TECHNICAL CODE

SPECIFICATION FOR LAND MOBILE RADIO EQUIPMENT

First Revision

Developed by

Registered by

Registered date:

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MCMC MTSFB TC T012:2015

DEVELOPMENT OF TECHNICAL CODES

The Communications and Multimedia Act 1998 ('the Act') provides for 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 requirement 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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Intel Corporation
Lock Spectrum Consultancy
Maxis Communications Berhad
Motorola Solutions
REDtone International Bhd
Rohde & Schwarz Malaysia Sdn Bhd
Sapura Research Sdn Bhd
SIRIM QAS International Sdn Bhd
Supreme Landmobile & Wireless Corporation Sdn Bhd
Telekom Malaysia Berhad
Universiti Tenaga Nasional Berhad (UNITEN)

FOREWORD

This technical code for the Specification for Land Mobile Radio Equipment ('this Technical Code') was developed pursuant to section 185 of the Act 588 by the Malaysian Technical Standards Forum Bhd ('MTSFB') via its Wireless Terminal Working Group.

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

This Technical Code is the first revision of SKMM WTS LMR Rev. 1.01:2007, Technical Specification for Land Mobile Radio Equipment.

Major modifications in this revision are as in Annex B.

This Technical Code cancels and replaces Technical Specification for Land Mobile Radio Rev. 1.01:2007.

This Technical Code shall continue to be valid and effective until reviewed or cancelled.

MCMC MTSFB TC T012:2015

SPECIFICATION FOR LAND MOBILE RADIO EQUIPMENT

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/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.

NOTE. Constant envelope angle modulation is either phase modulation or frequency modulation.

The technologies for digital trunk radio defined in this specification are Integrated Digital Enhanced Network (iDEN), Terrestrial Trunked Radio (TETRA), APCO25 and Global Open Trunking Architecture (GoTa).

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 abbreviation applies.

AC	Alternating Current
APCO25	The Association of Public-Safety Communications Officials International Inc, Project 25
DC	Direct Current
DSB	Double Sideband
EIRP	Effective Isotropic Radiated Power
EMC	Electromagnetic Compatibility
ERP	Effective Radiated Power
GoTa	Global Open Trunking Architecture
HF	High Frequency
iDEN	Integrated Digital Enhanced Network
LMR	Land Mobile Radio
RF	Radio Frequency
Rx	Receiver

SSB	Single Sideband
Sx	Simplex
TETRA	Terrestrial Trunked Radio
Tx	Transmitter
UHF	Ultra High Frequency
VHF	Very High Frequency

4. Requirements

4.1 General requirements

4.1.1 Power supply

AC adaptor used for LMR equipment shall not affect the capability of the equipment to meet this specification. The operating voltage shall be 240 V +5 %, -10 % and frequency 50 Hz ± 1 % as according to MS 406 or 230 V ± 10 % and frequency 50 Hz ± 1 % as according to MS IEC 60038 whichever is current.

Adaptor must be pre-approved by the relevant regulatory body before it can be used with the equipment.

4.1.2 Power supply cord and mains plug

The equipment shall be fitted with a suitable and appropriate approved power supply cord and mains plug. Both are regulated products and must be pre-approved by the relevant regulatory body before it can be used with the equipment.

The power supply cord shall be certified in according to:

a) MS 140; or

b) BS 6500; or

c) IEC 60227-5; or

d) IEC 60245-4.

The main plug shall be certified in according to:

a) 13 A fused plugs: MS 589: Part 1 or BS 1363: Part 1; or

b) 2.5 A, 250 V, flat non-rewirable two-pole plugs: MS 1578 or BS EN 50075.

4.1.3 Design of equipment and marking

The LMR 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.

The equipment shall be marked with the following information:

a) Supplier/manufacturer's name or identification mark;

b) Supplier/manufacturer's model or type reference; and

c) Other markings as required by the relevant standards.

The markings shall be legible, indelible and readily visible.

All markings and related documents shall be 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.

The LMR equipment under GoTa technology shall comply with the interoperability requirements as defined in the following standards:

a) 3GPP2 A.S0011;

b) 3GPP2 A.S0012;

c) 3GPP2 A.S0013;

d) 3GPP2 A.S0014;

e) 3GPP2 A.S0015;

f) 3GPP2 A.S0016; and

g) 3GPP2 A.S0017.

