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Report On

Application for Grant of Equipment Authorization of the
IPS Group Inc.
VDS-020 (Vehicle Detection Sensor)

FCC Part 15 Subpart C §15.231

Report No. SC1406410A_Rev1.0 July 2014

REPORT ON	Radio Testing of the IPS Group Inc. VDS (Vehicle Detection Sensor)
TEST REPORT NUMBER	SC1406410A_Rev1.0
PREPARED FOR	IPS Group Inc. 5601 Oberlin Drive San Diego, CA 92121
CONTACT PERSON	Gary Thomas Sr. RF Design Engineer (858) 768-2401 ext. 211 gary.thomas@ipsgroupinc.com
PREPARED BY	Juan Gonzalez **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Fleury Chip **Name** Authorized Signatory Title: EMC manager
DATED	July 14, 2014

Revision History

SC1406410A_Rev1.0 IPS Group Inc. VDS-020 (Vehicle Detection Sensor)					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
07/07/2014	Initial Release				Fleury Chip
07/14/2014	Initial Release	1.0	Remove EUT pictures	8 & 10.	Fleury Chip

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SECTION 1

REPORT SUMMARY

Radio Testing of the
IPS Group Inc.
Vehicle Detection Sensor

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the IPS Group Inc. VDS-020 (Vehicle Detection Sensor) to the requirements of FCC Part 15 Subpart C §15.231

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	IPS Group Inc.
Model Number(s)	VDS-020
FCC ID Number	SGWIPS2013VS
Serial Number(s)	Engineering Sample
Number of Samples Tested	3
Test Specification/Issue/Date	FCC Part 15 Subpart C §15.231 (October 1, 2013)
Start of Test	June 23, 2014
Finish of Test	July 03, 2014
Name of Engineer(s)	Juan Gonzalez Kathy Mackenzie
Related Document(s)	None. 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 Part 15 Subpart C §15.231 standard is shown below.

Section	§15.231 Spec Clause	Test Description	Result	Comments/Base Standard
2.1	§15.207 (a)	Conducted Emissions	N/A *	
2.2	§15.231(a)(2)	Transmission Verification For Transmitter Activated Automatically	N/A **	
2.3	§15.231(a)(3)	Polling Or Supervision Transmissions, Including Data, To Determine System Integrity Of Transmitters Used In Security Or Safety Applications	Compliant	
2.4	§15.231(b)	Field Strength Of Emissions	Compliant	
2.5	§15.231(c)	Bandwidth Requirement	Compliant	
—	—	Receiver Spurious Emissions	N/A	Applies to IC RSS Specification Only

* *Not applicable. EUT is battery operated device.*
** *EUT is a transmitter that activates automatically, however provisions of §15.231(a)(3)applies.*

1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was an IPS Group Inc. VDS-020 (Vehicle Detection Sensor) as shown in the photograph below. The EUT provides a reliable and secure detection system which detects the presence and absence of a vehicle in a public or garage parking space. The sensor uniquely directs all sensing information via the IPS single or multispace parking meter cellular communications backbone.

The parking locations weather they are located on a city street or parking structure will detect whatever is parked over it. This build in an added measure of security not only does it detect when a vehicle is located at a parking location it will also detect when it is vacant so if a vehicle is abandon, stolen or has been left on the street somewhere it can be immediately located and it will time date stamp the actual event. It will also tell the city workers that have shut down specific parking locations due to either road work or an event if someone has inadvertently left their vehicle on the street in a restricted area.

The sensor because it is mounted directly below the parking meter on the pole. It has a battery life of a minimum of 1yr depending on detection activity and sun light. To maximize and conserve battery life the sensor remains dormant until it actually senses a vehicle at which time it will wake up to detect whatever a vehicle come within its target area and relays the information or data to the meter and then returns to dormant state until the next event which is when the vehicle leaves. The sensor uses multiple sensing technologies combining RF as well as radar to detect vehicles. Its unique design provides the most accurate data on the sensor market and allows for quick installation and servicing.

1.3.2 EUT General Description

EUT Description	Vehicle Detection Sensor
Model Number(s)	VDS-020
Rated Voltage	Internal batteries are 3.6VDC hybrid layer capacitor lithium ion two cells
Mode Verified	400 MHz Transmit Mode

Capability

Item	Description
ISM/SRD Band Transceiver	400 MHz

Primary Unit (EUT)

☐ Production

☐ Pre-Production

☒ Engineering

Antenna Detail Specification

Manufacturer	LINX Tech
Model	ANT-433-HETH (helical, through-hole)
Type	Helical, through-hole
Frequency	418-458 MHz
Gain	1.9dBi
Length	38.1 mm
Wire Diameter	1.3mm
Wire Inside/outside Diameter	6.4mm / 8.89mm

1.3.3 Maximum Radiated Output Power

Transmitter Frequency (MHz)	Field Strength (dBµV/m @ 3 meters)	Part 15.231(e) limits in dBµV/m
	FSK modulation	
410	**77.9 (Quasi Peak)**	**79.53**
420	68.3 (Quasi Peak)	79.94
430	67.9 (Quasi Peak)	80.36

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	Radiated emission test configuration. Measurement was performed while EUT configured in continuously transmission mode.

1.4.2 EUT Exercise Software

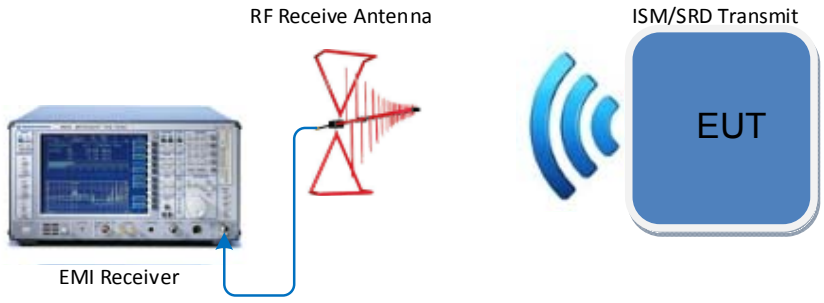
None. No special software was used to exercise the EUT. Software revision at the time of investigation is 1.04.6.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
—	—	—

1.4.4 Simplified Test Configuration Diagram

Radiated Emission Test Configuration



Not To Scale – Illustration Purpose Only
Objects may not represent actual image of original equipment/s or set-up.

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: Engineering Sample		
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 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 LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 Fax: 858 546 0364.

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

Sony Electronics Inc., Building #8, 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 Fax: 858 546 0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 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.

SECTION 2

TEST DETAILS

Radio Testing of the
IPS Group Inc.
Vehicle Detection Sensor

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

2.1 CONDUCTED EMISSIONS

2.1.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.1.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, 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 following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.*

2.1.3 Equipment Under Test and Modification State

Not applicable. EUT is a battery operated device.

