

Test Report No.:
FCC2023-0029-RF

RF Test Report

EUT	:	Bluetooth keyboard
MODEL	:	BAIPTHK109
BRAND NAME	:	N/A
APPLICANT	:	Digital Gadgets LLC
CLASSIFICATION OF TEST	:	N/A

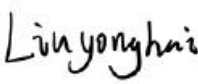
CVC Testing Technology Co., Ltd.



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Applicant		Name: Digital Gadgets LLC Address: 183 Locust Ave #427, West Long Branch, NJ	
Manufacturer		Name: Digital Gadgets LLC Address: 183 Locust Ave #427, West Long Branch, NJ	
Equipment Under Test		Name: Bluetooth keyboard Model/Type: BAIPTHK109 Brand: N/A Serial NO.: N/A Sample NO.: 3-1	
Date of Receipt.	2023.06.01	Date of Testing	2023.06.01~2023.06.09
Test Specification		Test Result	
FCC Part 15, Subpart C, Section 15.247		PASS	
Evaluation of Test Result		The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC Issue Date: 2023.06.12	
Tested by:  Xu ZhenFei Name Signature		Reviewed by:  Liu YongHai Name Signature	Approved by:  Chen HuaWen Name Signature
Other Aspects: NONE.			
Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			

This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC.



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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FCC2023-0029-RF	Original release	2023.06.12



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
FCC Part 15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
FCC Part 15.247(d) FCC Part 15.209	Radiated Emission and Restricted bands Measurements	PASS	Meet the requirement of limit.
FCC Part 15.247(d)	Out of band Emission and Band edge measurements	PASS	Meet the requirement of limit.
FCC Part 15.247(a)(2)	6dB Bandwidth Measurement	PASS	Meet the requirement of limit.
---	Occupied Channel Bandwidth	N/A	For reference
FCC Part 15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
FCC Part 15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
FCC Part 15.203 FCC Part 15.247(b)	Antenna Requirement	PASS	Meet the requirement of limit.



1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
WIFI & Bluetooth Test System 1					/
Communication Shielded Room 3	4m*3m*3m	CRTDSWKS R44301	VGDS-0702	CRT	2024/04/24
Bluetooth BQB test system	/	/	DZ-000338	CTTL	/
Bluetooth system integration	/	/	-	Tonscend	/
Wifi radiation system upgrade	/	/	-	Tonscend	/
Spectrum Analyzer	N9030A	MY53310374	EM-000395	Agilent	2024/04/22
Comprehensive Test Instrument	CMW270	100659	EM-000491	R&S	2023/12/06
Analog Signal Generator	N5173B	MY53270588	EM-000487-2	KEYSIGHT	2023/12/06
Vector Signal Generator	N5172B	MY53051933	EM-000487-1	KEYSIGHT	2023/12/06
Radiation Spurious Test System					/
3m Semi-Anechoic Chamber	FACT-4	ST08035	WKNA-0024	ETS	2024/12/12
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2024/02/22
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2024/02/22
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2023/06/25
Waveguide Horn Antenna	HF906	360306/008	EM-000093	R&S	2024/02/24
Waveguide Horn Antenna	BBHA9170	00949	DZ-000209-2	SCHWARZBECK	2023/07/31
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2023/06/05
5G Bandstop Filters	WRCJV12-4900- 5100-5900-6100 -50EE	851770	DZ-000186	WI	2023/12/06
Comprehensive tester	CMW500	159000	DZ-000240-2	R&S	2023/12/06
Conducted emission					/
EMI Test Receiver	ESW44	103123	EM-000698	R&S	2023-06-17
EMI Test Receiver	ESR3	102394	VG DY-0705	R&S	2024-02-22
LISN	NSLK 8127	8127644	VG DY-0150	SCHWARZBECK	2023-09-03
LISN	NSLK 8128	8128-316	VG DY-0149	SCHWARZBECK	2023-09-03
DC LISN	PVDC8301-017	PVDC8301#17	VG DY-0692	SCHWARZBECK	2023-10-07
LISN	NSLK 8129	8129-268	EM-000388	SCHWARZBECK	2024-02-22
Plus Limiter (#1)	VTSD 9561 F-N	00515	VG DY-0808	SCHWARZBECK	2024-03-03
Plus Limiter (#2)	VTSD 9561	9561-F017	VG DY-0152	SCHWARZBECK	2024-09-03
Impedance Stabilization Network	ISN T800	27095	WKNE-0195	TESEQ	2023-09-03
Impedance Stabilization Network	NTFM8158	8158-0092	VG DY-0356	SCHWARZBECK	2024-05-29
ImpedanceStabilizationNetwork	NTFM8131	#184	EM-000498	SCHWARZBECK	2024-05-29
Voltage Probe	TK9420	9420-499	VG DY-0128	SCHWARZBECK	2024-02-22
Power Divider	4901.17.B	22643830	DB-0016	HUBER+SUHNER	2023-08-31
Video Signal Generator	GV-798+	151064920001	VGDS-0215	PROMAX	2024-05-23
AudioSignalGenerator	GAG-810	EK871591	EM-000309	GW	2023-12-06
Shielding Room(#1)	GP1A	001	WKNF-0001	LEINING	2024-08-07
Shielding Room(#2)	GP1A	002	WKNF-0006	LEINING	2024-08-07
Current probe	EZ-17	0816.2063.02	EM-000567	R&S	2024-01-07
LISN	NNHV8123-200	8123200-020	EM-000385	SCHWARZBECK	2024-02-22
LISN	NNHV8123-200	8123200-021	EM-000386	SCHWARZBECK	2024-02-22



1.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

No.	Item	Frequency	Measurement Uncertainty
1	Conducted Emissions	9kHz~30MHz	±2.66dB
2	Radiated Spurious Emissions	9KHz ~ 30MHz	±0.769dB
		30MHz ~ 1GMHz	±0.877dB
		1GHz ~ 18GHz	±0.777dB
		18GHz ~ 40GHz	±1.315dB
Remark: 95% Confidence Levels, k=2.			

1.3 TEST LOCATION

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology Co., Ltd.

Address: No.3,TiantaiyiRoad,KaitaiAvenue,ScienceCity,Guangzhou,China

Post Code: 510663

Tel: 020-32293888

FAX: 020-32293889

E-mail: office@cvc.org.cn



2 GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	Bluetooth keyboard
BRAND	N/A
MODEL	BAIPTHK109
FCC ID	X2K-BAIPTHK109
POWER SUPPLY	1. DC 5V from USB host unit 2. DC 3.7V from Li-ion battery
MODULATIONTECHNOLOGY	GFSK
MODULATION TYPE	GKSK for BT-LE
OPERATING FREQUENCY	2402MHz ~ 2480MHz for BT-LE (1Mbps)
NUMBER OF CHANNEL	BT-LE GFSK (1Mbps): 40
CONDUCTED PEAK POWER	-0.26dBm (Maximum)
ANTENNA TYPE (Remark 4)	Ceramic antenna, with 1.5dBi gain
HARDWARE VERSION:	V3.0
SOFTWARE VERSION:	V3.0
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	Micro USB Cable, 0.5m, non-detachable, unshielded
Remark: 1. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report. 3. Please refer to the EUT photo document for detailed product photo. (Report NO.: FCC2023-0029-E) 4. Please refer to the antenna report. 5. Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, CVC is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion. 6. The EUT have SISO function, provides 1 completed transmitter and 1 receiver.	
MODULATION MODE	TX FUNCTION
BT-LE (1Mbps)	1TX/1RX



2.2 OTHER INFORMATION

Operating frequency of each channel

BT-LE (1Mbps)							
CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (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

The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefore, only the data of the test channels were recorded in this report.



2.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, xyz axis and antenna ports

EUT CONFIGURE MODE	APPLICABLE TEST ITEMS				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	√	√	BT-LE Function

Where **RE < 1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission

RE ≥ 1G: Radiated Emission above 1GHz
APCM: Antenna Port Conducted Measurement

RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ The worst case was found when positioned on x axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	BT-LE	0 to 39	0	DTS	GFSK	1.0

For the test results, only the worst case was shown in test report.

RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ The worst case was found when positioned on x axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	BT-LE	0 to 39	0	DTS	GFSK	1.0



POWER LINE CONDUCTED EMISSION TEST:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	TESTED CONDITION
A	BT-LE Link

ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	BT-LE	0 to 39	0	DTS	GFSK	1.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RSE<1G	24.3deg. C, 55%RH	DC 5V from USB host unit	Liu ShiWei
RSE≥1G	24.3deg. C, 55%RH	DC 5V from USB host unit	Liu ShiWei
PLC	24.9deg. C, 53%RH	DC 5V from USB host unit	Liu ShiWei
APCM	24.9deg. C, 53%RH	DC 5V from USB host unit	Liu ShiWei



2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC PART 15, Subpart C. Section 15.247

KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2020

All test items have been performed and recorded as per the above standards

2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Support Equipment							
NO	Description	Brand	Model No.		Serial Number	Supplied by	
1	Notebook	Lenovo	K43C-80		N/A	Lab	
2	Adapter	360	TEKA006-050100CHU		N/A	Lab	
Support Cable							
NO	Description	Quantity (Number)	Length (cm)	Detachable (Yes/ No)	Shielded (Yes/ No)	Cores (Number)	Supplied by
1	Micro USB Cable	1	50	No	No	N/A	Applicant

