

# AMATEUR RADIO HANDBOOK

Fifth Edition  
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## **PART A**

### **1 INTRODUCTION**

- 1.1 This document is an introductory guide for persons who wish to operate an amateur radio station in Singapore. It contains the examination requirements, licensing conditions, operating procedures and extracts of the general licence conditions on the Amateur Station Licence prescribed in the Telecommunications (Radio-communication) Regulations (“Regulations”).
- 1.2 The amateur service is a radio-communication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest.
- 1.3 To obtain an Amateur Station Licence in Singapore, the applicant must first satisfy the Info-communications Media Development Authority (hereinafter referred to as “IMDA” or “Authority”) that he/she has the necessary qualifications and skills to operate an amateur station without causing any radio interference to other users or radio licensees.
- 1.4 A licence is required for each class of amateur station. IMDA reserves the right to grant or renew any licence under the Regulations without assigning any reason therefor.

**PART B**

**2 Radio Amateurs' Examination**

**2.1 Purpose of Radio Amateurs' Examination**

2.1.1 The purpose of the Radio Amateurs' Examination ("Written Examination") is to qualify candidates for the Amateur Station Licence issued by IMDA and will be conducted by Singapore Amateur Radio Transmitting Society ("SARTS") on behalf of IMDA.

**2.2 Qualification of Candidates**

2.2.1 The examination is open to all candidates, regardless of whether they have attended a relevant course of study.

**2.3 Exemptions from Written Examination**

2.3.1 Applicants with valid Amateur Radio Licences issued by a competent authority and/or radio amateur qualifications acceptable to IMDA<sup>1</sup> may be exempted from the Written Examination.

**2.4 Registration for Radio Amateur Examination**

2.4.1 Candidates who wish to register for the Radio Amateur Examination may arrange a date and location with IMDA / SARTS.

2.4.2 Please refer to IMDA website: <https://iris.imda.gov.sg/application/amateur-station-licence> for more details.

**2.5 Examination Fees**

2.5.1 The examination fees are as follows:

<b>Candidate Type</b>	<b>Fee Payable</b>
Full-time secondary, pre-university, Institute of Technical Education, and tertiary students in Singapore	\$20
All other persons	\$40

2.5.2 The fee for the examination must be paid with the application.

<sup>1</sup> Applicant holding foreign amateur licence or qualification which is not in English shall arrange for the translation of the documents prior to submission to IMDA.

2.5.3 The fee will not be refunded to any candidate who withdraws from, or fails to attend the examination, nor can it be transferred from one examination to another at a later date.

## 2.6 Written Examination Sections

2.6.1 The Written Examination comprises two sections:

Section I: Operating conditions, procedures and practices and transmitter interference

Section II: Electrical, Electronics and Radio-communications Theory

### 2.6.2 Section I

2.6.2.1 The format for Section I will be 35 multiple-choice questions with an allocated time of 1 hour, covering the following domains:

- **Operating conditions**
  - a) Procedure
  - b) Call sign
  - c) Signal report
  - d) Band, power and emission
- **Operating practices and procedures**
  - a) Satellite
  - a) Repeater
  - b) Radio equipment
  - c) Q-codes
  - d) NATO phonetic alphabet
  - e) Station Safety
  - f) Amateur station log keeping
- **Transmitter interference**
  - a) Frequency stability
  - b) Audio bandwidth
  - c) Spurious emission
- **Propagation and antennas**
  - a) Impedance matching
  - b) Radio wave propagation
  - c) Antennas
  - d) Dummy load

### 2.6.3 Section II

2.6.3.1 The format for Section II will be 60 multiple-choice questions with an allocated time of 1 hour 45 minutes, covering the following domains:

- **Electronic theory**
  - a) Basic electronic theory
  - b) Measurement
  - c) Components
  - d) Ohm's law
  - e) Total inductance
  - f) Total capacitance
  - g) Total resistance
  - h) Transformer
  - i) Sine wave
  - j) Tuned circuits
  - k) Decibel scale
  
- **Semiconductor**
  - a) Rectification
  - b) Amplifier
  - c) Transistor
  - d) Power supply
  
