FCC Test Report

Part 15 subpart C

Client Information:

Applicant : Shenzhen mengzhilai Electronics Co.,limited

Applicant add.: Building3,25Wulian Road,Longxi Community Longcheng Street, Longgang district,Shenzhen,china

EUT Information:

EUT Name : bluetooth Speaker

Model No. : BT3500 (Refer to page 5)

Brand Name : N/A

FCC ID : 2AGOJBT3500

Prepared By:

Shenzhen HCtest PRODUCT SERVICE CO.,LTD.
Add. : Second floor A, A5 building, North yongfa technology Park, Heyijincheng Road, Shajing street, Bao'an district, Shenzhen City, China

Date of Receipt: Nov. 22, 2015 Date of Test: Nov. 22~ Nov. 27, 2015

Date of Issue: Nov. 28, 2015 Test Result: **Pass**

Test procedure used: ANSI C63.4-2009

This device described above has been tested by Shenzhen HCtest PRODUCT SERVICE CO.,LTD., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

*This test report must not be used by the client to claim product endorsement by any agency of the U.S. government.

Reviewed by: Jerome Luo

Approved by: Back Huang

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2 Test Summary

2.1 Compliance with FCC Part 15 subpart C

Test	Test Requirement	Standard Paragraph	Result
Antenna Requirement	FCC Part 15 C:2013	Section 15.247(c)	**PASS**
Conduction Emissions	FCC Part 15 C:2013	Section 15.207(a)	**PASS**
Radiated Emissions	FCC Part 15 C:2013	Section 15.247(d)	**PASS**
Carrier Frequencies Separated	FCC Part 15 C:2013	Section 15.247(a)(1)	**PASS**
Hopping Channel Number	FCC Part 15 C:2013	Section 15.247(a)(1) (iii)	**PASS**
Dwell Time	FCC Part 15 C:2013	Section 15.247(a)(1) (iii)	**PASS**
Maximum Peak Output Power	FCC Part 15 C:2013	Section 15.247(b)	**PASS**
Band edge	FCC Part 15 C:2013	Section 15.247(d)	**PASS**
Conducted Spurious Emissions	FCC Part 15 C:2013	Section 15.247(d)	**PASS**
Note: Reference to the KDB 867751 published on 04/16/2007 and DA 00-705			

2.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, The following measurements uncertainty Levels have estimated based on ANSI C63.4:2009, the maximum value of the uncertainty as below

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	Radiated Emission Test	±3.57dB

3 General Information

3.1 General Description of EUT

Manufacturer:	Shenzhen mengzhilai Electronics Co.,limited
Manufacturer Address:	Building3,25Wulian Road,Longxi Community Longcheng Street,Longgang district,Shenzhen,china
EUT Name:	bluetooth Speaker
Model No:	BT3500
Brand Name:	N/A
Derivative models:	BT3500XXX (X "*" stands for "A-Z", indicate different colours of appearance）
Operation frequency:	2402MHz to 2480MHz
Channel Number:	79
Modulation Technology:	GFSK, (π/4)DQPSK, 8DPSK
AntennaType:	Integral
Antenna Gain:	0 dBi
Power Supply Range:	DC 3.7V from battery or DC 5V from USB port
Power Supply:	DC 3.7V from battery or DC 5V from adapter, AC 120V/60Hz for adapter
Power Cord:	N/A
Effective Isotropic Radiated Power（max）:	2.93dBm

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3. The USB port is only used for charging, it can’t exchange data with PC.

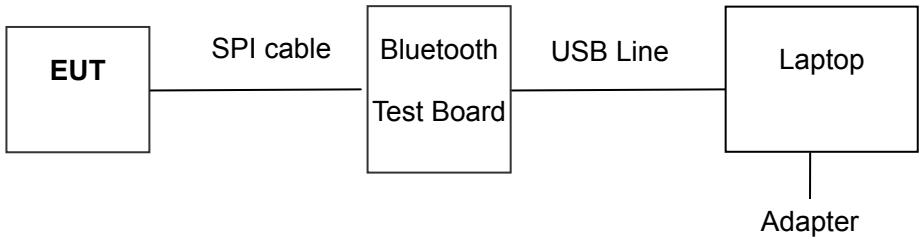
4. Pre-test the EUT in AC mode and B/O mode, find worse case in B/O mode.

5. According to the declaration of the applicant, the electrical circuit design, layout, components used and internal wiring were identical for above models, with only difference being the colours of appearance.
Therefore, only one model BT3500 was tested in this report.

3.2 Description of Test conditions

(1) EUT was tested in normal configuration (Please See following Block diagram)

1. Block diagram of EUT configuration(TX Mode)



The test setup as above is for product into transmitting engineer mode. When it completes, We will remove related fixture to start test.

(2) E.U.T. test conditions:

15.31(e): For intentional radiators, measurements of the variation of the input power or the adiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Test frequencies:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and. If required reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

(4) Frequency range of radiated measurements:

According to the 15.33, The test range will be up to the tenth harmonic of the highest fundamental frequency .

3.3 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	signal cable
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.4 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	signal cable
1	Lap top	ASUS	N/A	X401A	X16-96072	N/A	N/A
2	Adapter (laptop)	ASUS	N/A	EXA0703 YH	N/A	1.8m/unshielded /detachable	N/A
3	adapter	Stos	CE, FCC	QX5100	N/A	N/A	N/A
4	USB cable	N/A	N/A	N/A	N/A	0.5m/unshielded /detachable	N/A

3.5 Test Location

All tests were performed at:

Dongguan UTL Electronic Technology Co., Ltd.

1F, Hengzheng Bldg, North Road of Station, Nancheng District, Dongguan, Guangdong, China.

The FCC Registration No. of Dongguan Yaxu (AiT) Technology Limited is 713614.

4 Equipments List for All Test Items

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	ADVANTEST	R3182	150900201	2015.10.16	2016.10.15
2	EMI Measuring Receiver	Schaffner	SCR3501	235	2015.10.16	2016.10.15
3	Low Noise Pre Amplifier	Tsj	MLA-10K01-B01-27	1205323	2015.09.08	2016.09.07
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2015.04.08	2016.04.07
5	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2015.07.05	2016.07.04
6	Broadband Horn Antenna	SCHWARZBECK	BBHA9120A	451	2015.07.05	2016.07.04
7	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.09.08	2016.09.07
8	EMI Test Receiver	R&S	ESCI	100124	2014.12.29	2015.12.28
9	LISN	Kyoritsu	KNW-242	8-837-4	2015.04.08	2016.04.07
10	LISN	Kyoritsu	KNW-407	8-1789-3	2015.04.08	2016.04.07
11	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.04.08	2016.04.07
12	Loop Antenna	ARA	PLA-1030/B	1029	2015.04.08	2016.04.07
13	Power sensor	Anritsu	MA2411B	1126168	2015.06.17	2016.06.16
14	EMI Test Receiver	Rohde & Schwarz	ESIB26	100394	2015.04.08	2016.04.07
15	SHF-EHF Horn	SCHWARZBECK	BBHA9170	BBHA9170367	2015.04.08	2016.04.07

5 Test Result

5.1 Antenna Requirement

5.1.1 Standard requirement

15.203 requirement: For intentional device, 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.

15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.1.2 EUT Antenna

The antenna is integrated on the main PCB and no consideration of replacement. Antenna gain is max 0 dBi from 2.4GHz to 2.5GHz.

5.2 Conduction Emissions Measurement

5.2.1 Applied procedures / Limit

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

Note: Decreases with the logarithm of the frequency.

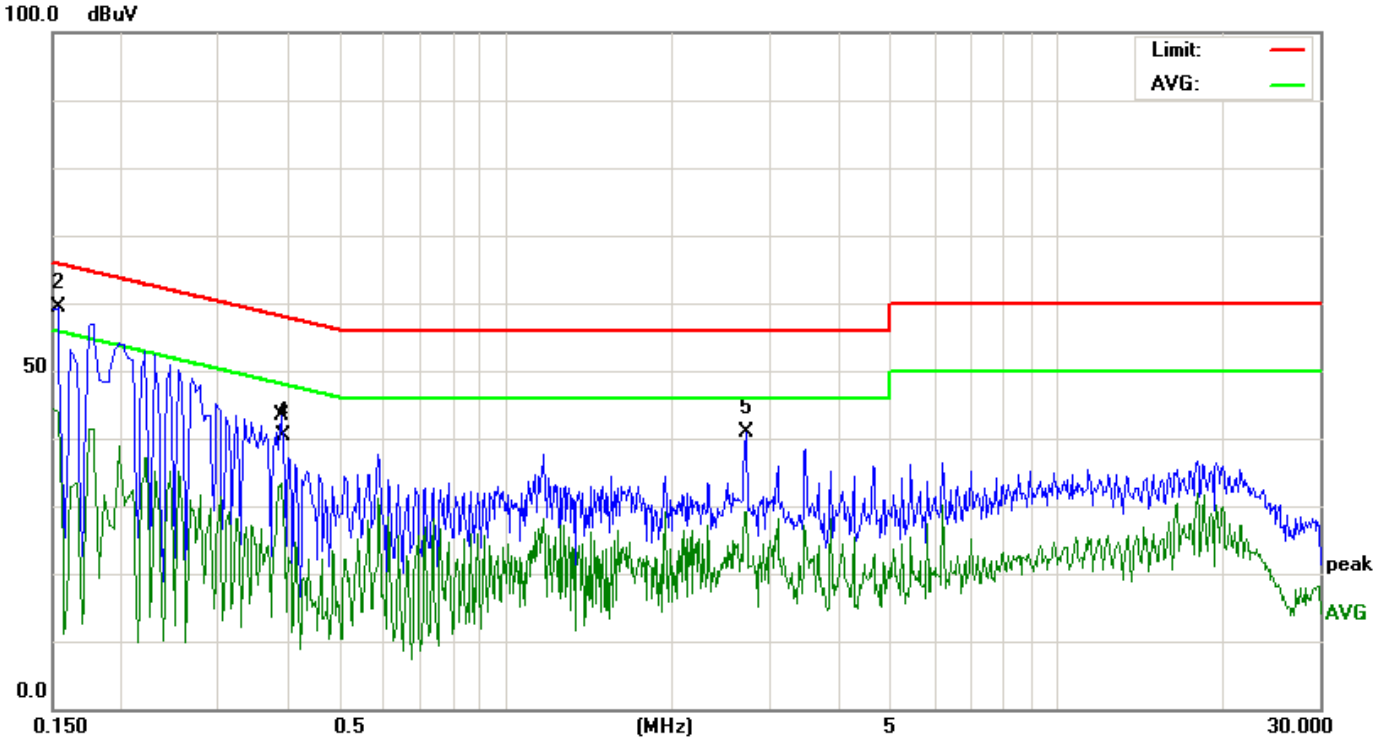
5.2.2 Test procedure

EUT was placed upon a wooden test table 0.8m above the horizontal metal reference plane and 0.4m from the vertical ground plane, and it was connected to an AMN. The closest distance between the boundary of the EUT and the surface of the AMN is 0.8m. All peripherals were connected to another AMN, and placed at a distance of 10cm from each other. A spectrum and receiver was connected to the RF output port of the AMN. Both average and quasi-peak value were detected.

5.2.3 Test results

EUT:	bluetooth Speaker	Model Name. :	BT3500
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Test Date :	2015-11-25
Test Mode:	TX(1Mbps-1DH1:2402)	Phase :	Line
Test Voltage :	DC 5V from adapter, AC 120V/60Hz for adapter		

Level(dBμV)

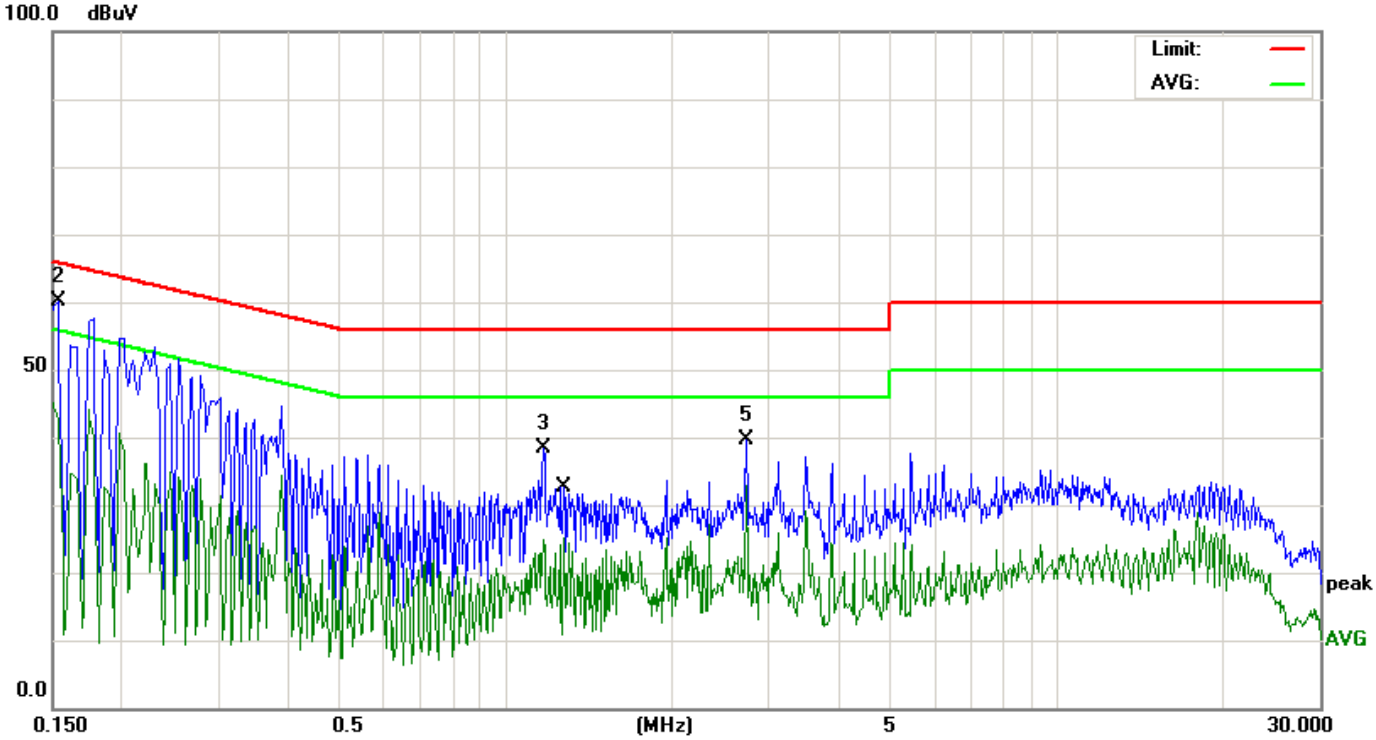


Measure data:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	33.26	11.94	45.20	55.99	-10.79	AVG
2	*	0.1539	48.38	11.84	60.22	65.78	-5.56	QP
3		1.1700	28.46	9.95	38.41	56.00	-17.59	QP
4		1.2740	15.06	9.96	25.02	46.00	-20.98	AVG
5		2.7260	29.55	10.03	39.58	56.00	-16.42	QP
6		2.7260	22.85	10.03	32.88	46.00	-13.12	AVG

EUT:	bluetooth Speaker	Model Name. :	BT3500
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Test Date :	2015-11-25
Test Mode:	TX(1Mbps-1DH1:2402)	Phase :	Neutral
Test Voltage :	DC 5V from adapter, AC 120V/60Hz for adapter		

Level(dBμV)



Measure result:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	32.44	11.94	44.38	55.99	-11.61	AVG
2	*	0.1539	47.46	11.84	59.30	65.78	-6.48	QP
3		0.3899	23.21	10.13	33.34	48.06	-14.72	AVG
4		0.3940	30.25	10.13	40.38	57.98	-17.60	QP
5		2.7260	30.79	10.03	40.82	56.00	-15.18	QP
6		2.7260	19.17	10.03	29.20	46.00	-16.80	AVG

5.3 Radiated Emissions Measurement

5.3.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency of Emission (MHz)	Field Strength		Measurement Distance (meters)
	μV/m	dBμV/m	
0.009-0.49	2400/F(kHz)		300
0.49-1.705	24000/F(kHz)		30
1.705-30	30		30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

5.3.2 Test procedure

EUT was placed upon a wooden test table which was placed on the turn table 0.8m above the horizontal metal ground plane, and operating in the mode as mentioned above. A receiving antenna was placed 3m away from the EUT. During testing, turn around the turn table and move the antenna from 1m to 4m to find the maximum field-strength reading. All peripherals were placed at a distance of 10cm between each other. Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

5.3.3 Test Result

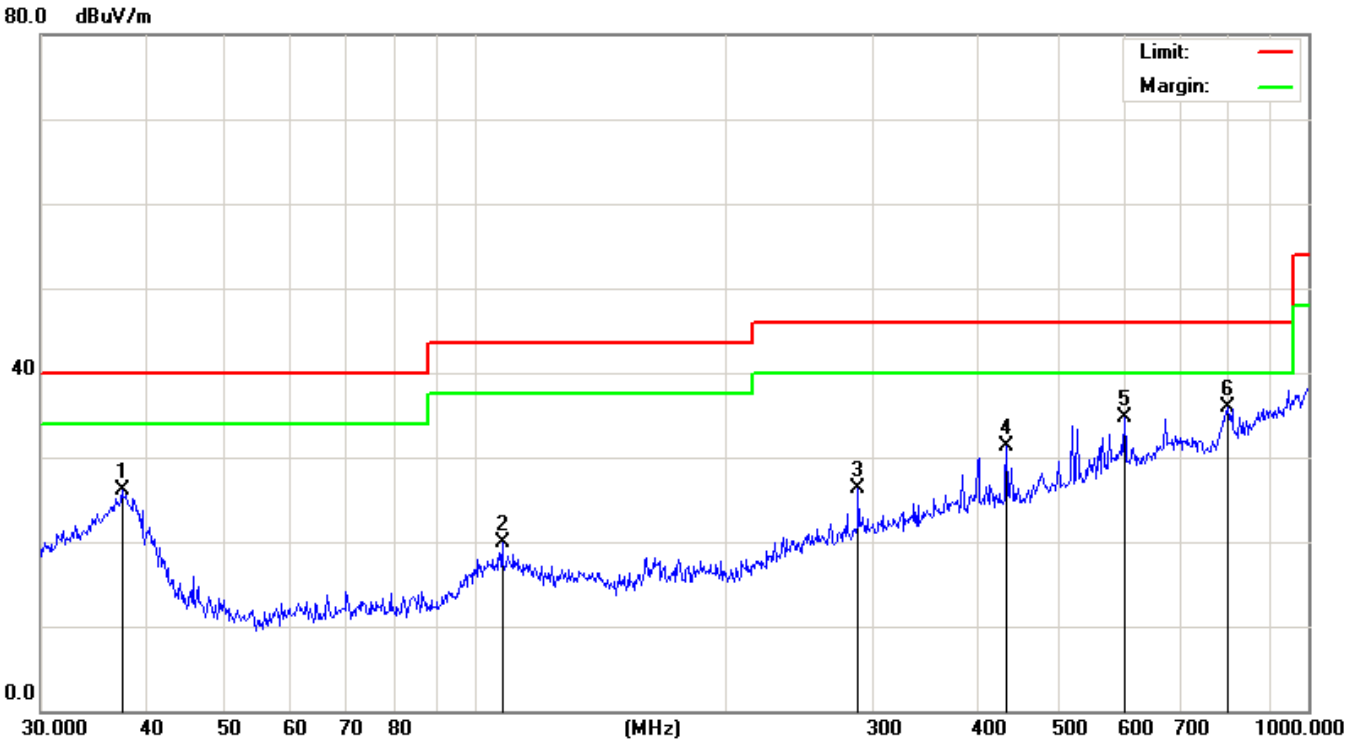
There is not detected blow 30MHz.

