Telecommunications Standards Advisory Committee (TSAC)

Draft

Land Mobile Radio Equipment

IDA TS LMR
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Telecommunications Standards Advisory Committee (TSAC)

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1. General Requirements

1.1 Scope of Specification

1.1.1 This Specification 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 or frequencies, and transmit within the corresponding output power levels given in Table 1.

1.1.2 LMR equipment may be base stations used in fixed locations, mobile stations used in vehicles or as transportable stations, or handheld portable stations that come with an external antenna or an integral antenna. Applications may include speech and/or data communication, and may be using digital radio technologies such as the Integrated Digital Enhanced Network (iDEN), Terrestrial Trunked Radio (TETRA), Digital Mobile Radio (DMR) or NXDN technology (see Table 1).

1.2 Design of LMR Equipment

LMR Equipment shall be designed to meet the following basic objectives:

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

(b) The device shall be marked with the supplier/manufacturer's name or identification mark, and the supplier/manufacturer's model or type reference. The markings shall be legible, indelible and readily visible.

1.3 Safety and Health

1.3.1 Where appropriate, the LMR 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.

1.3.2 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.

2 Technical Requirements

The LMR Equipment shall comply with the RF output power and spurious emissions given in Table 1, operating in its intended frequency band or frequencies. It shall fulfil the relevant requirements of this Specification on all the permitted frequencies which it is intended to operate.

3 Compliance with Technical Requirements

3.1 Suppliers shall demonstrate that the LMR equipment has been tested and certified for conformity with the applicable technical requirements stipulated in Table 1 of this Specification. Measurement methods and conditions shall be with reference to one of the following standards, whichever is applicable for the equipment under test (refer to Table 1 for guidance):

- 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 300 296-1 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

- FCC Part 90 Federal Communications Commission, Part 90 Private Land Mobile Radio Services

- 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 301 166-1 Electromagnetic compatibility and Radio spectrum Matters (ERM); 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; Part 1: Technical characteristics and methods of measurement

- ETSI EN 300 390-1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment intended for the transmission of data (and/or speech) and using an integral antenna; Part 1: Technical characteristics and methods of measurement

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

- 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 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 102 361-2 Electromagnetic compatibility and Radio spectrum Matters (ERM);Digital Mobile Radio (DMR) Systems; Part 2: DMR voice and generic services and facilities
- ETSI TS 102 361-3 Electromagnetic compatibility and Radio spectrum Matters (ERM);Digital Mobile Radio (DMR) Systems; Part 3: DMR data protocol
- ETSI TS 102 361-4 Electromagnetic compatibility and Radio spectrum Matters (ERM);Digital Mobile Radio (DMR) Systems; Part 4: DMR trunking protocol

3.2 Where appropriate, suppliers shall demonstrate the LMR equipment has been tested according to measurement methods and limits for:

(a) EMC emissions from the DC power or AC mains power input/output ports defined in ETSI EN 301 489-1 or IEC CISPR 22; and

(b) Electrical safety defined in the IEC 60950-1

Table 1: Technical Requirements for Radio Equipment to be used in Land Mobile Radio Services

Item No.	Operating Frequencies	Channel Spacing	Max RF Power Output	Spurious Emissions	Test Reference	Applications	Additional Requirements
1	80 MHz	12.5 kHz	Base/Mobile: 25 W ERP [Note 1] Portable: 5 W ERP [Note 1]	< 20 nW	ETSI EN 300 086-1 for radio equipment with an internal or external RF connector; ETSI EN 300 296-1 for radio equipment with integral antenna; or FCC Part 90 for Private Land Mobile Radio Services	Base, mobile or portable equipment for analogue speech	▪ Suppliers registering equipment for use in Private Radio Network operation are required to first seek the approval of IDA on the frequencies to be used. ▪ Suppliers registering equipment for use in Public Radio Data Communication Networks are advised to check with Network Operations on the exact operating frequencies used. ▪ Operation under this provision requires IDA licensing. ▪ Provision does not apply to equipment with special function such as tone coded squelch, selective calling decoders or encoders, which shall be disabled during testing.
	150 MHz						
	450 MHz						
	900 MHz	25 kHz					
2	Mobile Tx: 415 – 417 MHz Base Tx: 425 – 427 MHz	12.5 kHz/ 25 kHz	Base: 25 W ERP [Note 1] Mobile: 25 W ERP [Note 1] Portable: 5 W ERP [Note 1]	43 + 10log(P) where P = Rated carrier power in Watts	ETSI EN 300 113-1 for radio equipment with antenna connector; ETSI EN 300 390-1 for radio equipment with integral antenna; or FCC Part 90 for Private Land Mobile Radio Services	Base, mobile or portable equipment for data	
	Mobile Tx: 806 – 818 MHz Base Tx: 851 – 863 MHz	25 kHz					

[Note 1] Effective Radiated Power (ERP) refers to radiation of a half wave tuned dipole, which is used for frequencies below 1 GHz.

