

TECHNICAL CODE

LAND MOBILE RADIO EQUIPMENT - SPECIFICATIONS (SECOND REVISION)

Developed by



Registered by



Registered date:

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Development of technical codes

The Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) ('the Act') provides for a Technical Standards Forum designated under Section 184 of the Act or the Malaysian Communications and Multimedia Commission ('the Commission') to prepare a technical code. The technical code prepared pursuant to Section 185 of the Act shall consist of, at least, the requirements for network interoperability and the promotion of safety of network facilities.

Section 96 of the Act also provides for the Commission to determine a technical code in accordance with Section 55 of the Act if the technical code is not developed under an applicable provision of the Act and it is unlikely to be developed by the Technical Standards Forum within a reasonable time.

In exercise of the power conferred by Section 184 of the Act, the Commission has designated the Malaysian Technical Standards Forum Bhd ('MTSFB') as a Technical Standards Forum which is obligated, among others, to prepare the technical code under Section 185 of the Act.

A technical code prepared in accordance with Section 185 shall not be effective until it is registered by the Commission pursuant to Section 95 of the Act.

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Committee representation

This technical code was developed by Communications Terminal Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB), which consists of representatives from the following organisations:

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Redsun Engineering Sdn Bhd

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Terengganu Telecommunications Sdn Bhd

TM Technology Services Sdn Bhd

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DRAFT TC FOR PUBLIC COMMENT

Foreword

This technical code for Land Mobile Radio - Specifications ('Technical Code') was developed pursuant to Section 185 of the Communications and Multimedia Act 1998 (Laws of Malaysia Act 588) by the Communications Terminal Working Group of the Malaysian Technical Standards Forum Bhd (MTSFB).

This Technical Code was developed for the purpose of certifying communications equipment under the Communications and Multimedia (Technical Standards) Regulations 2000.

Major modifications in the revision of MCMC MTSFB TC T012:2015 are as follows:

- a) Update the safety requirements with latest reference standard.
- b) Removal of interoperability test related to GoTa.
- c) Exclusion of citizen band radio (477.0125 MHz - 477.4875 MHz), family band radio (477.5250 MHz - 477.9875 MHz) and marine radio from Table B.1.

This Technical Code replaces the MCMC MTSFB TC T012:2015, *Specification for Land Mobile Radio Equipment*. The latter shall be deemed to be invalid to the extent of any conflict with this Technical Code.

This Technical Code shall continue to be valid and effective from the date of its registration until it is replaced or revoked.

LAND MOBILE RADIO EQUIPMENT - SPECIFICATIONS

1. Scope

This Technical Code defines the minimum technical requirements for radio equipment to be used in Land Mobile Radio (LMR) services. LMR equipment shall operate in one of the authorised frequency bands and transmit within the corresponding output power levels given in Table 1.

LMR equipment includes base stations or repeater stations, mobile stations and handheld terminals, which are intended for voice and/or data communication. LMR equipment shall use constant envelope angle modulation with 12.5 kHz or 25 kHz channel spacing for analogue system and 6.25 kHz, 12.5 kHz or 25 kHz for digital system.

This Technical Code excludes the extreme test conditions.

2. Normative references

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies.

See Annex A.

3. Abbreviations

For the purposes of this Technical Code, the following abbreviations apply.

AA	Apparatus Assignment
AC	Alternating Current
CA	Class Assignment
DC	Direct Current
DSB	Double Sideband
DTRS	Digital Trunked Radio Systems
EMC	Electromagnetic Compatibility
HF	High Frequency
PVC	Polyvinyl Chloride
RF	Radio Frequency
SAR	Specific Absorption Rate
SSB	Single Sideband
SRSP	Standard Radio System Plan
LMR	Land Mobile Radio
RF	Radio Frequency
NXDN	Next Generation Digital Narrowband

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4. Requirements

4.1 General requirements

The equipment shall not cause interference with other authorised radiocommunication services and be able to tolerate any interference caused by other radiocommunication services, electrical or electronic equipment.

The 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.

4.1.1 Power supply

The equipment may be powered by Alternating Current (AC) or Direct Current (DC).

For AC powered equipment, the operating voltage shall be 240 V + 5 %, - 10 % and frequency 50 Hz \pm 1 % or 230 V \pm 10 % and frequency 50 Hz \pm 1 % in accordance with MS IEC 60038.

Where external power supply is used, e.g. AC adaptor, it shall not affect the capability of the equipment to meet this Technical Code. The adaptor shall be pre-approved by the relevant regulatory body before being used with the equipment.

For DC powered equipment, the operating voltage shall be not exceeding 42.4 V peak or 60 V DC + 20 % and - 15 %.

