

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS 247 CLASS II & IV PC REPORT

OF

Applicant: Acer Incorporated
8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi, New Taipei City
22181, Taiwan (R.O.C)

Product Name: WLAN and BT, 2x2 PCIe M.2 2230 adapter card

Brand Name: 

Model No.: 9560NGW

Model Difference: N/A

FCC ID: HLZ9560NG

IC: 1754F-9560NG

Report Number: E2/2018/60059

FCC Rule Part: §15.247, Cat: DSS

IC Rule Part: RSS-247 issue 2 Feb 2017

Issue Date: Aug. 03, 2018

Date of Test: Jul. 02, 2018

Date of EUT Received: Jun. 29, 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
E2/2018/60059	Rev.00	Initial creation of document	All	Aug. 03, 2018	Elle Chang

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name of Host:	Notebook Computer	
Brand Name:		
Marketing Name of Host:	SF314-54, SF314-54G	
Model No. of Host:	N8P1	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Model No. of BT/WLAN Module:	9560NGW	
Module FCC ID:	HLZ9560NG	
Module IC:	1754F-9560NG	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II & Class IV Permissive change:	WLAN and BT, 2x2 PCIe M.2 2230 adapter card INSTALLED IN Notebook Computer	
Power Supply:	15.2Vdc from Rechargeable Li-ion Battery Pack or 19V by AC/DC Power Adapter	
	Battery:	Model No.: AC14B8, Supplier: LG
	Adapter:	Model No.: A11-065N1A, Supplier: Chicony

Bluetooth_BR+EDR:

Bluetooth Version	V5.0 dual mode
Channel number:	79 channels
Modulation type:	GFSK + $\pi/4$ DQPSK + 8DPSK
Transmit Power:	10.51dBm
Type of Emission:	BR: 841KG1D, EDR: 1M43F1D
Frequency Range:	2.402GHz – 2.480GHz
Antenna Designation:	PIFA Antenna, Supplier: WNC 1. P/N: 1415-06UL0PB (81EAAL15.GKJ), Gain: 0.61dBi (Main) 2. P/N: 1415-06UL0PB (81EAAL15.GKY), Gain: 0.30dBi (Aux)

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

ANSI C63.10:2013

Canada RSS-247 issue 2 Feb. 2017

Canada RSS-Gen issue 5 Apr. 2018

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 Number and Designation number are: 735305 / TW0002

Canada Registration Number: 4620E-1

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 placed on a 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 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50 uH 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 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 plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	BT Test Software	N/A	N/A	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.247(b) (3)	RSS-247 §5.4 (2)	Peak Output Power	Compliant
§15.247(d)	RSS-247 §5.5	Radiated Spurious Emission	Compliant
§15.203 §15.247(b)	-	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

79 channels are provided for Bluetooth

CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY	CH	FREQUENCY
0	2402 MHz	20	2422 MHz	40	2442 MHz	70	2462 MHz
1	2403 MHz	21	2423 MHz	41	2443 MHz	71	2463 MHz
2	2404 MHz	22	2424 MHz	42	2444 MHz	72	2464 MHz
3	2405 MHz	23	2425 MHz	43	2445 MHz	73	2465 MHz
4	2406 MHz	24	2426 MHz	44	2446 MHz	74	2466 MHz
5	2407 MHz	25	2427 MHz	45	2447 MHz	75	2467 MHz
6	2408 MHz	26	2428 MHz	46	2448 MHz	76	2468 MHz
7	2409 MHz	27	2429 MHz	47	2449 MHz	77	2469 MHz
8	2410 MHz	28	2430 MHz	48	2450 MHz	78	2470 MHz
9	2411 MHz	29	2431 MHz	49	2451 MHz	79	2471 MHz
10	2412 MHz	30	2432 MHz	50	2452 MHz	80	2472 MHz
11	2413 MHz	31	2433 MHz	51	2453 MHz	81	2473 MHz
12	2414 MHz	32	2434 MHz	52	2454 MHz	82	2474 MHz
13	2415 MHz	33	2435 MHz	53	2455 MHz	83	2475 MHz
14	2416 MHz	34	2436 MHz	54	2456 MHz	84	2476 MHz
15	2417 MHz	35	2437 MHz	55	2457 MHz	85	2477 MHz
16	2418 MHz	36	2438 MHz	56	2458 MHz	86	2478 MHz
17	2419 MHz	37	2439 MHz	57	2459 MHz	87	2479 MHz
18	2420 MHz	38	2440 MHz	58	2460 MHz	88	2480 MHz
19	2421 MHz	39	2441 MHz	59	2461 MHz		

