

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

	OF		
Product Name:	Rugged Handheld Computer		
Brand Name:	unitech		
Model No.:	PA720		
Model Difference:	N/A		
FCC ID:	HLEPA720BTNFL		
Report No.:	ER/2016/60090		
Issue Date:	Jul. 08, 2016		
FCC Rule Part:	§15.247, Cat: DSS		
	unitech electronics co., ltd.		
Prepared for:	5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan		
	SGS Taiwan Ltd.		
	Electronics & Communication Laboratory		
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Prepared for: Prepared by:	unitech electronics co., Itd. 5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 Note: This report shall not be reproduced except in full, without the written approval of SGS Taiwan Ltd. This document may be altered or revised by SGS Taiwan Ltd. Personnel only, and shall be noted in the		

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VERIFICATION OF COMPLIANCE

Applicant:	unitech electronics co., ltd. 5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan
Product Name:	Rugged Handheld Computer
Brand Name:	unitech
Model No.:	PA720
Model Difference:	N/A
FCC ID:	HLEPA720BTNFL
Report Number:	ER/2016/60090
Date of test:	Jun. 16, 2016 ~ Jul. 01, 2016
Date of EUT Received:	Jun. 16, 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:	Ton Lis	Date:	Jul. 08, 2016
Prepared By:	Tin Lin / Engineer Tiffany Kao	Date:	Jul. 08, 2016
Approved By:	Tiffany Kao / Clerk Jim Chang Jim Chang / Asst. Manager	Date:	Jul. 08, 2016

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Revision History

Report Number	Revision	Description	Issue Date
ER/2016/60090	Rev.00	Initial creation of document	Jul. 08, 2016

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GENERAL INFORMATION 1

1.1 Product description

General:

Product Name:	Rugged H	Handheld Computer	
Brand Name:	unitech		
Model No.:	PA720		
Model Difference:	N/A		
Product SW/HW version:	298 / R00)4	
Radio SW/HW version:	N/A / N/A		
Test SW Version:	N/A		
RF power setting in TEST SW:	N/A		
USB Charging cable:	Model No.: N/A, Supplier: N/A		
	3.6Vdc from Rechargeable Li-polymer Battery or 5V from AC/DC Adapter		
Power Supply:	Battery: Model No.: 1400-900035G, Supplier: WELLTECH TECHNOLOGY		
	Adapter : Model No.: PSA10F-050Q, Supplier Phi Hong		

Bluetooth BR+EDR:

Bluetooth Version	BT V4.1 dual mode
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	3.08 dBm
Frequency Range:	2.402GHz – 2.480GHz
Antenna Designation:	PIFA Antenna, Gain: -3.76dBi

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1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is Rugged Handheld Computer, supporting GSM / WCDMA / LTE, Wi-Fi 802.11abgn, Bluetooth and NFC features, and below is details of information.

Product Feature			
Product Name:	Rugged Handheld Computer		
Brand Name:	unitech		
Model No.:	PA720		
Model Difference:	N/A		
FCC ID:	HLEPA720BTNFL		
GSM Operating Band(s)	GSM 850/1900MHz		
GPRS / EGPRS Multi Slot Class	GPRS Class 12		
WCDMA Operating Band(s)	FDD Band II / V		
WCDMA Rel. Version	Rel.9		
LTE Operating Band(s)	FCC Band 5: Part 22. / FCC Band 2: Part 24. FCC Band 7 / 38 / 41: Part 27		
LTE Rel. Version	Rel.9		
Bluetooth Version	V4.1 dual mode		
Wi-Fi- Specification	802.11a/b/g/n		
NFC Specification	NFC		

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

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1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC Public Notice DA 00-705 Measurement Guidelines

KDB648474 D03 Wireless Chargers Battery Cover

ANSI C63.10:2013

Note:

- 1. All test items have been performed and record as per the above standards.
- The composite system is compliance with FCC Subpart B is authorized under 2. a DoC procedure.

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 24803 (TAF code 0513)

FCC Registration Numbers are: 509634

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 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 1.1 dB.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

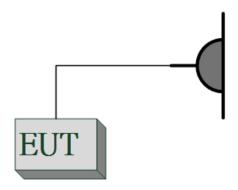
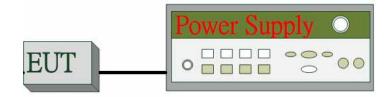


Fig. 2-2 Conducted Emission Configuration



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Fig. 2-3 AC Power Line Conducted Emission

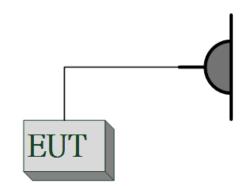


Table 2-1 Equipment Used in Tested System

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	HP	E3640A	KR93300208	N/A	Un-shielded

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SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b)(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

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

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

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 E1 position was reported; as for the wireless charging mode, the worst case E2 position was reported.

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ANTENNA PORT CONDUCTED TEST						
Peak Output Power, 20dB Band Width						
MODE	AVAILABLE	TESTED	MODULATION	PACKET		
MODE	CHANNEL	CHANNEL	MODULATION	TYPE		
	0 to 78	0,39,78	GFSK	DH5		
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	DH5		
	0 to 78	0,39,78	8-DPSK	DH5		
	Band Edge & Conducted Emission					
Bluetooth	0 to 78	0,78	GFSK	DH5		
Bluetooth	0 to 78	0,78	8-DPSK	DH5		
		Frequen	cy Separation			
Bluetooth	0 to 78	0,1,2	GFSK	DH5		
		Number of h	opping frequency			
Bluetooth	0 to 78	0 to 78	GFSK	DH5		
	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		



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:

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

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

This uncertainty represents an expanded uncertainty expressed at approximately the

95% confidence level using a coverage factor of k=2.

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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	ESCI7	100760	05/10/2016	05/09/2017		
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/16/2016	05/15/2017		
LISN	MESS TEC	FCC-LISN-50/250 -25-2-01	4034	05/16/2016	05/15/2017		
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2015	11/25/2016		

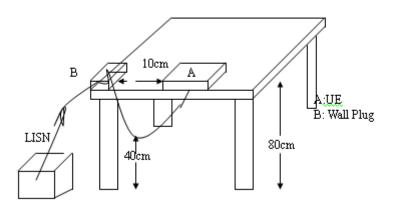
6.3 EUT Setup

- 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

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 Temperature: 20

Test Date: Jun. 29, 2016

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8

9

10

11

12

0.2980

0.5820

0.5820

9.8780

9.8780

20.90

38.80

28.60

35.20

25.50

0.09

0.11

0.11

0.37

0.37

20.99

38.91

28.71

35.57

25.87

50.30

56.00

46.00

60.00

50.00

-29.31

-17.09

-17.29

-24.43

-24.13

AVG

QP

AVG

QP

AVG

Site Conduction Room Temperature: 20 ℃ Phase: N Limit: FCC Class B Conduction(QP) AC 120V/60Hz Humidity: 58 % Power: Mode: Operation Note: Adapter PSA10F-050Q Conducted Emission File :60060 Data #1 Date: 2016/6/29 Time: 下午 02:52:08 80.0 dBuV FCC Class 8 Conduction(OP) B Conduction(AVG) FCC CL - Manual March 0.0 0.150 0.5 (MHz) 5 30.000 Reading Correct Measure-No. Mk Freq Limit Over Level Factor ment MHz dBuV dB dBuV dBuV dB Detector Comment 1 0.1580 38.40 0.07 38.47 65.57 -27.10 QP 2 0.1580 23.20 0.07 23.27 55.57 -32.30 AVG 3 0.2060 38.50 0.08 38.58 63.37 -24.79 QP 4 0.2060 25.60 0.08 25.68 53 37 -27 69 AVG 5 0.2540 36.80 0.09 36.89 61.63 -24.74 QP 6 0.2540 25.00 0.09 25.09 51.63 -26.54 AVG 7 QP 0.2980 31.70 0.09 31.79 60.30 -28.51

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PEAK OUTPUT POWER MEASUREMENT 7

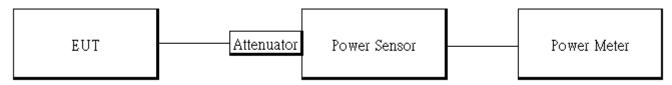
7.1 Standard Applicable

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.			
Power Meter	Anritsu	ML2495A	1005007	12/09/2015	12/08/2016		
Power Sensor	Anritsu	MA2411B	917032	12/09/2015	12/08/2016		
EXA Spectrum							
Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017		
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017		

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):

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	2.76	1.888	1000
39	2441	2.12	1.629	1000
78	2480	3.08	2.032	1000

1M BR mode (Average): Tune up tolerance ± dBm

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-1.17	0.764	1000
39	2441	0.62	1.153	1000
78	2480	1.45	1.396	1000

2M EDR mode (Peak):

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	2.59	1.816	125
39	2441	1.94	1.563	125
78	2480	2.90	1.950	125

2M EDR mode (Average): Tune up tolerance ± dBm

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-1.08	0.780	125
39	2441	-1.58	0.695	125
78	2480	-0.93	0.807	125

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3M EDR mode (Peak):

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	2.65	1.841	125
39	2441	2.01	1.589	125
78	2480	2.96	1.977	125

3M EDR mode (Average): Tune up tolerance ± dBm

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	-0.93	0.807	125
39	2441	1.51	1.416	125
78	2480	-0.69	0.853	125

NOTE: cable loss as 1.1dB that offsets in the spectrum

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20DB BANDWIDTH MEASUREMENT 8

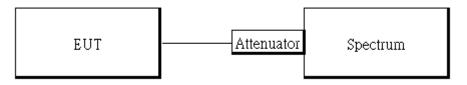
8.1 Standard Applicable

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.				
EXA Spectrum								
Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017			
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017			

8.3 Test Set-up



8.4 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 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
- Repeat above procedures until all test default channel is completed

NOTE:

- cable loss as 5.1dB 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	20 dB Bandwidth (MHz)	2/3 Bandwidth (MHz)
Low	0.9226	0.62
Mid	0.9255	0.62
High	0.9283	0.62

π/4-DQPSK

Channel	20 dB Bandwidth (MHz)	2/3 Bandwidth (MHz)
Low	1.256	0.84
Mid	1.306	0.87
High	1.259	0.84

