

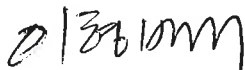
FCC Test Report

Equipment : Wireless charger
Model No : GSWD-SW01
Applicant : HaAinc Korea Company
3F Paradise Tower, Teheran-ro 52gil, 21, Gangnam-gu,
Seoul, South Korea
Date of test : August 05, 2019 to October 10, 2019
FCC Rule Part(s) : FCC Part 15 Subpart C §15.247
Report Type : Original Report

The product was received on August 05, 2019 and testing was completed on October 10, 2019. We, BWS TECH Inc. would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

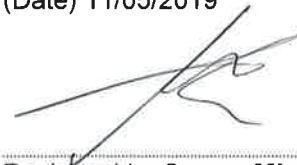
The test results in this report apply exclusively to the tested model / sample. Without written approval of BWS TECH Inc. the test report shall not be reproduced except in full.

(Date) 11/05/2019



Tested by **Hyeong-Bae, Lee**

(Date) 11/05/2019



Reviewed by **Seung-Min, Mun**

BWS TECH INC.

#23, Gokhyeon-ro 480beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si,
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<http://www.bws.co.kr>

*This test report is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.

*The authenticity of this test report can be confirmed in the Android app "DOCUQR" or www.docuqr.com

Report Revision

TEST REPORT NO.	DATE	DESCRIPTION
BWS-19-RF-0005	October 10, 2019	- First Approval Report
BWS-19-RF-0005-R1	October 22, 2019	- Update applied standard and antenna information of WPT
BWS-19-RF-0005-R2	November 05, 2019	- Removed test result of WPT mode

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1. General Information

Scope – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

1.1 Applicant

● Company Name	: HaAinc Korea Company
● Company Address	: 3F Paradise Tower, Teheran-ro 52gil, 21, Gangnam-gu, Seoul, South Korea
● Phone/Fax	: Tel No. : +82-2-3446-7421 Fax No. : N/A

1.2 Manufacturer

● Company Name	: ShenZhen Anzhiyuan Technology Co. Ltd
● Company Address	: 2nd Floor, No.3-1 Chihu Industry Area, Tongde Community, Baolong Street, Longgang District, Shenzhen, China
● Phone/Fax	: Tel No. : + 86-755-8465-7440 Fax No. : + 86-755-8465-1965

1.3 EUT Description

● Equipment	: Wireless charger
● Model(s)	: GSWD-SW01
● Operation Frequency	: 2402 MHz ~ 2480 MHz (Bluetooth)
● Number of Channels	: BLE Channel 40
● Modulation Method	: 1Mbps GFSK
● Power Tolerance	: +/- 2dB
● Input Voltage	: DC 5 V
● Antenna Peak Gain	: 2.3 dBi

1.4 Other Information

● FCC Rule Part(s)	: Part 15 Subpart C §15.247
● FCC ID	: 2AULFGSWD-SW01
● Test Procedure	: ANSI C63.10-2013 KDB 558074 D01 DTS Meas Guidance v05r02
● Date of Test	: August 05, 2019 to October 10, 2019
● Place of Test	: BWS TECH Inc. (FCC Registration Number : 287786) #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, South Korea TEL: +82 31 333 5997 FAX: +82 31 333 0017

2. Description of Test Facility

Site Description

Test Lab.	:	 NRRA Designation Number is KR0017.
		 The Certificate Designation Number is KR0017.
		 The Certificate Accreditation Number is KT174.
Name of Firm	:	BWS TECH Inc.
Site Location	:	#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, South Korea

3. Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and the requirements of FCC Rules Part 15.207, 15.209 and 15.247.

Radio testing was performed according to KDB 558074 D01 DTS Meas Guidance v05r02.

3.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and is operated in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

3.4 Description of Test Modes

This EUT use WPT(Wireless Power Transmission system) with Bluetooth.

The EUT has been tested under operating condition.

After verification, all tests were carried out with the worst case test modes as shown below, and these were chosen for full testing.

For BLE, Channel Low (Ch00 : 2402 MHz), Middle (Ch19 : 2440 MHz) and High (Ch39 : 2480 MHz) were chosen for full testing.

4. Summary of Test Result

Clause	TEST Description	Standard Section	Requirements	Result
6.1	AC Power Line Conducted Emission	§15.207	§15.207(a)	Pass
6.2	Peak Output Power Measurement	§15.247(b)(3)	≤ 30 dBm	Pass
6.3	Power Spectral Density	§15.247(e)	≤ 8 dBm/3 kHz	Pass
6.4	6 dB Bandwidth	§15.247(a)(2)	≥ 500 kHz	Pass
6.5	Conducted Spurious Emission	§15.247(d)	≥ 20 dBc/100 kHz	Pass
6.6	Band Edges Measurement	§15.247(d)	§15.205(a)	Pass
6.7	Radiated Spurious Emission	§15.247(d), §15.209(a), §15.35(b)	§15.209(a), §15.247(d)	Pass
6.8	Antenna Application	§15.247(b), §15.203	§15.247(b), §15.203	Pass

5. Test Equipment

Equipment	Model	Manufacturer	Serial number	Calibration Due date (year/month/date)
PROGRAMMABLE TEMP. & HUMID. CHAMBER	SJ1013-TH	SeoJin Corp.	9204245	2020/06/07
USB RF POWER SENSOR	RPR3006W	D.A.R.E!! Instruments	14I000048SNO09	2020/04/10
PROGRAMMABLE DC POWER SUPPLY	UDP-6015R	UNICORN	1301006	2020/08/26
SYNTHESIZED SIGNAL GENERATOR	68367C	ANRITSU	#004908	2020/05/20
MXA SIGNAL ANALYZER	N9020A	Agilent	MY52091373	2020/07/02
Signal Analyzer	FSP	Rohde & Schwarz	100631	2019/11/07
EMI Test Receiver	E7405A	Agilent	MY45104194	2020/02/19
Open Switch and Control Unit	OSP120	Rohde & Schwarz	101364	N/A
Digital Controller	Controller CO 2000	Innco systems GmbH	N/A	N/A
TRILOG Broadband Antenna	VULB9163	Schwarzbeck	777	2020/04/13
Active Horn Antenna	AHA-118	COM-POWER CORP.	701064	2021/04/30
Antenna master	MA 2000	Innco systems GmbH	N/A	N/A
Loop Antenna	FMZB1519	SCHWARZBECK	00025	2020/07/24
Turn table	DS 1200 S	Innco systems GmbH	N/A	N/A
POWER DIVIDER	MP0218-2	FAIRVIEW MICROWAVE INC.	12-SPC7026-081	2020/08/26
MXG VECTOR SIGNAL GENERATOR	N5182A	AGILENT	MY46240037	2020/08/26
POWER SPLITTER	11667B	Anritsu	52634	2020/07/26
STEP ATTENUATOR	AC115A-09-34	WEINSCHL	15892	2020/08/26
STEP ATTENUATOR	AC118A-90-34	WEINSCHL	13000	2020/02/21
ATTENUATOR	F04-B1810-01	SRT	17060802	2020/06/07

6. Test Data

6.1 AC Power Line Conducted Emission

6.1.1 Test Limit

For equipment 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.

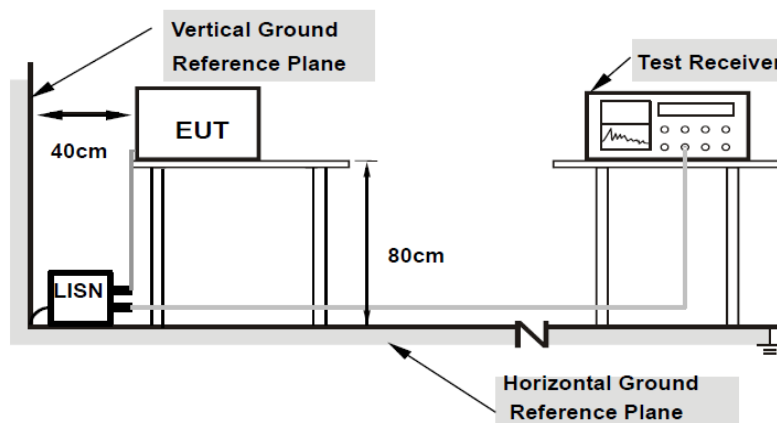
Frequency of emission(MHz)	Conducted limit(dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

6.1.2 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room and was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network(LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 μ H LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

