Mobile Devices business
iDEN Mobile Devices Operations

RF Test Report

FCC Rule Parts: 15C (MOTOtalk)
Industry Canada: RSS-Gen, RSS-210

Product Name: i706-Series Handsets
FCC ID: IHDP56LN1
IC ID: 109O-P56LN1

Date: July 9, 2010

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[1] Submitted as a separate exhibit, potentially covered under a Temporary Confidentiality request.

Test Report Details

Tests Performed by:	Motorola EMC Laboratory Plantation, Florida 8000 W. Sunrise Blvd Plantation, Florida 33322 FCC Registration Number: **91932** Industry Canada Number: **IC109U-1**
	TIMCO Engineering Laboratory details in report FCC Registration Number: **95517** Industry Canada Number: **2056A**
Product Type:	Cellular Phone
Signaling Capabilities:	MOTOtalk 900 MHz ISM
FCC ID:	IHDP56LN1
IC ID:	109O-P56LN1

Applicable Standards

All tests and measurements indicated in this document were performed in accordance with the United States Code of Federal Regulations, Title 47 Part 2, Sub-part J, as well as the following parts:

X	Part 15 Subpart C – Radio Frequency Devices.
X	RSS-210 – Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment.

Applicable Standards: TIA/EIA-603-A, TIA/EIA-603-B, ANSI C63.4-2003, and ANSI C63.10.

Exhibit 6b.1: Part 15 MOTOtalk ISM Band Transmitter Measured Data

6b.1 MOTOtalk ISM Band Transmitter Output Power -- Pursuant 47 CFR 2.1033(b)(6), §2.1041, §2.1046(a), §15.247(b)(2); RSS-Gen Section 3, RSS-210 Section A8.4.

Criterion: The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels.

The ISM transmitter operating in the 902-928 MHz band is a frequency hopped, fixed output power type. Output power (as defined in 47 CFR 15.247) is controlled as described in Exhibit 12.

Maximum peak output power rating: 1000 milliwatts (30 dBm), peak power. The modulation scheme employed can cause peak fluctuations in output power of up to 0.5 dB from maximum pulse average power, which is 890 mW (29.5 dBm). This product is rated at 800 mW, pulse average power.

Nominal output power is 743 mW (28.71 dBm), pulse average power. This level was established to maintain compliance with maximum output power rating. It includes consideration of variation of peak to average power fluctuations in the output RF power, variation in output power due to changes in voltage and operating temperature, and manufacturing tolerances in establishing nominal output power.

Power Setting	**maximum**
DC Voltage (Volts)	4
DC Current (A)	1.58
Output Power (mW)	800

Table 6b.1-1 Characteristics for MOTOtalk 902-928 MHz ISM band

Exhibit 6b.2: MOTOtalk Measured Data– Pursuant 47 CFR 2.1041; RSS-Gen Section 3.

6b.2.1 MOTOtalk ISM Band Carrier Separation between Hop Sets – Pursuant 47 CFR 15.247(a)(1); RSS-210 Section A8.1.

Criterion: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

The measurement shows a carrier frequency separation of 501 kHz, which is greater than the measured 20 dB bandwidth of 26.75 kHz.

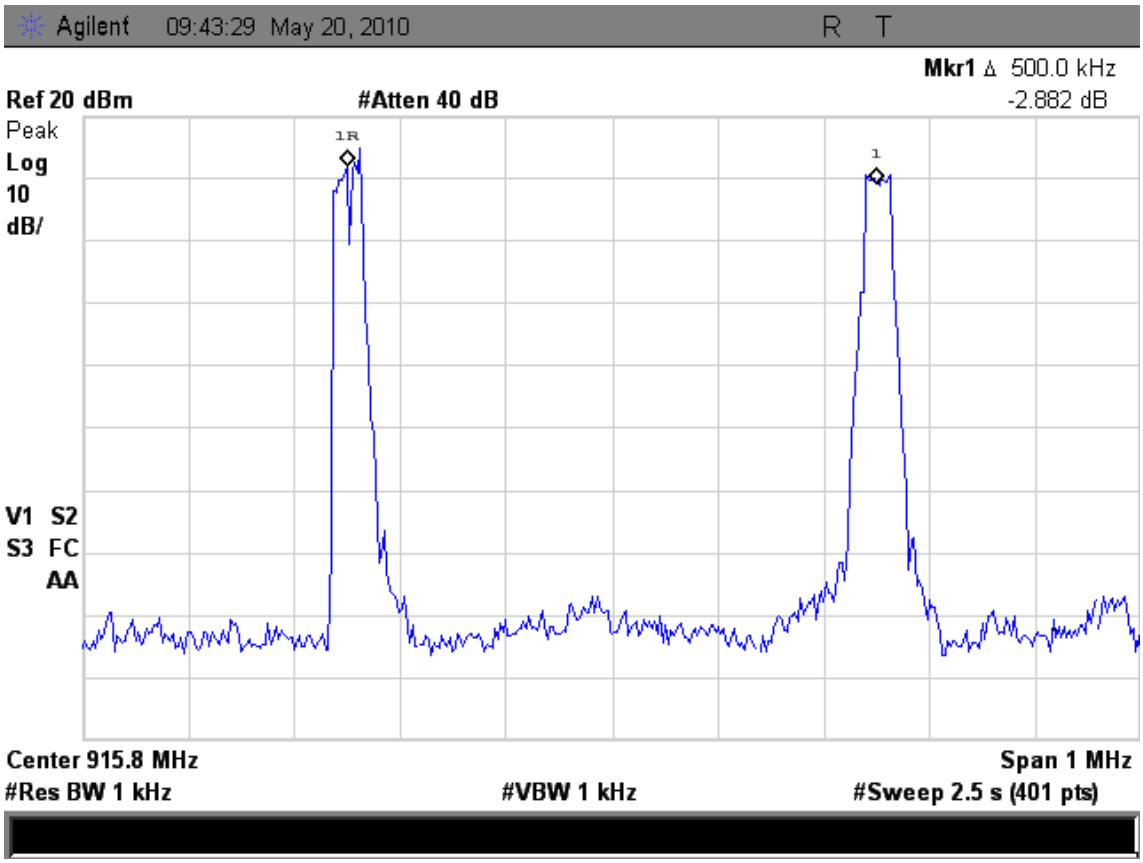

Figure 6b.2.1.1. Plot of MOTOtalk ISM Band adjacent channel separation within a hop set.

6b.2.2 MOTOtalk ISM Band Hopping Bandwidth between Hop Sets –Pursuant 47 CFR 15.247 (a)(1)(i); RSS-210 Section A8.1.

