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Report On

Application for Grant of Equipment Authorization of the
Cubic Defense Applications
COM5000-8 5KW HF Power Amplifier

FCC CFR 47 Part 2 and Part 87

Report No. SD72109613B-0915 September 2015

REPORT ON	Radio Testing of the Cubic Defense Applications 5KW HF Power Amplifier
TEST REPORT NUMBER	SD72109613B-0915
PREPARED FOR	Cubic Defense Applications 9233 Balboa Ave., San Diego, CA 92123
CONTACT PERSON	Ed Wise Sr. Electronic Engineer (858) 505-2162 Ed.Wise@cubic.com
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: EMC/Senior Wireless Test Engineer
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory Title: EMC West General Manager
DATED	September 15, 2015

Revision History

SD72109613B-0915 Cubic Defense Applications COM5000-8 5KW HF Power Amplifier					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
09/15/15	Initial Release				Chip R. Fleury

CONTENTS

SECTION 1

REPORT SUMMARY

Radio Testing of the
Cubic Defense Applications
5KW HF Power Amplifier

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Cubic Defense Applications 5KW HF Power Amplifier to the requirements of FCC CFR 47 Part 2 and Part 87.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Cubic Defense Applications
Model Number(s)	COM5000-8
FCC ID Number	2AFTMCOM5000-8
Serial Number(s)	00001
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 2 and Part 87 (October 1, 2014).
Start of Test	August 30, 2015
Finish of Test	September 11, 2015
Name of Engineer(s)	Ferdie Custodio
Related Document(s)	• FCC CFR 47 Part 2 and Part 87 (October 1, 2014). • ANSI/TIA-603-C-2004 – Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards. • 412172 D01 Determining ERP and EIRP v01r01 (Guidelines for Determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of a RF Transmitting System. • Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2 and Part 87 are shown below.

Section	FCC Part Sections(s)	Test Description	Result
2.1	2.1046 (b)(3),(c) and 87.131	RF Power Output	Compliant
2.2	2.1055 and 87.133 (c)(1)	Frequency Stability	Compliant
2.3	2.1049 (c) and 87.135	Occupied Bandwidth	Compliant
2.4	87.139 (c) (1)/(2)/(3)	Emission Limitations	Compliant
2.5	2.1047(a)(c) and 87.141(d)	Modulation Requirements	Compliant
2.6	2.1051 and 87.139 (c) (3)	Conducted Spurious Emissions	Compliant
2.7	2.1053 and 87.139 (c) (3)	Field Strength Of Spurious Radiation	Compliant

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Cubic Defense Applications COM5000-8 5KW HF Power Amplifier as shown in the photograph below.

Equipment Under Test

1.3.2 EUT General Description

EUT Description	5KW HF Power Amplifier
Model Name	COM5000-8
Model Number(s)	COM5000-8
Rated Voltage	208VAC 3Ø 60Hz
Power Output	Nominal 5000 watts
Harmonics	≥ 63 dBc
Input Power	+13 to +23 dBm
Power Gain	53 dB nominal
Operating Frequency	2 MHz to 30 MHz
Type of Emissions	H3E and J3E
Primary Unit (EUT)	☒ Production
	☐ Pre-Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable
Emission Designator/s	2K46J3E, 2K39H3E
Impedance	50 ohm nominal
Cooling	Forced Air
Dimensions	80” x 31” x 22.12”
Weight	800 pounds (approx.)
Temperature Range	0°C to 50°C (operating) -40°C to 70°C (storage)
Relative Humidity	0%C to 95% (operating)
Duty Cycle	Continuous

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	J3E Mode. SSB with Suppressed Carrier Power: Two Tones (400Hz and 1800Hz)
B	H3E Mode. SSB with Full Carrier. Single Tone (2500 Hz)
C	CW Mode. Exciter only (T-4180 multi-mode DSP)

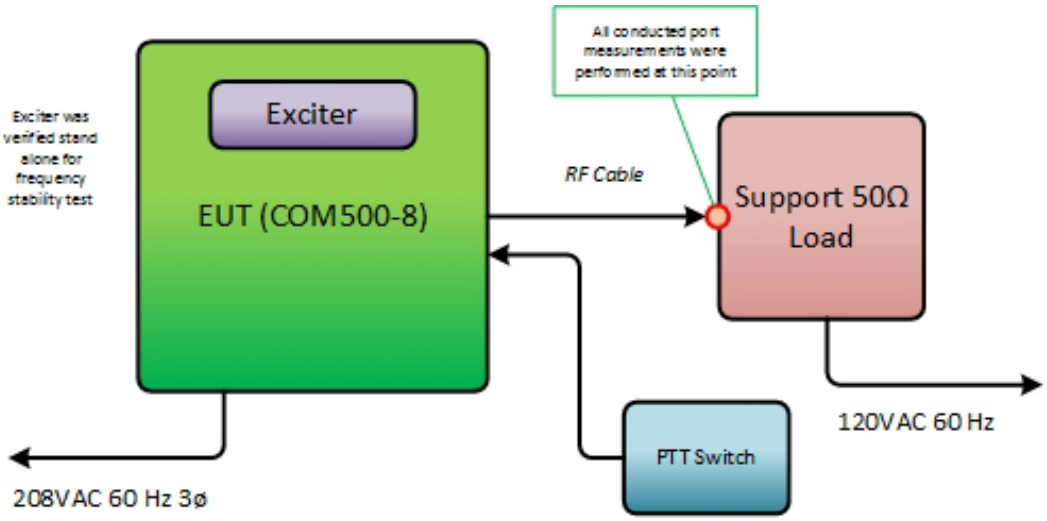
1.4.2 EUT Exercise Software

None. No special software was used during evaluation.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Termaline	Coaxial Resistor (dummy load)	Model 8931-115SC13 S/N 060200160 50Ω 10kW
-	RF output cable to support dummy load	3.0 meters, shielded, RG-393 coaxial cable with LC RF connector
Cubic	PTT Remote Switch for Exciter	2.4 meters, 24 AWG, shielded with DB15 connector (AMP)
-	Power Cable	2.0 meters, unshielded 10 AWG 4-wires, hardwired on one end with 120/208V 3ØY 30A plug on the other end.

1.4.4 Simplified Test Configuration Diagram



1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number 00001		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
For conducted (if applicable) and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY

1.8.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

1.8.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

1.9 SAMPLE CALCULATIONS

1.9.1 EUT Emission Designator

Emission Designator = 3K00J3E
3K00 = 3kHz Bandwidth Designator
J = Single-sideband, suppressed carrier
3 = A single channel containing analog information
E = Telephony (including sound broadcasting)

1.9.2 Spurious Radiated Emission (below 1GHz)

Measuring equipment raw measurement (dBµV/m) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dBµV/m) @ 30MHz			**11.8**

1.9.3 Spurious Radiated Emission – Substitution Method

Example = 84dBµV/m @ 1413 MHz (numerical sample only)

The field strength reading of 84dBµV/m @ 1413 MHz (2nd Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dBµV/m level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is -18dBm, then we have the following for both EIRP and ERP as required:

P_{EIRP} = -18 dBm + 7.8 dBi – 1dB
= 11.2 dBm
P_{ERP} = P_{EIRP} – 2.15 dB
= 11.2 dBm – 2.15 dB
= 9.05 dBm

SECTION 2

TEST DETAILS

Radio Testing of the
Cubic Defense Applications
5KW HF Power Amplifier

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

2.1 TRANSMITTER CONDUCTED OUTPUT POWER

2.1.1 Specification Reference

Part 2.1046 (b)(3) and (c), Part 87.131

2.1.2 Standard Applicable

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as follows. In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.
(3) As an alternative to paragraphs (b) (1) and (2) of this section other tones besides those specified may be used as modulating frequencies, upon a sufficient showing of need. However, any tones so chosen must not be harmonically related, the third and fifth order intermodulation products which occur must fall within the−25 dB step of the emission bandwidth limitation curve, the seventh and ninth order intermodulation product must fall within the 35 dB step of the referenced curve and the eleventh and all higher order products must fall beyond the −35 dB step of the referenced curve
(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§87.131 Power and Emissions

The following table lists authorized emissions and maximum power. Power must be determined by direct measurement.

Class of station	Frequency band/frequency	Authorized emission(s)[9]	Maximum power[1]
Aeronautical enroute and aeronautical fixed	HF	R3E, H3E, J3E, J7B, H2B, J2D	6 kw.

2.1.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration A and B

2.1.4 Date of Test/Initial of test personnel who performed the test

September 08, 2015/FSC

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	25.0 °C
Relative Humidity	44.5 %
ATM Pressure	99.9 kPa

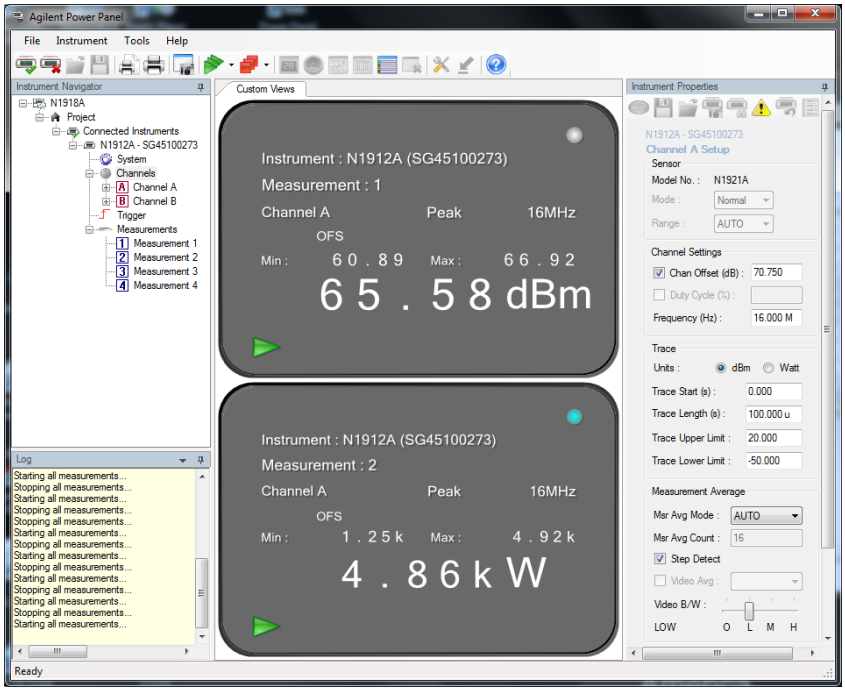
2.1.7 Additional Observations

- This is a conducted test using a peak power meter.
- A 70.75 dB offset was used for the High Power Directional Coupler and Cables correction factor.
- Measurement performed using client provided power meter and verified with TUV power meter. Results were identical.

2.1.8 Test Results

Modulation	Test Conditions	Transmitter Output Power (dBm)		
		2 MHz	*16 MHz*	*30 MHz*
J3E	208V 3Ø 60Hz @ 20°C	65.10	66.00	64.10
H3E		66.76	66.92	66.34

2.1.9 Sample Test Plot



H3E Full Carrier @ 16 MHz

2.2 FREQUENCY STABILITY

2.2.1 Specification Reference

Part 2.1055, Part 87.133 (c)(1)

2.2.2 Standard Applicable

(c) For single-sideband transmitters, the tolerance is: All aeronautical stations on land = 10 Hz.

2.2.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration C

2.2.4 Date of Test/Initial of test personnel who performed the test

September 10, 2015/FSC

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Mira Mesa facility.

Ambient Temperature	25.0 °C
Relative Humidity	44.5 %
ATM Pressure	98.6 kPa

2.2.7 Additional Observations

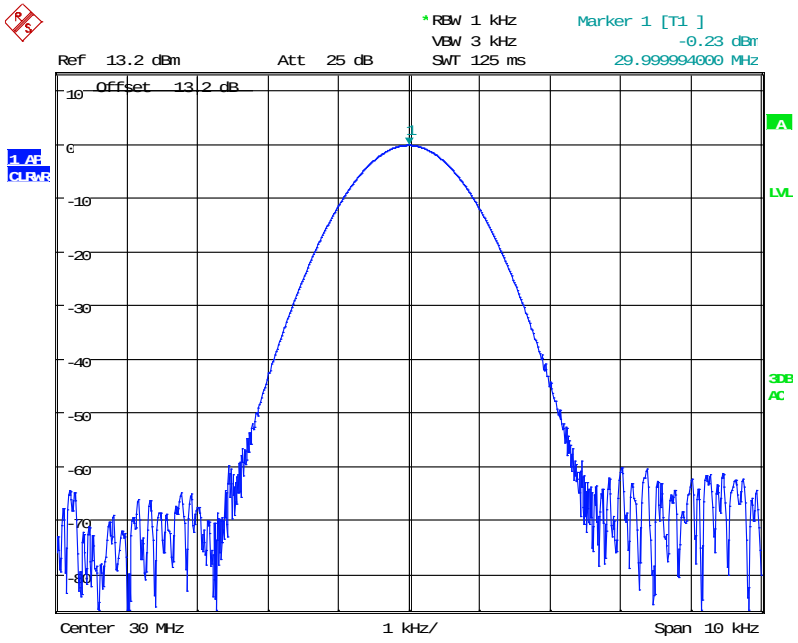
- This is a conducted test. Only the Exciter (size limitation) was verified in this test.
- The Temperature was reduced to -30°C and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The EUT is then powered with output source set to CW. Measurement was performed on reference high channel (30MHz). The temperature was then increased by 10°C steps and allowed to settle before taking the next set of measurements. EUT is "on" only during actual measurement time.
- Voltage variation was also performed at 85% and 115% of the nominal voltage.

2.2.8 Test Results

Voltage (%)	Power (VAC)	Temp (°C)	Frequency (MHz)	Max. Frequency Deviation (Hz)	Deviation Limit (Hz)
100	120.0	-30	30 Mhz	-6.0	±10 Hz

100	120.0	-20	30 MHz	-2.0	±10 Hz
100		-10		-6.0	
100		0		-6.0	
100		+10		-6.0	
100		+20		-6.0	
100		+30		-2.0	
100		+40		-6.0	
100		+50		-6.0	
115	138.0	+20		-6.0	
85	102.0	+20		-6.0	

2.2.9 **Sample Test Plots**



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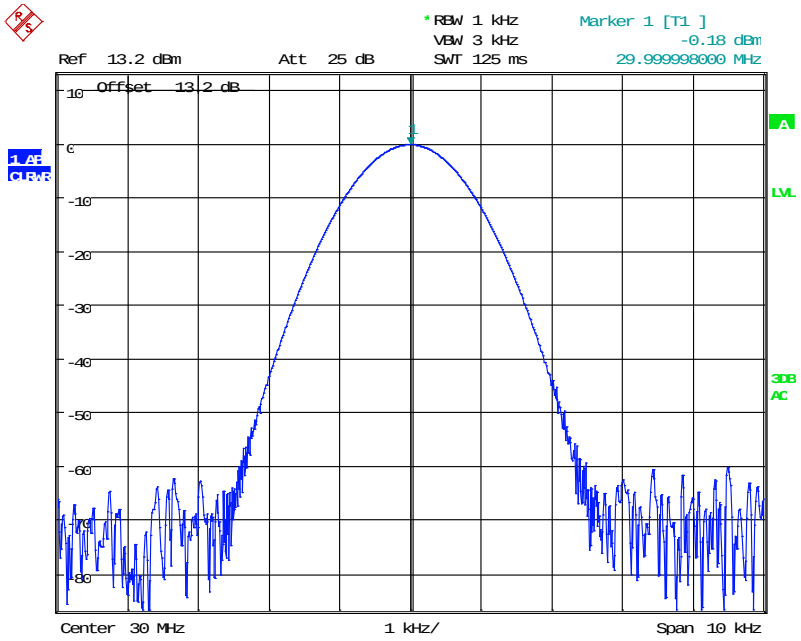
EUT @-30°C (Nominal Voltage)



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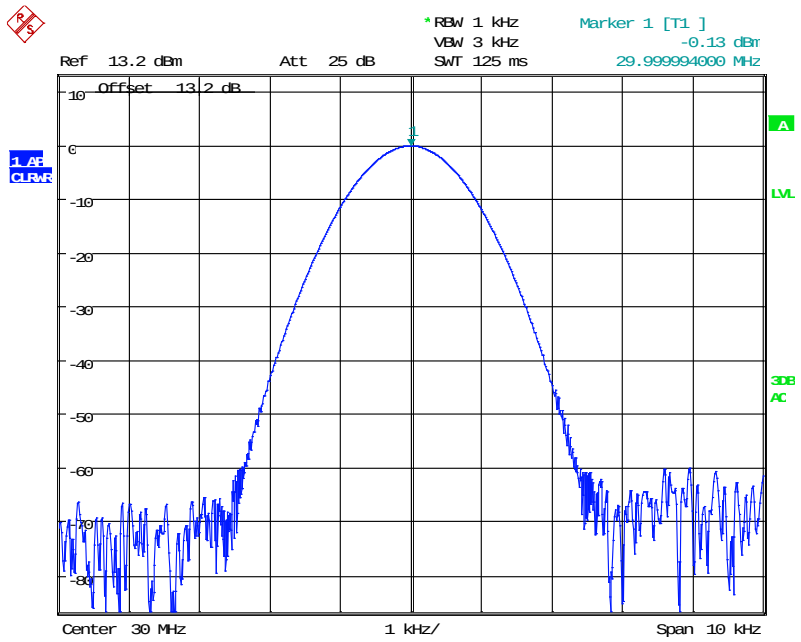
EUT @-20°C (Nominal Voltage)



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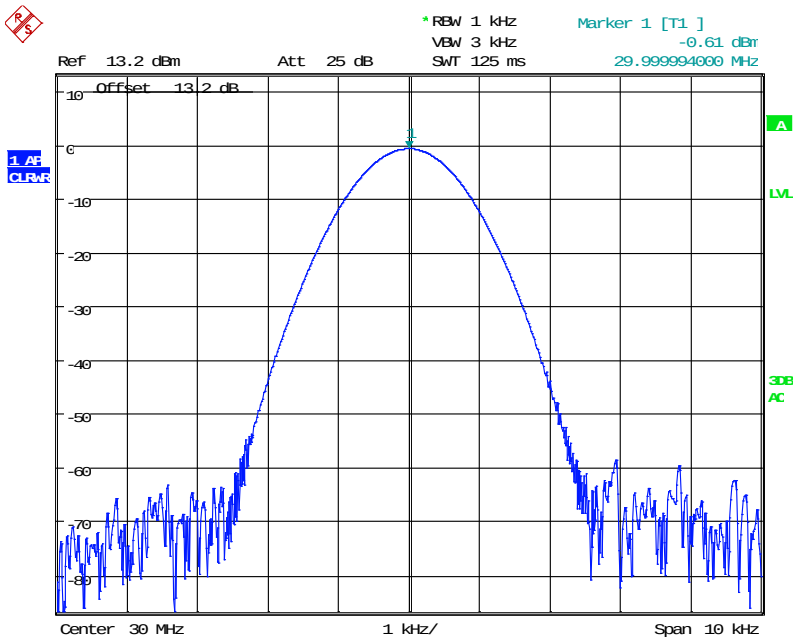
EUT @-10°C (Nominal Voltage)



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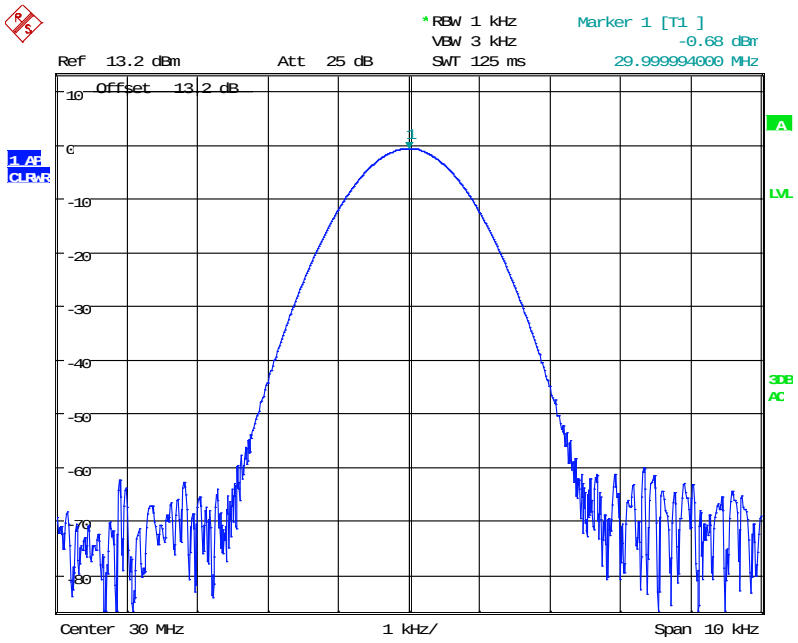
EUT @0°C (Nominal Voltage)