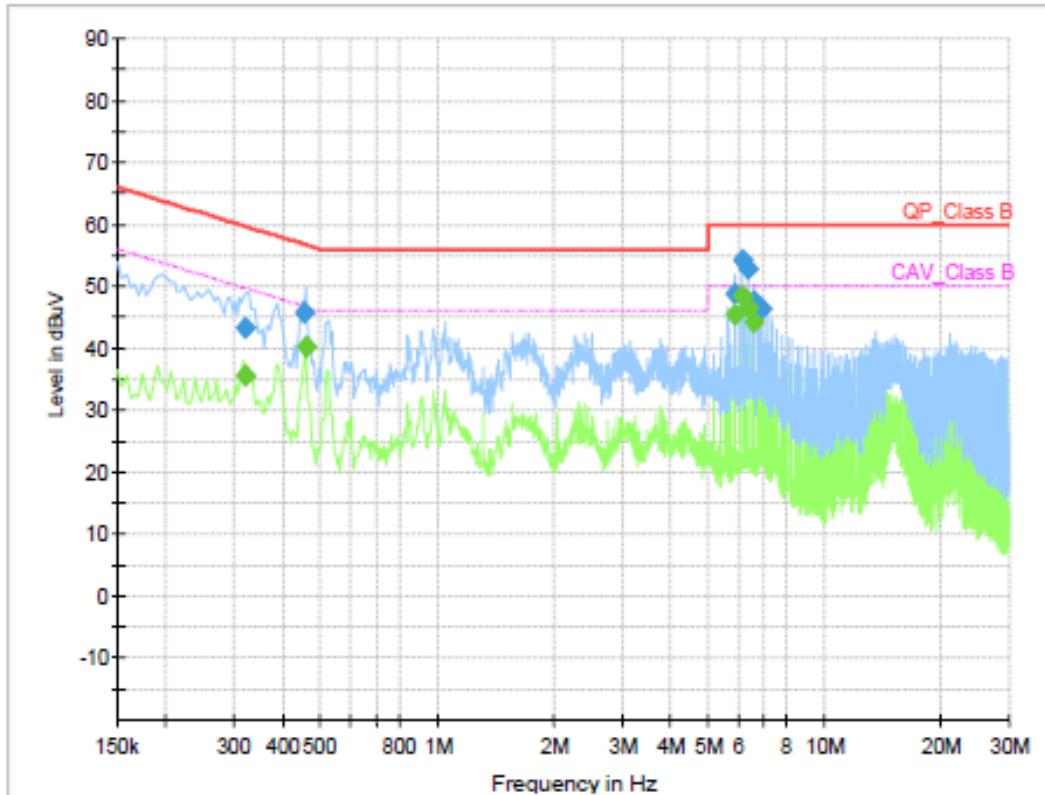
6.1.3 Test SET-UP (Block Diagram of Configuration)



6.1.4 Test Results

Common Information

Test Line: L1
Comment: BLE

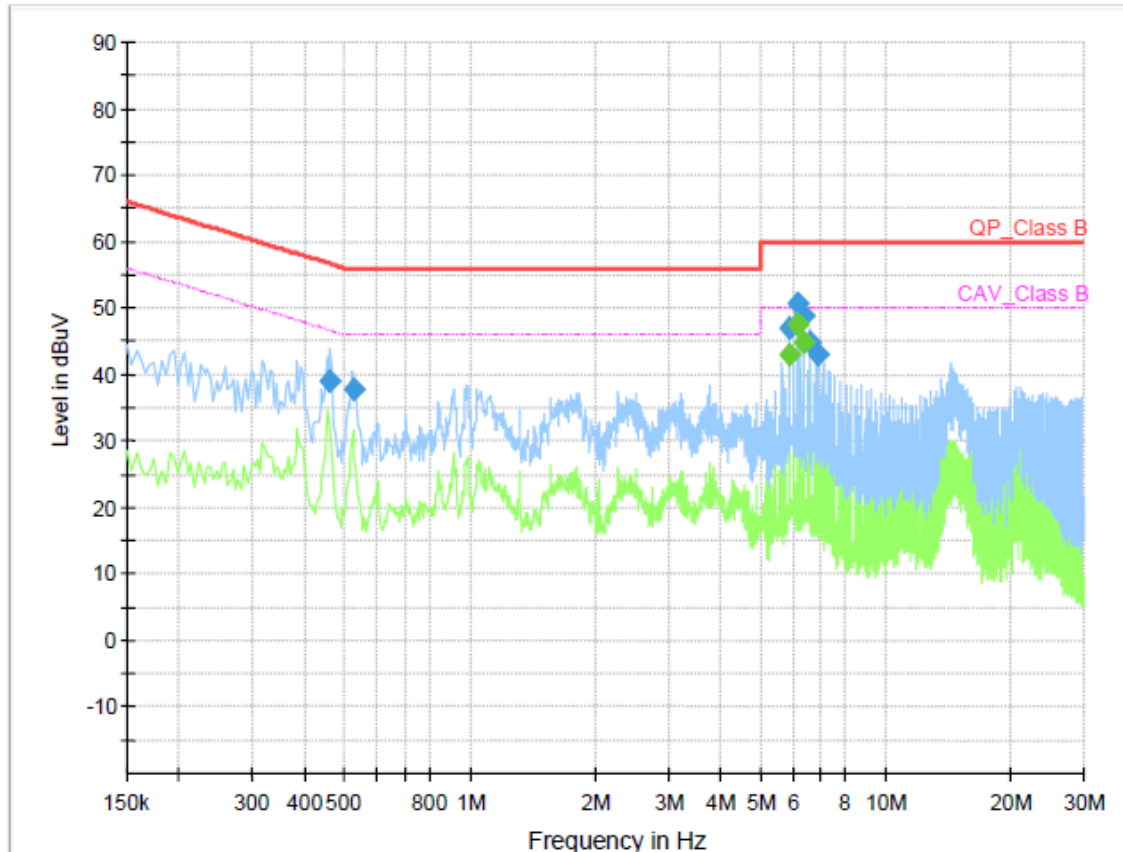


Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.321500	—	35.48	49.67	14.19	3000.0	9.000	L1	GND	8.1
0.321500	43.24	—	59.67	16.42	3000.0	9.000	L1	GND	8.1
0.453500	45.83	—	56.81	10.98	3000.0	9.000	L1	GND	8.1
0.457500	—	40.13	46.74	6.61	3000.0	9.000	L1	GND	8.1
5.888550	—	45.57	50.00	4.43	3000.0	9.000	L1	GND	8.4
5.888550	48.80	—	60.00	11.20	3000.0	9.000	L1	GND	8.4
6.127350	—	48.32	50.00	1.68	3000.0	9.000	L1	GND	8.4
6.127350	54.78	—	60.00	5.22	3000.0	9.000	L1	GND	8.4
6.366150	52.95	—	60.00	7.05	3000.0	9.000	L1	GND	8.4
6.366150	—	46.13	50.00	3.87	3000.0	9.000	L1	GND	8.4
6.608950	47.65	—	60.00	12.35	3000.0	9.000	L1	GND	8.4
6.608950	—	44.09	50.00	5.91	3000.0	9.000	L1	GND	8.4
6.847770	46.30	—	60.00	13.70	3000.0	9.000	L1	GND	8.4

Common Information

Test Line: N
Comment: BLE



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.461500	38.98	---	56.67	17.68	3000.0	9.000	N	GND	8.1
0.525500	37.73	---	56.00	18.27	3000.0	9.000	N	GND	8.1
5.884550	---	43.13	50.00	6.87	3000.0	9.000	N	GND	8.4
5.884550	47.13	---	60.00	12.87	3000.0	9.000	N	GND	8.4
6.127350	---	47.63	50.00	2.37	3000.0	9.000	N	GND	8.4
6.127350	50.55	---	60.00	9.45	3000.0	9.000	N	GND	8.4
6.366150	---	44.69	50.00	5.31	3000.0	9.000	N	GND	8.4
6.366150	48.86	---	60.00	11.14	3000.0	9.000	N	GND	8.4
6.604970	44.79	---	60.00	15.21	3000.0	9.000	N	GND	8.4
6.847770	42.84	---	60.00	17.16	3000.0	9.000	N	GND	8.4

6.2 Peak Output Power Measurement

6.2.1 Test Limit

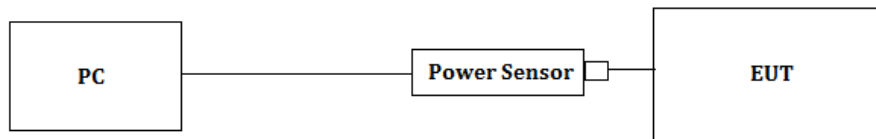
The maximum peak power shall be less than 1 Watt (30 dBm).

Note: If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the direction gain of the antenna exceeds 6dBi, In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

6.2.2 Measurement Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas. Guidance v05.
2. The RF output of EUT was connected to the power meter. The path loss was compensated to the results for each measurement.
3. Set to the maximum output power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.

