

Exhibit 7. Measurement Procedures -- 47 CFR. 2.947

This exhibit presents a brief summary of how the measurements were made.

7.1. RF Power -- Pursuant to 47 CFR 2.947(c)

(a) Method of Output Power Measurement: Adaptation of TIA/EIA-603 clause 2.2.1 for Pulsed Measurements

The RF output power is not adjustable by the user. The output power is controlled by the modem in response to the received signal strength or by or special modem service software. To obtain RF output power data the modem was programmed to utilize the maximum RF and minimum RF output power setting. A special adapter cable(to SMA) was used to interface with the antenna terminals. This connector was then connected through a 30 dB attenuator to an RF power sensor. To correct the average reading power meter, a setting of the duty cycle on the RF power meter was set to 16.667% for herein reported 6:1 TDM test signals.

(b) Method of Measurement for Effective Radiated Power: Proprietary

The maximum effective radiated power (ERP) of the transmitter was measured in an open-air test site (OATS) at Hermon Laboratories, Binyamina, Israel. This measurement was performed for two configurations: inside a PDA and inside a laptop computer. The method of measurement is described below:

- a) The unit-under-test was placed on the rotating table.
- b) The transmitter was turned on.
- c) The table was rotated until maximum power was obtained at the OATS receiving antenna.
- d) The OATS receiving antenna height was varied between 1 and 4 meters until maximum power was observed.
- e) The measured field strength measured at the OATS receiving antenna was recorded as a reference.
- f) The unit-under-test was replaced with a test antenna of known gain.
- g) A calibrated RF signal generator was set to the same frequency as the transmitter, and connected to the input of a 5W linear power amplifier. The output of the linear amplifier was fed through a directional coupler to the test antenna via a cable of known loss, and the coupled port of the directional coupler was connected to a calibrated spectrum analyzer. This setup is shown in Figure 7.1.

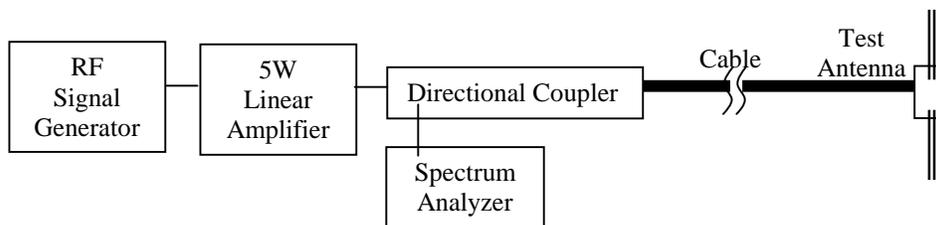


Figure 7.1

- h) The RF signal generator's output level was varied until the field strength measured at the OATS receiving antenna was the same as the reference recorded in step (e).
- i) The incident power at the cable leading to the test antenna was recorded (Pinc).
- j) The EIRP (effective isotropic radiated power) was calculated as follows:

$$\text{EIRP (dBm)} = \text{Pinc (dBm)} - \text{Cable_Loss (dB)} + \text{Test_Ant_Gain (dBi)}$$

- k) The ERP (effective radiated power) was calculated by subtracting the isotropic gain of an ideal dipole, which is 2.15 dB, from the EIRP:

$$\text{ERP (dBm)} = \text{EIRP (dBm)} - 2.15 \text{ (dB)}$$

- l) Finally, the EIRP and ERP in watts were calculated as follows:

$$\text{EIRP (W)} = 10^{[\text{EIRP (dBm)} - 30]/10}$$

$$\text{ERP (W)} = 10^{[\text{ERP (dBm)} - 30]/10}$$

7.2. Occupied Bandwidth -- Pursuant to 47 CFR 2.947(b)

Method of Measurement: Per TIA/EIA-603-1 clause 2.2.11

- 1.) Set the modem for measurement of RF output power using the power test procedure in the service manual which employs a pseudo random data sequence per part 2.1049(h), and attach it to a spectrum analyzer through a 30 dB attenuator. The analyzer is to be set for peak detection with a video bandwidth of 3 times the resolution bandwidth setting, a span of 100 kHz, and a sweep period of at least 20 seconds.
- 2.) Using a 30 kHz resolution bandwidth to assure that essentially all of the transmitted energy is measured, obtain a "rainbow" curve and adjust the analyzer setting so that the crest of the curve lies at the 0 dB reference location. This is portrayed as trace 1 on the analyzer display.
- 3.) Reduce the resolution bandwidth to 300 Hz to characterize the transmitter emission on-channel and adjacent channels spectral performance characteristic. This is portrayed as trace 2 on the analyzer display of Figures 6-7 to 6-12.
- 4.) Overlay the applicable emission mask on the analyzer display as trace 3.
- 5) Compare traces 2 and 3 to ensure that trace 2 never exceeds trace 3.

7.3. Radiated Spurious Emissions -- Pursuant to 47 CFR 2.947(b)

Test Site:

The test site is: Hermon Labs, located in Binyamina Israel. Hermon Labs is listed with FCC and Industry Canada as follows:

1. FCC OATS registration number is: 90623

2. FCC Anechoic chamber registration number is: 13040/SIT 1300F2
3. Industry Canada OATS registration number is: IC 2186-1
4. Industry Canada anechoic chamber registration number is: IC 2186-2
5. Accredited by A2LA.

Site address: Rakevet Ind. Zone, PO Box 23, Binyamina 30550, Israel.
This region is reasonably free from RF interference. The radiated emission testing was performed for minimum and maximum powers in transmit mode.

Method of Measurement: EIA/TIA-603-1 clauses 2.2.12 and 5.2.12

The equipment is placed on the turntable, connected to a dummy RF load (a 50 ohm load was attached to the adapter cable connected to the antenna connector) and placed in normal operation transmit mode of operation.

A broad-band receiving antenna located 3 meters from the transmitter receives any signal radiated from the transmitter. The antenna is adjustable in height and can be rotated for horizontal or vertical polarization. A spectrum analyzer covering the necessary frequency range is used to detect and measure any radiation received by the antenna.

The transmitter's modulated pseudo random digital signal is monitored and adjusted to obtain peak reading of received signals wherever they occur in the spectrum by:

1. Rotating the transmitter under test.
2. Adjusting the antenna height.

The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. Relative signal strength is indicated on the spectrum analyzer connected to this antenna. The spectrum analyzer resolution bandwidth was set to 10 kHz for emissions below 1 GHz, and 1 MHz for higher frequency emissions. To obtain actual radiated signal strength for each spurious and harmonic frequency observed, a standard signal generator with calibrated output is connected to an antenna adjusted to that particular frequency. This antenna is substituted for the transmitter under test. The signal generator output level is adjusted until a reading identical to that obtained with the actual transmitter is observed on the spectrum analyzer. Signal strength is then derived from the generator and appropriate cable losses due to set up. Measured emissions for both maximum and minimum transmit power levels are recorded in tables in exhibit 6.

7.4. Conducted Spurious Emissions -- Pursuant to FCC Rule 2.1051

Method of Measurement: ANSI/TIA/EIA-603-1992 clauses 2.2.13

To obtain conducted spurious emissions data the equipment is connected to a notch filter, which suppress the fundamental frequency. The radio is interfaced with a spectrum analyzer with sufficient dynamic range to permit the spurious emission level relative to the carrier level to be measured directly. Measurements at maximum and minimum output power settings are made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, or as high as the state of the art permits, except for that region within 50 kHz of the carrier. The spectrum analyzer is set to use a resolution bandwidth of 10 kHz for spurious emissions below 1 GHz, and 1

MHz for higher frequency spurious emissions. The video bandwidth is set to three times the resolution bandwidth for both cases.

7.5. Frequency Stability -- Pursuant to 47 CFR 2.947(c)

Measuring the frequency accuracy of the iDEN time division multiplexed (TDM) transmitter needs special procedures for 3 reasons. First is the short (15 ms.) nature of its TDM pulses which preclude the use of an ordinary CW type digital frequency counter. Second, software in the modem prevents the modem from transmitting its TDM pulses unless it is receiving a signal on the trunking system control channel. Third, to maintain the very high stability (greater than that required by part 90 rules) needed for system operation, the modem transmitter frequency is controlled by an automatic frequency control loop in the modem's receiver which locks onto the system forward control channel produced by a compatible FCC certified part 90 base station. This process results in electronically adjusting the initial frequency of the reference oscillator in the synthesizer section of the radio which is used for both transmission and reception.

As a result, unlike traditional transceivers which do not frequency lock to a remote base station reference frequency, the transmitter frequency accuracy is essentially independent of the voltage and temperature induced variations of the subject transceiver's frequency reference oscillator. Rather, the transceiver frequency stability is that of the remote base station, but degraded by any inaccuracy in the transceiver frequency locking process. This inaccuracy is primarily attributed to reference oscillator AFC resolution.

By locking onto a base station meeting the requirements of 47 CFR 90.213 which is necessary for the transceiver to function, the transceiver transmitter inherits the inherent 1.5 PPM or better stability of the compatible base station. To assure attainment of the 2.5 PPM accuracy requirement of part 90.213 for this transceiver, the frequency error is measured when locked to a base station simulator.

Method of Measurement: (Proprietary)

Since the transmitter frequency is locked to the frequency of the compatible base station via the receiver in this transceiver, frequency accuracy data was measured with the transceiver locked onto a base station transmitter emulated by two Motorola R2660C Service Monitors as shown in Figure 7-2. This was done using the QUAD-16QAM time division duplex (TDD) characteristic of the transceiver wherein it was placed into a TDD mode of transmission as normally used to make a call to a landline phone.

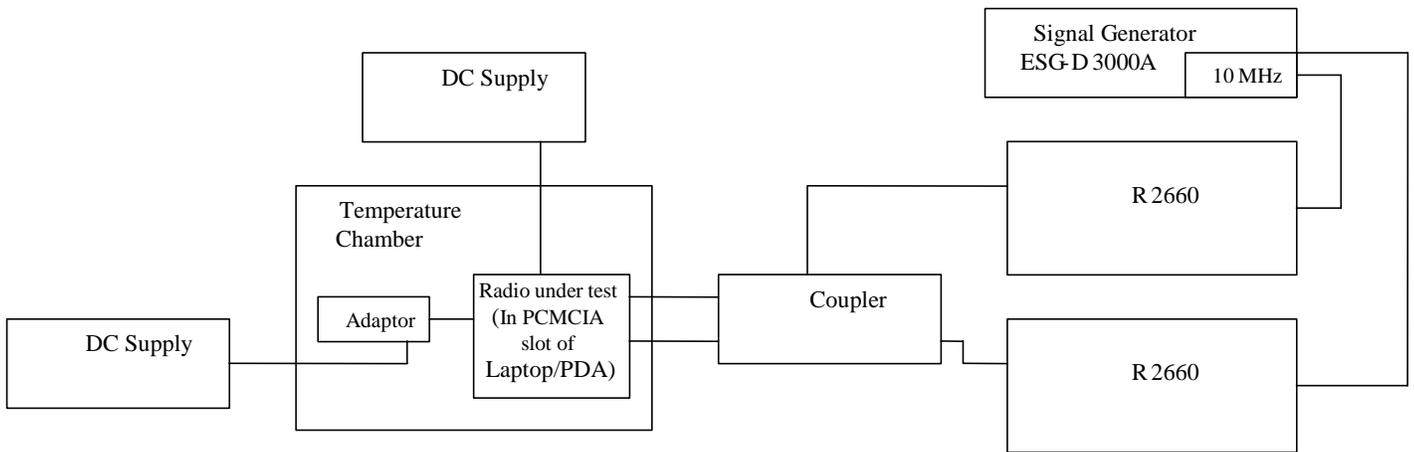


Figure 7-2: Transmit Frequency Measurement Setup

During the test the transceiver was receiving a very high accuracy forward control channel frequency signal from the compatible base station emulator and TDD transmitting a signal on the reverse control channel at a frequency 45 MHz lower corresponding to the normally assigned frequency separation. The frequency of the transceiver was measured as operating voltage or temperature was varied, and compared to the frequency of the assigned channel.

7.6 Power Line Conducted Spurious Emissions -- Pursuant 47 CFR 15.107

Test Site:

The test site is the Standards Institution of Israel located in Chaim Levanon St. Tel-Aviv 69977 Israel, Tel. 972-3-6467800. This Laboratory is a listed FCC institution.

Method of Measurement: EIA/TIA-603-1 clauses 2.1.3 and 5.1.3.3

Connect the receiver to the power line through a line stabilization network. A spectrum analyzer of nominal 50 Ω impedance to one terminal ("neutral") of the line stabilization network. The spectrum analyzer is then tuned to search for spurious outputs from *450kHz to 30 MHz pursuant 47 CFR 15.107*. Record all spurious outputs found. The spectrum analyzer is then connected to the other terminal ("phase") of the line stabilization network and record all spurious outputs found. The power line conducted spurious emissions is the largest reading obtained.

7.7. Measurement Equipment List ----- 47 CFR. 2.948

- 1) Computer: IBM Pentium PC, Window 95.
- 2) Spectrum Analyzer: H.P 8563E, 9 kHz-26.5 GHz Spectrum Analyzer.
- 3) Communications System Analyzer: Motorola R2660C
- 4) RF Signal Generator: HP 8657B, 0.1 - 2060 MHz RF Signal Generator.
- 5) Power Meter (a) Giga-tronics 8541.
(b) H.P 438A.
- 6) Multimeter: H.P 34401A Multimeter.
- 7) Power Supply: Motorola 470 mAh 3.6V Lithium Ion Battery, Kit #: NNTN4051A
- 8) Directional Coupler: H.P 778D, Dual Directional Coupler.
- 9) R.F Amplifier: JCA 110-213, 1 - 10 GHz, 20 dB Gain Amplifier.
- 10) Temperature Chamber: Themotron, model 2800.

Additional equipment used by Hermon Labs. Test Laboratory

1. Spectrum Analyzer: 10 kHz-23 GHz Anritsu MS-710C.
2. Antenna Remote Active Loop: 9 kHz – 30 MHz Electro-Metrics ALR 30
3. Ridged Guide Horn Antenna: 1-18 GHz Electro-Metrics RGA 50/60
4. Turntable: Motorized 2 m Diameter, Hermon Labs TMD-2
5. Cable, Coax, Microwave, DC-18 GHz, TNC-TNC, 4m Gore R3C01C01162.6
6. Anechoic Chamber: 9 (L) x 6.5 (W) x 5.5 (H) m Hermon Labs AC-1
7. Spectrum Analyzer with RF filter section (9 kHz - 6.5 GHz) HP 8546A
8. Amplifier: 2-18 GHz RF Miteq AFD4
9. Antenna Mast: 1-4 m/1-6 m Pneumatic Hermon Labs AM-F1
10. Antenna Biconilog Log-Periodic/T Bow-Tie, 26 - 2000 MHz EMCO 3141

Additional equipment used by the Standards Institution of Israel

11. EMI Receiver: HP Spectrum Analyzer model 8546A.
12. Lisen: Manufactured by FCC model Lisen-2.