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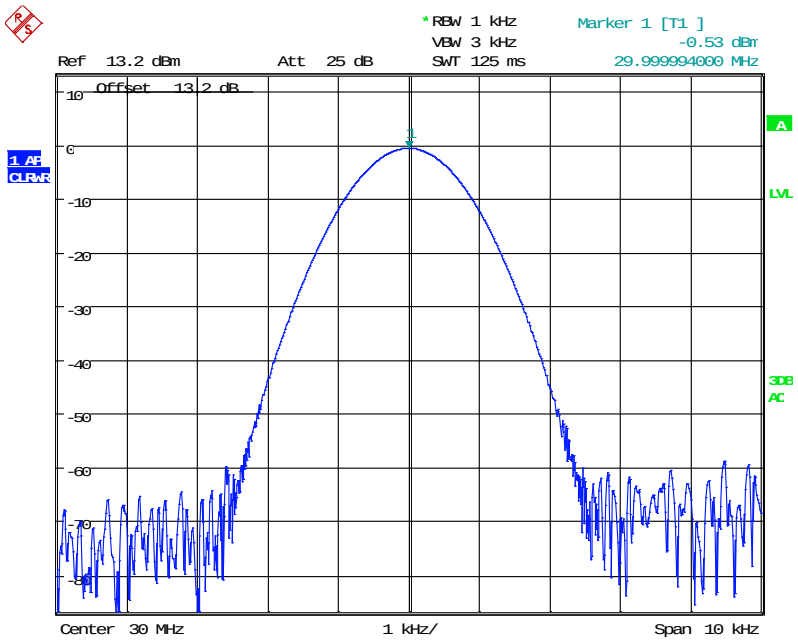
EUT @10°C (Nominal Voltage)



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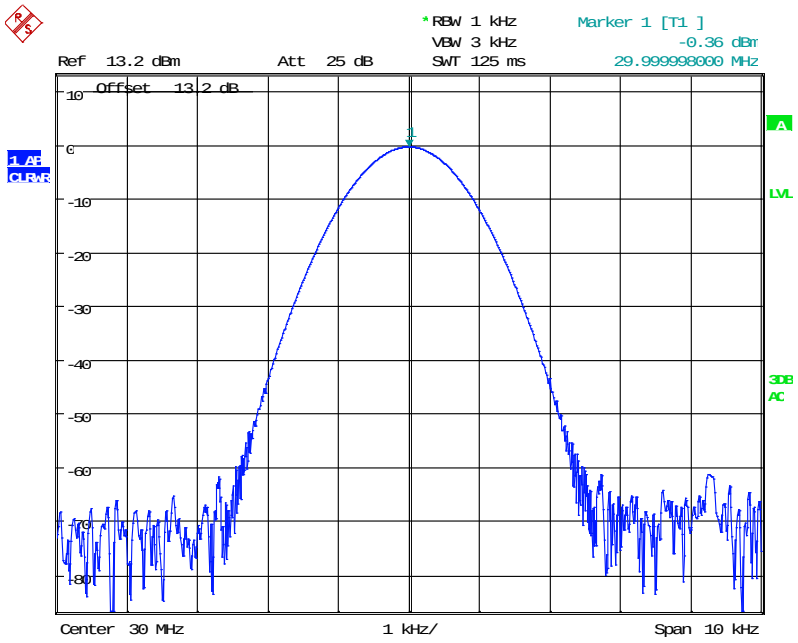
EUT @ 20°C (Nominal Voltage/ 138 VAC/ 102VAC)



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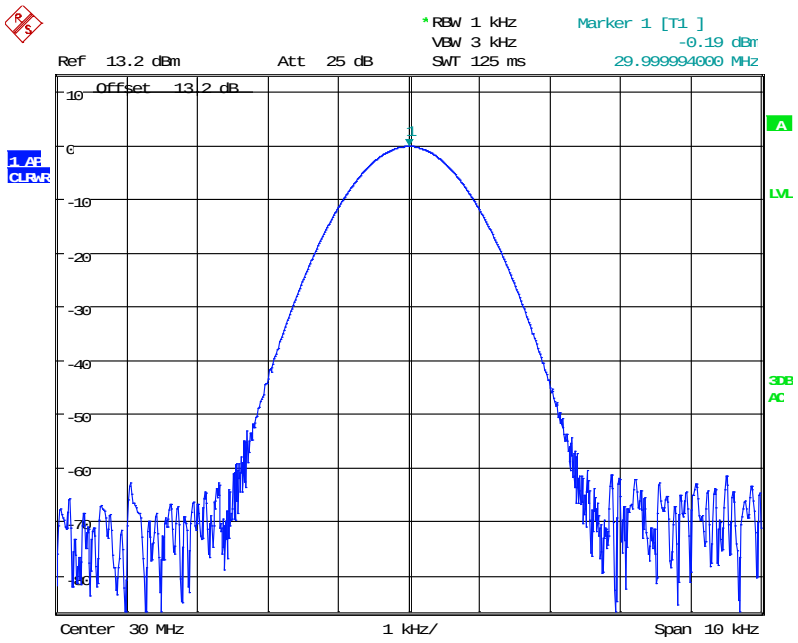
EUT @ 30°C (Nominal Voltage)



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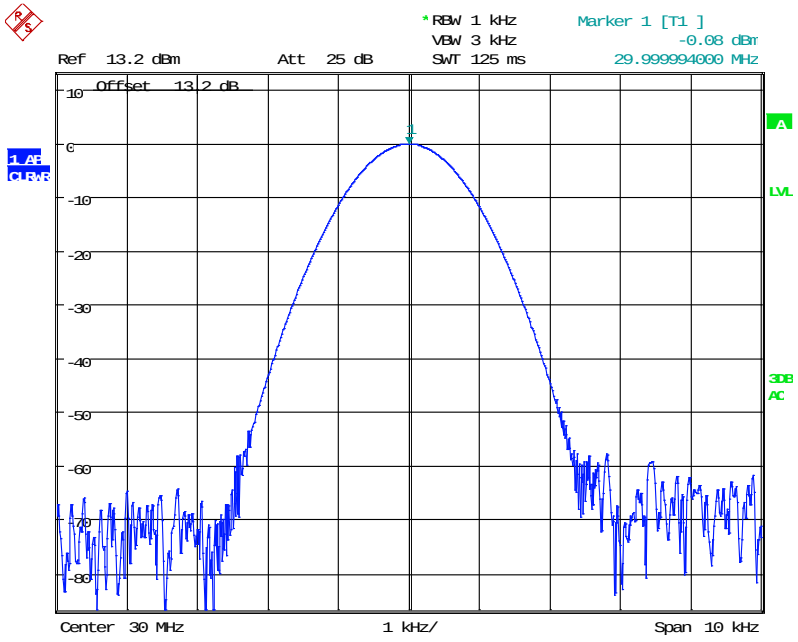
EUT @ 40°C (Nominal Voltage)



Date: 10.SEP.2015 13:35:49

EUT @ 50°C (Nominal Voltage)

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

Part 2.1049 (c), Part 87.135

2.3.2 Standard Applicable

Occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5 percent of the total mean power of a given emission.

2.3.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration A and B

2.3.4 Date of Test/Initial of test personnel who performed the test

August 30, 2015/FSC

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	25.4 °C
Relative Humidity	43.5 %
ATM Pressure	99.5 kPa

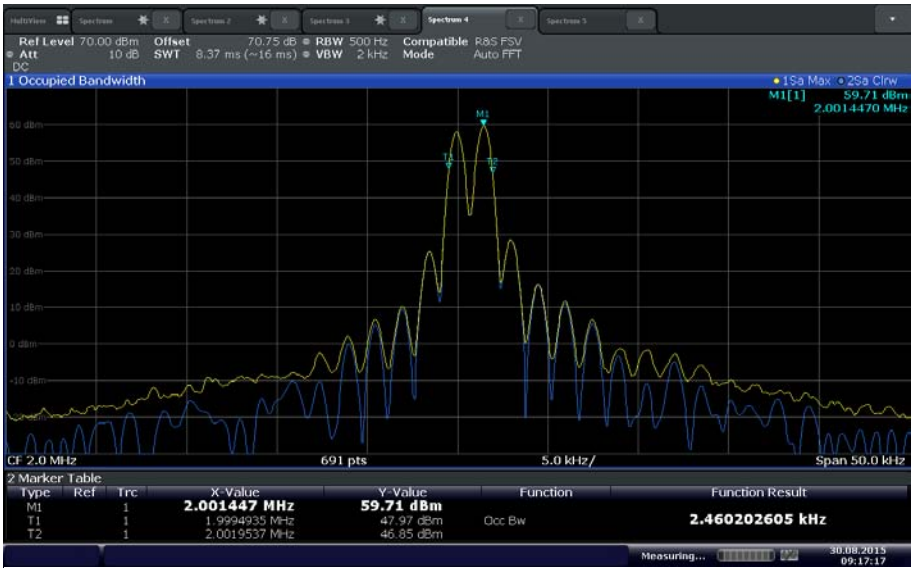
2.3.7 Additional Observations

- This is a conducted test. Both 26dB bandwidth and 99% occupied bandwidth presented.
- All channels for each carrier mode (J3E and H3E) verified.
- The RBW is set to 1% of the span while the VBW is 3X RBW.
- The audio level was adjusted 10dB greater than that necessary to produce rated peak envelope power, however EUT has ALC function and no difference was observed.
- The SA built-in emission bandwidth measurement feature is utilized. The power level setting is set to 99% while “x dB” is set to -26.

2.3.8 Results

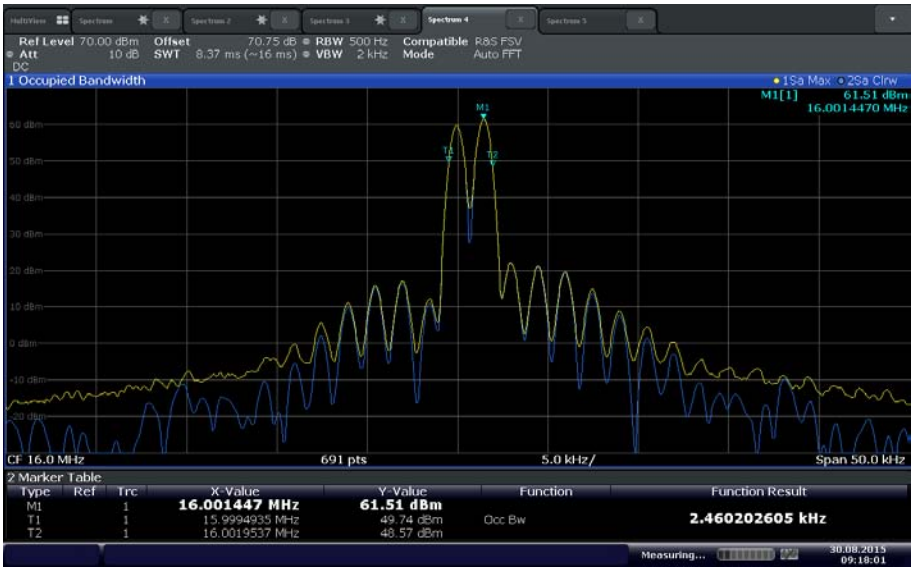
Complies. Both 99% OBW and 26dB BW presented complies with 3 kHz authorized bandwidth.

J3E 2MHz (99% OBW)



Date: 30.AUG.2015 09:17:18

J3E 16MHz (99% OBW)



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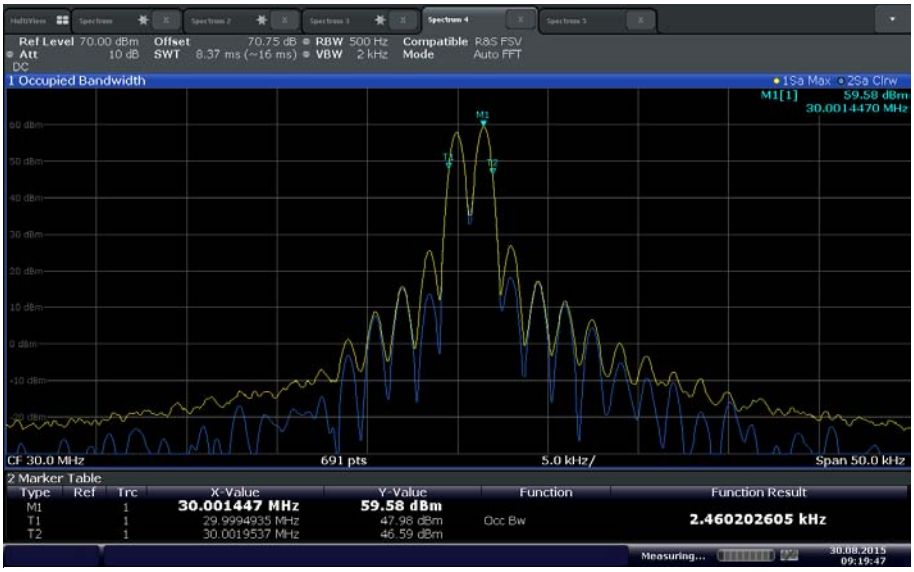
J3E 30MHz (99% OBW)



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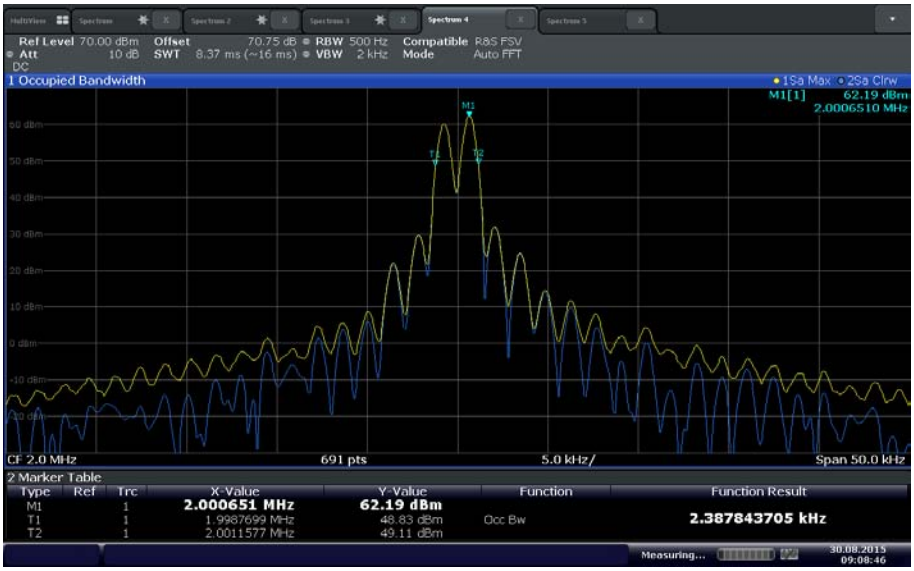
H3E 2MHz (99% OBW)



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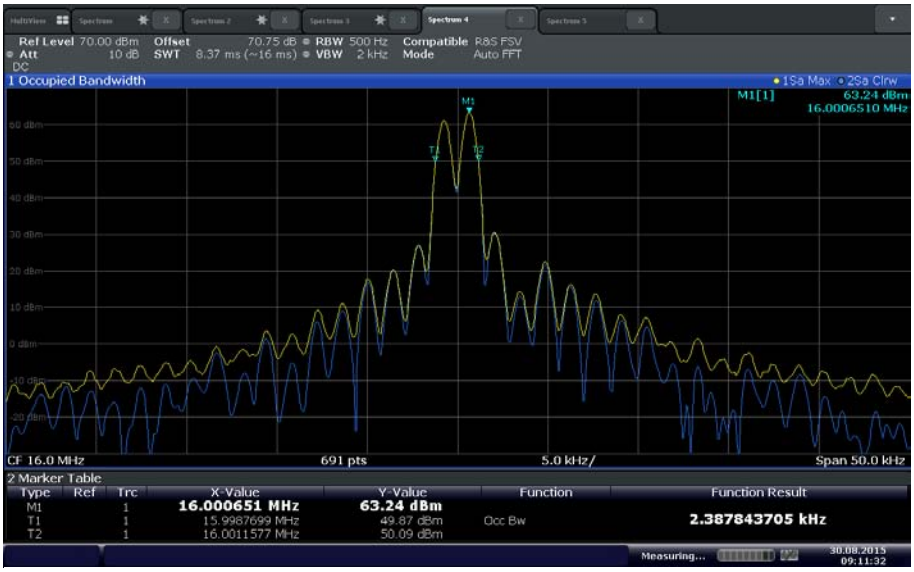
H3E 16MHz (99% OBW)



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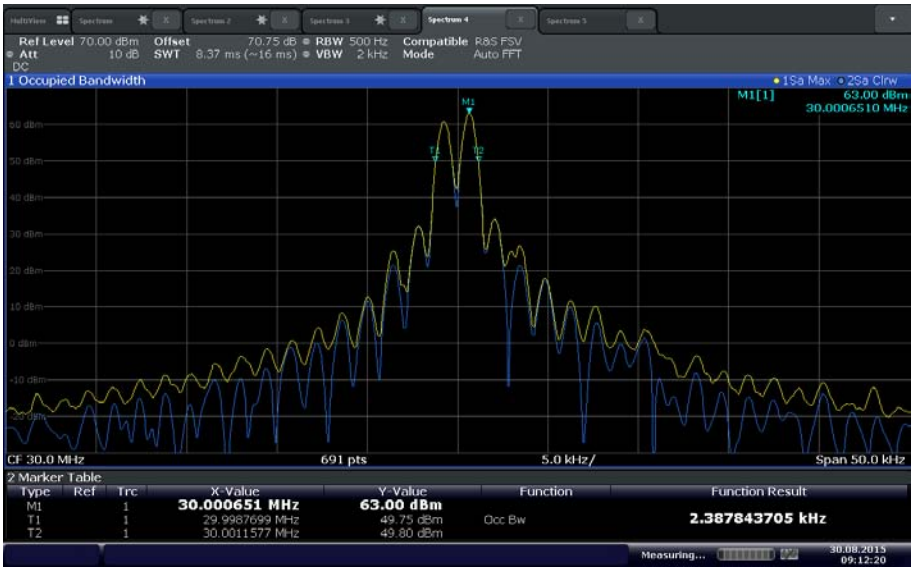
H3E 30MHz (99% OBW)



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J3E 2MHz (26dB BW)

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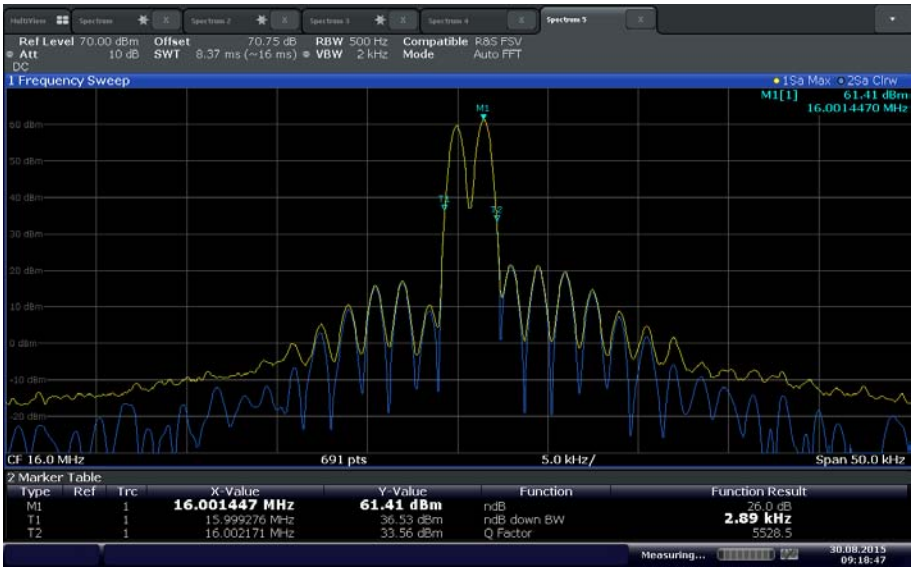
J3E 16MHz (26dB BW)



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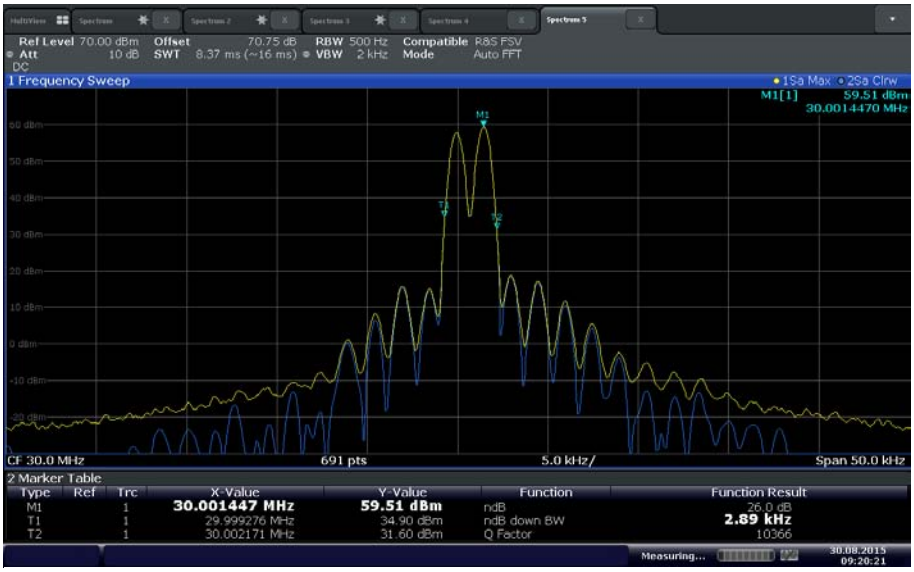
J3E 30MHz (26dB BW)



