FCC PART 15C TEST REPORT

TESTING
CNAS L3572

Issued to

The Nest Network S.L.

For

eNEST Bracelet

Model Name:	NE201
Trade Name:	eNEST Brace
Brand Name:	Nestwork
FCC ID:	2ABF8-NE201
Standard:	47 CFR Part 15 Subpart C
Test date:	2013-10-23 to 2013-11-19
Issue date:	2014-2-10

by

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Tested by	Nie Quan	***Approved by***	Zeng Dexin	***Reviewed by***	Peng Huarui
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Date	2014.2.10	***Date***	2014.2.10	***Date***	2014.2.10

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Change History		
Issue	Date	Reason for change
1.0	February 10, 2014	First edition

1. GENERAL INFORMATION

1.1. EUT Description

EUT Type.....:	eNEST Bracelet
Serial No. .....:	(n.a, marked #1 by test site)
Hardware Version.....:	V4.0
Software Version.....:	V1.5.2
Applicant.....:	The Nest Network S.L.
	Plaza Republica Argentina 3 Madrid Spain
Manufacturer .....:	The Nest Network S.L.
	Plaza Republica Argentina 3 Madrid Spain
Frequency Range.....:	The frequency range used is 2427MHz~2431MHz
Channel Number .....:	3(2427MHz,2429MHz,2431MHz)
Modulation Type.....:	GFSK
Antenna Type.....:	Integral Antenna
Antenna Gain.....:	0dBi

Note:

1. The EUT is a eNEST Bracelet, it contains 2.4G Module operating at 2.4GHz ISM band, they are all tested in this report.
2. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-12 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	**PASS**
2	15.215	20dB Bandwidth	**N/A**
3	15.249(d)	Band Edge	**PASS**
4	15.207	Conducted Emission	**N.A**
5	15.209	Radiated Emission	**PASS**
	15.249(a)	Field Strength	

NOTE:

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 Equipment in the range of 9 kHz to 40GHz for FCC ID Certification,.

1.3. Facilities and Accreditations

1.3.1. Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR PART 15C REQUIREMENTS

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. **Result:** Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

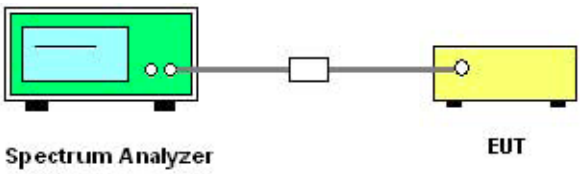
2.2. 20dBandwidth

2.2.1. Requirement

None; for reporting purpose only.

2.2.2. Test Description

A. Test Setup:



B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum analyzer	Agilent	E4407B	MY45101810	2013.05.12	2014.05.11

2.2.1. Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth

RBW =100KHz

VBW =300kHz

Sweep = auto

Detector function = peak

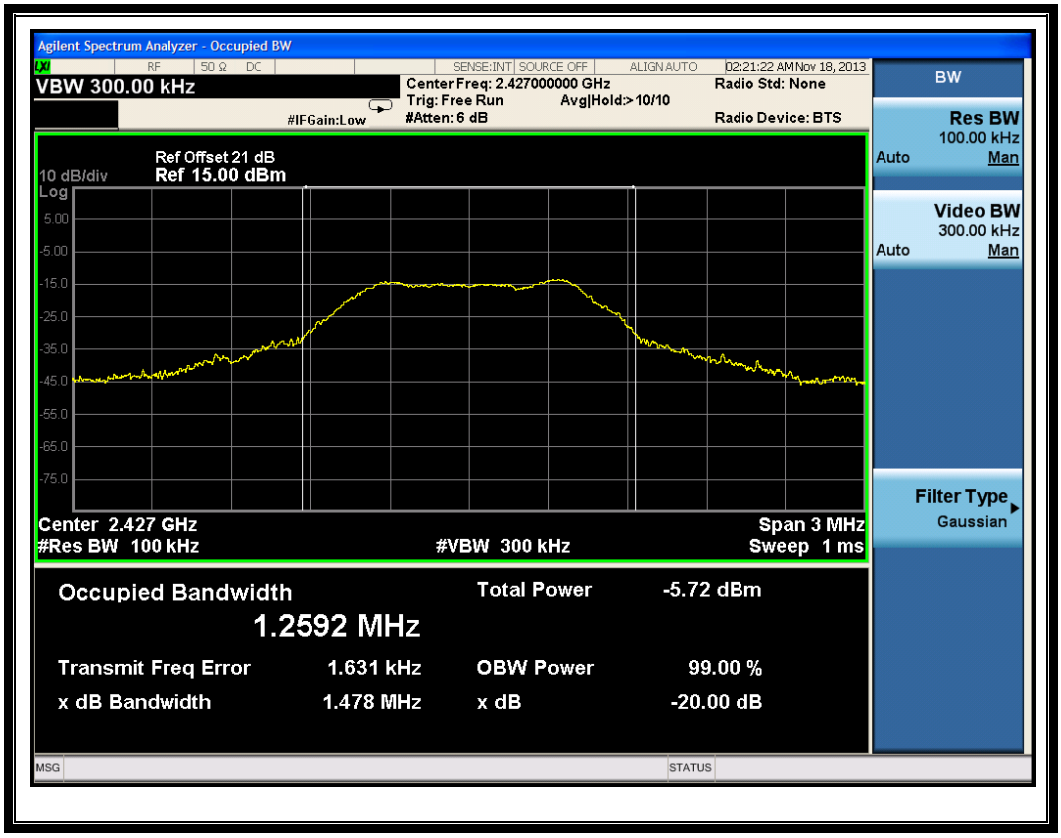
Trace = max hold

2.2.2. Test Result

A. Test Verdict:

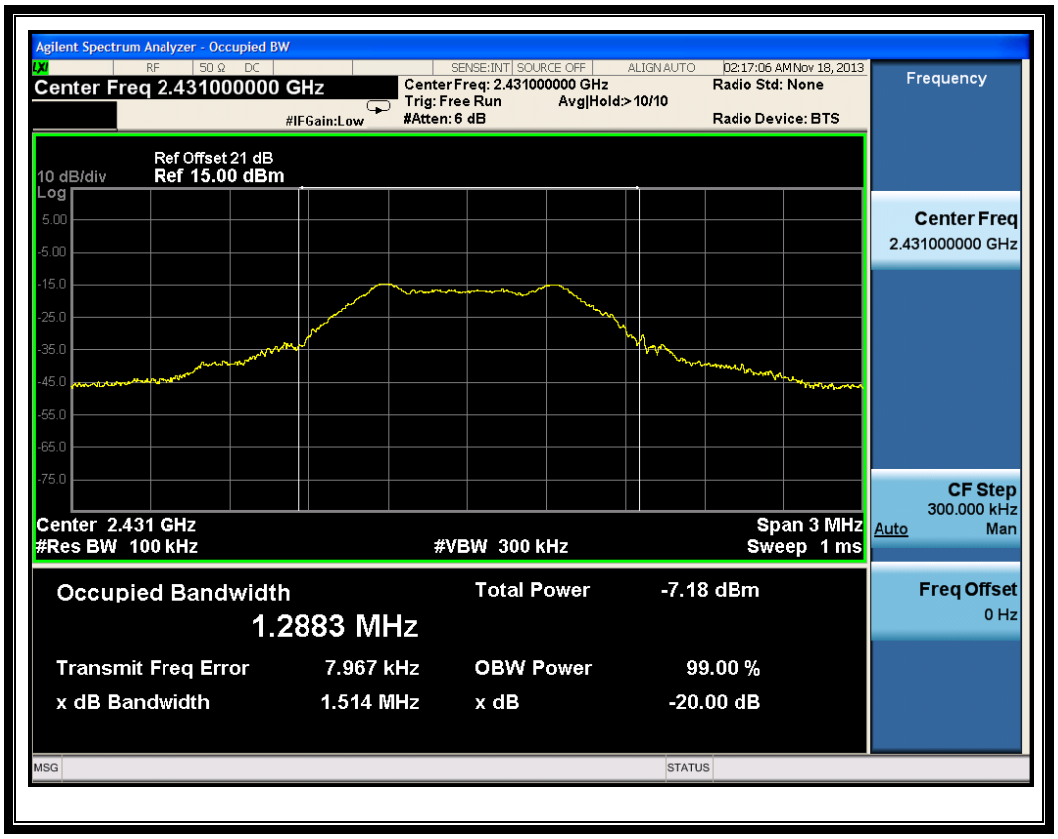
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
L	2427	1.478	Plot A
M	2429	1.376	Plot B
H	2431	1.514	Plot C

