FCC CFR47 Part 15 Subpart C
IC RSS-247
Certification Test Report

For the

Product	**: Wearable device**
Model	**: Revolar Instinct**
FCC ID	**: 2AHAI-INST1**
IC	**: 21057-INST1**
Applicant	**: Revolar Inc**
FCC Rule	**: CFR 47 Part 15 Subpart C**
IC Rule	**: IC RSS 247**

We hereby certify that the above product has been tested by us with the listed rules and found in compliance with the regulation. The test data and results are issued on the test report no. **TR-W1703-010**

Signature

Youn, In-soub / Technical Manager

Date: 2017-03-16

Test Laboratory: ENG Co., Ltd.

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FCC/IC CERTIFICATION TEST REPORT

Project Number	**: EA1702Q-179**
Test Report Number	**: TR-W1703-010**
Type of Equipment	**: Wearable device**
Model Name	**: Revolar Instinct**
FCC ID	**: 2AHAI-INST1**
IC	**: 21057-INST1**
Multiple Model Name	**: N/A**
Applicant	**: Revolar Inc**
Address	**: 800 N. Grant Street, Suite 120, Denver, CO 80203, Unite States**
Manufacturer	**: Celestica (Thailand) Ltd**
Address	**: 49/18 Moo 5, Laem Chabang Industrial Estate, Tungsukhla, Chonburi 20230, Thailand**
Regulation	**: FCC Part 15 Subpart C Section 15.247, IC RSS-247**
Total page of Report	**: 38 Pages**
Date of Receipt	**: 2017-02-27**
Date of Issue	**: 2017-03-16**
Test Result	**: PASS**

This test report only contains the result of a single test of the sample supplied for the examination.
It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by	Song, In-young / Senior Engineer	Signature	2017-03-16 Date
Reviewed by	Youn, In-soub / Technical Manager	Signature	2017-03-16 Date

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Release Control Record

Issue Report No.	Issued Date	Revisions	Effect Section
TR-W1703-010	2017-03-16	Initial Release	All

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1. TEST SUMMARY

1.1 Regulations and results

The sample submitted for evaluation (Referred to below as the EUT) has been tested in accordance with the following regulations or standards.

FCC Reference Section	IC Reference Section	Description	P (Pass)	F (Fail)	N.T. (Not Tested)	Note
15.203	-	Antenna Requirement	P			
15.205, 15.209	RSS247 5.5 RSS –GEN 8.9	Radiated Spurious Emissions	P			
15.207	RSS-GEN 8.8	AC Power-line Conducted Emissions			N.T	Note1
15.247 (a)(2)	RSS-247 5.2(1)	6 dB Occupied Bandwidth Occupied Bandwidth	P			
15.247 (b)(3)	RSS-247 5.4(4)	RF Output Power	P			
2.1051 15.247 (d)	RSS-247 5.5	Band Edge Conducted Spurious Emissions	P			
15.247 (e)	RSS-247 5.4(2)	Power Spectral Density	P			

Note1. This EUT is operated by battery only. (used button cell battery).

1.2 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC Part 15 Subpart C Section 15.247 and RGG-GEN and RSS-247.

1.3 Test Methodology

The tests mentioned in clause 1.1 in this test report were performed according to FCC CFR 47 Part 2, CFR 47 Part 15 and ANSI C63.10-2013.

KDB 558074 D01DTS Meas Guidance v03r05: Measurement Procedure PK is used for power and PKPSD is used for power spectral density..

1.3 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

1.4 Test Facility

The measurement facilities are located at 135-60 Gyeongchung-daero, Gonjiam-eup, Gwangju-si, Gyeonggi-do 12813, Korea. Description details of test facilities were submitted to the FCC and IC, designated by the RRA (Radio Research Agency), and accredited by Korea and accredited by KOLAS (Korea Laboratory Accreditation Scheme) in Korea according to the requirement of ISO 17025.

Agency Name	Registration No.	Mark
FCC	955964	
Industry Canada (IC)	IC 12721A-1	
RRA	KR0160	
Korean Agency for Technology and Standards	KT733	

2. EUT (Equipment Under Test) INFORMATION

2.1 General Description

The EUT is a device for transferring emergency alert messages to a Mobile phone through wireless communication. For wireless communication, the EUT has function for Bluetooth Low Energy, The product specification described herein was obtained from product data sheet or user's manual.

Description of equipment	Wearable device
Model Name	Revolar Instinct
Brand / Trade Name	Revolar
Serial Number	RB-17035-001D
Operating Frequency	2 402 ~ 2 480 MHz
Max. RF Output Power	-0.98 dBm (Measured)
Modulation Types	GFSK
Number of Channels	40 CH
Channel Bandwidth	2 MHz
Generated or used Freq. in EUT	37.768 kHz, 38.4 MHz
Type of Antenna	☐ Integrated Type ■ Dedicated Type(Planar antenna)
Antenna Gain	2.05 dBi
Operating Temperature	5 ℃ ~ 40 ℃
Normal Test Voltage	DC 3 V
Electrical Rating	DC 3 V, Lithium Battery(coin cell type CR2032)

2.2 Additional Model

None

3. TEST CONDITION

3.1 Equipment Used During Test

The following peripheral devices and/or interface cables were connected during the measurement:

Description	Model No.	Serial No.	Manufacturer.
Wearable device (EUT)	Revolar Instinct	RB-17035-001D	Celestica (Thailand) Ltd.
Mobile Phone	A1688	F17QKPSBGRY5	Apple Inc.

3.2 Mode of operation during the test

For finding worst case configuration and operating mode, preliminary testing was performed and radiated emission and conducted emission were performed with the EUT set to transmit at the channel with the highest output power as worst case scenario.

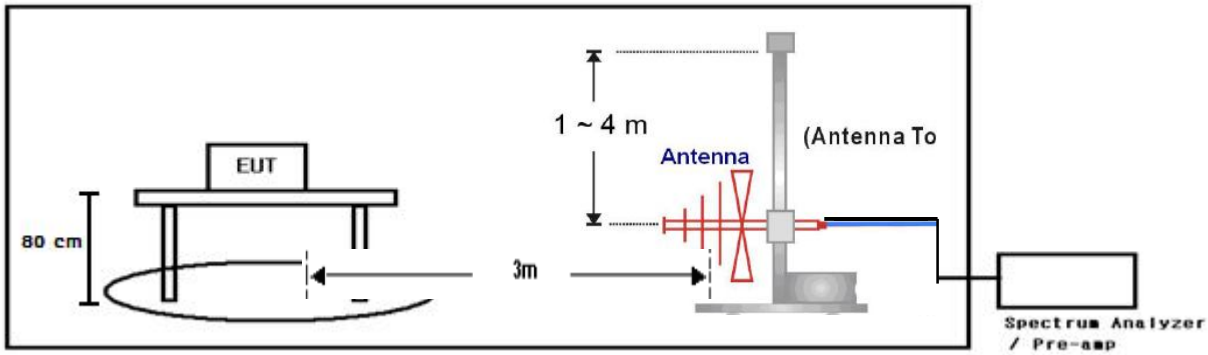
Based on preliminary testing following operating modes were selected for the final test as listed below.

3.2.1 Conducted / Radiated Emission Test Mode

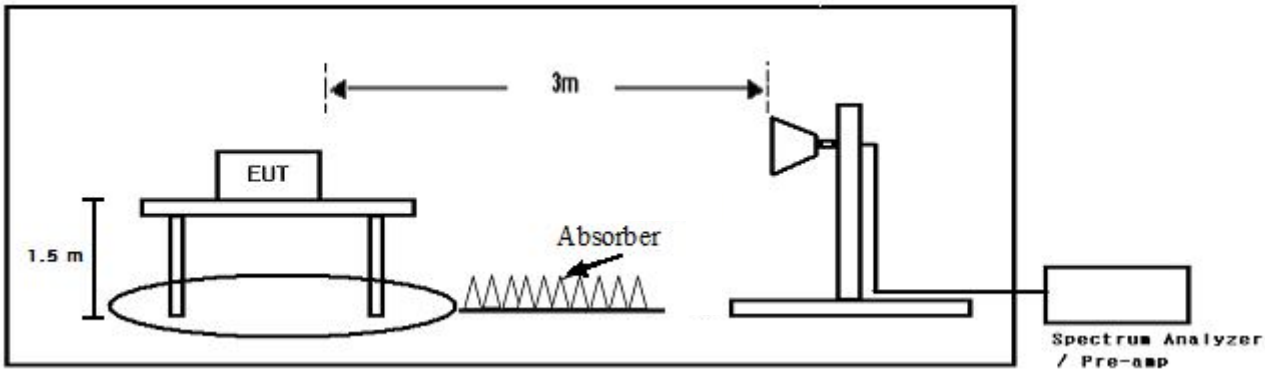
Operating Mode	Channel	Frequency (MHz)	Output Power (dBm)
BLE	Low	2402	-2.19
	Middle	2440	-1.23
	High	2480	-0.98

3.3 Test Setup Drawing

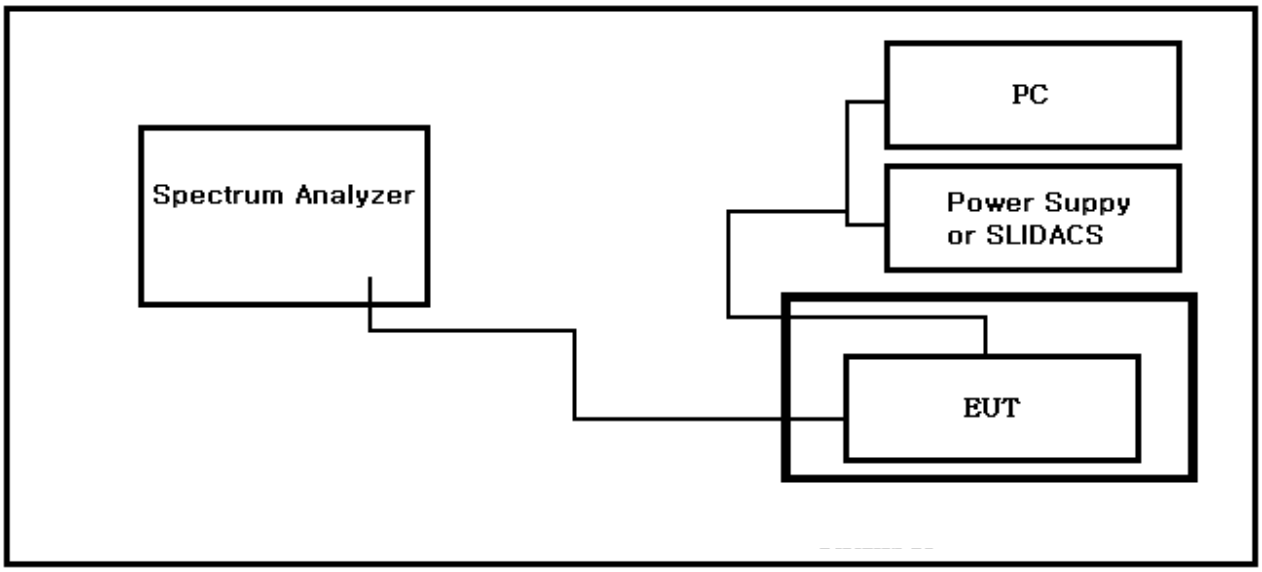
(Radiated Test below 1 GHz)



(Radiated Test above 1 GHz)



(Conducted Test)



3.4 EUT Modifications

Following modifications were implemented on the EUT for fixing the problem caused by EMC testing and the product will have all of the modifications incorporated into the product when manufactured and placed on the market.

- None.

4. ANTENNA REQUIREMENT

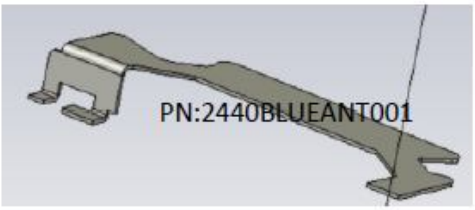
According to FCC CFR 47 Part 15 section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provision of this section.

4.1 Antenna Description

Frequency Band (GHz)	Antenna Type	Max Peak Gain (dBi)	Connector Type
2.400 – 2.498	Planar Antenna	2.05	Surface Mount

4.2 Conclusion

The antenna of the EUT is used a dedicate antenna, so the EUT met the requirement.



5. TEST RESULT

5.1 6 dB Bandwidth

5.1.1 Limit

The minimum 6 dB bandwidth shall be at least 500 kHz acc to Section 15.247 (a) (2)

5.1.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: 8.1 Option 1

The transmitter output is connected to a spectrum analyzer with the RBW set to 100 kHz, VBW ≥ 3 X RBW, peak detector and max hold.