- **Receivers**
  - a) Frequency modulation
  - b) Amplitude modulation
  - c) Receiver circuits
  - d) Operating techniques
  
- **Transmitters**
  - a) Frequency stability
  - b) Emission
  - c) Operating techniques
  - d) Matching unit
  
- **Advanced propagation and antennas**
  - a) Ionosphere
  - b) Radio wavelength
  - c) Feed impedance
  - d) Electromagnetic waves
  - e) Radio wave propagation
  - f) Skip and fading
  - g) Antennas
  - h) Standing wave
  - i) Propagation forecasting
  - j) Long path propagation

- **Making measurements**
  - a) Frequency Modulation (FM)
  - b) Amplitude Modulation (AM)
  - c) Continuous Wave (CW)
  
- **Amateur radio operating practices**
  - a) World Radiocommunication Conference (WRC) bands
  - b) Automatic Packet Reporting System (APRS)
  - c) Digital communication
  - d) Duty cycle
  - e) Block diagram
  - f) Ground & Electromagnetic Interference (EMI) suppression
  - g) Bandwidth & spectrum
  - h) Noise cancellers
  - i) Sideband
  - j) CW operation
  - k) Software Defined Radios (SDR)
  - l) RF Connectors

2.6.4 Please refer to the SARTS website (<https://sarts.org.sg>) for the latest study guides and practice examinations.

## 2.7 Qualifying Grade

2.7.1 The passing marks for each of the two sections is 60%. After passing the Written Examination, the candidate may apply for General Class or Restricted Class Amateur Station Licence.

## 2.8 Statement of Result

2.8.1 IMDA will send a statement of the result to every candidate who has sat for the Written Examination.

## **PART C**

### **3 AMATEUR STATION LICENCE**

#### **3.1 General Information**

3.1.1 IMDA may grant an Amateur Station Licence, which meets the recommendation under the ITU-R M. 1544 to qualified or approved persons interested in the operation of radio-communication equipment solely for pleasure and for the furtherance of radio-communication techniques and not for pecuniary gain.

3.1.2 Every applicant for an Amateur Station Licence must pass the Written Examination or hold a qualification which is acceptable to IMDA.

3.1.3 IMDA may refuse to issue an Amateur Station Licence to any applicant, even though he may have satisfied the examination requirements or possess the necessary qualifications, without assigning any reason therefor.

#### **3.2 Age Restrictions**

3.2.1 An Amateur Station Licence shall not be granted to a person below the age of 16 years.

3.2.2 Any application for an Amateur Station Licence by an applicant below the age of 21 years shall be countersigned by the applicant's parent, guardian or by any other person approved by IMDA.

3.2.3 Licensee between the ages of 16 and 21 years may only operate or use any Amateur Station if supervised by a qualified person approved by IMDA who has agreed to supervise the licensee, and that qualified person shall ensure that the licensee observes and complies with all the duties and obligations specified in the Amateur Station Licence and the Regulations.

#### **3.3 Class of Licence**

##### **3.3.1 Restricted Class**

3.3.1.1 The Amateur Station (Restricted Class) Licence permits the licensee to operate the amateur radio equipment only on the VHF/UHF bands allocated to the amateur service in accordance with Appendix 1.

3.3.1.2 Candidates who obtain 60% for Section I of the Written Examination may apply for the Amateur Station (Restricted Class) Licence.

3.3.1.3 An Amateur Station (Restricted Class) licensee who subsequently wants to apply for the Amateur Station (General Class) Licence will be required to pass Section II of the Written Examination.

### 3.3.2 General Class

3.3.2.1 The Amateur Station (General Class) Licence permits the licensee to operate the amateur radio equipment in all frequencies allocated to the amateur service in accordance with Appendix 1.

3.3.2.2 Candidates who obtain 60% each for Section I and Section II of the Written Examination may apply for the Amateur Station (General Class) Licence.

### 3.3.3 Temporary Amateur Station Licence

3.3.3.1 IMDA may issue a Temporary Amateur Station Licence (i.e., Temporary - Restricted Class or Temporary - General Class) to visiting radio amateurs who wish to operate their amateur radio equipment while on vacation or short visit in Singapore.

