

Test Report				
1. Client				
<ul> <li>Name :</li> <li>Address :</li> </ul>	Sena Technologies Co., Ltd. 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Republic of Korea			
2. Use of Report :	FCC & IC Approval			
3. Sample Description				
<ul> <li>Product Name :</li> <li>Model Name :</li> </ul>	DWO 7 PRO MESH SP139			
4. Date of Receipt :	2023-08-25			
<b>5. Date of Test :</b> 2023-09-11 ~ 2023-09-14				
6. Test Method :	FCC Part 15 Subpart C 15.247 RSS-247 Issue 2(2017-02), RSS-GEN Issue 5(2019-03)			
7. Test Results :	Refer to the test results			
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Affirmation Dae-	d by Seong, Choi Technical Manager Jong-Myoung, Shin			

Sep 15, 2023



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# <u>Version</u>

TEST REPORT NO.	DATE	DESCRIPTION
KR0140-RF2309-002	Sep 15, 2023	Initial Issue

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# 1. Applicant & Manufacturer & Test Laboratory Information

#### 1.1 Applicant Information

Applicant Sena Technologies Co., Ltd.	
Applicant Address	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Republic of Korea
Contact Person	Seunghyun Kim
Telephone No.	+82-2-573-7772
Fax No.	+82-2-573-7710
E-mail	shkim@sena.com

#### 1.2. Manufacturer Information

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

## 1.3 Test Laboratory Information

Laboratory	EMC Labs Co., Ltd.
Laboratory Address	100, Jangjateo-ro, Hobeop-myeon, Icheon-si, Gyeonggi-do, Republic of
Laboratory Address	Korea
Contact Person	Jong-Myoung, Shin
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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	DWO 7 PRO MESH	
Model Name	SP139	
FCC ID	S7A-SP139	
IC	8154A-SP139	
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	Chip Antenna
Antenna Gain	0.3 dBi
Firmware Version	1.0
Hardware Version	1.0
Test software	Lab Test Tool V2.9.1

#### 2.3 Test Frequency

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

#### 2.4 Used Test Software Setting Value

Test Mode	Setting Item	
Test Mode	Power	
BLE	46	

#### 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



# 3. Test Summary

Applied	FCC Rule	IC Rule	Test Items	Test Condition	Result	
$\square$	15.203	-	Antenna Requirement		С	
$\square$	15.247(a)	RSS-247 (5.2)	6 dB Bandwidth		С	
$\square$	_	RSS GEN (6.7)	Occupied Bandwidth (99%)			
	15.247(b)	RSS-247 (5.4)	Maximum Peak Output Power		С	
	15.247(e)	RSS-247 (5.2)	Peak Power Spectral Density		С	
$\square$	15.247(d)	RSS-247 (5.5)	Conducted Spurious Emission		С	
	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	
Note 1: 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	2023.12.15
CONTROLLER	AMWON TECHNOLOGY	TEMI2500	S7800VK191 0707	2023.12.15
PSA SERIES SPECTRUM ANALYZER	AGILENT	E4440A	MY45304057	2023.12.15
MXG ANALOG SIGNAL GENERATOR	AGILENT	N5183A	MY50141890	2023.12.14
SYSTEM DC POWER SUPPLY	AGILENT	6674A	MY53000118	2023.12.14
VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	SMBV100A	257524	2023.12.14
BLUETOOTH TESTER	TESCOM	TC-3000A	3000A480088	2023.12.14
DIRECTIONAL COUPLER	AGILENT	773D	2839A01855	2023.12.14
ATTENUATOR	AGILENT	8493C	73193	2023.12.14
TERMINATIOM	HEWLETT PACKARD	909D	07492	2023.12.14
POWER DIVIDER	HEWLETT PACKARD	11636A	06916	2023.12.14
SLIDE-AC	DAEKWANG TECH	SV-1023	NONE	2023.11.15
DIGITAL MULTIMETER	HUMANTECHSTORE	15B+	50561541WS	2023.12.14
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	2023.11.15
High Pass Filter	WT Microwave INC.	WT-A3314-HS	WT22111804-1	2023.12.14
High Pass Filter	WT Microwave INC.	WT-A1935-HS	WT22111804-2	2023.12.14
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	2023.11.29
Horn ANT	Schwarzbeck	BBHA9120D	1497	2024.01.09
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	2024.01.09
PULSE LIMITER	lignex1	EPL-30	NONE	2024.01.09

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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 Chip Antenna. The directional peak gain of the antenna is 0.3 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 ≥ 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 ≥ 6 dB.

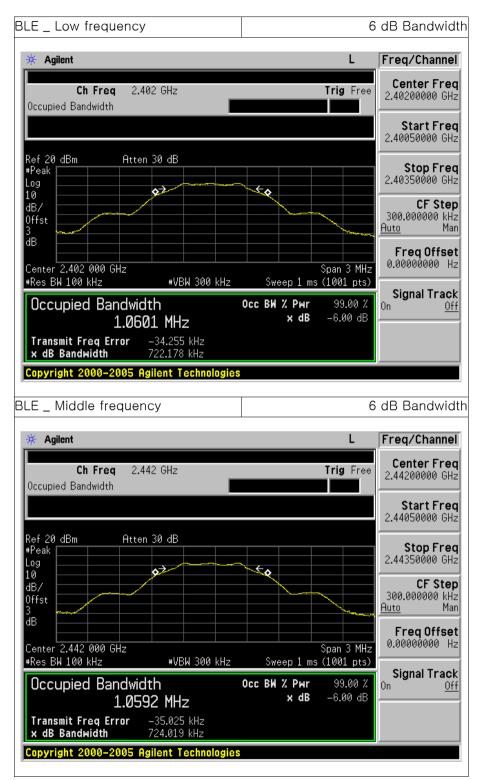
#### 6.4 Test Result

Test Mode	Test Frequency	Test Frequency 6 dB Bandwidth (MHz)			
	Low	0.722	1.044		
BLE	Middle	0.724	1.043		
	High	0.722	1.043		