6.2.3 Test SET-UP (Block Diagram of Configuration)



6.2.4 Test Results

[Duty Cycle]

Channel	Frequency (MHz)	Duty Cycle	Duty Cycle Factor (dB)
0	2402	0.603	2.2
19	2440	0.605	2.2
39	2480	0.595	2.3

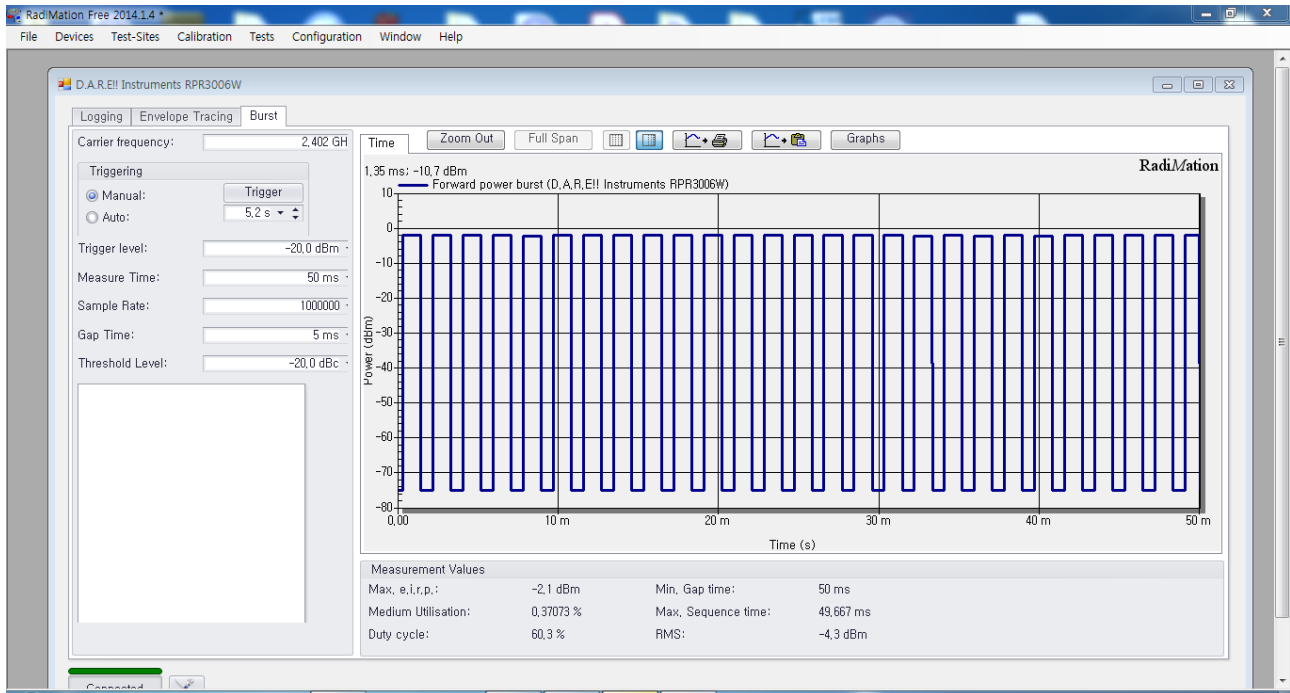
Notes : 1. Duty Cycle = T_{on} / T_{total}

2. Duty Cycle Factor = $10 \cdot \log(1/\text{Duty Cycle})$.

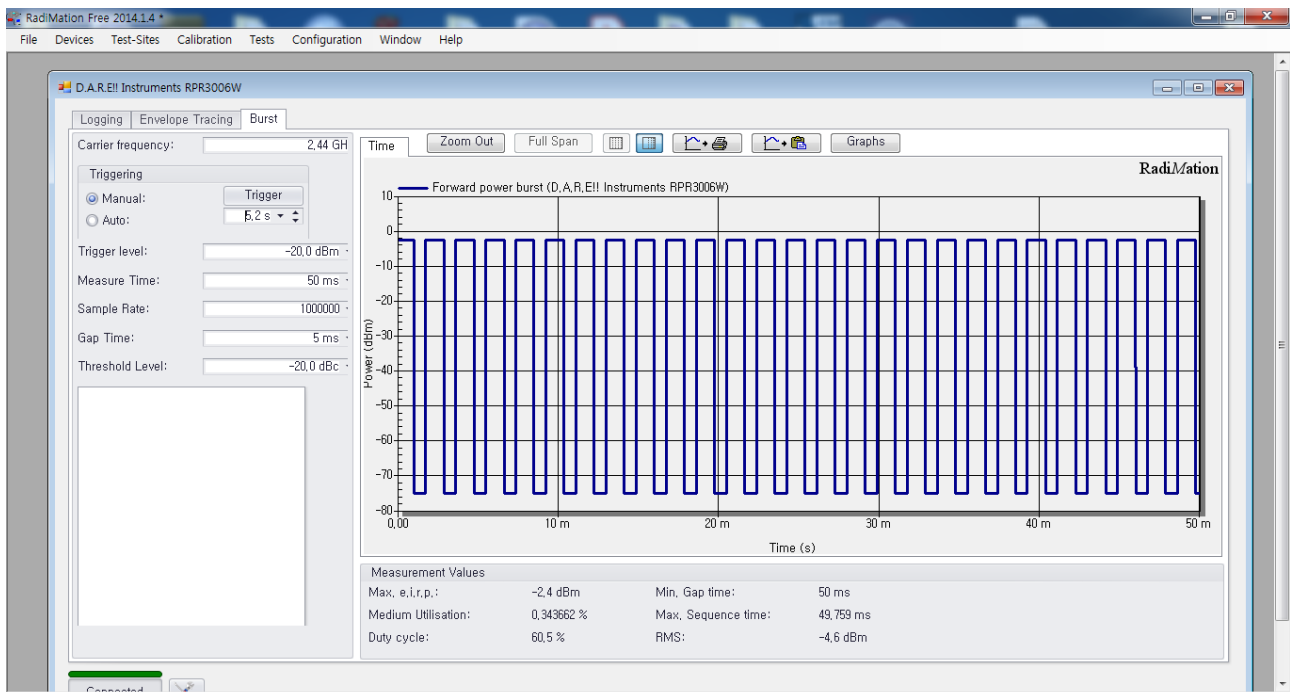
[Peak Output Power Measurement]

Channel	Frequency (MHz)	Peak Output Power (dBm)	Antenna Gain (dBi)	Peak Output Power (EIRP) (dBm)	Duty Cycle Factor + Peak Output Power (EIRP) (dBm)	Max. Limit (dBm)	Result
0	2402	-2.1	2.3	0.2	2.4	≤ 30	Pass
19	2440	-2.4	2.3	-0.1	2.1	≤ 30	Pass
39	2480	-2.9	2.3	-0.6	1.7	≤ 30	Pass

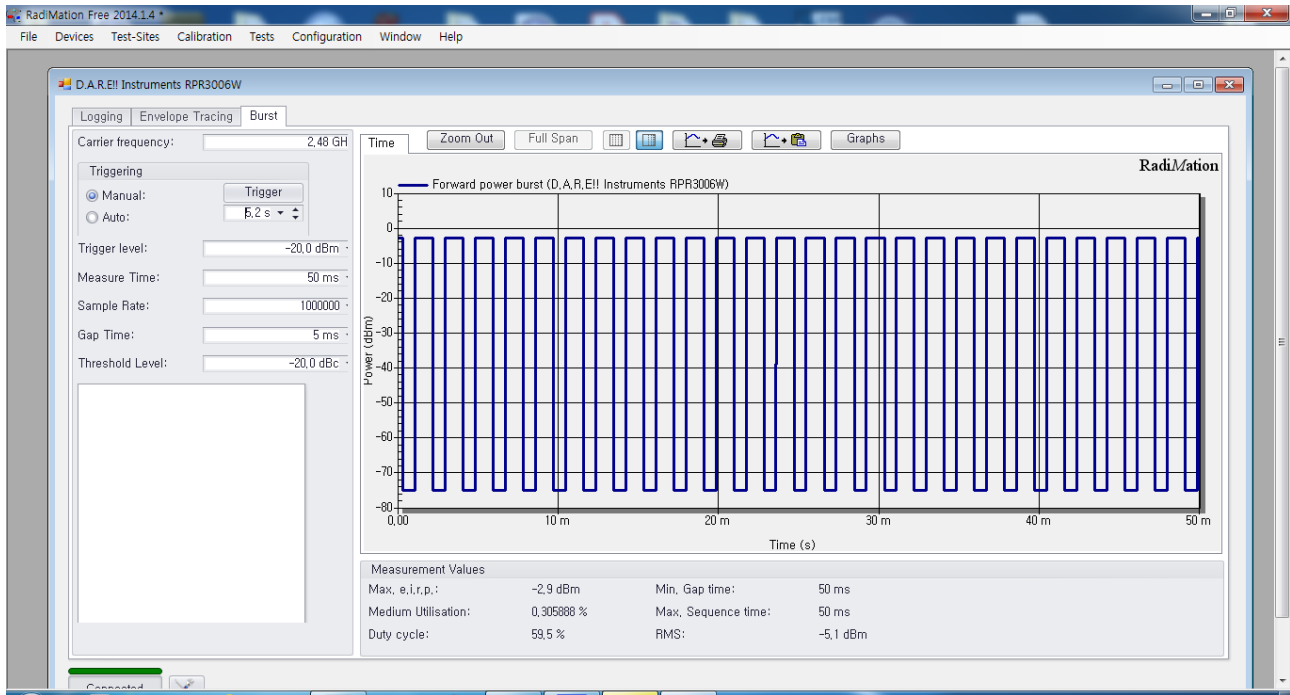
Test Mode : : LE 2402 MHz



Test Mode : LE 2440 MHz



Test Mode : LE 2480 MHz



6.3 Power Spectral Density

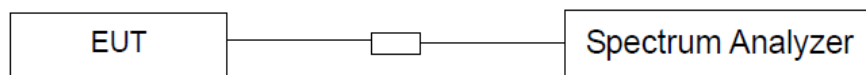
6.3.1 Test Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiated to the Antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

6.3.2 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas. Guidance v05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set (RBW = 3 kHz, VBW = 10 kHz, Detector = Peak, Span = 1.5 times DTS Channel Bandwidth, Trace mode = Max Hold, Sweep = Auto).
5. Measure and record the results in the test report.

