Compliance Testing, LLC
Previously Flom Test Lab
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Test Report

Prepared for: Wulfsberg Electronics Division

Model: RT-7000

Description: Panel Mounted Tactical Radio - Aviation and Land-Based

Serial Number: N/A

FCC ID: FRWRT7000PMR

To

FCC Part 90, 87, 80, 22

Date of Issue: March 24, 2017

On the behalf of the applicant:	**Wulfsberg Electronics Division** **6400 Wilkinson Drive** **Prescott, AZ 86301**
Attention of:	**Jim Buehring, Certification Manager** **Ph: (928)708-1527** **E-Mail: Jim.Buehring@cobham.com**

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Project No: p16b0030

Alex Macon
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	March 10, 2017	Alex Macon	Original Document
2.0	March 18, 2017	Alex Macon	Added table of tested frequency bands on page 7. Removed “MTM” nomenclature and replaced with “APX” which is now described in the additional info section. Added Part 87 test frequencies to test frequency table. Updated the Radiated Emissions test procedure. Updated Annex B to explain the P2 and CW designations in the plot titles. Annex C has been updated to include the MHz unit. A note that explains the naming convention and removed the reference plots and added mask designation to each title. Included correct masks with 300 Hz RBW Updated Annex D by removing the test procedure from the Annex. The procedure already exists in the body of the report and adding the frequency tested to the plot title. Removed unneeded transient plots
3.0	March 23, 2017	Alex Macon	Corrected description of radio to a mobile device. Updated bandwidth calculations. Added Part 87 frequencies into the output power table. Added manufacturer’s note to table on page 7 Added note to Annex B in regards to corrupted plot.
4.0	March 23, 2017	Alex Macon	Changed 8K10F1D to 8K10F1W. Added power measurements for 156.3MHz and 157.425 MHz.
5.0	March 24, 2017	Alex Macon	Added parts 87,80 and 22 to the cover page.

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The Applicant has been cautioned as to the following:

15.21: **Information to the User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): **Special Accessories**

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Subpart J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and the following individual Parts: FCC Part 22, 80, and 90.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
20.2 – 23.1	28.5 – 34.2	968 - 971

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description
Model: RT-7000
Description: Panel Mounted Tactical Radio - Aviation and land-based
Firmware: X23
Software: APX tuner
Serial Number: N/A
Additional Information:

The EUT is a mobile device

The EUT incorporates 2 different modules, the “Wideband “ and the “APX” All data with the included “APX” nomenclature are from the APX module. If the data does not contain the APC prefix, it was gathered from the Wideband Module.

EUT Operation during Tests
The EUT was controlled using the front panel, Motorola software, and manufacturer supplied software to enable to the radio to transmit its required test emissions.

The radio operates on the following listed frequency bands:

Rule Part	Frequency Range (MHz)	Comments
87	118.05 – 118.05	
87	127.5 – 127.5	
87	136.95 – 136.95	
87	156.3 – 156.3	
87	157.425 – 157.425	
80	161.775 – 161.775	
90	29.7 – 88.0	
22	72.0 – 73.0	
22	75.4 – 88.0	
90	136.0 – 149.05	Federal Use band. Not part of Part 90 but tested under Part 90
90	151.05 – 174.0	
90	380.0 – 520.0	
90	763.0 – 775.0	
90	793.0 – 805.0	
90	806.0 – 849.0	
22	809.0 – 851.0	
22, 90	851.0 – 870.0	
90	851.0 – 894.0	
22	854.0 – 896.0	
90	896.0 – 901.0	
90	902.0 – 930.0	
22	928.0 – 929.0	
22	931.0 – 935.0	
90	935.0 – 940.0	
22	941.0 – 960.0	

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	D-SS Series breakout box	SEI breakout boxes	SE-1030	N/A
1	Laptop	Dell	E6950	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
1	D-sub cable	8	Y	Y	N/A
1	TNC cable	<3m	Y	Y	N/A
2	Banana plug	<3m	N	N	N/A
1	GCAI to PC cable	<3m	N	N	N/A
1	Micro D-sub to CGAI interface cable	<3m	N	N	N/A

Modifications:

1	Uploaded the newest firmware X23 in order to comply with the FM modulation testing

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046	Carrier Output Power (Conducted)	Pass	
2.1051	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
90.210, 2.1049	Emission Masks (Occupied Bandwidth)	Pass	
2.1047	Audio Low Pass Filter (Voice Input)	Pass	
2.1047	Audio Frequency Response	Pass	
2.1047(a)	Modulation Limiting	Pass	
90.213	Frequency Stability (Temperature Variation)	Pass	
90.213	Frequency Stability (Voltage Variation)	Pass	
90.214	Transient Frequency Behavior	Pass	
RSS-Gen	Receiver Spurious Emissions	Pass	
2.202	Necessary Bandwidth Calculation	Pass	

Frequency Test List and Rule Section Summary Table

Frequency (MHz)	FCC Rule Section(s)	IC Rule Section(s)	Emissions Designator	FCC Extended Frequency
29.75	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
72.5	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
87.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
118.05	87		6K00A3E	
127.5	87		6K00A3E	
136.95	87		6K00A3E	
138.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	Yes
149.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
161.775	80, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
173.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
380.00	90		6K00A3E, 8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (Federal Use Only)	Yes
406.15	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (Federal Use Only)	
413	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (Federal Use Only)	
420.975	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (Federal Use Only)	
438.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
469.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
470.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
490.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
511.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E ,16K0F3E	
519.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	Yes
764.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
769.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
774.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
793.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
799.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
804.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
806.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	

Frequency (MHz)	FCC Rule Section(s)	IC Rule Section(s)	Emissions Designator	FCC Extended Frequency
809.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
827.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
848.95	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
850.95	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
851.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
854.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
869.95	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
872.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
893.95	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
895.95	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
896.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
900.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
902.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
916.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
928.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
928.95	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
929.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
931.05	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
934.95	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
935.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
939.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
941.05	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
950.05	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
959.95	22	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 138.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	Yes
APX 150.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 161.775	80, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 173.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	

Frequency (MHz)	FCC Rule Section(s)	IC Rule Section(s)	Emissions Designator	FCC Extended Frequency
APX 380.00	90		8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (Federal Use Only)	Yes
APX 406.15	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (Federal Use Only)	
APX 438.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 469.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 450.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 460.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 469.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E 16K0F3E (RSS-119 Only)	
APX 470.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 490.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 511.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 519.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	Yes
APX 764.05	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 769.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 774.95	90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 851.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 854.05	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	
APX 869.95	22, 90	RSS-119	8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E	

Carrier Output Power (Conducted)

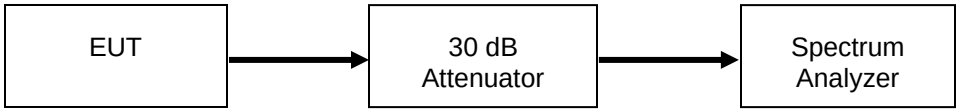
Engineer: Alex Macon

Test Date: 1/19/17

Measurement Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer through a 30 dB Power attenuator. All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained. The spectrum analyzer was set to 1 MHz RBW with a peak detector.