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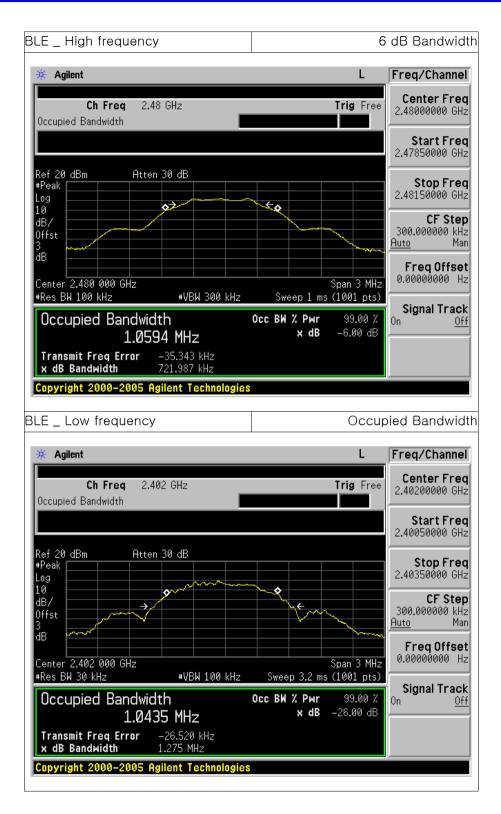


#### 6.5 Test Plot



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BLE _ Middle frequency	Occu	pied Bandwidth
* Agilent	L	Freq/Channel
Ch Freq 2.442 GHz Occupied Bandwidth	Trig Free	Center Freq 2.44200000 GHz
		<b>Start Freq</b> 2.44050000 GHz
Ref 20 dBm Atten 30 dB #Peak		Stop Freq 2.44350000 GHz
10 dB/ Offst	~~~	<b>CF Step</b> 300.000000 kHz <u>Auto</u> Man
dB Center 2.442 000 GHz #Res BW 30 kHz #VBW 100 kHz	Span 3 MHz Sweep 3.2 ms (1001 pts)	FreqOffset 0.00000000 Hz
Occupied Bandwidth 1.0428 MHz	0cc BW % Pwr 99.00 % × dB -26.00 dB	<b>Signal Track</b> On <u>Off</u>
Transmit Freq Error-26.856 kHzx dB Bandwidth1.273 MHz		
Copyright 2000–2005 Agilent Technologies		
BLE _ High frequency	Осси	pied Bandwidth
* Agilent	L	Freq/Channel
Ch Freq 2.48 GHz Occupied Bandwidth	Trig Free	Center Freq 2.48000000 GHz
		<b>Start Freq</b> 2.47850000 GHz
Ref 20 dBm Atten 30 dB #Peak Log		<b>Stop Freq</b> 2.48150000 GHz
10 dB/ 0ffst		CF Step 300.000000 kHz
		<u>Auto</u> Man
dB Center 2.480 000 GHz #Res BW 30 kHz #VBW 100 kHz	Span 3 MHz Sweep 3.2 ms (1001 pts)	Auto Man FreqOffset 0.00000000 Hz
Center 2.480 000 GHz	Span 3 MHz	Freq Offset
Center 2.480 000 GHz #Res BW 30 kHz #VBW 100 kHz Occupied Bandwidth	Span 3 MHz Sweep 3.2 ms (1001 pts) Occ BW % Pwr 99.00 %	Freq Offset 0.00000000 Hz Signal Track

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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

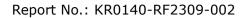
A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

- 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

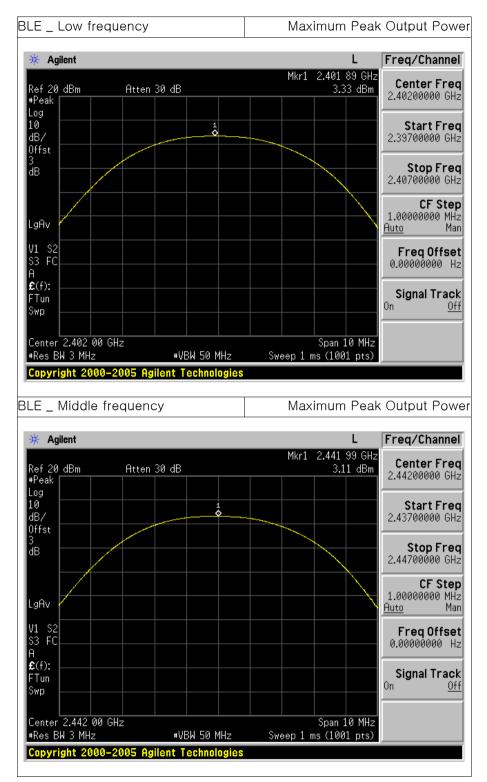
Test Mode	Tost Fraguanay	Peak Output Power				
iest mode	Test Frequency	dBm	mW			
	Low	3.33	2.15			
BLE	Middle	3.11	2.05			
	High	2.84	1.92			

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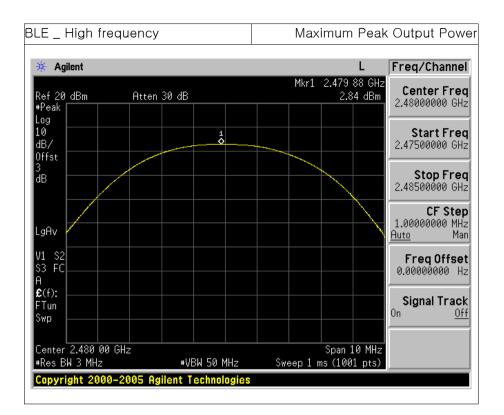


#### 7.5 Test Plot



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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.

