

## **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

OF

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

Product Name:	Keyboard	
Brand Name:	hp , Hewlett-Packard	
Model No.:	UH1B	
Model Difference:	N/A	
FCC ID:	O62-UH1B	
Report No.:	E2/2015/30081	
Issue Date:	May. 05, 2015	
FCC Rule Part:	§15.247, Cat: DSS	
Prepared for:	Darfon Electronics Corp. 167, Shanying Road, Gueishan, Taoyuan 33341, Taiwan, R.O.C.	
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803	
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Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 2 of 80

## VERIFICATION OF COMPLIANCE

Applicant:	Darfon Electronics Corp. 167, Shanying Road, Gueishan, Taoyuan 33341, Taiwan, R.O.C.
Product Name:	Keyboard
Brand Name:	hp , Hewlett-Packard
Model No.:	UH1B
Model Difference:	N/A
FCC ID:	O62-UH1B
Report No.:	E2/2015/30081
Date of test:	Mar. 31, 2015 ~ May. 05, 2015
Date of EUT Received:	Mar. 31, 2015
We hereby certify that	nt:

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:	Marcus Tseng	Date:	May. 05, 2015
Prepared By:	Marcus Tseng/Engineer Allon Tsai	Date:	May. 05, 2015
Approved By:	Allen Tsai / Engineer Jim Chang	Date:	May. 05, 2015

Jim Chang / Asst. Manager

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## **Revision History**

Report Number	Revision	Description	Issue Date
E2/2015/30081	Rev.00	Initial creation of document	May. 05, 2015



#### **Table of Contents**

1.	GEN	ERAL INFORMATION	7
	1.1.	Product description	7
	1.2	Product Feature of Equipment Under Test	
	1.3.	Test Methodology of Applied Standards	9
	1.4.	Test Facility	9
	1.5.	Special Accessories	9
	1.6.	Equipment Modifications	9
2.	SYST	FEM TEST CONFIGURATION	
	2.1.	EUT Configuration	
	2.2.	EUT Exercise	
	2.3.	Test Procedure	
	2.4.	Measurement Results Explanation Example	
	2.5.	Configuration of Tested System	
3.	SUM	IMARY OF TEST RESULTS	
4.	DES	CRIPTION OF TEST MODES	
	3.1.	Operated in 2400 ~ 2483.5MHz Band	14
	3.2.	The Worst Test Modes and Channel Details	
5.	MEA	SUREMENT UNCERTAINTY	
6.	CON	DUCTED EMISSION TEST	
	6.1.	Standard Applicable	
	6.2.	Measurement Equipment Used	
	6.3.	EUT Setup	
	6.4.	Test SET-UP (Block Diagram of Configuration)	
	6.5.	Measurement Procedure	
	6.6.	Measurement Result	
7.	PEA	K OUTPUT POWER MEASUREMENT	
	7.1.	Standard Applicable	
	7.2.	Measurement Equipment Used	
	7.3.	Test Set-up:	
	7.4.	Measurement Procedure:	
	7.5.	Measurement Result	
8.	20dB	BANDWIDTH MEASUREMENT	
	8.1.	Standard Applicable	
	8.2.	Measurement Equipment Used	



	8.3.	Test Set-up	
	8.4.	Measurement Procedure	
	8.5.	Measurement Result	29
9.	CON	DUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT	
	9.1.	Standard Applicable	
	10.1.	Measurement Equipment Used	
	10.2.	Test SET-UP	
	10.3.	Measurement Procedure	
	10.4.	Measurement Result	
11.	RADI	ATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT	
	11.1.	Standard Applicable	
	11.2.	Measurement Equipment Used	
	11.3.	Test SET-UP	
	11.4.	Measurement Procedure	45
	11.5.	Field Strength Calculation	46
	11.6.	Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz	46
	11.7.	Measurement Result	46
12.	FREC	UENCY SEPARATION	63
	12.1.	Standard Applicable	63
	12.2.	Measurement Equipment Used	63
	12.3.	Test Set-up	63
	12.4.	Measurement Procedure	63
	12.5.	Measurement Result	64
13.	NUM	BER OF HOPPING FREQUENCY	65
	13.1.	Standard Applicable	65
	13.2.	Measurement Equipment Used	65
	13.3.	Test Set-up	65
	13.4.	Measurement Procedure	65
	13.5.	Measurement Result	65
14.	TIME	C OF OCCUPANCY (DWELL TIME)	67
	14.1.	Standard Applicable	67
	14.2.	Measurement Equipment Used	67
	14.2. 14.3.	Measurement Equipment Used Test Set-up	
			67



	14.6.	Measurement Result	70
15.	ANTI	ENNA REQUIREMENT	. 80
	15.1.	Standard Applicable	80
	15.2.	Antenna Connected Construction	80



#### **GENERAL INFORMATION** 1.

#### 1.1. Product description

#### General:

Product Name:	Keyboard			
Brand Name:	hp , Hewle	hp, Hewlett-Packard		
Model No.:	UH1B			
Model Difference:	N/A			
Power Supply:	3.7Vdc from Rechargeable Li-Ion battery or 5Vdc from micro port			
	Battery:	Model No.: AEC232090, Supplier: AEC		

#### Bluetooth\_BR+EDR:

Bluetooth Version:	Bluetooth V3.0
Channel number:	79 channels
Modulation type:	$GFSK + \pi/4DQPSK + 8DPSK$
Transmit Power:	-0.01dBm
Frequency Range:	2.402GHz - 2.480GHz
Emission Designation:	931KF1D
Antenna Designation:	PCB Antenna, Antenna Gain: 1.54 dBi Model No.:UH1B ANTENNA Supplier: Darfon Electornic Corp.



#### **Product Feature of Equipment Under Test** 1.2

The equipment under Test (Hereafter Called: EUT) is a Keyboard supporting Bluetooth features, and below is details of information.

Product Feature			
Product Name: Keyboard			
Brand Name: hp , Hewlett-Packard			
Model No.:	UH1B		
Model Difference:	N/A		
FCC ID	O62-UH1B		
Bluetooth Version	Bluetooth V3.0		

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



#### 1.3. Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247 FCC KDB 558074 D01 DTS Meas. Guidance V03r02 ANSI C63.10:2013

#### Note:

- 1. All test items have been performed and record as per the above standards.
- 2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.
- 3. The EUT was placed 1.5m height for frequency above 1GHz in accordance with

ANSI C63. 10:2013

#### 1.4. Test Facility

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

FCC Registration Numbers are: 990257

Canada Registration Number: 4620A-5

#### **1.5.** Special Accessories

There is no special accessory used while test was conducted.

#### **1.6.** 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 plane. 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 §15.107. 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 80 cm above the reference ground plane. 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 and attenuator factor. Following shows an offset computation example with cable loss 4.7 dB.

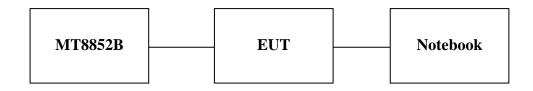
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#### 2.5. Configuration of Tested System

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



#### Fig. 2-2 Radiated Emission Configuration

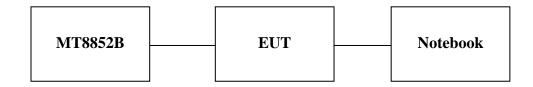


#### **Table 2-1 Equipment Used in Tested System**

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.	Bluetooth Test Set	Anritsu	MT8852B	1329002	Shielded	Unshielded
3.	Notebook	Lenovo	L430	R9-YYG88	Shield	Unshielded



#### Fig. 2-3 AC Power Line Conducted Emission



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

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	<b>Power Cord</b>
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-YYG88	Shield	Unshielded



## 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	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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## 4. DESCRIPTION OF TEST MODES

#### 3.1. 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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### 3.2. The Worst Test Modes and Channel Details

- 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.
- Investigation has been done on all the possible configurations for searching the worst case. 3

#### **RADIATED EMISSION TEST:**

RADIATED EMISSION TEST (BELOW 1 GHz)									
MODE	AVAILABLE	TESTED	MODULATION	PACKET	ANTENNA				
	CHANNEL	CHANNEL		TYPE	PORT				
Bluetooth	0 to 78 0,39,78 GFSK		DH5	MAIN					
	RADIATED EMISSION TEST (ABOVE 1 GHz)								
MODE	AVAILABLE	TESTED	MODULATION	PACKET	ANTENNA				
MODE	CHANNEL	CHANNEL	MODULATION	TYPE	PORT				
Bluetooth	0 to 78	0,39,78	GFSK	DH5	MAIN				

#### 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 MEASUREMENT:**

		CONDUCTED	TEST						
Peak Output Power, 20dB Band Width									
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE	ANTENNA PORT				
	0 to 78	0,39,78	GFSK	DH5	MAIN				
Bluetooth	0 to 78	0,39,78	/4-DQPSK	DH5	MAIN				
	0 to 78	0,39,78	8-DPSK	DH5	MAIN				
		Band Edg	ge						
Bluetooth	0 to 78	0,78	GFSK	DH5	MAIN				
		<b>Frequency Sep</b>	aration						
Bluetooth	0 to 78	0,1,2	GFSK DH5		MAIN				
	Nu	mber of hopping	frequency						
Bluetooth	0 to 78	0 to 78	GFSK	DH5	MAIN				
	Tim	e of Occupancy	(Dwell time)						
Bluetooth	0 to 78	0,39,78	GFSK	DH1/DH3/DH5	MAIN				
Bluetooth	0 to 78	39	/4-DQPSK	DH1/DH3/DH5	MAIN				
Bluetooth	0 to 78	39	8-DPSK	DH1/DH3/DH5	MAIN				

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#### **MEASUREMENT 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	+/- 1.55 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:** 

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

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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#### **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 t	he logarithm of the frequency in the r	ange 0.15 MHz to 0.50 MHz.					