2.2 TRANSMISSION VERIFICATION FOR TRANSMITTER ACTIVATED AUTOMATICALLY

2.2.1 Specification Reference

Part 15 Subpart C §15.231(a)(2)

2.2.2 Standard Applicable

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

2.2.3 Equipment Under Test and Modification State

- Test not applicable. When activated, the EUT transmits short bust (641µS) every time the sensor detects an event (vehicle entrance or departure), then returns to dormant state until the next EUT (sensor) event.
- The manufacturer declares that the EUT based from its intended application falls under the Security or Safety Application category. Therefore Part 15 Subpart C § 15.231(a) (3) applies. Please refer to Section 2.3 of this test report for details.

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

2.3 POLLING OR SUPERVISION TRANSMISSIONS, INCLUDING DATA, TO DETERMINE SYSTEM INTEGRITY OF TRANSMITTERS USED IN SECURITY OR SAFETY APPLICATIONS

2.3.1 Specification Reference

Part 15 Subpart C §15.231(a)(3)

2.3.2 Standard Applicable

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

2.3.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Default Test Configuration

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

June 23, 2014/JMG

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 Location

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

Ambient Temperature	24.3°C
Relative Humidity	28.9%
ATM Pressure	99.7 kPa

2.3.7 Calculations

EUT in normal operation does not transmit continuously, it transmits short burst (641.02µS) every time the sensor detects an event (vehicle entrance or departure). Calculation presented is based on worst case and considers the numbers of cars needed to meet the spec of < 2secs/hr:

Total transmission necessary to meet the 2 seconds (limit is less than 2 seconds per hour):
Pulse Width: 641.02 µS

1 car =Pulse Width **x** 2 events=1282 µS =1.282 mS = 0.001282 Sec
2 Seconds= 0.001282 S **x** # of Cars to reach the 2 Sec/hr
Cars needed in an hr to reach the 2 Sec= 1560 cars *
*in a real case scenario the same parking space would never achieve 1560 cars in a time frame of one hour.--> **Compliant**

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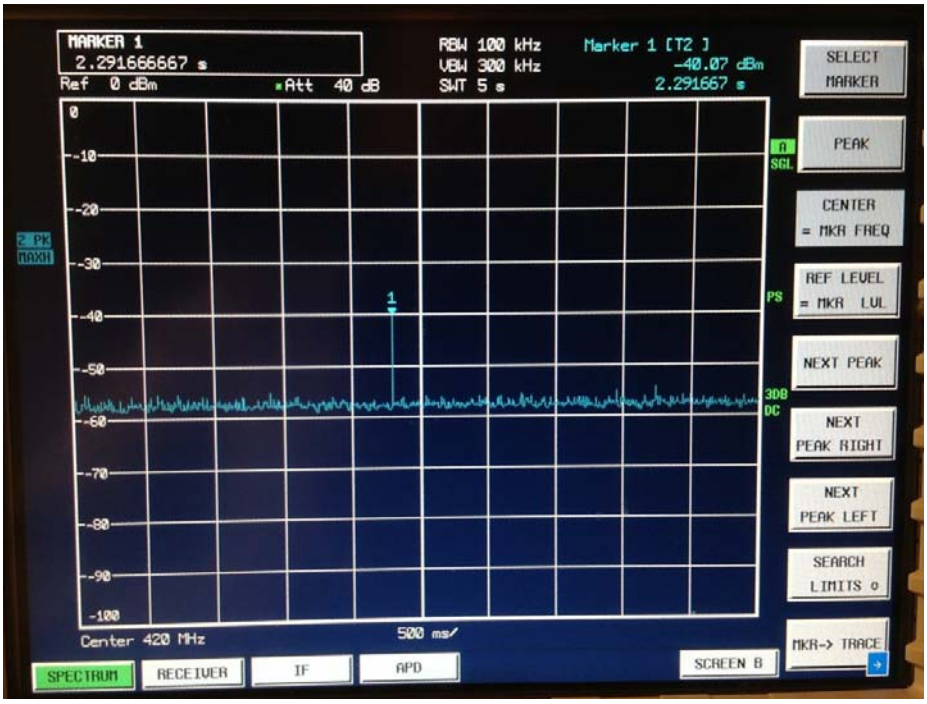
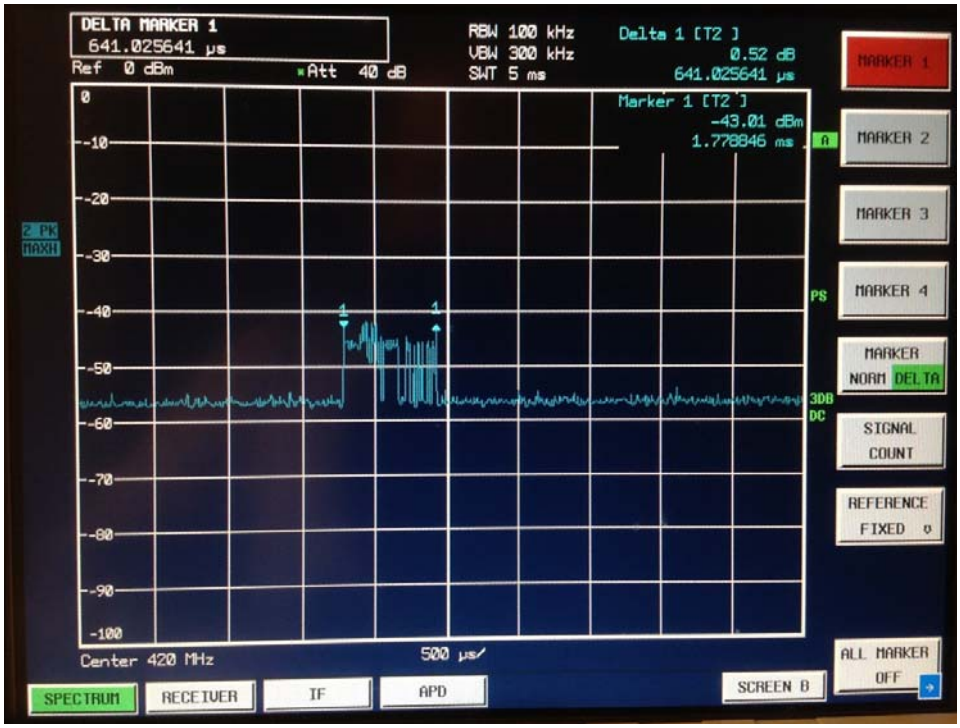
2.3.8 Test Result Plot



Simulated operation of the EUT showing a single burst.



Single transmission “Short burst =641µs)

2.4 FIELD STRENGTH OF EMISSIONS

2.4.1 Specification Reference

Part 15 Subpart C §15.231(b)

2.4.2 Standard Applicable

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1] 1,250 to 3,750	[1] 125 to 375
174-260	3,750	375
260-470	[1] 3,750 to 12,500	[1] 375 to 1,250
Above 470	12,500	1,250

[1]Linear Interpolations

2.4.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Default Test Configuration

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

June 23-July 02, 2014/JMG

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 Location

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

Ambient Temperature	24.3°C
Relative Humidity	28.9%
ATM Pressure	99.7 kPa

2.4.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (5GHz), up to 18GHz presented.

- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.3.8 for sample computation.

2.4.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 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**

2.4.9 Test Results

See attached plots.

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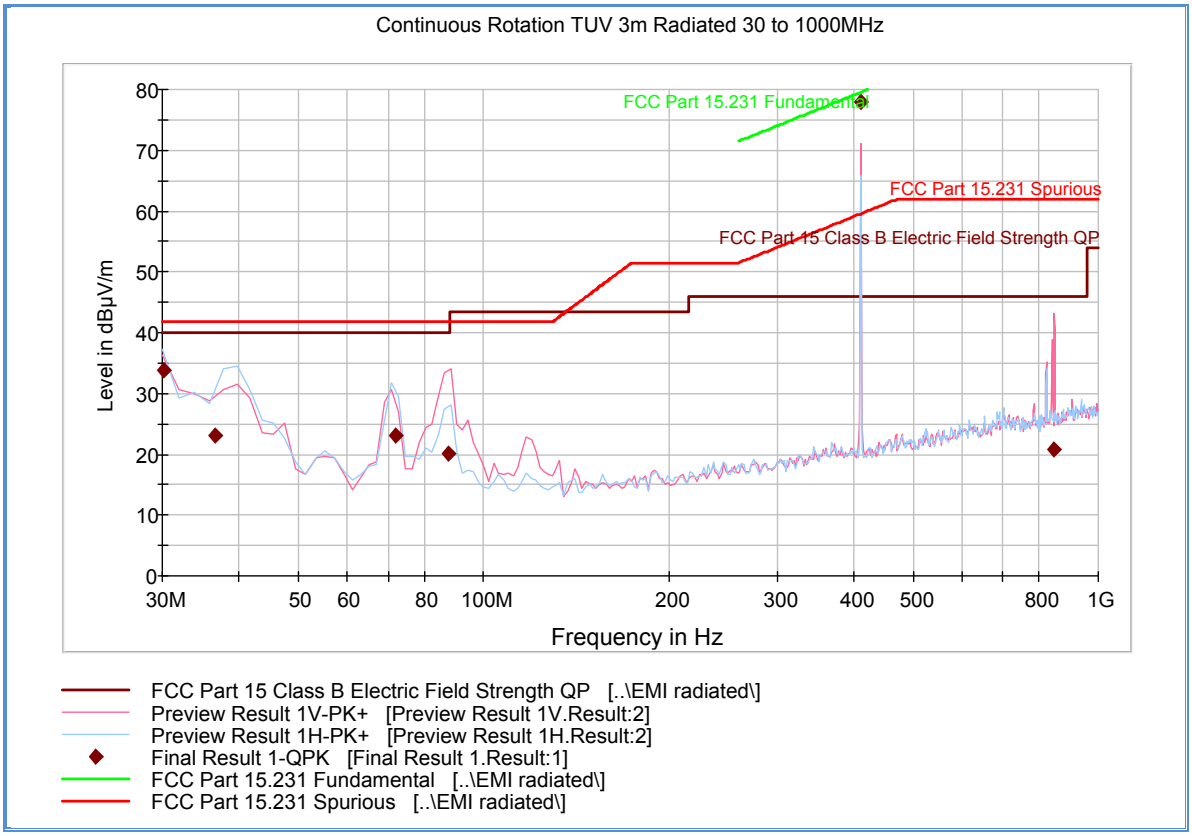
2.4.10 Test Results Below 1GHz (Low Channel 410 MHz)

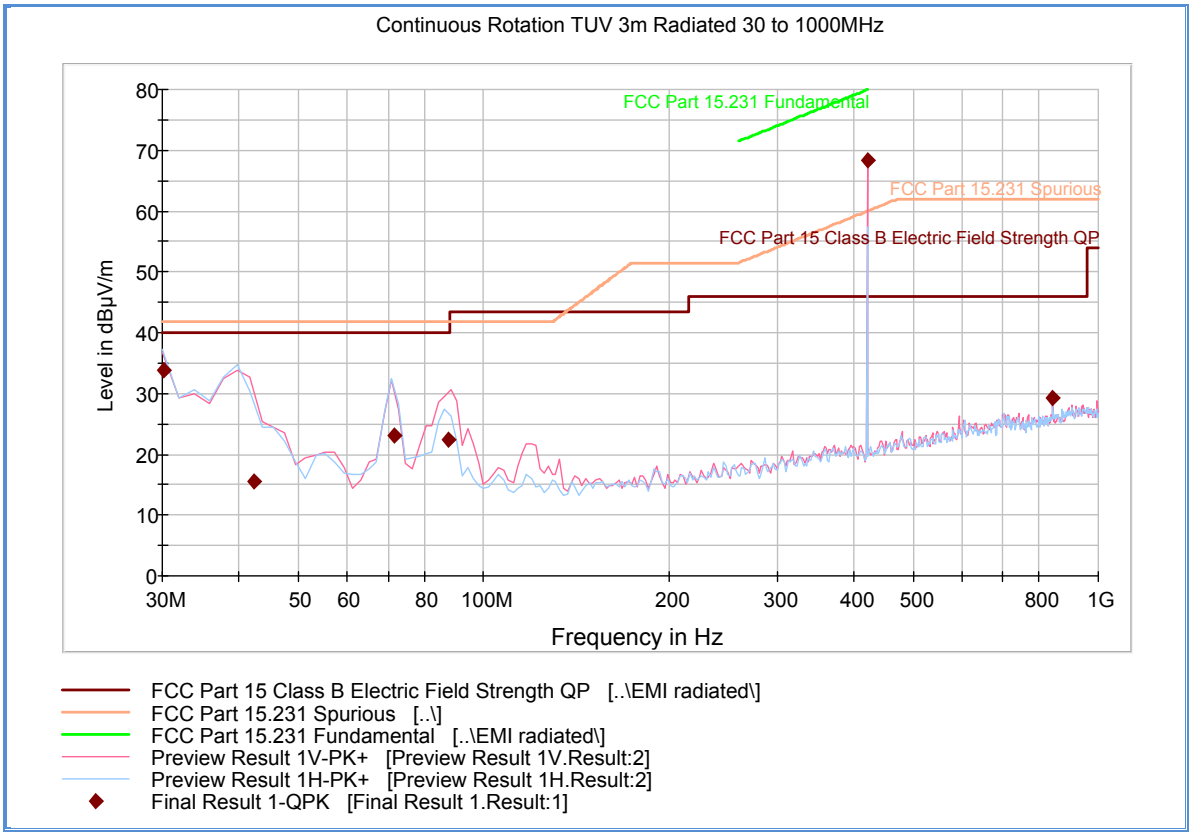


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.080000	33.9	1000.0	120.000	127.0	H	283.0	-10.7	6.1	40.0	
36.479439	23.1	1000.0	120.000	400.0	H	15.0	-14.0	16.9	40.0	
71.741643	23.1	1000.0	120.000	200.0	H	220.0	-21.4	16.9	40.0	
87.572745	20.1	1000.0	120.000	200.0	V	342.0	-20.4	19.9	40.0	
410.682004	77.9	1000.0	120.000	115.0	V	338.0	-8.2	1.63	79.53	fundamental
847.816754	20.8	1000.0	120.000	393.0	V	139.0	0.7	25.2	46.0	

