

Test Report

Product Name	Secured Network Extension Device
Model No.	FEV-211F, FEV-212F, FEV-211F-AM, FEV-212F-AM (Main model) (for detail model no. refer to section 1.1 EUT Description)
FCC ID	TVE-3317E142
Contains FCC ID	N7NEM75, N7NEM75S

Applicant	Fortinet, Inc.
Address	899 Kifer Road Sunnyvale California United States 94086

Date of Receipt	Jun. 14, 2022
Issued Date	Jun. 20, 2023
Report No.	2260415R-RFUSBLEV01-A
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

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Address	899 Kifer Road Sunnyvale California United States 94086
Manufacturer	Fortinet, Inc.
Model No.	FEV-211F, FEV-212F, FEV-211F-AM, FEV-212F-AM (Main model) (for detail model no. refer to section 1.1 EUT Description)
FCC ID	TVE-3317E142
Contains FCC ID	N7NEM75, N7NEM75S
EUT Rated Voltage	DC 7-36Vdc (from Car Charger) AC 100-240Vdc (from Power Adapter)
EUT Test Voltage	DC 36V (from Car Charger), AC 120V / 60Hz (from Power Adapter)
Trade Name	Fortinet
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

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Tested By : Ivan Chuang
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Approved By : Jack Hsu
(Senior Engineer / Jack Hsu)

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Appendix 1: EUT Test Photographs

Appendix 2: Product Photos-Please refer to the file: 2260415R-Product Photos

Revision History

Report No.	Version	Description	Issued Date
2260415R-RFUSBLEV01-A	V1.0	Initial issue of report.	Jun. 20, 2023

1. General Information

1.1. EUT Description

Product Name	Secured Network Extension Device
Trade Name	Fortinet
Model No. (Main model)	FEV-211F, FEV-212F FEV-211F-AM, FEV-212F-AM
Model No. (Series model)	FortiExtenderVehicle 211Fxxxxxxxxx FORTIEXTENDERVEHICLE-211Fxxxxxxxxx FEV-211Fxxxxxxxxx FortiExtenderVehicle 212Fxxxxxxxxx FORTIEXTENDERVEHICLE-212Fxxxxxxxxx FEV-212Fxxxxxxxxx FortiExtenderVehicle 211F-AMxxxxxxxxx FORTIEXTENDERVEHICLE-211F-AMxxxxxxxxx FEV-211F-AMxxxxxxxxx FortiExtenderVehicle 212F-AMxxxxxxxxx FORTIEXTENDERVEHICLE-212F-AMxxxxxxxxx FEV-212F-AMxxxxxxxxx (where “x” can be used “A-Z”, or “0-9”, or “-“, or blank for software purposes or marketing purposes only)
FCC ID	TVE-3317E142
Contains FCC ID	N7NEM75, N7NEM75S
Frequency Range	2402 - 2480 MHz
Channel Number	40CH
Type of Modulation	GFSK(1 Mbps) / (2 Mbps)
Channel Control	Auto
Car Charger	MFR: HUAI YANG CO., LTD M/N: FEVCBL-2M3-C Internal M/N: HWR-SH-20230116-01
Power Adapter	MFR: APD, M/N: WA-36W12R Input: 100-240V~50-60Hz, 0.9A Output: 12.0V=3.0A, 36.0W Cable Out: Non-shielded, 1.5m

Note: The different models name are for the market segment.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ADVANCED WIRELESS & ANTENNA INC.	A8EEE-000003	Dipole	2.0 dBi for 2.4 GHz (BLE)
2	ADVANCED WIRELESS & ANTENNA INC.	A8EEE-000002 (Main)	Dipole	3.5 dBi for 2.4 GHz (WLAN) 5.5 dBi for 5GHz (WLAN)
		A8EEE-000002 (Aux)		3.5 dBi for 2.4 GHz (WLAN) 5.5 dBi for 5GHz (WLAN)
3	Master Wave Technology Co., Ltd.	98619PRSX018 (Main)	Dipole	3.19 dBi for 2.4 GHz (WLAN) 5.85 dBi for UNII-1, 2A (WLAN) 5.73 dBi for UNII-2C (WLAN) 5.03 dBi for UNII-3 (WLAN)
		98619PRSX018 (Aux)		3.19 dBi for 2.4 GHz (WLAN) 5.85 dBi for UNII-1, 2A (WLAN) 5.73 dBi for UNII-2C (WLAN) 5.03 dBi for UNII-3 (WLAN)
4	SENAO	MA1505.AK.008 (5 in 1, cable 5M)	PIFA	1.99 dBi for WCDMA Band 2 2.64 dBi for WCDMA Band 4 0.86 dBi for WCDMA Band 5 1.99 dBi for LTE Band 2 2.64 dBi for LTE Band 4 0.86 dBi for LTE Band 5 1.23 dBi for LTE Band 7 -2.09 dBi for LTE Band 12 -1.98 dBi for LTE Band 13 -0.04 dBi for LTE Band 14 0.86 dBi for LTE Band 26 -0.91 dBi for LTE Band 30 1.23 dBi for LTE Band 41 -0.31 dBi for LTE Band 48 2.64 dBi for LTE Band 66

5	SENAO	MA1505.AK.008 (5 in 1, cable 0.3M)	PIFA	3.98 dBi for WCDMA Band 2 5.22 dBi for WCDMA Band 4 1.83 dBi for WCDMA Band 5 3.98 dBi for LTE Band 2 5.22 dBi for LTE Band 4 1.83 dBi for LTE Band 5 4.85 dBi for LTE Band 7 1.50 dBi for LTE Band 12 3.03 dBi for LTE Band 13 3.03 dBi for LTE Band 14 1.83 dBi for LTE Band 26 0.84 dBi for LTE Band 30 4.85 dBi for LTE Band 41 -0.07 dBi for LTE Band 48 5.22 dBi for LTE Band 66
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Note: The above EUT information is declared by the manufacturer.

Center Frequency of Each Channel:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	01	2404	02	2406	03	2408
04	2410	05	2412	06	2414	07	2416
08	2418	09	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

Note:

1. The EUT is a Secured Network Extension Device with built-in Bluetooth V5.2, Wi-Fi and WWAN transceiver, this report is for Bluetooth V5.2.
2. The different of each model is shown as below:

Model No.	Description
FEV-211F Series	Bluetooth + Wi-Fi + LTE module x1 (EM7565) Contains LTE module's FCC ID (N7NEM75)
FEV-212F Series	Bluetooth + Wi-Fi + LTE module x2 (EM7565) Contains LTE module's FCC ID (N7NEM75)
FEV-211F-AM Series	Bluetooth + Wi-Fi + LTE module x1 (EM7511) Contains LTE module's FCC ID (N7NEM75S)
FEV-212F-AM Series	Bluetooth + Wi-Fi + LTE module x2 (EM7511) Contains LTE module's FCC ID (N7NEM75S)

3. The identification of test sample is FEV-212F-AM with A8EEE-000003, A8EEE-000002 and MA1505.AK.008 (5 in 1, cable 0.3M) antennas for Bluetooth and co-location (EM7511) testing.
4. The identification of test sample is FEV-212F with A8EEE-000003, A8EEE-000002 and MA1505.AK.008 (5 in 1, cable 0.3M) antennas for co-location (EM7565) testing.
5. The radiation measurements are performed in X, Y and Z axis positioning, and only the worst case is shown in the report.
6. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
7. After evaluation and investigation, the worst case for Power Adapter and Car Charger is Power Adapter, so it was used to perform all testing and record in the test report.
8. The spectrum plot against conducted item only shows the worst case.
9. These tests were conducted on a sample for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.

Test Mode	Transmit - 1Mbps-BLE
	Transmit - 2Mbps-BLE
	Transmit - Co-location (EM7511, WCDMA_B5 + LTE_B5 + BLE + Wi-Fi)
	Transmit - Co-location (EM7511, WCDMA_B2 + LTE_B2 + BLE + Wi-Fi)
	Transmit - Co-location (EM7511, WCDMA_B4 + LTE_B30 + BLE + Wi-Fi)
	Transmit - Co-location (EM7511, LTE_B26 + LTE_B48 + BLE + Wi-Fi)
	Transmit - Co-location (EM7565, WCDMA_B5 + LTE_B26 + BLE + Wi-Fi)
	Transmit - Co-location (EM7565, WCDMA_B2 + LTE_B2 + BLE + Wi-Fi)
	Transmit - Co-location (EM7565, WCDMA_B4 + LTE_B7 + BLE + Wi-Fi)
	Transmit - Co-location (EM7565, LTE_B26 + LTE_B48 + BLE + Wi-Fi)

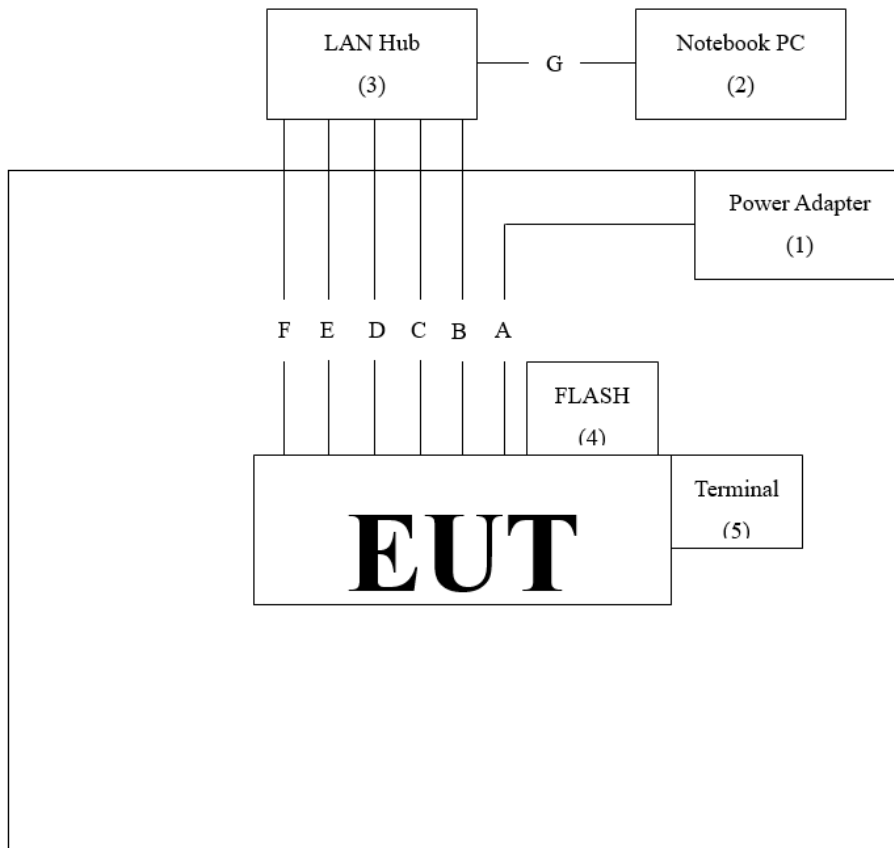
1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Power Adapter	APD	WA-36W12R	N/A	N/A
2 Notebook PC	DELL	Latitude 5501	4H94P13	N/A
3 LAN Hub	TP-LINK	TL-SG108	2161597000480	Non-shielded, 1.5m
4 FLASH	Kingston	DT100G3/8GB	N/A	N/A
5 Terminal	N/A	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
A Power Cable	Non-Shielded, 1.5m
B LAN Cable	Non-Shielded, 3m
C LAN Cable	Non-Shielded, 2m
D LAN Cable </td <td>Non-Shielded, 2m</td>	Non-Shielded, 2m
E LAN Cable	Non-Shielded, 2m
F LAN Cable	Non-Shielded, 2m
G LAN Cable	Non-Shielded, 2m

1.3. Configuration of Tested System



1.4. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.3.
- (2) Execute software “QSPR V5.0-00186” on the EUT.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press “OK” to start the continuous Transmit.
- (5) Verify that the EUT works properly.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	24.4 °C
	Humidity (%RH)	10~90 %	47.2 %
Radiated Emission	Temperature (°C)	10~40 °C	24.7 °C
	Humidity (%RH)	10~90 %	58.2 %
Conductive	Temperature (°C)	10~40 °C	22°C
	Humidity (%RH)	10~90 %	55%

USA : FCC Registration Number: TW0033

Canada : CAB Identifier Number: TW3023 / Company Number: 26930

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd

Address : No. 5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan

Performed Location : No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan,
R.O.C.

Phone Number : +886-3-275-7255

Fax Number : +886-3-327-8031

Email Address : info.tw@dekra.comWebsite : <http://www.dekra.com.tw>

1.6. List of Test Equipment

For Conduction Measurements / HY-SR01

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
V	EMI Test Receiver	R&S	ESR7	101601	2022.06.23	2023.06.22
V	Two-Line V-Network	R&S	ENV216	101306	2022.05.23	2023.05.22
V	Coaxial Cable	SUHNER	RG400_BNC	RF001	2021.09.08	2022.09.07

Note:

1. All equipment are calibrated every one year.
2. The test instruments marked with “V” are used to measure the final test results.
3. Test Software version: AUDIX e3 V9.

For Conducted Measurements / HY-SR02

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
V	Spectrum Analyzer	R&S	FSV30	103466	2021.12.27	2022.12.26
V	Power Meter	Anritsu	ML2496A	1739004& 1726078& 1726079	2022.05.06	2023.05.05

Note:

1. All equipment are calibrated every one year.
2. The test instruments marked with “V” are used to measure the final test results.
3. Test Software version: RF Conducted Test Tools R3 V3.0.1.19.

For Radiated measurements / HY-CB03

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
V	Loop Antenna	AMETEK	HLA6121	49611	2022.03.18 2023.02.21	2023.03.17 2024.02.20
V	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2021.08.11	2023.08.10
V	Horn Antenna	RF SPIN	DRH18-E	210508A18ES	2022.06.08	2023.06.07
V	Horn Antenna	RF SPIN	DRH18-E	210507A18ES	2023.05.11	2024.05.10
V	Horn Antenna	Com-Power	AH-840	101100	2021.10.04	2023.10.03
V	Pre-Amplifier	SGH	0301	20211007-10	2023.01.10	2024.01.09
V	Pre-Amplifier	SGH	PRAMP118	20200701	2023.01.10	2024.01.09
V	Pre-Amplifier	EMCI	EMC05820SE	980310	2023.01.10	2024.01.09
V	Pre-Amplifier	EMCI	EMC184045SE	980369	2023.01.10	2024.01.09
	Coaxial Cable	EMCI	EMC102-KM-KM-600	1160314		
	Coaxial Cable	EMCI	EMC102-KM-KM-7000	170242		
V	EMI Test Receiver	R&S	ESR3	102793	2022.12.05	2023.12.04
V	Spectrum Analyzer	R&S	FSV3044	101113	2023.02.04	2024.02.03
V	Coaxial Cable	SGH	SGH18	2021005-1	2023.01.10	2024.01.09
	Coaxial Cable	SGH	SGH18	202108-4		
	Coaxial Cable	SGH	HA800	GD20110223-1		
	Coaxial Cable	SGH	HA800	GD20110222-3		
V	Universal Radiocommunication tester	R&S	CMU200	113574	2022.06.06	2023.06.05
V	Wideband Radio Communication Tester	R&S	CMW500	157304	2023.03.06	2024.03.05
V	Radio communication analyzer	Anritsu	MT8820C	6201465467	2022.08.10	2023.08.09
V	Wideband Radio Communication Tester tester	Anritsu	MT8821C	6261849043	2023.01.11	2024.01.10

Note:

1. The test instruments marked with “V” are used to measure the final test results.
2. Test Software version: AUDIX e3 V9.

1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document.

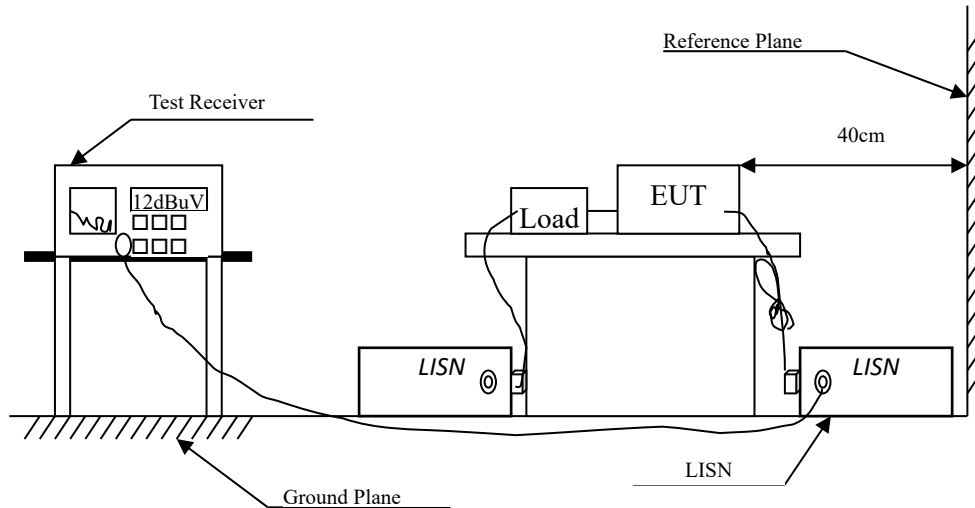
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	Uncertainty	
Conducted Emission	±3.42 dB	
Peak Power Output	±0.89 dB	
Radiated Emission	Under 1GHz ±4.42 dB	Above 1GHz ±4.28 dB
RF Antenna Conducted Test	±2.06 dB	
Band Edge	Under 1GHz ±4.42 dB	Above 1GHz ±4.28 dB
6dB Bandwidth	±1544.74 Hz	
Power Density	±2.06 dB	
Duty Cycle	±2.31 ms	

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

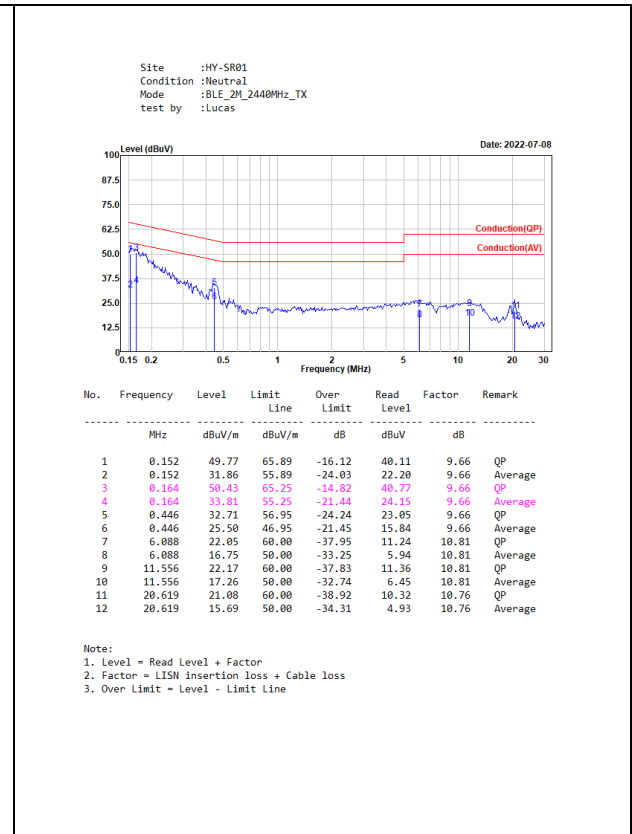
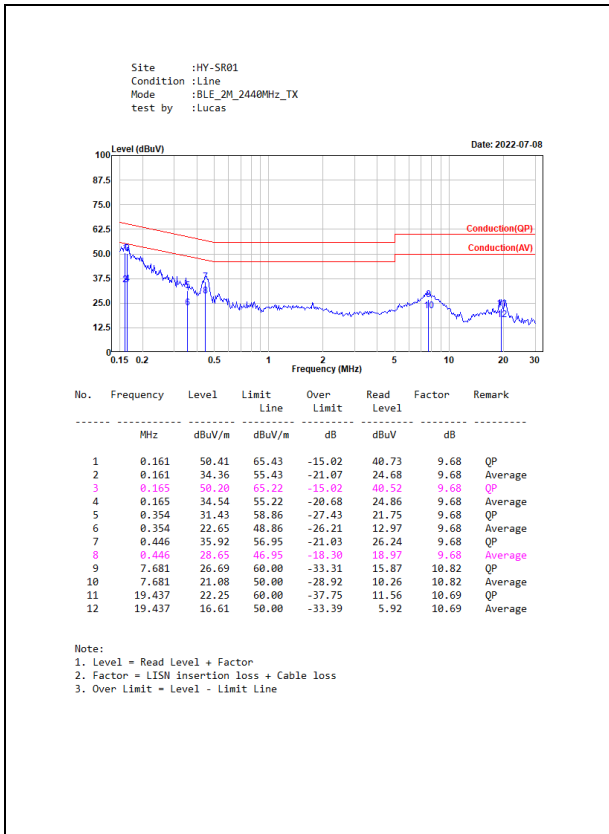
The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

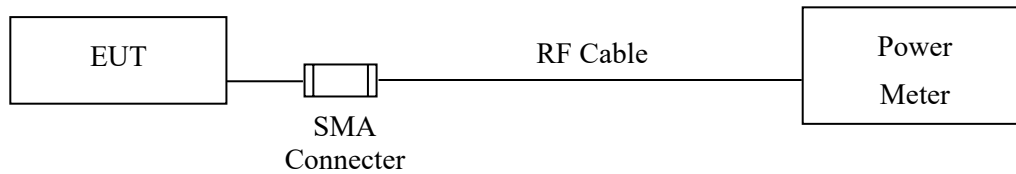
The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

2.4. Test Result of Conducted Emission



3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

The EUT was tested according to C63.10:2013 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using C63.10:2013 Section 11.9.1.3 PKPM1 Peak power meter method.

