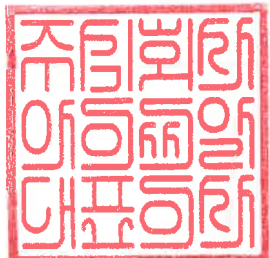




시험 성적서 TEST REPORT

페이지(page) : (1) / (총(Total) 120)

성적서 번호 Report No.		ICRT-TR-E222693-0A	
신청자 Client	기관명 Name	Monimoto UAB	
	주소 Address	Sauletekio al. 15, Vilnius LT-10224 Lithuania	
시험대상품목 Sample description		GPS tracker	
모델명 Type designation		Cycloop	
정격 Ratings		DC 3.7 V	
시험장소 Place of test		<input checked="" type="checkbox"/> 고정시험(Inside test) <input type="checkbox"/> 현장시험(Field test) 주소지(Address): 112, 113 Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea	
시험기간 Date of test		16. Sep. 2022 ~ 18. Oct. 2022	
시험방법/항목 Test Method/Item		FCC Part 15 Subpart C §15.247	
시험결과 Test Results		Refer to 3. Test Summary	
확인 Affirmation	작성자 Tested by	기술책임자 Technical Manager	
	성명 Name	Seong-Hun, Jeong	Min-Gi, Son
<p><input type="checkbox"/> 위 성적서는 고객이 제공한 시료에 대한 시험결과입니다. The above test report is certified that the above mentioned products have been tested for the sample.</p> <p><input type="checkbox"/> 위 성적서는 KS Q ISO/IEC 17025 및 한국인정기구(KOLAS)인정과 관련이 없습니다. The above test report is not related to accreditation by KS Q ISO/IEC 17025 and Korea Laboratory Accreditation scheme.</p> <p><input type="checkbox"/> 위 성적서는 주식회사 아이씨알의 승인 없이는 일부 복제에 대해 금지됩니다. The test report is prohibited for some reproduction without the approval of the ICR.</p>			
<p>2022. 10. 18</p> <p>주식회사 아이씨알 대표이사</p> <p>The head of INTERNATIONAL CERTIFICATION REGISTRAR</p>			

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The authenticity of the test report can be checked on the G4B or ICR website.

경기도 김포시 양촌읍 황금3로7번길 112 / Tel: 02-6351-9001 ~ 6



Contents

1. Applicant & Manufacturer & Test Laboratory Information	4
1.1 Applicant information.....	4
1.2 Manufacturer Information.....	4
1.3 Test Laboratory Information.....	4
2. Equipment under Test(EUT) Information	5
2.1 General Information.....	5
2.2 Additional Information.....	5
2.3 Pre-certified Module Information.....	6
2.4 Mode of operation during the test.....	6
2.5 Modifications of EUT.....	6
3. Test Summary	7
3.1 Test standards and results.....	7
3.2 Purpose of the test.....	7
3.3 Test Methodology.....	7
3.4 Configuration of Test System.....	7
3.5 Antenna requirement.....	8
4. Used equipment on test	9
5. 6 dB Bandwidth	10
5.1 Operating environment.....	10
5.2 Measurement method.....	10
5.3 Test data.....	10
6. Maximum Conducted Output Power	23
6.1 Operating environment.....	23
6.2 Measurement method.....	23
6.3 Test data.....	23
7. Power Spectral Density	32
7.1 Operating environment.....	32
7.2 Measurement method.....	32
7.3 Test data.....	32
8. Conducted Spurious Emission	45
8.1 Operating environment.....	45
8.2 Measurement method.....	45
8.3 Test data.....	45
9. Radiated Spurious Emission	74
9.1 Operating environment.....	74
9.2 Measurement method.....	74
9.3 Test setup.....	74
9.4 Test data.....	76



10. Power Line Conducted Emission 118

10.1 Operating environment 118

10.2 Measurement method..... 118

10.3 Limit 118

10.4 Test data 118

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E222693-0A	2022.10.18	Initial Issue	All



1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant information

Applicant	Monimoto UAB
Address	Sauletekio al. 15, Vilnius LT-10224 Lithuania
Contact Person	Rolandas Dranseika
Telephone No.	+37067266478
Fax No.	-
E-mail	info@monimoto.com

1.2 Manufacturer Information

Manufacturer	Monimoto UAB
Address	Sauletekio al. 15, Vilnius LT-10224 Lithuania

1.3 Test Laboratory Information

Conducted tests were performed at	
Laboratory	ICR Co., Ltd.
Address	112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No.	+82-2-6351-9002
Fax No.	+82-2-6351-9007
RRA No.	KR0165
KOLAS No.	KT652



2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	GPS tracker
Brand Name	-
Model Name	Cycloop
Additional Model Name	-
FCC ID	2AU3K-CYCLOOP
Power Supply	DC 3.7 V

2.2 Additional Information

Equipment Class	DTS-Digital Transmission System	
Device Type	Stand-alone	
Operating Frequency	802.11b/g/n(HT20)	2 412 MHz ~ 2 462 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
RF Output Power	802.11b	9.46 dBm
	802.11g	8.32 dBm
	802.11n(HT20)	8.15 dBm
	Bluetooth LE 1Mbps	-1.82 dBm
	Bluetooth LE 2Mbps	-1.41 dBm
	Bluetooth LE coded 500kbps	-1.85 dBm
	Bluetooth LE coded 125kbps	-1.96 dBm
Number of Channel	802.11b/g/n(HT20)	11
	Bluetooth LE	40
Modulation Type	Bluetooth LE, 802.11b: DSSS 802.11g/n(HT20) : OFDM	
Antenna Type	Stamped Metal Antenna	
Antenna Gain	802.11b/g/n(HT20)	5.2 dBi
	Bluetooth LE	-0.6 dBi
Antenna Operating Mode	Single antenna exists for each mode	



2.3 Pre-certified Module Information

Module Name	SARA-R510M8S	
FCC ID	XPYUBX19KM01	
Classification 1	Type & Date	LTE CAT-M1 Data Module / 07.23.2020
	Test Method/Item	FCC Part 22, 24, 27, 90
	Mode	CAT-M1 eFDD2, eFDD4, eFDD5, eFDD12, eFDD13, eFDD25, eFDD26
Classification 2	Type & Date	LTE CAT-M1 & NB2 Data only Module / 08.11.2021
	Test Method/Item	FCC Part 22, 24, 27
	Mode	CAT-M1 eFDD2, eFDD4, eFDD5, eFDD8, eFDD12, eFDD13, eFDD25, eFDD26, eFDD66, eFDD71 NB-IoT eFDD2, eFDD4, eFDD5, eFDD8, eFDD12, eFDD13, eFDD66, eFDD71, eFDD85

2.4 Mode of operation during the test

- The EUT is continuous transmission mode during the test with set to each of the Low Channel, Middle Channel, and High Channel at the worst case data rate. The worst case data rate for each modulation is determined 1 Mbps for IEEE 802.11b, 6 Mbps for IEEE 802.11g, 6.5 Mbps for HT20.

2.5 Modifications of EUT

- None



3. Test Summary

3.1 Test standards and results

FCC Part 15 Subpart C			
Clause	Test items	Applied	Results
§15.247 (a) (2)	6 dB Bandwidth	<input checked="" type="checkbox"/>	PASS
§15.247 (b) (3)	Maximum Conducted Output Power	<input checked="" type="checkbox"/>	PASS
§15.247 (e)	Power Spectral Density	<input checked="" type="checkbox"/>	PASS
§15.247 (d)	Conducted Spurious Emission	<input checked="" type="checkbox"/>	PASS
§15.247 (d) & §15.209 & §15.205	Radiated Spurious Emission	<input checked="" type="checkbox"/>	PASS
§15.203	Antenna Requirement	<input checked="" type="checkbox"/>	PASS
§15.207	Power Line Conducted Emission	<input checked="" type="checkbox"/>	PASS

Note : This test report is prepared according to the requirements of ISO / IEC 17025.

3.2 Purpose of the test

- To determine whether the equipment under test fulfills the requirements of the standards stated in FCC Part 15 Subpart C Section 15.247.

3.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013.

Radiated testing was performed at a distance of 3 m from EUT to the antenna.

3.4 Configuration of Test System

3.4.1 Radiated emission test

Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 m Semi Anechoic Chamber. The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

3.4.2 AC power line conducted emission test

The EUT was connected to LISN. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions



3.5 Antenna requirement

According to §15.203, 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.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.5.1 Result: Pass

The transmitter has a **Stamped Metal Antenna**. The directional gain of the antenna is

5.2 dBi (802.11b/g/n(HT20)), **-0.6 dBi** (Bluetooth LE)



4. Used equipment on test

	Description	Model Name	Serial Number	Manufacturer	Next Cal. (cycle)
<input checked="" type="checkbox"/>	Spectrum analyzer	FSW85	R&S	101306	2023-03-02 (1Y)
<input checked="" type="checkbox"/>	Signal Generator	SMB100A	R&S	180607	2023-03-03 (1Y)
<input checked="" type="checkbox"/>	DC Power Supply	XDL 35-5P	Sorensen	J00385373	2023-03-03 (1Y)
<input checked="" type="checkbox"/>	10 dB Attenuator	WA54-10-11	Weinschel	-	2023-03-07 (1Y)
<input checked="" type="checkbox"/>	Loop Antenna	HFH2-Z2	Rohde & Schwarz	100506	2023-07-05 (2Y)
<input checked="" type="checkbox"/>	TRILOG BROADBAND ANTENNA	VULB9162	SCHWARZBECK	143	2022-12-08 (2Y)
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU08	Rohde & Schwarz	100747	2023-04-13 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR7	Rohde & Schwarz	102034	2023-04-13 (1Y)
<input checked="" type="checkbox"/>	Horn Antenna	HF907	Rohde & Schwarz	102556	2023-08-22 (1Y)
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU18	Rohde & Schwarz	102342	2023-04-13 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR26	Rohde & Schwarz	101462	2023-04-13 (1Y)
<input checked="" type="checkbox"/>	Horn Antenna	LB-42-10-C-KF	AIBFO Inc.	J202024625	2023-03-10 (1Y)
<input checked="" type="checkbox"/>	PreAmplifier	AMF-4F-18265-35-8P-1	MITEQ	771846	2023-03-07 (1Y)
<input checked="" type="checkbox"/>	High Pass Filter	WT-A1698-HS	WT Microwave	WT171201-6-4	2023-03-03 (1Y)
<input checked="" type="checkbox"/>	LISN	ENV216	Rohde & Schwarz	102193	2023-05-20 (1Y)
<input checked="" type="checkbox"/>	Open Switch and Control Platform	OSP150	Rohde & Schwarz	101000	2023-03-04 (1Y)

※ All test equipment used is calibration on a regular basis.



5. 6 dB Bandwidth

5.1 Operating environment

Temperature : 23 °C

Relative humidity : 47 %

5.2 Measurement method

Standard : §15.247 (a) (2)

5.3 Test data

Operating mode : Transmit mode

Test Result : Pass



5.3.1 Measured Results

Modulation Type	Channel (Frequency)	Measured Value (kHz)	Limit (kHz)
802.11b	0 (2 412 MHz)	8 002.40	at least 500
	6 (2 437 MHz)	7 384.50	
	11 (2 462 MHz)	8 014.40	
802.11g	0 (2 412 MHz)	16 496.70	
	6 (2 437 MHz)	16 352.70	
	11 (2 462 MHz)	16 358.70	
802.11n(HT20)	0 (2 412 MHz)	17 582.50	
	6 (2 437 MHz)	17 594.50	
	11 (2 462 MHz)	17 582.50	
Bluetooth LE 1Mbps	0 (2 402 MHz)	797.20	
	19 (2 440 MHz)	791.20	
	39 (2 480 MHz)	794.20	
Bluetooth LE 2Mbps	0 (2 402 MHz)	1 380.00	
	19 (2 440 MHz)	1 460.00	
	39 (2 480 MHz)	1 330.00	
Bluetooth LE coded 500kbps	0 (2 402 MHz)	710.30	
	19 (2 440 MHz)	722.30	
	39 (2 480 MHz)	722.30	
Bluetooth LE coded 125kbps	0 (2 402 MHz)	782.20	
	19 (2 440 MHz)	725.30	
	39 (2 480 MHz)	791.20	



