Microtest
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Test Report

Report No.:	MTi221111011-05E2
Date of issue:	2023-06-01
Applicant:	IC Nexus Co. LTD.
Product:	SBC_NSD_EC
Model(s):	EC3510HL, EC3510, EC3507, EC3505, EC3510-HL, EC3510-HL-KK3, EC3507-HL, EC3507-HL-KK3, EC3505-HL, EC3505-HL-KK3, NSD3510, NSD3510-HL, NSD3510-HL-KK3, NSD3507, NSD3507-HL, NSD3507-HL-KK3, NSD3505, NSD3505-HL, NSD3505-HL-KK3, SBC3500
FCC ID:	2ACLCECNSDSBC350L60

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

Address: 101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Tel: (86-755)88850135 Fax: (86-755) 88850136 Web: www.mtitest.com E-mail: mti@51mti.com

Instructions

1. This test report shall not be partially reproduced without the written consent of the laboratory.

2. The test results in this test report are only responsible for the samples submitted

3. This test report is invalid without the seal and signature of the laboratory.

4. This test report is invalid if transferred, altered, or tampered with in any form without authorization.

5. Any objection to this test report shall be submitted to the laboratory within 15 days from the date of receipt of the report.

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Test Result Certification	
Applicant:	**IC Nexus Co. LTD.**
Address:	6F-1, No.3-2 Park Street, Nankang Software Park(NKSP), Taipei 115, Taiwan ROC
Manufacturer:	**IC Nexus Co. LTD.**
Address:	6F-1, No.3-2 Park Street, Nankang Software Park(NKSP), Taipei 115, Taiwan ROC
Product description	
Product name:	SBC_NSD_EC
Trademark:	ICNexus
Model name:	EC3510HL
Serial Model:	EC3510, EC3507, EC3505, EC3510-HL, EC3510-HL-KK3, EC3507-HL, EC3507-HL-KK3, EC3505-HL, EC3505-HL-KK3, NSD3510, NSD3510-HL, NSD3510-HL-KK3, NSD3507, NSD3507-HL, NSD3507-HL-KK3, NSD3505, NSD3505-HL, NSD3505-HL-KK3, SBC3500
Standards:	FCC 47 CFR Part 15 Subpart C
Test method:	ANSI C63.10-2013
Date of Test	
Date of test:	2023-01-11 ~ 2023-02-25
Test result:	Pass

Test Engineer : Letter. Lan.

(Letter Lan)

Reviewed By: : Leon chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of EUT

Product name:	SBC_NSD_EC
Model name:	EC3510HL
Series Model:	EC3510, EC3507, EC3505, EC3510-HL, EC3510-HL-KK3, EC3507-HL, EC3507-HL-KK3, EC3505-HL, EC3505-HL-KK3, NSD3510, NSD3510-HL, NSD3510-HL-KK3, NSD3507, NSD3507-HL, NSD3507-HL-KK3, NSD3505, NSD3505-HL, NSD3505-HL-KK3, SBC3500
Model difference:	All the models are the same circuit and module, except the model name .
Electrical rating:	Input: DC 12V/3.5A
Hardware version:	PCB0L600
Software version:	Android/Debian/Ubuntu
Accessories:	Adapter: Model: DSA-42PFB-12 1 120350 Input: 100-240V~ 50/60Hz 1.2A Output: 12V⎓3.5A, 42W
Test sample(s) number:	MTi221111011-05S1001
RF specification:	
Bluetooth version:	V5.2
Operation frequency:	2402 MHz ~ 2480 MHz
Modulation type:	GFSK
Antenna(s) information:	Antenna type: dipole antenna Antenna gain: 2.35 dBi
Max. peak conducted output power:	5.28 dBm

1.2 Description of test modes

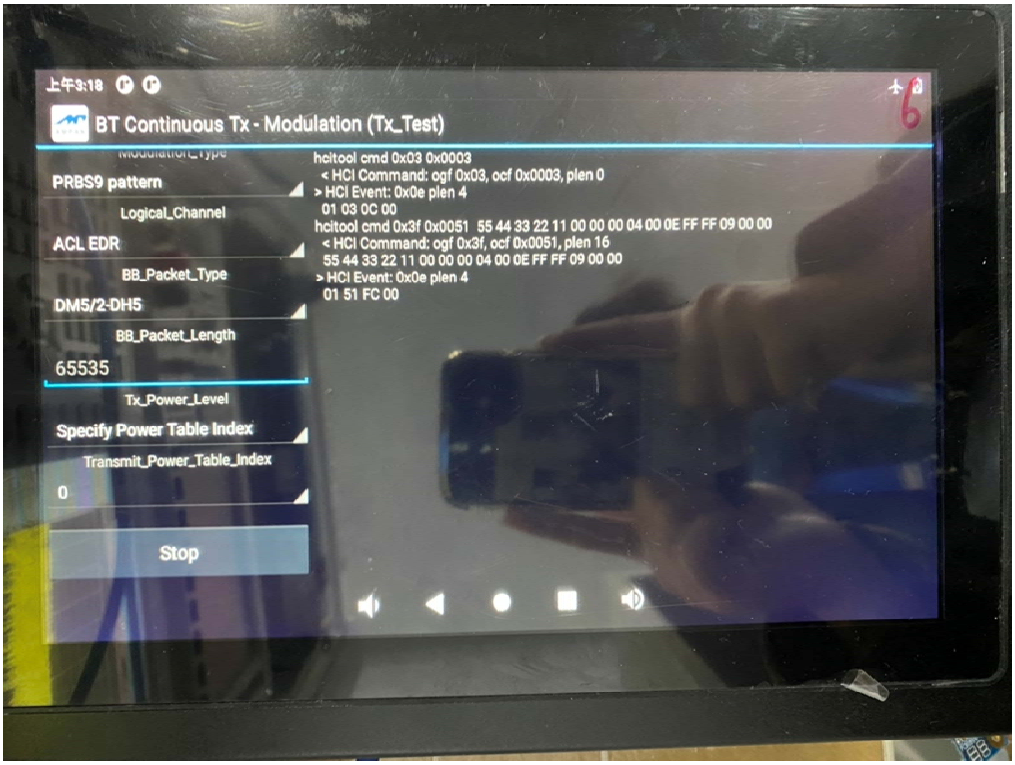
1.2.1 Operation channel list

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Note: The test software has been used to control EUT for working in engineering mode, that enables selectable channel, and capable of continuous transmitting mode.

Mode	Test Software	Ampak RFTestTool,VER:7.3		
	Channel	2402MHz	2440MHz	2480MHz
BLE_1M	Power setting	Default	Default	Default
BLE_2M		Default	Default	Default

The test software:



1.3 Environmental conditions for testing

Environment of test site:

Temperature:	15ºC~35ºC
Humidity:	20 % RH ~ 75 % RH

1.4 Description of support units

Support equipment list			
Description	Model	Serial No.	Manufacturer
phone	MATE 30	/	HUAWEI
Support cable list			
Description	Length (m)	From	To
/	/	/	/

2 Measurement uncertainty

Parameter	Measurement uncertainty
AC power line conducted emission (9 kHz~30 MHz)	±2.5 dB
Occupied Bandwidth	±3 %
Conducted RF output power	±0.16 dB
Conducted spurious emissions	±0.21 dB
Radiated emission (9 kHz ~ 30 MHz)	±4.0 dB
Radiated emission (30 MHz~1 GHz)	±4.2 dB
Radiated emission (above 1 GHz)	±4.3 dB

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

3 Summary of Test Result

No.	FCC reference	Description of test	Result
1	§ 15.203	Antenna requirement	Pass
2	§ 15.207	AC power line conducted emissions	Pass
3	§ 15.247(d), 15.209, 15.205	Radiated spurious emissions	Pass
4	§ 15.247(a)(2)	DTS bandwidth	Pass
5	§ 15.247(b)(3)	Maximum conducted output power	Pass
6	§ 15.247(e)	Power Spectral Density	Pass
7	§ 15.247(d)	Conducted emission at the band edge	Pass
8	§ 15.247(d)	Conducted spurious emissions	Pass
9	/	Duty Cycle	Pass

4 Test Laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573

5 Equipment List

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
MTi-E002	EMI Test Receiver	R&S	ESCI3	101368	2022/05/05	2023/05/04
MTi-E023	Artificial power network	Schwarzbeck	NSLK8127	NSLK8127# 841	2022/05/05	2023/05/04
MTi-E025	Artificial power network	Schwarzbeck	NSLK8127	8127183	2022/05/05	2023/05/04
MTI-E043	EMI test receiver	R&S	ESCI7	101166	2022/05/05	2023/05/04
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00044	2021/05/30	2023/05/29
MTI-E044	Broadband antenna	Schwarzbeck	VULB9163	9163-1338	2021/05/30	2023/05/29
MTI-E045	Horn antenna	Schwarzbeck	BBHA9120D	9120D-2278	2021/05/30	2023/05/29
MTI-E047	Pre-amplifier	Hewlett-Packard	8447F	3113A06184	2022/05/05	2023/05/04
MTI-E048	Pre-amplifier	Agilent	8449B	3008A01120	2022/05/05	2023/05/04
MTi-E120	Broadband antenna	Schwarzbeck	VULB9163	9163-1419	2021/05/30	2023/05/29
MTi-E121	Pre-amplifier	Hewlett-Packard	8447D	2944A09365	2022/04/15	2023/04/14
MTi-E123	Pre-amplifier	Agilent	8449B	3008A04723	2022/05/05	2023/05/04
MTi-E135	Horn antenna	Schwarzbeck	BBHA 9170	00987	2021/05/30	2023/05/29
MTi-E136	Pre-amplifier	Space-Dtronics	EWLAN1840G -G45	210405001	2022/05/05	2023/05/04
MTi-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2022/05/05	2023/05/04
MTi-E067	RF Control Unit	Tonscend	JS0806-1	19D8060152	2022/05/05	2023/05/04
MTi-E068	RF Control Unit	Tonscend	JS0806-2	19D8060153	2022/05/05	2023/05/04
MTi-E069	Band Reject Filter Group	Tonscend	JS0806-F	19D8060160	2022/05/05	2023/05/04
MTI-E010S	EMI Measurement Software	Farad	EZ-EMC Ver. EMEC-3A1	/	/	/
MTI-E014S	RF Test System	Tonscend	TS®JS1120 V2.6.88.0330	/	/	/

Note: the calibration interval of the test equipment is 12 or 24 months and the calibrations are traceable to international system unit(SI)

6 Test Result

6.1 Antenna requirement

§ 15.203 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 permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Description of the antenna of EUT

The antenna of the EUT is permanently attached.

Conclusion:

The EUT complies with the requirement of § 15.203.