3.3.3.2 The validity period of the Temporary Amateur Station Licence is three months and may be extended, subject to IMDA's approval.

3.3.3.3 The call-sign used shall be the first three digit of the Singapore call-sign followed by the licensee's home call-sign (i.e., 9V1/home call-sign)

3.3.3.4 Application shall be made 3 weeks prior to arrival in Singapore.

### 3.3.3.5 Temporary - Restricted Class

3.3.3.5.1 The Temporary - Restricted Class Licence permits the licensee to operate amateur radio equipment in the VHF/UHF bands allocated to the amateur service in accordance with Appendix 1.

### 3.3.3.6 Temporary - General Class

3.3.3.6.1 The Temporary - General Class permits the licensee to operate amateur radio equipment in the in all frequencies allocated to the amateur service in accordance with Appendix 1.

## 3.4 Application Details

3.4.1 When the applicant has attained the required qualifications, he may submit the application via <https://www.gobusiness.gov.sg/licences>, with the following information:

- a) statement of result from the Written Examination (or other amateur's qualifications); or
- b) radio amateur certificate issued by a competent authority, a photocopy of the certificate; or
- c) valid radio amateur station licence issued by a competent authority, a photocopy of the radio amateur licence; and
- d) amateur radio equipment  
*(Note that the amateur radio equipment must be approved by IMDA, hence applicant is advised not to purchase and install any radio amateur equipment without IMDA prior approval.)*

### 3.5 Licence Fee

#### 3.5.1 The licence fees are as follows:

<b>Licence Type</b>	<b>Fee Payable</b>
Restricted Class	\$50 for 5 years
General Class	\$100 for 5 years
Temporary - Restricted Class	\$25
Temporary - General Class	\$50

## **PART D**

### **4 RULES AND CONDITIONS GOVERNING THE OPERATION OF AN AMATEUR RADIO STATION**

#### **4.1 The Telecommunications (Radio-communication) Regulations**

4.1.1 The licensee shall observe and comply with the relevant provisions of the Regulations and any amendments made thereof.

#### **4.2 International Requirement**

4.2.1 The licensee shall observe and comply with the relevant provisions of the Radio Regulations of the International Telecommunication Union.

#### **4.3 Display of Licence**

4.3.1 The Amateur Station Licence shall be displayed at the station's licensed address in close proximity of the amateur radio equipment ("Amateur Radio Station").

#### **4.4 Frequency Bands and Classes of Emission**

4.4.1 The transmitting frequency bands allowed for an Amateur Radio Station shall be at the discretion of IMDA but within the limits prescribed by the Radio Regulations of the International Telecommunication Union. IMDA has waived the frequency application and processing fees and the annual fees for use of a frequency in operating an amateur radio station.

#### **4.5 Transmitting Power**

4.5.1 Appendix 1 shows the frequency bands, power and classes of emissions allowed for each frequency band.

4.5.2 The maximum power allowed of an Amateur Radio Station's transmitter shall be at the discretion of IMDA and shall be specified in the licence. In no case shall the power of the transmitter exceed the specifications in Appendix 1, provided that it does not cause radio frequency interference to other licensed or authorised stations or networks or telecommunication installation or equipment which may be lawfully owned, used or operated by any other person.

4.5.3 The maximum RF output power allowed for the Restricted Class Station Licence is 10 watts (ERP<sup>2</sup>) (Note: For the computation of ERP, the transmitter PEP will be multiplied

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<sup>2</sup> Effective Radiated Power

by the antenna gain relative to a half-wave dipole antenna. A half-wave dipole antenna will be presumed to have a gain of 1 (0dBd)).

