifier to prevent excessive drive.

An antenna tuner increases power transfer from the transmitter to the feed line.

Received signals may become distorted as a receiver's noise reduction control level is increased.

The correct adjustment for the LOAD or COUPLING control of a vacuum tube RF power amplifier will generate the desired output without exceeding maximum allowable plate current.

RF output is delayed after activating a transmitter's keying line to an external amplifier to allow time for the amplifier to switch the antenna between the transceiver and the amplifier output.

An electronic keyer allows the automatic generation of dots and dashes for Morse Code (CW) operation.

The ALC (automatic level control) system should be inactive when transmitting AFSK data signals because the ALC action distorts the signal.

A common use of the dual-VFO feature on a transceiver is to transmit on one frequency and listen on another.

A receive attenuator is used to prevent receiver overload from strong incoming signals.

Questions?

G4A01

What is the purpose of the notch filter found on many HF transceivers?

A. To restrict the transmitter voice bandwidth

B. To reduce interference from carriers in the receiver passband

C. To eliminate receiver interference from impulse noise sources

D. To remove interfering splatter generated by signals on adjacent frequencies

G4A01

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A. To restrict the transmitter voice bandwidth

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G4A02

What is the benefit of using the opposite or “reverse” sideband when receiving CW?

A. Interference from impulse noise will be eliminated

B. More stations can be accommodated within a given signal passband

C. It may be possible to reduce or eliminate interference from other signals

D. Accidental out-of-band operation can be prevented

G4A02

What is the benefit of using the opposite or “reverse” sideband when receiving CW?

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G4A03

How does a noise blanker work?

A. By temporarily increasing received bandwidth

B. By redirecting noise pulses into a filter capacitor

C. By reducing receiver gain during a noise pulse

D. By clipping noise peaks

G4A03

How does a noise blanker work?

A. By temporarily increasing received bandwidth

B. By redirecting noise pulses into a filter capacitor

C. By reducing receiver gain during a noise pulse

D. By clipping noise peaks

G4A04

What is the effect on plate current of the correct setting of a vacuum-tube RF power amplifier's TUNE control?

A. A pronounced peak

B. A pronounced dip

C. No change will be observed

D. A slow, rhythmic oscillation

G4A04

What is the effect on plate current of the correct setting of a vacuum-tube RF power amplifier's TUNE control?

A. A pronounced peak

B. A pronounced dip

C. No change will be observed

D. A slow, rhythmic oscillation

G4A05

Why is automatic level control (ALC) used with an RF power amplifier?

A. To balance the transmitter audio frequency response

B. To reduce harmonic radiation

C. To prevent excessive drive

D. To increase overall efficiency

G4A05

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G4A06

What is the purpose of an antenna tuner?

A. Reduce the SWR in the feed line to the antenna

B. Reduce the power dissipation in the feedline to the antenna

C. Increase power transfer from the transmitter to the feed line

D. All these choices are correct

G4A06

What is the purpose of an antenna tuner?

A. Reduce the SWR in the feed line to the antenna

B. Reduce the power dissipation in the feedline to the antenna

C. Increase power transfer from the transmitter to the feed line

D. All these choices are correct

G4A07

What happens as a receiver's noise reduction control level is increased?

A. Received signals may become distorted

B. Received frequency may become unstable

C. CW signals may become severely attenuated

D. Received frequency may shift several kHz

G4A07

What happens as a receiver’s noise reduction control level is increased?

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B. Received frequency may become unstable

C. CW signals may become severely attenuated

D. Received frequency may shift several kHz

G4A08

What is the correct adjustment for the LOAD or COUPLING control of a vacuum tube RF power amplifier?

A. Minimum SWR on the antenna

B. Minimum plate current without exceeding maximum allowable grid current

C. Highest plate voltage while minimizing grid current

D. Desired power output without exceeding maximum allowable plate current

G4A08

What is the correct adjustment for the LOAD or COUPLING control of a vacuum tube RF power amplifier?

A. Minimum SWR on the antenna

B. Minimum plate current without exceeding maximum allowable grid current

C. Highest plate voltage while minimizing grid current

D. Desired power output without exceeding maximum allowable plate current

G4A09

What is the purpose of delaying RF output after activating a transmitter's keying line to an external amplifier?

A. To prevent key clicks on CW

B. To prevent transient overmodulation

C. To allow time for the amplifier to switch the antenna between the transceiver and the amplifier output

D. To allow time for the amplifier power supply to reach operating level

G4A09

What is the purpose of delaying RF output after activating a transmitter's keying line to an external amplifier?

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D. To allow time for the amplifier power supply to reach operating level

G4A10

What is the function of an electronic keyer?

A. Automatic transmit/receive switching

B. Automatic generation of dots and dashes for CW operation

C. To allow time for switching the antenna from the receiver to the transmitter

D. Computer interface for PSK and RTTY operation

G4A10

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G4A11

Why should the ALC system be inactive when transmitting AFSK data signals?

A. ALC will invert the modulation of the AFSK mode

B. The ALC action distorts the signal

C. When using digital modes, too much ALC activity can cause the transmitter to overheat

D. All these choices are correct

G4A11

Why should the ALC system be inactive when transmitting AFSK data signals?

A. ALC will invert the modulation of the AFSK mode

B. The ALC action distorts the signal

C. When using digital modes, too much ALC activity can cause the transmitter to overheat

D. All these choices are correct

G4A12

Which of the following is a common use of the dual-VFO feature on a transceiver?

A. To allow transmitting on two frequencies at once

B. To permit full duplex operation -- that is, transmitting and receiving at the same time

C. To transmit on one frequency and listen on another

D. To improve frequency accuracy by allowing variable frequency output (VFO) operation

G4A12

Which of the following is a common use of the dual-VFO feature on a transceiver?

A. To allow transmitting on two frequencies at once

B. To permit full duplex operation -- that is, transmitting and receiving at the same time

C. To transmit on one frequency and listen on another

D. To improve frequency accuracy by allowing variable frequency output (VFO) operation

G4A13

What is the purpose of using a receive attenuator?

A. To prevent receiver overload from strong incoming signals

B. To reduce the transmitter power when driving a linear amplifier

C. To reduce power consumption when operating from batteries

D. To reduce excessive audio level on strong signals

G4A13

What is the purpose of using a receive attenuator?

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B. To reduce the transmitter power when driving a linear amplifier

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D. To reduce excessive audio level on strong signals

G4B – Tests and test equipment

Points of Discussion

Oscilloscope: an item of test equipment that contains horizontal and vertical channel amplifiers.

Complex waveforms can be measured on an oscilloscope but not on a digital voltmeter.

You can check the keying waveform of a CW transmitter on an oscilloscope.

The attenuated RF output of the transmitter is connected to the vertical input of an oscilloscope when checking the RF envelope pattern of a transmitted signal.

Voltmeters have a high input resistance to decrease the loading on circuits being measured.

A digital multimeter allows for higher precision in its readings than an analog multimeter.

Two non-harmonically related audio signals are used to conduct a two-tone test.

A two-tone test analyzes a transmitter's linearity.

An analog multimeter is preferred over a digital multimeter when adjusting circuits for minimum or maximum values.

A directional wattmeter can be used to determine Standing Wave Ratio (SWR).

An antenna and a feedline are connected to an antenna analyzer to measure Standing Wave Ratio (SWR).

Received power from strong signals transmitted by nearby transmitters can affect an antenna analyzer measuring Standing Wave Ratio (SWR).

The impedance of coaxial cable can be measured with an antenna analyzer.

Questions?

G4B01

What item of test equipment contains horizontal and vertical channel amplifiers?

A. An ohmmeter

B. A signal generator

C. An ammeter

D. An oscilloscope

G4B01

What item of test equipment contains horizontal and vertical channel amplifiers?

A. An ohmmeter

B. A signal generator

C. An ammeter

D. An oscilloscope

G4B02

Which of the following is an advantage of an oscilloscope versus a digital voltmeter?

A. An oscilloscope uses less power

B. Complex impedances can be easily measured

C. Greater precision

D. Complex waveforms can be measured

G4B02

Which of the following is an advantage of an oscilloscope versus a digital voltmeter?

A. An oscilloscope uses less power

B. Complex impedances can be easily measured

C. Greater precision

D. Complex waveforms can be measured

G4B03

Which of the following is the best instrument to use for checking the keying waveform of a CW transmitter?

A. An oscilloscope

B. A field strength meter

C. A sidetone monitor

D. A wavemeter

G4B03

Which of the following is the best instrument to use for checking the keying waveform of a CW transmitter?

A. An oscilloscope

B. A field strength meter

C. A sidetone monitor

D. A wavemeter

G4B04

What signal source is connected to the vertical input of an oscilloscope when checking the RF envelope pattern of a transmitted signal?

A. The local oscillator of the transmitter

B. An external RF oscillator

C. The transmitter balanced mixer output

D. The attenuated RF output of the transmitter

G4B04

What signal source is connected to the vertical input of an oscilloscope when checking the RF envelope pattern of a transmitted signal?

A. The local oscillator of the transmitter

B. An external RF oscillator

C. The transmitter balanced mixer output

D. The attenuated RF output of the transmitter

G4B05

Why do voltmeters have high input impedance?

A. It improves the frequency response

B. It allows for higher voltages to be safely measured

C. It improves the resolution of the readings

D. It decreases the loading on circuits being measured

G4B05

Why do voltmeters have high input impedance?

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G4B06

What is an advantage of a digital multimeter as compared to an analog multimeter?

A. Better for measuring computer circuits

B. Less prone to overload

C. Higher precision

D. Faster response

G4B06

What is an advantage of a digital multimeter as compared to an analog multimeter?

A. Better for measuring computer circuits

B. Less prone to overload

C. Higher precision

D. Faster response

G4B07

What signals are used to conduct a two-tone test?

A. Two audio signals of the same frequency shifted 90 degrees

B. Two non-harmonically related audio signals

C. Two swept frequency tones

D. Two audio frequency range square wave signals of equal amplitude

G4B07

What signals are used to conduct a two-tone test?

A. Two audio signals of the same frequency shifted 90 degrees

B. Two non-harmonically related audio signals

C. Two swept frequency tones

D. Two audio frequency range square wave signals of equal amplitude

G4B08

What transmitter performance parameter does a two-tone test analyze?

A. Linearity

B. Percentage of suppression of the carrier and undesired sideband for SSB

C. Percentage of frequency modulation

D. Percentage of carrier phase shift

G4B08

What transmitter performance parameter does a two-tone test analyze?

A. Linearity

B. Percentage of suppression of the carrier and undesired sideband for SSB

C. Percentage of frequency modulation

D. Percentage of carrier phase shift

G4B09

When is an analog multimeter preferred to a digital multimeter?

A. When testing logic circuits

B. When high precision is desired

C. When measuring the frequency of an oscillator

D. When adjusting circuits for maximum or minimum values

G4B09

When is an analog multimeter preferred to a digital multimeter?

A. When testing logic circuits

B. When high precision is desired

C. When measuring the frequency of an oscillator

D. When adjusting circuits for maximum or minimum values

G4B10

Which of the following can be determined with a directional wattmeter?

A. Standing wave ratio

B. Antenna front-to-back ratio

C. RF interference

D. Radio wave propagation

G4B10

Which of the following can be determined with a directional wattmeter?

A. Standing wave ratio

B. Antenna front-to-back ratio

C. RF interference

D. Radio wave propagation

G4B11

Which of the following must be connected to an antenna analyzer when it is being used for SWR measurements?

A. Receiver

B. Transmitter

C. Antenna and feed line

D. All these choices are correct

G4B11

Which of the following must be connected to an antenna analyzer when it is being used for SWR measurements?

A. Receiver

B. Transmitter

C. Antenna and feed line

D. All these choices are correct

G4B12

What effect can strong signals from nearby transmitters have on an antenna analyzer?

A. Desensitization which can cause intermodulation products which interfere with impedance readings

B. Received power that interferes with SWR readings

C. Generation of harmonics which interfere with frequency readings

D. All these choices are correct

G4B12

What effect can strong signals from nearby transmitters have on an antenna analyzer?

A. Desensitization which can cause intermodulation products which interfere with impedance readings

B. Received power that interferes with SWR readings

C. Generation of harmonics which interfere with frequency readings

D. All these choices are correct

G4B13

Which of the following can be measured with an antenna analyzer?

A. Front-to-back ratio of an antenna

B. Power output from a transmitter

C. Impedance of coaxial cable

D. Gain of a directional antenna

G4B13

Which of the following can be measured with an antenna analyzer?

A. Front-to-back ratio of an antenna

B. Power output from a transmitter

C. Impedance of coaxial cable

D. Gain of a directional antenna

G4C – Interference to consumer electronics; grounding and bonding

Points of Discussion

A bypass capacitor might be useful in reducing RF interference to audio frequency circuits.

Arcing at a poor electrical connection could be the cause of interference covering a wide range of frequencies.

Distorted speech can be heard from an audio device experiencing RF interference from a single sideband phone (voice) transmitter.

On-and-off humming or clicking can be heard from an audio device experiencing RF interference from a CW transmitter.

A ground wire that has high impedance on a specific frequency can cause high voltages that can produce RF burns.

A resonant ground connection can cause high RF voltages on the enclosures of station equipment.

Soldered joints should not be used in lighting protection ground connections because the joint will likely be destroyed by the heat of a lightning strike.

A ferrite choke on an audio cable can reduce RF interference caused by common-mode current passing through that cable.

Bonding equipment enclosures together can minimize the effects of ground loops.

A ground loop can cause a “hum” on your station's transmitted signal.

Bonding equipment enclosures together can help minimize RF “hot spots” in an amateur station.

All metal enclosures of station equipment must be grounded to ensure that hazardous voltages cannot appear on the chassis.

Questions?

G4C01

Which of the following might be useful in reducing RF interference to audio frequency circuits?

A. Bypass inductor

B. Bypass capacitor

C. Forward-biased diode

D. Reverse-biased diode

G4C01

Which of the following might be useful in reducing RF interference to audio frequency circuits?

A. Bypass inductor

B. Bypass capacitor

C. Forward-biased diode

D. Reverse-biased diode

G4C02

Which of the following could be a cause of interference covering a wide range of frequencies?

A. Not using a balun or line isolator to feed balanced antennas

B. Lack of rectification of the transmitter’s signal in power conductors

C. Arcing at a poor electrical connection

D. Using a balun to feed an unbalanced antenna

G4C02

Which of the following could be a cause of interference covering a wide range of frequencies?

A. Not using a balun or line isolator to feed balanced antennas

B. Lack of rectification of the transmitter’s signal in power conductors

C. Arcing at a poor electrical connection

D. Using a balun to feed an unbalanced antenna

G4C03

What sound is heard from an audio device experiencing RF interference from a single sideband phone transmitter?

A. A steady hum whenever the transmitter is on the air

B. On-and-off humming or clicking

C. Distorted speech

D. Clearly audible speech

G4C03

What sound is heard from an audio device experiencing RF interference from a single sideband phone transmitter?

A. A steady hum whenever the transmitter is on the air

B. On-and-off humming or clicking

C. Distorted speech

D. Clearly audible speech

G4C04

What sound is heard from an audio device experiencing RF interference from a CW transmitter?

A. On-and-off humming or clicking

B. A CW signal at a nearly pure audio frequency

C. A chirpy CW signal

D. Severely distorted audio

G4C04

What sound is heard from an audio device experiencing RF interference from a CW transmitter?

A. On-and-off humming or clicking

B. A CW signal at a nearly pure audio frequency

C. A chirpy CW signal

D. Severely distorted audio

G4C05

What is a possible cause of high voltages that produce RF burns?

A. Flat braid rather than round wire has been used for the ground wire

B. Insulated wire has been used for the ground wire

C. The ground rod is resonant

D. The ground wire has high impedance on that frequency

G4C05

What is a possible cause of high voltages that produce RF burns?

A. Flat braid rather than round wire has been used for the ground wire

B. Insulated wire has been used for the ground wire

C. The ground rod is resonant

D. The ground wire has high impedance on that frequency

G4C06

What is a possible effect of a resonant ground connection?

A. Overheating of ground straps

B. Corrosion of the ground rod

C. High RF voltages on the enclosures of station equipment

D. A ground loop

G4C06

What is a possible effect of a resonant ground connection?

A. Overheating of ground straps

B. Corrosion of the ground rod

C. High RF voltages on the enclosures of station equipment

D. A ground loop

G4C07

Why should soldered joints not be used in lightning protection ground connections?

A. A soldered joint will likely be destroyed by the heat of a lightning strike

B. Solder flux will prevent a low conductivity connection

C. Solder has too high a dielectric constant to provide adequate lightning protection

D. All these choices are correct

G4C07

Why should soldered joints not be used in lightning protection ground connections?

A. A soldered joint will likely be destroyed by the heat of a lightning strike

B. Solder flux will prevent a low conductivity connection

C. Solder has too high a dielectric constant to provide adequate lightning protection

D. All these choices are correct

G4C08

Which of the following would reduce RF interference caused by common-mode current on an audio cable?

A. Place a ferrite choke on the cable

B. Connect the center conductor to the shield of all cables to short circuit the RFI signal

C. Ground the center conductor of the audio cable causing the interference

D. Add an additional insulating jacket to the cable

G4C08

Which of the following would reduce RF interference caused by common-mode current on an audio cable?

A. Place a ferrite choke on the cable

B. Connect the center conductor to the shield of all cables to short circuit the RFI signal

C. Ground the center conductor of the audio cable causing the interference

D. Add an additional insulating jacket to the cable

G4C09

How can the effects of ground loops be minimized?

A. Connect all ground conductors in series

B. Connect the AC neutral conductor to the ground wire

C. Avoid using lock washers and star washers when making ground connections

D. Bond equipment enclosures together

G4C09

How can the effects of ground loops be minimized?

A. Connect all ground conductors in series

B. Connect the AC neutral conductor to the ground wire

C. Avoid using lock washers and star washers when making ground connections

D. Bond equipment enclosures together

G4C10

What could be a symptom caused by a ground loop in your station's audio connections?

A. You receive reports of "hum" on your station's transmitted signal

B. The SWR reading for one or more antennas is suddenly very high

C. An item of station equipment starts to draw excessive amounts of current

D. You receive reports of harmonic interference from your station

G4C10

What could be a symptom caused by a ground loop in your station's audio connections?

A. You receive reports of "hum" on your station's transmitted signal

B. The SWR reading for one or more antennas is suddenly very high

C. An item of station equipment starts to draw excessive amounts of current

D. You receive reports of harmonic interference from your station

G4C11

What technique helps to minimize RF “hot spots” in an amateur station?

A. Building all equipment in a metal enclosure

B. Using surge suppressor power outlets

C. Bonding all equipment enclosures together

D. Placing low-pass filters on all feed lines

G4C11

What technique helps to minimize RF “hot spots” in an amateur station?

A. Building all equipment in a metal enclosure

B. Using surge suppressor power outlets

C. Bonding all equipment enclosures together

D. Placing low-pass filters on all feed lines

G4C12

Why must all metal enclosures of station equipment be grounded?

A. It prevents a blown fuse in the event of an internal short circuit

B. It prevents signal overload

C. It ensures that the neutral wire is grounded

D. It ensures that hazardous voltages cannot appear on the chassis

G4C12

Why must all metal enclosures of station equipment be grounded?

A. It prevents a blown fuse in the event of an internal short circuit

B. It prevents signal overload

C. It ensures that the neutral wire is grounded

D. It ensures that hazardous voltages cannot appear on the chassis

G4D – Speech processors; S meters; sideband operation near band edges

Points of Discussion

A transceiver's speech processor increases the apparent loudness of transmitted voice (phone) signals.

A speech processor increases the average power of a single sideband (SSB) phone (voice) signal.

Distorted speech, excess intermodulation products, and excessive background noise can all be the result of an incorrectly adjusted speech processor.

An S-meter measures received signal strength.

A signal that reads 20 dB over S9 is 100x more powerful than a signal that reads S9.

1 S-unit on an S-meter represents a 6 dB change in signal strength.

The power output of a distant receiver needs to be raised about 4x to increase an S-meter reading from S8 to S9.

A 3 kHz lower sideband (LSB) signal with a carrier signal frequency of 7.178 MHz occupies a frequency range of 7.175 MHz to 7.178 MHz.

A 3 kHz upper sideband (USB) signal with a carrier signal frequency of 14.347 MHz occupies a frequency range of 14.347 MHz to 25.350 MHz.

Your displayed carrier frequency should be at least 3 kHz above the lower edge of the phone (voice) segment when using 3 kHz-wide LSB (lower sideband).

Your displayed carrier frequency should be at least 3 kHz below the upper edge of the phone (voice) segment when using 3 kHz-wide USB (upper sideband).

Questions?

G4D01

What is the purpose of a speech processor in a transceiver?

A. Increase the apparent loudness of transmitted voice signals

B. Increase transmitter bass response for more natural-sounding SSB signals

C. Prevent distortion of voice signals

D. Decrease high-frequency voice output to prevent out-of-band operation

G4D01

What is the purpose of a speech processor in a transceiver?

