

TEST REPORT

REPORT NUMBER: I23W00036-BLE RF-FCC

ON

Type of Equipment: POS System
Type of Designation: L15A1, L15B1
Brand Name: SUNMI
Manufacturer: Shanghai Sunmi Technology Co.,Ltd.
FCC ID: 2AH25T3PRO

ACCORDING TO

FCC Part 15C

Chongqing Academy of Information and Communications Technology

Month date, year

October 20, 2023

Signature



Director

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.



Report No.: I23W00036-BLE RF-FCC

Revision Version

Report Number	Revision	Date	Memo
I23W00036-BLE RF-FCC	00	2023-09-13	Initial creation of test report
I23W00036-BLE RF-FCC	01	2023-10-20	first change of test report

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1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
Identifier Number:	CN0044
Designation Number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35°C
Relative Humidity:	25-75%

1.3. Project data

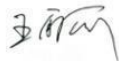
Testing Start Date:	2023-07-20
Testing End Date:	2023-10-20

1.4. Signature



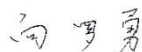
2023-10-20

Dong Junxin
(Prepared this test report)

Date

2023-10-20

Wang Lili
(Reviewed this test report)

Date

2023-10-20

Xiang Luoyong
Director of the laboratory
(Approved this test report)

Date

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2. Client Information

2.1. Applicant Information

Company Name:	Shanghai Sunmi Technology Co.,Ltd.
Address /Post:	Room 505,No.388,Song Hu Road,Yang Pu District,Shanghai,China
City:	Shanghai
Country:	China
Telephone:	+86 17302160204
Fax:	N/A
Email:	minfei.chen@sunmi.com
Contact Person:	Chen Minfei

2.2. Manufacturer Information

Company Name:	Shanghai Sunmi Technology Co.,Ltd.
Address /Post:	Room 505,No.388,Song Hu Road,Yang Pu District,Shanghai,China
City:	Shanghai
Country:	China
Telephone:	+86 17302160204
Fax:	N/A
Email:	minfei.chen@sunmi.com
Contact Person:	Chen Minfei

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	POS System
Model name	L15A1, L15B1
Brand name	SUNMI
BLUETOOTH Frequency Band	2402MHz-2480MHz
Type of BLE modulation	GFSK
Power Rating	DC 24 from Adapter

Note: Photographs of EUT are shown in ANNEX A of this test report.

Note: High and low voltage values in extreme condition test are given by manufacturer.

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Channel Separation
BLE	CH0-39	2402-2480		2MHz

Test frequency list:

BLE_1M	Channel	0	19	39
	Freq. (MHz)	2402	2440	2480
BLE_2M	Channel	0	19	39
	Freq. (MHz)	2402	2440	2480

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
S3	T302D37140072	6490Coreboard_MB_V2.0	1.0.0	2023-07-20
S8	T302D37140061	6490Coreboard_MB_V2.0	1.0.0	2023-07-20
S11	TK02D37240116	6490Coreboard_MB_V2.0	1.0.0	2023-07-20

*EUT ID: is used to identify the test sample in the lab internally.

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3.3. Outline of Equipment under Test

3.4. Internal Identification of AE used during the test

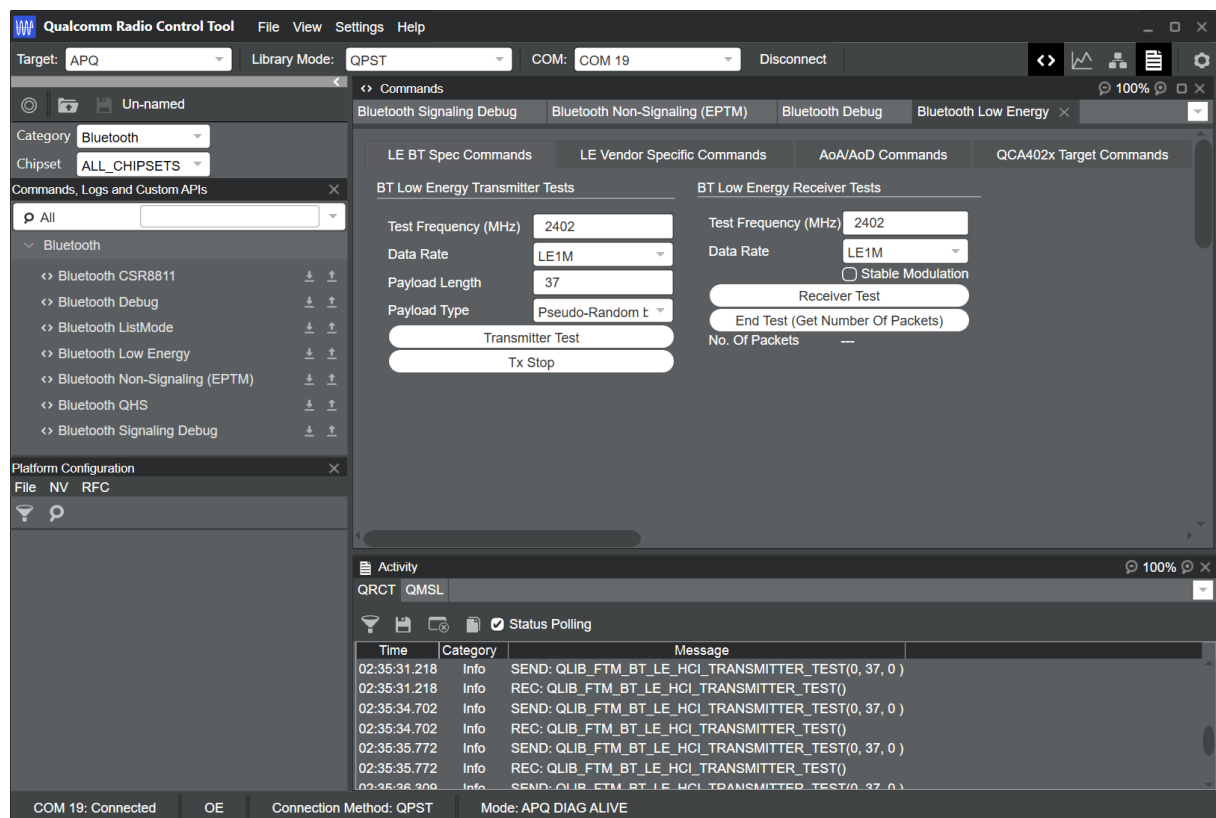
AE ID*	Description	Note
CB04	Adapter	Model: CYZSE65-240250 Input: 100-240V~50/60Hz 1.7A Output: 24.0V=2.5A 60.0W
AE1	RF cable	1dB

*AE ID: is used to identify the test sample in the lab internally.

dB*: is provided customer.

3.5. EUT Test RF Configuration

EUT uses QRCT working control emission measurement, Change power level, channel, rate and HT .



Power level:

Test Mode	Power level
BLE 1M	17
BLE 2M	17

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4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 15C	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz	--
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for Performing Compliance Measurements on Frequency Hopping Spread Spectrum systems (DSS) Operating Under §15.247	--
Note: KDB 558074 D01 15.247 Meas Guidance v05r02 is not A2LA certified.		

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5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacturer	Cal. Interval	Cal.Due Date
1	Spectrum analyzer	FSQ 26	201137/026	--	--	R&S	1 Year	2024-06-28
2	Spectrum analyzer	FSW26	104280	--	--	R&S	1 Year	2024-06-28
3	DC Power Supply	62015L-60-6	L02000001587	--	--	Chroma	1 Year	2024-06-28

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacturer	Cal. Interval	Cal.Due Date
1	EMI Test Receiver	ESU40	100307	--	--	R&S	1 Year	2024-06-28
2	TRILOG Broadband Antenna	VULB9163	9163-586	--	--	Schwarzbeck	2 Years	2023-10-29
3	Horn antenna	9120D	1083	--	--	Schwarzbeck	2 Years	2024-12-14
4	Horn antenna	DATE 1152	LM7127	--	--	ETS	2 Years	2024-09-06
5	Horn antenna	DATE 1012	LM5945	--	--	ETS	2 Years	2024-09-06
6	Loop Antenna	6502	00213256	--	--	ETS	1 Year	2024-06-29
7	Amplifier1	SCU-08F1	8320027	--	--	R&S	1 Year	2024-06-28
8	Amplifier2	SCU-18F	180093	--	--	R&S	1 Year	2024-06-28
9	2-Line V-Network	ENV216	102368	--	--	R&S	1 Year	2024-05-27
10	Test Receiver	ESR 3	101382	03	3.48 SP2	R&S	1 Year	2024-01-28
11	Test Receiver	ESW 26	101382	00	1.50 SP1	R&S	1 Year	2024-06-28

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5.3. Climate Chamber

No.	Name	Type	SN	Manufacture	Cal. Interval	Cal.Due Date
--	--	--	--	--	--	--

5.4. Anechoic chamber Vibration table

No.	Name	Type	SN	Manufacture	Cal. Interval	Cal.Due Date
1	Fully-Anechoic Chamber	FAC 5	--	TDK	3 Years	2024-09-22
2	Anechoic Chamber	SAC 10	--	TDK	3 Years	2024-08-26

5.5. Test software

No.	Name	version	SN	Manufacture
1	EMC32 (Transmitter Spurious Emission-Radiated Above 1GHz)	V 10.20.01	--	R&S
2	EMC32 (Transmitter Spurious Emission-Radiated Below 1GHz)	V9.26.01	--	R&S
3	EMC32 (AC Powerline Conducted Emission)	V 10.40.10	--	R&S

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6. Test Results

6.1. Summary of Test Results

FCC Rules	Name of Test	Result
15.247(b)	Maximum Peak Output Power	Pass
15.247(e)	Peak Power Spectral Density	Pass
15.247(a)	6dB Occupied Bandwidth	Pass
15.247(a)	99% Occupied Bandwidth	Pass
15.247(d)	Band Edges Compliance	Pass
15.247(d)	Transmitter Spurious Emission-Conducted	Pass
15.247/15.205/15.209	Transmitter Spurious Emission-Radiated	Pass
15.207	AC Powerline Conducted Emission	Pass
15.203/15.247(c)	Antenna requirement	Pass ^{Note 2}

NOTE 1

The L15A1, L15B1, manufactured by Shanghai Sunmi Technology Co.,Ltd.is a new product for testing. There are two configurations S3 &S8 mainly supply (With Printer) & S11 secondary supply (Without Printer). We mainly tested S3 mainly supply (conducted), S8 mainly supply(radiated) and S11 secondary supply tested the worst mode of the S8 mainly supply and recorded the test results of the worst respectively in the report.

The description of the differences between S3&S8 and S11 is as follows:

EUT ID	SN or IMEI	Model	Printer
S3	T302D37140072	L15A1	80 Printer
S8	T302D37140061	L15A1	80 Printer
S11	TK02D37240116	L15B1	N/A

NOTE 2:

The EUT have one RF welding disc interfaces for connecting internal FPC antenna, the antenna gain refer to section 6.2, So this EUT complies with the FCC section 15.203/15.247(c) antenna requirements, please refer to the internal photos.

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6.2. Peak Output Power-Conducted

Specifications:	FCC 47 Part 15.247(b)
DUT Serial Number:	S3
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Conducted Limit(dBm)
FCC 47 Part 15.247(b)	<30

Measurement Uncertainty:

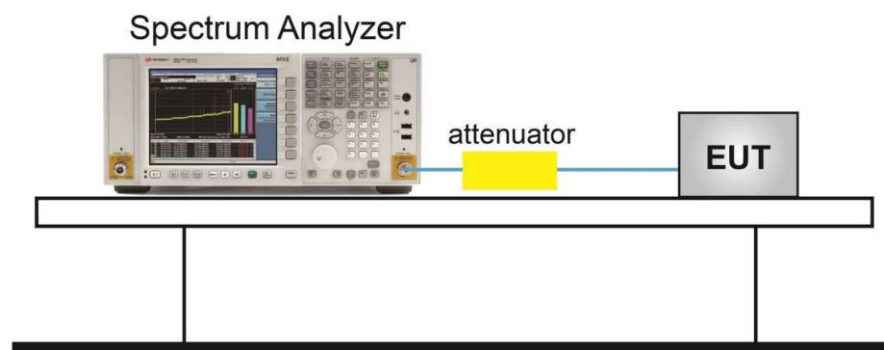
Measurement Uncertainty	±0.46dBm
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Test Procedure:

The measurement is according to ANSI C63.10 clause 11.9.1,

1. Set the RBW $\geq$ DTS bandwidth.
2. Set VBW $\geq$ $[3 \times \text{RBW}]$.
3. Set span $\geq$ $[3 \times \text{RBW}]$.
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

Test setup:



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Antenna gain of EUT:

No.	Item(s)	Data
1	Antenna gain of EUT	2.6dBi

Note: The data is provided by the customer may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.

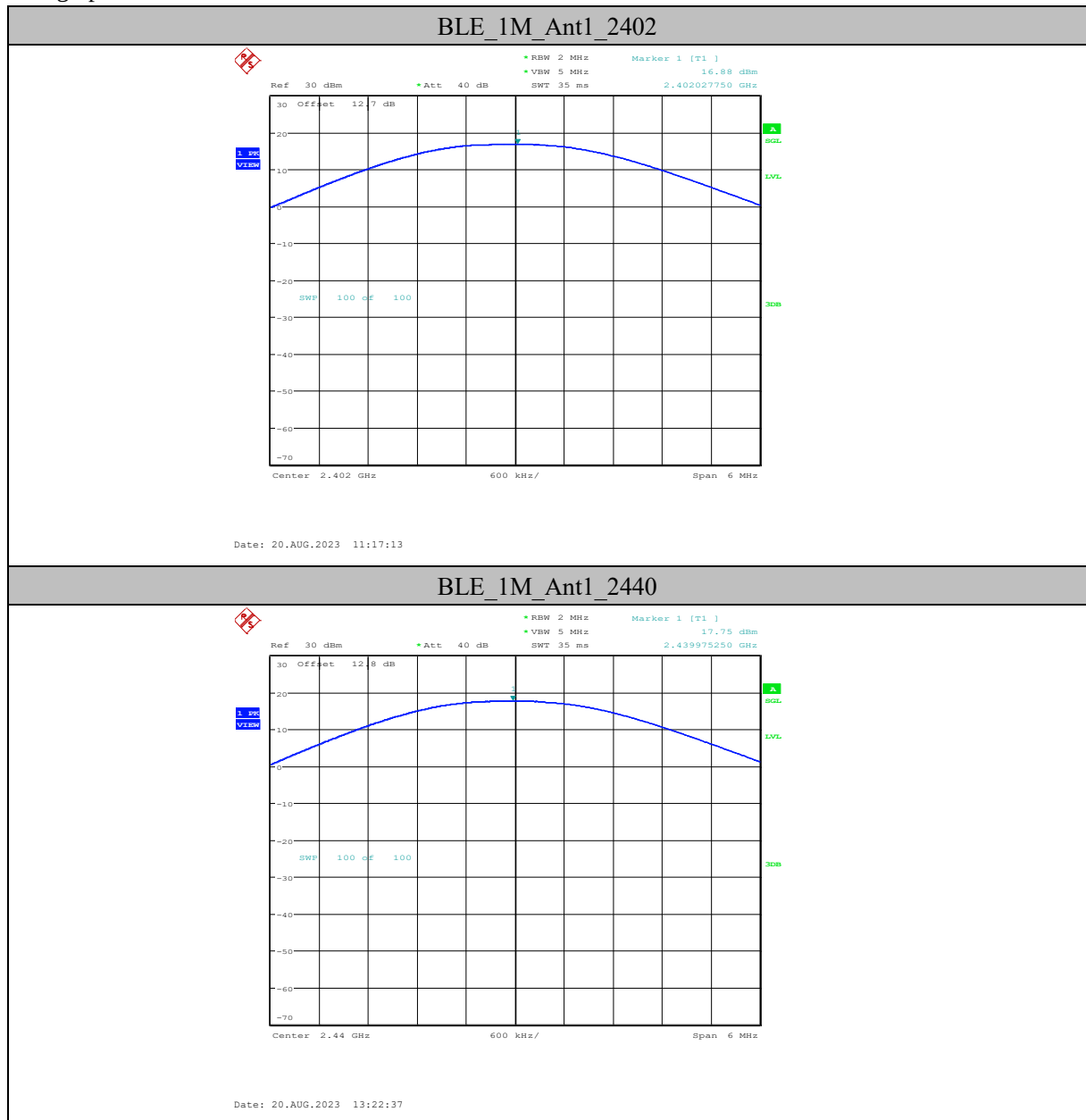
Measurement Results:

TestMode	Antenna	Frequency [MHz]	Conducted Peak Power [dBm]	Conducted Limit [dBm]	Verdict
BLE_1M	Ant1	2402	16.88	≤ 30	PASS
		2440	17.75	≤ 30	PASS
		2480	17.37	≤ 30	PASS
BLE_2M	Ant1	2402	17.06	≤ 30	PASS
		2440	17.96	≤ 30	PASS
		2480	17.68	≤ 30	PASS

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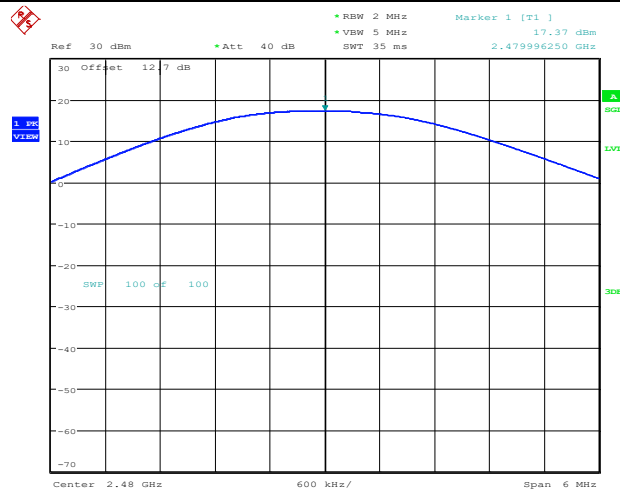
Test graphs as below



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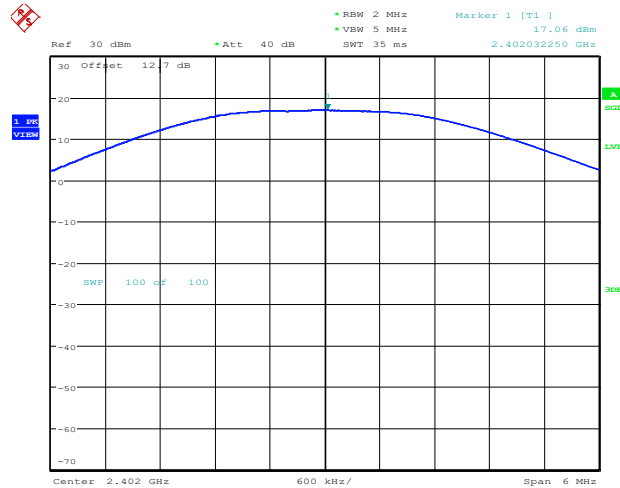
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BLE_1M_Ant1_2480



Date: 20.AUG.2023 13:24:31

BLE_2M_Ant1_2402

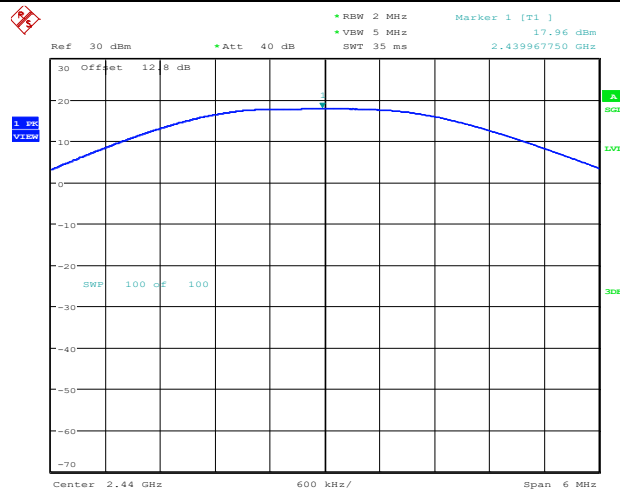


Date: 20.AUG.2023 11:44:55

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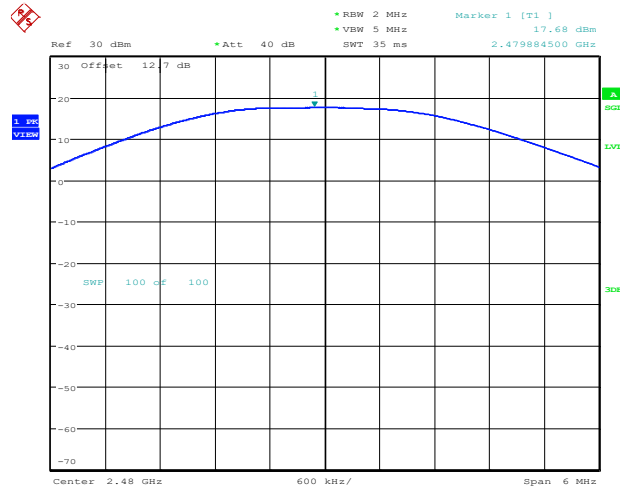
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BLE_2M_Ant1_2440



Date: 20.AUG.2023 11:47:19

BLE_2M_Ant1_2480



Date: 20.AUG.2023 11:49:10

6.3. Peak Power Spectral Density

Specifications:	FCC 47 Part 15.247(e)
DUT Serial Number:	S3
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247(e)	$\leq 8\text{dBm}/3\text{ kHz}$

Measurement Uncertainty:

Measurement Uncertainty	$\pm 0.56\text{dB}$
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Test procedures:

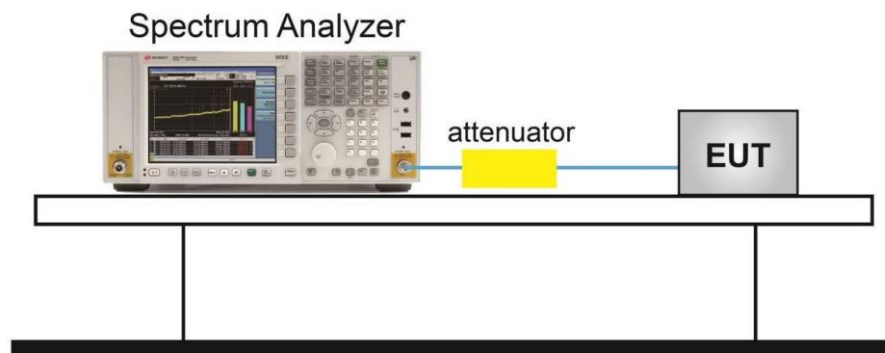
The measurement is according to ANSI C63.10 clause 11.10.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set analyzer center frequency to DTS channel center frequency.
4. Set the span to 1.5 times the DTS bandwidth.
5. Set the RBW to $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
6. Set the VBW $\geq [3 \times \text{RBW}]$.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum amplitude level within the RBW.
12. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

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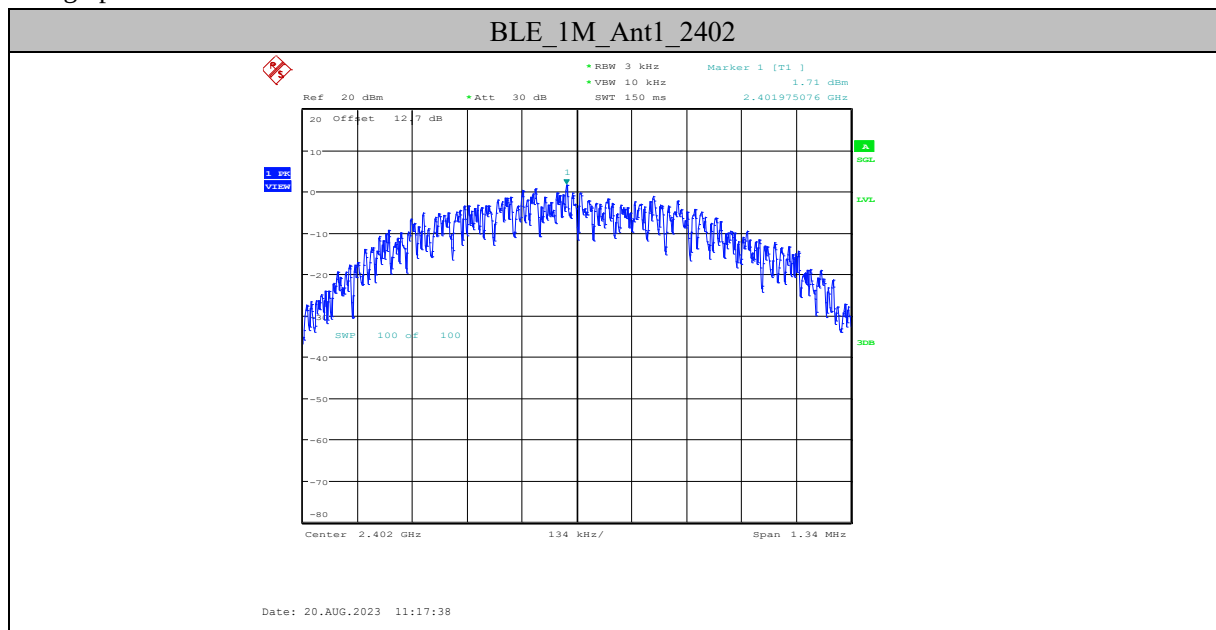
Test Setup



Measurement Results:

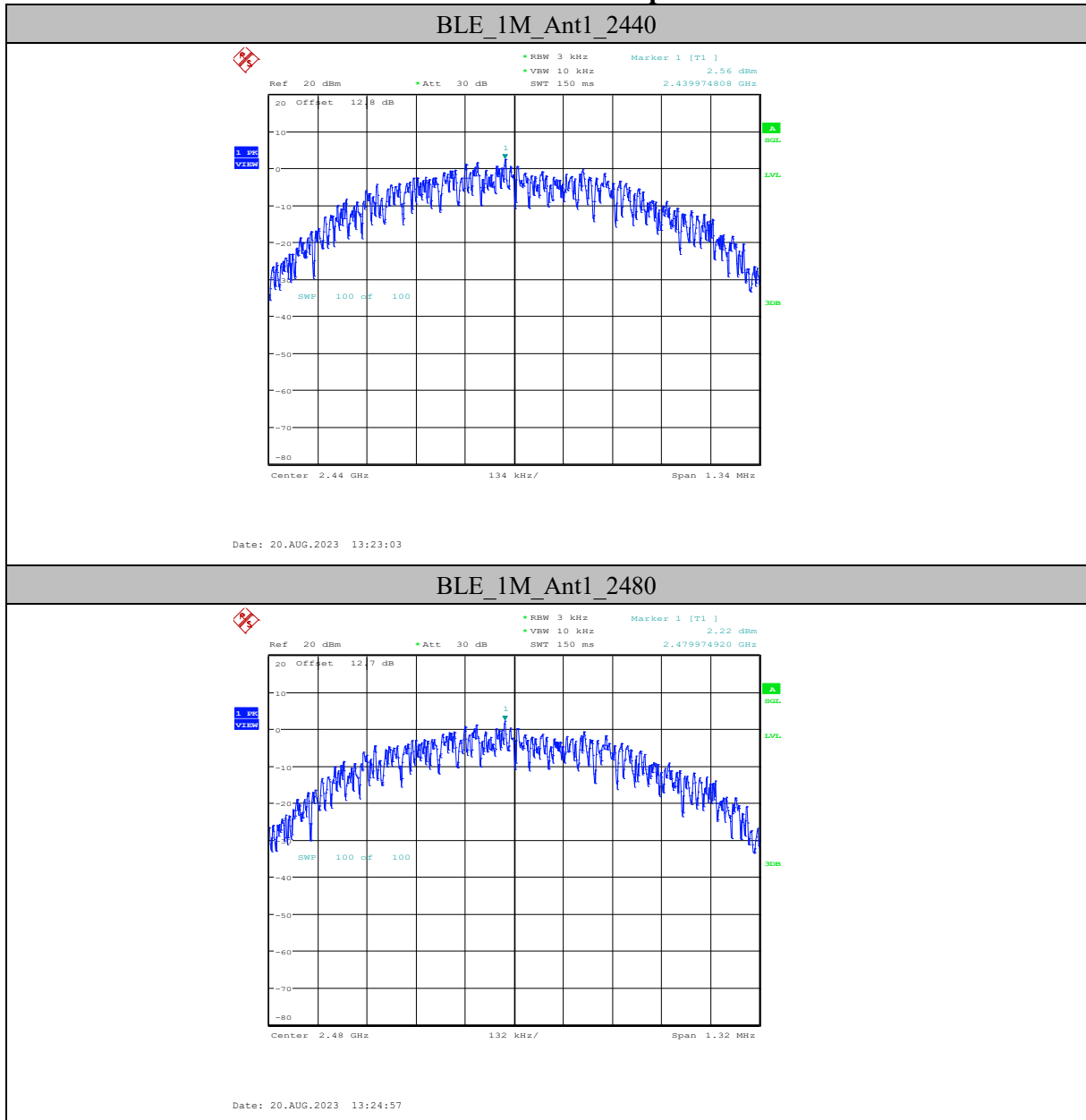
TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	1.71	≤8.00	PASS
		2440	2.56	≤8.00	PASS
		2480	2.22	≤8.00	PASS
BLE_2M	Ant1	2402	-1.06	≤8.00	PASS
		2440	-0.14	≤8.00	PASS
		2480	-0.37	≤8.00	PASS

Test graphs as below

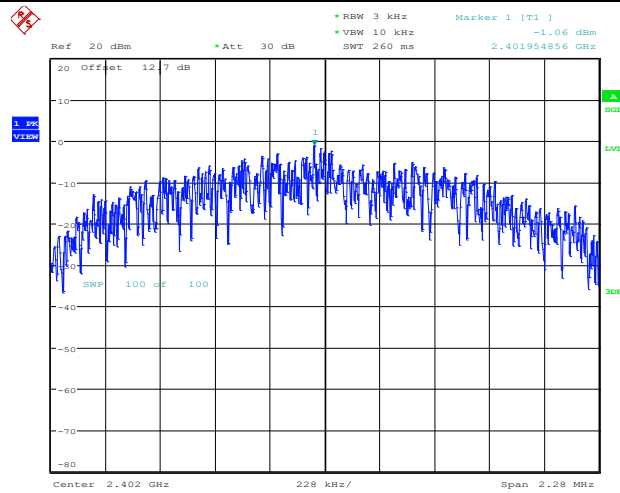


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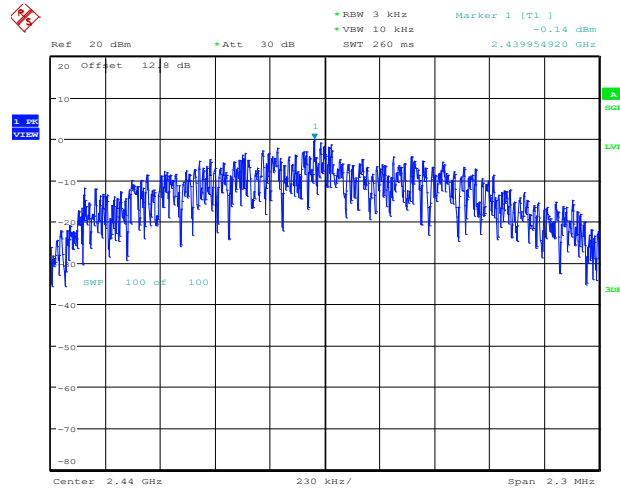


BLE_2M_Ant1_2402



Date: 20.AUG.2023 11:45:39

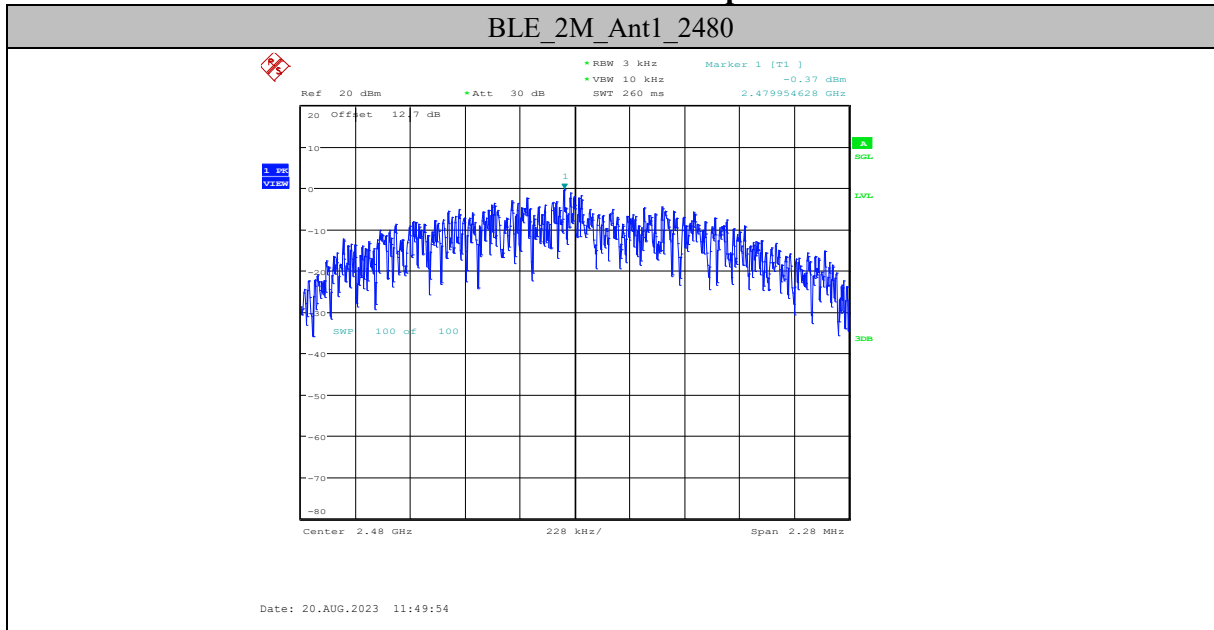
BLE_2M_Ant1_2440



Date: 20.AUG.2023 11:48:02

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6.4. 6dB Bandwidth

Specifications:	FCC 47 Part 15.247 (a) (2)
DUT Serial Number:	S3
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247 (a) (2)	$\geq 500\text{kHz}$

Measurement Uncertainty:

Measurement Uncertainty	$\pm 0.72\text{KHz}$
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Test procedures:

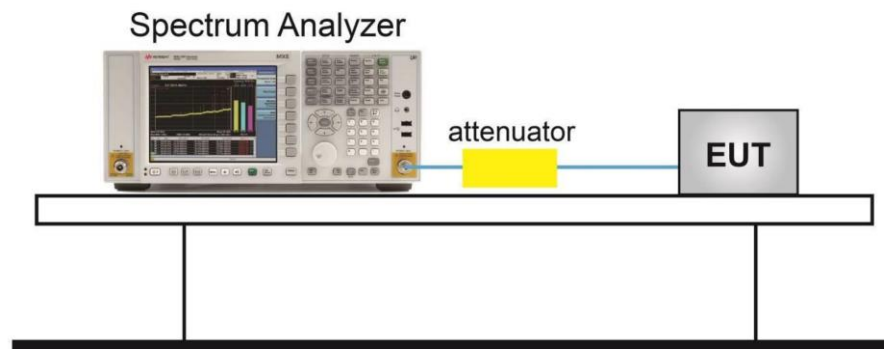
The measurement is according to ANSI C63.10 clause 11.8.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW = 100 kHz.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Detector = peak.
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

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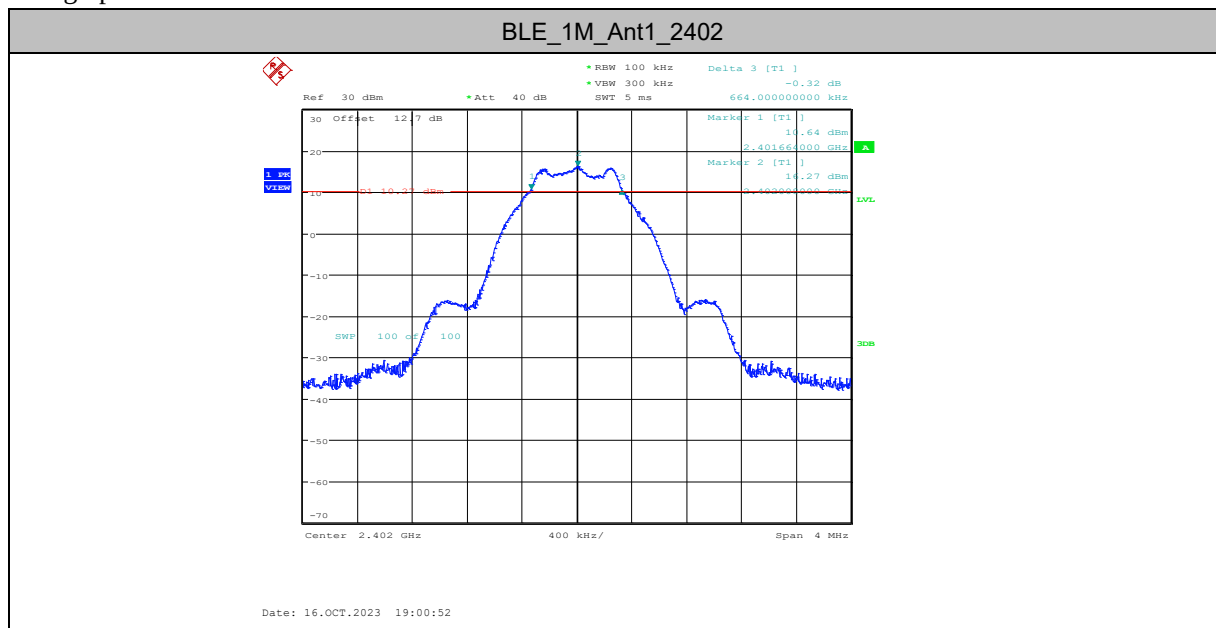
Test Setup:



Measurement Results:

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.66	2401.66	2402.33	0.5	PASS
		2440	0.66	2439.67	2440.33	0.5	PASS
		2480	0.67	2479.66	2480.33	0.5	PASS
BLE_2M	Ant1	2402	1.14	2401.43	2402.58	0.5	PASS
		2440	1.15	2439.43	2440.58	0.5	PASS
		2480	1.12	2479.43	2480.55	0.5	PASS

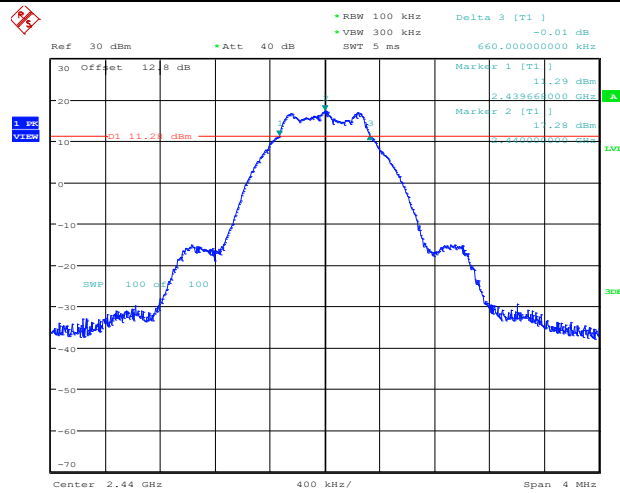
Test graphs as below



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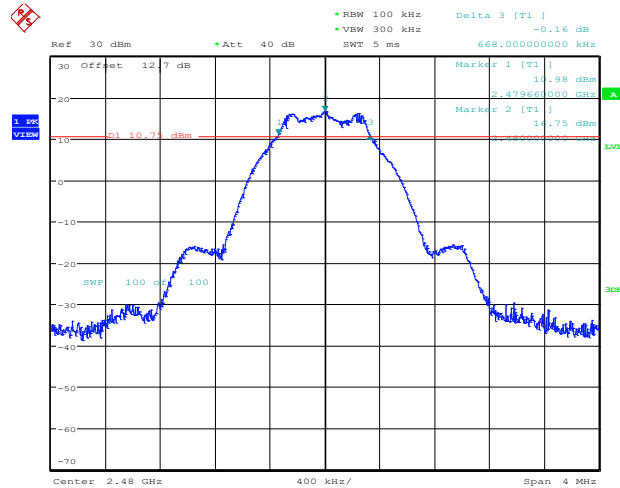
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BLE_1M_Ant1_2440



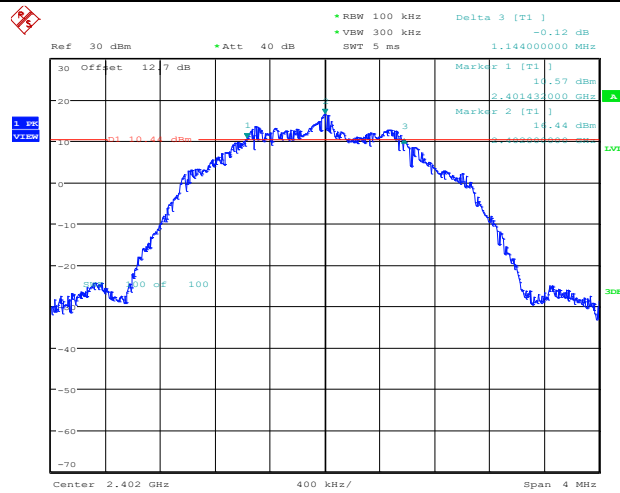
Date: 16.OCT.2023 19:07:04

BLE_1M_Ant1_2480



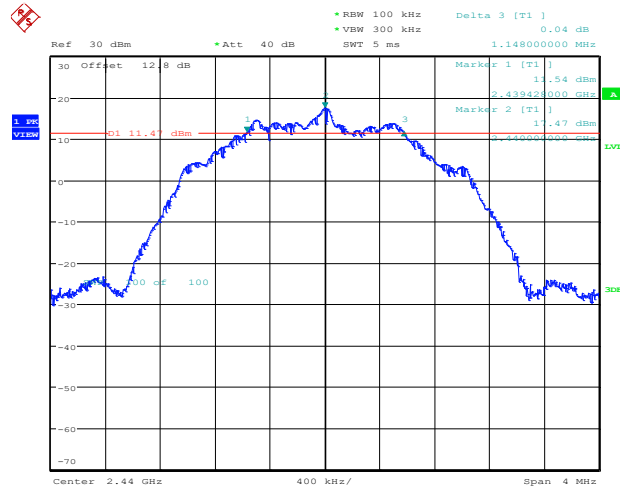
Date: 16.OCT.2023 19:14:52

BLE_2M_Ant1_2402



Date: 16.OCT.2023 19:17:26

BLE_2M_Ant1_2440



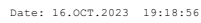
Date: 16.OCT.2023 19:18:18

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BLE_2M_Ant1_2480



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6.5. 99% Occupied Bandwidth

Specifications:	15.247(a)
DUT Serial Number:	S3
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
15.247(a)	N/A

Measurement Uncertainty:

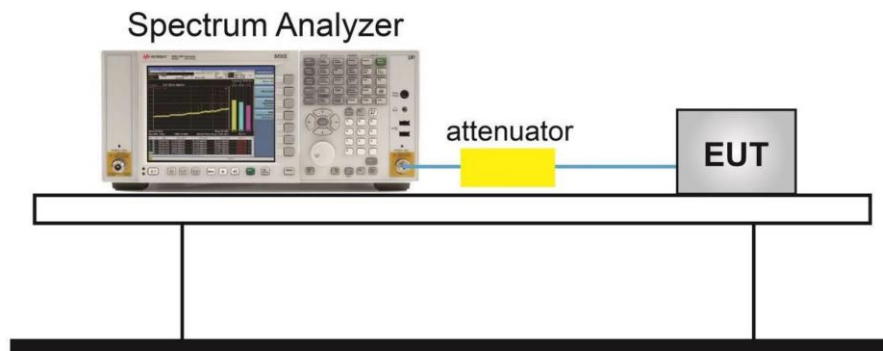
Measurement Uncertainty	±0.72KHz
-------------------------	----------

Test procedures:

The measurement is according to ANSI C63.10 clause 6.9.3.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW shall be in the range of 1% to 5% of the OBW.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Detector = peak.
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

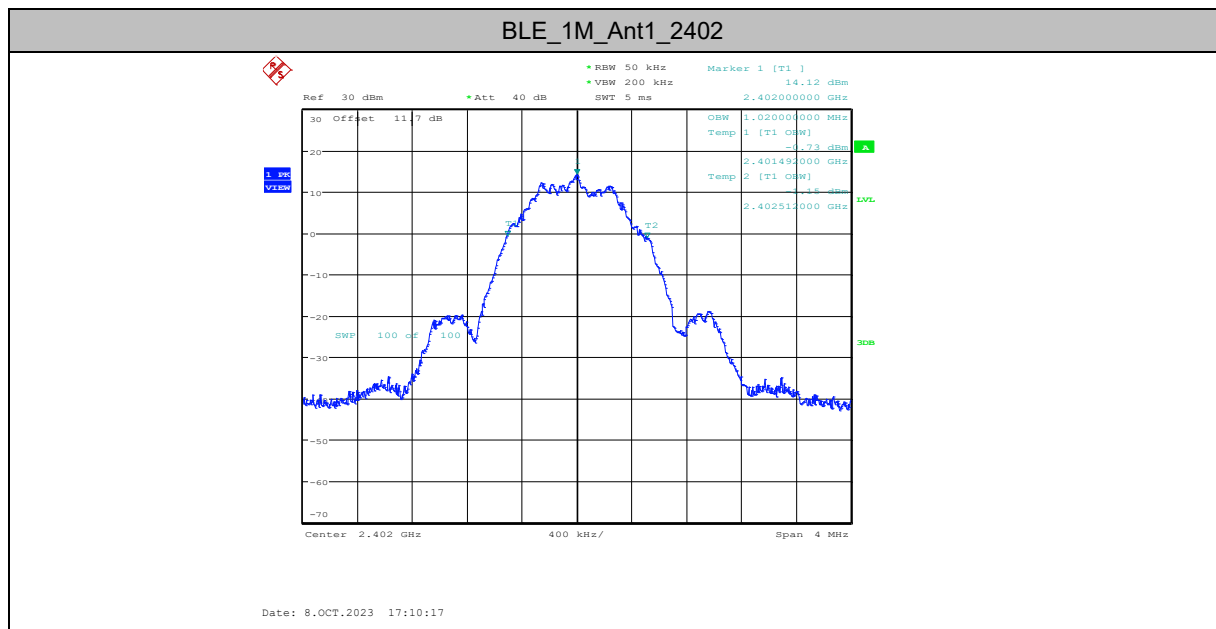
Test setup:



Measurement Results:

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.02	2401.4920	2402.5120	---	---
		2440	1.024	2439.4920	2440.5160	---	---
		2480	1.024	2479.4920	2480.5160	---	---
BLE_2M	Ant1	2402	2.012	2401.0080	2403.0200	---	---
		2440	2.012	2439.0080	2441.0200	---	---
		2480	2.012	2479.0040	2481.0160	---	---

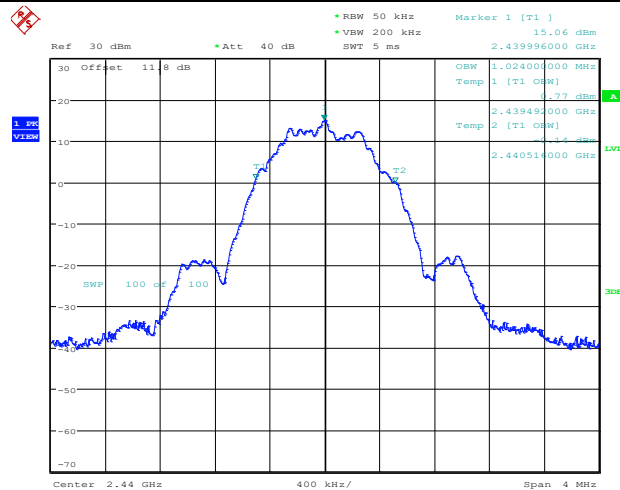
Test graphs as below



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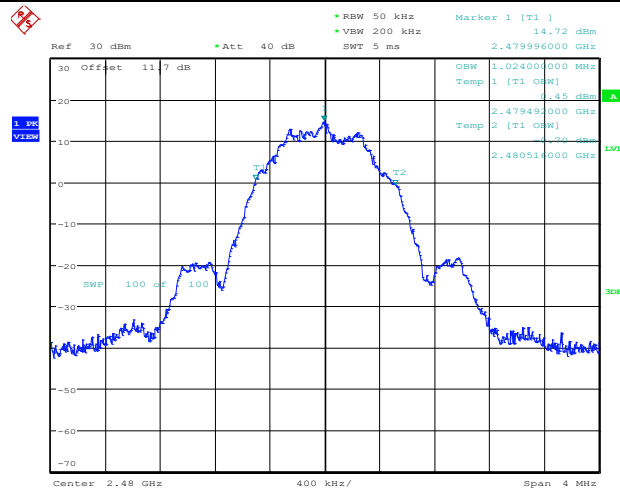
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BLE_1M_Ant1_2440



Date: 8.OCT.2023 17:14:51

BLE_1M_Ant1_2480

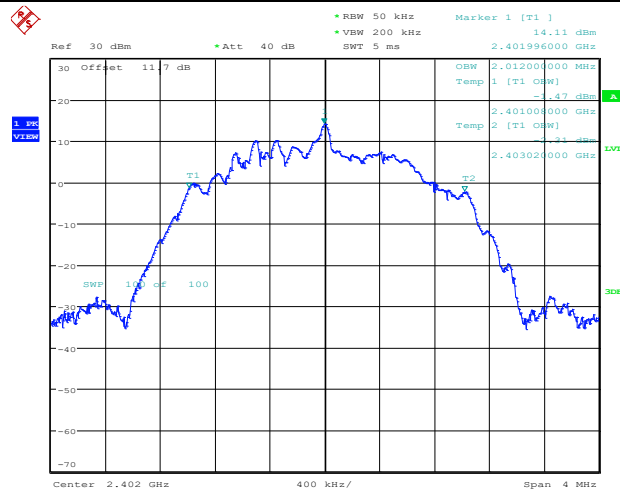


Date: 8.OCT.2023 17:16:02

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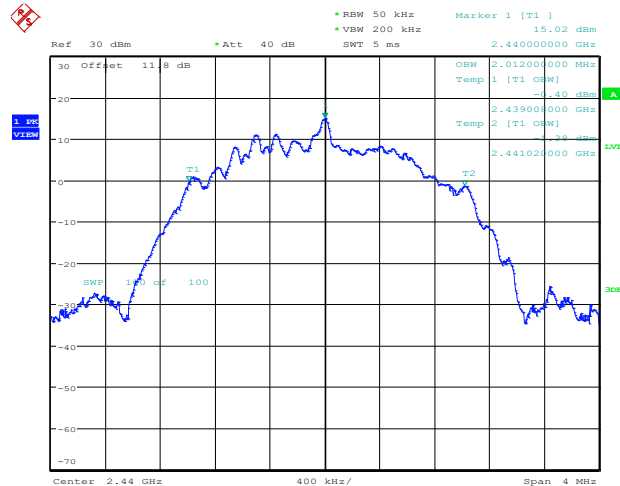
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BLE_2M_Ant1_2402



Date: 8.OCT.2023 17:16:53

BLE_2M_Ant1_2440



Date: 8.OCT.2023 17:17:13

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BLE_2M_Ant1_2480



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6.6. Frequency Band Edges-Conducted

Specifications:	FCC 47 Part 15.247(d)
DUT Serial Number:	S3
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit(dBc)
FCC 47 Part 15.247(d)	>20

Measurement Uncertainty:

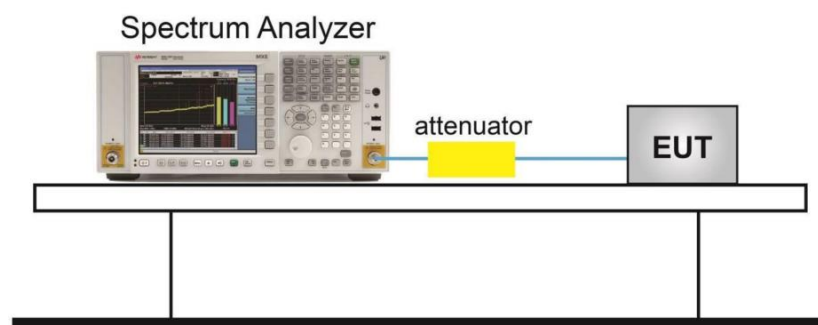
Measurement Uncertainty	$\pm 1.02\text{dBm/KHz}$
-------------------------	--------------------------

Test procedures:

The measurement is according to ANSI C63.10 clause 11.13.2

1. Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.
2. Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (\text{OBW}/\text{RBW})]$ below the reference level. Specific guidance is given in 4.1.5.2.
3. Attenuation: Auto (at least 10 dB preferred).
4. Sweep time: Coupled.
5. Resolution bandwidth: 100 kHz.6) Video bandwidth: 300 kHz.7) Detector: Peak.8) Trace: Max hold.

Test Setup:



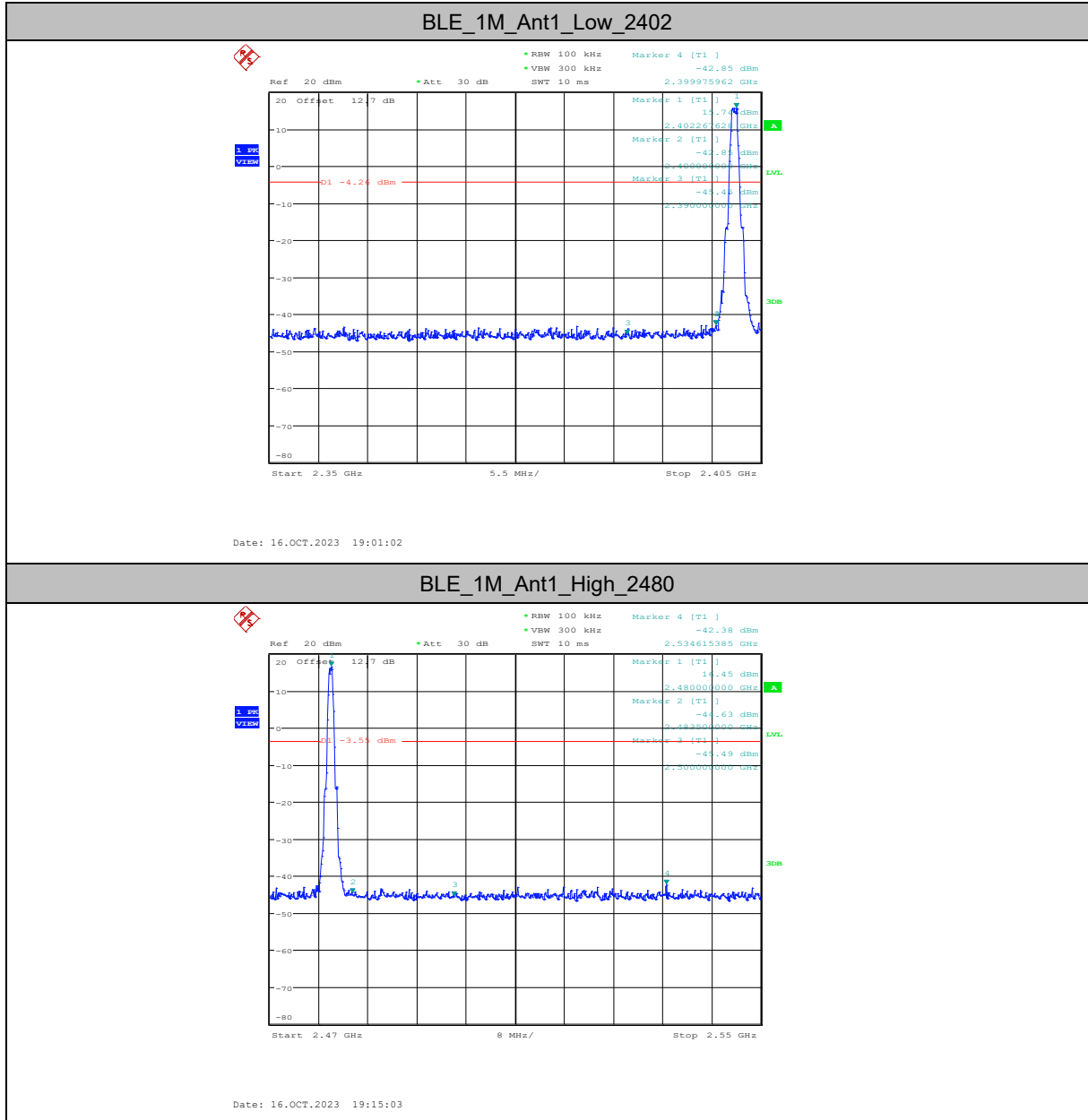
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Measurement Results:

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	15.74	-42.85	≤-4.26	PASS
		High	2480	16.45	-42.38	≤-3.55	PASS
BLE_2M	Ant1	Low	2402	16.53	-29.7	≤-3.47	PASS
		High	2480	17.12	-42.44	≤-2.88	PASS

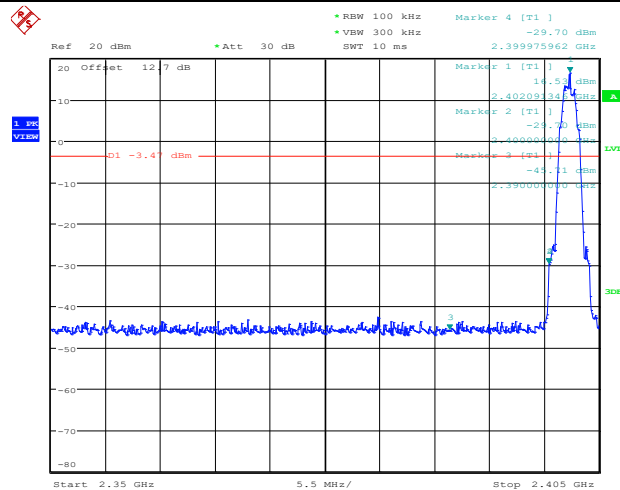
Test graphs as below



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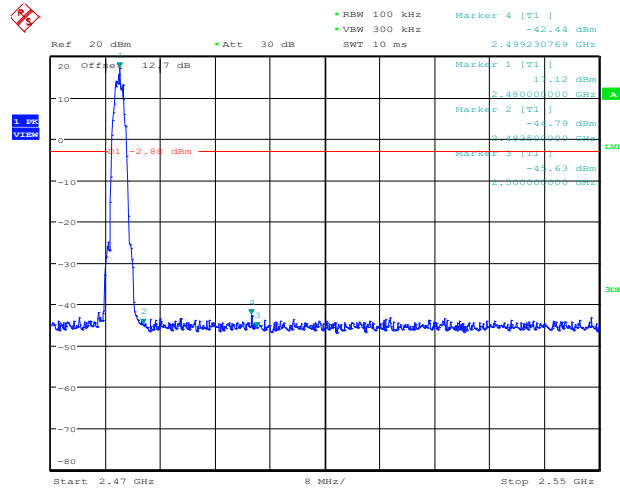
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BLE_2M_Ant1_Low_2402



Date: 16.OCT.2023 19:17:37

BLE_2M_Ant1_High_2480



Date: 16.OCT.2023 19:19:08

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6.7. Conducted Emission

Specifications:	FCC 47 Part 15.247(d)
DUT Serial Number:	S3
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247(d)	20dB below peak output power in 100KHz bandwidth

Measurement Uncertainty:

Measurement Uncertainty	±1.02dBm/kHz
-------------------------	--------------

Test procedures:

This measurement is according to ANSI C63.10 clause 11.11.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.

Reference level measurement

3. Set instrument center frequency to DTS channel center frequency.
4. Set the span to ≥ 1.5 times the DTS bandwidth.
5. Set the RBW = 100 kHz.
6. Set the VBW $\geq [3 \times \text{RBW}]$.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum PSD level.

Emission level measurement

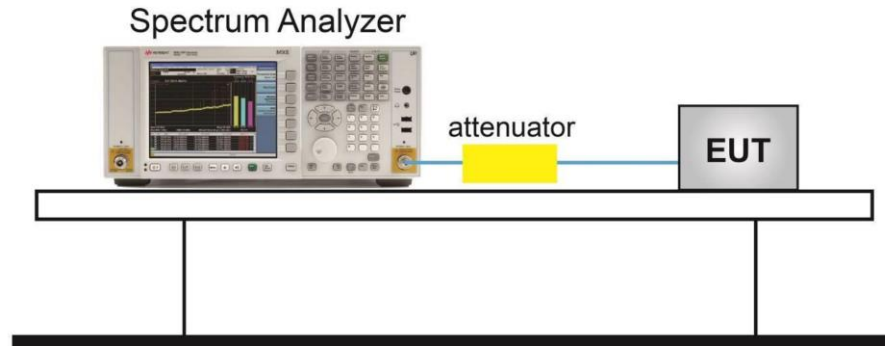
1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 100 kHz.
3. Set the VBW $\geq [3 \times \text{RBW}]$.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

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8. Use the peak marker function to determine the maximum amplitude level

Test Setup:



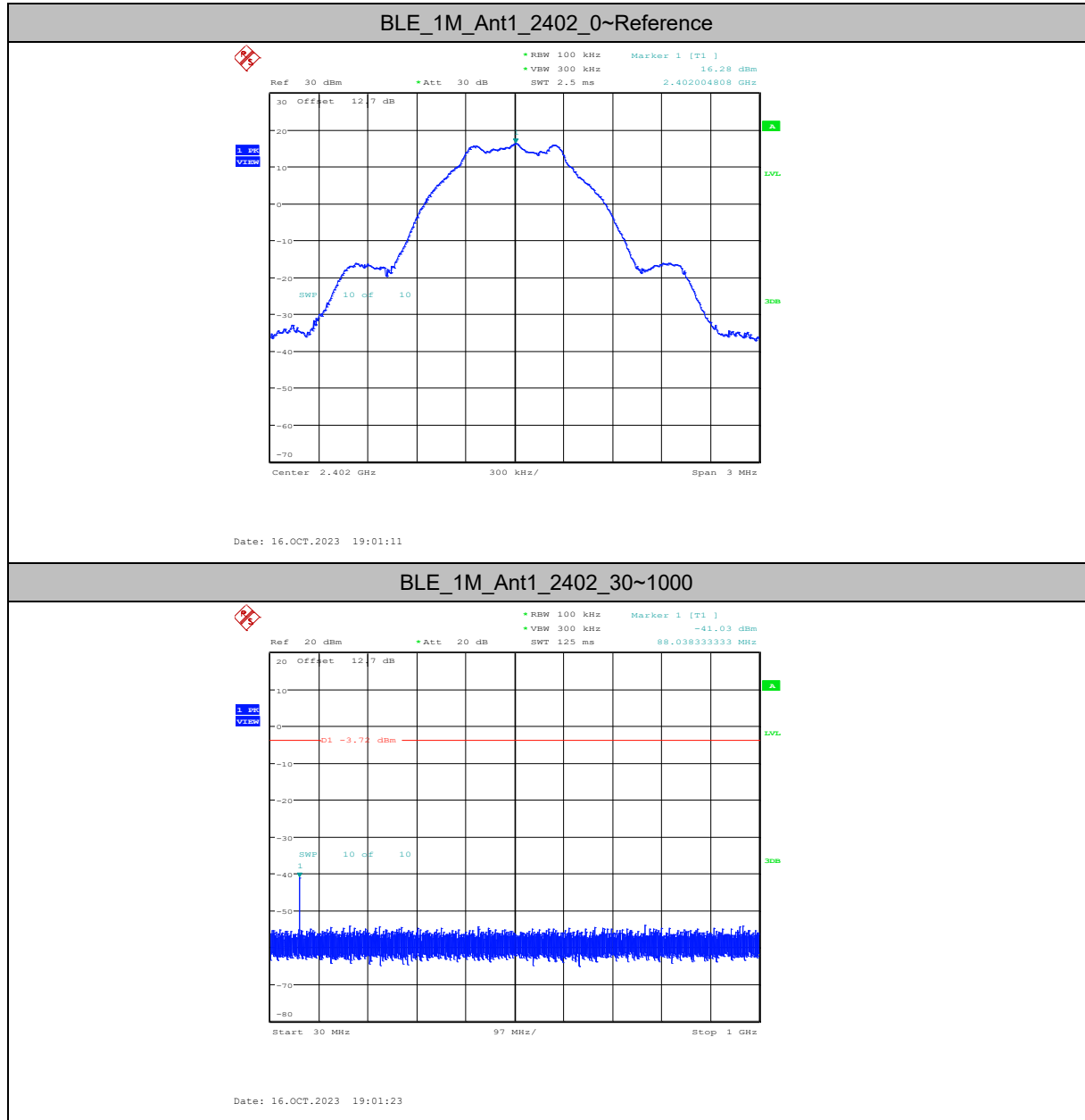
Measurement Results:

TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	16.28	16.28	---	PASS
			30~1000	16.28	-41.03	≤ -3.72	PASS
			1000~26500	16.28	-50.44	≤ -3.72	PASS
		2440	Reference	17.33	17.33	---	PASS
			30~1000	17.33	-39.16	≤ -2.67	PASS
			1000~26500	17.33	-50.88	≤ -2.67	PASS
		2480	Reference	16.90	16.90	---	PASS
			30~1000	16.90	-38.86	≤ -3.1	PASS
			1000~26500	16.90	-51.21	≤ -3.1	PASS
BLE_2M	Ant1	2402	Reference	15.24	15.24	---	PASS
			30~1000	15.24	-46.4	≤ -4.76	PASS
			1000~26500	15.24	-49.79	≤ -4.76	PASS
		2440	Reference	15.92	15.92	---	PASS
			30~1000	15.92	-42.71	≤ -4.08	PASS
			1000~26500	15.92	-49.05	≤ -4.08	PASS
		2480	Reference	16.54	16.54	---	PASS
			30~1000	16.54	-41.11	≤ -3.46	PASS
			1000~26500	16.54	-49.28	≤ -3.46	PASS

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Test graphs as below

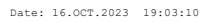


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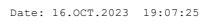
BLE_1M_Ant1_2402_1000~26500



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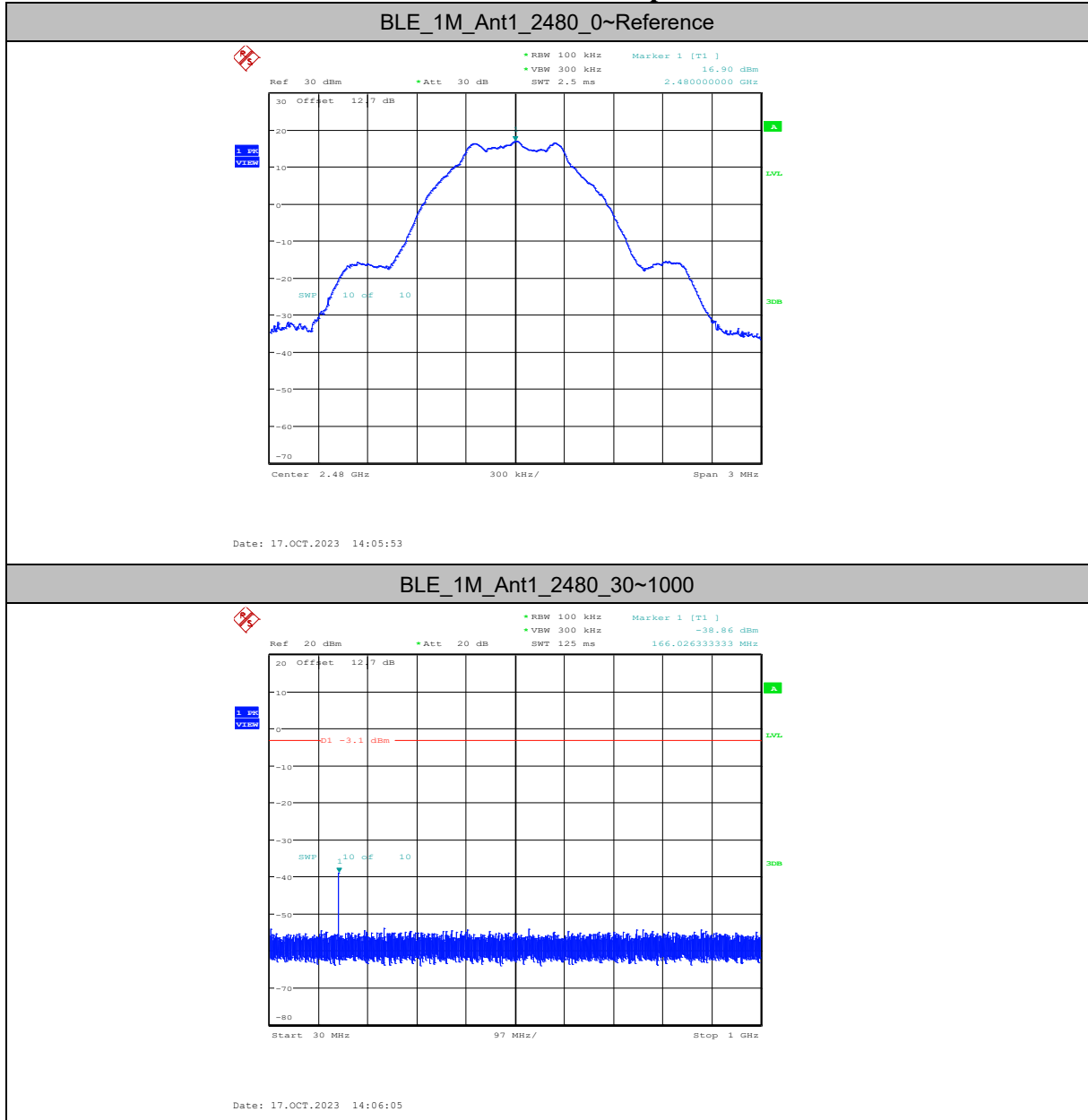


BLE_1M_Ant1_2440_30~1000



Date: 16.OCT.2023 19:09:12

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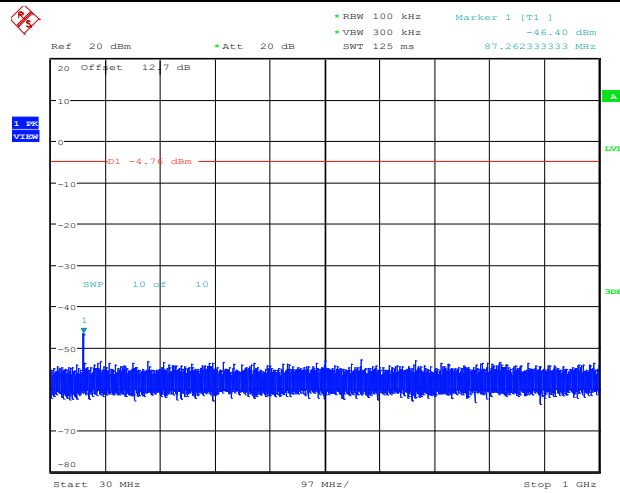
BLE_1M_Ant1_2480_1000~26500



Date: 25.AUG.2023 18:35:48

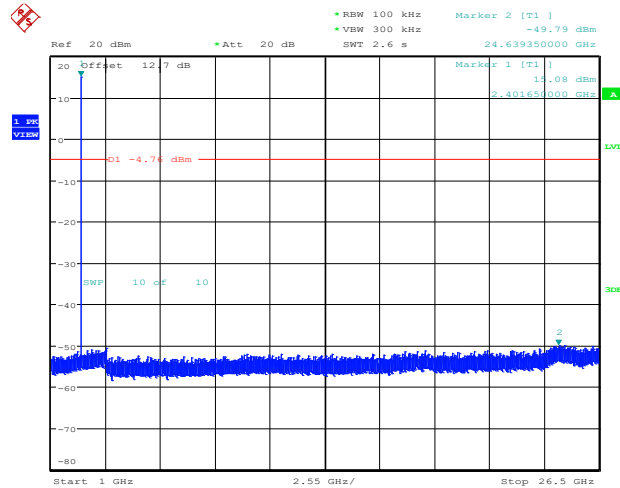
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BLE_2M_Ant1_2402_30~1000



Date: 25.AUG.2023 18:36:01

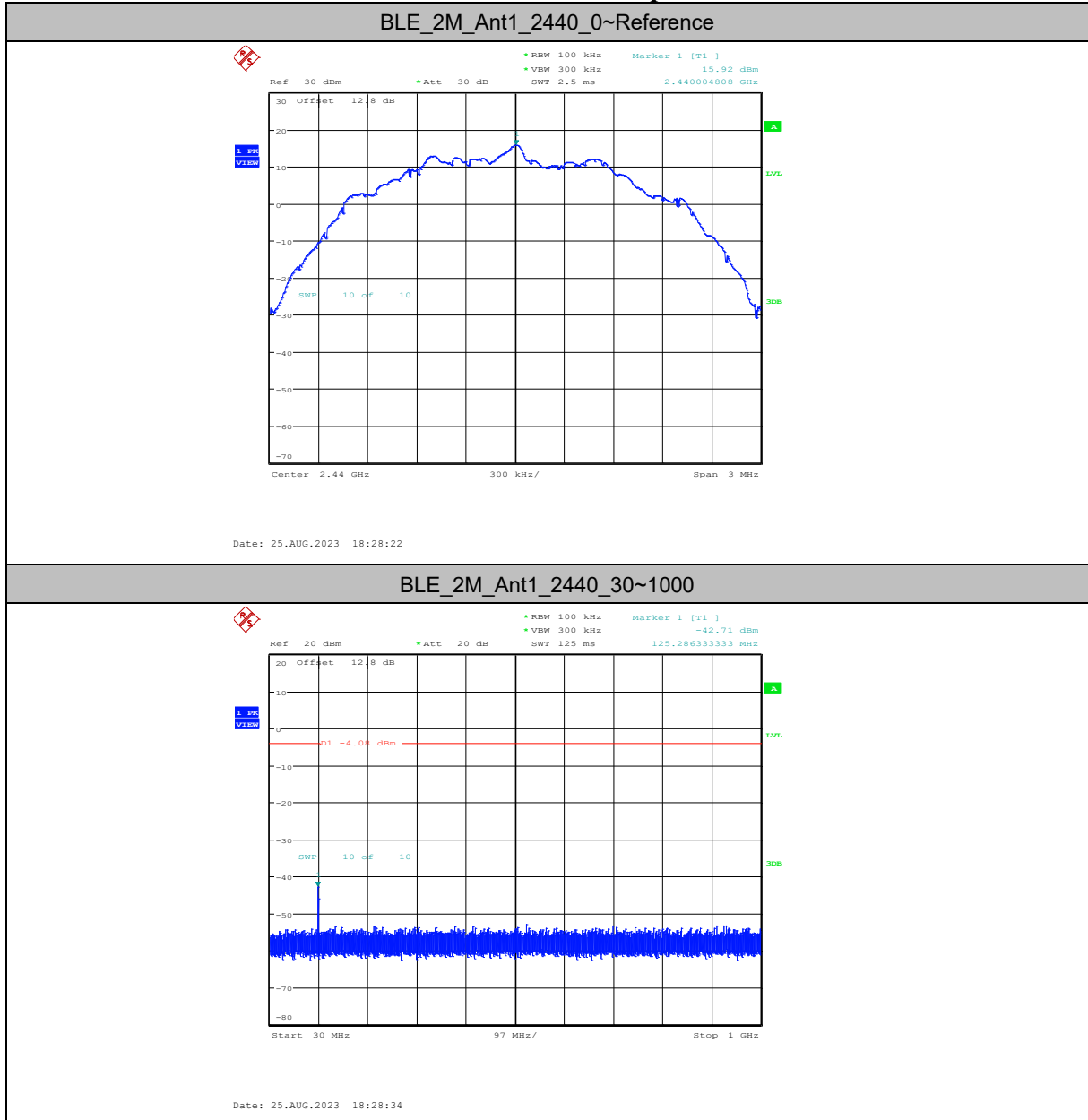
BLE_2M_Ant1_2402_1000~26500



Date: 25.AUG.2023 18:37:48

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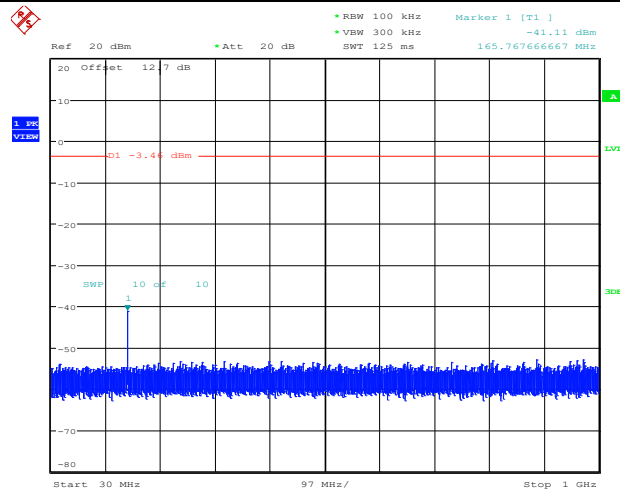
BLE_2M_Ant1_2440_1000~26500



Date: 25.AUG.2023 18:32:29

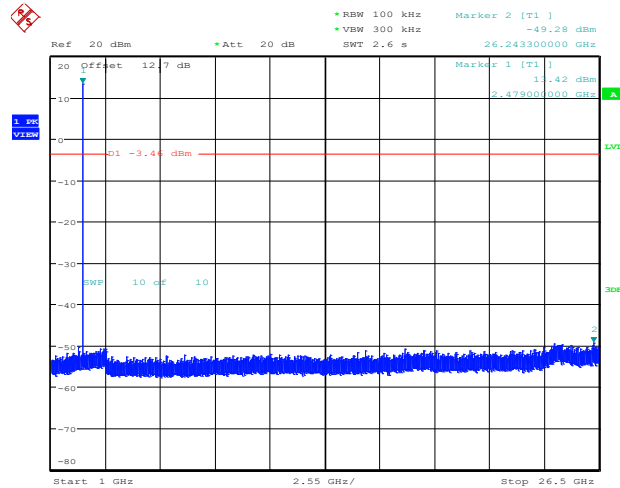
FAX:0086-23-88608777

BLE_2M_Ant1_2480_30~1000



Date: 25.AUG.2023 18:32:42

BLE_2M_Ant1_2480_1000~26500



Date: 25.AUG.2023 18:34:29

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6.8. Radiated Emission

Specifications:	FCC 47 Part 15.247(d),15.205(a),15.209(a)
DUT Serial Number:	S8 S11
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247(d),15.205(a),15.209(a)	20dB below peak output power in 100KHz bandwidth

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)).

Limit in restricted band

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)
0.009~0.49	2400/F (kHz)	129-94
0.49~1.705	24000/F (kHz)	74-63
1.705~30	30	70
30~88	100	40
88~216	150	43.5
216~960	200	46
Above 960	500	54

Measurement Uncertainty:

Measurement Uncertainty	30MHz-150MHz: 3.79 dB (k=2). 150MHz-1000MHz: 3.51dB (k=2). 1000MHz-6000MHz: 4.84 dB (k=2). 6000MHz-18000MHz: 4.52 dB (k=2).
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Test procedures:

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table

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Report No.: I23W00036-BLE RF-FCC

during operation shall be positioned on a non-conducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. but it may be larger or smaller to accommodate various sized EUTs. For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also ANSI C63.10-2013 section 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height varied from 1m to 4m and the EUT azimuth were varied from 0° to 360° in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Test Settings – Below 1GHz (Quasi-Peak Field Strength Measurements)

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 100 kHz.
3. Set the VBW = 300 kHz.
4. Detector = quasi-peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Trace was allowed to stabilize.

Test Settings – Above 1GHz (Peak Field Strength Measurements)

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 1MHz.
3. Set the VBW = 3MHz.
4. Detector = peak
5. Trace mode = max hold
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

Test Settings – Above 1GHz (Average Field Strength Measurements)

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 1MHz.
3. Set the VBW = 3MHz.
4. Detector = power average (RMS).
5. Number of measurement points = 1001 (Number of points must be $\geq 2 \times \text{span} \backslash \text{RBW}$)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

Frequency of emission (MHz)	RBW/VBW	Sweep Time (s)
0.009~30	9KHz/30KHz	Auto

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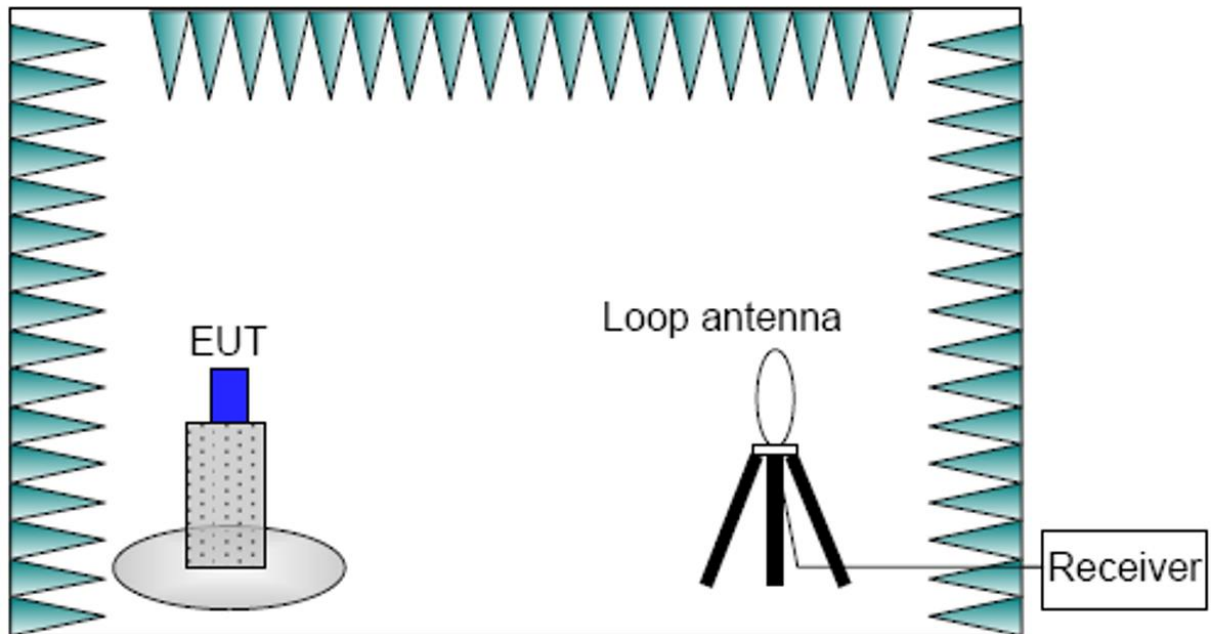
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Report No.: I23W00036-BLE RF-FCC

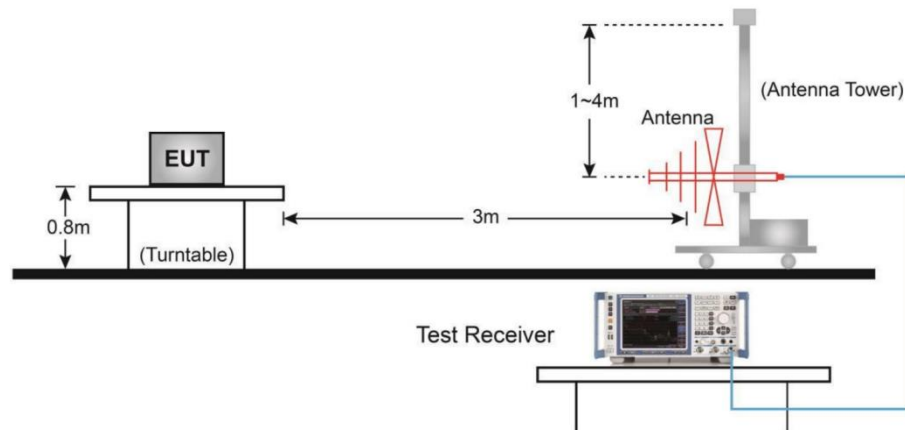
30~1000	100KHz/300KHz	5
1000~4000	1MHz/3MHz	15
4000~18000	1MHz/3MHz	40
18000~26500	1MHz/3MHz	20

Test Setup:

Below 30MHz Test Setup



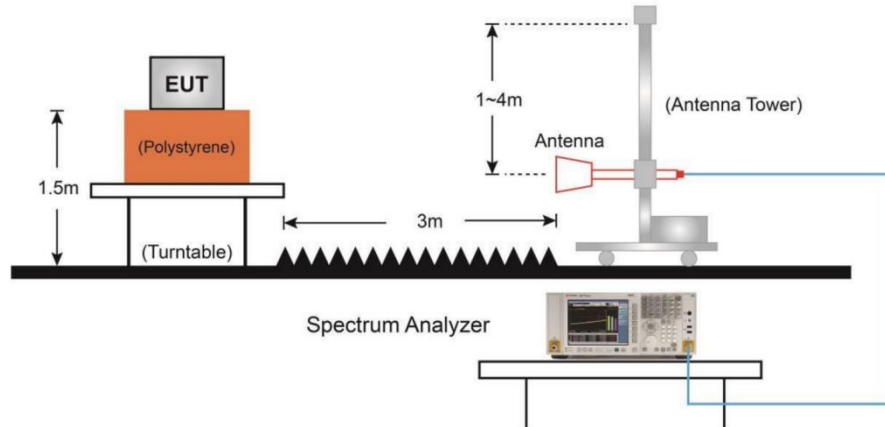
Below 1GHz Test Setup



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Above 1GHz Test Setup



Measurement Results:

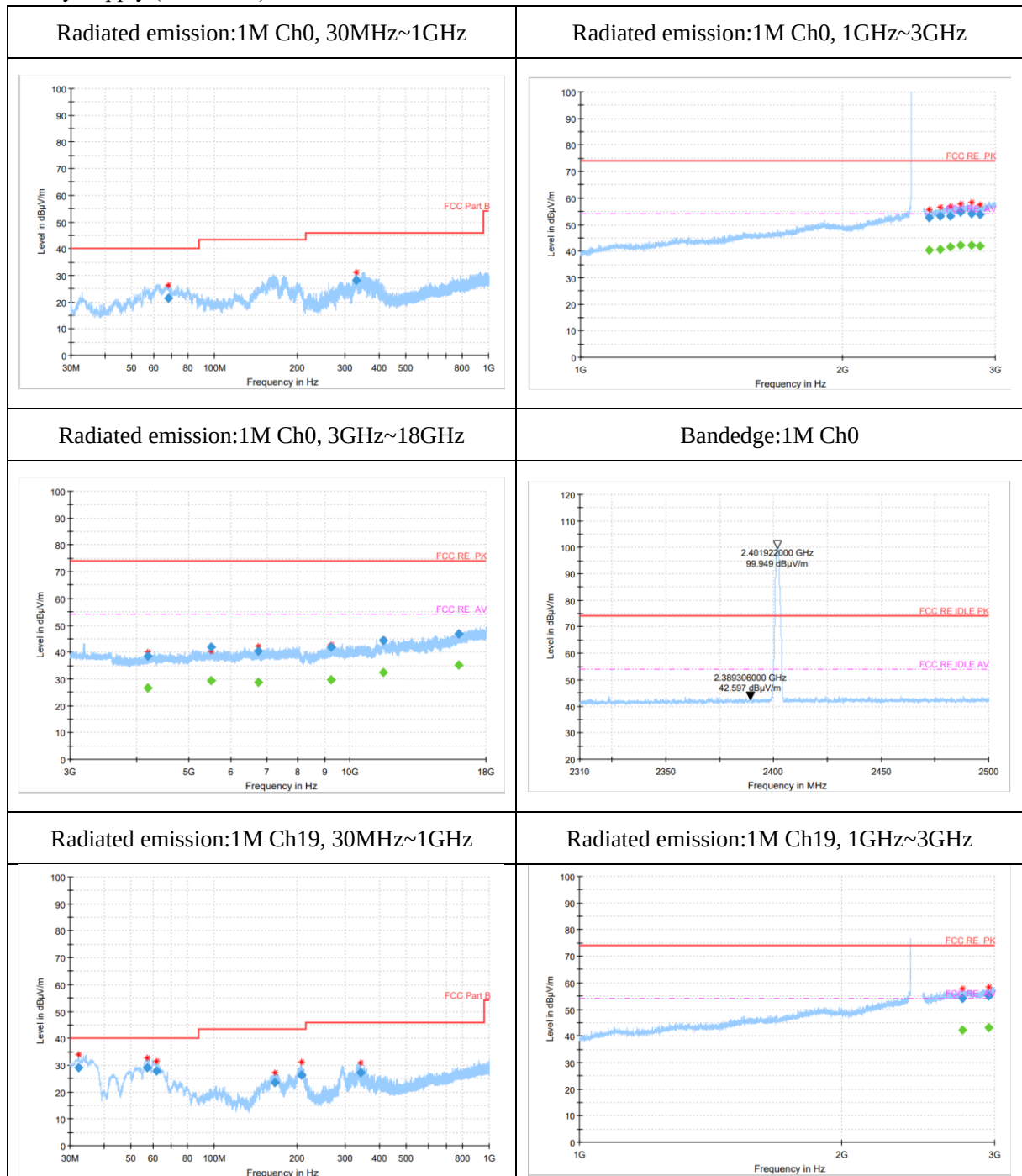
A “reference path loss” is established and A_{Rpi} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

The measurement results are obtained as described below:

$$A_{Rpi} = \text{Cable loss} + \text{Antenna Factor} - \text{Preamplifier gain}$$

$$\text{Result} = P_{Mea} + A_{Rpi}$$

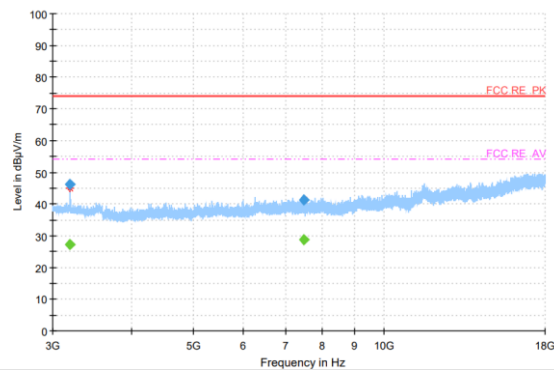
Mainly Supply (S8 L15A1)



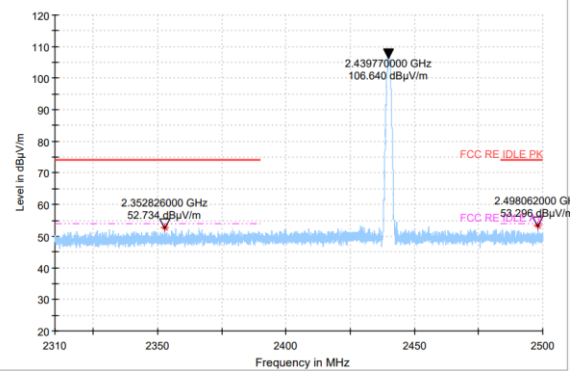
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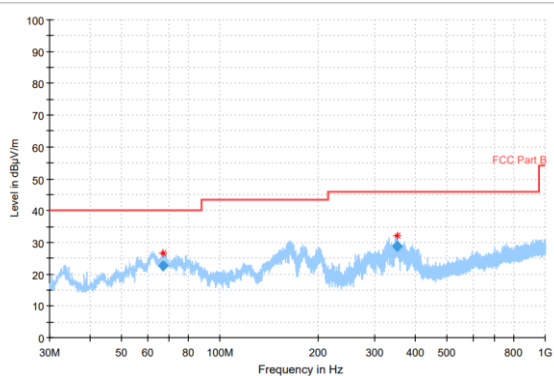
Radiated emission:1M Ch19, 3GHz~18GHz



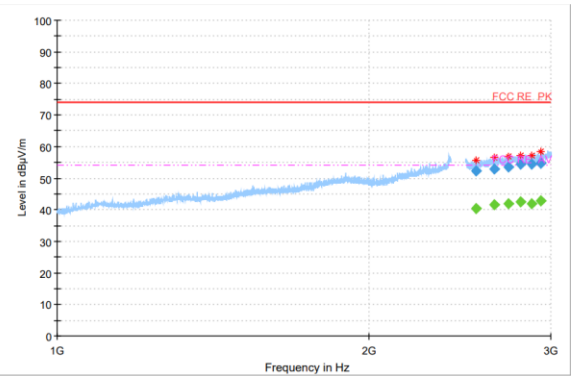
Bandedge:1M Ch19



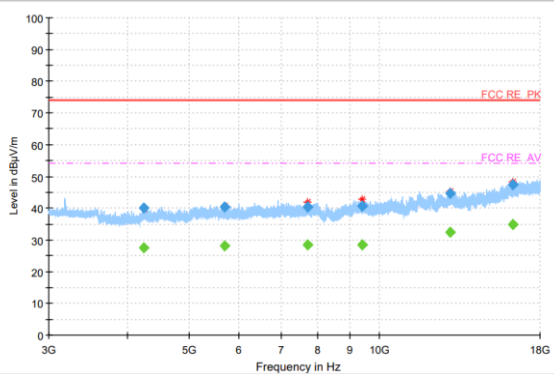
Radiated emission:1M Ch39, 30MHz~1GHz



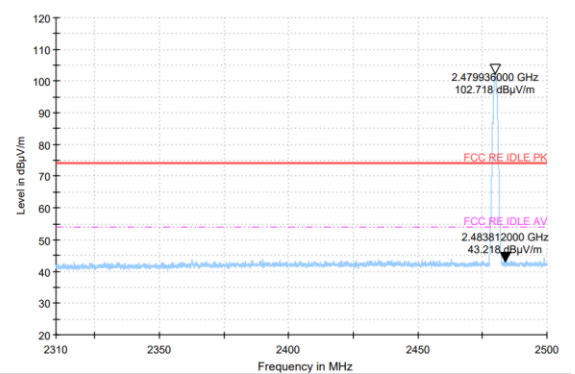
Radiated emission:1M Ch39, 1GHz~3GHz



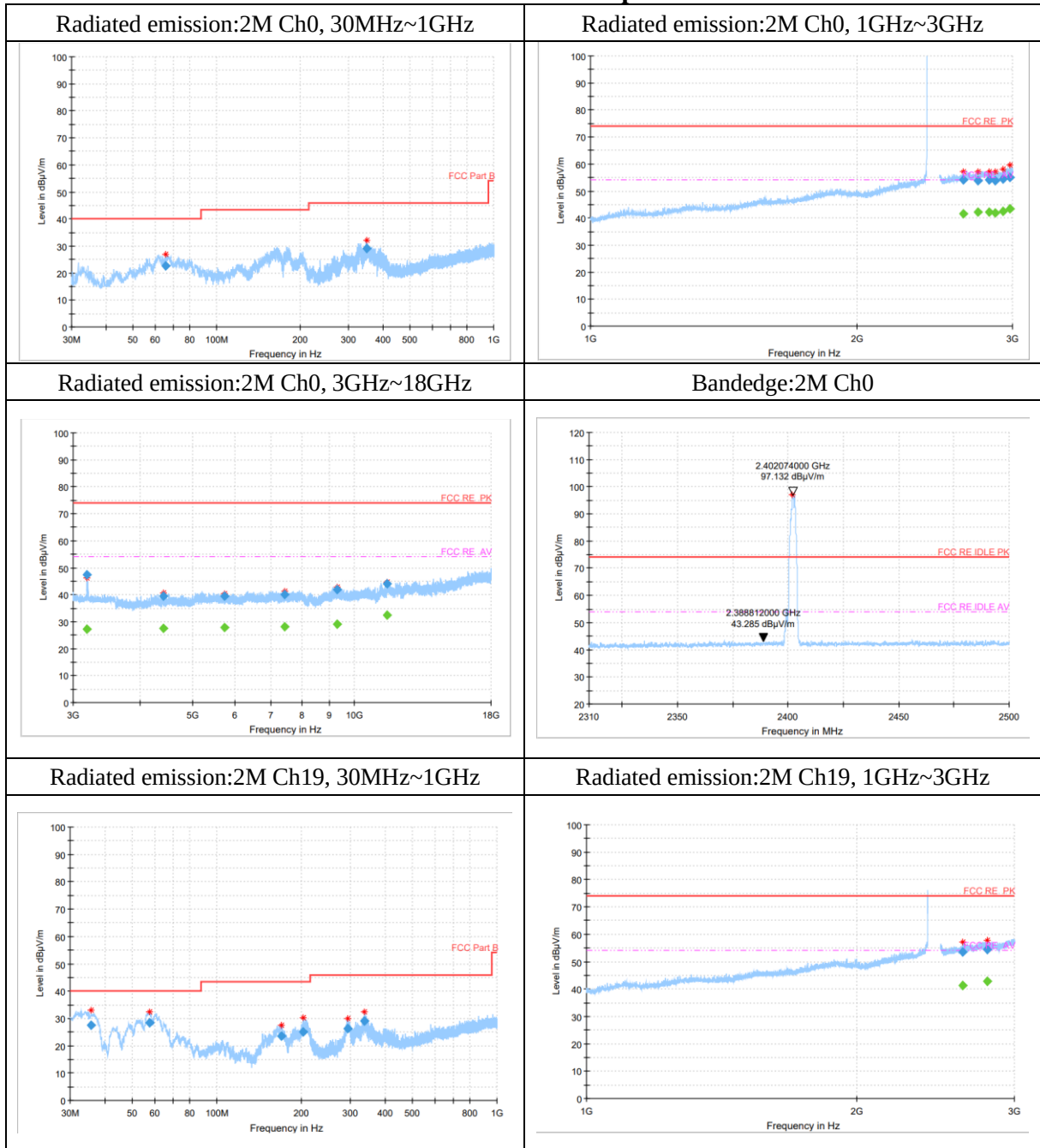
Radiated emission:1M Ch39, 3GHz~18GHz



Bandedge:1M Ch39



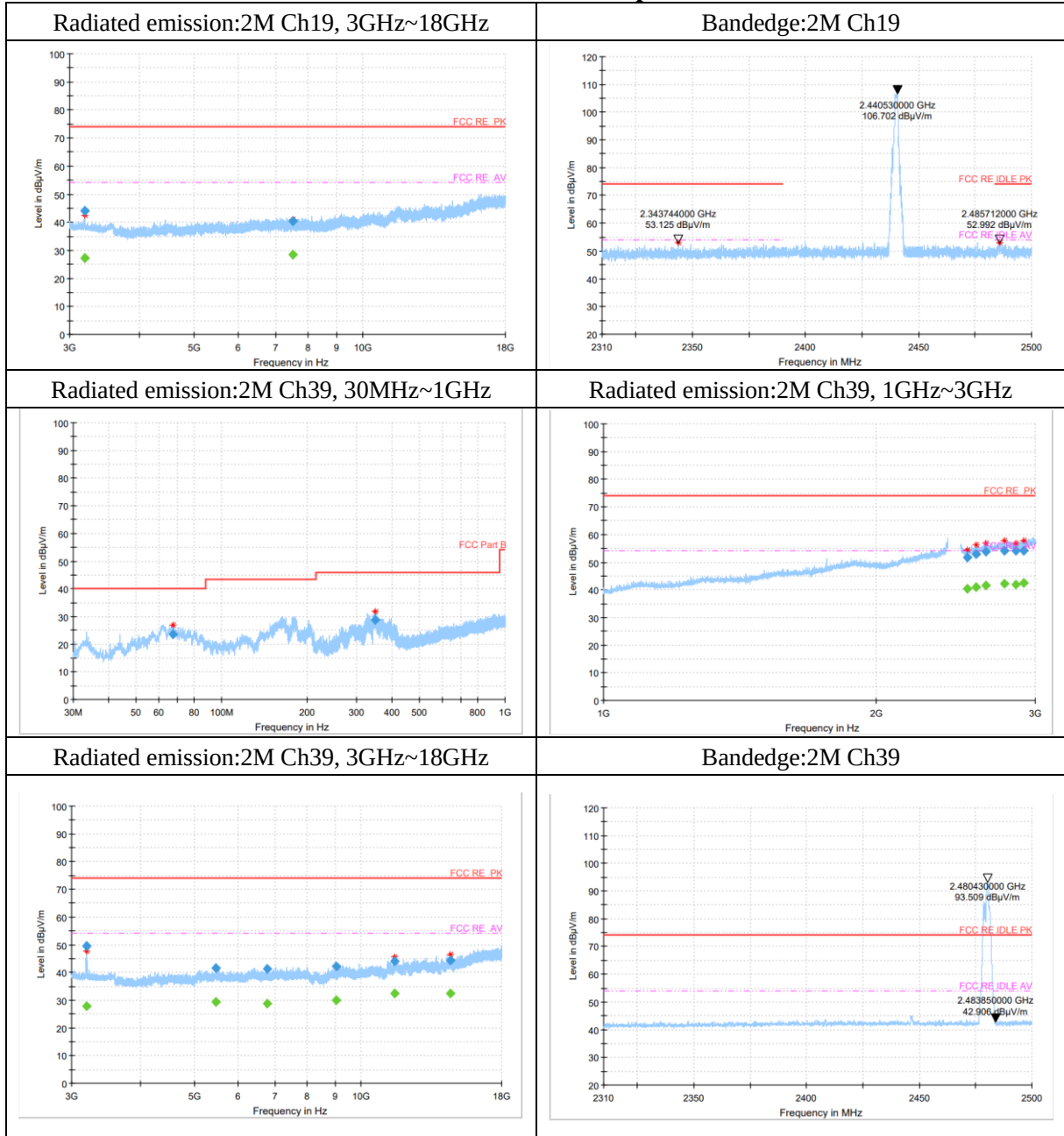
Report No.: I23W00036-BLE RF-FCC



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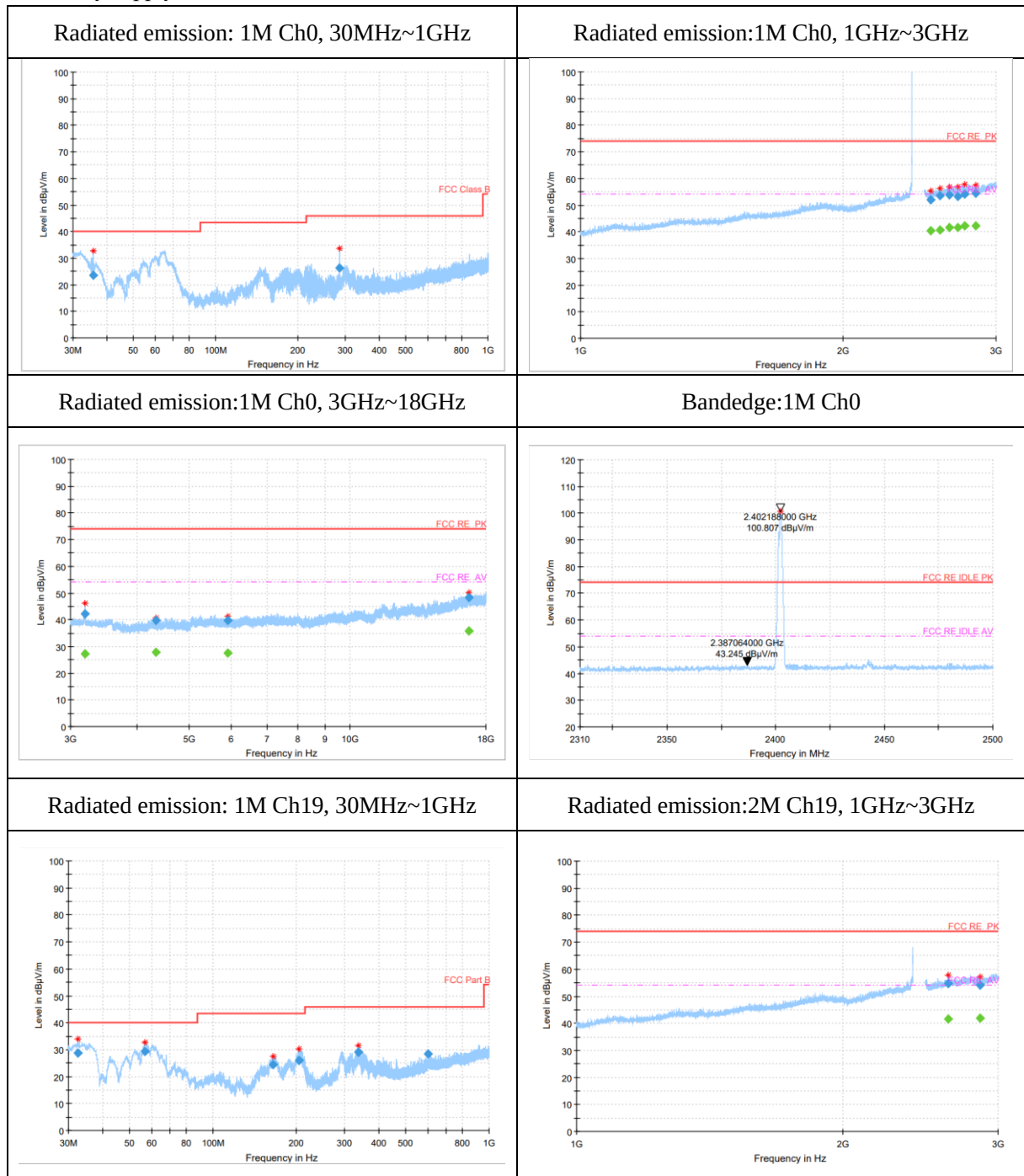
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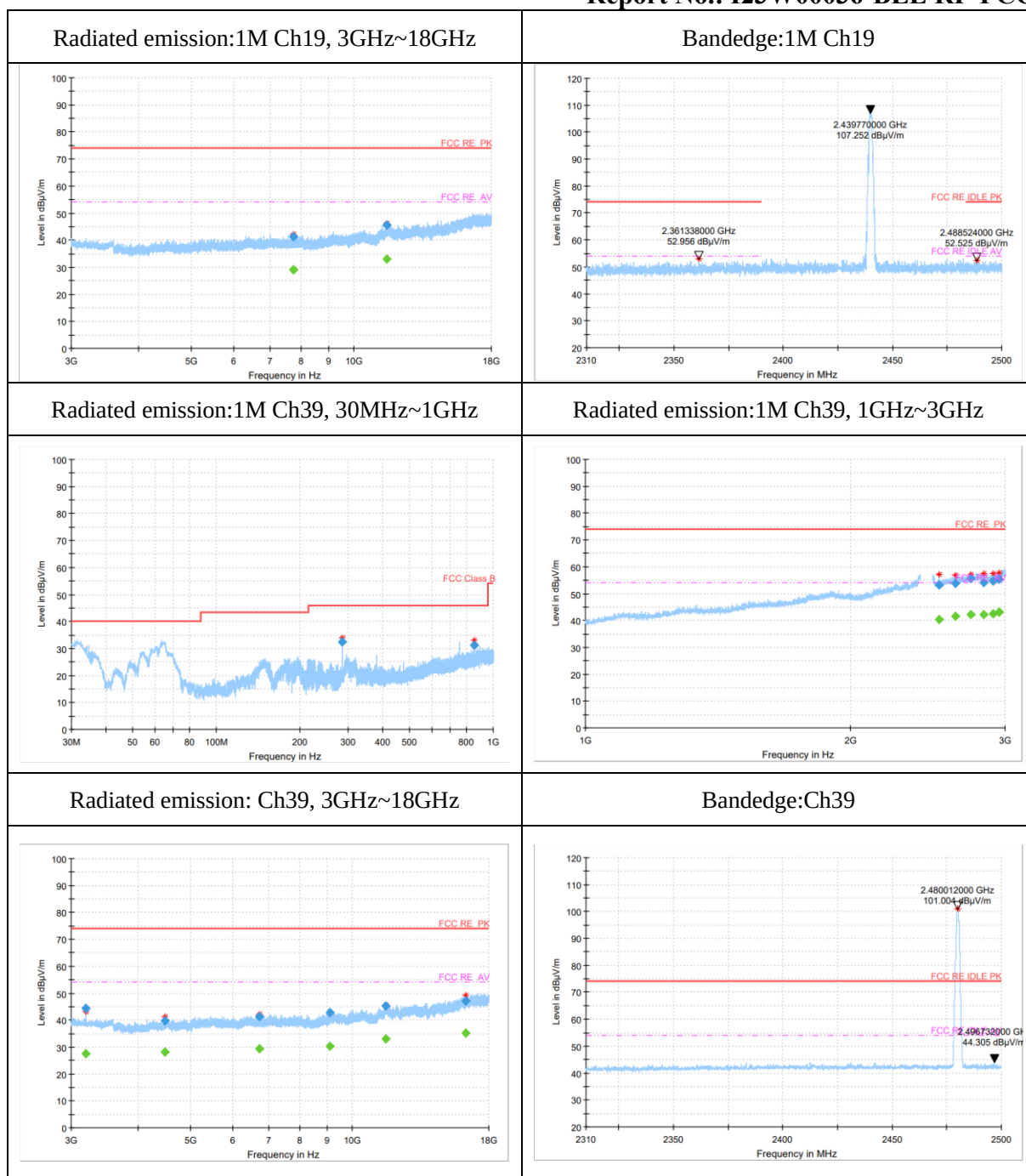
Secondary supply (S11 L15B1)



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Note:

1. The out-of- limit signal in the picture is the main frequency signal.
2. Only data in worst mode is provided.
3. Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier, the Emissions in the frequency band 18GHz~26.5GHz is more than 20dB below the limit are not report.
4. The test data below 30MHz is more than 20dB lower than the limit value, so it is not provided in the report.
5. Horizontal and vertical polarity is all have been tested, the result of them is synthesized in the above data

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diagram.