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.4.11 Test Results Below 1GHz (Mid Channel 420 MHz)

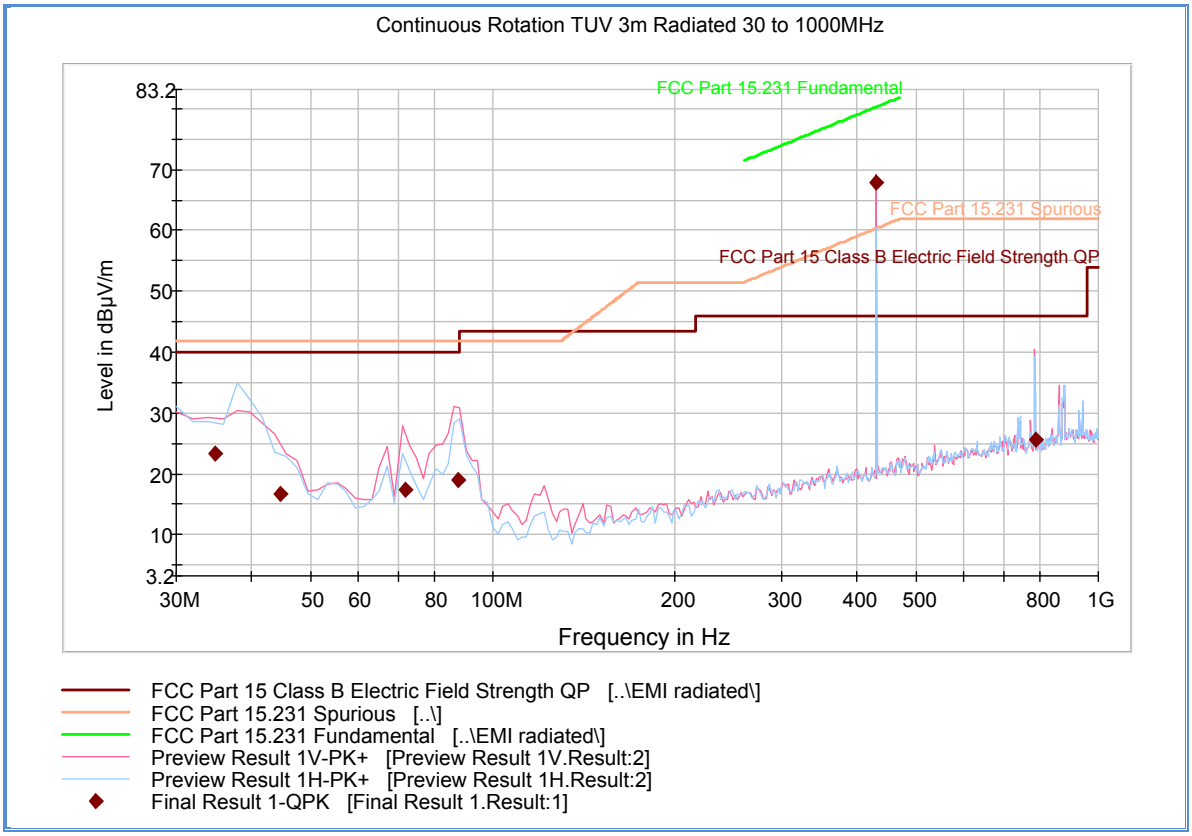


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.080000	33.9	1000.0	120.000	141.0	H	254.0	-10.7	6.1	40.0	
42.327214	15.5	1000.0	120.000	105.0	V	-15.0	-16.6	24.5	40.0	
71.701643	23.1	1000.0	120.000	200.0	H	-15.0	-21.4	16.9	40.0	
87.812745	22.4	1000.0	120.000	200.0	V	228.0	-20.3	17.6	40.0	
420.721443	68.3	1000.0	120.000	105.0	V	139.0	-8.1	11.64	79.94	Fundamental
840.945090	29.4	1000.0	120.000	100.0	V	255.0	0.8	16.6	46.0	

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.4.12 Test Results Below 1GHz (High Channel 430 MHz)