6.2 AC power line conducted emissions

6.2.1 Limits

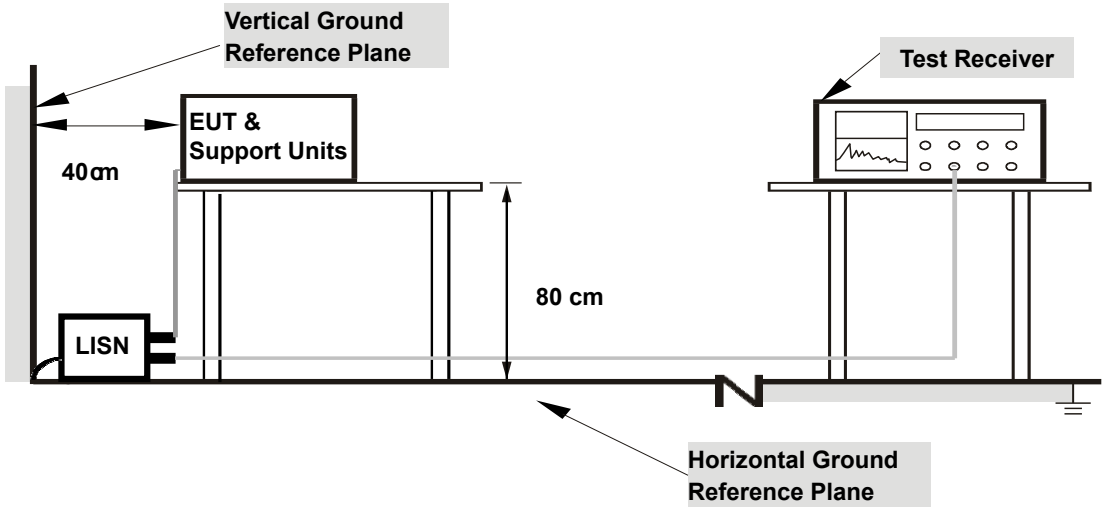
Frequency (MHz)	Detector type / Bandwidth	Limit-Quasi-peak dBµV	Limit-Average dBµV
0.15 -0.5	Average / 9 kHz	66 to 56	56 to 46
0.5 -5		56	46
5 -30		60	50

Note 1: the limit decreases with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz.

6.2.2 Test Procedures

a) Test method: ANSI C63.10-2013 Section 6.2.
b) The EUT is connected to the main power through a line impedance stabilization network (LISN). All support equipment is powered from additional LISN(s).
c) Emissions were measured on each current carrying line of the EUT using an EMI test receiver connected to the LISN powering the EUT.
d) The test receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes described in Item 1.2.
e) The test data of the worst-case condition(s) was recorded.

6.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the test setup.

6.2.4 Test Result

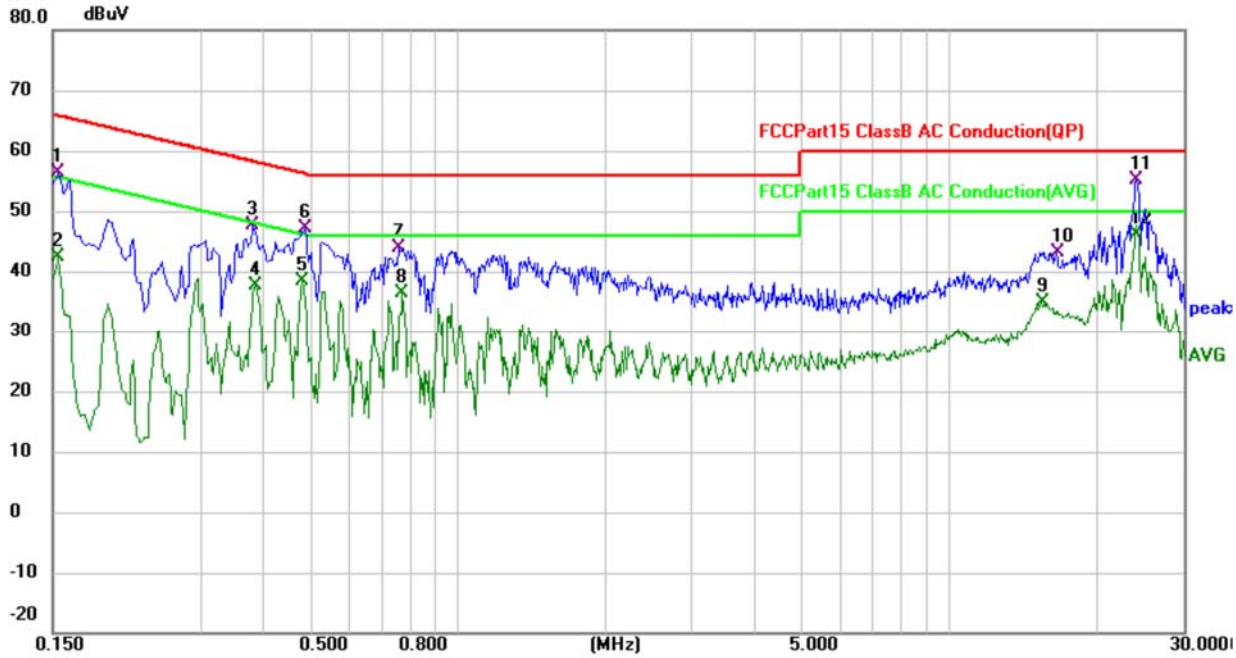
Notes:

All modes of operation of the EUT were investigated, and only the worst-case results are reported.

Calculation formula:

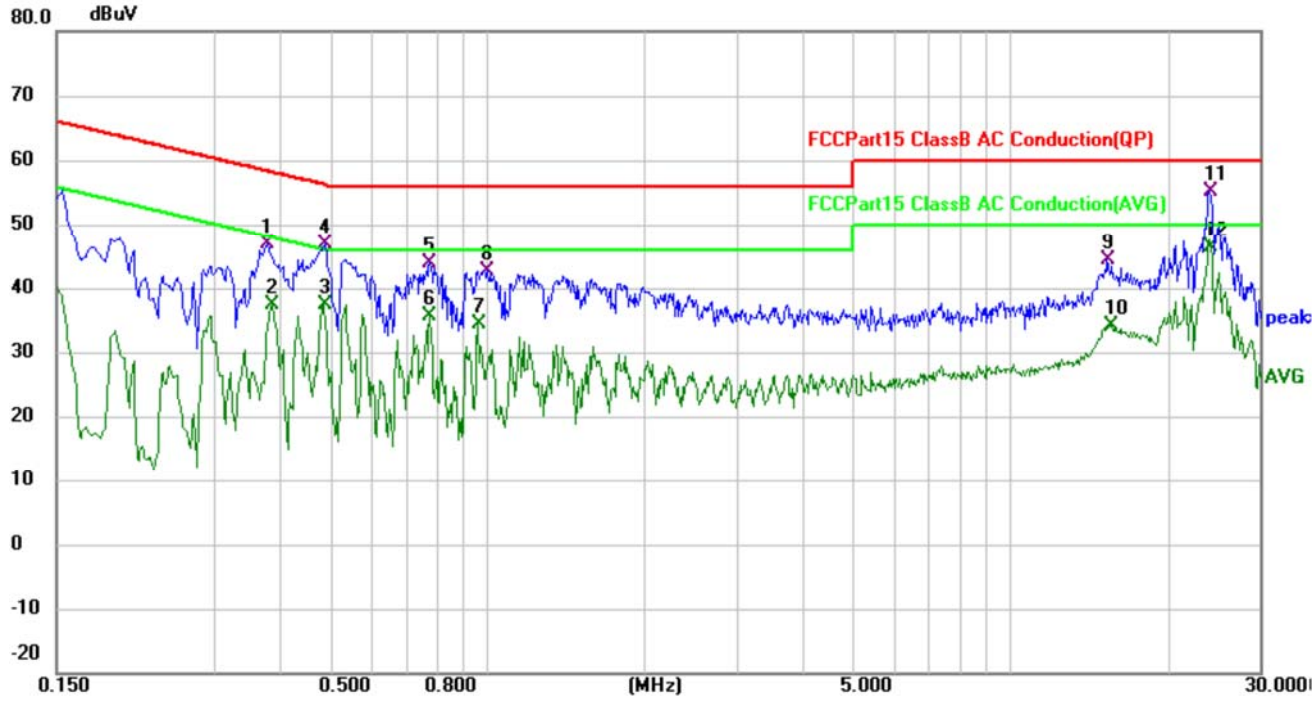
Measurement (dBµV) = Reading Level (dBµV) + Correct Factor (dB)
Over (dB) = Measurement (dBµV) – Limit (dBµV)

Test mode:	TX	Phase:	L
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



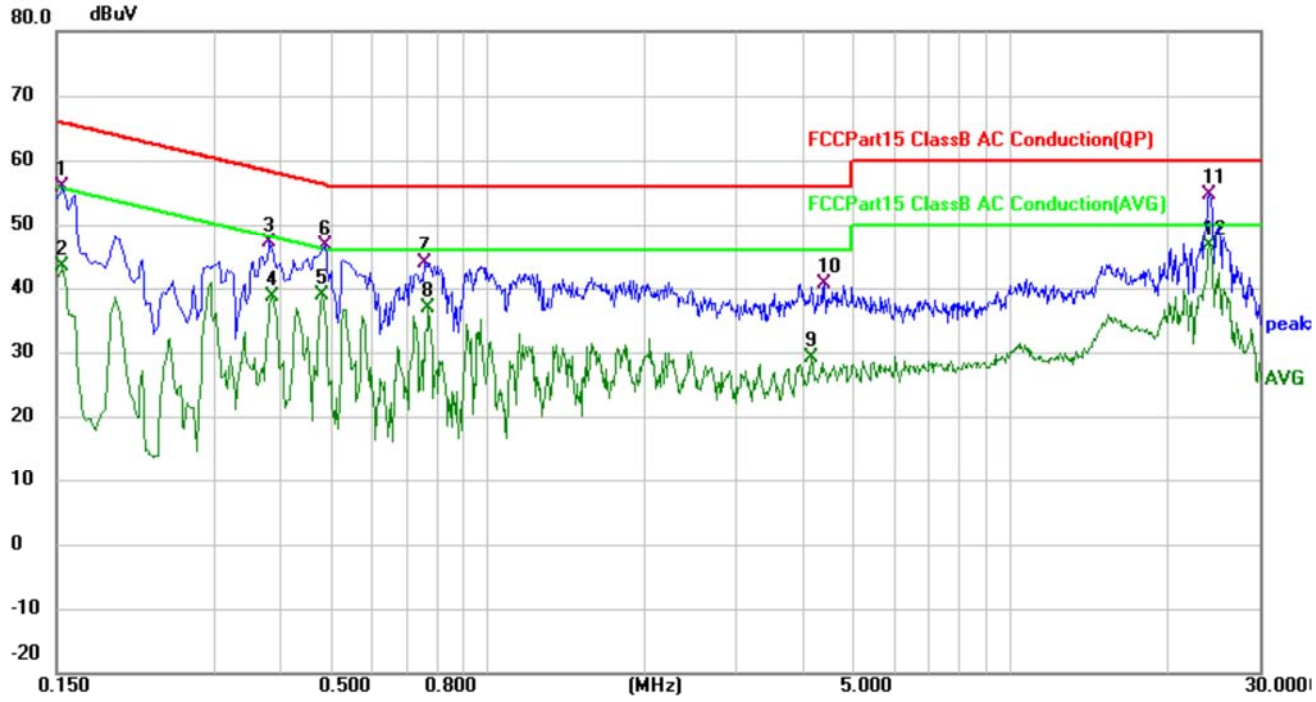
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	46.13	10.28	56.41	65.79	-9.38	QP
2		0.1539	32.13	10.28	42.41	55.79	-13.38	AVG
3		0.3820	36.70	11.05	47.75	58.24	-10.49	QP
4		0.3860	26.60	11.08	37.68	48.15	-10.47	AVG
5		0.4820	27.07	11.28	38.35	46.30	-7.95	AVG
6		0.4900	35.83	11.30	47.13	56.17	-9.04	QP
7		0.7620	32.01	11.89	43.90	56.00	-12.10	QP
8		0.7740	24.44	11.91	36.35	46.00	-9.65	AVG
9		15.4620	24.32	10.52	34.84	50.00	-15.16	AVG
10		16.5180	32.56	10.56	43.12	60.00	-16.88	QP
11		24.1140	44.26	10.75	55.01	60.00	-4.99	QP
12	*	24.1140	35.28	10.75	46.03	50.00	-3.97	AVG