Mainly Supply (S8 L15A1)

RSE-1M-30M-1G-CH0(QP)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
67.9	21.53	-15	36.53	H
329.9	28.15	-9	37.15	H

RSE-1M-1G-3G-CH0(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2519.7	52.57	15	37.57	V
2591.8	53.1	16	37.1	V
2660.5	53.28	17	36.28	V
2739.0	54.64	18	36.64	V
2816.2	54.13	18	36.13	V
2883.2	53.88	18	35.88	V

RSE-1M-1G-3G-CH0 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2739.0	42.18	18	24.18	V
2816.2	42.29	18	24.29	V

RSE-1M-3G-18G-CH0(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
4194.7	38.57	-6	44.57	V
5508.1	41.81	-3	44.81	V
6759.5	40.32	-3	43.32	H
9244.5	41.75	0	41.75	H
11547.7	44.3	3	41.3	V

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15990.0	46.89	9	37.89	H
---------	-------	---	-------	---

RSE-1M -30M-1G-CH19 (QP)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
32.2	28.98	-16	44.98	V
57.3	28.99	-12	40.99	V
62.1	27.88	-13	40.88	V
166.0	23.66	-15	38.66	H
207.3	26.22	-13	39.22	V
341.4	27.26	-8	35.26	H

RSE-1M-1G-3G-CH19(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2751.7	54.07	18	36.07	H
2955.7	54.92	19	35.92	H

RSE-1M-1G-3G-CH19 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2751.7	42.28	18	24.28	H
2955.7	43.13	19	24.13	H

RSE-1M-3G-18G-CH19(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3195.4	46.21	-6	52.21	V
7473.4	41.18	-2	43.18	H

RSE-1M-30M-1G-CH39(QP)
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Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
67.2	22.65	-14	36.65	H
349.9	28.89	-8	36.89	H

RSE-1M-1G-3G-CH39(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2541.5	52.34	16	36.34	V
2647.8	52.94	17	35.94	H
2732.8	53.62	18	35.62	H
2801.5	54.48	18	36.48	H
2873.5	54.37	18	36.37	V
2935.4	54.71	19	35.71	V

RSE-1M-1G-3G-CH39 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2801.5	42.59	18	24.59	H
2873.5	41.76	18	23.76	V
2935.4	42.67	19	23.67	V

RSE-1M-3G-18G-CH39(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
4246.4	40.12	-5	45.12	V
5694.4	40.27	-3	43.27	V
7721.8	40.32	-2	42.32	H
9414.7	40.58	0	40.58	V
12979.9	44.71	4	40.71	H
16300.2	47.46	9	38.46	V

RSE-2M-30M-1G-CH0(QP)
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Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
65.7	22.54	-14	36.54	H
349.3	28.96	-8	36.96	H

RSE-2M-1G-3G-CH0(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2637.3	54.14	17	37.14	V
2739.6	53.92	18	35.92	V
2823.6	53.98	18	35.98	V
2869.5	53.77	18	35.77	H
2924.9	54.53	18	36.53	H
2980.7	55.08	19	36.08	V

RSE-2M-1G-3G-CH0 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2637.3	41.7	17	24.7	V
2924.9	42.46	18	24.46	H
2980.7	43.49	19	24.49	V

RSE-2M-3G-18G-CH0(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3186.9	47.46	-6	53.46	V
4425.0	39.33	-4	43.33	V
5740.2	39.54	-4	43.54	H
7434.8	40.19	-2	42.19	V
9286.9	41.82	0	41.82	H
11528.3	44.17	3	41.17	H

RSE-2M -30M-1G-CH19(QP)
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Report No.: I23W00036-BLE RF-FCC

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
35.7	27.62	-15	42.62	V
57.7	28.54	-12	40.54	V
169.9	23.49	-15	38.49	H
203.3	25.06	-13	38.06	V
293.4	26.39	-10	36.39	H
336.6	29.04	-9	38.04	H

RSE-2M-1G-3G-CH19(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2625.3	53.54	17	36.54	H
2800.8	54.55	18	36.55	V

RSE-2M-1G-3G-CH19 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2800.8	42.67	18	24.67	V

RSE-2M-3G-18G-CH19(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3196.2	44.18	-6	50.18	V
7505.5	40.47	-2	42.47	V

RSE-2M-30M-1G-CH39(QP)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
67.5	23.42	-14	37.42	H
348.6	28.69	-8	36.69	H

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RSE-2M-1G-3G-CH39(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2523.8	51.77	15	36.77	V
2582.2	52.97	16	36.97	H
2645.6	53.77	17	36.77	V
2772.5	54.1	18	36.1	H
2853.4	54.17	18	36.17	H
2910.8	54.27	18	36.27	V

RSE-2M-1G-3G-CH39 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2772.5	42.19	18	24.19	H
2853.4	42	18	24	H
2910.8	42.54	18	24.54	V

RSE-2M-3G-18G-CH39(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3198.2	49.41	-7	56.41	V
5479.9	41.55	-3	44.55	V
6769.9	41.41	-3	44.41	H
9033.5	42.08	-1	43.08	H
11514.4	44.04	3	41.04	V
14539.8	44.4	6	38.4	H

Secondary Supply(S11 L15B1)

RSE-1M-30M-1G-CH0(QP)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
35.6	23.48	-15	38.48	V
284.6	26.41	-11	37.41	H

RSE-1M-1G-3G-CH0(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2524.0	52.03	15	37.03	V
2584.4	53.67	16	37.67	V
2652.4	53.81	17	36.81	V
2709.6	53.34	17	36.34	V
2759.6	54.05	18	36.05	V
2841.1	54.34	18	36.34	V

RSE-1M-1G-3G-CH0 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2759.6	42.09	18	24.09	V
2841.1	42.23	18	24.23	V

RSE-1M-3G-18G-CH0(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3188.9	42.13	-6	48.13	H
4344.9	39.87	-5	44.87	V
5913.1	39.62	-3	42.62	V
16696.5	48.21	10	38.21	H

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RSE-1M-30M-1G-CH19 (QP)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
32.5	28.86	-16	44.86	V
56.7	29.44	-12	41.44	V
164.9	24.32	-15	39.32	H
204.3	26.1	-13	39.1	V
335.9	28.91	-9	37.91	H
600.0	28.37	-2	30.37	H

RSE-1M-1G-3G-CH19(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2631.9	54.65	17	37.65	V
2863.7	54.07	18	36.07	H

RSE-1M-1G-3G-CH19 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2631.9	41.65	17	24.65	V
2863.7	41.96	18	23.96	H

RSE-1M-3G-18G-CH19(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
7728.0	41.26	-2	43.26	V
11507.6	45.69	3	42.69	H

RSE-1M-30M-1G-CH39(QP)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
284.5	32.48	-11	43.48	H
853.4	31.14	0	31.14	V

RSE-1M-1G-3G-CH39(PEAK)
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Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2524.6	53.15	15	38.15	H
2636.1	53.7	17	36.7	H
2741.7	55.63	18	37.63	H
2836.1	54.08	18	36.08	V
2906.4	54.7	18	36.7	H
2951.9	55.4	19	36.4	V

RSE-1M-1G-3G-CH39 (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2741.7	42.26	18	24.26	H
2836.1	42.16	18	24.16	V
2906.4	42.55	18	24.55	H
2951.9	43.17	19	24.17	V

RSE-1M-3G-18G-CH39(PEAK)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3196.7	44.24	-6	50.24	V
4477.9	39.78	-4	43.78	V
6734.7	41.44	-2	43.44	H
9110.5	42.82	-1	43.82	H
11579.7	45.24	3	42.24	V
16313.8	47.19	9	38.19	V

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6.9. AC Powerline Conducted Emission

Specifications:	FCC 47 Part 15.207
DUT Serial Number:	S8
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Method of Measurement: ANSI C63.10-2013-clause 6.2

1.The one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT.

2.If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed.

3.The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation.

4.If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

If the EUT uses a detachable antenna, these measurements shall be made with a suitable dummy load connected to the antenna output terminals; otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. When measuring the ac conducted emissions from a device that operates between 150 kHz and 30 MHz a non-detachable antenna may be replaced with a dummy load for the measurements within the fundamental emission band of the transmitter, but only for those measurements.³⁶ Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency. Diagram or photograph the test setup that was used. See Clause 8 for full reporting requirements.

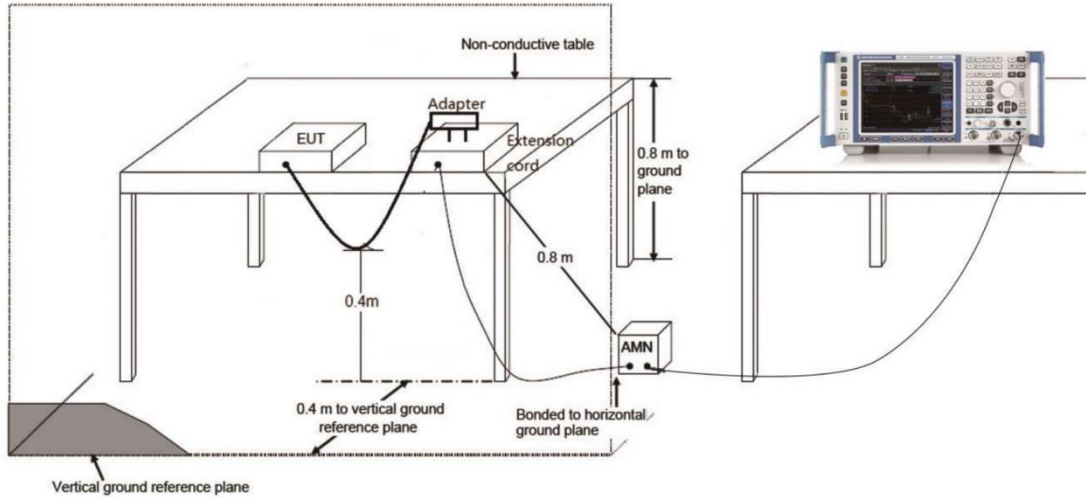
Measurement Uncertainty:

Measurement Uncertainty	1.97dB (k=2)
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Test Setup



Test Condition

Voltage (V)	Frequency (Hz)
120	60

Measurement Results and limit:

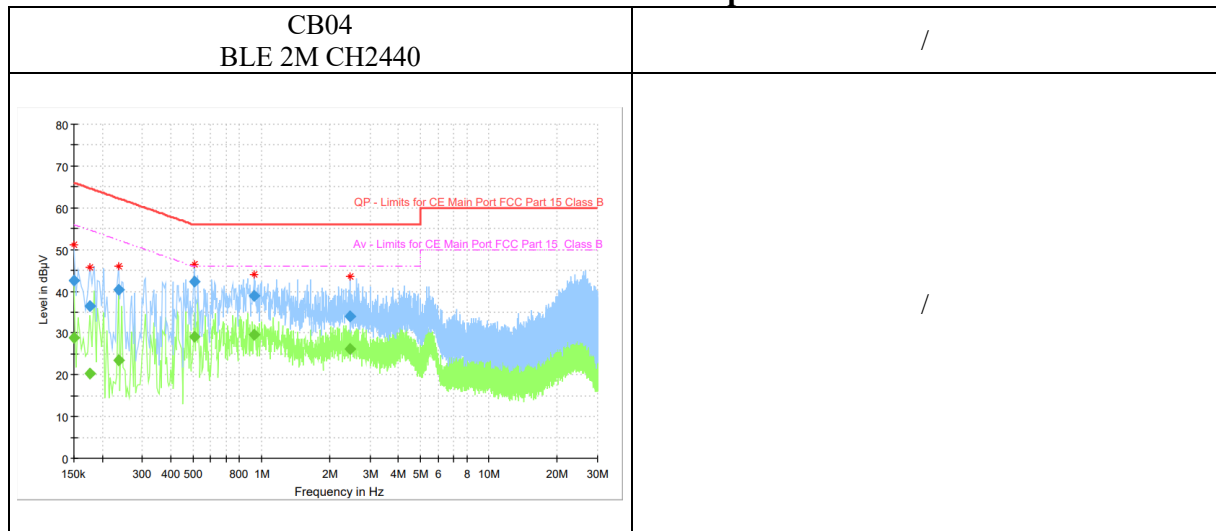
(Quasi-peak-average Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Average Limit (dBμV)	Conclusion
0.15 to 0.5	66 to 56	56 to 46	P
0.5 to 5	56	46	
5 to 30	60	50	

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

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Frequency (MHz)	QuasiPeak (dBμV)	Average (dμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	42.65	---	66.00	23.35	15000.0	9.000	N	ON	9.6
0.150000	---	28.97	56.00	27.03	15000.0	9.000	N	ON	9.6
0.176119	---	20.25	54.67	34.42	15000.0	9.000	L1	ON	9.6
0.176119	36.36	---	64.67	28.31	15000.0	9.000	L1	ON	9.6
0.235819	40.41	---	62.24	21.83	15000.0	9.000	L1	ON	9.6
0.235819	---	23.43	52.24	28.81	15000.0	9.000	L1	ON	9.6
0.508200	---	29.23	46.00	16.77	15000.0	9.000	N	ON	9.6
0.508200	42.30	---	56.00	13.70	15000.0	9.000	N	ON	9.6
0.929831	---	29.57	46.00	16.43	15000.0	9.000	N	ON	9.6
0.929831	38.80	---	56.00	17.21	15000.0	9.000	N	ON	9.6
2.452181	---	26.18	46.00	19.82	15000.0	9.000	N	ON	9.7
2.452181	34.09	---	56.00	21.91	15000.0	9.000	N	ON	9.7

Note:

1.All modes have been tested and only the worst mode is recorded in the report.

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ANNEX A EUT Photos

See the document” I23W00036-External Photos”.

See the document” I23W00036-Internal Photos”.

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ANNEX B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

*****END OF REPORT*****

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