FCC/ISED - TEST REPORT

Report Number	:	**68.950.23.0164.01**	Date of Issue:	**May 10, 2023**
Model / HVIN	:	**Zongle USB-A**		
Product Type	:	Audio Transmitter		
Applicant	:	Zound Industries International AB		
Address	:	Centralplan 15 SE-111 20 Stockholm, Sweden		
Manufacturer	:	Zound Industries International AB		
Address	:	Centralplan 15 SE-111 20 Stockholm, Sweden		
Factory	:	Sunitec Electronics Technology Limited		
Address	:	Floor 1-4, building C, Weixiangtai industrial park, no. 725, Dasan Village, Xingfu community, Fucheng Street, Longhua district, 518110 Shenzhen City, PEOPLE'S REPUBLIC OF CHINA		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**53**		

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District Shenzhen 518052 P.R. China
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299
FCC Registration No.:	514049
FCC Designation Number:	CN5009
IC Registration No.:	10320A

3 Description of the Equipment Under Test

Product:	Audio Transmitter
Model no.:	Zongle USB-A
Brand name:	N/A
Hardware Version Identification No. (HVIN)	Zongle USB-A
Firmware Identification No.(FVIN)	N/A
FCC ID:	2AAGF-ZONGLE
IC:	11153A-ZONGLE
Options and accessories:	N/A
Rating:	5VDC, 50mA
RF Transmission Frequency:	For 1Mbit/s 2402MHz-2480MHz For 2Mbit/s 2404MHz-2478MHz
No. of Operated Channel:	For 1Mbit/s 40 For 2Mbit/s 38
Modulation:	GFSK
Antenna Type:	FPC
Antenna	Gain: 0.77dBi
Description of the EUT:	The Equipment Under Test (EUT) is an Audio Transmitter which support with Bluetooth Low Energy function (Bluetooth edition: 5.0, bite rate: 1Mbit/s and 2Mbit/s).

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5 April 2018 + A1 + A2	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10 (2013).

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5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C/ RSS-247 Issue 2/RSS-Gen Issue 5			
Test Condition		Pages	Test Result
§15.207& RSS-Gen 8.8	Conducted emission AC power port	10	Pass
§15.247(b)(1)	Conducted peak output power	13	Pass
RSS-247 5.4(b)	Equivalent Isotropic Radiated Power	13	Pass
§15.247(e) & RSS-247 5.2(b)	Power spectral density	15	Pass
§15.247(a)(2) & RSS-247 5.2(a) & RSS-Gen 6.7	6dB bandwidth and 99% Occupied Bandwidth	18	Pass
§15.247(a)(1) & RSS-247 5.1(a) & RSS-Gen 6.7	20dB bandwidth and 99% Occupied Bandwidth	--	N/A
§15.247(a)(1) & RSS-247 5.1(b)	Min. of Hopping Channel Carrier Frequency Separation	--	N/A
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Min number of hopping frequencies	--	N/A
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Dwell Time - Average Time of Occupancy	--	N/A
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	24	Pass
§15.247(d) & RSS-247 5.5	Band edge	32	Pass
§15.247(d) & §15.209 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	35	Pass
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 2	Pass

Note 1: N/A=Not Applicable.
Note 2: The EUT uses an FPC antenna, which gain is 0.77dBi. In accordance to §15.203 & RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AAGF-ZONGLE, IC: 11153A-ZONGLE, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	February 27, 2023
Testing Start Date:	March 01, 2023
Testing End Date:	March 13, 2023

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:	Tested by:
John Zhi	Grace Gao	Carry Cai
Section Manager	Project Engineer	Test Engineer

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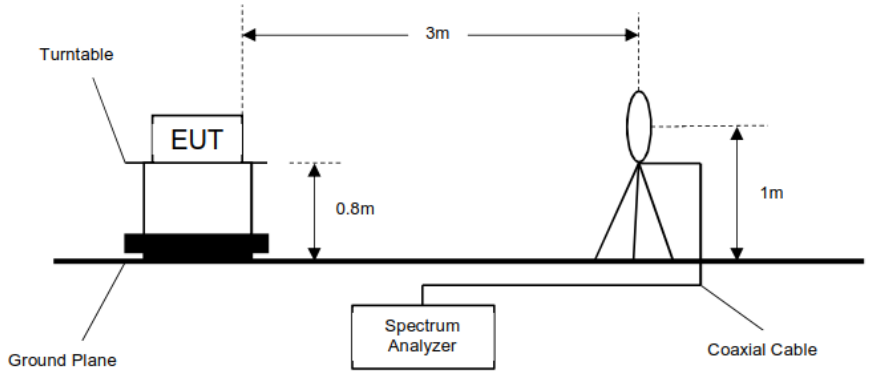
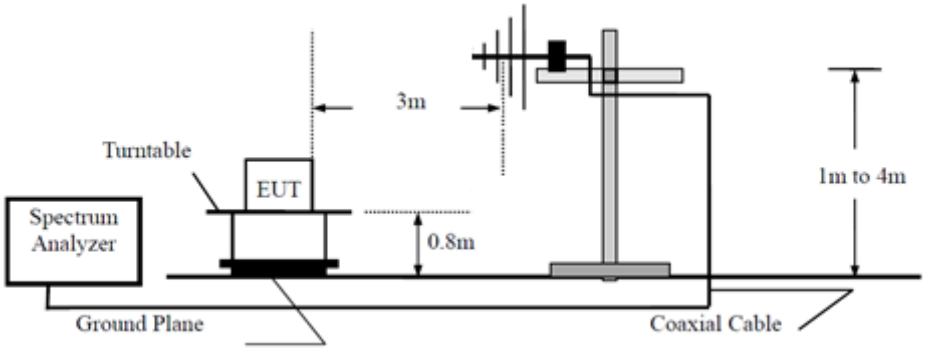
7 Test Setups

7.1 Radiated test setups

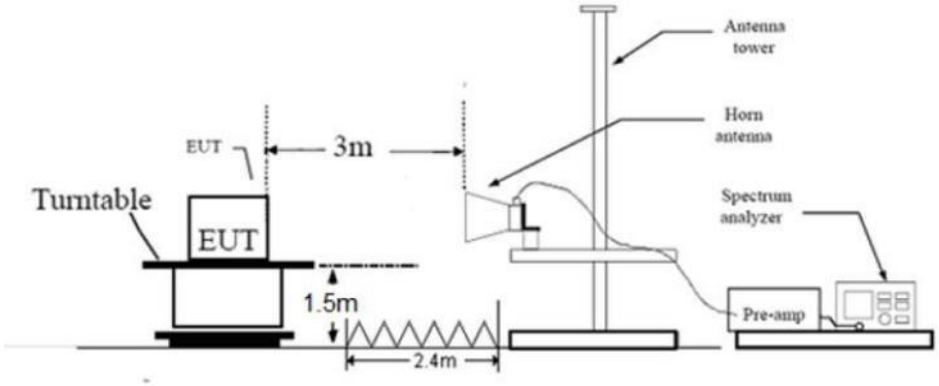
9KHz - 30MHz



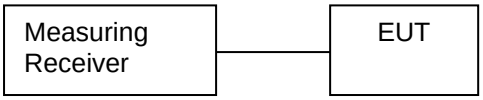
30MHz - 1GHz



Above 1GHz



7.2 Conducted RF test setups



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8 Systems Test Configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
Laptop	Thinkpad	X220	429044C

Cables Used During Test:

Cable	Length	Shielded/unshielded	With / without ferrite
/	/	/	/

Test software information:

Test Software Version	TX Setting Power	Packet Type (Data Rate)
AB1565/68 Lab Test Tool-3.3.0	Default Setting	1Mbps
AB1565/68 Lab Test Tool-3.3.0	Default Setting	2Mbps

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Note: For this test item, all modes were tested, only the worst case test data (normal working mode) is presented in this report.

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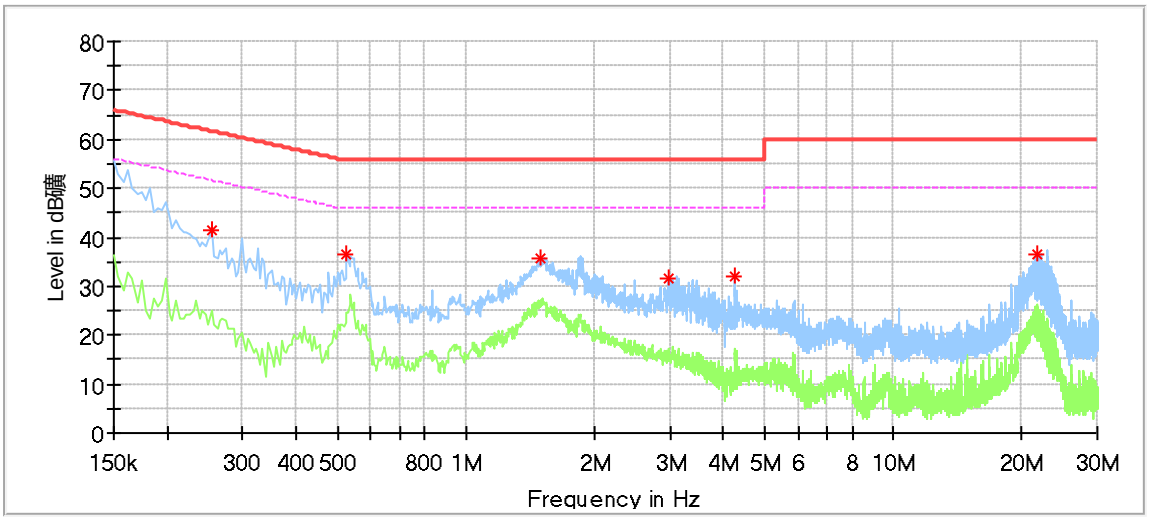
Conducted Emission

Product Type : Audio Transmitter
M/N : Zongle USB-A
Operating Condition : Normal Working
Test Specification : Line
Comment : Supplied by PC (Powered by 120VAC/60Hz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.254000	41.29	---	61.63	20.34	L1	9.60
0.526000	36.61	---	56.00	19.39	L1	9.63
1.490000	35.68	---	56.00	20.32	L1	9.65
2.990000	31.50	---	56.00	24.50	L1	9.69
4.266000	32.10	---	56.00	23.90	L1	9.74
21.774000	36.67	---	60.00	23.33	L1	10.09

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
---	---	---	---	---		---

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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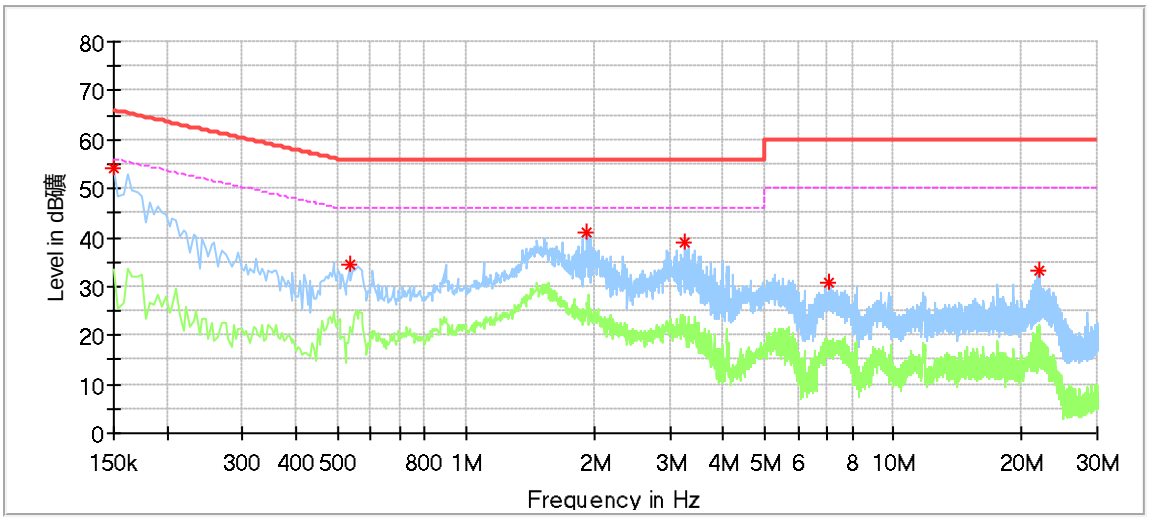
Conducted Emission

Product Type	:	Audio Transmitter
M/N	:	Zongle USB-A
Operating Condition	:	Normal Working
Test Specification	:	Neutral
Comment	:	Supplied by PC (Powered by 120VAC/60Hz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	54.06	---	66.00	11.94	N	9.56
0.534000	34.47	---	56.00	21.53	N	9.63
1.918000	41.18	---	56.00	14.82	N	9.65
3.238000	38.87	---	56.00	17.13	N	9.70
7.050000	30.62	---	60.00	29.38	N	9.85
21.902000	33.17	---	60.00	26.83	N	10.11

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
---	---	---	---	---		---

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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9.2 Conducted Peak Output Power & EIRP

Test Method

1. The RF output of EUT was connected to the power meter by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following test receiver settings:
   Span = approximately 5 times the 6dB bandwidth, centered on a hopping channel
   RBW > the 6dB bandwidth of the emission being measured, VBW≥3RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

Limits

According to §15.247 (b) (1) & RSS-247 5.4(b), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

According to & RSS-247 5.4(b), EIRP limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤4	≤36