4.1.2 Power supply cord and mains plug

The equipment shall be fitted with a suitable and certified power supply cord and mains plug. The power supply cord and mains plug are regulated products and shall be pre-approved by the relevant regulatory body, with the following requirements, before they can be used with the equipment.

- a) The power supply cord shall be certified according to:
 - i) MS 2112-5 or BS EN 50525-2-11 or IEC 60227-5 (for Polyvinyl Chloride (PVC) insulated - flexible cables or cords); or
 - ii) MS 2127-4 or IEC 60245-1 and IEC 60245-4 (for rubber insulated - flexible cables or cords).
- b) The mains plug shall be certified according to:
 - i) MS 589-1 or BS 1363 (for 13 A, fused plug);
 - ii) MS 1577 (for 15 A, fused plugs); or
 - iii) MS 1578 or BS EN 50075 (for 2.5 A, 250 V, flat non-rewireable two-pole plugs with cord for the connection of class II equipment).

4.1.3 Marking

The equipment shall be marked with the following information:

- a) supplier or manufacturer's name or identification mark;
- b) equipment's brand name or trademark and model; and
- c) other markings as required by the relevant standards.

The markings shall be legible, indelible and readily visible. All information on the marking shall be either in Bahasa Melayu or English language.

4.1.4 Interoperability

The LMR equipment shall have the ability to exchange information and to use the information that has been exchanged between two or more systems or components.

4.2 Technical requirements

The equipment shall comply with the following requirements:

- a) Radio Frequency (RF);
- b) Electromagnetic Compatibility (EMC); and
- c) Electrical Safety and Health.

4.2.1 Radio Frequency (RF)

The Equipment shall operate within the specified frequency bands and transmitter output power. It shall conform to the test references as specified in Table B.1 of Annex B and fulfil the relevant requirements of this Technical Code on all the permitted frequencies which it is intended to operate.

The LMR equipment designed for Analogue Personal Mobile Radio and Citizen band, it shall also conform to the test limits as specified in Table B.2.

4.2.2 Electromagnetic Compatibility (EMC)

The equipment shall comply with the EMC requirements as specified in ETSI EN 301 489-1 or equivalent standards. The requirements shall cover radiated and conducted emissions.

4.2.3 Safety and health

4.2.3.1 Electrical safety and health

The equipment shall comply with the safety requirements defined in IEC 60950-1 or IEC 62368-1 or any equivalent standards.

4.2.3.2 Specific Absorption Rate (SAR)

The equipment that is intended to be used at a position near the human body, in the manner described by the manufacturer, with the radiating part(s) of the device at distances up to and including 200 mm from a human body, e.g. body-mounted, body-supported, front-of-face, hand-held, limb-mounted, push-to-talk and clothing-integrated, shall comply with one or more of the following standards:

- a) BS EN 50360;
- b) IEC 62209-1; and/or
- c) IEC 62209-2.

Annex A
(normative)

Normative references

MCMC MTSFB TC T020, *Aeronautical Radiocommunications Equipment - Specifications*

MCMC MTSFB TC T021, *Maritime Radiocommunications Equipment - Specifications*

MS 589-1, *13 A plugs, socket-outlets, adaptors and connection units - Part 1: Specification for rewirable and non-rewirable 13 A fused plugs*

MS 1577, *Specification for 15 A plugs and socket-outlets for domestic and similar purposes*

MS 1578, *Specification for flat non-rewirable two-pole plugs, 2.5 A, 250 V with cord, for the connection of class II - Equipment for household and similar purposes*

MS 2112-5, *Electric cable and wire - Polyvinyl Chloride (PVC) insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables*

MS 2127-4, *Rubber insulated cables of rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables*

MS IEC 60038, *IEC standard voltages*

IEC 60227-5, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables (cords)*

IEC 60245-1, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 1: General requirements*

IEC 60245-4, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables*

IEC 60950-1, *Information technology equipment - Safety - Part 1: General requirements*

IEC 62209-1, *Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz)*

IEC 62209-2, *Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)*

IEC 62368-1, *Audio/video, information and communication technology equipment - Part 1: Safety requirements*

ETSI EN 300 086, *Land Mobile Service; Radio equipment with an internal or external RF connector intended primarily for analogue speech; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU*

ETSI EN 300 113, *Land Mobile Service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU*

ETSI EN 300 135-1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Citizens' Band (CB) radio equipment; Angle-modulated Citizens' Band radio equipment (PR 27 Radio Equipment); Part 1: Technical characteristics and methods of measurement*

