ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	HTC Corporation No. 88, Sec. 3, Zhongxing Rd. Xindian Dist., New Taipei City 231, Taiwan
Product Name:	VIVE Headset
Brand Name:	VIVE
Model No.:	2Q7Y100
Model Difference:	N/A
Report Number:	E2/2021/60088
FCC ID	NM82Q7Y100
Issue Date:	August 27, 2021
Date of Test:	July 7, 2021 ~ August 18, 2021
Date of EUT Received:	July 1, 2021

Approved By _____
Vito Pei

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab 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 comply with FCC rule part §15.247.

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

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Revision History

Report Number	Revision	Description	Issue Date	Revised By
E2/2021/60088	00	Original	August 27, 2021	Tiffany Kao

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	VIVE Headset
Brand Name:	VIVE
Model No.:	2Q7Y100
Model Difference:	N/A
Hardware Version:	XG
Firmware Version:	0.27.999.02
EUT Series No.:	5A11X2S00133
Power Supply:	3.85Vdc from Rechargeable Lithium-Ion Polymer Battery or 5V from USB cable

1.2 RF Specification

Radio Technology:	BLE
Frequency Range:	2402 – 2480MHz
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	BLE 1M: 8.86dBm BLE 2M: 9.11dBm

1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Dipole	Amphenol	2Q7Y100	2402-2480	-1.5

Note: Antenna information is provided by the applicant.

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1.4 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10:2013

1.5 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.				

1.6 Special Accessories

There are no special accessories used while test was conducted.

1.7 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. 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

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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

2.4.2 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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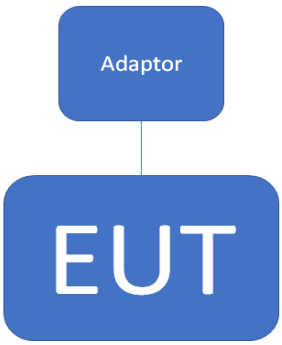
2.5 Test Configuration

Fig. 2-1 Conducted (Antenna Port) Emission Configuration

Fig 2-2 Radiated Emission

Fig 2-3 Conduction (AC Power Line) Radiated Emission



2.6 Control Unit(s)

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
1	Bluetooth Test Software	N/A	N/A	N/A
2	Notebook	Lenovo	L420	S0011721
3	Adapter	Sony	AC-0400-TW	3504600
4	Notebook	Lenovo	T470	P0001293

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	Emission Bandwidth	Compliant
§15.247(d) §15.205 §15.209	Radiated & Conducted Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operating Frequencies

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	FREQUENCY
1	2402 MHz	15	2430 MHz	29	2458 MHz
2	2404 MHz	16	2432 MHz	30	2460 MHz
3	2406 MHz	17	2434 MHz	31	2462 MHz
4	2408 MHz	18	2436 MHz	32	2464 MHz
5	2410 MHz	19	2438 MHz	33	2466 MHz
6	2412 MHz	20	2440 MHz	34	2468 MHz
7	2414 MHz	21	2442 MHz	35	2470 MHz
8	2416MHz	22	2444 MHz	36	2472 MHz
9	2418 MHz	23	2446 MHz	37	2474 MHz
10	2420 MHz	24	2448 MHz	38	2476 MHz
11	2422 MHz	25	2450 MHz	39	2478 MHz
12	2424 MHz	26	2452 MHz	40	2480 MHz
13	2426 MHz	27	2454 MHz		
14	2428 MHz	28	2456 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. The field strength of radiation emission was measured as EUT three orthogonal planes, E1 / E2 / H, are positioned to pre-scan the emission generating the highest one. The worst position is tested and recorded.
4. Investigation has been done on all the possible configurations for searching the worst case.

RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE 1M	0 to 39	20	GFSK	1
Bluetooth LE 2M	0 to 39	20	GFSK	2
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE 1M	0 to 39	0,20,39	GFSK	1
Bluetooth LE 2M	0 to 39	0,20,39	GFSK	2

CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE 1M	0 to 39	0,20,39	GFSK	1
Bluetooth LE 2M	0 to 39	0,20,39	GFSK	2

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/-	2.34	dB
Peak Output Power	+/-	1	dB
6dB Bandwidth & 99% Bandwidth	+/-	1.53	Hz
100 kHz Bandwidth Of Frequency Band Edges	+/-	1.69	dB
Peak Power Density	+/-	1.53	dB
Temperature	+/-	0.4	°C
Humidity	+/-	3.5	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	**+/-**	**2.64**	**dB**	9kHz~30MHz
	+/-	**4.93**	**dB**	30MHz - 1000MHz
	+/-	**4.81**	**dB**	1GHz - 18GHz
	+/-	**4.52**	**dB**	18GHz - 40GHz
Polarization: Horizontal	**+/-**	**2.64**	**dB**	9kHz~30MHz
	+/-	**4.45**	**dB**	30MHz - 1000MHz
	+/-	**4.81**	**dB**	1GHz - 18GHz
	+/-	**4.52**	**dB**	18GHz - 40GHz

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. 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 range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note
1.The lower limit shall apply at the transition frequencies
2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used:

Radiated Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	audix	e3	Ver. 6.11-20180419c	N.C.R	N.C.R
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	04/19/2021	04/18/2022
EMI Test Receiver	R&S	ESCI	101342	04/28/2021	04/27/2022
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2021	03/26/2022
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2021	03/26/2022
Adapter	Sony	AC-0400-TW	3504600	N.C.R	N.C.R
USB Cable	COXOC	C807M3A03E1E2	N/A	N.C.R	N.C.R
USB to Type-c	A-GOOD	USB to Type-c	N/A	N.C.R	N.C.R

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

6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.

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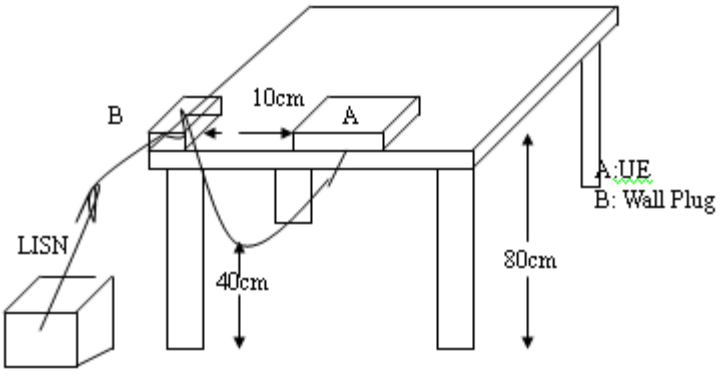
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

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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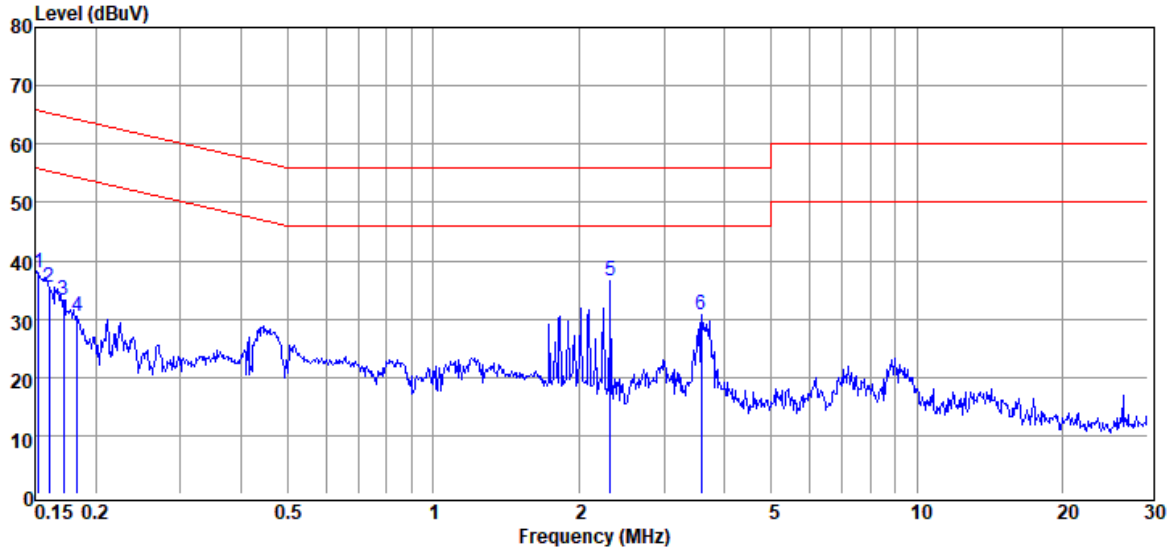
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:E2/2021/60088	Test Site	:Conduction Room C
Test Mode	:BLE 1M	Test Date	:2021-07-22
Power	:120V/60Hz	Temp./Humi.	:24.0/64
Probe	:L1	Engineer	:Jack Tseng



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Peak	27.60	10.30	37.90	65.87	-27.97
0.16	Peak	25.08	10.30	35.38	65.43	-30.05
0.17	Peak	23.00	10.30	33.30	64.86	-31.56
0.18	Peak	20.22	10.30	30.52	64.33	-33.81
2.32	Peak	25.58	11.07	36.65	56.00	-19.35
3.58	Peak	19.90	10.77	30.67	56.00	-25.33

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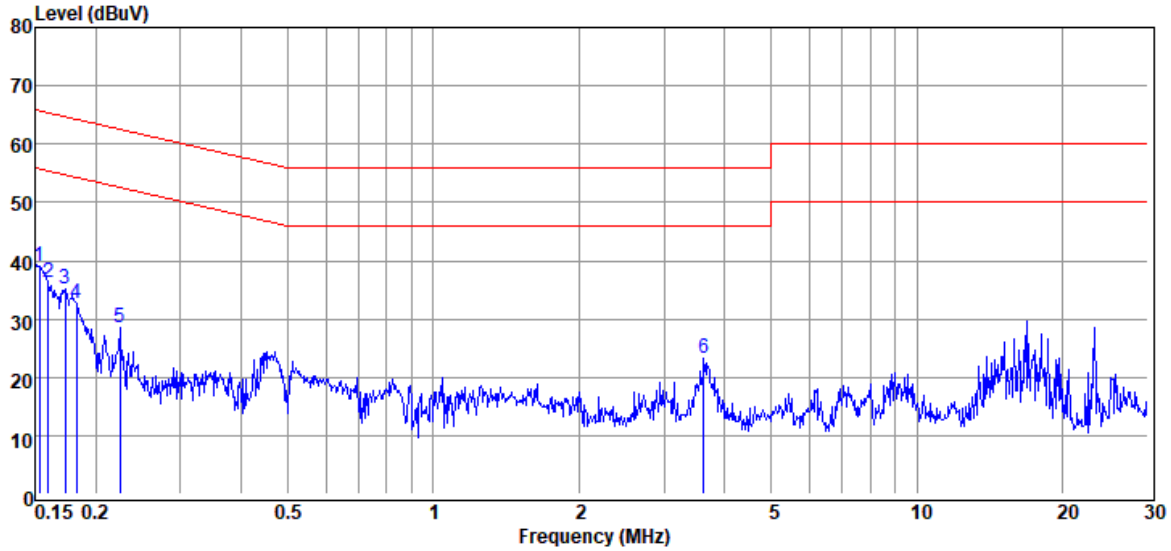
Report Number	:E2/2021/60088	Test Site	:Conduction Room C
Test Mode	:BLE 1M	Test Date	:2021-07-22
Power	:120V/60Hz	Temp./Humi.	:24.0/64
Probe	:N	Engineer	:Jack Tseng



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Peak	28.62	10.31	38.93	65.82	-26.89
0.16	Peak	25.99	10.31	36.30	65.47	-29.17
0.17	Peak	24.72	10.31	35.03	64.81	-29.78
0.18	Peak	22.48	10.30	32.78	64.37	-31.59
0.22	Peak	18.25	10.30	28.55	62.66	-34.11
3.62	Peak	12.58	10.78	23.36	56.00	-32.64

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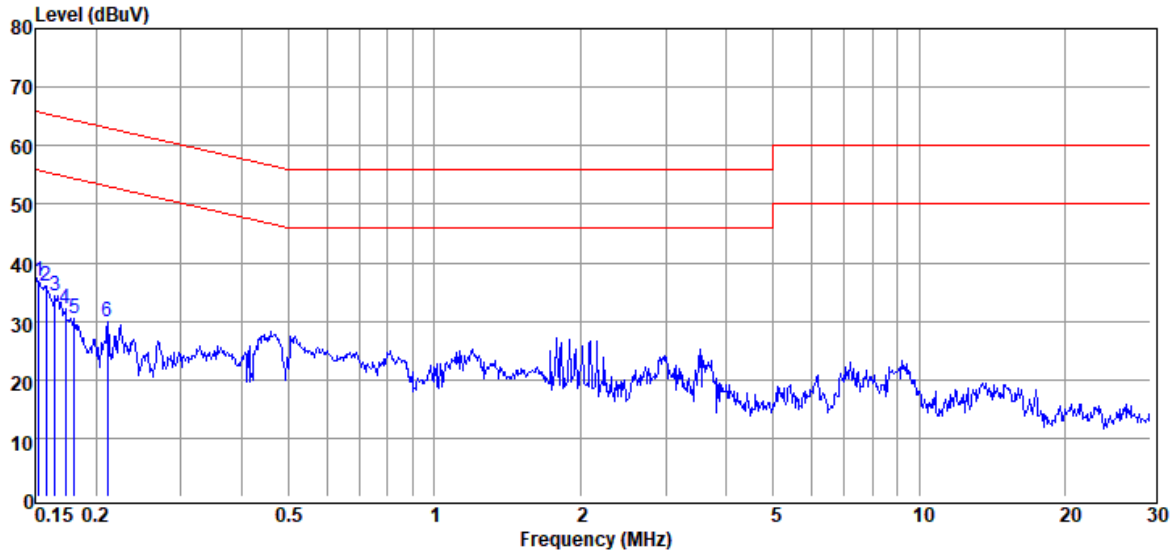
Report Number	:E2/2021/60088	Test Site	:Conduction Room C
Test Mode	:BLE 2M	Test Date	:2021-07-23
Power	:120V/60Hz	Temp./Humi.	:24.0/64
Probe	:L1	Engineer	:Jack Tseng