3.4. Test Result of Peak Power Output

Product : Secured Network Extension Device
Test Item : Peak Power Output
Test Mode : Transmit - 1Mbps-BLE
Test Date : 2022/07/04

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402	5.72	1 Watt= 30 dBm	Pass
Channel 19	2440	5.67	1 Watt= 30 dBm	Pass
Channel 39	2480	5.59	1 Watt= 30 dBm	Pass

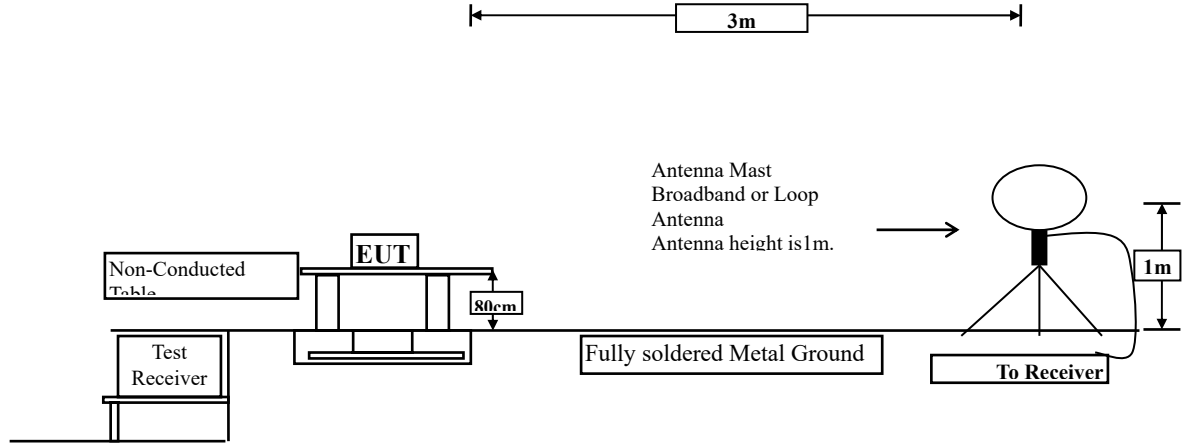
Product : Secured Network Extension Device
Test Item : Peak Power Output
Test Mode : Transmit - 2Mbps-BLE
Test Date : 2022/07/04

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402	5.75	1 Watt= 30 dBm	Pass
Channel 19	2440	5.66	1 Watt= 30 dBm	Pass
Channel 38	2478	5.39	1 Watt= 30 dBm	Pass
Channel 39	2480	1.41	1 Watt= 30 dBm	Pass

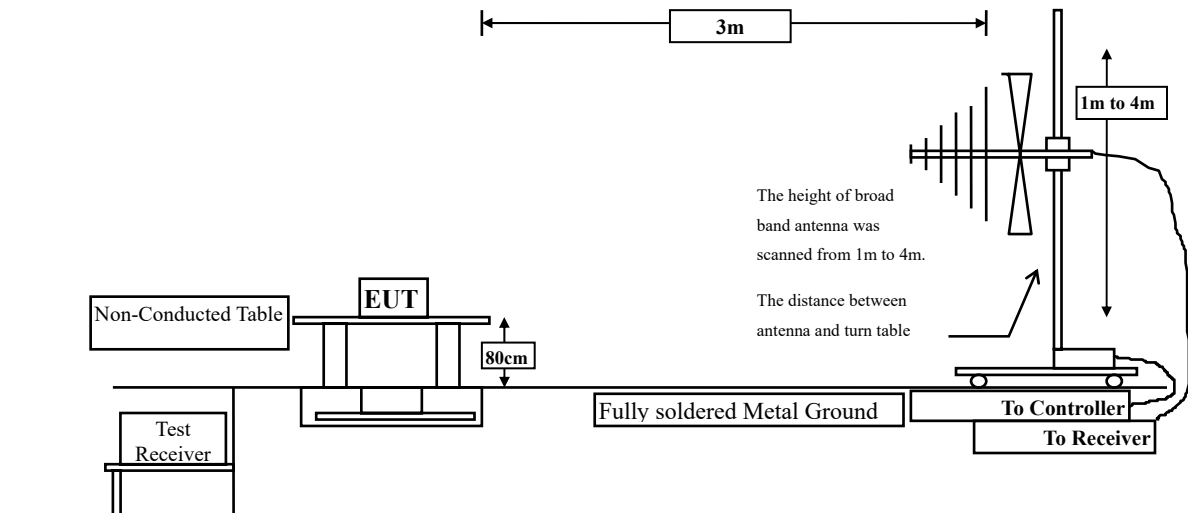
4. Radiated Emission

4.1. Test Setup

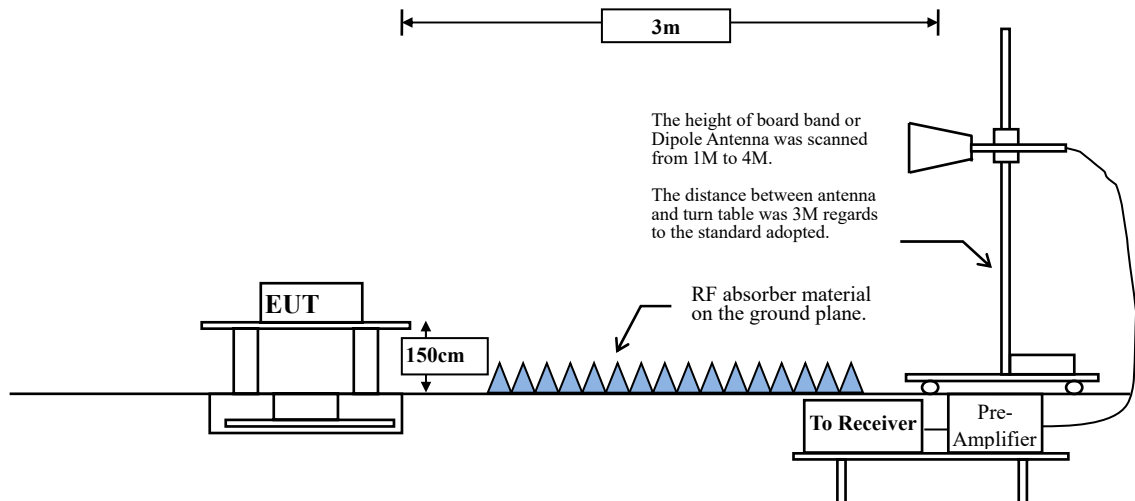
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

➤ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to C63.10:2013 Section 11.12.1 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure.

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to C63.10 Section 11.12.2.5 Average measurement procedure.

RBW = 1MHz.

VBW = 10Hz, when duty cycle $\geq 98\%$

$VBW \geq 1/T$, when duty cycle $< 98\%$

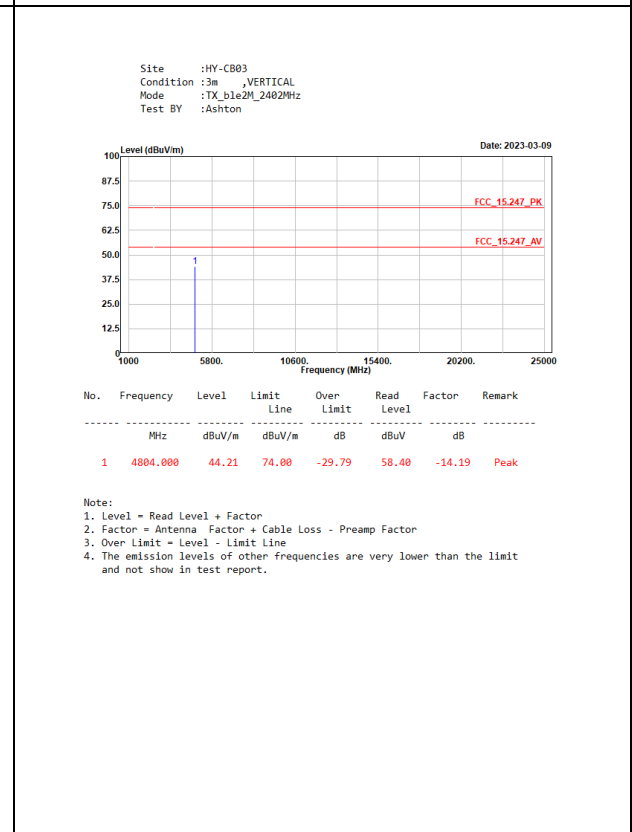
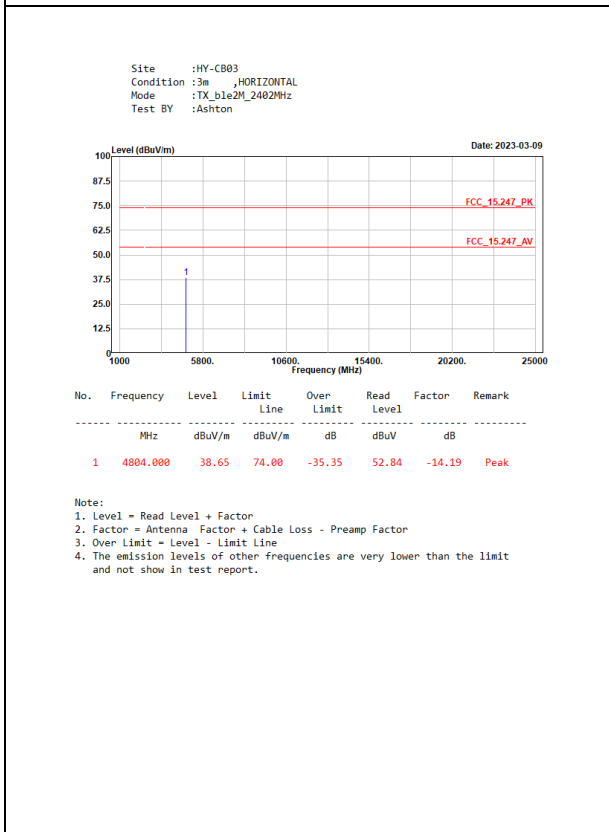
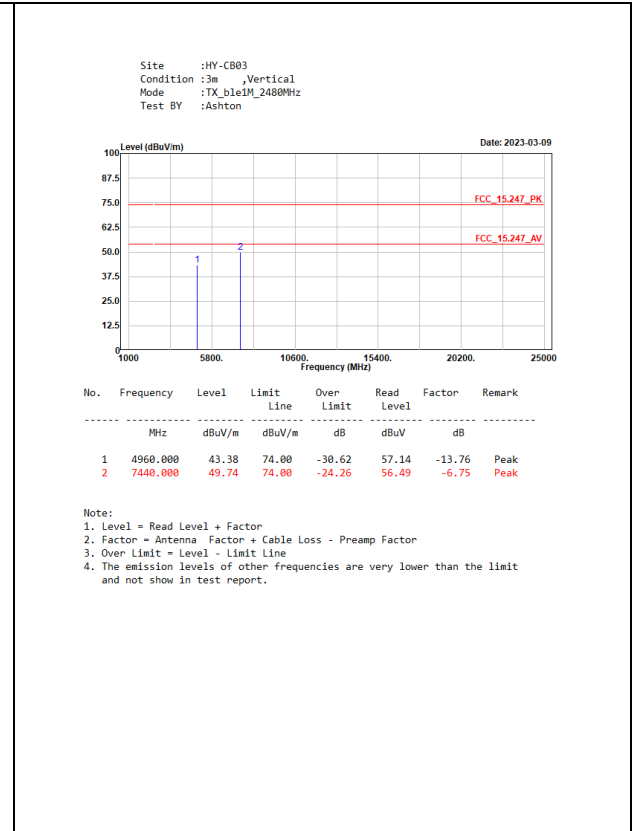
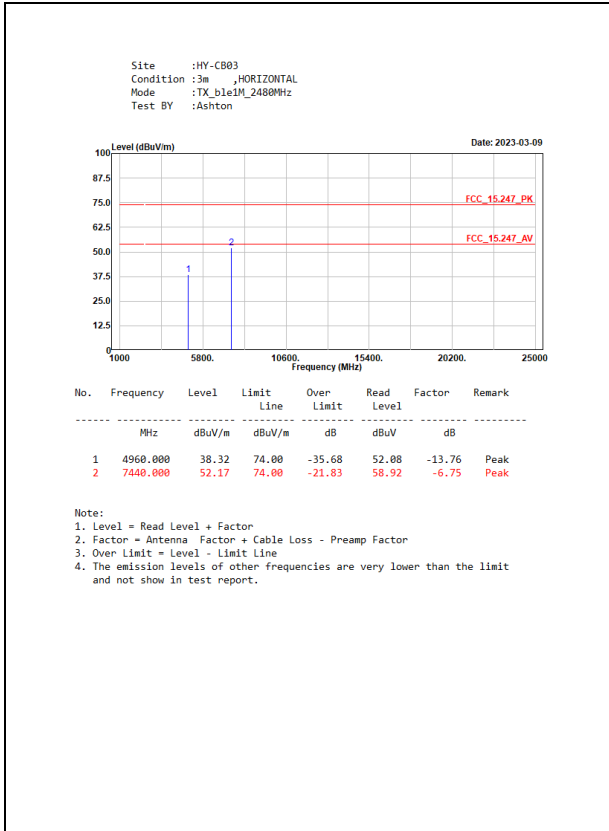
(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

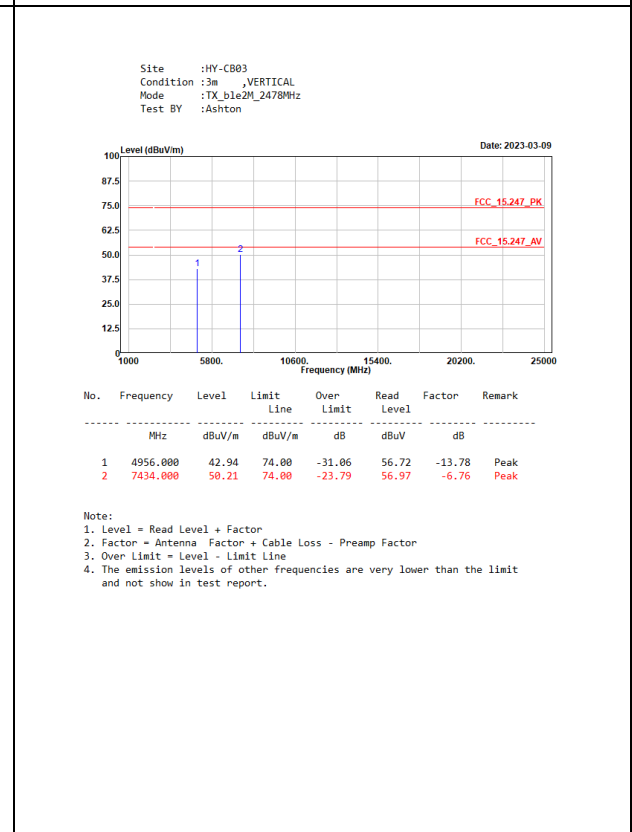
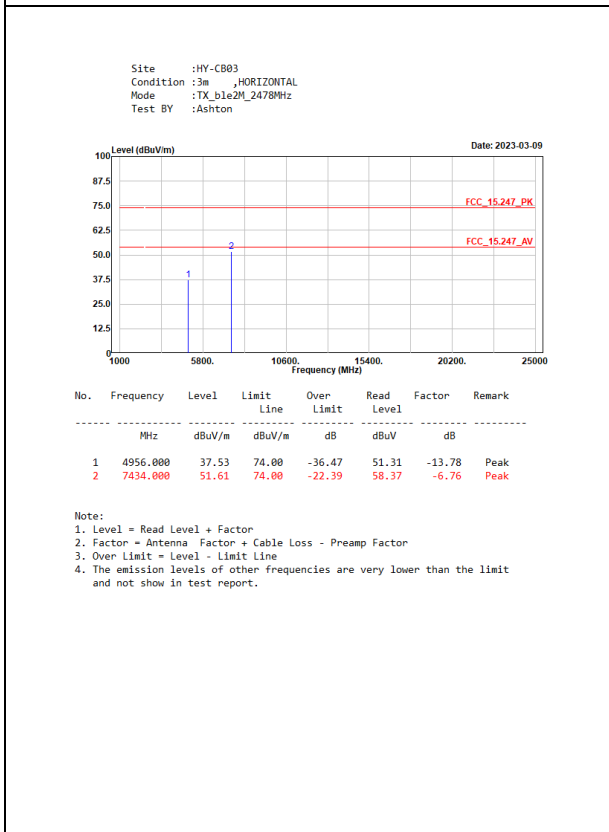
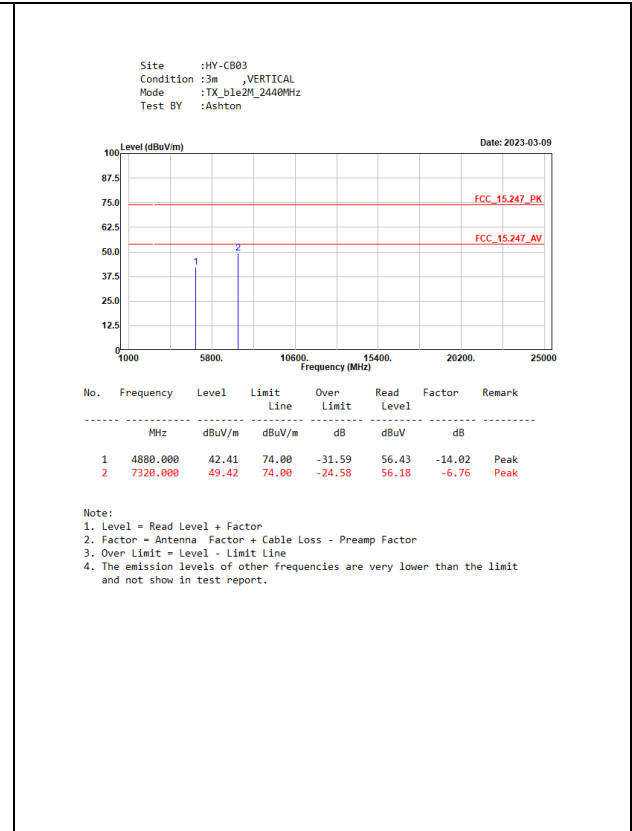
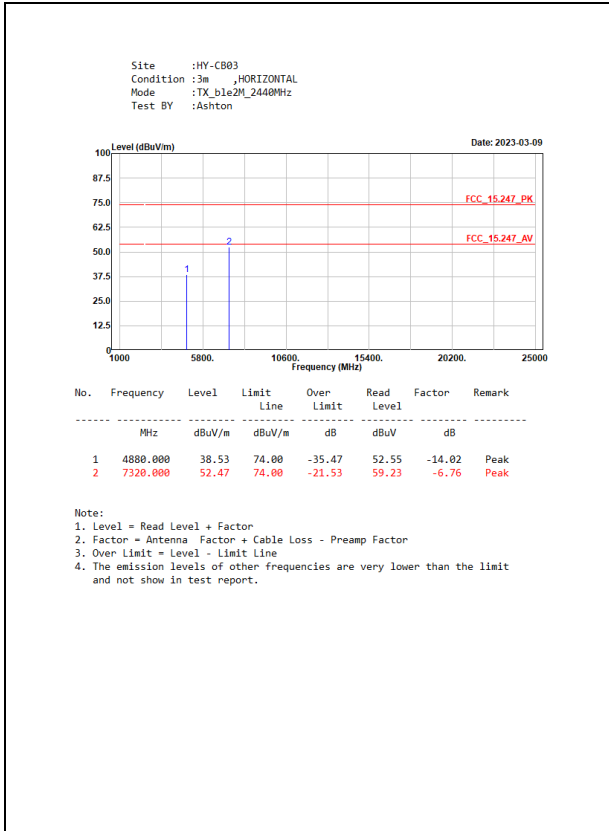
2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE (1M)	84.52	2.1300	469	500
BLE (2M)	57.18	1.0750	930	1000