#### 6.2. Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MFR MODEL		LAST	CAL DUE.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015			
LISN	SCHWARZB ECK	NSLK 8127	8127-649	05/02/2014	05/01/2015			
LISN	FCC	FCC-LISN-50/250-25 -2-01	04034	03/13/2015	03/12/2016			
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2014	11/25/2015			

#### 6.3. EUT Setup

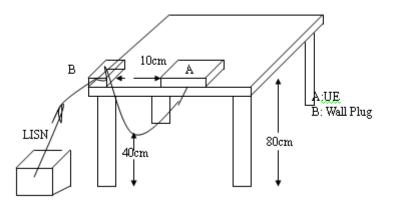
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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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 plane.
- 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

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

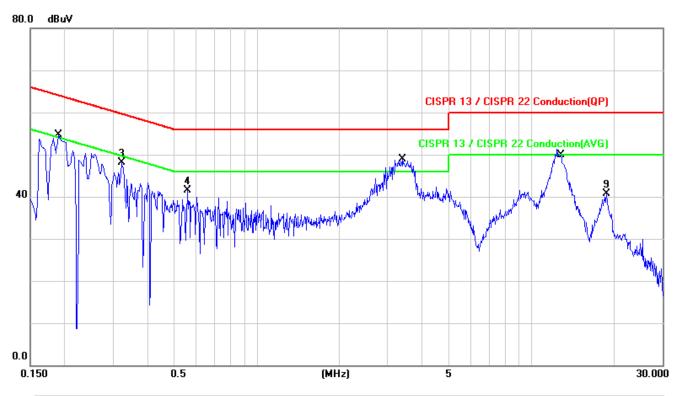
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Apr. 23, 2015
Temperature:	21	Humidity:	70 %	Test By:	Vito
Model No.:	UH1B				
Phase:	L1				



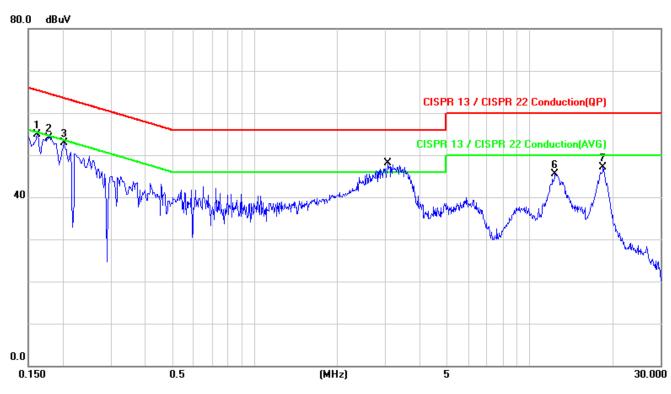
No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1	*	0.1900	52.70	0.08	52.78	64.04	-11.26	QP	
2		0.1900	38.50	0.08	38.58	54.04	-15.46	AVG	
3		0.3220	47.89	0.13	48.02	59.66	-11.64	peak	
4		0.5620	41.24	0.25	41.49	56.00	-14.51	peak	
5		3.4166	42.80	0.60	43.40	56.00	-12.60	QP	
6		3.4166	28.70	0.60	29.30	46.00	-16.70	AVG	
7		12.7090	42.80	0.64	43.44	60.00	-16.56	QP	
8		12.7090	36.30	0.64	36.94	50.00	-13.06	AVG	
9		18.7660	40.10	0.53	40.63	60.00	-19.37	peak	

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Operation Mode:	Operation mode			Test Date:	Apr. 23, 2015
Temperature:	21	Humidity:	70 %	Test By:	Vito
Model No.:	UH1B				
Phase:	Ν				



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1620	54.89	0.09	54.98	65.36	-10.38	peak	
2	*	0.1780	54.10	0.10	54.20	64.58	-10.38	peak	
3		0.2020	52.73	0.09	52.82	63.53	-10.71	peak	
4		3.0700	41.20	0.60	41.80	56.00	-14.20	QP	
5		3.0700	29.90	0.60	30.50	46.00	-15.50	AVG	
6		12.4380	44.90	0.65	45.55	60.00	-14.45	peak	
7		18.5900	46.55	0.57	47.12	60.00	-12.88	peak	

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#### PEAK OUTPUT POWER MEASUREMENT 7.

#### 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	Agilent	E4440A	MY45304525	03/12/2015	03/11/2016		
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016		
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016		
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016		

#### 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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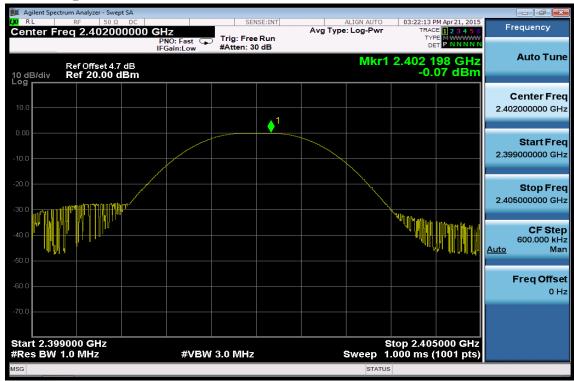
#### 7.5. Measurement Result

	GFSK (1 Mbps)				
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)	
0	2402.00	-0.07	0.98401	1000	
39	2441.00	-0.41	0.90991	1000	
78	2480.00 -1.12 0.77268		0.77268	1000	
		π/4-DQPSK	(2 Mbps)		
Channel	Frequency	Output Power	Output Power	Limit	
Channel	(MHz)	( <b>dBm</b> )	( <b>mW</b> )	( <b>mW</b> )	
0	2402.00	-0.08	0.98175	125	
39	2441.00	-0.41	0.90991	125	
78	2480.00	-1.12	0.77268	125	
	8-DPSK (3 Mbps)				
Channel	Frequency	<b>Output Power</b>	Output Power	Limit	
Channel	(MHz)	( <b>dBm</b> )	( <b>mW</b> )	( <b>mW</b> )	
0	0 2402.00 <b>-0.01</b>		0.99793	125	
39	2441.00	-0.38	0.91622	125	
78	78 2480.00 -1.07		0.78127	125	

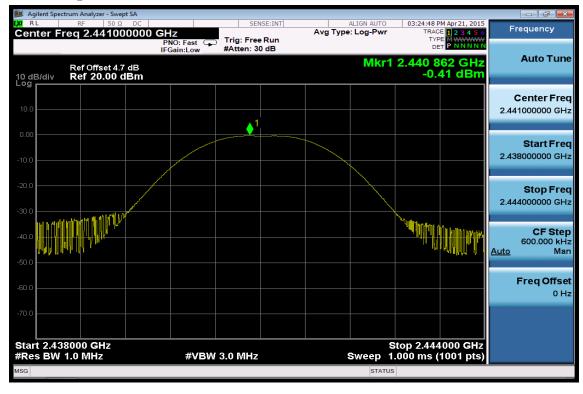
NOTE: cable loss as 4.7dB that offsets in the spectrum



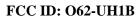
## Peak Power Output Data Plot (CH Low) (GFSK mode)



### Peak Power Output Data Plot (CH Mid) (GFSK mode)

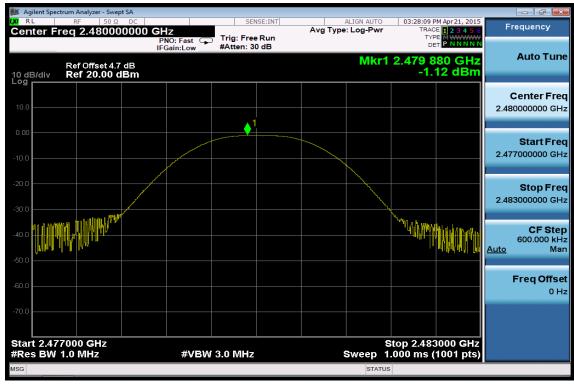


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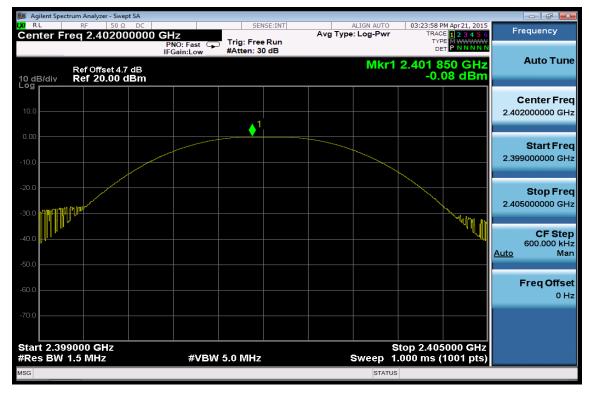




## Peak Power Output Data Plot (CH High) (GFSK mode)



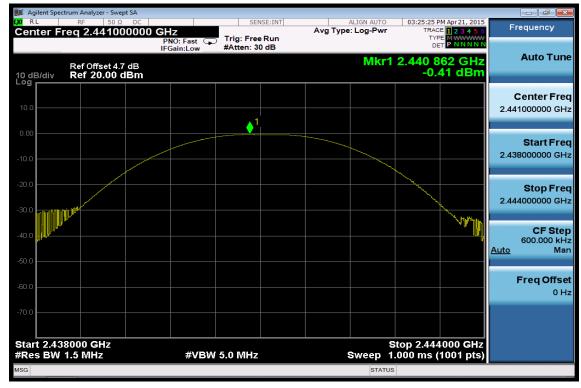
#### Peak Power Output Data Plot (CH Low) ( /4-DQPSK mode)



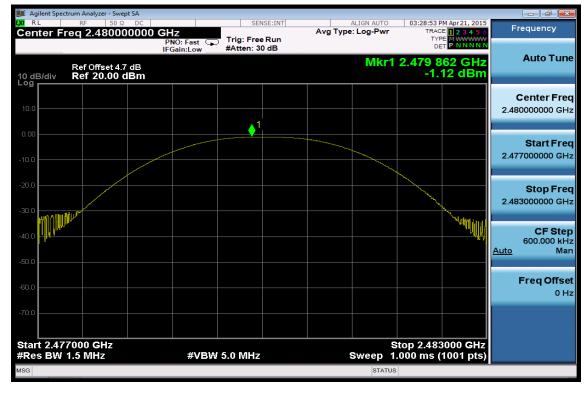
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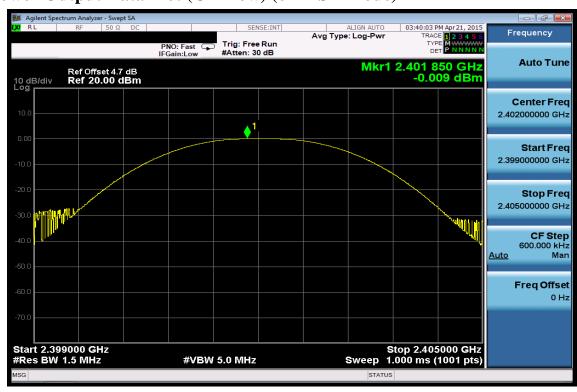
Peak Power Output Data Plot (CH High) ( /4-DQPSK mode)