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Peak	26.68	10.22	36.90	65.87	-28.97
0.16	Peak	25.90	10.22	36.12	65.56	-29.44
0.17	Peak	24.13	10.22	34.35	65.21	-30.86
0.17	Peak	21.93	10.22	32.15	64.81	-32.66
0.18	Peak	20.36	10.22	30.58	64.46	-33.88
0.21	Peak	19.70	10.22	29.92	63.14	-33.22

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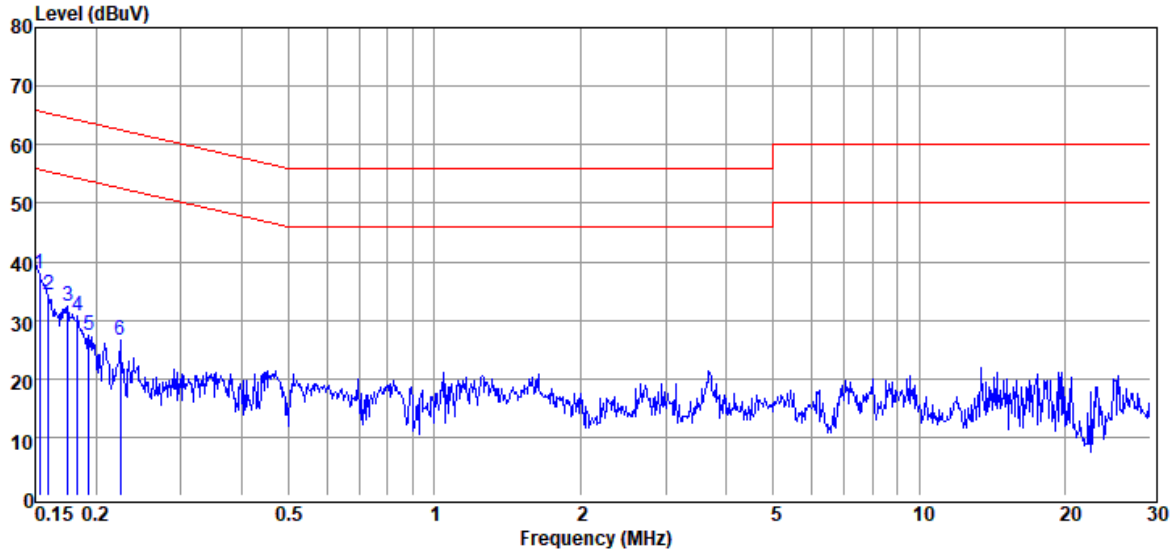
Report Number	:E2/2021/60088	Test Site	:Conduction Room C
Test Mode	:BLE 2M	Test Date	:2021-07-23
Power	:120V/60Hz	Temp./Humi.	:24.0/64
Probe	:N	Engineer	:Jack Tseng



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Peak	27.72	10.21	37.93	65.82	-27.89
0.16	Peak	24.09	10.21	34.30	65.47	-31.17
0.17	Peak	22.19	10.21	32.40	64.72	-32.32
0.18	Peak	20.57	10.21	30.78	64.33	-33.55
0.19	Peak	17.13	10.21	27.34	63.89	-36.55
0.22	Peak	16.34	10.21	26.55	62.66	-36.11

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7 PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

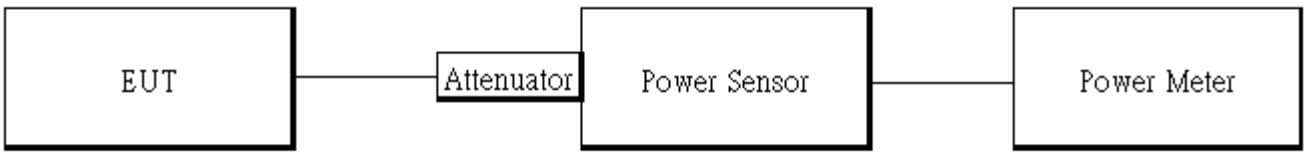
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

7.2 Measurement Equipment Used:

Conducted Emission Test Site: Conducted G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1512003	07/23/2020	07/22/2021
Power Sensor	Anritsu	MA2411B	1339378	07/23/2020	07/22/2021
Power Sensor	Anritsu	MA2411B	1339379	07/23/2020	07/22/2021
Attenuator	Marvelous	WATT-218FS-10	RF22	11/19/2020	11/18/2021
Attenuator	Marvelous	WATT-218FS-10	RF23	11/19/2020	11/18/2021
Power Meter	Anritsu	ML2496A	1804002	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726105	04/14/2021	04/13/2022
Power Sensor	Anritsu	MA2411B	1726106	04/14/2021	04/13/2022

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 the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.

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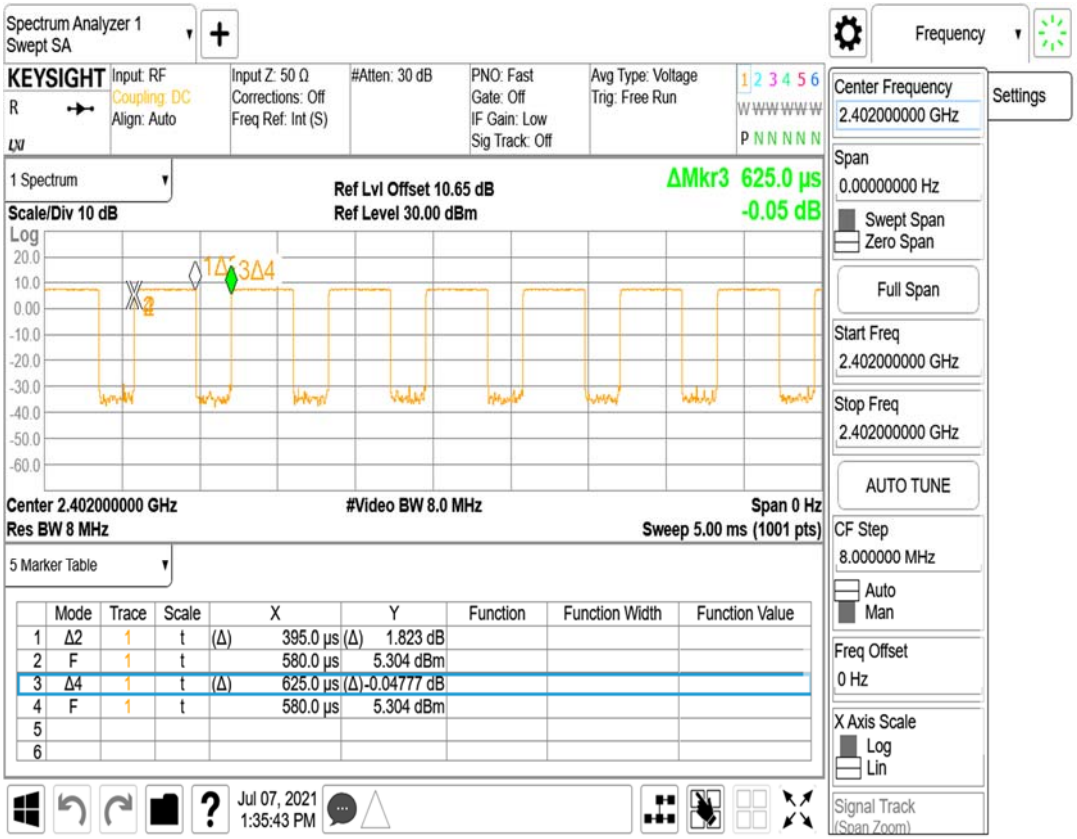
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
4. Record the max. Reading as observed from Power Meter.
5. Repeat above procedures until all test default channel measured was complete.

7.5 Duty Factor:

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
BLE	63.20	1.99	2.53	3.00



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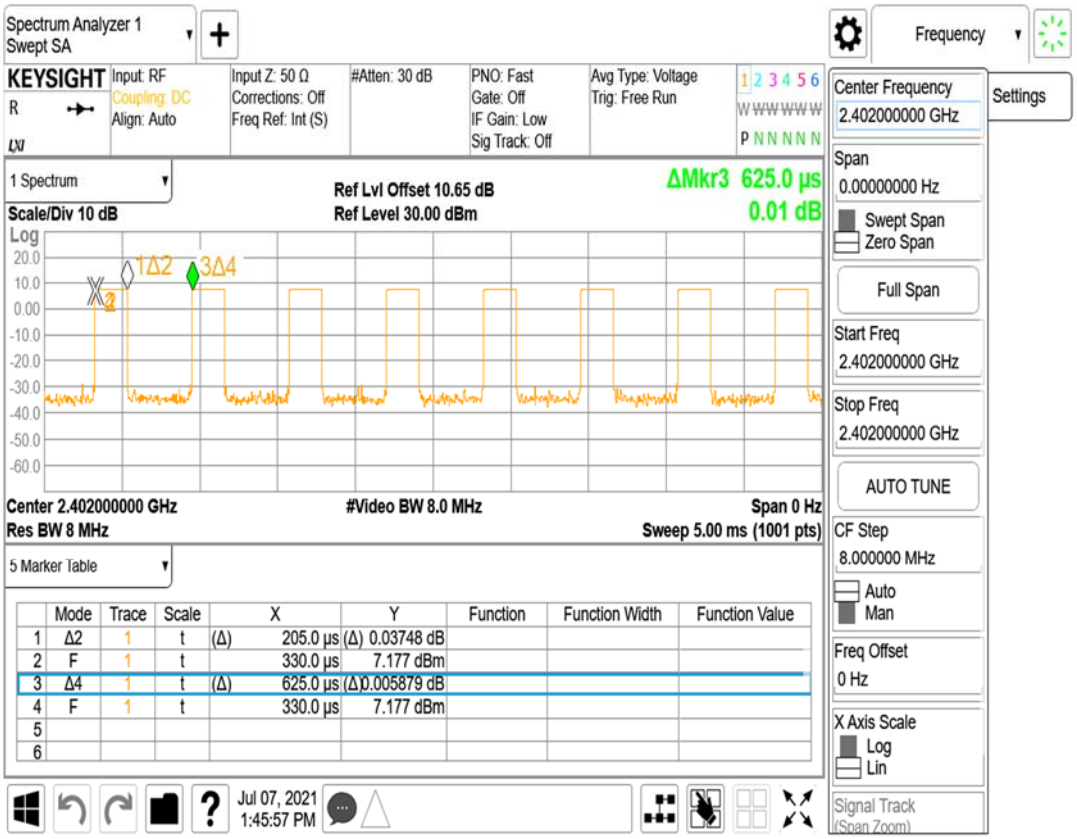
	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
BLE 2M	32.80	4.84	4.88	5.00



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7.6 Output Power:

7.6.1 Peak & Avg

BLE mode:

CH	Frequency (MHz)	Power set	Peak Power Output (dBm)	Required Limit (dBm)
Low	2402	default	7.39	30
Mid	2442	default	**8.86**	30
High	2480	default	8.50	30
CH	**Frequency (MHz)**	**Power set**	**Max. Avg. Output include tune up tolerance Power (dBm)**	**Required Limit (dBm)**
Low	2402	default	7.24	30
Mid	2442	default	8.85	30
High	2480	default	8.21	30

**Note: Measured by power meter, cable loss 10.65 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.*

BLE 2M mode:

CH	Frequency (MHz)	Power set	Peak Power Output (dBm)	Required Limit (dBm)
Low	2402	default	7.62	30
Mid	2442	default	**9.11**	30
High	2480	default	8.63	30
BLE 2M mode:				
CH	**Frequency (MHz)**	**Power set**	**Max. Avg. Output include tune up tolerance Power (dBm)**	**Required Limit (dBm)**
Low	2402	default	7.26	30
Mid	2442	default	8.44	30
High	2480	default	8.32	30

****Note: Measured by power meter, cable loss 10.65 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.***

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8 EMISSION BANDWIDTH MEASUREMENT

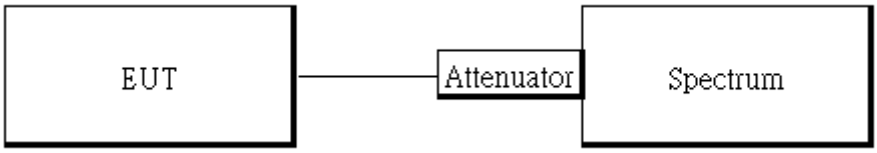
8.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz .

8.2 Measurement Equipment Used

Conducted Emission Test Site: Conducted G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Attenuator	Marvelous	WATT-218FS-10	RF23	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A

8.3 Test Set-up:



8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
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= 100 kHz ,
   VBW = 3 X RBW,
   Span= 2 to 5 times of the OBW,
   Sweep=auto,
   Detector = Peak, and Max hold for -6dB Bandwidth test.
5. Repeat above procedures until all test default channel is completed

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8.5 Measurement Result:

BLE mode

Frequency (MHz)	6dB BW (MHz)	Required BW (MHz)	Result
2402	0.6841	≧ 0.5	PASS
2442	0.6827	≧ 0.5	PASS
2480	0.6815	≧ 0.5	PASS

BLE 2M mode

Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	1.155	≧ 0.5	PASS
2442	1.153	≧ 0.5	PASS
2480	1.157	≧ 0.5	PASS

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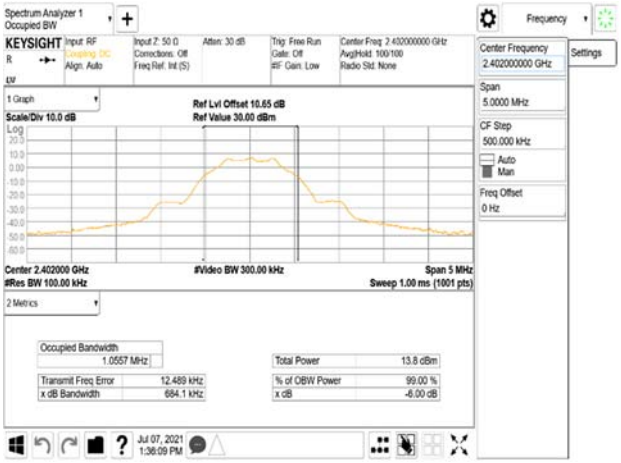
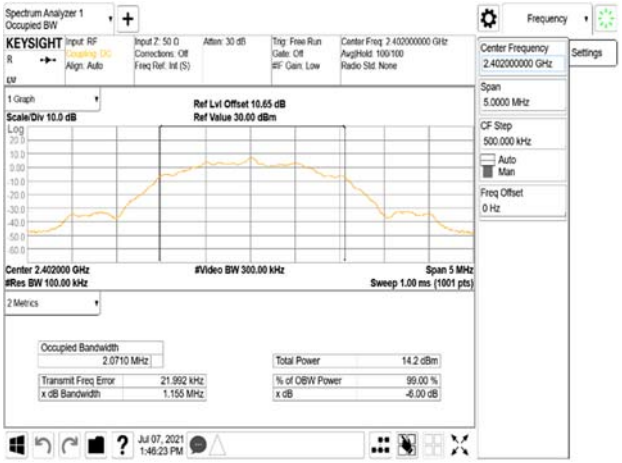
OBW_BLE 1M_LowCH00-2402MHz

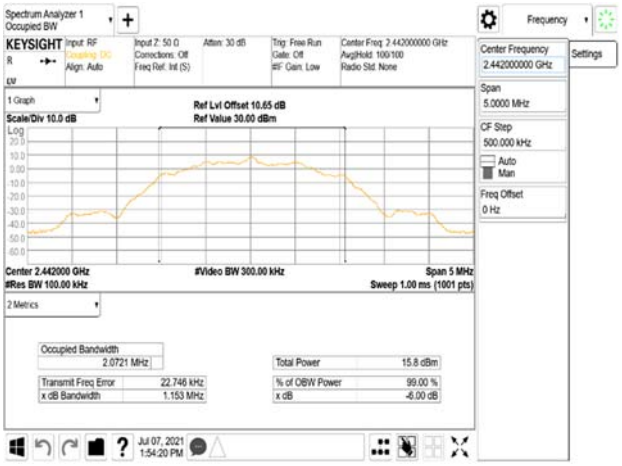


OBW_BLE 2M_LowCH00-2402MHz



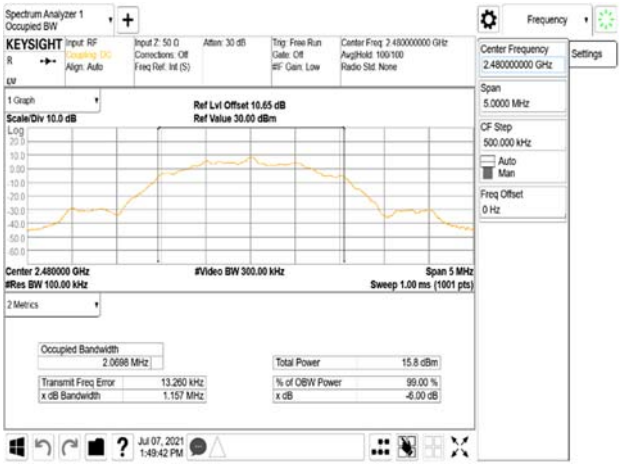
OBW_BLE 1M_MidCH20-2442MHz

OBW_BLE 2M_MidCH20-2442MHz



OBW_BLE 1M_HighCH39-2480MHz

OBW_BLE 2M_HighCH39-2480MHz



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9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

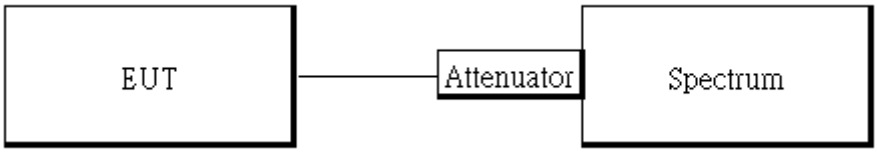
9.1 Standard Applicable

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

9.2 Measurement Equipment Used:

Conducted Emission Test Site: Conducted G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Attenuator	Marvelous	WATT-218FS-10	RF23	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A

9.3 Test SET-UP:



9.4 Measurement Procedure

9.4.1 Reference Level of Emission Limit:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 100kHz & VBW = 300 kHz.
5. Detector = peak.

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6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

9.4.2 Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
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 start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Set DL as the limit = reading on marker of reference level measurement – 20dBm
7. Mark the highest readings of the emissions outside of 2400MHz~2483.5MHz.
8. Repeat above procedures until all default test channel (low and high) was complete.

9.4.3 Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Set RBW = 100 kHz & VBW=300 kHz, Detector =Peak, Sweep = Auto
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

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9.5 Measurement Result

Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	6.98	-13.02
2442	8.59	-11.41
2480	8.47	-11.53

NOTE: cable loss as 10.65dB that offsets in the spectrum

NOTE: Refer to next page for plots.

Reference Level of Limit

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	7.00	-13.00
2442	8.63	-11.37
2480	8.62	-11.38

NOTE: cable loss as 10.65dB that offsets in the spectrum

NOTE: Refer to next page for plots.

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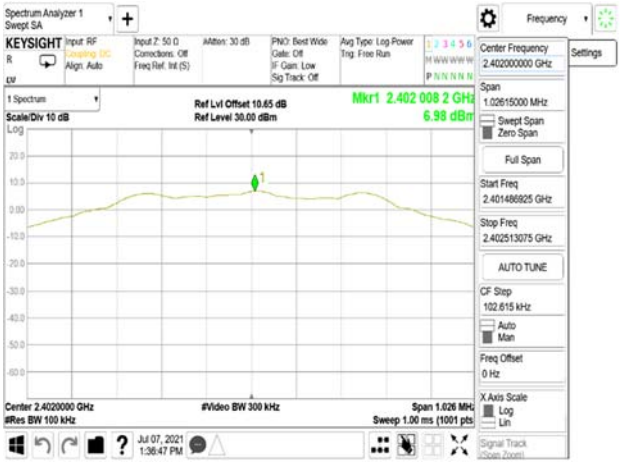
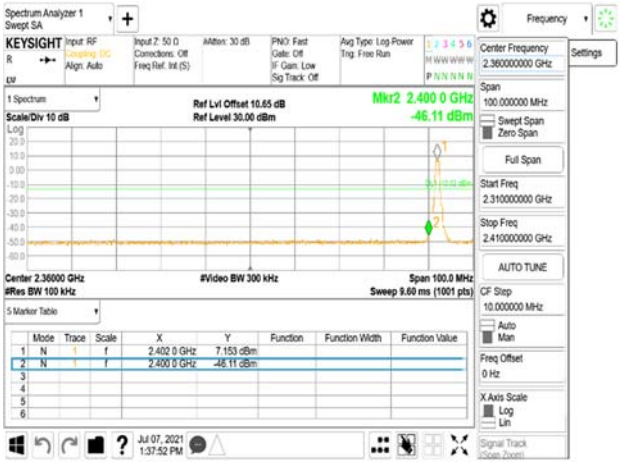
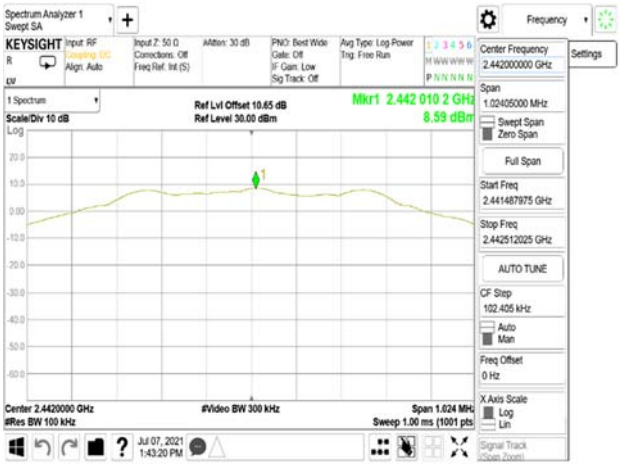
Reference Level_BLE 1M_LowCH00-2402MHz



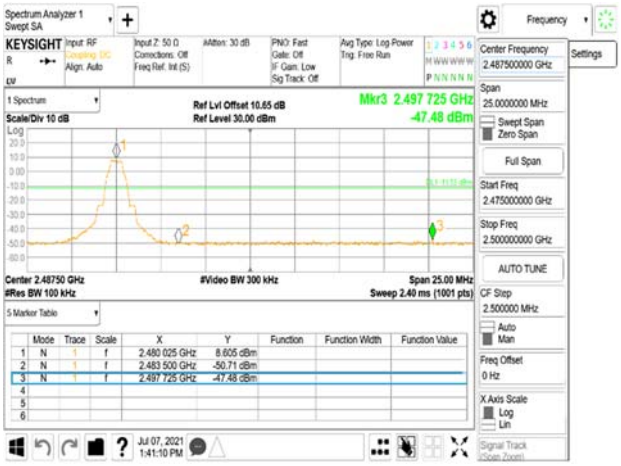
Band Edge_BLE 1M_LowCH00-2402MHz



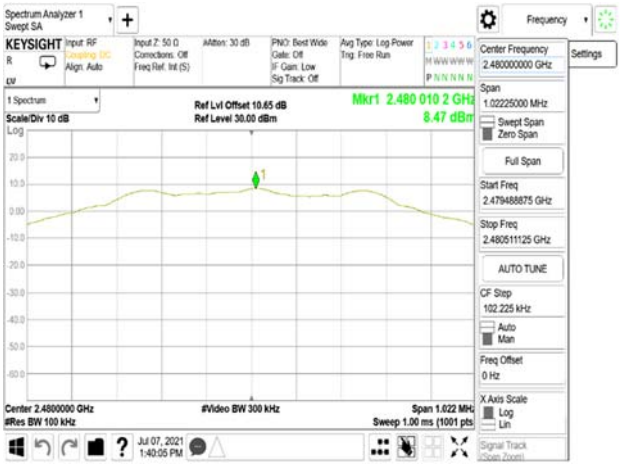
Reference Level_BLE 1M_MidCH20-2442MHz



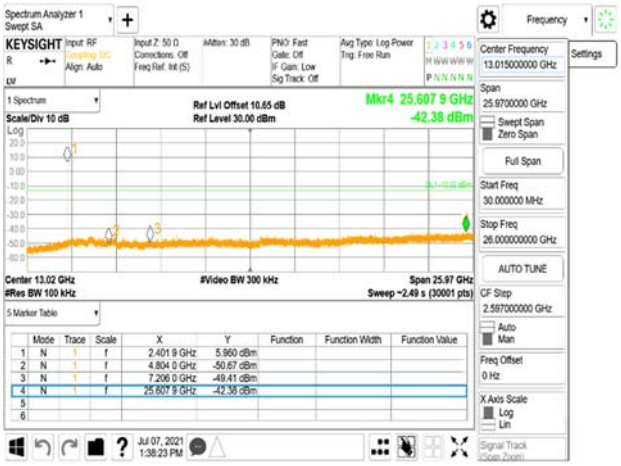
Band Edge_BLE 1M_HighCH39-2480MHz



Reference Level_BLE 1M_HighCH39-2480MHz



Spurious Emission_BLE 1M_LowCH00-2402MHz



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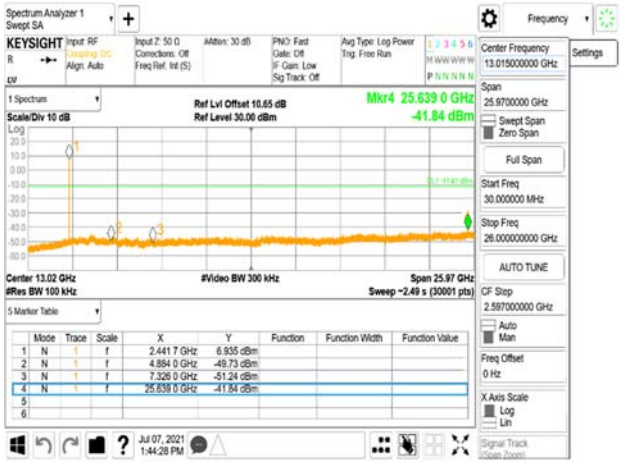
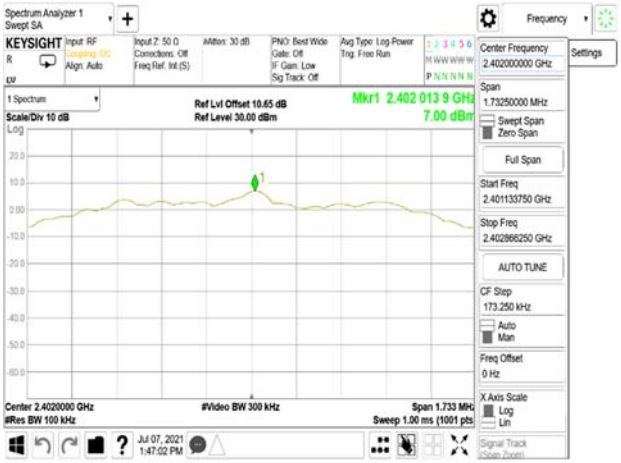
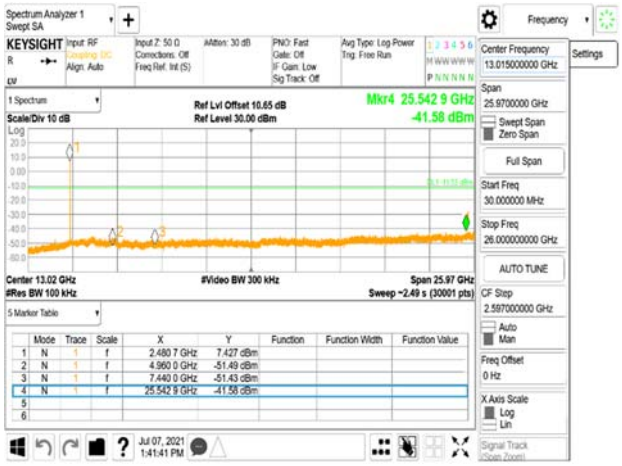
Spurious Emission_BLE 1M_MidCH20-2442MHz