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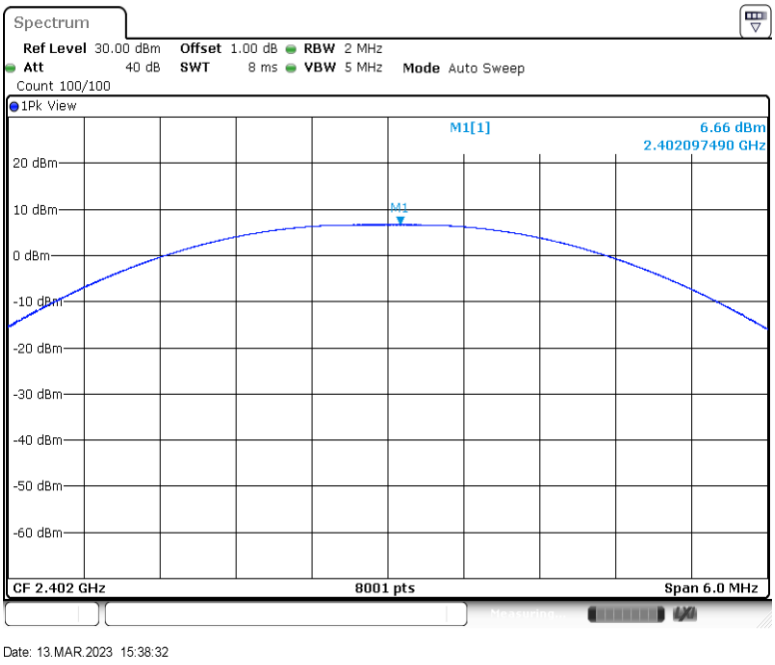
Conducted Peak Output Power & EIRP

Frequency MHz	Mode	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Low channel 2402MHz	LE 1M	6.66	0.77	7.43	Pass
Middle channel 2440MHz	LE 1M	6.5	0.77	7.27	Pass
High channel 2480MHz	LE 1M	6.38	0.77	7.15	Pass
Low channel 2404MHz	LE 2M	6.72	0.77	7.49	Pass
Middle channel 2440MHz	LE 2M	6.55	0.77	7.32	Pass
High channel 2478MHz	LE 2M	6.42	0.77	7.19	Pass

LE 1M：



2402MHz

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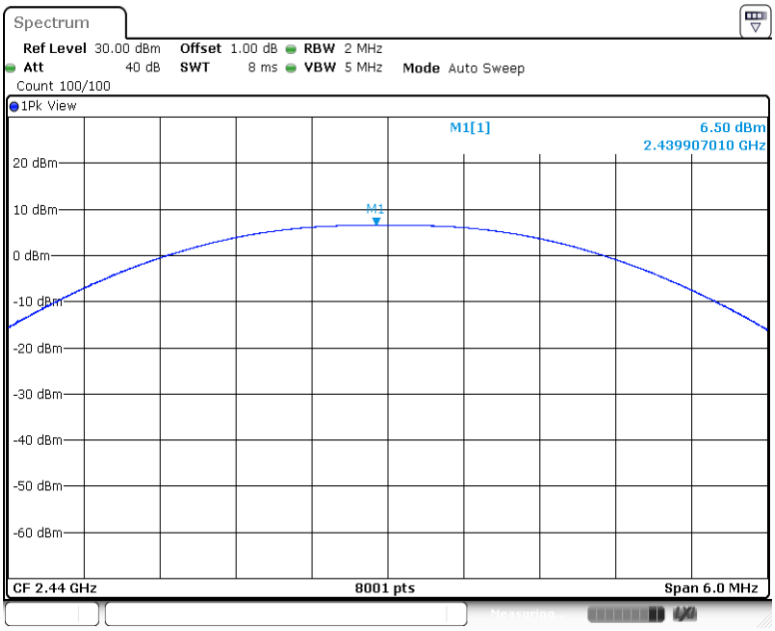
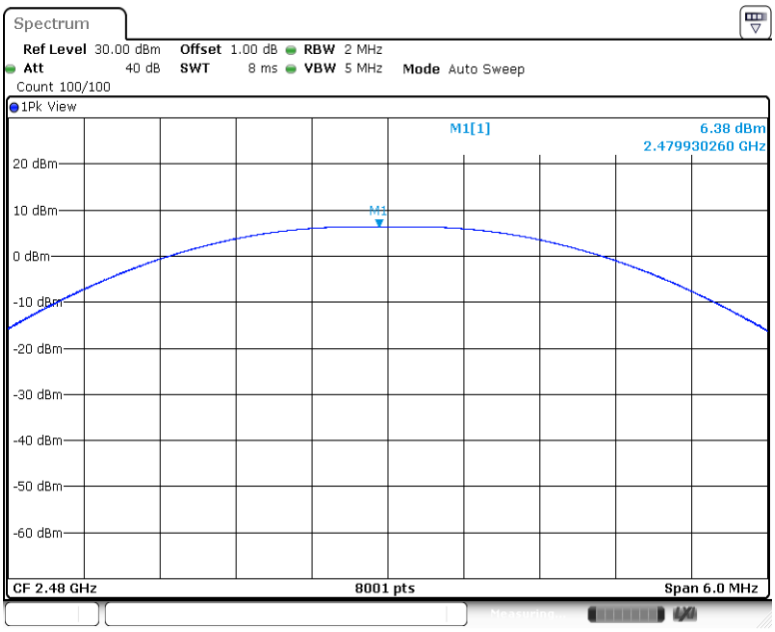


2440MHz



2480MHz

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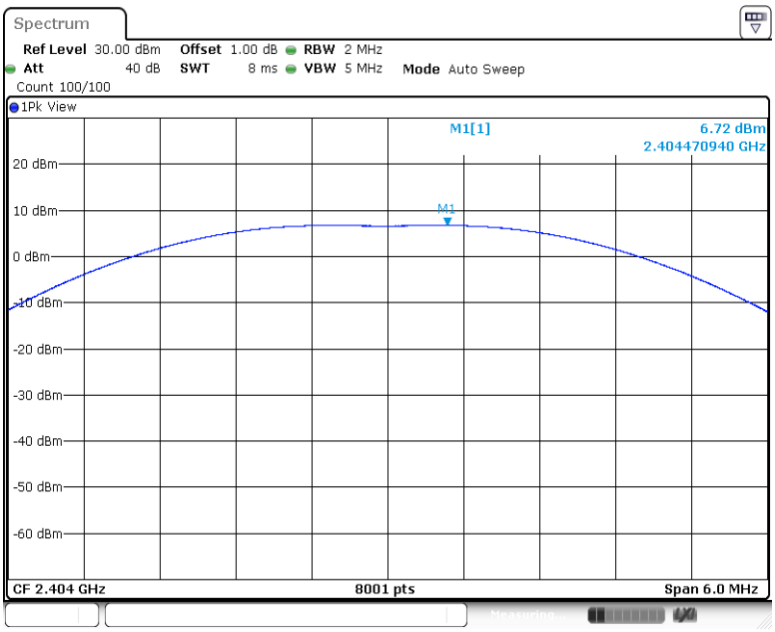
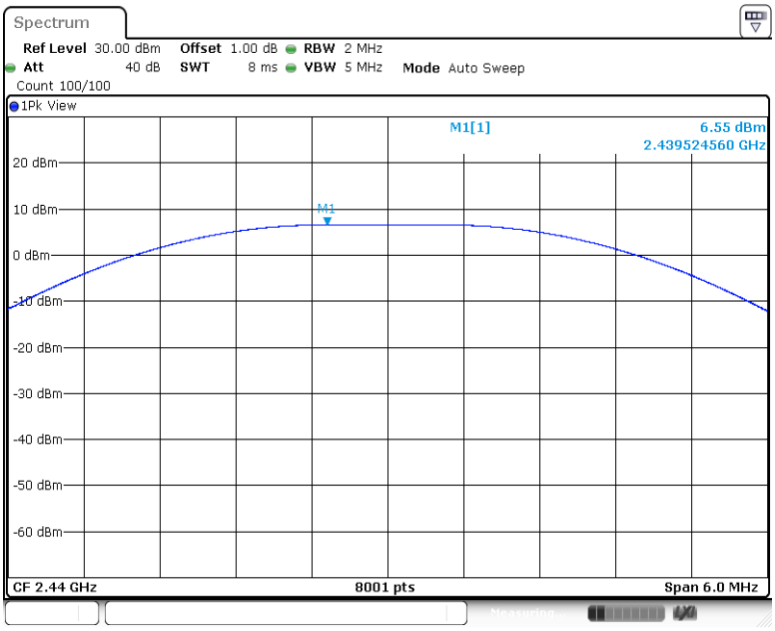
LE 2M：



2404MHz



2440MHz

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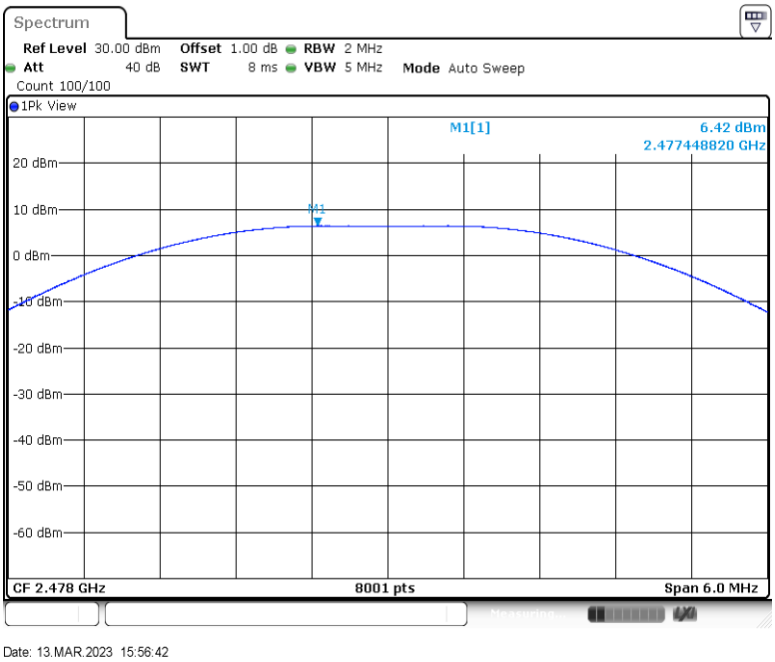

2478MHz

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9.3 Power Spectral Density

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3KHz]
≤8

Test result

Frequency MHz	Mode	Power spectral density dBm/3KHz	Result
Low channel 2402MHz	LE 1M	-8.99	Pass
Middle channel 2440MHz	LE 1M	-9.27	Pass
High channel 2480MHz	LE 1M	-9.27	Pass
Low channel 2404MHz	LE 2M	-11.09	Pass
Middle channel 2440MHz	LE 2M	-11.36	Pass
High channel 2478MHz	LE 2M	-11.44	Pass

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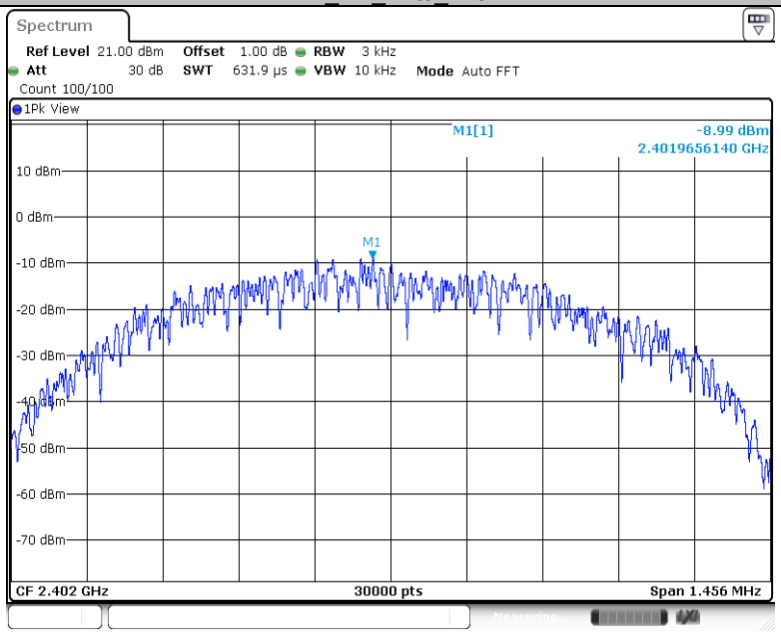
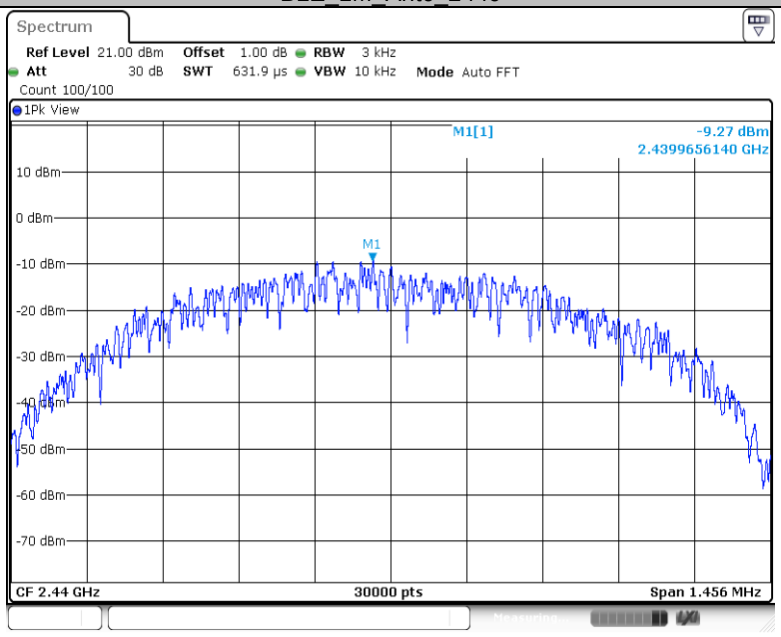
BLE_1M_Ant0_2402