5.3.1.1 Measured Graph for 802.11b



Low CH

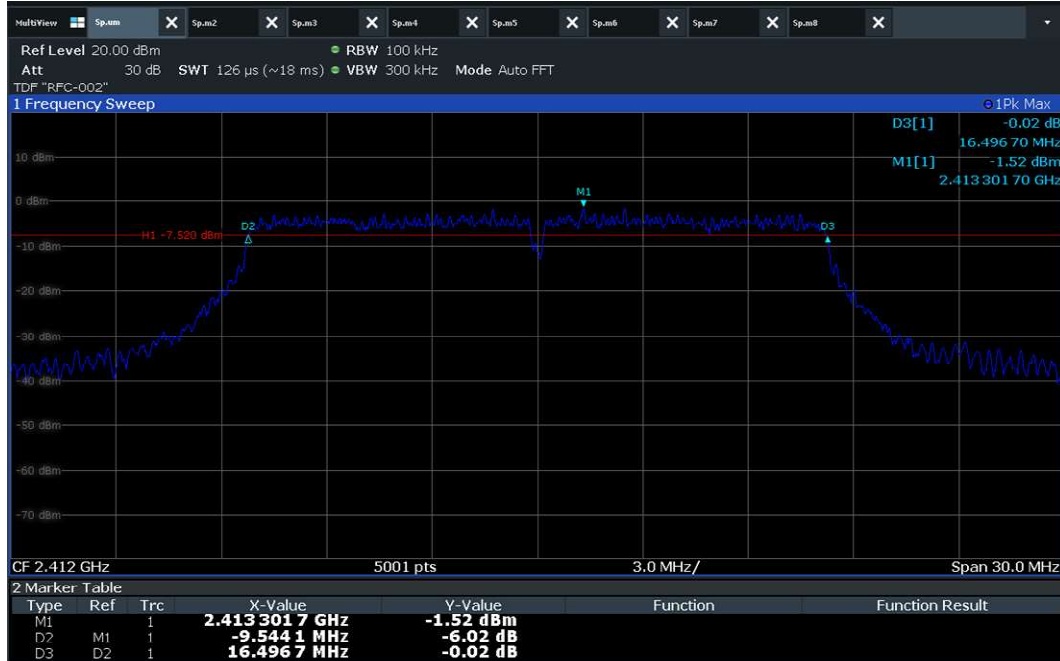


Mid CH

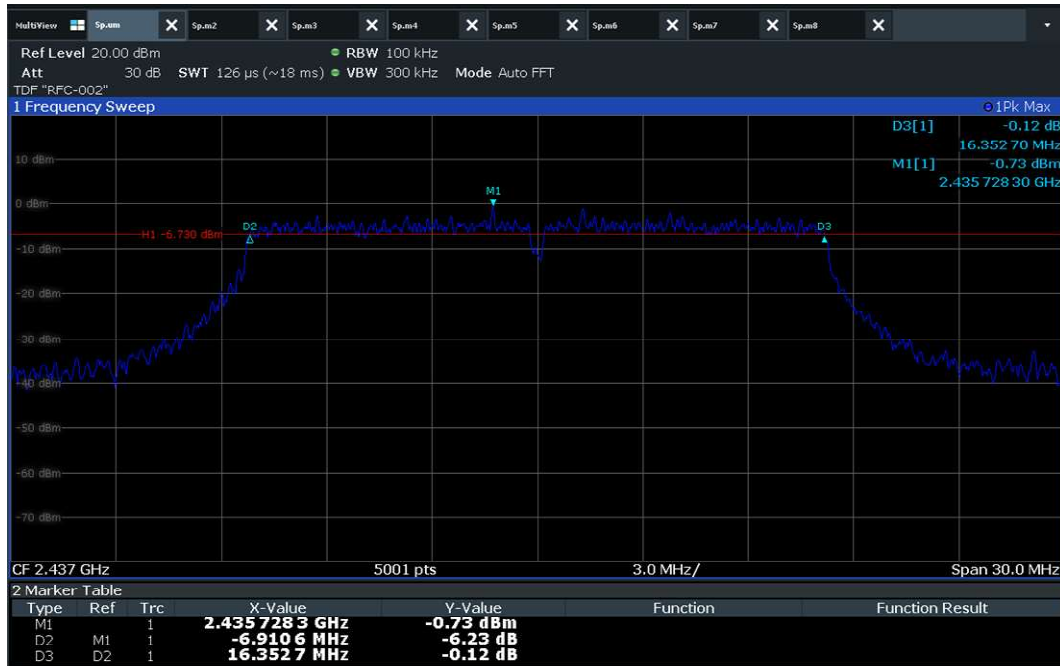


High CH

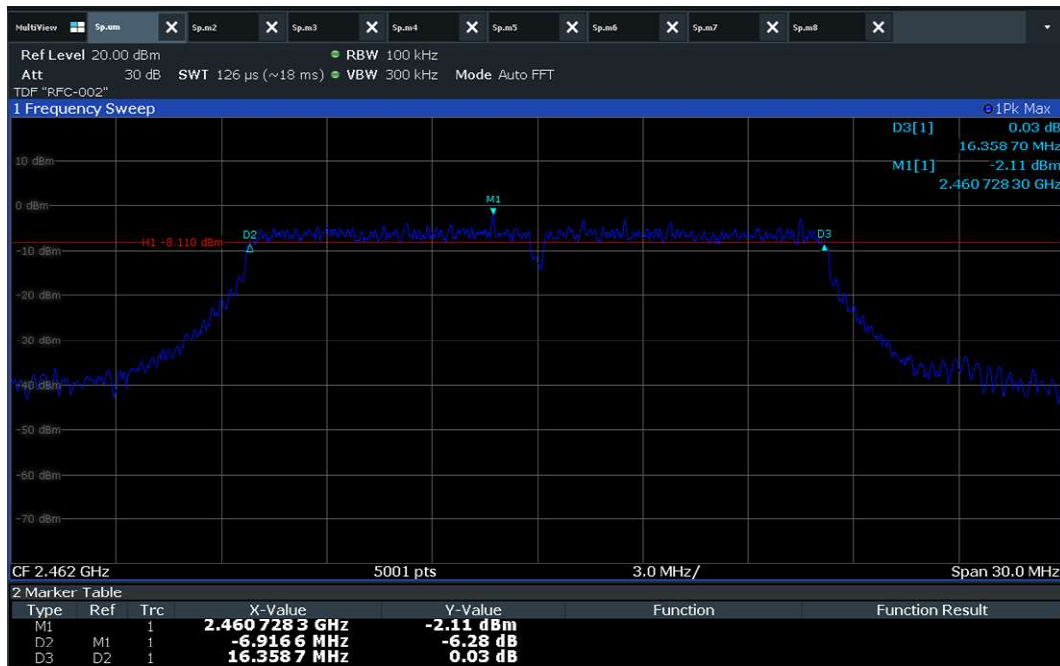
5.3.1.2 Measured Graph for 802.11g



Low CH



Mid CH



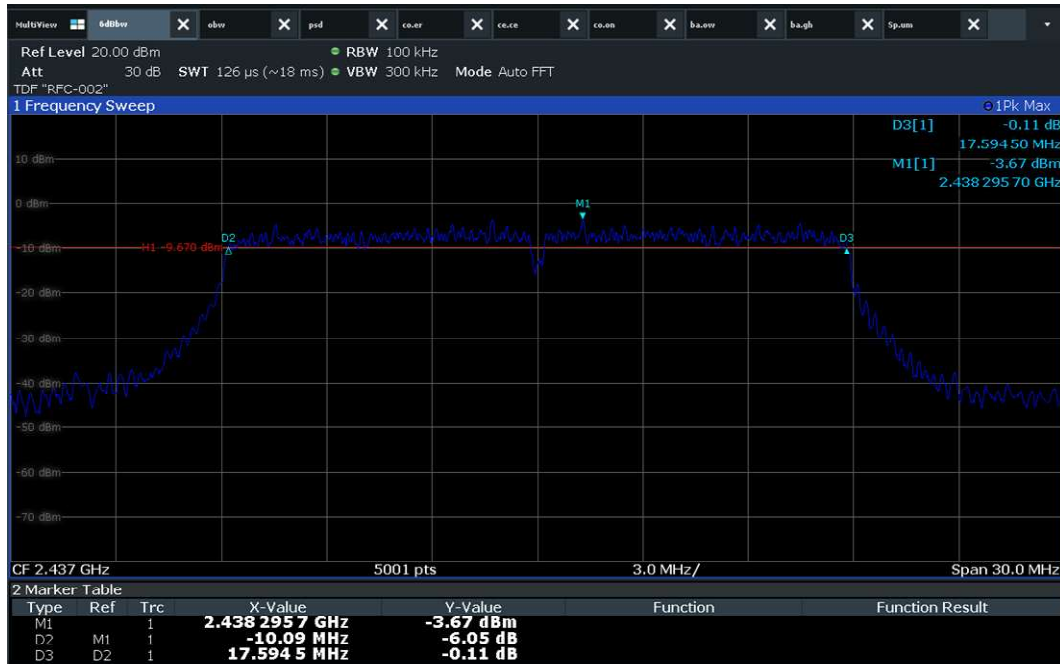
High CH



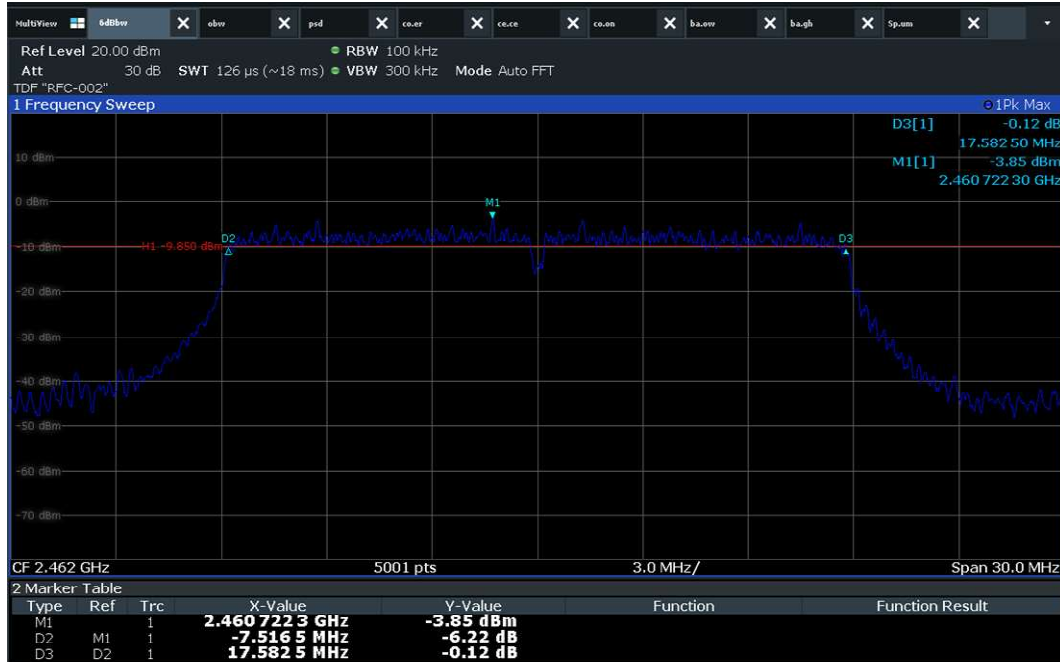
5.3.1.3 Measured Graph for 802.11n(HT20)



