18. unmodulated carriers, retransmission (RBR-4, section 11)

There are 4 possible exam questions from this section.

The key elements of knowledge are:

- *A repeater station is the type of station that is used to receive and retransmit signals of other stations.*
- *An unmodulated carrier transmission should only be made for brief tests while assessing SWR and tuner adjustments for bands below 30 MHz so as not to cause undue interference.*
- *Radiotelephone (voice) signals in a frequency band below 29.50 MHz cannot be automatically retransmitted unless these signals are received from a station operated by a person qualified to transmit on frequencies below 29.50 MHz.* (RBR-4, 11.2)

19. amplitude modulation, frequency stability, measurements (see RBR-4, section 12)

There are 6 possible exam questions from this section.

The key elements of knowledge are:

- *When operating in amateur bands below 144 MHz, the frequency stability of a transmitted signal must be comparable to quartz crystal control. (this is a very stable frequency determining device and will be the subject of further course material)*

- *An amateur radio station transmitting amplitude modulation (AM) is limited to 100 percent modulation.*
- *Amateur radio station must use a device (often part of modern multimode transceivers) for indicating or preventing overmodulation (which if not carefully control and cause interference).*
- *All amateur radio stations must be equipped with a reliable means of determining, with accuracy, the radio operating frequency. (now part of all modern radio circuit design)*

20. International Telecommunications Union (ITU) Radio Regulations, applicability

There are 5 possible exam questions from this section.

The key elements of knowledge are:

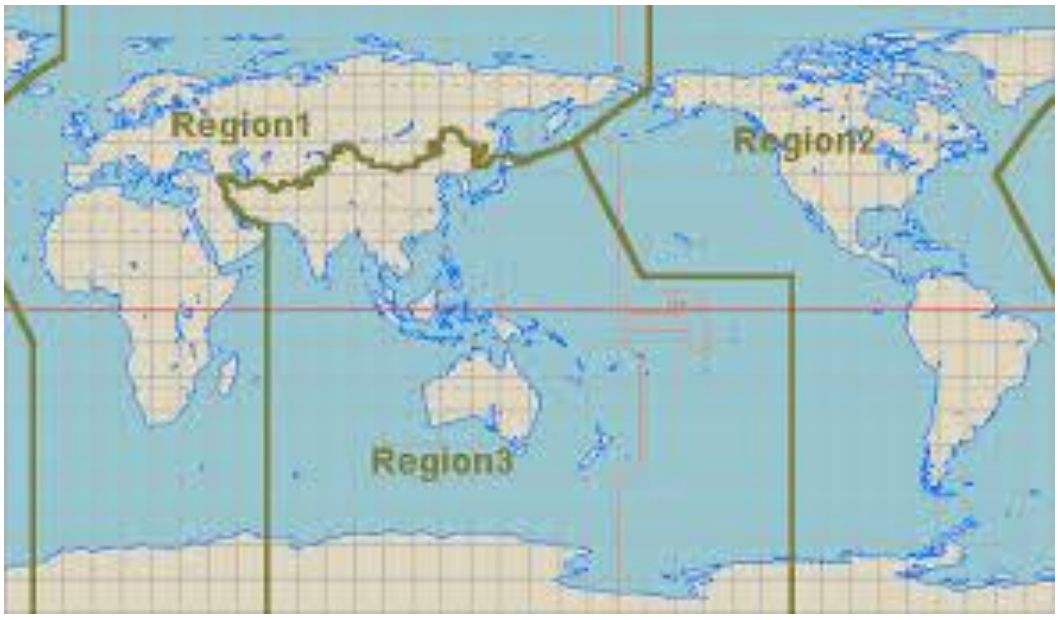
- *You should confine your messages in amateur radio to a technical nature or personal remarks of relative unimportance.*
- *You should avoid messages of a religious, political or patriotic nature.*
- *The ITU (International) Radio Regulations no longer demand proficiency in Morse code for the Amateur Radio Service.*
- *In addition to complying Canadian Radiocommunications Act and Regulations, Canadian Radio Amateurs must also comply with the regulations of the International Telecommunications Union (ITU).*

21. operation outside Canada, ITU regions

There are 5 possible exam questions from this section.

The key elements of knowledge are:

- *Canada is in ITU Region 2; this includes all of North and South America and Greenland.*
- *Canadian Amateurs operating their radios in the United States must abide by the rules for amateur radio in the US.*
- *Canadians operating on board a ship within the territorial waters of a country must abide by the rules and frequency allocations pertaining to the Amateur Radio service for that country.*
- *Asian countries and Australia and New Zealand are in ITU Region 3.*
- *European Countries are in ITU Region 1.*



22. examinations - Departments fees, diabled accommodation

There are 5 possible exam questions from this section.

The key elements of knowledge are:

- *The fee for taking an Amateur Radio examination at an Industry Canada office is $20.*
- *Examinations for disabled candidates may be given orally, or tailored to the candidate's abilities to complete the examination.*
- *An accredited examiner may recover the costs of administering an examination.*
- *Examinations will be provided directly to the candidate only in the English or French languages **without** the aid of an interpreter.*

23. antenna structure approvals, requirement for public consultation

There are 10 possible exam questions from this section.