BLE_1M_Ant0_2440



BLE_1M_Ant0_2480

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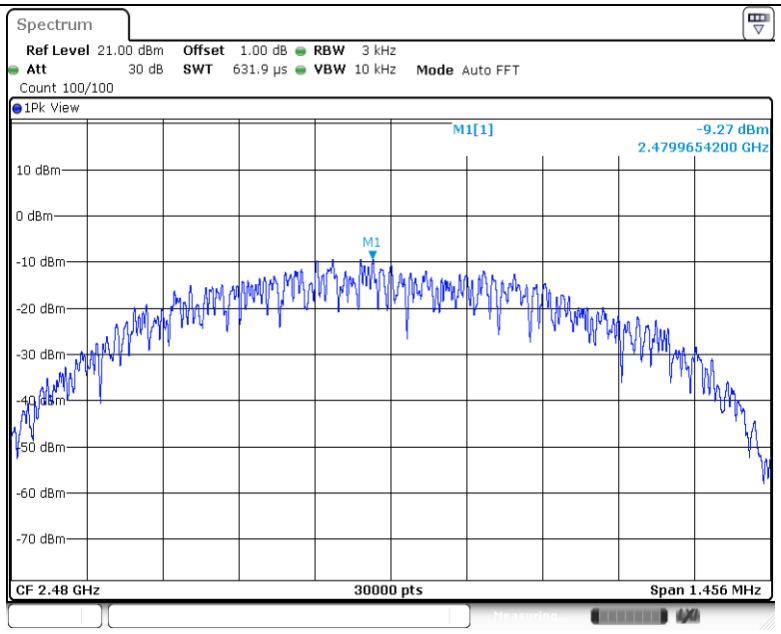

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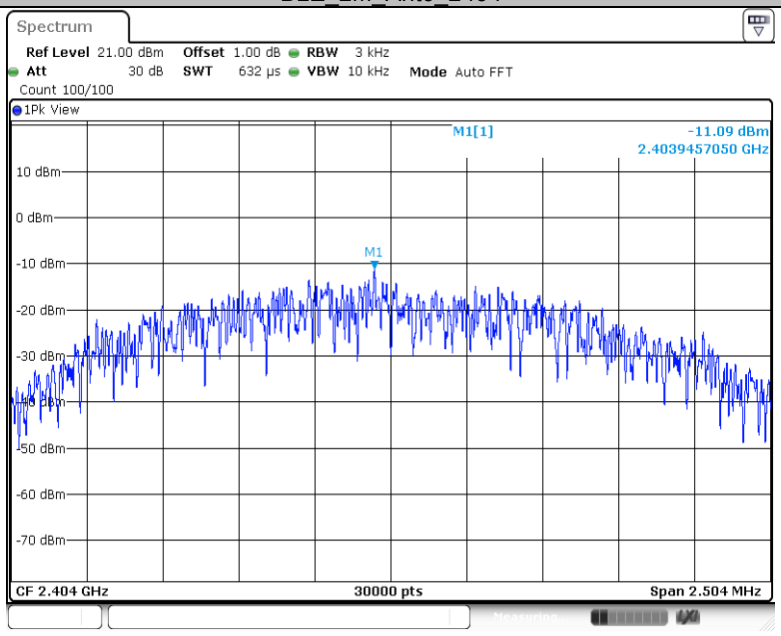

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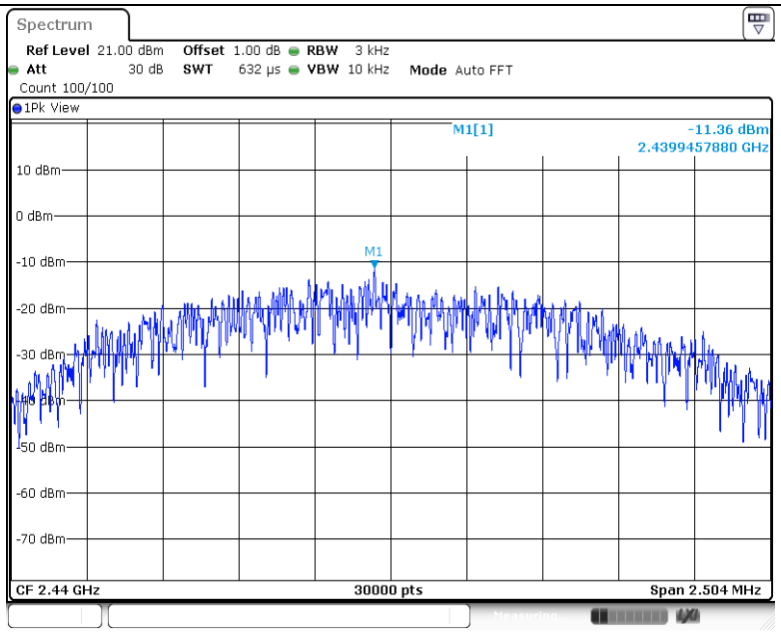
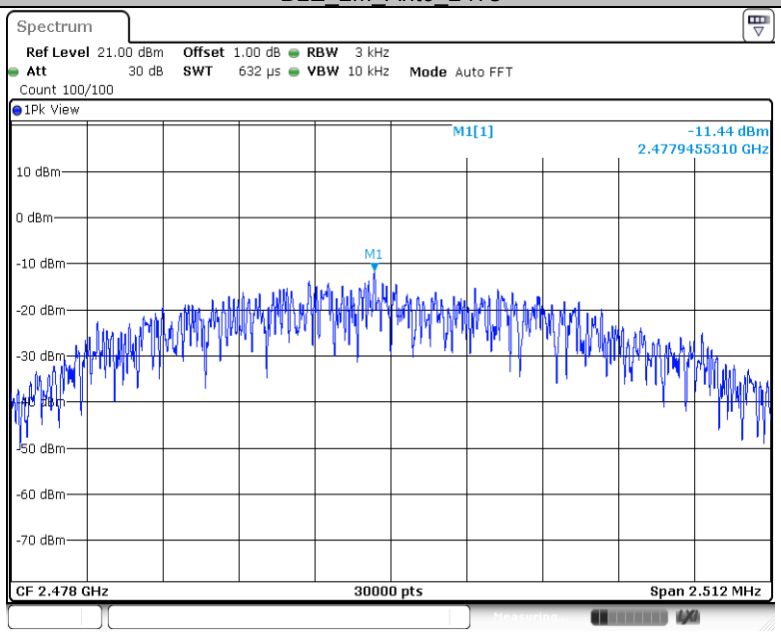


BLE_2M_Ant0_2478



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9.4 6 dB Bandwidth and 99% Occupied Bandwidth

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
   Span = approximately 5 times the 6dB bandwidth, centered on a hopping channel
   RBW =100KHz, VBW≥3RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
5. Repeat above procedures until all frequencies measured were complete.

Limit

Limit [kHz]
≥500

Test result

Frequency MHz	Mode	6dB bandwidth MHz	99% bandwidth MHz	Result
Low channel 2402MHz	LE 1M	0.728	1.039	Pass
Middle channel 2440MHz	LE 1M	0.728	1.039	Pass
High channel 2480MHz	LE 1M	0.728	1.039	Pass
Low channel 2404MHz	LE 2M	1.252	2.062	Pass
Middle channel 2440MHz	LE 2M	1.252	2.062	Pass
High channel 2478MHz	LE 2M	1.256	2.062	Pass

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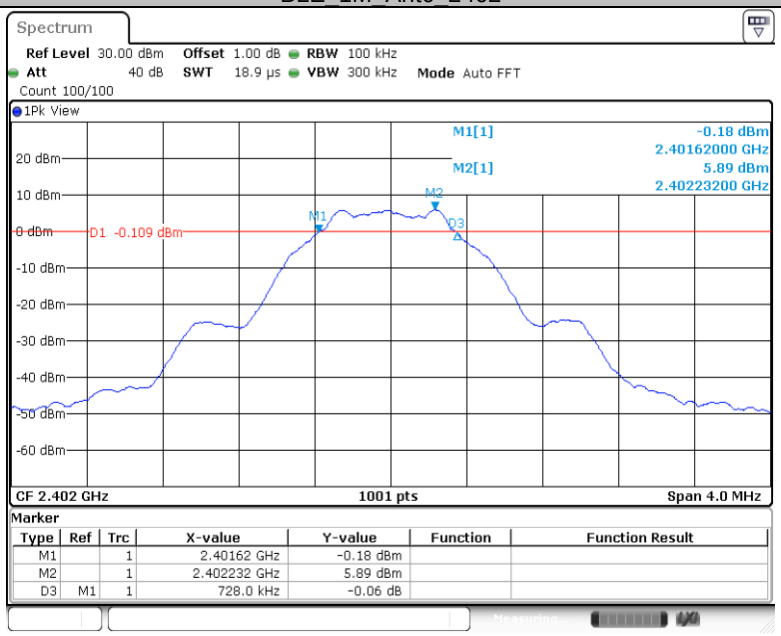
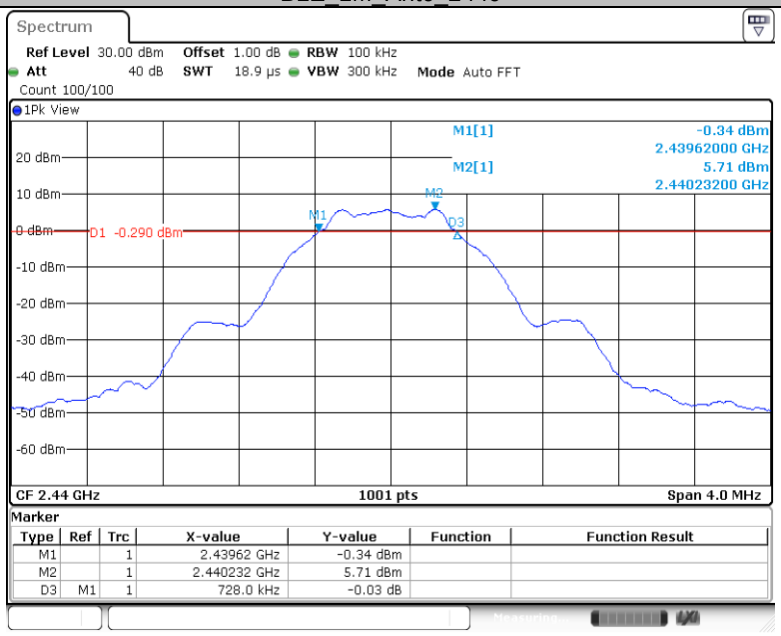
6 dB Bandwidth

BLE_1M_Ant0_2402



Date: 13.MAR.2023 15:38:15

BLE_1M_Ant0_2440



Date: 13.MAR.2023 15:41:30

BLE_1M_Ant0_2480

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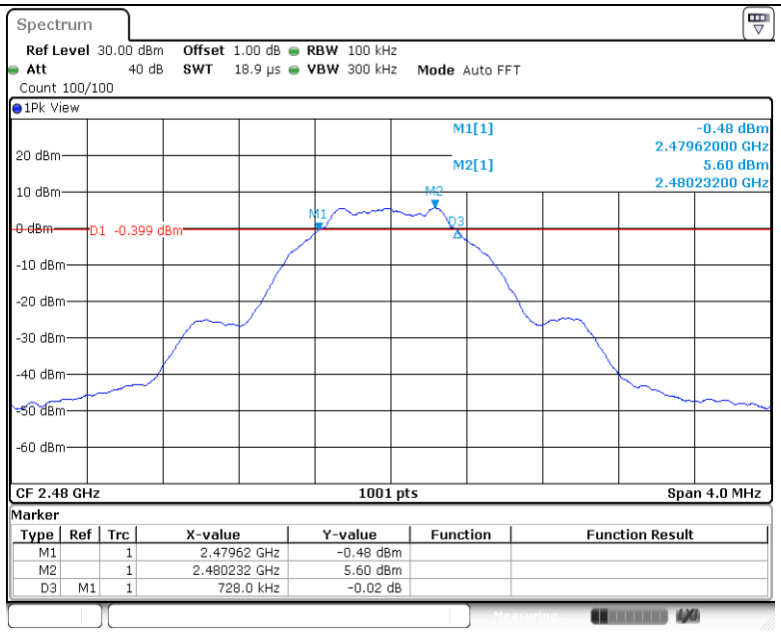
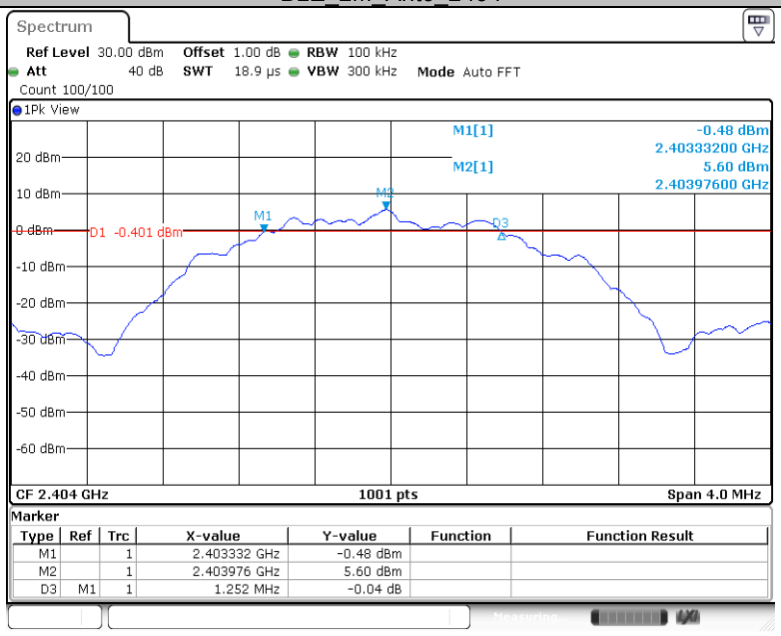
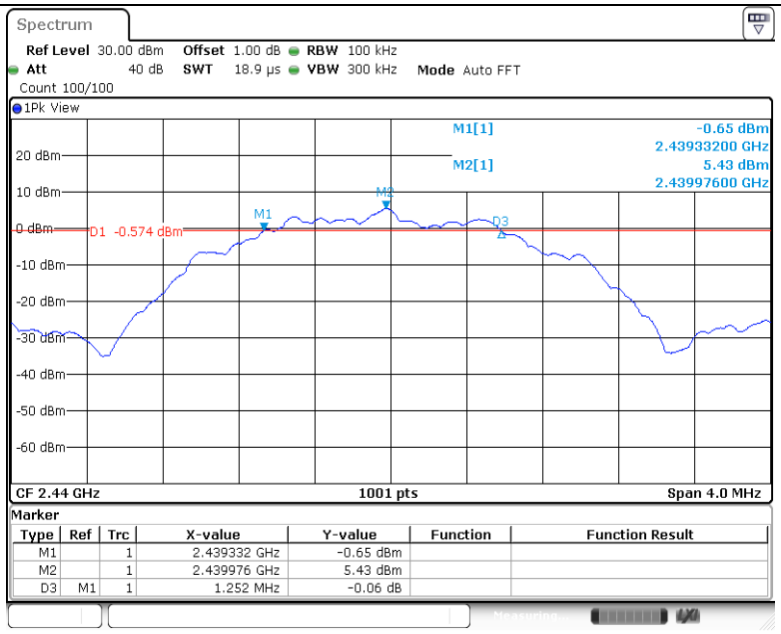