The Figure below shows the plot of the 8FSK, traffic channel MOTOtalk ISM Band spectrum with its 20 dB bandwidth of 26.75 kHz at 902.525 MHz. The plot shows at least 20 dBc with the 50 kHz offset from the carrier.

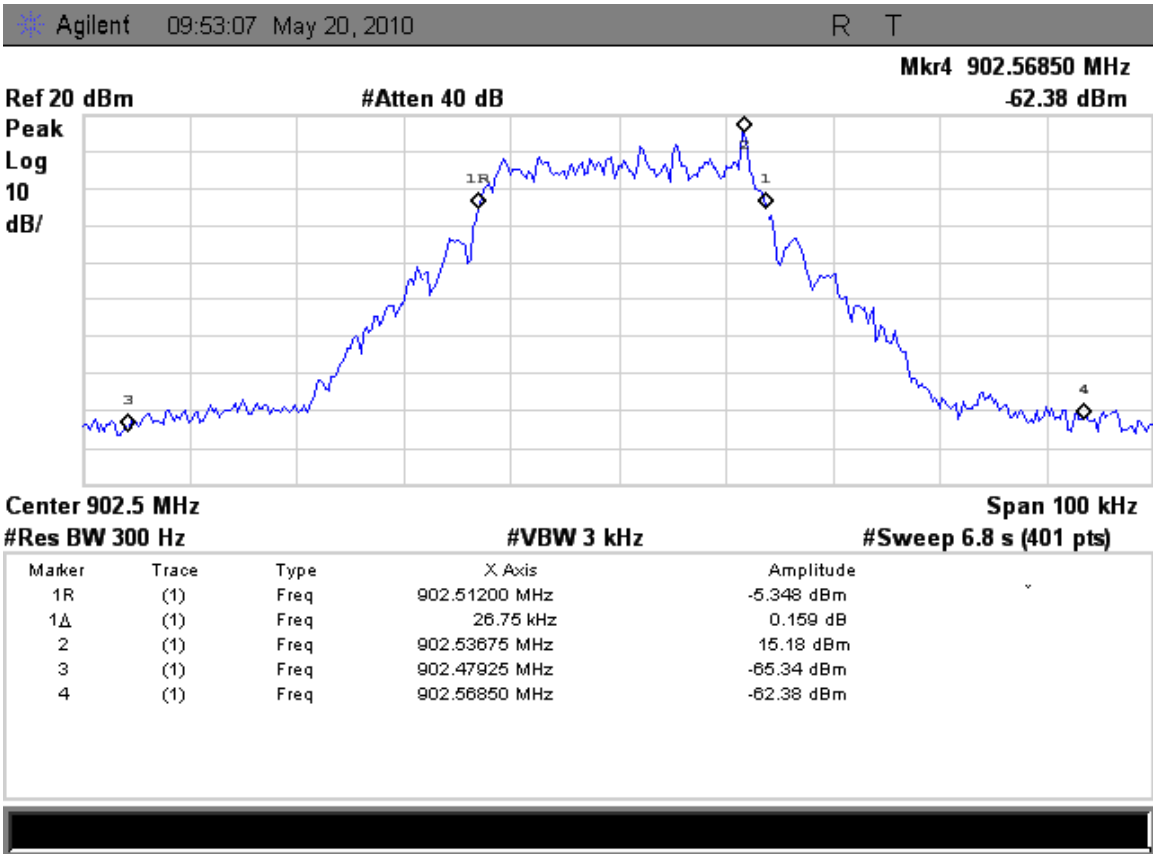

Figure 6b.2.2.1 Spectrum analyzer plot of MOTOtalk ISM Band 8-FSK traffic channel signal's 99% bandwidth at center frequency 902.525 MHz, with hopping function disabled.

The adjacent hop set channel separation was measured between hop set 1 at 902.525 MHz and hop set 2 at 902.575 MHz, which is 50 kHz.

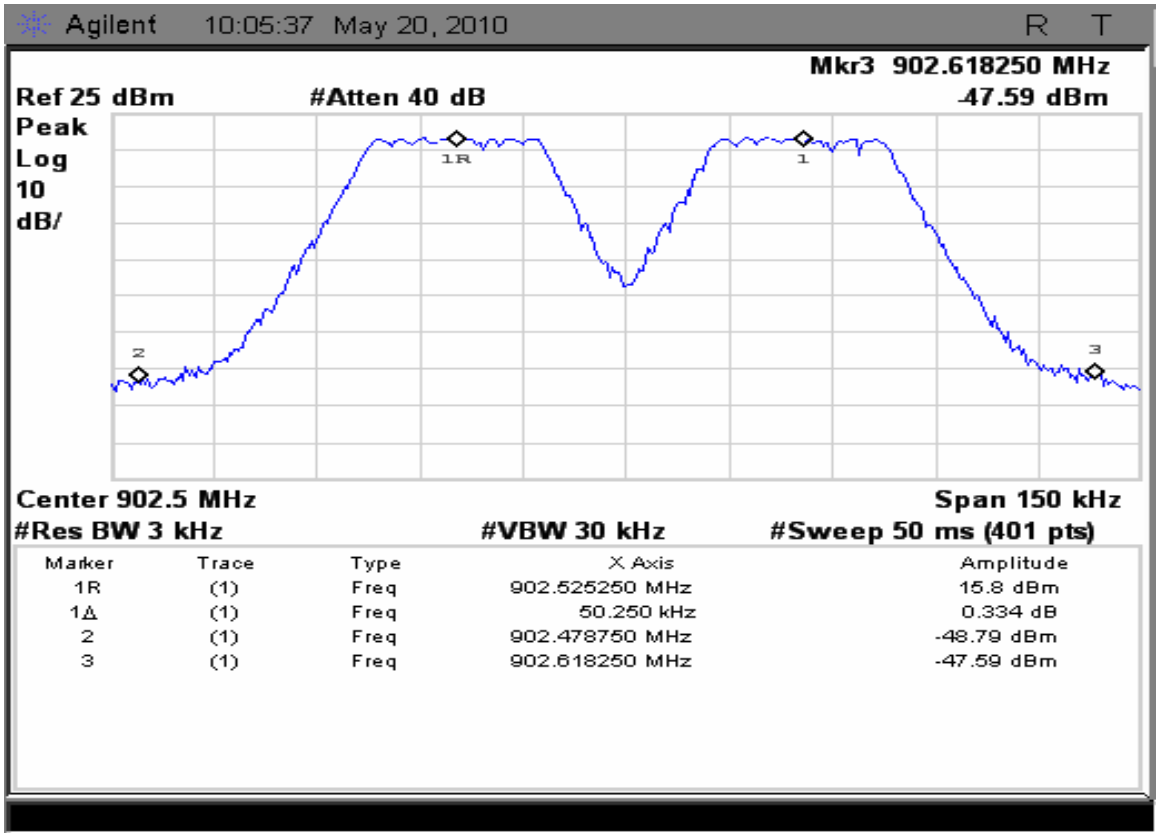

Figure 6b.2.2.2. Adjacent hop set separation with spectrum analyzer center frequency at 902.55 MHz.