A. Increase the apparent loudness of transmitted voice signals

B. Increase transmitter bass response for more natural-sounding SSB signals

C. Prevent distortion of voice signals

D. Decrease high-frequency voice output to prevent out-of-band operation

G4D02

How does a speech processor affect a single sideband phone signal?

A. It increases peak power

B. It increases average power

C. It reduces harmonic distortion

D. It reduces intermodulation distortion

G4D02

How does a speech processor affect a single sideband phone signal?

A. It increases peak power

B. It increases average power

C. It reduces harmonic distortion

D. It reduces intermodulation distortion

G4D03

What is the effect of an incorrectly adjusted speech processor?

A. Distorted speech

B. Excess intermodulation products

C. Excessive background noise

D. All these choices are correct

G4D03

What is the effect of an incorrectly adjusted speech processor?

A. Distorted speech

B. Excess intermodulation products

C. Excessive background noise

D. All these choices are correct

G4D04

What does an S meter measure?

A. Carrier suppression

B. Impedance

C. Received signal strength

D. Transmitter power output

G4D04

What does an S meter measure?

A. Carrier suppression

B. Impedance

C. Received signal strength

D. Transmitter power output

G4D05

How does a signal that reads 20 dB over S9 compare to one that reads S9 on a receiver, assuming a properly calibrated S meter?

A. It is 10 times less powerful

B. It is 20 times less powerful

C. It is 20 times more powerful

D. It is 100 times more powerful

G4D05

How does a signal that reads 20 dB over S9 compare to one that reads S9 on a receiver, assuming a properly calibrated S meter?

A. It is 10 times less powerful

B. It is 20 times less powerful

C. It is 20 times more powerful

D. It is 100 times more powerful

G4D06

How much change in signal strength is typically represented by one S unit?

A. 6 dB

B. 12 dB

C. 15 dB

D. 18 dB

G4D06

How much change in signal strength is typically represented by one S unit?

A. 6 dB

B. 12 dB

C. 15 dB

D. 18 dB

G4D07

How much must the power output of a transmitter be raised to change the S meter reading on a distant receiver from S8 to S9?

A. Approximately 1.5 times

B. Approximately 2 times

C. Approximately 4 times

D. Approximately 8 times

G4D07

How much must the power output of a transmitter be raised to change the S meter reading on a distant receiver from S8 to S9?

A. Approximately 1.5 times

B. Approximately 2 times

C. Approximately 4 times

D. Approximately 8 times

G4D08

What frequency range is occupied by a 3 kHz LSB signal when the displayed carrier frequency is set to 7.178 MHz?

A. 7.178 MHz to 7.181 MHz

B. 7.178 MHz to 7.184 MHz

C. 7.175 MHz to 7.178 MHz

D. 7.1765 MHz to 7.1795 MHz

G4D08

What frequency range is occupied by a 3 kHz LSB signal when the displayed carrier frequency is set to 7.178 MHz?

A. 7.178 MHz to 7.181 MHz

B. 7.178 MHz to 7.184 MHz

C. 7.175 MHz to 7.178 MHz

D. 7.1765 MHz to 7.1795 MHz

G4D09

What frequency range is occupied by a 3 kHz USB signal with the displayed carrier frequency set to 14.347 MHz?

A. 14.347 MHz to 14.647 MHz

B. 14.347 MHz to 14.350 MHz

C. 14.344 MHz to 14.347 MHz

D. 14.3455 MHz to 14.3485 MHz

G4D09

What frequency range is occupied by a 3 kHz USB signal with the displayed carrier frequency set to 14.347 MHz?

A. 14.347 MHz to 14.647 MHz

B. 14.347 MHz to 14.350 MHz

C. 14.344 MHz to 14.347 MHz

D. 14.3455 MHz to 14.3485 MHz

G4D10

How close to the lower edge of a band's phone segment should your displayed carrier frequency be when using 3 kHz wide LSB?

A. At least 3 kHz above the edge of the segment

B. At least 3 kHz below the edge of the segment

C. At least 1 kHz below the edge of the segment

D. At least 1 kHz above the edge of the segment

G4D10

How close to the lower edge of a band's phone segment should your displayed carrier frequency be when using 3 kHz wide LSB?

A. At least 3 kHz above the edge of the segment

B. At least 3 kHz below the edge of the segment

C. At least 1 kHz below the edge of the segment

D. At least 1 kHz above the edge of the segment

G4D11

How close to the upper edge of a band’s phone segment should your displayed carrier frequency be when using 3 kHz wide USB?

A. At least 3 kHz above the edge of the band

B. At least 3 kHz below the edge of the band

C. At least 1 kHz above the edge of the segment

D. At least 1 kHz below the edge of the segment

G4D11

How close to the upper edge of a band's phone segment should your displayed carrier frequency be when using 3 kHz wide USB?

A. At least 3 kHz above the edge of the band

B. At least 3 kHz below the edge of the band

C. At least 1 kHz above the edge of the segment

D. At least 1 kHz below the edge of the segment

G4E – Mobile and portable HF stations; alternative energy source operation

Points of Discussion

A “capacitance hat” on a mobile antenna electronically lengthens the physically short antenna.

A “corona ball” on an HF mobile antenna reduces the voltage discharge from the tip of the antenna that can occur while transmitting.

A direct, fused power connection directly to the battery using a heavy-gauge wire is best for a 100-watt mobile HF installation.

A vehicle's auxiliary power socket may not be able to handle the current drawn by a 100-watt HF mobile transceiver.

The (in)efficiency of the electrically short antenna most limits an HF mobile antenna.

One of the disadvantages of using a shortened mobile antenna (as opposed to a full size antenna) is that the operating bandwidth may be very limited.

A vehicle's battery charging system, fuel delivery system, and control computers can all cause receive interference to a mobile HF transceiver.

Solar cells are connected together in a series-parallel configuration.

The approximate open-circuit voltage from a fully illuminated silicon photovoltaic cell is 0.5 VDC.

A series diode is connected between a solar panel and storage batteries being charged by the solar panels to prevent the battery from discharging through the solar panel during times of low to no illumination.

As a precaution, you should use a charge controller when connection a solar panel to a lithium iron phosphate battery.

Questions?

G4E01

What is the purpose of a capacitance hat on a mobile antenna?

A. To increase the power handling capacity of a whip antenna

B. To reduce radiation resistance

C. To electrically lengthen a physically short antenna

D. To lower the radiation angle

G4E01

What is the purpose of a capacitance hat on a mobile antenna?

A. To increase the power handling capacity of a whip antenna

B. To reduce radiation resistance

C. To electrically lengthen a physically short antenna

D. To lower the radiation angle

G4E02

What is the purpose of a corona ball on an HF mobile antenna?

A. To narrow the operating bandwidth of the antenna

B. To increase the “Q” of the antenna

C. To reduce the chance of damage if the antenna should strike an object

D. To reduce RF voltage discharge from the tip of the antenna while transmitting

G4E02

What is the purpose of a corona ball on an HF mobile antenna?

A. To narrow the operating bandwidth of the antenna

B. To increase the “Q” of the antenna

C. To reduce the chance of damage if the antenna should strike an object

D. To reduce RF voltage discharge from the tip of the antenna while transmitting

G4E03

Which of the following direct, fused power connections would be the best for a 100-watt HF mobile installation?

A. To the battery using heavy-gauge wire

B. To the alternator or generator using heavy-gauge wire

C. To the battery using insulated heavy duty balanced transmission line

D. To the alternator or generator using insulated heavy duty balanced transmission line

G4E03

Which of the following direct, fused power connections would be the best for a 100-watt HF mobile installation?

A. To the battery using heavy-gauge wire

B. To the alternator or generator using heavy-gauge wire

C. To the battery using insulated heavy duty balanced transmission line

D. To the alternator or generator using insulated heavy duty balanced transmission line

G4E04

Why should DC power for a 100-watt HF transceiver not be supplied by a vehicle's auxiliary power socket?

A. The socket is not wired with an RF-shielded power cable

B. The socket's wiring may be inadequate for the current drawn by the transceiver

C. The DC polarity of the socket is reversed from the polarity of modern HF transceivers

D. Drawing more than 50 watts from this socket could cause the engine to overheat

G4E04

Why should DC power for a 100-watt HF transceiver not be supplied by a vehicle's auxiliary power socket?

A. The socket is not wired with an RF-shielded power cable

B. The socket's wiring may be inadequate for the current drawn by the transceiver

C. The DC polarity of the socket is reversed from the polarity of modern HF transceivers

D. Drawing more than 50 watts from this socket could cause the engine to overheat

G4E05

Which of the following most limits an HF mobile installation?

A. “Picket fencing”

B. The wire gauge of the DC power line to the transceiver

C. Efficiency of the electrically short antenna

D. FCC rules limiting mobile output power on the 75-meter band

G4E05

Which of the following most limits an HF mobile installation?

A. “Picket fencing”

B. The wire gauge of the DC power line to the transceiver

C. Efficiency of the electrically short antenna

D. FCC rules limiting mobile output power on the 75-meter band

G4E06

What is one disadvantage of using a shortened mobile antenna as opposed to a full-size antenna?

A. Short antennas are more likely to cause distortion of transmitted signals

B. Q of the antenna will be very low

C. Operating bandwidth may be very limited

D. Harmonic radiation may increase

G4E06

What is one disadvantage of using a shortened mobile antenna as opposed to a full-size antenna?

A. Short antennas are more likely to cause distortion of transmitted signals

B. Q of the antenna will be very low

C. Operating bandwidth may be very limited

D. Harmonic radiation may increase

G4E07

Which of the following may cause receive interference to an HF transceiver installed in a vehicle?

A. The battery charging system

B. The fuel delivery system

C. The control computers

D. All these choices are correct

G4E07

Which of the following may cause receive interference to an HF transceiver installed in a vehicle?

A. The battery charging system

B. The fuel delivery system

C. The control computers

D. All these choices are correct

G4E08

In what configuration are the individual cells in a solar panel connected together?

A. Series-parallel

B. Shunt

C. Bypass

D. Full-wave bridge

G4E08

In what configuration are the individual cells in a solar panel connected together?

A. Series-parallel

B. Shunt

C. Bypass

D. Full-wave bridge

G4E09

What is the approximate open-circuit voltage from a fully illuminated silicon photovoltaic cell?

A. 0.02 VDC

B. 0.5 VDC

C. 0.2 VDC

D. 1.38 VDC

G4E09

What is the approximate open-circuit voltage from a fully illuminated silicon photovoltaic cell?

A. 0.02 VDC

B. 0.5 VDC

C. 0.2 VDC

D. 1.38 VDC

G4E10

Why should a series diode be connected between a solar panel and a storage battery that is being charged by the panel?

A. To prevent overload by regulating the charging voltage

B. To prevent discharge of the battery through the panel during times of low or no illumination

C. To limit the current flowing from the panel to a safe value

D. To prevent damage to the battery due to excessive voltage at high illumination levels

G4E10

Why should a series diode be connected between a solar panel and a storage battery that is being charged by the panel?

A. To prevent overload by regulating the charging voltage

B. To prevent discharge of the battery through the panel during times of low or no illumination

C. To limit the current flowing from the panel to a safe value

D. To prevent damage to the battery due to excessive voltage at high illumination levels

G4E11

What precaution should be taken when connecting a solar panel to a lithium iron phosphate battery?

A. Ground the solar panel outer metal framework

B. Ensure the battery is placed terminals-up

C. A series resistor must be in place

D. The solar panel must have a charge controller

G4E11

What precaution should be taken when connecting a solar panel to a lithium iron phosphate battery?

A. Ground the solar panel outer metal framework

B. Ensure the battery is placed terminals-up

C. A series resistor must be in place

D. The solar panel must have a charge controller

SUBELEMENT G5 – ELECTRICAL PRINCIPLES

[3 Exam Questions – 3 Groups]

G5A – Reactance; inductance; capacitance; impedance; impedance transformation; resonance

Points of Discussion

In a series LC circuit where inductive reactance and capacitive reactance are equal, resonance causes impedance to be very low.

Reactance: opposition to the flow of alternating current caused by capacitance or impedance.

As the frequency of applied AC increases in a circuit with an inductor, reactance increases.

As the frequency of applied AC increases in a circuit with a capacitor, reactance decreases.

Admittance: the inverse of impedance.

Impedance: the ratio of voltage to current.

Ohm: units used to measure reactance.

The following devices can be used for impedance matching at radio frequencies: a transformer, a Pi-network, or a length of transmission line.

X: letter used to represent reactance in calculations/formulas.

When an LC circuit is in resonance, inductive reactance and capacitive reactance cancel.

Questions?

G5A01

What happens when inductive and capacitive reactance are equal in a series LC circuit?

A. Resonance causes impedance to be very high

B. Impedance is equal to the geometric mean of the inductance and capacitance

C. Resonance causes impedance to be very low

D. Impedance is equal to the arithmetic mean of the inductance and capacitance

G5A01

What happens when inductive and capacitive reactance are equal in a series LC circuit?

A. Resonance causes impedance to be very high

B. Impedance is equal to the geometric mean of the inductance and capacitance

C. Resonance causes impedance to be very low

D. Impedance is equal to the arithmetic mean of the inductance and capacitance

G5A02

What is reactance?

A. Opposition to the flow of direct current caused by resistance

B. Opposition to the flow of alternating current caused by capacitance or inductance

C. Reinforcement of the flow of direct current caused by resistance

D. Reinforcement of the flow of alternating current caused by capacitance or inductance

G5A02

What is reactance?

A. Opposition to the flow of direct current caused by resistance

B. Opposition to the flow of alternating current caused by capacitance or inductance

C. Reinforcement of the flow of direct current caused by resistance

D. Reinforcement of the flow of alternating current caused by capacitance or inductance

G5A03

Which of the following is opposition to the flow of alternating current in an inductor?

A. Conductance

B. Reluctance

C. Admittance

D. Reactance

G5A03

Which of the following is opposition to the flow of alternating current in an inductor?

A. Conductance

B. Reluctance

C. Admittance

D. Reactance

G5A04

Which of the following is opposition to the flow of alternating current in a capacitor?

A. Conductance

B. Reluctance

C. Reactance

D. Admittance

G5A04

Which of the following is opposition to the flow of alternating current in a capacitor?

A. Conductance

B. Reluctance

C. Reactance

D. Admittance

G5A05

How does an inductor react to AC?

A. As the frequency of the applied AC increases, the reactance decreases

B. As the amplitude of the applied AC increases, the reactance increases

C. As the amplitude of the applied AC increases, the reactance decreases

D. As the frequency of the applied AC increases, the reactance increases

G5A05

How does an inductor react to AC?

A. As the frequency of the applied AC increases, the reactance decreases

B. As the amplitude of the applied AC increases, the reactance increases

C. As the amplitude of the applied AC increases, the reactance decreases

D. As the frequency of the applied AC increases, the reactance increases

G5A06

How does a capacitor react to AC?

A. As the frequency of the applied AC increases, the reactance decreases

B. As the frequency of the applied AC increases, the reactance increases

C. As the amplitude of the applied AC increases, the reactance increases

D. As the amplitude of the applied AC increases, the reactance decreases

G5A06

How does a capacitor react to AC?

A. As the frequency of the applied AC increases, the reactance decreases

B. As the frequency of the applied AC increases, the reactance increases

C. As the amplitude of the applied AC increases, the reactance increases

D. As the amplitude of the applied AC increases, the reactance decreases

G5A07

What is the term for the inverse of impedance?

A. Conductance

B. Susceptance

C. Reluctance

D. Admittance

G5A07

What is the term for the inverse of impedance?

A. Conductance

B. Susceptance

C. Reluctance

D. Admittance

G5A08

What is impedance?

A. The ratio of current to voltage

B. The product of current and voltage

C. The ratio of voltage to current

D. The product of current and reactance

G5A08

What is impedance?

A. The ratio of current to voltage

B. The product of current and voltage

C. The ratio of voltage to current

D. The product of current and reactance

G5A09

What unit is used to measure reactance?

A. Farad

B. Ohm

C. Ampere

D. Siemens

G5A09

What unit is used to measure reactance?

A. Farad

B. Ohm

C. Ampere

D. Siemens

G5A10

Which of the following devices can be used for impedance matching at radio frequencies?

A. A transformer

B. A Pi-network

C. A length of transmission line

D. All these choices are correct

G5A10

Which of the following devices can be used for impedance matching at radio frequencies?

A. A transformer

B. A Pi-network

C. A length of transmission line

D. All these choices are correct

G5A11

What letter is used to represent reactance?

A. Z

B. X

C. B

D. Y

G5A11

What letter is used to represent reactance?

A. Z

B. X

C. B

D. Y

G5A12

What occurs in an LC circuit at resonance?

A. Current and voltage are equal

B. Resistance is canceled

C. The circuit radiates all its energy in the form of radio waves

D. Inductive reactance and capacitive reactance cancel

G5A12

What occurs in an LC circuit at resonance?

A. Current and voltage are equal

B. Resistance is canceled

C. The circuit radiates all its energy in the form of radio waves

D. Inductive reactance and capacitive reactance cancel

G5B – The decibel; current and voltage dividers; electrical power calculations; sine wave root-mean-square (RMS) values; PEP calculations

Points of Discussion

A doubling or halving of power is represented by a 3 dB (decibel) change.

In a circuit of parallel resistors, the total current is equal to the sum of the currents through each of the resistors.

200 watts of electrical power is consumed if 400 VDC (volts direct current) is supplied to an 800-ohm load.

2.4 watts of electrical power is consumed by a 12 VDC (volts direct current) light bulb that draws 0.2 amperes.

Approximately 61 milliwatts are consumed when 7.0 milliamperes flows through a 1250-ohm resistor.

100 watts peak envelope power (PEP) is produced by a 200 volts peak-to-peak across a 50-ohm dummy load.

The root mean square (RMS) value: the value of an AC signal that produces the same power dissipation in a resistor as a DC voltage.

The peak-to-peak voltage of a sine wave with a root mean square (RMS) voltage of 120 volts is 339.4 volts.

The root mean square (RMS) value of a sine wave with a value of 17 volts peak is 12 volts.

A 20.6% loss of power is equivalent to the loss of 1 dB (decibel).

The ratio of peak envelope power (PEP) to average power for an unmodulated carrier is 1.00.

The root mean square (RMS) voltage across a 50-ohm dummy load dissipating 1200 watts is 245 volts.

The output peak envelope power (PEP) of an unmodulated carrier if the average power is 1060 watts is 1060 watts.

The peak envelope power (PEP) of 500 volts peak-to-peak across a 50-ohm load is 625 watts.

Questions?

G5B01

What dB change represents a factor of two increase or decrease in power?

A. Approximately 2 dB

B. Approximately 3 dB

C. Approximately 6 dB

D. Approximately 9 dB

G5B01

What dB change represents a factor of two increase or decrease in power?

A. Approximately 2 dB

B. Approximately 3 dB

C. Approximately 6 dB

D. Approximately 9 dB

G5B02

How does the total current relate to the individual currents in a circuit of parallel resistors?

A. It equals the average of the branch currents

B. It decreases as more parallel branches are added to the circuit

C. It equals the sum of the currents through each branch

D. It is the sum of the reciprocal of each individual voltage drop

G5B02

How does the total current relate to the individual currents in a circuit of parallel resistors?

A. It equals the average of the branch currents

B. It decreases as more parallel branches are added to the circuit

C. It equals the sum of the currents through each branch

D. It is the sum of the reciprocal of each individual voltage drop

G5B03

How many watts of electrical power are consumed if 400 VDC is supplied to an 800-ohm load?

A. 0.5 watts

B. 200 watts

C. 400 watts

D. 3200 watts

G5B03

How many watts of electrical power are consumed if 400 VDC is supplied to an 800-ohm load?

A. 0.5 watts

B. 200 watts

C. 400 watts

D. 3200 watts

G5B04

How many watts of electrical power are consumed by a 12 VDC light bulb that draws 0.2 amperes?

A. 2.4 watts

B. 24 watts

C. 6 watts

D. 60 watts

G5B04

How many watts of electrical power are consumed by a 12 VDC light bulb that draws 0.2 amperes?

A. 2.4 watts

B. 24 watts

C. 6 watts

D. 60 watts

G5B05

How many watts are consumed when a current of 7.0 milliamperes flows through a 1,250-ohm resistance?

A. Approximately 61 milliwatts

B. Approximately 61 watts

C. Approximately 11 milliwatts

D. Approximately 11 watts

G5B05

How many watts are consumed when a current of 7.0 milliamperes flows through a 1,250-ohm resistance?

A. Approximately 61 milliwatts

B. Approximately 61 watts

C. Approximately 11 milliwatts

D. Approximately 11 watts

G5B06

What is the PEP produced by 200 volts peak-to-peak across a 50-ohm dummy load?

A. 1.4 watts

B. 100 watts

C. 353.5 watts

D. 400 watts

G5B06

What is the PEP produced by 200 volts peak-to-peak across a 50-ohm dummy load?

A. 1.4 watts

B. 100 watts

C. 353.5 watts

D. 400 watts

G5B07

What value of an AC signal produces the same power dissipation in a resistor as a DC voltage of the same value?

