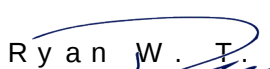


Prüfbericht-Nr.: Test report no.:	50310406 001	Auftrags-Nr.: Order no.:	2381 09482	Seite 1 von 84 Page 1 of 84
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2019.10.07	
Auftraggeber: Client:	KCodes Corporation 7F., No.252 Sec.1, Neihs Rd. Neihs Dist., Taipei, Taiwan			
Prüfgegenstand: Test item:	Wireless USB Device			
Bezeichnung / Typ-Nr.: Identification / Type no.:	KC612ac, WB112ac			
Auftrags-Inhalt: Order content:	FCC Part 15C/ ISSED RSS-247 Test report (Wifi 2.4G)			
Prüfgrundlage: Test specification:	FCC 47CFR Part 15: Subpart C Section 15.247(DTS) ISSED RSS-247 Issue 2 Feb 2017			
Wareneingangsdatum: Date of sample receipt:	2019.10.14			
Prüfmuster-Nr.: Test sample no.:	A001002320-006			
Prüfzeitraum: Testing period:	2019.10.14 - 2020.03.13			
Ort der Prüfung: Place of testing:	EMC/RF Laboratory Taipei			
Prüflaboratorium: Testing laboratory:	TUV Rheinland Taiwan Ltd.			
Prüfergebnis*: Test result*:	Pass			
rüft von: reviewed by:	 Mars Y. J. Lin		genehmigt von: authorized by:	 Ryan W. T. Chen
Datum: 2020.03.17 Date:			Datum: 2020.03.17 Date:	
Stellung / Position:	Project Engineer		Stellung / Position:	Project Manager
Sonstiges / Other:	KC612ac and WB112ac use the same RF Chip.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT

RESULT: *Passed*

5.1.2 PEAK OUTPUT POWER

RESULT: *Passed*

5.1.3 6dB BANDWIDTH AND 99% BANDWIDTH

RESULT: *Passed*

5.1.4 POWER DENSITY

RESULT: *Passed*

5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100KHz BANDWIDTH

RESULT: *Passed*

5.1.6 SPURIOUS EMISSION

RESULT: *Passed*

5.2.1 MAINS CONDUCTED EMISSIONS

RESULT: *Passed*

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: *Passed*

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1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix P: Photo Documentation internal view
(File Name: 50310406 001 001, 50310407 001 Appendix P)

Appendix D: Test Result of Radiated Emissions
(File Name: 50310406 001 001 Appendix D)

Test Specifications

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.247 FCC 47CFR Part 2: Subpart J Section 2.1091 ANSI C63.10:2013 ISED RSS-247 Issue 2 Feb 2017 ISED RSS-Gen Issue 5 Apr 2018 ISED RSS-102 Issue 5 Mar 2015 KDB662911 D01 Multiple Transmitter Output v02r01 KDB662911 D02 MIMO with Cross Polarized Antenna v01 KDB447498 D01 General RF Exposure Guidance v06 KDB558074 D01 DTS Meas Guidance v05

1.2 Decision Rule of conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

TUV Rheinland Taiwan Ltd.

AC Mains Conduction:
11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)
FCC Registration No.: 180491
IC Canada Registration No.: 9465A

Conducted Test / Radiated Test:
No. 458-18, Sec 2, Fenliao., Linkou Dist.
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 226631
IC Canada Registration No.: 25563

TAF Accredited NCC Test Lab. No.:3567
TAF ISO17025 Certification effective period: 6th-May-2019 to 05th-May-2022



Testing Laboratory
3567

2.3 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESR7	102108	2019/4/17	2020/4/16
Spectrum Analyzer	R&S	FSV40	101112	2019/10/15	2020/10/15
Pre-Amplifier	Agilent	8447D	2944A10772	2020/2/14	2021/2/13
Pre-Amplifier	EMCI	EMC051845SE	980633	2020/2/07	2021/2/06
Pre-Amplifier	EMCI	EMC184045SE	980657	2020/2/07	2021/2/06
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2020/1/14	2021/1/13
Horn Antenna	ETS-Lindgren	3117	00218930	2020/12/27	2021/12/26
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2019/4/12	2020/4/11
Loop Antenna	EMCI	LPA600	287	2019/12/20	2020/12/19
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Cable	HUBER+SUHNER	SUCOFLEX 104EA_9k~18G	800056/4EA	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	804680/4	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	MY37202/4	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800898/2EA	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800901/2EA	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	801027/2EA	2019/4/18	2020/4/17
Thermo Chamber	Giant Force	GHT-150-40-CP-SD	MAA1902-010	2020/2/1	2021/2/1
Signal Generator	R&S	SMB100A03	181335	2020/1/23	2021/1/23
Power Meter	Anritsu	ML2495A	1901008	2019/4/29	2020/4/28
Power Sensor	Anritsu	MA2411B	1725269	2019/4/29	2020/4/28
EXG-B RF Analog Signal Generator	Agilent	N5171B	MY53050377	2019/04/22	2020/04/21
MXG-B RF Vector Signal Generator	Agilent	N5182B	MY53050524	2019/04/22	2020/04/21
Two-Line V-Network (for EUT)	Rohde & Schwarz	ENV216	101243	2019/06/23	2020/06/23
Two-Line V-Network	Rohde & Schwarz	ENV216	101262	2019/07/16	2020/07/16
Telecom ISN 4 Line	Fischer Custom Communications	FFCC-TLISN- T4-02-09	101168	2020/02/03	2021/02/03
Impedance Stabilization Network	TESEQ	ISN T800	51949	2020/02/25	2021/02/25
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54- 102102-HN	2019/07/25	2020/07/25
Test Software	Audix	e3	Ver. 9	N/A	N/A

2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular schedule using in house standards or comparisons.

2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements .

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 0.1 ppm
RF power/RF Exposure(MPE), conducted	± 1.5 dB
RF power density, conducted	± 3 dB
spurious emissions, conducted	± 3 dB
all emissions, radiated	± 6 dB
Temperature	± 1 °C
Humidity	± 5 %
DC and low frequency voltages	±3 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Wireless USB Device. It contains a 2.4GHz compatible chip enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Wireless USB Device
Type Identification	KC612ac, WB112ac
Brand Name	Kcodes
FCC ID	U9XKCODES-612

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	802.11b/g/n20 : 2412MHz ~ 2462MHz 802.11n40 : 2422MHz ~ 2452MHz
Channel Spacing	5 MHz
Channel number	11 for 20MHz 7 for 40MHz
Operation Voltage	110 – 240Vac / 50 – 60Hz
Modulation	802.11b : DSSS(BPSK, QPSK, CCK) 802.11g/n : OFDM(BPSK, QPSK, 16QAM, 64QAM)
Antenna gain	2.0 dBi
Beamforming Mode	No support
Product Type	802.11b: WLAN (2TX, 2RX) 802.11g: WLAN (2TX, 2RX) 802.11n: WLAN (2TX, 2RX)

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
- B. Receiving

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Table 6: Table for Parameters of Test Software Setting

Mode/ Data Rate	Channel Frequency		
	2412 MHz	2437 MHz	2462 MHz
802.11b 1M	33/35	37/39	36/38
802.11g 6M	28/30	41/43	31/33
802.11n HT20	24/26	37/39	25/27
Mode/ Data Rate	2422 MHz	2437 MHz	2452 MHz
802.11n HT40	20/22	26/28	20/22

4.2 Test Operation and Test Software

Setup for testing: Test samples are provided with LAN interface which makes it possible to control them through a test software installed on a notebook computer.

This software MT76xxE_AP.exe was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:
A001002320-006

Full test was applied on all test modes, but only worst case was shown

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

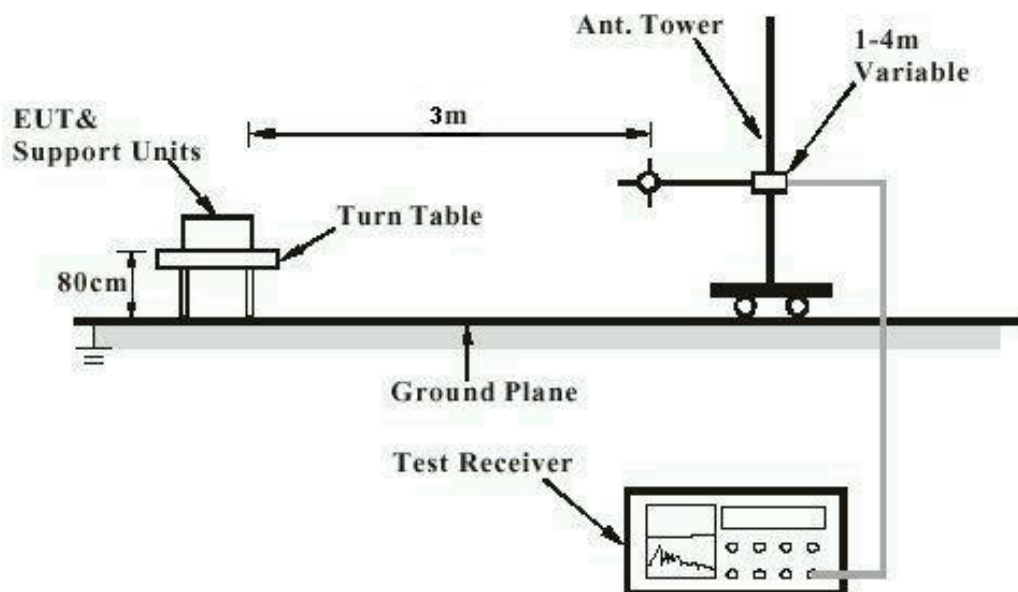
Kind of Equipment	Manufacturer	Model Name	S/N
Adapter	ADAPTER TECH.	ATS012T-W050E	N/A

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)

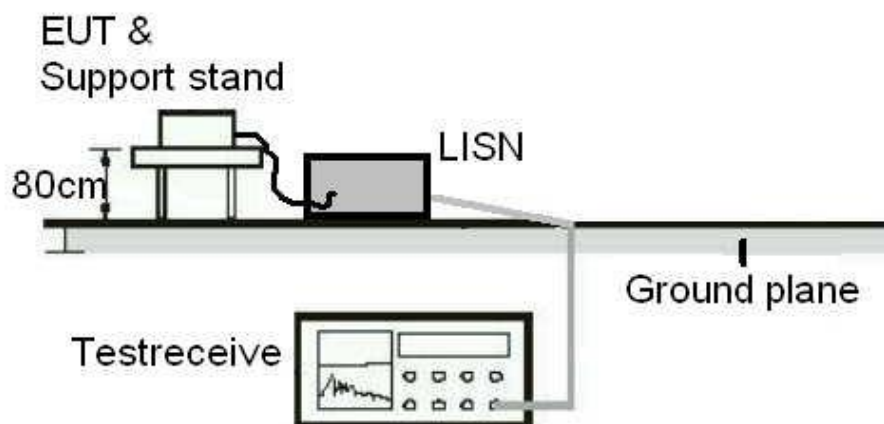
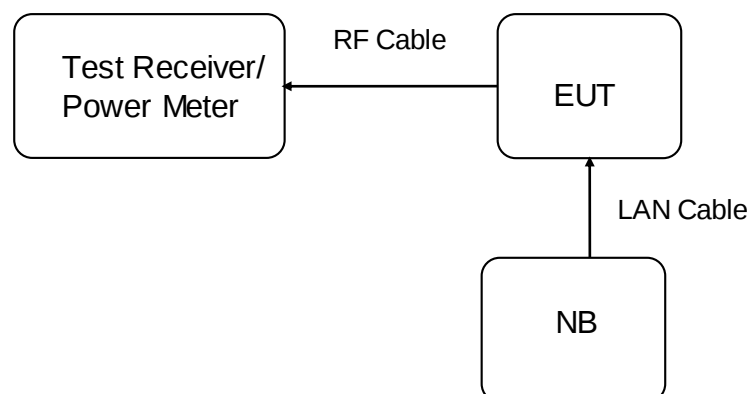


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Passed**

Test standard : FCC Part 15.247(b)(4), Part 15.203 and ISCED
RSS-Gen 6.8

Requirement : use of approved antennas only with directional gains that
do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2.0dBi. The antenna is a printed trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Peak Output Power

RESULT:
Passed

Test standard : FCC Part 15.247(b)(3), ISSED RSS-Gen 5.4(d)
 Basic standard : ANSI C63.10:2013, KDB558074
 Limit : 1 Watt
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A

 Ambient temperature : 20-24 °C
 Relative humidity : 50-65 %
 Atmospheric pressure : 100-103 kPa

Table 7: Test result of Output Power

Mode	Channel Frequency	Peak Output Power (dBm)		Total Peak Output Power	Total Peak Output Power	Total Average Output Power	Limit
	(MHz)	Ant1	Ant2	(dBm)	(W)	(W)	(W)
802.11b	2412	20.88	21.07	23.99	0.25	0.12	1
	2437	22.9	22.79	25.86	0.39	0.23	1
	2462	22.26	22.47	25.38	0.35	0.19	1
802.11g	2412	22.92	22.12	25.67	0.37	0.05	1
	2437	24.16	24.38	27.28	0.53	0.22	1
	2462	23.45	23.8	26.64	0.46	0.06	1
802.11n HT20	2412	21.33	21.56	24.61	0.29	0.04	1
	2437	23.81	24.15	26.99	0.50	0.22	1
	2462	22.21	22.51	25.37	0.34	0.05	1
802.11n HT40	2422	20.08	20.07	23.29	0.21	0.03	1
	2437	22.09	22.25	25.18	0.33	0.06	1
	2452	20.13	20.13	23.09	0.20	0.03	1

5.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:**Passed**

Test standard	:	FCC Part 15.247(a)(2), ISED RSS-247 5.2(a)
Basic standard	:	ANSI C63.10:2013, KDB558074
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A

Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

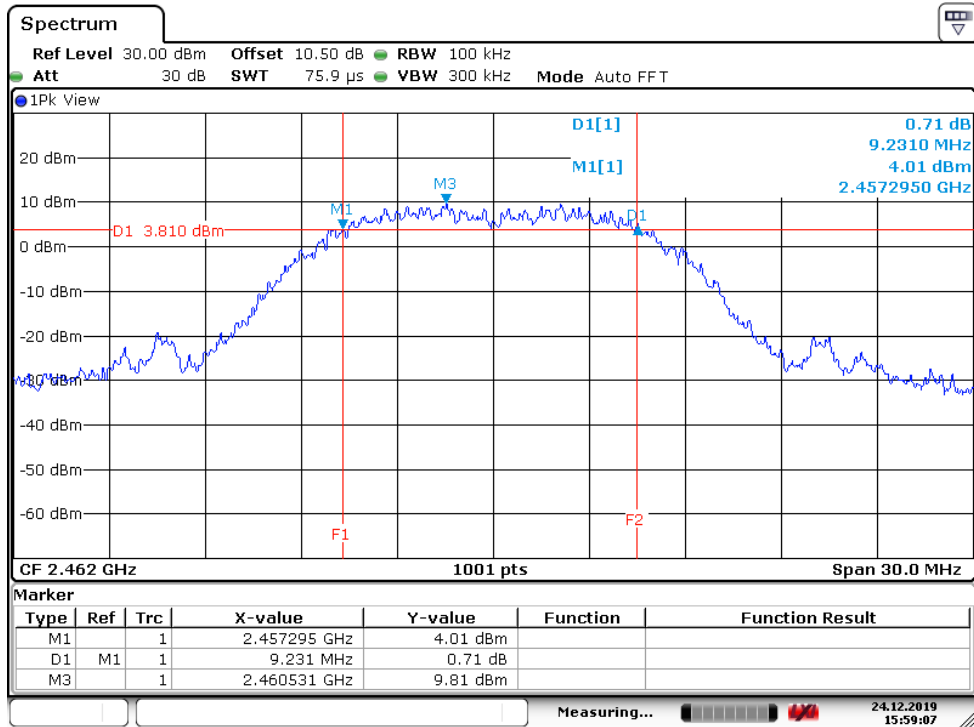
Table 8: Test result of 6dB Bandwidth

Mode	Channel Frequency	6dB Bandwidth (MHz)		Limit	Result
	(MHz)	Ant1	Ant2	(dBm)	
802.11b	2412	9.23	9.23	>500	Pass
	2437	9.65	9.53	>500	Pass
	2462	9.23	9.53	>500	Pass
802.11g	2412	16.36	16.36	>500	Pass
	2437	16.06	16.06	>500	Pass
	2462	16.36	16.33	>500	Pass
802.11n HT20	2412	16.54	16.38	>500	Pass
	2437	16.39	15.70	>500	Pass
	2462	16.39	16.39	>500	Pass
802.11n HT40	2422	35.12	35.12	>500	Pass
	2437	35.10	35.10	>500	Pass
	2452	35.14	35.09	>500	Pass

Table 9: Test result of 99% Bandwidth

Mode	Channel Frequency	99% Bandwidth (MHz)	
	(MHz)	Ant1	Ant2
802.11b	2412	12.20	12.14
	2437	12.53	12.56
	2462	12.41	12.35
802.11g	2412	16.69	16.51
	2437	17.95	17.68
	2462	17.05	16.51
802.11n HT20	2412	17.70	17.78
	2437	26.65	23.34
	2462	17.70	17.66
802.11n HT40	2422	36.28	36.28
	2437	36.36	36.44
	2452	36.28	36.28

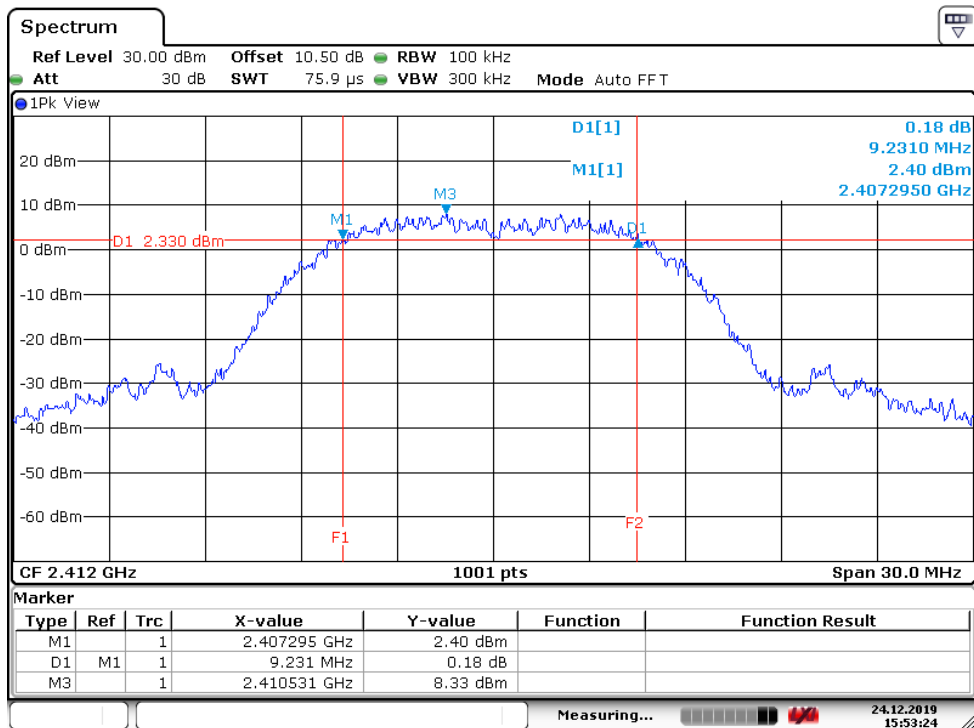
High Channel



Date: 24.DEC.2019 15:59:08

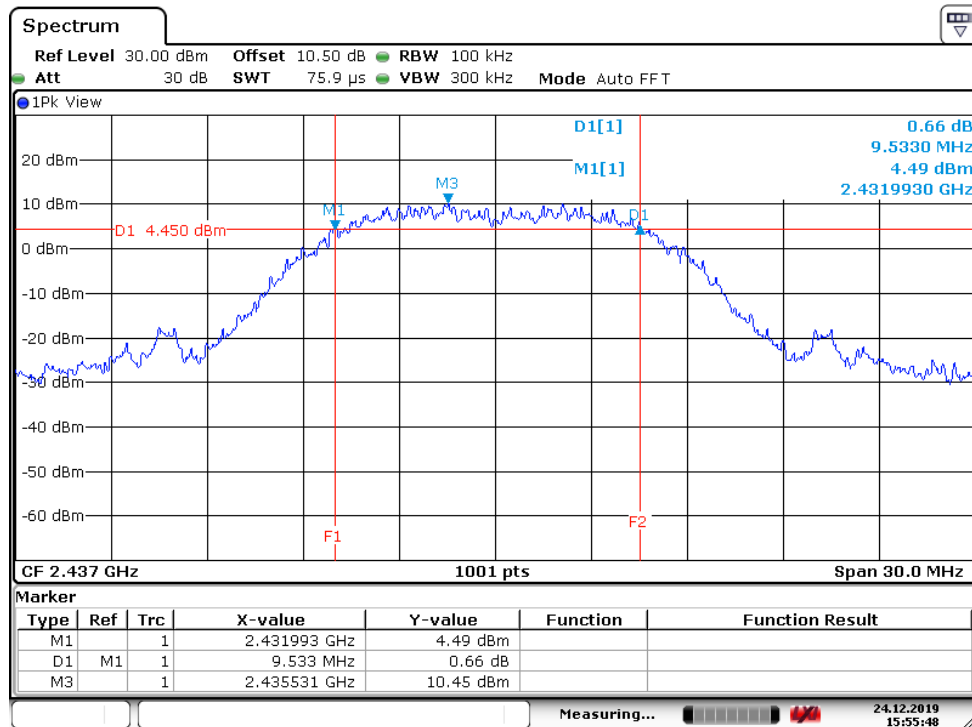
802.11b, Ant 2

Low Channel



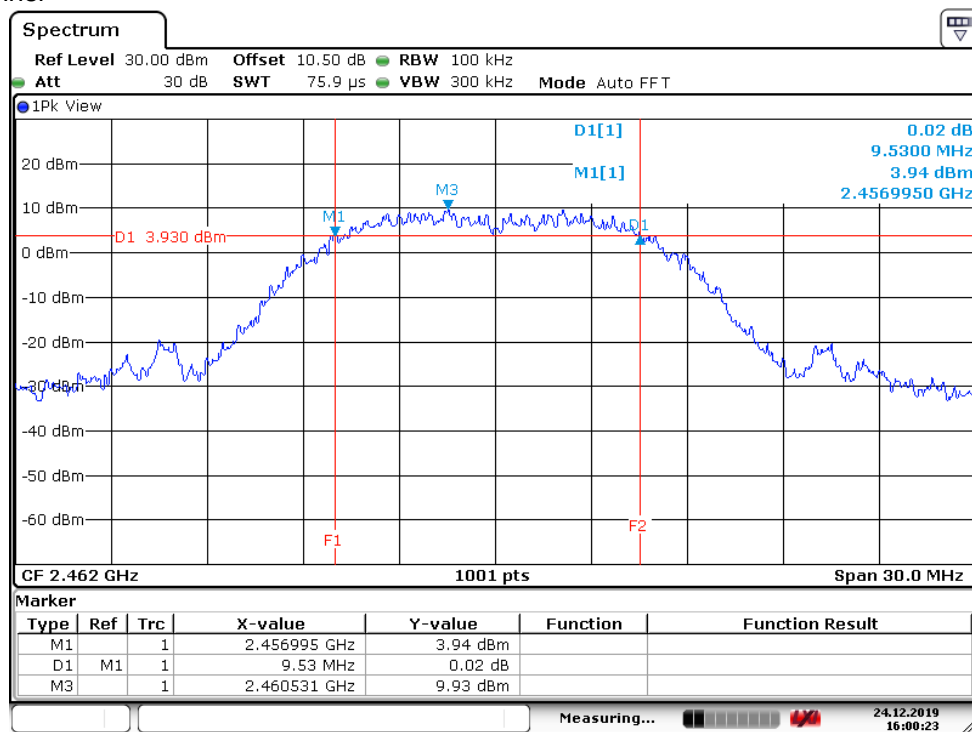
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Middle Channel

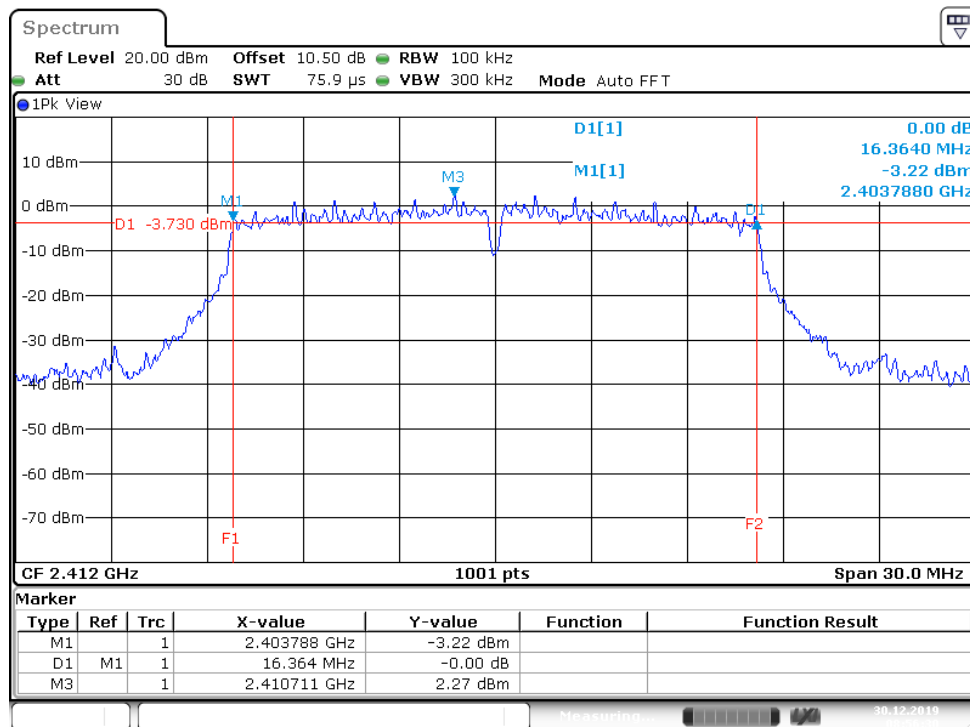


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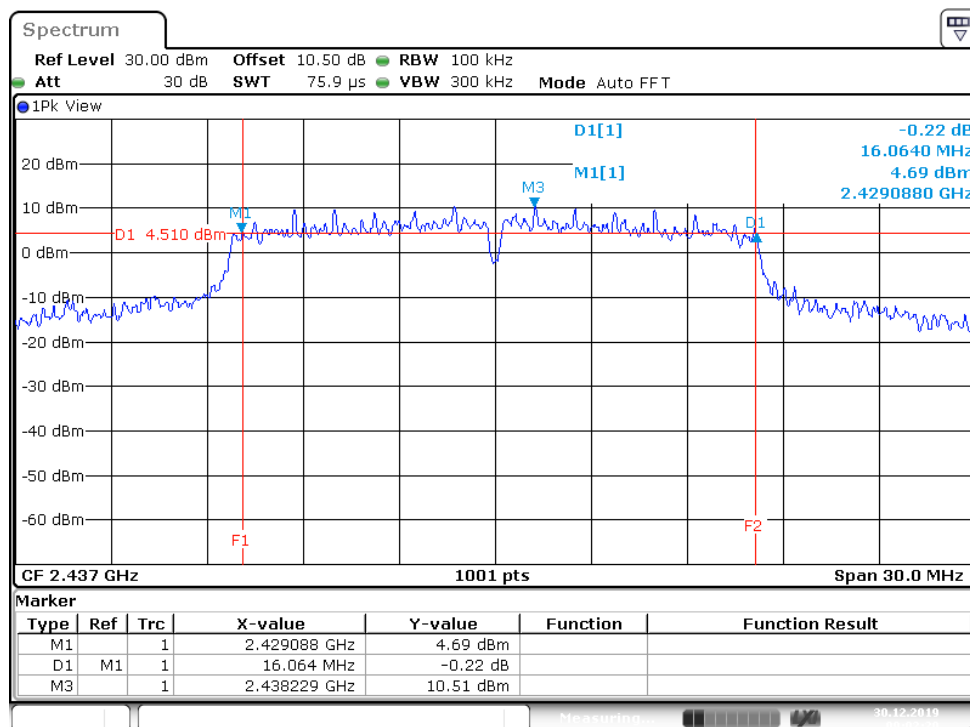
High Channel



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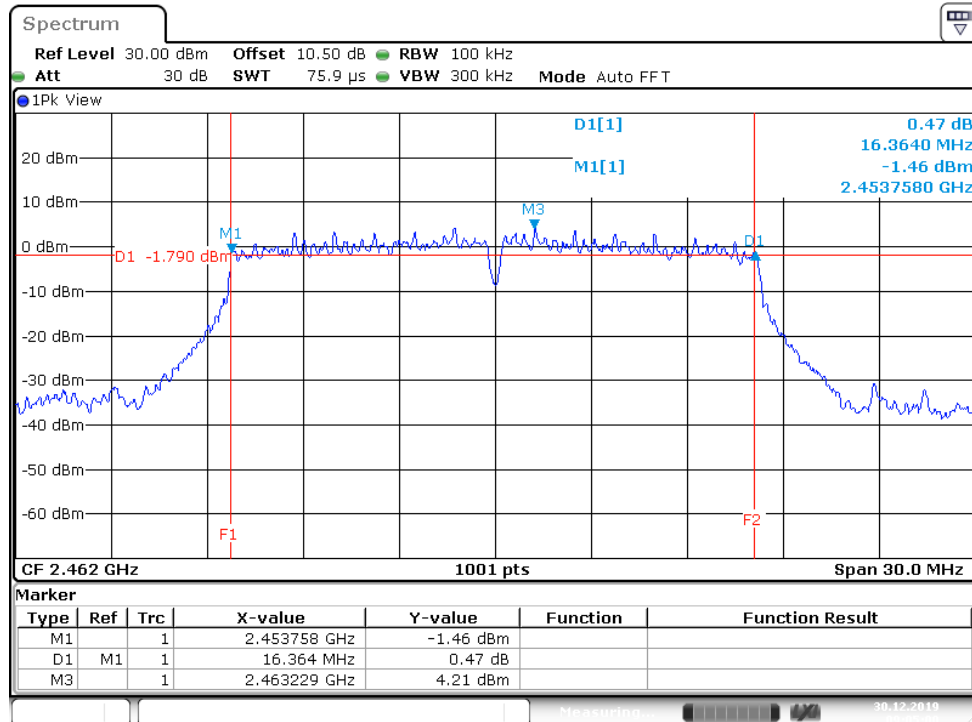
802.11g, Ant 1
Low Channel