Figure 6b.2.2.3 shows that, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator is at least 20dB (measured value here is 67.09 dB) below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

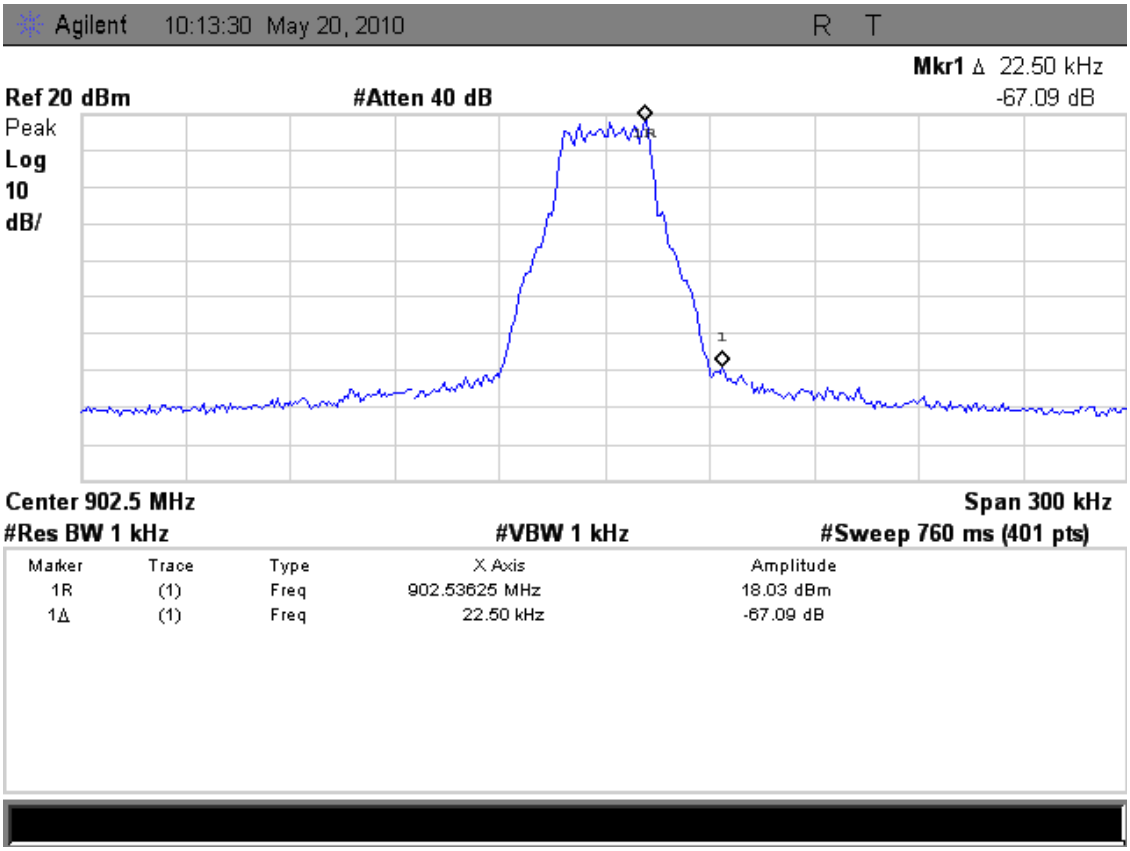

Figure 6b.2.2.3 MOTOtalk ISM band occupied bandwidth with frequency span of 300 kHz with hopping function disabled at center frequency 902.525 MHz.

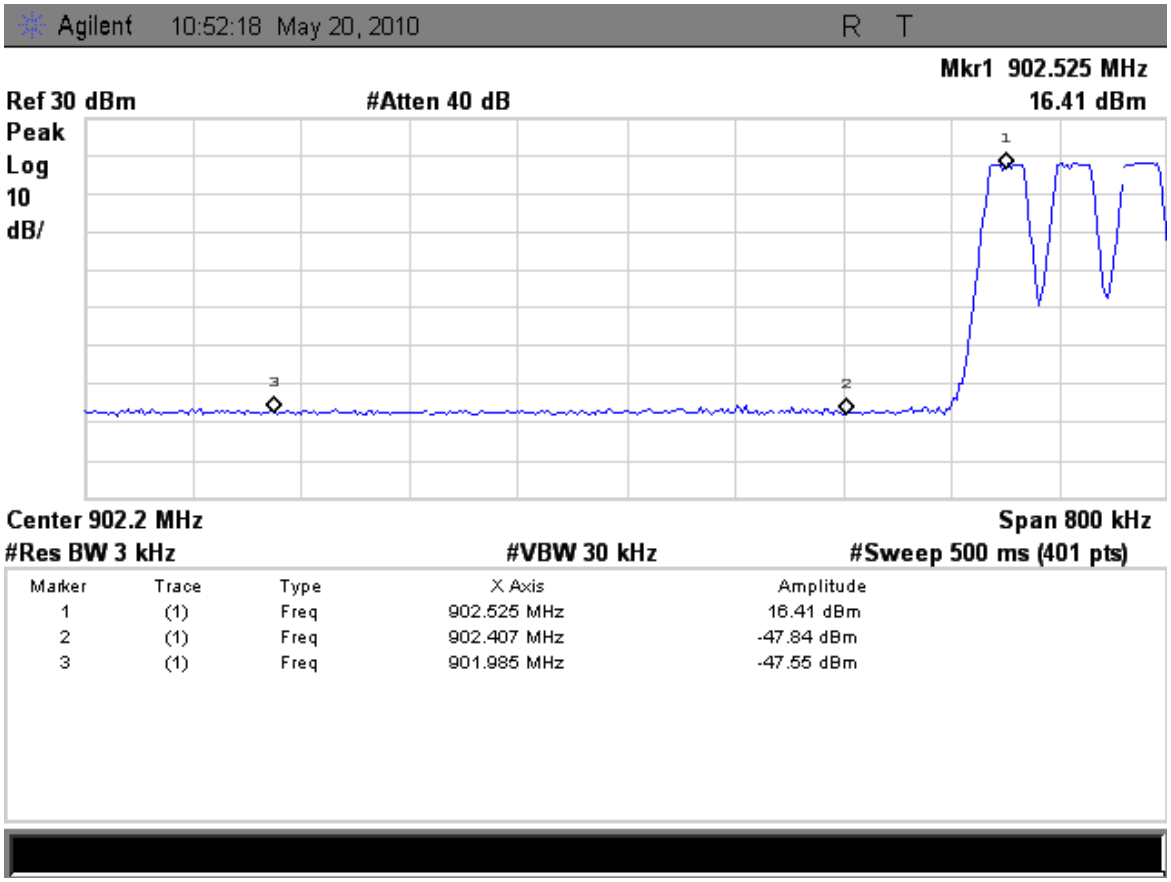

Figure 6b.2.2.4. Out-of-band transmitter spurious emissions low band edge, with hopping function enabled.

