

Report No.: T190226W02-RP3

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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

FCC Applicant: Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co.,

Ltd., Bantian, Longgang District, Shenzhen, 518129, China

IC Applicant: Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, China (Peo-

ples Republic Of)

Product Name: Notebook Computer Brand Name: HUAWEI, HONOR

FCC Model No.: HBL-W19, HBL-W09, HBL-W29, HBL-WXXXXX (X Can be 0-9,

A-Z, a-z, blank or symbol "-")

IC Model No.: HBL-W19, HBL-W09, HBL-W29

Model Difference: For the marketing purpose, only different model designations on

the marking plate for different markets. No RF concern.

Report Number: T190226W02-RP3

 FCC ID:
 QISHBL-WX9

 IC:
 6369A-HBLWX9

 FCC Rule Part:
 §15.247, Cat: DTS

IC Rule Part: RSS-247 issue 2 Feb 2017

Issue Date: Apr. 10, 2019

Date of Test: Feb. 27, 2019 ~ Mar. 13, 2019

Date of EUT Received: Feb. 27, 2019

Issued by Compliance Certification Services Inc.Wugu Lab.

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Tai-

wan. (R.O.C.) service@ccsrf.com

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

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

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

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Tested By:

Henry Chiang / Engineer

Approved By:

Kevin Tsai / Deputy Manager





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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
T190226W02-RP3	Rev.00	Initial creation of document	All	Mar. 29, 2019	Elle Chang
T190226W02-RP3	Rev.01	Update IC Model number	5	Apr. 10, 2019	Elle Chang

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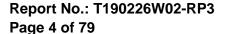




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GENERAL INFORMATION

1.1 Product description

Product Name:	Notebook Computer			
Brand Name:	HUAWEI, HONOR			
FCC Model No.:		, HBL-W09, HBL-W29, HBL-WXXXXX (X Can be a-z, blank or symbol "-")		
IC Model No.:	HBL-W19	, HBL-W09, HBL-W29		
Model Difference:	For the marketing purpose, only different model designations on the marking plate for different markets. No RF concern.			
Product SW/HW version:	1809 (OS	Build 17763.253) / C3A		
Radio SW/HW version:	Wi-Fi Component: 20 / Wi-Fi Component: 9560			
Test SW Version:	N/A	N/A		
RF power setting in TEST SW:	N/A			
	15.28Vdc from Rechargeable Li-ion Battery or 5Vdc / 9Vdc / 12Vdc / 15Vdc / 20Vdc from AC/DC Adapter.			
Power Supply:	Battery:	Model No.: HB6081V1ECW-41, Supplier: HUAWEI		
	Adapter:	Model No.: HW-200325YYY (Y=0-9,A-Z or blank), Supplier: HUAWEI		

Bluetooth_BR+EDR:

Bluetooth Version:	V5.0 Dual Mode
Channel number:	79 channels
Modulation type:	GFSK + π/4DQPSK + 8DPSK
Transmit Power:	9.95 dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	<= 0.4s
Antenna Designation:	PIFA Antenna, Antenna Gain: 1dBi

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1.2 Test Methodology of Applied Standards

Canada RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

FCC Part 15, Subpart C §15.247

KDB 558074 D01 v05r01 DSS Meas. Guidance

ANSI C63.10:2013

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

1.3 Test Facility

Compliance Certification Services Inc. Wugu Lab. No.11, Wugong 6th Rd.,

Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) (TAF code 1309)

FCC Designation number: TW1309 Canada Registration number: 2324G

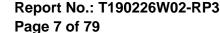
1.4 Special Accessories

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 a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm 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 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

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

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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.

2.5 Configuration of Tested System

Fig. 2-1 Radiated & Conducted Emission Configuration



Fig.2-2 AC power line Configuration

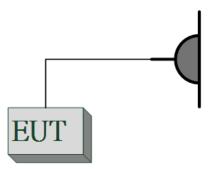
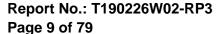


Table 2-1 Equipment Used in Tested System

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

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SUMMARY OF TEST RESULTS

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 §6.7	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 RSS-Gen §8.9 RSS-Gen §8.10	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 §6.8	Antenna Requirement Compl	

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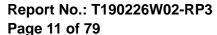
DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

79 channels are provided for Bluetooth

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEN4	FREQUENCY	ITEM	FREQUENCY
1	2402 MHz	21	2422 MHz	41	2442 MHz	71	2462 MHz
2	2403 MHz	22	2423 MHz	42	2443 MHz	72	2463 MHz
3	2404 MHz	23	2424 MHz	43	2444 MHz	73	2464 MHz
4	2405 MHz	24	2425 MHz	44	2445 MHz	74	2465 MHz
5	2406 MHz	25	2426 MHz	45	2446 MHz	75	2466 MHz
6	2407 MHz	26	2427 MHz	46	2447 MHz	76	2467 MHz
7	2408 MHz	27	2428 MHz	47	2448 MHz	77	2468 MHz
8	2409 MHz	28	2429 MHz	48	2449 MHz	78	2469 MHz
9	2410 MHz	29	2430 MHz	49	2450 MHz	79	2470 MHz
10	2411 MHz	30	2431 MHz	50	2451 MHz	70	2471 MHz
11	2412 MHz	31	2432 MHz	51	2452 MHz	71	2472 MHz
12	2413 MHz	32	2433 MHz	52	2453 MHz	72	2473 MHz
13	2414 MHz	33	2434 MHz	53	2454 MHz	73	2474 MHz
14	2415 MHz	34	2435 MHz	54	2455 MHz	74	2475 MHz
15	2416 MHz	35	2436 MHz	55	2456 MHz	75	2476 MHz
16	2417 MHz	36	2437 MHz	56	2457 MHz	76	2477 MHz
17	2418 MHz	37	2438 MHz	57	2458 MHz	77	2478 MHz
18	2419 MHz	38	2439 MHz	58	2459 MHz	78	2479 MHz
19	2420 MHz	39	2440 MHz	59	2460 MHz	79	2480 MHz
20	2421 MHz	40	2441 MHz	60	2461 MHz		

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4.2 The Worst Test Modes and Channel Details

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

AC POWER LINE CONDUCTED EMISSION TEST:

Test Condition	AC Power line conducted emission for line and neutral
Worst Case	Operation in normal mode

RADIATED EMISSION TEST:

10/05// TED EMISSION TEST:								
	RADIATED EMISSION TEST (BELOW 1 GHz)							
MODE FREQUENCY FREQUENCY MODULATION (MHz) (MHz)								
Bluetooth	2402 to 2480	2402, 2441, 2480	GFSK	DH5				
RADIATED EMISSION TEST (ABOVE 1 GHz)								
Bluetooth	2402 to 2480	2402, 2441, 2480	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 Power,	20dB Band Width				
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	PACKET TYPE			
Bluetooth	2402 to 2480	2402, 2441, 2480	GFSK, π/4-DQPSK, 8-DPSK	DH5			
		Band B	Edge				
Bluetooth	2402 to 2480	2402, 2441, 2480	GFSK	DH5			
		Frequency S	Separation				
Bluetooth 2402 to 2480 2402, 2441, 2480 GFSK DHS		DH5					
	Number of hopping frequency						
Bluetooth 2402 to 2480 2402, 2441, 2480 GFSK DH5							
Time of Occupancy (Dwell time)							
Bluetooth 2402 to 2480 2402, 2441, 2480 GFSK, π/4-DQPSK, 8-DPSK DH1/DH3/D				DH1/DH3/DH5			

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5 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575 dB
Peak Output Power	+/- 1.924 dB
20dB Bandwidth	+/- 147.256 Hz
100 kHz Bandwidth of Frequency Band Edges	+/- 1.924 dB
Frequency Separation	+/- 147.256 Hz
Number of hopping frequency	+/- 147.256 Hz
Time of Occupancy	+/- 147.256 Hz
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12 dB
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68 dB
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18 dB
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47 dB
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81 dB
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87 dB

Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.
- 3. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSION TEST

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

6.2 Measurement Equipment Used

	Conducted Emission Test Site							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
CABLE	EMCI	CFD300-NL	CERF	2018/06/29	2019/06/28			
EMI Test Receiver	R&S	ESCI	100064	2018/07/24	2019/07/23			
LISN	SCHWARZ- BECK	NSLK 8127	8127-541	2019/01/31	2020/01/30			
LISN	SCHAFFNER	NNB 41	03/10013	2019/02/13	2020/02/12			
Software	EZ-EMC(CCS-3A1-CE)							

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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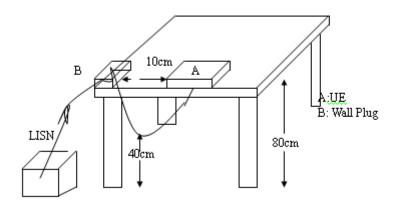
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^{1.} The lower limit shall apply at the transition frequencies

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



6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

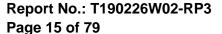
- 1. The EUT was placed on a table which is 0.8m above ground plan.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

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

Job No.: T190226W02-RP1~4 Date: 2019/3/12

Company: HUAWEI Time: AM 08:54:00

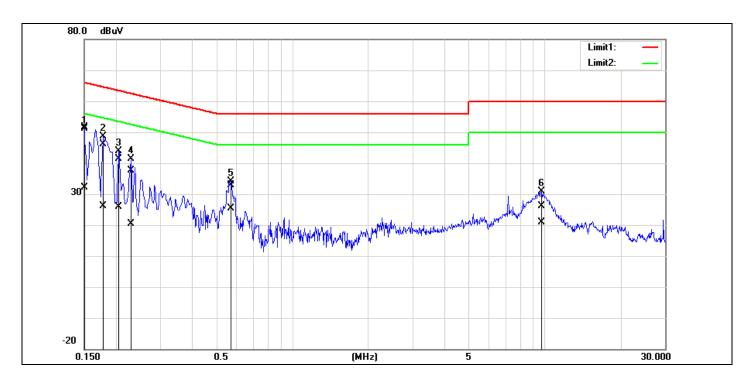
Standard: NCC/FCC/IC QP Temp.(°C)/Hum.(%): 23(°C)/60%

Test item: Conduction test Test By: Henry

Line: L1 Test Voltage: AC 120V/60Hz

Model: H97

Description:



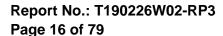
No.	Frequency	QuasiPeak reading	Average	Correction	QuasiPeak	Average	QuasiPeak limit	Average limit	QuasiPeak	Average	Remark
		reading	reading	factor	result	result	limit	IIIIII	margin	margin	
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1500	51.42	31.90	0.16	51.58	32.06	65.99	56.00	-14.41	-23.94	Pass
2	0.1785	45.95	26.01	0.15	46.10	26.16	64.55	54.56	-18.45	-28.40	Pass
3	0.2060	41.25	25.81	0.15	41.40	25.96	63.36	53.37	-21.96	-27.41	Pass
4	0.2300	37.44	20.33	0.15	37.59	20.48	62.45	52.45	-24.86	-31.97	Pass
5	0.5740	32.65	25.29	0.16	32.81	25.45	56.00	46.00	-23.19	-20.55	Pass
6	9.7299	25.79	20.41	0.45	26.24	20.86	60.00	50.00	-33.76	-29.14	Pass