ETSI EN 300 296, *Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU*

ETSI EN 300 396-2, *Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 2: Radio aspects*

ETSI EN 300 392-2, *Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)*

ETSI EN 300 433-1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Double Side Band (DSB) and/or Single Side Band (SSB) amplitude modulated citizen's band radio equipment; Part 1: Technical characteristics and methods of measurement*

ETSI EN 301 166, *Land mobile service; Radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrow band channels and having an antenna connector; 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; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility*

ETSI EN 303 035-1, *Terrestrial Trunked Radio (TETRA); Harmonized EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE Directive; Part 1: Voice plus Data (V+D)*

ETSI EN 303 035-2, *Terrestrial Trunked Radio (TETRA); Harmonized EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE Directive; Part 2: Direct Mode Operation (DMO)*

ETSI EN 303 758, *TETRA radio equipment using non-constant envelope modulation operating in a channel bandwidth of 25 kHz, 50 kHz, 100 kHz or 150 kHz; Harmonised Standard for access to radio spectrum*

ETSI TR 102 433, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Private Mobile Radio (DPMR) using a channel spacing of 6,25 kHz and operating in specified VHF and UHF bands under general authorization without individual rights; System reference document*

ETSI TS 102 361-1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Digital Mobile Radio (DMR) Systems; Part 1: DMR Air Interface (AI) protocol*

ETSI TS 102 490, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW*

ETSI TS 102 658, *Digital Private Mobile Radio (dPMR) using FDMA with a channel spacing of 6,25 kHz*

BS 1363, *13 A plugs, socket-outlets, adaptors and connection units. Specification for rewirable and non-rewirable 13 A fused plugs*

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BS EN 50075, *Specification for flat non-wirable two-pole plugs 2.5 A 250 V, with cord, for the connection of class II-equipment for household and similar purposes*

BS EN 50360, *Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz - 3 GHz)*

BS EN 50525-2-11, *Electric cables. Low voltage energy cables of rated voltages up to and including 450/750V (U0/U) Cables for general applications. Flexible cables with thermoplastic PVC insulation*

3GPP2 C.S0010, *Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations*

3GPP2 C.S0011, *Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations*

TIA/EIA-102, *APCO Project 25 Recommended Common Air Interface New Technology Standards Project Digital Radio Technical Standards*

FCC Part 90, *Land Mobile Radio Service*

Malaysian Communications and Multimedia Commission, www.mcmc.gov.my

Apparatus Assignment Interactive Guideline, <https://aaig.mcmc.gov.my/>

Class Assignment, <https://www.mcmc.gov.my/en/spectrum/assignment-of-spectrum/class-assignment>

Annex B
(normative)

Technical requirements

B.1. Technical requirements for land mobile radio

The use of the frequency listed in Table B.1 shall be subject to Spectrum Plan. Frequencies used for aeronautical and maritime radio equipment shall refer to MCMC MTSFB TC T020 and MCMC MTSFB TC T021 respectively. Frequencies used for amateur radio equipment shall refer to Guidelines for Amateur Radio Service in Malaysia.

Table B.1. Technical requirements for land mobile radio services

Type of Services	Type of Equipment	Channel Spacing (kHz)	Operating Frequency (MHz)	Maximum Transmitter Output power (W)	Test References	Remarks
HF radio (voice and data) ¹	Base station	2.8/ 3	3.0000 - 30.0000 (simplex)	Subject to Apparatus Assignment (AA)	Not applicable	The use of the frequency is subject to the issuance of AA ² .
	Handheld					
	Mobile					
Personal radio service (voice)	Citizen band radio	6 (DSB)/ 3 (SSB)	26.9650 - 27.4050 (simplex)	4 (DSB)/ 12 (SSB)	ETSI EN 300 433-1 ETSI EN 300 135-1	Classified under Class Assignment (CA) ³ .
VHF radio ¹ conventional two-way radio (voice)	Handheld	6.25/ 12.5	137.0000 - 174.0000	5	ETSI EN 300 086 ETSI EN 300 296	a) The maximum transmitter output power tolerance shall be within ± 1.5 dB. b) The use of the frequency is subject to the issuance of AA ² .
	Mobile			25	ETSI EN 300 086 ETSI EN 300 296	
	Base station or repeater			50	ETSI EN 300 086 ETSI EN 300 296	

Table B.1. Technical requirements for land mobile radio services (continued)

Type of services	Type of equipment	Channel spacing (kHz)	Operating frequency (MHz)	Maximum transmitter output power (W)	Test references	Remarks
UHF radio (conventional two-way radio) (voice)	Handheld	6.25/12.5	441.0000 - 445.0000 and 447.0000 - 450.0000	5	ETSI EN 300 086 ETSI EN 300 296	The use of the frequency is subject to the issuance of AA ² .
	Mobile			25		
	Base station or repeater			50		
Personal radio service (voice)	Analogue personal mobile radio	12.5	446.006250 - 446.093750 (simplex)	0.5	ETSI EN 300 296	Classified under CA ³ .
	Digital personal mobile radio	6.25	446.103125 - 446.196875 (simplex)	0.5	ETSI TR 102 433 ETSI EN 301 166	
VHF radio ¹ (telemetry - data)	Handheld	6.25/12.5/25	137.0000 - 174.0000	5	ETSI EN 300 113	a) The maximum transmitter output power tolerance shall be within ± 1.5 dB. b) The use of the frequency is subject to the issuance of AA ² .
	Mobile			25		
	Base station or repeater			50		
UHF radio (telemetry - data)	Handheld	6.25/12.5/25	440.0000 - 441.0000 and 445.0000 - 446.0000	5	ETSI EN 300 113	
	Mobile			25		
	Base station or repeater			50		

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Table B.1. Technical requirements for land mobile radio services (continued)

Type of services	Type of equipment	Channel spacing (kHz)	Operating frequency (MHz)	Maximum transmitter output power (W)	Test references	Remarks
Digital Trunked Radio Systems (DTRS)	Handheld	6.25/ 12.50/ 25.00	380.0000 - 399.9000 410.0000 - 430.0000	5	<p>TETRA</p> <p>a) Conformity assessment requirements: ETSI EN 303 758 ETSI EN 300 396-2 ETSI EN 300 392-2</p> <p>b) Test requirements: ETSI EN 303 035-1 ETSI EN 303 035-2</p>	<p>a) The use of the frequency for base station/ repeater station is subject to the issuance of AA².</p> <p>b) Subject to requirements in Standard Radio System Plan (SRSP) for DTRS⁴.</p> <p>c) For use of frequency for trunked radio access device is subject to requirement and conditions as specified in SRSP and Schedule for trunked radio access device in CA⁵.</p>
	Mobile			25	<p>iDEN</p> <p>FCC Part 90</p> <p>APCO25</p> <p>TIA/EIA-102 (all series)</p>	
	Base station or repeater			50	<p>DMR</p> <p>ETSI TS 102 361-1</p> <p>NXDN</p> <p>ETSI TS 102 490 ETSI TS 102 658 ETSI EN 300 113</p>	

Table B.1. Technical requirements for land mobile radio services (concluded)

Type of services	Type of equipment	Channel spacing (kHz)	Operating frequency (MHz)	Maximum transmitter output power (W)	Test references	Remarks
<p>Notes:</p> <p>¹ The frequency bands are based on the manufacturer's equipment tuning range, not the entire frequency band allocated for HF and VHF land mobile radio.</p> <p>² The use of frequency bands is by way of Apparatus Assignment (AA). Please refer to Guidelines for AA at www.mcmc.gov.my or AA Interactive Guideline at https://aaig.mcmc.gov.my for more information</p> <p>³ Please refer to www.mcmc.gov.my for Personal Radio Service Device Schedule in Class Assignment.</p> <p>⁴ Please refer to www.mcmc.gov.my for SRSP for DTRS in the frequency bands 380 MHz to 399.9 MHz and 410 MHz to 430 MHz.</p> <p>⁵ Please refer to www.mcmc.gov.my for Trunked Radio Access Device Schedule in Class Assignment.</p>						
<p>Note: Certification of all equipment is required in accordance with the aforementioned standards or any other relevant standards. The certifying agency will verify the relevancy of these standards through the certification process, which includes conducting a comprehensive suitability study and gap analysis.</p>						

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Table B.2. Test limits for LMR equipment for analogue personal mobile radio and citizen band

No	Parameter	Test limit	Test reference	Remarks
1.	RF power	± 1.5 dB	ETSI EN 300 296-1	Frequency range is based on the notification of issuance of class assignments under the provision of Communications and Multimedia Act 1998, Section 169, P. U. (B) 416.
2.	Frequency error	± 5 ppm		
3.	Spurious emission	0.25 μ W (- 36 dBm) (for 30 MHz to 1 000 MHz)		
4.		1 μ W (- 30 dBm) (for 1 GHz to 12.75 GHz)		
5.	Frequency deviation	± 2.5 kHz		
6.	Receiver sensitivity	31.5 dB relative to 1 μ V/m		
7.	Spurious radiation	- 57 dBm (30 MHz to 1 000 MHz)		

Acknowledgements

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