A. The peak-to-peak value

B. The peak value

C. The RMS value

D. The reciprocal of the RMS value

G5B07

What value of an AC signal produces the same power dissipation in a resistor as a DC voltage of the same value?

A. The peak-to-peak value

B. The peak value

C. The RMS value

D. The reciprocal of the RMS value

G5B08

What is the peak-to-peak voltage of a sine wave with an RMS voltage of 120 volts?

A. 84.8 volts

B. 169.7 volts

C. 240.0 volts

D. 339.4 volts

G5B08

What is the peak-to-peak voltage of a sine wave with an RMS voltage of 120 volts?

A. 84.8 volts

B. 169.7 volts

C. 240.0 volts

D. 339.4 volts

G5B09

What is the RMS voltage of a sine wave with a value of 17 volts peak?

A. 8.5 volts

B. 12 volts

C. 24 volts

D. 34 volts

G5B09

What is the RMS voltage of a sine wave with a value of 17 volts peak?

A. 8.5 volts

B. 12 volts

C. 24 volts

D. 34 volts

G5B10

What percentage of power loss is equivalent to a loss of 1 dB?

A. 10.9 percent

B. 12.2 percent

C. 20.6 percent

D. 25.9 percent

G5B10

What percentage of power loss is equivalent to a loss of 1 dB?

A. 10.9 percent

B. 12.2 percent

C. 20.6 percent

D. 25.9 percent

G5B11

What is the ratio of PEP to average power for an unmodulated carrier?

A. 0.707

B. 1.00

C. 1.414

D. 2.00

G5B11

What is the ratio of PEP to average power for an unmodulated carrier?

A. 0.707

B. 1.00

C. 1.414

D. 2.00

G5B12

What is the RMS voltage across a 50-ohm dummy load dissipating 1200 watts?

A. 173 volts

B. 245 volts

C. 346 volts

D. 692 volts

G5B12

What is the RMS voltage across a 50-ohm dummy load dissipating 1200 watts?

A. 173 volts

B. 245 volts

C. 346 volts

D. 692 volts

G5B13

What is the output PEP of an unmodulated carrier if the average power is 1060 watts?

A. 530 watts

B. 1060 watts

C. 1500 watts

D. 2120 watts

G5B13

What is the output PEP of an unmodulated carrier if the average power is 1060 watts?

A. 530 watts

B. 1060 watts

C. 1500 watts

D. 2120 watts

G5B14

What is the output PEP of 500 volts peak-to-peak across a 50-ohm load?

A. 8.75 watts

B. 625 watts

C. 2500 watts

D. 5000 watts

G5B14

What is the output PEP of 500 volts peak-to-peak across a 50-ohm load?

A. 8.75 watts

B. 625 watts

C. 2500 watts

D. 5000 watts

G5C – Resistors, capacitors, and inductors in series and parallel; transformers

Points of Discussion

Mutual inductance causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding.

If an input signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding, the voltage is multiplied by 4.

The total resistance of a circuit with three resistors (10-ohm, 20-ohm, and 50-ohm) connected in parallel is 5.9 ohms.

The total resistance of a 100-ohm and 200-ohm resistor connected in parallel is 67 ohms.

The primary winding wire of a voltage step-down transformer is usually a larger size than the secondary winding to accommodate the higher current in the primary winding.

The voltage output of a transformer with a 500-turn primary and a 1500-turn secondary when 120 VAC is applied is 360 volts.

A transformer turns ratio of 3.5:1 will match an antenna's 600-ohm feed point impedance to a 50-ohm coaxial cable.

The equivalent capacitance of two 5-nanofarad capacitors and a 750-picofarad capacitor connected in parallel is 10.750 nanofarads.

The capacitance of three 100-microfarad capacitors connected in series is 33.3 microfarads.

The inductance of three 100-millihenry inductors connected in parallel is 33.3 millihenries.

The inductance of a circuit with two inductors (20-millihenry and 50-millihenry) connected in series is 70 millihenries.

The capacitance of a circuit with two capacitors (20-microfarad and 50-microfarad) connected in series is 14.3 microfarads.

If you have a circuit with a capacitor, you can increase its capacitance by adding another capacitor in parallel.

If you have a circuit with an inductor, you can increase its inductance by adding another inductor in series.

$\overline{\text{Questions?}}$

G5C01

What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

A. Capacitive coupling

B. Displacement current coupling

C. Mutual inductance

D. Mutual capacitance

G5C01

What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

A. Capacitive coupling

B. Displacement current coupling

C. Mutual inductance

D. Mutual capacitance

G5C02

What is the output voltage if an input signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding?

A. The input voltage is multiplied by 4

B. The input voltage is divided by 4

C. Additional resistance must be added in series with the primary to prevent overload

D. Additional resistance must be added in parallel with the secondary to prevent overload

G5C02

What is the output voltage if an input signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding?

A. The input voltage is multiplied by 4

B. The input voltage is divided by 4

C. Additional resistance must be added in series with the primary to prevent overload

D. Additional resistance must be added in parallel with the secondary to prevent overload

G5C03

What is the total resistance of a 10-, a 20-, and a 50-ohm resistor connected in parallel?

A. 5.9 ohms

B. 0.17 ohms

C. 17 ohms

D. 80 ohms

G5C03

What is the total resistance of a 10-, a 20-, and a 50-ohm resistor connected in parallel?

A. 5.9 ohms

B. 0.17 ohms

C. 17 ohms

D. 80 ohms

G5C04

What is the approximate total resistance of a 100- and a 200-ohm resistor in parallel?

A. 300 ohms

B. 150 ohms

C. 75 ohms

D. 67 ohms

G5C04

What is the approximate total resistance of a 100- and a 200-ohm resistor in parallel?

A. 300 ohms

B. 150 ohms

C. 75 ohms

D. 67 ohms

G5C05

Why is the primary winding wire of a voltage step-up transformer usually a larger size than that of the secondary winding?

A. To improve the coupling between the primary and secondary

B. To accommodate the higher current of the primary

C. To prevent parasitic oscillations due to resistive losses in the primary

D. To ensure that the volume of the primary winding is equal to the volume of the secondary winding

G5C05

Why is the primary winding wire of a voltage step-up transformer usually a larger size than that of the secondary winding?

A. To improve the coupling between the primary and secondary

B. To accommodate the higher current of the primary

C. To prevent parasitic oscillations due to resistive losses in the primary

D. To ensure that the volume of the primary winding is equal to the volume of the secondary winding

G5C06

What is the voltage output of a transformer with a 500-turn primary and a 1500-turn secondary when 120 VAC is applied to the primary?

A. 360 volts

B. 120 volts

C. 40 volts

D. 25.5 volts

G5C06

What is the voltage output of a transformer with a 500-turn primary and a 1500-turn secondary when 120 VAC is applied to the primary?

A. 360 volts

B. 120 volts

C. 40 volts

D. 25.5 volts

G5C07

What transformer turns ratio matches an antenna’s 600-ohm feed point impedance to a 50-ohm coaxial cable?

A. 3.5 to 1

B. 12 to 1

C. 24 to 1

D. 144 to 1

G5C07

What transformer turns ratio matches an antenna’s 600-ohm feed point impedance to a 50-ohm coaxial cable?

A. 3.5 to 1

B. 12 to 1

C. 24 to 1

D. 144 to 1

G5C08

What is the equivalent capacitance of two 5.0-nanofarad capacitors and one 750-picofarad capacitor connected in parallel?

A. 576.9 nanofarads

B. 1,733 picofarads

C. 3,583 picofarads

D. 10.750 nanofarads

G5C08

What is the equivalent capacitance of two 5.0-nanofarad capacitors and one 750-picofarad capacitor connected in parallel?

A. 576.9 nanofarads

B. 1,733 picofarads

C. 3,583 picofarads

D. 10.750 nanofarads

G5C09

What is the capacitance of three 100-microfarad capacitors connected in series?

A. 0.33 microfarads

B. 3.0 microfarads

C. 33.3 microfarads

D. 300 microfarads

G5C09

What is the capacitance of three 100-microfarad capacitors connected in series?

A. 0.33 microfarads

B. 3.0 microfarads

C. 33.3 microfarads

D. 300 microfarads

G5C10

What is the inductance of three 10-millihenry inductors connected in parallel?

A. 0.30 henries

B. 3.3 henries

C. 3.3 millihenries

D. 30 millihenries

G5C10

What is the inductance of three 10-millihenry inductors connected in parallel?

A. 0.30 henries

B. 3.3 henries

C. 3.3 millihenries

D. 30 millihenries

G5C11

What is the inductance of a circuit with a 20-millihenry inductor connected in series with a 50-millihenry inductor?

A. 7 millihenries

B. 14.3 millihenries

C. 70 millihenries

D. 1,000 millihenries

G5C11

What is the inductance of a circuit with a 20-millihenry inductor connected in series with a 50-millihenry inductor?

A. 7 millihenries

B. 14.3 millihenries

C. 70 millihenries

D. 1,000 millihenries

G5C12

What is the capacitance of a 20-microfarad capacitor connected in series with a 50-microfarad capacitor?

A. 0.07 microfarads

B. 14.3 microfarads

C. 70 microfarads

D. 1,000 microfarads

G5C12

What is the capacitance of a 20-microfarad capacitor connected in series with a 50-microfarad capacitor?

A. 0.07 microfarads

B. 14.3 microfarads

C. 70 microfarads

D. 1,000 microfarads

G5C13

Which of the following components should be added to a capacitor to increase the capacitance?

A. An inductor in series

B. An inductor in parallel

C. A capacitor in parallel

D. A capacitor in series

G5C13

Which of the following components should be added to a capacitor to increase the capacitance?

A. An inductor in series

B. An inductor in parallel

C. A capacitor in parallel

D. A capacitor in series

G5C14

Which of the following components should be added to an inductor to increase the inductance?

A. A capacitor in series

B. A capacitor in parallel

C. An inductor in parallel

D. An inductor in series

G5C14

Which of the following components should be added to an inductor to increase the inductance?

A. A capacitor in series

B. A capacitor in parallel

C. An inductor in parallel

D. An inductor in series

SUBELEMENT G6 – CIRCUIT COMPONENTS

[2 Exam Questions – 2 Groups]

G6A – Resistors; capacitors; inductors; rectifiers; solid-state diodes and transistors; vacuum tubes; batteries

Points of Discussion

The minimum allowable discharge voltage for maximum life of a standard 12-volt lead-acid battery is 10.5 volts.

An advantage of batteries with low internal resistance is that they have a high discharge current.

The approximate forward threshold voltage of a germanium diode is 0.3 volts.

Electrolyte capacitors are known for having high capacitance for a given volume.

The approximate forward threshold voltage of a silicon junction diode is 0.7 volts.

Wire-wound resistors should not be used in RF circuits as the resistor's inductance could make circuit performance unpredictable.

When a bipolar transistor is used as a switch, its operating points are "saturation" and "cutoff."

Low voltage ceramic capacitors have a relatively low cost.

A metal-oxide semiconductor field effect transistor (or "MOSFET") has its gate separated from the channel by a thin insulating layer of oxide.

In a vacuum tube, the *control grid* regulates the flow of electrons between the cathode and the plate.

When an inductor is operated above its self-resonant frequency, it become capacitive.

A *screen grid* reduces the grid-to-plate capacitance in a vacuum tube.

Questions?

G6A01

What is the minimum allowable discharge voltage for maximum life of a standard 12-volt lead-acid battery?

A. 6 volts

B. 8.5 volts

C. 10.5 volts

D. 12 volts

G6A01

What is the minimum allowable discharge voltage for maximum life of a standard 12-volt lead-acid battery?

A. 6 volts

B. 8.5 volts

C. 10.5 volts

D. 12 volts

G6A02

What is an advantage of batteries with low internal resistance?

A. Long life

B. High discharge current

C. High voltage

D. Rapid recharge

G6A02

What is an advantage of batteries with low internal resistance?

A. Long life

B. High discharge current

C. High voltage

D. Rapid recharge

G6A03

What is the approximate forward threshold voltage of a germanium diode?

A. 0.1 volt

B. 0.3 volts

C. 0.7 volts

D. 1.0 volts

G6A03

What is the approximate forward threshold voltage of a germanium diode?

A. 0.1 volt

B. 0.3 volts

C. 0.7 volts

D. 1.0 volts

G6A04

Which of the following is characteristic of an electrolytic capacitor?

A. Tight tolerance

B. Much less leakage than any other type

C. High capacitance for a given volume

D. Inexpensive RF capacitor

G6A04

Which of the following is characteristic of an electrolytic capacitor?

A. Tight tolerance

B. Much less leakage than any other type

C. High capacitance for a given volume

D. Inexpensive RF capacitor

G6A05

What is the approximate forward threshold voltage of a silicon junction diode?

A. 0.1 volt

B. 0.3 volts

C. 0.7 volts

D. 1.0 volts

G6A05

What is the approximate forward threshold voltage of a silicon junction diode?

A. 0.1 volt

B. 0.3 volts

C. 0.7 volts

D. 1.0 volts

G6A06

Why should wire-wound resistors not be used in RF circuits?

A. The resistor’s tolerance value would not be adequate

B. The resistor’s inductance could make circuit performance unpredictable

C. The resistor could overheat

D. The resistor’s internal capacitance would detune the circuit

G6A06

Why should wire-wound resistors not be used in RF circuits?

A. The resistor's tolerance value would not be adequate

B. The resistor's inductance could make circuit performance unpredictable

C. The resistor could overheat

D. The resistor's internal capacitance would detune the circuit

G6A07

What are the operating points for a bipolar transistor used as a switch?

A. Saturation and cutoff

B. The active region (between cutoff and saturation)

C. Peak and valley current points

D. Enhancement and depletion modes

G6A07

What are the operating points for a bipolar transistor used as a switch?

A. Saturation and cutoff

B. The active region (between cutoff and saturation)

C. Peak and valley current points

D. Enhancement and depletion modes

G6A08

Which of the following is characteristic of low voltage ceramic capacitors?

A. Tight tolerance

B. High stability

C. High capacitance for given volume

D. Comparatively low cost

G6A08

Which of the following is characteristic of low voltage ceramic capacitors?

A. Tight tolerance

B. High stability

C. High capacitance for given volume

D. Comparatively low cost

G6A09

Which of the following describes MOSFET construction?

A. The gate is formed by a back-biased junction

B. The gate is separated from the channel by a thin insulating layer

C. The source is separated from the drain by a thin insulating layer

D. The source is formed by depositing metal on silicon

G6A09

Which of the following describes MOSFET construction?

A. The gate is formed by a back-biased junction

B. The gate is separated from the channel by a thin insulating layer

C. The source is separated from the drain by a thin insulating layer

D. The source is formed by depositing metal on silicon

G6A10

Which element of a vacuum tube regulates the flow of electrons between cathode and plate?

A. Control grid

B. Suppressor grid

C. Screen grid

D. Trigger electrode

G6A10

Which element of a vacuum tube regulates the flow of electrons between cathode and plate?

A. Control grid

B. Suppressor grid

C. Screen grid

D. Trigger electrode

G6A11

What happens when an inductor is operated above its self-resonant frequency?

A. Its reactance increases

B. Harmonics are generated

C. It becomes capacitive

D. Catastrophic failure is likely

G6A11

What happens when an inductor is operated above its self-resonant frequency?

A. Its reactance increases

B. Harmonics are generated

C. It becomes capacitive

D. Catastrophic failure is likely

G6A12

What is the primary purpose of a screen grid in a vacuum tube?

A. To reduce grid-to-plate capacitance

B. To increase efficiency

C. To increase the control grid resistance

D. To decrease plate resistance

G6A12

What is the primary purpose of a screen grid in a vacuum tube?

A. To reduce grid-to-plate capacitance

B. To increase efficiency

C. To increase the control grid resistance

D. To decrease plate resistance

G6B – Analog and digital integrated circuits (ICs); microwave ICs (MMICs); display devices; RF connectors; ferrite cores

Points of Discussion

The composition, or "mix," of materials used in a ferrite core determines its performance at different frequencies.

MMIC: Monolithic Microwave Integrated Circuit

An advantage of CMOS (complementary metal-oxide semiconductor) integrated circuits when compared to TTL (transistor-transistor logic) integrated circuits is that it has low power consumption.

A typical upper frequency limit for low SWR operation of a 50-ohm BNC connector is 4 GHz.

Ferrite core toroidal inductors have a number of advantages. They have the ability to obtain large values of inductance, most of the magnetic field they generate is contained within the core, and they can be optimized to work within a specific range of frequencies.

An analog device can be used as an integrated circuit operational amplifier.

A type-N connector is a moisture-resistant RF connector that is useful to 10 GHz.

A light-emitting diode (LED) is forward biased when emitting light.

A liquid crystal display (LCD) has a higher contrast in high ambient lighting when compared to a light-emitting diode (LED) display.

A ferrite bead or core can reduce common-mode RF current on the shield of a coaxial cable by creating an impedance in the current's path.

A SMA connector is a small-threaded connector suitable for signals up to several GHz.

An RCA Phono connector is commonly used for low frequency or DC signal connections to a transceiver.

Questions?

G6B01

What determines the performance of a ferrite core at different frequencies?

A. Its conductivity

B. Its thickness

C. The composition, or “mix,” of materials used

D. The ratio of outer diameter to inner diameter

G6B01

What determines the performance of a ferrite core at different frequencies?

A. Its conductivity

B. Its thickness

C. The composition, or “mix,” of materials used

D. The ratio of outer diameter to inner diameter

G6B02

What is meant by the term MMIC?

A. Multi-Mode Integrated Circuit

B. Monolithic Microwave Integrated Circuit

C. Metal Monolayer Integrated Circuit

D. Mode Modulated Integrated Circuit

G6B02

What is meant by the term MMIC?

A. Multi-Mode Integrated Circuit

B. Monolithic Microwave Integrated Circuit

C. Metal Monolayer Integrated Circuit

D. Mode Modulated Integrated Circuit

G6B03

Which of the following is an advantage of CMOS integrated circuits compared to TTL integrated circuits?

A. Low power consumption

B. High power handling capability

C. Better suited for RF amplification

D. Better suited for power supply regulation

G6B03

Which of the following is an advantage of CMOS integrated circuits compared to TTL integrated circuits?

A. Low power consumption

B. High power handling capability

C. Better suited for RF amplification

D. Better suited for power supply regulation

G6B04

What is a typical upper frequency limit for low SWR operation of 50-ohm BNC connectors?

A. 50 MHz

B. 500 MHz

C. 4 GHz

D. 40 GHz

G6B04

What is a typical upper frequency limit for low SWR operation of 50-ohm BNC connectors?

A. 50 MHz

B. 500 MHz

C. 4 GHz

D. 40 GHz

G6B05

What is an advantage of using a ferrite core toroidal inductor?

A. Large values of inductance may be obtained

B. The magnetic properties of the core may be optimized for a specific range of frequencies

C. Most of the magnetic field is contained in the core

D. All these choices are correct

G6B05

What is an advantage of using a ferrite core toroidal inductor?

A. Large values of inductance may be obtained

B. The magnetic properties of the core may be optimized for a specific range of frequencies

C. Most of the magnetic field is contained in the core

D. All these choices are correct

G6B06

What kind of device is an integrated circuit operational amplifier?

A. Digital

B. MMIC

C. Programmable Logic

D. Analog

G6B06

What kind of device is an integrated circuit operational amplifier?

A. Digital

B. MMIC

C. Programmable Logic

D. Analog

G6B07

Which of the following describes a type N connector?

A. A moisture-resistant RF connector useful to 10 GHz

B. A small bayonet connector used for data circuits

C. A low noise figure VHF connector

D. A nickel plated version of the PL-259

G6B07

Which of the following describes a type N connector?

A. A moisture-resistant RF connector useful to 10 GHz

B. A small bayonet connector used for data circuits

C. A low noise figure VHF connector

D. A nickel plated version of the PL-259

G6B08

How is an LED biased when emitting light?

A. In the tunnel-effect region

B. At the Zener voltage

C. Reverse biased

D. Forward biased

G6B08

How is an LED biased when emitting light?

A. In the tunnel-effect region

B. At the Zener voltage

C. Reverse biased

D. Forward biased

G6B09

How does a liquid crystal display compare to an LED display?

A. Higher contrast in high ambient lighting

B. Wider dynamic range

C. Higher power consumption

D. Shorter lifetime

G6B09

How does a liquid crystal display compare to an LED display?

A. Higher contrast in high ambient lighting

B. Wider dynamic range

C. Higher power consumption

D. Shorter lifetime

G6B10

How does a ferrite bead or core reduce common-mode RF current on the shield of a coaxial cable?

A. By creating an impedance in the current's path

B. It converts common-mode current to differential mode current

C. By creating an out-of-phase current to cancel the common-mode current

D. Ferrites expel magnetic fields

G6B10

How does a ferrite bead or core reduce common-mode RF current on the shield of a coaxial cable?

A. By creating an impedance in the current's path

B. It converts common-mode current to differential mode current

C. By creating an out-of-phase current to cancel the common-mode current

D. Ferrites expel magnetic fields

G6B11

What is an SMA connector?