Date: 30.DEC.2019 08:56:30

Middle Channel


Date: 30.DEC.2019 09:02:20

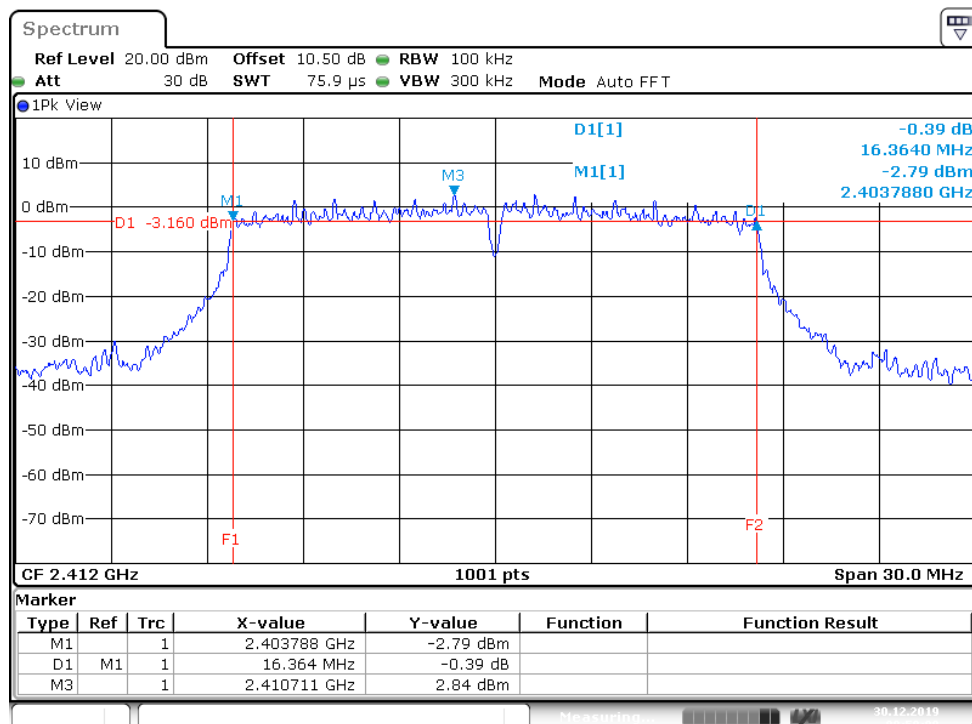
High Channel



Date: 30.DEC.2019 09:05:00

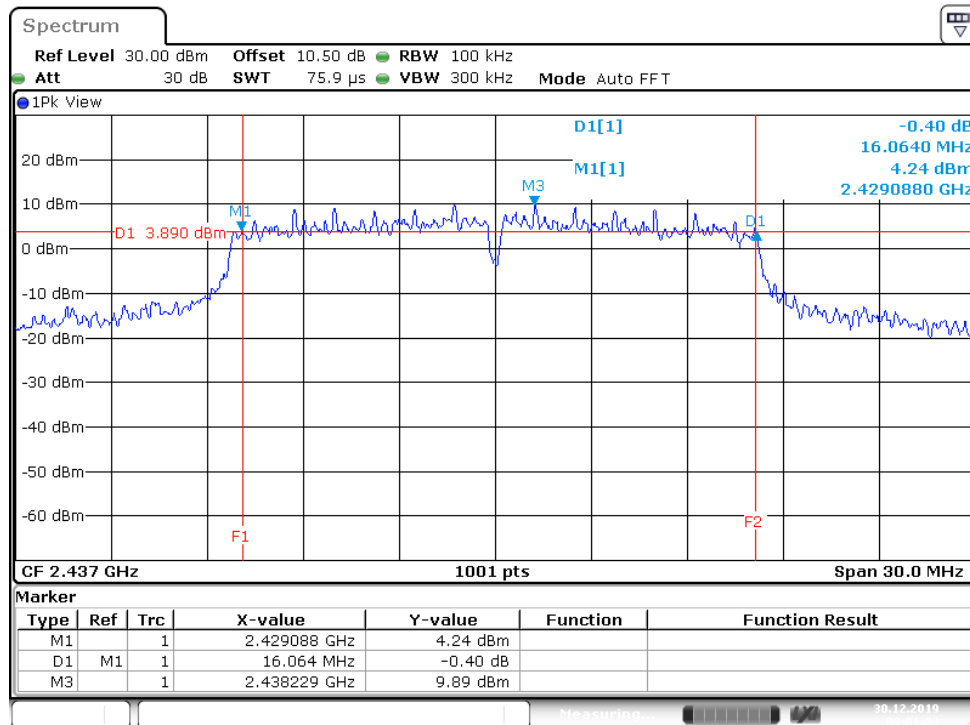
802.11g, Ant 2

Low Channel



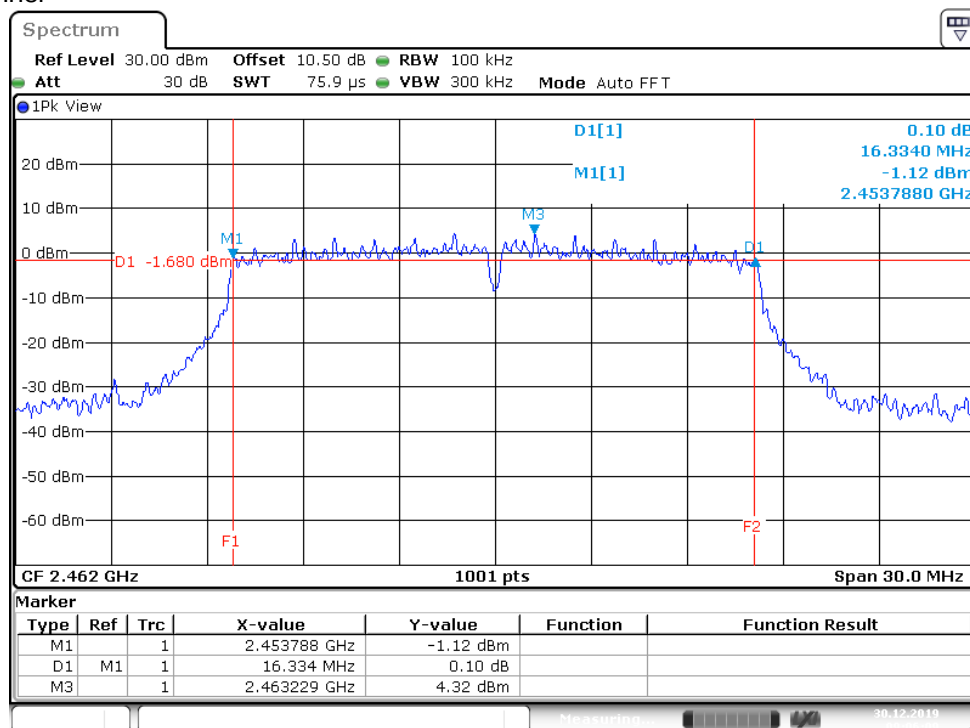
Date: 30.DEC.2019 08:57:59

Middle Channel

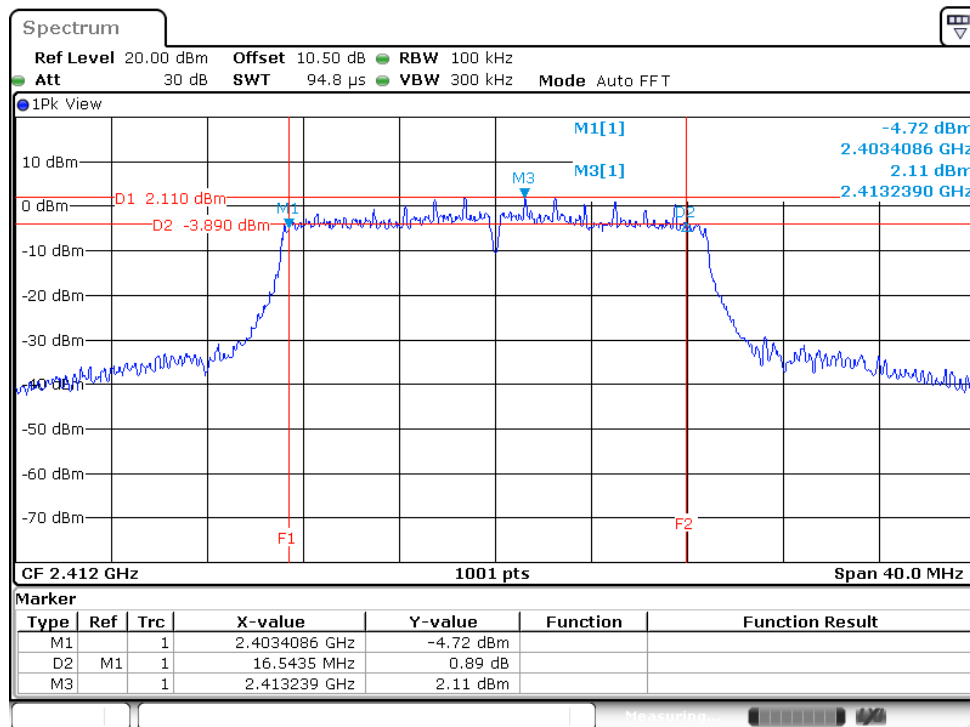


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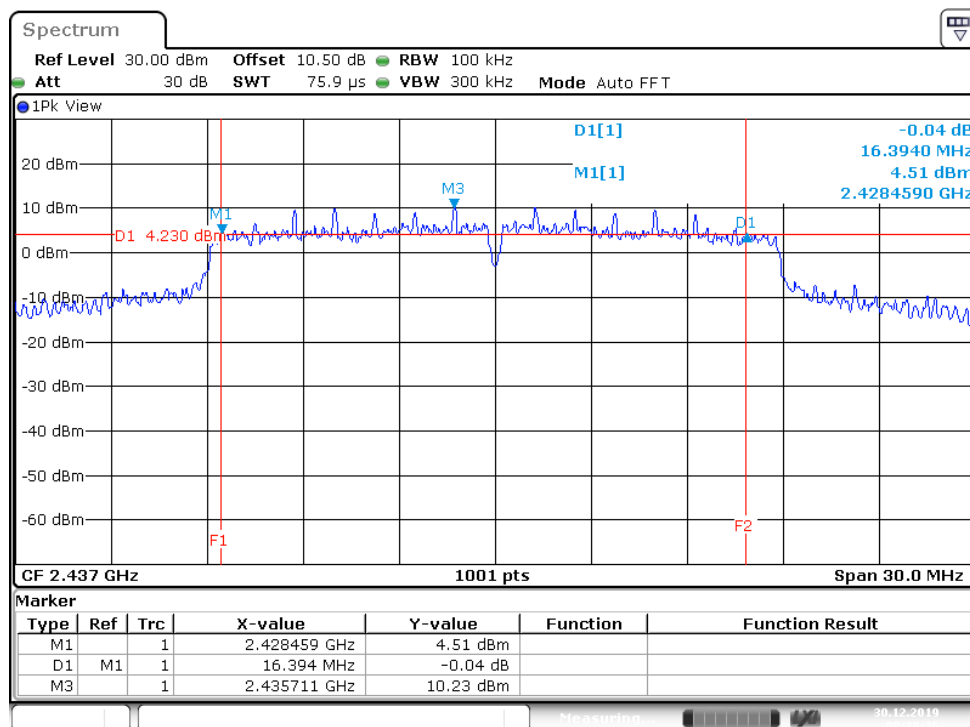
High Channel



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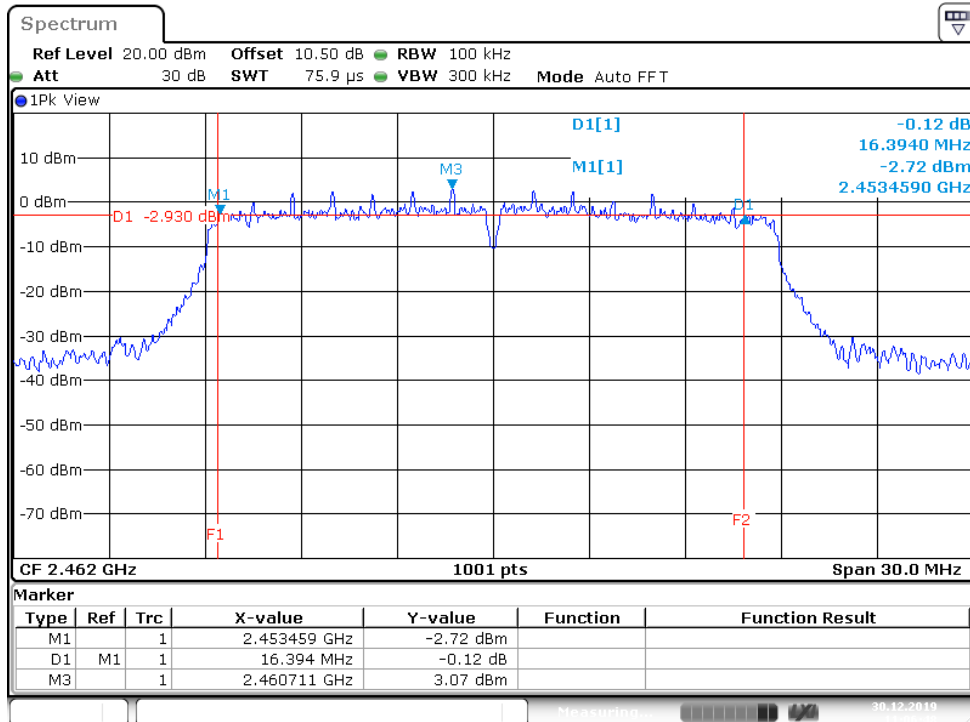
802.11n HT20, Ant 1
Low Channel


Date: 6.MAR.2020 03:26:10

Middle Channel


Date: 30.DEC.2019 09:38:26

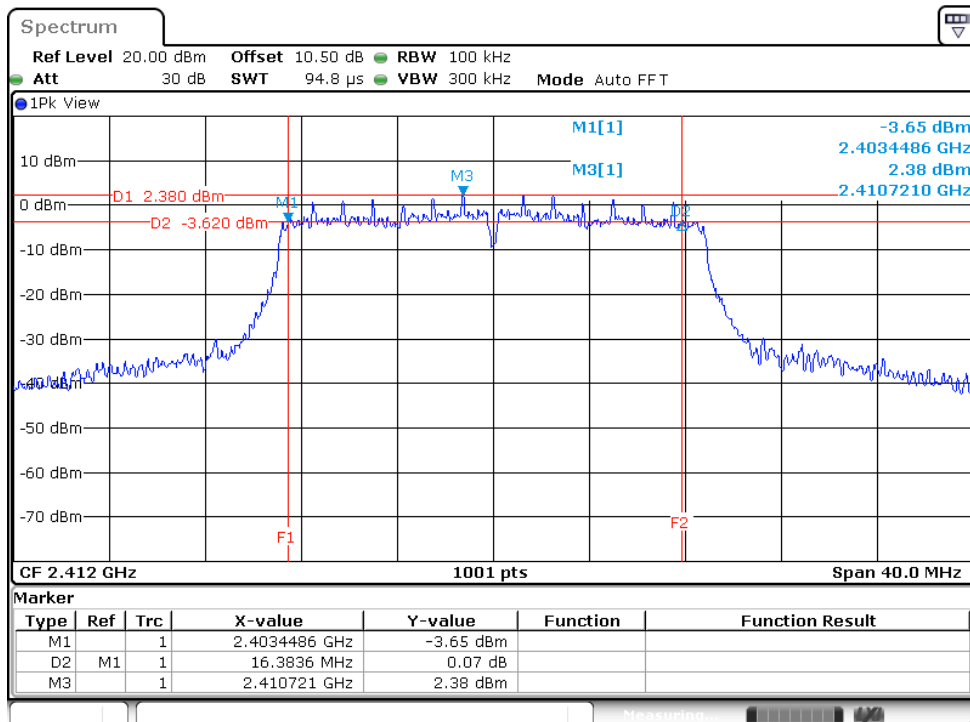
High Channel



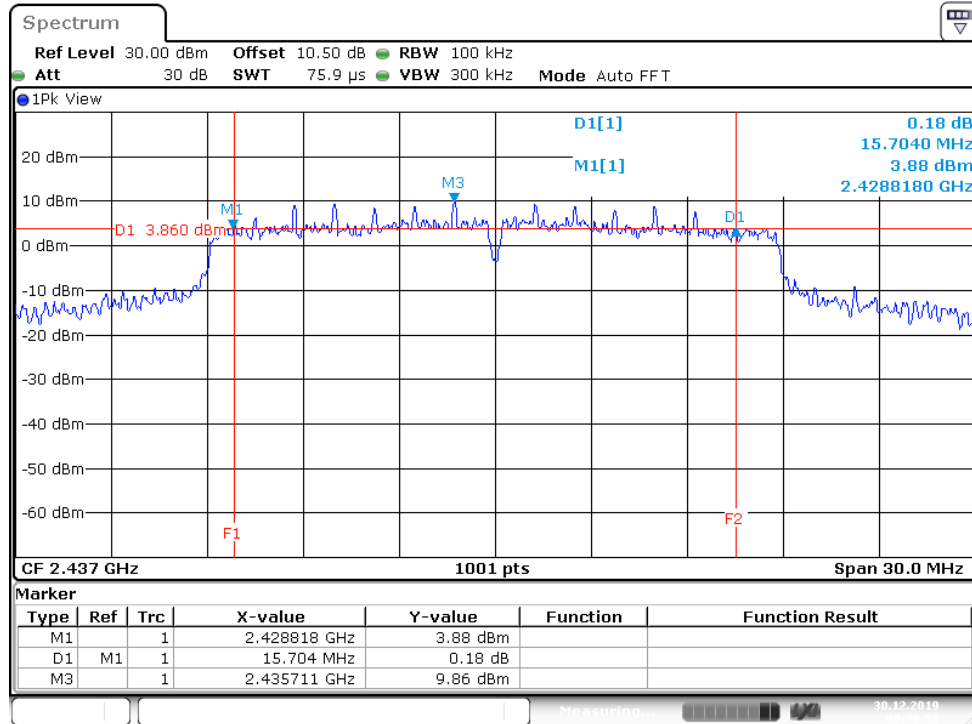
Date: 30.DEC.2019 11:06:48

802.11n HT20, Ant 2

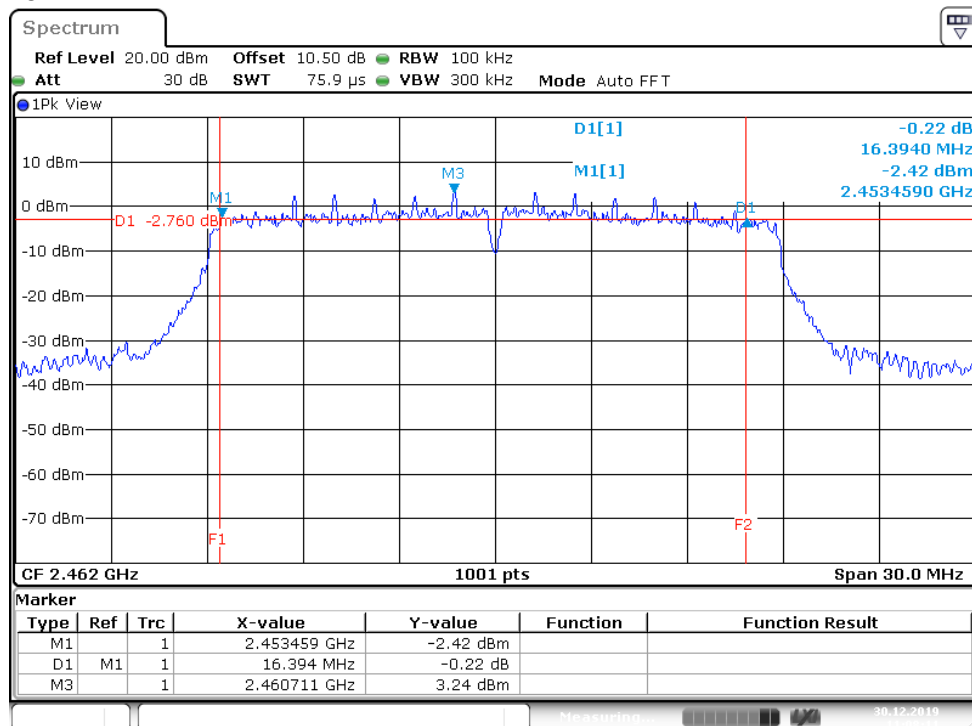
Low Channel



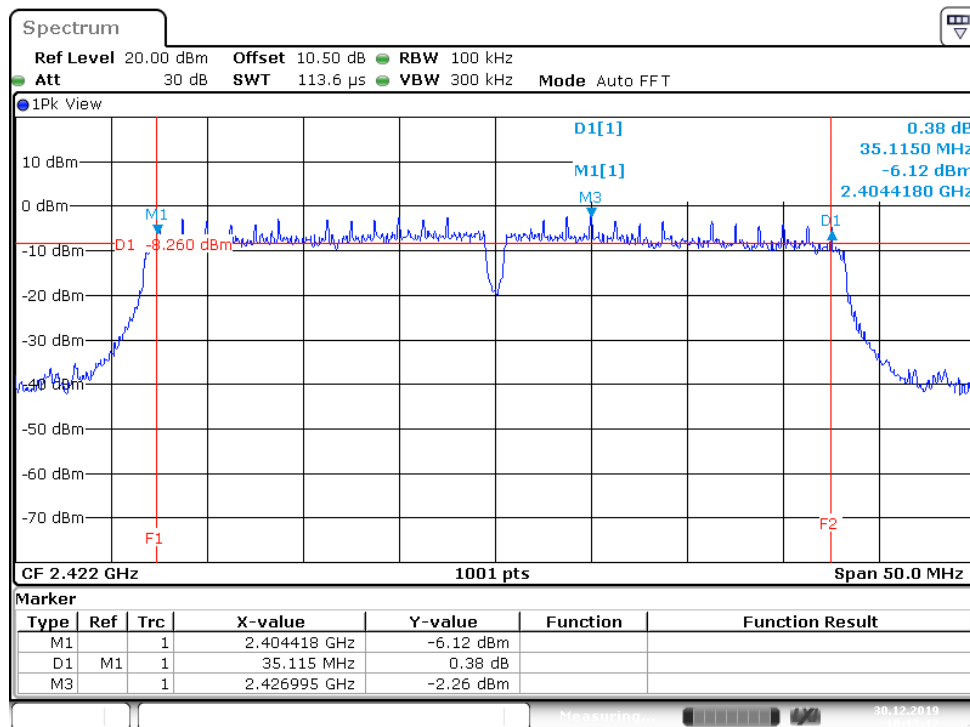
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Middle Channel


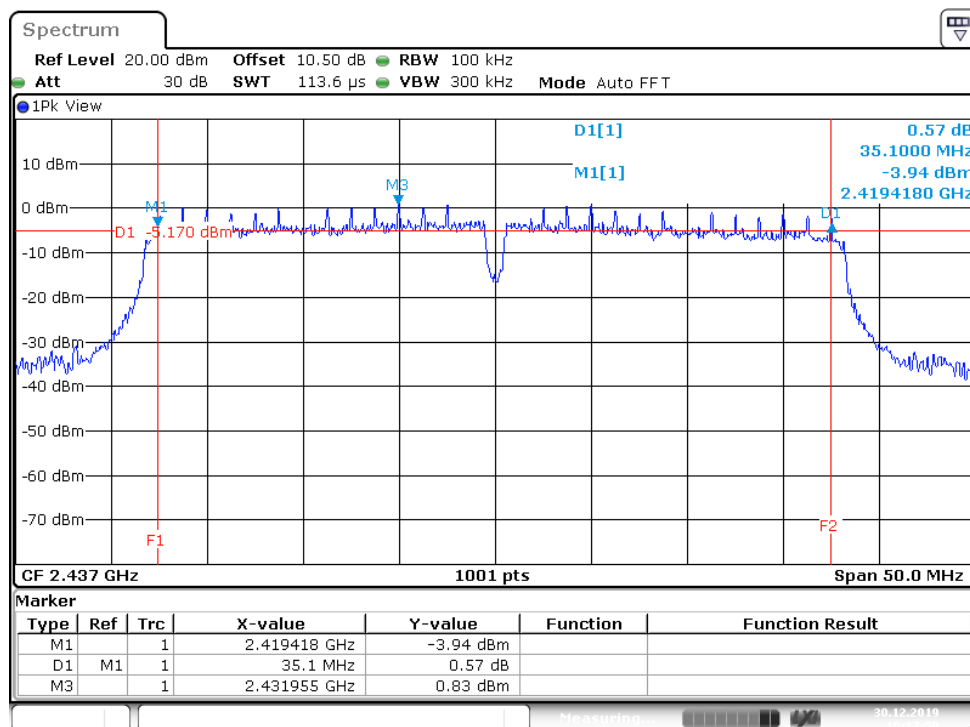
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High Channel


