

# **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

Product Name:	Mobile phone
FCC ID:	APYHRO00255
Report No.:	ER/2017/90121
Issue Date:	Oct. 26, 2017
FCC Rule Part:	§15.247, Cat: DTS
Prepared for:	Sharp Corporation, IoT Communication B.U. 2-13-1, Hachihonmatsu-Iida, Hi- gashi-hiroshima-shi, Hiroshima 739-0192, Japan
Manufacturer:	Sharp Corporation 1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522,Japan
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803
TAF Testing Laboratory 0513	<b>Note:</b> This report shall not be reproduced except in full, without the written approval of SGS Taiwan Ltd. This document may be altered or revised by SGS Taiwan Ltd. personnel only, and shall be noted in the revision section of the document.

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# VERIFICATION OF COMPLIANCE

Applicant:	Sharp Corporation, IoT Communication B.U. 2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima 739-0192, Japan
Manufacturer:	Sharp Corporation 1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522,Japan
Product Name:	Mobile phone
FCC ID:	APYHRO00255
Report Number:	ER/2017/90121
Date of test:	Sep. 15, 2017~ Oct. 13, 2017
Date of EUT Received:	Sep. 15, 2017

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Ton Lis	Date:	Oct. 26, 2017
-	Tin Lin / Engineer		
Prepared By:	Stefanie Yu	Date:	Oct. 26, 2017
_	Stefanie Yu / Clerk		
Approved By:	Jun Chang	Date:	Oct. 26, 2017
—	Jim Chang / Asst. Manager		

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# **Revision History**

Report Number	Revision	Description	Issue Date
ER/2017/90121	Rev.00	Initial creation of document	Oct. 26, 2017

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#### **GENERAL INFORMATION** 1

### **1.1 Product Description**

General:

Product Name:	Mobile phone		
Hardware Version:	DVT		
Software Version:	N/A		
Davies Question	3.85V from Rechargeable Li-ion Battery		
Power Supply:	Battery:	Mode No.: SHF34UAA, Supplier: SHARP CORPORATION	

### Bluetooth Low Energy:

Bluetooth Version:	Bluetooth V4.2 LE Single mode		
Channel number:	40 channels		
Modulation type:	GFSK		
Transmit Power:	6.07 dBm		
Frequency Range:	2402 – 2480MHz		
Antenna Designation:	ILA Antenna, Gain: 1.6dBi		

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### 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance.

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

### **1.3 Test Facility**

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Registration Number and Designation number are: 509634 / TW 0001

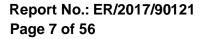
### **1.4 Special Accessories**

There are no special accessories used while test was conducted.

### **1.5 Equipment Modifications**

There was no modification incorporated into the EUT.

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# 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

### 2.4 Measurement Results Explanation Example

### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

### Note:

The spectrum analyzer offset is derived from RF cable loss 1 dB.

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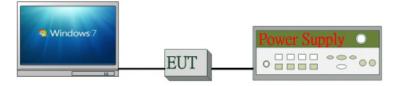


### 2.5 Configuration of Tested System

### Fig. 2-1 Radiated & AC Power Line Conducted Emission



### Fig 2-2 Conducted (Antenna Port) Emission



### Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Soft- ware	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	MY40000811	N/A	Unshielded
3.	Notebook	Lenovo	L430	P0000081	Shielded	Unshielded

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#### SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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#### **DESCRIPTION OF TEST MODES** 4

### 4.1 Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
0	2402 MHz	14	2430 MHz	28	2458 MHz
1	2404 MHz	15	2432 MHz	29	2460 MHz
2	2406 MHz	16	2434 MHz	30	2462 MHz
3	2408 MHz	17	2436 MHz	31	2464 MHz
4	2410 MHz	18	2438 MHz	32	2466 MHz
5	2412 MHz	19	2440 MHz	33	2468 MHz
6	2414 MHz	20	2442 MHz	34	2470 MHz
7	2416MHz	21	2444 MHz	35	2472 MHz
8	2418 MHz	22	2446 MHz	36	2474 MHz
9	2420 MHz	23	2448 MHz	37	2476 MHz
10	2422 MHz	24	2450 MHz	38	2478 MHz
11	2424 MHz	25	2452 MHz	39	2480 MHz
12	2426 MHz	26	2454 MHz		
13	2428 MHz	27	2456 MHz		

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### 4.2 The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- 2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

### **RADIATED EMISSION TEST:**

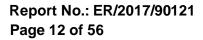
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)		
	RADIATED EMISSION TEST (BELOW 1 GHz)					
Bluetooth LE	0 to 39	0,19,39	GFSK	1		
	RADIATED EMISSION TEST (ABOVE 1 GHz)					
Bluetooth LE	0 to 39	0,19,39	GFSK	1		
<b>Note:</b> The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth LE Transmitter for channel Low, Mid and High, the						

worst case H position was reported.

### ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST							
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)			
Bluetooth LE	0 to 39	0,19,39	GFSK	1			

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#### **MEASUREMENT UNCERTAINTY** 5

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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#### 6 CONDUCTED EMISSION TEST

# 6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range	Limits dB(uV)					
MHz	Quasi-peak	Average				
0.15 to 0.50	66 to 56	56 to 46				
0.50 to 5	56	46				
5 to 30	60	50				
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.						

### 6.2 Measurement Equipment Used:

Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2016	12/11/2017			
Coaxial Cables N/A		N30N30-1042-150cm	N/A	08/30/2017	08/29/2018			
LISN	Schwarzbeck	NSLK 8127	8127-648	06/18/2017	06/17/2018			
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.			

### 6.3 EUT Setup:

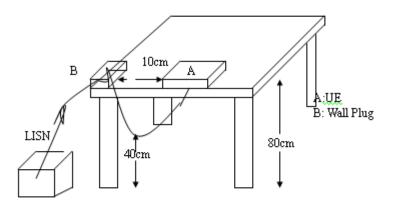
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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# 6.4 Test SET-UP (Block Diagram of Configuration)



### 6.5 Measurement Procedure:

- 1. The EUT was placed on a table which is 0.8m above ground plan.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed

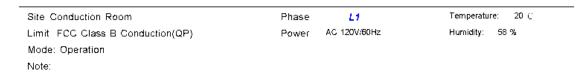
### 6.6 Measurement Result:

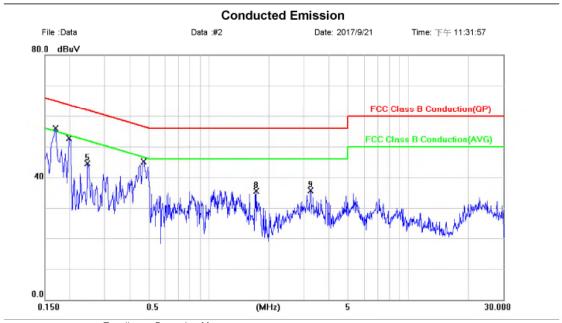
Note: Refer to next page for measurement data and plots. Note2: The \* reveals the worst-case results that closet to the limit.

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# AC POWER LINE CONDUCTED EMISSION TEST DATA



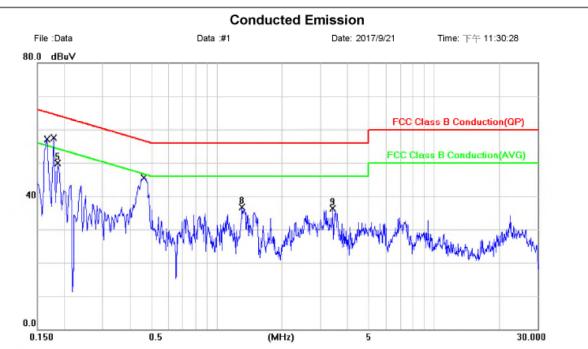


No.	Mk.	Freq	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1		0.1700	51.60	0.07	51.67	64 96	-13 29	QP		
2		0.1700	33.60	0.07	33.67	54.96	-21.29	AVG		
3		0.1980	47.00	0.07	47.07	63.69	-16.62	QP		
4		0.1980	31.50	0.07	31.57	53.69	-22.12	AVG		
5		0.2460	44.45	0.07	44.52	61.89	-17.37	peak		
6		0.4700	43.60	0.08	43.68	56.51	-12.83	QP		
7	•	0.4700	35.80	0.08	35.88	46.51	-10.63	AVG		
8		1.7260	35.35	0.10	35.45	56.00	-20.55	peak		
9		3.2300	35.48	0.17	35.65	56.00	-20.35	peak		

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Site Conduction Room	Phase: N	Temperature: 20 (1
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode Operation		
Note		



No.	MK.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1660	50.40	0.07	50.47	65.16	-14.69	QP	
2		0.1660	34.00	0.07	34.07	55.16	-21.09	AVG	
3		0.1780	51.90	0.07	51.97	64 58	-12.61	QP	
4		0.1780	35.40	0.07	35.47	54.58	-19.11	AVG	
5		0.1860	49.88	0.07	49.95	64.21	-14.26	peak	
6		0.4660	44.10	0.08	44.18	56.58	-12.40	QP	
7	•	0.4660	35.60	0.08	35.68	46.58	-10.90	AVG	
8		1.3140	36.65	0.10	36.75	56.00	-19.25	peak	
9		3.4340	36.05	0.18	36.23	56.00	-19.77	peak	

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#### PEAK OUTPUT POWER MEASUREMENT 7

# 7.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

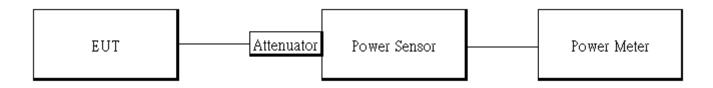
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

### 7.2 Measurement Equipment Used:

Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018				
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018				
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018				
Coaxial Cable 30cm	WOKEN	00100A1F1A1 95C	RF01	12/12/2016	12/11/2017				
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017				
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/12/2016	12/11/2017				
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017				
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018				

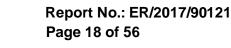
### 7.3 Test Set-up:



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### 7.4 Measurement Procedure:

- 1.Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

### **Power Meter:**

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Power Meter.

5.Repeat above procedures until all test default channel measured was complete.

### Formula:

Duty Cycle = Ton / (Ton+Toff)

# **Duty Factor:**

	Duty Cycle (%)	Duty Factor (dB)
BLE	62.56	2.04



# Duty Cycle Factor:10\*log(1/(62.56/100))=2.04

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DIE mode

#### 7.5 **Measurement Result:**

BLE mode:			
СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
0	2402	5.79	1 Watt = 30 dBm
19	2440	6.07	1 Watt = 30 dBm
39	2480	5.90	1 Watt = 30 dBm
BLE mode:			
СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
0	2402	5.65	1 Watt = 30 dBm
19	2440	5.93	1 Watt = 30 dBm
39	2480	5.77	1 Watt = 30 dBm

\*Note: Measured by power meter, cable loss as 11.5 dB that offsets on the power meter \*Note: Measured by power meter, as Duty cycle factor that offsets on the power meter in Peak. \*Note: Max. Output include tune up tolerance Power is average power

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#### 8 6DB BANDWIDTH MEASUREMENT

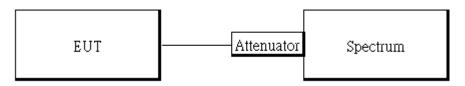
### 8.1 Standard Applicable

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

### 8.2 Measurement Equipment Used

Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018				
Coaxial Cable 30cm	WOKEN	00100A1F1A195 C	RF01	12/12/2016	12/11/2017				
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017				
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017				
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017				
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018				

### 8.3 Test Set-up:



### 8.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. For 6dB Bandwidth:

Set the spectrum analyzer as RBW=100 kHz, VBW= 3\*RBW, Span = 5MHz, Detector=Peak, Sweep=auto.

- 5. Mark the peak frequency and –6dB (upper and lower) frequency.
- 6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW=3\*RBW, Span = 2MHz, Detector=Sample, Sweep=auto.

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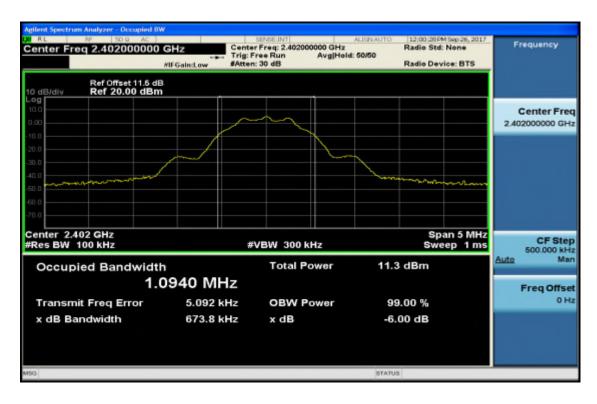
- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all test default channel is completed

### 8.5 Measurement Result:

BLE mode			
Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	0.674	> 0.5	PASS
2440	0.673	> 0.5	PASS
2480	0.675	> 0.5	PASS

Note: Refer to next page for plots.

# 6dB Band Width Test Data CH-Low



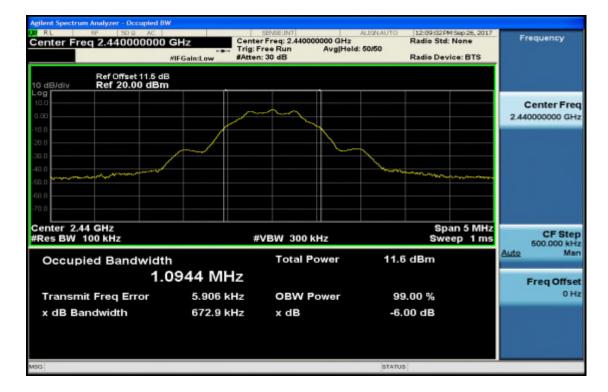
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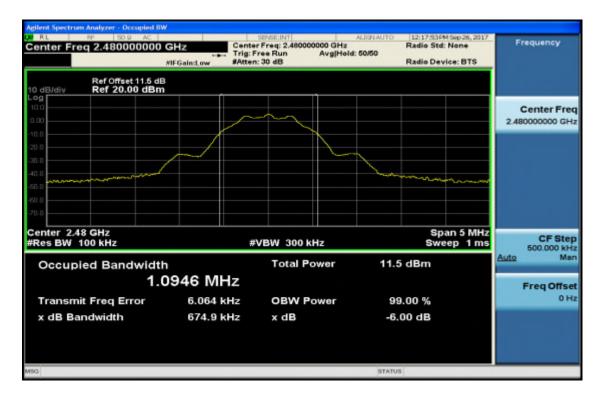
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### 6dB Band Width Test Data CH-Mid



# 6dB Band Width Test Data CH-High



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#### CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT 9

### 9.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Conducted Emission Test Site										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018					
Coaxial Cable 30cm	WOKEN	00100A1F1A1 95C	RF01	12/12/2016	12/11/2017					
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017					
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/12/2016	12/11/2017					
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017					
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018					

### 9.2 Measurement Equipment Used:

### 9.3 Test SET-UP:



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### 9.4 Measurement Procedure

### **Band Edge Limit Calculation:**

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

### **Conducted Band Edge:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
- 6. Mark the highest reading of the emission as the reference level measurement.
- 7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
- 8. Repeat above procedures until all default test channel (low, middle, and high) was complete.



### **Conducted Spurious Emission:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set RBW = 100 kHz & VBW=300 kHz, Detector = Peak, Sweep = Auto
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

### 9.5 Measurement Result

Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit = PSD - 20dB (dBm)							
2402	4.76	-15.24							
2480	5.00	-15.00							

### **Band Edgo Limit**

NOTE: cable loss as 11.5dB that offsets in the spectrum NOTE: Refer to next page for plots.

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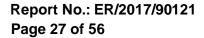
### Power Spectral Density for Bandedge Limit (CH-Low)



# Power Spectral Density for Bandedge Limit (CH-High)

RL NF 50.0 AC	GHz	SENSE:INT	Avg Type: Log-Pwr	12:18:56 PM 5ep 26, 2017 TRACE 2 2 3 4 5 5	Frequency
		Free Run n: 30 dB		DET P N DI N N	
Ref Offset 11.5 dB			Mkr1 2	.480 004 5 GHz 5.01 dBm	Auto Tu
		1			Center Fr 2.480000000 G
					Start Fr 2.479250000 0
					Stop Fr 2.480750000 0
					CF S 150.000 Auto
					Freq Off
art 2.4792500 GHz tes BW 100 kHz	#VBW 300 F	<h7< td=""><td>Sweep 1</td><td>op 2.4807500 GHz .000 ms (1001 pts)</td><td></td></h7<>	Sweep 1	op 2.4807500 GHz .000 ms (1001 pts)	

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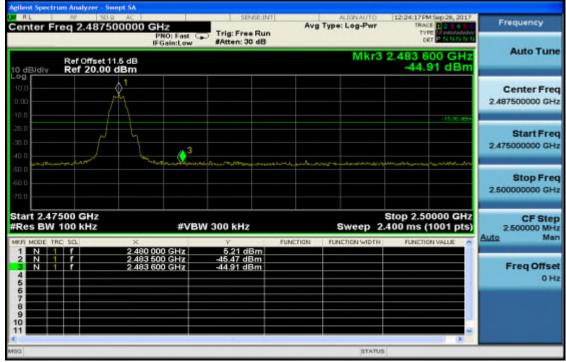




### BT4.0 mode **Band Edges Test Data CH-Low**

Ref Offset 11.5 dB 0 dBJdiv Ref 20.00 dBm 0 0 100	PND: East C Tri	g: Free Run tten: 30 dB	Avg 1	ALIGNAUTO	TYPE DET		Frequency Auto Tur Center Fre 2.360000000 Ge
Ref Offset 11.5 dB 0 dBJdiv Ref 20.00 dBm 0 0 100				Mk	067 <b>r3 2,390</b>	P NNR N 0 GHz 8 dBm ∲ <sup>1</sup>	Center Fre
0 dBJdiv Ref 20.00 dBm				Mk		8 dBm	Center Fre
10.0 0.00 0.00 20.0						-15.24.05%	
20.0						-15.24 (5%	
	وراري والمحر ويترار مهر وعاريده				3	2	Start Fre 2.310000000 G
							Stop Fr 2.410000000 G
tart 2.31000 GHz Res BW 100 kHz	#VBW 300	) kHz		Sweep 9	Stop 2.41 600 ms (1	001 pts)	CF St 10.000000 M
KR MODE THE SEL X	0 GHz	y 1.99 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	WALLE A	Auto M
2 N 1 f 2,399 3 N 1 f 2,390 4 5	9 GHz -43	3.68 dBm 1.28 dBm					Freq Offs 0
6 7 8 9 9							
						*	

# Band Edges Test Data CH-High



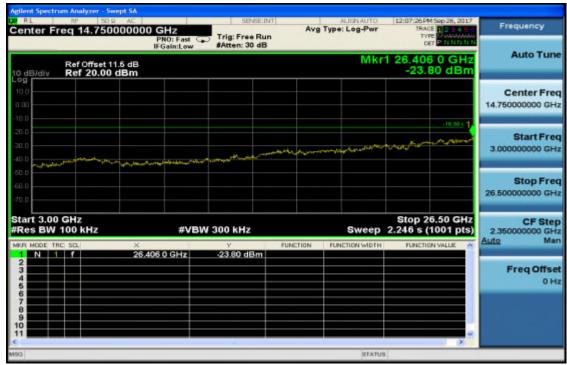
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# **Conducted Spurious Emission Measurement Result** CH-Low 30MHz - 3GHz

RL 199 909 AC Center Freq 1.515000000	PNO: Fast	Trig: Free Run #Atten: 30 dB	Aug Type: Log-Pwr		Frequency
Ref Offset 11.5 dB	N GOMECH		M	kr1 2.403 0 GHz 3.42 dBm	Auto Tun
0.0				<u> </u>	Center Fre 1.515000000 GH
20 D 30 D 40 D		ىق بىرا بىلا بىلەر بىلەر بىلەر بىلەر بىلەر بىلەر بىلەر		-16.50 05%	Start Free 30.000000 MH
	inen salarung self dar berkenigadur by				Stop Fre 3.000000000 GH
tart 30 MHz Res BW 100 kHz			Sweep	Stop 3.000 GHz 283.9 ms (1001 pts)	CF Ste 297.000000 MH Auto Ma
1 N 1 f 2 3 4 5 5 7	2.403 0 GHz	3,42 dBm			Freq Offse 0 H
8 9 10					

# CH-Low 3GHz – 26.5GHz



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# CH-Mid 30MHz – 3GHz

Agilent Spectrum Analyzer - Swept SA						
Center Freq 1.515000000	GHz		ALIGNAUTO	12:12:41PM Sep 26, 2 TRACE	50	Frequency
Ref Offset 11.5 dB	PNO: Fast Trig: Fre IFGain:Low #Atten: 3		Mk	r1 2,438 7 G		Auto Tune
10 dB/div Ref 20.00 dBm				5.29 dB	m	
10.0 10.0 10.0				• <sup>1</sup>		Center Freq 1.515000000 GHz
-70.0				-14.71		
-30.0	والمحافظ والمحافظ والمحافظ والمحافظ والمحافظ		الم			Start Freq 30.000000 MHz
.50 0						Stop Freq 3.000000000 GHz
Start 30 MHz #Res BW 100 kHz	#VBW 300 kH	z	Sweep 2	Stop 3.000 G 83.9 ms (1001 p	ts)	CF Step 297.000000 MHz
MKR MODE TRC SD. X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	~	Auto Man
1 N 1 F 2, 2 3 4 4 5 6	438 7 GHz 5.29 d	IBm				Freq Offset 0 Hz
7 8 9 10 11						
MSG			STATUS	1		

# CH-Mid 3GHz – 26.5GHz

Agilent Spectr	um Analyzer - Swept !						
11.00	req 14.750000	0000 GHz	Trig: Free Ru	Avg	Type: Log-Pwr	12:15:22PM Sep 26, 201 TRACE 1 2 54 TYPE PLOADOUT	Frequency
10 dB/div	Ref Offset 11.5 c Ref 20.00 dB	IFGain:Low	BAtten: 30 db		Mkr	1 26.429 5 GH -24.52 dBr	Auto Tune
10.0 0.00							Center Freq 14.75000000 GHz
-20.0	er Aleman and and		من المراجع الم	مه و الم	and the second	-1421	Start Freq 3.00000000 GHz
-50.0							Stop Free 26.500000000 GH;
Start 3.00 #Res BW	100 kHz	#VB	W 300 kHz	FUNCTION	Sweep	Stop 26.50 GH 2.246 s (1001 pts	
1 N 1 2 3 4 5 6 6 7 7 8 9 10 11		26.429 5 GHz	-24.52 dBm	PUNCTION	PORCHORWEDTH	TONE TION VALUE	Freq Offset 0 Hz
493					STATUS	1	

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# CH-High 30MHz – 3GHz

Agilent Spects	rum Analyzer - Swept							
Center F	reg 1.515000		SENSE:IN		Type: Log-Pwr	12:24:49 PM Sep 25 TRACE 1		Frequency
Center F	req 1.515000	PNO: Fast IFGain:Low	Trig: Free Run #Atten: 30 dB			DET P TO	uuuuu	
10 dB/div	Ref Offset 11.5 Ref 20.00 dE				Mk	r1 2.480 3 0 4.11 d		Auto Tune
10.0						1		Center Freq 1.515000000 GHz
-10.0	A		المراجع والمراجع المراجع المراجع	و المحمد الم	ور مواليو		0) dän	Start Freq 30.000000 MHz
-50 0 -60 0 -70,0							-	Stop Freq 3.00000000 GHz
Start 30 F #Res BW	100 kHz	#VE	3W 300 kHz	FUNCTION	Sweep 2	Stop 3.000 83.9 ms (1001	pts)	CF Step 297.000000 MHz Auto Man
1 N 2 3 4 5 6 7 8 9 10 11		2.480 3 GHz	4,11 dBm					Freq Offset 0 Hz
MISG .					STATUS			

# CH- High 3GHz – 26.5GHz

Center Freq 14.75	0000000 GHz PN0: Fa	Trig: Free Run #Atten: 30 dB	ALIONAUTO Avg Type: Log-Pwr	12:25:20 PM Sep 25, 2017 TRACE 1 2 3 4 5 4 TYPE PARTY OFT P 1121/21/11	Frequency
Ref Offset	11.5 dB		Mk	r1 26,500 0 GHz -23.42 dBm	Auto Tune
10.0 0.00					Center Fred 14.750000000 GHz
-10.0 -20.0 -30.0	Serie	المياسين المحالية	and the second	-13.00 c 1	Start Free 3.000000000 GHa
-50 0 -60 0 -70 0					Stop Free 26.50000000 GH
Start 3.00 GHz #Res BW 100 kHz	*	VBW 300 kHz	Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2.350000000 GH Auto Mar
1 N 1 F 2 3 4 5 6 7 8 9 10	26,500 0 GH	z .23.42 dBm			Freq Offse 0 H

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# 10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

#### **Standard Applicable** 10.1

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. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz. whichever is lower.

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

### Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level  $(dB\mu V/m) = 20 \log Emission level (dB\mu V/m)$

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#### 10.2 **Measurement Equipment Used**

966 Chamber									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018				
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/201 6	12/22/2017				
<b>Broadband Antenna</b>	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017				
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017				
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018				
Pre Amplifier	EMC Instru- ments	EMC330	980096	12/12/2016	12/11/2017				
Pre Amplifier	EMC Instru- ments	EMC0011830	980199	12/12/2016	12/11/2017				
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017				
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017				
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017				
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017				
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017				
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017				
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017				
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018				
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018				
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018				
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.				
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.				
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.				
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.				

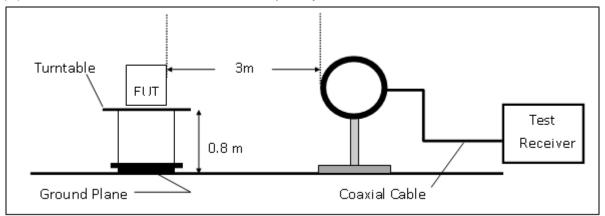
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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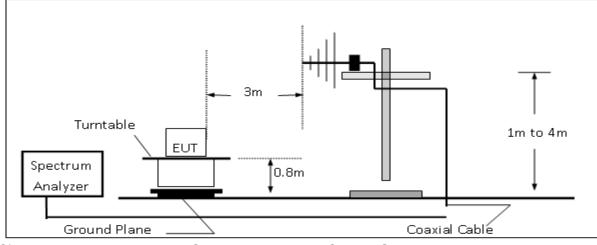


### 10.3 Test SET-UP

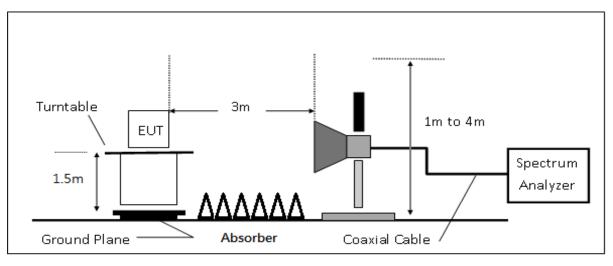
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



### (B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



#### 10.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plan.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 8. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 11. Repeat above procedures until all default test channel measured were complete.

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# 10.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

### FS = RA + AF + CL - AG

Where	8	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

### Note :

"F": denotes Fundamental Frequency.; "H": denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

#### Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz 10.6

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

#### 10.7 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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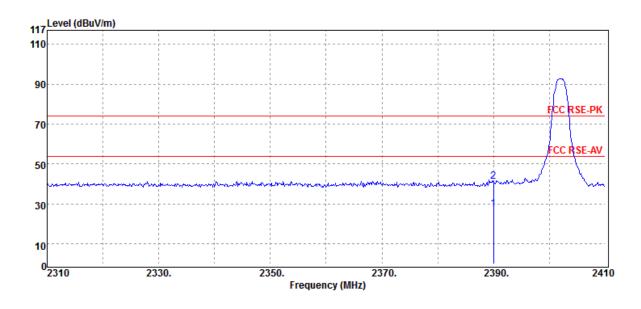
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### **Radiated Band Edge Measurement Result**

**Operation Band** :BLE Fundamental Frequency :2402 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

Test Date :2017-09-25 Temp./Humi. :21 deg\_C / 61 RH Engineer :Tin Measurement Antenna Pol. :VERTICAL



ote Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level		FS	@3m	
I/E/S PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
E Average	29.30	-1.74	27.56	54.00	-26.44
E Peak	42.92	-1.74	41.18	74.00	-32.82
	Mode H/E/S PK/QP/AV E Average	ModeReading LevelI/E/SPK/QP/AVdBμVEAverage29.30	ModeReading LevelI/E/SPK/QP/AVdBμVdBEAverage29.30-1.74	ModeReading LevelFSI/E/SPK/QP/AVdBµVdBdBµV/mEAverage29.30-1.7427.56	ModeReading LevelFS@3mI/E/SPK/QP/AVdBµVdBdBµV/mdBµV/mEAverage29.30-1.7427.5654.00

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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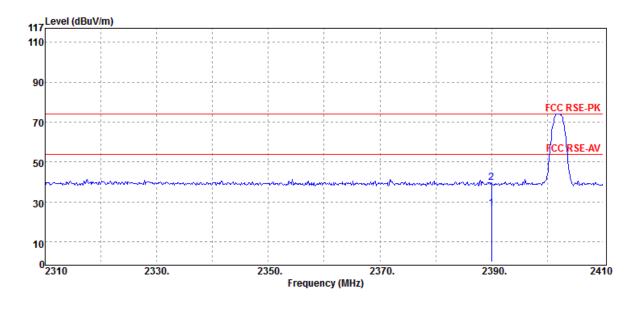


**Operation Band Fundamental Frequency Operation Mode** EUT Pol.

:BLE :2402 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-09-25 :21 deg\_C / 61 RH :Tin :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	28.50	-1.74	26.76	54.00	-27.24
2390.00	E	Peak	41.28	-1.74	39.54	74.00	-34.46

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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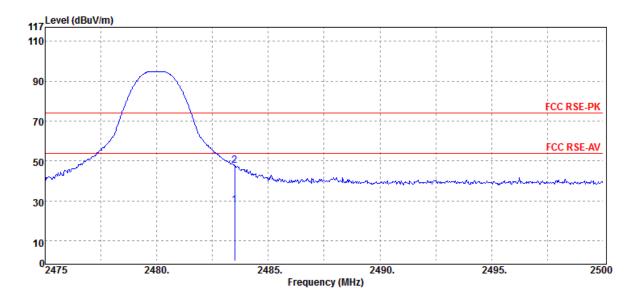


**Operation Band Fundamental Frequency Operation Mode** EUT Pol.

:BLE :2480 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer :Tin Measurement Antenna Pol.

:2017-09-25 :21 deg\_C / 61 RH :VERTICAL



Detector	Spectrum	Factor	Actual	Limit	Margin	
Mode	Reading Level		FS	@3m		
PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
Average	29.65	-1.62	28.03	54.00	-25.97	-
Peak	49.27	-1.62	47.65	74.00	-26.35	
	Mode PK/QP/AV Average	ModeReading LevelPK/QP/AVdBµVAverage29.65	ModeReading LevelPK/QP/AVdBµVdBAverage29.65-1.62	ModeReading LevelFSPK/QP/AVdBµVdBdBµV/mAverage29.65-1.6228.03	Mode         Reading Level         FS         @3m           PK/QP/AV         dBµV         dB         dBµV/m         dBµV/m           Average         29.65         -1.62         28.03         54.00	Mode         Reading Level         FS         @3m           PK/QP/AV         dBµV         dB         dBµV/m         dBµV/m         dB           Average         29.65         -1.62         28.03         54.00         -25.97

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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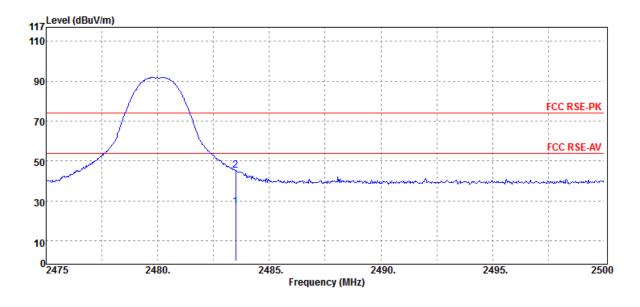


**Operation Band Fundamental Frequency Operation Mode** EUT Pol.

:BLE :2480 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-09-25 :21 deg\_C / 61 RH :Tin :HORIZONTAL



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
_	2483.50	E	Average	28.94	-1.62	27.32	54.00	-26.68
	2483.50	E	Peak	47.07	-1.62	45.45	74.00	-28.55

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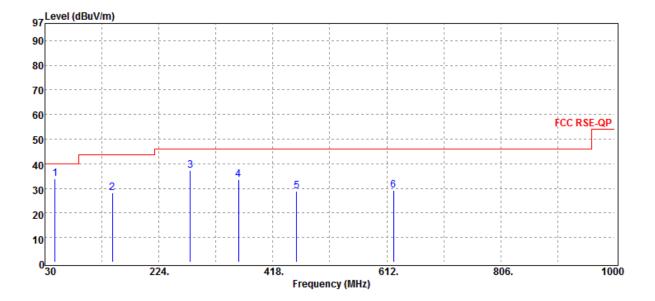
## **Radiated Spurious Emission Measurement Result**

For Frequency form 30MHz to 1000MHz Operation Band :BLE

Fundamental Frequency **Operation Mode** EUT Pol.

:2402 MHz :Tx CH LOW :H Plane

Test Date :2017-09-25 Temp./Humi. :21 deg\_C / 61 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
47.46	S	Peak	41.67	-7.85	33.82	40.00	-6.18
144.46	S	Peak	36.41	-8.07	28.34	43.50	-15.16
277.35	S	Peak	43.69	-6.55	37.14	46.00	-8.86
359.80	S	Peak	38.34	-4.79	33.55	46.00	-12.45
458.74	S	Peak	31.69	-2.68	29.01	46.00	-16.99
623.64	S	Peak	29.16	0.01	29.17	46.00	-16.83

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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:BLE **Operation Band** Test Date :2017-09-25 **Fundamental Frequency** Temp./Humi. :2402 MHz :21 deg\_C / 61 RH **Operation Mode** :Tx CH LOW Engineer :Tin EUT Pol. ·H Plane Measurement Antenna Pol. :HORIZONTAL 97 Level (dBuV/m) 90 80 70 60 FCC RSE-OP 50 40 30 20 10 0<mark>\_\_\_\_</mark> 224. 418. 612. 806. 1000 Frequency (MHz)

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
 MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
51.34	S	Peak	33.64	-7.75	25.89	40.00	-14.11	
199.75	S	Peak	38.26	-9.61	28.65	43.50	-14.85	
240.49	S	Peak	46.77	-8.04	38.73	46.00	-7.27	
359.80	S	Peak	34.98	-4.79	30.19	46.00	-15.81	
479.11	S	Peak	35.58	-2.39	33.19	46.00	-12.81	
699.30	S	Peak	26.79	1.44	28.23	46.00	-17.77	

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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:2017-09-25



:BLE

**Operation Band Fundamental Frequency** Temp./Humi. :2442 MHz :21 deg\_C / 61 RH **Operation Mode** :Tx CH MID Engineer :Tin EUT Pol. ·H Plane Measurement Antenna Pol. :VERTICAL 97 Level (dBuV/m) 90 80 70 60 FCC RSE-OP 50 40 30 20 10 0 30 224. 418. 612. 806. 1000 Frequency (MHz)

Test Date

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
47.46	S	Peak	42.20	-7.85	34.35	40.00	-5.65
144.46	S	Peak	34.99	-8.07	26.92	43.50	-16.58
277.35	S	Peak	41.45	-6.55	34.90	46.00	-11.10
359.80	S	Peak	37.12	-4.79	32.33	46.00	-13.67
474.26	S	Peak	32.73	-2.49	30.24	46.00	-15.76
623.64	S	Peak	29.58	0.01	29.59	46.00	-16.41

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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:2017-09-25



:BLE

**Operation Band** Test Date **Fundamental Frequency** Temp./Humi. :2442 MHz :21 deg\_C / 61 RH **Operation Mode** :Tx CH MID Engineer :Tin EUT Pol. ·H Plane Measurement Antenna Pol. :HORIZONTAL 97 Level (dBuV/m) 90 80 70 60 FCC RSE-OP 50 40 5 30 20 10 0<mark>\_\_\_\_</mark> 224. 418. 612. 806. 1000 Frequency (MHz)

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
51.34	S	Peak	33.51	-7.75	25.76	40.00	-14.24	
199.75	S	Peak	38.42	-9.61	28.81	43.50	-14.69	
240.49	S	Peak	47.21	-8.04	39.17	46.00	-6.83	
359.80	S	Peak	35.15	-4.79	30.36	46.00	-15.64	
479.11	S	Peak	35.14	-2.39	32.75	46.00	-13.25	
700.27	S	Peak	26.73	1.44	28.17	46.00	-17.83	

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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:2017-09-25



**Operation Band** 

:BLE

**Fundamental Frequency** Temp./Humi. :2480 MHz :21 deg\_C / 61 RH **Operation Mode** :Tx CH HIGH Engineer :Tin EUT Pol. ·H Plane Measurement Antenna Pol. :VERTICAL 97 Level (dBuV/m) 90 80 70 60 FCC RSE-OP 50 40 5 30 20 10 0 30 224. 418. 612. 806. 1000

Test Date

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
47.46	S	Peak	41.84	-7.85	33.99	40.00	-6.01
144.46	S	Peak	35.68	-8.07	27.61	43.50	-15.89
277.35	S	Peak	43.78	-6.55	37.23	46.00	-8.77
359.80	S	Peak	37.77	-4.79	32.98	46.00	-13.02
497.54	S	Peak	33.03	-2.38	30.65	46.00	-15.35
580.96	S	Peak	29.10	-0.38	28.72	46.00	-17.28

Frequency (MHz)

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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:2017-09-25



**Operation Band** 

:BLE

**Fundamental Frequency** Temp./Humi. :2480 MHz :21 deg\_C / 61 RH **Operation Mode** :Tx CH HIGH Engineer :Tin EUT Pol. ·H Plane Measurement Antenna Pol. :HORIZONTAL 97 Level (dBuV/m) 90 80 70 60 FCC RSE-OP 50 40 F 30 20 10 0 30 224. 418. 612. 806. 1000 Frequency (MHz)

Test Date

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
51.34	S	Peak	33.26	-7.75	25.51	40.00	-14.49
199.75	S	Peak	39.03	-9.61	29.42	43.50	-14.08
240.49	S	Peak	47.25	-8.04	39.21	46.00	-6.79
359.80	S	Peak	34.01	-4.79	29.22	46.00	-16.78
479.11	S	Peak	34.84	-2.39	32.45	46.00	-13.55
692.51	S	Peak	26.97	1.47	28.44	46.00	-17.56

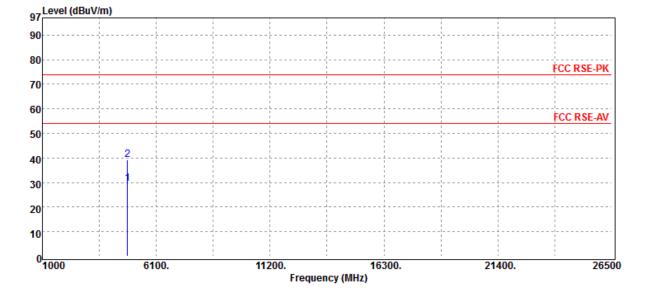
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