B. Test Plots:



(Plot A: Channel = 2427 @ GFSK)

(Plot B: Channel = 2429 @ GFSK)



(Plot C: Channel = 2431 @ GFSK)

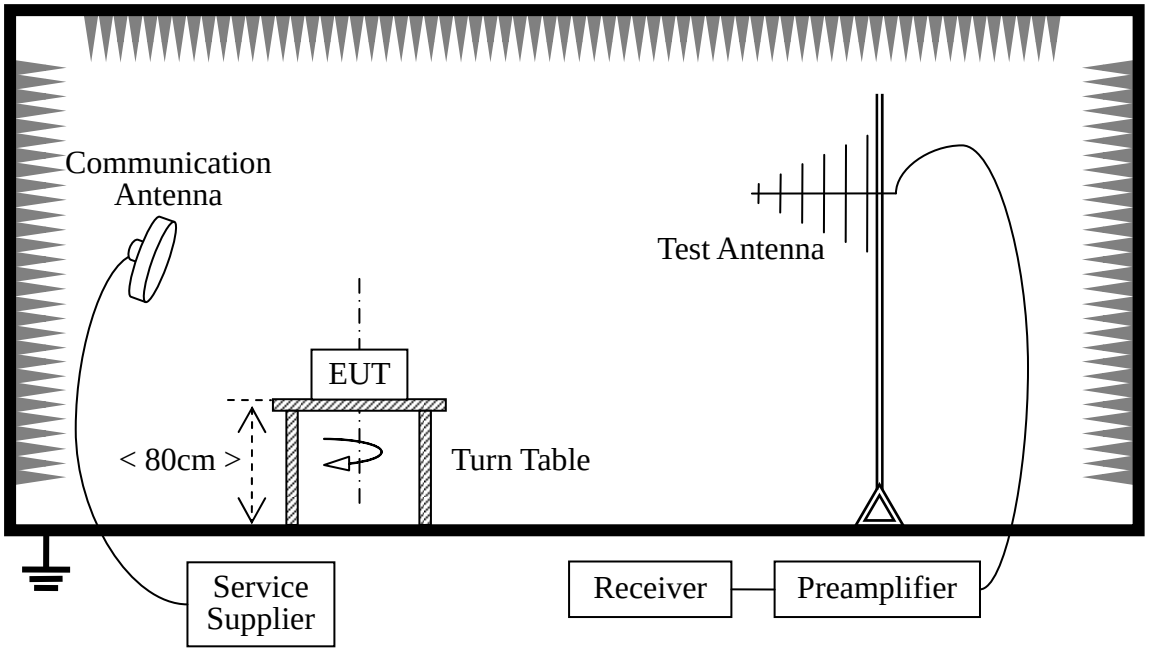
2.3. Band Edge

2.3.1. Requirement

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

2.3.2. Test Description

A. Test Setup:



The RF Module of the EUT is powered by the Battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the RF Module is activated and controlled by the software.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05.12	2014.05.11
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2013.05.12	2014.05.11

2.3.3. Test Procedure

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1GHz, 100 KHz for f < 1GHz

VBW = 3 MHz for peak and 10Hz for average

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.3.4. Test Result

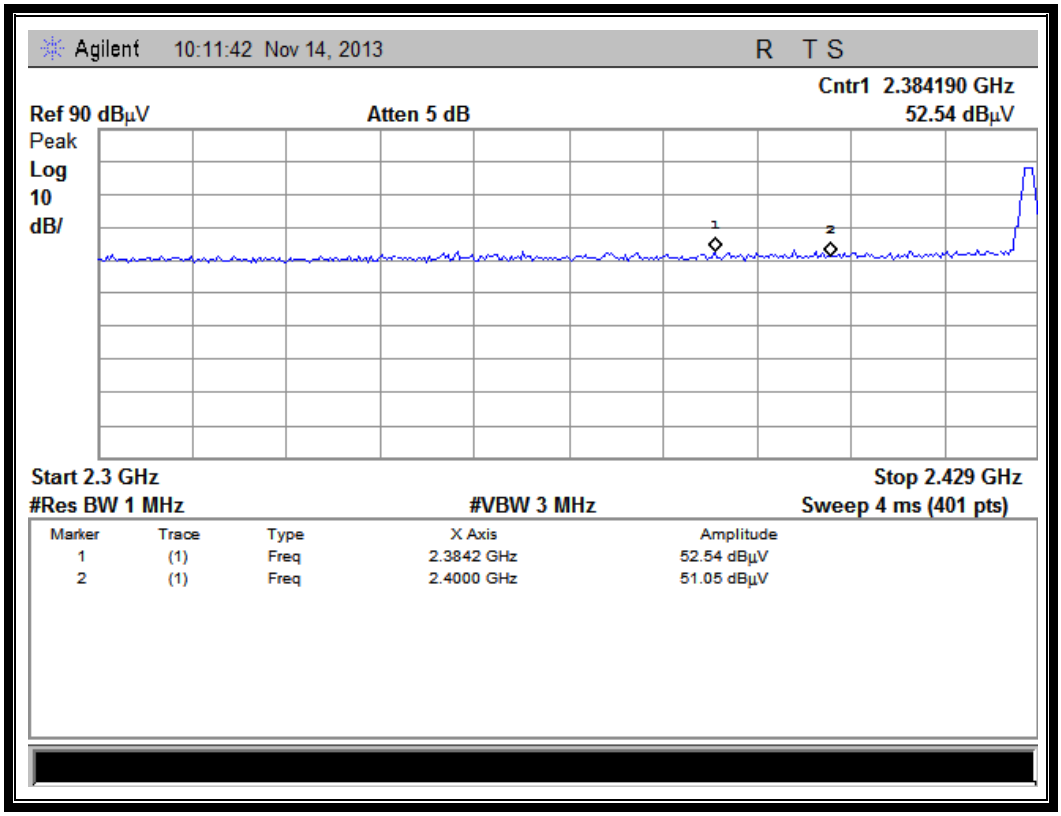
The lowest and highest channels are tested to verify the band edge emissions.

