

**Measurement Procedure & Test Equipment Used**

Except where otherwise stated, all measurements are made following the Electronic Industries Association (EIA) Minimum Standard for Portable/Personal Land Mobile Communications FM or PM Equipment 25-1000 MHz-(EIA/TIA-603-D).

This exhibit presents a brief summary of how the measurements were made, the required limits, and the test equipment used.

The following procedures are presented with this application.

- 1. Test Equipment List x
- 2. RF Power Output Data x
- 3. Radiated Spurious Emissions x
- 4. Conducted Spurious Emissions x
- 5. Frequency Stability (Volt/Temp) x

**Test Equipment List**

Pursuant To FCC Rules 2.947 (d)

Device	Model	S/N	Due Date
System Power Supply	HP 6033A	US36490106	14-May-14
Modulation Analyzer	HP 8901B	3749A06079	3-Aug-14
Power Meter	Agilent E4416A	GB41292519	23-Mac-14
Power Sensor	Agilent E9301B	MY41495479	24-Aug-14
Computer	HP EliteBook 8540w	CND120CQTM	-
High Pass Filter	Mini Circuit NHP-800	-	-
Attenuator Pad	9305-30, 20W, 30dB	Z6555	-
MotoTRBO USB Programming Cable	PMKN4013C	-	-

**Table 1a: List of equipment used**

Additional equipments used by ACS Test Laboratory

Device	Model	S/N	Due Date
Antennas	Chase CBL6111	1138	7-Jan-13
Antennas	EMCO 3146	1385	30-Nov-13
Antennas	EMCO 3115	2573	2-Mac-13
Antennas	EMCO 3115	2419	18-Jan-14
Amplifiers	HP 8447D	2443A03952	2-Jan-13
Cable Set	Chamber EMI Cable Set	2037	2-Jan-13
Cable Set	Substitution Cable Set	2078	12-Jan-13
Amplifiers	Agilent 83017A	3123A00214	22-Dec-12
Spectrum Analyzer	Agilent 8573A	2407A03233	12-Dec-13
Software	ETS Lindgren TILE4!-V4.2A	85242	NCR
Signal Generators	HP 8673D	3034A01078	22-Feb-13

**Table 1b: List of additional equipment used**

Test Name	FCC Rules Part (47 CFR)	IC Rules
RF Power Output Data	2.1046(a), 2.1033(c)(6), 2.1033(c)(7) and 2.1033(c)(8) 90.541, 90.542(a)(7), 90.545(b)(4) (700MHz)	RSS-Gen Sec 4.8, RSS-119 Sec 5.4.1
TX Audio Frequency Response	2.1047 and 2.1033(c)(13)	-
TX Audio Low Pass Filter Response	2.1047	-
Modulation Limiting	2.1047	-
Occupied Bandwidth	2.1049, 90.210 90.691 (800MHz)	RSS GEN Sec 4.6 RSS 119 Sec 5.5
TX Conducted Spurious Emissions	2.1051, 90.210	RSS GEN Sec 6.2 RSS 119
TX Radiated Spurious Emissions	2.1053, 90.210	RSS GEN Sec 4.9 RSS 119 Sec 4.2, 5.8
Frequency Stability (Temp / Supply Voltage)	2.1055, 90.213, 90.539 (700MHz)	RSS GEN Sec 4.7 RSS 119 Sec 5.3
Transient Frequency Behavior	90.214	RSS 119 Sec 5.9

**Table 2: List of applicable FCC and IC rules**

### **RF Power Output**

#### **Method of Measurement**

Conducted power is measured in accordance with TIA/EIA-603 section 2.2.1.2. The RF power output is measured with the transmitter adjusted in accordance with the tune-up procedure outlined in Exhibit 10 to give the value of voltage and current as specified in Exhibit 12 as required by 2.1033(c) (8). A 50-ohm RF attenuator of proper power rating was used as a load for making these measurements.

The power measurements are made using an Agilent series E4413A RF power meter and 30dB attenuator.

### **Conducted Spurious Emissions**

#### **Method of Measurement:**

The transmitter is terminated into a 50 ohm load and interfaced with a spectrum analyzer which allows the spurious emission level relative to the carrier level to be measured directly. Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of rated system deviation at 1000 Hz. Measurements shall be 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 close to the carrier equal to + 250% of the authorized bandwidth.

#### **FCC Limits** - Per Applicable Rule Parts.

Conducted spurious emissions shall be attenuated below the maximum level of emission of the carrier frequency in accordance with the following formula:

Spurious attenuation in dB = 43 + 10 log<sub>10</sub> (Power output in watts) for 25 kHz Channelization.

Spurious attenuation in dB = 50 + 10 log<sub>10</sub> (Power output in watts) for 12.5 kHz Channelization.

### **Radiated Spurious Emissions**

#### **Test Site:**

The test site is: Advanced Compliance Solutions, Inc, United States of America. Advanced Compliance Solutions, Inc is listed with FCC as follows:

1. FCC registration number is: 588486

#### **SITE ADDRESS:**

Advanced Compliance Solutions, Inc.  
3998 FAU Blvd.,  
Suite #310,  
Boca Raton, FL 33431-0991

The equipment is placed on the turntable, connected to a dummy RF load and then placed in normal operation using the intended power source. A broadband receiving antenna, located 3 meters from the transmitter-under-test (TUT), picks up any signals radiated from the transmitter and its operation accessories. The antenna is adjustable in height and can be horizontally and vertically polarized. A spectrum analyzer covering the necessary frequency range is used to detect and measure any radiation picked up by the above mentioned receiving antenna.

#### **Method of Measurement:**

The equipment is 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 the receiving antenna. To obtain actual radiated signal strength for each spurious and harmonic frequency observed, a standard signal generator with calibrated output is connected to a dipole antenna adjusted to that particular frequency. This dipole antenna is substituted for the transmitter under test. The signal generator is adjusted in output level until a reading identical to that obtained with the actual transmitter is observed on the spectrum analyzer. Signal strength is then read directly from the generator. Actual measurements are recorded on the attached graphs.

FCC Limits -- Per Applicable Rule Parts.

Radiated spurious emissions shall be attenuated below the maximum level of emission of the carrier frequency in accordance with the following formula:

Spurious attenuation in dB =  $43 + 10 \log_{10}$  (Power output in watts) for 25 kHz Channelization.

Spurious attenuation in dB =  $50 + 10 \log_{10}$  (Power output in watts) for 12.5 kHz Channelization.

### **Frequency Stability**

Method of Measurement:

A. Temperature (Non-heated type crystal oscillators):

Frequency measurements are made at the extremes of the temperature range -30 to +60 degrees centigrade and at intervals of not more than 10 degrees centigrade throughout the range. Sufficient time is allowed prior to each measurement for the circuit components to stabilize.

B. Power Supply Voltage:

The primary voltage was varied from 85% to 115% of the nominal supply voltage.

Voltage is measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

FCC Limits

Temperature - Frequency Stability of  $\pm 1.5$  ppm from -30 to +60 degrees centigrade.

Power Supply Voltage - Frequency Stability of  $\pm 1.5$  ppm from 85% to 115% of nominal voltage.