8-DPSK

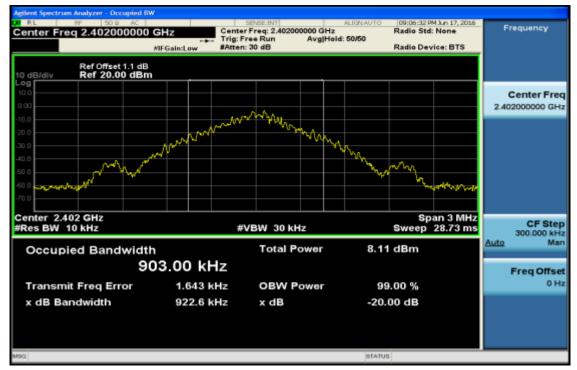
Channel	20 dB Bandwidth (MHz)	2/3 Bandwidth (MHz)
Low	1.285	0.86
Mid	1.265	0.84
High	1.266	0.84

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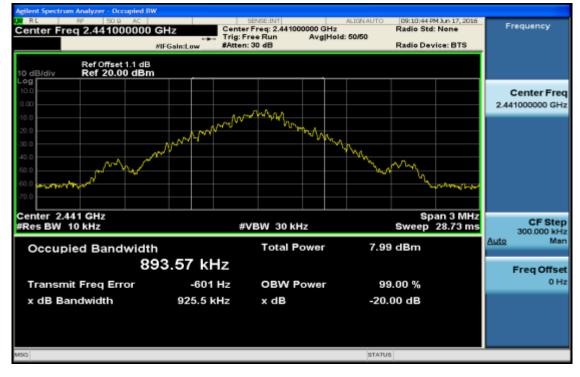
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20dB Band Width Test Data CH-Low (GFSK mode)



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

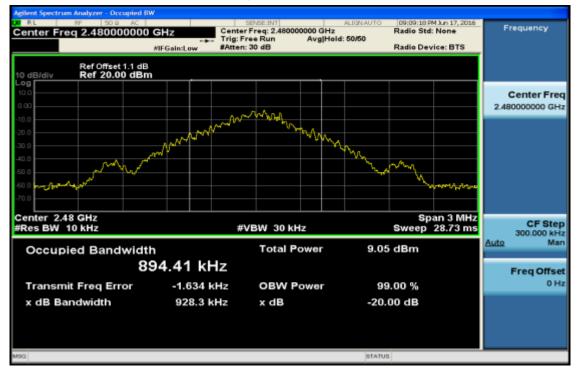


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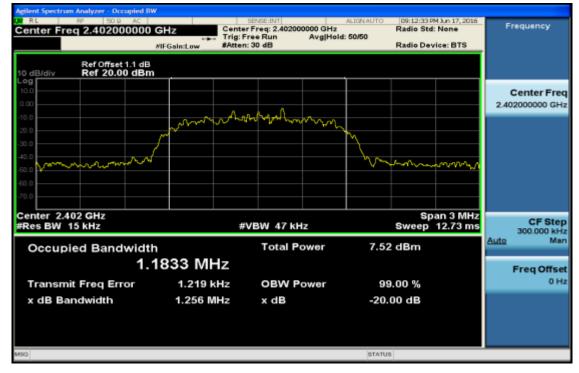
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20dB Band Width Test Data CH-High (GFSK mode)



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



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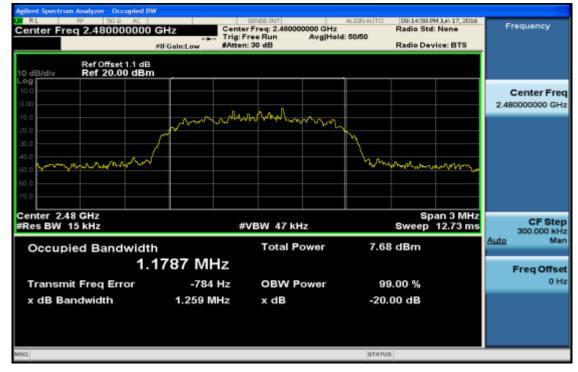
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20dB Band Width Test Data CH-Mid (π/4-DQPSK mode)

09:13:53 PM Jun 17, 2016 Radio Std: None Center Freq: 2.44100000 GHz Trig: Free Run Avg|Hold: 50/50 #Atten: 30 dB Frequency Center Freg 2.441000000 GHz Radio Device: BTS #IFGain:Low Ref Offset 1.1 dB Ref 20.00 dBm Center Freq 2.441000000 GHz Center 2.441 GHz Span 3 MHz **CF** Step #Res BW/15 kHz #VBW 47 kHz Sweep 12.73 ms 300.000 Auto Mar Occupied Bandwidth Total Power 6.41 dBm 1.1854 MHz Freq Offset Transmit Freq Error 533 Hz OBW Power 99.00 % 0 H; x dB Bandwidth 1.306 MHz x dB -20.00 dB STATUS

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

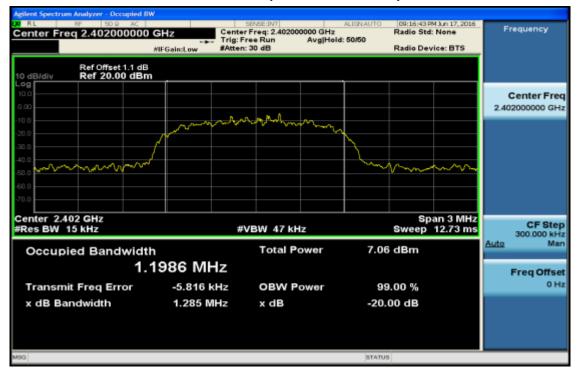


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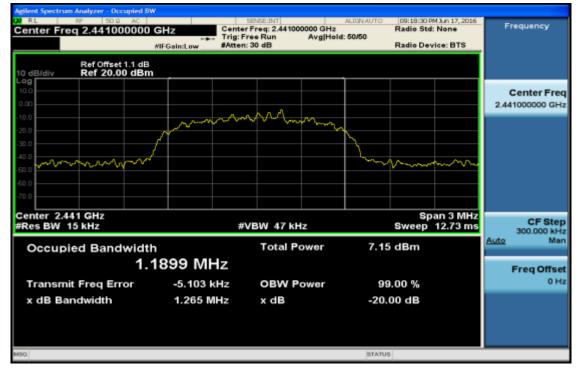
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20dB Band Width Test Data CH-Low (8-DPSK mode)



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

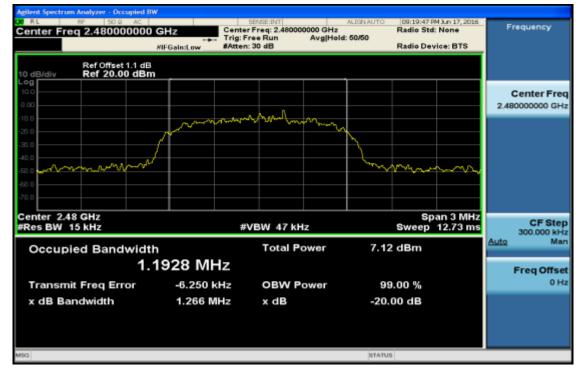


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20dB Width Test Data CH-High (8-DPSK mode)



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CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT 9

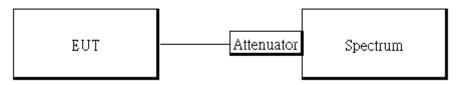
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
EXA Spectrum								
Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017			
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017			

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

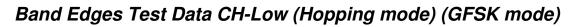
9.5 Measurement Result

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

- 1. Cable loss as 5.1dB that offsets in the spectrum
- 2. The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

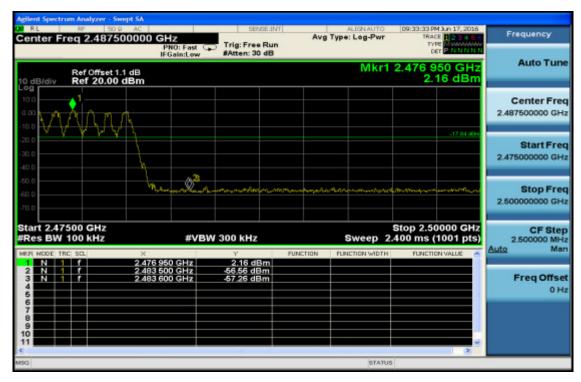
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Agilent Spectrum Analyzer - Swep		SENSE:IN		ALIONAUTO	09:33:17 PM Jun 1	2.0046	
Center Freq 2.36500	0000 GHz		Avg T	ype: Log-Pwr	TRACE 1 2 TYPE	3456	Frequency
Ref Offset 1.1 10 dB/div Ref 20.00 d		#Atten: 30 dB		Mkr	oer P N 1 2.417 03 0 3.09 c	GHZ	Auto Tune
10.0 a.00 -10.0					MM		Center Freq 2.365000000 GHz
-20.0							Start Freq 2.310000000 GHz
-50.0 -60.0 -70.0	all galactic des al a strategies	hunngalittin da una drigur	ernalistationen alter		<u>0</u>		Stop Freq 2.420000000 GHz
Start 2.31000 GHz #Res BW 100 kHz MKR MODE TRC SCL	ж	3W 300 kHz	FUNCTION		Stop 2.42000 0.53 ms (1001 FUNCTION VAL	1 pts)	CF Step 11.000000 MHz Auto Man
1 N 1 F 2 N 1 F 3 N 1 F 6 6 7 8 9 9 10 11	2,417 03 GHz 2,399 90 GHz 2,390 00 GHz 2,390 00 GHz	3.09 dBm -55.72 dBm -56.50 dBm					Freq Offset 0 Hz
493				STATUS	3		