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SGS Compliance Certification Services Inc. 程智科技股份有限公司





Job No.: T190226W02-RP1~4 Date: 2019/3/12

Company: HUAWEI Time: AM 08:57:33

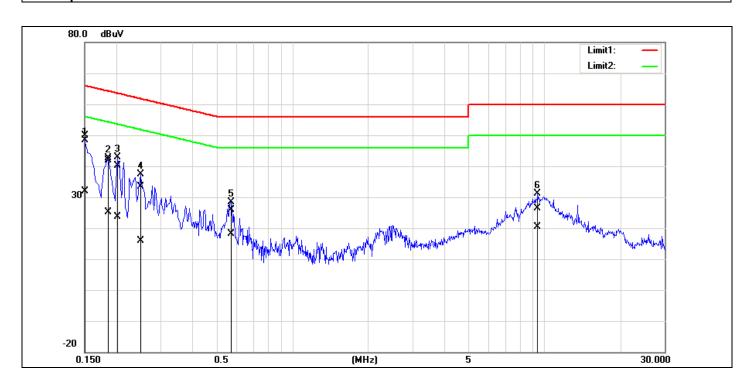
Standard: NCC/FCC/IC QP Temp.(°C)/Hum.(%): 23(°C)/60%

Test item: Conduction test Test By: Henry

Line: N Test Voltage: AC 120V/60Hz

Model: H97

Description:



No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark
		reading	reading	factor	result	result	limit	limit	margin	margin	
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1500	49.79	31.63	0.16	49.95	31.79	65.99	56.00	-16.04	-24.21	Pass
2	0.1860	41.75	25.00	0.15	41.90	25.15	64.21	54.21	-22.31	-29.06	Pass
3	0.2020	39.91	23.41	0.15	40.06	23.56	63.52	53.53	-23.46	-29.97	Pass
4	0.2500	33.26	15.85	0.15	33.41	16.00	61.75	51.76	-28.34	-35.76	Pass
5	0.5740	25.78	18.09	0.16	25.94	18.25	56.00	46.00	-30.06	-27.75	Pass
6	9.4100	25.82	19.96	0.44	26.26	20.40	60.00	50.00	-33.74	-29.60	Pass

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7 PEAK OUTPUT POWER MEASUREMENT

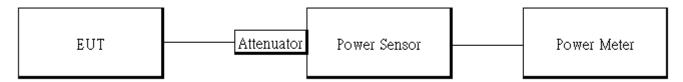
7.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts and the e.i.r.p. shall not exceed 0.5 W if the hop set uses less than 75 hopping channels.

7.2 Measurement Equipment Used

	Conducted Emission Test Site							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
				_				
Power Meter	Anritsu	ML2496A	1242004	2018/10/23	2019/10/22			
Power Sensor	Anritsu	MA2411B	1207365	2018/10/23	2019/10/22			
Power Sensor	Anritsu	MA2411B	1207368	2018/10/24	2019/10/23			
Attenuator	Marvelous	MVE2213-10	RF80	2019/02/26	2020/02/25			
DC Power Supply	Agilent	E3640A	KR93300208	2018/08/15	2019/08/14			

7.3 Test Set-up:

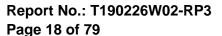


7.4 Measurement Procedure:

- 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)	СН	Freq. (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9.56	9.036	1000	0	2402	9.47	8.841	1000
39	2441	9.75	9.441	1000	39	2441	9.67	9.258	1000
78	2480	9.95	9.886	1000	78	2480	9.90	9.761	1000
		•					•		•

2M EDR mode (Peak):

2M EDR mode (Average):

Peak Output Limit Power (m)(A) CH (MILE) Max. Avg.Output include Output tune up Power	Limit
(MHz) Power (dBm) (mW) (mW) (MHz) tolerance (mW) (mW)	(mW)
0 2402 9.14 8.204 125 0 2402 7.60 5.748	125
39 2441 8.98 7.907 125 39 2441 7.32 5.389	125
78 2480 8.96 7.870 125 78 2480 7.17 5.206	125

3M EDR mode (Peak):

3M EDR mode (Average):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)	СН	Freq. (MHz)	Max. Avg.Output include tune up tolerance	Output Power (mW)	Limit (mW)
		(dDill)					Power (dBm)		
0	2402	8.74	7.482	125	0	2402	6.95	4.949	125
39	2441	8.76	7.516	125	39	2441	6.88	4.870	125
78	2480	8.81	7.603	125	78	2480	6.79	4.770	125

NOTE: cable loss as 1.2dB that offsets in the sp

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

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1M BR mode EIRP

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	9.47	1.00	11.130	4000
39	2441	9.67	1.00	11.655	4000
78	2480	9.90	1.00	12.289	4000

2M EDR mode EIRP

Channel	Frequency (MHz)	Max. Avg.Output include tune up tolerance	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)				
0	2402	7.60	1.00	7.236	4000				
39	2441	7.32	1.00	6.784	4000				
78	2480	7.17	1.00	6.554	4000				

3M EDR mode EIRP

Channel	Frequency (MHz)	Max. Avg.Output include tune up tolerance	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
0	2402	6.95	1.00	6.230	4000
39	2441	6.88	1.00	6.131	4000
78	2480	6.79	1.00	6.005	4000

* Note: EIRP = Average Power + Gain

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8 20dB & 99% BANDWIDTH MEASUREMENT

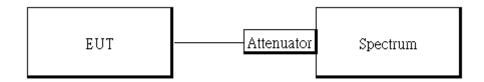
8.1 Standard Applicable

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

8.2 Measurement Equipment Used

	Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20				
DC Power Supply	Agilent	E3640A	KR93300208	2018/08/15	2019/08/14				
DC Block	PASTERNACK	PE8210	RF29	2019/02/26	2020/02/25				
Attenuator	Marvelous	MVE2213-10	RF80	2019/02/26	2020/02/25				

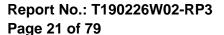
8.3 Test Set-up



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.
- 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

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8.5 Measurement Result

GFSK

GI SK	OI OIX						
	20 dB	2/3					
СН	BW	BW					
	(MHz)	(MHz)					
Low	0.924	0.62					
Mid	0.923	0.62					
High	0.924	0.62					

π	/4-	D	O	P	S	K
	-	u	w		u	г 🔪

11/4-レ	11/4-DQP3K				
	20 dB	2/3 BW			
СН	BW				
	(MHz)	(MHz)			
Low	1.449	0.97			
Mid	1.401	0.93			
High	1.403	0.94			

8-DPSK

СН	20 dB BW (MHz)	2/3 BW (MHz)	
Low	1.407	0.94	
Mid	1.409	0.94	
High	1.410	0.94	

CECK

Gran		
	99%	
СН	Bandwidth	
	(MHz)	
Low	0.8779	
Mid	0.8698	
High	0.8743	

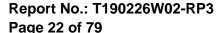
π/4-DQPSK

II/T DQI OIL			
	99%		
CH	Bandwidth		
	(MHz)		
Low	1.3472		
Mid	1.3470		
High	1.3458		
·			

8-DPSK

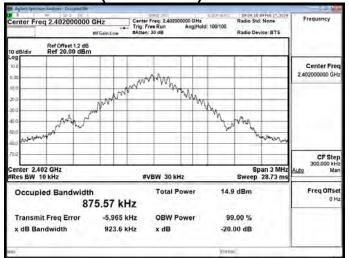
	99%		
СН	Bandwidth		
	(MHz)		
Low	1.3435		
Mid	1.3472		
High	1.3480		

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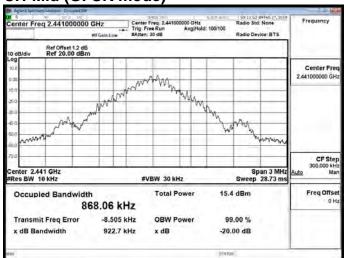




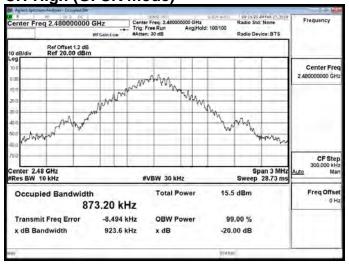
BW CH-Low (GFSK mode)



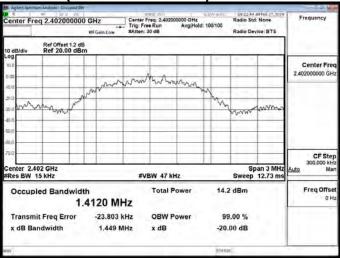
CH-Mid (GFSK mode)



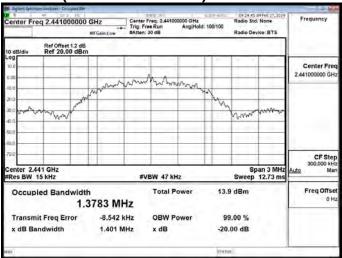
CH-High (GFSK mode)



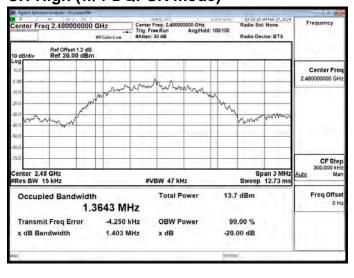
CH-Low (π/4-DQPSK mode)



CH-Mid (π/4-DQPSK mode)



CH-High (π/4-DQPSK mode)



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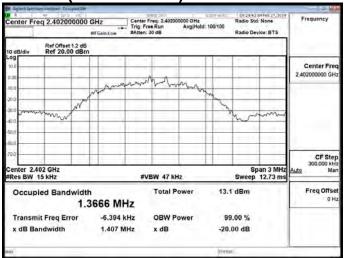
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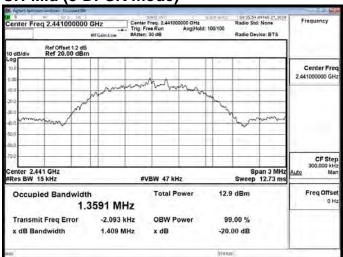
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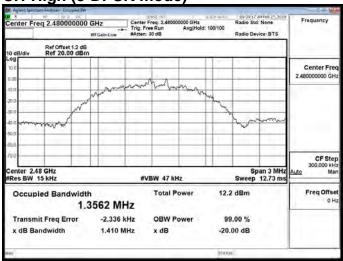
CH-Low (8-DPSK mode)



CH-Mid (8-DPSK mode)