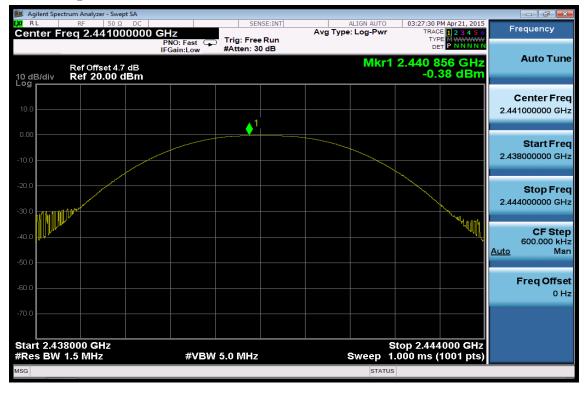
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#### Peak Power Output Data Plot (CH Mid) (8-DPSK mode)

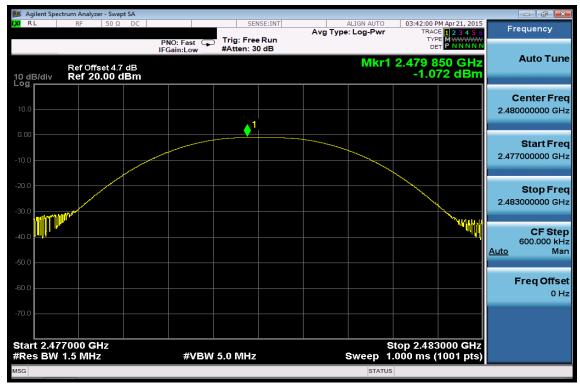


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Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 27 of 80

## Peak Power Output Data Plot (CH High) (8-DPSK mode)



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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.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/12/2015	03/11/2016		
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016		
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016		
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016		

#### 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. cable loss as 4.7dB that offsets in the spectrum
- 2. For the plot of bandwidth measurement, the marker of the 20dB BW is arrow-mark

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#### 8.5. Measurement Result

GFSK								
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	2/3 Bandwidth (MHz)					
0	2402	0.63	-					
39	2441	0.92	-					
78	2480	0.93	-					
	/4-DQPSK							
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	2/3 Bandwidth (MHz)					
0	2402	0.57	0.38					
39	2441	0.57	0.38					
78	2480	0.57	0.38					
	8	B-DPSK						
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	2/3 Bandwidth (MHz)					
0	0 2402		0.59					
39	2441	0.88	0.59					
78 2480		0.90	0.60					

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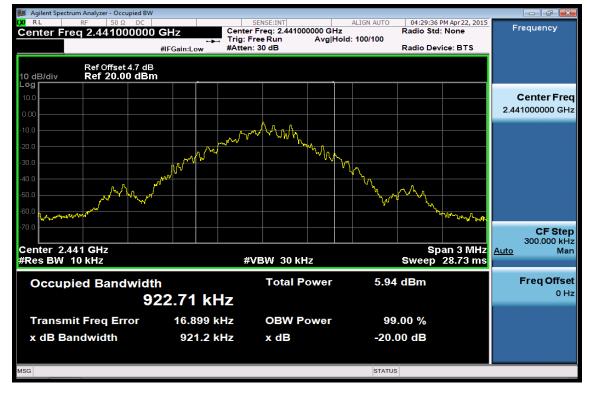
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## 20dB Band Width Test Data CH-Low (GFSK mode)



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

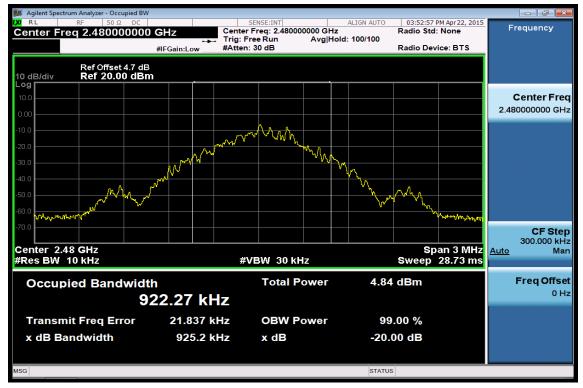


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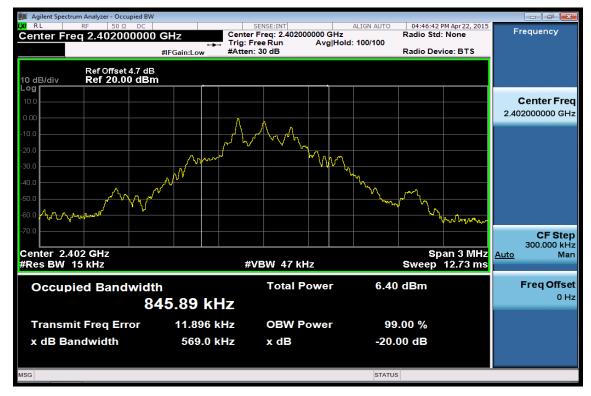
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## 20dB Band Width Test Data CH-High (GFSK mode)



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



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



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



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



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

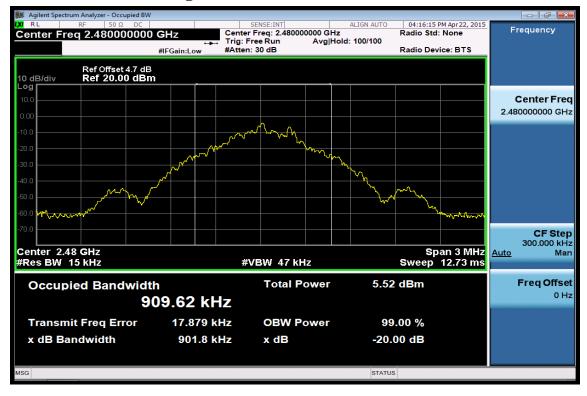


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## 20dB Width Test Data CH-High (8-DPSK mode)



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# 9. CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

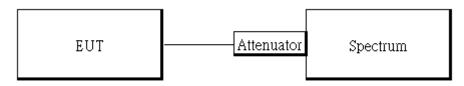
#### 9.1. Standard Applicable

10. 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).

#### 10.1. Measurement Equipment Used

Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/12/2015	03/11/2016		
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016		
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016		
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016		

#### 10.2. Test SET-UP



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## **10.3. 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 = 100K, VBW=300 kHz, Sweep = auto
- 6. Mark Peak, 2.390GHz and 2.4835GHz 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 = 100K & VBW = 300K, 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:

## $\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$

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

### **10.4. Measurement Result**

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

### NOTE:

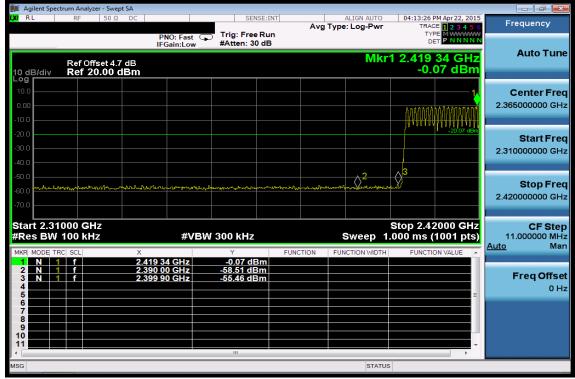
- 1. Cable loss as 4.7dB that offsets in the spectrum
- 2. The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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

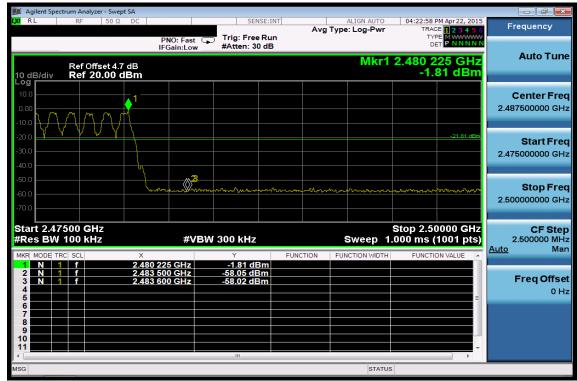
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## EDR Mode The Worst Case(Hopping mode) **Band Edges Test Data CH-Low**



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



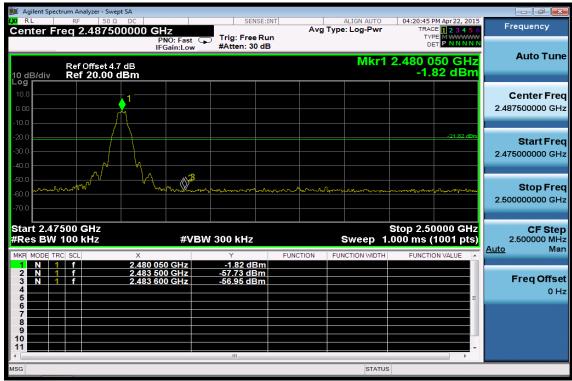
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## **Band Edges Test Data CH-Low (Non-Hopping mode)**

	ent Specti	'um Ai	nalyzer - Sw	ept SA														- F	×
IXI RL		RF	50 \$				SEI	NSE:INT				IGN AUTO	04		PM Apr 22,			Frequency	
Cent	er Fr	eq 2	2.3650	00000	GHZ PNO: Fa	. ()	Trig: Free	Run		Avg	Type:	Log-Pwr		TY	E 1 2 3 4	www.		requerie:	, 
					IFGain:Lo		#Atten: 3							D		N N N			
												Mk	r1 2	402	29 G			Auto T	une
10.10			Offset 4										2.		30 dE				
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-40.0														ļ				10000000	OTTE
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-70.0																			
	2.310										_				2000 G				Step
#Res	BW 1	100	KHZ		#	VBW	300 kHz				S	weep	1.000	ms (	1001 p	ts)	Auto	11.000000	MHz Man
MKR M		SCL		×			Y		FUNC	TION	FUNC	TION WIDTH	4   I	FUNCTI	ON VALUE	*	Auto		wan
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## **Band Edges Test Data CH-High**