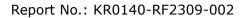
(ANSI C63.10-2013 \_ Section 11.10.2 - Method PKPSD)

- 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	-11.94			
BLE	Middle	-12.20			
	High	-12.40			

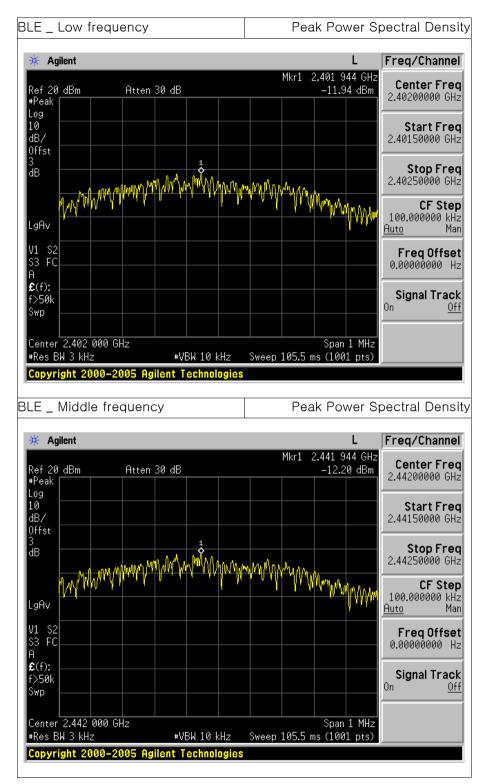
#### 8.4 Test Result

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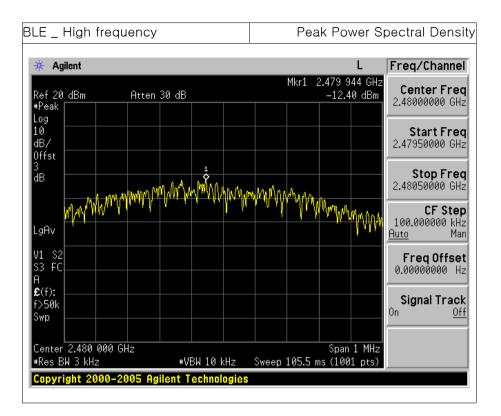


#### 8.5 Test Plot



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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

	ia olioligii lovolo opoeliloa il l	ino ronowing tablo
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 listed			
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			
10.00 10.41			

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

#### • Low frequency

Frequency	Rea	ding			T.5. 0.05		Limits		Result		Margin	
riequency	(dBu	V/m)	Pol.	T.F (dB)	DCF (dB)	(dBu	V/m)	(dBu	V/m)	(dB)		
(MHz)	AV ,	/ Peak		(00)	(00)	AV /	Peak	k AV / Peak		AV / Peak		
2 389.32	15.85	30.09	V	9.48	2.20	54.0	74.0	27.5	39.6	26.5	34.4	
4 803.96	39.53	45.85	V	-0.56	2.20	54.0	74.0	41.2	45.3	12.8	28.7	
5 972.72	26.88	39.49	V	3.62	2.20	54.0	74.0	32.7	43.1	21.3	30.9	

#### Middle frequency

Fraguaday	uency (dBuV/m)				Limits		Result		Margin		
Frequency	(dBu	V/m)	Pol.	T.F (dB)	DCF (dB)	(dBu	IV/m)	(dBu	ıV/m)	(dB)	
(MHz)	AV / Peak			(UD)	(00)	AV / Peak		AV / Peak		AV / Peak	
4 884.04	37.14	44.83	V	-0.60	2.20	54.0	74.0	38.7	44.2	15.3	29.8
5 981.11	26.91	40.50	V	3.62	2.20	54.0	74.0	32.7	44.1	21.3	29.9

#### • High frequency

	Frequency (dBu)/(m)			<b></b>	0.05	Limits		Result		Margin	
Frequency	(dBu	V/m)	Pol.	T.F (dB)	DCF (dB)	(dBu	V/m)	(dBu	IV/m)	(dB)	
(MHz)	Hz) AV /			(46)	AV / Peak		AV / Peak		Peak	AV /	Peak
2 484.53	16.27	28.60	V	10.21	2.20	54.0	74.0	28.7	38.8	25.3	35.2
4 959.97	36.13	43.52	V	-0.42	2.20	54.0	74.0	37.9	43.1	16.1	30.9
5 998.04	26.97	39.93	V	3.62	2.20	54.0	74.0	32.8	43.6	21.2	30.5

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)

-  $T_{\text{on}}$  = 0.377 ms /  $T_{\text{off}}$  = 0.248 ms

- Duty Cycle =  $T_{on}$  / ( $T_{on}+T_{off}$ ) = 0.377 / (0.377+0.248) = 0.603

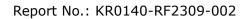
- DCF =  $10 \times \log(1/\text{Duty Cycle}) dB = 10 \times \log(1/0.603) dB = 2.20 dB$ 