A. A type-S to type-M adapter

B. A small threaded connector suitable for signals up to several GHz

C. A connector designed for serial multiple access signals

D. A type of push-on connector intended for high-voltage applications

G6B11

What is an SMA connector?

A. A type-S to type-M adapter

B. A small threaded connector suitable for signals up to several GHz

C. A connector designed for serial multiple access signals

D. A type of push-on connector intended for high-voltage applications

G6B12

Which of these connector types is commonly used for low frequency or dc signal connections to a transceiver?

A. PL-259

B. BNC

C. RCA Phono

D. Type N

G6B12

Which of these connector types is commonly used for low frequency or dc signal connections to a transceiver?

A. PL-259

B. BNC

C. RCA Phono

D. Type N

SUBELEMENT G7 – PRACTICAL CIRCUITS

[3 Exam Questions – 3 Groups]

G7A – Power supplies; schematic symbols

Points of Discussion

A power supply bleeder resistor discharges the filter capacitors when power is removed.

Both capacitors and inductors are used in a power supply's filter network.

A full-wave rectifier circuit used two diodes and a center-tapped transformer.

In a power supply's half-wave rectifier, only one diode is required.

180 degrees of the AC cycle is converted to DC by a half-wave rectifier.

360 degrees of the AC cycle is converted to DC by a full-wave rectifier.

The output waveform of an unfiltered full-wave rectifier when connected to a resistive load is a series of DC pulses at twice the frequency of the AC input.

Characteristic of a switchmode power supply (but not a linear power supply) is high-frequency operation that allows the use of smaller components.

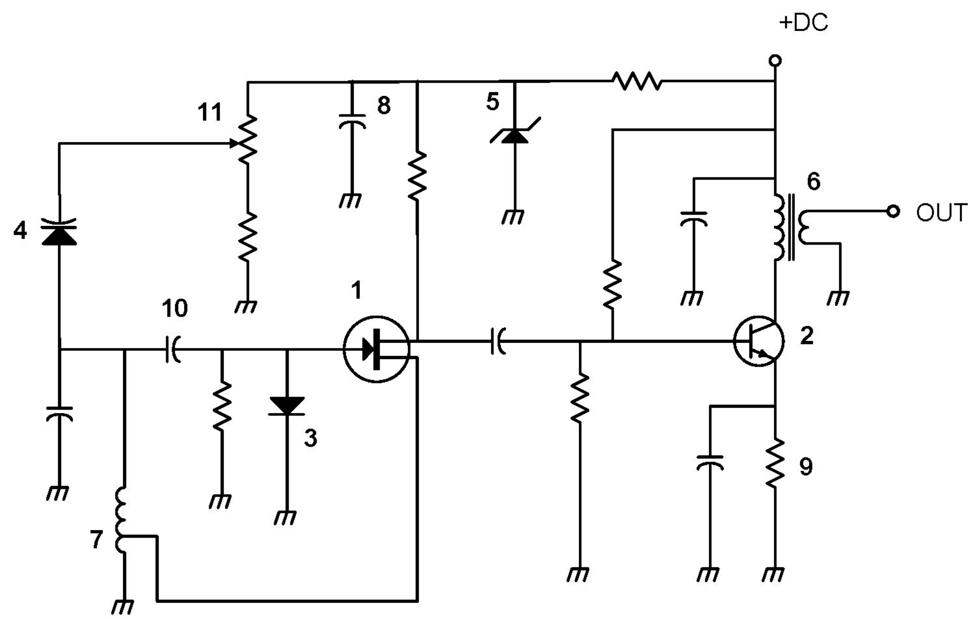

Figure G7-1

Symbol 1 represents a field effect transistor.

Symbol 5 represents a Zener diode.

Symbol 2 represents an NPN junction transistor.

Symbol 6 represents a solid core transformer.

Symbol 7 represents a tapped (or variable) inductor.

Questions?

G7A01

What is the function of a power supply bleeder resistor?

A. It acts as a fuse for excess voltage

B. It discharges the filter capacitors when power is removed

C. It removes shock hazards from the induction coils

D. It eliminates ground loop current

G7A01

What is the function of a power supply bleeder resistor?

A. It acts as a fuse for excess voltage

B. It discharges the filter capacitors when power is removed

C. It removes shock hazards from the induction coils

D. It eliminates ground loop current

G7A02

Which of the following components are used in a power supply filter network?

A. Diodes

B. Transformers and transducers

C. Capacitors and inductors

D. All these choices are correct

G7A02

Which of the following components are used in a power supply filter network?

A. Diodes

B. Transformers and transducers

C. Capacitors and inductors

D. All these choices are correct

G7A03

Which type of rectifier circuit uses two diodes and a center-tapped transformer?

A. Full-wave

B. Full-wave bridge

C. Half-wave

D. Synchronous

G7A03

Which type of rectifier circuit uses two diodes and a center-tapped transformer?

A. Full-wave

B. Full-wave bridge

C. Half-wave

D. Synchronous

G7A04

What is characteristic of a half-wave rectifier in a power supply?

A. Only one diode is required

B. The ripple frequency is twice that of a full-wave rectifier

C. More current can be drawn from the half-wave rectifier

D. The output voltage is two times the peak input voltage

G7A04

What is characteristic of a half-wave rectifier in a power supply?

A. Only one diode is required

B. The ripple frequency is twice that of a full-wave rectifier

C. More current can be drawn from the half-wave rectifier

D. The output voltage is two times the peak input voltage

G7A05

What portion of the AC cycle is converted to DC by a half-wave rectifier?

A. 90 degrees

B. 180 degrees

C. 270 degrees

D. 360 degrees

G7A05

What portion of the AC cycle is converted to DC by a half-wave rectifier?

A. 90 degrees

B. 180 degrees

C. 270 degrees

D. 360 degrees

G7A06

What portion of the AC cycle is converted to DC by a full-wave rectifier?

A. 90 degrees

B. 180 degrees

C. 270 degrees

D. 360 degrees

G7A06

What portion of the AC cycle is converted to DC by a full-wave rectifier?

A. 90 degrees

B. 180 degrees

C. 270 degrees

D. 360 degrees

G7A07

What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?

A. A series of DC pulses at twice the frequency of the AC input

B. A series of DC pulses at the same frequency as the AC input

C. A sine wave at half the frequency of the AC input

D. A steady DC voltage

G7A07

What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?

A. A series of DC pulses at twice the frequency of the AC input

B. A series of DC pulses at the same frequency as the AC input

C. A sine wave at half the frequency of the AC input

D. A steady DC voltage

G7A08

Which of the following is characteristic of a switchmode power supply as compared to a linear power supply?

A. Faster switching time makes higher output voltage possible

B. Fewer circuit components are required

C. High-frequency operation allows the use of smaller components

D. Inherently more stable

G7A08

Which of the following is characteristic of a switchmode power supply as compared to a linear power supply?

A. Faster switching time makes higher output voltage possible

B. Fewer circuit components are required

C. High-frequency operation allows the use of smaller components

D. Inherently more stable

G7A09

Which symbol in figure G7-1 represents a field effect transistor?

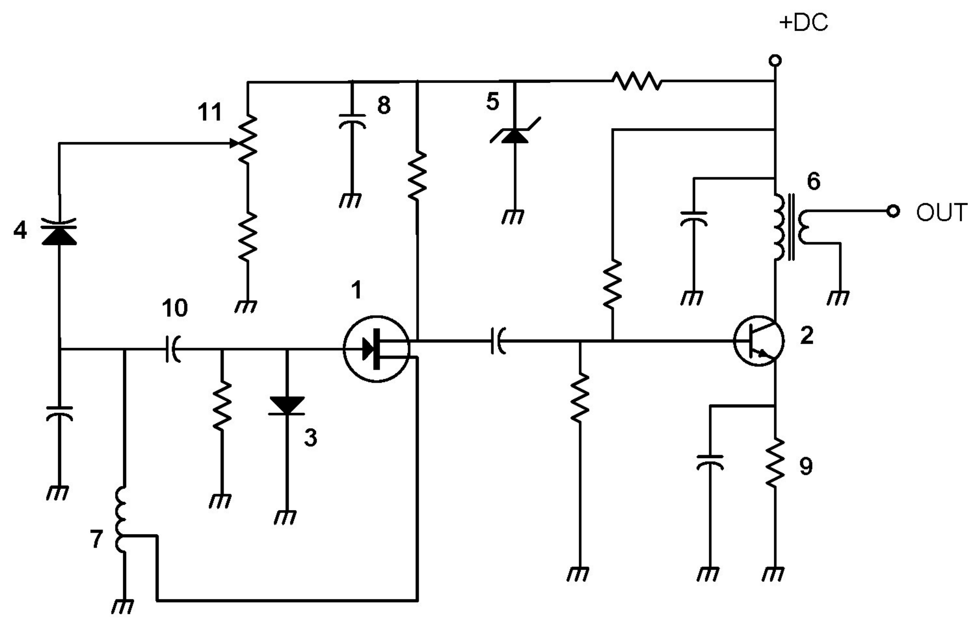

Figure G7-1

A. Symbol 2

B. Symbol 5

C. Symbol 1

D. Symbol 4

G7A09

Which symbol in figure G7-1 represents a field effect transistor?

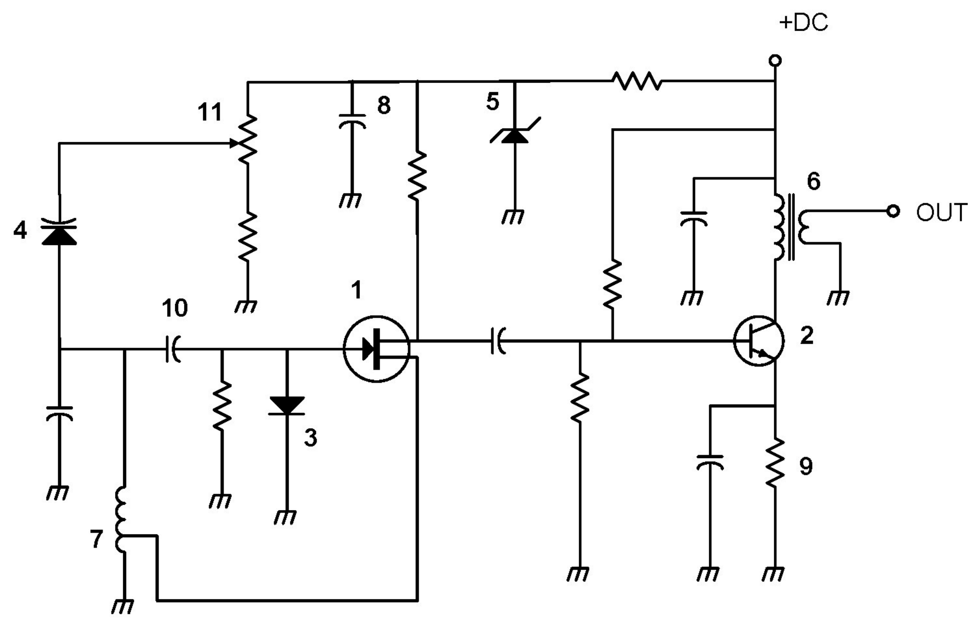

Figure G7-1

A. Symbol 2

B. Symbol 5

C. Symbol 1

D. Symbol 4

G7A10

Which symbol in figure G7-1 represents a Zener diode?

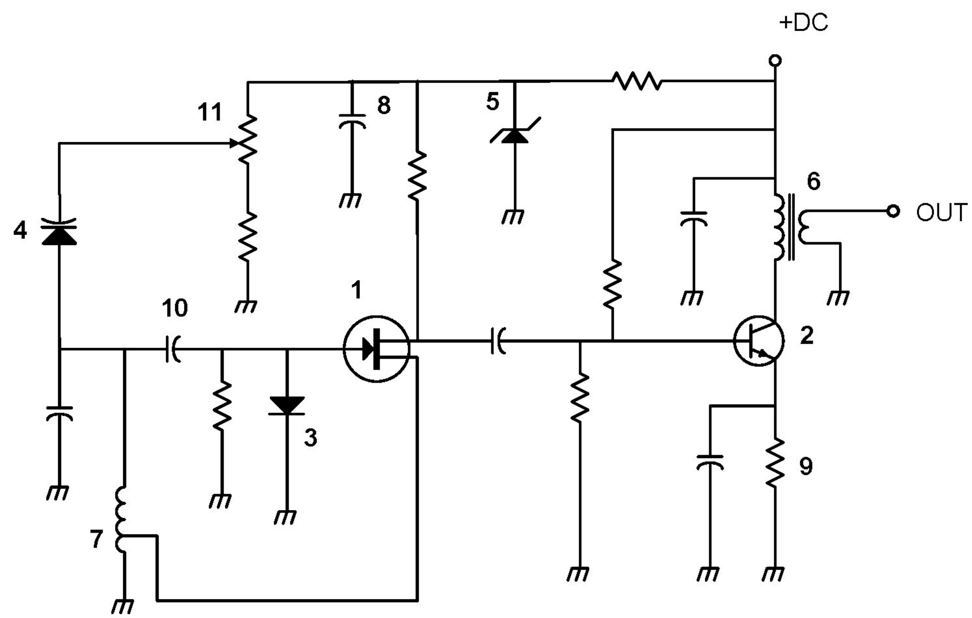

Figure G7-1

A. Symbol 4

B. Symbol 1

C. Symbol 11

D. Symbol 5

G7A10

Which symbol in figure G7-1 represents a Zener diode?

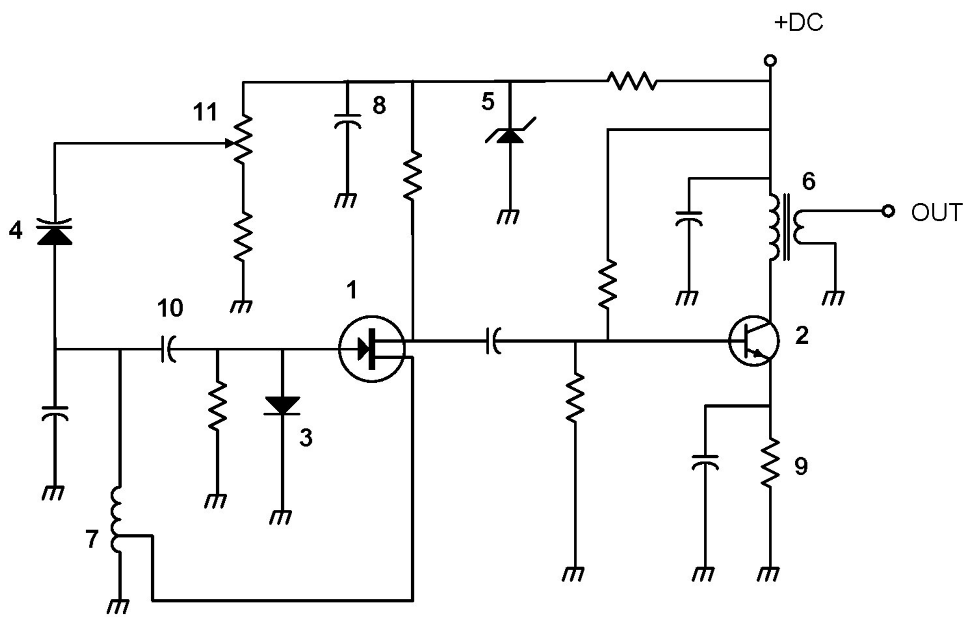

Figure G7-1

A. Symbol 4

B. Symbol 1

C. Symbol 11

D. Symbol 5

G7A11

Which symbol in figure G7-1 represents an NPN junction transistor?

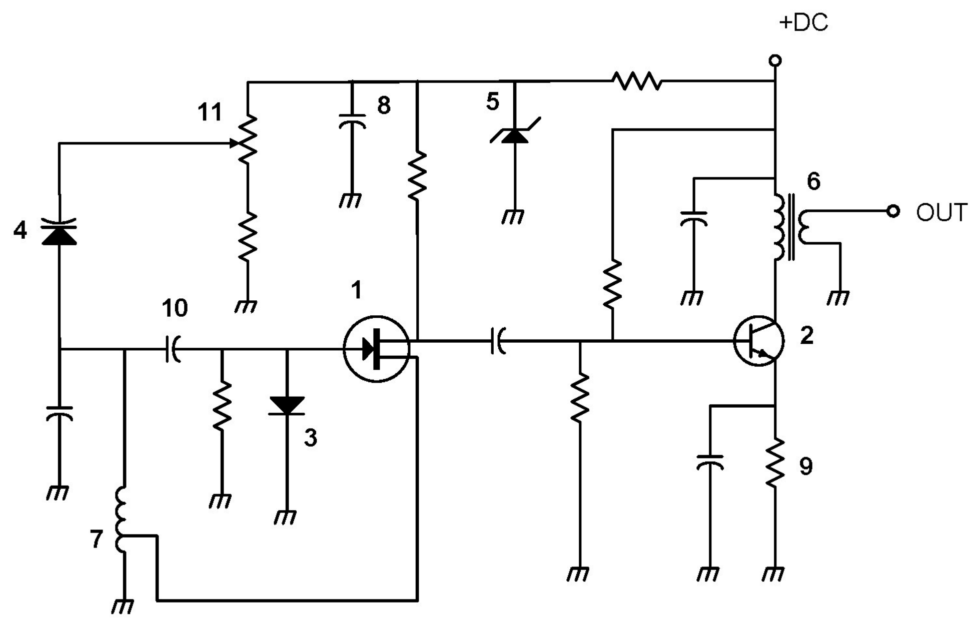

Figure G7-1

A. Symbol 1

B. Symbol 2

C. Symbol 7

D. Symbol 11

G7A11

Which symbol in figure G7-1 represents an NPN junction transistor?

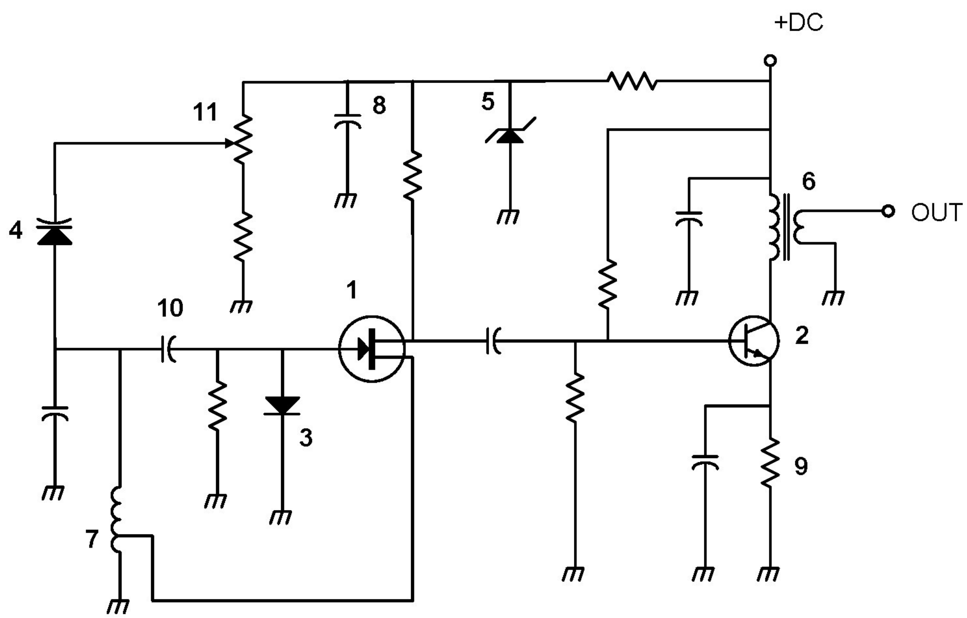

Figure G7-1

A. Symbol 1

B. Symbol 2

C. Symbol 7

D. Symbol 11

G7A12

Which symbol in Figure G7-1 represents a solid core transformer?

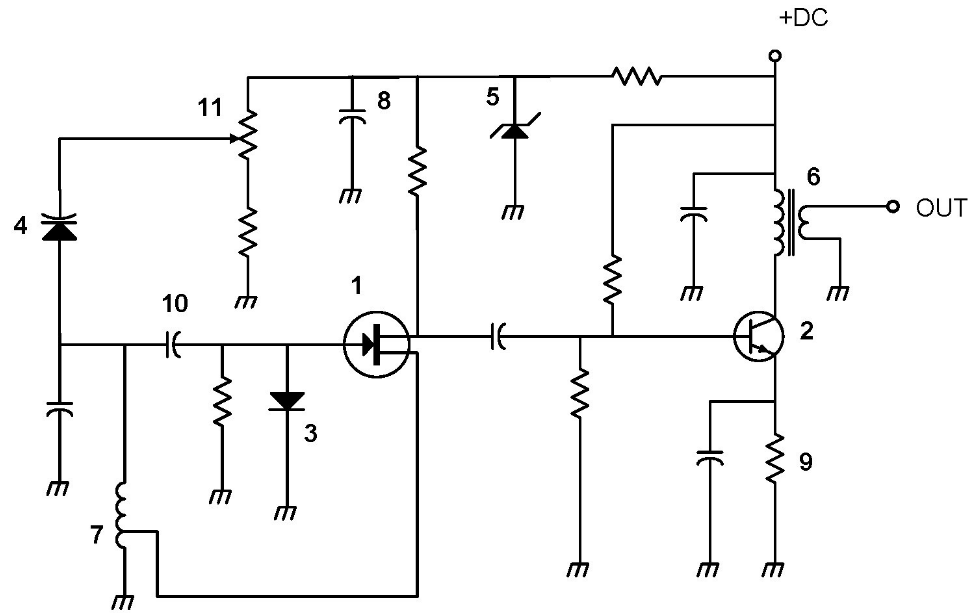

Figure G7-1

A. Symbol 4

B. Symbol 7

C. Symbol 6

D. Symbol 1

G7A12

Which symbol in Figure G7-1 represents a solid core transformer?