Test Setup



Transmitter Output Power

Tuned Frequency (MHz)	Recorded Measurement (dBm)	Recorded Measurement (Watts)	Result
29.75	40.63	11.6	Pass
72.5	40.6	11.5	Pass
87.05	40.44	11.1	Pass
118.05	40.52	11.3	Pass
127.5	40.33	10.8	Pass
136.95	39.95	9.89	Pass
138.05	40.37	10.9	Pass
149.05	40.74	11.9	Pass
156.3	39.8	9.55	Pass
157.425	40.15	10.4	Pass
161.775	39.91	9.79	Pass
173.95	40.49	11.2	Pass
380.00 (AM)	39.93	9.84	Pass
380.00 (FM)	39.36	8.63	Pass
406.15	40.37	10.9	Pass
413	39.48	8.87	Pass
420.975	39.74	9.42	Pass
438.05	40.5	11.2	Pass
469.95	39.93	9.84	Pass
470.05	39.88	9.73	Pass
490.05	39.32	8.55	Pass
511.95	39.93	9.84	Pass
519.95	39.49	8.89	Pass
764.05	39.04	8.02	Pass
769.95	39.17	8.26	Pass
774.95	39.38	8.67	Pass
793.05	40.36	10.9	Pass
799.95	40.26	10.6	Pass
804.95	40.46	11.1	Pass
806.05	40.25	10.6	Pass
809.05	39.65	9.23	Pass

827.05	39.71	9.35	Pass

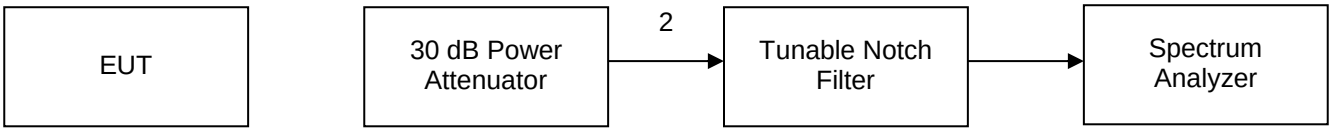
Tuned Frequency (MHz)	Recorded Measurement (dBm)	Recorded Measurement (Watts)	Result
848.95	39.77	9.48	Pass
850.95	39.26	8.43	Pass
851.05	39.43	8.77	Pass
854.05	39.73	9.40	Pass
869.95	40.64	11.60	Pass
872.05	40.78	12.00	Pass
893.95	39.78	9.51	Pass
895.95	39.70	9.33	Pass
896.05	39.81	9.57	Pass
900.95	39.84	9.64	Pass
902.05	39.80	9.55	Pass
916.05	39.96	9.91	Pass
928.05	40.23	10.5	Pass
929.95	39.55	9.02	Pass
931.05	39.7	9.33	Pass
934.95	40.09	10.20	Pass
935.05	40.21	10.50	Pass
939.95	39.81	9.57	Pass
941.05	39.69	9.31	Pass
950.05	39.92	9.82	Pass
959.95	39.71	9.35	Pass
APX 138.05	37.39	5.48	Pass
APX 160.125	37.46	5.57	Pass
APX 173.95	37.35	5.43	Pass
APX 380.00	36.47	4.44	Pass
APX 406.15	37.02	5.04	Pass
APX 438.05	35.15	3.27	Pass
APX 469.95	36.01	3.99	Pass
APX 450.05	35.31	3.40	Pass
APX 480.125	36.74	4.72	Pass
APX 519.95	36.60	4.57	Pass
APX 764.05	32.99	1.99	Pass
APX 769.95	33.1	2.04	Pass
APX 774.95	33.08	2.03	Pass
APX 851.05	33.68	2.33	Pass
APX 854.05	33.75	2.37	Pass
APX 869.95	34.61	2.61	Pass

Conducted Spurious Emissions
Engineer: Alex Macon
Test Date: 2/16/17

Test Procedure

The EUT was connected to a spectrum analyzer through a 30 dB power attenuator to verify that the UUT met the requirements for spurious emissions. A tunable notch filter was utilized to ensure the fundamental did not put the spectrum analyzer into compression. The reference level was adjusted to ensure the system had sufficient dynamic range to measure spurious emissions. The frequency range from 25 MHz to the 10th harmonic of the fundamental transmitter was observed and plotted. Multiple frequencies per rule section and frequency band were tested ensuring compliance across all operational rule sections.

Test Setup



All emissions were below the limit

See Annex A for test plots

Field Strength of Spurious Radiation
Engineer: Alex Macon
Test Date: 2/16/17

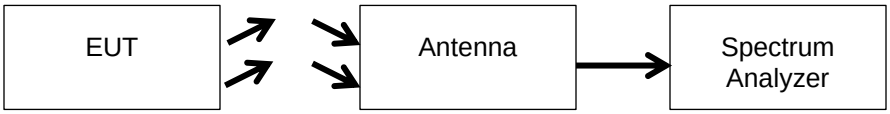
Radiated Spurious Emissions: 30 – 1000 MHz

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The output of the transmitter was connected to a non-radiating balance load. The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

All emissions from 30 MHz to the 10th harmonic were examined.
Measured Level includes antenna and receiver cable correction factors.
Correction factors were input into the spectrum analyzer before recording "Measured Level".

RBW = 100 KHz
VBW = 300 KHz
Detector – Quasi Peak

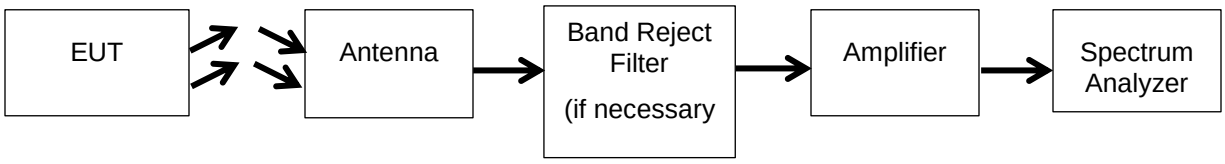
Test Setup



Test Procedure for
Radiated Spurious Emissions above 1 GHz

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The output of the transmitter was connected to a non-radiating balance load. The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

Test Setup



*Note: All modulations and protocols were investigated. Only the emissions associated with the highest amplitude modulation are included.

See Annex B for results

Emission Masks (Occupied Bandwidth)

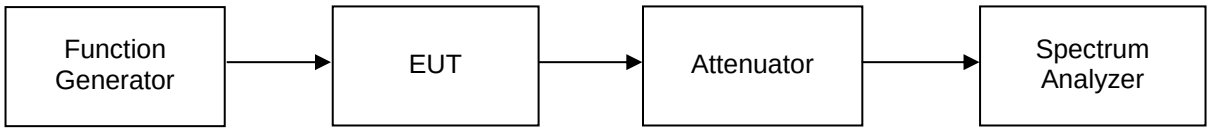
Engineer: Alex Macon

Test Date: 2/15/17

Measurement Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask. A modulation frequency of 2.5 kHz at a level of 100 mVPP was input into the EUT.

Test Setup



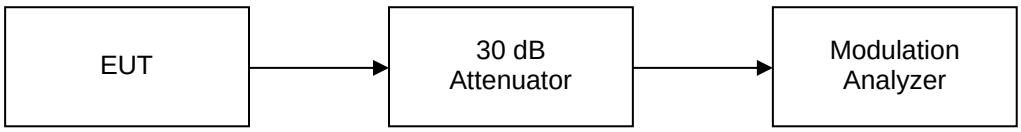
Please see Annex C for test results

Transient Frequency Behavior
Engineer: Alex Macon
Test Date: 3/5/17

Measurement Procedure

The EUT was connected directly to a modulation analyzer through a 30 dB attenuator to verify that the EUT meets the required Transient Frequency Behavior response per the specification. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.
The turn on and turn off transient timing was measured and recorded.