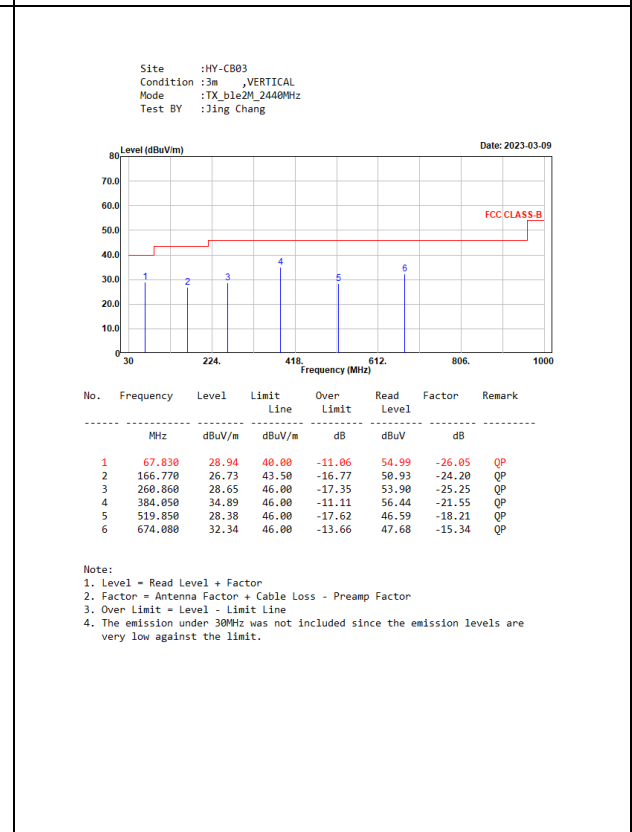
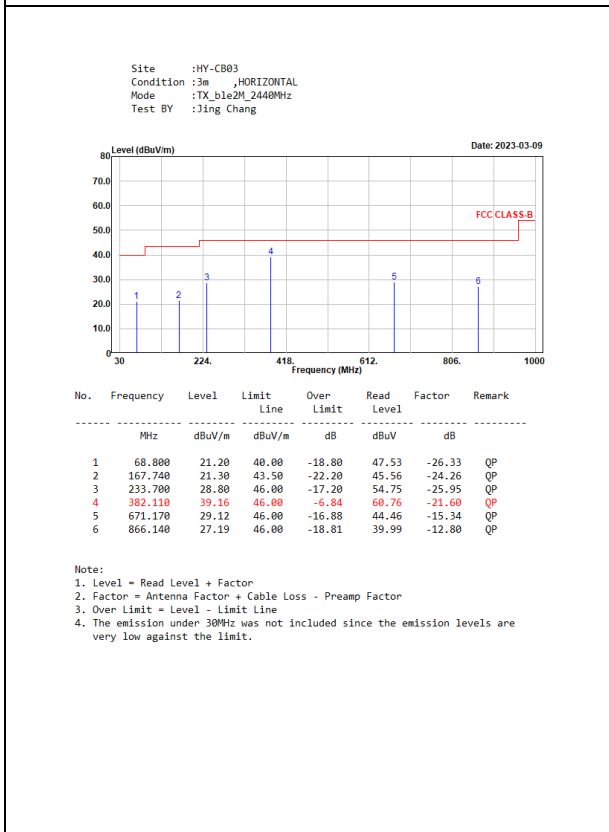
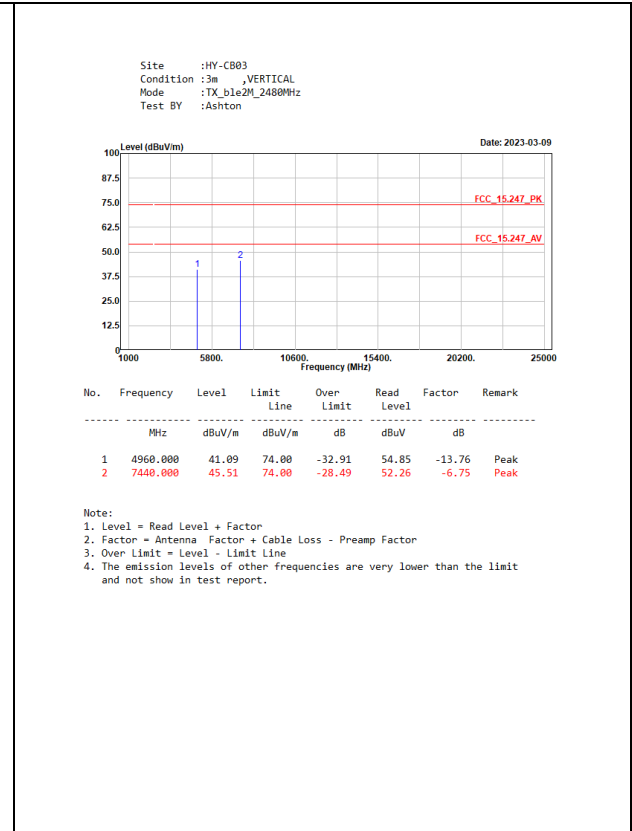
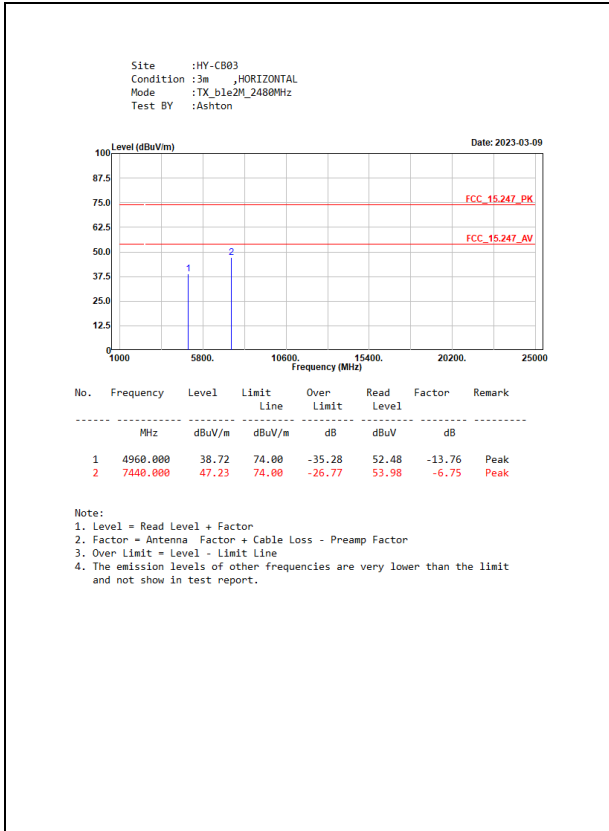
Note: Duty Cycle Refer to Section 9.

4.4. Test Result of Radiated Emission

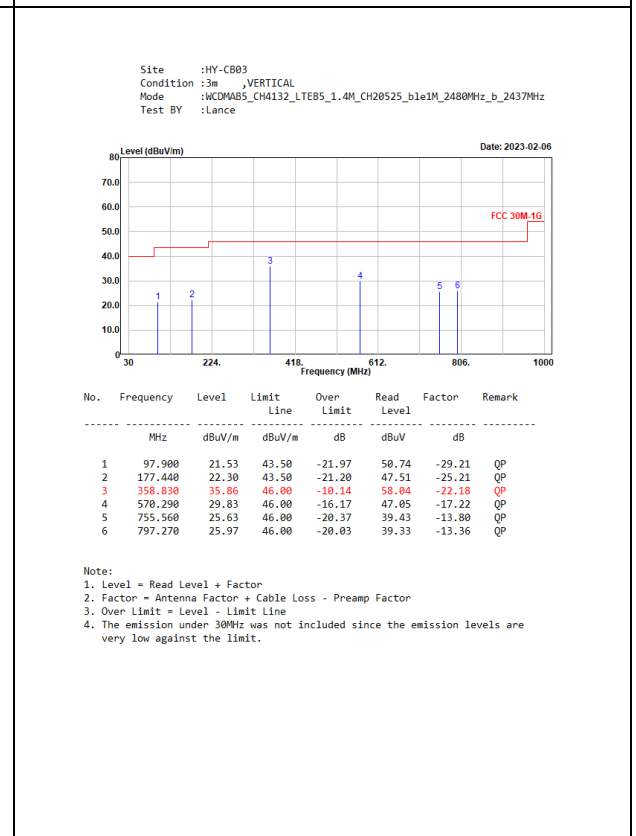
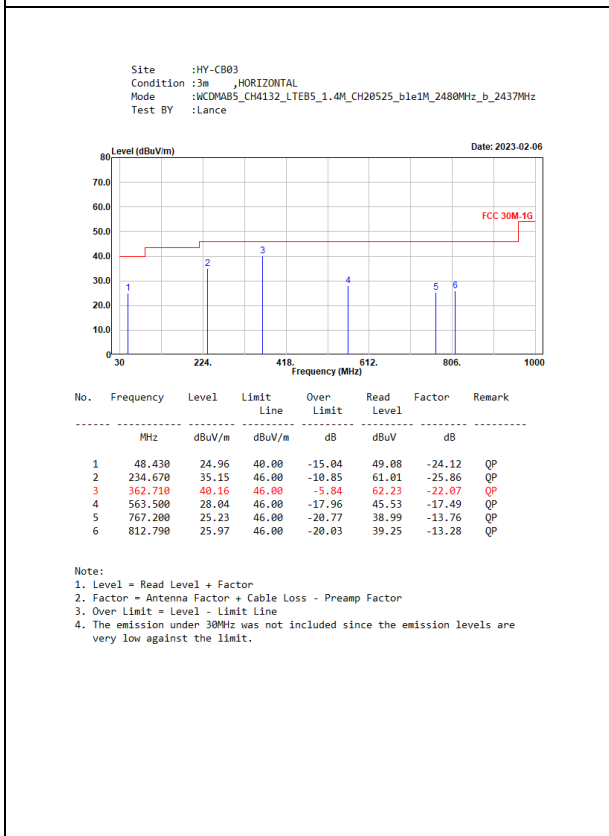
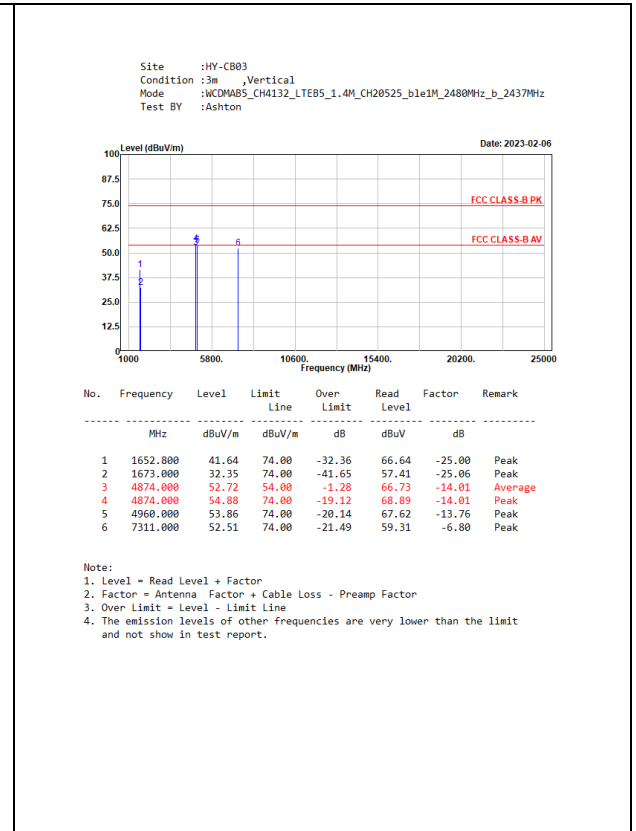
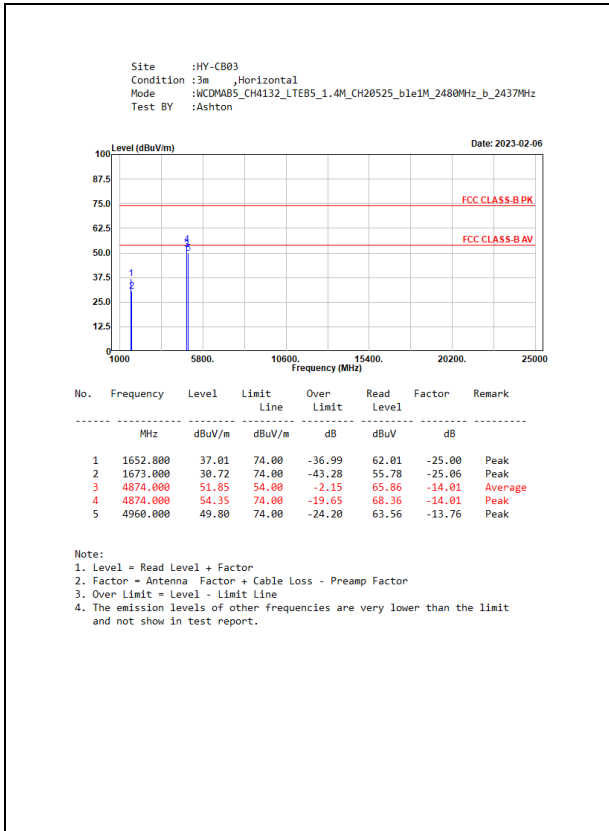
<p>Site :HY-CB03 Condition :3m ,HORIZONTAL Mode :TX_ble1M_2402MHz Test BY :Ashton</p> <p>Date: 2023-03-09</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Frequency MHz</th> <th>Level dBuV/m</th> <th>Limit Line dBuV/m</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4884.000</td> <td>38.96</td> <td>74.00</td> <td>-35.04</td> <td>53.15</td> <td>-14.19</td> <td>Peak</td> </tr> </tbody> </table> <p>Note: 1. Level = Read Level + Factor 2. Factor = Antenna Factor + Cable Loss - Preamp Factor 3. Over Limit = Level - Limit Line 4. The emission levels of other frequencies are very lower than the limit and not show in test report.</p>	No.	Frequency MHz	Level dBuV/m	Limit Line dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark	1	4884.000	38.96	74.00	-35.04	53.15	-14.19	Peak	<p>Site :HY-CB03 Condition :3m ,VERTICAL Mode :TX_ble1M_2402MHz Test BY :Ashton</p> <p>Date: 2023-03-09</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Frequency MHz</th> <th>Level dBuV/m</th> <th>Limit Line dBuV/m</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4884.000</td> <td>44.62</td> <td>74.00</td> <td>-29.38</td> <td>58.81</td> <td>-14.19</td> <td>Peak</td> </tr> </tbody> </table> <p>Note: 1. Level = Read Level + Factor 2. Factor = Antenna Factor + Cable Loss - Preamp Factor 3. Over Limit = Level - Limit Line 4. The emission levels of other frequencies are very lower than the limit and not show in test report.</p>	No.	Frequency MHz	Level dBuV/m	Limit Line dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark	1	4884.000	44.62	74.00	-29.38	58.81	-14.19	Peak																
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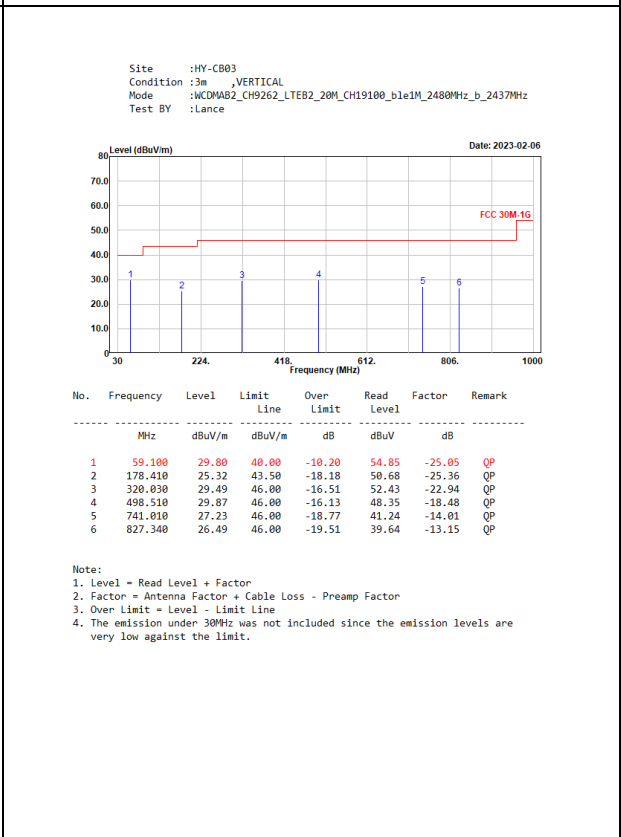
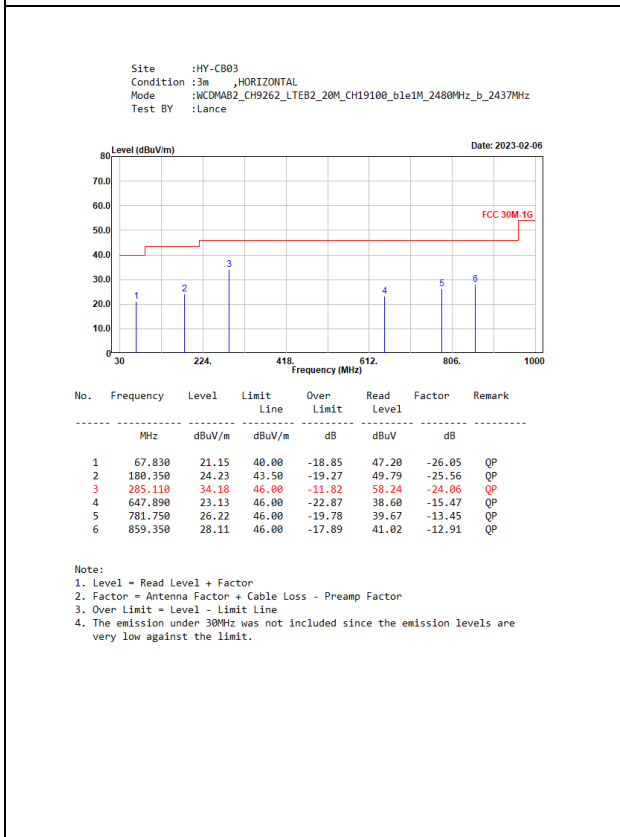
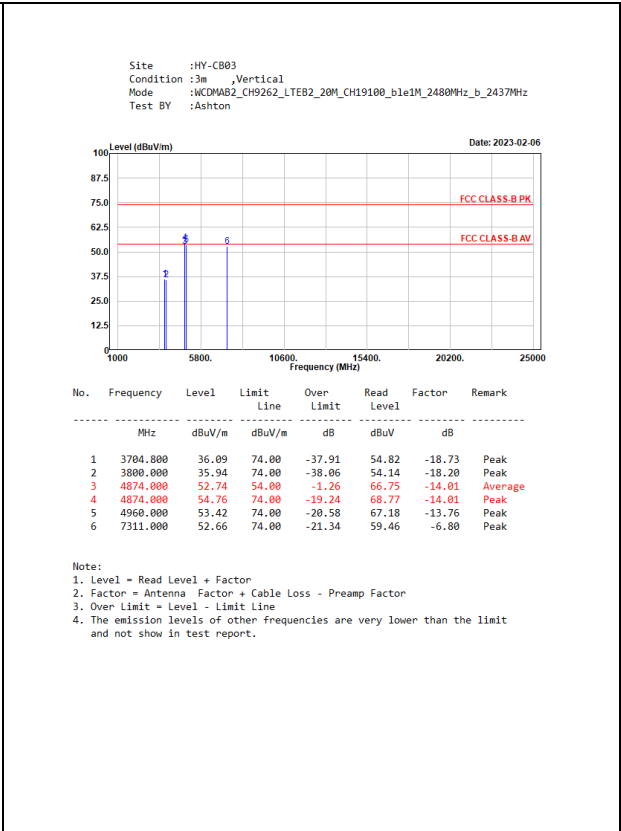
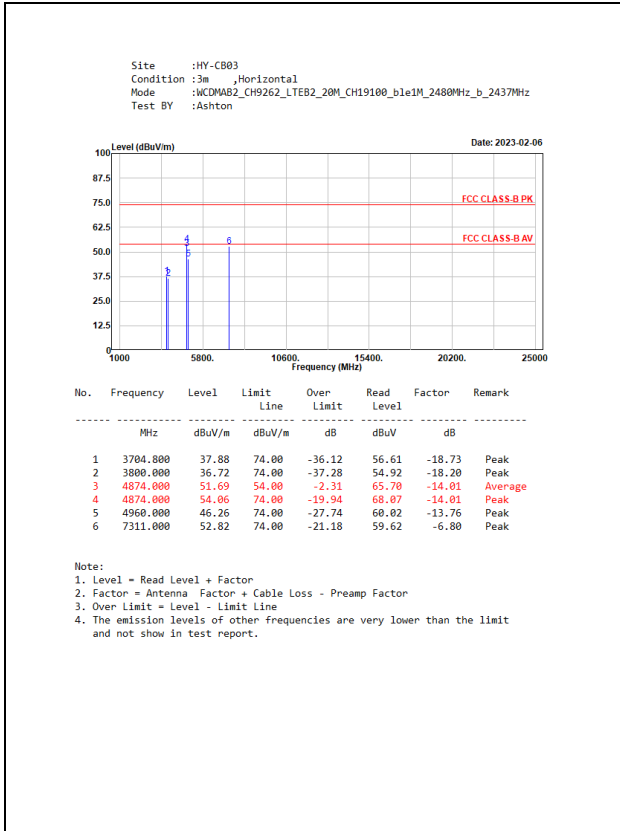