Low CH

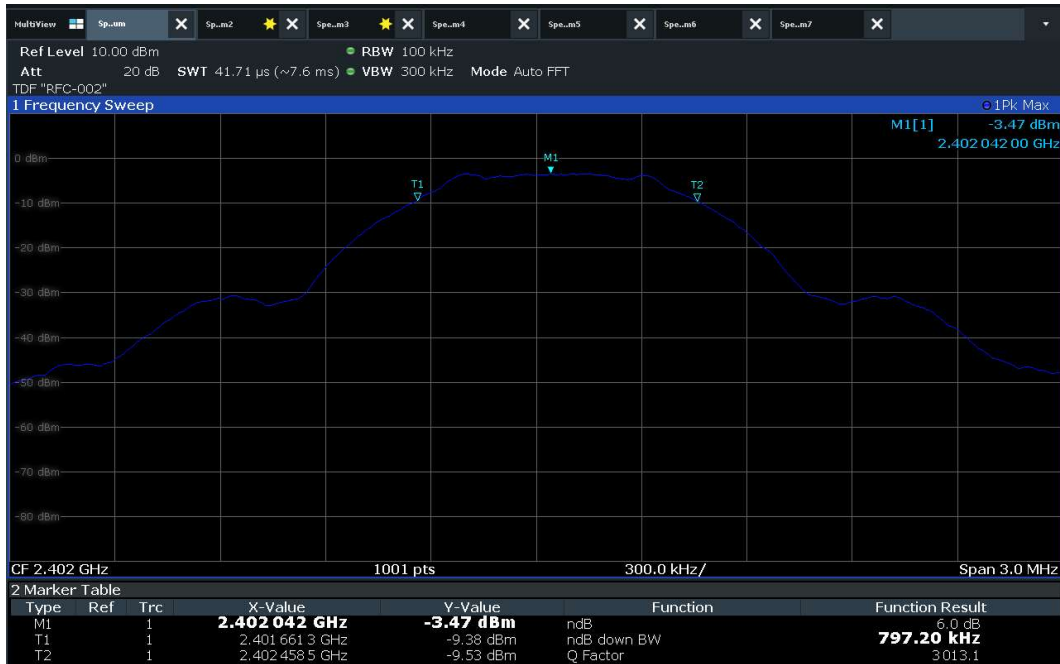


Mid CH

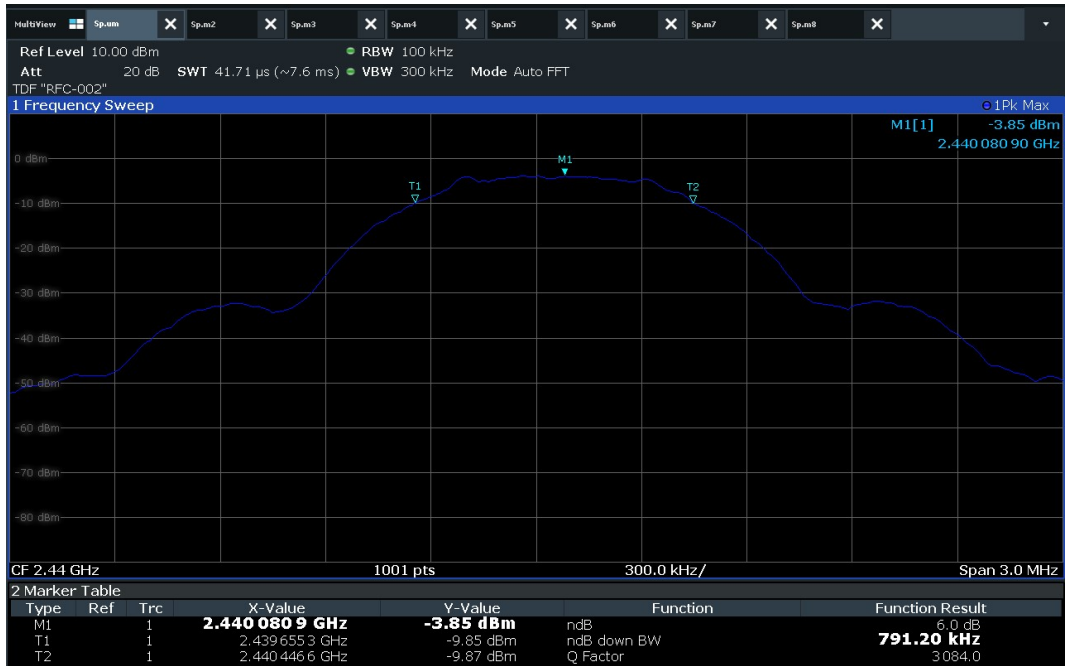


High CH

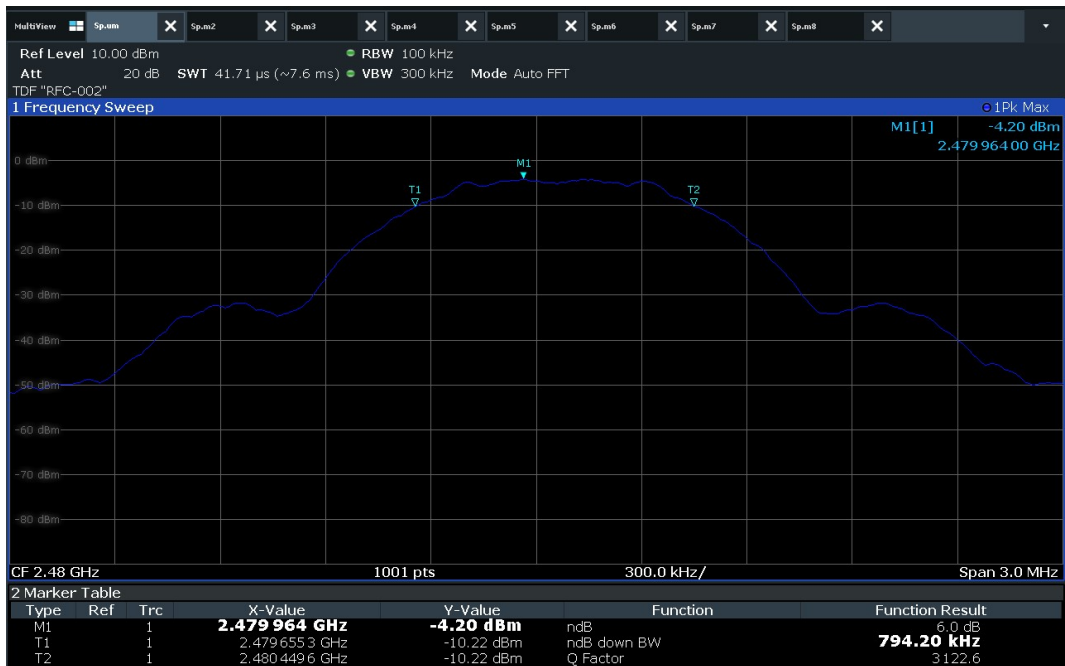
5.3.1.4 Measured Graph for Bluetooth LE 1Mbps



Low CH



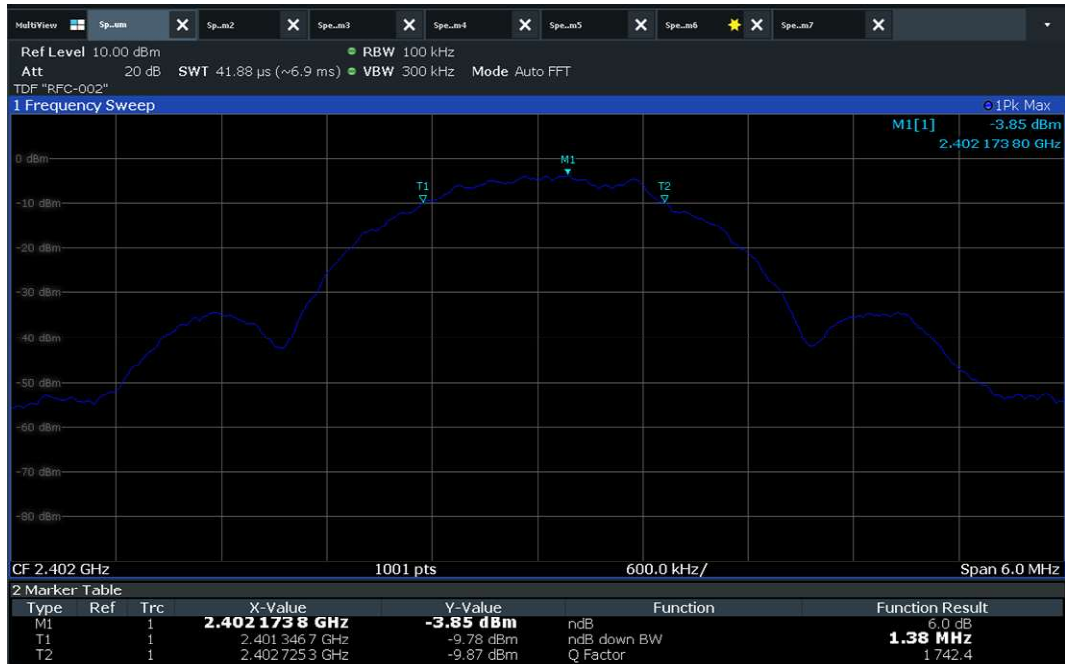
Mid CH



High CH



5.3.1.5 Measured Graph for Bluetooth LE 2Mbps



Low CH



Mid CH

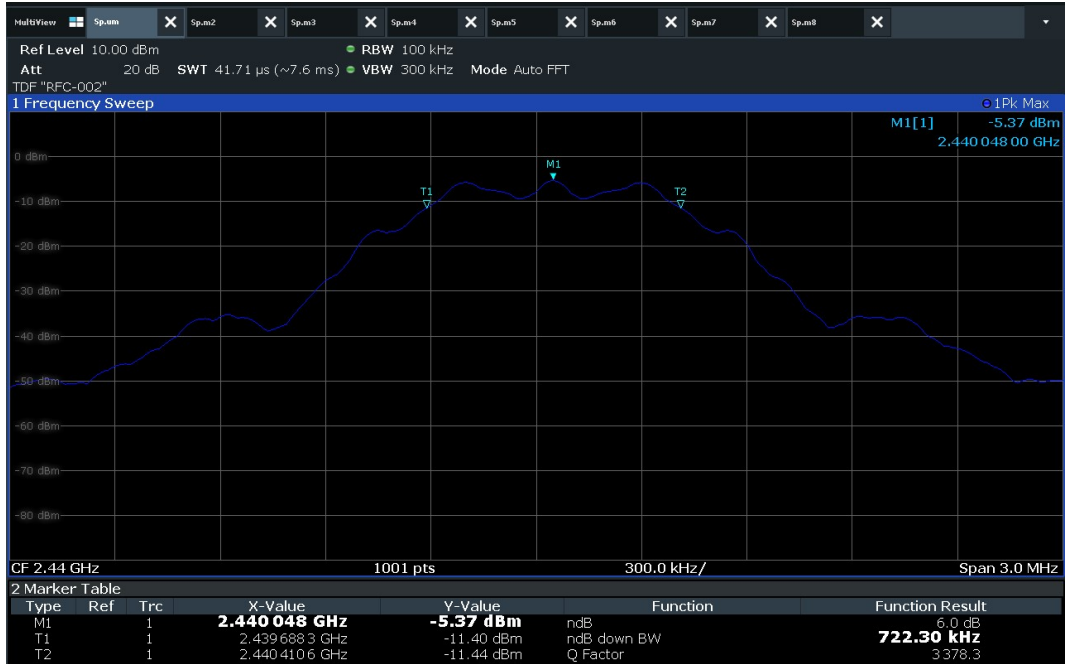


High CH

5.3.1.6 Measured Graph for Bluetooth LE Coded 500kbps



Low CH



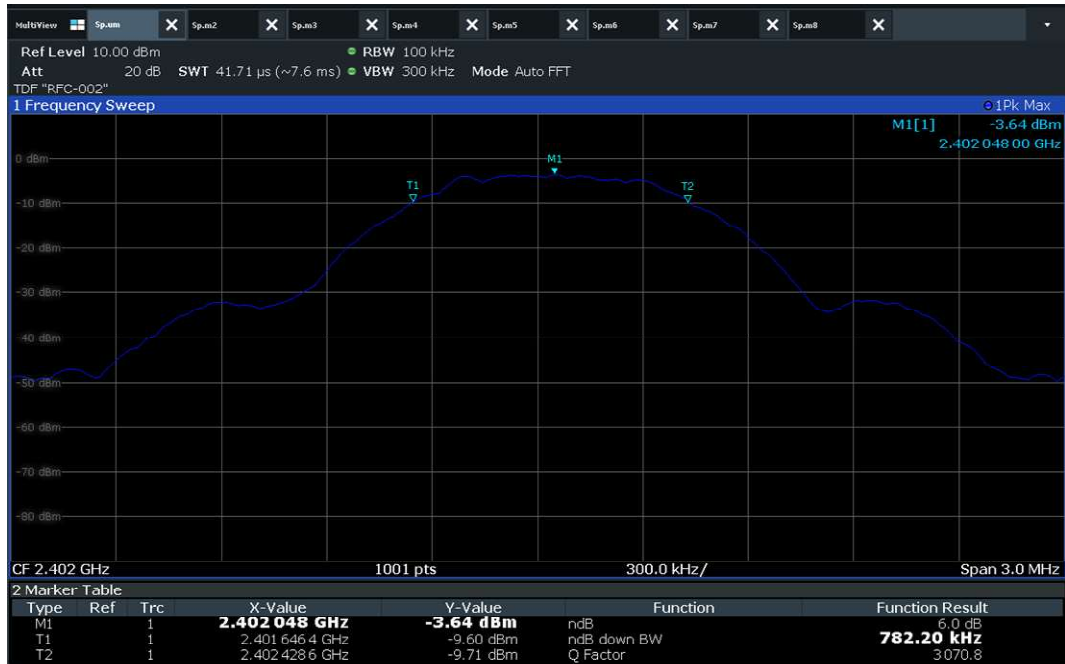
Mid CH



High CH



5.3.1.7 Measured Graph for Bluetooth LE Coded 125kbps



Low CH



Mid CH



High CH



6. Maximum Conducted Output Power

6.1 Operating environment

Temperature : 25 °C

Relative humidity : 46 %

6.2 Measurement method

Standard : §15.247 (b) (3)

6.3 Test data

Operating mode : Transmit mode

Test Result : Pass



6.3.1 Measured Results

Maximum Conducted Output Power			
Modulation Type	Channel (Frequency)	Measured Value (dBm)	Limit (dBm)
802.11b	0 (2 412 MHz)	9.33	30 (1 Watt)
	6 (2 437 MHz)	9.17	
	11 (2 462 MHz)	9.46	
802.11g	0 (2 412 MHz)	8.04	
	6 (2 437 MHz)	8.09	
	11 (2 462 MHz)	8.32	
802.11n(HT20)	0 (2 412 MHz)	8.00	
	6 (2 437 MHz)	7.95	
	11 (2 462 MHz)	8.15	
Bluetooth LE 1Mbps	0 (2 402 MHz)	-1.82	
	19 (2 440 MHz)	-2.09	
	39 (2 480 MHz)	-2.44	
Bluetooth LE 2Mbps	0 (2 402 MHz)	-1.41	
	19 (2 440 MHz)	-1.91	
	39 (2 480 MHz)	-2.49	
Bluetooth LE coded 500kbps	0 (2 402 MHz)	-1.85	
	19 (2 440 MHz)	-2.12	
	39 (2 480 MHz)	-2.66	
Bluetooth LE coded 125kbps	0 (2 402 MHz)	-1.96	
	19 (2 440 MHz)	-2.23	
	39 (2 480 MHz)	-2.75	



