

6c.1 ISM Band Transmitter Conducted Output Power -- Pursuant 47 CFR 2.1033(b)(6) and 15.247(b)(2)

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 .5 dB from maximum pulse average power, which is 891 mW (29.5 dBm).

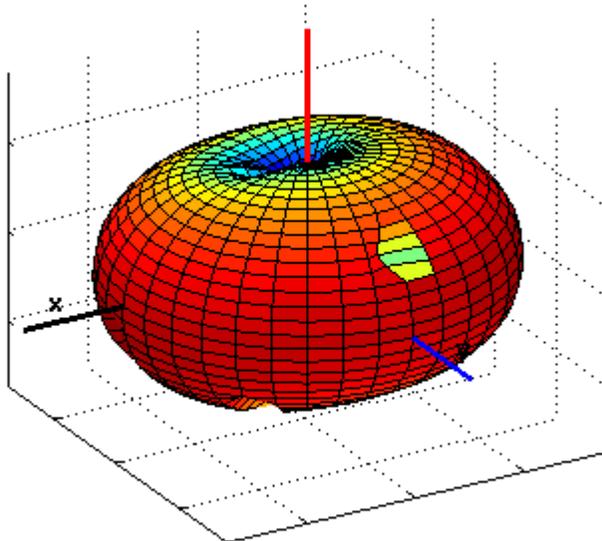
Output power is intentionally not adjusted in operation in the ISM frequency range. Nominal output power is 743 mW (28.71 dBm), pulse average power. This level established to maintain compliance with maximum output power rating. It includes consideration of variation of peak to average power fluctuations 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 (V)	4
DC Current (A)	1.57
Output Power (mW)	888

Table 6c-1 Transmitter characteristics for 902-928 ISM MHz band

6c.2 Effective Radiated Power (ERP) – Pursuant 15.247(b)(3)

Effective Radiated Power was measured in a 3D Anechoic Antenna Chamber.



900 MHz antenna radiation pattern SN:00JD FF FO Ext

TRP	27.4	dBm
EIRP	29.6	dBm
ERP	27.4	dBm
Conducted	29.5	dBm
Gain	-2.1	dBd
Phi	289	deg
Theta	111	deg

Table 6b-6. Maximum ERP.

6c.3 900 ISM Band Carrier Separation between Hopsets – Pursuant 47 CRF, Part 15.247(a)(1)

The separation between frequencies is measured to be 500 kHz.