EUT:	bluetooth Speaker	Model Name :	BT3500
Temperature:	25 ℃	Test Data	2015-11-25
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX(1Mbps-DH1:2402)	Test Voltage :	DC 3.7V from battery
Measurement Distance	3 m	Frenqucy Range	30MHz to 1GHz
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

(a) Antenna polarization: Horizontal

Peak scan

Level (dBμV/m)



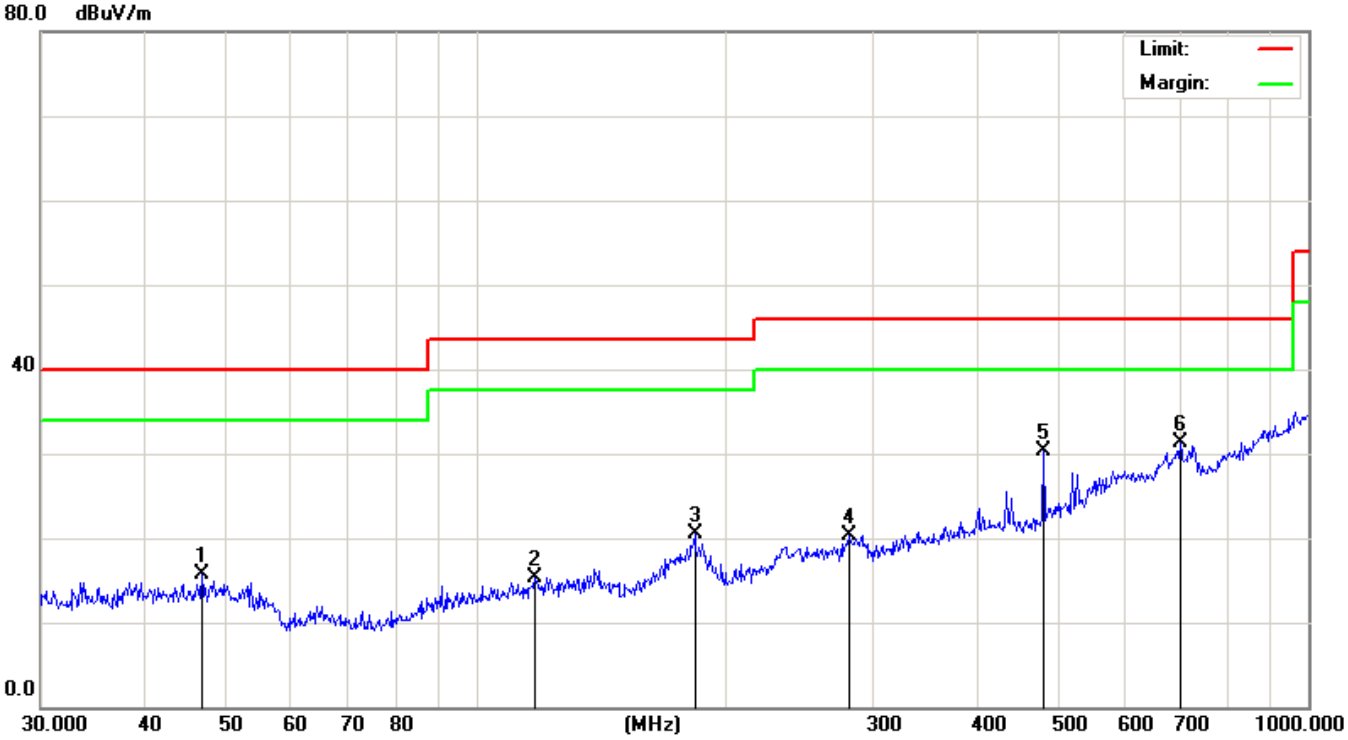
Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		37.5478	42.77	-16.70	26.07	40.00	-13.93	QP
2		107.5100	33.41	-13.48	19.93	43.50	-23.57	QP
3		287.9904	36.10	-9.85	26.25	46.00	-19.75	QP
4		434.0650	37.98	-6.61	31.37	46.00	-14.63	QP
5		601.4265	35.57	-0.89	34.68	46.00	-11.32	QP
6	*	801.7862	32.58	3.30	35.88	46.00	-10.12	QP

(b) Antenna polarization: vertical

Peak scan

Level (dBμV/m)



Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		46.8303	29.97	-14.29	15.68	40.00	-24.32	QP
2		117.7724	30.37	-15.00	15.37	43.50	-28.13	QP
3		183.2005	30.96	-10.48	20.48	43.50	-23.02	QP
4		281.0074	30.59	-10.23	20.36	46.00	-25.64	QP
5		480.5276	36.16	-5.90	30.26	46.00	-15.74	QP
6	*	701.7609	30.96	0.32	31.28	46.00	-14.72	QP

EUT：	bluetooth Speaker	Model Name ：	BT3500
Temperature：	25 ℃	Test Data	2015-11-25
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	1Mbps-DH1(the worst case)	Test Voltage ：	DC 3.7V from battery
Measurement Distance	3 m	Frenqucy Range	1GHz to 25GHz
RBW/VBW	1MHz/1MHz for Peak, 1MHz/10Hz for Average.		

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Vertical Measurement:

Frequency (MHz)	Reading Level (dBμV)	factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna polarization
4804.000	50.67	5.06	55.73	74.00	-18.27	peak
4804.000	35.15	5.06	40.21	54.00	-13.79	AVG
7206.000	46.34	7.03	53.37	74.00	-20.63	peak
7206.000	33.12	7.03	40.15	54.00	-13.85	AVG
9608.000	39.87	10.63	50.50	74.00	-23.50	peak
9608.000	27.11	10.63	37.74	54.00	-16.26	AVG

Horizontal Measurement:

Frequency (MHz)	Reading Level (dBμV)	factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna polarization
4804.000	50.66	5.06	55.72	74.00	-18.28	peak
4804.000	34.43	5.06	39.49	54.00	-14.51	AVG
7206.000	45.89	7.03	52.92	74.00	-21.08	peak
7206.000	32.12	7.03	39.15	54.00	-14.85	AVG
9608.000	39.67	10.63	50.30	74.00	-23.70	peak
9608.000	26.79	10.63	37.42	54.00	-16.58	AVG

Note: **10~25GHz at least have 20dBm margin. No recording in the test report.**

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss-Preamp Factor

Low Channel 00: 2402 MHz

Data rate: 1Mbps

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Vertical Measurement:

Frequency (MHz)	Reading Level (dBμV)	factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna polarization
4882.000	48.83	5.14	53.97	74.00	-20.03	peak
4882.000	33.84	5.14	38.98	54.00	-15.02	AVG
7323.000	44.58	7.54	52.12	74.00	-21.88	peak
7323.000	30.82	7.54	38.36	54.00	-15.64	AVG
9764.000	38.36	11.39	49.75	74.00	-24.25	peak
9764.000	26.12	11.39	37.51	54.00	-16.49	AVG

Horizontal Measurement:

Frequency (MHz)	Reading Level (dBμV)	factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna polarization
4882.000	49.26	5.14	54.40	74.00	-19.60	peak
4882.000	35.74	5.14	40.88	54.00	-13.12	AVG
7323.000	45.00	7.54	52.54	74.00	-21.46	peak
7323.000	32.30	7.54	39.84	54.00	-14.16	AVG
9764.000	38.64	11.39	50.03	74.00	-23.97	peak
9764.000	26.24	11.39	37.63	54.00	-16.37	AVG

Note: **10~25GHz at least have 20dBm margin. No recording in the test report.**

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss-Preamp Factor

Middle Channel 39: 2441 MHz

Data rate: 1Mbps

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Vertical Measurement:

Frequency (MHz)	Reading Level (dBμV)	factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna polarization
4960.000	48.98	5.22	54.20	74.00	-19.80	peak
4960.000	35.21	5.22	40.43	54.00	-13.57	AVG
7440.000	44.35	8.06	52.41	74.00	-21.59	peak
7440.000	32.37	8.06	40.43	54.00	-13.57	AVG
9920.000	38.14	12.29	50.43	74.00	-23.57	peak
9920.000	25.92	12.29	38.21	54.00	-15.79	AVG

Horizontal Measurement:

Frequency (MHz)	Reading Level (dBμV)	factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna polarization
4960.000	49.84	5.22	55.06	74.00	-18.94	peak
4960.000	36.23	5.22	41.45	54.00	-12.55	AVG
7440.000	44.81	8.06	52.87	74.00	-21.13	peak
7440.000	31.90	8.06	39.96	54.00	-14.04	AVG
9920.000	39.58	12.10	51.68	74.00	-22.32	peak
9920.000	25.99	12.10	38.09	54.00	-15.91	AVG

Note: **10~25GHz at least have 20dBm margin. No recording in the test report.**

Measurement Level = Reading Level + Factor

Factor=Ant Factor + Cable Loss-Preamp Factor

High Channel 78: 2480 MHz

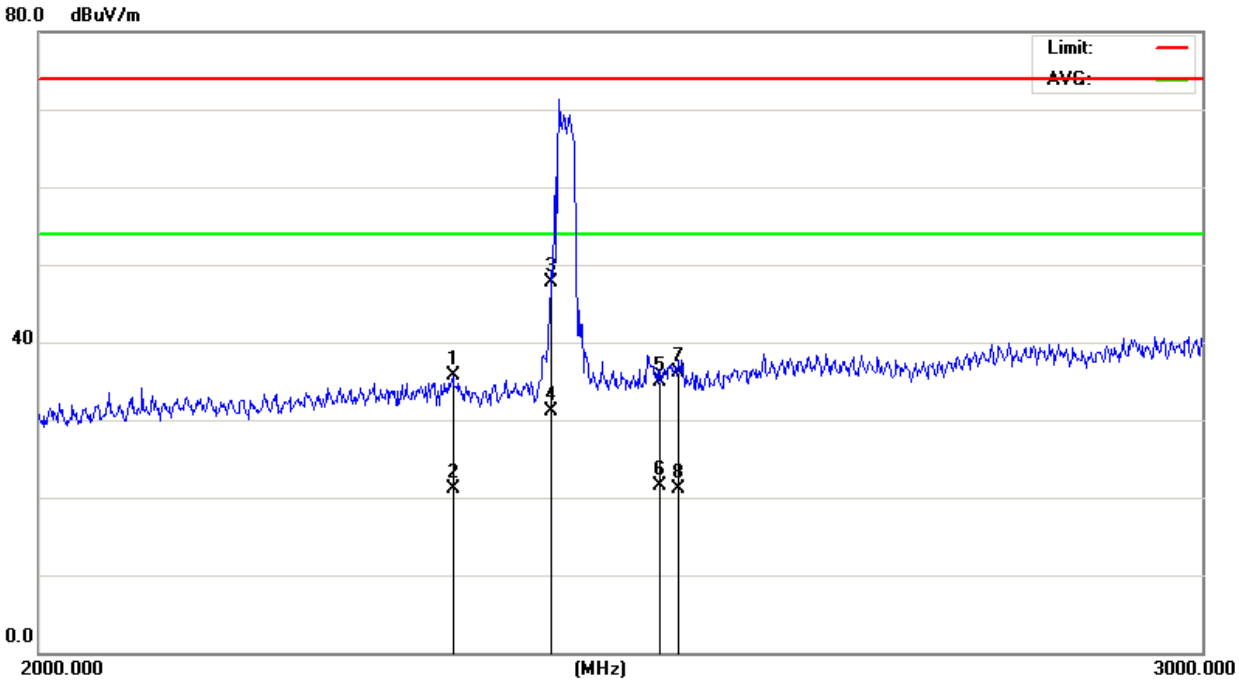
Data rate: 1Mbps

5.3.4 TEST RESULTS (Restricted Bands Requirements)

1Mbps-DH1(the worst case)

1. Low Channel

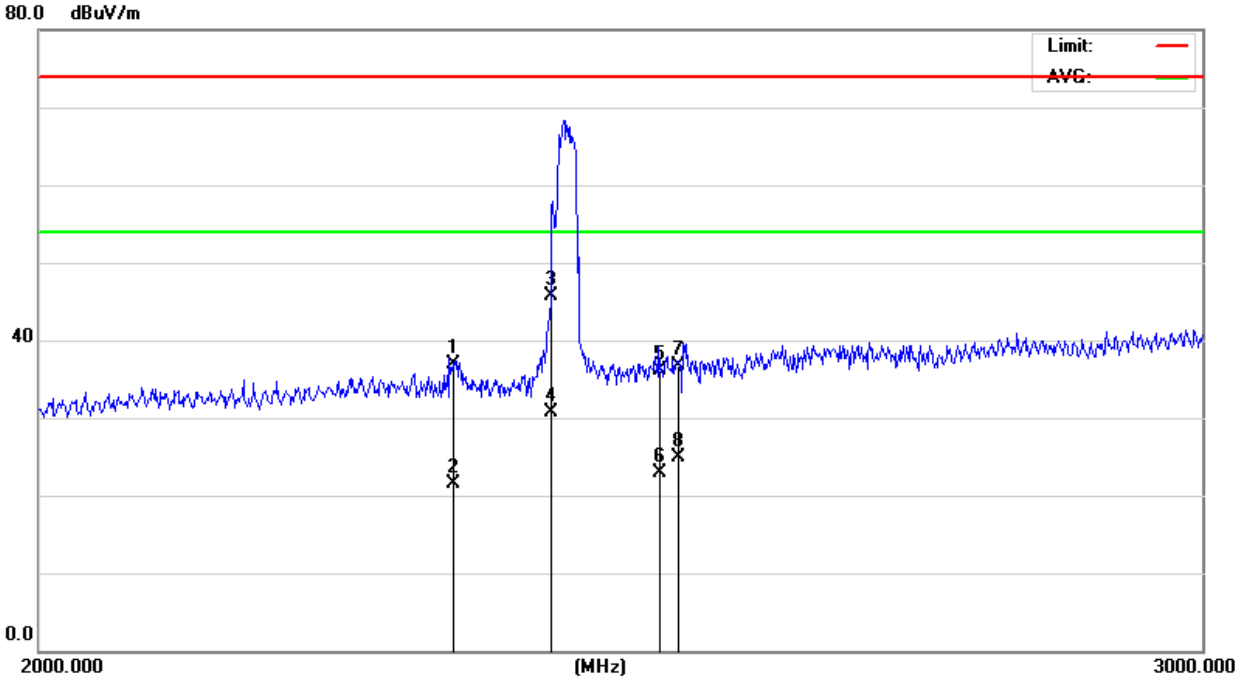
Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	42.12	-6.42	35.70	74.00	-38.30	peak
2		2310.000	27.62	-6.42	21.20	54.00	-32.80	AVG
3		2390.000	53.51	-5.79	47.72	74.00	-26.28	peak
4	*	2390.000	36.95	-5.79	31.16	54.00	-22.84	AVG
5		2483.500	39.88	-4.98	34.90	74.00	-39.10	peak
6		2483.500	26.56	-4.98	21.58	54.00	-32.42	AVG
7		2500.000	41.03	-4.83	36.20	74.00	-37.80	peak
8		2500.000	25.84	-4.83	21.01	54.00	-32.99	AVG

1. Low Channel

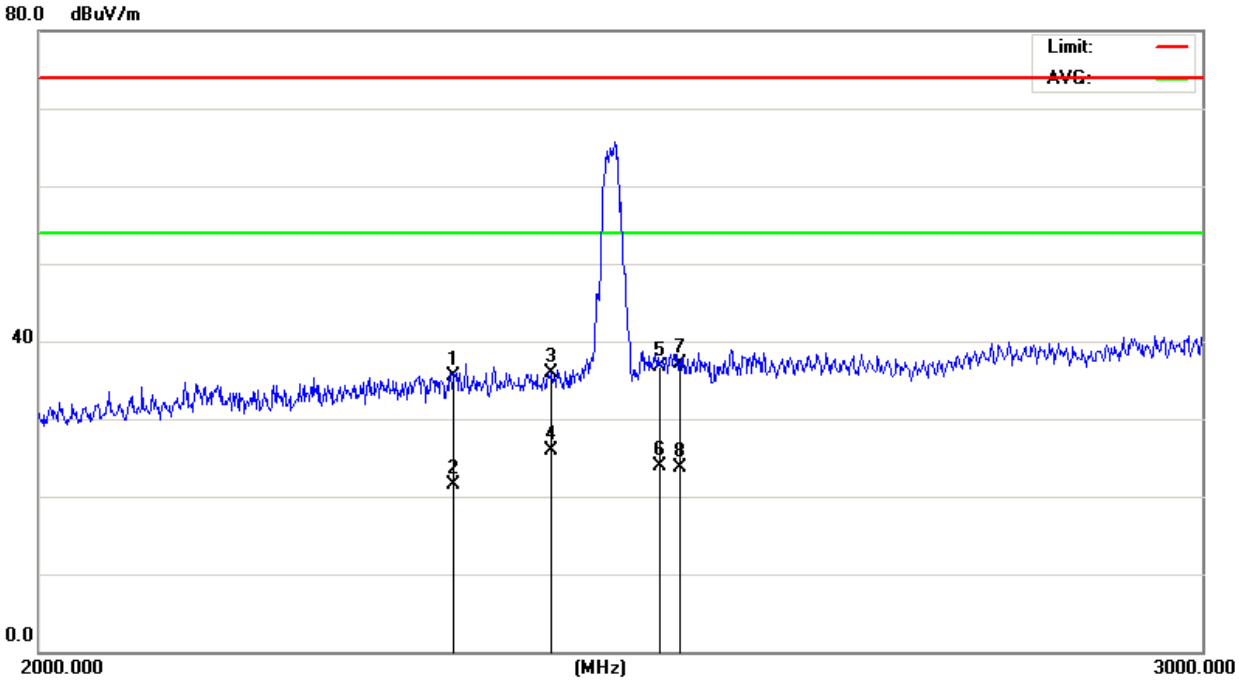
Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	43.32	-6.42	36.90	74.00	-37.10	peak
2		2310.000	27.86	-6.42	21.44	54.00	-32.56	AVG
3		2390.000	51.59	-5.79	45.80	74.00	-28.20	peak
4	*	2390.000	36.55	-5.79	30.76	54.00	-23.24	AVG
5		2483.500	41.18	-4.98	36.20	74.00	-37.80	peak
6		2483.500	27.95	-4.98	22.97	54.00	-31.03	AVG
7		2500.000	41.63	-4.83	36.80	74.00	-37.20	peak
8		2500.000	29.79	-4.83	24.96	54.00	-29.04	AVG

2. Middle Channel

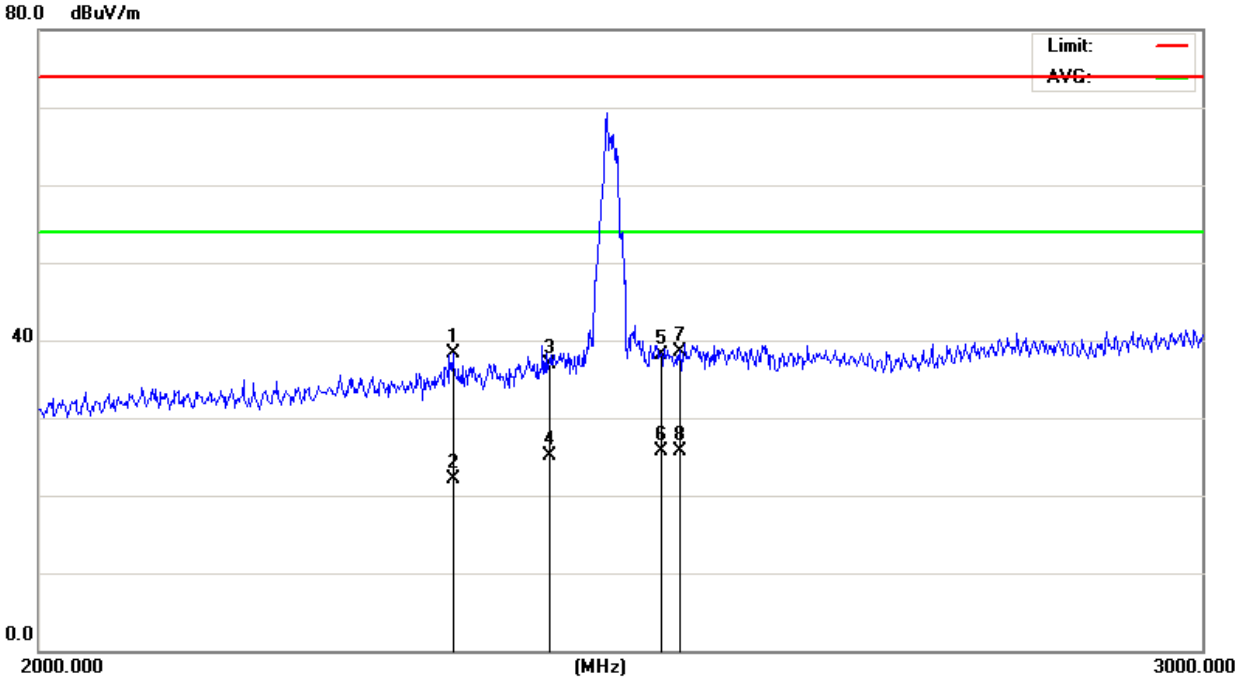
Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	42.02	-6.42	35.60	74.00	-38.40	peak
2		2310.000	27.85	-6.42	21.43	54.00	-32.57	AVG
3		2390.000	41.79	-5.79	36.00	74.00	-38.00	peak
4	*	2390.000	31.65	-5.79	25.86	54.00	-28.14	AVG
5		2483.500	41.68	-4.98	36.70	74.00	-37.30	peak
6		2483.500	28.96	-4.98	23.98	54.00	-30.02	AVG
7		2500.000	42.03	-4.83	37.20	74.00	-36.80	peak
8		2500.000	28.51	-4.83	23.68	54.00	-30.32	AVG