5.1.3 Test Data

Date of Test	2017-02-28	Temperature	(21.2 ~ 21.8) °C
		Relative humidity	(38.8 ~ 39.6) % R.H.
Test Result	***PASS***	Tested by	Inyong Song
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2 402	0.749	0.5
Middle	2 440	0.740	
High	2 480	0.749	

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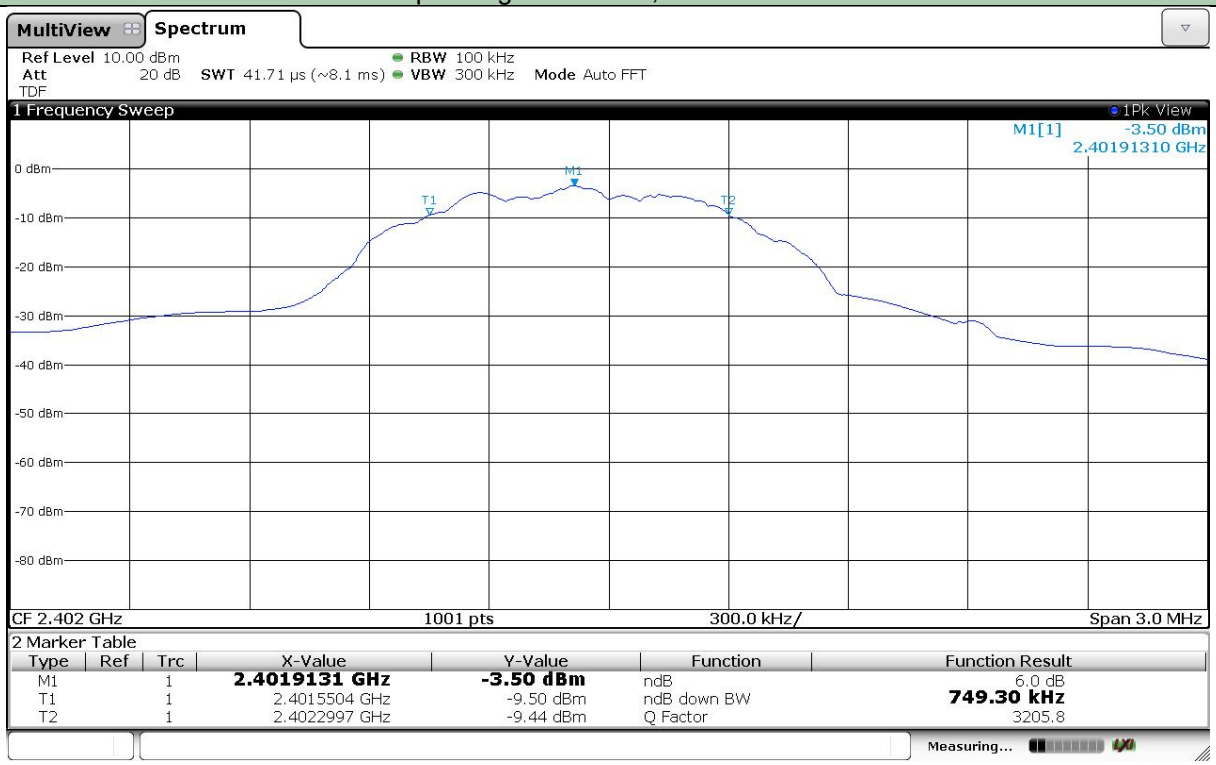
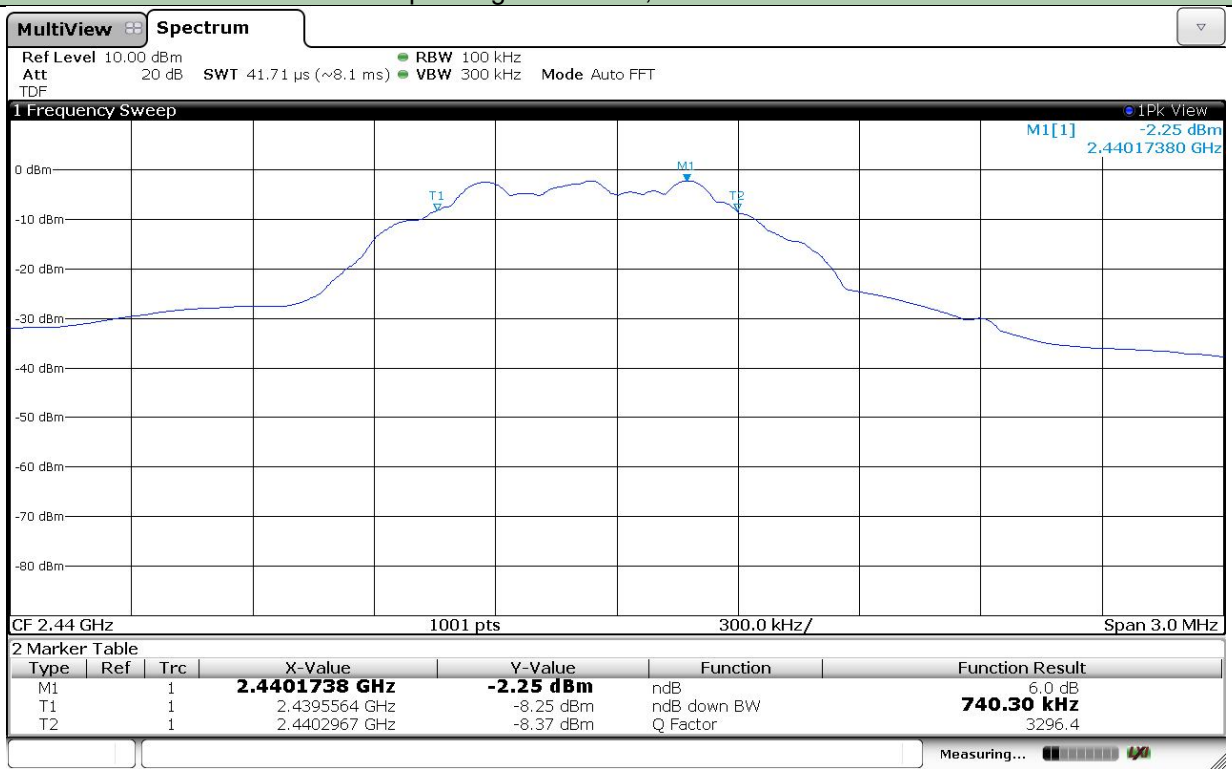
5.1.4 Test Plots

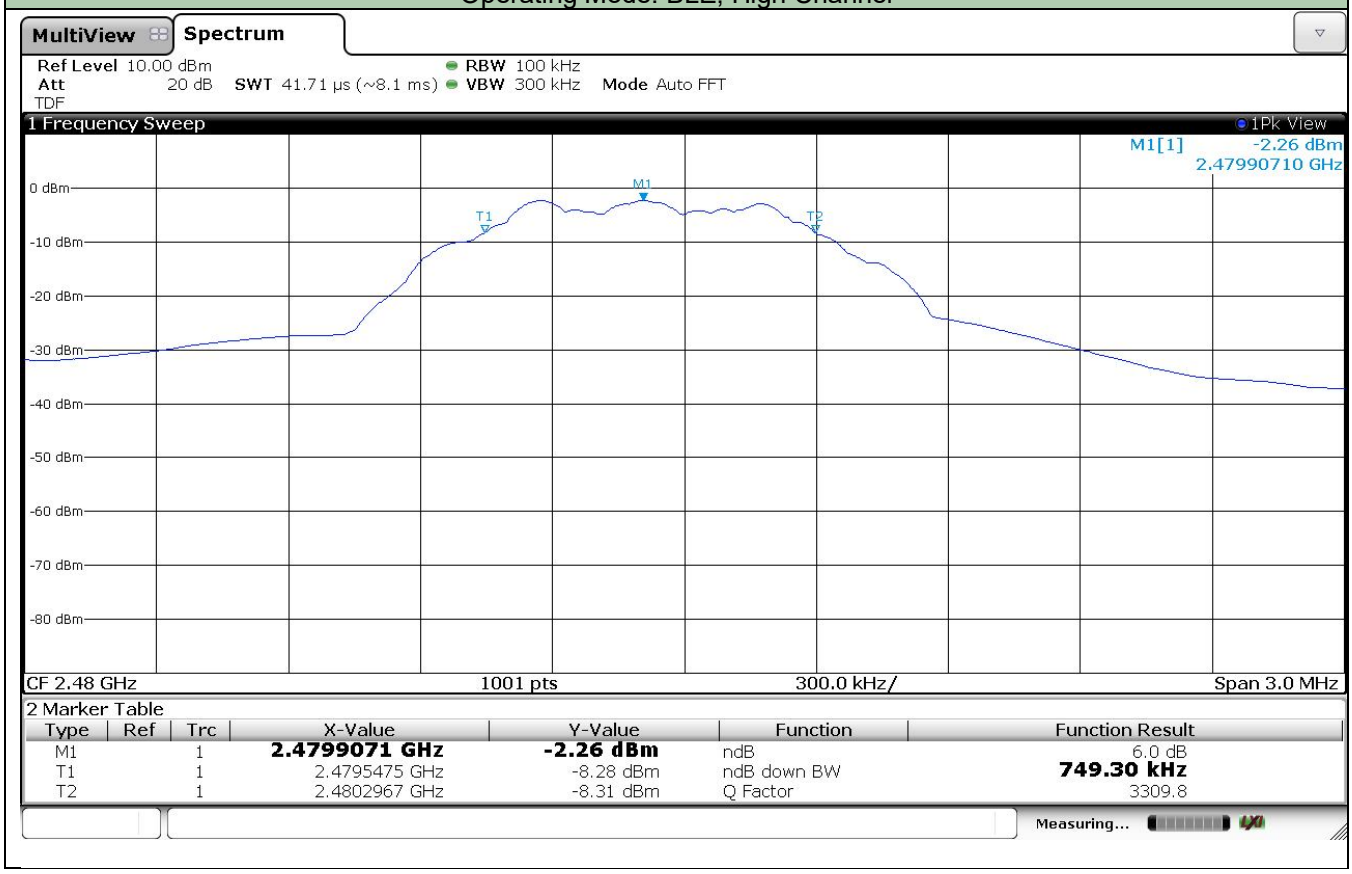
Operating Mode: BLE, Low Channel



Operating Mode: BLE, Middle Channel



Operating Mode: BLE, High Channel



5.2 99 % Bandwidth

5.2.1 Limit

Not applicable. For reporting purpose only.

5.2.2 Method of Measurement

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1 % to 5 % of the OBW.

The span is set to capture all products of the modulation process, including the emission skirts.

The VBW is set to 3 times the RBW. The sweep time is coupled and peak detection and max hold mode is used. The spectrum analyzer internal 99% bandwidth function is utilized.

5.2.3 Test Data

Date of Test	2017-02-28	Temperature	(21.2 ~ 21.8) °C
		Relative humidity	(38.8 ~ 39.6) % R.H.
Test Result	***PASS***	Tested by	Inyong Song

Channel	Frequency (MHz)	99 % Bandwidth (MHz)
Low	2 402	1.073
Middle	2 440	1.076
High	2 480	1.070

5.2.4 Test Plots

Operating Mode: BLE, Low Channel

Operating Mode: BLE, Middle Channel

Operating Mode: BLE, High Channel

5.3 Maximum Peak Output Power

5.3.1 Limit

Acc. To section 15.247, For system using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: 9.1.1 RBW ≥ DTS bandwidth.

The Antenna output of the EUT was connected to a spectrum analyzer directly.

The cable assembly insertion loss was entered as an offset in the spectrum analyzer to allow for direct reading of power.

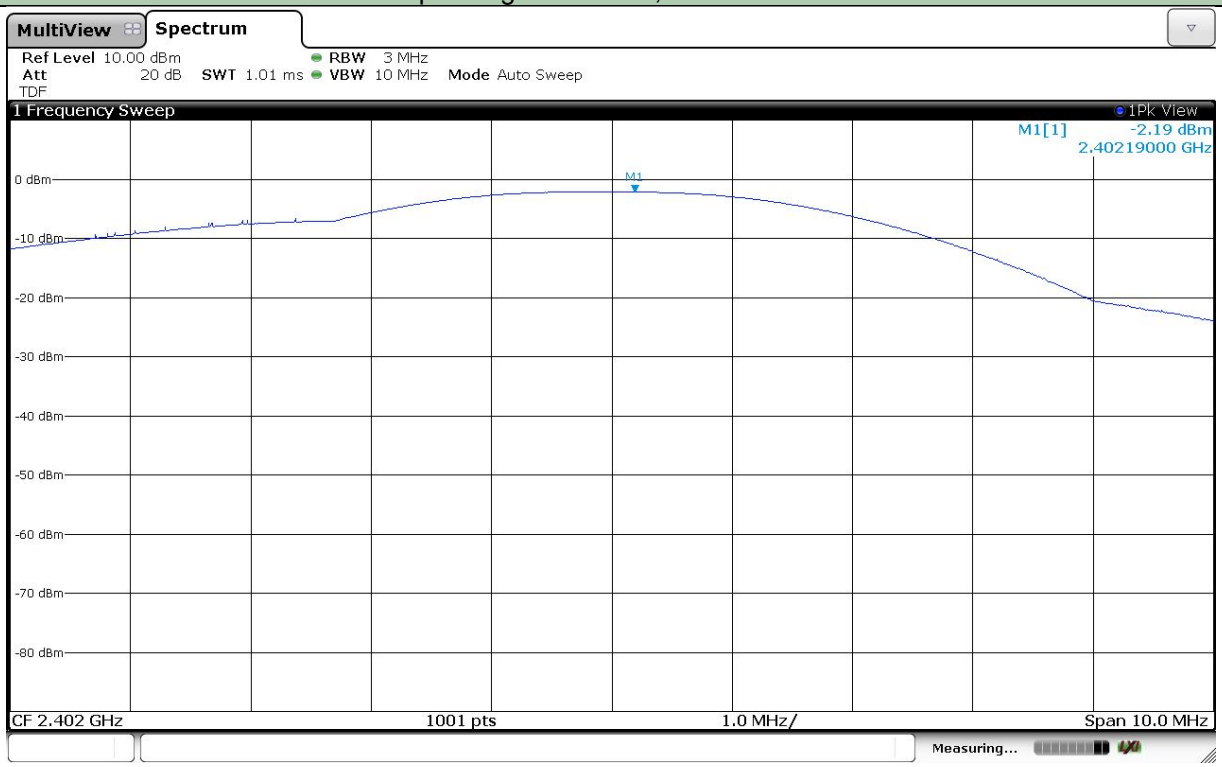
5.3.3 Test Data for Output Power

Date of Test	2017-02-28	Temperature	(21.2 ~ 21.8) °C
		Relative humidity	(38.8 ~ 39.6) % R.H.
Test Result	***PASS***	Tested by	Inyong Song

