

Test Report				
1. Client				
Name :Address :	Sena Technologies Co., Ltd. 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea			
2. Use of Report	: FCC & IC Approval			
3. Sample Descr	iption			
Product Name Model Name	-			
4. Date of Recei	pt: 2023-12-18			
5. Date of Test :	2024-01-17 ~ 2024-01-26			
6. Test Method : FCC Part 15 Subpart C 15.247 RSS-247 Issue 3(2023-08), RSS-GEN Issue 5(2019				
7. Test Results : Refer to the test results				
This test report must not be reproduced or reproduced in any way. The results shown in this test report are the results of testing the samples provided. This test report is prepared according to the requirements of ISO / IEC 17025.				
Affirmation	Tested by Technical Manager Jong-Myoung, Shin Kyung-Taek, Lee			
	Feb 08, 2024			

EMC Labs Co., Ltd.

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Version

TEST REPORT NO.	DATE	DESCRIPTION
KR0140-RF2402-002	Feb 08, 2024	Initial Issue

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1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant Information

Applicant Sena Technologies Co., Ltd.	
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1.2. Manufacturer Information

Manufacturer	Sena Technologies Co., Ltd.	
Manufacturer Address	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea	

1.3 Test Laboratory Information

Laboratory	EMC Labs Co., Ltd.
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FCC Designation No.	KR0140
FCC Registration No.	580000
IC Site Registration No.	28751



2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	PHANTOM
Model Name	SP149
FCC ID	S7A-SP149
IC	8154A-SP149
Rated Voltage	DC 3.7 V

2.2 Additional Information

Operating Frequency	2 402 MHz ~ 2 480 MHz
Number of Channel	40
Modulation Type	GFSK
Antenna Type	PCB Pattern Antenna(M/N:GRSN23128BT25) for BLE 1M / PCB Pattern Antenna(M/N:GRSN23126wf21) for BLE 2M
Antenna Gain	0.86 dBi for BLE 1M / 0.65 dBi for BLE 2M
Firmware Version	1.0
Hardware Version	1.0
Test Software	Lab Test Tool V3.5.4.2 for BLE 1M / EspRFTestTool_v3.6 for BLE 2M

2.3 Test Frequency

Test mode	Test Frequency (MHz)			
	Low Frequency	Middle Frequency	High Frequency	
BLE 1M	2 402	2 442	2 480	
BLE 2M	2 402	2 442	2 480	

2.4 Used Test Software Setting Value

Test Mode	Setting Item	
Test Mode	Power	
BLE 1M	38	
BLE 2M	9	

2.5 Mode of operation during the test

- The EUT continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.6 Modifications of EUT

- None

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3. Test Summary

Applied	FCC Rule	IC Rule	Test Items	Test Condition	Result	
\square	15.203	_	Antenna Requirement		С	
\boxtimes	15.247(a)	RSS-247 (5.2)	6 dB Bandwidth		С	
\square	_	RSS GEN (6.7)	Occupied Bandwidth (99%)		С	
\square	15.247(b)	RSS-247 (5.4)	Maximum Peak Output Power	Conducted	С	
\square	15.247(e)	RSS-247 (5.2)	Peak Power Spectral Density		С	
\square	15.247(d)	RSS-247 (5.5)	Conducted Spurious Emission		С	
\square	15.247(d) 15.205 & 15.209	RSS-247 (5.5) RSS-GEN (8.9 & 8.10)	Radiated Spurious Emission	Radiated	С	
\square	15.207	RSS-GEN (8.8)	Conducted Emissions	AC Line Conducted	С	
<u>Note 1</u> : C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable						

The sample was tested according to the following specification: ANSI C63.10:2013.

Compliance was determined by specification limits of the applicable standard according to customer requirements.



4. Used equipment on test

Description	Manufacturer	Model Name	Serial Name	Next Cal.
TEMP & HUMID CHAMBER	JFM	JFMA-001	20200929-01	2024.12.07
CONTROLLER	AMWON TECHNOLOGY	TEMI2500	S7800VK191 0707	2024.12.07
PSA SERIES SPECTRUM ANALYZER	AGILENT	E4440A	MY45304057	2024.12.08
MXG ANALOG SIGNAL GENERATOR	AGILENT	N5183A	MY50141890	2024.12.08
SYSTEM DC POWER SUPPLY	AGILENT	6674A	MY53000118	2024.12.11
VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	SMBV100A	257524	2024.12.08
BLUETOOTH TESTER	TESCOM	TC-3000A	3000A480088	2024.12.08
DIRECTIONAL COUPLER	AGILENT	773D	2839A01855	2024.12.08
ATTENUATOR	AGILENT	8493C	73193	2024.12.08
TERMINATIOM	HEWLETT PACKARD	909D	07492	2024.12.08
POWER DIVIDER	HEWLETT PACKARD	11636A	06916	2024.12.08
SLIDE-AC	DAEKWANG TECH	SV-1023	NONE	2024.11.10
DIGITAL MULTIMETER	HUMANTECHSTORE	15B+	50561541WS	2024.12.08
ATTENUATOR	ACE RF COMM	ATT SMA 20W 20dB 8GHz	A-0820.SM20.2	2024.04.04
DC POWER SUPPLY	AGILENT	E3634A	MY40012120	2024.02.23
USB Peak Power Sensor	Anritsu	MA24408A	12321	2024.11.09
High Pass Filter	WT Microwave INC.	WT-A3314-HS	WT22111804-1	2024.12.08
High Pass Filter	WT Microwave INC.	WT-A1935-HS	WT22111804-2	2024.12.08
SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSU26	200444	2024.02.22
ACTIVE LOOP ANTENNA	TESEQ	HLA 6121	55685	2024.12.22
Biconilog ANT	Schwarzbeck	VULB 9160	3260	2025.01.09
Biconilog ANT	Schwarzbeck	VULB9168	902	2024.11.30
Horn ANT	Schwarzbeck	BBHA9120D	974	2024.11.30
Horn ANT	Schwarzbeck	BBHA9120D	1497	2025.01.04
Amplifier	TESTEK	TK-PA18H	200104-L	2024.03.14
Horn ANT	Schwarzbeck	BBHA9170	01188	2024.03.16
Horn ANT	Schwarzbeck	BBHA9170	01189	2024.03.16
AMPLIFIER	TESTEK	TK-PA1840H	220105-L	2024.03.14
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	101952	2024.03.14
Test Receiver	ROHDE & SCHWARZ	ESR7	101616	2024.06.27
LISN	ROHDE & SCHWARZ	ENV216	100409	2025.01.04
PULSE LIMITER	lignex1	EPL-30	NONE	2025.01.04

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5. Antenna Requirement

Accoding 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. 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Accoding to §15.247(b)(4) e conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1 Result

Complies

(The transmitter has a PCB Pattern Antenna. The directional peak gain of the antenna is 0.86 dBi and 0.65 dBi.)



6. 6 dB Bandwidth & Occupied Bandwidth (99%)

6.1 Test Setup

Refer to the APPENDIX I.

6.2 Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

6.3 Test Procedure

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the EUT's antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

- 1. Set resolution bandwidth (RBW) = 100 kHz
- 2. Set the video bandwidth (VBW) \geq 3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = Max Hold.
- 5. Sweep = Auto
- 6. Allow the trace to stabilize.
- 7. Option 1 Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
 - Option 2 The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW \geq 3 x RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.

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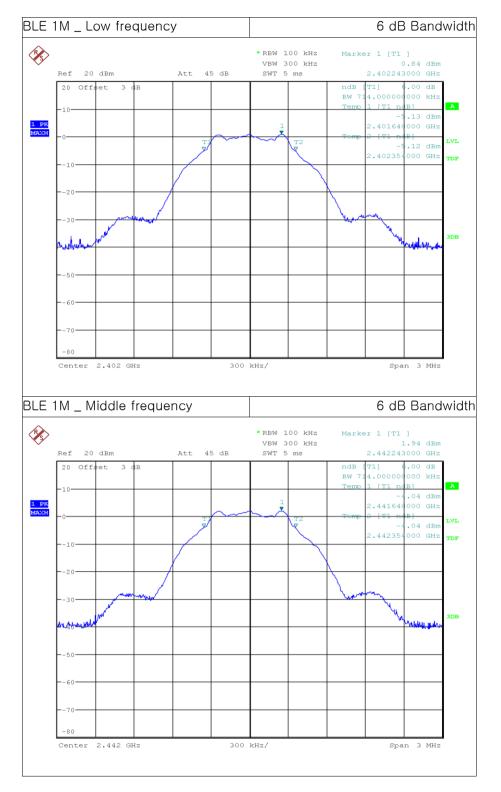
6.4 Test Result

Test Mode	Test Frequency	6 dB Bandwidth (MHz)	Occupied Bandwidth (MHz)		
	Low	0.714	1.035		
BLE 1M	Middle	0.714	1.035		
	High	0.720	1.035		
	Low	1.111	2.106		
BLE 2M	Middle	1.111	2.106		
	High	1.111	2.106		