Test mode:	TX	Phase:	N
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



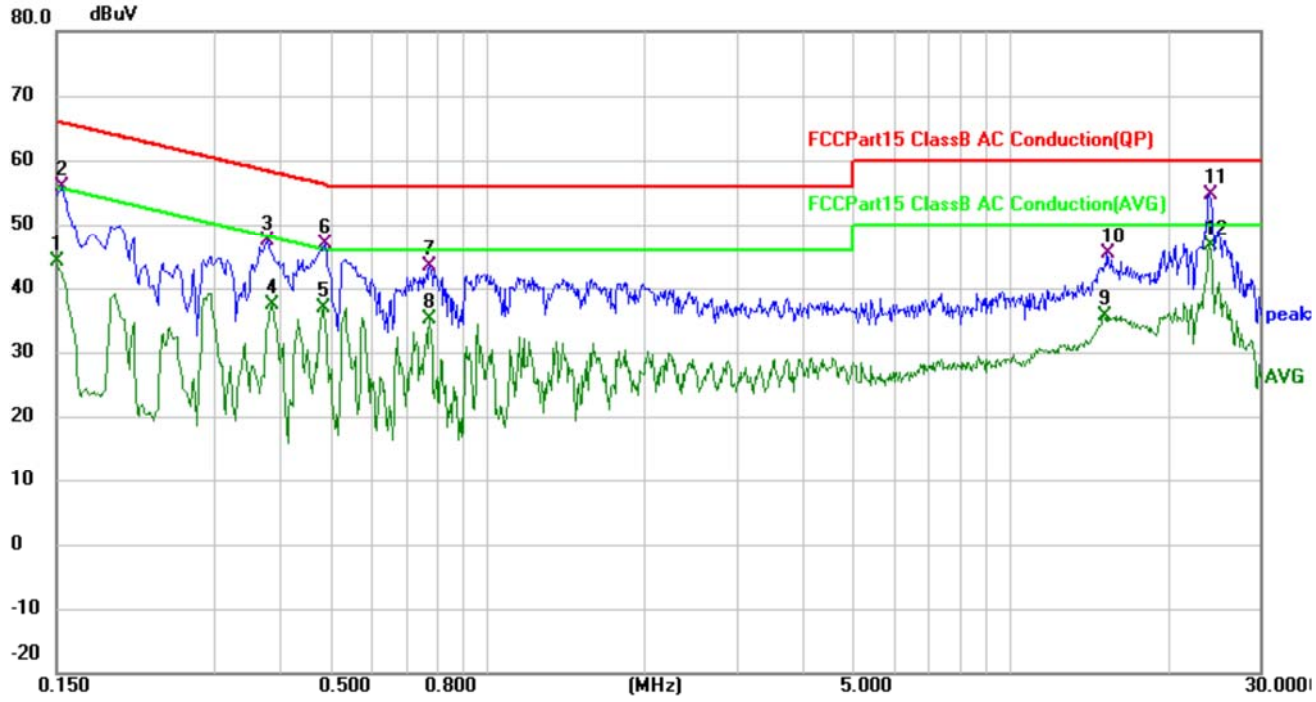
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.3780	35.87	11.00	46.87	58.32	-11.45	QP
2		0.3860	26.31	11.02	37.33	48.15	-10.82	AVG
3		0.4860	26.17	11.29	37.46	46.24	-8.78	AVG
4		0.4900	35.51	11.29	46.80	56.17	-9.37	QP
5		0.7780	31.93	11.93	43.86	56.00	-12.14	QP
6		0.7780	23.76	11.93	35.69	46.00	-10.31	AVG
7		0.9620	22.06	12.26	34.32	46.00	-11.68	AVG
8		1.0020	30.42	12.33	42.75	56.00	-13.25	QP
9		15.3220	33.88	10.51	44.39	60.00	-15.61	QP
10		15.6140	23.63	10.51	34.14	50.00	-15.86	AVG
11		24.0660	44.26	10.77	55.03	60.00	-4.97	QP
12	*	24.0660	35.60	10.77	46.37	50.00	-3.63	AVG

Test mode:	TX	Phase:	L
Power supply:	Power by AC/DC adapter (AC 240V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	45.63	10.28	55.91	65.79	-9.88	QP
2		0.1539	33.13	10.28	43.41	55.79	-12.38	AVG
3		0.3820	36.20	11.05	47.25	58.24	-10.99	QP
4		0.3860	27.60	11.08	38.68	48.15	-9.47	AVG
5		0.4818	27.57	11.28	38.85	46.31	-7.46	AVG
6		0.4900	35.33	11.30	46.63	56.17	-9.54	QP
7		0.7620	32.01	11.89	43.90	56.00	-12.10	QP
8		0.7740	24.94	11.91	36.85	46.00	-9.15	AVG
9		4.1577	18.86	10.26	29.12	46.00	-16.88	AVG
10		4.4218	30.41	10.26	40.67	56.00	-15.33	QP
11		24.1140	43.82	10.75	54.57	60.00	-5.43	QP
12	*	24.1140	35.96	10.75	46.71	50.00	-3.29	AVG

Test mode:	TX	Phase:	N
Power supply:	Power by AC/DC adapter (AC 240V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	33.76	10.29	44.05	56.00	-11.95	AVG
2		0.1539	45.64	10.28	55.92	65.79	-9.87	QP
3		0.3780	36.37	11.00	47.37	58.32	-10.95	QP
4		0.3860	26.31	11.02	37.33	48.15	-10.82	AVG
5		0.4858	25.67	11.29	36.96	46.24	-9.28	AVG
6		0.4900	35.51	11.29	46.80	56.17	-9.37	QP
7		0.7780	31.43	11.93	43.36	56.00	-12.64	QP
8		0.7780	23.26	11.93	35.19	46.00	-10.81	AVG
9		15.0977	25.21	10.49	35.70	50.00	-14.30	AVG
10		15.3217	34.88	10.51	45.39	60.00	-14.61	QP
11		24.0658	43.76	10.77	54.53	60.00	-5.47	QP
12	*	24.0658	35.85	10.77	46.62	50.00	-3.38	AVG

6.3 Radiated spurious emission

6.3.1 Limits

§ 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 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)).

§ 15.209 Radiated emission limits at restricted bands:

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

Note 1: the tighter limit applies at the band edges.
Note 2: the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector

§ 15.35 (b) requirements:
When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

According to ANSI C63.10-2013, the tests shall be performed in the frequency range shown in the following table:

Frequency range of measurements for unlicensed wireless device

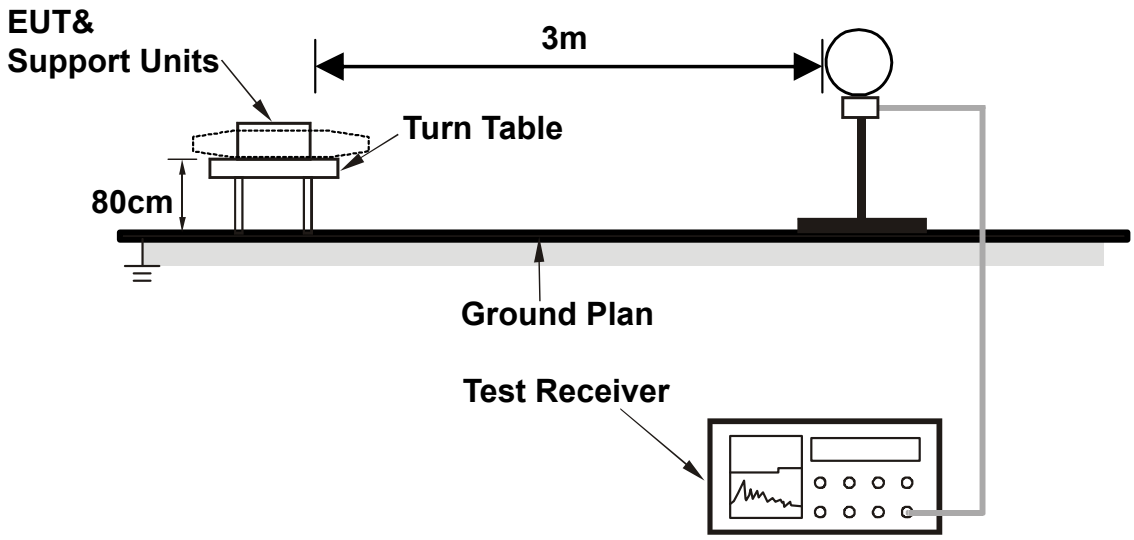
Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

Frequency range of measurements for unlicensed wireless device with digital device

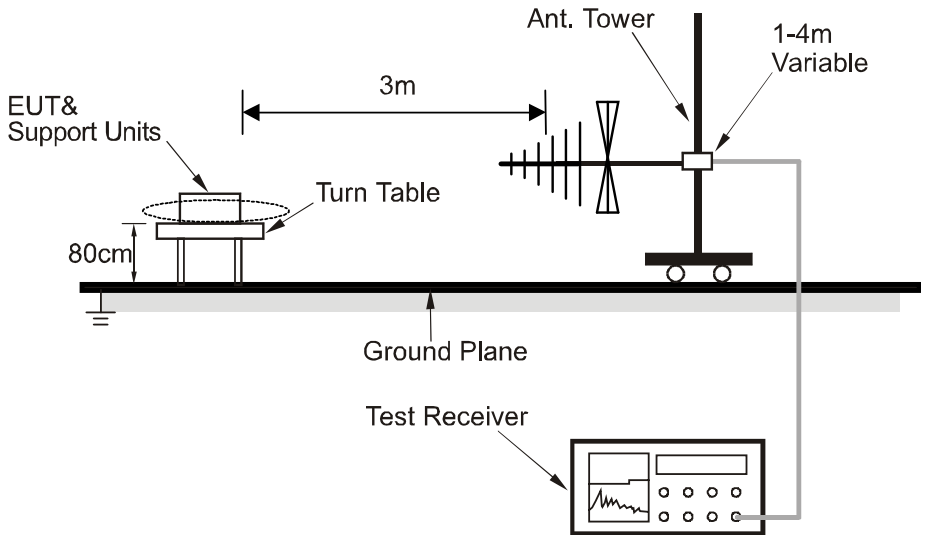
Highest frequency generated or used in the device or on which the device operates or tunes	Upper frequency range of measurement
Below 1.705 MHz	30 MHz
1.705 MHz to 108 MHz	1000 MHz
108 MHz to 500 MHz	2000 MHz
500 MHz to 1000 MHz	5000 MHz
Above 1000 MHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower

6.3.2 Test setup

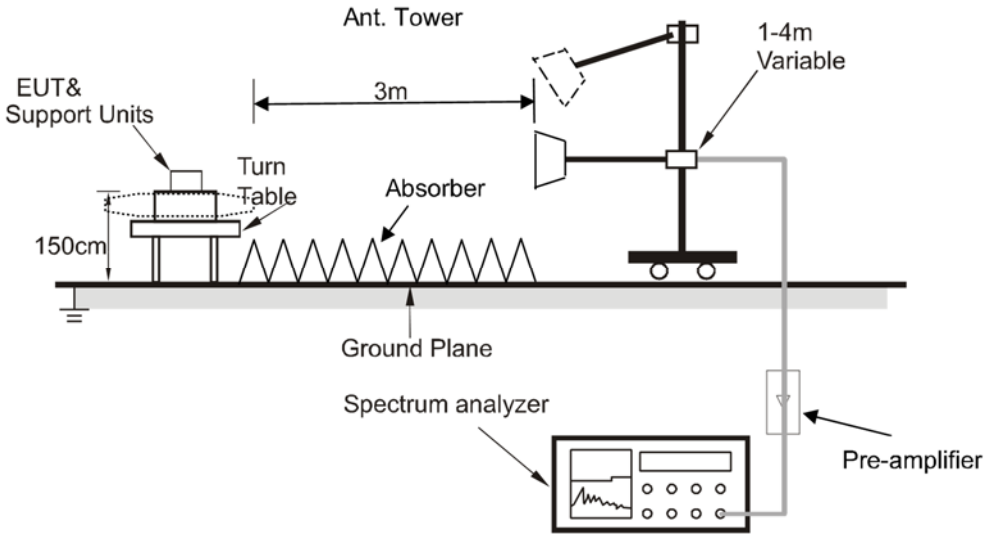
Below 30MHz:



30MHz~1GHz:



Above 1GHz:



For the actual test configuration, please refer to the related item – Photographs of the test setup.

6.3.3 Test procedure

a) Test method: ANSI C63.10-2013 Section 6.3, 6.4, 6.5, 6.6, 11.11, 11.12, 11.13.
b) The EUT is placed on an on-conducting table 0.8 meters above the ground plane for measurement below 1GHz, 1.5 meters above the ground plane for measurement above 1GHz.
c) Emission blew 18 GHz were measured at a 3 meters test distance, above 18 GHz were measured at 1-meter test distance with the application of a distance correction factor
d) The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Test instrument setup

Frequency	Test receiver / Spectrum analyzer setting
9 kHz ~ 150 kHz	Quasi Peak / RBW: 200 Hz
150 kHz ~ 30 MHz	Quasi Peak / RBW: 9 kHz
30 MHz ~ 1 GHz	Quasi Peak / RBW: 120 kHz
Above 1 GHz	Peak / RBW: 1 MHz, VBW: 3MHz, Peak detector AVG / RBW: 1 MHz, VBW: 3MHz, Average detector

6.3.4 Test results

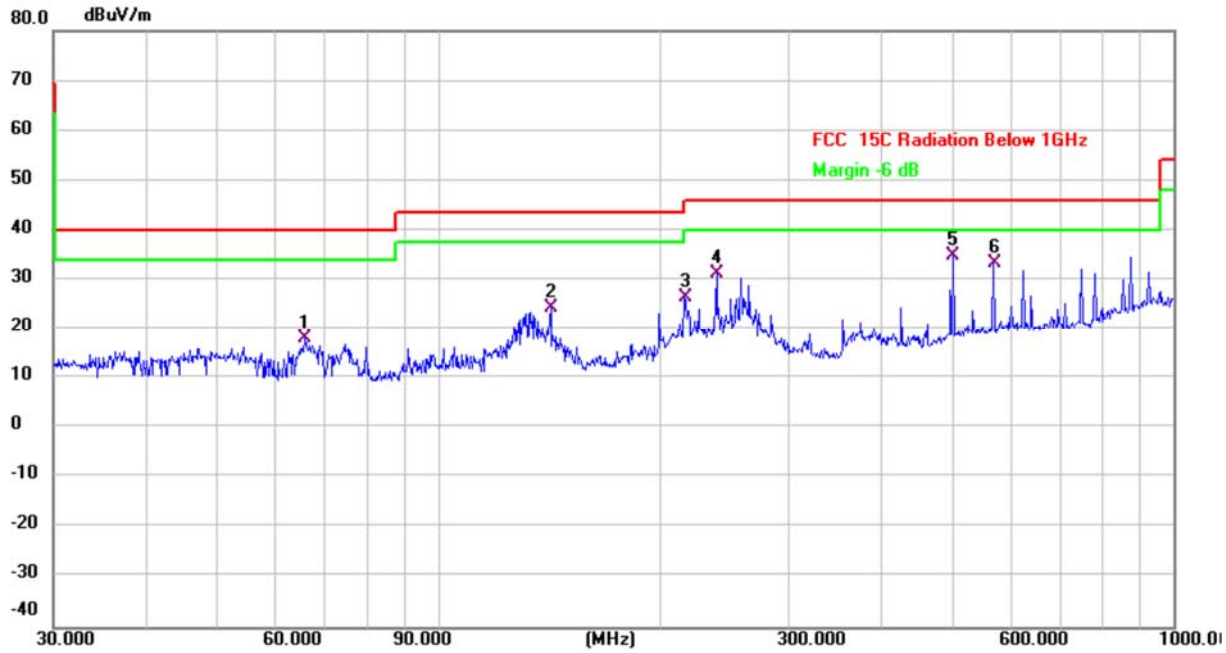
Notes:

The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.
All modes of operation of the EUT were investigated, and only the worst-case results are reported.
There were no emissions found below 30MHz within 20dB of the limit.

Calculation formula:
Measurement (dBμV/m) = Reading Level (dBμV) + Correct Factor (dB/m)
Over (dB) = Measurement (dBμV/m) – Limit (dBμV/m)

Radiated emissions between 30MHz – 1GHz

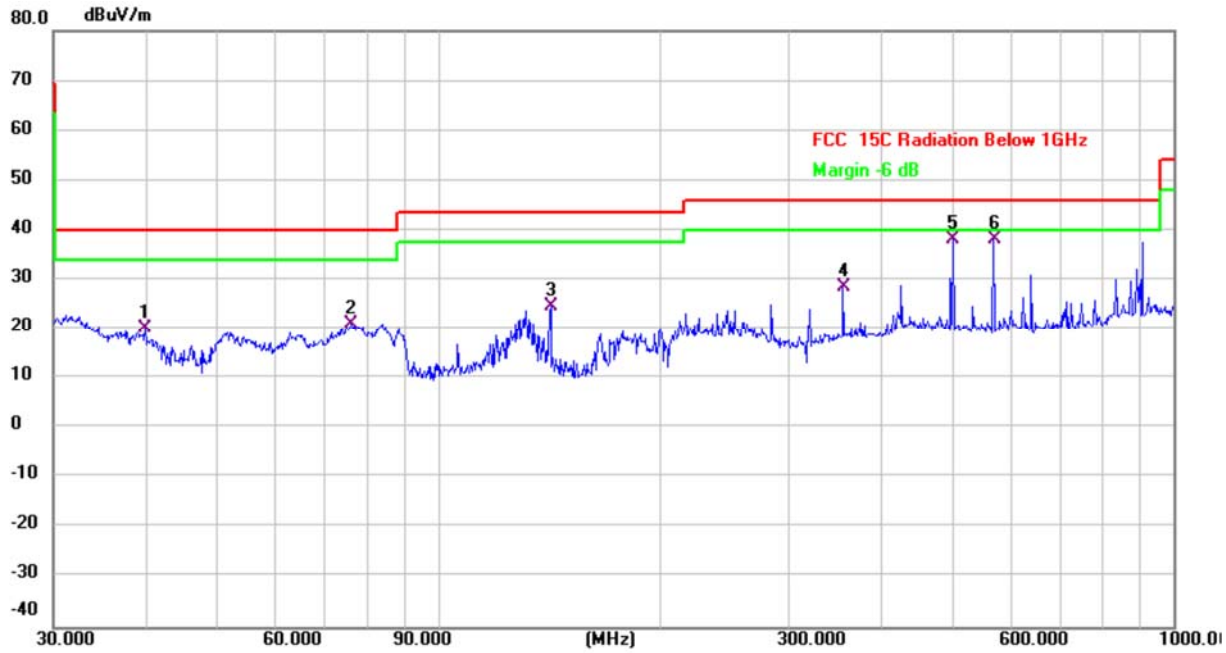
Test mode:	BLE 1Mbps – 2480 MHz TX mode	Polarization:	Horizontal
Power supply:	DC 12V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		66.0342	29.51	-11.46	18.05	40.00	-21.95	QP
2		142.3243	37.21	-12.79	24.42	43.50	-19.08	QP
3		216.0240	35.75	-9.40	26.35	46.00	-19.65	QP
4		239.1473	39.72	-8.57	31.15	46.00	-14.85	QP
5	*	501.1790	39.60	-4.84	34.76	46.00	-11.24	QP
6		568.6127	36.67	-3.30	33.37	46.00	-12.63	QP

Radiated emissions between 30MHz – 1GHz

Test mode:	BLE 1Mbps – 2480 MHz TX mode	Polarization:	Vertical
Power supply:	DC 12V	Test site:	RE chamber 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		39.9942	30.27	-10.11	20.16	40.00	-19.84	QP
2		76.2442	32.78	-11.71	21.07	40.00	-18.93	QP
3		142.3243	37.47	-12.79	24.68	43.50	-18.82	QP
4		355.4273	35.66	-7.06	28.60	46.00	-17.40	QP
5	*	501.1790	43.07	-4.84	38.23	46.00	-7.77	QP
6		568.6127	41.35	-3.30	38.05	46.00	-7.95	QP

Radiated emissions 1 GHz ~ 25 GHz

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
BLE 1Mbps - 2402 MHz TX mode							
4804.000	41.97	1.52	43.49	74.00	-30.51	Peak	V
4804.000	35.64	1.52	37.16	54.00	-16.84	AVG	V
7206.000	41.25	5.46	46.71	74.00	-27.29	Peak	V
7206.000	34.82	5.46	40.28	54.00	-13.72	AVG	V
9608.000	41.65	6.33	47.98	74.00	-26.02	Peak	V
9608.000	34.96	6.33	41.29	54.00	-12.71	AVG	V
4804.000	41.50	1.52	43.02	74.00	-30.98	Peak	H
4804.000	35.58	1.52	37.10	54.00	-16.90	AVG	H
7206.000	40.14	5.46	45.60	74.00	-28.40	Peak	H
7206.000	33.86	5.46	39.32	54.00	-14.68	AVG	H
9608.000	41.71	6.33	48.04	74.00	-25.96	Peak	H
9608.000	35.72	6.33	42.05	54.00	-11.95	AVG	H
BLE 1Mbps - 2440 MHz TX mode							
4880.000	41.29	1.68	42.97	74.00	-31.03	Peak	V
4880.000	34.59	1.68	36.27	54.00	-17.73	AVG	V
7320.000	41.22	5.45	46.67	74.00	-27.33	Peak	V
7320.000	34.74	5.45	40.19	54.00	-13.81	AVG	V
9760.000	41.58	6.37	47.95	74.00	-26.05	Peak	V
9760.000	35.19	6.37	41.56	54.00	-12.44	AVG	V
4880.000	41.08	1.68	42.76	74.00	-31.24	Peak	H
4880.000	34.71	1.68	36.39	54.00	-17.61	AVG	H
7320.000	41.25	5.45	46.70	74.00	-27.30	Peak	H
7320.000	35.09	5.45	40.54	54.00	-13.46	AVG	H
9760.000	42.37	6.37	48.74	74.00	-25.26	Peak	H
9760.000	35.91	6.37	42.28	54.00	-11.72	AVG	H

Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
BLE 1Mbps - 2480 MHz TX mode							
4960	41.13	1.83	42.96	74.00	-31.04	Peak	V
4960	29.14	1.83	30.97	54.00	-23.03	AVG	V
7440	41.51	5.43	46.94	74.00	-27.06	Peak	V
7440	29.49	5.43	34.92	54.00	-19.08	AVG	V
9920	41.28	6.41	47.69	74.00	-26.31	Peak	V
9920	29.39	6.41	35.80	54.00	-18.20	AVG	V
4960	41.41	1.83	43.24	74.00	-30.76	Peak	H
4960	29.49	1.83	31.32	54.00	-22.68	AVG	H
7440	41.57	5.43	47.00	74.00	-27.00	Peak	H
7440	29.27	5.43	34.70	54.00	-19.30	AVG	H
9920	41.38	6.41	47.79	74.00	-26.21	Peak	H
9920	29.42	6.41	35.83	54.00	-18.17	AVG	H

Radiated emissions at band edge

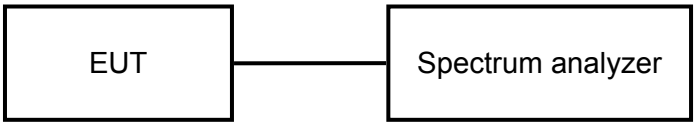
Frequency	Reading Level	Correct Factor	Measurement	Limits	Over	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
BLE 1Mbps – Low band-edge							
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	Peak/AVG	H/V
2310.000	47.59	-6.60	40.99	74.00	-33.01	Peak	V
2310.000	37.30	-6.60	30.70	54.00	-23.30	AVG	V
2390.000	47.19	-6.23	40.96	74.00	-33.04	Peak	V
2390.000	37.95	-6.23	31.72	54.00	-22.28	AVG	V
2310.000	46.69	-6.60	40.09	74.00	-33.91	Peak	H
2310.000	37.41	-6.60	30.81	54.00	-23.19	AVG	H
2390.000	50.17	-6.23	43.94	74.00	-30.06	Peak	H
2390.000	39.71	-6.23	33.48	54.00	-20.52	AVG	H
BLE 1Mbps – High band-edge							
2483.500	47.38	-5.79	41.59	74.00	-32.41	Peak	V
2483.500	37.95	-5.79	32.16	54.00	-21.84	AVG	V
2500.000	48.12	-5.72	42.40	74.00	-31.60	Peak	V
2500.000	38.45	-5.72	32.73	54.00	-21.27	AVG	V
2483.500	48.89	-5.79	43.10	74.00	-30.90	Peak	H
2483.500	38.87	-5.79	33.08	54.00	-20.92	AVG	H
2500.000	49.78	-5.72	44.06	74.00	-29.94	Peak	H
2500.000	39.86	-5.72	34.14	54.00	-19.86	AVG	H

6.4 DTS bandwidth

6.4.1 Limits

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.4.2 Test setup



6.4.3 Test procedures

Test method: ANSI C63.10-2013 Section 11.8.1

6.4.4 Test results

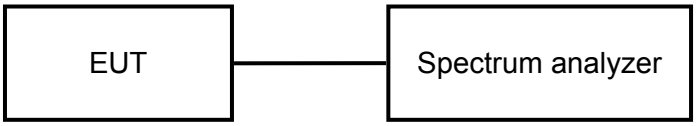
Note: See the appendix A

6.5 Maximum conducted output power

6.5.1 Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

6.5.2 Test setup



6.5.3 Test procedure

Test method for peak power: ANSI C63.10-2013 Section 11.9.1.1
Test method for average power: ANSI C63.10-2013 Section 11.9.2.3.1 Method AVGPM

6.5.4 Test results

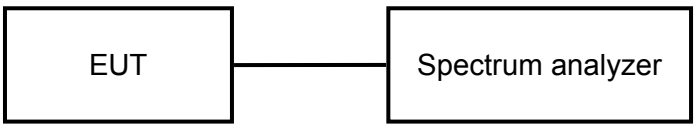
Note: see the appendix B

6.6 Power spectral density

6.6.1 Limit

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

6.6.2 Test setup



6.6.3 Test Procedure

Test method: ANSI C63.10-2013 Section 11.10.2

6.6.4 Test Results

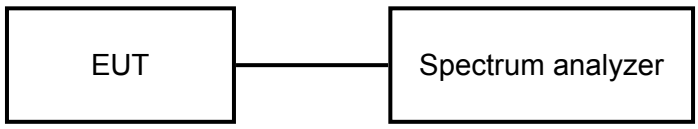
Note: see the appendix C

6.7 Band edge (Conducted)

6.7.1 Limits

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)).

6.7.2 Test setup



6.7.3 Test procedure

Test method: ANSI C63.10-2013 Section 11.13

6.7.4 Test results

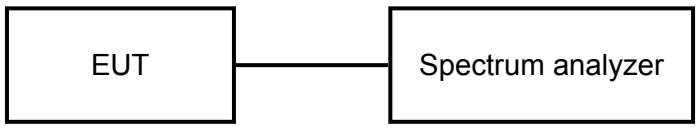
Note: see the appendix D

6.8 Conducted spurious emissions

6.8.1 Limits

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)).

6.8.2 Test setup



6.8.3 Test procedure

Test method: ANSI C63.10-2013 Section 11.11

6.8.4 Test results

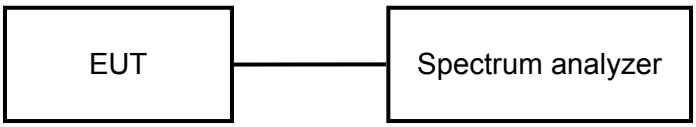
Note: see the appendix E

6.9 Duty Cycle

6.9.1 Conformance Limit

None, for reporting purposes only.

6.9.2 Test setup



6.9.3 Test procedure

Test method: KDB 558074 section 6, zero-span spectrum analyzer method.

6.9.4 Test Results

Note: see the appendix F

Appendix A: DTS Bandwidth

Test Result

Test Mode	Antenna	Frequency [MHz]	DTS BW [MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	0.692	0.5	PASS
		2440	0.692	0.5	PASS
		2480	0.708	0.5	PASS
BLE_2M	Ant1	2402	1.104	0.5	PASS
		2440	1.104	0.5	PASS
		2480	1.108	0.5	PASS

Test Graphs

BLE_1M_Ant1_2402

BLE_1M_Ant1_2440

BLE_1M_Ant1_2480

BLE_2M_Ant1_2402

BLE_2M_Ant1_2440

BLE_2M_Ant1_2480

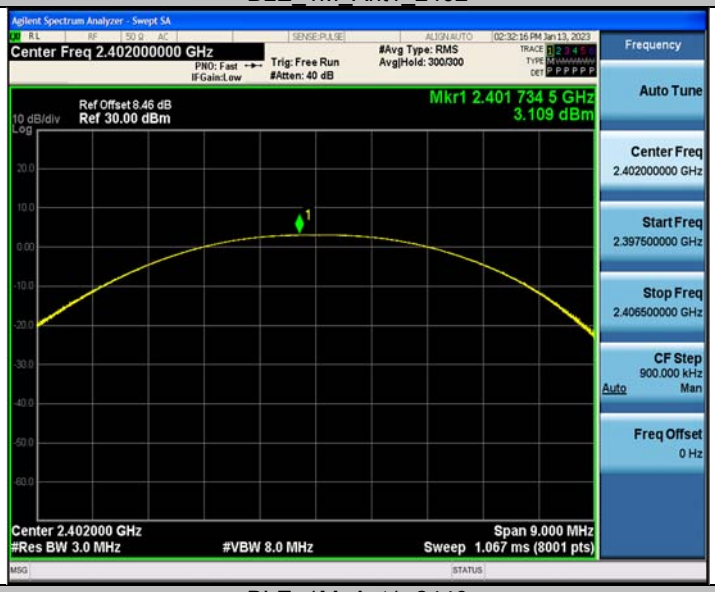
Appendix B: Maximum conducted output power

Test Result-Peak

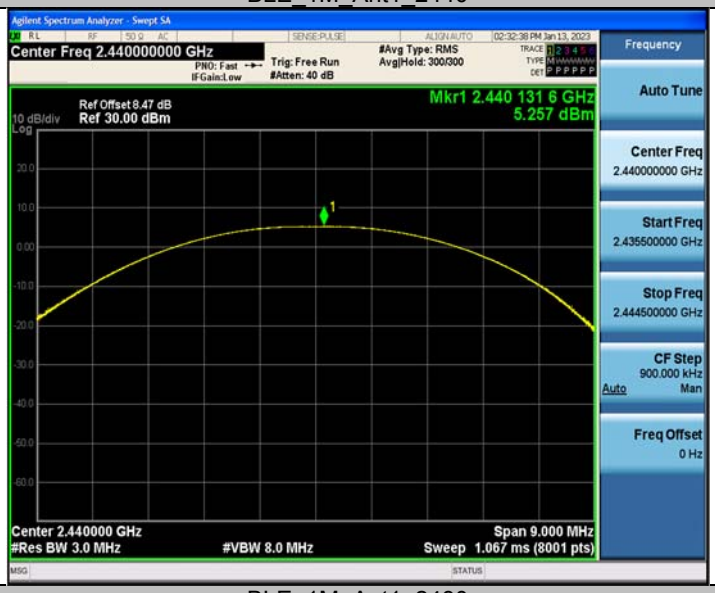
Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power [dBm]	Limit [dBm]	Verdict
BLE_1M	Ant1	2402	3.11	≤30	PASS
		2440	5.26	≤30	PASS
		2480	4.49	≤30	PASS
BLE_2M	Ant1	2402	3.12	≤30	PASS
		2440	5.28	≤30	PASS
		2480	4.57	≤30	PASS