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4.2 The Worst Test Modes and Channel Details

- 1 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.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

Radiated Emission Test (ABOVE 1 GHz) (Worst case)				
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 Transmitter for channel Low, Mid and High, the worst case H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
Bluetooth	0 to 78	0,39,78	GFSK	1	Aux

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5 ASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
20dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Frequency Separation	+/- 51.33 Hz
Number of hopping frequency	+/- 51.33 Hz
Time of Occupancy	+/- 51.33 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

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

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

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 PEAK OUTPUT POWER MEASUREMENT

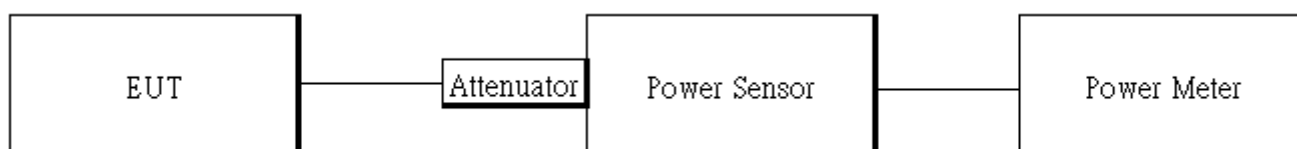
6.1 Standard Applicable

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.

6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Power Meter	Anritsu	ML2496A	1326001	07/25/2018	07/24/2019
Power Sensor	Anritsu	MA2411B	1315048	07/25/2018	07/24/2019
Power Sensor	Anritsu	MA2411B	1315049	07/25/2018	07/24/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/26/2017	12/25/2018
Attenuator	Marvelous	MVE2213-10	RF31	12/26/2017	12/25/2018
DC Block	PASTER-NACK	PE8210	RF29	12/26/2017	12/25/2018

6.3 Test Set-up:



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6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI 63.10:2013. 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.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

1. Record the max. Reading as observed from Power Meter.
2. Repeat above procedures until all test default channel measured was complete.

6.5 Measurement Result:

BR mode (GFSK) (Peak):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	10.02	0.01005	0.125
2441.00	10.14	0.01033	0.125
2480.00	10.51	0.01125	0.125

BR mode (GFSK) (Average):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	9.01	0.00796	0.125
2441.00	9.13	0.00818	0.125
2480.00	9.48	0.00887	0.125

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EDR mode ($\pi/4$ DQPSK) (Peak):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	9.53	0.00897	0.125
2441.00	9.62	0.00916	0.125
2480.00	9.88	0.00973	0.125

EDR mode ($\pi/4$ DQPSK) (Average):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	7.46	0.00557	0.125
2441.00	7.42	0.00552	0.125
2480.00	7.71	0.00590	0.125

EDR mode (8DPSK) (Peak):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	9.68	0.00929	0.125
2441.00	9.69	0.00931	0.125
2480.00	9.94	0.00986	0.125

EDR mode (8DPSK) (Average):

Frequency (MHz)	Reading Power (dBm)	Output Power (W)	Limit (W)
2402.00	7.53	0.00566	0.125
2441.00	7.43	0.00553	0.125
2480.00	7.71	0.00590	0.125

Note: Measured by power meter, **cable loss as 10.4dB that offsets on the power meter.*

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7 RADIATED SPURIOUS EMISSION MEASUREMENT

7.1 Standard Applicable

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

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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7.2 Measurement Equipment Used

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/04/2018	01/03/2019
EMI Test Receiver	R&S	ESU 40	100363	04/11/2018	04/10/2019
Pre-Amplifier	EMC Instruments	EMC0011830	980199	12/26/2017	12/25/2018
Attenuator	Marvelous	WATT-218FS-10	RF246	12/26/2017	12/25/2018
Highpass Filter	Micro Tronics	BRM50701-01	G008	12/26/2017	12/25/2018
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	12/26/2017	12/25/2018

