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FCC MPE Calculation Report

Test Sample: 900 MHz Band Frequency Hopping Radio
Model Number: SI902M160

Report Number: M160245-2Rev1
(Replaces Report M160245-2)

FCC ID: UIPS1902M160
Tested for: 4RF Ltd

Date of Issue: 9 August 2016

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FCC Maximum Permissible Exposure (MPE) Calculation**EMC Technologies Report No. M160245-2Rev1****Issue Date: 09 August 2016****1.0 GENERAL INFORMATION****Report Number:** M160245-2Rev1**Test Sample:** 900 MHz Band Frequency Hopping Radio
Model: SI902M160**Equipment Type:** Intentional Radiator (Transceiver)**Manufacturer:** 4RF Ltd
Address: 26 Glover Street, Ngauranga,
Wellington, NEW ZEALAND
Phone: +64 (0)4 499 6000
Contact: Mr Paul Young
Email: paul.young@4rf.com**Test Standard:** 447498 D01 General RF Exposure Guidance v06**Calculation Summary:** An MPE calculation was performed according to 47CFR2.1091 for the 900 MHz Band Frequency Hopping Radio, Model SI902M160 for a declared minimum operating distance of **30 cm**.

The maximum antenna assembly gain maintaining the exposure level within the limit is 8.3 dBi. Antenna gains exceeding **6 dBi** as stated in Part 15.247(b)(4) are not permitted without reducing the power settings by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Dates: 21 May 2016
Test Officer: Mahan Ghassempouri
EMC/EMR/SAR/Wireless Engineer
M.Sc. in Telecommunication
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2.0 DESCRIPTION OF DEVICE

2.1 Description of Test Sample

The device assessed was a 900 MHz band frequency hopping transmitter, Model: SI902M160. It included a transmitter operating at the frequency range of 902-928 MHz.

The DUT was a Point-To-Multipoint (PMP) digital radio providing 915 MHz Industrial Licence Free Spread Spectrum communications. The radios carried a combination of serial data and Ethernet data between the base station and remote stations. A single unit was configurable as a Point-To-Multipoint base station or remote station. Transmitter specifications are shown in below table.

Nominal <u>Peak</u> Conducted Power:	30 dBm
Measured Conducted Power:	29.3 dBm (Refer EMC Technologies Radio Report M160245-1)
Rated Separation Distance	30 cm
DC Supply Port Voltage Rating:	12 to 24 VDC
Operating Frequency Range:	902.5 MHz to 927.5 MHz
	Low: 902.5 MHz
	Middle: 915.0 MHz
	High: 927.5 MHz
Number of Channels:	50 to 400, set in blocks of 50
20 dB Bandwidth:	50 kHz
Modulation and power settings:	64QAM: +7 dBm to +23 dBm 16QAM: +8 dBm to +24 dBm QPSK: +10 dBm to +26 dBm
Antenna supplied for testing:	Monopole (2.5 dBi, Note 1) Ventev M4025025R10005 Antenna
Operating Temperature Range:	-40 °C to 70 °C

Note 1: The following table and an accompanying explanation were given in the product manual regarding different types of antenna which could be used and how to calculate the maximum permissible gain for each.

Antenna Type and Gain	Feeder Coax Length and Loss	Regulatory Limit	Maximum SRI Power Setting
Yagi, 11 dBi	10 m of ½" Helix @ 0.11 dB/m gives 1.1 dB loss	+36 dBm PEP	22 dBm
Panel, 12 dBi	33 m of RG214 @ 0.22 dB/m gives 7.3 dB loss	+30 dBm	25 dBm
Dipole, 3.5 dBi	3 m of RG214 @ 0.22 dB/m gives 0.66 dB loss	+30 dBm	26 dBm
Grid, 18 dBi	15 m of ½" Helix @ 0.11 dB/m gives 1.65 dB loss	+30 dBm	13 dBm

2.2 Limits

As specified in table 1 of 47 CFR 1.1310 limits for occupational/controlled exposure and general public/uncontrolled exposure are as follows:

Frequency (MHz)	Power Density (mW/cm ²)
General public/Uncontrolled	
300-1,500	f/1,500
902 =	0.601
928 =	0.619
1,500-100,000	1
Occupational/Controlled	
300-1,500	f/300
902 =	3.007
928 =	3.093
1,500-100,000	5

2.3 Device Category

According to the manufacturer declaration and based on DUT intended use, DUT was considered as a Mobile device.

For purposes of 47 CFR 2.1091, a mobile device was defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres was normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location.

Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimetre separation requirement.

3.0 Method of Calculation

The calculation was done according to KDB 447498 D01 v06 and using the excel sheet provided by FCC at:

<http://transition.fcc.gov/oet/ea/presentations/files/oct05/MPE-mobile.xls>

Utilising the following equation:

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density
 P = power input to the antenna
 G = power gain of the antenna in the direction of interest relative to an isotropic radiator
 R = distance to the centre of radiation of the antenna

4.0 Calculation Results

Frequency	902 MHz
Power	1 W
Separation Distance	0.3 m
MPE - General public or Uncontrolled Limit	0.601 mW/cm ²
Maximum Antenna Gain	8.3 dBi

The maximum antenna assembly gain maintaining the exposure level within the limit is 8.3 dBi. Antenna gains exceeding **6 dBi** as stated in Part 15.247(b)(4) are not permitted without reducing the power settings by the amount in dB that the directional gain of the antenna exceeds 6 dBi.