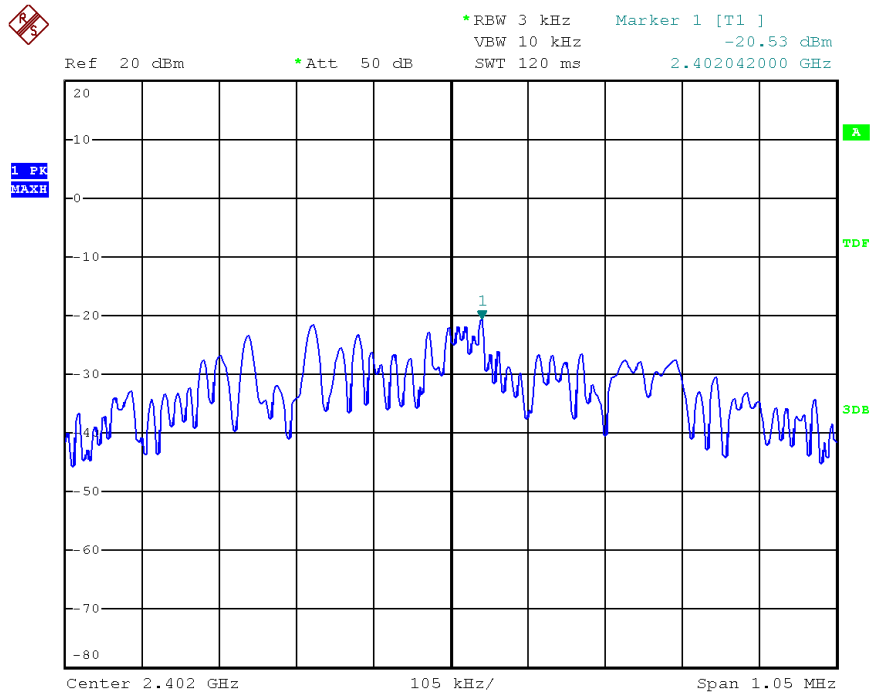
6.3.3 Test SET-UP (Block Diagram of Configuration)



6.3.4 Test Results

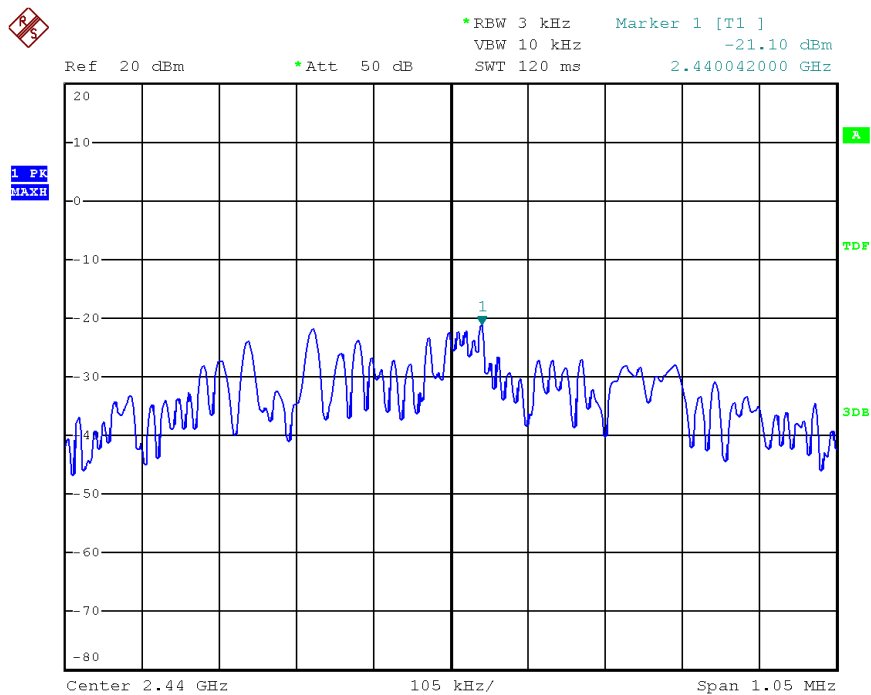
Channel	Frequency (MHz)	Power Density (dBm/3 kHz)	Max. Limit (dBm/3 kHz)	Result
0	2402	-20.53	≤ 8.00	Pass
19	2440	-21.10	≤ 8.00	Pass
39	2480	-20.74	≤ 8.00	Pass

Test Mode : LE 2402 MHz



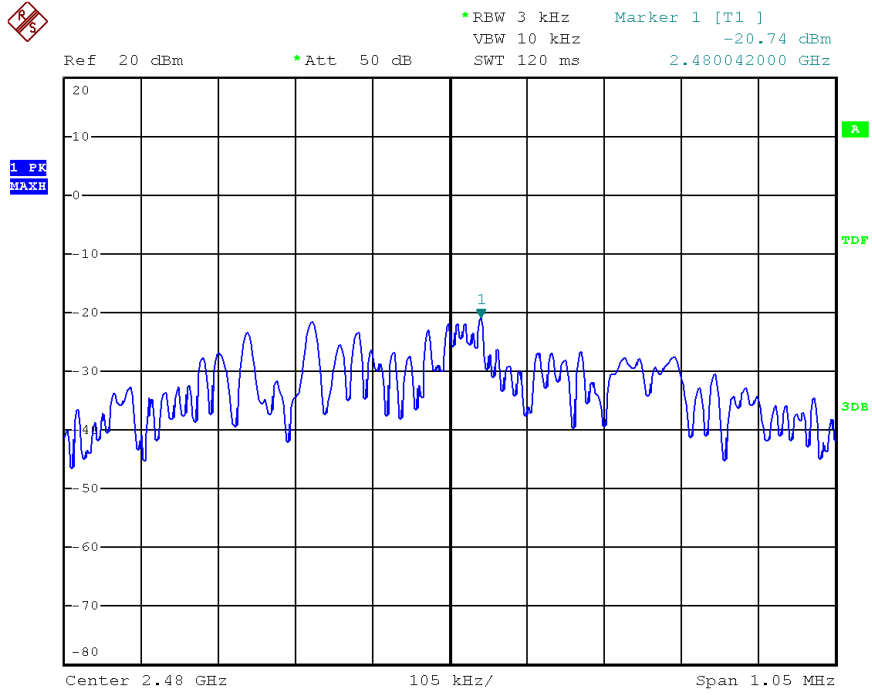
Date: 8.OCT.2019 15:12:39

Test Mode : LE 2440 MHz



Date: 8.OCT.2019 15:13:08

Test Mode : LE 2480 MHz



Date: 8.OCT.2019 15:13:36

6.4 6 dB Bandwidth

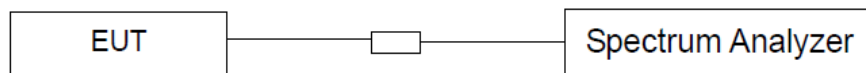
6.4.1 Test Limit

The minimum 6 dB bandwidth shall be at least 500 kHz.

6.4.2 Measurement Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas. Guidance v05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set (RBW = 100 kHz, VBW = 300 kHz, Detector = Peak, Trace mode = Max Hold, Sweep = Auto).
5. Measure and record the results in the test report.

