

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

	OF
Applicant:	Euro-CB (Phils.) Inc. SFB No 2, MEZ 1, Lapu Lapu City, 6015 Cebu, Philippines
Product Name:	Interphone Edge
Brand Name:	Interphone
Model No.:	INTERPHONE BTF8
Model Difference:	N/A
FCC ID:	2AE5MBTF8
IC:	20468-BTF8
Report No.:	ER/2018/40078
FCC Rule Part:	§15.247, Cat: DSS
IC Rule Part:	RSS-247 issue 2 Feb. 2017
Issue Date:	May 18, 2018
Date of Test:	Apr. 19, 2018 ~ May 11, 2018

Date of EUT Received: Apr. 19, 2018

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By:

Louis Chen / Sr. Engineer

Approved By:

Jim Chang / Manager





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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/40078	Rev.00	Initial creation of document	All	May 18, 2018	Violetta Tang

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GENERAL INFORMATION 1

1.1 Product description

General:

Product Name:	Interphon	e Edge	
Brand Name:	Interphon	e	
Model No.:	INTERPH	IONE BTF8	
Model difference:	N/A		
Product SW/HW version:	R157 (affects only user interface) / 1.0		
Radio SW/HW version:	26h + EDR / N/A		
Test SW Version:	N/A		
RF power setting in TEST SW:	N/A		
Data Cable (USB):	Model No.: N/A, Supplier: N/A		
Dower Supply	3.7V from Rechargeable Lithium Polymer Battery or 5Vdc from USB Port		
Power Supply:	Battery:	Model No.: 602055P, Supplier: Shenzhen BAK Technology Co., Ltd.	

Bluetooth BR+EDR:

Bluetooth Version:	BT V3.0
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	9.13dBm
Frequency Range:	2.402GHz – 2.480GHz
Antenna Designation:	Printed PCB Antenna, Gain: 2.5dBi

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

RSS-247 issue 2 Feb. 2017

RSS-Gen issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Registration Numbers are: 509634 / TW0001

Canada Registration Number: 4620A-5.

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.



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 1dB.

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EUI

Fig. 2-3 Conducted (Antenna Port) Emission

😻 Windows 7

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission



Fig. 2-2 AC Power Line Conducted Emission



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	DELL	D505	34056609472	Shielded	Unshielded

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SUMMARY OF TEST RESULTS 3

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b)(1)	RSS-247 §5.4 (2)	Peak Output Power	Compliant
§15.247(a)(1)	RSS-247 §5.1 (1) RSS-Gen §6.6	20dB & 99% Bandwidth	Compliant
§15.247(d)	RSS-247 §5.5	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	RSS-247 §5.5	Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)	RSS-247 §5.1 (2)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	RSS-247 §5.1 (4)	Number of hopping frequency	Compliant
§15.247(a)(1)(iii)	RSS-247 §5.1 (4)	Time of Occupancy	Compliant
§15.203 §15.247(b)	RSS- Gen §8.3	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
- Test program used to control the EUT for staying in continuous transmitting and receiving 2 mode is programmed.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

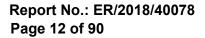
	RADIATED TEST					
	Radiated	I Emission Test	(BELOW 1 GHz) (We	orst case)		
MODE	AVAILABLE	TESTED	MODULATION	PACKET		
MODE	CHANNEL	CHANNEL	WODULATION	TYPE		
Bluetooth	0 to 78	0,39,78	8-DPSK	3DH5		
	Radiated Emission Test (ABOVE 1 GHz) (Worst case)					
MODE	AVAILABLE	ILABLE TESTED MODULATION		PACKET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

Note: The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth BR+EDR Transmitter for channel Low, Mid and High, the worst case H position was reported.

	ANTENNA PORT CONDUCTED TEST				
	F	Peak Output Pov	ver, 20dB Band Wid	th	
MODE	AVAILABLE	TESTED	MODULATION	PACKET	
NODE	CHANNEL	CHANNEL	MODULATION	TYPE	
	0 to 78	0,39,78	GFSK	DH5	
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	2DH5	
	0 to 78	0,39,78	8-DPSK	3DH5	
		Band Edge & C	onducted Emission		
Bluetooth	0 to 78	0,78	GFSK	DH5	
Bluetooth 0 to 78 0,78 8-DPSK		3DH5			
		Frequen	cy Separation		
Bluetooth	0 to 78	0,1,2	8-DPSK	3DH5	
		Number of h	opping frequency		
Bluetooth	0 to 78	0 to 78	8-DPSK	3DH5	
	Time of Occupancy (Dwell time)				
Bluetooth	0 to 78	0,39,78	GFSK	DH1/DH3/DH5	
Bluetooth	0 to 78	39	π/4-DQPSK	2DH1/2DH3/2DH5	
Bluetooth	0 to 78	39	8-DPSK	3DH1/3DH3/3DH5	

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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	+/- 0.84 dB
Frequency Separation	+/- 51.33 Hz
Number of hopping frequency	+/- 51.33 Hz
Time of Occupancy	+/- 51.33 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

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

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

This uncertainty represents an expanded uncertainty expressed at approximately the

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

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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				
101112	Quasi-peak	Avelaye				
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	1. The lower limit shall apply at the transition frequencies					
2.The limit decreases linearly with	the logarithm of the frequency in t	he range 0.15 MHz to 0.50 MHz.				

6.2 Measurement Equipment Used

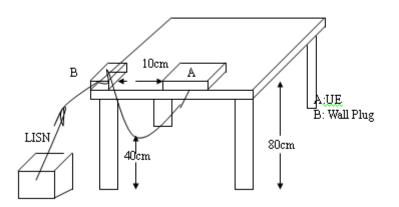
Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
EMI Test Receiver	R&S	ESCI7	100760	2017/06/06	2018/06/05		
Coaxial Cables	N/A	WK CE Cable	N/A	2018/01/02	2019/01/01		
Notebook	DELL	D505	34056609472	N/A	N/A		
LISN	SCHWARZBECK	NSLK 8127	8127-649	2017/05/22	2018/05/21		

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.



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



AC POWER LINE CONDUCTED EMISSION TEST DATA

ation Mode		ion mode				e: Apr. 25, 2
perature:	20 °C	Ηι	umidity:	58 %	Test By:	Tin
Site Conduc	tion Room		Phase:	L1	Temperatu	ire: 20 °C
Limit: FCC C	Class B Conduc	tion(QP)	Power:	AC 120V/60Hz	Humidity:	58 %
Mode: Opera	ation					
Note:						
2		(Conducted E	mission		
File :Da	ata	Data :#7		Date: 2018/4/25	5 Time: 下午 10:32	2:48
80.0 dB	uV					
-						
					FCC Class B Conduction	(QP)
¥2					CC Class B Conduction(avoj
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0.0			(MHz)			30.000
0.150	Reading	0.5 Correct Meas		5		30.000
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0.150	Freq. Level MHz dBuV	g Correct Meas Factor me dB dB	ure- int Limit (uV dBuV	Over dB Detector	Comment	30.000
0.150 No. Mk. F	Freq.LevelMHzdBuV0.170048.85	g Correct Meas Factor me dB dBu 0.12 48.3	ent Limit (uV dBuV 97 64.96 -	Over dB Detector 15.99 peak	Comment	30.000
0.150 No. Mk. F 1 0 2 0	Freq. Level MHz dBuV	Correct Meas Factor me dB dB 0.12 48.9 0.12 46.9	eure- ent Limit (uV dBuV 97 64.96 - 50 64.21 -	Over dB Detector 15.99 peak 17.71 peak	Comment	30.000
0.150 No. Mk. F 1 0 2 0 3 0	Freq. Level MHz dBuV 0.1700 48.85 0.1860 46.38	g Correct Meas Factor me dB dBu 0.12 48.3	Limit Contraction Limit Contraction Limit Contraction	Over dB Detector 15.99 peak	Comment	30.000
0.150 No. Mk. F 1 00 2 00 3 00 4 00	Freq. Level MHz dBuV 0.1700 48.85 0.1860 46.38 0.2340 42.47	Correct Factor Measure Measure dB dBu 0.12 48.3 0.12 46.3 0.12 42.3	Aure- Ant Limit (AUV dBuV 207 64.96 - 50 64.21 - 59 62.31 - 207 59.55 -	Over dB Detector 15.99 peak 17.71 peak 19.72 peak	Comment	30.000

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4

5

6 *

0.3260

1.9060

3,9820

39.86

37.23

40.01

0.08

0.11

0.21

39.94

37.34

40.22

59.55

56.00

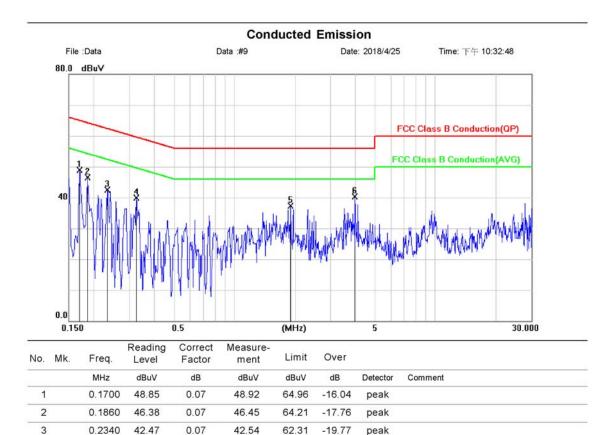
56.00

-19.61

-18.66

-15.78

Site Conduction Room Phase: N Temperature: 20 °C AC 120V/60Hz Humidity: 58 % Limit: FCC Class B Conduction(QP) Power: Mode: Operation Note:



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peak

peak peak

peak



PEAK OUTPUT POWER MEASUREMENT 7

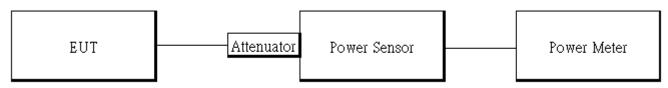
7.1 Standard Applicable

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	ML2496A	1242004	2017/10/16	2018/10/15	
Notebook	DELL	D505	34056609472	N/A	N/A	

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 ANSI C63.10:2013. 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):

1M BR mode (Average):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	7.31	5.383	1000
39	2441	6.92	4.920	1000
78	2480	6.55	4.519	1000

СН	Freq. (MHz)	Max. Output include tune up tolerance	Output Power (mW)	Limit (mW)
		Power (dBm)		
0	2402	6.15	4.121	1000
39	2441	5.73	3.741	1000
78	2480	5.38	3.451	1000

2M EDR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9.06	8.054	125
39	2441	8.80	7.586	125
78	2480	8.28	6.730	125

2M EDR mode (Average):

СН	Freq. (MHz)	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	4.60	2.884	125
39	2441	4.24	2.655	125
78	2480	3.92	2.466	125

3M EDR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9.13	8.185	125
39	2441	8.76	7.516	125
78	2480	8.49	7.063	125

3M EDR mode (Average):

	Sin EDR mode (Average).						
(СН	Freq. (MHz)	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)		
	0	2402	4.60	2.884	125		
4	39	2441	4.22	2.642	125		
	78	2480	3.90	2.455	125		

NOTE: cable loss as 1dB that offsets in the spectrum

*Note: Max. Output include tune up tolerance Power measured by using average detector.