Date: 30.DEC.2019 11:08:11

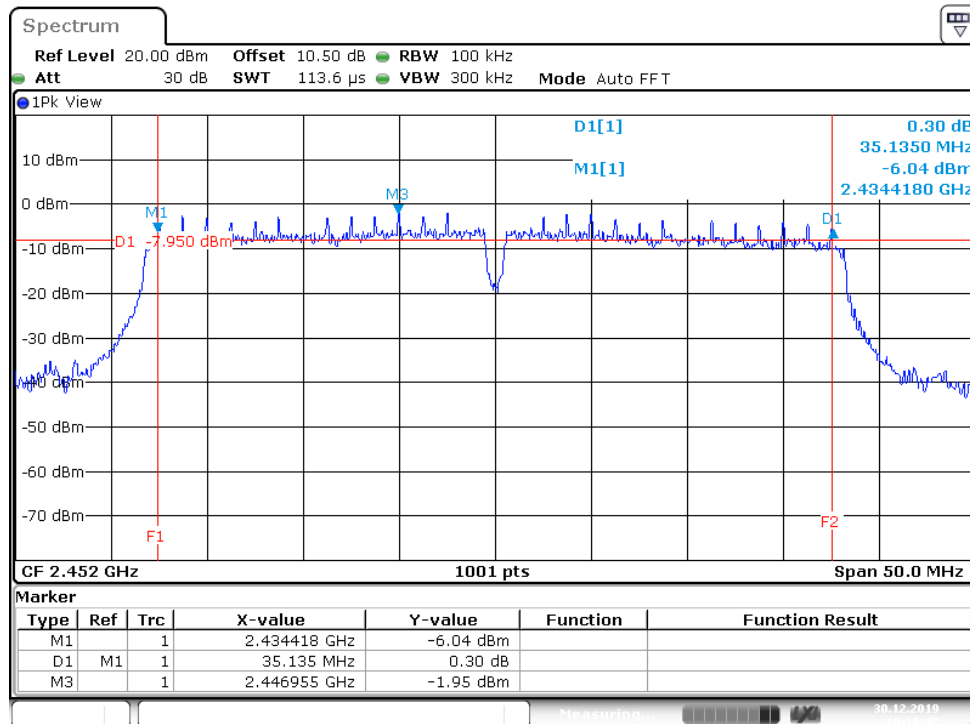
802.11n HT40, Ant 1
Low Channel


Date: 30.DEC.2019 10:13:12

Middle Channel


Date: 30.DEC.2019 10:17:50

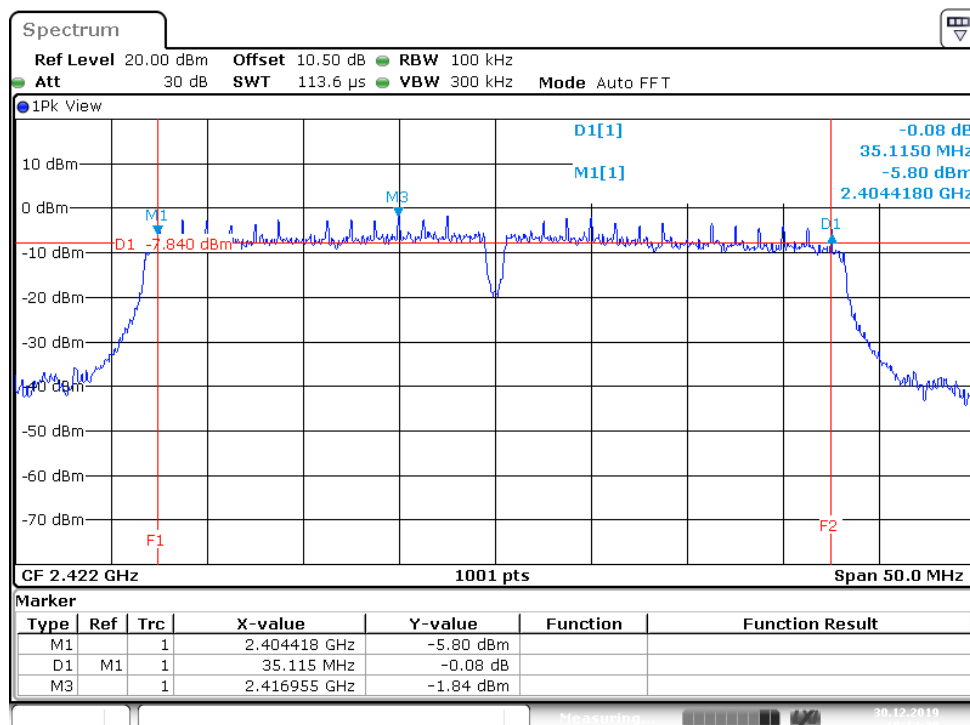
High Channel



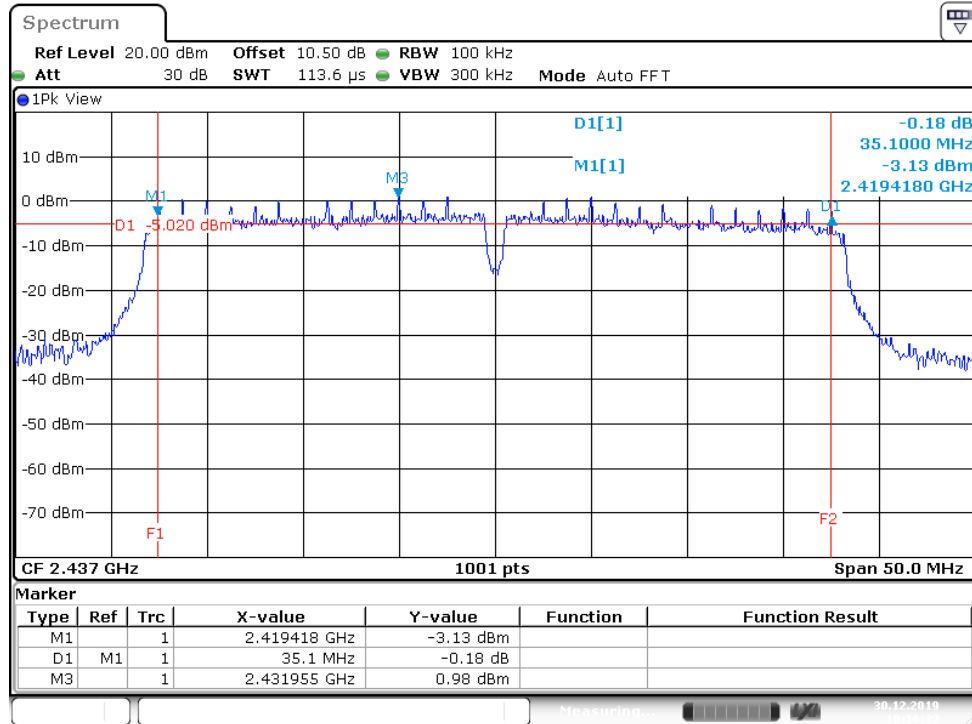
Date: 30.DEC.2019 10:19:42

802.11n HT40, Ant 2

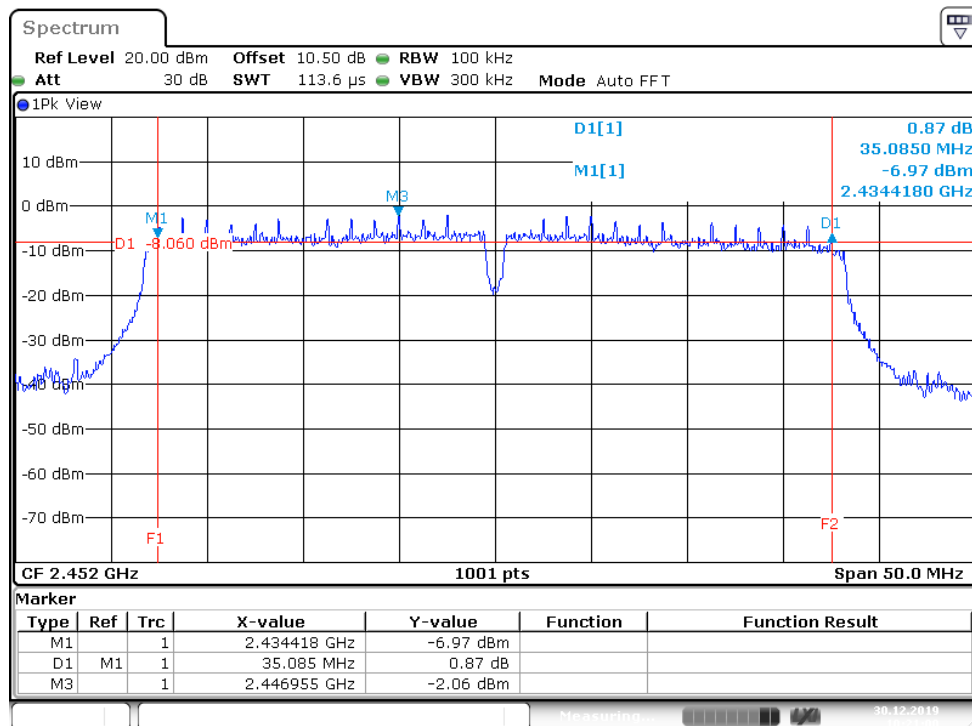
Low Channel



Date: 30.DEC.2019 10:14:29

Middle Channel


Date: 30.DEC.2019 10:16:33

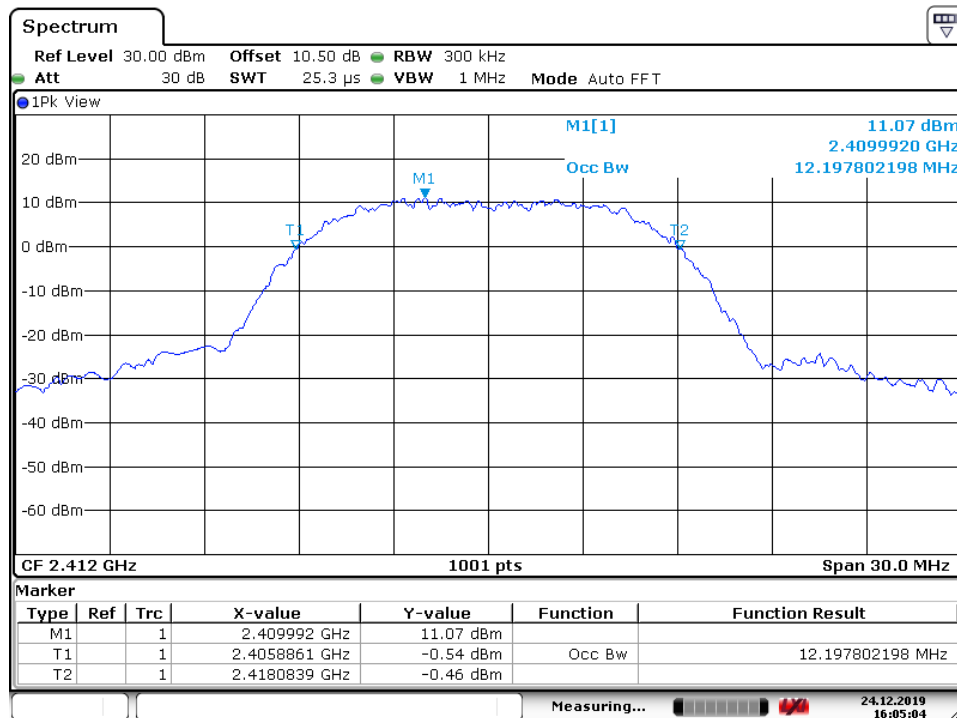
High Channel


Date: 30.DEC.2019 10:21:00

Test Plot of 99% Bandwidth

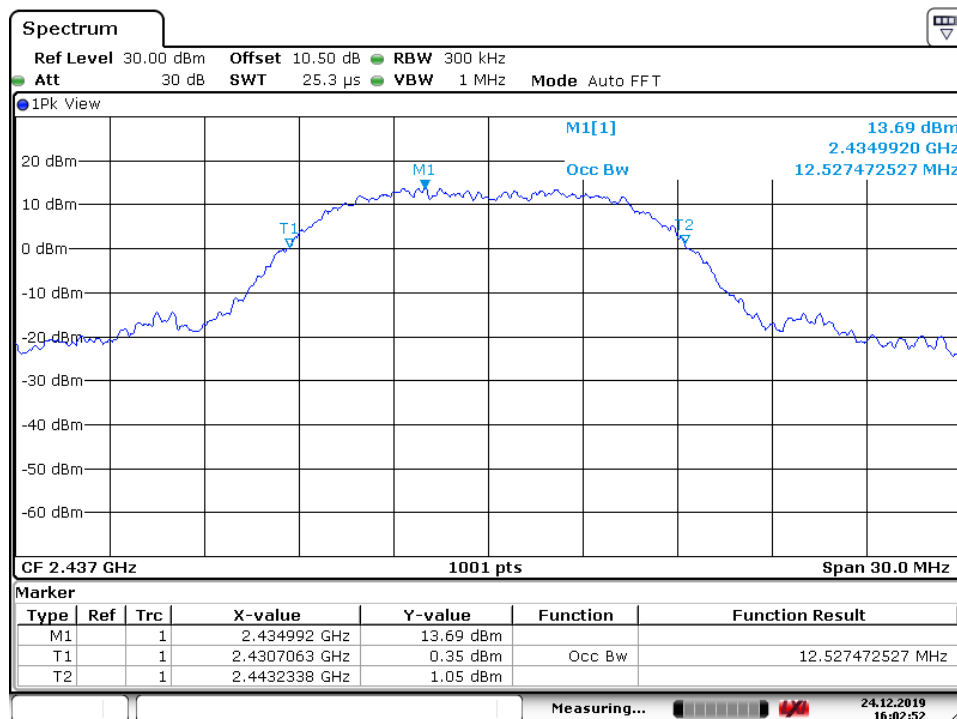
802.11b, Ant 1

Low Channel



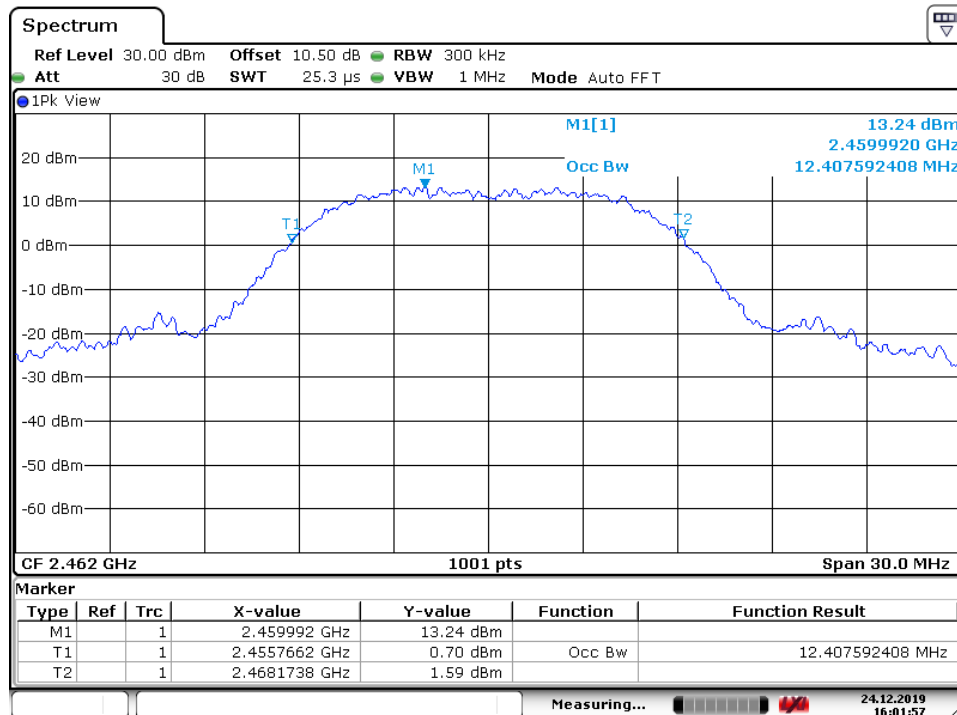
Date: 24.DEC.2019 16:05:04

Middle Channel



Date: 24.DEC.2019 16:02:52

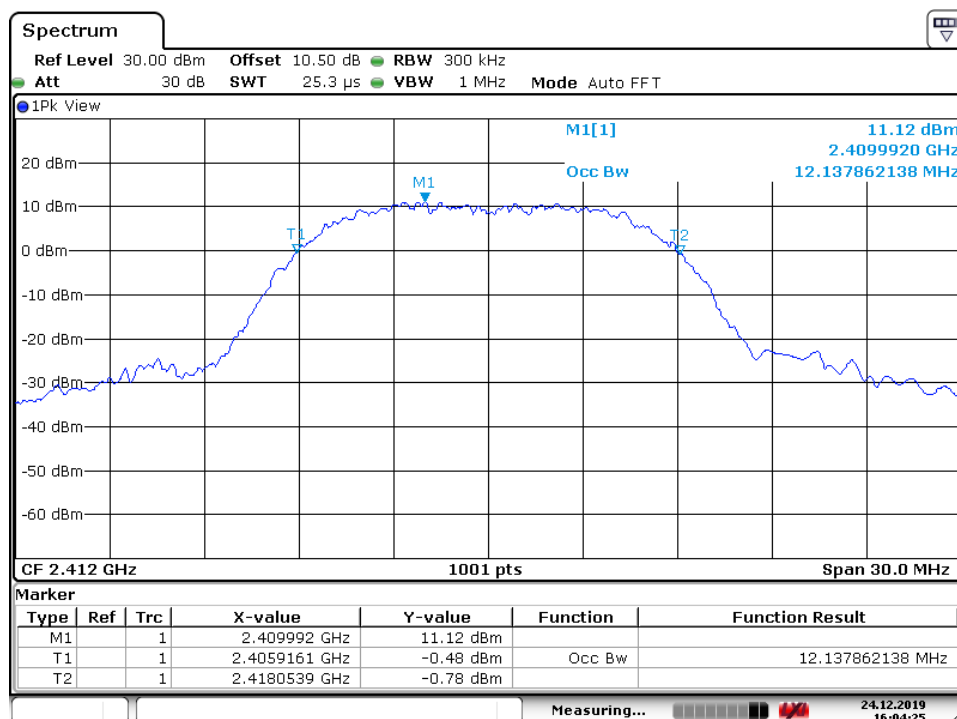
High Channel



Date: 24.DEC.2019 16:01:57

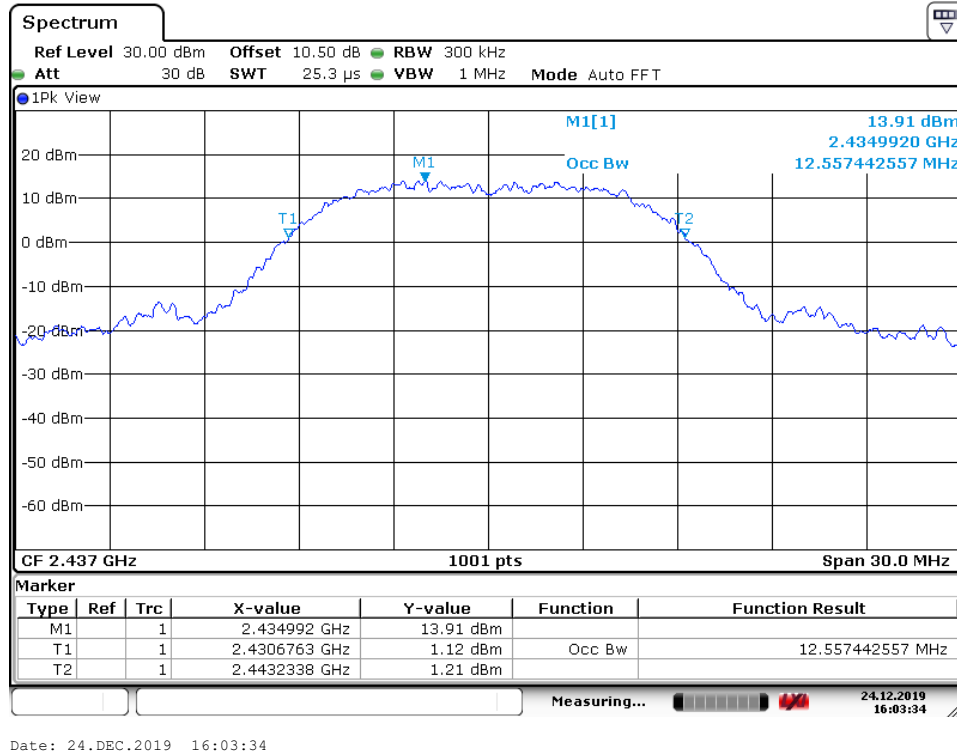
802.11b, Ant 2

Low Channel

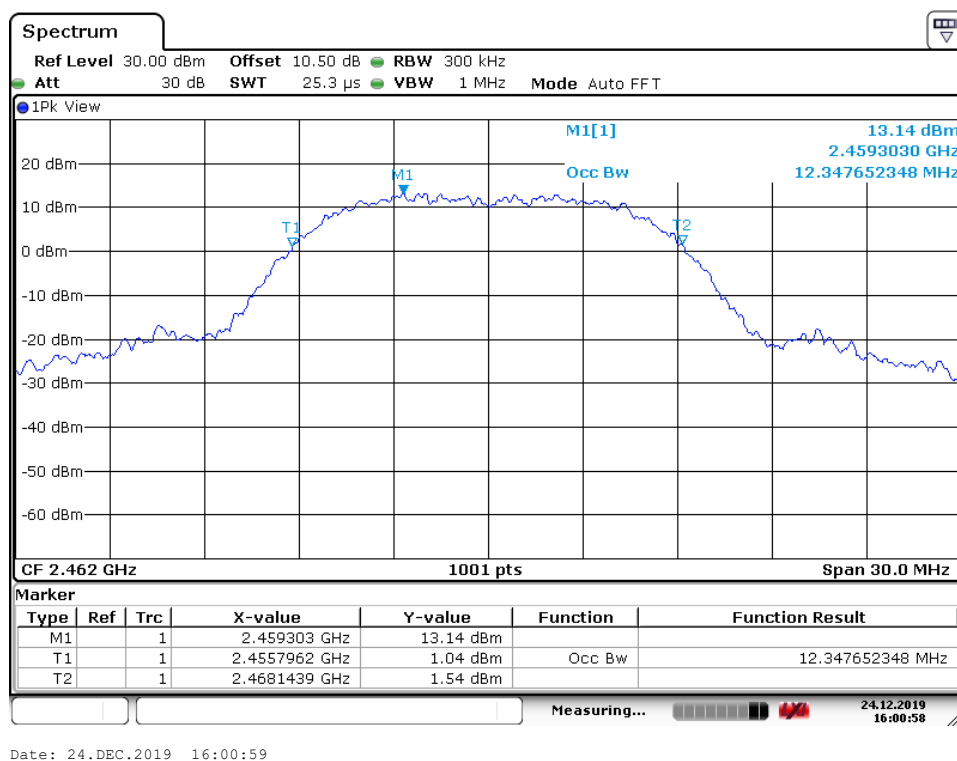


Date: 24.DEC.2019 16:04:25

Middle Channel

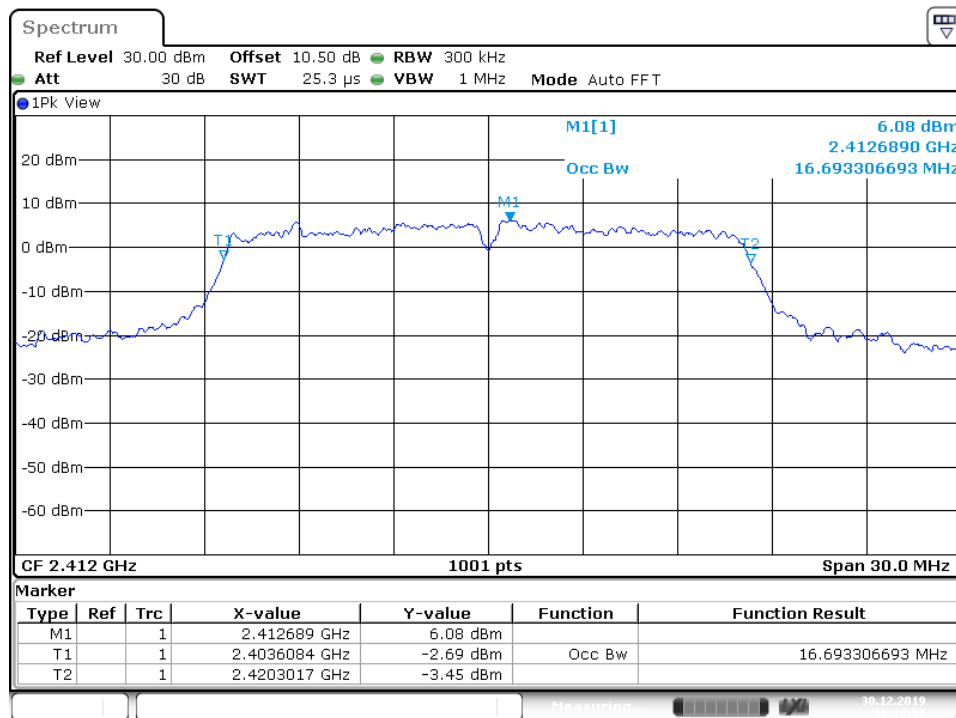


High Channel



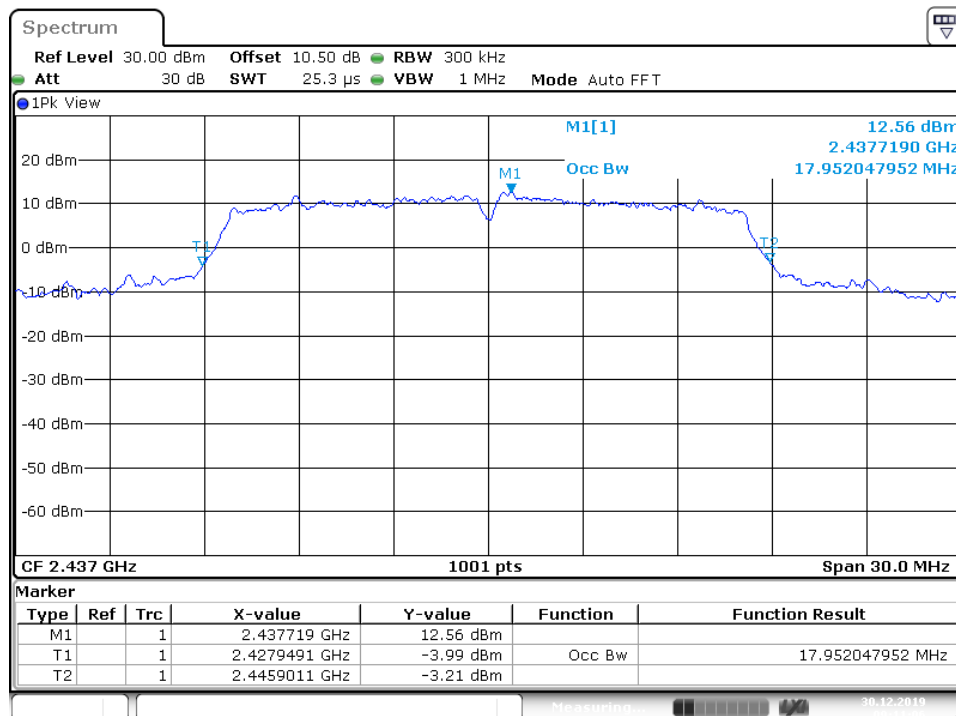
802.11g, Ant 1

Low Channel



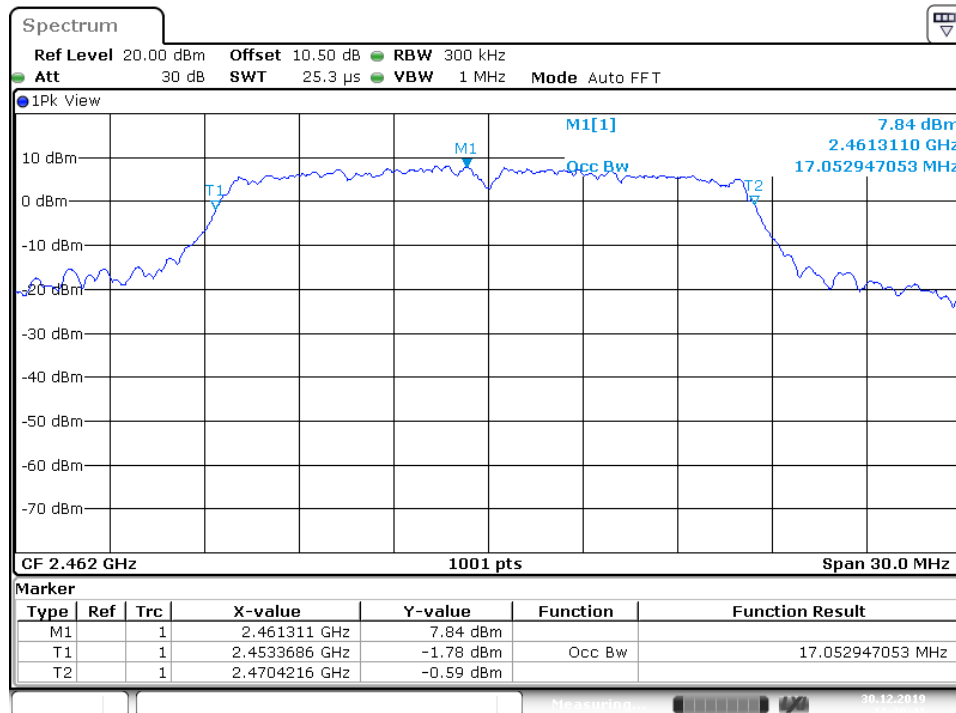
Date: 30.DEC.2019 09:13:37

Middle Channel



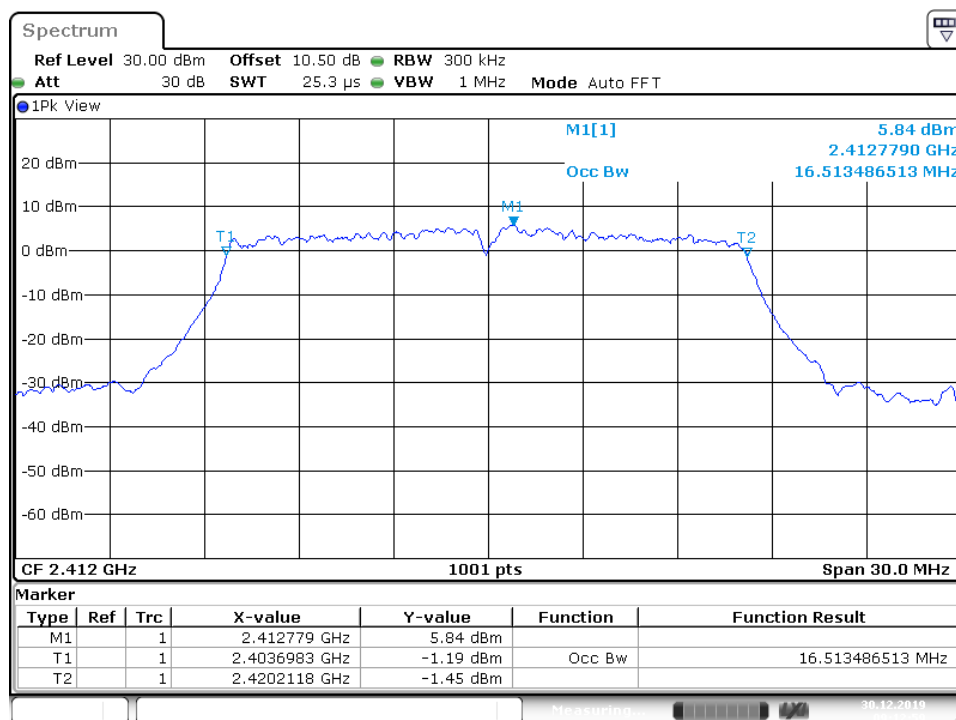
Date: 30.DEC.2019 09:11:06

High Channel

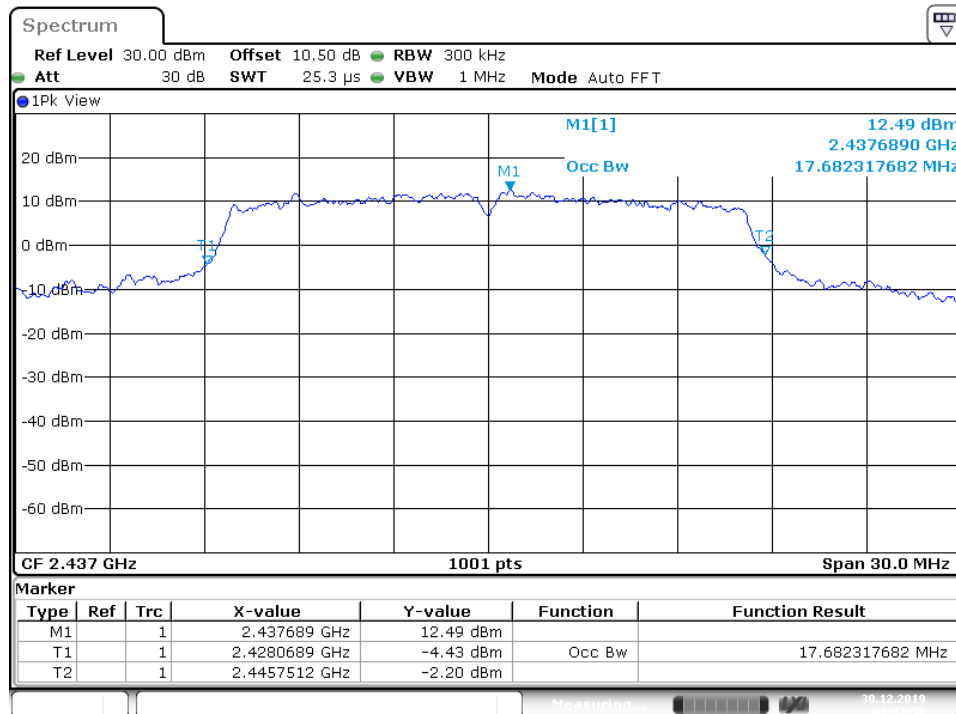


802.11g, Ant 2

Low Channel

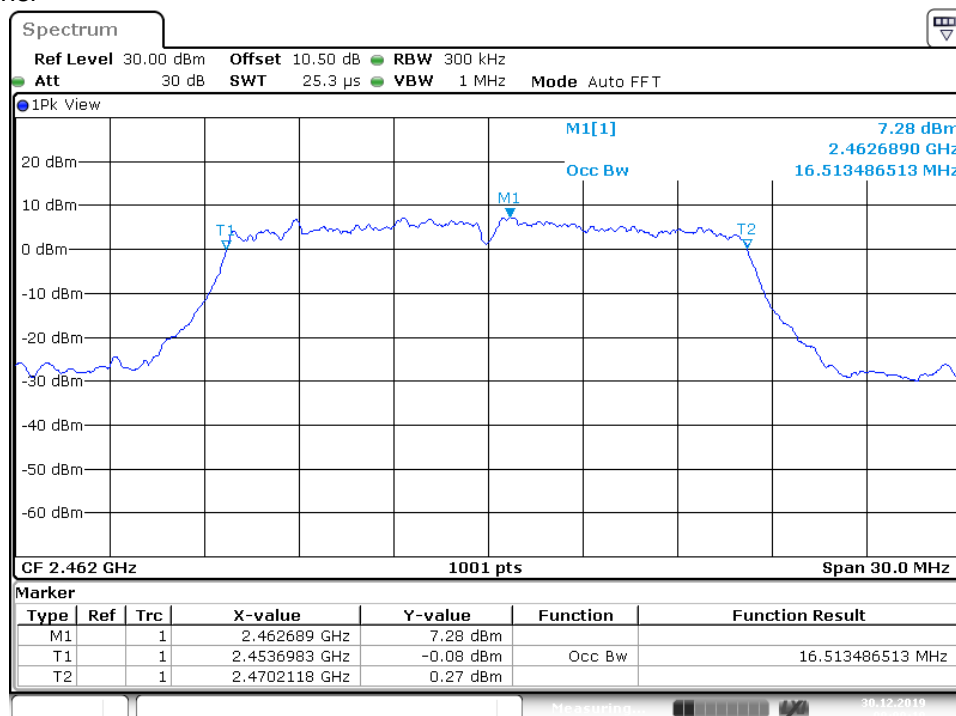


Middle Channel



Date: 30.DEC.2019 09:11:56

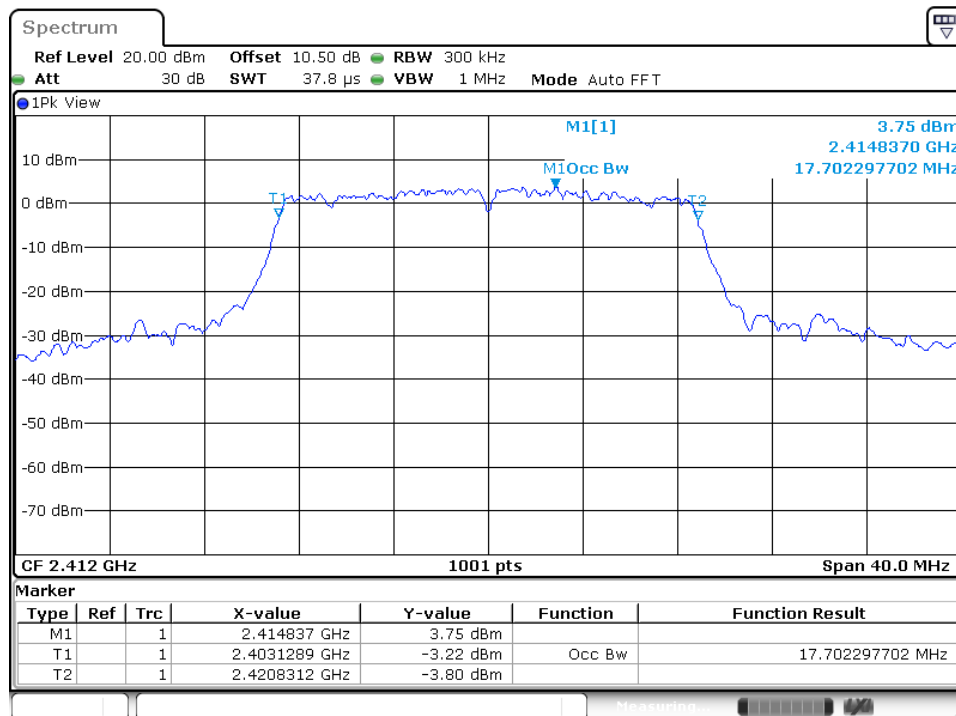
High Channel



Date: 30.DEC.2019 09:09:10

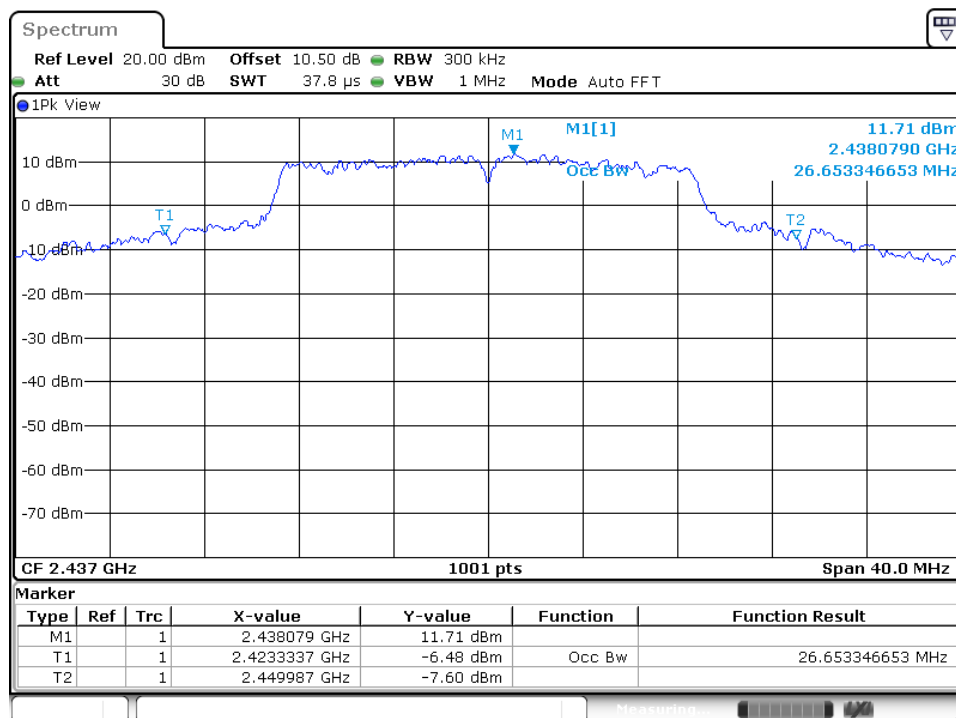
802.11n HT20, Ant 1

Low Channel



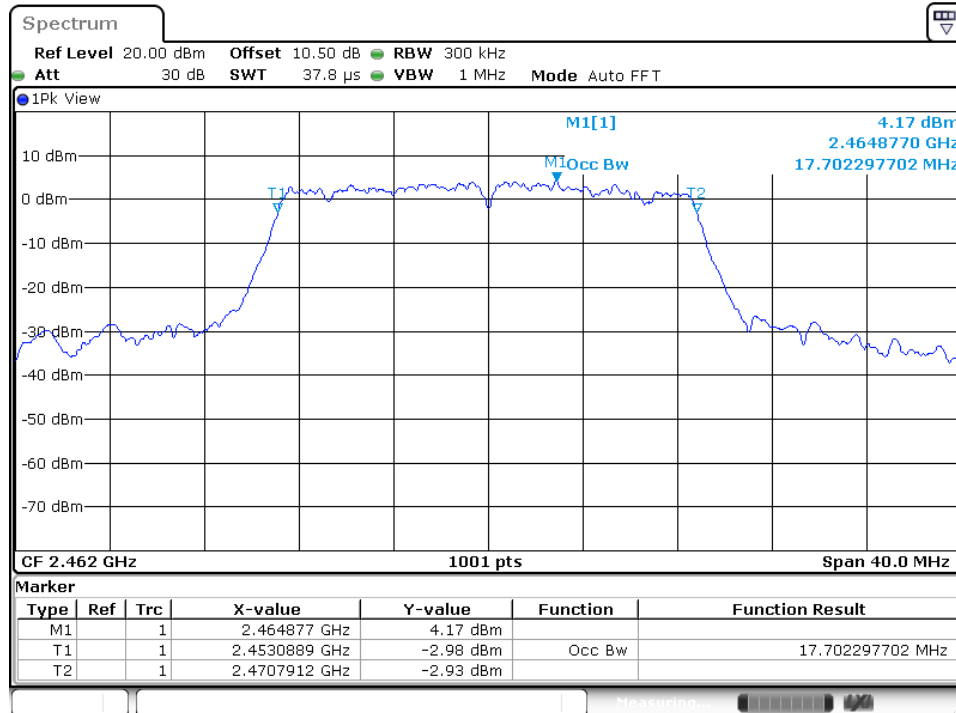
Date: 6.MAR.2020 03:46:36

Middle Channel



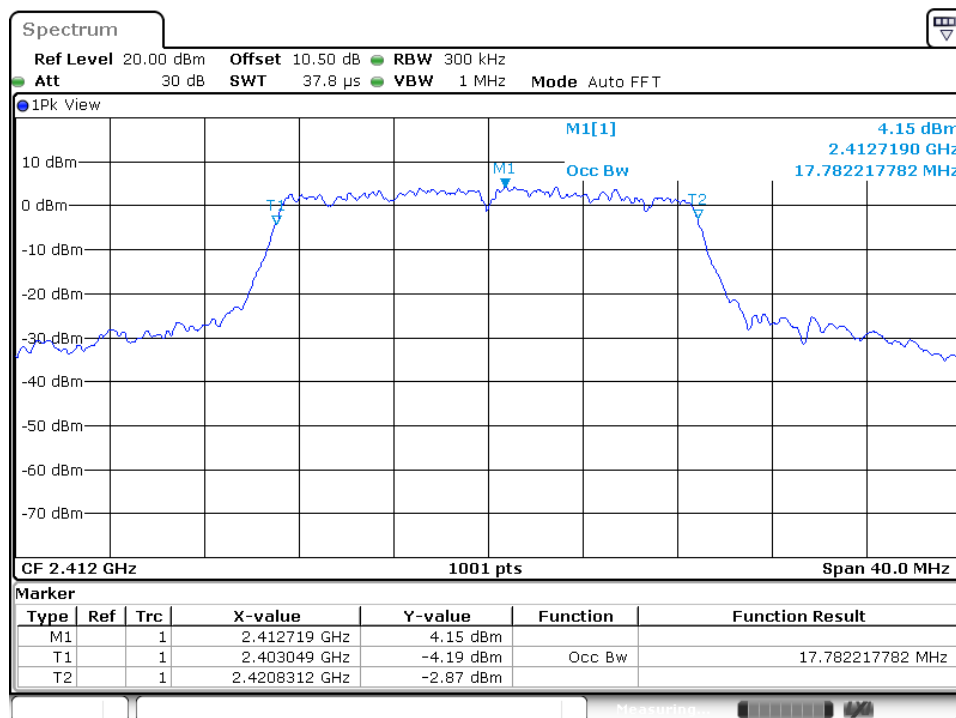
Date: 6.MAR.2020 03:48:13

High Channel

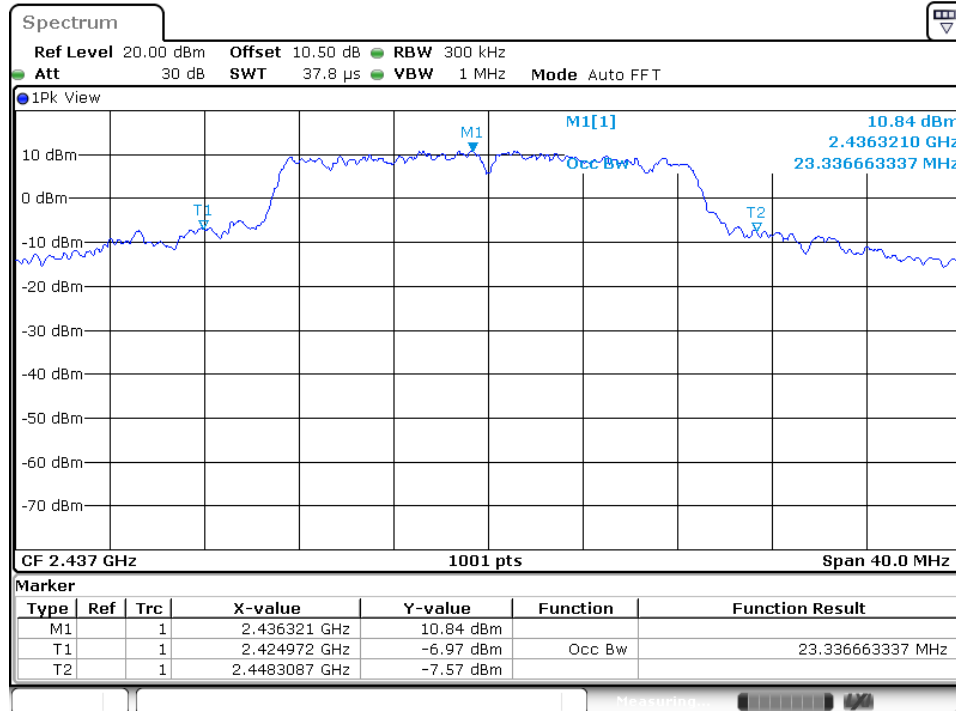


802.11n HT20, Ant 2

Low Channel

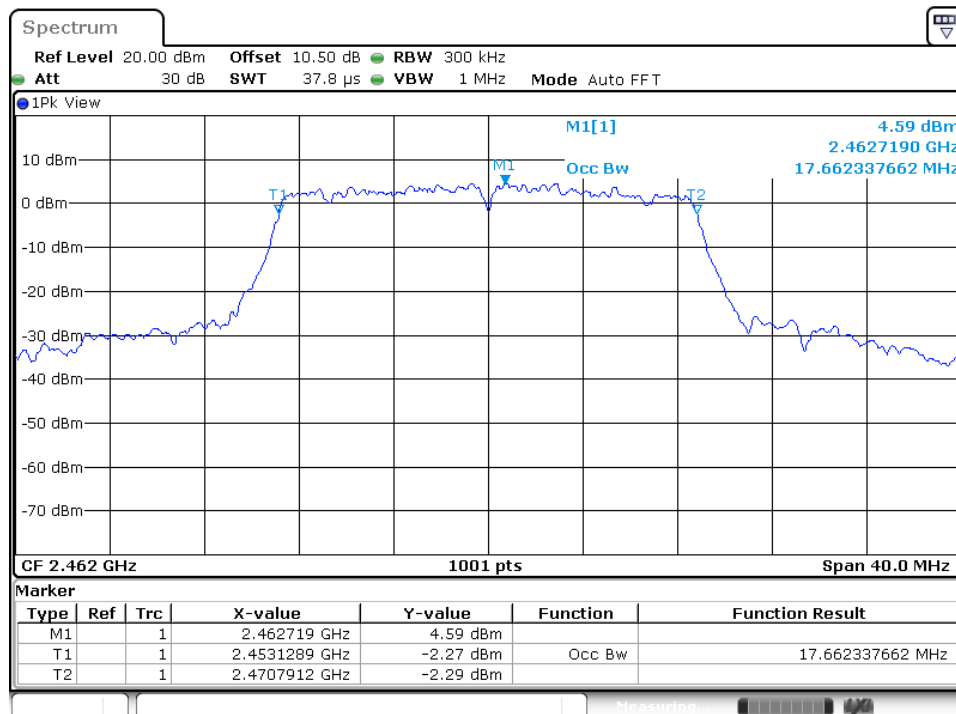


Middle Channel

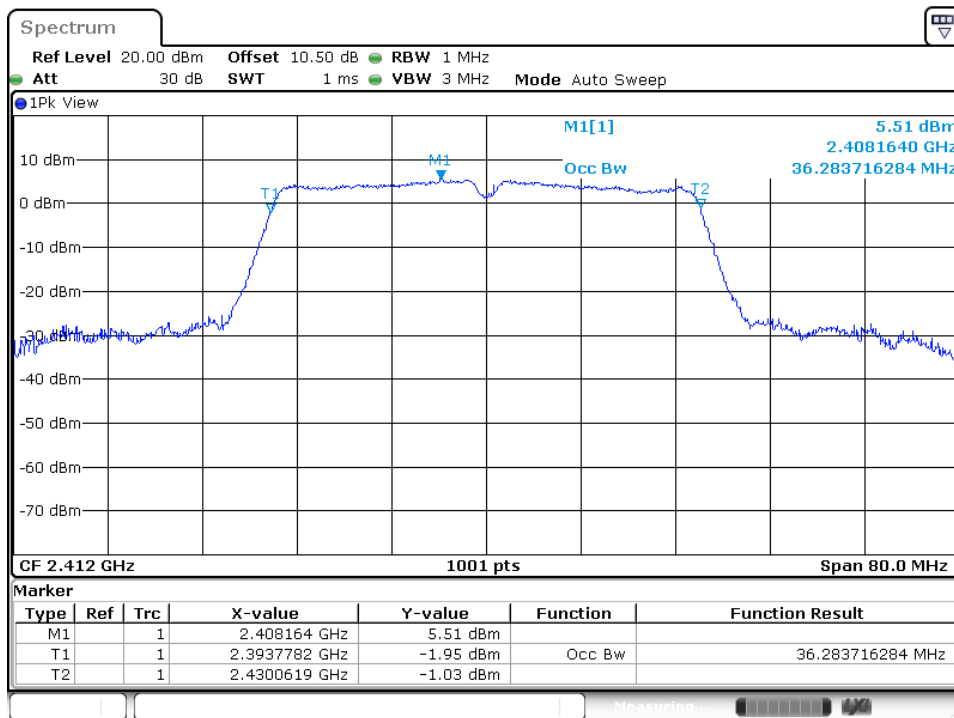