The Figure below shows the plot of the 8FSK, traffic channel MOTOtalk ISM Band spectrum with its bandwidth of 26.0 kHz at 927.475 MHz. The plot shows spurious emissions attenuation of at least 20 dBc, with the 50 kHz offset from the carrier.

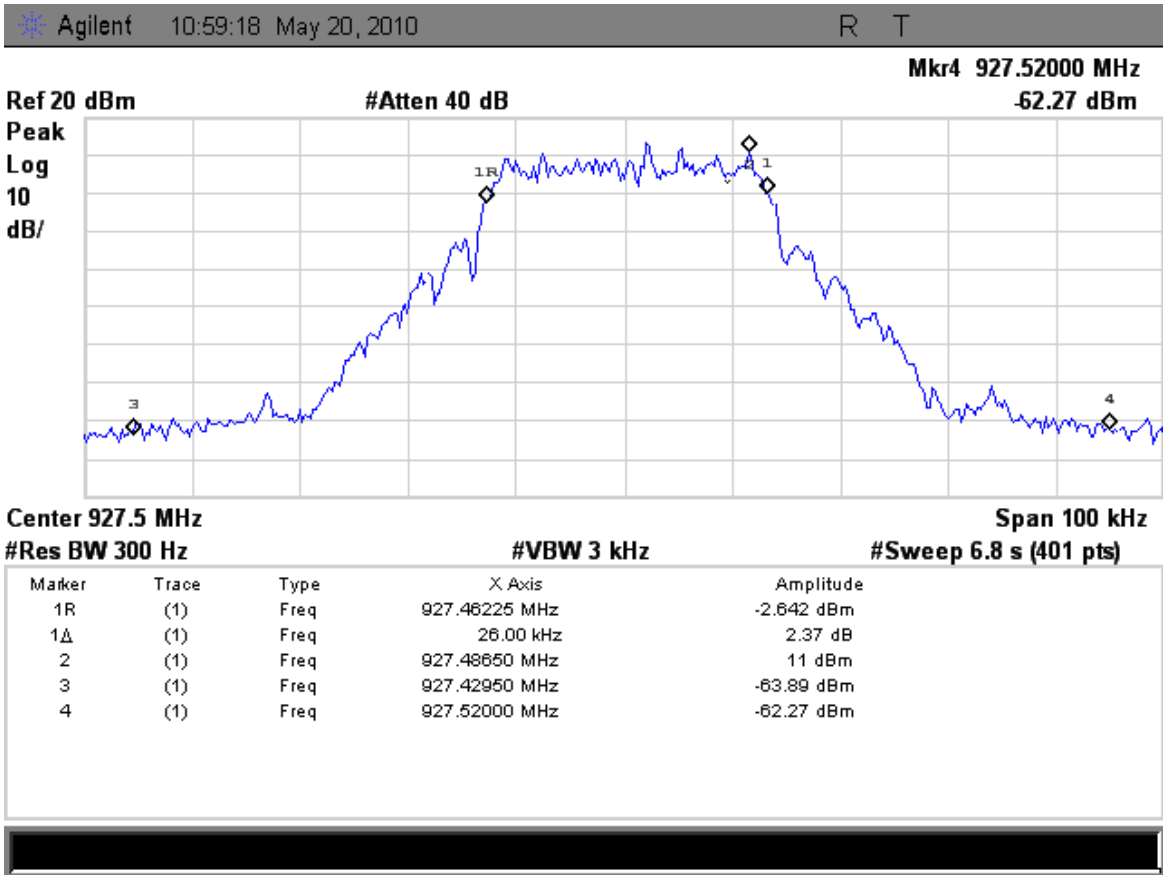

Figure 6b.2.2.5 Spectrum analyzer plot of MOTOtalk ISM Band 8-FSK traffic channel signal's 99% bandwidth with hopping function disabled, at center frequency 927.475 MHz.

The adjacent hop set channel separation was measured between hopset9 @ 927.475 MHz and hopset10 @ 927.525 MHz which is 50 kHz.