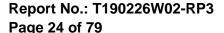


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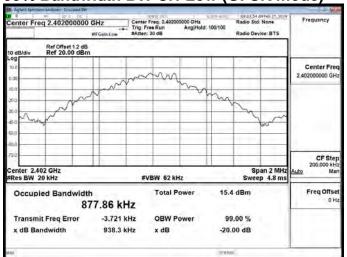
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99% Bandwidth BW CH-Low (GFSK mode)



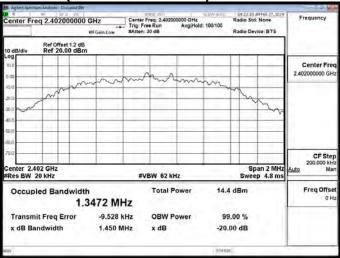
CH-Mid (GFSK mode)



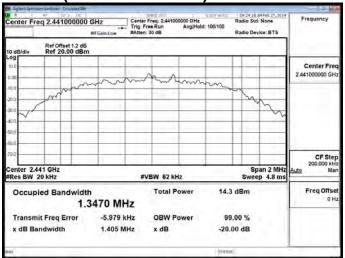
CH-High (GFSK mode)



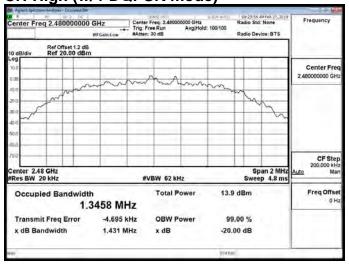
CH-Low (π/4-DQPSK mode)



CH-Mid (π/4-DQPSK mode)



CH-High (π/4-DQPSK mode)



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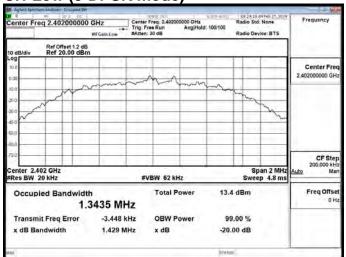
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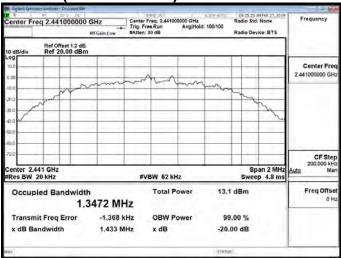
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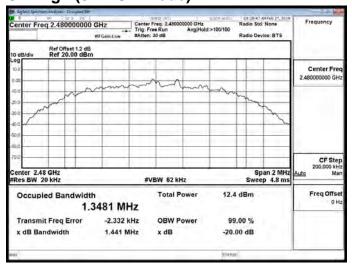
CH-Low (8-DPSK mode)



CH-Mid (8-DPSK mode)



CH-High (8-DPSK mode)



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CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

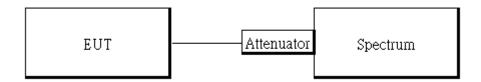
9.1 Standard Applicable

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) & RSS-Gen §8.9 limit.

9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20
DC Power Supply	Agilent	E3640A	KR93300208	2018/08/15	2019/08/14
DC Block	PASTERNACK	PE8210	RF29	2019/02/26	2020/02/25
Attenuator	Marvelous	MVE2213-10	RF80	2019/02/26	2020/02/25

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. Measurement Guidelines.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
- 6. Mark Peak, 2.3999GHz and 2.4836GHz and record the max. level.
- 7. Repeat above procedures until all frequency measured were complete.

Conducted Spurious Emission:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
- 3. Set RBW = 100 kHz & VBW = 300 kHz, Detector = Peak, Sweep = Auto
- 4. Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 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	S .	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.

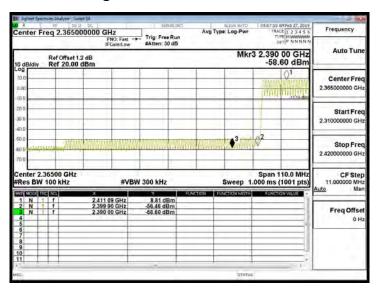
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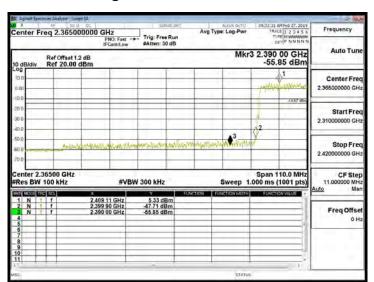
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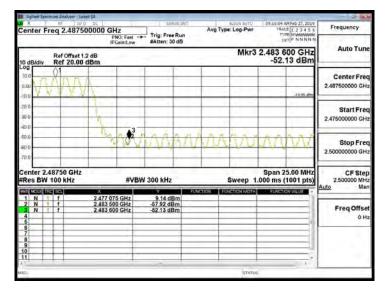
Hopping mode BR Band Edge CH-Low



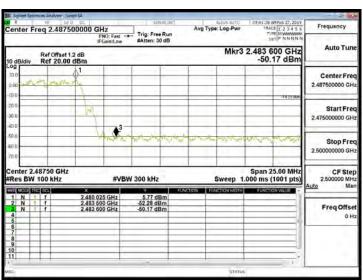
EDR Band Edge CH-Low



BR Band Edge CH-High



EDR Band Edge CH-High



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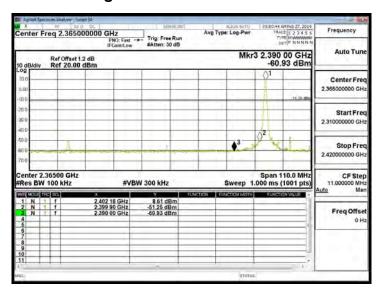
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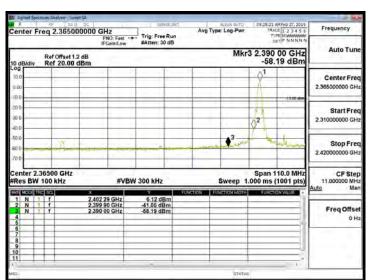
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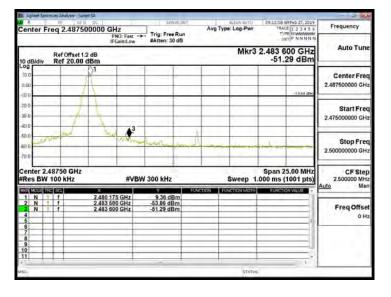
Non-Hopping BR Band Edge CH-Low



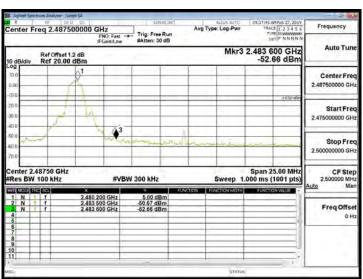
EDR Band Edge CH-Low



BR Band Edge CH-High



EDR Band Edge CH-High



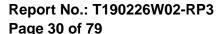
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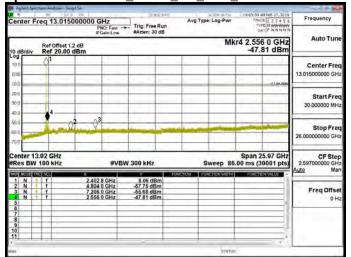
SGS Compliance Certification Services Inc.

程智科技股份有限公司

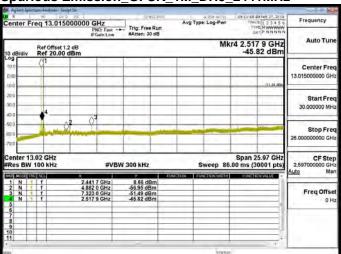




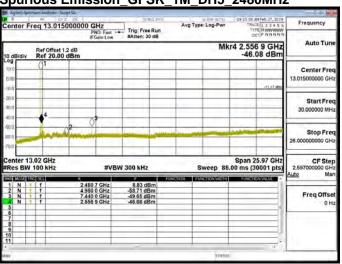
Spurious Emission_GFSK_1M_DH5_2402MHz



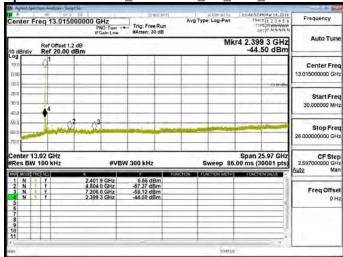
Spurious Emission GFSK 1M DH5 2441MHz



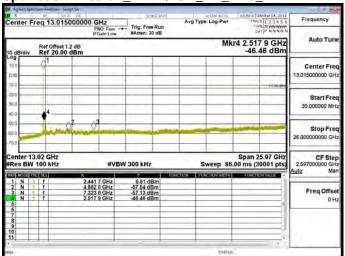
Spurious Emission GFSK 1M DH5 2480MHz



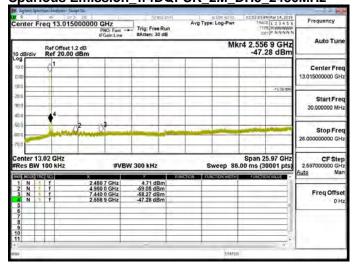
Spurious Emission_π4DQPSK_2M_DH5_2402MHz



Spurious Emission π4DQPSK 2M DH5 2441MHz



Spurious Emission π4DQPSK 2M DH5 2480MHz



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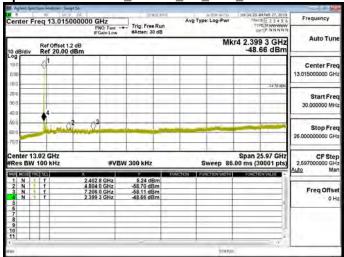
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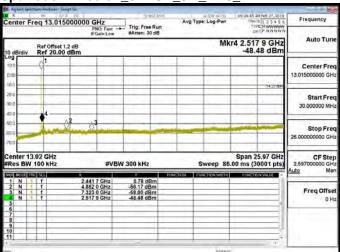
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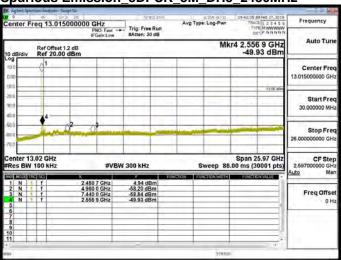
Spurious Emission_8DPSK_3M_DH5_2402MHz



Spurious Emission 8DPSK 3M DH5 2441MHz



Spurious Emission 8DPSK 3M DH5 2480MHz

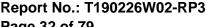


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10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

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 & 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 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.	
Band Reject Filters	MICRO TRONICS	BRM 50702	120	2019/02/26	2020/02/25	
Bilog Antenna	Sunol Sciences	JB3	A030105	2018/07/13	2019/07/12	
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	2019/02/26	2020/02/25	
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	2019/02/26	2020/02/25	
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	2019/01/30	2020/01/29	
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	2018/08/20	2019/08/19	
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07	
Pre-Amplifier	EMEC	EM330	060609	2019/02/26	2020/02/25	
Pre-Amplifier	HP	8449B	3008A00965	2019/02/26	2020/02/25	
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	2018/05/31	2019/05/30	
Antenna Tower	ccs	CC-A-1F	N/A	N.C.R	N.C.R	
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R	
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R	
Software	e3 V6.11-20180413					

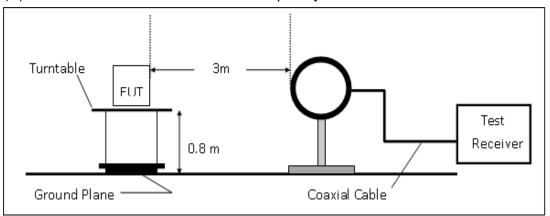
NOTE: N.C.R refers to Not Calibrated Required.