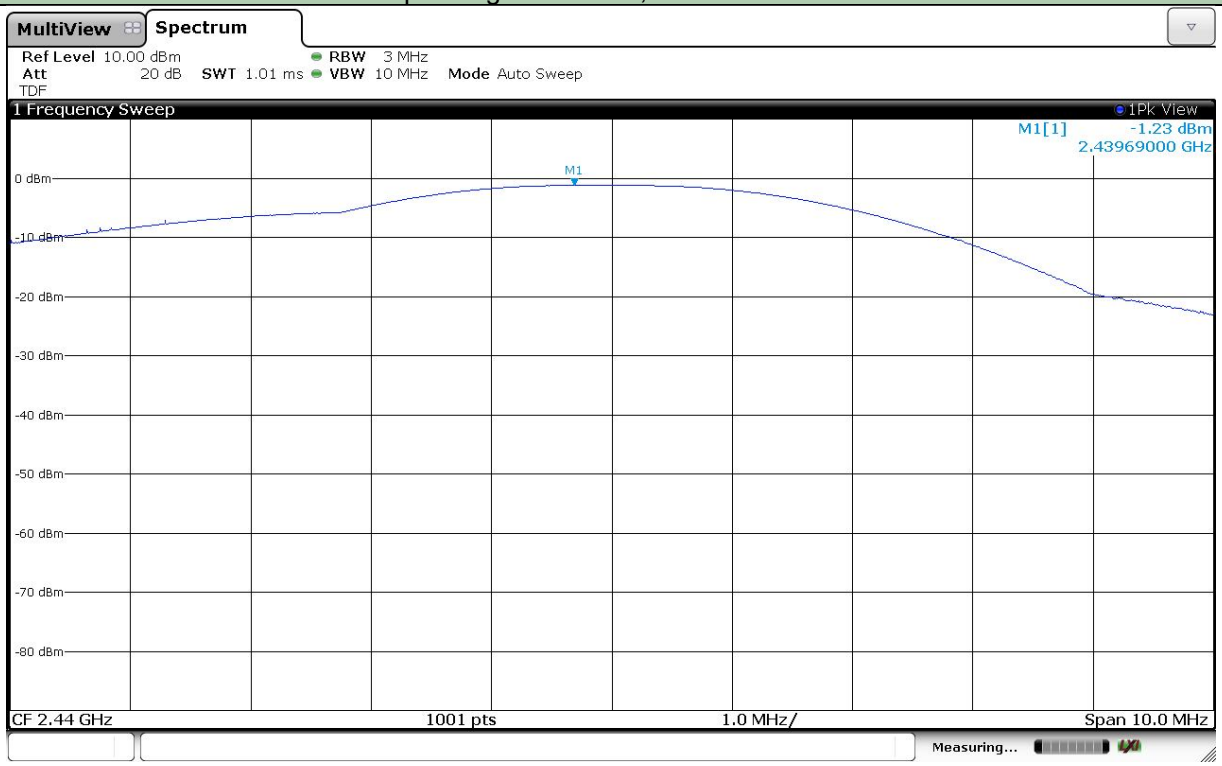
Channel	Frequency (MHz)	Measured Value (dBm)	Limit (dBm)	Margin (dB)
Low	2 402	-2.19	30	32.19
Middle	2 440	-1.23		31.23
High	2 480	-0.98		30.98

5.2.4 Test Plots

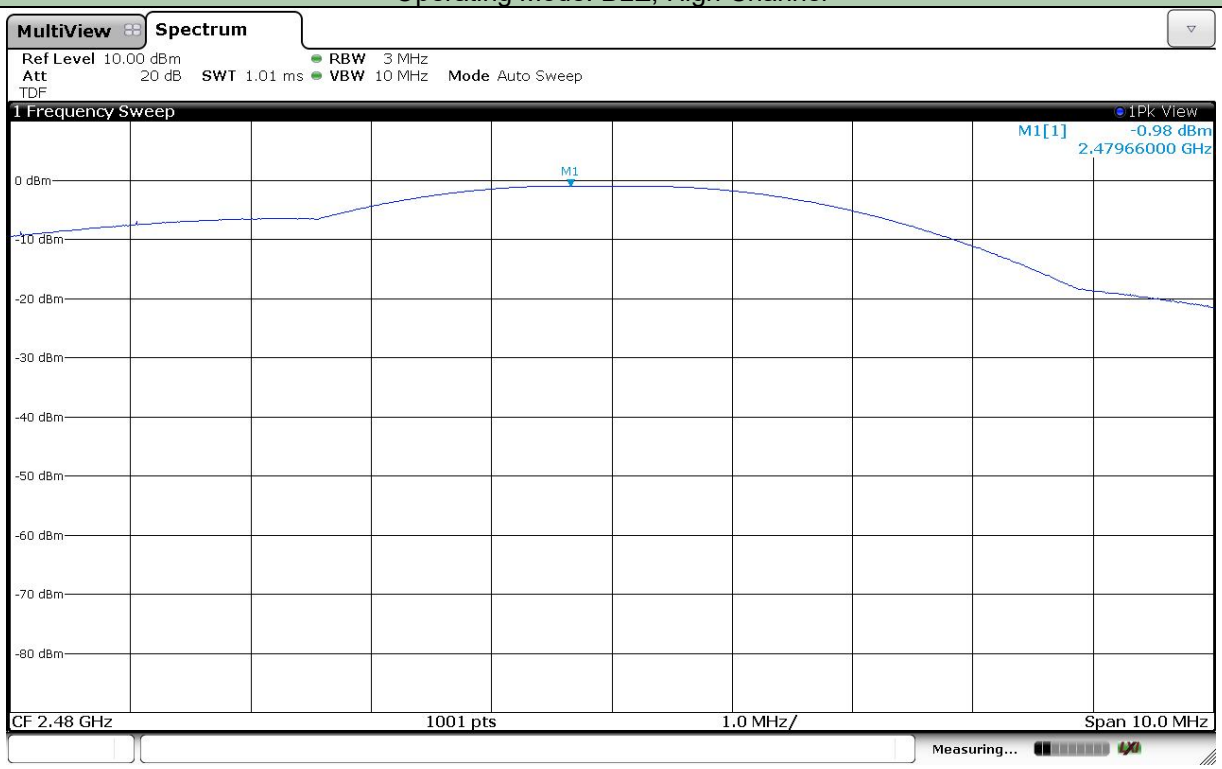
Operating Mode: BLE, Low Channel



Operating Mode: BLE, Middle Channel



Operating Mode: BLE, High Channel



5.4 Peak Power Spectral Density

5.4.1 Limit

Acc. To section 15.247, the power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.4.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: 10.2 Method PKPSD (peak PSD).

The transmitter output is connected to a spectrum analyzer with the RBW set from 3 kHz to 100 kHz, VBW ≥ 3 X RBW, peak detector and max hold.

5.4.3 Test Data

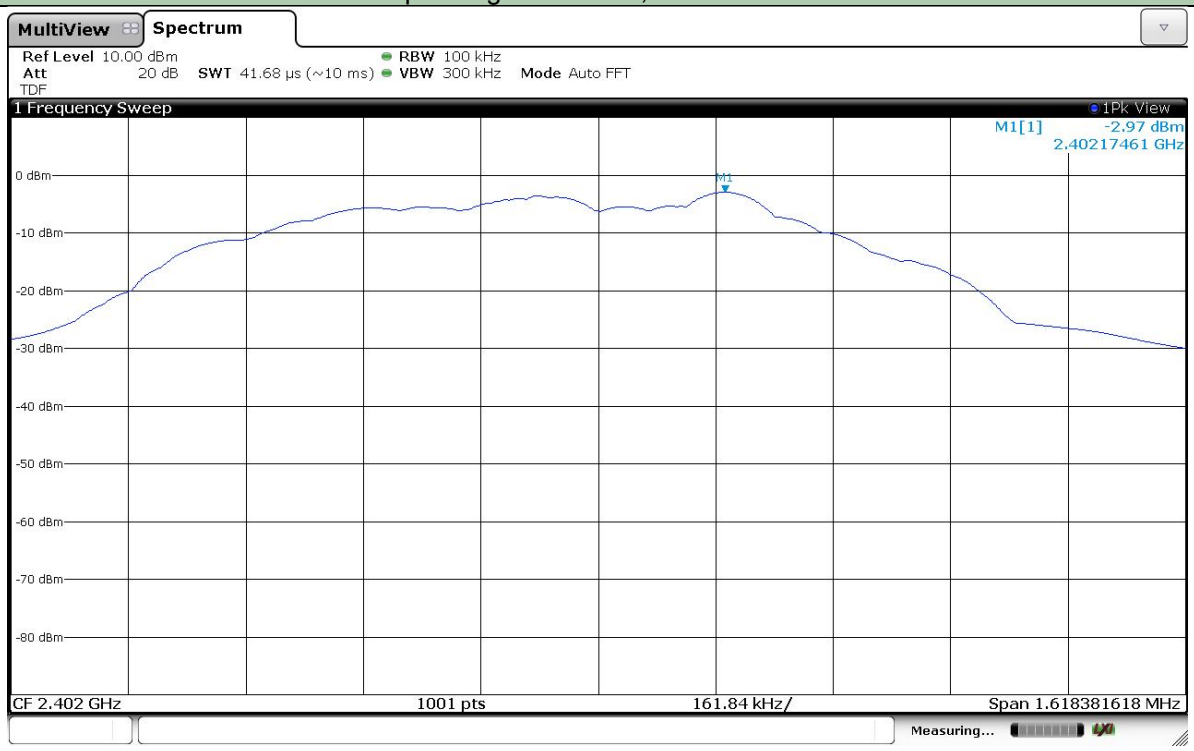
Date of Test	2017-02-28	Temperature	(21.2 ~ 21.8) °C
		Relative humidity	(38.8 ~ 39.6) % R.H.
Test Result	***PASS***	Tested by	Inyong Song

Channel	Frequency (MHz)	Measured Value (dBm)	Limit (dBm)	Margin (dB)
Low	2 402	-2.97	8	10.97
Middle	2 440	-2.32		10.32
High	2 480	-1.79		9.79