6.3.1.1 Measured Graph for 802.11b

- PKPM1 Peak power meter method was used

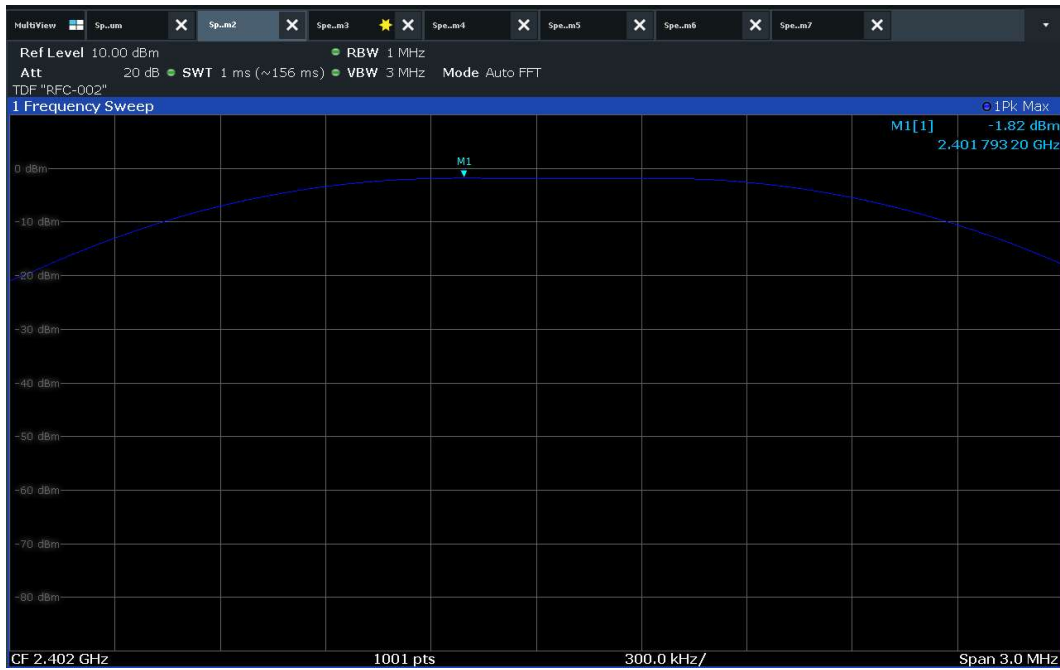
6.3.1.2 Measured Graph for 802.11g

- PKPM1 Peak power meter method was used

6.3.1.3 Measured Graph for 802.11n(HT20)

- PKPM1 Peak power meter method was used

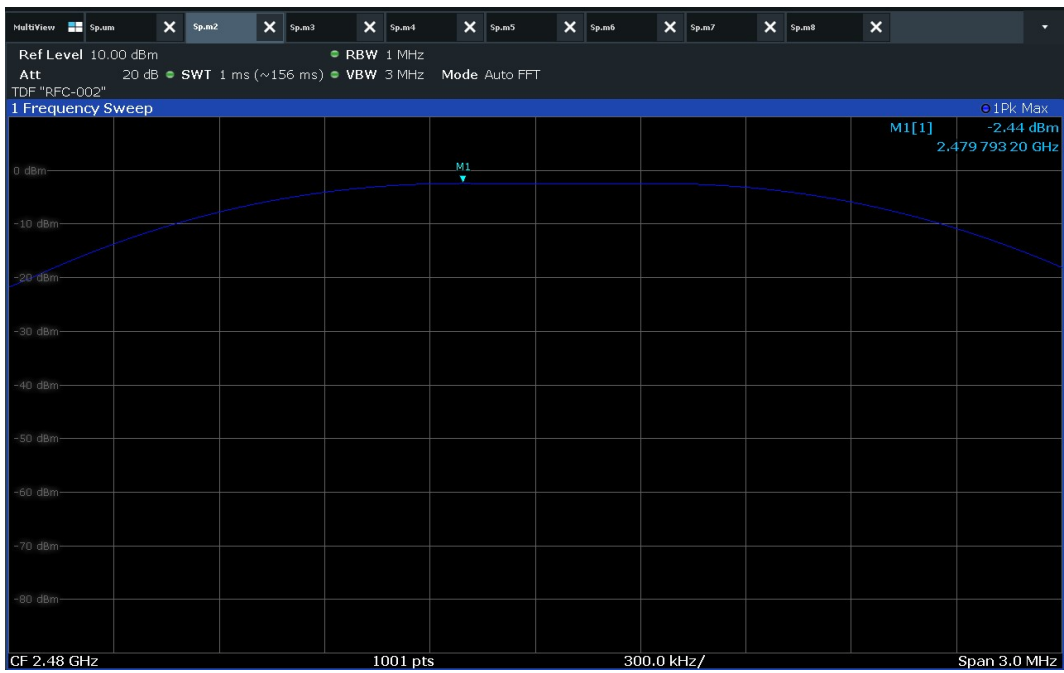
6.3.1.4 Measured Graph for Bluetooth LE 1Mbps



Low CH



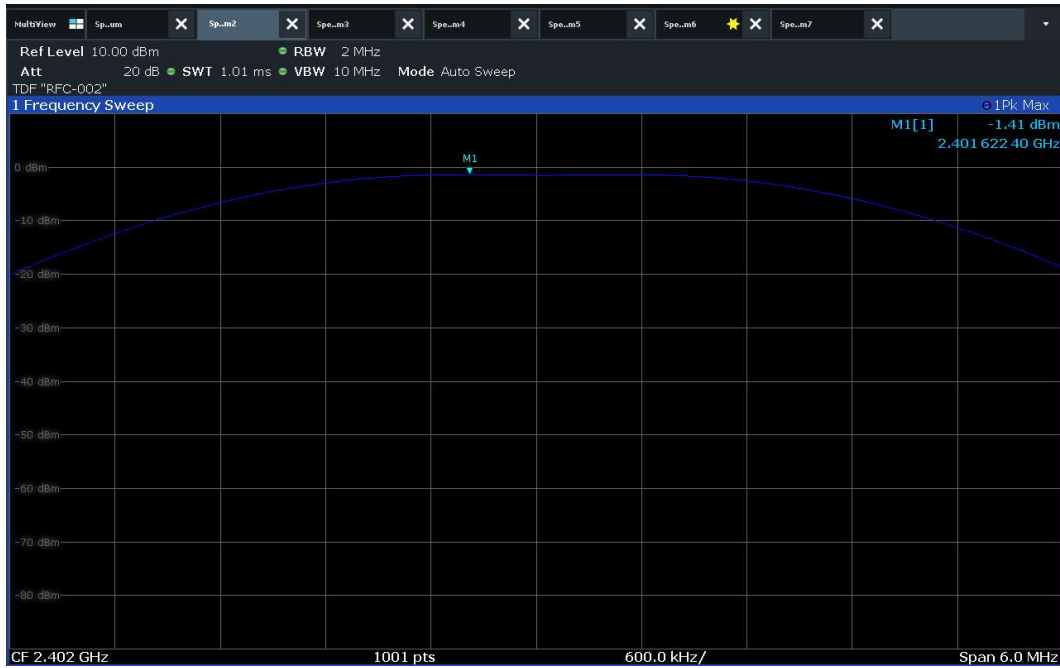
Mid CH



High CH



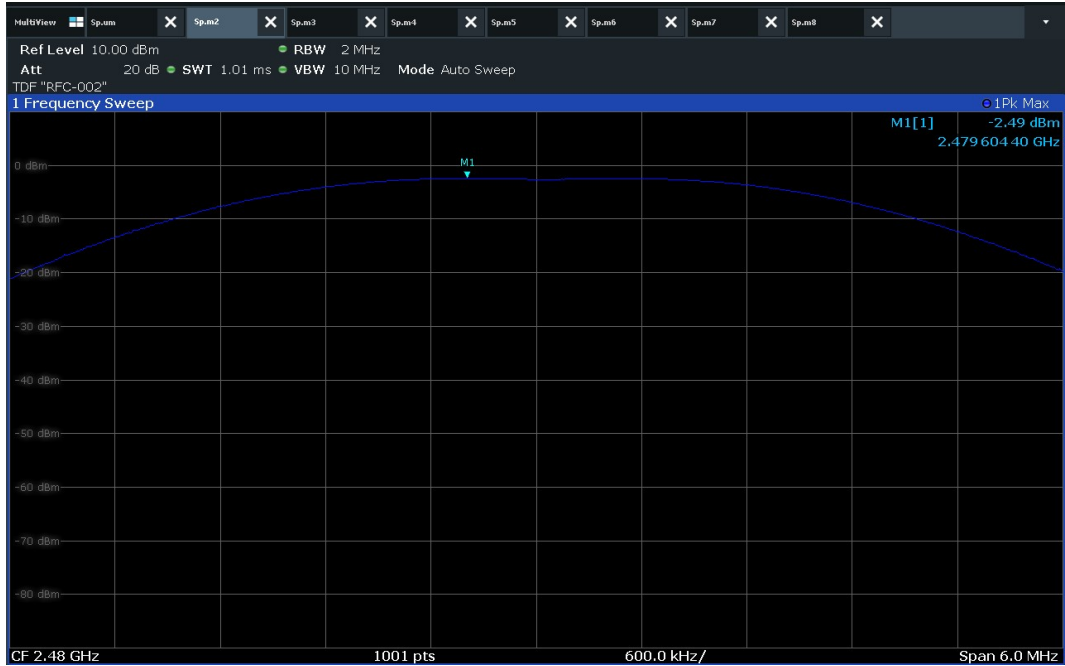
6.3.1.5 Measured Graph for Bluetooth LE 2Mbps