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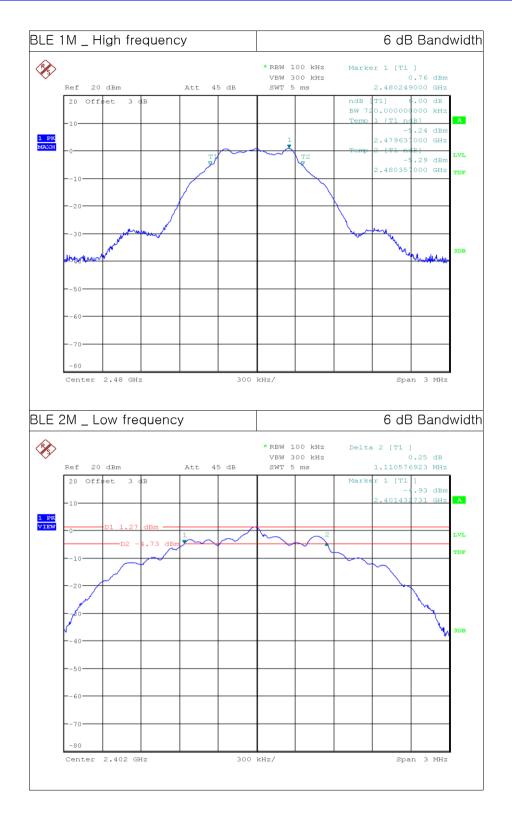


6.5 Test Plot



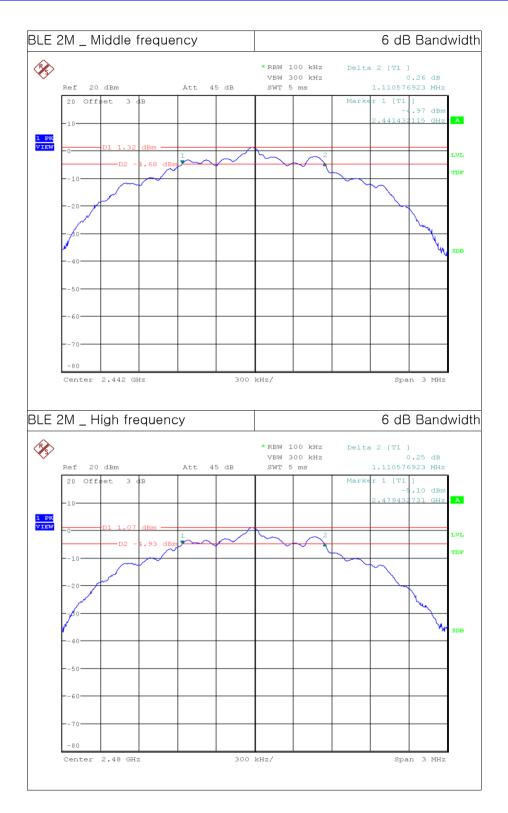
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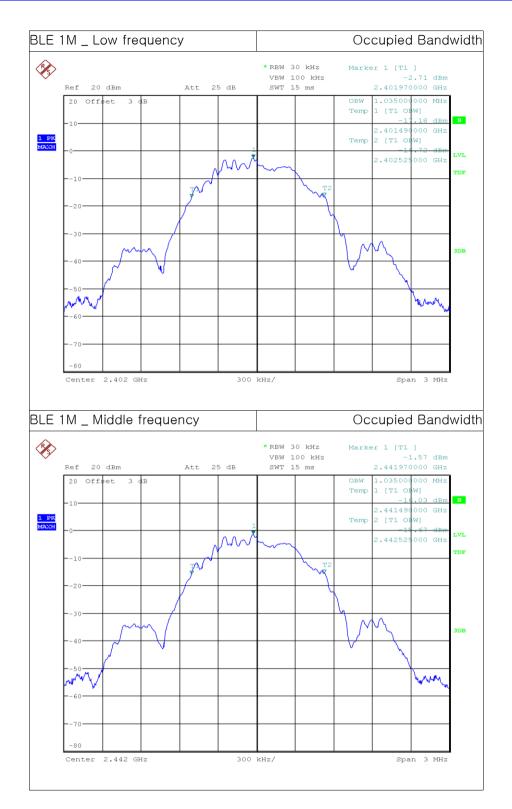
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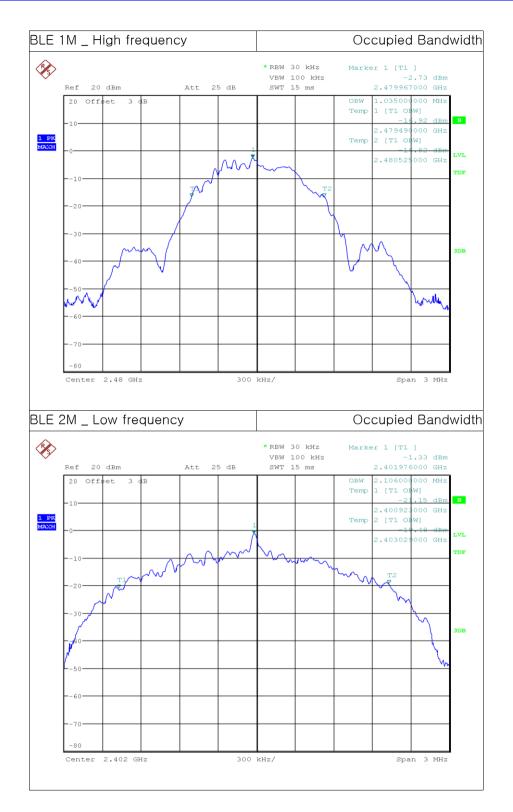
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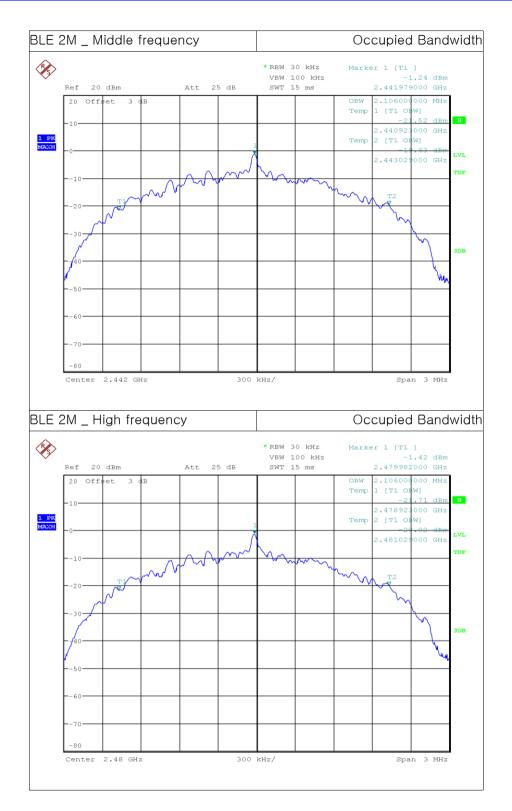
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7. Maximum Peak Output Power

7.1 Test Setup

Refer to the APPENDIX I.

7.2 Limit

The maximum permissible conducted output power is 1 Watt.

7.3 Test Procedure

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

- 1. Set the RBW \geq DTS bandwidth
- 2. Set VBW \geq 3 x RBW
- 3. Set span \geq 3 x RBW.
- 4. Sweep time = auto couple
- 5. Detector = peak
- 6. Trace mode = max hold
- 7. Allow trace to fully stabilize
- 8. Use peak search function to determine the peak amplitude level.

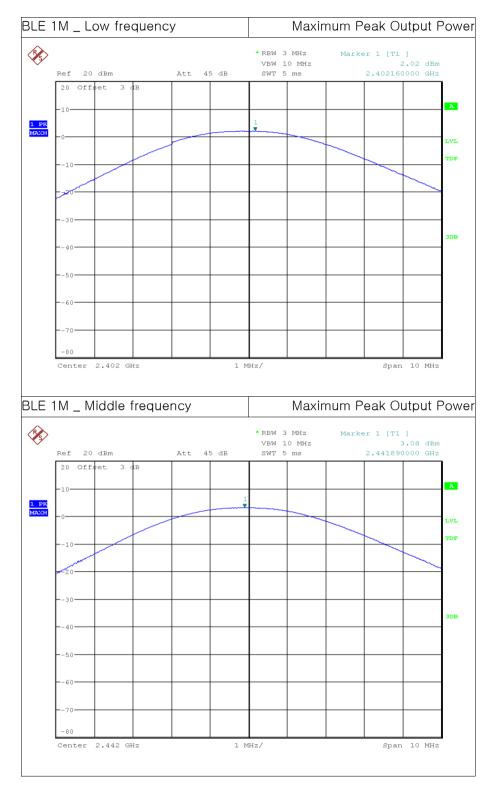
7.4	Test	Result	

Test Mode	Toot Fraguanay	Peak Output Power					
Test Mode	Test Frequency	dBm	mW				
	Low	2.02	1.59				
BLE 1M	Middle	3.08	2.03				
	High	2.01	1.59				
	Low	2.25	1.68				
BLE 2M	Middle	2.41	1.74				
	High	2.42	1.75				