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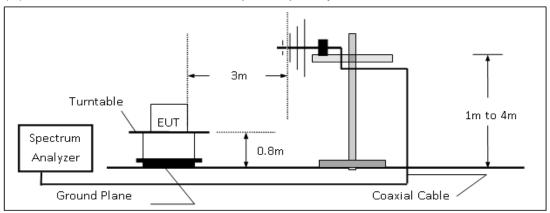


10.3 Test SET-UP

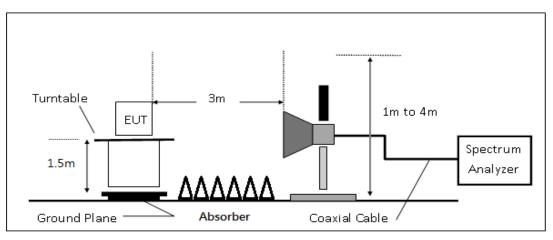
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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

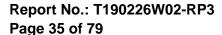


(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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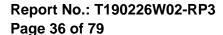


10.4 Measurement Procedure

Radiated Emission

- 1. The testing follows ANSI C63.10:2013. Measurement Guidelines.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground 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. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Du-ty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 8. 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.
- 9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 11. 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	3	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

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

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

Factor(dB) = Antenna Factor(dBµV/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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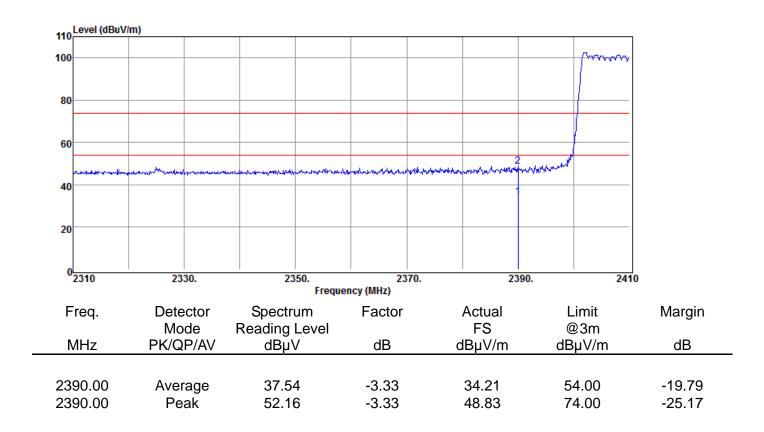






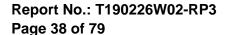
Radiated Band Edge Measurement Result: (Hopping Mode)

Operation Mode :BT BR Hopping Test Date :2019-03-13 :BE CH LOW Test Mode Temp./Humi. :22/57 **EUT Pol** :H Plan Antenna Pol. :VERTICAL **Test Channel** :2402 MHz Engineer :Jerry



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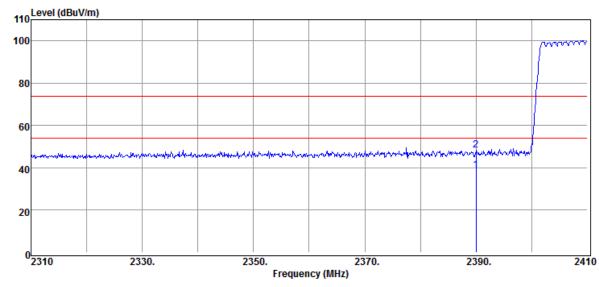
Operation Mode Test Mode

:BT BR Hopping :BE CH LOW **EUT Pol** :H Plan Test Channel :2402 MHz

Test Date :2019-03-13 Temp./Humi. :22/57

Antenna Pol. :HORIZONTAL

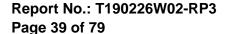
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2390.00	Average	42.06	-3.33	38.73	54.00	-15.27
2390.00	Peak	51.62	-3.33	48.29	74.00	-25.71

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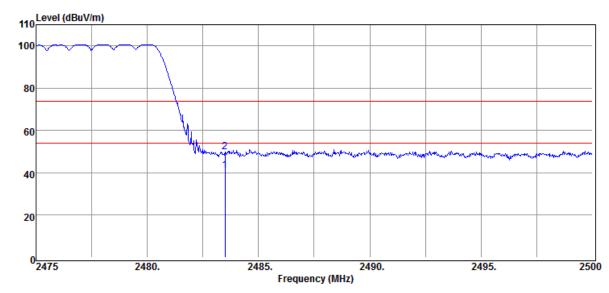


:BT BR Hopping :BE CH HIGH :H Plan :2480 MHz

Test Date Temp./Humi. Antenna Pol. :2019-03-13 :22/57

:HORIZONTAL

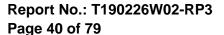
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	Average	43.76	-2.72	41.04	54.00	-12.96
2483.50	Peak	52.42	-2.72	49.70	74.00	-24.30

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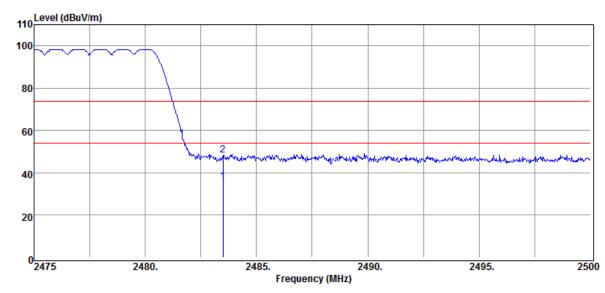
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:BT BR Hopping :BE CH HIGH :H Plan :2480 MHz

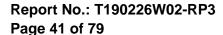
Test Date :2019-03-13 Temp./Humi. :22/57 Antenna Pol. :VERTICAL Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin	
 MHz	PK/QP/AV	dBµV	dB	dΒμV/m	dBµV/m	dB	
2483.50	Average	38.40	-2.72	35.68	54.00	-18.32	
2483.50	Peak	50.98	-2.72	48.26	74.00	-25.74	

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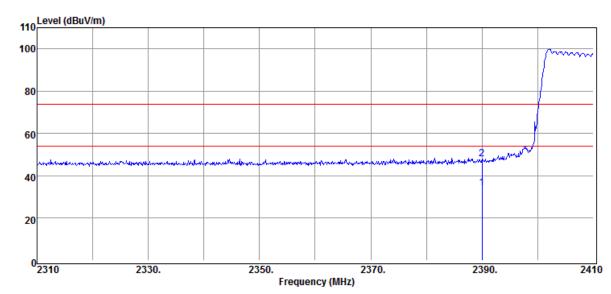
:BT EDR Hopping :BE CH LOW :H Plan

:2402 MHz

Test Date Temp./Humi. Antenna Pol. Engineer

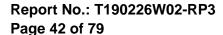
:2019-03-13 :22/57

:VERTICAL :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	37.50	-3.33	34.17	54.00	-19.83
2390.00	Peak	51.31	-3.33	47.98	74.00	-26.02

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Operation Mode Test Mode **EUT Pol**

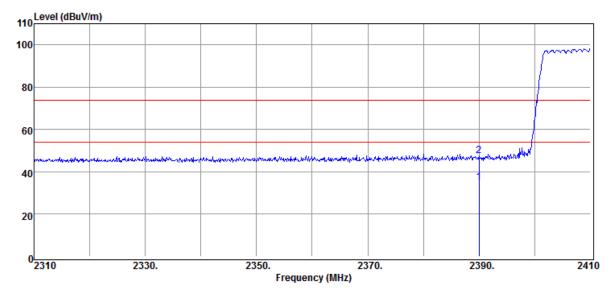
Test Channel

:BT EDR Hopping :BE CH LOW

:H Plan :2402 MHz **Test Date** :2019-03-13 Temp./Humi. :22/57

Antenna Pol. :HORIZONTAL

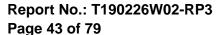
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	38.29	-3.33	34.96	54.00	-19.04
2390.00	Peak	50.86	-3.33	47.53	74.00	-26.47

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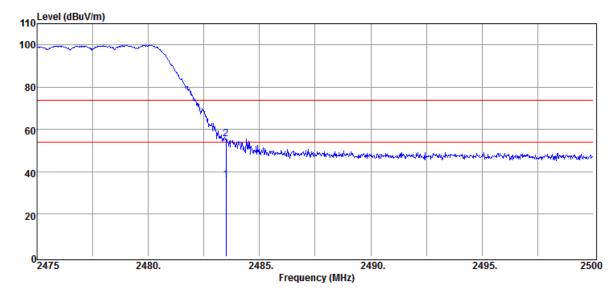
:BT EDR Hopping :BE CH HIGH :H Plan

:2480 MHz

Test Date :2019-03-13 Temp./Humi. :22/57

Antenna Pol. :HORIZONTAL

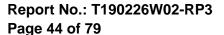
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	38.76	-2.72	36.04	54.00	-17.96
2483.50	Peak	58.27	-2.72	55.55	74.00	-18.45

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:VERTICAL



Operation Mode Test Mode **EUT Pol** Test Channel

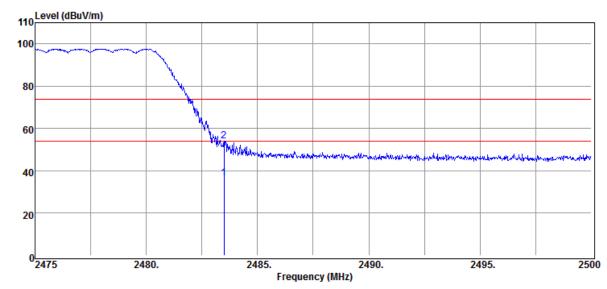
:BT EDR Hopping :BE CH HIGH :H Plan

:2480 MHz

Test Date :2019-03-13 Temp./Humi. :22/57

Engineer :Jerry

Antenna Pol.



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	Average	39.34	-2.72	36.62	54.00	-17.38
2483.50	Peak	56.62	-2.72	53.90	74.00	-20.10

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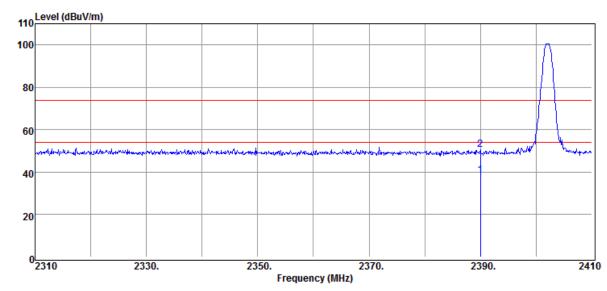






Radiated Emission – Band Edge (Non-Hopping Mode):

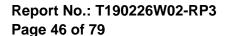
Operation Mode :BT BR Test Date :2019-03-13 Test Mode :BE CH LOW Temp./Humi. :22/57 **EUT Pol** Antenna Pol. :VERTICAL :H Plan **Test Channel** :2402 MHz Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	41.73	-3.33	38.40	54.00	-15.60
2390.00	Peak	54.06	-3.33	50.73	74.00	-23.27

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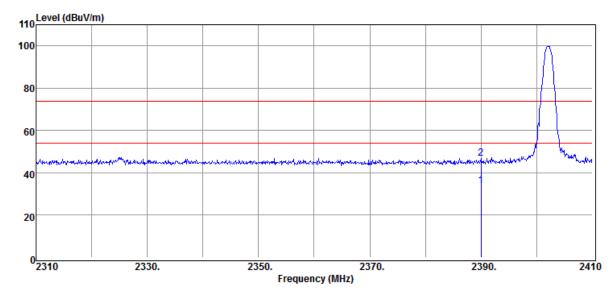


Operation Mode :BT BR Test Mode :BE CH LOW

EUT Pol :H Plan Test Channel :2402 MHz **Test Date** :2019-03-13 Temp./Humi. :22/57

Antenna Pol. :HORIZONTAL

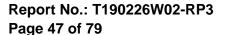
Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBμ̈V	dB	dBµV/m	dBμV/m	dB
2390.00	Average	37.39	-3.33	34.06	54.00	-19.94
2390.00	Peak	50.02	-3.33	46.69	74.00	-27.31

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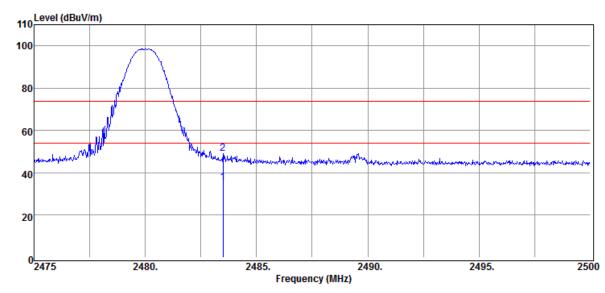
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。





:BT BR :BE CH HIGH :H Plan :2480 MHz

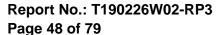
Test Date :2019-03-13 Temp./Humi. :22/57 Antenna Pol. :VERTICAL Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
 MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	38.12	-2.72	35.40	54.00	-18.60
2483.50	Peak	51.82	-2.72	49.10	74.00	-24.90

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Operation Mode Test Mode **EUT Pol**

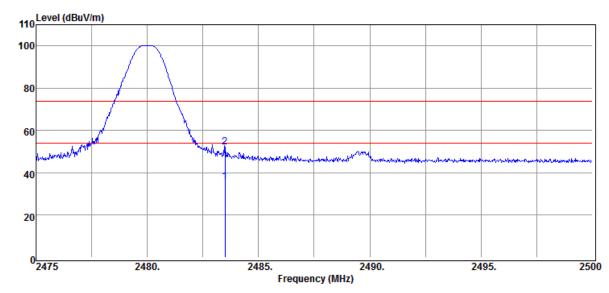
Test Channel

:BT BR :BE CH HIGH

:H Plan :2480 MHz **Test Date** :2019-03-13 Temp./Humi. :22/57

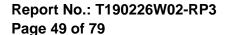
Antenna Pol. :HORIZONTAL

Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	38.66	-2.72	35.94	54.00	-18.06
2483.50	Peak	54.82	-2.72	52.10	74.00	-21.90

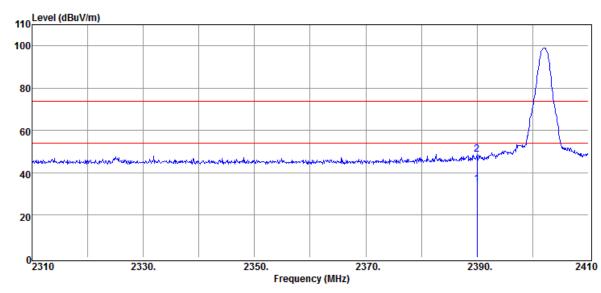
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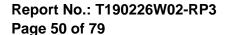
Operation Mode :BT EDR Test Mode :BE CH LOW **EUT Pol** :H Plan **Test Channel** :2402 MHz

Test Date :2019-03-13 Temp./Humi. :22/57 Antenna Pol. :VERTICAL Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
 MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	Average	37.99	-3.33	34.66	54.00	-19.34
2390.00	Peak	51.94	-3.33	48.61	74.00	-25.39

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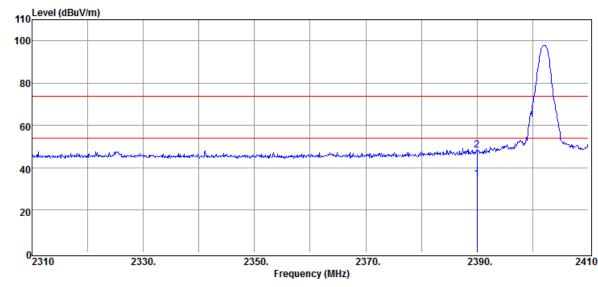


Operation Mode :BT EDR Test Mode :BE CH LOW **EUT Pol** :H Plan

Test Channel :2402 MHz **Test Date** :2019-03-13 Temp./Humi. :22/57

Antenna Pol. :HORIZONTAL

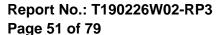
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
2390.00	Average	38.14	-3.33	34.81	54.00	-19.19
2390.00	Peak	51.61	-3.33	48.28	74.00	-25.72

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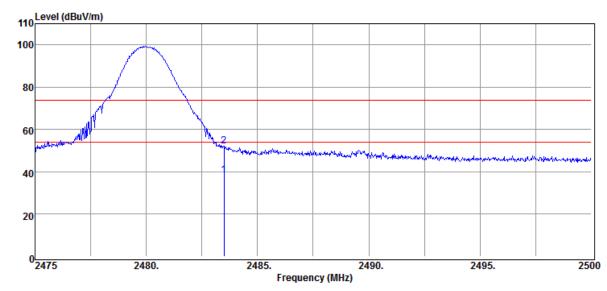
Operation Mode Test Mode **EUT Pol**

Test Channel

:BT EDR :BE CH HIGH

:H Plan :2480 MHz **Test Date** :2019-03-13 Temp./Humi. :22/57 Antenna Pol. :HORIZONTAL

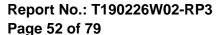
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	Average	41.08	-2.72	38.36	54.00	-15.64
2483.50	Peak	55.05	-2.72	52.33	74.00	-21.67

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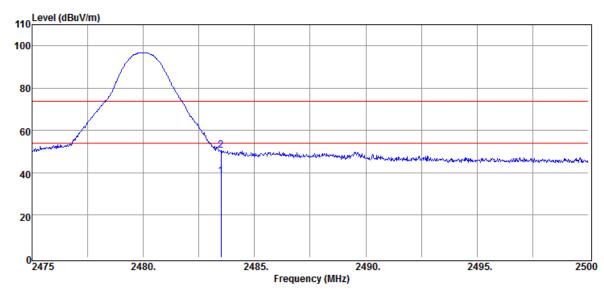
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。





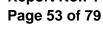
Operation Mode :BT EDR Test Mode :BE CH HIGH **EUT Pol** :H Plan Test Channel :2480 MHz

Test Date :2019-03-13 Temp./Humi. :22/57 Antenna Pol. :VERTICAL Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	41.09	-2.72	38.37	54.00	-15.63
2483.50	Peak	53.23	-2.72	50.51	74.00	-23.49

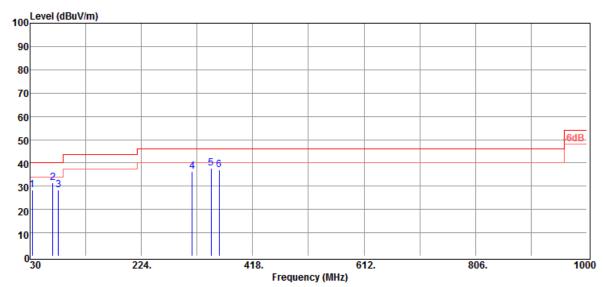
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Radiated Spurious Emission Measurement Result: Frequency form 30MHz to 1000MHz

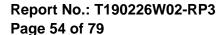
Operation Mode :BT BR Test Date :2019-03-13 Test Mode :TX CH LOW Temp./Humi. :22/56 **EUT Pol** Antenna Pol. :VERTICAL :H Plan Test Channel :2402 MHz Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
33.88	Peak	32.67	-4.13	28.54	40.00	-11.46
69.77	Peak	45.83	-14.46	31.37	40.00	-8.63
79.47	Peak	42.95	-14.63	28.32	40.00	-11.68
312.27	Peak	43.33	-7.08	36.25	46.00	-9.75
345.25	Peak	43.92	-6.37	37.55	46.00	-8.45
359.80	Peak	42.87	-5.79	37.08	46.00	-8.92

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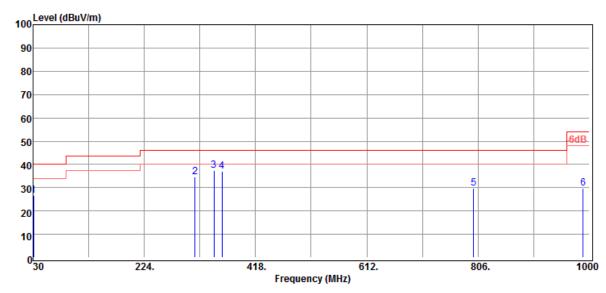




Operation Mode **Test Date** :BT BR :2019-03-13 Test Mode :TX CH LOW Temp./Humi. :22/56

EUT Pol Antenna Pol. :HORIZONTAL :H Plan

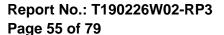
Test Channel :2402 MHz Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBμV/m	dBµV/m	dB
30.97	Peak	28.56	-2.00	26.56	40.00	-13.44
312.27	Peak	41.65	-7.08	34.57	46.00	-11.43
345.25	Peak	43.60	-6.37	37.23	46.00	-8.77
359.80	Peak	42.69	-5.79	36.90	46.00	-9.10
798.24	Peak	27.07	2.81	29.88	46.00	-16.12
989.33	Peak	23.30	6.44	29.74	54.00	-24.26