Low CH

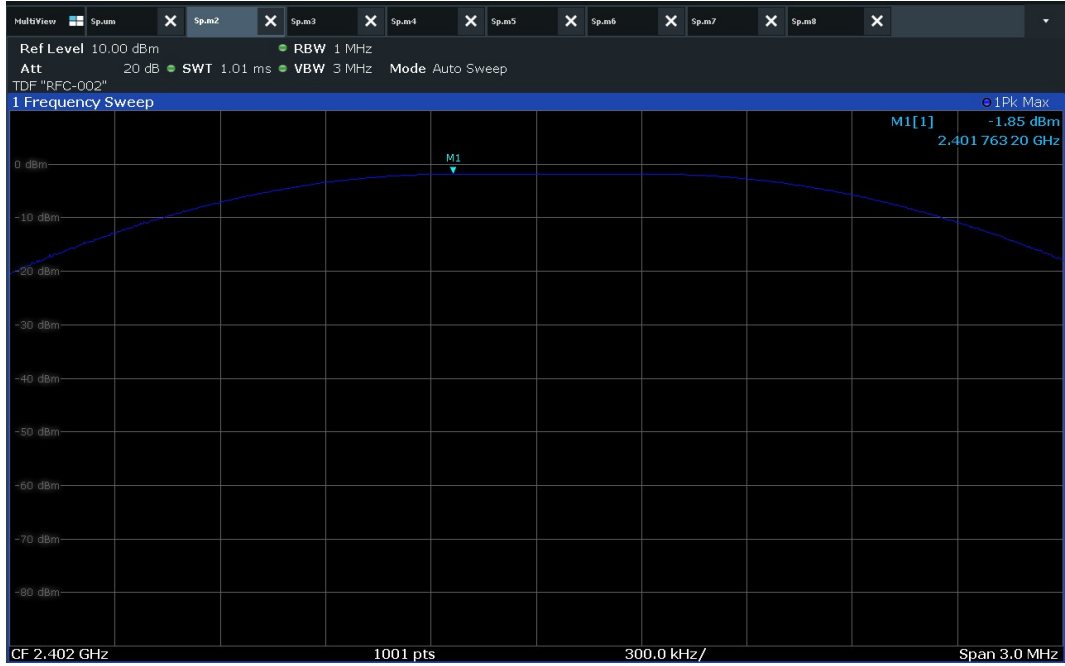


Mid CH

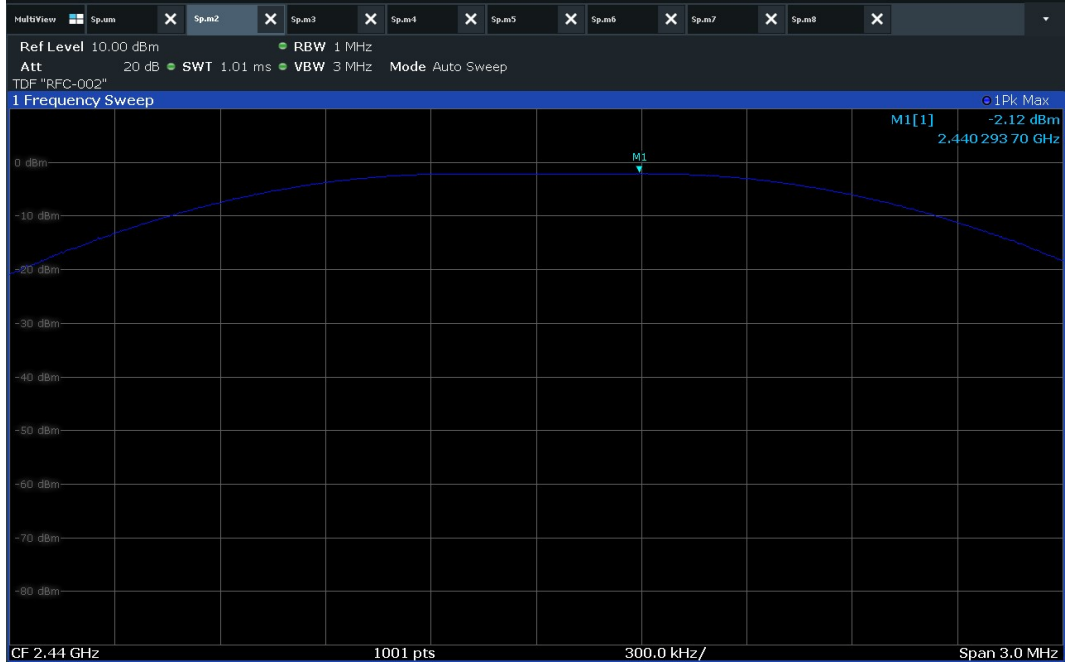


High CH

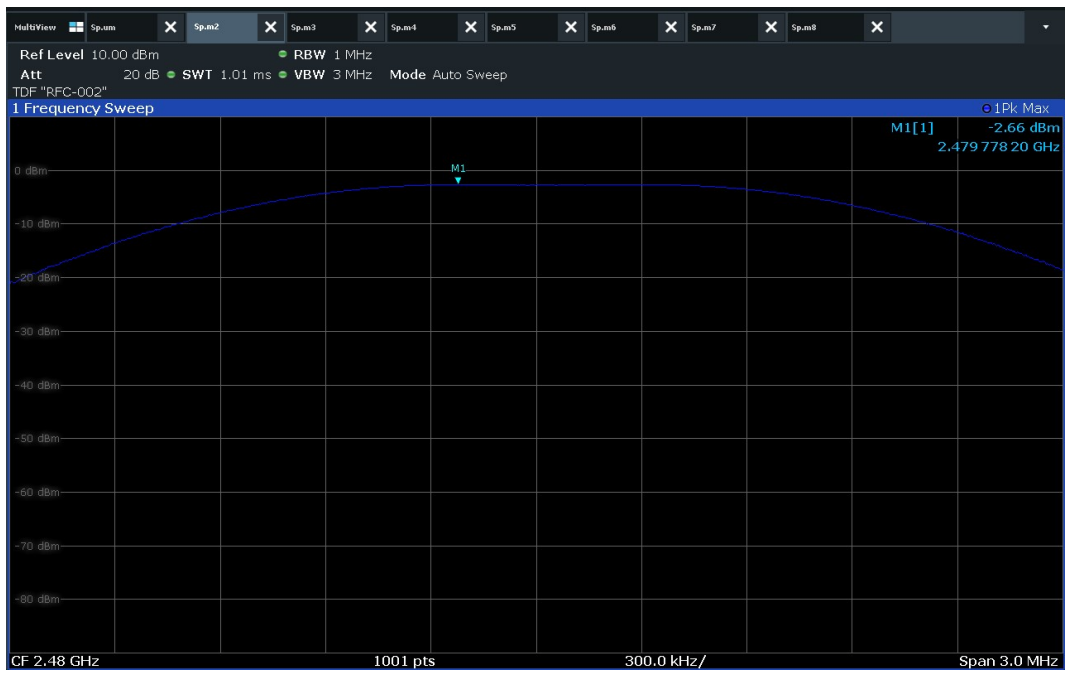
6.3.1.6 Measured Graph for Bluetooth LE Coded 500kbps



Low CH



Mid CH



High CH



6.3.1.7 Measured Graph for Bluetooth LE LE Coded 125kbps



Low CH



Mid CH



High CH



7. Power Spectral Density

7.1 Operating environment

Temperature : 25 °C

Relative humidity : 46 %

7.2 Measurement method

Standard : §15.247 (e)

7.3 Test data

Operating mode : Transmit mode

Test Result : Pass

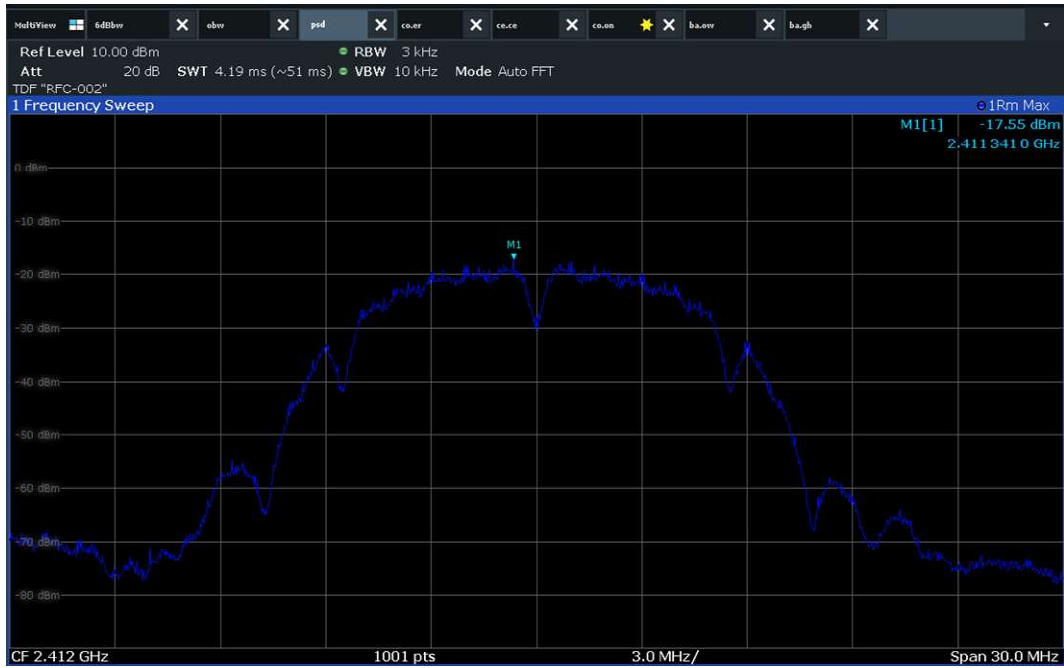


7.3.1 Measured Results

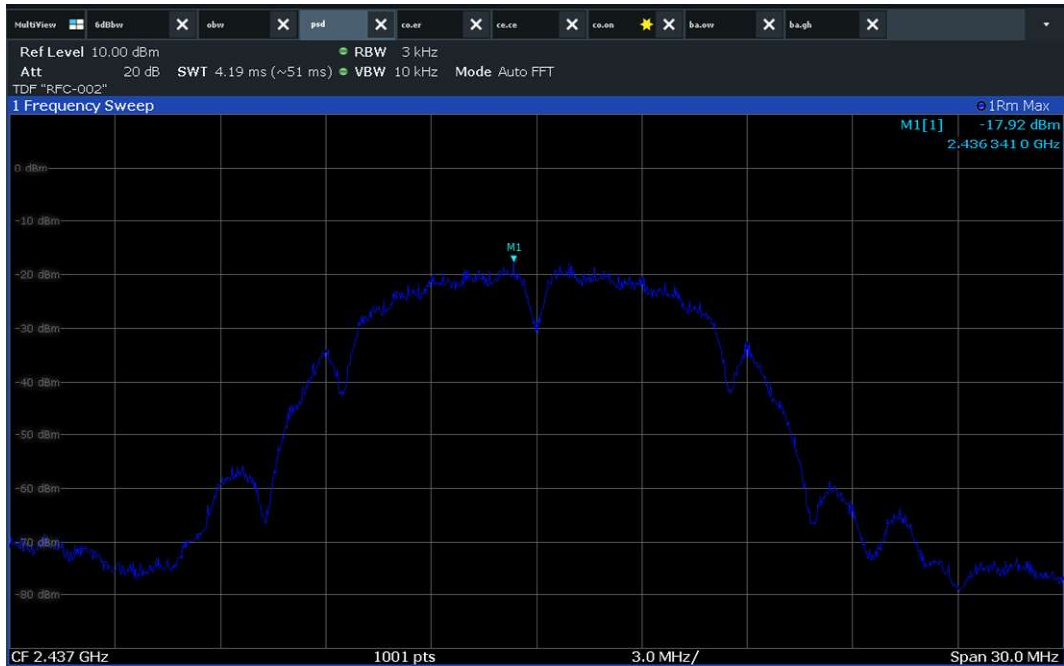
Modulation Type	Channel (Frequency)	Highest signal level (dBm)	Limit (dBm/3kHz)
802.11b	0 (2 412 MHz)	-17.55	8
	6 (2 437 MHz)	-17.92	
	11 (2 462 MHz)	-18.53	
802.11g	0 (2 412 MHz)	-22.19	
	6 (2 437 MHz)	-22.41	
	11 (2 462 MHz)	-22.39	
802.11n(HT20)	0 (2 412 MHz)	-21.79	
	6 (2 437 MHz)	-22.29	
	11 (2 462 MHz)	-22.87	
Bluetooth LE 1Mbps	0 (2 402 MHz)	-15.35	
	19 (2 440 MHz)	-15.70	
	39 (2 480 MHz)	-16.50	
Bluetooth LE 2Mbps	0 (2 402 MHz)	-17.94	
	19 (2 440 MHz)	-17.99	
	39 (2 480 MHz)	-18.85	
Bluetooth LE coded 500kbps	0 (2 402 MHz)	-7.96	
	19 (2 440 MHz)	-8.20	
	39 (2 480 MHz)	-8.73	
Bluetooth LE coded 125kbps	0 (2 402 MHz)	-14.23	
	19 (2 440 MHz)	-14.00	
	39 (2 480 MHz)	-14.01	