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





### 9.6 Test Plot for Radiated Spurious Emission

#### • BLE \_ Low frequency

						F	lestricte	ed Band	d – Peak
MultiView 🗄	Spectrum	Spectrur	n 2 🕱	Spectrum 3	X Spectru	ım 4 🕱			_ ▽
Ref Level 87 Att	.00 dBµV		V 1 MHz	e Auto Sweep			Fre	equency 2.35	500000 GHz
Input 1 Frequency S	1 AC PS	On Not	ch Off	·					• 1Pk Max
80 dBµV								M1[1] 2	30.09 dBµV 3893207 GHz
70 dBµV									
60 dBµV									
50 dBµV									
40 dBµV									
30 dBµV									M1
	and the second second	Mundamur	shammanymph	Wouldward	handerheadleander	Mannahrad	somewhere	Mulandudy	Walanderge
20 dBµV									
10 dBµV									
0 dBµV									
0 06pv									
-10 dBµV			1001 pt		0	.0 MHz/			2.39 GHz
2.31 012			1001 pt	3	0				
						Rest	ricted t	Band -	Average
MultiView 🕀	Spectrum	X Spectrur							
Ref Level 87				Spectrum 3	X Spectru	ım 4 🛛 🕱			▽
<ul> <li>Att Input</li> </ul>	0 dB SWT 1 AC PS		V 1 MHz V 3 MHz Mod		SGL Count 100/100		Fre	equency 2.35	
	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg
Input 1 Frequency S	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input I Frequency S 80 dBµV	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input 1 Frequency S 80 dBµV	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fra	M1[1]	●1Rm Avg 15.85 dBµV
Input I Frequency S 80 dBµV	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input           1 Frequency S           80 dBμν           70 dBμν           60 dBμν	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input           I Frequency S           80 dBμν           70 dBμν           60 dBμν           50 dBμν           40 dBμν	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input I Frequency S 80 dBμν 70 dBμν 50 dBμν 50 dBμν 50 dBμν	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input           I Frequency S           80 dBμν           70 dBμν           60 dBμν           50 dBμν           40 dBμν	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	●1Rm Avg 15.85 dBµV
Input           I Frequency S           80 dBµv           70 dBµv           60 dBµv           50 dBµv           40 dBµv           30 dBµv	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	• 1Rm Avg 15.85 dBµV :3861239 GHz
Input           I Frequency S           80 dBμv           70 dBμv           60 dBμv           50 dBμv           40 dBμv           30 dBμv	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	• 1Rm Avg 15:85 dBµV :3861239 GHz
Input           I Frequency S           80 dBµv           70 dBµv           60 dBµv           50 dBµv           40 dBµv           30 dBµv	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fra	M1[1]	• 1Rm Avg 15:85 dBµV :3861239 GHz
Input           I Frequency S           80 dBµv           70 dBµv           60 dBµv           50 dBµv           30 dBµv           30 dBµv           20 dBµv           10 dBµv	0 dB SWT 1 AC PS	● RBV 1.01 ms ● VBV	V 1 MHz V 3 MHz Mod		SGL		Fre	M1[1]	• 1Rm Avg 15:85 dBµV :3861239 GHz

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							S	Spuriou	s – Peal
MultiView	Spectrum	x Sp	ectrum 2	X Spect	rum 3 🛛 🕱	3			▽
Ref Level 80.0 Att	DO dBµV		1 MHz	Auto Sweep		1	Fre	equency 4.8	040000 GHz
Input 1 Frequency S	1 AC PS	Off Noto							• 1Pk Max
								M1[1]	45.85 dBµV .80396004 GHz
70 dBµV									
60 dBµV									
50 dBµV				,					
40, dBµV	an and the second	-Nimprovantwo	in this way in the	adadd and a second	and and a second as		mantinanyu	KARLAN, ANALA	h dont that have a subs
40.dBµV							a a nd a sa shea a	allennalle aver er Henne A	l Naviet autorite Asta -
30 dBµV									
20 dBµV									
10 dΒμV									
0 dBµV									
10 40-01									
-10 dBµV									
CF 4.804 GHz			1001 pt	s	1	.0 MHz/			Span 10.0 MHz
							uaS	rious -	Average
						-			
MultiView 8	( .		ectrum 2	Spect	rum 3 🛛 🛛 SGL				▽
Att Input	0 dB SWT 1 AC PS	1.01 ms ● VBW Off Note	3 MHz Mode		Count 100/100		Fre	equency 4.8	040000 GHz
I Frequency S	weep							M1[1]	• 1Rm Avg 39.53 dBµV
70 dBµV								4	.80398002 GHz
60 dBµV									
50 dBµV									
					•				
40 dBµV					marken				
30 dBµV		and a statement of	www.es.commen.com		- m	Service and		atta con A	
	. M. Mar	t v ty v to the second second	Prove of the second sec				h . we de general de series de	and the second	dam Marringer
20 dBµV									
10 dBµV									
0 devu-									
0 dBµV									
-10 dBµV									
CF 4.804 GHz		-	1001 pt	s	1	.0 MHz/			Span 10.0 MHz