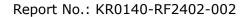
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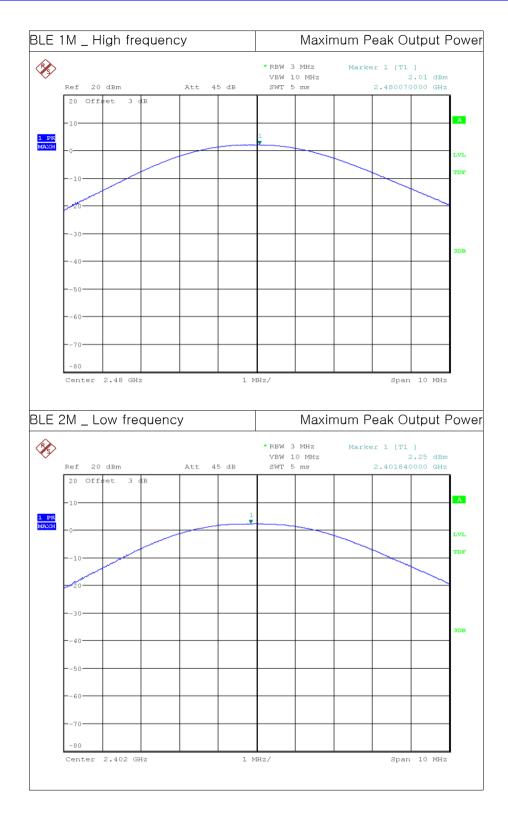
7.5 Test Plot



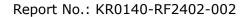
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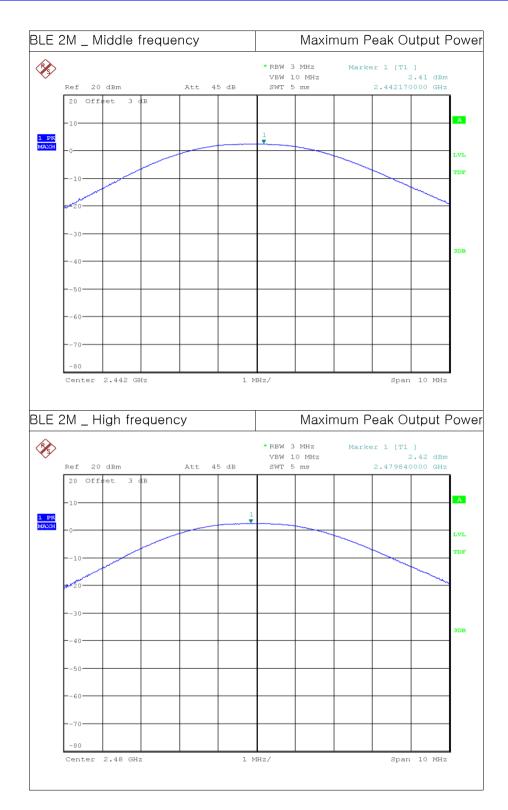




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8. Peak Power Spectral Density

8.1 Test Setup

Refer to the APPENDIX I.

8.2 Limit

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

8.3 Test Procedure

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

(ANSI C63.10-2013 _ Section 11.10.2 - Method PKPSD)

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to 1.5 times the DTS bandwidth.
- 3. Set the RBW : 3 kHz \leq RBW \leq 100 kHz.
- 4. Set the VBW \geq 3 x RBW.
- 5. Detector = Peak.
- 6. Sweep time = Auto
- 7. Trace mode = Max Hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

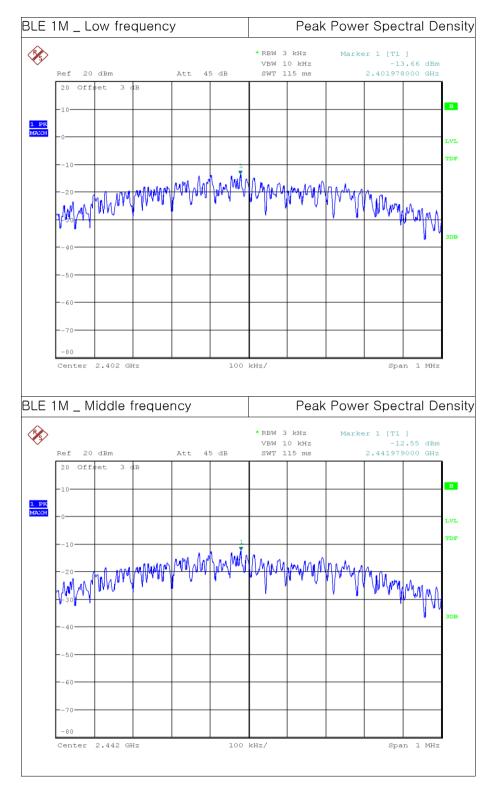
Test Mode	Test Frequency	Peak Power Spectral Density (dBm)
	Low	-13.66
BLE 1M	Middle	-12.55
	High	-13.76
	Low	-13.54
BLE 2M	Middle	-13.14
	High	-12.34

8.4 Test Result

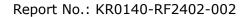
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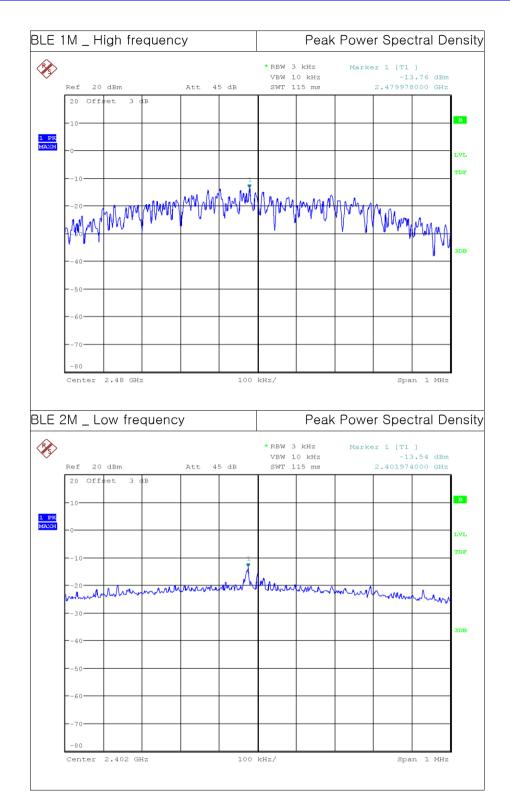
8.5 Test Plot



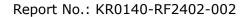
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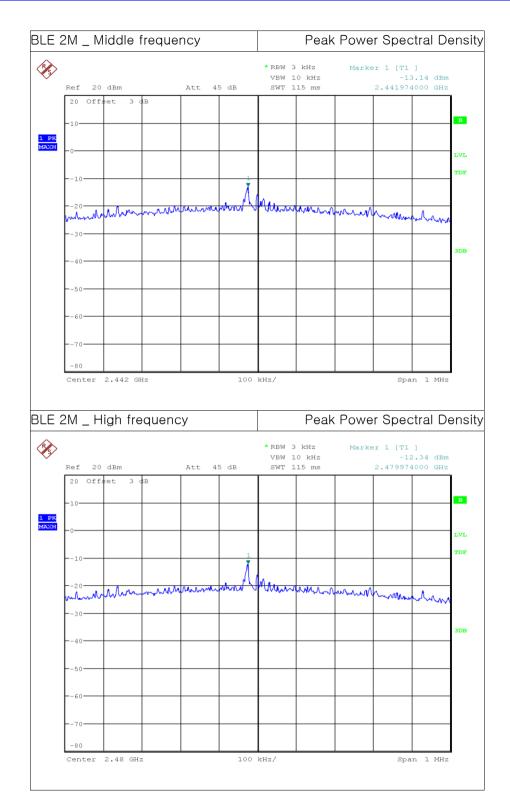




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9. TX Radiated Spurious Emission and Conducted Spurious Emission

9.1 Test Setup

Refer to the APPENDIX I.

9.2 Limit

According to §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 section §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))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional

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Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1705	24000/F (kHz)	30
1705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

radiator shall not exceed the field strength levels specified in the following table

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.



According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

nequency bands instea	Delow		
MHz	MHz	MHz	GHz
0.009 ~ 0.110	16.42 ~ 16.423	399.90 ~ 410	4.5 ~ 5.15
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.	1435 ~ 1626.5	9.0 ~ 9.2
4.20725 ~ 4.20775	25 73 ~ 74.6	1645.5 ~ 1646.5	9.3 ~ 9.5
4.17725 ~ 4.17775	74.8 ~ 75.2	1660 ~ 1710	10.6 ~ 12.7
6.215 ~ 6.218	108 ~ 121.94	1718.8 ~ 1722.2	13.25 ~ 13.4
6.26775 ~ 6.26825	149.9 ~ 150.05	2200 ~ 2300	14.47 ~ 14.5
6.31175 ~ 6.31225	156.52475 ~ 156.52525	2310 ~ 2390	15.35 ~ 16.2
8.291 ~ 8.294	156.7 ~ 156.9	2483.5 ~ 2500	17.7 ~ 21.4
8.362 ~ 8.366	162.0125 ~ 167.17	2690 ~ 2900	22.01 ~ 23.12
8.37625 ~ 8.38675	3345.8 ~ 3358	3260 ~ 3267	23.6 ~ 24.0
8.41425 ~ 8.41475	3600 ~ 4400	3332 ~ 3339	31.2 ~ 31.8
12.51975 ~ 12.52025	3345.8 ~ 3358	240 ~ 285	36.43 ~ 36.5
12.57675 ~ 12.57725	3600 ~ 4400	322 ~ 335.4	Above 38.6
13.36 ~ 13.41			

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.