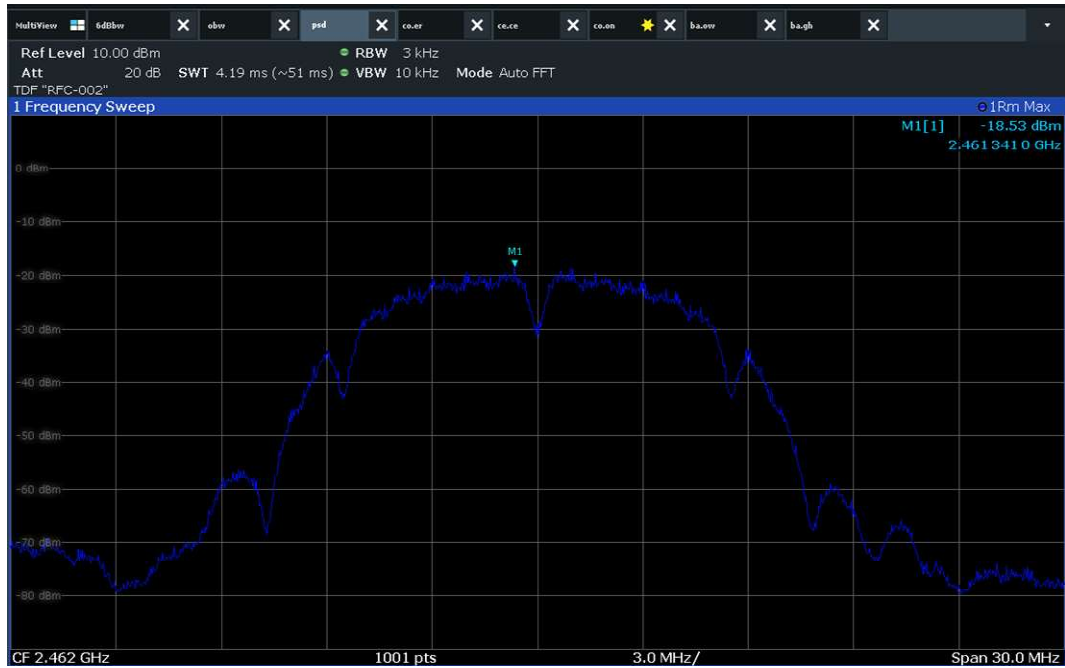
7.3.1.1 Measured Graph for 802.11b



Low CH

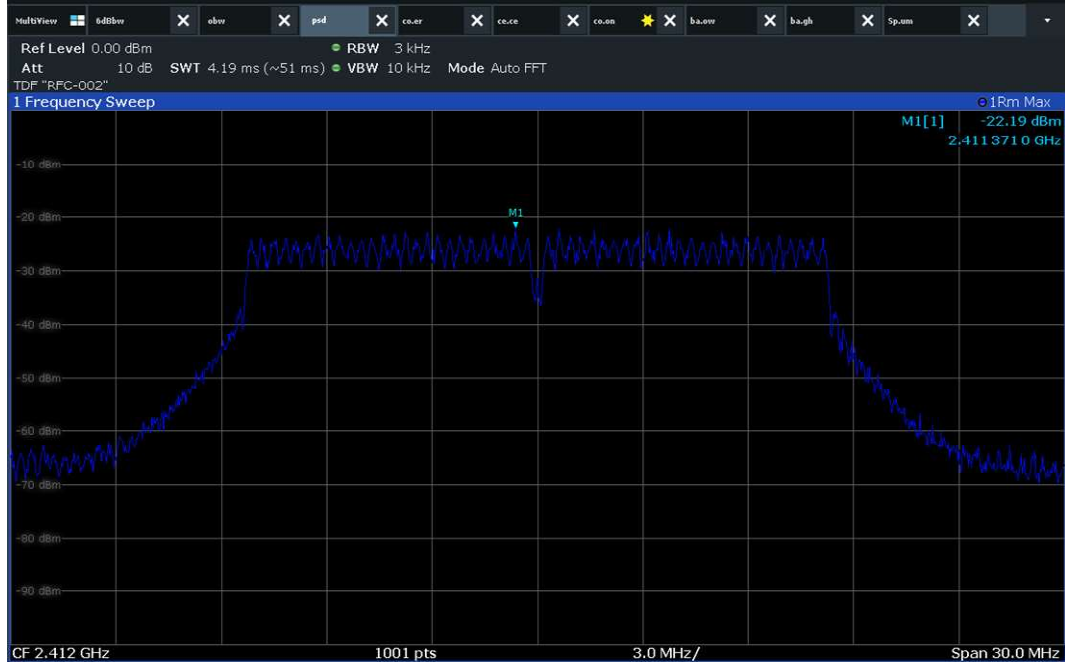


Mid CH

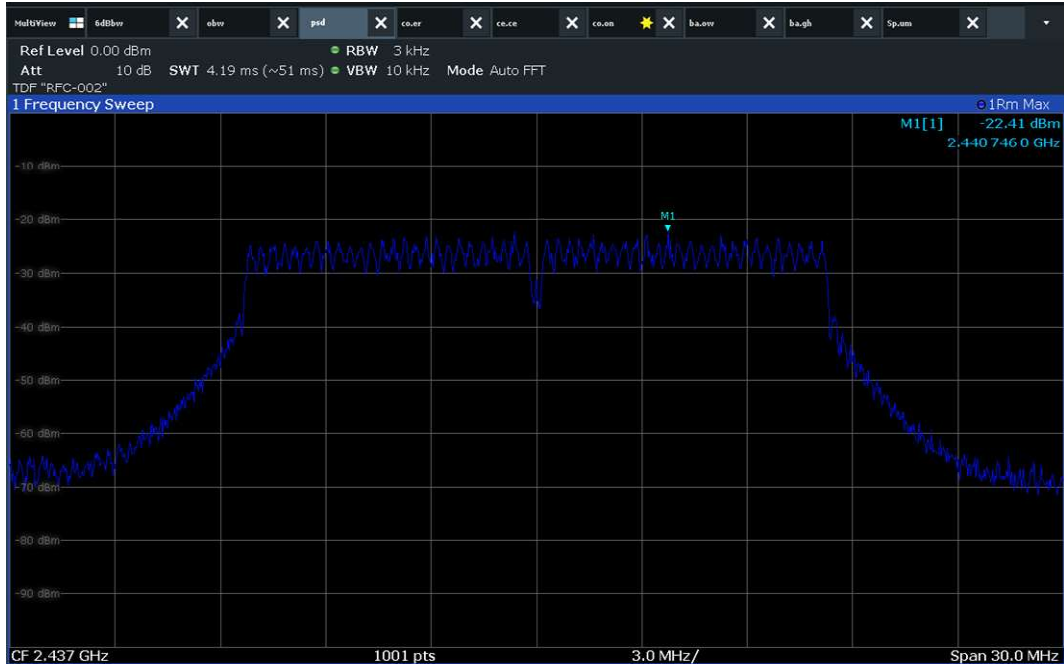


High CH

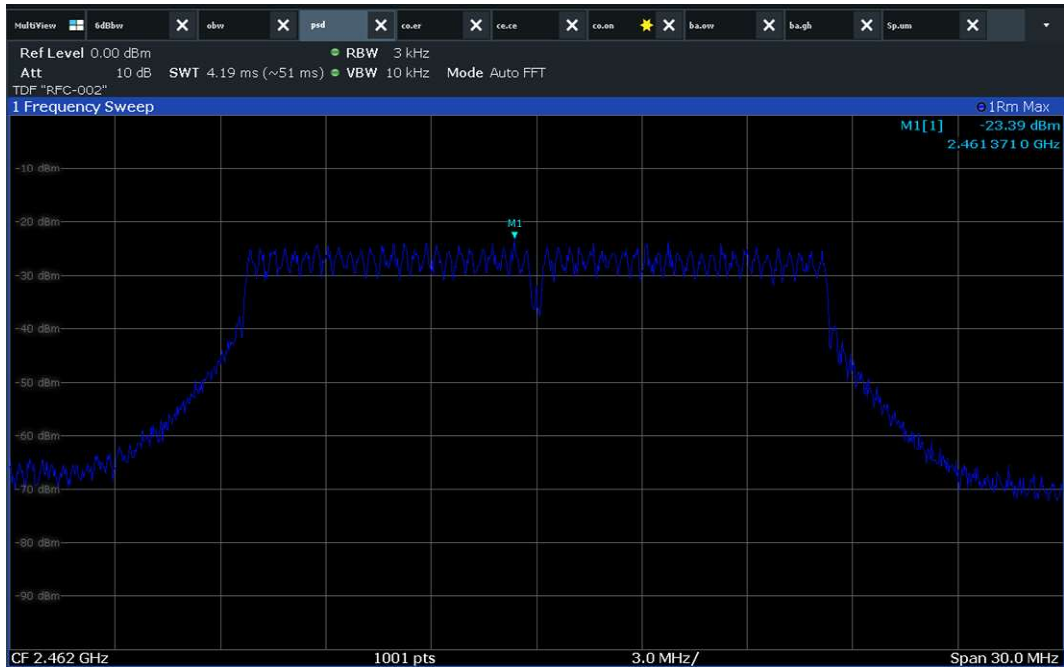
7.3.1.2 Measured Graph for 802.11g



Low CH



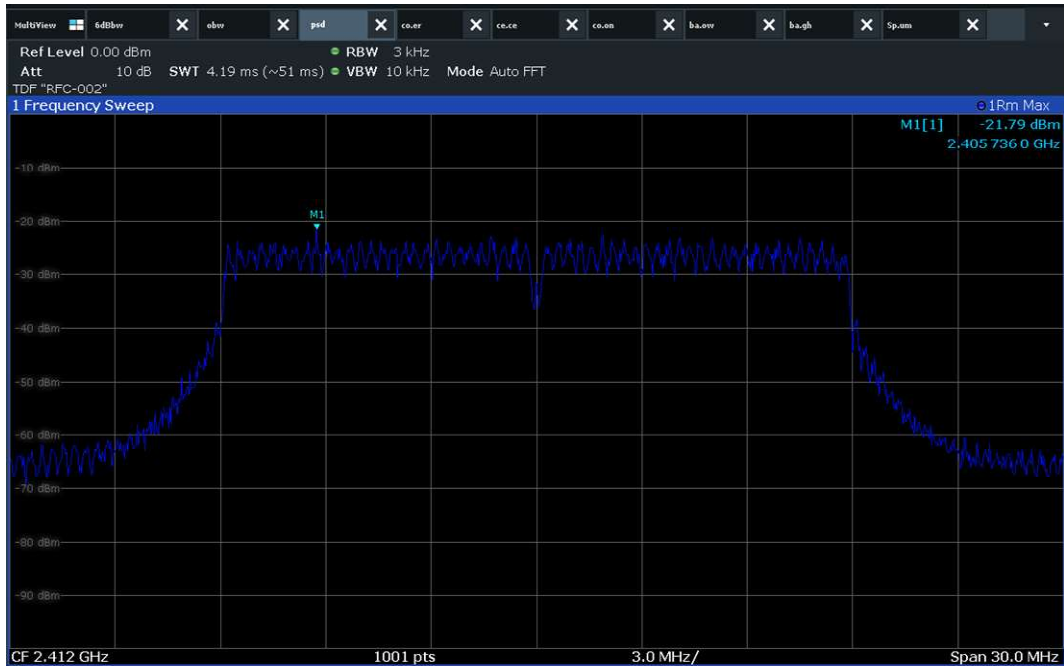
Mid CH



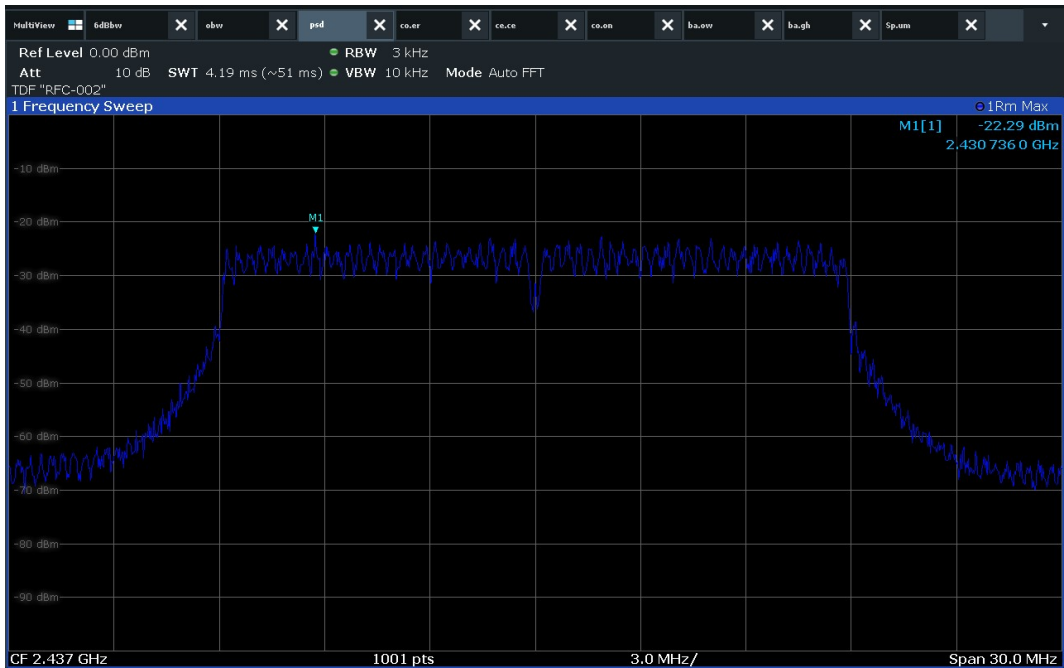
High CH



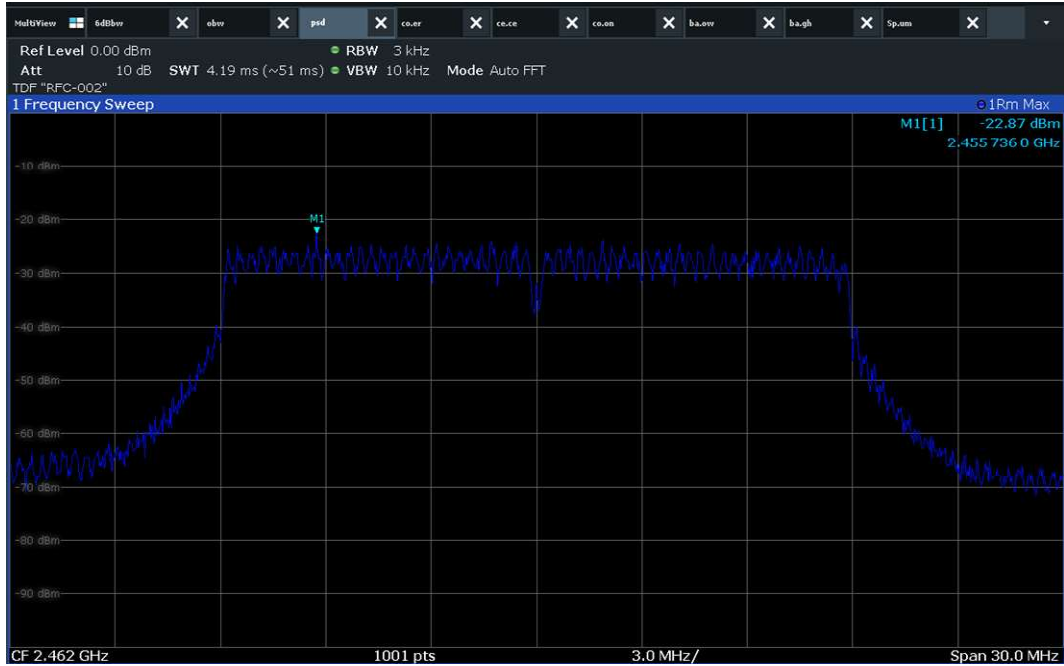
7.3.1.3 Measured Graph for 802.11n(HT20)