3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 Limit

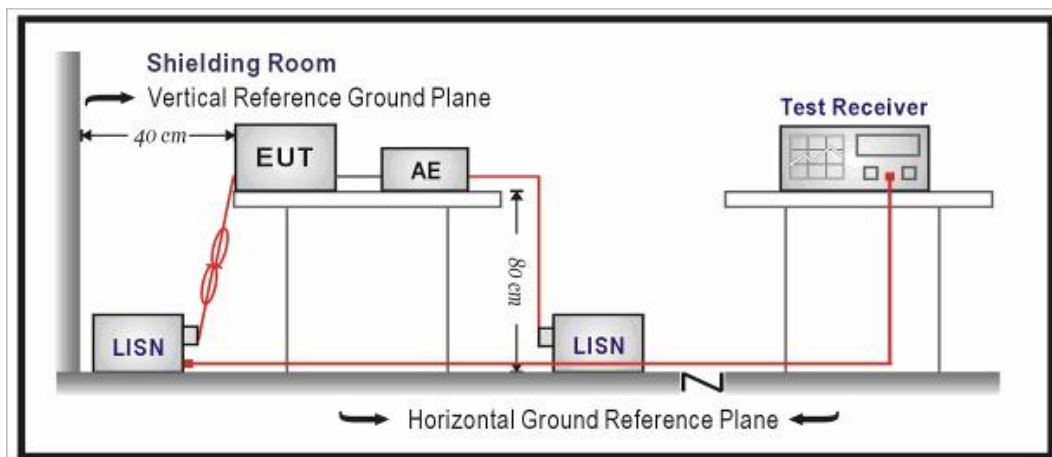
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
NOTE: 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.1.2 Measurement procedure

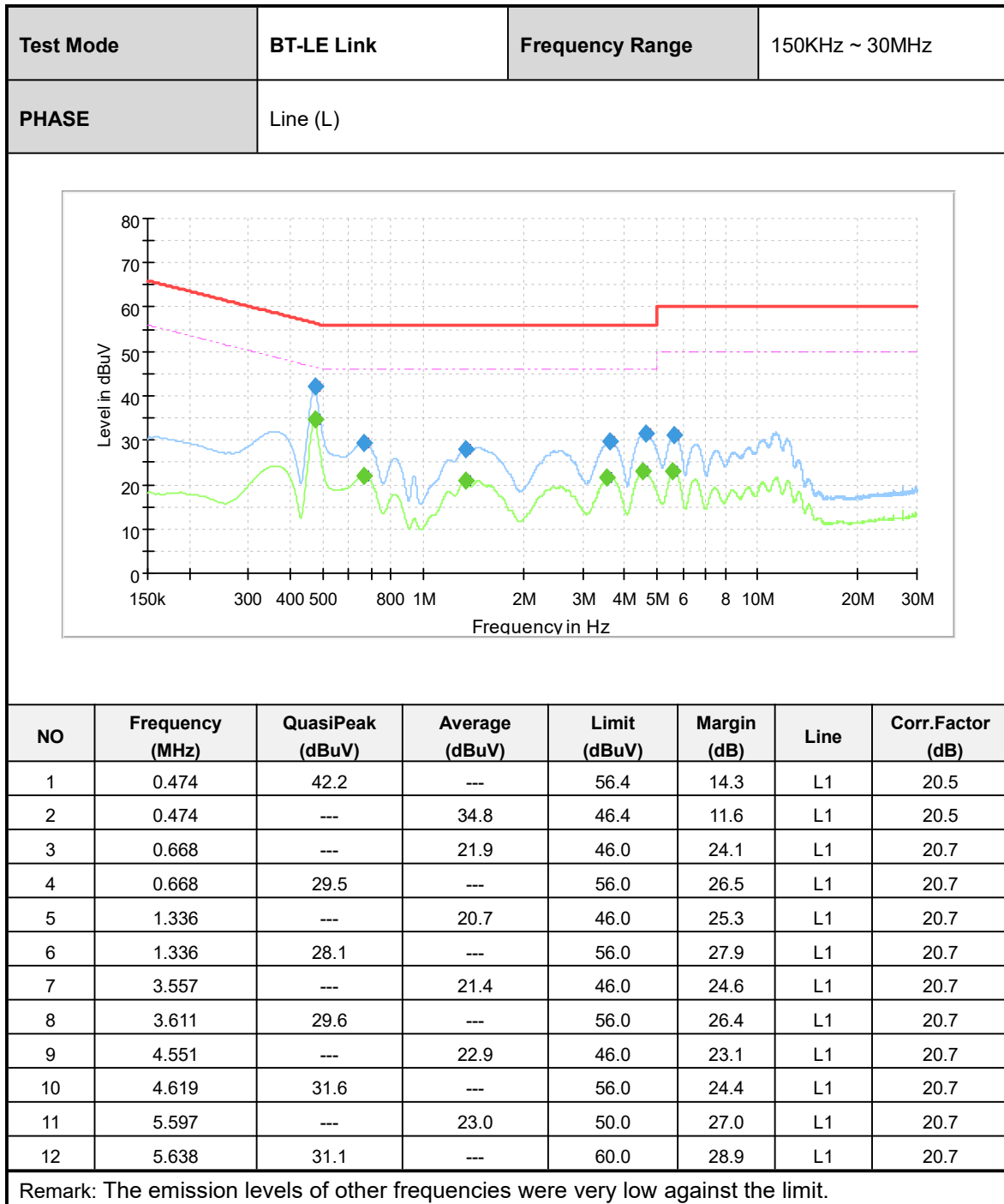
- The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the Test photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. The equipment under test shall be placed on a support of non-metallic material, the height of which shall be 1.5m above the ground,
- The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

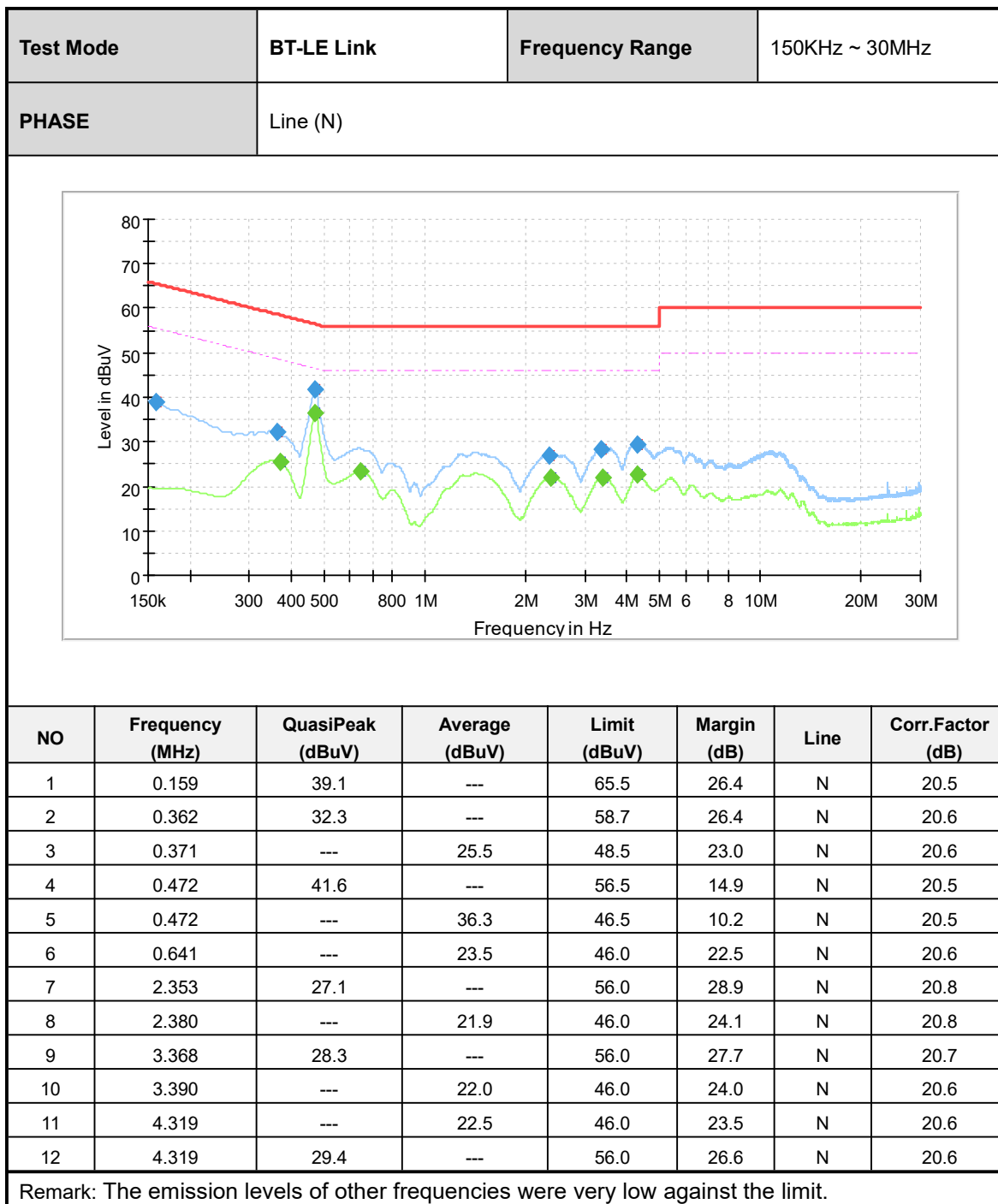
3.1.3 Test setup





3.1.4 Test results







3.2 RADIATED EMISSION AND RESTRICTED BANDS MEASUREMENTS

3.2.1 Limit

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).