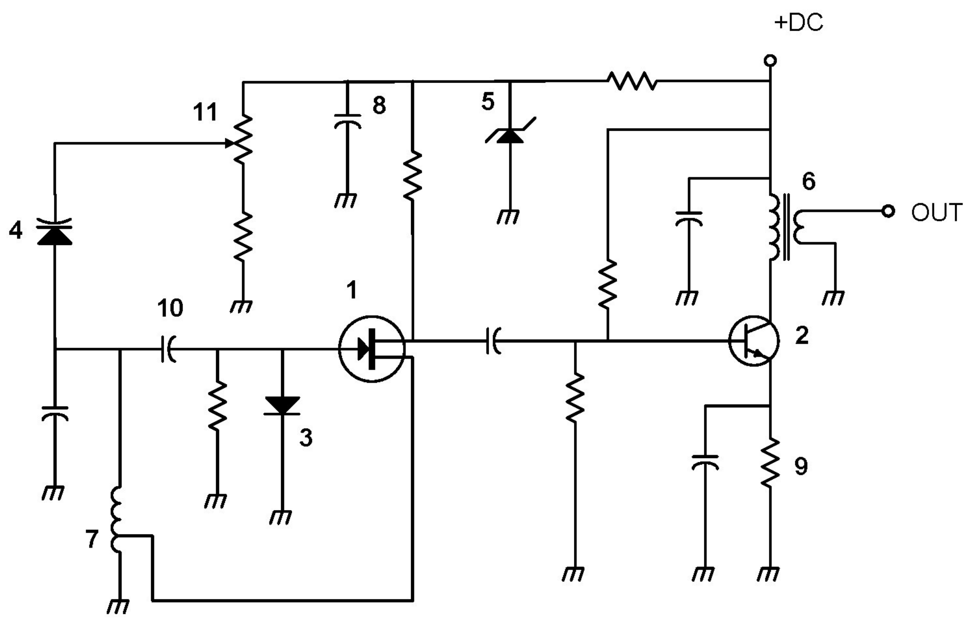

Figure G7-1

A. Symbol 4

B. Symbol 7

C. Symbol 6

D. Symbol 1

G7A13

Which symbol in Figure G7-1 represents a tapped inductor?

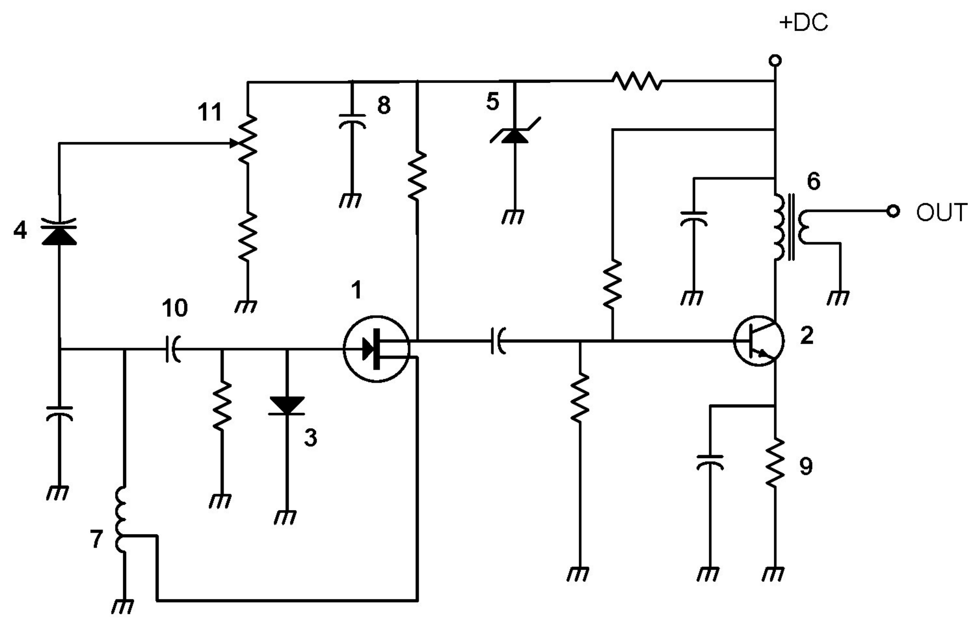

Figure G7-1

A. Symbol 7

B. Symbol 11

C. Symbol 6

D. Symbol 1

G7A13

Which symbol in Figure G7-1 represents a tapped inductor?

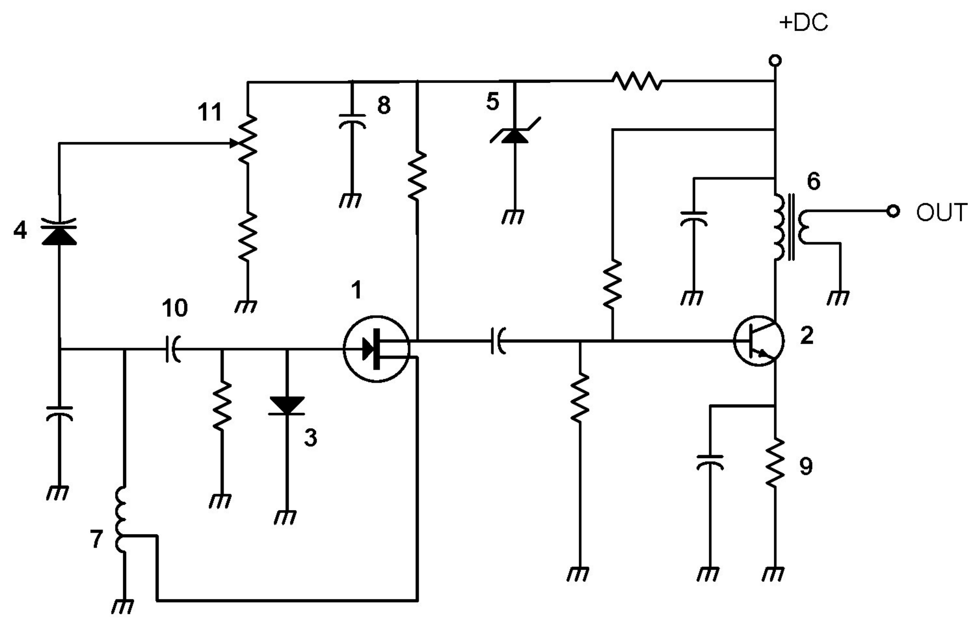

Figure G7-1

A. Symbol 7

B. Symbol 11

C. Symbol 6

D. Symbol 1

G7B – Digital circuits; amplifiers and oscillators

Points of Discussion

An amplifier is neutralized to eliminate self-oscillations.

Class C amplifiers have the highest efficiency.

In a two-input AND gate, output is high only when both inputs are high.

A Class A amplifier spends 100% of its time conducting.

A 3-bit binary counter has 8 states.

Shift Register: a clocked array of circuits that passes data in steps along the array.

A filter and an amplifier (operating in a feedback loop) are the basic components of a singe wave oscillator.

The efficiency of an RF power amplifier is determined by dividing the RF power output by the DC input power.

The frequency of an LC oscillator is determined by the inductance and capacitance in the take circuit.

Linear Amplifier: an amplifier in which the output preserves the input waveform.

Class C amplifiers are most appropriate for CW and FM signals.

Questions?

G7B01

What is the purpose of neutralizing an amplifier?

A. To limit the modulation index

B. To eliminate self-oscillations

C. To cut off the final amplifier during standby periods

D. To keep the carrier on frequency

G7B01

What is the purpose of neutralizing an amplifier?

A. To limit the modulation index

B. To eliminate self-oscillations

C. To cut off the final amplifier during standby periods

D. To keep the carrier on frequency

G7B02

Which of these classes of amplifiers has the highest efficiency?

A. Class A

B. Class B

C. Class AB

D. Class C

G7B02

Which of these classes of amplifiers has the highest efficiency?

A. Class A

B. Class B

C. Class AB

D. Class C

G7B03

Which of the following describes the function of a two-input AND gate?

A. Output is high when either or both inputs are low

B. Output is high only when both inputs are high

C. Output is low when either or both inputs are high

D. Output is low only when both inputs are high

G7B03

Which of the following describes the function of a two-input AND gate?

A. Output is high when either or both inputs are low

B. Output is high only when both inputs are high

C. Output is low when either or both inputs are high

D. Output is low only when both inputs are high

G7B04

In a Class A amplifier, what percentage of the time does the amplifying device conduct?

A. 100%

B. More than 50% but less than 100%

C. 50%

D. Less than 50%

G7B04

In a Class A amplifier, what percentage of the time does the amplifying device conduct?

A. 100%

B. More than 50% but less than 100%

C. 50%

D. Less than 50%

G7B05

How many states does a 3-bit binary counter have?

A. 3

B. 6

C. 8

D. 16

G7B05

How many states does a 3-bit binary counter have?

A. 3

B. 6

C. 8

D. 16

G7B06

What is a shift register?

A. A clocked array of circuits that passes data in steps along the array

B. An array of operational amplifiers used for tri-state arithmetic operations

C. A digital mixer

D. An analog mixer

G7B06

What is a shift register?

A. A clocked array of circuits that passes data in steps along the array

B. An array of operational amplifiers used for tri-state arithmetic operations

C. A digital mixer

D. An analog mixer

G7B07

Which of the following are basic components of a sine wave oscillator?

A. An amplifier and a divider

B. A frequency multiplier and a mixer

C. A circulator and a filter operating in a feed-forward loop

D. A filter and an amplifier operating in a feedback loop

G7B07

Which of the following are basic components of a sine wave oscillator?

A. An amplifier and a divider

B. A frequency multiplier and a mixer

C. A circulator and a filter operating in a feed-forward loop

D. A filter and an amplifier operating in a feedback loop

G7B08

How is the efficiency of an RF power amplifier determined?

A. Divide the DC input power by the DC output power

B. Divide the RF output power by the DC input power

C. Multiply the RF input power by the reciprocal of the RF output power

D. Add the RF input power to the DC output power

G7B08

How is the efficiency of an RF power amplifier determined?

A. Divide the DC input power by the DC output power

B. Divide the RF output power by the DC input power

C. Multiply the RF input power by the reciprocal of the RF output power

D. Add the RF input power to the DC output power

G7B09

What determines the frequency of an LC oscillator?

A. The number of stages in the counter

B. The number of stages in the divider

C. The inductance and capacitance in the tank circuit

D. The time delay of the lag circuit

G7B09

What determines the frequency of an LC oscillator?

A. The number of stages in the counter

B. The number of stages in the divider

C. The inductance and capacitance in the tank circuit

D. The time delay of the lag circuit

G7B10

Which of the following describes a linear amplifier?

A. Any RF power amplifier used in conjunction with an amateur transceiver

B. An amplifier in which the output preserves the input waveform

C. A Class C high efficiency amplifier

D. An amplifier used as a frequency multiplier

G7B10

Which of the following describes a linear amplifier?

A. Any RF power amplifier used in conjunction with an amateur transceiver

B. An amplifier in which the output preserves the input waveform

C. A Class C high efficiency amplifier

D. An amplifier used as a frequency multiplier

G7B11

For which of the following modes is a Class C power stage appropriate for amplifying a modulated signal?

A. SSB

B. FM

C. AM

D. All these choices are correct

G7B11

For which of the following modes is a Class C power stage appropriate for amplifying a modulated signal?

A. SSB

B. FM

C. AM

D. All these choices are correct

G7C – Transceiver design; filters; oscillators; digital signal processing (DSP)

Points of Discussion

A filter circuit is used to select one of the sidebands from a balanced modulator.

A balanced modulator produces double-sideband modulated RF output.

One reason to use an impedance matching transformer at a transmitter output is to present the desired impedance to the transmitter and feed line.

A product detector is used in a single sideband (SSB) receiver to extract the modulated signal.

A Direct Digital Synthesizer (DDS) is characterized as having a variable output frequency with the stability of a crystal oscillator.

A wide range of filter bandwidths and shapes can be created when using a digital signal processing (DSP) filter. This is something that an analog filter cannot produce.

Insertion Loss: a filter's attenuation inside its passband.

Input amplifier gain, demodulator stage bandwidth, and input amplifier noise figure all affect receiver sensitivity.

The phase difference between the I and Q RF signals that software-defined radio (SDR) equipment uses for modulation and demodulation is 90 degrees.

An advantage of using I-Q modulation with software-defined radio (SDR) is that all types of modulation can be created with the appropriate processing.

Filtering, detection, and modulation are all functions that can be performed by the software in a software-defined radio (SDR).

Cutoff Frequency: the frequency above which a low-pass filter's output power is less than half of the input power.

Ultimate Rejection: a filter's maximum ability to reject signals outside its passband.

The bandwidth of a band-pass filter is measured between the upper and lower half-power frequencies.

Questions?

G7C01

What circuit is used to select one of the sidebands from a balanced modulator?

A. Carrier oscillator

B. Filter

C. IF amplifier

D. RF amplifier

G7C01

What circuit is used to select one of the sidebands from a balanced modulator?

A. Carrier oscillator

B. Filter

C. IF amplifier

D. RF amplifier

G7C02

What output is produced by a balanced modulator?

A. Frequency modulated RF

B. Audio with equalized frequency response

C. Audio extracted from the modulation signal

D. Double-sideband modulated RF

G7C02

What output is produced by a balanced modulator?

A. Frequency modulated RF

B. Audio with equalized frequency response

C. Audio extracted from the modulation signal

D. Double-sideband modulated RF

G7C03

What is one reason to use an impedance matching transformer at a transmitter output?

A. To minimize transmitter power output

B. To present the desired impedance to the transmitter and feed line

C. To reduce power supply ripple

D. To minimize radiation resistance

G7C03

What is one reason to use an impedance matching transformer at a transmitter output?

A. To minimize transmitter power output

B. To present the desired impedance to the transmitter and feed line

C. To reduce power supply ripple

D. To minimize radiation resistance

G7C04

How is a product detector used?

A. Used in test gear to detect spurious mixing products

B. Used in transmitter to perform frequency multiplication

C. Used in an FM receiver to filter out unwanted sidebands

D. Used in a single sideband receiver to extract the modulated signal

G7C04

How is a product detector used?

A. Used in test gear to detect spurious mixing products

B. Used in transmitter to perform frequency multiplication

C. Used in an FM receiver to filter out unwanted sidebands

D. Used in a single sideband receiver to extract the modulated signal

G7C05

Which of the following is characteristic of a direct digital synthesizer (DDS)?

A. Extremely narrow tuning range

B. Relatively high-power output

C. Pure sine wave output

D. Variable output frequency with the stability of a crystal oscillator

G7C05

Which of the following is characteristic of a direct digital synthesizer (DDS)?

A. Extremely narrow tuning range

B. Relatively high-power output

C. Pure sine wave output

D. Variable output frequency with the stability of a crystal oscillator

G7C06

Which of the following is an advantage of a digital signal processing (DSP) filter compared to an analog filter?

A. A wide range of filter bandwidths and shapes can be created

B. Fewer digital components are required

C. Mixing products are greatly reduced

D. The DSP filter is much more effective at VHF frequencies

G7C06

Which of the following is an advantage of a digital signal processing (DSP) filter compared to an analog filter?

A. A wide range of filter bandwidths and shapes can be created

B. Fewer digital components are required

C. Mixing products are greatly reduced

D. The DSP filter is much more effective at VHF frequencies

G7C07

What term specifies a filter's attenuation inside its passband?

A. Insertion loss

B. Return loss

C. Q

D. Ultimate rejection

G7C07

What term specifies a filter's attenuation inside its passband?

A. Insertion loss

B. Return loss

C. Q

D. Ultimate rejection

G7C08

Which parameter affects receiver sensitivity?

A. Input amplifier gain

B. Demodulator stage bandwidth

C. Input amplifier noise figure

D. All these choices are correct

G7C08

Which parameter affects receiver sensitivity?

A. Input amplifier gain

B. Demodulator stage bandwidth

C. Input amplifier noise figure

D. All these choices are correct

G7C09

What is the phase difference between the I and Q RF signals that software-defined radio (SDR) equipment uses for modulation and demodulation?

A. Zero

B. 90 degrees

C. 180 degrees

D. 45 degrees

G7C09

What is the phase difference between the I and Q RF signals that software-defined radio (SDR) equipment uses for modulation and demodulation?

A. Zero

B. 90 degrees

C. 180 degrees

D. 45 degrees

G7C10

What is an advantage of using I-Q modulation with software-defined radios (SDRs)?

A. The need for high resolution analog-to-digital converters is eliminated

B. All types of modulation can be created with appropriate processing

C. Minimum detectable signal level is reduced

D. Automatic conversion of the signal from digital to analog

G7C10

What is an advantage of using I-Q modulation with software-defined radios (SDRs)?

A. The need for high resolution analog-to-digital converters is eliminated

B. All types of modulation can be created with appropriate processing

C. Minimum detectable signal level is reduced

D. Automatic conversion of the signal from digital to analog

G7C11

Which of these functions is performed by software in a software-defined radio (SDR)?

A. Filtering

B. Detection

C. Modulation

D. All these choices are correct

G7C11

Which of these functions is performed by software in a software-defined radio (SDR)?

A. Filtering

B. Detection

C. Modulation

D. All these choices are correct

G7C12

What is the frequency above which a low-pass filter's output power is less than half the input power?

A. Notch frequency

B. Neper frequency

C. Cutoff frequency

D. Rolloff frequency

G7C12

What is the frequency above which a low-pass filter's output power is less than half the input power?

A. Notch frequency

B. Neper frequency

C. Cutoff frequency

D. Rolloff frequency

G7C13

What term specifies a filter's maximum ability to reject signals outside its passband?

A. Notch depth

B. Rolloff

C. Insertion loss

D. Ultimate rejection

G7C13

What term specifies a filter’s maximum ability to reject signals outside its passband?

A. Notch depth

B. Rolloff

C. Insertion loss

D. Ultimate rejection

G7C14

The bandwidth of a band-pass filter is measured between what two frequencies?

A. Upper and lower half-power

B. Cutoff and rolloff

C. Pole and zero

D. Image and harmonic

G7C14

The bandwidth of a band-pass filter is measured between what two frequencies?

A. Upper and lower half-power

B. Cutoff and rolloff

C. Pole and zero

D. Image and harmonic

SUBELEMENT G8 – SIGNALS AND EMISSIONS

[3 Exam Questions – 3 Groups]

G8A – Carriers and modulation: AM, FM, and single sideband; modulation envelope; digital modulation; overmodulation; link budgets and link margins

Points of Discussion

Direct binary Frequency Shift Keyed (FSK) modulation is generated by changing an oscillator's frequency directly with a digital control signal.

Phase Modulation; the process that changes the phase angle of an RF signal to convey information.

Frequency Modulation: the process that changes the instantaneous frequency of an RF wave to convey information.

A phase modulation signal is produced by a reactance modulator connected to a transmitter RF amplifier stage.

Amplitude Modulation: the type of modulation that varies the instantaneous power of the RF signal.

QPSK31 is sideband sensitive, is encoded to provide error correction, and has approximately the same bandwidth as BPSK31.

Single sideband phone (voice) emissions has one of the narrowest bandwidths.

Overmodulation can cause excessive bandwidth.

8-tone Frequency Shift Keying (FSK) is the type of modulation used by FT8.

"Flat-topping": Signal distortion in an amplitude-modulated phone (voice) signal caused by excessive drive or speech levels.

The modulation envelope of an AM signal is the waveform created by connecting peak values of the modulated signal.

QPSK modulation: Modulation in which digital data is transmitted using 0-, 90-, 180-, and 270-degree phase shifts to represent pairs of bits.

Link Budget: the sum of transmit power and antenna gains minus system losses (as seen at the receiver)

Link Margin: the difference between received power level and minimum required signal level at the input to the receiver.

Questions

G8A01

How is direct binary FSK modulation generated?

A. By keying an FM transmitter with a sub-audible tone

B. By changing an oscillator's frequency directly with a digital control signal

C. By using a transceiver's computer data interface protocol to change frequencies

D. By reconfiguring the CW keying input to act as a tone generator

G8A01

How is direct binary FSK modulation generated?

