TEST REPORT

Product Name	:	B91 FEM Dongle-V1
Brand Mark	:	Telink
Model No.	:	TLSR9518APDG80D-V1
FCC ID	:	OEOTLSR9518APDG80
Report Number	:	BLA-EMC-202311-A6202
Date of Sample Receipt	:	2023/11/27
Date of Test	:	2023/11/30 to 2023/12/7
Date of Issue	:	2023/12/7
Test Standard	:	47 CFR Part 15, Subpart C 15.247
Test Result	:	Pass

Prepared for:

Telink Semiconductor (Shanghai) Co., Ltd.
Building 3, No. 1500 Zuchongzhi Rd Zhangjiang Hi-Tech Park, Shanghai

Prepared by:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.
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Review by: Sweets

Approved by: Blue.Zheng

Date: 2023/12/7

BlueAsia of Technical Services(Shenzhen) Co., Ltd.

REPORT REVISE RECORD

Version No.	Date	Description
00	2023/12/7	Original

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass

2 GENERAL INFORMATION

Applicant	Telink Semiconductor (Shanghai) Co., Ltd.
Address	Building 3, No. 1500 Zuchongzhi Rd Zhangjiang Hi-Tech Park, Shanghai
Manufacturer	Telink Semiconductor (Shanghai) Co., Ltd.
Address	Building 3, No. 1500 Zuchongzhi Rd Zhangjiang Hi-Tech Park, Shanghai
Factory	N/A
Address	N/A
Product Name	B91 FEM Dongle-V1
Test Model No.	TLSR9518APDG80D-V1

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	C1T213A16_V1.3
Software Version	N/A
Engineer sample no:	BLA-EMC-202311-A62

Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK
Data Rata	1Mbps; 2Mbps
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	External Antenna
Antenna Gain:	1dBi(Provided by the customer)

Note:

Evaluation Information:

Product uses uniquely coupled antenna with intentional radiator, detachable non-standard jack antenna, it is reverse polarity, connector is RP-SMA, female screw. full the requirement of 15.203.

4 OPERATION FREQUENCY EACH OF CHANNEL

BLE:

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	11	2422MHz	21	2442MHz	31	2462MHz
2	2404MHz	12	2424MHz	22	2444MHz	32	2464MHz
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2442MHz
The Highest channel	2480MHz

5 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25℃	DC3.3V

6 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in transmitting mode with modulation
Remark:Only the data of the worst mode would be recorded in this report.For Radiated emission，1Mbps and 2Mbps mode all have been tested，only worse case 1Mbps mode is reported.	

7 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3.0 dB
Unwanted Emissions, conducted	±3.0 dB
Temperature	±3 °C
Supply voltages	±3 %
Time	±5 %
Radiated Emission(9kHz-30MHz)	±4.34dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB
Unwanted Radiated Emission (30MHz ~ 1000MHz)	±4.35 dB
Unwanted Radiated Emission (1GHz ~ 18GHz)	±4.44 dB

8 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	lenovo	E460C	N/A	From lab (No.BLA-ZC-BS-2022005)

9 LABORATORY LOCATION

All tests were performed at:

BlueAsia of Technical Services(Shenzhen) Co., Ltd.

Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China

Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673

No tests were sub-contracted.

10 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Chamber 1	SKET	966	N/A	2023/11/16	2026/11/15
Chamber 2	SKET	966	N/A	2021/07/20	2024/7/19
Spectrum	R&S	FSP40	100817	2023/08/30	2024/08/29
Receiver	R&S	ESR7	101199	2023/08/30	2024/08/29
Receiver	R&S	ESPI7	101477	2023/07/07	2024/07/06
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2022/10/12	2025/10/11
Horn Antenna	Schwarzbeck	BBHA9120D	01892 P:00331	2022/09/13	2025/09/12
Horn Antenna	Schwarzbeck	BBHA 9170	1106	2022/04/24	2024/04/23
Amplifier	SKET	LNPA_30M01G-30	SK2021060801	2023/07/07	2024/07/06
Amplifier	SKET	PA-000318G-45	N/A	2023/08/30	2024/08/29
Amplifier	SKET	LNPA_18G40G-50	SK2022071301	2023/07/14	2024/07/13
Filter group	SKET	2.4G/5G Filter group r	N/A	2023/07/07	2024/07/06
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2022/09/14	2025/09/13
1kHZ calibration audio source	SKET	MCS-ABT-C35	N/A	2023/09/04	2024/09/03
Free Field Microphone	SKET	MGS MP 663	0414	2023/09/04	2024/09/03
Audio shielding box	SKET	SB-ABT-C35	N/A	2023/03/30	2024/03/29
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A

Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A
Signal Generator DTV	ECREDIX	DSG-1000	N/A	N/A	N/A

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Shield room	SKET	833	N/A	2023/11/16	2025/11/15
Receiver	R&S	ESPI3	101082	2023/08/30	2024/08/29
LISN	R&S	ENV216	3560.6550.15	2023/08/30	2024/08/29
LISN	AT	AT166-2	AKK1806000003	2023/08/30	2024/08/29
ISN	TESEQ	ISNT8-cat6	53580	2023/08/30	2024/08/29
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01045	2023/07/07	2024/07/06
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01075	2023/07/07	2024/07/06
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

Test Equipment Of RF Conducted Test					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2023/08/30	2024/08/29
Spectrum	Agilent	N9020A	MY49100060	2023/08/30	2024/08/29
Spectrum	Agilent	N9020A	MY54420161	2023/08/30	2024/08/29
Signal Generator	Agilent	N5182A	MY47420955	2023/08/30	2024/08/29
Signal Generator	Agilent	N5181A	MY46240904	2023/07/07	2024/07/06
Signal Generator	R&S	CMW500	132429	2023/08/30	2024/08/29
BluetoothTester	Anritsu	MT8852B	06262047872	2023/08/30	2024/08/29
Power probe	DARE	RPR3006W	14I00889SN042	2023/09/01	2024/08/31
Power detection box	CDKMV	MW100-PSB	MW201020JYT	2023/07/07	2024/07/06
DCPowersupply	zhaoxin	KXN-305D	20K305D1221363	2023/08/30	2024/08/29
DCPowersupply	zhaoxin	RXN-1505D	19R1505D050168	2023/08/30	2024/08/29

2.4GHz/5GHz RF Test software	MTS	MTS 8310	Version 2.0.0.0	N/A	N/A
Audio Analyzer	Audio Precision	ATS-1	ATS141094	2023/07/07	2024/07/06

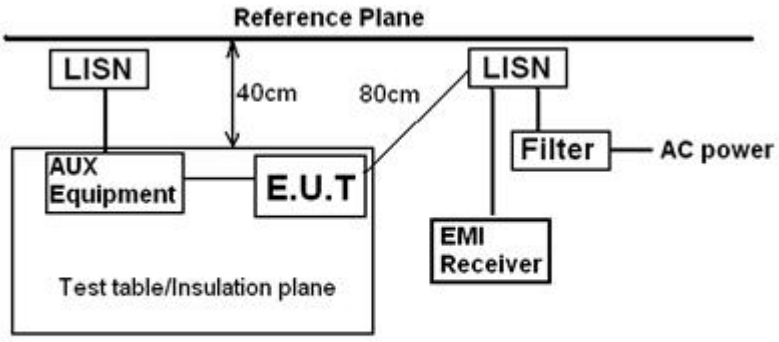
11 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

11.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

11.2 BLOCK DIAGRAM OF TEST SETUP



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

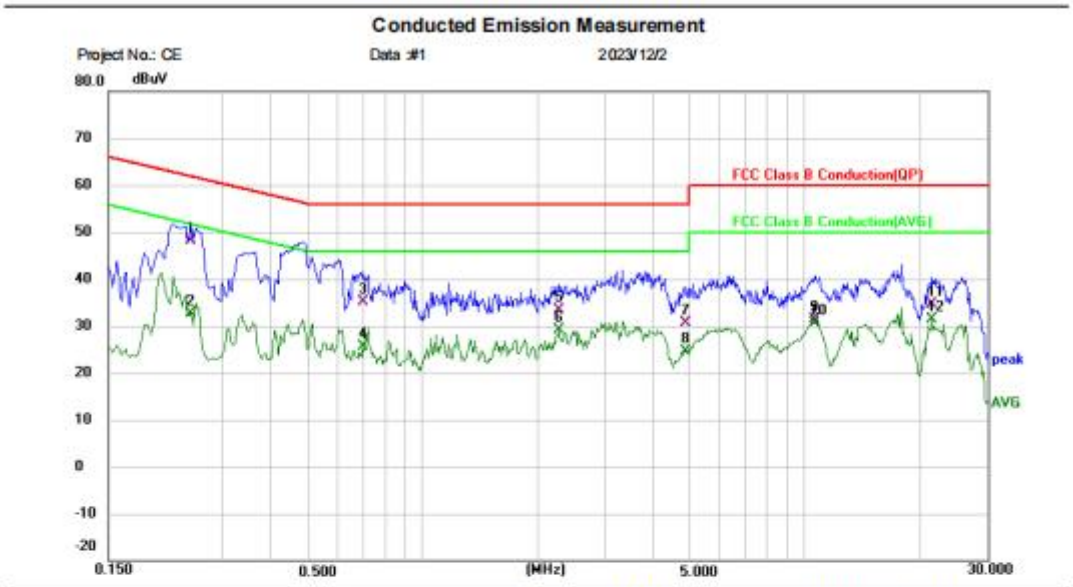
11.3 PROCEDURE

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

11.4 TEST DATA

[TestMode: TX]; [Line: Line];[Power:AC120V/60Hz]



Site
Limit: FCC Class B Conduction(QP)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: TX mode
Note:

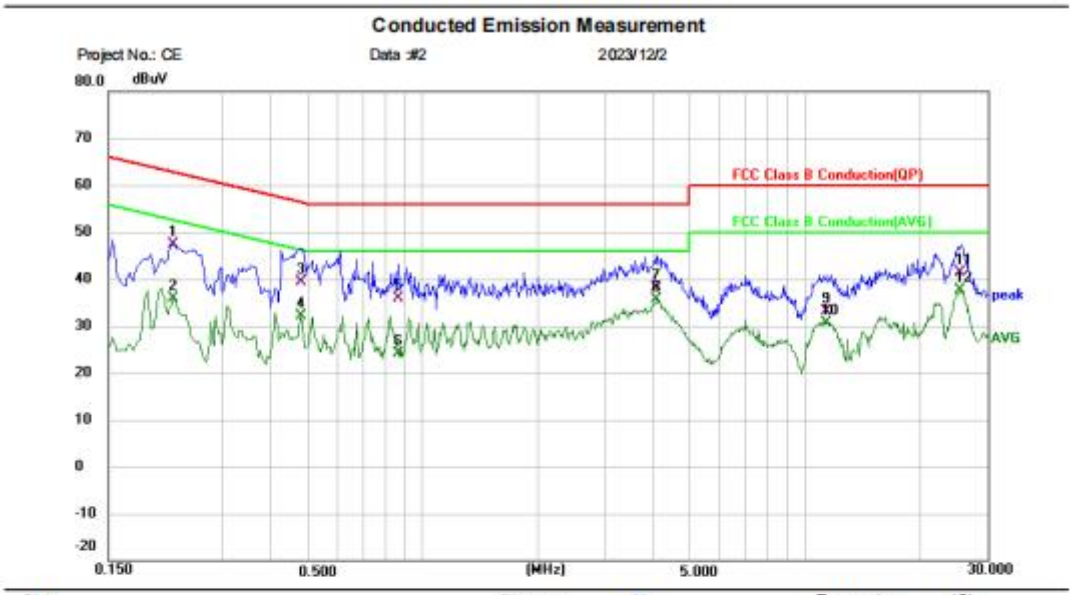
Phase: L1
Power:
Distance:
RBW: 9 KHz
VBW: 30 KHz

Temperature: (C)
Humidity: %RH
Sweep Time: 10 ms

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	cm	degree	Comment
1	*	0.2460	37.68	10.53	48.21	61.89	-13.68	QP			
2		0.2460	22.04	10.53	32.57	51.89	-19.32	AVG			
3		0.6980	25.22	10.01	35.23	56.00	-20.77	QP			
4		0.6980	15.65	10.01	25.66	46.00	-20.34	AVG			
5		2.2700	23.34	10.12	33.46	56.00	-22.54	QP			
6		2.2700	18.96	10.12	29.08	46.00	-16.92	AVG			
7		4.8780	20.36	10.23	30.59	56.00	-25.41	QP			
8		4.8780	14.40	10.23	24.63	46.00	-21.37	AVG			
9		10.5780	30.26	1.12	31.38	60.00	-28.62	QP			
10		10.5780	29.57	1.12	30.69	50.00	-19.31	AVG			
11		21.5459	19.80	14.81	34.61	60.00	-25.39	QP			
12		21.5459	16.47	14.81	31.28	50.00	-18.72	AVG			