2. Middle Channel

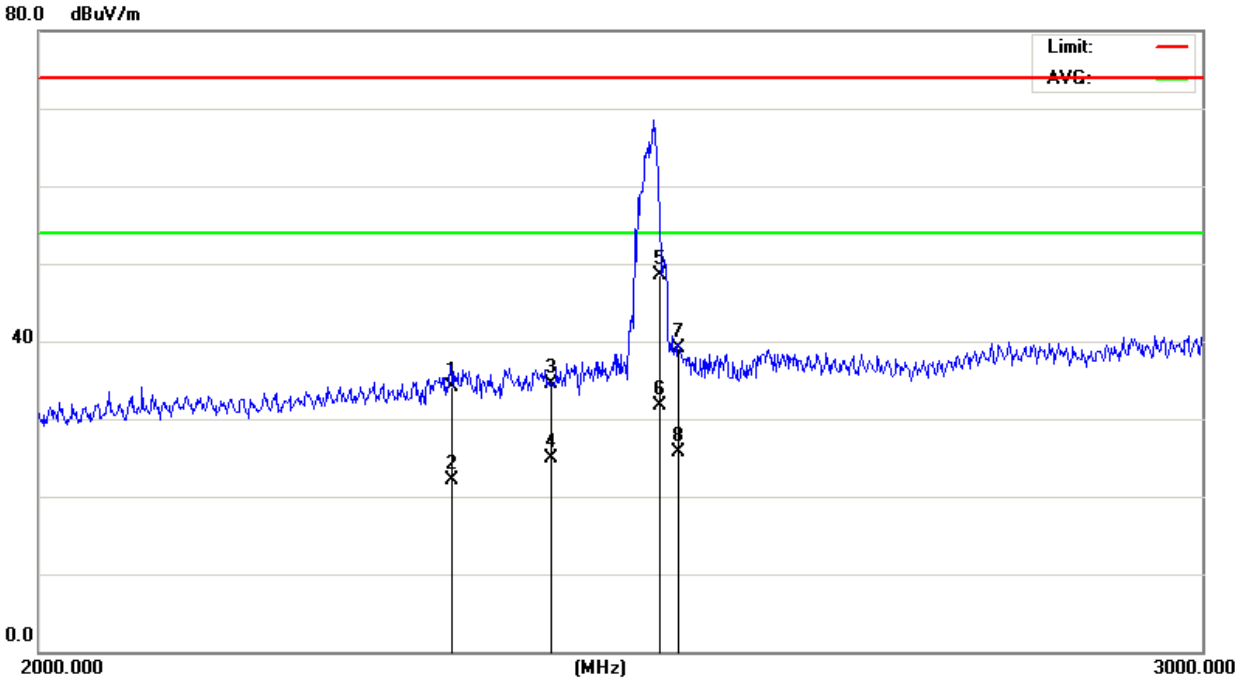
Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	44.72	-6.42	38.30	74.00	-35.70	peak
2		2310.000	28.61	-6.42	22.19	54.00	-31.81	AVG
3		2390.000	42.69	-5.79	36.90	74.00	-37.10	peak
4		2390.000	30.88	-5.79	25.09	54.00	-28.91	AVG
5		2483.500	43.18	-4.98	38.20	74.00	-35.80	peak
6	*	2483.500	30.64	-4.98	25.66	54.00	-28.34	AVG
7		2500.000	43.43	-4.83	38.60	74.00	-35.40	peak
8		2500.000	30.49	-4.83	25.66	54.00	-28.34	AVG

3. High Channel

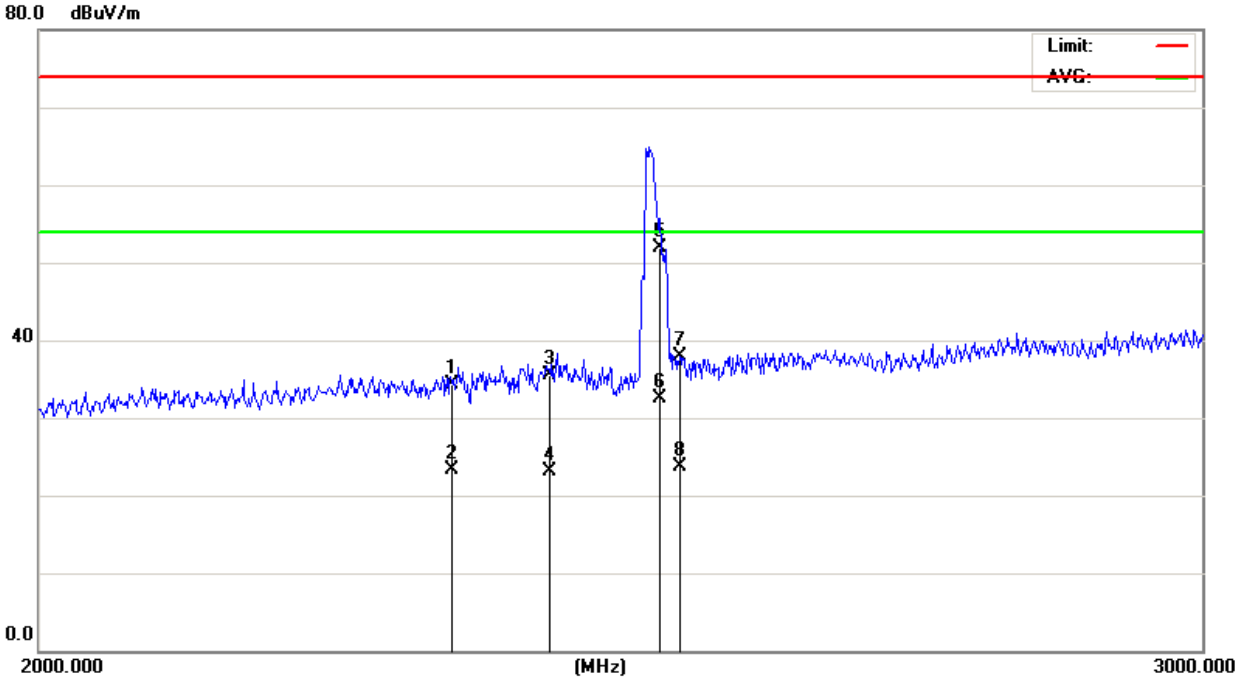
Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	40.52	-6.42	34.10	74.00	-39.90	peak
2		2310.000	28.52	-6.42	22.10	54.00	-31.90	AVG
3		2390.000	40.39	-5.79	34.60	74.00	-39.40	peak
4		2390.000	30.75	-5.79	24.96	54.00	-29.04	AVG
5		2483.500	53.48	-4.98	48.50	74.00	-25.50	peak
6	*	2483.500	36.74	-4.98	31.76	54.00	-22.24	AVG
7		2500.000	43.93	-4.83	39.10	74.00	-34.90	peak
8		2500.000	30.50	-4.83	25.67	54.00	-28.33	AVG

3. High Channel

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2310.000	40.82	-6.42	34.40	74.00	-39.60	peak
2		2310.000	29.73	-6.42	23.31	54.00	-30.69	AVG
3		2390.000	41.29	-5.79	35.50	74.00	-38.50	peak
4		2390.000	28.81	-5.79	23.02	54.00	-30.98	AVG
5		2483.500	56.98	-4.98	52.00	74.00	-22.00	peak
6	*	2483.500	37.51	-4.98	32.53	54.00	-21.47	AVG
7		2500.000	42.83	-4.83	38.00	74.00	-36.00	peak
8		2500.000	28.59	-4.83	23.76	54.00	-30.24	AVG

Remark: No any other emission which falls in restricted bands can be detected and be reported.

Test result: The unit does meet the FCC requirements.

5.4 BANDWIDTH TEST

5.4.1 Applied procedures / Limit

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

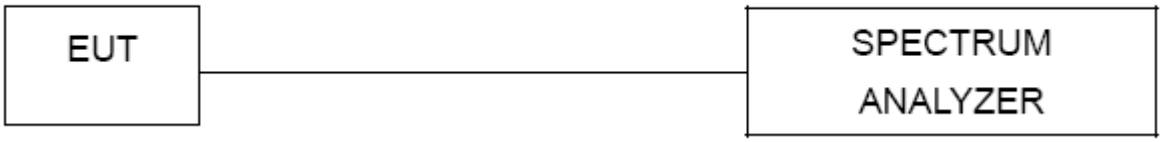
5.4.2 Test procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW= 100KHz, VBW≧RBW, Sweep time = Auto.

5.4.3 Deviation from standard

No deviation.

5.4.4 Test setup



5.4.5 Test results

EUT：	bluetooth Speaker	Model Name ：	BT3500
Temperature：	26 ℃	Relative Humidity：	53%
Pressure：	1010 hPa	Test Power ：	DC 3.7V from battery
Test Mode ：	TX 1Mbps-DH1/3Mbps-DH1		

Test result:

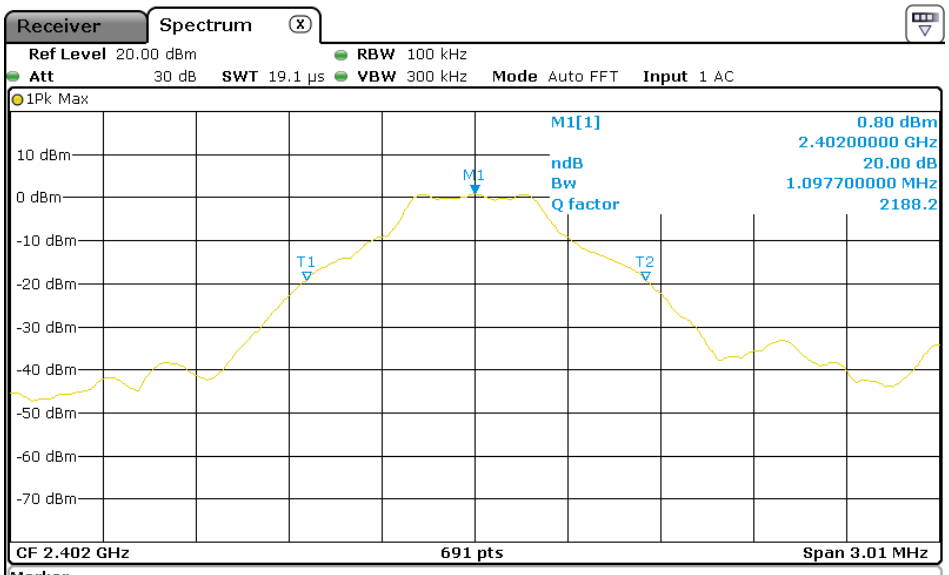
Normal mode:

Test Channel	Bandwidth(MHz)	2/3 bandwidth(MHz)
Lowest	1.0977	0.7318
Middle	1.0977	0.7318
Highest	1.0977	0.7318

EDR mode:

Test Channel	bandwidth	2/3 bandwidth
Lowest	1.3373	0.8915
Middle	1.3373	0.8915
Highest	1.3373	0.8915

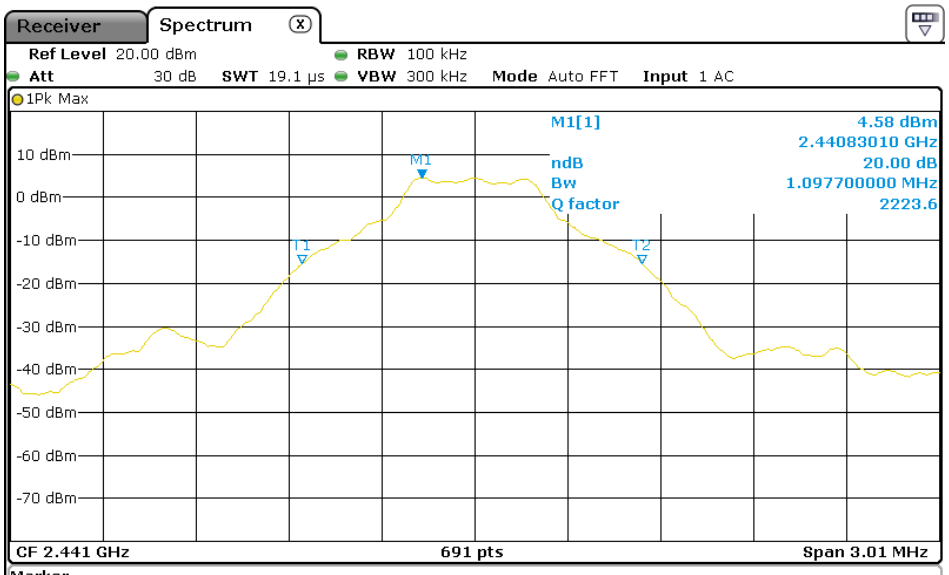
CH00-1Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402 GHz	0.80 dBm	ndB down	1.0977 MHz
T1		1	2.4014555 GHz	-19.17 dBm	ndB	20.00 dB
T2		1	2.4025532 GHz	-19.19 dBm	Q factor	2188.2

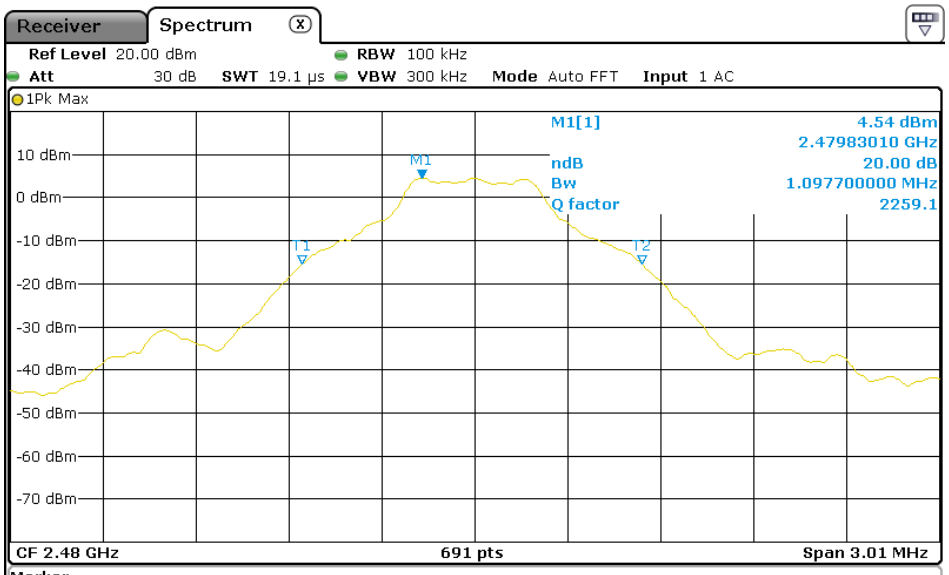
CH 39-1Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4408301 GHz	4.58 dBm	ndB down	1.0977 MHz
T1		1	2.4404424 GHz	-15.34 dBm	ndB	20.00 dB
T2		1	2.4415401 GHz	-15.33 dBm	Q factor	2223.6

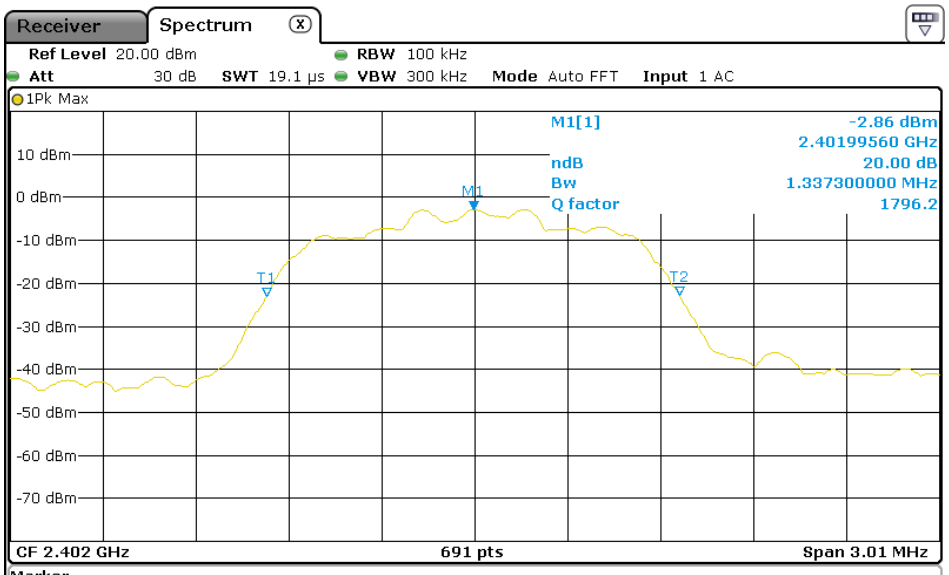
CH 78-1Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4798301 GHz	4.54 dBm	ndB down	1.0977 MHz
T1		1	2.4794424 GHz	-15.45 dBm	ndB	20.00 dB
T2		1	2.4805401 GHz	-15.38 dBm	Q factor	2259.1

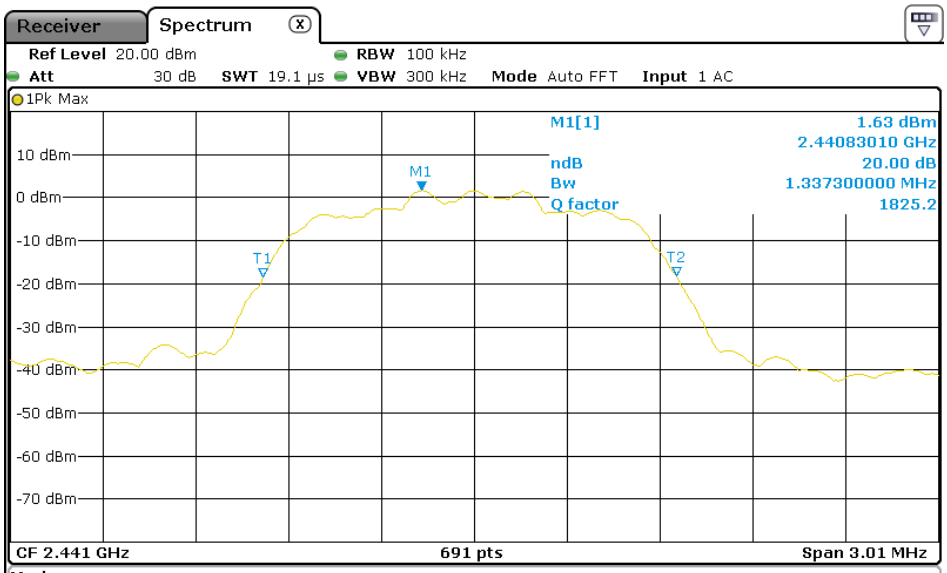
CH 00-3Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4019956 GHz	-2.86 dBm	ndB down	1.3373 MHz
T1		1	2.4013248 GHz	-23.04 dBm	ndB	20.00 dB
T2		1	2.4026621 GHz	-22.69 dBm	Q factor	1796.2

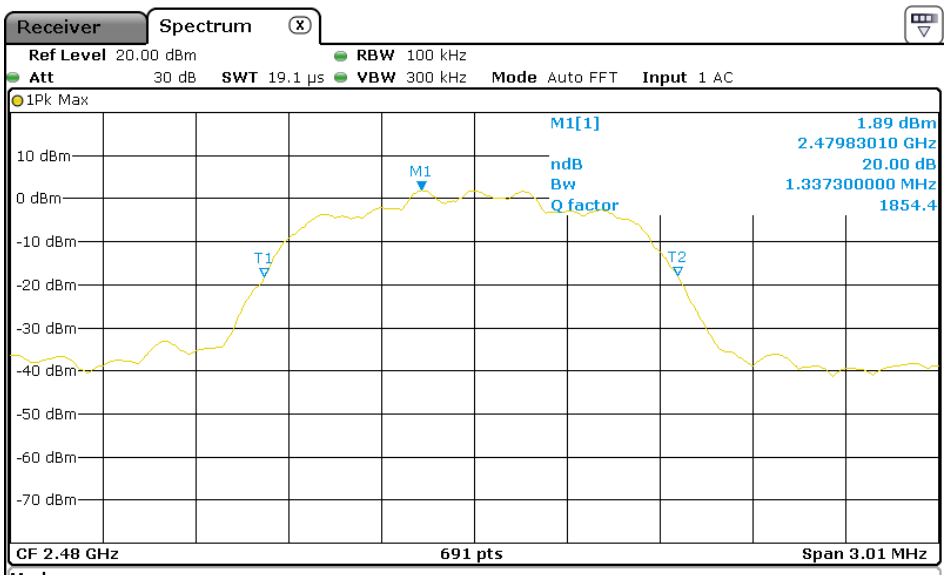
CH 39-3Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4408301 GHz	1.63 dBm	ndB down	1.3373 MHz
T1		1	2.4403161 GHz	-18.29 dBm	ndB	20.00 dB
T2		1	2.4416534 GHz	-18.14 dBm	Q factor	1825.2

CH 78-3Mbps



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4798301 GHz	1.89 dBm	ndB down	1.3373 MHz
T1		1	2.4793205 GHz	-18.09 dBm	ndB	20.00 dB
T2		1	2.4806578 GHz	-17.91 dBm	Q factor	1854.4

5.5 Carrier Frequencies Separated

5.5.1 Applied procedures / Limit

15.247(a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.5.2 Test procedure

(1) Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as RBW=100kHz, VBW≧RBW, Sweep time=Auto, Detector Function=Peak.
(2) The EUT should be transmitting at its maximum data rate. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.
(3) The above procedure shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range with modulated mode. also shall be performed at different modes of operation.

5.5.3 Deviation from standard

No deviation.