A. By keying an FM transmitter with a sub-audible tone

B. By changing an oscillator's frequency directly with a digital control signal

C. By using a transceiver's computer data interface protocol to change frequencies

D. By reconfiguring the CW keying input to act as a tone generator

G8A02

What is the name of the process that changes the phase angle of an RF signal to convey information?

A. Phase convolution

B. Phase modulation

C. Phase transformation

D. Phase inversion

G8A02

What is the name of the process that changes the phase angle of an RF signal to convey information?

A. Phase convolution

B. Phase modulation

C. Phase transformation

D. Phase inversion

G8A03

What is the name of the process that changes the instantaneous frequency of an RF wave to convey information?

A. Frequency convolution

B. Frequency transformation

C. Frequency conversion

D. Frequency modulation

G8A03

What is the name of the process that changes the instantaneous frequency of an RF wave to convey information?

A. Frequency convolution

B. Frequency transformation

C. Frequency conversion

D. Frequency modulation

G8A04

What emission is produced by a reactance modulator connected to a transmitter RF amplifier stage?

A. Multiplex modulation

B. Phase modulation

C. Amplitude modulation

D. Pulse modulation

G8A04

What emission is produced by a reactance modulator connected to a transmitter RF amplifier stage?

A. Multiplex modulation

B. Phase modulation

C. Amplitude modulation

D. Pulse modulation

G8A05

What type of modulation varies the instantaneous power level of the RF signal?

A. Power modulation

B. Phase modulation

C. Frequency modulation

D. Amplitude modulation

G8A05

What type of modulation varies the instantaneous power level of the RF signal?

A. Power modulation

B. Phase modulation

C. Frequency modulation

D. Amplitude modulation

G8A06

Which of the following is characteristic of QPSK31?

A. It is sideband sensitive

B. Its encoding provides error correction

C. Its bandwidth is approximately the same as BPSK31

D. All these choices are correct

G8A06

Which of the following is characteristic of QPSK31?

A. It is sideband sensitive

B. Its encoding provides error correction

C. Its bandwidth is approximately the same as BPSK31

D. All these choices are correct

G8A07

Which of the following phone emissions uses the narrowest bandwidth?

A. Single sideband

B. Vestigial sideband

C. Phase modulation

D. Frequency modulation

G8A07

Which of the following phone emissions uses the narrowest bandwidth?

A. Single sideband

B. Vestigial sideband

C. Phase modulation

D. Frequency modulation

G8A08

Which of the following is an effect of overmodulation?

A. Insufficient audio

B. Insufficient bandwidth

C. Frequency drift

D. Excessive bandwidth

G8A08

Which of the following is an effect of overmodulation?

A. Insufficient audio

B. Insufficient bandwidth

C. Frequency drift

D. Excessive bandwidth

G8A09

What type of modulation is used by FT8?

A. 8-tone frequency shift keying

B. Vestigial sideband

C. Amplitude compressed AM

D. 8-bit direct sequence spread spectrum

G8A09

What type of modulation is used by FT8?

A. 8-tone frequency shift keying

B. Vestigial sideband

C. Amplitude compressed AM

D. 8-bit direct sequence spread spectrum

G8A10

What is meant by the term “flat-topping,” when referring to an amplitude-modulated phone signal?

A. Signal distortion caused by insufficient collector current

B. The transmitter’s automatic level control (ALC) is properly adjusted

C. Signal distortion caused by excessive drive or speech levels

D. The transmitter’s carrier is properly suppressed

G8A10

What is meant by the term "flat-topping," when referring to an amplitude-modulated phone signal?

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B. The transmitter's automatic level control (ALC) is properly adjusted

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D. The transmitter's carrier is properly suppressed

G8A11

What is the modulation envelope of an AM signal?

A. The waveform created by connecting the peak values of the modulated signal

B. The carrier frequency that contains the signal

C. Spurious signals that envelop nearby frequencies

D. The bandwidth of the modulated signal

G8A11

What is the modulation envelope of an AM signal?

A. The waveform created by connecting the peak values of the modulated signal

B. The carrier frequency that contains the signal

C. Spurious signals that envelop nearby frequencies

D. The bandwidth of the modulated signal

G8A12

What is QPSK modulation?

A. Modulation using quasi-parallel to serial conversion to reduce bandwidth

B. Modulation using quadra-pole sideband keying to generate spread spectrum signals

C. Modulation using Fast Fourier Transforms to generate frequencies at the first, second, third, and fourth harmonics of the carrier frequency to improve noise immunity

D. Modulation in which digital data is transmitted using 0-, 90-, 180- and 270-degrees phase shift to represent pairs of bits

G8A12

What is QPSK modulation?

A. Modulation using quasi-parallel to serial conversion to reduce bandwidth

B. Modulation using quadra-pole sideband keying to generate spread spectrum signals

C. Modulation using Fast Fourier Transforms to generate frequencies at the first, second, third, and fourth harmonics of the carrier frequency to improve noise immunity

D. Modulation in which digital data is transmitted using 0-, 90-, 180- and 270-degrees phase shift to represent pairs of bits

G8A13

What is a link budget?

A. The financial costs associated with operating a radio link

B. The sum of antenna gains minus system losses

C. The sum of transmit power and antenna gains minus system losses as seen at the receiver

D. The difference between transmit power and receiver sensitivity

G8A13

What is a link budget?

A. The financial costs associated with operating a radio link

B. The sum of antenna gains minus system losses

C. The sum of transmit power and antenna gains minus system losses as seen at the receiver

D. The difference between transmit power and receiver sensitivity

G8A14

What is link margin?

A. The opposite of fade margin

B. The difference between received power level and minimum required signal level at the input to the receiver

C. Transmit power minus receiver sensitivity

D. Receiver sensitivity plus 3 dB

G8A14

What is link margin?

A. The opposite of fade margin

B. The difference between received power level and minimum required signal level at the input to the receiver

C. Transmit power minus receiver sensitivity

D. Receiver sensitivity plus 3 dB

G8B – Frequency changing; bandwidths of various modes; deviation; intermodulation

Points of Discussion

On a mixer, local oscillator input is varied or tuned to convert signals of different frequencies to an intermediate frequency (IF).

Image response: interference from a signal at twice the IF frequency from the desired frequency.

Heterodyning: another term for the mixing of two RF signals.

It is the multiplier stage in a VHF FM transmitter that generates a harmonic of a lower frequency signal to reach the desired operating frequency.

Odd-order intermodulation products are closest to the original signal frequencies.

The total bandwidth of an FM phone (voice) transmission that has 5 kHz deviation and a 3 kHz modulating frequency is 16 kHz.

The frequency deviation for a 12.21 MHz reactance modulated oscillator in a 5 kHz deviation, 146.52 MHz FM phone (voice) transmitter is 416.7 Hz

It is important to know the duty cycle of any mode you are using to transmit as the high duty cycle of some modes could exceed the transmitter's average power rating.

Matching receiver bandwidth to the bandwidth of the operating mode results in the best signal-to-noise ratio.

Digital modes with higher symbol rates require wider bandwidth.

The sum and difference of a mixer's Local Oscillator (LO) and RF input frequencies are found in its output.

Intermodulation: a process that combines two signals in a non-linear circuit that produce unwanted spurious outputs.

2F1-F2 is an odd-order intermodulation product of frequencies F1 and F2.

Questions?

G8B01

Which mixer input is varied or tuned to convert signals of different frequencies to an intermediate frequency (IF)?

A. Image frequency

B. Local oscillator

C. RF input

D. Beat frequency oscillator

G8B01

Which mixer input is varied or tuned to convert signals of different frequencies to an intermediate frequency (IF)?

A. Image frequency

B. Local oscillator

C. RF input

D. Beat frequency oscillator

G8B02

What is the term for interference from a signal at twice the IF frequency from the desired signal?

A. Quadrature response

B. Image response

C. Mixer interference

D. Intermediate interference

G8B02

What is the term for interference from a signal at twice the IF frequency from the desired signal?

A. Quadrature response

B. Image response

C. Mixer interference

D. Intermediate interference

G8B03

What is another term for the mixing of two RF signals?

A. Heterodyning

B. Synthesizing

C. Frequency inversion

D. Phase inversion

G8B03

What is another term for the mixing of two RF signals?

A. Heterodyning

B. Synthesizing

C. Frequency inversion

D. Phase inversion

G8B04

What is the stage in a VHF FM transmitter that generates a harmonic of a lower frequency signal to reach the desired operating frequency?

A. Mixer

B. Reactance modulator

C. Balanced converter

D. Multiplier

G8B04

What is the stage in a VHF FM transmitter that generates a harmonic of a lower frequency signal to reach the desired operating frequency?

A. Mixer

B. Reactance modulator

C. Balanced converter

D. Multiplier

G8B05

Which intermodulation products are closest to the original signal frequencies?

A. Second harmonics

B. Even-order

C. Odd-order

D. Intercept point

G8B05

Which intermodulation products are closest to the original signal frequencies?

A. Second harmonics

B. Even-order

C. Odd-order

D. Intercept point

G8B06

What is the total bandwidth of an FM phone transmission having 5 kHz deviation and 3 kHz modulating frequency?

A. 3 kHz

B. 5 kHz

C. 8 kHz

D. 16 kHz

G8B06

What is the total bandwidth of an FM phone transmission having 5 kHz deviation and 3 kHz modulating frequency?

A. 3 kHz

B. 5 kHz

C. 8 kHz

D. 16 kHz

G8B07

What is the frequency deviation for a 12.21 MHz reactance modulated oscillator in a 5 kHz deviation, 146.52 MHz FM phone transmitter?

A. 101.75 Hz

B. 416.7 Hz

C. 5 kHz

D. 60 kHz

G8B07

What is the frequency deviation for a 12.21 MHz reactance modulated oscillator in a 5 kHz deviation, 146.52 MHz FM phone transmitter?

A. 101.75 Hz

B. 416.7 Hz

C. 5 kHz

D. 60 kHz

G8B08

Why is it important to know the duty cycle of the mode you are using when transmitting?

A. To aid in tuning your transmitter

B. Some modes have high duty cycles that could exceed the transmitter's average power rating

C. To allow time for the other station to break in during a transmission

D. To prevent overmodulation

G8B08

Why is it important to know the duty cycle of the mode you are using when transmitting?

A. To aid in tuning your transmitter

B. Some modes have high duty cycles that could exceed the transmitter's average power rating

C. To allow time for the other station to break in during a transmission

D. To prevent overmodulation

G8B09

Why is it good to match receiver bandwidth to the bandwidth of the operating mode?

A. It is required by FCC rules

B. It minimizes power consumption in the receiver

C. It improves impedance matching of the antenna

D. It results in the best signal-to-noise ratio

G8B09

Why is it good to match receiver bandwidth to the bandwidth of the operating mode?

A. It is required by FCC rules

B. It minimizes power consumption in the receiver

C. It improves impedance matching of the antenna

D. It results in the best signal-to-noise ratio

G8B10

What is the relationship between transmitted symbol rate and bandwidth?

A. Symbol rate and bandwidth are not related

B. Higher symbol rates require wider bandwidth

C. Lower symbol rates require wider bandwidth

D. Bandwidth is half the symbol rate

G8B10

What is the relationship between transmitted symbol rate and bandwidth?

A. Symbol rate and bandwidth are not related

B. Higher symbol rates require wider bandwidth

C. Lower symbol rates require wider bandwidth

D. Bandwidth is half the symbol rate

G8B11

What combination of a mixer's Local Oscillator (LO) and RF input frequencies is found in the output?

A. The ratio

B. The average

C. The sum and difference

D. The arithmetic product

G8B11

What combination of a mixer's Local Oscillator (LO) and RF input frequencies is found in the output?

A. The ratio

B. The average

C. The sum and difference

D. The arithmetic product

G8B12

What process combines two signals in a non-linear circuit to produce unwanted spurious outputs?

A. Intermodulation

B. Heterodyning

C. Detection

D. Rolloff

G8B12

What process combines two signals in a non-linear circuit to produce unwanted spurious outputs?

A. Intermodulation

B. Heterodyning

C. Detection

D. Rolloff

G8B13

Which of the following is an odd-order intermodulation product of frequencies F1 and F2?

A. 5F1-3F2

B. 3F1-F2

C. 2F1-F2

D. All these choices are correct

G8B13

Which of the following is an odd-order intermodulation product of frequencies F1 and F2?

A. 5F1-3F2

B. 3F1-F2

C. 2F1-F2

D. All these choices are correct

G8C – Digital emission modes

Points of Discussion

Licensed amateurs share channels with unlicensed Wi-Fi services on 2.4 GHz.

WSPR is a digital mode that is used as a low-power beacon for assessing HF propagation.

The header of a packet radio frame contains its routing and handling information.

Baudot code is a 5-bit code with additional start and stop bits.

The response “NAK” in an ARQ mode is a request for the retransmission of the packet.

In an ARQ mode, the failure to exchange information due to excessive retransmission attempts will result in a dropped connection.

FT8 is a narrow-band digital mode that can receive signals with a very low signal-to-noise ratio.

In PSK31, uppercase letters use longer Varicode bit sequences that invariably slow down transmission.

Within a mesh network of microwave nodes, if one node fails, a packet may still reach its target station via an alternate node.

Forward Error Correction (FEC) allows the receiver to correct data errors by transmitting redundant information with the data.

"Mark" and "space" are used to identify the two separate frequencies of a Frequency Shift Keyed (FSK) signal.

Varicode is used in a PSK31 signal to transmit characters.

On a waterfall display, one or more vertical lines on either side of a digital signal can indicate overmodulation.

In a waterfall display, the frequency is horizontal, signal strength is intensity, and time is vertical.

An FT8 signal report of "+3" means that the signal-to-noise ratio is equivalent to +3 dB in a 2.5 kHz bandwidth.

DMR, D-Star, and SystemFusion all provide digital voice (phone) modes.

Questions?

G8C01

On what band do amateurs share channels with the unlicensed Wi-Fi service?

A. 432 MHz

B. 902 MHz

C. 2.4 GHz

D. 10.7 GHz

G8C01

On what band do amateurs share channels with the unlicensed Wi-Fi service?

A. 432 MHz

B. 902 MHz

C. 2.4 GHz

D. 10.7 GHz

G8C02

Which digital mode is used as a low-power beacon for assessing HF propagation?

A. WSPR

B. MFSK16

C. PSK31

D. SSB-SC

G8C02

Which digital mode is used as a low-power beacon for assessing HF propagation?

A. WSPR

B. MFSK16

C. PSK31

D. SSB-SC

G8C03

What part of a packet radio frame contains the routing and handling information?

A. Directory

B. Preamble

C. Header

D. Trailer

G8C03

What part of a packet radio frame contains the routing and handling information?

A. Directory

B. Preamble

C. Header

D. Trailer

G8C04

Which of the following describes Baudot code?

A. A 7-bit code with start, stop, and parity bits

B. A code using error detection and correction

C. A 5-bit code with additional start and stop bits

D. A code using SELCAL and LISTEN

G8C04

Which of the following describes Baudot code?

A. A 7-bit code with start, stop, and parity bits

B. A code using error detection and correction

C. A 5-bit code with additional start and stop bits

D. A code using SELCAL and LISTEN

G8C05

In an ARQ mode, what is meant by a NAK response to a transmitted packet?

A. Request retransmission of the packet

B. Packet was received without error

C. Receiving station connected and ready for transmissions

D. Entire file received correctly

G8C05

In an ARQ mode, what is meant by a NAK response to a transmitted packet?

A. Request retransmission of the packet

B. Packet was received without error

C. Receiving station connected and ready for transmissions

D. Entire file received correctly

G8C06

What action results from a failure to exchange information due to excessive transmission attempts when using an ARQ mode?

A. The checksum overflows

B. The connection is dropped

C. Packets will be routed incorrectly

D. Encoding reverts to the default character set

G8C06

What action results from a failure to exchange information due to excessive transmission attempts when using an ARQ mode?

A. The checksum overflows

B. The connection is dropped

C. Packets will be routed incorrectly

D. Encoding reverts to the default character set

G8C07

Which of the following narrow-band digital modes can receive signals with very low signal-to-noise ratios?

A. MSK144

B. FT8

C. AMTOR

D. MFSK32

G8C07

Which of the following narrow-band digital modes can receive signals with very low signal-to-noise ratios?

A. MSK144

B. FT8

C. AMTOR

D. MFSK32

G8C08

Which of the following statements is true about PSK31?

A. Upper case letters are sent with more power

B. Upper case letters use longer Varicode bit sequences and thus slow down transmission

C. Error correction is used to ensure accurate message reception

D. Higher power is needed as compared to RTTY for similar error rates

G8C08

Which of the following statements is true about PSK31?

A. Upper case letters are sent with more power

B. Upper case letters use longer Varicode bit sequences and thus slow down transmission

C. Error correction is used to ensure accurate message reception

D. Higher power is needed as compared to RTTY for similar error rates

G8C09

Which is true of mesh network microwave nodes?

A. Having more nodes increases signal strengths

B. If one node fails, a packet may still reach its target station via an alternate node

C. Links between two nodes in a network may have different frequencies and bandwidths

D. More nodes reduce overall microwave out of band interference

G8C09

Which is true of mesh network microwave nodes?

A. Having more nodes increases signal strengths

B. If one node fails, a packet may still reach its target station via an alternate node

C. Links between two nodes in a network may have different frequencies and bandwidths

D. More nodes reduce overall microwave out of band interference

G8C10

How does forward error correction (FEC) allow the receiver to correct data errors?

A. By controlling transmitter output power for optimum signal strength

B. By using the Varicode character set

C. By transmitting redundant information with the data

D. By using a parity bit with each character

G8C10

How does forward error correction (FEC) allow the receiver to correct data errors?

A. By controlling transmitter output power for optimum signal strength

B. By using the Varicode character set

C. By transmitting redundant information with the data

D. By using a parity bit with each character

G8C11

How are the two separate frequencies of a Frequency Shift Keyed (FSK) signal identified?

A. Dot and dash

B. On and off

C. High and low

D. Mark and space

G8C11

How are the two separate frequencies of a Frequency Shift Keyed (FSK) signal identified?

A. Dot and dash

B. On and off

C. High and low

D. Mark and space

G8C12

Which type of code is used for sending characters in a PSK31 signal?

A. Varicode

B. Viterbi

C. Volumetric

D. Binary

G8C12

Which type of code is used for sending characters in a PSK31 signal?

A. Varicode

B. Viterbi

C. Volumetric

D. Binary

G8C13

What is indicated on a waterfall display by one or more vertical lines on either side of a data mode or RTTY signal?

A. Long path propagation

B. Backscatter propagation

C. Insufficient modulation

D. Overmodulation

G8C13

What is indicated on a waterfall display by one or more vertical lines on either side of a data mode or RTTY signal?

A. Long path propagation

B. Backscatter propagation

C. Insufficient modulation

D. Overmodulation

G8C14

Which of the following describes a waterfall display?

A. Frequency is horizontal, signal strength is vertical, time is intensity

B. Frequency is vertical, signal strength is intensity, time is horizontal

C. Frequency is horizontal, signal strength is intensity, time is vertical

D. Frequency is vertical, signal strength is horizontal, time is intensity

G8C14

Which of the following describes a waterfall display?

A. Frequency is horizontal, signal strength is vertical, time is intensity

B. Frequency is vertical, signal strength is intensity, time is horizontal

C. Frequency is horizontal, signal strength is intensity, time is vertical

D. Frequency is vertical, signal strength is horizontal, time is intensity

G8C15

What does an FT8 signal report of +3 mean?

A. The signal is 3 times the noise level of an equivalent SSB signal

B. The signal is S3 (weak signals)

C. The signal-to-noise ratio is equivalent to +3dB in a 2.5 kHz bandwidth

D. The signal is 3 dB over S9

G8C15

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B. The signal is S3 (weak signals)

C. The signal-to-noise ratio is equivalent to +3dB in a 2.5 kHz bandwidth

D. The signal is 3 dB over S9

G8C16

Which of the following provide digital voice modes?

A. WSPR, MFSK16, and EasyPAL

B. FT8, FT4, and FST4

C. Winlink, PACTOR II, and PACTOR III

D. DMR, D-STAR, and SystemFusion

G8C16

Which of the following provide digital voice modes?

A. WSPR, MFSK16, and EasyPAL

B. FT8, FT4, and FST4

C. Winlink, PACTOR II, and PACTOR III

D. DMR, D-STAR, and SystemFusion

SUBELEMENT G9 – ANTENNAS AND FEED LINES

[4 Exam Questions – 4 Groups]

G9A – Feed lines: characteristic impedance and attenuation; standing wave ratio (SWR) calculation, measurement, and effects; antenna feed point matching

Points of Discussion

The distance between the centers of the conductors and the radius of the conductors determines the characteristic impedance of a parallel conductor feed line.

High standing wave ratio (SWR) increases loss in a lossy transmission line.

The nominal characteristic impedance of “window line” transmission line is 450 ohms.

A difference between feed line impedance and antenna feed point impedance causes reflected power at an antenna's feed point.

The attenuation of coaxial cable increases with increasing frequency.

RF feed line loss is generally expressed in dB per 100 feet.