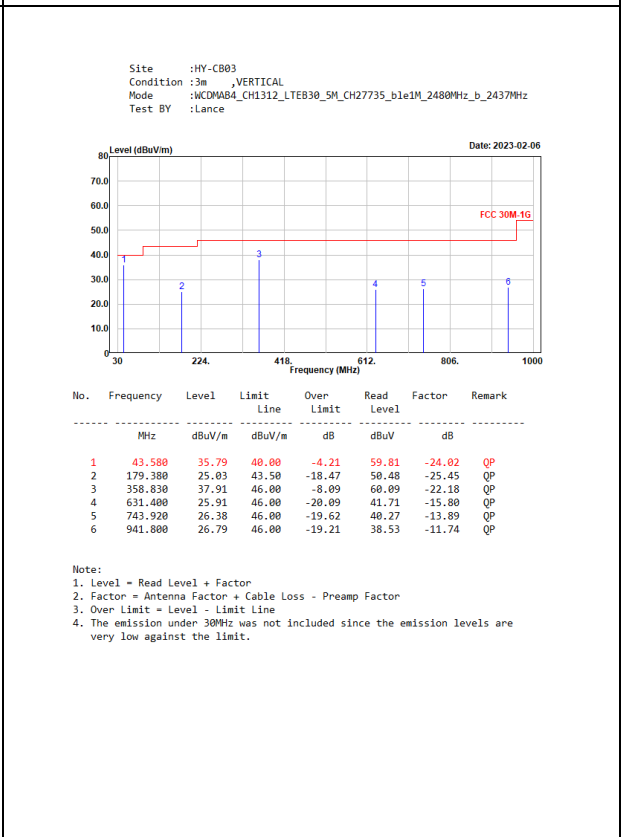
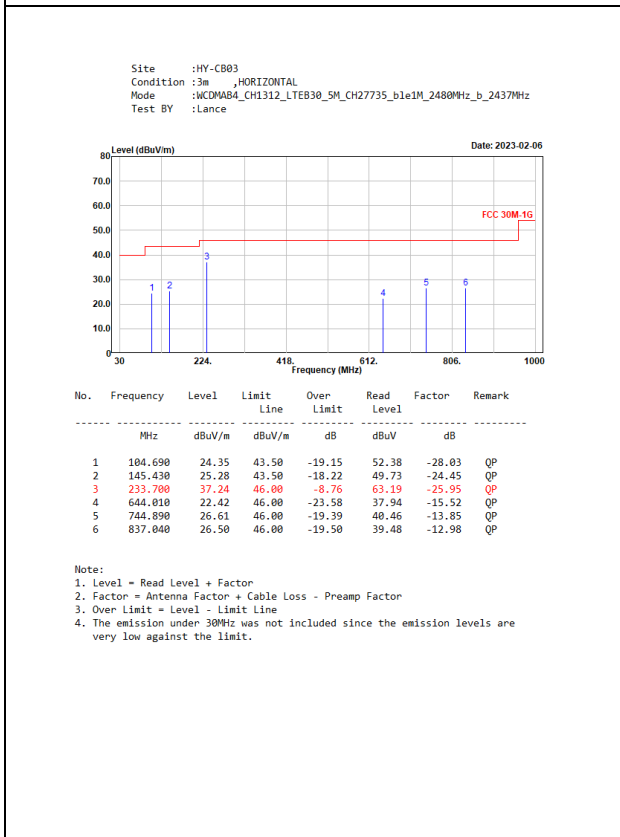
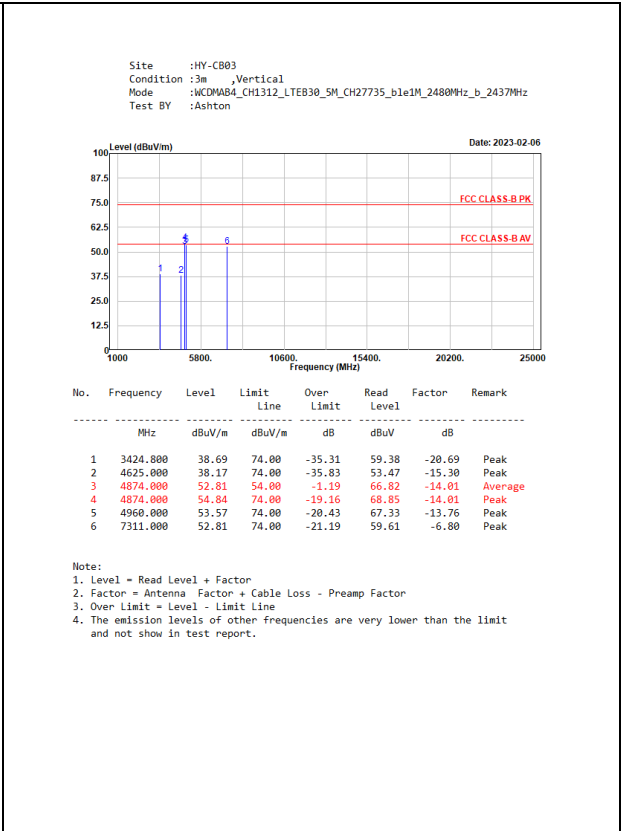
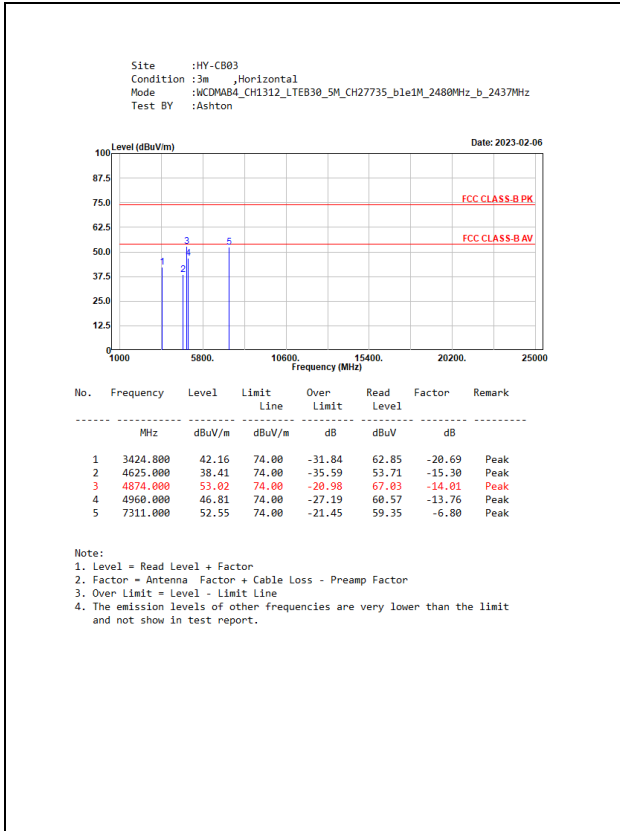


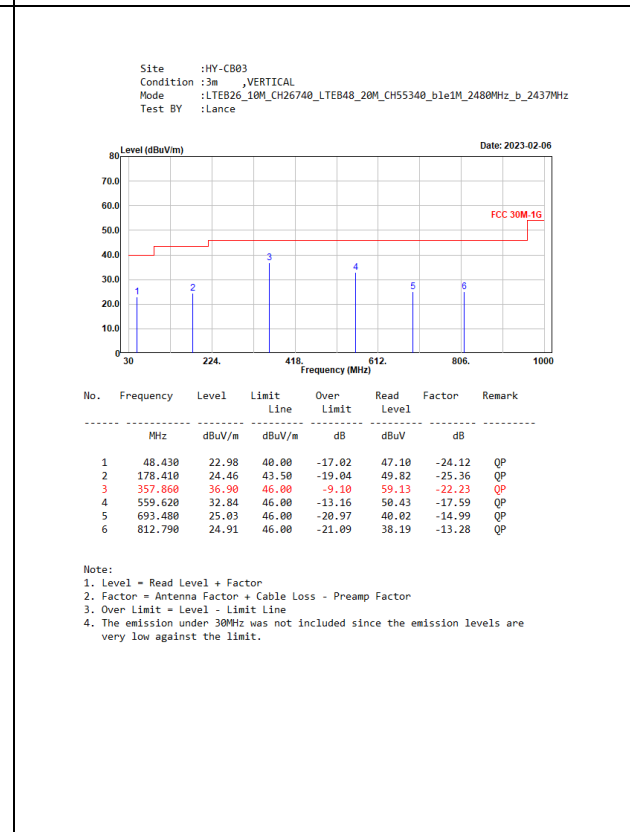
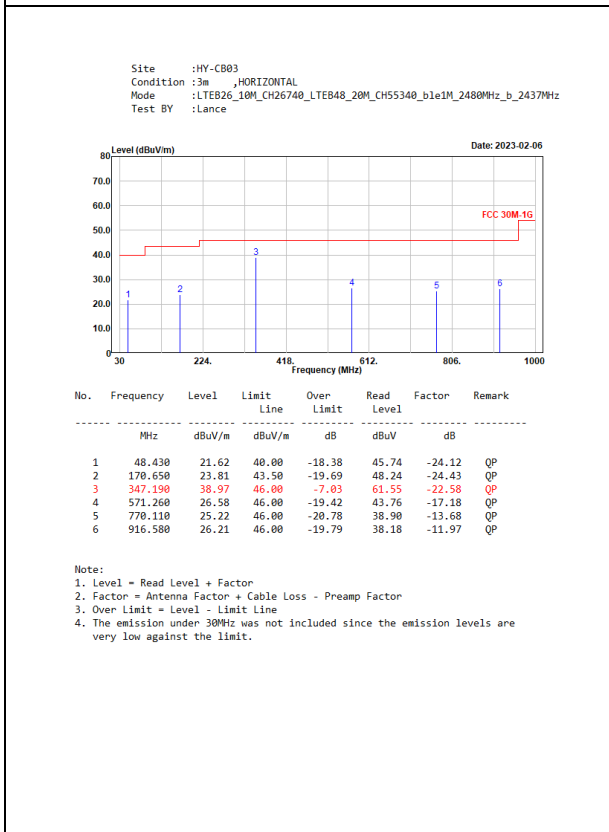
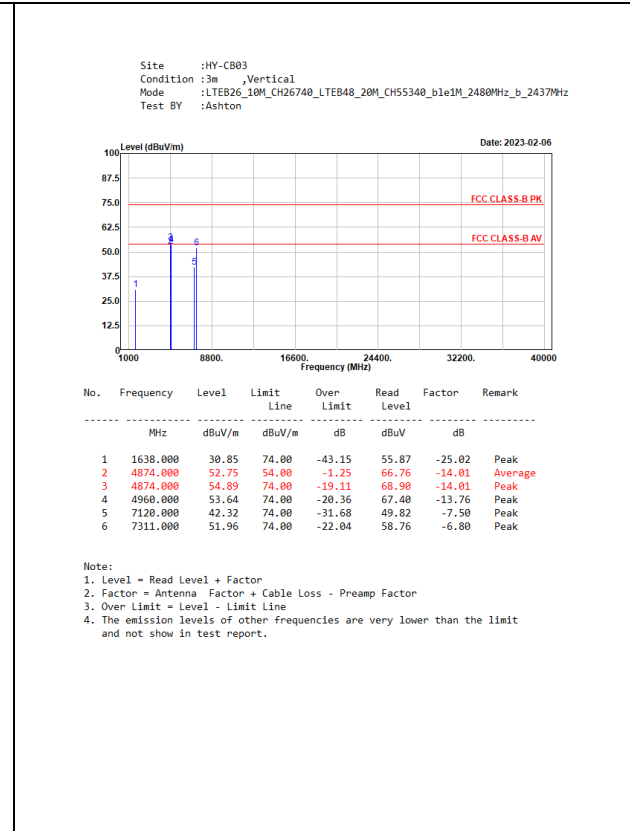
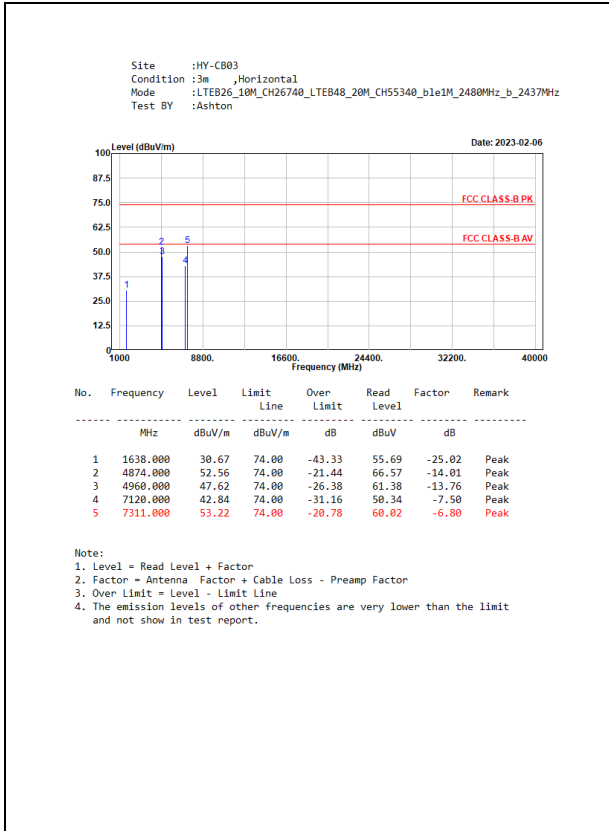


Co-location for EM7511

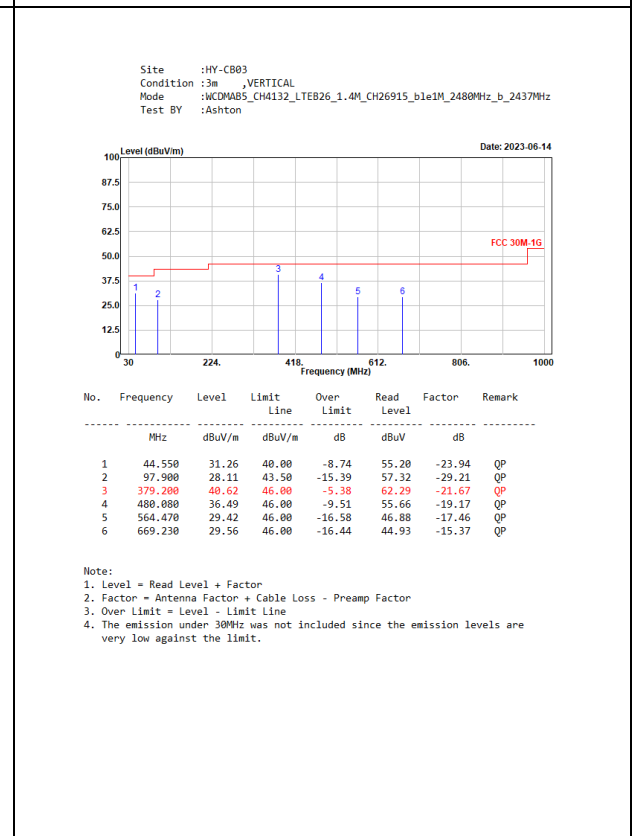
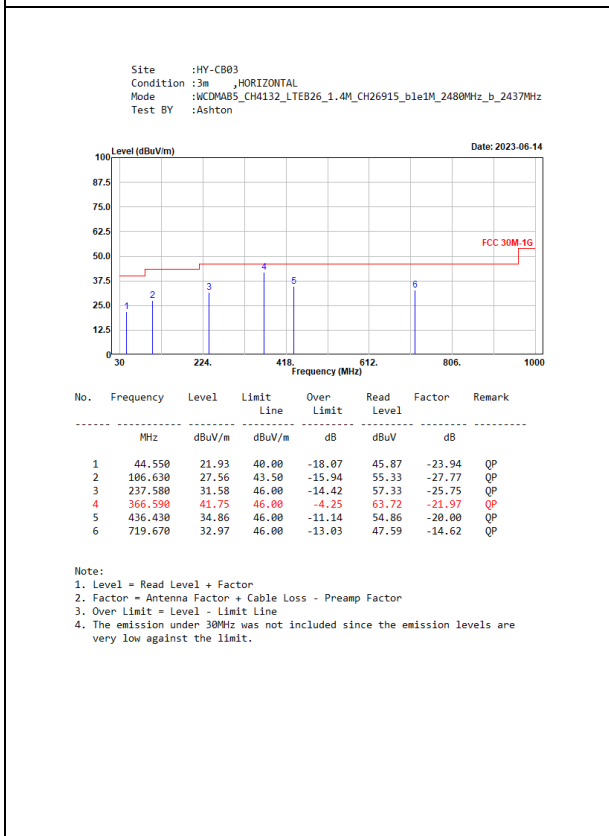
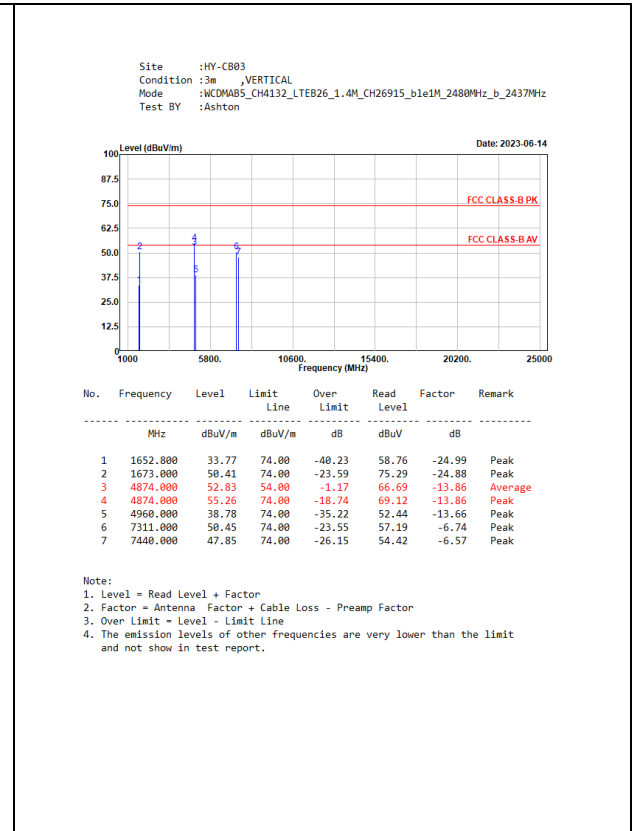
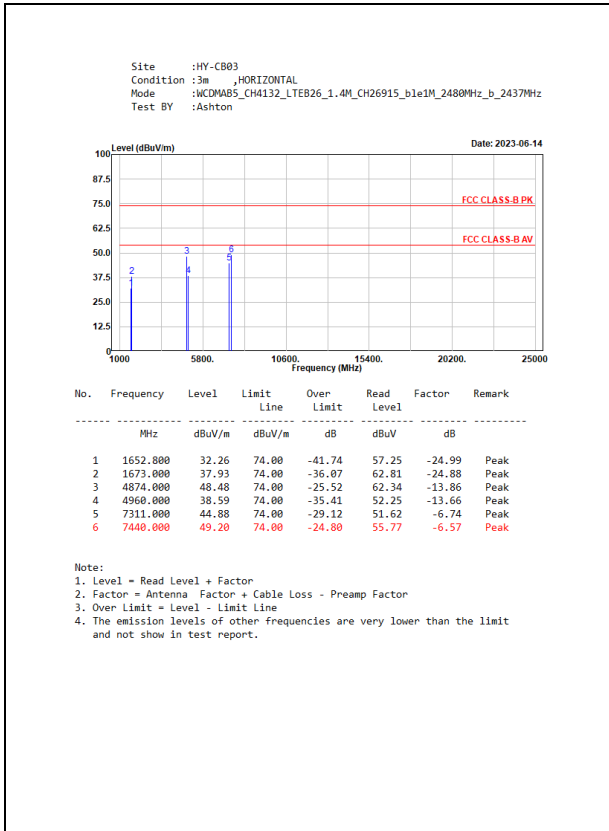