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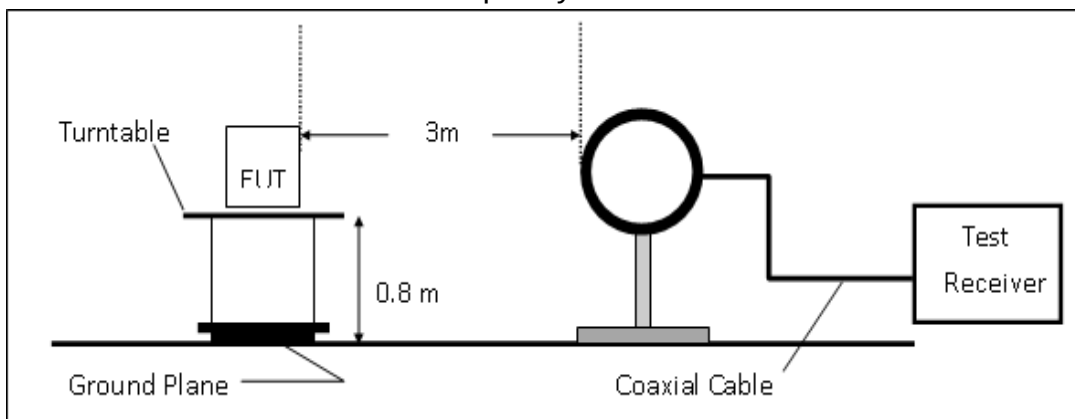
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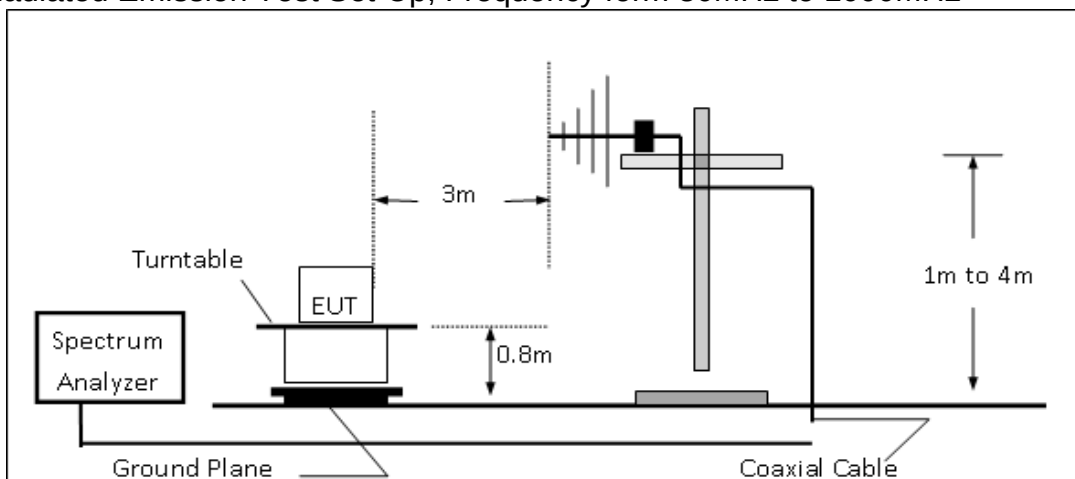
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7.3 Test SET-UP