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							ç	Spuriou	s – Peak
MultiView	B Spectrum	x Sp	ectrum 2	X Spect	rum 3 🛛 🕱	2			▽
Ref Level 80. Att	.00 dBµV		1 MHz	Auto Sweep		1	Fn	equency 5 90	900000 GHz
Input 1 Frequency S	1 AC PS	Off Note	h Off	nato enrop				Equency 5.5.	• 1Pk Max
								M1[1]	39.49 dBµV 5.9727173 GHz
70 dBµV									
60 dBµV									
00 0844									
50 dBµV									
40.40.41	M1								
40 dBµV		munumuna	anyma	muluhan	former formendat	Margaren Margare	Munihard and and	North Maria	Margan to Marshall
30 dBµV							A CHIEF OF COM		arthada a tita
20 dBµV									
20 06/14									
10 dBµV									
0.40.41									
0 dBµV									
-10 dBµV									
CF 5.99 GHz			1001 pt	s	5	5.0 MHz/		S	pan 50.0 MHz
							Spu	rious –	Average
MultiView	Spectrum	X Sp	ectrum 2	x Spect	rum 3 🗊	Ĵ			
Ref Level 80.	.00 dBµV	● RBW	/ 1 MHz	<u> </u>	SGL				
Att Input 1 Frequency S	1 AC PS	1.01 ms ● VBW Off Note	r 3 MHz Mode nh Off	Auto Sweep	Count 100/100		Fn	equency 5.99	000000 GHz
z noquene, e								M1[1]	26.88 dBµV .9944456 GHz
70 dBµV									13944430 012
60 dBµV									
50 dBµV									
40 dBµV									
30 dBµV									
rynniniany	and a mar a faller	www.www.	an gradient	innerthe	alenhoursen	man when	montering	mandersonanterior	Management
20 dBµV									
10 dBµV									
						1	-	1	
0 dBµV									
0 dBµV									

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#### • BLE \_ Middle frequency

				ç	Spurious - Pea
MultiView 🗄 Spectr	um 🕱 Spectrum 2	X Spectru	m 3 🕱		_ ▽
Ref Level 80.00 dBµV	RBW 1 MHz	le Auto Sweep			equency 4.8840000 GHz
Input 1 AC P	S Off Notch Off	e Auto Sweep		FI-	• 1Pk Max
					M1[1] 44.83 dBµV 4.88403996 GHz
10 dBµV					
0 dBµV					
0 dBµV					
and which have been and		a summer a	when we down as		
D dBUV			Stand Stranger	montherman	mandadhar Angersanan sana
0 dBµV					
0 dBµV					
0 dBµV					
dBµV					
10 dBµV					
F 4.884 GHz	1001 p	its	1.0 MHz/		Span 10.0 MHz
				Sou	rious - Averag
				Spu	nous - Averag
MultiView 🕀 Spectr		Spectru			$\nabla$
Ref Level 80.00 dBµV Att 0 dB S Input 1 AC P	● RBW 1 MHz WT 1.01 ms ● VBW 3 MHz Mod S Off Notch Off	Ie Auto Sweep Co	L unt 100/100	Fr	equency 4.8840000 GHz
Frequency Sweep					• 1Rm Avg M1[1] 37.14 dBµV
0 dвµv					4.88386014 GHz
0 dBµV					
0 dBµV					
0 dBµV					
0 dвµV			man and a second		
and the second second	den har and an and a second		Junghan	man and and a start and a	phones and a second sec
0 dBµV					
0 dBµV					
і dBµV					
dBμV					

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							S	Spuriou	s – Peal
MultiView	Spectrum	x Sp	ectrum 2	X Spect	rum 3 🛛 🗴	2			▽
Ref Level 80.0 Att	0 dB SWT	1.01 ms 🖷 VBW		e Auto Sweep		_	Fr	equency 5.99	900000 GHz
Input I Frequency Sv	1 AC PS weep	Off Notd	h Off					M1[1]	• 1Pk Max 40,50 dBµV
									5.9811089 GHz
70 dBµV									
60 dBµV									
50 dвµV									
			M1						
40 dBµV	Auron	munnage	Monutan	wellowendow	www.hunowyead	mar and the Unit			1
м.Агултана 10 dBµV	entran.						A-Rollford and	wonanternative	and a start and a second
20 dBµV									
10 dBµV									
) dBµV									
-10 dBµV									
CF 5.99 GHz			1001 pt	ts	5	.0 MHz/			Span 50.0 MHz
							Sou	rious –	Average
						_	opu	nous	
MultiView 8 Ref Level 80.0	Spectrum		ectrum 2 1 MHz		rum 3 🛛 🛛 SGL				▽
Att Input	0 dB SWT 1 AC PS	1.01 ms ⊕ VBW Off Notd	3 MHz Mod		Count 100/100		Fr	equency 5.99	900000 GHz
Frequency S	weep							M1[1]	
70 dBµV									5.9737662 GHz
50 dBµV									
50 dBµV									
40 dBµV									
30 dBµV	Market Market	and the second second	www.www.	month	when when we	man war			
20 dBµV	- Alexandra						. Mannenghing	andersagraphi	p~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
10 dBµV									
u sopr									
0 dBµV									
-10 dBµV									
			1001 pt		-	.0 MHz/	1		Span 50.0 MHz

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#### • BLE \_ High frequency

