

SKMM WTS LMR
Rev. 1.01:2007

**TECHNICAL SPECIFICATION
FOR
LAND MOBILE RADIO EQUIPMENT**



Suruhanjaya Komunikasi dan Multimedia Malaysia
Off Pesiaran Multimedia, 63000 Cyberjaya, Selangor Darul Ehsan, Malaysia

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FOREWORD

This Technical Specification was developed under the authority of the Malaysian Communications and Multimedia Commission (SKMM) under the Communications and Multimedia Act 1998 (CMA 98) and the relevant provisions on technical regulation of Part VII of the CMA 98. It is based on recognised International Standards documents.

This Technical Specification specifies the specification to conform for approval of telecommunications devices.

NOTICE

This Specification is subject to review and revision

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TECHNICAL SPECIFICATION FOR LAND MOBILE RADIO EQUIPMENT

1. Scope

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

LMR equipments include base stations/repeater stations, mobile stations and handportable stations, Family Radio Services (FRS) and marine radio, and are intended for voice and/or data communication. LMR equipments shall apply to 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 trunked radio defined in this specification are Integrated Digital Enhanced Network (iDEN), Terrestrial Trunked Radio (TETRA), APCO25 and Global Open Trunking Architecture (GoTa).

This specification excludes the extreme test conditions.

2. Normative references

The following normative references are indispensable for the application of this Technical Specification. 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 purpose of this Technical Specification, the following abbreviation applies.

APCO25	The Association of Public-Safety Communications Officials International Inc, Project 25
CB	Citizen Band
Dx	Duplex
EIRP	Effective Isotropic Radiated Power
ERP	Effective Radiated power
FRS	Family Radio Services

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GoTa	Global Open Trunking Architecture
iDEN	Integrated Digital Enhanced Network
LMR	Land Mobile Radio
Rx	Receiver
SSB	Single Side Band
Sx	Simplex
TETRA	Terrestrial Trunked Radio
Tx	Transmitter

4. Requirements

4.1 General requirements

4.1.1 Power supply requirements

AC adaptor used for LMR equipments 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 \pm 1 % as according to MS 406 or 230 V \pm 10 % and frequency 50 Hz \pm 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 requirements

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 according to:

- MS 140; or
- BS 6500; or
- IEC 60227-5; or
- IEC 60245-4.

The main plug shall be certified according to:

- 13 A fused plugs: MS 589: Part 1 or BS 1363: Part 1; or
- 2.5 A, 250 V, flat non-rewirable two-pole plugs: MS 1578 or BS EN 50075.

4.1.3 Interoperability and connectivity requirements

The LMR equipments shall comply with the minimum requirement that is specified by the regulatory body.

4.1.3.1 Interoperability

The LMR equipments 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 equipments under GoTa technology shall comply with interoperability specification as define 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.

4.1.3.2 Connectivity

The LMR equipments shall have the ability to link with other programs and devices to allow interoperability.

4.1.4 Design of equipment and marking requirements

The LMR equipments 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.

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4.1.5 Language

All markings and related documents shall be in Bahasa Melayu or English language.

4.2 Technical requirements

The equipment shall comply with the following requirements:

- a) Radio Frequency (RF).
- b) Electromagnetic Compatibility (EMC).
- c) Electrical safety and health.

4.2.1 Radio Frequency requirements

4.2.1.1 The LMR equipments shall operate within the frequency bands, maximum transmitter output power and channel spacing as defined in Table 1.

4.2.1.2 The specification test limit for FRS is defined in Table 2.

4.2.2 Conformity requirements

LMR equipments shall comply with the standards as specified in test reference of Table 1.

4.2.3 Electromagnetic Compatibility (EMC) requirements

The equipment shall comply with the EMC emissions requirements from the DC power or AC mains power input/output ports as defined in the ETSI EN 301 489-1 or equivalent standards. The requirements shall cover radiated and conducted emission.

4.2.4 Safety and health requirements

4.2.4.1 Electrical safety and health

The equipment shall comply with the safety requirements defined in MS IEC 60950-1. The supplier shall submit full type test report to MS IEC 60950 -1 or equivalent standards.