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EIRP

1M BR mode EIRP

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	6.15	2.50	7.328	4000
39	2441	5.73	2.50	6.653	4000
78	2480	5.38	2.50	6.138	4000

2M EDR mode EIRP

		tune up Gain (tolerance Power (dBm) 4.60 2.50			
		Avg.Output			
Channel	Frequency	include	Antenna	EIRP	Limit
Channel	(MHz)	tune up	Gain (dBi)	(mW)	(mW)
		tolerance			
		Power (dBm)			
0	2402	4.60	2.50	5.129	4000
39	2441	4.24	2.50	4.721	4000
78	2480	3.92	2.50	4.385	4000

3M EDR mode EIRP

		Max.			
		Avg.Output ency include Antenn Iz) tune up Gain (d tolerance Power (dBm) 2 4.60 2.50			
Channel	Frequency	include	Antenna	EIRP	Limit
Channel	(MHz)	tune up	Gain (dBi)	(mW)	(mW)
		tolerance		. ,	. ,
		Power (dBm)			
0	2402	4.60	2.50	5.129	4000
39	2441	4.22	2.50	4.699	4000
78	2480	3.90	2.50	4.365	4000

* Note: EIRP = Average Power + Gain



8 20DB & 99% BANDWIDTH MEASUREMENT

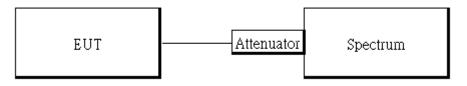
8.1 Standard Applicable

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

8.2 Measurement Equipment Used

	Condu	cted Emissio	n Test Site		
EQUIPMENT	MFR MODEL SERIAL LAST			LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	2018/04/09	2019/04/08
Notebook	DELL	D505	34056609472	N/A	N/A

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 ANSI C63.10:2013. 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.
- 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. Turn on the 99% bandwidth function, max reading.
- 7. Repeat above procedures until all test default channel is completed

NOTE:

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



8.5 Measurement Result

GFSK

GFSK π/4-DQPSK 8-DPSK								
СН	20 dB BW	2/3 BW	СН	20 dB BW	2/3 BW	СН	20 dB BW	2/3 BW
	(MHz)	(MHz)		(MHz)	(MHz)		(MHz)	(MHz)
Low	0.924	0.62	Low	1.318	0.88	Low	1.290	0.86
Mid	0.931	0.62	Mid	1.316	0.88	Mid	1.284	0.86
High	0.925	0.62	High	1.313	0.88	High	1.294	0.86

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	_	-	ч.		~	

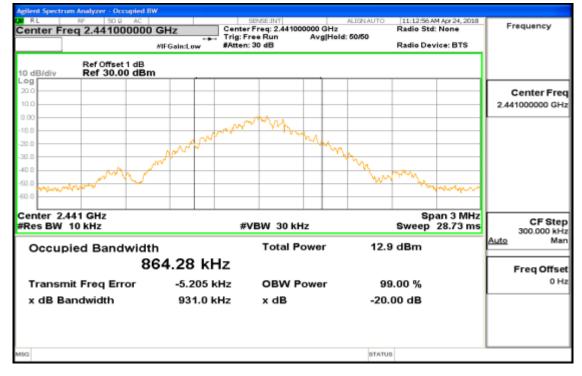
8-DPSK	
--------	--

СН	99% Bandwidth (MHz)	СН	99% Bandwidth (MHz)	СН	99% Bandwidth (MHz)
Low	0.85456	Low	1.2427	Low	1.2324
Mid	0.87691	Mid	1.2358	Mid	1.2375
High	0.86091	High	1.2376	High	1.2348

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



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



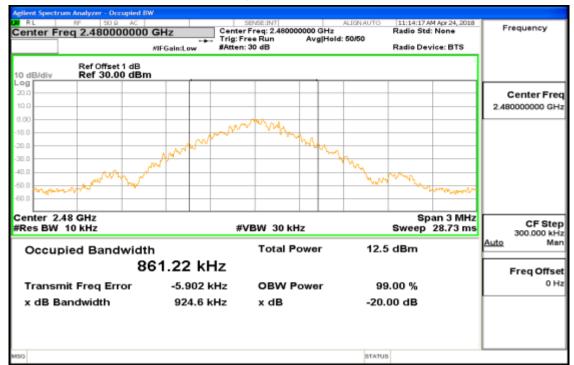
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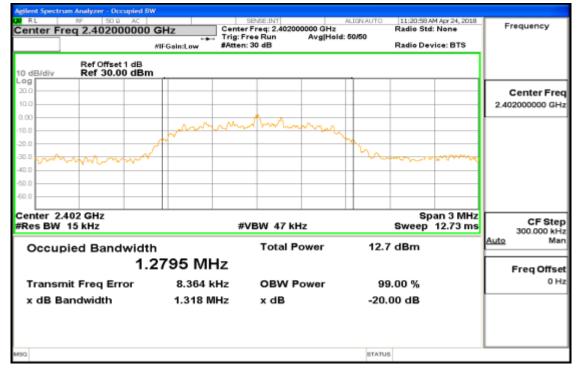
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20dB Band Width Test Data CH-High (GFSK mode)



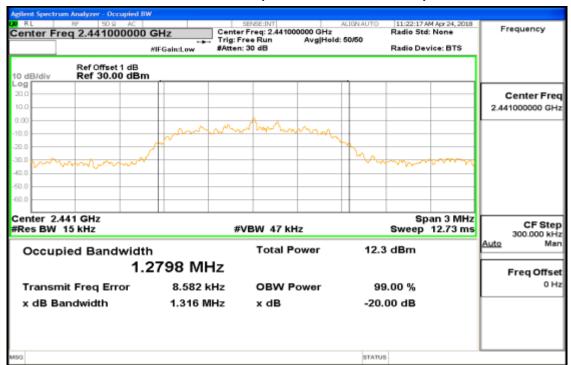
20dB Band Width Test Data CH-Low (π/4-DQPSK mode)



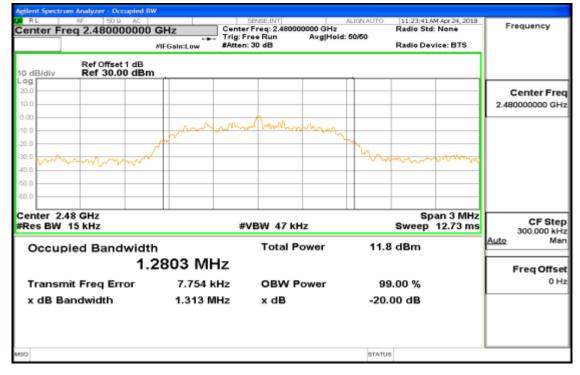
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20dB Band Width Test Data CH-Mid (π/4-DQPSK mode)



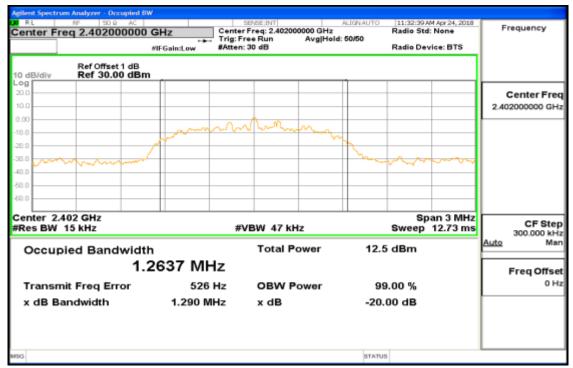
20dB Band Width Test Data CH-High (π/4-DQPSK mode)



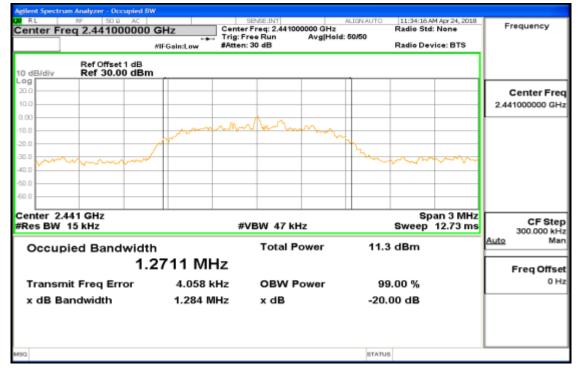
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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



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



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

gilent Spectrum Analyzer - Occupied BW					
RL NF 50 Q AC Center Freq 2.480000000 G		SENSE:INT er Freq: 2.480000000 GHz	Radio St	AM Apr 24, 2018 d: None	Frequency
	Trig:	FreeRun Avg Hold n:30 dB		vice: BTS	
Ref Offset 1 dB 10 dB/div Ref 30.00 dBm					
-0g 20.0					Center Fre 2.480000000 GH
0.00	and the second	Mulmun	N		
30.0			mon	~~~~	
60.0					
Center 2.48 GHz #Res BW 15 kHz	#	VBW 47 kHz		pan 3 MHz 12.73 ms	CF Ste 300.000 kH
Occupied Bandwidth		Total Power	12.3 dBm		Auto Ma
1.2	735 MHz				Freq Offs
Transmit Freq Error	4.487 kHz	OBW Power	99.00 %		01
x dB Bandwidth	1.294 MHz	x dB	-20.00 dB		
20			STATUS		

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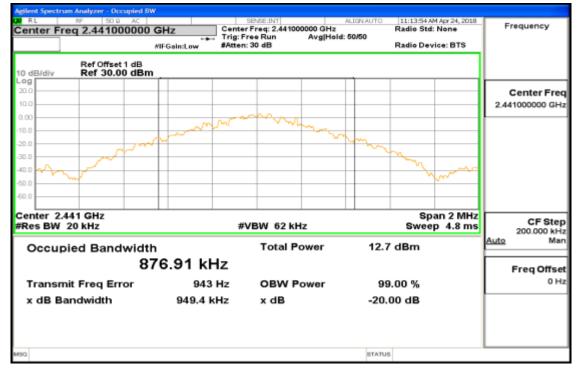
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99% Band Width Test Data CH-Low (GFSK mode)



99% Band Width Test Data CH-Mid (GFSK mode)



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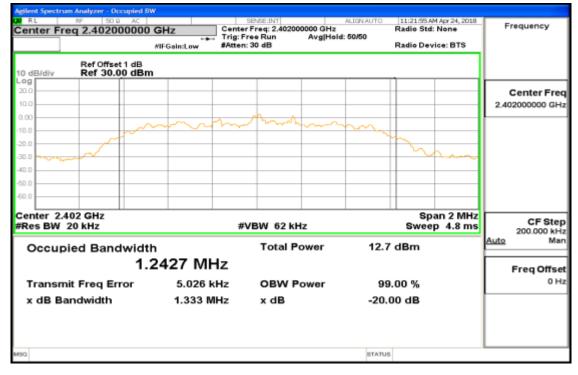
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99% Band Width Test Data CH-High (GFSK mode)



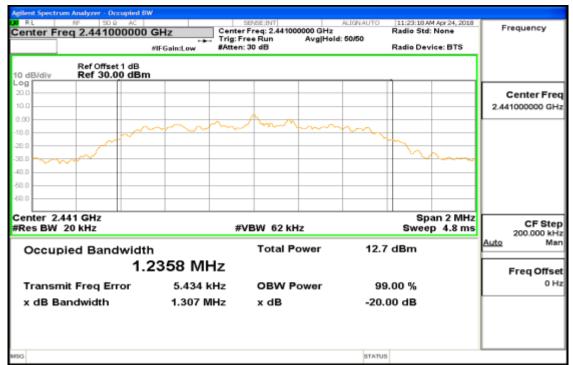
99% Band Width Test Data CH-Low (π/4-DQPSK mode)