#### 4.6 Operational Conditions

4.6.1 A licensee shall observe the following conditions:

- a) the Amateur Radio Station shall only be operated at locations approved by IMDA;
- b) the Amateur Radio Station shall be operated by the licensee or by other IMDA licensed amateurs in the presence of the licensee, or, in the case of a training institution, by members of such institution in the presence of the licensee. The licensee will at all times be responsible for the proper operation of the Amateur Radio Station;
- c) the Amateur Radio Station and all equipment used or intended to be used by the licensee shall be erected, fixed, placed and used, so as not to cause interference to radio-communications in Singapore;
- d) the licensee shall identify himself by the transmission of the callsign assigned to him by the Authority at the beginning and end of each transmission;
- e) any change in the approved location, equipment, mast or antenna system must be approved by IMDA prior to the change being made;
- f) the licensee shall obtain the approval of all relevant authorities before erecting any mast or antenna to be used in connection with the operation of the Amateur Radio Station; and
- g) the licensee may not make use of encryption devices or equipment in the operation or use of the Amateur Radio Station.

#### 4.7 Restrictions On Transmission

4.7.1 The Amateur Radio Station may be operated at any time provided that no period of uninterrupted transmission shall exceed ten minutes.

4.7.2 Messages transmitted shall be in plain language and shall relate solely to the licensee's experiments or to the licensee's personal affairs (not being business affairs or transactions) or to such personal affairs of the person with whom the licensee is communicating.

4.7.3 The Amateur Radio Station shall not be used for sending news, advertisements, communications of a business or non-experimental character, messages for pecuniary reward, or messages for or on behalf of a third party.

- 4.7.4 Except with the written permission of the Authority, no licensee of an Amateur Radio Station shall call or transmit to any station other than an Amateur Radio Station.
- 4.7.5 Messages may only be exchanged with another Amateur Radio Station, except where prohibited by law.
- 4.7.6 Transmission shall not commence without listening in on the radio frequency to be used in order to ascertain that no interference is likely to be caused to any other station which may be functioning.
- 4.7.7 No message which is grossly offensive, obscene or of an indecent nature shall be sent.
- 4.7.8 In calling another station, the call-sign of that station shall be sent, followed by the call-sign of the calling station.
- 4.7.9 In answering a call, the call-sign of the calling station shall be sent followed by the call-sign of the answering station.
- 4.7.10 The licensee shall use the accepted practice of transmitting messages and shall be conversant with the accepted international Q codes.
- 4.7.11 The other Amateur Radio Station's callsign is called followed by the originating Amateur Radio Station's callsign during telephony communications.
- 4.8 Station Call-Sign
  - 4.8.1 The Amateur Radio Station's call-sign may be altered at any time by IMDA by notice in writing. It must be sent for identification purpose at the beginning and end of each period of transmission. The standard prefix for Singapore licensed stations is '9V1' and shall always be included in the call-sign.
- 4.9 Radiotelephony Operation
  - 4.9.1 When telephony is used, the letters of the call-sign and in cases where it is necessary to spell out words or figures, the international accepted Phonetic Alphabet and Figure Code as shown in Appendix 2 should be used. Words used in this manner shall not be capable of any undesirable or improper interpretation.
- 4.10 Station Logbook
  - 4.10.1 A log of all transmissions shall be kept electronically or on paper, with the following details:

- a) date and time of commencement and ending of every call made from the Amateur Radio Station;
  - b) call-signs of the stations from which messages addressed to the Amateur Radio Station are received or to which messages are sent;
  - c) time (local or UTC) of the commencement and termination of radio traffic;
  - d) test transmissions of the station;
  - e) frequency band(s) and class or classes of emission in each case;
  - f) no gaps shall be left between entries and all entries shall be made at the time of sending and receiving; and
  - g) the record shall in all cases be signed at the time of recording by the licensee.
- 4.10.2 Every such logbook shall be preserved by the licensee for a period of 2 years so that at any time full particulars of sending periods in the preceding calendar years are available for inspection.
- 4.10.3 The logbook shall be available for examination at all reasonable times by an authorised officer of IMDA.
- 4.11 Avoidance of Interference
- 4.11.1 The Amateur Radio Station shall be designed, constructed, maintained and operated such that radio transmission does not cause any harmful interference to other authorised radio services or stations.
- 4.11.2 In the case of interference, the licensee shall take all possible steps to eliminate the source of such interference.
- 4.11.3 The licensee shall at all times, take all precautions to avoid over-modulation, and keep the radiated energy within the narrowest possible frequency bands having regard for the class of emission in use. In particular, the radiation of harmonics and spurious emissions shall be suppressed to such a level that they shall minimise interference with authorised radio services or stations.
- 4.11.4 The licensee shall ensure that tests are conducted to verify that the Amateur Radio Station does not cause any harmful interference to other authorised radio services or stations and the results shall be recorded in the logbook.
- 4.11.5 The adjustment of the Amateur Radio Station shall be made by using a dummy load.