9.3 Test Procedure for Radiated Spurious Emission

- 1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3.75 meter away from the interference-receiving antenna.
- 3. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.
- 4. The antenna is a Broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading. (The EUT was pre-tested with three axes (X, Y, Z) and the final test was performed at the worst case.)
- 6. Repeat above procedures until the measurements for all frequencies are complete.

Measurement Instrument Setting

- 1. Frequency Range: Below 1 GHz RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak
- 2. Frequency Range: Above 1 GHz

```
Peak Measurement
RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto,
Trace mode = Max Hold until the trace stabilizes
```

Average Measurement RBW = 1 MHz, VBW = 3 MHz, Detector = RMS (Number of points ≥ 2 x Span / RBW), Trace Mode = Average (Averaging type = power(i.e. RMS)), Sweep Time = Auto, Sweep Count = at least 100 traces

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

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- 1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
- 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
- If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than tuning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

9.4 Test Procedure for Conducted Spurious Emission

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. The reference level of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 kHz, VBW = 300 kHz.
- 3. The conducted spurious emission was tested each ranges were set as below. Frequency range: 30 MHz ~ 26.5 GHz RBW = 100 kHz, VBW = 300 kHz, Sweep Time = Auto, Detector = Peak, Trace = Max Hold

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)



9.5 Test Result

9 kHz \sim 25 GHz Data for BLE 1M

• Low frequency

Frequency	Reading (dBuV/m)			. T.F . (dB)	DCF (dB)	Limits (dBuV/m)		Result (dBuV/m)		Margin	
			Pol.							(dB)	
(MHz)	AV /	[/] Peak		(00)	(00)	AV /	Peak	AV / Peak		AV / Peak	
2 362.39	16.01	27.89	V	9.78	2.20	54.0	74.0	28.0	37.7	26.0	36.3
4 803.82	32.23	42.37	V	-0.16	2.20	54.0	74.0	34.3	42.2	19.7	31.8

• Middle frequency

Frequency	Reading					Limits		Result		Margin			
	(dBuV/m)		Pol.	T.F (dB)	DCF (dB)	(dBu	V/m)	(dBu	ıV/m)	(d	B)		
(MHz)	AV / Peak		AV / Peak				(00)	AV / Peak		AV / Peak		AV / Peak	
4 884.63	31.04	41.16	V	-0.19	2.20	54.0	74.0	33.1	41.0	20.9	33.0		

• High frequency

Frequency	Reading (dBuV/m) AV / Peak			.	0.05	Limits		Result		Margin	
			Pol.	⊺.⊢ (dB)	T.F DCF (dB) (dB)		(dBuV/m)		(dBuV/m)		(dB)
(MHz)				(00)	(00)	AV / Peak		AV / Peak		AV / Peak	
2 489.66	16.56	30.09	V	10.61	2.20	54.0	74.0	29.4	40.7	24.6	33.3
4 960.58	31.18	41.65	V	0.01	2.20	54.0	74.0	33.4	41.7	20.6	32.3

Note 1: The radiated emissions were investigated 9 kHz to 25 GHz. And no other spurious and harmonic emissions were found above listed frequencies.

Note 2: DCF(Duty Cycle Factor)

- T_{on} = 0.377 ms / T_{off} = 0.249 ms

- Duty Cycle = T_{on} / (T_{on}+T_{off}) = 0.377 / (0.377+0.249) = 0.602

- DCF = 10 x log(1/Duty Cycle) dB = 10 x log(1/0.602) dB = 2.20 dB

Note 3: Sample Calculation.

Margin = Limit - Result / Peak Result = Peak Reading + TF / Average Result = Average Reading + TF + DCF TF = Ant factor + Cable Loss + Filter Loss - Amp Gain + Distance Factor

Distance Factor = 20log(applied distance/required distance) = 20log(3.75m/3m) = 1.94



9 kHz \sim 25 GHz Data for BLE 2M

• Low frequency

Frequency	Reading				2.25	Limits		Result		Margin	
	(dBuV/m)		Pol.	T.F (dB)	DCF (dB)	(dBu	V/m)	(dBu	V/m)	(d	B)
(MHz)	AV / Peak			(00)	(00)	AV / Peak		AV / Peak		AV / Peak	
2 371.50	15.93	27.52	Н	9.78	2.46	54.0	74.0	28.2	37.3	25.8	36.7

• Middle frequency

)									
Frequency	Reading (dBuV/m) AV / Peak		Pol.	T.F (dB)	DCF (dB)	Limits (dBuV/m) AV / Peak		Result (dBuV/m)		Margin (dB)	
Frequency											
(MHz)				(00)				AV / Peak		AV / Peak	

• High frequency

Fraguanav	Rea	ding			0.05	Lin	nits	Re	sult	Mai	rgin
Frequency	(dBu	V/m)	Pol.	T.F (dB)	DCF (dB)	(dBu	V/m)	(dBu	V/m)	(d	B)
(MHz)	AV ,	/ Peak		(UD)	(00)	AV /	Peak	AV /	Peak	AV /	Peak
2 483.61	18.35	33.30	Н	10.61	2.46	54.0	74.0	31.4	43.9	22.6	30.1

Note 1: The radiated emissions were investigated 9 kHz to 25 GHz. And no other spurious and harmonic emissions were found above listed frequencies.

Note 2: DCF(Duty Cycle Factor)

- T_{on} = 1.067 ms / T_{off} = 0.811 ms

- Duty Cycle = $T_{on} / (T_{on}+T_{off}) = 1.067 / (1.067+0.811) = 0.568$

- DCF = $10 \times \log(1/\text{Duty Cycle}) dB = 10 \times \log(1/0.568) dB = 2.46 dB$ Note 3: Sample Calculation.

Margin = Limit - Result / Peak Result = Peak Reading + TF / Average Result = Average Reading + TF + DCF

TF = Ant factor + Cable Loss + Filter Loss - Amp Gain + Distance Factor Distance Factor = 20log(applied distance/required distance) = 20log(3.75m/3m) = 1.94



9.6 Test Plot for Radiated Spurious Emission

• BLE 1M _ Low frequency

				Restr	icted Ban	a – Pea
MultiView 🕀 Spectrum	Spectrum 2	X Spectrum 3	X Spectrum 4	X		
Input 1 AC PS	● RBW 1 M /T 1.01 ms ● VBW 3 M On Notch	Hz Hz Mode Auto Sweep Off			Frequency 2.3	
Frequency Sweep					M1[1]	
80 dBµV						2.3623876 GHz
0 dBµV						
0 dBµV						
0 dBµV						
40 dBµV						
30 dBuv	A Prairie and some	and the second and a second and the	Hundungara	M1	Mulphantanala	and a subable of
20 dBµV	an an an air an	An	· · · · · · · · · · · · · · · · · · ·	ارد اوسیات بین کرد به م		A - AN A reason in AM
10 dBµV						
) dBµV						
10 dBµV						
		1001 pts	8.0 MHz	:/		2.39 GHz
10 dBµV 2.31 GHz		1001 pts			ed Band -	
2.31 GHz MultiView Spectrum		Spectrum 3	X Spectrum 4	Restricte	ed Band -	
AultiView # Spectrum Ref Level 87.00 dBµ/ Att 0 dB SW Input 1 AC PS	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3	Spectrum 4	Restricte	ed Band – Frequency 2.3	Averag
2.31 GHz MultiView C Spectrum Ref Level 87.00 dBµV Att 0 dB SW Input 1 AC PS Frequency Sweep	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte		Averag
2.31 GHz MultiView # Spectrum Ref Level 87.00 dBµV Att 0 dB SW Input 1 AC PS Frequency Sweep 10 dBµV	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz 4ultiView 1: Spectrum Ref Level 87.00 dBµV Att 0 dB SW Input 1 AC PS Frequency Sweep 0 dBµV 0 dBµV 0 dBµV	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz MultiView Spectrum Ref Level 87.00 dB _W / Att 0 dB SW Input 1 AC PS Frequency Sweep 10 dB _W /	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz VultiView Spectrum Ref Level 87.00 dB _W Maintain and the system Att 0 dB SW Input 1 AC Frequency Sweep Maintain and the system 10 dB _W 0 dB SW 10 dB _W 0 dB _W 10 dB _W 50 dB _W	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz VultiView Spectrum Ref Level 87.00 dB _V / Att 0 dB SW Input 1 AC Frequency Sweep 00 dB _W /- 00 dB _W /-	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
Spectrum MultiView E Spectrum Ref Level 87.00 60µ/ Att 0 dB 0 dB Frequency Sweep 0 50 dBµ/	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz AultiView E Spectrum Ref Level 87.00 dBµV Att 0 dB §W Input 1 AC PS Frequency Sweep 0 dBµV 0 0 dBµV 0	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	Averag 500000 GHz 16.01 dBµV
2.31 GHz VultiView Spectrum Ref Level 87.00 dB _V / Att 0 dB SW Input 1 AC Frequency Sweep 00 dB _W /- 00 dB _W /-	● RBW 1 M /T 1.01 ms ● VBW 3 M	Spectrum 3 Hz Hz Mode Auto Sweep	Spectrum 4	Restricte	Frequency 2.3	v 500000 GHz • 1Rm Avg 16.01 dBµV

