

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Applicant:	Hong Kong AMobile Intelligent Corp. Limited Tai- wan Branch
	8F1, No.700, Zhongzheng Rd., Zhonghe Dist., New Taipei City 235, Taiwan
Product Name:	GT78-V Rugged Android Tablet
Brand Name:	AMobile
Model No.:	GT78-V8, GT78-V7
Model Difference:	Difference in screen size and position of light sen-
	sor
FCC ID:	2AQ5W-GT78V8
Report Number:	E2/2018/80019
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	Jan. 23, 2019
Date of Test:	Aug. 02, 2018 ~ Sep. 26, 2018
Date of EUT Re- ceived:	Aug. 02, 2018

#### 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.

Tested By:

Vito Pei / Engineer CHUN, CHIZEH, CHIEN Approved By: Chun Chieh Chen / Sr. Engineer



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# **Revision History**

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/80019	Rev.00	Initial creation of docu- ment	All	Nov. 21, 2018	Stefanie Yu / Clerk
E2/2018/80019	Rev.01	Update information for Section 7.4	17	Jan. 16, 2019	Stefanie Yu / Clerk
E2/2018/80019	Rev.02	Update information for Section 7.4	17	Jan. 18, 2019	Stefanie Yu / Clerk
E2/2018/80019	Rev.03	Update information for Section 7.4	17	Jan. 23, 2019	Stefanie Yu / Clerk

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#### **GENERAL INFORMATION** 1

# **1.1 Product Description**

General:

Product Name:	GT78-V Rugged Android Tablet		
Brand Name:	AMobile		
Model No.:	GT78-V8, GT78-V7		
Model difference:	Difference in screen size and position of light sensor		
Hardware Version:	N/A		
Software Version:	N/A		
USB Cable	Model No.: N/A, Supplier: N/A		
Dawar Guarku	3.8Vdc from Rechargeable Li-polymer Battery		
Power Supply:	Battery: Model No.: DPR999-00 Supplier: AMobile		

### Bluetooth Low Energy:

Bluetooth Version:	Bluetooth V4.0 LE Single mode
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	-1.2 dBm
Frequency Range:	2402 – 2480MHz
Antenna Designation:	PCB Antenna, Gain: 3.5dBi

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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 v05.

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.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Number and Designation number are: 735305 / TW 0002

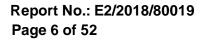
### 1.4 Special Accessories

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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#### SYSTEM TEST CONFIGURATION 2

# 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 30 MHz,. 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.

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# 2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (Antenna Port)



# Fig. 2-2 Conduction (AC Power Line)



# Table 2-1 Equipment Used in Tested System

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Ca- ble	Power Cord
1	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2	Notebook	Lenovo	L430	R9-WR6X4	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
1	2402 MHz	15	2430 MHz	29	2458 MHz
2	2404 MHz	16	2432 MHz	30	2460 MHz
3	2406 MHz	17	2434 MHz	31	2462 MHz
4	2408 MHz	18	2436 MHz	32	2464 MHz
5	2410 MHz	19	2438 MHz	33	2466 MHz
6	2412 MHz	20	2440 MHz	34	2468 MHz
7	2414 MHz	21	2442 MHz	35	2470 MHz
8	2416MHz	22	2444 MHz	36	2472 MHz
9	2418 MHz	23	2446 MHz	37	2474 MHz
10	2420 MHz	24	2448 MHz	38	2476 MHz
11	2422 MHz	25	2450 MHz	39	2478 MHz
12	2424 MHz	26	2452 MHz	40	2480 MHz
13	2426 MHz	27	2454 MHz		
14	2428 MHz	28	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:**

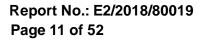
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)
	RADIA	TED EMISSION TEST (	(BELOW 1 GHz)	
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1
	RADIATED EMISSION TEST (ABOVE 1 GHz)			
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1
<b>Note:</b> The field strength of radiation 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				

# ANTENNA PORT CONDUCTED MEASUREMENT:

worst case E1 position was reported.

CONDUCTED TEST				
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)
Bluetooth LE	2402 to 2480	2402, 2442, 2480	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:

Measurement uncertainty (Polarization : <b>Vertical</b> )	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	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(µV)							
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 th 2.The limit decreases linearly wit MHz.	e transition frequencies h the logarithm of the frequency ir	the range 0.15 MHz to 0.50						

### 6.2 Measurement Equipment Used:

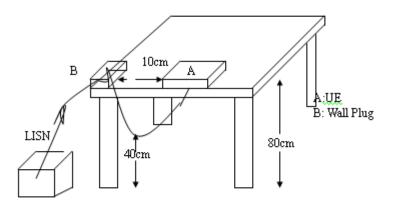
Conducted Emission Test Site											
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.						
TYPE		NUMBER	NUMBER	CAL.							
LISN	TESEQ	NNB 51	36076	2018/02/14	2019/2/13						
EMI Test Receiver	R&S	ESCI	101300	2017/11/02	2018/11/1						
Notebook	Lenovo	L420	S0012467	N/A	N/A						

# 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.



# 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

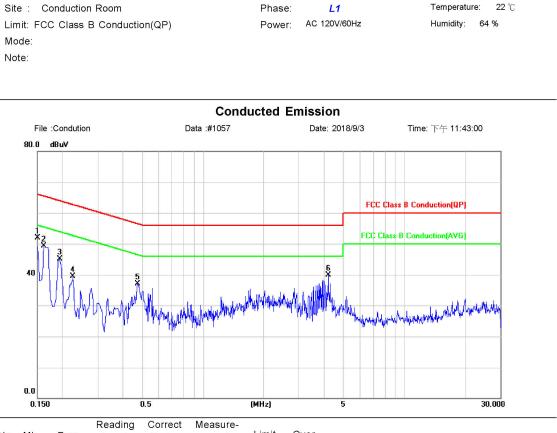
# 6.6 Measurement Result:

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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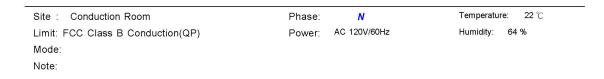
# AC POWER LINE CONDUCTED EMISSION TEST DATA

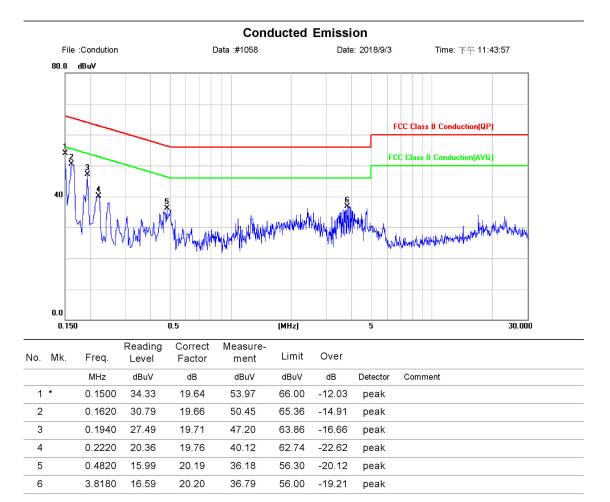


No.	Mk.	Freq.	Level	Factor	ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	32.18	19.65	51.83	66.00	-14.17	peak	
2		0.1620	29.56	19.67	49.23	65.36	-16.13	peak	
3		0.1940	25.46	19.73	45.19	63.86	-18.67	peak	
4		0.2260	19.72	19.78	39.50	62.60	-23.10	peak	
5		0.4740	16.89	20.19	37.08	56.44	-19.36	peak	
6		4.1900	19.85	20.14	39.99	56.00	-16.01	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.

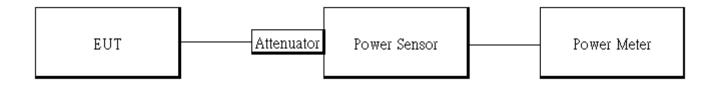
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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	MFR	MODEL	SERIAL	LAST	CAL DUE.								
TYPE		NUMBER	NUMBER	CAL.									
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02								
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02								
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02								
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25								
Attenuator	Marvelous	MVE2213-10	RF31	2017/12/26	2018/12/25								

# 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)	1/T (kHz)	VBW setting (kHz)
BLE	60.20	2.20	2.66	3.00

🎒 Keysigh	nt Spect	trum A			pt SA													
N R		RJF		50 Q	DC			_	SEN	VSE: IN	Т	A		LIGN AUTO			ep 06, 2018	Frequency
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-20.0		+		$\vdash$	<u> </u>	-++		$\rightarrow$		-			-				+	Start Fre
-30.0		$\rightarrow$			L	$-\parallel$		$\rightarrow$				L						2.442000000 GH
-40.0																		2.44200000 GH
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		120	0000													-		-
Center Res B\				JU G	Hz		#VF	зw	8.0 MHz				S	weep	1.600 n	եր Տ (10	an 0 Hz 001 pts)	CF Step 8.000000 MH
			_					_	0.01					-				Auto Ma
MRR MOD 1 Δ2			<b>(Δ)</b>		x	376.0	) µs (/	A1	0.01	dB	FUN	TION	FUN	CTION WOTH	FU FU	NCTION	VALUE	
2 F	1	t				499.2	2 µs		-3.14 dE	3m								E
3 Δ4 4 F	1	t	<b>(</b> Δ)			624.0	) µs (/	Δ)	-1.96 -3.14 dE								_	Freq Offse
5		-				499.2	LIS .		-3.14 up	sm								он
6							_			$\rightarrow$								
7	+	+	-				+			+								
9							$\rightarrow$	_										
10	+	+					+			+		$\rightarrow$						
-		· ·	'									'			1			
														STAT				The second se

# Duty Cycle Factor:10\*log(1/(60.2/100))=2.2

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

#### **BLE mode:**

СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit							
0	2402	-2.99	1 Watt = 30 dBm							
20	2442	-2.37	1 Watt = 30 dBm							
39	2480	-1.20	1 Watt = 30 dBm							
BLE mo	BLE mode:									
СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit							
0	2402	-3.47	1 Watt = 30 dBm							
20	2442	-2.75	1 Watt = 30 dBm							
39	2480	-1.68	1 Watt = 30 dBm							

\*Note: Measured by power meter, cable loss as 10.8 dB that offsets on the power meter in Peak \*Note: Measured by power meter, as cable loss+ Duty cycle factor that offsets on the power meter \*Note: Max. Output include tune up tolerance Power is average power

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#### 8 6DB BANDWIDTH MEASUREMENT

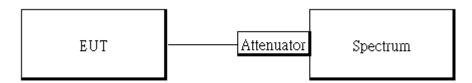
# 8.1 Standard Applicable

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

# 8.2 Measurement Equipment Used

	Conducted Emission Test Site												
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.								
TYPE		NUMBER	NUMBER	CAL.									
Spectrum Analyzer	Agilent	N9010A	MY53400256	2017/10/30	2018/10/29								
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25								
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25								

# 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.

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

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#### 8.5 Measurement Result:

BLE mode											
Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result								
2402	0.712	> 0.5	PASS								
2442	0.706	> 0.5	PASS								
2480	0.709	> 0.5	PASS								

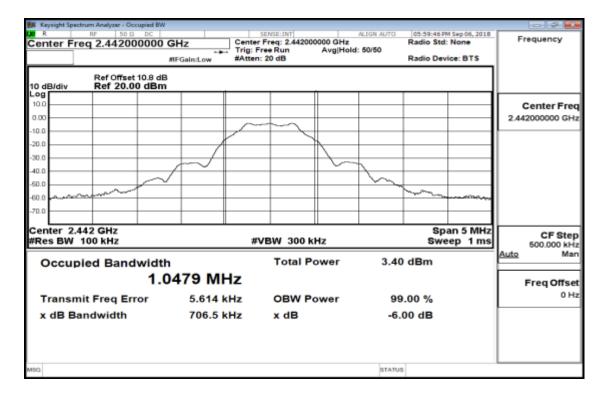
# 6dB Band Width Test Data CH-Low

🗱 Keysight Spectrum A										_	
Center Freq 2	enter Freq 2.402000000 GHz				Center Freq: 2.402000000 GHz Trig: Free Run Avg Hold: 50/50 #Atten: 20 dB				None	Fre	quency
	Ref Offset 10. Ref 20.00 d	8 dB	1			n					
10.0				~	~						enter Fre 000000 GH
-20.0			Á								
-40.0 -50.0 -60.0		$\sim$					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~	-Aut-10-17-17		
70.0 Center 2.402									an 5 MHz		CF Ste
Res BW 100		idth		#VE	Total Po		2.67	dBm	ep 1ms	Auto 6	500.000 kł Ma
		1.050	8 MH	z						F	req Offs
Transmit F	req Error	. 3	3.864 kH	z	OBW Po	ower	99	.00 %			01
x dB Band	width	7	712.3 kH	Iz	x dB		-6.	00 dB			
							STATUS				
15G							STATUS	2			

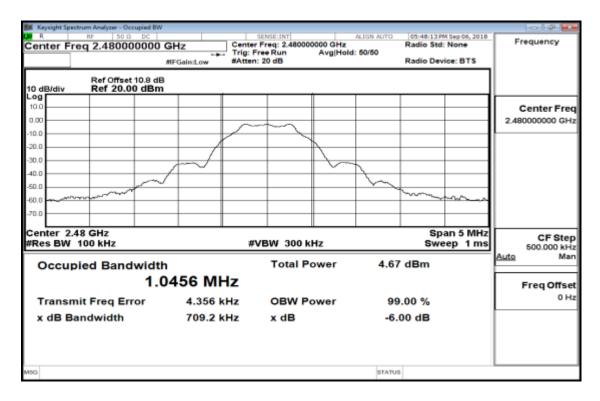
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# 6dB Band Width Test Data CH-Mid



# 6dB Band Width Test Data CH-High



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

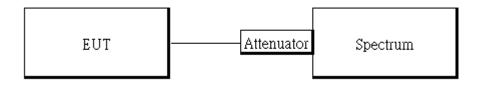
### 9.1 Standard Applicable

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).

### 9.2 Measurement Equipment Used:

	Conducted Emission Test Site												
EQUIPMENT	MFR	MODEL	SERIAL		CAL DUE.								
TYPE		NUMBER	NUMBER	CAL.									
Spectrum Analyzer	Agilent	N9010A	MY53400256	2017/10/30	2018/10/29								
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25								
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25								

# 9.3 Test SET-UP:



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# 9.4 Measurement Procedure

# **Reference Level of Emission Limit:**

- 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.
- Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5MHz) 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.
- 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)	Reference Level of Limit = PSD - 20dB (dBm)
2402	-4.75	-24.75
2442	-3.97	-23.97
2480	-2.71	-22.71

### **Reference Level of Limit**

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

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#### Reference Level of Emission Limit (CH-Low)

enter Freq 2.40200000 GHz Trig: Free Run Provide Avg Type: Log-Pwr Theod: 12.23.55 Trig: Free Run Provide FreqUeint: Trig: Free Run Provide Avg Type: Log-Pwr Theod: 12.23.55 Trig: Free Run Provide Avg Type: Log-Pwr Av	Keysight Spe	ectrum Analyzer - Swept SA					
Parce wilds Control of Auton Trig: Pres Run Parce Run Pa	enter Fr	reg 2.40200000	00 GHz	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	05:40:32 PM Sep 06, 2018 TR4CE 1 2 3 4 5 6	Frequency
dB/dv/     Ref 20.00 dBm     -4.75 dBm       -dB/dv/     -4.75 dBm     -4.75 dB			PNO: Wide 😱	#Atten: 20 dB		DET P NNNN	A
Center 1 2.40200000 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1					Mkr1 2		Auto Tu
1     2     1     2     1     3	8						Center Fr
Start 2 401250000 2 202750000 2 202750000 CFF CFF CFF CFF CFF CFF CFF	.0						2.402000000 G
2 401250000 2 401250000 2 401250000 2 401250000 2 401250000 2 401250000 CF 1 150.000 Auto Freq O				1			Start Fr
2.40275000 2.40275000 CF 4 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	0		$\sim$				2.401250000 G
2.40275000 2.40275000 CF 4 Auto Freq O	0						
							2.402750000 G
Auto 150.000	°						
0	.0						150.000 k
	0						Auto N
							Freq Offs
0							0
	.0						
art 2.4012500 GHz es BW 100 KHz #VBW 300 KHz Sweep 1.000 ms (1001 pts)							

#### **Reference Level of Emission Limit (CH-Mid)**

									n Analyzer - Swe		
Peak Search	Sep 06, 2018	TRAC	Log-Pwr		ENSE:INT			500000	RF 50 Ω 2.441995		Mark
NextPeak	5 5 GHz 66 dBm	441 99		Avginoid	20 dB	Atten: 2	PNO: Wide G	.8 dB	ef Offset 10. ef 20.00 d		10 dB
Next Pk Righ											10.0
Next Pk Lef					¢1	~~~~					0.00
Marker Delta										/	-20.0
Mkr→C	$\sim$										-30.0
Mkr→RefLv											50.0 60.0
Mor 1 of	'500 GHz	op 2.4427	St						500 GHz	2.4412	-70.0
	1001 pts)		Sweep 1 STATUS	#	z	300 kHz	#VBW		) kHz	BW 10	#Res

### Reference Level of Emission Limit (CH-High)

	ectrum Analyzer - Swe								
	req 2.48000	0000 GI	IZ NO: Wide	1	Rup	Log-Pwr	TRAC	E 1 2 3 4 5 6 MWWWWW T P N N N N N	Frequency
10 dB/div	Ref Offset 10. Ref 20.00 d	8 dB	NO: Wide C	#Atten: 20	dB	Mkr1 2	2,479 99		Auto Tun
10.0									Center Fre 2.480000000 GF
10.0		_	~		<u> </u>				Start Fre 2.479250000 GP
30.0									Stop Fre 2.480750000 GP
10.0								~	CF Ste 150.000 ki Auto M
0.0									Freq Offs 0
70.0	792500 GHz					s	top 2.480	7500 GHz	
	100 kHz		#VBW	300 kHz			1.000 ms (		
93						STATU	15		

### **Band Edges Test Data CH-Low**

🗱 Keysight Spectrum	Analyzer - Swept SA						
Center Freq	2.36000000 GH	lz _	Trig: Free Ri	Avg	ALIGN AUTO	TRACE 1 2 3 4 5	Frequency
	F Offset 10.8 dB	NO:Fast 😱 Sain:Low	#Atten: 20 d	В	м	kr3 2.390 0 GHz -60.82 dBm	Auto Tune
10.0 0.00 -10.0						1	Center Free 2.360000000 GHz
-20.0						-24.25 dBH	Start Free 2.310000000 GHz
-50.0 -60.0	مورد او میں ورادور مراد <del>رسایر مرد ا</del>					3 2	Stop Free 2.410000000 GH:
Start 2.31000 #Res BW 100	kHz ×		300 kHz		Sweep	Stop 2.41000 GHz 9.600 ms (1001 pts)	CF Step 10.000000 MH <u>Auto</u> Mar
1 N 1 f 2 N 1 f 3 N 1 f 4 5 6	2,401 2,399 2,390	9 GHz	-4.52 dBm -68.96 dBm -60.82 dBm				Freq Offse 0 Ha
7 8 9 10 11							
< <u></u>					Ioran	,	

#### Band Edges Test Data CH-High

🗱 Keysight Spi	ectrum Analyzer - Sw			_				
Center F	req 2.48750	00000 GHz	Trig: Free Ru	Avg	ALIGN AUTO Type: Log-Pwr	05:53:24 PM TRACE	123456	Frequency
10 dB/div	Ref Offset 10 Ref 20.00				Mkr3	2.483 60	0 GHz 4 dBm	Auto Tune
10.0 0.00 -10.0		1						Center Freq 2.487500000 GHz
-20.0 -30.0 -40.0							-22-21-054	Start Freq 2.475000000 GHz
-50.0 -60.0	- second a	the second secon					موسور ومد الديمو	Stop Freq 2.500000000 GHz
Start 2.47 #Res BW	100 kHz	#V	BW 300 kHz	FUNCTION	Sweep 2	Stop 2.50 2.400 ms (1	001 pts)	CF Step 2.500000 MHz Auto Man
1 N 1 2 N 1 3 N 1 4 5 6 7 7 8 9	1	2.479 750 GHz 2.483 500 GHz 2.483 600 GHz	-2,49 dBm -59,46 dBm -58.84 dBm				<u></u>	Freq Offset 0 Hz
8 9 10 11 4 MBG					STATU	5		

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# **Conducted Spurious Emission Measurement Re**sult

# CH-Low 30MHz - 3GHz

R RF 50 Ω DC	SENSE:INT		
Center Freq 1.51500000		ALIGN AUTO 06:14:26 PM S Avg Type: Log-Pwr TRACE	123456 Frequency
Ref Offset 10.8 dB 10 dB/div Ref 20.00 dBm	0 GHz 3 dBm		
000 10.0		∳ <sup>1</sup>	Center Freq 1.515000000 GHz
20.0			-24.75 dBh 30.000000 MHz
50.0 60.0 70.0	- and the second and	An and a state of the second s	Stop Free 3.00000000 GH
Center 1.515 GHz #Res BW 100 kHz	#VBW 300 kHz	Span 2.9 Sweep 283.9 ms (10	297.000000 MH
DE MADE TIRR SQL X 1 N 1 f : 2 3 4 5 6 7 7 8 9 0 1 1	2.403 0 GHz4.83 dBm		Freq Offset 0 Hz

#### CH-Low 3GHz - 26.5GHz

									n Amalyzer - Sv		Key
Frequency	4 Sep 06, 2018 26 1 2 3 4 5 6 26 MWWWWW T P NNNNN	TRAC	LIGN AUTO	Avg Type	Run	1	Hz	000000 0	14.750		Cent
Auto Tune	9 5 GHz 79 dBm	1 25.959	Mkr		0 dB	#Atten: 2	Gain:Low	1F 0.8 dB	of Offset 1 ef 20.00		10 dE
Center Free 14.750000000 GH											10.0
Start Free 3.000000000 GH	-24.75 dBm										-20.0 -30.0 -40.0
Stop Fre 26.50000000 GH	- North	dera portano				an sand and a starter			and the state of the	<u>مريو</u> مې	-50.0 -60.0 -70.0
	3.50 GHz 1001 pts)	2.246 s (		TION I FU	F	300 kHz	#VBV	×	kHz	er 14.75 BW 10	#Res
Freq Offse 0 H					3m	-48.79 df	5 GHz	25.959		N 1 1	
		1			'	10					•
		ŧ.	STATUS								193

#### CH-Mid 30MHz - 3GHz

📕 Keysight Spe	ctrum Analyze								
Center Fr		50 0 DC	z		ESE: INT	LIGN AUTO	TRA	M Sep 06, 2018 CE 1 2 3 4 5 6	Frequency
10 dB/div		PN IFG et 10.8 dB .00 dBm	IO: Fast G	Trig: Free #Atten: 2	Run 0 dB	 М	(r1 2.44	1 6 GHz 85 dBm	Auto Tune
10.0 0.00							<b>♦</b> <sup>1</sup>		Center Freq 1.515000000 GHz
-20.0								-23.96 060	Start Freq 30.000000 MHz
50.0 60.0			a a fair an	terret-oca-		 	and the second second		Stop Free 3.000000000 GH:
Center 1.4 Res BW	100 kHz		#VBV	V 300 kHz			83.9 ms	2.970 GHz (1001 pts)	
1 N 1 2 3 4 5	f	2.441 6	5 GHz	-3.85 di			Power		Freq Offse 0 Hi
6 7 8 9 10 11									
11				10	_			*	

#### CH-Mid 3GHz – 26.5GHz

📕 Keysight Spe	ictrum /	Analyzer - Swe	ipt SA								- 2 -
R Center Fr	req '	14.7500	00000 G	Hz		VSE:INT	Avg	Type: Log-Pwr	TRA	M Sep 06, 2018 CE 1 2 3 4 5 6	Frequency
10 dB/div		Offset 10	8 dB	NO: Fast ( Sain:Low	#Atten: 2			Mk	r1 25.93	6 0 GHz 80 dBm	Auto Tune
10.0 0.00											Center Freq 14.750000000 GHz
20.0										-23 36 3691	Start Freq 3.000000000 GHz
30.0 40.0 50.0 60.0		استان کوراند بخوره				enninnenin		Baller Internation			Stop Freq 26.50000000 GHz
Center 14 Res BW	100	kHz		#VB	W 300 kHz				2.246 s	23.50 GHz (1001 pts)	CF Step 2.35000000 GHz Auto Man
Ave     Avoide     arr       1     N     1       2     3     -       4     -     -       5     -     -       6     -     -       7     -     -       8     -     -       9     -     -       10     -     -       11     -     -	1		× 25.936 (	0 GHz	-48.80 df		CHON	FURCTION WOT		KAN WALUE	Freq Offset 0 Hz
3								STAT	18		

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#### CH-High 30MHz – 3GHz

								nalyzer - Swi		vight Sp	M Ke	
Frequency	21 PM Sep 06, 2018 TRACE 1 2 3 4 5 6		ALIGN AUTO	SE:INT	SET	-	0000 GH	50 Q	RJ.	tor F	R	
A	DET P NNNN	T C		Run 0 dB	#Atten: 2	IZ IO: Fast G Sain:Low	PI	.51500	req		-en	
Auto Tur	480 3 GHz -3.05 dBm											
Center Fre		41	_								og 10.0	
1.515000000 GH		<b>↑</b>									3.00 10.0	
Start Fre	-22.71 dBn		_								10.0	
30.000000 MH											90.0 10.0	
Stop Fre											0.0	
3.000000000 Gł	hadara ay ang mang mang ang ang ang ang ang ang ang ang ang		and a start of the			and a state of the	a landa an	and a dege	mer		0.0 0.0	
CF Ste	n 2.970 GHz ns (1001 pts)		Sween 2		300 kHz	#VBV			.515 C			
<u>Auto</u> Ma	NOTION WALLE		FUNCTION WOTH		Y		x		TRC SCL	NOTCE N	ed.	
Freq Offs				3m	-3.05 di	3 GHz	2.480		1 1	N	23	
01											4 5	
				-		_				+	6 7 8	
										-	9	
		-		-	10	-				-	11	
		18	STATUS									

#### CH- High 3GHz – 26.5GHz

	rum Analyzer - Swept S				_		
Center Fre	eq 14.750000		Trig: Free R	Av	Type: Log-Pwr	06:16:11 PM Sep 06, 2018 TRACE 1 2 3 4 5 TYPE M WWWW DET P NNNN	Frequency
10 dB/div	Ref Offset 10.8 d Ref 20.00 dB	IFGain:Low	#Atten: 20 d	8	Mkr	1 26.006 5 GHz -49.21 dBm	Auto Tune
10.0 0.00							Center Freq 14.750000000 GHz
-20.0						-22.71 080	Start Freq 3.00000000 GHz
-50.0 -60.0		,	nerrola de relation	in ward and a start of the star		and a second and a second s	Stop Freq 26.50000000 GHz
Center 14.7 #Res BW 1	00 kHz	#VE	300 kHz	EUNCTION	Sweep	Span 23.50 GHz 2.246 s (1001 pts	
1 N 1 2 3 4 4 5 6 7 7 8 9 9 10 10 11 11		26.006 5 GHz	-49.21 dBn				Freq Offset 0 Hz
90					STATU	5	

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.

Difference states are states ar prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. [No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



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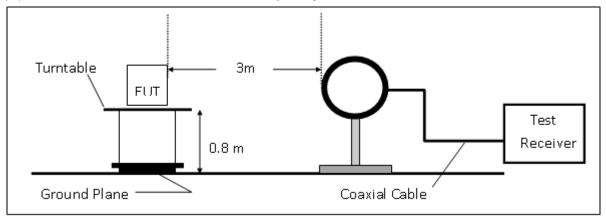
#### 10.2 **Measurement Equipment Used**

966 Chamber										
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
<b>Broadband Antenna</b>	SCHWAZBECK	VULB 9168	9168-617	2017/10/27	2018/10/26					
Horn Antenna	Schwarzbeck	BBHA9120D	1341	2018/06/07	2019/06/06					
Horn Antenna	SCHWAZBECK	BBHA9170	184	2017/12/12	2018/12/11					
Loop Antenna	ETS.LINDGREN	6502	148045	2018/04/19	2019/04/18					
3m Site NSA	SGS	966 chamber D	N/A	2018/07/06	2019/07/05					
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/04/10					
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	2017/10/27	2018/10/26					
Pre-Amplifier	EMC Instru- ments	EMC9135	980234	2017/12/26	2018/12/25					
Pre-Amplifier	EMC Instru- ments	EMC12630SE	980271	2017/12/26	2018/12/25					
Attenuator	Marvelous	WATT-218FS-10	RF246	2017/12/26	2018/12/25					
Highpass Filter	Micro Tronics	BRM50701-01	G008	2017/12/26	2018/12/25					
Coaxial Cable	Huber Suhner	EMC106-SM-SM -7200	150703	2017/12/26	2018/12/25					
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25					

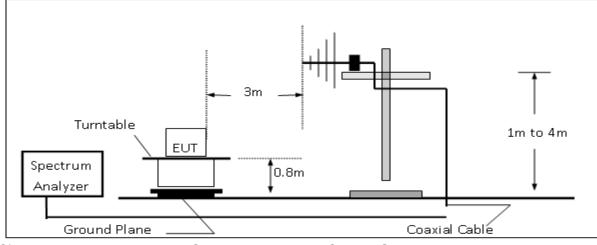


# 10.3 Test SET-UP

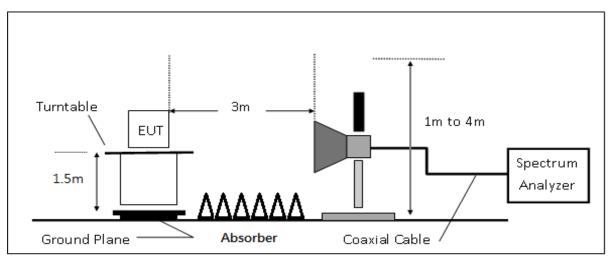
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



# (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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#### Field Strength Calculation 10.5

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	•	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)

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

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.



## **Radiated Band Edge Measurement Result**

Test N EUT I			:BE :E1	:BLETest Date:BE CH LowTemp./Humi.:E1 PlanAntenna Pol.:2402 MHzEngineer							:2018-09-10 :25/60 :VERTICAL :Jerry
400	Level (dBuV/	/m)									
120											]
110											-
90											-
70											-
										$   \rangle =$	
50	an and the state of the second	and the second second	everet-a-manager	and management and when		Kalena and an and a star		and the second and the second and the	2 Horan Marine M	I have	- K
									1		
30											-
10											-
U	2310	23	30.	23	350. Freque	23 ncy (MHz)	70.	23	390.	24	10
F	req.	Dete	ector	Spectr	-	Factor		Actual	I	_imit	Margin
•		Mo		Reading		1 40101		FS		2)3m	in a giri
Ν	ЛНz	PK/Q	P/AV	dBµV		dB		dBµV/m	dB	μV/m	dB
	90.00	Aver		40.5		-5.57		34.96			-19.04
23	90.00	Pe	ak	54.1	4	-5.57		48.57	7	4.00	-25.43

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Operation Mo Test Mode EUT Pol Test Channel	:BI :E :24	LE E CH Low 1 Plan 102 MHz		:2018-09-10 :25/60 :HORIZONTAL :Jerry		
120 Level (dBuV/	m)				1	-
110						-
90						_
70					Λ	_
50	and the second			marken harten anader der	mananan human	-
30						_
10						-
0 2310	2330.	2350. Freque	2370 ency (MHz)	. 239	0. 24	110
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBμV	dB	FS dBµV/m	@3m dBµV/m	dB
111112		αυμγ	UD	αυμνγΠ	αυμνγΠ	ub
2390.00 2390.00	Average Peak	41.53 54.08	-5.57 -5.57	35.96 48.51	54.00 74.00	-18.04 -25.49

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Operation Mo Test Mode EUT Pol Test Channel		:E1 F	CH High	Test Date Temp./Humi. Antenna Pol. Engineer						:2018-09-10 :25/60 :VERTICAL :Jerry
120 Level (dBuV/	/m)									
110										
90		~								
70		$\rightarrow$								
			,							
50 mm mm month		4	Whenter	الإدو الإستانية بالمحيطانيون	a ng mga na ang mga ng mga		Charles and a second second	deflected annual to a start of the	~~~ <u>~~</u> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
30										
10										
0 <mark></mark> 2475	248	80.	24	485. Freque	24 ncy (MHz)	90.	24	495.	250	D
Freq.	Dete		Spectr		Factor		Actual		imit	Margin
MHz	Moo PK/QI		Reading dBu		dB	Ċ	FS lBµV/m	-	≀3m ıV/m	dB
	11/041		αυμ	v	UD		τυμ ν / Πι	αDj	ιν / 111	
2483.50	Aver		41.3		-4.90		36.43		4.00	-17.57
2483.50	Pea	ak	53.9	4	-4.90		49.04	74	4.00	-24.96

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Operation Mo Test Mode EUT Pol Test Channel		:BLE :BE C :E1 PI :2480	/ interind Fol.						:2018-09-10 :25/60 :HORIZONTAL :Jerry	
120 Level (dBuV/	m)									-
110										-
										_
90	_									-
70		$\mathbf{i}$								-
50 marthantana			2							-
						*****				
30										-
10										-
0 <mark></mark> 2475	2480.		248		24 ncy (MHz)	90.	24	495.	25	ดีด
Freq.	Detect		Spectru		Factor		Actual		Limit	Margin
	Mode		eading L				FS		@3m	
MHz	PK/QP/	/AV	dBµV	-	dB		dBµV/m		BµV/m	dB
2483.50	Avera	ge	42.01		-4.90		37.11		54.00	-16.89
2483.50	Peak		53.75		-4.90		48.85		74.00	-25.15
2483.50	Peak	k	53.75	i i	-4.90		48.85		74.00	-25.15



# **Radiated Spurious Emission Measurement Result**

For Frequency form 30MHz to 1000MHz oration Mode :BLE

Operation mode
Test Mode
EUT Pol
Test Channel

818.61

987.39

Peak

Peak

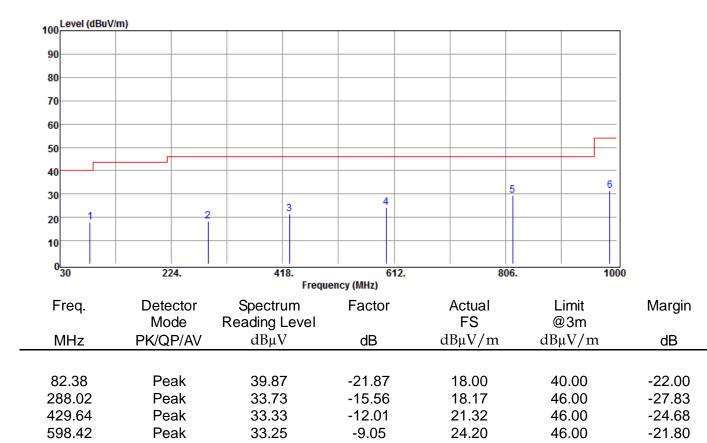
:Tx CH Low :E1 Plan :2402 MHz

Test Date Temp./Humi. Antenna Pol. Engineer

29.37

31.60

:2018-09-03 :25/60 :VERTICAL :Jerry



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35.40

35.38

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-6.03

-3.78

46.00

54.00

-16.63

-22.40

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Operation Mo Test Mode EUT Pol Test Channel	ר: :E	BLE Fx CH Low E1 Plan 2402 MHz				Test Dat Temp./H Antenna Enginee	Humi. a Pol.				:2018-09-03 :25/60 :HORIZONTAL :Jerry
100 Level (dBuV/	m)										
90											
80										_	
70										_	
60										_	
50											
40										_	
30			3		4			5		6	
20 1		2	Ĭ.								
10											
0 <mark></mark> 30	224.	418.	Freque	61 ncy (MHz)	2.		806.			1000	)
Freq.	Detector	Spectrum		Factor		Actua	1	I	imit		Margin
ricq.	Mode	Reading Lev		1 actor		FS	.1		23m		Margin
MHz	PK/QP/AV	dBµV		dB		dBµV/	m	dBµ	ıV/m		dB
49.40	Peak	32.81		-16.90		15.91			0.00		-24.09
320.03	Peak	37.35		-16.87		20.48			6.00		-25.52
480.08	Peak	36.33		-11.04		25.29			5.00		-20.71
640.13	Peak	36.92		-8.14		28.78			6.00		-17.22
861.29	Peak	35.04		-5.35		29.69			5.00		-16.31
980.60	Peak	34.13		-3.50		30.63	)	54	4.00		-23.37

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Operation Mo Test Mode EUT Pol Test Channel	:Tx :E1	LE 3 CH Mid 1 Plan 142 MHz		Test Date Temp./Humi. Antenna Pol Engineer		:2018-09-03 :25/60 :VERTICAL :Jerry
100 Level (dBuV/i	m)					-
90						
80						
70						
60						
50						
40					_ 6	
30		3	4			
20 1	2					
10						
030	224.	418.	612.	806.	100	0
			ency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
N 41 1	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
83.35	Peak	40.46	-22.01	18.45	40.00	-21.55
252.13	Peak	32.81	-16.81	16.00	46.00	-30.00
432.55	Peak	33.59	-11.93	21.66	46.00	-24.34
629.46	Peak	33.84	-8.16	25.68	46.00	-20.32
851.59	Peak	34.08	-5.69	28.39	46.00	-17.61
984.48	Peak	34.82	-3.65	31.17	54.00	-22.83

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Operation Mo Test Mode EUT Pol Test Channel		:BLE :Tx CH Mid :E1 Plan :2442 MHz			:2018-09-03 :25/60 :HORIZONTAL :Jerry				
100 Level (dBuV/	m)								_
90									
80									
70									
60									
50									
40									
30			3		4		5	6	
20		2							
10									
0 <mark></mark> 30	224.	4	18. Freque	61 ncy (MHz)	2.	8	06.	100	00
Freq.	Detecto	or Spectr	um	Factor		Actual	L	imit	Margin
	Mode	0				FS	-	23m	-
MHz	PK/QP//	AV dBµ'	V	dB		dBµV/m	dBı	uV/m	dB
			_						
30.00	Peak			-17.05		17.90		0.00	-22.10
320.03 480.08	Peak Peak			-16.87 -11.04		19.78 25.29		6.00 6.00	-26.22 -20.71
639.16	Peak			-8.13		30.73		5.00 6.00	-15.27
857.41	Peak			-5.51		29.29		6.00	-16.71
971.87	Peak	34.1	8	-3.33		30.85	54	4.00	-23.15

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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Operation Mode Test Mode EUT Pol Test Channel	:Tx :E1	.E CH High Plan 80 MHz		:2018-09-03 :25/60 :VERTICAL :Jerry		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	100 Level (dBuV/m)						1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	90						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	80						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	20						
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	0 <mark></mark>	224.	418.	612.	806.	100	] 00
Mode     Reading Level     FS     @3m       MHz     PK/QP/AV     dBμV     dB     dBμV/m     dBμV/m     dB       83.35     Peak     40.19     -22.01     18.18     40.00     -21.82       340.40     Peak     32.61     -14.32     18.29     46.00     -27.71       480.08     Peak     33.62     -11.04     22.58     46.00     -23.42       640.13     Peak     33.66     -8.14     25.52     46.00     -20.48			Frequ	ency (MHz)			
MHzPK/QP/AVdBμVdBdBμV/mdBμV/mdB83.35Peak40.19-22.0118.1840.00-21.82340.40Peak32.61-14.3218.2946.00-27.71480.08Peak33.62-11.0422.5846.00-23.42640.13Peak33.66-8.1425.5246.00-20.48	Freq.			Factor			Margin
83.35Peak40.19-22.0118.1840.00-21.82340.40Peak32.61-14.3218.2946.00-27.71480.08Peak33.62-11.0422.5846.00-23.42640.13Peak33.66-8.1425.5246.00-20.48			•		-	-	
340.40Peak32.61-14.3218.2946.00-27.71480.08Peak33.62-11.0422.5846.00-23.42640.13Peak33.66-8.1425.5246.00-20.48	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
340.40Peak32.61-14.3218.2946.00-27.71480.08Peak33.62-11.0422.5846.00-23.42640.13Peak33.66-8.1425.5246.00-20.48	00.05		10.10	<u> </u>	10.10	10.00	04.00
480.08Peak33.62-11.0422.5846.00-23.42640.13Peak33.66-8.1425.5246.00-20.48							
640.13 Peak 33.66 -8.14 25.52 46.00 -20.48							
000.00 i can 00.01 -0.40 20.00 40.00 -10.44							
984.48 Peak 34.98 -3.65 31.33 54.00 -22.67							

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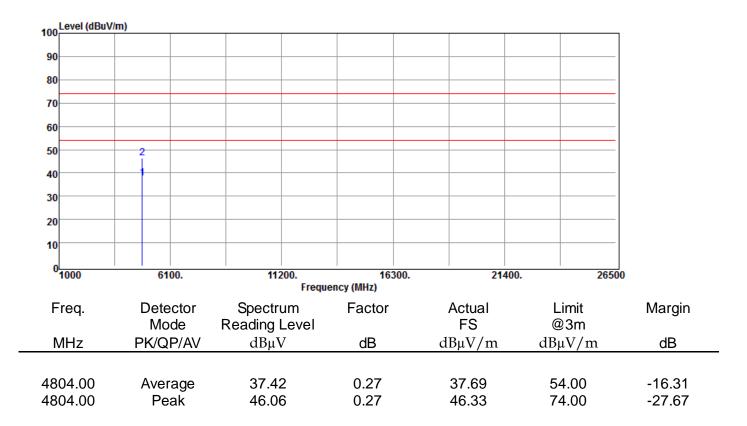


Operation M Test Mode EUT Pol Test Channe		:BLE :Tx CH High :E1 Plan :2480 MHz			:2018-09-03 :25/60 :HORIZONTAL :Jerry				
100 Level (dBu	V/m)						_		
90									
80									
70									
60									
50									
40									
30					4	5		6	
			3						
20									
10									
0 <mark> </mark> 30	224	, I. ·	418.		2.		806.	100	]  0
_		_		ncy (MHz)					
Freq.	Detec			Factor		Actual		_imit	Margin
MHz	Mod PK/QP	0		dB		FS dBµV/m		⊉3m µV/m	dB
	F IV QF	/Αν άδμ	. V	uВ		ασμν/Π	uD	μν/ 111	UD
30.00	Pea	k 34.2	07	-17.05		17.22	1	0.00	-22.78
152.22	Pea			-16.16		16.45		3.50	-27.05
480.08	Pea			-11.04		25.29		6.00	-20.71
640.13	Pea	k 37.7	72	-8.14		29.58	4	6.00	-16.42
781.75	Pea			-7.08		28.37		6.00	-17.63
992.24	Pea	k 35.′	10	-3.85		31.25	5	4.00	-22.75



## **Radiated Spurious Emission Measurement Result**

For Frequency above 1GHz									
Operation Mode	:BLE	Test Date	:2018-09-03						
Test Mode	:Tx CH Low	Temp./Humi.	:25/60						
EUT Pol	:E1 Plan	Antenna Pol.	:VERTICAL						
Test Channel	:2402 MHz	Engineer	:Jerry						



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Test M EUT F		de	:T) :E	LE Test Date x CH Low Temp./Humi. 1 Plan Antenna Pol. 402 MHz Engineer							:2018-09-03 :25/60 :HORIZONT/ :Jerry	
100 <sup>L</sup>	evel (dBuV/n	n)									_	
90											_	
80											_	
70											_	
60											_	
50											_	
40		2									_	
30											_	
20											_	
10											_	
0	1000	61	00.	11:	200.		300.	21	1400.	26	500	
					Freque	ency (MHz)						
Fi	req.	Dete		Spectr		Factor		Actual FS		Limit	Margin	
N	1Hz	Mo PK/Q		Reading dBµV		dB		г5 dBµV/m	d	@3m BμV/m	dB	
								. ,		. ,		
	04.00	Aver		35.5		0.27		35.82		54.00	-18.18	
480	04.00	Pe	ak	43.8	1	0.27		44.08		74.00	-29.92	

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Test M EUT F Test C	Pol Channel		:E	_E ( CH Mid 1 Plan 142 MHz			- - 	:2018-09-03 :25/60 :VERTICAL :Jerry			
100	.evel (dBuV/m	1)									7
90											_
80											-
70											-
60											-
50		2									-
40		-									-
30											-
20											-
10											-
0 <mark>1</mark>	000	610	00.	11:	200. Freque	163 ency (MHz)	300.	21	<b>400.</b>	265	
Fr	req.	Dete		Spectr		Factor		Actual		Limit	Margin
Μ	1Hz	Mo PK/QI		Reading dBµV		dB		FS dBµV/m		@3m 3μV/m	dB
		_			_						
	34.00 34.00	Aver Pea		37.5 45.3		0.71 0.71		38.29 46.05		54.00 74.00	-15.71 -27.95
-00	J00	1.6	an	40.0	т	0.71		40.00	1	00	-21.30

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Test N EUT F		de	:T) :E	LE < CH Mid 1 Plan 142 MHz	Test Date Temp./Humi. Antenna Pol. Engineer						:2018-09-03 :25/60 :HORIZONTAL :Jerry
100	Level (dBuV/r	n)			1				1		-
90											_
80											_
70											_
60											_
50		2									_
40											_
30											_
20											-
10											-
0	1000	610	00.	11:	200. Freque	163 ency (MHz)	00.	21	400.	265	500
F	req.	Dete		Spectr		Factor		Actual		Limit	Margin
N	/IHz	Mo PK/QI		Reading dBµV		dB		FS dBµV/m		@3m 3μV/m	dB
	84.00 84.00	Aver Pea		35.64 44.22		0.71 0.71		36.35 44.93		54.00 74.00	-17.65 -29.07
480	04.00	P6	aĸ	44.Z	2	0.71		44.93		4.00	-29.07

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Operation Mo Test Mode EUT Pol Test Channel	:T :E	LE x CH High 1 Plan 480 MHz	n Antenna Pol.					
100 Level (dBuV/	m)				1	7		
90						_		
80						_		
70						-		
60						_		
50	2					-		
40	<b>I</b>					_		
30						-		
20						-		
10						_		
0 <mark></mark>	6100.	11200. Freque	16300. ency (MHz)	21400	. 265	500		
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin		
MHz	Mode PK/QP/AV	Reading Level dBμV	dB	FS dBµV/m	@3m dBµV/m	dB		
4960.00 4960.00	Average Peak	38.01 47.53	1.24 1.24	39.25 48.77	54.00 74.00	-14.75 -25.23		

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Operation Test Mode EUT Pol Test Chan	nel	:BLE :Tx CH High :E1 Plan :2480 MHz	ımi. Pol.	:2018-09-03 :25/60 :HORIZONTAL :Jerry		
100 Level (c	IBuV/m)	1			1	
90						
80						
70						_
60						
50	2					_
40						_
30						—
20						—
10						—
0 <mark></mark>	6100.	11200. I	163 Frequency (MHz)	300. 2 <sup>,</sup>	1400. 2	6500
Freq.	Detecto		Factor	Actual	Limit	Margin
MHz	Mode PK/QP/A	Reading Lev W dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
4960.00 4960.00	0	e 36.73 45.22	1.24 1.24	37.97 46.46	54.00 74.00	-16.03 -27.54



# 11 PEAK POWER SPECTRAL DENSITY

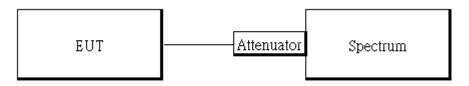
## 11.1 Standard Applicable:

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	MFR	MODEL	SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
Spectrum Analyzer	Agilent	N9010A	MY53400256	2017/10/30	2018/10/29		
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25		
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25		

## 11.3 Test Set-up:



## 11.4 Measurement Procedure:

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

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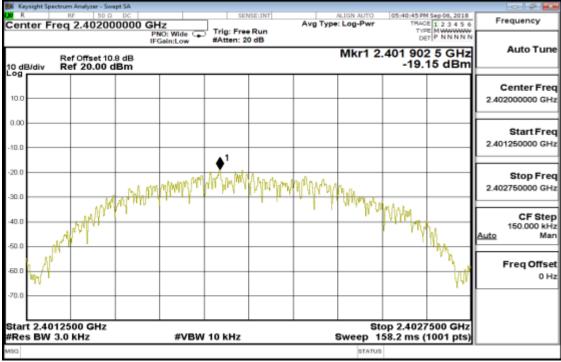


#### 11.5 **Measurement Result:**

BLE mode			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-19.15	8	PASS
2442	-18.44	8	PASS
2480	-17.21	8	PASS

NOTE: cable loss as 10.8dB that offsets in the spectrum

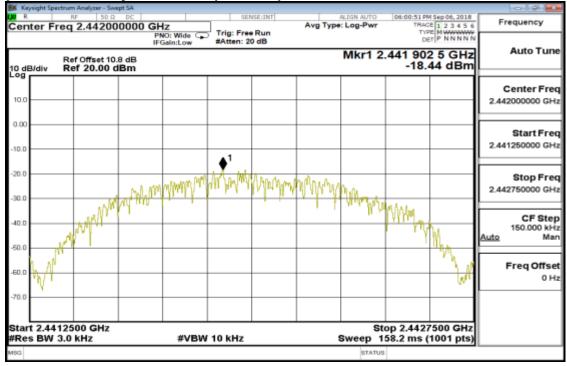
# **BLE mode** Power Spectral Density Test Plot (CH-Low)



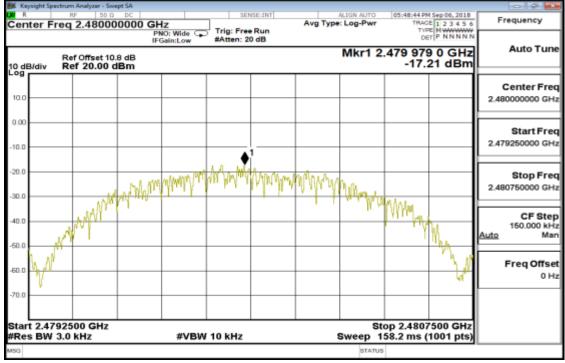
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# **Power Spectral Density Test Plot (CH-Mid)**



# 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:**

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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