

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

	Acer Being Signage (Taiwan) Inc.
Applicant:	7F5, No.369, Fuxing N. Rd., Songshan Dist., Taipei City
	105, Taiwan (R.O.C.)
Product Name:	Smart Computer Stick
Brand Name:	acer / BYOC
Model No.:	ABS-3G1
Model Difference:	N/A
FCC ID:	2APRRABS-3G1
Report Number:	E2/2018/50025
FCC Rule Part:	§15.247, Cat: DSS
Issue Date:	Jun. 08, 2018
Date of Test:	Apr. 25, 2018~ Jun. 04, 2018
Date of EUT Received:	Apr. 25, 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:

Aken Huang / Engineer

Approved By:

Jim Chang / Manager



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# **Revision History**

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/50025	Rev.00	Initial creation of document	All	Jun. 08, 2018	Violetta Tang

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#### **GENERAL INFORMATION** 1

# **1.1 Product description**

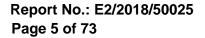
#### General:

Product Name:	Smart Computer Stick		
Brand Name:	acer / BYOC		
Model No.:	ABS-3G1		
Model difference:	N/A		
Hardware Version:	N/A		
Software Version:	N/A		
	12V from AC/DC Adapter		
Power Supply:	Adapter:1. Model No.: FSP036-RBBN2, Supplier: FSP GROUP INC.2. Model No.: DA-36A12, Supplier: Asian Power Devices Inc.		

#### Bluetooth\_BR+EDR:

Bluetooth Version:	Bluetooth V4.2 Dual Mode
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	7.46dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	<= 0.4s
Antenna Designation:	PIFA Antenna, Antenna Gain: -2.44dBi

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### 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

ANSI C63.10:2013

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

#### **1.3 Test Facility**

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305 / TW0002

#### **1.4 Special Accessories**

There is no special accessory used while test was conducted.

#### **1.5 Equipment Modifications**

There was no modification incorporated into the EUT.

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# 2 SYSTEM TEST CONFIGURATION

# 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

# 2.3 Test Procedure

# 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

# 2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this 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 11.5dB.

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# 2.5 Configuration of Tested System

Fig. 2-1 Radiated & Conducted Emission Configuration

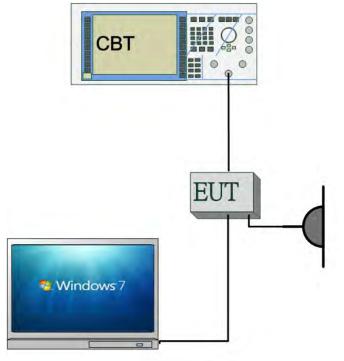


Fig.2-2 AC power line Configuration

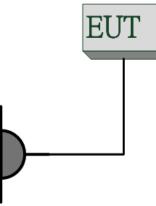


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	Bluetooth Test Set	R&S	CBT	101140	N/A	N/A
3.	Notebook	Lenovo	L420	S0012467	N/A	N/A

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#### UMMARY 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	CH	FREQUENCY	СН	FREQUENCY
0	2402 MHz	20	2422 MHz	40	2442 MHz	60	2462 MHz
1	2403 MHz	21	2423 MHz	41	2443 MHz	61	2463 MHz
2	2404 MHz	22	2424 MHz	42	2444 MHz	62	2464 MHz
3	2405 MHz	23	2425 MHz	43	2445 MHz	63	2465 MHz
4	2406 MHz	24	2426 MHz	44	2446 MHz	64	2466 MHz
5	2407 MHz	25	2427 MHz	45	2447 MHz	65	2467 MHz
6	2408 MHz	26	2428 MHz	46	2448 MHz	66	2468 MHz
7	2409 MHz	27	2429 MHz	47	2449 MHz	67	2469 MHz
8	2410 MHz	28	2430 MHz	48	2450 MHz	68	2470 MHz
9	2411 MHz	29	2431 MHz	49	2451 MHz	69	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.
- Test program used to control the EUT for staying in continuous transmitting and receiving 2 mode is programmed.
- Investigation has been done on all the possible configurations for searching the worst 3 case.

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

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

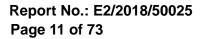
#### Note:

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 H position was reported.

### ANTENNA PORT CONDUCTED MEASUREMENT:

	CONDUCTED TEST				
		Peak Output Pov	ver, 20dB Band Wid	th	
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE	
	0 to 78	0,39,78	GFSK	DH5	
Bluetooth	0 to 78	0,39,78	π/4-DQPSK	2DH5	
	0 to 78	0,39,78	8-DPSK	3DH5	
		Ba	nd Edge		
Bluetooth	0 to 78	0,78	GFSK / 8-DPSK	DH5/3DH5	
		Frequen	cy Separation		
Bluetooth	Bluetooth 0 to 78 0,1,2 GFSK DH5		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	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 : <b>Vertical</b> )	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			
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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
EMI Test Receiver	R&S	ESCI 7	100950	2017/12/24	2018/12/23			
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	2017/08/30	2018/08/29			
LISN	Schwarzbeck	NSLK 8127	8127-648	2017/06/18	2018/06/17			
Test Software Farad		EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.			

# 6.3 EUT Setup

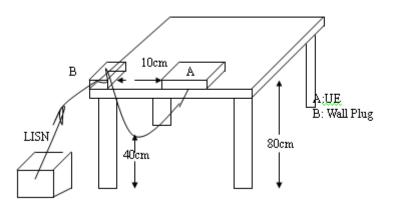
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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



#### **6.5 Measurement Procedure**

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

#### **6.6 Measurement Result**

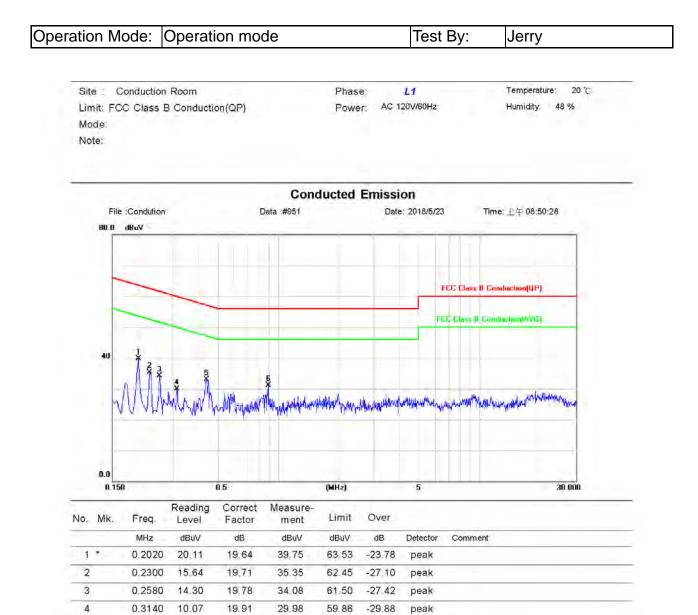
Note: Refer to next page for measurement data and plots. Note2: The \* reveals the worst-case results that closet to the limit

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# AC POWER LINE CONDUCTED EMISSION TEST DATA



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12.87

11.26

20 11

19.89

32 98

31.15

57.02

56.00

-24.04

-24.85

peak

peak

0.4420

0.8900

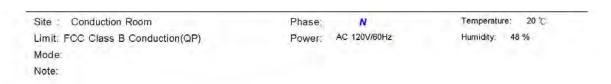
5

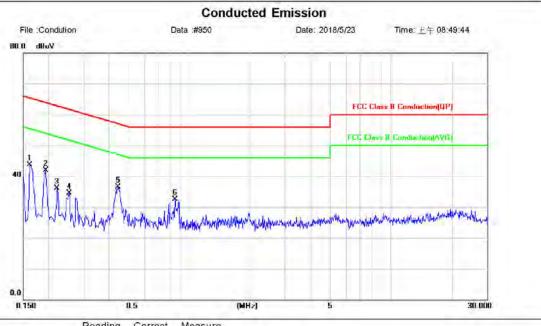
6

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No.	Mk.	Freq.	Level	Factor	measure- ment	Limit	Over		
-		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1620	24.16	19.64	43.80	65.36	-21.56	peak	
2	1	0.1940	22.28	19.62	41.90	63.86	-21.96	peak	
3	1	0.2220	16.41	19.67	36.08	62.74	-26.66	peak	
4		0.2540	14.77	19.75	34.52	61.63	-27.11	peak	
5	•	0.4460	16.47	20.10	36.57	56.95	-20.38	peak	
6		0.8500	12.62	19.90	32.52	56.00	-23.48	peak	
_									

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5

6

7

9

10

11

12

8 \*

0.2380

0.2380

0.4980

0.4980

2.7900

2.7900

14.0620

14.0620

32.40

14.80

35.00

28.30

26.00

16.10

33 10

25.00

0.03

0.03

0.04

0.04

0.30

0.30

0.81

0.81

32.43

14.83

35.04

28.34

26.30

16.40

33.91

25.81

62.17

52.17

56.03

46.03

56.00

46.00

60.00

50.00

-29.74

-37.34

-20.99

-17.69

-29.70

-29.60

-26.09

-24.19

QP

AVG

QP

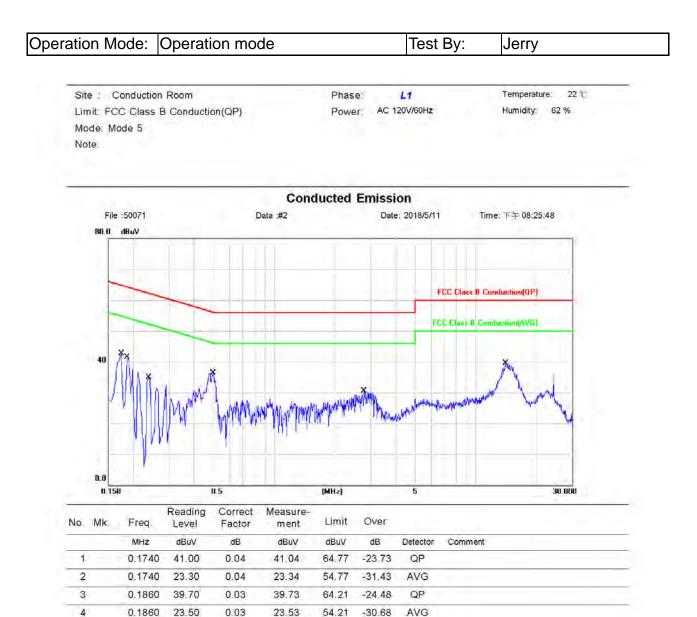
AVG

QP

AVG

OP

AVG



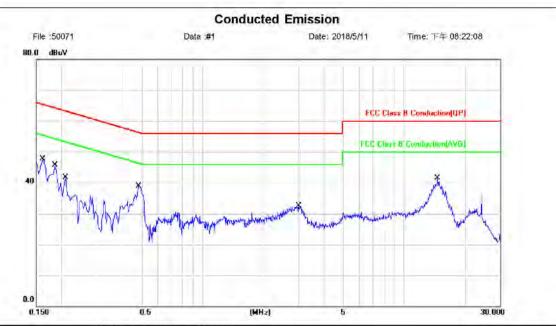
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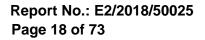
Site : Conduction Room Phase: Temperature: 22 °C N AC 120V/60Hz Humidity: 62 % Limit: FCC Class B Conduction(QP) Power: Mode: Mode 5 Note:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1620	43.30	0.12	43.42	65.36	-21.94	QP	
2	0.4	0.1620	27.20	0.12	27.32	55.36	-28.04	AVG	
3		0.1860	40.40	0.11	40.51	64.21	-23.70	QP	
4		0.1860	25.30	0.11	25.41	54.21	-28.80	AVG	
5		0.2100	36.60	0.11	36.71	63.21	-26.50	QP	
6	1.1	0.2100	21.20	0.11	21.31	53.21	-31.90	AVG	
7		0.4860	36.20	0.12	36.32	56.24	-19.92	QP	
8	•	0.4860	29.70	0.12	29.82	46.24	-16.42	AVG	
9		3.0100	27.70	0.26	27.96	56.00	-28.04	QP	
10		3.0100	16.80	0.26	17.06	46.00	-28.94	AVG	
11		14.7340	34.10	0.60	34.70	60.00	-25.30	QP	
12		14.7340	24.90	0.60	25.50	50.00	-24.50	AVG	

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#### PEAK OUTPUT POWER MEASUREMENT 7

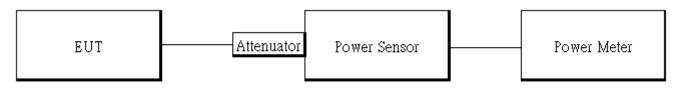
# 7.1 Standard Applicable

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 and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels.