4.11.6 The licensee shall, where so directed by IMDA, cease to operate all or any of the equipment comprised in his Amateur Radio Station for such period or periods of time as may be required by IMDA for the purposes of investigation of interference to radio-communications.

4.12 Power of Authority to order transmission

4.12.1 The licensee shall, if required by the Authority by notice in writing, transmit any message provided by the Authority by means of his licensed Amateur Radio Station.

4.13 Mobile/Portable Station

4.13.1 The licensee may operate an Amateur Radio Station as a portable or mobile station, subject to following conditions:

- a) The mobile or portable station shall only operate in the frequency bands approved by IMDA and shall only be allowed to operate in Singapore.
- b) The mobile or portable station and the general or restricted station for which a licence has been issued shall not be operated simultaneously.
- c) When established as a mobile or portable station, the call-sign shall be the call sign allotted to the general or restricted station followed by '/M' or '/P' and the transmitter output power of the portable station shall not exceed 10 watts (ERP).
- d) The licence to establish a mobile or portable station may be modified or revoked at any time by IMDA without assigning any reason therefor.
- e) The licensee shall ensure that approval from the owner of the premises is obtained, if required.

4.14 Period of Licence, Renewal, Revocation and Variation

4.14.1 The licence shall continue in force for five years from the date of issue, and thereafter so long as the licensee pays the prescribed renewal fee to IMDA before the expiry of the current licence.

4.14.2 IMDA may, at any time, vary all or any of the conditions upon which a licence is granted or impose additional conditions and a licensee shall, at his own expense, comply with the varied or additional conditions.

4.14.3 IMDA may refuse to renew a licence without assigning any reason therefor.

4.14.4 The licence is not transferable except with the consent in writing of IMDA.

**TABLE 1 - FREQUENCY BANDS, POWER AND CLASSES OF EMISSIONS**

Footnote No.	Frequency Bands (in MHz)	Classes of Emission	Radio Frequency Power Level
2 & 4	1.8 - 2.0	AM (A1A, A1B, A2A, A2B, A3E, R3E, H3E and J3E)	26.67 watts PEP
2	3.5 - 3.9 7 - 7.1 7.1 - 7.2	FM (F1A, F1B, F2A, F2B and F3E) PM (G3E)	800 watts PEP
1 & 2	10.1 - 10.15		
2	14.0 - 14.35		
	18.068 - 18.168		
	21.0 - 21.45		
	24.890 - 24.990		
	28.0 - 29.7		
2 & 5	144 - 146		25 watts PEP
1, 2 & 5	430 - 440		10 watts ERP
1, 2, 3 & 5	1,240 - 1,300 2,400 - 2,450 5,650 - 5,850 10,000 - 10,500		Subject to licensing conditions
	24,000 - 24,050		
	24,050 - 24,250		
	5,700 - 5,800 10,050 - 10,450	Pulses (K1A, K2A, L2A, K2E and L3E)	

**FOOTNOTES**

1. These frequency bands are allocated to the amateur service on a secondary basis and are used on condition that they do not cause interference to other radio services.
2. These frequency bands are shared by other radio services.
3. Only certain spot frequencies within these frequency bands are allowed for use by radio amateurs and these spot frequencies can be obtained on written application.
4. The type of transmission known as Radio Teleprinter (RTTY) may not be used in this frequency band.
5. The use of any frequency in these frequency bands shall be only with the prior written consent of the IMDA and it shall indicate the power and conditions under which the station may transmit, taking into consideration the operational characteristics of the station.