The antenna feed line impedance must be matched to the characteristic impedance of the feedline in order to prevent standing waves on a feed line.

If the SWR (standing wave ratio) on an antenna feedline is 5:1 and a matching network at the transmitter end of the feed line is adjusted to present a 1:1 SWR to the transmitter, the resulting SWR on the feed line is 5:1

A standing wave ratio (SWR) of 4:1 results from connecting a 50-ohm feed line to a 200-ohm resistive load.

A standing wave ratio (SWR) of 5:1 results from connecting a 50-ohm feed line to a 10-ohm resistive load.

When measured at the input to the feed line, higher line loss reduces the SWR (standing wave ratio).

Questions?

G9A01

Which of the following factors determine the characteristic impedance of a parallel conductor feed line?

A. The distance between the centers of the conductors and the radius of the conductors

B. The distance between the centers of the conductors and the length of the line

C. The radius of the conductors and the frequency of the signal

D. The frequency of the signal and the length of the line

G9A01

Which of the following factors determine the characteristic impedance of a parallel conductor feed line?

A. The distance between the centers of the conductors and the radius of the conductors

B. The distance between the centers of the conductors and the length of the line

C. The radius of the conductors and the frequency of the signal

D. The frequency of the signal and the length of the line

G9A02

What is the relationship between high standing wave ratio (SWR) and transmission line loss?

A. There is no relationship between transmission line loss and SWR

B. High SWR increases loss in a lossy transmission line

C. High SWR makes it difficult to measure transmission line loss

D. High SWR reduces the relative effect of transmission line loss

G9A02

What is the relationship between high standing wave ratio (SWR) and transmission line loss?

A. There is no relationship between transmission line loss and SWR

B. High SWR increases loss in a lossy transmission line

C. High SWR makes it difficult to measure transmission line loss

D. High SWR reduces the relative effect of transmission line loss

G9A03

What is the nominal characteristic impedance of “window line” transmission line?

A. 50 ohms

B. 75 ohms

C. 100 ohms

D. 450 ohms

G9A03

What is the nominal characteristic impedance of “window line” transmission line?

A. 50 ohms

B. 75 ohms

C. 100 ohms

D. 450 ohms

G9A04

What causes reflected power at an antenna's feed point?

A. Operating an antenna at its resonant frequency

B. Using more transmitter power than the antenna can handle

C. A difference between feed line impedance and antenna feed point impedance

D. Feeding the antenna with unbalanced feed line

G9A04

What causes reflected power at an antenna's feed point?

A. Operating an antenna at its resonant frequency

B. Using more transmitter power than the antenna can handle

C. A difference between feed line impedance and antenna feed point impedance

D. Feeding the antenna with unbalanced feed line

G9A05

How does the attenuation of coaxial cable change with increasing frequency?

A. Attenuation is independent of frequency

B. Attenuation increases

C. Attenuation decreases

D. Attenuation follows Marconi’s Law of Attenuation

G9A05

How does the attenuation of coaxial cable change with increasing frequency?

A. Attenuation is independent of frequency

B. Attenuation increases

C. Attenuation decreases

D. Attenuation follows Marconi's Law of Attenuation

G9A06

In what units is RF feed line loss usually expressed?

A. Ohms per 1,000 feet

B. Decibels per 1,000 feet

C. Ohms per 100 feet

D. Decibels per 100 feet

G9A06

In what units is RF feed line loss usually expressed?

A. Ohms per 1,000 feet

B. Decibels per 1,000 feet

C. Ohms per 100 feet

D. Decibels per 100 feet

G9A07

What must be done to prevent standing waves on a feed line connected to an antenna?

A. The antenna feed point must be at DC ground potential

B. The feed line must be an odd number of electrical quarter wavelengths long

C. The feed line must be an even number of physical half wavelengths long

D. The antenna feed point impedance must be matched to the characteristic impedance of the feed line

G9A07

What must be done to prevent standing waves on a feed line connected to an antenna?

A. The antenna feed point must be at DC ground potential

B. The feed line must be an odd number of electrical quarter wavelengths long

C. The feed line must be an even number of physical half wavelengths long

D. The antenna feed point impedance must be matched to the characteristic impedance of the feed line

G9A08

If the SWR on an antenna feed line is 5:1, and a matching network at the transmitter end of the feed line is adjusted to present a 1:1 SWR to the transmitter, what is the resulting SWR on the feed line?

A. 1:1

B. 5:1

C. Between 1:1 and 5:1 depending on the characteristic impedance of the line

D. Between 1:1 and 5:1 depending on the reflected power at the transmitter

G9A08

If the SWR on an antenna feed line is 5:1, and a matching network at the transmitter end of the feed line is adjusted to present a 1:1 SWR to the transmitter, what is the resulting SWR on the feed line?

A. 1:1

B. 5:1

C. Between 1:1 and 5:1 depending on the characteristic impedance of the line

D. Between 1:1 and 5:1 depending on the reflected power at the transmitter

G9A09

What standing wave ratio results from connecting a 50-ohm feed line to a 200-ohm resistive load?

A. 4:1

B. 1:4

C. 2:1

D. 1:2

G9A09

What standing wave ratio results from connecting a 50-ohm feed line to a 200-ohm resistive load?

A. 4:1

B. 1:4

C. 2:1

D. 1:2

G9A10

What standing wave ratio results from connecting a 50-ohm feed line to a 10-ohm resistive load?

A. 2:1

B. 1:2

C. 1:5

D. 5:1

G9A10

What standing wave ratio results from connecting a 50-ohm feed line to a 10-ohm resistive load?

A. 2:1

B. 1:2

C. 1:5

D. 5:1

G9A11

What is the effect of transmission line loss on SWR measured at the input to the line?

A. Higher loss reduces SWR measured at the input to the line

B. Higher loss increases SWR measured at the input to the line

C. Higher loss increases the accuracy of SWR measured at the input to the line

D. Transmission line loss does not affect the SWR measurement

G9A11

What is the effect of transmission line loss on SWR measured at the input to the line?

A. Higher loss reduces SWR measured at the input to the line

B. Higher loss increases SWR measured at the input to the line

C. Higher loss increases the accuracy of SWR measured at the input to the line

D. Transmission line loss does not affect the SWR measurement

G9B – Basic dipole and monopole antennas

Points of Discussion

Station equipment may carry significant RF current when using a random-wire HF antenna connected directly to the transmitter.

A common way to adjust the feed-point impedance of an elevated quarter-wave ground-plane vertical antenna to approximately 50 ohms is to slope the radials downward.

The radiation pattern of a quarter-wave, ground-plane vertical antenna is omnidirectional in azimuth.

The radiation pattern of a dipole antenna in free space in a plane containing the conductor is a figure-eight at right angles to the antenna.

When a horizontal dipole HF antenna with an elevation angle of more than 46 degrees is less than ½ wavelength high, its azimuthal radiation pattern is almost omnidirectional.

The radial wires of a ground-mounted vertical antenna should be placed either on the surface of the ground or buried no more than a few inches below the ground.

The feed point impedance of a horizontal ½ wave dipole antenna steadily decreases as the antenna height is lowered to 1/10 wavelength above the ground.

The feed point impedance of a ½ wave dipole steadily increases as its feed point is moved from the center towards one of its ends.

An advantage of using a horizontally polarized HF antenna versus a vertically polarized HF antenna is that the horizontally polarized HF antenna has lower ground losses.

length (feet) = 492 / frequency (MHz)

The approximate length for a ½ wave dipole antenna cut for 14.250 MHz is roughly 33 feet (but may be closer to 34.5').

The approximate length for a ½ wave dipole antenna cut for 3.550 MHz is roughly 132 feet (but may be closer to 138.5').

length (feet) = 246 / frequency (MHz)

The approximate length for a ¼ wave monopole antenna cut for 28,5 MHz is roughly 8 feet (but may be closer to 8.6').

Questions?

G9B01

What is a characteristic of a random-wire HF antenna connected directly to the transmitter?

A. It must be longer than 1 wavelength

B. Station equipment may carry significant RF current

C. It produces only vertically polarized radiation

D. It is more effective on the lower HF bands than on the higher bands

G9B01

What is a characteristic of a random-wire HF antenna connected directly to the transmitter?

A. It must be longer than 1 wavelength

B. Station equipment may carry significant RF current

C. It produces only vertically polarized radiation

D. It is more effective on the lower HF bands than on the higher bands

G9B02

Which of the following is a common way to adjust the feed point impedance of an elevated quarter-wave ground-plane vertical antenna to be approximately 50 ohms?

A. Slope the radials upward

B. Slope the radials downward

C. Lengthen the radials beyond one wavelength

D. Coil the radials

G9B02

Which of the following is a common way to adjust the feed point impedance of an elevated quarter-wave ground-plane vertical antenna to be approximately 50 ohms?

A. Slope the radials upward

B. Slope the radials downward

C. Lengthen the radials beyond one wavelength

D. Coil the radials

G9B03

Which of the following best describes the radiation pattern of a quarter-wave ground-plane vertical antenna?

A. Bi-directional in azimuth

B. Isotropic

C. Hemispherical

D. Omnidirectional in azimuth

G9B03

Which of the following best describes the radiation pattern of a quarter-wave ground-plane vertical antenna?

A. Bi-directional in azimuth

B. Isotropic

C. Hemispherical

D. Omnidirectional in azimuth

G9B04

What is the radiation pattern of a dipole antenna in free space in a plane containing the conductor?

A. It is a figure-eight at right angles to the antenna

B. It is a figure-eight off both ends of the antenna

C. It is a circle (equal radiation in all directions)

D. It has a pair of lobes on one side of the antenna and a single lobe on the other side

G9B04

What is the radiation pattern of a dipole antenna in free space in a plane containing the conductor?

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B. It is a figure-eight off both ends of the antenna

C. It is a circle (equal radiation in all directions)

D. It has a pair of lobes on one side of the antenna and a single lobe on the other side

G9B05

How does antenna height affect the azimuthal radiation pattern of a horizontal dipole HF antenna at elevation angles higher than about 45 degrees?

A. If the antenna is too high, the pattern becomes unpredictable

B. Antenna height has no effect on the pattern

C. If the antenna is less than 1/2 wavelength high, the azimuthal pattern is almost omnidirectional

D. If the antenna is less than 1/2 wavelength high, radiation off the ends of the wire is eliminated

G9B05

How does antenna height affect the azimuthal radiation pattern of a horizontal dipole HF antenna at elevation angles higher than about 45 degrees?

A. If the antenna is too high, the pattern becomes unpredictable

B. Antenna height has no effect on the pattern

C. If the antenna is less than 1/2 wavelength high, the azimuthal pattern is almost omnidirectional

D. If the antenna is less than 1/2 wavelength high, radiation off the ends of the wire is eliminated

G9B06

Where should the radial wires of a ground-mounted vertical antenna system be placed?

A. As high as possible above the ground

B. Parallel to the antenna element

C. On the surface or buried a few inches below the ground

D. At the center of the antenna

G9B06

Where should the radial wires of a ground-mounted vertical antenna system be placed?

A. As high as possible above the ground

B. Parallel to the antenna element

C. On the surface or buried a few inches below the ground

D. At the center of the antenna

G9B07

How does the feed point impedance of a horizontal 1/2 wave dipole antenna change as the antenna height is reduced to 1/10 wavelength above ground?

A. It steadily increases

B. It steadily decreases

C. It peaks at about 1/8 wavelength above ground

D. It is unaffected by the height above ground

G9B07

How does the feed point impedance of a horizontal 1/2 wave dipole antenna change as the antenna height is reduced to 1/10 wavelength above ground?

A. It steadily increases

B. It steadily decreases

C. It peaks at about 1/8 wavelength above ground

D. It is unaffected by the height above ground

G9B08

How does the feed point impedance of a 1/2 wave dipole change as the feed point is moved from the center toward the ends?

A. It steadily increases

B. It steadily decreases

C. It peaks at about 1/8 wavelength from the end

D. It is unaffected by the location of the feed point

G9B08

How does the feed point impedance of a 1/2 wave dipole change as the feed point is moved from the center toward the ends?

A. It steadily increases

B. It steadily decreases

C. It peaks at about 1/8 wavelength from the end

D. It is unaffected by the location of the feed point

G9B09

Which of the following is an advantage of using a horizontally polarized as compared to a vertically polarized HF antenna?

A. Lower ground losses

B. Lower feed point impedance

C. Shorter radials

D. Lower radiation resistance

G9B09

Which of the following is an advantage of using a horizontally polarized as compared to a vertically polarized HF antenna?

A. Lower ground losses

B. Lower feed point impedance

C. Shorter radials

D. Lower radiation resistance

G9B10

What is the approximate length for a 1/2 wave dipole antenna cut for 14.250 MHz?

A. 8 feet

B. 16 feet

C. 24 feet

D. 33 feet

G9B10

What is the approximate length for a 1/2 wave dipole antenna cut for 14.250 MHz?

A. 8 feet

B. 16 feet

C. 24 feet

D. 33 feet

G9B11

What is the approximate length for a 1/2 wave dipole antenna cut for 3.550 MHz?

A. 42 feet

B. 84 feet

C. 132 feet

D. 263 feet

G9B11

What is the approximate length for a 1/2 wave dipole antenna cut for 3.550 MHz?

A. 42 feet

B. 84 feet

C. 132 feet

D. 263 feet

G9B12

What is the approximate length for a 1/4 wave monopole antenna cut for 28.5 MHz?

A. 8 feet

B. 11 feet

C. 16 feet

D. 21 feet

G9B12

What is the approximate length for a 1/4 wave monopole antenna cut for 28.5 MHz?

A. 8 feet

B. 11 feet

C. 16 feet

D. 21 feet

G9C – Directional antennas

Points of Discussion

A larger-diameter element would increase the bandwidth of a Yagi antenna.

The approximate length of the driven element of a Yagi antenna is ½ wavelength.

In a three-element Yagi antenna, the reflector is longer than the driven element and the director is shorter than the driven element.

Antenna gain in dBi is about 2.15 dB higher than than gain stated in dBd for the same antenna.

If you increase the boom length of a Yagi antenna and add directors to its front, you increase its gain.

The front-to-back ratio of a Yagi antenna is a comparison between the power radiated in its major lobe (the front) and the radiated power in the opposite direction.

The "main lobe" of a directional antenna is the direction of maximum radiated field strength from the antenna.

The gain of two three-element, horizontally polarized Yagi antennas space vertically ½ wavelenght apart is about 3 dB higher than a single three-element Yagi antenna.

The physical length of the antenna's boom, the number elements on the boom, or the spacing of each element along the boom's length can all be adjusted to optimize forward gain, front-to-back ratio, or SWR bandwidth of a Yagi antenna.

A beta or hairpin match is a shorted transmission line stub placed at the feed point of a Yagi antenna to provide impedance matching.

Using a gamma match with a Yagi antenna does not require the driven element to be insulated from the boom.

Questions?

G9C01

Which of the following would increase the bandwidth of a Yagi antenna?

A. Larger-diameter elements

B. Closer element spacing

C. Loading coils in series with the element

D. Tapered-diameter elements

G9C01

Which of the following would increase the bandwidth of a Yagi antenna?

A. Larger-diameter elements

B. Closer element spacing

C. Loading coils in series with the element

D. Tapered-diameter elements

G9C02

What is the approximate length of the driven element of a Yagi antenna?

A. 1/4 wavelength

B. 1/2 wavelength

C. 3/4 wavelength

D. 1 wavelength

G9C02

What is the approximate length of the driven element of a Yagi antenna?

A. 1/4 wavelength

B. 1/2 wavelength

C. 3/4 wavelength

D. 1 wavelength

G9C03

How do the lengths of a three-element Yagi reflector and director compare to that of the driven element?

A. The reflector is longer, and the director is shorter

B. The reflector is shorter, and the director is longer

C. They are all the same length

D. Relative length depends on the frequency of operation

G9C03

How do the lengths of a three-element Yagi reflector and director compare to that of the driven element?

A. The reflector is longer, and the director is shorter

B. The reflector is shorter, and the director is longer

C. They are all the same length

D. Relative length depends on the frequency of operation

G9C04

How does antenna gain in dBi compare to gain stated in dBd for the same antenna?

A. Gain in dBi is 2.15 dB lower

B. Gain in dBi is 2.15 dB higher

C. Gain in dBd is 1.25 dBd lower

D. Gain in dBd is 1.25 dBd higher

G9C04

How does antenna gain in dBi compare to gain stated in dBd for the same antenna?

A. Gain in dBi is 2.15 dB lower

B. Gain in dBi is 2.15 dB higher

C. Gain in dBd is 1.25 dBd lower

D. Gain in dBd is 1.25 dBd higher

G9C05

What is the primary effect of increasing boom length and adding directors to a Yagi antenna?

A. Gain increases

B. Beamwidth increases

C. Front-to-back ratio decreases

D. Resonant frequency is lower

G9C05

What is the primary effect of increasing boom length and adding directors to a Yagi antenna?

A. Gain increases

B. Beamwidth increases

C. Front-to-back ratio decreases

D. Resonant frequency is lower

G9C06

Question Removed (section not renumbered)

G9C07

What does “front-to-back ratio” mean in reference to a Yagi antenna?

A. The number of directors versus the number of reflectors

B. The relative position of the driven element with respect to the reflectors and directors

C. The power radiated in the major lobe compared to that in the opposite direction

D. The ratio of forward gain to dipole gain

G9C07

What does “front-to-back ratio” mean in reference to a Yagi antenna?

A. The number of directors versus the number of reflectors

B. The relative position of the driven element with respect to the reflectors and directors

C. The power radiated in the major lobe compared to that in the opposite direction

D. The ratio of forward gain to dipole gain

G9C08

What is meant by the “main lobe” of a directive antenna?

A. The magnitude of the maximum vertical angle of radiation

B. The point of maximum current in a radiating antenna element

C. The maximum voltage standing wave point on a radiating element

D. The direction of maximum radiated field strength from the antenna

G9C08

What is meant by the “main lobe” of a directive antenna?

A. The magnitude of the maximum vertical angle of radiation

B. The point of maximum current in a radiating antenna element

C. The maximum voltage standing wave point on a radiating element

D. The direction of maximum radiated field strength from the antenna

G9C09

In free space, how does the gain of two three-element, horizontally polarized Yagi antennas spaced vertically 1/2 wavelength apart typically compare to the gain of a single three-element Yagi?

A. Approximately 1.5 dB higher

B. Approximately 3 dB higher

C. Approximately 6 dB higher

D. Approximately 9 dB higher

G9C09

In free space, how does the gain of two three-element, horizontally polarized Yagi antennas spaced vertically 1/2 wavelength apart typically compare to the gain of a single three-element Yagi?

A. Approximately 1.5 dB higher

B. Approximately 3 dB higher

C. Approximately 6 dB higher

D. Approximately 9 dB higher

G9C10

Which of the following can be adjusted to optimize forward gain, front-to-back ratio, or SWR bandwidth of a Yagi antenna?

A. The physical length of the boom

B. The number of elements on the boom

C. The spacing of each element along the boom

D. All these choices are correct

G9C10

Which of the following can be adjusted to optimize forward gain, front-to-back ratio, or SWR bandwidth of a Yagi antenna?

A. The physical length of the boom

B. The number of elements on the boom

C. The spacing of each element along the boom

D. All these choices are correct

G9C11

What is a beta or hairpin match?

A. A shorted transmission line stub placed at the feed point of a Yagi antenna to provide impedance matching

B. A 1/4 wavelength section of 75-ohm coax in series with the feed point of a Yagi to provide impedance matching

C. A series capacitor selected to cancel the inductive reactance of a folded dipole antenna

D. A section of 300-ohm twin-lead transmission line used to match a folded dipole antenna

G9C11

What is a beta or hairpin match?

A. A shorted transmission line stub placed at the feed point of a Yagi antenna to provide impedance matching

B. A 1/4 wavelength section of 75-ohm coax in series with the feed point of a Yagi to provide impedance matching

C. A series capacitor selected to cancel the inductive reactance of a folded dipole antenna

D. A section of 300-ohm twin-lead transmission line used to match a folded dipole antenna

G9C12

Which of the following is a characteristic of using a gamma match with a Yagi antenna?

A. It does not require the driven element to be insulated from the boom

B. It does not require any inductors or capacitors

C. It is useful for matching multiband antennas

D. All these choices are correct

G9C12

Which of the following is a characteristic of using a gamma match with a Yagi antenna?

A. It does not require the driven element to be insulated from the boom

B. It does not require any inductors or capacitors

C. It is useful for matching multiband antennas

D. All these choices are correct

G9D – Specialized antenna types and applications

Points of Discussion

A horizontal dipole placed between 1/10 and ¼ wavelength above the ground would be ideal for NVIS (near-vertical incidence skywave) short-skip communications on 40 MHz during the day.

The feed point impedance of an end-fed half-wave antenna is very high.

The maximum radiation from a UHF/VHF “halo” (or “loop”) antenna is omnidirectional in the plane of the halo.

The primary function of antenna traps is to allow multiband operation.

Vertically stacking horizontally polarized Yagi antennas narrows the main lobe in elevation.