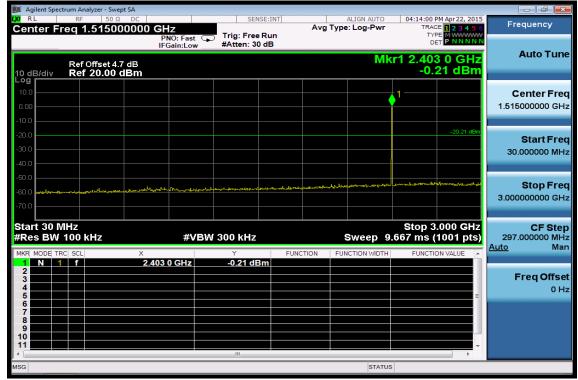
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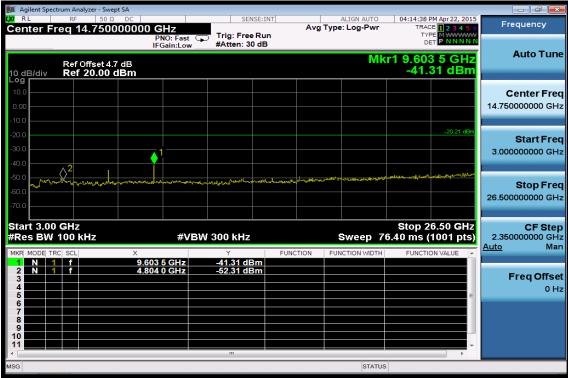
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### **Conducted Spurious Emission Measurement Result** Ch Low 30MHz - 3GHz



## Ch Low 3GHz - 26.5GHz



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## Ch Mid 30MHz – 3GHz

🎉 Agilent Spectrum Analyzer - Swept SA				
X         RL         RF         50 Ω         DC           Center Freq         1.515000000	GH7	ALIGN AUTO Avg Type: Log-Pwr	04:38:18 PM Apr 22, 2015 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 4.7 dB 10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB		TYPE DET PNNNNN r1 2.441 6 GHz -0.67 dBm	Auto Tune
Log 10.0 .00 -10.0			1	Center Freq 1.515000000 GHz
-20.0			-20.67 dBm	Start Freq 30.000000 MHz
-50.0	hand and a start and a start of a start and a start and a start and a start a start a start a start a start a s	engenegen zichen omgenetienen Stephense mer ver	สโบเกระระกาะที่งไม่สะครับสะเกระระการสะ	<b>Stop Freq</b> 3.00000000 GHz
Start 30 MHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 9.	Stop 3.000 GHz 667 ms (1001 pts)	CF Step 297.000000 MHz <u>Auto</u> Man
	441 6 GHz -0.67 dBm			<b>Freq Offset</b> 0 Hz
MSG		STATUS		

## Ch Mid 3GHz – 26.5GHz

Min     N     I     P     S0.0     DC     SENSE: NT     Aug Type: Log. Pwr     Trace 12.24.55     Frequency       Center Freq 14.75000000 GHz IFGsin:Low     Trig: Free Run IFGsin:Low     Trig: Free Run #Atten: 30 dB     Avg Type: Log. Pwr     Trace 12.24.55     Auto Tune       0 dB/div     Ref Offset 4.7 dB	📕 Agilent Spectrum Analyzer - Swept SA										
If Gaint.Low     #Atten: 30 dB     Det FNNNN       Ref Offset 4.7 dB     Mikr1 9.768 0 GHz     -43.56 dBm       10 dB/div     Ref 20.00 dBm     -43.56 dBm       20 d     -20.57 dB     -20.57 dB       20 d     -20.57 dB     -20.57 dB       30 d     -20.57 dB     -20.57 dB       40 d     -20.57 dB     -20.57 dB       50 d     -20.57 dB     -20.57 dB       50 d     -20.57 dB     -20.57 dB       60 d     -20.57 dB     -20.57 dB       50 d     -20.57 dB     -20.57 dB       51 d     -20.57 dB     -20.50 dB       51 d     -20.57 dB     -20.50 dB       1 f     -20.57 dB <td></td> <td>00000 GHz</td> <td></td> <td>Avg</td> <td></td> <td>TRACE 1 2 3 4 5</td> <td>6 Frequency</td>		00000 GHz		Avg		TRACE 1 2 3 4 5	6 Frequency				
10 dB/div       Ref 20.00 dBm       -43.56 dBm         10 dB/div       Ref 20.00 dBm       -50.07 dBm         20 dB/div       -50.07 dBm       -50.07 dBm         -40 dB/div       -40.07 dBm       -50.07 dBm         -60 dB/div       -50.07 dBm       -50.07 dBm         -60 dB/div       -50.07 dBm       -50.07 dBm         -60 dB/div       -50.07 dBm       -50.07 dBm         -70 dB/div       -50.07 dBm       -50.07 dBm </th <th>Ref Offset 4.7</th> <th>IFGain:Low</th> <th></th> <th></th> <th>Mk</th> <th>r1 9.768 0 GH</th> <th>Auto Tune</th>	Ref Offset 4.7	IFGain:Low			Mk	r1 9.768 0 GH	Auto Tune				
100       Center Freq         200       Center Freq         300       Center Freq         400       Center Freq         500       Center Freq         600       Center Freq         700       Center Freq         8       Center Freq         1       Center Freq         1       Center Freq         3.00000000 GHz       Center Freq         3.00000000 GHz       Stop Freq         26.50000000 GHz       Stop Freq         26.50000000 GHz       Stop Freq         2.350000000 GHz       CF Step         2 N 1       f         4       Stop GHz         5       Stop GHz         4       Stop GHz         4       Stop GHz         4       Stop GHz         5       Stop GHz         4       Stop	10 dB/div Ref 20.00 d					-43.56 dBn					
30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0000000 GHz         40.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       30.0       Start Freq       3.00000000 GHz       Stop Freq       26.50000000 GHz       Stop Freq       26.50000000 GHz       3.00000000 GHz       3.00000000 GHz       2.350000000 GHz       4.000       Man       4.000       Man       4.000       Man       Freq Offset       0.000       0.000       9.000       9.000       9.000       9.000       9.000000 GHz       4.000       Man       Freq Offset       0.000000 GHz       0.000000 GHz       4.000       Man       Freq Offset       0.000000 GHz       4.000       0.000000 GHz       4.000       4.000       Man       Freq Offset       0.000000 GHz       0.000000 GHz       4.000       4.000       0.00000 GHz       4.000       0.000000 GHz </td <td>0.00</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>· · · · ·</td>	0.00						· · · · ·				
30.0       40.0	-20.0					-20.67 dB					
-60.0       -70.0 <td< td=""><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></td<>		1									
#Res BW 100 kHz     #VBW 300 kHz     Sweep     76.40 ms (1001 pts)       MKR MODE TRC SCL     X     Y     FUNCTION     FUNCTION WIDTH     FUNCTION VALUE       1     N     1     1     9.768 0 GHz     43.56 dBm       2     N     1     1     9.768 0 GHz     43.56 dBm       3     -     -     -     -       4     -     -     -     -       5     -     -     -     -       6     -     -     -     -       7     -     -     -     -       8     -     -     -     -       9     -     -     -     -       10     -     -     -     -	-60.0	and an and a state of the second	NL-MLIN, HUBHAN AND AND AND AND AND	lage of the second s	and a second and a s	and a second					
MRR     MODE     TRC     SCL     X     Y     FUNCTION     FUNCTION WIDTH     FUNCTION VALUE       1     N     1     f     9.768.0 GHz     -43.56 dBm     -43.56 dBm       2     N     1     f     4.882.0 GHz     -43.56 dBm	#Res BW 100 kHz	#VE	3W 300 kHz		Sweep 7		2.35000000 GHz				
2       N       1       f       4.882 0 GHz       -52.29 dBm         3       -       -       -       -       -       0         4       -       -       -       -       0 Hz       0 Hz         5       -       -       -       -       -       0 Hz         6       -       -       -       -       -       0 Hz         7       -       -       -       -       -       -       -       0 Hz         9       -       -       -       -       -       -       -       -       -       -       -       -       -       0 Hz       0 Hz       -       -       -       -       -       -       0 Hz       0 Hz       -       -       -       -       -       0 Hz       0 Hz       0 Hz       -       -       -       -       0 Hz       0 Hz       0 Hz       0 Hz       -       -       0 Hz       0 Hz       0 Hz       0 Hz       0 Hz       0 Hz       -       -       0 Hz	MKR MODE TRC SCL				FUNCTION WIDTH	FUNCTION VALUE					
	2 N 1 f 3 4 5						• • • • • • • • • • • • • • • • • • •				
	8 9										
✓ ₩											
MSG STATUS	MSG				STATUS	•					



## Ch High 30MHz – 3GHz

🎉 Agilent Spectrum An									
Center Freg 1	50 Ω DC .515000000 GHz	sense:INT		ALIGN AUTO		2 3 4 5 6	Frequency		
Ref 10 dB/div Ref	Ref Offset 4.7 dB         Mkr1 2.480 3 GHz           0 dB/div         Ref 20.00 dBm								
Log 10.0 0.00					▲1 		Center Freq 1.515000000 GHz		
-20.0 -30.0 -40.0						-21.73 dBm	Start Freq 30.000000 MHz		
-50.0 -60.0	ىلىمايىرىكىكىكىكى يەرىدىن <sub>كە</sub> رىمىيەرىنى يەرىمىرىيى	and a state of the second	landan an a	fratzarpitezer inderete	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	yn Jyan den gerkeng	<b>Stop Freq</b> 3.00000000 GHz		
Start 30 MHz #Res BW 100 H	<hz #<="" td=""><td>VBW 300 kHz</td><td></td><td>Sweep 9.</td><td>Stop 3.00 667 ms (100</td><td>01 pts)</td><td><b>CF Step</b> 297.000000 MHz <u>Auto</u> Man</td></hz>	VBW 300 kHz		Sweep 9.	Stop 3.00 667 ms (100	01 pts)	<b>CF Step</b> 297.000000 MHz <u>Auto</u> Man		
1 N 1 f 2 3 4 5 6	2.480 3 GH:	z -1.73 dBm				Ξ	<b>Freq Offset</b> 0 Hz		
6 7 8 9 10 11						-			
MSG		m		STATUS		4			

## Ch High 3GHz - 26.5GHz

	m Analyzer - Swept SA							
Center Fre	RF 50 Ω DC q 14.750000000		SENSE:II	Avg	ALIGN AUTO Type: Log-Pwr	04:24:04 PM Apr TRACE	3456	Frequency
10 dB/div	Ref Offset 4.7 dB Ref 20.00 dBm	PNO: Fast G	#Atten: 30 dB		Mk		GHz	Auto Tune
Log 10.0 0.00 -10.0								Center Freq 14.750000000 GHz
-20.0 -30.0 -40.0	∧2 ∳ <sup>1</sup>						1.73 dBm	Start Freq 3.000000000 GHz
-50.0 -60.0 -70.0	Vorfreitung von der soften von	ward and the other states of the second states of t	anton and a strategy to the strategy	Almondo gelijken in Annon Annoh	Jano filomotic , mar allano , allo filomotica	مر دارد او در بارد موند بر این مرد موند. مرابع	<del>ال</del> لەمىمالەر	<b>Stop Freq</b> 26.500000000 GHz
Start 3.00 C #Res BW 1	00 kHz	#VBV	V 300 kHz		Sweep 7	Stop 26.50 6.40 ms (100	1 pts)	CF Step 2.350000000 GHz Auto Man
MKR         MODE         TRC           1         N         1           2         N         1           3         4         -           4         -         -           6         -         -           7         -         -           8         -         -           9         -         -           10         -         -           11         -         -	f 7.4	441 5 GHz 960 0 GHz	Υ -43.85 dBm -53.10 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VA		Freq Offset 0 Hz
MSG					STATUS			