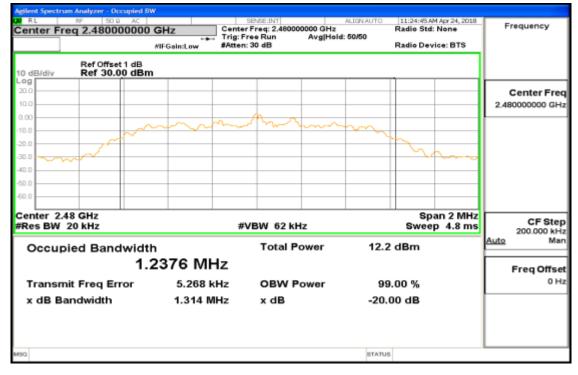
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99% Band Width Test Data CH-Mid (π/4-DQPSK mode)



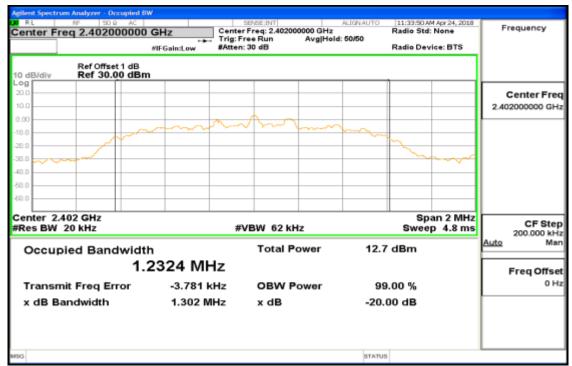
99% Band Width Test Data CH-High (π/4-DQPSK mode)



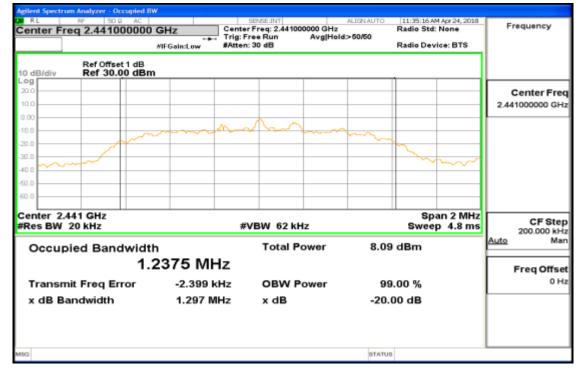
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99% Band Width Test Data CH-Low (8-DPSK mode)



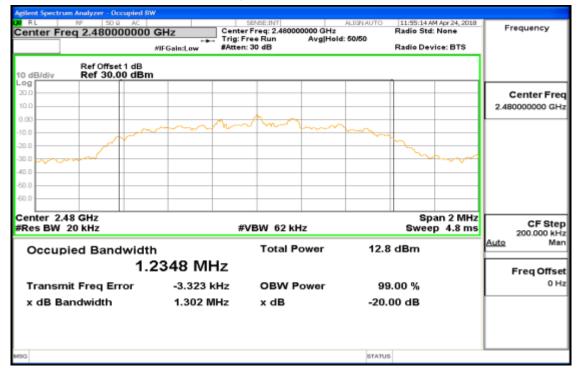
99% Band Width Test Data CH-Mid (8-DPSK mode)



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



99% Band Width Test Data CH-High (8-DPSK mode)



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9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

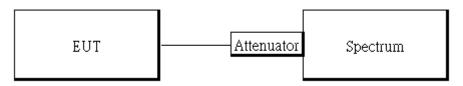
9.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digi-tally 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) & RSS-Gen §8.9 limit.

9.2 Measurement Equipment Used

Conducted Emission Test SiteEQUIPMENTMFRMODELSERIALLASTOTYPENUMBERNUMBERCAL.PXA Spectrum AnalyzerAgilentN9030AMY531207602018/04/092					
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
-	Agilent	N9030A	MY53120760	2018/04/09	2019/04/08
Notebook	DELL	D505	34056609472	N/A	N/A

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



9.4 Measurement Procedure

Conducted Band Edge:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013. 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
- 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 ANSI C63.10:2013. 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	

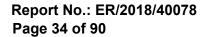
9.5 Measurement Result

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

1. The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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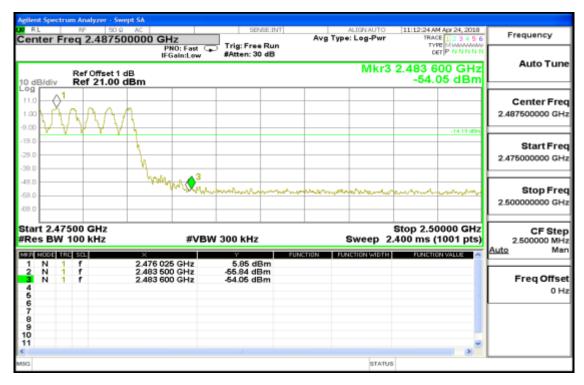




Band Edges Test Data CH-Low (Hopping mode) (GFSK mode)

					m Analyzer - S		
Frequency	11:12:08 AM Apr 24, 2018 TRACE 1 2 3 4 5 6 TYPE Museumon	ALIGNAUTO Avg Type: Log-Pwr	SENSE:INT	5000000 GHz			Cen
Auto Tuno	3 2.390 00 GHz -52.77 dBm	Mkr	JAtten: 30 dB		Ref Offset 1 Ref 21.00		
Center Fred 2.365000000 GH							11.0 1.00 -9.00
Start Free 2.310000000 GH	0 ²	•3					-19.0 -29.0 -39.0
Stop Free 2.420000000 GH		3 	and a descent of the starter	anan dari sa sarahar kara manara	and the second	-	-49.0 -59.0 -69.0
CF Step 11.000000 MH Auto Mar	Stop 2.42000 GHz 0.53 ms (1001 pts)		W 300 kHz		000 GHz 100 kHz	es BW 1	#Re
Freq Offse	FUNCTION WILLS	CTION FUNCTION WIDTH	6.33 dBm -46.40 dBm -52.77 dBm	2.414 83 GHz 2.399 90 GHz 2.390 00 GHz	f f f	N 1 N 1 N 1	1 2 3 4 5 6
	~						7 8 9 10 11
	\$	STATU					MBG

Band Edges Test Data CH-High



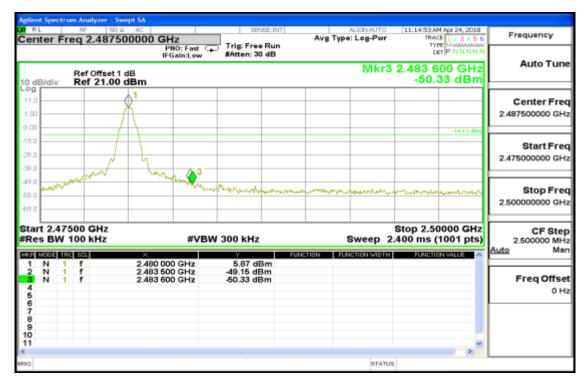
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.





							lyzer - Swept S/			
Frequency	M Apr 24, 2018 CE 1 2 3 4 5 6	TRA	Lignauto	Avg T	SENSE:1		3650000	rea		RL Cent
Auto Tune		D	Mkr		Trig: Free Ru #Atten: 30 dB	PNO: Fast C IFGain:Low				
	07 dBm					n	Offset 1 dB 21.00 dBn		3/div	
Center Freq 2.36500000 GHz										.og 11.0 1.00 9.00
Start Free 2.310000000 GHz	-13.15 001	02								19.0 29.0 39.0
Stop Free 2.42000000 GHz	the office and	- Vina	en Nyakowa	inne Nersonned	www.whereards	samutu dan sanafasa ba	entralin anenten	r-silo	بالمد وجد	49.0 59.0 69.0
CF Step 11.000000 MH: Auto Mar	2000 GHz (1001 pts)	0.53 ms (V 300 kHz	#VB			t 2.3' s BW	
Freq Offset	ON VALUE	FUNCTION	ICTION WIDTH	FUNCTION	6.85 dBm -45.68 dBm -56.07 dBm	2,401 96 GHz 2,399 90 GHz 2,390 00 GHz		1 f 1 f 1 f	N N N	1
										7 8 9 10
		3	STATU							86

Band Edges Test Data CH-High



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

	rum Analyzer - Sv						
Center F	req 2.3650	00000 GHz	Trig: Free Run	ALIGNAUTO Avg Type: Log-Pwr	TRAC	Apr 24, 2018 E 1 2 3 4 5 6	Frequency
10 dB/div	Auto Tune						
11.0 1.00	Ref 21.00				Nump	05 dBm \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Center Free 2.365000000 GH;
-19.0 -29.0 -39.0					Ø ²	-14.70 dBm	Start Fred 2.310000000 GHz
-49.0 -59.0				3-			Stop Fred 2.420000000 GH
Start 2.31 #Res BW		#VBV	V 300 kHz	Sweep	Stop 2.42000 GHz Sweep 10.53 ms (1001 pts)		
1 N 2 N 3 N 4 5 6	f f f	2.404 05 GHz 2.399 90 GHz 2.390 00 GHz	5,30 dBm -39,90 dBm -55,05 dBm	INCTION FUNCTION WIDT	H PUNCTIO	IN VALUE	Auto Mar Freq Offse 0 Ha
7 8 9 10 11							
MSG				STAT	US		

Band Edges Test Data CH-High



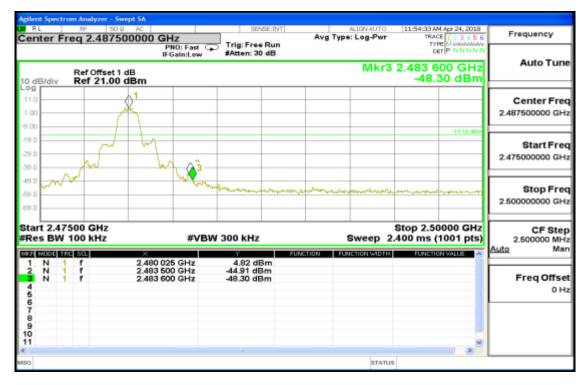
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.