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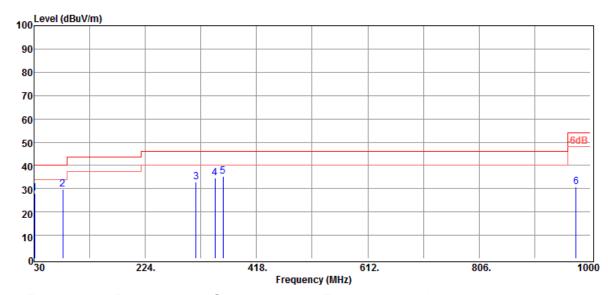
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Operation Mode :BT BR Test Mode :TX CH MID **EUT Pol** :H Plan Test Channel :2441 MHz

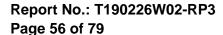
Test Date :2019-03-13 Temp./Humi. :22/56 Antenna Pol. :VERTICAL Engineer :Jerry



Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
PK/QP/AV	dΒμ̈V	dB	dBμV/m	dBµV/m	dB
Peak	30.02	-2.00	28.02	40.00	-11.98
Peak	44.51	-14.76	29.75	40.00	-10.25
Peak	39.86	-7.08	32.78	46.00	-13.22
Peak	40.97	-6.37	34.60	46.00	-11.40
Peak	41.10	-5.79	35.31	46.00	-10.69
Peak	24.04	6.64	30.68	54.00	-23.32
	Mode PK/QP/AV Peak Peak Peak Peak Peak	Mode PK/QP/AV Reading Level dBμV Peak 30.02 Peak 44.51 Peak 39.86 Peak 40.97 Peak 41.10	Mode PK/QP/AV Reading Level dBμV dB Peak 30.02 -2.00 Peak 44.51 -14.76 Peak 39.86 -7.08 Peak 40.97 -6.37 Peak 41.10 -5.79	Mode PK/QP/AV Reading Level dBμV FS dBμV/m Peak 30.02 -2.00 28.02 Peak 44.51 -14.76 29.75 Peak 39.86 -7.08 32.78 Peak 40.97 -6.37 34.60 Peak 41.10 -5.79 35.31	Mode PK/QP/AV Reading Level dBμV FS dBμV/m @3m dBμV/m Peak 30.02 -2.00 28.02 40.00 Peak 44.51 -14.76 29.75 40.00 Peak 39.86 -7.08 32.78 46.00 Peak 40.97 -6.37 34.60 46.00 Peak 41.10 -5.79 35.31 46.00

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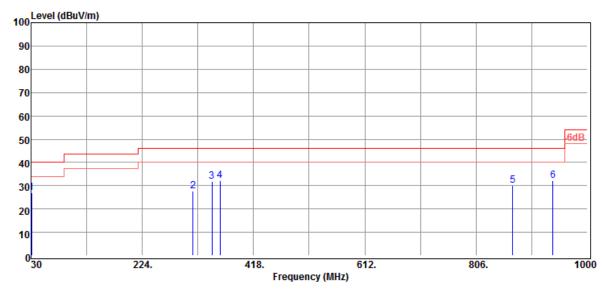


Operation Mode :BT BR Test Mode :TX CH MID **EUT Pol** :H Plan

Test Channel :2441 MHz **Test Date** :2019-03-13 Temp./Humi. :22/56

Antenna Pol. :HORIZONTAL

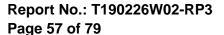
Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
30.97	Peak	28.85	-2.00	26.85	40.00	-13.15
312.27	Peak	34.71	-7.08	27.63	46.00	-18.37
345.25	Peak	38.20	-6.37	31.83	46.00	-14.17
359.80	Peak	37.83	-5.79	32.04	46.00	-13.96
870.02	Peak	26.16	3.91	30.07	46.00	-15.93
939.86	Peak	27.01	5.04	32.05	46.00	-13.95

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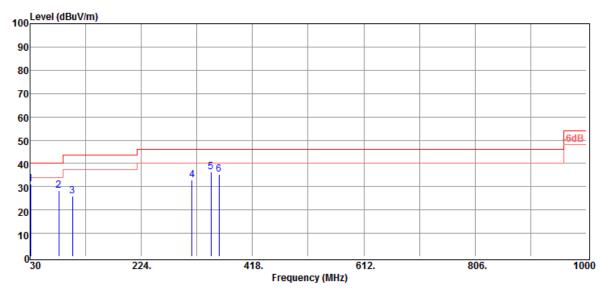
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Operation Mode :BT BR Test Mode :TX CH HIGH **EUT Pol** :H Plan Test Channel :2480 MHz

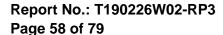
Test Date :2019-03-13 Temp./Humi. :22/56 Antenna Pol. :VERTICAL Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
30.97	Peak	33.15	-2.00	31.15	40.00	-8.85
80.44	Peak	43.27	-14.76	28.51	40.00	-11.49
103.72	Peak	36.87	-11.06	25.81	43.50	-17.69
312.27	Peak	39.97	-7.08	32.89	46.00	-13.11
345.25	Peak	42.69	-6.37	36.32	46.00	-9.68
359.80	Peak	41.21	-5.79	35.42	46.00	-10.58

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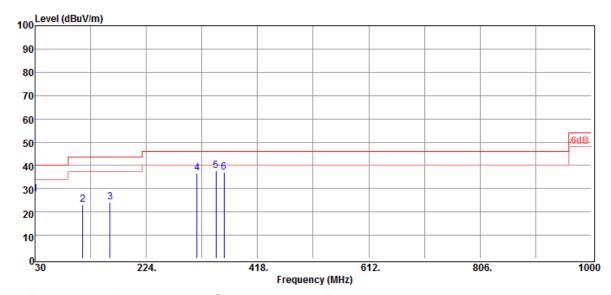




Operation Mode **Test Date** :BT BR :2019-03-13 Test Mode :TX CH HIGH Temp./Humi. :22/56

EUT Pol Antenna Pol. :HORIZONTAL :H Plan

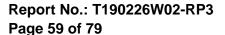
Test Channel :2480 MHz Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμ̈V	dB	dBμV/m	dBµV/m	dB
30.00	Peak	29.17	-1.51	27.66	40.00	-12.34
113.42	Peak	32.03	-8.98	23.05	43.50	-20.45
160.95	Peak	33.80	-9.55	24.25	43.50	-19.25
312.27	Peak	43.86	-7.08	36.78	46.00	-9.22
345.25	Peak	43.92	-6.37	37.55	46.00	-8.45
359.80	Peak	42.70	-5.79	36.91	46.00	-9.09

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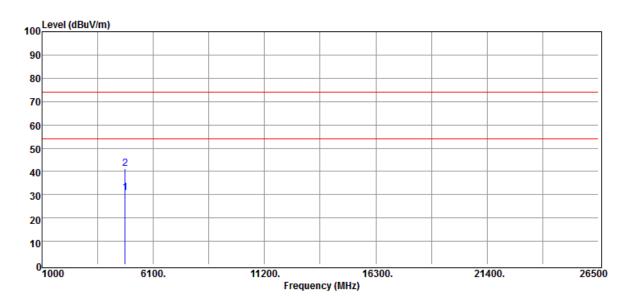
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Frequency above 1 GHz

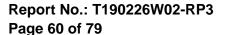
Operation Mode :BT BR Test Date :2019-03-13 Test Mode :TX CH LOW Temp./Humi. :23/56 **EUT Pol** :H Plan Antenna Pol. :VERTICAL **Test Channel** :2402 MHz Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμ̈V	dB	dBμV/m	dBµV/m	dB
4804.00	Average	27.64	3.11	30.75	54.00	-23.25
4804.00	Peak	38.13	3.11	41.24	74.00	-32.76

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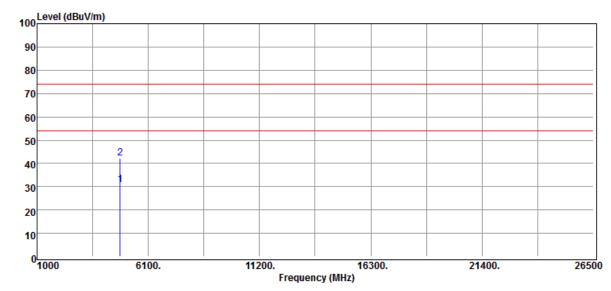


Operation Mode :BT BR Test Mode :TX CH LOW **EUT Pol** :H Plan

Test Channel :2402 MHz **Test Date** :2019-03-13 Temp./Humi. :23/56

Antenna Pol. :HORIZONTAL

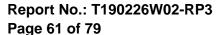
Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4804.00	Average	27.85	3.11	30.96	54.00	-23.04
4804.00	Peak	39.05	3.11	42.16	74.00	-31.84

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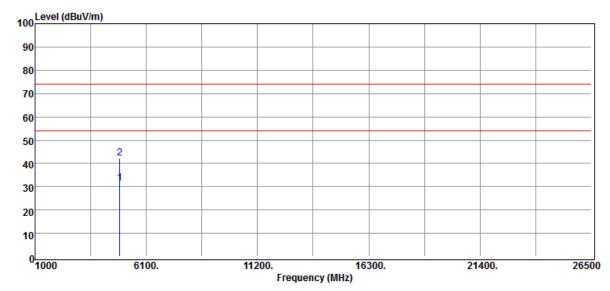
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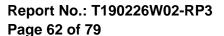
Operation Mode :BT BR Test Mode :TX CH MID **EUT Pol** :H Plan Test Channel :2441 MHz

Test Date :2019-03-13 Temp./Humi. :23/56 Antenna Pol. :VERTICAL Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	27.89	3.46	31.35	54.00	-22.65
4882.00	Peak	38.71	3.46	42.17	74.00	-31.83

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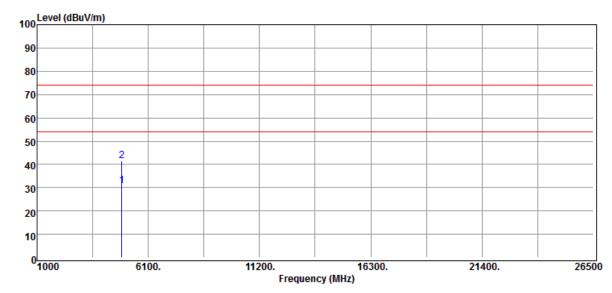
Operation Mode :BT BR
Test Mode :TX CH MID
EUT Pol :H Plan

Test Channel :2441 MHz

Test Date :2019-03-13 Temp./Humi. :23/56

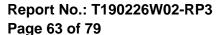
Antenna Pol. :HORIZONTAL

Engineer :Jerry



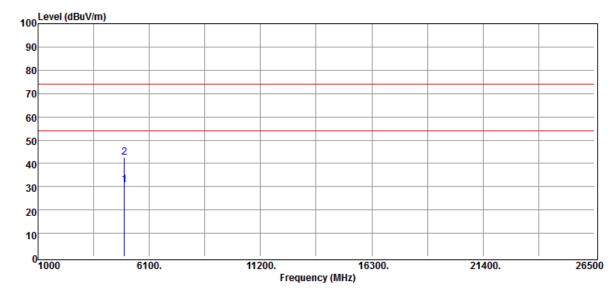
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBμ̈V	dB	dBμV/m	dBμV/m	dB
4882.00	Average	27.45	3.46	30.91	54.00	-23.09
4882.00	Peak	38.23	3.46	41.69	74.00	-32.31

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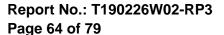


Operation Mode **Test Date** :BT BR :2019-03-13 Test Mode :TX CH HIGH Temp./Humi. :23/56 **EUT Pol** Antenna Pol. :VERTICAL :H Plan Test Channel :2480 MHz Engineer :Jerry



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBμV/m	dBµV/m	dB
4960.00	Average	26.17	4.48	30.65	54.00	-23.35
4960.00	Average Peak	37.93	4.48	42.41	74.00	-23.55 -31.59

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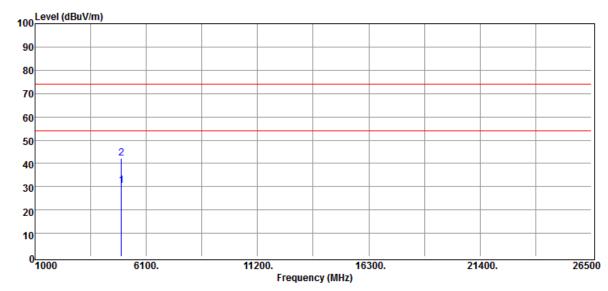




Operation Mode **Test Date** :BT BR :2019-03-13 Test Mode :TX CH HIGH Temp./Humi. :23/56

EUT Pol Antenna Pol. :HORIZONTAL :H Plan

Test Channel :2480 MHz Engineer :Jerry



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
N 41 I —	Mode	Reading Level	٩D	FS	@3m	٩D
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4960.00	Average	26.03	4.48	30.51	54.00	-23.49
4960.00	Peak	37.85	4.48	42.33	74.00	-31.67

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11 FREQUENCY SEPARATION

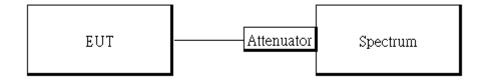
11.1 Standard Applicable

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

11.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20			
DC Power Supply	Agilent	E3640A	KR93300208	2018/08/15	2019/08/14			
DC Block	PASTERNACK	PE8210	RF29	2019/02/26	2020/02/25			
Attenuator	Marvelous	MVE2213-10	RF80	2019/02/26	2020/02/25			

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 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 = 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.

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.

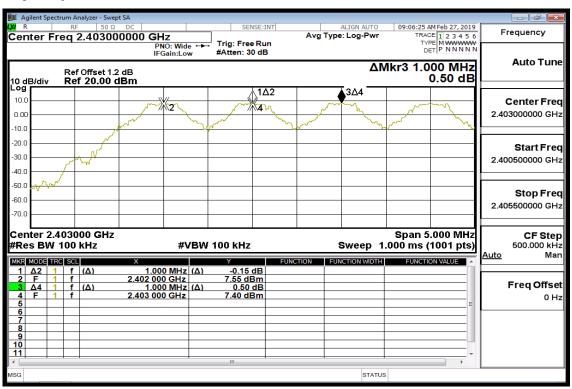
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。



11.5 Measurement Result

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

Frequency Separation Test Data



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12 NUMBER OF HOPPING FREQUENCY

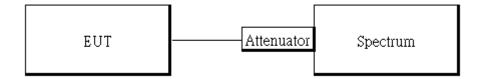
12.1 Standard Applicable

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

12.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20			
DC Power Supply	Agilent	E3640A	KR93300208	2018/08/15	2019/08/14			
DC Block	PASTERNACK	PE8210	RF29	2019/02/26	2020/02/25			
Attenuator	Marvelous	MVE2213-10	RF80	2019/02/26	2020/02/25			

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.

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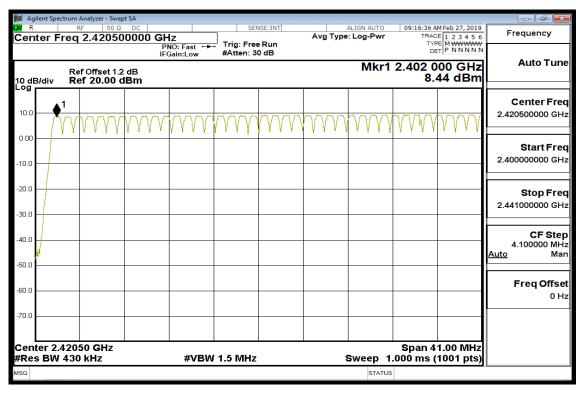
12.5 Measurement Result

Tabular Data of Total Channel Number

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

Channel Number

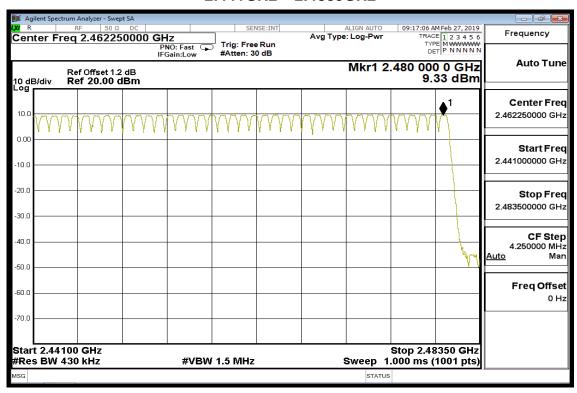
2.400GHz - 2.441GHz



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2.441GHz - 2.4835GHz



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13 TIME OF OCCUPANCY (DWELL TIME)

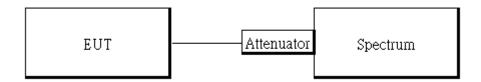
13.1 Standard Applicable

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	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Spectrum Analyzer	Agilent	N9010A	MY53400256	2018/11/21	2019/11/20			
DC Power Supply	Agilent	E3640A	KR93300208	2018/08/15	2019/08/14			
DC Block	PASTERNACK	PE8210	RF29	2019/02/26	2020/02/25			
Attenuator	Marvelous	MVE2213-10	RF80	2019/02/26	2020/02/25			

13.3 Test Set-up



13.4 Measurement Procedure

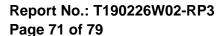
- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = 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.

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DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2 DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4 DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

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

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

13.5 Tabular Result of the Measurement

GFSK (1Mbps)

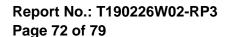
Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
	DH1	121.60	400ms	2.63	3.00
0	DH3	262.40	400ms	0.61	1.00
	DH5	307.20	400ms	0.35	1.00
	DH1	121.60	400ms	2.63	3.00
39	DH3	262.40	400ms	0.61	1.00
	DH5	307.20	400ms	0.35	1.00
	DH1	121.60	400ms	2.63	3.00
78	DH3	262.40	400ms	0.61	1.00
	DH5	308.80	400ms	0.00	1.00

π/4 DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
	2DH1	124.80	400ms	2.56	3.00
39	2DH3	264.00	400ms	0.61	1.00
	2DH5	308.80	400ms	0.35	1.00

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8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	1/T (kHz)	VBW setting (kHz)
	3DH1	124.80	400ms	2.56	3.00
39	3DH3	262.40	400ms	0.61	1.00
	3DH5	308.80	400ms	0.35	1.00

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

GFSK (1Mbps):

CH Low	DH1 time slot =	0.380 *	(1600/2/79) *	31.6 =	121.60 (ms)
	DH3 time slot =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	DH5 time slot =	2.880 *	(1600/6/79) *	31.6 =	307.20 (ms)
CH Mid	DH1 time slot =	0.380 *	(1600/2/79) *	31.6 =	121.60 (ms)
	DH3 time slot =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	DH5 time slot =	2.880 *	(1600/6/79) *	31.6 =	307.20 (ms)
CH High	DH1 time slot =	0.380 *	(1600/2/79) *	31.6 =	121.60 (ms)
	DH3 time slot =	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	DH5 time slot =	2.895 *	(1600/6/79) *	31.6 =	308.80 (ms)
π/4 -DQPS	K (2Mbps):				
CH Mid	2DH1 time slot=	0.390 *	(1600/2/79) *	31.6 =	124.80 (ms)
	2DH3 time slot=	1.650 *	(1600/4/79) *	31.6 =	264.00 (ms)
	2DH5 time slot=	2.895 *	(1600/6/79) *	31.6 =	308.80 (ms)

8-DPSK (3Mbps):

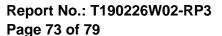
CH Mid	3DH1 time slot=	0.390 *	(1600/2/79) *	31.6 =	124.80 (ms)
	3DH3 time slot=	1.640 *	(1600/4/79) *	31.6 =	262.40 (ms)
	3DH5 time slot=	2.895 *	(1600/6/79) *	31.6 =	308.80 (ms)

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GFSK (1Mbps) for AFH Mode						
Hopping Channel	PACKET TYPE	Measurement Result	Limit			
Number	FACKLITIFL	(ms)	(ms)			
20	DH5	154.40	400ms			
π/4 DQPSK (2Mbps) for AFH Mode						
Hopping Channel	PACKET TYPE	Measurement Result	Limit			
Number	PACKETTIPE	(ms)	(ms)			
20 2DH5		154.40	400ms			
8-DPSK (3Mbps) for AFH Mode						
Hopping Channel	PACKET TYPE	Measurement Result	Limit			
Number	PACKET TIPE	(ms)	(ms)			
20	3DH5	154.40	400ms			

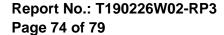
GFSK (1Mbps):

DH5 time sl =	2.895	(ms)	*	(800/6/20)*8 =	154.40	(ms)
π/4 -DQPSK (2Mbps						
2DH5 time :=	2.895	(ms)	*	(800/6/20)* 8 =	154.40	(ms)
8-DPSK (3Mbps):						
3DH5 time :=	2.895	(ms)	*	(800/6/20)* 8 =	154.40	(ms)

13.6 **Measurement Result**

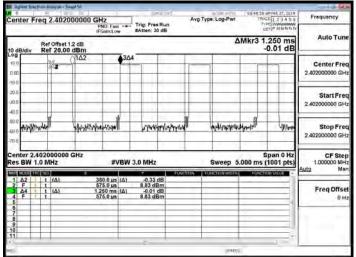
Note: Refer to next page for plots.

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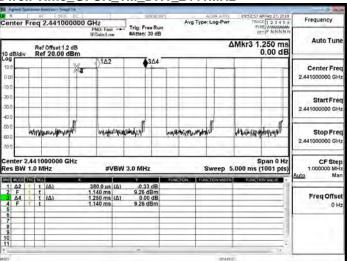




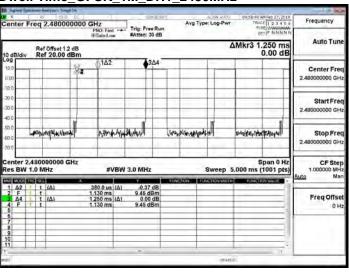
Dwell Time_GFSK_1M_DH1_2402MHz



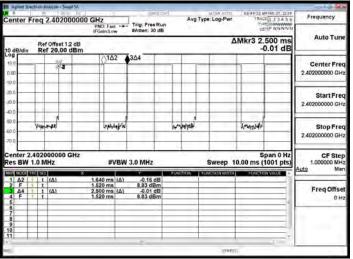
Dwell Time GFSK 1M DH1 2441MHz



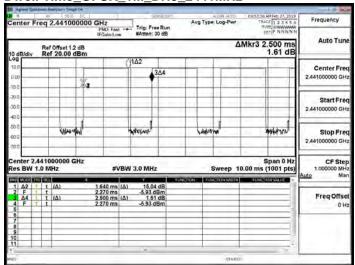
Dwell Time GFSK 1M DH1 2480MHz



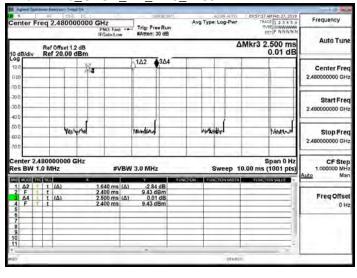
Dwell Time_GFSK_1M_DH3_2402MHz



Dwell Time_GFSK_1M_DH3_2441MHz



Dwell Time GFSK 1M DH3 2480MHz

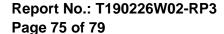


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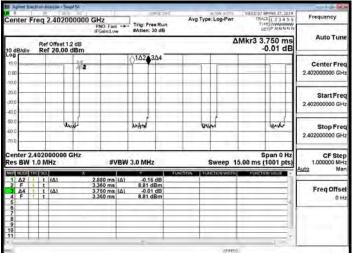
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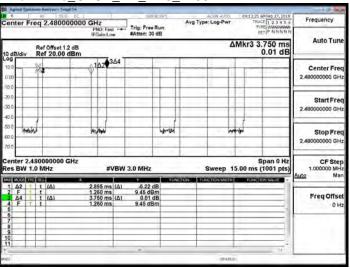
Dwell Time_GFSK_1M_DH5_2402MHz



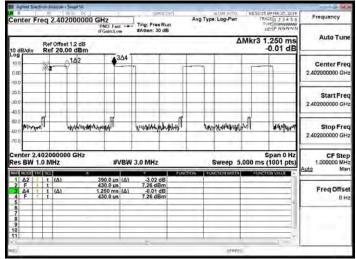
Dwell Time GFSK 1M DH5 2441MHz

Agent Spectrum Analyza						
enter Freq 2.44	1000000 GHz	Trig: Free Run	Avg Type: Log-Pwr	7RACE 1 2 3 4 5 6	Frequency	
	et 1.2 dB .00 dBm	#Atten: 30 dB	Δ	Mkr3 3.750 ms 0.00 dB	Auto Tur	
10.0 Ref 20	01Δ2 4 3Δ4			0.00 GB	Center Fre	
90					Start Fre	
000	rej. Sp. Jil	Weight.	w/staff	many	2.441000000 GH	
enter 2.4410000	00 GHz			Span 0 Hz	2.441000000 G	
es BW 1.0 MHz		W 3.0 MHz		5.00 ms (1001 pts)	1.000000 M Auto M	
1 Δ2 t (Δ) 2 F t 3 Δ4 t (Δ) 4 F t 5 6	2.880 ms (// 90.00 us 3.750 ms (// 90.00 us	9.25 dBm	Approach Function (A) (A)	FUNCTION WALUE	Freq Offs	
8 9 0 1						

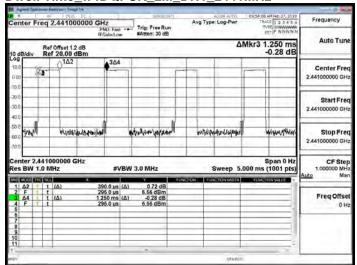
Dwell Time GFSK 1M DH5 2480MHz



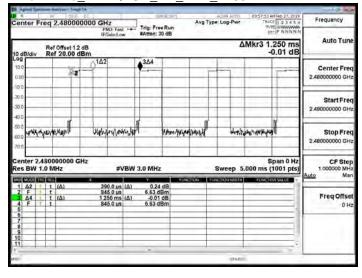
Dwell Time_π4DQPSK_2M_DH1_2402MHz



Dwell Time π4DQPSK 2M DH1 2441MHz



Dwell Time π4DQPSK 2M DH1 2480MHz

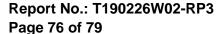


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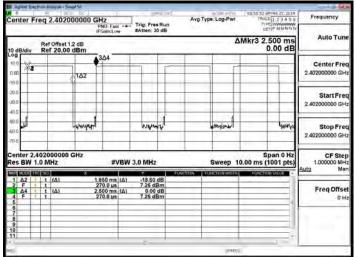
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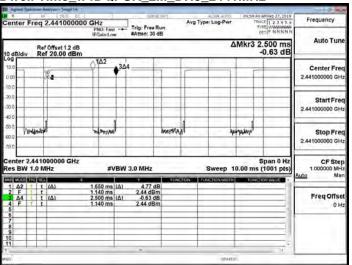




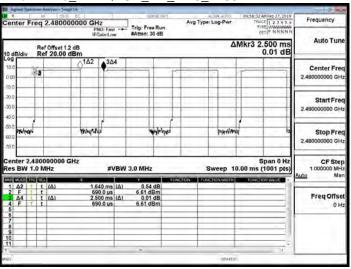
Dwell Time_π4DQPSK_2M_DH3_2402MHz



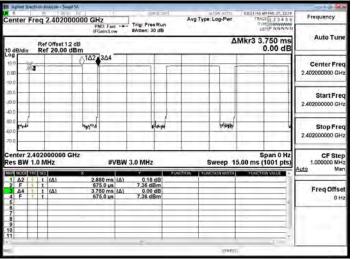
Dwell Time_π4DQPSK_2M_DH3_2441MHz



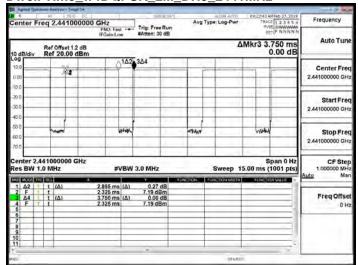
Dwell Time π4DQPSK 2M DH3 2480MHz



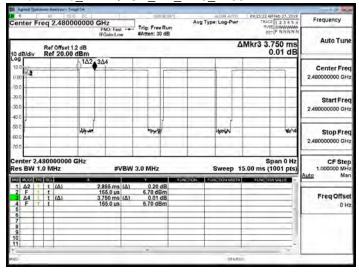
Dwell Time_π4DQPSK_2M_DH5_2402MHz



Dwell Time π4DQPSK 2M DH5 2441MHz



Dwell Time π4DQPSK 2M DH5 2480MHz

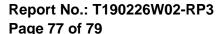


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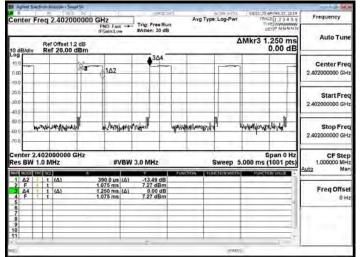
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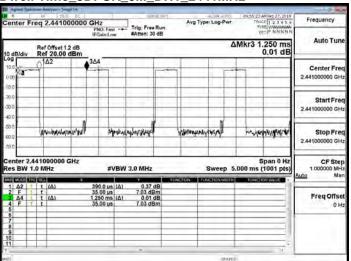




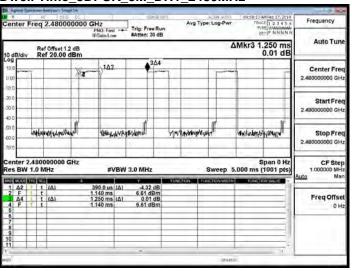
Dwell Time_8DPSK_3M_DH1_2402MHz



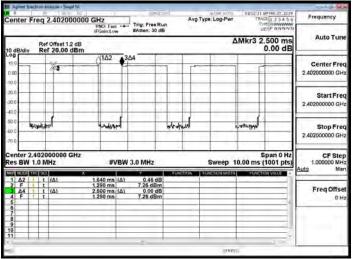
Dwell Time 8DPSK 3M DH1 2441MHz



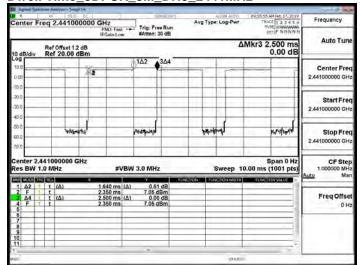
Dwell Time 8DPSK 3M DH1 2480MHz



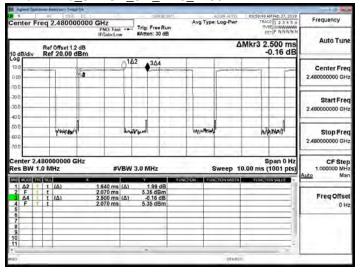
Dwell Time_8DPSK_3M_DH3_2402MHz



Dwell Time 8DPSK 3M DH3 2441MHz



Dwell Time 8DPSK 3M DH3 2480MHz

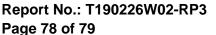


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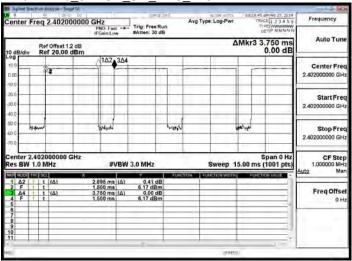
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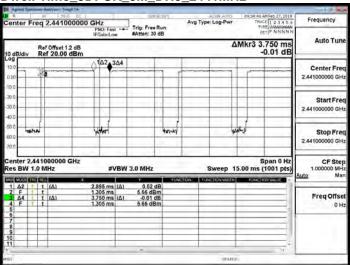




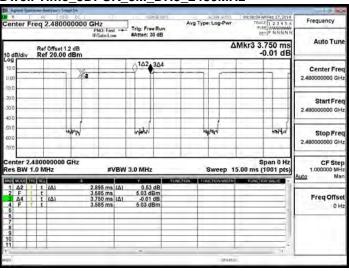
Dwell Time_8DPSK_3M_DH5_2402MHz



Dwell Time 8DPSK 3M DH5 2441MHz



Dwell Time 8DPSK 3M DH5 2480MHz

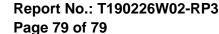


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14 ANTENNA REQUIREMENT

14.1 **Standard Applicable**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

14.2 **Antenna Connected Construction**

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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