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## **11. RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT 11.1. 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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### **11.2.** Measurement Equipment Used

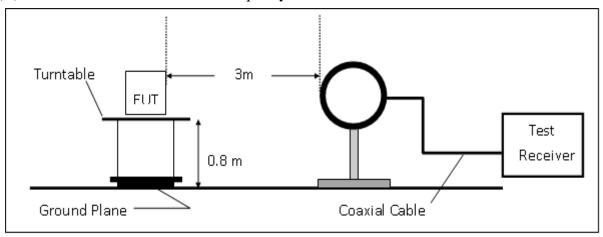
		966 Chamber			
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
EXA Spectrum Ana- lyzer	Agilent	N9010A	MY50420195	12/22/2014	12/21/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/07/2014	10/06/2015
Loop Antenna	ETS.LINDGREN	6502	00148045	07/03/2014	07/02/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/23/2014	12/22/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2014	05/18/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2014	12/24/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2015	01/01/2016
Pre-Amplifier	Agilent	8449B	3008A00578	01/02/2015	01/01/2016
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2015	01/01/2016
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	004	01/02/2015	01/01/2016
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/02/2015	01/01/2016
3m Site NSA	SGS	966 chamber	N/A	07/15/2014	07/14/2015

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

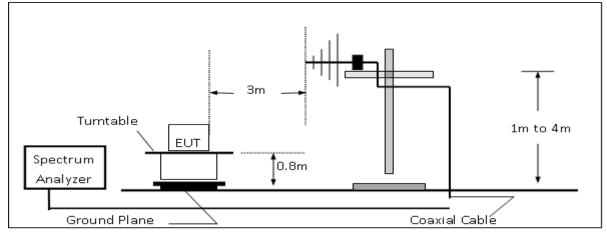


### 11.3. Test SET-UP

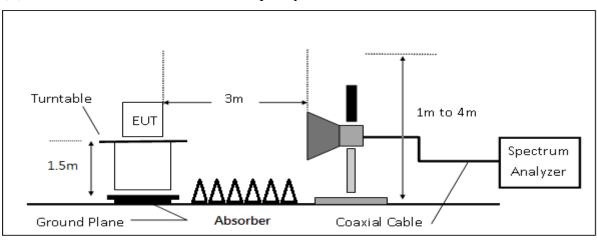
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



### (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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### **11.4. 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 1.5m for frequency> 1GHz above ground plane.
- 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.



#### 11.5. 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:

#### $\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$

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)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

#### Note :

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

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

### 11.6. 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.

#### **11.7. 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)**

Operation Band	:EDR+Hopping	Test Date	:2015-04-23
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	Е	39.70	6.62	46.32	74.00	-27.68
2390.00	Average	Е	31.35	6.62	37.97	54.00	-16.03

Operation Band	:EDR+Hopping	Test Date	:2015-04-23
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	Е	41.13	6.62	47.75	74.00	-26.25
2390.00	Average	E	31.35	6.62	37.97	54.00	-16.03



Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 48 of 80

Operation Band	:EDR+Hopping	Test Date	:2015-04-23
Fundamental Frequency	:2480 MHz	Temp./Humi.	:22.7deg_C/70RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	) Peak	Е	40.04	6.96	47.00	74.00	-27.00
2483.50	) Average	Е	31.54	6.96	38.50	54.00	-15.50

Operation Ba Fundamental Operation M EUT Pol.	Frequency	:EDR+Hopp :2480 MHz :Band Edge :E2 Plane	HIGH	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2015-04-23 :22.7deg_C/7 :Vito :HORIZONTA	
Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Lev	vel	FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Peak	Е	55.85	6.96	62.82	74.00	-11.18
2483.50	Average	Е	31.85	6.96	38.81	54.00	-15.19



#### 10.6.2 Radiated Emission - Band Edge (Non-Hopping Mode):

Operation Band	:EDR	Test Date	:2015-04-23
Fundamental Frequency	:2402 MHz	Temp./Humi.	:22.7deg_C/70RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	Е	41.33	6.62	47.94	74.00	-26.06
2390.00	Average	Е	31.34	6.62	37.96	54.00	-16.04

Operation Band	:EDR	Test Date	:2015-04-23
Fundamental Frequency	:2402 MHz	Temp./Humi.	:22.7deg_C/70RH
Operation Mode	:Band Edge LOW	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	Е	42.58	6.62	49.19	74.00	-24.81
2390.00	Average	E	31.36	6.62	37.98	54.00	-16.02



Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 50 of 80

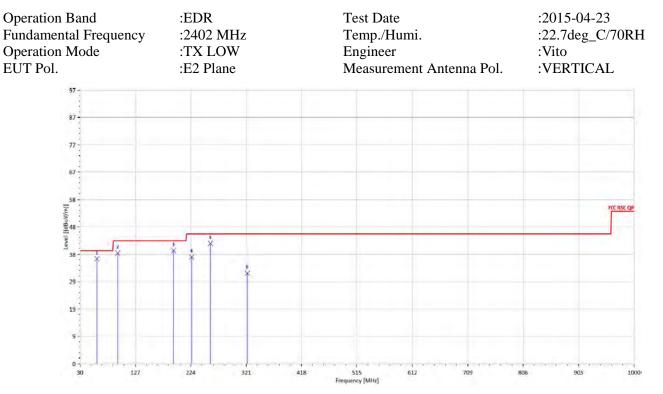
Operation Band	:EDR	Test Date	:2015-04-23
Fundamental Frequency	:2480 MHz	Temp./Humi.	:22.7deg_C/70RH
Operation Mode	:Band Edge HIGH	Engineer	:Vito
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Peak	Е	51.94	6.96	58.91	74.00	-15.09
2483.50	Average	E	31.88	6.96	38.84	54.00	-15.16

Operation Ba Fundamental Operation M EUT Pol.	Frequency	:EDR :2480 MHz :Band Edge :E2 Plane	HIGH	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2015-04-23 :22.7deg_C/70 :Vito :HORIZONTA	
Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Lev	el	FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Peak	Е	59.05	6.96	66.01	74.00	-7.99
2483.50	Average	Е	38.04	6.96	45.00	54.00	-9.00

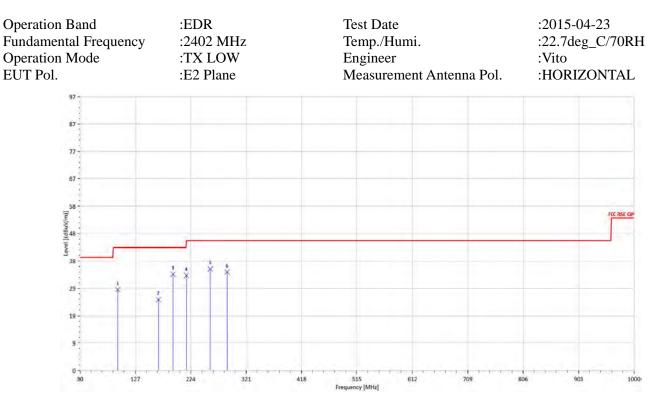


## **Radiated Spurious Emission Measurement Result:** For Frequency form 30MHz to 1000MHz



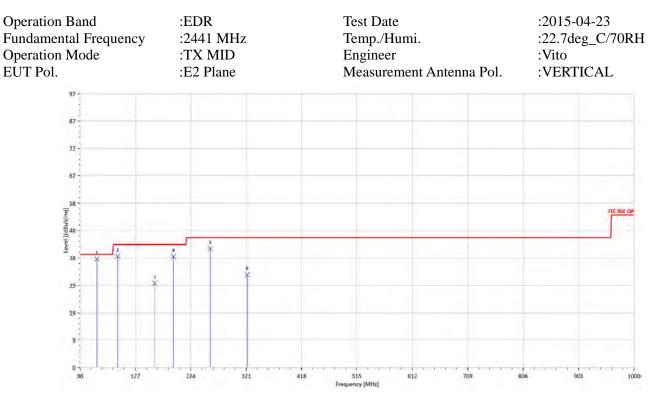
Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV∕m	dBµV/m	dB
59.99	QP	S	65.70	-28.50	37.20	40.00	-2.80
95.96	Peak	S	63.73	-24.54	39.19	43.50	-4.31
193.93	Peak	S	63.93	-23.82	40.11	43.50	-3.39
225.94	Peak	S	60.40	-22.60	37.80	46.00	-8.20
258.28	QP	S	62.20	-19.53	42.67	46.00	-3.33
322.94	Peak	S	50.63	-18.55	32.07	46.00	-13.93





Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV∕m	dBµV/m	dB
95.96	Peak	S	53.19	-24.54	28.65	43.50	-14.85
167.74	Peak	S	48.76	-23.65	25.11	43.50	-18.39
192.96	Peak	S	58.00	-23.91	34.09	43.50	-9.41
216.24	Peak	S	56.57	-22.96	33.61	46.00	-12.39
257.95	Peak	S	55.52	-19.57	35.95	46.00	-10.05
288.02	Peak	S	54.30	-19.45	34.85	46.00	-11.15

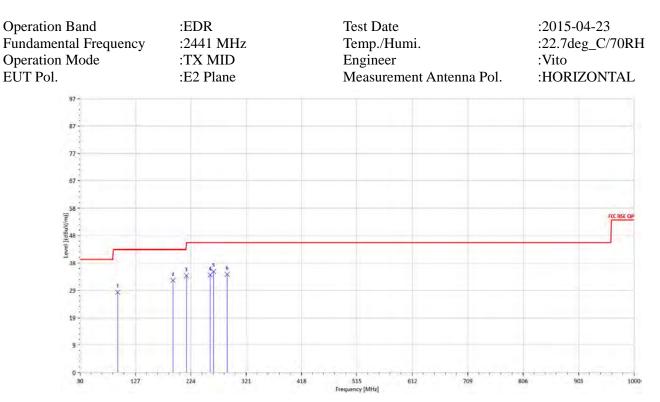




Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
59.99	QP	S	66.90	-28.50	38.40	40.00	-1.60
95.96	Peak	S	63.92	-24.54	39.38	43.50	-4.12
160.95	Peak	S	53.03	-23.20	29.83	43.50	-13.67
193.76	QP	S	63.12	-23.84	39.28	43.50	-4.22
257.99	QP	S	61.67	-19.56	42.11	46.00	-3.89
322.94	Peak	S	51.42	-18.55	32.87	46.00	-13.14