Agilent Spectrum Analyzer - S									
Center Freq 2.365		SENSE:INT	Autonau Avg Type: Log-F	wr TRACE	123456	Frequency			
PN0: Fast Trig: Free Run Cer P NNNN IFGain:Low #Atten: 30 dB DKr3 2.390 00 GHZ									
11.0 1.00						Center Free 2.36500000 GH			
-9.00 -19.0 -29.0 -39.0				2	-14.94 (8h)	Start Free 2.310000000 GH			
-49.0 -59.0 -69.0	production and a second se	and the forest of the state of	20 K		and have	Stop Free 2.420000000 GH			
Start 2.31000 GHz #Res BW 100 kHz	#VBV	CF Step 11.000000 MH Auto Ma							
MSU MODE THE SE 1 N 1 f 2 N 1 f 3 N 1 f 4 5 6 7	2.401 96 GHz 2.399 90 GHz 2.390 00 GHz	5.06 dBm -38.44 dBm -56.76 dBm	PUNCTION FUNCTION W	FUNCTION	VALLE	Freq Offse			
8 9 10 11				TATUS	~				

Band Edges Test Data CH-High



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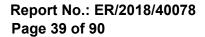
Conducted Spurious Emission Measurement Result (GFSK mode) Ch Low 30MHz – 3GHz

	um Analyzer - Swept SA					
enter F	req 1.51500000	PNO: Fast	Trig: Free Run	Avg Type: Log-Pwr	11:10:41 AM Apr 24, 2018 TRACE 1 2 3 4 5 6 TYPE MUMANANA DET P NNNNN	<u> </u>
	Ref Offset 1 dB	IFGain:Low	#Atten: 30 dB	M	(r1 2.403 0 GHz 5.51 dBm	Auto Tu
dB/div	Ref 21.00 dBm				1	Center F 1.515000000 0
					-14.49 (00)	Start F 30.000000 M
1.0 1.0	an a	alan talah yang bergan salah telapatan y	la-m-1491,40 Hoursonad	Antoneous Stanley Sector Sector	ปัญหาการสามได้จังมีการกระวงคระด	Stop F 3.0000000000000
art 30 M tes BW	MHZ 100 kHz	#VBW	300 kHz	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	CF S 297.000000 M
0 NOBE 11 N 1 2 3 4 5 5 5 7 3 9 0 1		2.403 0 GHz	5.51 dBm	UNCTION PUNCTION WADTH		Freq Off 0
3				STATU	5	

Ch Low 3GHz – 26.5GHz



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Ch Mid 30MHz – 3GHz

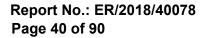
	rum Analyzer - Se					
Center F	req 1.5150		SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:13:34 AM Apr 24, 2018 TRACE 1 2 3 4 5 6 TYPE MUMANAN	
10 dB/div	Ref Offset 1 Ref 21.00		#Atten: 30 dB	м	kr1 2.441 6 GHz 5.31 dBm	Auto Tum
11.00					¢ ¹	Center Free 1.515000000 GH
-19.00 -19.0 -29.0 -39.0					-14.03 dBm	Start Free 30.000000 MH
-49.0 -59.0	ملى 1000 مەلمەلىرىنى مەلمەلىرىنى مەلمەلىرىنى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىرىكى مەلمە مەلمەلىكى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىكى مەلمەلىكى مەلمەلىرىكى مەلمەلىرىكى مەلمەلىرى			han all share an end of a state and		Stop Free 3.000000000 GH
Start 30 #Res BW	100 kHz	#VB\	V 300 kHz	Sweep 2	Stop 3.000 GHz 283.9 ms (1001 pts)	
1 N 2 3 4 5 6 7	1 f	2.441 6 GHz	5.31 dBm			Freq Offse 0 H
8 9 10 11 <				STAT	15	

Ch Mid 3GHz – 26.5GHz



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Ch High 30MHz – 3GHz

								alyzer - Sw			
	4 Apr 24, 2018 2 1 2 3 4 5 6	TRA	Log-Pwr	Avg Ty	SENSE:INT		00000 G		Freq		R NU
Auto Tun		r1 2.48	MI		frig: Free Run Atten: 30 dB	PNO: Fast 😱 FGain:Low	IF	Offset 1	Re		
	48 dBm	5.						f 21.00		dB/div	10 d Log
Center Free 1.515000000 GH		∮ ¹								0	11.0
	-14.52 dBn			_		_				·	-9.00
Start Free 30.000000 MH										-	-19.0 -29.0 -39.0
Stop Free 3.000000000 GH	Principal cognit	whore	والزران مهر الرزما		alan dega di Sena Provinci e Mal		an and the second s	ale and the second	e-seniteite	0 54034	-49.0 -59.0
	.000 GHz								MHz	art 30	
297.000000 MH Auto Mar	1001 pts)					#VBW			N 100		
Freq Offse		PUNCH	ICTION WDTH	NCTION	5.48 dBm	3 GHz	2.480		THE SE		1 2 3 4
											6 7 8
											9 10 11
		8	STATU								MSG

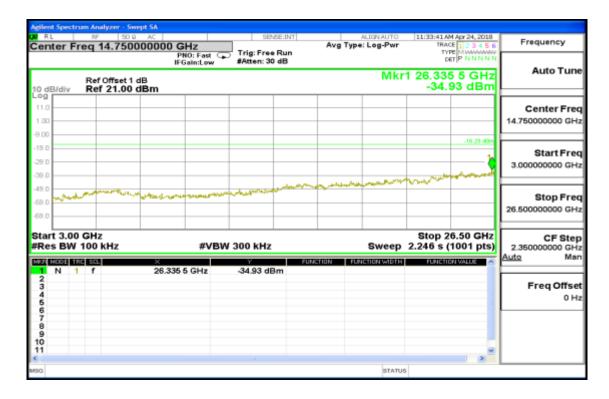
Ch High 3GHz – 26.5GHz





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

plent Spectro RL	um Analyzer - Swept RF 50 ລ	AC AC	SEN	SE:INT		LIGNAUTO	11:33:29 A	M Apr 24, 2018	
enter Fr	req 1.515000	PNO: Fasi IFGain:Loo			Avg Type	Log-Pwr	TYI	28 1 2 3 4 5 6 PE MUMUUUU ET P N N N N N	Frequency
dB/div	Ref Offset 1 dE Ref 21.00 dE					Mk		3 0 GHz 71 dBm	Auto Tu
						•	1		Center F 1.515000000 0
00								-16.29.090	
.0									Start F 30.000000 f
0			an a	ومحاوليموم	eraturiarte	يەلىرە ئۆريە	ارد میروند و اور اور اور اور اور اور اور اور اور ا	arme fright and the start	Stop F 3.000000000
art 30 N tes BW	1Hz 100 kHz	#\	/BW 300 kHz		s	weep 2		.000 GHz 1001 pts)	CF S 297.000000
NODE TR	6 901 f	2,403 0 GHz	3.71 dE		TION FUN	CTION WIDTH	PUNCTIC	IN VALUE	Auto
		2.403 0 612	3.71 46						Freq Off
4						STATUS		>	



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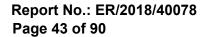


Ch Mid 30MHz – 3GHz

								Swept SA		etrun		
Frequency	4 Apr 24, 2018 2 1 2 3 4 5 6 PE MUMAAAAAA	TRAC	Log-Pwr	Avg Ty	ENSE:INT		GHz	5000000		Fre		Cer
Auto Tune	T P NNNN	(r1 2.44	M			Trig: Fre #Atten: 3	PNO: Fast G IFGain:Low		ef Offse			
Center Freq 1.515000000 GHz	20 dBm	2.:						0 dBm	ef 21.0	v		Log 11.0
Start Freq 30.000000 MHz	-17.00 dBm											-9.00 -19.0 -29.0 -39.0
Stop Free 3.00000000 GH2	8-10-10-0-0-0-0-	and an approximately a second	-poge-ter designede	وملامي ويورين وي			iller - maine and	and a star of the	مادر را بودها	ış ka bişa bi	Mes	-49.0 -59.0 -69.0
CF Step 297.000000 MH: Auto Mar	.000 GHz 1001 pts)	83.9 ms (Sweep 2	NCTION		N 300 kHz	#VBI	~	0 kHz	0 MH W 10	s B	#Re
Freq Offset 0 Ha					iBm	2.20 d	41 6 GHz	2.4		1		
												7 8 9 10 11
		5	STATU									MBG

Ch Mid 3GHz – 26.5GHz







Ch High 30MHz – 3GHz

	um Analyzer - Swi							
Center Fi	req 1.51500		SENSE:INT	Avg Type: L	og-Pwr	TRAC	4 Apr 24, 2018 1 2 3 4 5 6 PE MUMANANA	Frequency
10 1011	Ref Offset 1 o		Trig: Free Run #Atten: 30 dB		Mk	n 1 2.48	0 3 GHz 37 dBm	Auto Tune
10 dB/div 11.0 1.00	Ref 21.00 C					• ¹		Center Fred 1.515000000 GH:
-19.0 -29.0 -39.0							-18.63 dBm	Start Free 30.000000 MH:
-49.0 -59.0 Manada -69.0	لمستعلم المستعلم مستعلم المستعلم المستعلم المستعلم المستعلم المستعلم المستعلم المستعلم المستعلم المستعلم مستعلم مستعلم مستعلم مستعلم مستعلم مستعلم مستعلم المستعلم مستعلم مستحمم مستحمم مستم مستمم ممستمم ممست مستمم ممستمم ممست مستمم ممستمم ممست مستمم ممستم ممست مستمم ممستمم ممستم مستمم ممستمم ممستمم مستمم مستمم ممستحمم ممممما مستمم ممست مممما ممما مستحمم مممما مما ممستحمم مممما ممم			هو موجودتها و م	ا ي ملين - بروري ا	Junior	niti Tentrapilanation	Stop Free 3.000000000 GH
Start 30 M #Res BW	100 kHz	#VB)	V 300 kHz		veep 28	3.9 ms (.000 GHz 1001 pts)	CF Step 297.000000 MH Auto Ma
1 N 1 2 3 4 5 6 7 8		2.480 3 GHz	1.37 dBm	INCTON FUNCT		PORLIN		Freq Offse 0 H
9 10 11 <					STATUS		>	

Ch High 3GHz – 26.5GHz





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 digi-tally 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 con-ducted 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 & RSS-Gen §8.10 Table 6 limit.

And according to §15.33(a) (1) & RSS-Gen §8.9 Table 4 & 5, for an intentional radiator oper-ates 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

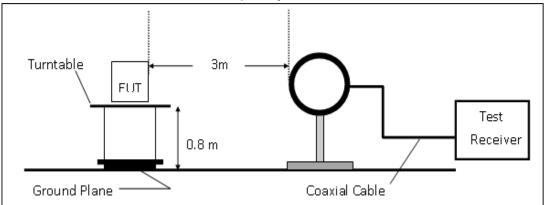
	so	GS 966 Chambe	r No.C		
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2017/08/04	2018/08/03
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
Spectrum Analyzer	Agilent	E4446A	MY51100003	2017/05/10	2018/05/09
EMI Test Receiver	R&S	ESCI7	100760	2017/06/06	2018/06/05
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	2018/01/02	2019/01/01
Attenuator	Mini-Circuit	BW-S10W2+	N/A	2018/01/02	2019/01/01
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01
Notebook	DELL	D505	34056609472	N/A	N/A

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

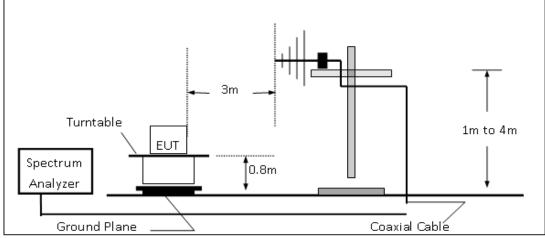


10.3 Test SET-UP

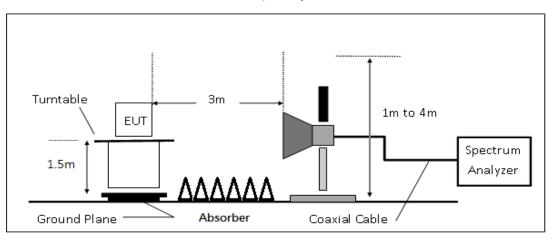




(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



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



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10.4 Measurement Procedure

Radiated Emission

- 1. The testing follows ANSI C63.10:2013. 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) 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.