Table 1: Technical Requirements for Radio Equipment to be used in Land Mobile Radio Services

(Continued)

Item No.	Operating Frequencies	Channel Spacing	Max RF Power Output	Spurious Emissions	Test Reference	Applications	Additional Requirements
3	446.3250 – 446.4750 MHz	12.5 kHz	1 W ERP [Note 1]	< 2 nW	ETSI EN 300 296-1 for radio equipment with integral antenna	Multi-channel portable radio equipment for analogue speech (localised use)	▪ Operation above 500 mW ERP under this provision requires IDA licensing. ▪ Frequencies specified in this provision are to be used on non-interference, non-protected and shared basis. ▪ Provision does not apply to equipment with special function such as tone coded squelch, selective calling decoders or encoders, which shall be disabled during testing. ▪ Repeaters and amplifiers are not allowed to be used with the multi-channel portable radio equipment to extend the range of coverage. ▪ Equipment shall use integral antenna only, and be designed to ensure that no antenna other than that furnished by the responsible party shall be used. ▪ Equipment shall be equipped with the Continuous Tone Code Sub-audible Squelch (CTCSS) capability with a minimum number of 10 distinct tones out of 32 as specified in Annex A of this Specification.

[Note 1] Effective Radiated Power (ERP) refers to radiation of a half wave tuned dipole, which is used for frequencies below 1 GHz.

Table 1: Technical Requirements for Radio Equipment to be used in Land Mobile Radio Services

(Continued)

Item No.	Operating Frequencies	Channel Spacing	RF Power Output	Spurious Emissions	Test Reference	Applications	Additional Requirements
4	446.00 – 446.10 MHz	12.5 kHz	500 mW ERP Note 1	< 2 nW	ETSI EN 300 296-1 for radio equipment with integral antenna	Portable radio equipment for analogue speech (localised use)	▪ Frequencies specified in this provision are to be used on non-interference, non-protected and shared basis. ▪ Provision does not apply to equipment with special function such as tone coded squelch, selective calling decoders or encoders, which shall be disabled during testing. ▪ Repeaters and amplifiers are not allowed to be used with the multi-channel portable radio equipment to extend the range of coverage. ▪ Equipment shall use integral antenna only, and be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Note 1 Effective Radiated Power (ERP) refers to radiation of a half wave tuned dipole, which is used for frequencies below 1 GHz.

Table 1: Technical Requirements for Radio Equipment for use in Land Mobile Radio Services

(Continued)

Item No.	Operating Frequencies	Channel Spacing	Max RF Power Output	Spurious Emissions	Test Reference	Applications	Additional Requirements
5	Tx: 806 – 825 MHz Rx: 851 – 870 MHz	25 kHz	Base/Mobile: 25 W ERP [Note 1] Portable: 5 W ERP [Note 1]	43 + 10log(P) where P = Rated carrier power in Watts	FCC Part 90 for Private Land Mobile Radio Services	Base, mobile and portable equipment for digital radio mobile system such as iDEN trunked mobile radio system	▪ Operation under this provision requires IDA licensing. ▪ If the radio equipment supports connection to the public mobile radio network, suppliers shall demonstrate that equipment has been tested and certified to comply with the relevant requirements given in IDA TS CMT. ▪ If the radio equipment supports WLAN mode, suppliers shall demonstrate that equipment has been tested and certified to comply with the relevant requirements for WLAN given in the IDA TS SRD.
6	380 – 400 MHz	25 kHz	25 W ERP [Note 1]	-36 dBm in 100 kHz bandwidth in frequency range 9 kHz to 1 GHz -30 dBm in 1 MHz bandwidth in frequency range 1 to 4 GHz	Conformity assessment requirements: ETSI EN 300 394-1, EN 300 396-2 and EN 300 392-2 Testing Requirements: ETSI EN 303 035-1 and EN 303 035-2.	Base and mobile stations for digital radio mobile system such as TETRA trunked mobile radio system	▪ Operation under this provision requires IDA licensing.

[Note 1] Effective Radiated Power (ERP) refers to radiation of a half wave tuned dipole, which is used for frequencies below 1 GHz.