### 7.2 Measurement Equipment Used

Conducted Emission Test Site							
EQUIPMENT	QUIPMENT MFR MODEL SEI		SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
Power Meter	Anritsu	ML2496A	1326001	2017/07/26	2018/07/25		
Power Sensor	Anritsu	MA2411B	1315048	2017/07/26	2018/07/25		
Power Sensor	Anritsu	MA2411B	1315049	2017/07/26	2018/07/25		
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25		
Notebook	Lenovo	L420	S0011721	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.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
- 4. Record the max. reading.
- 5. Repeat above procedures until all default test channel is completed.

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#### 7.5 Measurement Result

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

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)				
0	2402	6.63	4.603	1000				
39	2441	7.46	5.572	1000				
78	2480	7.20	5.248	1000				

1M BR mode (	Average):
	Max. Outp

СН	Freq. (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5.25	3.350	1000
39	2441	6.19	4.159	1000
78	2480	5.93	3.917	1000

2M EDR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5.65	3.673	125
39	2441	6.10	4.074	125
78	2480	6.03	4.009	125

2M EI	)R moo	de (A	Average	e):

СН	Freq. (MHz)	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	1.90	1.549	125
39	2441	2.43	1.750	125
78	2480	2.36	1.722	125

3M EDR mode (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	5.92	3.908	125
39	2441	6.40	4.365	125
78	2480	6.24	4.207	125

3M EDR mode (Average):

СН	Freq. (MHz)	Max. Avg.Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	1.91	1.552	125
39	2441	2.44	1.754	125
78	2480	2.26	1.683	125

NOTE: cable loss as 11.5dB that offsets in the spectrum

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

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#### 20dB BANDWIDTH MEASUREMENT 8

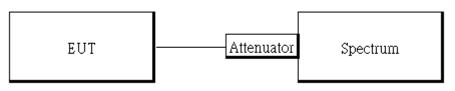
# 8.1 Standard Applicable

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

### 8.2 Measurement Equipment Used

	Cond	ucted Emission Te	st Site		
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent		MY51440113		2018/06/20
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Notebook	Lenovo	L420	S0011721	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.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set the spectrum analyzer as RBW=10 kHz (1 % of 20 dB Bandwidth.), VBW = 30 kHz, Span= 3MHz, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
- 5. Mark the peak frequency and -20dB (upper and lower) frequency
- 6. Turn on the 99% bandwidth function, max reading.
- 7. Repeat above procedures until all test default channel is completed.

### 8.5 Measurement Result

GFSK	Σ.		π/4-D	QPSK		8-DPS	SK	
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	0.925	0.62	Low	1.324	0.88	Low	1.309	0.87
Mid	0.939	0.63	Mid	1.322	0.88	Mid	1.309	0.87
High	0.925	0.62	High	1.323	0.88	High	1.308	0.87

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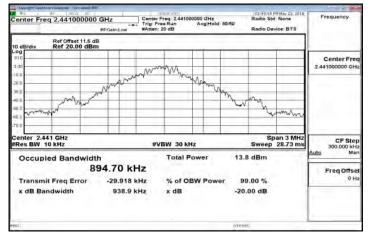
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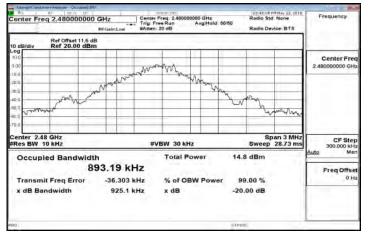
# **OBW CH-Low (GFSK mode)**



# CH-Mid (GFSK mode)



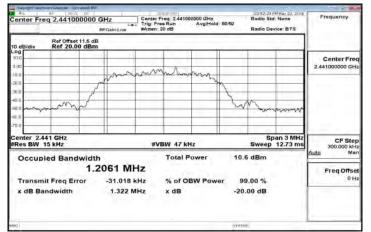
# CH-High (GFSK mode)



# CH-Low (π/4-DQPSK mode)



# CH-Mid (π/4-DQPSK mode)



# CH-High (π/4-DQPSK mode)

Center Fre	q 2.48000000	Trig	Free Run AvgiHold n: 20 dB	50/50 Ra	dio Std: None dio Device: BTS	Frequency
10 dB/div	Ref Offset 11.5 dl Ref 20.00 dBn				- 0	
10.0 0.00		man	manna			Center Free 2.480000000 GH
20 0 30 0 40 0	et			7		
sa u ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man			mm	runna	-
Center 2.48 Res BW 1			VBW 47 kHz	SI	Span 3 MHz weep 12.73 ms	CF Ste
Occupi	ed Bandwidt 1.	h 2085 MHz	Total Power	11.7 dl	Bm	Auto Man
Transmi x dB Bar		-38.579 kHz 1.323 MHz	% of OBW Powe x dB	er 99.00 -20.00	1.1.1	Freq Offse 0H
80				=7#105		

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488

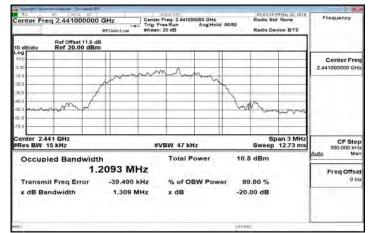
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www.tw.sgs.com
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#### CH-Low (8-DPSK mode)

Expedit Space	Ar Story Document		1.2	1:2 :MT			02-50-401	14 May 23, 2018	E Frequency	
Center Fre	q 2.4020000	00 GHz		req: 2.4020	AvgiHald	1 60/60	Radio Sto Radio De	I: None	Frequen	cy.
10 dB/div	Ref Offset 11.5 Ref 20.00 de							-1		
100 100 100 -100			mm		mary				Center 2.40200000	
-30.0 -40.0 -50.0 -60.0	mmu	/				J.	m.	www		
-70 0 Center 2.4 #Res BW 1			#V	BW 47 k	Hz			an 3 MHz 12.73 ms	300.00	
Occupi	led Bandwid			Total F	ower	10	.0 dBm		Aute	Ma
	it Freq Error ndwidth	-32.504 1.309 (	kHz	% of O x dB	BW Pow		99.00 %. ).00 dB		Freq Offse 0 H	
11							105		-	_

### CH-Mid (8-DPSK mode)



### CH-High (8-DPSK mode)

Center Freq 2.48000000		Center Freq. 2.4800 Trig: Free Run #Atten: 20 dB	00000 GHz AvgiHold: 50/50	Radio Std Radio Dev		Frequency
10 dB/div Ref 20.00 dB					= 0	
100	man	man	m			Center Free 2.480000000 GH:
30.0			- M			
40.0 51.0				m	-	
70.α						
Center 2.48 GHz #Res BW 15 kHz		#VBW 47 k	Hz		an 3 MHz 12.73 ms	CF Step 300.000 kH
Occupied Bandwid	th 2093 MH	Total F	Power 1	1.9 dBm		Auto Mar
Transmit Freq Error	-46.478 kH	z % of O	BW Power	99.00 %		Freq Offse 0 H
eio				04102		

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# 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

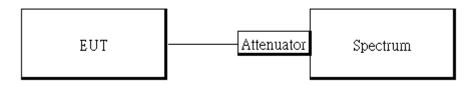
#### 9.1 Standard Applicable

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

#### 9.2 Measurement Equipment Used

	Cond	ucted Emission Te	st Site		
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Notebook	Lenovo	L420	S0011721	N/A	N/A

#### 9.3 Test SET-UP



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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 ANSI C63.10:2013.
- 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 ANSI C63.10:2013.
- 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.

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# Hopping mode BR Band Edge CH-Low

	Lifetimity - Smalld 2	-						
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tart 2.3100				-			2000 GHz	CFSte
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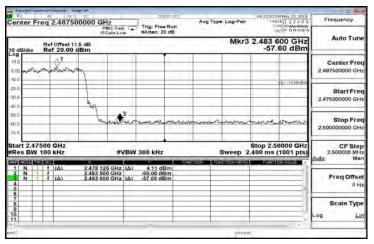
# BR Band Edge CH-High

228	24-09140 PM May 23, 2010		-	2192.0			134	Hanny Same - Same	Splatter	PL	
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							?	M	TΛ	0	10.0
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-		=retus								1	80

# EDR Band Edge CH-Low

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Scale Typ					-	-		-			-	-	6 7 8 9 10

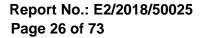
# EDR Band Edge CH-High



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# Non-Hopping BR Band Edge CH-Low

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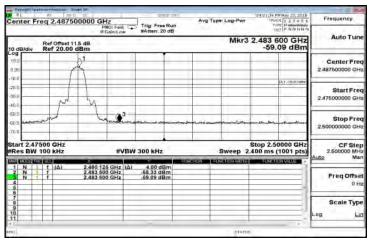
# BR Band Edge CH-High

Frequency	102-4030 PM May 23, 2018 TRACE 1, 2, 3 + 5 + Type N M N N N Oct P, N N N N N	Type: Log-Pwr		ree Rur	1 2	NO: Fest	00000 G	2.4875		ente
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Start Free 2.475000000 GH	Di vi il az din						Ţ	1		10.0 20.0 
Stop Free 2.500000000 GH	Bainstington attend			anten fun	-	<b>1</b> <sup>3</sup>	1	m	anter quantum	40.0. 50.0. 60.0.× 70.0
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Freq Offse				dBm dBm dBm	4) 8,13 -57.77 -67.83	25 GHz 1/ 00 GHz 00 GHz	2,480 13 2,483 50 2,483 60	[Δ)		1 1 1
	195									67

# EDR Band Edge CH-Low

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Start Fre 2.310000000 GH	DL1-17.72 dBm										-10.0
Stop Fre 2 42000000 GH	-	(2) 	3	~~~~·			مرد مرد العام الع			y-alicetado	50.0 60.0
CF Ste 11.000000 MH Auto Ma	2000 GHz 1001 pts)	53 ms (	ep 10	S	Bing	300 kHz	#VBW		kHz	2.31000 BW 100	#Re
Freq Offse 0 F					-	2.28 dB -56.59 dB -59.63 dB	GHZ (A) GHZ GHZ	2.402 10 2.399 90 2.390 00	[Δ)		12345
Scale Typ											6 7 8 9 10