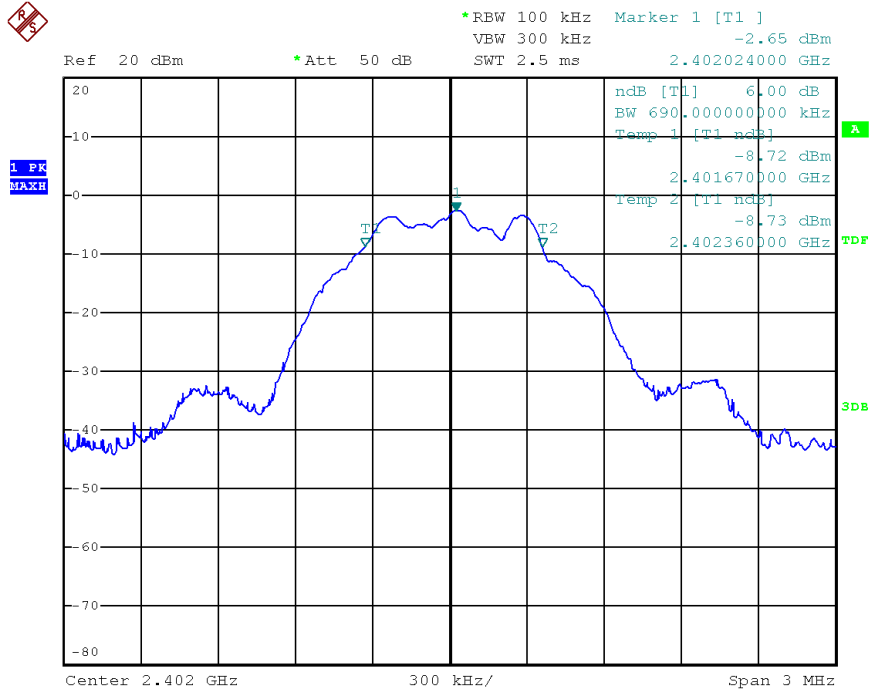
6.4.3 Test SET-UP (Block Diagram of Configuration)



6.4.4 Test Results

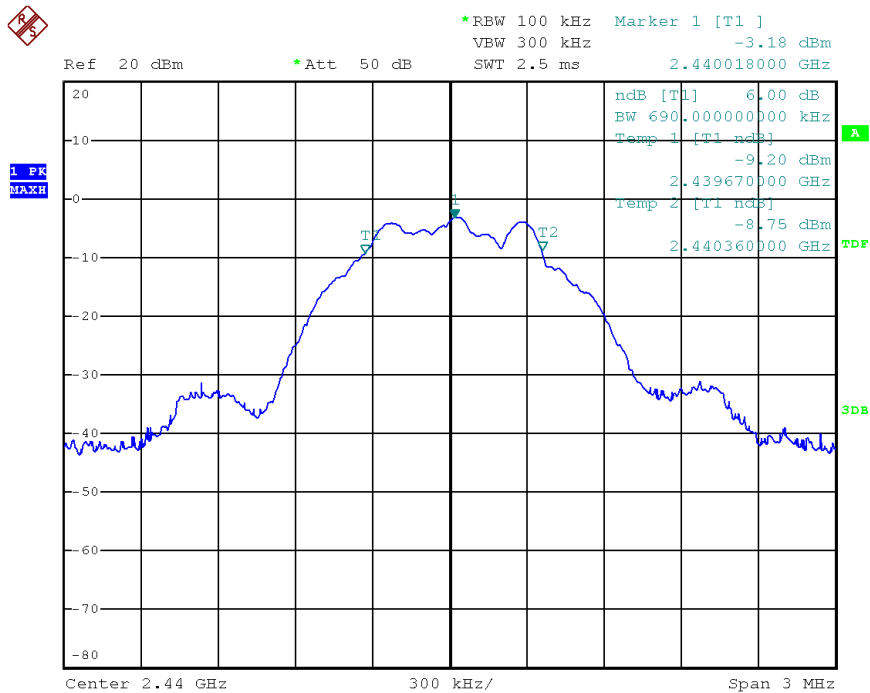
Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
0	2402	690	≥ 500	Pass
19	2440	690	≥ 500	Pass
39	2480	588	≥ 500	Pass

Test Mode : LE 2402 MHz



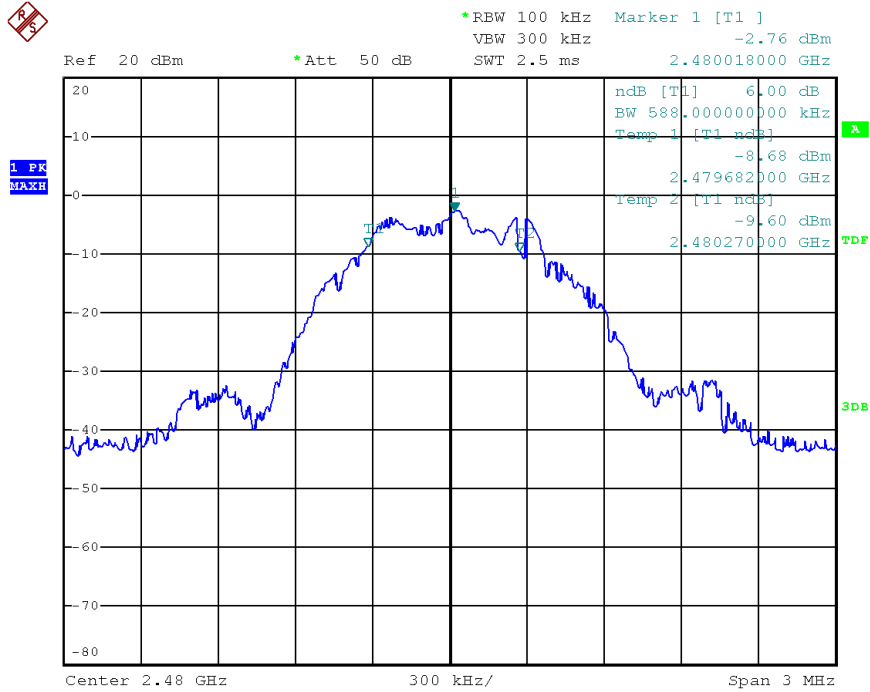
Date: 8.OCT.2019 15:00:24

Test Mode : LE 2440 MHz



Date: 8.OCT.2019 14:59:50

Test Mode : LE 2480 MHz



Date: 8.OCT.2019 15:00:56

6.5 Conducted Spurious Emission

6.5.1 Test Limit

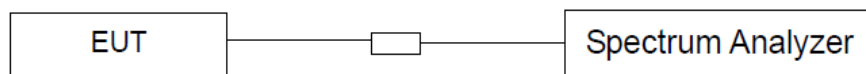
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

6.5.2 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas. Guidance v05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set (RBW = 100 kHz, VBW = 300 kHz, Detector = Peak, Trace mode = Max Hold, Sweep = Auto).
5. Measure and record the results in the test report.

6.5.3 Test SET-UP (Block Diagram of Configuration)

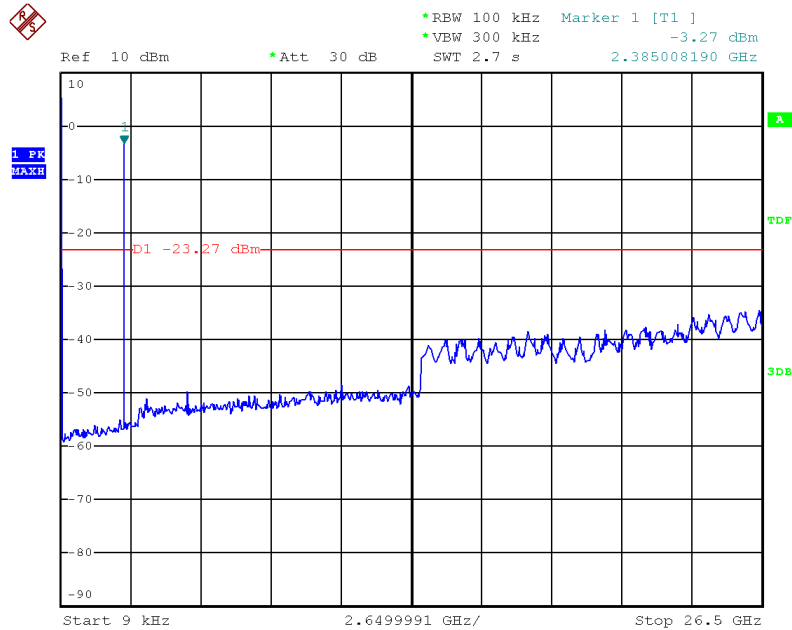
Conducted Emission Test Set-Up, Frequency above 1000 MHz