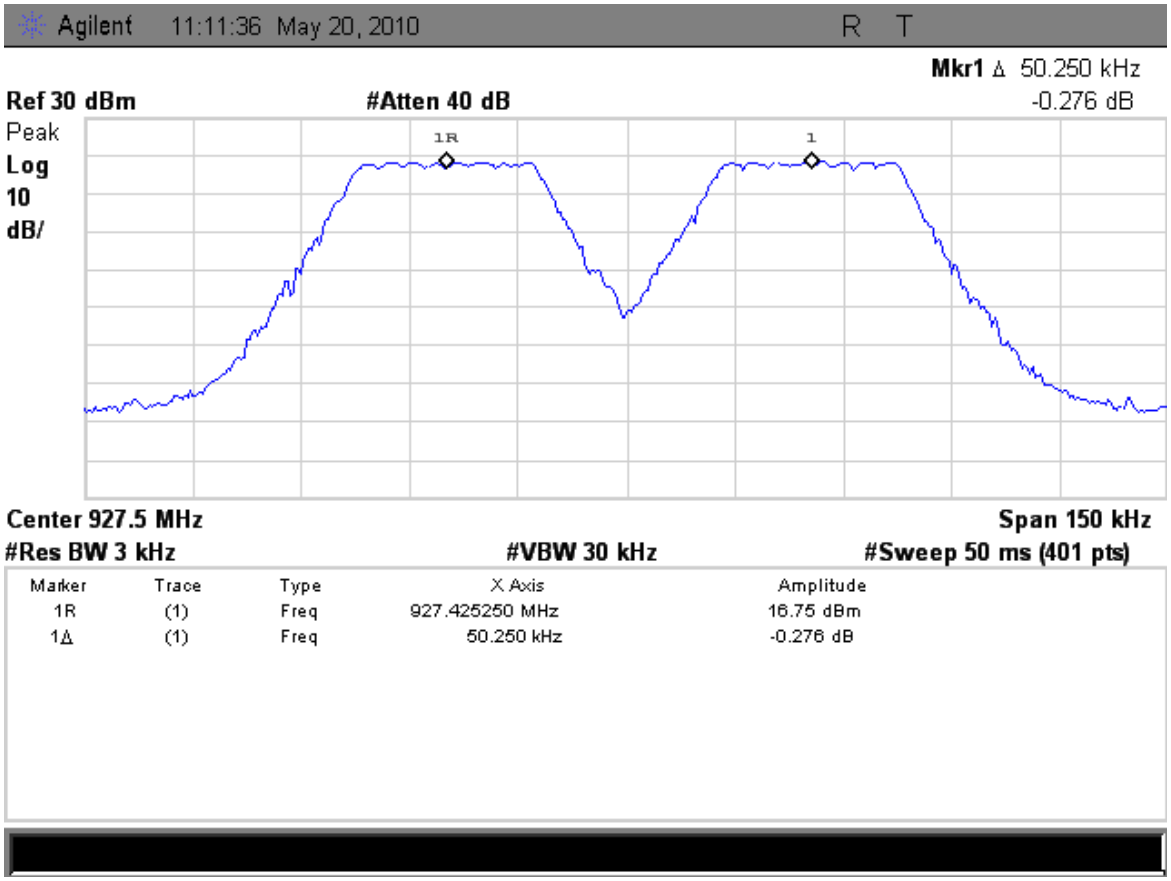

Figure 6b.2.2.6. Adjacent hop set separation with spectrum analyzer center frequency 927.5 MHz.

Figure 6b.2.2.7 shows that, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator is at least 20 dB (measured value here is 70.97 dB) below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

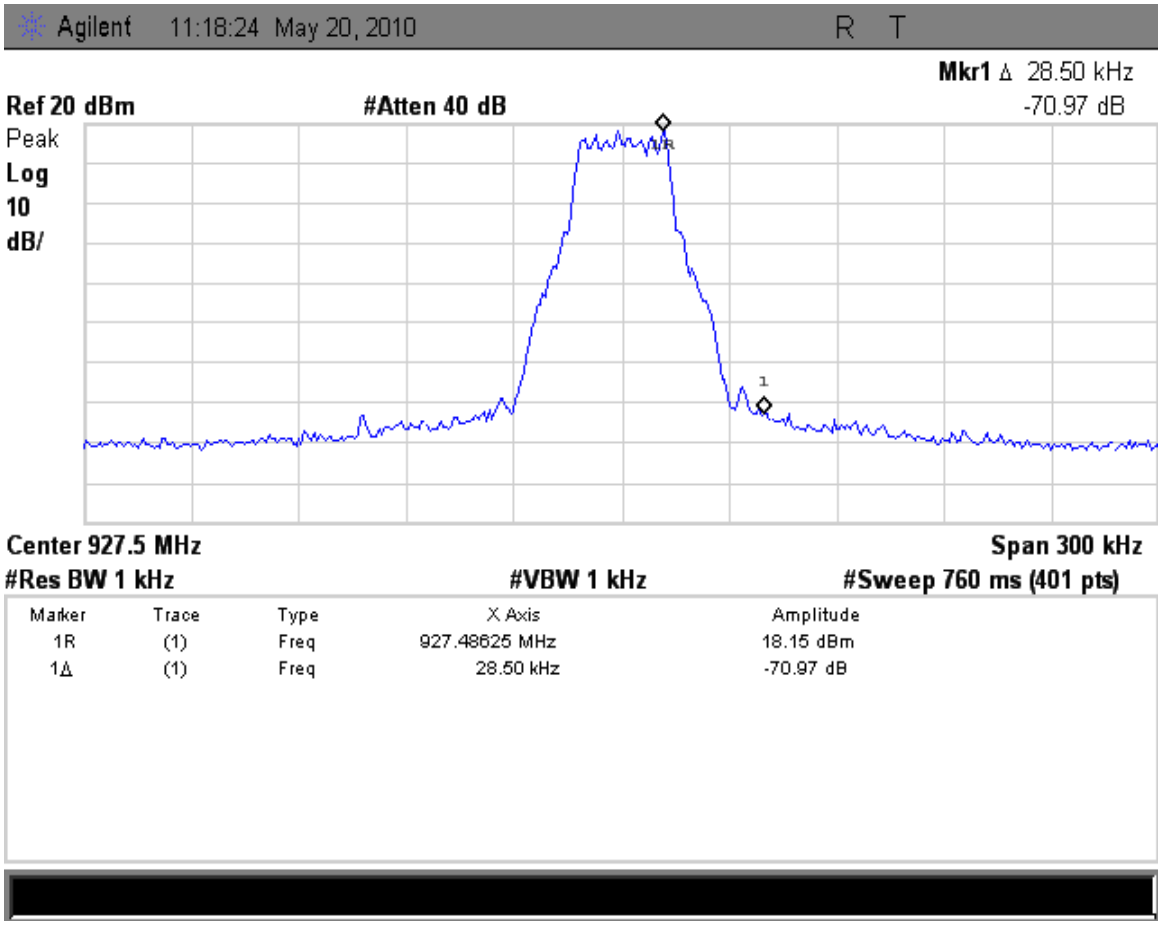

Figure 6b.2.2.7 MOTOtalk ISM band occupied bandwidth with frequency span of 300 kHz with hopping function disabled, at center frequency 927.475.