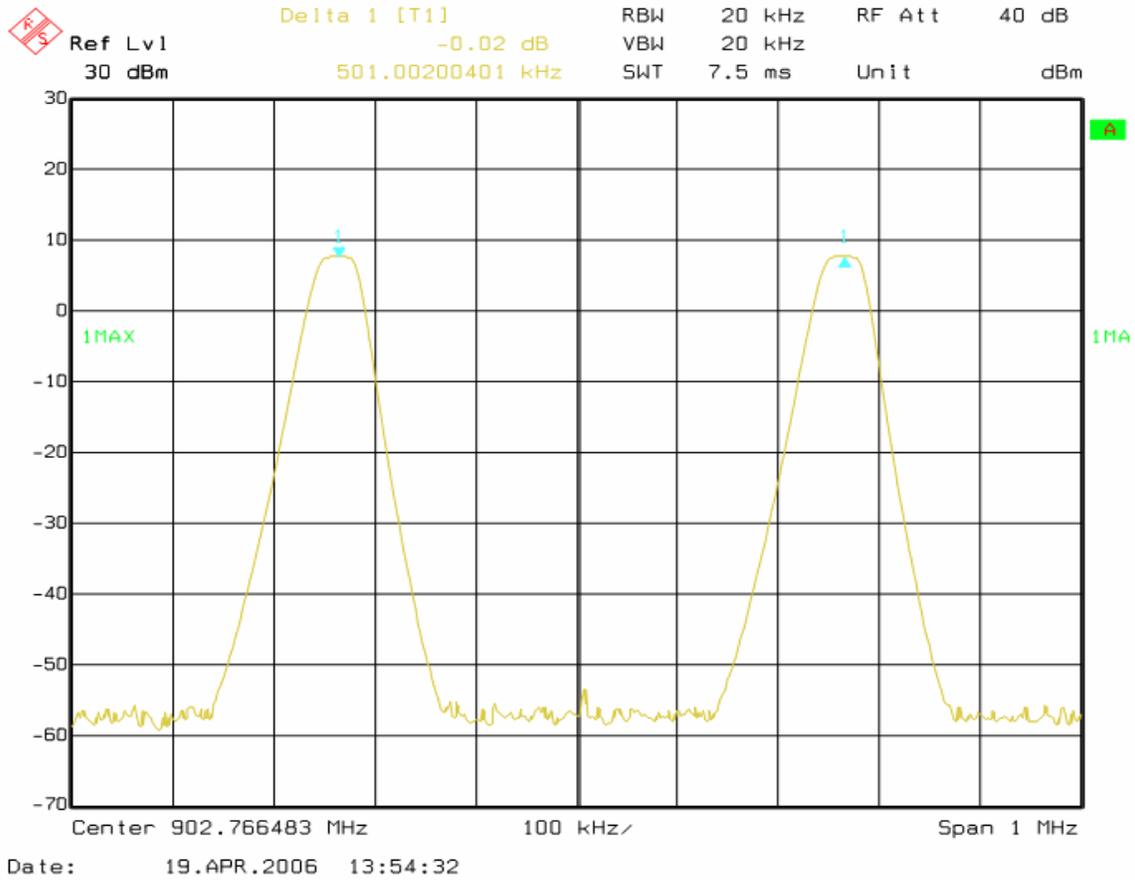


Figure 6b-2.1 Plot of MOTotalk ISM Band adjacent channel separation within a hopset

Figure 6c-1. Plot of 900 MHz ISM Band adjacent channel separation within a hops

The adjacent hopset channel separation was measured between hopset @ 915.525 MHz and hopset @ 916.025 MHz which is 50 kHz.