BLE_2M_Ant0_2404

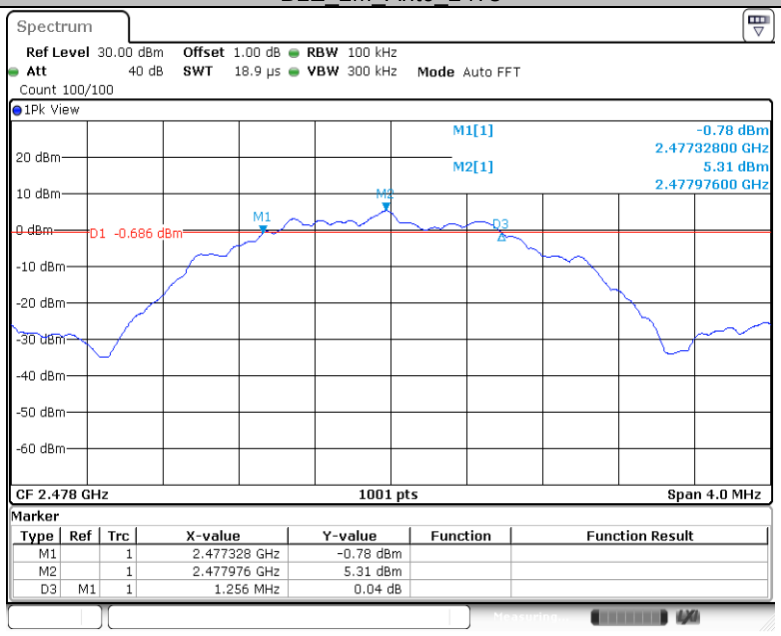


BLE_2M_Ant0_2440



Date: 13.MAR.2023 15:49:58

BLE_2M_Ant0_2478



Date: 13.MAR.2023 15:56:25

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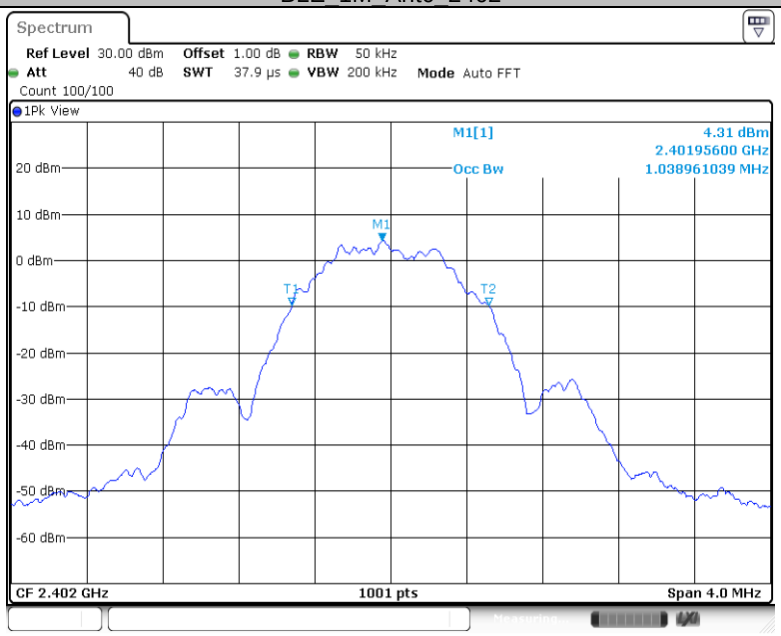
99% Bandwidth

BLE_1M_Ant0_2402



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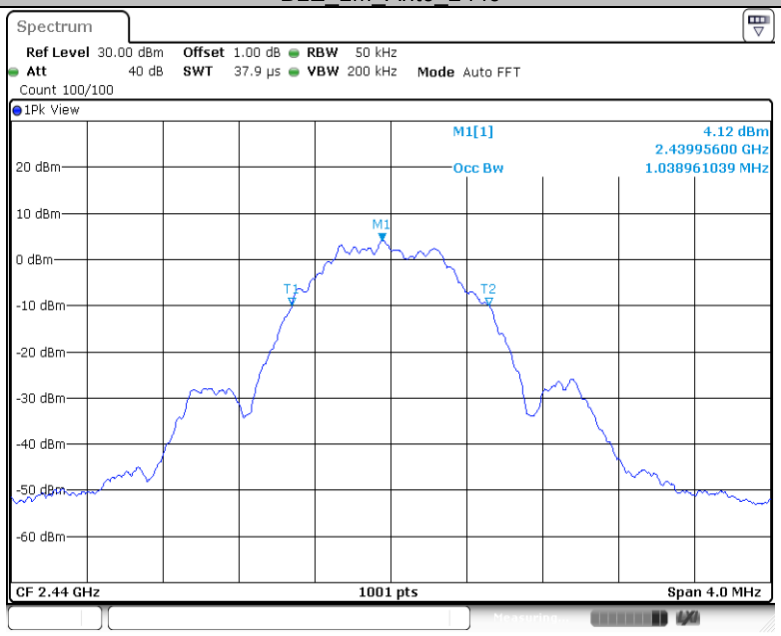
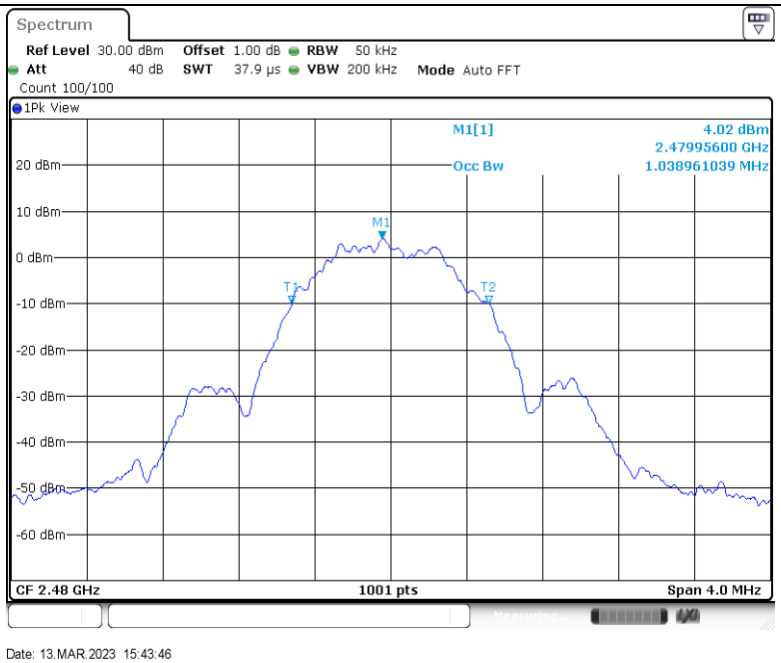
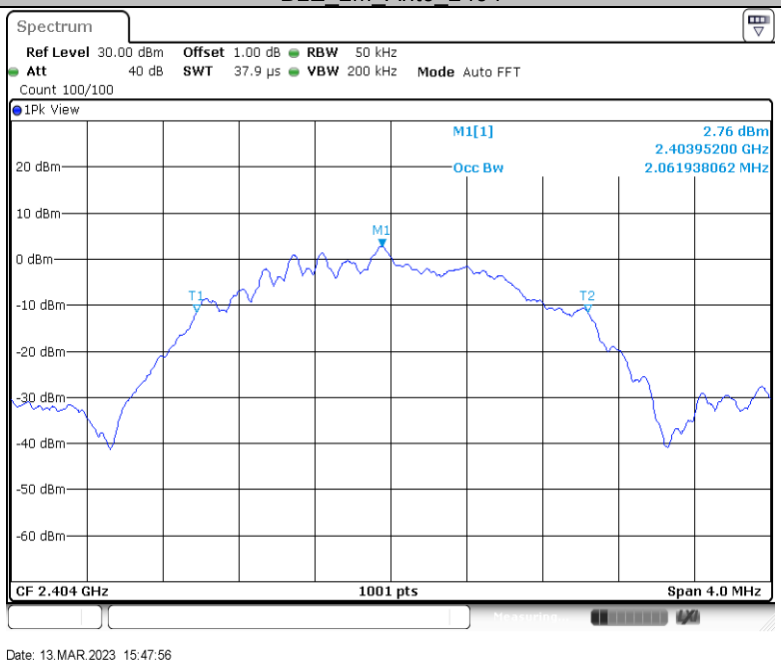


Date: 13.MAR.2023 15:41:41

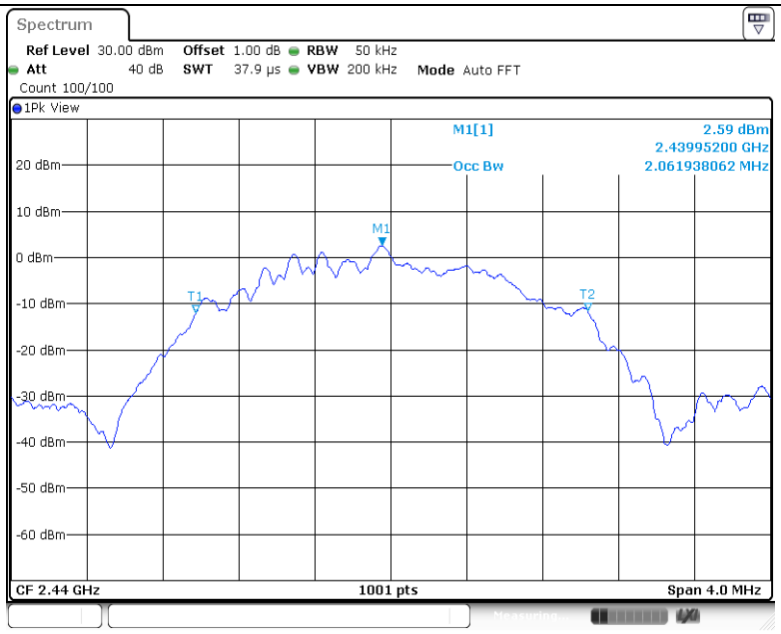
BLE_1M_Ant0_2480



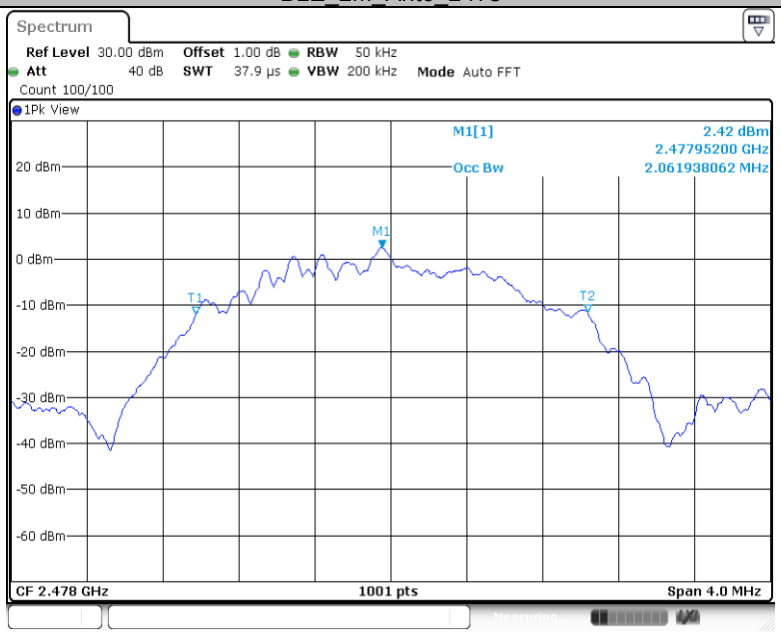
BLE_2M_Ant0_2404



BLE_2M_Ant0_2440



BLE_2M_Ant0_2478



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9.5 Spurious RF Conducted Emissions

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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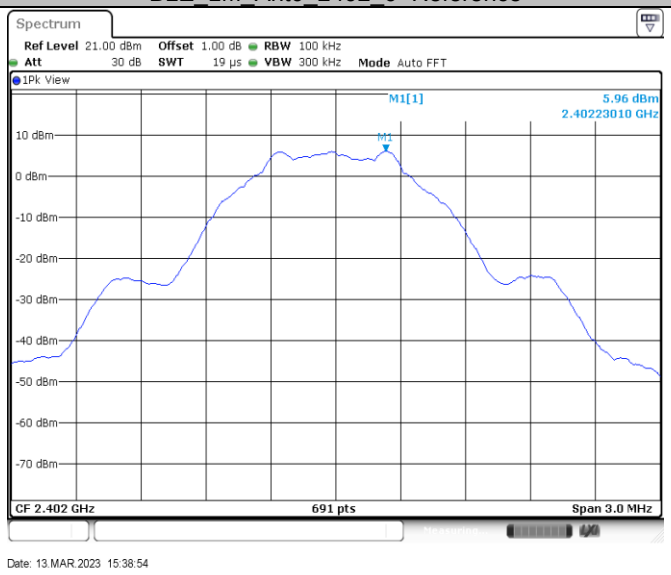
Spurious RF conducted emissions

Test Mode	Antenna	Channel (MHz)	Frequency Range (MHz)	Reference Level	Result (dBm)	Limit (dBm)	Verdict
BLE_1M	Ant0	2402	Reference	5.96	5.96	---	PASS
			30~1000	30~1000	-68.57	<=-14.04	PASS
			1000~26500	1000~26500	-47.56	<=-14.04	PASS
		2440	Reference	5.65	5.65	---	PASS
			30~1000	30~1000	-68.49	<=-14.35	PASS
			1000~26500	1000~26500	-52.35	<=-14.35	PASS
		2480	Reference	5.64	5.64	---	PASS
			30~1000	30~1000	-67.66	<=-14.36	PASS
			1000~26500	1000~26500	-52.65	<=-14.36	PASS
BLE_2M	Ant0	2404	Reference	5.69	5.69	---	PASS
			30~1000	30~1000	-67.26	<=-14.31	PASS
			1000~26500	1000~26500	-52.87	<=-14.31	PASS
		2440	Reference	5.35	5.35	---	PASS
			30~1000	30~1000	-68.38	<=-14.65	PASS
			1000~26500	1000~26500	-52.25	<=-14.65	PASS
		2478	Reference	5.35	5.35	---	PASS
			30~1000	30~1000	-68.34	<=-14.65	PASS
			1000~26500	1000~26500	-52.45	<=-14.65	PASS

BLE_1M_Ant0_2402_0~Reference



BLE_1M_Ant0_2402_30~1000

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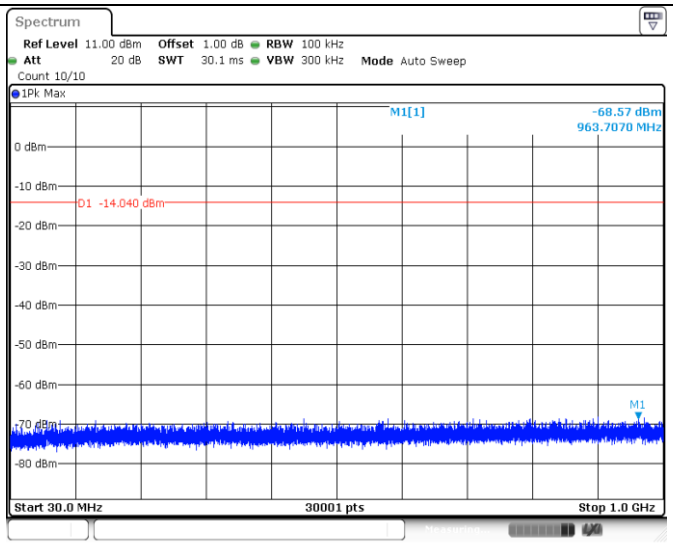
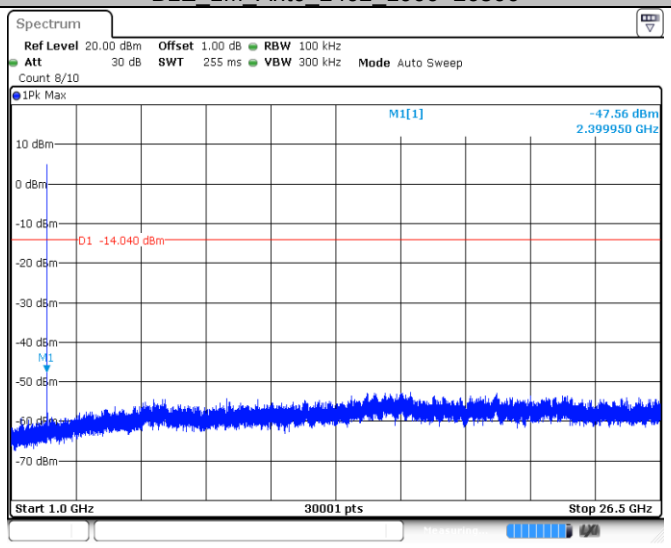
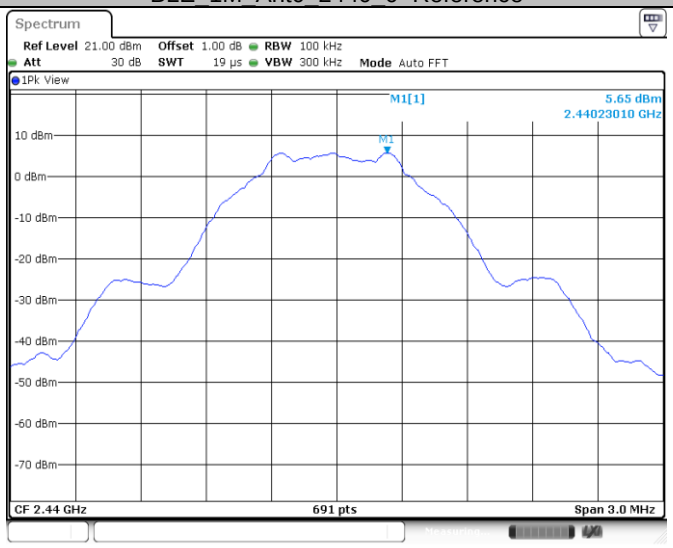


BLE_1M_Ant0_2402_1000~26500



BLE_1M_Ant0_2440_0~Reference



BLE_1M_Ant0_2440_30~1000

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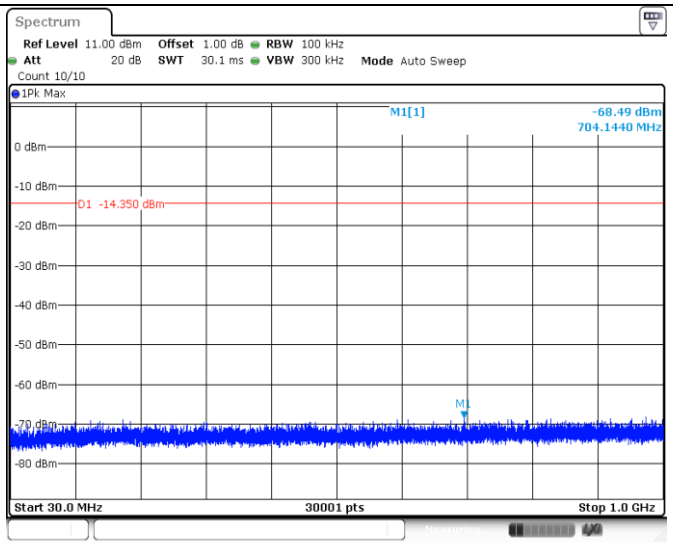
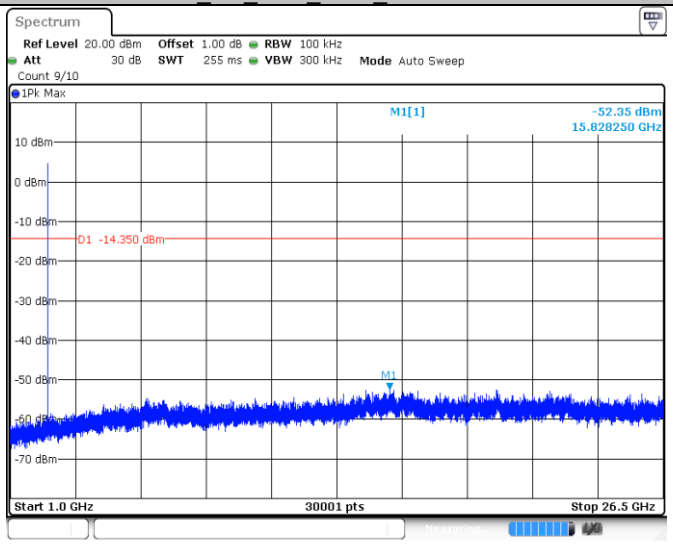
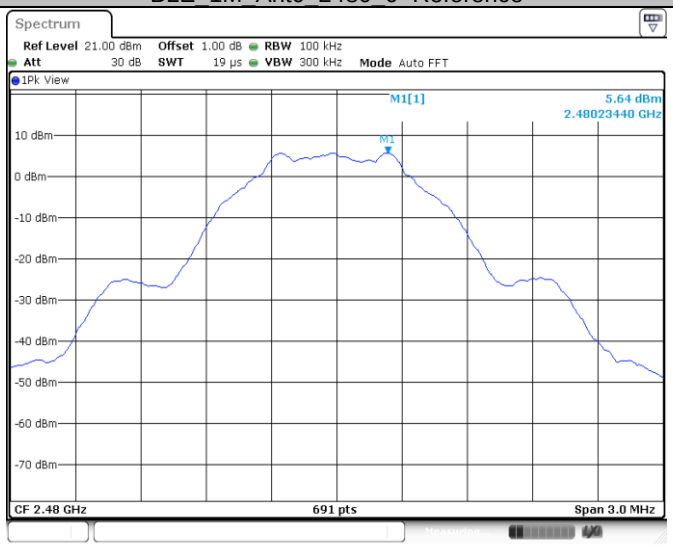


BLE_1M_Ant0_2440_1000~26500



BLE_1M_Ant0_2480_0~Reference



BLE_1M_Ant0_2480_30~1000

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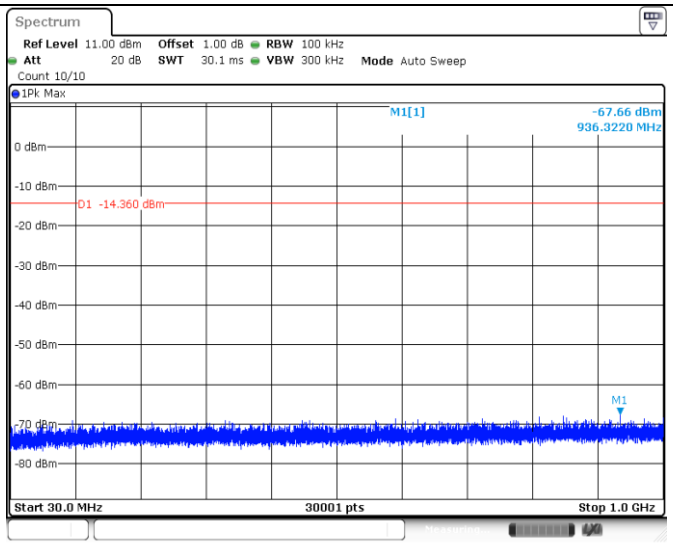
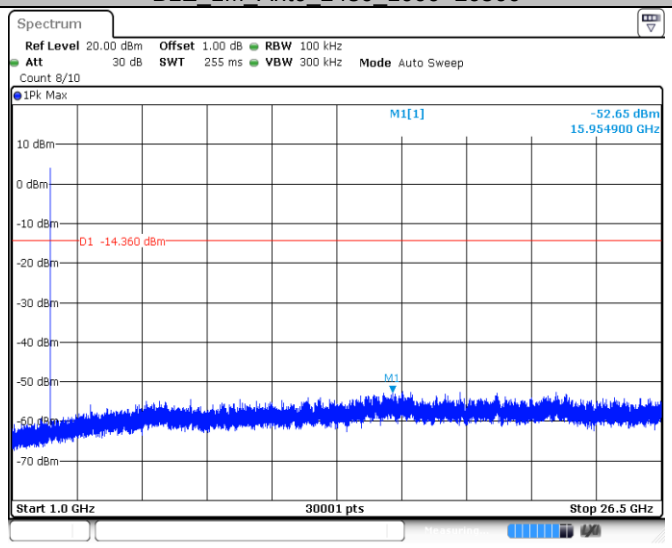
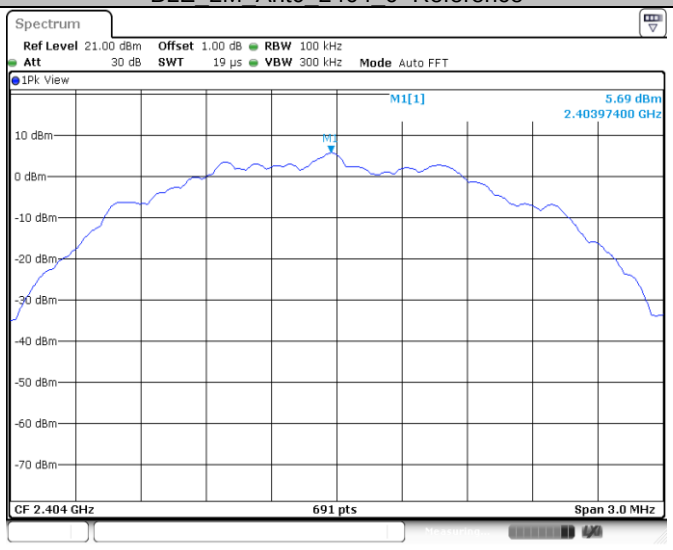


BLE_1M_Ant0_2480_1000~26500



BLE_2M_Ant0_2404_0~Reference



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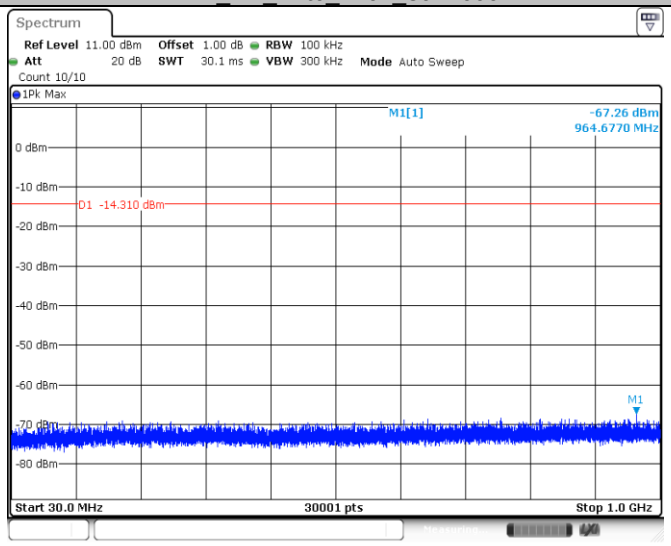
BLE_2M_Ant0_2404_30~1000



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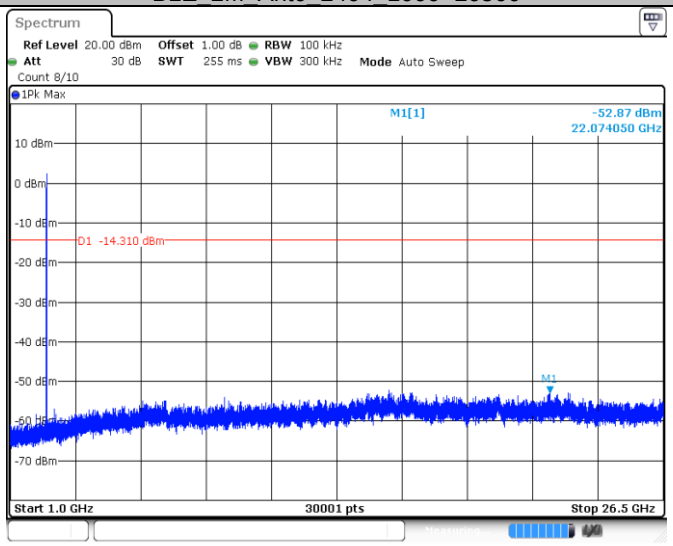
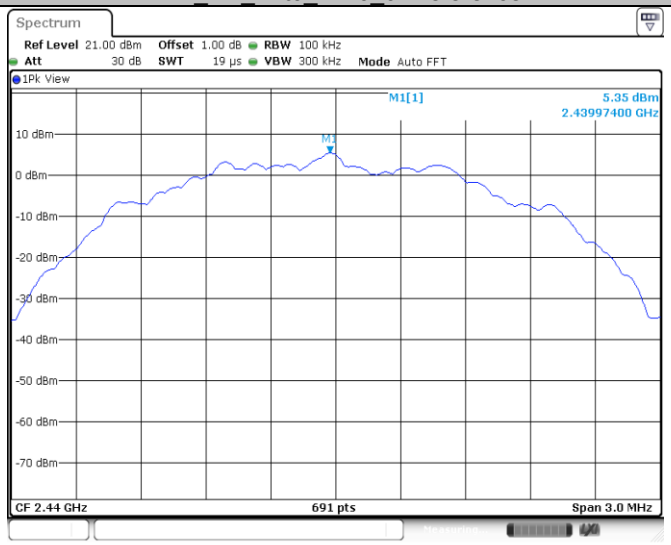
BLE_2M_Ant0_2404_1000~26500



Date: 13.MAR.2023 15:48:37

BLE_2M_Ant0_2440_0~Reference



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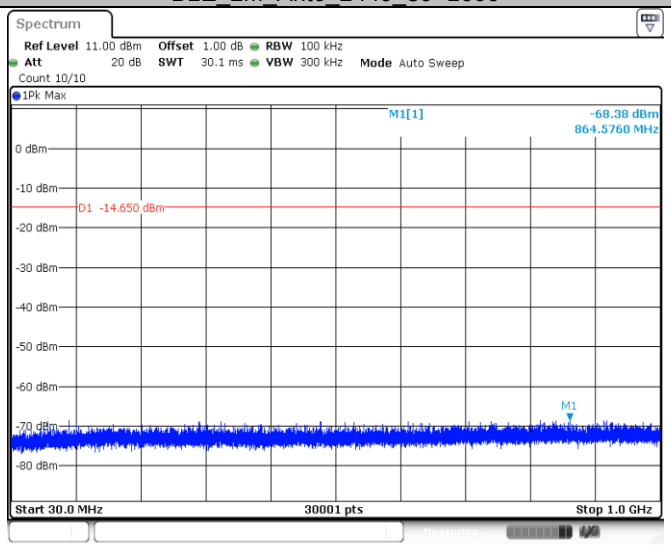
BLE_2M_Ant0_2440_30~1000



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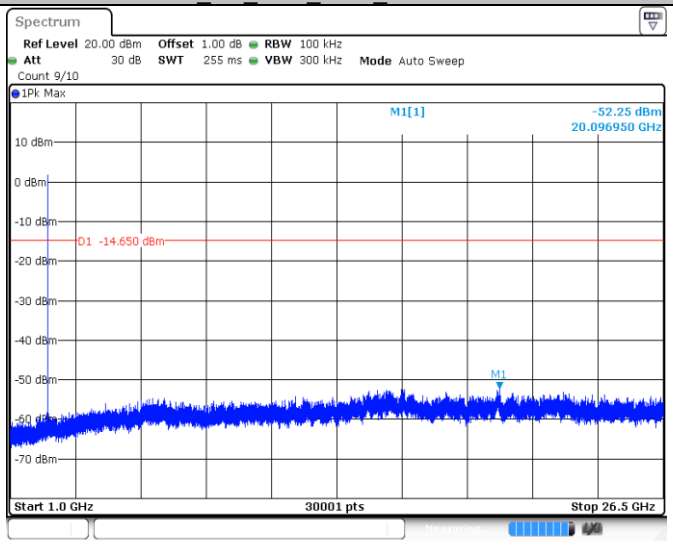
BLE_2M_Ant0_2440_1000~26500



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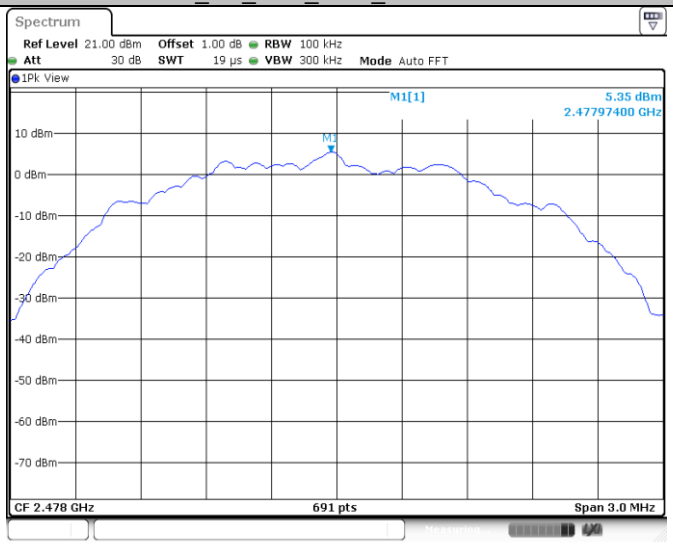
BLE_2M_Ant0_2478_0~Reference



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BLE_2M_Ant0_2478_30~1000

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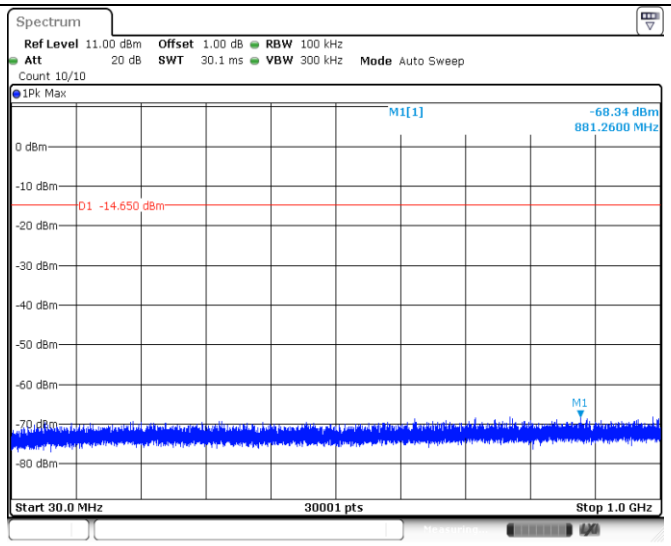
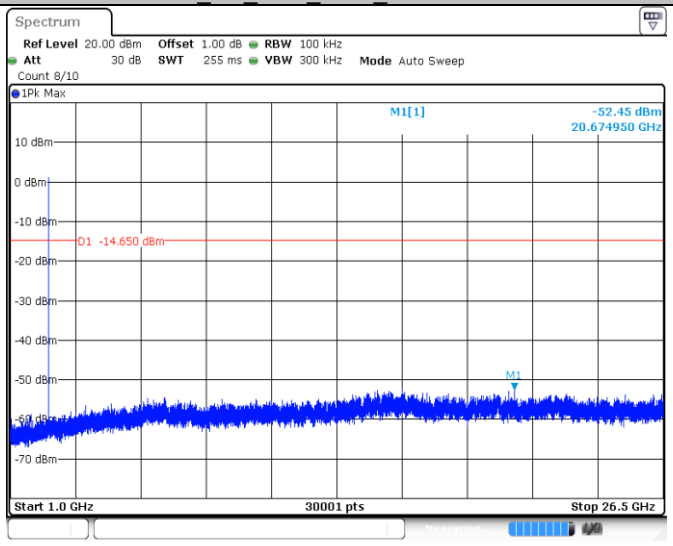


BLE_2M_Ant0_2478_1000~26500



9.6 Band Edge

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the power setting and enable the EUT transmit continuously.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency
6. Repeat the test on both lowest channel and highest channel.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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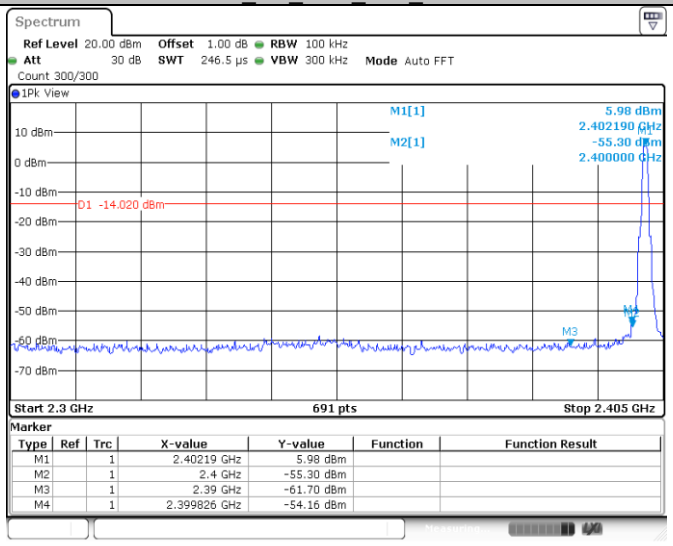
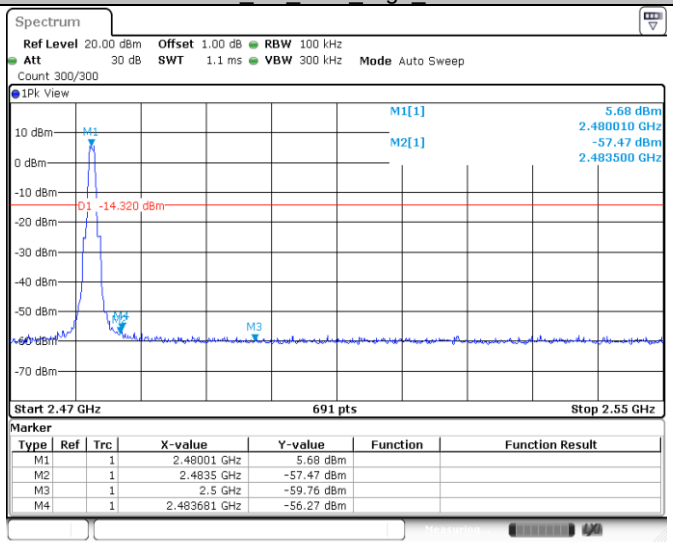
Band edge testing

Test Mode	Antenna	Channel	Channel (MHz)	Reference Level (dBm)	Result (dBm)	Limit (dBm)	Verdict
BLE_1M	Ant0	Low	2402	5.98	-54.16	<=-14.02	PASS
		High	2480	5.68	-56.27	<=-14.32	PASS
BLE_2M	Ant0	Low	2404	5.44	-57.66	<=-14.56	PASS
		High	2478	5.50	-57.15	<=-14.5	PASS

BLE_1M_Ant0_Low_2402



BLE_1M_Ant0_High_2480



BLE_2M_Ant0_Low_2404

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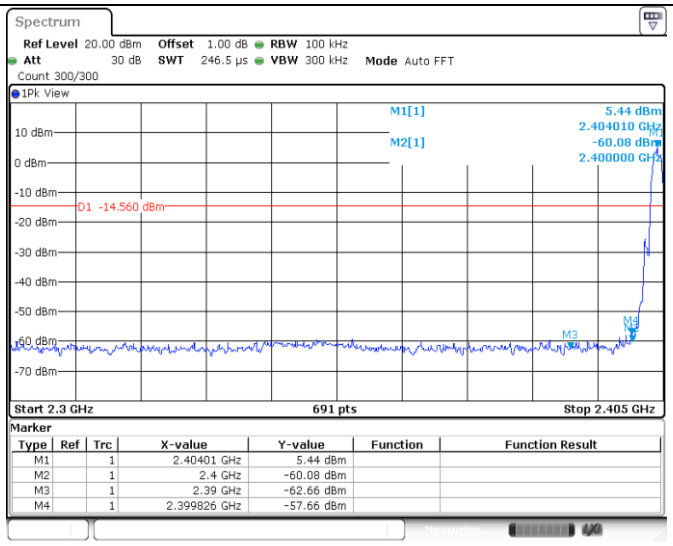

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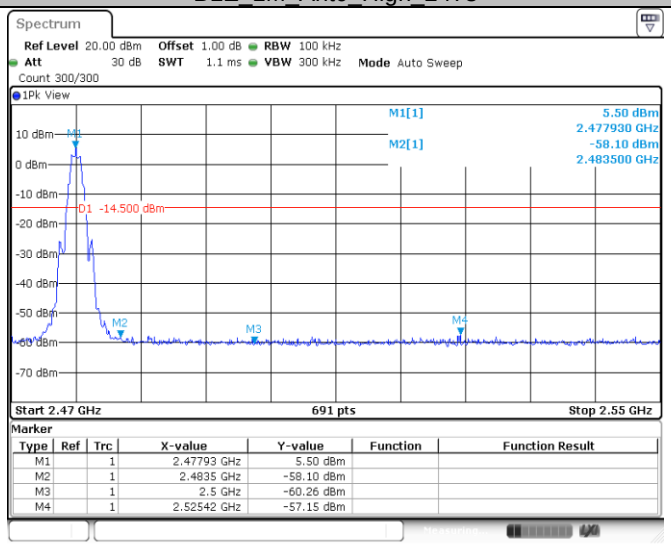
BLE_1M_Ant0_High_2478



Date: 13.MAR.2023 15:56:57

9.7 Spurious Radiated Emissions for Transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:
For 9KHz to 30MHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 10KHz, VBW≥3RBW, Sweep = auto, Detector function = QP, Trace = max hold.

For 30MHz to 1GHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100KHz to 120KHz, VBW≥3RBW, Sweep = auto, Detector function = QP peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement ,Sweep = auto, Detector function = peak, Trace = max hold.
Procedures for average unwanted emissions measurements above 1000 MHz
a) RBW = 1 MHz.
b) VBW ≥[3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D,where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

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g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205 & RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209 & RSS-Gen 6.13.

Frequency MHz	Field Strength µV/m	Field Strength dBµV/m	Detector	Measurement distance meters
0.009-0.490	2400/F(kHz)	48.5-13.8	AV	300
0.490-1.705	24000/F(kHz)	33.8-23.0	QP	30
1.705-30	30	29.5	QP	30
30-88	100	40	QP	3
88-216	150	43.5	QP	3
216-960	200	46	QP	3
960-1000	500	54	QP	3
Above 1000	500	54	AV	3
Above 1000	5000	74	PK	3

Note 1: Limit 3m(dBµV/m)=Limit 300m(dBµV/m)+40Log(300m/3m) (Below 30MHz)
Note 2: Limit 3m(dBµV/m)=Limit 30m(dBµV/m)+40Log(30m/3m) (Below 30MHz)

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.
The only worse case (which is subject to the maximum EIRP, GFSK mode, 2480MHz (1Mbit/s) and 2478MHz (2Mbit/s) test result are listed in the report.

GFSK Modulation 2480MHz (1Mbit/s) Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
30-1000MHz	722.276875	38.44	H	46.00	QP	7.56	29.29	Pass
	918.277500	38.41	H	46.00	PK	7.59	32.20	Pass
	Other Frequencies	--	H	--	QP	--	--	Pass
	30.970000	33.87	V	40.00	PK	6.13	17.82	Pass
	41.640000	29.28	V	40.00	PK	10.72	19.64	Pass
	504.936250	35.98	V	46.00	PK	10.02	25.84	Pass
	929.493125	38.39	V	46.00	PK	7.61	32.11	Pass
	Other Frequencies	--	V	--	QP	--	--	Pass
1000-25000MHz	4569.000000	48.59	H	74	PK	25.41	3.03	Pass
	9629.500000	45.72	H	74	PK	28.28	13.23	Pass
	13346.000000	50.60	H	74	PK	23.40	17.78	Pass
	Other frequency	---	H	74	PK	---	---	Pass
	3041.500000	46.32	V	74	PK	27.68	-0.41	Pass
	11382.000000	48.73	V	74	PK	25.27	15.89	Pass
	12641.500000	49.71	V	74	PK	24.29	18.63	Pass

GFSK Modulation 2478MHz (2Mbit/s) Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
30-1000MHz	721.235689	37.99	H	46.00	QP	8.01	26.30	Pass
	919.325678	38.10	H	46.00	PK	7.90	29.50	Pass
	Other Frequencies	--	H	--	QP	--	--	Pass
	31.220000	32.19	V	40.00	PK	7.81	15.62	Pass
	43.560000	28.12	V	40.00	PK	11.88	22.17	Pass
	504.225670	32.33	V	46.00	PK	13.67	34.19	Pass
	925.22890	36.45	V	46.00	PK	9.55	28.55	Pass
	Other Frequencies	--	V	--	QP	--	--	Pass
1000-25000MHz	4577.000000	48.45	H	74	PK	25.55	3.05	Pass
	8845.500000	45.00	H	74	PK	29.00	13.20	Pass
	12286.500000	49.73	H	74	PK	24.27	17.38	Pass
	Other frequency	---	H	74	PK	---	---	Pass
	9147.500000	45.11	V	74	PK	28.89	12.57	Pass
	12632.000000	49.88	V	74	PK	24.12	18.53	Pass
	15232.500000	50.20	V	74	PK	23.80	20.09	Pass
	Other frequency	---	V	74	PK	---	---	Pass

Remark:

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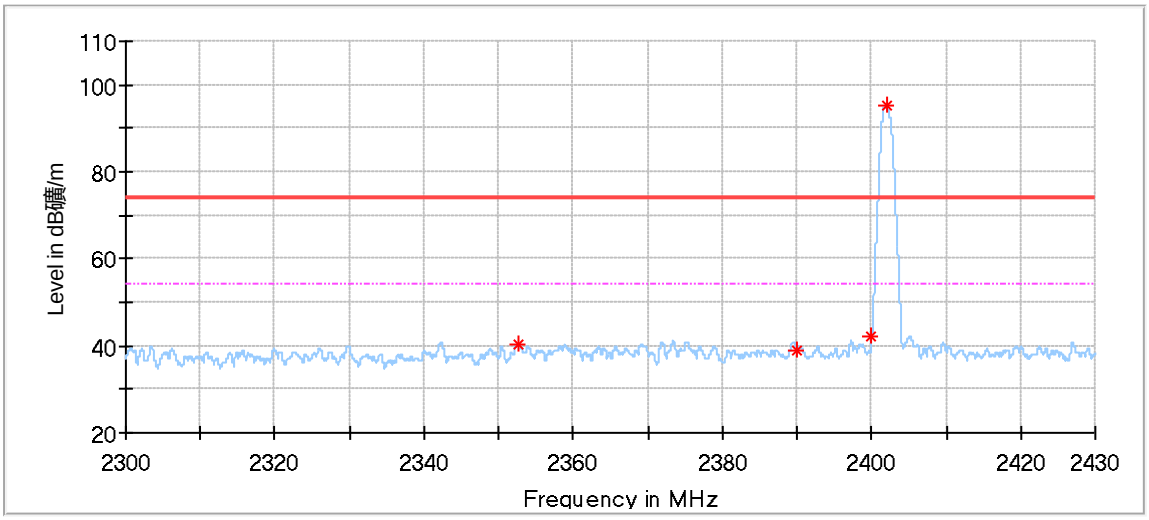
(1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205 & RSS-GEN 8.10.
(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(3) We test both rates for Low channel, Middle channel and High channel separately, only the worse case recorded in this report.
(4) Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

Restricted bands of operation. test result as below:

2402（1M）



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2352.559000	40.26	74.00	33.74	150.0	H	322.0	-3.12
2390.025000	39.01	74.00	34.99	150.0	H	260.0	-2.94
2400.022000	41.94	74.00	32.06	150.0	H	255.0	-2.86
2401.972000	95.32	74.00	-21.32	150.0	H	124.0	-2.84

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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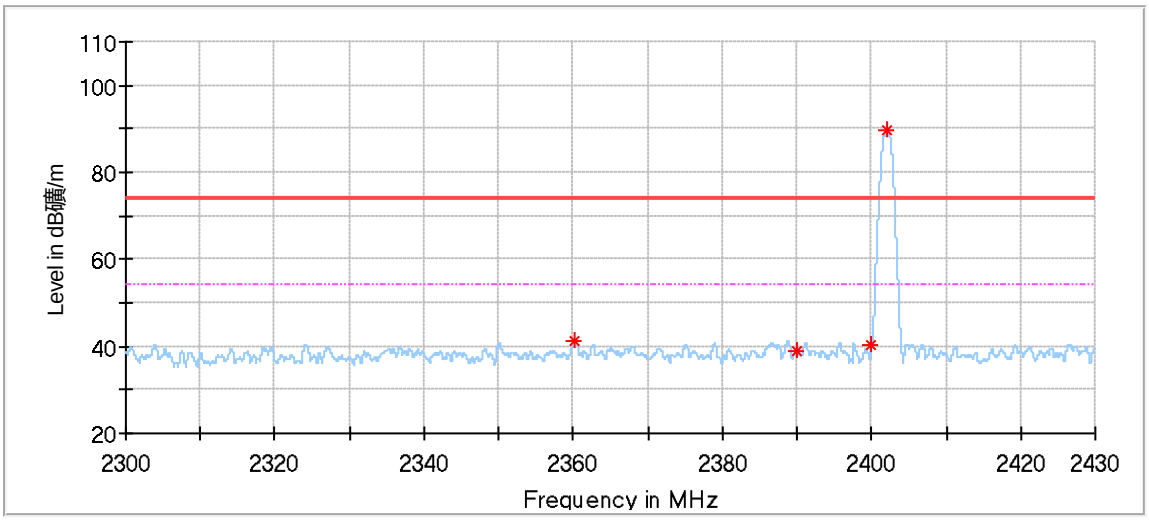

Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2360.242000	41.30	74.00	32.70	150.0	V	298.0	-3.09
2389.986000	38.81	74.00	35.19	150.0	V	333.0	-2.94
2400.022000	40.11	74.00	33.89	150.0	V	272.0	-2.86
2401.933000	89.57	74.00	-15.57	150.0	V	96.0	-2.84

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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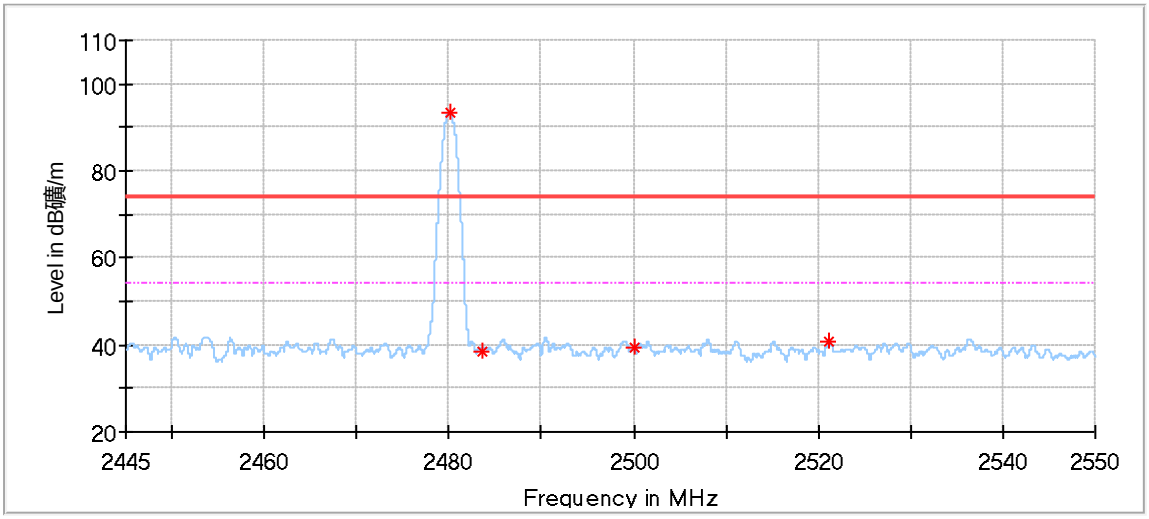
2480（1M）



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.122500	93.32	74.00	-19.32	150.0	H	163.0	-2.21
2483.514000	38.56	74.00	35.44	150.0	H	322.0	-2.20
2500.009500	39.39	74.00	34.61	150.0	H	32.0	-2.14
2521.072500	40.95	74.00	33.05	150.0	H	143.0	-2.17

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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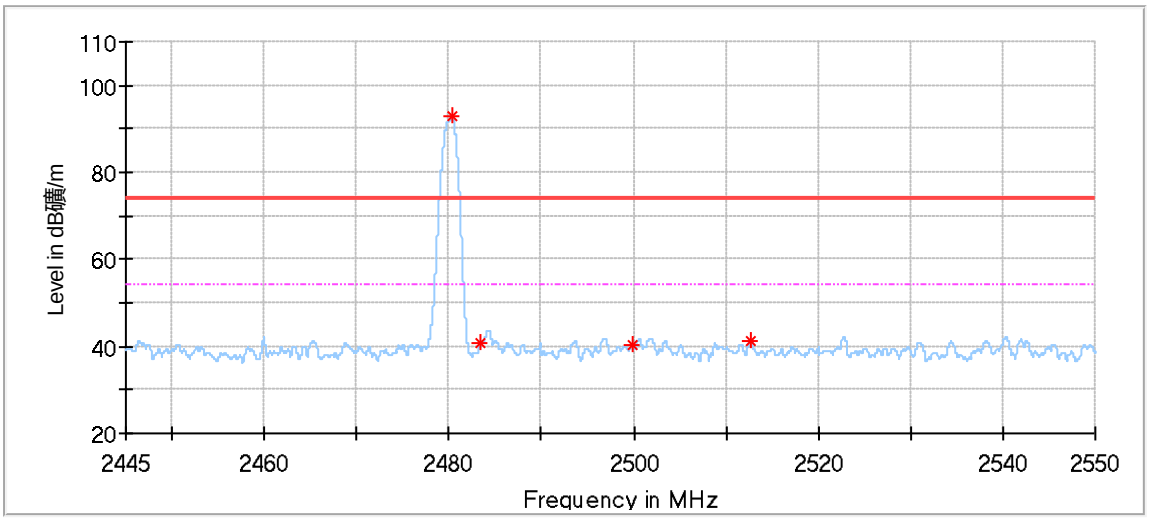

Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.259000	92.94	74.00	-18.94	150.0	V	133.0	-2.21
2483.482500	40.97	74.00	33.03	150.0	V	213.0	-2.20
2499.925500	40.27	74.00	33.73	150.0	V	62.0	-2.14
2512.693500	41.37	74.00	32.63	150.0	V	193.0	-2.16

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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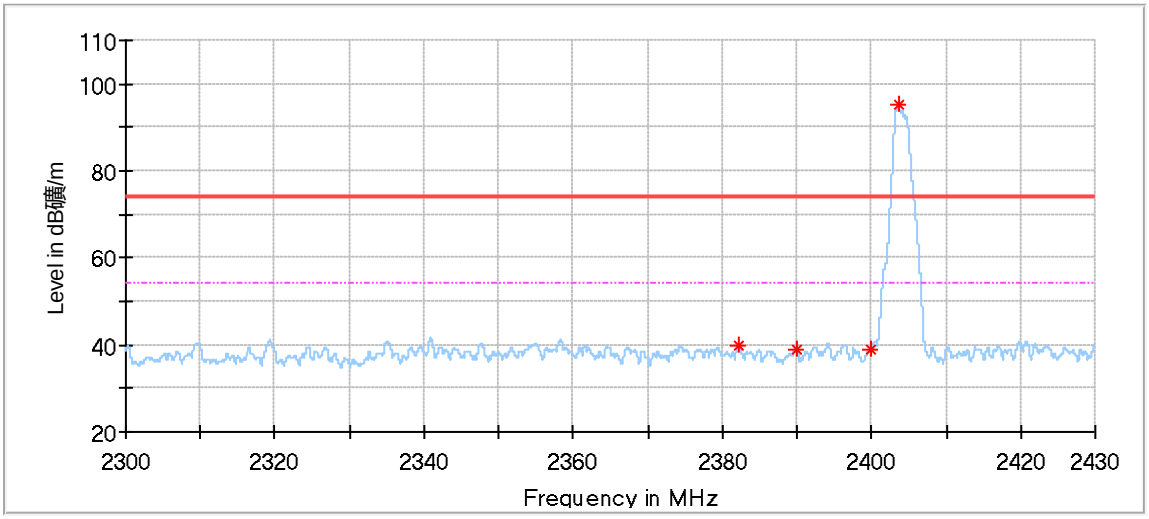
2404（2M）



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2382.186000	39.85	74.00	34.15	150.0	H	4.0	-3.01
2389.986000	38.75	74.00	35.25	150.0	H	148.0	-2.94
2400.009000	38.77	74.00	35.23	150.0	H	203.0	-2.86
2403.545000	95.41	74.00	-21.41	150.0	H	128.0	-2.82

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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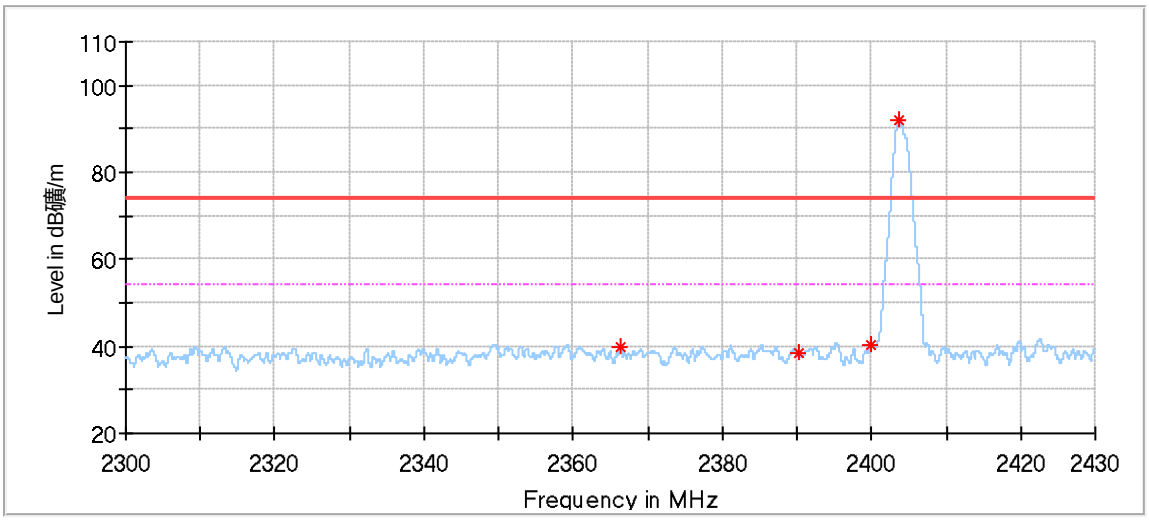

Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2366.313000	40.02	74.00	33.98	150.0	V	145.0	-3.08
2390.155000	38.61	74.00	35.39	150.0	V	343.0	-2.94
2400.009000	40.26	74.00	33.74	150.0	V	260.0	-2.86
2403.805000	92.13	74.00	-18.13	150.0	V	103.0	-2.81

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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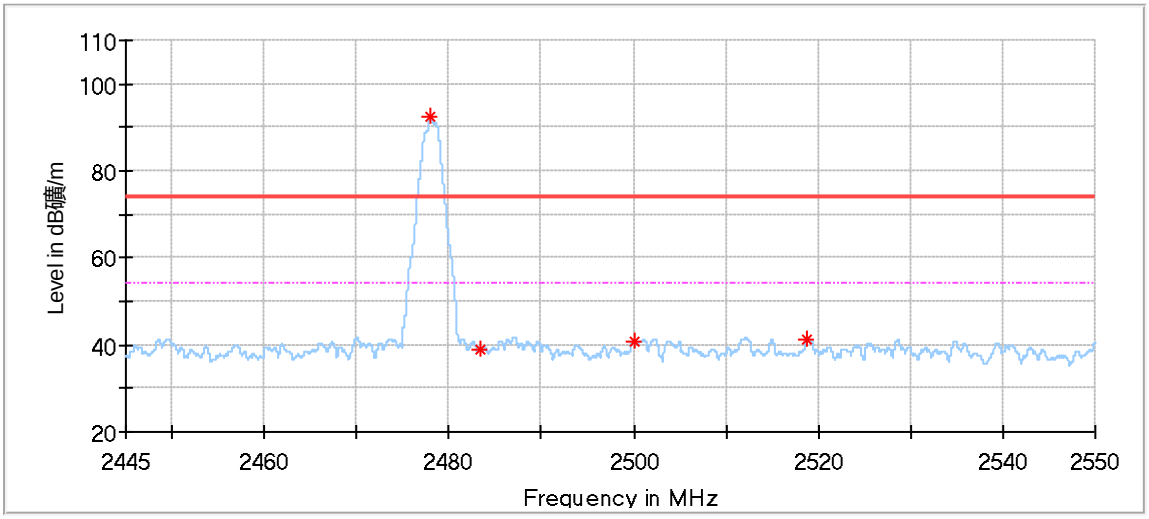
2478（2M）



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2478.043500	92.43	74.00	-18.43	150.0	H	128.0	-2.22
2483.493000	38.91	74.00	35.09	150.0	H	262.0	-2.20
2500.030500	40.93	74.00	33.07	150.0	H	41.0	-2.14
2518.815000	41.45	74.00	32.55	150.0	H	193.0	-2.17

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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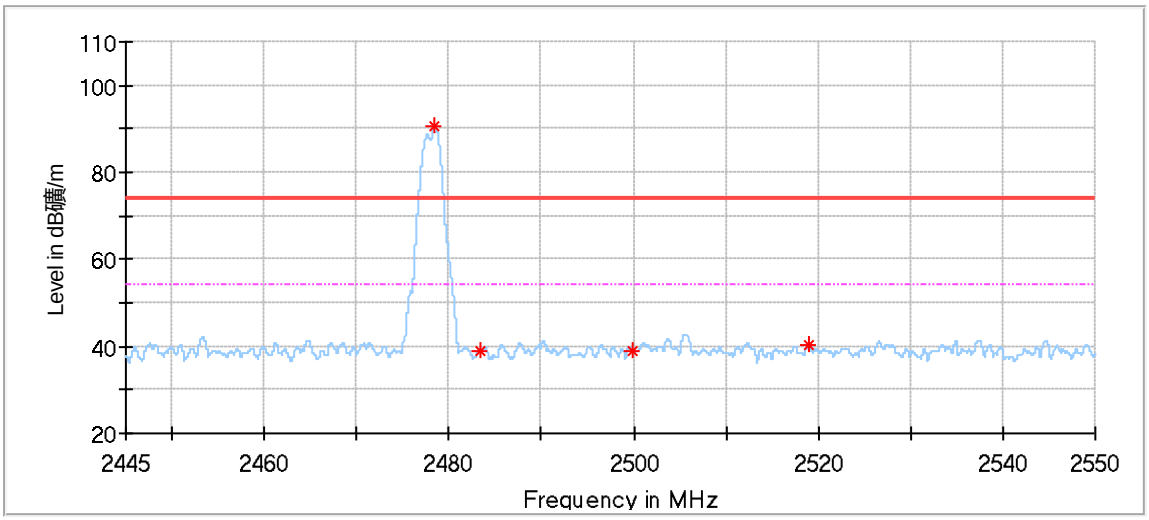

Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2478.453000	90.65	74.00	-16.65	150.0	V	138.0	-2.22
2483.503500	38.90	74.00	35.10	150.0	V	168.0	-2.20
2499.831000	38.86	74.00	35.14	150.0	V	213.0	-2.14
2518.941000	40.26	74.00	33.74	150.0	V	2.0	-2.17

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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10 Test Equipment List

List of Test Instruments

Radiated Spurious Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-003	101031	1	2023-5-27
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-003	708	1	2023-6-20
Horn Antenna	Rohde & Schwarz	HF907	68-4-80-14-004	102295	1	2023-7-20
Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2023-7-12
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2023-5-28
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	1	2023-5-28
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2023-7-27
Fully Anechoic Chamber	TDK	8X4X4	68-4-90-14-002	--	2	2023-9-2
Test software	Rohde & Schwarz	EMC32	68-4-90-14-002-A10	Version 9.15.00	N/A	N/A

Conducted Emission 2# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2023-5-27
LISN	Rohde & Schwarz	ENV216	68-4-87-19-001	102472	1	2023-5-27
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	1	2023-5-27
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	1	2023-5-27
High Voltage Probe	Schwarzbeck	TK9420(VT 9420)	68-4-27-14-001	9420-584	1	2023-5-27
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	1	2023-5-31
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2023-5-27
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version10.35.02	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	3	2025-10-15

Conducted RF Test System

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	68-4-48-14-001	108272	1	2023-5-27
Vector Signal Generator	Rohde & Schwarz	SMBV100A	68-4-48-18-001	262825	1	2023-5-27
Communication Synthetical Test Instrument	Rohde & Schwarz	CMW 270	68-4-48-18-003	101251	1	2023-5-27
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2023-5-27
Vector Signal Generator	Rohde & Schwarz	SMU 200A	68-4-48-14-003	105324	1	2023-5-27
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	68-4-93-14-003	101226/100851	1	2023-5-27

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Power Splitter	Weinschel	1580	68-4-85-14-001	SC319	1	2023-5-28
10dB Attenuator	Weinschel	4M-10	68-4-81-14-003	43152	1	2023-5-28
10dB Attenuator	R&S	DNF	68-4-81-14-004	DNF-001	1	2023-5-27
10dB Attenuator	R&S	DNF	68-4-81-14-005	DNF-002	1	2023-5-27
10dB Attenuator	R&S	DNF	68-4-81-14-006	DNF-003	1	2023-5-27
10dB Attenuator	R&S	DNF	68-4-81-14-007	DNF-004	1	2023-5-27
Test software	Rohde & Schwarz	EMC32	68-4-48-14-003-A10	Version 10.60.10	N/A	N/A
Test software	Tonscend	System for BT/WIFI	68-4-74-14-006-A13	Version 2.6.77.0518	N/A	N/A
Shielding Room	TDK	TS8997	68-4-90-19-003	----	3	2025-10-15

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission in new shielding room (68-4-90-19-005) 150kHz-30MHz (for test using AMN ENV216)	3.33dB
Uncertainty for Radiated Electromagnetic Disturbance in shielding room (68-4-90-19-005) 9KHz-30MHz	3.20dB
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.33dB; Vertical: 4.41dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.27dB; Vertical: 4.26dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.52dB; Vertical: 4.51dB;
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.31dB Frequency test involved: 0.6×10^{-8} or 1%

Measurement Uncertainty Decision Rule:
Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.

THE END

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