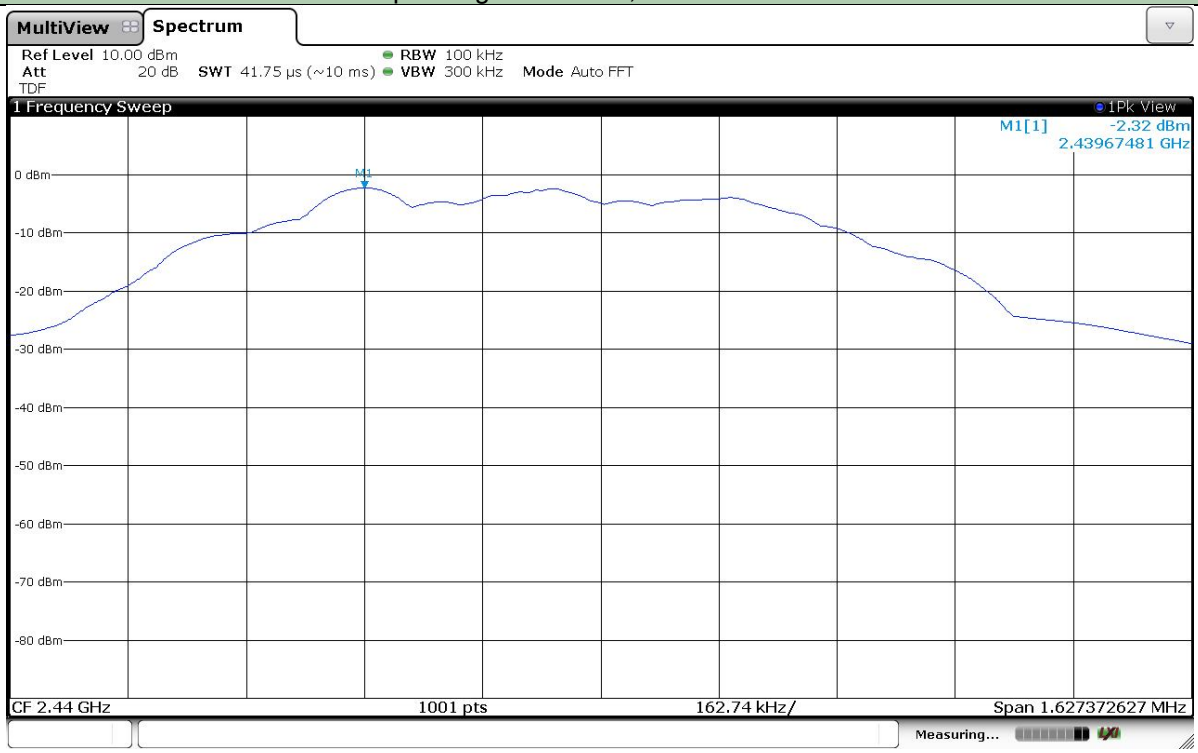
Remark. Margin = Limit – Measured Value

5.4.4 Test Plots

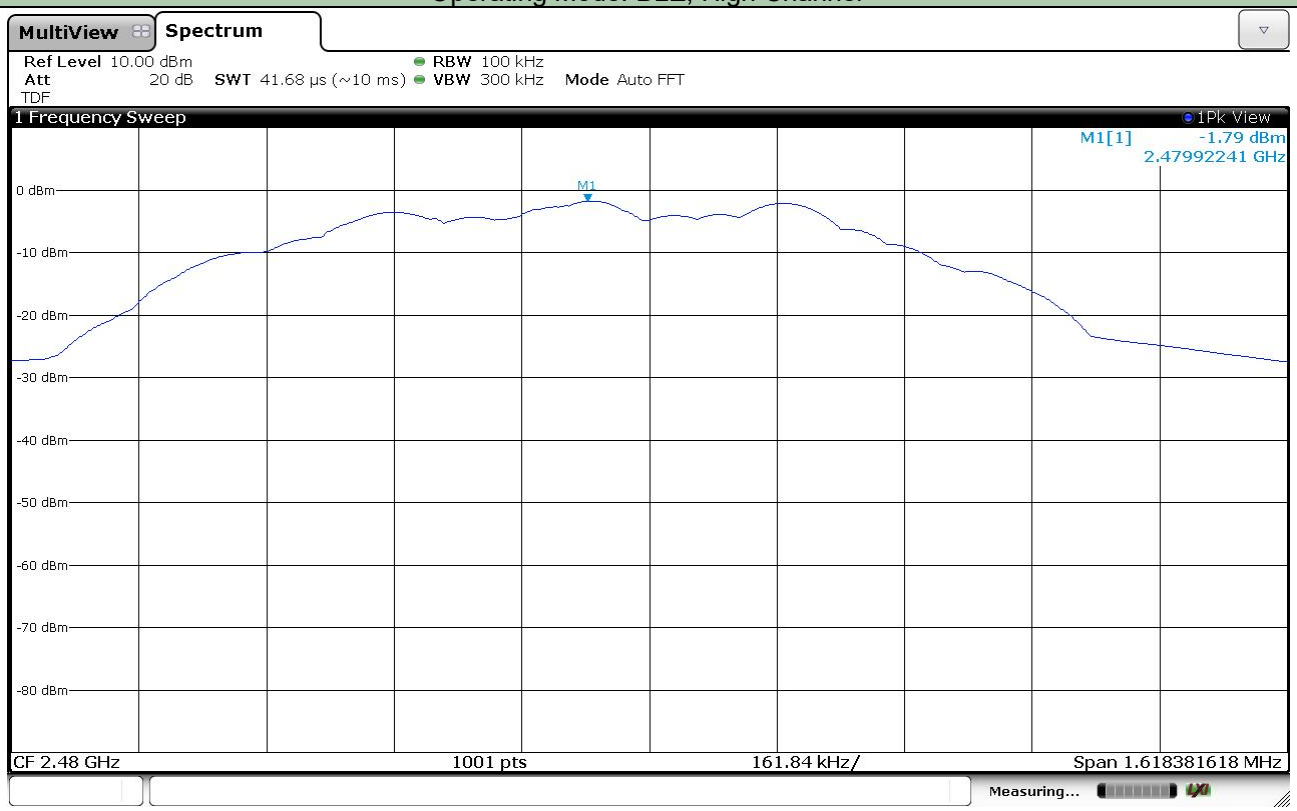
Operating Mode: BLE, Low Channel



Operating Mode: BLE, Middle Channel



Operating Mode: BLE, High Channel



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5.5 Out of Band Emission

5.5.1 Limit

Acc. To section 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

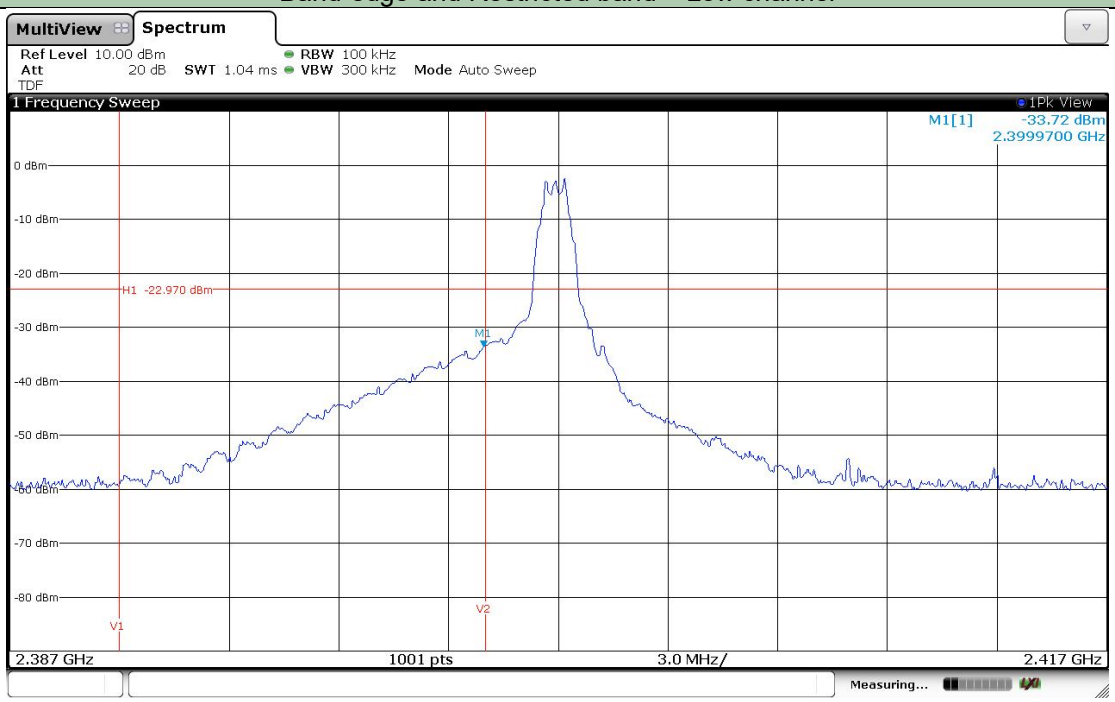
5.5.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: 11.0 Emissions in non-restricted frequency bands. The transmitter output is connected to a spectrum analyzer with the RBW set to 100 kHz, VBW ≥ 3 X RBW, peak detector and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

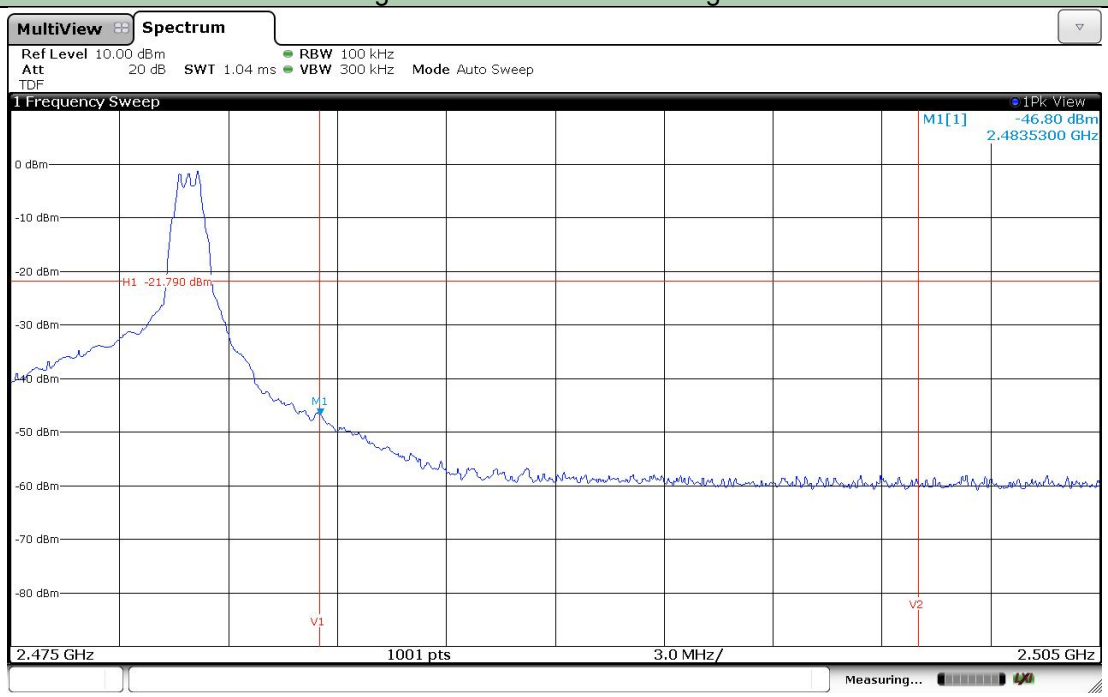
5.5.3 Test Data

Date of Test	2017-02-28	Temperature	(21.2 ~ 21.8) °C
		Relative humidity	(38.8 ~ 39.6) % R.H.
Test Result	***PASS***	Tested by	Inyong Song

