Technical Standards for Land Mobile Radio Service.

May 27th, 2008

NATIONAL TELECOMMUNICATIONS REGULATORY COMMISSION

SAINT LUCIA

TABLE OF CONTENTS

1.0 SCOPE

1.0.1 This document sets out the technical standards for radio transmitters operating in the Land Mobile Radio (LMR) services. The technical standards include acceptability of equipment, frequency tolerance, emission types, modulation, power and bandwidth restrictions. These standards are industry standards applicable to equipment intended for use in Saint Lucia.

1.0.2 LMR equipment may be base stations used in fixed locations, mobile stations used in vehicles or as transportable stations, or hand held portable stations and may use an external antenna or an integral antenna. Applications of the LMR service include voice and/or data transmissions.

1.0.3 These standards are applicable to any equipment imported into St. Lucia.

1.0.4 In the event of any inconsistencies between this document and the Act or Regulations, the provisions of the Act or applicable Regulations shall take precedence.

2.0 RESOURCES

2.0.1 The material from the following sources was used to prepare this document:

- The Telecommunications Act 2000;
- The National Telecommunications Regulatory Commission Procedures Manual;
- Code of Federal Regulations.
- Framework for Land Mobile Radio Operations in St. Lucia.

3.0 DEFINITION OF TERMS

***Act* :** The Telecommunications Act [No. 27 of 2000] in the jurisdiction of Saint Lucia.

AF: An abbreviation for Audio Frequency.

***Applicant*:** A person applying for a licence or a frequency authorisation under the Act.

***Application*:** An application for a licence or frequency authorisation, including a modification or renewal of a licence or a frequency authorisation, under the Act.

Authorized Bandwidth: The maximum permissible bandwidth of a transmission.

***Band*:** A range of frequencies.

***Bandwidth*:** The width of a frequency band (outside of which the mean power of the transmitted signal is attenuated at least 26 dB below the mean power if the transmitted signal is within the band).

Base Station: Telecommunications radio equipment used at a fixed location usually having external antennas and power source.

Commission**:** The National Telecommunications Regulatory Commission, established under section 8 of the Act

Cloning**:** Copying a program directly from one transmitter to another

DSB: Double Side Band Modulation

ECTEL: Eastern Caribbean Telecommunications Authority

Emergency communications**:** Communications that take place during situations where there is danger to lives and/ or property.

E.R.P. : An abbreviation for Effective Radiated Power. The product of the power supplied to the antenna and its *gain relative to a half-wave dipole* in a given direction.

FM**:** Abbreviation for frequency modulation. A method of radio transmission in which the frequency of the carrier wave (the signal-carrying wave) increases or decreases instantaneously in response to changes in the amplitude of the signal being transmitted, giving a better signal-to-noise ratio than amplitude modulation.

Frequency allocation Plan: A Plan which shows the frequencies to be used in particular areas without specifying the stations to which the frequencies are to be assigned.

Frequency Authorisation**:** Means an authorisation granted by the Minister under section 36 to use radio frequencies in connection with the operation of a network or the provision of services under an individual licence or class licence or otherwise.

Frequency stability: is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.

Harmful interference**:** Any radiation or induction which endangers the functioning of radio navigation service or of a safety service or obstructs or repeatedly interrupts a radio service operating in accordance with the approved Table of Frequency Allocation and with the Telecommunications (Spectrum Management) Regulations, 2002.

HF **:** High Frequency. Refers to the band of frequencies that range from 3 MHz to 30 MHz.

Licence**:** Means an individual or a class licence.

Minister: Minister responsible for Telecommunications.

MF**:** Medium Frequency. Refers to the band of frequencies that range from 300 kHz to 3000 kHz.

Mobile Station: Telecommunication radio equipment installed in a vehicle or any mobile platform usually with an external antenna and power source, intended for use while in motion or at brief stops.

***Out-of-band emission*:** Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

***Passband*:** Is the portion of spectrum, between limiting frequencies that is transmitted with minimum relative loss or maximum relative gain by a filtering device.

***PEP*:** An abbreviation for Peak Envelope Power. The average power supplied to the antenna transmission line by a transmitter during one RF cycle at the crest of the modulation envelope taken under normal operating conditions.

***Plan*:** Frequency Allocation Plan.

***ppm*:** An abbreviation for parts per million.

Portable Station: Telecommunications radio equipment intended to be carried by an individual for use while in motion or at brief stops. Units consist of internal

***Regulations*:** Refers to the Regulations that have been made under the Telecommunications Act, No 27 of 2000 in the jurisdiction of Saint Lucia.