The measurement results are obtained as below:
$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m
Note: Test were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

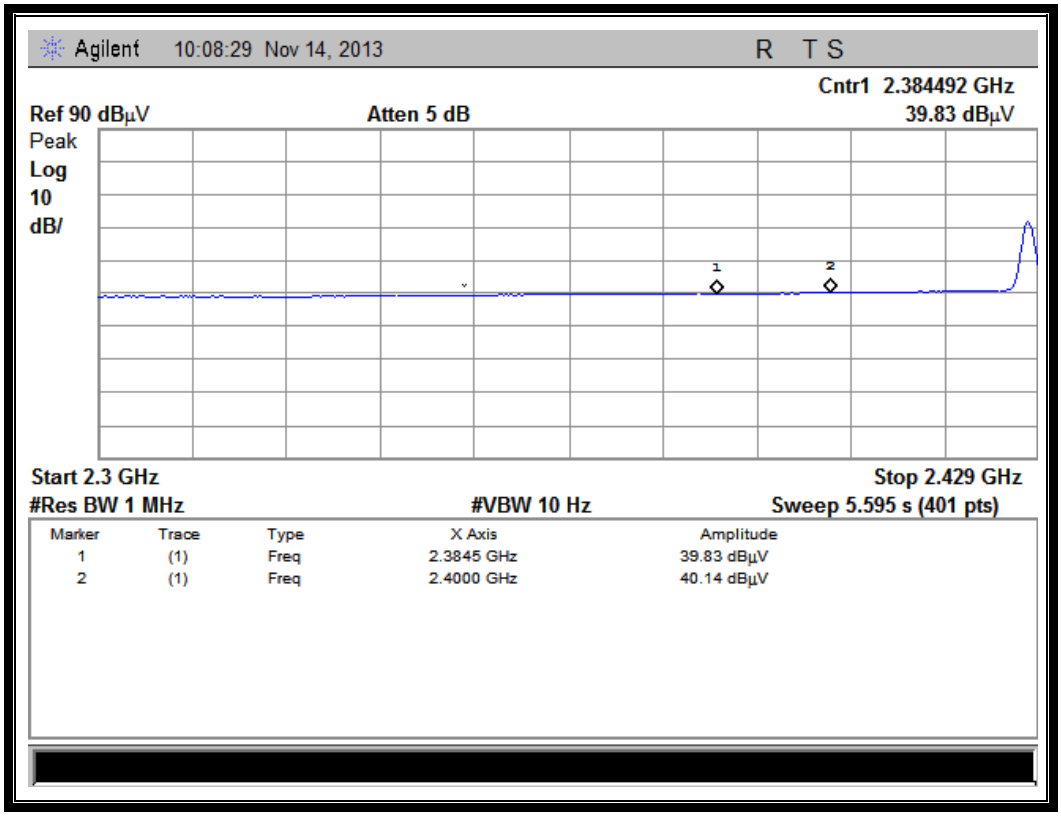
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
L	2384.19	PK	52.54	-30.93	32.56	54.17	74	Pass
L	2384.49	AV	39.83	-30.93	32.56	41.46	54	Pass
H	2484.94	PK	54.17	-29.05	32.50	57.62	74	Pass
H	2491.94	AV	42.42	-29.05	32.50	45.87	54	Pass

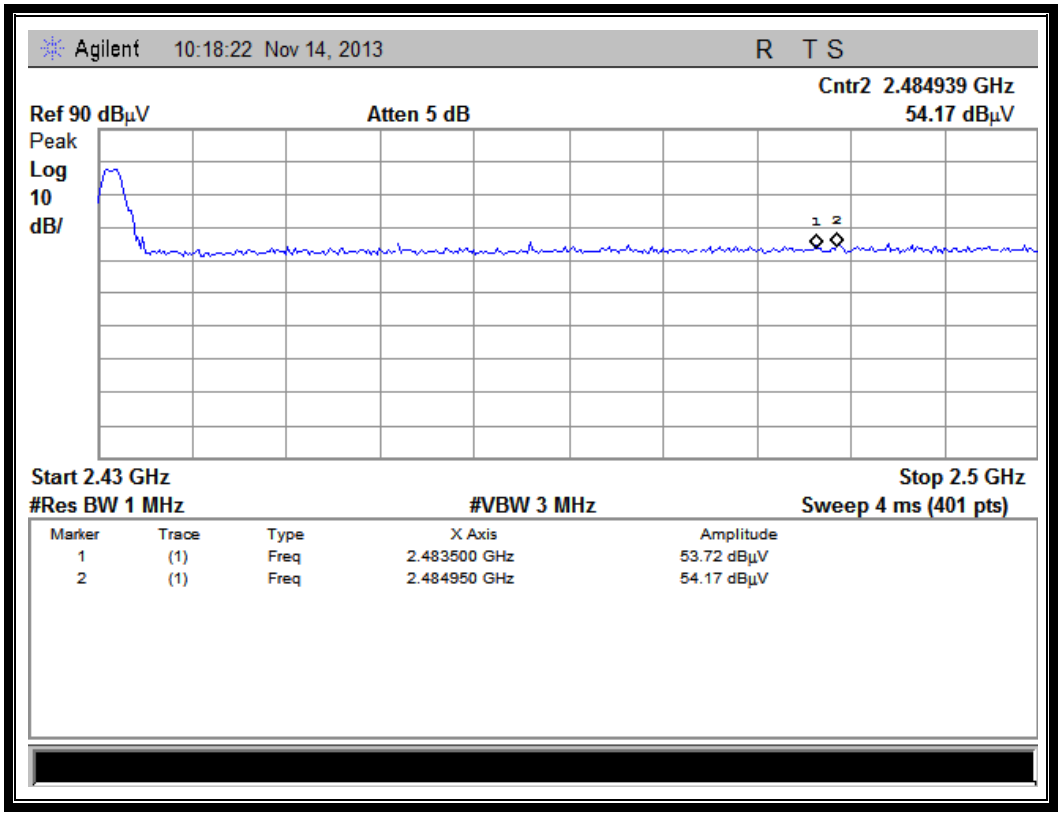
B. Test Plots:



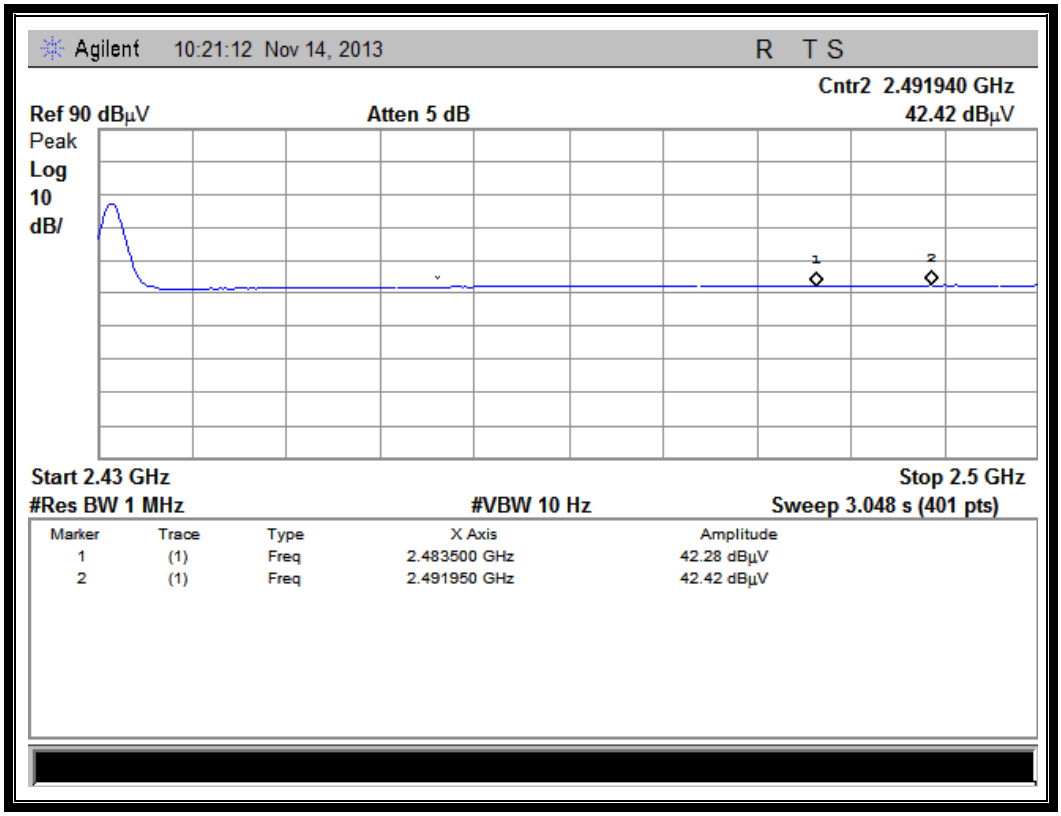
(Plot A1:Channel L PEAK @ GFSK)