6.5.4 Test Result

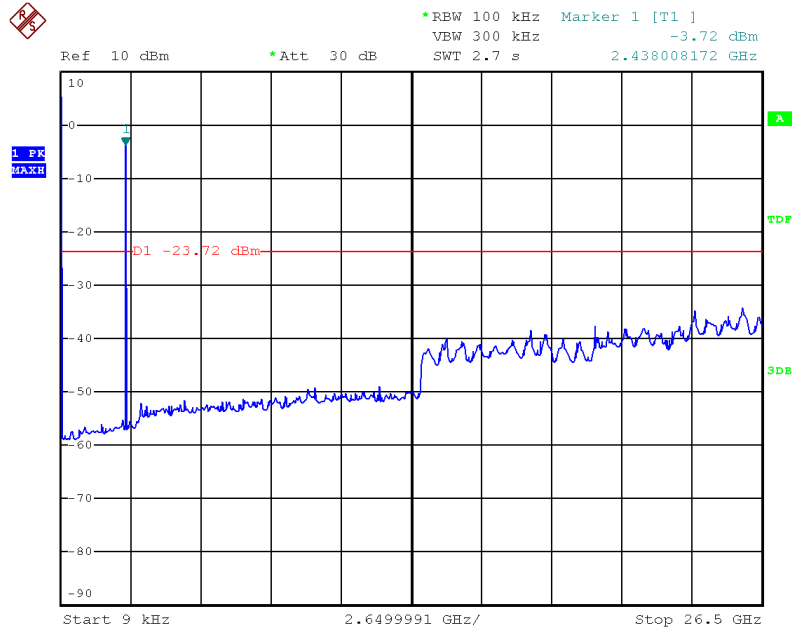
[Conducted Spurious Emission Test]

Test Mode : LE 2402 MHz



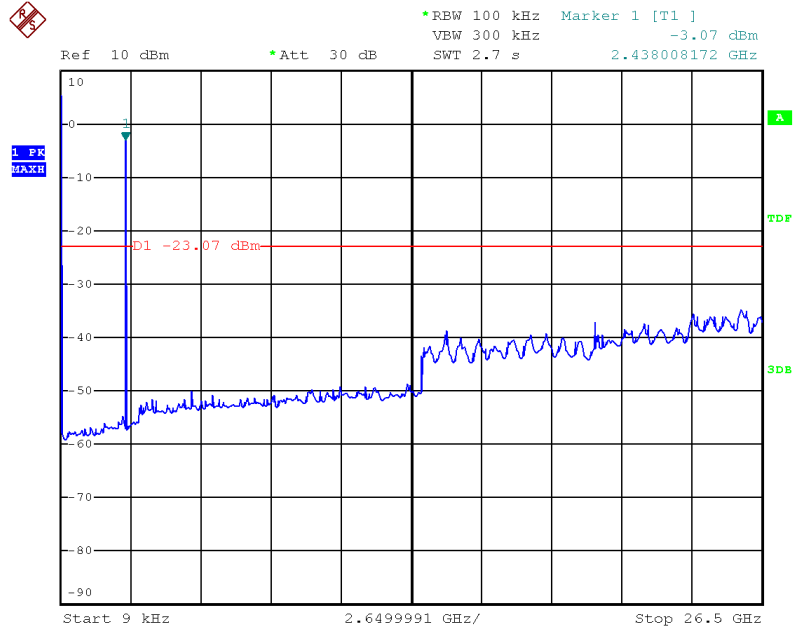
Date: 7.OCT.2019 16:25:24

Test Mode : LE 2440 MHz



Date: 7.OCT.2019 17:01:52

Test Mode : LE 2480 MHz



Date: 7.OCT.2019 17:03:11

6.6 Band Edges Measurement

6.6.1 Test Limit

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

6.6.2 Test Procedure

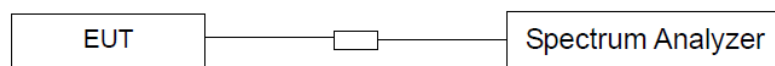
The EUT is placed on a turntable with 1.5 meter above ground.
The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

PEAK: RBW=VBW=100 kHz / Sweep=AUTO
AVERAGE: RBW=100 kHz / VBW=10Hz / Sweep=AUTO

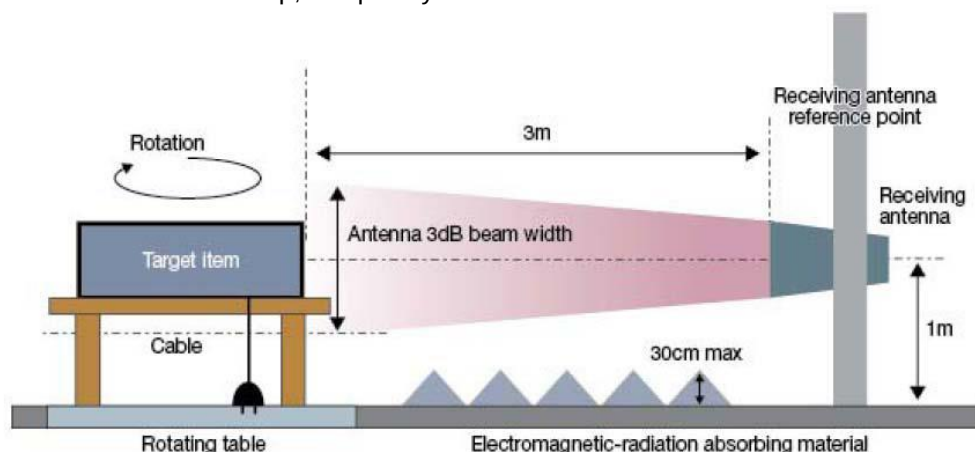
Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

6.6.3 Test SET-UP (Block Diagram of Configuration)

(a) Conducted Emission Test Set-Up, Frequency above 1000 MHz



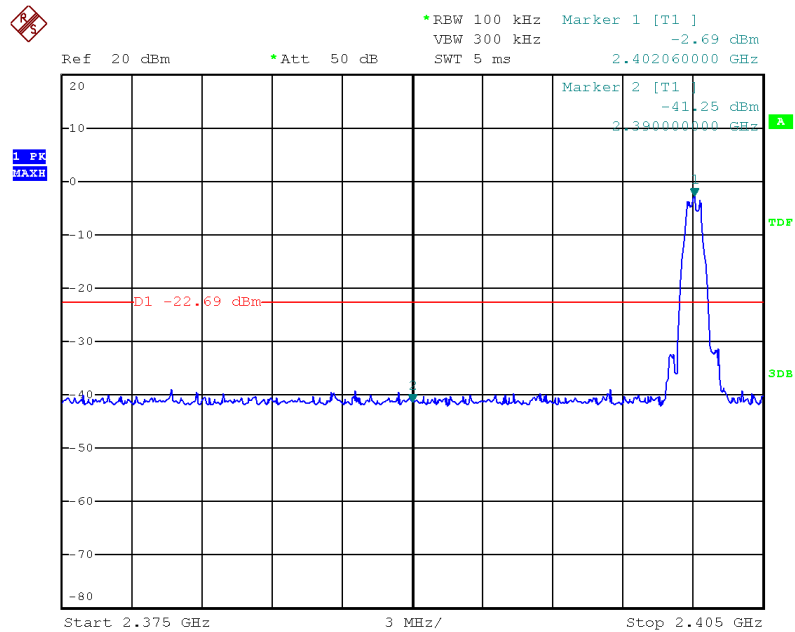
(b) Radiated Emission Test Set-Up, Frequency above 1000 MHz



6.6.4 Test Result

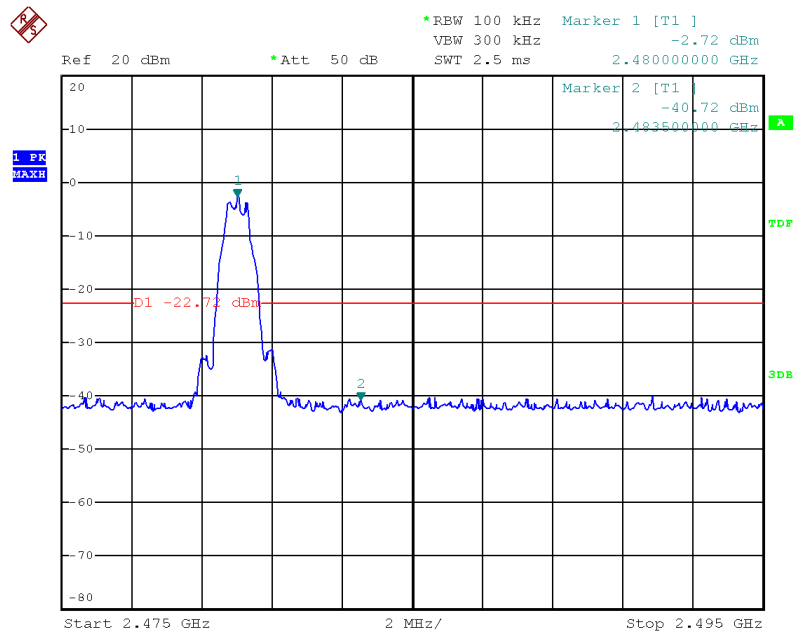
[Conducted Band Edges]

Test Mode : BLE 2402 MHz Band Edge



Date: 8.OCT.2019 15:04:03

Test Mode : BLE 2480 MHz Band Edge



Date: 8.OCT.2019 15:05:45

[Radiated Band Edges Test]

LE

Frequency [MHz]	Reading [dB μ V]	Detector Mode	Factor [dB]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol/Phase
2390	36.32	Peak	-5.7	30.62	73.98	43.36	Hor
2390	36.17	Peak	-5.7	30.47	73.98	43.51	Ver
2483.5	35.08	Peak	-4.8	30.28	73.98	43.70	Hor
2483.5	34.92	Peak	-4.8	30.12	73.98	43.86	Ver

Note : Factor = Antenna Gain + Cable loss – Amplifier Gain.