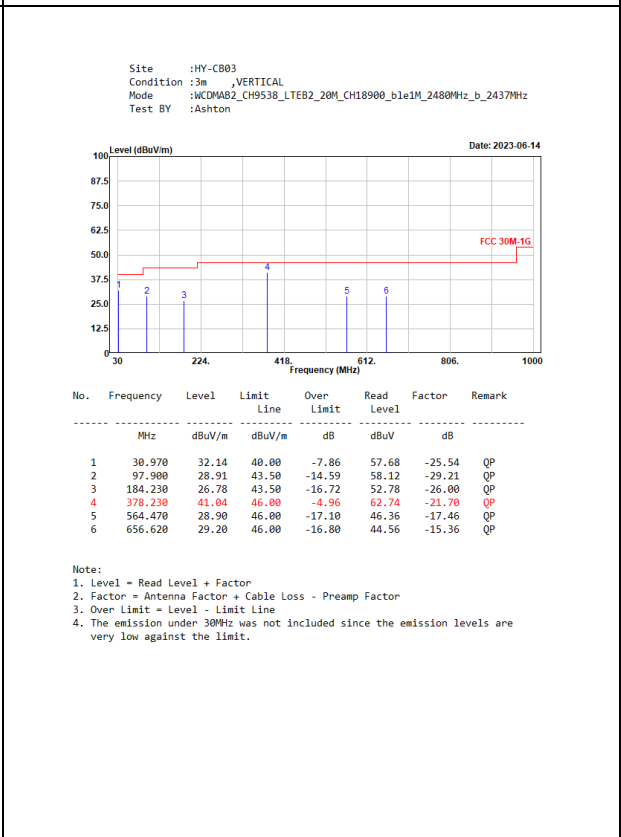
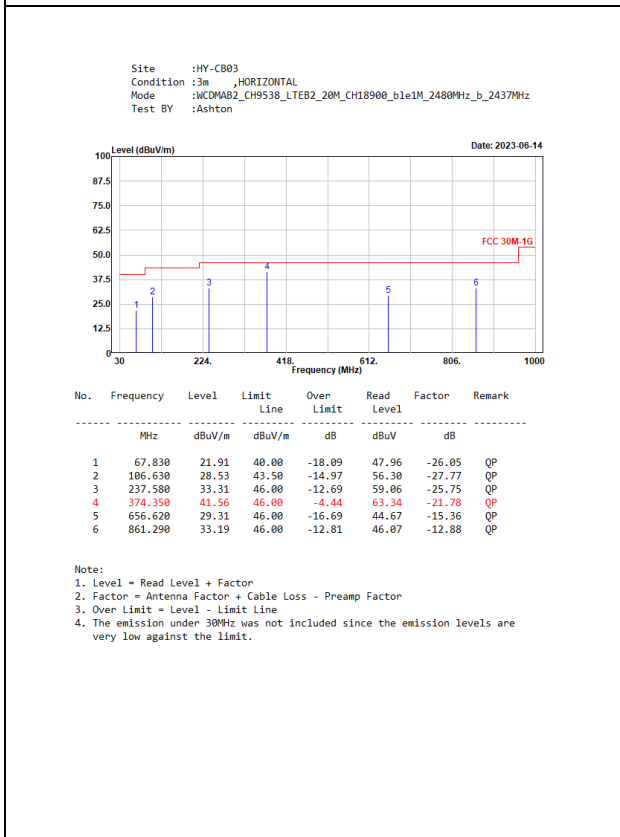
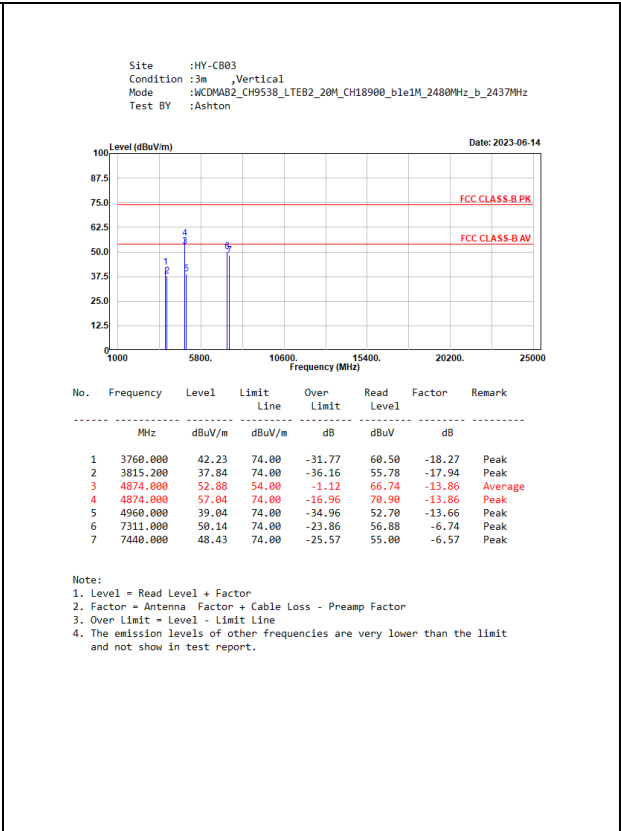
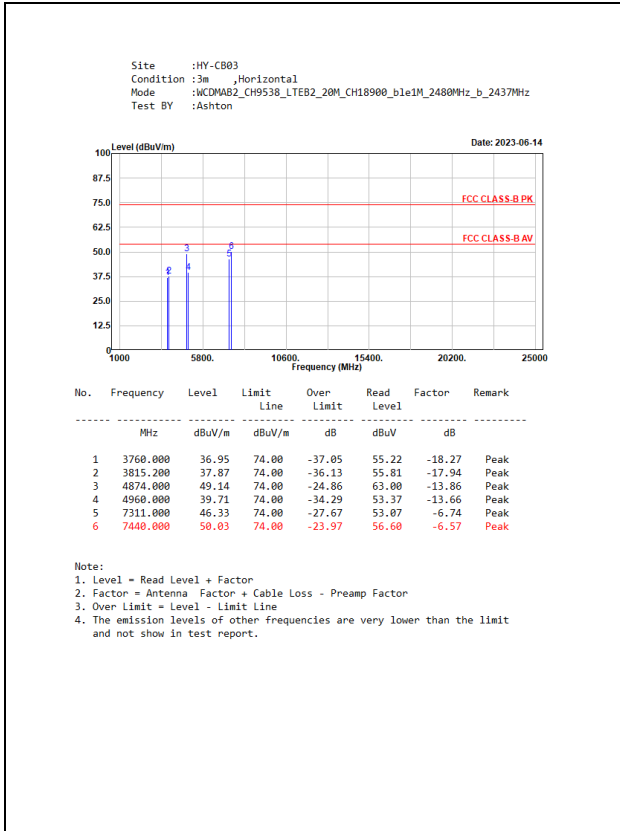


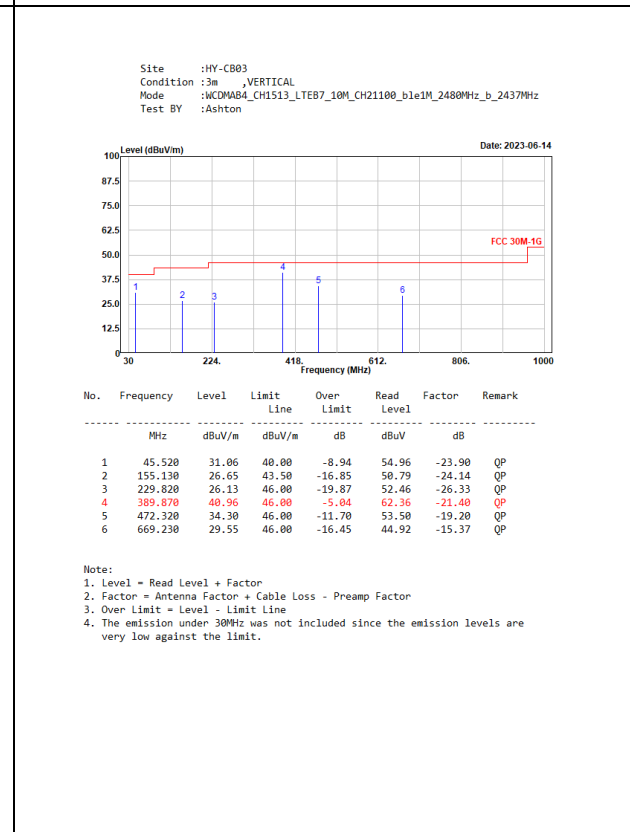
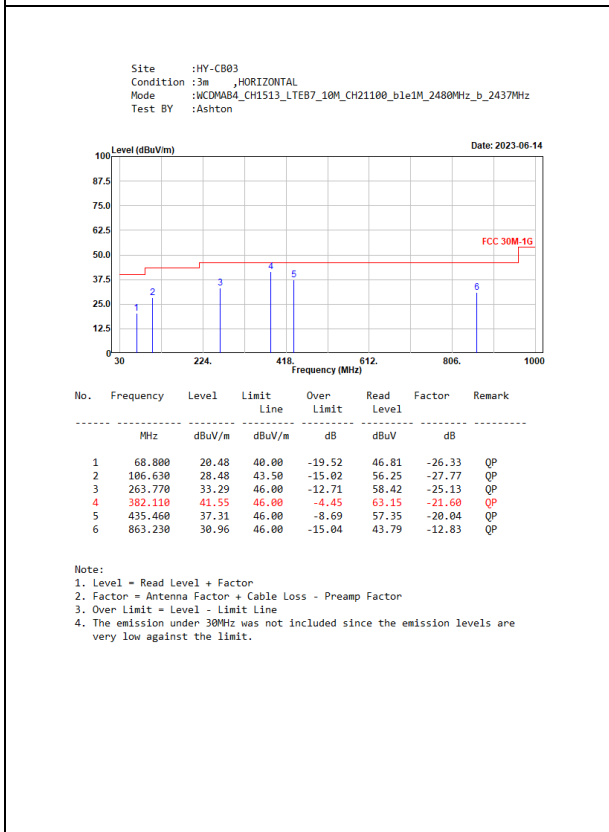
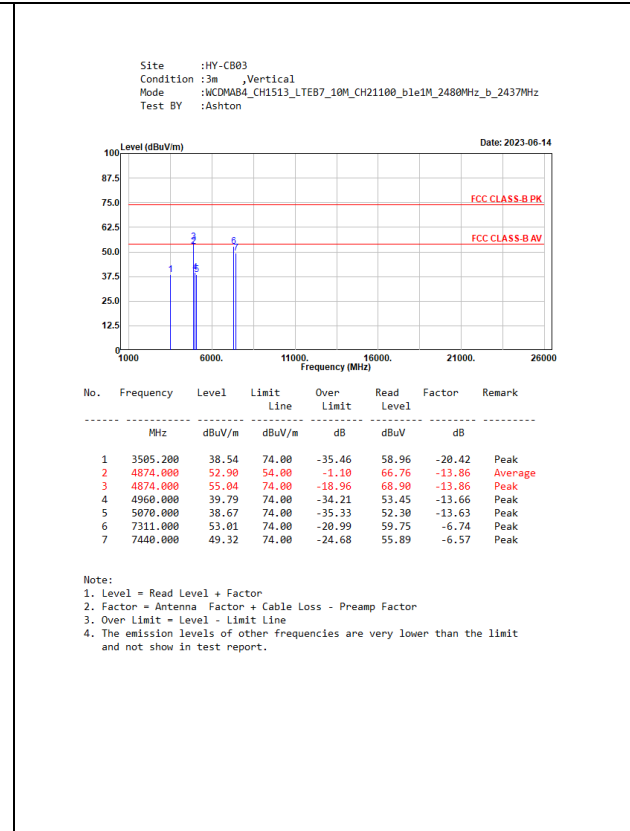
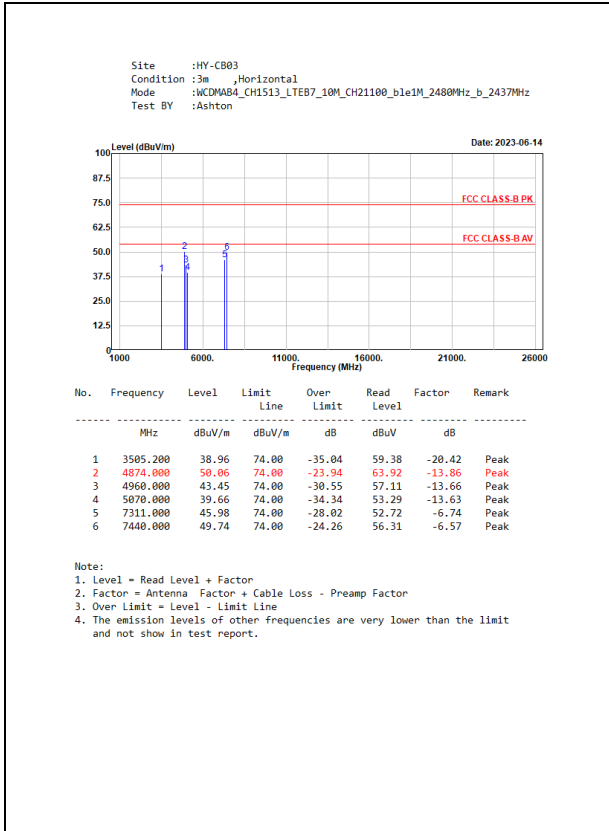


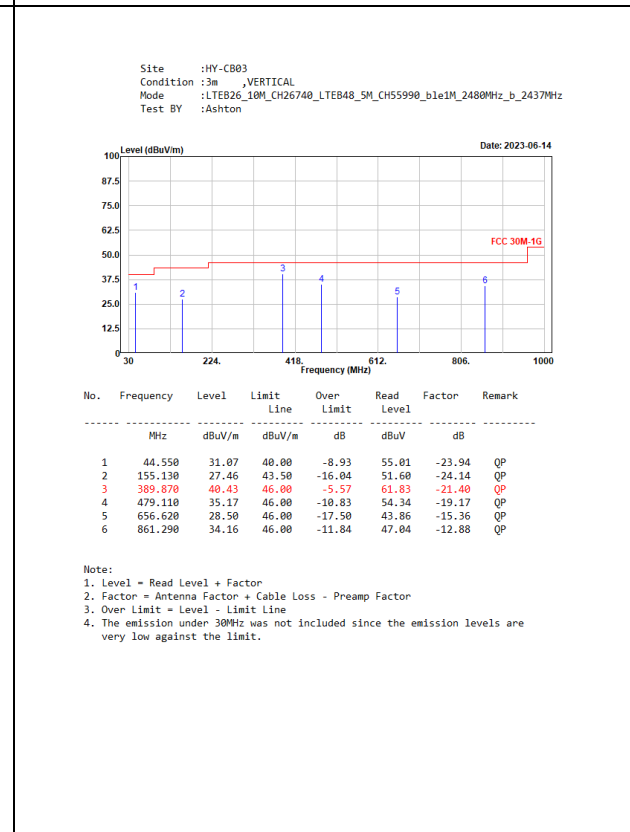
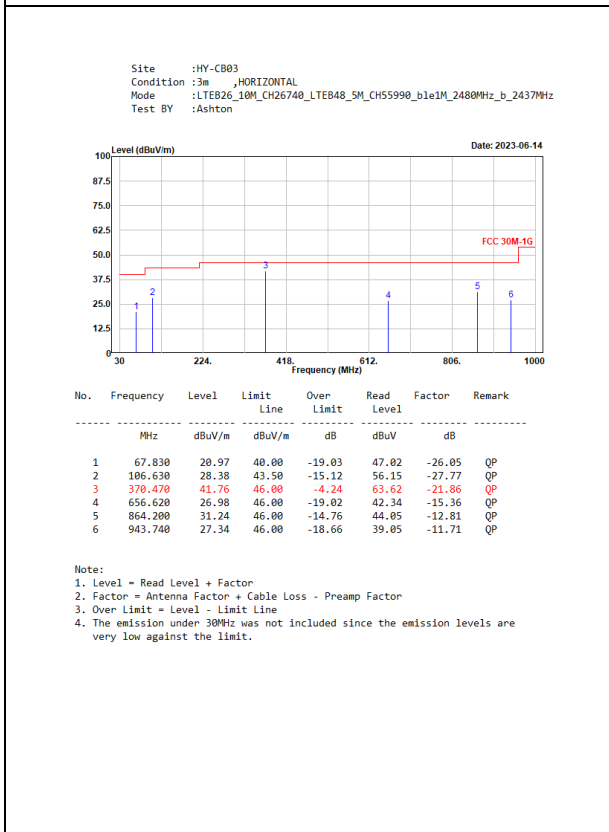
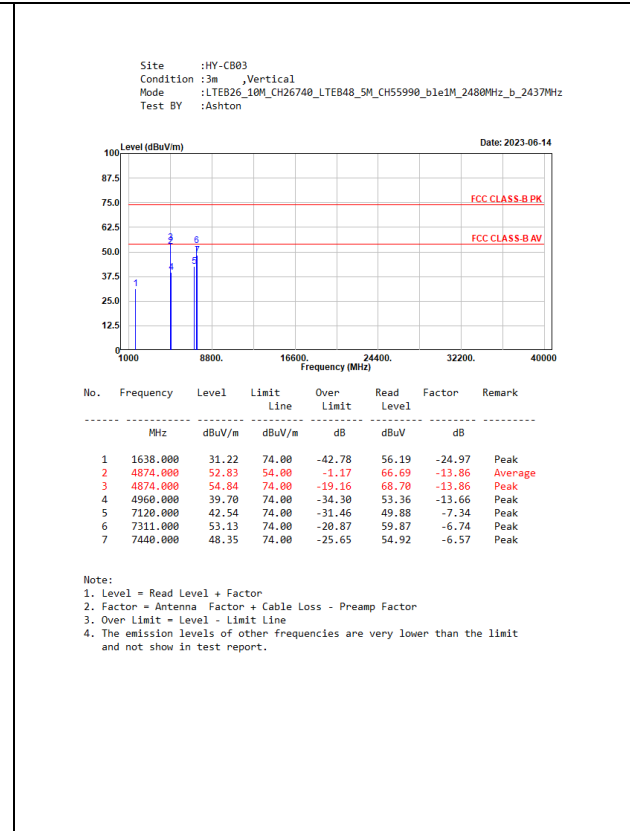
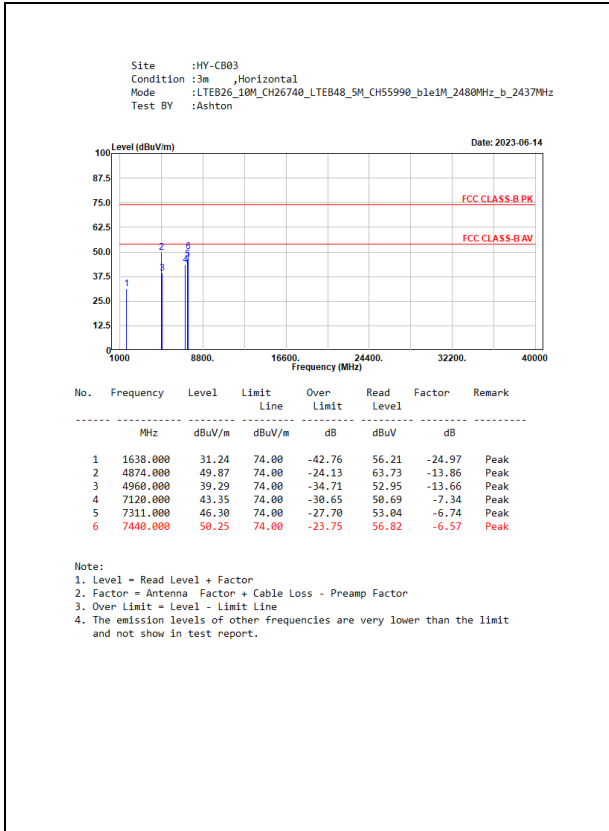


Co-location for EM7565



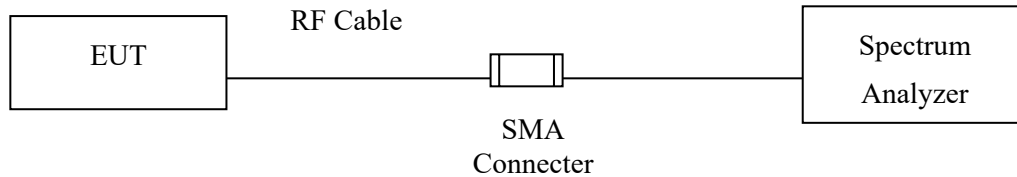






5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

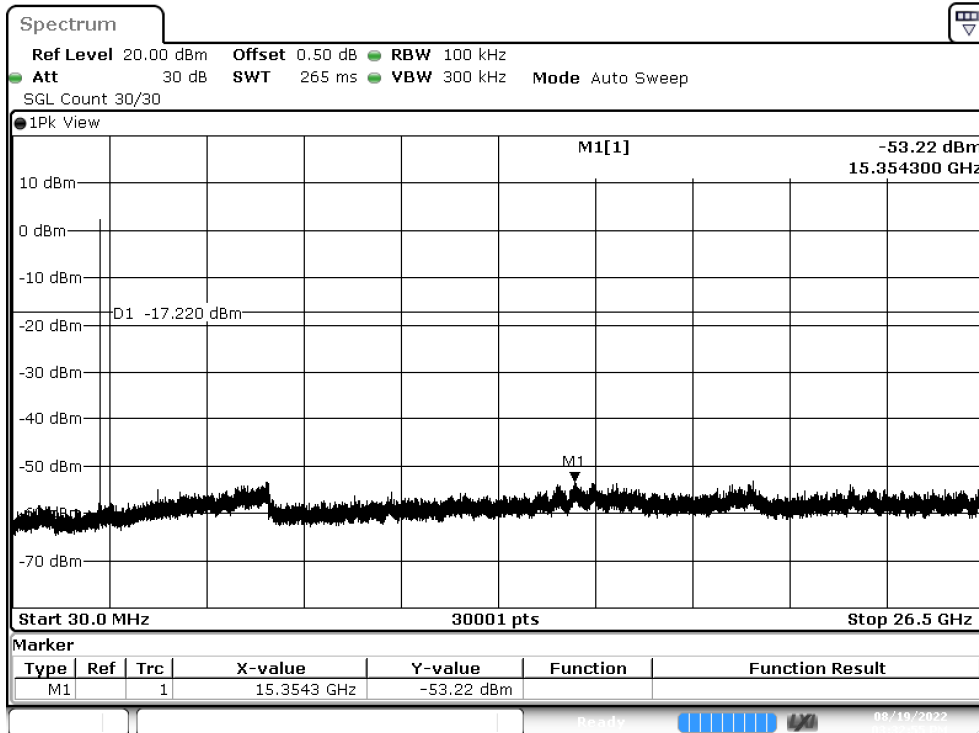
The EUT was tested according to C63.10:2013 Section 11.11 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.4. Test Result of RF Antenna Conducted Test

Product : Secured Network Extension Device
 Test Item : RF Antenna Conducted Test
 Test Mode : Transmit - 1Mbps-BLE
 Test Date : 2022/08/19

Figure Channel 00:

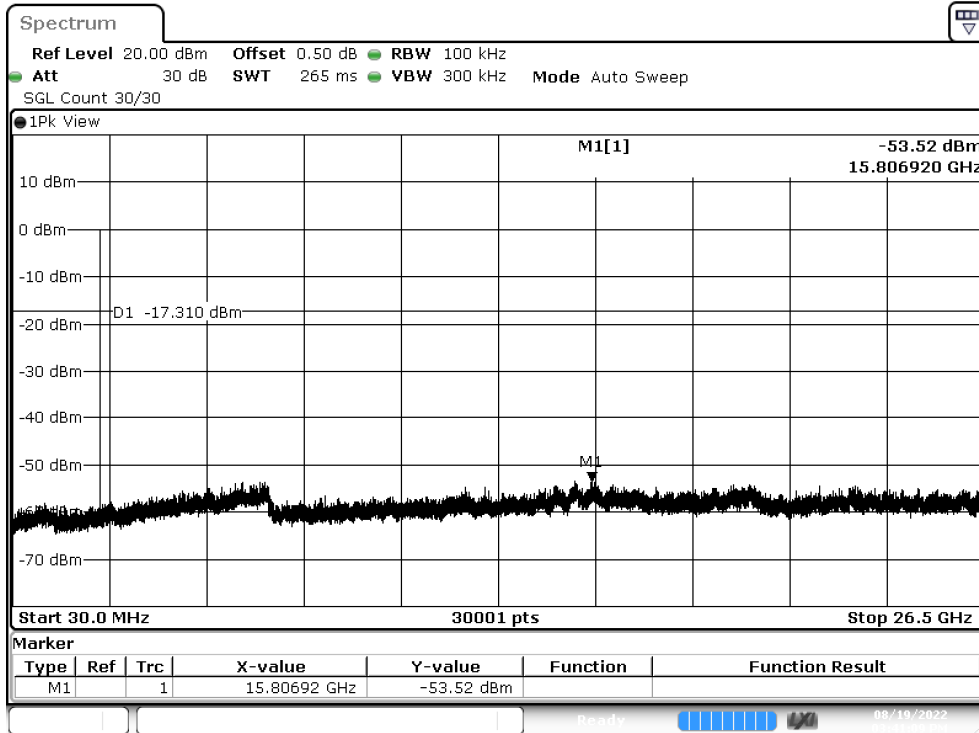


Date: 19.AUG.2022 15:32:56

Note: The above test pattern is synthesized by multiple of the frequency range.