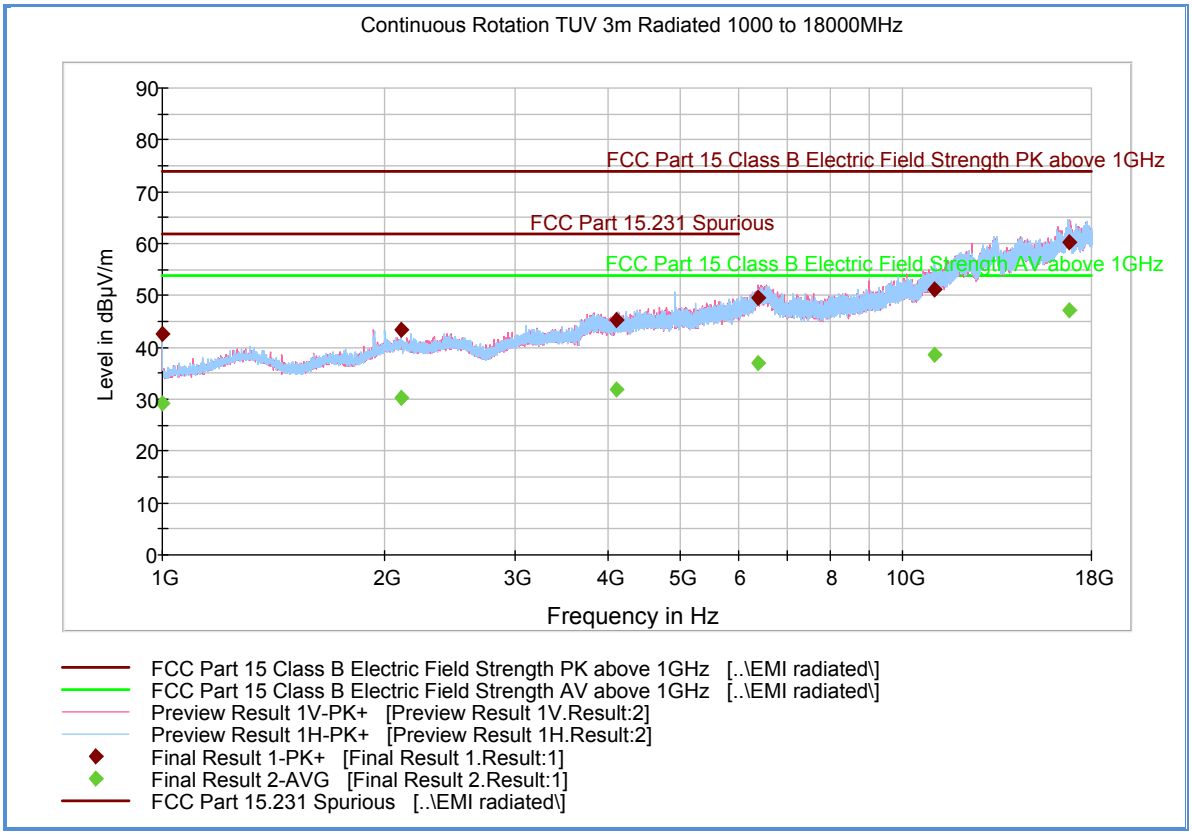


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)	Comment
34.815551	23.2	1000.0	120.000	400.0	H	-2.0	-13.2	16.8	40.0	
44.567214	16.6	1000.0	120.000	150.0	V	15.0	-17.3	23.4	40.0	
71.781643	17.4	1000.0	120.000	100.0	V	221.0	-21.4	22.6	40.0	
87.852745	19.0	1000.0	120.000	300.0	V	-12.0	-20.3	21.0	40.0	
430.280882	67.9	1000.0	120.000	106.0	V	190.0	-7.8	12.46	80.36	Fundamental
786.452345	25.5	1000.0	120.000	250.0	V	206.0	-0.1	20.5	46.0	

Test Notes: There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

2.4.13 Test Results Above 1GHz (Low Channel)



Peak Data

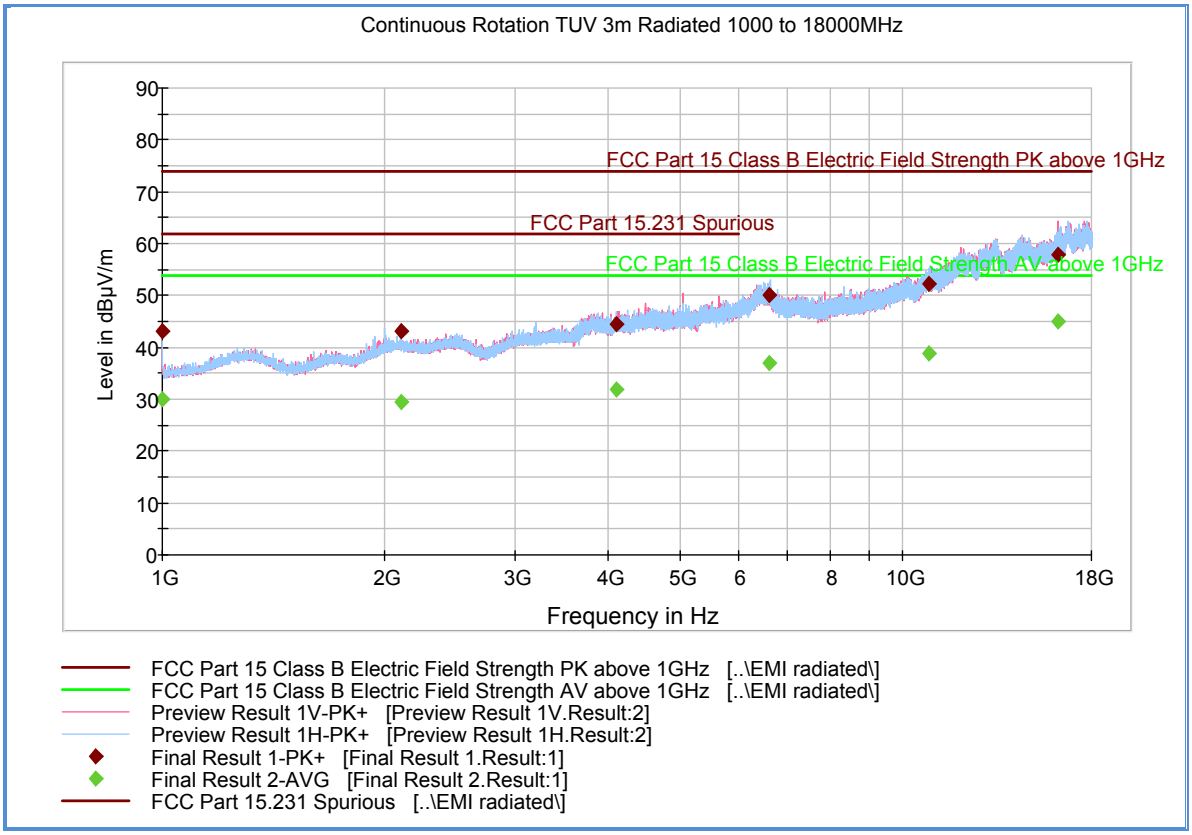
Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	42.5	1000.0	1000.000	177.6	H	174.0	-7.0	31.4	73.9
2099.700000	43.5	1000.0	1000.000	302.2	H	195.0	-1.0	30.4	73.9
4116.066667	45.2	1000.0	1000.000	247.3	H	4.0	6.2	28.7	73.9
6390.666667	49.7	1000.0	1000.000	128.7	V	215.0	12.7	24.2	73.9
11066.233333	51.3	1000.0	1000.000	278.3	H	-20.0	16.7	22.6	73.9
16794.833333	60.3	1000.0	1000.000	122.7	V	22.0	25.9	13.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	29.2	1000.0	1000.000	177.6	H	174.0	-7.0	24.7	53.9
2099.700000	30.2	1000.0	1000.000	302.2	H	195.0	-1.0	23.7	53.9
4116.066667	32.0	1000.0	1000.000	247.3	H	4.0	6.2	21.9	53.9
6390.666667	36.8	1000.0	1000.000	128.7	V	215.0	12.7	17.1	53.9
11066.233333	38.6	1000.0	1000.000	278.3	H	-20.0	16.7	15.3	53.9
16794.833333	47.2	1000.0	1000.000	122.7	V	22.0	25.9	6.7	53.9

Test Notes: No significant emissions observed above 1GHz. Measurement are noise floor figures.