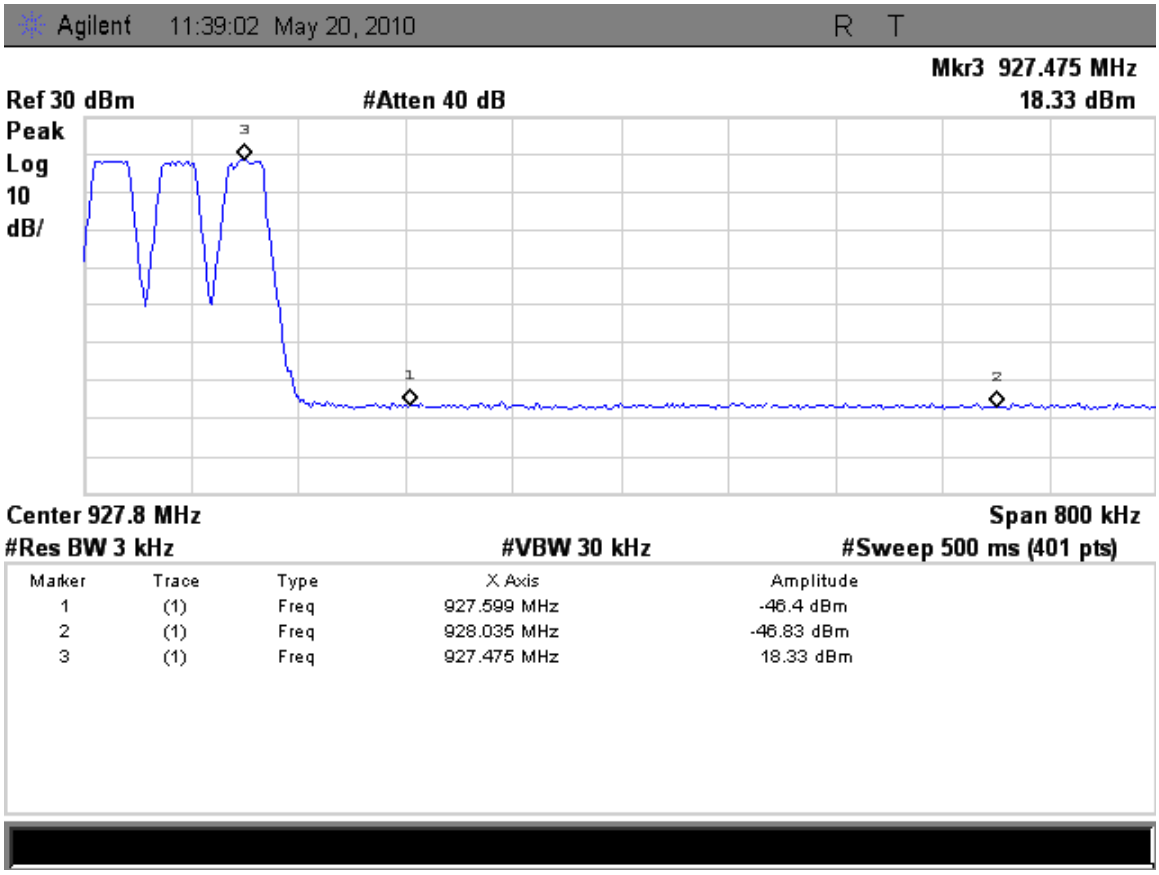

Figure 6b.2.2.8. Out-of-band transmitter spurious emissions high band edge, with hopping function enabled.

6b.2.3 MOTOtalk ISM Band Receiver Bandwidth – Pursuant 47 CFR 15.247(a)(1); RSS-210 Section A8.1.

The receiver bandwidth is limited by a 2-pole analog filter and digital processing that includes a 5th order SIN filter, IIR high-pass programmable bandwidth filter, and a 15th order programmable selectivity filter. The composite 3 dB bandwidth is 28 kHz.

6b.2.4 MOTOtalk ISM Band Number of Hopping Frequencies – Pursuant 47 CFR 15.247(a)(1)(i); RSS-210 Section A8.1.

The MOTOtalk ISM Band transmitter uses 50 frequencies within each selected hop set.

Hop Set	1st Frequency (MHz)	Progression (MHz)	Last (50th) Frequency (MHz)
1	902.525	903.025, 903.525, 904.025...	927.025
2	902.575	903.075, 903.575, 904.075...	927.075
3	902.625	903.125, 903.625, 904.125...	927.125
4	902.675	903.175, 903.675, 904.175...	927.175
5	902.725	903.225, 903.725, 904.225...	927.225
6	902.775	903.275, 903.775, 904.275...	927.275
7	902.825	903.325, 903.825, 904.325...	927.325
8	902.875	903.375, 903.875, 904.375...	927.375
9	902.925	903.425, 903.925, 904.425...	927.425
10	902.975	903.475, 903.975, 904.475...	927.475

Table 6b.2.4.1. MOTOtalk ISM Band Transmitter Frequency Hop Sets.

6b.2.5 MOTOtalk ISM Band Average Time of Occupancy – Pursuant 47 CFR 15.247(a)(1)(i); RSS-210 Section A8.1.

Worst-case scenario (continuous transmission) is as follows:

- 85.73 ms bursts at 90 ms intervals (hop intervals)
- 20 seconds per window / 0.09 seconds per hop = 222.22 hops per window
- 222.22 hops / 50 carriers = 4.444 bursts per carrier window
- 4.444 bursts * 0.0856 seconds per burst = 0.38 seconds.

The calculations show the average time of occupancy of 0.4 seconds or less.

Verification of burst is shown in the Figure below.

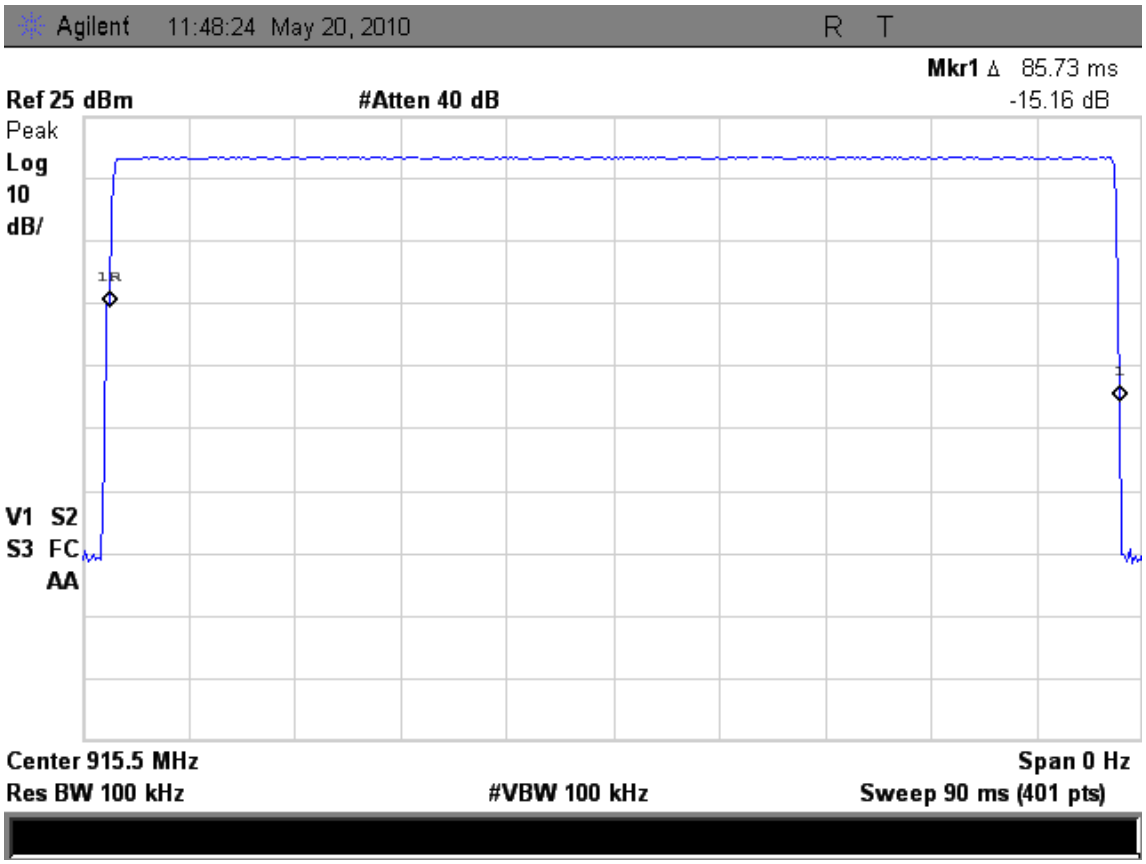

Figure 6b.2.5.1. MOTOtalk ISM Band Average Measured Time of Occupancy.