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							2	Spuriou	s – rear
MultiView	Spectrum	x Sp	ectrum 2	X Spectr	um 3 🛛 🕱	<u>]</u>			▽
Ref Level 80. Att	00 dBµV 0 dB SWT	● RBW 1.01 ms ● VBW Off Note	1 MHz 3 MHz Mode	Auto Sweep		A	Fn	equency 4.8	040000 GHz
Input 1 Frequency S	1 AC PS	Off Noto	h Off						• 1Pk Max
								M1[1] 4	42.37 dBµV .80382018 GHz
70 dBµV									
60 dBµV									
50 dBµV				M1					
40 dBµV	hannann	moment	when makes	and whater	www.	Munanderal	here to a horas	where we are and the second	where the Mary w
30 dBµV									
20 dBµV									
10 dBµV									
0 dBµV									
-10 dBµV									
CF 4.804 GHz			1001 pt	S	1	.0 MHz/			Span 10.0 MHz
							0		•
							Spu	rious –	Average
			ectrum 2	x Spectr			Spu	rious –	Average
Ref Level 80. Att	00 dBuV	= RBW	1 MHz	·	GL				
Ref Level 80. Att Input	00 dBµV 0 dB SWT 1 AC PS		1 MHz		GL			equency 4.8	v 040000 GHz • 1Rm Avg
Ref Level 80.0 Att Input I Frequency S	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz		GL]		equency 4.8 (▼ 040000 GHz
Ref Level 80.0 Att Input I Frequency S	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz		GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level 80. Att Input Frequency S	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz		GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level 80. Att Input I Frequency S 70 dBµV	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz		GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level 80.1 Att Input IFrequency S 70 dBµV 60 dBµV 50 dBµV	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz		GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level 80.1 Att Input IFrequency S 70 dBµV 60 dBµV 50 dBµV	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	e Auto Sweep	GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input Infraquency S 60 dBµV 50 dBµV 40 dBµV 40 dBµV 30 dBµV	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz		GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input I Frequency S 60 dbµV 50 dbµV 40 dbµV 30 dbµV	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Auto Sweep	GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input I Frequency S 60 dbµV 50 dbµV 40 dbµV 30 dbµV	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Auto Sweep	GL			equency 4.8 (040000 GHz ● 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input I Frequency S 60 dbµ/ 50 dbµ/ 40 dbµ/ 30 dbµ/ 20 dbµ/	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Auto Sweep	GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input I Frequency S 60 dbµ/ 50 dbµ/ 40 dbµ/ 30 dbµ/ 20 dbµ/ 20 dbµ/ 10 dbµ/	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Auto Sweep	GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Att Input Input 17 day 70 day 60 day 50 day 40 day 40 day	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Auto Sweep	GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input I Frequency S 60 dbµ/ 50 dbµ/ 40 dbµ/ 30 dbµ/ 20 dbµ/ 20 dbµ/ 10 dbµ/	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Auto Sweep	GL			equency 4.8 (v 040000 GHz • 1Rm Avg 32.23 dBµV
Ref Level S0.1 Att Input Input 50 dbµv 50 dbµv 50 dbµv 40 dbµv 30 dbµv 20 dbµv 10 dbµv 10 dbµv 0 dbµv	00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz	Mi Mi	SGL	.0 MHz/		equency 4.8	v 040000 GHz • 1Rm Avg 32.23 dBµV

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• BLE 1M _ Middle frequency

					S	ouriou	s – Pea
1ultiView 🕀 Spect			Spectrum 3				∇
	● RBW SWT 1.01 ms ● VBW PS Off Notch	3 MHz Mode Auto S	weep		Freq	uency 4.8	840000 GH:
Input 1 AC I Frequency Sweep	PS OI NOLCH	UI				MILT	• 1Pk Max
						M1[1] 4	41.16 dBµV 88462937 GHz
0 dBµV							
) dBµV							
ару - сору							
I dBµV							
			M1				
I dBUV-	manonterio	North Martin	. And and the first of the second state of the second second second second second second second second second s	ast mouth the	Management	Matural	waterman
) dBµV							
I dBµV							
dBµV							
dBµV							
0 dBµV							
4.884 GHz							
אוט דטטיד		1001 pts	1	.0 MHz/	Spuri		
		1001 pts	1	.0 MHz/	Spuri		
IultiView 🗄 Spect	<u> </u>	ctrum 2 🕱	Spectrum 3	7	Spuri		
IultiView Spect	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S		7		ous –	Span 10.0 MHz Averag v 840000 GHz
IultiView (Spect Ref Level 80.00 dB/V Att 0 dB s input 1 AC	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.8 8	Averag
IultiView Spect Ref Level 80.00 dBµ/ Att 0 dB Input 1 AC	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag
fultiView Spect Ref Level 80.00 dBµV Att 0 dB 1 Input 1 AC 1 Frequency Sweep	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
tultiView Spect Ref Level 80.00 dBµV Att 0 dB i Frequency Sweep	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
tultiView Spect Ref Level 80.00 dBµV Att 0 dB i Frequency Sweep	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Ref Level 80.00 dBµV Att 0 dB i Frequency Sweep D dBµV	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Ref Level 80.00 dBµV Att 0 dB i Frequency Sweep D dBµV	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Xef Level 80.00 dBµV National 0 dB Input 1 AC Frequency Sweep 0 0 dBµV 0 0 dBµV 0 0 dBµV 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Ref Level 80.00 dBy/V tt 0 dB input 1 AC Frequency Sweep 0 dBy/V 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Ref Level 80.00 dBy/V tt 0 dB input 1 AC Frequency Sweep 0 dBy/V 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Ref Level 80.00 dBy/V tt 0 dB input 1 AC Frequency Sweep 0 dBy/V 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Ref Level 80.00 dBy/V tt 0 dB input 1 AC Frequency Sweep 0 dBy/V 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
fultiView Spect Ref Level 80.00 dByV Att 0 dB 0 regularity 80.00 dByV 0 dByV 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
fultiView Spect Ref Level 80.00 dByV Att 0 dB 0 dByV 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Vef Level 80.00 dByV Nut 0 dB Imput 1 AC	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
IultiView Spect Sef Level 80:00 dBy/v 0 dB yr I AC 1 I AC 1 Frequency Sweep 0 dB yr 0 dBy/v 0 0 dBy/v 0	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV
AultiView Spect	● RBW SWT 1.01 ms ● VBW	ctrum 2 🗶 1 MHz 3 MHz Mode Auto S	Spectrum 3	7		OUS — uency 4.84 M1[1]	Averag 840000 GHz 1Rm Avg 31.04 dBµV