5.5.4 Test results

EUT：	bluetooth Speaker	Model Name ：	BT3500
Temperature：	22 ℃	Relative Humidity：	53%
Pressure：	1010 hPa	Test Power ：	DC 3.7V from battery
Test Mode ：	TX 3Mbps-DH1(the worst case)		

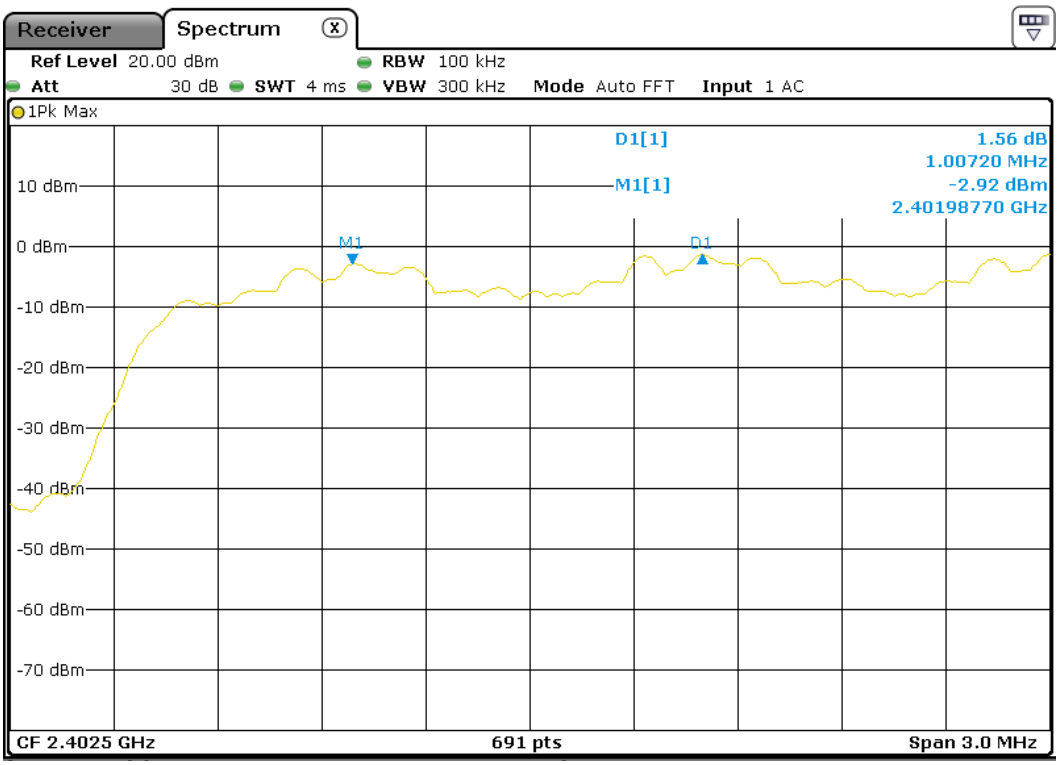
Test result:

Test Channel	Carrier Frequencies Separated	Pass/Fail
Lower Channels (channel 0 and channel 1)	1.0072MHz	Pass
Middle Channels (channel 39 and channel 40)	1.0072MHz	Pass
Upper Channels (channel 77 and channel 78)	1.0029MHz	Pass

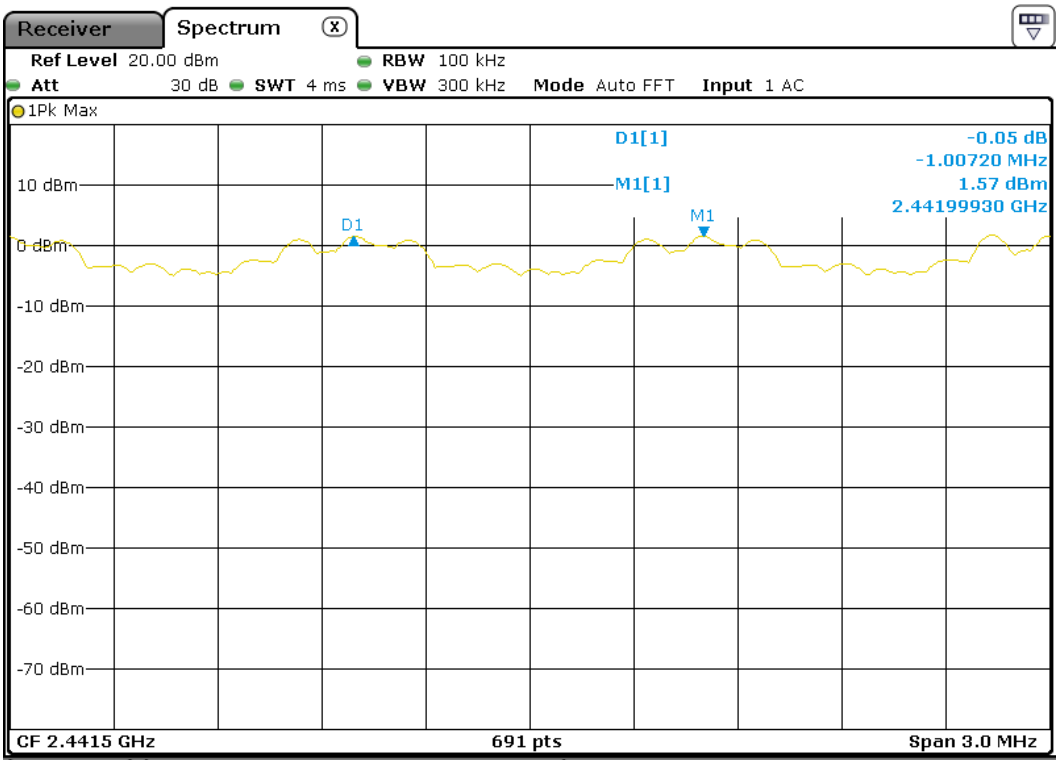
Remark:

The limit is maximum two-thirds of the 20 dB bandwidth: 891.5KHz.

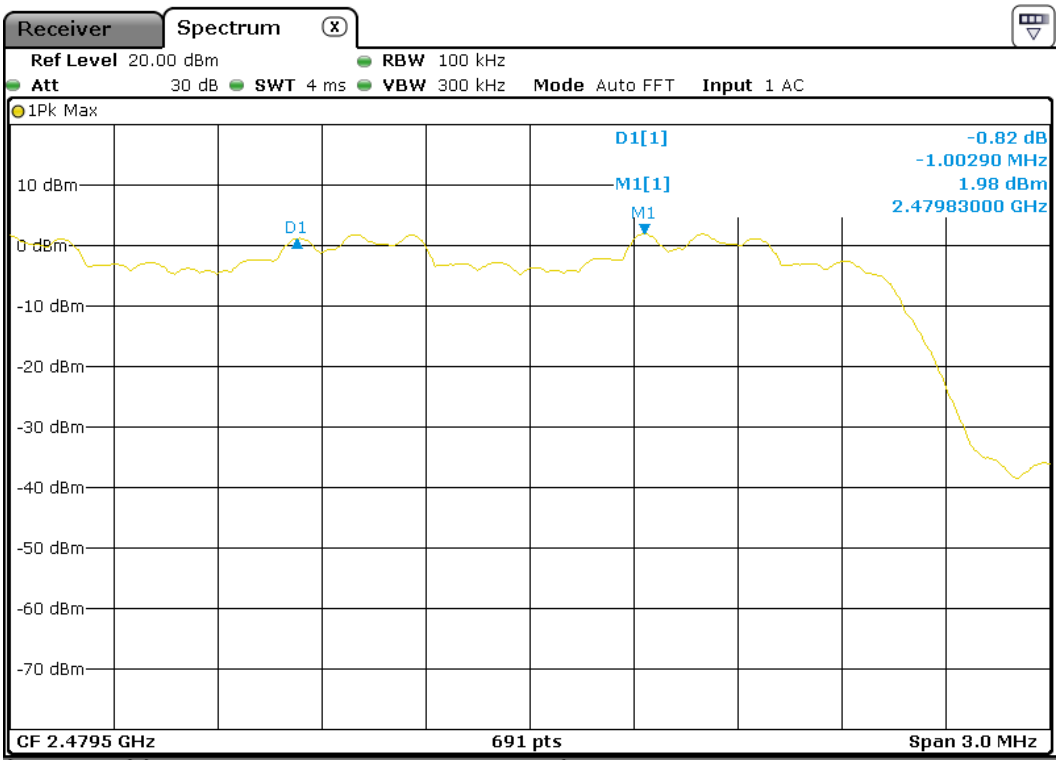
CH 00-1Mbps



CH 39-1Mbps



CH 78-1Mbps



Test result: The unit does meet the FCC requirements.

5.6 Hopping Channel Number

5.6.1 Applied procedures / Limit

15.247(a) (1) (iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6.2 Test procedure

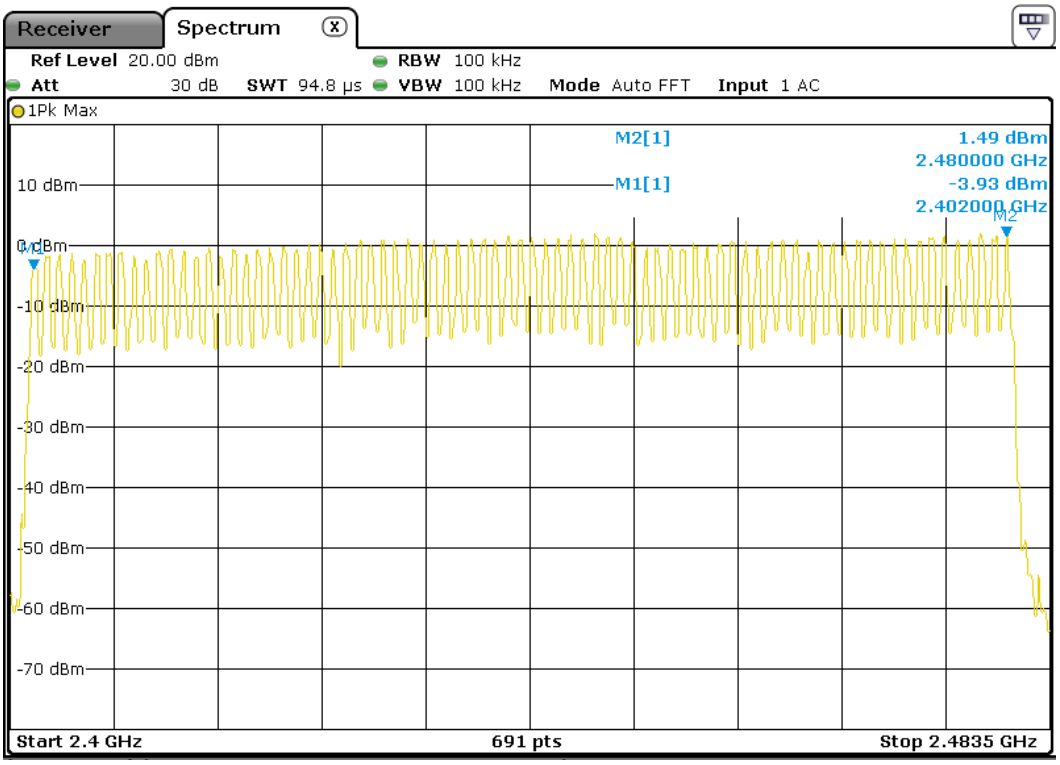
(1) Connected the antenna port to the Spectrum Analyzer , set the Spectrum Analyzer as RBW=100kHz,VBW≧RBW, Sweep time=Auto, Detector Function=Peak Trace=Maxhold.

(2) The EUT should be have its hopping function enabled. Maxhold and record hopping channels It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies.

5.6.3 Test result

Hopping Channel Number result		
Operating Mode: 1Mbps/3Mbps Mode	Test date:2015-11-25	
Result	Limit	Conclusion
79	15	Pass

EUT：	bluetooth Speaker	Model Name ：	BT3500
Temperature：	22 ℃	Relative Humidity：	53%
Pressure：	1010 hPa	Test Power ：	DC 3.7V from battery
Test Mode ：	TX 1Mbps-DH1		



Test result: The unit does meet the FCC requirements.

5.7 Dwell time

5.7.1 Applied procedures / Limit

15.247(a) (1) (iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.7.2 Test procedure

(1) Place the EUT on the table in the chamber or connect the antenna port of the EUT to spectrum analyzer and set it in transmitting mode.
(2) Set RBW of spectrum analyzer to 1MHz, VBW ≥ RBW
(3) Use a video trigger with the trigger level set to enable triggering only on full pulses.
(4) Sweep Time is more than once pulse time.
(5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.
(6) Measure the maximum time duration of one single pulse.
(7) Set the EUT for DH5, DH3 and DH1 packet transmitting.
(8) Measure the maximum time duration of one single pulse.
(9) A Period Time = 79*0.4=31.6 S
DH1 Time Slot: Reading * (1600/2)*31.6/79
DH3 Time Slot: Reading * (1600/4)*31.6/79
DH5 Time Slot: Reading * (1600/6)*31.6/79

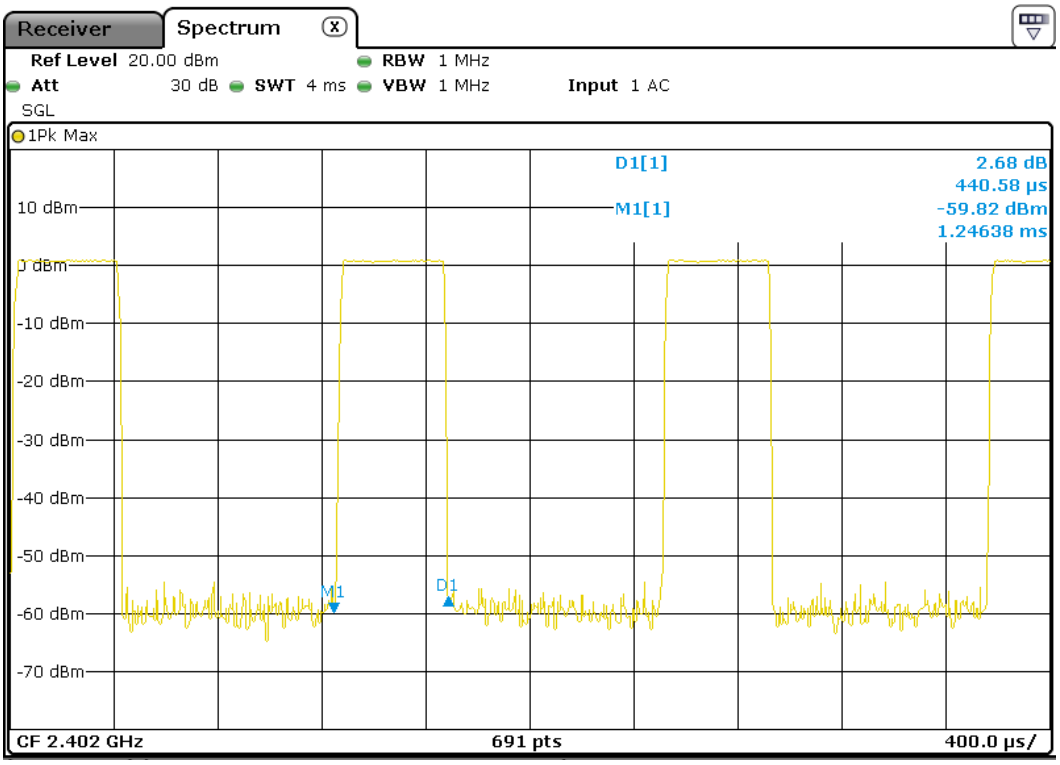
5.7.3 Test result

EUT:	bluetooth Speaker	Model Name :	BT3500
Temperature:	22 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power :	DC 3.7V from battery
Test Mode :	CH00-DH1/DH3/DH5 (1Mbps & 3Mbps Modes)		

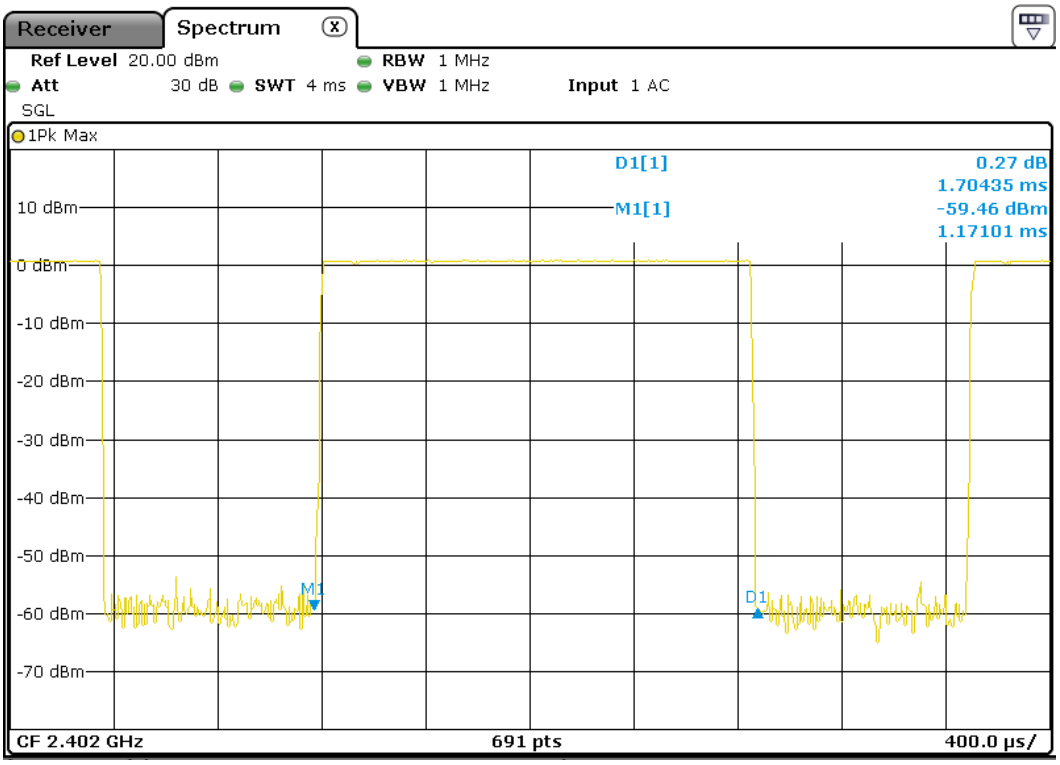
1Mbps				
Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (ms)	Limits (s)
DH1	2402 MHz	0.440	140.800	0.4000
DH3	2402 MHz	1.704	272.640	0.4000
DH5	2402 MHz	2.962	315.946	0.4000
3Mbps				
Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (ms)	Limits (s)
DH1	2402 MHz	0.463	148.160	0.4000
DH3	2402 MHz	1.710	273.600	0.4000
DH5	2402 MHz	2.962	315.946	0.4000

Result plot as follows:

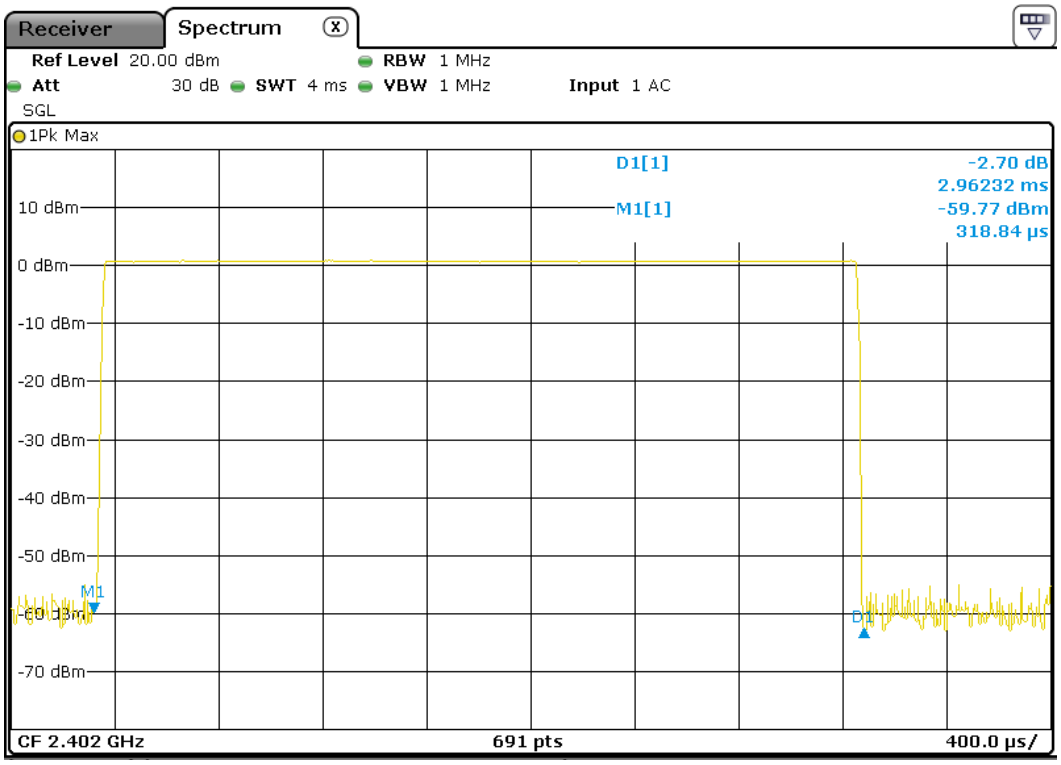
CH 00-DH1



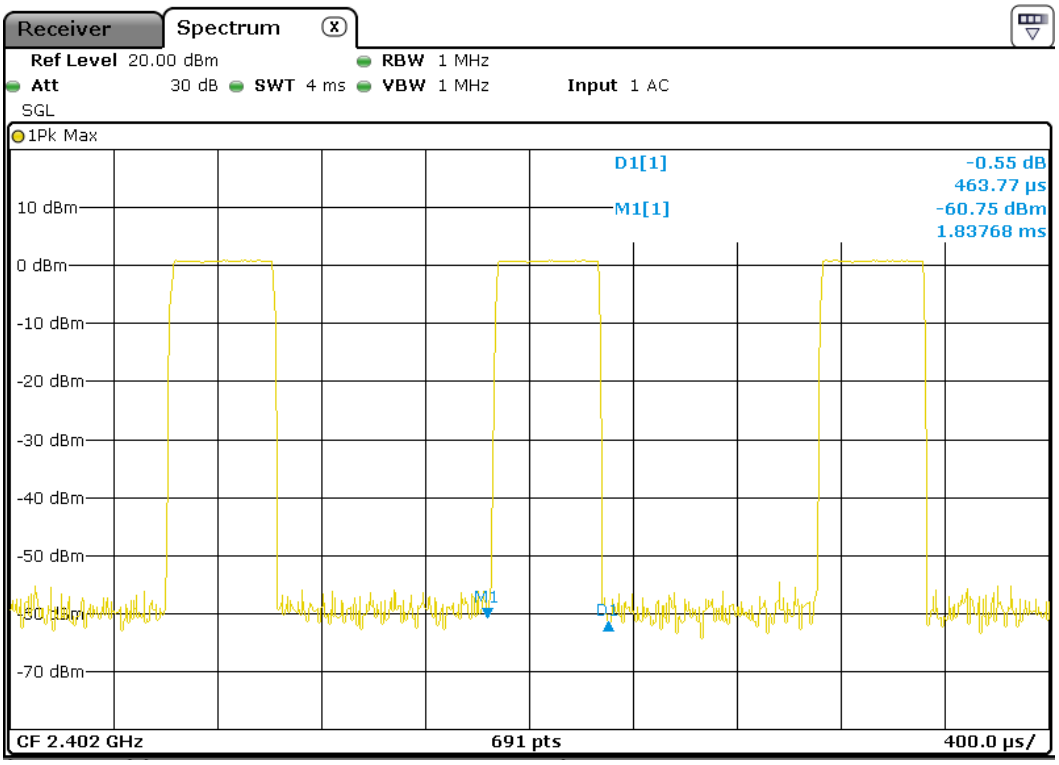
CH 00-DH3



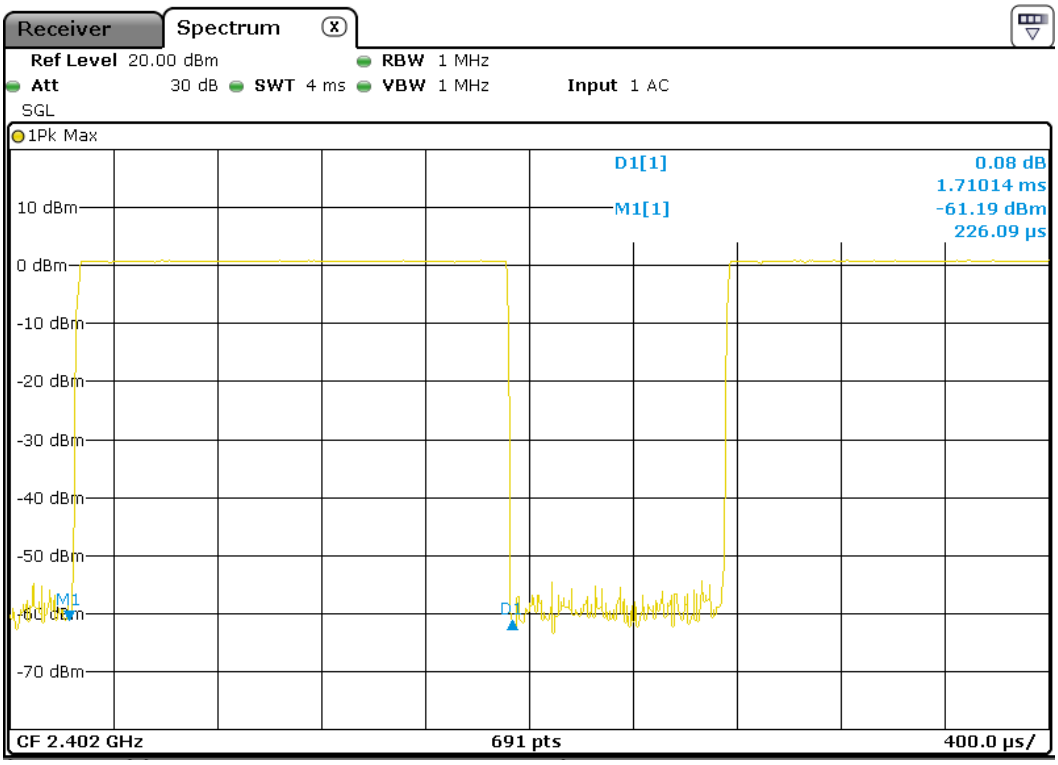
CH 00-DH5



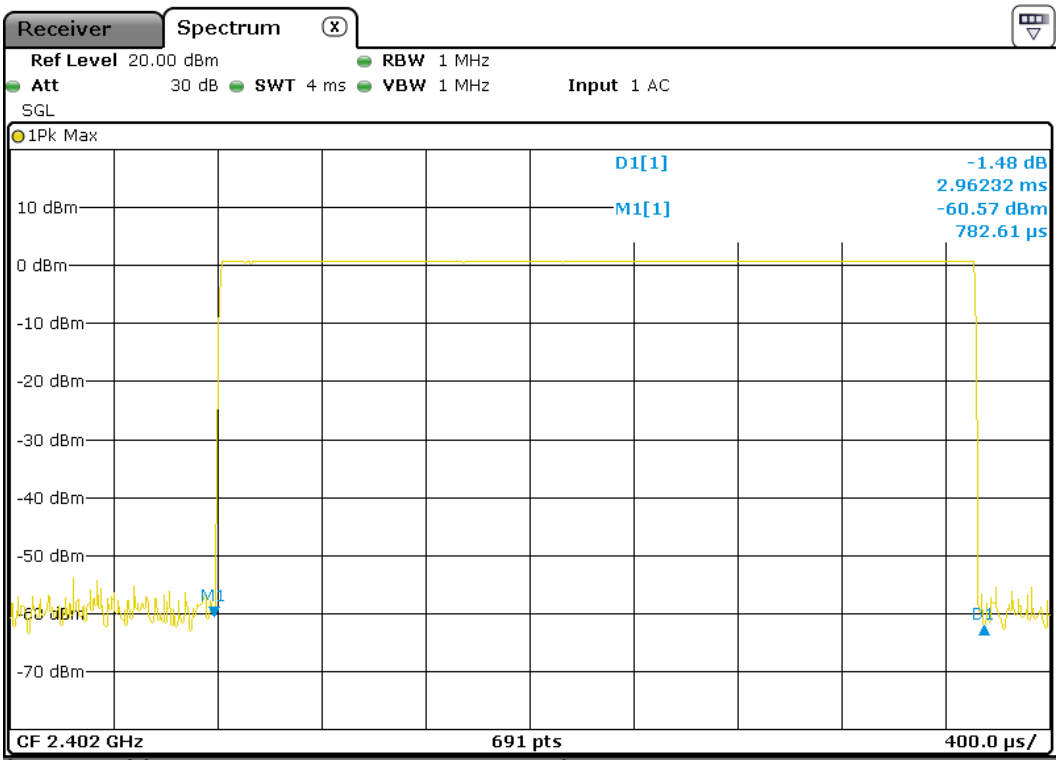
CH 00-3DH1



CH 00-3DH3



CH 00-3DH5



5.8 Maximum Peak Output Power

5.8.1 Applied procedures / Limit

15.247(b) (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.8.2 Test procedure

(1) Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as RBW=3MHz,VBW≧RBW, Sweep time=Auto, Detector Function=Peak.

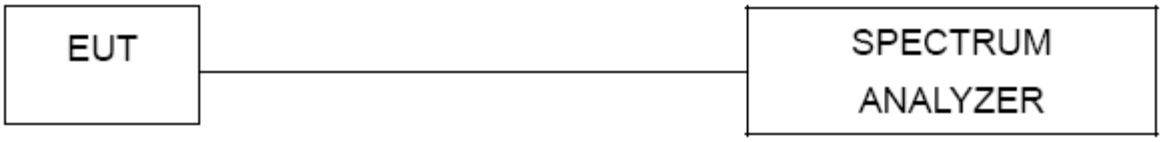
(2) The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

(3) The above procedure shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range with modulated mode. also shall be performed at different modes of operation.

5.8.3 Deviation from standard

No deviation.

5.8.4 Test setup



5.8.5 Test results

EUT:	bluetooth Speaker	Model Name :	BT3500
Temperature:	22 ℃	Relative Humidity:	60%
Pressure:	1010 hPa	Test Voltage :	DC 3.7V from battery
Test Mode :	TX(1Mbps-DH1 & 2Mbps-DH1 & 3Mbps-DH1)		

Test Result:

Normal mode:

Test Channel	Fundamental Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Result
Lowest	2402	1.16	30.0	Pass
Middle	2441	2.78	30.0	Pass
Highest	2480	2.93	30.0	Pass

EDR mode-2Mbps:

Test Channel	Fundamental Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Result
Lowest	2402	-0.41	30.0	Pass
Middle	2441	1.00	30.0	Pass
Highest	2480	0.73	30.0	Pass

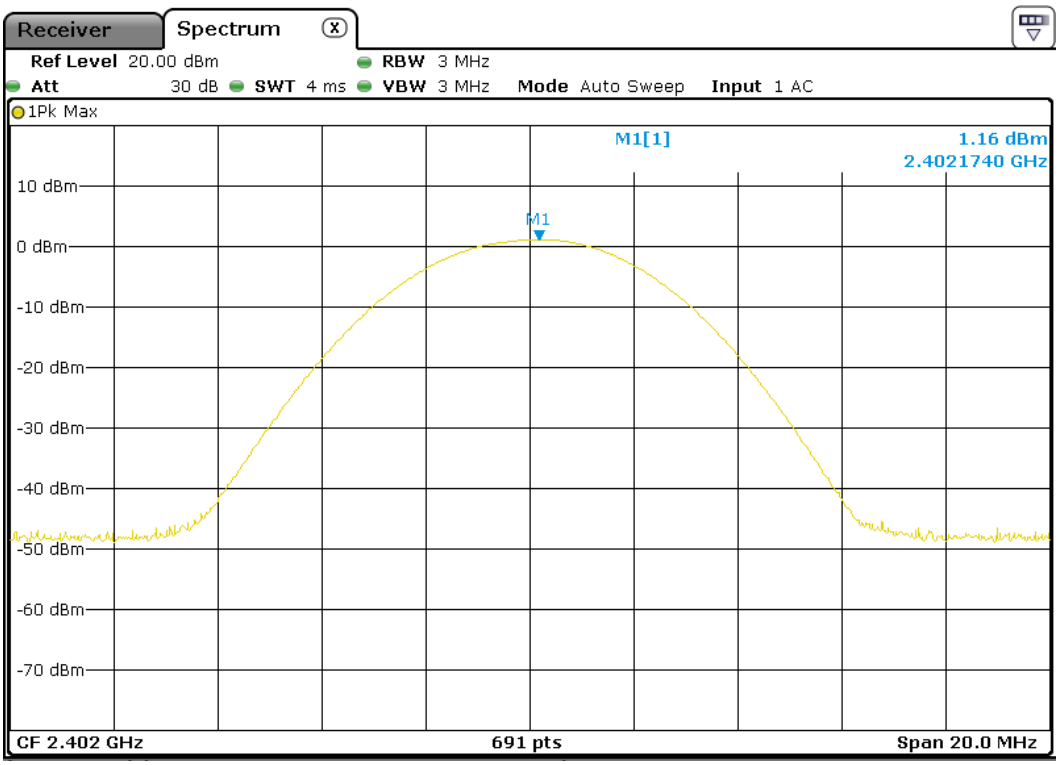
EDR mode-3Mbps:

Test Channel	Fundamental Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Result
Lowest	2402	-0.73	30.0	Pass
Middle	2441	0.21	30.0	Pass
Highest	2480	0.37	30.0	Pass

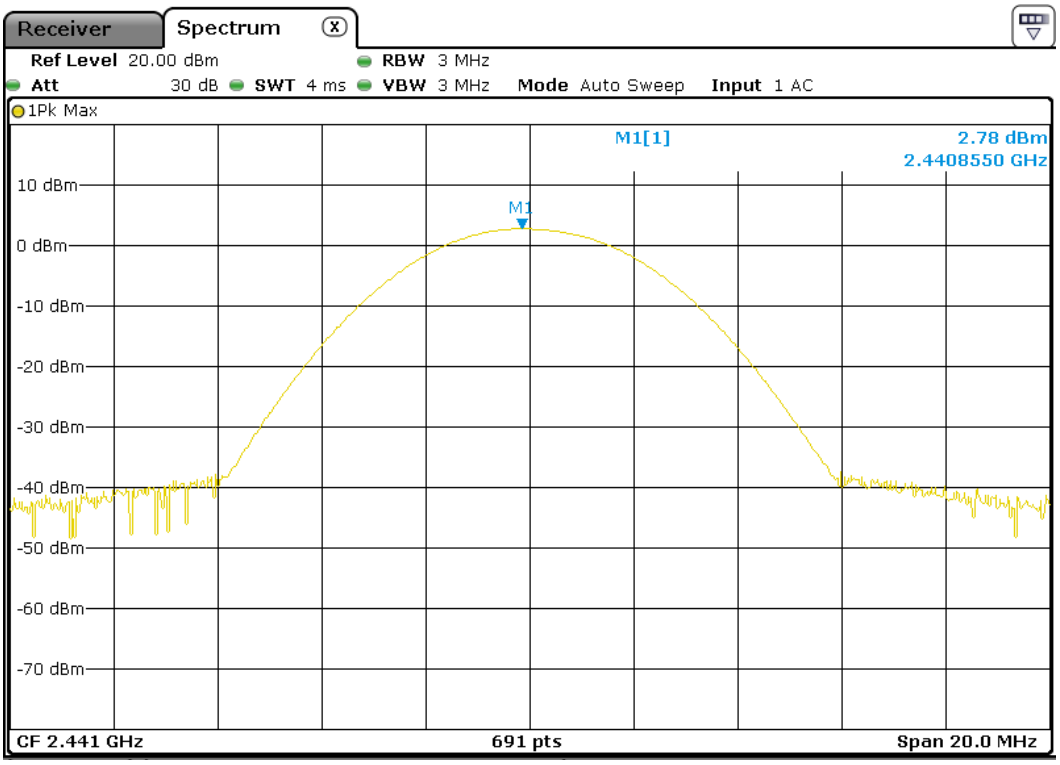
Remark: cable lose=0.5 dB

Test result: The unit does meet the FCC requirements.