6.7 Radiated Spurious Emission

6.7.1 Test Limit

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

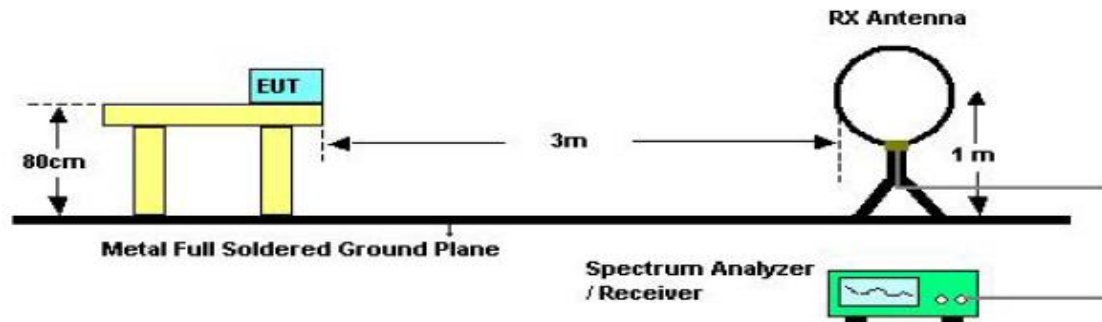
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

6.7.2 Test Procedure

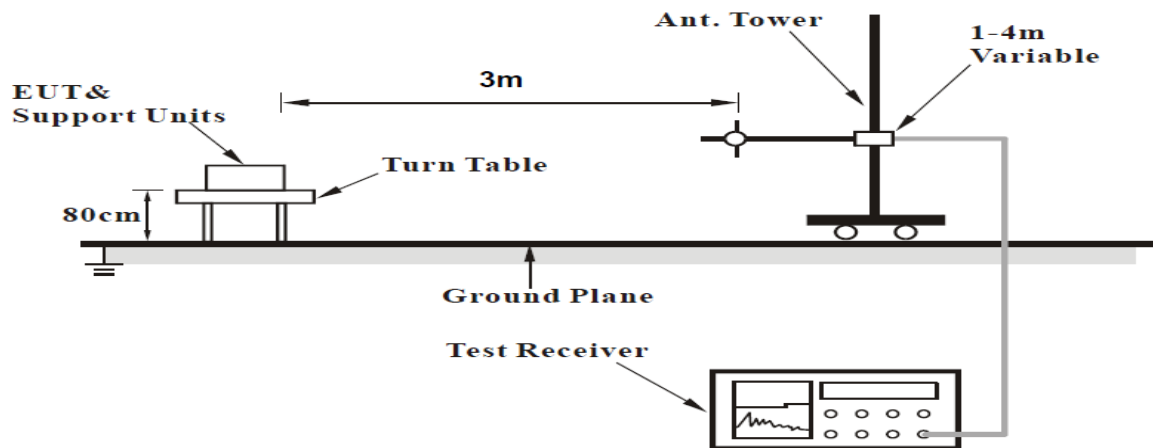
- The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas. Guidance v05.
- The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
- The EUT was placed on a turntable. For emissions testing at or below 1 GHz, the table height was 80cm above the reference ground plane. For emission measurements above 1 GHz, the table height was 1.5m.
- The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- For measurement below 1 GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- Use the following spectrum analyzer settings and peak emission levels are measured :
 - Span shall wide enough to fully capture the emission being measured;
 - Set RBW (9-150 kHz: 200 Hz, 0.15-30MHz: 9kHz, 30-1000 MHz: 120 kHz, above 1GHz: 1 MHz).
 - VBW $\geq 3 \times$ RBW ; Sweep = auto; Detector function = peak; Trace = max hold
 For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent 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.
- Measure and record the results in the test report.

6.7.3 Test SET-UP (Block Diagram of Configuration)

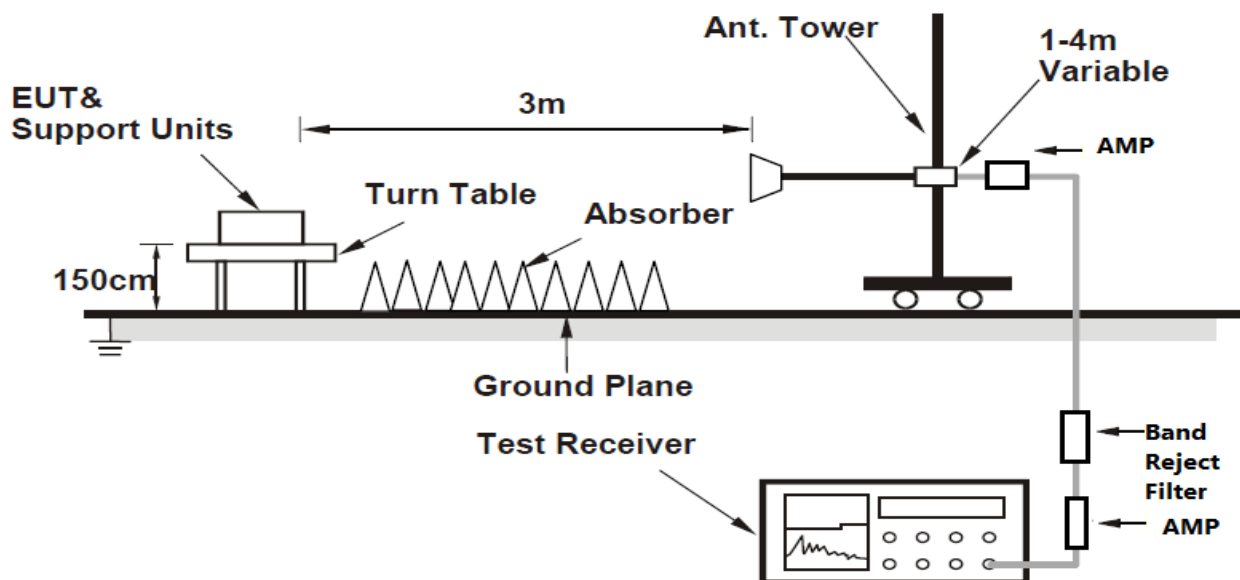
1. Radiated Emission Test Set-Up, Frequency Below 30 MHz



2. Radiated Emission Test Set-Up, Frequency Below 1000 MHz



3. Radiated Emission Test Set-Up, Frequency Above 1000 MHz.



6.7.4 Test Results

[Below 30MHz]

Test Mode : LE

Frequency [MHz]	Reading [dB μ V]	Antenna Factor [dB]	Cable Loss [dB]	Preamp Factor [dB]	Level [dBuV/m]	Pol/Phase
No other emissions were detected at a level greater than 20 dB below limit.						

Remark: §15.31(o)_The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

[Below 1 GHz – 30 MHz ~ 1 GHz]

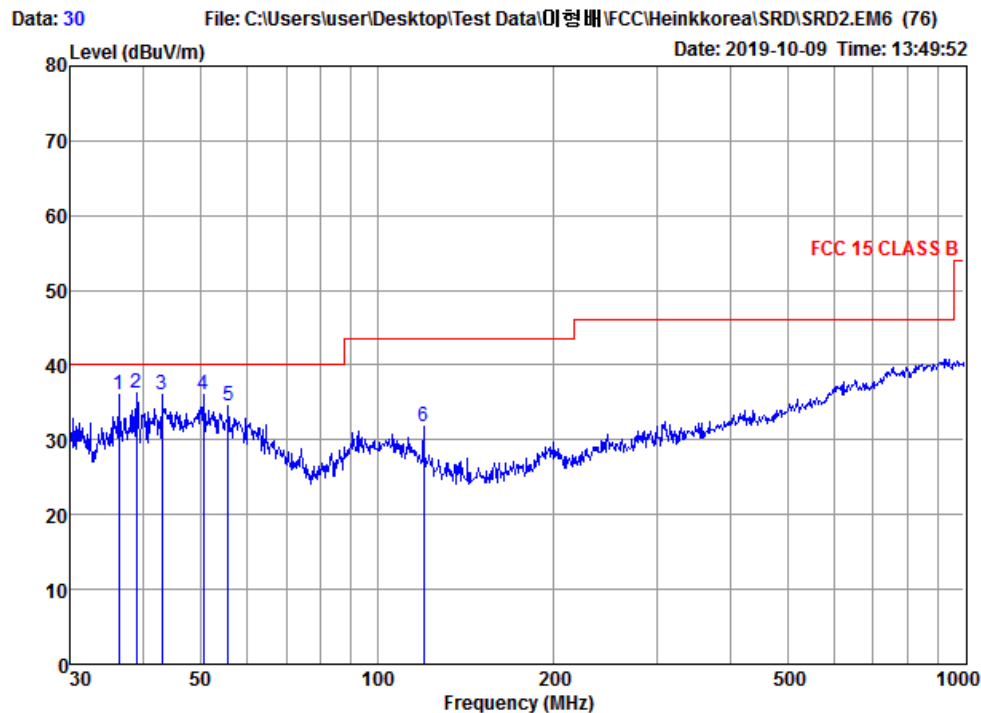
Test Mode : LE (Worst case : Horizontal F3)