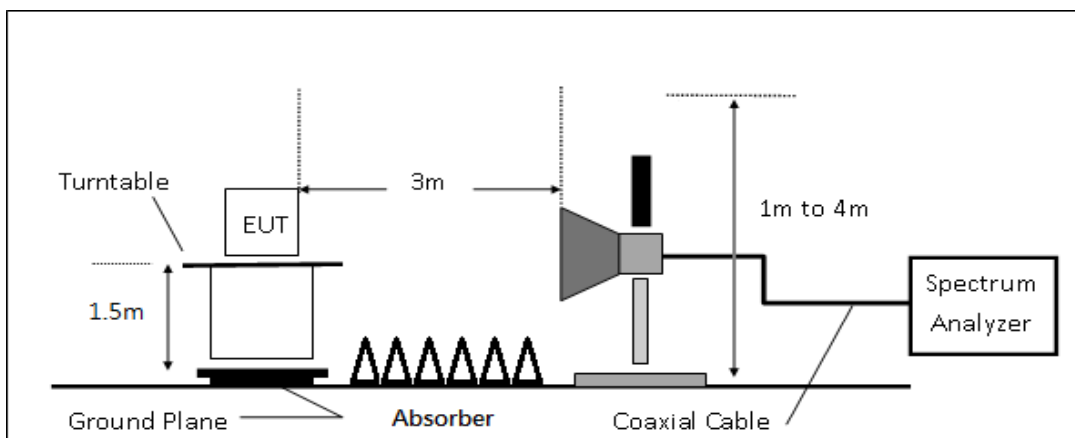
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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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7.4 Measurement Procedure

Radiated Emission

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground 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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, VBW $\geq$ 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

$$\text{On time} = N1 \cdot L1 + N2 \cdot L2 + \dots + N(n-1) \cdot L(n-1) + N(n) \cdot L(n)$$
 Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.
 Average Emission Level = Peak Emission Level + $20 \cdot \log(\text{duty Cycle})$
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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7.5 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 $20 \cdot \log(\mu\text{V/m})$

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

Factor(dB) = Antenna Factor(dBuV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

7.6 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.

7.7 Measurement Result

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

Note: There is a comparison data of both open-field test site and semi-Anechoic, and test result came out very similar.

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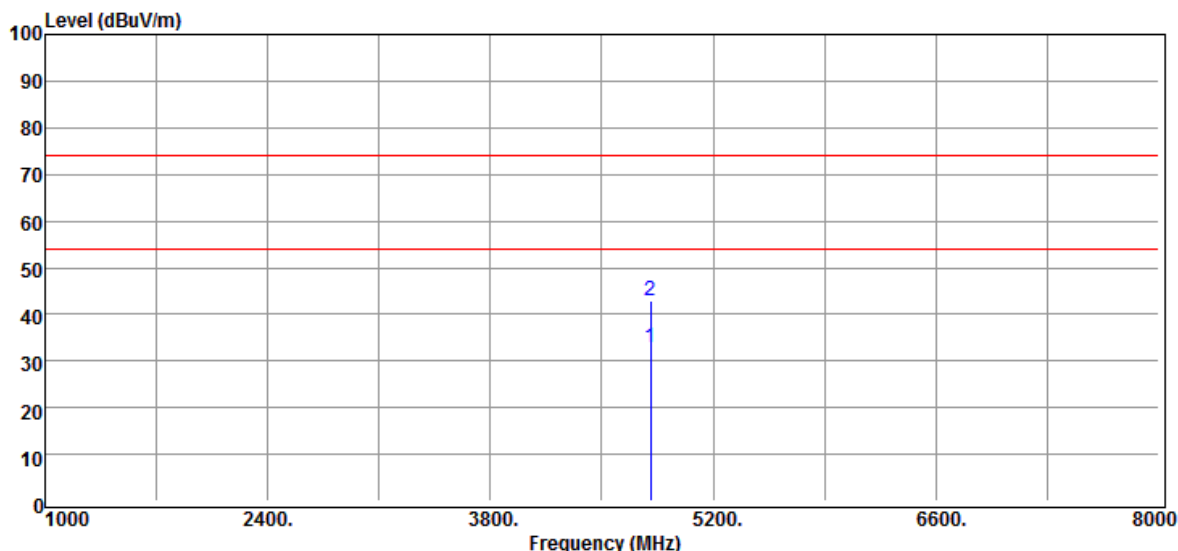
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Radiated Spurious Emission Measurement Result (Above 1GHz) (Worst Case):

Operation Mode	:BT BR	Test Date	:2018-07-02
Test Mode	:TX CH LOW	Temp./Humi.	:23/64
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	Average	20.57	12.29	32.86	54.00	-21.14
4804.00	Peak	30.62	12.29	42.91	74.00	-31.09

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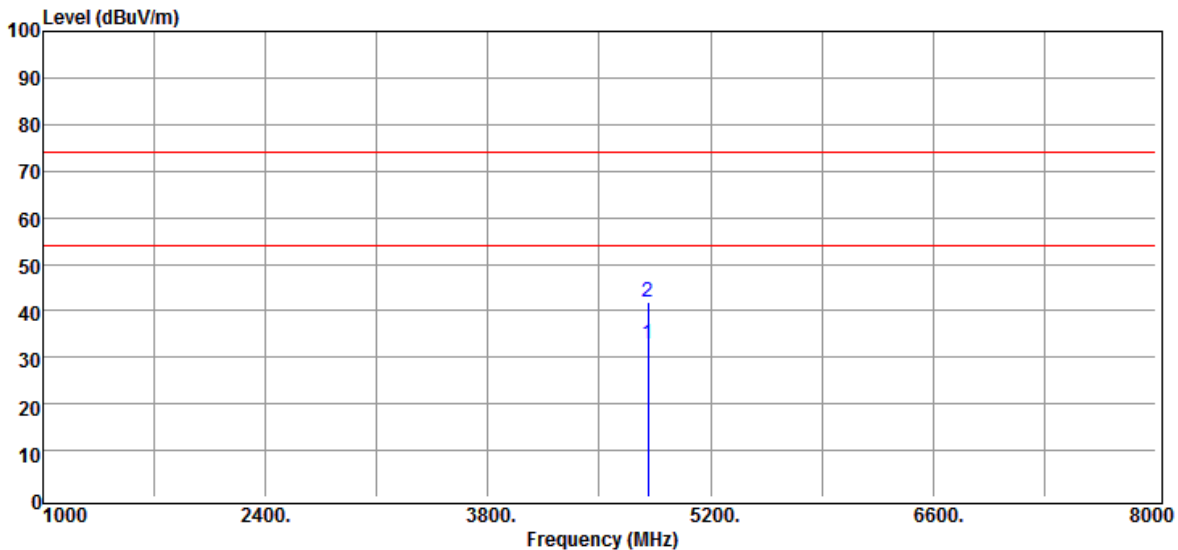
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Operation Mode	:BT BR	Test Date	:2018-07-02
Test Mode	:TX CH LOW	Temp./Humi.	:23/64
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2402 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	Average	20.46	12.29	32.75	54.00	-21.25
4804.00	Peak	29.49	12.29	41.78	74.00	-32.22

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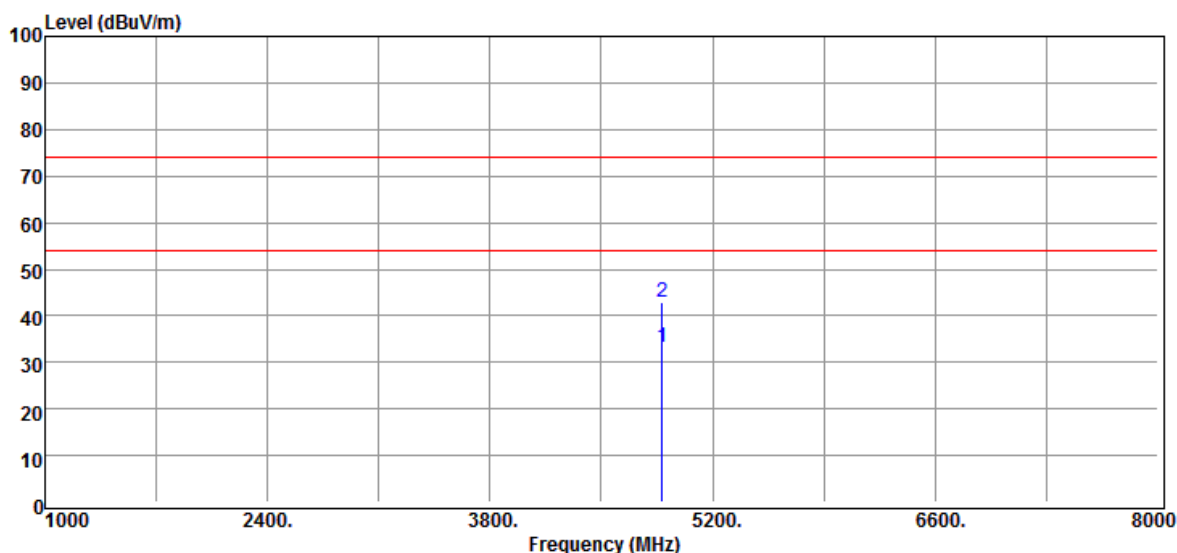
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Operation Mode	:BT BR	Test Date	:2018-07-02
Test Mode	:TX CH MID	Temp./Humi.	:23/64
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2441 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	20.45	12.61	33.06	54.00	-20.94
4882.00	Peak	30.47	12.61	43.08	74.00	-30.92