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 $20^{10}(uV/m)$

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

Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

Note :

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

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

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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

10.7 Measurement Result

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

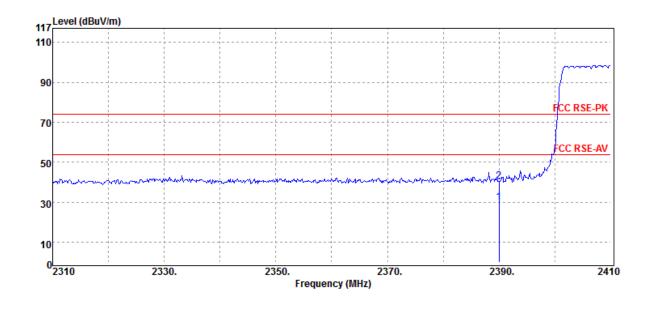


Radiated Band Edge Measurement Result: (Hopping Mode)

Operation Band Fundamental Frequency Operation Mode EUT Pol.

:BR Hopping :2402 MHz :Bandedge CH LOW :H Plane

:2018-04-23 Test Date Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	29.60	0.20	29.80	54.00	-24.20
2390.00	E	Peak	40.45	0.20	40.65	74.00	-33.35

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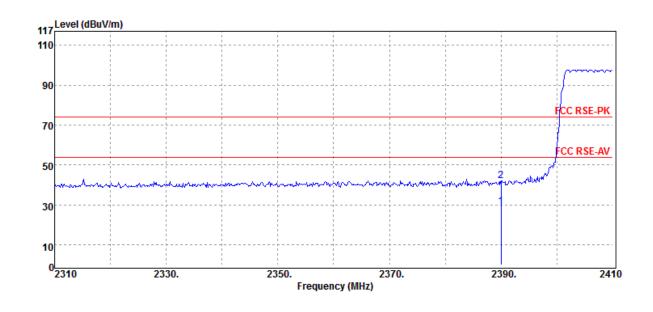
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Operation Band Fundamental Frequency Operation Mode EUT Pol.

:BR Hopping :2402 MHz :Bandedge CH LOW :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	28.99	0.20	29.19	54.00	-24.81
2390.00	Е	Peak	42.05	0.20	42.25	74.00	-31.75

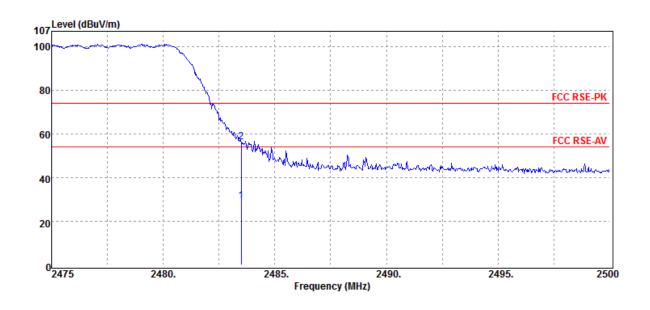
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Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:BR Hopping :2480 MHz :Bandedge CH HIGH :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	28.88	0.53	29.41	54.00	-24.59
2483.50	E	Peak	55.75	0.53	56.28	74.00	-17.72

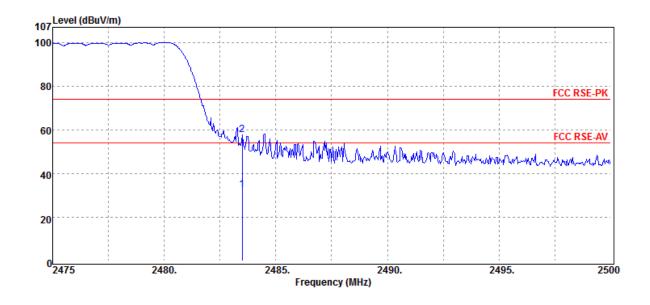
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Operation Band Fundamental Frequency Operation Mode EUT Pol.

:BR Hopping :2480 MHz :Bandedge CH HIGH :H Plane

Test Date :2018-04-23 :23 deg_C / 62 RH Temp./Humi. Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	32.10	0.53	32.63	54.00	-21.37
2483.50	Е	Peak	57.17	0.53	57.70	74.00	-16.30

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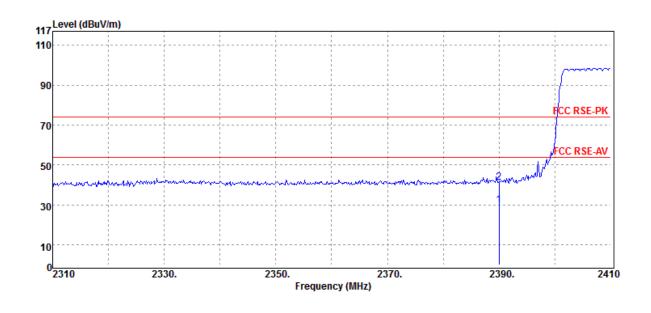
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Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:EDR Hopping :2402 MHz :Bandedge CH LOW :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	29.69	0.20	29.89	54.00	-24.11
2390.00	Е	Peak	41.10	0.20	41.30	74.00	-32.70

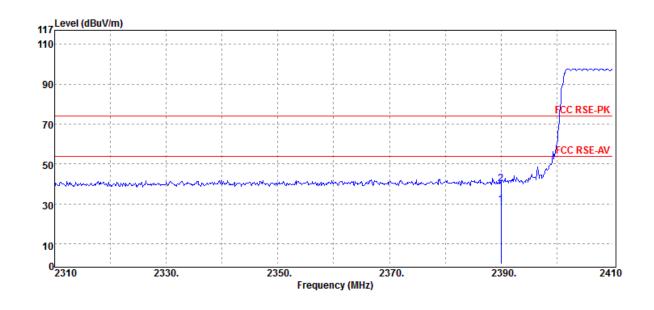
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Operation Band Fundamental Frequency Operation Mode EUT Pol.

:EDR Hopping :2402 MHz :Bandedge CH LOW :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	29.43	0.20	29.63	54.00	-24.37
2390.00	E	Peak	39.88	0.20	40.08	74.00	-33.92

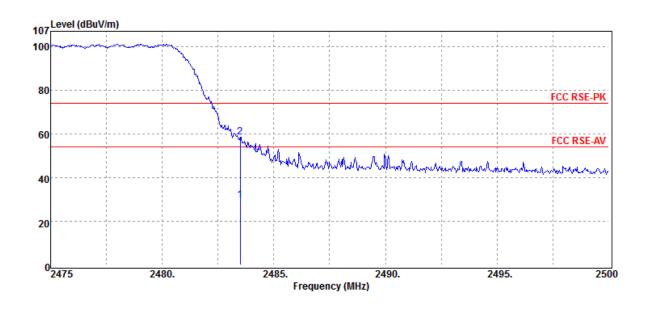
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Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:EDR Hopping :2480 MHz :Bandedge CH HIGH :H Plane

Test Date :2018-04-23 :23 deg_C / 62 RH Temp./Humi. Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	29.07	0.53	29.60	54.00	-24.40
2483.50	E	Peak	58.11	0.53	58.64	74.00	-15.36

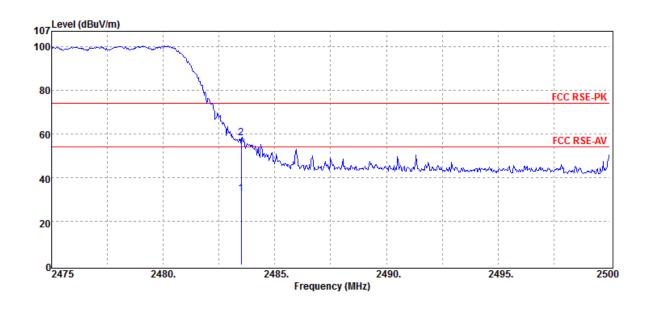
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Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:EDR Hopping :2480 MHz :Bandedge CH HIGH :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	32.00	0.53	32.53	54.00	-21.47
2483.50	Е	Peak	57.57	0.53	58.10	74.00	-15.90



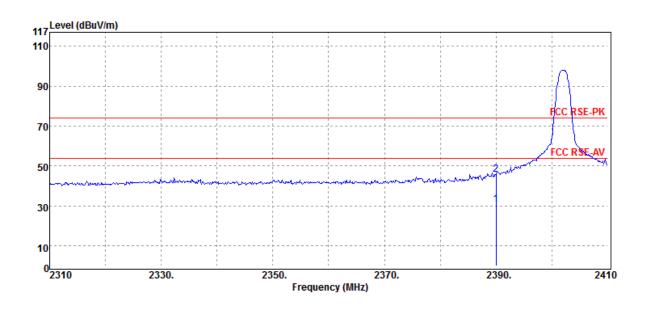
Radiated Band Edge Measurement Result: (Non-Hopping Mode)

Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:BR(1M) :2402 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2018-04-23 :23 deg_C / 62 RH :Tin :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	30.67	0.20	30.87	54.00	-23.13
2390.00	Е	Peak	45.69	0.20	45.89	74.00	-28.11

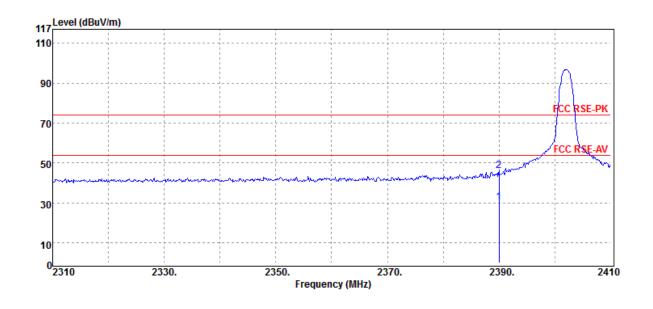
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Operation Band :BR(1M) Fundamental Frequency :2402 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

Test Date :2018-04-23 :23 deg_C / 62 RH Temp./Humi. Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



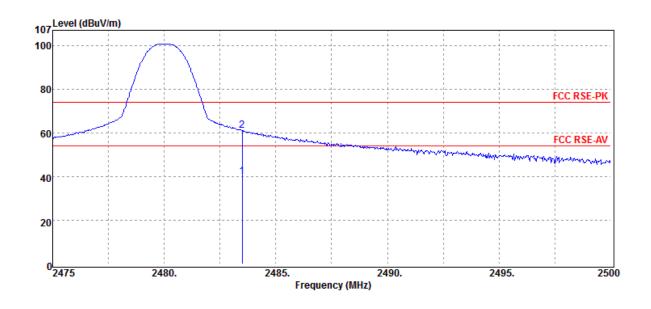
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	30.03	0.20	30.23	54.00	-23.77
2390.00	Е	Peak	45.79	0.20	45.99	74.00	-28.01

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Operation Band :BR(1M) Fundamental Frequency :2480 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



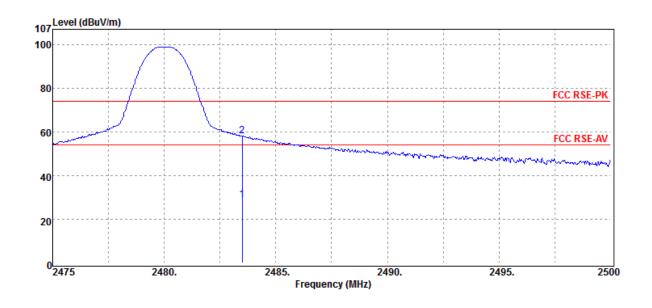
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	39.60	0.53	40.13	54.00	-13.87
2483.50	Е	Peak	60.66	0.53	61.19	74.00	-12.81

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Operation Band :BR(1M) Fundamental Frequency :2480 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :HORIZONTAL Measurement Antenna Pol.

