

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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## INTENTIONAL RADIATOR CERTIFICATION TO **FCC PART 15 SUBPART C REQUIREMENT**

	OF		
Product Name:	WIRELESS LAN + BLUETOOTH MODULE		
Brand Name:	MITSUMI		
Model No.:	DWM-W314K		
Model Difference:	N/A		
FCC ID:	EW4DWMW314K		
Report No.:	E2/2016/B0007		
Issue Date:	Nov. 24, 2016		
FCC Rule Part:	§15.247, Cat: DSS		
Prepared for:	MITSUMI ELECTRIC CO., LTD. 2-11-2, Tsurumaki, Tama-shi, Tokyo, 206-8567, JAPAN		
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333		
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## VERIFICATION OF COMPLIANCE

Applicant:	MITSUMI ELECTRIC CO., LTD. 2-11-2, Tsurumaki, Tama-shi, Tokyo, 206-8567, JAPAN
Product Name:	WIRELESS LAN + BLUETOOTH MODULE
Brand Name:	MITSUMI
Model No.:	DWM-W314K
Model Difference:	N/A
FCC ID:	EW4DWMW314K
Report Number:	E2/2016/B0007
Date of test:	Oct. 29, 2016 ~ Nov. 16, 2016
Date of EUT Received:	Oct. 29, 2016

### 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:	Nov. 24, 2016
Prepared By:	Jerry Lu/Sr. Engineer Vroletta Tang	Date:	Nov. 24, 2016
Approved By:	Violetta Tang / Clerk Jim Ch ang	Date:	Nov. 24, 2016

Jim Chang / Asst. Manager

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# **Revision History**

Report Number	Revision	Description	Issue Date
E2/2016/B0007	Rev.00	Initial creation of document	Nov. 24, 2016

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# **Contents**

1	GENERAL INFORMATION	5
2	SYSTEM TEST CONFIGURATION	7
3	SUMMARY OF TEST RESULTS	9
4	DESCRIPTION OF TEST MODES	. 10
5	ASUREMENT UNCERTAINTY	. 12
6	CONDUCTED EMISSION TEST	. 13
7	PEAK OUTPUT POWER MEASUREMENT	. 15
8	20dB BANDWIDTH MEASUREMENT	. 18
9	CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT	. 25
10	RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT	. 37
11	FREQUENCY SEPARATION	. 70
12	NUMBER OF HOPPING FREQUENCY	. 72
13	TIME OF OCCUPANCY (DWELL TIME)	. 75
14	ANTENNA REQUIREMENT	. 89

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#### **GENERAL INFORMATION** 1

### **1.1 Product description**

#### General:

Product Name:	WIRELESS LAN + BLUETOOTH MODULE
Brand Name:	MITSUMI
Model No.:	DWM-W314K
Model Difference:	N/A
Hardware Version:	V1.0
Software Version:	V1.0
Power Supply:	3.3V from DC Power Supply

#### Bluetooth\_BR+EDR:

Frequency Range:	2.402GHz – 2.480GHz
Bluetooth Version	BT V4.0 dual mode
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	-3.70dBm (Peak)
Antenna Designation:	PCB Printed Antenna, Gain: -4.7dBi

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### 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC Public Notice DA 00-705 Measurement Guidelines

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 is no special accessory 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 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 0.7dB.

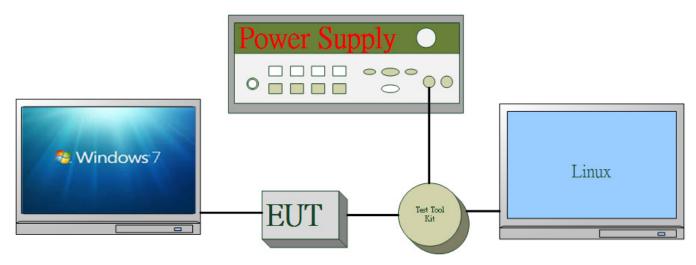
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#### 2.5 Configuration of Tested System

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



#### **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.	Notebook	Lenovo	L440	R9-007LAZ	N/A	Un-shield
3.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	N/A
4.	Test Tool Kit	N/A	N/A	N/A	N/A	N/A

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#### SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§15.247(a)(1)(iii)	Time of Occupancy	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

#### 79 channels are provided for Bluetooth

СН	FREQUENCY	СН	FREQUENCY	СН	FREQUENCY	СН	FREQUENCY
0	2402 MHz	20	2422 MHz	40	2442 MHz	70	2462 MHz
1	2403 MHz	21	2423 MHz	41	2443 MHz	71	2463 MHz
2	2404 MHz	22	2424 MHz	42	2444 MHz	72	2464 MHz
3	2405 MHz	23	2425 MHz	43	2445 MHz	73	2465 MHz
4	2406 MHz	24	2426 MHz	44	2446 MHz	74	2466 MHz
5	2407 MHz	25	2427 MHz	45	2447 MHz	75	2467 MHz
6	2408 MHz	26	2428 MHz	46	2448 MHz	76	2468 MHz
7	2409 MHz	27	2429 MHz	47	2449 MHz	77	2469 MHz
8	2410 MHz	28	2430 MHz	48	2450 MHz	78	2470 MHz
9	2411 MHz	29	2431 MHz	49	2451 MHz	79	2471 MHz
10	2412 MHz	30	2432 MHz	50	2452 MHz	70	2472 MHz
11	2413 MHz	31	2433 MHz	51	2453 MHz	71	2473 MHz
12	2414 MHz	32	2434 MHz	52	2454 MHz	72	2474 MHz
13	2415 MHz	33	2435 MHz	53	2455 MHz	73	2475 MHz
14	2416 MHz	34	2436 MHz	54	2456 MHz	74	2476 MHz
15	2417 MHz	35	2437 MHz	55	2457 MHz	75	2477 MHz
16	2418 MHz	36	2438 MHz	56	2458 MHz	76	2478 MHz
17	2419 MHz	37	2439 MHz	57	2459 MHz	77	2479 MHz
18	2420 MHz	38	2440 MHz	58	2460 MHz	78	2480 MHz
19	2421 MHz	39	2441 MHz	59	2461 MHz		

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### 4.2 The Worst Test Modes and Channel Details

- 1 The EUT has been tested under operating condition.
- Test program used to control the EUT for staying in continuous transmitting and receiving 2 mode is programmed.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

RADIATED TEST							
	Radiated Emission Test (BELOW 1 GHz) (Worst case)						
MODE	AVAILABLE	TESTED	MODULATION	PACKET			
MODE	CHANNEL	CHANNEL	WODULATION	TYPE			
Bluetooth	0 to 78	0,39,78	8-DPSK	3DH5			
	Radiated Emission Test (ABOVE 1 GHz) (Worst case)						
MODE	AVAILABLE	TESTED	MODULATION	PACKET			
MODE	CHANNEL	CHANNEL	WODULATION	TYPE			
Bluetooth	0 to 78	0,39,78	8-DPSK	3DH5			
Band Edge							
Bluetooth	0 to 78	0,78	GFSK	DH5			
Bluetooth	0 to 78	0,78	8-DPSK	3DH5			

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 BR+EDR Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

ANTENNA PORT CONDUCTED TEST							
	Peak Output Power, 20dB Band Width						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE			
	0 to 78	0,39,78	GFSK	DH5			
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	2DH5			
	0 to 78	0,39,78	8-DPSK	3DH5			
		Band Edge & C	onducted Emission	l			
Bluetooth	0 to 78	0,78	GFSK	DH5			
Bluetooth	0 to 78	0,78	8-DPSK	3DH5			
		Frequen	cy Separation				
Bluetooth     0 to 78     0,39,78     8-DPSK     3DH5		3DH5					
		Number of h	opping frequency				
Bluetooth	0 to 78	0 to 78	8-DPSK	3DH5			
Time of Occupancy (Dwell time)							
Bluetooth	0 to 78	0,39,78	GFSK	DH1/DH3/DH5			
Bluetooth	0 to 78	39	π/4-DQPSK	DH1/DH3/DH5			
Bluetooth	0 to 78	39	8-DPSK	DH1/DH3/DH5			

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#### **ASUREMENT UNCERTAINTY** 5

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
20dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Frequency Separation	+/- 51.33 Hz
Number of hopping frequency	+/- 51.33 Hz
Time of Occupancy	+/- 51.33 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

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

Measurement uncertainty (Polarization : <b>Horizontal</b> )	9kHz – 30MHz: +/- 2.87 dB
	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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#### CONDUCTED EMISSION TEST 6

### 6.1 Standard Applicable

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

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

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

#### 6.2 Measurement Equipment Used

Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2015	12/11/2016	
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.	

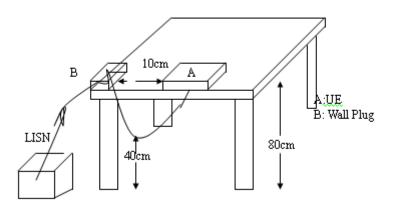
#### 6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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



#### 6.5 Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plan.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

#### 6.6 Measurement Result

N/A, the device is powered by DC 3.3V.

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## 7 PEAK OUTPUT POWER MEASUREMENT

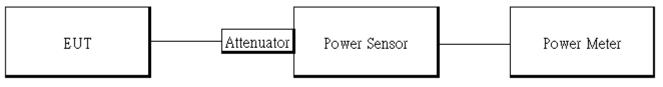
## 7.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts.

#### 7.2 Measurement Equipment Used

Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017	
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017	
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017	
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016	
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016	
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016	
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016	
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017	

### 7.3 Test Set-up:



### 7.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
- 4. Record the max. reading.
- 5. Repeat above procedures until all default test channel is completed.

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#### 7.5 Measurement Result

#### 1M BR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-4.07	0.392	125
39	2441	-4.02	0.396	125
78	2480	-4.31	0.371	125

#### 1M BR mode (Average):

СН	Freq. (MHz)	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-6.83	0.207	125
39	2441	-7.14	0.193	125
78	2480	-7.57	0.175	125

#### 2M EDR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-4.20	0.380	125
39	2441	-4.44	0.360	125
78	2480	-4.81	0.330	125

#### 2M EDR mode (Average):

СН	Freq. (MHz)	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-7.10	0.195	125
39	2441	-7.31	0.186	125
78	2480	-7.69	0.170	125

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#### 3M EDR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-3.70	0.427	125
39	2441	-4.02	0.396	125
78	2480	-4.37	0.366	125

3M EDR mode (Average):

СН	Freq. (MHz)	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-7.07	0.196	125
39	2441	-7.44	0.180	125
78	2480	-7.86	0.164	125

NOTE: cable loss as 0.7dB that offsets in the spectrum

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## 8 20DB BANDWIDTH MEASUREMENT

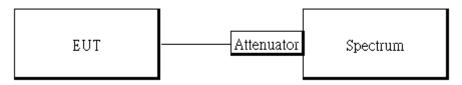
#### 8.1 Standard Applicable

For frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

#### 8.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL SERIAL		LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017			
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017			
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016			
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016			
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016			
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016			
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017			

#### 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 FCC Public Notice DA 00-705 Measurement Guidelines.
- 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 the spectrum analyzer as RBW=10 kHz (1 % of 20 dB Bandwidth.), VBW = 30 kHz, Span= 3MHz, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
- 5. Mark the peak frequency and –20dB (upper and lower) frequency
- 6. Repeat above procedures until all test default channel is completed

#### NOTE:

1. For the plot of bandwidth measurement, the marker of the 20dB BW is arrow-mark.

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#### 8.5 Measurement Result

#### **GFSK**

	20 dB	2/3
СН	BW	BW
	(MHz)	(MHz)
Low	0.923	0.62
Mid	0.923	0.62
High	0.923	0.62

#### π/4-DQPSK

	20 dB	2/3
СН	BW	BW
	(MHz)	(MHz)
Low	1.313	0.88
Mid	1.313	0.88
High	1.315	0.88

#### 8-DPSK

	20 dB	2/3	
СН	BW	BW	
	(MHz)	(MHz)	
Low	1.283	0.86	
Mid	1.283	0.86	
High	1.284	0.86	