Date: 6.MAR.2020 03:47:42

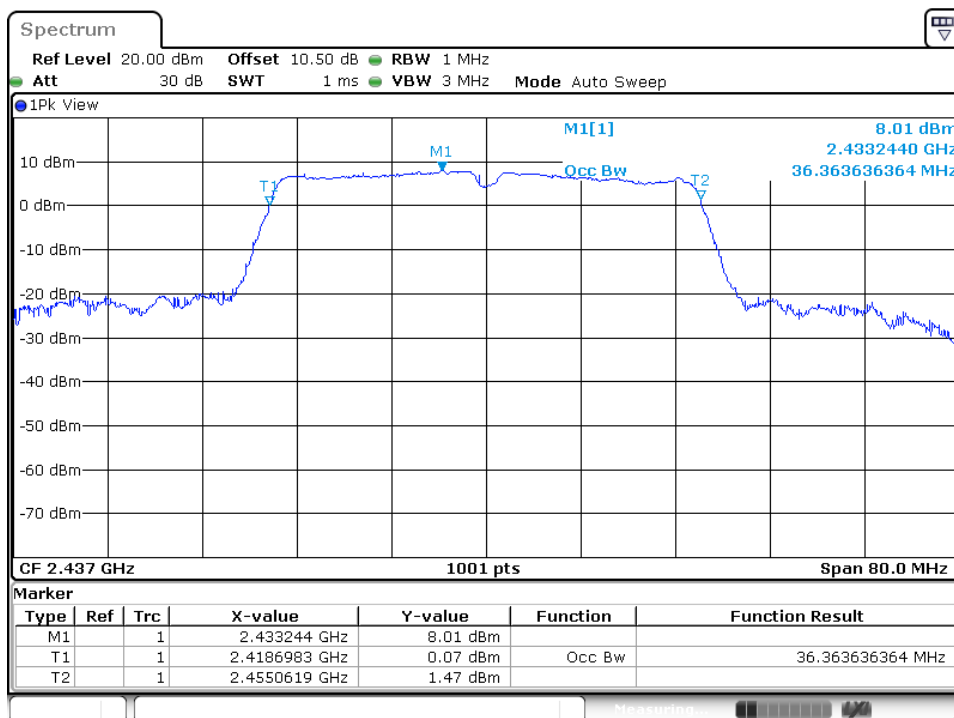
High Channel



Date: 6.MAR.2020 03:49:52

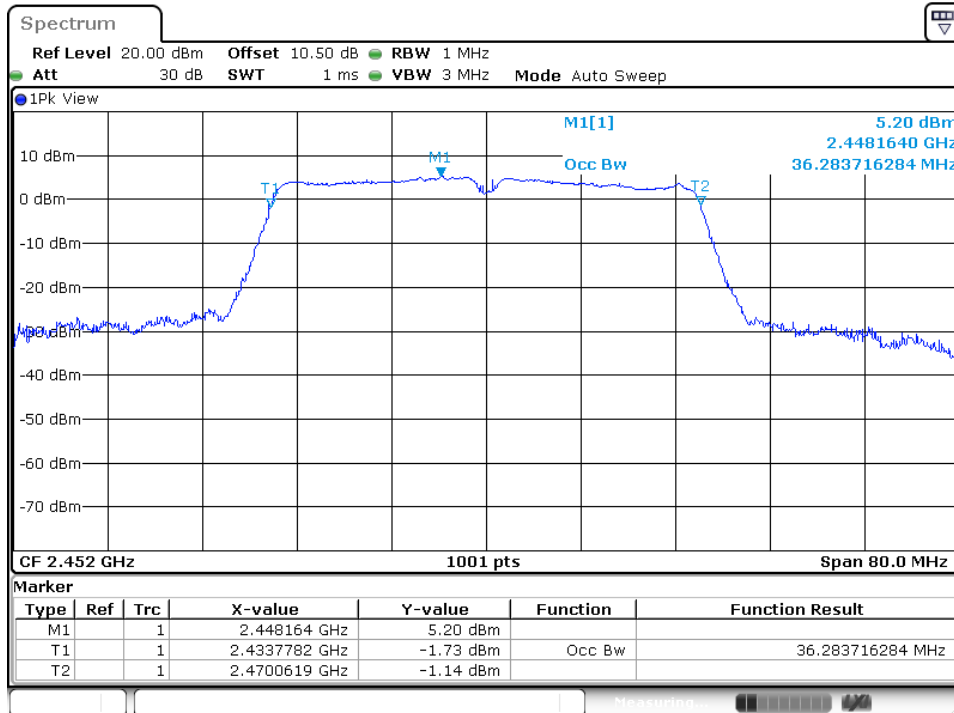
802.11n HT40, Ant 1
Low Channel


Date: 6.MAR.2020 03:51:10

Middle Channel


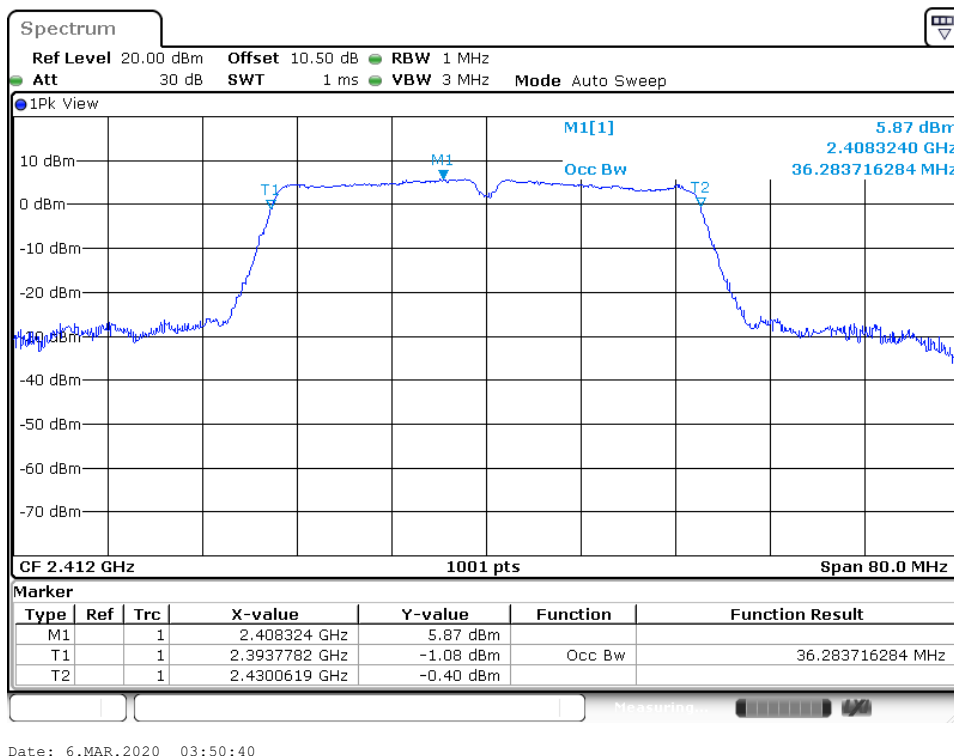
Date: 6.MAR.2020 03:51:53

High Channel

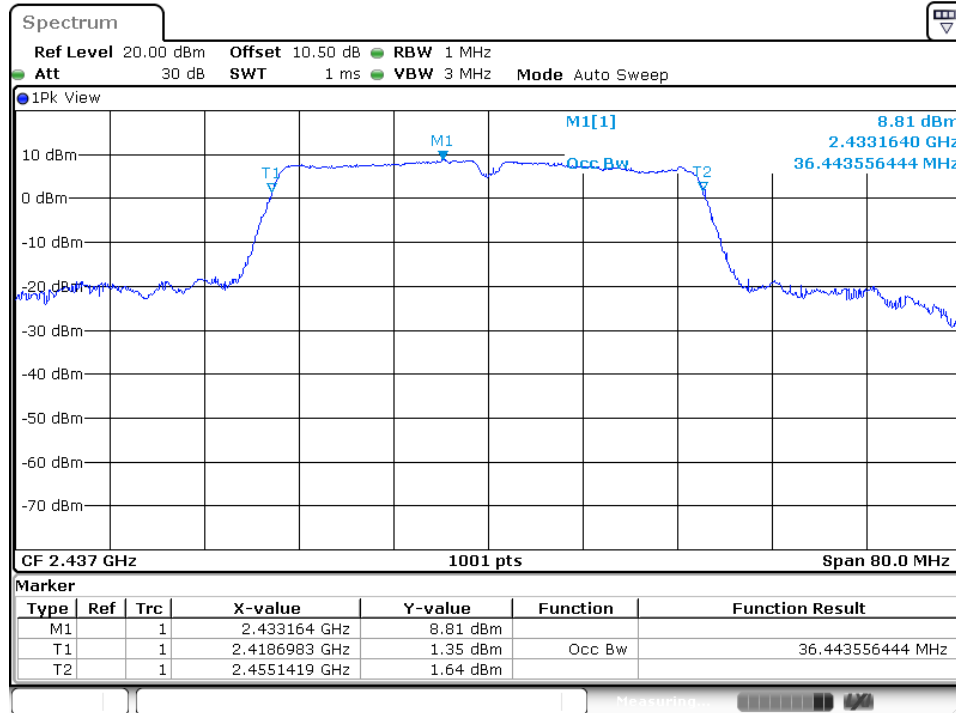


802.11n HT40, Ant 2

Low Channel

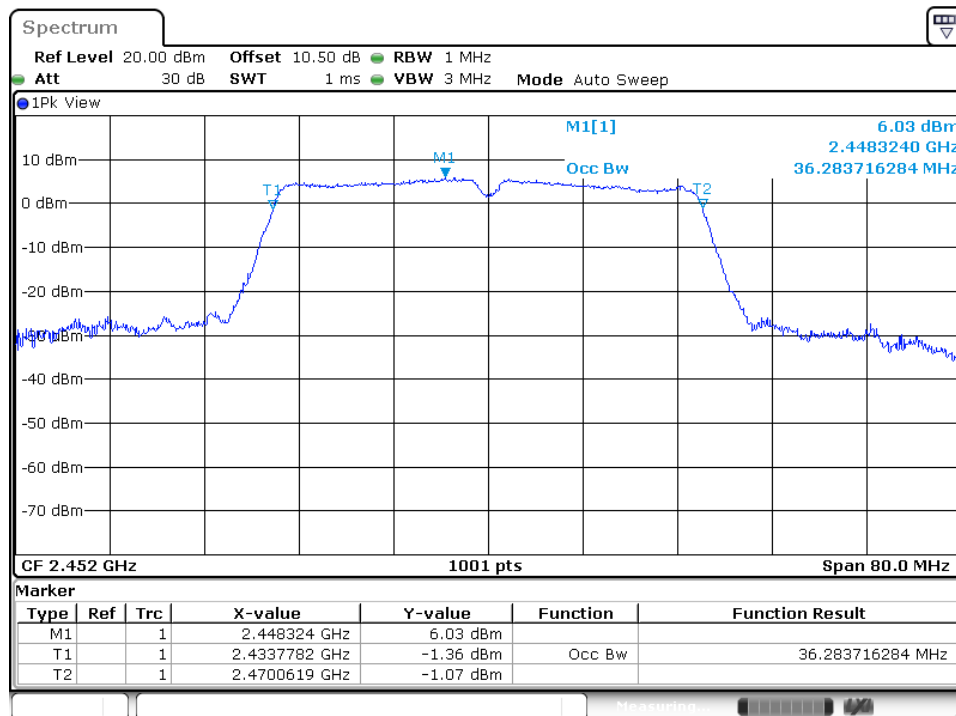


Middle Channel



Date: 6.MAR.2020 03:52:22

High Channel



Date: 6.MAR.2020 03:54:15

5.1.4 Power Density

RESULT:

Passed

Test standard : FCC Part 15.247(e), ISSED RSS-247 5.2(b)
 Basic standard : ANSI C63.10:2013, KDB558074
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A
 Ambient temperature : 20-24°C
 Relative humidity : 50-65%
 Atmospheric pressure : 100-103 kPa

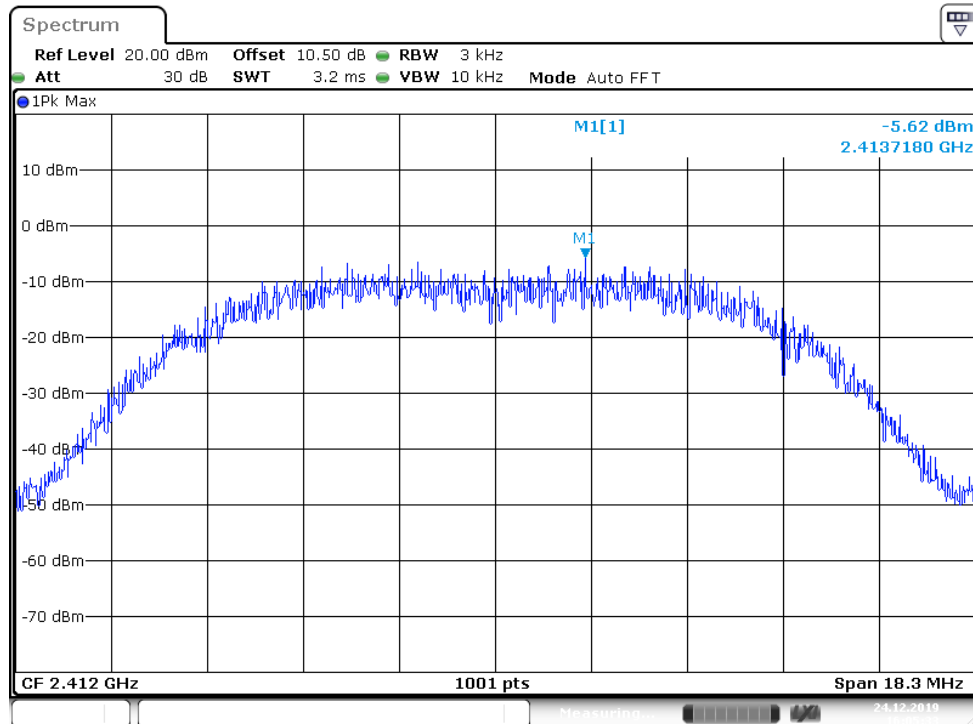
Table 10: Test result of Power Density

Mode	Channel Frequency	Power Density (dBm/3kHz)		Total Power Density	Limit	Result
	(MHz)	Ant1	Ant2	(dBm/3kHz)	(dBm/3kHz)	
802.11b	2412	-5.62	-5.17	-2.38	8	Pass
	2437	-2.82	-2.59	0.31	8	Pass
	2462	-3.39	-3.50	-0.43	8	Pass
802.11g	2412	-12.21	-12.62	-9.40	8	Pass
	2437	-5.36	-5.76	-2.55	8	Pass
	2462	-9.68	-11.17	-7.35	8	Pass
802.11n HT20	2412	-12.39	-12.61	-9.49	8	Pass
	2437	-4.63	-6.71	-2.54	8	Pass
	2462	-11.93	-11.03	-8.45	8	Pass
802.11n HT40	2422	-17.40	-17.23	-14.30	8	Pass
	2437	-14.45	-14.35	-11.39	8	Pass
	2452	-17.32	-17.23	-14.26	8	Pass

Test Plot of Power Density

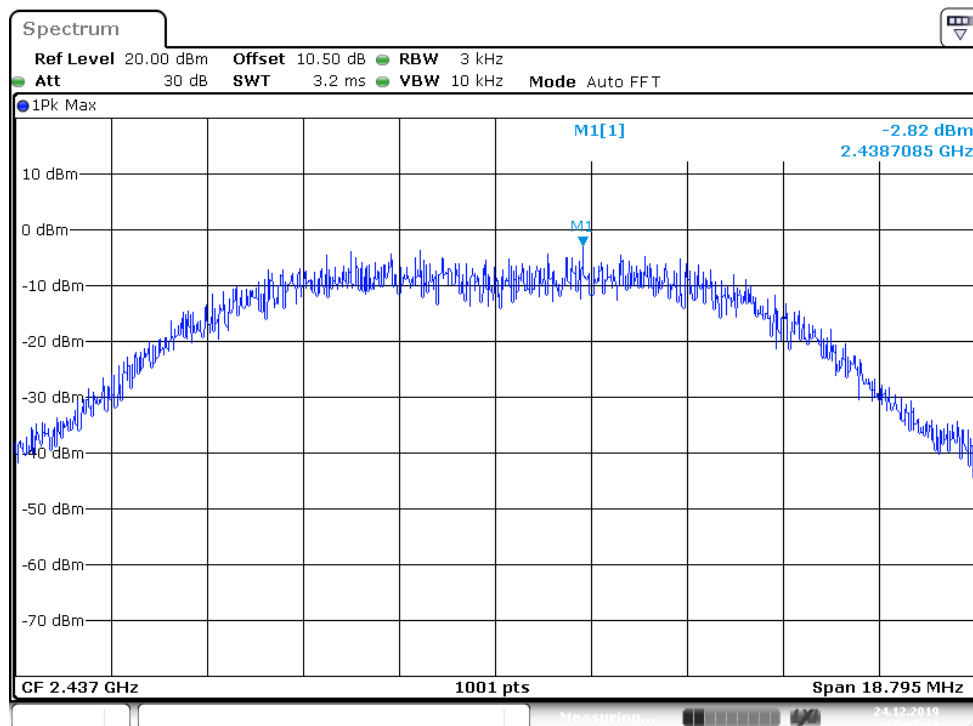
802.11b, Ant 1

Low Channel



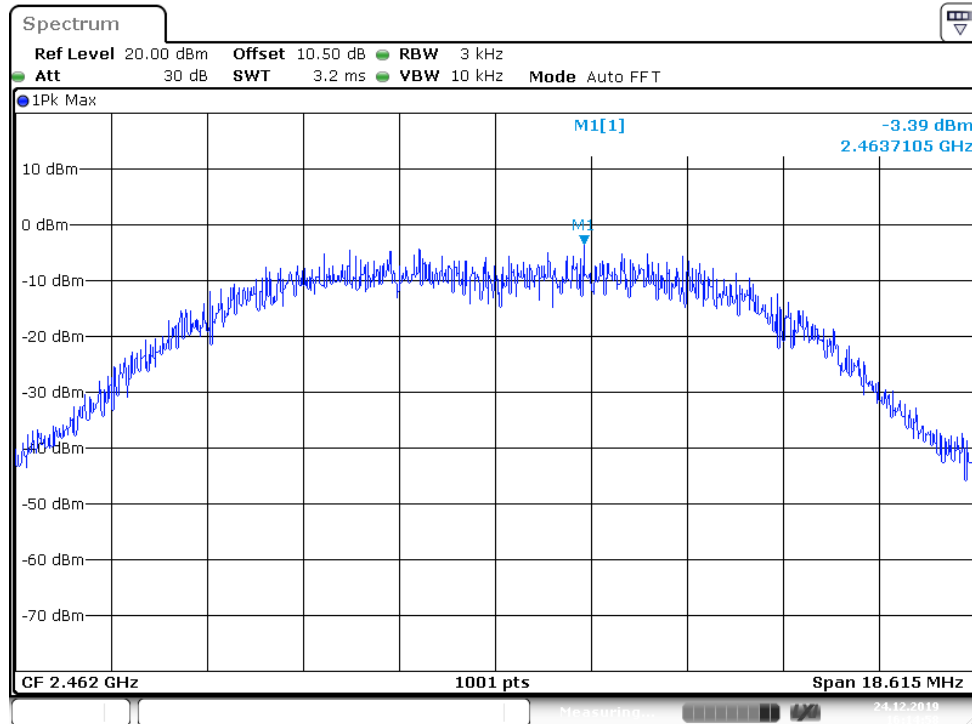
Date: 24.DEC.2019 16:05:33

Middle Channel



Date: 24.DEC.2019 16:07:20

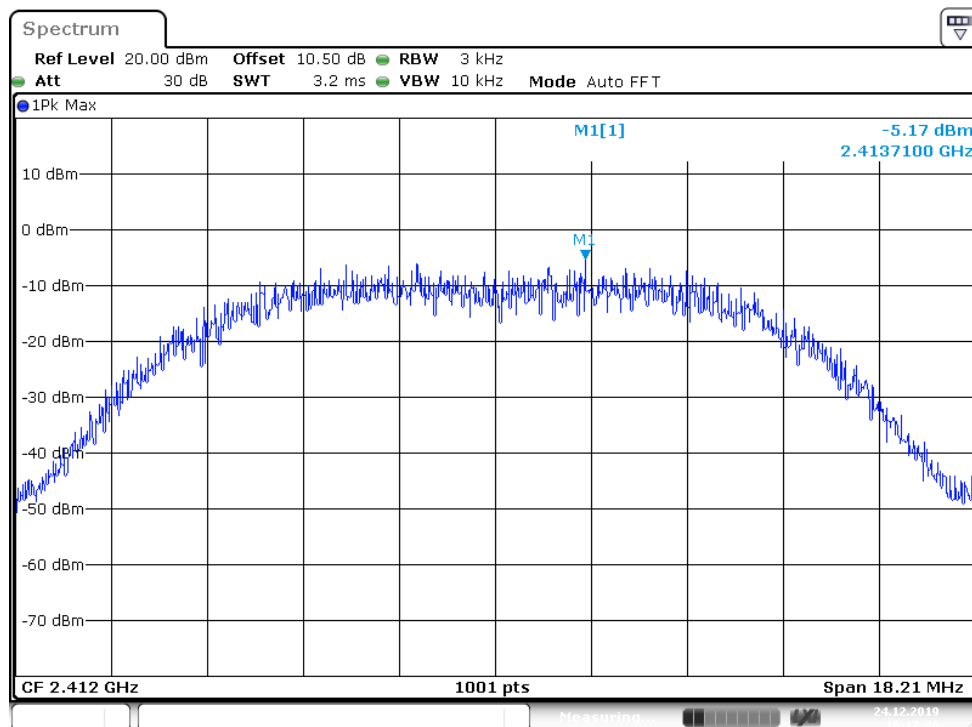
High Channel



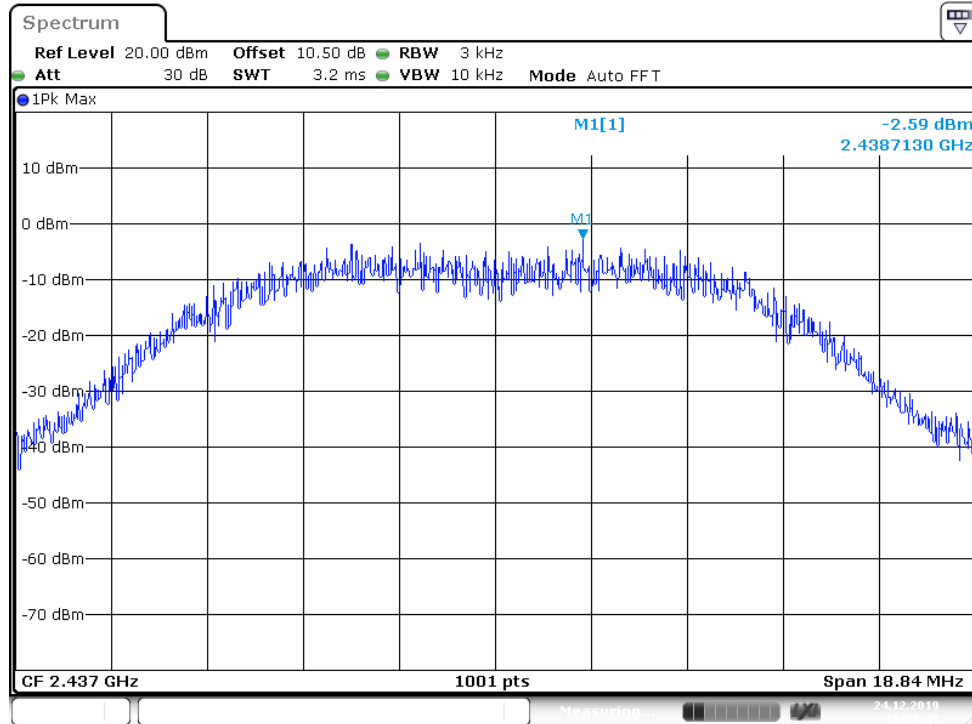
Date: 24.DEC.2019 16:14:59

802.11b, Ant 2

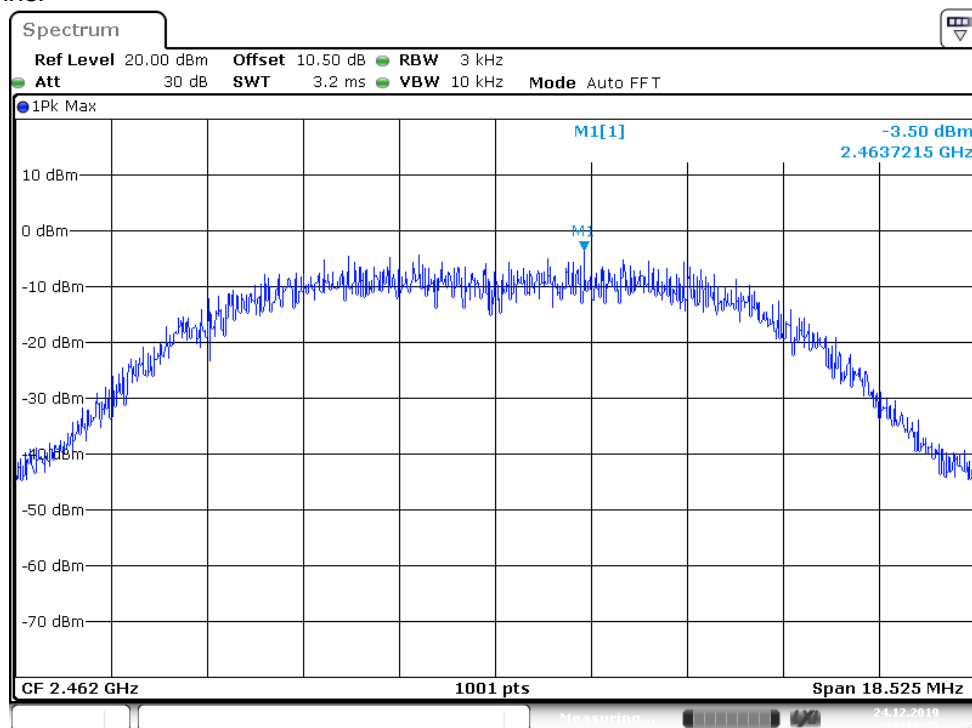
Low Channel



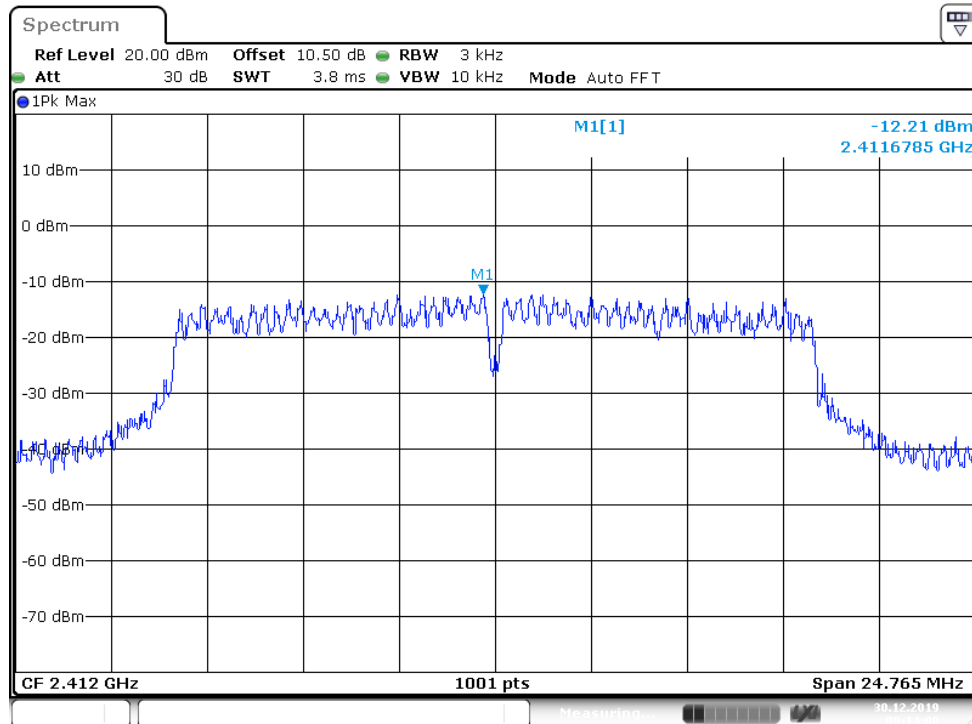
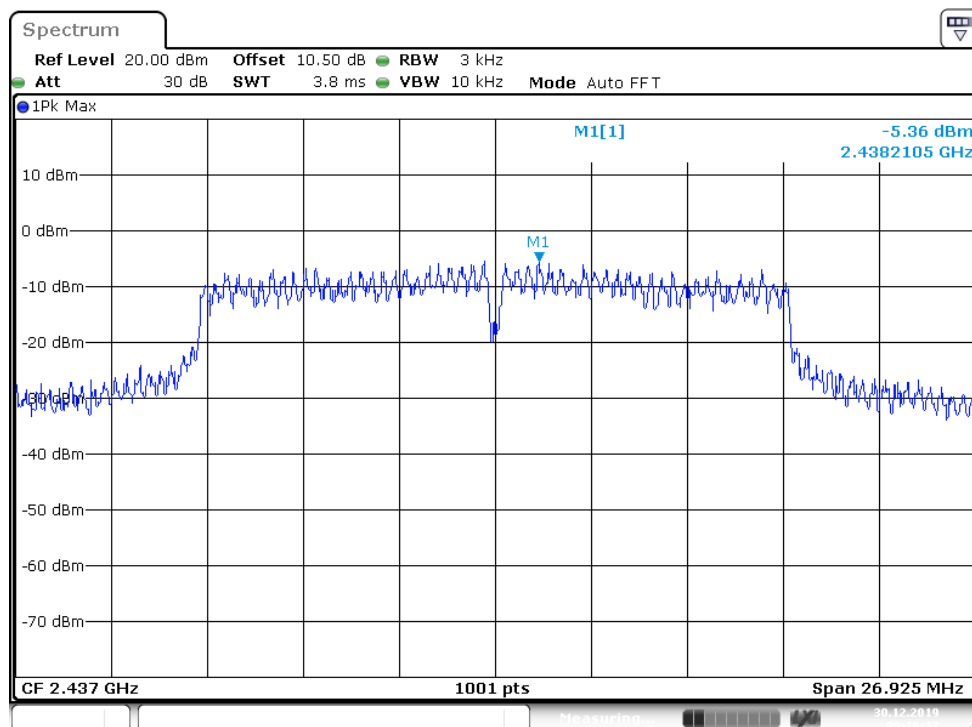
Date: 24.DEC.2019 16:17:26