Test Result: Pass

[TestMode: TX]; [Line: Neutral];[Power:AC120V/60Hz]



Site
Limit: FCC Class B Conduction(QP)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: TX mode
Note:

Phase: N
Power:
Distance:
RBW: 9 KHz
VBW: 30 KHz

Temperature: (C)
Humidity: %RH
Sweep Time: 10 ms

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	cm	degree	Comment
1		0.2220	37.00	10.26	47.26	62.74	-15.48	QP			
2		0.2220	25.67	10.26	35.93	52.74	-16.81	AVG			
3		0.4780	29.67	9.81	39.48	56.37	-16.89	QP			
4		0.4780	22.40	9.81	32.21	46.37	-14.16	AVG			
5		0.8620	25.98	9.89	35.87	56.00	-20.13	QP			
6		0.8620	14.15	9.89	24.04	46.00	-21.96	AVG			
7		4.0780	28.07	10.07	38.14	56.00	-17.86	QP			
8	*	4.0780	25.48	10.07	35.55	46.00	-10.45	AVG			
9		11.3900	32.64	0.53	33.17	60.00	-26.83	QP			
10		11.3900	30.01	0.53	30.54	50.00	-19.46	AVG			
11		25.6259	26.50	14.94	41.44	60.00	-18.56	QP			
12		25.6259	22.75	14.94	37.69	50.00	-12.31	AVG			

Test Result: Pass

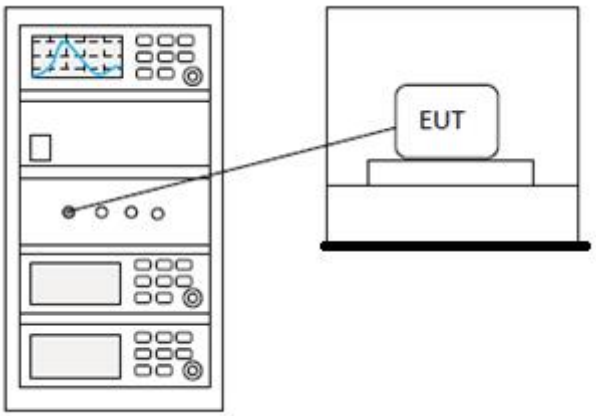
12 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

12.1 LIMITS

Limit:	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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

13 RADIATED SPURIOUS EMISSIONS

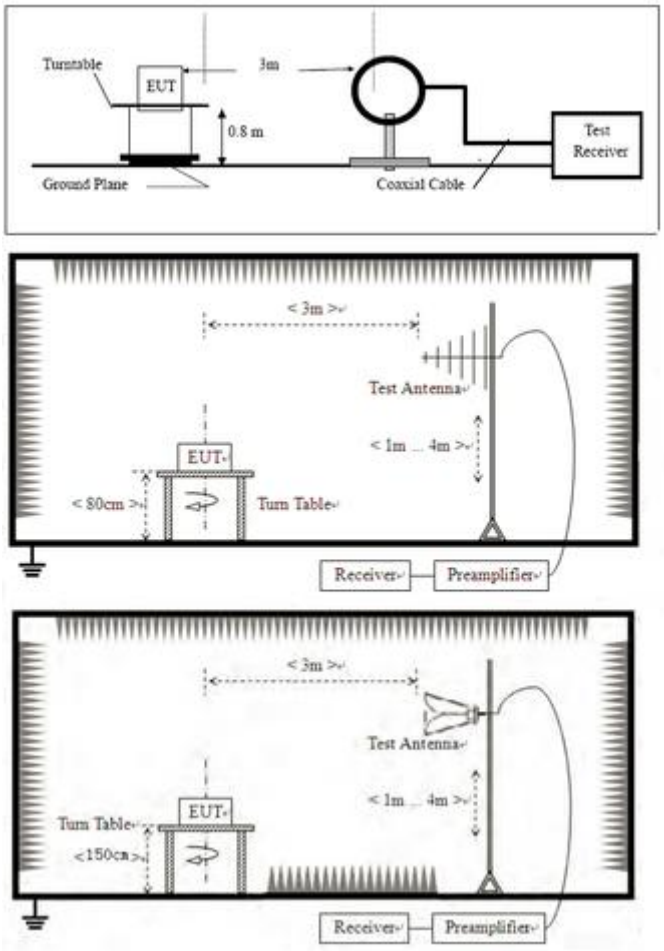
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

13.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

13.2 BLOCK DIAGRAM OF TEST SETUP



13.3 PROCEDURE

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. The antenna height 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.
e. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

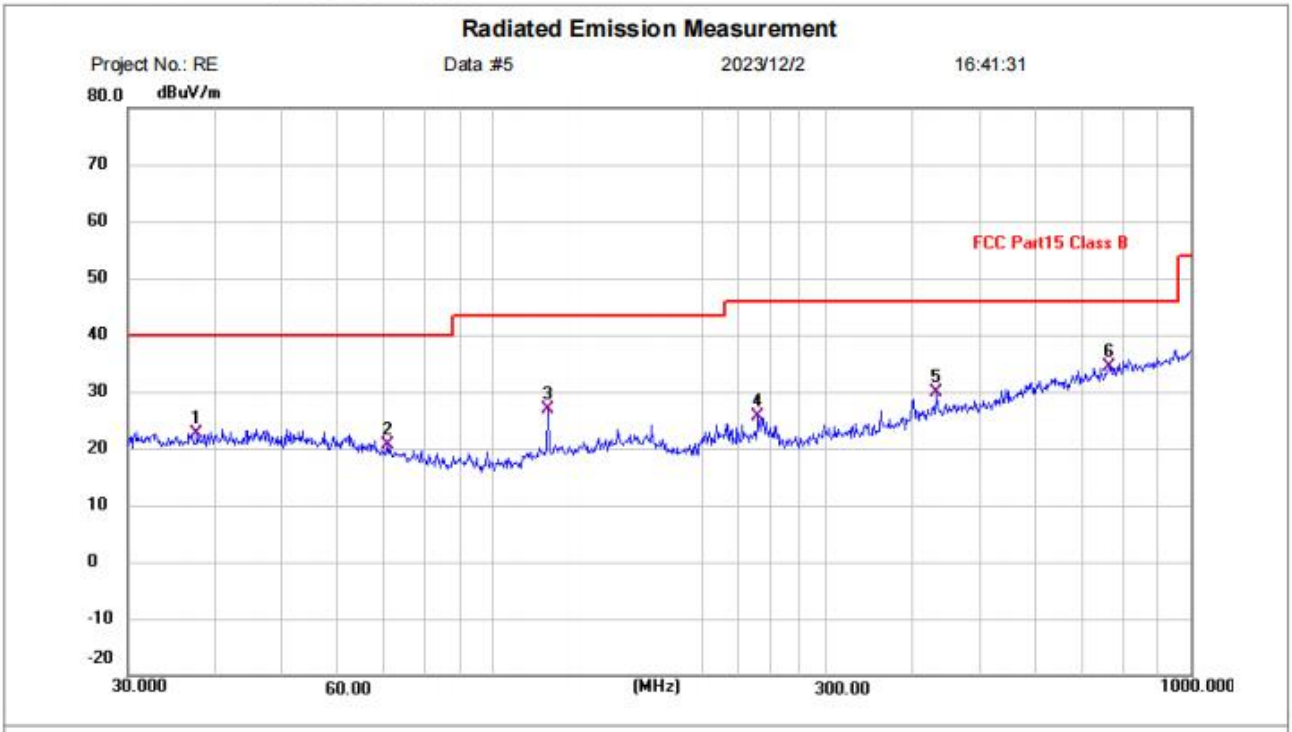
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.

Remark:
1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.fundamental frequency is blocked by filter, and only spurious emission is shown.
4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

13.4 TEST DATA

Below 1GHz

[TestMode: TX]; [Polarity: Horizontal]



Site
Limit: FCC Part15 Class B
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE TX mode
Note:

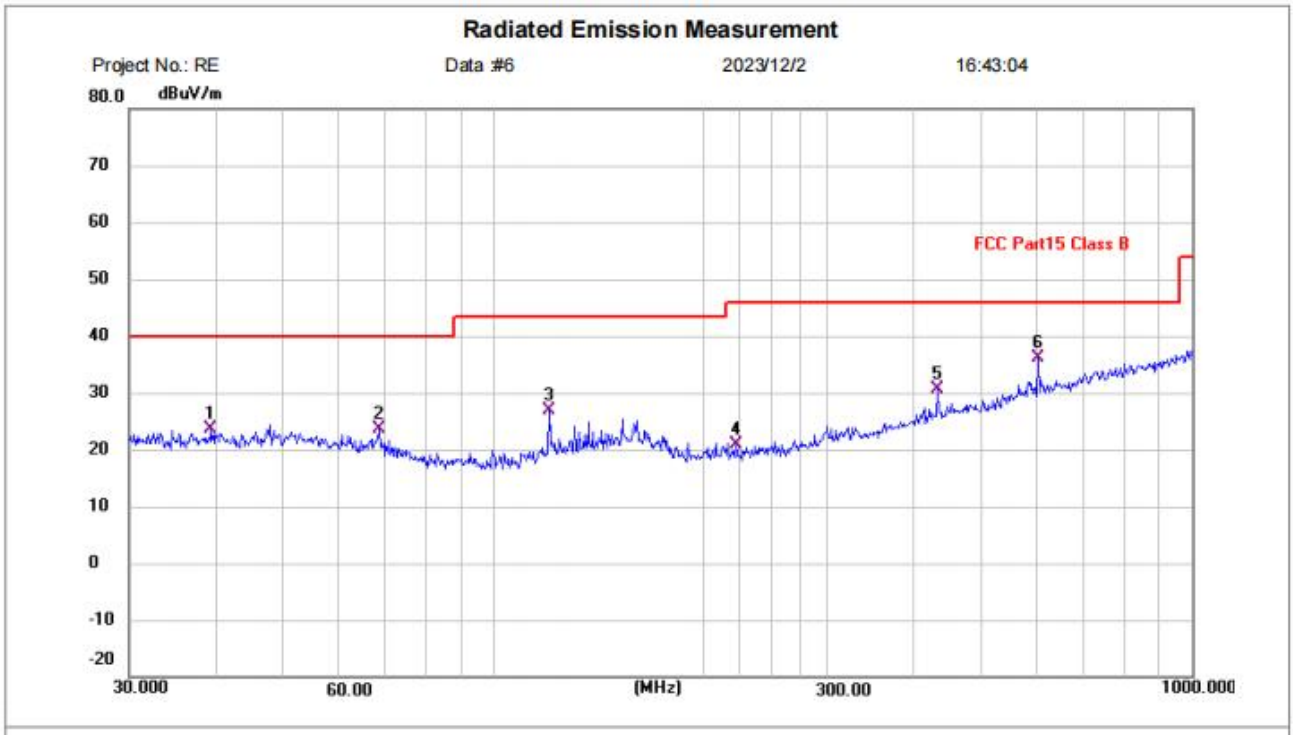
Polarization: *Horizontal*
Power:

Temperature: (C)
Humidity: %RH

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	37.6797	-0.44	23.08	22.64	40.00	-17.36	QP	P	
2	70.8315	-0.33	20.89	20.56	40.00	-19.44	QP	P	
3	119.8556	5.62	21.19	26.81	43.50	-16.69	QP	P	
4	239.9873	4.43	21.14	25.57	46.00	-20.43	QP	P	
5	432.5456	3.09	26.79	29.88	46.00	-16.12	QP	P	
6 *	763.3757	0.91	33.40	34.31	46.00	-11.69	QP	P	

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]



Site
Limit: FCC Part15 Class B
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE TX mode
Note:

Polarization: *Vertical*
Power:

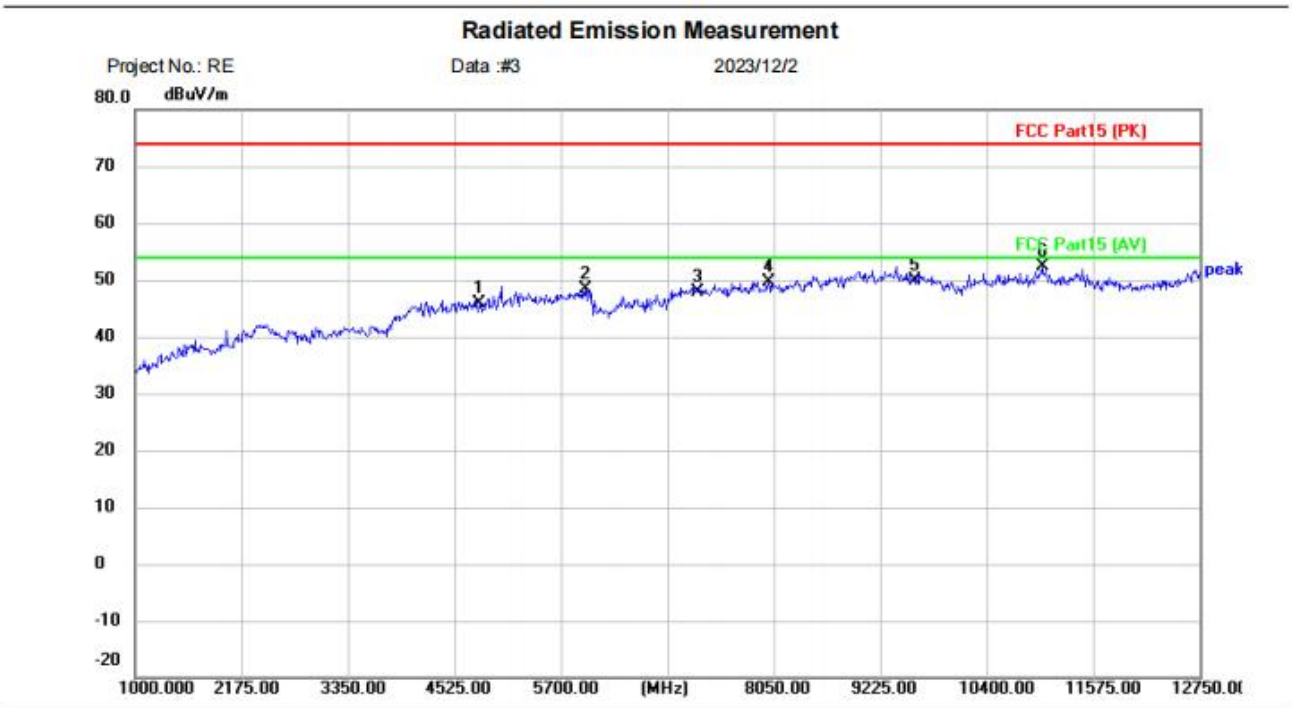
Temperature: (C)
Humidity: %RH

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	39.2991	0.26	23.28	23.54	40.00	-16.46	QP	P	
2	68.3908	2.65	20.89	23.54	40.00	-16.46	QP	P	
3	119.8556	5.59	21.19	26.78	43.50	-16.72	QP	P	
4	222.1698	0.98	19.78	20.76	46.00	-25.24	QP	P	
5	431.0316	3.84	26.79	30.63	46.00	-15.37	QP	P	
6 *	601.4265	5.74	30.28	36.02	46.00	-9.98	QP	P	

Test Result: Pass

Above 1GHz:

[TestMode: TX low channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2402
Note:

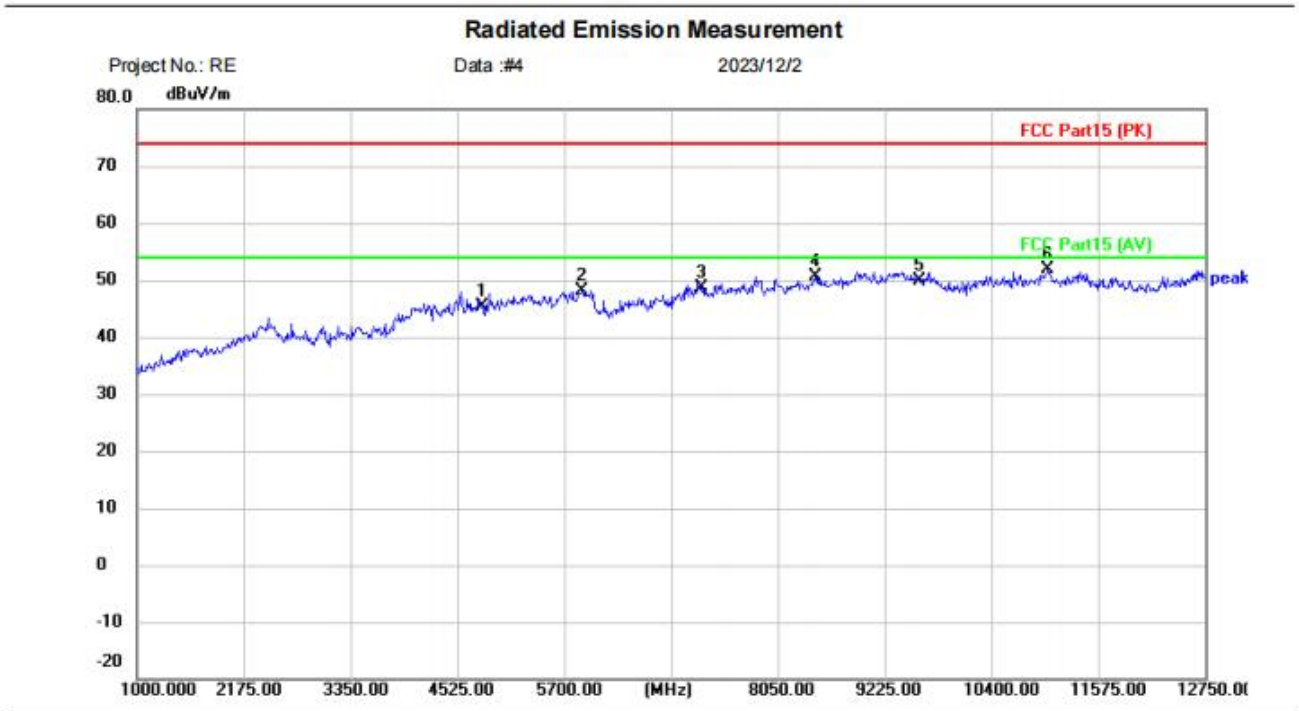
Polarization: *Horizontal*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	40.19	5.64	45.83	74.00	-28.17	peak	
2		5970.250	39.54	8.72	48.26	74.00	-25.74	peak	
3		7206.000	38.53	9.24	47.77	74.00	-26.23	peak	
4		7991.250	39.73	9.86	49.59	74.00	-24.41	peak	
5		9608.000	37.67	12.31	49.98	74.00	-24.02	peak	
6	*	11011.00	38.87	13.40	52.27	74.00	-21.73	peak	

Test Result: Pass

[TestMode: TX low channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2402
Note:

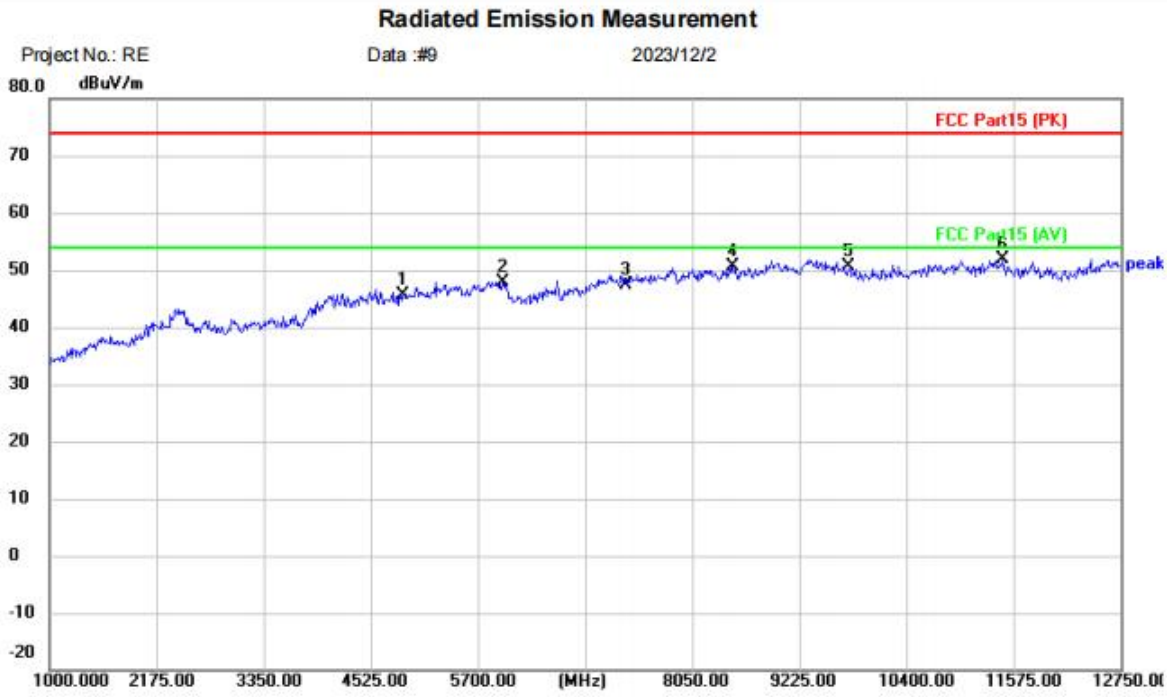
Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	39.71	5.64	45.35	74.00	-28.65	peak	
2		5899.750	39.55	8.66	48.21	74.00	-25.79	peak	
3		7206.000	39.47	9.24	48.71	74.00	-25.29	peak	
4		8461.250	39.89	10.70	50.59	74.00	-23.41	peak	
5		9608.000	37.53	12.31	49.84	74.00	-24.16	peak	
6	*	11022.75	38.64	13.32	51.96	74.00	-22.04	peak	

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2442
Note:

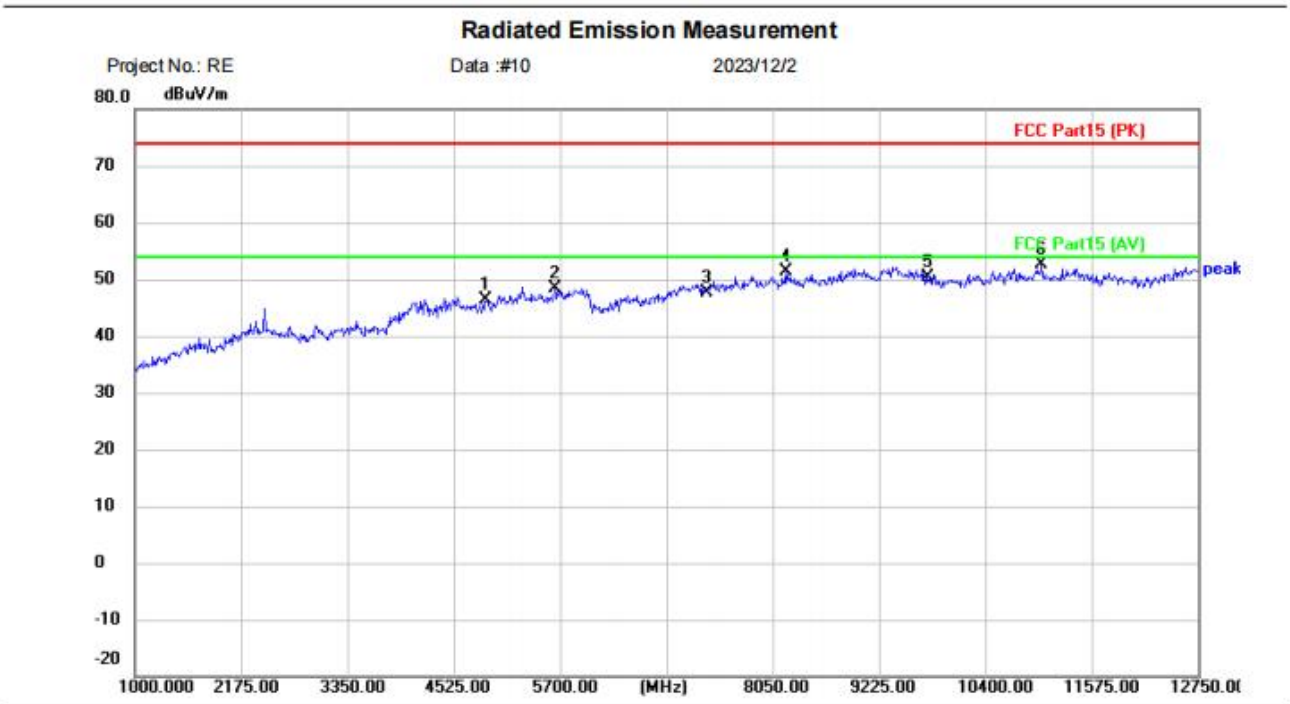
Polarization: *Horizontal*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4884.000	39.93	5.75	45.68	74.00	-28.32	peak	
2		5970.250	39.19	8.72	47.91	74.00	-26.09	peak	
3		7326.000	38.05	9.43	47.48	74.00	-26.52	peak	
4		8496.500	39.64	10.90	50.54	74.00	-23.46	peak	
5		9768.000	38.47	12.22	50.69	74.00	-23.31	peak	
6	*	11457.50	39.34	12.62	51.96	74.00	-22.04	peak	

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2442
Note:

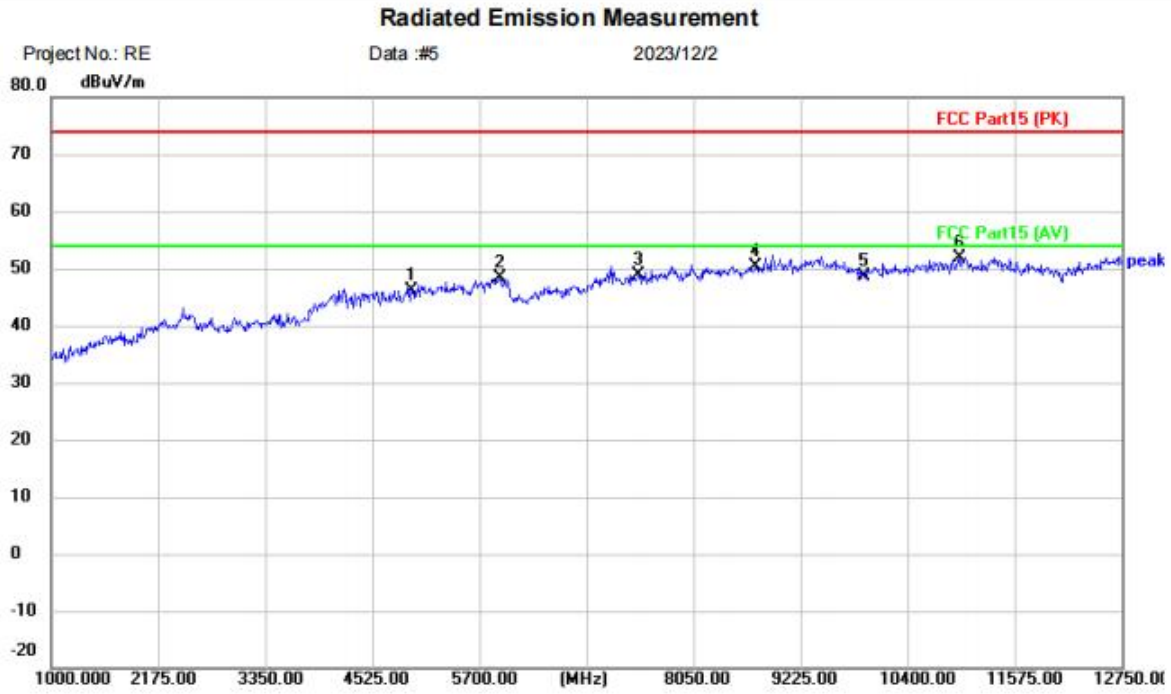
Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4884.000	40.67	5.75	46.42	74.00	-27.58	peak	
2		5641.250	40.69	7.65	48.34	74.00	-25.66	peak	
3		7326.000	38.14	9.43	47.57	74.00	-26.43	peak	
4		8191.000	41.61	9.88	51.49	74.00	-22.51	peak	
5		9768.000	38.18	12.22	50.40	74.00	-23.60	peak	
6	*	11022.75	39.26	13.32	52.58	74.00	-21.42	peak	

Test Result: Pass

[TestMode: TX High channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2480
Note:

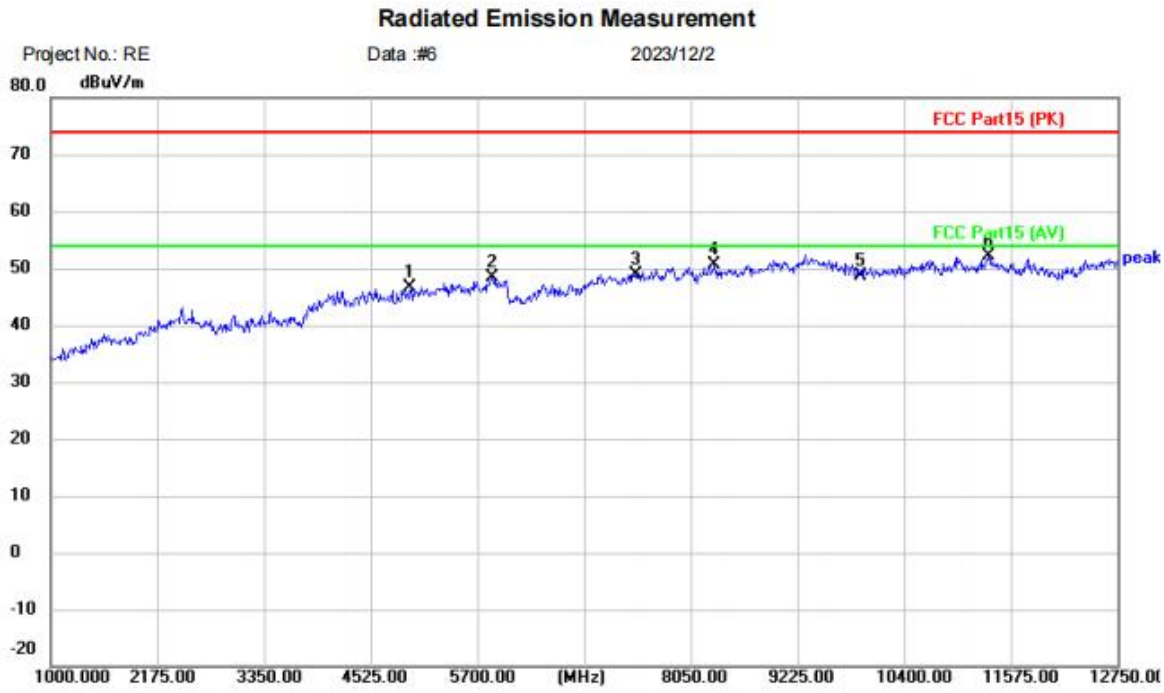
Polarization: *Horizontal*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	39.44	6.60	46.04	74.00	-27.96	peak	
2		5923.250	39.64	8.67	48.31	74.00	-25.69	peak	
3		7440.000	39.27	9.64	48.91	74.00	-25.09	peak	
4		8731.500	38.92	11.56	50.48	74.00	-23.52	peak	
5		9920.000	36.60	12.14	48.74	74.00	-25.26	peak	
6	*	10964.00	38.59	13.35	51.94	74.00	-22.06	peak	

Test Result: Pass

[TestMode: TX High channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2480
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	40.08	6.60	46.68	74.00	-27.32	peak	
2		5864.500	39.97	8.48	48.45	74.00	-25.55	peak	
3		7440.000	39.22	9.64	48.86	74.00	-25.14	peak	
4		8308.500	40.30	10.24	50.54	74.00	-23.46	peak	
5		9920.000	36.55	12.14	48.69	74.00	-25.31	peak	
6	*	11328.25	39.56	12.67	52.23	74.00	-21.77	peak	

Test Result: Pass

14 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

14.1 CONCLUSION

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

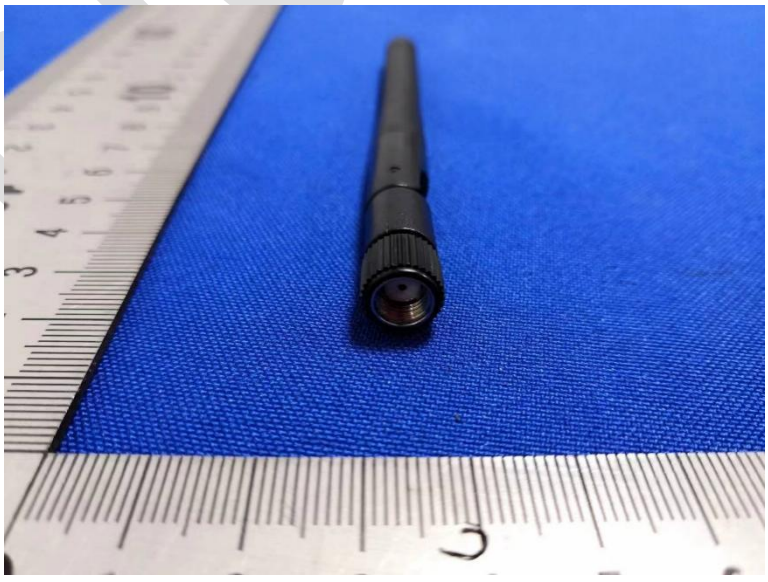
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Evaluation Information:

Product uses uniquely coupled antenna with intentional radiator, detachable non-standard jack antenna, it is reverse polarity, connector is RP-SMA, female screw. full the requirement of this section.

EUT Antenna:

The best case gain of the antenna is 1dBi.



15 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

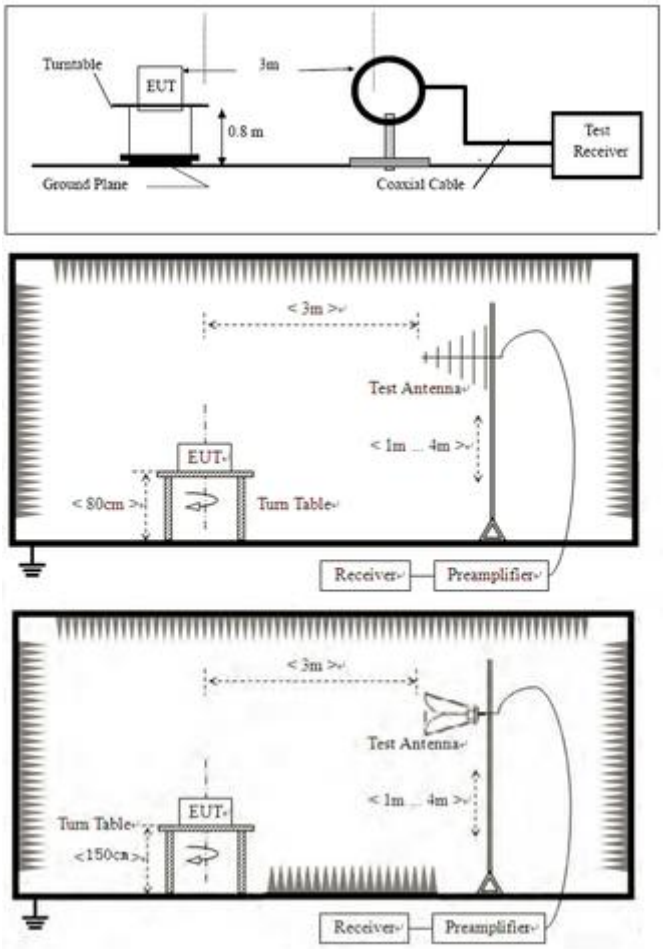
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

15.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

15.2 BLOCK DIAGRAM OF TEST SETUP



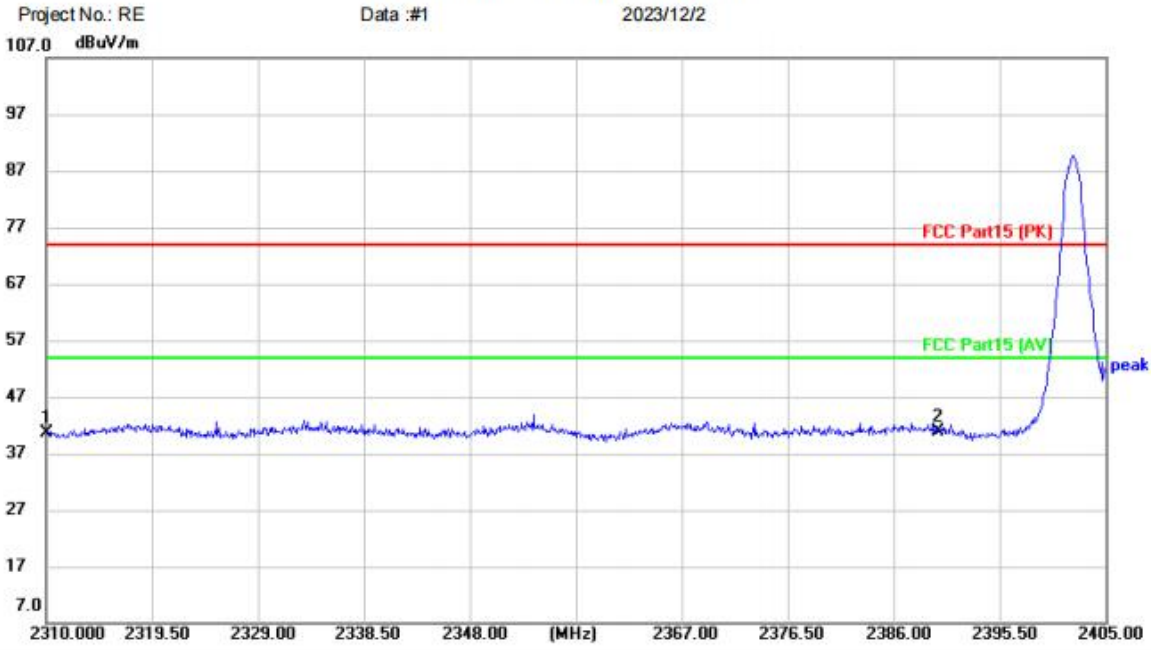
15.3 PROCEDURE

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. The antenna height 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.
e. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