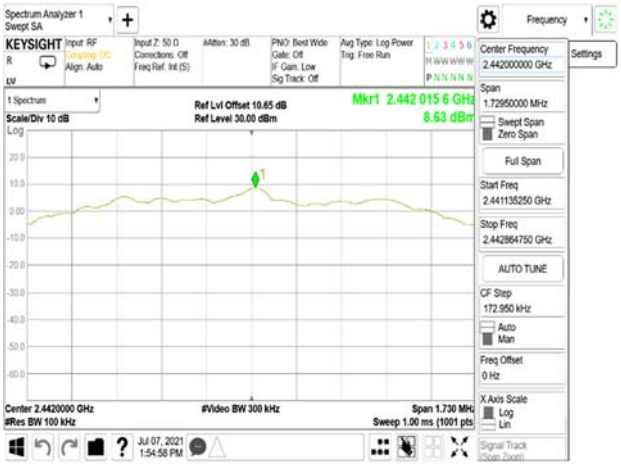
Reference Level_BLE 2M_LowCH00-2402MHz



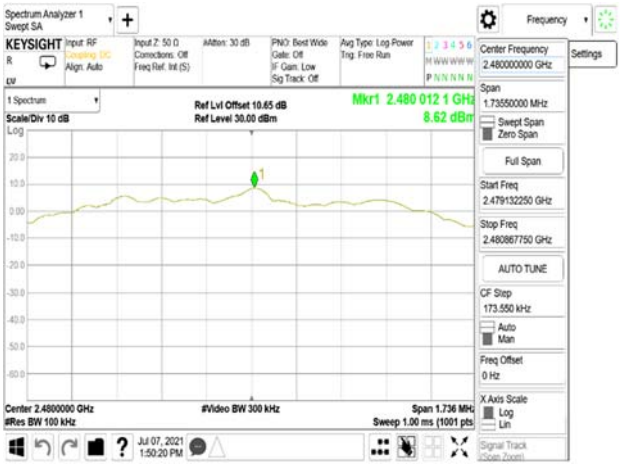
Spurious Emission_BLE 1M_HighCH39-2480MHz



Reference Level_BLE 2M_MidCH20-2442MHz



Reference Level_BLE 2M_HighCH39-2480MHz



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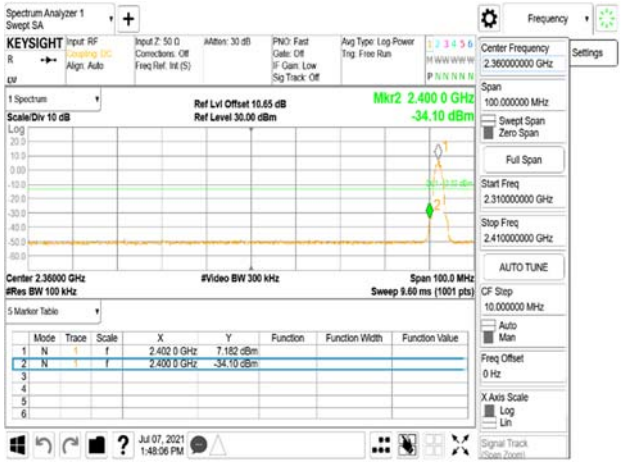
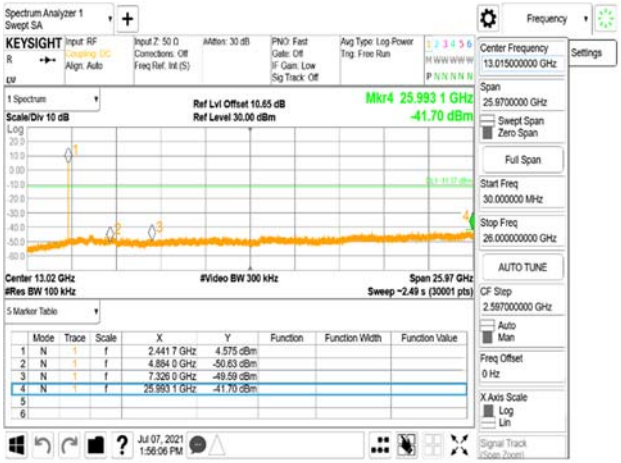
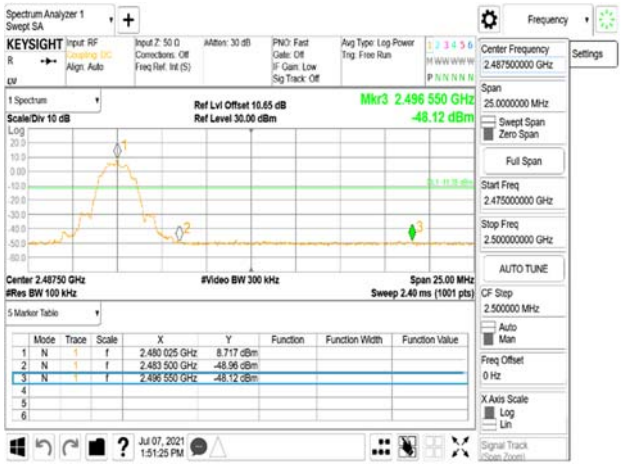
Band Edge_BLE 2M_LowCH00-2402MHz



Spurious Emission_BLE 2M_MidCH20-2442MHz

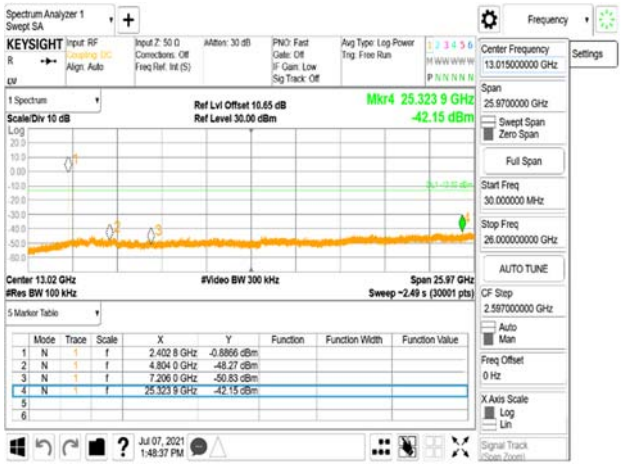


Band Edge_BLE 2M_HighCH39-2480MHz



Spurious Emission_BLE 2M_HighCH39-2480MHz

Spurious Emission_BLE 2M_LowCH00-2402MHz



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10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

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

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

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

Note:

1. The lower limit shall apply at the transition frequencies.

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10.2 Measurement Equipment Used

Radiated Emission Test Site: SAC D					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35240	09/08/2020	09/07/2021
Horn Antenna	Schwarzbeck	BBHA9120D	1341	06/04/2021	06/03/2022
Horn Antenna	Schwarzbeck	BBHA9170	185	07/30/2020	07/29/2021
Loop Antenna	ETS.LINDGREN	6502	143303	05/07/2021	05/06/2022
3m Site NSA	SGS	966 chamber D	N/A	07/12/2021	07/11/2022
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	03/22/2021	03/21/2022
Pre-Amplifier	EMC Instruments	EMC184045 B	980135	10/27/2020	10/26/2021
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/19/2020	11/18/2021
Pre-Amplifier	EMC Instruments	EMC12630S E	980271	11/19/2020	11/18/2021
Attenuator	Marvelous	WATT-218FS-10	RF25	11/19/2020	11/18/2021
High Pass Filter	R&S	F13 HPF 3GHz	RF175	11/19/2020	11/18/2021
Lowpass Filter	Woken	EWT-56-0019	RF173	11/19/2020	11/18/2021
Notch Filter	Woken	EWT-54-0038	RF178	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	11/19/2020	11/18/2021
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/19/2020	11/18/2021
Test Software	audix	e3	20923 sgs Ver.9	N.C.R	N.C.R
USB Cable	COXOC	C807M3A03 E1E2	N/A	N.C.R	N.C.R
Notebook	Lenovo	T470	P0001293	N/A	N/A
USB to Type-c	A-GOOD	USB to Type-c	N/A	N.C.R	N.C.R

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

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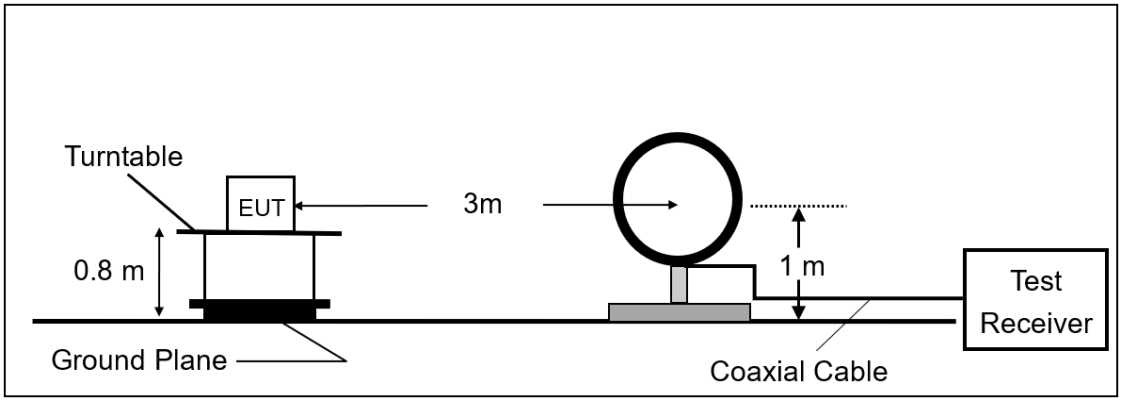
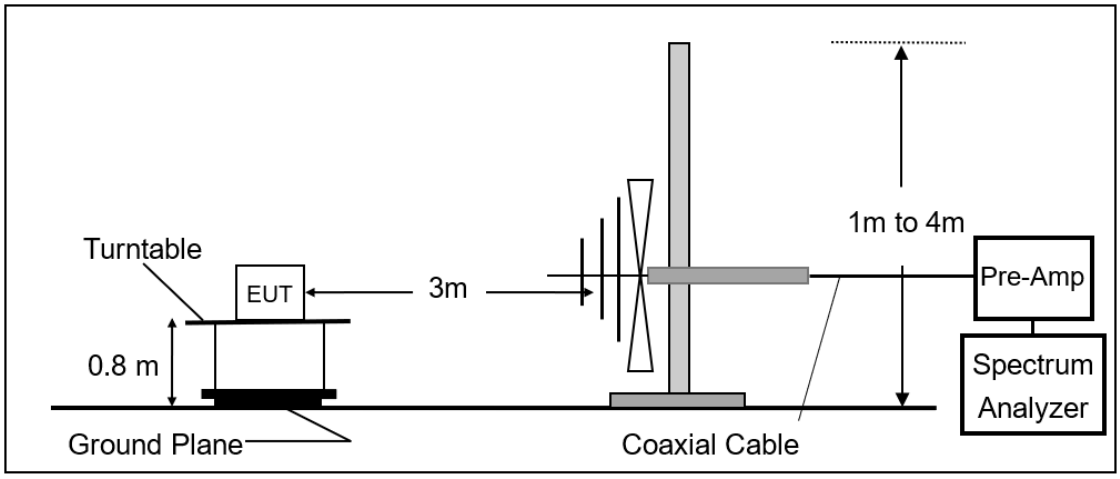
10.3 Test SET-UP

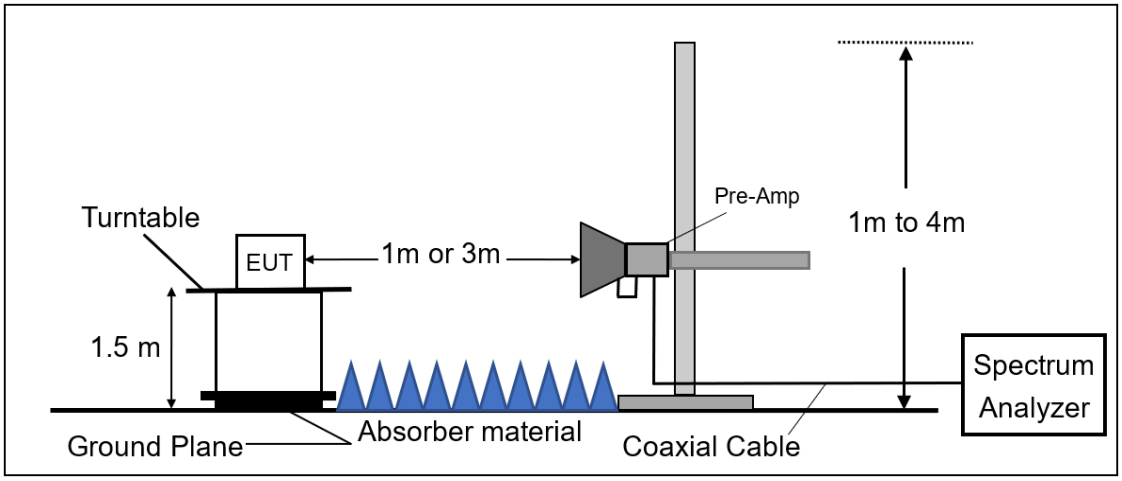
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



(C) Radiated Emission Test Set-Up, Frequency Above 1GHz.