Band-edge and Restricted band – Low channel



Band-edge and Restricted band – High channel



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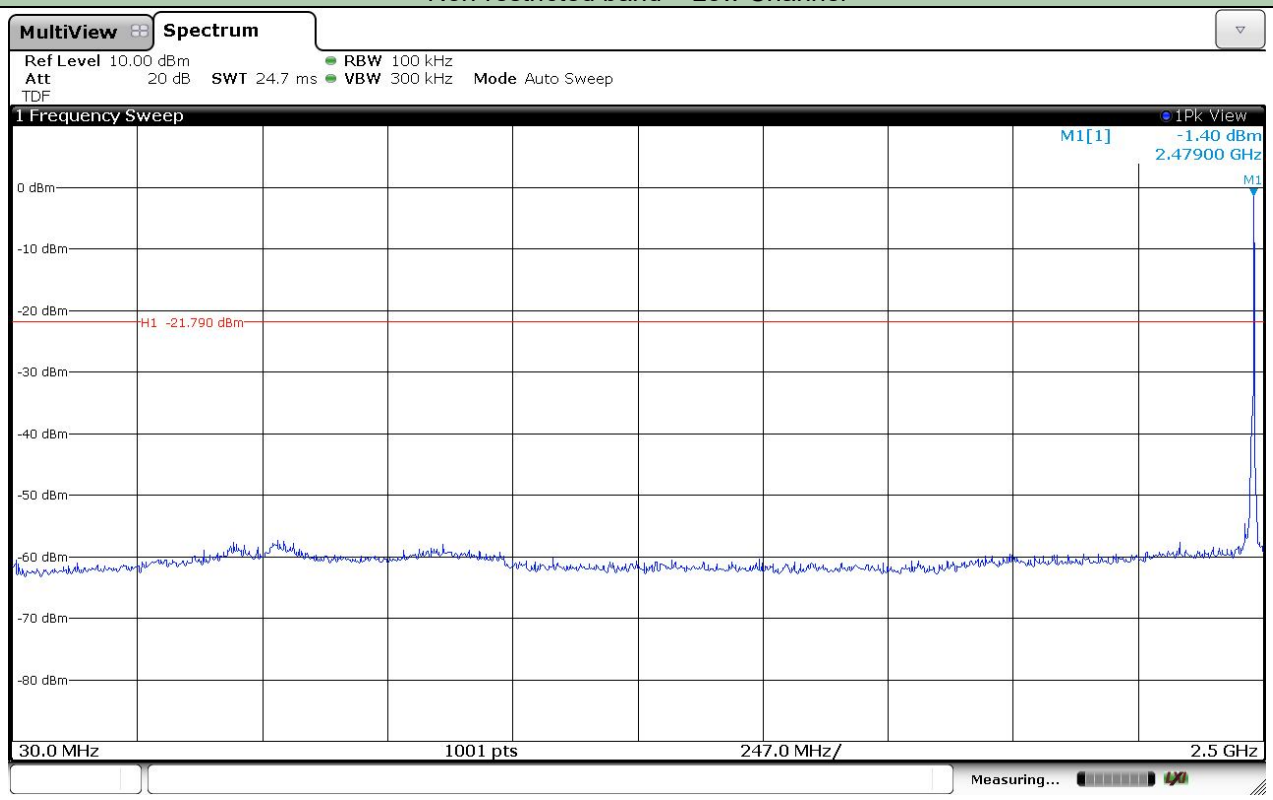
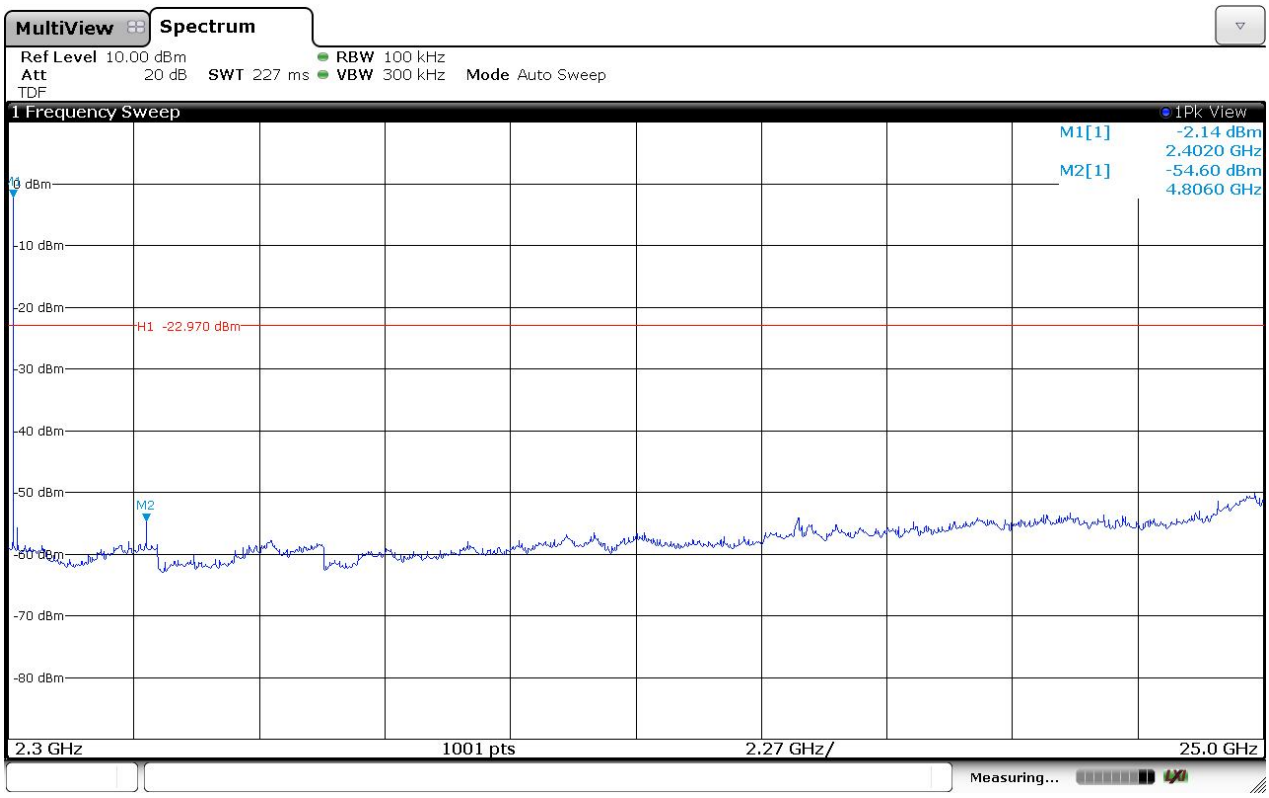
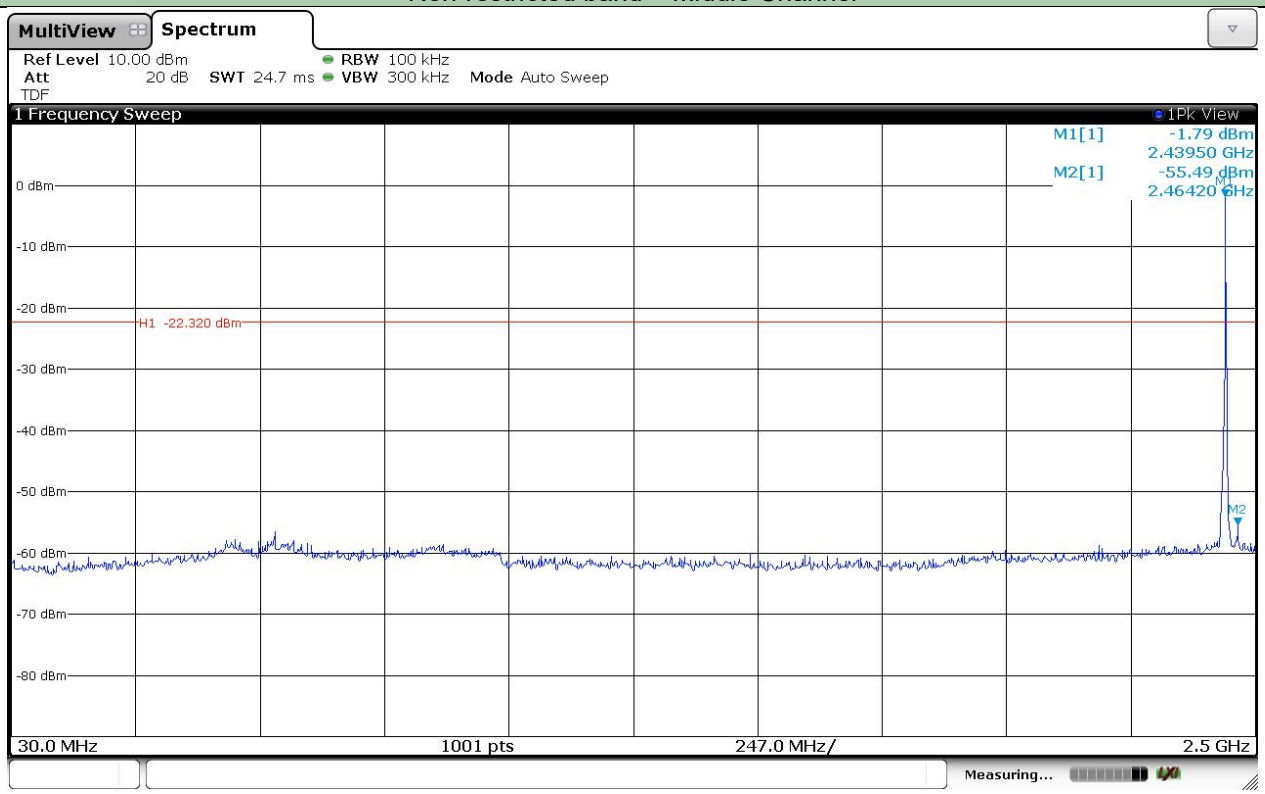
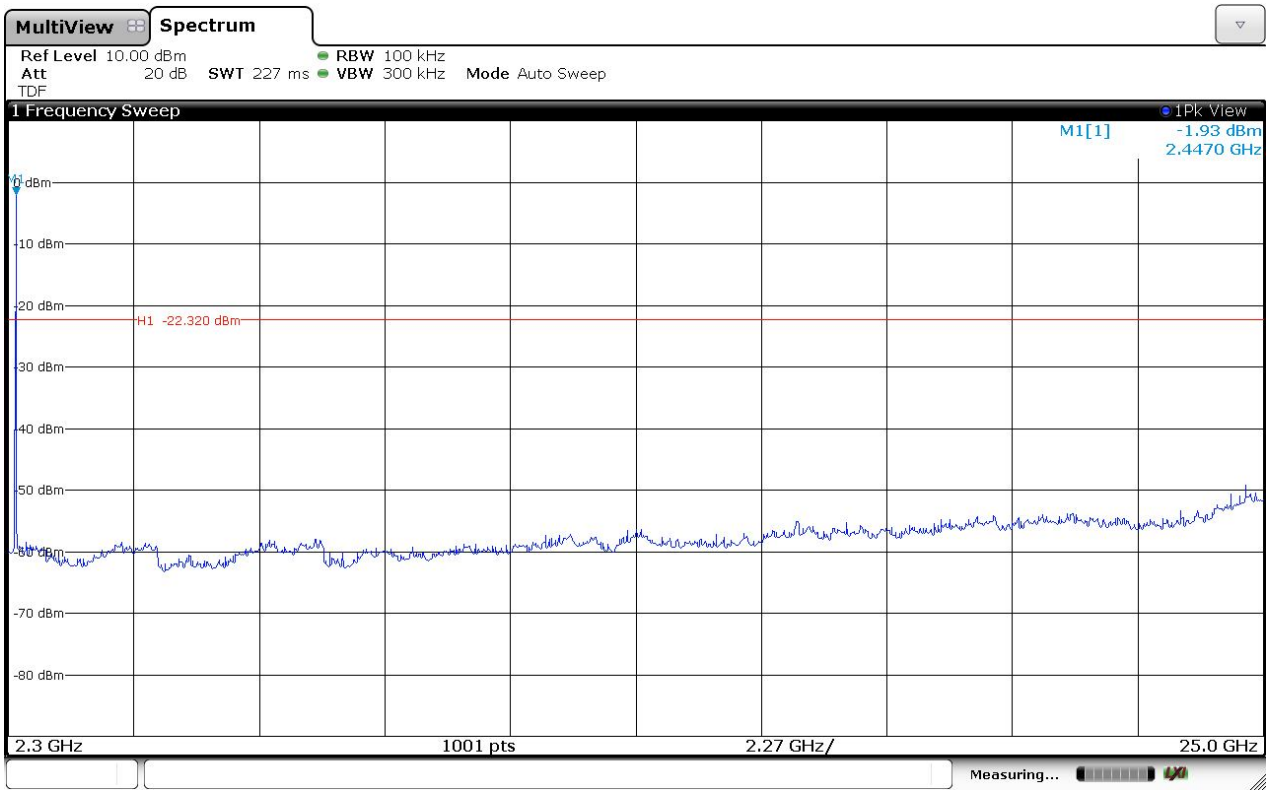
Non-restricted band – Low Channel



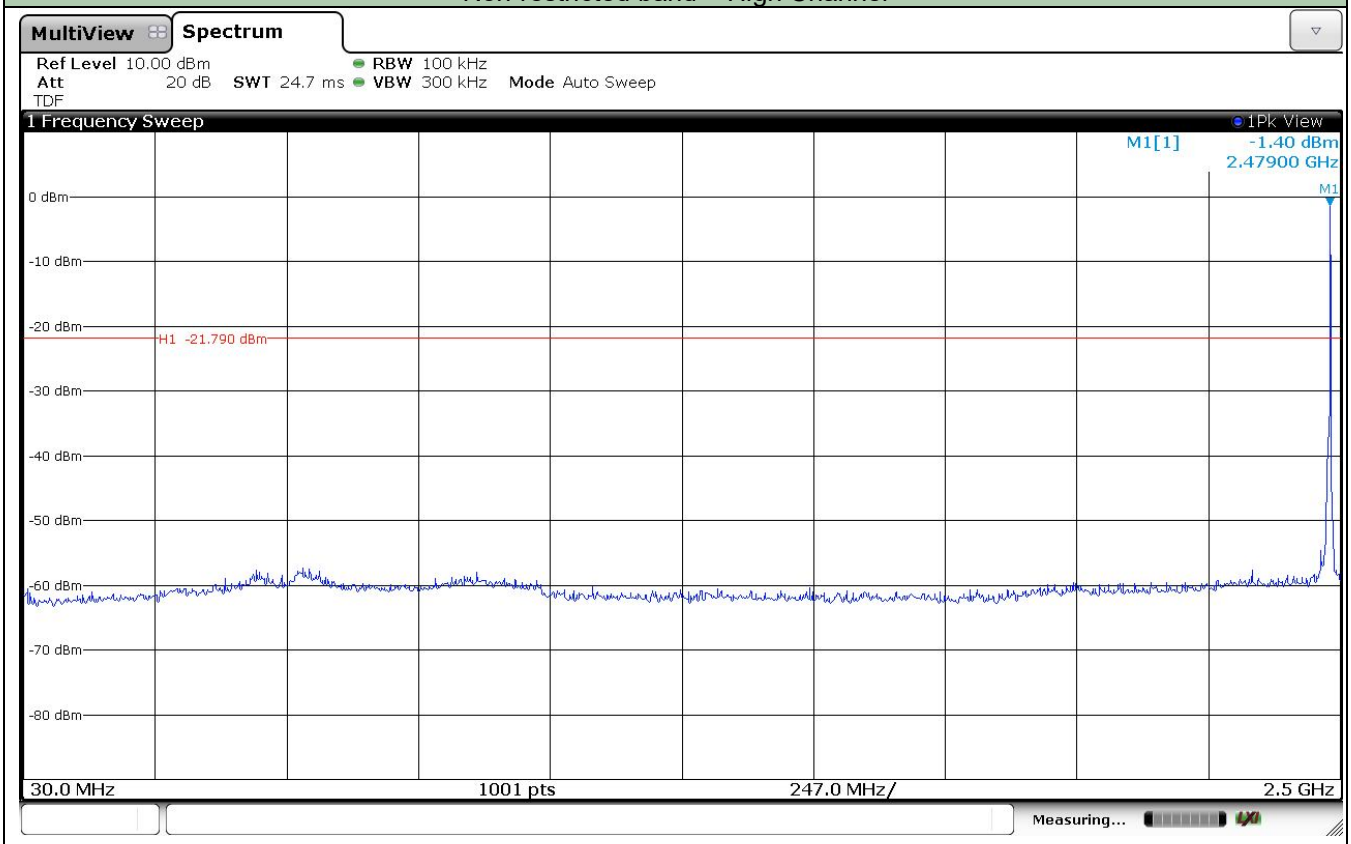


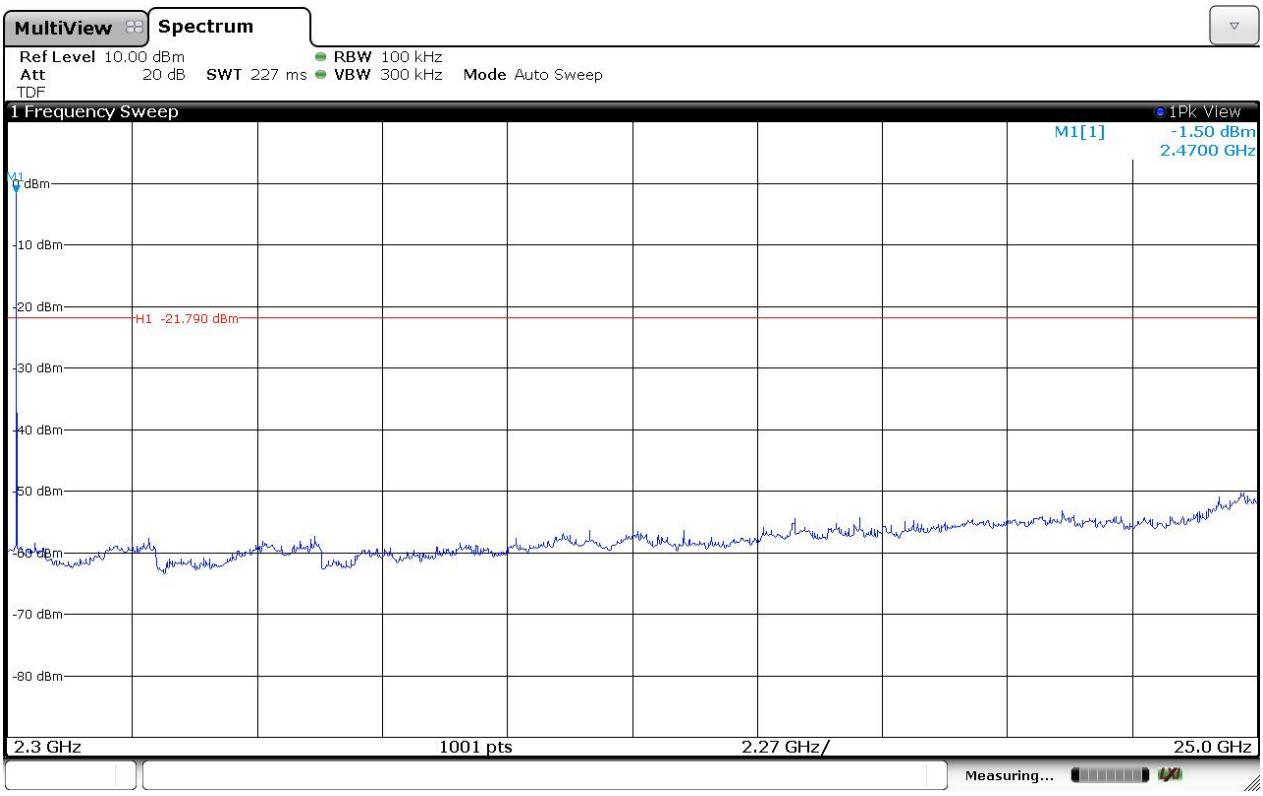
Non-restricted band – Middle Channel





Non-restricted band – High Channel





5.6 Radiated Emission

5.6.1 Limit

Acc. To section 15.205 and 15.209, following table shall be applied.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
Above 960	500	24

5.6.2 Method of Measurement

Reference to KDB 558074 D01 DTS Meas Guidance v03r05: 12.1 Radiated emission measurements.