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

The LMR equipment shall operate within the frequency bands, maximum transmitter output power, channel spacing and shall conform to the test references as specified in Table 1.

The LMR equipment designed for Analog Personal Mobile Radio and Family Band Services shall also conform to the test limits as specified in Table 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 specified in MS IEC 60950-1 or equivalent standards and full type test report shall be submitted.

4.2.3.2 Radiation hazards

The LMR equipment shall comply with occupational limits of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for limiting exposure to time varying Electromagnetic Field (EMF) in the frequency range up to 300 GHz.

Table 1. Technical requirements for radio equipment to be used in land mobile radio services

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks
				(ERP) (W)	(EIRP) (W)		
HF radio (voice)	Citizen Band Radio	6 (DSB) / 3 (SSB)	26.9650 - 27.4050 - Sx	4 (DSB) / 12 (SSB)	-	ETSI EN 300 433-1 ETSI EN 300 135-1	Refer to the 5th Schedule of Class Assignments
VHF radio (voice)	Handheld	12.5/25	136.0000 – 174.0000	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	The maximum transmitter output power shall be within +/- 1.5 dB
	Mobile			25	-		
	Base Station/ Repeater			50	-		
UHF radio (voice)	Handheld	12.5/25	400.0000 – 527.0000	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	
	Mobile			25	-		
	Base Station/ Repeater			50	-		
	Analog Personal Mobile Radio	12.5	446.006250 - 446.093750 - Sx	0.5	-	ETSI EN 300 296-1	Refer to the 5th Schedule of Class Assignments
	Digital Personal Mobile Radio	6.25	446.103125 - 446.196875 - Sx	0.5	-	ETSI TR 102 433 ETSI EN 301 166	
	Citizen Band Radio	12.5	477.0125 - 477.4875 - Sx	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	
	Family Band	12.5	477.5250 - 477.9875 - Sx	-	0.5	ETSI EN 300 296-1	

Table 1. Technical requirements for radio equipment to be used in land mobile radio services *(continue)*

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks
				(ERP) (W)	(EIRP) (W)		
VHF radio (data)	Hand held	12.5/25	136.0000 – 174.0000	5	-	ETSI EN 300 113-1	• The maximum transmitter output power shall be within +/- 1.5 dB. • The frequency and RF Output Power for radio access device is subject to Class Assignment. • The fixed station is subject to Apparatus Assignment.
	Mobile			25	-		
	Base Station/ Repeater			50	-		
UHF radio (data)	Handheld	12.5/25	400.0000 – 527.0000	5	-	ETSI EN 300 113-1	
	Mobile			25	-		
	Base Station/ Repeater			50	-		

Note : System such as radio telemetry or SCADA are considered in VHF or UHF data type of service.

Table 1. Technical requirements for radio equipment to be used in land mobile radio services *(continue)*

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks
				(ERP) (W)	(EIRP) (W)		
Trunk radio (digital)	Handheld	6.25/ 12.50/ 25.00	380.0000 – 399.9000 MHz 410.0000 – 430.0000 MHz	5	-	**TETRA** : 1.Conformity assessment requirements a. ETSI EN 300 394-1 b. ETSI EN 300 396-2 c. ETSI EN 300 392-2 2.Test requirements a. ETSI EN 303 035-1 b. ETSI EN 303 035-2 **iDEN** : FCC Part 90 **GoTa**: 3GPP2 C.S0010 3GPP2 C.S0011 **APCO25** :TIA/EIA-102 (all series)	**-**
	Mobile			25	-		
	Base Station/ Repeater			50	-		
Marine radio	Handheld	25	6.0250 – 162.9750 MHz – Dx/Sx	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	Only applicable to constant envelope angle modulation system
	Mobile			25	-		
	Base Station/ Repeater			50	-		
	HF	-	1.605 kHz – 27.500 MHz	400	-	ETSI EN 300 373-1	-

Table 2. Test Limits for LMR Equipment for Analog Personal Mobile Radio and Family Band Services

Parameter	Test limit	Test reference	Remarks
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.
Frequency error	± 5 ppm		
Spurious emission	0.25 µW (-36 dBm) (for 30 MHz to 1000 MHz)		
	1 µW(-30 dBm) (for 1 GHz to 12.75 GHz)		
Frequency deviation	± 2.5 kHz		
Receiver sensitivity	31.5 dB relative to 1 µV/m		
Spurious radiation	-57 dBm (30 MHz to 1000 MHz)		