Band Edges Test Data CH-High



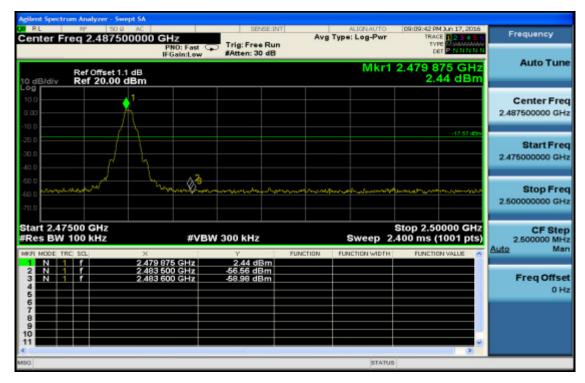
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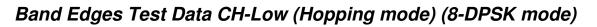
Agilent Spectrum Analyzer - Swep							
Center Freq 2.365000		SENSE:IN	Avg T	ype: Log-Pwr	09:06:55 PM J TRACE	1 2 3 4 5 6	Frequency
Ref Offset 1.1 10 dB/div Ref 20.00 d		Trig: Free Run #Atten: 30 dB		Mkr	DET	PNNNNN	Auto Tune
10.0 0.00 -10.0					1		Center Freq 2.365000000 GHz
-20.0 -30.0 -40.0						-18 25 dBn	Start Freq 2.310000000 GHz
-50.0 -60.0 -70.0	and the specific sectors.	and the second	Mahaya ay Safara Ang Sa		d ²		Stop Freq 2.420000000 GHz
Start 2.31000 GHz #Res BW 100 kHz	#VB	W 300 kHz	FUNCTION		Stop 2.420 0.53 ms (10 FUNCTION	001 pts)	CF Step 11.000000 MHz Auto Man
1 N 1 f 2 N 1 f 3 N 1 f 4 5 5 5 6 6 6 6 7 8 9 9 10 11 1 1	2,401 96 GHz 2,399 90 GHz 2,390 00 GHz	1.75 dBm -55.90 dBm -56.16 dBm					Freq Offset 0 Hz
K MSG				STATUS	1	>	8

Band Edges Test Data CH-High



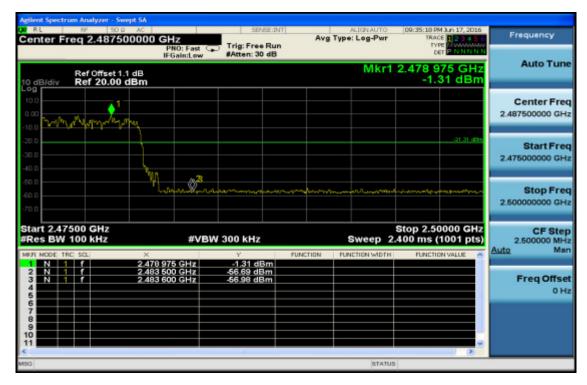
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Agilent Spectrum Analyzer - Swept SA	SENSE:INT	ALIGNAUTO	09:35:04 PM Jun 17, 2016	
Center Freq 2.365000000	GHz	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE 2 00000000	Frequency
Ref Offset 1.1 dB 10 dB/div Ref 20.00 dBm	PND: Fast Trig: Free Run IFGain:Low #Atten: 30 dB	Mkr	1 2.411 09 GHz 1.68 dBm	Auto Tune
10.0 0.00 -10.0			navana Mayora	Center Freq 2.36500000 GHz
-20.0			-18.32 dBn	Start Fred 2.310000000 GH;
-50.0 -60.0 -70.0	พ.ศ.ศ.ชีวสุรสุราชสุดที่สารมากมากมา (1969-1979) ส	the framework to fail the frame of the	\$- 	Stop Free 2.420000000 GH;
Start 2.31000 GHz #Res BW 100 kHz	#VBW 300 kHz		Stop 2.42000 GHz 0.53 ms (1001 pts)	CF Step 11.000000 MH Auto Mar
2 N 1 F 2.39	11 09 GHz 1.68 dBm 99 90 GHz -54.51 dBm 90 00 GHz -56.25 dBm			Freq Offse 0 H
41 ¢		STATU	×	

Band Edges Test Data CH-High



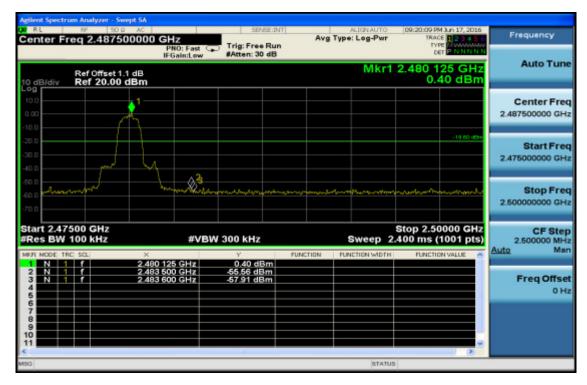
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Agilent Spectrum Analyzer - Swe				ALIONAUTO	00.13.01.01	A	
Center Freq 2.36500	0000 GHz	SENSE:INT	Avg Typ	e: Log-Pwr	TRAC	a.n 17, 2016	Frequency
Ref Offset 1.1 10 dB/div Ref 20.00 d		#Atten: 30 dB		Mkr	06 1 2.402	PNNNNN	Auto Tune
10.0 0.00 -10.0							Center Freq 2.365000000 GHz
-20.0 -30.0 -40.0						-10.05 dBm	Start Freq 2.310000000 GHz
-50.0 -60.0 -70.0	ะการการสารการสารสารสารสารสารสารสารสาร	ะสุ _{ของ}	da.at.t mite vernenet	and menter	w ² have	hadamayoo ya dhe	Stop Free 2.42000000 GHz
Start 2.31000 GHz #Res BW 100 kHz	ж	W 300 kHz	FUNCTION FL		Stop 2.42 0.53 ms (1 FUNCTIO	1001 pts)	CF Step 11.000000 MHz Auto Mar
1 N 1 F 2 N 1 F 3 N 1 F 4 5 6 7 8 9 10	2.402 18 GHz 2.399 90 GHz 2.390 00 GHz	1.15 dBm -55.82 dBm -55.94 dBm					Freq Offset 0 Hz
4 MSQ		4		STATUS	1	>	

Band Edges Test Data CH-High



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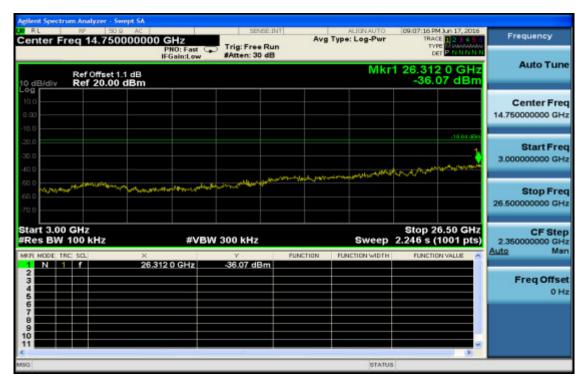
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Conducted Spurious Emission Measurement Result (GFSK mode) Ch Low 30MHz – 3GHz

	um Analyzer - Swept						
enter Fr	req 1.515000			Avg	Type: Log-Pwr	09:07:06 PM Jun 17, 201 TRACE 1 2 3 4 TYPE PLANNER DET PINNEN	Frequency
0 dB/div	Ref Offset 1.1 d Ref 20.00 dB	1B			Mk	r1 2.403 0 GH 1.36 dBr	
10.0 0.00						1	Center Fre 1.515000000 GH
10.0 20.0 30.0 40.0						10.64.05	Start Fre 30.000000 MH
50.0 50.0 70.0	ويط ويهد الدواوس المدينين المدونين	en alle and a strategies and a strategies of the	an a	algradi. galiki, additi dirani	مىلىنى ئارىمىن ^{ى ر} ىملۇنىپ	ىرمانلىدۇرى ^{يىل} انلىر	Stop Fro 3.000000000 Gi
tart 30 N Res BW		#1	VBW 300 kHz		Sweep 2	Stop 3.000 GH 83.9 ms (1001 pts	
KR MODE TR 1 N 1 2 3 4 3 4 4 5 6 7 7 8 9 0 1 1	f f	× 2.403 0 GHz	Y 1.36 dBn	PUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Offs 0
0					STATUS	1	

Ch Low 3GHz – 26.5GHz

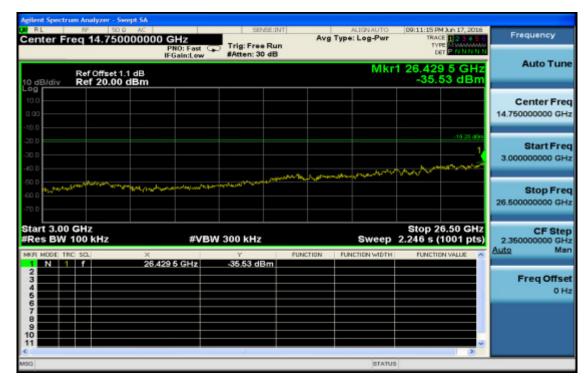




Ch Mid 30MHz – 3GHz

Agilent Spectr	um Analyzer - S								
Center F	req 1.5150	000000	SHZ PNO: Fast	Trig: Free Ru	Avg	Type: Log-Pwr	TRA	M.A.n 17, 2016 CE 123456 PE 1000000000000000000000000000000000000	Frequency
10 dB/div	Ref Offset 1 Ref 20.00	.1 dB	IFGain:Low	#Atten: 30 dE		MI	(r1 2.44	er PNNNNN 1 6 GHz 75 dBm	Auto Tune
10.0 0.00 -10.0							• ¹		Center Freq 1.515000000 GHz
-20.0 -30.0 -40.0								19.25 dBm	Start Freq 30.000000 MHz
-50.0 -60.0	hanga aya dalar daha	ing got a featimeter	ng tenget in holine ran aan aa		Arrighting adultan	la hine an	ale operators	a a lyfraffig a _{a llo} nn yw d	Stop Freq 3.000000000 GHz
Start 30 M #Res BW	100 kHz	×		W 300 kHz	FUNCTION	Sweep 2	83.9 ms	000 GHz (1001 pts)	CF Step 297.000000 MHz Auto Man
2 3 4 5 6 7 8 9 9 10 11 •		2.44	116 GHz	0.75 dBm				~	Freq Offset 0 Hz
MSG						BTATU	8		