An advantage of a log-periodic antenna is its wide bandwidth.

A log-periodic antenna is one where its elements lengths and spacing vary logarithmically along the boom.

A “screwdriver” mobile antenna adjusts its feed point impedance by varying the base loading inductance.

A Beverage antenna allows directional receiving of MF and low HF bands.

An electrically small loop (less than 1/10 wavelength in circumference) has nulls in its radiation pattern broadside to the loop.

A disadvantage of multiband antennas is that they have poor harmonic rejection.

A common name for a dipole antenna with a single central support is an “inverted 'V'.”

Questions?

G9D01

Which of the following antenna types will be most effective as a near vertical incidence skywave (NVIS) antenna for short-skip communications on 40 meters during the day?

A. A horizontal dipole placed between 1/10 and 1/4 wavelength above the ground

B. A vertical antenna placed between 1/4 and 1/2 wavelength above the ground

C. horizontal dipole placed at approximately 1/2 wavelength above the ground

D. A vertical dipole placed at approximately 1/2 wavelength above the ground

G9D01

Which of the following antenna types will be most effective as a near vertical incidence skywave (NVIS) antenna for short-skip communications on 40 meters during the day?

A. A horizontal dipole placed between 1/10 and 1/4 wavelength above the ground

B. A vertical antenna placed between 1/4 and 1/2 wavelength above the ground

C. horizontal dipole placed at approximately 1/2 wavelength above the ground

D. A vertical dipole placed at approximately 1/2 wavelength above the ground

G9D02

What is the feed point impedance of an end-fed half-wave antenna?

A. Very low

B. Approximately 50 ohms

C. Approximately 300 ohms

D. Very high

G9D02

What is the feed point impedance of an end-fed half-wave antenna?

A. Very low

B. Approximately 50 ohms

C. Approximately 300 ohms

D. Very high

G9D03

In which direction is the maximum radiation from a VHF/UHF “halo” antenna?

A. Broadside to the plane of the halo

B. Opposite the feed point

C. Omnidirectional in the plane of the halo

D. On the same side as the feed point

G9D03

In which direction is the maximum radiation from a VHF/UHF "halo" antenna?

A. Broadside to the plane of the halo

B. Opposite the feed point

C. Omnidirectional in the plane of the halo

D. On the same side as the feed point

G9D04

What is the primary function of antenna traps?

A. To enable multiband operation

B. To notch spurious frequencies

C. To provide balanced feed point impedance

D. To prevent out-of-band operation

G9D04

What is the primary function of antenna traps?

A. To enable multiband operation

B. To notch spurious frequencies

C. To provide balanced feed point impedance

D. To prevent out-of-band operation

G9D05

What is an advantage of vertically stacking horizontally polarized Yagi antennas?

A. It allows quick selection of vertical or horizontal polarization

B. It allows simultaneous vertical and horizontal polarization

C. It narrows the main lobe in azimuth

D. It narrows the main lobe in elevation

G9D05

What is an advantage of vertically stacking horizontally polarized Yagi antennas?

A. It allows quick selection of vertical or horizontal polarization

B. It allows simultaneous vertical and horizontal polarization

C. It narrows the main lobe in azimuth

D. It narrows the main lobe in elevation

G9D06

Which of the following is an advantage of a log-periodic antenna?

A. Wide bandwidth

B. Higher gain per element than a Yagi antenna

C. Harmonic suppression

D. Polarization diversity

G9D06

Which of the following is an advantage of a log-periodic antenna?

A. Wide bandwidth

B. Higher gain per element than a Yagi antenna

C. Harmonic suppression

D. Polarization diversity

G9D07

Which of the following describes a log-periodic antenna?

A. Element length and spacing vary logarithmically along the boom

B. Impedance varies periodically as a function of frequency

C. Gain varies logarithmically as a function of frequency

D. SWR varies periodically as a function of boom length

G9D07

Which of the following describes a log-periodic antenna?

A. Element length and spacing vary logarithmically along the boom

B. Impedance varies periodically as a function of frequency

C. Gain varies logarithmically as a function of frequency

D. SWR varies periodically as a function of boom length

G9D08

How does a “screwdriver” mobile antenna adjust its feed point impedance?

A. By varying its body capacitance

B. By varying the base loading inductance

C. By extending and retracting the whip

D. By deploying a capacitance hat

G9D08

How does a "screwdriver" mobile antenna adjust its feed point impedance?

A. By varying its body capacitance

B. By varying the base loading inductance

C. By extending and retracting the whip

D. By deploying a capacitance hat

G9D09

What is the primary use of a Beverage antenna?

A. Directional receiving for MF and low HF bands

B. Directional transmitting for low HF bands

C. Portable direction finding at higher HF frequencies

D. Portable direction finding at lower HF frequencies

G9D09

What is the primary use of a Beverage antenna?

A. Directional receiving for MF and low HF bands

B. Directional transmitting for low HF bands

C. Portable direction finding at higher HF frequencies

D. Portable direction finding at lower HF frequencies

G9D10

In which direction or directions does an electrically small loop (less than 1/10 wavelength in circumference) have nulls in its radiation pattern?

A. In the plane of the loop

B. Broadside to the loop

C. Broadside and in the plane of the loop

D. Electrically small loops are omnidirectional

G9D10

In which direction or directions does an electrically small loop (less than 1/10 wavelength in circumference) have nulls in its radiation pattern?

A. In the plane of the loop

B. Broadside to the loop

C. Broadside and in the plane of the loop

D. Electrically small loops are omnidirectional

G9D11

Which of the following is a disadvantage of multiband antennas?

A. They present low impedance on all design frequencies

B. They must be used with an antenna tuner

C. They must be fed with open wire line

D. They have poor harmonic rejection

G9D11

Which of the following is a disadvantage of multiband antennas?

A. They present low impedance on all design frequencies

B. They must be used with an antenna tuner

C. They must be fed with open wire line

D. They have poor harmonic rejection

G9D12

What is the common name of a dipole with a single central support?

A. Inverted V

B. Inverted L

C. Sloper

D. Lazy H

G9D12

What is the common name of a dipole with a single central support?

A. Inverted V

B. Inverted L

C. Sloper

D. Lazy H

G9D13

Question Removed (section not renumbered)

SUBELEMENT G0 – ELECTRICAL AND RF SAFETY

[2 Exam Questions – 2 Groups]

G0A – RF safety principles, rules, and guidelines; routine station evaluation

Points of Discussion

RF energy can heat body tissue.

The duty cycle, transmission frequency, and transmission power density are all used to determine RF exposure from a transmitted signal.

You can determine that your station is compliant with FCC RF exposure guidelines by performing calculations based on FCC OET Bulletin 65, by using computer modeling, or by measuring your transmitter's field strength using calibrated equipment.

“Time averaging” during evaluation of RF radiation exposure is when total RF exposure is averaged over a certain period.

If an evaluation of your station shows that the RF energy radiated by your station exceeds permissible limits, you must take action to prevent exposure to the excessive RF fields.

If your station fails to meet FCC RF exposure exemption criteria, you must perform an RF Exposure Evaluation in accordance with FCC OET Bulletin 65.

A low duty cycle allows for greater power levels to be transmitted. This effect is often referred to as a modulated duty cycle.

An amateur operator must perform routine RF exposure evaluations and prevent access to any identified high exposure areas to ensure compliance with RF safety regulations.

A calibrated field strength meter with a calibrated antenna can be used to accurately measure an RF field strength.

If an evaluation shows that a neighbor might receive more than the allowable limit of RF exposure from the main lobe of a directional antenna, you should take precautions to ensure that the antenna cannot be pointed in their direction when they are present.

If you install an indoor transmitting antenna, you should make sure that the MPE (maximum permissible exposure) limits are not exceeded in occupied areas.

All stations with a time-averaged transmission of more than 1 milliwatt are subject to the FCC rules on RF exposure.

Questions?

G0A01

What is one way that RF energy can affect human body tissue?

A. It heats body tissue

B. It causes radiation poisoning

C. It causes the blood count to reach a dangerously low level

D. It cools body tissue

G0A01

What is one way that RF energy can affect human body tissue?

A. It heats body tissue

B. It causes radiation poisoning

C. It causes the blood count to reach a dangerously low level

D. It cools body tissue

G0A02

Which of the following is used to determine RF exposure from a transmitted signal?

A. Its duty cycle

B. Its frequency

C. Its power density

D. All these choices are correct

G0A02

Which of the following is used to determine RF exposure from a transmitted signal?

A. Its duty cycle

B. Its frequency

C. Its power density

D. All these choices are correct

G0A03 [97.13(c)(1)]

How can you determine that your station complies with FCC RF exposure regulations?

A. By calculation based on FCC OET Bulletin 65

B. By calculation based on computer modeling

C. By measurement of field strength using calibrated equipment

D. All these choices are correct

G0A03 [97.13(c)(1)]

How can you determine that your station complies with FCC RF exposure regulations?

A. By calculation based on FCC OET Bulletin 65

B. By calculation based on computer modeling

C. By measurement of field strength using calibrated equipment

D. All these choices are correct

G0A04

What does “time averaging” mean when evaluating RF radiation exposure?

A. The average amount of power developed by the transmitter over a specific 24-hour period

B. The average time it takes RF radiation to have any long-term effect on the body

C. The total time of the exposure

D. The total RF exposure averaged over a certain period

G0A04

What does “time averaging” mean when evaluating RF radiation exposure?

A. The average amount of power developed by the transmitter over a specific 24-hour period

B. The average time it takes RF radiation to have any long-term effect on the body

C. The total time of the exposure

D. The total RF exposure averaged over a certain period

G0A05 [97.13(c)(2), 1.1307(b)]

What must you do if an evaluation of your station shows that the RF energy radiated by your station exceeds permissible limits for possible human absorption?

A. Take action to prevent human exposure to the excessive RF fields

B. File an Environmental Impact Statement (EIS-97) with the FCC

C. Secure written permission from your neighbors to operate above the controlled MPE limits

D. All these choices are correct

G0A05 [97.13(c)(2), 1.1307(b)]

What must you do if an evaluation of your station shows that the RF energy radiated by your station exceeds permissible limits for possible human absorption?

A. Take action to prevent human exposure to the excessive RF fields

B. File an Environmental Impact Statement (EIS-97) with the FCC

C. Secure written permission from your neighbors to operate above the controlled MPE limits

D. All these choices are correct

G0A06 [97.13(c)(2), 1.1307(1)(b)(3)(i)]

What must you do if your station fails to meet the FCC RF exposure exemption criteria?

A. Perform an RF Exposure Evaluation in accordance with FCC OET Bulletin 65

B. Contact the FCC for permission to transmit

C. Perform an RF exposure evaluation in accordance with World Meteorological Organization guidelines

D. Use an FCC-approved band-pass filter

G0A06 [97.13(c)(2), 1.1307(1)(b)(3)(i)]

What must you do if your station fails to meet the FCC RF exposure exemption criteria?

A. Perform an RF Exposure Evaluation in accordance with FCC OET Bulletin 65

B. Contact the FCC for permission to transmit

C. Perform an RF exposure evaluation in accordance with World Meteorological Organization guidelines

D. Use an FCC-approved band-pass filter

G0A07

What is the effect of modulation duty cycle on RF exposure?

A. A lower duty cycle permits greater power levels to be transmitted

B. A higher duty cycle permits greater power levels to be transmitted

C. Low duty cycle transmitters are exempt from RF exposure evaluation requirements

D. High duty cycle transmitters are exempt from RF exposure requirements

G0A07

What is the effect of modulation duty cycle on RF exposure?

A. A lower duty cycle permits greater power levels to be transmitted

B. A higher duty cycle permits greater power levels to be transmitted

C. Low duty cycle transmitters are exempt from RF exposure evaluation requirements

D. High duty cycle transmitters are exempt from RF exposure requirements

G0A08 [97.13(c)(2)]

Which of the following steps must an amateur operator take to ensure compliance with RF safety regulations?

A. Post a copy of FCC Part 97.13 in the station

B. Notify neighbors within a 100-foot radius of the antenna of the existence of the station and power levels

C. Perform a routine RF exposure evaluation and prevent access to any identified high exposure areas

D. All these choices are correct

G0A08 [97.13(c)(2)]

Which of the following steps must an amateur operator take to ensure compliance with RF safety regulations?

A. Post a copy of FCC Part 97.13 in the station

B. Notify neighbors within a 100-foot radius of the antenna of the existence of the station and power levels

C. Perform a routine RF exposure evaluation and prevent access to any identified high exposure areas

D. All these choices are correct

G0A09

What type of instrument can be used to accurately measure an RF field strength?

A. A receiver with digital signal processing (DSP) noise reduction

B. A calibrated field strength meter with a calibrated antenna

C. An SWR meter with a peak-reading function

D. An oscilloscope with a high-stability crystal marker generator

G0A09

What type of instrument can be used to accurately measure an RF field strength?

A. A receiver with digital signal processing (DSP) noise reduction

B. A calibrated field strength meter with a calibrated antenna

C. An SWR meter with a peak-reading function

D. An oscilloscope with a high-stability crystal marker generator

G0A10

What should be done if evaluation shows that a neighbor might experience more than the allowable limit of RF exposure from the main lobe of a directional antenna?

A. Change to a non-polarized antenna with higher gain

B. Use an antenna with a higher front-to-back ratio

C. Take precautions to ensure that the antenna cannot be pointed in their direction when they are present

D. All these choices are correct

G0A10

What should be done if evaluation shows that a neighbor might experience more than the allowable limit of RF exposure from the main lobe of a directional antenna?

A. Change to a non-polarized antenna with higher gain

B. Use an antenna with a higher front-to-back ratio

C. Take precautions to ensure that the antenna cannot be pointed in their direction when they are present

D. All these choices are correct

G0A11

What precaution should be taken if you install an indoor transmitting antenna?

A. Locate the antenna close to your operating position to minimize feed-line radiation

B. Position the antenna along the edge of a wall to reduce parasitic radiation

C. Make sure that MPE limits are not exceeded in occupied areas

D. Make sure the antenna is properly shielded

G0A11

What precaution should be taken if you install an indoor transmitting antenna?

A. Locate the antenna close to your operating position to minimize feed-line radiation

B. Position the antenna along the edge of a wall to reduce parasitic radiation

C. Make sure that MPE limits are not exceeded in occupied areas

D. Make sure the antenna is properly shielded

G0A12 [1.1307(1)(b)(3)(i)(A)]

What stations are subject to the FCC rules on RF exposure?

A. All commercial stations; amateur radio stations are exempt

B. Only stations with antennas lower than one wavelength above the ground

C. Only stations transmitting more than 500 watts PEP

D. All stations with a time-averaged transmission of more than one milliwatt

G0A12 [1.1307(1)(b)(3)(i)(A)]

What stations are subject to the FCC rules on RF exposure?

A. All commercial stations; amateur radio stations are exempt

B. Only stations with antennas lower than one wavelength above the ground

C. Only stations transmitting more than 500 watts PEP

D. All stations with a time-averaged transmission of more than one milliwatt

G0B – Station safety: electrical shock, grounding, fusing, interlocks, and wiring; antenna and tower safety

Points of Discussion

Only the hot wires in a 240 VAC circuit should be attached to fuses or circuit breakers.

According to the National Electric Code, the minimum wire size that may be used for wiring with a 20-ampere circuit breaker is AWG number 12.

A 15 ampere fuse or circuit breaker would be appropriate to use sith a circuit that uses AWG number 14 wiring.

Your station's lightning protection ground system should be located outside of the building.

A ground fault circuit interrupter (GFCI) will disconnect AC power if current flows from one or more of the hot wires directly to ground.

The National Electric Code addresses the electrical safety of a station.

Before climbing a tower using a safety harness, confirm that the harness is rated for the weight of the climber and that is within its allowable service life.

Before climbing a tower that supports electrically powered devices, make sure that all circuits that supply power to the tower are locked out and tagged.

Emergency generators should be operated in well-ventilated areas.

Lead-tin solder can contaminate food if hands are not washed carefully after handling the solder.

Lightning protection ground rods should be bonded together with all other grounds.

A power supply interlock helps ensure that dangerous voltages are removed if its cabinet is opened.

Lighting arrestors should be located where feed lines enter the building.

Questions?

G0B01

Which wire or wires in a four-conductor 240 VAC circuit should be attached to fuses or circuit breakers?

A. Only the hot wires

B. Only the neutral wire

C. Only the ground wire

D. All wires

G0B01

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D. All wires

G0B02

According to the National Electrical Code, what is the minimum wire size that may be used safely for wiring with a 20-ampere circuit breaker?

A. AWG number 20

B. AWG number 16

C. AWG number 12

D. AWG number 8

G0B02

According to the National Electrical Code, what is the minimum wire size that may be used safely for wiring with a 20-ampere circuit breaker?

A. AWG number 20

B. AWG number 16

C. AWG number 12

D. AWG number 8

G0B03

Which size of fuse or circuit breaker would be appropriate to use with a circuit that uses AWG number 14 wiring?

A. 30 amperes

B. 25 amperes

C. 20 amperes

D. 15 amperes

G0B03

Which size of fuse or circuit breaker would be appropriate to use with a circuit that uses AWG number 14 wiring?

A. 30 amperes

B. 25 amperes

C. 20 amperes

D. 15 amperes

G0B04

Where should the station’s lightning protection ground system be located?

A. As close to the station equipment as possible

B. Outside the building

C. Next to the closest power pole

D. Parallel to the water supply line

G0B04

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A. As close to the station equipment as possible

B. Outside the building

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G0B05

Which of the following conditions will cause a ground fault circuit interrupter (GFCI) to disconnect AC power?

A. Current flowing from one or more of the hot wires to the neutral wire

B. Current flowing from one or more of the hot wires directly to ground

C. Overvoltage on the hot wires

D. All these choices are correct

G0B05

Which of the following conditions will cause a ground fault circuit interrupter (GFCI) to disconnect AC power?

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G0B06

Which of the following is covered by the National Electrical Code?

A. Acceptable bandwidth limits

B. Acceptable modulation limits

C. Electrical safety of the station

D. RF exposure limits of the human body

G0B06

Which of the following is covered by the National Electrical Code?

A. Acceptable bandwidth limits

B. Acceptable modulation limits

C. Electrical safety of the station

D. RF exposure limits of the human body

G0B07

Which of these choices should be observed when climbing a tower using a safety harness?

A. Always hold on to the tower with one hand

B. Confirm that the harness is rated for the weight of the climber and that it is within its allowable service life

C. Ensure that all heavy tools are securely fastened to the harness

D. All these choices are correct

G0B07

Which of these choices should be observed when climbing a tower using a safety harness?

A. Always hold on to the tower with one hand

B. Confirm that the harness is rated for the weight of the climber and that it is within its allowable service life

C. Ensure that all heavy tools are securely fastened to the harness

D. All these choices are correct

G0B08

What should be done before climbing a tower that supports electrically powered devices?

A. Notify the electric company that a person will be working on the tower

B. Make sure all circuits that supply power to the tower are locked out and tagged

C. Unground the base of the tower

D. All these choices are correct

G0B08

What should be done before climbing a tower that supports electrically powered devices?

A. Notify the electric company that a person will be working on the tower

B. Make sure all circuits that supply power to the tower are locked out and tagged

C. Unground the base of the tower

D. All these choices are correct

G0B09

Which of the following is true of an emergency generator installation?

A. The generator should be operated in a well-ventilated area

B. The generator must be insulated from ground

C. Fuel should be stored near the generator for rapid refueling in case of an emergency

D. All these choices are correct

G0B09

Which of the following is true of an emergency generator installation?

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G0B10

Which of the following is a danger from lead-tin solder?

A. Lead can contaminate food if hands are not washed carefully after handling the solder

B. High voltages can cause lead-tin solder to disintegrate suddenly

C. Tin in the solder can “cold flow,” causing shorts in the circuit

D. RF energy can convert the lead into a poisonous gas

G0B10

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G0B11

Which of the following is required for lightning protection ground rods?

A. They must be bonded to all buried water and gas lines

B. Bends in ground wires must be made as close as possible to a right angle

C. Lightning grounds must be connected to all ungrounded wiring

D. They must be bonded together with all other grounds

G0B11

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G0B12

What is the purpose of a power supply interlock?

A. To prevent unauthorized changes to the circuit that would void the manufacturer's warranty

B. To shut down the unit if it becomes too hot

C. To ensure that dangerous voltages are removed if the cabinet is opened

D. To shut off the power supply if too much voltage is produced

G0B12

What is the purpose of a power supply interlock?

A. To prevent unauthorized changes to the circuit that would void the manufacturer's warranty

B. To shut down the unit if it becomes too hot

C. To ensure that dangerous voltages are removed if the cabinet is opened

D. To shut off the power supply if too much voltage is produced

G0B13

Where should lightning arrestors be located?

Where the feed lines enter the building

On the antenna, opposite the feed point

In series with each ground lead

At the closest power pole ground electrode

G0B13

Where should lightning arrestors be located?

Where the feed lines enter the building

On the antenna, opposite the feed point

In series with each ground lead

At the closest power pole ground electrode

FIN