***SHF*:** Super High Frequency. Refers to the band of frequencies that range from 3 GHz to 30 GHz.

***Spurious Emission*:** Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

SSB: Single Side Band Modulation is a refinement of the technique of amplitude modulation designed to be more efficient in its use of electrical power and bandwidth.

***Telecommunications*:** Any form of transmission, emission or reception of signs, texts, images and sounds or other intelligence of any nature by wire, radio, optical or other electromagnetic means.

***Telemetry*:** A one-way transmission of measurements at a distance from the measuring instrument.

***Transmitter*:** Any apparatus that converts electrical energy received from a source into radio frequency energy capable of being emitted.

UHF: *Ultra High Frequency.* Refers to the band of frequencies that range from 300 MHz to 3000 MHz.

***Unwanted emissions*:** Spurious emissions and out-of-band emissions as defined in the ITU's Radio Regulations.

***VHF*:** Very High Frequency. Refers to the band of frequencies that range from 30 MHz to 300 MHz.

4.0 ROLE OF THE COMMISSION

4.0.1 The National Telecommunications Regulatory Commission (NTRC) was established under the Telecommunications Act 2000 to regulate the telecommunications sector in Saint Lucia. Based on the functions of the Commission as outlined in section 12 of the Act, and relevant to the Land Mobile service, the Commission is required to:

(i) be responsible for technical regulations and the setting of technical standards of telecommunications and ensure compatibility with the Regional Spectrum Plan;

(ii) plan, supervise and manage the use of the radio frequency spectrum in conjunction with ECTEL, including the assignment and registration of radio frequencies to be used by all stations operating in St. Lucia or on any ship, aircraft or other floating or airborne contrivance or spacecraft registered in Saint Lucia.

5.0 ACCEPTIBILITY OF EQUIPMENT

5.0.1 The telecommunications equipment intended for use in the Land Mobile Radio service shall have Type Approval certificate granted by the Commission and must meet the requisite technical standards established for operation in Saint Lucia.

5.0.2 Land Mobile Radio services networks may consist of some or all of the following equipment:

- Base Stations
- Mobile units
- Hand held units
- Repeaters

6.0 EQUIPMENT REQUIREMENTS

6.0.1 Equipment Labels

6.0.1.1 Equipment that has been Typed Approved by the Commission shall be permanently labelled. The label shall contain the following:

(a) The type Approval Reference Number or markings;
(b) The manufacturer's name or trade name or brand name;
(c) The model name or number; and
(d) The serial number.

6.0.2 Transmitter External Controls

6.0.2.1 The transmitter must not have any external controls accessible to the end user that can be adjusted outside the limits of this standard.

To prevent radio interference caused by end users' transmissions in unauthorized frequencies, the following measures are taken:

(a) Transmitters having frequency programming capabilities are exempted from clause 6.0.2.1 if the design of such transmitters:

(1) Is such that, transmitters with external controls normally available to the operator must be internally modified to place the equipment in the programming mode. Further, while in the programming mode, the equipment shall not be capable of transmitting. The procedures for making the modification and altering the frequency program shall not be made available to the end user of the equipment; or

(2) Requires the transmitter to be programmed for frequencies through controls inaccessible to the end user; or

(3) Requires equipment to be programmed for frequencies through use of external devices or specifically programmed modules made available only to service/maintenance personnel; or

(4) Requires equipment to be programmed through cloning using devices made available only to service/maintenance personnel.

6.0.2.2 The radio frequency output circuit of all transmitters shall be designed for operation into unbalanced transmission lines having a nominal impedance of 50 ohms. (Equipment with a self-contained antenna and have provisions for external connection of RF termination with 50 ohm impedance).

7.0 Frequency Band, Channel Spacing, Authorized Bandwidth and Emissions Type

7.0.1 The table illustrates the frequency band, channel spacing, authorized bandwidth and emission types for radio equipment operating in the LMR service.

7.0.2 A 25 kHz channel bandwidth transmitter typically has an authorized bandwidth of 20 kHz and uses a channel spacing of 25 kHz; a 12.5 kHz channel bandwidth transmitter typically has an authorized bandwidth of 11.25 kHz and uses a channel spacing of 12.5 kHz.

Frequency Band (MHz)	**Channel Spacing (KHz)**	**Authorized Bandwidth (KHz)**	**Emission Mask**
29.700 - 50.000	20	20	F3E, G3E, J3E, F3C, G3C, A1D, A2D, F1D, F2D, A1A, A2B, F1B, F2B, G1B, G1D, G2B, G2D
72.000 - 76.000	20	20	
138.000 - 144.000	25, 12.5	20, 11.25	
148.000 - 150.050	25, 12.5	20, 11.25	
150.050 - 156.025	25, 12.5	20, 11.25	
162.025 - 174.000	25, 12.5	20, 11.25	

220.000 - 225.000	12.5	11.25	
225.000 - 328.600	12.5	11.25	
406.100 - 430.000	25, 12.5, 6.25	20, 11.25, 6	
440.000 - 454.675	25, 12.5, 6.25	20, 11.25, 6	
806.000 - 824.000	25, 12.5	20, 11.25	
851.000 - 869.000	25, 12.5	20, 11.25	

Table 1.0: Table showing frequency band, channel spacing, authorized bandwidth and emission types for the LMR service (emission symbols are explained in ANNEX A).