The radiated emissions measurements were on 3 m, semi-anechoic chamber. The EUT and other support equipment were placed on a non-conductive table 80 cm for below 1 GHz and 1.5 m for above 1 GHz above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

For measurement below 1 GHz, the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For peak emission measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz and for average measurement, resolution bandwidth is set to 1 MHz; and the video bandwidth is set to 10 Hz, when duty cycle is more than 98 %. If duty cycle is less than 98 %, the video bandwidth is set to ≥ 1/T, where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

5.6.3 Test Site Requirement for KDB 937606

Acc. to KDB 937606, Semi Anechoic Chamber (SAC) shall be verified test results below 30 MHz with Open Area Test Site (OATS), so we compared test results between the measurements from our SAC and an OATS and found test results almost same, so we declare test result for below 30 MHz from our SAC is valid and met the requirement acc. to KDB 937606.

5.6.4 Measurement Uncertainty

Measurement uncertainties were not taken into account and following uncertainty levels have been estimated for tests performed on the apparatus. The measurement uncertainties are given with at least 95 % confidence.

Frequency Range	Uncertainty	Frequency Range	Uncertainty
9 kHz ~ 30 MHz	± 3.2 dB	30 MHz ~ 1 GHz	± 3.8 dB
1 GHz ~ 18 GHz	± 4.9 dB	18 GHz ~ 40 GHz	± 5.1 dB

5.6.5 Sample Calculated Example

At 80 MHz Limit = 40.0 dBuV/m

Result =Receiver reading value + Antenna Factor + Cable Loss – Pre-amplifier gain = 30 dBuV/m

Margin = Limit – Result = 40 – 30 = 10 so the EUT has 10.0 dB margin at 80 MHz

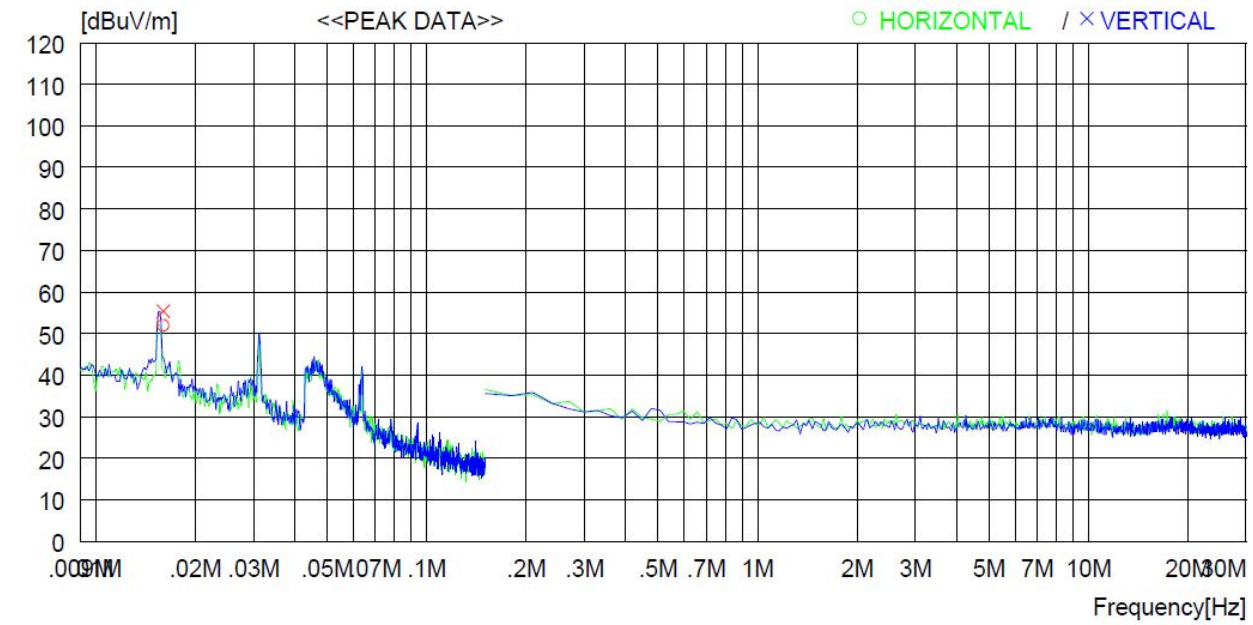
5.6.6 Test Data

Date of Test	2017-03-04	Temperature	(18.4 ~ 19.3) °C
		Relative humidity	(28.1 ~ 29.4) % R.H.
Measurement Frequency Range		9 kHz ~ 26 GHz	
Test Result	***PASS***	Tested By	In-yong Song

Frequency range	Detector Mode	Resolution BW	Video BW	Video Filtering	Measurement distance
Below 30 MHz	Peak or Q.P.	9 kHz	100 kHz	-	3 m
30 MHz ~ 1 000 MHz	Peak or Q.P.	100 kHz	300 kHz	-	3 m

5.6.6.1 Test Data below 30 MHz

Graphical Test Data – Below 30 MHz



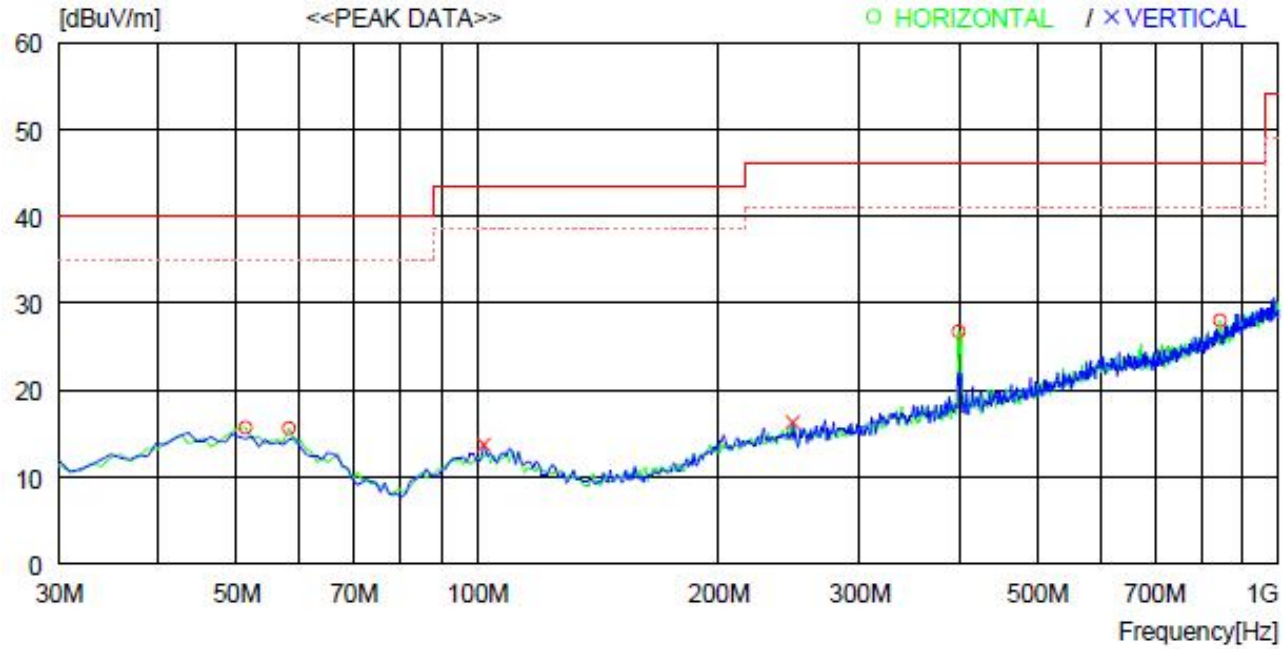
Tabulated Test Data – Low / Middle / High Channel

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
* Spurious emissions that 20 dB below the limits didn't be recorded										

NOTE: The test results below 30 MHz in our SAC (Semi Anechoic Chamber) was compared with other OATS (Open Area Test Site) and found the result was almost same with OATS.

5.6.6.2 Test Data from 30 MHz to 1 GHz

Graphical Test Data – Low Channel

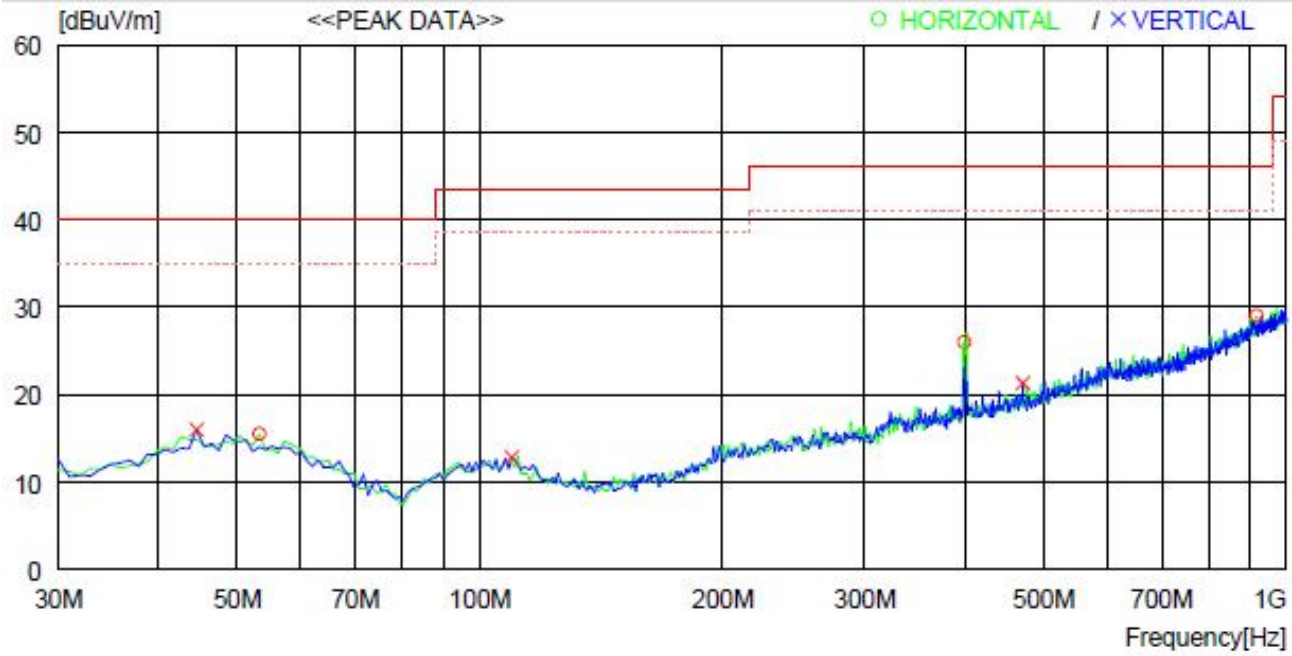


No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	51.340	28.7	12.8	6.9	32.7	15.7	40.0	24.3	300	359
2	58.130	29.2	12.1	7.0	32.7	15.6	40.0	24.4	300	165
3	398.600	34.4	15.8	9.2	32.7	26.7	46.0	19.3	300	359
4	844.791	27.8	22.0	11.0	32.8	28.0	46.0	18	300	231
----- Vertical -----										
5	101.780	28.4	11.5	6.5	32.7	13.7	43.5	29.8	200	359
6	247.280	27.9	12.6	8.4	32.6	16.3	46.0	29.7	100	0

Tabulated Test Data

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
51.34	28.7	Peak	H	12.8	-25.8	15.7	40.0	24.3	300	359
58.13	29.2	Peak	H	12.1	-25.7	15.6	40.0	24.4	300	165
101.78	28.4	Peak	V	11.5	-26.2	13.7	43.5	29.8	200	359
247.28	27.9	Peak	V	12.6	-24.2	16.3	46.0	29.7	100	0
398.60	34.4	Peak	H	15.8	-23.5	26.7	46.0	19.3	300	359
844.791	27.8	Peak	H	22.0	-21.8	28.0	46.0	18.0	300	231