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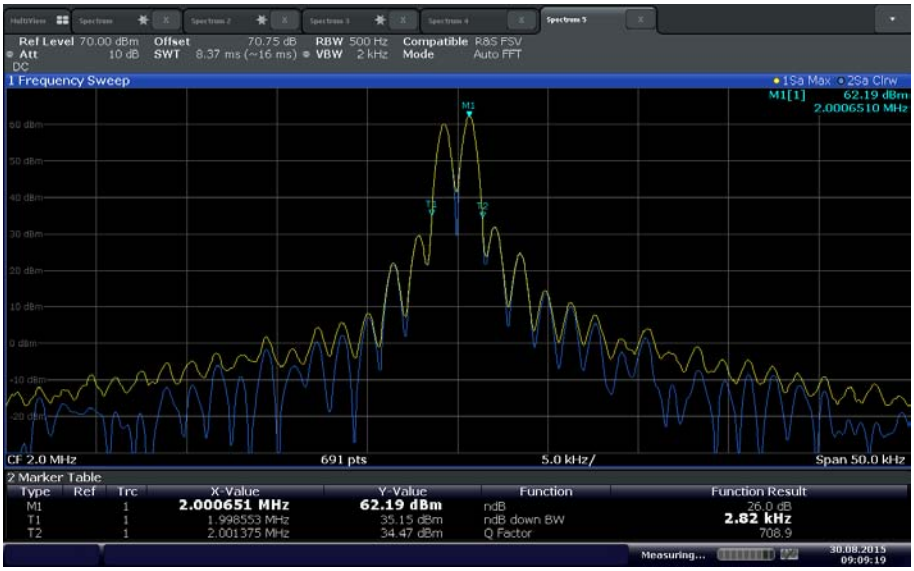
H3E 2MHz (26dB BW)



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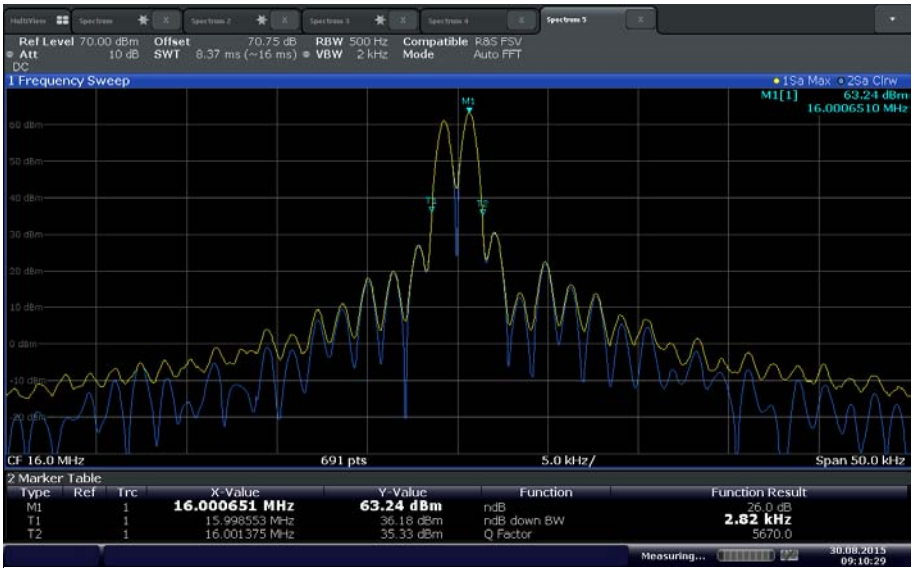
H3E 16MHz (26dB BW)



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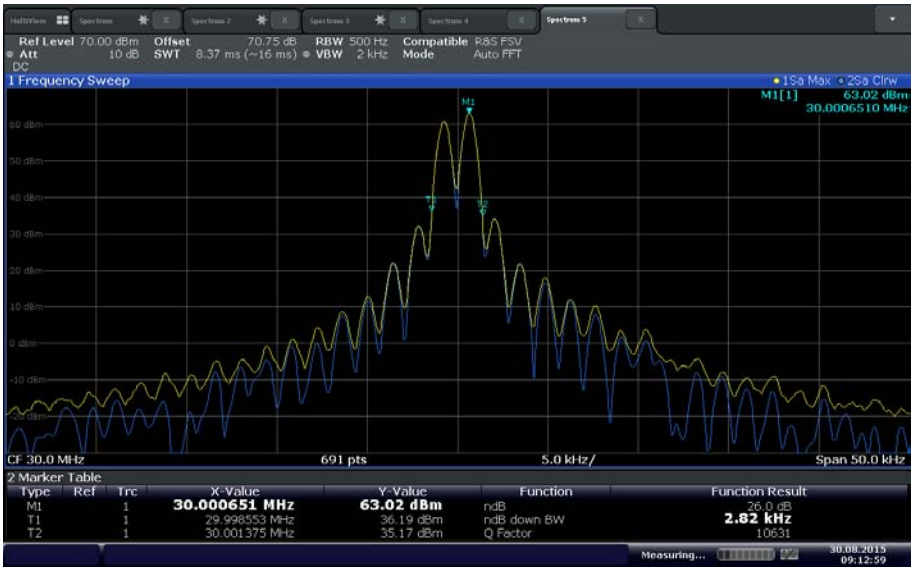
H3E 30MHz (26dB BW)



Date: 30.AUG.2015 09:12:59

2.4 EMISSION LIMITATIONS

2.4.1 Specification Reference

Part 87.139 (c)(1)/(2)/(3)

2.4.2 Standard Applicable

(c) For aircraft station transmitters first installed after February 1, 1983, and for aeronautical station transmitters in use after February 1, 1983, and using H2B, H3E, J3E, J7B or J9W, the peak envelope power of any emissions must be attenuated below the peak envelope power of the transmitter (pX) as follows:
(1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 150 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 30 dB.
(2) When the frequency is removed from the assigned frequency by more than 150 percent up to and including 250 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 38 dB.
(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth of 3.0 kHz for aircraft transmitters the attenuation must be at least 43 dB. For aeronautical station transmitters with transmitter power up to and including 50 watts the attenuation must be at least 43 + 10 log10 pX dB and with transmitter power more than 50 watts the attenuation must be at least 60 dB.

2.4.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration A and B

2.4.4 Date of Test/Initial of test personnel who performed the test

August 29, 2015/FSC

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	25.2 °C
Relative Humidity	44.4 %
ATM Pressure	99.7kPa

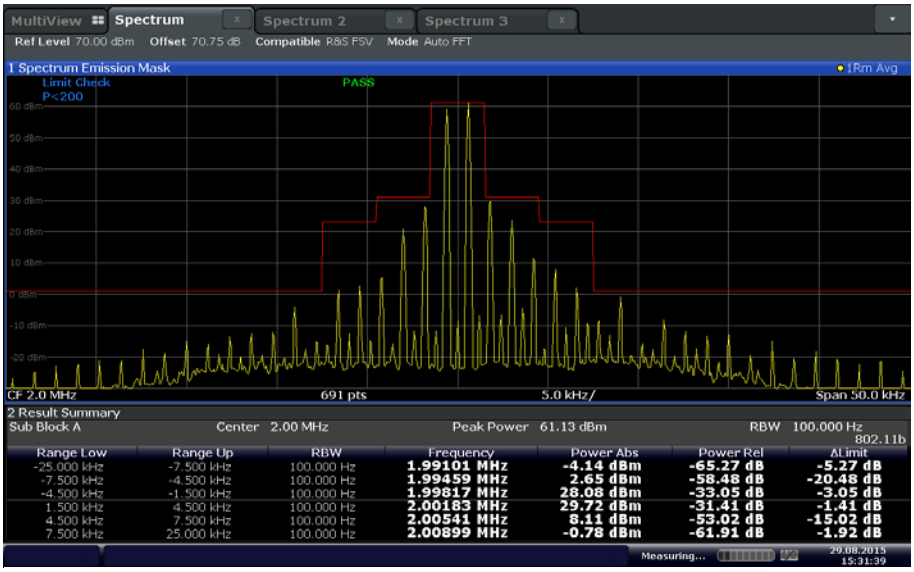
2.4.7 Additional Observations

- This is a conducted test.
- All channels for each carrier mode (J3E and H3E) verified.
- Spectrum Mask measuring mode of the spectrum analyzer was used for this test.

2.4.8 Results

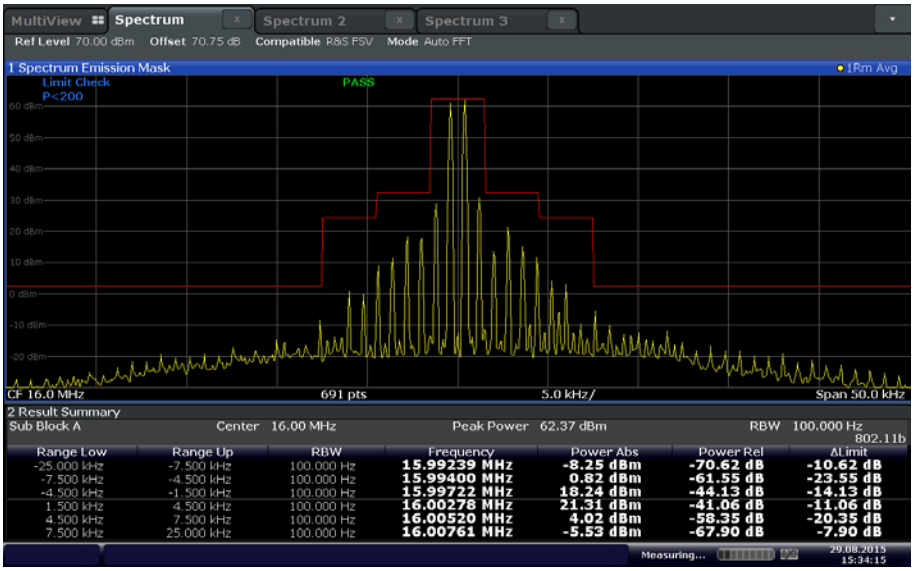
Complies. See attached plots.

H3E 2MHz



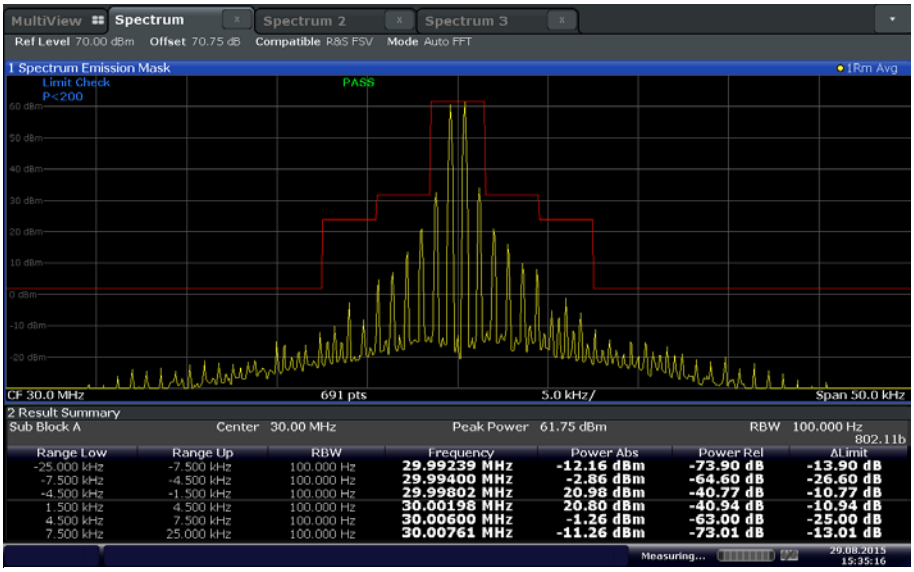
Date: 29 AUG 2015 15:31:39

H3E 16MHz



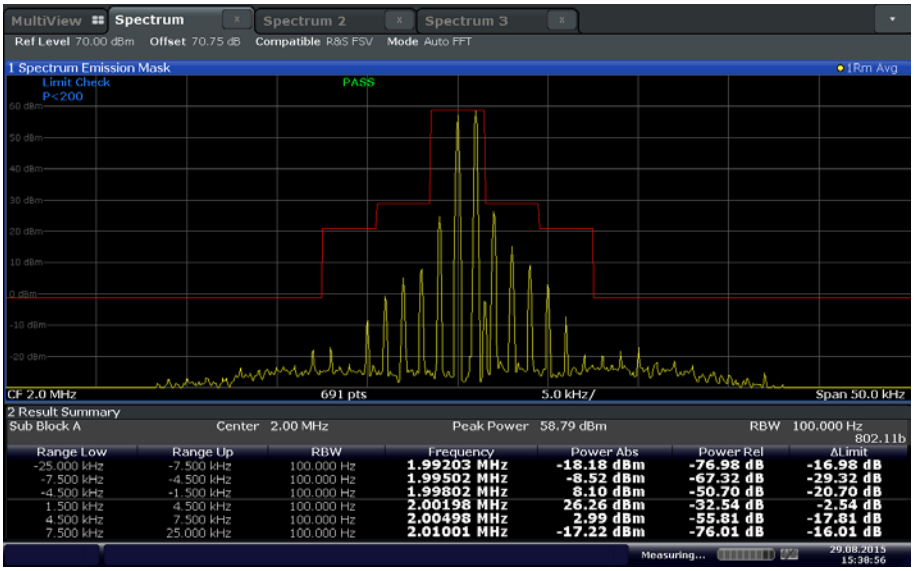
Date: 29 AUG 2015 15:34:15

H3E 30MHz



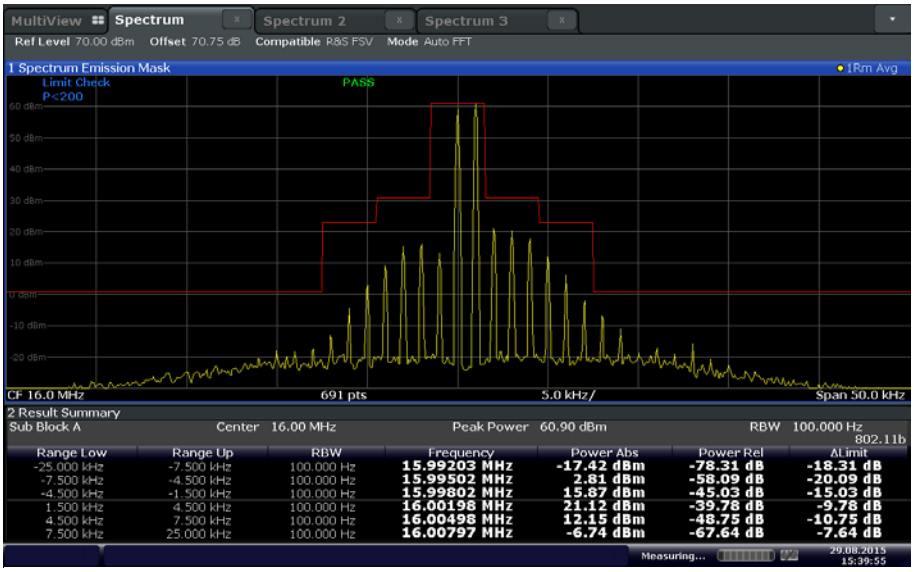
Date: 29 AUG 2015 15:35:16

J3E 2MHz



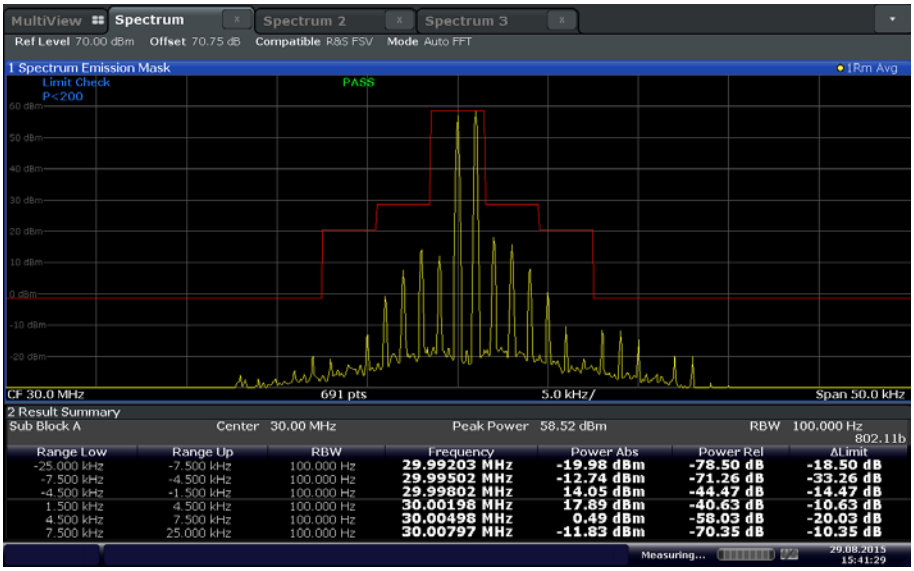
Date: 29 AUG 2015 15:38:56

J3E 16MHz



Date: 29.AUG.2015 15:39:55

J3E 30MHz



Date: 29.AUG.2015 15:41:29

2.5 MODULATION REQUIREMENTS

2.5.1 Specification Reference

Part 2 Subpart J §2.1047(a),(c) and Part 80 Subpart D §87.141(d)

2.5.2 Standard Applicable

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests

(d) Single sideband transmitters must be able to operate in the following modes:

Carrier mode	Level N(dB) of the carrier with respect to peak envelope power
Full carrier (H3E)	O>N>−6.
Suppressed carrier (J3E)	Aircraft stations N<−26;
	Aeronautical stations N<−40.

2.5.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration A and B

2.5.4 Date of Test/Initial of test personnel who performed the test

September 11, 2015/FSC

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

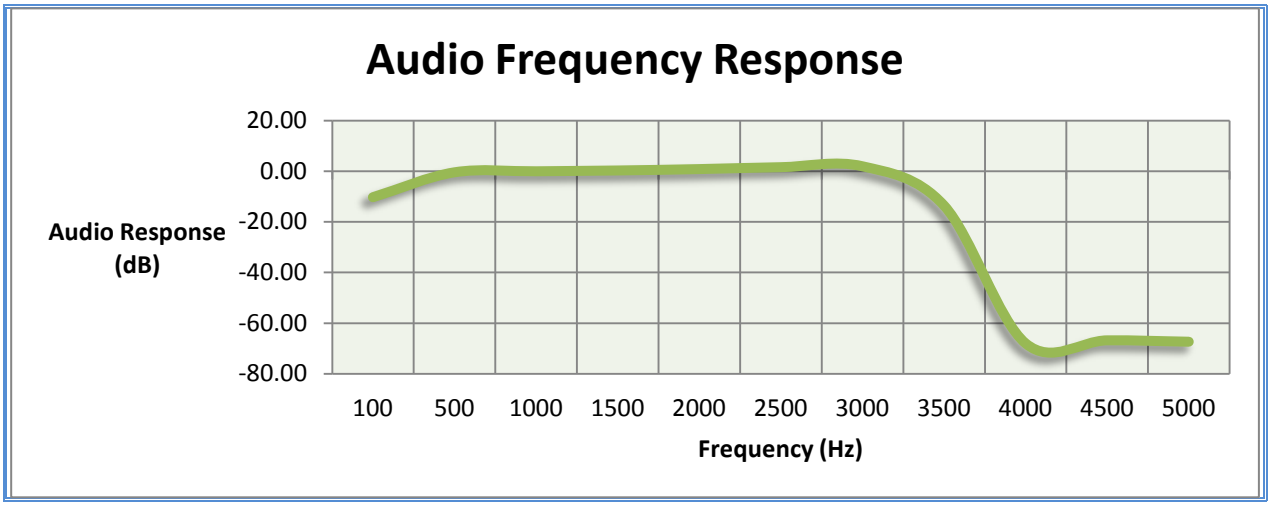
Ambient Temperature	25.0 °C
Relative Humidity	28.2 %
ATM Pressure	98.6 kPa

2.5.7 Additional Observations

- For Frequency Response, test methodology per ANSI TIA 603-C applies.
- Presented graph is the ratio between DEV_{FREQ} and DEV_{REF} over 100 Hz to 5000 Hz.
- For Peak Envelope Power Output Versus The Modulation Input Voltage test and Carrier Level With Respect To Peak Envelope Power test , rear line input of the exciter was utilized using an external Synthesized Function/Arb Generator. A 1kHz tone was used for verification.