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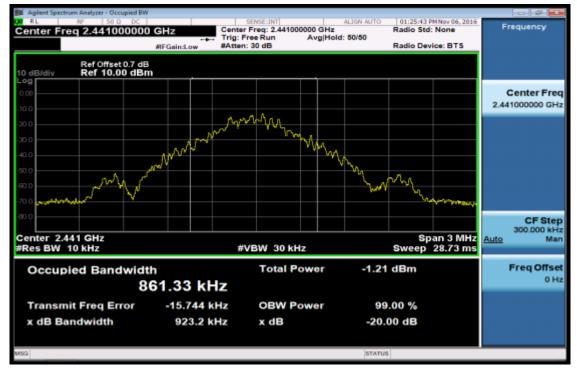
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## 20dB Band Width Test Data CH-Low (GFSK mode)



## 20dB Band Width Test Data CH-Mid (GFSK mode)

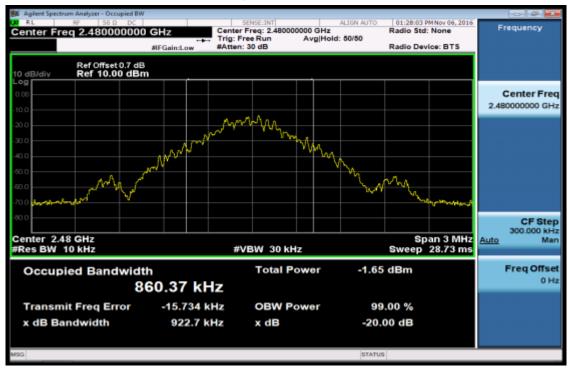


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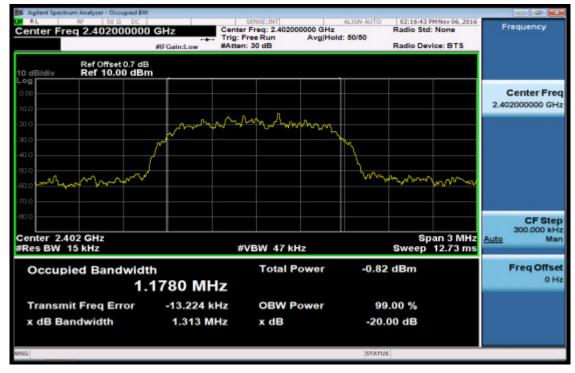
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## 20dB Band Width Test Data CH-High (GFSK mode)



## 20dB Band Width Test Data CH-Low (π/4-DQPSK mode)



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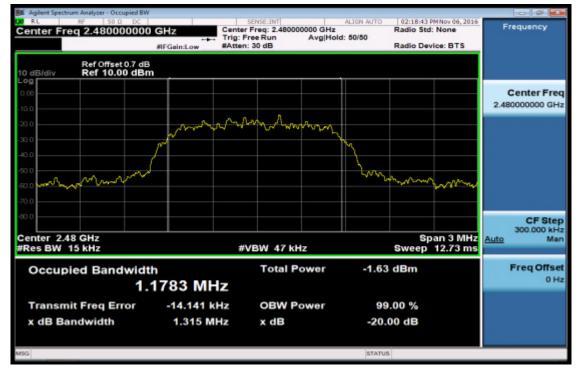
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## 20dB Band Width Test Data CH-Mid (π/4-DQPSK mode)



## 20dB Band Width Test Data CH-High (π/4-DQPSK mode)

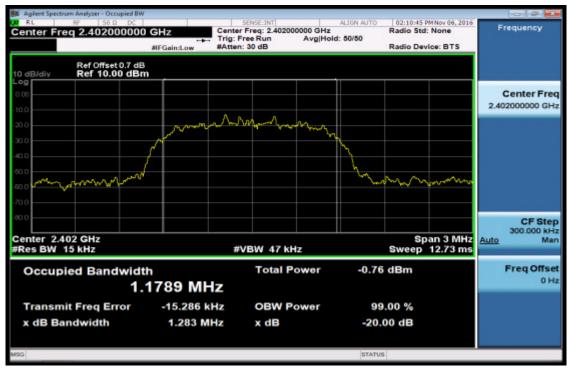


Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

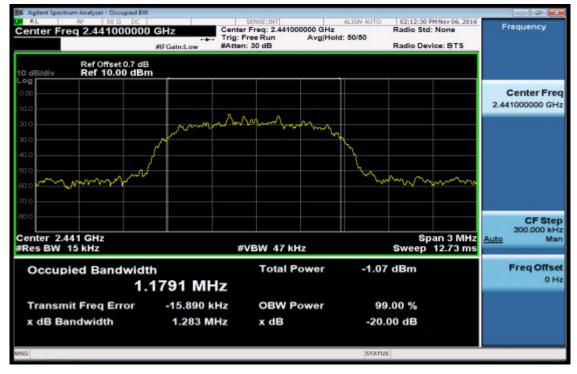
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## 20dB Band Width Test Data CH-Low (8-DPSK mode)



## 20dB Band Width Test Data CH-Mid (8-DPSK mode)



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## 20dB Band Width Test Data CH-High (8-DPSK mode)



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

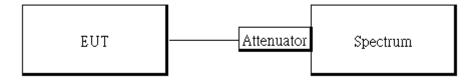
#### 9.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

	Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL SERIAL		LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017			
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017			
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016			
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016			
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016			
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016			
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017			

#### 9.2 Measurement Equipment Used

#### 9.3 Test SET-UP



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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### 9.4 Measurement Procedure

#### **Conducted Band Edge:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 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 center frequency of spectrum analyzer = operating frequency.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
- 6. Mark Peak, 2.3999GHz and 2.4836GHz and record the max. level.
- 7. Repeat above procedures until all frequency measured were complete.

### **Conducted Spurious Emission:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 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.

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

#### 9.5 Measurement Result

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

- 1. Cable loss as 0.7dB that offsets in the spectrum
- 2. The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

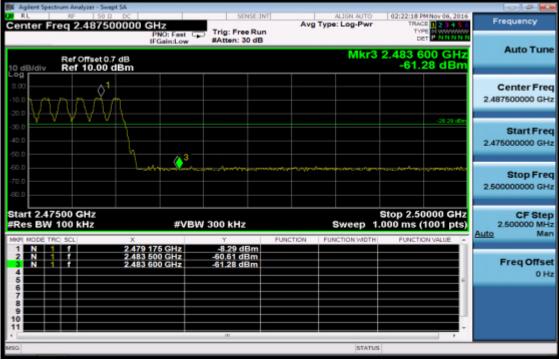
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#### Center Freq 2.365000000 GHz ALIGN AUTO Avg Type: Log-Pwr Frequency Trig: Free Run #Atten: 30 dB Auto Tune Mkr3 Ref Offset 0.7 dB Ref 10.00 dBm -61.25 dBm Ŷ Center Freq 2.365000000 GH: H UMAN MADINAN Start Freq 2.310000000 GHz ●3 Stop Freq 2.42000000 GHz Stop 2.42000 GHz Sweep 1.000 ms (1001 pts) Start 2.31000 GHz #Res BW 100 kHz CF Step #VBW 300 kHz 11.000000 MH Auto -7 28 dBm -61.60 dBm -61.25 dBm Freq Offset N 0 Hz

## Band Edges Test Data CH-Low (Hopping mode) (GFSK mode)

Band Edges Test Data CH-High



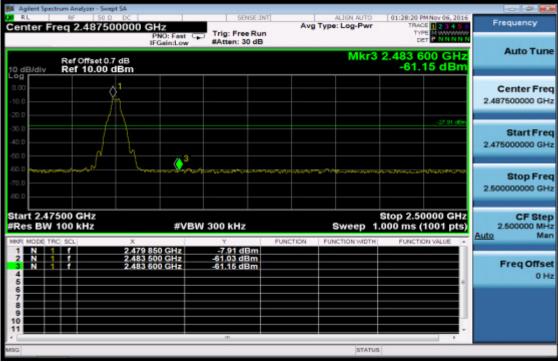
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#### ALIGN AUTO Avg Type: Log-Pwr Frequency Center Freq 2.365000000 GHz Trig: Free Run #Atten: 30 dB Auto Tune Mkr1 02 18 GHz -5.12 dBm Ref Offset 0.7 dB Ref 20.00 dBm **Center Freq** 2.365000000 GH: Start Freq 2.310000000 GHz **∂**<sup>3</sup> Stop Freq 2.42000000 GHz Stop 2.42000 GHz 1.000 ms (1001 pts) Start 2.31000 GHz #Res BW 100 kHz CF Step 11.000000 MH #VBW 300 kHz Sweep Auto -5.12 dBm -53.25 dBm -59.83 dBm N Freq Offset 0 Hz STATUS

## Band Edges Test Data CH-Low (Non-Hopping mode) (GFSK mode)

## Band Edges Test Data CH-High



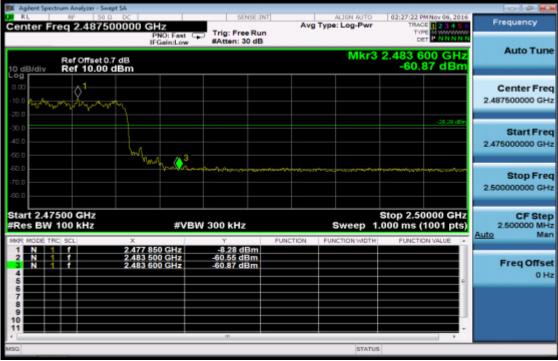
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#### Center Freq 2.365000000 GHz ALIGN AUTO Avg Type: Log-Pwr Frequency Trig: Free Run #Atten: 30 dB Auto Tune Mkr3 2.3 Ref Offset 0.7 dB Ref 10.00 dBm -60.86 dBm $\delta^1$ Center Freq 2.365000000 GH: evolution Start Freq 2.310000000 GHz 03 Ŷ Stop Freq 2.42000000 GHz Stop 2.42000 GHz Sweep 1.000 ms (1001 pts) Start 2.31000 GHz #Res BW 100 kHz CF Step #VBW 300 kHz 11.000000 MH Auto 54.95 dBm 60.86 dBm Freq Offset N 0 Hz

## Band Edges Test Data CH-Low (Hopping mode) (8-DPSK mode)

Band Edges Test Data CH-High



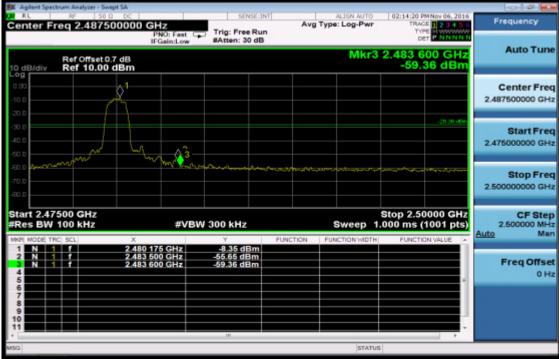
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## Band Edges Test Data CH-Low (Non-Hopping mode) (8-DPSK mode)

RL RF 500 DC Center Freq 2.365000000 GHz PNO: Faat F IFGain:Low ALIGN AUTO Avg Type: Log-Pwr Frequency Trig: Free Run #Atten: 30 dB Auto Tune Mkr3 2.3 Ref Offset 0.7 dB Ref 10.00 dBm -60.68 dBm Center Freq 2.365000000 GH: Start Freq 2.310000000 GHz ٥ 13 Stop Freq 2.42000000 GHz Stop 2.42000 GHz Sweep 1.000 ms (1001 pts) Start 2.31000 GHz #Res BW 100 kHz **CF** Step #VBW 300 kHz 11.000000 MH Auto -7.44 dBm 53.21 dBm 60.68 dBm N Freq Offset 0 Hz

## Band Edges Test Data CH-High



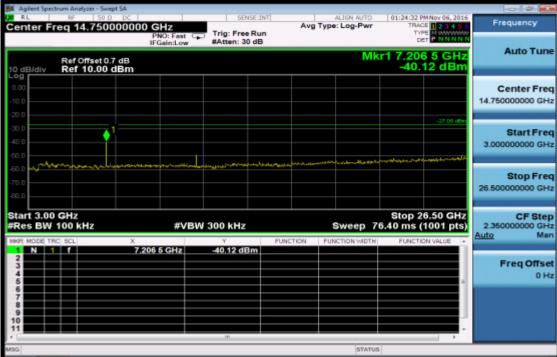
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## **Conducted Spurious Emission Measurement Result (GFSK mode)** Ch Low 30MHz – 3GHz