Low CH

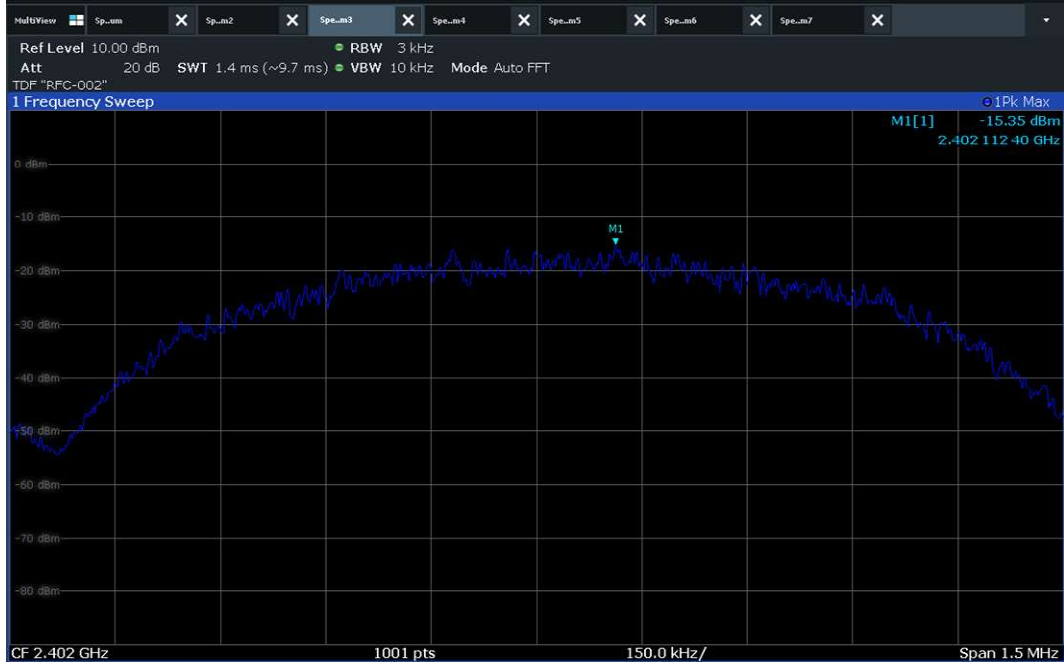


Mid CH

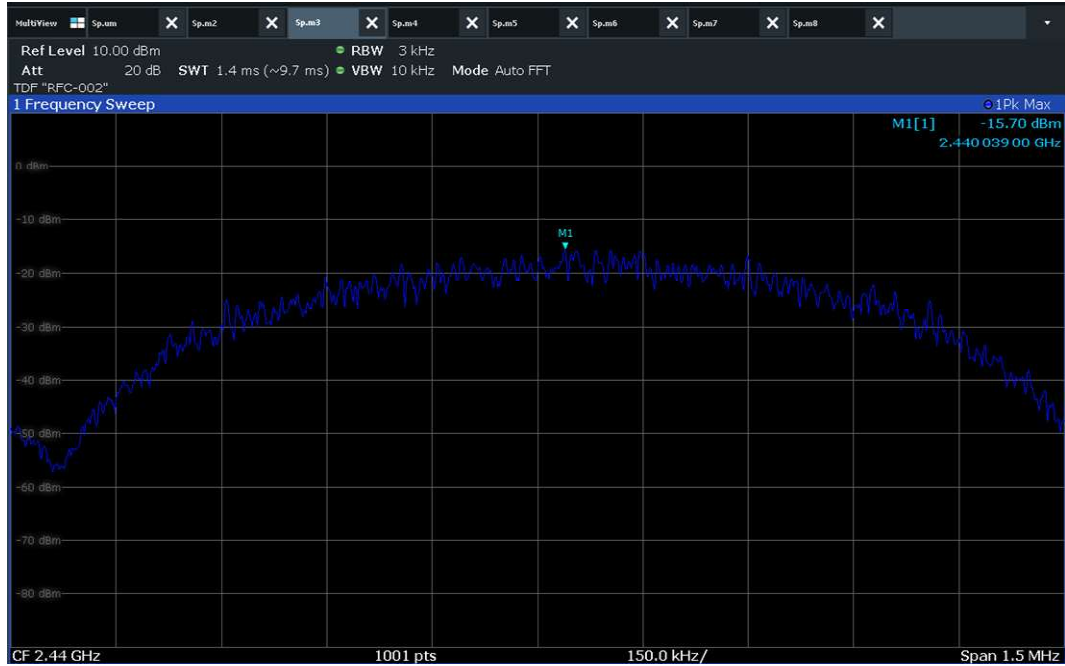


High CH

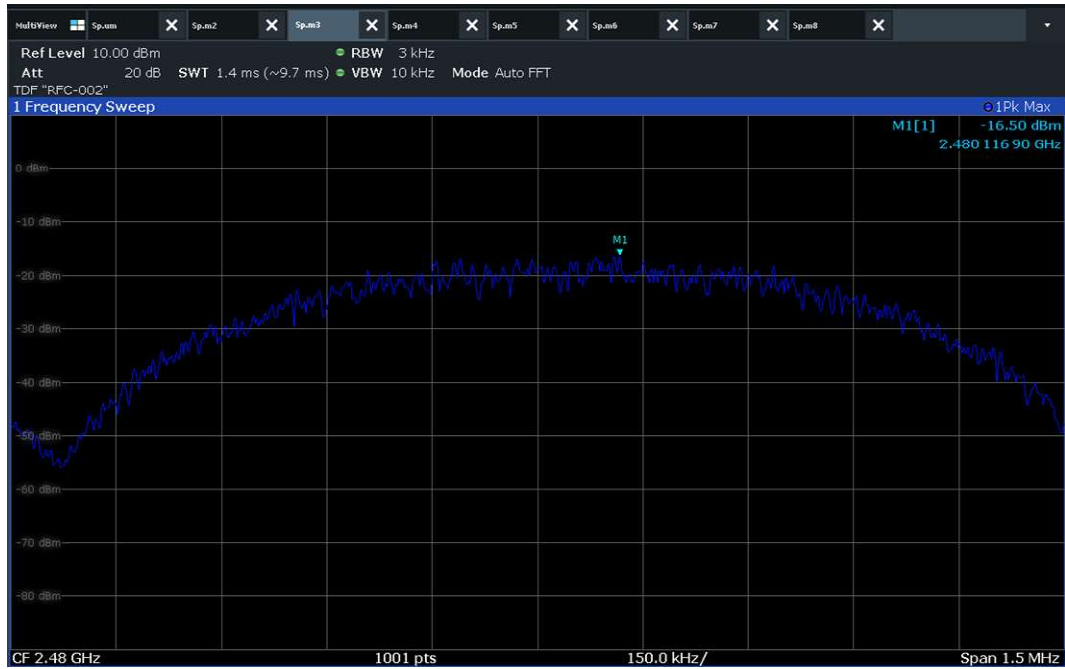
7.3.1.4 Measured Graph for Bluetooth LE 1Mbps



Low CH



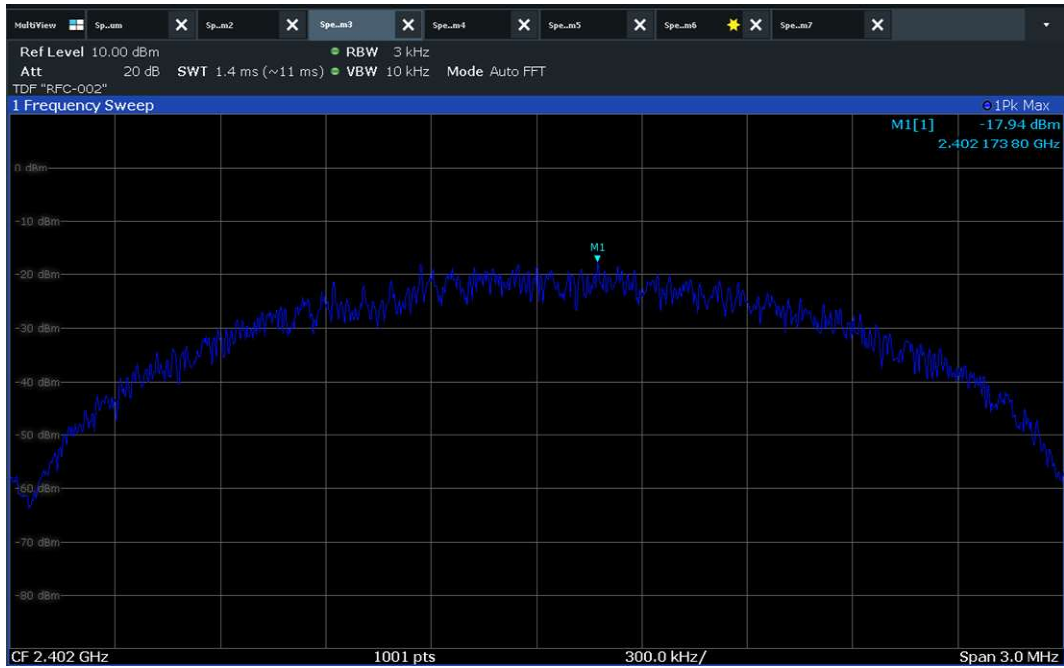
Mid CH



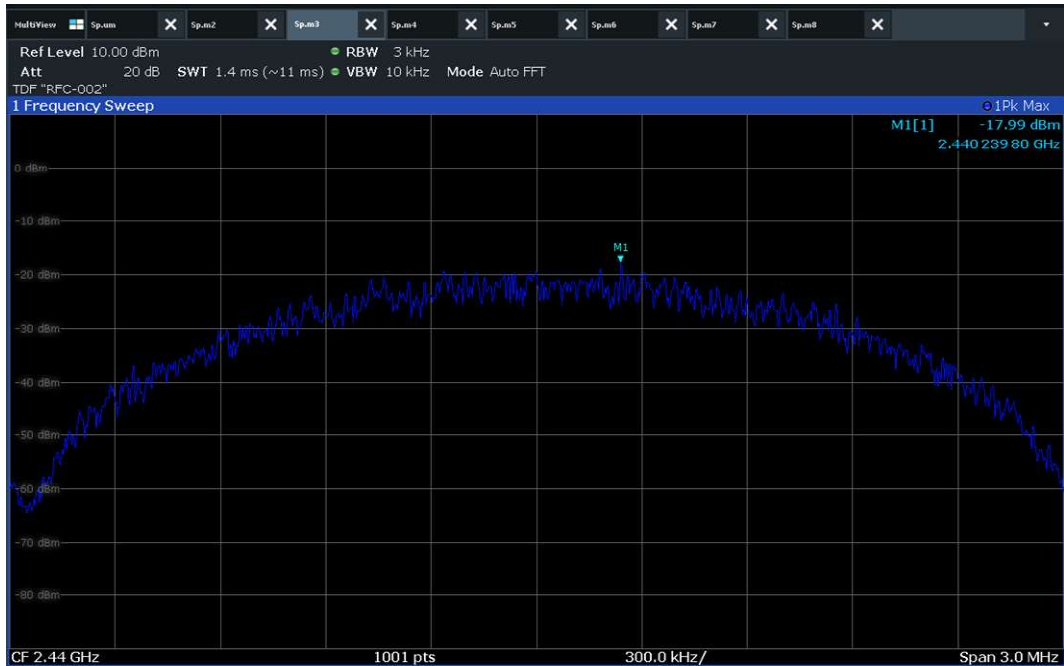
High CH



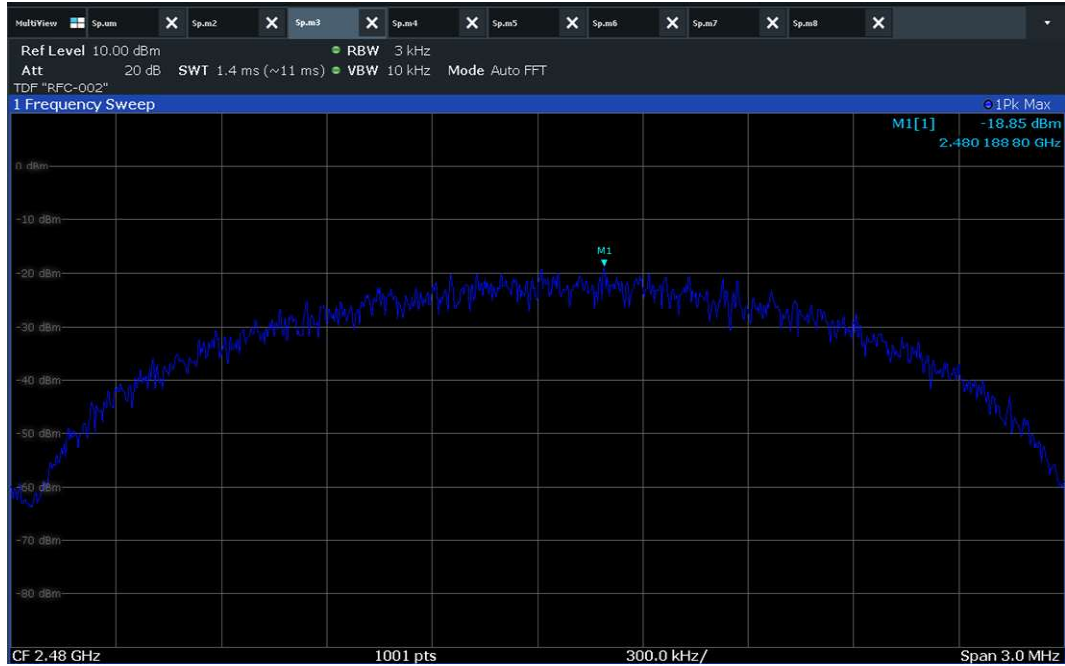
7.3.1.5 Measured Graph for Bluetooth LE 2Mbps