15.4 TEST DATA

[TestMode: TX low channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2402
Note:

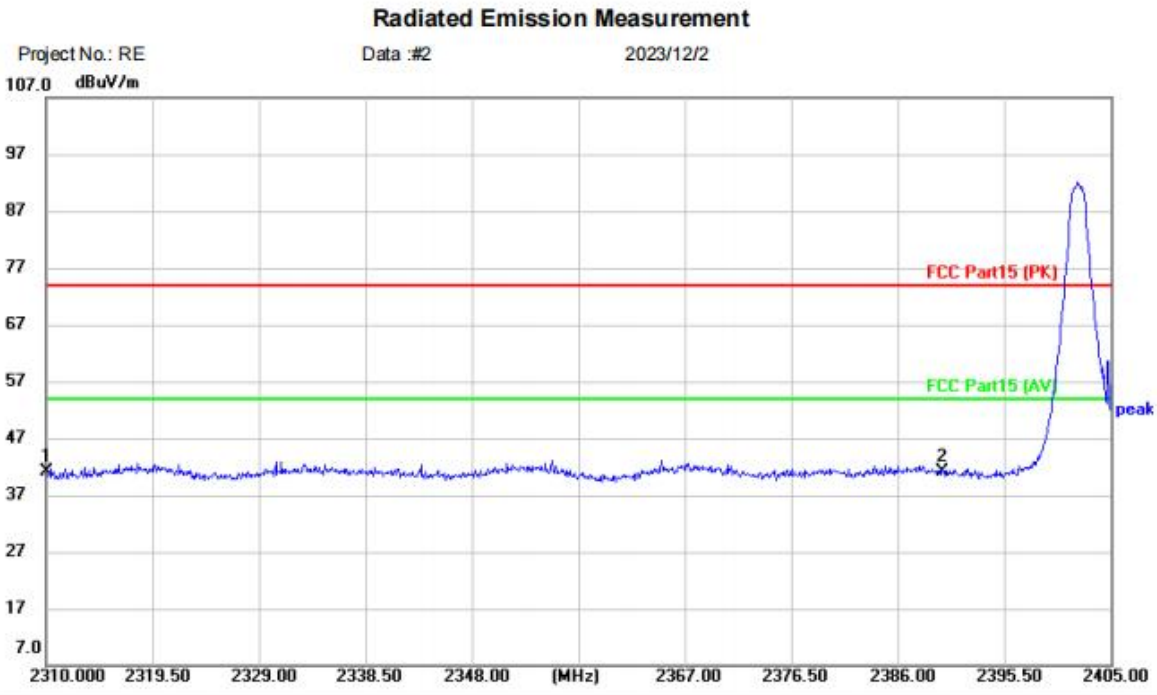
Polarization: *Horizontal*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	43.48	-2.89	40.59	74.00	-33.41	peak	
2	*	2390.000	43.69	-2.70	40.99	74.00	-33.01	peak	

Test Result: Pass

[TestMode:TX low channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2402
Note:

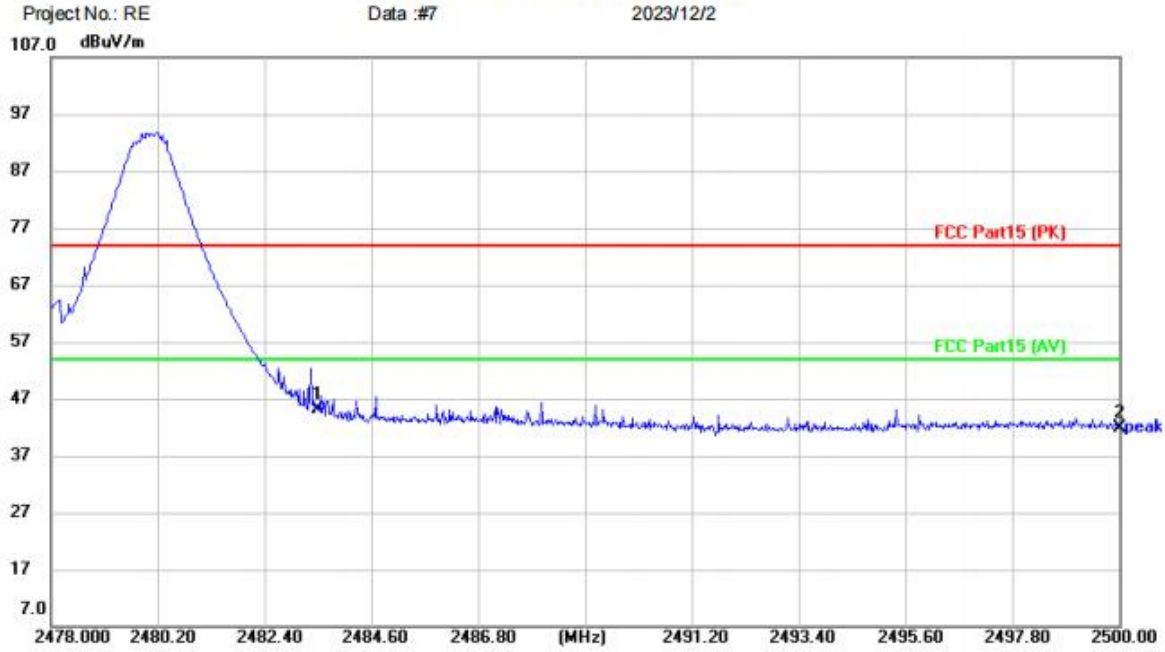
Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	43.93	-2.89	41.04	74.00	-32.96	peak	
2	*	2390.000	43.90	-2.70	41.20	74.00	-32.80	peak	

Test Result: Pass

[TestMode: TX High channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2480
Note:

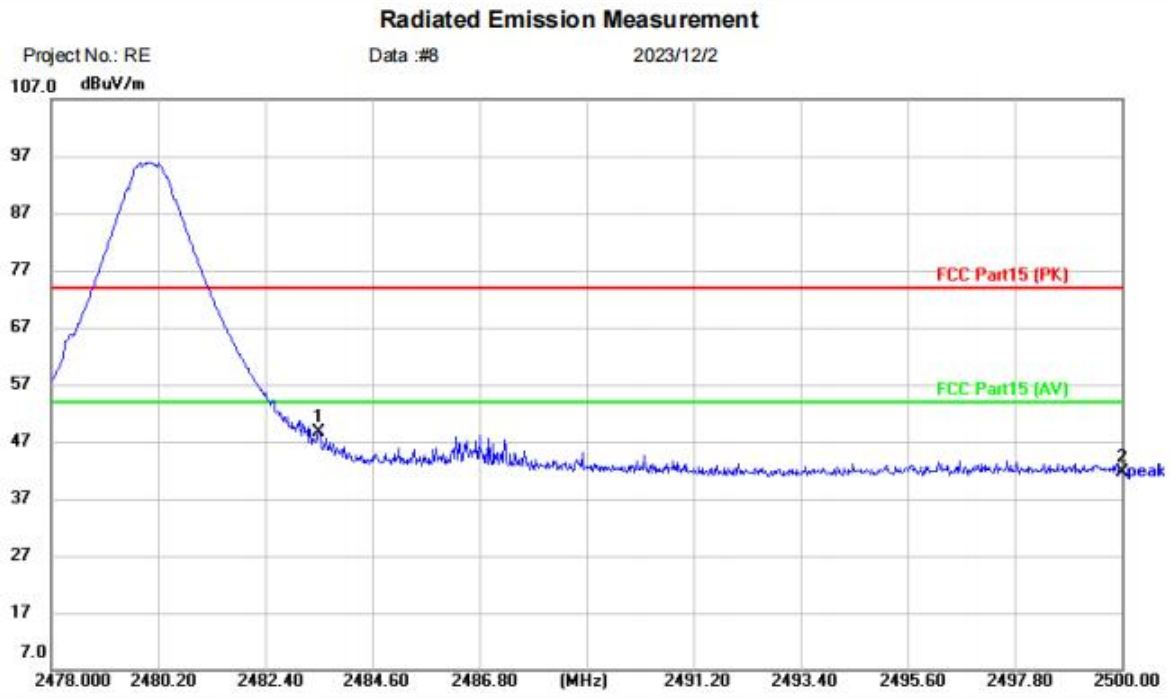
Polarization: *Horizontal*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	46.20	-1.03	45.17	74.00	-28.83	peak	
2		2500.000	43.04	-1.26	41.78	74.00	-32.22	peak	

Test Result: Pass

[TestMode:TX High channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: B91 FEM Dongle-V1
M/N: TLSP9518APDG80D-V1
Mode: BLE1M-TX-2480
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	49.65	-1.03	48.62	74.00	-25.38	peak	
2		2500.000	42.84	-1.26	41.58	74.00	-32.42	peak	

Test Result: Pass

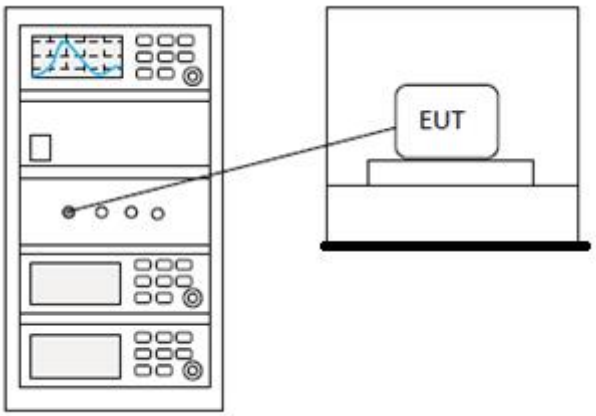
16 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

16.1 LIMITS

Limit:	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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

16.2 BLOCK DIAGRAM OF TEST SETUP



16.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

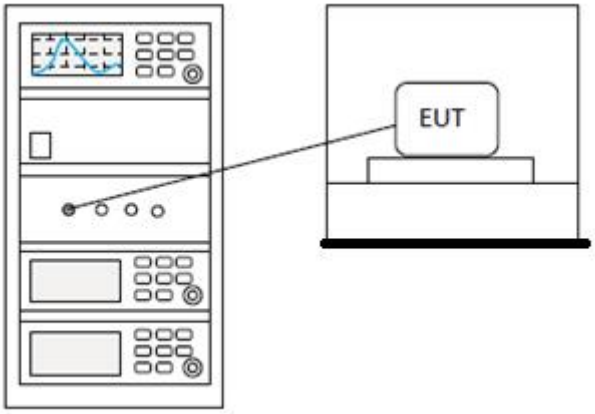
17 POWER SPECTRUM DENSITY

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.10.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

17.1 LIMITS

Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

17.2 BLOCK DIAGRAM OF TEST SETUP



17.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

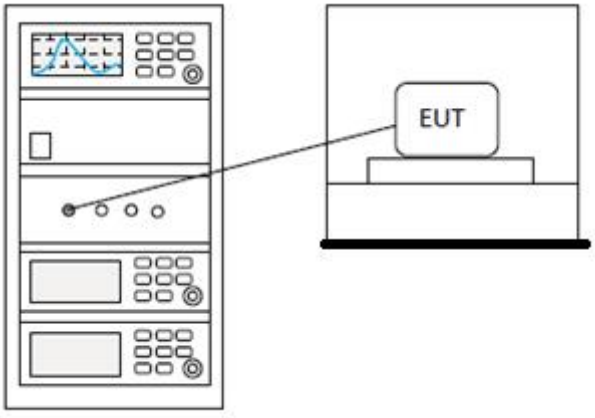
18 CONDUCTED PEAK OUTPUT POWER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

18.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

18.2 BLOCK DIAGRAM OF TEST SETUP



18.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

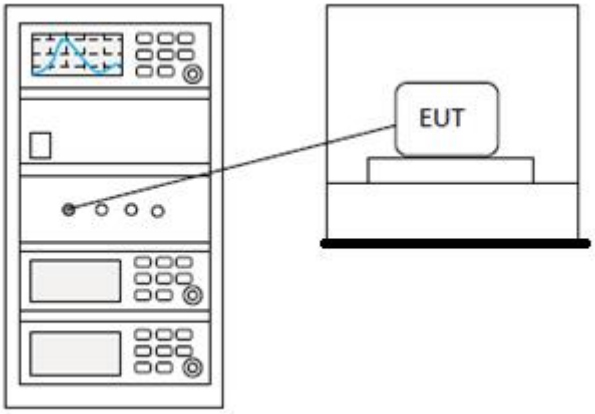
19 MINIMUM 6DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.8.1
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Charlie
Temperature	25℃
Humidity	60%

19.1 LIMITS

Limit:	≥500 kHz

19.2 BLOCK DIAGRAM OF TEST SETUP



19.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

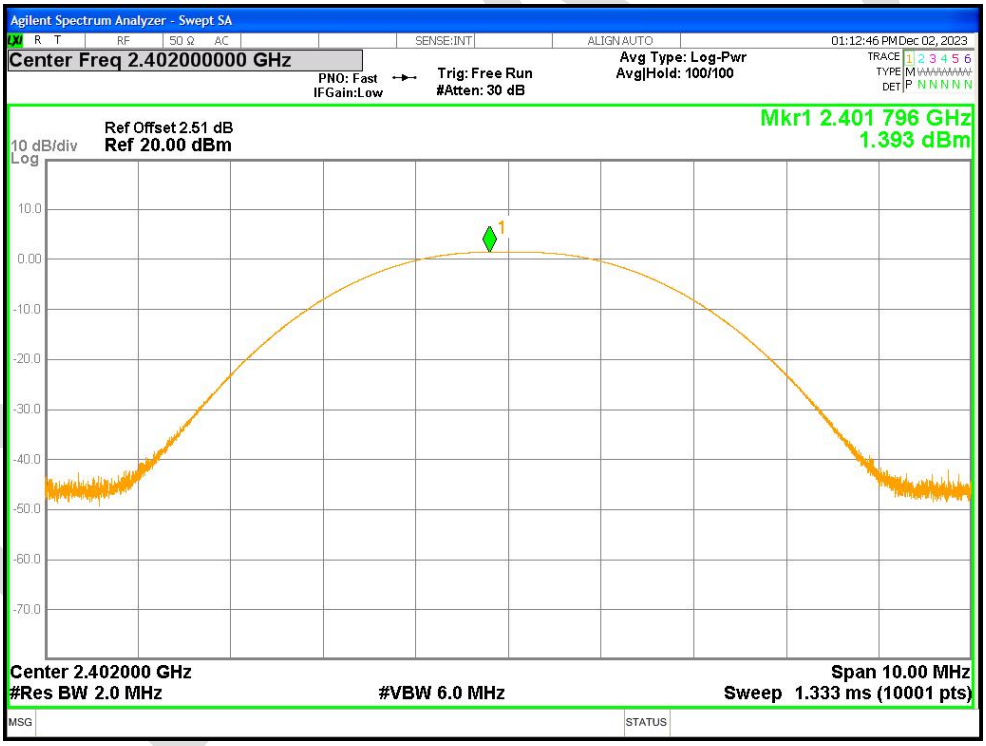
20 APPENDIX

Appendix1

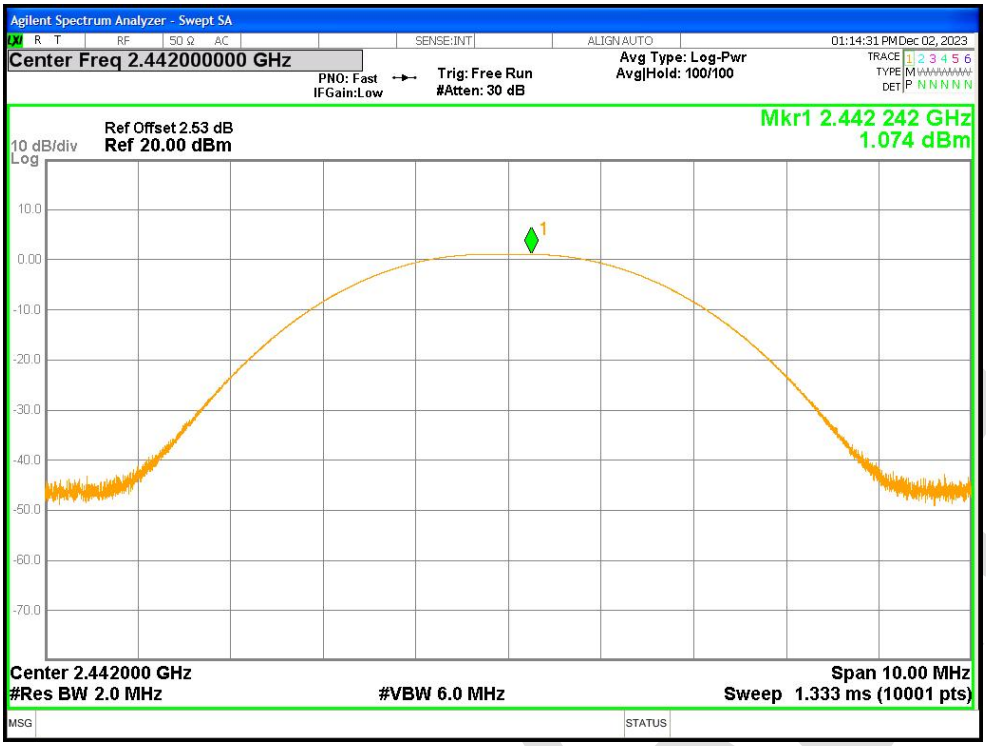
20.1 MAXIMUM CONDUCTED OUTPUT POWER

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	1.393	30	Pass
NVNT	BLE 1M	2442	Ant1	1.074	30	Pass
NVNT	BLE 1M	2480	Ant1	1.257	30	Pass
NVNT	BLE 2M	2402	Ant1	1.352	30	Pass
NVNT	BLE 2M	2442	Ant1	1.033	30	Pass
NVNT	BLE 2M	2480	Ant1	1.222	30	Pass

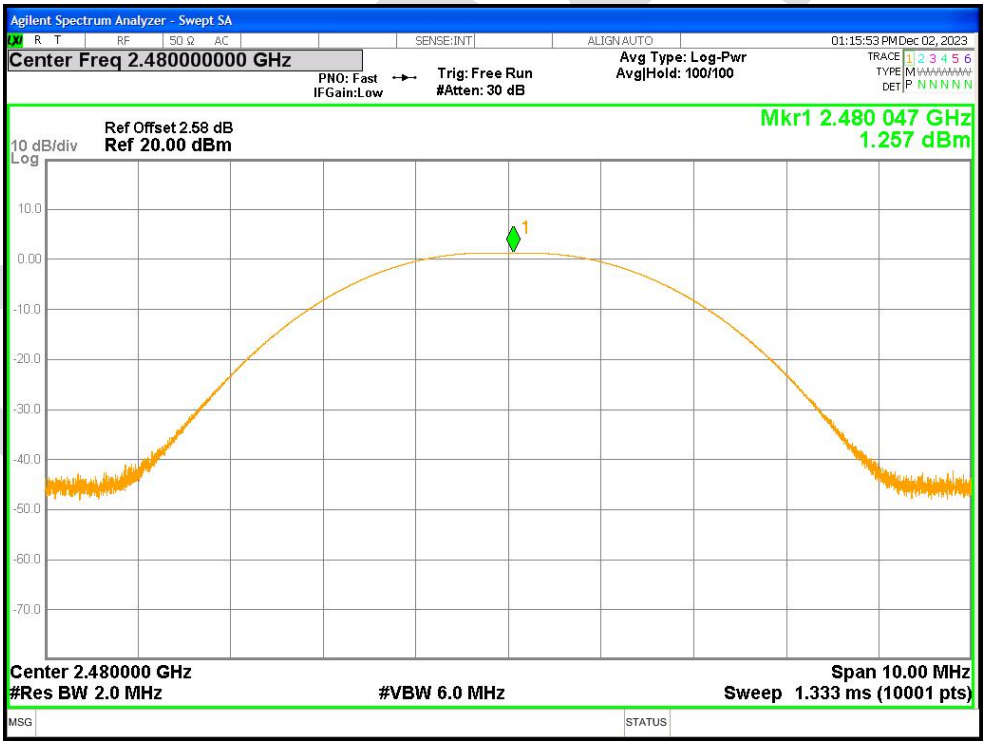
Power NVNT BLE 1M 2402MHz Ant1



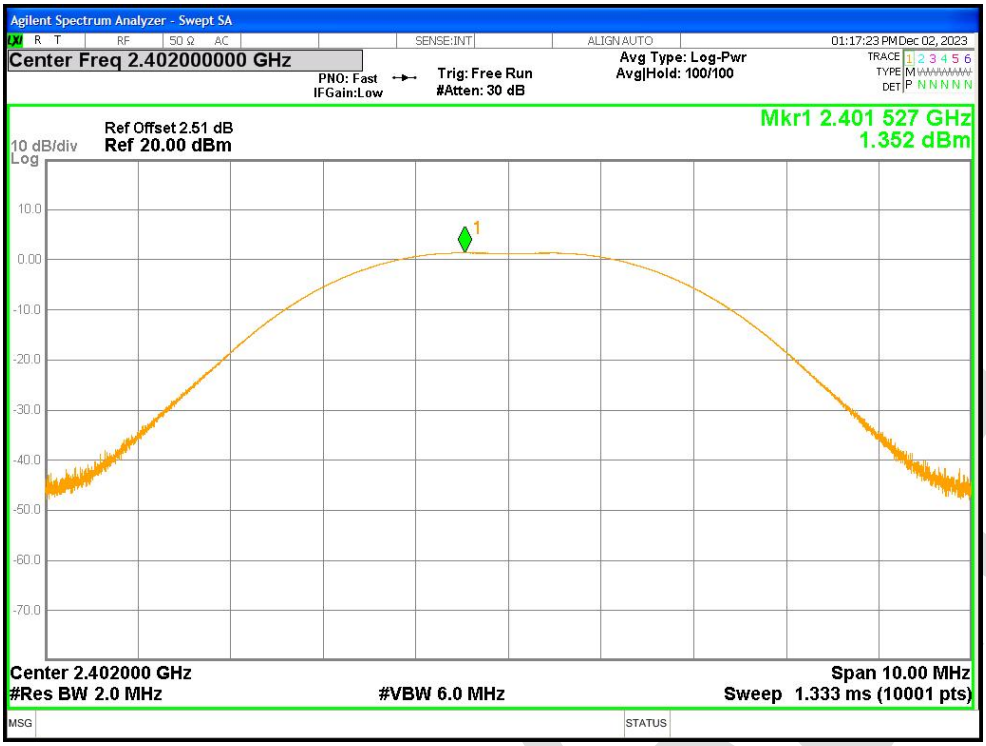
Power NVNT BLE 1M 2442MHz Ant1



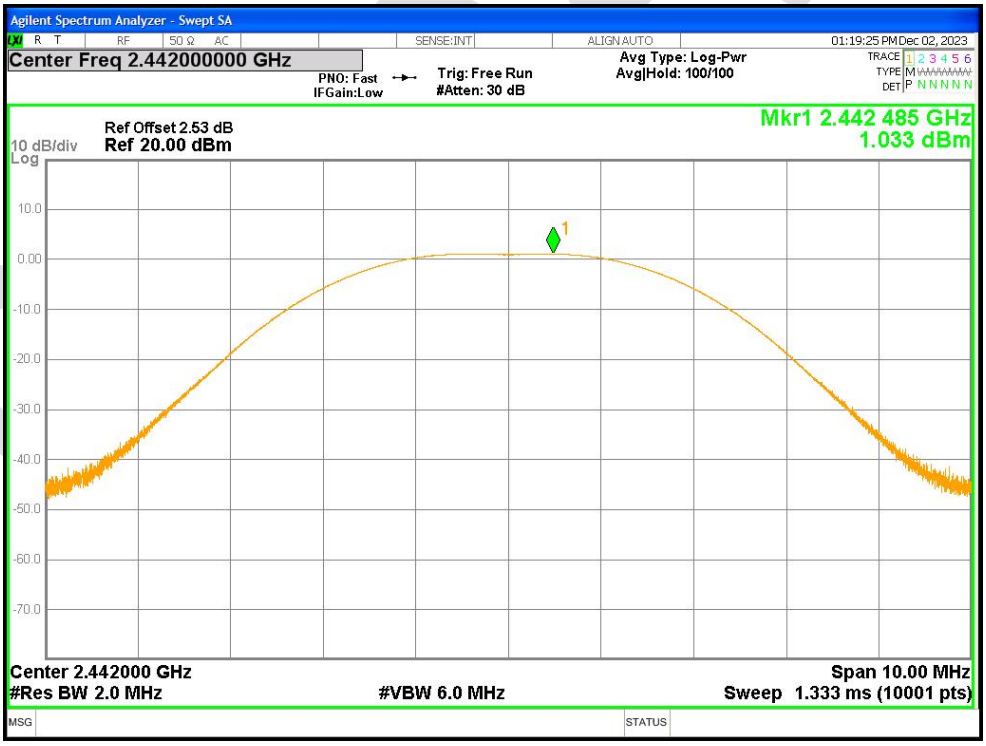
Power NVNT BLE 1M 2480MHz Ant1



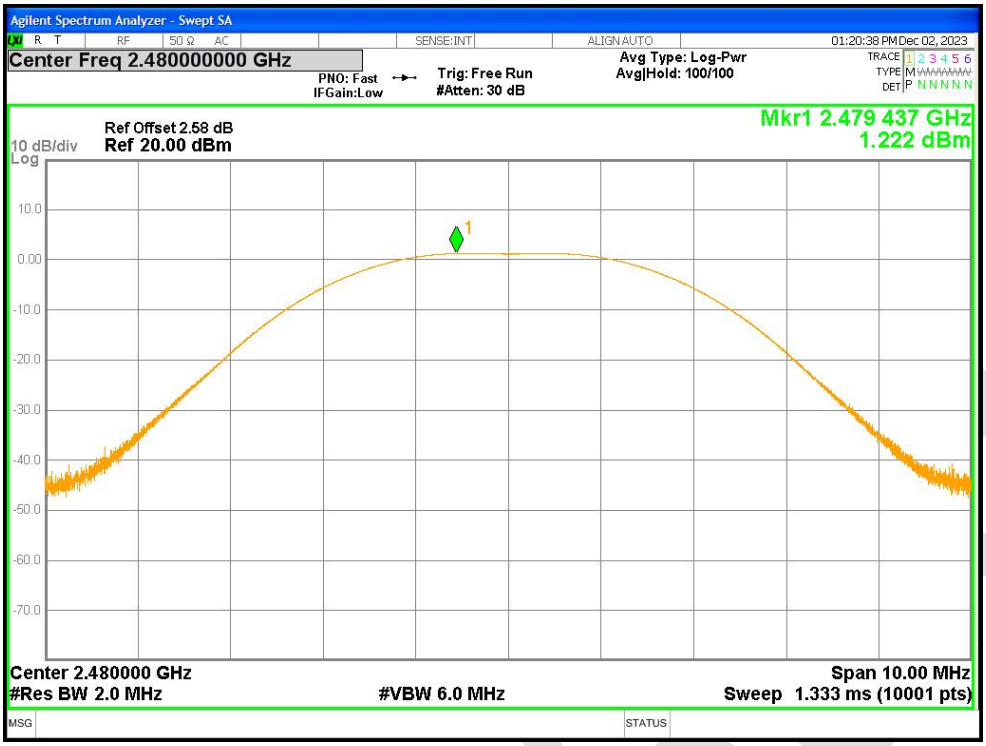
Power NVNT BLE 2M 2402MHz Ant1



Power NVNT BLE 2M 2442MHz Ant1



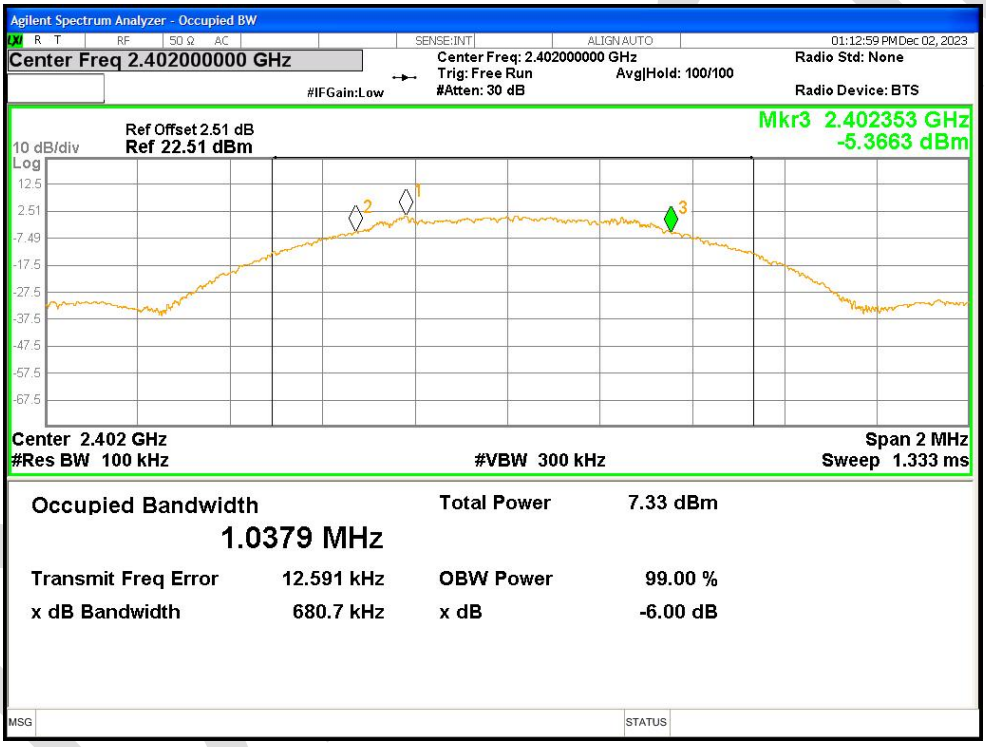
Power NVNT BLE 2M 2480MHz Ant1


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
01:20:38 PM Dec 02, 2023
Ref Offset 2.58 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.479 437 GHz
1.222 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)
MSG
STATUS

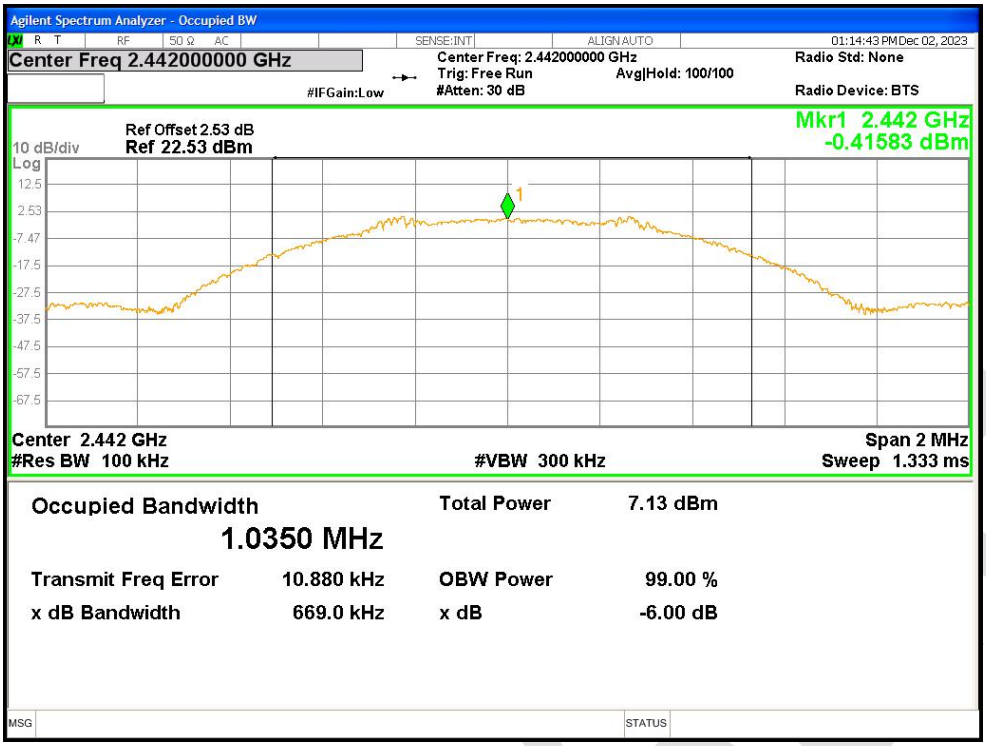
20.2 -6DB BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.681	0.5	Pass
NVNT	BLE 1M	2442	Ant1	0.669	0.5	Pass
NVNT	BLE 1M	2480	Ant1	0.682	0.5	Pass
NVNT	BLE 2M	2402	Ant1	1.345	0.5	Pass
NVNT	BLE 2M	2442	Ant1	1.303	0.5	Pass
NVNT	BLE 2M	2480	Ant1	1.37	0.5	Pass

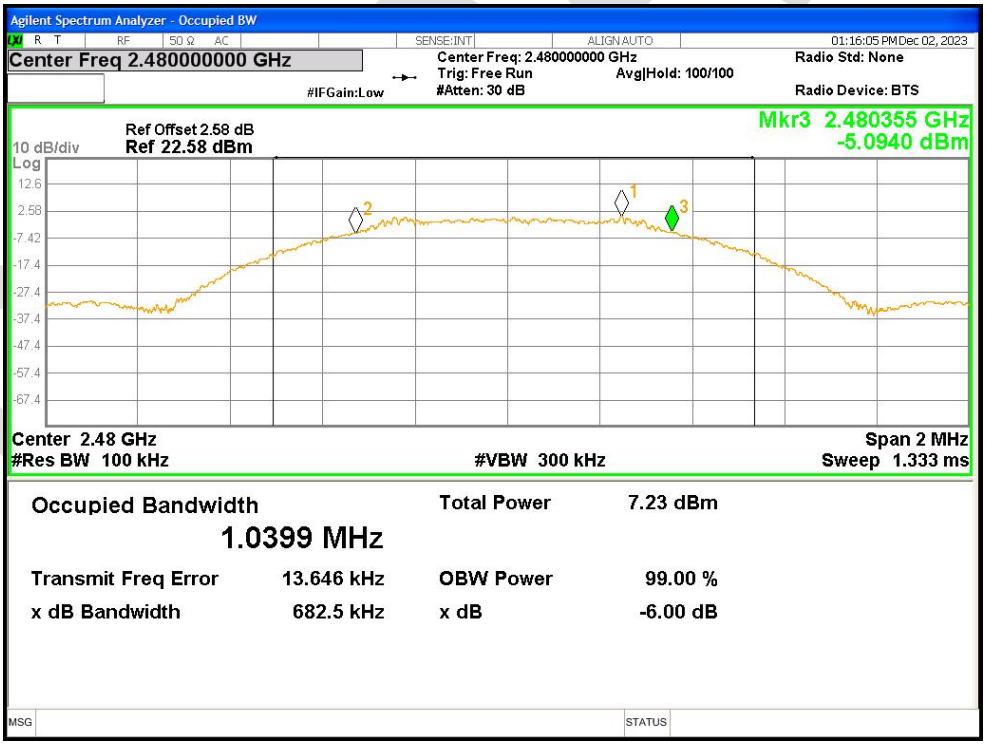
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



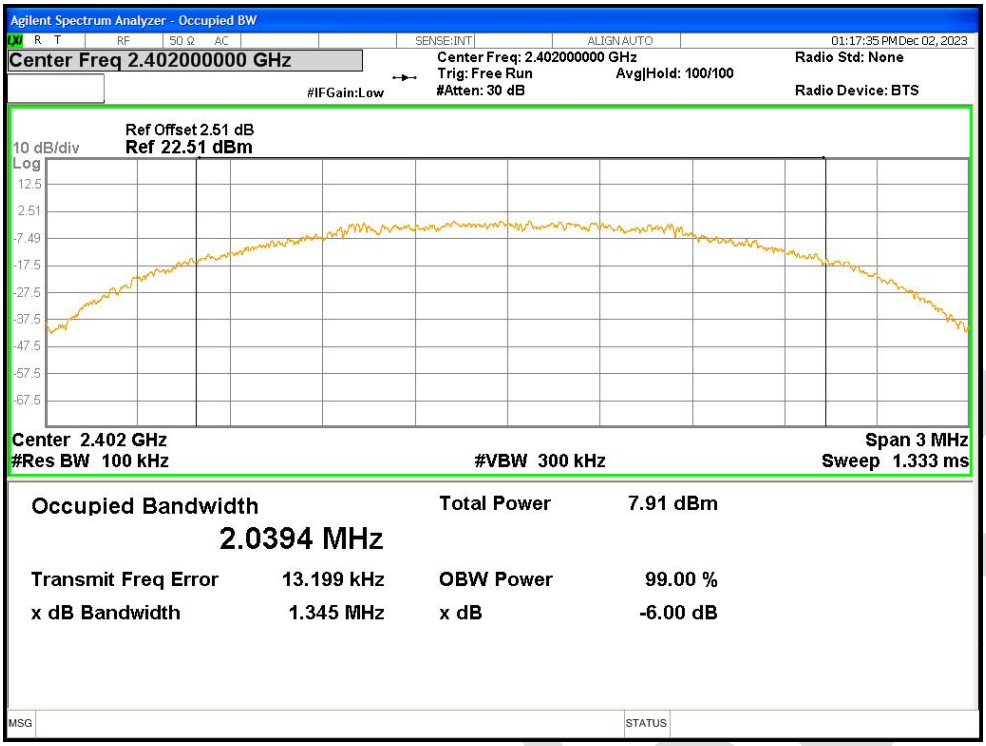
-6dB Bandwidth NVNT BLE 1M 2442MHz Ant1



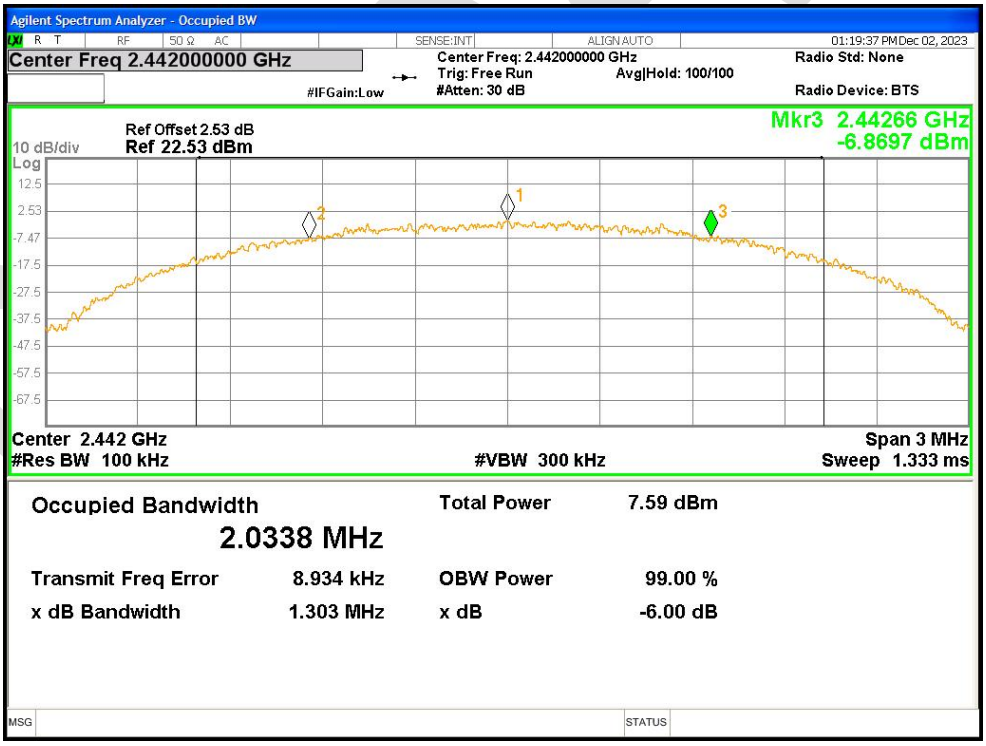
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