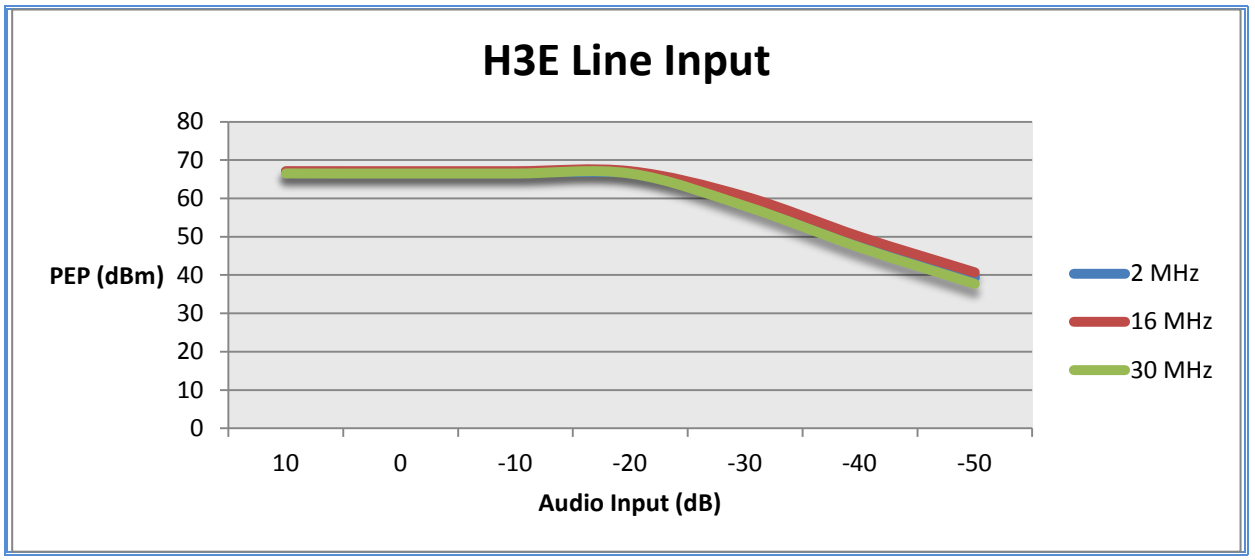
2.5.8 Test Results (Frequency Response)

Frequency	**100 Hz**	**500 Hz**	**1000 Hz**	**1500 Hz**	**2000 Hz**	**2500 Hz**
DEV_{FREQ}	52.19 dB	62.0 dB	62.41 dB	62.73 dB	63.28 dB	64.03 dB
Frequency	**3000 Hz**	**3500Hz**	**4000 Hz**	**4500 Hz**	**5000 Hz**	
DEV_{FREQ}	64.39 dB	48.92 dB	-5.51 dB	-4.33 dB	-4.87 dB	
DEV_{REF} = 62.41 dB @1000 Hz						

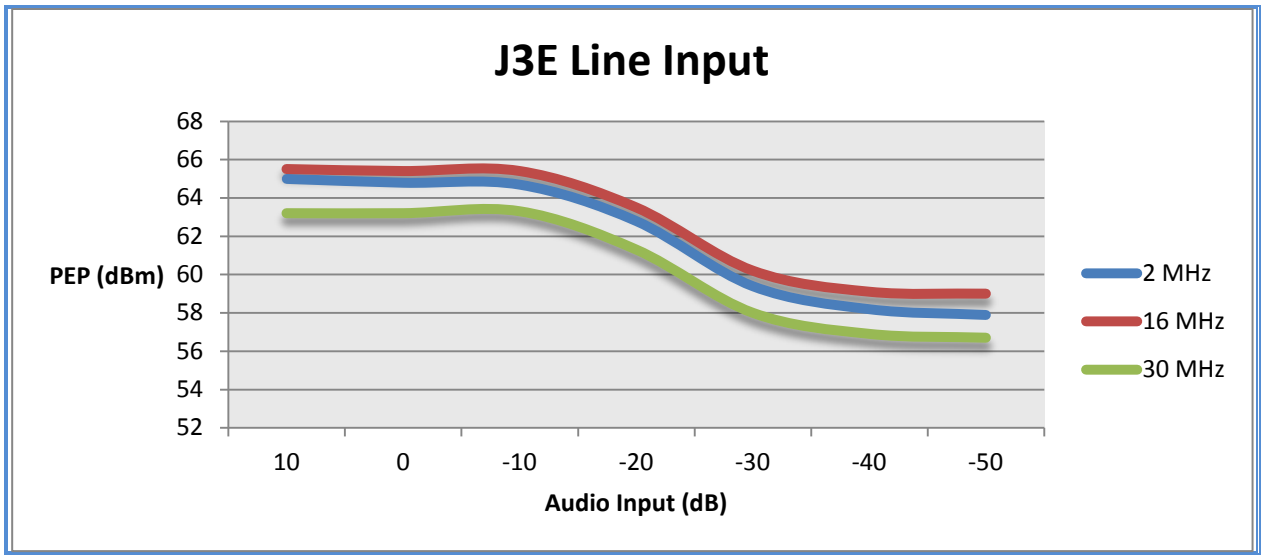


2.5.9 Test Results (Peak Envelope Power Output Versus The Modulation Input Voltage)

H3E								
Audio Input (dB)		**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**
PEP (dBm)	2 MHz	67.0	66.9	66.9	66.9	60.1	49.2	39.4
	16 MHz	67.1	67.1	67.1	67.1	60.5	50.0	40.7
	30 MHz	66.5	66.5	66.5	66.5	58.0	47.2	37.7



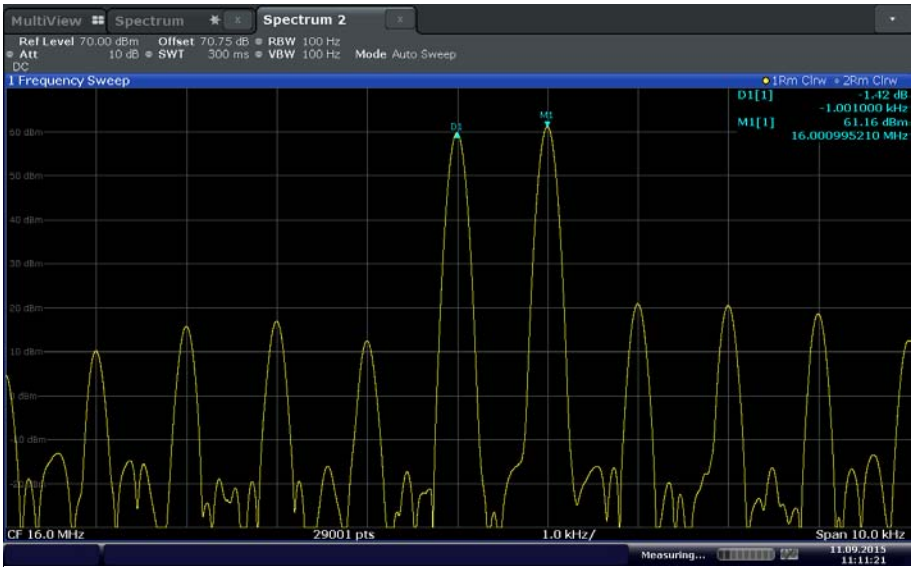
J3E								
Audio Input (dB)		10	0	-10	-20	-30	-40	-50
PEP (dBm)	2 MHz	65.0	64.8	64.7	62.8	59.4	58.2	57.9
	16 MHz	65.5	65.4	65.4	63.5	60.2	59.1	59.0
	30 MHz	63.2	63.2	63.3	61.3	58.0	56.9	56.7



2.5.10 Test Results (Carrier Level With Respect To Peak Envelope Power)

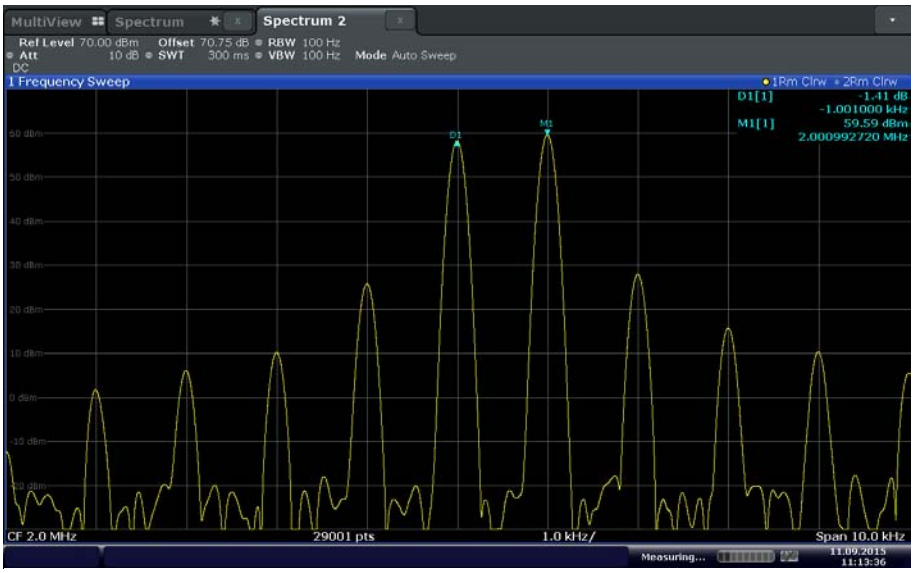
Frequency	Carrier Mode		Limit	Compliance
	J3E	*H3E*		
2 MHz	-74..05	-1.35	**-6 to 0 for H3E <-40 for J3E**	Complies
16 MHz	-70.72	-1.40		Complies
30 MHz	-70.18	-1.40		Complies

2.5.11 Sample Test Plots (Carrier Level With Respect To Peak Envelope Power)



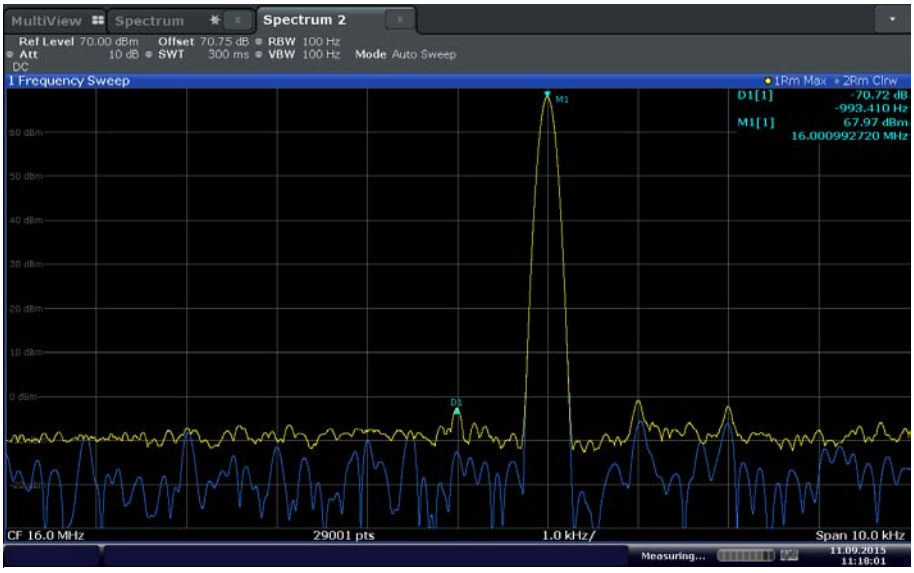
Date: 11.SEP.2015 11:11:20

H3E @ 16 MHz



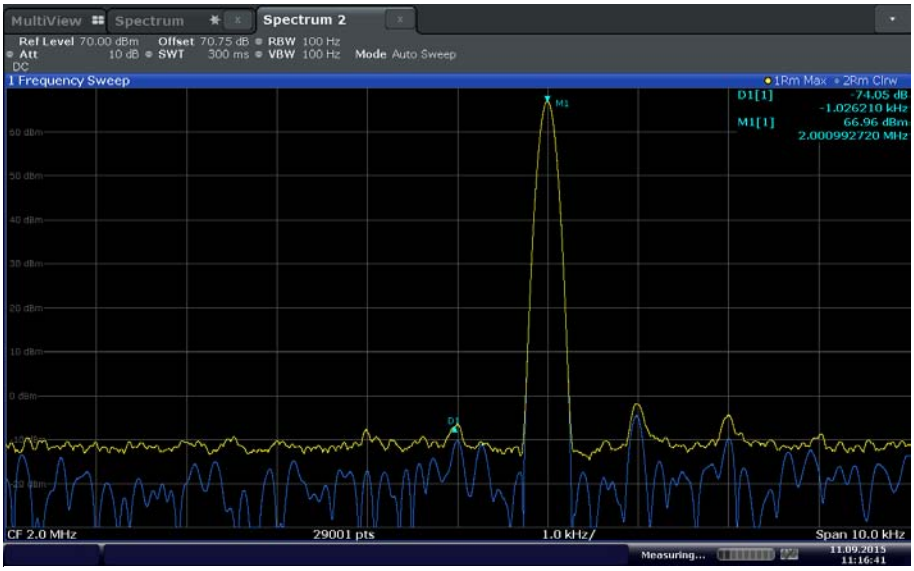
Date: 11.SEP.2015 11:13:37

H3E @ 2 MHz



Date: 11.SEP.2015 11:18:01

J3E @ 16 MHz


MultiView
Spectrum
Spectrum 2
Ref Level 70.00 dBm Offset 70.75 dB RBW 100 Hz
Att 10 dB SWT 300 ms VBW 100 Hz Mode Auto Sweep
DC
1 Frequency Sweep
1Rm Max 2Rm Clrw
D1[1] -74.05 dB
-1.026210 kHz
M1[1] 66.96 dBm
2.000992720 MHz
CF 2.0 MHz
29001 pts
1.0 kHz/
Span 10.0 kHz
Measuring...
11.09.2015
11:16:41
Date: 11.SEP.2015 11:16:42

J3E @ 2 MHz

2.6 CONDUCTED SPURIOUS EMISSIONS

2.6.1 Specification Reference

Part 2.1051, Part 87.139 (c) (3)

2.6.2 Standard Applicable

(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth of 3.0 kHz for aircraft transmitters the attenuation must be at least 43 dB. For aeronautical station transmitters with transmitter power up to and including 50 watts the attenuation must be at least 43 + 10 log10 pX dB and with transmitter power more than 50 watts the attenuation must be at least 60 dB.

2.6.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration A and B

2.6.4 Date of Test/Initial of test personnel who performed the test

August 29, 2015/FSC

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

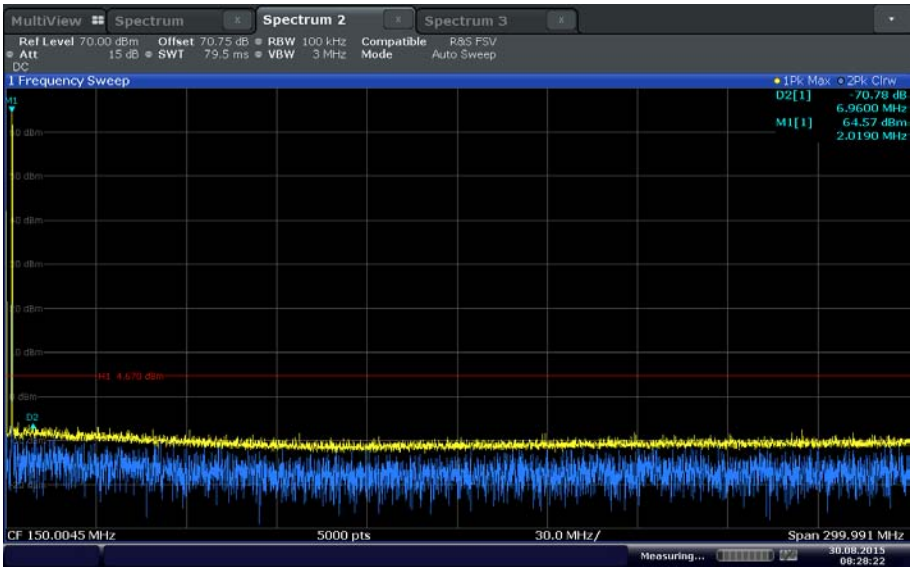
2.6.6 Environmental Conditions

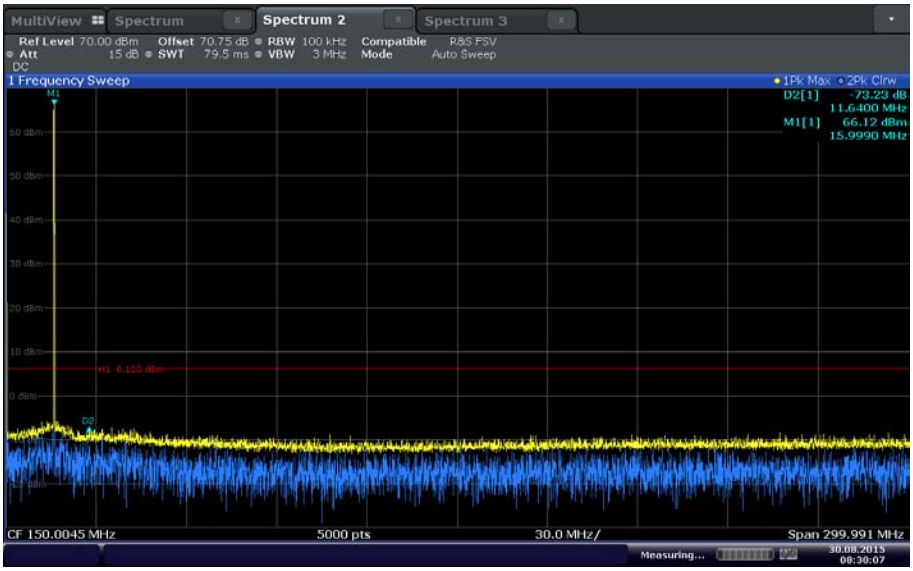
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

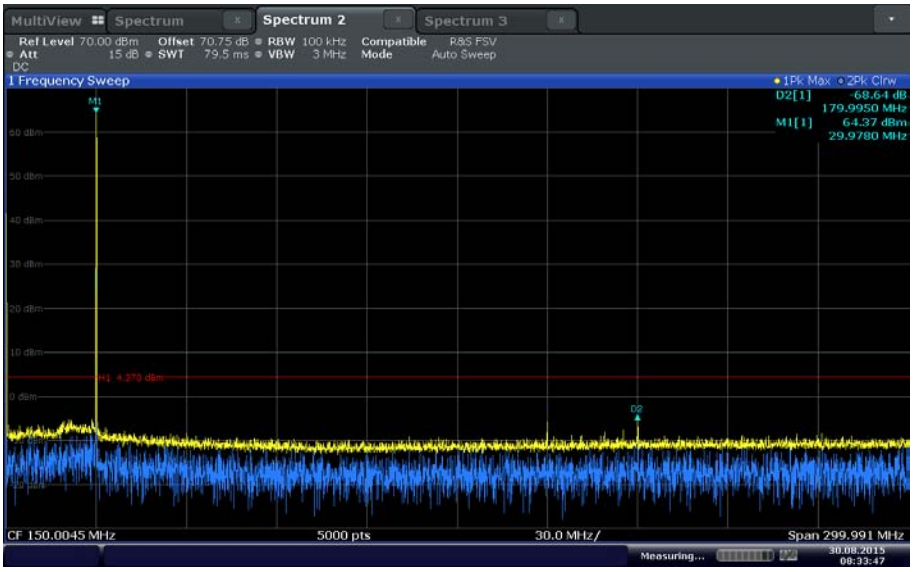
Ambient Temperature	25.2 °C
Relative Humidity	44.4 %
ATM Pressure	99.7kPa

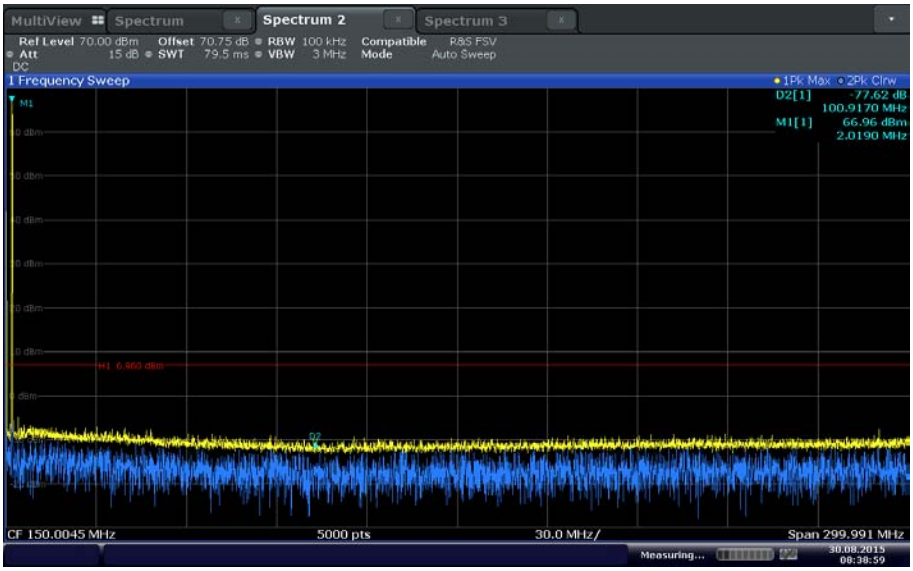
2.6.7 Additional Observations

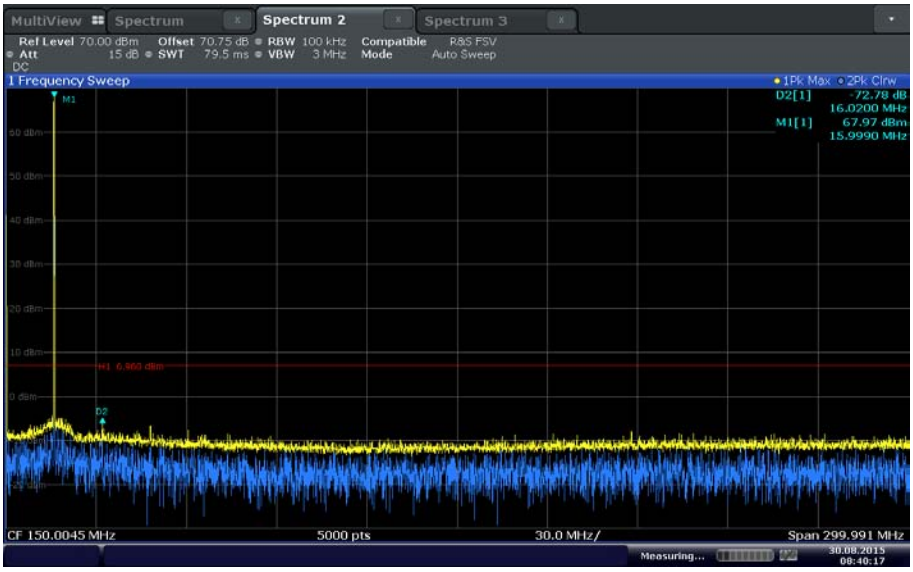
- This is a conducted test.
- Frequency removed from the assigned frequency by less than 250 percent of the authorized bandwidth of 3.0 kHz is covered under Section 2.4 of this test report.
- All channels for each carrier mode (J3E and H3E) verified.
- Verification performed up to the tenth harmonic of the highest fundamental frequency (30 MHz).
- EUT has ALC function thus adjusting the carrier level to 10dB greater than that necessary to produce rated peak envelope power is not required.
- Limit was set to 60 dBc for each carrier mode and channel verified.