Middle Channel


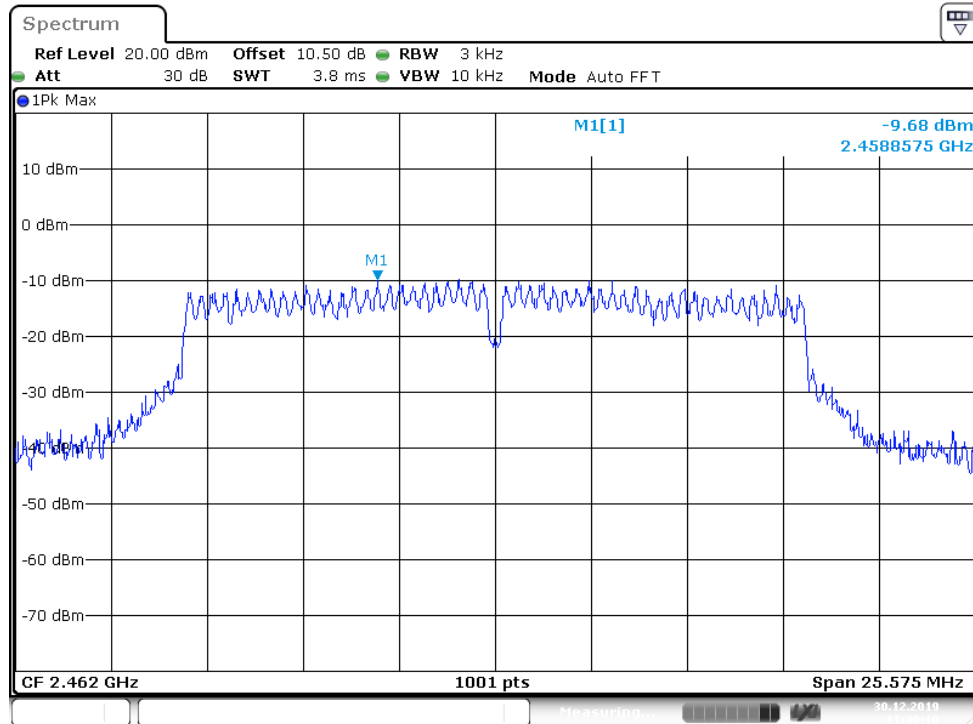
Date: 24.DEC.2019 16:08:49

High Channel


Date: 24.DEC.2019 16:10:35

802.11g, Ant 1
Low Channel

Middle Channel


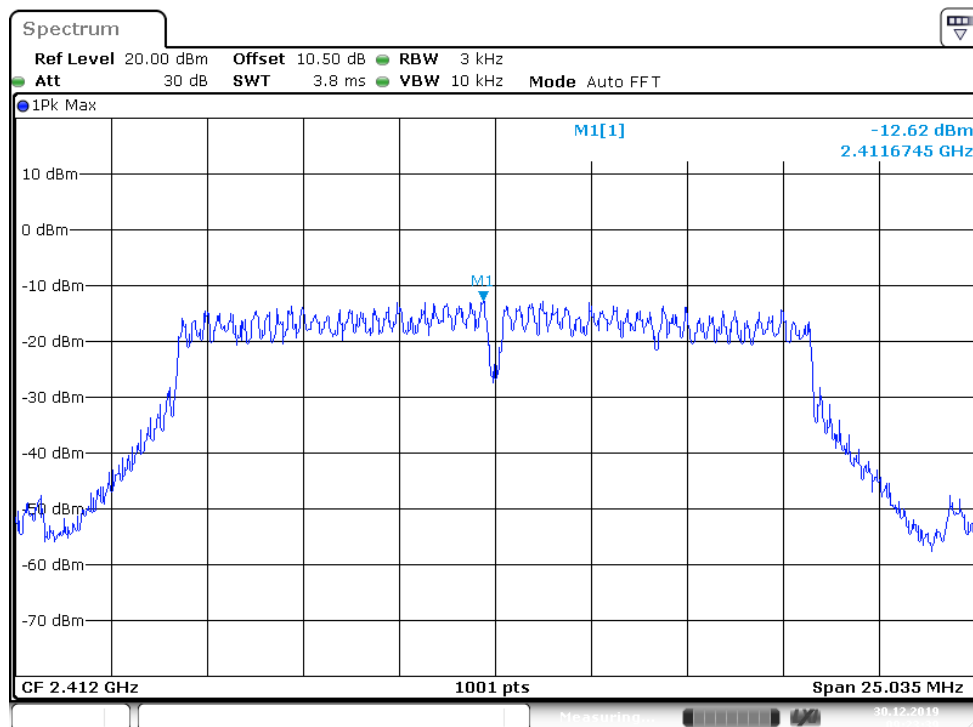
High Channel



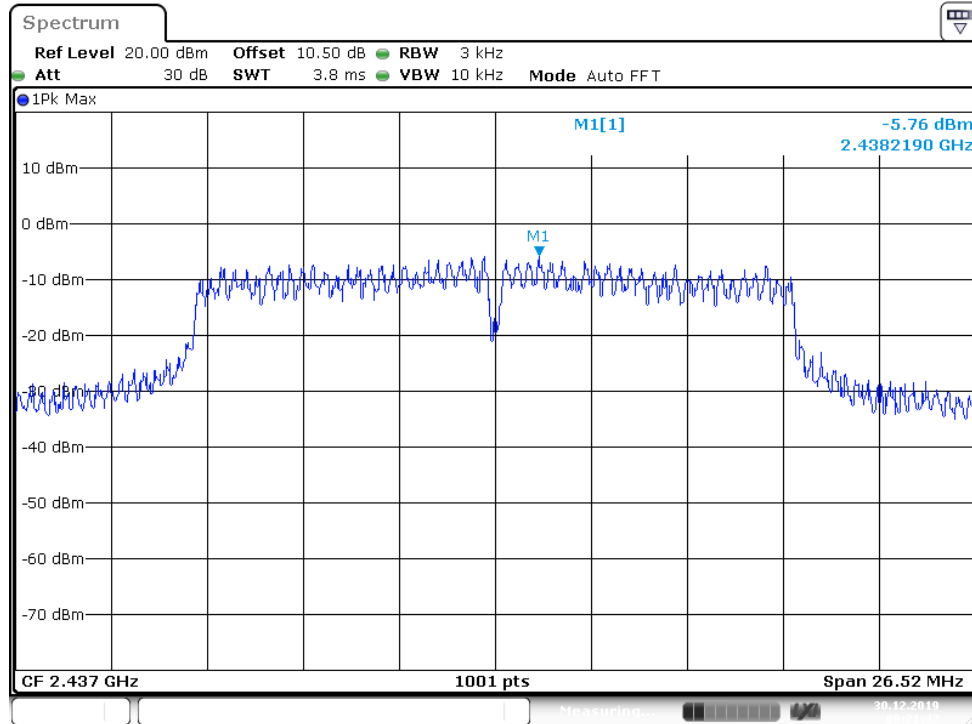
Date: 30.DEC.2019 11:40:10

802.11g, Ant 2

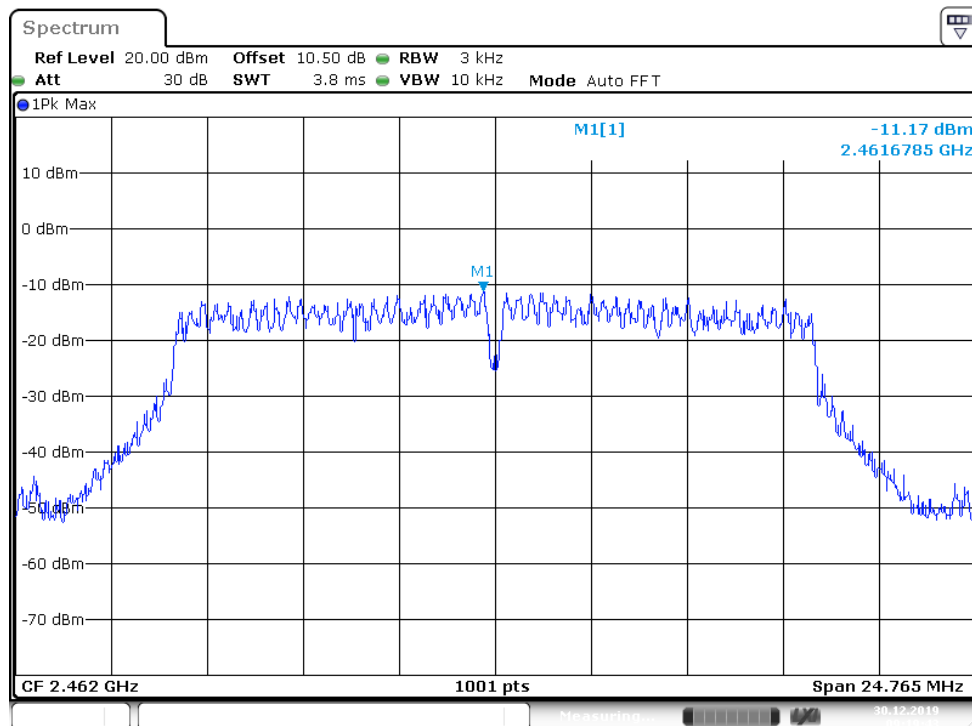
Low Channel



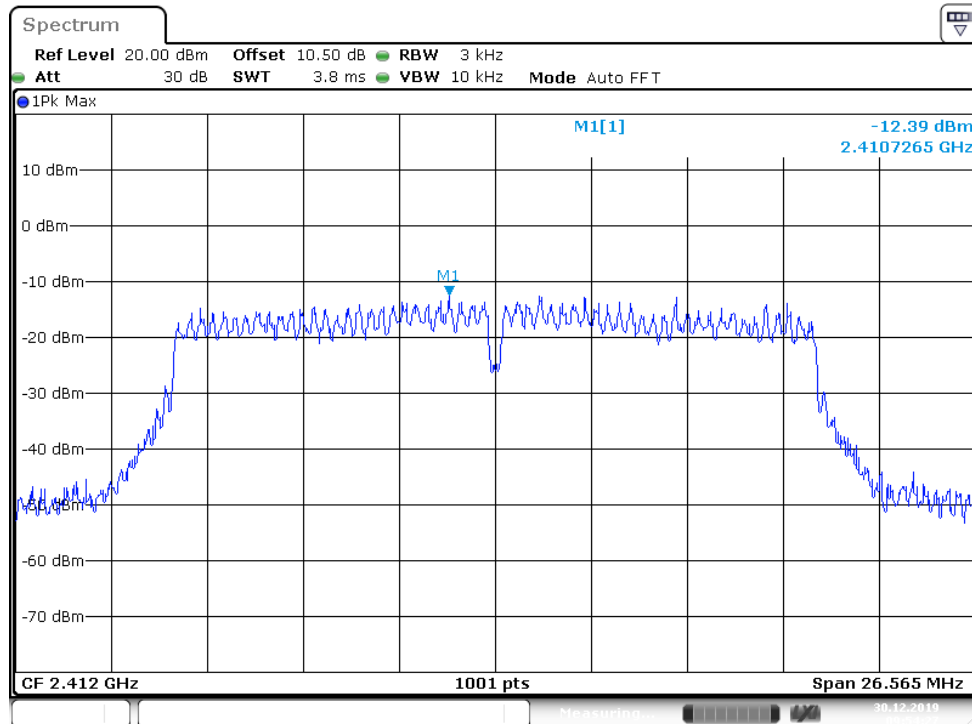
Date: 30.DEC.2019 09:23:39

Middle Channel


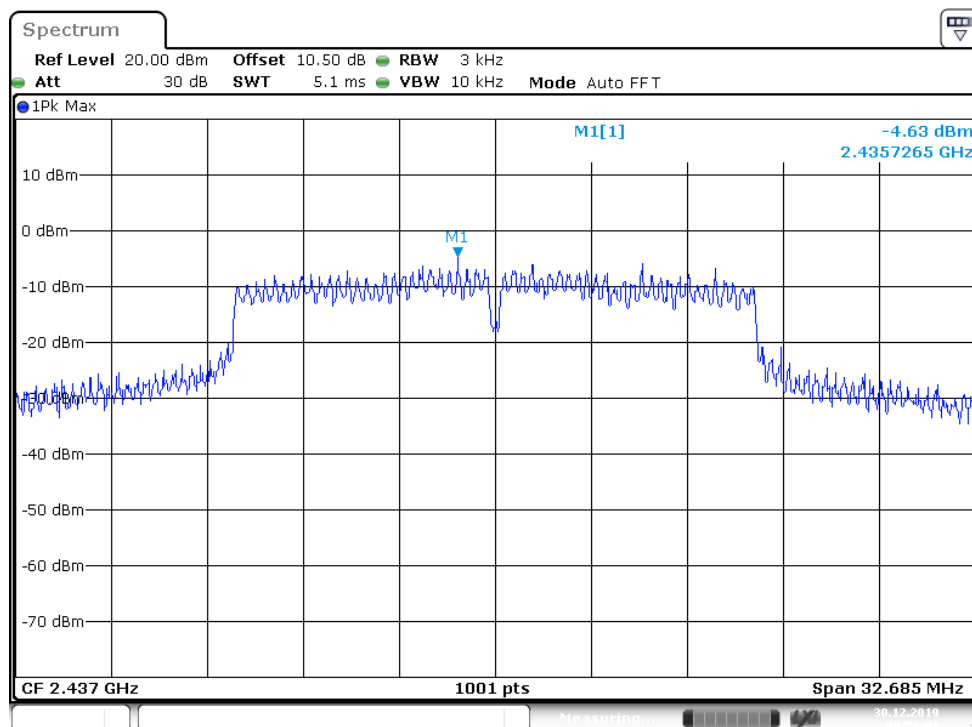
Date: 30.DEC.2019 09:21:41

High Channel


Date: 30.DEC.2019 09:19:43

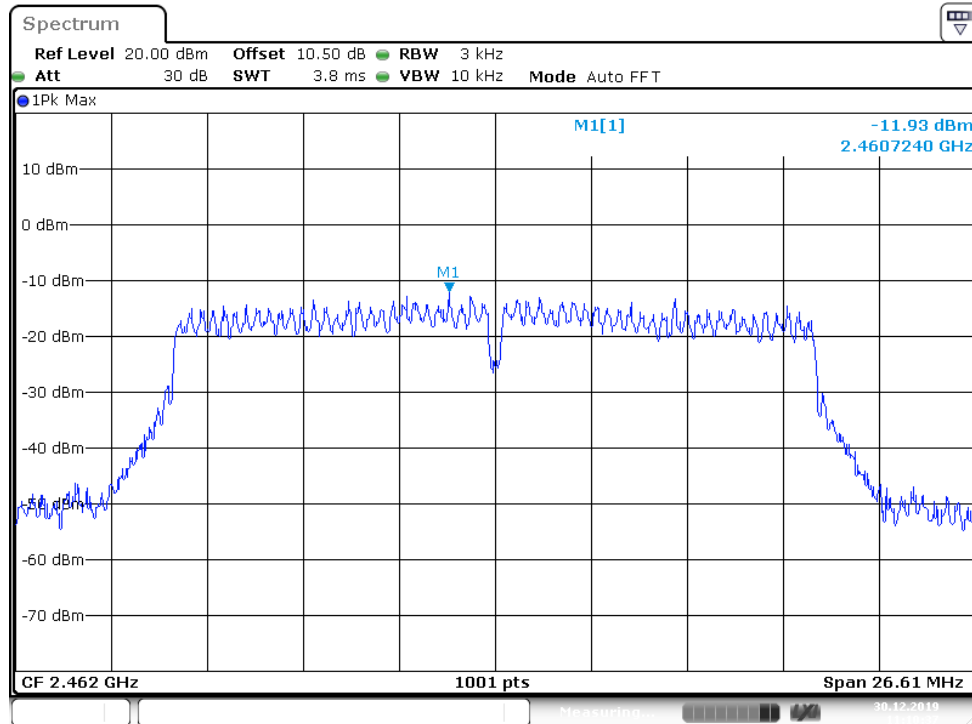
802.11n HT20, Ant 1
Low Channel


Date: 30.DEC.2019 09:54:27

Middle Channel


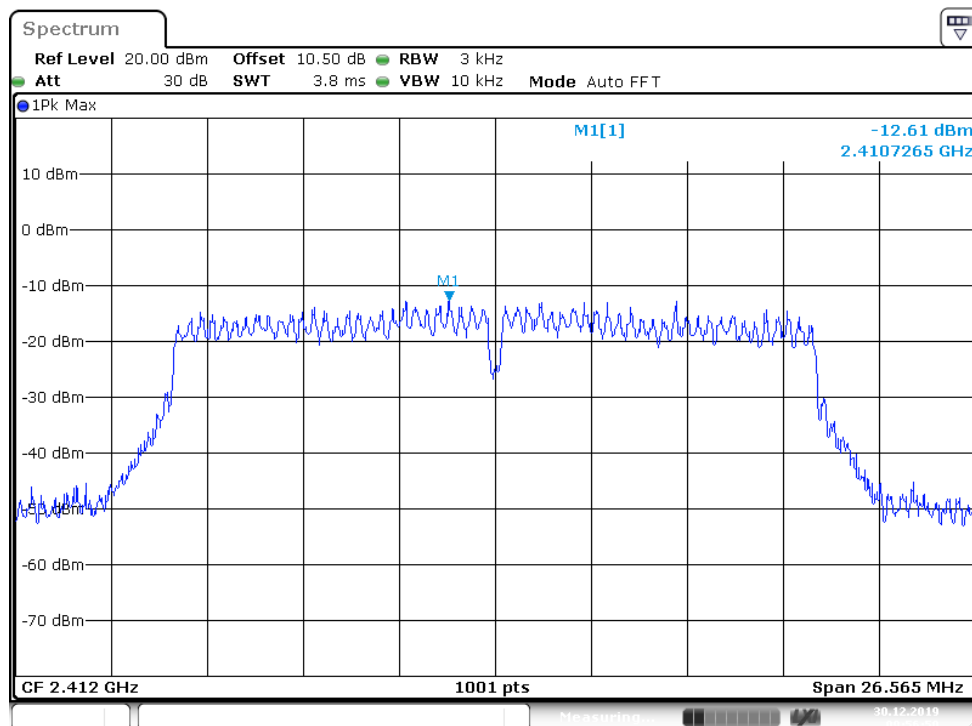
Date: 30.DEC.2019 09:53:01

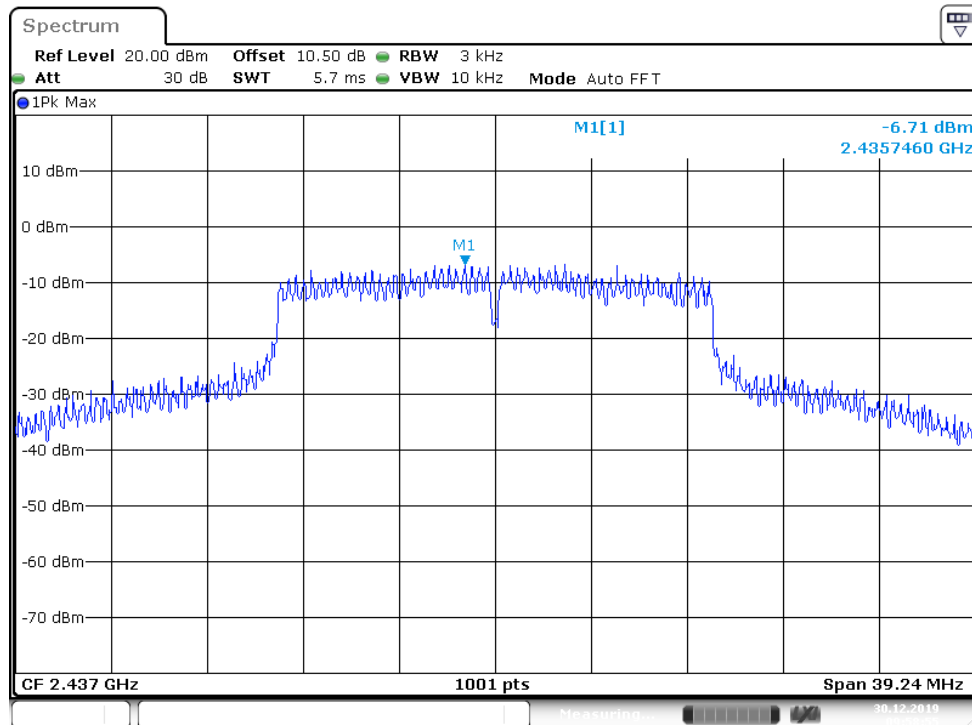
High Channel



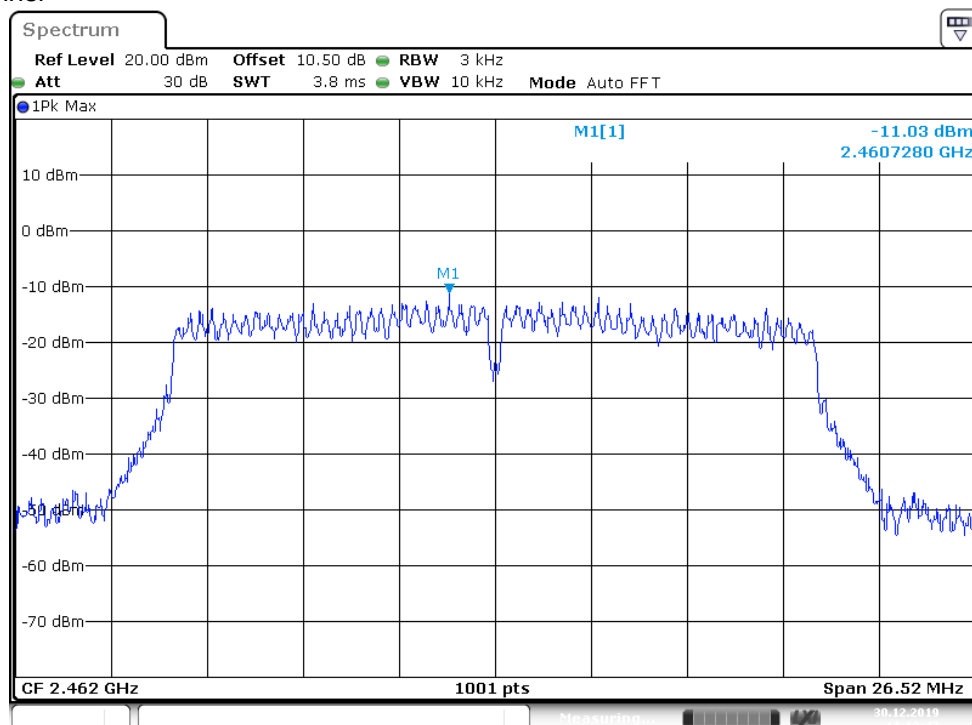
802.11n HT20, Ant 2

Low Channel



Middle Channel


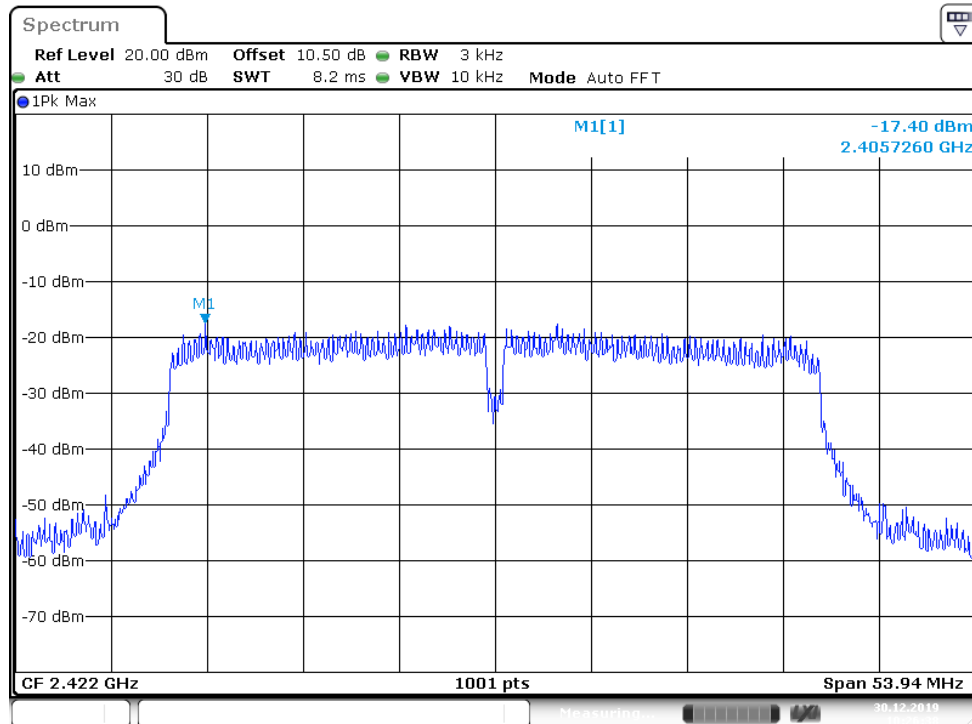
Date: 30.DEC.2019 09:58:55

High Channel


Date: 30.DEC.2019 11:12:47

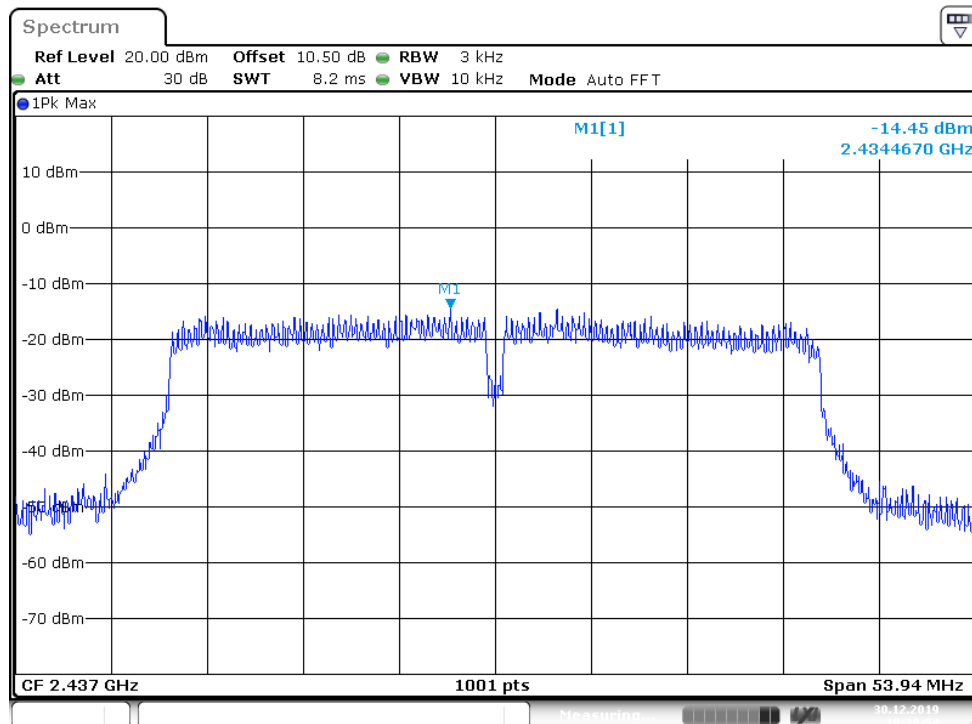
802.11n HT40, Ant 1

Low Channel



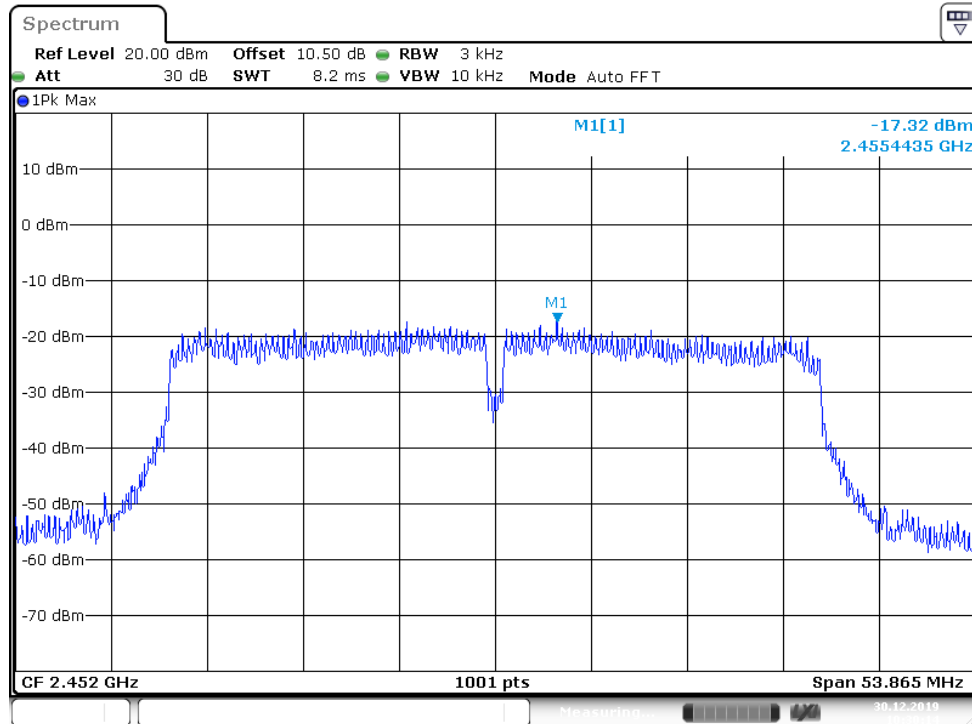
Date: 30.DEC.2019 10:26:38

Middle Channel



Date: 30.DEC.2019 10:28:54

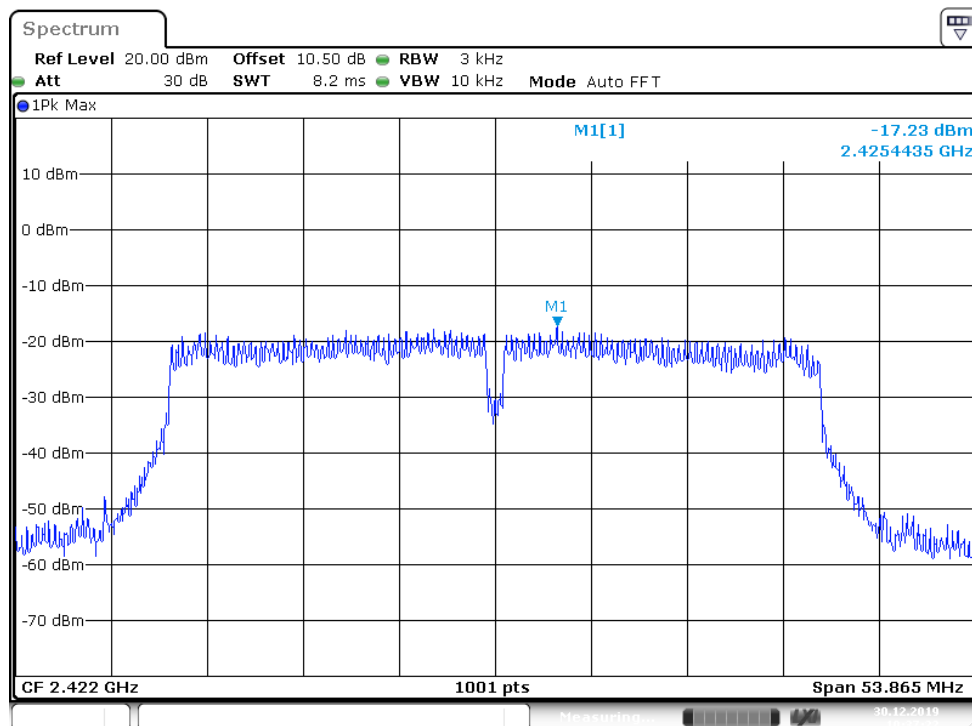
High Channel



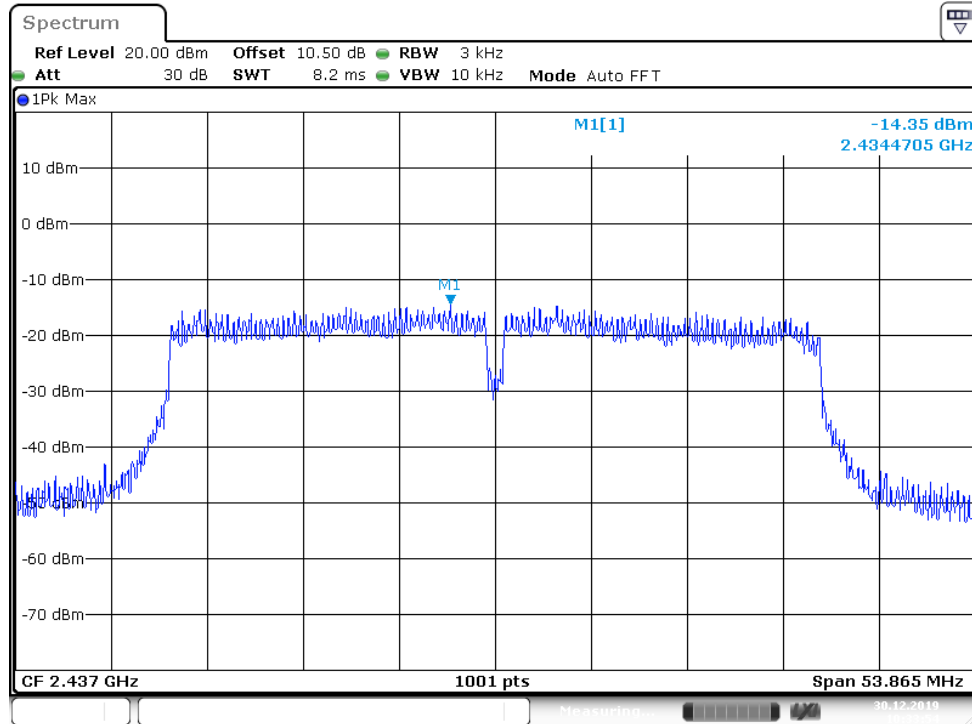
Date: 30.DEC.2019 10:30:14

802.11n HT40, Ant 2

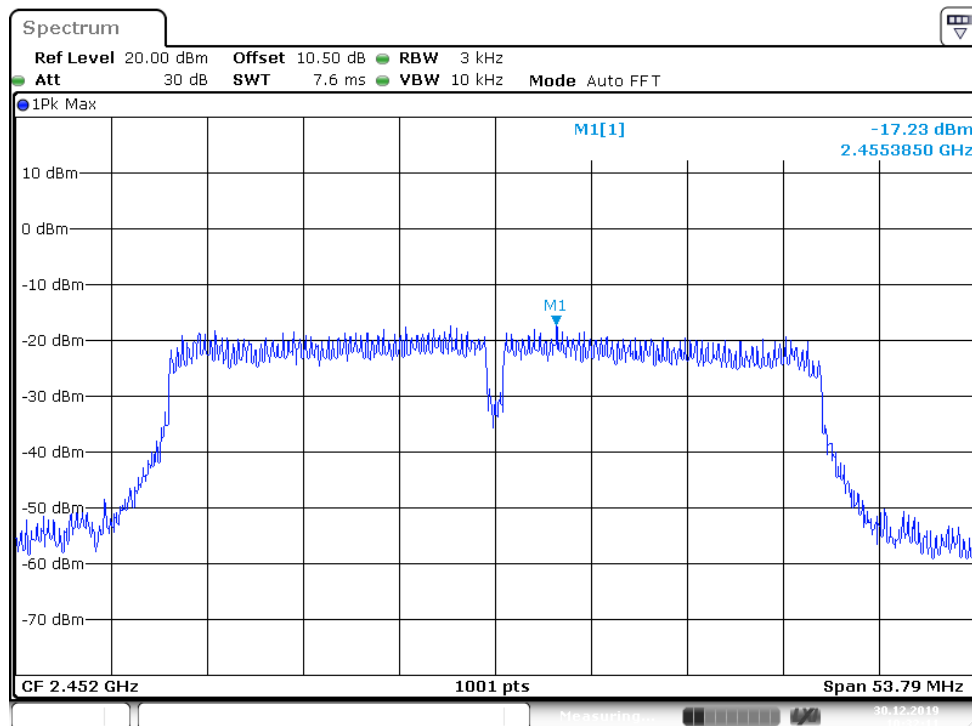
Low Channel



Date: 30.DEC.2019 10:37:22

Middle Channel


Date: 30.DEC.2019 10:33:54

High Channel


Date: 30.DEC.2019 10:32:11

5.1.5 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

RESULT:**Passed**

Test standard	:	FCC part 15.247(d), ISED RSS-247 5.5
Basic standard	:	ANSI C63.10:2013, KDB558074
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High for Conducted Spurious Emissions Low/ High for Frequency Band Edge
Operation Mode	:	A
Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

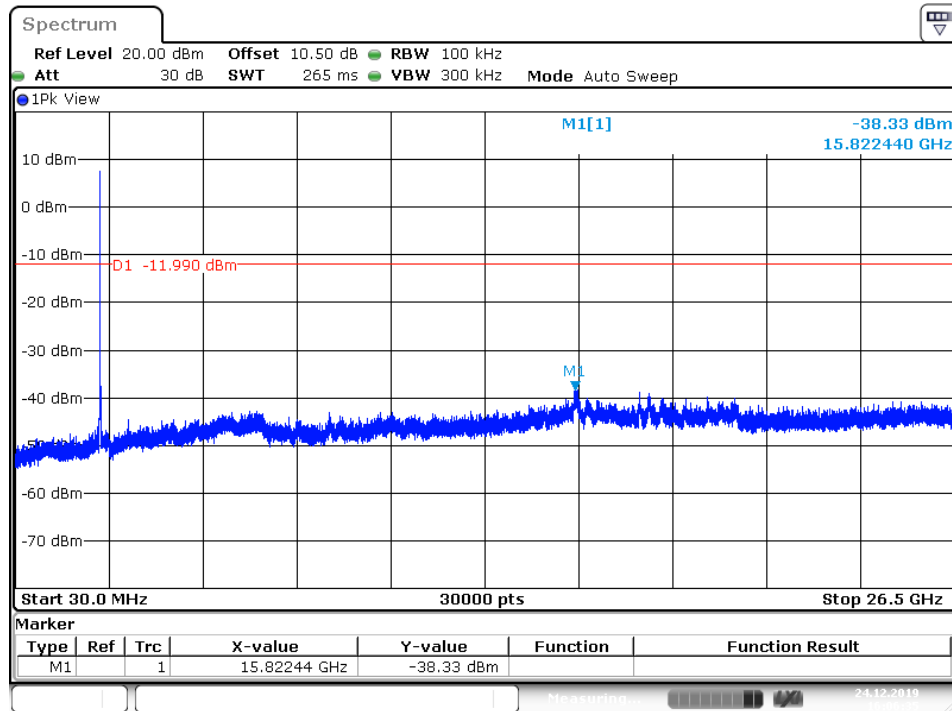
All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

Due to the small size of the RF circuit and that there are no inductive components of significant size connected to the antenna port, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Test Plot 100kHz Conducted Emissions