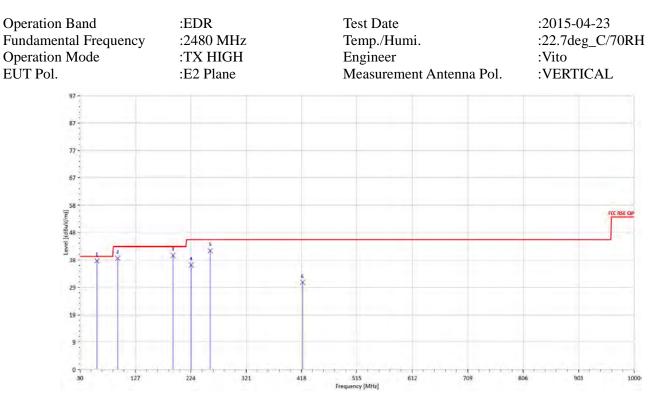
Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 54 of 80



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV∕m	dBµV/m	dB
95.96	Peak	S	52.93	-24.54	28.39	43.50	-15.11
192.96	Peak	S	56.55	-23.91	32.64	43.50	-10.86
216.24	Peak	S	57.21	-22.96	34.25	46.00	-11.75
257.95	Peak	S	54.11	-19.57	34.55	46.00	-11.45
263.77	Peak	S	55.25	-19.47	35.77	46.00	-10.23
288.02	Peak	S	54.18	-19.45	34.73	46.00	-11.27

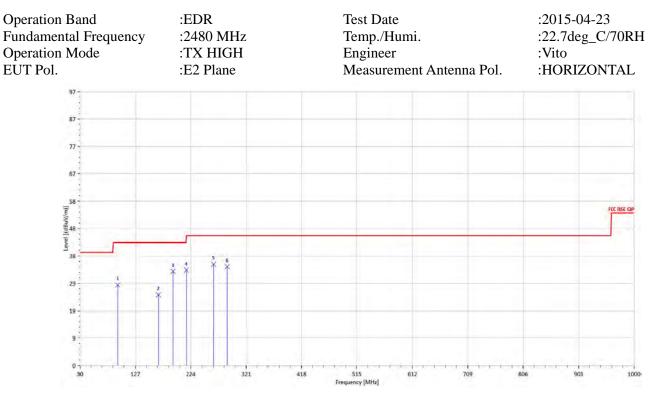


Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 55 of 80



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
60.01	QP	S	66.97	-28.50	38.47	40.00	-1.53
95.96	Peak	S	63.95	-24.54	39.41	43.50	-4.09
192.96	Peak	S	64.29	-23.91	40.38	43.50	-3.12
224.97	Peak	S	59.69	-22.67	37.01	46.00	-8.99
257.95	QP	S	61.63	-19.57	42.06	46.00	-3.94
419.94	Peak	S	46.24	-15.40	30.84	46.00	-15.16

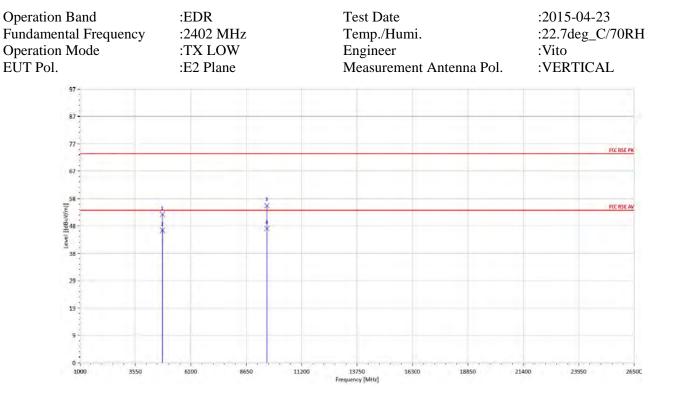




Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
95.96	Peak	S	53.05	-24.54	28.52	43.50	-14.98
167.74	Peak	S	48.69	-23.65	25.04	43.50	-18.46
192.96	Peak	S	57.26	-23.91	33.35	43.50	-10.15
216.24	Peak	S	56.72	-22.96	33.76	46.00	-12.24
263.77	Peak	S	55.35	-19.47	35.87	46.00	-10.13
288.02	Peak	S	54.43	-19.45	34.98	46.00	-11.02

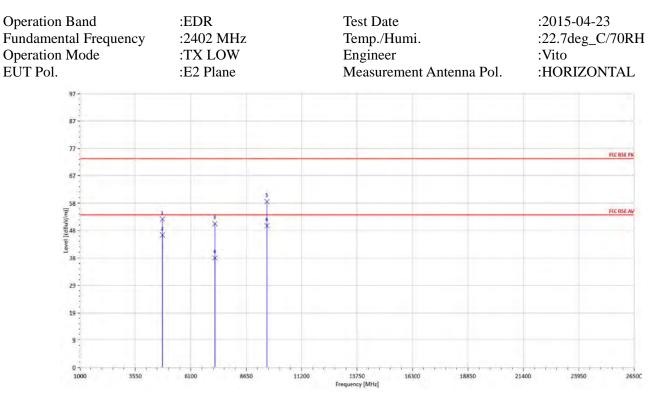


## **Radiated Spurious Emission Measurement Result:** For Frequency over 1GHz



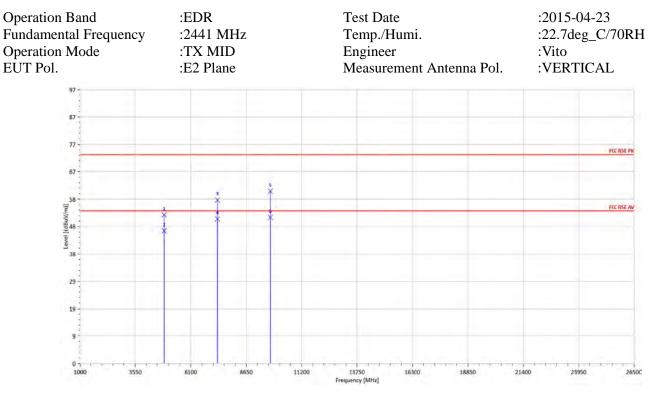
Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Peak	Н	41.64	10.98	52.62	74.00	-21.38
4804.00	Average	Н	35.93	10.98	46.91	54.00	-7.09
9608.00	Peak	Н	37.98	17.69	55.68	74.00	-18.32
9608.00	Average	Н	29.82	17.69	47.51	54.00	-6.49





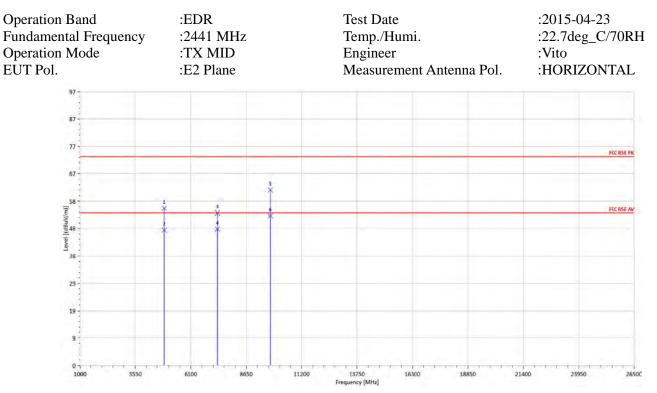
Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	Peak	Н	41.61	10.98	52.59	74.00	-21.41
4804.00	Average	Н	35.93	10.98	46.91	54.00	-7.09
7206.00	Peak	Н	35.73	15.14	50.87	74.00	-23.13
7206.00	Average	Н	23.62	15.14	38.76	54.00	-15.24





Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	Peak	Н	41.72	10.91	52.64	74.00	-21.36
4882.00	Average	Н	36.08	10.91	46.99	54.00	-7.01
7323.00	Peak	Н	42.49	15.37	57.86	74.00	-16.14
7323.00	Average	Н	35.83	15.37	51.20	54.00	-2.80
9764.00	Peak	Н	43.13	17.91	61.04	74.00	-12.96
9764.00	Average	Н	33.81	17.91	51.72	54.00	-2.28





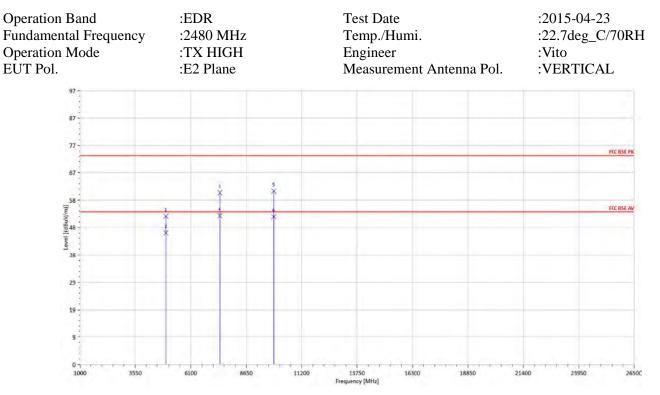
Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	Peak	Н	44.76	10.91	55.67	74.00	-18.33
4882.00	Average	Н	37.01	10.91	47.92	54.00	-6.08
7323.00	Peak	Н	38.61	15.37	53.99	74.00	-20.01
7323.00	Average	Н	32.86	15.37	48.23	54.00	-5.77
9764.00	Peak	Н	44.23	17.91	62.14	74.00	-11.86
9764.00	Average	Н	35.05	17.91	52.96	54.00	-1.04

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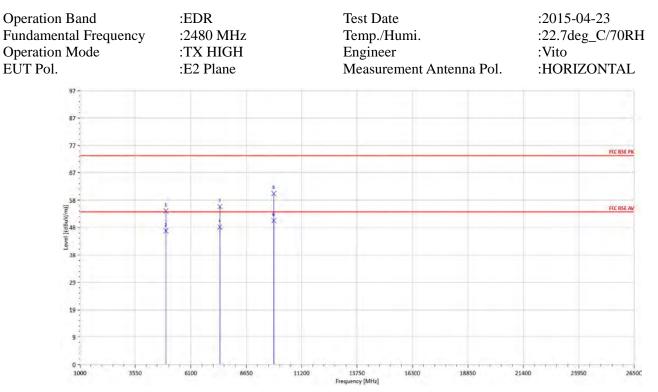


Report No.: E2/2015/30081 Issue Date: May. 05, 2015 Page: 61 of 80



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Peak	Н	41.52	10.99	52.51	74.00	-21.49
4960.00	Average	Н	35.66	10.99	46.65	54.00	-7.35
7440.00	Peak	Н	45.15	15.65	60.80	74.00	-13.20
7440.00	Average	Н	37.08	15.65	52.73	54.00	-1.27
9920.00	Peak	Н	43.15	18.26	61.41	74.00	-12.59
9920.00	Average	Н	34.07	18.26	52.33	54.00	-1.67





Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Peak	Н	43.37	10.99	54.37	74.00	-19.63
4960.00	Average	Н	36.30	10.99	47.29	54.00	-6.71
7440.00	Peak	Н	40.24	15.65	55.89	74.00	-18.11
7440.00	Average	Н	32.99	15.65	48.64	54.00	-5.36
9920.00	Peak	Н	42.28	18.26	60.54	74.00	-13.46
9920.00	Average	Н	32.69	18.26	50.95	54.00	-3.05



## **12. FREQUENCY SEPARATION**

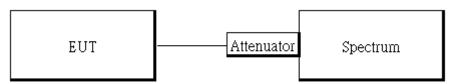
### 12.1. Standard Applicable

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.