Test Graphs

BLE_1M_Ant1_2402

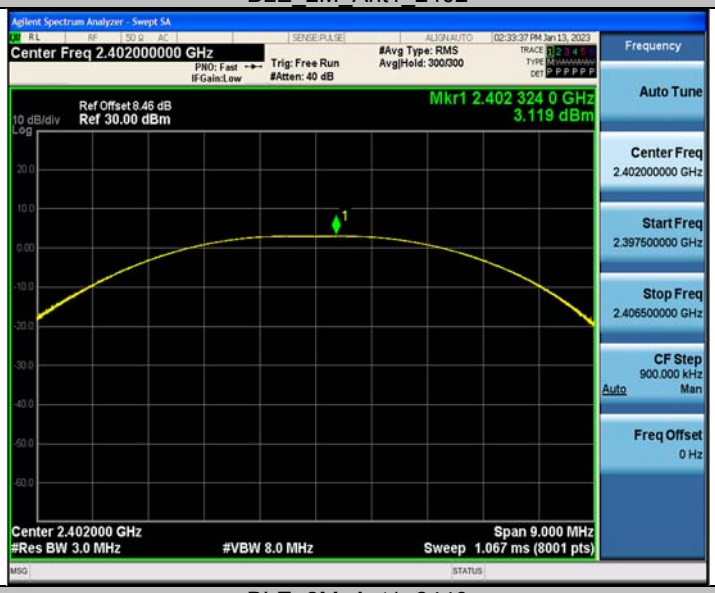


BLE_1M_Ant1_2440

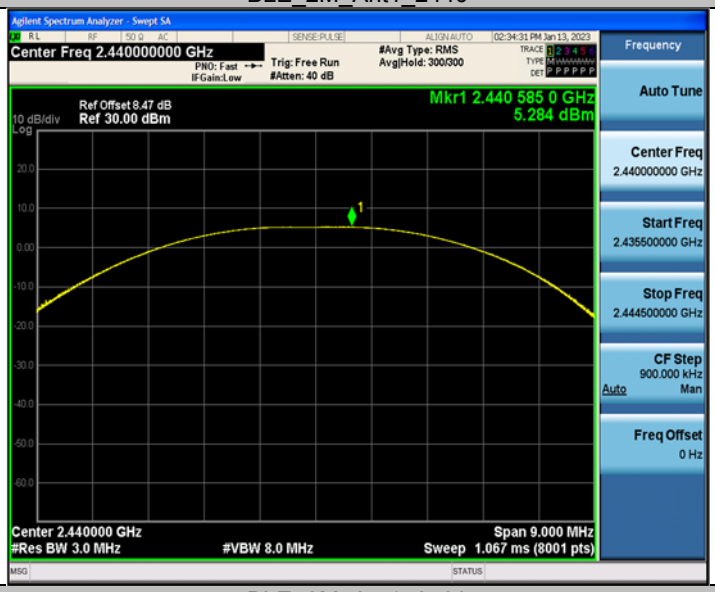


BLE_1M_Ant1_2480

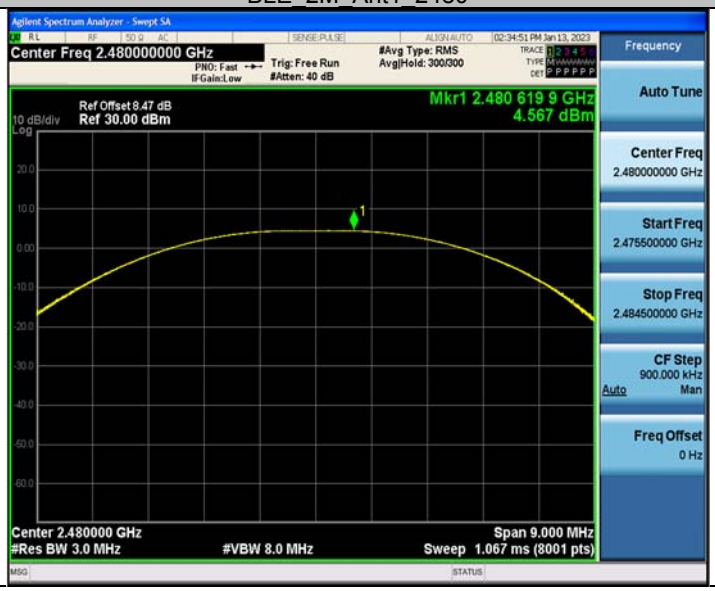
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



Appendix C: Maximum power spectral density

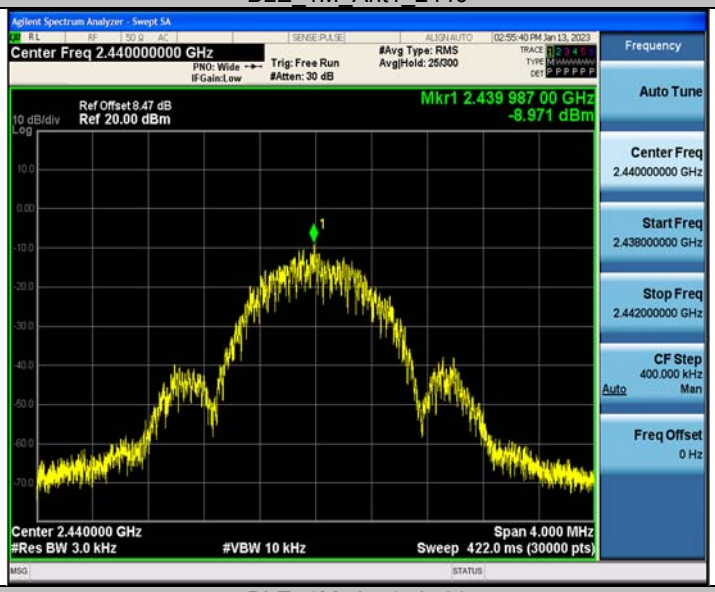
Test Result

Test Mode	Antenna	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-9.28	≤8.00	PASS
		2440	-8.97	≤8.00	PASS
		2480	-9.8	≤8.00	PASS
BLE_2M	Ant1	2402	-13.81	≤8.00	PASS
		2440	-11.7	≤8.00	PASS
		2480	-12.47	≤8.00	PASS

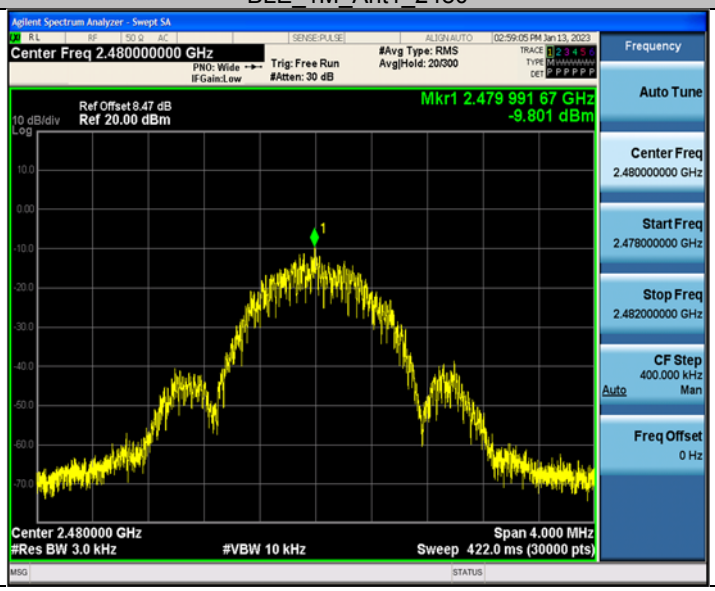
Test Graphs

BLE_1M_Ant1_2402

BLE_1M_Ant1_2440

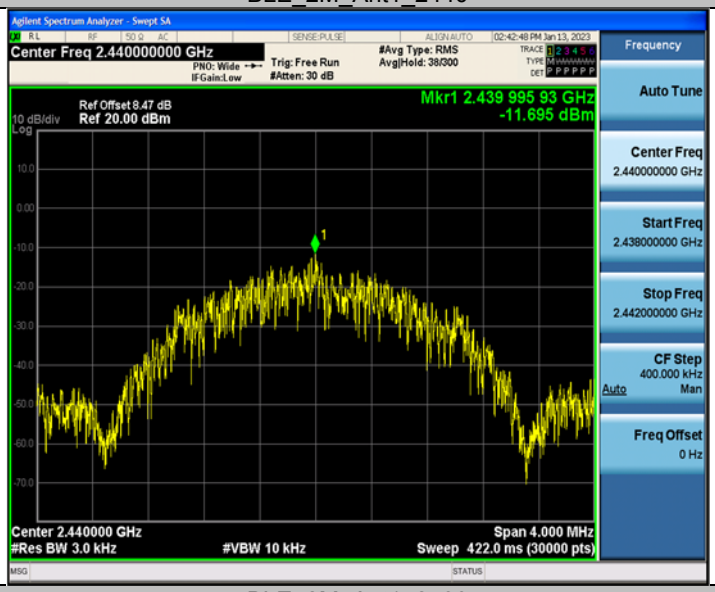


BLE_1M_Ant1_2480



BLE_2M_Ant1_2402

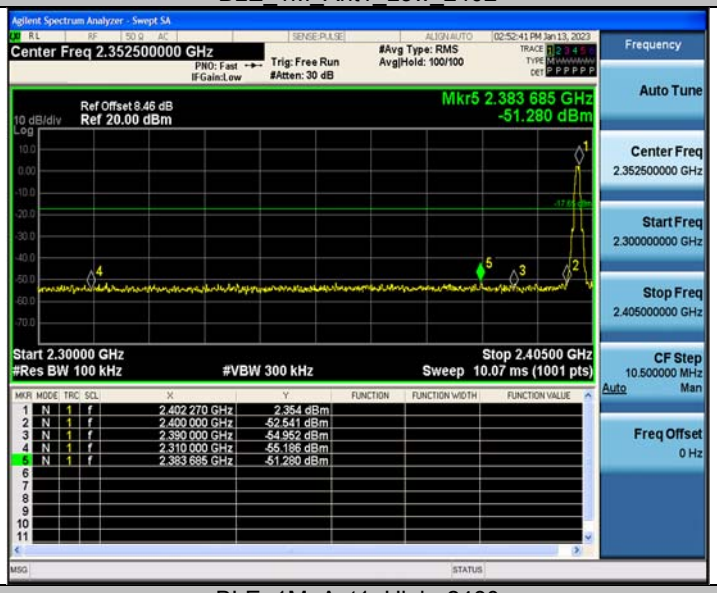
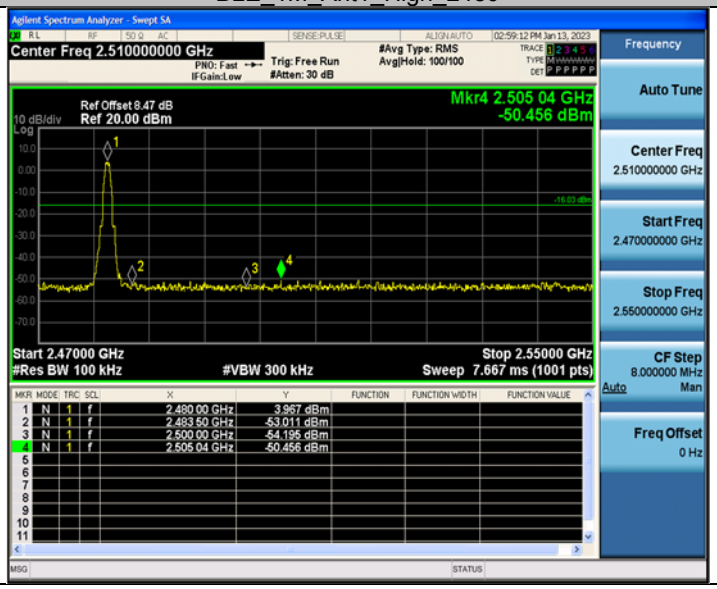
BLE_2M_Ant1_2440