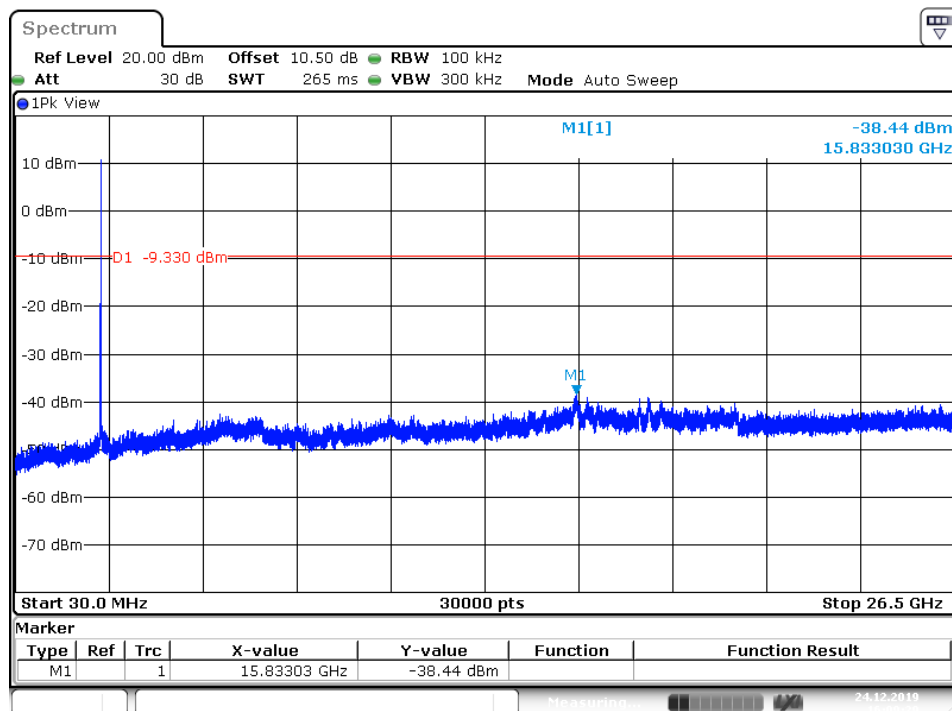
802.11b, Ant 1

Low Channel



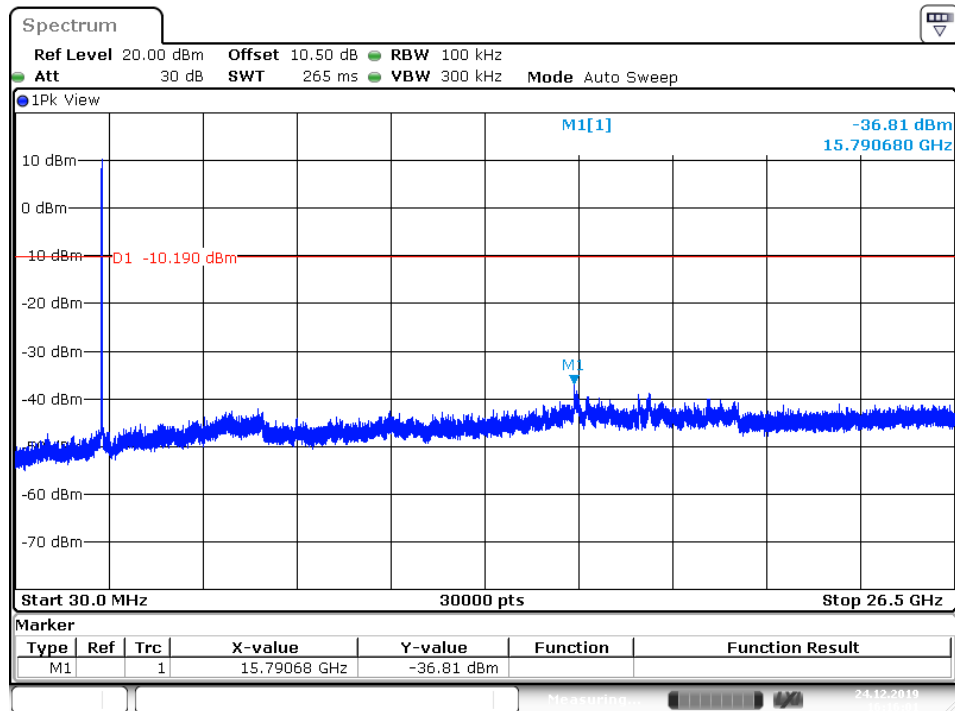
Date: 24.DEC.2019 16:06:35

Middle Channel



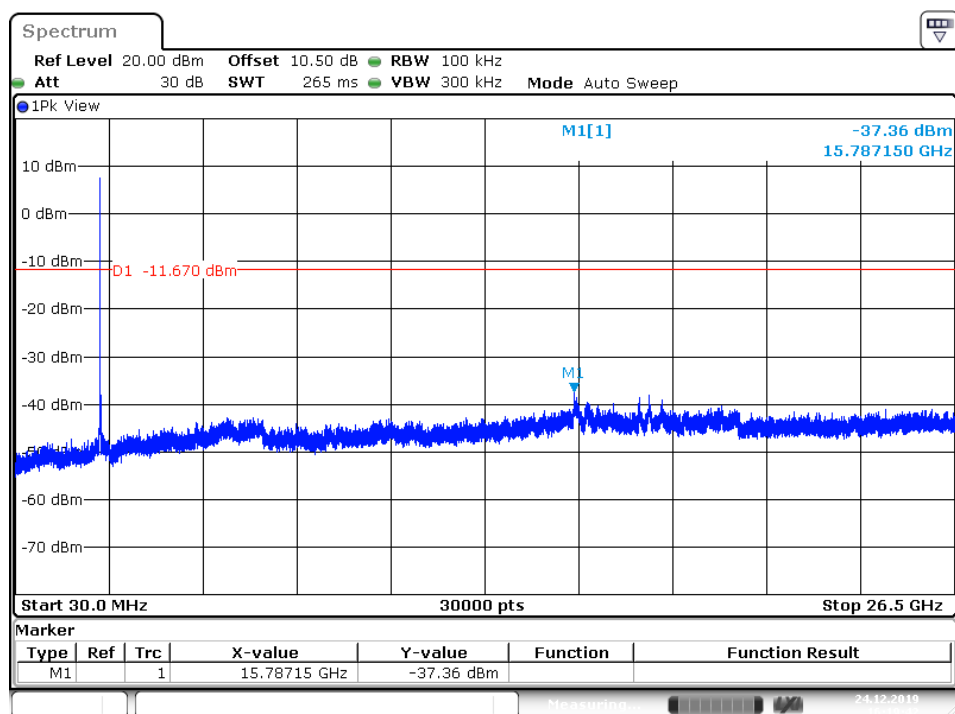
Date: 24.DEC.2019 16:09:29

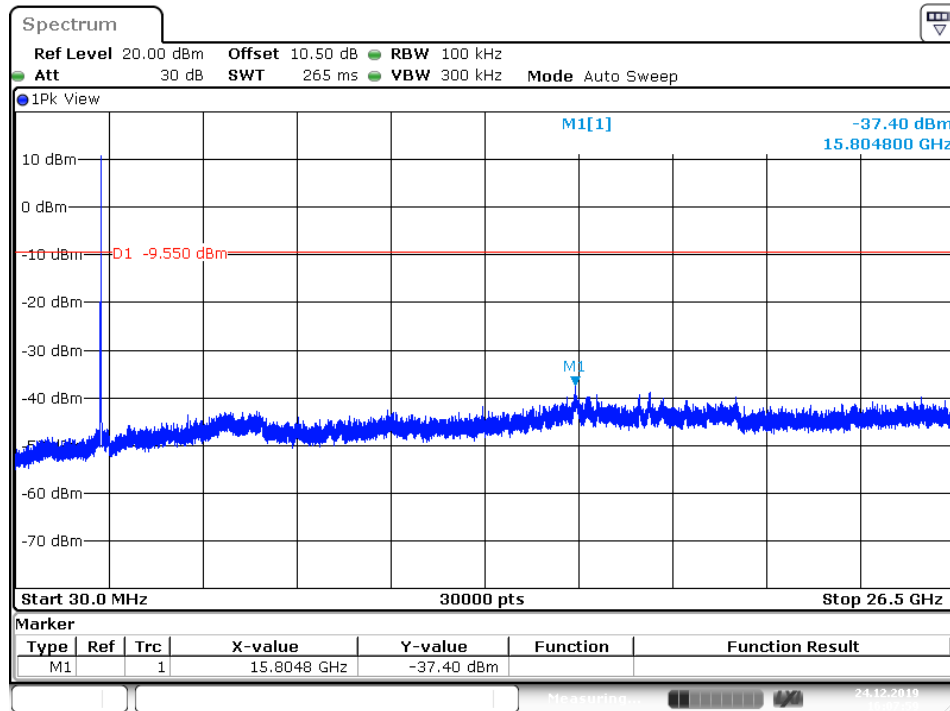
High Channel



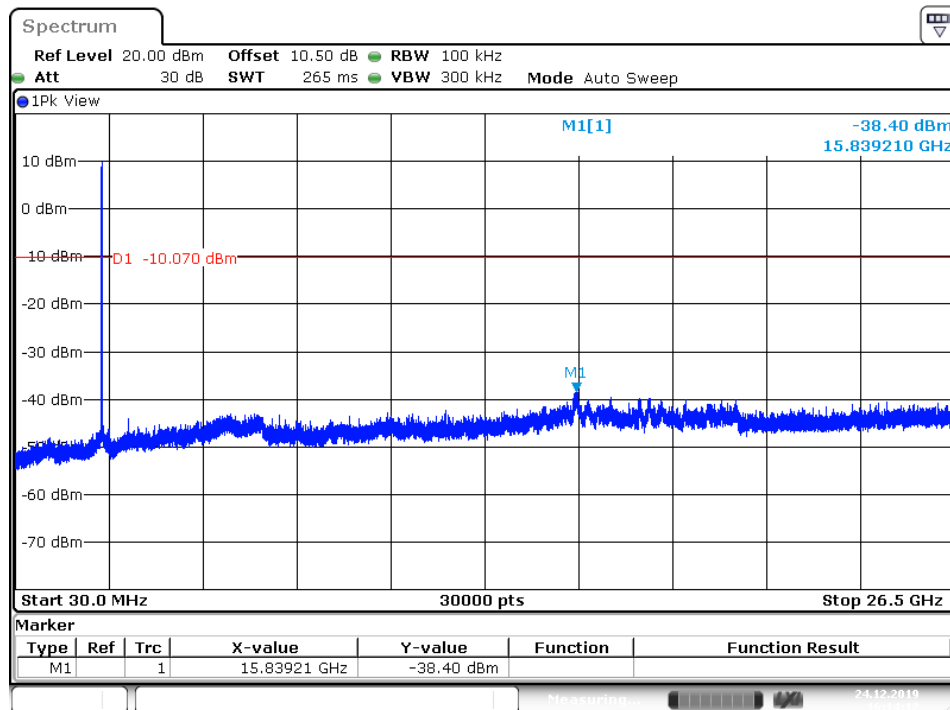
802.11b, Ant 2

Low Channel



Middle Channel


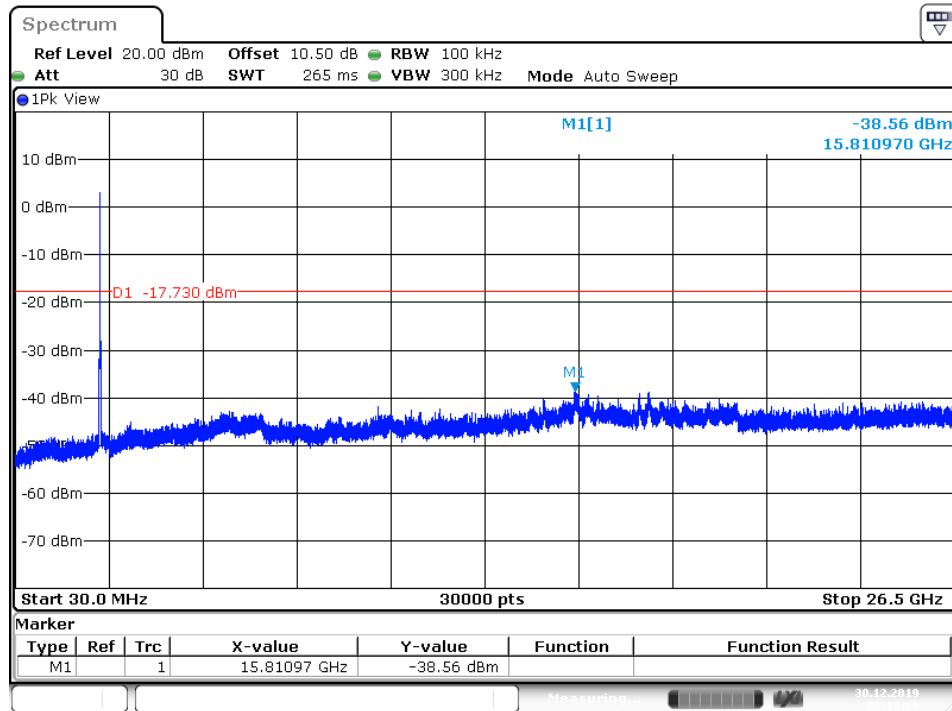
Date: 24.DEC.2019 16:07:59

High Channel


Date: 24.DEC.2019 16:14:12

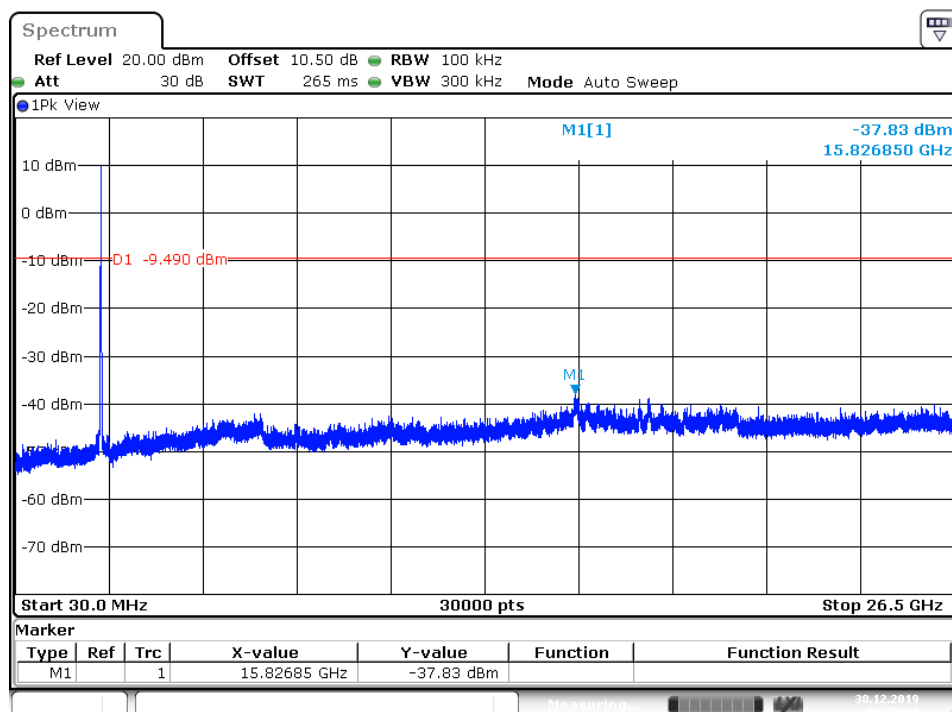
802.11g, Ant 1

Low Channel



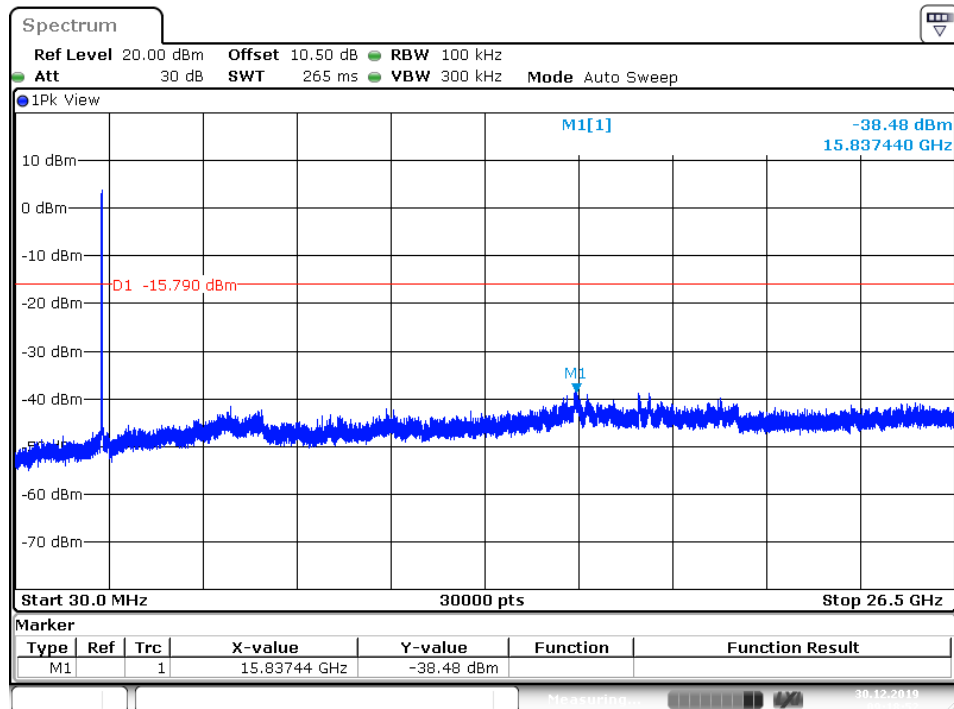
Date: 30.DEC.2019 09:15:09

Middle Channel



Date: 30.DEC.2019 09:17:01

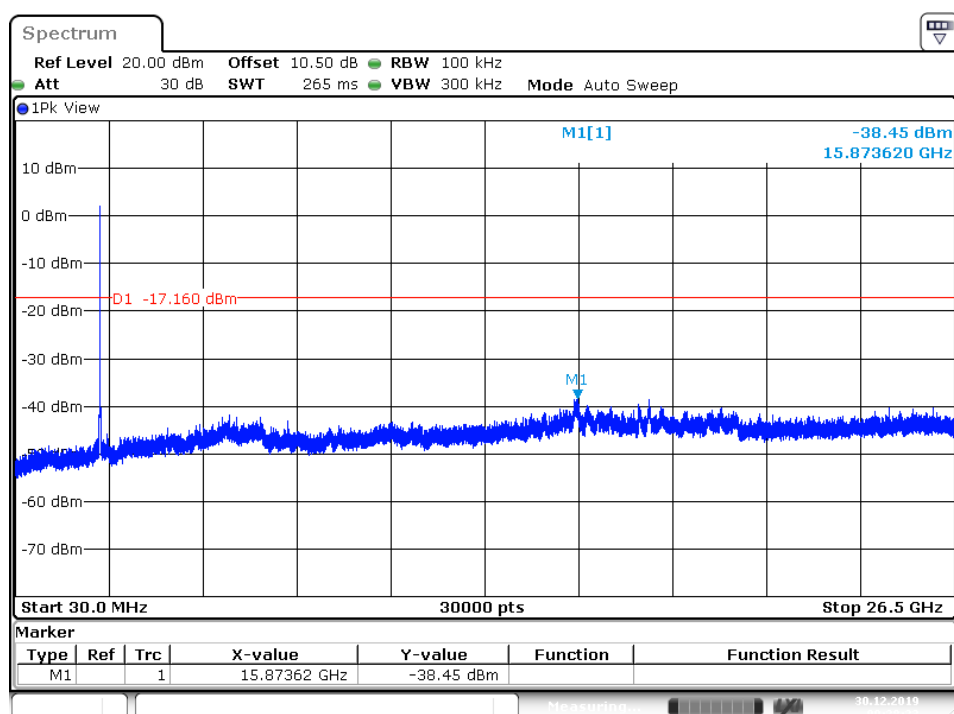
High Channel



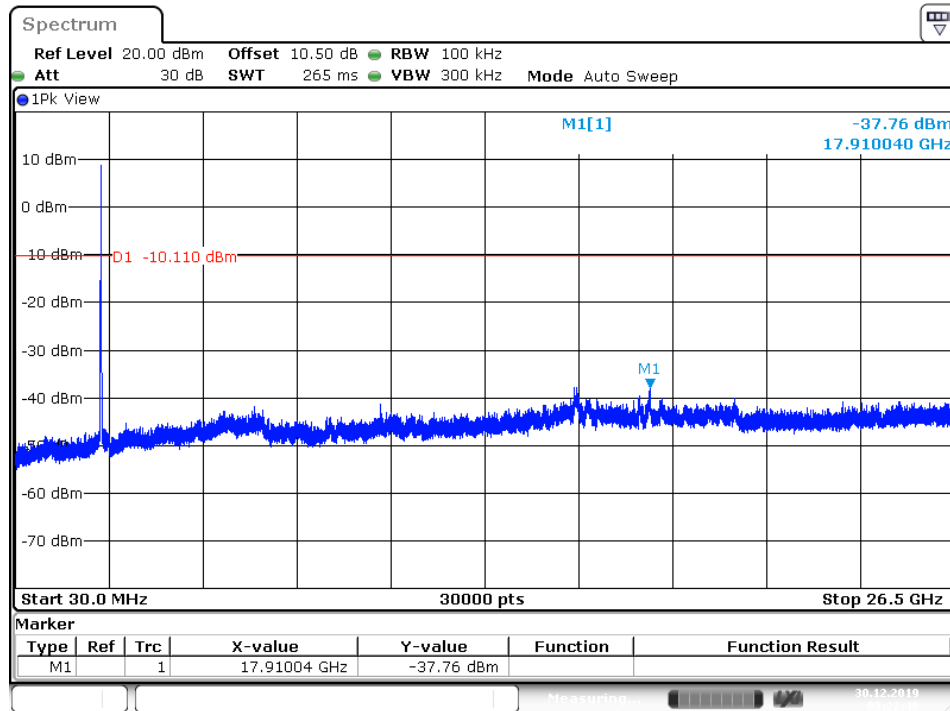
Date: 30.DEC.2019 09:18:51

802.11g, Ant 2

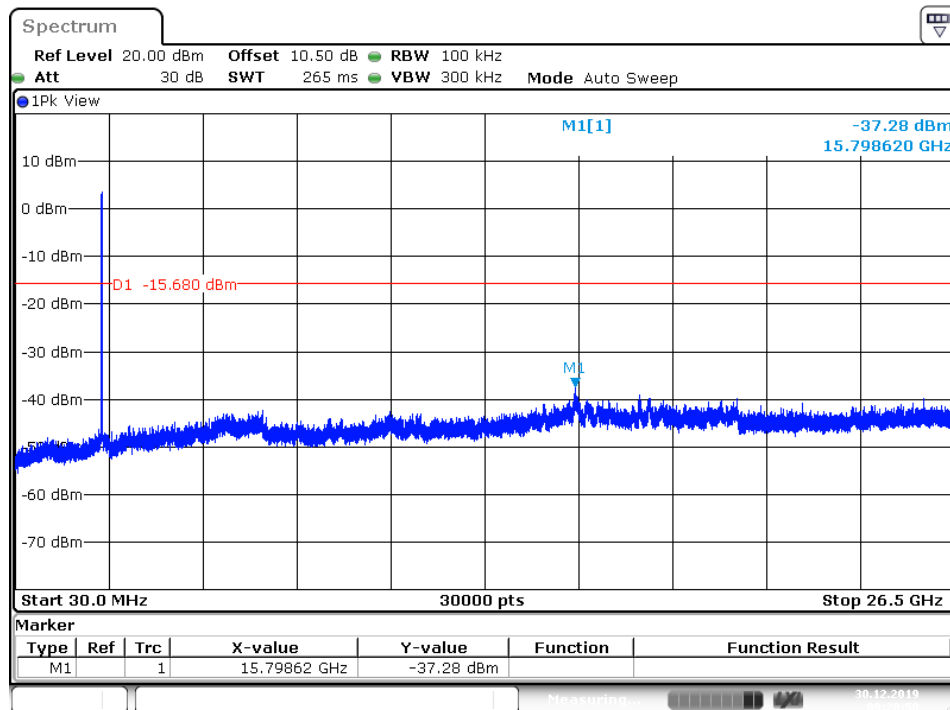
Low Channel



Date: 30.DEC.2019 09:28:23

Middle Channel


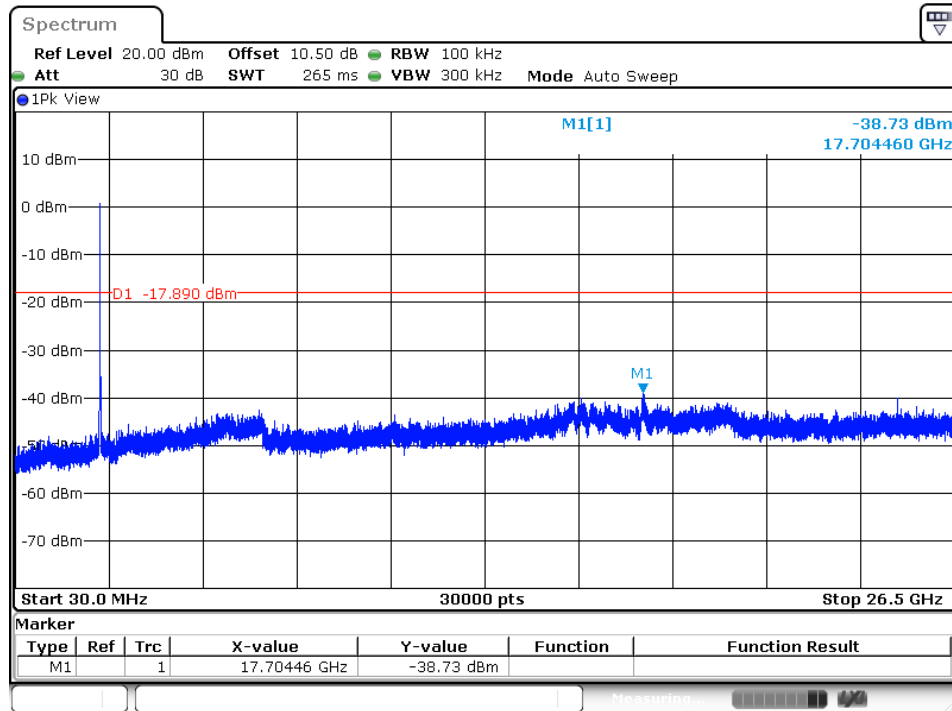
Date: 30.DEC.2019 09:22:48

High Channel


Date: 30.DEC.2019 09:20:50

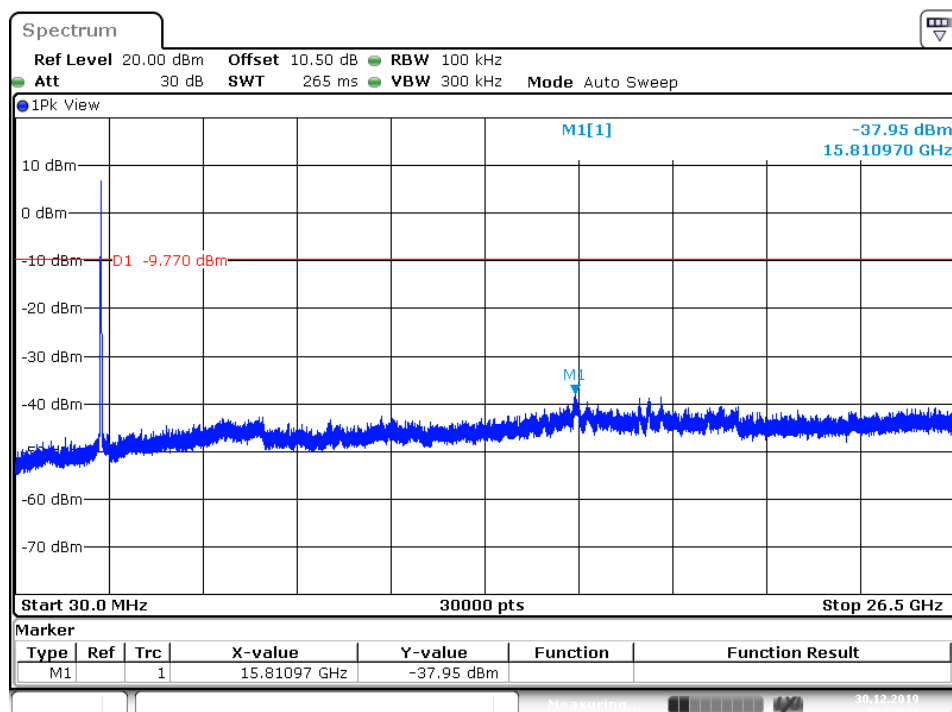
802.11n HT20, Ant 1

Low Channel



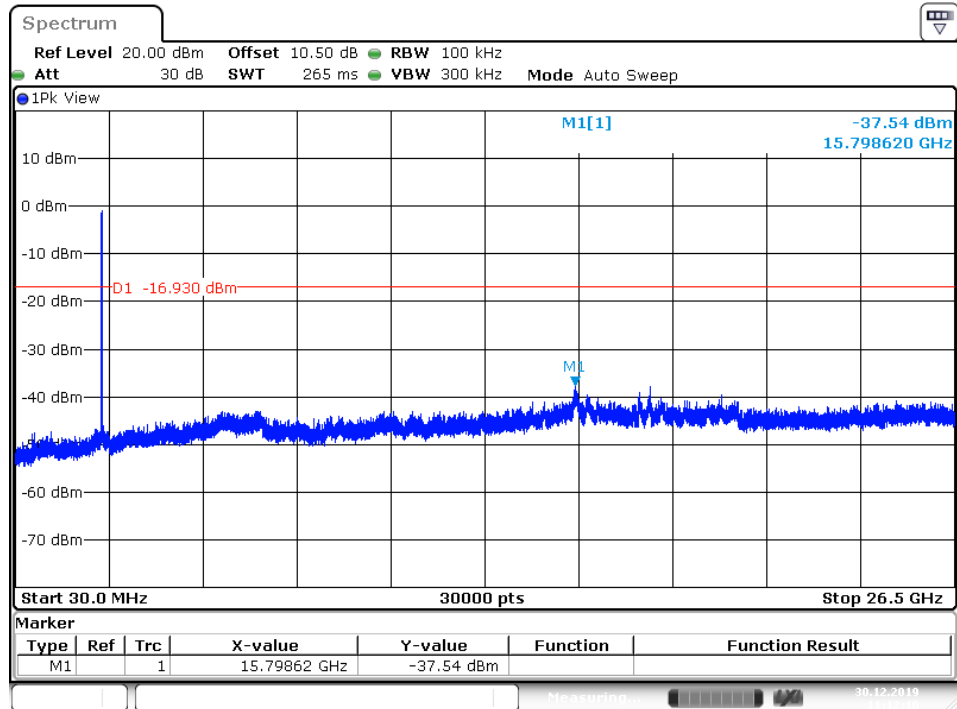
Date: 6.MAR.2020 03:26:50

Middle Channel



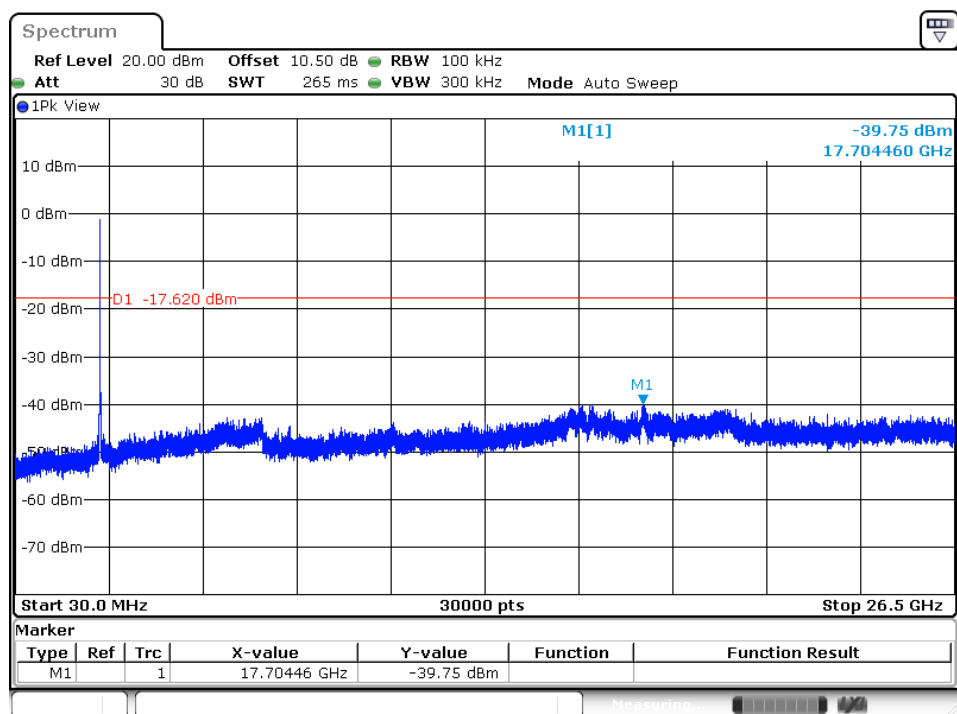
Date: 30.DEC.2019 09:53:41

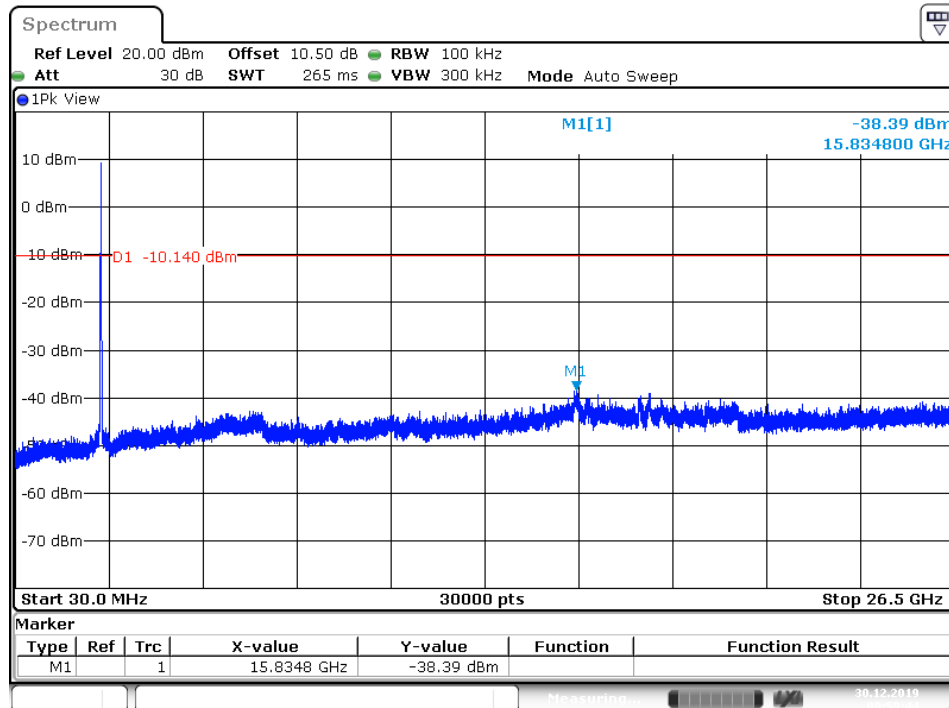
High Channel



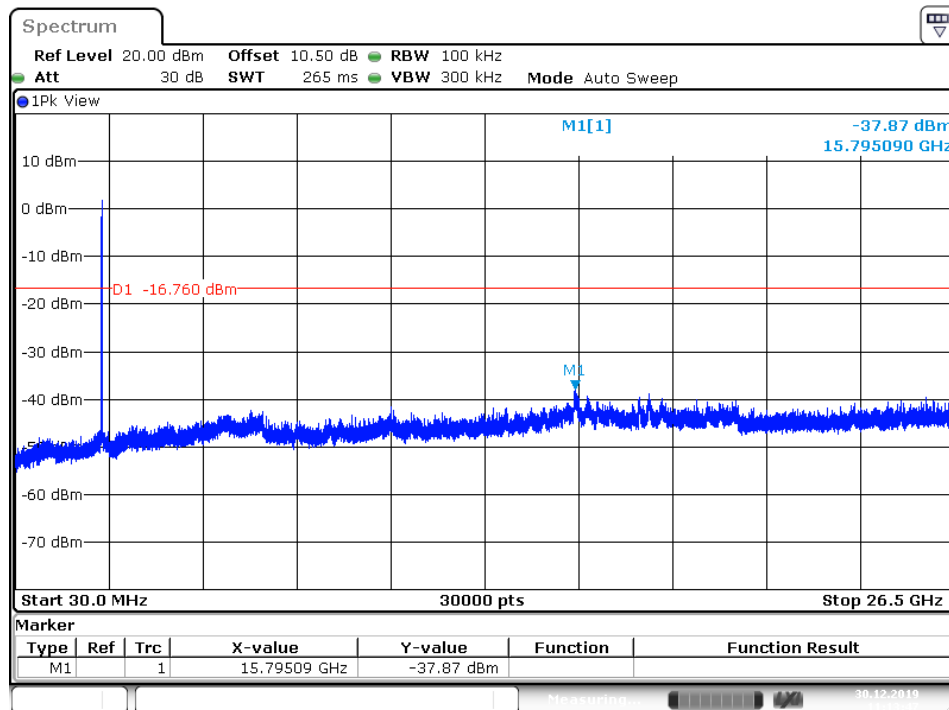
802.11n HT20, Ant 2

Low Channel

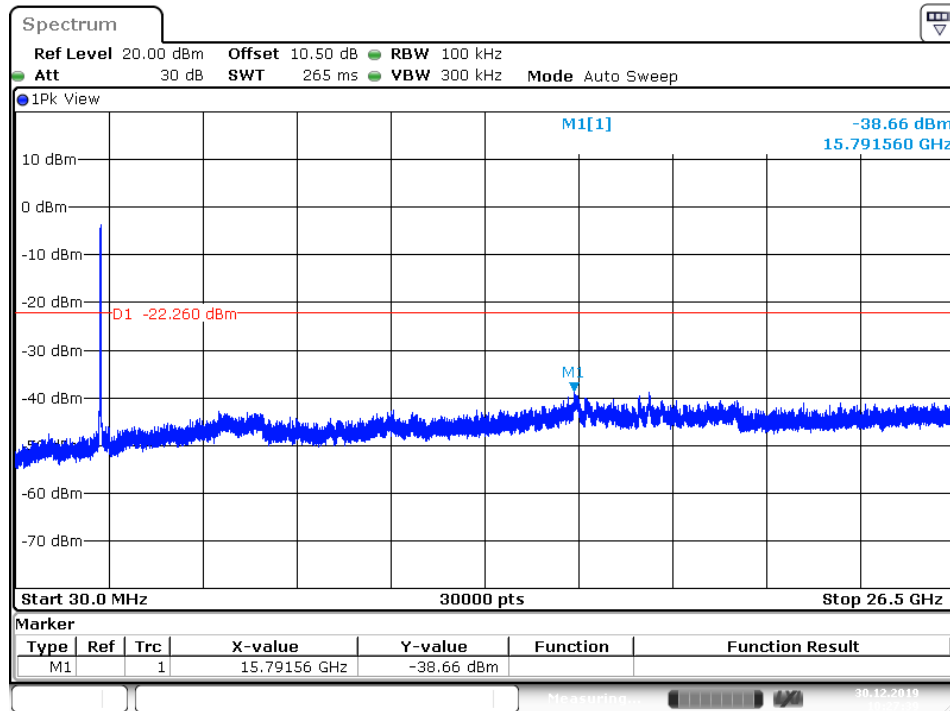


Middle Channel


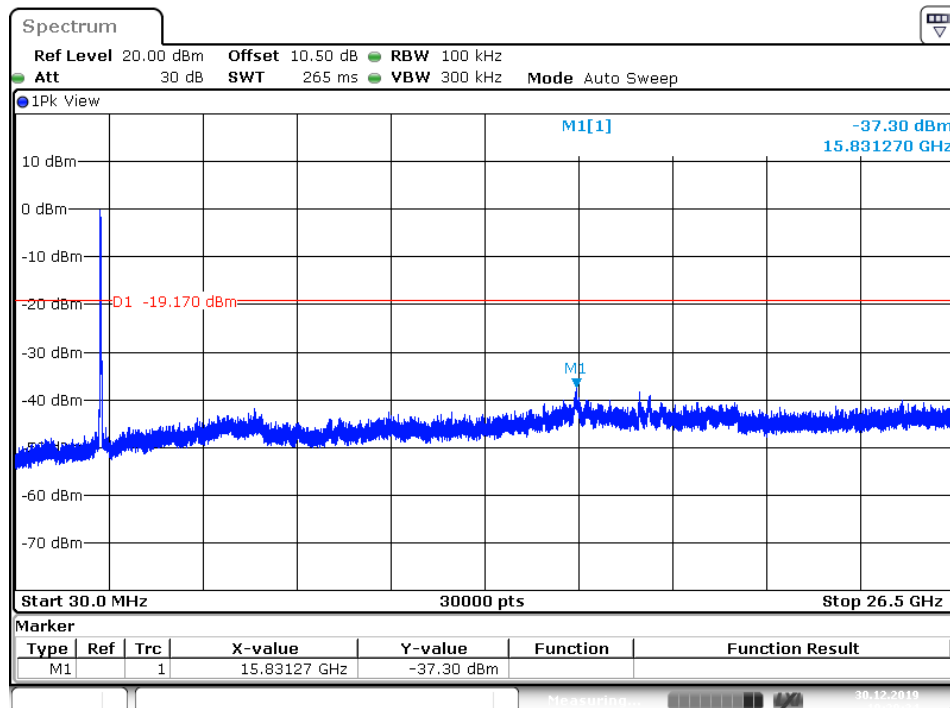
Date: 30.DEC.2019 09:59:44

High Channel


Date: 30.DEC.2019 11:13:47

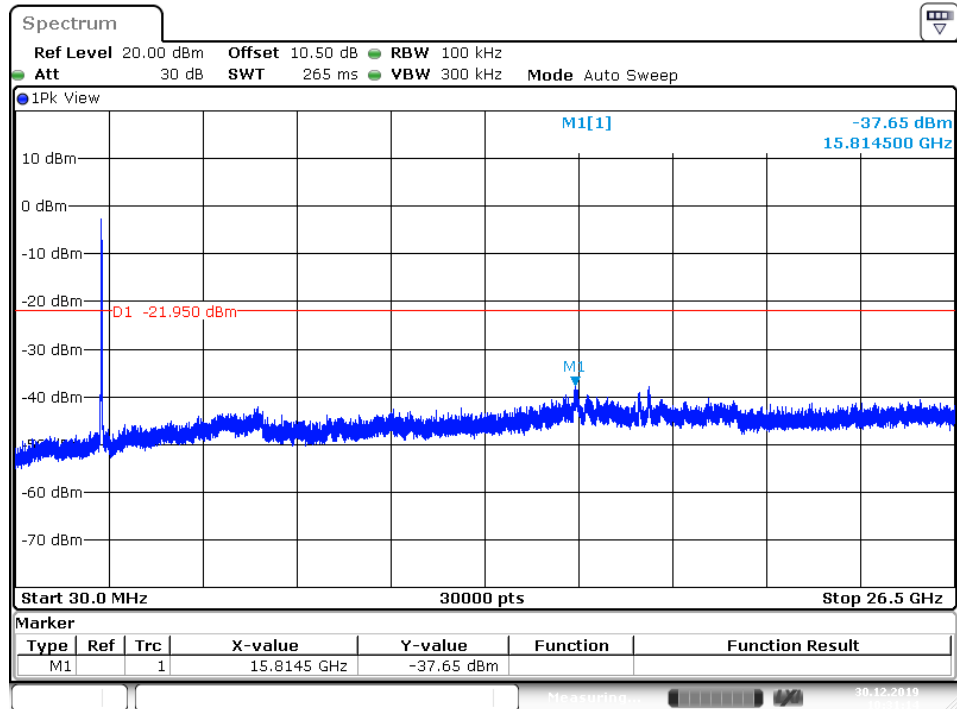
802.11n HT40, Ant 1
Low Channel


Date: 30.DEC.2019 10:27:39

Middle Channel


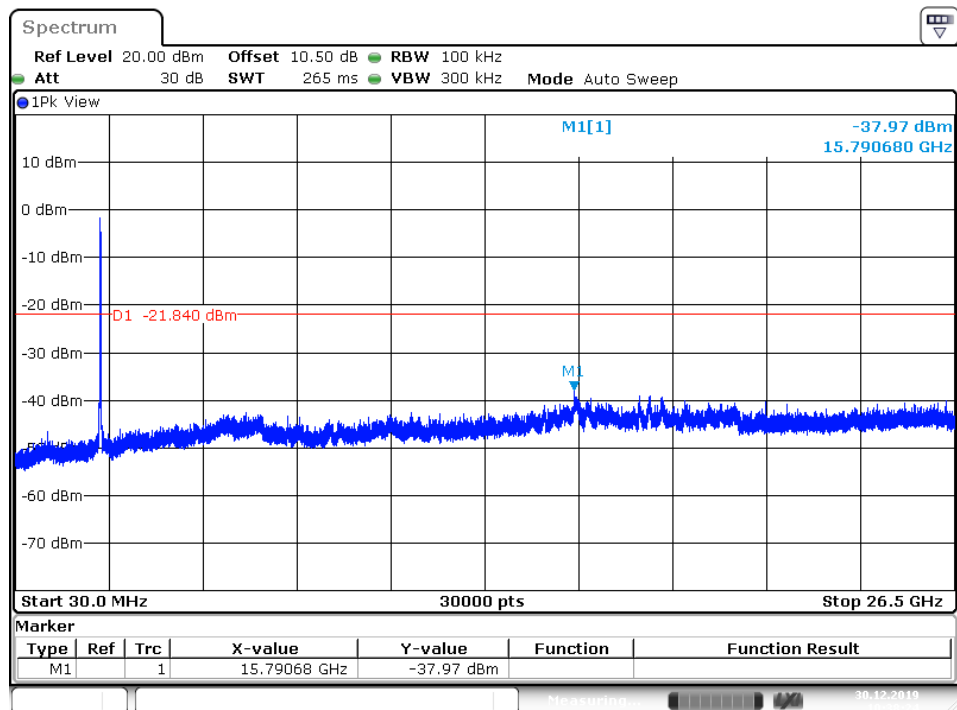
Date: 30.DEC.2019 10:29:33

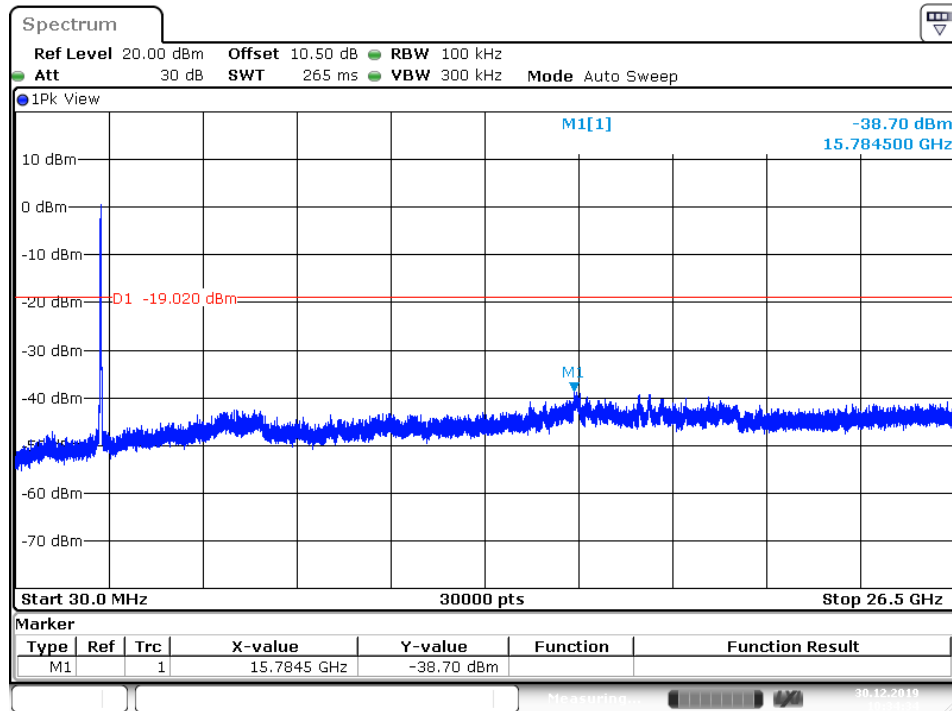
High Channel



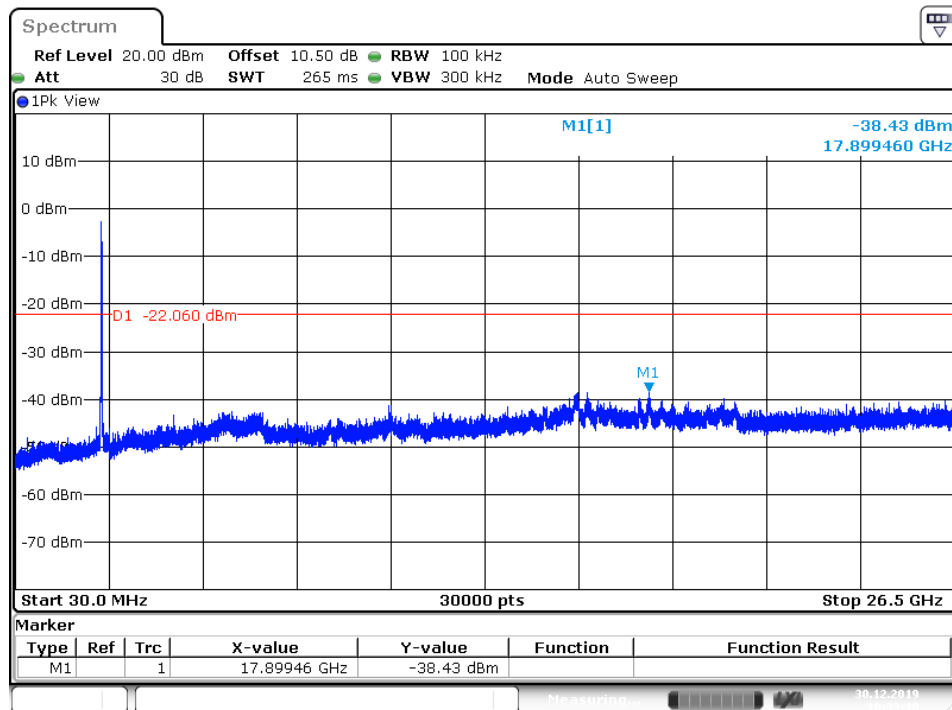
802.11n HT40, Ant 2

Low Channel



Middle Channel


Date: 30.DEC.2019 10:34:34

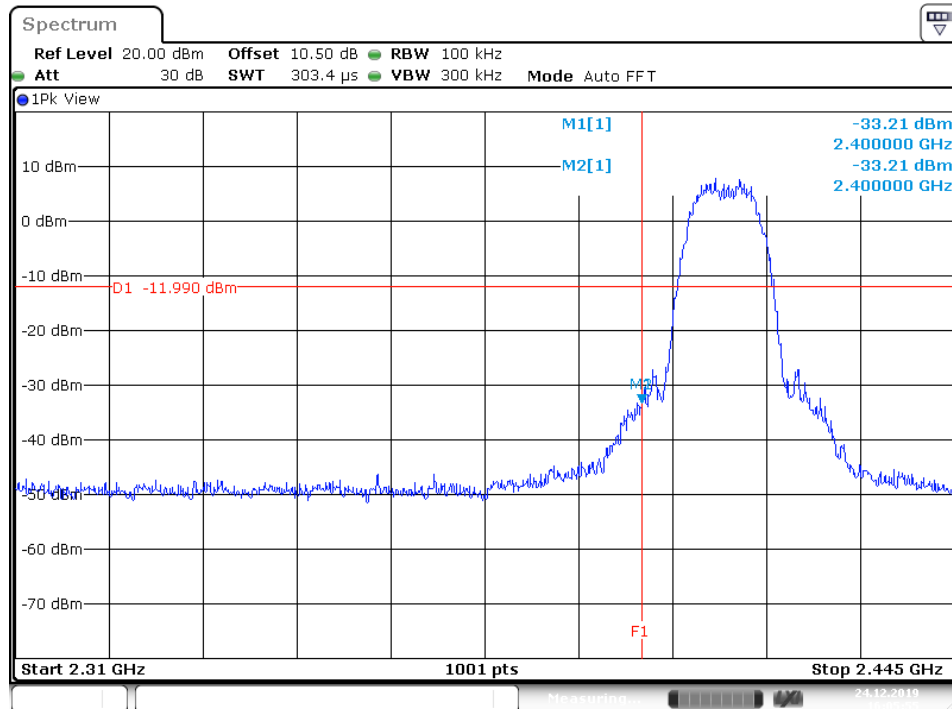
High Channel


Date: 30.DEC.2019 10:33:18

Test Plot 100kHz RBW of Band Edge

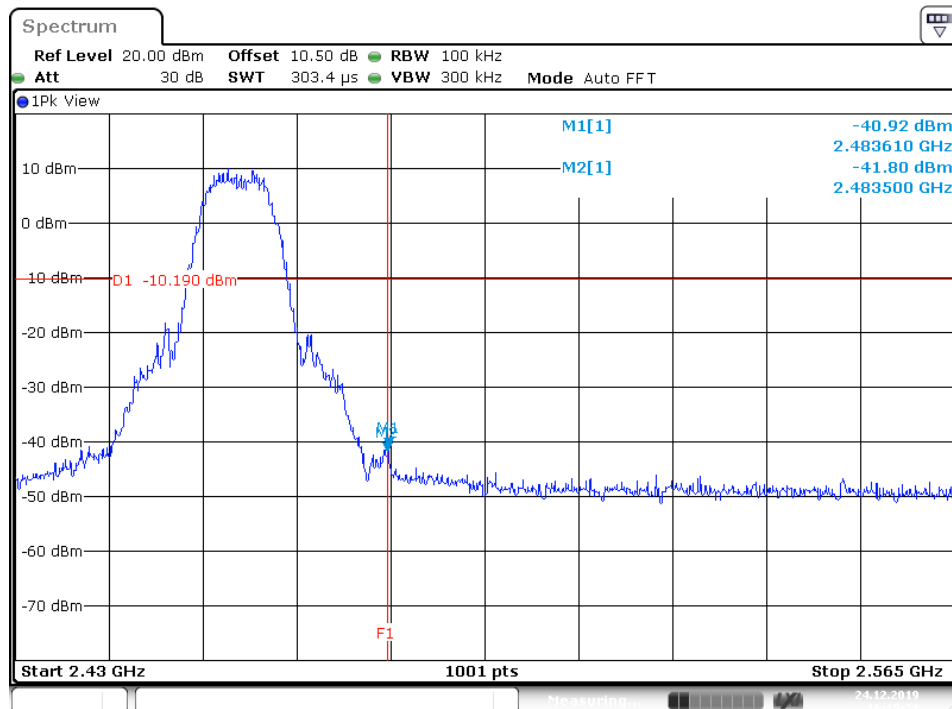
802.11b, Ant 1

Low Channel



Date: 24.DEC.2019 16:05:55

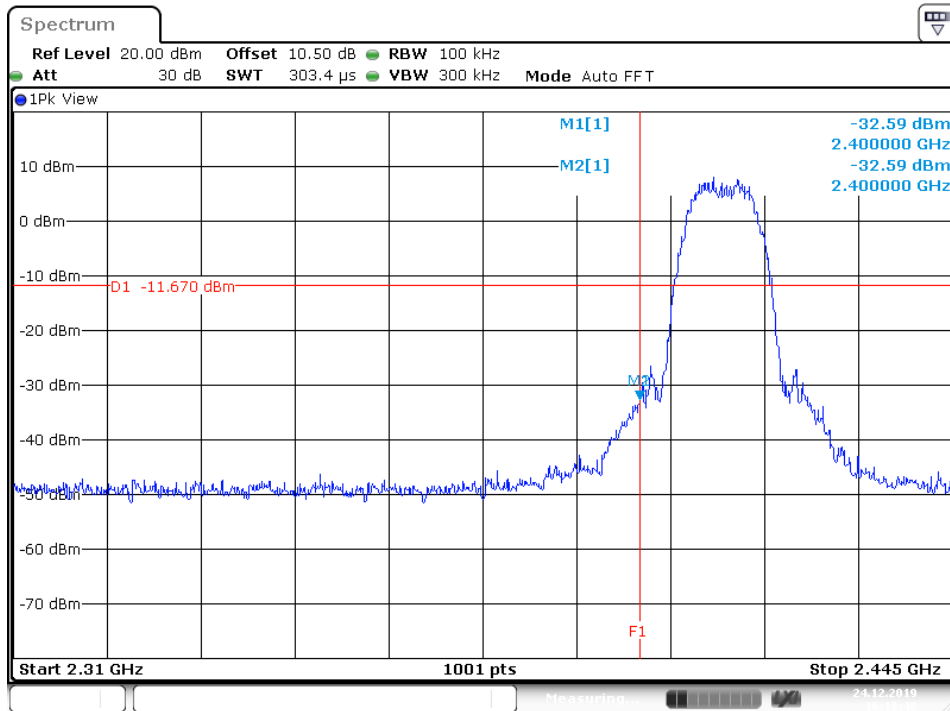
High Channel



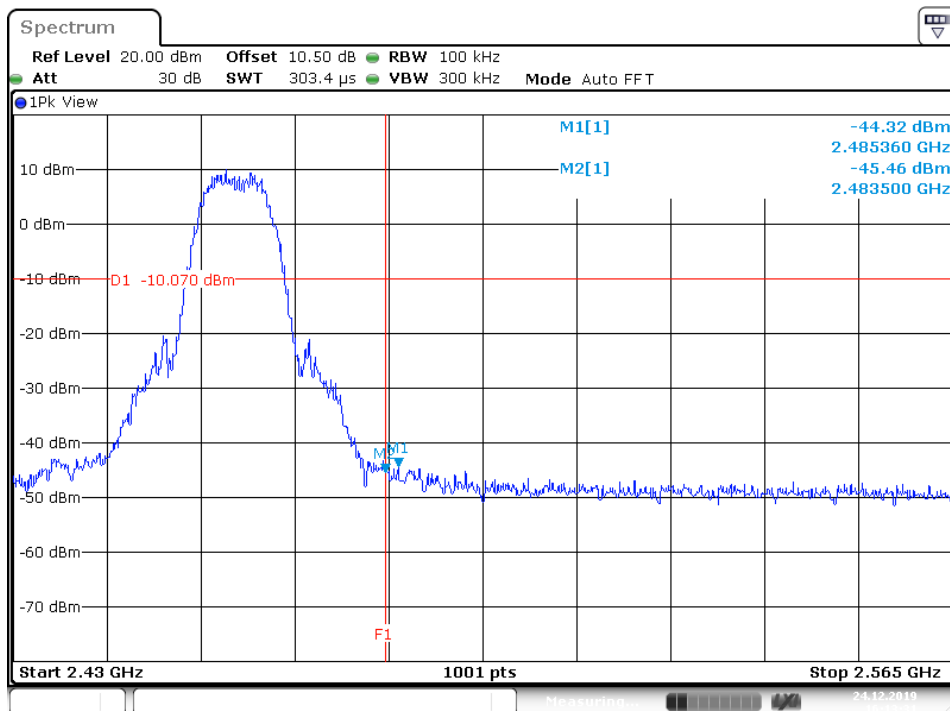
Date: 24.DEC.2019 16:15:21

802.11b, Ant 2

Low Channel

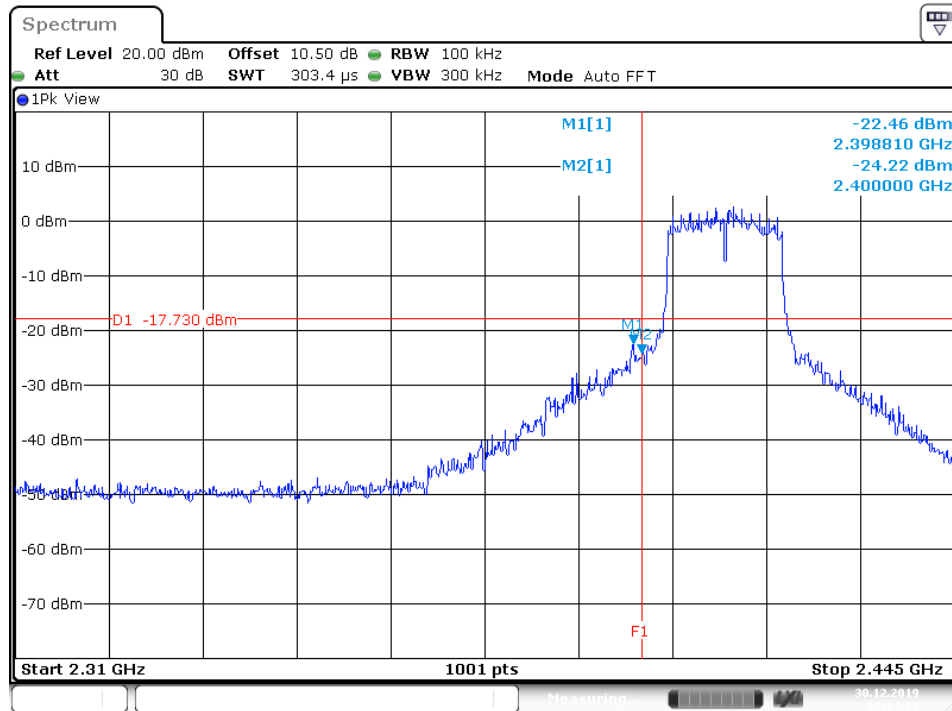


High Channel



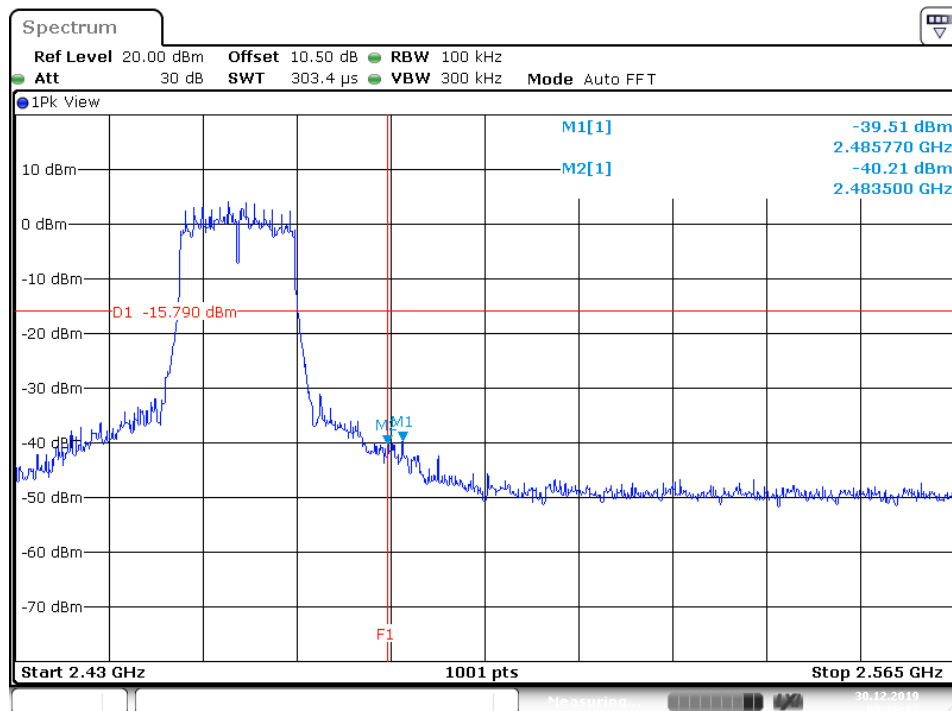
802.11g, Ant 1

Low Channel

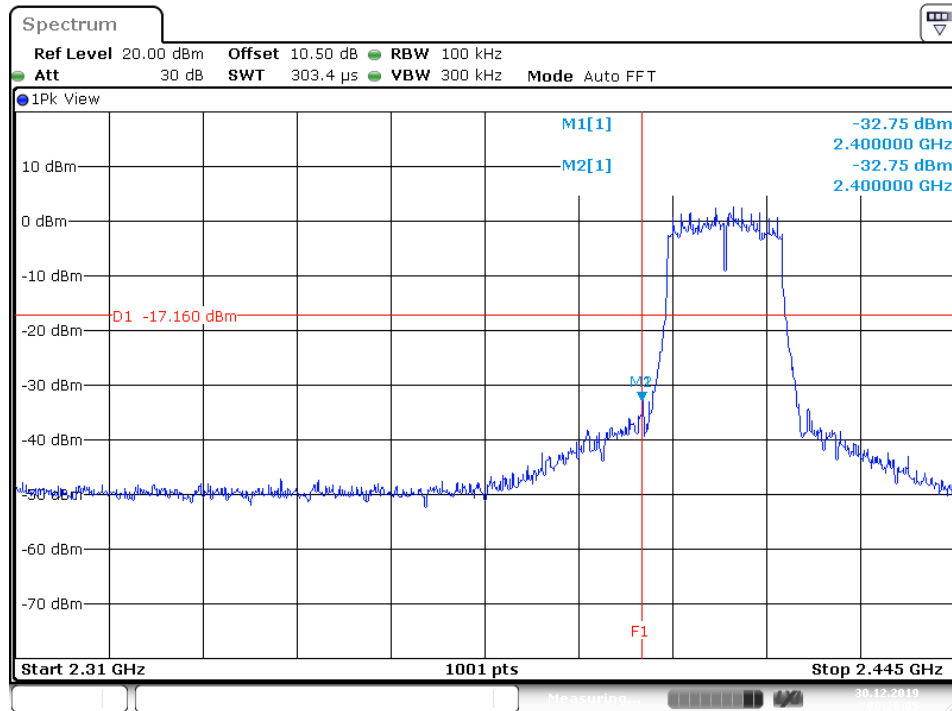


Date: 30.DEC.2019 09:14:29

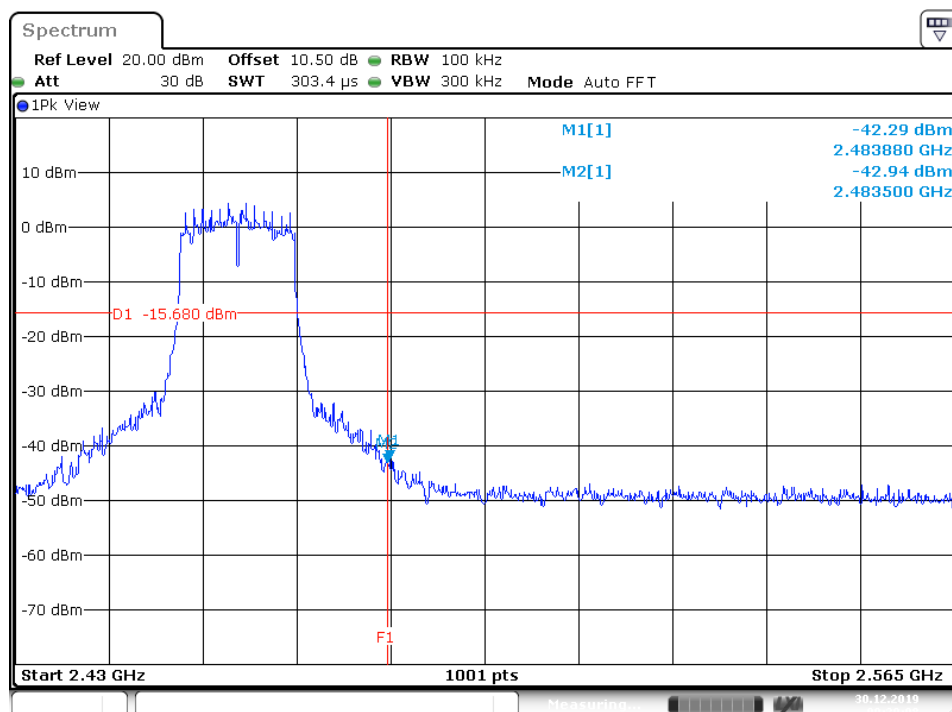
High Channel



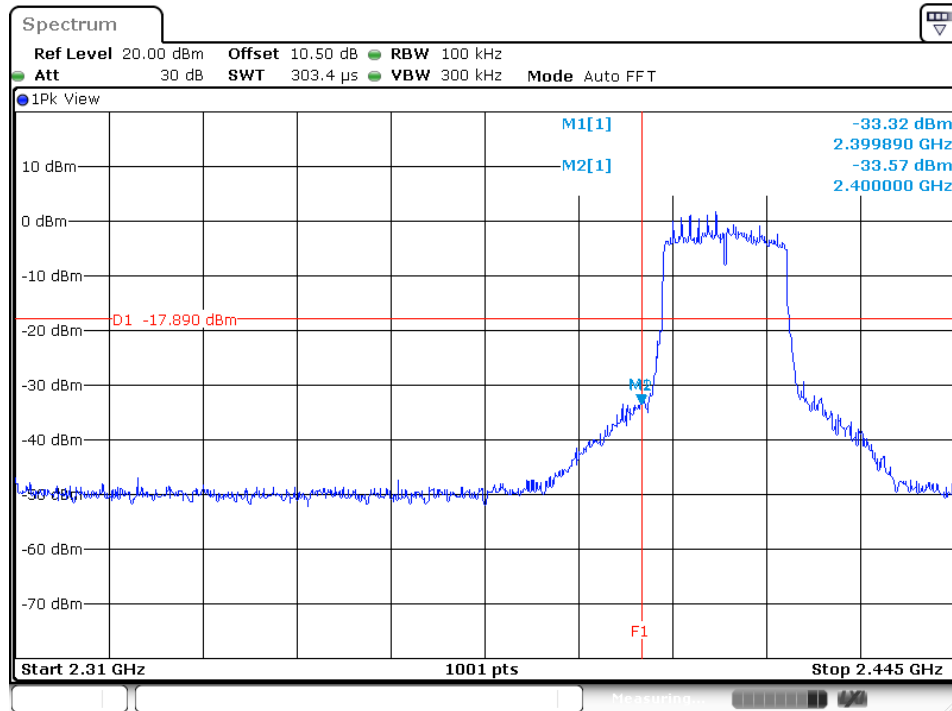
Date: 30.DEC.2019 09:18:11

802.11g, Ant 2
Low Channel


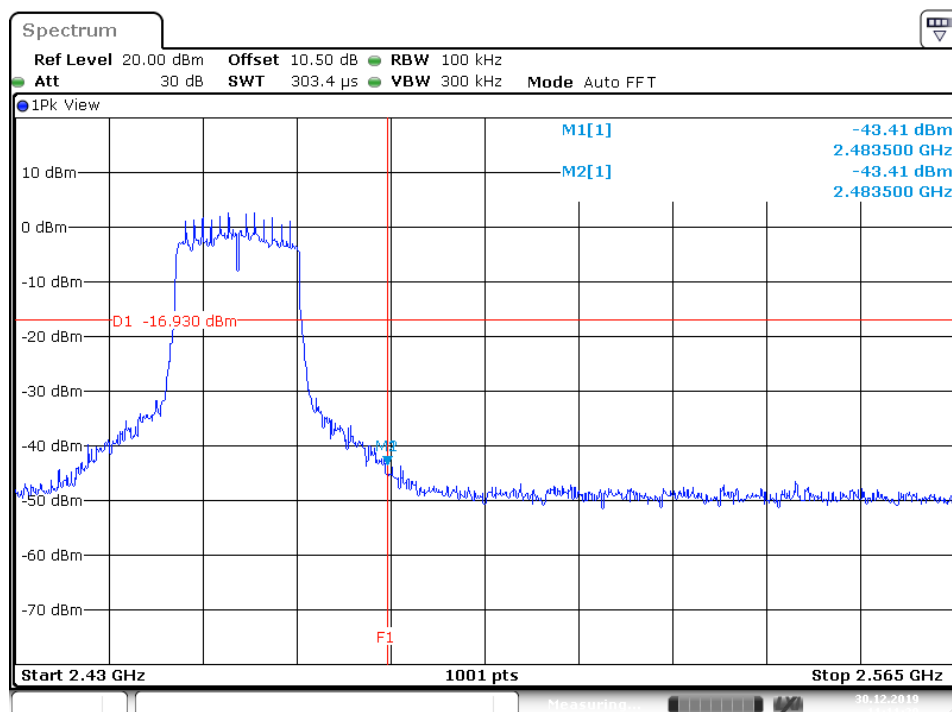
Date: 30.DEC.2019 09:26:05

High Channel


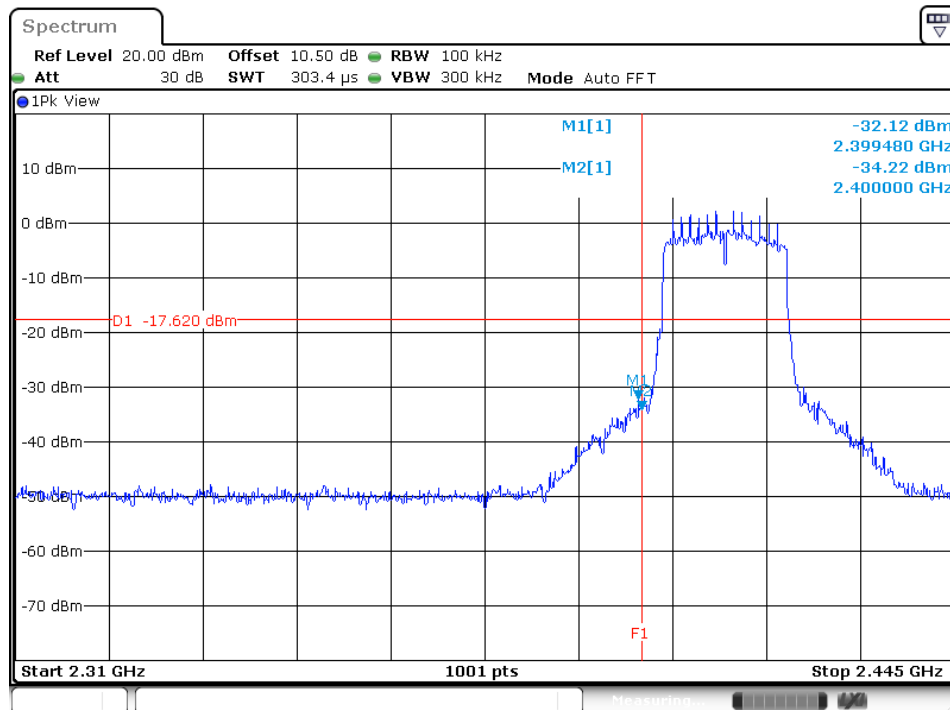
Date: 30.DEC.2019 09:20:08

802.11n HT20, Ant 1
Low Channel


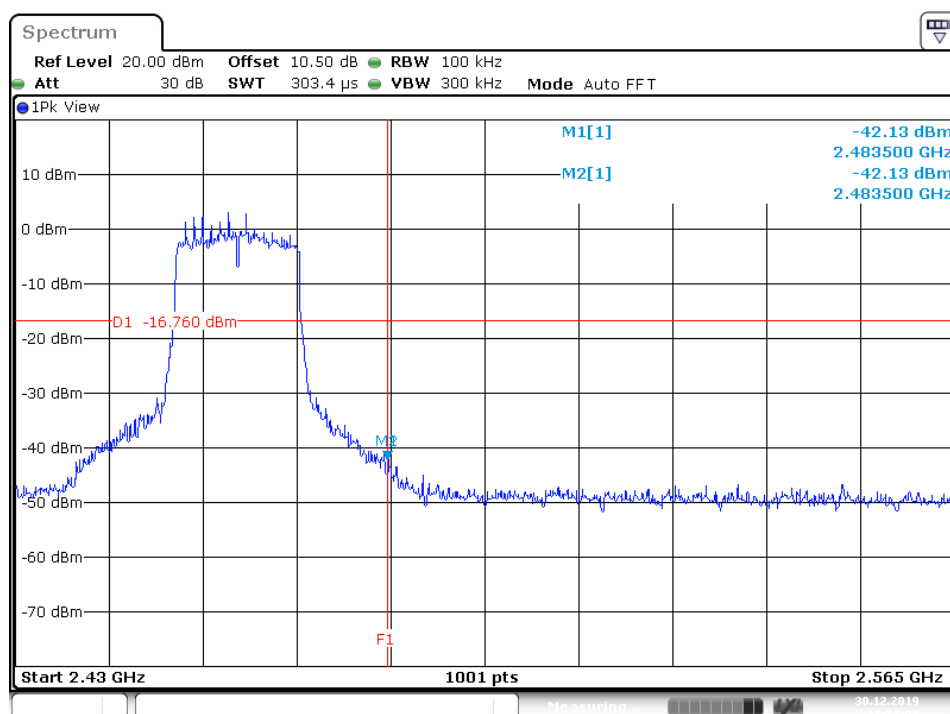
Date: 6.MAR.2020 03:26:29

High Channel


Date: 30.DEC.2019 11:11:29

802.11n HT20, Ant 2
Low Channel


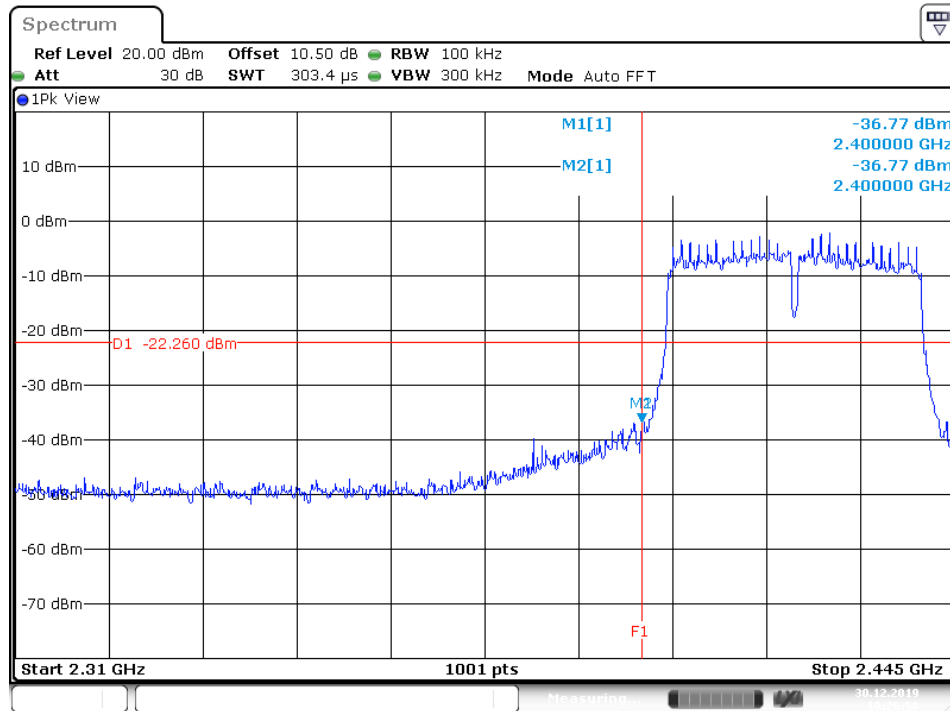
Date: 6.MAR.2020 03:27:55

High Channel


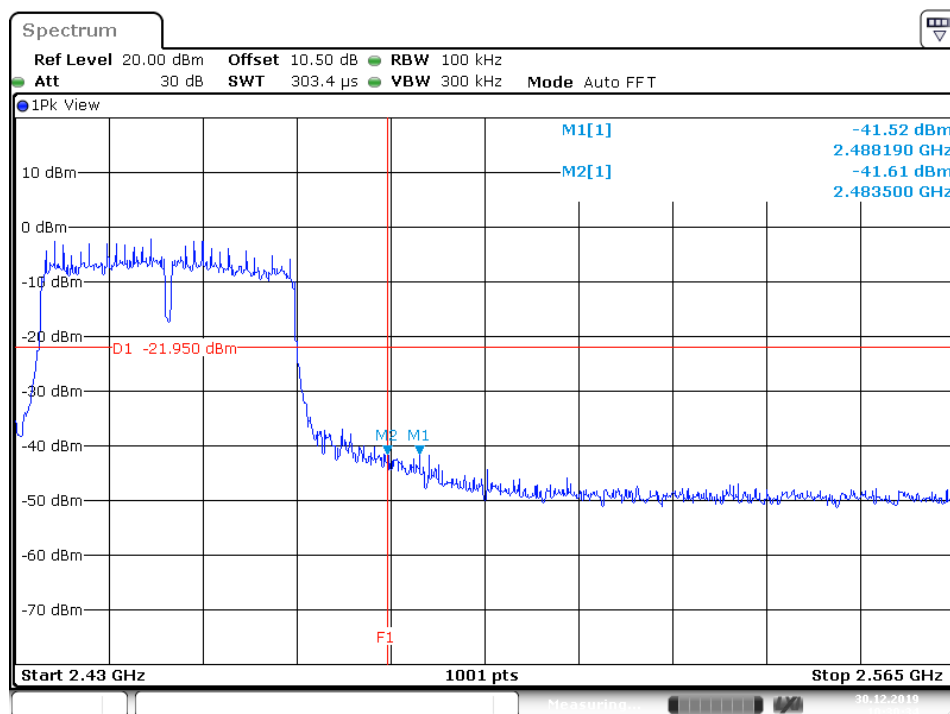
Date: 30.DEC.2019 11:13:07

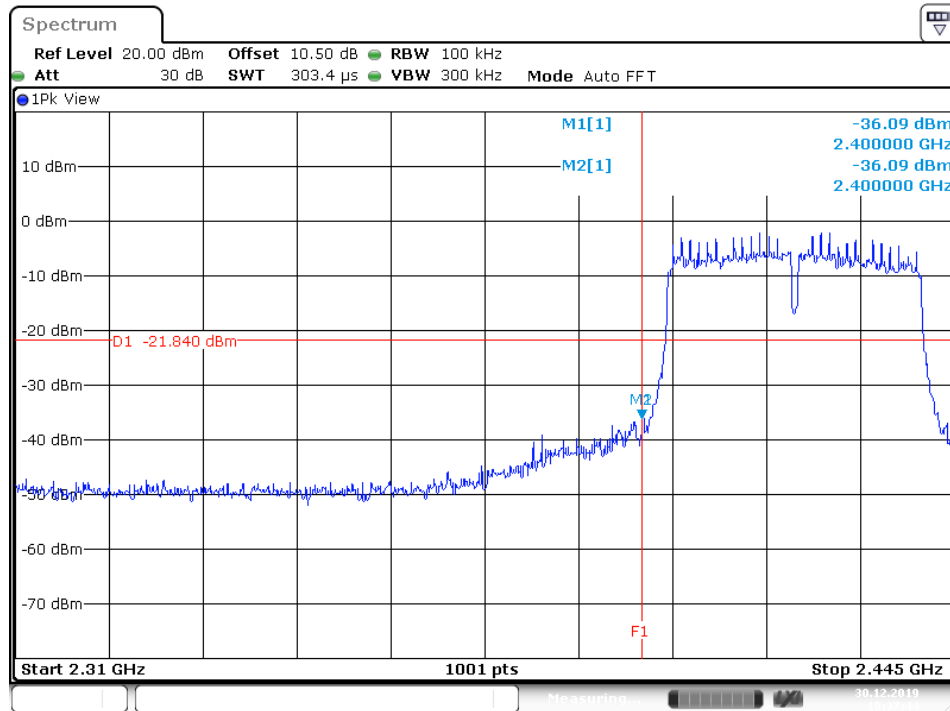
802.11n HT40, Ant 1

Low Channel

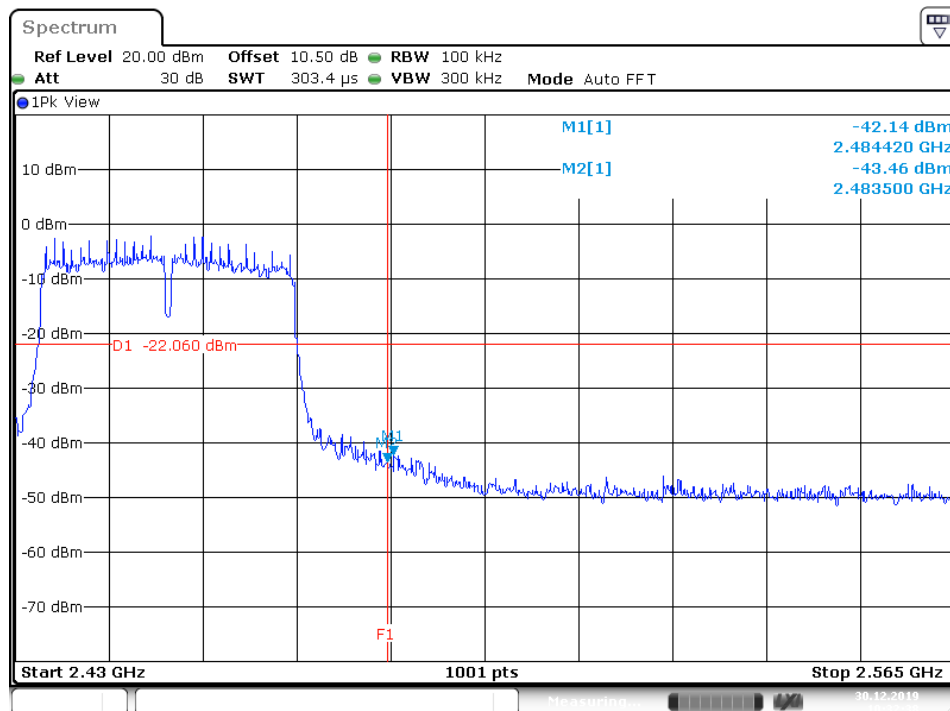


High Channel



802.11n HT40, Ant 2
Low Channel


Date: 30.DEC.2019 10:37:44

High Channel


Date: 30.DEC.2019 10:32:38

5.1.6 Spurious Emission

RESULT:**Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209, ISED RSS-Gen 8.9 and ISED RSS-Gen 8.10
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and ISED RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and ISED RSS-Gen 5, 8.9 (Table 5 and 6). Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) and ISED RSS-247 i2, 5.5
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Refer to table 6
Test Mode	:	MIMO
Operation mode	:	A

Ambient temperature	:	20-24 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)

Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)

Testing was carried out within frequency range 9kHz to the tenth harmonic. For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

All tests are based on current power, which is a worse mode under MIMO conditions.

5.2 Mains Emissions

5.2.1 Mains Conducted Emissions

RESULT:**Passed**

Test standard	:	FCC Part 15.207 FCC Part 15.107 ISED RSS-Gen 8.8
Limits	:	Mains Conducted emissions as defined in above test standards must comply with the mains conducted emission limits specified
Kind of test site	:	Shielded Room

Test setup

Test Channel	:	802.11b, 2412MHz
Operation mode	:	A
Ambient temperature	:	20-24 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)
Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)
Remark: For details refer to Appendix D.

6. Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Passed**

Test standard : FCC CFR 47 Part 2 Subpart J Section 2.1091
RSS-102 Issue 5, 2.5.2

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied.

FCC Maximum Exposure:

Mode	Frequenc y (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Maximum Output Power (dBm)	Output Power (mW)	Power Density (S)(mW/cm ²)	Test Result
802.11g	2437	2.00	1.5849	27.2817	534.7728	0.168702	Pass

Limit FCC: 1500-100,000 MHz 1.0 mW/cm²

ISED:**Exemption Limits for Routine Evaluation – RF Exposure Evaluation**

At or above 300MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W, where f is in MHz;

f= 2437MHz

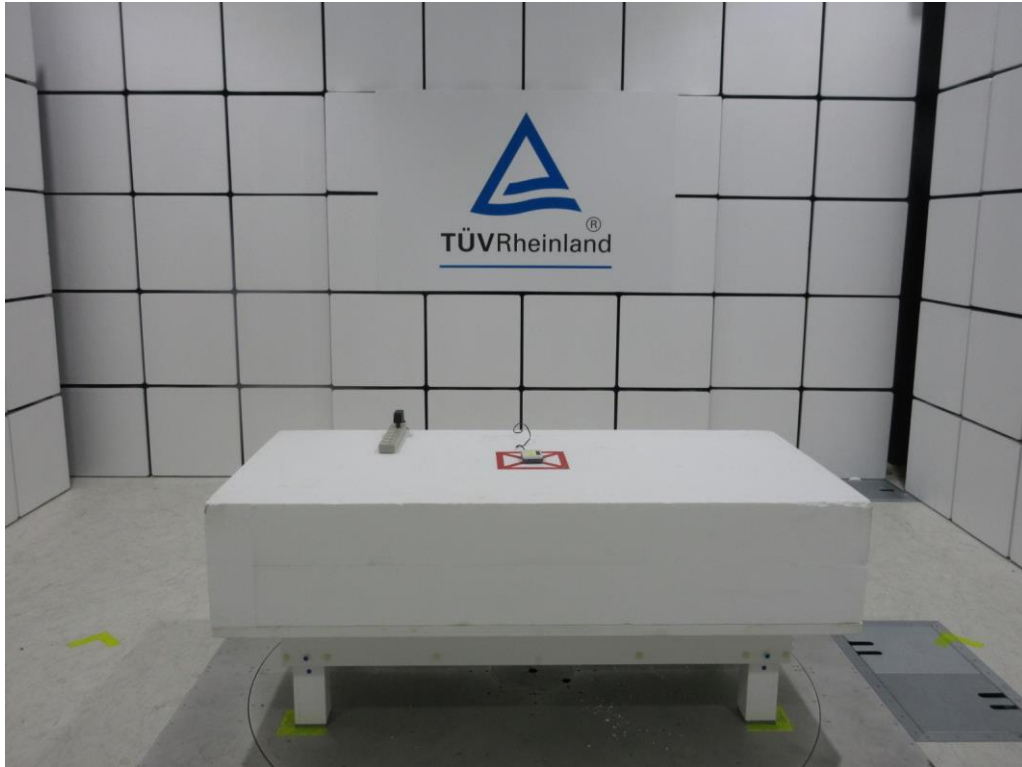
$$1.31 \times 10^{-2} \times 2437^{0.6834} = 2.7W$$

After evaluation the 2437MHz e.i.r.p 29.28dBm calculated result is closer to its limit.

29.28dBm = 0.847W, it is well below the limit of Exemption Limits for Routine Evaluation, so RF exposure assessment meets its standards.

7. Photographs of the Test Set-Up

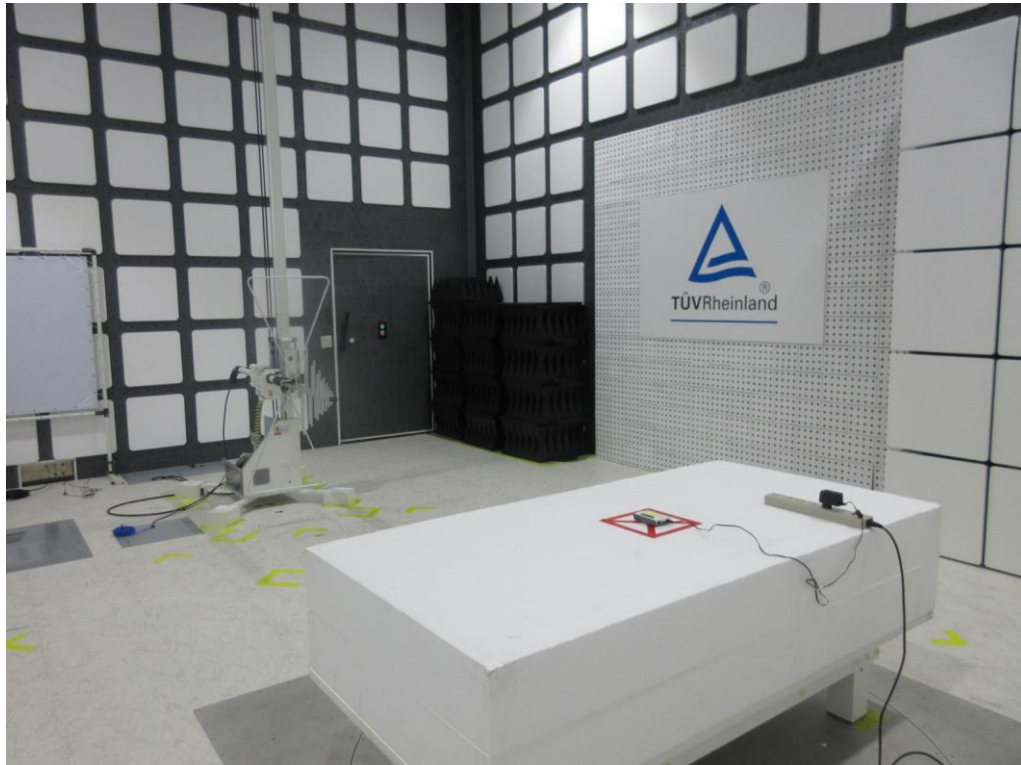
Photograph 1: Set-up for Spurious Emissions (Front View 1)



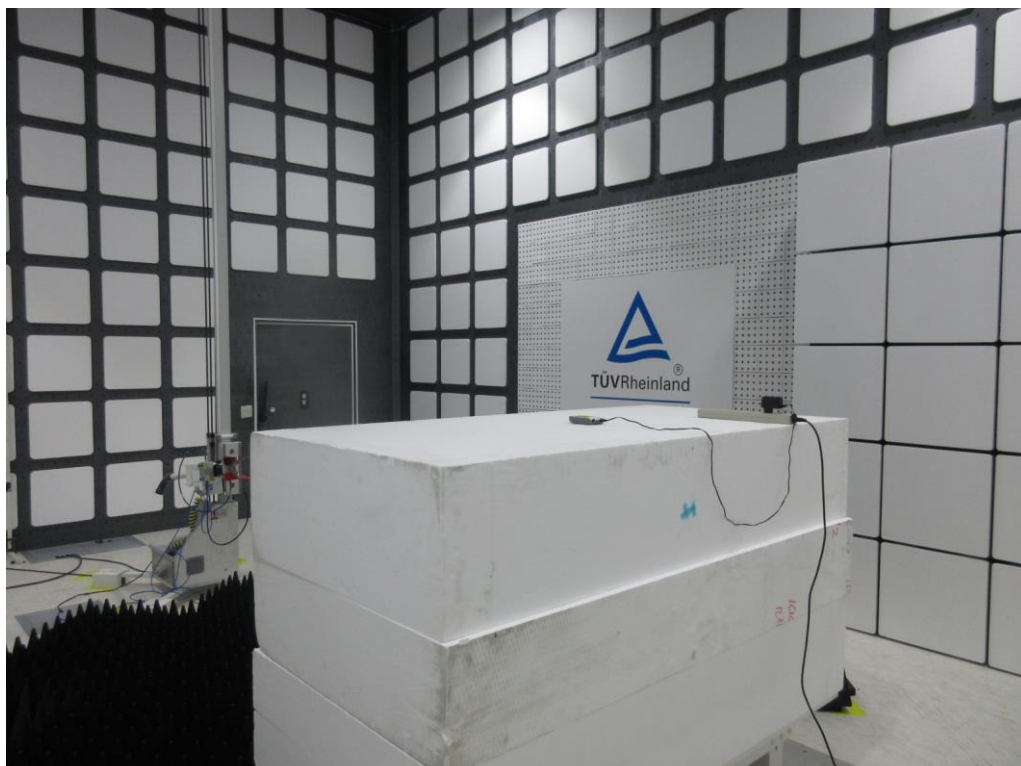
Photograph 2: Set-up for Spurious Emissions (Front View 2)



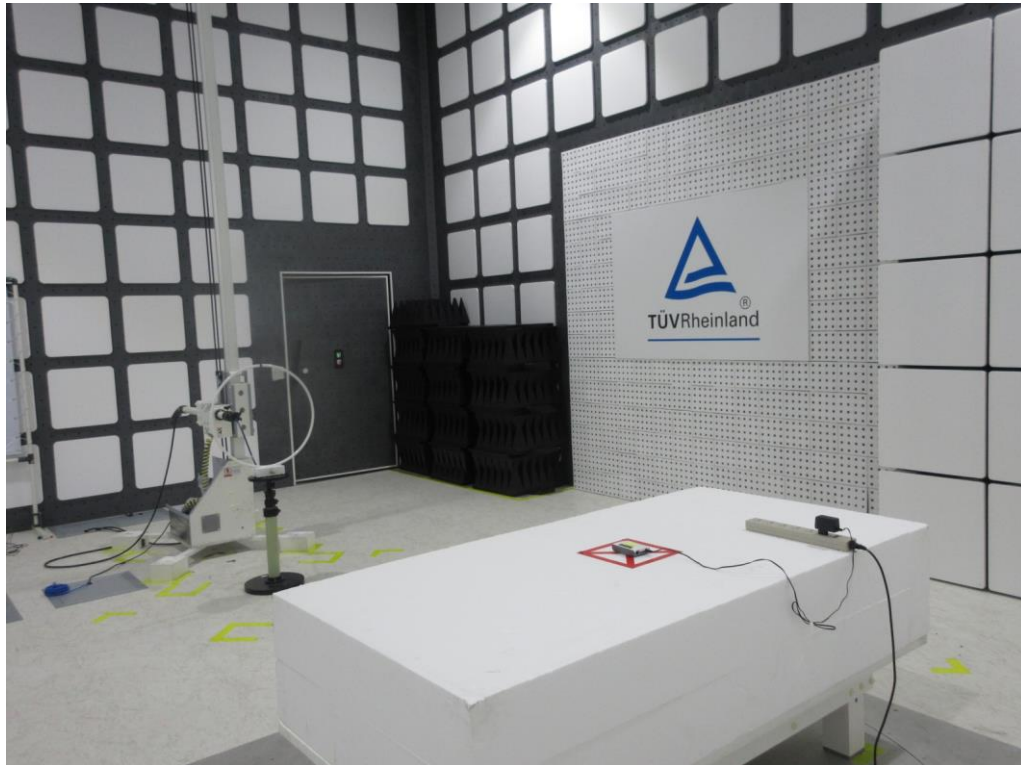
Photograph 3: Set-up for Spurious Emissions (Back View 1)



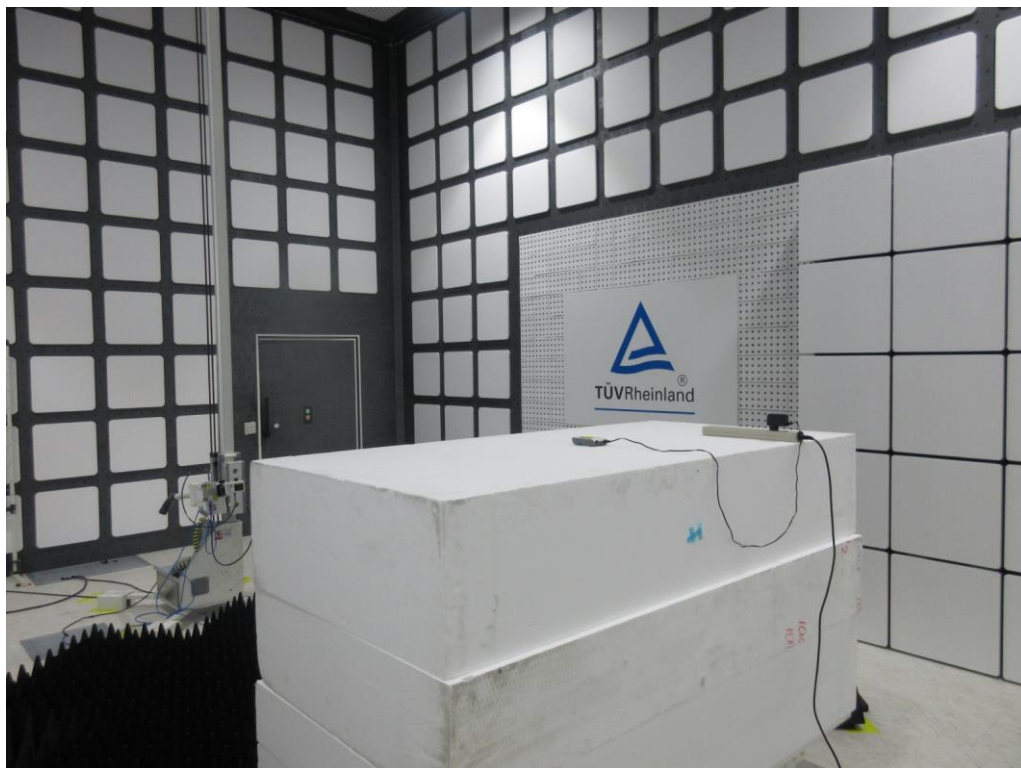
Photograph 4: Set-up for Spurious Emissions (Back View 2)



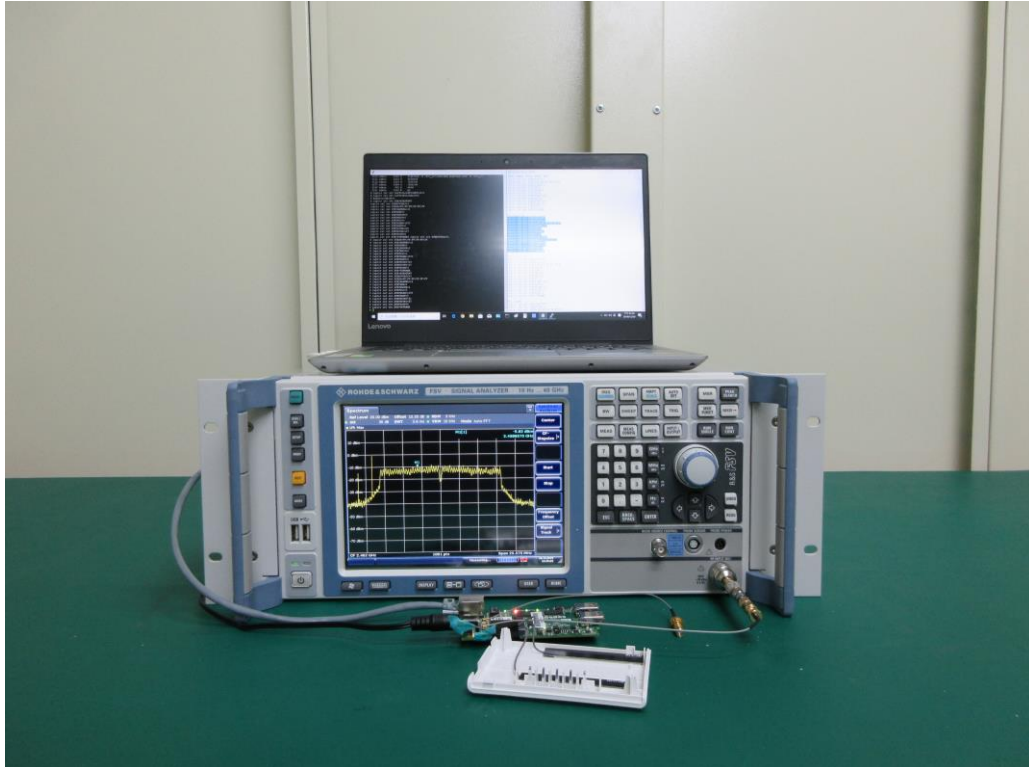
Photograph 5: Set-up for Spurious Emissions (Back View 3)



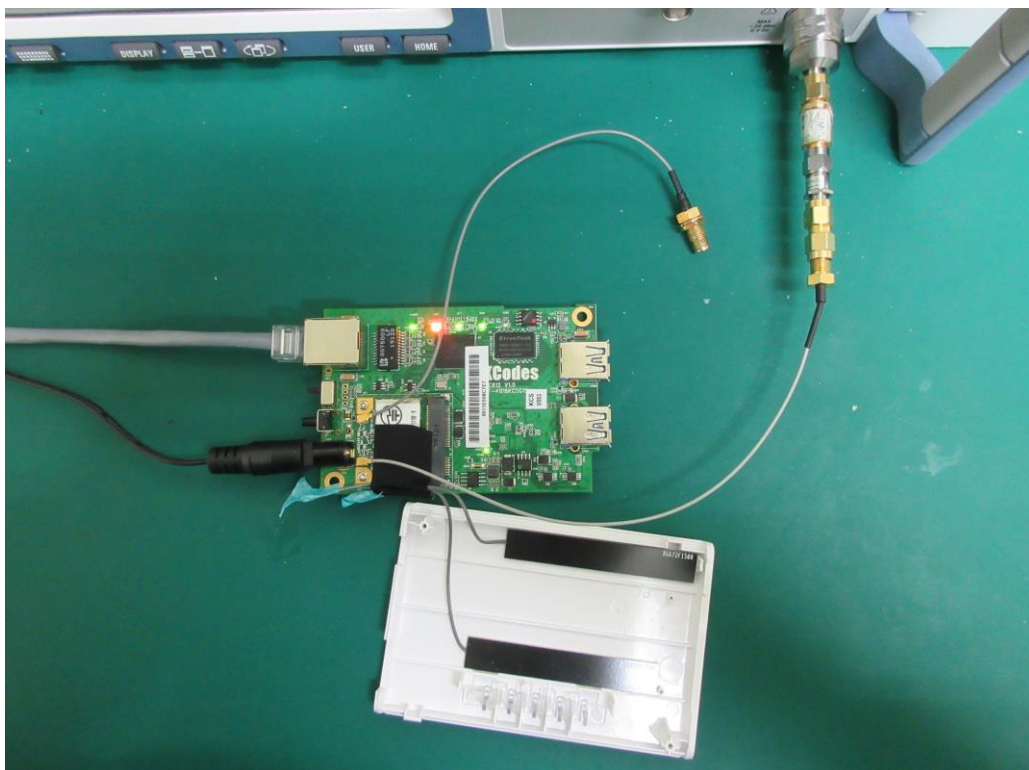
Photograph 6: Set-up for Spurious Emissions (Back View 4)



Photograph 7: Set-up for Conducted testing(View 1)



Photograph 8: Set-up for Conducted testing(View 2)



Photograph 9: Set-up for AC Mains (Front View)



Photograph 10: Set-up for AC Mains (Back View)



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