(Plot A2:Channel = L AVERAGE @ GFSK)



(Plot B1: Channel H PEAK @ GFSK)



(Plot B2: Channel = H AVERAGE @ GFSK)

2.4. Conducted Emission

2.4.1. Requirement

According to FCC section 15.207, for 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

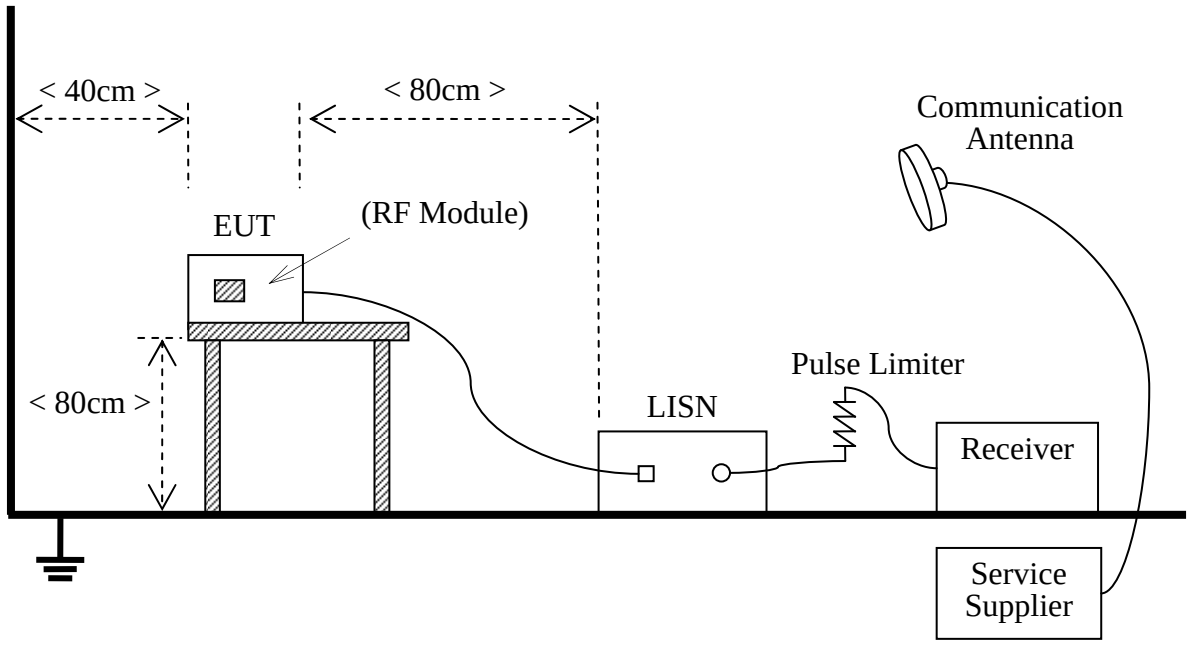
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.4.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
LISN	Schwarzbeck	NSLK 8127	812744	2013.05.12	2014.05.11
Service Supplier	R&S	CMU200	100448	2013.05.12	2014.05.11
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	2013.05.12	2014.05.11

2.4.3. Test Result

This test item is not applicable, since the EUT powered by button battery.

2.5. Field strength

2.5.1. Requirement

According to section 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902~928	50mV/m (94dBμV/m)	500μV/m (54dBμV/m)	3
2400~2483.5	50mV/m (94dBμV/m)	500μV/m (54dBμV/m)	3
5725~5875	50mV/m (94dBμV/m)	500μV/m (54dBμV/m)	3

According to section 15.249(d), Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	μV/m	Dist	(uV/m)	(dBuV/m)
0.009 - 0.490	2400/F(KHz)	300m	10000* 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 - 1.705	2400/F(KHz)	30m	100* 2400/F(KHz)	20log 2400/F(KHz) + 40
1.705 - 30.00	30	30m	100*30	20log 30 + 40
30.0 - 88.0	100	3m	100	20log 100
88.0 - 216.0	150	3m	150	20log 150
216.0 - 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

According to section 15.249(e), for frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Note:

1) The tighter limit shall apply at the boundary between two frequency range.
2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).
3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^{2.}$

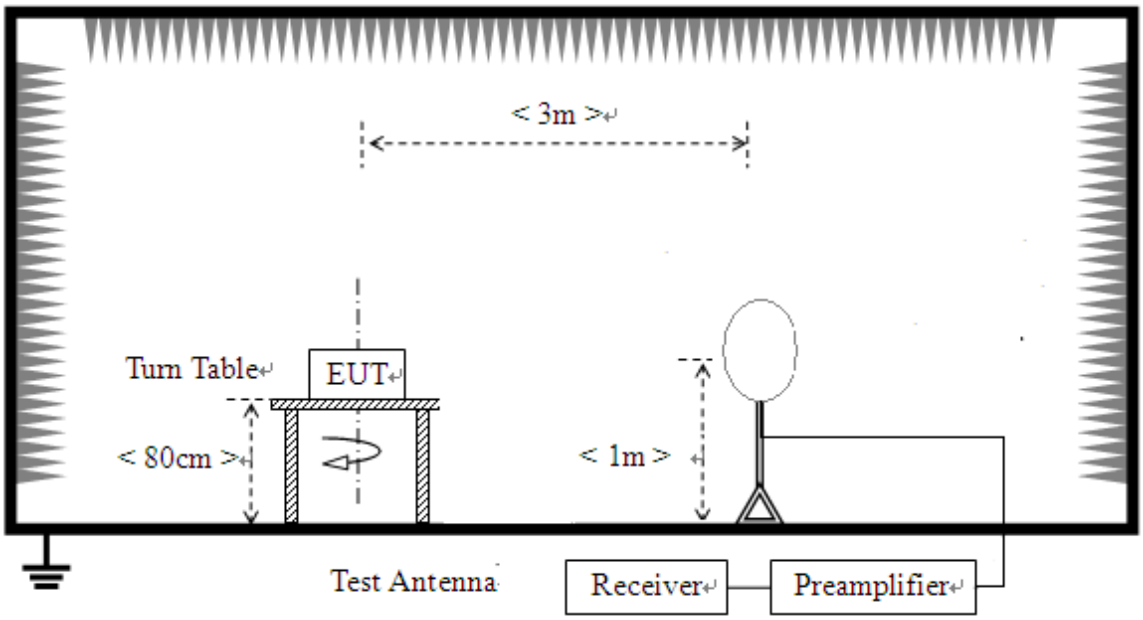
   Example: F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as