8.0 TRANSMITTER OUTPUT POWER

8.0.1 For all authorized frequency bands **excluding 72 - 76 MHz and 220 - 225 MHz bands.**

Maximum transmitter output power is as follows:

- Base/Fixed 100 watts
- Mobile 50 watts
- Portable 5 watts
- Repeaters 150 watts

8.0.2 LMR Stations within the 72 – 76 MHz band and in the 220 - 225 MHz band may be authorized to transmit powers listed in 8.0.1. The maximum allowable power will be determined on a case by case basis. This is necessary to protect the adjacent TV channels 4 and 5 in the 74.8 - 75.2 MHz band and channel 13 (210 - 216 MHz) and Maritime Mobile in the 216 - 220 MHz band.

9.0 FREQUENCY TOLERANCE

9.0.1 Table below specifies the minimum frequency stability for transmitters operating in the LMR service;

Frequency Band (MHz)	**Authorized Bandwidth (KHz)**	**Frequency Tolerance (ppm)**		
		Base/Fixed	**Mobile Station**	
29.700 - 50.000	20	20	20	50
72.000 - 76.000	20	5	20	50
138.000 - 174.000	20 11.25	5.0 2.5	5.0 5.0	5.0 5.0
220.000 - 328.600	11.25	2.5	5.0	5.0

406.100 - 430.000 / 440.000 - 454.625	20 11.25	2.5 1.5	5.0 2.5	5.0 2.5
806.000 - 824.000 / 851.000 - 869.00	20 11.25	1.5 1.0	2.5 1.5	2.5 1.5

Table 2.0: Table showing Frequency Stability for LMR.

10.0 TRANSIENT FREQUENCY BEHAVIOUR

10.0.1 When a transmitter is turned on, the RF frequency may take some time to stabilize. During the initial period, the frequency error or difference frequency (i.e. between the instantaneous and the steady state frequencies) must not exceed the limits specified in the Table for each of the frequency bands: 138 – 174 MHz and 406.1 - 470.0 MHz.

Transient Frequency Behaviour

Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels			
Time Intervals	Maximum Frequency Difference (kHz)	Frequency Range	
		138 – 174 MHz	406.1 – 470 MHz
T1 T2 T3	± 25 ±12.5 ±25	5 milliseconds 20 milliseconds 5 milliseconds	10 milliseconds 25 milliseconds 10 milliseconds

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
Time Intervals	Maximum Frequency Difference (kHz)	Frequency Range	
		138 – 174 MHz	406.1 – 470 MHz
T1 T2 T3	±12.5 ±6.25 ±12.5	5 milliseconds 20 milliseconds 5 milliseconds	10 milliseconds 25 milliseconds 10 milliseconds

Legend:

T on	is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
T1	is the time period immediately following T on
T2	is the time period immediately following T1
T3	the time period from the instant when the transmitter is turned off until T off
T off	the instant when the 1 kHz test signal starts to rise.

11.0 Conducted Spurious Emissions

An emission on a frequency or frequencies that are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information,

Limits:

The receiver spurious emission should not exceed -80 dBw.

ANNEX A

EMISSION SYMBOLS

(1) The first symbol indicates the type of modulation on the transmitter carrier:

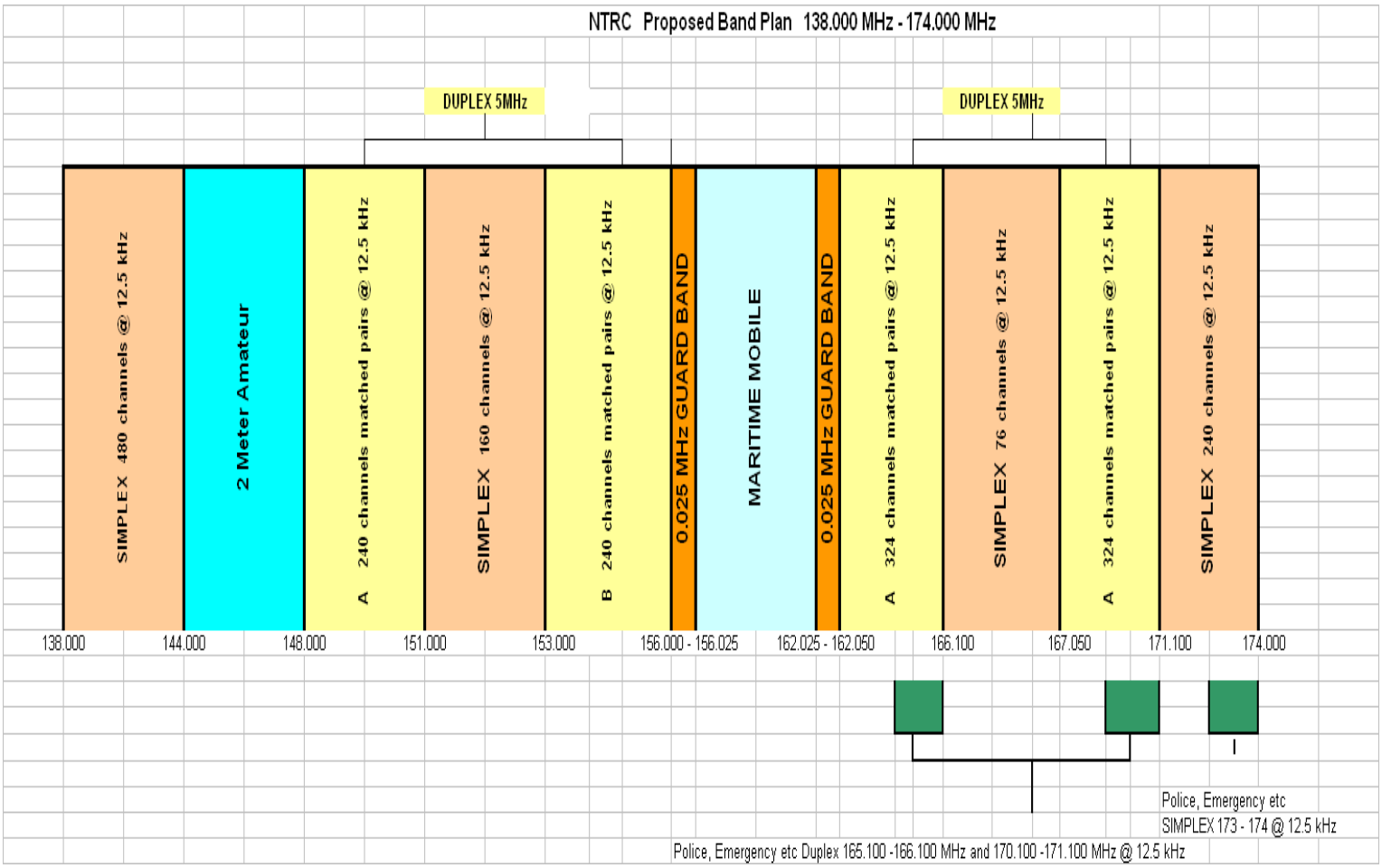
A - Amplitude Modulation, with double sidebands
F - Frequency Modulation
G - Phase Modulation
J - Single Sideband with suppressed carrier
P - Unmodulated Pulse
W - Any combination of two or more of the following modes: Amplitude, Angle, Pulse

(2) The second Symbol indicates the type of signal modulating the transmitter carrier:

0 - No Modulation
1 - Digital Modulation, no sub-carrier
2 - Digital Modulation, sub-carrier
3 - Analog Modulation

(3) The third symbol indicates the type of transmitted symbol:

A - Telegraphy for aural reception
B - Telegraphy for machine reception
C - Facsimile
D - Data, telemetry and telecommand
E - Voice
N - No transmitted information
W - Combination of the above


NTRC Proposed Band Plan 138.000 MHz - 174.000 MHz
DUPLEX 5MHz
DUPLEX 5MHz
SIMPLEX 480 channels @ 12.5 kHz
2 Meter Amateur
A 240 channels matched pairs @ 12.5 kHz
SIMPLEX 160 channels @ 12.5 kHz
B 240 channels matched pairs @ 12.5 kHz
0.025 MHz GUARD BAND
MARITIME MOBILE
0.025 MHz GUARD BAND
A 324 channels matched pairs @ 12.5 kHz
SIMPLEX 76 channels @ 12.5 kHz
A 324 channels matched pairs @ 12.5 kHz
SIMPLEX 240 channels @ 12.5 kHz
138.000
144.000
148.000
151.000
153.000
156.000 - 156.025
162.025 - 162.050
166.100
167.050
171.100
174.000
Police, Emergency etc
SIMPLEX 173 - 174 @ 12.5 kHz
Police, Emergency etc Duplex 165.100 -166.100 MHz and 170.100 -171.100 MHz @ 12.5 kHz