



Telecommunications  
Standards Advisory  
Committee (TSAC)

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Technical Specification

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Amateur Radio  
Equipment

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**IMDA TS AR  
Issue 1, 1 October 2016**

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## Technical Specification for Amateur Radio Equipment

### 1. Scope

- 1.1. This Specification defines the minimum technical requirements for amateur radio (AR) equipment to be used in Singapore.
- 1.2. Details of the authorised frequency bands for radio amateur service are shown in clause 2.1 of this Specification and in the booklet 'The Radio Amateur Licensing Handbook'.

### 2. References

For the technical requirements captured in this Specification, reference has been made to the following standards. Where versions are not indicated, implementation of this Specification shall be based on current and valid versions of these standards published by the respective Standards Development Organisations.

ETSI EN 301 783	Commercially available amateur radio equipment; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU
ETSI EN 301 489-1	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Harmonised Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU and the essential requirements of article 6 of the Directive 2014/30/EU; Part 1: Common technical requirements
ETSI EN 301 489-15	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 15: Specific conditions for commercially available amateur radio equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU
FCC Part 97	Amateur Radio Services Subpart D – Technical Standards
IEC CISPR 32	Electromagnetic compatibility of multimedia equipment – Emission requirements  Note: Validity of the IEC CISPR 22 (2008), EMC standard for information technology equipment, will lapse by 31 March 2017, in sync with IEC's timeline for withdrawing this CISPR standard and replacing it with the CISPR 32 standard
IEC CISPR 24	Information technology equipment – Immunity characteristics – Limits and methods of measurement
IEC 60950-1	Information technology equipment – Safety – Part 1: General requirements
IEC 62368-1	Audio/video, information and communication technology equipment – Part 1: Safety requirements
ITU-T K.116	EMC requirements and test methods for radio telecommunication terminal equipment

### **3. General Requirements**

#### **3.1. Design of Equipment**

The amateur radio equipment shall not be constructed with any external or readily accessible control which permits the adjustment if its operation in a manner that is inconsistent with this Specification.

#### **3.2. Radiation Hazards**

3.2.1. Where appropriate, amateur radio equipment shall comply with the International Commission on Non-Ionising Radiation Protection (ICNIRP) guidelines for limiting exposure to time-varying EMFs in the frequency range up to 300 GHz.

3.2.2. It should be noted that compliance with any radiation safety standard does not by itself confer immunity from legal obligations and requirements imposed by national health or safety authorities.

#### **3.3. Power Supply**

The amateur radio equipment may be AC powered or DC powered. For an AC powered equipment, the Specification shall be complied with when operating from an AC mains supply of voltage, 230V  $\pm$  10% and frequency, 50 Hz  $\pm$  2%. Where external power supply is used, e.g. AC/DC power adaptor or charger, it shall not affect the capability of the equipment to meet the requirements of this Specification.

#### **3.4. Electromagnetic (EMC) Compatibility and Safety Requirements**

##### **3.4.1. EMC assessment**

For EMC assessment, the amateur radio and/or ancillary equipment shall be classified as equipment for portable use (i.e. powered by its integral battery). This equipment classification is used to determine the applicability of the EMC (emission and immunity) testing requirements based on §5.5 and §7 of ETSI EN 301 489-1; or §7.5 and §9 of ITU-T K.116. The ETSI EN 301 489-1 standard shall be used in conjunction with the ETSI EN 301 489-15 standard for product related test conditions for amateur radio and ancillary equipment.

##### **3.4.1.1. EMI or emission measurements**

- (a) Radiated emissions from associated ancillary equipment not incorporated in the amateur radio equipment shall be measured to Class B requirements defined in §4 and Tables A.4 and A.5 of IEC CISPR 32.
- (b) Conducted emission at the AC mains port shall be measured for amateur radio equipment with dedicated power adapter/charger to Class B requirements defined in §4 and Table A.10 of IEC CISPR 32. Equipment with DC power port which is powered by a dedicated AC/DC power converter is defined as AC mains powered equipment (§3.1.1 of CISPR 32).

Note: Emission measurements performed to FCC Part 15 Subpart B for unintentional radiators (§15.109) may be acceptable as an alternative to IEC CISPR 32.

##### **3.4.1.2. EMS or immunity testing**

The following immunity tests may be performed on the amateur radio equipment to requirements defined in IEC CISPR 24, §11 of ITU-T K.116 or §9 of ETSI EN 301 489-1, where applicable:

- (a) RF electromagnetic field (80 MHz to 1 GHz and 1.4 GHz to 6 GHz) at the

enclosure of the equipment

- (b) Electrostatic discharge at the enclosure of the equipment
- (c) Fast transients (common mode) at DC power and AC main power ports that have cables longer than 3 m
- (d) RF common mode 0.15 MHz to 80 MHz at DC power and AC mains power ports that have cables longer than 3 m
- (e) Voltage dips and interruptions at AC mains power port of portable terminal with dedicated power adapter/charger
- (f) Surges, common and differential mode at AC mains power port of portable terminal with dedicated power adapter/charger

3.4.2. Equipment safety testing

3.4.2.1. Equipment safety testing or assessment shall be performed to requirements defined in IEC 60950-1 or IEC 62368-1, based on the following assumptions:

- (a) Amateur radio equipment is powered by a dedicated external power supply (power adapter/charger); and
- (b) Amateur radio equipment operates with SELV in environments where overvoltage from telecommunication networks is not possible. SELV refers to voltages not exceeding 42.4 V peak or 60 V DC.