FREQUENCIES (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 lower limit shall apply at the transition frequencies.
NOTE: 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
NOTE: 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

3.2.2 Measurement procedure

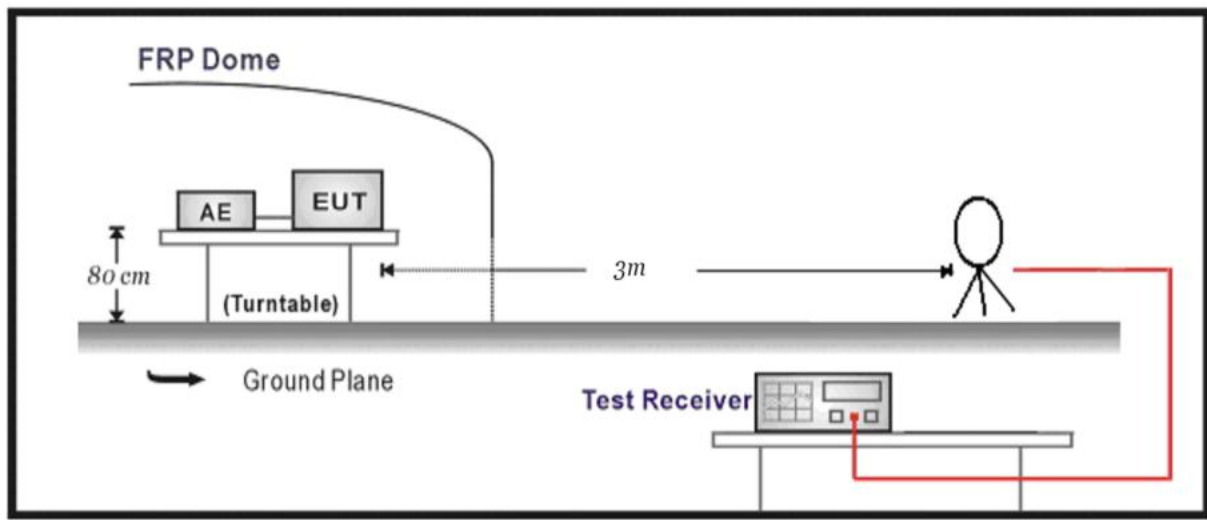
- The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

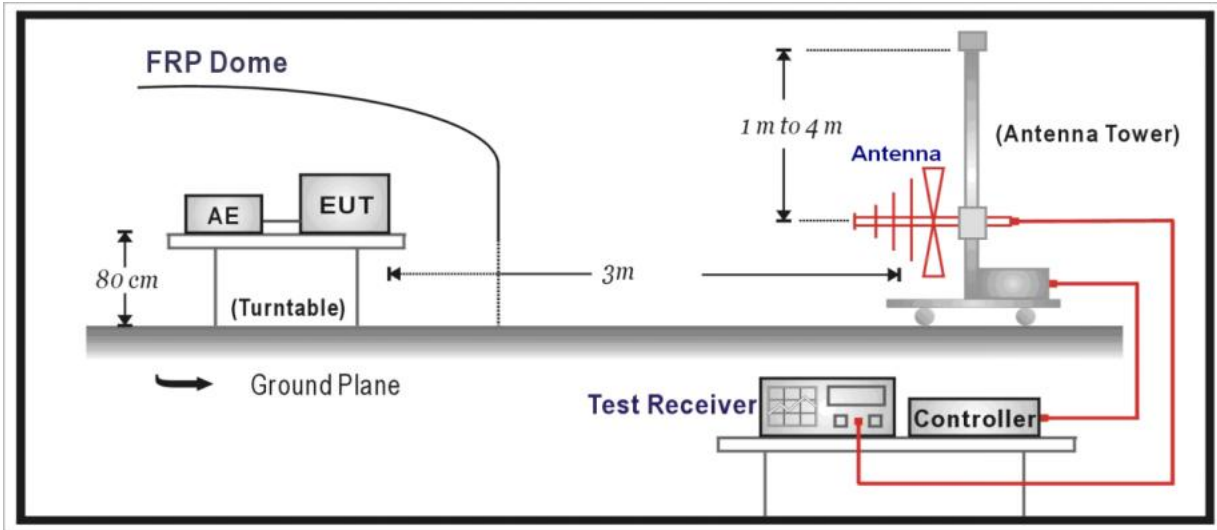
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

3.2.3 Test setup

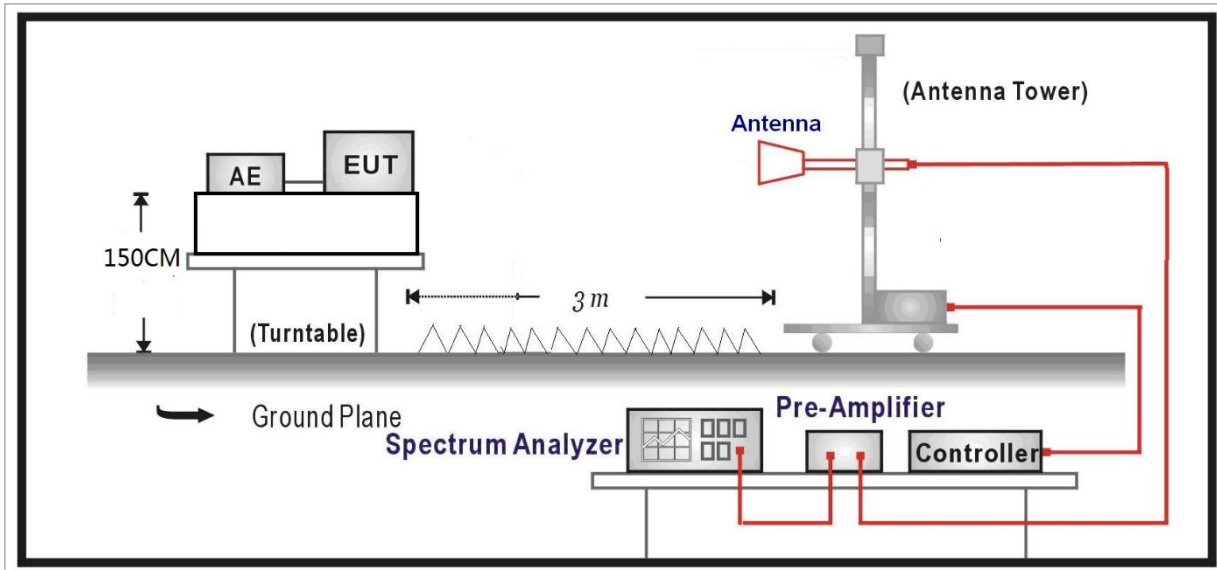
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



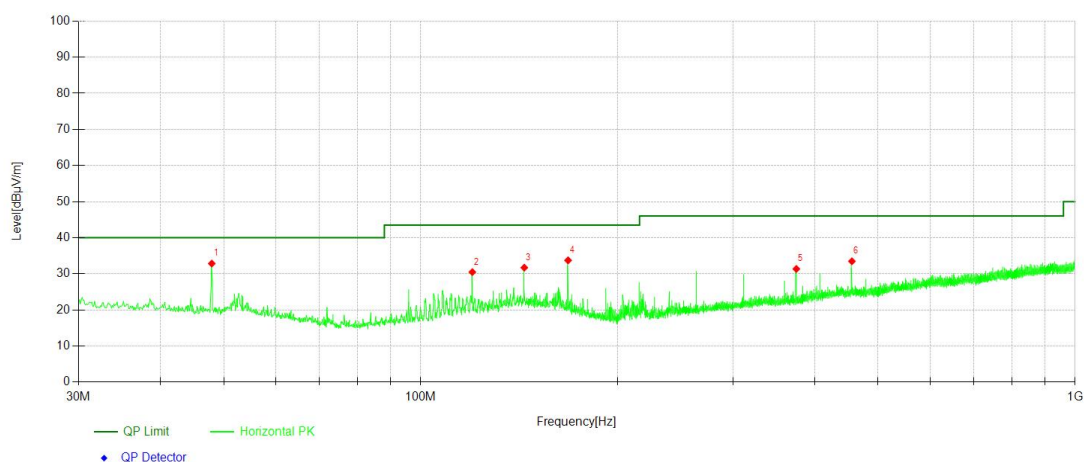


3.2.4 Test results

BELOW 1GHz WORST-CASE DATA:

Worst Test Mode	BLE	Channel	CH 0
Frequency Range	9KHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Horizontal



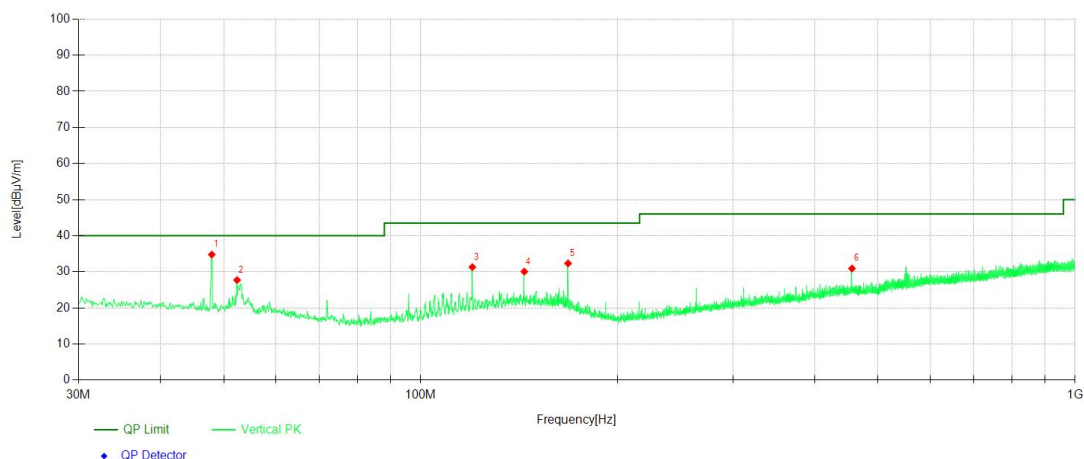
NO.	Freq. [MHz]	Level [dBμV/m]	Reading [dBμV]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]
1	47.9468	32.85	13.03	19.82	40.00	7.15	200	36
2	119.928	30.49	10.54	19.95	43.50	13.01	200	293
3	143.9864	31.71	10.66	21.05	43.50	11.79	200	270
4	167.9478	33.73	13.61	20.12	43.50	9.77	200	106
5	374.9665	31.36	9.25	22.11	46.00	14.64	100	318
6	455.9696	33.48	8.87	24.61	46.00	12.52	200	112

Remark: 1. 9KHz~30MHz have been test and test data more than 20dB margin.
2. The emission levels of other frequencies were greater than 20dB margin.
3. Level (dBμV/m) = Reading (dBμV/m) + Factor (dB).
4. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
5. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]



Worst Test Mode	BLE	Channel	CH 0
Frequency Range	9KHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Reading [dBμV]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]
1	47.9468	34.77	14.95	19.82	40.00	5.23	100	183
2	52.4092	27.72	8.20	19.52	40.00	12.28	100	166
3	119.928	31.30	11.35	19.95	43.50	12.20	100	235
4	143.9864	30.06	9.01	21.05	43.50	13.44	100	200
5	167.9478	32.34	12.22	20.12	43.50	11.16	100	230
6	456.0666	30.92	6.31	24.61	46.00	15.08	100	183