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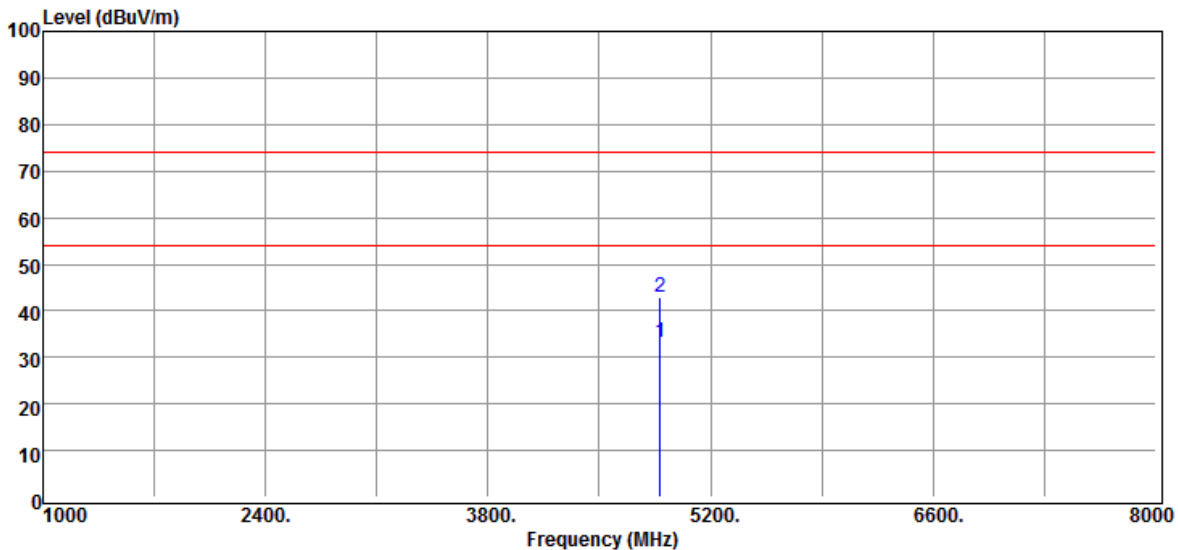
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Operation Mode	:BT BR	Test Date	:2018-07-02
Test Mode	:TX CH MID	Temp./Humi.	:23/64
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2441 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	20.48	12.61	33.09	54.00	-20.91
4882.00	Peak	30.15	12.61	42.76	74.00	-31.24

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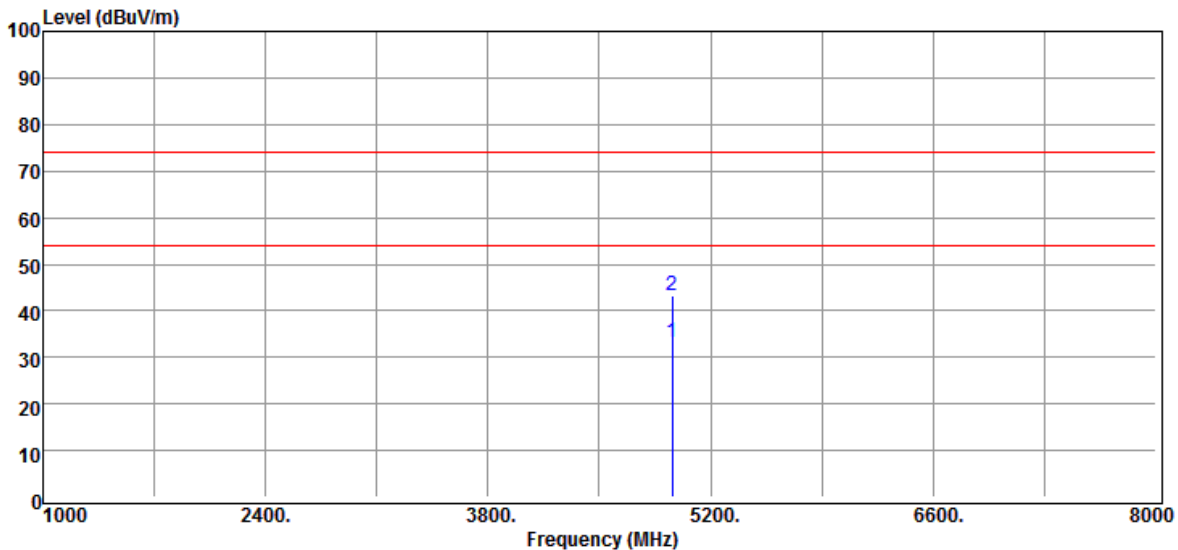
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Operation Mode	:BT BR	Test Date	:2018-07-02
Test Mode	:TX CH HIGH	Temp./Humi.	:23/64
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2480 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	Average	20.39	12.93	33.32	54.00	-20.68
4960.00	Peak	30.46	12.93	43.39	74.00	-30.61

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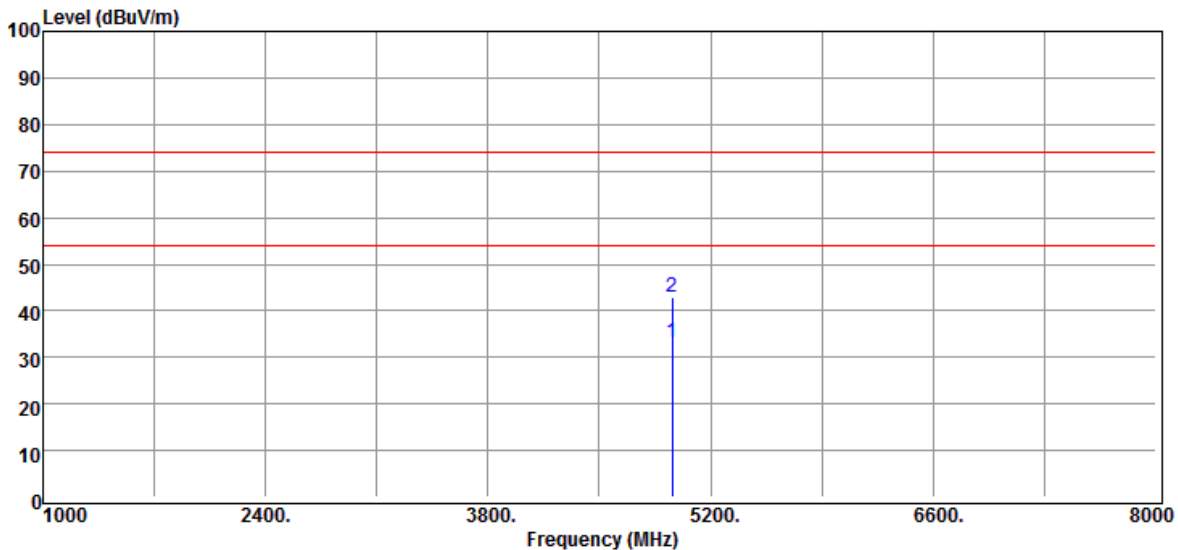
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Operation Mode	:BT BR	Test Date	:2018-07-02
Test Mode	:TX CH HIGH	Temp./Humi.	:23/64
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2480 MHz	Engineer	:Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4960.00	Average	20.42	12.93	33.35	54.00	-20.65
4960.00	Peak	30.10	12.93	43.03	74.00	-30.97

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8 ANTENNA REQUIREMENT

8.1 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.

8.2 Antenna Connected Construction

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

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