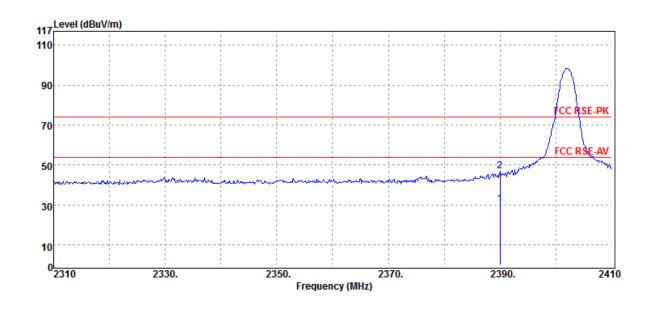


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	28.46	0.53	28.99	54.00	-25.01
2483.50	Е	Peak	57.55	0.53	58.08	74.00	-15.92



Operation Band :EDR(3M) Fundamental Frequency :2402 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.

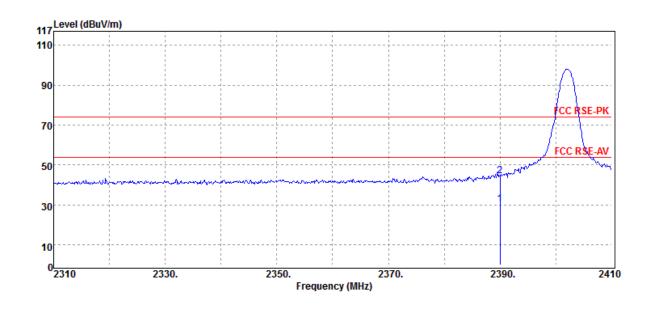


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	30.12	0.20	30.32	54.00	-23.68
2390.00	Е	Peak	46.79	0.20	46.99	74.00	-27.01



Operation Band :EDR(3M) Fundamental Frequency :2402 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



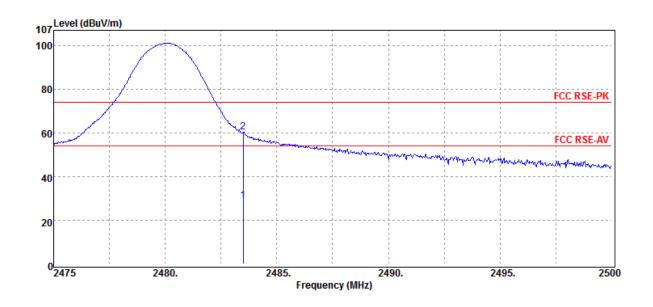
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	30.04	0.20	30.24	54.00	-23.76
2390.00	E	Peak	44.28	0.20	44.48	74.00	-29.52

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Operation Band :EDR(3M) Fundamental Frequency :2480 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



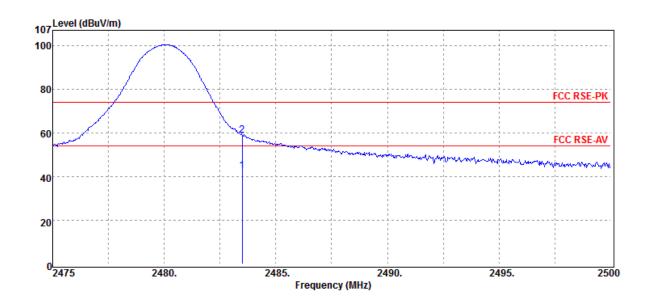
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	28.50	0.53	29.03	54.00	-24.97
2483.50	E	Peak	59.84	0.53	60.37	74.00	-13.63

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Operation Band :EDR(3M) Fundamental Frequency :2480 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	42.04	0.53	42.57	54.00	-11.43
2483.50	E	Peak	58.19	0.53	58.72	74.00	-15.28



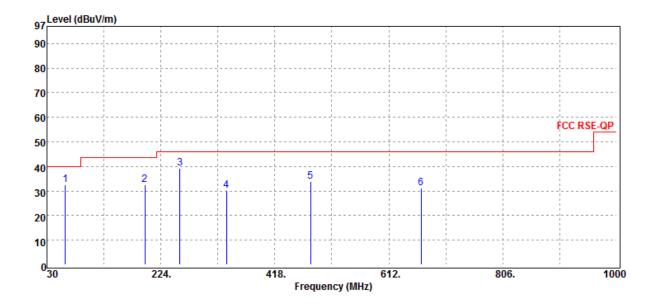
Radiated Spurious Emission Measurement Result: (Worst Case)

Operation Band
Fundamental Frequency
Operation Mode
EUT Pol.

:EDR(3M) :2441 MHz :Tx CH MID :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2018-04-23 :23 deg_C / 62 RH :Tin :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
61.04	S	Peak	40.64	-8.05	32.59	40.00	-7.41
196.84	S	Peak	41.63	-9.19	32.44	43.50	-11.06
256.01	S	Peak	46.39	-7.13	39.26	46.00	-6.74
335.55	S	Peak	35.13	-4.89	30.24	46.00	-15.76
479.11	S	Peak	35.98	-2.10	33.88	46.00	-12.12
667.29	S	Peak	30.66	0.49	31.15	46.00	-14.85

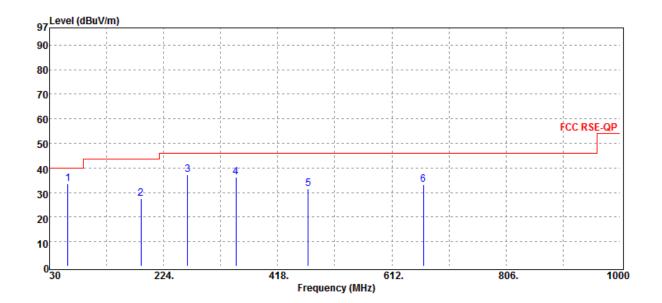
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Operation Band	:EDR(3M)
Fundamental Frequency	:2441 MHz
Operation Mode	:Tx CH MID
EUT Pol.	:H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
61.04	S	Peak	41.62	-8.05	33.57	40.00	-6.43
185.20	S	Peak	36.21	-8.64	27.57	43.50	-15.93
264.74	S	Peak	44.07	-6.83	37.24	46.00	-8.76
347.19	S	Peak	40.81	-4.61	36.20	46.00	-9.80
469.41	S	Peak	33.84	-2.14	31.70	46.00	-14.30
665.35	S	Peak	32.95	0.34	33.29	46.00	-12.71

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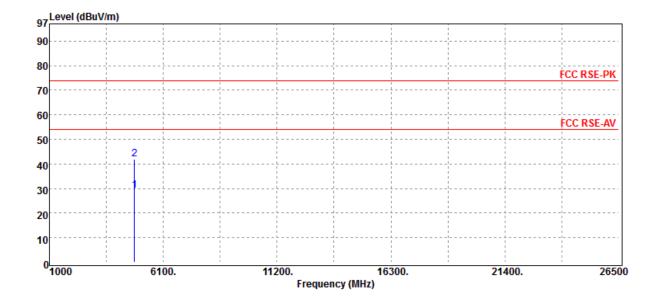
S Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134號

Radiated Spurious Emission Measurement Result: (Worst Case)

For Frequency above 1 GHz

Operation Band :EDR(3M) **Fundamental Frequency** :2402 MHz **Operation Mode** :Tx CH LOW EUT Pol. :H Plane

Test Date :2018-04-23 Temp./Humi. :23 deg_C / 62 RH Engineer :Tin :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
4804.00	Н	Average	21.78	7.38	29.16	54.00	-24.84	
4804.00	Н	Peak	34.46	7.38	41.84	74.00	-32.16	

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4804.00

Н

Н

peration Bai undamental peration Mo	Frequency	:EDR(3M) :2402 MHz :Tx CH LOV	V	Test Date Temp./Hu Engineer	ımi.	:2018-(:23 deo :Tin	04-23 g_C / 62 RI
UT Pol.		:H Plane		Measurement Antenna Pol			ZONTAL
97	(dBuV/m)		· · · ·				
90							
80		· - 				FCC RSE-P	ĸ
70				 			
60						FCC RSE-4	N
50	2	- L					
40							
30							
20							
10							
0 <mark></mark>	6	100.	11200. Frequency (16300. MHz)	21400.	20	5500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

22.40

35.49

Average

Peak

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7.38

7.38

29.78

42.87

54.00

74.00

-24.22

-31.13



Н

Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:EDR(3M) :2441 MHz :Tx CH MID :H Plane)	Test Date Temp./Hu Engineer Measurer		:Tin	_C / 62 RH
97	(dBuV/m)						
90							
80		-					
70				 		FCC RSE-P	
60		-				FCC RSE-A	
50						FUU ROE-A	
40	2						
30							
20							
10							
0 <mark></mark>	6	100.	11200.	16300.	21400.	26	500
1000	U	100.	Frequency (N		21400.	20	500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	Н	Average	21.63	7.67	29.30	54.00	-24.70

Peak

33.17

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7.67

40.84

74.00

-33.16



Н

Operation Ba Fundamental Operation Mc EUT Pol.	Frequency	:EDR(3M) :2441 MHz :Tx CH MID :H Plane		Test Date Temp./Hu Engineer Measurer		:Tin	04-23 g_C / 62 RH ZONTAL
ozLevel	(dBuV/m)						
90		-					
80							
70						FCC RSE-P	<u>K</u>
60						FCC RSE-A	
50						FUU KSE-A	·
40	2						
30		-					
20						·	
10							
0 <mark></mark>	6	100.	11200.	16300.	21400.	20	500
1000	U	100.	Frequency (N		21400.	20	500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	Н	Average	21.92	7.67	29.59	54.00	-24.41

Peak

34.45

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7.67

42.12

74.00

-31.88



4960.00

Н

Н

Operation Band Jundamental Frequency Operation Mode	:EDR(3M) :2480 MHz :Tx CH HIG	iΗ	Test Date Temp./Humi. Engineer		:2018-0 :23 deg :Tin	4-23 _C / 62 R
UT Pol.	:H Plane		Measurement Antenna Pol.		ol. :VERTI	CAL
97						
97						
80						
70					FCC RSE-PI	<u><</u>
60						
50					FCC RSE-A	<u>/</u>
40						
30						
20					 	
10						
0 <mark>1000 6</mark>	100.	11200. Frequency (I	16300. ЛНz)	21400.	26	500
Freq. Note	Detector	Spectrum	Factor	Actual	Limit	Safe
	Mode	Reading Level		FS	@3m	Margin
MHz F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
MHz F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

21.38

34.30

Average

Peak

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7.80

7.80

29.18

42.10

54.00

74.00

-24.82

-31.90



Н

Operation Ba Fundamental Operation Mc EUT Pol.	Frequency	:EDR(3M) :2480 MHz :Tx CH HIG :H Plane	Η	Test Date Temp./Hu Engineer Measurer	ımi.	:23 de :Tin	-04-23 eg_C / 62 RH IZONTAL
97	(dBuV/m)						
90							
80						FCC RSE	DK
70							
60						FCC RSE	-AV
50	2						
40							
30							
20					· · · · · · · · · · · · · · · · · · ·		
10							
0 <mark>.</mark> 1000	6	100.	11200. Frequency (I	16300. ЛНz)	21400.		26500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	н	Average	21.60	7.80	29.40	54.00	-24.60