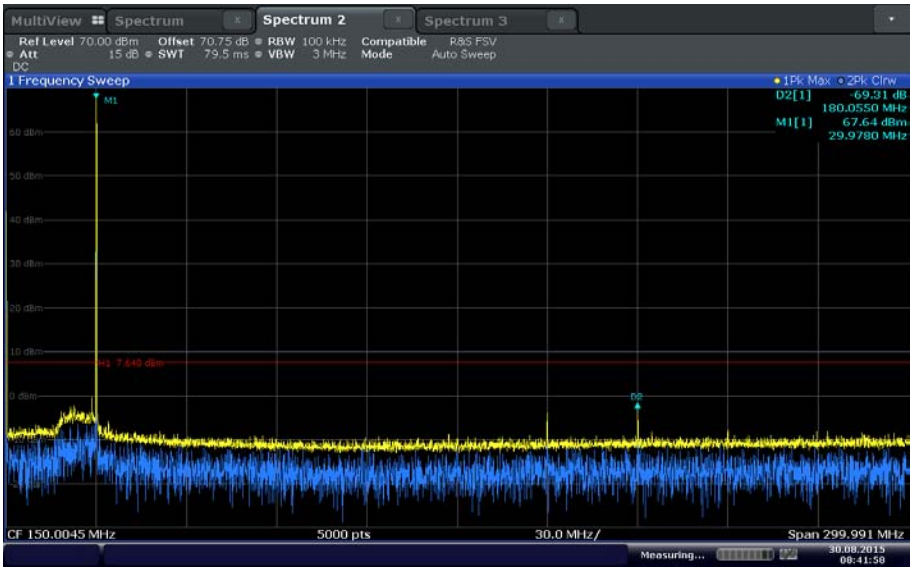
J3E 2MHz
 Date: 30.AUG.2015 08:28:23

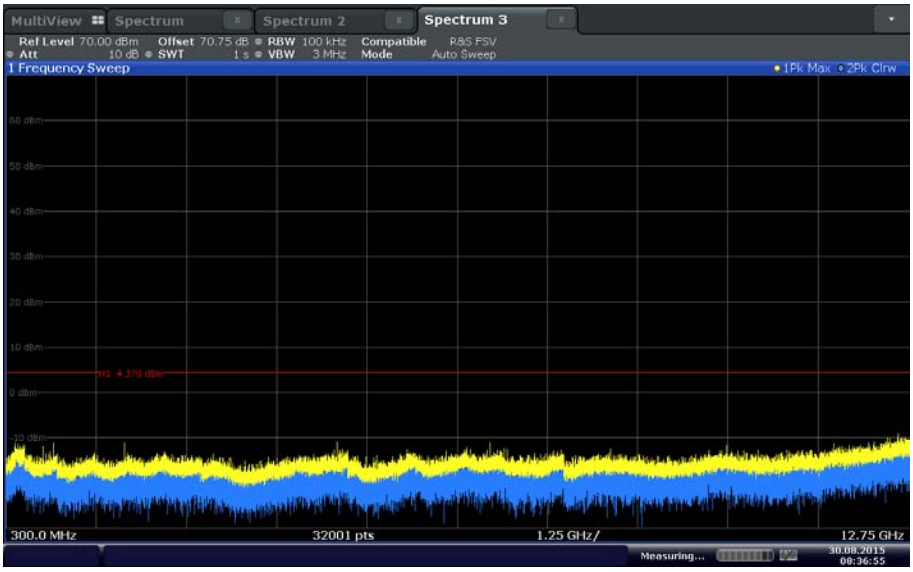
J3E 16MHz
 Date: 30.AUG.2015 08:30:07

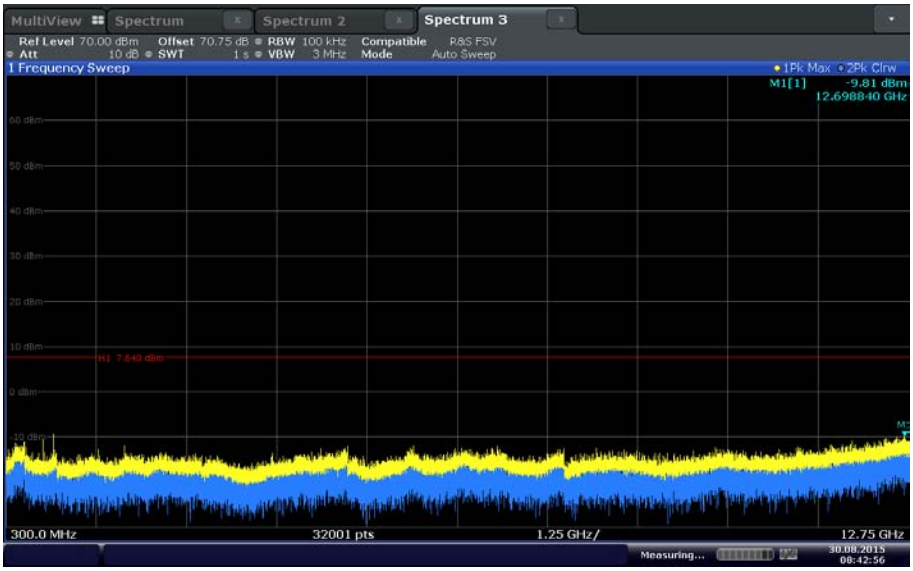
J3E 30MHz
 Date: 30.AUG.2015 08:33:47

H3E 2MHz
 Date: 30.AUG.2015 08:38:59

H3E 16MHz
 Date: 30 AUG 2015 08:40:18

H3E 30MHz
 Date: 30 AUG 2015 08:41:58

J3E >30MHz
 Date: 30.AUG.2015 08:36:56

H3E >30MHz
 Date: 30.AUG.2015 08:42:57

2.7 FIELD STRENGTH OF SPURIOUS RADIATION

2.7.1 Specification Reference

Part 2.1053, Part 87.139 (c) (3)

2.7.2 Standard Applicable

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

2.7.3 Equipment Under Test and Modification State

Serial No: 00001 / Test Configuration A and B

2.7.4 Date of Test/Initial of test personnel who performed the test

September 03, 2015/FSC

2.7.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	25.7 °C
Relative Humidity	43.8 %
ATM Pressure	99.9kPa

2.7.7 Additional Observations

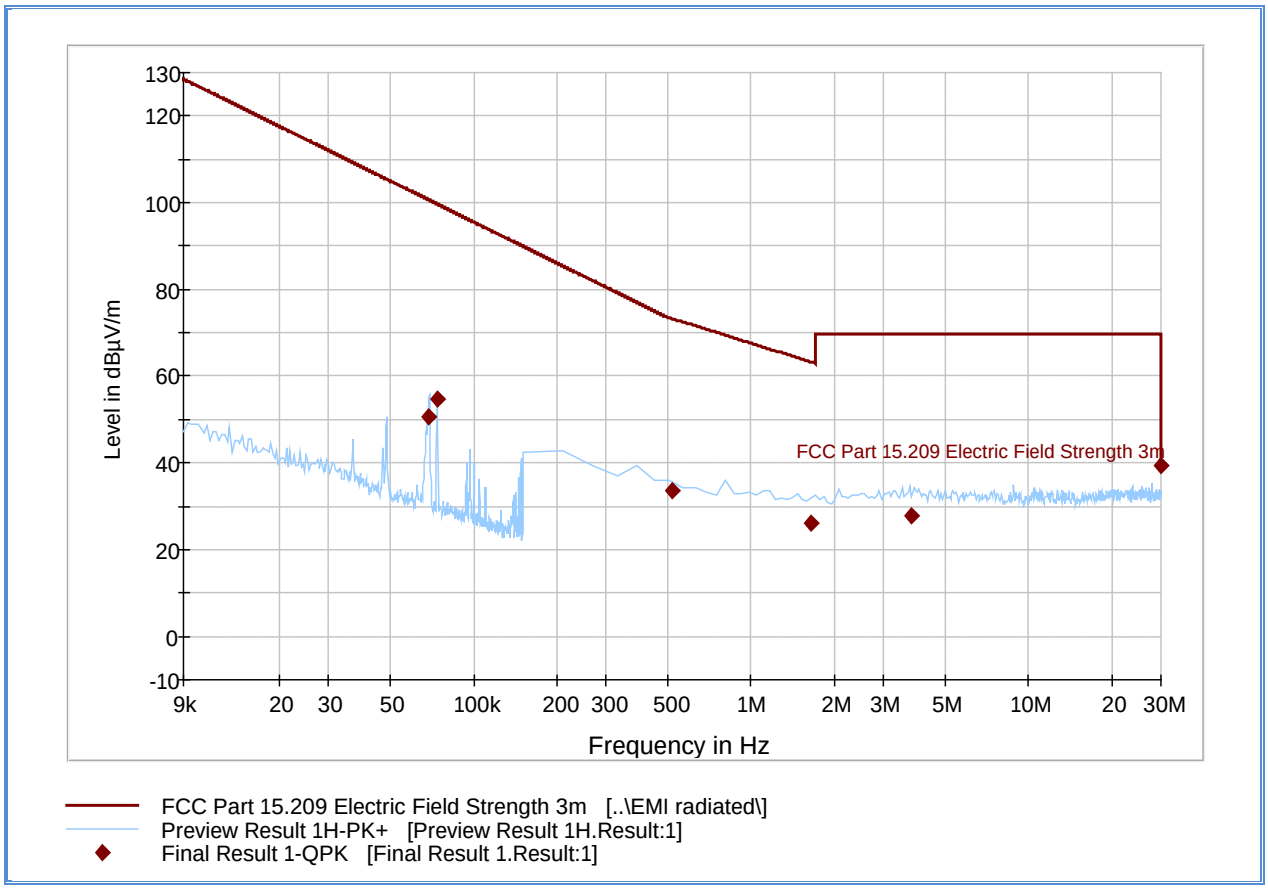
- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.

- There were no emissions observed within 60 dB in reference to the rated power output of the transmitter. Substitution method verification not required. EUT complies.
- Graphs presented were plotted against Part 15.209 limits below 30MHz and Part 15.109 Class A limits between 30 MHz and 1GHz (reference only).
- For J3E, modulation used was 2-tone with 1.0 kHz spacing with output power of 5kW. For H3E, modulation used was a single tone of 2500 Hz with output power of 5 kW.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.7.8 **Test Results**

See attached plots.

2.7.9 **Standby Mode (below 30 MHz)**

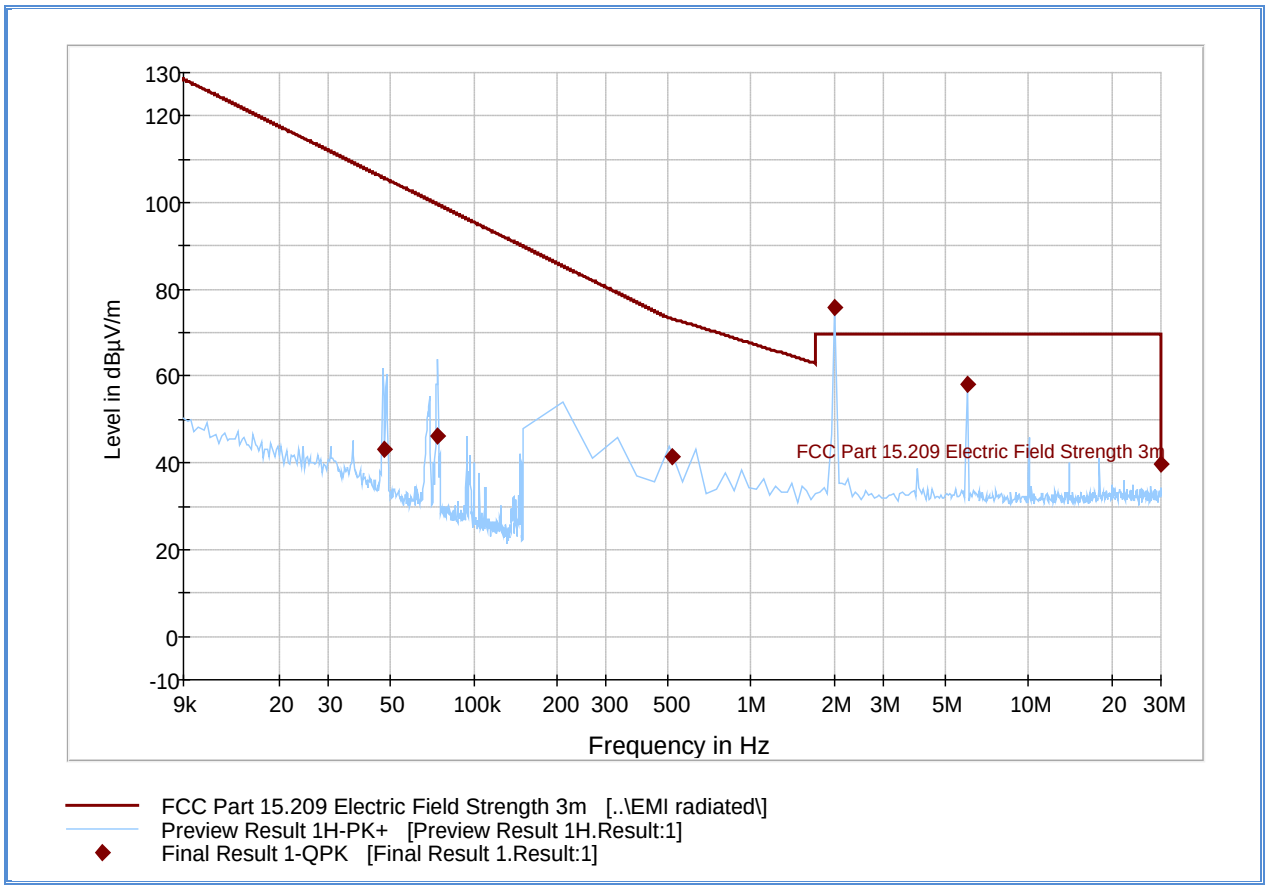


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.069169	50.6	1000.0	0.200	100.0	-	53.0	19.9	50.0	100.6
0.073690	54.8	1000.0	0.200	100.0	-	34.0	19.9	44.9	99.7
0.521418	33.7	1500.0	9.000	100.0	-	306.0	19.8	39.6	73.3
1.645991	26.2	1500.0	9.000	100.0	-	270.0	20.3	37.1	63.3
3.760678	27.9	1500.0	9.000	100.0	-	269.0	20.6	41.6	69.5
30.000000	39.4	1500.0	9.000	100.0	-	171.0	24.4	0.6	40.0

Test Notes: This is for reference only using Part 15.209 Limits below 30 MHz.

2.7.10 Test Results Below 30 MHz (H3E Low Frequency)

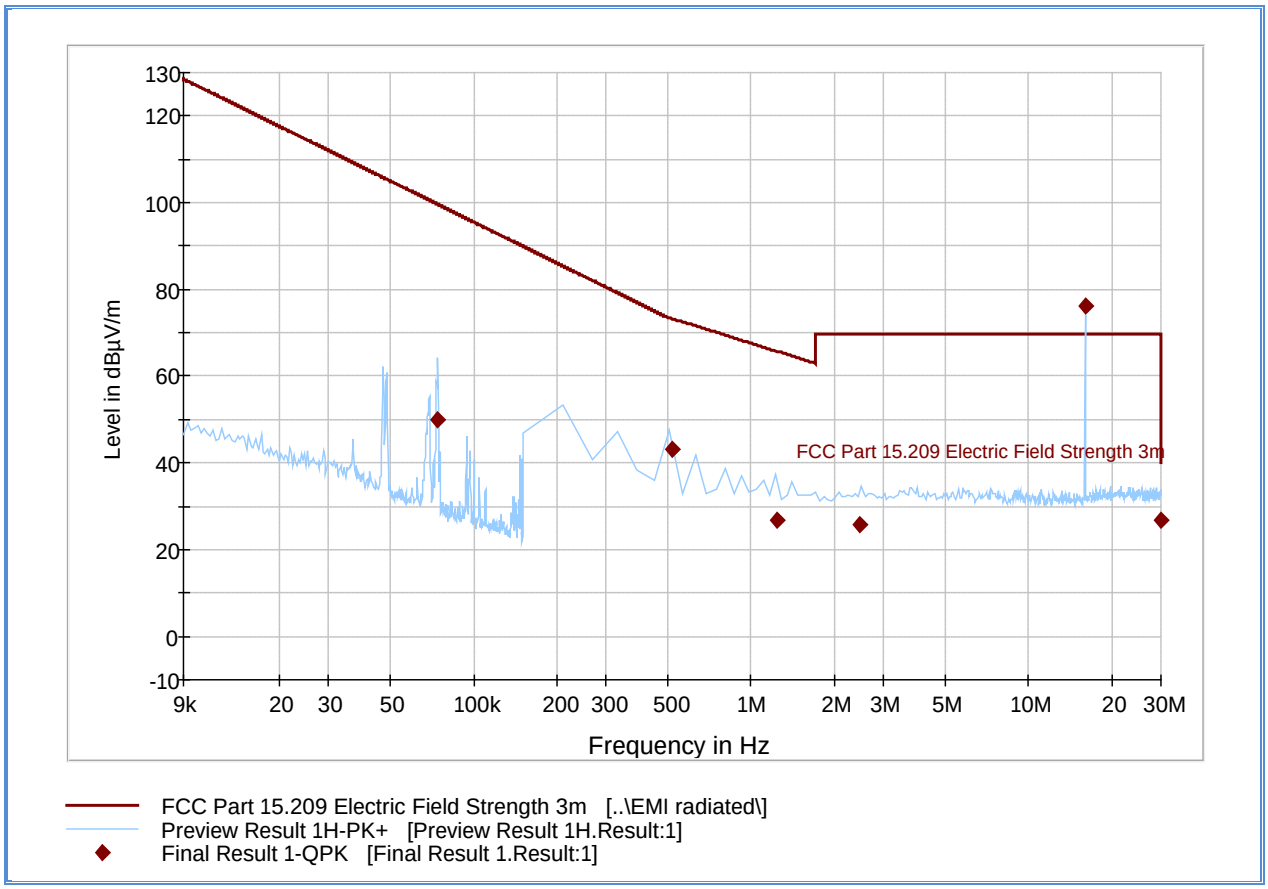


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.047446	43.0	1000.0	0.200	100.0	-	288.0	20.2	62.8	105.8
0.073973	46.2	1000.0	0.200	100.0	-	34.0	19.9	53.5	99.7
0.517418	41.6	1500.0	9.000	100.0	-	329.0	19.8	31.7	73.3
2.000909	75.7	1500.0	9.000	100.0	-	284.0	20.3	Fundamental	
6.000825	58.3	1500.0	9.000	100.0	-	60.0	20.7	11.3	69.5
30.000000	39.6	1500.0	9.000	100.0	-	0.0	24.4	0.4	40.0

Test Notes: Limit used is the more stringent Part 15.209 Limits below 30 MHz. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.11 Test Results Below 30 MHz (H3E Mid Frequency)

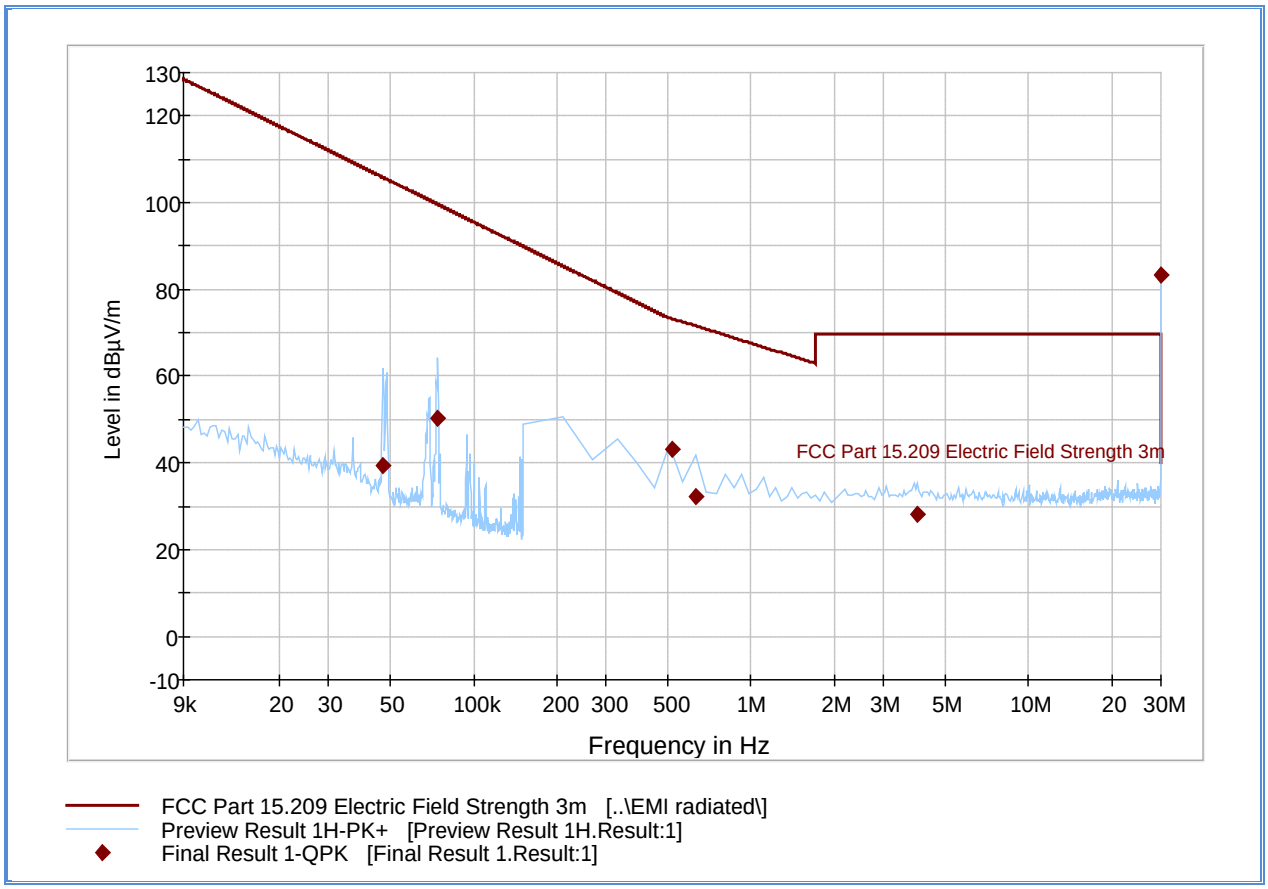


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.073973	50.0	1000.0	0.200	100.0	-	39.0	19.9	49.6	99.7
0.517418	43.3	1500.0	9.000	100.0	-	314.0	19.8	30.1	73.3
1.247254	26.7	1500.0	9.000	100.0	-	6.0	20.3	39.0	65.7
2.467466	25.8	1500.0	9.000	100.0	-	262.0	20.4	43.8	69.5
15.998704	76.2	1500.0	9.000	100.0	-	66.0	21.6	Fundamental	
29.986500	26.7	1500.0	9.000	100.0	-	142.0	24.4	42.8	69.5