### 12.2. Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/12/2015	03/11/2016			
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016			
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016			
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016			

### 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 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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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.



### 12.5. Measurement Result

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

## **Frequency Separation Test Data**



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## **13. NUMBER OF HOPPING FREQUENCY**

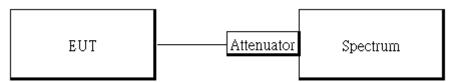
## 13.1. Standard Applicable

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

### 13.2. Measurement Equipment Used

	Conducted Emission Test Site														
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.										
ТҮРЕ		NUMBER	NUMBER	CAL.											
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/12/2015	03/11/2016										
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016										
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016										
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016										

### 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 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.

### **13.5. Measurement Result**

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

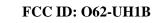
	Channel Number	Limit
2.4 GHz – 2.441GHz	40	
2.441 GHz – 2.4835GHz	39	>15
2.4GHz ~2.4835GHz	(40+39) = 79	

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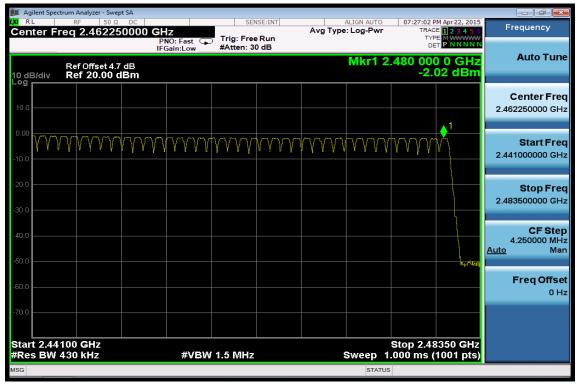


## **Channel Number**

Swept SA 07:25:39 PM Apr 22, 2015 Frequency TRACE 1 2 3 4 5 TYPE M DET P NNNN Center Freq 2.420500000 GHz Avg Type: Log-Pwr Trig: Free Run #Atten: 30 dB PNO: Fast IFGain:Low Auto Tune Mkr1 2.402 000 GHz -0.53 dBm Ref Offset 4.7 dB Ref 20.00 dBm 0 dB/div Center Freq 2.420500000 GHz VVV Start Freq 2.40000000 GHz Stop Freq 2.441000000 GHz CF Step 4.100000 MHz Auto Man **Freq Offset** 0 Hz Stop 2.44100 GHz Sweep 1.000 ms (1001 pts) Start 2.40000 GHz #Res BW 430 kHz #VBW 1.5 MHz STATUS

2.4 GHz – 2.441GHz

## 2.441 GHz - 2.4835GHz



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#### 14. TIME OF OCCUPANCY (DWELL TIME)

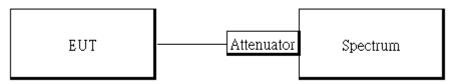
### 14.1. Standard Applicable

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.

### 14.2. Measurement Equipment Used

	Conducted Emission Test Site														
EQUIPMENT	MFR	MODEL	SERIAL	CAL DUE.											
ТҮРЕ		NUMBER	NUMBER	CAL.											
Spectrum Analyzer	Agilent	E4440A	MY4530452 5	03/12/2015	03/11/2016										
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016										
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016										
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016										

### 14.3. Test Set-up



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### **14.4. 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

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.

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### 14.5. Tabular Result of the Measurement

	GFSK	(1Mbps)				
Channel		Measurement Result	Limit			
Channel	PACKET TYPE	(ms)	( <b>ms</b> )			
	DH1	137.60	400ms			
0	DH3	270.72	400ms			
	DH5	312.53	400ms			
	DH1	137.60	400ms			
39	DH3	271.52	400ms			
	DH5	312.53	400ms			
	DH1	137.28	400ms			
78	DH3	270.72	400ms			
	DH5	312.43	400ms			
	/4 DQP	SK (2Mbps)				
Channel	PACKET TYPE	Measurement Result	Limit			
	PACKETTYPE	(ms)	( <b>ms</b> )			
	DH1	140.80	400ms			
39	DH3	268.48	400ms			
	DH5	313.81	400ms			
	8-DPSk	K (3Mbps)				
Channel	PACKET TYPE	Measurement Result	Limit			
	PACKETTYPE	(ms)	( <b>ms</b> )			
	DH1	139.20	400ms			
39	DH3	268.64	400ms			
	DH5	312.53	400ms			

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

#### GFSK (1Mbps):

CH Low	DH1 time slot =	0.430 (ms) * (1600/2/79) * 31.6 =	137.60 (ms)
	DH3 time slot =	1.692 (ms) * (1600/4/79) * 31.6 =	270.72 (ms)
	DH5 time slot =	2.930 (ms) * (1600/6/79) * 31.6 =	312.53 (ms)

CH Mid DH1 time slot = 
$$0.430 \text{ (ms)} * (1600/2/79) * 31.6 = 137.60 \text{ (ms)}$$
  
DH3 time slot =  $1.697 \text{ (ms)} * (1600/4/79) * 31.6 = 271.52 \text{ (ms)}$   
DH5 time slot =  $2.930 \text{ (ms)} * (1600/6/79) * 31.6 = 312.53 \text{ (ms)}$ 

CH High DH1 time slot = 
$$0.429 \text{ (ms)} * (1600/2/79) * 31.6 = 137.28 \text{ (ms)}$$
  
DH3 time slot =  $1.692 \text{ (ms)} * (1600/4/79) * 31.6 = 270.72 \text{ (ms)}$   
DH5 time slot =  $2.929 \text{ (ms)} * (1600/6/79) * 31.6 = 312.43 \text{ (ms)}$ 

#### /4 -DQPSK (2Mbps):

CH Mid	2DH1 time slot =	0.440 (ms) * (1600/2/79) * 31.6 =	140.80 (ms)
	2DH3 time slot =	1.678 (ms) * (1600/4/79) * 31.6 =	268.48 (ms)
	2DH5 time slot =	2.942 (ms) * (1600/6/79) * 31.6 =	313.81 (ms)
8-DPSK (3Mbps):			
CH Mid	3DH1 time slot =	0.435 (ms) * (1600/2/79) * 31.6 =	139.20 (ms)
	3DH3 time slot =	1.679 (ms) * (1600/4/79) * 31.6 =	268.64 (ms)
	3DH5 time slot =	2.930 (ms) * (1600/6/79) * 31.6 =	312.53 (ms)

#### 14.6. Measurement Result

Note: Refer to next page for plots.

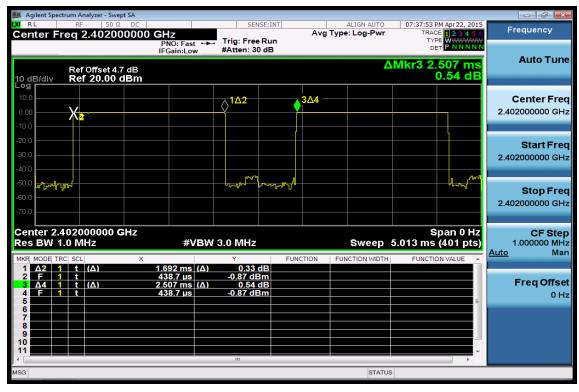
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## **CH-Low** DH1

	trum Analyzer - Swe										
Center F	RF 50Ω reg 2.40200			SENSE:	A		ALIGN AUTO	TRAC	PM Apr 22, 2015	Frequency	
10 dB/div	PNO: Fast →→ IFGain:Low #Atten: 30 dB TYPE WINNING Ref Offset 4.7 dB ΔMkr3 1.2001 dB										
10.0 0.00 -10.0		1Δ2				3∆4				Center Freq 2.402000000 GHz	
-20.0 -30.0 -40.0										<b>Start Freq</b> 2.402000000 GHz	
-50.0 = -60.0 = -70.0 =				ֈֈֈՠֈՠֈՠֈՠֈՠֈՠՠՠ	๛ <u>๚</u> ֈֈ ֈֈֈ	<u></u>		տիտ	ᢦᡪᡛᡰᡁᢔᠭᡃᡗᡃ <u></u>	<b>Stop Freq</b> 2.402000000 GHz	
Center 2.4 Res BW 1		SHz X	#VBW 3.	0 MHz	FUNCTION	EUN	Sweep	2.000 ms	pan 0 Hz (401 pts)	<b>CF Step</b> 1.000000 MHz <u>Auto</u> Man	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	t (Δ) t t (Δ)	430.0 40.00	ms (Δ)	2.20 dB -2.60 dBm -0.01 dB -2.60 dBm	TONCHON			TUNCTI	E	<b>Freq Offset</b> 0 Hz	
7 8 9 10 11											
MSG				III			STATUS				