- A The symbols used to designate the classes of emission have the meanings assigned to them in the Radio Regulations of the International Telecommunication Union. They are:

**Amplitude Modulation (“AM”)**

- A1A Morse telegraphy without the use of modulating audio frequency
- A1B Teletype telegraphy without the use of modulating audio frequency
- A2A Morse telegraphy with the use of modulating audio frequency
- A2B Teletype telegraphy with the use of modulating audio frequency
- A3E Telephony, double-sideband
- R3E Telephony, single-sideband, reduced carrier
- H3E Telephony, single-sideband, full carrier
- J3E Telephony, single-sideband, suppressed carrier

**Frequency (or phase) Modulation (“FM”)**

- F1A Morse telegraphy by frequency-shift keying without modulating audio frequency
- F1B Teletype telegraphy by frequency-shift keying without modulating audio frequency
- F2A Morse telegraphy by on-off keying of frequency-modulating audio frequency
- F2B Teletype telegraphy by on-off keying of frequency-modulating audio frequency
- F3E Telephony by frequency modulation
- G3E Telephony by phase modulation

**Pulse Modulation (“PM”)**

- K1A Telegraphy by on-off keying of a pulse carrier without the use of a modulating audio frequency.
- K2A Telegraphy by on-off keying of a modulating audio frequency or frequencies or by on-off keying of a modulated pulse carrier - the audio frequency or frequencies modulating the amplitude of the pulses.

- L2A Telegraphy by on-off keying of a modulating audio frequency or frequencies or by on-off keying of a modulated pulsed carrier - the audio frequency of frequencies modulating the width (or duration) of the pulses.
  - K2E Telephony, amplitude modulated pulses.
  - L3E Telephony, width (or duration) modulated pulses.
- B Double-sideband suppressed carrier emissions are permitted within the terms of this licence.

**PHONETIC ALPHABET AND FIGURE CODE**

When it is necessary to spell out call-signs, service abbreviations, words and figures the following tables are suggested to be used:

**Letter Spelling Table**

Letter to be transmitted	Word to be used	Spoken as*
A	Alfa	<u>AL</u> FAH
B	Bravo	<u>BRAH</u> VOH
C	Charlie	<u>CHAR</u> LEE or <u>SHAR</u> LEE
D	Delta	<u>DELL</u> TAH
E	Echo	<u>ECK</u> OH
F	Foxtrot	<u>FOKS</u> TROT
G	Golf	GOLF
H	Hotel	HOH <u>TELL</u>
I	India	<u>IN</u> DEEAH
J	Juliet	<u>JEW</u> LEE <u>ETT</u>
K	Kilo	<u>KEY</u> LOH
L	Lima	<u>LEE</u> MAH
M	Mike	MIKE
N	November	NO VEM BER
O	Oscar	<u>OSS</u> CAH
P	Papa	PAH <u>PAH</u>
Q	Quebec	KEH <u>BECK</u>
R	Romeo	<u>ROW</u> ME OH
S	Sierra	SEE <u>AIR</u> RAH
T	Tango	<u>TANG</u> GO
U	Uniform	<u>YOU</u> NEE FORM or <u>OO</u> NEE FORM
V	Victor	<u>VIK</u> TAH
W	Whisky	<u>WISS</u> KEY
X	X-ray	<u>ECKS</u> RAY
Y	Yangkee	<u>YAN</u> KEE
Z	Zulu	<u>ZOO</u> LOO

**THE INTERNATIONAL Q-CODE**

Below are some of the International Q-Codes which are commonly used in the amateur service:

QRG ? : Will you tell me my exact frequency?  
Your exact frequency is .....kHz.

QRH ? : Does my frequency vary?  
Your frequency varies.

QRI ? : What is the tone of my transmission?  
The tone of your transmission is .....(a) good, (b) variable, (c) bad.

QRK ? : What is the intelligibility of my signals?  
The intelligibility of your signals is .....(a) bad, (b) poor, (c) fair, (d) good, (e) excellent.

QRL ? : Are you busy?  
I am busy. Please do not interfere.

QRM ? : Is my transmission being interfered with?  
Your transmission is being interfered with .....(a) nil, (b) slightly, (c) moderately, (d) severely, (e) extremely.