Test Notes: Limit used is the more stringent Part 15.209 Limits below 30 MHz. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.12 Test Results Below 30 MHz (H3E High Frequency)

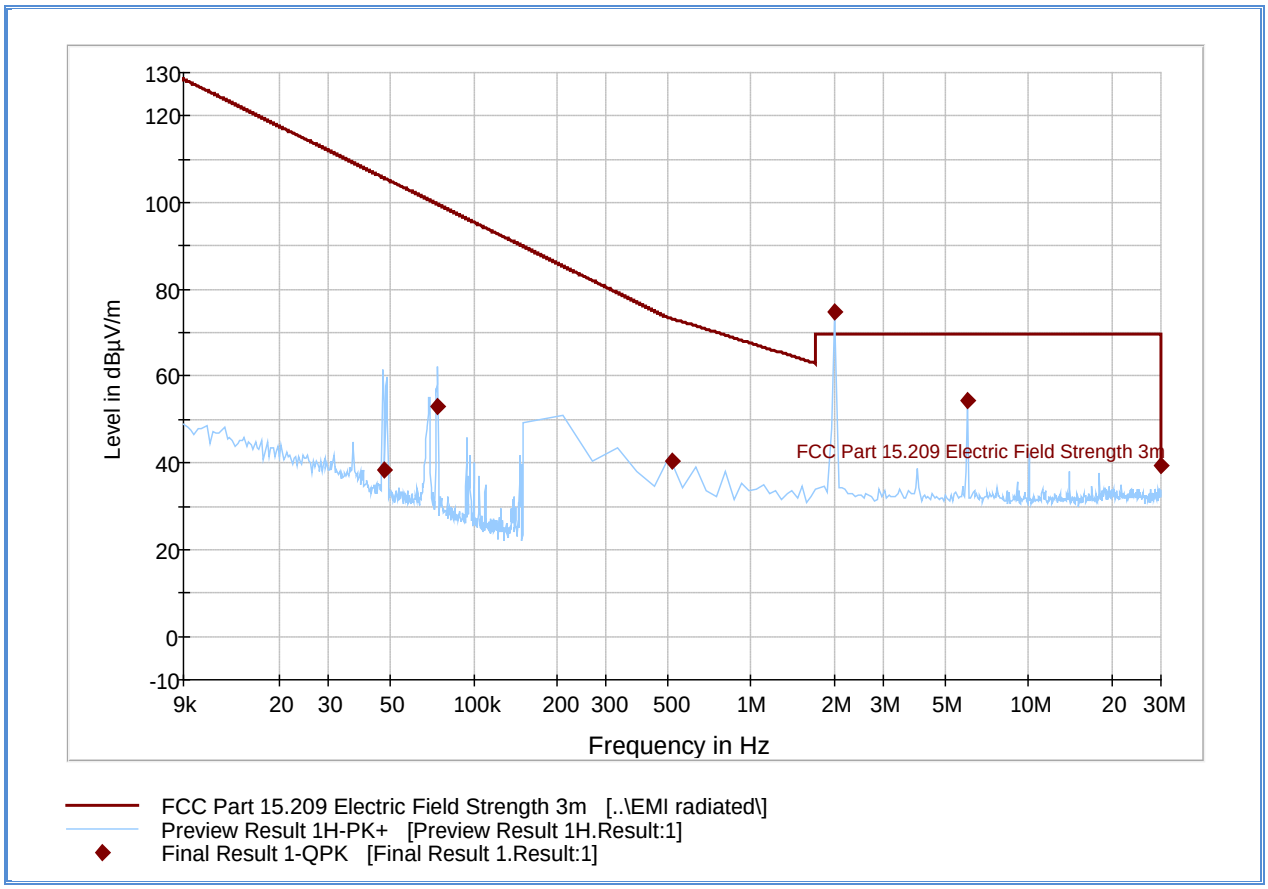


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.046846	39.5	1000.0	0.200	100.0	-	73.0	20.3	66.4	105.9
0.073973	50.4	1000.0	0.200	100.0	-	53.0	19.9	49.3	99.7
0.517418	43.2	1500.0	9.000	100.0	-	307.0	19.8	30.1	73.3
0.629057	32.2	1500.0	9.000	100.0	-	0.0	19.8	39.4	71.6
3.978957	28.2	1500.0	9.000	100.0	-	156.0	20.6	41.3	69.5
30.000000	83.3	1500.0	9.000	100.0	-	58.0	24.4	Fundamental	

Test Notes: Limit used is the more stringent Part 15.209 Limits below 30 MHz. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.13 Test Results Below 30 MHz (J3E Low Frequency)

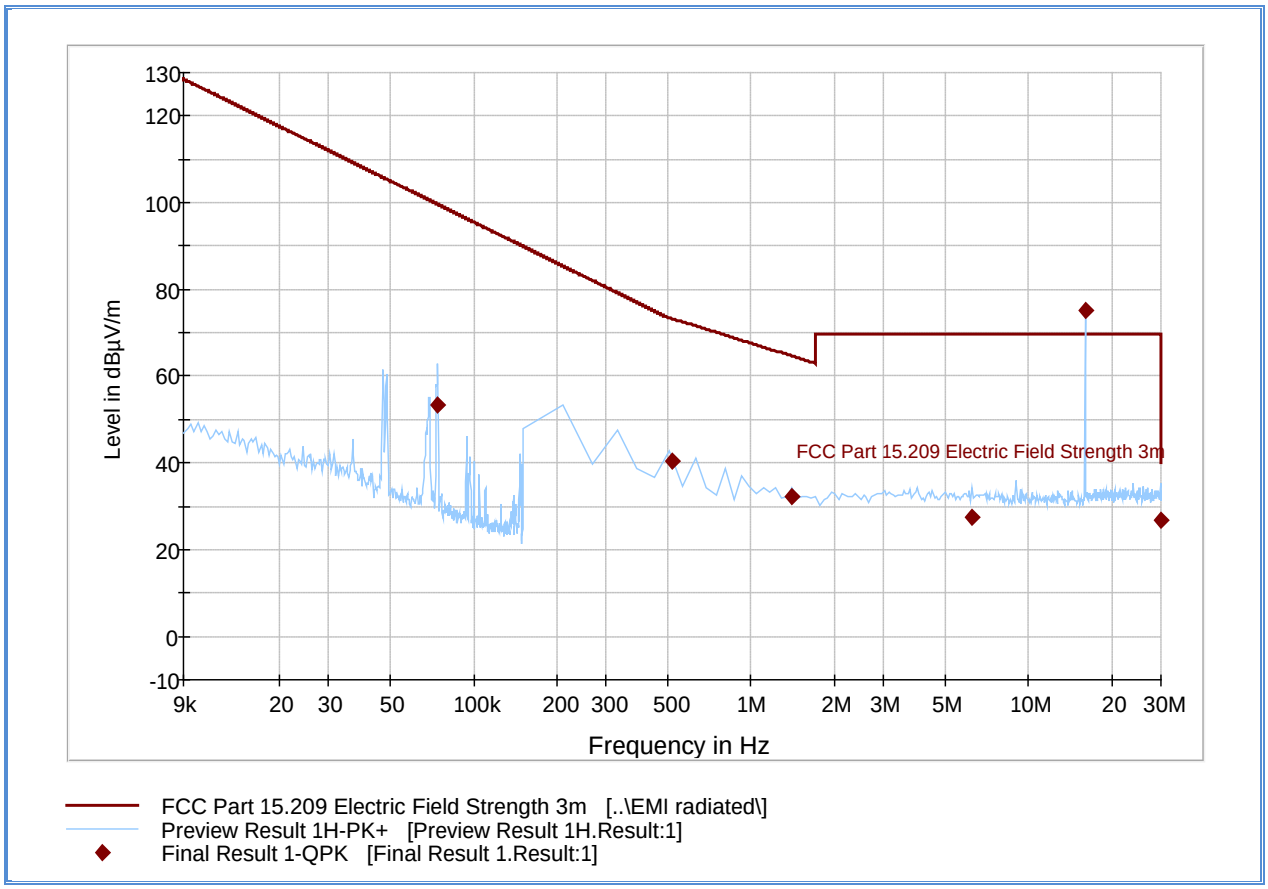


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.047446	38.5	1000.0	0.200	100.0	-	315.0	20.2	67.3	105.8
0.073973	52.9	1000.0	0.200	100.0	-	50.0	19.9	46.8	99.7
0.517418	40.3	1500.0	9.000	100.0	-	309.0	19.8	33.0	73.3
2.000909	74.9	1500.0	9.000	100.0	-	279.0	20.3	Fundamental	
6.004825	54.3	1500.0	9.000	100.0	-	54.0	20.7	15.2	69.5
30.000000	39.3	1500.0	9.000	100.0	-	174.0	24.4	0.7	40.0

Test Notes: Limit used is the more stringent Part 15.209 Limits below 30 MHz. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.14 Test Results Below 30 MHz (J3E Mid Frequency)

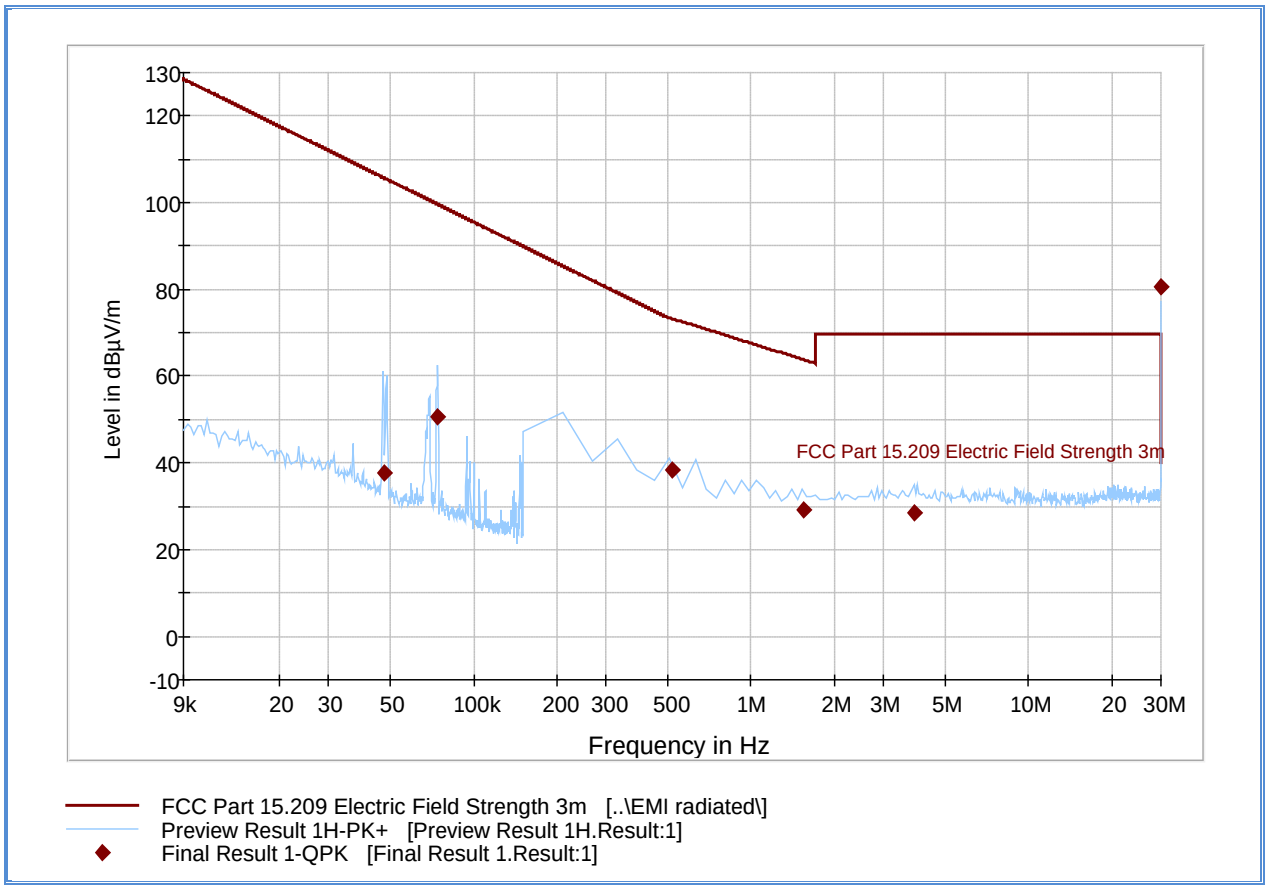


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.073973	53.4	1000.0	0.200	100.0	-	44.0	19.9	46.3	99.7
0.517418	40.3	1500.0	9.000	100.0	-	68.0	19.8	33.1	73.3
1.406713	32.1	1500.0	9.000	100.0	-	67.0	20.3	32.6	64.6
6.277103	27.4	1500.0	9.000	100.0	-	-31.0	20.7	42.2	69.5
16.002704	75.3	1500.0	9.000	100.0	-	67.0	21.6	Fundamental	
29.988500	26.7	1500.0	9.000	100.0	-	135.0	24.4	42.8	69.5

Test Notes: Limit used is the more stringent Part 15.209 Limits below 30 MHz. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.15 Test Results Below 30 MHz (J3E High Frequency)

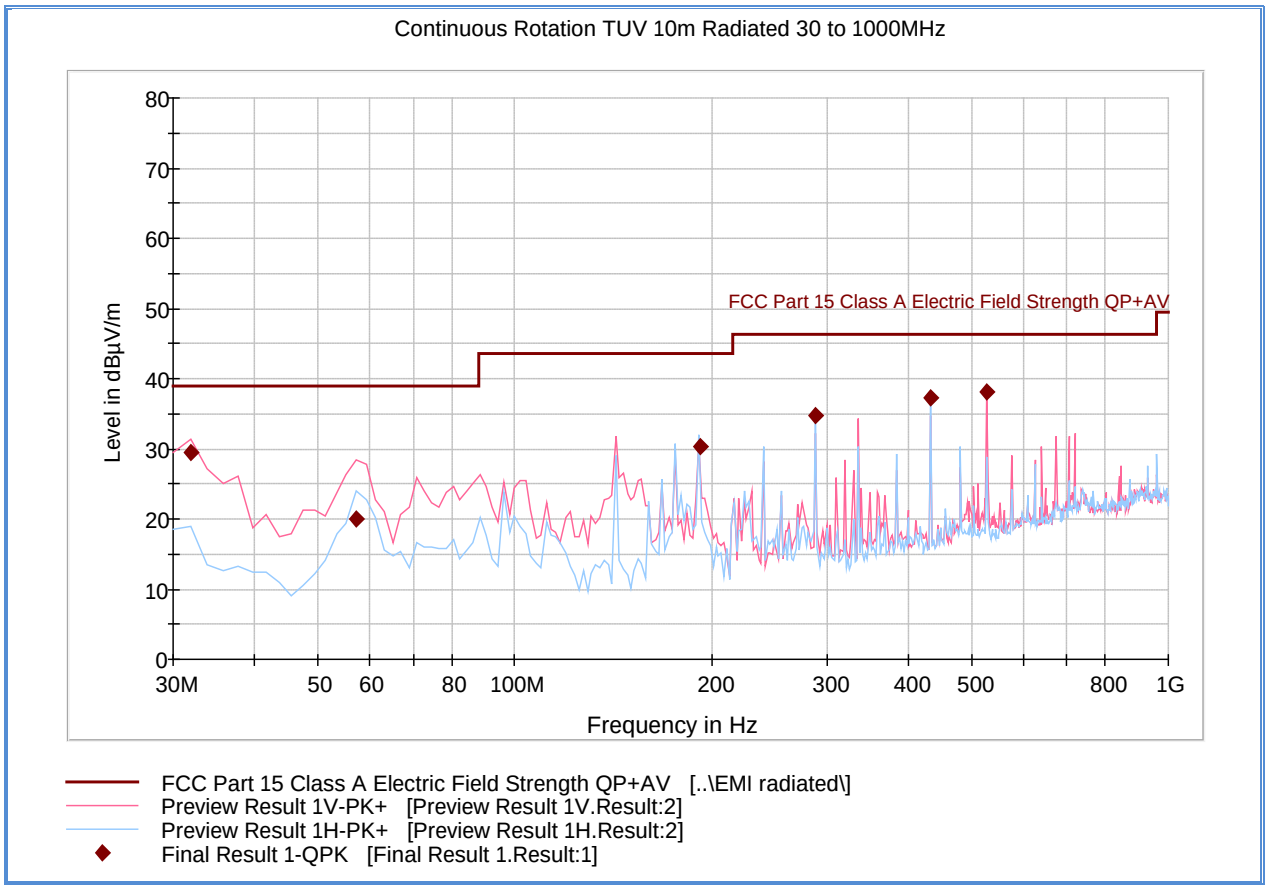


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.047446	37.7	1000.0	0.200	100.0	-	90.0	20.2	68.0	105.8
0.073973	50.7	1000.0	0.200	100.0	-	50.0	19.9	49.0	99.7
0.517418	38.4	1500.0	9.000	100.0	-	60.0	19.8	34.9	73.3
1.538352	29.2	1500.0	9.000	100.0	-	331.0	20.3	34.6	63.9
3.871318	28.5	1500.0	9.000	100.0	-	-1.0	20.6	41.0	69.5
30.000000	80.5	1500.0	9.000	100.0	-	67.0	24.4	Fundamental	

Test Notes: Limit used is the more stringent Part 15.209 Limits below 30 MHz. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.16 **Standby Mode (above 30 MHz)**

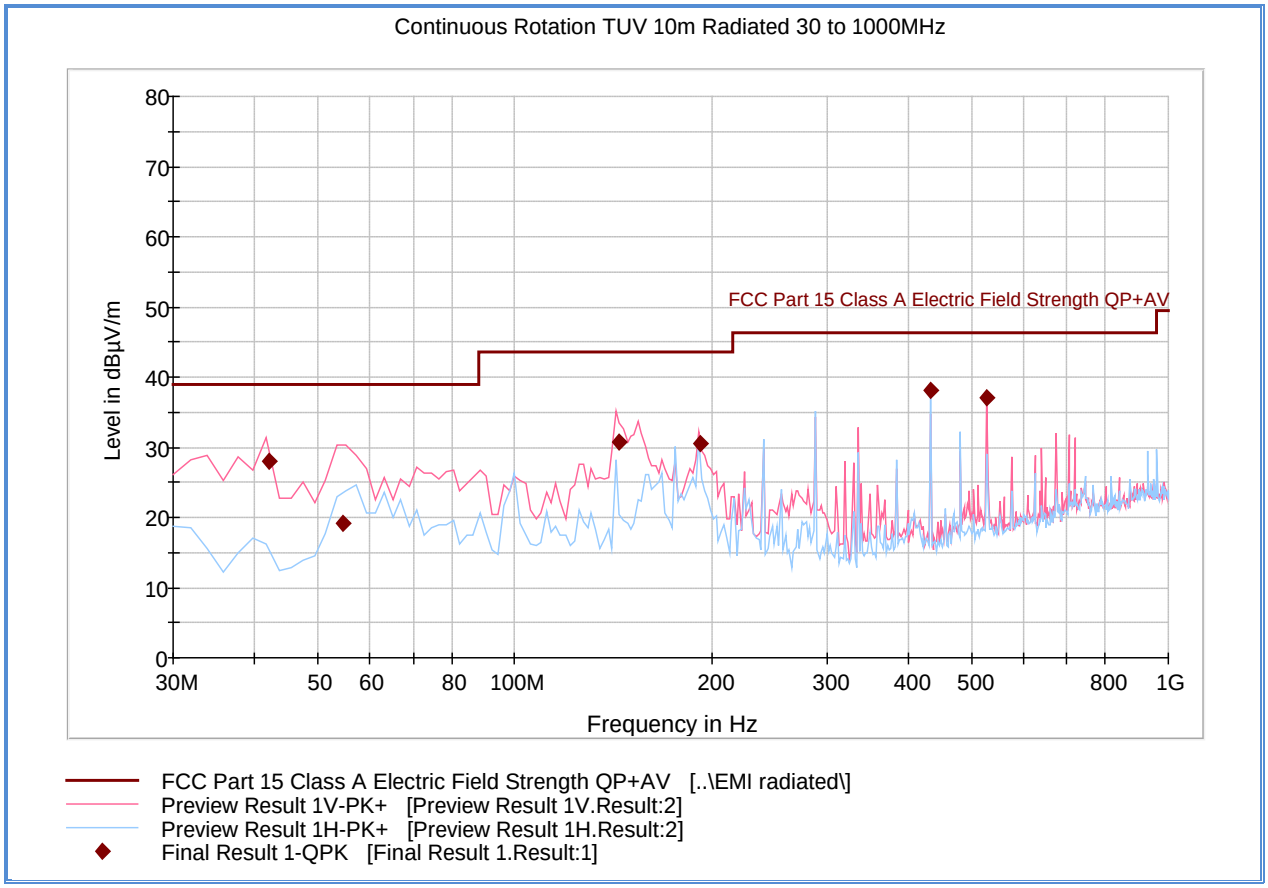


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.000000	29.5	1000.0	120.000	105.0	V	311.0	-13.8	9.5	39.0
57.174429	19.9	1000.0	120.000	109.0	V	160.0	-22.8	19.1	39.0
192.022685	30.4	1000.0	120.000	400.0	H	326.0	-18.3	13.1	43.5
288.017074	34.8	1000.0	120.000	289.0	H	333.0	-15.6	11.6	46.4
431.984770	37.3	1000.0	120.000	209.0	H	187.0	-10.6	9.1	46.4
527.995271	38.1	1000.0	120.000	290.0	V	-8.0	-7.5	8.3	46.4

Test Notes: This is for reference only using Part 15.109 Class A Limits.

