

.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).

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.

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Test Equipment List

Pursuant To FCC Rules 2.947 (d)

	MODEL	MANUFACTURER	Instrument	Calibration Due Date	Calibration Interval
1	3488A	Hewlett-Packard	Switch Control	No Cal. Required	NA
2	6672A	Hewlett-Packard	Power Supply	8/5/2014	1 Year
3	E4440	Agilent	Spectrum Analyzer	8/5/2014	1 Year
4	8656A	Hewlett-Packard	Signal Generator	8/5/2014	1 Year
5	8902A	Hewlett-Packard	Measuring Receiver	8/5/2014	1 Year
6	8903A	Hewlett-Packard	Audio Analyzer	8/5/2014	1 Year
7	SMP22	Rhode & Schwarz	Signal Generator	12/11/2014	1 Year
8	ESI 26	Rhode & Schwarz	Spectrum Analyzer/ESI Test Receiver	5/2/2014	1 Year
9	ESI 26	Rhode & Schwarz	EMI Test Receiver	9/4/2014	1 Year
10	SC99V	Sunol Sciences Corp.	System controller	No Cal. Required	NA
11	FM2011VS	Sunol Sciences Corp.	Turntable. Flush Mount 2M Part# 15284	No Cal. Required	NA
12	TLT2	Sunol Sciences Corp.	Antenna Positioning Tower	No Cal. Required	NA
13	TLT2	Sunol Sciences Corp.	Antenna Positioning Tower	No Cal. Required	NA
14	2000	Motorola	RF Tray	No Cal. Required	NA
15	6032A	Hewlett Packard	Power Supply	12/19/2014	1 Year
16	SAS-571	A.H. Systems Inc.	DRG Horn Freq. 700MHZ-18GHZ antenna	9/5/2014	1 Year
17	SAS-571	A.H. Systems Inc.	DRG Horn Freq. 700MHZ-18GHZ antenna	6/13/2014	1 Year
18	CBL 6112D	TESEQ GmbH Berlin	Bilog Antenna 30MHz to 2GHz	9/4/2014	1 Year
19	3141	EMCO	Biconilog. Freq. 30MHZ-2GHZ antenna	4/30/2014	1 Year
20	CBL 6112D	TESEQ GmbH Berlin	Bilog Antenna 30MHz to 2GHz	9/26/2014	1 Year
21	6632A	Hewlett-Packard	System DC Power Supply	10/14/2014	1 Year
22	437B	Hewlett-Packard	Power Meter	1/14/2015	1 Year
23	8481A	Agilent	Power Sensor	10/17/2014	1 Year
24	9305-20	Weinschel	20 dB Attenuator	10/14/2014	1 Year
25	N9030A	Agilent	Signal Analyzer	12/05/2014	1 Year

RF Power Output

Pursuant to FCC Rules 2.1046 (a)

Method of Measurement

The RF power output is measured as required by 2.1033(c) (8) with the transmitter adjusted in accordance with the tune-up procedure. A 50-ohm RF attenuator of proper power rating was used as a load for making these measurements.

The power measurements are made using a Hewlett-Packard 437B power meter, an Agilent 8481A power sensor, and a 20dB attenuator.

Occupied Bandwidth

Pursuant to FCC Rules 2.1049

Method of Measurement

Data on occupied bandwidth is presented in the form of a spectrum analyzer photograph, which illustrates the transmitter sidebands. For analog signals, the reference line for the data plot is taken of the unmodulated carrier, to which is superimposed the sideband display generated by modulating the carrier with a 2500 Hz tone at a level 16 dB greater than that required to produce 50 percent modulation. For digital voice, data, and TDMA, the reference line for the data plot is that of the peak value of the modulated carrier. For digital data, the Standard Transmitter Test Pattern is a continuously repeating 511 bit pseudo-random bit sequence based on ITU-T 0.153. If tone or digital coded squelch is indicated, photographs using both the 2500 Hz tone and the indicated squelch signal are used to modulate the transmitter. During these measurements, the instantaneous Deviation Control is set for a maximum of +5 kHz.

FCC Limits - Per Applicable Rule Parts.

For Part 90

Measured Data: At least +25 dB down on any frequency removed from the assigned frequency by more than 50 % and up to and including 100% of the authorized bandwidth. At least +35 dB down on any frequency removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth; at least 43 plus 10 log 10 (mean output power in watts) decibels or 70 decibels, whichever is the lesser attenuation. The resolution bandwidth used is per TIA procedures.

Radiated Spurious Emissions

Pursuant to FCC Rules 2.1053

Test Site:

The site, located at Plantation, Florida, is in a region which is reasonably free from RF interference and has been approved by the Commission for Spurious Measurements.

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 10 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.

Note: Measurement is made following a resolution bandwidth setting of 100 KHz.

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)

Conducted Spurious Emissions

Pursuant to FCC Rule 2.1051

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 $\pm 250\%$ of the authorized bandwidth.

Note:

For part 90, the resolution bandwidth used is per TIA procedures.

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 = $43 + 10 \log_{10}$ (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.

Adjacent Channel Coupled Power Ratio

Pursuant to FCC Rule 2.1051

Method of Measurement:

The transmitter is terminated into a 50 ohm load and interfaced with a spectrum analyzer which allows the adjacent channel coupled power ratio level relative to the carrier level to be measured. Modulate the transmitter with prescribed conditions and modulation. The power shall be measured on the adjacent channel power analyzer in the specified measurement bandwidth centered at both the upper and lower Specified frequency offsets from the carrier frequency. For offsets greater than 400 kHz, a sweep measurement is used.

Note:

For part 90.543, the resolution bandwidth used is per TIA procedures.