### DH3



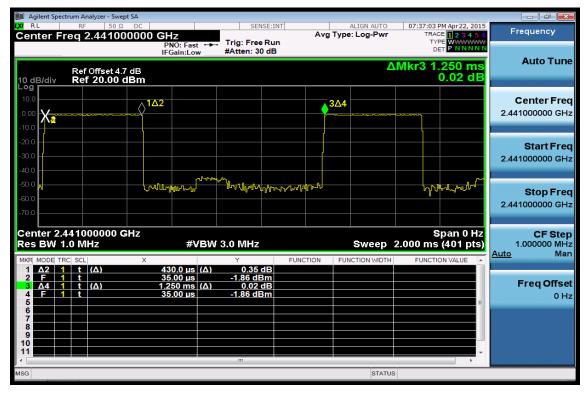


### DH5

📁 Agilent Spectrum Analyzer - Swept SA				
M RL RF 50 Ω DC Center Freq 2.40200000		Avg Type: Log-Pwr	07:39:48 PM Apr 22, 2015 TRACE 1 2 3 4 5 6 TYPE WWWWWW	Frequency
Ref Offset 4.7 dB 10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free Ru IFGain:Low #Atten: 30 dE	3	Mkr3 3.752 ms -0.01 dB	Auto Tune
10.0 10.0 10.0 10.0	14	2 3Δ4		Center Freq 2.402000000 GHz
-20.0 -30.0 -40.0				<b>Start Freq</b> 2.402000000 GHz
-50.0fl <sup>th</sup> \ <sub>https://</sub> -60.0			Juli Commence	<b>Stop Freq</b> 2.402000000 GHz
Center 2.402000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	-	Span 0 Hz 8.880 ms (401 pts)	CF Step 1.000000 MHz Auto Man
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2.930 ms (Δ) -0.02 dB 1.443 ms -0.27 dBm 3.752 ms (Δ) -0.01 dB 1.443 ms -0.27 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
MSG	III	STATUS		

## CH-Mid

#### DH1





### DH3



### DH5



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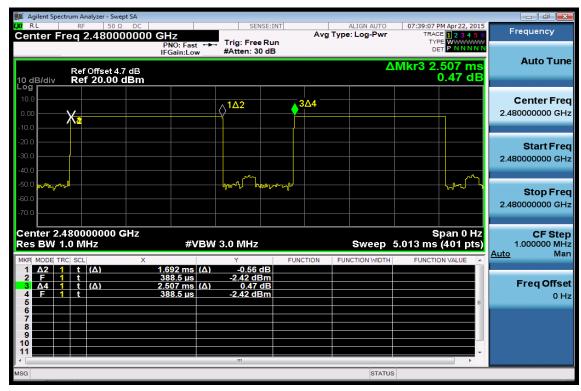


# **CH-High**

## DH1

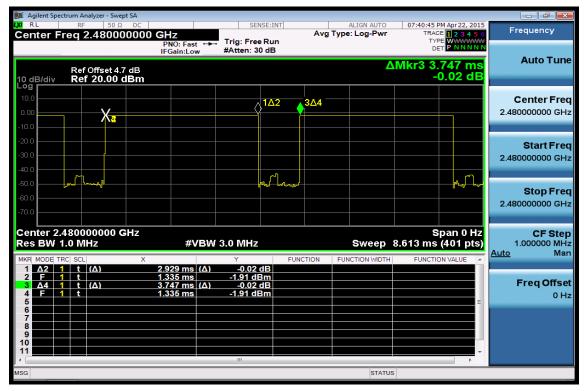
	trum Analyzer - Swept	t SA								
Center Fr	RF 50 Ω req 2.48000	DC   0000 G	Hz		NSE:INT	Avg 1	ALIGN AUTO ype: Log-Pwr	TRAC	PM Apr 22, 2015	Frequency
10 dB/div	Ref Offset 4.7 <b>Ref 20.00 d</b>	dB	PNO: Fast  • FGain:Low	Trig: Fre #Atten: 3				Δ <b>Mkr3 1</b> .	251 ms 0.22 dB	Auto Tune
10.0 0.00		Xa		142		3,	<u>\</u> 4			Center Freq 2.480000000 GHz
-20.0										<b>Start Fred</b> 2.480000000 GHz
-50.0		<sub>₩</sub> 1.			אין איירעייער איירעייער	Falleport			╵╝ ᡶᡒᡂᡒᢪᢦᡆᡀᡠᠵᡧᡪᡁ	<b>Stop Fred</b> 2.480000000 GHz
Center 2.4 Res BW 1		Hz	#VB	W 3.0 MHz		CTION	Sweep	3.013 ms	pan 0 Hz (401 pts)	CF Step 1.000000 MH: <u>Auto</u> Mar
1 <b>Δ2</b> 1 2 <b>F</b> 1 <b>3 Δ4</b> 1 4 <b>F</b> 1 5 6 7 7 8	t (Δ) t t (Δ)	6 1.	29.4 µs (// 78.0 µs 251 ms (// 78.0 µs	-2.93 d	Bm dB					Freq Offset 0 Hz
9 10 11 MSG				m			STATU	JS		

#### DH3





### DH5

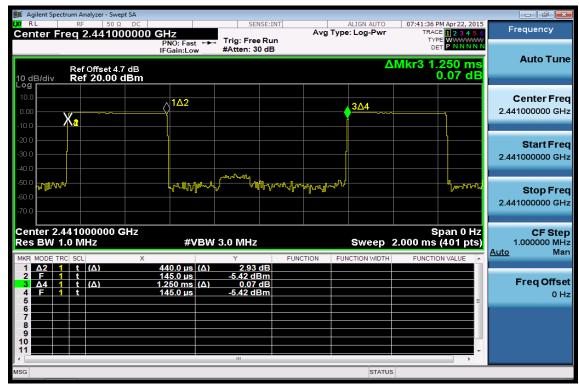


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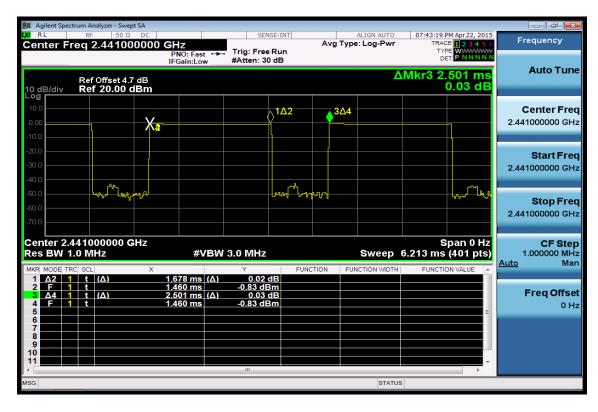
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## CH-Mid 2DH1



### **2DH3**



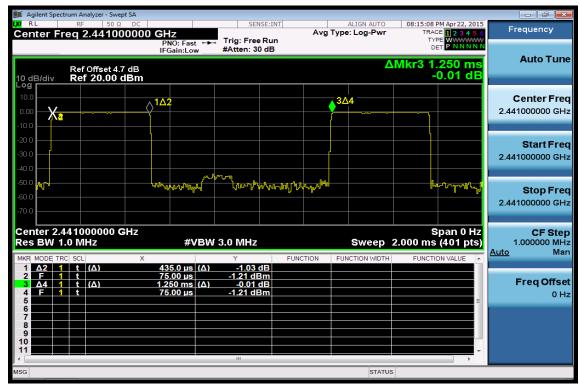


2DH5

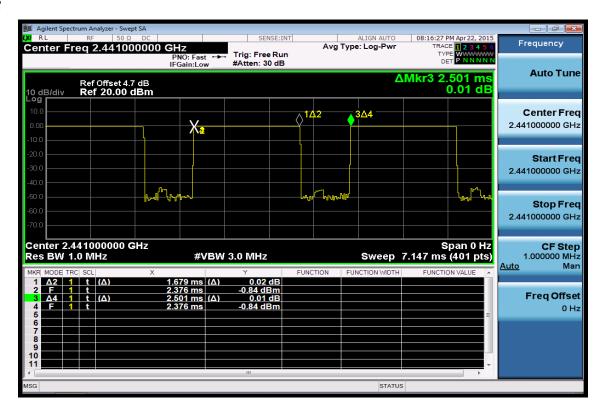
	Agilent Sp	pectrur	n An	alyzer - S	Swept	SA																			e X
<mark>іхі</mark> Се	<sup>RL</sup> nter l	Fre	RF q 2			DC						NSE:IN	_		Avg		ALIGN AUTO		TR	ACE 1	pr 22, 20 <b>2 3 4</b>	56		Frequer	ncy
10	dB/div			Offset				IO: Fas ain:Lo		#Atte		e Rur 0 dB						۵M		DET Р	56 m	N N		Auto	o Tune
Lōg 10. 0.0				X <u>.</u>							<b>\</b>	∆2	¢	34	4						1		2.4		e <b>r Freq</b> 00 GHz
-20. -30. -40.	o 🗕 –																						2.4		<b>rt Freq</b> 100 GHz
-50. -60. -70.				N]																		<b>724</b>	2.4		<b>p Freq</b> 00 GHz
Re	nter 2 s BW	1.0	MI SCL		0 GI	Hz ×	2.0	#\ 12 ms		3.0 N Y	/IHz 0.62		FUI	NCTI	ION	FUN	Sweep			s (4	_		<u>Auto</u>	1.0000	F Step 00 MHz Man
2 3 4 5 6	F	1 1 1	t t t	<u>(Δ)</u>			1.04	43 ms 56 ms 43 ms	i (Δ)	-1.4	0.62 11 dl 0.59 11 dl	Bm dB										III		Freq	Offset 0 Hz
7 8 9 10 11																						+			
I < MSG					_	_	_	_	_	m					_	_	STATI	JS		_	4				



## CH-Mid **3DH1**

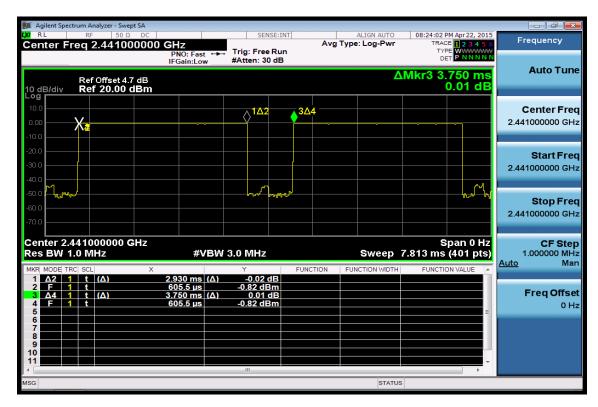


### 3DH3





3DH5



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## **15. ANTENNA REQUIREMENT**

### 15.1. 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.

### **15.2.** Antenna Connected Construction

An embedded-in antenna design is used.

The antenna is designed as permanent 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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