Table 1: Technical Requirements for Radio Equipment for use in Land Mobile Radio Services
(Continued)

Item No.	Operating Frequencies	Channel Spacing	Max RF Power Output	Spurious Emissions	Test Reference	Applications	Additional Requirements
7	136 – 174 MHz 400 – 410 MHz 430 – 450 MHz	6.25 kHz or equivalent/ 12.5 kHz	Base/Mobile: 25 W ERP Note 1 Portable: 5 W ERP Note 1	43 + 10log(P) where P = Rated carrier power in Watts	ETSI EN 300 113-1 for radio equipment with antenna connector; ETSI EN 301-166-1 for radio equipment operating at narrowband channel with antenna connector; ETSI EN 300 390-1 for radio equipment with integral antenna; or FCC Part 90 for Private Land Mobile Radio Services	Base, mobile and portable equipment for digital conventional or trunked mobile radio system such as DMR, NXDN or equivalent	▪ Operation under this provision requires IDA licensing. ▪ If the radio equipment supports connection to the public mobile radio network, suppliers shall demonstrate that equipment has been tested and certified to comply with the relevant requirements given in IDA TS CMT. ▪ If the radio equipment supports WLAN mode, suppliers shall demonstrate that equipment has been tested and certified to comply with the relevant requirements for WLAN given in the IDA TS SRD.

Note 1 Effective Radiated Power (ERP) refers to radiation of a half wave tuned dipole, which is used for frequencies below 1 GHz.

Annex A: Continuous Tone Code Sub-audible Squelch (CTCSS) Code Frequency

The standard frequencies (in Hz) available for assignment are shown below.

67.0	110.9	146.2	192.8
71.9	114.8	151.4	203.5
77.0	118.8	156.7	210.7
82.5	123.0	162.2	218.1
88.5	127.3	167.9	225.7
94.8	131.8	173.8	233.6
103.5	136.5	179.9	241.8
107.2	141.	186.2	250.3

Annex B: Corrigendum / Addendum

Changes to IDA TS LMR, Issue 1, Rev 4, June 11			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
7	Table 1 (3)	Migration of frequency band from 477 – 477.25 MHz to 446.3250 – 446.4750 MHz with maximum RF Power output increased to 1 W ERP.	DD MM YY

Changes to IDA TS LMR, Issue 1, Rev 3, May 11			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
9, 10	Table 1 (5, 7)	Editorial changes to the column, 'Additional Requirements' – Reference to IDA TS GSM-MT was changed to IDA TS CMT	17 June 11

Changes to IDA TS LMR, Issue 1, Rev 2, Feb 11			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
		Change of IDA's address at cover page to Mapletree Business City.	1 May 11

Changes to IDA TS LMR, Issue 1, Rev 1, Aug 06			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
10	Table 1(7)	Provision of services operating with 6.25 kHz channel spacing is intended for improving the spectrum efficiency of equipment operating in the following frequency bands: a. 136.00 – 174.00 MHz b. 400.00 – 410.00 MHz c. 430.00 – 450.00 MHz	Feb 11

Changes to IDA TS LMR, Issue 1, Jul 05			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
6 and 7	Table 1(3) and 1(4)	Provisions have been aligned with the Schedule to the Telecommunications (Exemption from sections 33, 34(1)(b) and 35) (Amendment) Notification 2006: d. 477.00 – 477.25 MHz frequency band, output power up to 500 mW ERP e. 446.00 – 446.10 MHz frequency band, output power up to	Jun 06

Changes to IDA TS LMR, Issue 1, Jul 05			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
		500 mW ERP	

Changes to IDA TS 101, 102, 107, 108, 111, 112, 115 and TETRA			
Page	**TS Ref.**	**Items Changed**	**Effective Date**
—	—	This Specification supersedes the following IDA Type Approval Specifications: a. IDA TS 101 Issue 1 Rev 4 b. IDA TS 102 Issue 1 Rev 4 c. IDA TS 107 Issue 1 Rev 3 d. IDA TS 108 Issue 1 Rev 3 e. IDA TS 111 Issue 1 Rev 3 f. IDA TS 112 Issue 1 Rev 3 g. IDA TS 115 Issue 1 h. IDA TS TETRA Issue 1 Rev 1	21 Jul 05
—	—	Title of Specification has been renamed as “Technical Specification for Land Mobile Radio Equipment” (IDA TS LMR Issue 1). Changes are mainly editorial in nature. The essential technical requirements for conformity assessment remain unchanged.	21 Jul 05