Product : Secured Network Extension Device
 Test Item : RF Antenna Conducted Test
 Test Mode : Transmit - 2Mbps-BLE
 Test Date : 2022/08/19

Figure Channel 00:



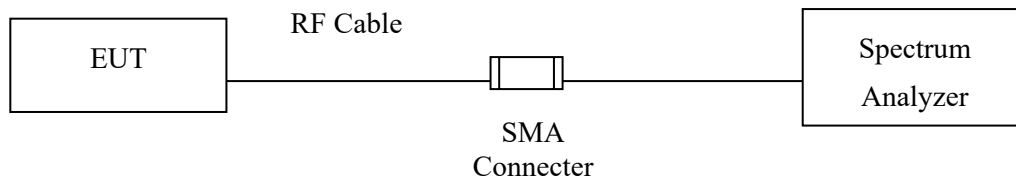
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Note: The above test pattern is synthesized by multiple of the frequency range.

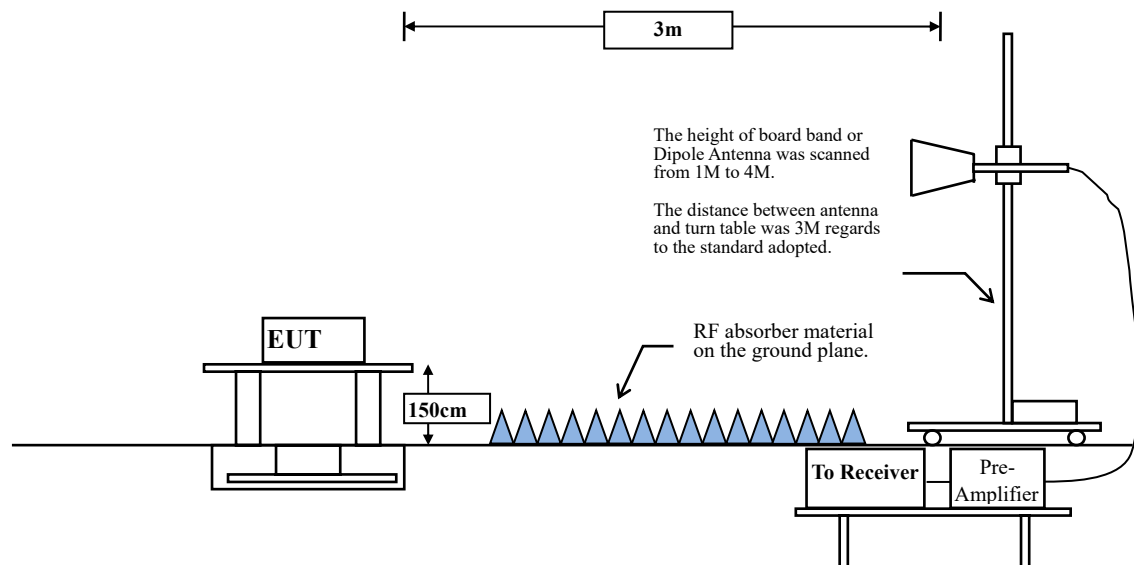
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.2. Limit

According to FCC Section 15.247(d). 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to C63.10:2013 Section 11.12.1 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure.

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to C63.10 Section 11.12.2.5 Average measurement procedure.

RBW = 1MHz.

VBW = 10Hz, when duty cycle $\geq 98\%$

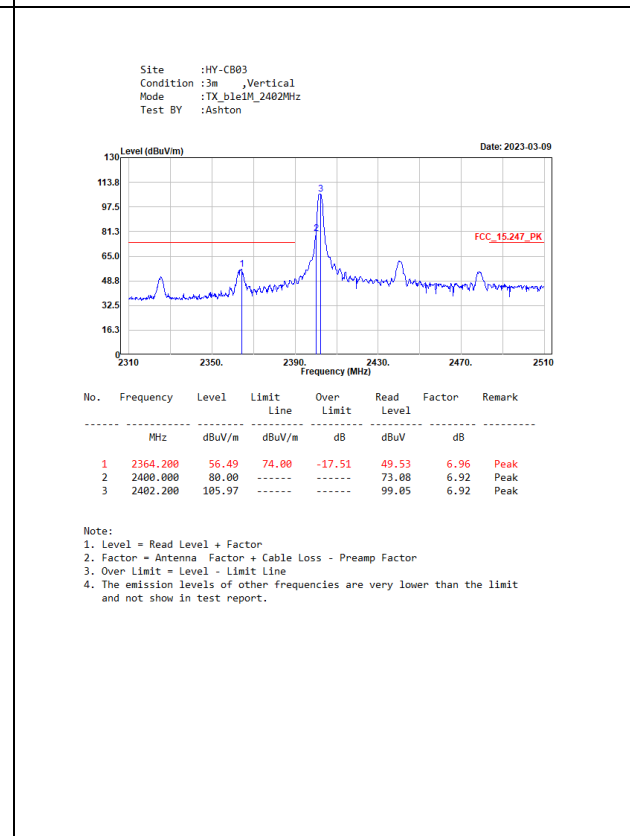
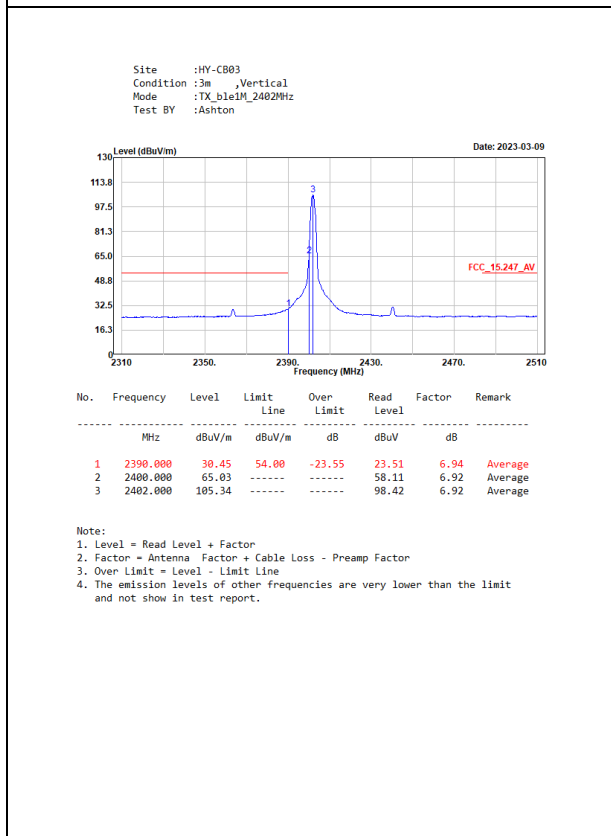
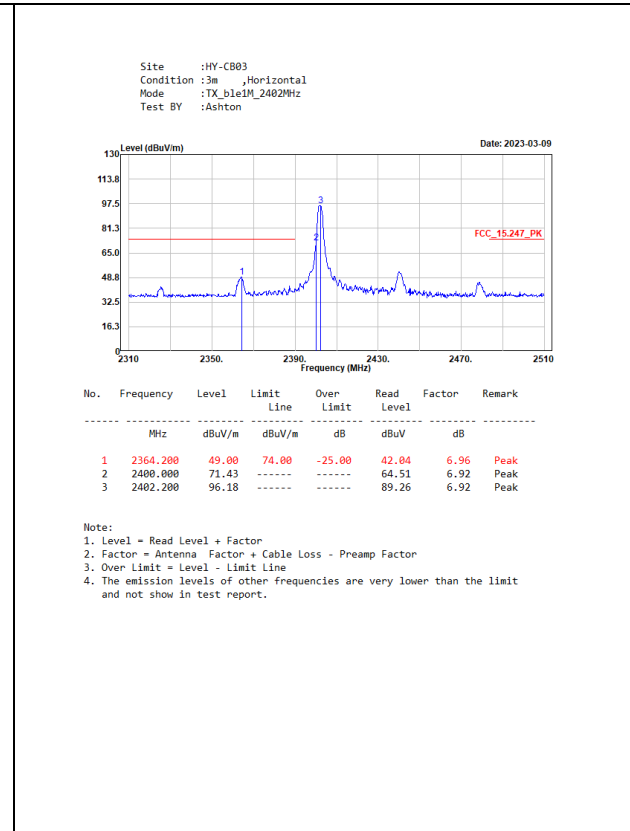
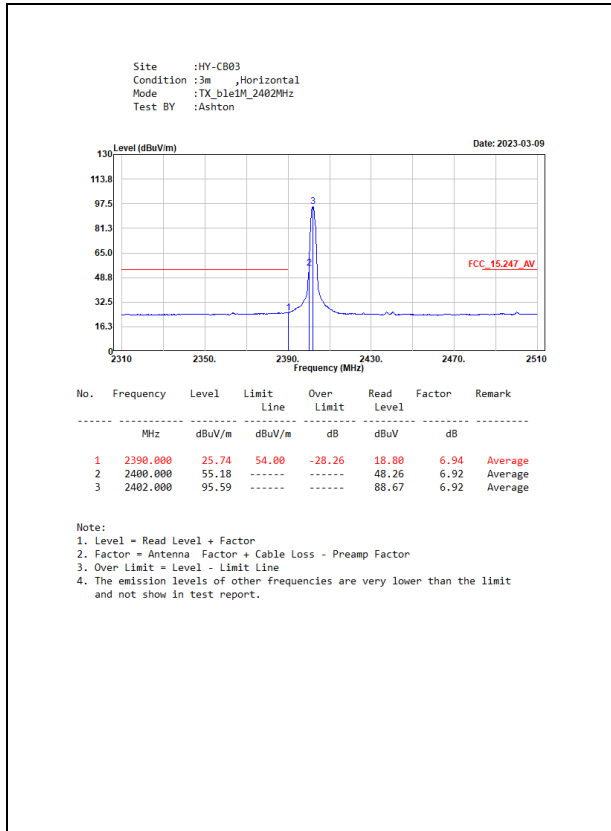
$VBW \geq 1/T$, when duty cycle $< 98\%$

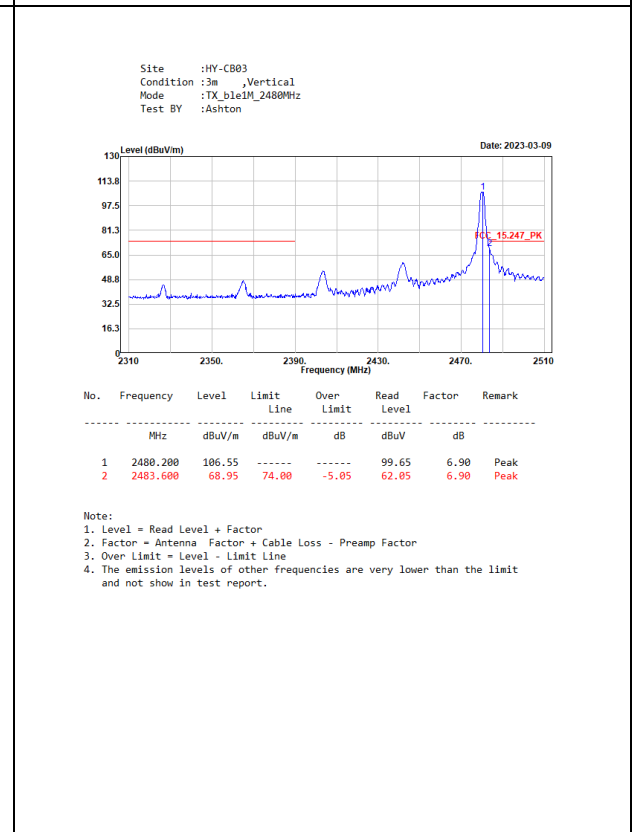
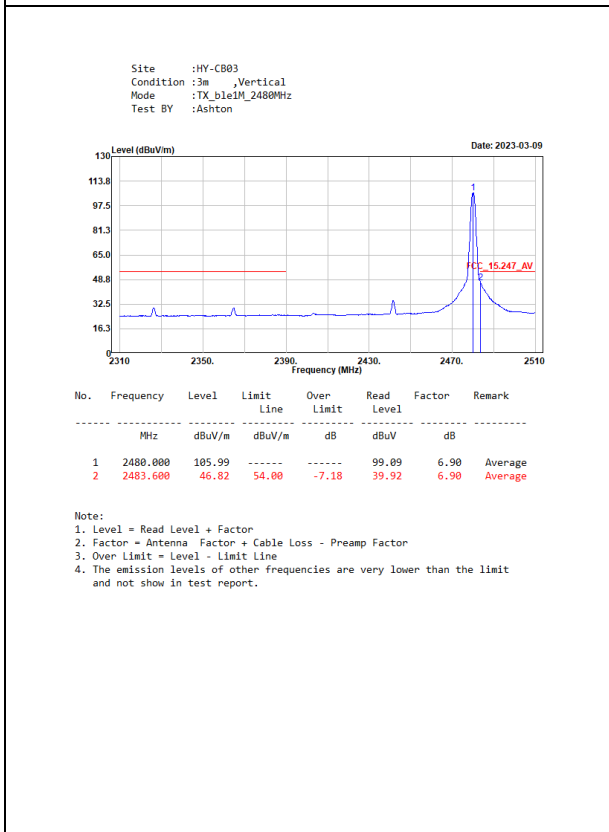
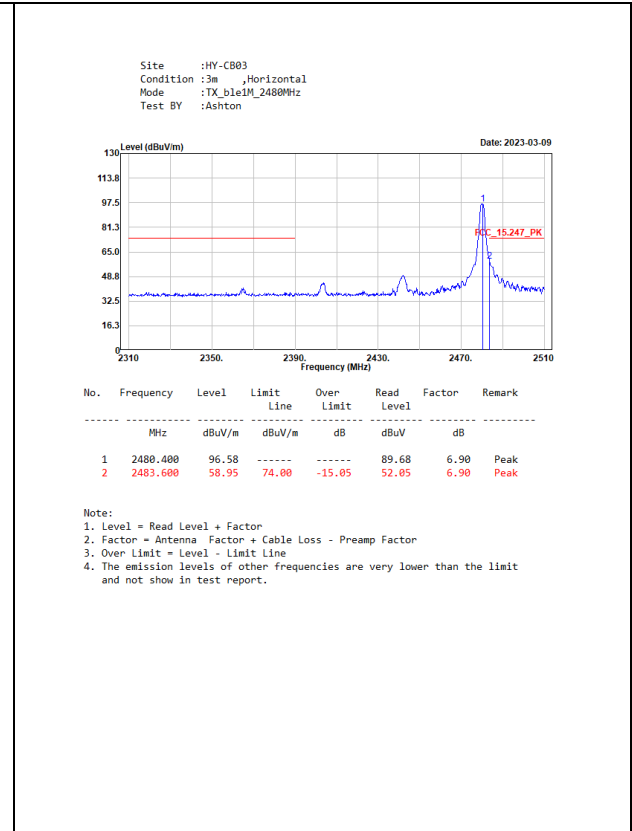
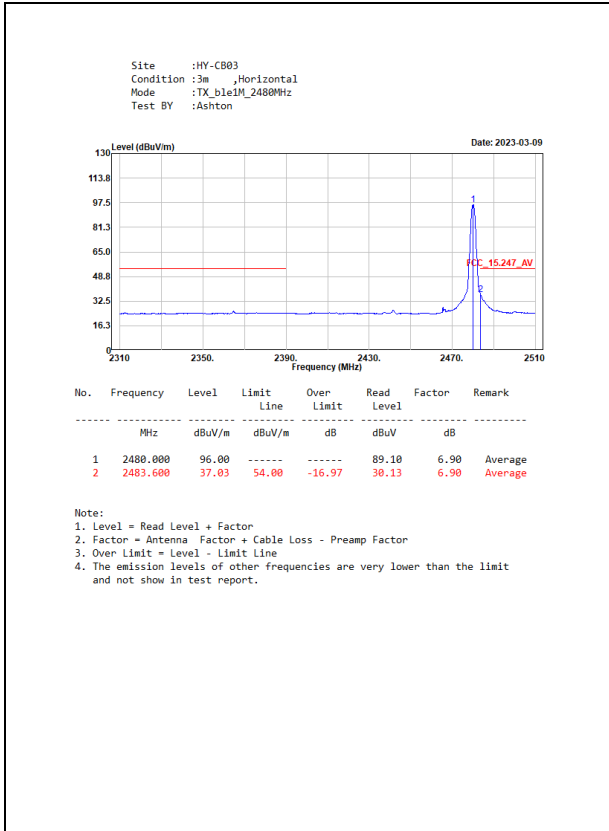
(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

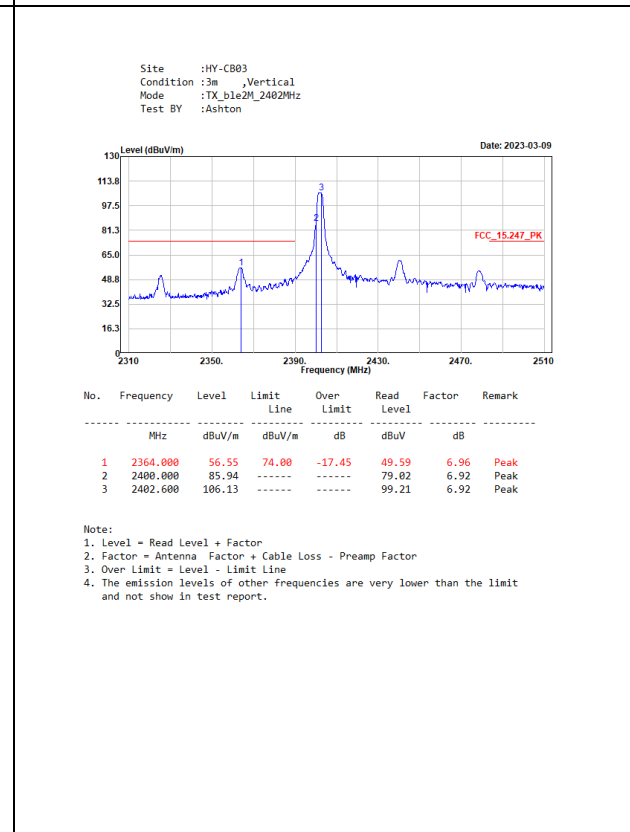
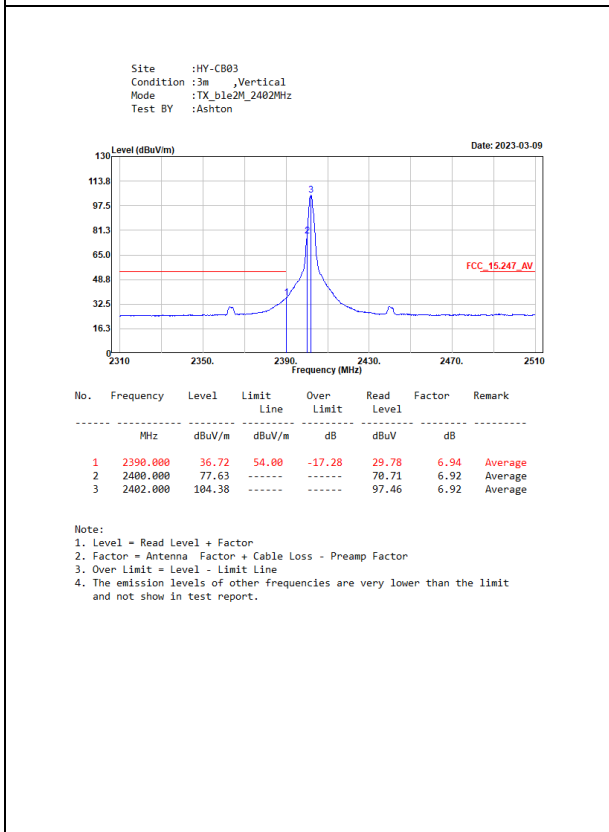
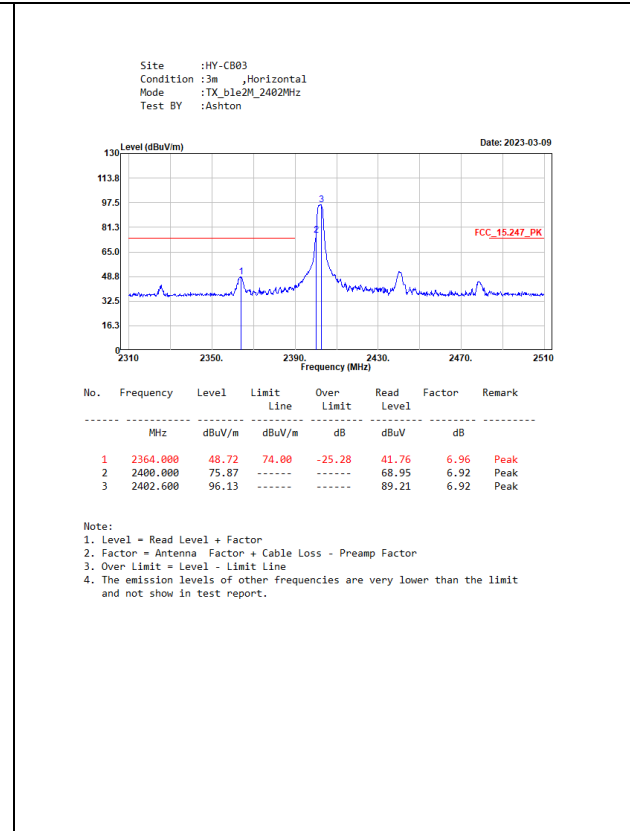
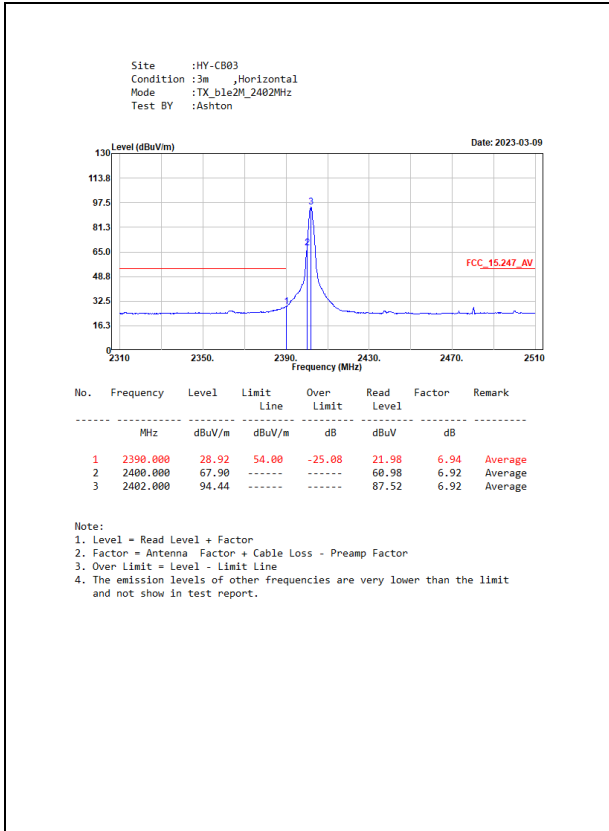
2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE (1M)	84.52	2.1300	469	500
BLE (2M)	57.18	1.0750	930	1000

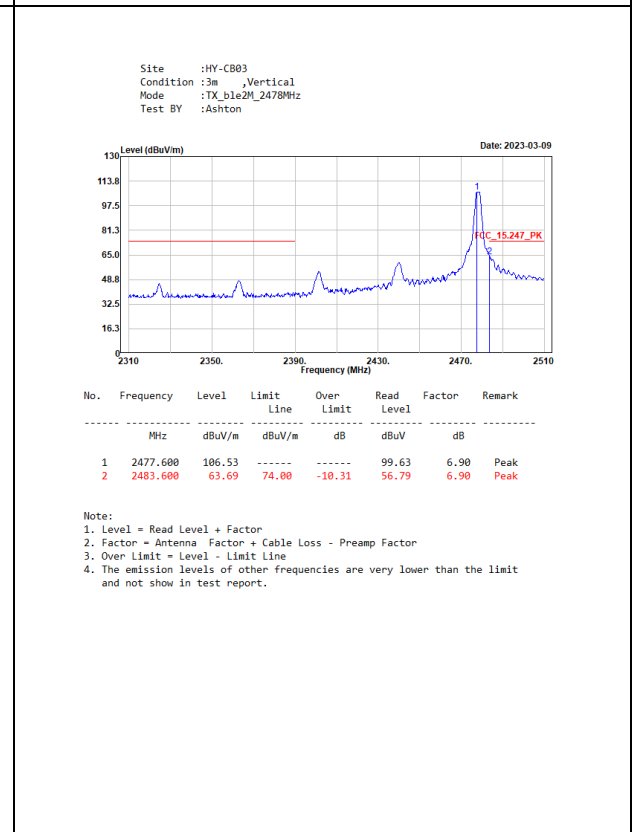
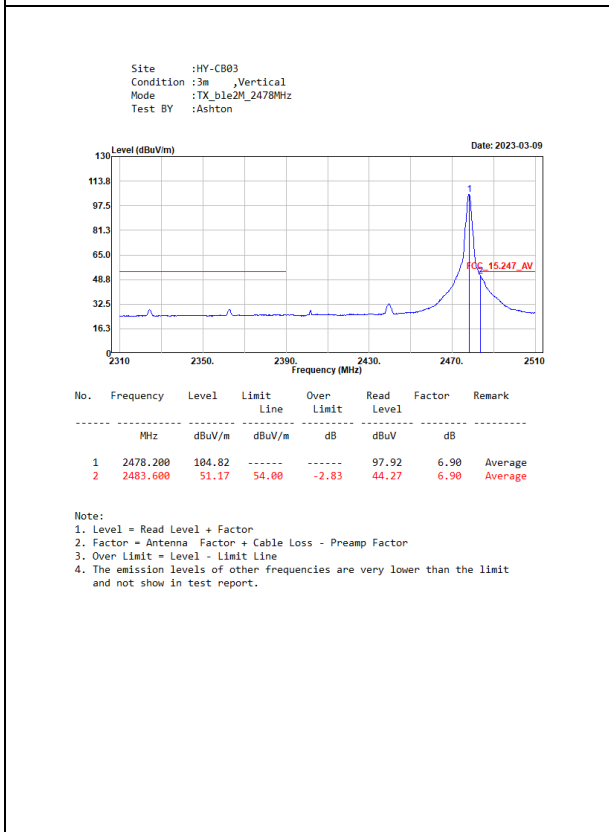
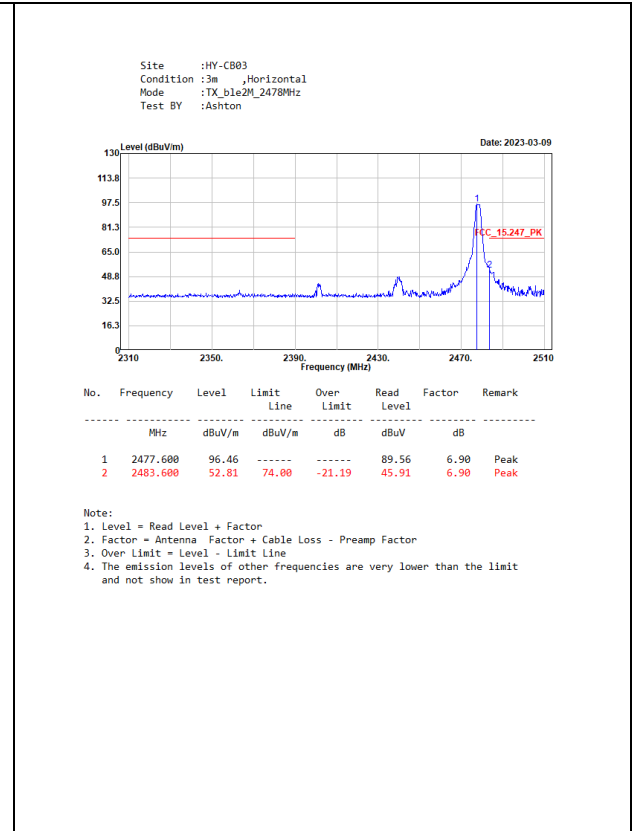
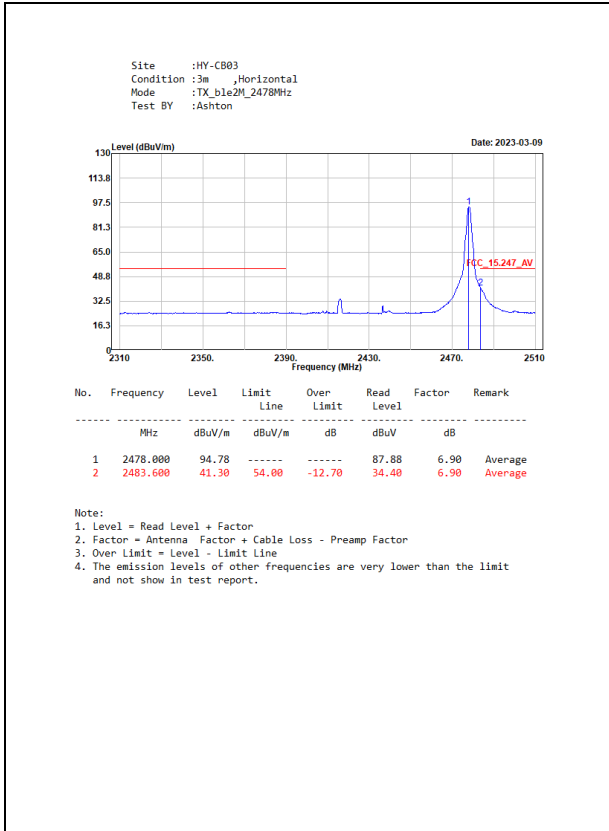
Note: Duty Cycle Refer to Section 9.

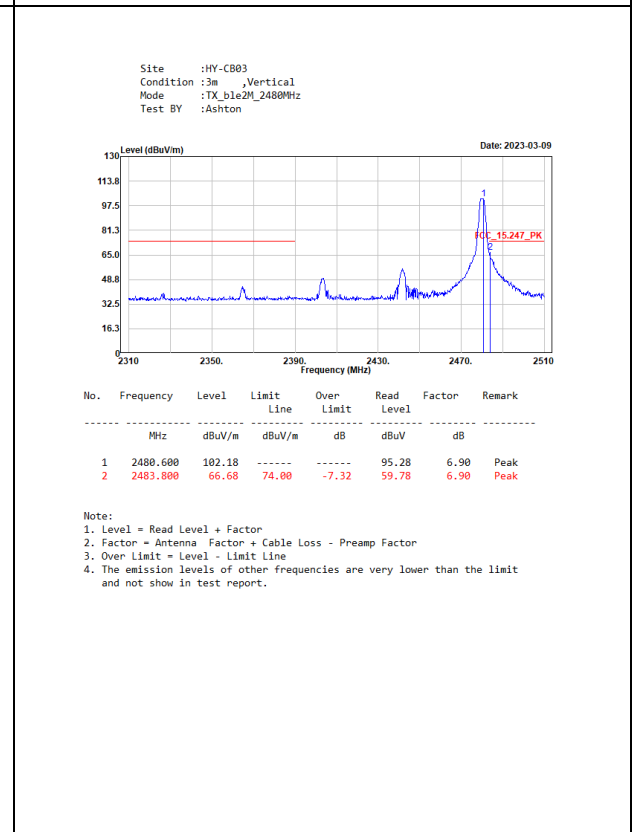
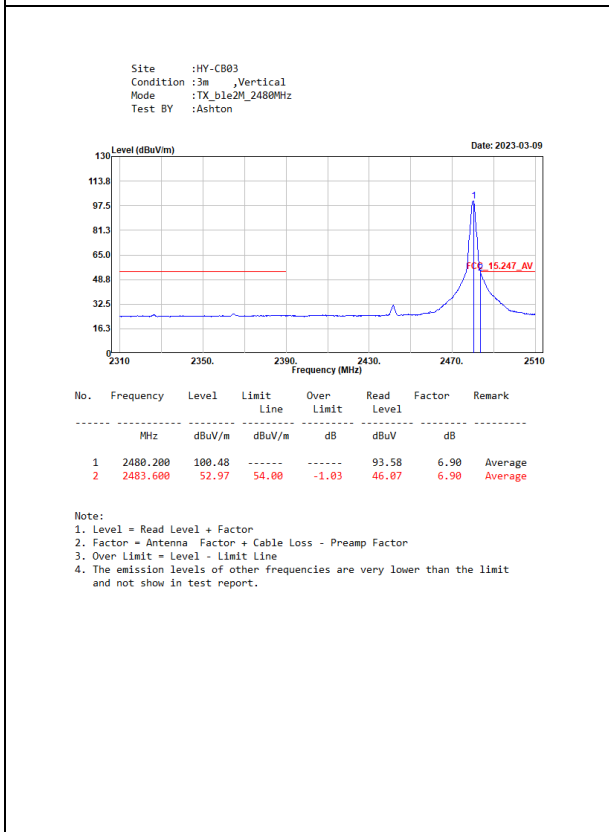
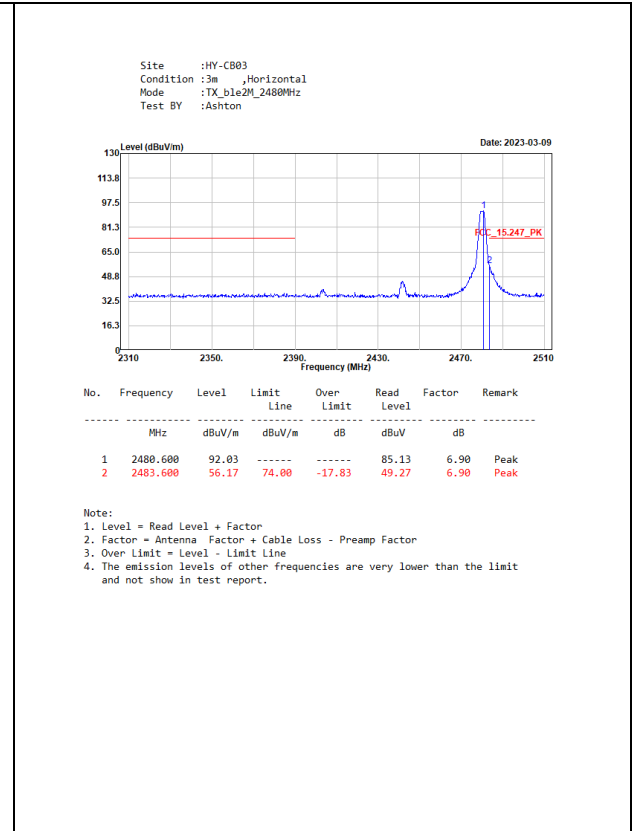
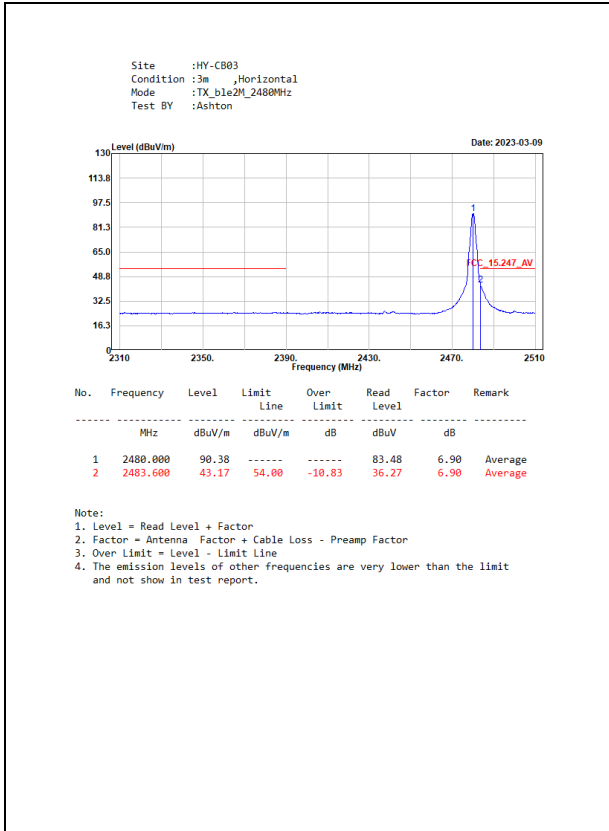
6.4. Test Result of Band Edge







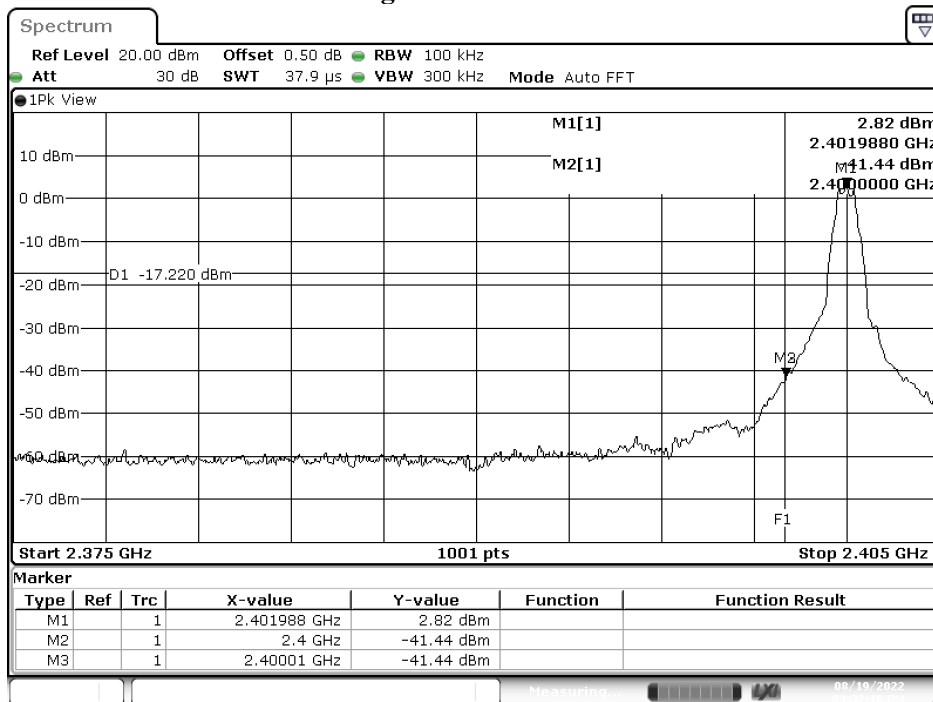




Product : Secured Network Extension Device
 Test Item : Band Edge
 Test Mode : Transmit - 1Mbps-BLE
 Test Date : 2022/08/19

Measurement Level	Result
Δ (dB)	
> 20	PASS

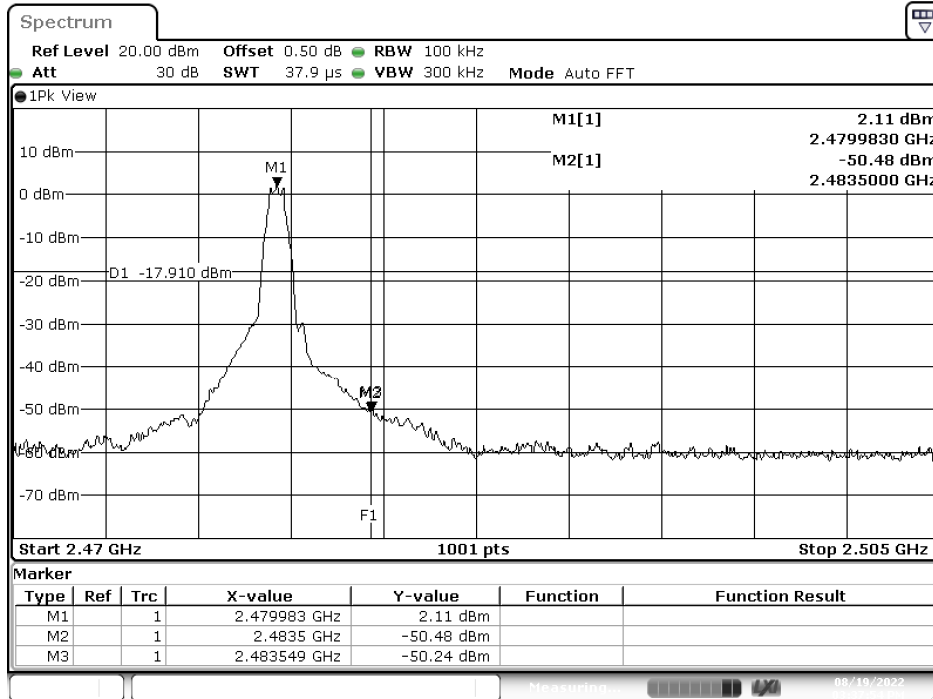
Figure Channel 00:



Date: 19.AUG.2022 15:32:18

Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel 39:

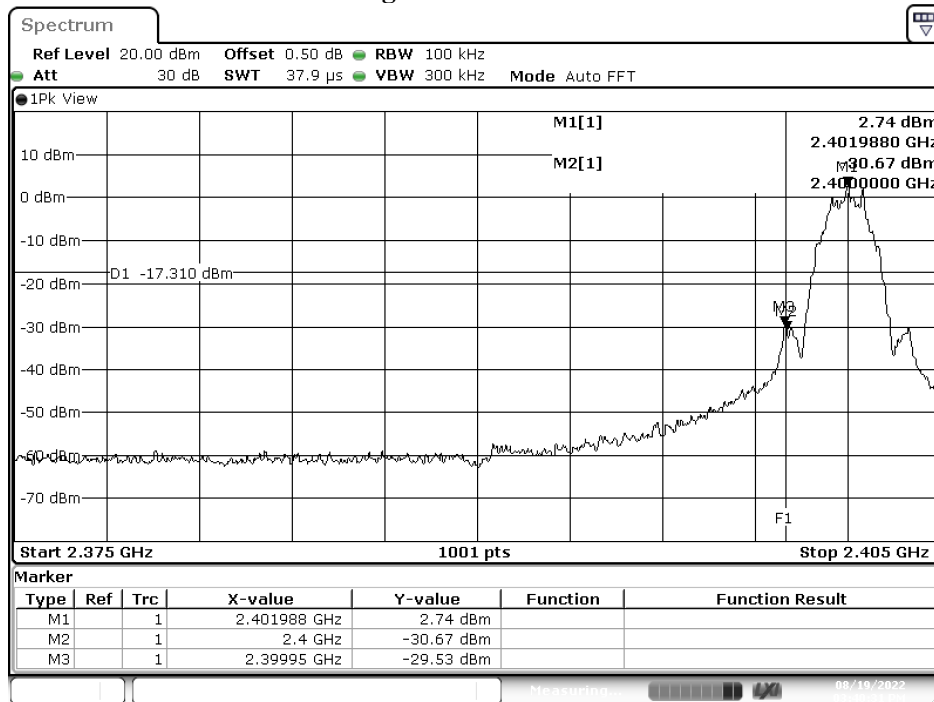


Date: 19.AUG.2022 15:37:55

Product : Secured Network Extension Device
 Test Item : Band Edge
 Test Mode : Transmit - 2Mbps-BLE
 Test Date : 2022/08/19

Measurement Level	Result
Δ (dB)	
> 20	PASS

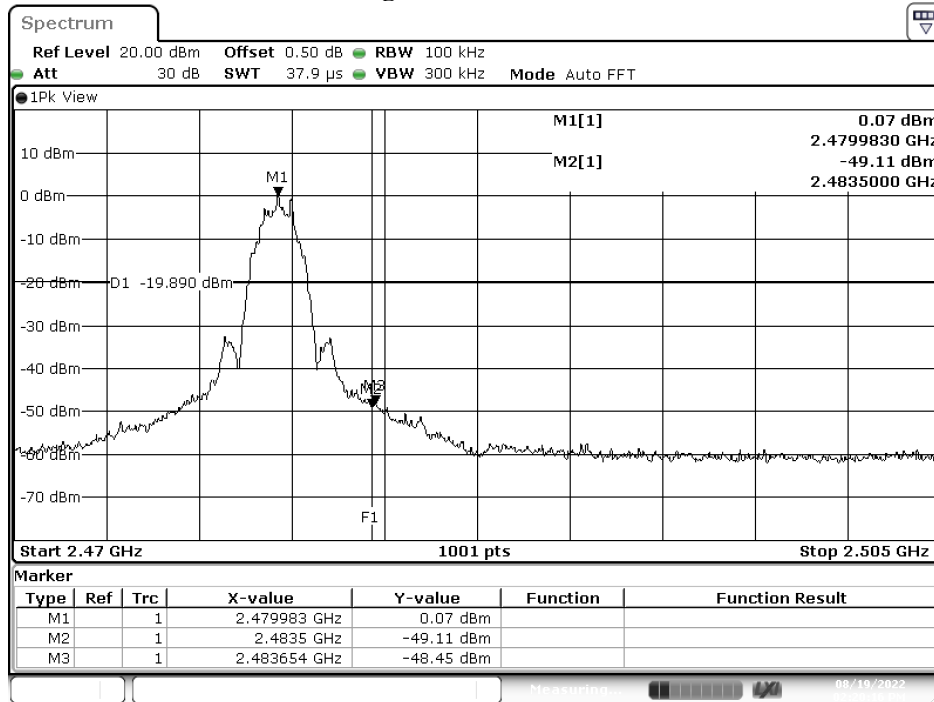
Figure Channel 00:



Date: 19.AUG.2022 15:40:32

Measurement Level	Result
Δ (dB)	
> 20	PASS

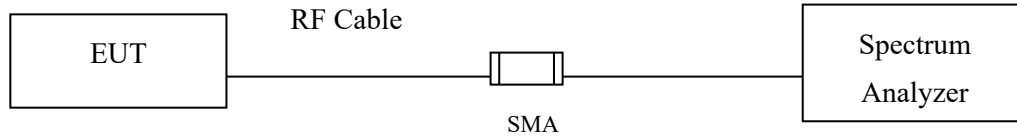
Figure Channel 39:



Date: 19.AUG.2022 14:20:16

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

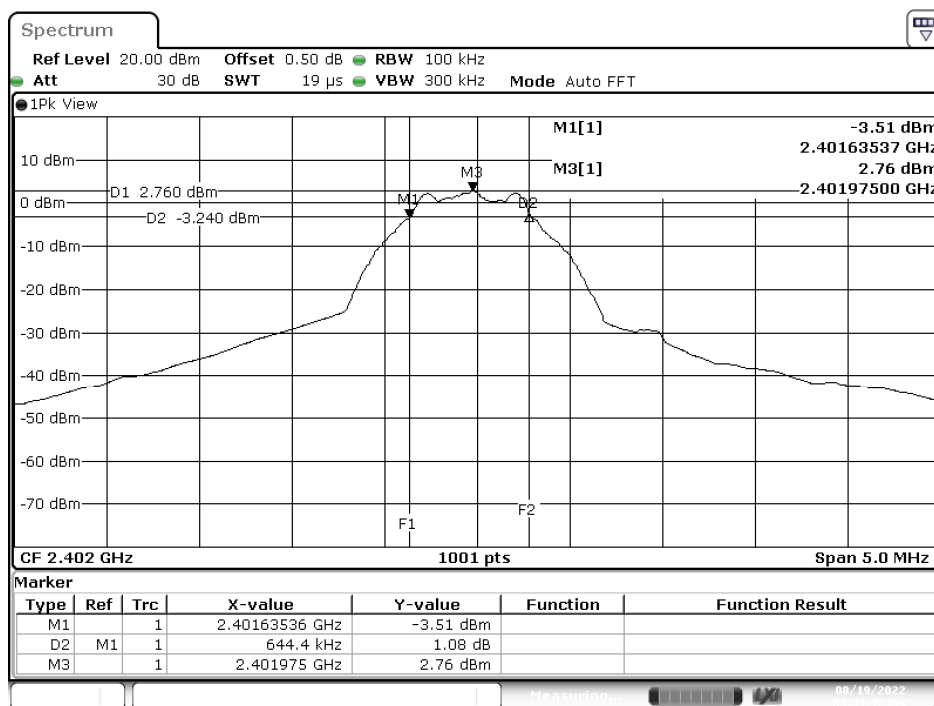
The EUT was setup according to ANSI C63.4, 2014; tested according to ANSI C63.10 Section 11.8 for compliance to FCC 47CFR 15.247 requirements.

7.4. Test Result of 6dB Bandwidth

Product : Secured Network Extension Device
 Test Item : 6dB Bandwidth Data
 Test Mode : Transmit - 1Mbps-BLE
 Test Date : 2022/08/19

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	644	>500	Pass
19	2440	644	>500	Pass
39	2480	644	>500	Pass

Figure Channel 00:

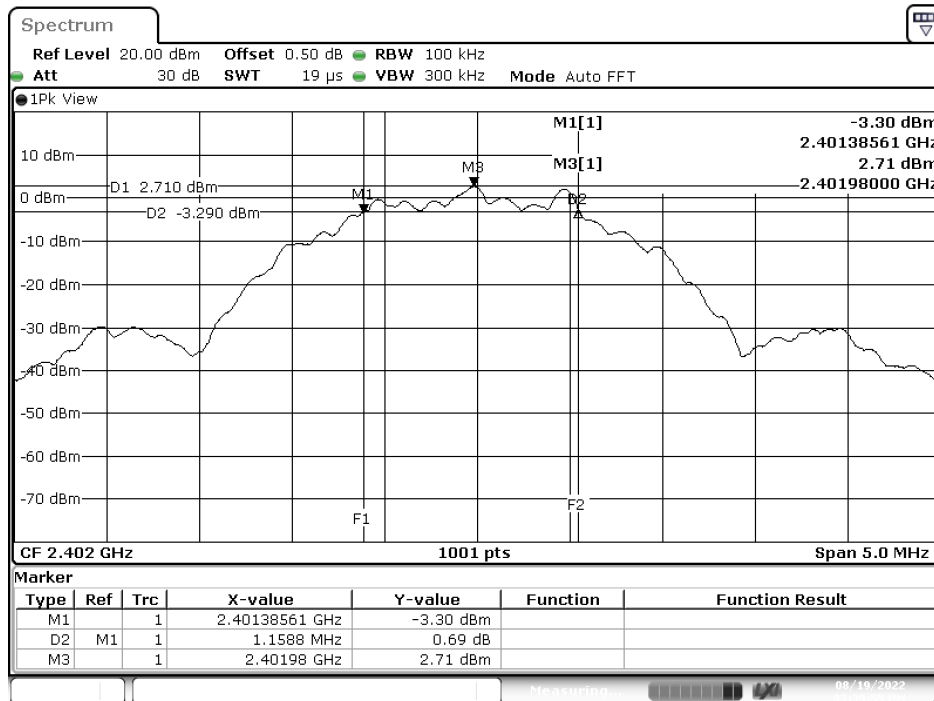


Date: 19.AUG.2022 15:31:42

Product : Secured Network Extension Device
 Test Item : 6dB Bandwidth Data
 Test Mode : Transmit - 2Mbps-BLE
 Test Date : 2022/08/19

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1159	>500	Pass
19	2440	1159	>500	Pass
38	2478	1171	>500	Pass
39	2480	1159	>500	Pass

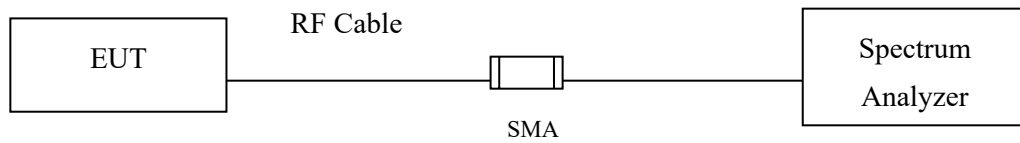
Figure Channel 00:



Date: 19.AUG.2022 15:39:56

8. Power Density

8.1. Test Setup



8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

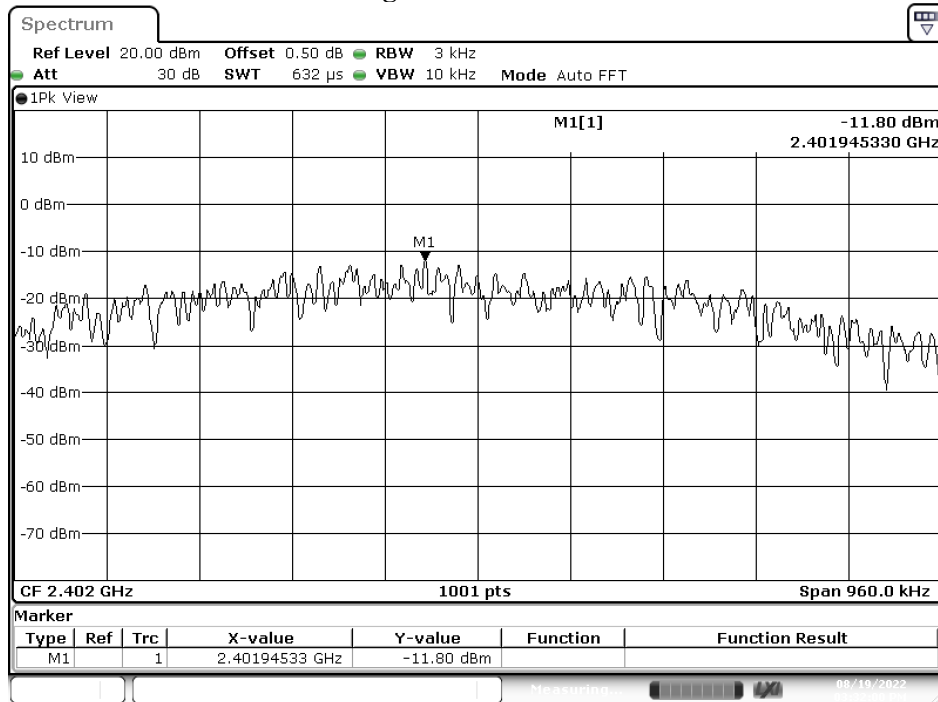
The maximum power spectral density using C63.10 Section 11.10.2 Method PKPSD (peak PSD)

8.4. Test Result of Power Density

Product : Secured Network Extension Device
 Test Item : Power Density Data
 Test Mode : Transmit - 1Mbps-BLE
 Test Date : 2022/08/19

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-11.80	≤ 8dBm	Pass
19	2440	-12.04	≤ 8dBm	Pass
39	2480	-12.45	≤ 8dBm	Pass

Figure Channel 00:

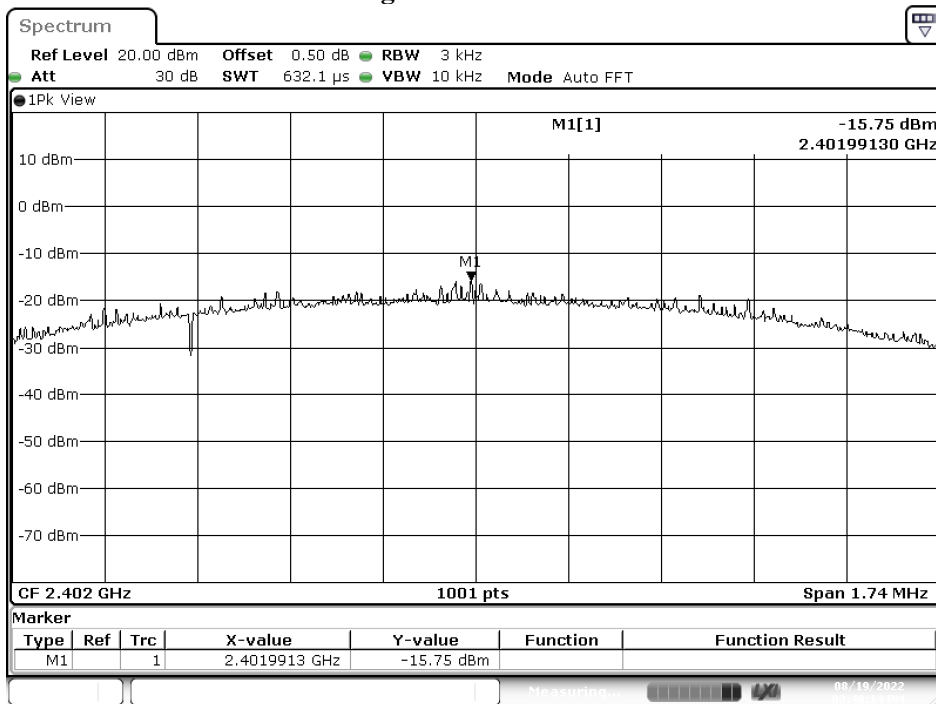


Date: 19.AUG.2022 15:32:01

Product : Secured Network Extension Device
 Test Item : Power Density Data
 Test Mode : Transmit - 2Mbps-BLE
 Test Date : 2022/08/19

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-15.75	≤ 8dBm	Pass
19	2440	-16.00	≤ 8dBm	Pass
38	2478	-17.07	≤ 8dBm	Pass
39	2480	-18.33	≤ 8dBm	Pass

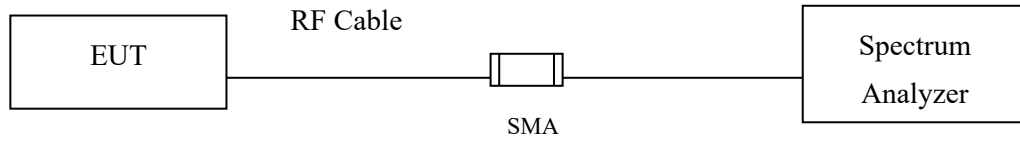
Figure Channel 00:



Date: 19.AUG.2022 15:40:14

9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to ANSI C63.10 2013 for compliance to FCC 47CFR 15.247 requirements.

9.3. Test Result of Duty Cycle

Product : Secured Network Extension Device
Test Item : Duty Cycle

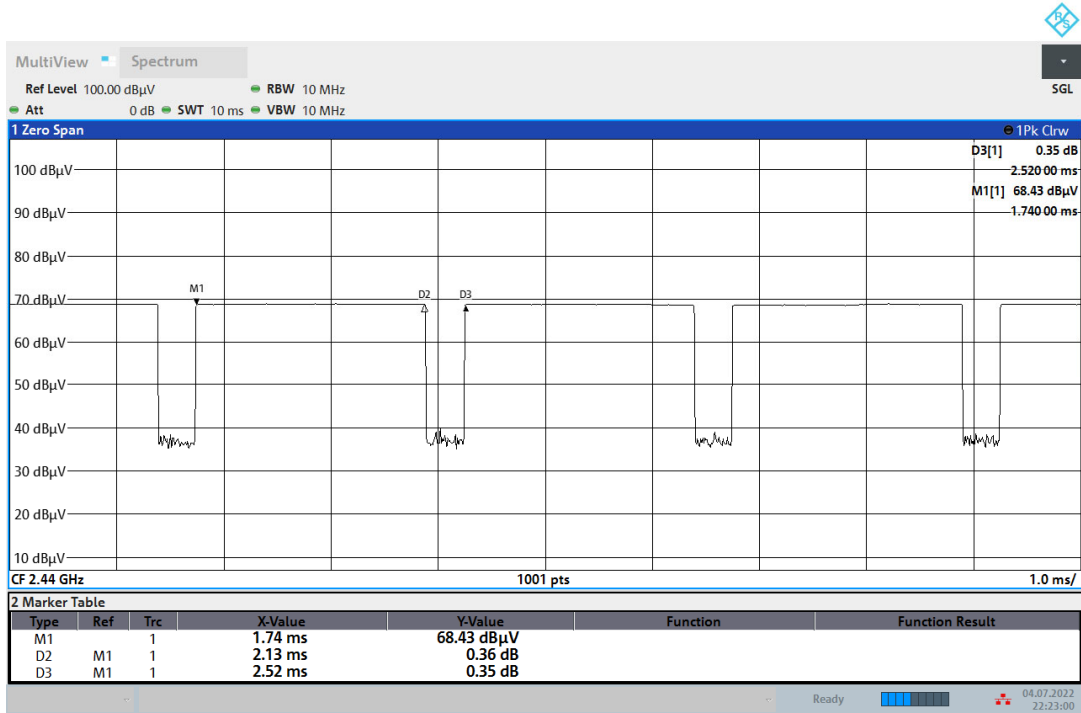
Formula:

Duty Cycle = $T_{on} / (T_{on} + T_{off})$

Duty Factor = $10 \text{ Log } (1/\text{Duty Cycle})$

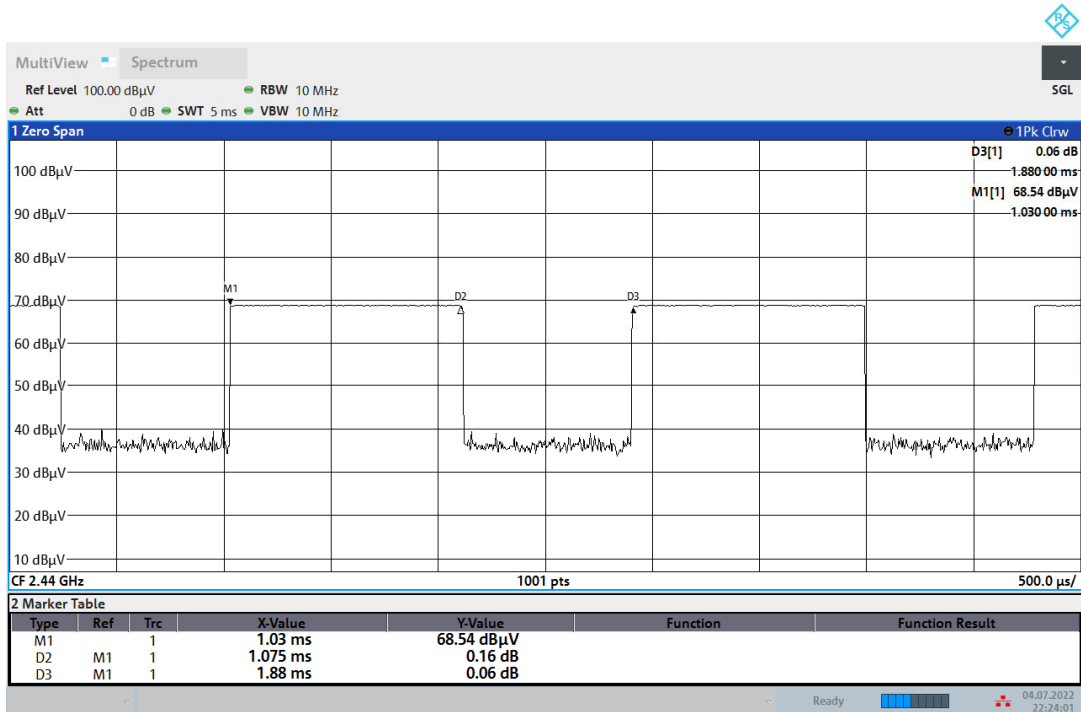
2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE (1M)	2.1300	2.5200	84.52	0.73
BLE (2M)	1.0750	1.8800	57.18	2.43

BLE (1M)



22:23:00 04.07.2022

BLE (2M)



22:24:01 04.07.2022