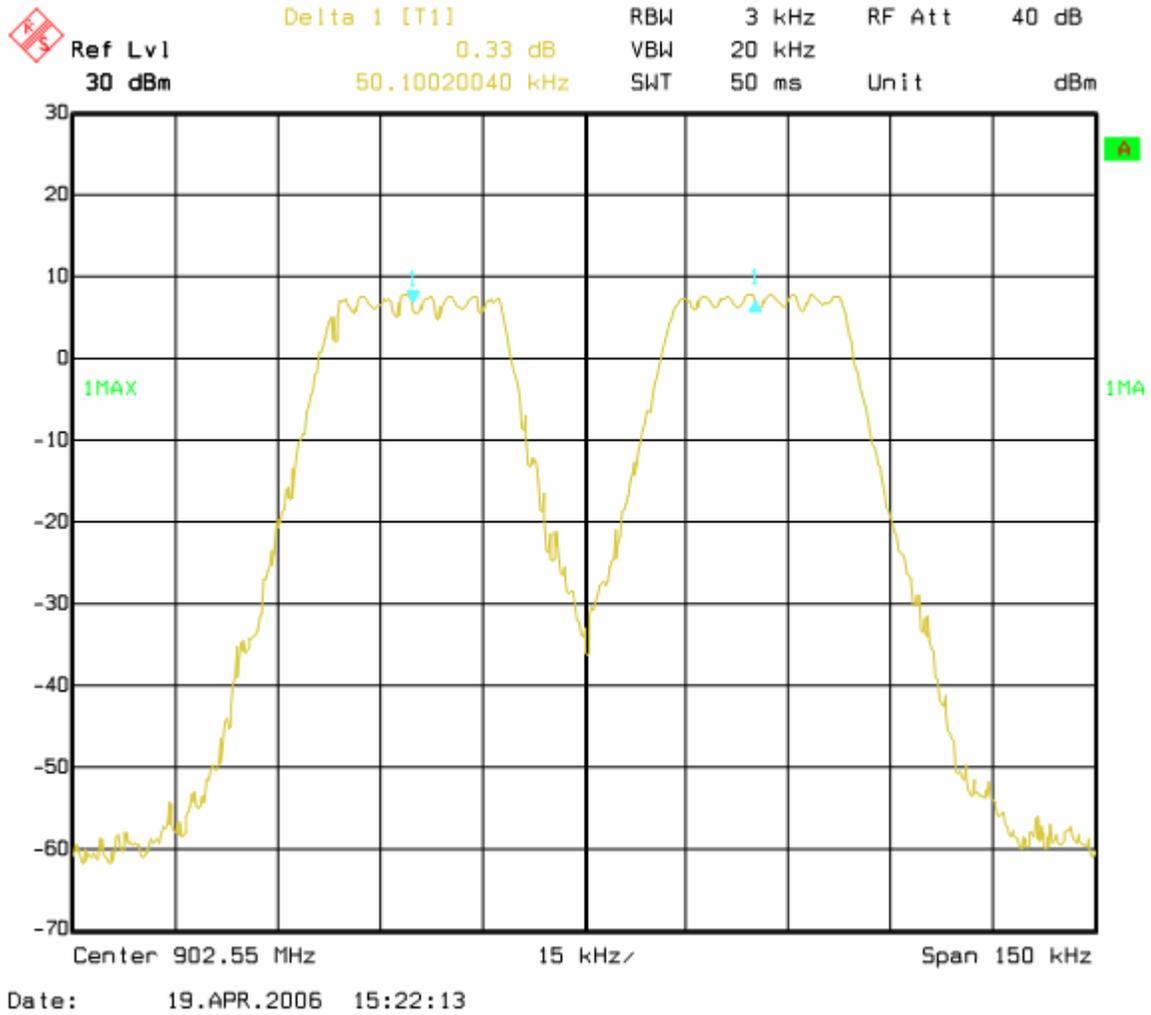


Figure 6c-3. Adjacent hopset separation.

6c.5 900 ISM Band Receiver Bandwidth – Pursuant 47 CFR, Part 15.247(a)(1)

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

6c.6 900 ISM Band Number of Hopping Frequencies – Pursuant 47 CFR, 15.247(a)(1)(i)

The 900 MHz ISM Band transmitter uses 50 frequencies within each selected hopset.

Hopset	1 st 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 6c-4. 900 MHz Band Transmitter Frequency Hopsets.

6c.7 900 ISM Band Average Time of Occupancy – Pursuant 47 CFR, Part 15.247(a)(1)(i)

Worst case scenario (continuous transmission) is as follows:

85.65 ms bursts at 90 ms intervals (hop intervals)

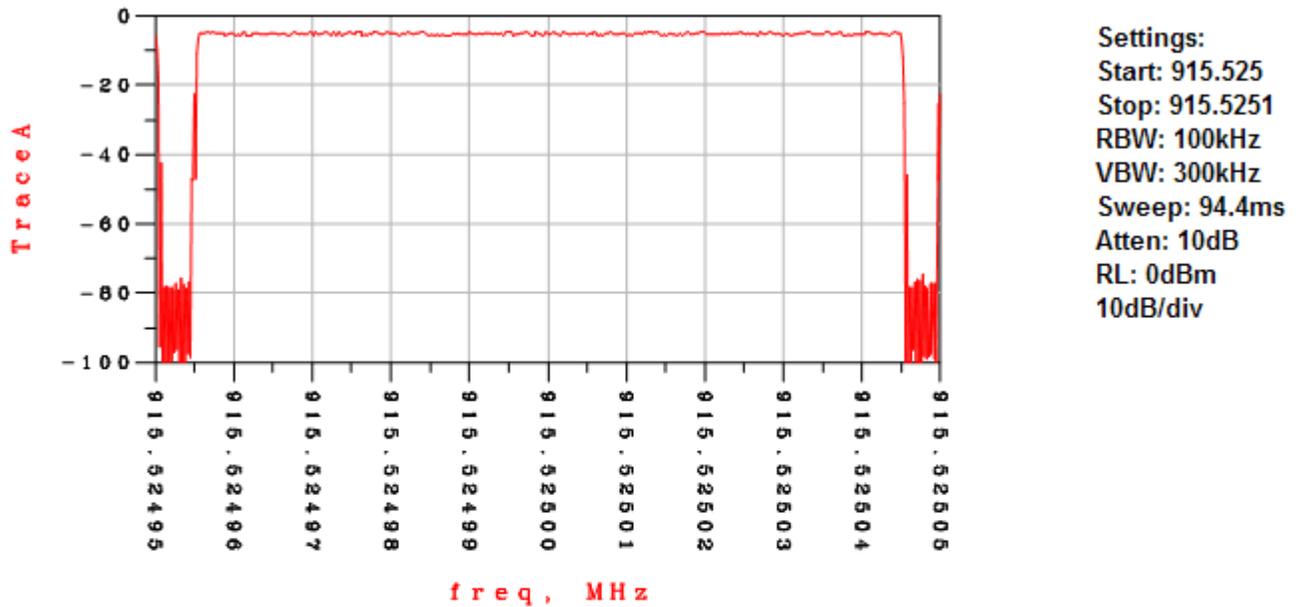
20 seconds per window / 0.09 seconds per hop = 222.22 hops per window

222.22 hops / 50 carriers = 4.444 bursts per carrier window

4.444 bursts * 0.08565 seconds per burst = 0.38 seconds (less than the 0.4 second requirement)

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

Verification of burst is shown in the Figure below.



Worse Case Scenario

84.96ms bursts @ 94.4ms interval

20 sec (per window) / .0944 sec per hop = 211.86

211.86 hops / 50 carriers = 4.24

4.24 * .0944 = .400

The calculations show the average time of occupancy of 0.4

Figure 6c-5. 900 MHz ISM Band Average Measured Time of Occupancy.

6c.8 900 ISM Band Equal Distribution of Hopping Frequencies for Continuous Transmission – Pursuant 47 CFR, Part 15.247(a)(1)(i) & 15.247(g)

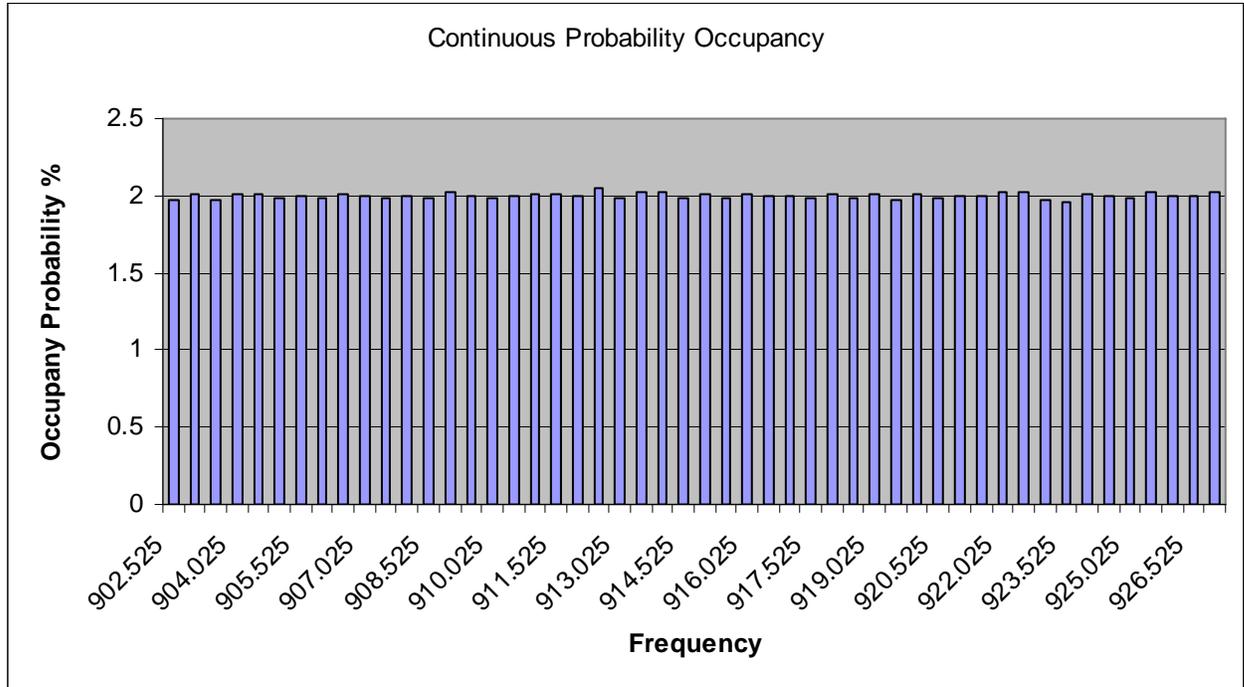


Figure 6c-6. Histogram for 900 MHz ISM Band Continuous Transmission

6c.9 900 ISM Band Equal Distribution of Hopping Frequencies for Discontinuous Transmission - Pursuant 47 CFR, Part 15.247(a)(1)(i) & 15.247(g)

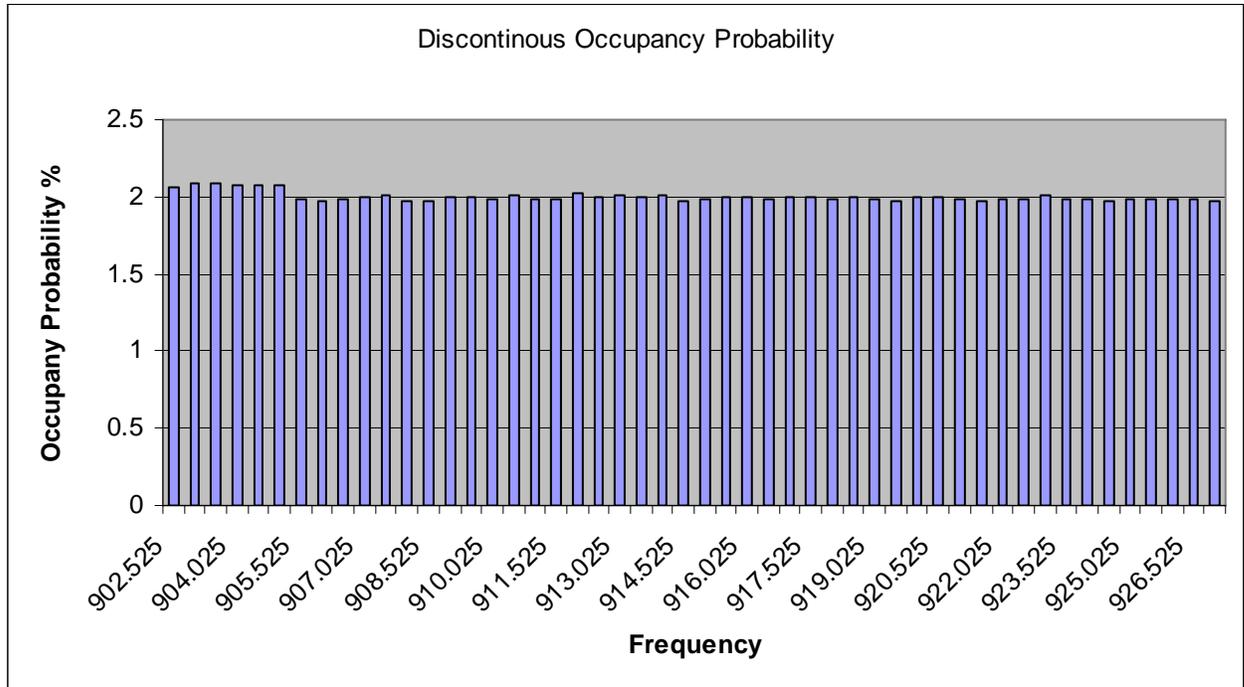


Figure 6c-7. Histogram for 900 MHz ISM Band Discontinuous Transmission

6c.10 Frequency Stability in the 900 MHz ISM Band -- Pursuant 47 CFR 2.1055a(1) & 2.1055(d)2

The transmitter output frequency stability in the ISM band depends upon the inherent frequency stability of the Temperature Compensated Crystal Oscillator (TCXO) used as the frequency reference in the frequency generation scheme described in Exhibit 12. The total variation of the reference TCXO frequency, including changes caused by ambient temperature, supply voltage variation, and aging of the crystal is specified to be less than 2.25 PPM. This TCXO performance results in a total variation of frequency in the 900 MHz ISM band of less than 2100 Hz from nominal frequency.

Measurements were made at 915.525 MHz.

SUBSCRIBER IB0.00.23
 CP 62.01.00
 CSD C01.06.08
 FLASHSTRAP FSB0v00.02
 DSP 0184
 ROM 0C

TEMP	3.55V		4.0V		4.3V	
	Hz	PPM	Hz	PPM	Hz	PPM
-30	28.40	0.031	44.60	0.049	27.52	0.030
-20	3.70	0.004	21.55	0.024	19.80	0.022
-10	50.30	0.055	16.00	0.017	29.44	0.032
0	20.60	0.023	26.30	0.029	45.70	0.050
10	28.70	0.031	19.98	0.022	18.75	0.020
20	32.70	0.036	20.71	0.023	20.13	0.022
30	78.00	0.085	33.67	0.03678	20.13	0.022
40	15.70	0.017	26.02	0.02842	28.70	0.031
50	35.85	0.039	59.31	0.06478	61.60	0.067
60	19.02	0.021	62.41	0.06817	90.75	0.099
70	73.20	0.080	73.5	0.08028	81.8	0.089

Table 6b-5. Frequency stability vs. temperature, at different battery voltages

Power Supply Output	Freq Error in Hz	PPM
3.6	37.5	0.041
3.7	24.9	0.027
3.8	12.1	0.013
3.9	3.5	0.004
4	1.0	0.001
4.1	10.1	0.011
4.2	18.6	0.020
4.3	23.0	0.025

Table 6b-6 . Frequency stability at room temperature, as function of voltage