



FCC RADIO TEST REPORT

FCC ID : 2ATUQ-6699
Equipment : Tablet
Model Name : K72LL3
Applicant : Mangled Horses LLC
225 Wilmington-West Chester Pike,
Suite 202, Chadds Ford, PA 19317
Standard : FCC Part 15 Subpart C §15.247

The product was received on Oct. 30, 2019 and testing was started from Nov. 11, 2019 and completed on Feb. 27, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description.....	5
1.1 Feature of Equipment Under Test	5
1.2 Product Specification of Equipment Under Test.....	5
1.3 Modification of EUT	5
1.4 Testing Location	6
1.5 Applicable Standards.....	6
2 Test Configuration of Equipment Under Test.....	7
2.1 Carrier Frequency Channel	7
2.2 Test Mode	8
2.3 Connection Diagram of Test System.....	9
2.4 Support Unit used in test configuration and system	10
2.5 EUT Operation Test Setup	10
2.6 Measurement Results Explanation Example.....	10
3 Test Result.....	11
3.1 6dB and 99% Bandwidth Measurement	11
3.2 Output Power Measurement.....	24
3.3 Power Spectral Density Measurement	25
3.4 Conducted Band Edges and Spurious Emission Measurement	38
3.5 Radiated Band Edges and Spurious Emission Measurement	55
3.6 AC Conducted Emission Measurement.....	59
3.7 Antenna Requirements.....	61
4 List of Measuring Equipment	62
5 Uncertainty of Evaluation.....	64
Appendix A. Conducted Test Results	
Appendix B. AC Conducted Emission Test Result	
Appendix C. Radiated Spurious Emission	
Appendix D. Radiated Spurious Emission Plots	
Appendix E. Duty Cycle Plots	



History of this test report



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
3.1	15.247(a)(2)	6dB Bandwidth	Pass
3.1	2.1049	99% Occupied Bandwidth	Reporting only
3.2	15.247(b)(3)	Peak Output Power	Pass
3.3	15.247(e)	Power Spectral Density	Pass
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	Pass
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	Pass
3.6	15.207	AC Conducted Emission	Pass
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Tracy Lin



1 General Description

1.1 Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Model Name	K72LL3
FCC ID	2ATUQ-6699
EUT supports Radios application	WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE WPC Receive only

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel (37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	<Ant. 1>: -1.80 dBm (0.0007 W) for 1Mbps -1.50 dBm (0.0007 W) for 2Mbps <Ant. 2>: -1.80 dBm (0.0007 W) for 1Mbps -1.90 dBm (0.0006 W) for 2Mbps
99% Occupied Bandwidth	<Ant. 1>: 1.033 MHz for 1Mbps 2.070 MHz for 2Mbps <Ant. 2>: 1.033 MHz for 1Mbps 2.070 MHz for 2Mbps
Antenna Type / Gain	<Ant. 1>: IFA Antenna with gain 2.8 dBi <Ant. 2>: Monopole Antenna with gain 2.8 dBi
Type of Modulation	Bluetooth LE : GFSK

1.3 Modification of EUT

No modifications are made to the EUT during all test items.



1.4 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH15-HY	

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW0007

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-



2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane with notebook mode) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

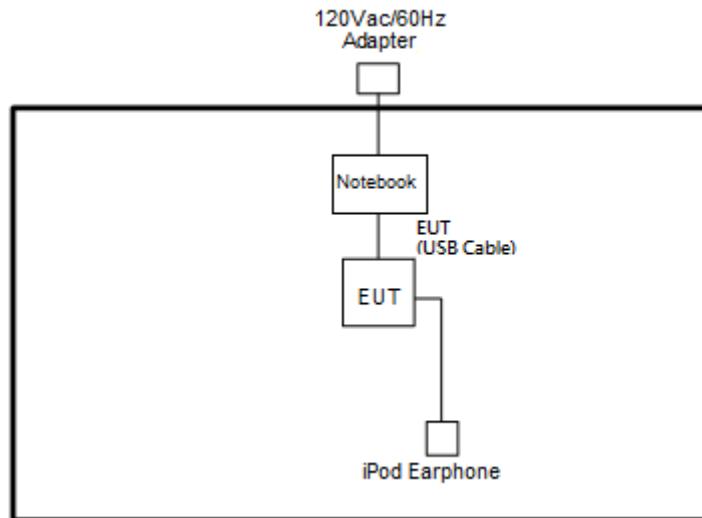
Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth – LE / GFSK
Conducted Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
Radiated Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
AC Conducted Emission	Mode 1: WLAN (2.4GHz) Link + Bluetooth Link + Play MPEG4 from SD Card + USB Cable (Charging from Adapter (AP15))

Remark:

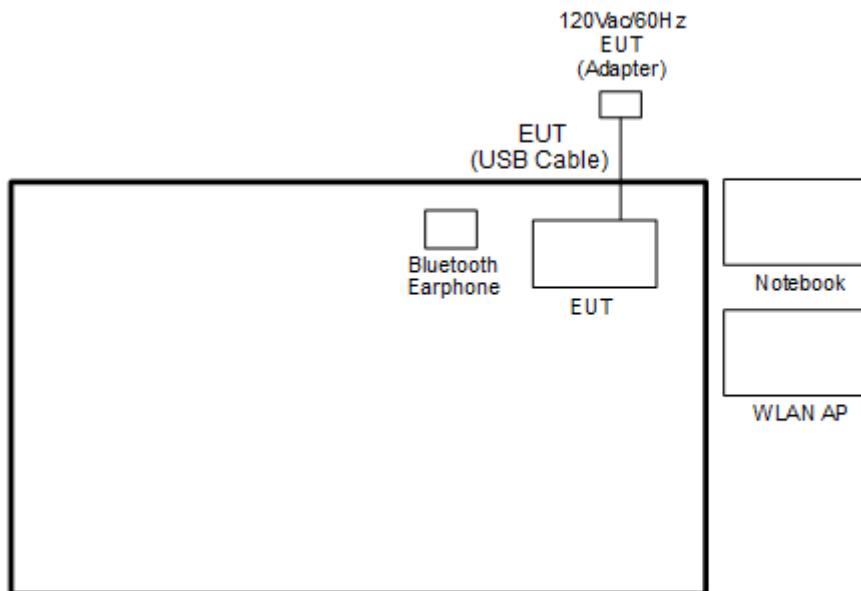
1. For Radiated Test Cases, the tests were performed with Adapter 1.
2. The AC Conducted Emission test case has leveraged from the worst mode of Part 15B AC Conducted Emission.

2.3 Connection Diagram of Test System

<Bluetooth - LE Tx Mode >



<AC Conducted Emission Mode>





2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
2.	WLAN AP	ASUS	RT-AC1750	N/A	N/A	N/A
3.	Notebook	DELL	Latitude E3340	FCC DoC/ Contains FCC ID: PD97260NGU	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
5.	Notebook	Lenovo	L570	N/A	N/A	N/A
6.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
7.	Wireless Charger	ANKER	A2524	2AOKB-A2524	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “CMD” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

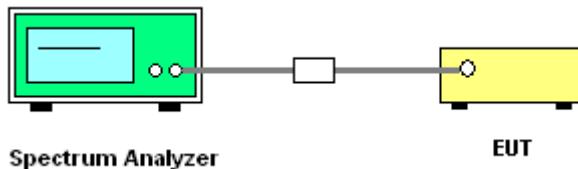
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) $\geq 3 * \text{RBW}$.
6. Measure and record the results in the test report.

3.1.4 Test Setup



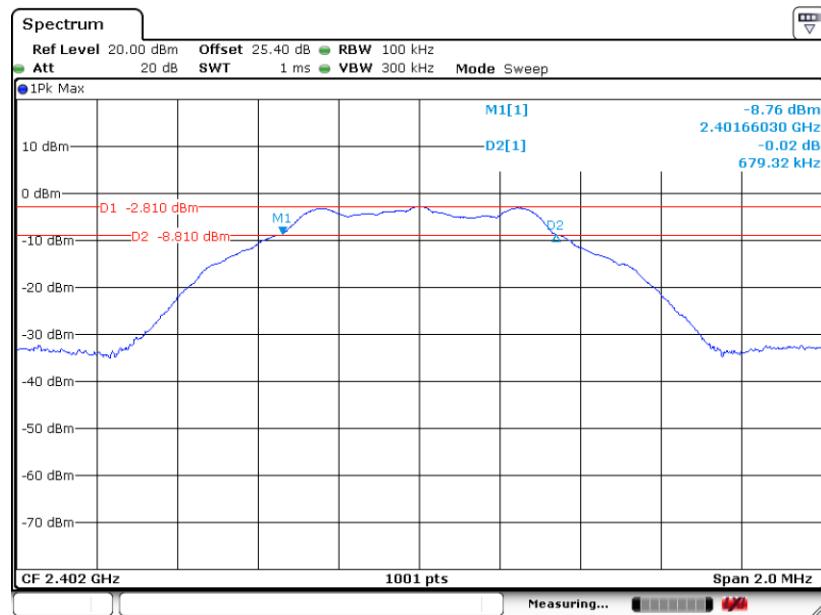
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

<Ant. 1>

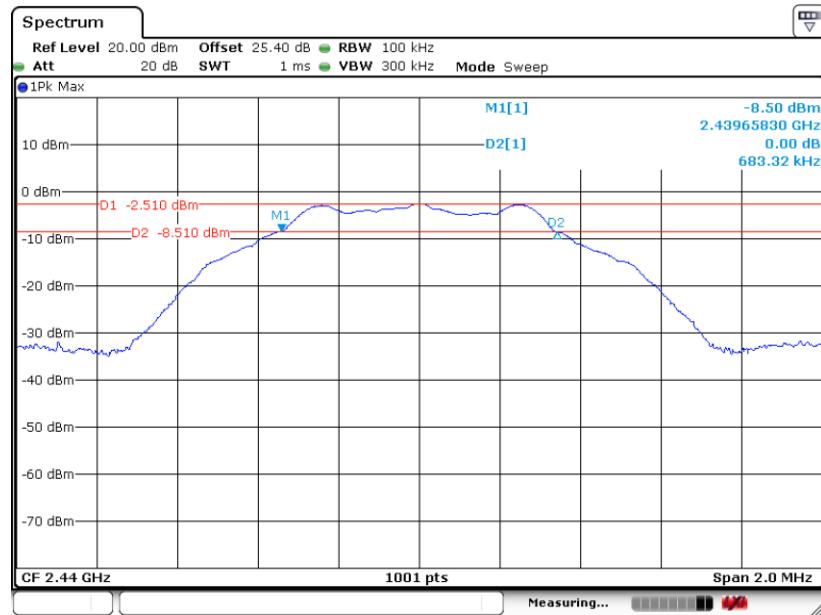
<1Mbps>

6 dB Bandwidth Plot on Channel 00



Date: 18.NOV.2019 22:23:51

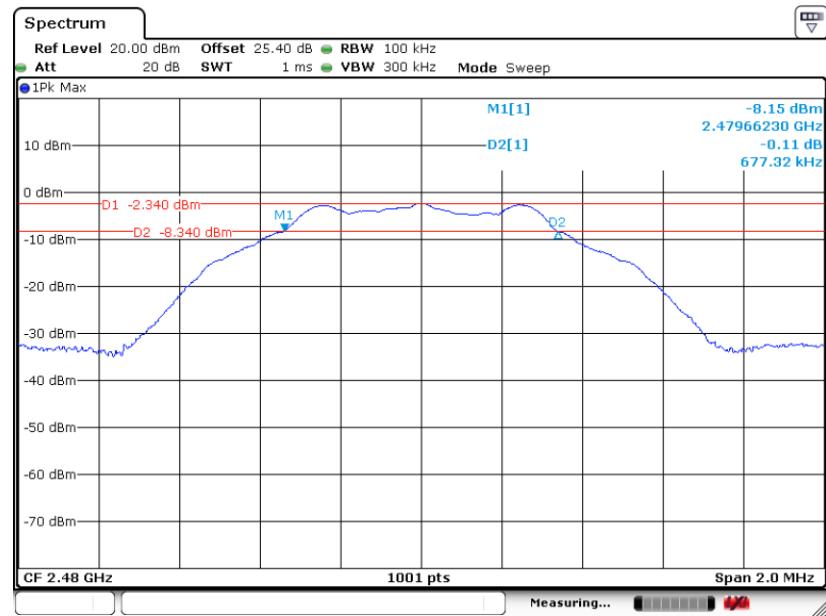
6 dB Bandwidth Plot on Channel 19



Date: 18.NOV.2019 22:25:51

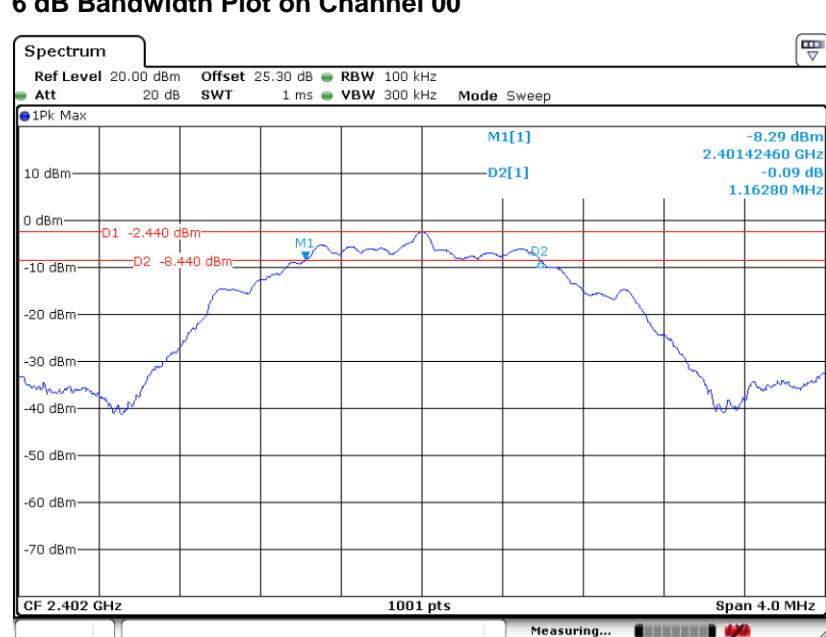


6 dB Bandwidth Plot on Channel 39



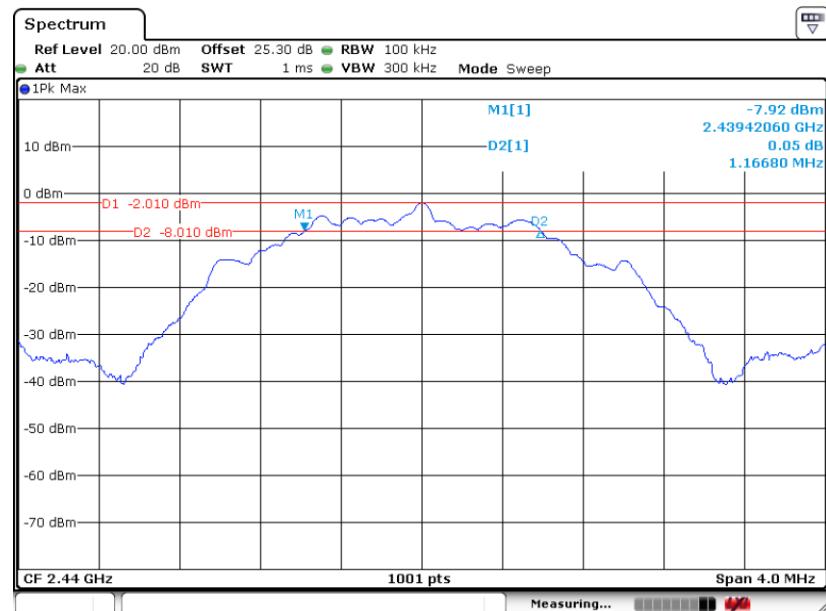
<2Mbps>

6 dB Bandwidth Plot on Channel 00



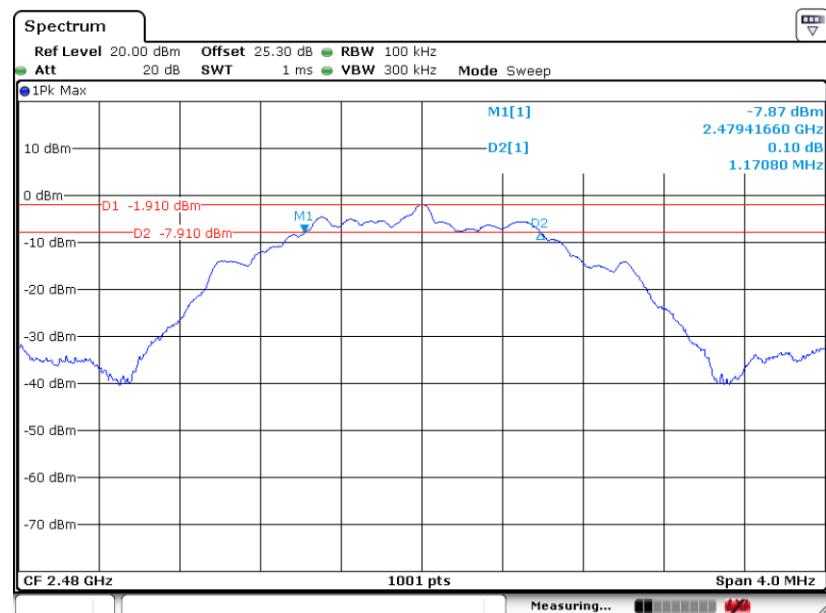


6 dB Bandwidth Plot on Channel 19



Date: 27.FEB.2020 00:54:21

6 dB Bandwidth Plot on Channel 39



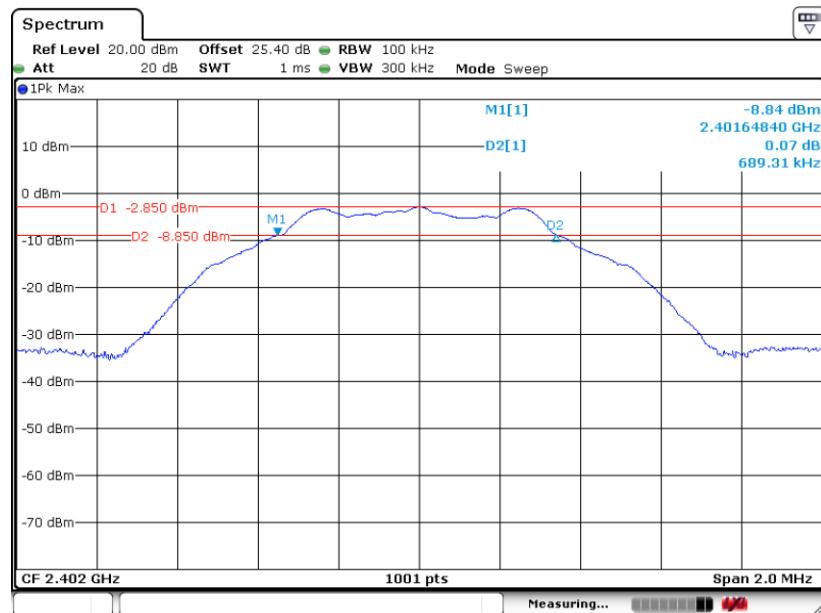
Date: 27.FEB.2020 00:57:39



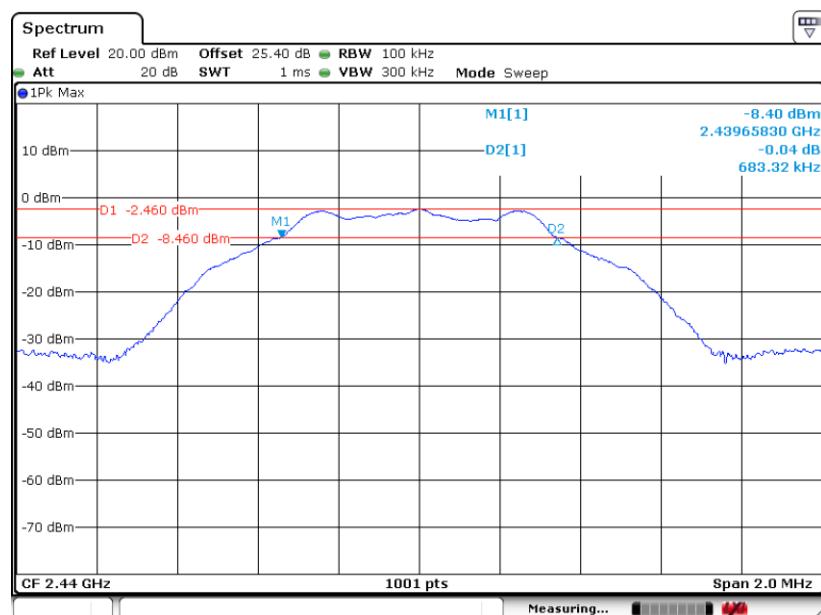
<Ant. 2>

1Mbps

6 dB Bandwidth Plot on Channel 00

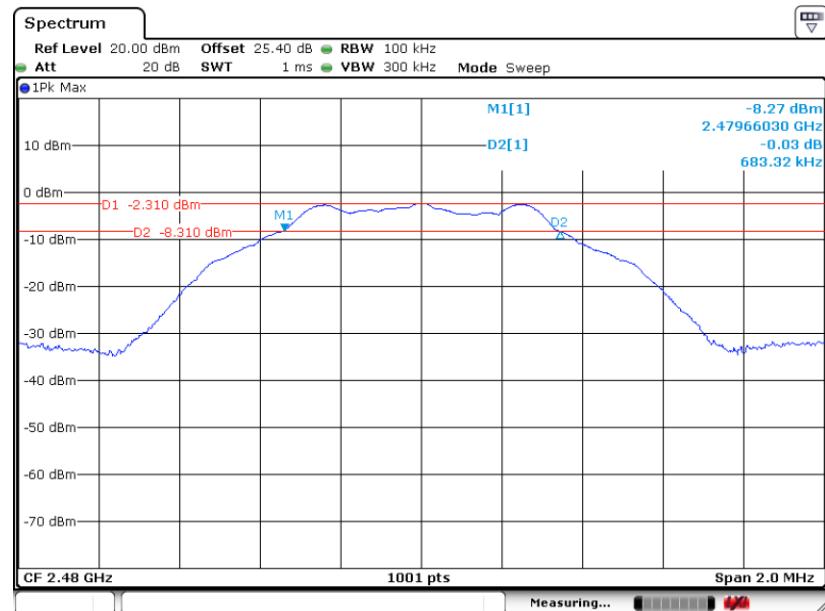


6 dB Bandwidth Plot on Channel 19



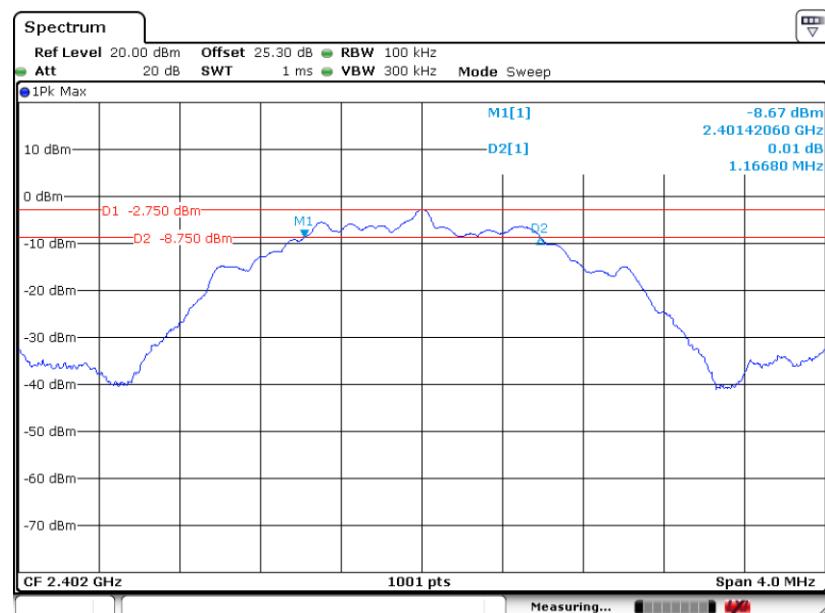


6 dB Bandwidth Plot on Channel 39



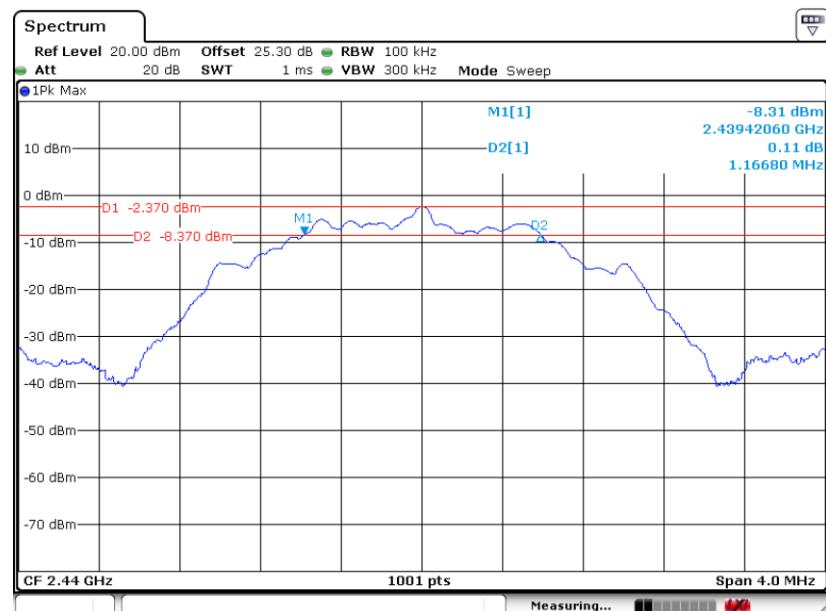
2Mbps

6 dB Bandwidth Plot on Channel 00



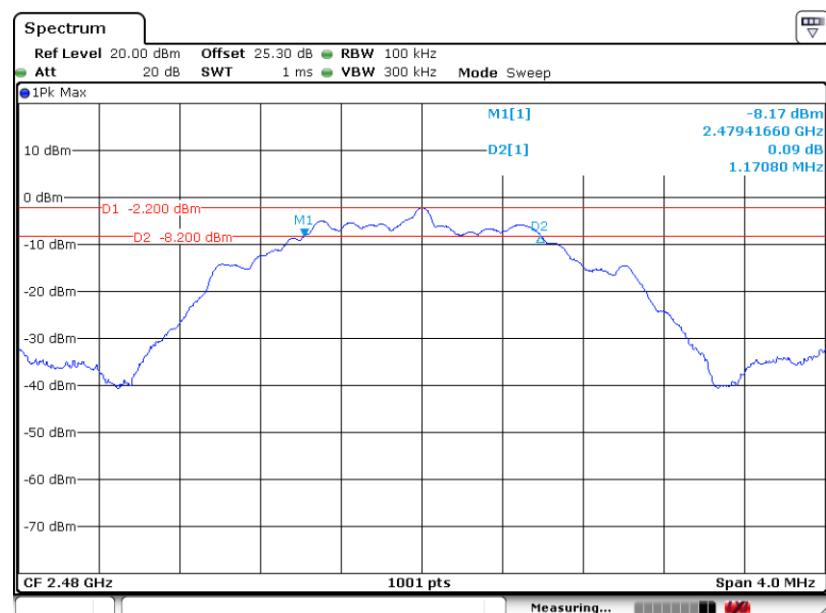


6 dB Bandwidth Plot on Channel 19



Date: 27.FEB.2020 01:09:01

6 dB Bandwidth Plot on Channel 39



Date: 27.FEB.2020 01:14:55

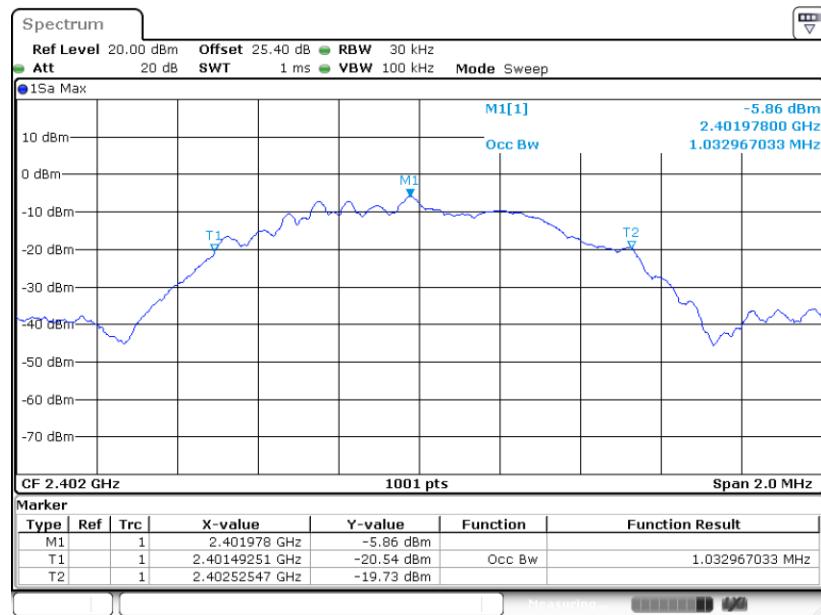
3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

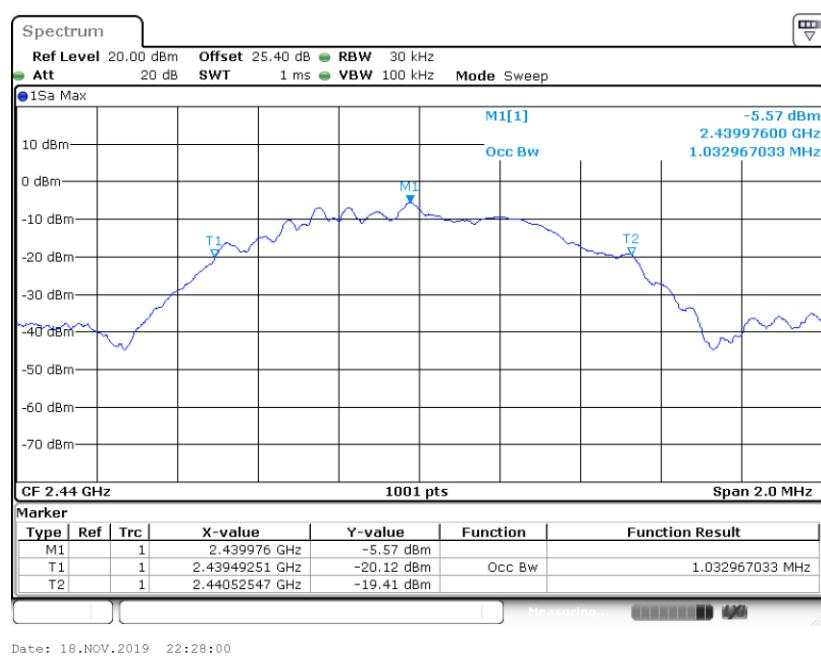
<Ant. 1>

<1Mbps>

99% Bandwidth Plot on Channel 00

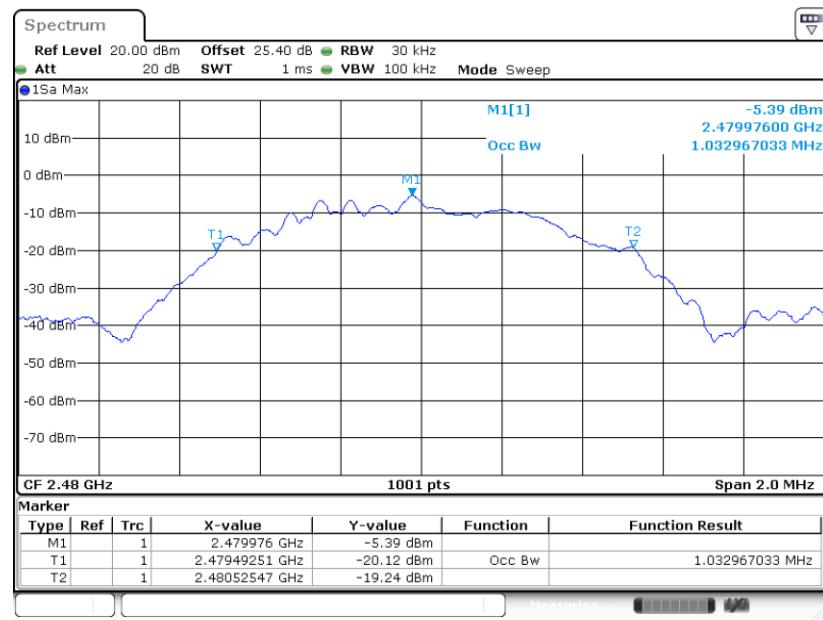


99% Occupied Bandwidth Plot on Channel 19





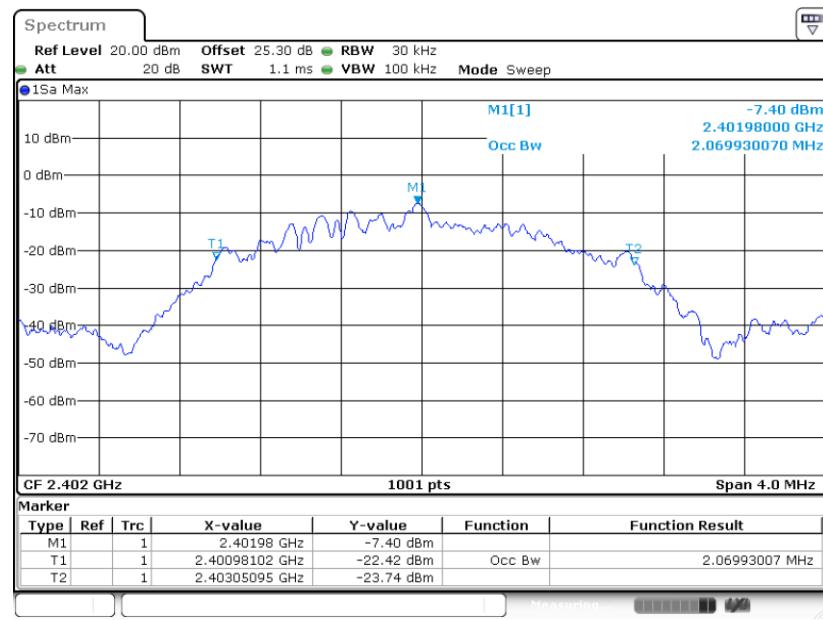
99% Occupied Bandwidth Plot on Channel 39



Date: 18.NOV.2019 22:38:48

<2Mbps>

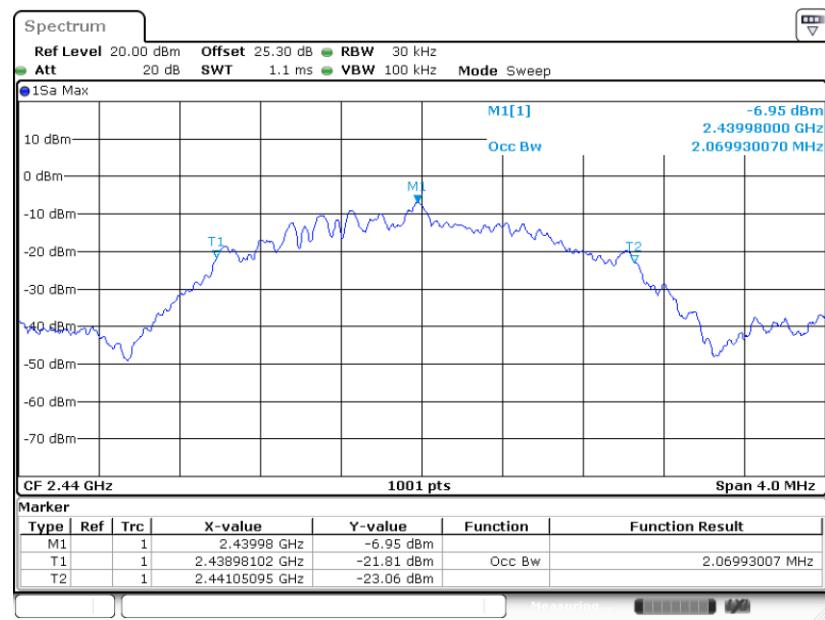
99% Bandwidth Plot on Channel 00



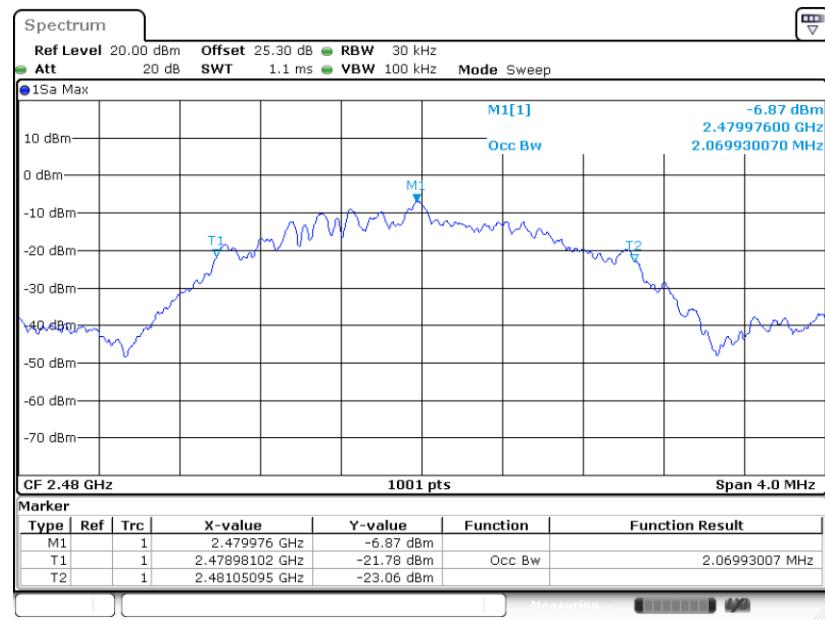
Date: 27.FEB.2020 00:52:42



99% Occupied Bandwidth Plot on Channel 19



99% Occupied Bandwidth Plot on Channel 39

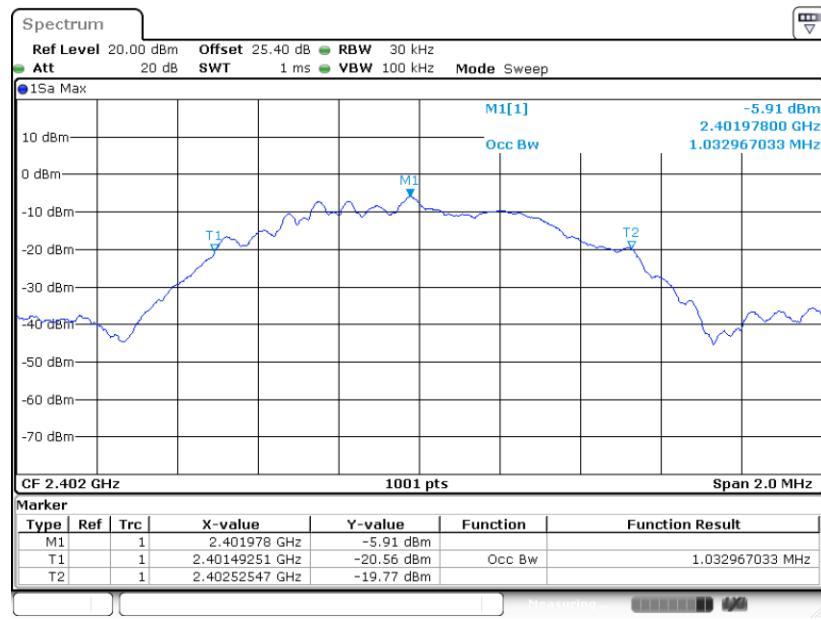




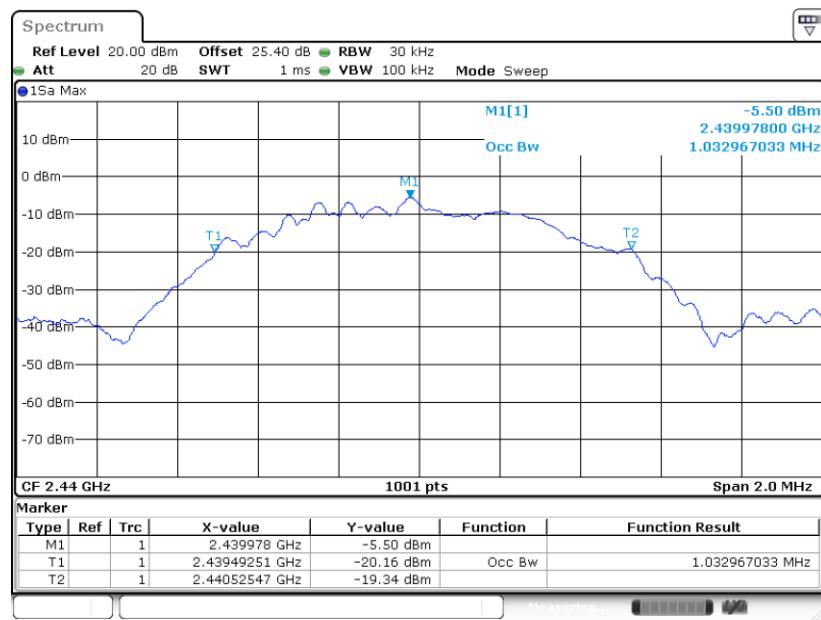
<Ant. 2>

<1Mbps>

99% Bandwidth Plot on Channel 00

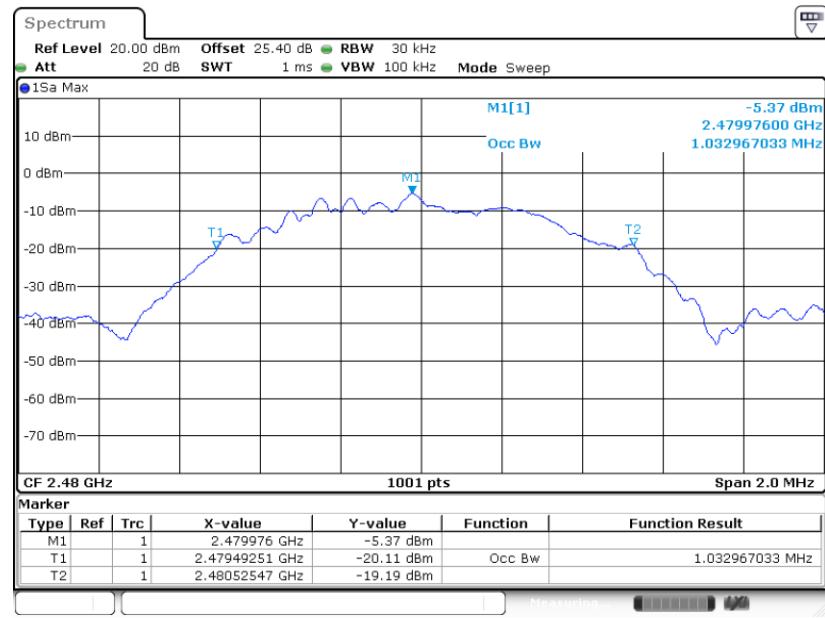


99% Occupied Bandwidth Plot on Channel 19



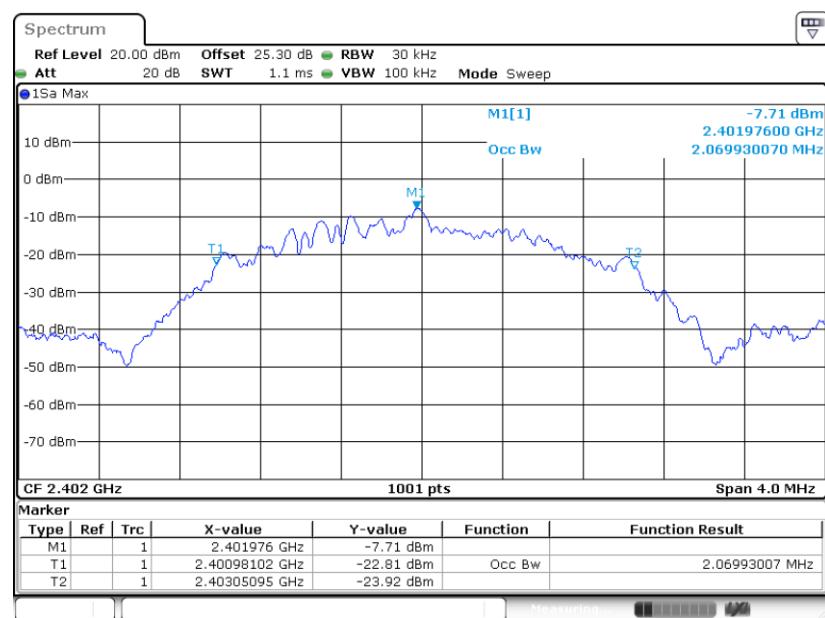


99% Occupied Bandwidth Plot on Channel 39



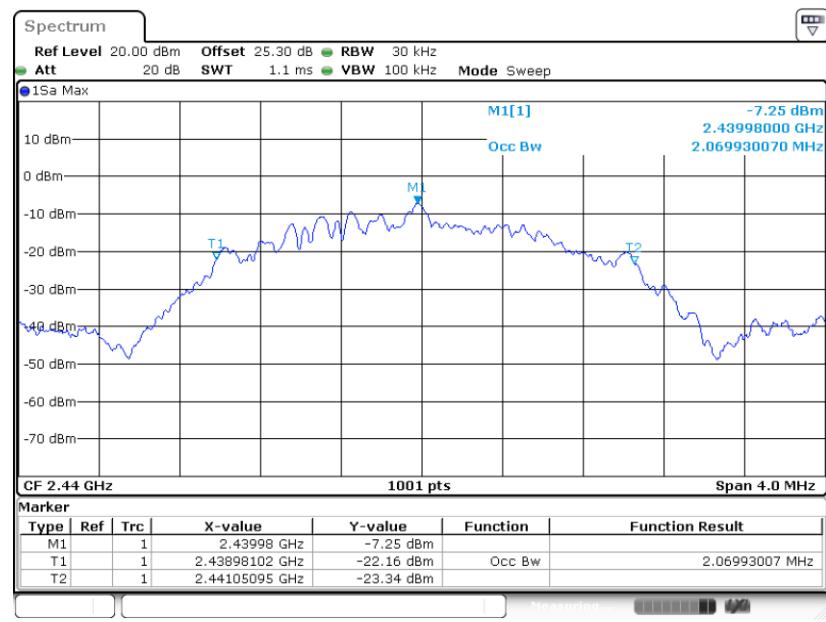
<2Mbps>

99% Bandwidth Plot on Channel 00

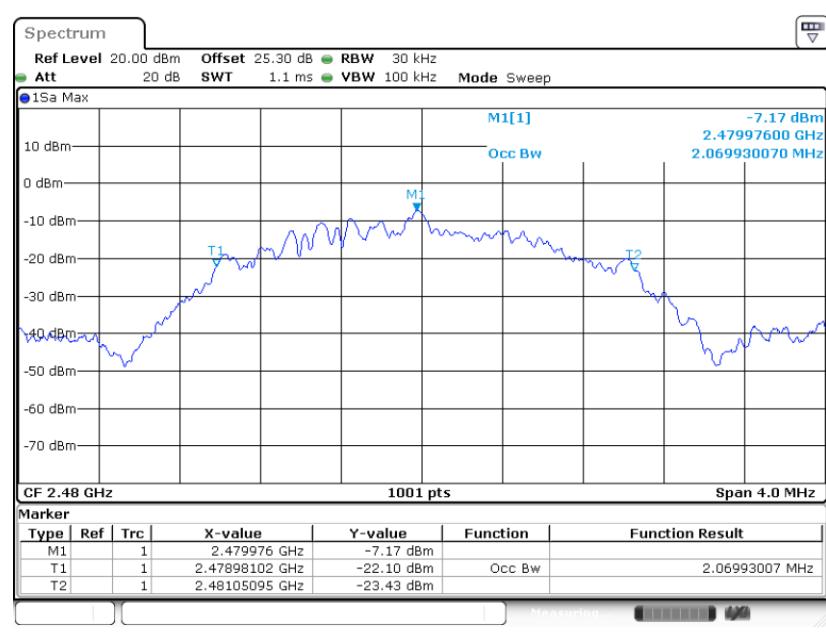




99% Occupied Bandwidth Plot on Channel 19



99% Occupied Bandwidth Plot on Channel 39



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for average output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the average output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

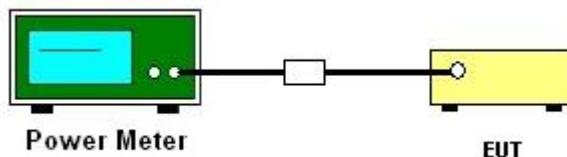
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Average Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

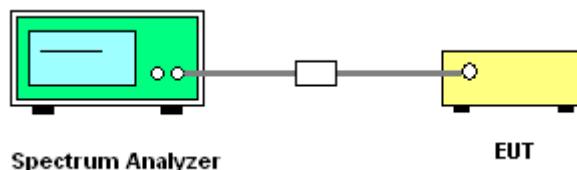
3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. 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.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 30dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

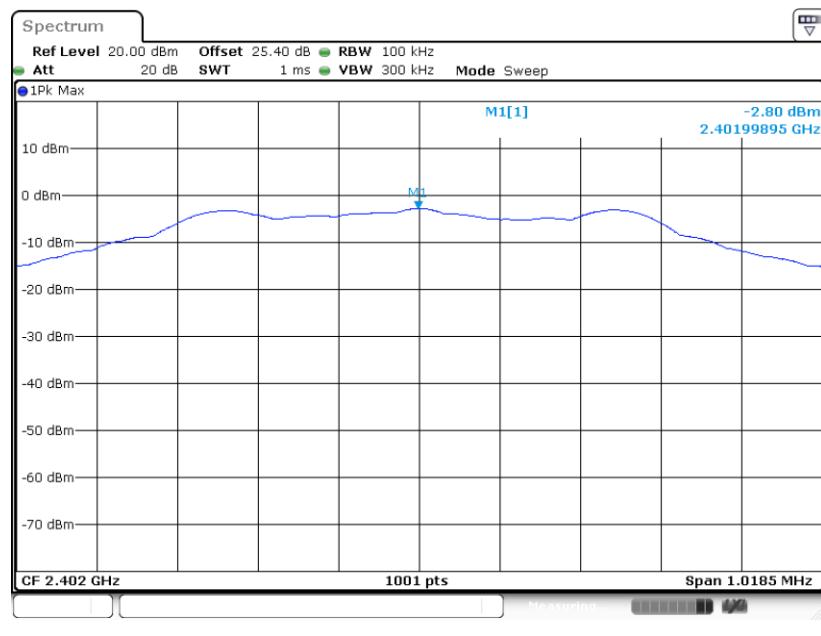


3.3.6 Test Result of Power Spectral Density Plots (100kHz)

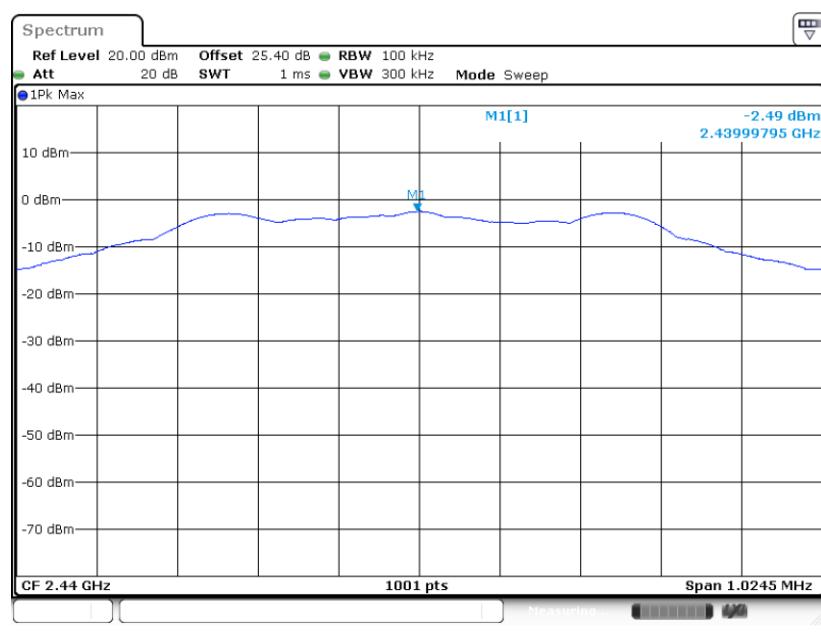
<Ant. 1>

<1Mbps>

PSD 100kHz Plot on Channel 00

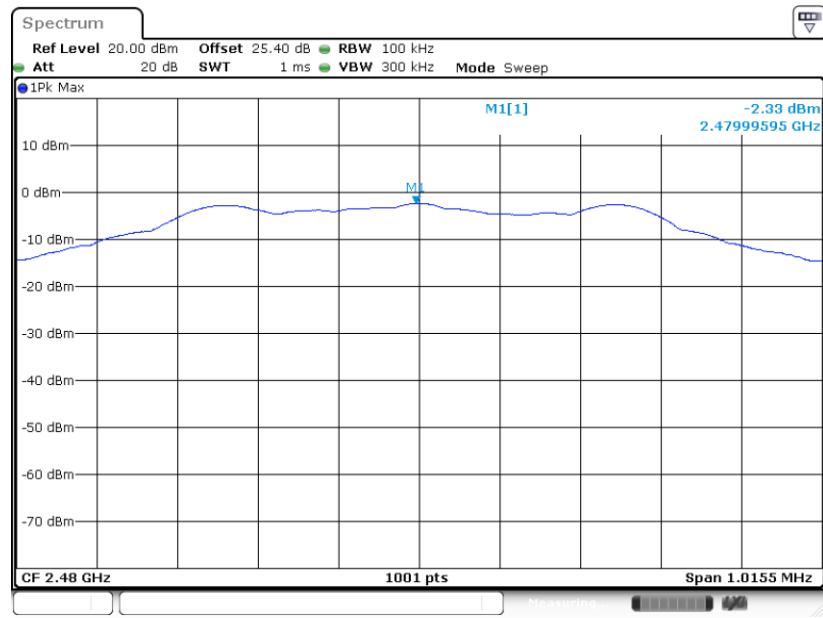


PSD 100kHz Plot on Channel 19



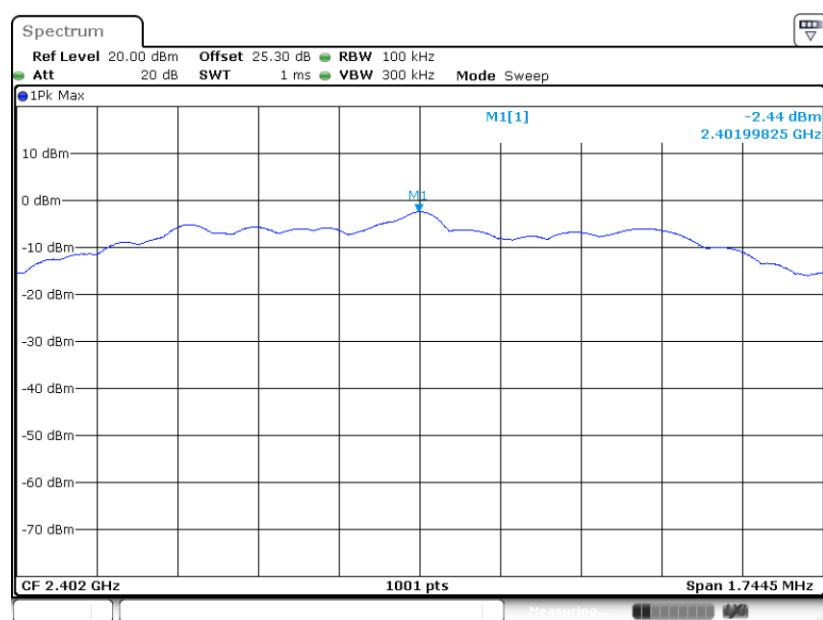


PSD 100kHz Plot on Channel 39



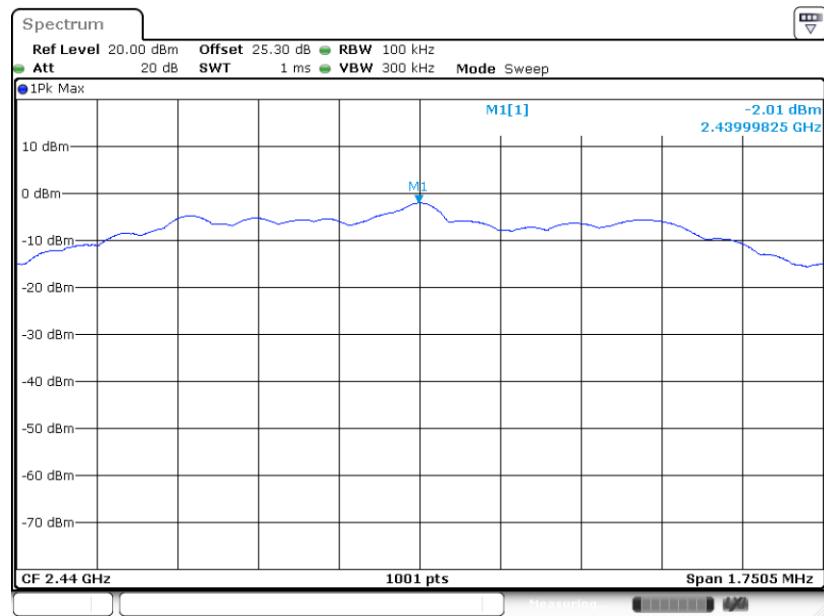
<2Mbps>

PSD 100kHz Plot on Channel 00

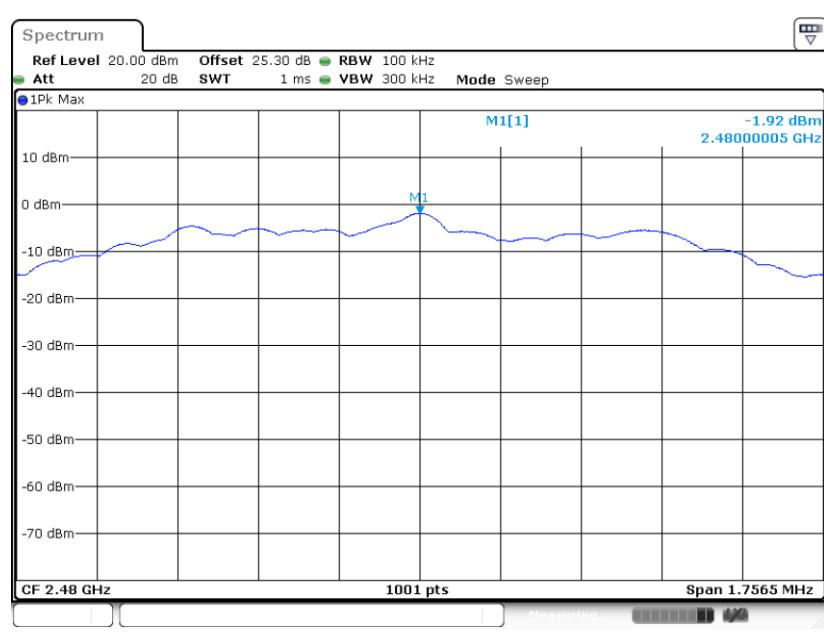




PSD 100kHz Plot on Channel 19



PSD 100kHz Plot on Channel 39

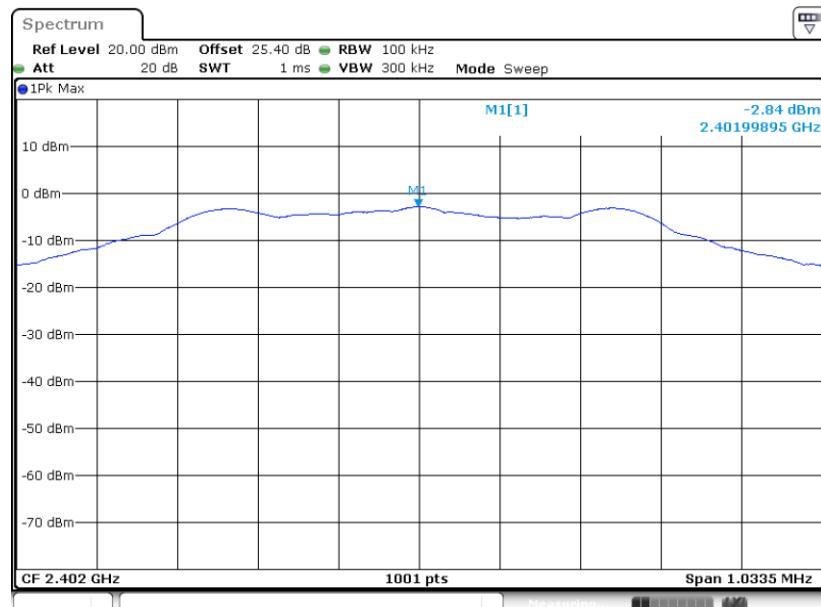




<Ant. 2>

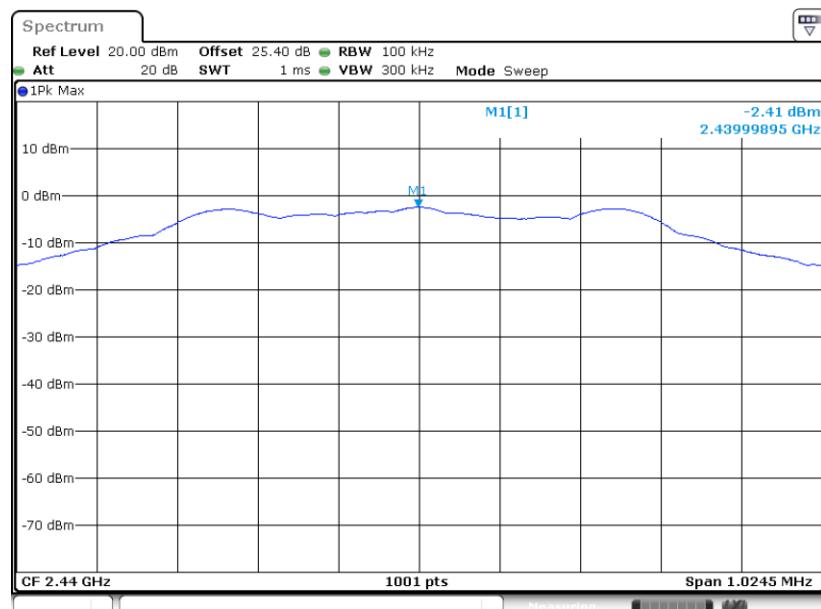
<1Mbps>

PSD 100kHz Plot on Channel 00



Date: 18.NOV.2019 22:50:57

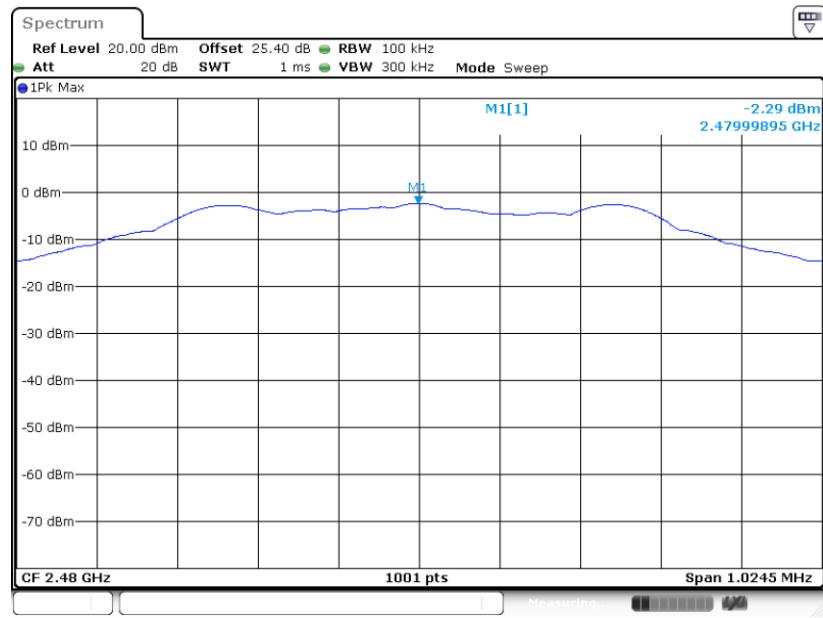
PSD 100kHz Plot on Channel 19



Date: 18.NOV.2019 22:53:48

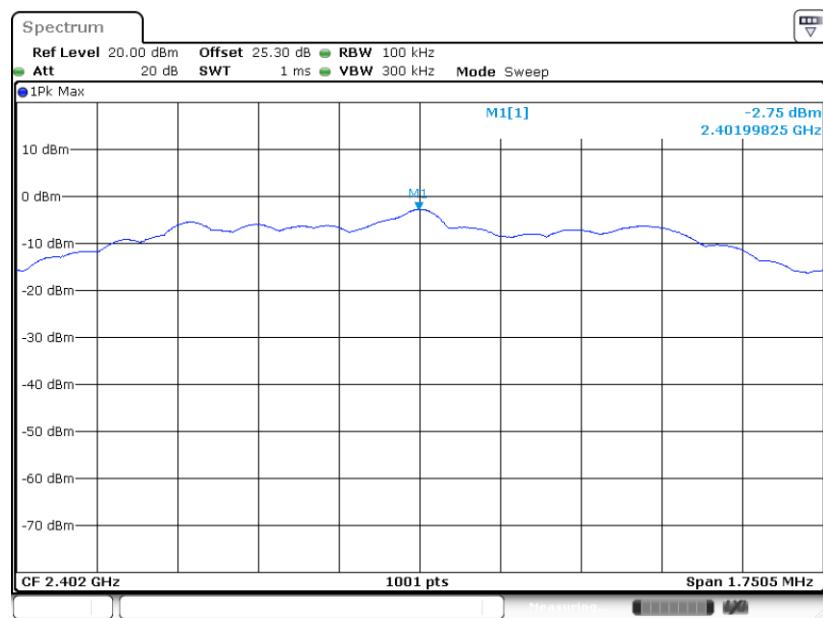


PSD 100kHz Plot on Channel 39



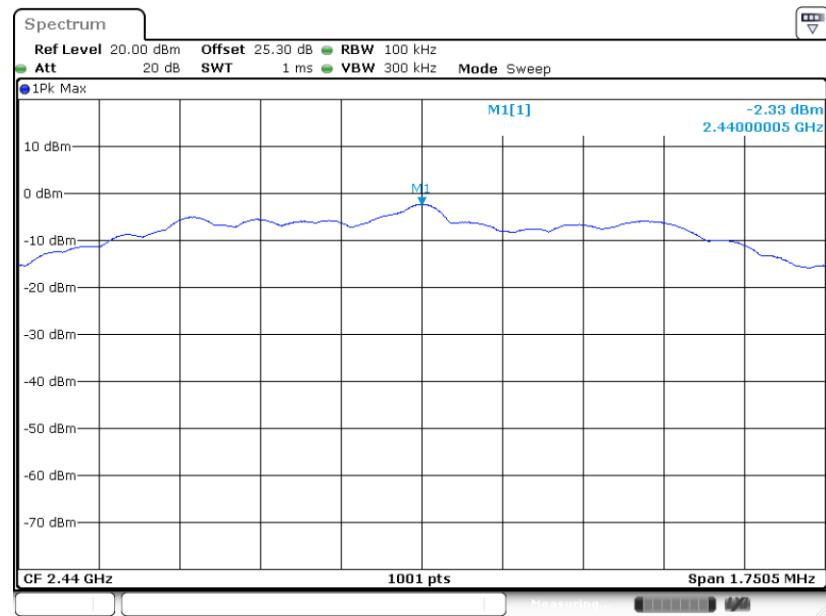
<2Mbps>

PSD 100kHz Plot on Channel 00

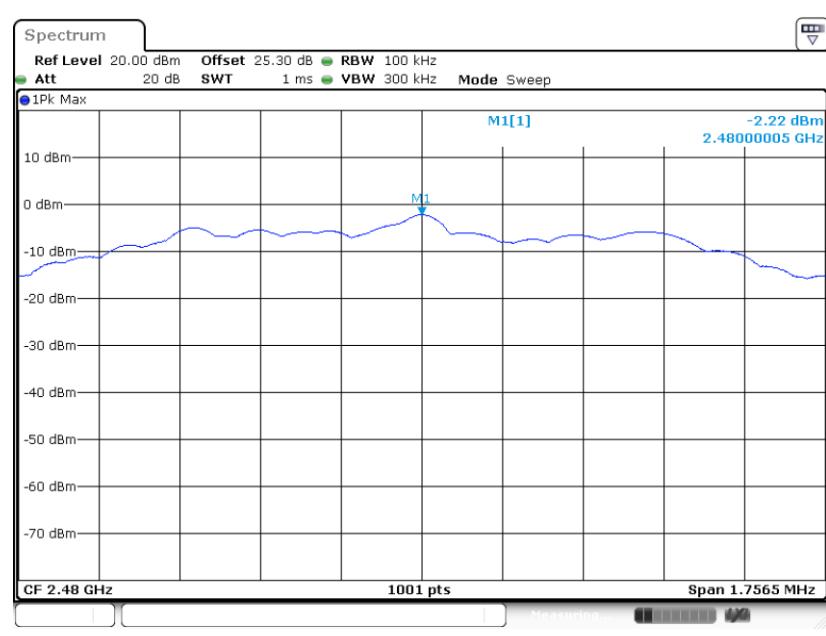




PSD 100kHz Plot on Channel 19



PSD 100kHz Plot on Channel 39



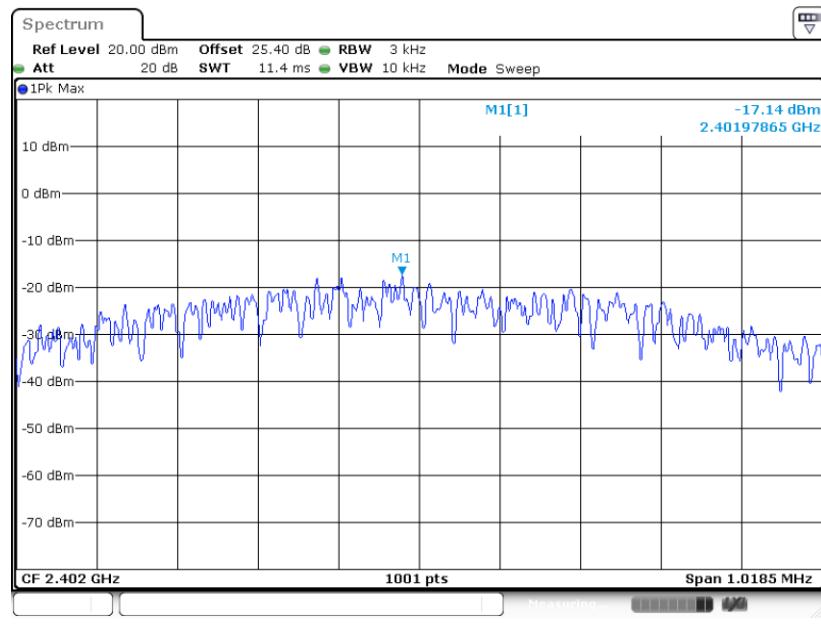


3.3.7 Test Result of Power Spectral Density Plots (3kHz)

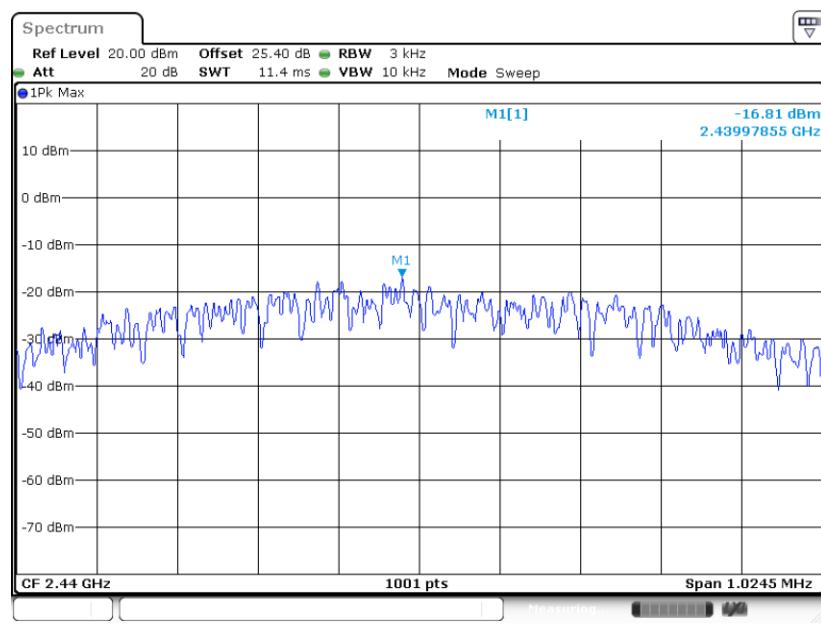
<Ant. 1>

<1Mbps>

PSD 3kHz Plot on Channel 00

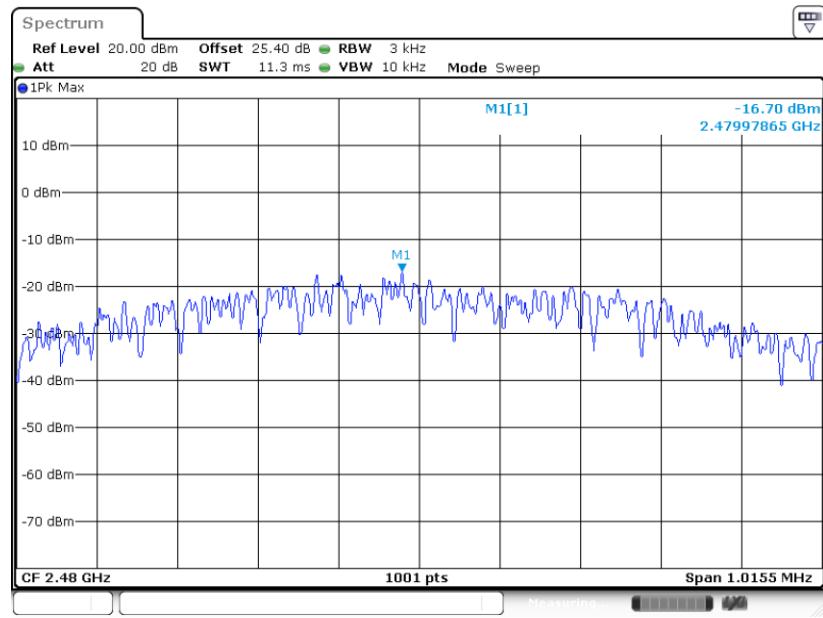


PSD 3kHz Plot on Channel 19



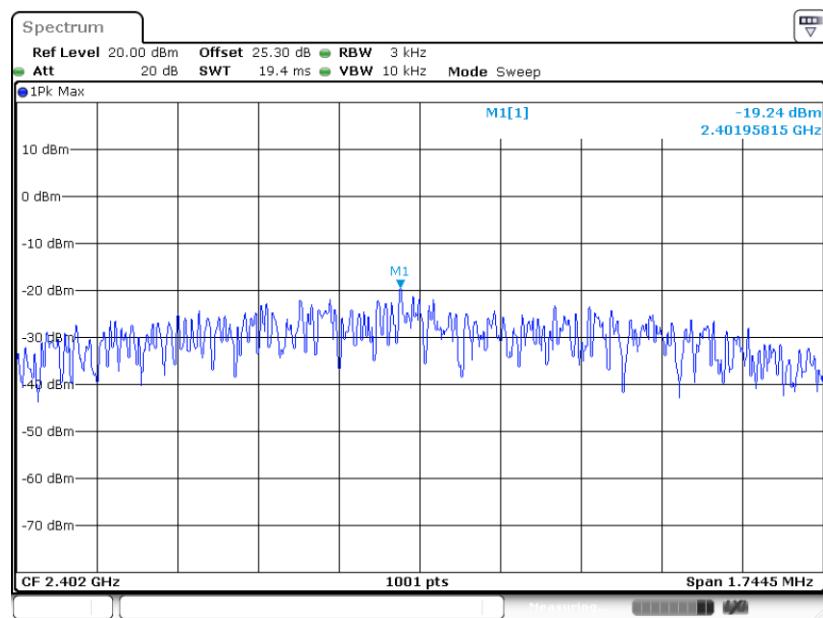


PSD 3kHz Plot on Channel 39



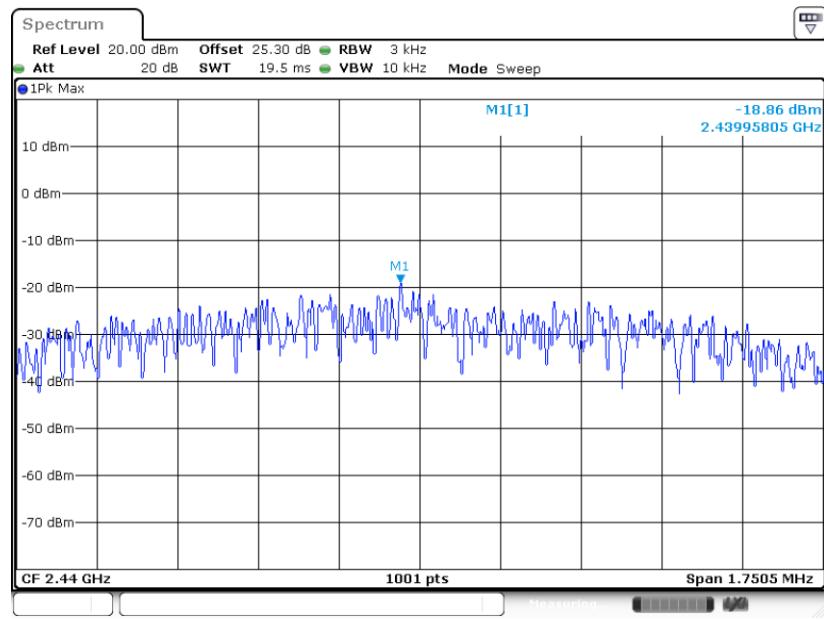
<2Mbps>

PSD 3kHz Plot on Channel 00



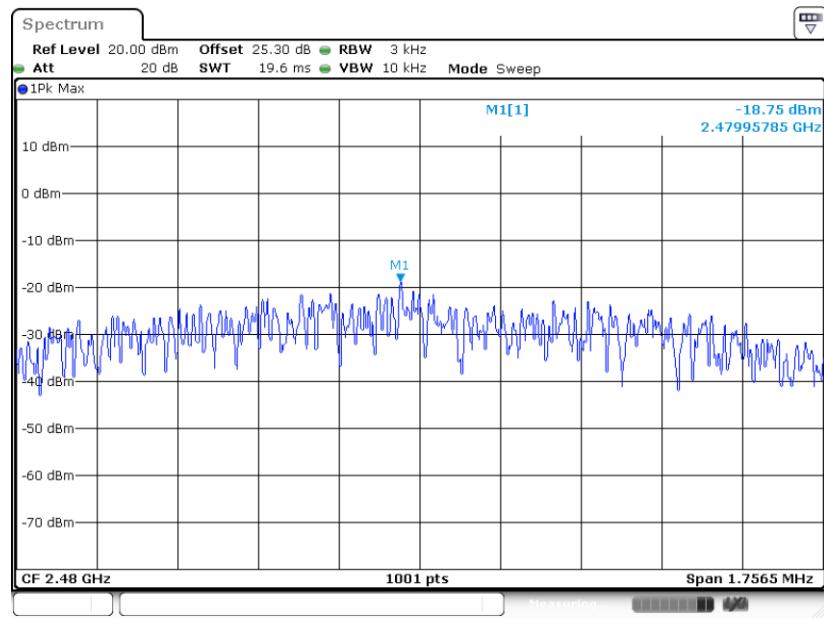


PSD 3kHz Plot on Channel 19



Date: 27.FEB.2020 00:54:48

PSD 3kHz Plot on Channel 39



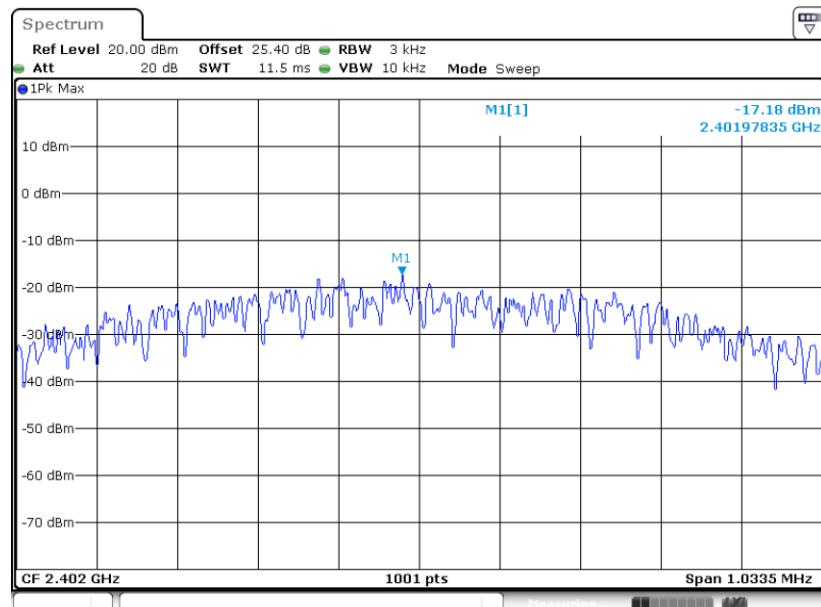
Date: 27.FEB.2020 00:58:01



<Ant. 2>

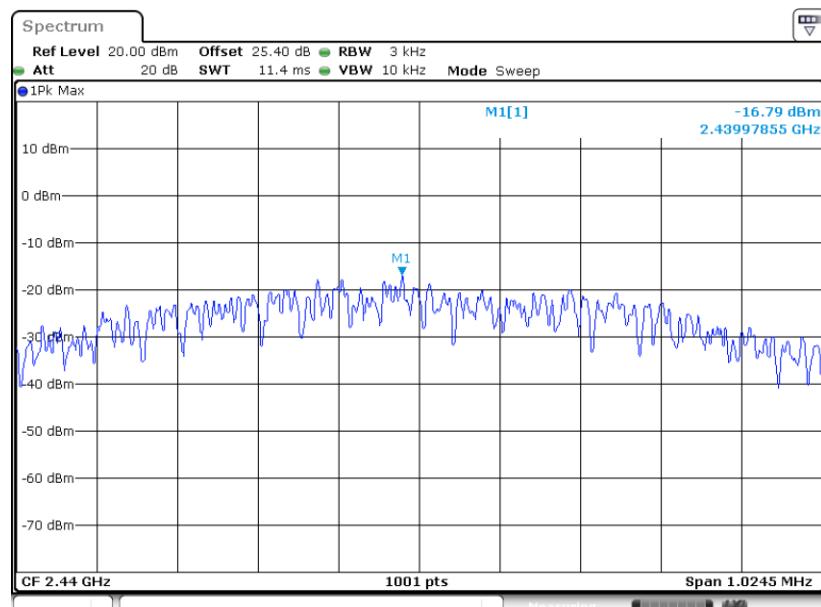
<1Mbps>

PSD 3kHz Plot on Channel 00



Date: 18.NOV.2019 22:50:46

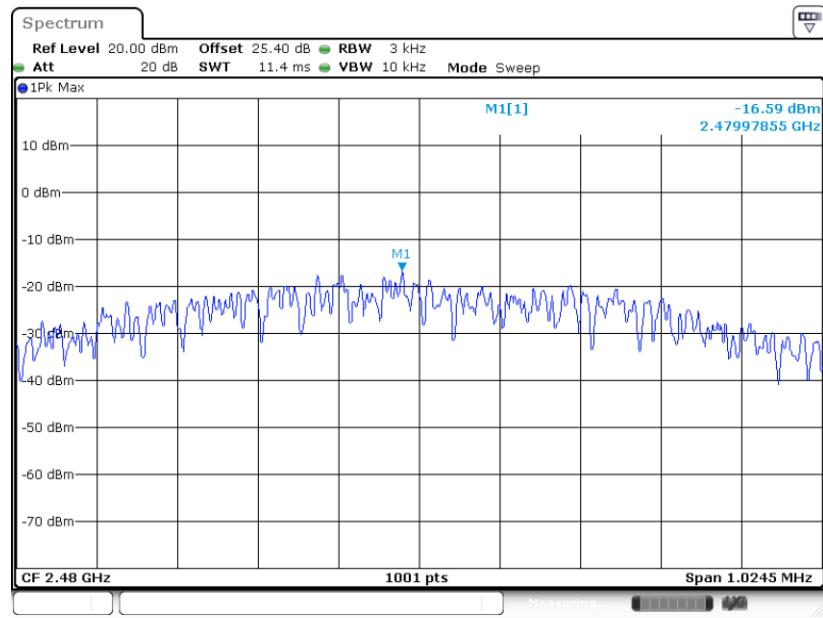
PSD 3kHz Plot on Channel 19



Date: 18.NOV.2019 22:53:36

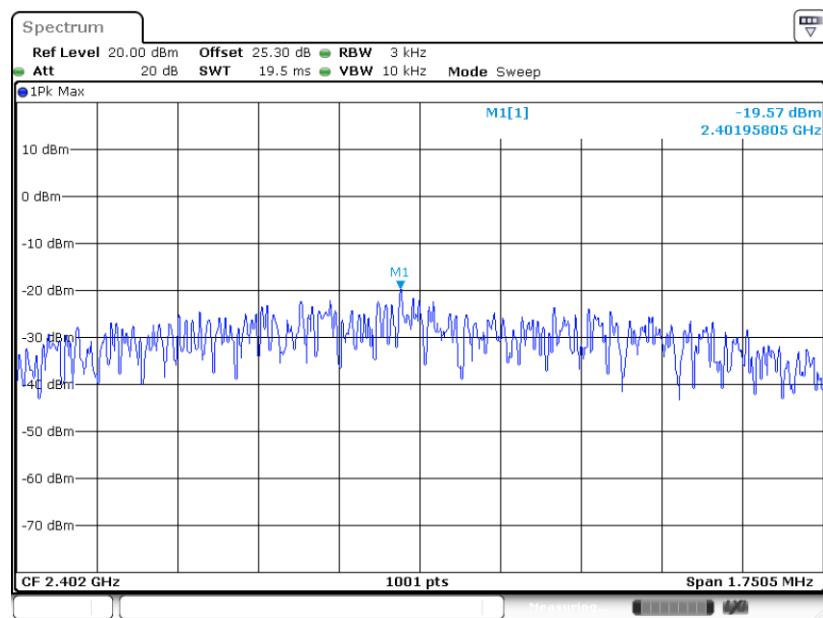


PSD 3kHz Plot on Channel 39



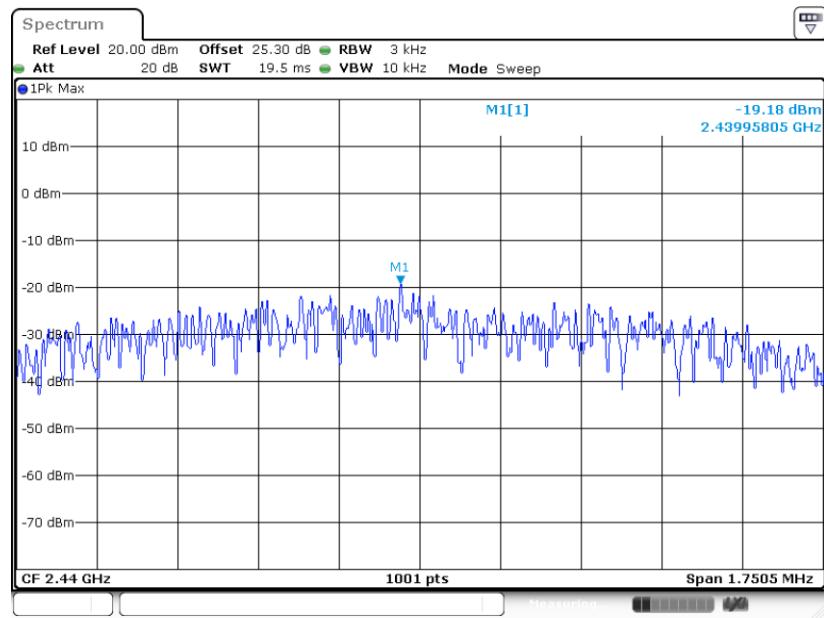
<2Mbps>

PSD 3kHz Plot on Channel 00



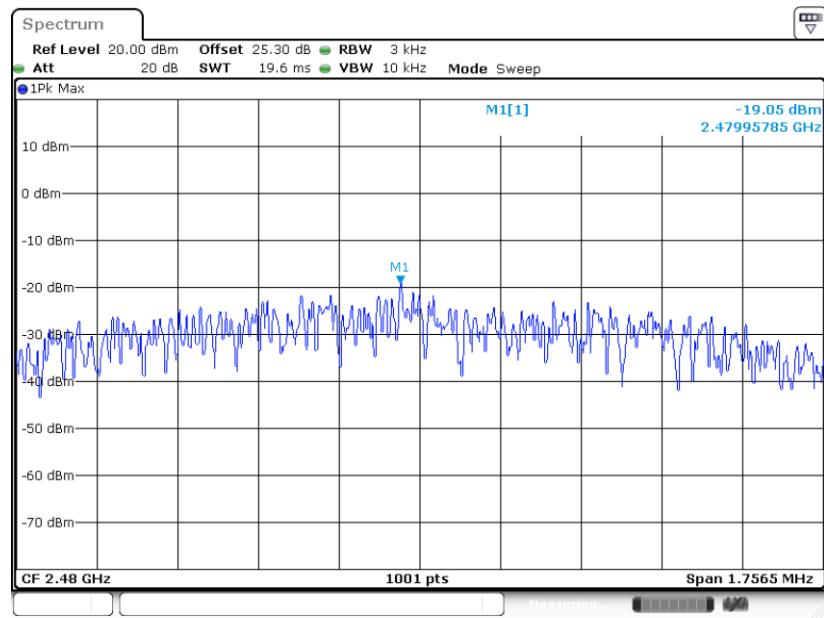


PSD 3kHz Plot on Channel 19



Date: 27.FEB.2020 01:11:28

PSD 3kHz Plot on Channel 39



Date: 27.FEB.2020 01:15:13



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 30 dB down from the highest emission level within the authorized band.

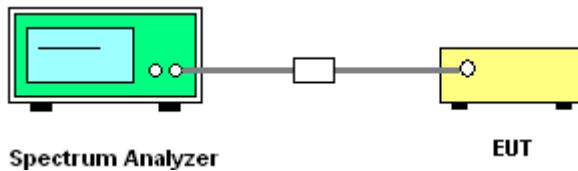
3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedure

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

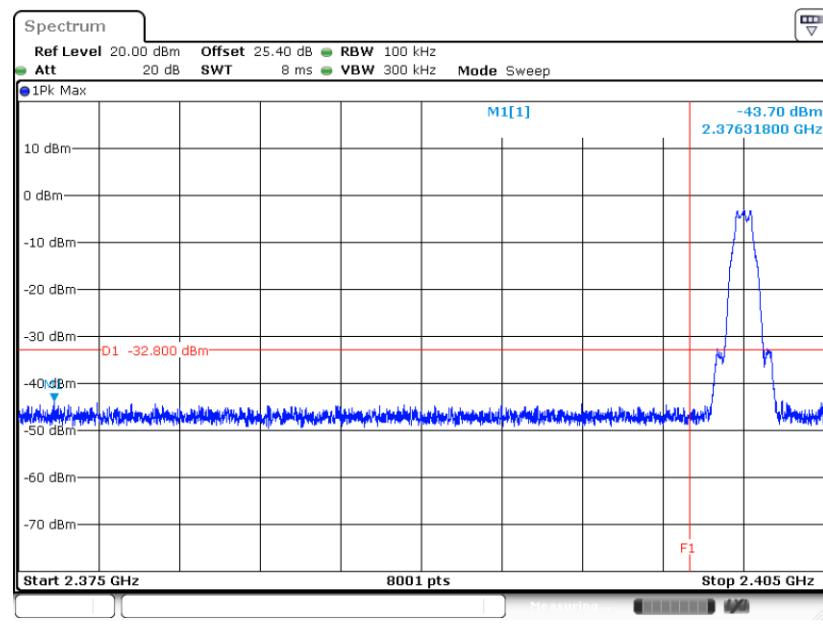


3.4.5 Test Result of Conducted Band Edges Plots

<Ant. 1>

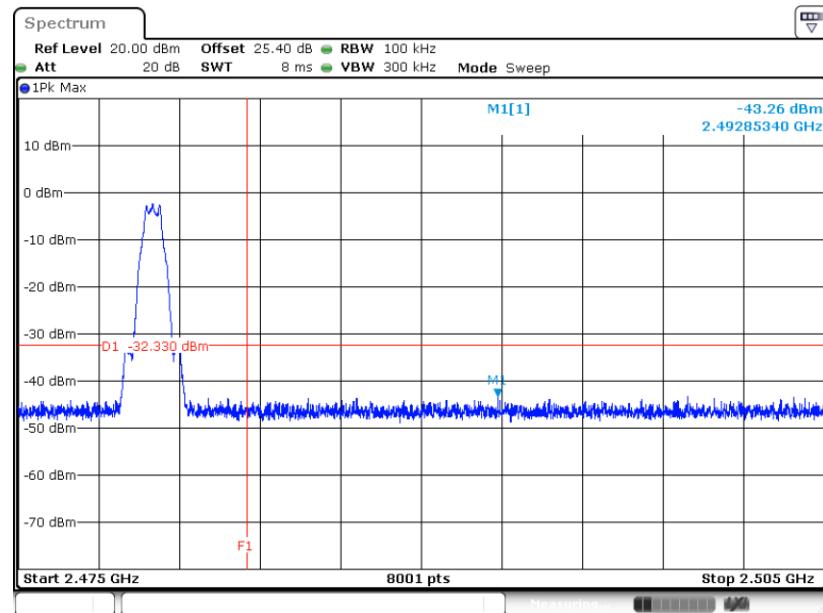
<1Mbps>

Low Band Edge Plot on Channel 00



Date: 18.NOV.2019 22:24:43

High Band Edge Plot on Channel 39

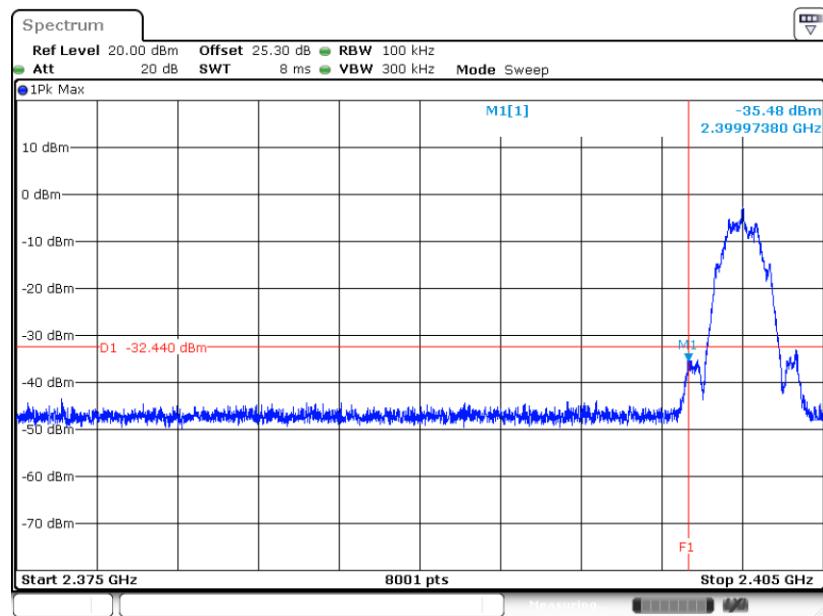


Date: 18.NOV.2019 22:38:12

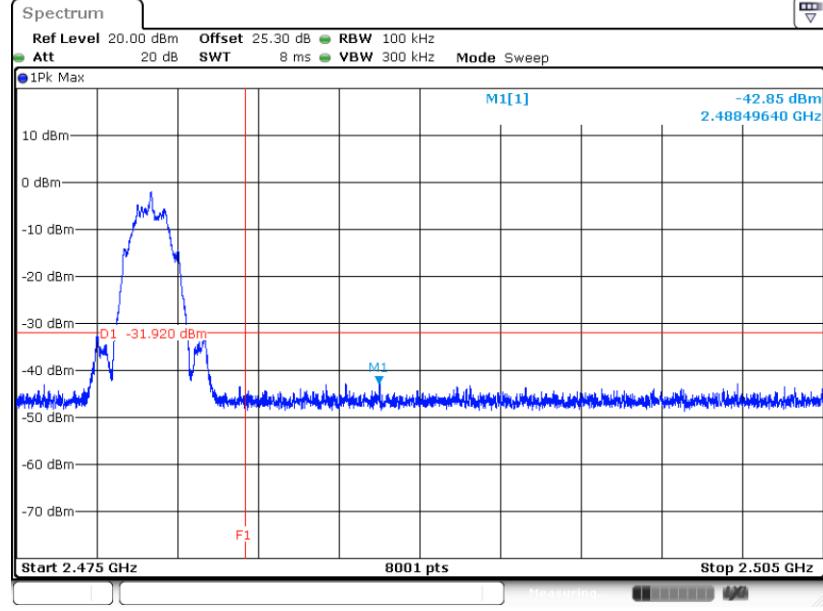


<2Mbps>

Low Band Edge Plot on Channel 00



High Band Edge Plot on Channel 39

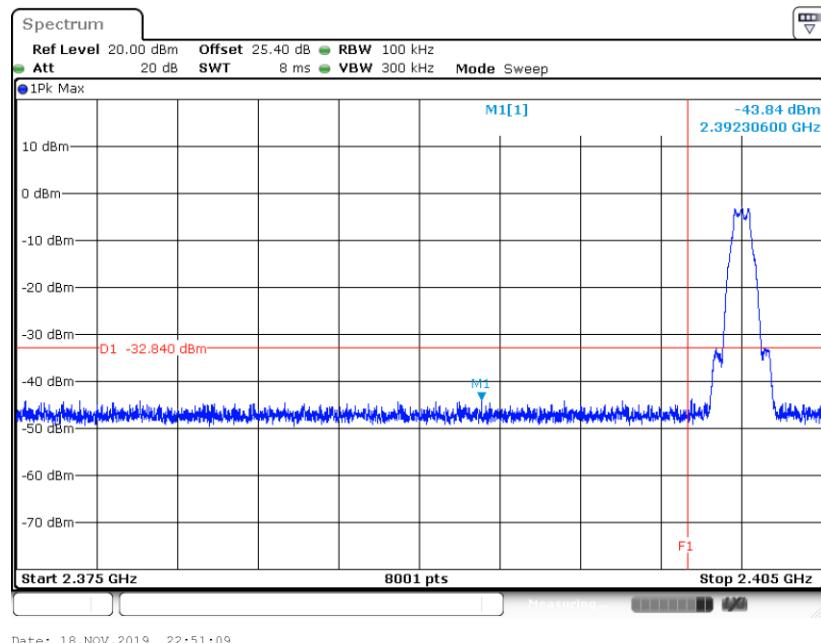




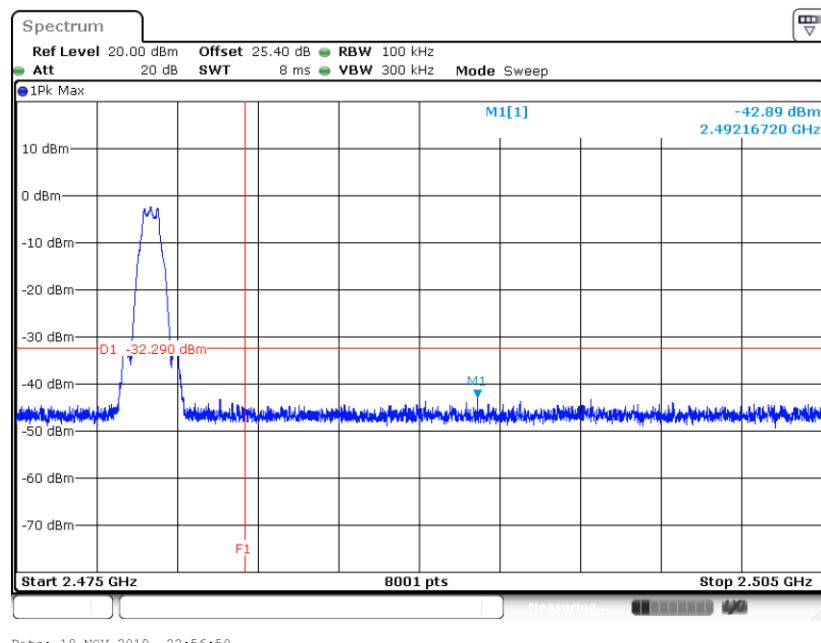
<Ant. 2>

<1Mbps>

Low Band Edge Plot on Channel 00



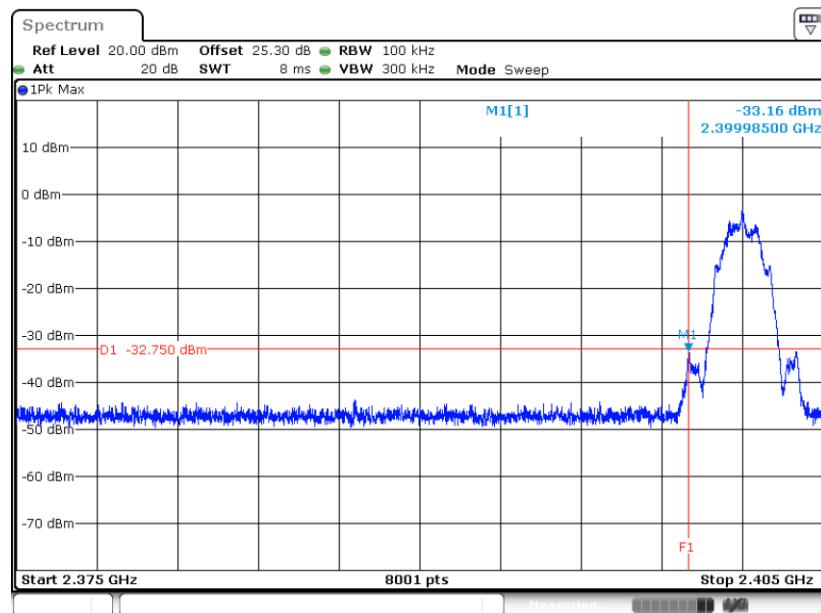
High Band Edge Plot on Channel 39



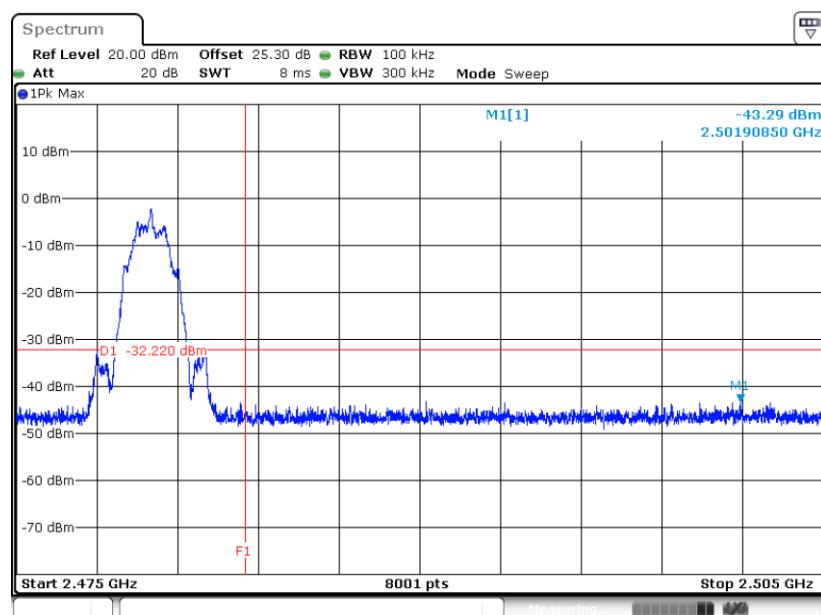


<2Mbps>

Low Band Edge Plot on Channel 00



High Band Edge Plot on Channel 39



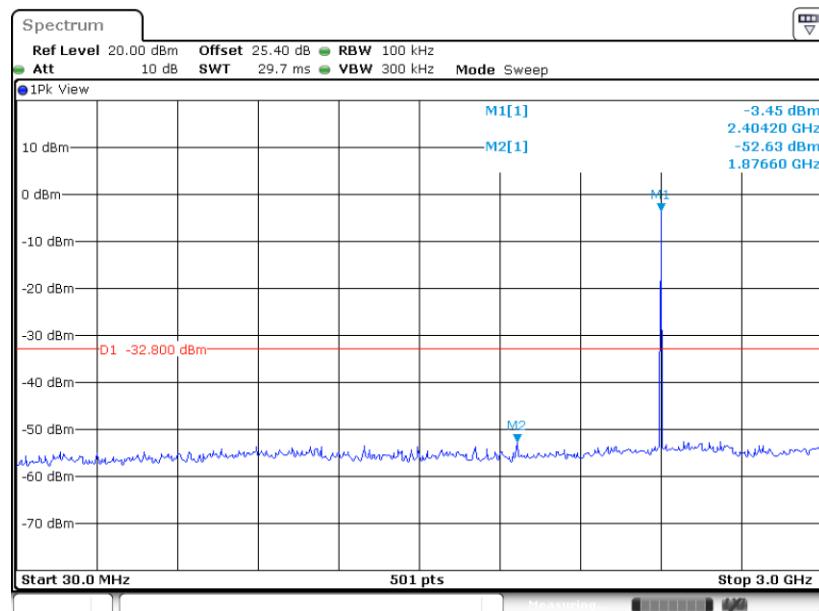
3.4.6 Test Result of Conducted Spurious Emission Plots

<Ant. 1>

<1Mbps>

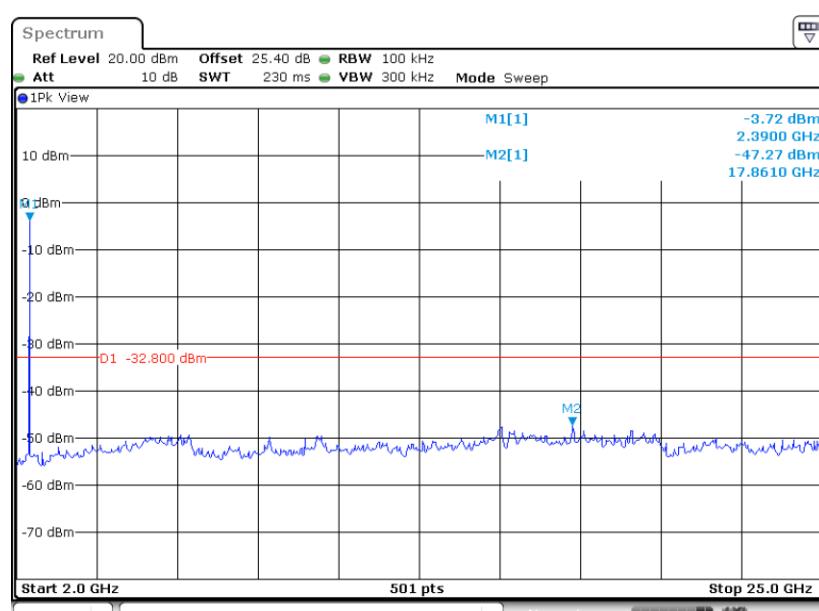
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

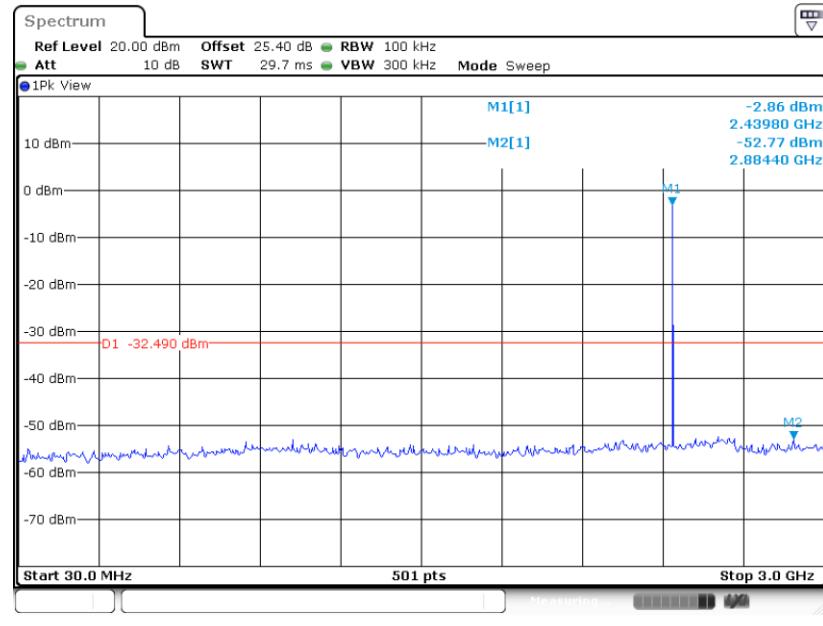
GFSK Channel 00





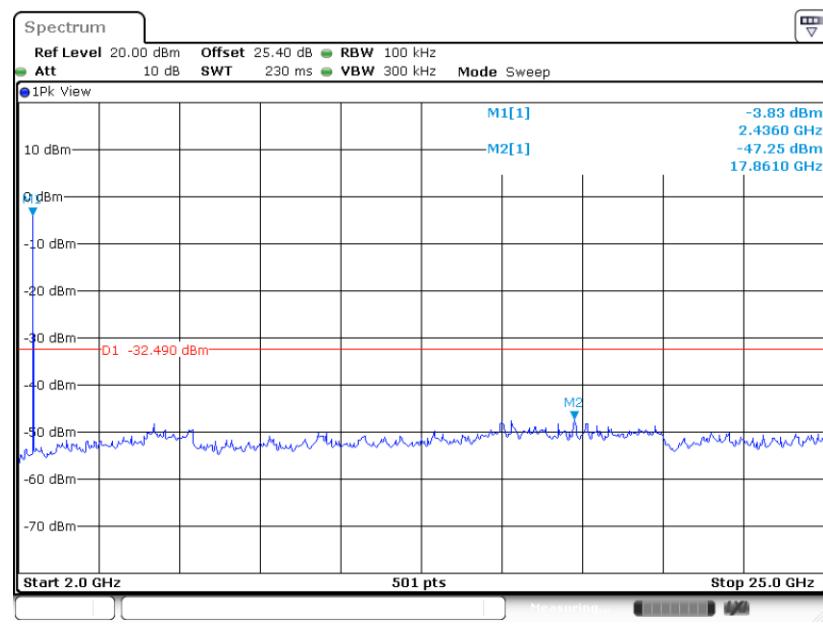
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

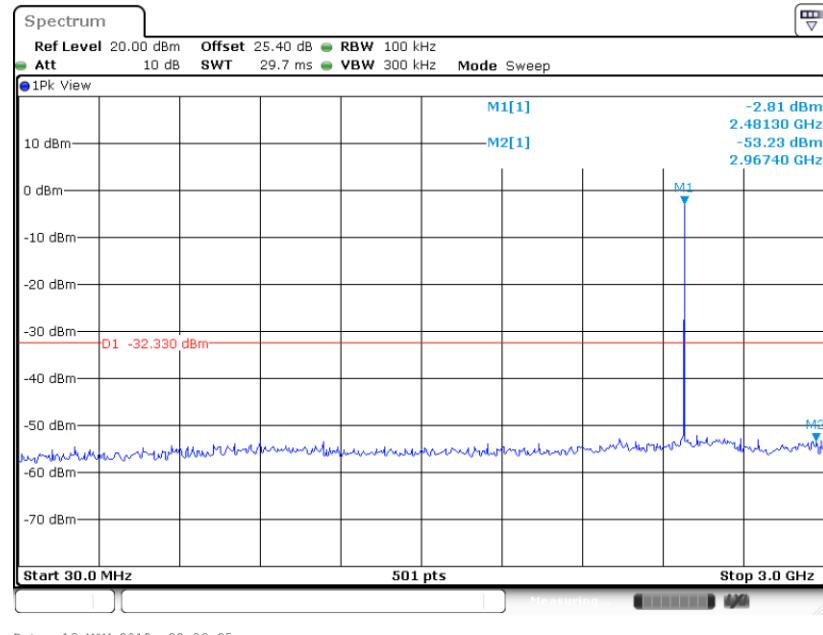
GFSK Channel 19





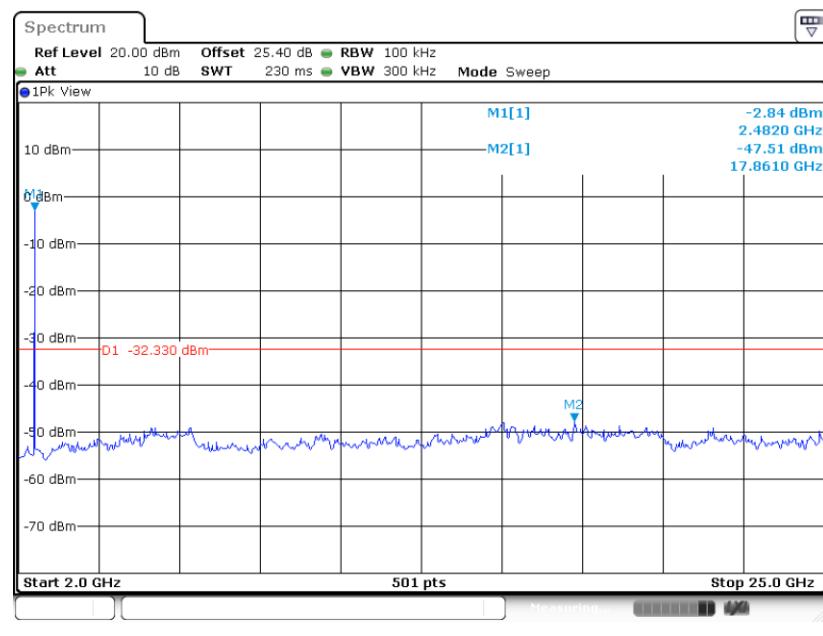
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39

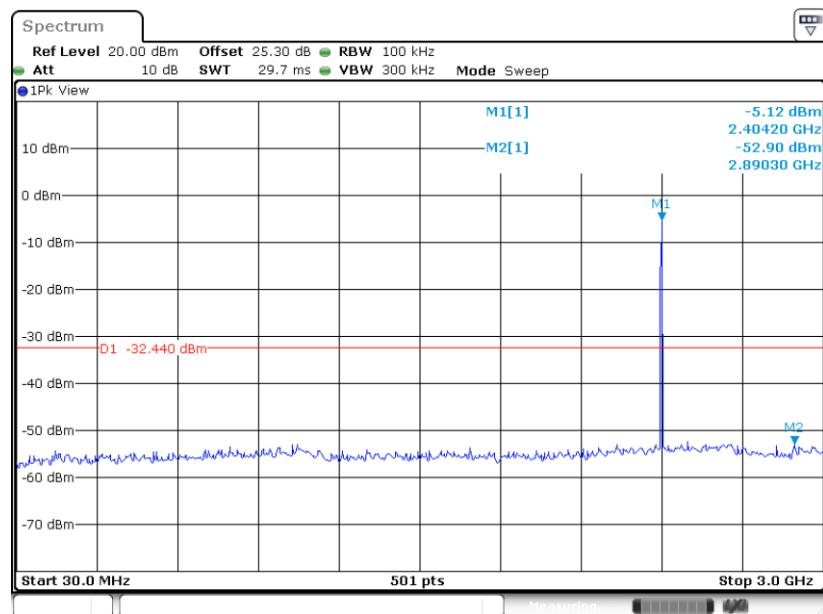




<2Mbps>

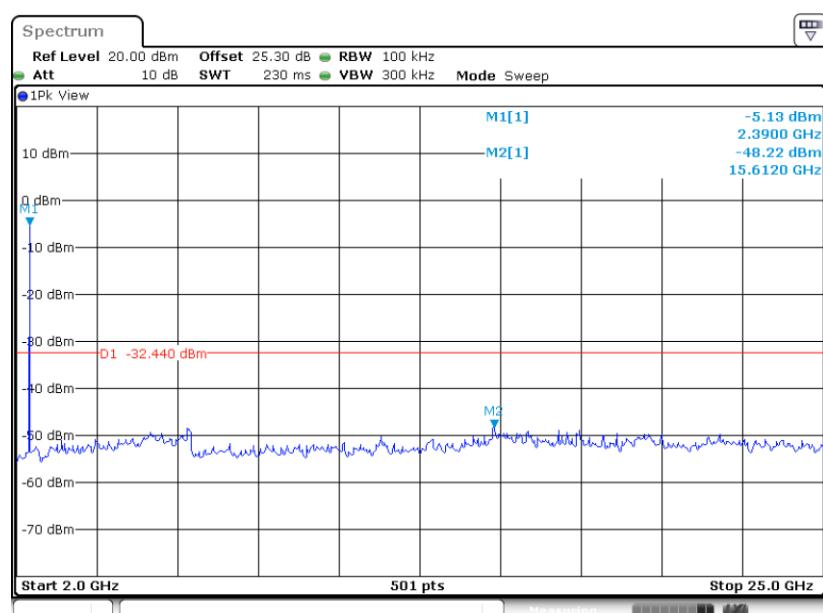
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 00



Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

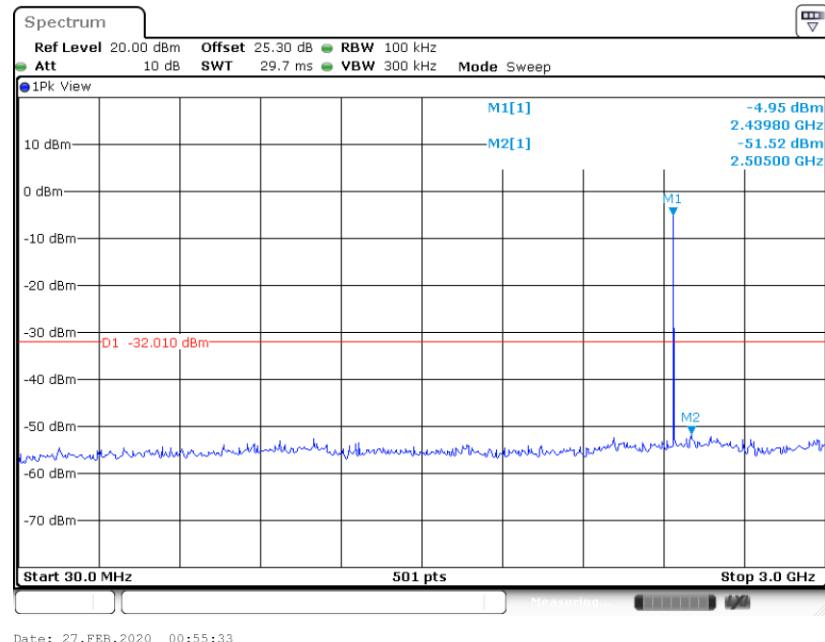
GFSK Channel 00





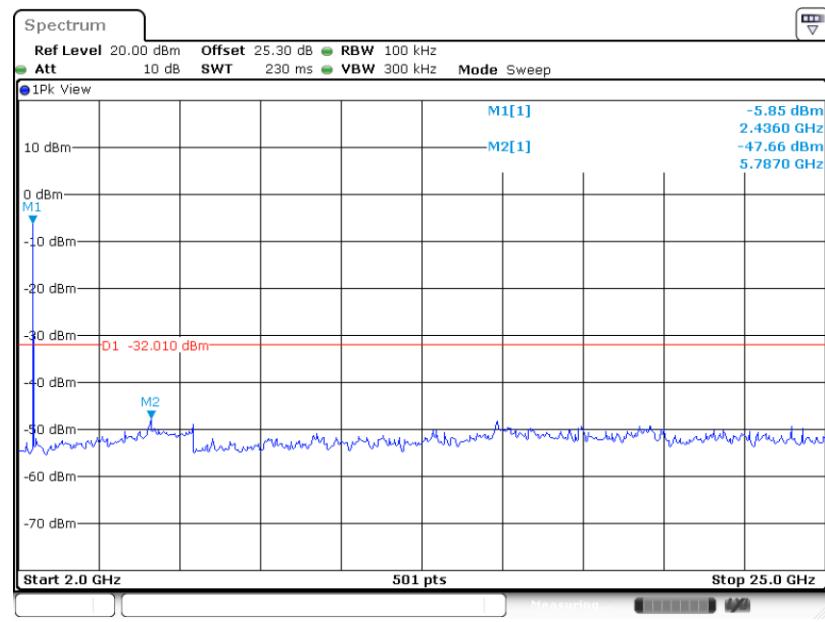
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 19



Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

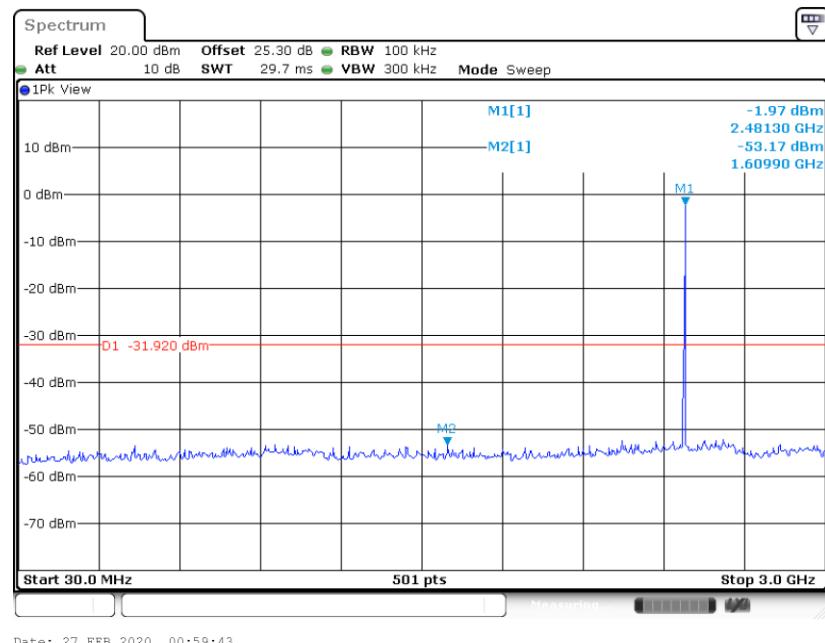
GFSK Channel 19





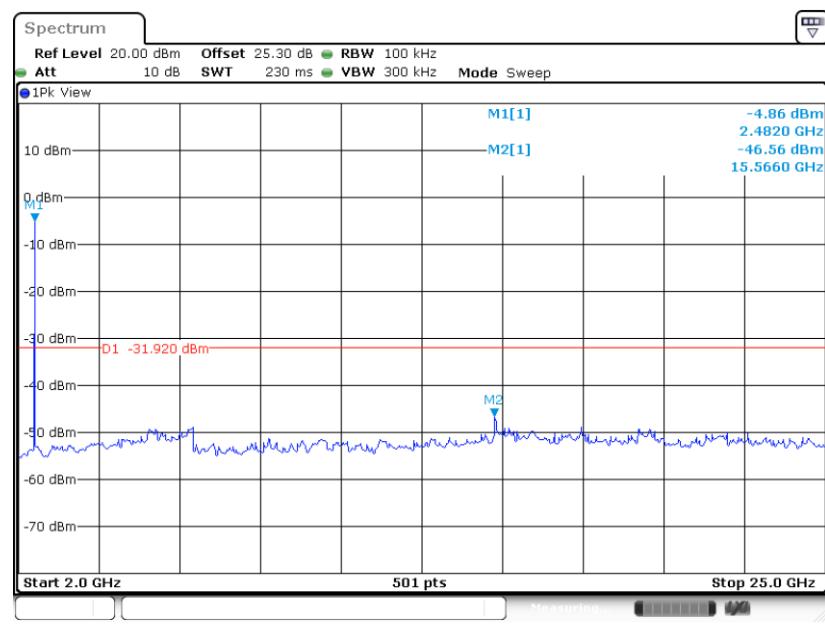
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 39



Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

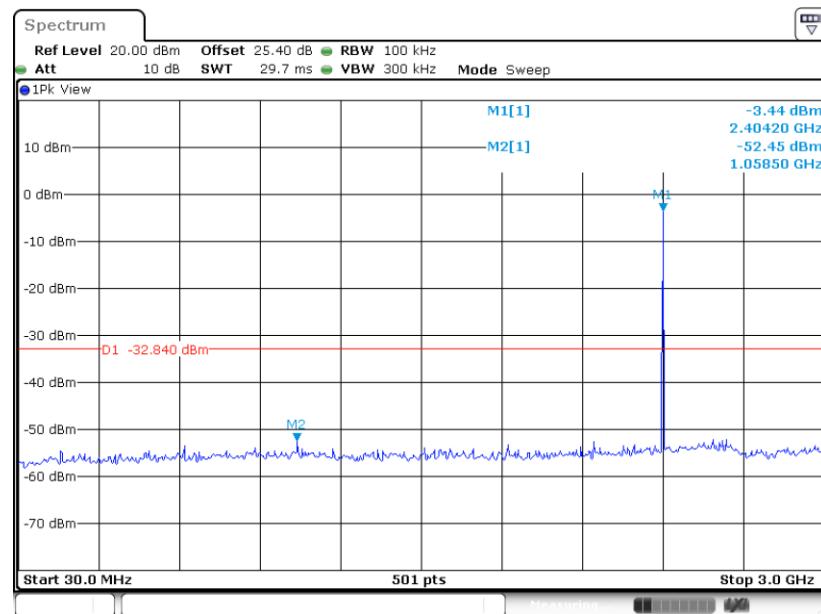
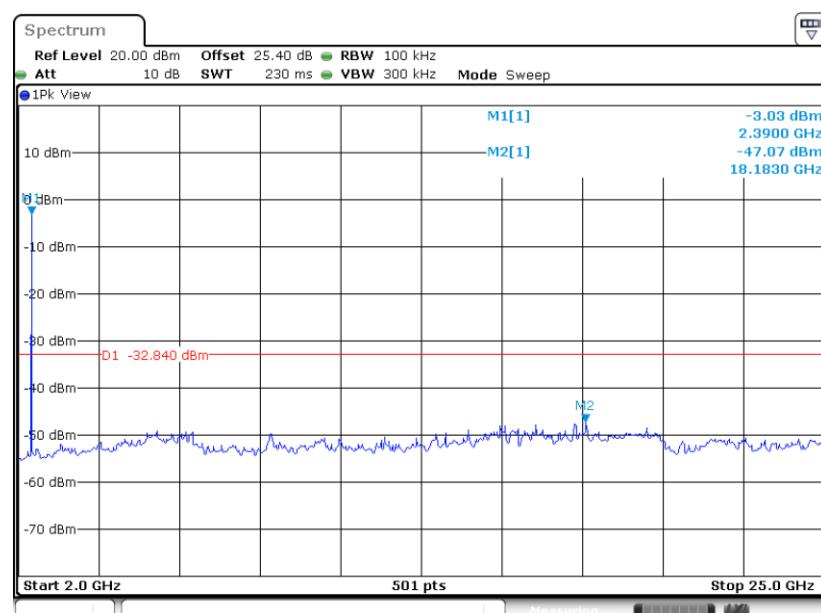
GFSK Channel 39





<Ant. 2>

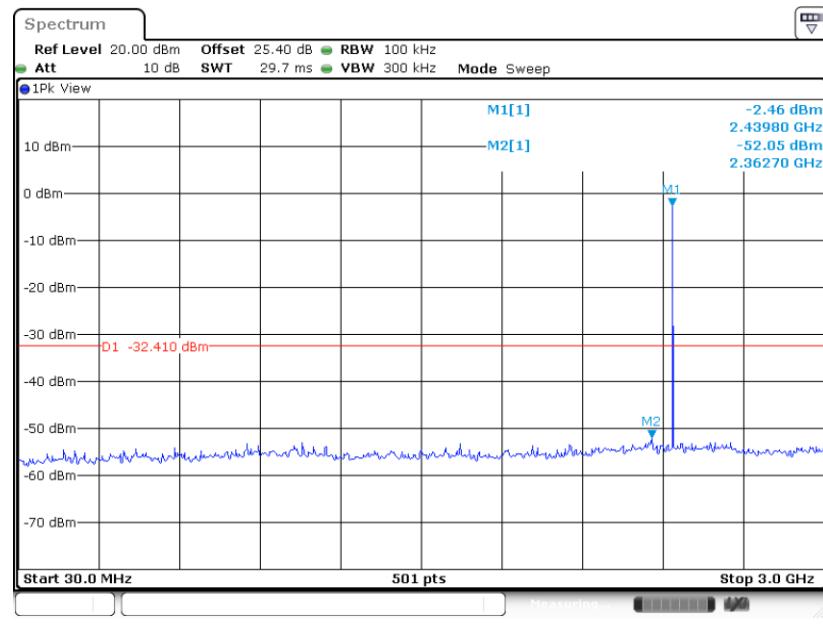
<1Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps**GFSK Channel 00****Conducted Spurious Emission Plot on Bluetooth LE 1Mbps****GFSK Channel 00**



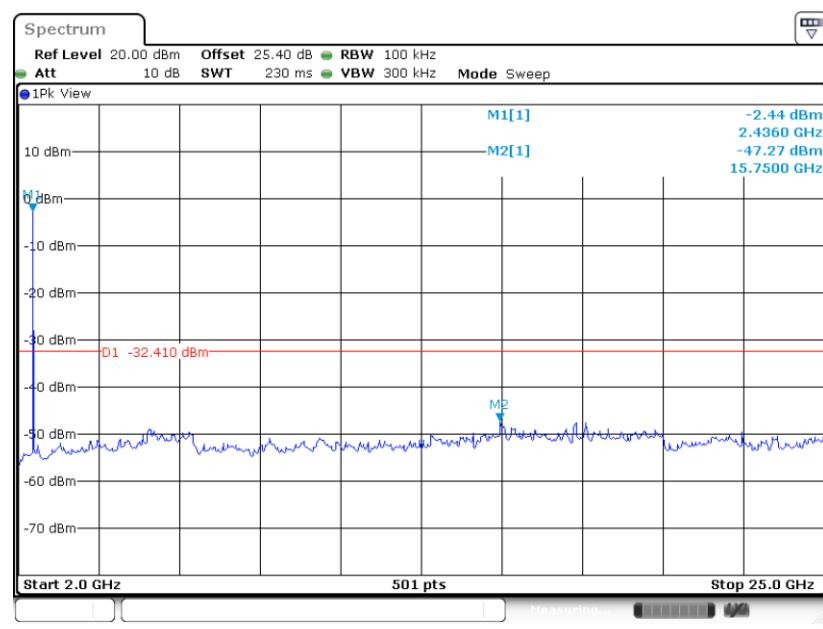
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

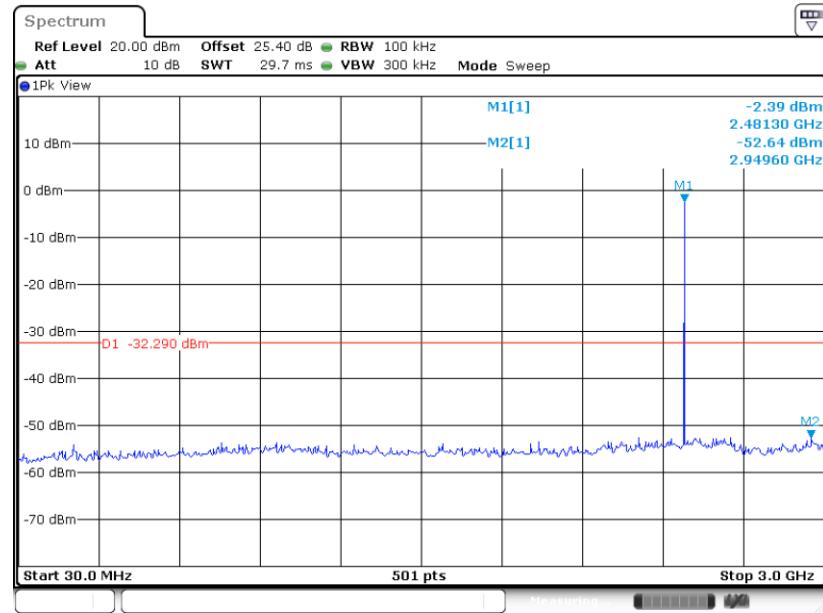
GFSK Channel 19





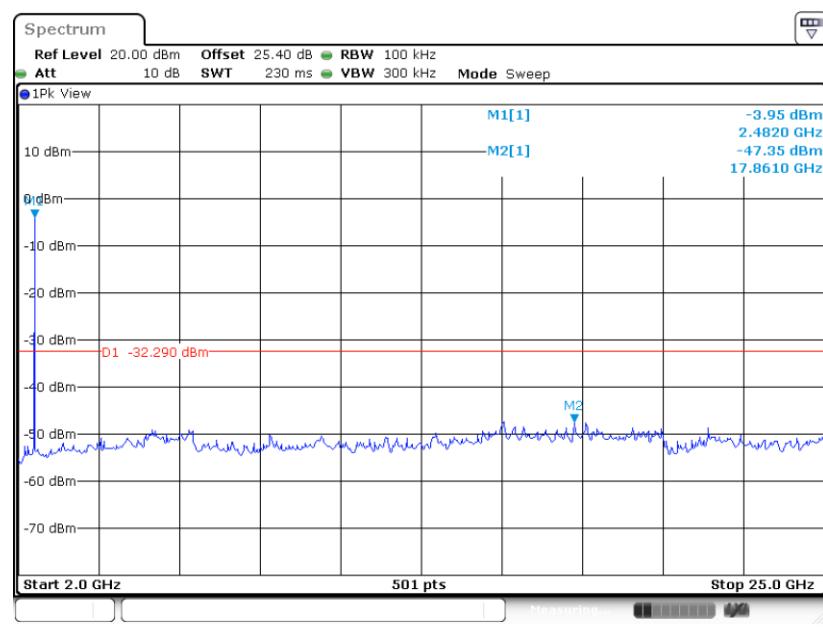
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39

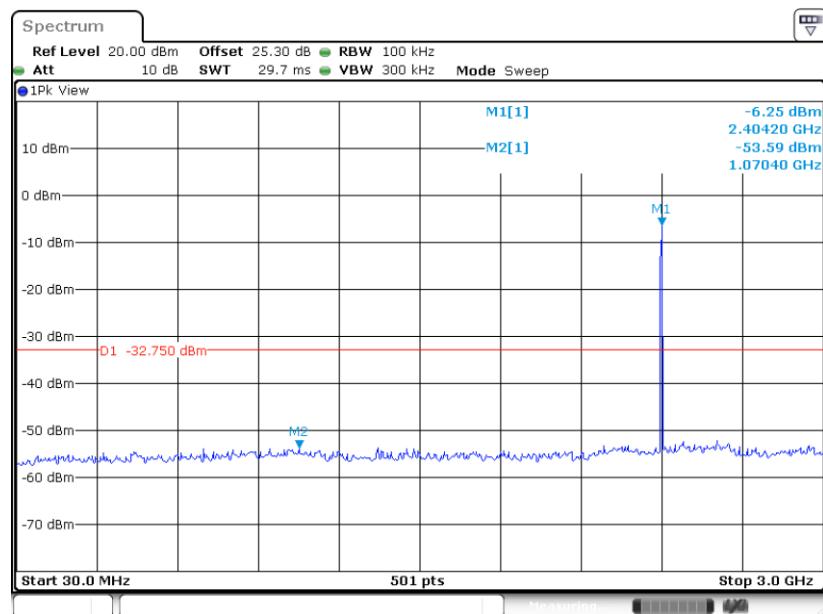




<2Mbps>

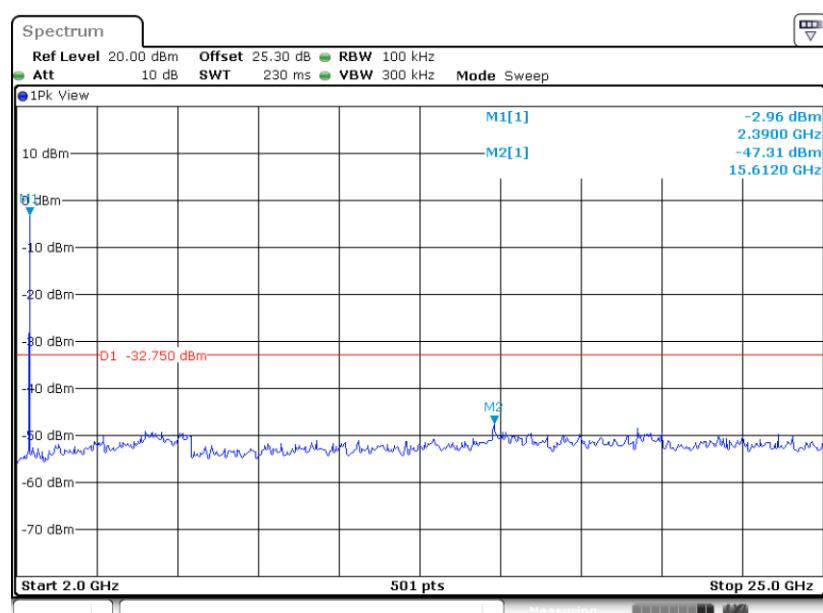
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 00



Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

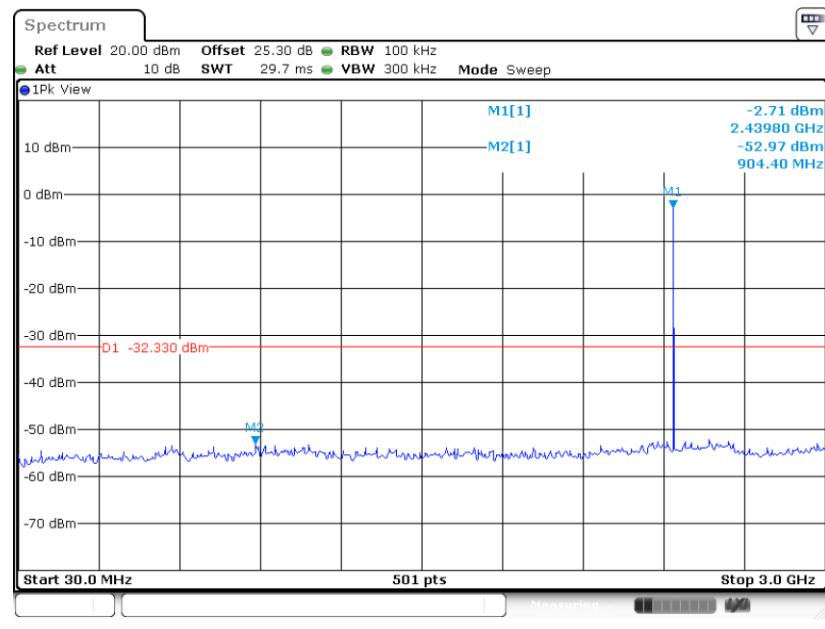
GFSK Channel 00





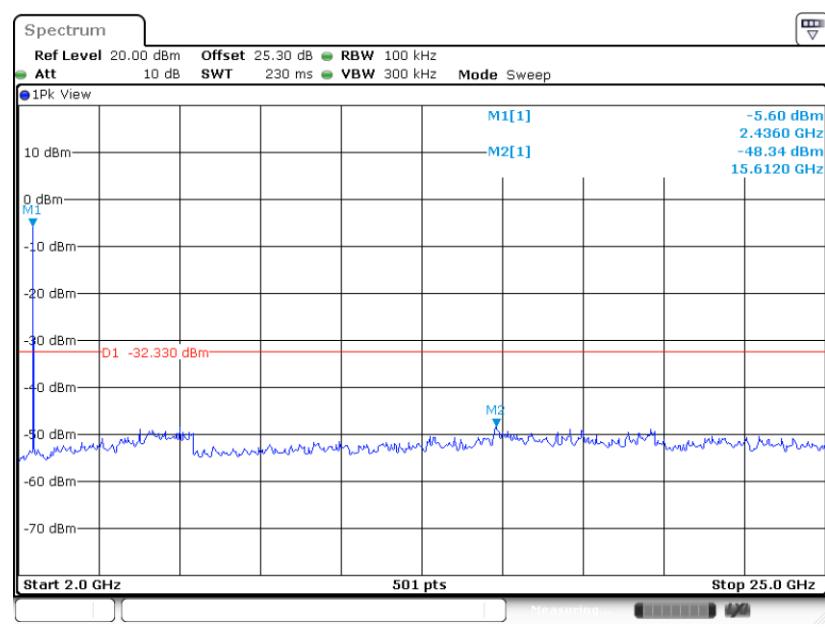
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 19



Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

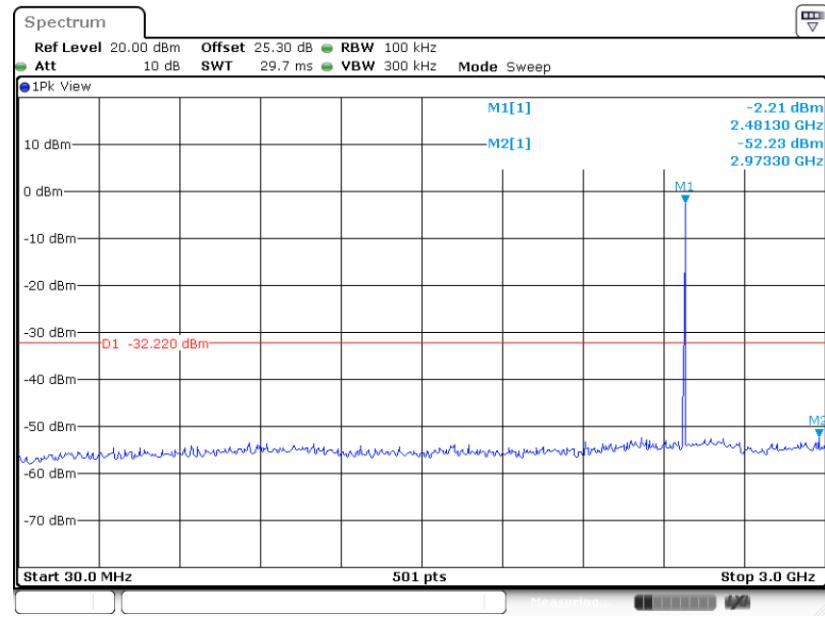
GFSK Channel 19





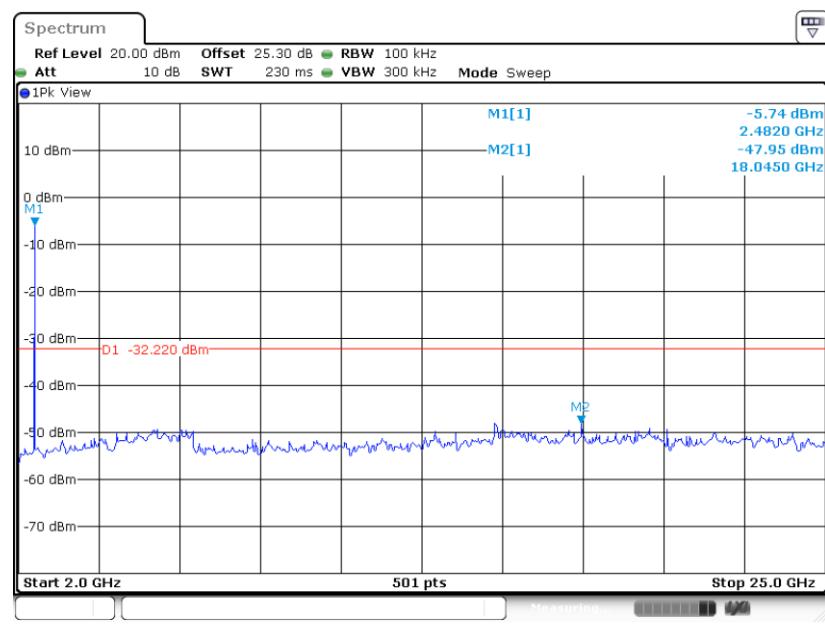
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 39



Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 39





3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

See list of measuring equipment of this test report.



3.5.3 Test Procedures

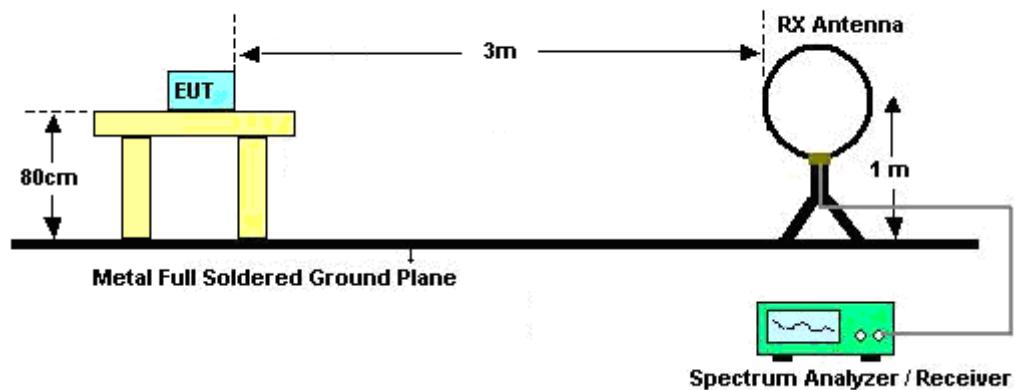
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

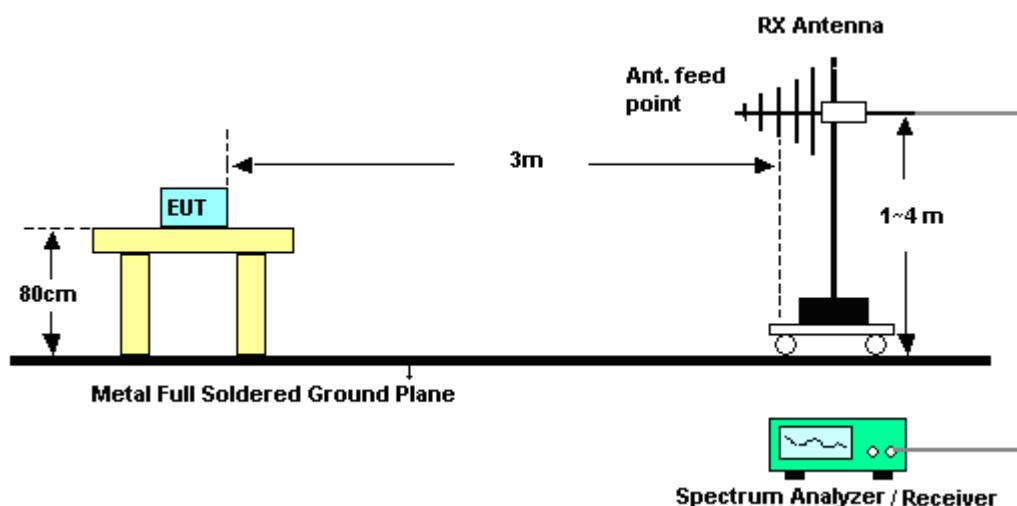
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

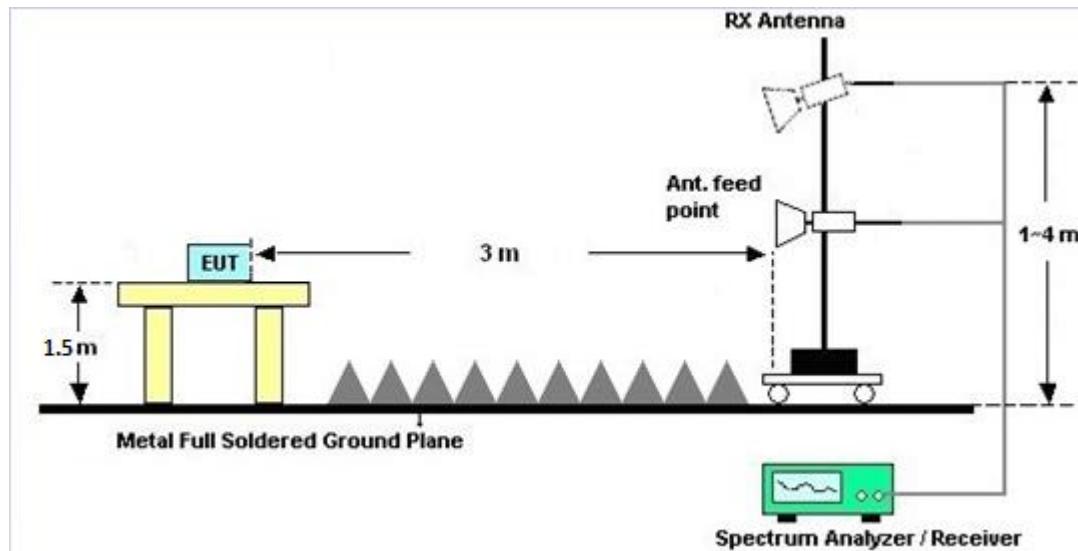
3.5.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz**3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.



3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.