Remark: 1. 9KHz~30MHz have been test and test data more than 20dB margin.
 2. The emission levels of other frequencies were greater than 20dB margin.
 3. Level (dBμV/m) = Reading (dBμV/m) + Factor (dB).
 4. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 5. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]



ABOVE 1GHz DATA

Channel		BT-LE(1Mbps) CH0			Frequency		2402MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector
1	2390.0000	36.69	-0.15	36.54	54.00	17.46	215	178	AV
2	2390.0000	44.41	-0.15	44.26	74.00	29.74	170	358	PK
3	2402.0642	84.78	-0.04	84.74			167	16	AV
4	2402.0642	85.17	-0.04	85.13			168	16	PK
5	4804.0000	34.47	9.29	43.76	54.00	10.24	177	221	PK
6	4804.0000	42.69	9.29	51.98	74.00	22.02	241	283	PK
7	7206.0000	20.75	12.81	33.56	54.00	20.44	154	310	AV
8	7206.0000	28.82	12.81	41.63	74.00	32.37	231	154	PK
9	9608.0000	19.83	13.32	33.15	54.00	20.85	200	26	AV
10	9608.0000	27.46	13.32	40.78	74.00	33.22	227	164	PK
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	36.90	-0.15	36.75	54.00	17.25	170	80	AV
2	2390.0000	45.27	-0.15	45.12	74.00	28.88	153	120	PK
3	2401.9502	80.40	-0.03	80.37			180	248	AV
4	2402.2732	81.00	-0.04	80.96			167	248	PK
5	4804.0000	35.13	9.29	44.42	54.00	9.58	190	283	AV
6	4804.0000	43.78	9.29	53.07	74.00	20.93	178	141	PK
7	7206.0000	20.98	12.81	33.79	54.00	20.21	174	180	AV
8	7206.0000	29.71	12.81	42.52	74.00	31.48	174	202	PK
9	9608.0000	19.81	13.32	33.13	54.00	20.87	162	30	AV
10	9608.0000	27.45	13.32	40.77	74.00	33.23	209	40	PK
Remark:1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = Limit[dBuV/m] - Level [dBuV/m]									



Channel		BT-LE(1Mbps) CH19			Frequency		2440MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector
1	4880.0000	35.97	9.79	45.76	54.00	8.24	181	248	AV
2	4880.0000	43.51	9.79	53.30	74.00	20.70	160	225	PK
3	7320.0000	22.62	11.02	33.64	54.00	20.36	231	210	AV
4	7320.0000	30.29	11.02	41.31	74.00	32.69	197	46	PK
5	9760.0000	20.30	13.25	33.55	54.00	20.45	238	308	AV
6	9760.0000	28.06	13.25	41.31	74.00	32.69	171	359	PK
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4880.0000	35.09	9.79	44.88	54.00	9.12	184	106	AV
2	4880.0000	43.66	9.79	53.45	74.00	20.55	227	150	PK
3	7320.0000	22.40	11.02	33.42	54.00	20.58	182	19	AV
4	7320.0000	30.00	11.02	41.02	74.00	32.98	186	19	PK
5	9760.0000	19.31	13.25	32.56	54.00	21.44	218	210	AV
6	9760.0000	27.67	13.25	40.92	74.00	33.08	236	320	PK
Remark:1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = Limit[dBuV/m] - Level [dBuV/m]									



Channel		BT-LE(1Mbps) CH39			Frequency		2480MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector
1	2480.0100	85.86	0.31	86.17			217	260	AV
2	2480.1050	86.26	0.31	86.57			213	265	PK
3	2483.5000	38.07	0.45	38.52	54.00	15.48	229	275	AV
4	2483.5000	48.20	0.45	48.65	74.00	25.35	240	310	PK
5	4960.0000	35.17	10.70	45.87	54.00	8.13	242	114	AV
6	4960.0000	43.01	10.70	53.71	74.00	20.29	178	330	PK
7	7440.0000	21.31	9.75	31.06	54.00	22.94	248	35	AV
8	7440.0000	29.60	9.75	39.35	74.00	34.65	151	332	PK
9	9920.0000	19.84	13.83	33.67	54.00	20.33	194	75	AV
10	9920.0000	26.78	13.83	40.61	74.00	33.39	203	179	PK
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2480.0100	85.42	0.31	85.73			234	218	AV
2	2483.5000	37.59	0.45	38.04			226	223	AV
3	2483.5000	45.44	0.45	45.89	74.00	28.11	227	144	PK
4	2483.5000	37.59	0.45	38.04	54.00	15.96	181	223	AV
5	4960.0000	34.78	9.79	44.57	54.00	9.43	211	255	AV
6	4960.0000	43.03	9.79	52.82	74.00	21.18	168	218	PK
7	7440.0000	20.85	11.02	31.87	54.00	22.13	172	114	AV
8	7440.0000	28.89	11.02	39.91	74.00	34.09	209	1	PK
9	9920.0000	19.12	13.25	32.37	54.00	21.63	182	166	AV
10	9920.0000	27.76	13.25	41.01	74.00	32.99	179	65	PK
Remark:1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]									



3.3 6dB BANDWIDTH MEASUREMENT

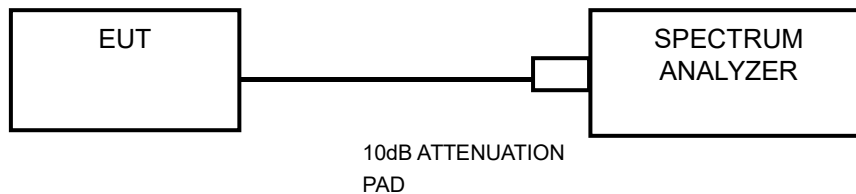
3.3.1 Limits

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

3.3.2 Measurement procedure

- Set resolution bandwidth (RBW) = 100KHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3.3 Test setup



3.3.4 Test result

Please refer Annex A



3.4 CONDUCTED OUTPUT POWER

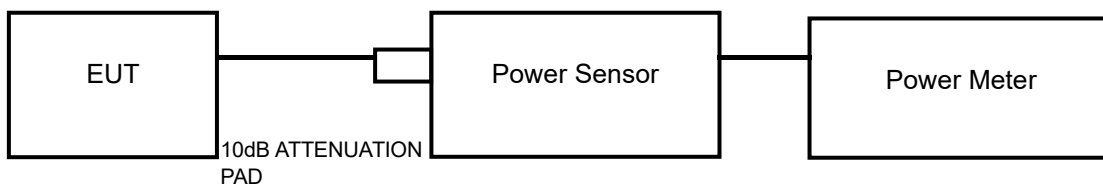
3.4.1 Limits

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm).

3.4.2 Measurement procedure

- A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor and set the detector to PEAK. Record the power level.
- An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor and set the detector to AVERAGE. Record the power level.

3.4.3 Test setup



3.4.4 Test result

Please refer Annex A.



3.5 POWER SPECTRAL DENSITY MEASUREMENT

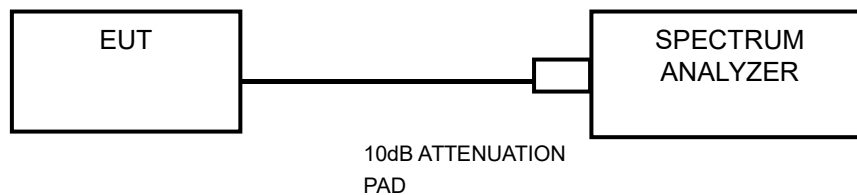
3.5.1 Limits

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

3.5.2 Measurement procedure

- Set instrument center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set RBW to: 3KHz
- Set VBW $\geq 3 \times$ RBW.
- Detector = peak
- Ensure that the number of measurement points in the sweep $\geq 2 \times$ span/RBW.
- Sweep time = auto couple.
- Use the peak marker function to determine the maximum amplitude level.

3.5.3 Test setup



3.5.4 Test result

Please refer Annex A.



3.6 OUT OF BAND EMISSION AND BAND EDGE MEASUREMENTS

3.6.1 Limits

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

3.6.2 Measurement procedure

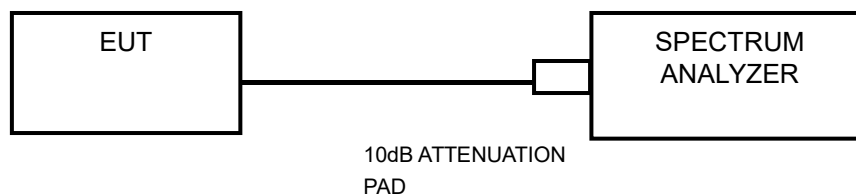
Measurement Procedure -Reference Level

- Set the RBW = 100 kHz.
- Set the VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHzband segment within the fundamental EBW.

Measurement Procedure –Unwanted Emission Level

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Set span to encompass the spectrum to be examined
- Detector = peak.
- Trace Mode = max hold.
- Sweep = auto couple.

3.6.3 Test setup



3.6.4 Test result

Please refer Annex A.



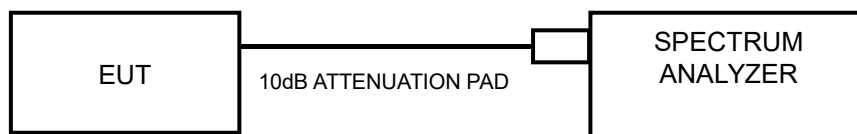
3.7 OCCUPIED BANDWIDTH MEASUREMENT

3.7.1 Measurement procedure

The transmitter antenna output was connected to the spectrum analyzer through an attenuator. The resolution bandwidth shall be set to the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

3.7.2 Test setup



3.7.3 Test result

Please refer Annex A.



4 PHOTOGRAPHS OF TEST SETUP

Please refer to the attached file (Test Setup Photo).



5 PHOTOGRAPHS OF THE EUT

Please refer to the attached file (External Photos report and Internal Photos).



6 Appendix A (Please refer to the following pages for test results.)

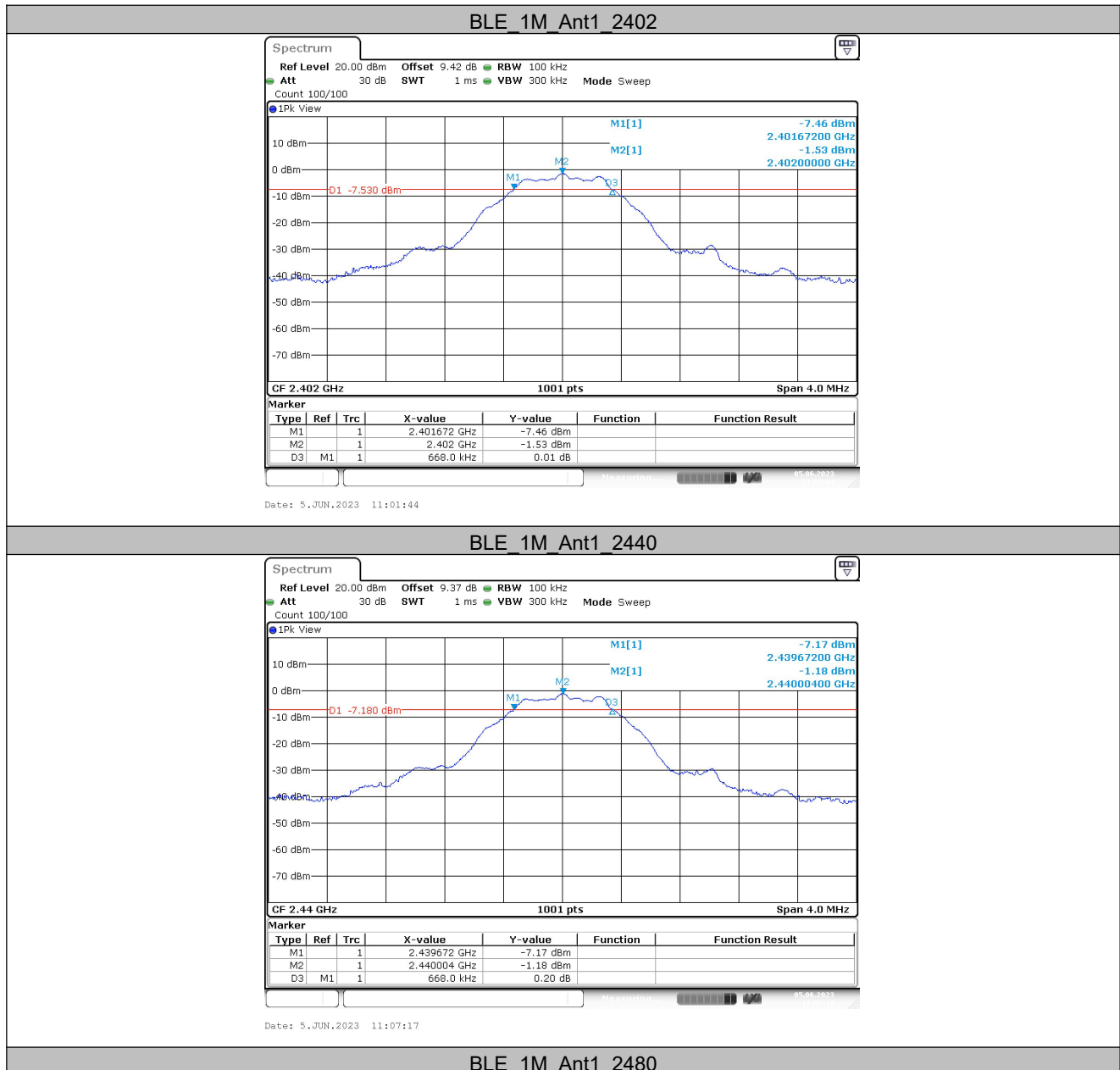
6.1 6DB BANDWIDTH MEASUREMENT

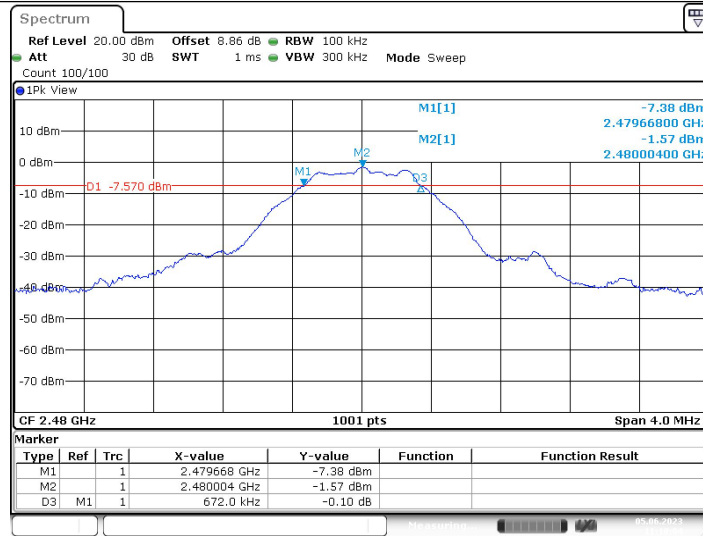
6.1.1 Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.67	2401.67	2402.34	0.5	PASS
		2440	0.67	2439.67	2440.34	0.5	PASS
		2480	0.67	2479.67	2480.34	0.5	PASS



6.1.2 Test Graphs





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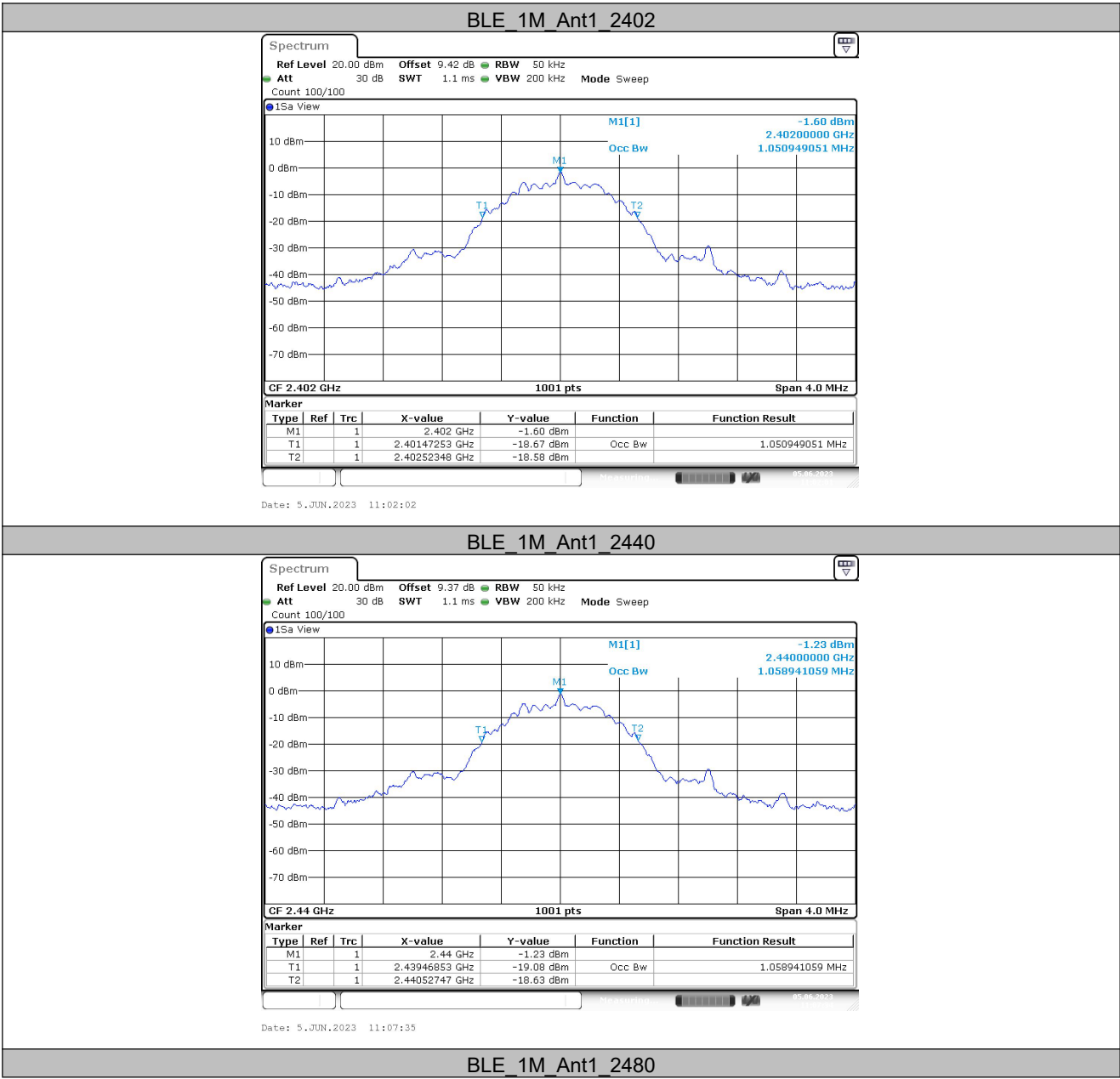
6.2 Occupied Channel Bandwidth (For reference)

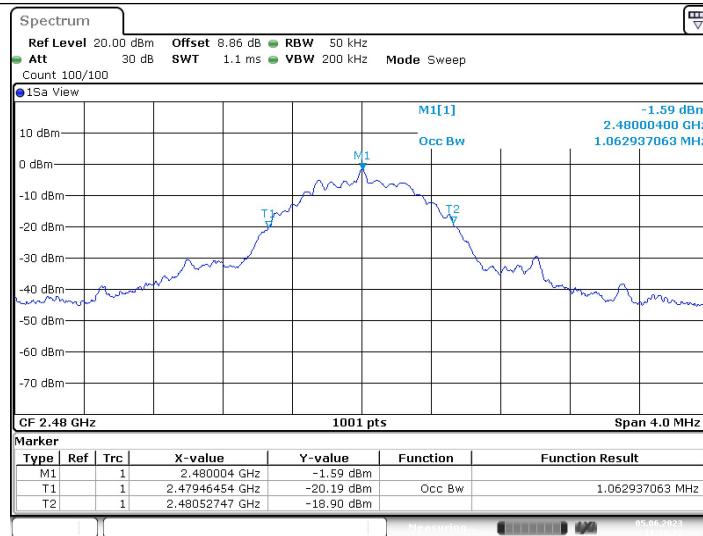
6.2.1 Test Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.051	2401.473	2402.523	---	---
		2440	1.059	2439.469	2440.527	---	---
		2480	1.063	2479.465	2480.527	---	---