						F	Restrict	ed Ba	and – Pea
1ultiView 🎛	Spectrum	Spectru	m 2 🕱	Spectrum 3	X Spectru	um 4 🕱	1		⊽
Ref Level 87 Att Input		「 1.01 ms ⊜ VBV		e Auto Sweep			Fr	equency 2	2.4917500 GH
Frequency								Letter 1	•1Pk Max
0 dBµV								1[1]	28.60 dBµ 2.4845302 GH
o app v									
0 dBµV									
) dBµV									
) dBµV									
) dBµV									
) dвµV									
munulipu	multin	hand	whenever	www.www.uww	hymner	eles. Marther and Mart	growmall the	mounth	half the molecular
) dBµV									
) dBµV									
dBµV									
10 dBµV									
1005									
.4835 GHz			1001 pt	s	1	.65 MHz/			2.5 GH:
2.4835 GHz			1001 pt	S	1.		tricted	Band	2.5 GH2 - Averag
						Rest	tricted	Band	- Averaç
IultiView	Spectrum	X Spectru	m 2 🕱	Spectrum 3	X Spectru	Rest	tricted	Band	
IultiView Ref Level 87 Att	Spectrum 7.00 dBµV		m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest			- Averaç
IultiView Ref Level 87 Att Input	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averaç
IultiView E Ref Level 83 Att Input Frequency	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr		- Averac
IultiView E Ref Level 83 Att Input Frequency	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
Ref Level 87 Att Input Frequency	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView Ref Level 87 Ref Level 87 Att Input Frequency 0 dBµV	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView Ref Level 8: Att Input Frequency d dbµV	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView Ref Level 8: Att Input Frequency J J dBµV J dBµV	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView Ref Level 8: Att Input Frequency J J dBµV J dBµV	Spectrum 7.00 dBµV 0 dB SW 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView Ref Level 8: Att Input Frequency d dbµV d dbµV d dbµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView Ref Level 8: Att Input Frequency d dBµV d dBµV d dBµV d dBµV d dBµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
iultiView Ref Level 8: Att Процt Frequency d dbµV d dbµV d dbµV d dbµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView           Ref Level 8: Att           Input           Frequency           d dbµv           d dbµv           d dbµv           d dbµv           d dbµv           d dbµv	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView           Ref Level 8: Att Input           Trequency           d вµv	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView           Ref Level 8: Att Input           Frequency           0 dBµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView           Ref Level 8: Att Input           Frequency           0 dBµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView           Ref Level 8: Att Input           2 dBµV           2 dBµV           2 dBµV           3 dBµV           3 dBµV           4 dBµV           4 dBµV           5 dBµV           6 dBµV           7 dBµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
IultiView           Ref Level 8: Att Input           2 dBµV           2 dBµV           2 dBµV           3 dBµV           3 dBµV           4 dBµV           4 dBµV           5 dBµV           6 dBµV           7 dBµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3	X Spectra SGL	Rest	Fr	requency	- Averag .4917500 GH
2.4835 GHz           AultiView           Ref Level 8:           Att           Input           Frequency           0 dBµV           0 dBµV	Spectrum 7.00 dBµV 0 dB SW1 1 AC PS	● RBV	m 2 🗶 🕅	Spectrum 3 e Auto Sweep	SGL Count 100/100	Rest	Fr	requency	- Averag .4917500 GH

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						S	Spuriou	s – Peal
MultiView 🕀 Sı	ectrum 🕱 S	pectrum 2	X Spectr	rum 3 🛛 🕅	2			▽
Ref Level 80.00 dBµ Att 0 d	B SWT 1.01 ms ⊕ VB	W 1 MHz W 3 MHz Mode /	Auto Sweep		_	Fre	equency 4.96	500000 GHz
Input 1 A Frequency Sweep	C PS Off No	tch Off					M1[1]	<ul> <li>1Pk Max</li> <li>43.52 dBμV</li> </ul>
								95997003 GHz
70 dBµV								
50 dBµV								
0 dBµV								
			law marine					
to dBUV	What and and a grant of	howallywan	. Martin Com		enclipped bach	anger strategyer and	rthalana	Whatle with MA
10 dBµV								
20 dBµV								
.0 dBµV								
) dBµV								
10 dBµV								
F 4.96 GHz		1001 pts		1	.0 MHz/		S	pan 10.0 MHz
						Sou	rious –	Average
					_	opu	1000	
MultiView :: S Ref Level 80.00 dB		pectrum 2 W 1 MHz	Spectr	<b>'um 3</b> SGL				▽
Att 0 c Input 1 A	B SWT 1.01 ms ⊕ VB C PS Off No	W 3 MHz Mode /				Fre	equency 4.96	500000 GHz
I Frequency Sweep							M1[1]	<ul> <li>1Rm Avg</li> <li>36.13 dBµV</li> </ul>
70 dBµV							4.	95984016 GHz
i0 dBµV								
60 dBµV								
40 dBµV			M1					
			MI	and the second se				
30 dBµV	www.warmana	mad more and more and		- A an	mannen	nanstannaturati	manyahanana	anter montantante
20 dBµV								
LO dBµV								
10 VOUY								
) dBµV								
-10 dBµV								
CF 4.96 GHz		1001 pts		1	.0 MHz/		S	pan 10.0 MHz