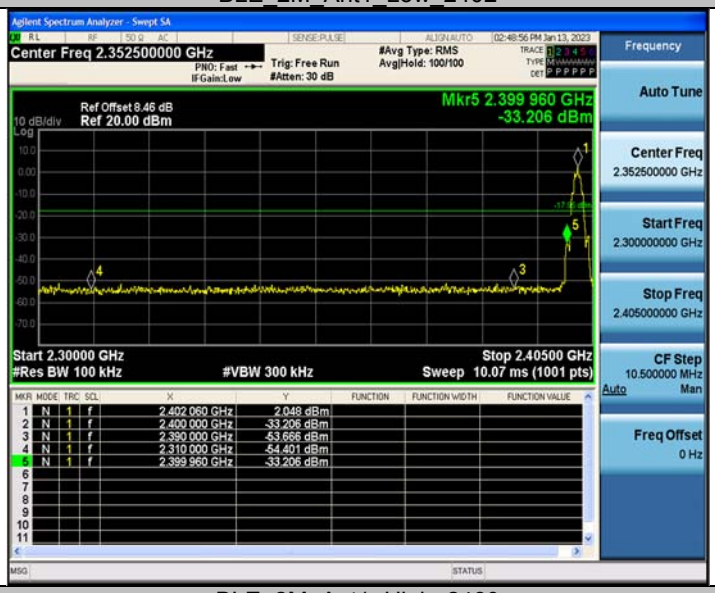
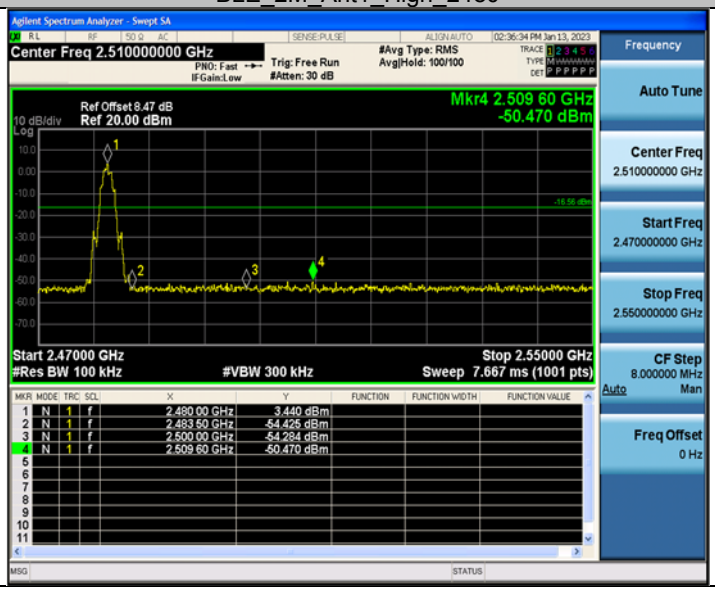


BLE_2M_Ant1_2480

Appendix D: Band edge measurements

Test Graphs

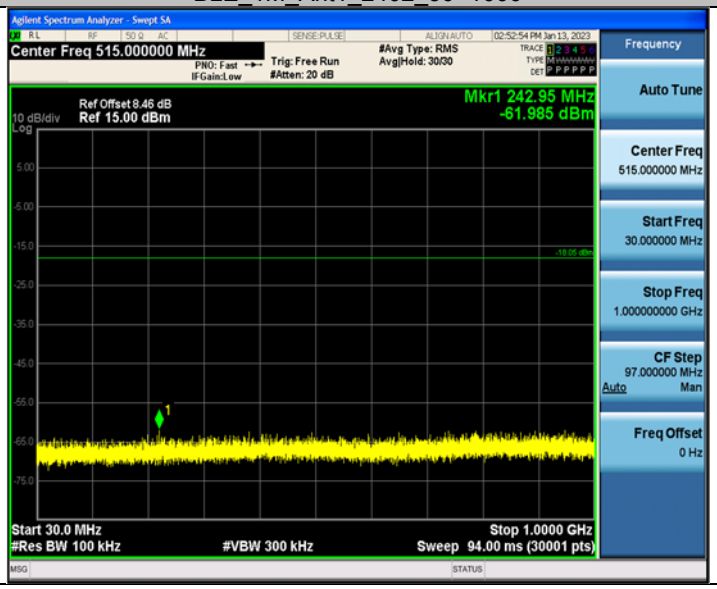
BLE_1M_Ant1_Low_2402

BLE_1M_Ant1_High_2480


BLE_2M_Ant1_Low_2402

BLE_2M_Ant1_High_2480


Appendix E: Conducted Spurious Emission

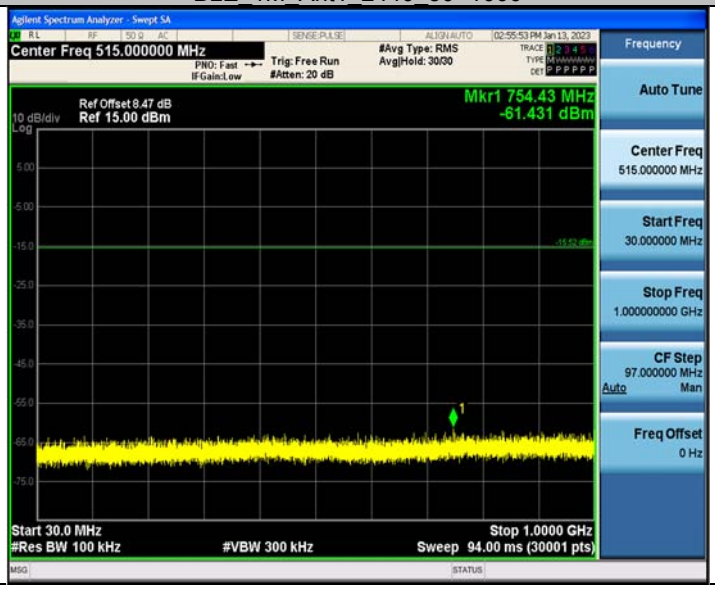
Test Graphs

BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000


BLE_1M_Ant1_2402_1000~26500

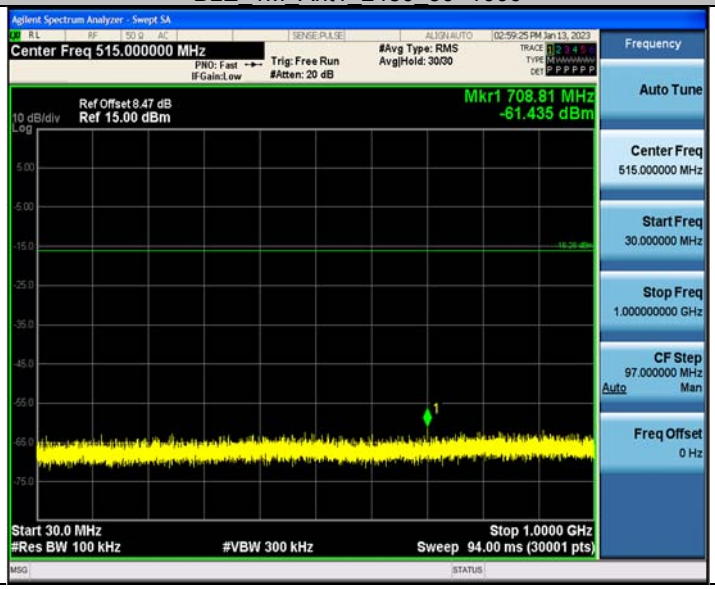
BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000


BLE_1M_Ant1_2440_1000~26500

BLE_1M_Ant1_2480_0~Reference

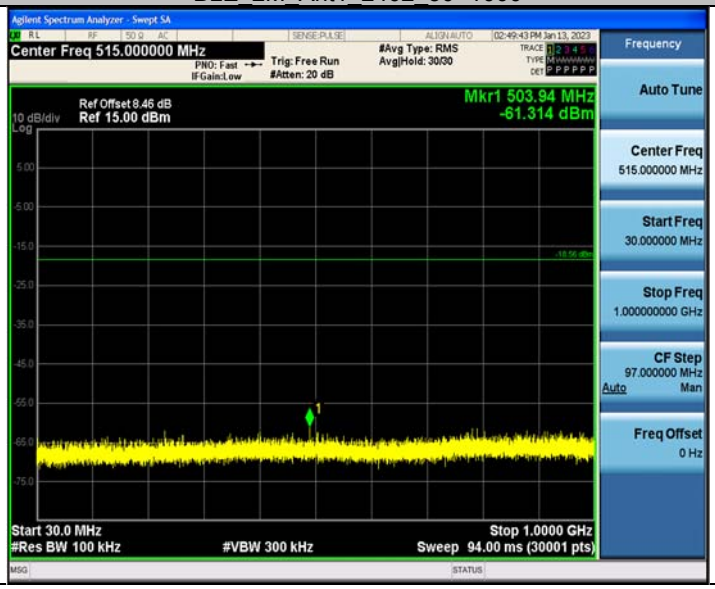
BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500