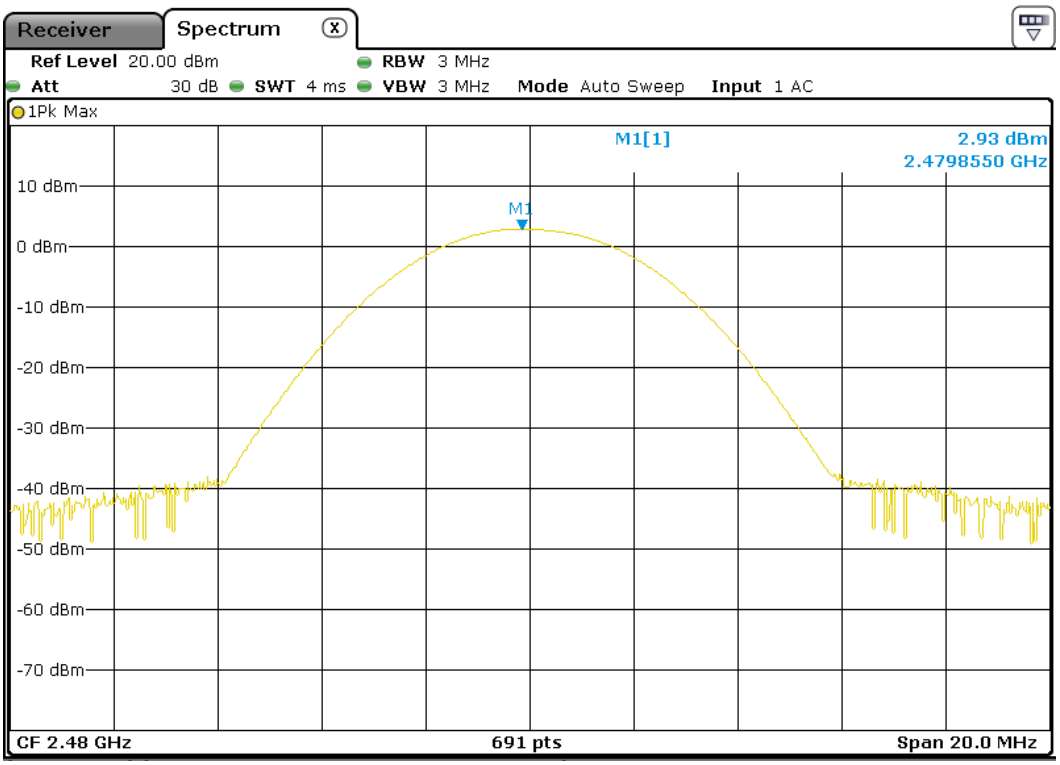
CH 00-1Mbps



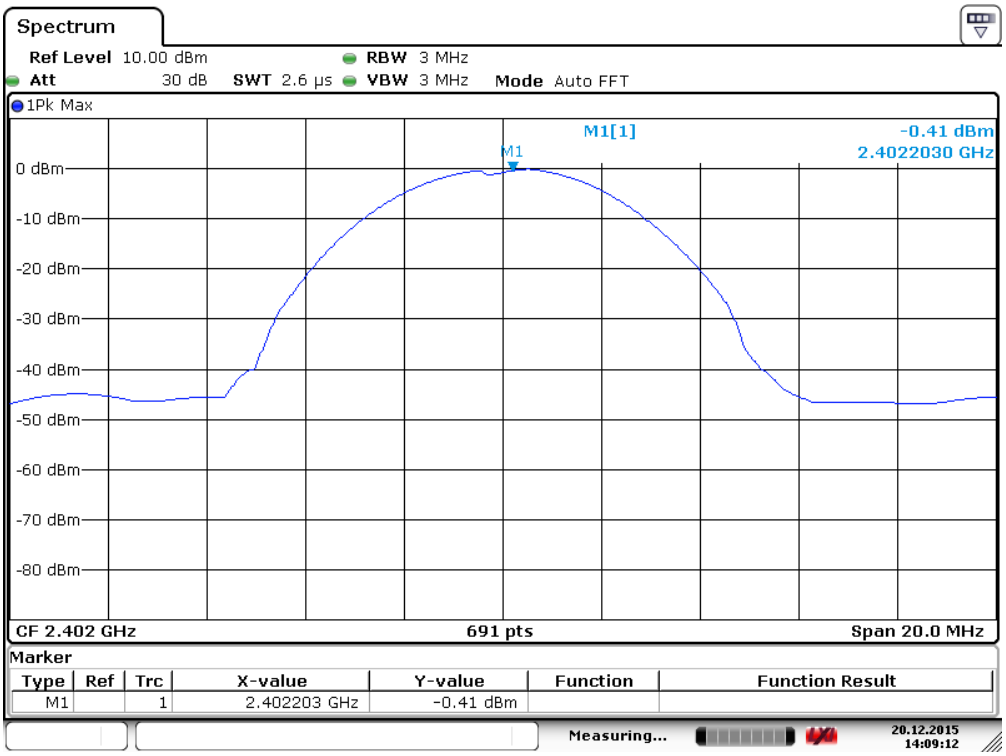
CH 39-1Mbps



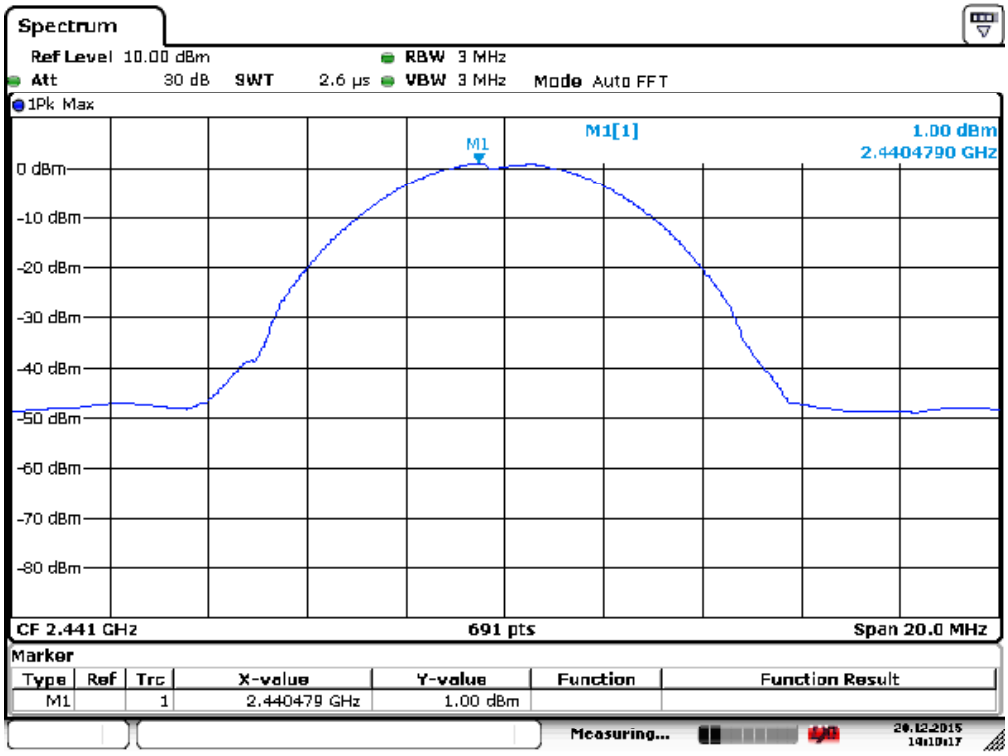
CH 78-1Mbps



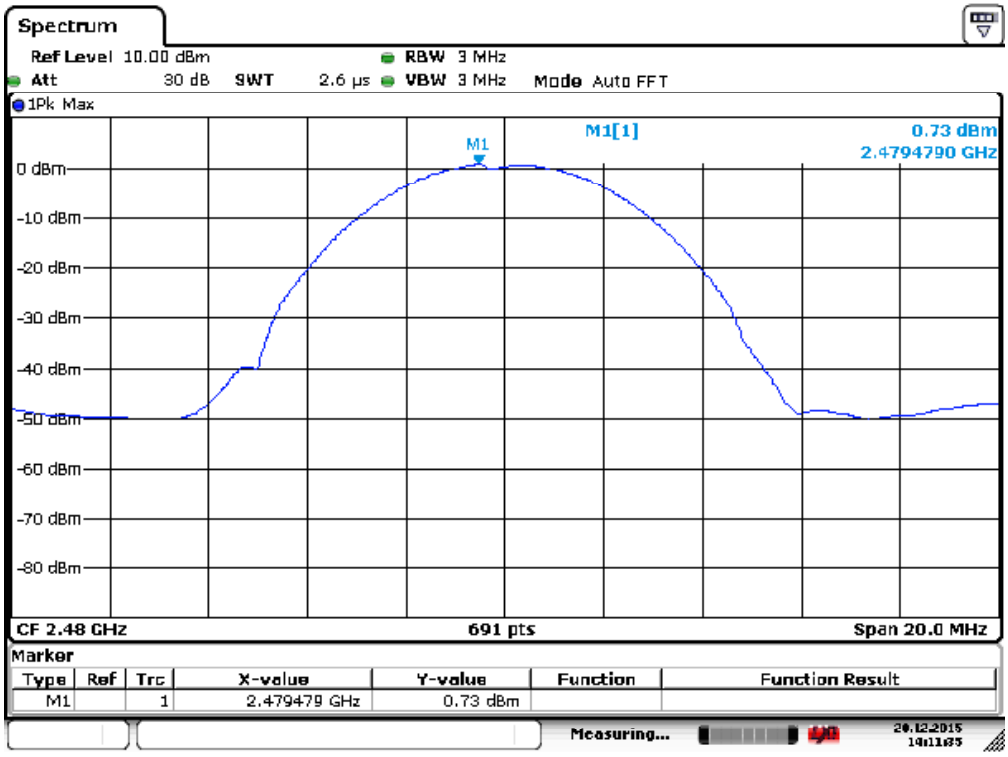
CH 00-2Mbps



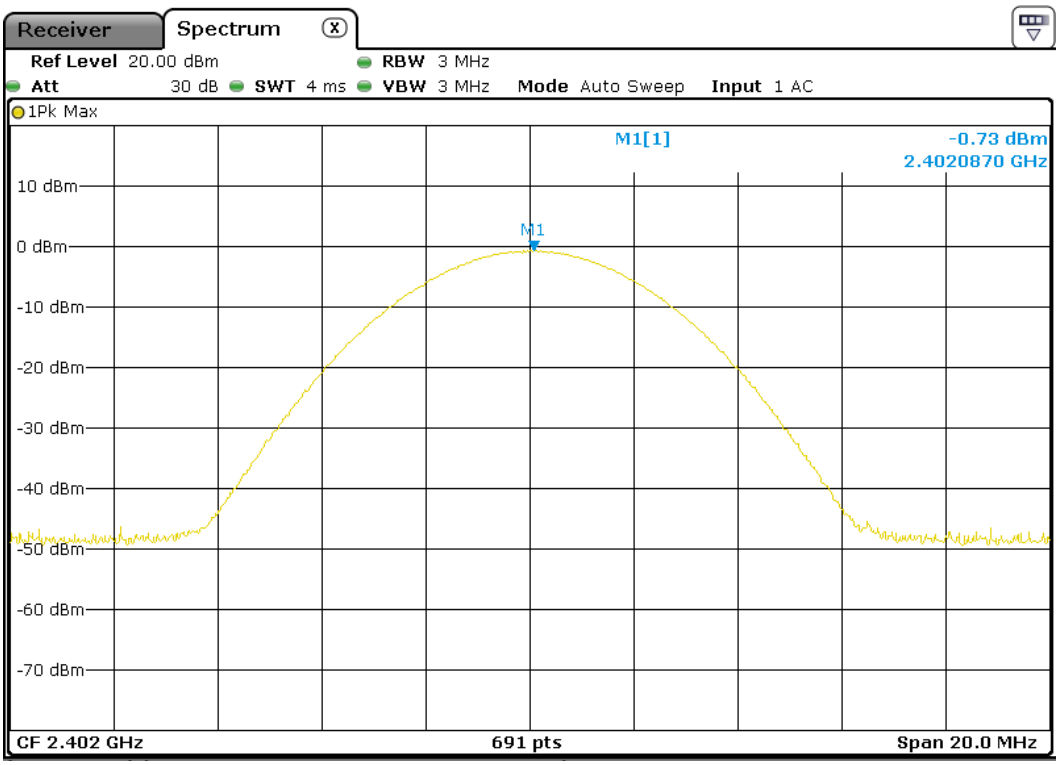
CH 39-2Mbps



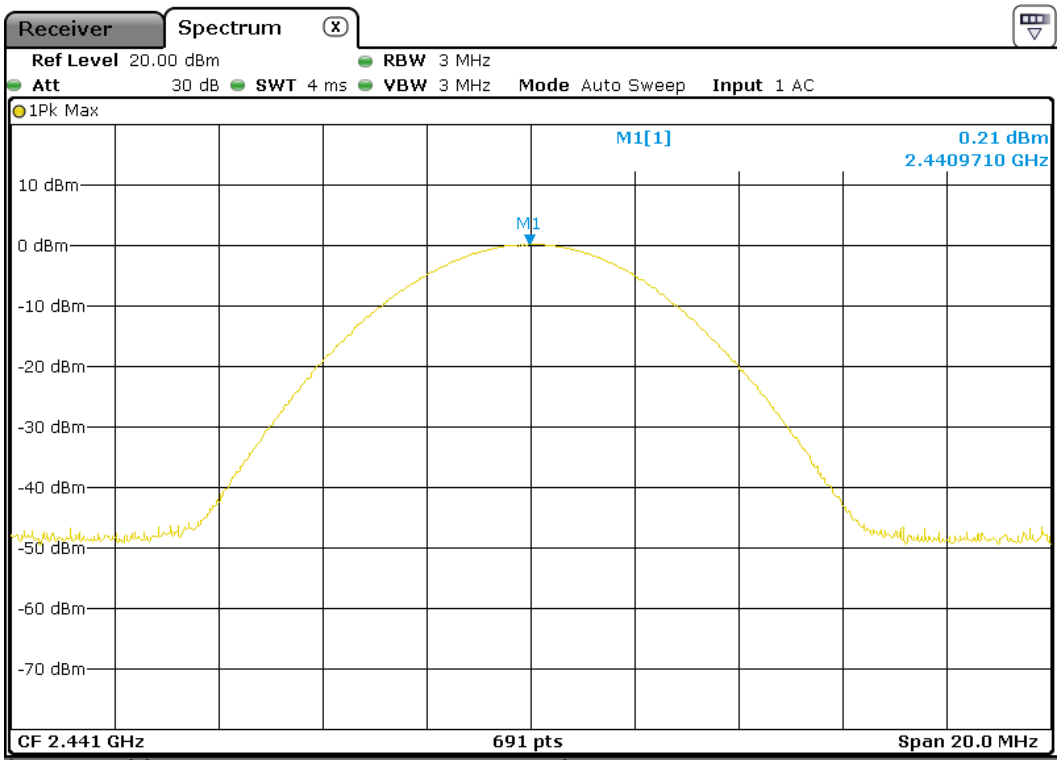
CH 78-2Mbps



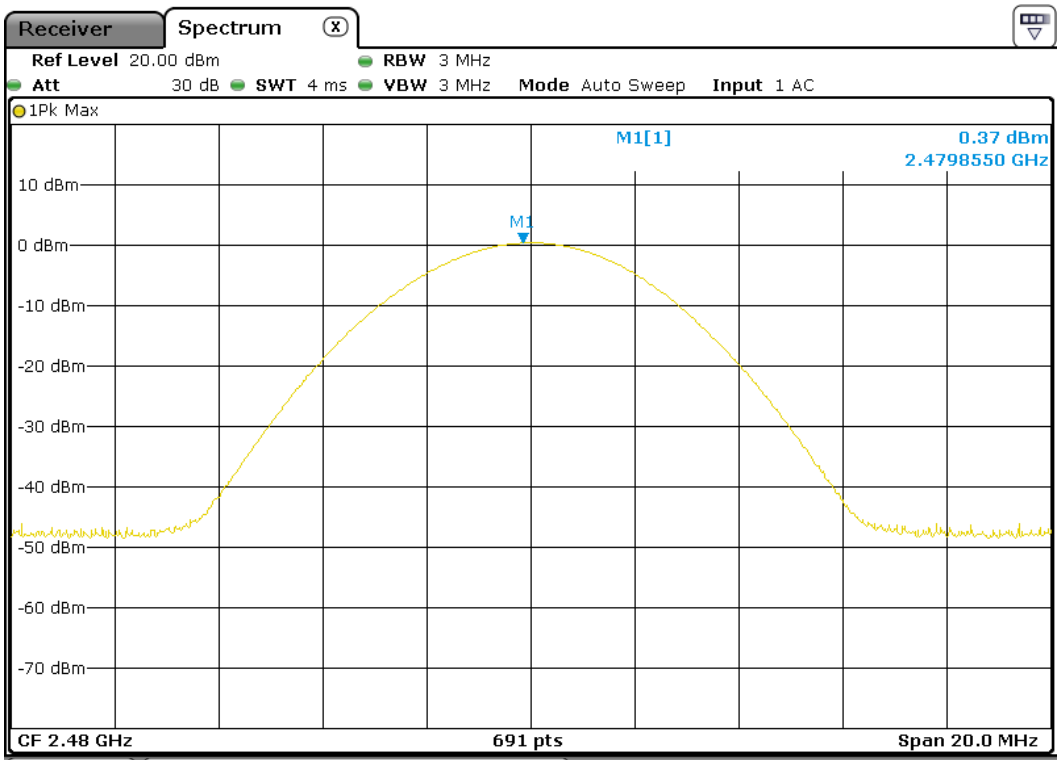
CH 00-3Mbps



CH 39-3Mbps



CH 78-3Mbps


Receiver
Spectrum
Ref Level 20.00 dBm
RBW 3 MHz
Att 30 dB
SWT 4 ms
VBW 3 MHz
Mode Auto Sweep
Input 1 AC
1Pk Max
M1[1]
0.37 dBm
2.4798550 GHz
M1
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
691 pts
Span 20.0 MHz

5.9 Band edge

5.9.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

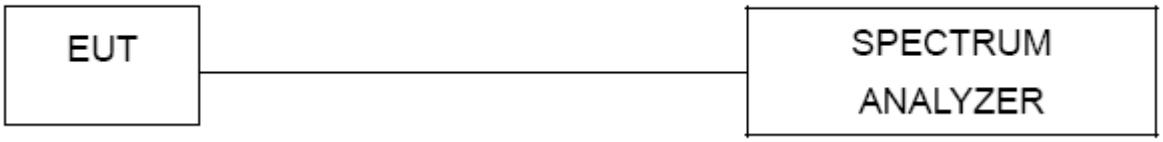
5.9.2 Test procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW=100kHz, VBW≧RBW, Sweep time=Auto, Detector Function=Peak.

5.9.3 Deviation from standard

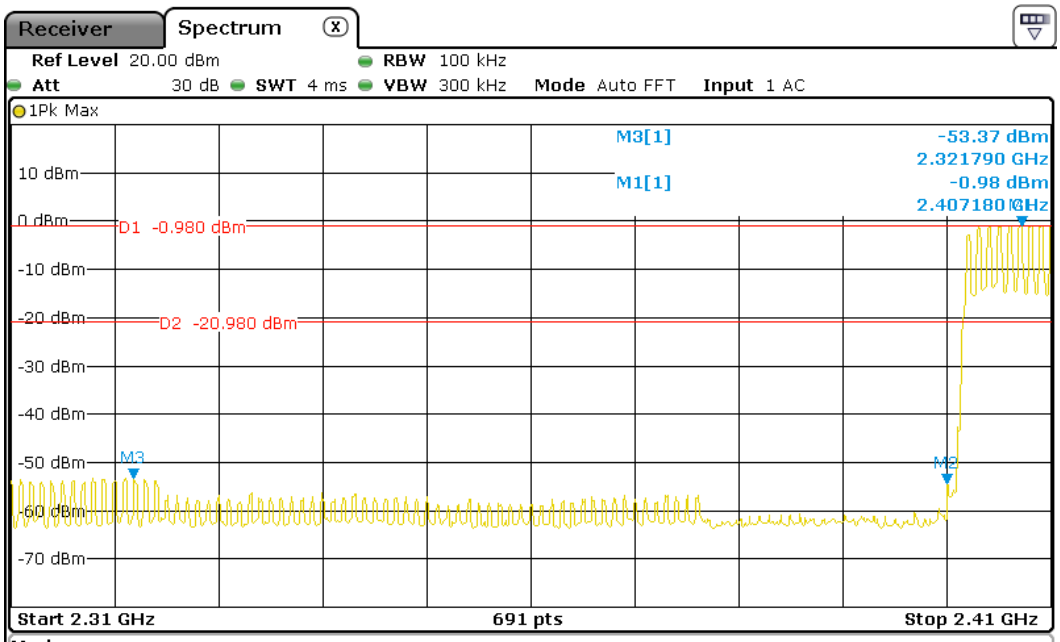
No deviation.

5.9.4 Test setup



5.9.5 Test results

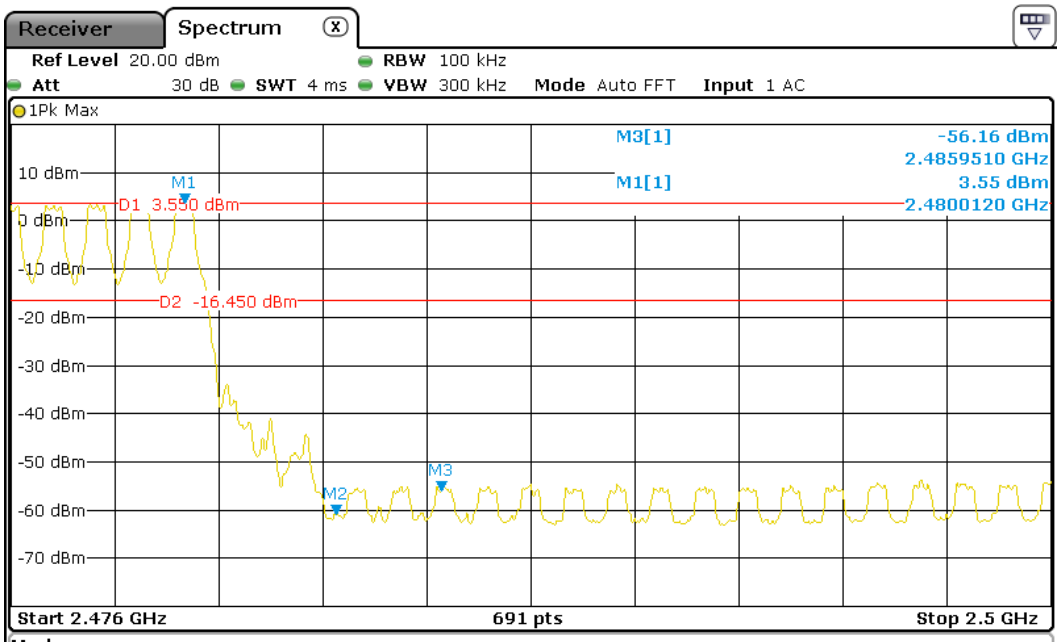
CH00 (Lower) Data rate 1Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40718 GHz	-0.98 dBm		
M2		1	2.4 GHz	-54.48 dBm		
M3		1	2.32179 GHz	-53.37 dBm		

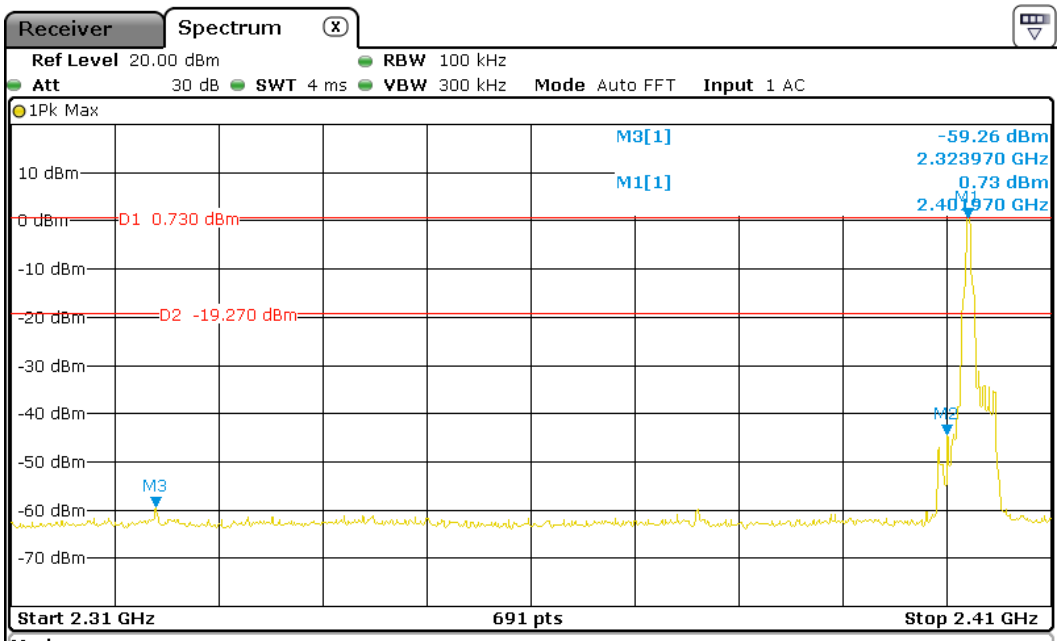
CH 78 (Upper) Data rate 1Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.480012 GHz	3.55 dBm		
M2		1	2.4835 GHz	-60.79 dBm		
M3		1	2.485951 GHz	-56.16 dBm		

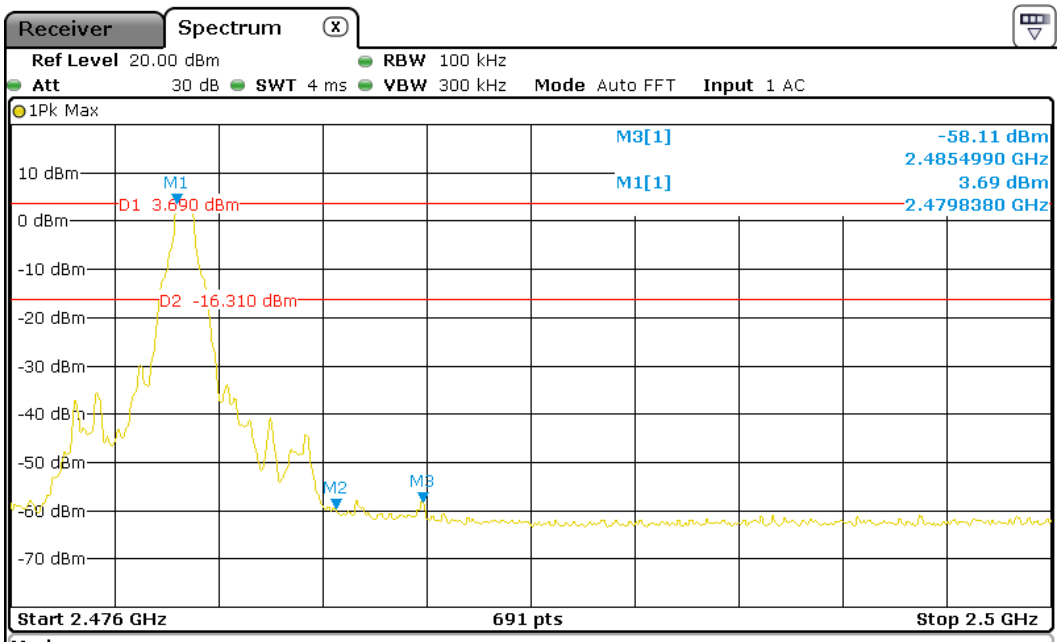
CH00 (Lower) Data rate 1Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40197 GHz	0.73 dBm		
M2		1	2.4 GHz	-44.29 dBm		
M3		1	2.32397 GHz	-59.26 dBm		

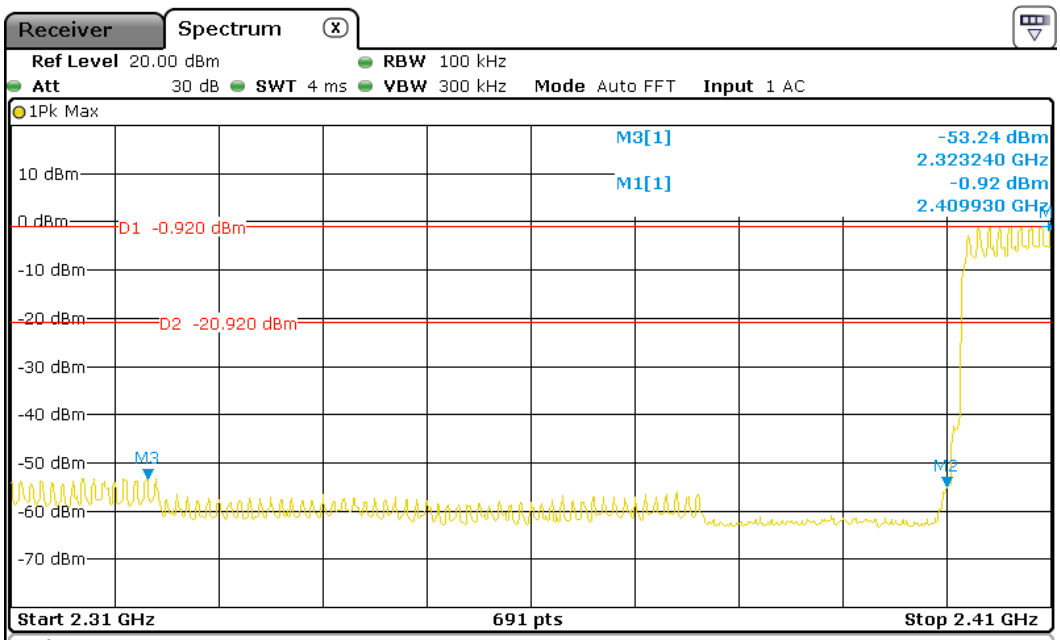
CH 78 (Upper) Data rate 1Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479838 GHz	3.69 dBm		
M2		1	2.4835 GHz	-59.69 dBm		
M3		1	2.485499 GHz	-58.11 dBm		

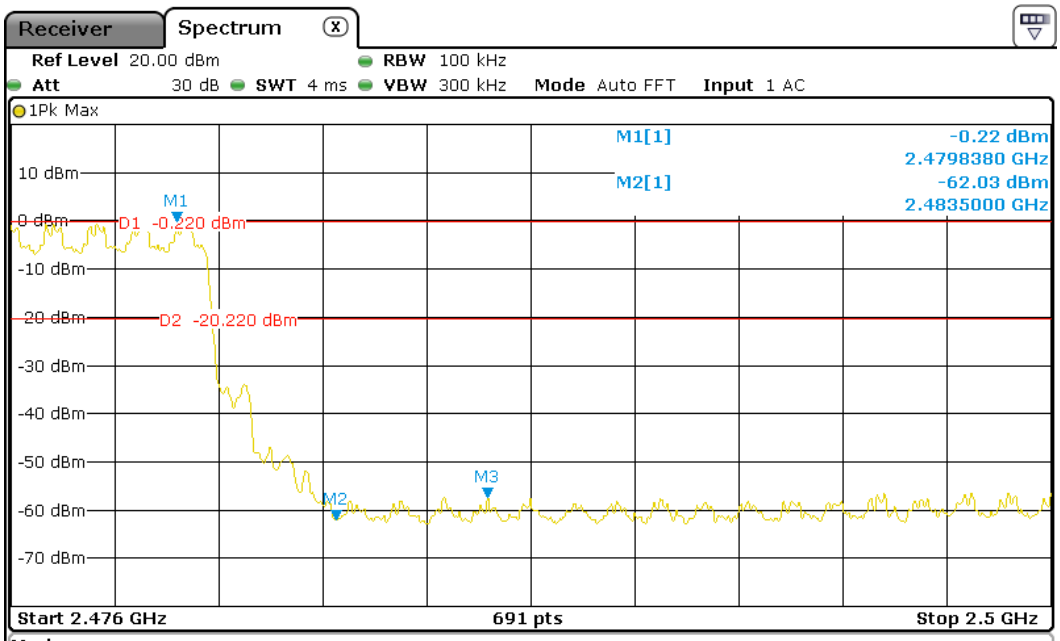
CH00 (Lower) Data rate 3Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40993 GHz	-0.92 dBm		
M2		1	2.4 GHz	-54.98 dBm		
M3		1	2.32324 GHz	-53.24 dBm		

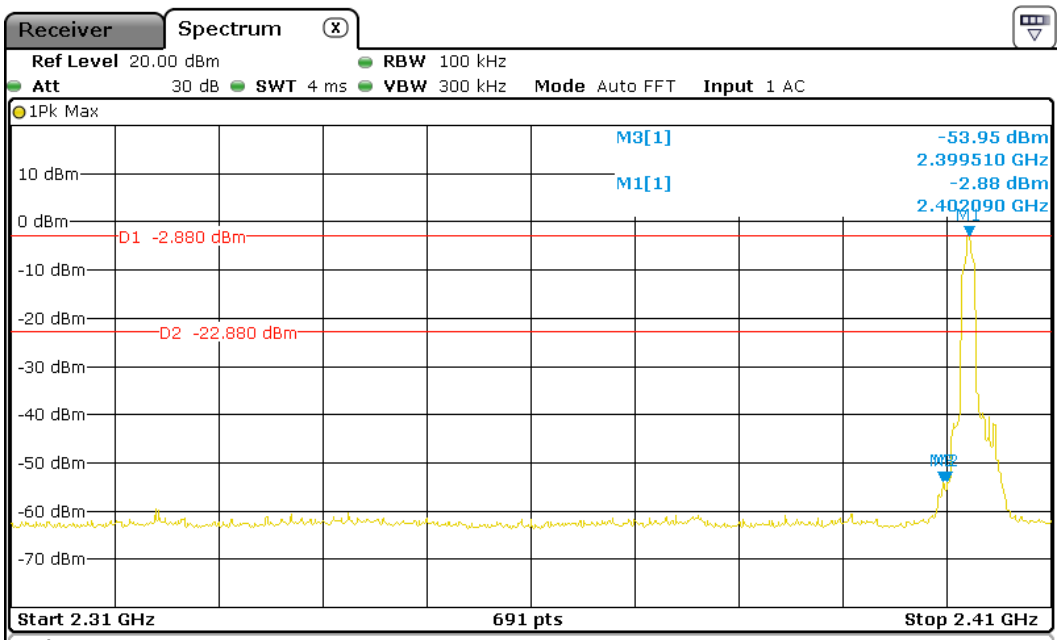
CH 78 (Upper) Data rate 3Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479838 GHz	-0.22 dBm		
M2		1	2.4835 GHz	-62.03 dBm		
M3		1	2.486993 GHz	-57.50 dBm		

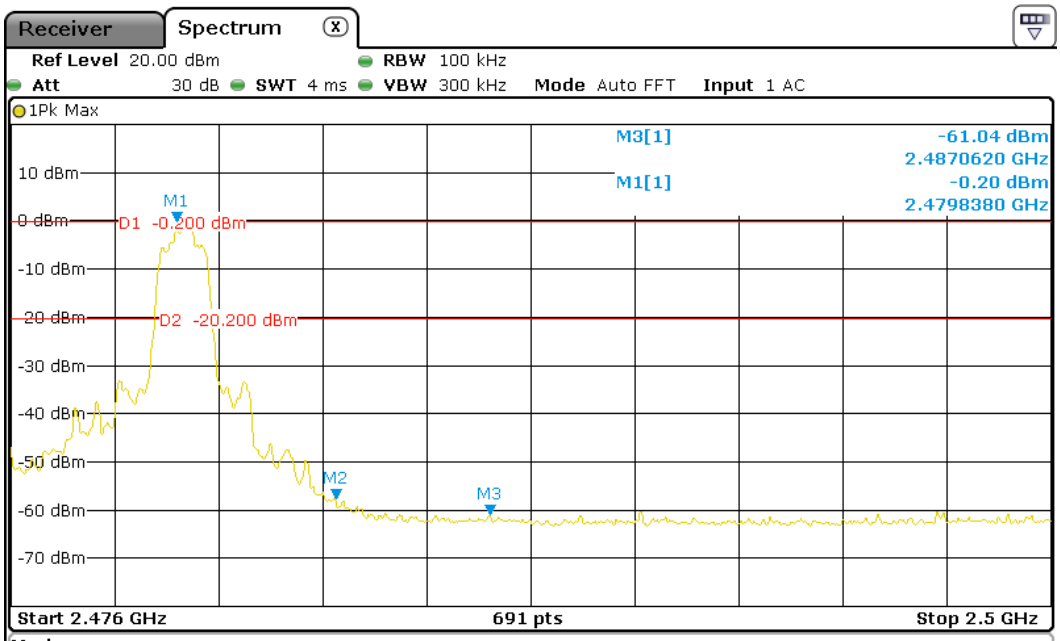
CH00 (Lower) Data rate 3Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40209 GHz	-2.88 dBm		
M2		1	2.4 GHz	-53.80 dBm		
M3		1	2.39951 GHz	-53.95 dBm		

CH 78 (Upper) Data rate 3Mbps-DH1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479838 GHz	-0.20 dBm		
M2		1	2.4835 GHz	-57.57 dBm		
M3		1	2.487062 GHz	-61.04 dBm		

5.10 Conducted Spurious Emissions

5.10.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

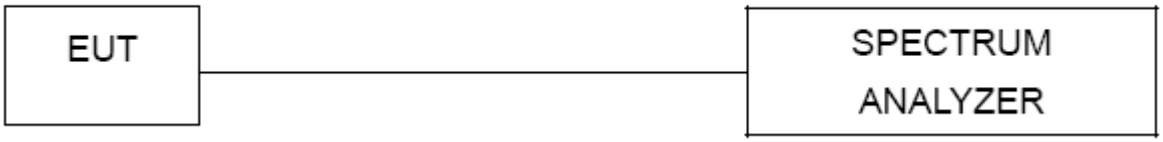
5.10.2 Test procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW=100kHz, VBW≧RBW, Sweep time=Auto, Detector Function=Peak.

5.10.3 Deviation from standard

No deviation.

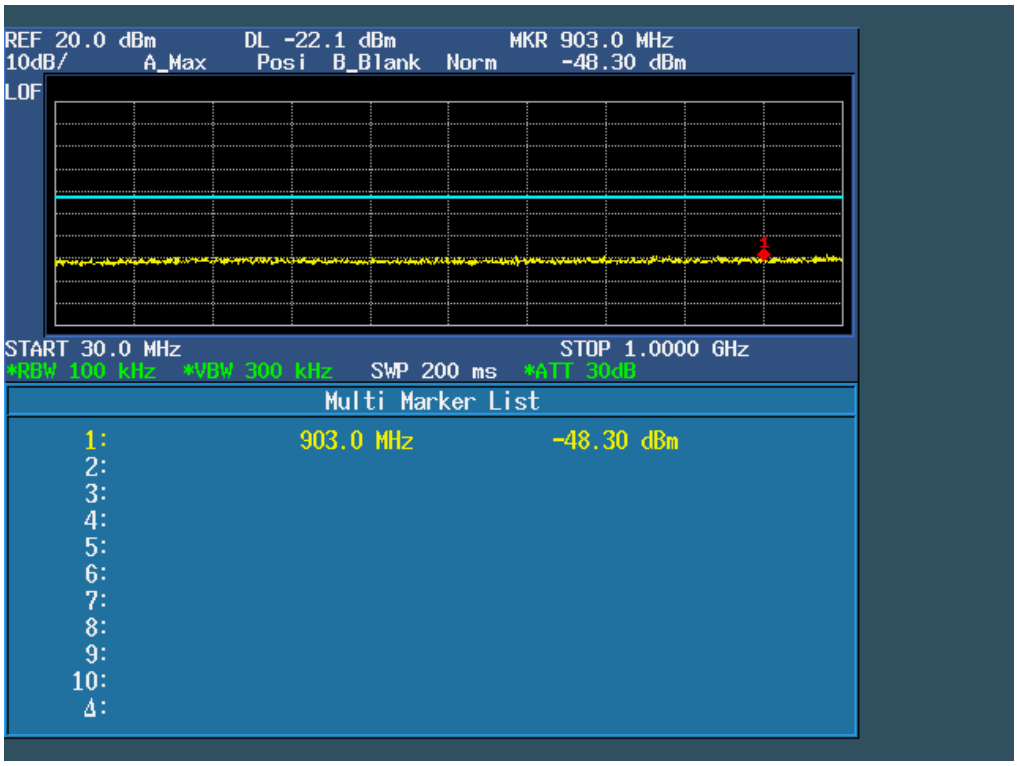
5.10.4 Test setup

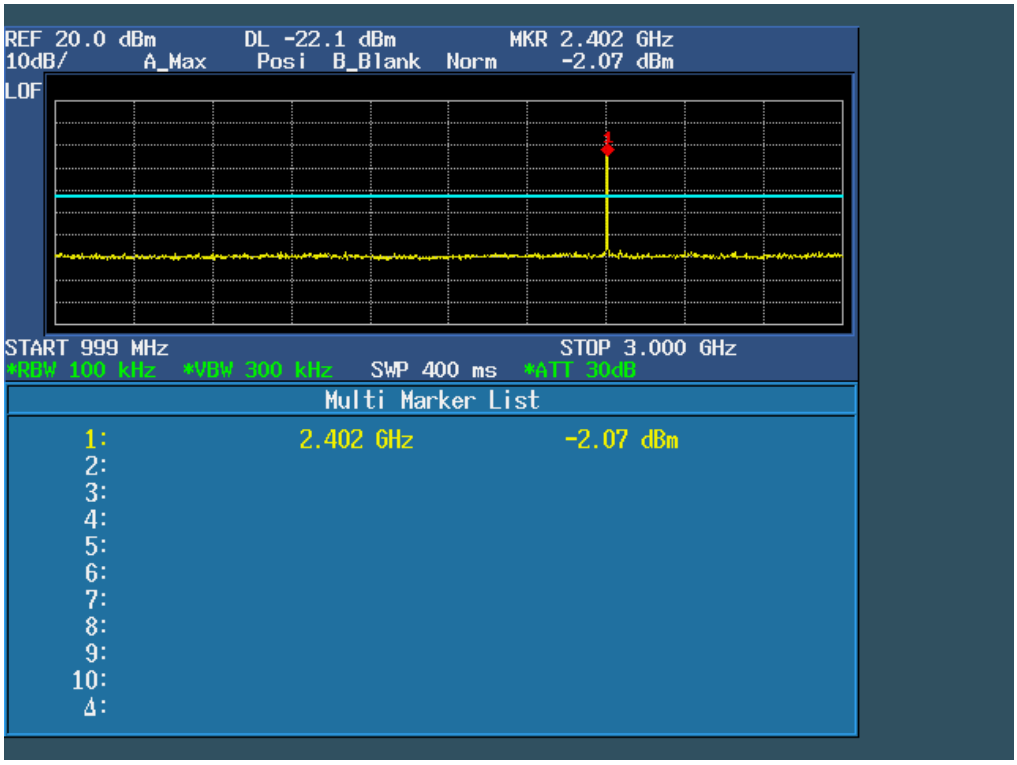


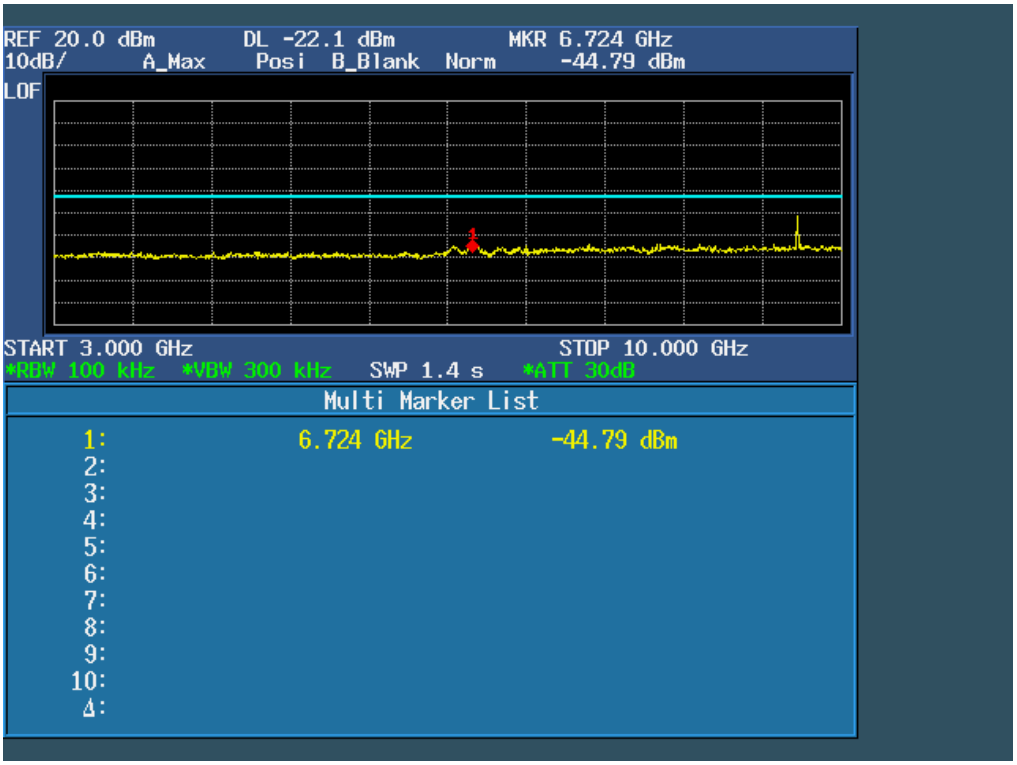
5.10.5 Test results

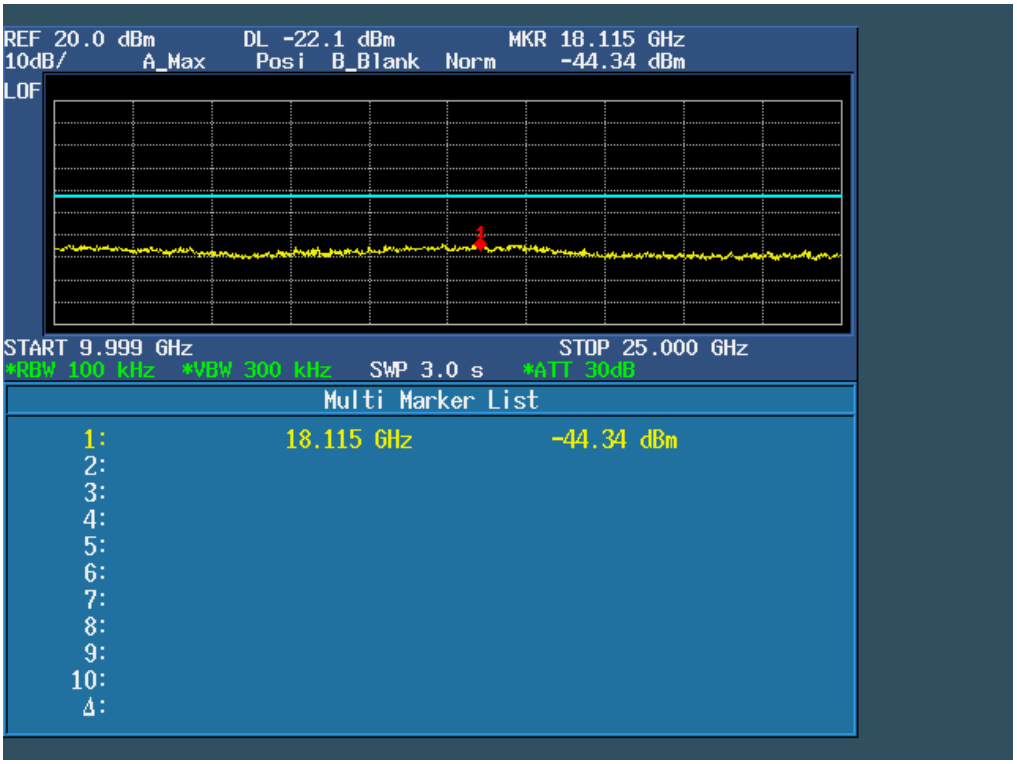
Pre-test EUT in TX 1Mbps & 2Mbps & 3Mbps modes, find worst case in 3Mbps modes.

Lowest Channel-3Mbps

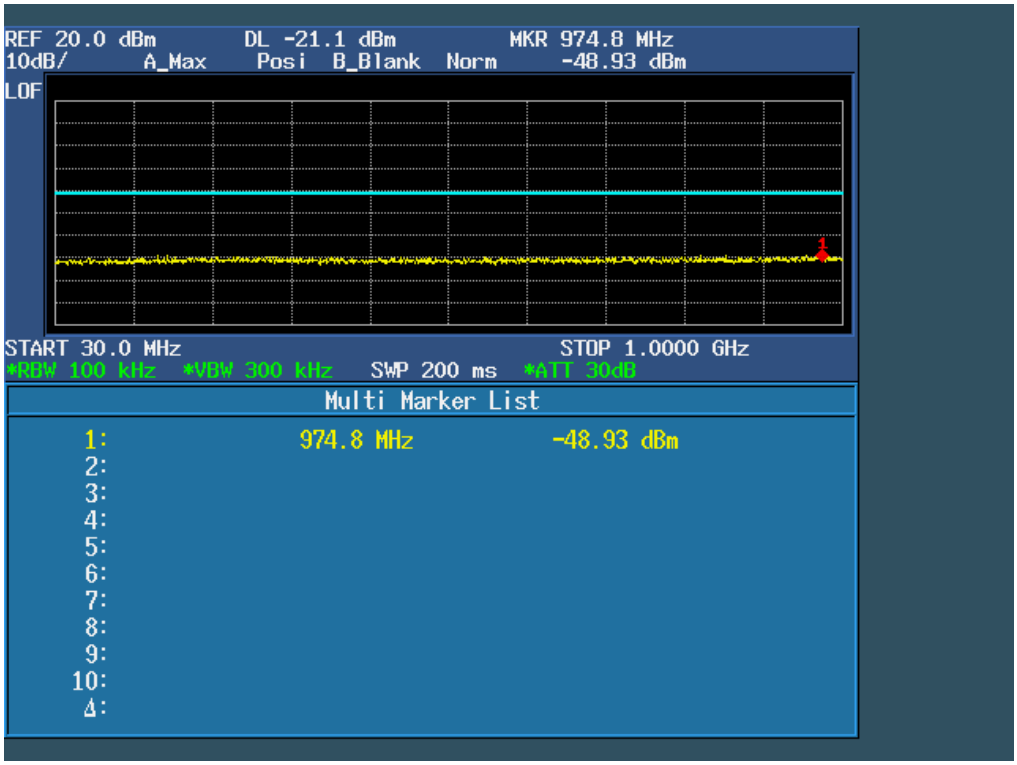


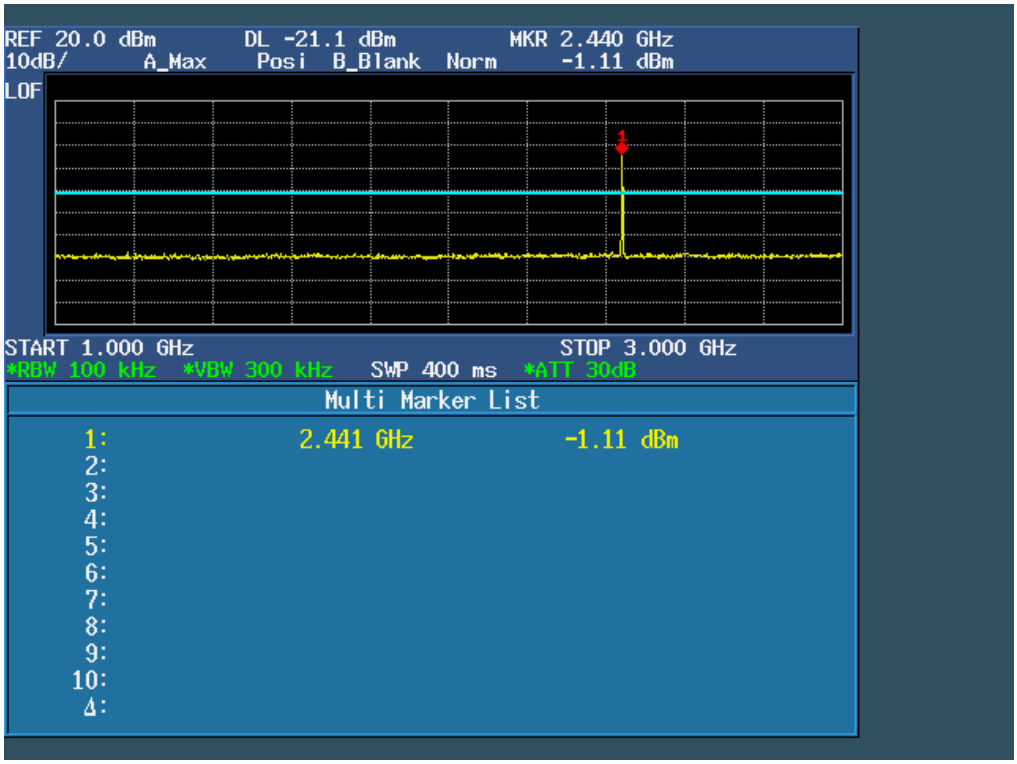


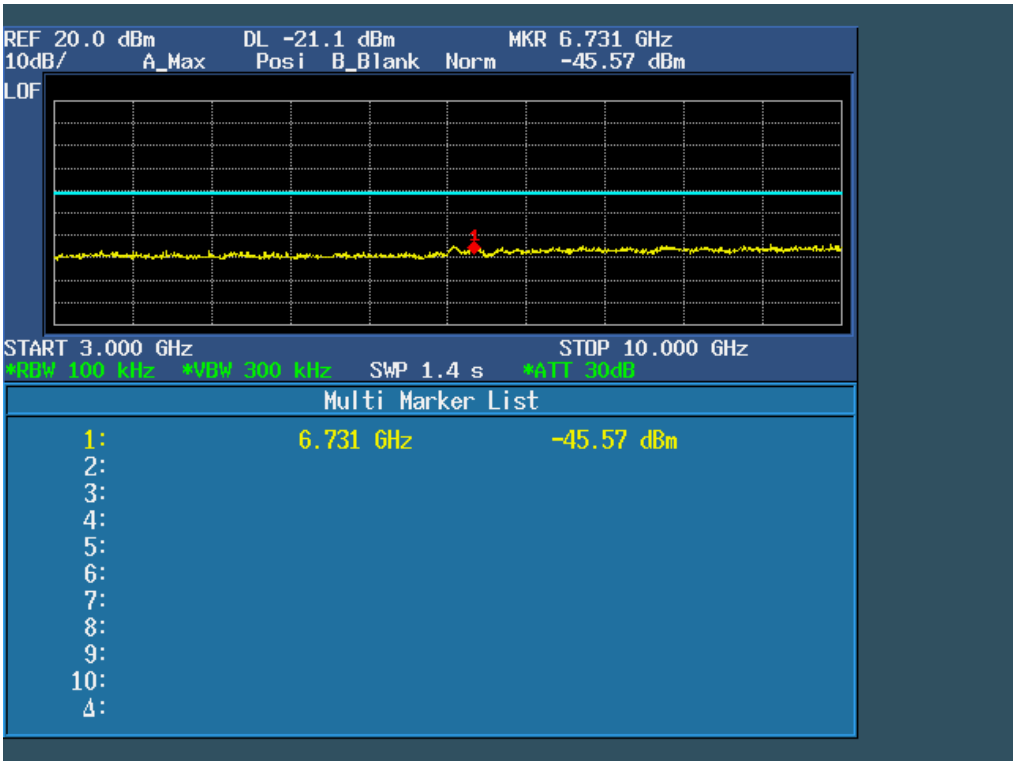

REF 20.0 dBm
DL -22.1 dBm
MKR 6.724 GHz
10dB/
A_Max
Posi
B_Blank
Norm
-44.79 dBm
LOF
START 3.000 GHz
STOP 10.000 GHz
*RBW 100 kHz
*VBW 300 kHz
SWP 1.4 s
*ATT 30dB
Multi Marker List
1: 6.724 GHz -44.79 dBm
2:
3:
4:
5:
6:
7:
8:
9:
10:
Δ:

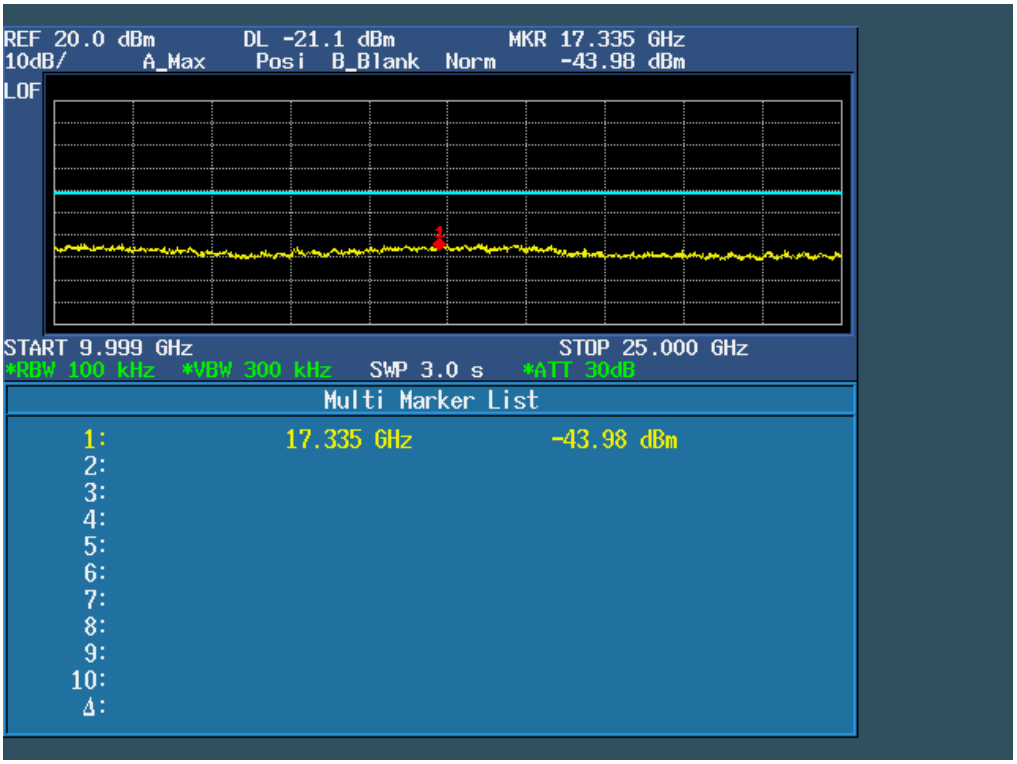

REF 20.0 dBm
DL -22.1 dBm
MKR 18.115 GHz
10dB/
A_Max
Posi
B_Blank
Norm
-44.34 dBm
LOF
START 9.999 GHz
STOP 25.000 GHz
*RBW 100 kHz
*VBW 300 kHz
SWP 3.0 s
*ATT 30dB
Multi Marker List
1: 18.115 GHz -44.34 dBm
2:
3:
4:
5:
6:
7:
8:
9:
10:
Δ:

Middle Channel-3Mbps

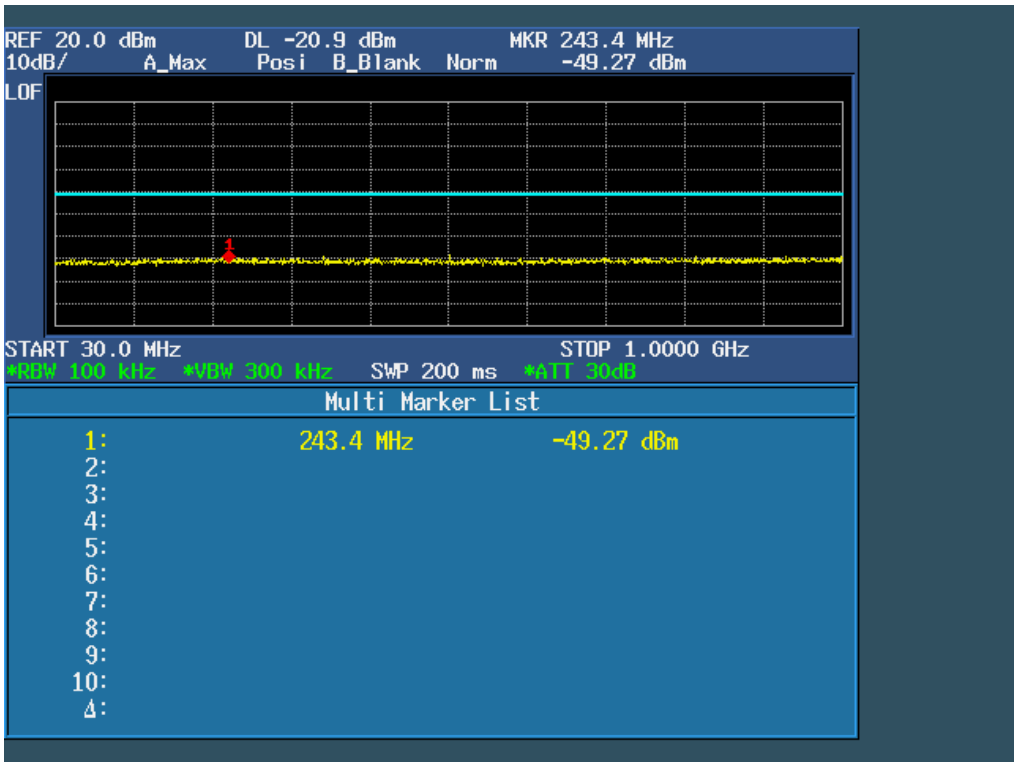


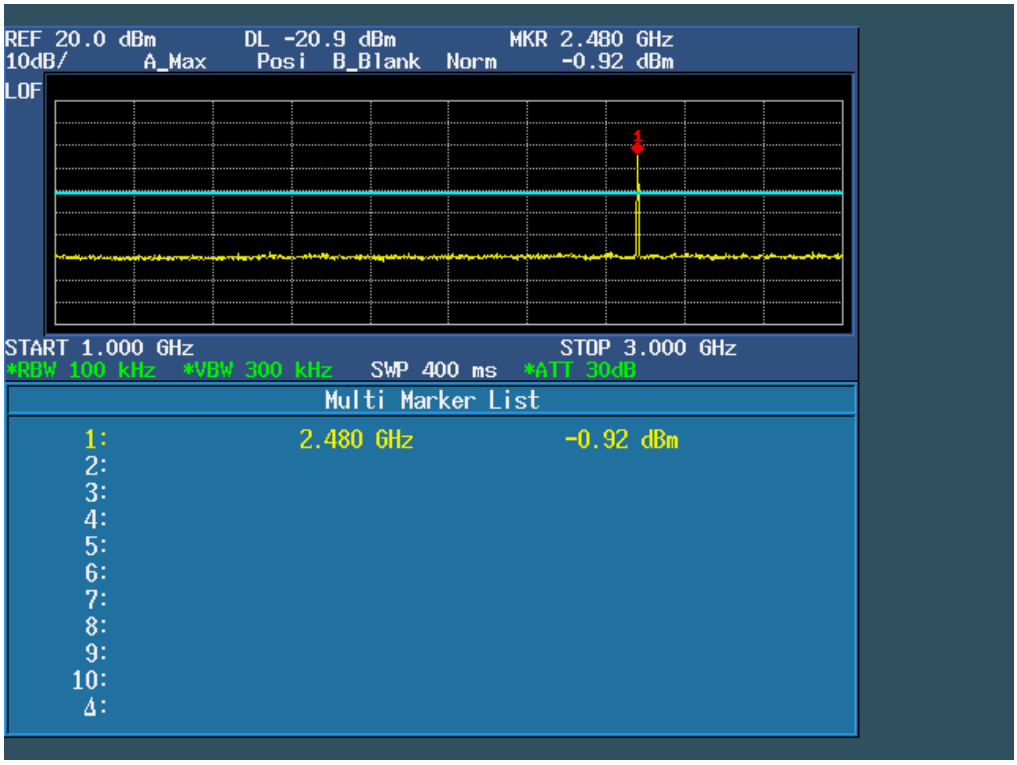


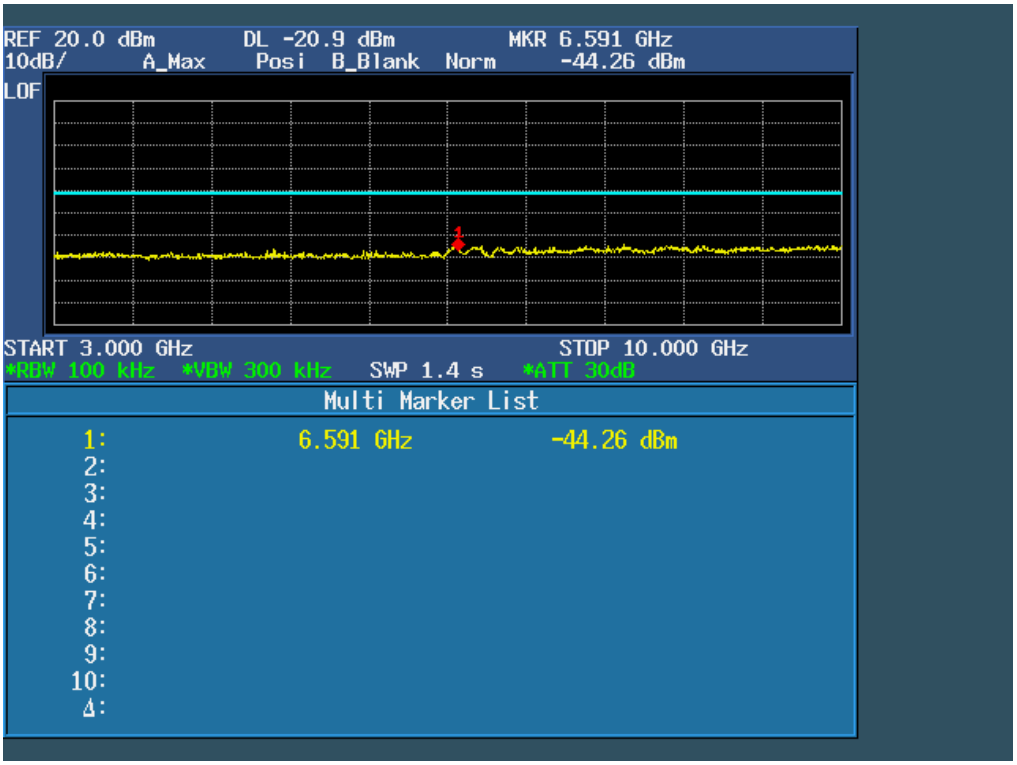

REF 20.0 dBm
DL -21.1 dBm
MKR 6.731 GHz
10dB/
A_Max
Posi
B_Blank
Norm
-45.57 dBm
LOF
START 3.000 GHz
STOP 10.000 GHz
*RBW 100 kHz
*VBW 300 kHz
SWP 1.4 s
*ATT 30dB
Multi Marker List
1: 6.731 GHz -45.57 dBm
2:
3:
4:
5:
6:
7:
8:
9:
10:
Δ:

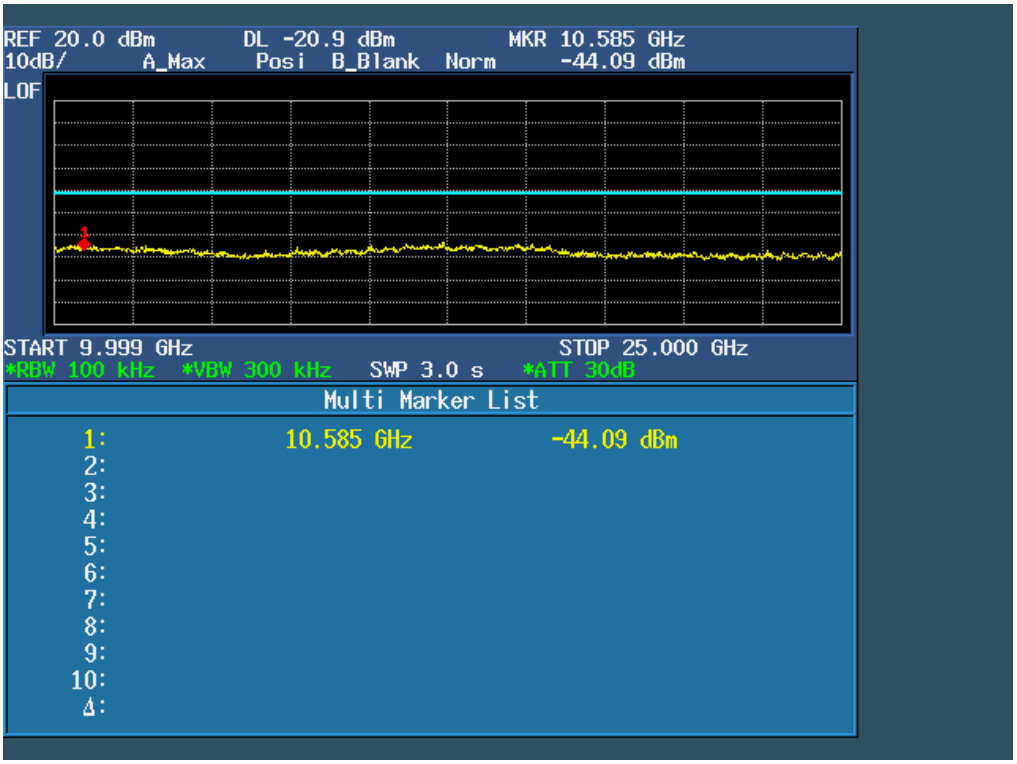

REF 20.0 dBm
DL -21.1 dBm
MKR 17.335 GHz
10dB/
A_Max
Posi
B_Blank
Norm
-43.98 dBm
LOF
START 9.999 GHz
STOP 25.000 GHz
*RBW 100 kHz
*VBW 300 kHz
SWP 3.0 s
*ATT 30dB
Multi Marker List
1: 17.335 GHz -43.98 dBm
2:
3:
4:
5:
6:
7:
8:
9:
10:
Δ:

Highest Channel-3Mbps






REF 20.0 dBm
DL -20.9 dBm
MKR 6.591 GHz
10dB/
A_Max
Posi
B_Blank
Norm
-44.26 dBm
LOF
START 3.000 GHz
STOP 10.000 GHz
*RBW 100 kHz
*VBW 300 kHz
SWP 1.4 s
*ATT 30dB
Multi Marker List
1: 6.591 GHz -44.26 dBm
2:
3:
4:
5:
6:
7:
8:
9:
10:
Δ:


REF 20.0 dBm
DL -20.9 dBm
MKR 10.585 GHz
10dB/
A_Max
Posi
B_Blank
Norm
-44.09 dBm
LOF
START 9.999 GHz
STOP 25.000 GHz
*RBW 100 kHz
*VBW 300 kHz
SWP 3.0 s
*ATT 30dB
Multi Marker List
1: 10.585 GHz -44.09 dBm
2:
3:
4:
5:
6:
7:
8:
9:
10:
Δ: