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## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

**Product Name: HUAWEI MateBook** 

**Brand Name: HUAWEI** 

Model No.: PL-W29, PL-W09, PL-W19

**Model Difference:** For Marketing Purpose

FCC ID: **QISPL-WX9** 

IC: 6369A-PLWX9

**Report No.:** E2/2017/10033

**Issue Date:** Feb. 18, 2017

**FCC Rule Part:** §15.247, Cat: DTS

IC Rule Part: RSS-247 issue 1:2015

Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei **Prepared for FCC:** 

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### VERIFICATION OF COMPLIANCE

Huawei Technologies Co., Ltd.

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Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., **Applicant for IC:** 

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**HUAWEI MateBook Product Name:** 

**Brand Name: HUAWEI** 

Model No.: PL-W29, PL-W09, PL-W19

**Model Difference:** For Marketing Purpose

FCC ID: QISPL-WX9 IC: 6369A-PLWX9 **Report Number:** E2/2017/10033

Date of test: Jan. 12, 2017 ~ Feb. 14, 2017

Date of EUT Received: Jan. 12, 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:	Jerry Lu	Date:	Feb. 18, 2017	
Prepared By:	Jerry Lu/Sr. Engineer Vroletta Tang	Date:	Feb. 18, 2017	
Approved By:	Violetta Tang / Clerk  Jim Chang / Asst. Manager	Date:	Feb. 18, 2017	

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# **Revision History**

Report Number	Revision	Description	Issue Date
E2/2017/10033	Rev.00	Initial creation of document	Feb. 18, 2017

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### 1. GENERAL INFORMATION

## 1.1 Product Description

#### General:

General.			
Product Name:	HUAWEI MateBook		
Brand Name:	HUAWEI		
Model No.:	PL-W29, PL-W09, PL-W19		
Model Difference:	For Marketing Purpose		
Product SW/HW version:	PAIKU052 / C2A		
Radio SW/HW version:	19.0 / 8265		
Test SW Version:	N/A		
RF power setting in TEST SW:	N/A		
	11.4Vdc from Rechargeable Li-ion Battery or 19V by AC/DC Power Adapter		
Power Supply:	Battery:	Model No.: HB46K497ECW; Supplier: HUAWEI	
	Adapter:	Model No.: HW-19034YYYY (Y=0-9,A-Z or blank); Supplier: HUAWEI	

Bluetooth Low Energy:

Frequency Range:	2402 – 2480MHz
Bluetooth Version	BT V4.0+HS (dual mode)
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	9.17dBm
Antenna Designation:	PIFA Antenna, Gain: -2.73dBi (Aux) Part No.: 81EAA515.G77

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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

Canada RSS-247 issue 1: 2015

Canada RSS-Gen issue 4: 2014

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 Numbers are: 735305

Canada Registration Number: 4620A-5.

### 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 hand-held 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 10.9dB.

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## 2.5 Configuration of Tested System

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

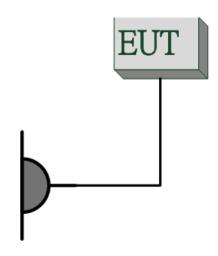
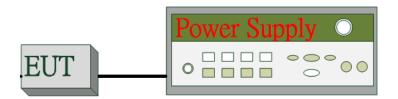


Fig. 2-2 Conducted (Antenna Port) Emission



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

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	HOLA	DP-3003	D7070035	N/A	Un-Shielded

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### 3. SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	RSS-247 §5.4(4)	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.2 (1) RSS-Gen §6.6	6dB and 99% Bandwidth	Compliant
§15.247(d)	RSS-247 §5.5	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	RSS-247 §5.5	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	RSS-247 §5.2(2)	Peak Power Density	Compliant
§15.203 §15.247(b)	RSS- Gen §8.3	Antenna Requirement	Compliant

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### 4. DESCRIPTION OF TEST MODES

## 4.1 Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

40 Charine	40 Charmers 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		

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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:**

	RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	
Bluetooth LE	0 to 39	19	GFSK	1	
RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	
Bluetooth LE	0 to 39	0,19,39	GFSK	1	

#### Note:

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 E2 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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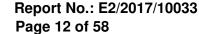
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5. MEASUREMENT UNCERTAINTY

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 (Polarization : <b>Vertical</b> )	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

	9kHz – 30MHz: +/- 2.87 dB	
Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB	
	167MHz -500MHz: +/- 3.44dB	
	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)  Quasi-peak  Average		
MHz			
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	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2016	12/11/2017	
Coaxial Cables	N/A	N30N30-1042- 150cm	N/A	02/07/2016	02/06/2017	
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017	
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.

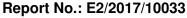
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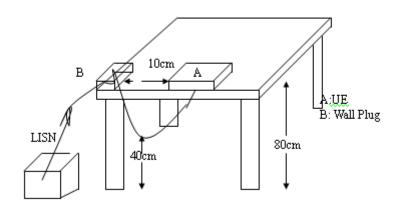
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### 6.4 Test SET-UP (Block Diagram of Configuration)



#### **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

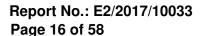
Test Date: Jan. 23, 2017 Operation Mode: Operation mode

Temperature: 23

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Site : Conduction Room Phase:

Temperature:

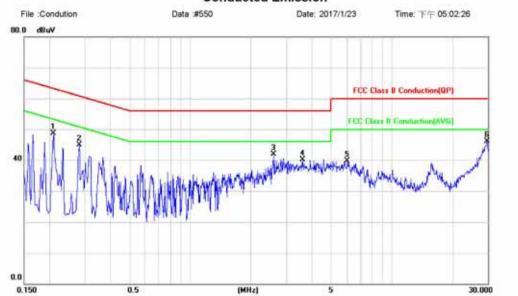
23 ℃

Limit: FCC Class B Conduction(QP)

Mode: 廣煌 Note:

Power: AC 120V/60Hz Humidity: 65 %

# Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2100	29.03	19.73	48.76	63.21	-14,45	peak	
2		0.2820	25.05	19.77	44.82	60.76	-15.94	peak	
3		2.6020	22.01	19.95	41.96	56.00	-14.04	peak	
4		3.6220	20.17	19.96	40.13	56.00	-15.87	peak	
5		6.0300	19.66	20.01	39,67	60.00	-20.33	peak	
6	•	29.8340	25.13	21.00	46.13	60.00	-13.87	peak	

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### 7. PEAK OUTPUT POWER MEASUREMENT

### 7.1 Standard Applicable:

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

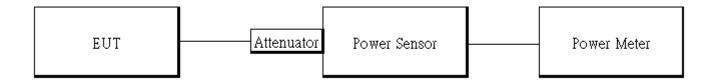
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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	06/23/2016	06/22/2017	
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017	
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017	

### 7.3 Test Set-up:

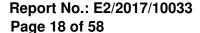


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7.4 Measurement Procedure:

- 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.

### **Duty Factor:**

	Duty Cycle (%)	Duty Factor (dB)
BLE	62.82	2.02



Duty Cycle Factor:10\*log(1/62.82/100)=2.02

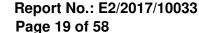
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#### 7.5 Measurement Result:

#### BI F mode:

DLE IIIC	ouc.						
СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit				
0	2402	9.04	1 Watt = 30 dBm				
20	2442	9.17	1 Watt = 30 dBm				
39	2480	9.02	1 Watt = 30 dBm				
BLE mo	BLE mode:						
СН	Frequency (MHz)	Avg. Output Power (dBm)	Required Limit				
0	2402	6.91	1 Watt = 30 dBm				
20	2442	6.99	1 Watt = 30 dBm				
39	2480	6.96	1 Watt = 30 dBm				

\*Note: Measured by power meter, cable loss as 10.89 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

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### 8. 6DB & 99% BANDWIDTH MEASUREMENT

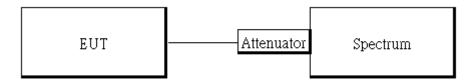
### 8.1 Standard Applicable

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 DUI					CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017	
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017	

#### 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.
- 8. Repeat above procedures until all test default channel is completed

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#### 8.5 Measurement Result:

#### BI E mode

Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	0.64	> 0.5	PASS
2442	0.646	> 0.5	PASS
2480	0.657	> 0.5	PASS

#### **BLE** mode

Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0775
2442	1.0245
2480	1.0667

Note: Refer to next page for plots.

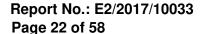
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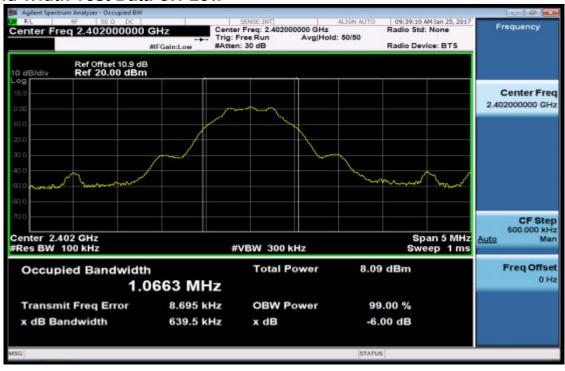
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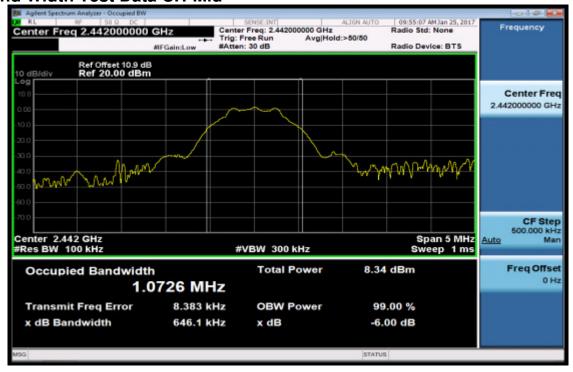




**BLE** mode 6dB Band Width Test Data CH-Low



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



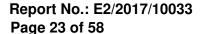
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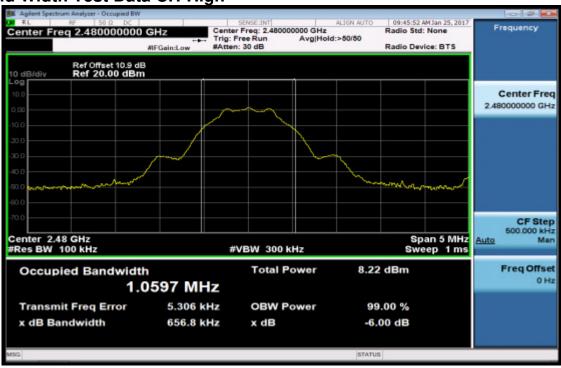
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6dB Band Width Test Data CH-High



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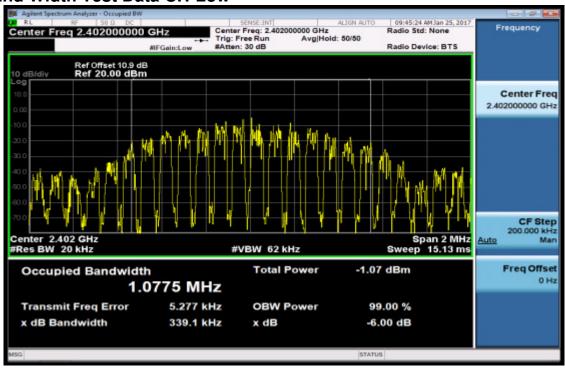
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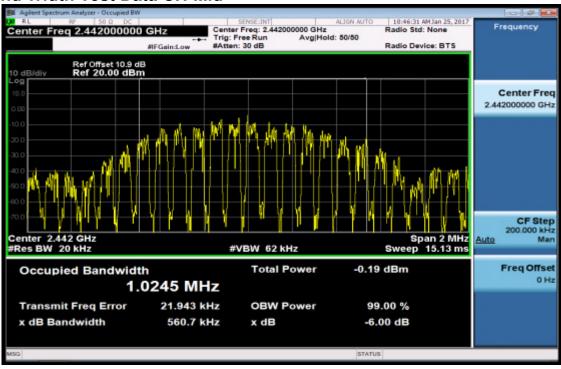


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### 99 % Band Width Test Data CH-Low



## 99 % Band Width Test Data CH-Mid



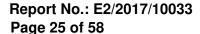
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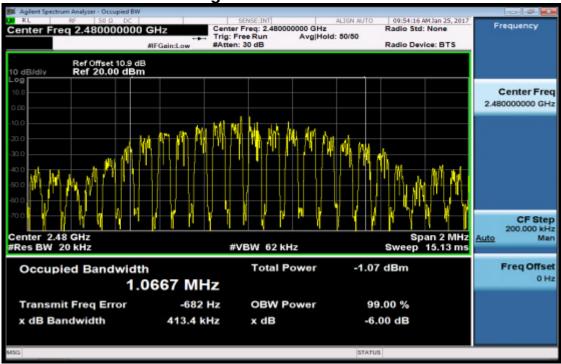
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99 % Band Width Test Data CH-High



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

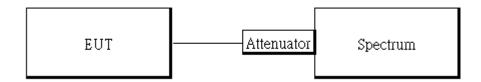
### 9.1 Standard Applicable

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:

1 1							
	Conducted Emission Test Site						
EQUIPMENT MFR MODEL SERIAL LAST CAL DU					CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017		
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017		
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017		

#### 9.3 Test SET-UP:



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#### 9.4 Measurement Procedure

### **Conducted Band Edge:**

- To connect Antenna Port of EUT to Spectrum.
- 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. 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 =
- 6. Mark the highest reading of the emission as the reference level measurement.
- 7. Set DL as the limit = reading on marker 1 20dBm
- 8. 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.
- 9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

#### **Conducted Spurious Emission:**

- 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

- 1. Refer to next page spectrum analyzer data chart and tabular data sheets.
- 2. For restricted Band Edge Limit, please refer to section 12.5 of this report for measurement result.

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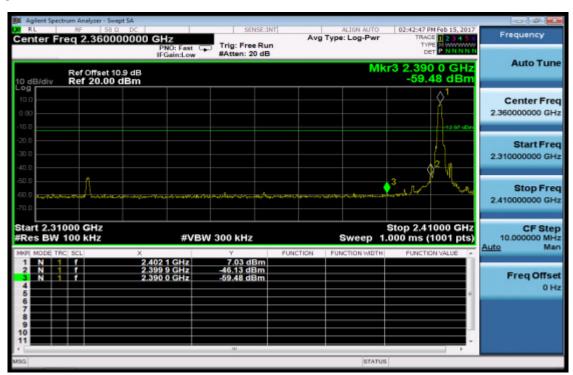
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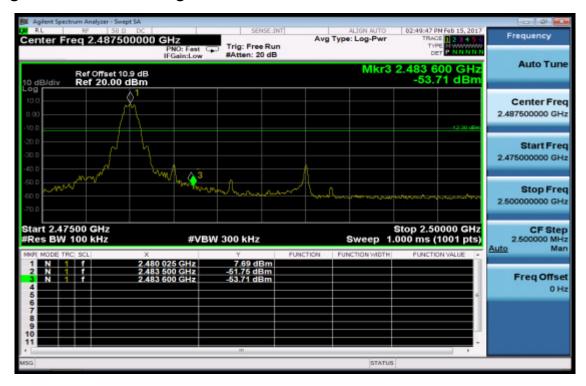
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## **BLE** mode **Band Edges Test Data CH-Low**



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



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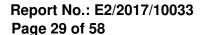
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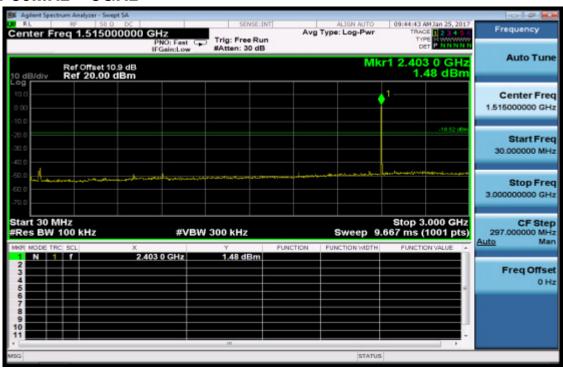
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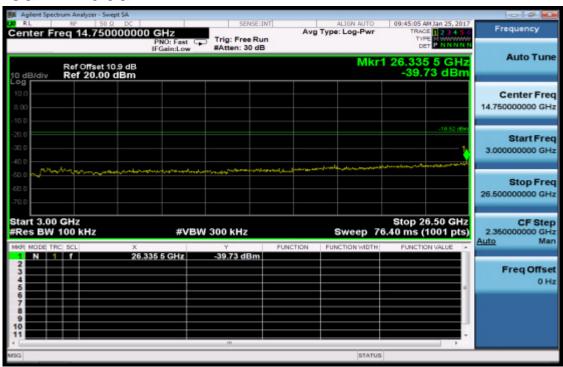




## **Conducted Spurious Emission Measurement Result** CH-Low 30MHz - 3GHz



### CH-Low 3GHz - 26.5GHz



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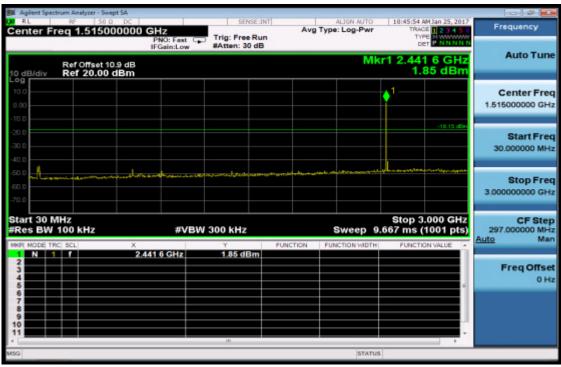
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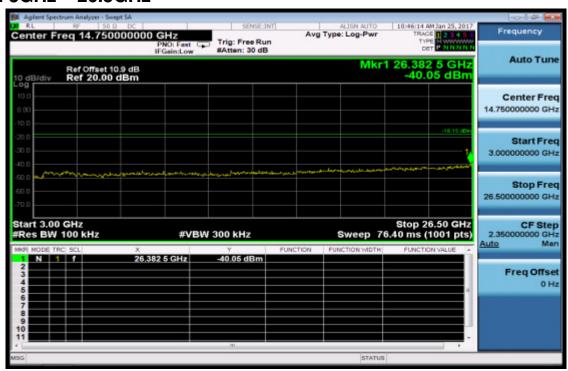
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### CH-Mid 30MHz - 3GHz



## CH-Mid 3GHz - 26.5GHz



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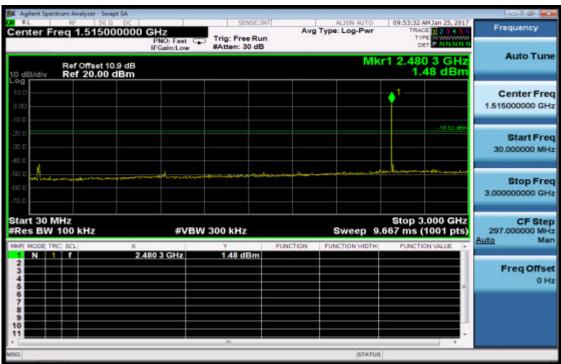
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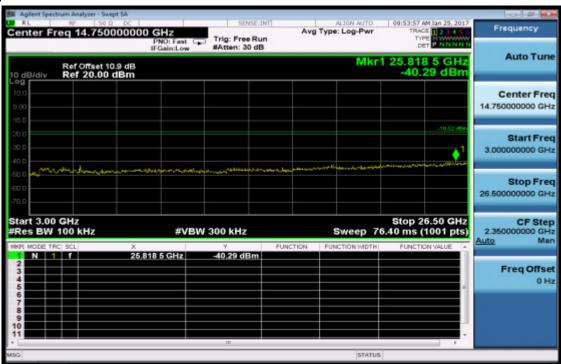
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## CH-High 30MHz - 3GHz



# CH- High 3GHz - 26.5GHz



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#### 10. RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 10.1 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 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.
- Emission level (dBµV/m) = 20 log Emission level (dBµV/m)

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### 10.2 Measurement Equipment Used

SGS 966 Chamber No.C						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017	
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017	
Broadband Antenna	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	07/24/2016	07/23/2017	
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017	
Pre Amplifier	EMC Instruments	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	03/04/2016	03/03/2017	
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017	
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017	
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.	

Note: N.C.R refers to Not Calibrated Required.

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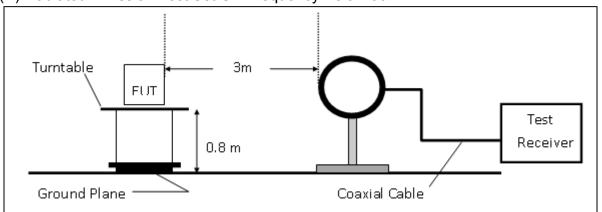
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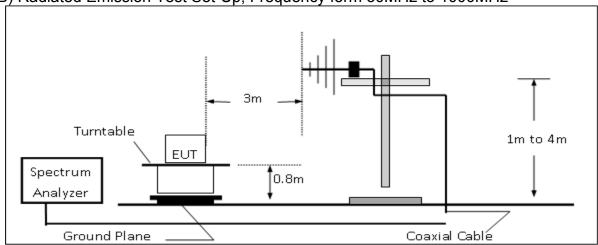
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#### 10.3 Test SET-UP

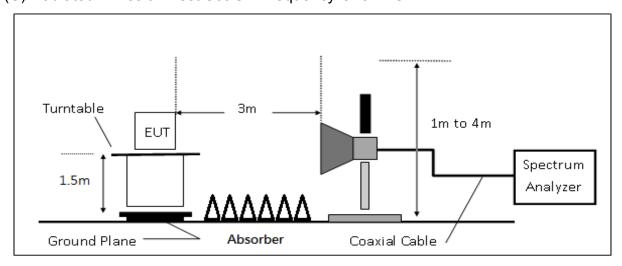
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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#### 10.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 0.8m for frequen-2. cy> 1GHz above ground plan.
- The turn table shall rotate 360 degrees to determine the position of maximum emission level. 3.
- EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the 4. 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 compli-
- 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	S	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.

### 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.

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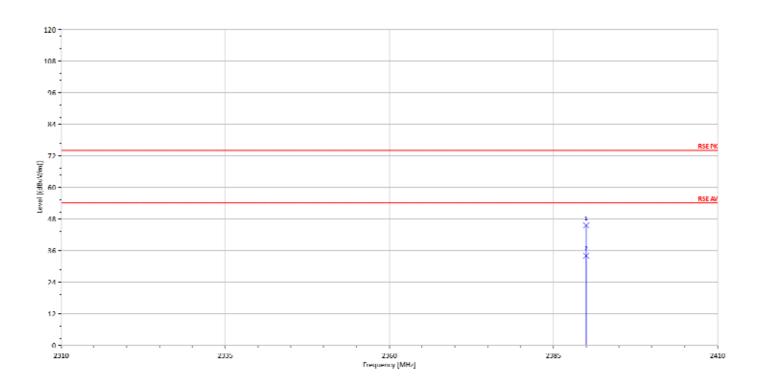
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# Radiated Band Edge Measurement Result (BLE mode)

**BLE** Operation Mode: Test Date: 2017/2/3

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: BE CH Low Enzo EUT Pol.: F2 Measurement Antenna Pol.: Vertical



	Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
•	2390.00	E	Peak	44.67	0.92	45.59	74	-28.41	•
	2390.00	E	Average	33.01	0.92	33.93	54	-20.07	

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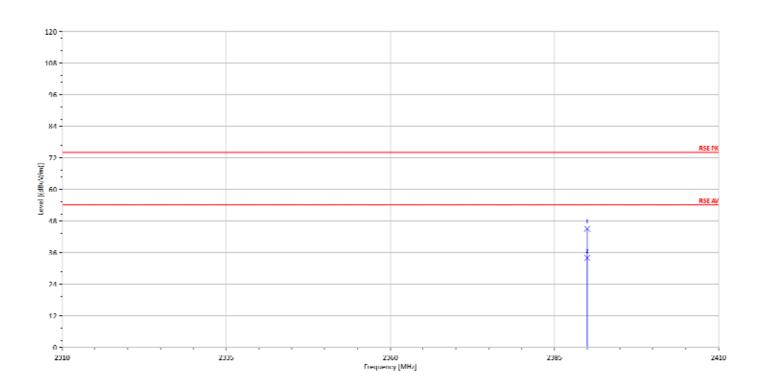


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Operation Mode: **BLE** Test Date: 2017/2/4

Fundamental Frequency: 2402 MHz Temp. / Humi. : 22.7deg\_C/57RH

Operation Band: BE CH Low Test Engineer: Enzo EUT Pol.: Measurement Antenna Pol.: Horizontal E2



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Peak	44.15	0.92	45.08	74	-28.92
2390.00	Ε	Average	32.97	0.92	33.89	54	-20.11

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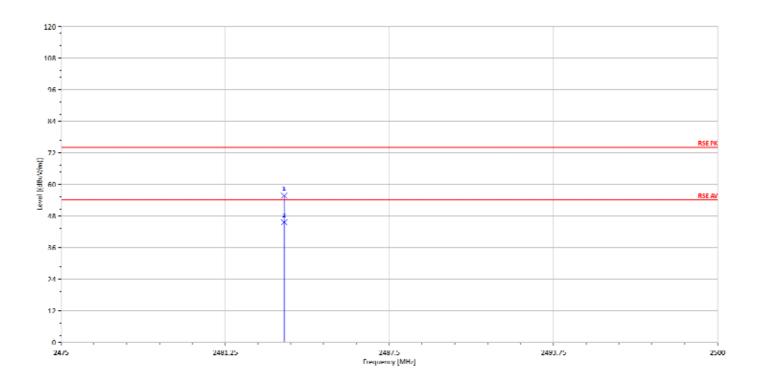


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Operation Mode: BLE Test Date: 2017/2/4

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg\_C/57RH

BE CH High Operation Band: Test Engineer: Enzo EUT Pol.: Measurement Antenna Pol.: Vertical E2



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Peak	54.48	1.16	55.64	74	-18.36
2483.50	E	Average	44.46	1.16	45.62	54	-8.38

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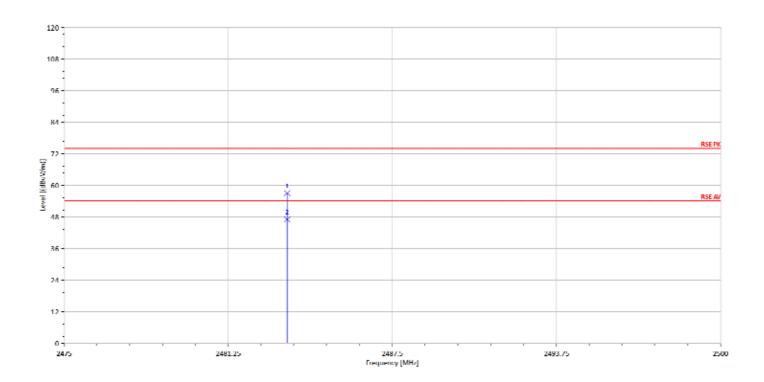


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Operation Mode: BLE Test Date: 2017/2/4

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg\_C/57RH

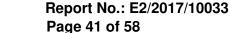
BE CH High Operation Band: Test Engineer: Enzo EUT Pol.: Measurement Antenna Pol.: Horizontal E2



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Peak	55.86	1.16	57.02	74	-16.98
2483.50	Е	Average	45.91	1.16	47.07	54	-6.93

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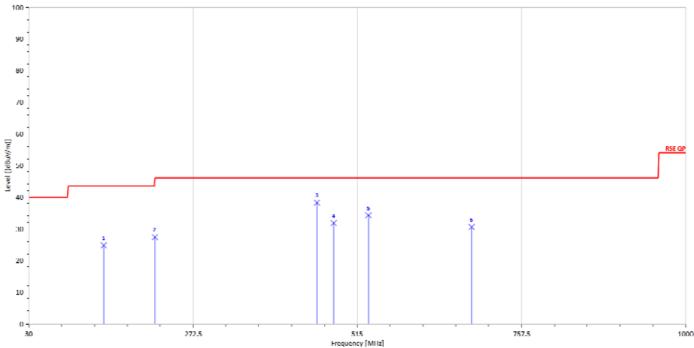


# Radiated Spurious Emission Measurement Result (BLE mode) For Frequency form 30MHz to 1000MHz

Operation Mode: Test Date: 2017/1/25

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



			medacine) limit	-1			
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
140.58	S	Peak	40.96	-16.17	24.79	43.5	-18.71
216.24	S	Peak	44.54	-17.15	27.39	46	-18.61
455.83	S	Peak	46.70	-8.43	38.27	46	-7.73
480.08	S	Peak	39.55	-7.81	31.74	46	-14.26
531.49	S	Peak	41.43	-7.22	34.21	46	-11.79
683.78	S	Peak	36.03	-5.55	30.47	46	-15.53

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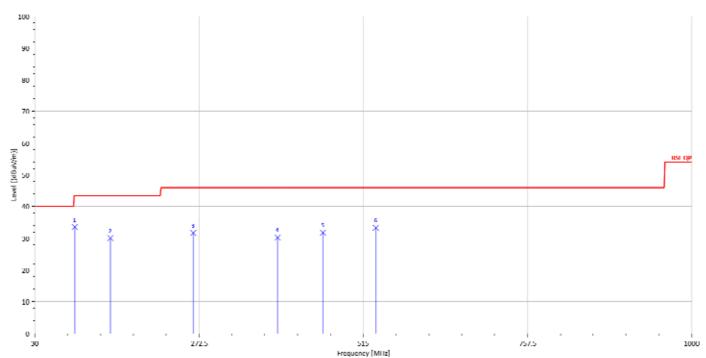


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**BLE** Operation Mode: Test Date: 2017/1/25

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Test Engineer: Tx CH Low Ashton EUT Pol.: F2 Measurement Antenna Pol.: Horizontal



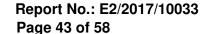
				-			
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
89.17	S	Peak	53.24	-19.63	33.61	43.5	-9.89
141.55	S	Peak	46.33	-16.25	30.08	43.5	-13.42
263.77	S	Peak	45.52	-13.80	31.72	46	-14.28
388.90	S	Peak	40.27	-10.02	30.26	46	-15.74
455.83	S	Peak	40.23	-8.43	31.79	46	-14.21
533.43	S	Peak	40.44	-7.09	33.35	46	-12.65

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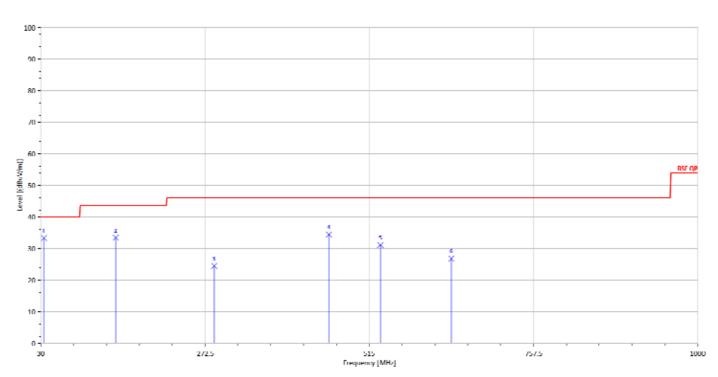




Operation Mode: Test Date: 2017/1/25 BLE

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg\_C/57RH

Ashton Operation Band: Tx CH Mid Test Engineer: EUT Pol.: F2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	<b>@</b> 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
34.85	S	Peak	43.09	-9.78	33.30	40	-6.70
140.58	S	Peak	49.58	-16.17	33.41	43.5	-10.09
286.08	S	Peak	37.96	-13.41	24.55	46	-21.45
455.83	S	Peak	42.87	-8.43	34.44	46	-11.56
531.49	S	Peak	38.28	-7.22	31.07	46	-14.93
636.25	S	Peak	32.03	-5.25	26.79	46	-19.21

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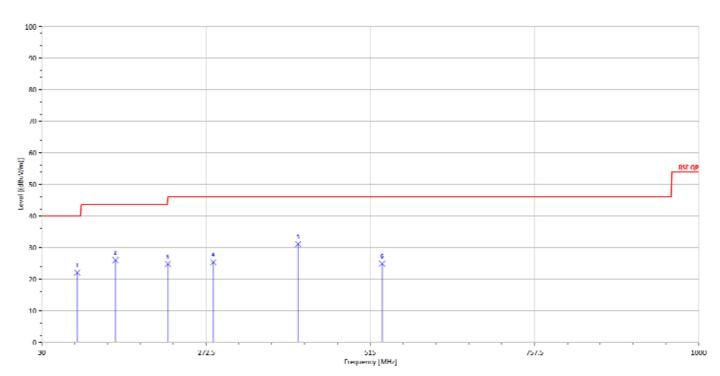




Operation Mode: Test Date: 2017/1/25 BLE

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg\_C/57RH

Ashton Operation Band: Tx CH Mid Test Engineer: EUT Pol.: F2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	<b>@</b> 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
82.38	S	Peak	42.71	-20.61	22.09	40	-17.91
138.64	S	Peak	41.96	-15.97	26.00	43.5	-17.50
216.24	S	Peak	42.01	-17.15	24.86	46	-21.14
283.17	S	Peak	38.87	-13.48	25.39	46	-20.61
408.30	S	Peak	40.27	-9.25	31.02	46	-14.98
532.46	S	Peak	32.01	-7.09	24.92	46	-21.08