2.7.17 **Test Results above 30 MHz (H3E Low Frequency)**

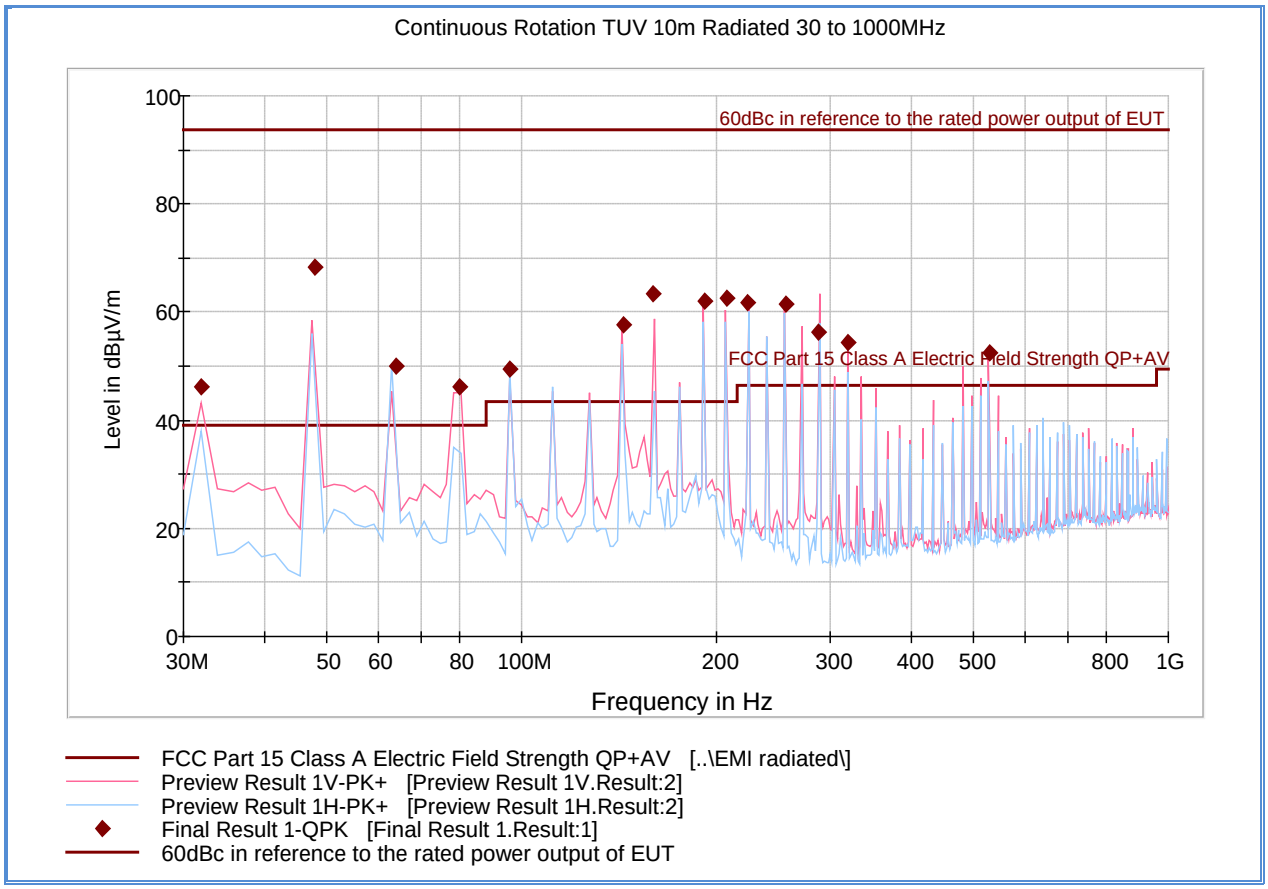


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.023327	28.1	1000.0	120.000	100.0	V	359.0	-18.9	10.9	39.0
54.606653	19.1	1000.0	120.000	110.0	V	-15.0	-22.4	19.9	39.0
144.025491	30.8	1000.0	120.000	100.0	V	251.0	-21.1	12.7	43.5
191.982685	30.4	1000.0	120.000	100.0	V	172.0	-18.3	13.1	43.5
431.984770	38.1	1000.0	120.000	209.0	H	186.0	-10.6	8.3	46.4
527.995271	37.1	1000.0	120.000	289.0	V	358.0	-7.5	9.3	46.4

Test Notes: Limit used is Part 15.109 Class A. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.18 **Test Results above 30 MHz (H3E Mid Frequency)**

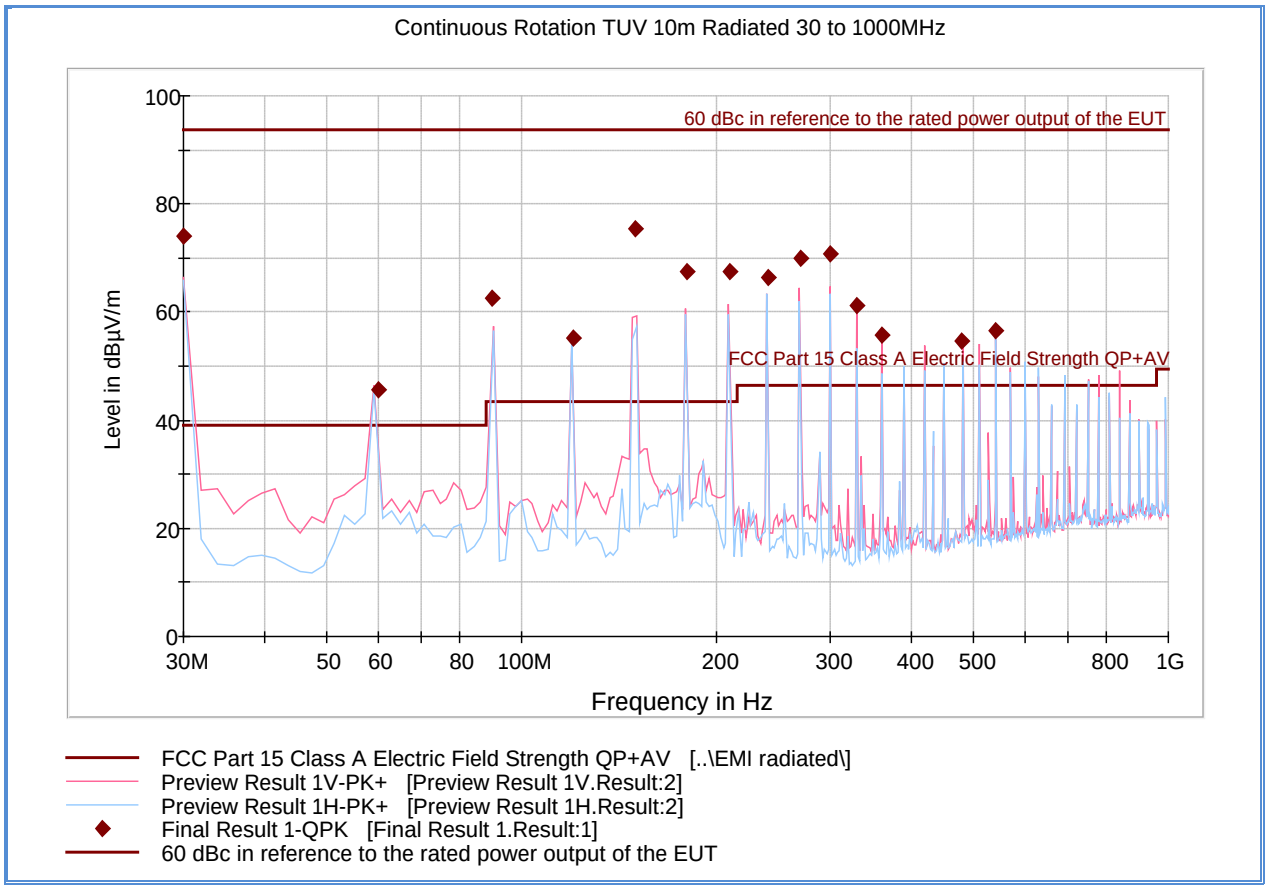


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.000000	46.3	1000.0	120.000	250.0	V	322.0	-13.8	-7.3	39.0
48.014990	68.2	1000.0	120.000	250.0	V	15.0	-21.0	-29.2	39.0
64.006092	49.9	1000.0	120.000	400.0	H	277.0	-22.9	-10.9	39.0
80.021082	46.1	1000.0	120.000	150.0	V	322.0	-23.2	-7.1	39.0
96.012184	49.4	1000.0	120.000	350.0	H	2.0	-21.3	-5.9	43.5
143.985491	57.8	1000.0	120.000	250.0	V	-2.0	-21.1	-14.3	43.5
160.000481	63.5	1000.0	120.000	100.0	V	-15.0	-18.9	-20.0	43.5
191.982685	62.0	1000.0	120.000	250.0	V	322.0	-18.3	-18.5	43.5
208.013788	62.6	1000.0	120.000	150.0	V	150.0	-18.0	-19.1	43.5
223.988778	61.8	1000.0	120.000	100.0	V	15.0	-17.0	-15.4	46.4
256.010982	61.5	1000.0	120.000	100.0	V	333.0	-15.8	-15.1	46.4
288.017074	56.2	1000.0	120.000	350.0	V	-14.0	-15.6	-9.8	46.4
319.999279	54.3	1000.0	120.000	250.0	V	-15.0	-13.8	-7.9	46.4
527.995271	52.4	1000.0	120.000	278.0	V	5.0	-7.5	-6.0	46.4

Test Notes: Limit used is Part 15.109 Class A. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.19 **Test Results above 30 MHz (H3E High Frequency)**

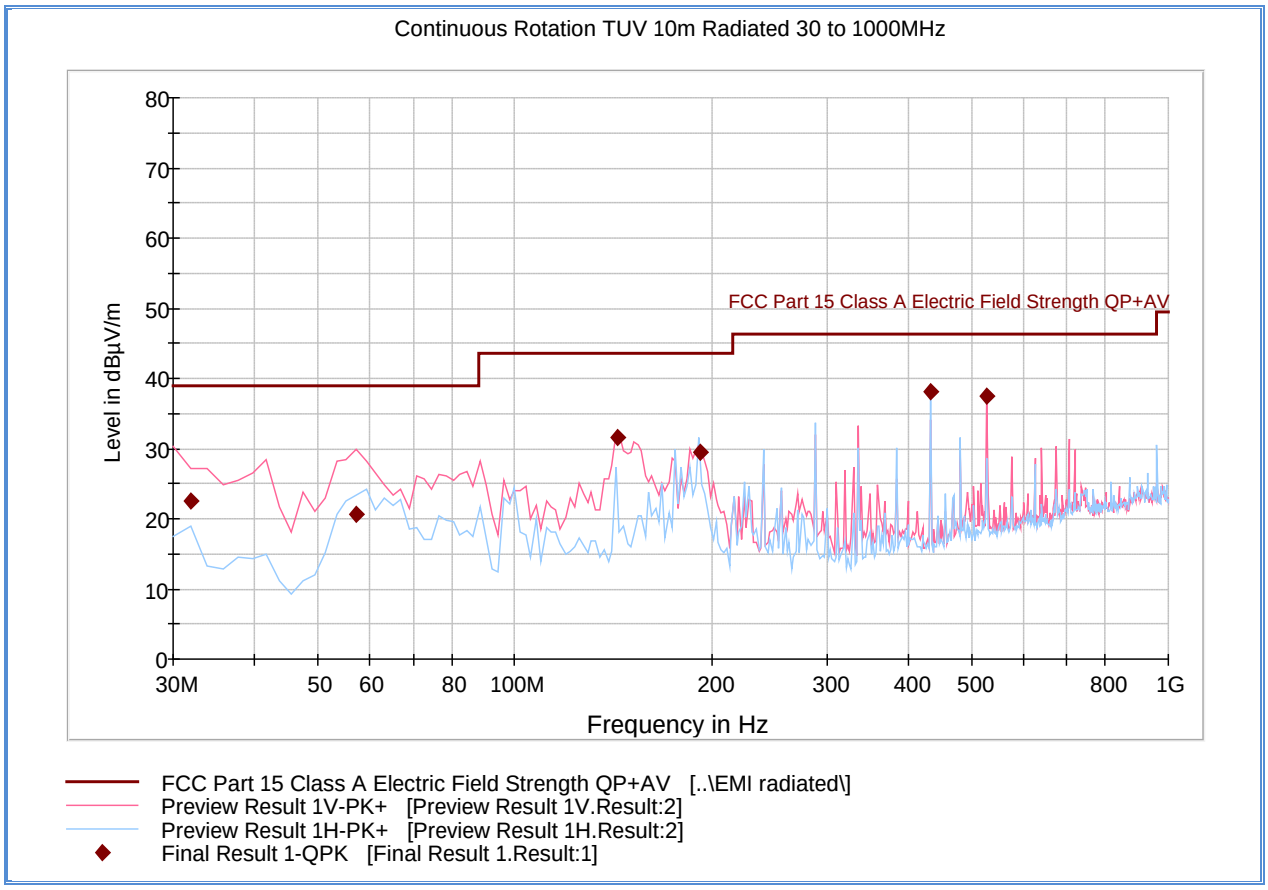


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.000000	74.1	1000.0	120.000	250.0	V	157.0	-13.1	-35.1	39.0
59.998317	45.6	1000.0	120.000	400.0	V	202.0	-22.9	-6.6	39.0
90.020521	62.7	1000.0	120.000	150.0	V	340.0	-22.0	-19.2	43.5
120.018838	55.1	1000.0	120.000	389.0	H	330.0	-22.2	-11.6	43.5
150.001042	75.4	1000.0	120.000	250.0	V	13.0	-20.4	-31.9	43.5
179.999359	67.6	1000.0	120.000	150.0	V	-14.0	-18.8	-24.1	43.5
209.997675	67.4	1000.0	120.000	400.0	V	354.0	-17.9	-23.9	43.5
240.019880	66.3	1000.0	120.000	300.0	H	292.0	-16.2	-19.9	46.4
270.018196	69.8	1000.0	120.000	100.0	V	347.0	-15.0	-23.4	46.4
300.000401	70.7	1000.0	120.000	350.0	V	2.0	-15.0	-24.3	46.4
329.998717	61.3	1000.0	120.000	350.0	V	347.0	-13.5	-14.9	46.4
360.020922	55.8	1000.0	120.000	314.0	V	-15.0	-11.5	-9.4	46.4
480.021964	54.6	1000.0	120.000	100.0	V	162.0	-8.1	-8.2	46.4
540.002485	56.5	1000.0	120.000	300.0	V	316.0	-8.0	-10.1	46.4

Test Notes: Limit used is Part 15.109 Class A. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.20 **Test Results above 30 MHz (J3E Low Frequency)**

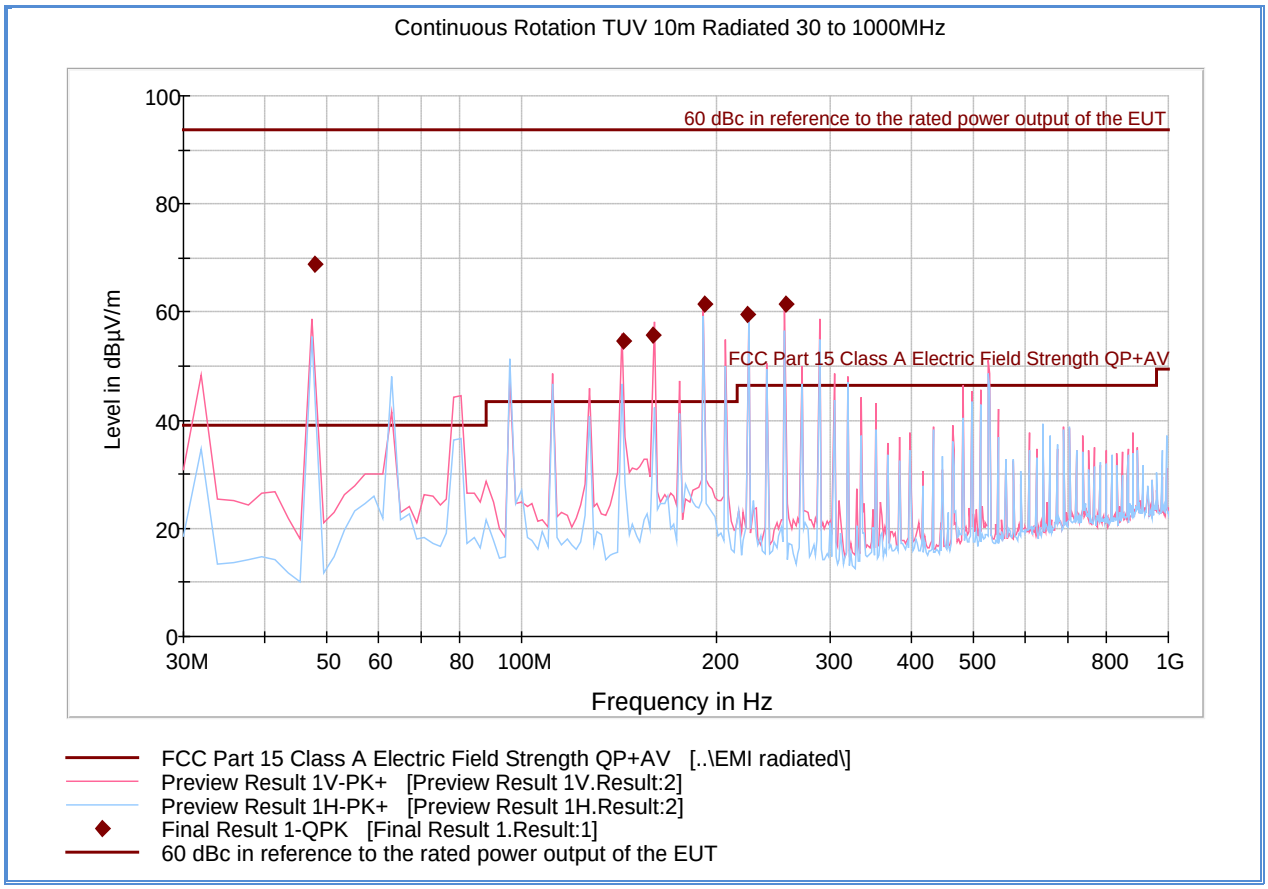


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.000000	22.6	1000.0	120.000	350.0	V	15.0	-13.8	16.4	39.0
57.254429	20.5	1000.0	120.000	109.0	V	-15.0	-22.8	18.5	39.0
143.985491	31.6	1000.0	120.000	100.0	V	4.0	-21.1	12.0	43.5
192.022685	29.6	1000.0	120.000	250.0	H	175.0	-18.3	13.9	43.5
431.984770	38.0	1000.0	120.000	211.0	H	186.0	-10.6	8.4	46.4
527.995271	37.5	1000.0	120.000	289.0	V	-1.0	-7.5	8.9	46.4

Test Notes: Limit used is Part 15.109 Class A. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.21 Test Results above 30 MHz (J3E Mid Frequency)