   $Ld1 = L1 = 30uV/m * (10)^2 = 100 * 30uV/m$

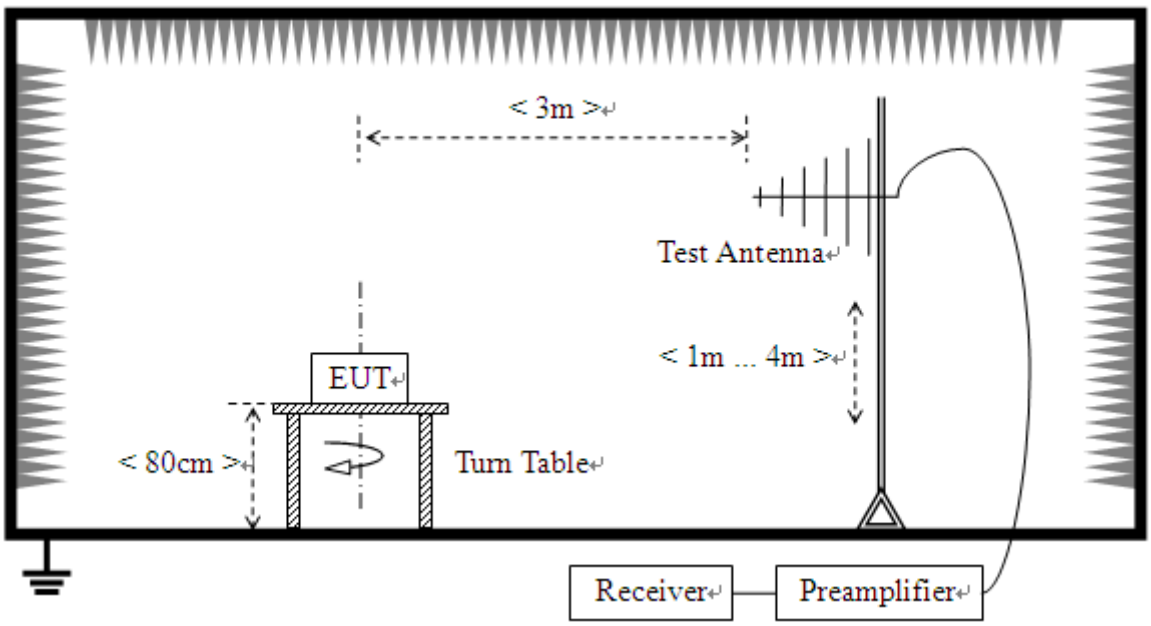
2.5.2. Test Description

A. Test Setup:

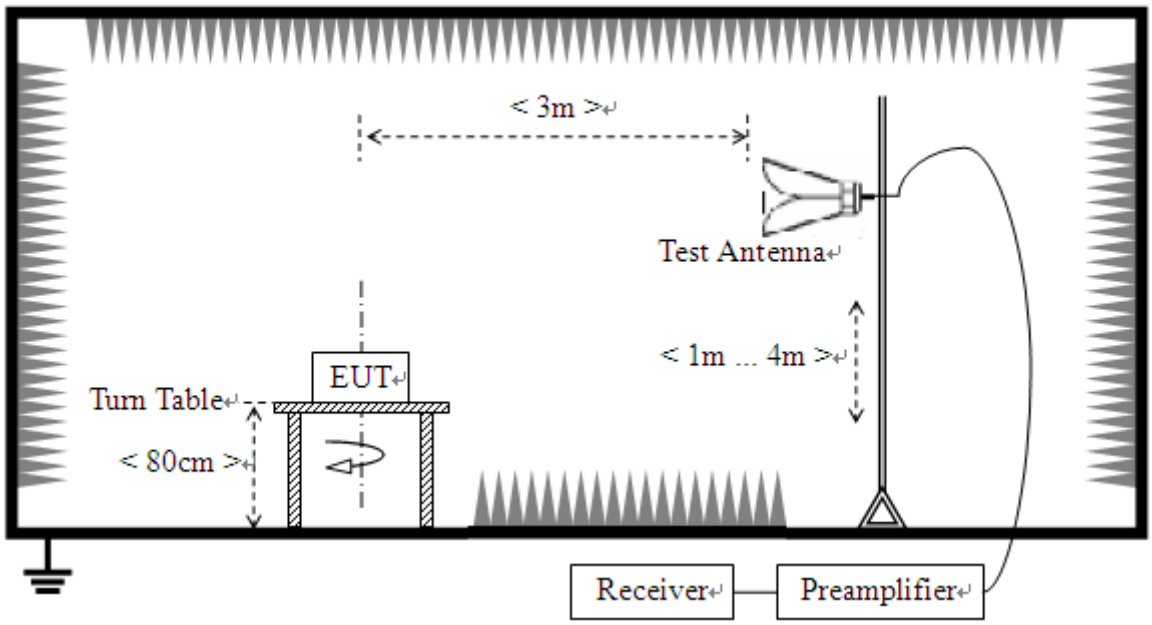
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2013.05.12	2014.05.11
Receiver	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05.12	2014.05.11
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2013.05.12	2014.05.11
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2013.05.12	2014.05.11
Test Antenna - Horn	R&S	HL050S7	71688	2013.05.12	2014.05.11
Test Antenna - Loop	Schwarzbeck	FMZB 1519	1519-022	2013.05.12	2014.05.11

2.5.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.5.4. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

A. Test Plots for Field strength of Fundamental:

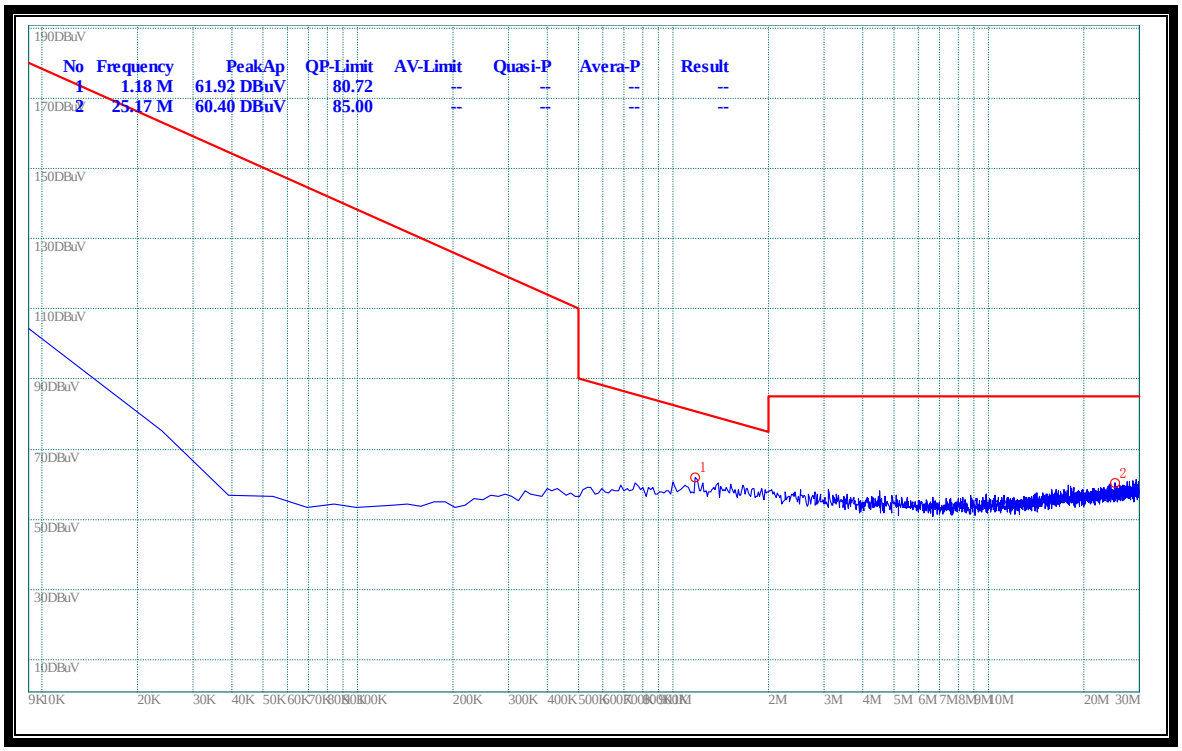
Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	Antenna polarization	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
2427	PK	78.46	H	-30.93	32.56	80.09	114	Pass
		78.60	V	-30.93	32.56	80.23		Pass
	AV	65.66	H	-30.93	32.56	67.29	94	Pass
		65.60	V	-30.93	32.56	67.23		Pass

Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	Antenna polarization	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
2429	PK	80.63	H	-30.93	32.56	82.26	114	Pass
		80.48	V	-30.93	32.56	82.11		Pass
	AV	66.71	H	-30.93	32.56	68.34	94	Pass
		67.02	V	-30.93	32.56	68.65		Pass

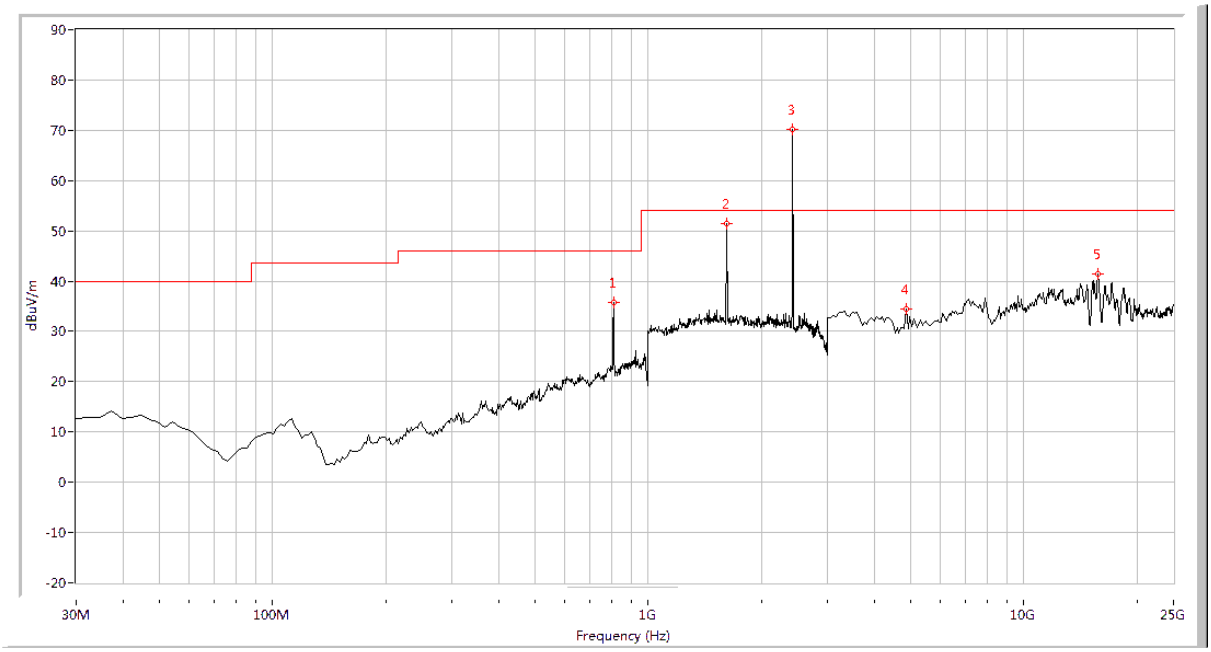
Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	Antenna polarization	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
2431	PK	75.54	H	-30.93	32.56	77.17	114	Pass
		75.59	V	-30.93	32.56	77.22		Pass
	AV	65.26	H	-30.93	32.56	66.89	94	Pass
		65.54	V	-30.93	32.56	67.17		Pass

B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel L

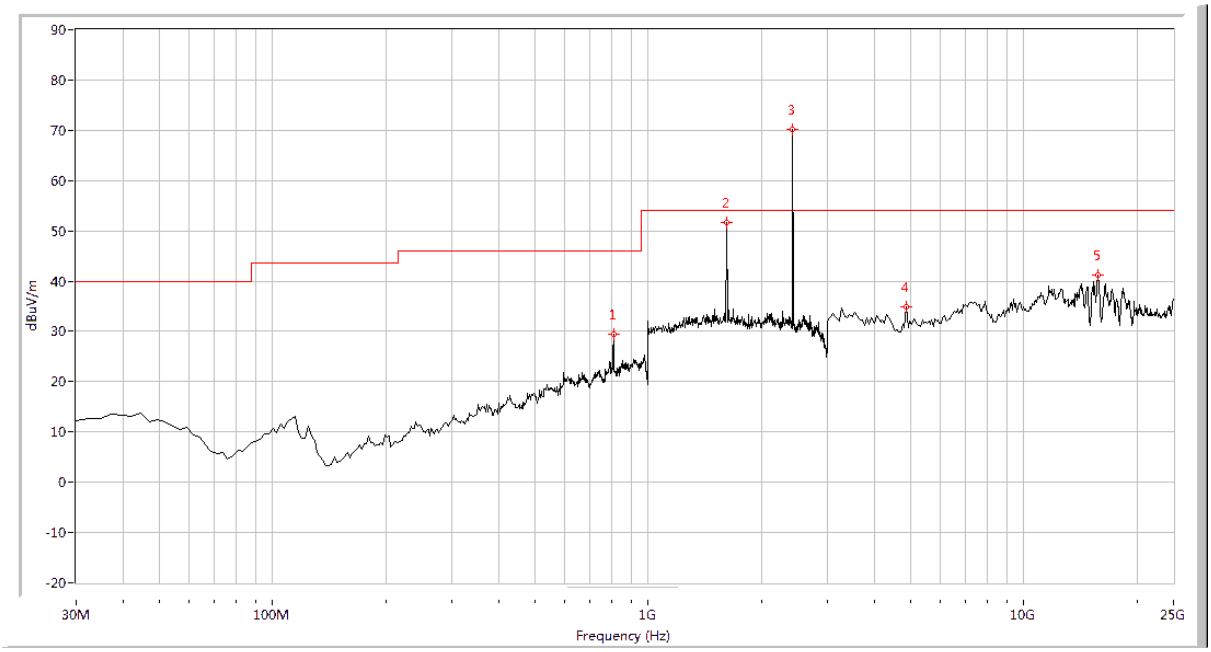


(Plot A.0: 9kHz to 30MHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
808.903	35.86	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
1618.454	51.49	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2427.000	70.14	N.A	N.A	114.0	N.A	74.0	Horizontal	PASS
4865.337	34.45	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15783.042	41.35	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

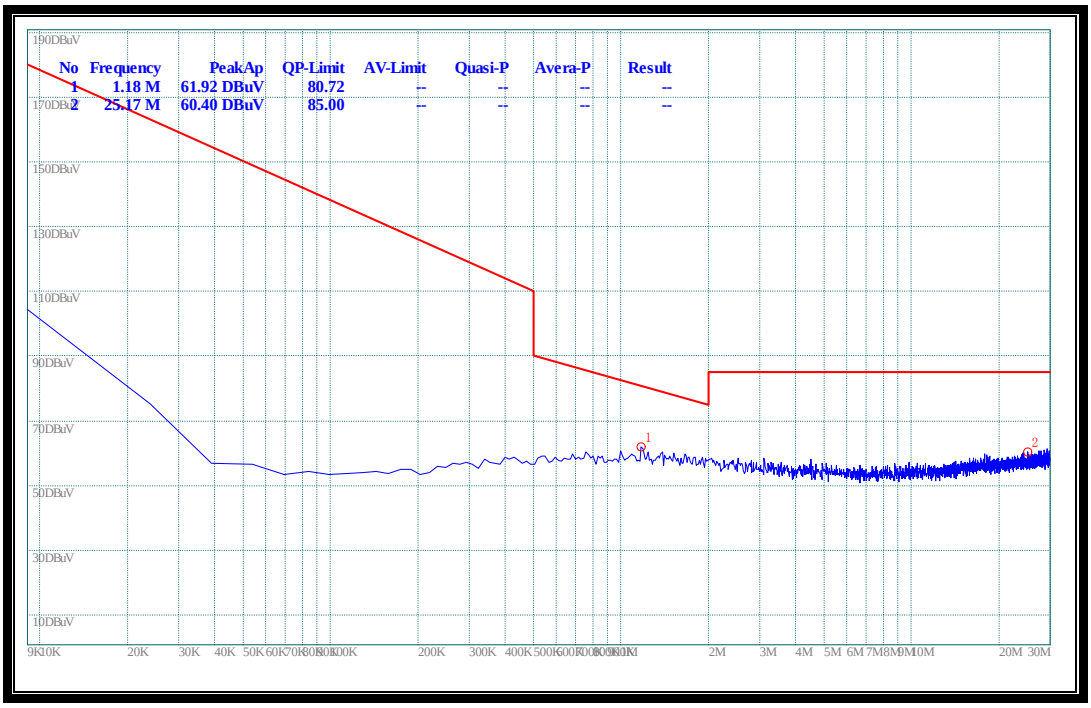
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal)



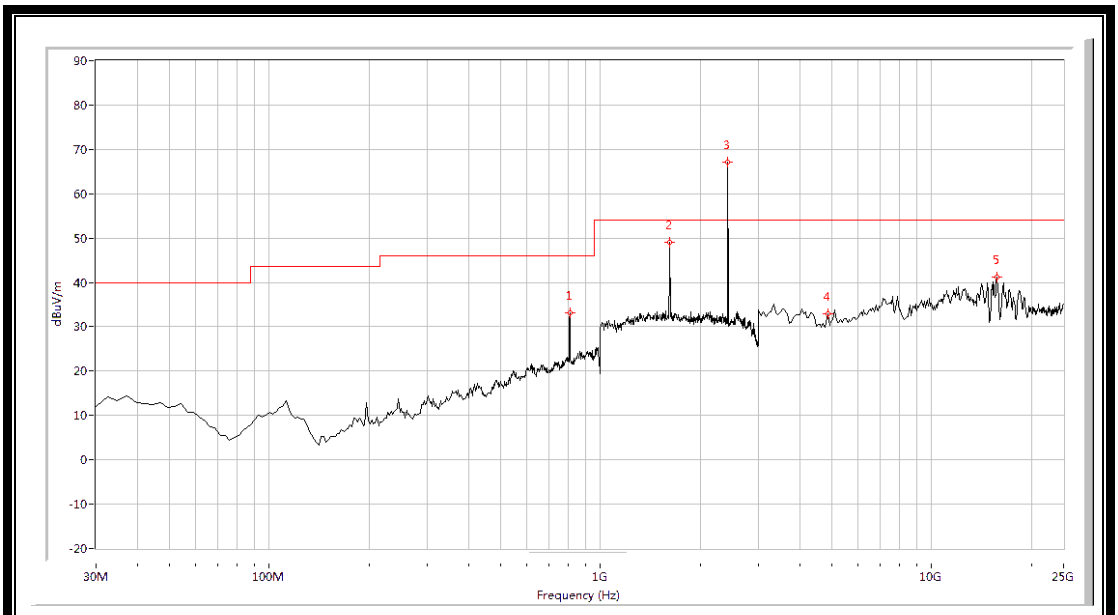
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
808.903	29.47	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
1618.454	51.57	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2427.000	70.08	N.A	N.A	114.0	N.A	94.0	Vertical	PASS
4865.337	34.93	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15728.180	41.11	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot A.2: 30MHz to 25GHz, Antenna Vertical)

Plots for Channel M

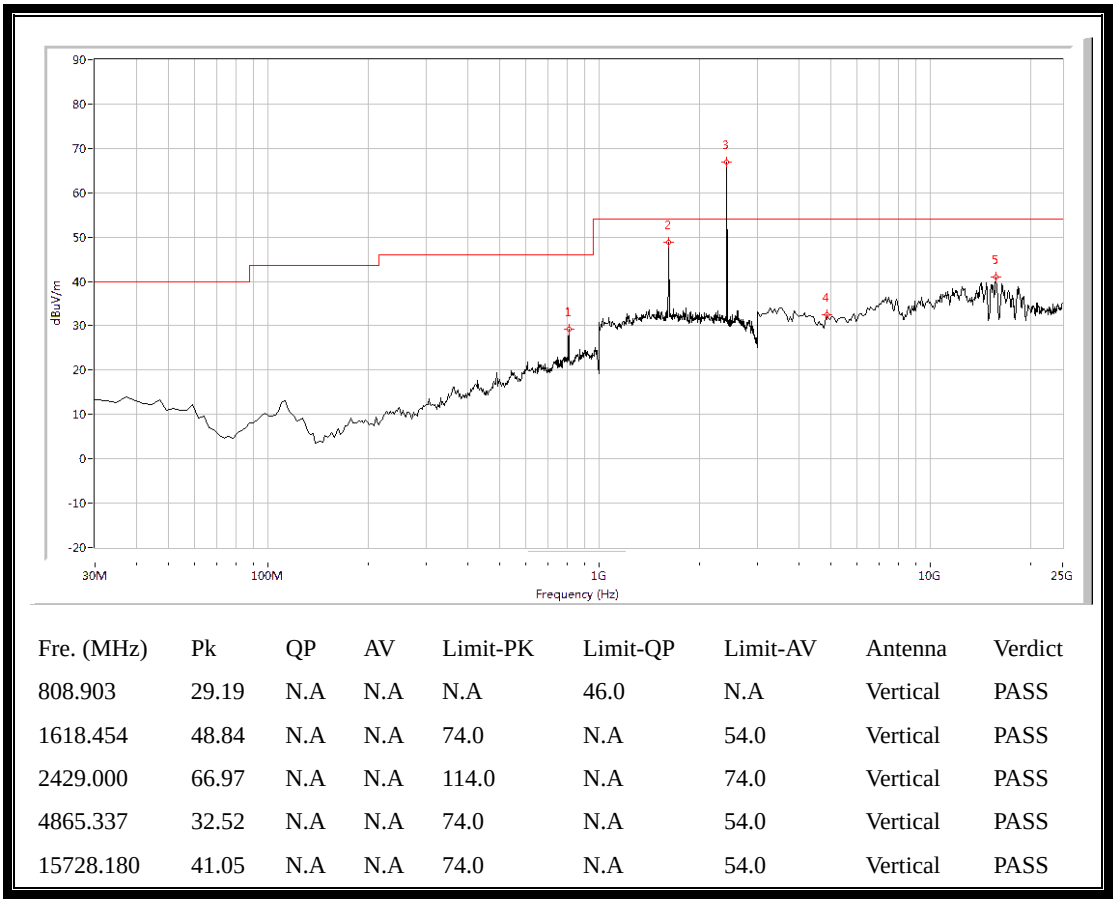


(Plot A.0: 9kHz to 30MHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
808.903	33.05	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
1618.454	49.08	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2429.000	67.05	N.A	N.A	114.0	N.A	74.0	Horizontal	PASS
4865.337	33.01	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15728.180	41.26	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