Peak

33.79

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7.80

41.59

74.00

-32.41



11 FREQUENCY SEPARATION

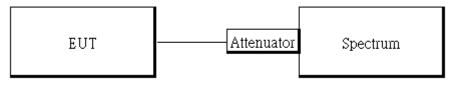
11.1 Standard Applicable

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.				
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	2018/04/09	2019/04/08			
Notebook	DELL	D505	34056609472	N/A	N/A			

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 C63.10:2013 section 7.8.2.
- 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

	etrur		dyzer - Swe										
RL		RF		AC			SEN	SE:INT		ALIGNAUT		AM Apr 24, 2018	Frequency
enter	Fre	eq 2	2.40300	0000 GH	1Z NO: Wide Gain:Los	, -	Trig: Free #Atten: 30		Avg T	ype: Log-Pw	1	ACE 123456 YPE MUMUUUUU DET PINNNNN	
) dB/div			Offset 1 d 21.00 d							4	Mkr3 1.	000 MHz -9.71 dB	Auto Tu
1.0 .00				www	2.00	~	wood	142	n	~~\$ ^{3∆4} ~~	n	and the second	Center Fr 2.403000000 G
.0 .0	m	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~										Start Fr 2.400500000 G
8.0 8.0 9.0													Stop Fr 2.405500000 G
art 2. Res Bl					#V	вw	100 kHz			Sweep		05500 GHz (1001 pts)	CF St 500.000 k
JI NODE	TRC	501		х			Y	P1	INCTION	FUNCTION WID	TH FUNC	TION WALLIE	Auto N
1 <u>A2</u>	1	f	(<u>(</u>)		0 MHz	(Δ)	4.81						
2 F 3 Δ4	1	f	(<u>A</u>)	2.402.00	0 GHz 0 MHz	(0)	-1.32 dE						Freq Offs
4 F	1	f	(11)	2.403.00		ш	3.49 dE						· ·
5													0
7 8 9													
0												~	

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12 NUMBER OF HOPPING FREQUENCY

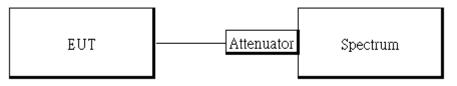
12.1 Standard Applicable

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

12.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	2018/04/09	2019/04/08			
Notebook	DELL	D505	34056609472	N/A	N/A			

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 ANSI C63.10:2013. 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

Agilent Spectrum Analyzer - Swept SA					
Center Freq 2.420500000 GHz	SENSE:0	Avg Type:	LIGNAUTO	11:30:51 AM Apr 24, 2018 TRACE 1 2 3 4 5 6	Frequency
PN0: Fast 🔾 IFGain:Low	#Atten: 30 dB	in }		DET P N N N N N	Auto Tune
Ref Offset 1 dB 10 dB/div Ref 21.00 dBm			Mkr1	2.402 000 GHz 4.83 dBm	Auto Tune
					Center Freq 2.420500000 GHz
-9.00	uder over the		, /u.,		Start Freq 2.400000000 GHz
-19.0					Stop Freq 2.441000000 GHz
-49.0					CF Step 4.100000 MHz Auto Man
-59.0					Freq Offset 0 Hz
-69.0					
Start 2.40000 GHz #Res BW 430 kHz #VBW	1.5 MHz	S		Stop 2.44100 GHz .000 ms (1001 pts)	
M9G			STATUS		

2.4 GHz - 2.441GHz

2.441 GHz - 2.4835GHz



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13 TIME OF OCCUPANCY (DWELL TIME)

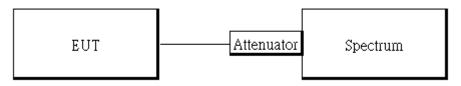
13.1 Standard Applicable

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	MODEL	SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	2018/04/09	2019/04/08		
Notebook	DELL	D505	34056609472	N/A	N/A		

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 ANSI C63.10:2013. 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.

GI SK (Twipps)			
Channel	PACKET TYPE	Measurement Result	Limit
Channel		(ms)	(ms)
	DH1	157.70	400ms
0	DH3	280.16	400ms
	DH5	320.85	400ms
	DH1	159.10	400ms
39	DH3	281.60	400ms
	DH5	319.36	400ms
	DH1	161.92	400ms
78	DH3	280.16	400ms
	DH5	320.85	400ms

13.5 Tabular Result of the Measurement

GESK (1Mbns)

$\pi/4$ DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	2DH1	164.74	400ms
39	2DH3	282.24	400ms
	2DH5	320.85	400ms

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	3DH1	163.33	400ms
39	3DH3	281.60	400ms
	3DH5	320.85	400ms

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

GFSK (1Mbps):

CH Low	DH1 time slot = DH3 time slot = DH5 time slot =	1.751 *	(1600/4/79) *	31.6 =	157.70 (ms) 280.16 (ms) 320.85 (ms)
CH Mid	DH1 time slot = DH3 time slot = DH5 time slot =	1.760 *	(1600/4/79) *	31.6 =	159.10 (ms) 281.60 (ms) 319.36 (ms)
CH High	DH1 time slot = DH3 time slot = DH5 time slot =	1.751 *	(1600/4/79) *	31.6 =	161.92 (ms) 280.16 (ms) 320.85 (ms)

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

CH Mid	2DH1 time slo =	0.515 *	(1600/2/79) *	31.6 =	164.74 (ms)
	2DH3 time slo =	1.764 *	(1600/4/79) *	31.6 =	282.24 (ms)
	2DH5 time slo =	3.008 *	(1600/6/79) *	31.6 =	320.85 (ms)

8-DPSK (3Mbps):

CH Mid	3DH1 time slo =	0.510	*	(1600/2/79) *	31.6 =	163.33	(ms)
	3DH3 time slo =	1.760	*	(1600/4/79) *	31.6 =	281.60	(ms)
	3DH5 time slo =	3.008	*	(1600/6/79) *	31.6 =	320.85	(ms)



GFSK (1Mbps) for AFH Mode								
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)					
20	DH5	160.43	400ms					
π/4 DQPSK (2Mbps) for AFH Mode								
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)					
20	2DH5	160.43	400ms					
	8-DPSK (3Mbps) for AFH Mode						
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)					
20	3DH5	160.43	400ms					

GFSK (1Mbps):

DH5 time s =	3.008	(ms)	*	(800/6/20)	* 8 =	160.43	(ms)
π/4 -DQPSK (2Mbp							
2DH5 time =	3.008	(ms)	*	(800/6/20)	* 8 =	160.43	(ms)
8-DPSK (3Mbps):							
3DH5 time =	3.008	(ms)	*	(800/6/20)	* 8 =	160.43	(ms)

13.6 Measurement Result

Note: Refer to next page for plots.

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CH-Low DH1

	um Analyzer - Swept SA							
Center Fi	req 2.40200000		SENSE:INT	Avg Type:	LIGNAUTO		123456	Frequency
		PNO: Fast IFGain:Low	Trig:Free Run ≢Atten:30 dB			DET	PNNNNN	Auto Tune
10 dB/div	Ref Offset 1 dB Ref 21.00 dBm	1			4	Mkr1 49. 15.	2.8 µs 08 dB	
11.0 1.00			1Δ2				£	Center Freq 2.402000000 GHz
-19.0 -29.0 -39.0								Start Freq 2.402000000 GHz
-49.0 -59.0 -69.0	n bhainn	ernipan natur	With rear dues	yylungyl	w.w	Adrese Augusta		Stop Freq 2.402000000 GHz
Center 2.4 Res BW 1		#VBW	3.0 MHz		weep 4.	Sp 400 ms (10		CF Step 1.000000 MHz Auto Man
1 ∆2 1 2 F 1 3 4 5 6	t (Δ) t	492.8 μs (Δ) 1.571 ms	15.08 dB -8.24 dBm			CONCINCIP		Freq Offset 0 Hz
7 8 9 10 11							~	
MSG					STATUS			

DH3

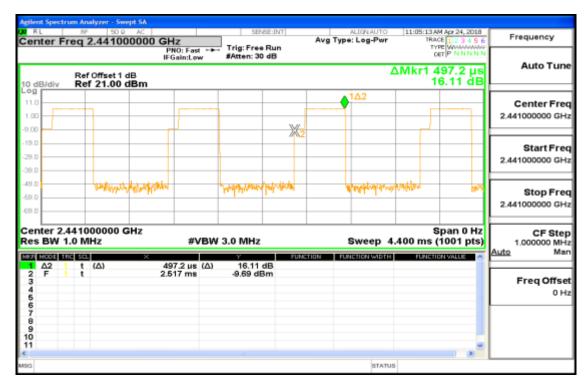
50.9 AC		SENSE:INT	ALIGNAUTO	11:06:46	AM Aby 24, 2018	
02000000 GHz PN0: Fas		rig: Free Run	Avg Type: Log-Pwr	16	RACE 1 2 3 4 5 6	Frequency
						Auto Tu
		1Δ2				Center Fr 2.402000000 G
						Start Fr 2.402000000 0
hand performance		hand the get		terniers		Stop F
	/BW 3.0					CF S 1.000000 M Auto
		15.07 dB				Freq Off
					~	
	02000000 GHz PN0: Fas IFGain:Le fset 1 dB 1.00 dBm 2 2 000 GHz 1.751 ms	02000000 GHz PN0: Fast → T IFGain:Low fset 1 dB 1.00 dBm 2 2 0000 GHz #VBW 3.0 1.751 ms (Δ)	O2000000 GHz Trig: Free Run PN0: Fast Free Run #Atten: 30 dB 1Δ2 1.00 dBm 1Δ2 2 1Δ2 2 1Δ2 2 1Δ2 000 GHz #VBW 3.0 MHz	O2000000 GHz Avg Type: Log-Pwr PN0: Fast → IFGain:Low Trig: Free Run #Atten: 30 dB fset1 dB 1Δ2 1.00 dBm 1Δ2 2 1Δ2 2 1Δ2 2 1Δ2 000 GHz #VBW 3.0 MHz 30 GHz 15.07 dB	O2000000 GHz Avg Type: Log-Pwr If PN0: Fast +++ Trig: Free Run #Atten: 30 dB ΔMkr1 fset1 dB ΔMkr1 1.00 dBm 1Δ2 w/whyt 1.00 dB	O2000000 GHz Trig: Free Run BAtten: 30 dB Avg Type: Leg-Pwr Type: Leg-Pwr Trace [1,2,3,4,5,6] fset1 dB ΔMkr1 1.751 ms 15.07 dB ΔMkr1 1.751 ms 15.07 dB fset1 dB 1Δ2 ΔMkr1 1.751 ms 15.07 dB www.wb.gr 1Δ2 ΔMkr1 1.751 ms 15.07 dB www.wb.gr 1Δ2 ΔMkr1 1.751 ms 15.07 dB www.wb.gr 1Δ2 ΔMkr1 1.751 ms 15.07 dB



RL RF	SO 9 AC		SENSE:IN	(7) I	ALIGNAUTO	11110/10 10	Apr 24, 2018	
ter Freq 2.				Avg 1	Type: Log-Pwr	TRAC	E 1 2 3 4 5 6	Frequency
Perf O	ffset 1 dB	PNO: Fast IFGain:Low	#Atten: 30 dB	1	Δ	Mkr1 3.	008 ms	Auto Tu
	21.00 dBm					14	4.25 dB	
				×2	+	1Δ2		Center F 2.402000000
				/%2				Start F
				n -		nition .		Stop F 2.402000000
nter 2.402000 BW 1.0 MH		#VB	W 3.0 MHz		Sweep 1	3.13 ms (CF S 1.000000
$\begin{array}{c} \text{NODE THE SEL} \\ \Delta 2 & 1 & t & (4 \\ F & 1 & t \end{array}$	× ۲	3.008 ms (∆ 7.302 ms) 14.25 dB -8.45 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N WALLIE	FreqOf
							~	