6.2.2 Test Graphs





Date: 5.JUN.2023 11:10:23



6.3 CONDUCTED OUTPUT POWER

6.3.1 Test Result Peak

TestMode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-0.59	≤30	0.91	≤36	PASS
		2440	-0.26	≤30	1.24	≤36	PASS
		2480	-0.72	≤30	0.78	≤36	PASS

6.3.2 Test Result Average

Test Mode	Antenna	Frequency[MHz]	Conducted Average power [dBm]	Limit [dBm]	Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
BLE_1M	Ant1	2402	-2.42	≤30.00	1.50	-0.92	≤36.00	PASS
		2440	-2.14	≤30.00	1.50	-0.64	≤36.00	PASS
		2480	-2.50	≤30.00	1.50	-1.00	≤36.00	PASS



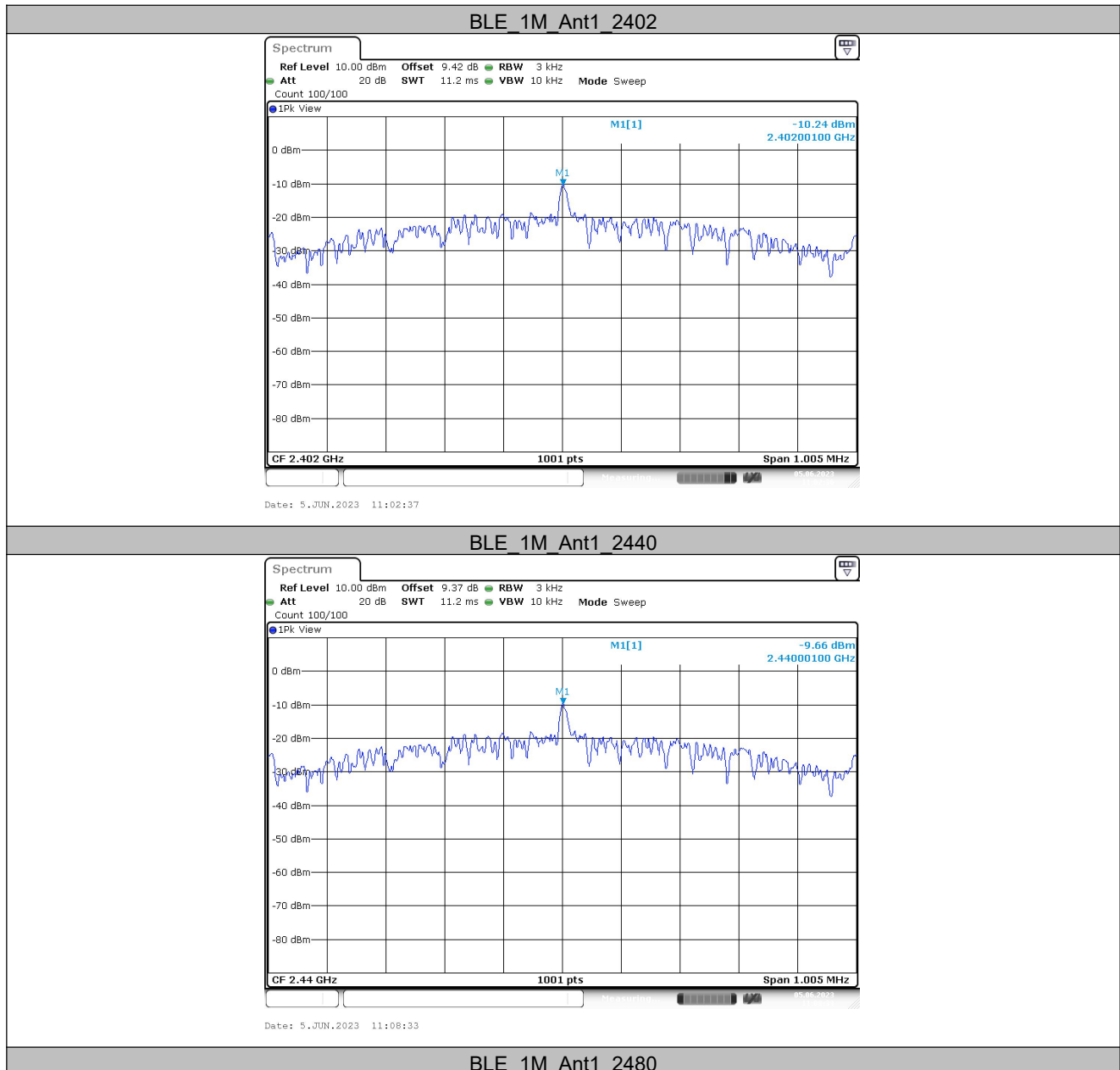
6.4 POWER SPECTRAL DENSITY MEASUREMENT

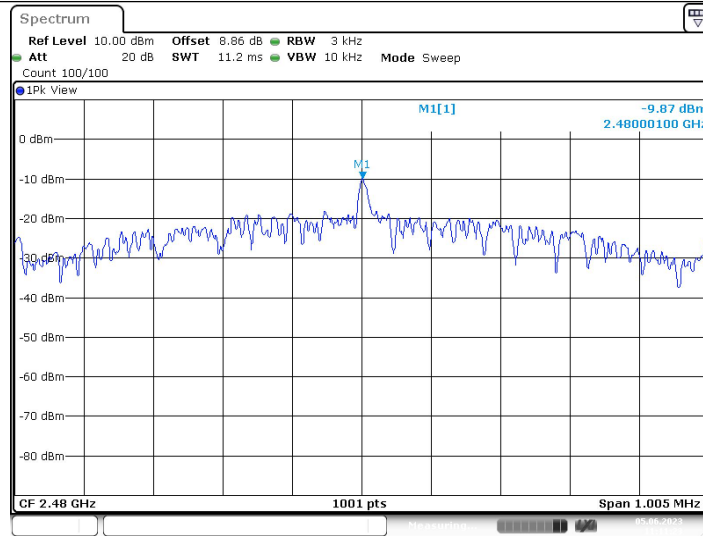
6.4.1 Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-10.24	≤8.00	PASS
		2440	-9.66	≤8.00	PASS
		2480	-9.87	≤8.00	PASS



6.4.2 Test Graphs





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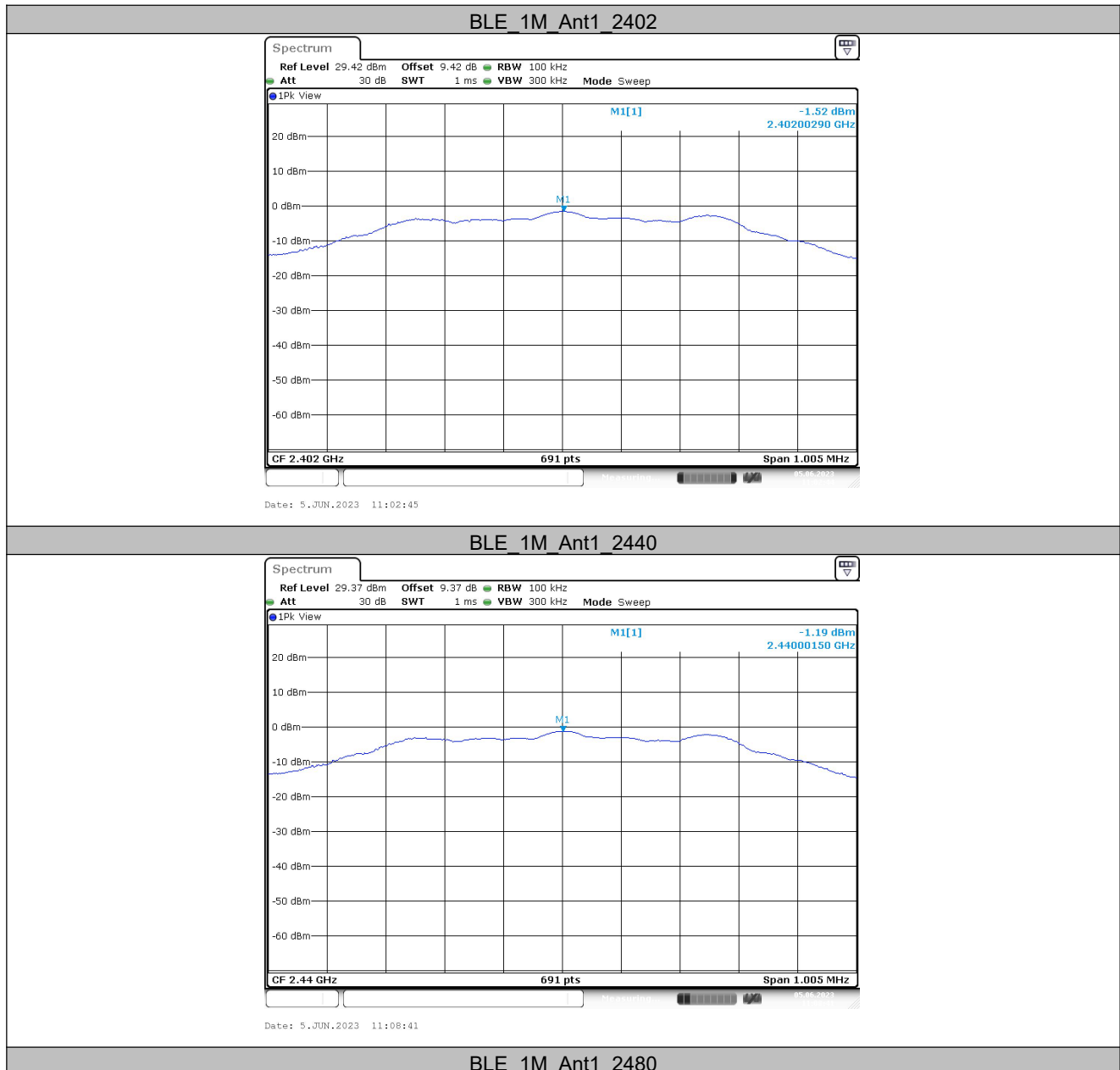
6.5 REFERENCE LEVEL MEASUREMENT