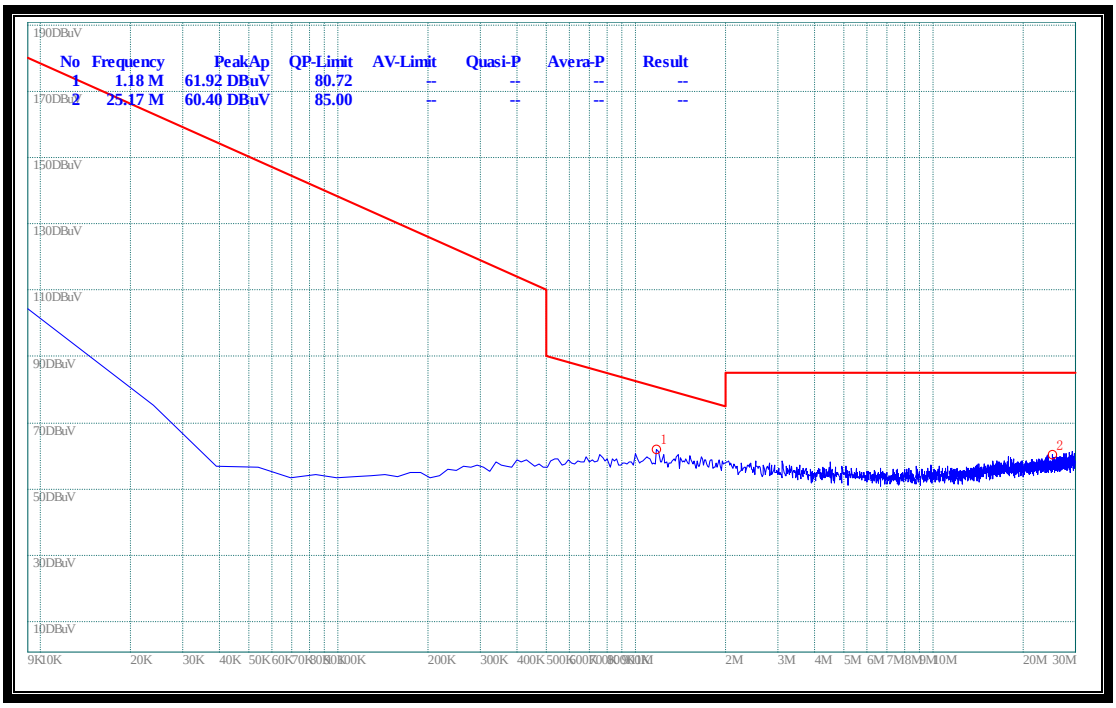
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal)



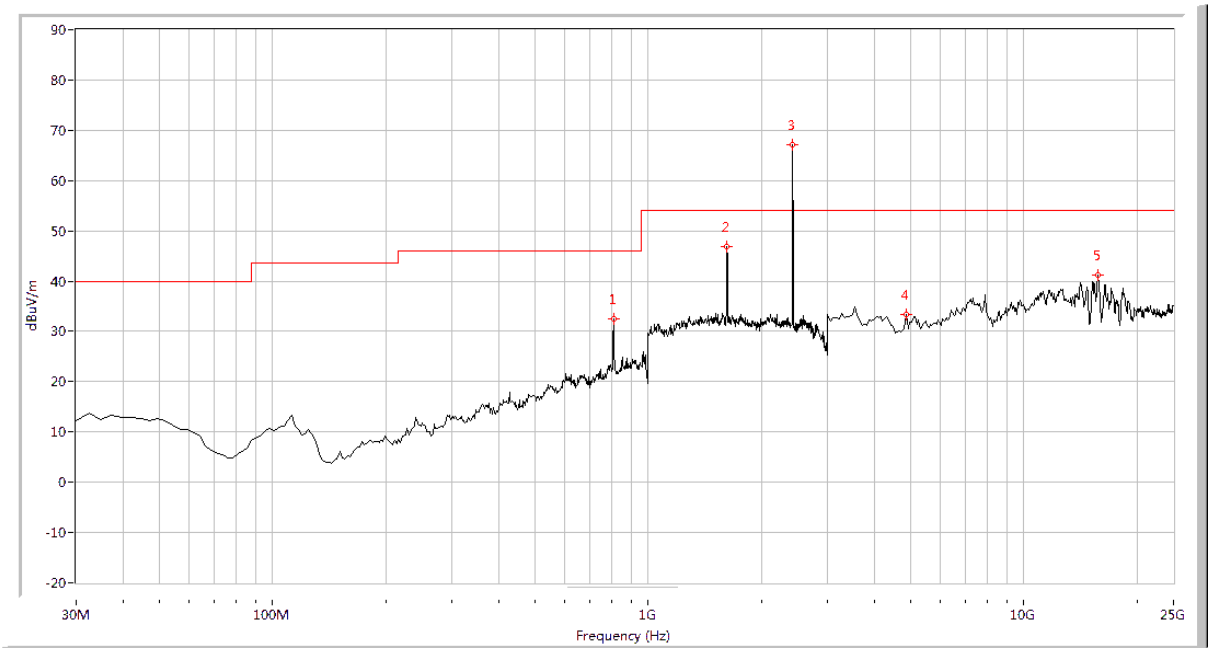
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
808.903	29.19	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
1618.454	48.84	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2429.000	66.97	N.A	N.A	114.0	N.A	74.0	Vertical	PASS
4865.337	32.52	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15728.180	41.05	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot A.2: 30MHz to 25GHz, Antenna Vertical)

Plots for Channel H

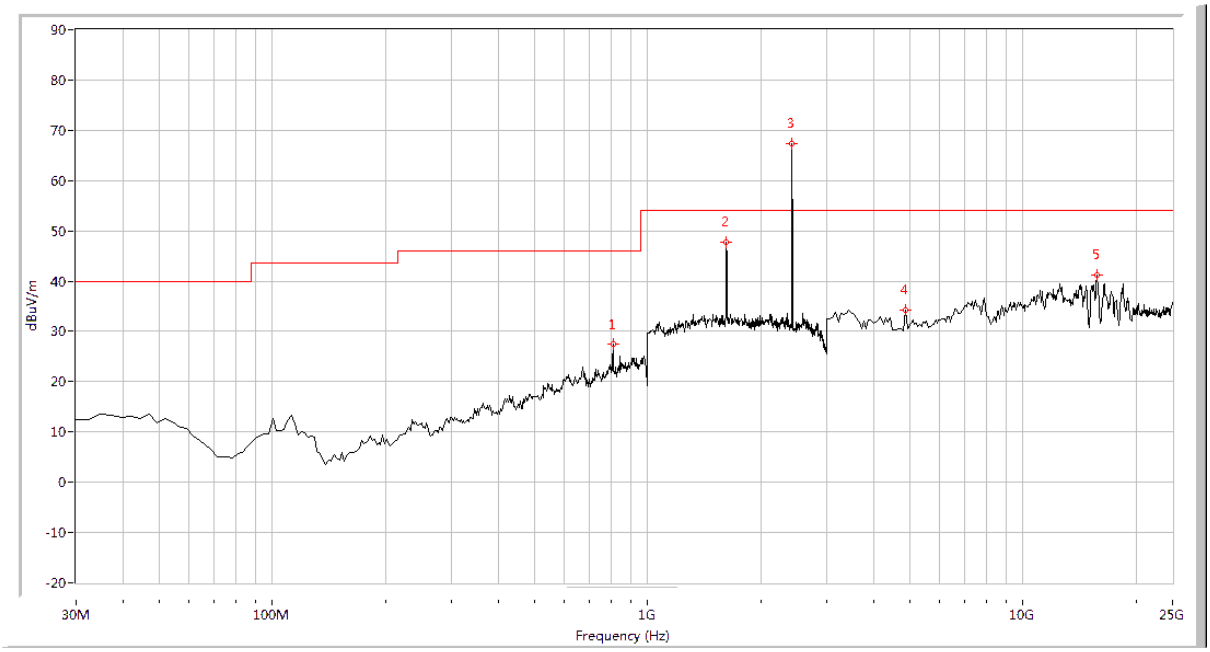


(Plot A.0: 9kHz to 30MHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
808.903	32.47	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
1618.454	46.96	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
2431.000	67.16	N.A	N.A	1140.	N.A	94.0	Horizontal	PASS
4865.337	33.29	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15783.042	41.18	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Plot A.1: 30MHz to 25GHz, Antenna Horizontal)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
808.903	27.52	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
1618.454	47.68	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2431.000	67.30	N.A	N.A	114	N.A	94.0	Vertical	PASS
4865.337	34.24	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15728.180	41.11	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot A.2: 30MHz to 25GHz, Antenna Vertical)

** END OF REPORT **