01:24:15 PM N Frequency Center Freg 1.515000000 GHz Avg Type: Log-Pwr Trig: Free Run #Atten: 30 dB PNO: Fast Auto Tune Mkr1 2.403 0 GHz -7.05 dBm Ref Offset 0.7 dB Ref 10.00 dBm 0 dB bğ Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3,000000000 GHz Stop 3.000 GHz Sweep 9.667 ms (1001 pts) Start 30 MHz #Res BW 100 kHz **CF** Step #VBW 300 kHz 297.000000 MHz Ma Auto 2.403 0 GHz 7.05 dB Freq Offset 0 Hz

## Ch Low 3GHz - 26.5GHz



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## Ch Mid <u>30MHz – 3GHz</u>

Center Freq 1.5150		ALIGN AUTO 01:26:18 PM Nov 06, 2016	
		Avg Type: Log-Pwr TRACE 123450	Frequency
Genter Freq 1.5150	PNO: East Trig: Free Run	TYPE MYNAWAW DET PNNNNN	
	IFGain:Low #Atten: 30 dB	DET	A
Ref Offset 0	7 dB	Mkr1 2.441 6 GHz	Auto T
10 dB/div Ref 10.00	dBm	-7.44 dBm	
Log			
0.00		• • • • • • • • • • • • • • • • • • •	Center
-10.0			1.515000000
-20.0			
-30.0		-27.44 dBn	
-40.0			Start
-60.0			30.000000
-60.0	have a second a second a second designed and a second of the second designed and the second designed as the second		Stop
-70.0			3.000000000
-80.0			
Start 30 MHz	#UBW 200 LU-	Stop 3.000 GHz	CF
#Res BW 100 kHz	#VBW 300 kHz	Sweep 9.667 ms (1001 pts)	297.000000 Auto
MKR MODE TRC SCL	X Y FUNCTI	ION FUNCTION WIDTH FUNCTION VALUE	
1 N 1 f	2,441 6 GHz -7,44 dBm		
3			Freq O
5			
6			
7 8			
9			
10		-	
1	m		
MSG		STATUS	
	_		
BGHz – 26.50	ept SA	1 41100 41170 101126/35 DMMon 06 3016	
	pt SA DC SENSE-INT 0000000 GHZ PNO: Fast C Trig: Free Run	ALIGN AUTO 01:26:35 PMNov 06, 2016 Avg Type: Log-Pwr TRACE 2 3 4 5 0 TYPE	Frequenc
Agilent Spectrum Analyzer - Swe RL RF S0.0	ppt SA 2 DC SENSE:INT 0000000 GHz	Avg Type: Log-Pwr TRACE 1 2 3 4 5 6 TYPE MUNICIPAL PWR DET P.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N	Frequency
Agient Spectrum Analyzer - Swe RL & SO Center Freq 14.750	pt SA 2 DC SENSE INT 0000000 GHZ PN0: Fast IFGain:Low #Atten: 30 dB	Avg Type: Log-Pwr TRACE 1234 56 TYPE PARAMETER Det PARAMETER Mkr1 7.324 0 GHz	
Agitent Spectrum Analyzer - Sw RL 8F 50 C Center Freq 14.750 Ref Offset 0. 10 dB/div Ref 10.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 1 2 3 4 5 6 TYPE MUNICIPAL PWR DET P.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N.N	
Agilent Spectrum Analyzer - Sw RL 8F 500 Center Freq 14.750 Ref Offset 0 10 dB/div Ref 10.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 1234 56 TYPE PARAMETER Det PARAMETER Mkr1 7.324 0 GHz	Auto
Agilent Spectrum Analyzer - Sw RL 8F 50 C Center Freq 14.750 Center Freq 14.750 Ref Offset 0. 0 dBJdiv Ref 10.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 1234 56 TYPE PARAMETER Det PARAMETER Mkr1 7.324 0 GHz	Auto Center
Agitent Spectrum Analyzer - Swith       RL     RF     S0 0       Center Freq 14.750     Ref Offset 0       Ref Offset 0     Ref 10.00       0.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 1234 56 TYPE PARAMETER Det PARAMETER Mkr1 7.324 0 GHz	Auto Center
Agilent Spectrum Analyzer - Sw RL 8F 50 C Center Freq 14.750 Center Freq 14.750 Ref Offset 0. 0 dBJdiv Ref 10.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 0 284 66 TYPE 0 TYPE 0 TYPE 0 TRACE 0 284 66 TYPE 0 TYPE 0 TYP	Auto
Agient Spectrum Analyzer - Swa Center Freq 14.750 Ref Offset 0 0 dB/div Ref 10.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 1234 56 TYPE PARAMETER Det PARAMETER Mkr1 7.324 0 GHz	Auto Center 14.75000000
Agient Spectrum Analyzer - Swa       RL     85     50 g       Center Freq 14.750       Ref Ontset 0       Cog     Ref 10.00       0.00     Ref 10.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 0 284 66 TYPE 0 TYPE 0 TYPE 0 TRACE 0 284 66 TYPE 0 TYPE 0 TYP	Auto Center 14.75000000 Start
Agient Spectrum Analyzer - Swo       RL     RF     50 0       Center Freq 14.750     Ref Offset 0       10 dB/div     Ref 10.00       0.00     Ref 0.00	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 0 284 % TYPE 284 % Det PNNNN N Mkr1 7.324 0 GHz -37.47 dBm	Auto Center 14.75000000 Start
Agient Spectrum Analyzer - Sweiger     So c       RL     RF     So c       Center Freq 14.750     Ref Offset 0.       10 dB/div     Ref 10.00       -10 0	pt SA 2 DC SENSE-INT 0000000 GHz PN0: Fast IFGain:Low #Atten: 30 dB 7 dB	Avg Type: Log-Pwr TRACE 0 284 66 TYPE 0 TYPE 0 TYPE 0 TRACE 0 284 66 TYPE 0 TYPE 0 TYP	Auto Center 14.75000000 Start
Agrent Spectrum Analyzer - Swe RL	pt SA DC SENSE-INT OO00000 GHz IFGain:Low Trig: Free Run #Atten: 30 dB 7 dB dBm	Avg Type: Log-Pwr TRACE 0 284 % TYPE 284 % Det PNNNN N Mkr1 7,324 0 GHz -37.47 dBm	Auto Center 14.75000000 Start 3.00000000
Agient Spectrum Analyzer - Sweding     So c       RL     85     50 c       Center Freq 14.750     Ref Offset 0       10 dB/div     Ref 10.00       -00	pt SA DC SENSE-INT OO00000 GHz IFGain:Low Trig: Free Run #Atten: 30 dB 7 dB dBm	Avg Type: Log-Pwr TRACE 0 284 % TYPE 284 % Det PNNNN N Mkr1 7,324 0 GHz -37.47 dBm	Auto Center 14.75000000 Start 3.00000000 Stop
Agrent Spectrum Analyzer - Swe RL	pt SA DC SENSE-INT OO00000 GHz IFGain:Low Trig: Free Run #Atten: 30 dB 7 dB dBm	Avg Type: Log-Pwr TRACE 0 284 % TYPE 284 % Det PNNNN N Mkr1 7,324 0 GHz -37.47 dBm	Auto Center 14.75000000 Start 3.00000000 Stop
Agrent Spectrum Analyzer - Sweet OF RL 85 50 0 Center Freq 14.750 Code State	pt SA DC SENSE-INT OO00000 GHz IFGain:Low Trig: Free Run #Atten: 30 dB 7 dB dBm	Avg Type: Log-Pwr TRACE 1234 5 G TYPE 1 WOMEN TO DET 17,324 0 GHz -37.47 dBm	Auto Center 14.75000000 Start 3.00000000 Stop 26.50000000
Agient Spectrum Analyzer - Sweet Office to Center Freq 14.750 Ref Office to	pt SA DC SENSE-INT OODOOOO GH2 PNO: Fast IFGain:Low 7 dB dBm 1 1 1 1 1 1 1 1 1 1 1 1 1	Avg Type: Log-Pwr TRACE    234 % G TYPE    WWWWW P NNNNN Mkr1 7,324 0 GHz -37.47 dBm -27.44 dbc -27.44 dbc -27.44 dbc	Auto Center 14.75000000 Start 3.00000000 Stop 26.50000000
Agient Spectrum Analyzer - Swo RL 85 50 0 Center Freq 14.750 10 dBJdiv Ref 10.00 0 00 -10 0 -20 0 -0	#VBW 300 kHz	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.00000000 Stop 26.50000000
Agient Spectrum Analyzer - Sweet       RL     SF     So C       Center Freq 14.750     Ref Offset 0       10 dB/div     Ref 10.00       000     Ref 000     Ref 000       10 dB/div     Ref 10.00     Ref 10.00	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 % G TYPE    WWWWW P NNNNN Mkr1 7,324 0 GHz -37.47 dBm -27.44 dbc -27.44 dbc -27.44 dbc	Auto Center 14.75000000 Start 3.00000000 Stop 26.50000000
Agrent Spectrum Analyzer - Sweet       RL     85     50 C       Center Freg 14.750       Ref Offset 0       10 dB/div     Ref 10.00       0.00     80 0     90 0       -10 0     90 0     90 0       -10 0     90 0     90 0       -10 0     90 0     90 0       -10 0     90 0     90 0       -10 0     90 0     90 0       -10 0     90 0     90 0       -20 0     90 0     90 0       -30 0     90 0     90 0       -30 0     90 0     90 0       -30 0     90 0     90 0       -30 0     90 0     90 0       -30 0     90 0     90 0       -30 0     90 0     90 0       -30 0     90 0     90 0	#VBW 300 kHz	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.00000000 26.50000000 26.50000000 Auto
Agrent Spectrum Analyzer - Sweet       RL     RF     50 c       Center Freq 14.750     Ref Offset 0       10 dB/div     Ref 10.00       000     Ref 0     Ref 0       000     Ref 0     Ref 0       000     Ref 10.00     Ref 0       000     Ref 0     Ref 0       000     Ref 0     Ref 10.00       000     Ref 10.00     Ref 10.00       1     1     1     1       2     3     4     4	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.00000000 26.50000000 26.50000000 Auto
Agrent Spectrum Analyzer - Swo       RL     BF     50 c       Center Freq 14.750     Ref Offset 0       10 dB/div     Ref 10.00       20.0	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.00000000 26.50000000 26.50000000 Auto
Agrent Spectrum Analyzer - Sweet       RL     BF     S0 C       Center Freg 14.750       Ref Offset 0       10 dB/div     Ref 10.00       000     Ref 000000000000000000000000000000000000	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.00000000 26.50000000 Auto
Agrent Spectrum Analyzer - Sweet       RL     RF     So C       Center Freq 14.750       Ref Offset 0       O dB/div     Ref 10.00       O dB/div     Ref 10.00       O dB/div     Ref 10.00       O dB/div     Ref 10.00       Start 3.00 GHz     Ref 000 kHz       #Res BW 100 kHz     Mode TRC SCL       N     1     1       Start 3.00 GHz     8     3	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.000000000 Stop 26.500000000 Auto
Agient Spectrum Analyzer - Swo       RL     RF     So C       Center Freq 14.750       Ref Offset 0       10 dB/div     Ref 10.00       20 0     Ref 000       30 0     Ref 10.00       20 0     Ref 10.00	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto Center 14.75000000 Start 3.00000000 Stop 26.50000000 Auto
Agrent Spectrum Analyzer - Sweet       RL     RF     So C       Center Freq 14.750       Ref Offset 0       O dB/div     Ref 10.00       O dB/div     Ref 10.00       O dB/div     Ref 10.00       O dB/div     Ref 10.00       Start 3.00 GHz     Ref 000 kHz       #Res BW 100 kHz     Mode TRC SCL       N     1     1       Start 3.00 GHz     8     9	ATT SA DC DC PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB T dB dB dB dB dB dB dB dB dB dB	Avg Type: Log-Pwr TRACE    234 5 G TRACE    23	Auto 1 Center 14.75000000 Start 3.00000000 Stop 26.50000000 CF 2.350000000

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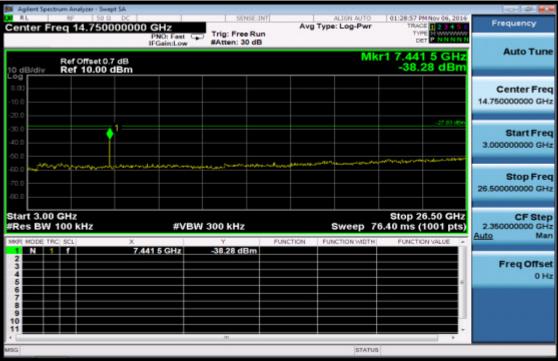
No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號 SGS Taiwan Ltd.