Ch Mid 3GHz – 26.5GHz



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Ch High 30MHz – 3GHz

OZ PL PF SO 9 AC Center Freq 1.515000000 Ref 0ffset 1.1 dB Ref 0ffset 1.1 dB Ref 20.00 dBm	PND: Fast IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg	ALIGNAUTO Type: Log-Pwr Mik	09:09:53 PM Jun 1 TRACE 12 TYPE Mile DET P N r1 2.480 3	3456 NNNN	Frequency
10 dB/div Ref 20.00 dBm				Mk		_	
					1.63 0	GHz IBm	Auto Tune
10.0					•1		Center Freq 1.515000000 GHz
-20.0						1.37 d i m	Start Freq 30.000000 MHz
-50.0 -60.0 -70.0	وألواللوره وردامورل جسان ساماته	aaayahagaa ahaa ahaa hadi	manaha wakalin huma	en spiedernet at worden			Stop Freq 3.000000000 GHz
Start 30 MHz #Res BW 100 kHz	#VBW	300 kHz 7 1.63 dBm	FUNCTION	Sweep 2	Stop 3.000 83.9 ms (1001 FUNCTION VAL	pts)	CF Step 297.000000 MHz Auto Man
2 3 4 5 6 7 8 9 9 10	.480 3 GHZ	1.65 dBm				×	Freq Offset 0 Hz

Ch High 3GHz – 26.5GHz



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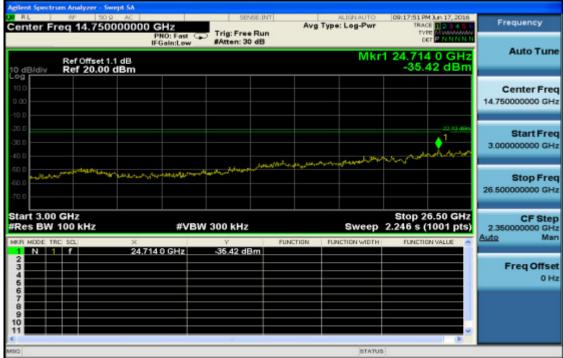
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Conducted Spurious Emission Measurement Result (8DPSK mode) Ch Low 30MHz – 3GHz

	um Analyzer - Swept S							
Center Fi	req 1.5150000	00 GHz	Trig: Free Ru	Avg	Type: Log-Pwr	09:17:15 PM Jun 17,2 TRACE 1 2 3 TYPE 10000	56	Frequency
10 dB/div	Ref Offset 1.1 dB Ref 20.00 dBn	PNO: Fast IFGain:Low	#Atten: 30 dB		Mk	HZ Bm	Auto Tune	
10.0 0.00 -10.0						1		Center Free 1.515000000 GH
-20.0						22.4	-	Start Free 30.000000 MH
-60.0	inerinen postalistin ar Afrika ar And	lanar magini Anarika par	ىر ^ى يەلەمدىنىڭ مۇرىكى بىلەرى.	and a state of the	generation and a second second	ىرىير)يە ^ر الى ^ي ەر ^{ىي} ىرىيەرسى		Stop Fre 3.000000000 GH
Start 30 M #Res BW	100 kHz	#VE	3W 300 kHz	FUNCTION	Sweep 2	Stop 3.000 G 83.9 ms (1001 p	ots)	CF Step 297.000000 MH Auto Mar
1 N 1 2 3 4 5 6 7 8 9 10 11		2.403 0 GHz	-2.43 dBm				×	Freq Offse 0 H
193					STATUS	1		

Ch Low 3GHz – 26.5GHz



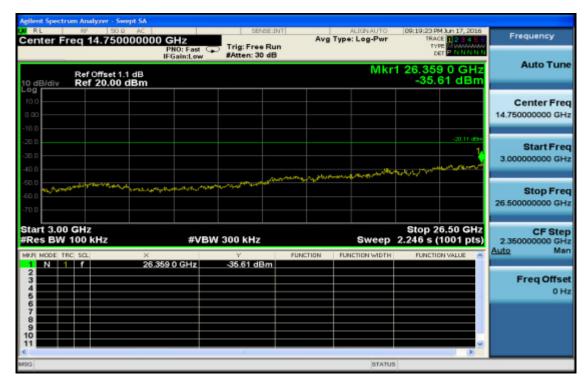
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Ch Mid 30MHz – 3GHz

RL	m Analyzer - Swep № 50 a eq 1.515000	AC.	SENSE:IM		ALIGNAUTO Type: Log-Pwr	09:19:13 PM Jun 1 TRACE 1 2 TYPE MA DET P M	3456	Frequency
10 dB/div	Ref Offset 1.1 Ref 20.00 d	IFGain:Low	#Atten: 30 dB		Mk	r1 2.441 6 -0.11 c	GHZ	Auto Tun
10.0 0.00						1		Center Fre 1.515000000 GH
-20.0						-2	0.11 dBm	Start Free 30.000000 MH
-50.0 -60.0 -50.0	مى رەرەسىيەر ^{يىلى} رە يەرەسىيە مەرەسىيە مەرەسىيە مەرەسىيە مەرەسىيە مەرەسىيە مەرەسىيە مەرەسىيە مەرەسىيە مەرەسەيە	an a	www.auc.andmag.md%d=4	hada baya kalana karana	ويقو والمريم من المريس و	a	pahanni	Stop Fre 3.000000000 GH
Start 30 M #Res BW	100 kHz		W 300 kHz			Stop 3.000 83.9 ms (100	1 pts)	CF Ste 297.000000 MH Auto Ma
MARY MODE TH 1 N 1 2 4 5 6 7 8 9 9 10 11 11		× 2,441 6 GHz	-0.11 dBm	PUNCTION	FUNCTION WIDTH	FUNCTION VAL		Freq Offs 0 F
3					STATUS		_	

Ch Mid 3GHz – 26.5GHz



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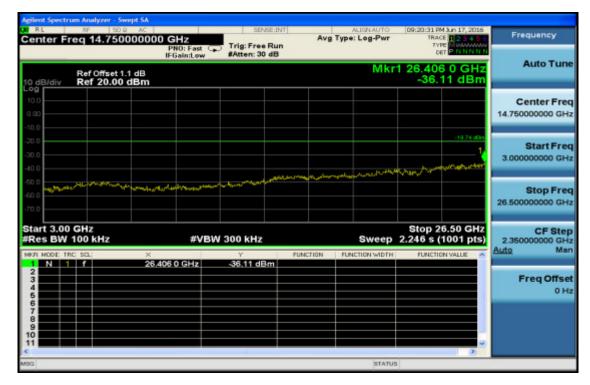
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Ch High 30MHz – 3GHz

Agilent Spectr	rum Analyzer - Swept							
Center F	reg 1.515000		SENSE:IN	Avg	Type: Log-Pwr	09:20:20 PM Jun 17, 20 TRACE 1 2 3 4 TYPE 100000	5.6	Frequency
10 dB/div	Ref Offset 1.1 d Ref 20.00 dB	IFGain:Low	#Atten: 30 dB		Mk	r1 2.480 3 GI 0.26 dB	12	Auto Tune
10.0 0.00 -10.0						• ¹		Center Freq 1.515000000 GHz
-20.0 -30.0 -40.0						-19.74	an I	Start Freq 30.000000 MHz
-60.0 -60.0		มีมาร์มาร์การจากระ เมษายาการจากระ	ىرىمىيە ئۇرلىغ ^{ىر} ىكىرىمىرە 1981-يىلىغانلىرىكى بىلىمىرىكى بىلىمىرىكى بىلىمىرىكى بىلىمىرىكى بىلىمىرىكى بىلىمىرىكى بىلىمىرىكى بىلىمىرىكى بىلى	Lado Josef (komo	en flyr yn orycheithian y ffri	and an	****	Stop Freq 3.000000000 GHz
Start 30 M #Res BW	100 kHz	#VB	W 300 kHz	FUNCTION	Sweep 2	Stop 3.000 G 83.9 ms (1001 p	ts)	CF Step 297.000000 MHz Auto Man
		2.480 3 GHz	0.26 dBm	PUNCTION		FUNCTION VALUE		Freq Offset 0 Hz
11 M9G					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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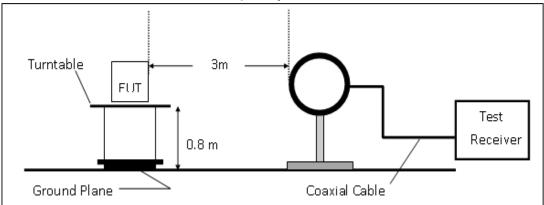
10.2 Measurement Equipment Used

		SGS SAC-II	<u> </u>		
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
EMI Test Receiver	R&S	ESCI7	100760	05/10/2016	05/09/2017
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2016	01/28/2017
Loop Antenna	ETS.LINDGREN	6502	148045	09/07/2015	09/06/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/10/2015	08/09/2016
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/02/2015	07/01/2016
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2016	01/01/2017

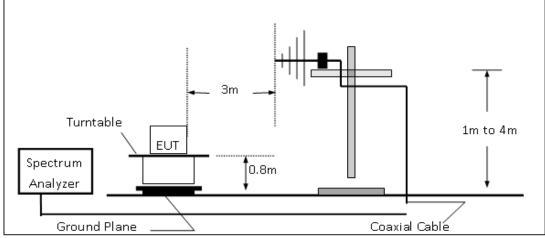


10.3 Test SET-UP

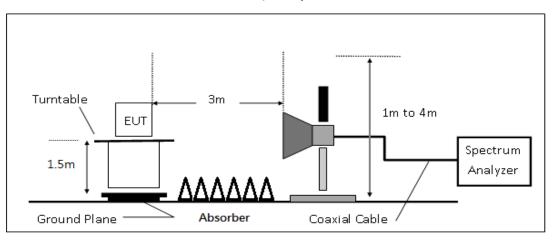




(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



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





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 μ V/m) = SPA. Reading level(dB μ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB μ 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.

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.

Note: WPC wireless charging functions are implemented in field strength of spurious radiation measurement.