Graphical Test Data– Middle Channel

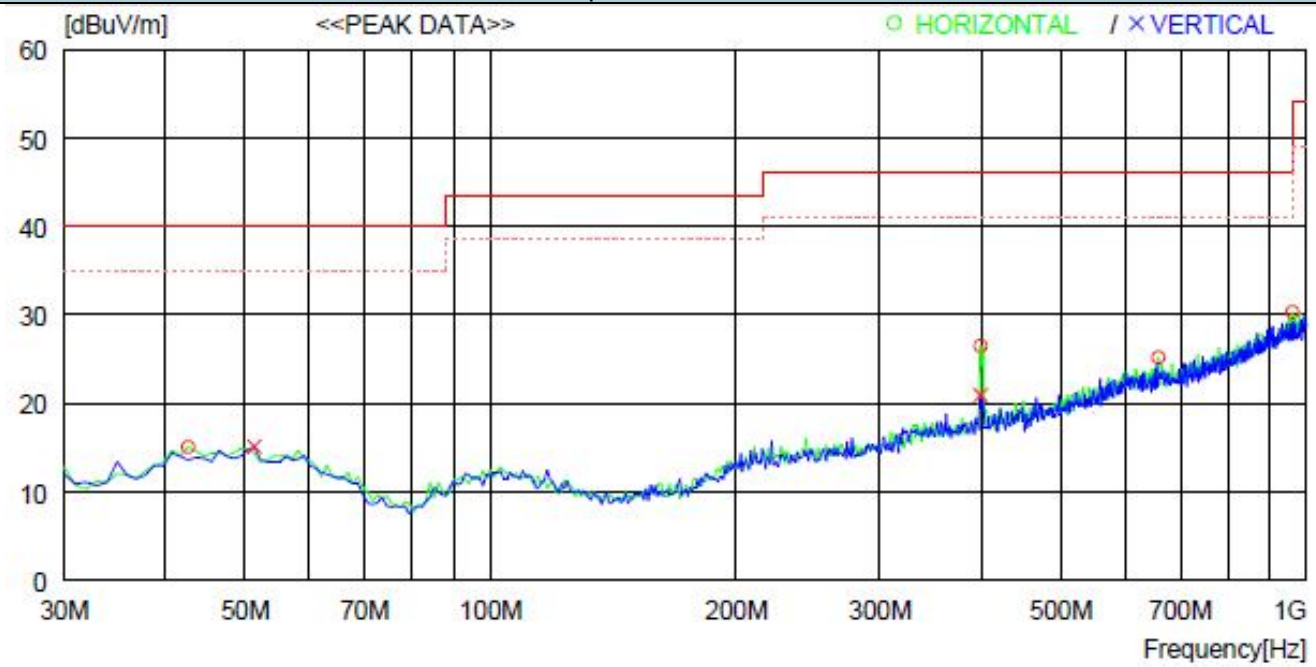


No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	53.280	28.7	12.6	6.9	32.7	15.5	40.0	24.5	300	277
2	398.600	33.7	15.8	9.2	32.7	26.0	46.0	20	300	75
3	918.508	27.1	22.9	11.3	32.3	29.0	46.0	17	200	7
----- Vertical -----										
4	44.550	29.1	12.8	6.8	32.7	16.0	40.0	24	100	311
5	109.540	27.7	10.4	7.4	32.7	12.8	43.5	30.7	100	359
6	471.351	27.7	17.0	9.5	32.9	21.3	46.0	24.7	100	61

Tabulated Test Data

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
44.55	29.1	Peak	V	12.8	-25.9	16.0	40.0	24.0	100	311
53.28	28.7	Peak	H	12.6	-25.8	15.5	40.0	24.5	300	277
109.54	27.7	Peak	V	10.4	-25.3	12.8	43.5	30.7	100	359
398.60	33.7	Peak	H	15.8	-23.5	26.0	46.0	20.0	300	75
471.35	27.7	Peak	V	17.0	-23.4	21.3	46.0	24.7	100	61
918.51	27.1	Peak	H	22.9	-21.0	29.0	46.0	17.0	200	7

Graphical Test Data



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	42.610	28.5	12.5	6.8	32.7	15.1	40.0	24.9	400	0
2	398.600	34.2	15.8	9.2	32.7	26.5	46.0	19.5	300	359
3	658.556	28.1	19.9	10.3	33.1	25.2	46.0	20.8	300	359
4	961.187	27.6	23.1	11.5	31.9	30.3	54.0	23.7	400	349
----- Vertical -----										
5	51.340	28.1	12.8	6.9	32.7	15.1	40.0	24.9	100	359
6	398.600	28.6	15.8	9.2	32.7	20.9	46.0	25.1	200	254

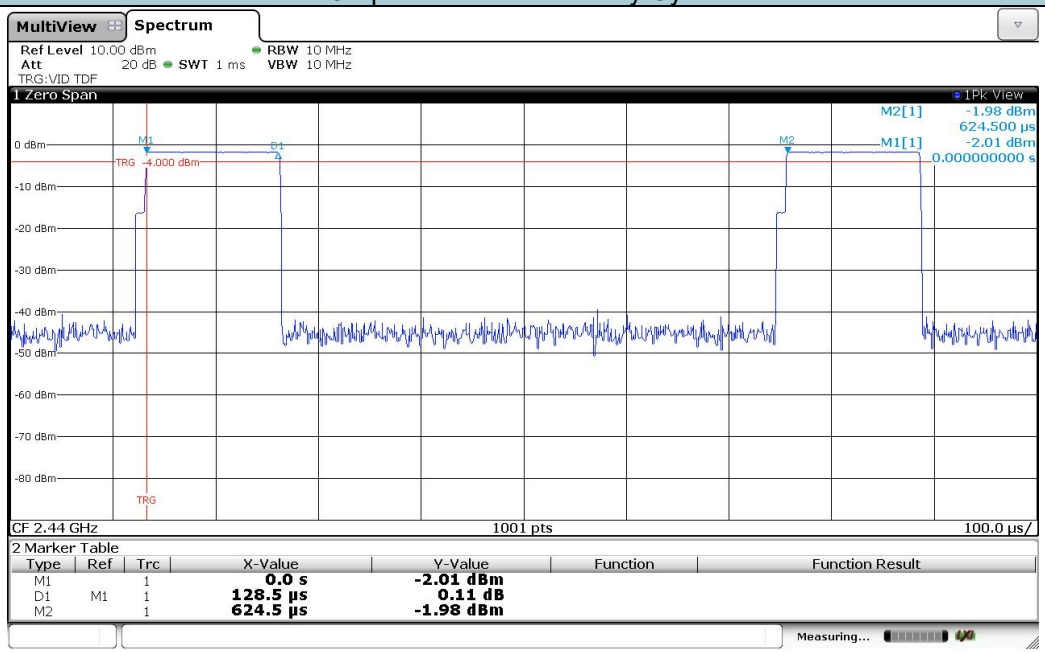
Tabulated Test Data – High Channel

Frequency (MHz)	Receiver Reading (dBuV)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Degree)
42.61	28.5	Peak	H	12.5	-25.9	15.1	40.0	24.9	400	0
51.34	28.1	Peak	V	12.8	-25.8	15.1	40.0	24.9	100	359
398.60	34.2	Peak	H	15.8	-23.5	26.5	46.0	19.5	300	359
398.60	28.6	Peak	V	15.8	-23.5	20.9	46.0	25.1	200	254
658.56	28.1	Peak	H	19.9	-22.8	25.2	46.0	20.8	300	359
961.19	27.6	Peak	H	23.1	-20.4	30.3	54.0	23.7	400	349

5.6.6.3Test Data above 1 GHz

5.6.6.3.1 Duty Cycle

Graphical Test Data - Duty Cycle



Tabulated Test Data

Operating Mode	On Time (ms)	On + Off Time (ms)	Duty Cycle (%)	Duty Factor
BLE	0.128 5	0.624 5	20.58	6.87

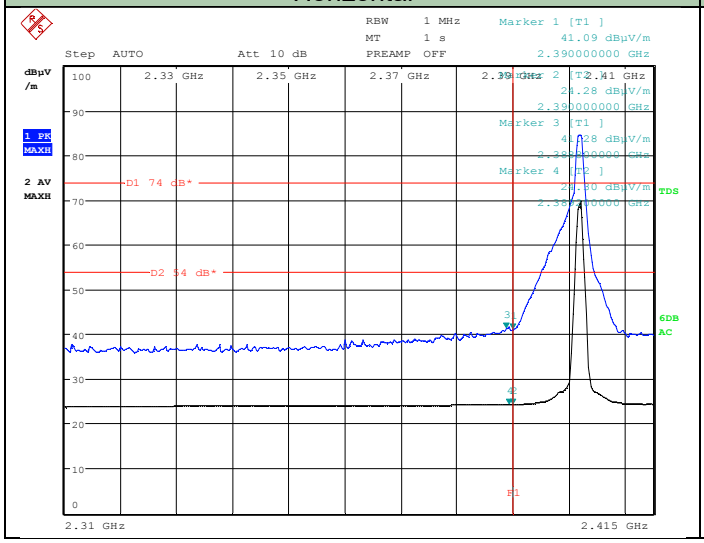
For the RMS measurement, following setting condition and span was set to (SPAN/(501) ≤ 500 kHz (=RBW/2) and performed a trace average of at least 100 traces.

Detector Mode	Resolution BW	Video BW	Sweep Time	Measurement distance
Peak	1 MHz	3 MHz	Auto	3 m
RMS	1 MHz	3 MHz	Auto	3 m

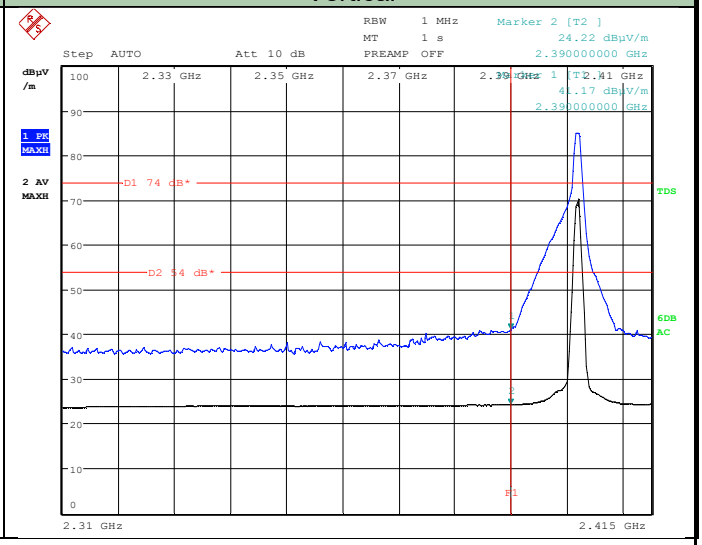
5.6.6.3.2 Test Data for Band edge (Restricted band)

Graphical Test Data – Low Channel

Horizontal



Vertical



Tabulated Test Data – Low Channel

Freq. (MHz)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor (dB)	Receiver Reading (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
2 390.0	Peak	H	28.9	-26.5	41.28	-	41.28	74	32.72	100	134
2 390.0	Average	H	28.9	-26.5	24.30	6.87	31.17	54	22.83	100	134
2 390.0	Peak	V	28.9	-26.5	41.17	-	41.17	74	32.83	275	0
2 390.0	Average	V	28.9	-26.5	24.22	6.87	31.09	54	22.91	275	0

NOTE: Peak results are met average limit, so average measurement is not necessary, but performed.

"H" means Horizontal polarity, "V" means Vertical polarity.

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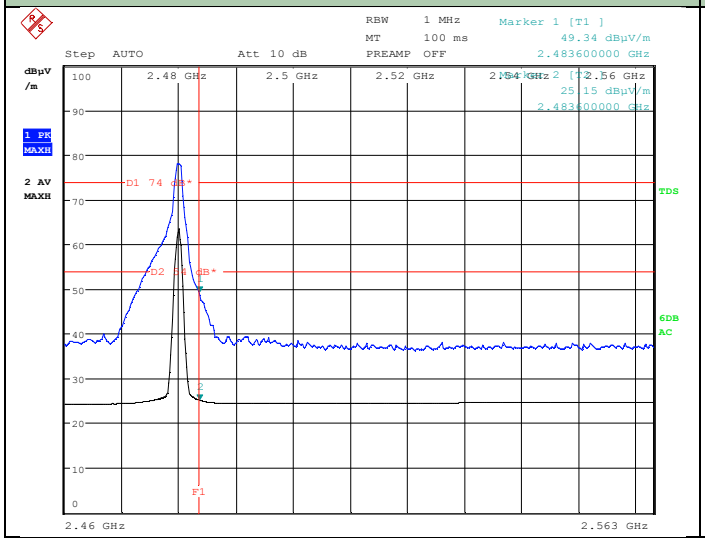
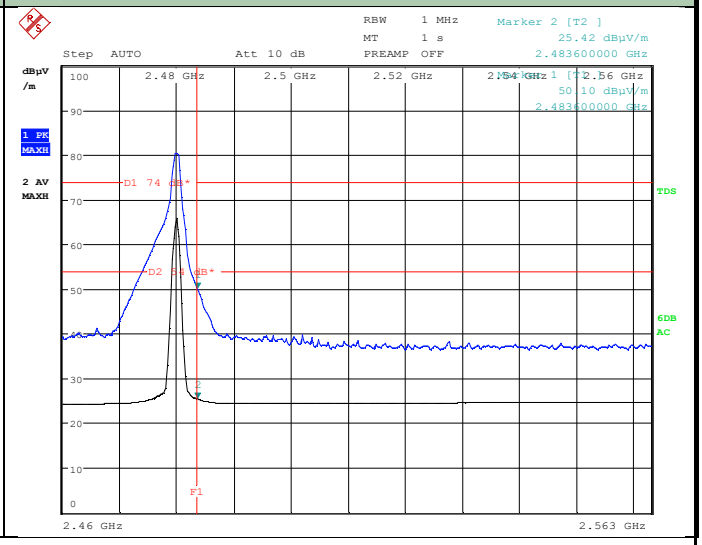
Graphical Test Data – High Channel