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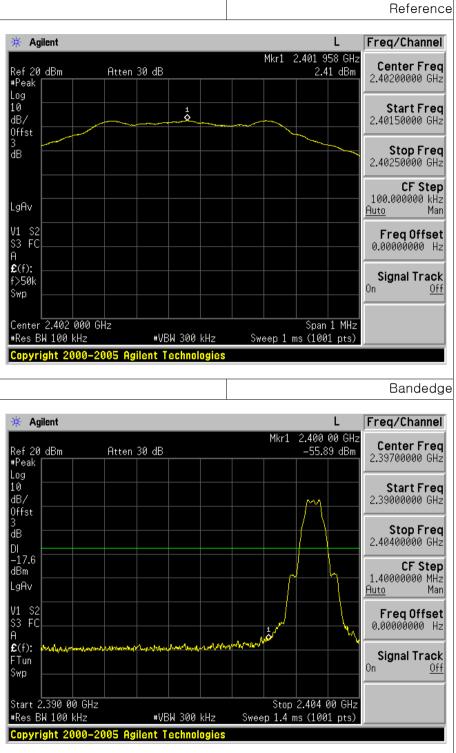
							9	Spuriou	s – Peal
MultiView E	Spectrum	x Sp	ectrum 2	X Spect	rum 3 🛛 🗴	3			▽
Ref Level 80.00 Att	D dBµV 0 dB SWT	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode			1	Fn	equency 5.99	900000 GHz
Input I Frequency Sw	1 AC PS	Off Notd	h Off				1		• 1Pk Max
								M1[1]	39.93 dBµV 5.9980420 GHz
70 dBµV									
60 dBµV									
50 dBµV									
40 dBµV						M1			
- Marchanner	www.	redgilige Westermell	man yuu	howwww.	and an and a stranged	remember	Muranertonia	rembershand	whenter
30 dBµV									
20 dBµV									
20 0004									
10 dBµV									
0 dBµV									
0.0904									
-10 dBµV									
CF 5.99 GHz			1001 pt	s	5	.0 MHz/		5	pan 50.0 MHz
							Spu	rious –	Average
10 10 C	You I			(m) (m and		3			v
Ref Level 80.00	D dBµV	● RBW	ectrum 2 1 MHz		SGL				
Att Input I Frequency Sw	1 AC PS	1.01 ms ● VBW Off Notd	3 MHz Mode h Off	Auto Sweep	Count 100/100		Fn	equency 5.99	900000 GHz
in requercy of	reep							M1[1]	26.97 dBµV 3.9775125 GHz
70 dBµV									5.9773123 GHZ
60 dBµV									
50 dBµV									
40 dBµV									
30 dBµV		Ma							
Munderstowner	man Mr. Mr.	muniter	MUMMM	muhanna	mmun	Margan Margar	Munan	young	an an an an
20 dBµV									
10 dBµV									
0 dBµV									
-10 dBµV									
-									
CF 5.99 GHz			1001 pt	<u> </u> s	5	.0 MHz/		5	pan 50.0 MHz

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#### 9.7 Test Plot for Conducted Spurious Emission

BLE \_ Low frequency



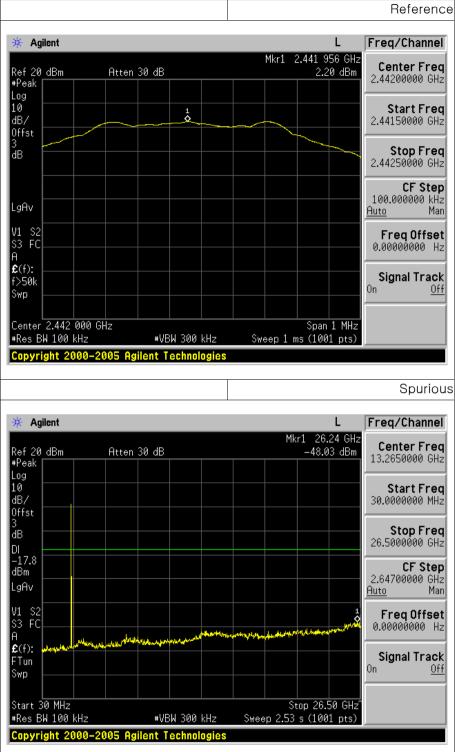
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					Spurio
K Agilent				L	Freq/Channe
ef 20 dBm Peak	Atten 30 dB		Mł	r1 26.18 GHz -48.09 dBm	Center Fre 13.2650000 GH
og Ø B/ ffst					Start Fre 30.0000000 MH
в					Stop Fre 26.5000000 GH
17.6 Bm gAv					<b>CF Stej</b> 2.64700000 GH <u>Auto</u> Ma
1 S2 3 FC	LASS YOU MAR AND A SIGN FOR PAR	الله به معالم المراسم ما المراجع المحافظ المجامع	ل ومن الله من المناسب المن المن المن المن المن المن المن المن	1 Aufhan day hadan harring and A	FreqOffse 0.00000000 H
(f): Martin (f): Tun Wp					<b>Signal Trac</b> On <u>Of</u>
tart 30 MHz Res BW 100 kHz	#VB	W 300 kHz		top 26.50 GHz^ s (1001 pts)	



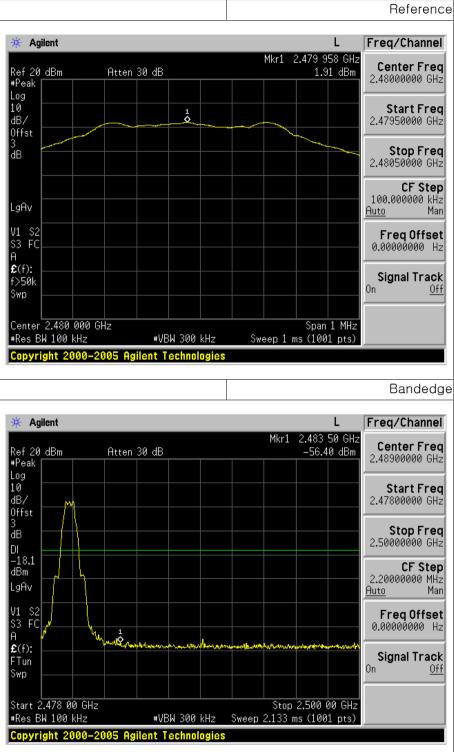
• BLE \_ Middle frequency



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BLE \_ High frequency



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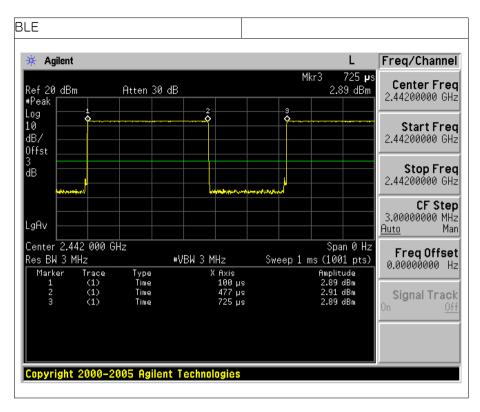