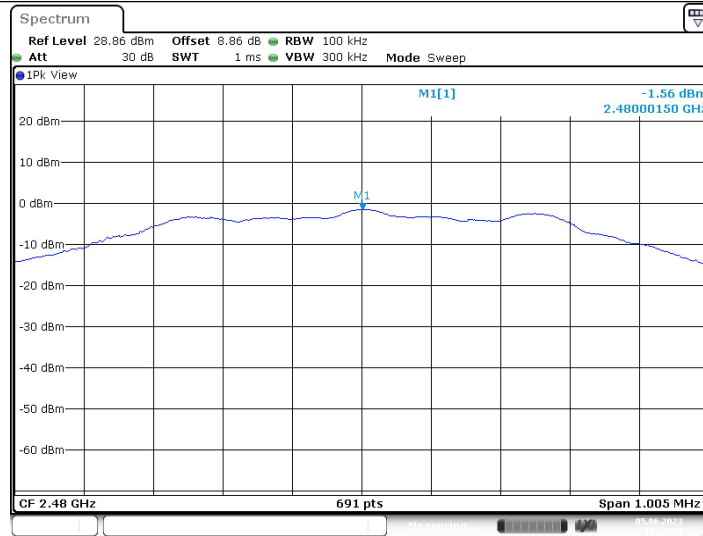
6.5.1 Test Result

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm]
BLE_1M	Ant1	2402	2402.00	-1.52
		2440	2440.00	-1.19
		2480	2480.00	-1.56



6.5.2 Test Graphs





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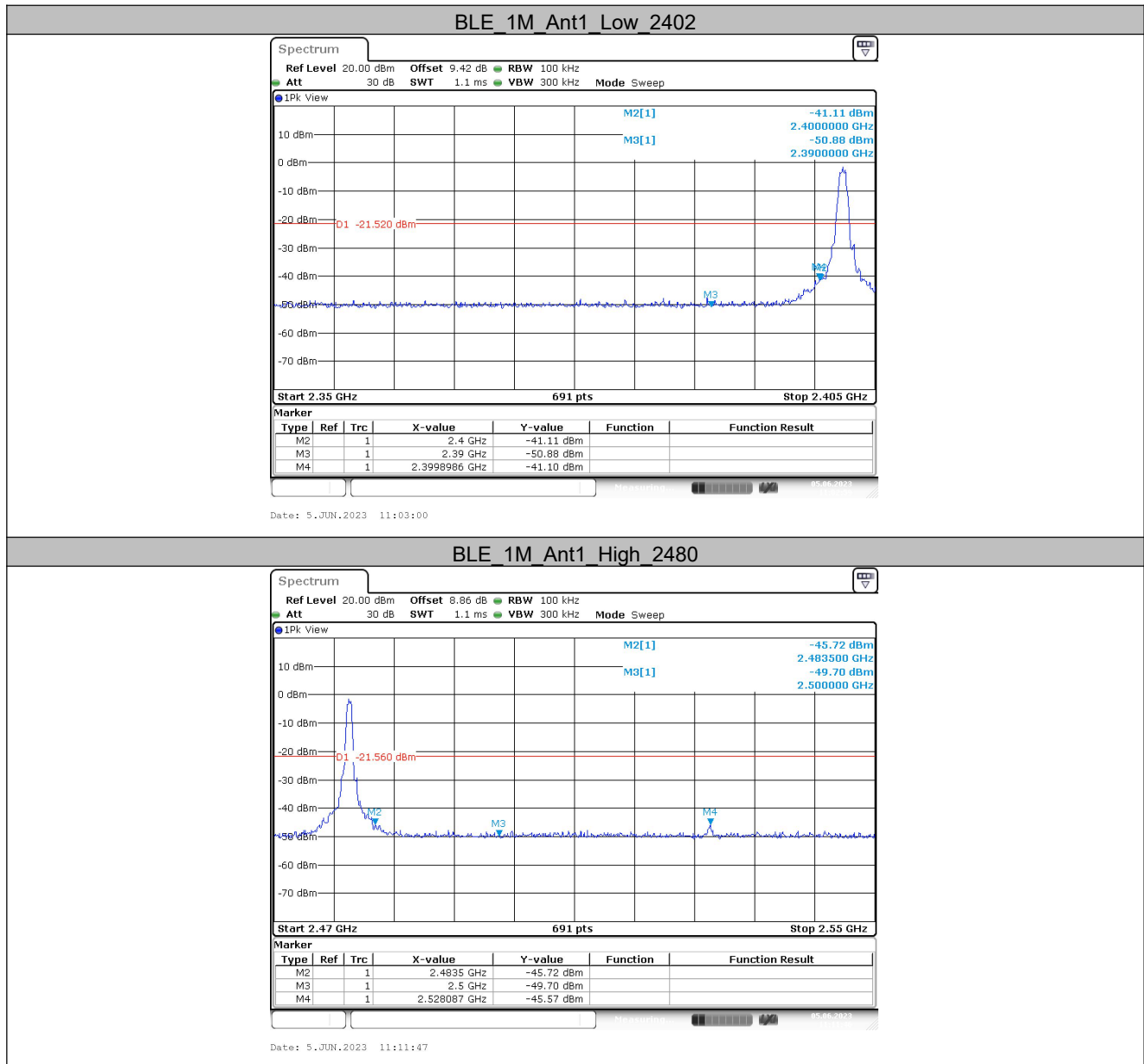
6.6 Band edge measurements

6.6.1 Test Result

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-1.52	-41.1	≤ -21.52	PASS
		High	2480	-1.56	-45.57	≤ -21.56	PASS