Annex A
(Normative)

Normative References

BS 1363: Part 1	13 A plugs, socket-outlets, adaptors and connection units - Part 1: Specification for rewirable and non-rewirable 13 A fused plugs
BS 6500	Electric cables Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments
Class Assignment	Class Assignment confers rights on any person to use the frequency bands as listed under the class assignment
ETSI EN 300 373-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime mobile transmitters and receivers for use in the MF and HF bands; Part 1: Technical characteristics and methods of measurement
3GPP2 A.S0011	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 1 Overview
3GPP2 A.S0012	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 2 Transport
3GPP2 A.S0013	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 3 Features
3GPP2 A.S0014	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 4 (A1, A1p, A2, and A5 Interfaces)
3GPP2 A.S0015	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 5 (A3 and A7 Interfaces)
3GPP2 A.S0016	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 6 (A8 and A9 Interfaces)
3GPP2 A.S0017	Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 7 (A10 and A11 Interfaces)
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
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
ETSI EN 300 086-1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment with an internal or external RF connector intended primarily for analogue speech; Part 1: Technical characteristics and methods of measurement

ETSI EN 300 113-1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); 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; Part 1: Technical characteristics and methods of measurement
ETSI EN 300 135-1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Angle-modulated Citizens Band radio equipment (CEPT PR 27 Radio Equipment); Part 1: Technical characteristics and methods of measurement
ETSI EN 300 296-1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; Part 1: Technical characteristics and methods of measurement
ETSI EN 300 392-2	Terrestrial Trunked Radio (TETRA); Voice plus data (V+D); Part 2: Air Interface (AI)
ETSI EN 300 394-1	Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 1: Radio
ETSI EN 300 396-2	Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 2: Radio aspects
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	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Land mobile service; Technical characteristics and test conditions for radio equipment for analogue and/or digital communication (speech and/or data) and operating on narrowband channels and having an antenna connector
ETSI EN 301 489-1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN 303 035-1	Terrestrial Trunked Radio (TETRA); Harmonised 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); Harmonised EN for TETRA equipment covering essential requirements under article 3.2 of the R&TTE Directive; Part 2: Direct Mode Operation (DMO)
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
IEC 60227-5	Electric cables Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments
IEC 60245-4	Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables

MS 140	Specification for insulated flexible cords and cables
MS 406	Specification for voltages and frequency for alternating current transmission and distribution system (Second revision)
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 589 Part 1	Specification for 13 A plugs, socket outlets, adaptors and connection units – Part 1: Specification for rewirable and non-rewirable 13 A fused plugs
MS IEC 60038	IEC Standard Voltage
MS IEC 60950-1	Information Technology equipment - Safety

Annex B
(Informative Reference)

Amendments

Amendments to SKMM WTS LMR Rev. 1.01:2007		
Page	**Clause**	**Items Amended**
Cover	-	The document has been rename and renumbered as 'Specification For Land Mobile Radio Equipment and MCMC MTSFB TC T012:2015'. The document has adopted new cover page.
i	-	Explanatory note on the development of Technical Codes has been included.
1	1 (Scope)	The statement for the scope has been changed.
5 - 7	4.2.1 (Table 1)	1. The following changes have been made to Table 1: a) The frequency band of 26.9650 – 27.4050 MHz (Sx) for Citizen Band Radio is reclassified under HF radio (voice). b) The frequency band for VHF Radio (voice) and VHF Radio (data) is amended to 136.0000 – 174.0000 MHz. c) The frequency band for UHF Radio (voice) and UHF Radio (data) for handheld, mobile and base station/repeater is amended to 400.0000 – 527.0000 MHz. d) The frequency bands for UHF Radio (voice) under the Class Assignment are updated to include analog and digital Personal Mobile Radio services. e) The frequency bands for digital Trunk Radio are amended to 380.0000 – 399.9000 MHz and 410.0000 – 430.0000 MHz. f) The frequency bands for analog Trunk Radio are removed.
8	4.2.1 (Table 2)	The title of Table 2 is amended to include analog Personal Mobile Radio and Family Band services.
9	Annex A	The normative references have been updated

Acknowledgements

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