4.2.4.2 Radiation hazards

Where appropriate, the LMR equipments shall comply with occupational limits of the International Commission on Non-Ionising 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)		
VHF radio (voice)	Handportable	12.5/25	137.0125 – 139.4000 } Dx	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	-
	Mobile		142.6000 – 144.0000 } Dx	25	-		
	Base Station/ Repeater		141.0000 – 142.0000 - Sx	50	-		
UHF radio (voice)	Handportable	12.5/25	443.0125 – 444.9875 } Dx	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	-
	Mobile		448.0125 – 449.9875 } Dx	25	-		
			456.5250 – 456.9750 } Dx/Sx				
			466.5250 – 466.9750 } Dx/Sx	50	-		
			457.5250 – 457.9750 } Dx/Sx				
			467.5250 – 467.9750 } Dx				
	Base Station/ Repeater		458.0000 – 459.9750 } Dx				
			468.0000 – 469.9750 } Dx				

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

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks
				(ERP) (W)	(EIRP) (W)		
UHF radio (voice)	CB	10	26.9650 – 27.4050 – Sx	4/12	-	ETSI EN 300 433-1 ETSI EN 300 135-1	4 Watts for AM/FM modulation 12 Watts for SSB
		12.5	477.0125 – 477.5250 – Sx	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	-
	FRS	12.5	477.5250 – 477.9875 – Sx	-	0.5	ETSI EN 300 296-1	-

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

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks
				(ERP) (W)	(EIRP) (W)		
VHF radio (data)	Handportable	12.5/25	163.0000 – 164.0000 } Dx/Sx 173.0000 – 174.0000 }	5	-	ETSI EN 300 113-1	-
	Mobile			25	-		
	Base Station/ Repeater			50	-		
UHF radio (data)	Handportable	12.5/25	450.0000 – 452.0000 } Dx/Sx 460.0000 – 462.0000 } 470.0000 – 510.0000 - Dx	5	-	ETSI EN 300 113-1	-
	Mobile			25	-		
	Base Station/ Repeater			50	-		
Trunked radio (analog)	Handportable	12.5/25	806.0000 – 811.0000 } Tx/Rx 851.0000 – 856.0000 } 811.0000 – 816.0000 } Tx/Rx 856.0000 – 861.0000 }	5	-	ETSI EN 300 086-1 ETSI EN 300 296-1	The validity of apparatus assignment up to 31 December 2008 (refer to SRSP-502M DTRS Sept 06).
	Mobile			25	-		
	Repeater			50	-		

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

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks	
				(ERP) (W)	(EIRP) (W)			
Trunked radio (digital)	Handportable	6.25 – 1 250	380.0000 – 390.0000 } Tx/Rx	5	-	TETRA : <ul style="list-style-type: none"> • Conformity assessment requirements - ETSI EN 300 394-1 - ETSI EN 300 396-2 - ETSI EN 300 392-2 	-	
	Mobile		390.0000 – 400.0000 } Tx/Rx				25	-
			410.0000 – 420.0000 } Tx/Rx	-	-			
			420.0000 – 430.0000 } Tx/Rx					
	Repeater		452.0000 – 456.4750 } Tx/Rx	50	-		<ul style="list-style-type: none"> • Test requirements - ETSI EN 303 035-1 - ETSI EN 303 035-2 	-
			462.0000 – 466.4750 } Tx/Rx					
			806.0000 – 811.0000 } Tx/Rx					
			851.0000 – 856.0000 } Tx/Rx					
			811.0000 – 816.0000 } Tx/Rx					
856.0000 – 861.0000 } Tx/Rx	-	-	iDEN : FCC Part 90 GoTa : 3GPP2 C.S0010 3GPP2 C.S0011	-				
816.0000 – 821.0000 } Tx/Rx								
861.0000 – 866.0000 } Tx/Rx	-	-	APCO25 : TIA/EIA-102 (all series)	-				

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

Type of services		Channel Spacing (kHz)	Operating frequency (MHz)	Max Transmitter Output Power		Test Reference	Remarks
				(ERP) (W)	(EIRP) (W)		
Marine radio	Handportable	25	156.0250 – 162.9750 - 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			50	-		
	HF	-	1.605 kHz – 27.500 MHz	400	-	ETSI EN 300 373-1	-

NOTE. Malaysian frequency allocation is based on Spectrum Plan (9 kHz to 420 THz), edition November 2006

Table 2. Technical specification for Family Radio 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
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 6500	Electric cables Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments
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

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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 300 373-1	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
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 301 489-1	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)

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FCC Part 90	Federal Communications Commission, Part 90 Private Land Mobile Radio Services
IEC 60227-5	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables (cords)
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 systems
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 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 IEC 60038	IEC standard voltages
MS IEC 60950-1	Information technology equipment - Safety - Part 1: General requirements
TIA/EIA-102 (all series)	P25 Phase I and Phase II standards