					Spurio
Agilent				L	Freq/Channe
ef 20 dBm Peak	Atten 30 d	B	Mk	r1 25.89 GHz -47.71 dBm	Center Fred 13.2650000 GH:
og 0 B/ ffst					Start Fred 30.0000000 MH:
в					Stop Fred 26.5000000 GH
18.1 Bm gAv					<b>CF Step</b> 2.64700000 GH: <u>Auto</u> Ma
1 \$2 3 FC		upper comments	مهروبه المراجع المحالي والمراجع	Halley and a start of the	Freq Offse 0.00000000 Ha
(f): Tun Wp					<b>Signal Tracl</b> On <u>Of</u>
tart 30 MHz Res BW 100 kHz	#	VBW 300 kHz		top 26.50 GHz^ s (1001 pts)	

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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.

Frequency Range (MHz)	Conducted Limit (dBuV)			
Frequency Range (MHZ)	lz) 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.
- 2. 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.

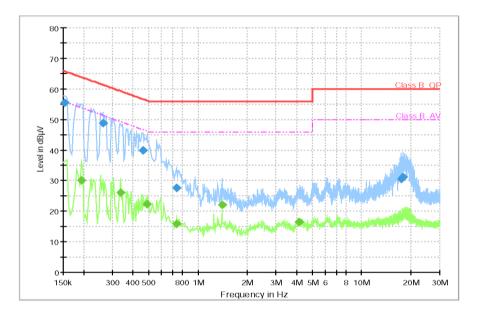
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#### 10.4 Test Result

• AC Line Conducted Emission (Graph)

#### SP139\_BLE\_L1



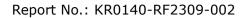
# **Power Interference**

Final	Result
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Frequency	QuasiPeak	CAverage	Limit	Margin	Bandwidth	Line	Filter
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dB)	(kHz)		
0.154	55.51		65.78	10.27	9	L1	ON
0.194		30.02	53.86	23.85	9	L1	ON
0.262	48.73		61.37	12.64	9	L1	ON
0.338		26.09	49.25	23.16	9	L1	ON
0.462	40.00		56.66	16.66	9	L1	ON
0.486		22.29	46.24	23.95	9	L1	ON
0.740	27.55		56.00	28.45	9	L1	ON
0.740		15.88	46.00	30.12	9	L1	ON
1.400		22.00	46.00	24.00	9	L1	ON
4.120		16.58	46.00	29.42	9	L1	ON
17.450	30.47		60.00	29.53	9	L1	ON
17.820	31.20		60.00	28.80	9	L1	ON

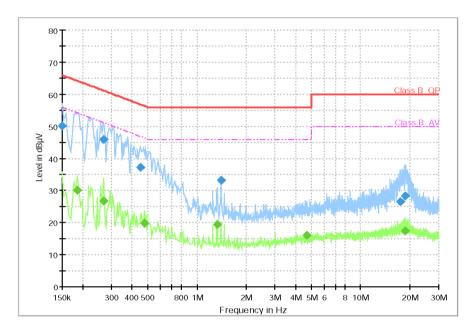
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#### SP139\_BLE\_N



# **Power Interference**

Ein	ы	Result
Fin	a	Result

I III III III III III III III III III	<u> </u>						
Frequency	QuasiPeak	CAverage	Limit	Margin	Bandwidth	Line	Filter
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dB)	(kHz)		
0.150	50.16		66.00	15.84	9	Ν	ON
0.186		30.17	54.21	24.04	9	Ν	ON
0.270		26.74	51.12	24.38	9	Ν	ON
0.270	45.86		61.12	15.26	9	Ν	ON
0.450	37.26		56.88	19.61	9	Ν	ON
0.478		19.81	46.37	26.56	9	Ν	ON
1.330		19.42	46.00	26.58	9	Ν	ON
1.400	33.24		56.00	22.76	9	Ν	ON
4.710		16.11	46.00	29.89	9	Ν	ON
17.530	26.47		60.00	33.53	9	Ν	ON
18.750	-	17.44	50.00	32.56	9	Ν	ON
18.750	28.34		60.00	31.66	9	N	ON

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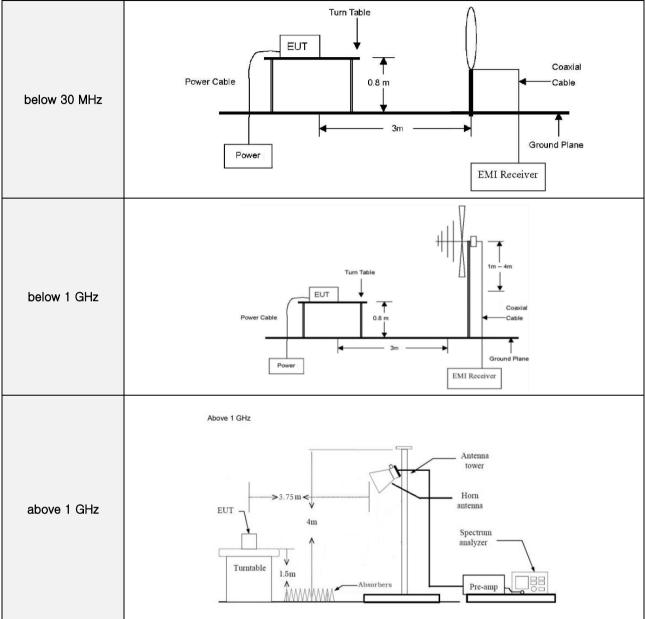
APPENDIX I

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		