6.6.2 Test Graphs





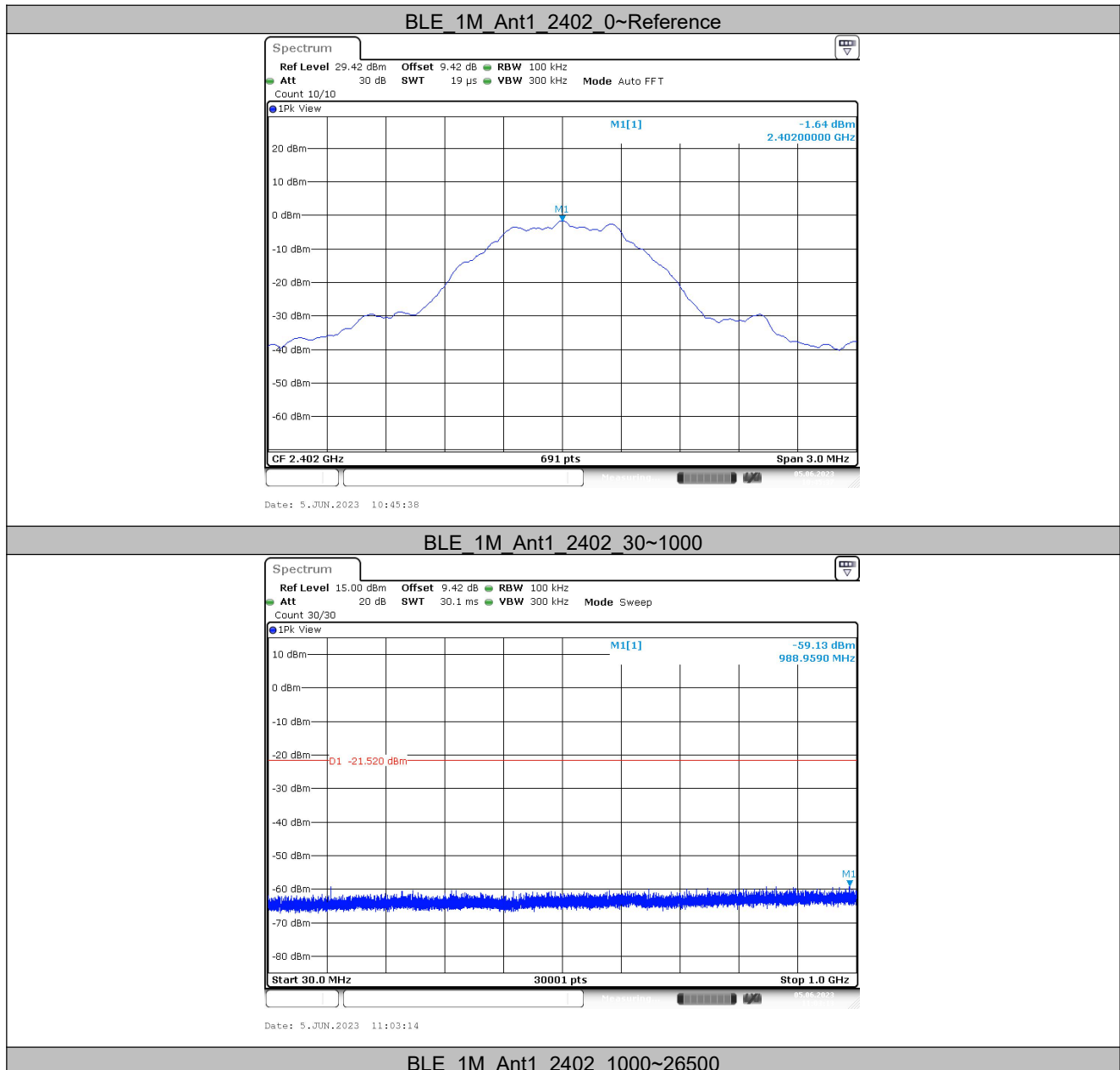
6.7 OUT OF BAND EMISSION MEASUREMENT

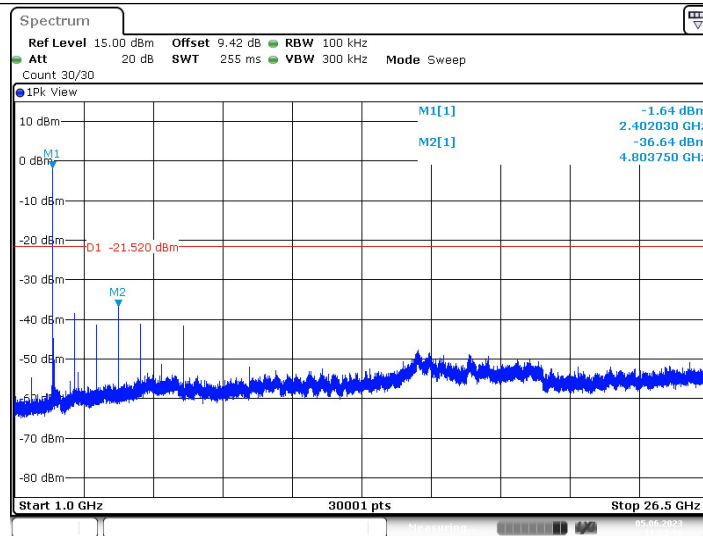
6.7.1 Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-1.64	-1.64	---	PASS
			30~1000	-1.52	-59.13	≤-21.52	PASS
			1000~26500	-1.52	-36.64	≤-21.52	PASS
		2440	Reference	-1.11	-1.11	---	PASS
			30~1000	-1.19	-58.65	≤-21.19	PASS
			1000~26500	-1.19	-37.4	≤-21.19	PASS
		2480	Reference	-1.42	-1.42	---	PASS
			30~1000	-1.56	-59.4	≤-21.56	PASS
			1000~26500	-1.56	-39.39	≤-21.56	PASS



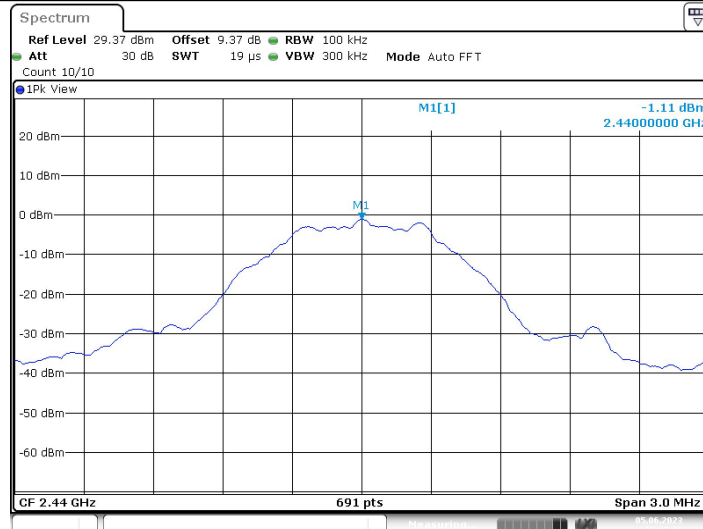
6.7.2 Test Graphs





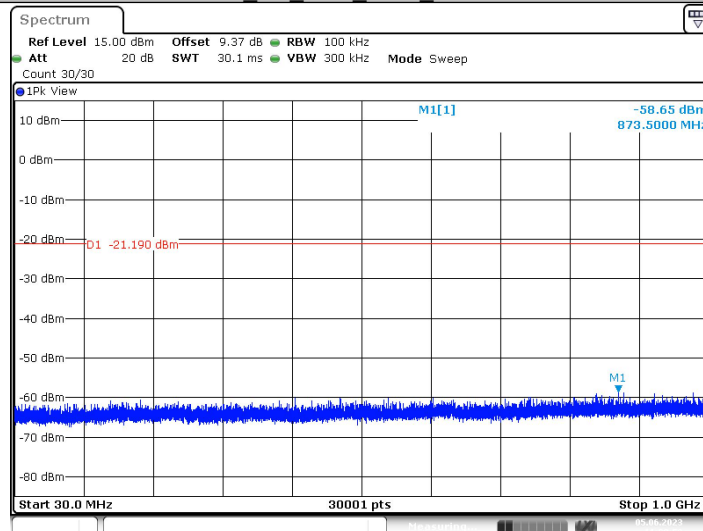
Date: 5.JUN.2023 11:03:51

BLE_1M_Ant1_2440_0~Reference



Date: 5.JUN.2023 10:47:20

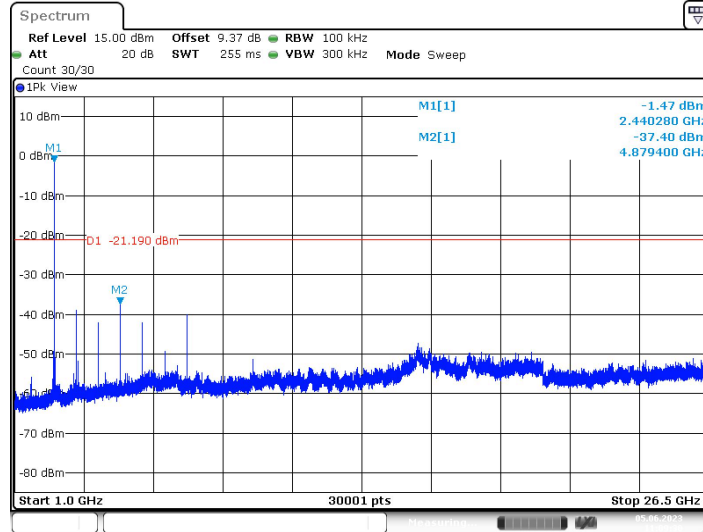
BLE_1M_Ant1_2440_30~1000



Date: 5.JUN.2023 11:08:54

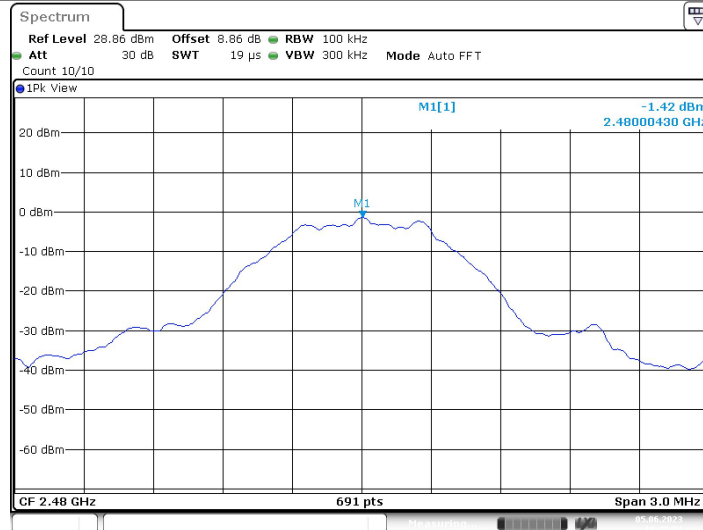


BLE_1M_Ant1_2440_1000~26500



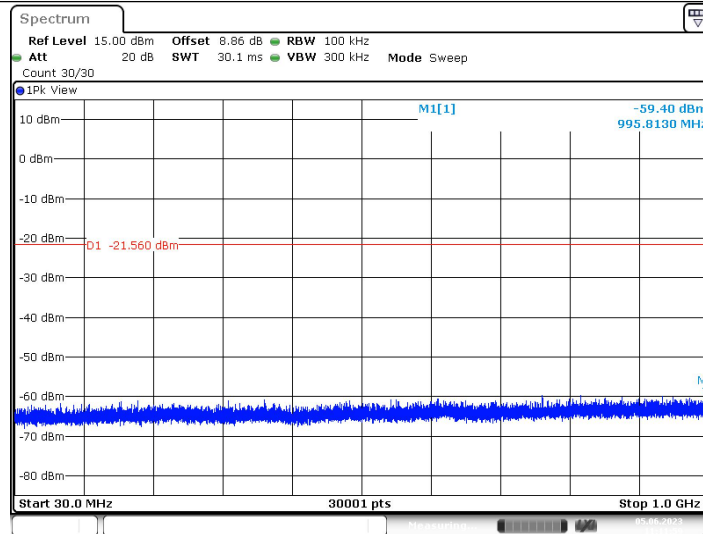
Date: 5.JUN.2023 11:09:31

BLE_1M_Ant1_2480_0~Reference



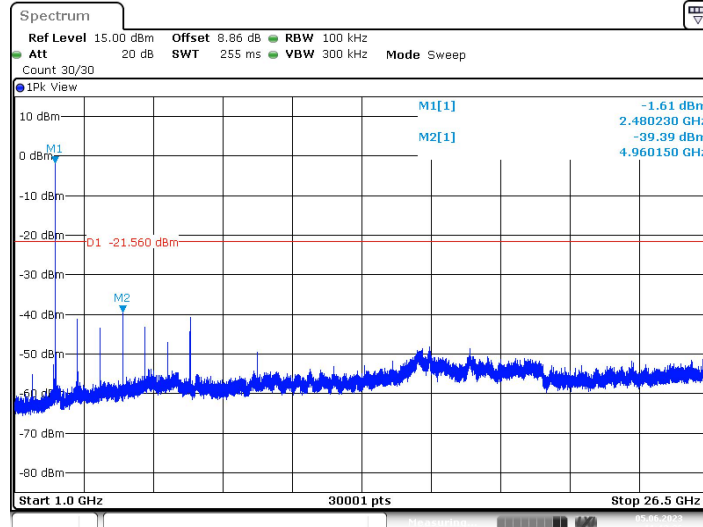
Date: 5.JUN.2023 10:49:03

BLE_1M_Ant1_2480_30~1000



Date: 5.JUN.2023 11:12:00

BLE_1M_Ant1_2480_1000~26500



Date: 5.JUN.2023 11:12:37

----- End of the Report -----



Important

- (1) The test report is valid without the official stamp of CVC;
- (2) Any part photocopies of the test report are forbidden without the written permission from CVC;
- (3) The test report is invalid without the signatures of Approval and Reviewer;
- (4) The test report is invalid if altered;
- (5) Objections to the test report must be submitted to CVC within 15 days.
- (6) Generally, commission test is responsible for the tested samples only.
- (7) As for the test result “-” or “N” means “not applicable”, “/” means “not test”, “P” means “pass” and “F” means “fail”

The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented.

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