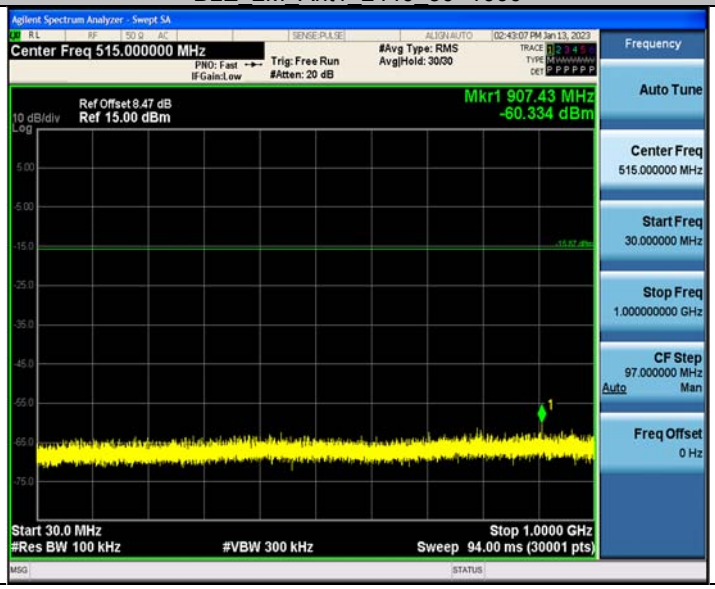
BLE_2M_Ant1_2402_0~Reference

BLE_2M_Ant1_2402_30~1000



BLE_2M_Ant1_2402_1000~26500

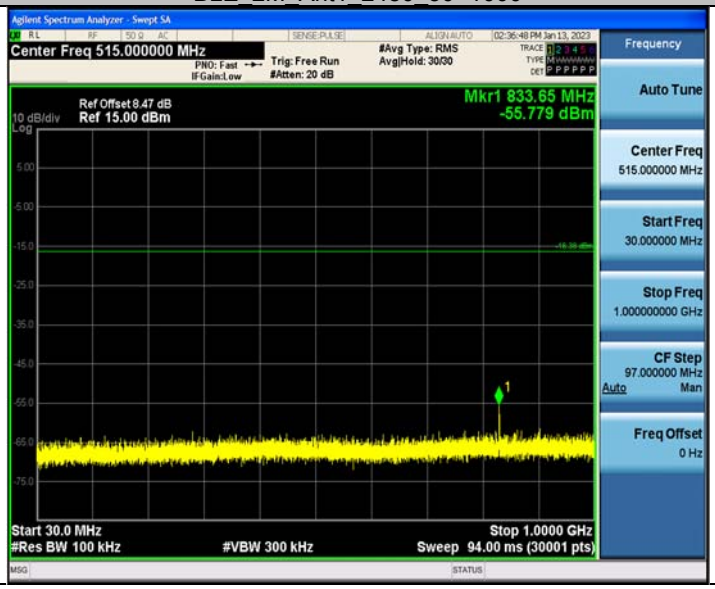
BLE_2M_Ant1_2440_0~Reference

BLE_2M_Ant1_2440_30~1000


BLE_2M_Ant1_2440_1000~26500

BLE_2M_Ant1_2480_0~Reference

BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500

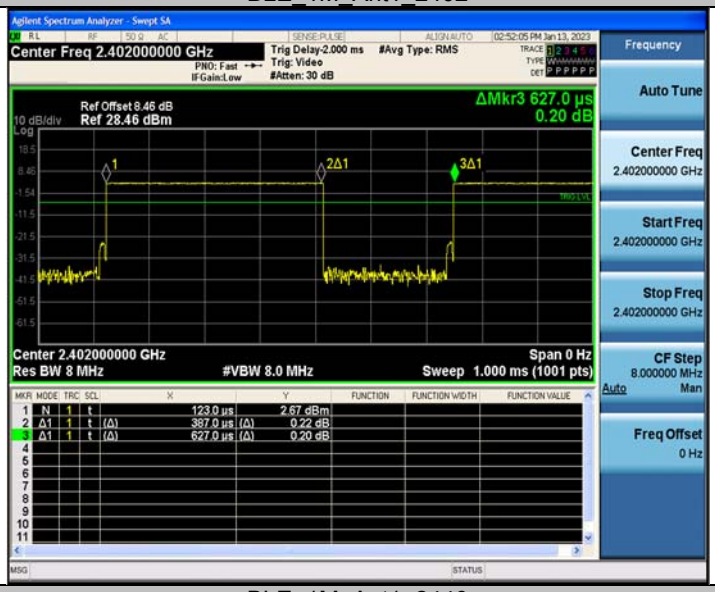

Appendix F: Duty Cycle

Test Result

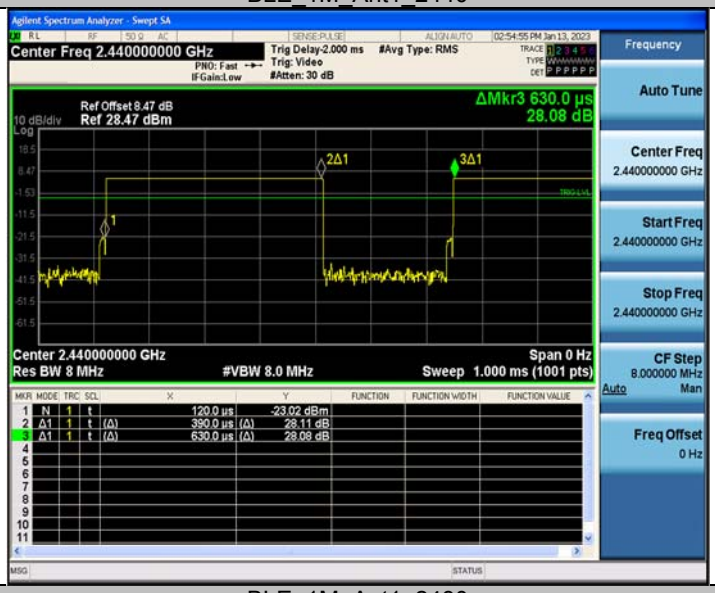
Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
BLE_1M	Ant1	2402	0.39	0.63	61.90	2.08
		2440	0.39	0.63	61.90	2.08
		2480	0.39	0.63	61.90	2.08
BLE_2M	Ant1	2402	0.20	0.62	32.26	4.91
		2440	0.20	0.62	32.26	4.91
		2480	0.20	0.62	32.26	4.91

Test Graphs

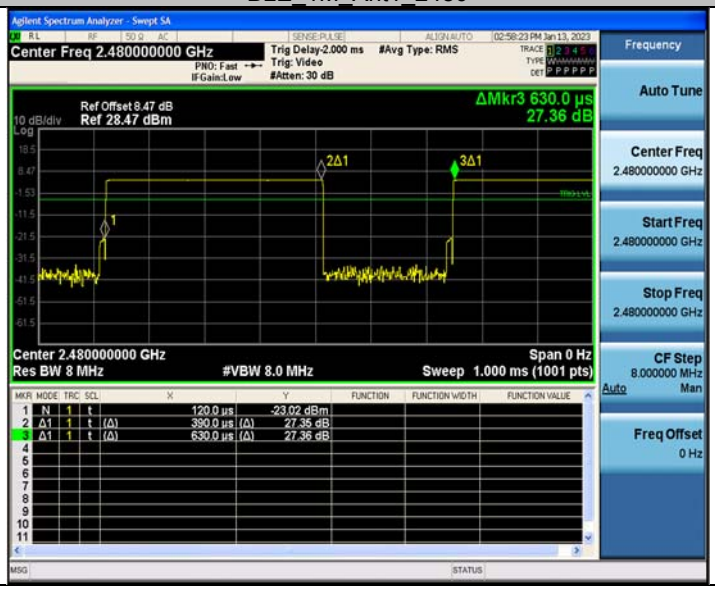
BLE_1M_Ant1_2402



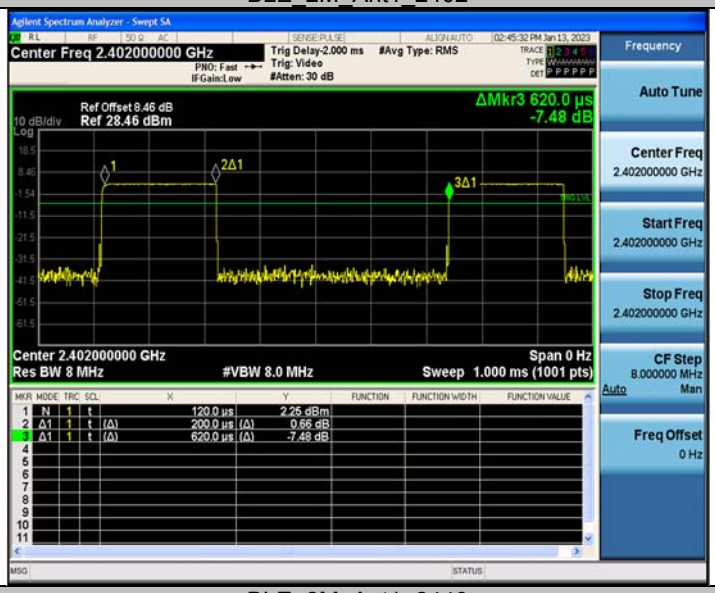
BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



BLE_2M_Ant1_2402



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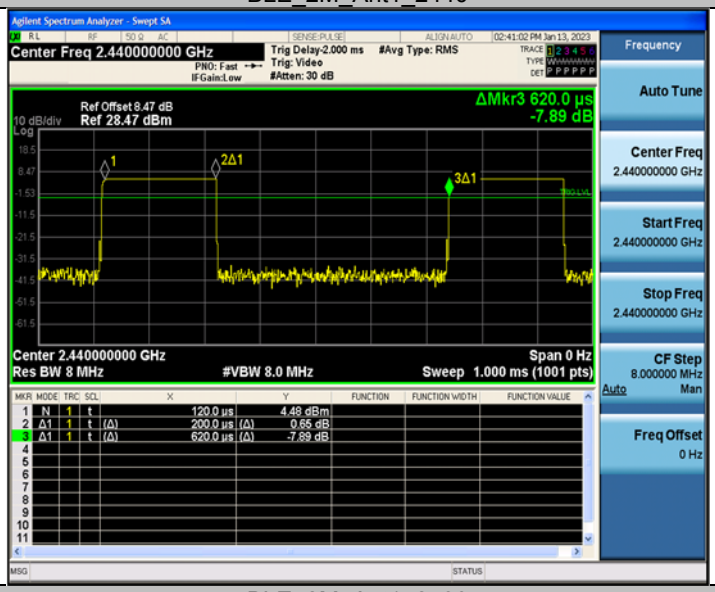
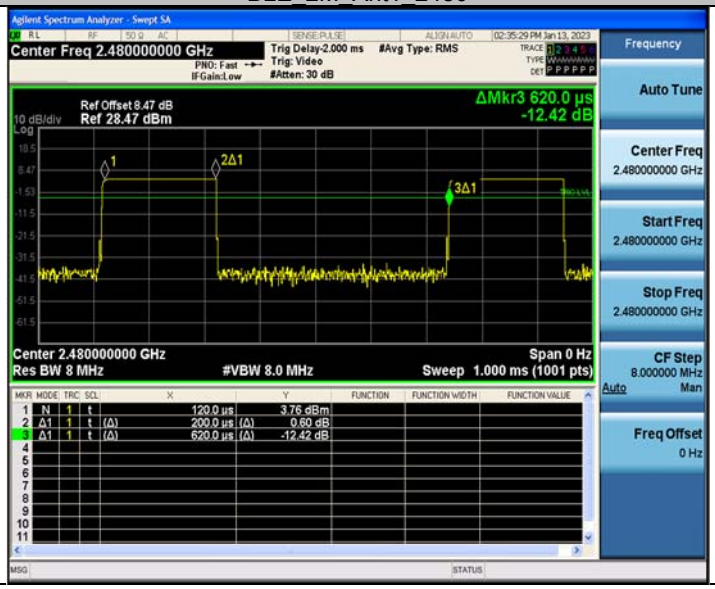


BLE_2M_Ant1_2480



Photographs of the Test Setup

See the Appendix – Test Setup Photos.

Photographs of the EUT

See the Appendix - EUT Photos.

----End of Report----