Horizontal



Vertical



Tabulated Test Data – High Channel

Freq. (MHz)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor (dB)	Receiver Reading (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
2 483.6	Peak	H	29.1	-26.5	49.34	-	49.34	74	24.66	135	138
2 483.6	Average	H	29.1	-26.5	25.15	6.87	32.02	54	21.98	135	138
2 483.6	Peak	V	29.1	-26.5	50.10	-	50.10	74	23.90	270	350
2 483.6	Average	V	29.1	-26.5	25.42	6.87	32.29	54	21.71	270	350

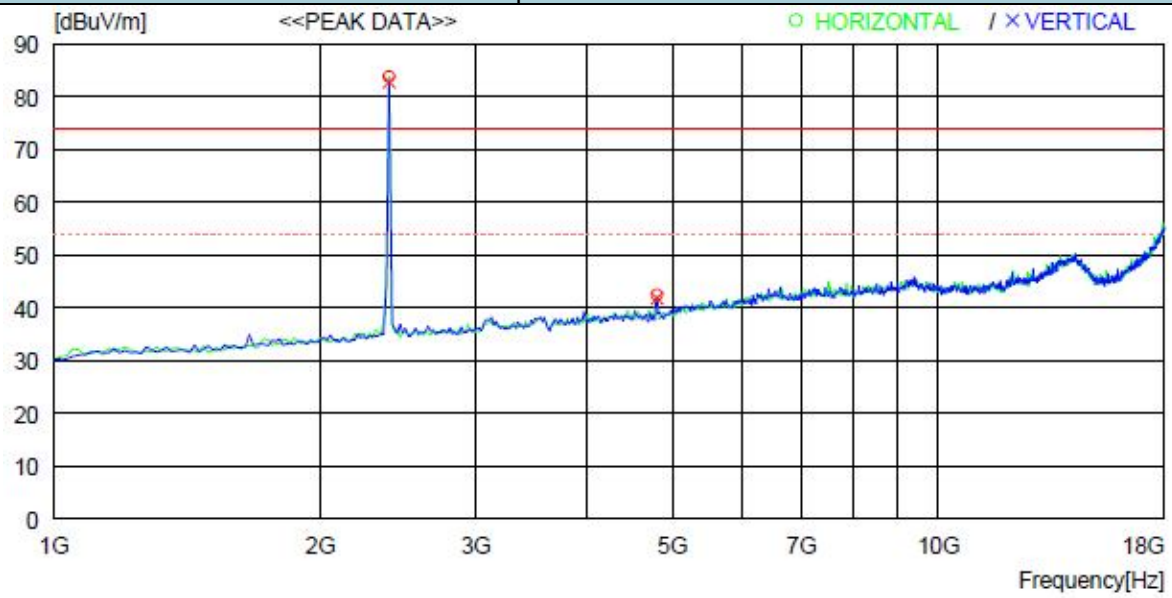
NOTE: Peak results are met average limit, so average measurement is not necessary, but performed.

"H" means Horizontal polarity, "V" means Vertical polarity.

5.6.6.3.3 Test Data for Harmonic & Spurious emission

5.6.6.3.3.1 Low Channel

Graphical Test Data



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
---- Horizontal ----										
1	2394.000	86.3	28.9	2.0	33.5	83.7	74.0	-9.7	100	108
2	4808.000	33.0	32.3	10.0	32.9	42.4	74.0	31.6	100	129
---- Vertical ----										
3	2394.000	85.3	28.9	2.0	33.5	82.7	74.0	-8.7	100	20
4	4808.000	32.3	32.3	10.0	32.9	41.7	74.0	32.3	100	8

Tabulated Test Data – Low Channel

Freq. (MHz)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor (dB)	Receiver Reading (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
4 808.0	Peak	H	32.3	-22.9	33.0	-	42.40	74	31.6	100	129
4 808.0	Peak	V	32.3	-22.9	32.3	-	41.70	74	32.3	100	8

NOTE: Peak results are met average limit, so average measurement was not performed.

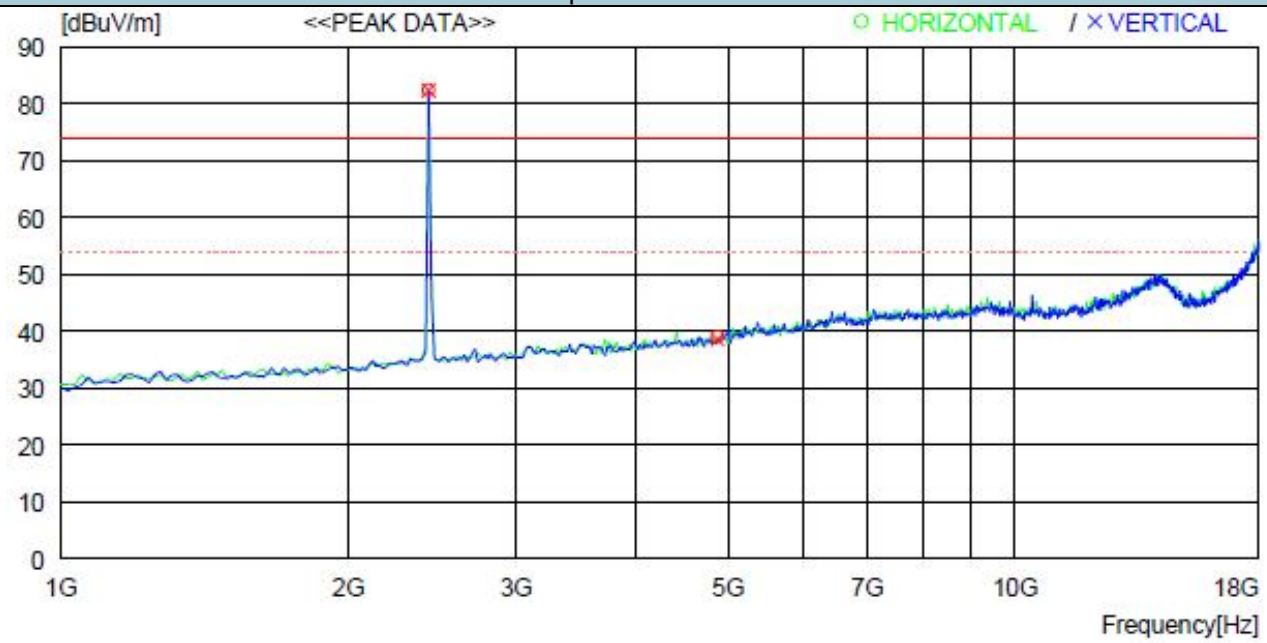
Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

“*” indicates frequency in Band edge (Restricted band)

5.6.6.3.3.2 Middle Channel

Graphical Test Data



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
---- Horizontal ----										
1	2428.000	84.8	29.0	2.0	33.5	82.3	74.0	-8.3	100	0
2	4876.000	29.2	32.5	10.2	32.9	39.0	74.0	35	200	359
---- Vertical ----										
3	2428.000	84.8	29.0	2.0	33.5	82.3	74.0	-8.3	100	0
4	4876.000	28.7	32.5	10.2	32.9	38.5	74.0	35.5	100	114

Tabulated Test Data – Middle Channel

Freq. (MHz)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor (dB)	Receiver Reading (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
4 808.0	Peak	H	32.5	-22.7	29.2	-	39.0	74.0	35.0	200	359
4 808.0	Peak	V	32.5	-22.7	28.7	-	38.5	74.0	35.5	100	114

NOTE: Peak results are met average limit, so average measurement was not performed.

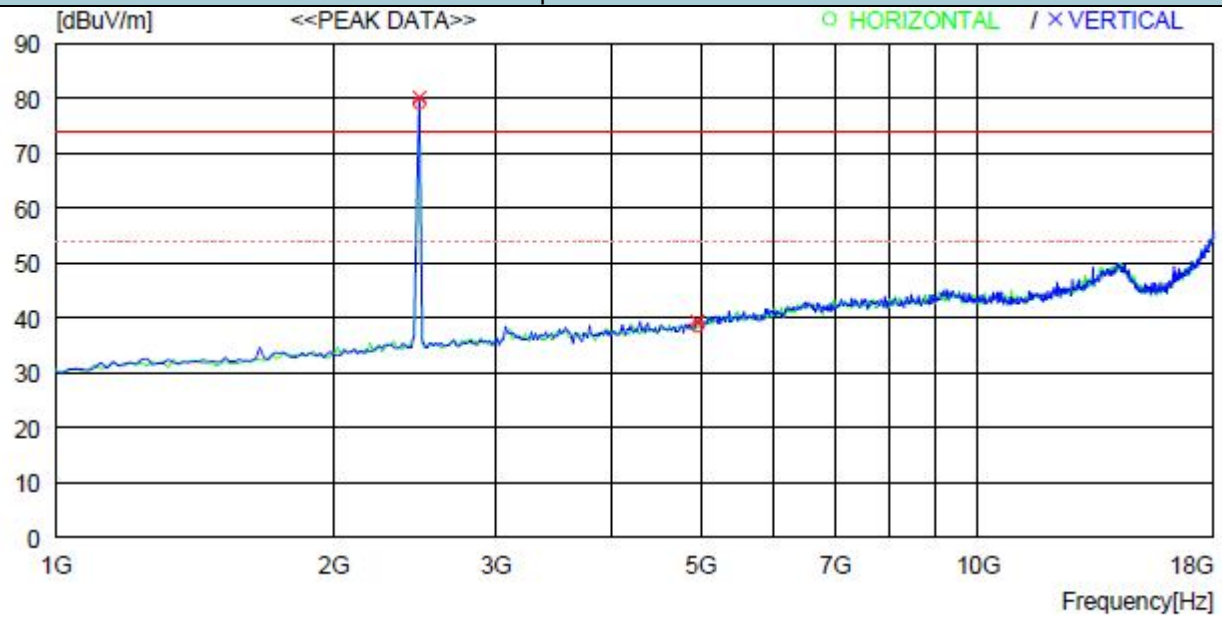
Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

“*” indicates frequency in Band edge(Restricted band).

5.6.6.3.3.3 High Channel

Graphical Test Data



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	2479.000	81.5	29.1	2.0	33.6	79.0	74.0	-5	100	104
2	4961.000	28.0	32.6	10.6	32.8	38.4	74.0	35.6	100	303
----- Vertical -----										
3	2479.000	82.6	29.1	2.0	33.6	80.1	74.0	-6.1	100	0
4	4961.000	28.9	32.6	10.6	32.8	39.3	74.0	34.7	100	0

Tabulated Test Data – High Channel

Freq. (MHz)	Detector Mode	Pol.	Ant. Factor (dB/m)	Corr. Factor (dB)	Receiver Reading (dBuV/m)	Duty Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (Deg)
4 808.0	Peak	H	32.6	-22.2	28.0	-	38.4	74.0	35.6	100	303
4 808.0	Peak	V	32.6	-22.2	28.9	-	39.3	74.0	34.7	100	0

NOTE: Peak results are met average limit, so average measurement was not performed.

Emission was scanned up to 26 GHz; No emissions were detected above the noise floor which was at least 20 dB below the specification limit

Note. “H” means Horizontal polarity, “V” means Vertical polarity.

“*” indicates frequency in Band edge(Restricted band).

Appendix I – Test Instrumentation

Description	Model No.	Serial No.	Manufacturer.	Due for Cal Date
TS8997 System				
Signal & Spectrum Analyzer	FSW 43	100578	Rohde & Schwarz	2017-05-04
Power Module	OSP 120	101389	Rohde & Schwarz	2018-01-19
Signal Generator	SMF100A	101441	Rohde & Schwarz	2018-01-19
Vector Signal Generator	SMBV100A	257560	Rohde & Schwarz	2018-01-19
DC Power Supply	U8001A	MY51080019	AGILENT	2017-07-29
Slidacs	DSD-1005	M06-117	Digitek Power	N/A
Attenuator	56-10	58769	WEINSCHEL	2018-01-19
Attenuator	10dB	N/A	Rohde & Schwarz	2018-01-19
Temperature & Humidity Chamber	PR-3KP	14004209	Espec	2017-07-29
Test Receiver	ESU 26	100303	Rohde & Schwarz	2018-01-19
Loop Antenna	HFH2-Z2	100341	Rohde & Schwarz	2017-06-04
TRILOG Broadband Antenna	VULB9163	9163.770	Schwarzbeck	2019-02-13
Dipole Antenna	UHA9105	N/A	Schwarzbeck	2017-07-17
Horn Antenna	HF 907	102426	Rohde & Schwarz	2019-01-06
DOPPEL STEG Horn Antenna	HF 906	100332	Rohde & Schwarz	2019-02-13
Attenuator	6dB	272.4110.50	Rohde & Schwarz	2018-01-19
Pre-Amplifier	310N	344015	Sonoma Instrument	2018-01-19
Pre-Amplifier	SCU 18D	19006450	Rohde & Schwarz	2018-01-19
Turn Table	DT3000-3t	1310814	INNCO SYSTEM	N/A
Antenna Master	MA4000-EP	4600814	INNCO SYSTEM	N/A
Camera Controller	HDCon4102	6531445048	PONTIS	N/A
CO3000 Controller	Co3000-4Port	CO3000/806/ 34130814/L	INNCO SYSTEM	N/A
EMI Test Receiver	ESCI 7	100722	Rohde & Schwarz	2018-01-19
LISN	ENV216	100110	Rohde & Schwarz	2017-07-29
LISN	LS16C	16011403310	AFJ	2017-07-29

The measuring equipment utilized to perform the tests documented in this test report has been calibrated in accordance with manufacturer's recommendations, and is traceable to recognized national standards.