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Radiated Band Edge Measurement Result: (Hopping Mode)

Operation Fundamer Operation EUT Pol. :	ntal Frequer Band :	BR Hop ncy : 2402 M Banded E2 Plan	Hz Ige CH LOW	Test Date : Temp. / Humi. : Test Engineer : Measurement Ante	enna Pol. :	06/27/2016 21 deg_C / 6 Kane VERTICAL	52 RH
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	/el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2390.00	E	Average	27.27	29.01	-1.74	54.00	-26.73
2390.00	Е	Peak	39.14	40.88	-1.74	74.00	-34.86
Fundamer	Operation Mode : BR Hopping Fundamental Frequency : 2402 MHz		Test Date: Temp. / Humi. :		06/27/2016 21 deg_C / 62 RH		
Operation			ge CH LOW	Test Engineer :		Kane	
EUT Pol. :		E2 Plan	e	Measurement Ante	enna Pol. :	HORIZONT	AL
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	/el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2390.00	E	Average	27.12	28.86	-1.74	54.00	-26.88
2390.00	Е	Peak	40.48	42.22	-1.74	74.00	-33.52

Operation Mode :BR HoppingFundamental Frequency :2480 MHzOperation Band :Bandedge CH HIGHEUT Pol. :E2 Plane			Test Date :06/27/2016Temp. / Humi. :21 deg_C / 62 RHTest Engineer :KaneMeasurement Antenna Pol. :VERTICAL			32 RH	
Freq.	Note	Decetor Mode	Actual Reading Lev	Spectrum el FS	Factor	Limit @3m	Margin
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	E	Average	26.94	28.56	-1.62	54.00	-27.06
2483.50	Е	Peak	38.90	40.52	-1.62	74.00	-35.10
•	Fundamental Frequency : 2480 MHz		Test Date: Temp. / Humi.: Test Engineer:		06/27/2016 21 deg_C / 62 RH Kane		
EUT Pol. :		E2 Plan	-	Measurement Ante	enna Pol		4
Freq.	Note	Decetor Mode	Actual Reading Lev	Spectrum	Factor	Limit @3m	Margin
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	E	Average	27.20	28.82	-1.62	54.00	-26.80
2483.50	Е	Peak	39.90	41.51	-1.62	74.00	-34.10

2390.00

2390.00

Е

Е

Average

Peak

Operation Mode :		EDR Hopping		Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2402 MH	Ηz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Band :	Bandedge CH LOW		Test Engineer :		Kane	
EUT Pol. :		E2 Plane	е	Measurement Ante	enna Pol. :	VERTICAL	
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
rieq.	Note		Reading Lev	•	i doloi	@3m	Waigin
			•		15	-	15
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2390.00	E	Average	27.02	28.76	-1.74	54.00	-26.98
2390.00	Е	Peak	39.23	40.97	-1.74	74.00	-34.77
Operation	Mode :	EDR Ho	pping	Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2402 MH	Ηz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Operation Band : Bandedge CH LO		ge CH LOW	Test Engineer :		Kane	
EUT Pol. :	EUT Pol. : E2 Plane		Measurement Ante	enna Pol. :	HORIZONT	AL	
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB

28.79

41.43

27.05

39.68

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-1.74

-1.74

54.00

74.00

-26.95

-34.32

2483.50

2483.50

Е

Е

Average

Peak

-26.83

-34.12

54.00

74.00

Operation Mode :		EDR Hopping		Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2480 Mł	Ηz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Band :	Bandedge CH HIGH		Test Engineer :		Kane	
EUT Pol. :		E2 Plan	е	Measurement Ante	enna Pol. :	VERTICAL	
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	el FS		@3m	·
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	E	Average	27.17	28.79	-1.62	54.00	-26.83
2483.50	Е	Peak	39.23	40.85	-1.62	74.00	-34.77
Operation	Mode :	EDR Ho	pping	Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2480 Mł	Ηz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Band :	Banded	ge CH HIGH	Test Engineer :		Kane	
EUT Pol.	EUT Pol. : E2 Plane		Measurement Ante	enna Pol. :	HORIZONT	AL	
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB

28.79

41.50

-1.62

-1.62

27.17

39.88



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

Operation Fundamer Operation EUT Pol. :	ital Frequer Band :	BR(1M) ncy : 2402 MH Bandedo E2 Plane	Hz ge CH LOW	Test Date : Temp. / Humi. : Test Engineer : Measurement Ante	enna Pol. :	06/27/2016 21 deg_C / 6 Kane VERTICAL	52 RH
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	/el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2390.00	E	Average	27.27	29.01	-1.74	54.00	-26.73
2390.00	Е	Peak	40.06	41.80	-1.74	74.00	-33.94
Operation	ital Frequer Band :		Hz ge CH LOW	Test Date : Temp. / Humi. : Test Engineer :		06/27/2016 21 deg_C / 6 Kane	
EUT Pol. :		E2 Plane	3	Measurement Ante		HURIZUNT	AL
Freq.	Note	Decetor Mode	Actual Reading Lev	Spectrum /el FS	Factor	Limit @3m	Margin
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2390.00	E	Average	27.27	29.01	-1.74	54.00	-26.73
2390.00	Е	Peak	39.84	41.58	-1.74	74.00	-34.16

Operation Mode : Fundamental Frequence		()		Test Date :		06/27/2016 21 deg_C / 62 RH	
	•	•		Temp. / Humi. :			
Operation		Bandedge CH HIGH		•		Kane	
EUT Pol. :		E2 Plar	ne	Measurement Ante	enna Pol. :	VERTICAL	
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	/el FS		@3m	-
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	E	Average	27.04	28.66	-1.62	54.00	-26.96
2483.50	Е	Peak	39.99	41.61	-1.62	74.00	-34.01
Operation	Mode :	BR(1M))	Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2480 M	Hz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Band :	Bandeo	lge CH HIGH	Test Engineer :		Kane	
EUT Pol. :		E2 Plar	•	Measurement Ante	enna Pol. :	HORIZONT	AL
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	/el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	E	Average	26.96	28.58	-1.62	54.00	-27.04
2483.50	Е	Peak	43.08	44.69	-1.62	74.00	-30.92

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Operation Fundamer Operation EUT Pol. :	ntal Frequer Band :	•	Hz ge CH LOW	Test Date : Temp. / Humi. : Test Engineer : Measurement Ante	enna Pol. :	06/27/2016 21 deg_C / 6 Kane VERTICAL	32 RH
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
MHz	F/H/E/S	Mode QP/AV/PK	Reading Lev dBµV/m	/el FS dBµV/m	dB	@3m dBuV/m	dB
2390.00	E	Average	27.12	28.86	-1.74	54.00	-26.88
2390.00	Е	Peak	39.98	41.72	-1.74	74.00	-34.02
	ntal Frequer	•	Ηz	Test Date : Temp. / Humi. :		06/27/2016 21 deg_C / 6	32 RH
Operation			ge CH LOW	Test Engineer:	nee Del 1	Kane	A 1
EUT Pol. :		E2 Plan	e	Measurement Ante	enna Pol. :	HURIZUNT	AL.
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2390.00	E	Average	27.05	28.79	-1.74	54.00	-26.95
2390.00	E	Peak	40.57	42.32	-1.74	74.00	-33.43

2483.50

Е

Peak

Operation Mode :		EDR(3M) 1		Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2480 M	Hz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Band :	Bandec	lge CH HIGH	Test Engineer :		Kane	
EUT Pol. :		E2 Plar	ne	Measurement Ante	enna Pol. :	VERTICAL	
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	E	Average	27.14	28.76	-1.62	54.00	-26.86
2483.50	Е	Peak	40.13	41.75	-1.62	74.00	-33.87
Operation	Mode :	EDR(3	VI)	Test Date :		06/27/2016	
Fundamer	ntal Frequer	ncy: 2480 M	Hz	Temp. / Humi. :		21 deg_C / 6	62 RH
Operation	Band :	Banded	lge CH HIGH	Test Engineer :		Kane	
EUT Pol. :		E2 Plan	ne	Measurement Ante	enna Pol. :	HORIZONT	AL
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Lev	el FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
2483.50	Е	Average	27.13	28.75	-1.62	54.00	-26.87

44.33

-1.62

74.00

-31.29

42.71



Radiated Spurious Emission Measurement Result: (Worst Case) For Frequency form 30MHz to 1000MHz

Operation Mode : Fundamental Frequency Operation Band :	BR(1M) : 2402 MHz Tx CH LOW	Test Date: Temp. / Humi.: Test Engineer:	06/27/20 21 deg_0 Kane	16 C / 62 RH
EUT Pol. :	E2 Plane	Measurement Ante	nna Pol.: VERTIC	AL
97				
80				
Level [dBuV]			FCC RSE-QP 3	<u>M</u>
40			5	e K
20	2 × ×	4 X		
30 20		600 Jency [MHz]	800 1	.000

Freq.	Note	Decetor Mod e	Actual Reading Level	Spectrum FS	Factor	Limit @3m	Margin
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
122.15	S	Peak	26.40	36.65	-10.25	43.50	-17.10
275.41	S	Peak	19.98	26.60	-6.63	46.00	-26.02
449.04	S	Peak	25.31	28.27	-2.96	46.00	-20.69
548.95	S	Peak	26.52	28.42	-1.90	46.00	-19.48
747.80	S	Peak	32.24	29.74	2.50	46.00	-13.76
987.39	S	Peak	32.80	26.76	6.04	54.00	-21.20

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Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2402 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band**: **Tx CH LOW** Test Engineer: Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: HORIZONTAL 97 80 Level [dBuV] FCC RSE-QP 3N 40 6 5 2 20 200 400 600 800 30 1000 Frequency [MHz] Freq. Note Decetor Actual Spectrum Factor Limit Margin

1 10 9.	11010	Beceter	7100001	opoolaann	i dotoi	=	margin	
		Mode	Reading Level	FS		@3m		
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB	
59.10	S	Peak	19.59	27.61	-8.03	40.00	-20.41	_
277.35	S	Peak	20.59	27.13	-6.54	46.00	-25.41	
439.34	S	Peak	25.16	28.40	-3.24	46.00	-20.84	
478.14	S	Peak	26.92	29.36	-2.43	46.00	-19.08	
744.89	S	Peak	30.10	27.85	2.25	46.00	-15.90	
982.54	S	Peak	33.05	27.03	6.02	54.00	-20.95	



Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2441 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band**: Tx CH MID Test Engineer: Kane EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL 97 80 Level [dBuV] FCC RSE-QP 3N 40 6 5 2 20 400 600 30 200 800 1000 Frequency [MHz] Mata Deceter ا مدینه Cinacterium

	Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin	
			Mode	Reading Level	FS		@3m		
_	MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB	_
_	41.64	S	Peak	33.86	42.24	-8.38	40.00	-6.14	_
	279.29	S	Peak	19.96	26.38	-6.42	46.00	-26.04	
	406.36	S	Peak	24.91	28.50	-3.59	46.00	-21.09	
	551.86	S	Peak	26.54	28.17	-1.63	46.00	-19.46	
	741.01	S	Peak	30.27	28.11	2.16	46.00	-15.73	
	968.96	S	Peak	33.27	27.06	6.21	54.00	-20.73	



Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2441 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band**: Tx CH MID Test Engineer: Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: HORIZONTAL 97 80 Level [dBuV] FCC RSE-QP 3N 40 6 5 X 2 20 400 30 200 600 800 1000 Frequency [MHz] Mata Deceter Cinacterium 1 : ----- :+ Marain

	Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin	
			Mode	Reading Level	FS		@3m		
-	MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB	_
	57.16	S	Peak	20.56	28.53	-7.97	40.00	-19.44	
	165.80	S	Peak	19.73	27.12	-7.39	43.50	-23.77	
	444.19	S	Peak	24.78	28.00	-3.22	46.00	-21.22	
	547.01	S	Peak	27.12	28.79	-1.67	46.00	-18.88	
	750.71	S	Peak	30.34	27.58	2.76	46.00	-15.66	
	885.54	S	Peak	32.96	28.60	4.36	46.00	-13.04	



Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2480 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band**: Tx CH HIGH Test Engineer: Kane EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL 97 80 Level [dBuV] FCC RSE-QP 3M 40 6 5 3 2 400 800 30 200 600 1000 Frequency [MHz] Fred Note Decetor Actual Spectrum Factor Limit Margin

Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	wargin	
		Mode	Reading Level	FS		@3m		
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB	
30.97	S	Peak	23.07	32.22	-9.15	40.00	-16.93	
170.65	S	Peak	21.32	28.98	-7.66	43.50	-22.18	
450.01	S	Peak	25.08	28.00	-2.92	46.00	-20.92	
551.86	S	Peak	26.14	27.77	-1.63	46.00	-19.86	
745.86	S	Peak	31.45	29.15	2.30	46.00	-14.55	
970.90	S	Peak	34.25	27.96	6.28	54.00	-19.75	

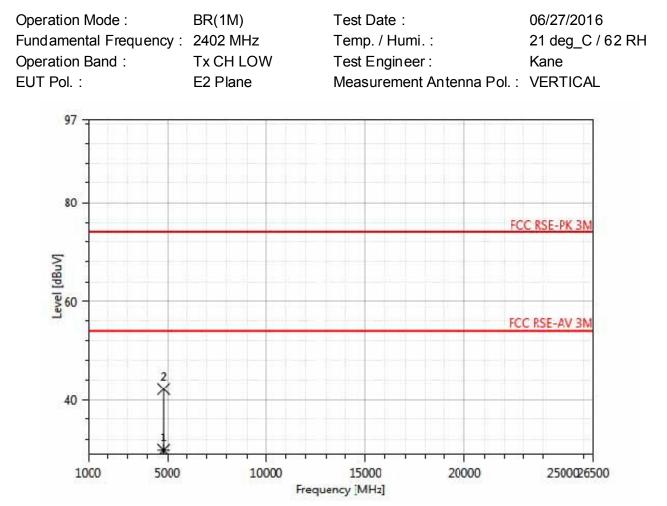


Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2480 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band**: Tx CH HIGH Test Engineer: Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: HORIZONTAL 97 80 Level [dBuV] FCC RSE-QP 3N 40 6 5 3 1 20 400 600 800 30 200 1000 Frequency [MHz] Mata Deceter ا مدینه Cinacterium 1 : ----- :+ Marain

	Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin	
			Mode	Reading Level	FS		@3m		
-	MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB	
	57.16	S	Peak	20.68	28.65	-7.97	40.00	-19.32	
	275.41	S	Peak	20.27	26.90	-6.63	46.00	-25.73	
	449.04	S	Peak	24.67	27.63	-2.96	46.00	-21.33	
	556.71	S	Peak	27.56	28.90	-1.34	46.00	-18.44	
	749.74	S	Peak	29.93	27.21	2.72	46.00	-16.07	
	970.90	S	Peak	33.14	26.85	6.28	54.00	-20.86	



Radiated Spurious Emission Measurement Result: For Frequency above 1 GHz



Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
4804.00	Н	Average	29.68	24.76	4.92	54.00	-24.32
4804.00	Н	Peak	42.15	37.22	4.92	74.00	-31.85

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Operation Mode : 06/27/2016 BR(1M) Test Date : Fundamental Frequency: 2402 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band : Tx CH LOW** Test Engineer : Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: HORIZONTAL 97 80 FCC RSE-PK 3N Level [dBuV] FCC RSE-AV 3N 2 ж 40 10000 20000 1000 5000 15000 2500@6500 Frequency [MHz] Decetor Actual Spectrum Margin Freq. Note Factor Limit Mode Reading Level FS @3m

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QP/AV/PK

Average

Peak

dBµV/m

29.64

42.43

F/H/E/S

Н

Н

MHz

4804.00

4804.00

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dBµV/m

24.72

37.50

dBuV/m

54.00

74.00

dB

-24.36

-31.57

dB

4.92

4.92



4882.00

4882.00

Н

Н

Operation Mode : Test Date : BR(1M) 06/27/2016 Fundamental Frequency: 2441 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band :** Tx CH MID Test Engineer : Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: VERTICAL 97 80 FCC RSE-PK 3M Level [dBuV] FCC RSE-AV 3N 2 40 10000 20000 1000 5000 15000 2500@6500 Frequency [MHz] Decetor Actual Spectrum Margin Freq. Note Factor Limit Mode Reading Level FS @3m F/H/E/S QP/AV/PK dBuV/m MHz dBµV/m dBµV/m dB dB

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29.90

40.97

Average

Peak

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24.72

35.79

5.18

5.18

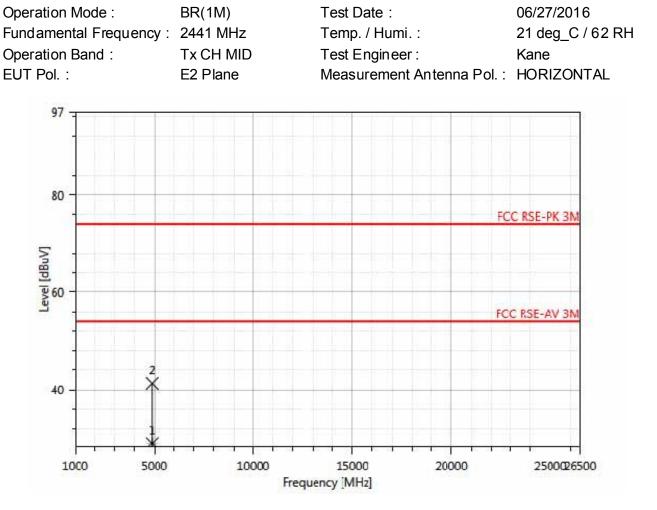
-24.10

-33.03

54.00

74.00





Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
4882.00	Н	Average	29.02	23.84	5.18	54.00	-24.98
4882.00	Н	Peak	41.32	36.14	5.18	74.00	-32.68

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Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2480 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band : Tx CH HIGH** Test Engineer : Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: VERTICAL 97 80 FCC RSE-PK 3N Level [dBuV] FCC RSE-AV 3N 2 ж 40 10000 20000 1000 5000 15000 2500@6500 Frequency [MHz] Decetor Actual Spectrum Margin Freq. Note Factor Limit Mode Reading Level FS @3m

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.

QP/AV/PK

Average

Peak

dBµV/m

29.61

42.81

F/H/E/S

Н

Н

MHz

4960.00

4960.00

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dBµV/m

24.32

37.52

dBuV/m

54.00

74.00

dB

-24.39

-31.19

dB

5.29

5.29



Operation Mode : Test Date : 06/27/2016 BR(1M) Fundamental Frequency: 2480 MHz Temp. / Humi. : 21 deg C / 62 RH **Operation Band : Tx CH HIGH** Test Engineer : Kane EUT Pol. : E2 Plane Measurement Antenna Pol.: HORIZONTAL 97 80 FCC RSE-PK 3N Level [dBuV] FCC RSE-AV 3N 2 40 10000 20000 1000 5000 15000 2500@6500 Frequency [MHz] Decetor Actual Spectrum Margin Freq. Note Factor Limit Mode Reading Level FS @3m

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.

QP/AV/PK

Average

Peak

dBµV/m

29.63

41.61

F/H/E/S

Н

Н

MHz

4960.00

4960.00

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dBµV/m

24.34

36.32

dBuV/m

54.00

74.00

dB

-24.37

-32.39

dB

5.29

5.29



11 FREQUENCY SEPARATION

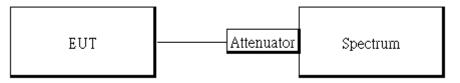
11.1 Standard Applicable

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.				
EXA Spectrum								
Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017			
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017			

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



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12 NUMBER OF HOPPING FREQUENCY

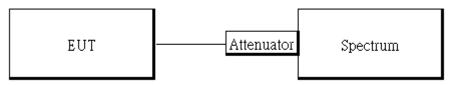
12.1 Standard Applicable

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.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
EXA Spectrum								
Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017			
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017			

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.