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ext:123

Radiated Emission TEST ..test

EUT: HaAincKorea
Manufacturer: LE-F3
Operating Condition: Below_1GHz_H



Freq. MHz	AntFac (dB/m)	CabLoss (dB)	Preamp (dB)	Reading (dBuV)	Measured (dBuV/m)	Over (dBuV/m)	Limit (dBuV/m)	Pol/Phase	Remark
36.25	16.58	0.65	0.00	18.84	36.07	-3.93	40.00	Peak	
38.89	17.84	0.64	0.00	17.80	36.28	-3.72	40.00	Peak	
42.90	18.94	0.63	0.00	16.48	36.05	-3.95	40.00	Peak	
50.59	19.46	0.62	0.00	15.89	35.97	-4.03	40.00	Peak	
55.61	19.14	0.66	0.00	14.82	34.62	-5.38	40.00	Peak	
119.86	15.71	0.91	0.00	15.13	31.75	-11.75	43.50	Peak	

Note: 1. Measured Level = Antenna Factor + Cable Loss - Preamp + Reading

Note : Only the worst case plots for Radiated Spurious Emissions.

[Above 1 GHz – 1 GHz ~ 18 GHz]

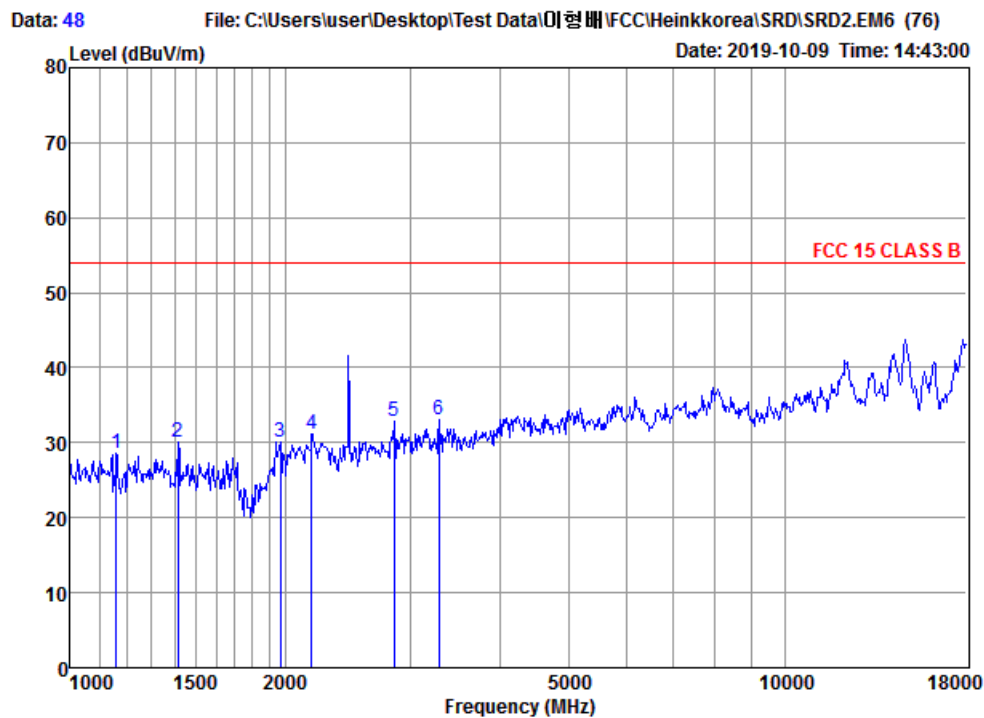
Test Mode : LE (Worst case : Vertical F3)



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Radiated Emission TEST ..test

EUT: HaAincCorea
Manufacturer: LE-F3
Operating Condition: Above_1GHz_V



Freq. MHz	AntFac (dB/m)	CabLoss (dB)	Preamp (dB)	Reading (dBUV)	Measured (dBUV/m)	Over (dBUV/m)	Limit (dBUV/m)	Pol/Phase	Remark
1158.83	-14.58	2.31	0.00	40.87	28.60	-25.40	54.00		Peak
1414.60	-14.27	2.16	0.00	42.22	30.11	-23.89	54.00		Peak
1966.68	-11.87	2.49	0.00	39.46	30.08	-23.92	54.00		Peak
2176.05	-11.46	2.99	0.00	39.69	31.22	-22.78	54.00		Peak
2838.92	-10.82	3.82	0.00	39.78	32.78	-21.22	54.00		Peak
3280.33	-10.56	4.06	0.00	39.51	33.01	-20.99	54.00		Peak

Note: 1. Measured Level = Antenna Factor + Cable Loss - Preamp + Reading

Note : Only the worst case plots for Radiated Spurious Emissions.

[Above 18 GHz – 18 GHz ~ 30 GHz]

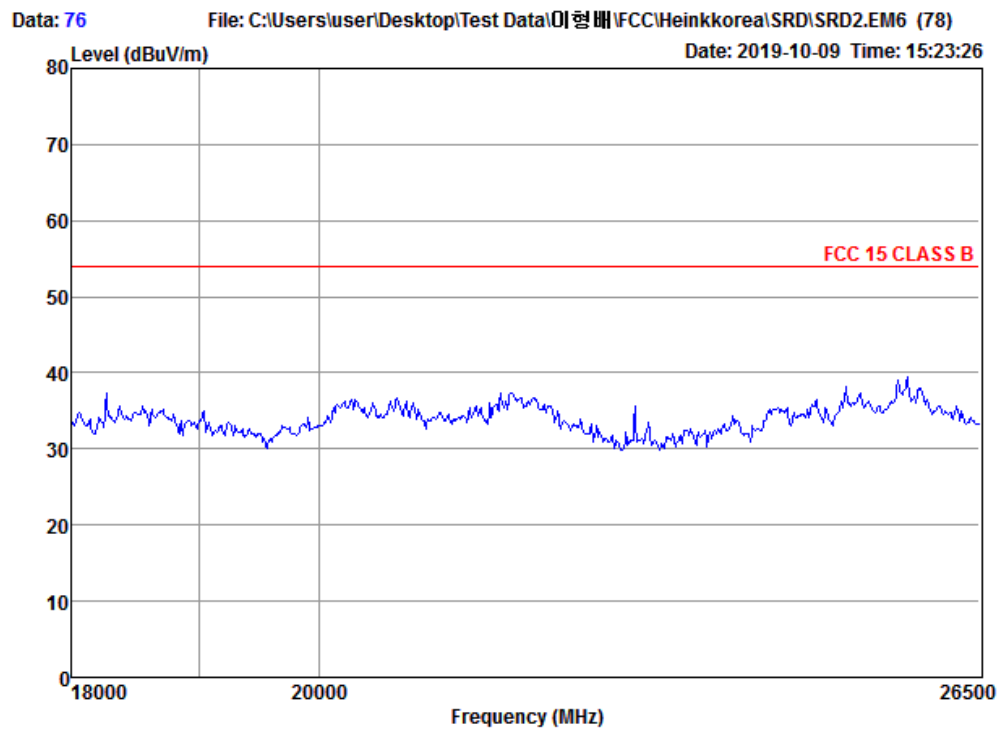
Test Mode : LE (Worst case : Horizontal F3)



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Radiated Emission TEST ..test

EUT: HaAincCorea
Manufacturer: LE-F3
Operating Condition: Above_18GHz_H



Note ⁽¹⁾ : Only the worst case plots for Radiated Spurious Emissions.

Note ⁽²⁾ : No other emissions were detected.

6.8 Antenna Application

6.8.1 Antenna Requirement

According to §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.

And according to §15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.8.2 Test Results

Antenna Type	Frequency	Antenna Gain	Limit	Result
Chip Antenna	2.450 GHz	2.3 dBi	≤ 6 dBi	Pass