### **Radiated Spurious Emission Measurement Result**

For Frequency	above 1GHz
---------------	------------

Operation Band	:BLE	Test Date	:2017-09-25
Fundamental Frequency	:2402 MHz	Temp./Humi.	:21 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Н	Average	24.65	4.92	29.57	54.00	-24.43
4804.00	Н	Peak	34.20	4.92	39.12	74.00	-34.88

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:2017-09-25



:BLE

**Operation Band** 

Dperation Mode : 7		:2402 MHz :Tx CH LO\ :H Plane	N	Engineer :Tin			eg_C / 61 RH	
97 Level (dl	BuV/m)						1	
90								
80						FCC RSE-PK		
70				·		FUC NOE-PN		
60				·		FCC RSE-AV		
50		     		       				
40	2							
30								
20								
10								
0 <mark></mark> 1000	610	10.	11200. Frequency (Mi	16300. Iz)	21400.	2650	)0	
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4804.00	н	Average	24.55	4.92	29.47	54.00	-24.53	
4804.00	Н	Peak	37.07	4.92	41.99	74.00	-32.01	

Test Date

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Operation Ba Fundamental Operation Mc EUT Pol.	Frequency	:BLE :2442 MHz :Tx CH MID :H Plane	)	Test Date Temp./Hu Engineer Measure	ımi.	:Tin	_C / 61 RH
97	BuV/m)						
90							
80						FCC RSE-PK	
70		 				· · · · · · · · · · · · · · · ·	
60				·		FCC RSE-AV	
50	2						
40							
30							
20							
10				· • • • • • • • • • • • • • • • • • • •			
0 <sup>L</sup> 1000	610	0.	11200. Frequency (MI	16300. Iz)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4884.00	н	Average	24.48	5.20	29.68	54.00	-24.32
4884.00	Н	Peak	35.29	5.20	40.49	74.00	-33.51



н

4884.00

Operation Fundame Operation EUT Pol.	ntal Frequency	:BLE :2442 MHz :Tx CH MID :H Plane		Test Date Temp./Hu Engineer Measurer	ımi.	:Tin	9-25 _C / 61 RH CONTAL
97	vel (dBuV/m)						
90							
80							
70			· · · · · · · · · · · · · · · · · · ·			FCC RSE-PK	
60						FCC RSE-AV	
50						FUC RSE-AV	
40	2						
30							
20							
10						1 1 1 1	
0			44200	40200	04400	2050	•
100	00 610	υ.	11200. Frequency (MHz	16300. :)	21400.	2650	U
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	Margin dB
4884.00	) Н	Average	24.60	5.20	29.80	54.00	-24.20

35.18

Peak

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5.20

74.00

-33.62

40.38

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Operation Band Fundamental Frequency Operation Mode EUT Pol.	:BLE :2480 MHz :Tx CH HIGH :H Plane		Test Date Temp./Hun Engineer Measurem	ni. ent Antenna P	:Tin	_C / 61 RH
97						
90						
80					FCC RSE-PK	
70						
60	 		1 	1 1 1 1	FCC RSE-AV	
50	 					
40						
30						
20						
10						
0 <mark>1000 6100</mark>	). 1'	1200. Frequency (MHz	16300.	21400.	2650	)
		frequency (milz	,			
Freq. Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz F/H/E/S	Mode R PK/QP/AV	leading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	Margin dB
4960.00 H 4960.00 H	Average Peak	24.44 34.37	5.29 5.29	29.73 39.66	54.00 74.00	-24.27 -34.34

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Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:BLE :2480 MHz :Tx CH HIG :H Plane	iΗ	Test Date Temp./Hu Engineer Measure	umi.	:Tin	09-25 _C / 61 RH CONTAL
97	BuV/m)						
90							
80						FCC RSE-PK	
70							
60						FCC RSE-AV	
50		      		1 		 	
40	2						
30				· · · · · · · · · · · · · · · · · · ·			
20						 	
10							
0 <mark>0</mark>	610	0.	11200. Frequency (M	16300. Hz)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum	Factor	Actual FS	Limit @3m	Safe
MHz	F/H/E/S	PK/QP/AV	Reading Level dBµV	dB	rs dBµV/m	dBµV/m	Margin dB
4960.00	н	Average	24 5 4	F 20	29.83	54.00	-24.17
4960.00 4960.00	H	Average Peak	24.54 35.07	5.29 5.29	29.83 40.36	54.00 74.00	-24.17 -33.64



# 11 PEAK POWER SPECTRAL DENSITY

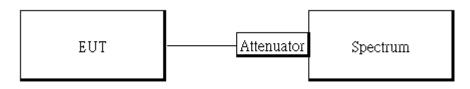
#### 11.1 Standard Applicable:

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

#### 11.2 **Measurement Equipment Used:**

Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018			
Coaxial Cable 30cm	WOKEN	00100A1F1A 195C	RF01	12/12/2016	12/11/2017			
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017			
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/12/2016	12/11/2017			
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017			
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018			

#### 11.3 Test Set-up:



#### 11.4 Measurement Procedure:

- Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz. & the VBW = 10 kHz
- 5. For defining Restricted Band Edge Limit:

Set the RBW = 100kHz & VBW = 300 kHz.

- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.

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- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

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#### 11.5 **Measurement Result:**

BLE mode								
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result					
2402	-10.53	8	PASS					
2442	-10.18	8	PASS					
2480	-10.24	8	PASS					

NOTE: cable loss as 11.5dB that offsets in the spectrum

## **BLE mode** Power Spectral Density Test Plot (CH-Low)



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## **Power Spectral Density Test Plot (CH-Mid)**



# Power Spectral Density Test Plot (CH-High)



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# **12 ANTENNA REQUIREMENT**

#### Standard Applicable: 12.1

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

#### 12.2 **Antenna Connected Construction:**

An embedded-in antenna design is used.

The antenna is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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