QRN ? : Are you troubled by static?  
I am troubled by static .....(a) nil, (b) slightly, (c) moderately, (d) severely, (e) extremely.

QRO ? : Shall I increase transmitter power?  
Increase transmitter power.

QRP ? : Shall I decrease transmitter power?  
Decrease transmitter power.

QRQ ? : Shall I send faster?  
Send faster (.....words per minute).

QRS ? : Shall I send slowly?  
Send more slowly (..... words per minute).

QRT ? : Shall I stop sending?  
Stop sending.

QRU ? : Have you anything for me?  
I have nothing for you.

- QRV ? : Are you ready?  
I am ready.
- QRX ? : When will you call me again?  
I will call you again at .....hours on .....kHz.
- QRZ ? : Who is calling me?  
You are being called by ..... on .....kHz.
- QSA ? : What is the strength of my signals?  
The strength of your signals is .....(a) scarcely perceptible, (b) weak, (c) fairly good, (d) good, (e) very good.
- QSB ? : Are my signals fading?  
Your signals are fading.
- QSD ? : Are my signals mutilated?  
Your signals are mutilated.
- QSL ? : Can you acknowledge receipt?  
I am acknowledging receipt.
- QSO ? : Can you communicate with .....direct?  
I can communication with .....direct.
- QSP ? : Will you relay to .....  
I will relay to .....
- QSV ? : Shall I send a series of V's for adjustment on this frequency?  
Send a series of V's.
- QSZ ? : Shall I send each word or group more than once?  
Send each word or group twice.
- QTH ? : What is your location?  
My location is .....
- QTR ? : What is the correct time?  
The correct time is .....hours.

## **FREQUENCY-CHECKING EQUIPMENT IN AMATEUR STATIONS**

The following notes may be helpful as a guide.

1. A licensee must:
  - a) be able to verify that his transmissions are within the authorised frequency band (i.e., that no appreciable energy is radiated outside the frequency band).
  - b) use a satisfactory method of frequency control.
  - c) ensure that his transmissions do not contain unwanted frequencies (i.e., harmonics and spurious frequencies).
2. When his station is inspected by an authorised officer of IMDA, the licensee will be expected to demonstrate that he can conform with the above requirements.
3. Within these requirements the licensee is free to decide how he will meet the licence regulations. IMDA does not approve or endorse specific makes and models of equipment. Due to the changeable nature of shared frequency bands in Singapore, each application is evaluated on an individual basis at the time of submission.
4. Frequency measuring equipment should be of sufficient accuracy to verify that emissions are within the authorised frequency bands. For example, operation in the centre of the 21.0 - 21.45 MHz band would require frequency measurement to an accuracy of + 1.0% to ensure that emissions were within frequency band, whereas operation within, say, 10 kHz of band-edge would require measurement to an accuracy of + 0.05%. When determining the proximity of an emission to band-edge, the bandspread due to modulation, on the appropriate side of the carrier, needs to be added to the frequency tolerance of the carrier.

## STUDY GUIDE

Visit SARTS website for the latest study guide through the following link:

<https://www.sarts.org.sg/>

## **PART E**

### **SINGAPORE AMATEUR RADIO TRANSMITTING SOCIETY ("SARTS")**

(Contributed by SARTS)

1. SARTS is an independent registered society, run by unpaid volunteers. SARTS supports anyone in Singapore who holds a license to transmit on the Amateur Radio bands, and people interested in gaining such a license. SARTS works with IMDA to agree practical arrangements for Amateur Radio in Singapore and SARTS represents the nation's Amateur Radio community at the International Amateur Radio Union.
2. Many of SARTS services are available to all, including regular public meetings and talks, support for those new to the hobby, and advice for licensed operators visiting from overseas. SARTS provides free access to our VHF and UHF repeaters, HF receivers and online services, including a social community and AI-based noise reduction.
3. SARTS also offers some services exclusively for members who pay a subscription. These include access to club equipment and events, and opportunities to work with facilities set up with partners such as Singapore Scouting Association and Singapore School of Science and Technology. In addition, individual members organize their own activities such as radio contest participation and radio balloon launches.
4. For details, please visit: <https://www.sarts.org.sg>