12.5 Measurement Result

Tabular Data of Total Channel Number

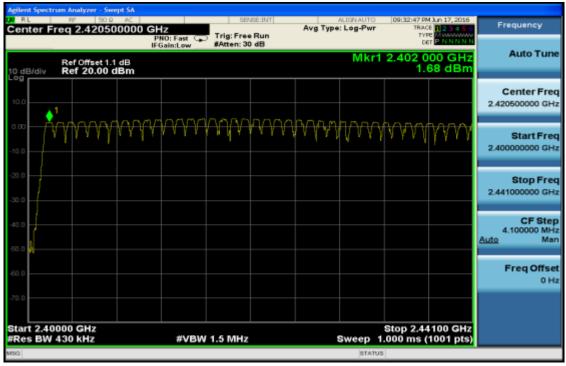
	Channel Number	Limit
2.4 GHz – 2.441GHz	40	
2.441 GHz – 2.4835GHz	39	>15
2.4GHz ~2.4835GHz	(40+39) = 79	

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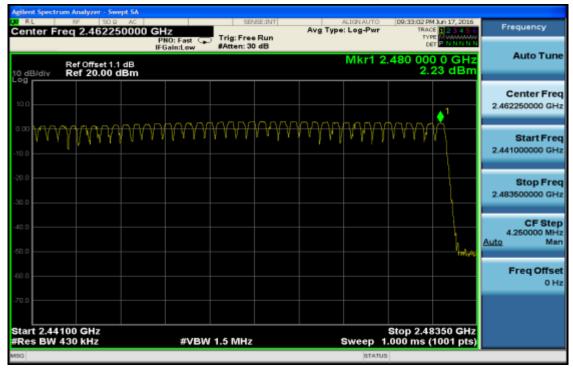


Channel Number



2.4 GHz – 2.441GHz

2.441 GHz – 2.4835GHz



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13 TIME OF OCCUPANCY (DWELL TIME)

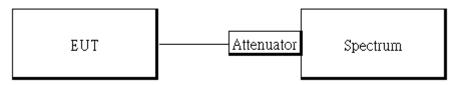
13.1 Standard Applicable

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	MFR MODEL SERIAL		LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
EXA Spectrum										
Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017					
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017					
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017					

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

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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.

Gran (Twipps)		Maaaan waxaa Daarid	1
Channel	PACKET TYPE	Measurement Result	Limit
		(ms)	(ms)
	DH1	118.08	400ms
0	DH3	260.64	400ms
	DH5	307.95	400ms
	DH1	120.00	400ms
39	DH3	258.72	400ms
	DH5	307.95	400ms
	DH1	118.08	400ms
78	DH3	260.64	400ms
	DH5	305.92	400ms

13.5 Tabular Result of the Measurement

GESK (1Mbns)

π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	DH1	121.60	400ms
39	DH3	260.64	400ms
	DH5	305.92	400ms

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	DH1	122.88	400ms
39	DH3	260.64	400ms
	DH5	307.95	400ms



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

GFSK (1Mbps):

CH Low	DH1 time slot =	0.369 *	(1600/2/79) *	31.6 =	118.08 (ms)
	DH3 time slot =	1.629 *	(1600/4/79) *	31.6 =	260.64 (ms)
	DH5 time slot $=$	2.887 *	(1600/6/79) *	31.6 =	307.95 (ms)
CH Mid	DH1 time slot =	0.375 *	(1600/2/79) *	31.6 =	120.00 (ms)
	DH3 time slot =	1.617 *	(1600/4/79) *	31.6 =	258.72 (ms)
	DH5 time slot =	2.887 *	(1600/6/79) *	31.6 =	307.95 (ms)
CH High	DH1 time slot =	0.369 *	(1600/2/79) *	31.6 =	118.08 (ms)
	DH3 time slot =	1.629 *	(1600/4/79) *	31.6 =	260.64 (ms)
	DH5 time slot $=$	2.868 *	(1600/6/79) *	31.6 =	305.92 (ms)

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

CH Mid	2DH1 time slot =	0.380 *	(1600/2/79) *	31.6 =	121.60 (ms)
	2DH3 time slot =	1.629 *	(1600/4/79) *	31.6 =	260.64 (ms)
	2DH5 time slo [†] =	2.868 *	(1600/6/79) *	31.6 =	305.92 (ms)

8-DPSK (3Mbps):

CH Mid	3DH1 time slo [:] =	0.384 *	(1600/2/79) *	31.6 =	122.88 (ms)
	3DH3 time slot =	1.629 *	(1600/4/79) *	31.6 =	260.64 (ms)
	3DH5 time slot =	2.887 *	(1600/6/79) *	31.6 =	307.95 (ms)



GFSK (1Mbps) for AFH Mode								
Hopping Channel Number	Measurement Result (ms)	Limit (ms)						
20	DH5	152.96	400ms					
	π/4 DQPSK (2	Mbps) for Mode						
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)					
20	DH5	152.96	400ms					
8-DPSK (3Mbps) for AFH Mode								
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)					
20	DH5	153.97	400ms					

GFSK (1Mbps):

DH5 time sl =	2.868	(ms)	*	(800/6/20)* 8 =	152.96	(ms)
$\pi/4$ -DQPSK (2Mbps						
2DH5 time :=	2.868	(ms)	*	(800/6/20)* 8 =	152.96	(ms)
8-DPSK (3Mbps):						
3DH5 time :=	2.887	(ms)	*	(800/6/20)* 8 =	153.97	(ms)

13.6 Measurement Result

Note: Refer to next page for plots.

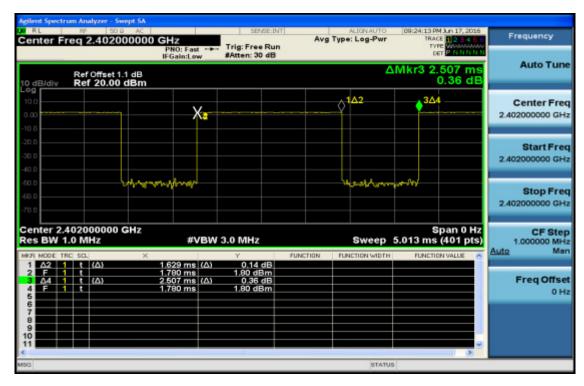
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CH-Low DH1

Aglient Spectrum Analyzer - Swept SA DRL IP SOG AC Center Freq 2.402000000	GHZ PNO: Fast Trig: Free	Run	ALIGNAUTO Type: Log-Pwr	09:22:25 PM Jun 17, 2016 TRACE 1 2 3 4 5 6 TYPE WARMAN	Frequency
Ref Offset 1.1 dB 10 dB/div Ref 20.00 dBm	IFGain:Low #Atten: 30) dB	Δ	Mkr3 1.251 ms 0.01 dB	Auto Tune
10.0 0.00 -10.0	¢ ^{1∆2}	304			Center Free 2.402000000 GH
-20.0					Start Free 2.402000000 GH
-50.0 0000000000000000000000000000000000	hanging angelikation	Newyour	house	trienen leriensten	Stop Free 2.402000000 GH:
Center 2.402000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	PUNCTION	Sweep :	Span 0 Hz 3.013 ms (401 pts)	CF Stej 1.000000 MH Auto Ma
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	369.1 μs (Δ) -0.65 565.0 μs - 2.18 dE 1.251 ms (Δ) - 0.01 565.0 μs - 2.18 dE	dB 3m dB	FOREITON WIDTH	FEREITER WEDE	Freq Offse
7 8 9 10 11				~	
e M93			STATUS		

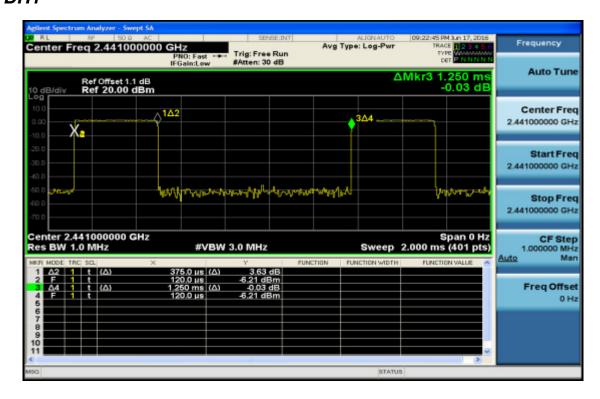
DH3





	rum Analyzer - !					all and the second		
Center F		000000 GH	z	SENSE:	Ave	Type: Log-Pwr	09:06:44 PM Jun 17, 2016 TRACE 1 2 3 4 5 6	Frequency
		IFG	0: Fast 🔸	Trig: Free Ru #Atten: 30 dB			Mkr3 3.754 ms	Auto Tune
10 dB/div	Ref Offset Ref 20.0						0.38 dB	
10.0 0.00 -10.0	X.			(14)	2 34			Center Freq 2.402000000 GHz
-20.0 -30.0 -40.0								Start Freq 2.402000000 GHz
-50.0	~~~				~+~~/			Stop Freq 2.402000000 GHz
Center 2. Res BW		GHz	#VBW	3.0 MHz	FUNCTION	Sweep	Span 0 Hz 7.547 ms (401 pts)	CF Step 1.000000 MHz Auto Man
1 Δ2 2 F 3 Δ4 4 F	t (Δ) t t (Δ)	2.86 773 3.75	17 ms (Δ) 3.5 μs 64 ms (Δ) 3.5 μs	0.03 dB 2.13 dBm 0.38 dB 2.13 dBm		FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
6 7 8 9 10 11							~	
MSG						STATUS	1	

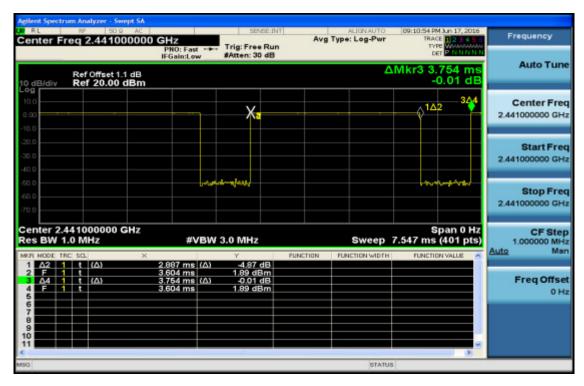
CH-Mid DH1





	: Free Run en: 30 dB	Avg type	: Log-Pwr	TRACE T TYPE W DET P	23456 NNNNN	Frequency
100.COW			Δ	Mkr3 2.49 0.0	4 ms 0 dB	Auto Tun
×		¢ ^{1∆2}		3Δ4		Center Fre 2.441000000 GH
						Start Fre 2.441000000 GH
)		Loggite	honnara			Stop Fre 2.441000000 GH
#VBW 3.0 I		10M FLB	Sweep 5	Spa .013 ms (40		CF Ste 1.000000 Mi Auto Mi
7 ms (∆) · 7 ms 1. 4 ms (∆)	0.07 dB 55 dBm 0.00 dB 55 dBm			FORE HER IS		Freq Offs 0 F
					_	