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10.4 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
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=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz.
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Emission Measurements at frequency above 1 GHz.
9. 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.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
12. Repeat above procedures until all default test channel measured were complete.

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10.5 Field Strength Calculation

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

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

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

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

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

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

10.6 Test Results of Radiated Spurious Emissions from 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.

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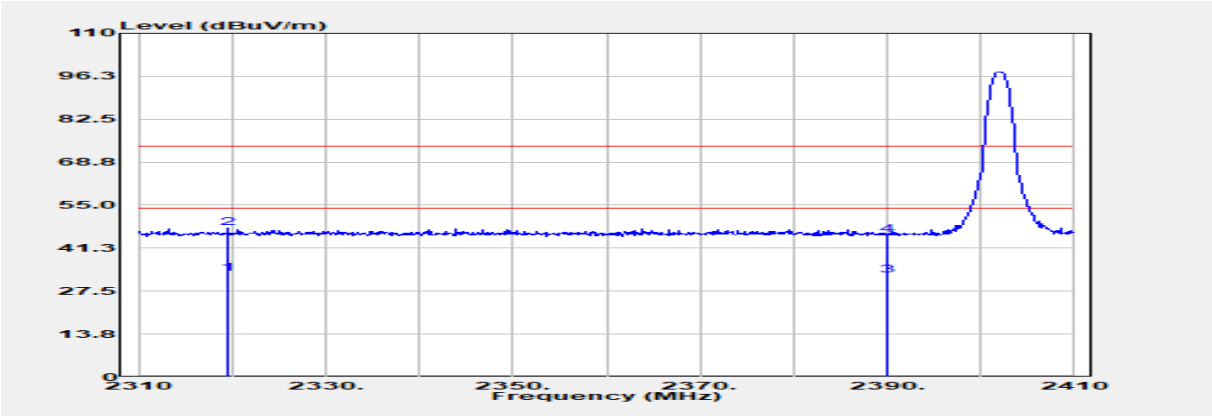
10.7 Measurement Result:

10.7.1 Radiated Band Edge Measurement Result

Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2319.500	Average	40.88	-7.68	33.20	54.00	-20.80
2319.500	Peak	55.33	-7.68	47.65	74.00	-26.35
2390.000	Average	40.53	-7.89	32.64	54.00	-21.36
2390.000	Peak	53.48	-7.89	45.59	74.00	-28.41

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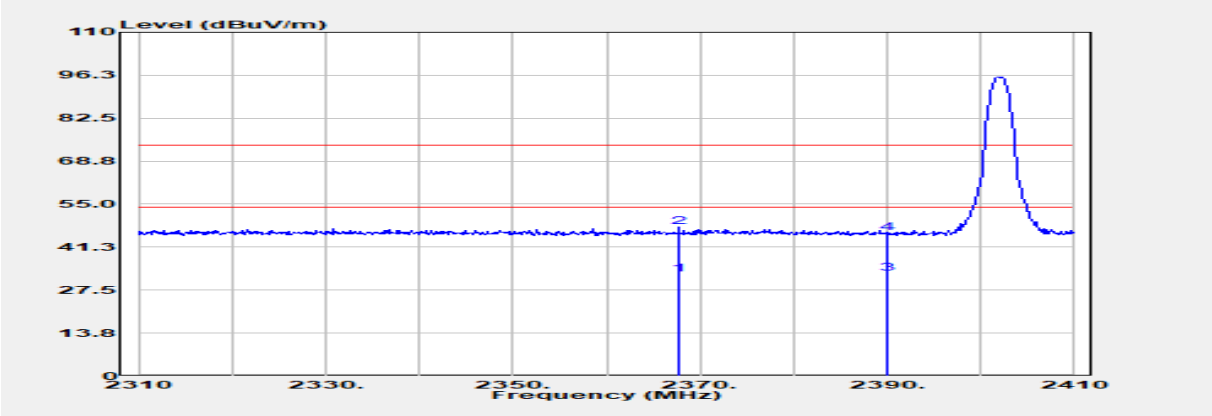
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH LOW	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2367.700	Average	40.33	-7.67	32.66	54.00	-21.34
2367.700	Peak	55.37	-7.67	47.70	74.00	-26.30
2390.000	Average	40.60	-7.89	32.71	54.00	-21.29
2390.000	Peak	53.60	-7.89	45.71	74.00	-28.29

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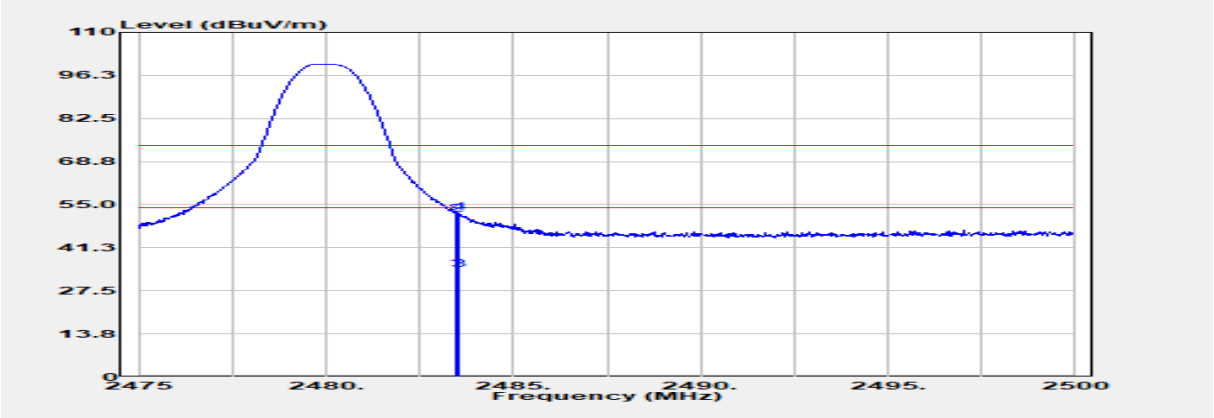
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH HIGH	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	42.53	-8.15	34.37	54.00	-19.63
2483.500	Peak	59.92	-8.15	51.76	74.00	-22.24
2483.550	Average	42.39	-8.15	34.24	54.00	-19.76
2483.550	Peak	60.54	-8.15	52.39	74.00	-21.61

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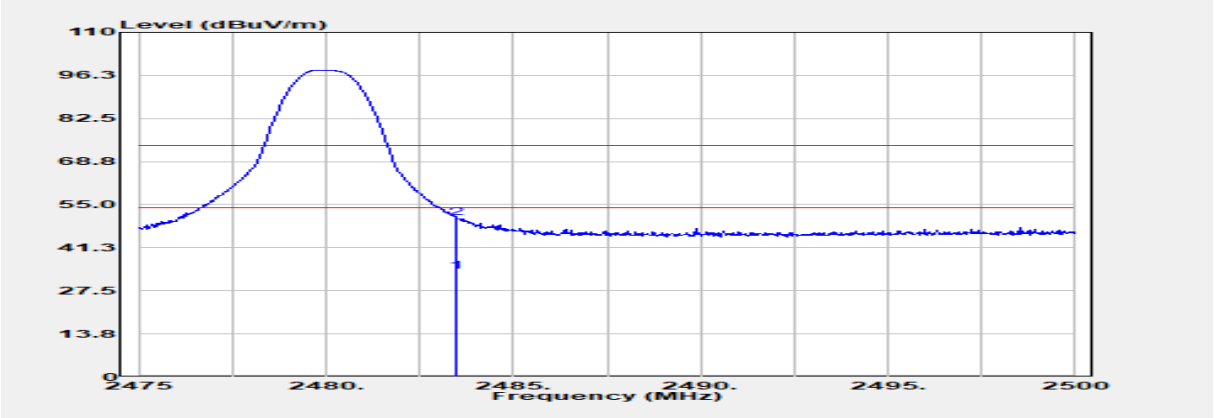
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH HIGH	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	41.84	-8.15	33.69	54.00	-20.31
2483.500	Peak	58.87	-8.15	50.72	74.00	-23.28

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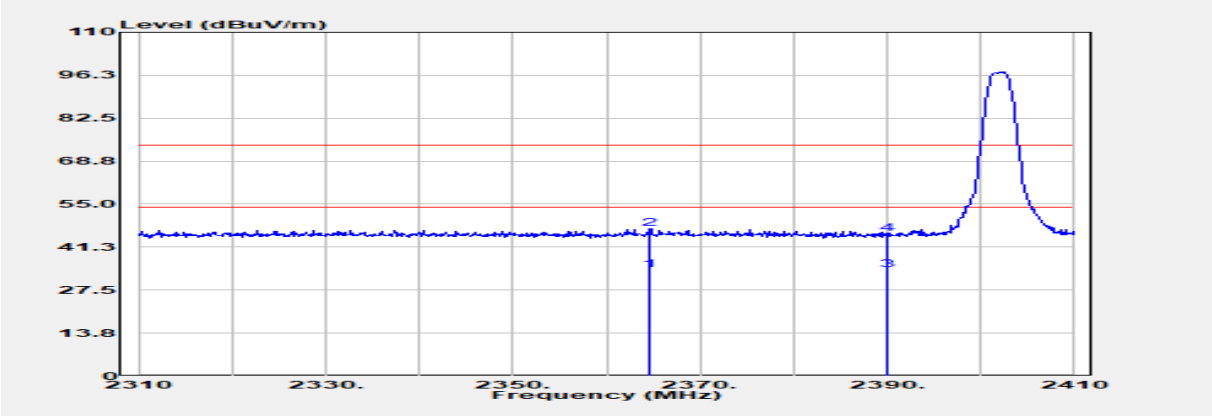
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2364.700	Average	41.74	-7.74	34.00	54.00	-20.00
2364.700	Peak	54.96	-7.74	47.22	74.00	-26.78
2390.000	Average	41.69	-7.89	33.80	54.00	-20.20
2390.000	Peak	53.50	-7.89	45.61	74.00	-28.39

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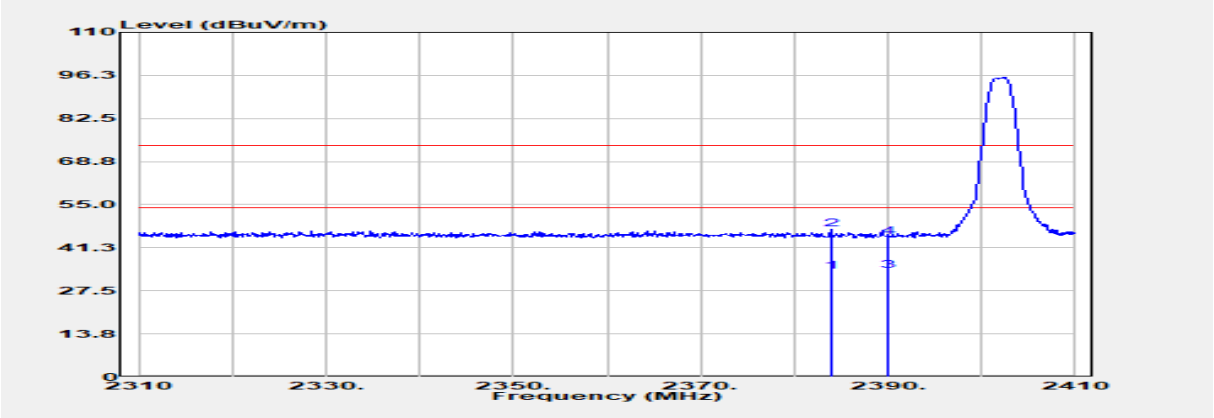
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH LOW	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2383.900	Average	41.32	-7.70	33.62	54.00	-20.38
2383.900	Peak	54.77	-7.70	47.07	74.00	-26.93
2390.000	Average	41.91	-7.89	34.02	54.00	-19.98
2390.000	Peak	52.67	-7.89	44.78	74.00	-29.22

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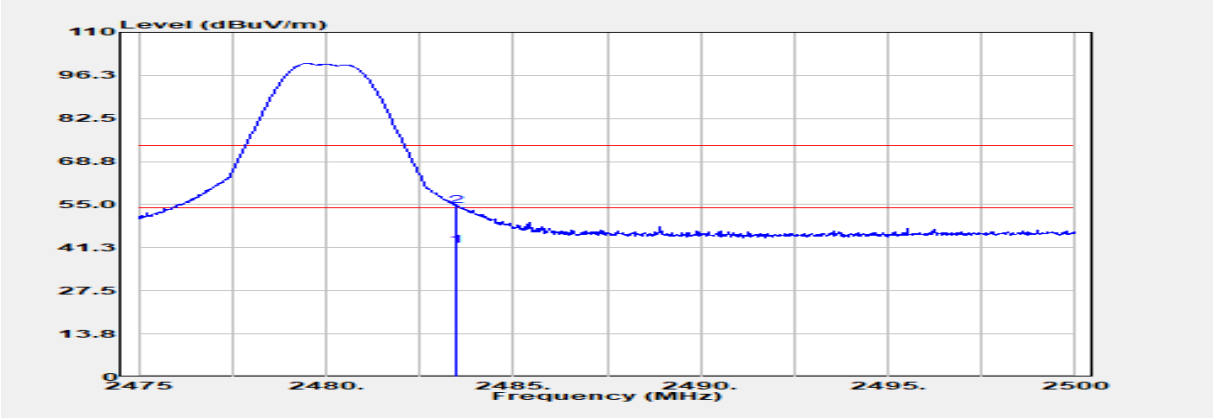
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH HIGH	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	49.96	-8.15	41.80	54.00	-12.20
2483.500	Peak	62.73	-8.15	54.57	74.00	-19.43

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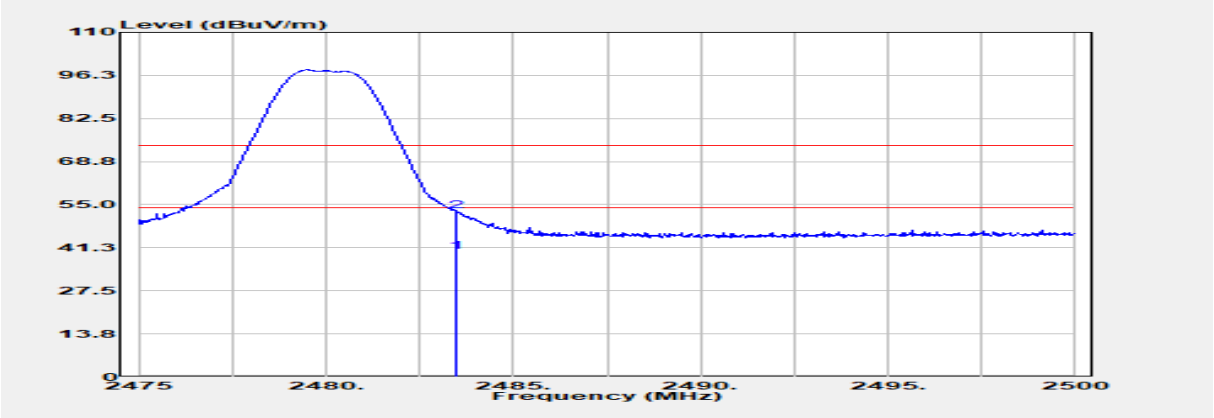
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:BE CH HIGH	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.500	Average	48.10	-8.15	39.94	54.00	-14.06
2483.500	Peak	61.07	-8.15	52.92	74.00	-21.08

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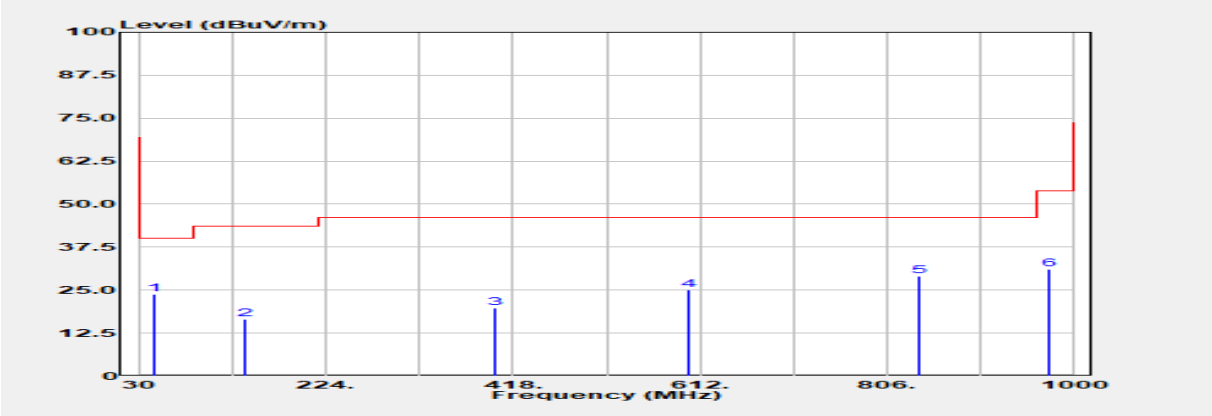
10.7.2 Radiated Spurious Emission

Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-20
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/66
Test Mode	:TX CH MID	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
46.490	Peak	41.39	-17.53	23.85	40.00	-16.15
140.580	Peak	33.63	-17.00	16.63	43.50	-26.87
399.570	Peak	33.42	-13.74	19.68	46.00	-26.32
599.390	Peak	33.86	-8.89	24.98	46.00	-21.02
838.010	Peak	35.78	-6.61	29.16	46.00	-16.84
974.780	Peak	35.49	-4.38	31.11	54.00	-22.89

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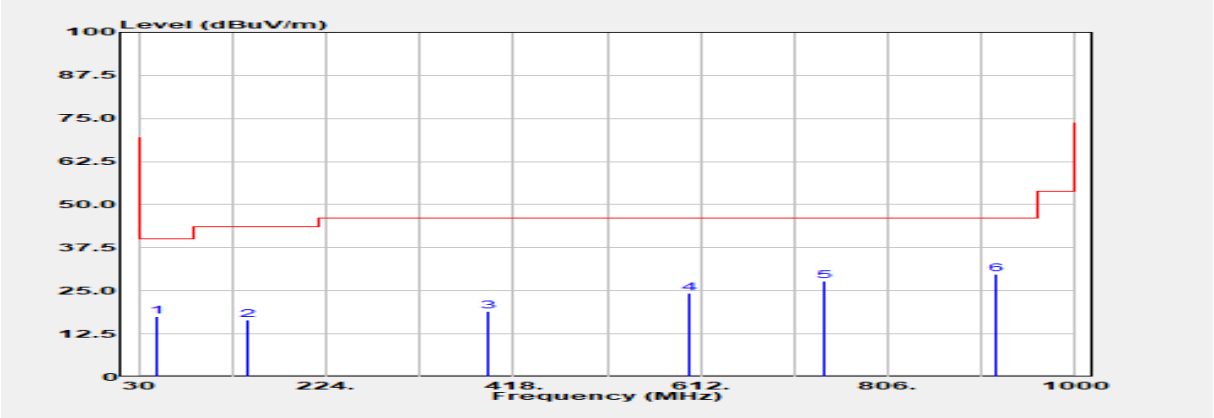
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-20
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/66
Test Mode	:TX CH MID	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
48.430	Peak	35.19	-17.64	17.55	40.00	-22.45
142.520	Peak	33.43	-16.92	16.51	43.50	-26.99
390.840	Peak	33.03	-13.89	19.13	46.00	-26.87
600.360	Peak	33.18	-8.84	24.34	46.00	-21.66
740.040	Peak	35.19	-7.37	27.81	46.00	-18.19
918.520	Peak	35.27	-5.36	29.91	46.00	-16.09

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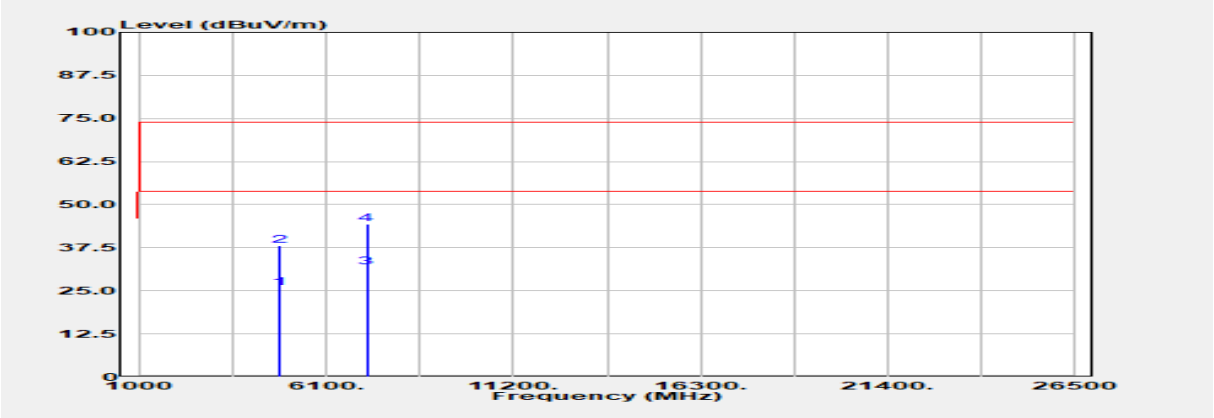
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Average	28.83	-3.04	25.78	54.00	-28.22
4804.000	Peak	41.08	-3.04	38.04	74.00	-35.96
7206.000	Average	28.95	2.98	31.93	54.00	-22.07
7206.000	Peak	41.26	2.98	44.25	74.00	-29.75

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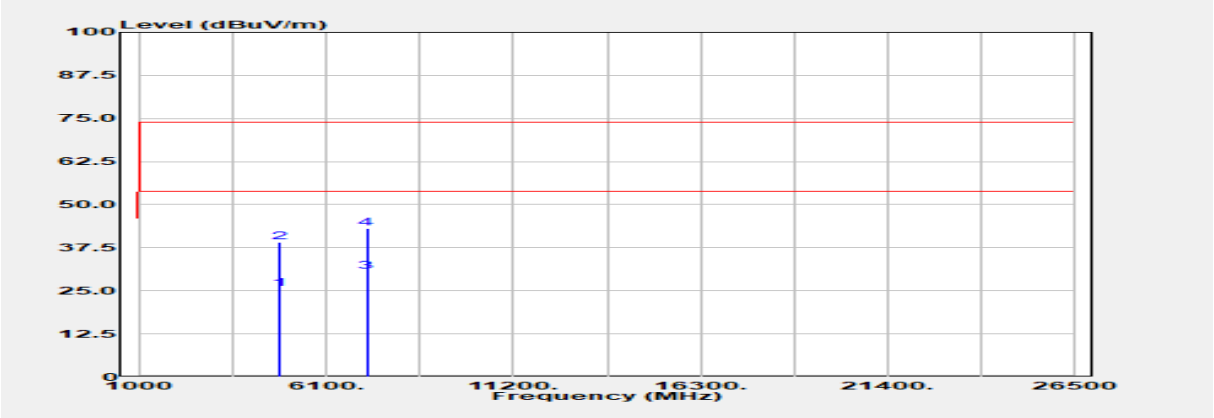
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH LOW	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Average	28.64	-3.04	25.60	54.00	-28.40
4804.000	Peak	42.11	-3.04	39.07	74.00	-34.93
7206.000	Average	27.56	2.98	30.54	54.00	-23.46
7206.000	Peak	40.19	2.98	43.17	74.00	-30.83

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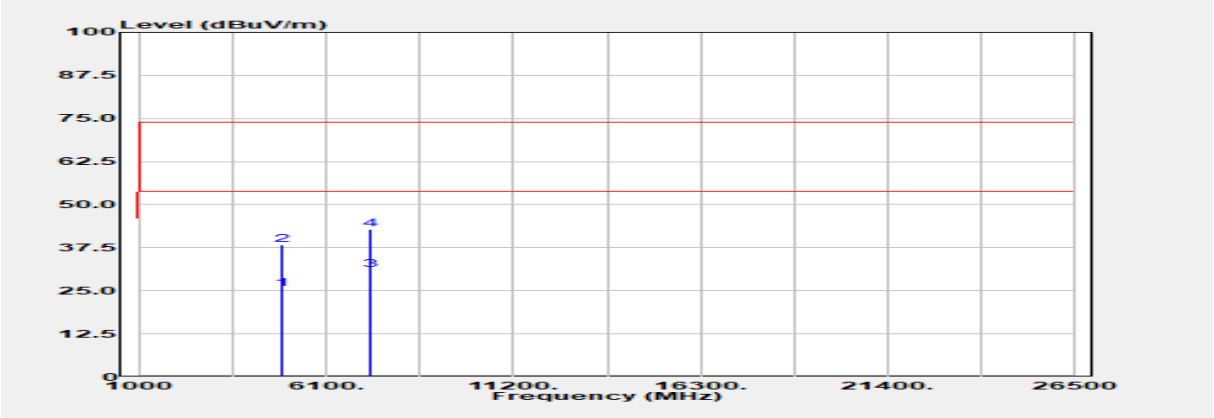
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH MID	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4884.000	Average	28.82	-3.20	25.61	54.00	-28.39
4884.000	Peak	41.59	-3.20	38.38	74.00	-35.62
7326.000	Average	27.93	3.24	31.17	54.00	-22.83
7326.000	Peak	39.64	3.24	42.88	74.00	-31.12

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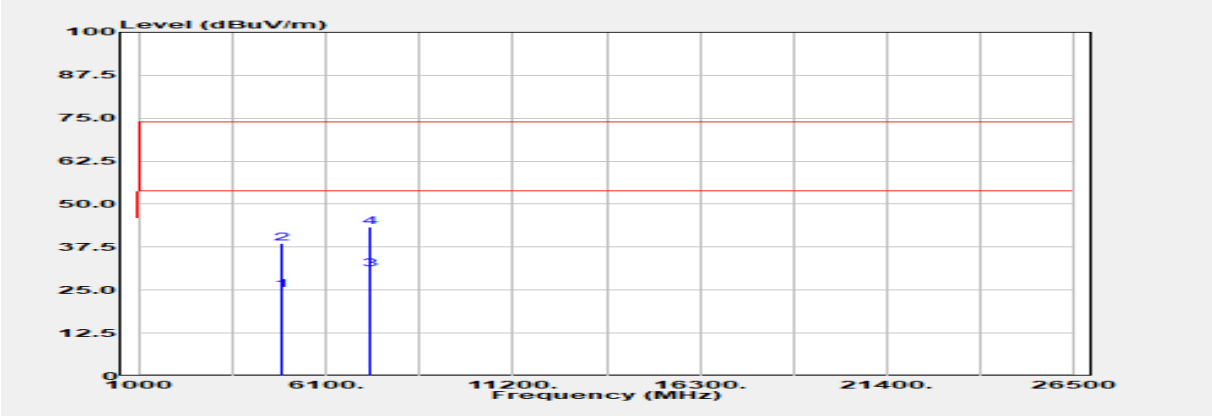
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH MID	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4884.000	Average	28.33	-3.20	25.13	54.00	-28.87
4884.000	Peak	41.92	-3.20	38.72	74.00	-35.28
7326.000	Average	27.90	3.24	31.14	54.00	-22.86
7326.000	Peak	40.20	3.24	43.44	74.00	-30.56

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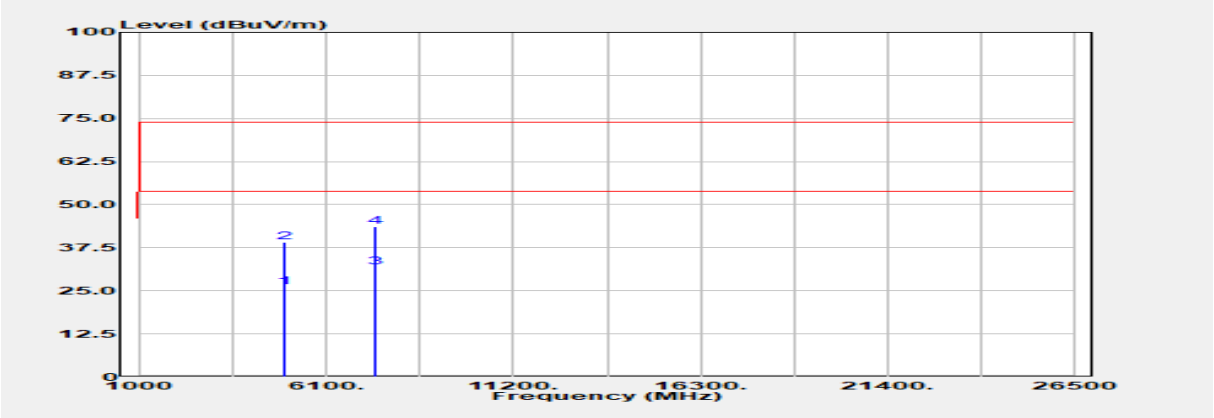
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH HIGH	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	28.89	-2.87	26.01	54.00	-27.99
4960.000	Peak	41.96	-2.87	39.09	74.00	-34.91
7440.000	Average	27.94	3.85	31.79	54.00	-22.21
7440.000	Peak	39.73	3.85	43.58	74.00	-30.42

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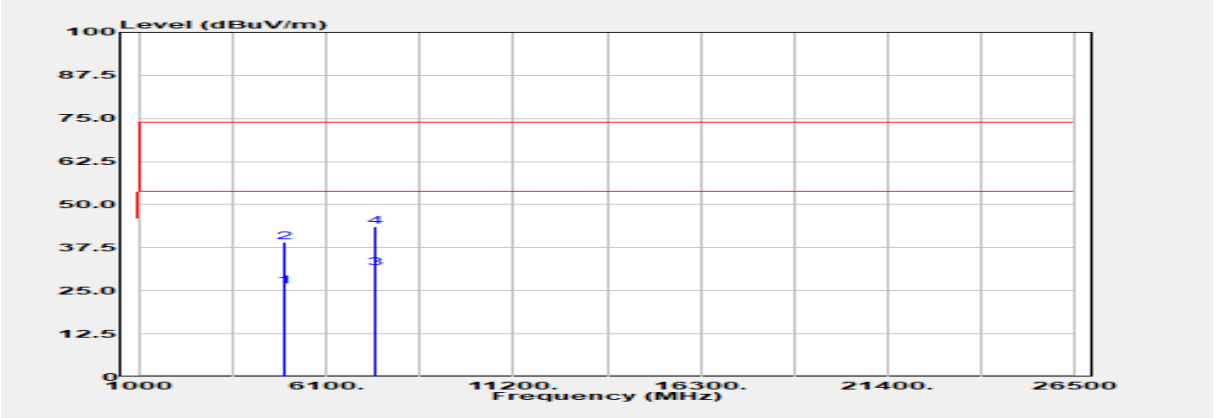
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 1M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH HIGH	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	29.13	-2.87	26.25	54.00	-27.75
4960.000	Peak	41.86	-2.87	38.99	74.00	-35.01
7440.000	Average	27.79	3.85	31.64	54.00	-22.36
7440.000	Peak	39.81	3.85	43.66	74.00	-30.34

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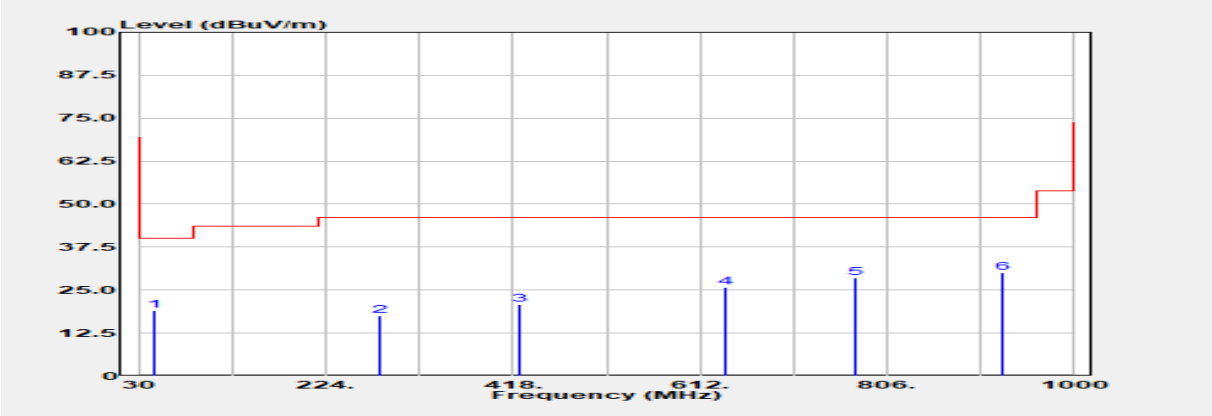
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/66
Test Mode	:TX CH MID	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
46.490	Peak	36.50	-17.53	18.97	40.00	-21.03
279.290	Peak	33.97	-16.52	17.46	46.00	-28.54
424.790	Peak	33.38	-12.66	20.72	46.00	-25.28
639.160	Peak	33.87	-8.11	25.76	46.00	-20.24
772.050	Peak	35.08	-6.57	28.51	46.00	-17.49
925.310	Peak	35.16	-5.05	30.11	46.00	-15.89

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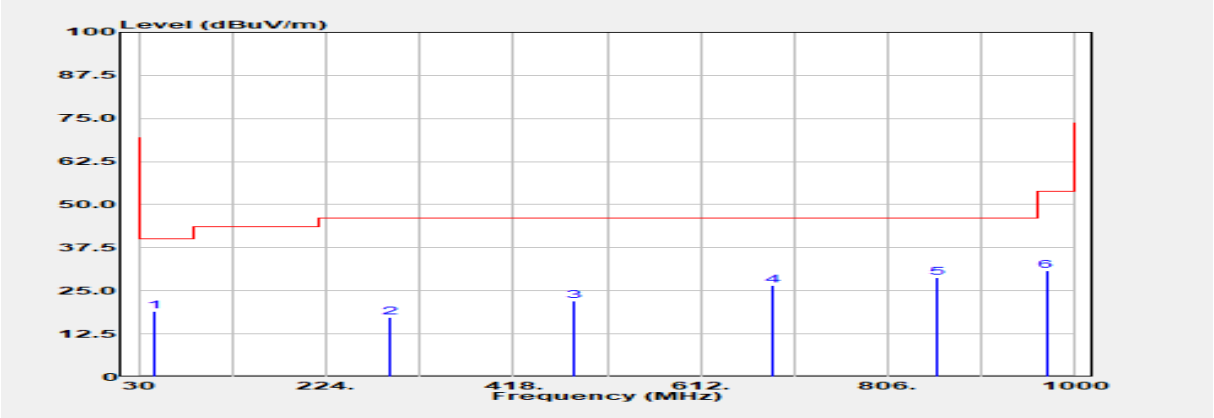
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-20
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/66
Test Mode	:TX CH MID	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
45.520	Peak	36.45	-17.52	18.93	40.00	-21.07
290.930	Peak	33.65	-16.35	17.30	46.00	-28.70
481.050	Peak	33.72	-11.72	22.01	46.00	-23.99
685.720	Peak	34.59	-7.94	26.65	46.00	-19.35
856.440	Peak	34.67	-5.90	28.78	46.00	-17.22
969.930	Peak	34.70	-3.85	30.84	54.00	-23.16

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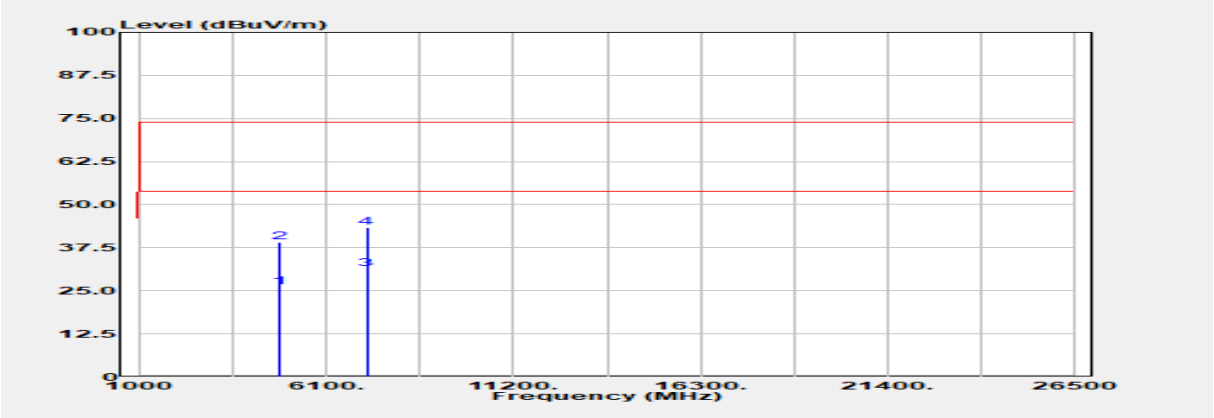
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Average	29.19	-3.04	26.15	54.00	-27.85
4804.000	Peak	42.02	-3.04	38.98	74.00	-35.02
7206.000	Average	28.34	2.98	31.32	54.00	-22.68
7206.000	Peak	40.49	2.98	43.48	74.00	-30.52

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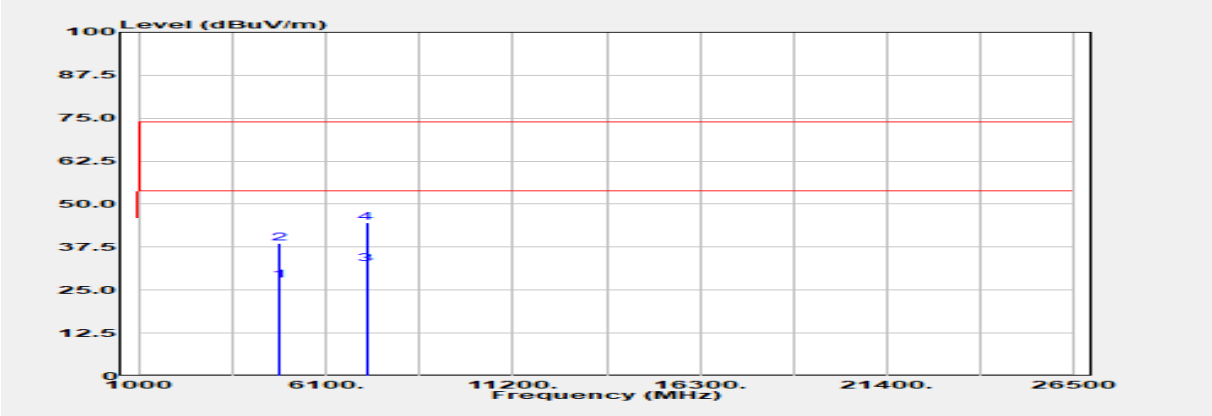
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2402 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH LOW	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.000	Average	30.88	-3.04	27.84	54.00	-26.16
4804.000	Peak	41.54	-3.04	38.50	74.00	-35.50
7206.000	Average	29.56	2.98	32.54	54.00	-21.46
7206.000	Peak	41.60	2.98	44.58	74.00	-29.42

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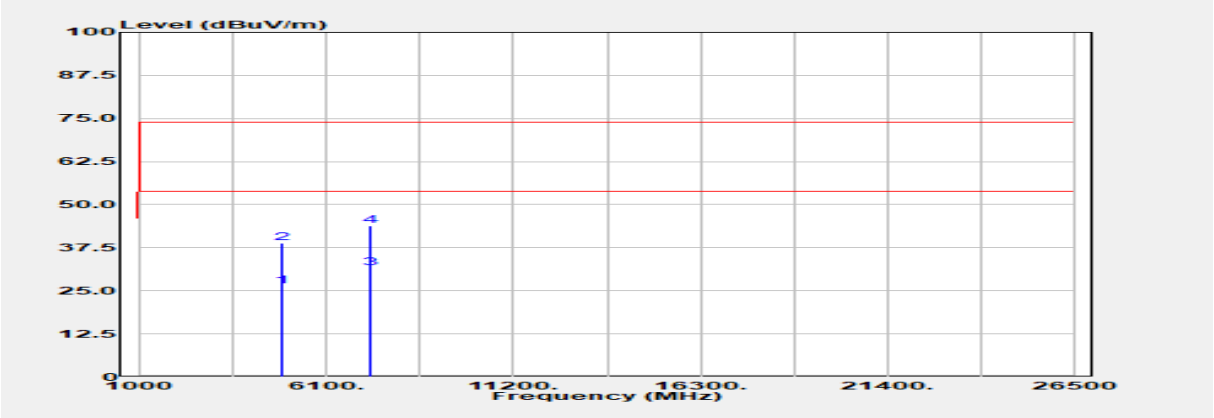
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH MID	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4884.000	Average	29.40	-3.20	26.20	54.00	-27.80
4884.000	Peak	42.02	-3.20	38.82	74.00	-35.18
7326.000	Average	28.22	3.24	31.46	54.00	-22.54
7326.000	Peak	40.64	3.24	43.88	74.00	-30.12

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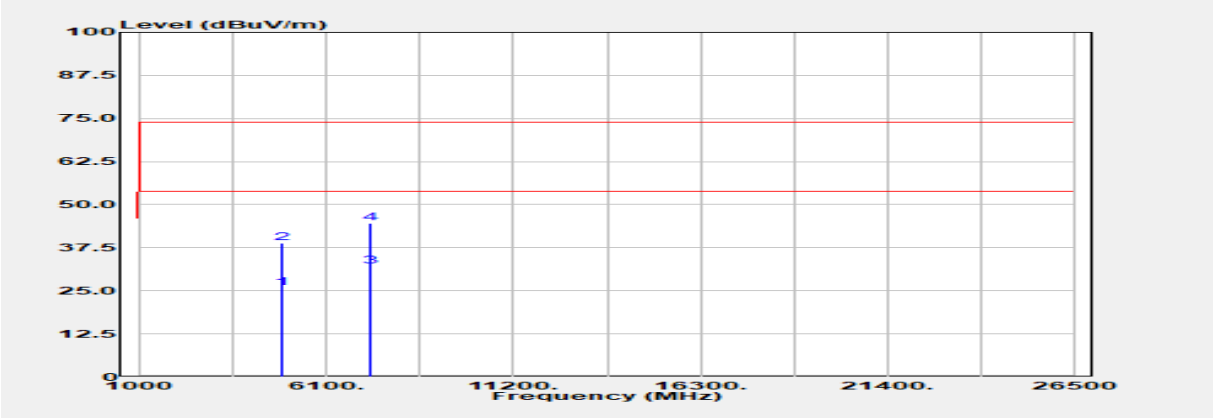
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2442 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH MID	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4884.000	Average	29.13	-3.20	25.93	54.00	-28.07
4884.000	Peak	42.12	-3.20	38.91	74.00	-35.09
7326.000	Average	28.77	3.24	32.01	54.00	-21.99
7326.000	Peak	41.29	3.24	44.53	74.00	-29.47

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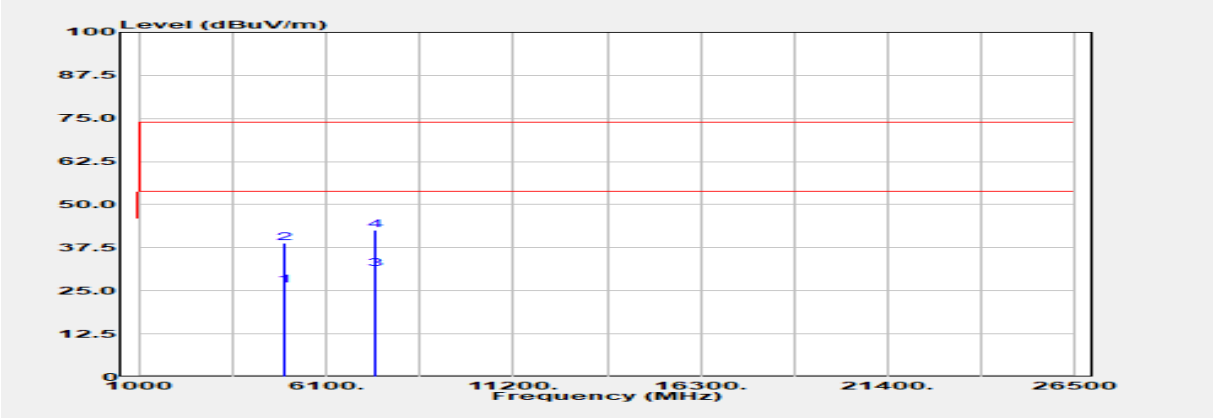
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH HIGH	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	29.36	-2.87	26.48	54.00	-27.52
4960.000	Peak	41.78	-2.87	38.91	74.00	-35.09
7440.000	Average	27.41	3.85	31.26	54.00	-22.74
7440.000	Peak	38.83	3.85	42.68	74.00	-31.32

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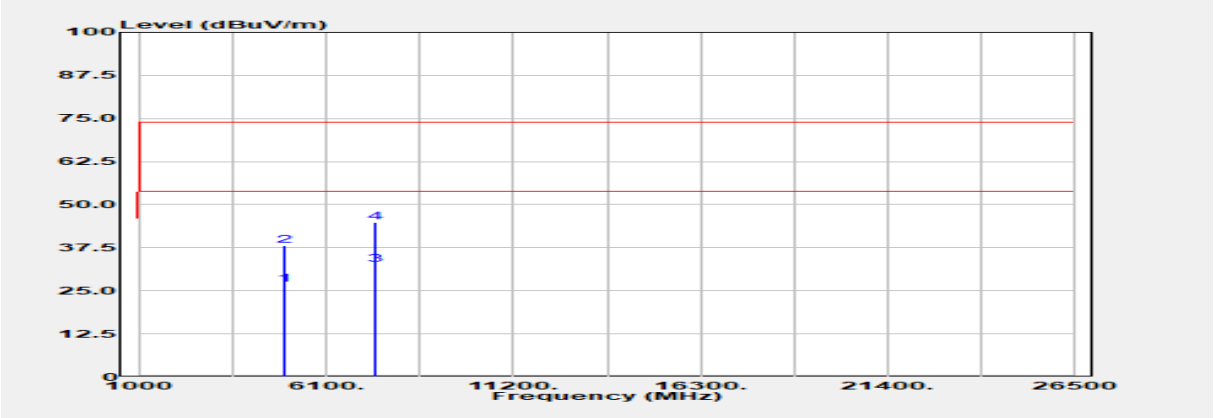
Report Number	:E2/2021/60088	Test Site	:SAC D
Operation Mode	:BLE 2M	Test Date	:2021-07-21
Test Frequency	:2480 MHz	Temp./Humi.	:21.8/68
Test Mode	:TX CH HIGH	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Andy Wang



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.000	Average	29.57	-2.87	26.70	54.00	-27.30
4960.000	Peak	41.01	-2.87	38.14	74.00	-35.86
7440.000	Average	28.64	3.85	32.49	54.00	-21.51
7440.000	Peak	40.90	3.85	44.75	74.00	-29.25

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11 POWER SPECTRAL DENSITY

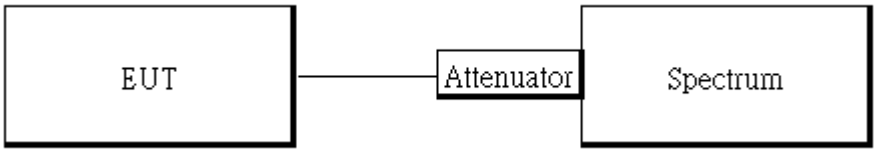
11.1 Standard Applicable:

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Measurement Equipment Used:

Conducted Emission Test Site: Conducted G					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY60240506	06/18/2021	06/17/2022
Attenuator	Marvelous	WATT-218FS-10	RF23	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A	N/A

11.3 Test Set-up:



11.4 Measurement Procedure:

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz. & the VBW = 10 kHz
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

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11.5 Measurement Result:

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-7.650	8	PASS
2442	-5.960	8	PASS
2480	-6.120	8	PASS

NOTE: cable loss as 10.65dB that offsets in the spectrum

BLE 2M mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-11.110	8	PASS
2442	-9.390	8	PASS
2480	-9.440	8	PASS

NOTE: cable loss as 10.65dB that offsets in the spectrum

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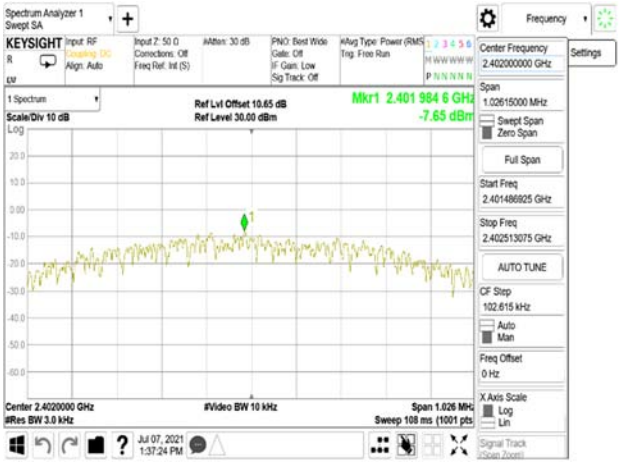
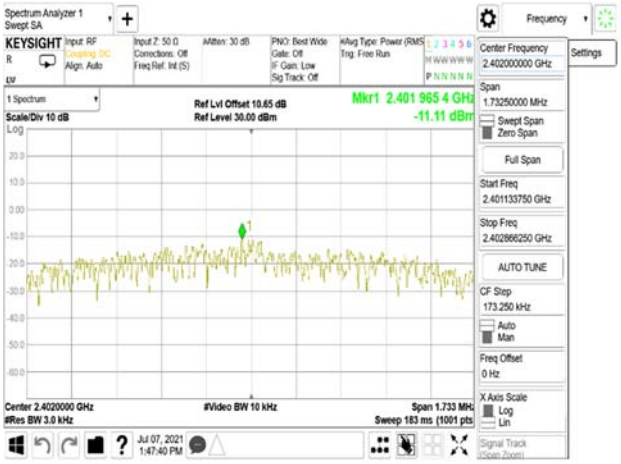
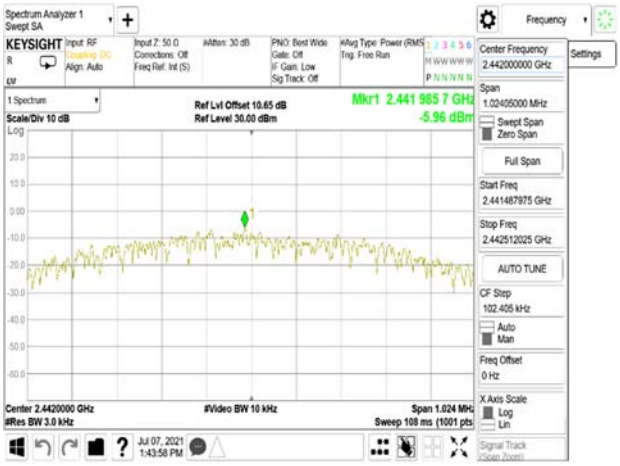
PSD_BLE 1M_LowCH00-2402MHz



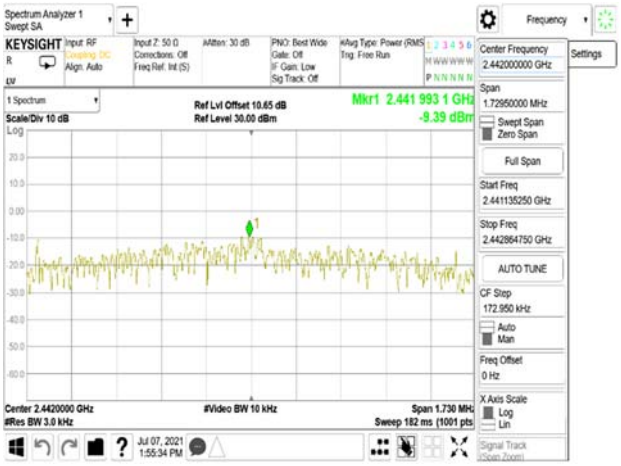
PSD_BLE 2M_LowCH00-2402MHz



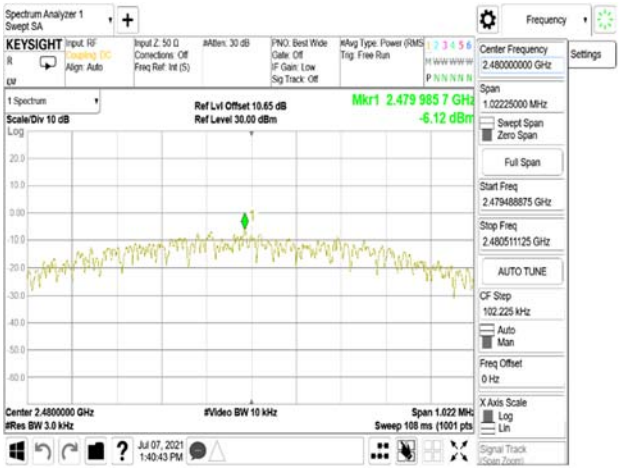
PSD_BLE 1M_MidCH20-2442MHz



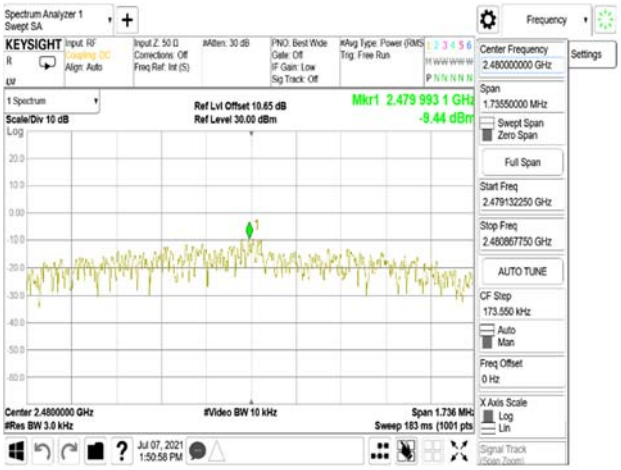
PSD_BLE 2M_MidCH20-2442MHz



PSD_BLE 1M_HighCH39-2480MHz



PSD_BLE 2M_HighCH39-2480MHz



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12 ANTENNA REQUIREMENT

12.1 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.

12.2 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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