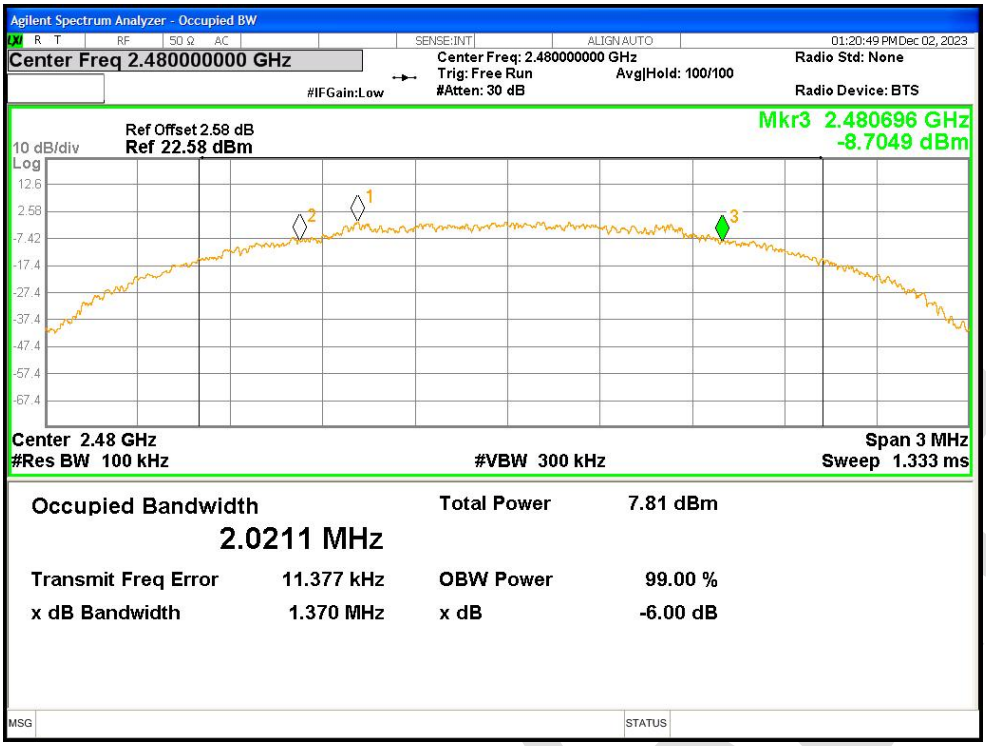
-6dB Bandwidth NVNT BLE 2M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 2M 2442MHz Ant1



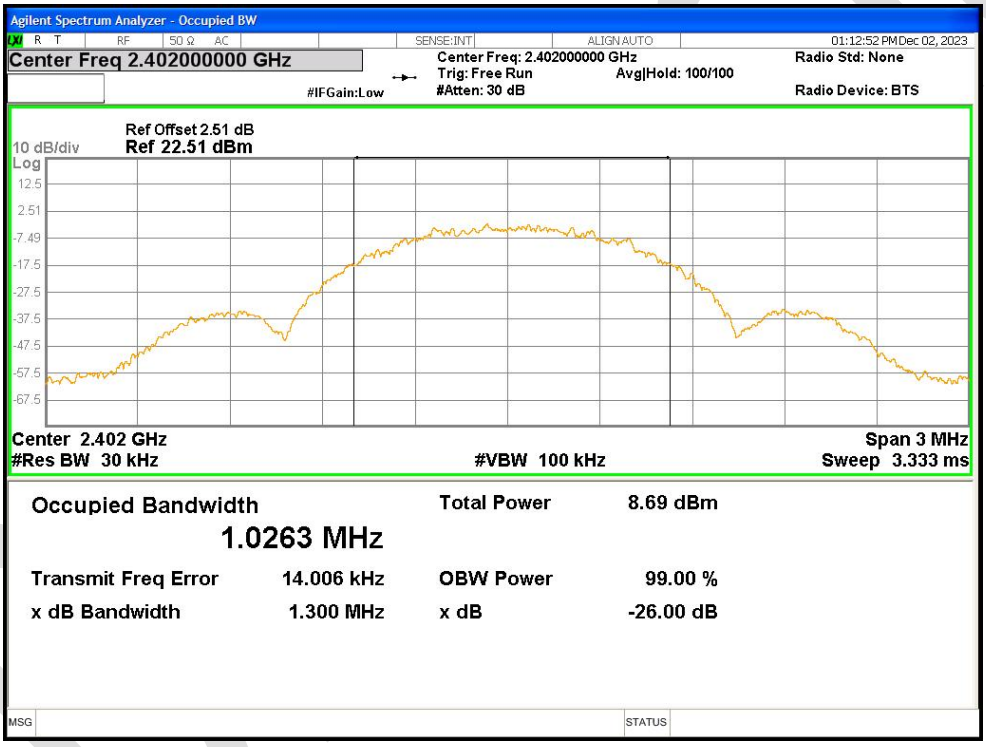
-6dB Bandwidth NVNT BLE 2M 2480MHz Ant1


Agilent Spectrum Analyzer - Occupied BW
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:20:49 PM Dec 02, 2023
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 2.58 dB
10 dB/div
Ref 22.58 dBm
Log
12.6
2.58
-7.42
-17.4
-27.4
-37.4
-47.4
-57.4
-67.4
Mkr3 2.480696 GHz
-8.7049 dBm
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1.333 ms
Occupied Bandwidth
2.0211 MHz
Total Power 7.81 dBm
Transmit Freq Error 11.377 kHz
OBW Power 99.00 %
x dB Bandwidth 1.370 MHz
x dB -6.00 dB
MSG
STATUS

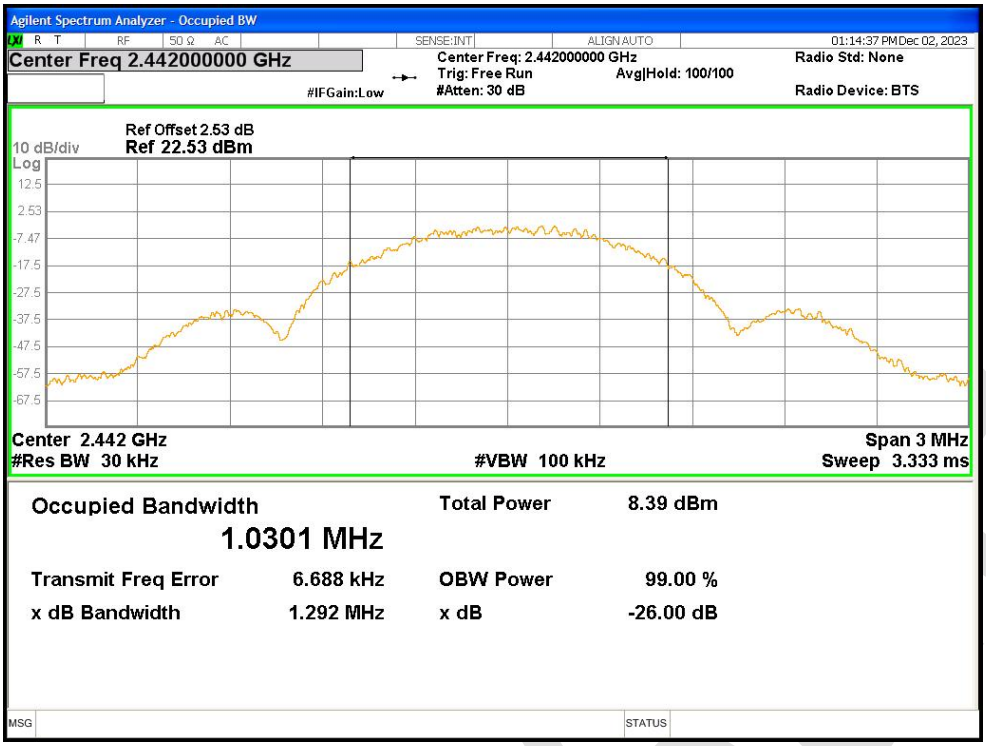
20.3 OCCUPIED CHANNEL BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE 1M	2402	Ant1	1.0263
NVNT	BLE 1M	2442	Ant1	1.0301
NVNT	BLE 1M	2480	Ant1	1.0195
NVNT	BLE 2M	2402	Ant1	2.0224
NVNT	BLE 2M	2442	Ant1	2.0323
NVNT	BLE 2M	2480	Ant1	2.0120

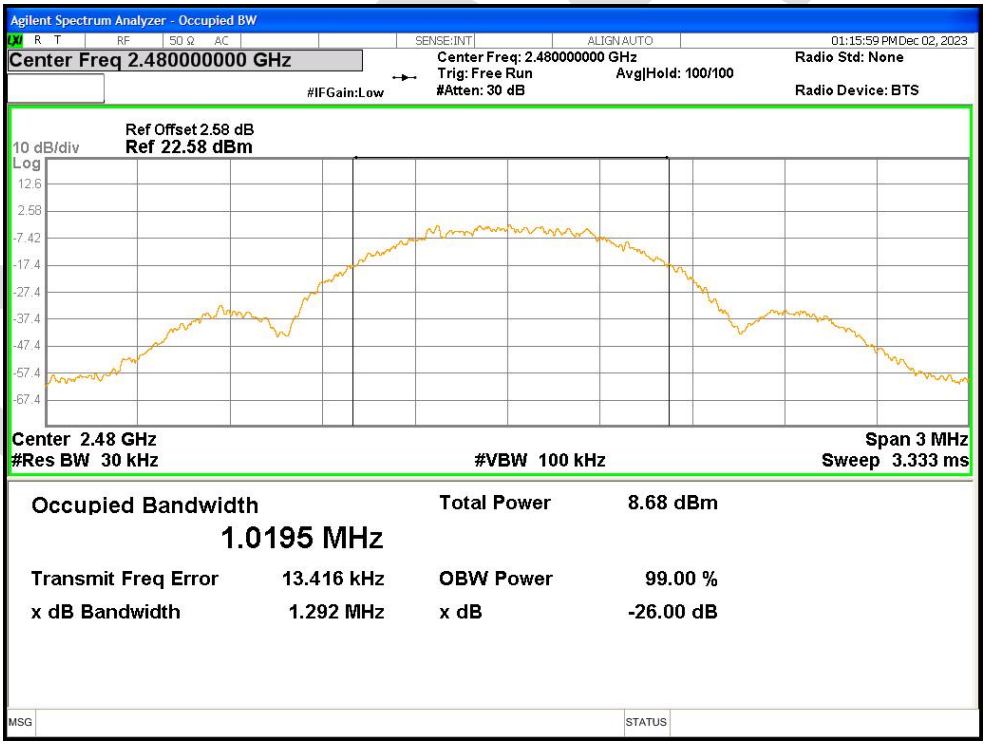
OBW NVNT BLE 1M 2402MHz Ant1



OBW NVNT BLE 1M 2442MHz Ant1



OBW NVNT BLE 1M 2480MHz Ant1



OBW NVNT BLE 2M 2402MHz Ant1