3.4.2.2. For amateur radio equipment safety assessment performed with the hazard-based approach, the processes defined in IEC 62368-1 shall be used:

- (a) Identify energy sources in the Amateur radio equipment;
- (b) Classify energy sources (effect on the body or combustible material, e.g. possibility of injury or ignition);
- (c) Identify safeguards for protection against energy sources; and
- (d) Consider the effectiveness of safeguards with respect to compliance criteria or requirements defined in the IEC 62368-1 standard.

## 4. Technical Requirements

### 4.1. Authorised Frequency Bands, Emissions and Transmitter Power Limits

(a)	HF Band (MHz)	Class of Emission	Power
	160m: 1.8 – 2.0	A1A, A1B, A2A, A2B, A3E, R3E, H3E & J3E	Input 150 Watts (for CW) and 400 Watts (PEP) for SSB
	80m : 3.5 – 3.9		
	40m : 7.0 – 7.1		
	30m : 10.1 – 10.15		
	20m : 14.0 – 14.35		
	17m : 18.068 – 18.168		
	15m : 21.0 – 21.45		
	12m : 24.890 – 24.990		
	10m : 28.0 – 29.7		

(b)	VHF Band (144 – 146 MHz)	Mode	Power
	144.000 - 146.000	CW, SSB, SSTV RTTY, FAX	10 Watts (ERP)

(c)	UHF (430 - 440 MHz)	Mode	Power
	432.000 - 432.150	CW	10 Watts (ERP)
	432.150 - 432.500	CW, SSB	
	432.500 - 432.800	RTTY, FAX	
	433.375 - 434.600	FM Simplex	

Note:

Peak Envelope Power (PEP) is the power supplied to the antenna feeder during one radio frequency cycle at the highest crest of the modulation envelope.

### 4.2. Transmitter Frequency Tolerance

The frequency tolerance is the maximum permissible departure of the transmitter output frequency from the reference frequency which shall be the nominal carrier frequency. The frequency tolerance shall not exceed the following:

- (a) HF: The frequency drift shall not be more than 100 Hz over any period of 15 minutes, after 30 minutes of warm up period.
- (b) VHF:  $\pm 0.001\%$  (10 ppm)
- (c) UHF:  $\pm 0.0005\%$  (5 ppm)

### 4.3. Transmitter Modulation / Deviation

The modulation level shall be within the following limits:

- (a) HF: Between 50 % to 100 % (AM)
- (b) VHF/UHF:  $\pm 5$  KHz (25 kHz channel spacing)

### 4.4. Transmitter Bandwidth

- (a) HF: 6 kHz at -32 dBc (DSB)  
3 kHz at -32 dBc (SSB Full Carrier)
- (b) VHF/UHF: 16 kHz at -26 dBc (25 kHz channel spacing)

**4.5. Transmitter Spurious Emissions**

The level of the spurious emissions shall be:

- (a) HF: - 40 dBc (below 30 MHz)
- (b) VHF/UHF: - 70 dBc

**4.6. Receiver Operating Frequency**

- (a) HF: The receiver shall operate on the same frequency bands as the transmitter [clause 2.1 (a)]. Synthesized receiver operating in the frequency bands between 150 kHz and 30 MHz may be used.
- (b) VHF/UHF: The receiver shall operate within the frequency bands given in paragraph 2.1 (b) and (c).

**4.7. Receiver Sensitivity**

- (a) HF: 0.25  $\mu$ V at 10 dB S/N
- (b) VHF/UHF: 0.5  $\mu$ V at 12 dB SINAD

**4.8. Compliance with Technical Requirements**

The amateur radio equipment shall be tested to comply with the power and emission limits, and the permitted frequency bands stated in clause 4.1 this Specification. Measurement methods of the testing shall be in accordance with the relevant FCC Part 97 rules or the radio tests given in the ETSI EN 300 783.



## Annex

### Corrigendum / Addendum

Revised TS		Items Changed	Date of Issue
Page	Section		
<b>Changes to IDA TS AR Issue 1 Rev 1, May 2011</b>			
3	§3.4	<p>The IMDA TS AR Issue 1 (October 2016) has replaced the IDA TS AR Issue 1 Rev 1 (May 2011).</p> <p>Changes are largely editorial to provide updates and clarity in the application of EMC and safety requirements, in line with standards development that has taken place in the Standards Development Organisations concerned.</p>	1 Oct 16

Page	TS Ref.	Items Changed	Effective Date
<b>Changes to IDA TS AR Issue 1, Jul 05</b>			
		Change of IDA's address at cover page to Mapletree Business City.	1 May 11
<b>Changes to IDA TS 2, Issue 1 Rev 3, Dec 99</b>			
—	—	<p>Title of Specification has been renamed as "Technical Specification for Amateur Radio Equipment" (IDA TS AR Issue 1).</p> <p>Changes are mainly editorial in nature. The essential technical requirements for conformity assessment remain unchanged.</p>	21 Jul 05