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• BLE 1M _ High frequency

					F	Restricte	ed Ban	d - Pea
MultiView 🕀 Spectrum	Spectrum	2	Spectrum 3	X Spectru	um 4 🕅 🕱			_ ▽
Ref Level 87.00 dBµV Att 0 dB S	● RBW WT 1.01 ms ● VBW	3 MHz Mode	e Auto Sweep			Fre	equency 2.4	917500 GHz
Input 1 AC P I Frequency Sweep	S On Notch	n Off						• 1Pk Max
80 dBµV						N	1[1]	30.09 dBµV 2.4896566 GHz
00 00µv-								
70 dBµV								
60 dBµV	_							
50 dBµV								
40 dBµV								
30 dBµV		M1						
Manana Manana Manana Manana M	nombourbo	tomeropologies	hope without	adeadh way	Muhan	innorman	monorahl	with my Marine
20 dBµV								
10 dBµV								
0 dBµV								
-10 dBµV								
	_							
		1001 pts	6	1.	.65 MHz/			2.5 GHz
2.4835 GHz		1001 pt:	5	1.		ricted (Band -	
2.4835 GHz	X Spectrum		Spectrum 3		Rest	ricted (Band -	
2.4835 GHz MultiView : Spectrum Ref Level 87.00 dBµ/ Att 0 dB S	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3		Rest			Averag
2.4835 GHz MultiView # Spectrum Ref Level 87.00 dBµV	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz
2.4835 GHz MultiView	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre		Averag
2.4835 GHz MultiView # Spectrum Ref Level 87.00 dBµV Att 0 dB s Input 1 AC P If Requency Sweep 80 dBµV 80 dBµV	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2.4835 GHz MultiView # Spectrum Ref Level 87.00 dBµV Att 0 dB s Input 1 AC P If Requency Sweep 80 dBµV 80 dBµV	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2.4835 GHz MultiView : Spectrum Ref Level 87.00 dBµ/ Att 0 dB S	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2,4835 GHz MultiView ** Spectrum Ref Level 87.00 db/v 0 dB S Input 0 dB S 1 A/C P 80 db/v 0 70 db/v 60 db/v	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2,4835 GHz MultiView ∰ Spectrum Ref Level \$7.00 dBµV A Att 0 dB S Input 1 AC P I Frequency Sweep 80 dBµV	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2,4835 GHz MultiView Spectrum Ref Level 87.00 dbµ/ 0 dB S Att 0 dB S Input 1 AC P I requency Sweep 80 dbµ/ 0 60 dbµ/ 0 50 dbµ/ 0	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2.4835 GHz MultiView Spectrum Ref Level 87.00 dbµ/ Att 0 dB S Input 1 AC PI Frequency Sweep 80 dbµ/ 80 dbµ/	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2.4835 GHz MultiView Spectrum Ref Level 87.00 dBµV Att 0 dB S Sinput 1.AC P IFrequency Sweep 90 dBµV 80 dBµV 90 dBµV 50 dBµV 90 dBµV 50 dBµV 90 dBµV 40 dBµV 90 dBµV 20 dBµV 90 dBµV	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2.4835 GHz MultiView 1: Spectrum Ref Level 87.00 dbµ/ Att 0 dB 5 Input 1 AC P I Frequency Sweep 80 dbµ/ 60 dbµ/ 50 dbµ/ 40 dbµ/ 50 dbµ/ 40 dbµ/ 90 dbµ/ 40 dbµ/ 90 dbµ/ 90 dbµ/ 10 dbµ/	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV
2.4835 GHz MultiView Spectrum Ref Level 87.00 dbµ/ Att 0 dB S Input 1 AC P Irrequency Sweep 80 dbµ/	● RBW WT 1.01 ms ● VBW	2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2.4	Averag v 917500 GHz 16.56 dBµV

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							S	Spuriou	s – Peak
MultiView	# Spectrum	x Spe	ectrum 2	X Spectr	rum 3 🛛 🕱	J			∇
Ref Level 80. Att	.00 dBµV 0 dB SWT :		1 MHz 3 MHz Mode	Auto Sweep		1	Fn	equency 4.96	500000 GHz
Input 1 Frequency S	1 AC PS	Off Notch	h Off						• 1Pk Max
								M1[1] 4.	41.65 dBµV 96057942 GHz
70 dBµV									
60 dBµV									
50 dBµV					M1				
40 dBµV	a		an en strange after	Participant and addingly.	and the second second	Maley ward Ward			at a secolo
	Mappinenth	Malin Insurance	longenddodor o'r 'r			and the second	y Manhada Indopendents	Manifertan da Alina da Alina da A	water
30 dBµV									
20 dBµV									
10 dBµV									
10 0004.									
0 dBµV									
-10 dBµV									
CF 4.96 GHz			1001 pts	s	1	.0 MHz/		S	pan 10.0 MHz
							Spu	rious –	Average
MultiViow	Cooctrum	w Snd	ostrum)	Spectr	11m 3 🗑	<u>_</u>]	Spu	rious -	Average
MultiView Ref Level 80.	.00 dBµV	● RBW	ectrum 2		GL]			
	.00 dBµV 0 dB SWT : 1 AC PS		1 MHz 3 MHz Mode		GL			rious — equency 4.96	
Ref Level 80. Att Input	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	·	GL			equency 4.96	v 500000 GHz
Ref Level 80. Att Input	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	·	GL	:]		equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input I Frequency S	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	·	GL			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 Frequency S 70 dBµV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	·	GL	Ē		equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 Frequency S 70 dBµV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	·	GL			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 Frequency S 70 dвµV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	·	GL			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input Input 1 Frequency S 60 d8μV 50 d8μV 60 d8μV 40 d8μV 60 d8μV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	Auto Sweep	GL			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input TFrequency S 70 dBµV 60 dBµV 50 dBµV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	GL			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 Frequency S 70 d8µV 60 d8µV 50 d8µV 40 d8µV 30 d8µV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	SGL Count 100/100			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 70 dbµv 60 byv 50 dbµv 40 dbµv 30 dbµv 20 20	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	SGL Count 100/100			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 Frequency S 70 dbµV 60 dbµV 50 dbµV 40 dbµV 30 dbµV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	SGL Count 100/100			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 70 dbµv 60 byv 50 dbµv 40 dbµv 30 dbµv 20 20	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	SGL Count 100/100			equency 4.96	v 500000 GHz • 1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 1 70 dBµV 60 50 dBµV 50 40 30 40 40 40 40 30 40 40 40 30 40 </td <td>.00 dBµV 0 dB SWT : 1 AC PS</td> <td>● RBW 1.01 ms ● VBW</td> <td>' 1 MHz 3 MHz Mode h Off</td> <td>Auto Sweep</td> <td>SGL Count 100/100</td> <td></td> <td></td> <td>equency 4.96</td> <td>▼ 500000 GHz ●1Rm Avg 31.18 dBµV</td>	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	SGL Count 100/100			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV
Ref Level 80. Att Input 1 70 dBµV 60 dBµV 50 30 dBµV 20 dBµV 10 dBµV	.00 dBµV 0 dB SWT : 1 AC PS	● RBW 1.01 ms ● VBW	' 1 MHz 3 MHz Mode h Off	Auto Sweep	SGL Count 100/100			equency 4.96	▼ 500000 GHz ●1Rm Avg 31.18 dBµV

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• BLE 2M _ Low frequency

	Cy		Res	stricted Band	d - Pea
MultiView 🗄 Spectrum	Spectrum 2	Spectrum 3	Spectrum 4		∇
Ref Level 87.00 dBµV Att 0 dB S Input 1 AC P	● RBW 1 MHz WT 1.01 ms ● VBW 3 MHz M S On Notch Off	ode Auto Sweep		Frequency 2.35	00000 GHz
I Frequency Sweep				M1[1]	 1Pk Max 27.52 dBµV
80 dBµV					.3714985 GHz
70 dBµV					
60 dBµV					
50 dBµV					
40 dBµV					
30 dBpV	how he was hard a low and a start and a	hundarmalarm	arminin manager	mandershaking	marken
20 dBµV-					
10 dBµV					
0 dBµV					
-10 dBµV					
2.31 GHz	1001	pts	8.0 MHz/		2.39 GHz
			Restric	cted Band -	Average
MultiView Spectrum Ref Level 87.00 dBµV	Spectrum 2 X • RBW 1 MHz	Spectrum 3 🛛 🕱 SGL	Spectrum 4		
Att 0 dB S Input 1 AC P	WT 1.01 ms ● VBW 3 MHz M		100/100	Frequency 2.35	
1 Frequency Sweep				M1[1]	 1Rm Avg 15.93 dBµV .3754146 GHz
80 dBµV					IOTO TI TO OTIL
70 dBµV					
60 dBµV					
60 dBµV					
60 dBµV					
60 dвµv					
60 d8µV					
60 dBµV					
60 dBµV 50 dBµV 40 dBµV 30 dBµV 20 dBµV 				M1	
60 dBµV 50 dBµV 40 dBµV 30 dBµV 20 dBµV 10 dBµV			8.0 MHz/		2.39 GHz

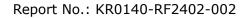
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• BLE 2M _ High frequency

						F	Restricte	ed Ba	nd – Pea
MultiView 🕀	Spectrum	Spectrur	m 2 🕱	Spectrum 3	X Spectru	um 4 🕅 🕱			_ ▽
Ref Level 87 Att Input	.00 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW On Note	V 1 MHz V 3 MHz Mode ch Off	e Auto Sweep			Fre	equency 2	.4917500 GHz
Frequency S							N	1[1]	●1Pk Max 33.30 dBµV
80 dBµV									2.4836071 GHz
70 dBµV									
i0 dBµV									
0 dBµV									
0 dBµV									
о ивро <u>14</u>									
	annalananan	with also dia addi	White Marine	allow the fully is	Hundhand	mulmulliou	when when	han Mente Ande	mound
0 dBµV									
0 dBµV									
і dBµV									
-10 dBµV									
		1	1001 -			(EMD)			0.5.011
2.4835 GHz			1001 pts	5	1	.65 MHz/	rictod (Band	2.5 GHz
						Rest	ricted (Band ·	
MultiView = Ref Level 87 Att	0 dB SWT	1.01 ms ⊜ VB¥	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest			- Averag
AultiView T Ref Level 87 Att Input	.00 dBµV 0 dB SWT 1 AC PS	⊖ RBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag v 4917500 GHz
AultiView Ref Level 87 Att Input Frequency S	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre		- Averag
AultiView Ref Level 87 Att Input Frequency S 0 d8µV	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag 4917500 GHz 18.35 dBµV
AultiView F Ref Level 87 Att Input Frequency S 0 dbµV	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag .4917500 GHz 18.35 dBµV
MultiView # Ref Level 87 Att Input Input # 10 d8µV # 10 d8µV # 10 d8µV # 10 d8µV #	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag .4917500 GHz 18.35 dBµV
MultiView Ref Level 87 Att Input Frequency S 80 dbµV 90 dbµV 60 dbµV 60 dbµV	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag v 4917500 GHz 18.35 dBµV
MultiView Ref Level 87 Att Input Frequency S 10 dbµV	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag .4917500 GHz 18.35 dBµV
MultiView Ref Level 87 Att Input Frequency S 10 dbµV	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag .4917500 GHz 18.35 dBµV
ViultiView Ref Level 87 Att Input Frequency S 00 dbµV	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag .4917500 GHz 18.35 dBµV
ViultiView Image: Control of the second	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag v 4917500 GHz 18.35 dBµV
MultiView # Ref Level 87 Att Input Input # 10 d8µV # 10 d8µV # 10 d8µV # 10 d8µV #	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3	Spectru SGL	Rest	Fre	equency 2	- Averag .4917500 GHz 18.35 dBµV
Vultiview Image: Constraint of the second seco	.00 dBµV 0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	n 2 X 1 MHz 3 MHz Mode	Spectrum 3 e Auto Sweep	X Spectra SGL Count 100/100	Rest	Fre	equency 2	- Averag v 4917500 GHz 18.35 dBµV