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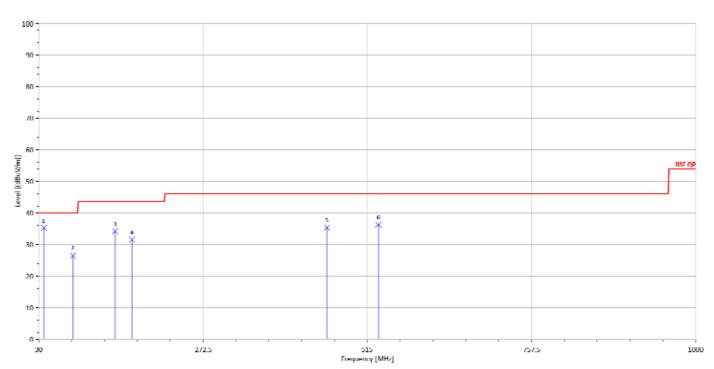


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Operation Mode: BLE Test Date: 2017/1/25

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
37.76	S	Peak	46.78	-11.49	35.29	40	-4.71
80.44	S	Peak	47.35	-20.88	26.47	40	-13.53
142.52	S	Peak	50.48	-16.26	34.22	43.5	-9.28
167.74	S	Peak	49.57	-18.06	31.51	43.5	-11.99
455.83	S	Peak	43.80	-8.43	35.37	46	-10.63
531.49	S	Peak	43.50	-7.22	36.29	46	-9.71

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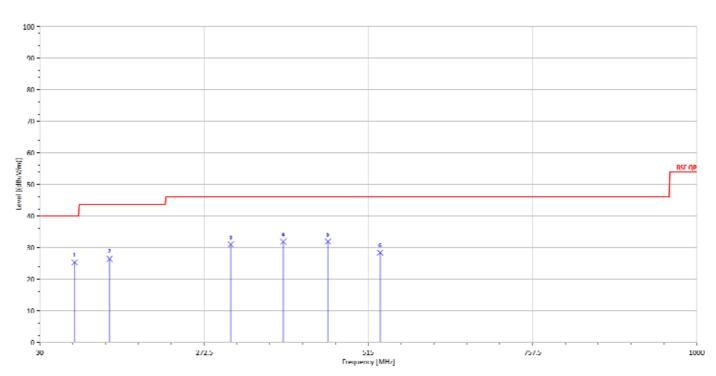


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Operation Mode: BLE Test Date: 2017/1/25

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	<b>@</b> 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
81.41	S	Peak	46.06	-20.74	25.32	40	-14.68
132.82	S	Peak	42.19	-15.76	26.43	43.5	-17.07
312.27	S	Peak	43.45	-12.52	30.93	46	-15.07
389.87	S	Peak	41.83	-10.03	31.81	46	-14.19
455.83	S	Peak	40.27	-8.43	31.84	46	-14.16
532.46	S	Peak	35.42	-7.09	28.32	46	-17.68

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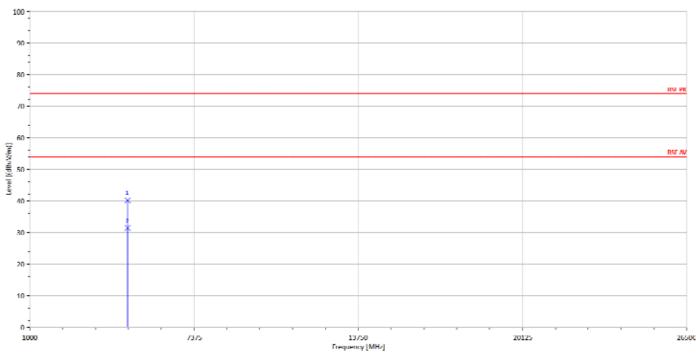


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Operation Mode: Test Date: 2017/2/10 BLE

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: Tx CH Low Enzo EUT Pol.: F2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
4804.00	Н	Peak	32.58	7.66	40.24	74	-33.76	
4804.00	Н	Average	23.78	7.66	31.44	54	-22.56	

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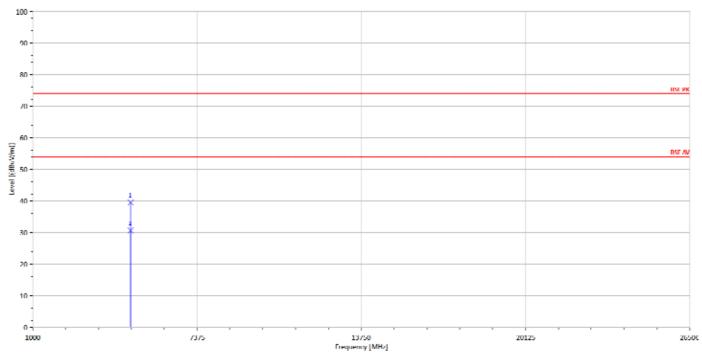


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Operation Mode: Test Date: 2017/2/10 BLE

Fundamental Frequency: 2402 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: Tx CH Low Enzo EUT Pol.: F2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4804.00	Н	Peak	31.88	7.66	39.54	74	-34.46
4804.00	Н	Average	22.94	7.66	30.60	54	-23.40

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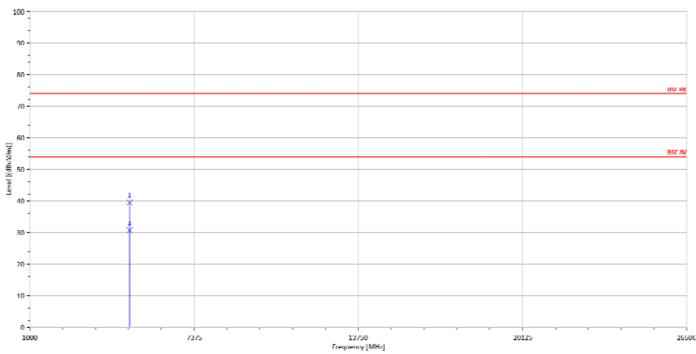


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Operation Mode: Test Date: 2017/2/10 BLE

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Mid Test Engineer: Enzo EUT Pol.: F2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4884.00	Н	Peak	31.92	7.62	39.54	74	-34.46
4884.00	Н	Average	23.06	7.62	30.68	54	-23.32

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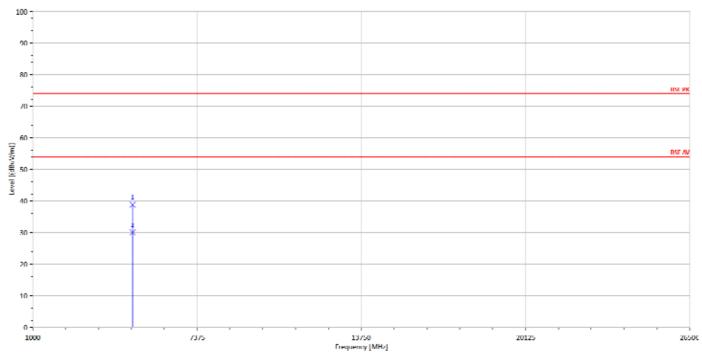


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Operation Mode: Test Date: 2017/2/10 BLE

Fundamental Frequency: 2442 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Mid Test Engineer: Enzo EUT Pol.: F2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4884.00	Н	Peak	31.22	7.62	38.84	74	-35.16
4884.00	Н	Average	22.37	7.62	29.99	54	-24.01

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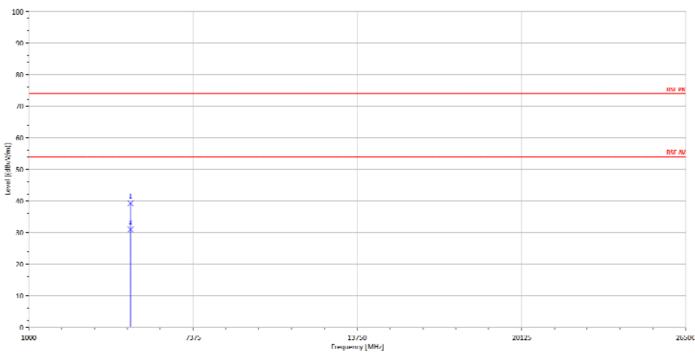


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Operation Mode: Test Date: BLE 2017/2/10

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: Tx CH High Enzo EUT Pol.: E2 Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4960.00	Н	Peak	31.59	7.69	39.28	74	-34.72
4960.00	Н	Average	23.23	7.69	30.92	54	-23.08

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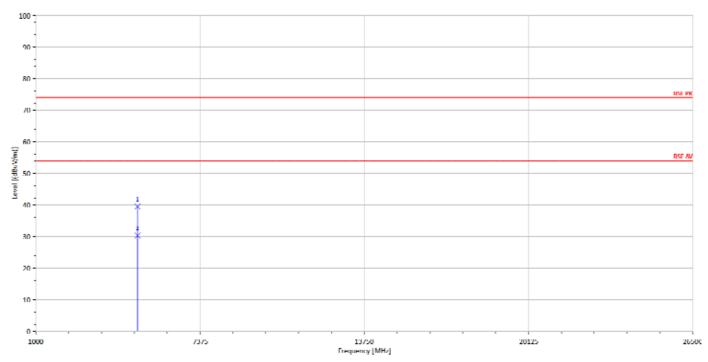


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Operation Mode: Test Date: BLE 2017/2/10

Fundamental Frequency: 2480 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: Tx CH High Enzo EUT Pol.: E2 Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	<b>@</b> 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4960.00	Н	Peak	31.84	7.69	39.52	74	-34.48
4960.00	Н	Average	22.57	7.69	30.26	54	-23.74

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### 11. PEAK POWER SPECTRAL DENSITY

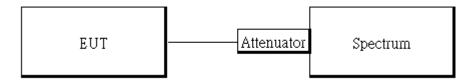
## 11.1 Standard Applicable:

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 SE		SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017	
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017	

## 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 & 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	-7.93	8	PASS
2442	-7.49	8	PASS
2480	-6.82	8	PASS

NOTE: cable loss as 10.9dB that offsets in the spectrum

## **Band Edge Limit**

Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit = PSD - 20dB
2402	7.03	-12.97
2480	7.70	-12.30

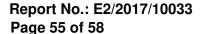
NOTE: cable loss as 10.9dB that offsets in the spectrum

NOTE: Refer to next page for plots.

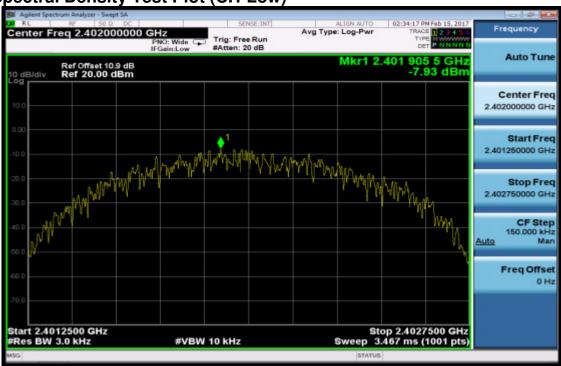
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**Power Spectral Density Test Plot (CH-Low)** 



Power Spectral Density Test Plot (CH-Mid)

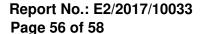


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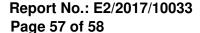


**Power Spectral Density Test Plot (CH-High)** 



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Power Spectral Density for Bandedge Limit (CH-Low)



Power Spectral Density for Bandedge Limit (CH-High)



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## 12. ANTENNA REQUIREMENT

## 12.1 Standard Applicable:

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.

### According to RSS-GEN 8.3

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

### 12.2 Antenna Connected Construction:

An embedded-in antenna design is used.

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

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

~ End of Report ~

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