Low CH

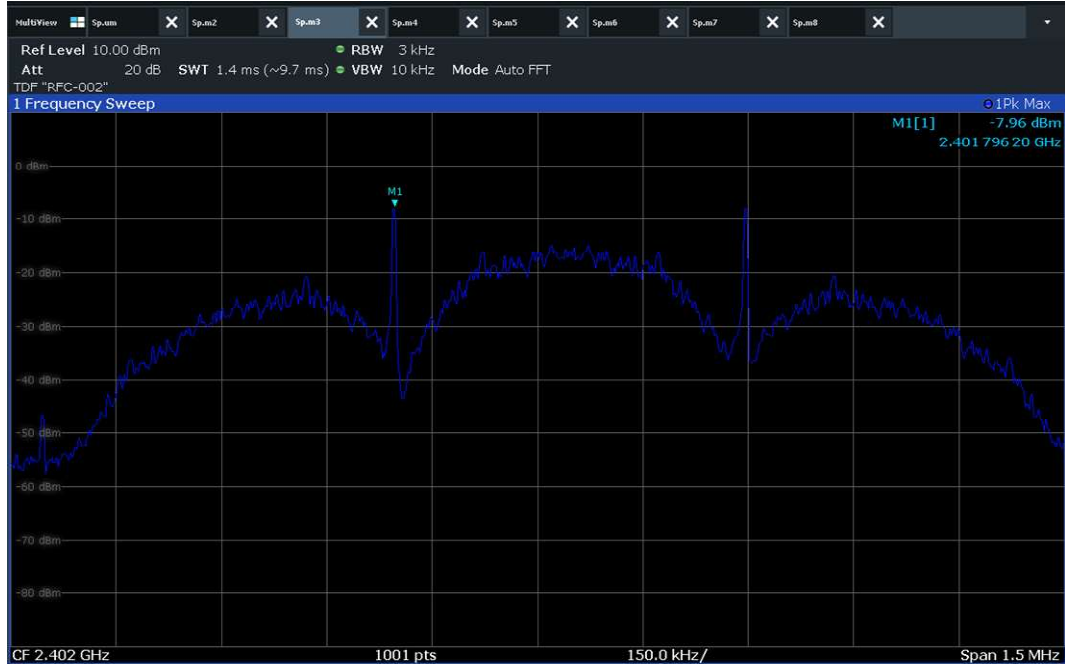


Mid CH

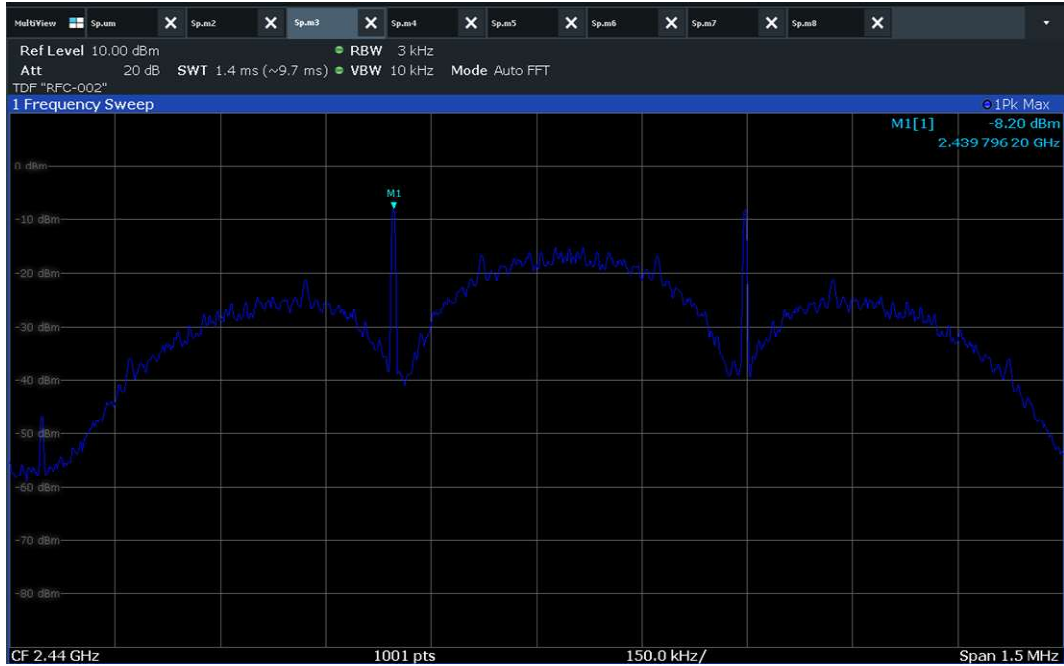


High CH

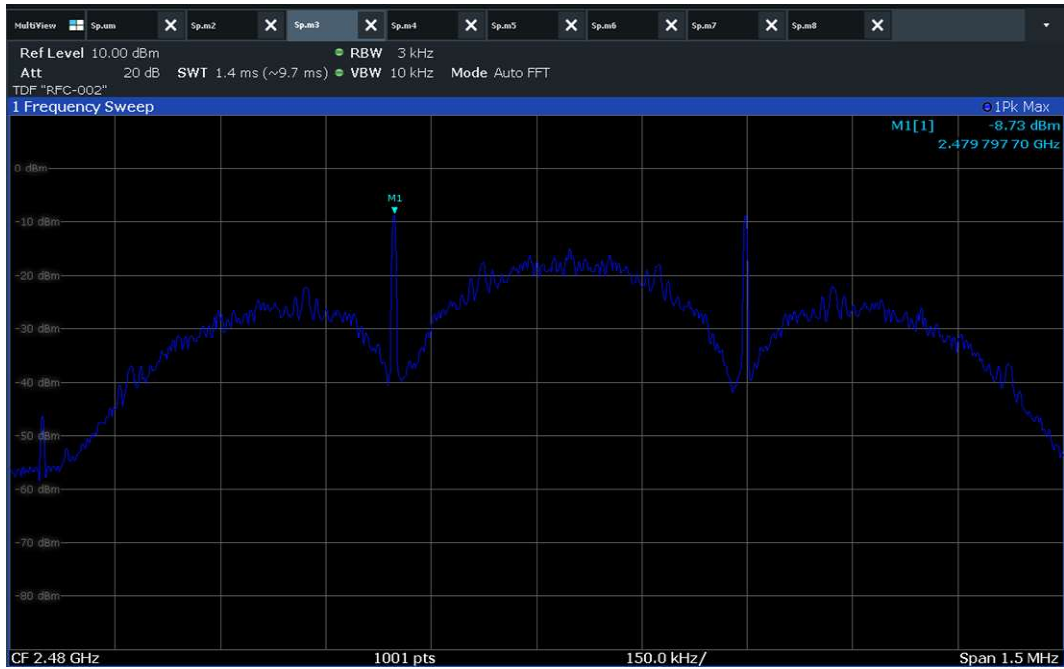
7.3.1.6 Measured Graph for Bluetooth Coded 500kpbs



Low CH



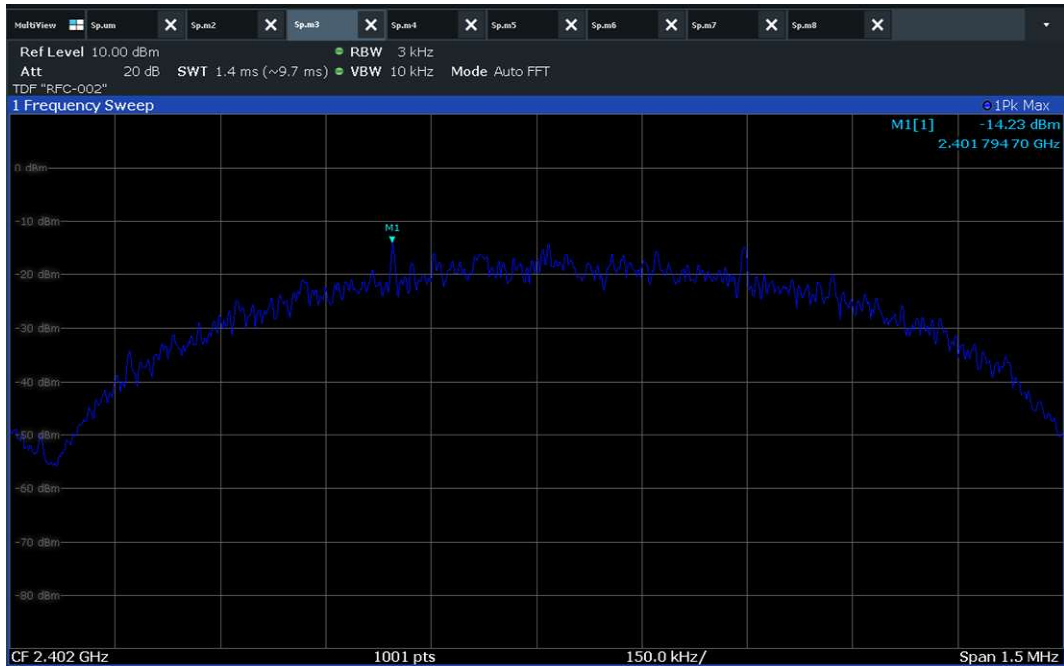
Mid CH



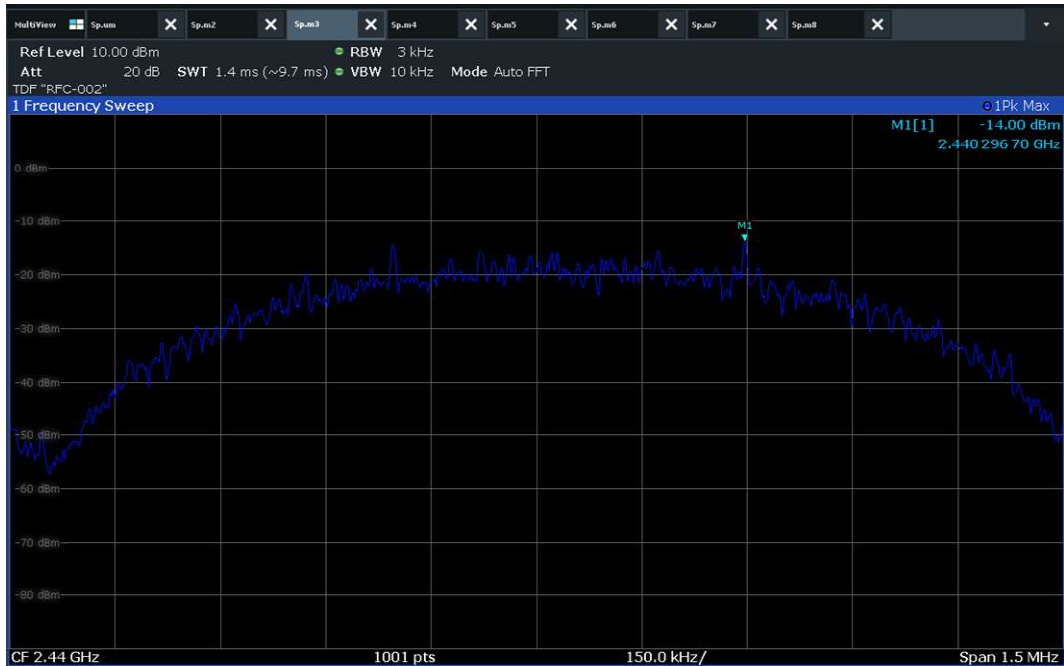
High CH



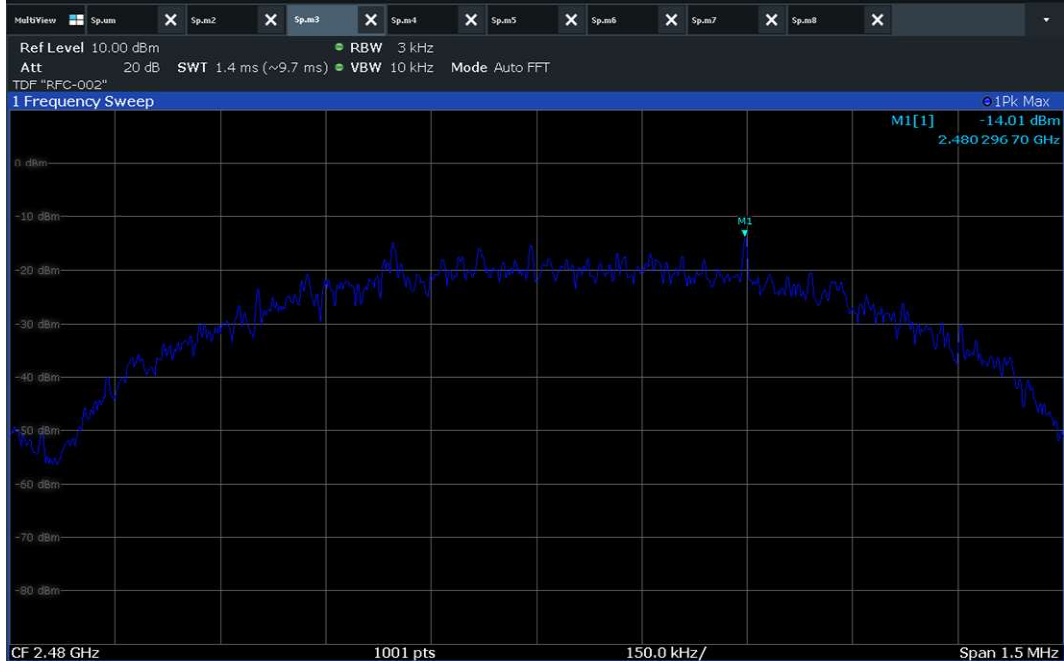
7.3.1.7 Measured Graph for Bluetooth LE Coded 125kbps



Low CH



Mid CH



High CH