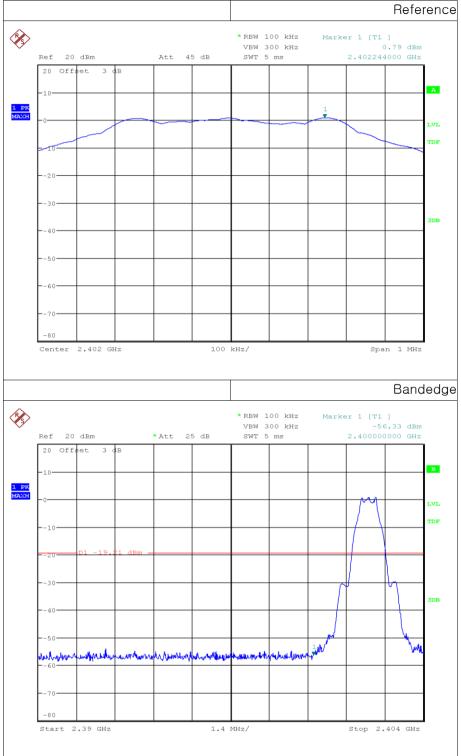
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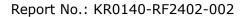


9.7 Test Plot for Conducted Spurious Emission

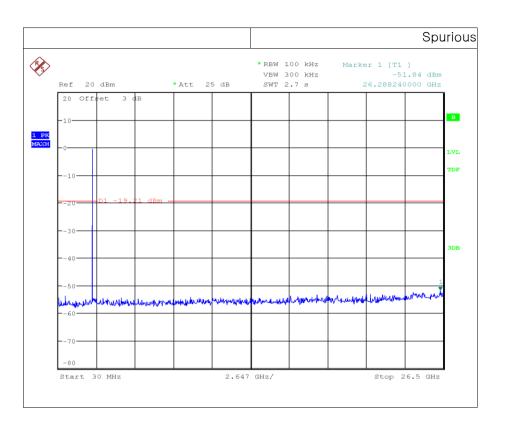
• BLE 1M _ Low frequency



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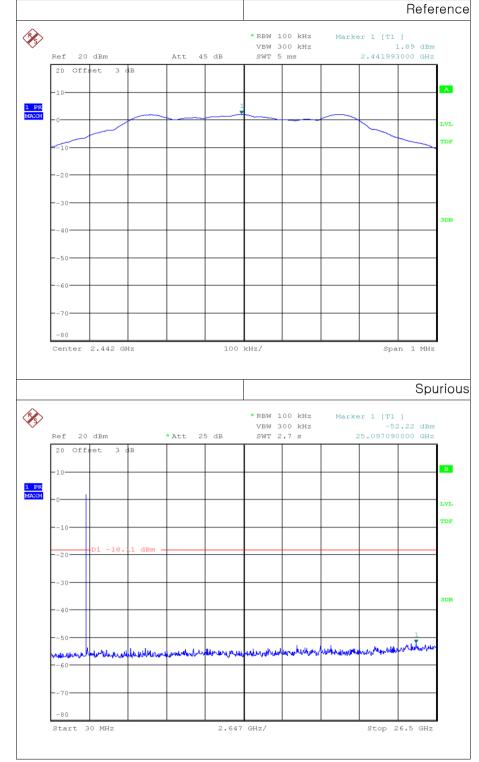




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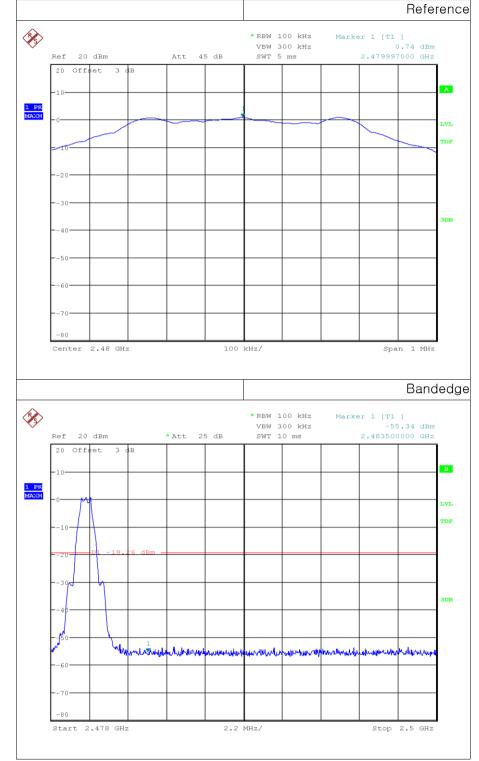
• BLE 1M _ Middle frequency



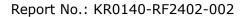
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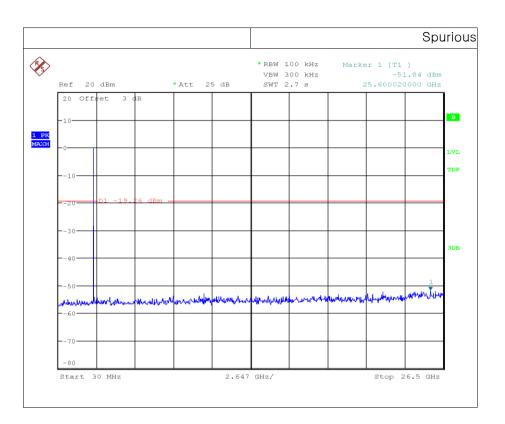
• BLE 1M _ High frequency



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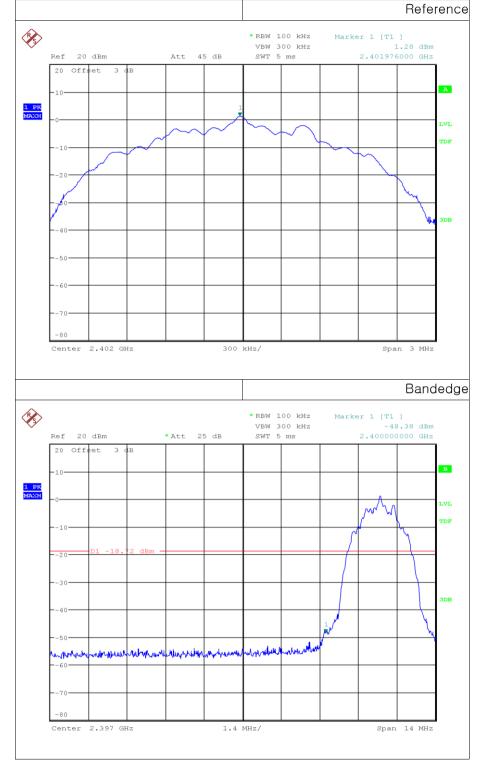




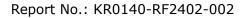
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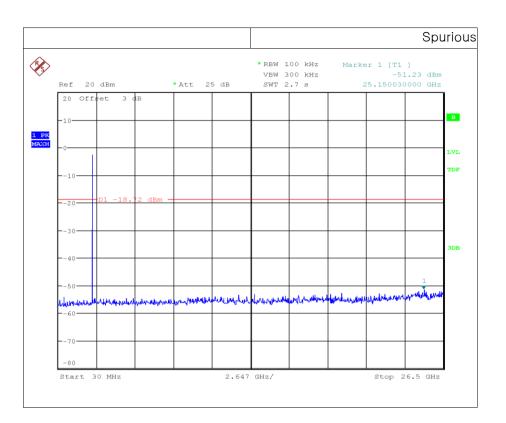
• BLE 2M _ Low frequency