# EDR Band Edge CH-High



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

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06127254	1944	ype: Log-Pwr	Avg	rig: Free Ru		PMO: Fast	00000 G			Cent
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-	alar-aa waa	munun		Alphania			1407-2014 M			50.0 60.0
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				6.29 dBm	(A)	03 0 GHz	2.403			2345
										6 7 8
	3 0 GHz 29 dBm	6.29 dBm 1 	Type: Log-Per Type: Log-Per Mkr1 2.403 0 GHz 6.29 dBm 1 6.29 dBm 1 6.29 dBm 5 6.29 dBm 5 6.29 dBm 6 6 6 6 6 6 6 6 6 6 6 6 6	Avg Type: Log-Pwr Mkr12:403 0 GH2 6.29 dBm 1 1 1 1 1 1 1 1 1 1 1 1 1	Avg Type: Log-Pwr         "Model [] 2.1 & 3 & 1           Trig: Free Run #Atten: 20 dB         "Model [] 2.1 & 3 & 1           Mkr1 2.403 0 GHz         G.29 dBm           1         1           4         1  <	Avg Type: Log-Pwr ************************************	Hz         Avg Type: Log-Per         "NetCl [2] 23 # 3 #           Gain Low         Trig: Free Run Edin Low         NetCl [2] 23 # 3 #           Mixt 12, 20 dB         Mixt 12, 20 dB           Mixt 12, 20 dB         Stop 3, 000 GHz           #VBW 300 kHz         Stop 3, 000 GHz           Stop 3, 000 GHz         Stop 3, 000 GHz           Stop 3, 000 KHz         Stop 3, 000 GHz	BOOD GH2         Care care         Avg Type Log-Per         Care care           BMO Feat         Trig: Free Run Hitter. 20 off         Avg Type Log-Per         Mice List as a mice of hitter. 20 off           6 dB         Mkr1 2.403 0 GH2         6.29 dBm           6 dB         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0           1         0         0	Issection         Area training         Area trainin	err Freg 1,515000000 GHz (FEahLow)         Trig: Free Run Avg Type: Log-Perr Trig: Free Run Avg Type: Log-Perr

### Ch Low 3GHz – 26.5GHz (BR Mode)

102-47:30 PM May 23, 2018 TRACE 1 2 3 4 5 5								
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		_	300 kHz	#VBW		0 kHz	BW 10	Re
FUNCTION VALUE			-41.18 dE	GHz (Δ)	3.211			2345
								6 7 8 9
		1	-			-		10
Hz Bm Hz SHz ots)	1 3.211 5 G -41.18 df	Mkr1 3.211 5 G -41.18 df 	Mkr1 3.211 5 G -41.18 df	Mkr1 3.211 5 G -41.18 df -41.18 df 	Mkr1 3.211 5 G -41.18 df	Its dB         Mkr1 3.211 5 G           dBm         -41.18 dE           dBm </td <td>Mkr1 3.211 5 G         Mkr1 3.211 5 G           ef 0ffset 11.5 dB         -41.18 dE           ef 20.00 dBm         -41.1</td> <td>Ref Offset 115 dB         Mkr1 3.211 5 G           Jaiw         Ref 20.00 dBm         -41.18 dB           1        </td>	Mkr1 3.211 5 G         Mkr1 3.211 5 G           ef 0ffset 11.5 dB         -41.18 dE           ef 20.00 dBm         -41.1	Ref Offset 115 dB         Mkr1 3.211 5 G           Jaiw         Ref 20.00 dBm         -41.18 dB           1

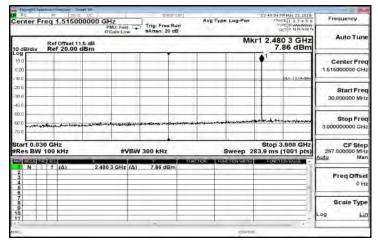
### Ch Mid 30MHz – 3GHz (BR Mode)

ADE 1 2 7 2 5 4	TN	e: Log-Pwr	Ave	Run	Trig: Free	P	PMO: Fee					en P
		MH									B/div	
	<b>†</b> <sup>1</sup>										-	10.0
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****	hubiyan	and the second second			allen Periopus					-Joghor A		-40.0 60.0 60.0
(1001 pts)	283.9 ms		1010041		300 kHz	VBW :	#1		kHz	V 100	s BV	Star #Re
				am	6.36 di	(A)	41 6 GHz	2.4			N	2345
		_							-		_	678
	Arch 23 4 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	6.36 dBm	Type: Log-Pwr         Model []         1.2.8.8         Trace []         1.2.8.8         Trace []         1.2.8.8         Trace []         1.0.8.8          1.0.8.8         Tra	Avg Type Log-Per Mkr1 2.13 # 3 # Mkr1 2.441 6 GH2 6.36 dBm 1 1 1 1 1 1 1 1 1 1 1 1 1	Avg Type: Log-Per         Theory (1,23,24,32)           Bundon (1,23,24,32)         Theory (1,23,24,32)           Mkr1 2.441 6 GHz 6,36 dBm         Mkr1 2.441 6 GHz 6,36 dBm           Image: Comparison of the state	Arg Type: Log-Pwr RAtten: 20 dB         The C [ ] 2.3 ± 8 ± Tree [ ] 2.5 ± 8 ± Tree [ ] 1.3 ± 8 ± S.3 ± 1 ± 10 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± Tree [ ] 1.3 ± 8 ± S.3 ± 10 ± S.3 ± 10 ± S.5 ± 10 ± S	Avg Type: Log-Per Tract [1,24,85 Avg Type: Log-Per Tract [1,25,85	HZ         Avg Type: Log-Xer         Med El 1.2.8.55           PROF Patt Market 20 dB         Avg Type: Log-Xer         Med El 1.2.8.55           Mkr1 2.441 6 GHz         G.36 dBm           Image: Autom 20 dB         Image: Autom 20 dB           Mkr1 2.441 6 GHz         G.36 dBm           Image: Autom 20 dB         Image: Autom 20 dB           Mkr1 2.441 6 GHz         G.36 dBm           Image: Autom 20 dB         Image: Autom 20 dB           Image	Avg Type: Log:-Pirot         Bit Sold Hilling 72, and 12, as a 5 million 10, and 10, as a 5 million 10, as a 5 mil	1.515000000 GHz BMOLFAR         Trig: Free Run BAtten: 20 dB         Avg Type: Log-Per         Trig: Common Topic Trig: Free Run Batten: 20 dB           000feet 11 3 dB         Mkr1 2.441 6 GHz 6.36 dBm         6.36 dBm           1         1         1           1         1 <td>Freg 1.515000000 GHZ ING Fact         Trig: Free Run Beden Low         Avg Type: Log-Per         Index [] 1.2 a = 3 Trig: Free Run Beden Low           Ref Offset 11.6 gHz Ref 20.00 dBm         Mkr1 2.4d1 6 GHz 6.36 dBm         Mkr1 2.4d1 6 GHz 6.36 dBm           1         1         1</td> <td>Ref Offset 115 dB         Mkr1 2.441 6 GHz           Bridge Ref 20.00 dBm         Frig: Free Run Bediel Low           Index (1,2,2,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,</td>	Freg 1.515000000 GHZ ING Fact         Trig: Free Run Beden Low         Avg Type: Log-Per         Index [] 1.2 a = 3 Trig: Free Run Beden Low           Ref Offset 11.6 gHz Ref 20.00 dBm         Mkr1 2.4d1 6 GHz 6.36 dBm         Mkr1 2.4d1 6 GHz 6.36 dBm           1         1         1	Ref Offset 115 dB         Mkr1 2.441 6 GHz           Bridge Ref 20.00 dBm         Frig: Free Run Bediel Low           Index (1,2,2,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,3,

# Ch Mid 3GHz – 26.5GHz (BR Mode)

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Auto Tur	8 5 GHz		ARL		0 68	#Atten: 2	GaintLow			_	_
	22 dBm		IVIK						ef Offset 1 ef 20.00		10 dE
Center Fre					-		1				10.0
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	TAT-THE MEN	-	-	-	-				-	_	10.0
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3.000000000 GH										1	-30.0
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26.50000000 GH		_	-				-	-		_	70.0
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2.350000000 GH	(1001 pts)	2.246 s (	Sweep			300 kHz	#VBW			BW 10	
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# Ch High 30MHz – 3GHz (BR Mode)



# Ch High 3GHz – 26.5GHz (BR Mode)

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### Ch Low 30MHz – 3GHz (EDR Mode)

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# Ch Low 3GHz – 26.5GHz (EDR Mode)

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# Ch Mid 30MHz – 3GHz (EDR Mode)

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				3.06 dB	(Δ)	16 GHz	2.441						
											6 7 8 9		
		Ikr1 2.441 6 GHz           3.06 dBm           1           23.7 55 4 gs           5 ftop 3.000 GHz           283.9 ms (1001 pts)	Avg Type: Log-Per Time: (1, 2, 3, 2, 5, 4, 1, 1, 2, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	Run dt: Mixer Type: Log-Byer Time [] 2.3 × 5 × Time [] 2.3 × 5 × T	Trig: Free Run PArter: 20 dtl     Avg Type: Log-Rwn     Trig: Free Run Trig: Free Run Parter: 20 dtl       Mkr1 2.441 6 GHz 3.06 dBm       Image: Run Parter: Run Parte	Avg Type: Log-Pier Trig: Free Run Avg Type: Log-Pier Trig: Free	Hz         Avg Type: Log-Per         "nacc [:] 23 a 5 s           Gaint Low         Trig: Free Run Bitter: 20 dB         Mixed States         23 a 5 s           Mixed: [:] 23 a 5 s         Trig: Free Run Bitter: 20 dB         Mixed States         23 a 5 s           Mixed: [:] 23 a 5 s         Trig: Free Run Bitter: 20 dB         Mixed States         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1           Mixed: [:] 24 a 5 s         1         1         1         1           Mixed: [:] 24 a 5 s         1         1         1         1           Mixed: [:] 24 a 5 s         1         1         1         1           Mixed: [:] 24 a 5 s         1         1         1         1           Mixed: [:] 24 a 5 s	Bodd         Constraint         Constraint <td>Image         Image         <th< td=""><td>Bit Discount         Discount</td><td>err Freg 1.515000000 GHz (FEGNLIOW)         Trig: Free Run Patter: 20 db         Avg Type: Log-Per US         Tract (): 21 as to the second to the s</td></th<></td>	Image         Image <th< td=""><td>Bit Discount         Discount</td><td>err Freg 1.515000000 GHz (FEGNLIOW)         Trig: Free Run Patter: 20 db         Avg Type: Log-Per US         Tract (): 21 as to the second to the s</td></th<>	Bit Discount         Discount	err Freg 1.515000000 GHz (FEGNLIOW)         Trig: Free Run Patter: 20 db         Avg Type: Log-Per US         Tract (): 21 as to the second to the s		

# Ch Mid 3GHz – 26.5GHz (EDR Mode)

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# Ch High 30MHz – 3GHz (EDR Mode)

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# Ch High 3GHz – 26.5GHz (EDR Mode)

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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.

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**

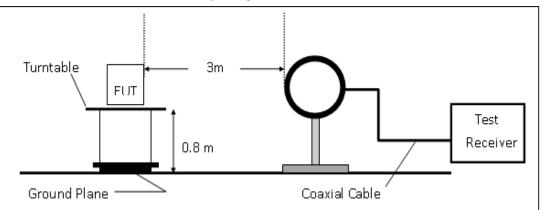
	966 Chamber									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	2017/10/27	2018/10/26					
Horn Antenna	Schwarzbeck	BBHA9120D	1341	2017/05/31	2018/05/30					
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25					
3m Site NSA	SGS	966 chamber D	N/A	2018/07/06	2019/07/05					
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/04/10					
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	2017/10/27	2018/10/26					
Pre-Amplifier	EMC Instru- ments	EMC9135	980234	2017/12/26	2018/12/25					
Pre-Amplifier	EMC Instru- ments	EMC12630SE	980271	2017/12/26	2018/12/25					
Attenuator	Marvelous	WATT-218FS-10	RF246	2017/12/26	2018/12/25					
Highpass Filter	Micro Tronics	BRM50701-01	G008	2017/12/26	2018/12/25					
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2017/12/26	2018/12/25					
Coaxial Cable	Huber Suhner	EMC106-SM-SM -7200	150703	2017/12/26	2018/12/25					
Notebook	Lenovo	L420	S0012467	N/A	N/A					

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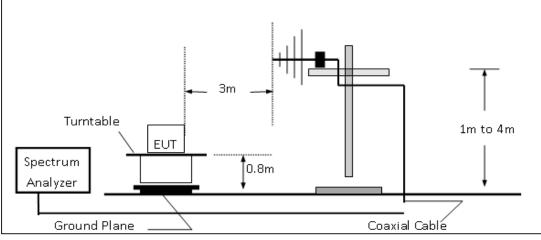


#### 10.3 Test SET-UP

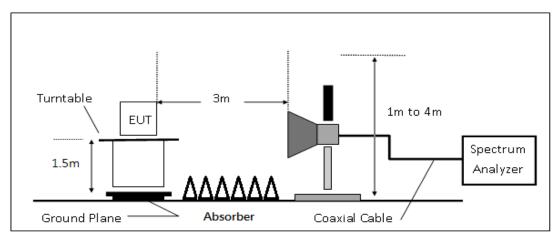
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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# **10.4 Measurement Procedure**

#### **Radiated Emission**

- 1. The testing follows ANSI C63.10:2013.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 0.8m for frequency> 1GHz above ground plan.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Use the follow spectrum analyzer setting:
  - (1) Span = wide enough to fully capture the emission being measured
  - (2) RBW = 1 MHz for  $f \ge 1$  GHz, 100 kHz for f < 1 GHz, VBW  $\ge$  RBW, Sweep = auto, Detector function = peak, Trace = max hold
  - (3) For average measurement: use duty cycle correction factor method per 15.35(c)

Duty Cycle = On time/100 milliseconds

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

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

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

- 6. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 7. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 8. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 9. Repeat above procedures until all frequency of the interest measured were complete.

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# **10.5 Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

### FS = RA + AF + CL - AG

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

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

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

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

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

#### 10.7 Measurement Result

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

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

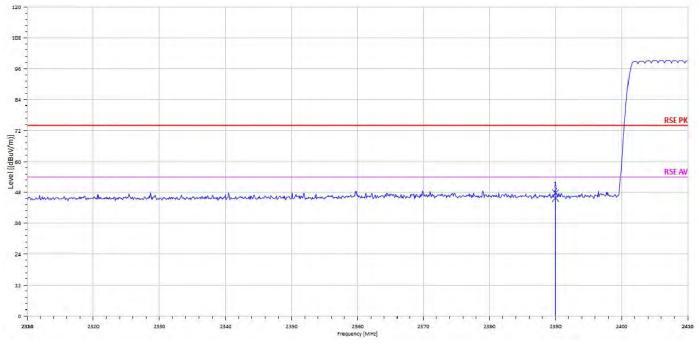
peration Mode : undamental Frequency : peration Band : UT Pol. :	BT BR Hopping 2402 MHz BE CH Low H	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :	2018/5/22 22.7deg_C/57RH Jerry Vertical	
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			RSEA	
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Freq.	Detector	Spectum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	54.14	-6.84	47.30	74	-26.70
2390.00	Average	52.06	-6.84	45.21	54	-8.79

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Operation Mode :	BT BR Hopping	Test Date :	2018/5/22
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Jerry
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

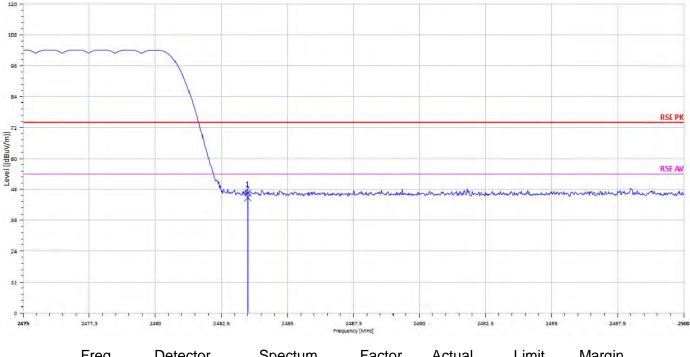


Freq.	Detector	Spectum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	54.65	-6.84	47.81	74	-26.19
2390.00	Average	52.57	-6.84	45.72	54	-8.28

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Operation Mode :	BT BR Hopping	Test Date :	2018/5/22
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Jerry
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

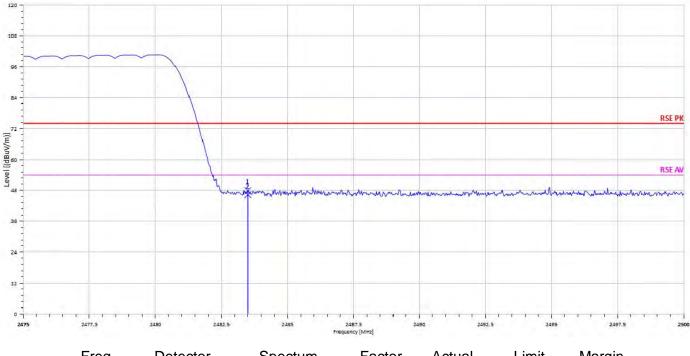


⊢req.	Detector	Spectum	Factor	Actual	Limit	iviargin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
2483.50	Peak	52.87	-6.38	46.49	74	-27.51	-
2483.50	Average	51.22	-6.38	44.84	54	-9.16	

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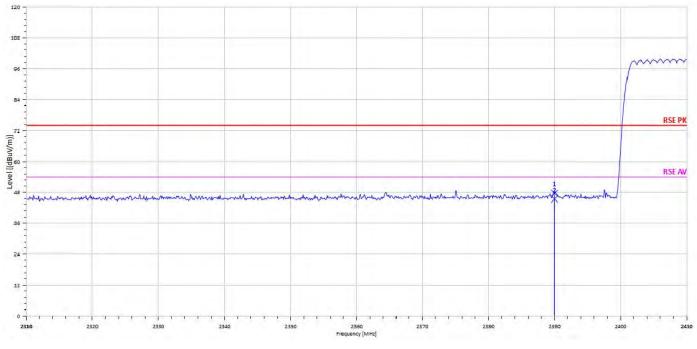
Operation Mode :	BT BR Hopping	Test Date :	2018/5/22
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH High	Test Engineer :	Jerry
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. Detector		Spectum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
2483.50	Peak	54.29	-6.38	47.90	74	-26.10	
2483.50	Average	52.63	-6.38	46.25	54	-7.75	



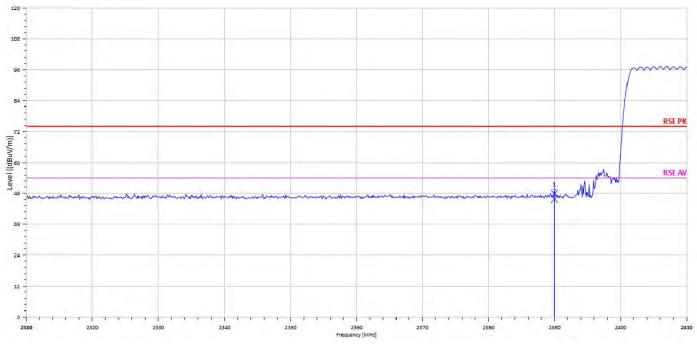
Operation Mode :	BT EDR Hopping	Test Date :	2018/5/22
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH Low	Test Engineer :	Jerry
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq.	Detector	Spectum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	54.51	-6.84	47.67	74	-26.33
2390.00	Average	52.25	-6.84	45.40	54	-8.60

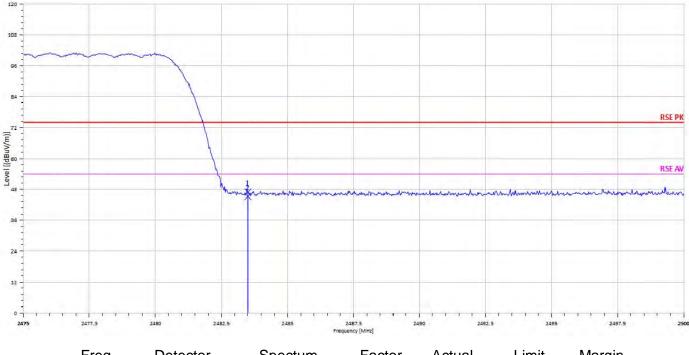


Fundamental Frequency : 2402 MHz Temp Operation Band : BE CH Low Test I	Date :2018/5/22b. / Humi. :22.7deg_C/57Engineer :JerrySurement Antenna Pol. :Horizontal	7RH
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Detector	Spectum	Factor	Actual	Limit	Margin
Mode	Reading Level		FS	@3m	
PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
Peak	54.84	-6.84	48.00	74	-26.00
Average	52.58	-6.84	45.73	54	-8.27
	Mode PK/QP/AV Peak	ModeReading LevelPK/QP/AVdBμVPeak54.84	ModeReading LevelPK/QP/AVdBµVdBPeak54.84-6.84	ModeReading LevelFSPK/QP/AVdBµVdBdBµV/mPeak54.84-6.8448.00	Mode         Reading Level         FS         @3m           PK/QP/AV         dBμV         dB         dBμV/m         dBμV/m           Peak         54.84         -6.84         48.00         74



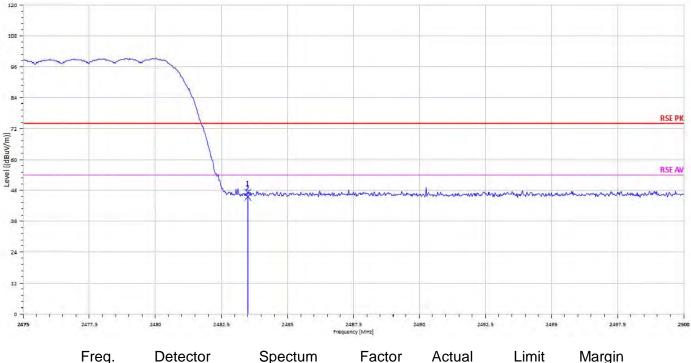


	Freq. Detector		Spectum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
	2483.50	Peak	53.34	-6.38	46.96	74	-27.04	,
	2483.50	Average	51.69	-6.38	45.30	54	-8.70	



Operation Mode :	BT EDR Hopping	Test Date :	2018
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.70
Operation Band :	BE CH High	Test Engineer :	Jerry
EUT Pol. :	Н	Measurement Antenna Pol. :	Horiz

8/5/22 deg\_C/57RH y zontal



⊢req.	Detector	Spectum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
2483.50	Peak	53.55	-6.38	47.17	74	-26.83	
2483.50	Average	51.86	-6.38	45.48	54	-8.52	



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

Funda	ition Mode amental Fre ition Band : Pol. :	equency :	BT BR 2402 MHz BE CH Low H	Test Date : Temp. / Humi. Test Engineer Measurement	:	2018/5/ 22.7dec Jerry : Vertical	<u>_</u> C/57R	Η
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2310	2320	2330	2340 2350	2360 : Frequency [MHz]	1 1 1 1 1 1	2390	2400	241
	Freq.	Detector	Spectur Booding L		Actual	Limit M	largin	

	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	55.18	-6.84	48.33	74	-25.67
2390.00	Average	52.76	-6.84	45.91	54	-8.09



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									RSE P
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			2350 2340 2350	2550 2340 2350 2 Prequer	2350 2340 2350 2560 2 rrequency [Mit2]	Frequency [MHz]	2350 2350 2350 2560 2370 2380 Frequency [MH2]	2350 2340 2350 2350 2370 2360 2350 requency [Mitz]	2350 2340 2350 2350 2370 2380 2350 2400 requency [MH2]

Detector	Spectum	Factor	Actual	Limit	Margin	
Mode	Reading Level		FS	@3m		
PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
Peak	53.89	-6.84	47.05	74	-26.95	
Average	51.81	-6.84	44.96	54	-9.04	
	Mode PK/QP/AV Peak	ModeReading LevelPK/QP/AVdBµVPeak53.89	ModeReading LevelPK/QP/AVdBµVdBPeak53.89-6.84	ModeReading LevelFSPK/QP/AVdBµVdBdBµV/mPeak53.89-6.8447.05	Mode         Reading Level         FS         @3m           PK/QP/AV         dBμV         dB         dBμV/m         dBμV/m           Peak         53.89         -6.84         47.05         74	Mode         Reading Level         FS         @3m           PK/QP/AV         dBμV         dB         dBμV/m         dBμV/m         dB           Peak         53.89         -6.84         47.05         74         -26.95

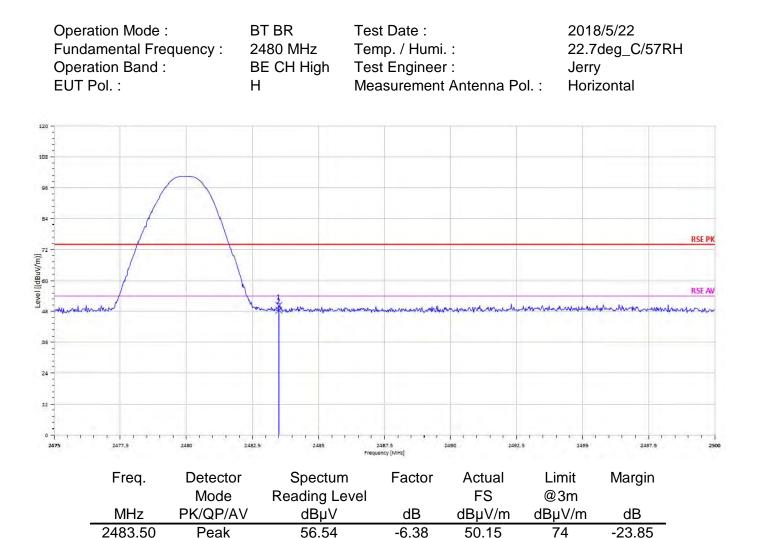


Fundar Operat	Dperation Mode : Fundamental Frequency : Dperation Band : EUT Pol. :		BT BR 2480 MHz BE CH High H	Temp. / n Test Eng	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :			7RH
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Average



-6.38

48.50

54

-5.50

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.

54.88



## Report No.: E2/2018/50025 Page 46 of 73

Fundan Operati	ndamental Frequency : eration Band :		peration Mode : undamental Frequency : peration Band : UT Pol. :		BT EDR 2402 MHz BE CH Lov H	Ter v Tes	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :			2018/5/22 22.7deg_C/57RH Jerry Vertical		
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0   1   1   2310	<sup>2320</sup> Freq.	Detecto	2340 235 r Spec	Freq	2360 Juency [MHz] Factor	Actual	1 , , , , 360 Lin	2390	2400 largin	 24		

Detector	Spectum	Factor	Actual	Limit	Margin	
Mode	Reading Level		FS	@3m		
PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
Peak	55.22	-6.84	48.38	74	-25.62	
Average	52.96	-6.84	46.12	54	-7.88	
	Mode PK/QP/AV Peak	ModeReading LevelPK/QP/AVdBµVPeak55.22	ModeReading LevelPK/QP/AVdBµVdBPeak55.22-6.84	ModeReading LevelFSPK/QP/AVdBµVdBdBµV/mPeak55.22-6.8448.38	Mode         Reading Level         FS         @3m           PK/QP/AV         dBμV         dB         dBμV/m         dBμV/m           Peak         55.22         -6.84         48.38         74	Mode         Reading Level         FS         @3m           PK/QP/AV         dBμV         dB         dBμV/m         dBμV/m         dB           Peak         55.22         -6.84         48.38         74         -25.62



## Report No.: E2/2018/50025 Page 47 of 73

F	Dperation Fundame Dperation EUT Pol.	ntal Frequ Band :	lency :	BT EDR 2402 M⊦ BE CH L H		Tem Test	Date : p. / Humi Enginee surement		Pol. :	22.7 Jerry	3/5/22 deg_C/s / zontal	57RI	H
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2310	-1 - 1 - 1 - 1	1 1 1 1	2330	2340	2350			2370	2380	2390	- <u>1 - 1 - 1</u>	400	<del></del>

Freq.	Detector	Spectum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Peak	54.06	-6.84	47.21	74	-26.79
2390.00	Average	51.79	-6.84	44.95	54	-9.05



MHz

2483.50

2483.50

PK/QP/AV

Peak

Average

dBµV

55.38

53.69

	Operation Fundamer Operation EUT Pol. :	ntal Freq Band :	uency :	BT EI 2480 BE C H	MHz	Test Dat Temp. / Test Eng Measure	Humi. : jineer :	ntenna P		2018/5/ 22.7deg Jerry Vertical	g_C/57	RH
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dB

-6.38

-6.38

dBµV/m

49.00

47.31

dBµV/m

74

54

dB

-25.00

-6.69

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## Report No.: E2/2018/50025 Page 49 of 73

57RH	018/5/22 2.7deg_C erry prizontal	22. Jer		st Date : mp. / Humi st Enginee asurement	Ter Tes	EDR 0 MHz CH High	: 248	quency	ntal Fred Band :	Operation Fundame Operation EUT Pol.
RSEPK									-	
RSEAN						3.				mhurmhendergent
A month of the set										
97.5 22	95 2	5 2495	490 2493			2485	2482.5	2480	1 1 1 1	475 24
n	Marg	Limit @3m	Actual FS	Factor	um	Spectu Reading		Deteo Moo	req.	F

·	Mode	Reading Level		FS	@3m	Ū
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Peak	54.38	-6.38	47.99	74	-26.01
2483.50	Average	52.69	-6.38	46.30	54	-7.70



## **Radiated Spurious Emission Measurement Result:**

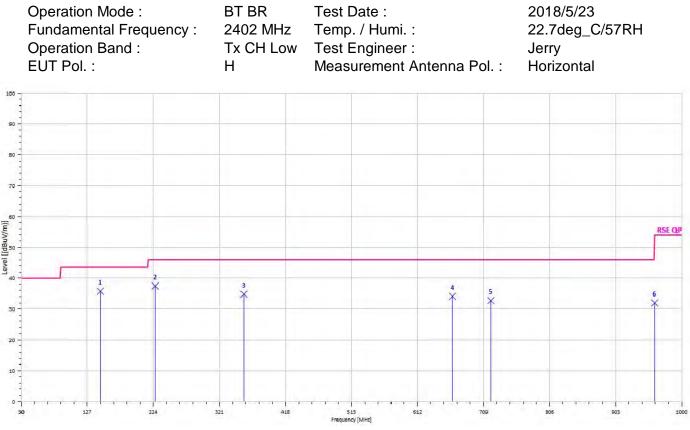
## For Frequency form 30MHz to 1000MHz

Fundame Operatio	Dperation Mode : Fundamental Frequency : Dperation Band : EUT Pol. :		BT BR 2402 MHz Tx CH Low H	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Po	Jerry	22.7deg_C/57RH Jerry		
						RS		
1 ×	2 ×	3	4		5 X	6 ×		
	27 2	1 1 1 1	321 418	515 512 7 Frequency [MHz]	709 806 ·	903		

Freq.	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
60.07	Peak	51.48	-18.00	33.48	40	-6.52
147.37	Peak	50.73	-15.99	34.74	43.5	-8.76
225.94	Peak	53.65	-18.10	35.55	46	-10.45
388.90	Peak	45.01	-13.13	31.88	46	-14.12
777.87	Peak	37.67	-6.59	31.08	46	-14.92
963.14	Peak	36.67	-4.34	32.33	54	-21.67



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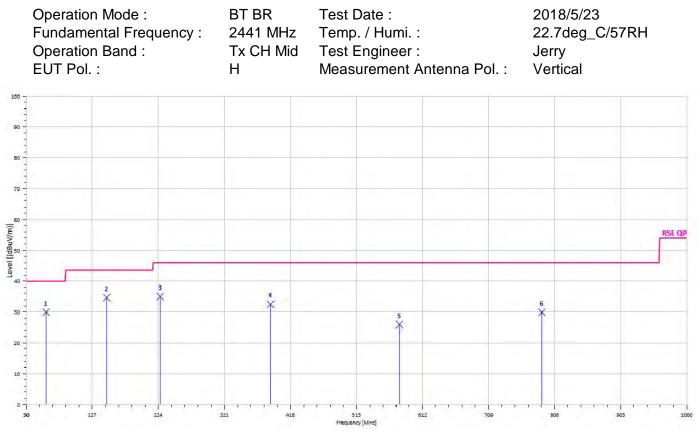
Freq.	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
146.40	Peak	51.78	-16.05	35.73	43.5	-7.77
226.91	Peak	55.46	-18.01	37.45	46	-8.55
356.89	Peak	48.91	-14.10	34.81	46	-11.19
663.41	Peak	42.42	-8.32	34.10	46	-11.90
719.67	Peak	40.28	-7.53	32.76	46	-13.24
960.23	Peak	36.44	-4.46	31.98	54	-22.02

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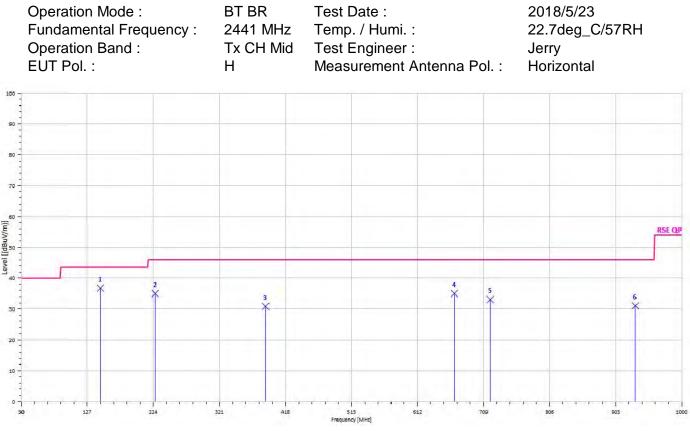
## Report No.: E2/2018/50025 Page 52 of 73



Freq.	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
59.10	Peak	47.89	-17.92	29.97	40	-10.03
148.34	Peak	50.59	-15.93	34.66	43.5	-8.84
226.91	Peak	53.00	-18.01	35.00	46	-11.00
388.90	Peak	45.63	-13.13	32.50	46	-13.50
578.05	Peak	35.01	-9.03	25.97	46	-20.03
787.57	Peak	36.73	-6.81	29.91	46	-16.09



## Report No.: E2/2018/50025 Page 53 of 73



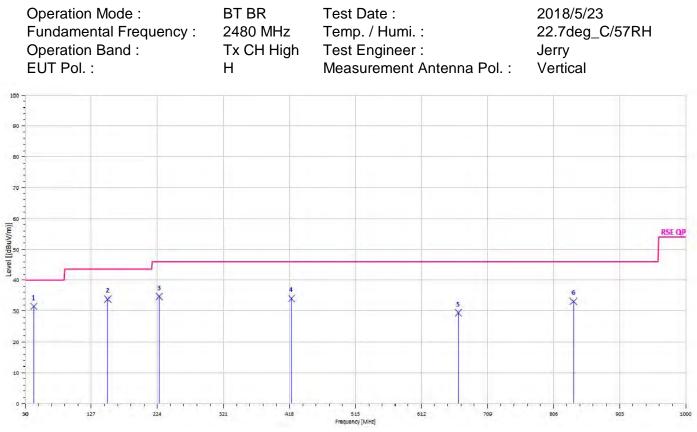
Freq.	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
146.40	Peak	52.84	-16.05	36.79	43.5	-6.71
226.91	Peak	53.01	-18.01	35.00	46	-11.00
388.90	Peak	43.97	-13.13	30.84	46	-15.16
666.32	Peak	43.51	-8.48	35.03	46	-10.97
718.70	Peak	40.57	-7.50	33.07	46	-12.93
932.10	Peak	35.70	-4.67	31.02	46	-14.98

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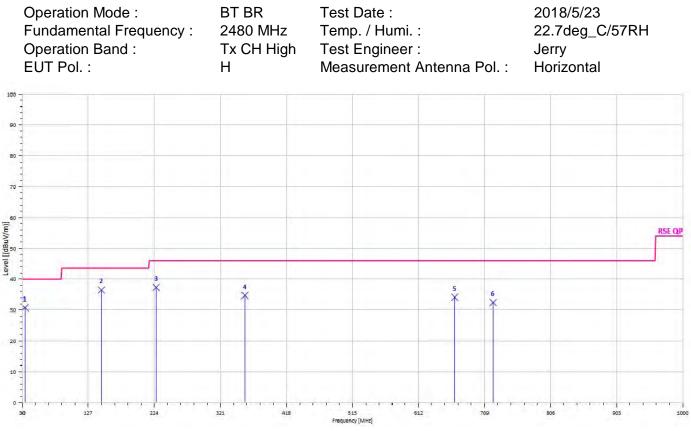
Freq.	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
42.61	Peak	48.69	-17.18	31.51	40	-8.49
151.25	Peak	49.62	-15.79	33.83	43.5	-9.67
226.91	Peak	52.72	-18.01	34.71	46	-11.29
420.91	Peak	46.15	-12.09	34.06	46	-11.94
666.32	Peak	37.89	-8.48	29.41	46	-16.59
835.10	Peak	38.98	-5.86	33.13	46	-12.87

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Freq.	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	Peak	48.78	-18.03	30.74	40	-9.26
146.40	Peak	52.53	-16.05	36.48	43.5	-7.02
226.91	Peak	55.37	-18.01	37.36	46	-8.64
356.89	Peak	48.83	-14.10	34.73	46	-11.27
665.35	Peak	42.56	-8.43	34.14	46	-11.86
721.61	Peak	40.00	-7.56	32.43	46	-13.57



## **Radiated Spurious Emission Measurement Result:**

## For Frequency above 1 GHz

4804.00

4804.00

Peak

Average

Funda Operat	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		2402 MHz Tx CH Low	Test Date : Temp. / Humi. Test Engineer Measurement .	:	22.7d Jerry	2018/5/23 22.7deg_C/57RH Jerry Vertical		
80									
								RSE PK	
								RSE AV	
0 0 1 1 1	×								
10									
10 								7 1 1	
1000	Freq.	Detector Mode	Spectum Reading Le	Frequency [MH2] Factor	Actual FS	Limit @3m	Margin	26	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		

-1.16

-1.16

48.17

46.51

74

54

-25.83

-7.49

49.32

47.67



Average

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Fund Oper	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		BT BR 2402 MHz Tx CH Low H	Test Date : Temp. / Humi. Test Engineer Measurement	-			
2								
								RSE P
, <u> </u>								RSE A
	117							
			· · · · · · ·					
) <del>-</del>								
ייך <sup>נ</sup> 1000	3550	6100 865		Frequency [MHz]	16300 1885		23950	2
	Freq.	Detector Mode	Spectun Reading Le		Actual FS	Limit @3m	Margin	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
-	4804.00	Peak	46.96	-1.16	45.80	74	-28.20	

45.31

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-1.16

44.15

54

-9.85



Average

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	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		BT BRTest Date :2441 MHzTemp. / Humi. :Tx CH MidTest Engineer :HMeasurement Antenna Pol. :			22.7d Jerry	2018/5/23 22.7deg_C/57RH Jerry Vertical		
100 -									
80									
70								RSE PK	
(m/)] 8								RSE AV	
ل(m//m)] المراجع [[dBu//m]] المراجع ال المراجع المراجع	*								
30									
20 -									
10									
0 - 100	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6100 865	0 11200	13750 Frequency [MHz]	16300 1885	io 21400	23950	26500	
	Freq.	Detector Mode	Spectum Reading Lev	Factor	Actual FS	Limit @3m	Margin		
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
	4882.00	Peak	50.54	-0.70	49.83	74	-24.17		

-0.70

48.18

54

-5.82

48.88



Average

## Report No.: E2/2018/50025 Page 59 of 73

Fund Oper	Dperation Mode : Fundamental Frequency : Dperation Band : EUT Pol. :		BT BRTest Date :2441 MHzTemp. / Humi. :Tx CH MidTest Engineer :HMeasurement Antenio			2018/5/23 22.7deg_C/57RH Jerry tenna Pol. : Horizontal			
0									
30 -									
10								RSE PK	
50								RSE AV	
50	***								
50									
20									
10									
0 - 1 1 1 1000	3550	5100 8650		13750 Frequency [MHz]	16300 1885		23950	2650	
	Freq.	Detector Mode	Spectur Reading L		Actual FS	Limit @3m	Margin		
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
	4882.00	Peak	47.22	-0.70	46.52	74	-27.48		

-0.70

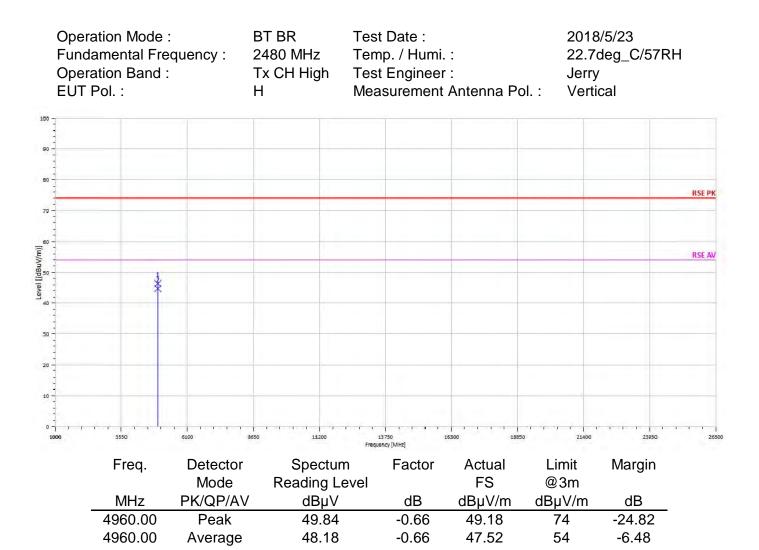
44.86

54

-9.14

45.56





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Average

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Fund Oper	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		3T BR 2480 MHz Fx CH High H	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :			2018/5/23 22.7deg_C/57RH Jerry Horizontal		
100									
90 - - - -									
70								RSE PK	
60 [(W/)	_							RSE AV	
Level [[dBuV/m]]	17								
40									
20 -					· · · · ·				
10									
0	3550	6100 865	0 11200	13750 Frequency [MHz]	16300 1885	0 21400	23950	26500	
	Freq.	Detector Mode	Spectum Reading Le		Actual FS	Limit @3m	Margin		
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
	4960.00	Peak	47.02	-0.66	46.36	74	-27.64		

-0.66

44.71

54

-9.29

45.37



# 11 FREQUENCY SEPARATION

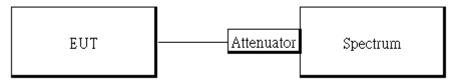
#### **Standard Applicable** 11.1

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.

#### **Measurement Equipment Used** 11.2

Conducted Emission Test Site						
EQUIPMENT MFR MODEL SERIAL TYPE NUMBER NUMBER				LAST CAL.	CAL DUE.	
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20	
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25	
Notebook	Lenovo	L420	S0011721	N/A	N/A	

#### **Test Set-up** 11.3



#### 11.4 **Measurement Procedure**

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

to Tune
ter Fred
art Free
op Free
CF Step 0.000 kH Mar
q Offse 0 H
ale Type

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# 12 NUMBER OF HOPPING FREQUENCY

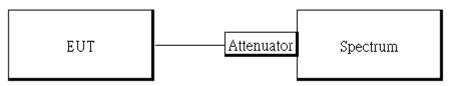
### 12.1 **Standard Applicable**

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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20	
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25	
Notebook	Lenovo	L420	S0011721	N/A	N/A	

### **Test Set-up** 12.3



### 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
- 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

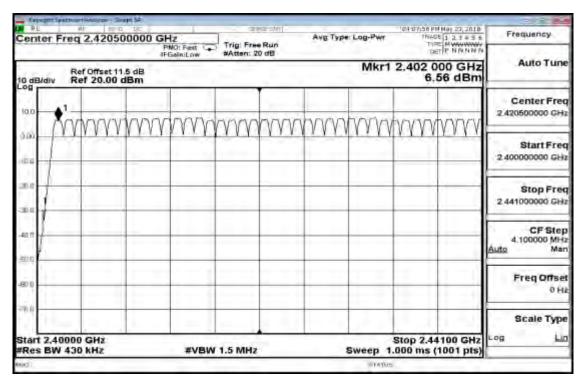
	Channel Number	Limit
2.4 GHz – 2.441GHz	40	
2.441 GHz – 2.4835GHz	39	>15
2.4GHz ~2.4835GHz	(40+39) = 79	

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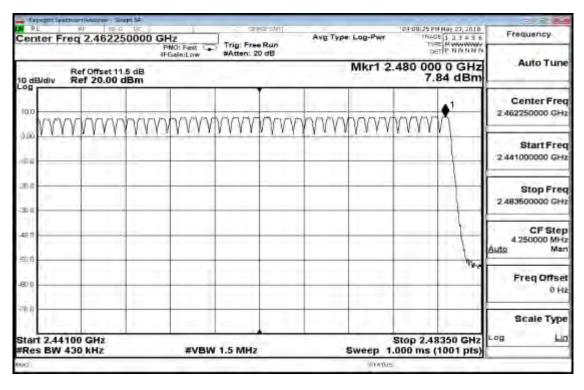


## **Channel Number**



## 2.402GHz - 2.441GHz

## 2.441GHz - 2.4835GHz



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# 13 TIME OF OCCUPANCY (DWELL TIME)

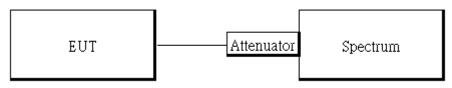
## 13.1 Standard Applicable

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 TYPE					CAL DUE.	
Spectrum Analyzer	Agilent	N9010A	MY51440113	2017/06/21	2018/06/20	
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25	
Notebook	Lenovo	L420	S0011721	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.
- 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.

#### 13.5 **Tabular Result of the Measurement**

## GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result	Limit
Channel	PACKETTIPE	(ms)	(ms)
	DH1	118.40	400ms
0	DH3	257.12	400ms
	DH5	301.23	400ms
	DH1	118.40	400ms
39	DH3	257.60	400ms
	DH5	302.61	400ms
	DH1	118.72	400ms
78	DH3	257.12	400ms
	DH5	301.23	400ms

## π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	2DH1	120.00	400ms
39	2DH3	257.60	400ms
	2DH5	302.61	400ms

## 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
	3DH1	120.00	400ms
39	3DH3	257.60	400ms
	3DH5	304.00	400ms

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

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## GFSK (1Mbps):

CH Low	DH1 time slot DH3 time slot DH5 time slot	=	0.370 * 1.607 * 2.824 *	(1600/2/79) * (1600/4/79) * (1600/6/79) *	31.6 =	118.40 (ms) 257.12 (ms) 301.23 (ms)
			2.024	(1000/0/10)	01.0 -	001.20 (110)
CH Mid	DH1 time slot	=	0.370 *	(1600/2/79) *	31.6 =	118.40 (ms)
	DH3 time slot	=	1.610 *	(1600/4/79) *	31.6 =	257.60 (ms)
	DH5 time slot	=	2.837 *	(1600/6/79) *	31.6 =	302.61 (ms)
CH High	DH1 time slot	=	0.371 *	(1600/2/79) *		118.72 (ms)
	DH3 time slot		1.607 *	(1600/4/79) *		257.12 (ms)
	DH5 time slot	=	2.824 *	(1600/6/79) *	31.6 =	301.23 (ms)
π/4 -DQPS	K (2Mbps):					
CH Mid	2DH1 time slot 2DH3 time slot 2DH5 time slot	=	0.375 * 1.610 * 2.837 *	(1600/2/79) * (1600/4/79) * (1600/6/79) *	31.6 = 31.6 = 31.6 =	120.00 (ms) 257.60 (ms) 302.61 (ms)

## 8-DPSK (3Mbps):

CH Mid	3DH1 time slot =	0.375 *	(1600/2/79) *	31.6 =	120.00 (ms)
	3DH3 time slot =	1.610 *	(1600/4/79) *	31.6 =	257.60 (ms)
	3DH5 time slot =	2.850 *	(1600/6/79) *	31.6 =	304.00 (ms)



GFSK (1Mbps) for AFH Mode						
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)			
20	DH5	150.61	400ms			
π/4 DQPSK (2Mbps) for AFH Mode						
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)			
20	2DH5	151.31	400ms			
8-DPSK (3Mbps) for AFH Mode						
Hopping Channel Number	PACKET TYPE	Measurement Result (ms)	Limit (ms)			
20	3DH5	152.00	400ms			

## GFSK (1Mbps):

DH5 time s =	2.824	(ms)	*	(800/6/20)	* 8 =	150.61	(ms)
π/4 -DQPSK (2Mbp							
2DH5 time =	2.837	(ms)	*	(800/6/20)	* 8 =	151.31	(ms)
8-DPSK (3Mbps):							
3DH5 time =	2.850	(ms)	*	(800/6/20)	* 8 =	152.00	(ms)

#### 13.6 **Measurement Result**

Note: Refer to next page for plots.

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# **CH-Low DH1**

# **CH-Mid DH1**

Corpupati Calastroiner Grangezar - Slovatt SP		2 2 <b>24</b>	Keywant Spath an House Sangt Sh PL at Sa G DC					
	Vpe: Log-Pwr TRACE 1: 2 3 5 5 1	Frequency	Center Freg 2.441000000 GHz	Avg Type: Log-Pwr TRACE [1 23 25]	Frequency			
PNO: Fest Trig: Free Run IFGainLow #Atten: 20 dB		Auto Tune	PNO: Fest IFGsiniLow	Atten: 20 dB	A destruction			
10 dB/div Ref 20.00 dBm	ΔMkr1 369.6 μs 0.11 dB	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	Ref Offset 11.5 dB         ΔMkr1 369.6 μs           10 dB/div         Ref 20.00 dBm         -0.02 dE					
		Center Freq 402000000 GHz			Center Freq 2 441000000 GHz			
-200 	24	Start Freq 402000000 GHz	-26.0		Start Freq 2 441000000 GHz			
600 600 600 700	NA MANANA CHARACTER	Stop Freq 402000000 GHz	60 0 000 000 000 000 000 000 000 000 00	agreen adjustic appropriation of the	Stop Freq 2 441000000 GHz			
Center 2.402000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz www.modetre=[e0] c entertow r	Span 0 Hz Sweep 4.400 ms (1001 pts) Auto	1.000000 MHz Man	Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.		CF Step 1.000000 MHz Auto Man			
1 Δ2         t         369.6 μs (Δ)         0.11 dB           2         F         t         1.148 ms         5.43 dBm           3         4         5         5         5		Freq Offset 0 Hz	1         Δ2         t         (Δ)         369.6 μs         (Δ)           2         F         t         299.2 μs         3           4         5         5         5         5	-0.02 dB 5.99 dBm	Freq Offset 0 Hz			
7 7 8 9 10 11	Log	Scale Type	9 10		Scale Type			
(90)	statos .		Ne C	=twitzs				

# **CH-Low DH3**

# **CH-Mid DH3**

Kaywegitt Synstement Annual - Singet SA		22.24	Real of States			
Center Freq 2.402000000 GHz PN0: Fast Trig: Free Run	Avg Type: Log-Pwr	Frequency	Center Freq 2.44100000	0 GHz PN0: Fest Trig: Free Run	Avg Type: Log-Pwr TRADE 1 2 3 4 5 5 TRADE 1 2 3 4 5 5 TREE VWWWWW	Frequency
IFGeinLow #Atten: 20 dB	ΔMkr1 1.607 ms	Auto Time		IFGein:Low #Atten: 20 db	ΔMkr1 1.610 ms	Auto Tune
Ref Offset 11.5 dB 10 dB/div Ref 20.00 dBm	0.17 dB		10 dB/div Ref 20.00 dBm		0.14 dB	
		Center Freq 2.402000000 GHz	100 0.00 .100	1Δ2		Center Freq 2.441000000 GHz
200 50 <i>m</i>		Start Freq 2 402000000 GHz	-20.0			Start Freq 2 441000000 GHz
600	njahruppur hitrame	Stop Freq 2.402000000 GHz	60/0 Wawyhaw	Providing	undersonal whereas	Stop Freq 2 441000000 GHz
Center 2.402000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz	Span 0 Hz Sweep 8.733 ms (1001 pts)	CF Step 1.000000 MHz <u>Auto</u> Man	Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Span 0 Hz Sweep 8.800 ms (1001 pts)	CF Step 1.000000 MHz Auto Man
1 Δ2 1 (Δ) 1.607 ms (Δ) 0.17 dB 2 F t 1.450 ms 6.64 dBm 4 6		Freq Offset 0 Hz	T         Δ2         1         (Δ)           2         F         t         3           4         5         6         6	1.610 ms (A) 0.14 dB 1.540 ms 7.02 dBm		Freq Offset 0 Hz
7 8 9 10		Scale Type	7 8 9 10 11			Scale Type
<b>m</b> ()	status		MIRO		status	

**CH-Low DH5** 

# CH-Mid DH5

14			C 2 14	Karpergritt Spine	tearristanyan - South 54			and a second second second	20 A M
000 GHz	Avg Type: Log-Pwr	102-40:42 PH May 23, 2018 TRADE 1 2 3 4 5 5	Frequency	Center Fr	eq 2.441000000	GHz Tric Free But	Avg Type: Log-Pwr	103-5012 PH May 23, 2010 TRADE 1 2 3 4 5 5	Frequency
IFGain:Low #Atten:	20 dB		Auto Tuno	1		IFGain:Low #Atten: 20 dB			Auto Tune
dB Sm	Δ	Mkr1 2.824 ms 0.16 dB	Det Offeet 11 5 dB AMKET 2.837 ms						
1Δ2			Center Freq 2.402000000 GHz	10.0	×2	102			Center Fred 2 441000000 GH
			Start Freq 2.402000000 GHz	-20.0					Start Free 2.441000000 GH
izazinativ	huletor	mariany	Stop Freq 2.402000000 GHz	50.0	ateriate	nullyman	when	444	Stop Free 2.441000000 GH
			CF Step 1.000000 MHz Auto Man	Res BW 1.	0 MHz	#VBW 3.0 MHz			CF Ste 1.000000 MH Auto Ma
2 824 ms (A) 0.1( 1.208 ms 6.48 c		FOURIE WWALDE	Freq Offset 0 Hz		τ (Δ) τ		PUNCTION FUNCTION WETH		Freq Offse 0 H
			Scale Type	6 7 8 9					Scale Type
	1000 GHZ PROF Feet HEGelinLow BB 102 102 102 102 102 102 102 102	1000 GHZ         Avg Type: Log-Pwr           PHOLO Feat         Trig: Free Run PAtten: 20 dB         Avg Type: Log-Pwr           dB         Δ         Δ           1000 GHZ         Δ         Δ           tdB         Δ         Δ           1000 GHZ         Δ         Δ           1000 GHZ         Δ         Δ           1000 GHZ         Δ         Δ           100 GHZ         Δ         Δ           110 GHZ	1000 GHZ         Trig: Free Run           PROC   12 at at at         Trig: Free Run           Avg Type: Log-Pwr         Trig: C (12 at at at           Bin         CMMK12 (224 ms)           0100 GHZ         CMMK12 (224 ms)           142         Span 0 Hz           #VBW 3.0 MHz         Sweep 13.13 ms (1001 pts)           Span 0 Hz         Sweep 13.13 ms (1001 pts)	D000 GHz Production         Avg Type: Log-Bwr Production         Production         2 2 2 4 3 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	D000 GHz HolenLow         Trig: Free Run Mitten: 20 dB         Avg Type: Log-Per Todo (1, 2, 2, 4, 5, 4)         Free Run Mitten: 20 dB         Avg Type: Log-Per Todo (1, 2, 4, 5, 4)         Free Run Mitten: 20 dB         Center Free D0         Center Free D0           1 d2         1 d2         1 d2         1 d2         1 d2         1 d0         1 d0	D000 GHz Hotorstow         Trig: Free Run Matter: 20 dB         Avg Type: Log-Pwr Matter: 20 dB         Trig: Cog Pwr Tool (* 16 dB)         Trig: Cog Pwr Tool (* 16 dB)         Center Freq 2.441000000           1 d2         0.16 dB         0.16 dB         0.16 dB         0.16 dB         0.16 dB         0.16 dB         0.000 GHz         0	D000 GHz HotenLow         Trig: Free Run Mitten: 20 dB         Avg Type: Log-Pwr Mitten: 20 dB         Trig: C (2 12 4 3 4 (2 0 2 0 0 0 0 0 Hz) (2 0 0 1 0 Hz)         Center Freq 2.441000000 GHz HotenLow         Trig: Free Run HotenLow         Trig: Free Run HotenLow	D000 GHz HotenLow         Avg Type: Log-Pwr Incel 12 3 d s d m         Trig: Free Run Matter: 20 dB         Avg Type: Log-Pwr Incel 12 3 d s d m         Frequency Incel 12 3 d s d m         Center Freq 2.441000000 GHz Reference         Trig: Free Run Reference         Avg Type: Log-Pwr Incel 12 3 d s d m           0 dB Bm         0.16 dB         0.0000 GHz         102         102         0         102         0 <td>D000 GHz Hotelstaw     Avg Type: Log-Pwr Mitten: 20 dB     Index (1, 23 a 3 5 m)     Frequency     Center Freq 2.441000000 GHz Hotelstaw     True: Free Run Hotelstaw     Avg Type: Log-Pwr Mitten: 20 dB     Avg T</td>	D000 GHz Hotelstaw     Avg Type: Log-Pwr Mitten: 20 dB     Index (1, 23 a 3 5 m)     Frequency     Center Freq 2.441000000 GHz Hotelstaw     True: Free Run Hotelstaw     Avg Type: Log-Pwr Mitten: 20 dB     Avg T

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# **CH-High DH1**

## CH-Mid 2DH1

Keyneget Spittheethourikeurgen - Smith 54		C) 2 14	Yongari (pathamining) an Sangi Sh     S
Center Freq 2.480000000 GHz Avg Type: Log-Pwr	1840E1 23 45 5	Frequency	Cepter Freq 2 441000000 GHz Avg Type Log-Pwr Truct 1 23 = 5 Frequency
IFGainLow #Atten: 20 dB Ref Offset 11.5 dB	kr1 370.7 µs	Auto Tune	Ref Offset 11.5 dB ΔMkr1 375.2 μs Auto Tune
10 dB/div Ref 20.00 dBm	-0.03 08		100 Log 100 March 102 Center Freq
200		Start Freq 2 48000000 GHz	250
200 ไม่ หรือของเรื่องมีเรื่องเหตุ 200 ไม่ หรือของเรื่องมีเรื่องเหตุ 200	an han	Stop Freq 2.48000000 GHz	000         Инимператур         Чуники ини инимператур         Stop Freq         2.441000000 GHz         5.5 уни общини ини инимператур         2.441000000 GHz
	Span 0 Hz 7 ms (1001 pts)	1.000000 MHz	Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 4.457 ms (1001 pts) 1000000 MHz Ltds (2006 km   633 ms / 640 km
Τ         Δ2         1         (Δ)         370.7 μg (Δ)         -0.0.1 dB           2         F         T         151.9 μg         7.93 dBm           3         4         5         6         6		Freq Offset 0 Hz	T         Δ2         t         1/Δ1         376.2 us (Δ1         1.37 dB           2         F         t         679.0 us         3.01 dBm         5.01 dBm         5.01 dBm         6.01 dBm
		Scale Type	7     Scale Type       9     Scale Type       10     Log
CTARUS CRAW			MRQ BTATUS

# **CH-High DH3**

# CH-Mid 2DH3

Experience Spants	All State DC			02-41-46 PM May 23, 2018		DE PL	In Selection	ALC: No. 15	inated \$2		3193				2 PM May 23, 2018	
	q 2.48000000	PNO: Fest Trig: F	Avg Type: Log-Pwr	TRADE 1 2 3 4 5 6 TIRE WWWWWW	Frequency				00000 CH	Z	Trig: Free Ru #Atten: 20 dB		Avg Type: Log-F	Wr T	NADE 1 2 3 4 5 1 THE WWWWW	Frequency
10 dB/div	Ref Offset 11.5 dB Ref 20.00 dBm	IFGain Low #Atten	20 88	Mkr1 1.607 ms 0.10 dB	Auto Tune	10 dE	B/div F	tef Offset 1 tef 20.00	1.5 dB	ieln Low	#Atten: 20 dE				1.610 ms 1.82 dB	Auto Tune
10.0 0.00	2	1Δ2			Center Freq 2 48000000 GHz				1A:	2		1				Center Freq 2 441000000 GHz
-20-0					Start Freq 2 480000000 GHz	-20.0										Start Freq 2 441000000 GHz
60.0 60.0 -70.0	m74	Ny+++1242-34-0	Pytudehnaturi	phetholographics	Stop Freq 2.480000000 GHz	50.0	rliddyrli.		heribe	w-kri		stern	<b>YUM</b>	huto	n), mil	Stop Freq 2.441000000 GHz
Res BW 1.0	A.17.10	#VBW 3.0 M	Hz Sweep 8	Span 0 Hz 733 ms (1001 pts)	CF Step 1.00000 MHz Auto Man	Res	BW 1.0	MHz	GHz	#VBW	/ 3.0 MHz		Swee	-	Span 0 Hz s (1001 pts)	CF Step 1.000000 MHz Auto Man
Υ Δ2 2 F 3 4 5	τ (Δ) τ	1.607 ms (Δ) 0. 943.2 μs 8.06	10 dB dBm	FUNETENIMALOE	Freq Offset 0 Hz	2 3 4 5	Δ2 F	τ (Δ) τ	1.61 671	10 ms (Δ) 7.6 μs	1.82 dB 2.96 dBm			LUIRI - EUI		Freq Offset 0 Hz
7 8 9 10 11					Scale Type	7 8 9 10										Scale Type
(CRIN)			=1=103			A CONTRACT								TATUS		

**CH-High DH5** 

# CH-Mid 2DH5

	attent Anny an - South 54					2 2 M	- Coperation		the second se			322
Center Fi	req 2.4800000		Trig: Free Run	Avg Type: Log-Pwr	102-40:25 PM May 23, 2018 TRADE 1 2 3 4 5 5 TURE VINNER	Frequency		2.441000000 GHz	Fest Trig: Free Run	Avg Type: Log-Pw	103-52:39 PM May 23, 2018 10405 1 2.3 = 5 5 1,755 V WWWWWWW 057 P WWWWWW	Frequency
		IFGain/Low	#Atten: 20 dB			Auto Tune	1.11	IFGain	Low #Atten: 20 dB			Auto Tune
10 dB/div	Ref Offset 11.5 dE Ref 20.00 dBm	3		Δ	Mkr1 2.824 ms 0.05 dB	1	Ref Offset 11.5 dB         ΔMkr1 2.837 ms           10 dB/div         Ref 20.00 dBm         1.67 dE					
10.0	¥2	142				Center Freq 2 48000000 GHz	10.0 0.00		1Δ2			Center Free 2.441000000 GH
-20 0 -20 0 -30 0			1			Start Freq 2.480000000 GHz	-2010					Start Free 2.441000000 GH
50.0 60.0	venime	14-2017	*	ignerita	Liphight	Stop Freq 2.480000000 GHz	60.0 60.0	therease	ralianty'	(	of the second se	Stop Free 2.441000000 GH
Center 2. Res BW 1			3.0 MHz	Sweep 1	Span 0 Hz 3.13 ms (1001 pts)	CF Step 1.000000 MHz Áuto Man	Center 2.441 Res BW 1.0 M	WHz	#VBW 3.0 MHz	Sweep	Span 0 Hz 13.13 ms (1001 pts)	CF Ste 1.000000 Mi Auto Ma
	τ (Δ)	2.824 ms (Δ) 1.694 ms	0.05 dB 7.99 dBm			Freq Offset 0 Hz		[Δ) 2.837 ( 3.654 (				Freq Offse 0 H
8 9 10						Scale Type	6 7 8 9 10 11					Scale Type
10				Status			( COM			=74	tus	

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# CH-Mid 3DH1

PL	er Freq		00000 G	Hz NO: Fest Galation		Trig: Fra		Avg Ty	pe: Log-P	wr	TRAD	Hay 23, 2018 E 1 2 3 4 5 8 C 000000000000000000000000000000000000	Frequency
dB/	div Re	Offset 11	5 dB	Colon (Low						4	Mkr1 3	75.2 µs	Auto Tun
00		2 million	162		-	- markey		Ī	unterior			-	Center Fre 2 441000000 GH
10 10 10		-			1							1	Start Fre 2 441000000 GH
	194.187.128		internet	nt/4-hav	*	ų	Maryneramor	ennerheiten		A-44	nayiwathalan	en-17%	Stop Fre 2.441000000 GH
ente es B	er 2.4410 SW 1.0 N	IHz	GHz	#VI	BW :	3.0 MH:	_	Real Trades			S 467 ms (1		CF Ste 1.000000 Mit Auto Mit
2 F	2 1	[Δ)	36	75.2 µs ( 09.2 µs	A)	1.31	dB		CONTECTA:		-0410-		Freq Offs 0 F
3										-			Scale Typ
2 F 3 4 5 6 7 8 9 0 1				09.2 119		3.020	BM.						Scale

## CH-Mid 3DH3

Report Spathartine	Ver-Simpt 54	great day		0357/04 PM May 23, 2010	22 2 2
	41000000 GHz	Trig: Free Run	Avg Type: Log-Pwr	THEOE 1 2 3 4 5 5 THEOE P NOVING	Frequency
0 dB/div Ref 2	IFGeiniLow fset 11.5 dB 0.00 dBm	#Atten: 20 dB	۵۸	Akr1 1.610 ms 4.29 dB	Auto Tune
000 1000 1000	1Δ2 			- Alexandrian a	Center Fred 2 441000000 GH
00 00				_	Start Free 2 441000000 GH
	helphysicon	www.hrad		(uninging)	Stop Free 2.441000000 GH
enter 2.441000 es BW 1.0 MHz		BW 3.0 MHz	Sweep 8.8	Span 0 Hz 00 ms (1001 pts)	CF Ster 1.000000 MH Auto Ma
T Δ2 T ΙΔ	1,610 ms () 299.2 us	Δ) 4.29 dB 0.24 dBm			Freq Offse 0 H
2 F t 3					Scale Type
			Status		

# CH-Mid 3DH5

000 GHz	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 5 TRACE 1 2 3 4 5 5 TVRE WWWWWW DET P NR NW N	Frequency
dB		ΔMkr1 2.850 ms 1.60 dB	Auto Tuni
			Center Fre 2 441000000 GH
			Start Free 2 441000000 GH
handshid	astronom.	L*42407	Stop Fre 2 441000000 GH
			CF Ste 1.000000 MH Auto Ma
2.850 ms (Δ) 1.6 1.353 ms 3.02	0 dB	HEATER AND -	Freq Offse 0 H
			Scale Type
	000 GH2 PRO: Fract - Trig: Fr FACINICIAN - Trig: Action: dB 3m 102 102 102 104 104 104 104 104 104 104 104	Bit         1Δ2         #After: 20 dB           dB         1Δ2         #After: 20 dB	000 GHZ         Frig: Free Run MAtter: 20 dB         Avg Type: Log-Pwr         Tract [2,216.2]           File         Free Run Matter: 20 dB         Tract [2,216.2]         Tract [2,216.2]           Bit         Avg Type: Log-Pwr         Tract [2,216.2]         Tract [2,216.2]           Bit         Bit         Super [2,16.2]         Span 0 Hz           Statistics         Statistics         Statistics         Statistics           Bit         Bit         Statistics         Statistics         Statistics           Statistics         Bit         Statistics         Statistics         Statistics         Statistics

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ooo fulfulf Etd.	no. 10 1, Waltangi toda, New Taipe		Ginawanz 1000/m Ju 中立成區和Ju注示	



# **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

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

~ End of Report ~

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