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-603C).

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)

Device	Model	Serial Number	Cal Due Date
Computer	Jooyun Dest-top(Win 7)	JT1012G102430002B	-
RF Communications Test Set	Hewlett Packard 8920B	US35060357	3-May-13
Audio Analyzer	Hewlett Packard 8903B	3514A16599	14-Dec-12
Modulation Analyzer	Hewlett Packard 8901B	3538A05526	14-Dec-12
Signal Generator	Hewlett Packard 8647A	3349A03398	14-Dec-12
Spectrum Analyzer	Advantest R3267	110305283	24-Jul-13
Oscilloscope	Hewlett Packard 54810A	US38450235	24-Jul-13
Power Meter	Hewlett Packard 437B	3125U11949	21-Jan-13
30dB Attenuator	Hewlett Packard 8498A	1801A07053	21-Jan-13
Power Sens	Hewlett Packard 8482B	3318A06331	21-Jan-13
Reference Oscillation	Electronic Research 130	348	7-Feb-13
DC Power Supply	Han Young Elect. HYP-3010D	210251	-
Multimeter	FLUKE 175	96950938	-
Splitter	Mini circuits ZFSC-2-2	BF821500361	-
30dB Attenuator	Bird 8308-300-N (30dB)	MFC70998	-
Chamber	Kuk Je Eng. KTH-080	-	-
High Pass Filter	Mini circuits BHP-800+	-	-
High Pass Filter	Mini circuits BHP-250+	-	-

OATS Test Equipment

Manufacturer	Model	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
EMCO	3108	Antennas	2147	11/30/2011	11/30/2013
EMCO	3146	Antennas	1385	11/30/2011	11/30/2013
EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
EMCO	3115	Antennas	2419	1/18/2012	1/18/2014
Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
Mini Circuits	NHP-800	Filter	10247	1/19/2012	1/19/2013
ACS Boca	Substitution Cable Set	Cable Set	2078	1/12/2012	1/12/2013
Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
Mini Circuits	SHP-1000+	Filter	R UU27401137	2/21/2012	2/21/2013
Hewlett-Packard	8673D	Signal Generators	3034A01078	2/22/2011	2/22/2013
Agilent Technologies, Inc.	83017A	Amplifiers	3123A00168	9/23/2011	9/23/2012

RF Power Output vs. DC Power Input

Pursuant to 47 CFR 2.1046

Method of Measurement

The transmitter is operated under normal conditions at the specified nominal DC input voltage. The antenna output is terminated in 50 ohms. The DC supply path to the final stage only is interrupted to allow insertion of the DC ammeter in series with the DC supply. The DC voltage drop of the ammeter is negligible. A DC voltmeter is computed as the product of the DC current (in amps) times the DC voltage (in volts). This measurement is performed at the upper, middle and lower limits of the frequency range. At each frequency, the measurement is performed at the upper and lower limits of the specified adjustable power range.

Transmit Audio Frequency Response

Pursuant to 47 CFR 2.1047(a)

Method of Measurement

The transmitter output is monitored with an HP8901B modulation analyzer, whose FM demodulator output is fed to an HP8903B audio analyzer. De-emphasis or filtering within the test equipment is not used. An audio oscillator signal, derived from the HP8903B Audio Analyzer, is connected to the microphone audio input of the transmitter. At a frequency of 1 kHz, the level is adjusted to obtain 20% of full system deviation, to ensure that limiting does not occur at any frequency in the range of 300 Hz – 3000 Hz. A constant input level is then maintained and the oscillator frequency is varied between the ranges of 100 Hz to 5000 Hz. The frequency response is plotted, using a reference of 0 dB at 1 kHz.

Transmit Audio Post Limiter Low Pass Filter Response

Pursuant to 47 CFR 2.1047(a)

Method of Measurement

The audio oscillator portion of an HP8903B audio analyzer is connected to the input of the post limiter low pass filter. The oscillator is adjusted, at 1000 Hz and level 20dB greater than that required to produce standard test modulation. The output of the low pass filter is measured with a R3267 spectrum analyzer. The response is swept between the limits of 1000 Hz - 30000 Hz. Oscillator level is chosen to be as high as possible and that will not cause limiting at any frequency, and maintaining a constant input level versus frequency.

Modulation Limiting Characteristics

Pursuant to 47 CFR 2.1047(d)

Method of Measurement

An audio oscillator is connected to the microphone audio input. The transmitter output is monitored with an HP8901B modulation analyzer. The flat frequency response FM demodulator output of the HP8901B is fed to an HP8903B audio analyzer. The 20 kHz low pass filter of the modulation analyzer is used to reduce the level of residual high frequency noise. The oscillator level is adjusted, at 1 kHz, to obtain 60% of full system deviation.

The oscillator level is then varied over a range of +/-25dB in 5dB increments, and the resulting deviation is plotted. This measurement is repeated at 300 Hz and 3 kHz. The above procedure is performed three times, for conditions with Tone Private Line, Digital Private Line, and Carrier Squelch Mode (without sub-audible signaling).

Occupied Bandwidth

Pursuant to 47 CFR 2.1049(c) (i)

Method of Measurement

An audio oscillator is connected to the microphone audio input. The frequency is set to 2500 Hz and the amplitude is adjusted to a level 16dB above that is required to produce 50% of full system deviation at the frequency of maximum response of the audio modulation circuit, in accordance with FCC rules Part 2.1049(c)(1).

The transmitter output is connected, via a 30 dB attenuator, which also provides a 50-ohm termination to the transmitter output, to a R3267 spectrum analyzer that outputs directly to a computer. Spectrum analysis of the transmitter output is performed to at least +/-2.5 times the channel spacing. The unmodulated carrier is used to establish a 0-dB reference, then with the modulating signal applied. This 0 dB reference is equivalent to the power rating of the transmitter, which is specified in each page of the exhibit. This measurement is repeated with Tone Private Line continuous sub-audible signaling added (250.3 Hz at 15% full system deviation) and again with Digital Private Line (code 131 at 15% of full system deviation) for both channel spacing, 12.5 kHz and 25 kHz.

Conducted Spurious Emissions

Pursuant to FCC Rule 2.1051

Method of Measurement:

The output of the transmitter is connected, via a suitable 30dB attenuator, to the input of a R3267 spectrum analyzer. This data is measured at the lower, mid and upper frequency limits of the frequency range. If transmit power is adjusted, the measurement is repeated at various power levels including minimum and maximum.

Radiated Spurious Emissions

Pursuant to FCC Rules 2.1053

Method of Measurement:

Transmitter radiated spurious emissions were measured by Motorola Plantation EMC Lab. Measurements were made at an approved open field test site constructed in accordance with Appendix B, FCC/OST 55 (1982), and were performed in accordance with the Code of Federal Regulations, Title 47, Part 2, paragraph 2.1053. The data is plotted as “Radiated Spurious Emissions” on the graphs comprising EXHIBIT 6G. The specification limit corresponding to a level of 43 dB + 10log (Pout) for 25kHz Channel Spacing and 50 dB + 10log (Pout) for 12.5kHz Channel Spacing below the fundamental carrier power of the transmitter as indicated on each graph for reference.
The test site is: ACS test lab;

Address: 3998, FAU Boulevard, Suite #310
Boca Raton, FL 33431 USA

Frequency Stability

Pursuant to FCC Rule 2.1055(a) (d)

Method of Measurement:

Frequency Stability vs. Temperature data is measured in accordance with FCC Rules Part 2.1055(a)(1). An HP8901B modulation analyzer is used to measure the frequency of the signal transmitter by the radio. The radio is placed in a Kuk Je Eng., model KTH-080 Temperature Chamber, and the frequency is measured as the temperature is incremented from –30 to +60 degrees C in 10 degrees increments.

Frequency Stability versus Voltage data is measured in accordance with FCC Rules Part 2.1055(d). An HP8901B modulation analyzer is used to measure the frequency of the signal transmitter by the radio by way of a 30dB attenuator. The supply voltage of the radio is swept +30% and –30% of 7.5Vdc.

Transient Frequency Behavior

Pursuant to FCC Rules Part 90.214 & 90.215

This data measured in accordance with FCC Rules. Applicable method of measurement and definition in Section 2.2.19 of the TIA/EIA 603C. Specifically, the triggering level was set in the following manner.

Method of Measurement:

The output of the radio is connected to an HP8901B modulation analyzer by way of a directional coupler, 30dB attenuator, and 2:1 combining network. This output is first measured with an HP437 power meter and then the power meter is replaced by the HP8901B modulation analyzer, and the RF output of an HP8657B signal generator is connected to the second port of the combining network at a level of 30dB less than the output level of the radio measured after the attenuator. The RF output of the HP8657B signal generator is modulated with a 1 kHz tone and deviation of 12.5 kHz or 25 kHz depending on the channel spacing. The modulation output of the HP8901B modulation analyzer is connected to an oscilloscope, 54810A. The signal generator is turned on first, and then the radio keyed or de-keyed depending on the particular test. The oscilloscope is triggered by way of a RF peak detector that detects the RF output of the radio by way of the directional coupler.

The picture of the oscilloscope display is stored on a floppy disk and transferred to a computer. The key up attack time plots show the 1 kHz from the RF signal generator signal from the modulation output of the HP8901B modulation analyzer, and when the radio is keyed, the output signal from the radio captures the receiver of the HP8901B modulation analyzer, resulting in the carrier only signal. The de-key decay time plots show the unmodulated signal from the radio and when the radio is de-keyed, the 1 kHz from the RF signal generator signal captures the receiver of the HP8901B modulation analyzer, resulting in the 1 kHz signal shown in the plots.

Power Line Conducted Spurious Emissions

Pursuant to FCC Rule 15.107

This data measured in accordance with FCC Rules 15.107. The equipment is connected to the power line through a line stabilization network. A spectrum analyzer of nominal 50Ω impedance to one terminal of the line stabilization network. The spectrum analyzer is then tuned to search for spurious outputs from 150 kHz to 30 MHz. Record all spurious outputs found. The spectrum analyzer is then connected to the other terminal of the line stabilization network and record all spurious outputs found. The power line conducted spurious emissions is the largest reading obtained. The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the Table: 1.

Table: 1

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.