The key elements of knowledge are:

- *The Minister of Innovation, Science and Economic Development Canada has authority over antenna installations including antenna masts and towers. Document CPC-2-0-03 entitled "Radiocommunication and Broadcasting Antenna Systems"applies to all proponents of radio antenna installations including radio amateur antennas.*
- *However, there is an exclusion criteria of < 15 metres height where the proponent (generally with exception) does not have to hold a public consultation. This applies to the amateur radio proponent.*
- *If the antenna system height is above the exclusion criteria and if the Land Use Authority (LUA eg. Municipality) does not have a consultation process established, then the default public consultation process as outlined in CPC-2-0-03 shall be followed.*
- *If there is an impasse in permission from the LUA to erect a tower for the purpose of radiocommunications and provided the requirements for consultation are met as those outlined in CPC-2-0-03, then ISED may be called in to render a decision in the matter.*

- *The height below which there is an exemption for public consultation (unless increased by the Land Use Authority) is 15 metres. This however does not apply to* ***Telecommunications Carriers (cell towers operators) and Broadcast undertakings in which all proposed antenna towers and now subject to public consultation.*** *(Changes in the latest CPC-2-0-03 document)*

24. radio frequency electromagnetic field limits

There are 5 possible questions from this section.

The key elements of knowledge are:

- ***Health Canada is the government Department that publishes the safety guidelines for Radio Frequency energy exposure to the human body known as Safety Code 6.*** *A copy of this document is included in your student files.*
- *The power intensity of electromagnetic (radio) radiation decreases with the inverse square of the distance. That is, by doubling the distance away from the radiator (antenna), the power density of the RF energy is 4 times less.*
- *According to Safety Code 6 (refer to Table 5 on Page 19),* ***30 to 300 MHz*** *is the frequency range that the* ***least amount of power density*** *is acceptable for exposure to the human body and therefore suggests this frequency ranges poses the greatest risk. This range absorbs the most RF energy in human tissue and therefore causes the greatest heating affect in the body.*

- *According to SC 6, above and below the range of 30 to 300 MHz (designated VHF spectrum), the maximum allowable radio electric and magnetic fields for safe human RF energy exposure increases.*
- *There is no specified maximum safe output power for an amateur hand held power radio with integrated antenna, nevertheless, all equipment regardless of RF output power must meet the guideline limits of SC-6.*
- *In SC 6, there are two tables that specify safe limits of human exposure to Radio Frequency energy. Table 1 on page 13 specifies "**Exposure Limits for RF and Microwave Exposed Workers"**. Amateur radio operators fall into this category since they should understand the risk and should have **control** of their transmitting equipment. This is known as a **Controlled** Radio Environment. Table 5 on page 19 specifies the **Exposure Limits for the General Public** in which they typically have **no control** over the Radio Exposure. This is known as an **uncontrolled** environment.*
- *The allowable uncontrolled Radio Exposure for the general public is 5 times (or 7 dB) less that controlled limits.*
- *RF exposure is normally determined as an **average exposure over a 6 minute period** of time.*
- *It is implied that an Amateur Radio installation will be compliant with the limits of RF exposure specified in Table 1 of SC 6 within the bounds of the station's property line and will be compliant with lesser limits of RF exposure specified in Table 5 of SC 6 outside the bounds of the station's property line*

providing the amateur maintains controlled access to the property.

- *SC-6 also specifies the maximum limits of RF energy absorbed into the human body (as dissipated heat) known as* ***Specific Absorption Rate (SAR).*** *Cell phones, for example, must be tested and not exceed a local heating effect limit of 1.6 watts/kilogram of head tissue averaged over any one gram of tissue. Failing this test means the portable radio or cell phone cannot be certified and marketed in Canada. Notwithstanding, amateur radio equipment is generally certification exempt.*
- *SC-6 also limits the amount of induced and contact currents from conductors carrying RF currents.*
- *All radio station operators including Amateur Radio stations are bound by the provisions of Safety Code 6 according to Industry Canada document CPC-2-0-06, section 7.1 that states:* ***"It is the responsibility of proponents of (radio) installations to ensure that all radiocommunications and broadcasting installations comply with Safety Code 6 at all times, including the considerations of combined effects of nearby installations with the local radio environment."***

25. criteria for resolution of radio frequency interferency complaints (Reference for this section is the EMCAB-2 document as part of your student files)

There are 5 possible questions from this section.

The key elements of knowledge are:

- *In the event of an amateur station causing interference or malfunction to a neighbour's broadcast FM receiver or stereo system, or other "radio sensitive device", the lack of RF immunity in the design of such equipment will be deemed the cause of the problem if "on the premises of the offended equipment", the field strength of the amateur's transmitted radio signal intensity is **below** the criteria set forth in EMCAB-2.*
- *In the above example, if the amateur's transmitted radio signal is **above** the criteria set in EMCAB-2, the fault lies with excessive signal level from the Amateur station.*
- *The EMCAB-2 document classifies subject equipment as being "Broadcasting Receivers", and "Associated Equipment" (to broadcast receivers) or "Radio-Sensitive Equipment". Broadcast Receivers and Associated Equipment must withstand up to 1.83 Volts/Metre field strength. All other Radio Sensitive equipment must withstand up to 3.16 Volts/Metre field strength from a nearby transmitting station.*

- *Definition: The standard unit of electric field (E-Field) measure is the (volt per metre or V/M); this is represented by a potential difference of 1 volt existing (from a radio frequency (RF) field) between two points that are 1 metre apart.*