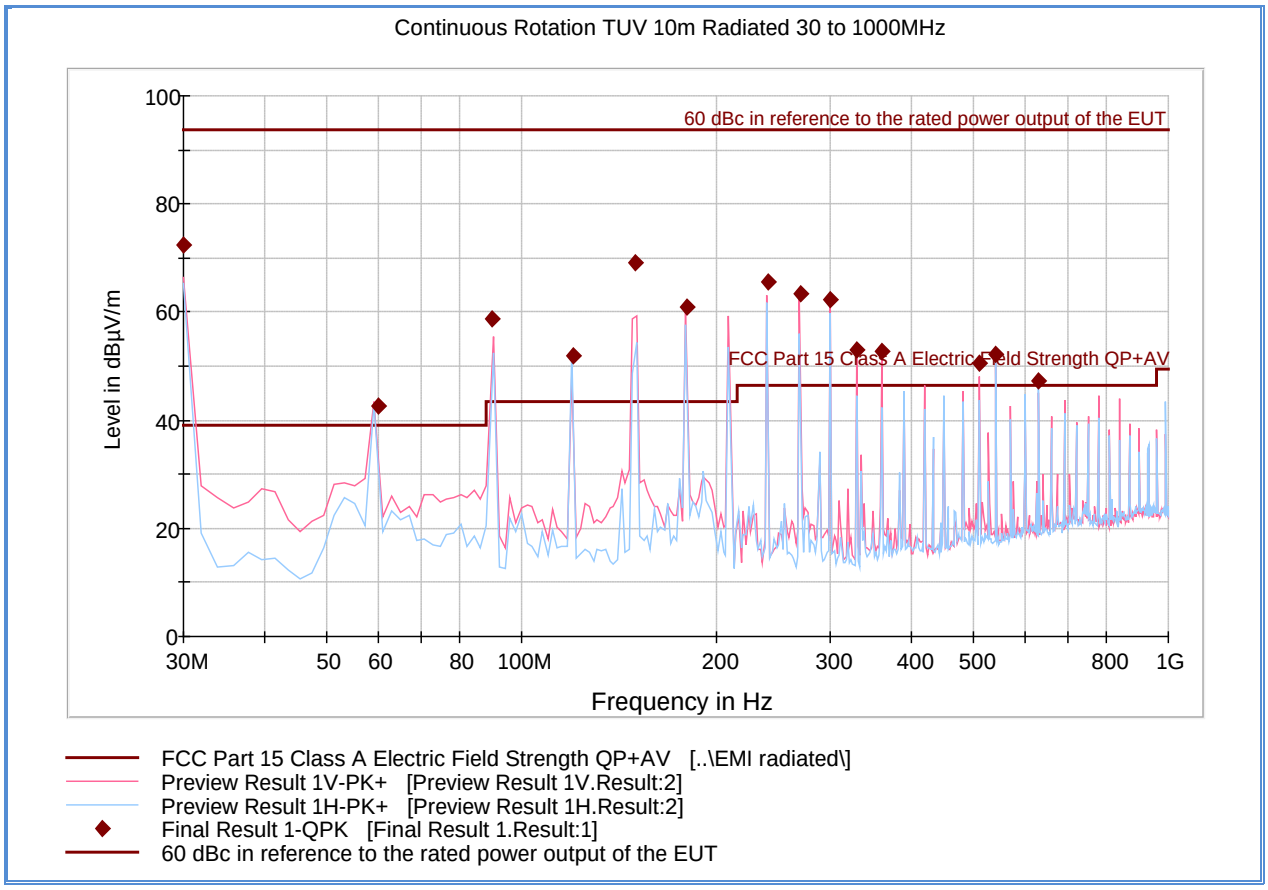


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
48.014990	68.9	1000.0	120.000	350.0	V	20.0	-21.0	-29.9	39.0
144.025491	54.6	1000.0	120.000	150.0	V	0.0	-21.1	-11.1	43.5
160.000481	55.8	1000.0	120.000	250.0	V	187.0	-18.9	-12.3	43.5
192.022685	61.4	1000.0	120.000	389.0	V	314.0	-18.3	-17.9	43.5
224.028778	59.5	1000.0	120.000	100.0	V	170.0	-17.0	-13.1	46.4

Test Notes: Limit used is Part 15.109 Class A. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

2.7.22 Test Results above 30 MHz (J3E High Frequency)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.000000	72.4	1000.0	120.000	350.0	V	171.0	-13.1	-33.4	39.0
59.998317	42.7	1000.0	120.000	391.0	V	216.0	-22.9	-3.7	39.0
90.020521	58.7	1000.0	120.000	127.0	V	-8.0	-22.0	-15.2	43.5
120.018838	51.9	1000.0	120.000	378.0	H	321.0	-22.2	-8.4	43.5
150.001042	69.0	1000.0	120.000	150.0	V	5.0	-20.4	-25.5	43.5
179.999359	61.1	1000.0	120.000	100.0	V	-14.0	-18.8	-17.6	43.5
240.019880	65.7	1000.0	120.000	150.0	V	158.0	-16.2	-19.3	46.4
270.018196	63.3	1000.0	120.000	100.0	V	324.0	-15.0	-16.9	46.4
300.000401	62.2	1000.0	120.000	350.0	V	-3.0	-15.0	-15.8	46.4
329.998717	52.9	1000.0	120.000	332.0	V	-14.0	-13.5	-6.5	46.4
360.020922	52.6	1000.0	120.000	327.0	V	338.0	-11.5	-6.2	46.4
510.020281	50.5	1000.0	120.000	350.0	V	331.0	-8.3	-4.1	46.4
540.042485	52.2	1000.0	120.000	100.0	H	15.0	-8.0	-5.8	46.4
630.021323	47.2	1000.0	120.000	139.0	H	39.0	-6.3	-0.8	46.4

Test Notes: Limit used is Part 15.109 Class A. There were no emissions observed within 60 dB in reference to the rated power output of the transmitter (Part 87.139).

SECTION 3

TEST EQUIPMENT USED

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
7604	P-Series Power Meter	N1912A	SG45100273	Agilent	05/27/15	05/27/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/10/15	04/10/16
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/03/15	09/03/16
Cubic	Directional Power Sensor	4024	TM 0122	Bird Electronic Corporation	02/27/14	02/27/16
Cubic	RF Power Meter	4421	CC 000158	Bird Electronic Corporation	02/27/14	02/27/16
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	12/22/14	12/22/15
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16
Cubic	21.5 MHz Synthesized Function/Arb Generator	SG-100/A	CC 0168	Telulex	12/11/14	12/11/15
Cubic	High Power Directional Coupler	C1449	8816	Werlatone	Verified by 7582 and 7608	
8773	10dB Attenuator	606-10-1F4/DR	N/A	Meca	Verified by 7582 and 7608	
Radiated Emissions						
6628	Loop Antenna	HFH 2 –Z2	880 458/25	Rhode & Schwarz	10/31/13	10/31/15
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/29/14	08/29/15
1016	Pre-amplifier	PAM-0202	187	PAM	12/10/14	12/10/15
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
6610	Temperature/Humidity Chamber	SH-27C	09963481-S10746	Environtronics	01/23/15	01/23/16
	AC Power Source	EW801	972430001	Elgar	Verified by 6792	
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.41
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.82

3.2.2 Conducted Antenna Port Measurement

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.34	0.20	0.04
2	Cables	Rectangular	1.00	0.58	0.33
3	EUT Setup	Rectangular	0.50	0.29	0.08
				Combined Uncertainty (u_c):	0.67
				Coverage Factor (k):	1.96
				Expanded Uncertainty:	1.32

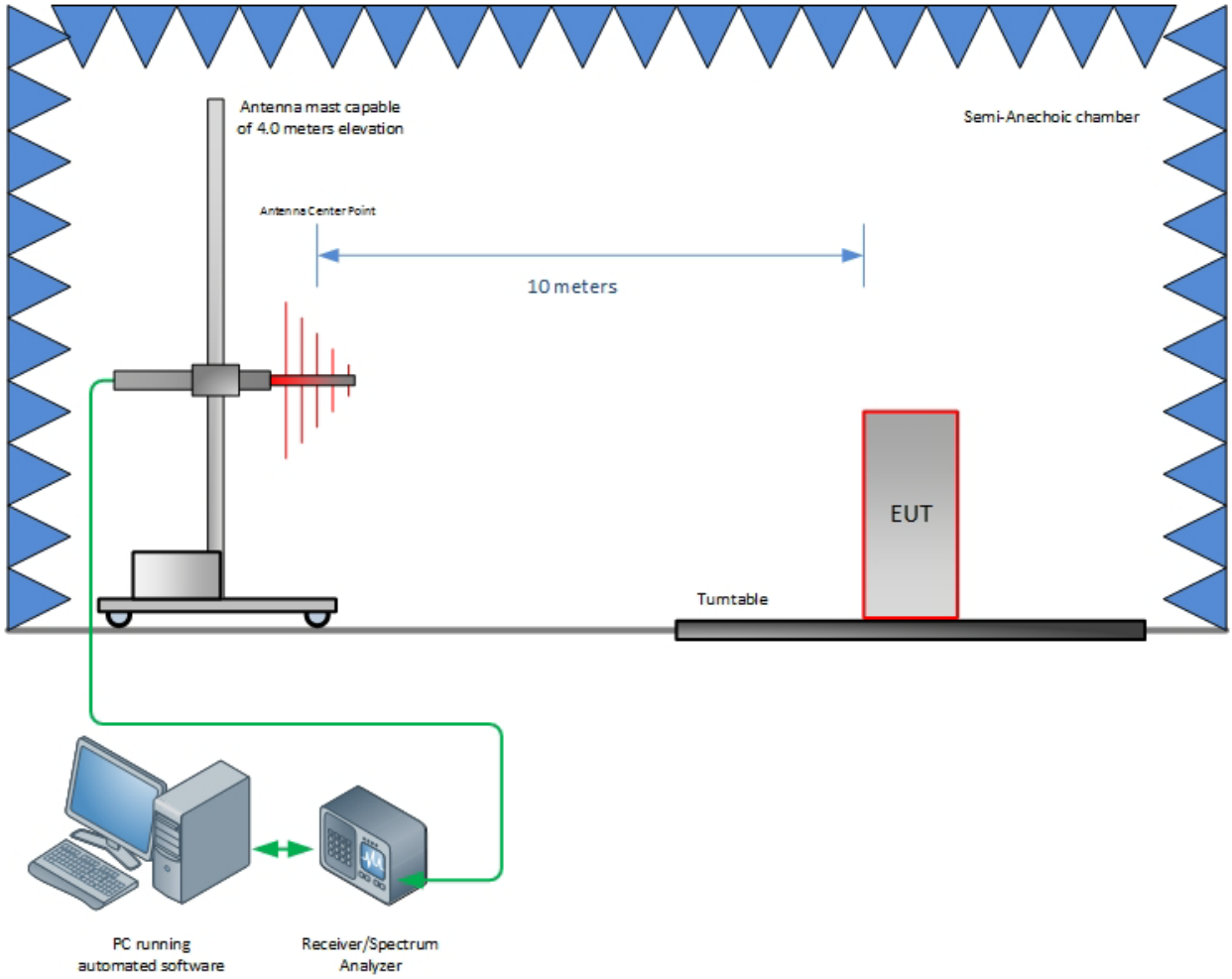
3.2.3 RF Power with Power Sensor

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.08	0.05	0.00
2	Cables	Rectangular	0.30	0.17	0.03
3	EUT Setup	Rectangular	0.50	0.29	0.08
				Combined Uncertainty (u_c):	0.34
				Coverage Factor (k):	1.96
				Expanded Uncertainty:	0.67

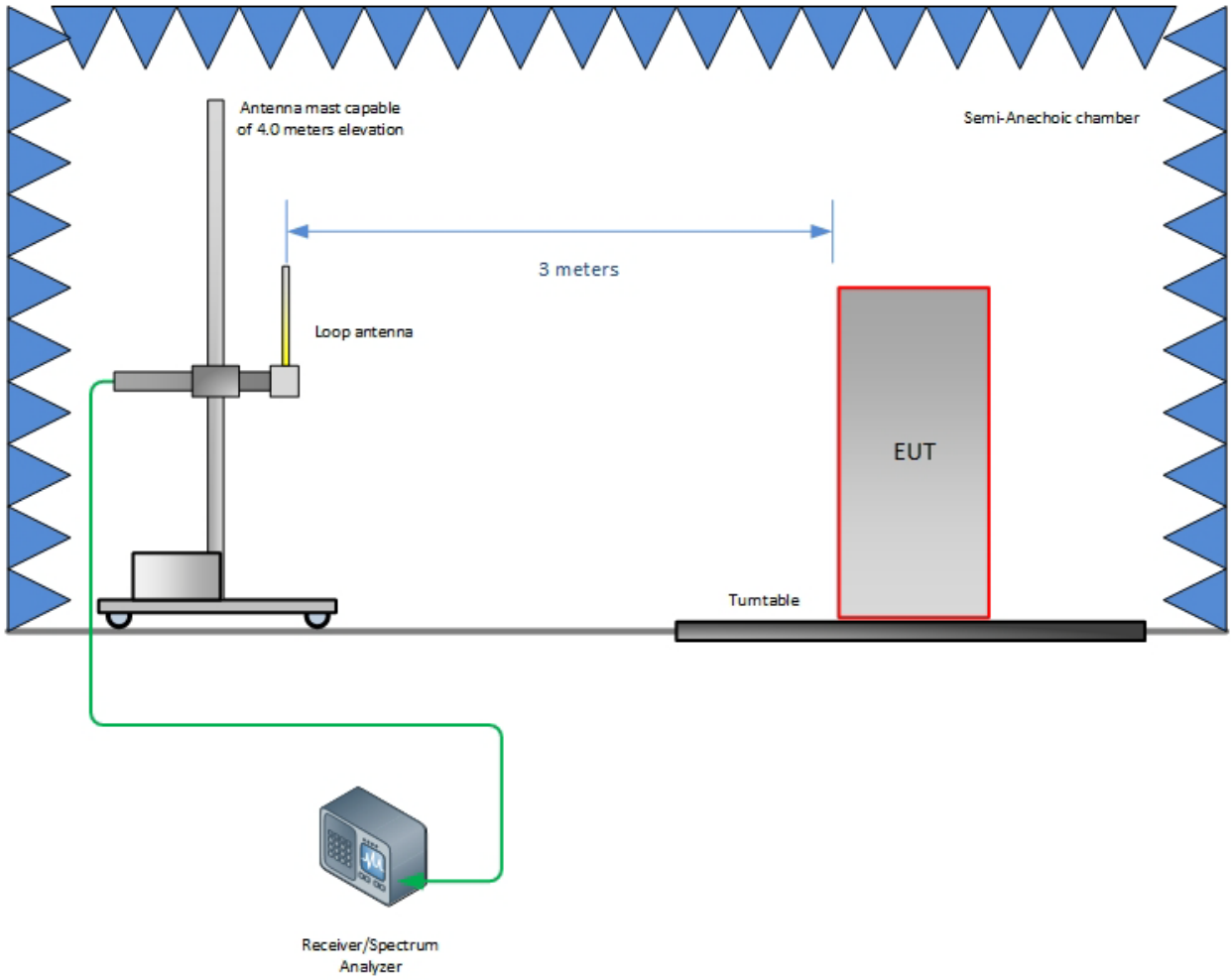
SECTION 4

DIAGRAM OF TEST SETUP

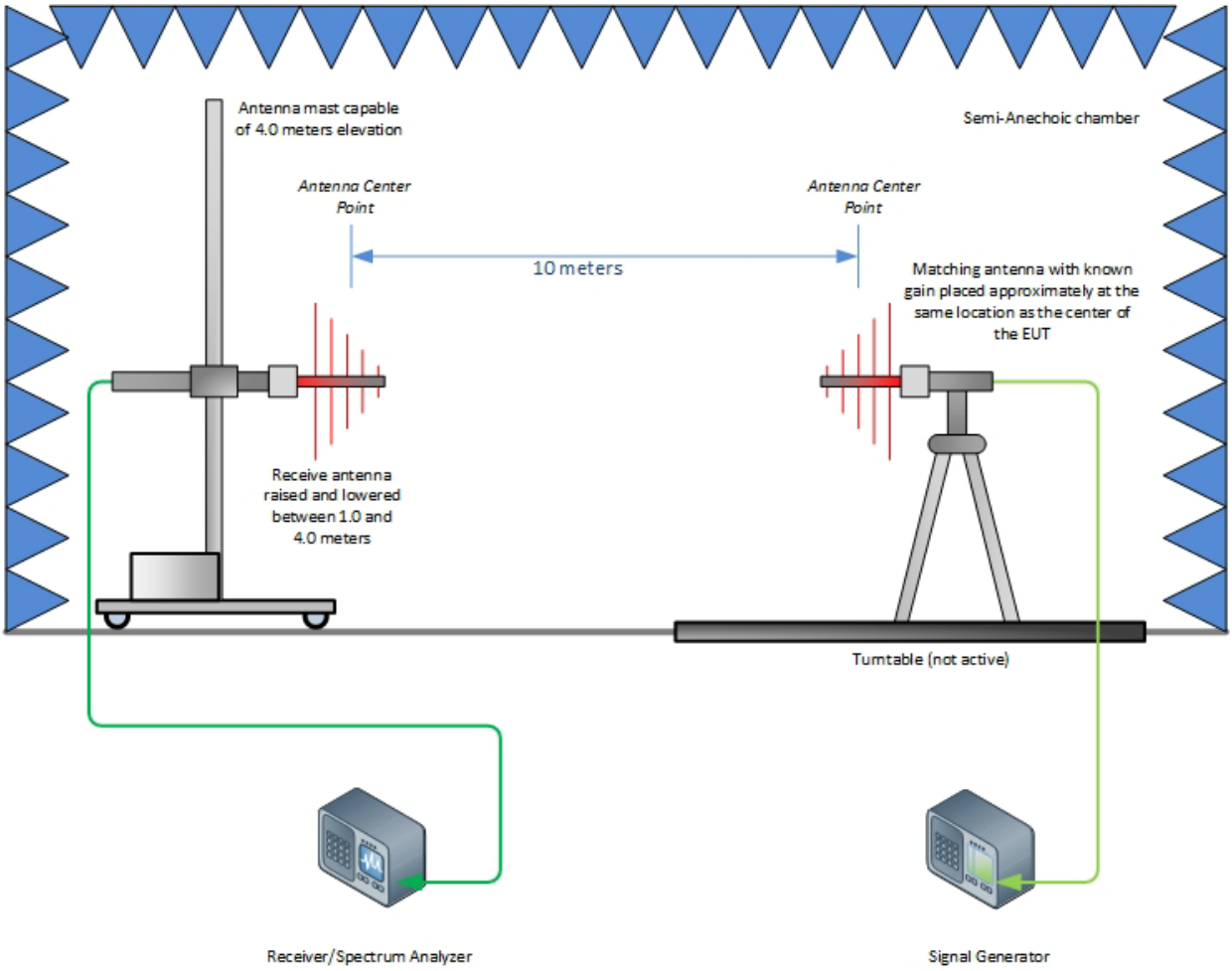
4.1 TEST SETUP DIAGRAM



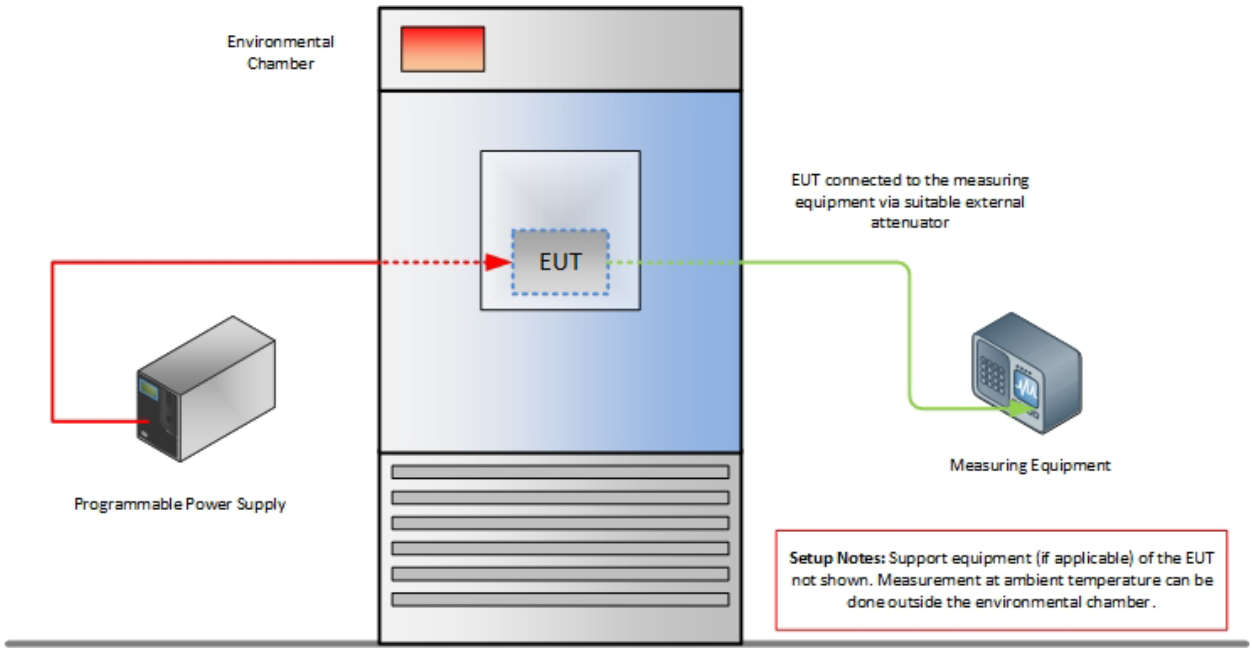
Radiated Emission Test Setup (30 MHz to 1000 MHz)



Radiated Emission Test Setup (Below 30MHz)



Substitution Test Method (30 MHz to 1GHz, if applicable)



Frequency Stability Test Configuration

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364