CH-Mid

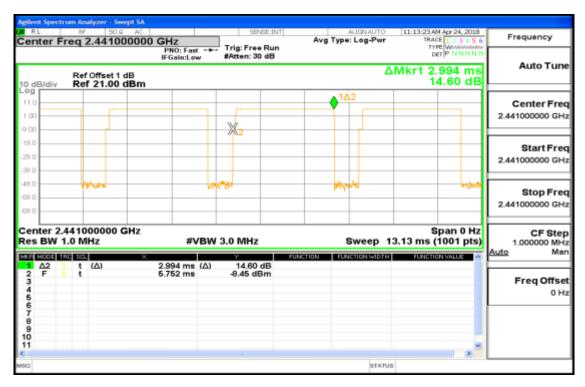
DH1





pectrum Analyzer - Swep		SENSE:INT	ALIGNAUTO	11.07.00 MI 4	
er Freq 2.441000	0000 GHz		Avg Type: Log-Pwr	11:07:20 AM Apr 24, 2018 TRACE 1 2 3 4 5 6 TYPE Water Address	Frequence
	PNO: Fast IFGain:Low	#Atten: 30 dB		DET P N N N N	Auto
Ref Offset 1 de /div Ref 21.00 dl			Δ	Mkr1 1.760 ms 15.80 dB	
			1Δ2		Center
					2.44100000
		×2			
					2.44100000
					E.11100000
devel Proup		an a	10000000	phile	Stop
					2.44100000
er 2.441000000 GI				Span 0 Hz	CF
BW 1.0 MHz	#VBW	/ 3.0 MHz		.800 ms (1001 pts)	1.00000 Auto
$\Delta 2 \frac{1}{t} \frac{t}{\Delta}$	× 1.760 ms (Δ)	15.80 dB	INCTION FUNCTION WIDTH	FUNCTION VALUE	
F 1 t	4.136 ms	-9.58 dBm			Freq
				×	
			STATUS		

DH5



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CH-High DH1

	nalyzer - Swept SA					
enter Freg	2.480000000 GHz			aLIGNAUTO g Type: Log-Pwr	11:05:45 AM Apr 24, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Far IFGain:Le				DET P N N N N	Auto Tun
	f Offset 1 dB of 21.00 dBm				ΔMkr1 506.0 μs 11.37 dB	
1.0		1/	<u>۵</u> 2			Center Fre
						2.48000000 G
0		×2				
						Start Fr 2.48000000 G
.0						2.400000000
0	papersistered and the	l un	moundard	1040	an a	Stop Fr
.0						2.480000000 G
anter 2 490	000000 GHz				Span 0 Hz	0.5.01
es BW 1.0 M		VBW 3.0 MHz		Sweep 4	.400 ms (1001 pts)	CF Ste 1.000000 Mi
n mode the se ∆2 1 t		(Δ) 11.37	FUNCTION	FUNCTION WIDTH	FUNCTION WALLIE	Auto M
2 F 1 t	1.575 ms					Freq Offs
4						0
5						-
9						
D 1					~	
				STATUS	3	L

DH3

	50.9 AC		SENSE:INT	ALIGNAUTO	11:07:55 AM Apr 24, 2018	Frequenc
ter Freq 2.4	480000000 GH: PN IFG	Z O: Fast ain:Low	Trig:Free Run ≢Atten:30 dB	Avg Type: Log-Pwr	TYPE WARMANN N DET P N N N N N	
	ffset 1 dB 21.00 dBm			4	Mkr1 1.751 ms 14.23 dB	Auto
				1/	12	Center
						2.48000000
-						
						2.48000000
	LINEAL D		get-dayen	। । (শ)	n Pale	Stop
						2.48000000
ter 2.480000 BW 1.0 MH		#VBW :	3.0 MHz	Sweep 8	Span 0 Hz 8.800 ms (1001 pts)	1.000000
$\frac{1}{\Delta 2} \frac{1}{1} t (2)$	× 1.75	1 ms (Δ)	7 14.23 dB	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Auto
Fit		2 ms	-8.38 dBm			Freq O



	um Analyzer - Swept SA						
Center Fi	reg 2.48000000	0 GHz	SENS	Avg Type: Log-	Pwr TRAC	4 Apr 24, 2018 E 1 2 3 4 5 6	Frequency
	2110000000	PNO: Fast = IFGain:Low	#Atten: 30 d		ΔMkr1 3.		Auto Tune
10 dB/div	Ref Offset 1 dB Ref 21.00 dBm				Дикгт 3. 1	5.26 dB	L
11.0				142			Center Freq 2.480000000 GHz
-9.00 -19.0 -29.0 -39.0			<u> </u>				Start Freq 2.480000000 GHz
-49.0 -59.0 -69.0	- lowerol		A Market	ladytes.			Stop Freq 2.480000000 GHz
Center 2.4 Res BW 1		#VB	W 3.0 MHz	Swee	ep 13.13 ms (CF Step 1.000000 MHz Auto Man
1 Δ2 1 2 F 1 3 4 5 6 7	t (Δ)	3.008 ms (∆ 6.002 ms) 15.26 d -9.48 dBr	B			Freq Offset 0 Hz
8 9 10 11						*	
MSG					STATUS		

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CH-Mid 2DH1

st Spectrum Analyzer - Swept SA				
ter Freg 2.441000000 GHz	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:17:28 AM Apr 24, 2018 TRACE 1 2 3 4 5 6	Frequency
PN0: Fast IFGain:Low Ref Offset 1 dB B/div Ref 21.00 dBm	#Atten: 30 dB		ΔMkr1 514.8 μs 16.39 dB	Auto Tur
	1Δ2			Center Fr 2.441000000 G
	₩2			Start Fr 2.441000000 G
territerie	HAN NOLLOWAY	New York	alter for a state for the state of a	Stop Fr 2.441000000 0
	W 3.0 MHz		Span 0 Hz .400 ms (1001 pts)	CF St 1.000000 M Auto M
Μασεμπτίζεσ∟ × Δ2: 1 t (Δ) 514.8 μs (μ F 1 t 1.791 ms		TION FUNCTION WADTH	FUNCTION VALUE	Freq Off
			×	

2DH3

RF 50.9 AC		SENSE:INT	ALIONAUTO	11:19:41 AM Apr 24, 2018	
ter Freq 2.441000000 (PNO: Fast	Trig: Free Run	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE WWWWWWW DET P N N N N N	Frequenc
Ref Offset 1 dB B/div Ref 21.00 dBm	IFGain:Low	aracett. VV 412	Δ	Mkr1 1.764 ms 15.30 dB	Auto
			1Δ2		Center 2.441000000
		×2			Start
		Marchel	an Wellard		2.44100000
		• • • • • • • • • •			Stop 2.44100000
ter 2.441000000 GHz BW 1.0 MHz	#VBW	3.0 MHz	Sweep 8	Span 0 Hz 733 ms (1001 pts)	CF 1.000000
	1.764 ms (∆) 4.524 ms	15.30 dB -10.73 dBm	NCTION FUNCTION WIDTH	PUNCTION VALUE	
					FreqC
				M	



	rum Analyzer - Swept SA					
Center F	reg 2.44100000	0 GHz	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:22:47 AM Apr 24, 2018 TRACE 1 2 3 4 5 6	Frequency
	Ref Offset 1 dB	PNO: Fast 😁 IFGain:Low	#Atten: 30 dB	Δ	Mkr1 3.008 ms 15.38 dB	Auto Tun
0 dB/div 0 g 11.0 1.00	Ref 21.00 dBm	1.001		^{1Δ2}		Center Fre 2.441000000 GF
19.0 19.0 29.0			¥2			Start Fre 2.441000000 G
9.0 9.0 9.0	- Lancel		anywał			Stop Fr 2.441000000 G
	441000000 GHz 1.0 MHz	#VBV	V 3.0 MHz	Sweep 1	Span 0 Hz 3.13 ms (1001 pts)	CF Sto 1.000000 M Auto M
1 Δ2 2 F 3 4 5 6 7	t (Δ)	3.008 ms (Δ) 5.989 ms	15.38 dB -10.71 dBm			Freq Offs 0
8 9 0						
11 < 49G				STATUS		

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CH-Mid **3DH1**

	Analyzer - Swept SA							
	2.441000000	GHz	SENS	Avg	ALIGNAUTO Type: Log-Pwr	11:26:19 AM TRACE	123456	Frequency
R	ef Offset 1 dB ef 21.00 dBm	PNO: Fast == IFGain:Low	#Atten: 30 of			06 2Mkr1 5	10.4 μs 8.83 dB	Auto Tur
				201	1Δ2			Center Fr 2.441000000 G
				262				Start Fr 2.441000000 G
	Windowywa	with	hipmen	MANA MA	hamayah	rhalt-y-bal		Stop Fr 2.441000000 0
s BW 1.0		#VB	W 3.0 MHz			.400 ms (1		CF St 1.000000 M Auto
		510.4 μs (Δ 2.666 ms) 15.83 dl -11.07 dBn	в	PUNCTION WIDTH	FUNCTION	A WALLE	Freq Off
					STATUS	1		

3DH3

RF 50.9 AC	SENSE:IN	IT ALIGNAUTO	11:28:28 AM Apr 24, 2018	
Freq 2.441000000	PNO: East Trig: Free Run	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE WWWWWWW	Frequer
Ref Offset 1 dB	IFGain:Low #Atten: 30 dB	Δ	Mkr1 1.760 ms 15.85 dB	Aut
v Ref 21.00 dBm		•1∆2		Cent 2.441000
	<u>%</u> 2			Sta 2.441000
	at stay ma	News	Martiture	Sto 2.441000
2.441000000 GHz N 1.0 MHz	#VBW 3.0 MHz	Sweep 8	Span 0 Hz .800 ms (1001 pts)	1.000 Auto
t mc sc. × 1 t (Δ) 1 t	1.760 ms (Δ) 15.95 dB 4.004 ms -11.16 dBm			Free



	ctrum Analyzer - Swept S/						
Center	Freq 2.4410000		SENSE:INT	Aug Type: Log-P	WF TRACE	123456	Frequency
10 dB/div	Ref Offset 1 dB	PNO: Fast IFGain:Low	 Trig: Free Run #Atten: 30 dB 		ΔMkr1 3.0	008 ms	Auto Tune
11.0 1.00				1Δ2		r r	Center Freq 2.441000000 GHz
-19.0			X 2				Start Free 2.441000000 GHz
-49.0 -59.0 -69.0	hint	- herein		- Ward		to populat	Stop Free 2.441000000 GHz
	2.441000000 GHz 1.0 MHz	#VB	W 3.0 MHz	Sweep) 13.13 ms (1		CF Step 1.000000 MH: Auto Mar
1 ∆2 2 F 3 4 5 6 7	1 t (∆) 1 t	3.008 ms (/ 5.188 ms	15.92 dB -11.79 dBm				Freq Offse 0 H
8 9 10 11							
MSG				ST	ATUS		

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14 ANTENNA REQUIREMENT

14.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device. If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

According to RSS-GEN 8.3

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

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

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

14.2 Antenna Connected Construction

An embedded-in antenna design is used.

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

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

~ End of Report ~

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