6b.2.6 MOTOtalk ISM Band Equal Distribution of Hopping Frequencies for Continuous Transmission – Pursuant 47 CFR 15.247(a)(1)(i) & 15.247(g); RSS-210 Section A8.1.

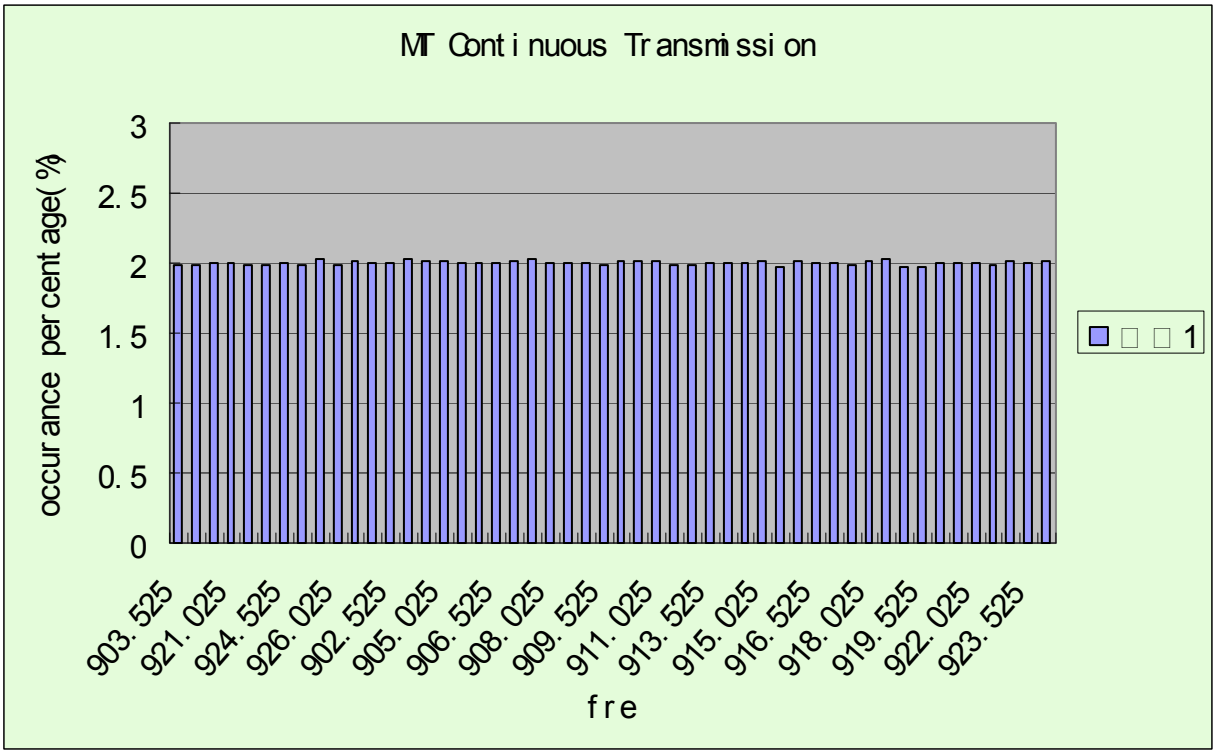

Figure 6b.2.6.1. Histogram of MOTOtalk ISM Band Continuous Transmission.

6b.2.7 MOTOtalk ISM Band Equal Distribution of Hopping Frequencies for Discontinuous Transmission - Pursuant 47 CFR 15.247(a)(1)(i) and 15.247(g); RSS-210 Section A8.1.

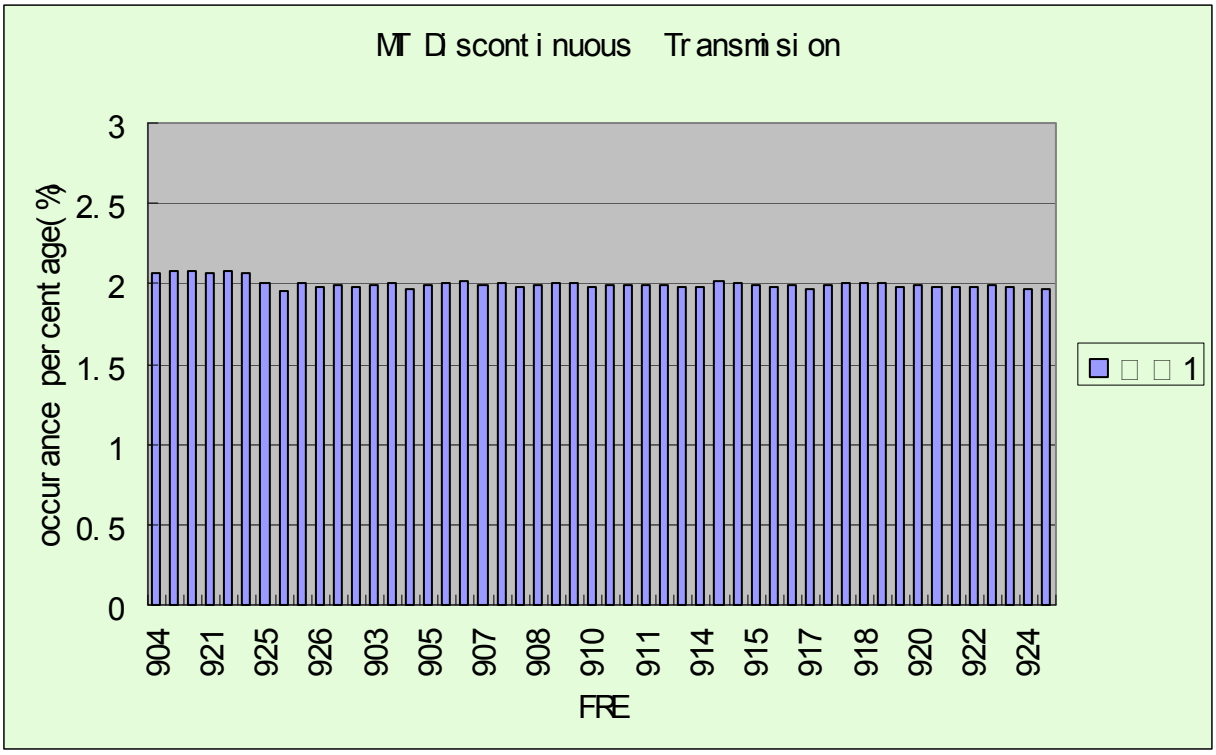

Figure 6b.2.7.1. Histogram of MOTOtalk ISM Band Discontinuous Transmissions.

6b.4 Frequency Stability in the MOTOtalk ISM Band -- 47 CFR 47 CFR 2.1055a(1) and §2.1055(d)(2); RSS-Gen Section 3, RSS-210 Section 2.1.

The transmitter was set to transmit on a single frequency of 915.525 MHz using a special test mode not accessible by the user. The data shown below shows the maximum frequency excursion due to temperature and voltage extremes.

Frequency Stability (in ppm) at 915.525 MHz, Voltage = 4V_{DC}		
TEMP (ºC)	**Frequency Error (Hz)**	**Error (ppm)**
-30	163	0.178
-20	185	0.202
-10	159	0.174
0	179	0.196
10	256	0.280
20	352	0.384
30	196	0.214
40	167	0.182
50	271	0.296
60	207	0.226

Table 6b.4-1 Transmitter Frequency Stability vs. Temperature at 915.525 MHz.

Frequency Stability (in ppm) at 915.525 MHz, Temperature = 25°C		
Power Supply Output Voltage (V)	**Frequency Error (Hz)**	**Error (ppm)**
3.55	174	0.190
3.6	162	0.177
3.7	157	0.171
3.8	182	0.200
3.9	203	0.222
4.0	169	0.185
4.1	145	0.158
4.2	187	0.204

Table 6b.4-2 Transmitter Frequency Stability vs. Voltage at 915.525 MHz.

6b.5 Effective Radiated Power (ERP) – 47 CFR 2.1046 and §15.247(b)(3); RSS-Gen Section 3.2, RSS-210 Section A8.4.

The ERP characteristic was measured while a radio was set to transmit a test mode signal at the maximum rated output power (+/- 5%) and was vertically mounted on a non-conducting platform/turntable in a spherical RF Anechoic Chamber. The power at the receive antenna was recorded on a power meter with the unit rotating about the z-axis. The azimuth of receiving antenna is rotated 180 degrees while the UUT is rotating producing a spiral antenna measurement. For this ERP test, the phi cuts were taken in 15 degree increments or slices and the theta spins used about 200 measurements per rotation. ERP data is extracted from the phi= 90 degree cut. The power recorded from the meter is then corrected to compensate for path loss, cable losses, and amplifier and antenna gains at the given frequencies resulting in absolute radiated power.

The following calculations show how the reported scaled max ERP was determined.

$$Measured\ MaxERP, dBm = 10 * \log(measured\ output\ power, mW) + measured\ antenna\ gain, dBd$$

= 27.06 dBm

The resulting max ERP was converted to mW:

$$MeasuredMaxERP, mW = 10^{\left(\frac{Measured\ MaxERP, dBm}{10}\right)} = 508.16\ mW$$

Since the measured max ERP was not determined at the production maximum output power, a simple scaling is performed to 890 mW:

Scaled Max ERP, mW = Measured ERP, mW * (890mW / measured output power, mW)

= 574.2 mW

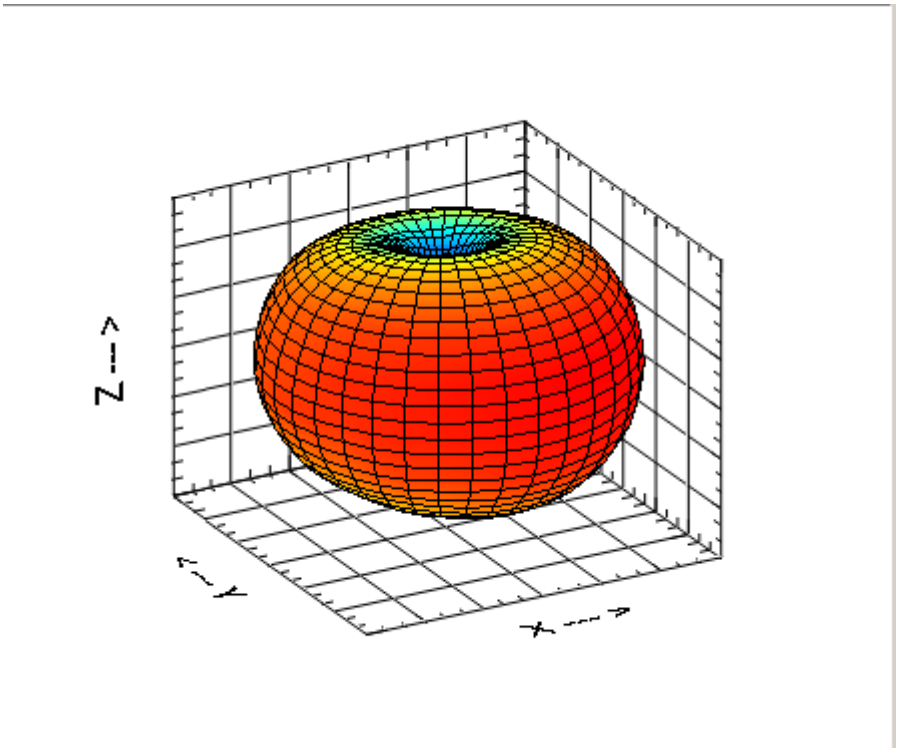

Figure 6b.5-1 i706 Antenna Radiation Pattern in the 900 MHz ISM band.

6b.5.1. De Facto EIRP Limit – Pursuant 47 CFR 15.247(b)(4); RSS-210 Section A8.4.

Criterion: The conducted output power limit of 1-watt is based on the use of antennas with directional gains that do not exceed 6 dB_i. If transmitting antennas of directional gain greater than 6 dB_i are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB_i.

The antenna employed by this transmitter is intended to be omni-directional, and exhibits directional gain less than 6 dB_i (gain = +0.71 dB_i). The conducted power is, therefore, less than the limits set forth (see elsewhere in this report for details).