## Ch High 30MHz – 3GHz

Agilent Spectrum Analyzer - Swept SA							
RL 85 500 D Center Freq 1.5150000	<b>N</b>	Trig: Free Run #Atten: 30 dB	Avg	ALIGN AUTO Type: Log-Pwr	01:28:40 PM Nov TRACE TYPE NO DET	3456	Frequency
Ref Offset 0.7 dE		and an ov do		Mk	r1 2.480 3 -7.83		Auto Tun
0,00 10.0					• <sup>1</sup>		Center Fre 1.515000000 GR
20.0 30.0 40.0						7.53 (64)	Start Fr 30.000000 Mi
60. D <u>bases - sepele - sepel</u>	an a	1		an far a	,		Stop Fro 3.000000000 G
Start 30 MHz Res BW 100 kHz	#VB	W 300 KHz	FUNCTION	Sweep 9	Stop 3.000 .667 ms (100	1 pts)	CF Ste 297.000000 M Auto M
1 N 1 7 2 3 3 4 5 5 6 7	2.480 3 GHz	-7.83 dBm					Freq Offs 01
8 9 10 11		791					
SG				STATUS			

## Ch High 3GHz – 26.5GHz



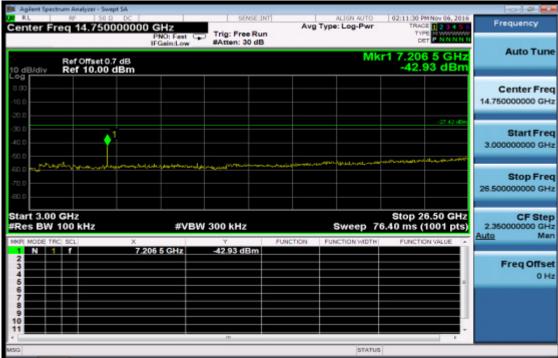
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## **Conducted Spurious Emission Measurement Result (8DPSK mode)** Ch Low 30MHz – 3GHz

02:11 Frequency Center Freq 1.515000000 GHz Avg Type: Log-Pwr PNO: Fast Trig: Free Run #Atten: 30 dB Auto Tune Mkr1 Ref Offset 0.7 dB Ref 10.00 dBm -7.42 dBn **Center Freq** 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GH: Stop 3.000 GHz Sweep 9.667 ms (1001 pts) CF Step Start 30 MHz #VBW 300 kHz #Res BW 100 kHz 297.000000 M MH Auto 2,403 0 GHz -7.42 dBr Freq Offset 0 Hz

## Ch Low 3GHz – 26.5GHz



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## Ch Mid 30MHz – 3GHz

Ch Mid

Agilent Spectrum Analyzer - Swep			
enter Freg 1.51500	DC SENSE_INT	ALIGN AUTO 02:12:45 PM Nov 06, 2016 Avg Type: Log-Pwr TRACE 12 3 4 5 6 TVPE	Frequency
	PNO: Fast Ing. Free Run	DET P NNNNN	
	IFGain:Low #Atten: 30 dB		Auto Tun
Ref Offset 0.7	dB	Mkr1 2.441 6 GHz -7.82 dBm	
dB/div Ref 10.00 d	BIII		
0		<b>↓</b> 1	Center Fre
i			1.515000000 GH
,		-27.52.6Bn	Start Fre
			30.000000 MI
0			
	ومحاف المراجع والمحافظ والأراب المراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع	And some starting and the second	
			Stop Fre 3,000000000 Gi
,			3.000000000 Gr
rt 30 MHz sBW 100 kHz	#VBW 300 kHz	Stop 3.000 GHz Sweep 9.667 ms (1001 pts)	CF Ste 297.000000 Mi
MODE TRC SCL		UNCTION FUNCTION WIDTH FUNCTION VALUE	Auto M
N 1 1	2.441 6 GHz -7.82 dBm	ORCIUM PUNCTUR MUTH PUNCTION VALUE A	
			Freq Offs
			01
		-	
		STATUS	
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 14.7500		ALIGN AUTO 02:13:00 PM Nov 06, 2016 Avg Type: Log-Pwr TRACE 2 3 4 5 0	Frequency
	PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB	Avg Type: Log-Pwr TRACE 123450 TYPE Det PNNNNN	
		Mkr1 7.324 0 GHz	Auto Tun
Ref Offset 0.7 B/div Ref 10.00 d	dB IBm	-37.64 dBm	
			Center Fre 14.75000000 Gi
			14.75000000 G
		-27.62.000	
			Start Fre
			3.00000000 GI
mound		مراجع المراجع ا	
			Stop Fre
			26.50000000 GI
rt 3.00 GHz sBW 100 kHz	#VBW 300 kHz	Stop 26.50 GHz Sweep 76.40 ms (1001 pts)	CF Ste 2.35000000 GF
MODE TRC SCL		UNCTION FUNCTION WIDTH FUNCTION VALUE	Auto Mi
N 1 1	7,324 0 GHz -37,64 dBm		
			Freq Offs 01
			01

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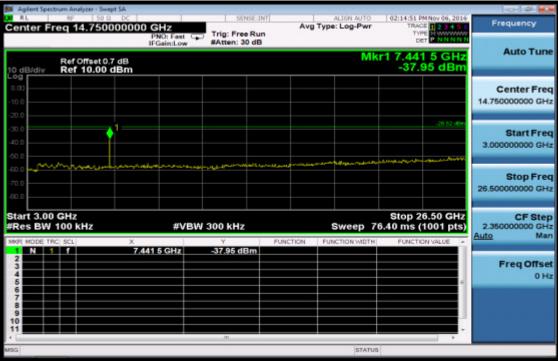
STATUS



## Ch High 30MHz – 3GHz

Agilent Spectrum Analyzer - Swept							
RL № 50Ω Center Freq 1.515000	0000 GHz PNO: Fast IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg	ALIGN AUTO Type: Log-Pwr	02:14:37 PM Nov 06, TRACE 2 3 TYPE NWW DET P NN	456	Frequency
Ref Offset 0.7 d	dB	And an a state		Mk	r1 2.480 3 G -8.52 di		Auto Tun
-og 0.00 10.0					• <sup>1</sup>		Center Fre 1.515000000 Gi
20.0 50.0 40.0 50.0					-20.5		Start Fre
60.0	ىرىدىيەت بەر يەرىپىرىيە يەتىپ ئوران	a		an a	and the second s		<b>Stop Fr</b> 3.000000000 GI
Start 30 MHz Res BW 100 kHz	#VE	W 300 kHz	FUNCTION	Sweep 9.	Stop 3.000 C 667 ms (1001 )	pts)	CF Sto 297.000000 M Ito M
2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	2.480 3 GHz	-8.52 dBm	PORCHUN		FOR THE PART		Freq Offs 0
6 7 8 9 10							
		m.				•	
29				STATUS			

## 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.
- 2. Emission level ( $dB\mu V/m$ ) = 20 log Emission level ( $dB\mu V/m$ )

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### **10.2 Measurement Equipment Used**

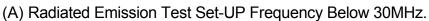
SGS 966 Chamber No.C									
Name of Equipment	Manufacturer	Model	Serial Number	Calibra- tion Date	Calibra- tion Due				
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017				
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2015	12/22/2016				
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017				
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016				
Horn Antenna	Schwarzbeck	BBHA9170	185	07/18/2016	07/17/2017				
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2015	12/11/2016				
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2015	12/11/2016				
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016				
Pre Amplifier	R&S	SCU-26	100780	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016				
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016				
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.				

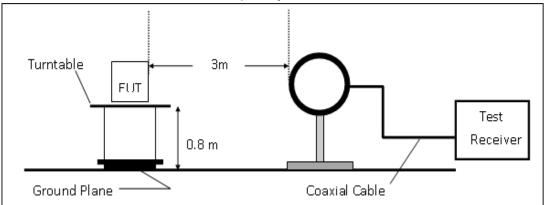
Note: N.C.R refers to Not Calibrated Required.

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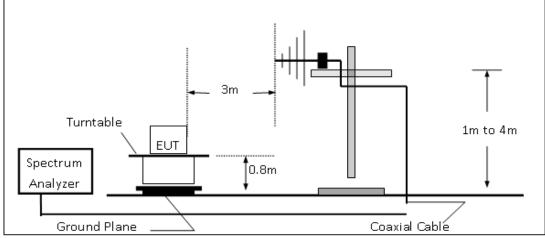


### 10.3 Test SET-UP

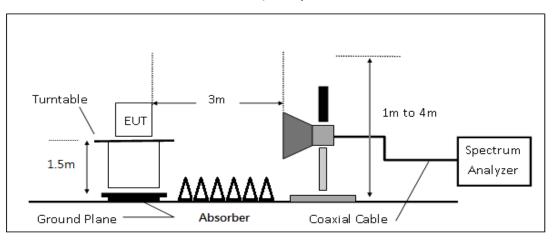




### (B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



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



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### **10.4 Measurement Procedure**

### **Radiated Emission**

- 1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 0.8m 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. Use the follow spectrum analyzer setting:
  - (1) Span = wide enough to fully capture the emission being measured
  - (2) RBW = 1 MHz for  $f \ge 1$  GHz, 100 kHz for f < 1 GHz, VBW  $\ge$  RBW, Sweep = auto, Detector function = peak, Trace = max hold
  - (3) For average measurement: use duty cycle correction factor method per 15.35(c)

Duty Cycle = On time/100 milliseconds

On time = N1\*L1=N2\*L2+...+N(n-1)\*LN(n-1)+N(n)\*L(n)

Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

Average Emission Level = Peak Emission Level + 20\*log (duty Cycle)

- 6. 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.
- 7. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 8. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 9. Repeat above procedures until all frequency of the interest 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	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dBuV/m, which converts 20\*log(uV/m)

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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#### Radiated Band Edge Measurement Result: (Hopping Mode)

Fu Op	peration Mo Indamental peration Ba JT Pol. :	Frequency	BT BR Ho 2402 MH BE CH Lo E2	z Ter ow Tes	t Date : np. / Humi. : t Engineer : asurement Ar	ntenna Pol. :	Ashton	/17 _C/57RH	
110 99									
88	-								
77								FCC RSE PK	
Level [(dBuV/m)] 55 55								TCENSE AV	
[ level ]							1		
44	<u>.</u>						Ť		
33							×		
22									
11 0 2				 Z3 Frequen			5		υ
	Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
			Mode	Reading Lev	vel	FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
	2390.00	Е	Peak	44.50	0.92	45.42	74	-28.58	
	2390.00	Е	Average	32.72	0.92	33.64	54	-20.36	

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Fi Oj	peration Mo undamental peration Ba JT Pol. :	Frequency	BT BR Ho 2402 MH BE CH Lo E2	z Ter ow Tes	st Date: np. / Humi.: st Engineer: asurement An	tenna Pol. :	2016/11 22.7 deg Ashton Horizont	_C/57RH
110								
20								
88								
,,,	-							FCC RSE PK
_ 66	-							
Level [(dBuX/mt]) 5	:							101-1051 AV
Level (							÷	
							Į	
33							Î	
22								
11								
0 2	1 010		2335		со су [МН-]	2385	,	2410
	Freq.	Note	Detector	Spectum		Actual	Limit	Margin
	MHz	F/H/E/S	Mode PK/QP/AV	Reading Le dBµV	vel dB	FS dBµV/m	@3m dBµV/m	dB
-	2390.00	E	Peak	42.73	0.92	43.65	74	-30.35
	2390.00	Е	Average	32.63	0.92	33.55	54	-20.45



Fu Op	eration Mo ndamental eration Ba JT Pol. :	Frequency	BT BR H 2480 MH BE CH H E2	z T igh T	est Dat emp. / est Eng leasure	Humi. : gineer :	enna Pol. :	2016/11/ 22.7 deg Ashton Vertical	'17 _C/57RH
110 -									
- cr					_				
- 88									
									FCC RSE PK
66 - 2									
Level [(dBuV/m)]									ICC IISL AV
44 -			×						
			*						
33 -									
<i>"</i> -									
11 -									
0-									
24			2481.25	Fre	2487.5 quency [MHz]		2493.7	5	2500
	Freq.	Note	Detector	Spectu		Factor	Actual	Limit	Margin
	MHz	F/H/E/S	Mode PK/QP/AV	Reading I dBµ\		dB	FS dBµV/m	@3m dBµV/m	dB
-	2483.50	<u> </u>	PR/QP/AV	авил 44.27		<u>ив</u> 1.16	<u>и Бр V/III</u> 45.43	<u>ивµv/ш</u> 74	-28.57
	2483.50	E	Average	33.34		1.16	34.50	54	-19.50



Fu Op	eration Mo ndamental eration Ba IT Pol. :	Frequency	BT BR H 2480 MH BE CH H E2	z igh	Test Da Temp. / Test En Measure	Humi. : gineer :	enna Pol. :	2016/11/ 22.7deg Ashton Horizont	_C/57RH
110 -									
- CC									
- 88									
									FCC RSE PK
66 - [lw/A									
Level [(dBuV/m)]									TCE ISL W
44-			×						
33 -			¥						
22 -									
- 11 -									
0 - 24	Δ.		2481.25	 г	2487.5 requency [MHz]		2493.7	· · ·	2500
	Freq.	Note	Detector	Spect		Factor	Actual	Limit	Margin
	MHz	F/H/E/S	Mode PK/QP/AV	Reading dBµ		dB	FS dBµV/m	@3m dBµV/m	dB
	2483.50	E	Peak	42.8		1.16	44.05	74	-29.95
	2483.50	Е	Average	32.8		1.16	34.00	54	-20.00



Fur Op	eration Moo ndamental I eration Bar T Pol. :	Frequency:	BT EDR H 2402 MHz BE CH Lo E2	Te w Te	est Date : emp. / Humi. : est Engineer : easurement A	ntenna Pol. :	Ashton	g_C/57RH
110								
88	-							
11-								FCC RSE PK
66 52 53	:							IC ISLW
The set I (c							¥	
33							ļ	
							Î	
22								
11								
0	1							
	310		2335		су [MH2]	2385		2410
	Freq.	Note	Detector Mode	Spectum Reading Le		Actual FS	Limit @3m	Margin
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2390.00	E	Peak	45.65	0.92	46.57	74 54	-27.43
	2390.00	Е	Average	32.56	0.92	33.48	54	-20.52



Fur Op	eration Moo ndamental l eration Bar T Pol. :	Frequency :	BT EDR H 2402 MHz BE CH Lo E2	w Te	est Date: emp. / Humi.: est Engineer: easurement Ai	ntenna Pol. :	Ashton	g_C/57RH
110								
88 -								FCC RSE PK
66 55 55								TCERSE AV
14 -							, ,	
33 · 22 ·								
11 -								
Ζ.	10		2335		GO GY [MH2]	2385		2410
	Freq.	Note	Detector Mode	Spectum Reading Le	vel	Actual FS	Limit @3m	Margin
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2390.00 2390.00	E E	Peak Average	43.80 32.63	0.92 0.92	44.72 33.55	74 54	-29.28 -20.45



Fur Ope	eration Mod Indamental I eration Bar T Pol. :	Frequency:	BT EDR ⊢ 2480 MHz BE CH Hig E2	gh T	est En	Humi. : gineer :	tenna Pol. :	Ashton	/17 J_C/57RH
110									
יט - -									
88 - // -									
									FCC RSE PK
- 66 7									
Level [(dBuV/ml)]									TCENSE AV
10 Fever			Ť.						
			ļ						
.33 -									
·// -									
11 -									
0-									
24	6		2481.25		487.5 mcy [MHz]		2493.7	5	2500
	Freq.	Note	Detector Mode	Spectun Reading Le		Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBµV		dB	dBµV/m	dBµV/m	dB
_	2483.50	E	Peak	48.45		1.16	49.61	74	-24.39
	2483.50	E	Average	32.69		1.16	33.85	54	-20.15

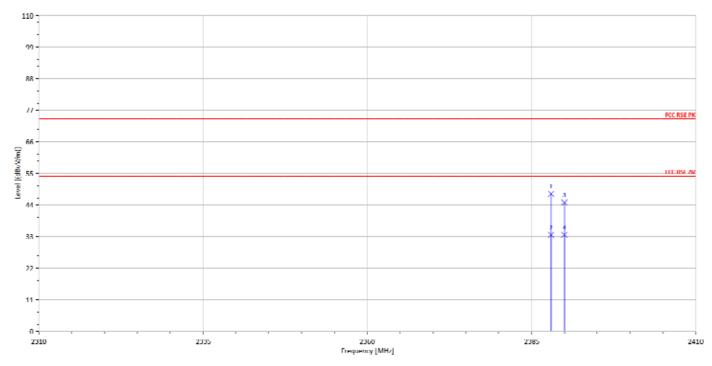


Fund Ope	eration Moo damental l eration Bar Pol. :	Frequency:	BT EDR H 2480 MHz BE CH Hig E2	с Т gh Т	est Date emp. / H est Engir leasurem	umi. : neer :	tenna Pol. :	2016/11 22.7deg Ashton Horizon	j_C/57RH
110									
RR									
66 - [luu/\/n									FCC RSE PK
[lmi/Angp] [char			×						TIT ISS AV
33 - 22 -			*						
11									
24/	• • •		2481.25		487.5 ency [MHz]		2493.7		2500
	Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectun Reading Le dBµV		actor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
	2483.50 2483.50	E	Peak Average	45.26 32.87		1.16 1.16	46.42 34.03	74 54	-27.58 -19.97



### Radiated Band Edge Measurement Result: (Non-Hopping Mode)

Operation Mode :	BT BR	Test Date :	2016/11/17
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical

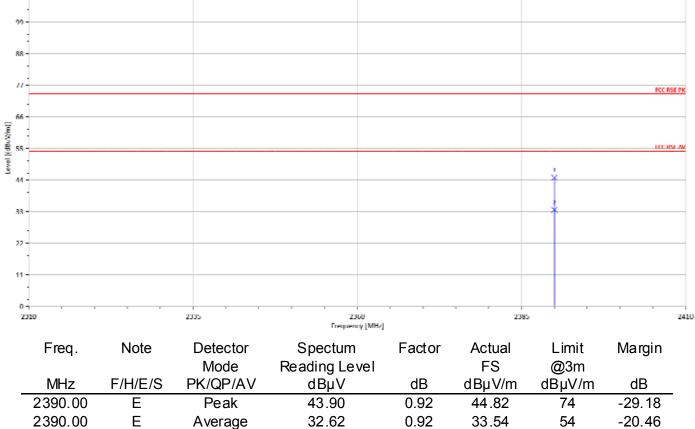


Fre	q.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MH	lz F	/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2388	.00	S	Peak	46.90	0.89	47.79	74	-26.21
2388	.00	S	Average	32.66	0.89	33.55	54	-20.45
2390	.00	Е	Peak	43.97	0.92	44.89	74	-29.11
2390	.00	Е	Average	32.65	0.92	33.57	54	-20.43

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Operation Mode :	BT BR	Test Date :	2016/11/17
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal
110			





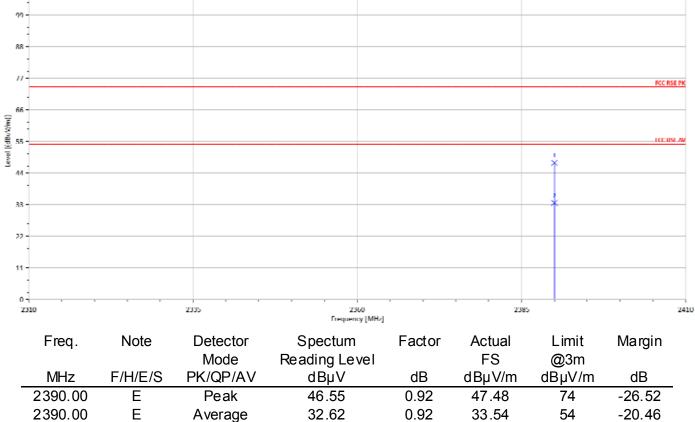
	Operation M Fundament Operation E EUT Pol. :	al Frequen	BT BF cy : 2480 I BE CH E2	VHz T High T	¯est Date ¯emp. / H ¯est Engi ∕leasuren	lumi. :	nna Pol. :	2016/11/17 22.7deg_0 Ashton Vertical	
110									
22									
88	:								
11	<u> </u>								FCC RSE PK
			1 X						
Level [(dBuV/ml] 5			Ť						ICE ISLAW
44			*						
33			- T						
22	·								
11	_								
	]								
0 2	4/5		2481.25		2487.5 Frequency [MHz]		2493	љ. ,	2500
	Freq.	Note	Detector	Spec		Factor	Actual FS	Limit	Margin
	MHz	F/H/E/S	Mode PK/QP/AV	Readin dBi	-	dB	rs dBµV/m	@3m dBµV/m	dB
-	2483.50	Е	Peak	59.		1.16	61.05	74	-12.95
	2483.50	Е	Average	35.	88	1.16	37.04	54	-16.96



	Operation M Fundament Operation E EUT Pol. :	al Frequen	BT BR cy : 2480 M BE CH E2	IHz Temp High Test	Date : o. / Humi. : Engineer : surement Ante	enna Pol. :	2016/11/1 22.7deg_0 Ashton Horizontal	C/57RH
110	]							
<b>9</b> 9								
88								
,,,	<u>.</u>							FCC RSE PK
_ 66								
Level [(dBuX/m)]			¥					ICE IISE AV
I level 1	-							
			×					
33	_							
22								
11								
	4/5		2481.25		87.5 ey [MHz]	249		2500
	Freq.	Note	Detector Mode	Spectum Reading Le		Actual FS	Limit @3m	Margin
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2483.50 2483.50	E E	Peak Average	54.27 34.75	1.16 1.16	55.43 35.91	74 54	-18.57 -18.09



Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical
1			





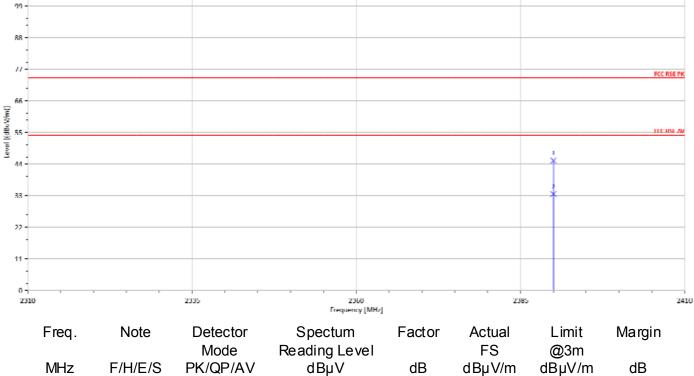
2390.00

2390.00

Ε

Е

Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal
110			



44.22

32.59

Peak

Average

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0.92

0.92

45.15

33.51

74

54

-28.85

-20.49



F	Operation N Fundament Operation E EUT Pol. :	al Frequen	BT ED cy : 2480 M BE CH E2	1Hz Tem High Test	Date: p. / Humi.: Engineer: surement Ante	enna Pol. :	2016/11/1 22.7deg_0 Ashton Vertical	
110 - - - - - - - - - - 								
								FCC RSE PK
66 - 66 - 55 - 55 - 55 - 55 - 55 - 55 -			×					ICENSE AV
3 44 - 33 -			*					
27 - 11 -								
0 - 24			2481.25		87.5 ny [MHz]	2493.	Б	2500
	Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Le dBµV		Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
	2483.50 2483.50	E	Peak Average	58.22 36.36	1.16 1.16	59.38 37.52	74 54	-14.62 -16.48

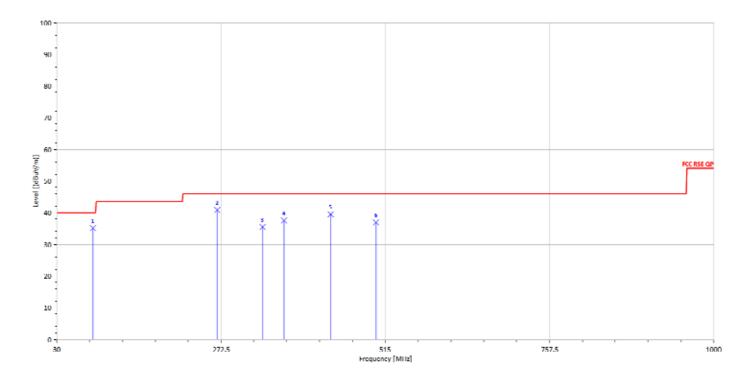


	Operation M Fundament Operation E EUT Pol. :	al Frequen	BT EDF cy : 2480 M BE CH E2	Hz Temı High Test	Date : p. / Humi. : Engineer : surement Ante	enna Pol. :	2016/11/1 22.7deg_0 Ashton Horizontal	
110	]							
99								
88	-							
11								FCC RSE PK
_ 66								
Level [(dBuV/m]) 5	<u> </u>		1 *					ICE IN IN
Level 1	-							
33			×					
22								
11								
	40	в в	2481.25		87.5 ey [MHz]	249.		2500
	Freq.	Note	Detector Mode	Spectum Reading Le		Actual FS	Limit @3m	Margin
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
_	2483.50 2483.50	E	Peak	54.87 35.37	1.16 1.16	56.03 36.53	74 54	-17.97
	2483.50	E	Average	35.37	1.16	36.53	54	-17.47

#### Radiated Spurious Emission Measurement Result: (Worst Case)

#### For Frequency form 30MHz to 1000MHz

Operation Mode :	BT EDR	Test Date :	2016/11/17
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

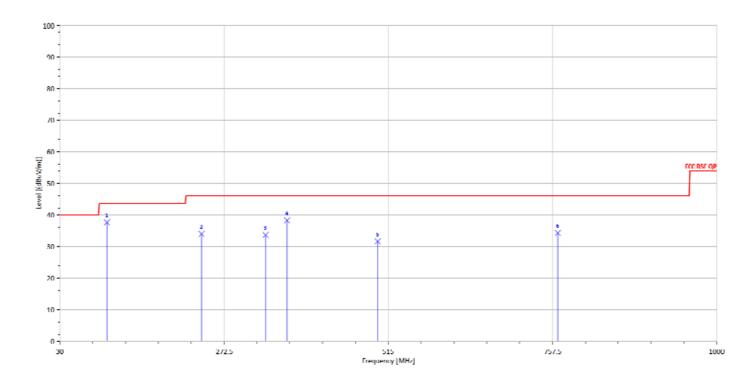


Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
83.35	S	Peak	55.53	-20.47	35.06	40	-4.94
266.68	S	Peak	54.72	-13.86	40.86	46	-5.14
333.61	S	Peak	47.32	-11.88	35.44	46	-10.56
365.62	S	Peak	48.38	-10.89	37.49	46	-8.51
434.49	S	Peak	48.87	-9.41	39.46	46	-6.54
501.42	S	Peak	44.47	-7.59	36.88	46	-9.12

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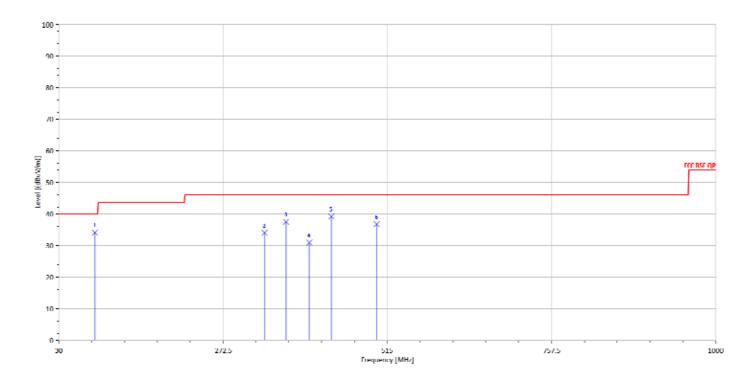
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
99.84	S	Peak	55.42	-17.77	37.65	43.5	-5.85
239.52	S	Peak	49.27	-15.28	33.99	46	-12.01
333.61	S	Peak	45.53	-11.88	33.65	46	-12.35
365.62	S	Peak	49.18	-10.89	38.29	46	-7.71
499.48	S	Peak	39.24	-7.66	31.57	46	-14.43
765.26	S	Peak	38.61	-4.32	34.29	46	-11.71



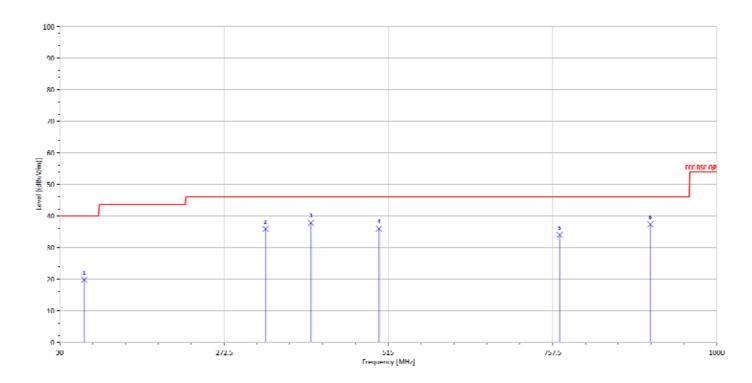
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2441 MHz	Temp. / Humi. :	22.7deg C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
83.35	S	Peak	54.55	-20.47	34.08	40	-5.92
333.61	S	Peak	45.90	-11.88	34.02	46	-11.98
365.62	S	Peak	48.43	-10.89	37.54	46	-8.46
399.57	S	Peak	40.62	-9.73	30.88	46	-15.12
432.55	S	Peak	48.70	-9.47	39.23	46	-6.77
499.48	S	Peak	44.43	-7.66	36.77	46	-9.23



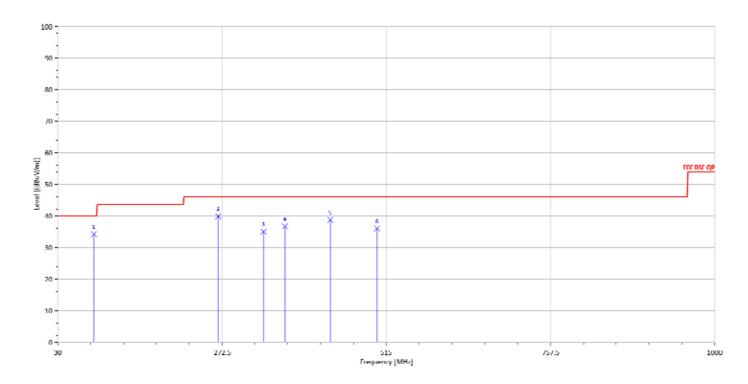
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2441 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV		dB	dBµV/m	dBµV/m	dB
65.89	S	Peak	42.09	-22.29	19.80	40	-20.20
333.61	S	Peak	47.77	-11.88	35.89	46	-10.11
400.54	S	Peak	47.62	-9.76	37.86	46	-8.14
501.42	S	Peak	43.54	-7.59	35.95	46	-10.05
768.17	S	Peak	38.25	-4.23	34.02	46	-11.98
902.03	S	Peak	39.35	-1.99	37.36	46	-8.64

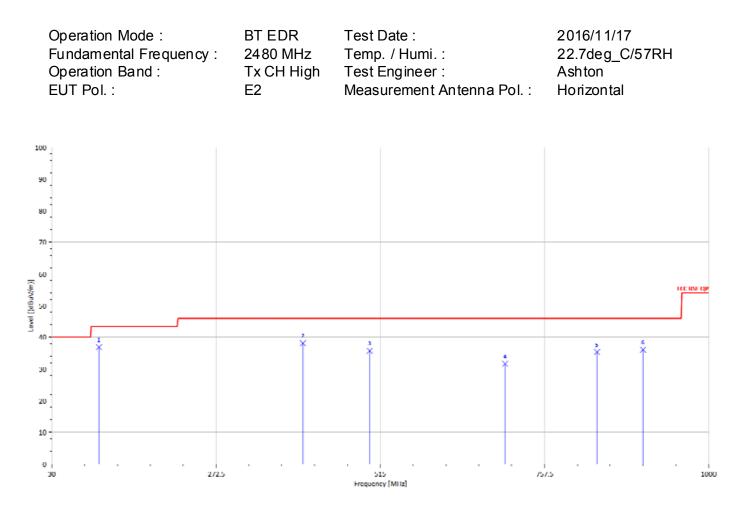


Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
83.35	S	Peak	54.71	-20.47	34.23	40	-5.77
266.68	S	Peak	53.81	-13.86	39.95	46	-6.05
333.61	S	Peak	46.89	-11.88	35.00	46	-11.00
365.62	S	Peak	47.62	-10.89	36.73	46	-9.27
432.55	S	Peak	48.26	-9.47	38.79	46	-7.21
501.42	S	Peak	43.64	-7.59	36.05	46	-9.95

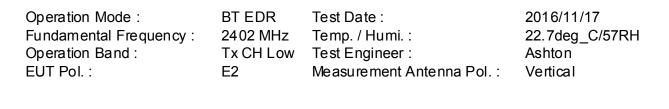


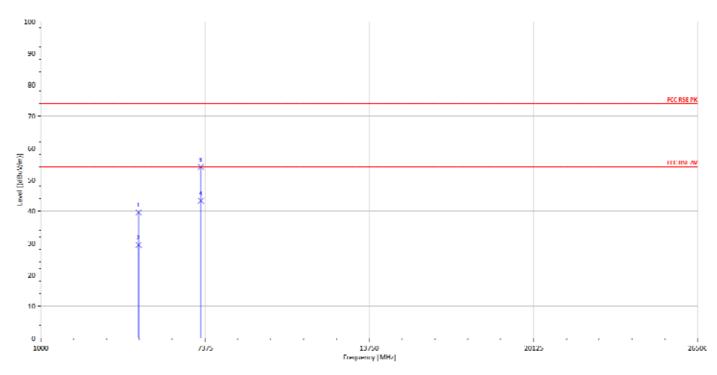


Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
99.84	S	Peak	54.73	-17.77	36.96	43.5	-6.54
400.54	S	Peak	47.95	-9.76	38.19	46	-7.81
499.48	S	Peak	43.47	-7.66	35.81	46	-10.19
699.30	S	Peak	36.76	-5.09	31.66	46	-14.34
835.10	S	Peak	38.39	-2.98	35.41	46	-10.59
903.00	S	Peak	38.08	-1.92	36.16	46	-9.84



# **Radiated Spurious Emission Measurement Result:** For Frequency above 1 GHz





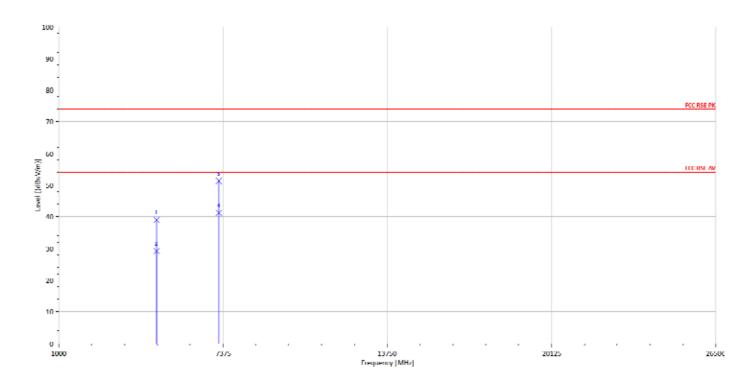
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Н	Peak	31.93	7.66	39.59	74	-34.41
4804.00	Н	Average	21.75	7.66	29.41	54	-24.59
7206.00	Н	Peak	39.04	14.95	53.99	74	-20.01
7206.00	Н	Average	28.41	14.95	43.36	54	-10.64

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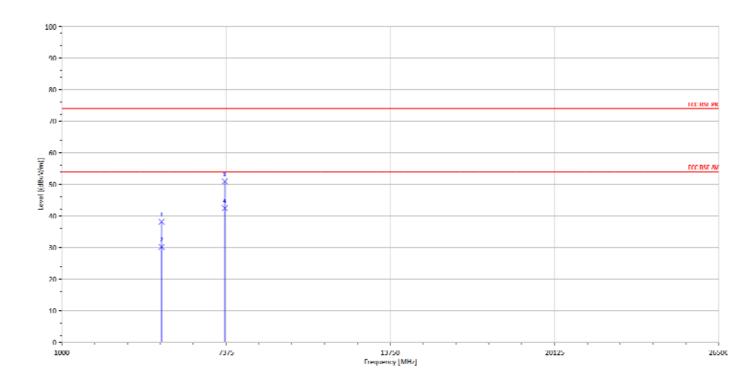
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	4804.00	Н	Peak	31.33	7.66	38.98	74	-35.02
	4804.00	Н	Average	21.53	7.66	29.19	54	-24.81
	7206.00	Н	Peak	36.39	14.95	51.34	74	-22.66
	7206.00	Н	Average	26.29	14.95	41.24	54	-12.76



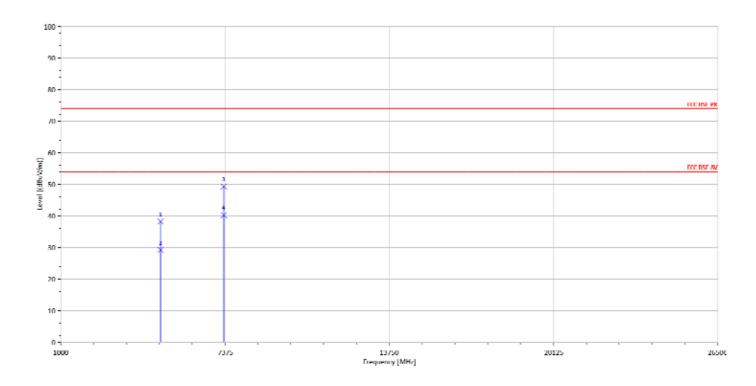
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2441 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	Н	Peak	30.50	7.70	38.20	74	-35.80
4882.00	Н	Average	22.46	7.70	30.16	54	-23.84
7323.00	Н	Peak	36.16	14.79	50.95	74	-23.05
7323.00	Н	Average	27.60	14.79	42.39	54	-11.61



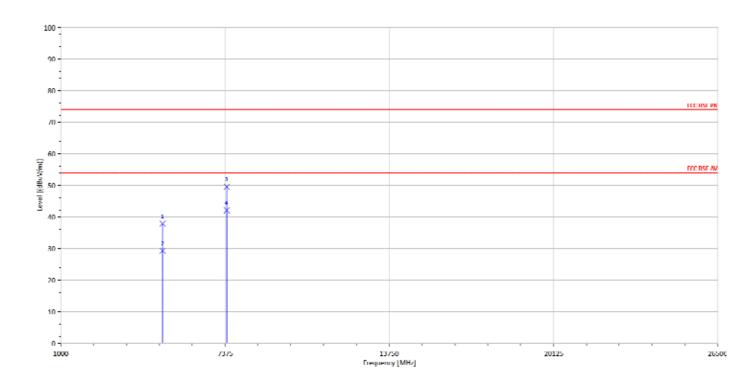
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2441 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	Н	Peak	30.58	7.70	38.28	74	-35.72
4882.00	Н	Average	21.47	7.70	29.17	54	-24.83
7323.00	Н	Peak	34.52	14.79	49.31	74	-24.69
7323.00	Н	Average	25.51	14.79	40.30	54	-13.70

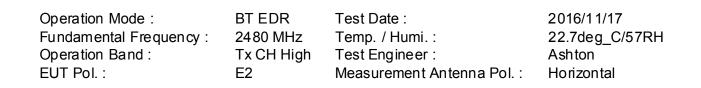


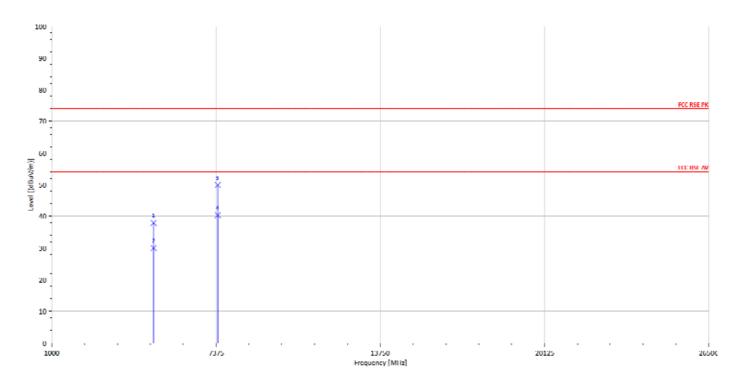
Operation Mode :	BT EDR	Test Date :	2016/11/17
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Н	Peak	30.22	7.69	37.91	74	-36.09
4960.00	Н	Average	21.56	7.69	29.25	54	-24.75
7440.00	Н	Peak	34.11	15.43	49.55	74	-24.45
7440.00	Н	Average	26.64	15.43	42.07	54	-11.93







Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Н	Peak	30.32	7.69	38.01	74	-35.99
4960.00	Н	Average	22.31	7.69	30.00	54	-24.00
7440.00	Н	Peak	34.52	15.43	49.95	74	-24.05
7440.00	Н	Average	24.90	15.43	40.33	54	-13.67

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# **11 FREQUENCY SEPARATION**

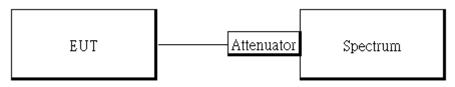
### **11.1 Standard Applicable**

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3\*20dB bandwidth of the hopping channel, whichever is greater.

### **11.2 Measurement Equipment Used**

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017			
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017			
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016			
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016			
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016			
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016			
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017			

### 11.3 Test Set-up



### **11.4 Measurement Procedure**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 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 center frequency of spectrum analyzer = middle of hopping channel.
- 5. Set the spectrum analyzer as RBW, VBW=100 kHz, Adjust Span to 5MHz, Sweep = auto.
- 6. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

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#### **11.5 Measurement Result**

Channel separation (MHz)	Limit	Result
1	>=25 kHz or 2/3 times 20dB bandwidth	PASS

# **Frequency Separation Test Data**

Agilent Spectrum Analyzer - Swept SA				- # <b>2</b>
Center Freq 2.403000000 GHz	SENSE INT	ALIGN AUTO Avg Type: Log-Pwr	02:29:12 PMNov 06, 2016 TRACE 23450 TYPE	Frequency
PNO: Wide IFGain:Low	#Atten: 30 dB		DET PINNNN	
Ref Offset 0.7 dB 10 dB/div Ref 10.00 dBm		ΔΝ	0.34 dB	Auto Tune
1.00 -10.0 -20.0	1 <u>02</u>	304		Center Freq 2.403000000 GHz
-200 -200 -400 -600			$\lambda$	Start Freq 2.400500000 GHz
-60.0 -70.0 -80.0				Stop Freq 2.405500000 GHz
Start 2.400500 GHz #Res BW 100 kHz #VI		Sweep 1	top 2.405500 GHz .000 ms (1001 pts)	CF Step 500.000 kHz Auto Man
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	-8.60 dBm			Freq Offset 0 Hz
7 8 9 10 11				
MSG	m.	STATUS	4	

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# **12 NUMBER OF HOPPING FREQUENCY**

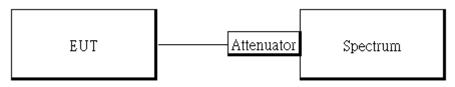
# 12.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

### **12.2 Measurement Equipment Used**

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017			
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017			
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017			
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016			
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016			
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016			
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016			
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017			

### 12.3 Test Set-up



### **12.4 Measurement Procedure**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 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 spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
- 5. Set the spectrum analyzer as RBW=430 kHz, VBW=1.5MHz., Detector = Peak
- 6. Max hold, view and count how many channel in the band.

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#### **12.5 Measurement Result**

#### **Tabular Data of Total Channel Number**

	Channel Number	Limit
2.4 GHz – 2.441GHz	40	
2.441 GHz – 2.4835GHz	39	>15
2.4GHz ~2.4835GHz	(40+39) = 79	

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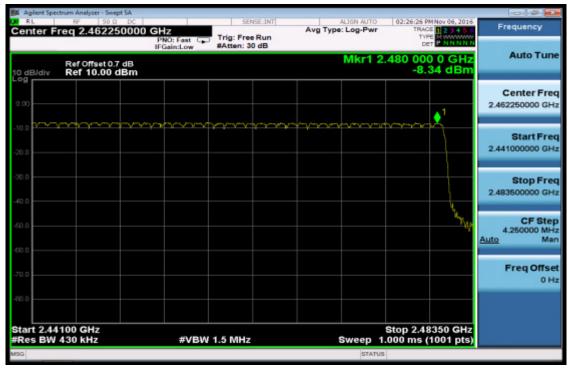


## **Channel Number**

C SENSE:INT ALIGN AUTO 02:25:57 PMNov 06, 2016 OO GHz Avg Type: Log-Pwr TRACE 23.4.50 PNO: Fast Trig: Free Run IFGain.Low #Atten: 30 dB cer Distance	Frequency
Mkr1 2.402 000 GHz n -7.45 dBm	Auto Tune
	Center Free 2.420500000 GH:
	Start Free 2.400000000 GH
	Stop Fre 2.441000000 GH
	CF Ste 4.100000 MH Auto Ma
	Freq Offs 0 F
Stop 2.44100 GHz #VBW 1.5 MHz Sweep 1.000 ms (1001 pts)	

#### 2.4 GHz - 2.441GHz

### 2.441 GHz - 2.4835GHz



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# **13 TIME OF OCCUPANCY (DWELL TIME)**

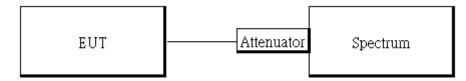
## **13.1 Standard Applicable**

Frequency hopping systems operating in the 2400MHz-2483.5MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

### **13.2 Measurement Equipment Used**

Conducted Emission Test Site										
EQUIPMENT	MFR	IFR MODEL		LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017					
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017					
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017					
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017					
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016					
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016					
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016					
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016					
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017					

### 13.3 Test Set-up





### **13.4 Measurement Procedure**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
- 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 center frequency of spectrum analyzer = operating frequency.
- 5. Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz, Detector = Peak, Adjust Sweep = 2~8ms.
- 6. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2

DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4

DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

In AFH mode, hopping rate is 800 hop/s with 6 slots in 20 hopping channels with channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 \* 20 ) (S), Hop Over Occupancy Time comes to (800 / 6 / 20 )\*(0.4 \*20 ) =53.33

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.



### 13.5 Tabular Result of the Measurement

### GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result	Limit
Channel		(ms)	(ms)
	DH1	112.00	400ms
0	DH3	256.00	400ms
	DH5	304.00	400ms
	DH1	108.80	400ms
39	DH3	257.60	400ms
	DH5	304.00	400ms
78	DH1	108.80	400ms
	DH3	257.60	400ms
	DH5	304.00	400ms

### π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	DH1	108.80	400ms
39	DH3	256.00	400ms
	DH5	304.00	400ms

### 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	DH1	112.00	400ms
39	DH3	256.00	400ms
	DH5	304.00	400ms



### A period time = 0.4 (s) \* 79 = 31.6 (s)

### GFSK (1Mbps):

CH Low	DH1 time slot = DH3 time slot = DH5 time slot =	1.600 *	(1600/4/79) *	31.6 =	112.00 (ms) 256.00 (ms) 304.00 (ms)
CH Mid	DH1 time slot = DH3 time slot = DH5 time slot =	1.610 *	(1600/4/79) *	31.6 =	108.80 (ms) 257.60 (ms) 304.00 (ms)
CH High	DH1 time slot = DH3 time slot = DH5 time slot =	1.610 *	· · · · ·	31.6 =	108.80 (ms) 257.60 (ms) 304.00 (ms)

#### $\pi/4$ -DQPSK (2Mbps):

CH Mid	2DH1 time slo =	0.340	*	(1600/2/79) *	31.6 =	108.80 (ms)
	2DH3 time slo =	1.600	*	(1600/4/79) *	31.6 =	256.00 (ms)
	2DH5 time slo =	2.850	*	(1600/6/79) *	31.6 =	304.00 (ms)

### 8-DPSK (3Mbps):

CH Mid	3DH1 time slo =	0.350	*	(1600/2/79) *	31.6 =	112.00 (ms)
	3DH3 time slo =	1.600	*	(1600/4/79) *	31.6 =	256.00 (ms)
	3DH5 time slo =	2.850	*	(1600/6/79) *	31.6 =	304.00 (ms)



GFSK (1Mbps) for AFH Mode							
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)				
20	DH5	152.00	400ms				
	π/4 DQPSK (2Mbps) for Mode						
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)				
20	DH5	152.00	400ms				
8-DPSK (3Mbps) for AFH Mode							
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)				
20	DH5	152.00	400ms				

### GFSK (1Mbps):

DH5 time s	2.850	(ms)	*	(800/6/20)	* 8 =	152.00	(ms)
π/4 -DQPSK (2Mbp៖							
2DH5 time =	2.850	(ms)	*	(800/6/20)	* 8 =	152.00	(ms)
8-DPSK (3Mbps):							
3DH5 time =	2.850	(ms)	*	(800/6/20)	* 8 =	152.00	(ms)

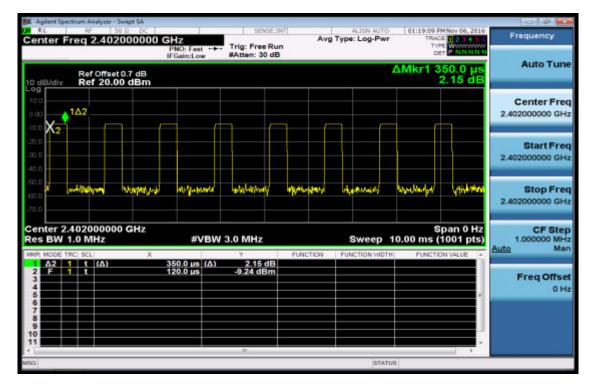
### **13.6 Measurement Result**

Note: Refer to next page for plots.

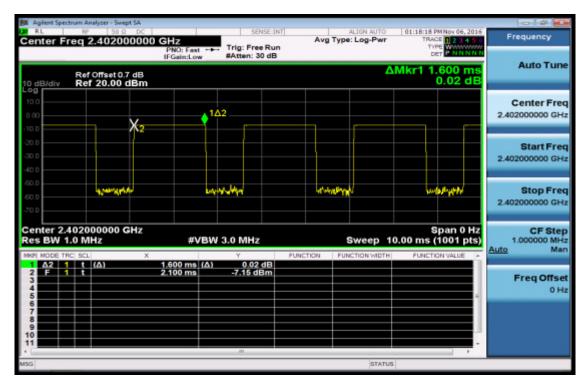
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# CH-Low DH1



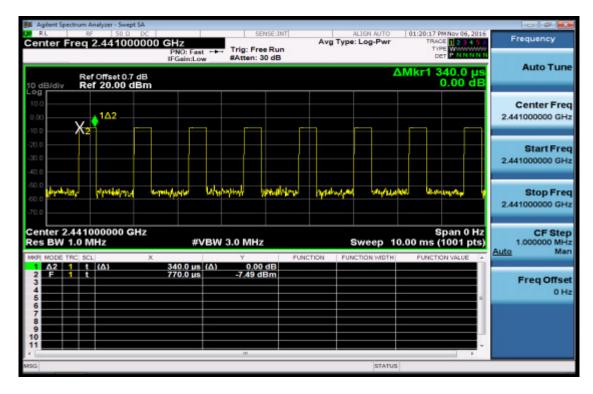
### DH3



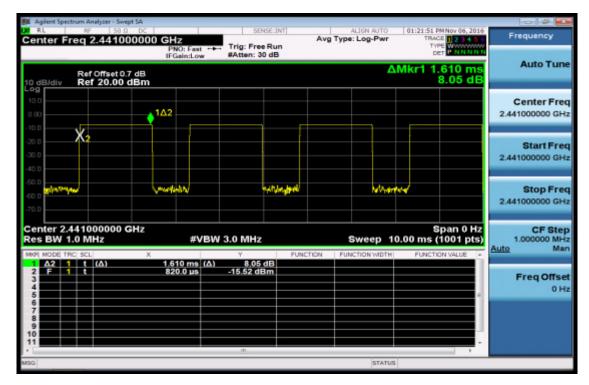




## CH-Mid DH1





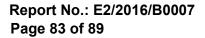


## DH5



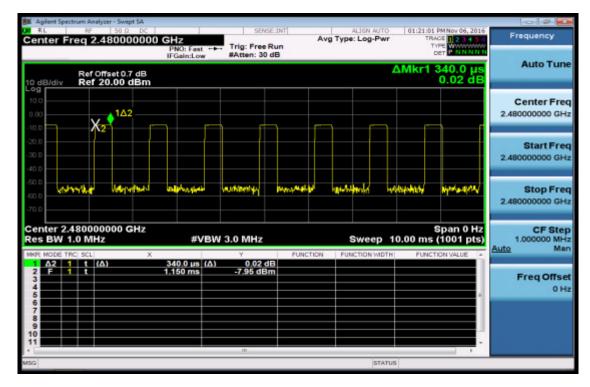
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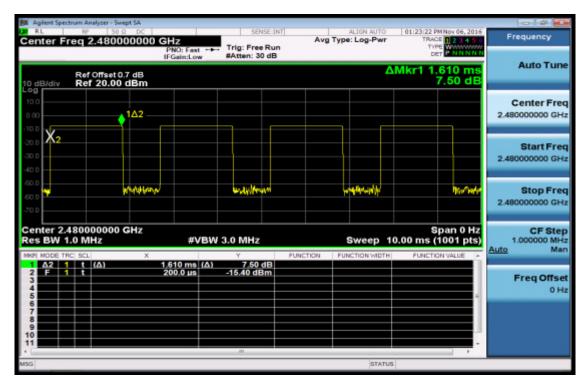




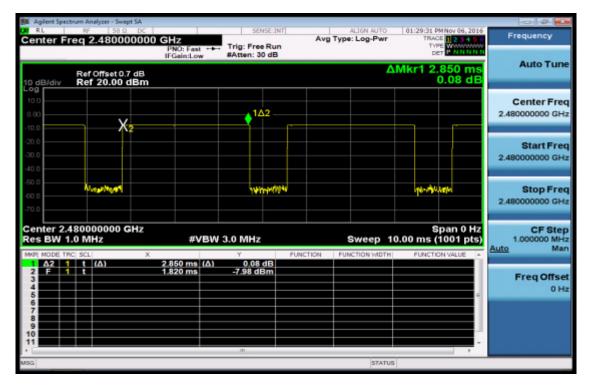
# CH-High DH1



### DH3





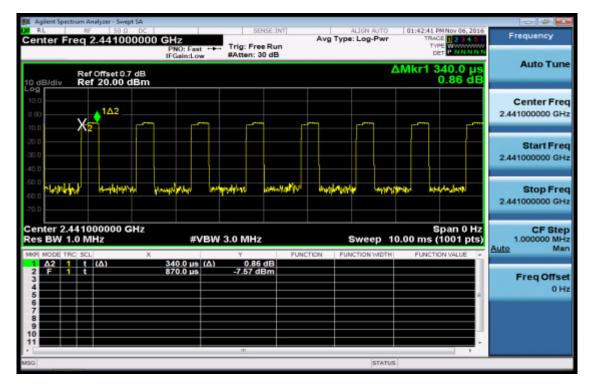


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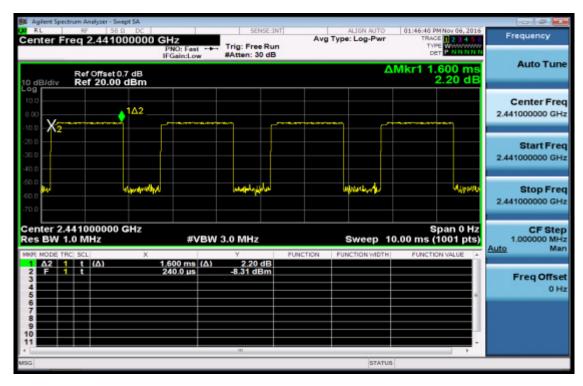
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# CH-Mid 2DH1



## 2DH3



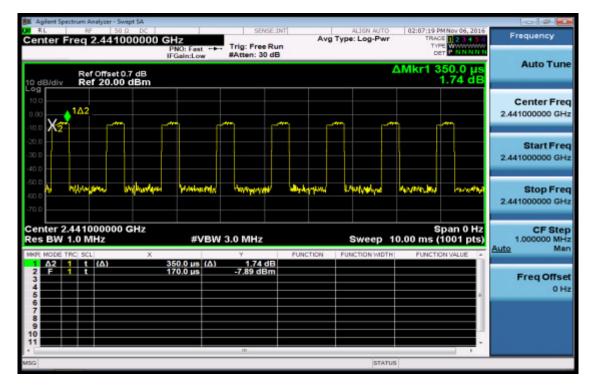


M Agilent Spectrum Analyzer - Swept SA		101-1010-1016 y			- <b>3</b>
Center Freq 2.441000000			ALIGN AUTO	02:17:50 PM Nov 06, 2016 TRACE 23450 Type	Frequency
Ref Offset 0.7 dB		Free Run en: 30 dB	۵	Mkr1 2.850 ms 8.04 dB	Auto Tune
Log 10.0 0.00		1Δ2			Center Freq 2.441000000 GHz
-20.0 -20.0 -40.0					Start Freq 2.441000000 GHz
-50.0 -60.0 -70.0		Contraction		wantwar	Stop Freq 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 M	AHZ FUNCTIO		Span 0 Hz 0.00 ms (1001 pts)	CF Step 1.000000 MHz <u>Auto</u> Man
Δ2     1     t     (Δ)       2     F     1     t       3     -     -     -       4     -     -     -       5     -     -     -	2 850 ms (∆) 2 250 ms -14.9	8.04 dB 94 dBm			Freq Offset 0 Hz
6 7 8 9 10				-	
MSG	n		STATUS	•	

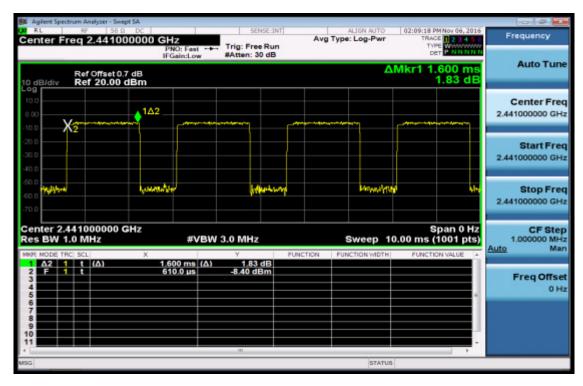
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# CH-Mid **3DH1**



## **3DH3**





Agilent Spectrum Analyzer - Swept SA			1.000			×
Center Freq 2.441000000	) GHz	SENSE: INT	Aug Type: Lo		7 PM Nov 06, 2016 RACE 1 2 3 4 5 0	Frequency
Ref Offset 0,7 dB	PNO: Fast ++- IFGain:Low	Trig: Free Run #Atten: 30 dB		ΔMkr1	2.850 ms 1.07 dB	Auto Tune
Log 10.0 -10.0	X2			east-stadigtingst-stadigtingst-stadig	Factor and Approximation	Center Free 2.441000000 GH:
-20.0						Start Free 2.441000000 GH
-50.0	nta mata y		Mat Had April			Stop Fred 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW	3.0 MHz		eep 10.00 ms		CF Step 1.000000 MH Auto Mar
1 A2 1 t (A) 2 F 1 t 3 4 5 4	2.850 ms (Δ) 3.180 ms	1.07 dB -7.91 dBm			-	Freq Offse 0 H
6 7 8 9 10						
e (		m		STATUS	P	

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## **14 ANTENNA REQUIREMENT**

## 14.1 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.

## 14.2 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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