DH5



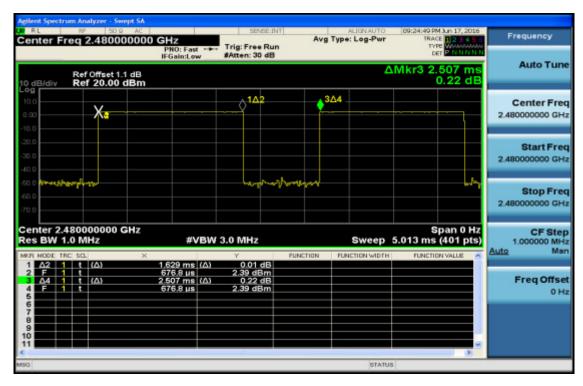
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CH-High DH1

RL	analyzer - Swept SA № 50.9 AC q 2.4800000000	GHz PN0: Fast	SENSE D	Avg	ALIGNAUTO Type: Log-Pwr	09:23:25 PM Jun 17, 2016 TRACE 1 2 3 4 5 TYPE WARNAN DET P.N.N.N	Frequency
10 dB/div	Ref Offset 1.1 dB Ref 20.00 dBm	IFGain:Low	sinten: 50 db		Δ	Mkr3 1.246 ms -1.83 dB	
10.0 0.00 -10.0		Х.	1∆2		3∆4		Center Freq 2.480000000 GHz
-20.0 -30.0 -40.0							Start Freq 2.480000000 GHz
-50.0 -60.0 -70.0	าราวารสาร		(Jimport)	nonatio	v*ragi	provenue	Stop Freq 2.480000000 GHz
Center 2.48 Res BW 1.0		#VBV	V 3.0 MHz	FUNCTION	Sweep	Span 0 Hz 3.280 ms (401 pts	
1 Δ2 1 2 F 1 3 Δ4 1 4 F 1 6 7	t (Δ) t t (Δ) t	369.0 μs (Δ) 1.107 ms 1.246 ms (Δ) 1.107 ms	-0.36 dB 2.64 dBm -1.83 dB 2.64 dBm				Freq Offset 0 Hz
8 9 10 11 <			1		STATUS		

DH3





Agilent Spects	rum Analyzer - Swept SA						
Center F	req 2.48000000		SENSE:IN	Av	aLIGNAUTO	09:09:30 PM 3un 17, 2016 TRACE 1 2 3 4 5 6 TYPE	Frequency
10 dB/div	Ref Offset 1.1 dB Ref 20.00 dBm	IFGain:Low	#Atten: 30 dB		Δ	Mkr3 3.736 ms -0.15 dB	Auto Tune
10.0 0.00 -10.0	X.		¢	142	304		Center Freq 2.480000000 GHz
-20.0 -30.0 -40.0							Start Freq 2.480000000 GHz
-60.0 4 -60.0	ntroden i						Stop Freq 2.480000000 GHz
Center 2. Res BW	RC SOL X		3.0 MHz	FUNCTION	Sweep FUNCTION WIDTH	Span 0 Hz 7.547 ms (401 pts)	CF Step 1.000000 MHz Auto Man
1 Δ2 2 F 3 Δ4 4 F 5 6 7 8 9 9 10	1 t (Δ) 1 t (Δ) 1 t (Δ) 1 t	2.868 ms (Δ) 1.151 ms 3.736 ms (Δ) 1.151 ms	0.33 dB 2.97 dBm 0.15 dB 2.97 dBm			~	Freq Offset 0 Hz
MSG					STATU	8	



CH-Mid 2DH1

RL NF 50.9 AC Center Freq 2.441000000 GHz	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	09:26:11 PM Jun 17, 2016 TRACE 1 2 3 4 5 5 TYPE	Frequency
PNO: Fast IFGain:Lev Ref Offset 1.1 dB 10 dB/div Ref 20.00 dBm		Δ	Mkr3 1.248 ms -0.40 dB	Auto Tune
Log 10.0 0.00 .10.0		3 ∆4		Center Freq 2.441000000 GHz
				Start Free 2.441000000 GHz
-60.0	Man marine	lowent	Warverner	Stop Free 2.441000000 GH2
Center 2.441000000 GHz Res BW 1.0 MHz #V	BW 3.0 MHz	Sweep :	Span 0 Hz 2.080 ms (401 pts)	CF Step 1.000000 MH Auto Mar
1 Δ2 1 t Δ) 379.6 μs 2 F 1 t 161.2 μs 3 Δ4 1 t Δ) 1.248 ms 4 F 1 t 161.2 μs 5 6 7 7	0.80 dBm			Freq Offse 0 Hi
9 9 10			*	

2DH3

enter Fi	eq 1	50 9 AC 2.44100000	D GHz PNO: Fast IFGain:Low		SENSE:IN Trig: Free Run #Atten: 30 dB	Avg	Type: Log-Pwr	TYPE	An 17, 2016 1 2 3 4 5 6 Without the P N N N N N	Frequency
dB/div		Offset 1.1 dB f 20.00 dBm	1 Gam.Co				۵	Mkr3 2.4 -0	194 ms .02 dB	Auto Tur
0.0 .00 .00					X			\$2	_3∆4	Center Fre 2.441000000 GH
0.0										Start Fr 2.441000000 G
0.0 0.0 0.0			here	لود.	~			agent, to see a	~	Stop Fr 2.441000000 G
es BW 1	.0 M		#V	BW	3.0 MHz		Sweep	5.013 ms (CF St 1.000000 M Auto M
I A2 1	C SOL		1.629 ms	(4)	۲ -1.74 dB	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE A	
2 F 1 3 ∆4 1 4 F 1	t	(Δ)	2.231 ms 2.494 ms 2.231 ms		0.81 dBm -0.02 dB 0.81 dBm					Freq Off: 0
6 7 8 9 0										
1									>	



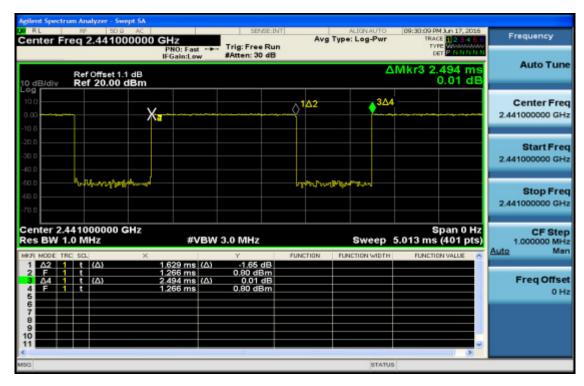
Agilent Spectrum Analyzer - Swept SA RL NF 50 9 AC Center Freq 2.441000000		ALIGNAUTO Avg Type: Log-Pwr	09:14:05 PM Jun 17, 2016 TRACE 1 2 3 4 5 C TYPE	Frequency
Ref Offset 1.1 dB	PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB	Ĺ	۵۳ Mkr3 3.736 ms -1.05 dB	Auto Tune
10.0 -10.0	X.		162 364	Center Freq 2.441000000 GHz
-20.0				Start Freq 2.441000000 GHz
-60.0	Koish-righ		whytop for	Stop Fred 2.441000000 GH:
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep	Span 0 Hz 7.547 ms (401 pts)	CF Step 1.000000 MH Auto Mar
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.868 ms (Δ) -0.19 dB 3.056 ms 1.16 dBm 3.736 ms (Δ) -1.05 dB 3.056 ms 1.18 dBm			Freq Offse 0 Ha
8 9 10 11 11		STATU		



CH-Mid **3DH1**

RL	req 2.44100	AC 0000 GHz PN0: Fast		Avg	ALIGNAUTO	TYPE	IN 17, 2016 1 2 3 4 5 6 Weight of the P N N N N N	Frequency
10 dB/div	Ref Offset 1.1 Ref 20.00 d		Anten: 30 g	0	L	Mkr3 1.2	51 ms 35 dB	Auto Tune
10.0			X.	Δ2		3∆4		Center Free 2.441000000 GH
-20.0								Start Fre 2.441000000 GH
-50.0 -60.0 -70.0	a Manun	renarizentenatu		www.engle	nnese vertine		urry la page	Stop Fre 2.441000000 GH
Center 2.4 Res BW 1			BW 3.0 MHz	PUNCTION	Sweep	3.013 ms (4		CF Ste 1.000000 MH Auto Ma
1 Δ2 1 2 F 1 3 Δ4 1 4 F 1 5	t (∆) t t (∆) t	384.2 µs 1,122 ms 1,251 ms 1,122 ms	(Δ) 6.52 dB -7.33 dBn	3 1 3				Freq Offse 0 H
7 8 9 10 11							×	
¢ 15G					STATU	5	>	

3DH3





N RL	Im Analyzer - Swep Im 50 0 req 2.441000	AC DOOD GHZ PNO: F		g: Free Run	Avg	ALIONAU Type: Log-P	WF TR	PM Jun 17, 2016 AGE 1 2 3 4 5 F YPE WARDEN N N N	Frequency
10 dB/div	Ref Offset 1.1 Ref 20.00 d		Low BA	ten: 30 aB			AMkr3 3	3.754 ms -0.01 dB	Auto Tune
10.0 0.00		X				142	304		Center Freq 2.441000000 GHz
-20.0 -30.0 -40.0									Start Freq 2.441000000 GHz
-50.0 -60.0 -70.0		h-New grade				hanson			Stop Freq 2.441000000 GHz
Center 2. Res BW 1	IC SOL	×		Y	FUNCTION	Swee	ep 7.547 m	Span 0 Hz s (401 pts)	CF Step 1.000000 MHz Auto Man
1 Δ2 1 2 F 1 3 Δ4 1 4 F 1 5 6 7 7 8	t (Δ) t (Δ) t (Δ)	2.887 n 2.075 n 3.754 n 2.075 n	ns (∆)	-0.80 dB 0.80 dBm -0.01 dB 0.80 dBm					Freq Offset 0 Hz
9 10 11 •				-1		81	TATUS	>	



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.

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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