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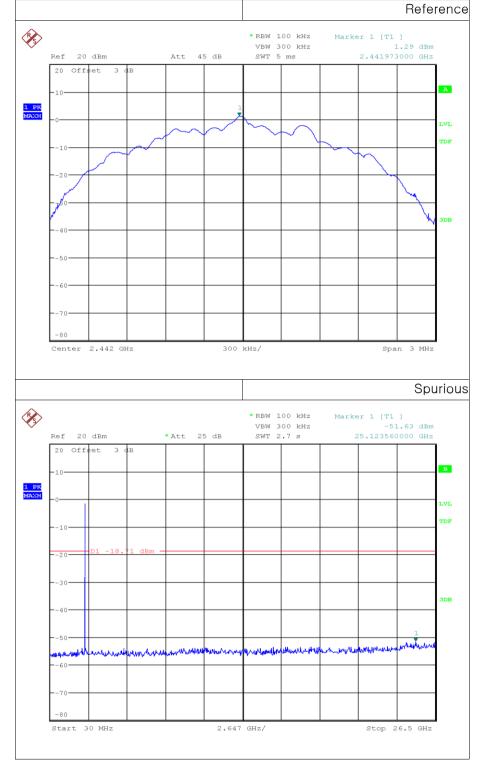




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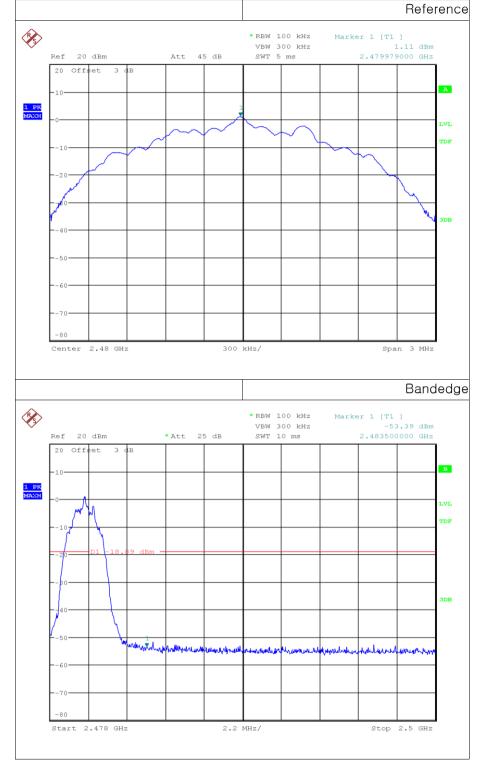
• BLE 2M _ Middle frequency



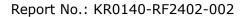
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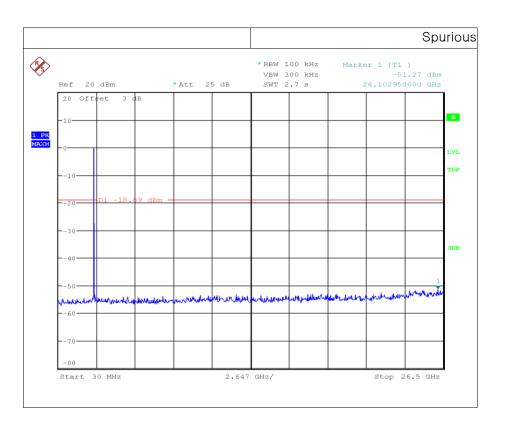
• BLE 2M _ High frequency



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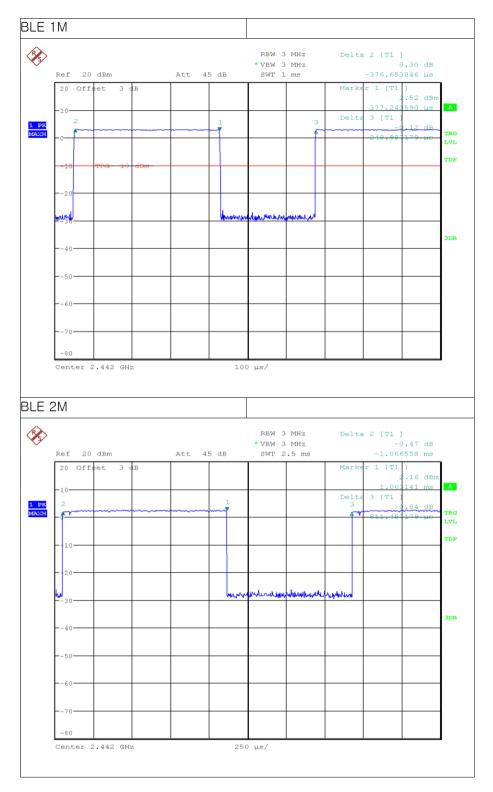




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9.8 Test Plot for Duty Cycle



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10. Conducted Emission

10.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

10.2 Limit

According to §15.207(a) 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 or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Fraguency Panga (MHz)	Conducted Limit (dBuV)				
Frequency Range (MHz)	Quasi-Peak	Average			
0.15 ~ 0.5	66 to 56 *	56 to 46 *			
0.5 ~ 5	56	46			
5 ~ 30	60	50			

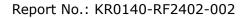
* Decreases with the logarithm of the frequency

10.3 Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

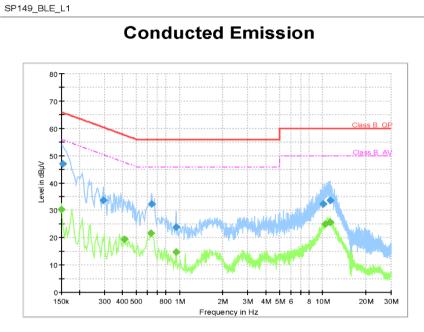
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10.4 Test Result

• AC Line Conducted Emission (Graph)



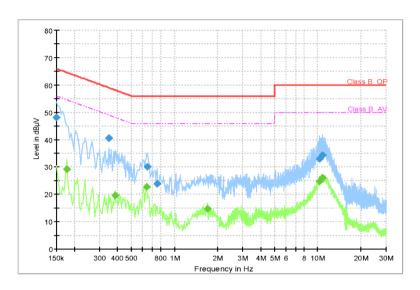
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150	(<u>ab</u> µt) 	30.33	56.00	25.67	9	L1	10.6
0.154	47.11		65.78	18.67	9	L1	10.6
0.294	33.69		60.41	26.72	9	L1	10.6
0.414		19.44	47.57	28.12	9	L1	10.7
0.630		21.65	46.00	24.35	9	L1	10.5
0.640	32.22		56.00	23.78	9	L1	10.4
0.950	23.73		56.00	32.27	9	L1	10.0
0.950		14.65	46.00	31.35	9	L1	10.0
10.100	32.32		60.00	27.68	9	L1	9.9
10.370		24.88	50.00	25.12	9	L1	9.9
11.220		25.60	50.00	24.40	9	L1	9.9
11.220	33.59		60.00	26.41	9	L1	9.9

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SP149_BLE_N



Conducted Emission

Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBµV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150	48.12	(ubµt) 	66.00	17.88	9	N	10.6
0.178		29.23	54.58	25.35	9	N	10.8
0.350	40.64		58.96	18.32	9	N	10.7
0.386		19.61	48.15	28.54	9	N	10.7
0.640		22.65	46.00	23.35	9	N	10.4
0.650	30.13		56.00	25.87	9	N	10.3
0.760	23.81		56.00	32.19	9	N	9.9
1.700		14.69	46.00	31.31	9	N	9.9
10.250	33.03		60.00	26.97	9	N	9.9
10.360		24.84	50.00	25.16	9	N	9.9
10.780		25.96	50.00	24.04	9	N	9.9
10.780	34.25		60.00	25.75	9	N	9.9

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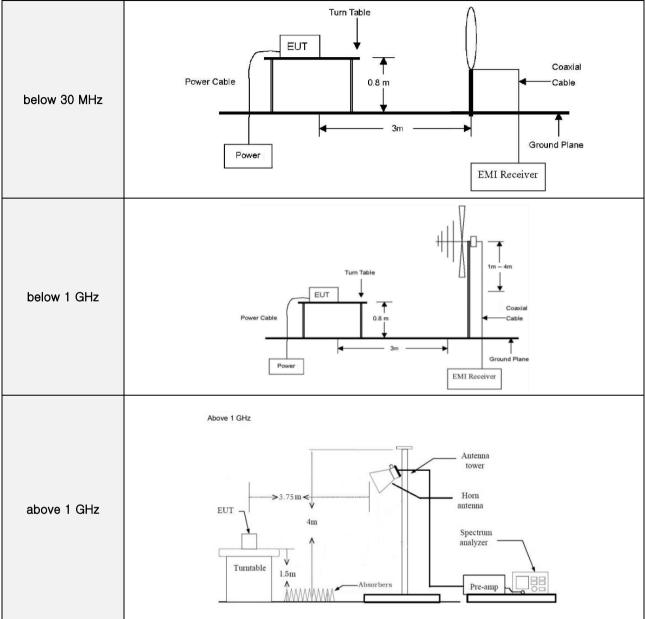
APPENDIX I

TEST SETUP

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Radiated Measurement



• Conducted Measurement

	_				
Conducted		EUT	 Attenuator	Spectrum Analyzer	

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APPENDIX II

UNCERTAINTY

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Measurement Item	Expanded Uncertainty U = <i>k</i> Uc (<i>k</i> =2)			
Conducted RF power	0.32 dB			
Conducted Spurious Emissions	0.32 dB			
Radiated Spurious Emissions	6.34 dB			
Conducted Emissions	1.74 dB			