2.4.14 Test Results Above 1GHz (Mid Channel)



Peak Data

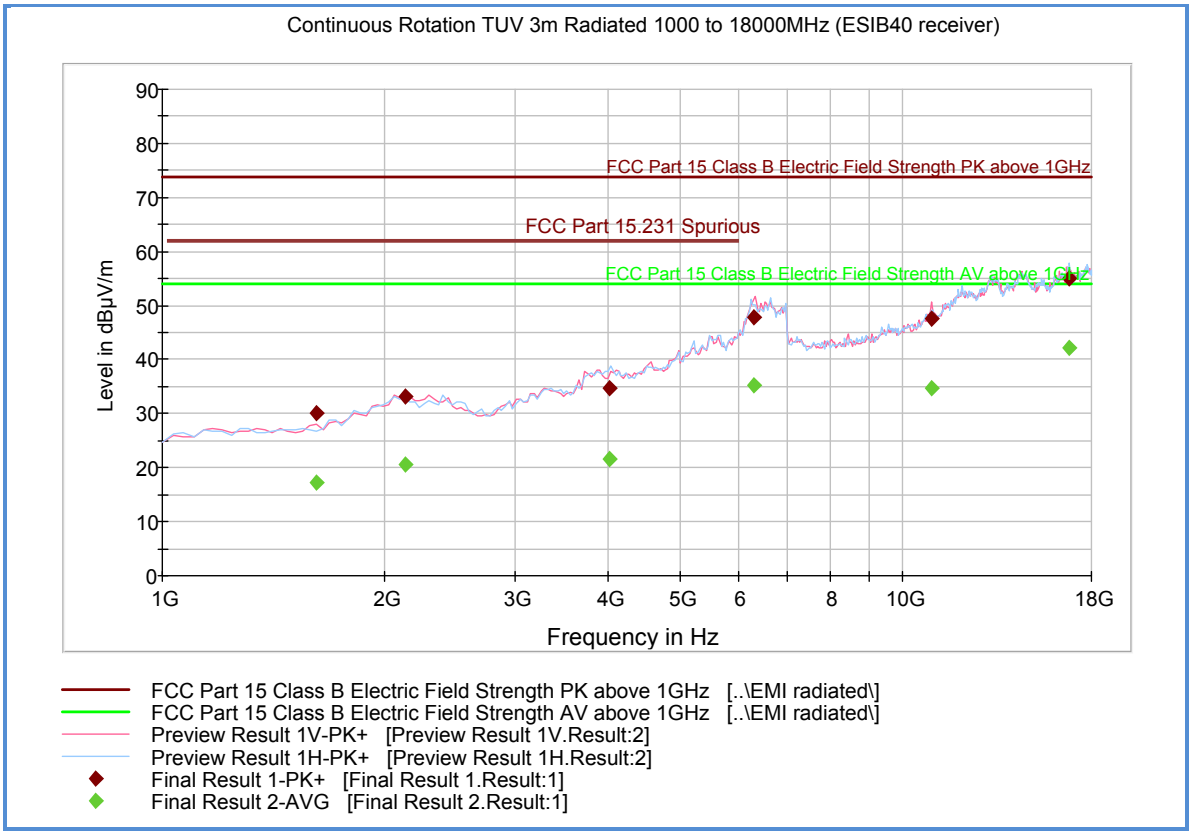
Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	43.2	1000.0	1000.000	177.6	H	0.0	-7.0	30.7	73.9
2098.200000	43.2	1000.0	1000.000	247.3	H	193.0	-1.0	30.7	73.9
4107.233333	44.5	1000.0	1000.000	217.4	H	180.0	6.2	29.4	73.9
6620.566667	50.0	1000.0	1000.000	404.3	H	-20.0	12.7	23.9	73.9
10880.933333	52.1	1000.0	1000.000	404.3	H	149.0	16.7	21.8	73.9
16246.733333	57.9	1000.0	1000.000	301.6	V	299.0	23.8	16.0	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	29.9	1000.0	1000.000	177.6	H	0.0	-7.0	24.0	53.9
2098.200000	29.4	1000.0	1000.000	247.3	H	193.0	-1.0	24.5	53.9
4107.233333	32.0	1000.0	1000.000	217.4	H	180.0	6.2	21.9	53.9
6620.566667	37.0	1000.0	1000.000	404.3	H	-20.0	12.7	16.9	53.9
10880.933333	38.8	1000.0	1000.000	404.3	H	149.0	16.7	15.1	53.9
16246.733333	44.9	1000.0	1000.000	301.6	V	299.0	23.8	9.0	53.9

Test Notes: No significant emissions observed above 1GHz. Measurement are noise floor figures.

2.4.15 Test Results Above 1GHz (High Channel)



Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1618.526453	30.0	1000.0	1000.000	269.3	V	254.0	-4.7	43.9	73.9
2127.948497	33.2	1000.0	1000.000	313.2	V	99.0	-1.0	40.7	73.9
4026.164128	34.7	1000.0	1000.000	99.8	H	133.0	6.0	39.2	73.9
6310.729259	47.9	1000.0	1000.000	347.1	V	307.0	12.0	26.0	73.9
10947.595792	47.5	1000.0	1000.000	220.4	V	321.0	16.9	26.4	73.9
16808.515230	54.9	1000.0	1000.000	302.2	H	185.0	25.7	19.0	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1618.526453	17.4	1000.0	1000.000	269.3	V	254.0	-4.7	36.5	53.9
2127.948497	20.5	1000.0	1000.000	313.2	V	99.0	-1.0	33.4	53.9
4026.164128	21.7	1000.0	1000.000	99.8	H	133.0	6.0	32.2	53.9
6310.729259	35.2	1000.0	1000.000	347.1	V	307.0	12.0	18.7	53.9
10947.595792	34.6	1000.0	1000.000	220.4	V	321.0	16.9	19.3	53.9
16808.515230	42.1	1000.0	1000.000	302.2	H	185.0	25.7	11.8	53.9

Test Notes: No significant emissions observed above 1GHz. Measurement are noise floor figures.

2.5 BANDWIDTH REQUIREMENT

2.5.1 Specification Reference

Part 15 Subpart C §15.231(c)

2.5.2 Standard Applicable

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

2.5.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Default Test Configuration

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

July 03, 2014/KM

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 Location

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

Ambient Temperature	24.7°C
Relative Humidity	48.8%
ATM Pressure	98.8 kPa

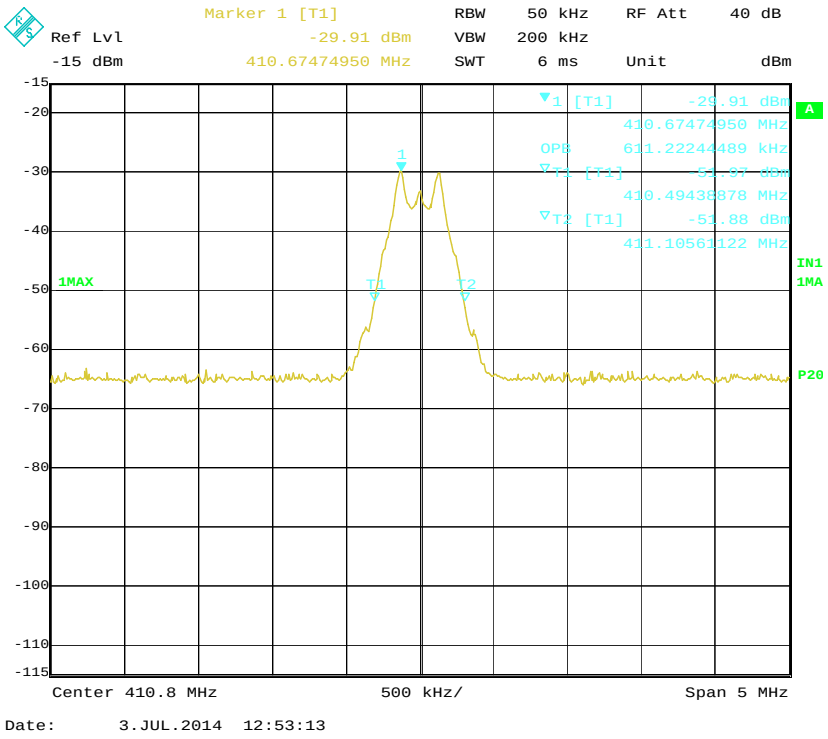
2.5.7 Additional Observations

- This is a radiated test.
- Offset were added to compensate for the antenna factor, preamp, and cable used from the antenna to spectrum analyzer.
- Span is set to encompass the whole emission
- RBW is 1% of the span while VBW is greater than 3X RBW.
- Sweep is auto.
- Detector is peak.
- Max hold function activated.

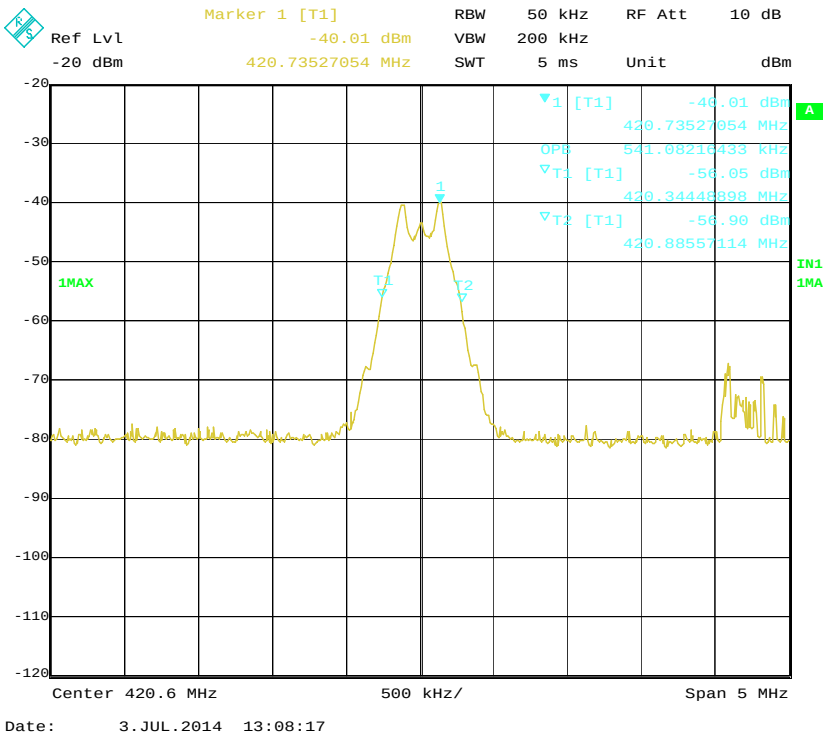
2.5.8 Test Results

Transmitter Frequency (MHz)	Modulation	0.25% of the center frequency requirement	Measured 20dB Bandwidth (MHz)
410	FSK	<1.026 MHZ	611.22 kHz
420	FSK	<1.051 MHz	541.08 kHz
430	FSK	<1.075 MHz	521.04 kHz

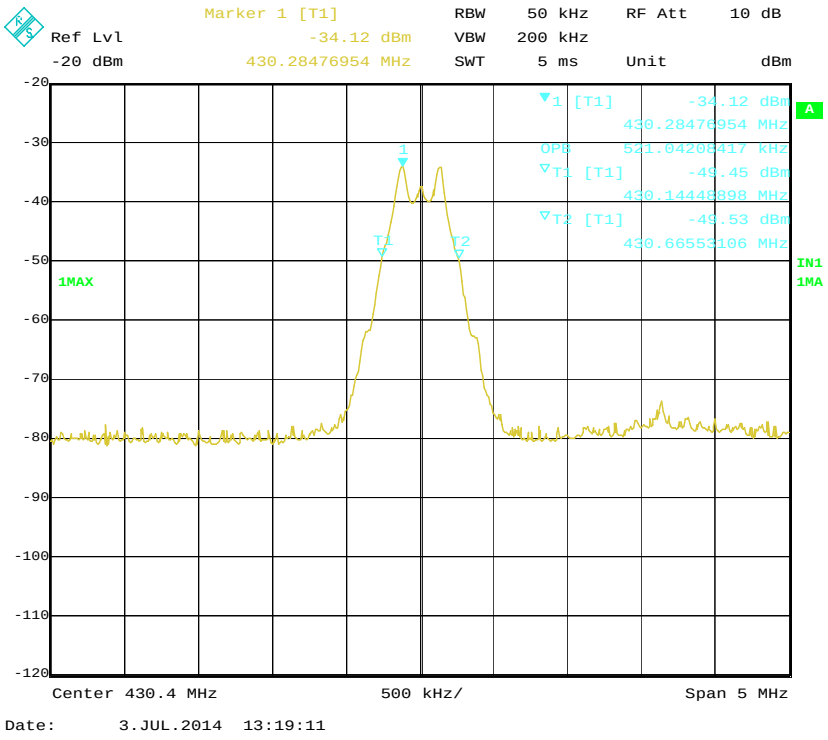
2.5.9 Test Results Plots



20dB BW – Low Channel 410 MHz



20dB BW – Mid Channel 420 MHz



20dB BW – High Channel 430 MHz

SECTION 3

TEST EQUIPMENT USED

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
Radiated Emissions						
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	07/31/13	07/31/14
1016	Pre-amplifier	PAM-0202	187	PAM	10/08/13	10/08/14
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/17/14	03/17/15
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	09/03/13	09/03/14
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	04/08/14	04/08/15
Miscellaneous						
6452	Multimeter	3478A	2911A52177	Hewlett Packard	08/02/13	08/02/14
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	01/30/14	01/30/15
	EMC 32	Software	N/A	R&S	N/A	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

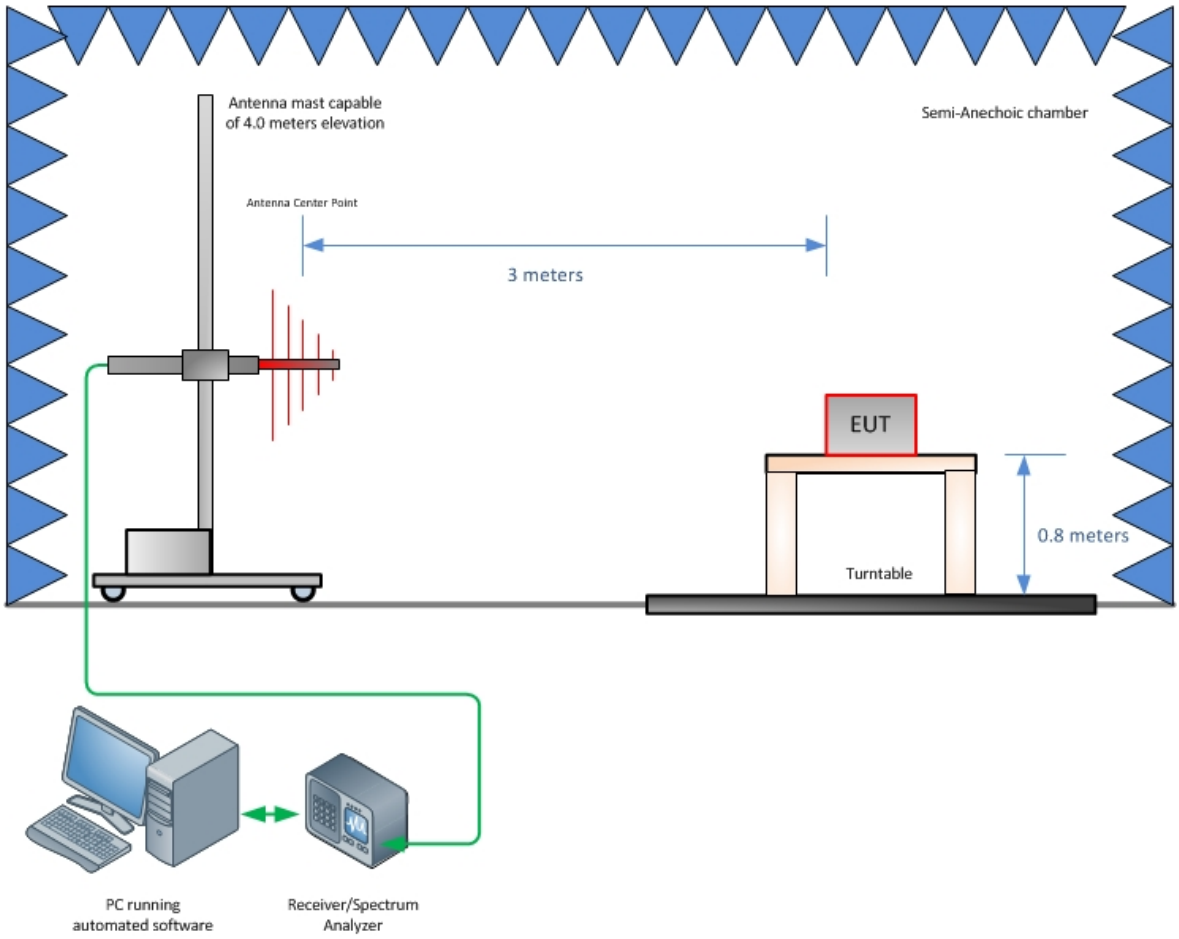
3.2.2 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.40
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.81

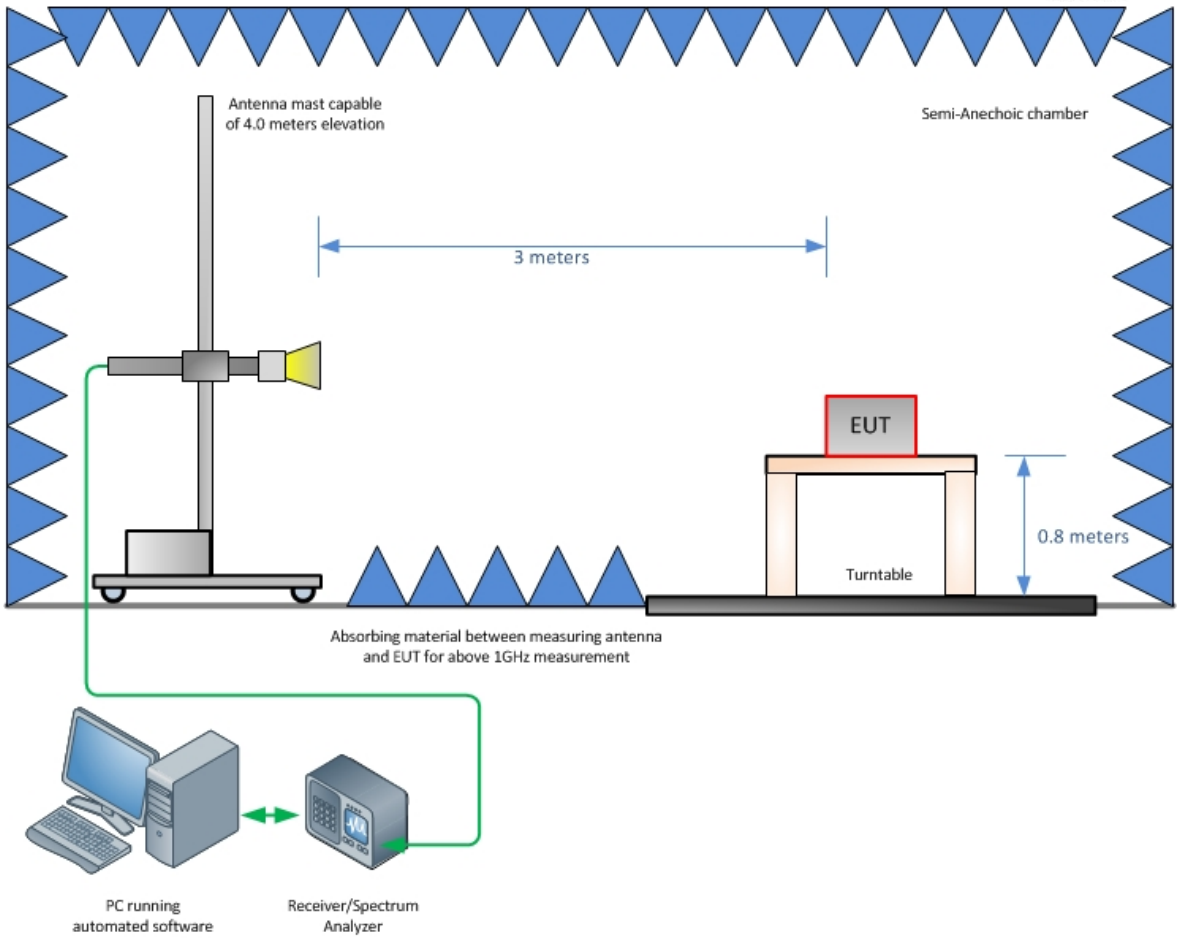
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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