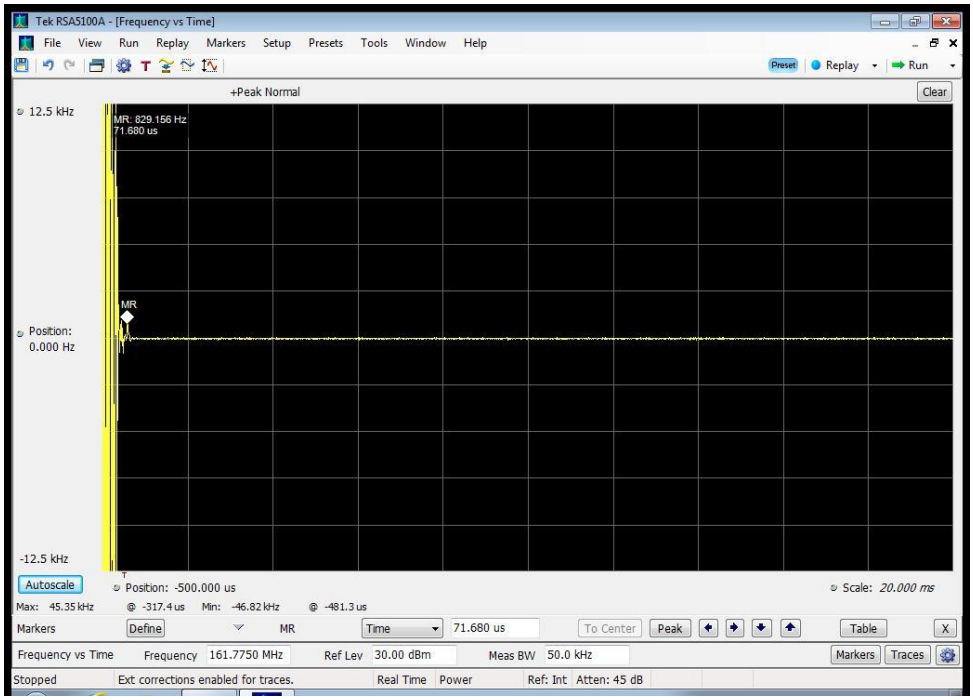
Test Setup



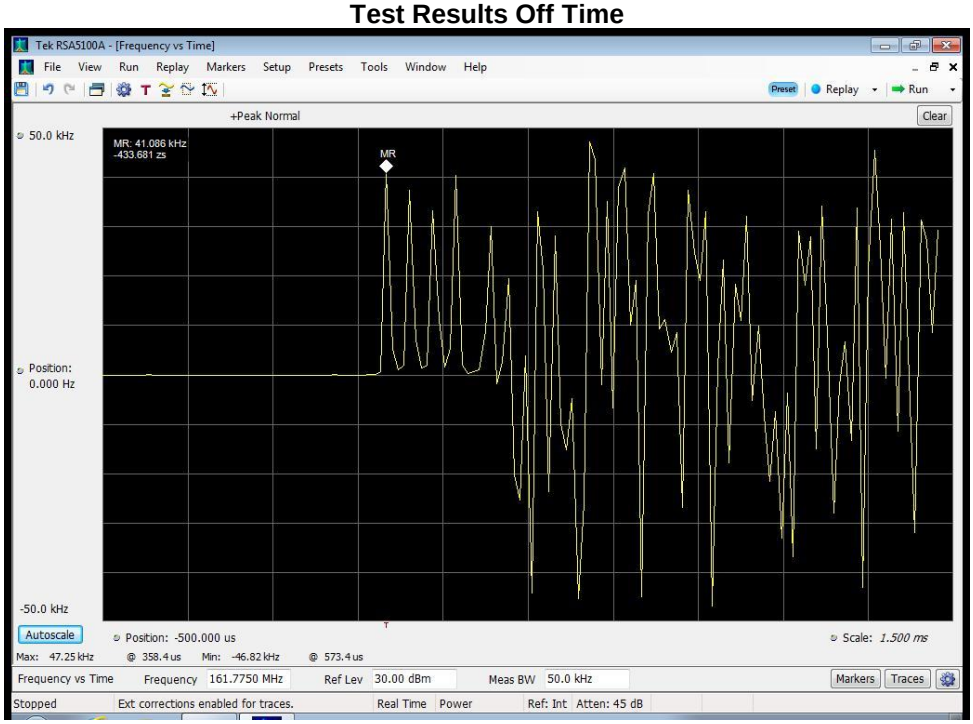
136-174 MHz Band

11K0F3E

Test Results On Time



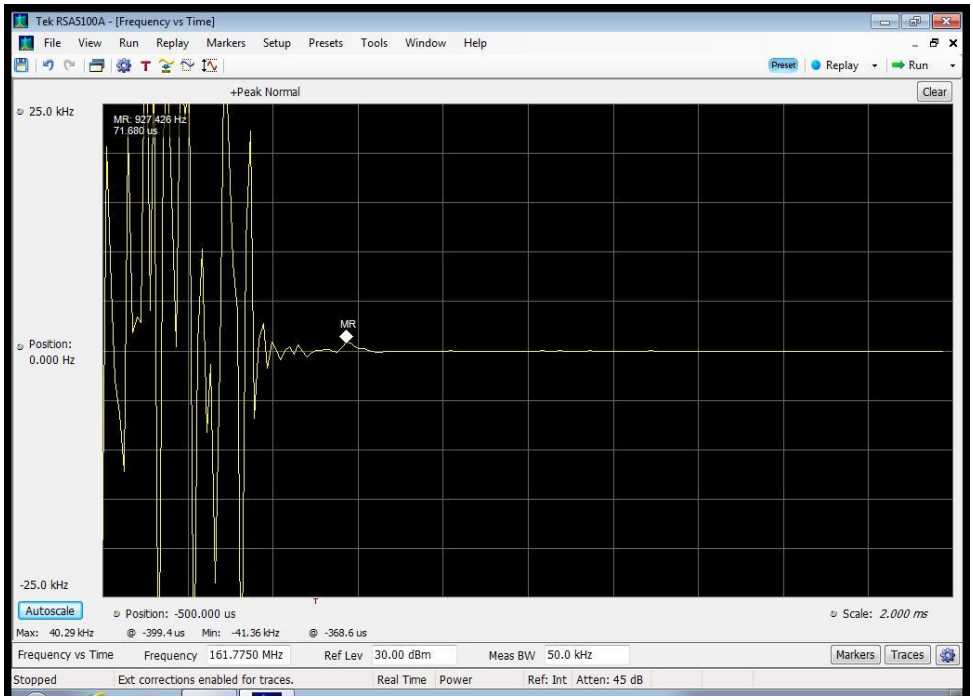
Test Results Off Time



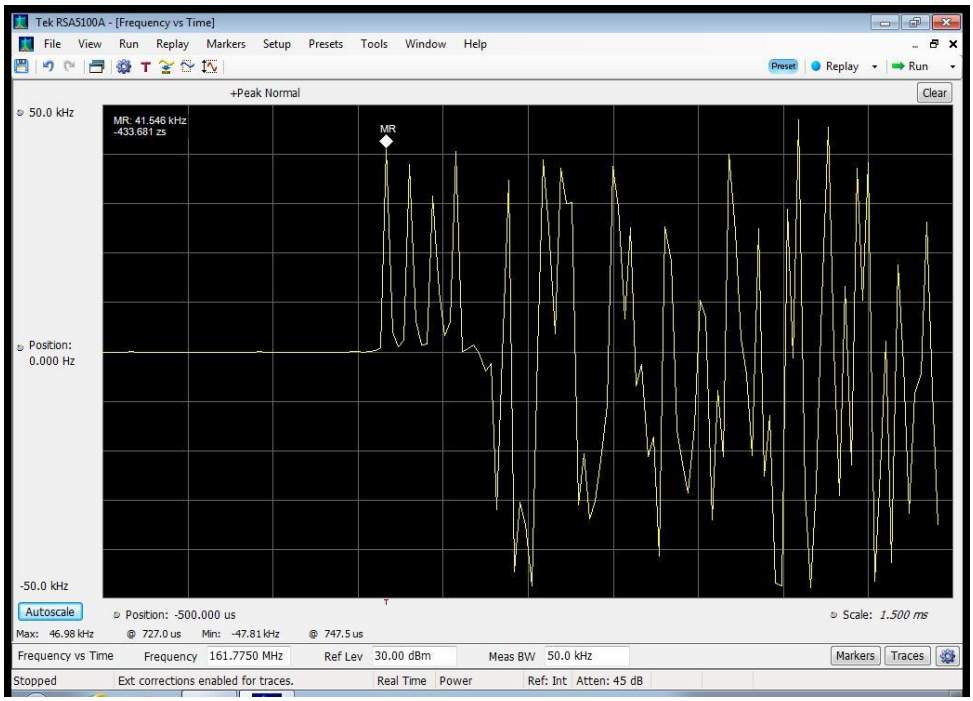
136-174 MHz Band

16K0F3E

Test Results On Time



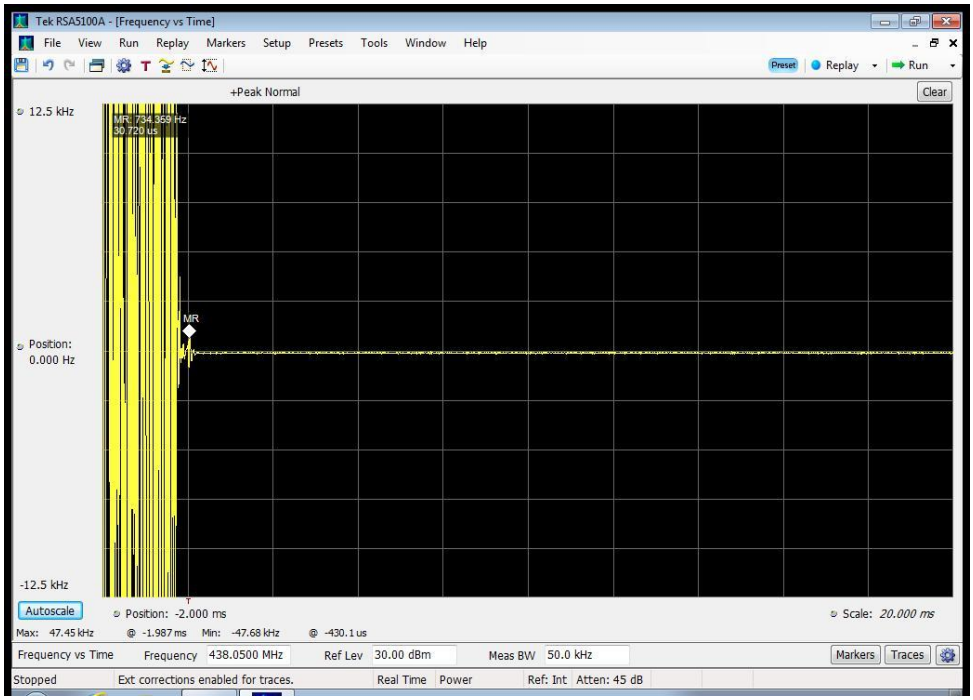
Test Results Off Time



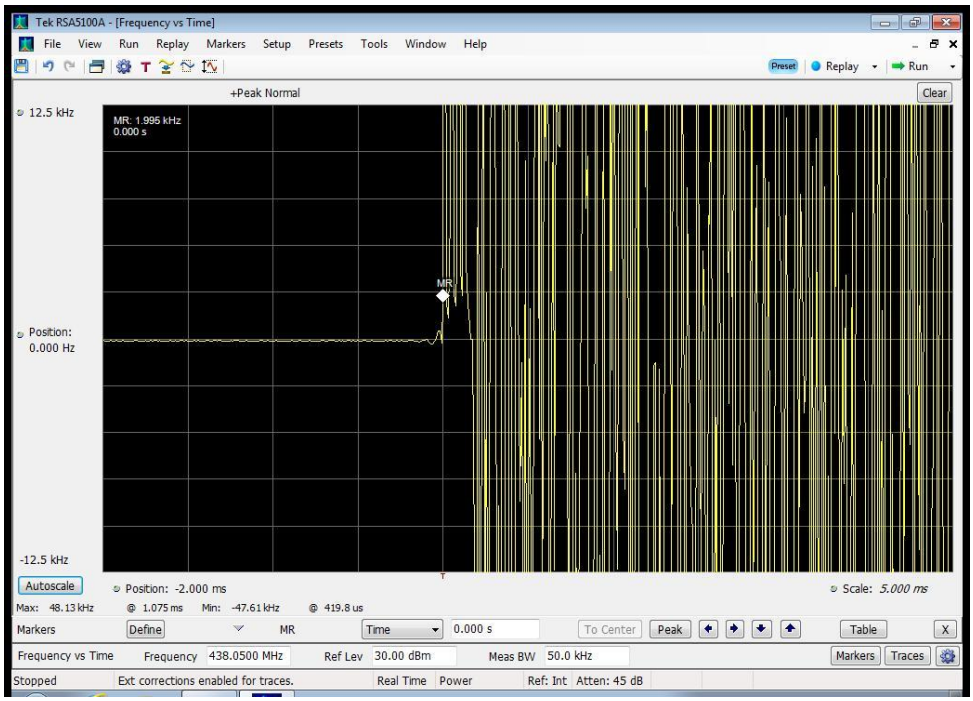
380 - 520 MHz Band

11K0F3E

Test Results On Time



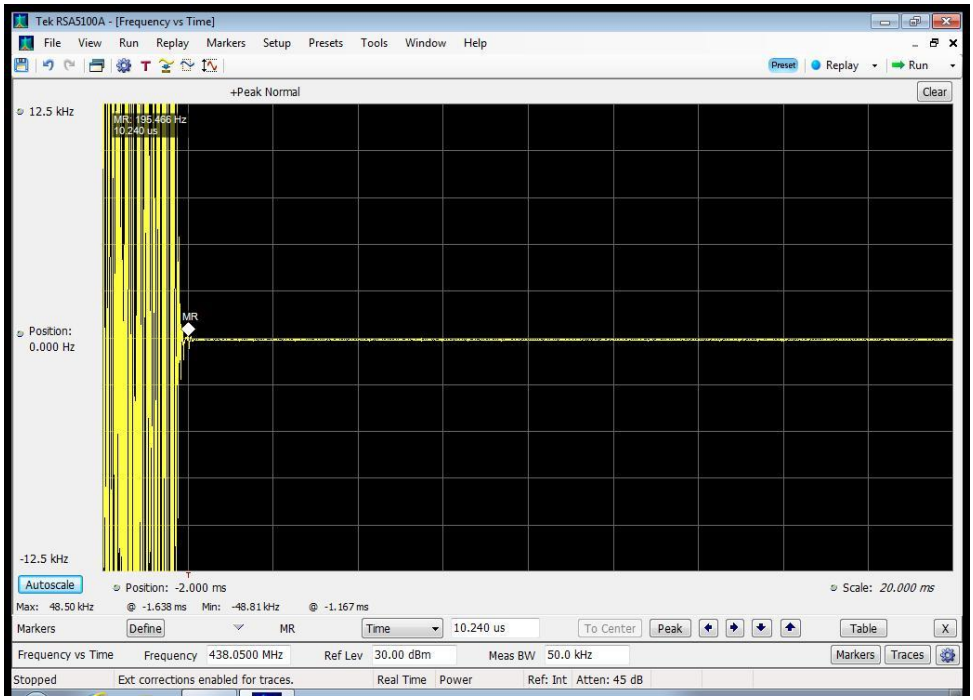
Test Results Off Time



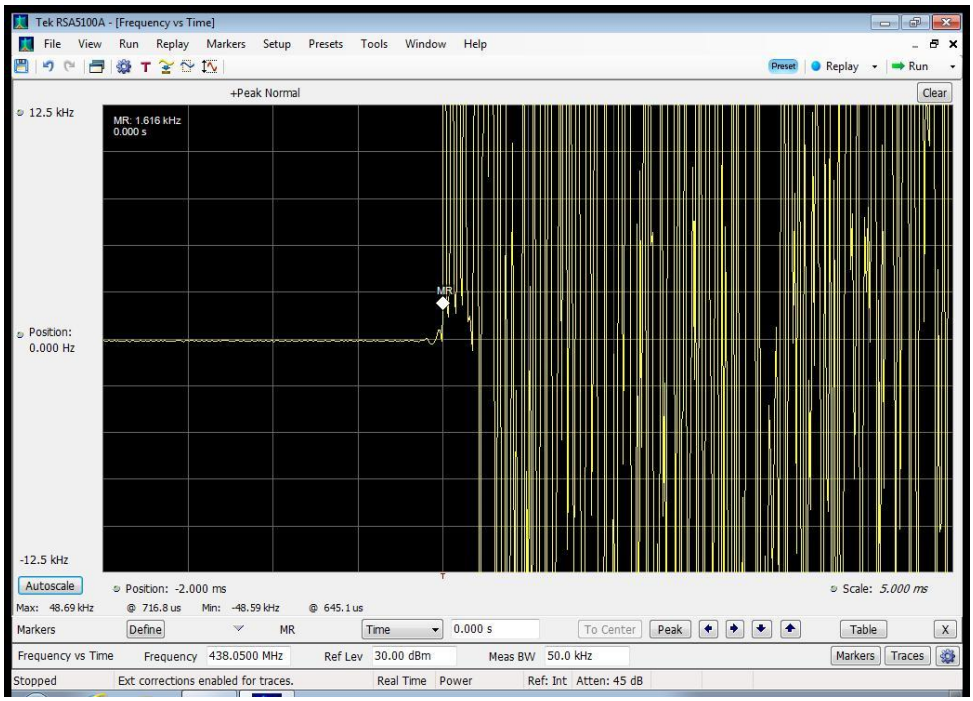
380 – 520 MHz Band

16K0F3E

Test Results On Time



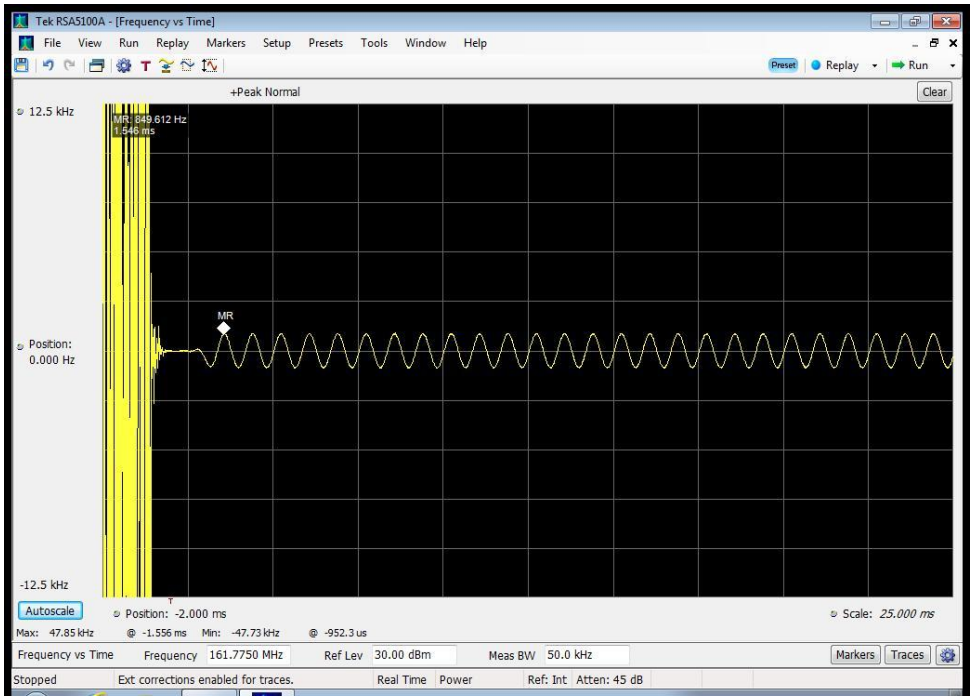
Test Results Off Time



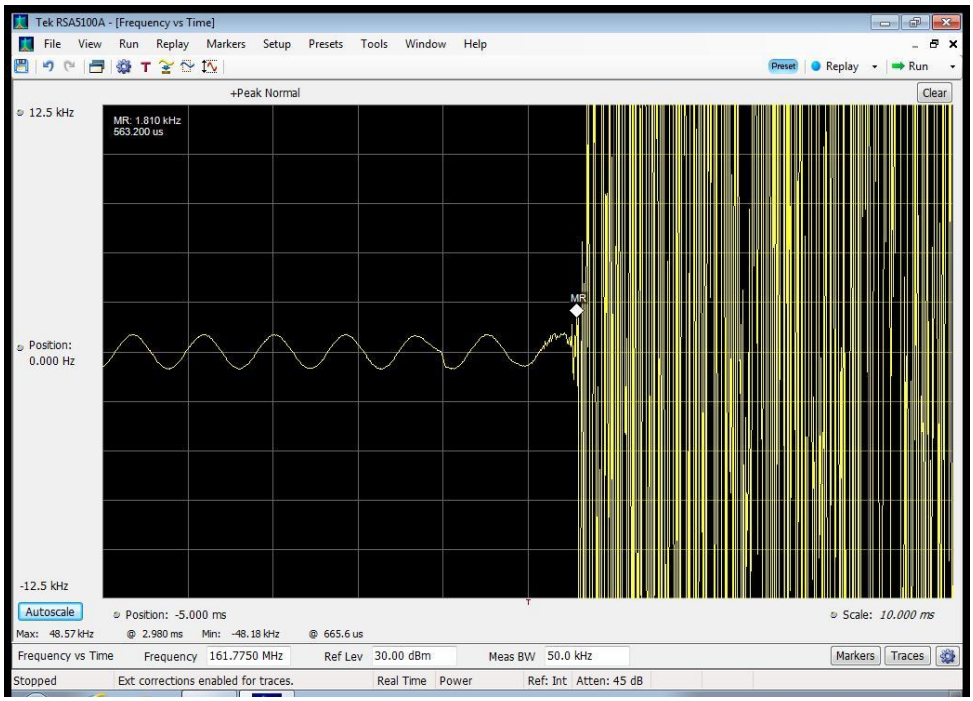
APX 136-174 MHz Band

11K0F3E

Test Results On Time



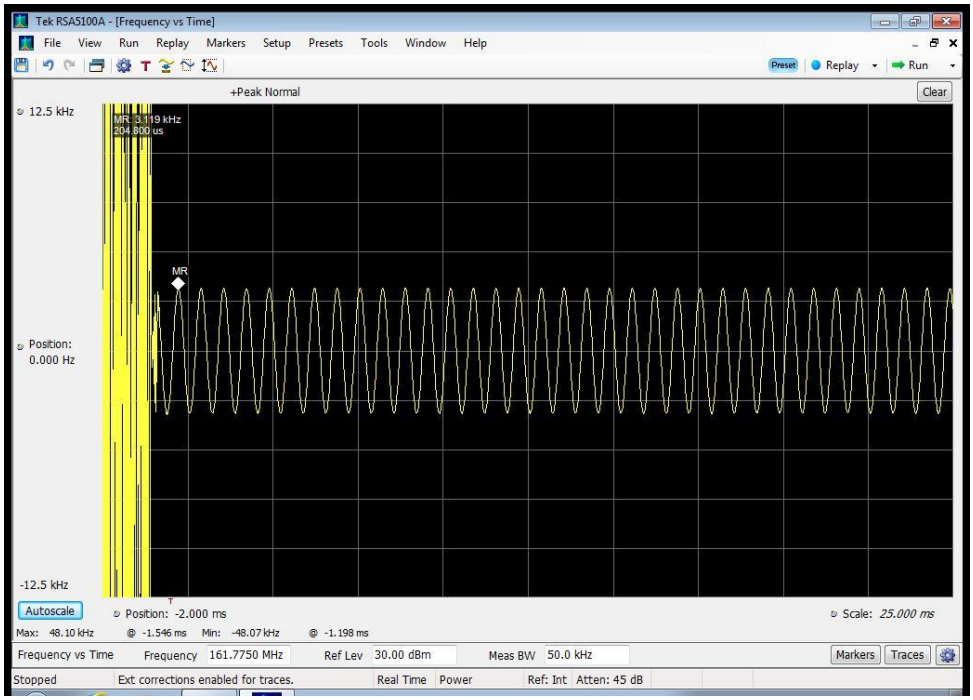
Test Results Off Time



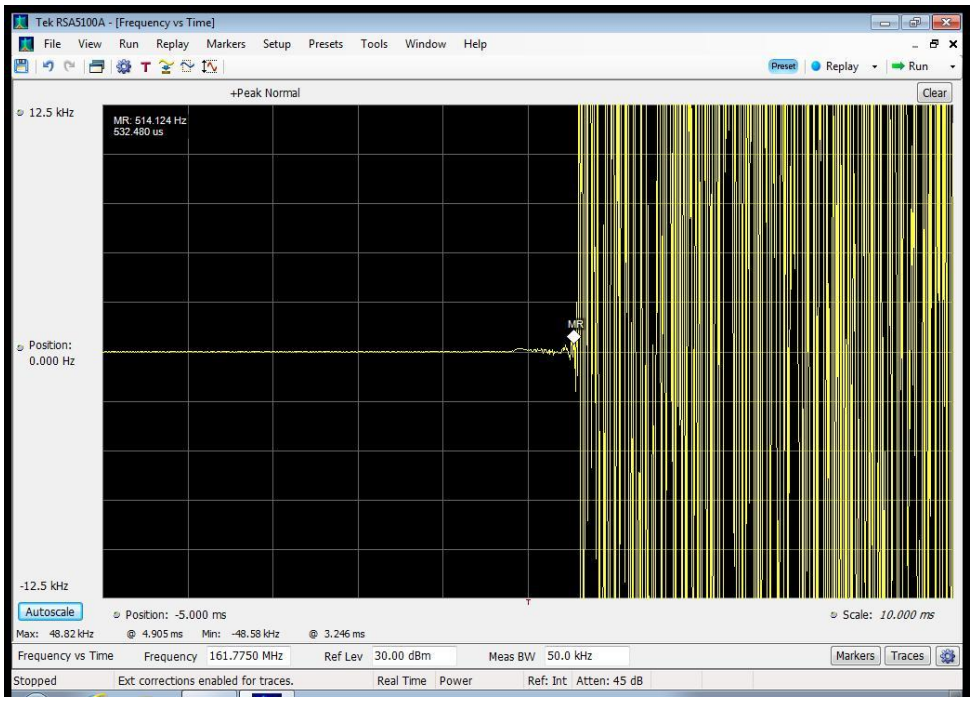
APX 136-174 MHz Band

16K0F3E

Test Results On Time



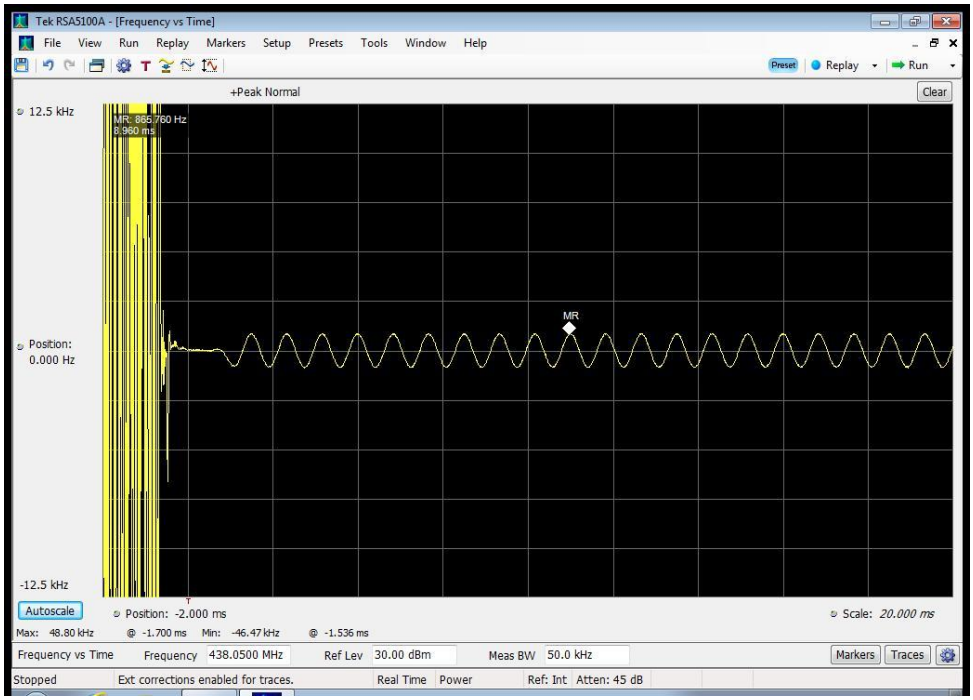
Test Results Off Time



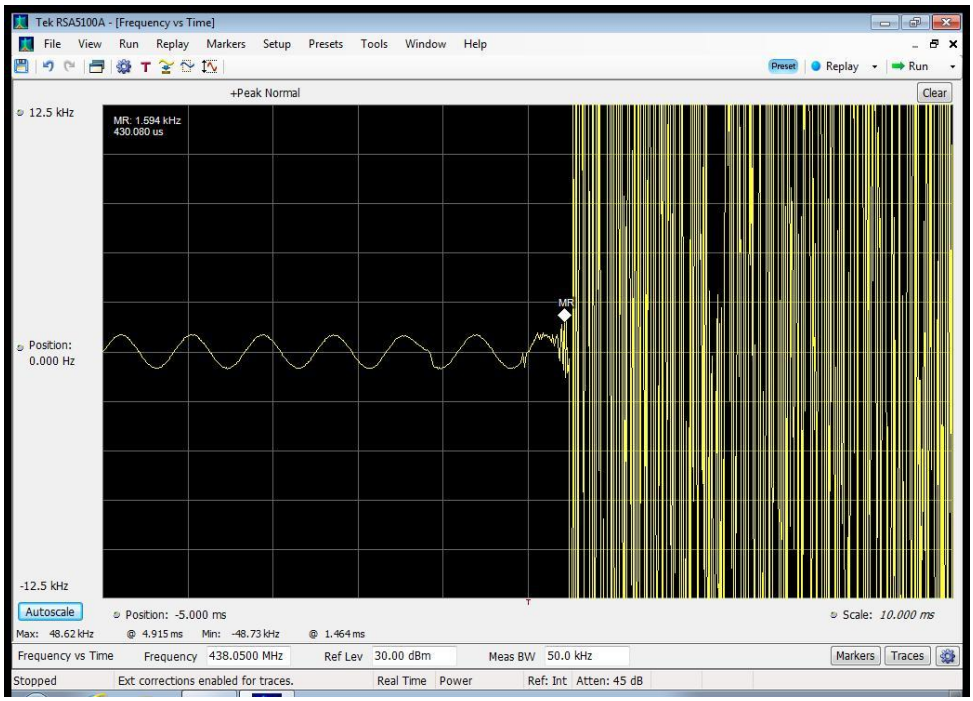
APX 380-470 MHz Band

11K0F3E

Test Results On Time



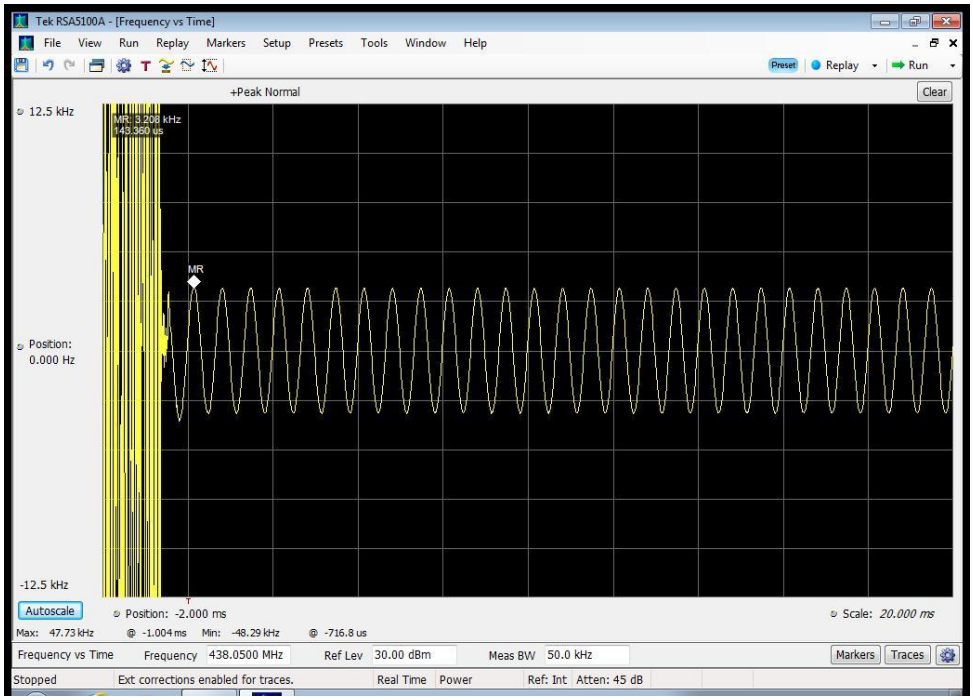
Test Results Off Time



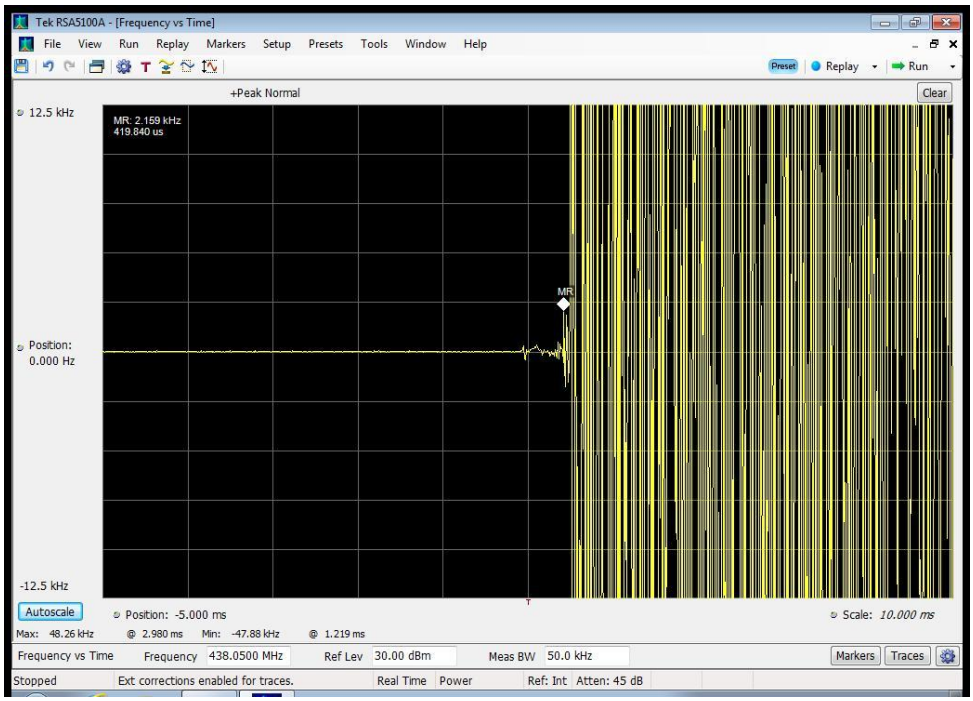
APX 380 - 470 MHz Band

16K0F3E

Test Results On Time



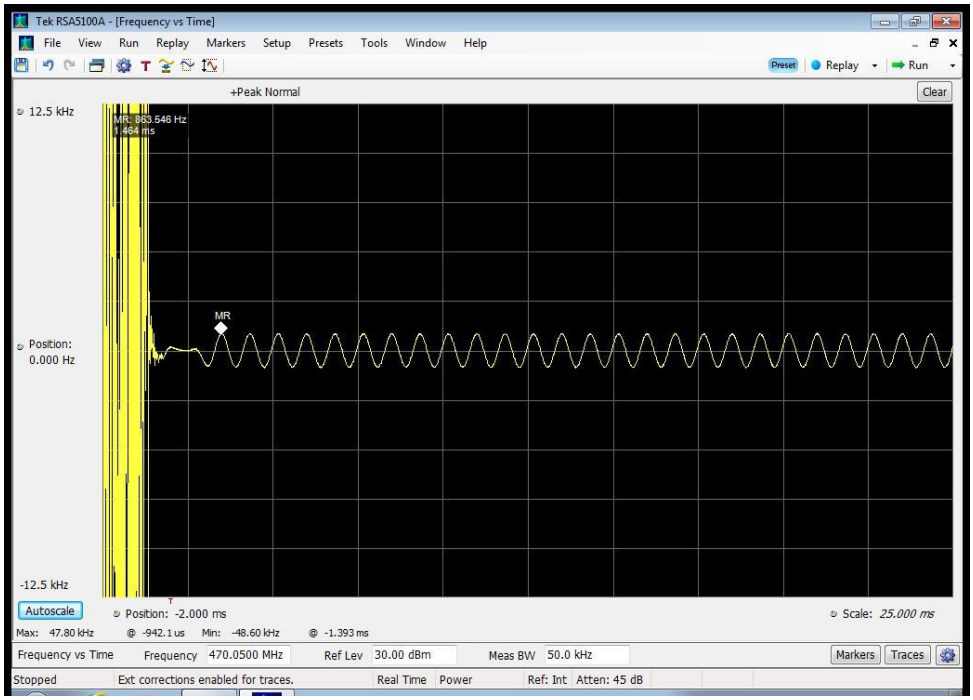
Test Results Off Time



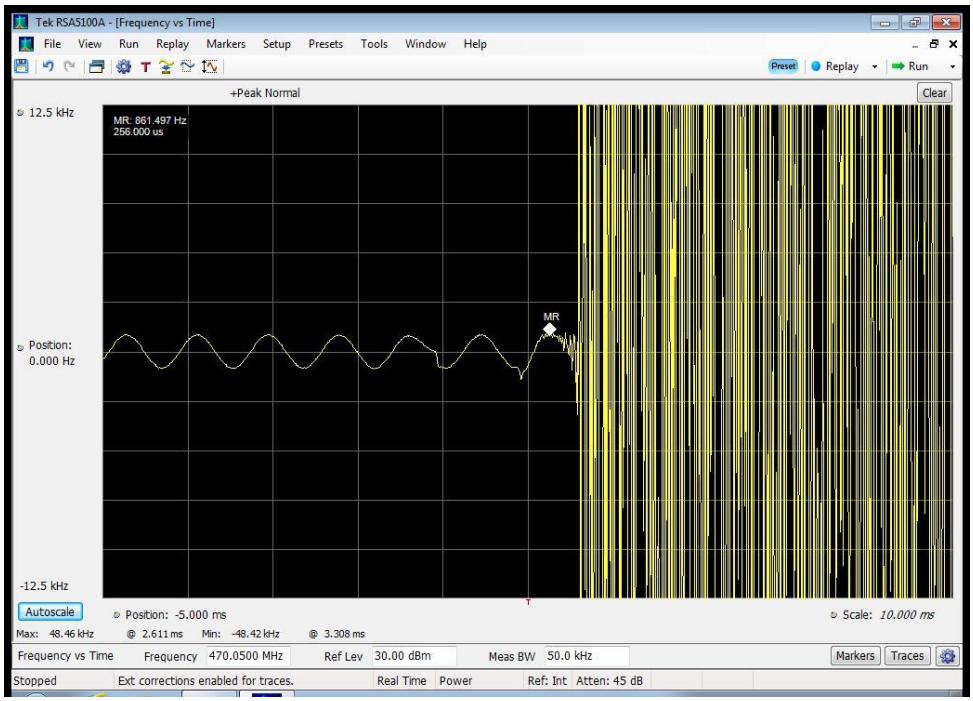
APX 450 - 520 MHz Band

11K0F3E

Test Results On Time



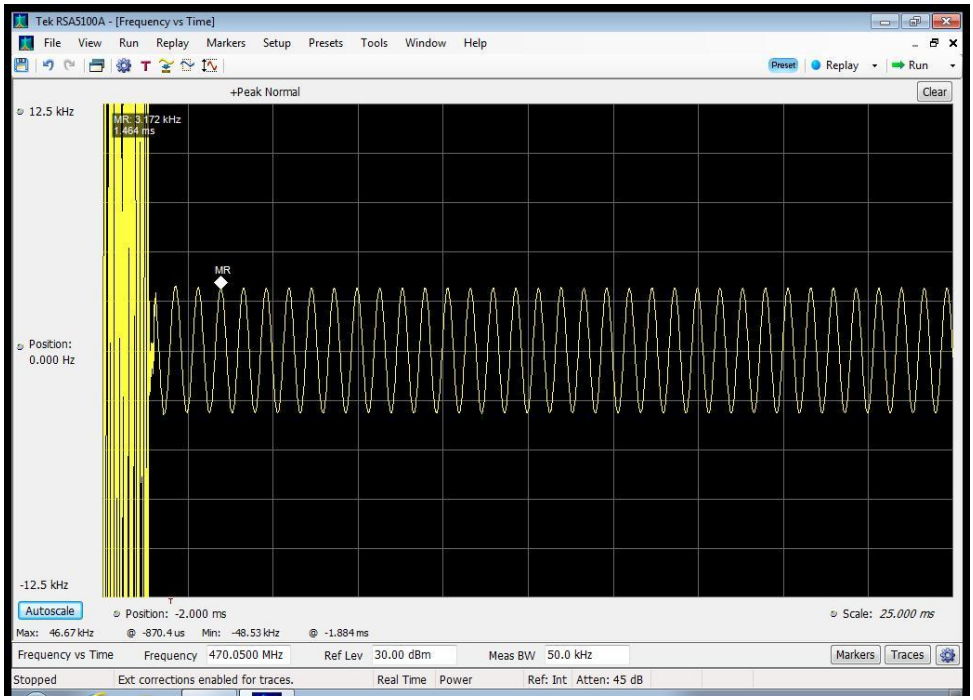
Test Results Off Time



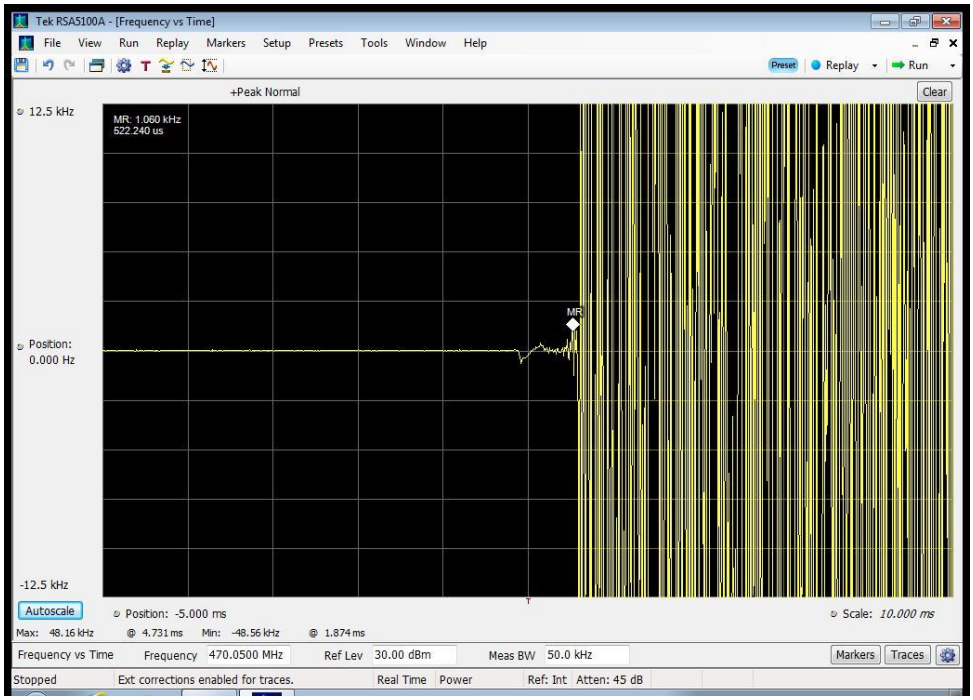
APX 450 - 520 MHz Band

16K0F3E

Test Results On Time



Test Results Off Time



Audio Low Pass Filter (Voice Input)

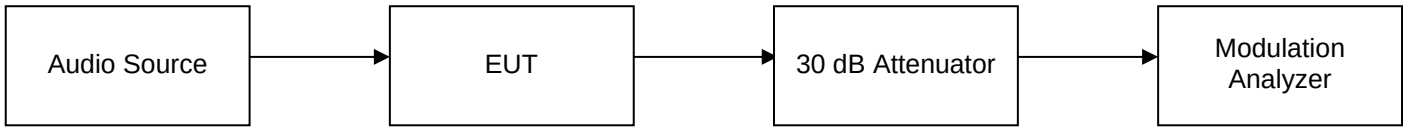
Engineer: Alex Macon

Test Date: 3/9/17

Measurement Procedure

The EUT was connected directly to a modulation analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the audio low pass filter response was measured and plotted. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Setup



Measurement Results

See Annex D for test results

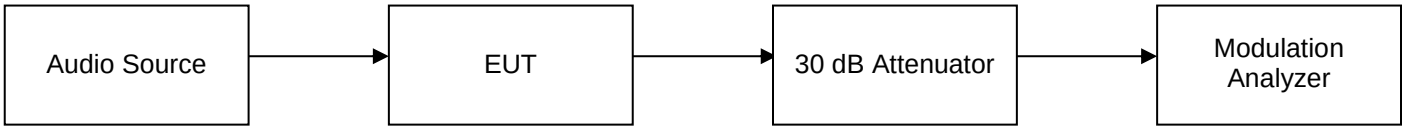
This unit is a digital radio and the roll-off for the filter is very linear in the operational band and sharp out of band.

Audio Frequency Response
Engineer: Alex Macon
Test Date: 3/9/17

Measurement Procedure

The EUT was connected directly to a modulation analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the audio frequency response was measured and plotted. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Setup



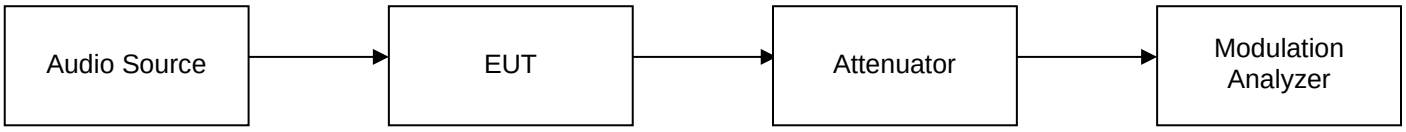
See Annex D for test results

Modulation Limiting
Engineer: Alex Macon
Test Date: 3/9/17

Measurement Procedure

The EUT was connected directly to a modulation analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the modulation limiting response was measured and plotted. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Setup



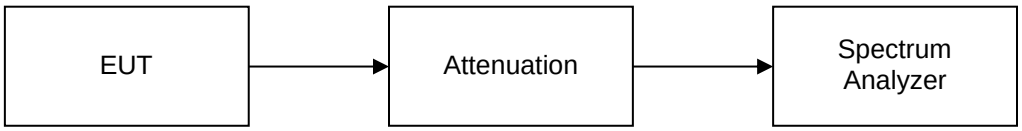
See Annex D for test results

Frequency Stability
Engineer: Alex Macon
Test Date: 2/28/17

Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected directly to a spectrum analyzer. The temperature was varied from -30°C to 50°C in 10°C increments. After a sufficient time for temperature stabilization the RF output frequency was measured. At 20°C the power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.
There was no change in frequency output during the voltage variation test.

Measurement Setup



See Annex F for test results

Necessary Bandwidth Calculations

Modulation = 6K00A3E		
Necessary Bandwidth Calculation:		
Modulation	=	3000
Necessary Bandwidth (B_N), kHz	=	2M
	=	6000 Hz

Modulation = 11K0F3E		
Necessary Bandwidth Calculation:		
Maximum Modulation (M), kHz	=	3
Maximum Deviation (D), kHz	=	2.5
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	(2xM)+(2xDxK)
	=	11.0

Modulation = 16K0F3E (RSS-119 Only)		
Necessary Bandwidth Calculation:		
Maximum Modulation (M) kHz	=	3
Maximum Deviation (D), kHz	=	5
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	(2xM)+(2xDxK)
	=	16.0

Modulation = 8K10F1E		
Necessary Bandwidth Calculation:		
Maximum Modulation (M), kHz	=	1.65
Maximum Deviation (D), kHz	=	2.5
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	(2xM)+(2xDxK)
	=	8.1

Modulation = 8K10F1W		
Necessary Bandwidth Calculation:		
Data Rate (R) Kbps	=	2.3
Maximum Deviation (D), kHz	=	2.5
Necessary Bandwidth (B_N), kHz	=	2.4D+1.0R
	=	8.1

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Temperature Chamber	Tenney	Tenney Jr	i00027	Verified on: 2/28/17	
Function Generator	HP	33120A	i00118	Verified on: 3/1/17	
Power Supply	HP	6673A	i00492	Verified on: 2/27/17	
Horn Antenna	ARA	DRG-118/A	i00271	6/16/16	6/16/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	5/26/16	5/26/17
Voltmeter	Fluke	87III	i00319	4/11/16	4/11/19
Spectrum Analyzer	Agilent	E4407B	i00331	10/19/16	10/19/17
Data Logger	Fluke	Hydra Data Bucket	i00343	4/5/16	4/5/17
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/16	8/3/18
EMI Analyzer	Agilent	E7405A	i00379	2/22/17	2/22/18
Spectrum Analyzer	Textronix	RSA5126A	i00424	3/28/16	3/28/17
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
PSA Spectrum Analyzer	Agilent	E4445A	i00471	8/30/16	8/30/17
Power Supply	HP	6673A	i00492	Verified on: 2/17/17	

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT