FCC Part 15.247

TEST REPORT

For

Actiontec Electronics Inc.

3301 Olcott St. Santa Clara, CA 95054

FCC ID: LNQT3270S

Report Type: Original Report	**Product Type:** Bonded VDSL Wireless AC Gateway Router

Report Producer : Kaylee Chiang

Report Number : RXZ190708006-00B

Report Date : 2019-09-17

Reviewed By: Jerry Chang

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RXZ190708006	RXZ190708006-00B	2019-09-17	Original Report	Kaylee Chiang

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	Actiontec Electronics Inc.
	3301 Olcott St. Santa Clara, CA 95054
Manufacturer	Actiontec Electronics Inc.
	3301 Olcott St. Santa Clara, CA 95054
Brand(Trade) Name	Actiontec
Product (Equipment)	Bonded VDSL Wireless AC Gateway Router
Main Model Name	T3270S
Series Model Name	T3270
Model Discrepancy	The major electrical and mechanical constructions of series models are identical to the basic model, except T3270S has 1 of SFP interface, and T3270 has it removed. The model, T3270S is the testing sample, and the final test data are shown on this test report.
Frequency Range	IEEE 802.11b/g / IEEE 802.11n HT20 Mode: 2412 ~ 2462 MHz IEEE 802.11n HT40 Mode: 2422 ~ 2452 MHz
Transmit Power	IEEE 802.11b Mode: 29.39 dBm (0.869W) IEEE 802.11g Mode: 29.19 dBm (0.830W) IEEE 802.11n HT20 Mode: 29.62 dBm (0.916W) IEEE 802.11n HT40 Mode: 27.47 dBm (0.558W)
Modulation Technique	IEEE 802.11b Mode: DSSS IEEE 802.11g Mode: OFDM IEEE 802.11n HT20 Mode: OFDM IEEE 802.11n HT40 Mode: OFDM
Transmit Data Rate	IEEE 802.11b Mode: 1~11 Mbps IEEE 802.11g Mode: 6~54 Mbps IEEE 802.11n HT 20 Mode: MCS 0~7 IEEE 802.11n HT 40 Mode: MCS 0~7
Number of Channels	IEEE 802.11b/g / IEEE 802.11n HT20 Mode: 11 Channels IEEE 802.11n HT40 Mode: 7 Channels

Antenna Specification	Ant1: PIFA Antenna / 4.41 dBi Ant2: PIFA Antenna / 4.85 dBi Ant3: PIFA Antenna / 4.86 dBi
Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter Brand: Actiontec Model: CDS024T-W120U I/P: 120Vac, 50/60Hz, 0.58A O/P: 12Vdc, 2A ☐ By AC Power Cord ☐ PoE
	☐ DC Type ☐ Battery ☐ DC Power Supply ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	Jul 08, 2019
Date of Test	Jul 15, 2019 ~ Aug 01, 2019

**All measurement and test data in this report was gathered from production sample serial number: 190708006 (Assigned by BACL, Taiwan).*

1.2 Objective

This report is prepared on behalf of *Actiontec Electronics Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15.407 NII submission with FCC ID: LNQT3270S

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 662911 D01 Multiple Transmitter Output v02r01
KDB 558074 D01 DTS Meas Guidance v05r02

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.
☐68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180) and the FCC designation No.TW3180 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

For WIFI mode, there are totally 11 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

For 802.11 b/g/n20 Modes were tested with channel 1, 6 and 11.

For 802.11n40 Mode were tested with channel 3, 6 and 9.

SISO mode and MIMO mode have the same power level setting and base on output power testing, MIMO mode power than SISO mode large, MIMO mode was selected for full testing.

The device supports MIMO (CDD) at all modes.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The EUT was programmed to be in continuously transmitting mode.

Engineering Mode		Chain 0		
Test Frequency		Low	Mid	High
Power Level Setting	B Mode MIMO(CDD)	21	24	21
	G Mode MIMO(CDD)	20	24	20
	N20 Mode MIMO(CDD)	20.5	24	20
	N40 Mode MIMO(CDD)	20	22	19
Engineering Mode		Chain 1		
Test Frequency		Low	Mid	High
Power Level Setting	B Mode MIMO(CDD)	21	24	21
	G Mode MIMO(CDD)	20	24	20
	N20 Mode MIMO(CDD)	20.5	24	20
	N40 Mode MIMO(CDD)	20	22	19

Engineering Mode		Chain 2		
Test Frequency		Low	Mid	High
Power Level Setting	B Mode MIMO(CDD)	21	24	21
	G Mode MIMO(CDD)	20	24	20
	N20 Mode MIMO(CDD)	20.5	24	20
	N40 Mode MIMO(CDD)	20	22	19

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.
The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

802.11b: 1Mbps
802.11g: 6Mbps
802.11n ht20 MIMO: MCS0
802.11n ht40 MIMO: MCS0

2.4 Test Mode

Pre-Scan
Mode 1: Full System (model: T3270S) for all test item.
Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available.

Final Test
Mode 1: Full System (model: T3270S) for all test item.

2.5 Support Equipment List and Details

Description	Manufacturer	Model Number	BSMI	FCC ID	S/N
Adapter	Actiontec	CDS024T-W120U	N/A	N/A	N/A

2.6 External Cable List and Details

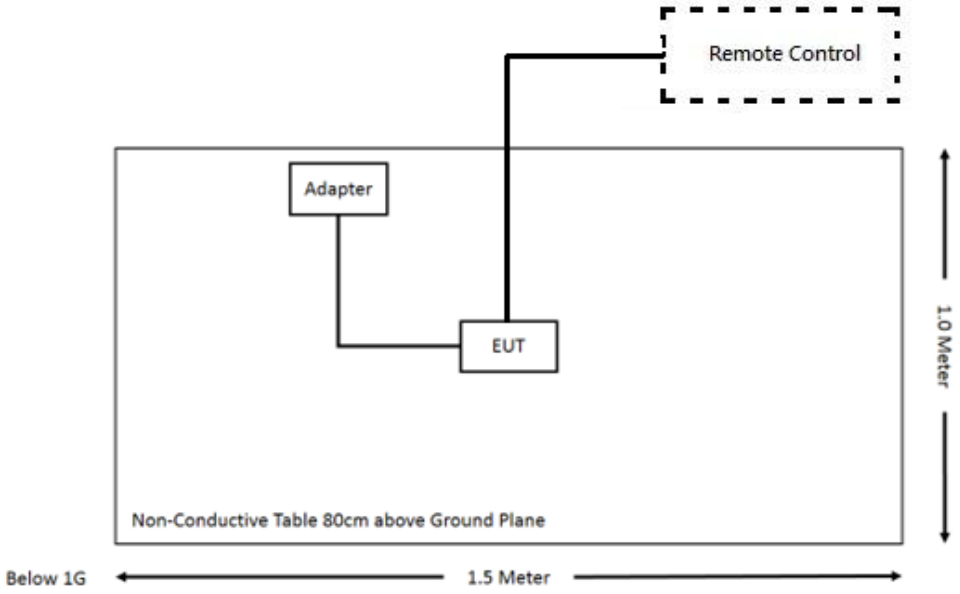
Cable Description	Length (m)	From	To
N/A	N/A	N/A	N/A

2.7 Block Diagram of Test Setup

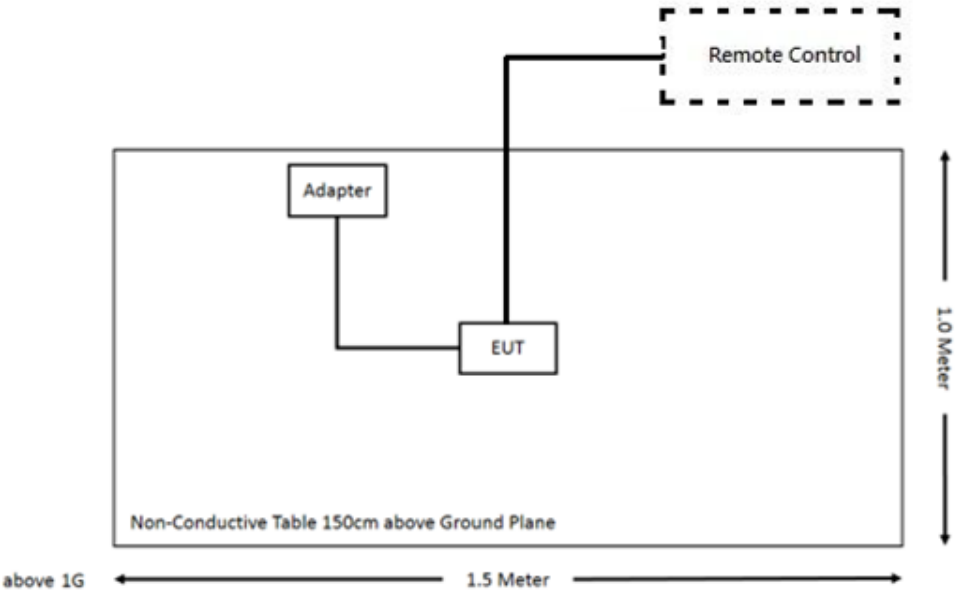
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

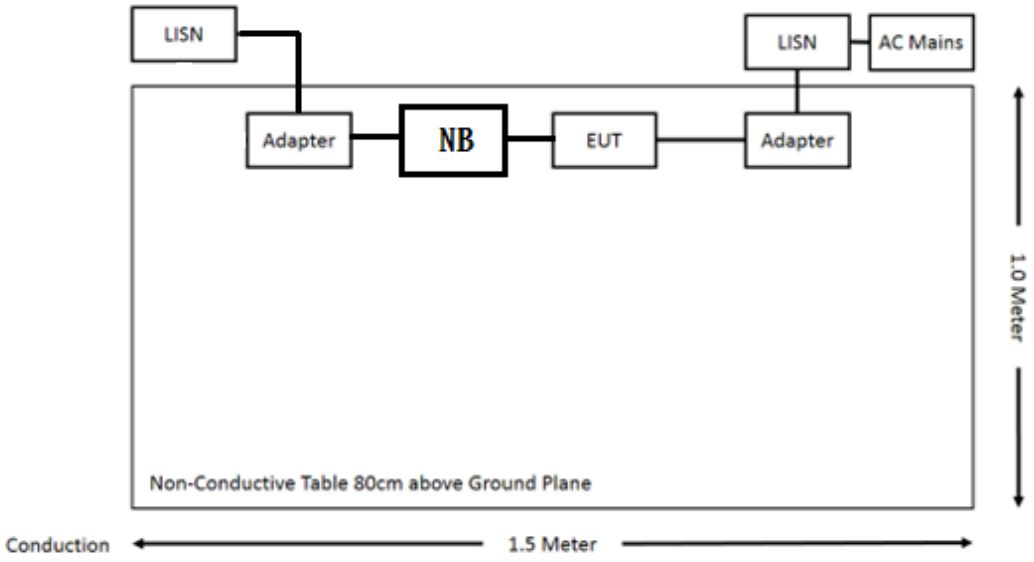
Below 1GHz:



Above 1GHz:



Conduction:


LISN
LISN
AC Mains
Adapter
NB
EUT
Adapter
1.0 Meter
Non-Conductive Table 80cm above Ground Plane
Conduction
1.5 Meter

2.8 Duty Cycle

According to KDB 558074 D01 15.247 Meas Guidance v05r02 section 6.0:

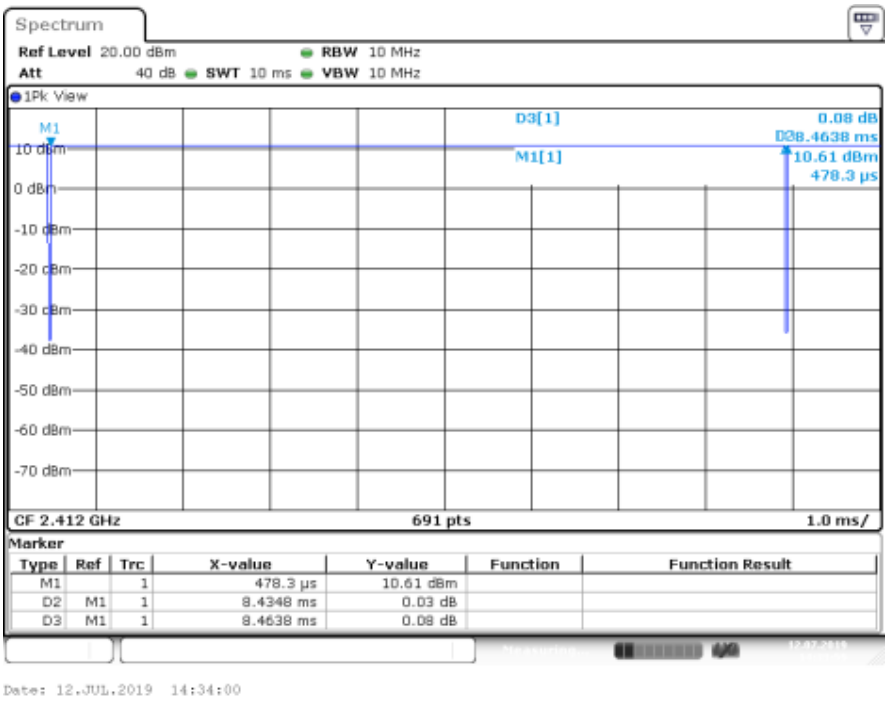
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximumpower transmission duration, T, are required for each tested mode of operation.

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	8.43	8.46	99	0.04
802.11g	2.00	2.67	80	0.97
802.11n20	1.88	2	94	0.27
802.11n40	0.869	0.985	88	0.56

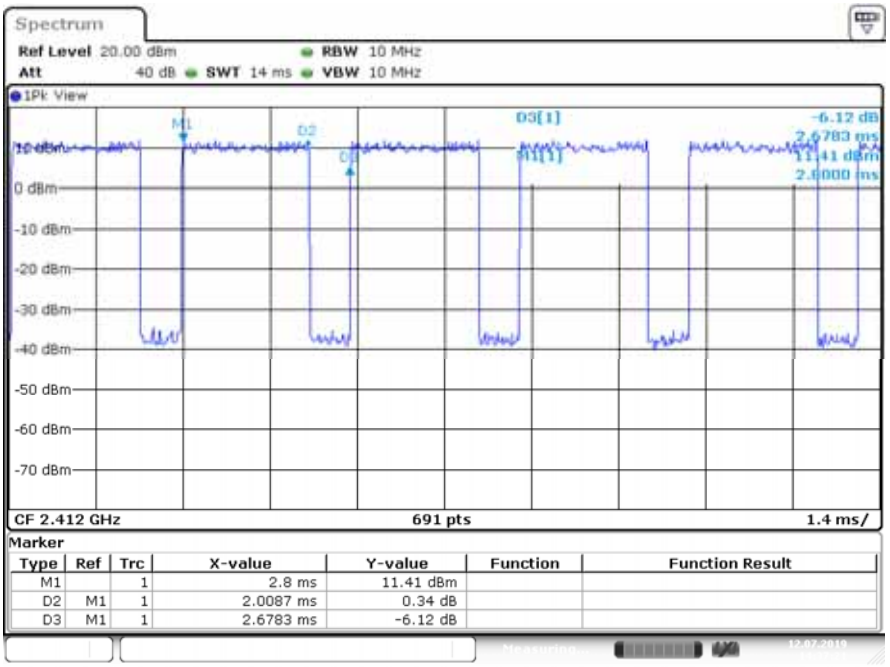
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

B Mode

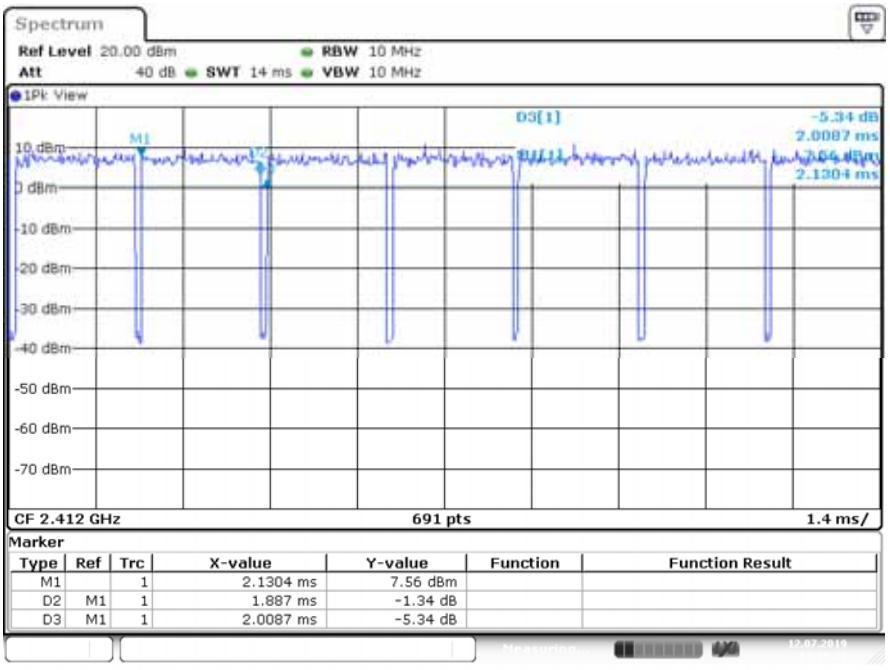


G Mode



Date: 12.JUL.2019 14:37:21

N20 Mode



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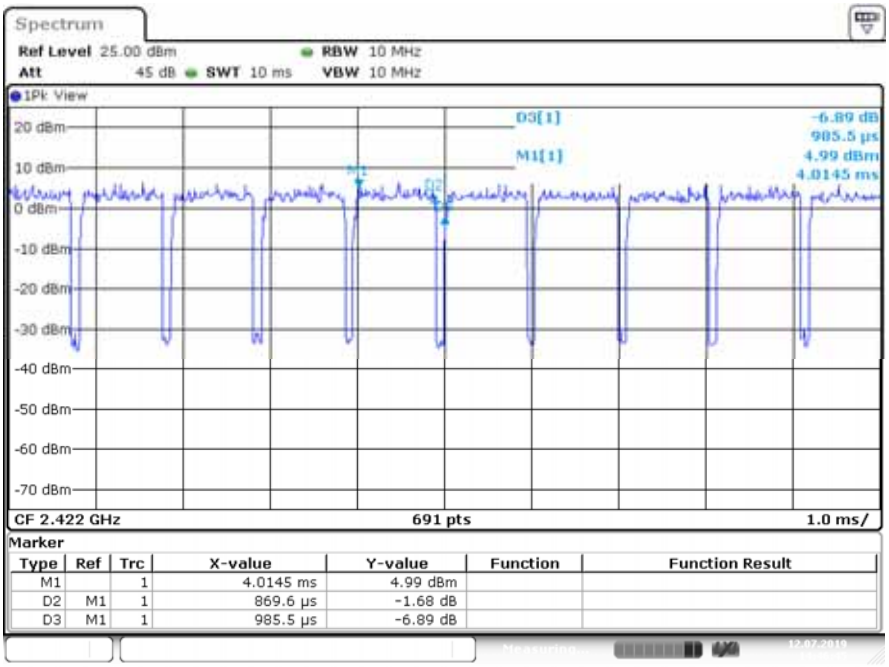
N40 Mode


Spectrum
Ref Level 25.00 dBm
RBW 10 MHz
Att 45 dB SWT 10 ms VBW 10 MHz
1Pk View
D3[1] -6.89 dB 985.5 µs
M1[1] 4.99 dBm 4.0145 ms
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.422 GHz
691 pts
1.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 4.0145 ms 4.99 dBm
D2 M1 1 869.6 µs -1.68 dB
D3 M1 1 985.5 µs -6.89 dB
Date: 12.JUL.2019 14:46:46

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1310, §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2018/02/22	2019/02/21
LISN	Rohde & Schwarz	ENV216	101248	2019/06/26	2020/06/25
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2019/07/01	2020/06/30
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2018/12/11	2019/12/10
Horn Antenna	EMCO	SAS-571	1020	2019/04/17	2020/04/16
Horn Antenna	ETS-Lindgren	3116	62638	2018/08/29	2019/08/28
Preamplifier	Sonoma	310N	130602	2019/06/26	2020/06/25
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2018/12/07	2019/12/06
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2019/01/11	2020/01/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2019/02/13	2020/02/12
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2019/07/01	2020/06/30
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2019/03/04	2020/03/03
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2019/01/16	2020/01/15
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2018/11/22	2019/11/21
Cable	WOKEN	SFL402	S02-160323-07	2019/02/11	2020/02/10
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2019/03/06	2020/03/05
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2019/03/07	2020/03/07

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements*

5 FCC §15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE)

5.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

RF Exposure Evaluation Result

MPE evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G WIFI	2412-2462	4.85	3.055	30	1000	30	0.2701	1.0
5G WIFI B1	5150-5250	5.52	3.565	29.5	891.251	30	0.2809	1.0
5G WIFI B2	5250-5350	5.83	3.828	24	251.189	30	0.0850	1.0
5G WIFI B3	5470-5725	4.85	3.055	24	251.189	30	0.0678	1.0
5G WIFI B4	5725-5825	4.85	3.055	30	1000	30	0.2701	1.0

Note: the maximum antenna gain was used for evaluation.

MPE evaluation for simultaneous transmission:

2.4G WIFI and 5G WIFI can transmit at the same time, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+……＜1, PD (Power Density)

MPE evaluation=MPE of 2.4G WIFI/1 + MPE of 5G WIFI/1= 0.2701/1+0.2809/1=0.551＜1.0

Result: MPE evaluation of single and simultaneous transmission meet 30cm the requirement of standard.

6 FCC §15.203 – Antenna Requirements

6.1 Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

6.2 Antenna List and Details

Frequency Range (MHz)	PCB No. and Gain (dBi)			Correlated Gain (dBi)
	DB1	DB2	DB3	
2400	-5.5	2.6	0.1	4.41
2450	-9.0	2.5	2.5	4.85
2500	-9.8	3.1	2.1	4.86

The EUT has three internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

Result: Compliance

7 FCC §15.207(a) – AC Line Conducted Emissions

7.1 Applicable Standard

According to §15.207

For an intentional radiator 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, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

Note 2: A linear average detector is required

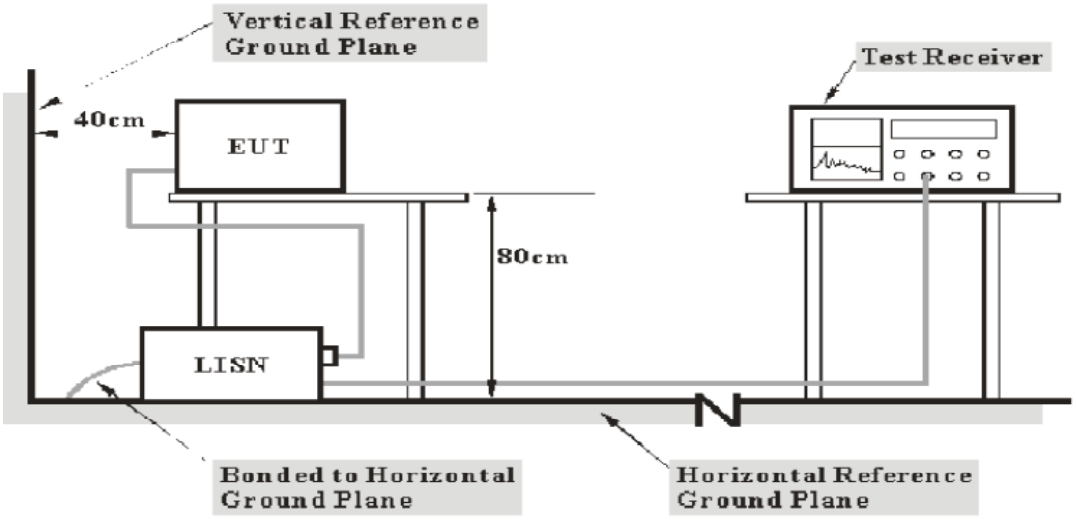
7.2 Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN/ISN and receiver, LISN/ISN voltage division factor, LISN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Taiwan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Expanded Measurement uncertainty
AC Mains	2.71 dB (k=2, 95% level of confidence)

7.3 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

7.4 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

7.5 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

7.6 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "Over Limit" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

7.7 Environmental Conditions

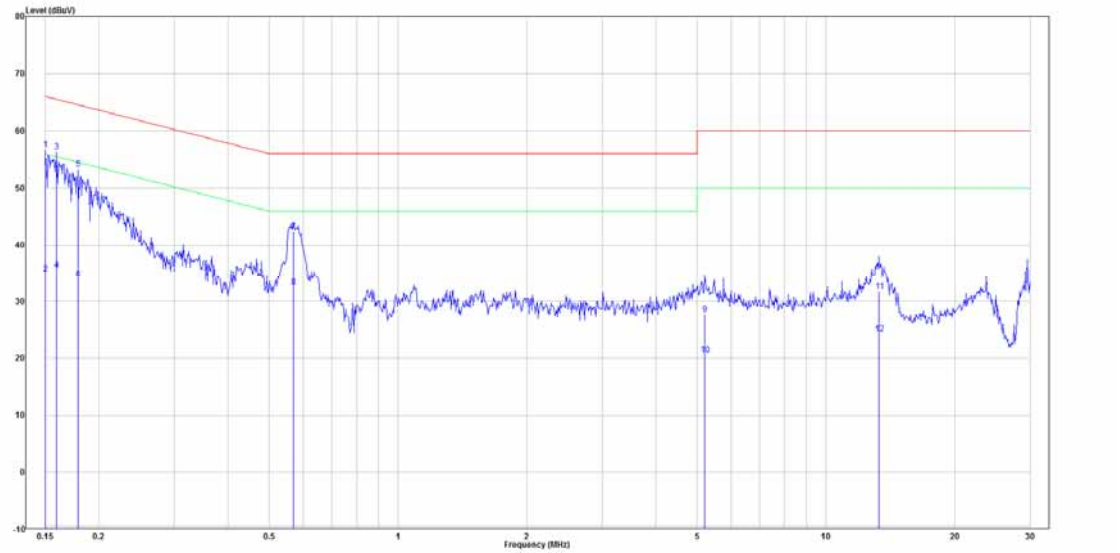
Temperature:	26 ℃
Relative Humidity:	40 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-07-31.

7.8 Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.150	47.08	9.60	56.68	66.00	-9.32	QP
2	0.150	25.32	9.60	34.92	56.00	-21.08	Average
3	0.159	46.78	9.60	56.38	65.50	-9.12	QP
4	0.159	26.02	9.60	35.62	55.50	-19.88	Average
5	0.179	43.68	9.59	53.27	64.55	-11.28	QP
6	0.179	24.40	9.59	33.99	54.55	-20.56	Average
7	0.570	32.76	9.61	42.37	56.00	-13.63	QP
8	0.570	22.84	9.61	32.45	46.00	-13.55	Average
9	5.216	18.01	9.76	27.77	60.00	-32.23	QP
10	5.216	10.85	9.76	20.61	50.00	-29.39	Average
11	13.313	21.96	9.85	31.81	60.00	-28.19	QP
12	13.313	14.49	9.85	24.34	50.00	-25.66	Average

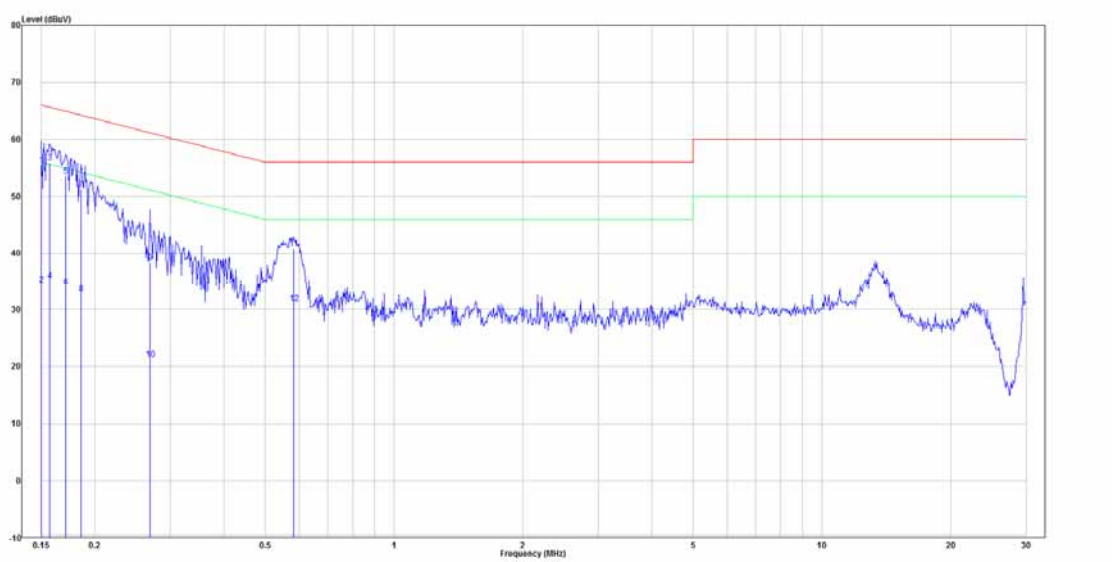
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.150	45.96	9.61	55.57	66.00	-10.43	QP
2	0.150	24.79	9.61	34.40	56.00	-21.60	Average
3	0.157	46.23	9.61	55.84	65.63	-9.79	QP
4	0.157	25.53	9.61	35.14	55.63	-20.49	Average
5	0.171	43.89	9.60	53.49	64.92	-11.43	QP
6	0.171	24.38	9.60	33.98	54.92	-20.94	Average
7	0.186	41.65	9.60	51.25	64.22	-12.97	QP
8	0.186	23.09	9.60	32.69	54.22	-21.53	Average
9	0.269	28.75	9.59	38.34	61.16	-22.82	QP
10	0.269	11.66	9.59	21.25	51.16	-29.91	Average
11	0.582	31.23	9.61	40.84	56.00	-15.16	QP
12	0.582	21.38	9.61	30.99	46.00	-15.01	Average

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

8.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

8.2 Measurement Uncertainty

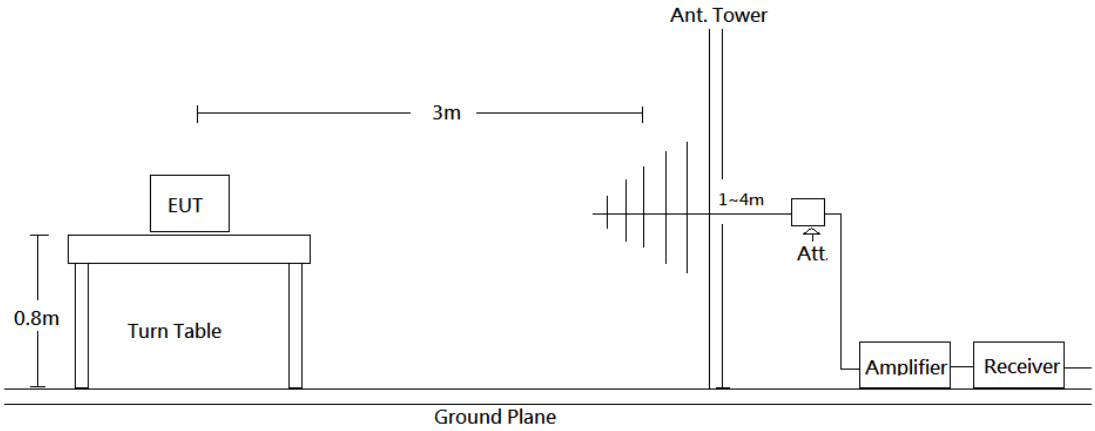
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

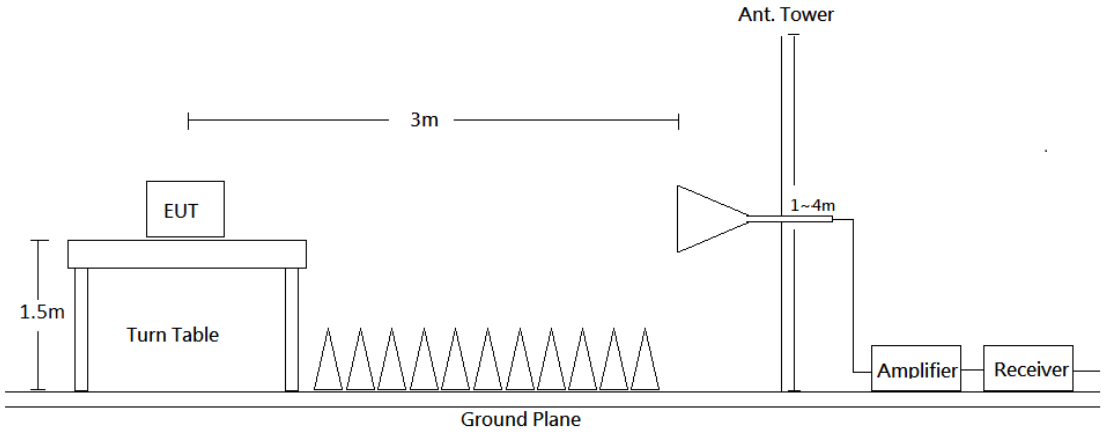
Frequency	Measurement uncertainty
30 MHz~200 MHz	3.75 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.21 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.83 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.18 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.55 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.67 dB (k=2, 95% level of confidence)

8.3 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

8.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP		QP
Above 1 GHz	1 MHz	3 MHz	PK		PK
	1 MHz	3 MHz	RMS	>98%	Ave
	1 MHz	1/T	PK	<98%	Ave

8.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

8.6 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Result – Limit

8.7 Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209 Limit.

8.8 Environmental Conditions

Radiation		Conducted	
Temperature:	25 ℃	**Temperature:**	25.3 ℃
Relative Humidity:	61 %	**Relative Humidity:**	44 %
ATM Pressure:	1010 hPa	**ATM Pressure:**	1010 hPa

The Radiation Spurious Emissions testing was performed by David Lee on 2019-07-15 ~ 2019-07-17.

The Conducted Spurious Emissions testing was performed by Tom Hsu on 2019-08-01.

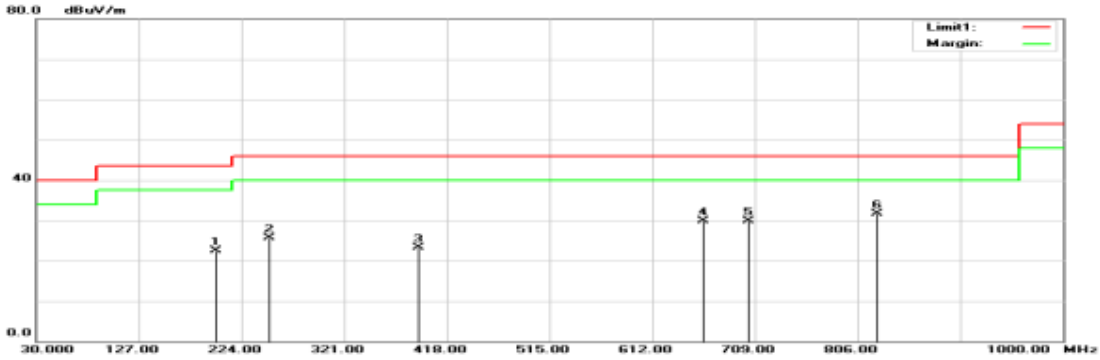
8.9 Test Results

Test Mode: Transmitting

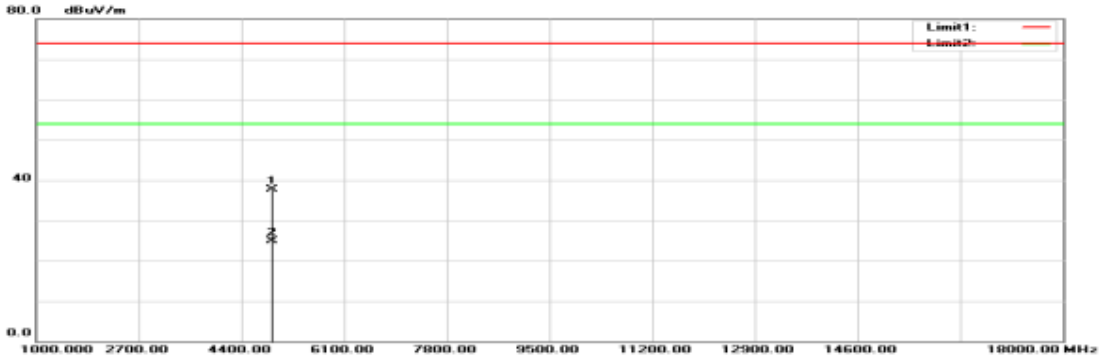
(Pre-scan with three orthogonal axis, and worse case as Z axis.)

Horizontal (*worst case is Wi-Fi N40 mode high channel*)

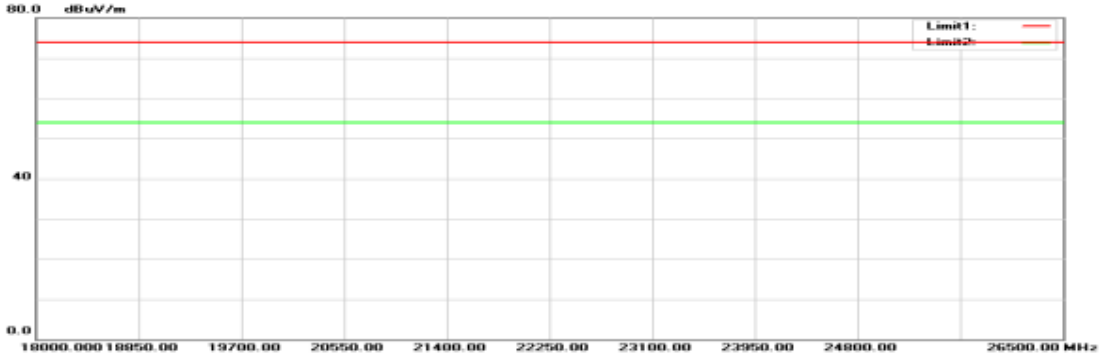
30MHz-1GHz:



1GHz-18GHz:

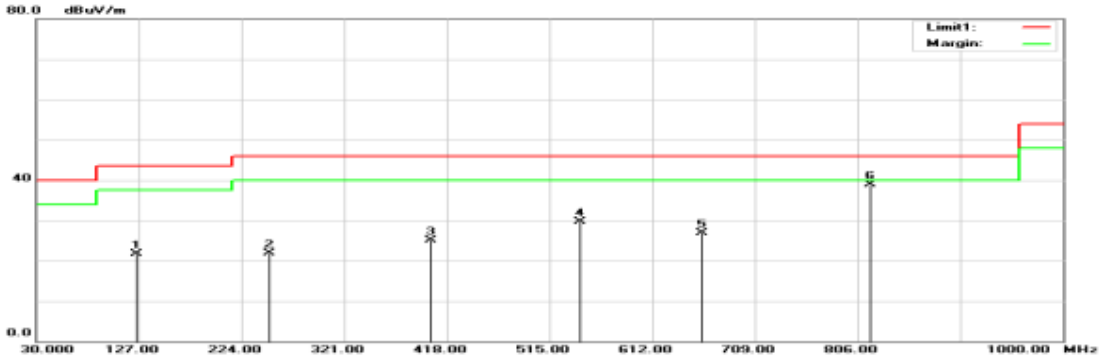


18GHz-26.5GHz:

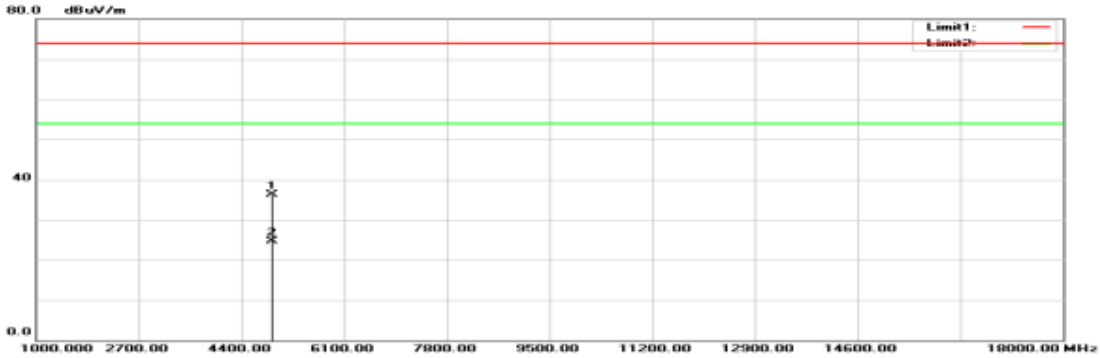


Vertical (*worst case is Wi-Fi N40 mode high channel*)

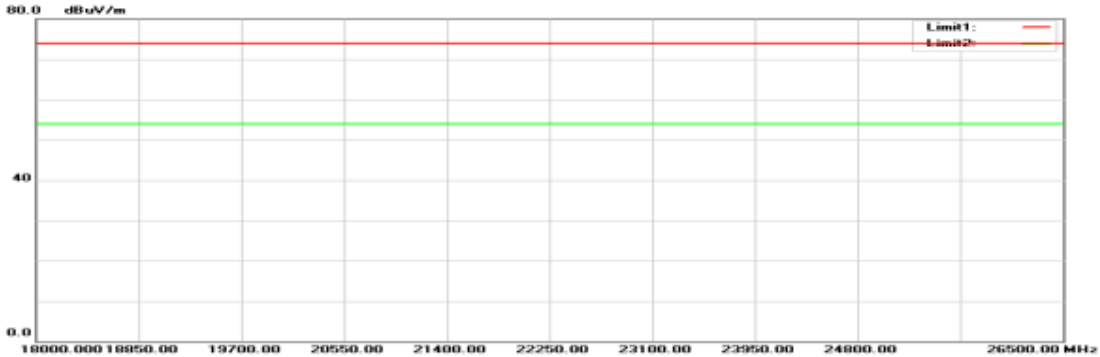
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
B Mode Middle channel								
250.1900	35.74	-10.22	25.52	46.00	-20.48	100	299	QP
392.7800	28.66	-6.15	22.51	46.00	-23.49	100	180	QP
544.1000	28.04	-4.11	23.93	46.00	-22.07	100	134	QP
609.0900	28.60	-3.40	25.20	46.00	-20.80	100	301	QP
655.6500	31.97	-2.85	29.12	46.00	-16.88	100	132	QP
702.2100	32.09	-2.32	29.77	46.00	-16.23	100	124	QP
G Mode Middle channel								
250.1900	34.43	-10.22	24.21	46.00	-21.79	100	310	QP
386.9600	28.01	-6.26	21.75	46.00	-24.25	100	353	QP
553.8000	28.64	-4.02	24.62	46.00	-21.38	100	101	QP
612.0000	27.59	-3.38	24.21	46.00	-21.79	100	315	QP
655.6500	32.25	-2.85	29.40	46.00	-16.60	100	127	QP
805.0300	33.26	-0.41	32.85	46.00	-13.15	100	146	QP
N20 Mode Middle channel								
250.1900	35.98	-10.22	25.76	46.00	-20.24	100	310	QP
385.0200	28.81	-6.31	22.50	46.00	-23.50	100	172	QP
549.9200	28.64	-4.06	24.58	46.00	-21.42	100	95	QP
657.5900	32.40	-2.83	29.57	46.00	-16.43	100	121	QP
704.1500	33.25	-2.30	30.95	46.00	-15.05	100	131	QP
803.0900	33.28	-0.43	32.85	46.00	-13.15	100	139	QP
N40 Mode Middle channel								
199.7500	31.36	-8.81	22.55	43.50	-20.95	100	233	QP
250.1900	35.93	-10.22	25.71	46.00	-20.29	100	303	QP
391.8100	29.39	-6.18	23.21	46.00	-22.79	100	173	QP
660.5000	32.74	-2.79	29.95	46.00	-16.05	100	126	QP
703.1800	32.25	-2.30	29.95	46.00	-16.05	100	126	QP
824.4300	31.98	-0.20	31.78	46.00	-14.22	100	293	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
B Mode Middle channel								
125.0600	31.45	-9.27	22.18	43.50	-21.32	100	145	QP
200.7200	30.50	-8.93	21.57	43.50	-21.93	100	344	QP
250.1900	32.05	-10.22	21.83	46.00	-24.17	100	2	QP
425.7600	31.52	-5.59	25.93	46.00	-20.07	100	324	QP
539.2500	33.59	-4.14	29.45	46.00	-16.55	100	261	QP
816.6700	38.65	-0.28	38.37	46.00	-7.63	100	22	QP
G Mode Middle channel								
125.0600	31.58	-9.27	22.31	43.50	-21.19	100	302	QP
201.6900	29.09	-9.17	19.92	43.50	-23.58	100	230	QP
250.1900	30.95	-10.22	20.73	46.00	-25.27	100	340	QP
412.1800	30.57	-5.83	24.74	46.00	-21.26	100	310	QP
551.8600	36.28	-4.04	32.24	46.00	-13.76	100	293	QP
815.7000	38.19	-0.30	37.89	46.00	-8.11	100	210	QP
N20 Mode Middle channel								
125.0600	31.64	-9.27	22.37	43.50	-21.13	100	154	QP
203.6300	29.95	-9.63	20.32	43.50	-23.18	100	225	QP
250.1900	31.26	-10.22	21.04	46.00	-24.96	100	0	QP
554.7700	33.87	-4.00	29.87	46.00	-16.13	100	285	QP
700.2700	30.50	-2.33	28.17	46.00	-17.83	100	42	QP
816.6700	38.74	-0.28	38.46	46.00	-7.54	100	203	QP
N40 Mode Middle channel								
125.0600	30.98	-9.27	21.71	43.50	-21.79	100	128	QP
250.1900	32.13	-10.22	21.91	46.00	-24.09	100	359	QP
403.4500	31.04	-5.97	25.07	46.00	-20.93	100	322	QP
544.1000	33.80	-4.11	29.69	46.00	-16.31	100	358	QP
659.5300	29.74	-2.81	26.93	46.00	-19.07	100	311	QP
818.6100	39.11	-0.28	38.83	46.00	-7.17	100	241	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
B Mode, Low channel								
2390.000	52.56	-3.87	48.69	74.00	-25.31	300	205	peak
2390.000	39.74	-3.87	35.87	54.00	-18.13	300	205	AVG
2412.000	102.14	-3.66	98.48	N/A	N/A	300	211	peak
2412.000	98.96	-3.66	95.30	N/A	N/A	300	211	AVG
4824.000	35.20	2.04	37.24	74.00	-36.76	100	359	peak
4824.000	22.72	2.04	24.76	54.00	-29.24	100	359	AVG
B Mode, Middle channel								
2437.000	101.34	-3.39	97.95	N/A	N/A	300	212	peak
2437.000	98.15	-3.39	94.76	N/A	N/A	300	212	AVG
4874.000	34.40	2.59	36.99	74.00	-37.01	100	118	peak
4874.000	25.58	2.59	28.17	54.00	-25.83	100	118	AVG
B Mode, High channel								
2462.000	101.20	-3.12	98.08	N/A	N/A	300	263	peak
2462.000	98.21	-3.12	95.09	N/A	N/A	300	263	AVG
2483.500	52.00	-2.88	49.12	74.00	-24.88	300	261	peak
2483.500	39.57	-2.88	36.69	54.00	-17.31	300	261	AVG
4924.000	33.22	2.81	36.03	74.00	-37.97	100	113	peak
4924.000	22.82	2.81	25.63	54.00	-28.37	100	113	AVG

Vertical

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
B Mode, Low channel								
2390.000	55.44	-3.87	51.57	74.00	-22.43	200	53	peak
2390.000	42.74	-3.87	38.87	54.00	-15.13	200	53	AVG
2412.000	105.78	-3.66	102.12	N/A	N/A	200	48	peak
2412.000	102.56	-3.66	98.90	N/A	N/A	200	48	AVG
4824.000	33.08	2.04	35.12	74.00	-38.88	100	98	peak
4824.000	21.67	2.04	23.71	54.00	-30.29	100	98	AVG
B Mode, Middle channel								
2437.000	106.13	-3.39	102.74	N/A	N/A	200	47	peak
2437.000	103.00	-3.39	99.61	N/A	N/A	200	47	AVG
4874.000	33.26	2.59	35.85	74.00	-38.15	100	178	peak
4874.000	23.45	2.59	26.04	54.00	-27.96	100	178	AVG
B Mode, High channel								
2462.000	106.47	-3.12	103.35	N/A	N/A	200	58	peak
2462.000	103.31	-3.12	100.19	N/A	N/A	200	58	AVG
2483.500	56.20	-2.88	53.32	74.00	-20.68	200	359	peak
2483.500	42.69	-2.88	39.81	54.00	-14.19	200	359	AVG
4924.000	32.82	2.81	35.63	74.00	-38.37	100	334	peak
4924.000	22.30	2.81	25.11	54.00	-28.89	100	334	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
G Mode, Low channel								
2390.000	70.66	-3.87	66.79	74.00	-7.21	300	206	peak
2390.000	46.90	-3.87	43.03	54.00	-10.97	300	206	AVG
2412.000	105.34	-3.66	101.68	N/A	N/A	300	134	peak
2412.000	96.26	-3.66	92.60	N/A	N/A	300	134	AVG
4824.000	33.24	2.04	35.28	74.00	-38.72	100	92	peak
4824.000	21.58	2.04	23.62	54.00	-30.38	100	92	AVG
G Mode, Middle channel								
2437.000	104.27	-3.39	100.88	N/A	N/A	300	141	peak
2437.000	95.05	-3.39	91.66	N/A	N/A	300	141	AVG
4874.000	33.70	2.59	36.29	74.00	-37.71	100	330	peak
4874.000	21.00	2.59	23.59	54.00	-30.41	100	330	AVG
G Mode, High channel								
2462.000	103.06	-3.12	99.94	N/A	N/A	300	141	peak
2462.000	93.85	-3.12	90.73	N/A	N/A	300	141	AVG
2483.500	66.30	-2.88	63.42	74.00	-10.58	300	252	peak
2483.500	42.85	-2.88	39.97	54.00	-14.03	300	252	AVG
4924.000	33.96	2.81	36.77	74.00	-37.23	100	86	peak
4924.000	21.60	2.81	24.41	54.00	-29.59	100	86	AVG

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
G Mode, Low channel								
2390.000	73.18	-3.87	69.31	74.00	-4.69	200	44	peak
2390.000	51.87	-3.87	48.00	54.00	-6.00	200	44	AVG
2412.000	108.22	-3.66	104.56	N/A	N/A	200	4	peak
2412.000	99.11	-3.66	95.45	N/A	N/A	200	4	AVG
4824.000	33.67	2.04	35.71	74.00	-38.29	100	42	peak
4824.000	21.45	2.04	23.49	54.00	-30.51	100	42	AVG
G Mode, Middle channel								
2437.000	108.98	-3.39	105.59	N/A	N/A	200	355	peak
2437.000	99.57	-3.39	96.18	N/A	N/A	200	355	AVG
4874.000	33.52	2.59	36.11	74.00	-37.89	100	217	peak
4874.000	21.51	2.59	24.10	54.00	-29.90	100	217	AVG
G Mode, High channel								
2462.000	106.85	-3.12	103.73	N/A	N/A	200	351	peak
2462.000	97.78	-3.12	94.66	N/A	N/A	200	351	AVG
2483.500	73.91	-2.88	71.03	74.00	-2.97	200	4	peak
2483.500	51.38	-2.88	48.50	54.00	-5.50	200	4	AVG
4924.000	33.71	2.81	36.52	74.00	-37.48	100	164	peak
4924.000	21.62	2.81	24.43	54.00	-29.57	100	164	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N20 Mode, Low channel								
2390.000	73.33	-3.87	69.46	74.00	-4.54	300	359	peak
2390.000	49.47	-3.87	45.60	54.00	-8.40	300	359	AVG
2412.000	104.48	-3.66	100.82	N/A	N/A	300	215	peak
2412.000	95.39	-3.66	91.73	N/A	N/A	300	215	AVG
4824.000	33.64	2.04	35.68	74.00	-38.32	100	225	peak
4824.000	21.67	2.04	23.71	54.00	-30.29	100	225	AVG
N20 Mode, Middle channel								
2437.000	103.48	-3.39	100.09	N/A	N/A	300	144	peak
2437.000	93.67	-3.39	90.28	N/A	N/A	300	144	AVG
4874.000	33.76	2.59	36.35	74.00	-37.65	100	106	peak
4874.000	21.53	2.59	24.12	54.00	-29.88	100	106	AVG
N20 Mode, High channel								
2462.000	102.59	-3.12	99.47	N/A	N/A	300	126	peak
2462.000	93.33	-3.12	90.21	N/A	N/A	300	126	AVG
2483.500	72.20	-2.88	69.32	74.00	-4.68	300	123	peak
2483.500	50.47	-2.88	47.59	54.00	-6.41	300	123	AVG
4924.000	32.74	2.81	35.55	74.00	-38.45	100	232	peak
4924.000	21.42	2.81	24.23	54.00	-29.77	100	232	AVG

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N20 Mode, Low channel								
2390.000	75.15	-3.87	71.28	74.00	-2.72	200	359	peak
2390.000	52.65	-3.87	48.78	54.00	-5.22	200	359	AVG
2412.000	107.63	-3.66	103.97	N/A	N/A	200	330	peak
2412.000	97.49	-3.66	93.83	N/A	N/A	200	330	AVG
4824.000	33.39	2.04	35.43	74.00	-38.57	100	175	peak
4824.000	21.34	2.04	23.38	54.00	-30.62	100	175	AVG
N20 Mode, Middle channel								
2437.000	108.39	-3.39	105.00	N/A	N/A	200	360	peak
2437.000	98.31	-3.39	94.92	N/A	N/A	200	360	AVG
4874.000	33.67	2.59	36.26	74.00	-37.74	100	332	peak
4874.000	21.37	2.59	23.96	54.00	-30.04	100	332	AVG
N20 Mode, High channel								
2462.000	106.49	-3.12	103.37	N/A	N/A	200	41	peak
2462.000	96.88	-3.12	93.76	N/A	N/A	200	41	AVG
2483.500	75.40	-2.88	72.52	74.00	-1.48	200	335	peak
2483.500	51.36	-2.88	48.48	54.00	-5.52	200	335	AVG
4924.000	33.56	2.81	36.37	74.00	-37.63	100	14	peak
4924.000	21.42	2.81	24.23	54.00	-29.77	100	14	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N40 Mode, Low channel								
2390.000	73.87	-3.87	70.00	74.00	-4.00	300	203	peak
2390.000	53.16	-3.87	49.29	54.00	-4.71	300	203	AVG
2422.000	101.55	-3.55	98.00	N/A	N/A	300	213	peak
2422.000	90.33	-3.55	86.78	N/A	N/A	300	213	AVG
4844.000	33.33	2.25	35.58	74.00	-38.42	100	187	peak
4844.000	21.88	2.25	24.13	54.00	-29.87	100	187	AVG
N40 Mode, Middle channel								
2437.000	101.37	-3.39	97.98	N/A	N/A	300	138	peak
2437.000	91.40	-3.39	88.01	N/A	N/A	300	138	AVG
4874.000	33.88	2.59	36.47	74.00	-37.53	100	0	peak
4874.000	21.96	2.59	24.55	54.00	-29.45	100	0	AVG
N40 Mode, High channel								
2452.000	99.33	-3.22	96.11	N/A	N/A	300	127	peak
2452.000	89.91	-3.22	86.69	N/A	N/A	300	127	AVG
2483.500	69.77	-2.88	66.89	74.00	-7.11	300	123	peak
2483.500	52.92	-2.88	50.04	54.00	-3.96	300	123	AVG
4904.000	34.82	2.87	37.69	74.00	-36.31	100	148	peak
4904.000	22.09	2.87	24.96	54.00	-29.04	100	148	AVG

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N40 Mode, Low channel								
2390.000	74.62	-3.87	70.75	74.00	-3.25	200	43	peak
2390.000	55.97	-3.87	52.10	54.00	-1.90	200	43	AVG
2422.000	106.27	-3.55	102.72	N/A	N/A	200	43	peak
2422.000	95.69	-3.55	92.14	N/A	N/A	200	43	AVG
4844.000	34.04	2.25	36.29	74.00	-37.71	100	21	peak
4844.000	21.83	2.25	24.08	54.00	-29.92	100	21	AVG
N40 Mode, Middle channel								
2437.000	104.94	-3.39	101.55	N/A	N/A	200	42	peak
2437.000	95.11	-3.39	91.72	N/A	N/A	200	42	AVG
4874.000	32.77	2.59	35.36	74.00	-38.64	100	115	peak
4874.000	21.36	2.59	23.95	54.00	-30.05	100	115	AVG
N40 Mode, High channel								
2452.000	102.16	-3.22	98.94	N/A	N/A	200	46	peak
2452.000	92.90	-3.22	89.68	N/A	N/A	200	46	AVG
2483.500	74.59	-2.88	71.71	74.00	-2.29	200	2	peak
2483.500	55.80	-2.88	52.92	54.00	-1.08	200	2	AVG
4904.000	33.39	2.87	36.26	74.00	-37.74	100	225	peak
4904.000	21.87	2.87	24.74	54.00	-29.26	100	225	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Test Mode: simultaneous transmissions (2.4G WIFI+5G WIFI)

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
203.6300	31.69	-9.63	22.06	43.50	-21.44	100	163	QP
250.1900	35.69	-10.22	25.47	46.00	-20.53	100	304	QP
391.8100	29.34	-6.18	23.16	46.00	-22.84	100	168	QP
658.5600	32.63	-2.83	29.80	46.00	-16.20	100	125	QP
700.2700	31.63	-2.33	29.30	46.00	-16.70	100	133	QP
806.9700	34.17	-0.38	33.79	46.00	-12.21	100	146	QP
4824.000	32.77	2.04	34.81	74.00	-39.19	100	342	peak
4824.000	22.53	2.04	24.57	54.00	-29.43	100	342	AVG
10360.000	29.87	14.38	44.25	68.23	-23.98	100	248	peak

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
107.6000	33.23	-11.24	21.99	43.50	-21.51	100	1	QP
250.1900	31.66	-10.22	21.44	46.00	-24.56	100	358	QP
544.1000	34.87	-4.11	30.76	46.00	-15.24	100	124	QP
658.5600	30.33	-2.83	27.50	46.00	-18.50	100	304	QP
702.2100	29.82	-2.32	27.50	46.00	-18.50	100	312	QP
814.7300	38.88	-0.30	38.58	46.00	-7.42	100	248	QP
4824.000	32.65	2.04	34.69	74.00	-39.31	100	142	peak
4824.000	21.87	2.04	23.91	54.00	-30.09	100	142	AVG
10360.000	36.12	14.38	50.50	68.23	-17.73	100	129	peak

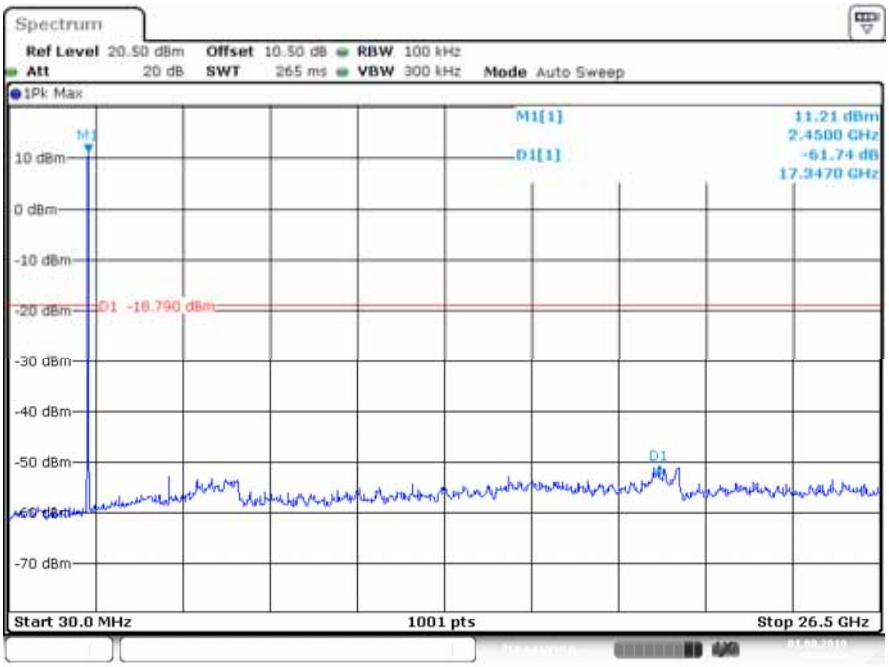
Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)			Limit (dBc)	Result
		Chain 0	Chain 1	Chain 2		
B Mode						
Low	2412	61.74	59.11	61.89	≥ 30	PASS
Mid	2437	59.62	61.46	60.79	≥ 30	PASS
High	2462	60.83	61.28	62.18	≥ 30	PASS
G Mode						
Low	2412	61.93	61.88	62.76	≥ 30	PASS
Mid	2437	61.18	61.65	60.53	≥ 30	PASS
High	2462	60.33	61.21	61.86	≥ 30	PASS
N20 Mode						
Low	2412	61.44	61.06	60.92	≥ 30	PASS
Mid	2437	61.78	60.43	62.32	≥ 30	PASS
High	2462	61.41	60.10	62.37	≥ 30	PASS
N40 Mode						
Low	2422	60.77	62.15	61.80	≥ 30	PASS
Mid	2437	60.10	60.99	60.12	≥ 30	PASS
High	2452	61.81	60.76	61.05	≥ 30	PASS

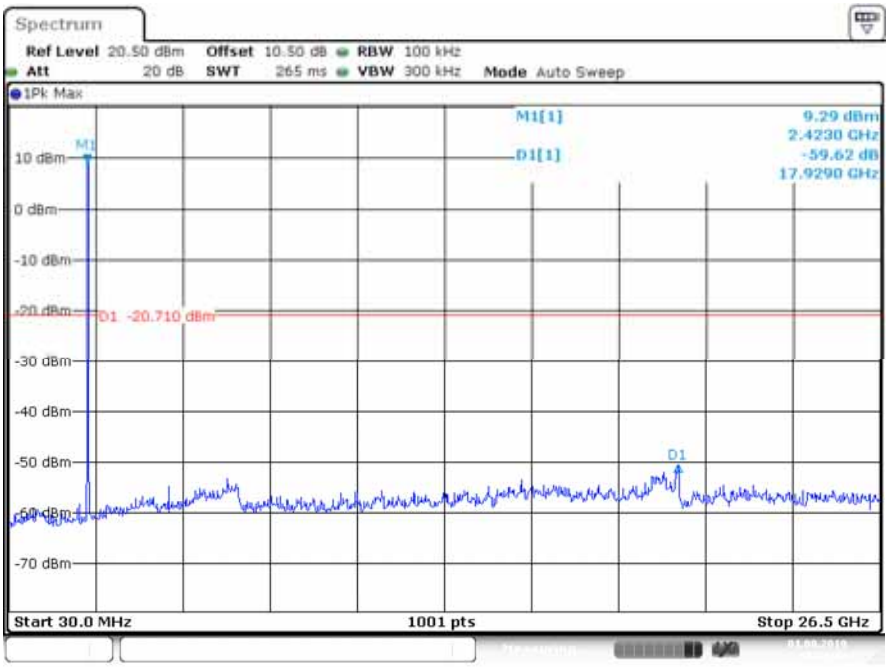
B Mode (Chain 0)

Low Channel



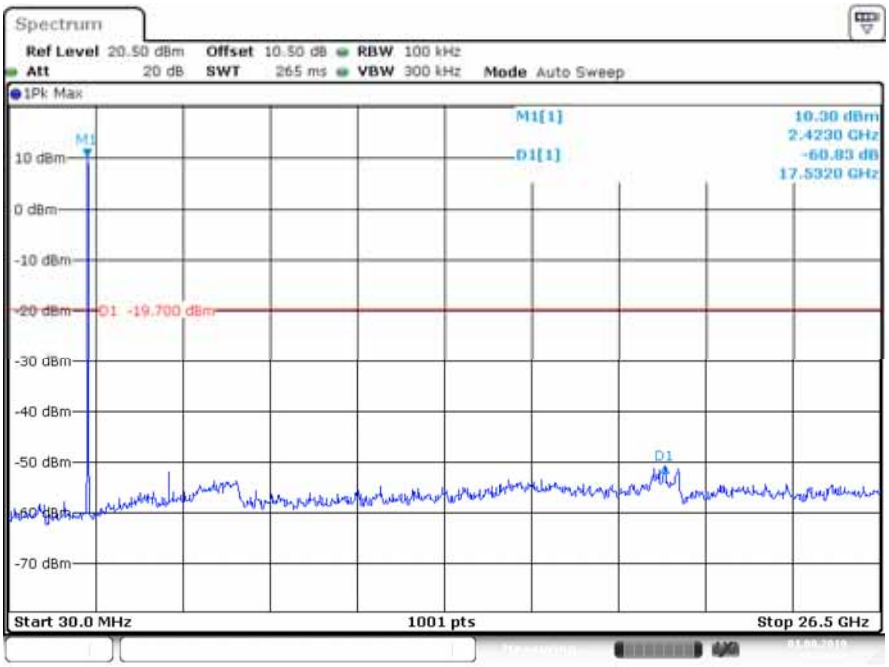
Date: 1.AUG.2019 18:15:00

Middle Channel



Date: 1.AUG.2019 18:15:46

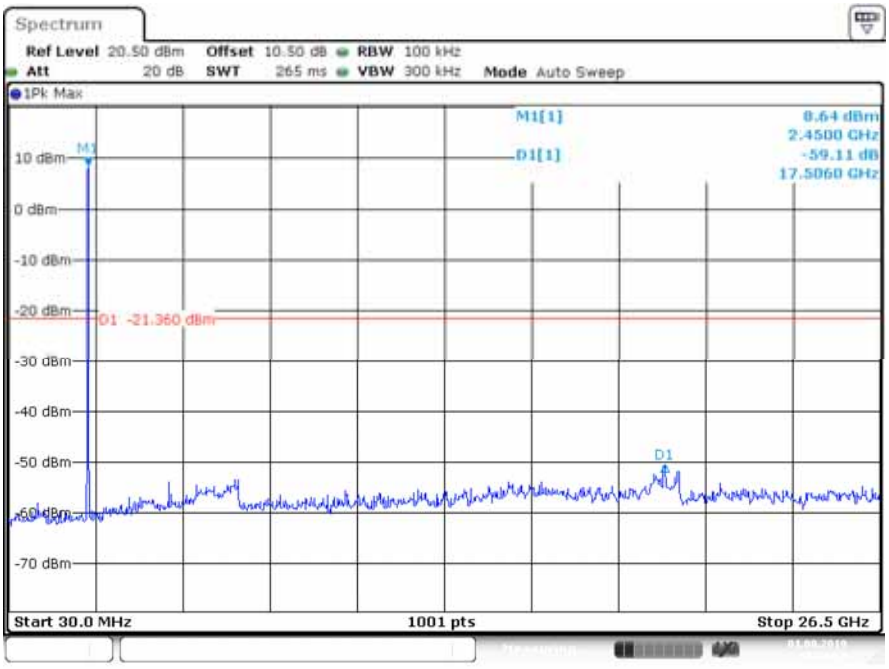
High Channel



Date: 1.AUG.2019 18:16:32

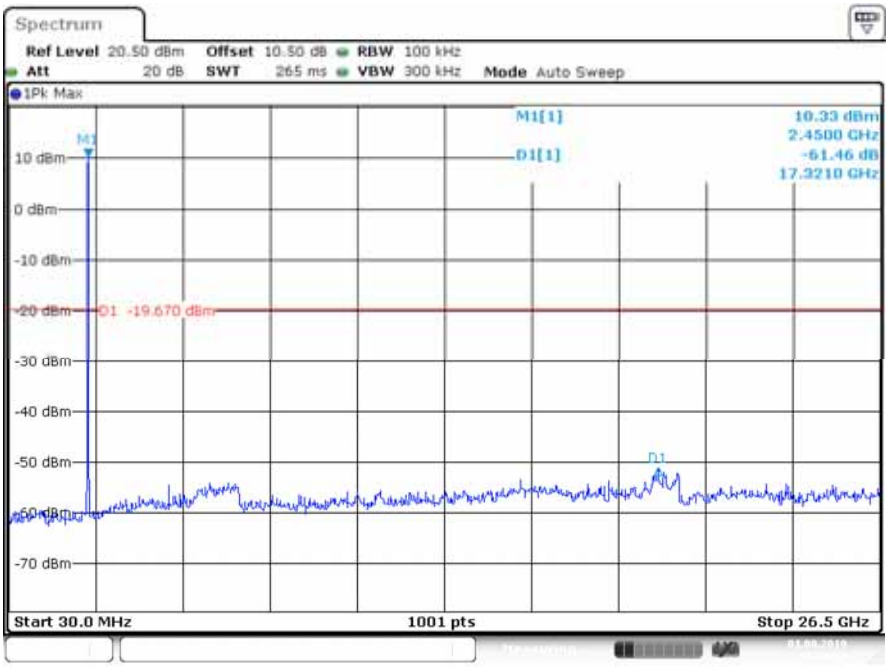
B Mode (Chain 1)

Low Channel



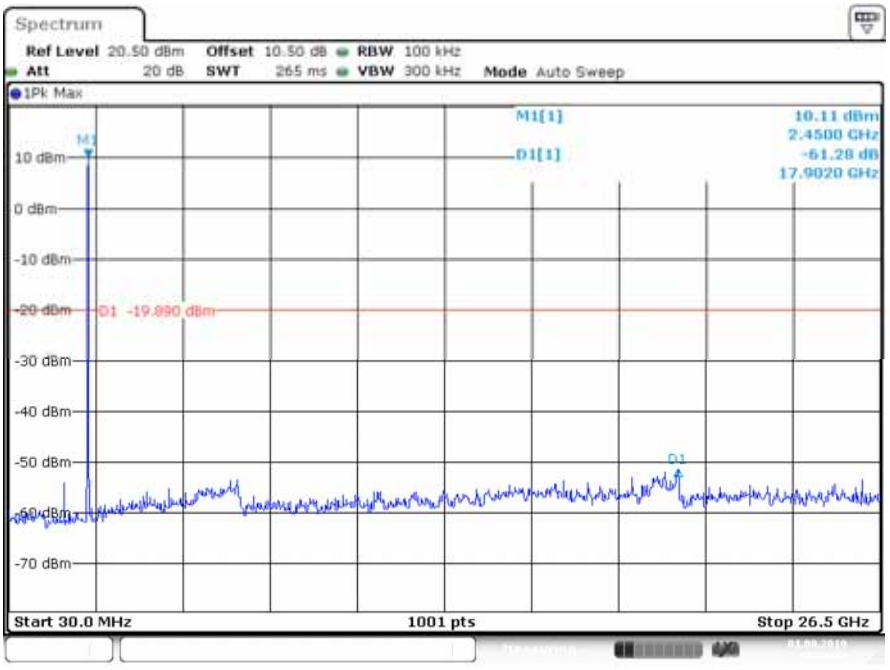
Date: 1.AUG.2019 18:16:55

Middle Channel



Date: 1.AUG.2019 18:17:15

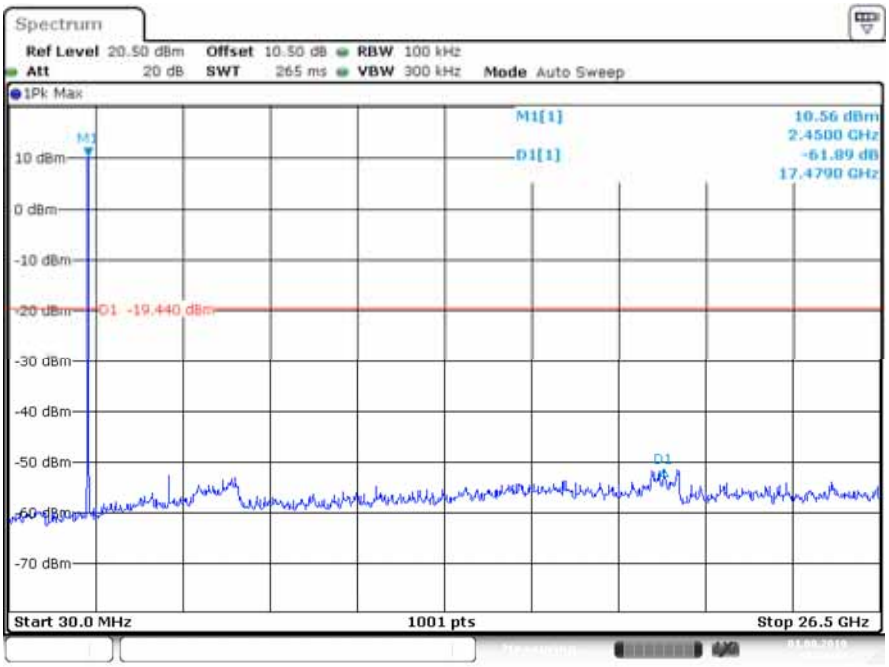
High Channel



Date: 1.AUG.2019 18:17:43

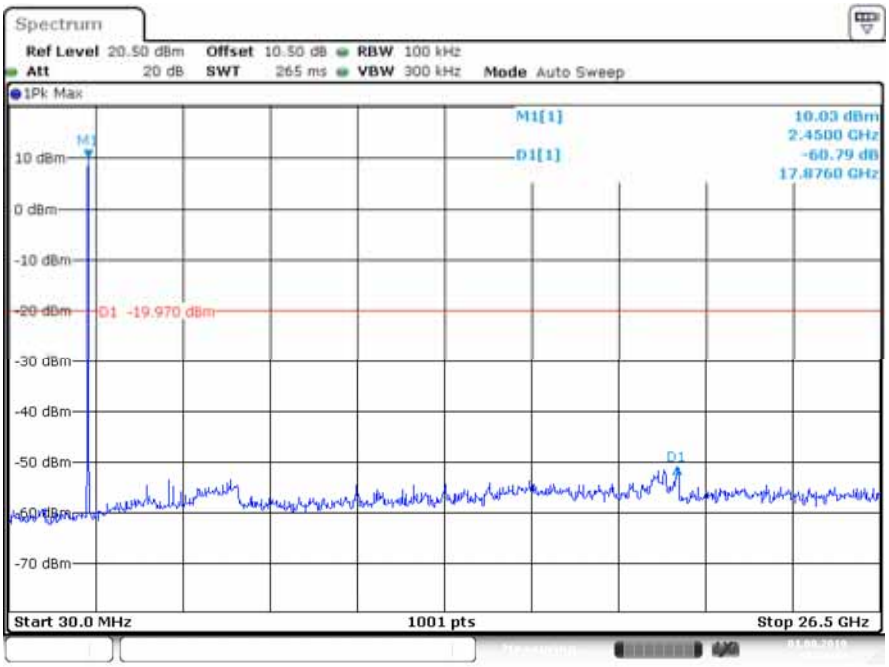
B Mode (Chain 2)

Low Channel



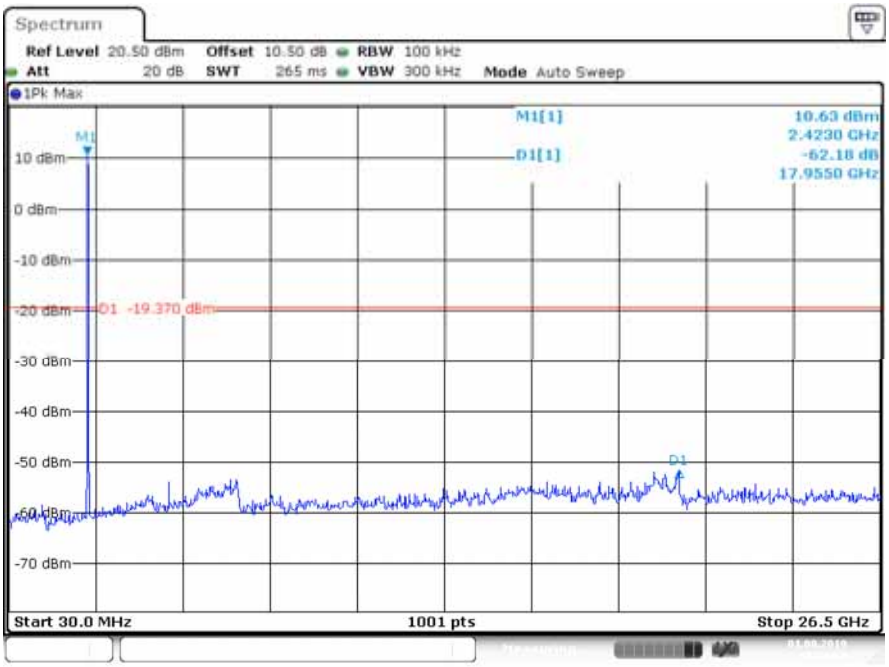
Date: 1.AUG.2019 18:18:14

Middle Channel



Date: 1.AUG.2019 18:18:44

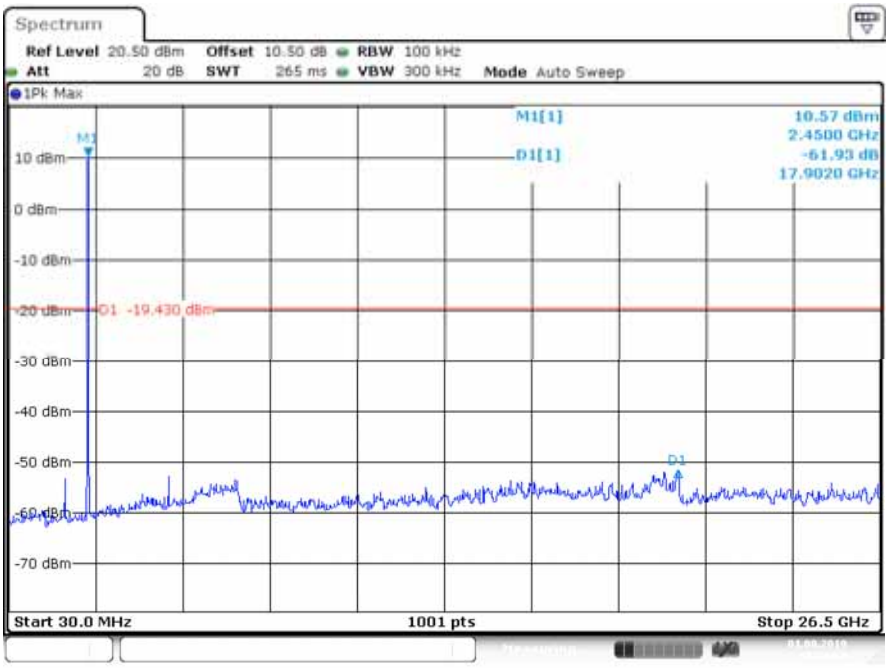
High Channel



Date: 1.AUG.2019 18:19:08

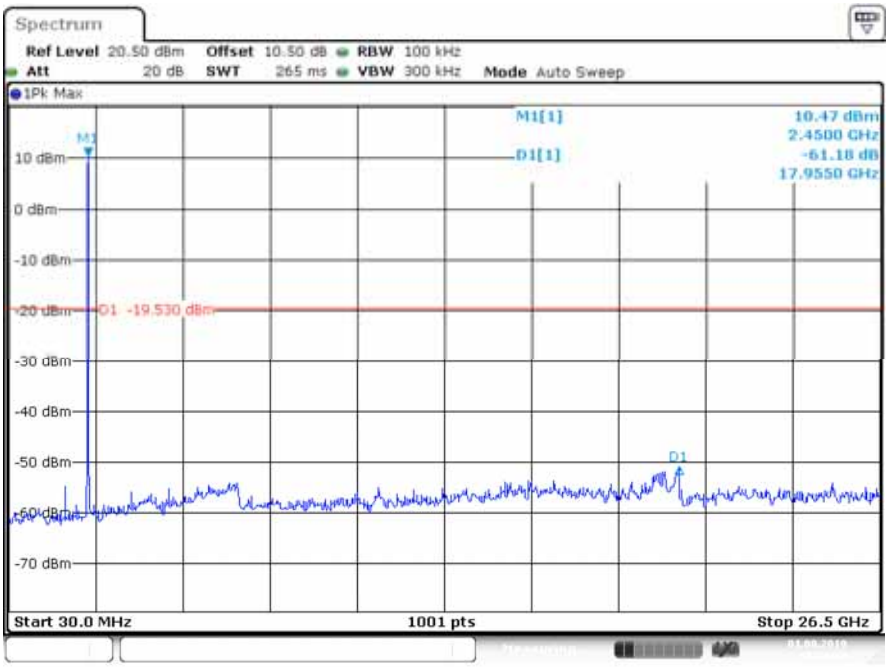
G Mode (Chain 0)

Low Channel



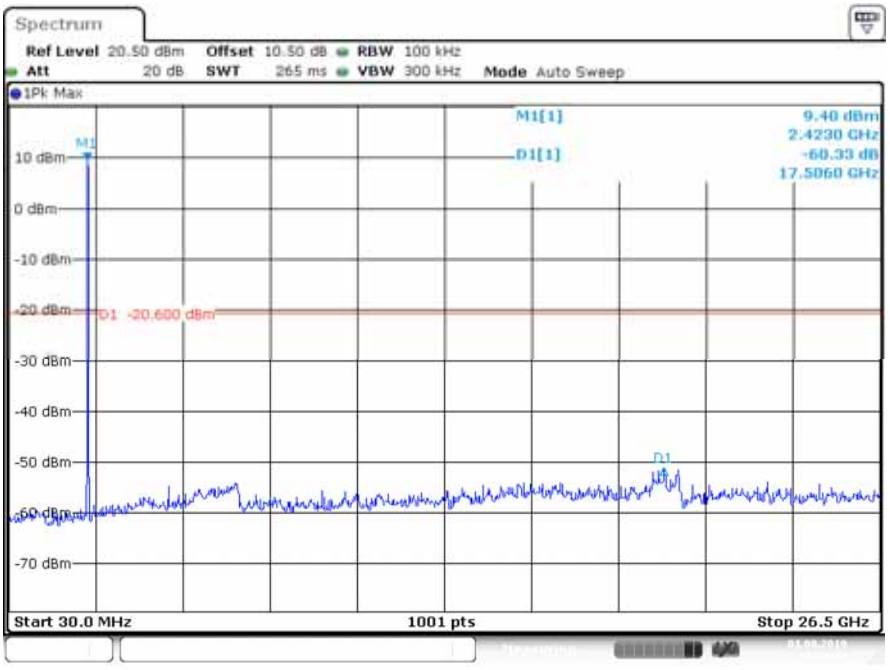
Date: 1.AUG.2019 18:19:59

Middle Channel



Date: 1.AUG.2019 18:20:20

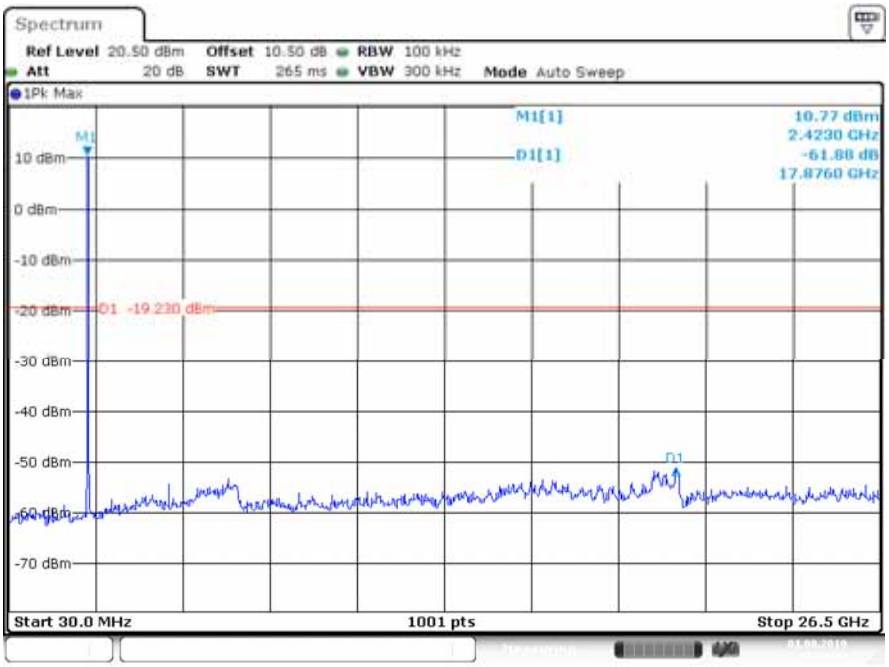
High Channel



Date: 1.AUG.2019 18:20:42

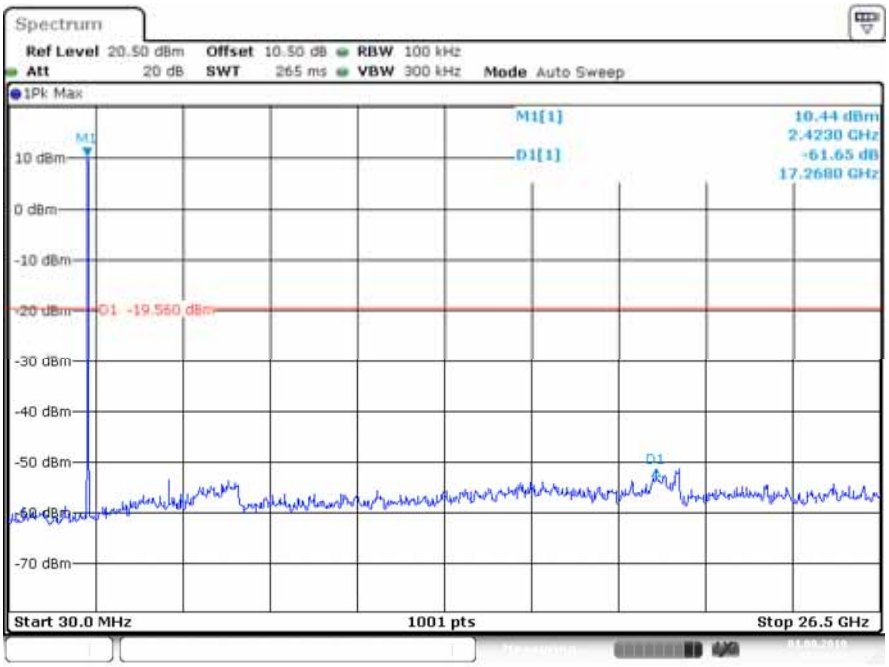
G Mode (Chain 1)

Low Channel



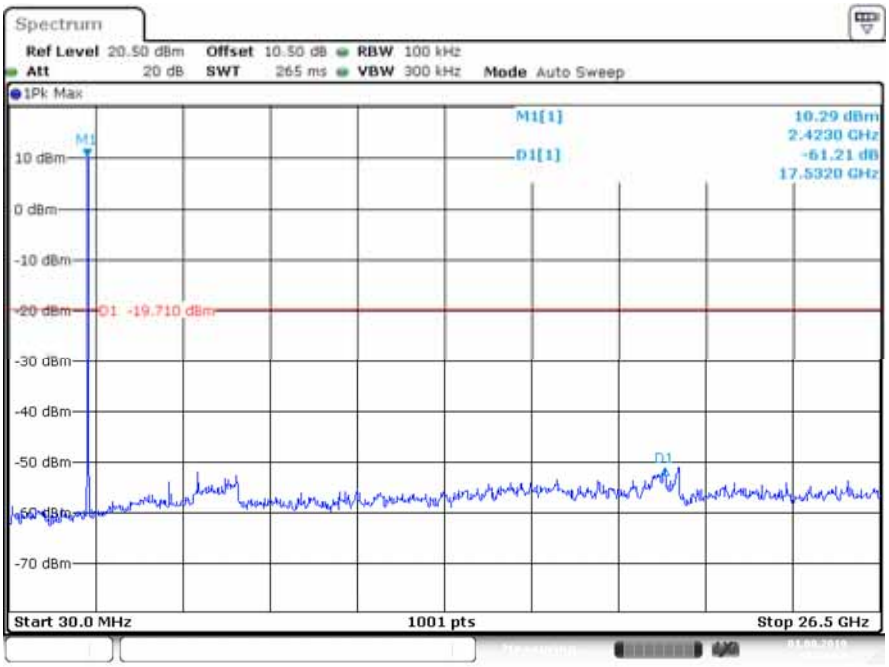
Date: 1.AUG.2019 18:21:13

Middle Channel



Date: 1.AUG.2019 18:21:32

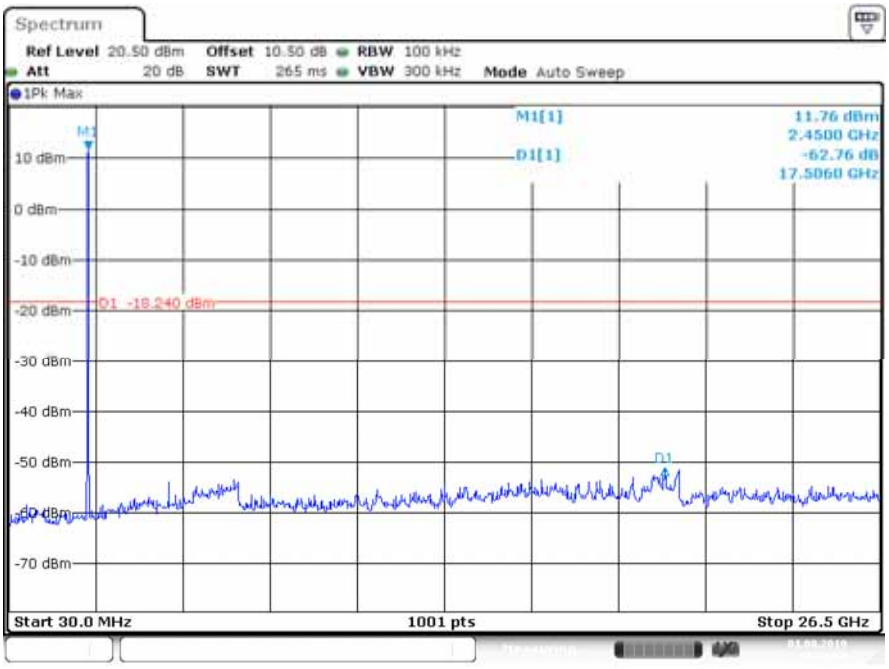
High Channel



Date: 1.AUG.2019 18:21:59

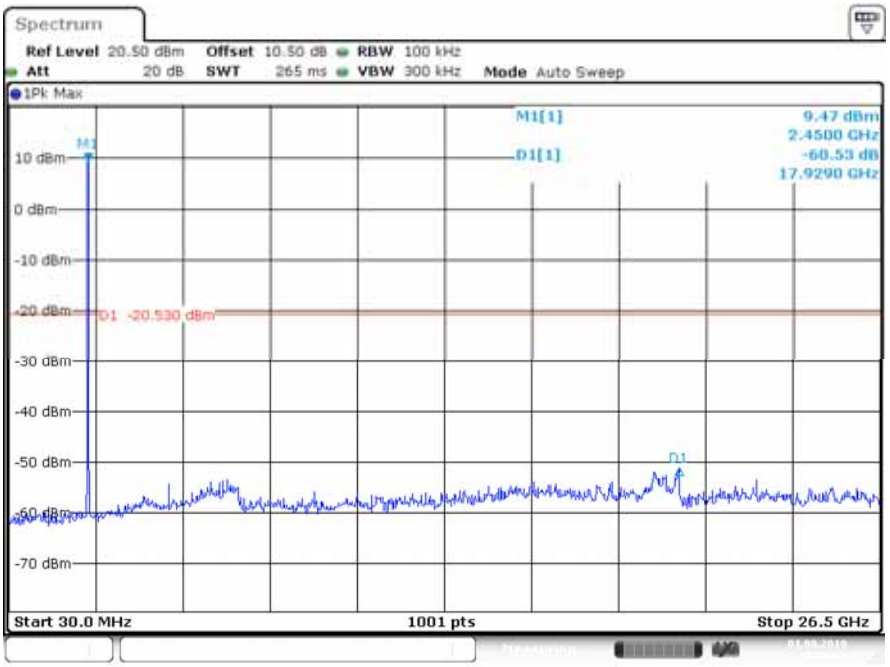
G Mode (Chain 2)

Low Channel



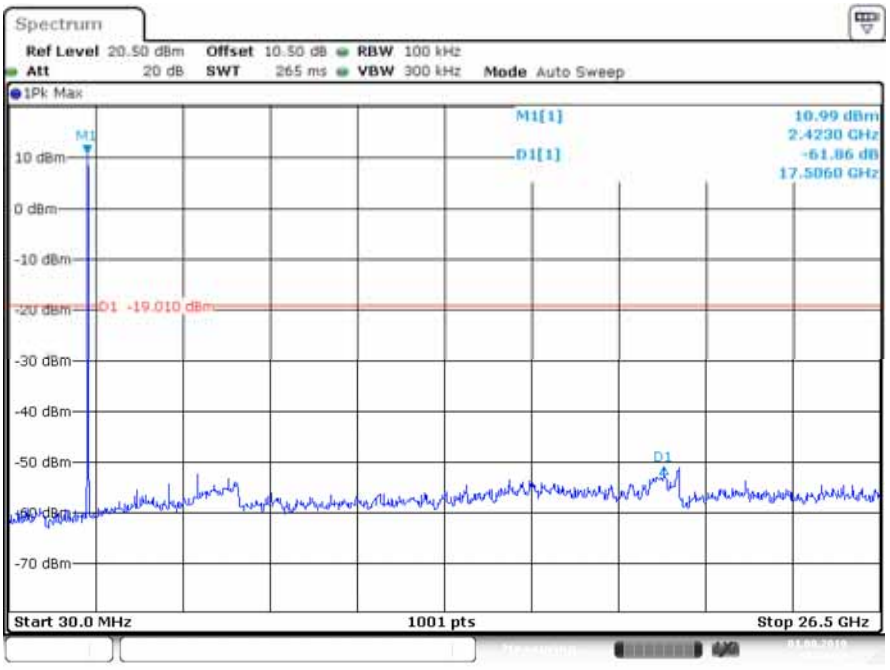
Date: 1.AUG.2019 18:22:58

Middle Channel



Date: 1.AUG.2019 18:23:17

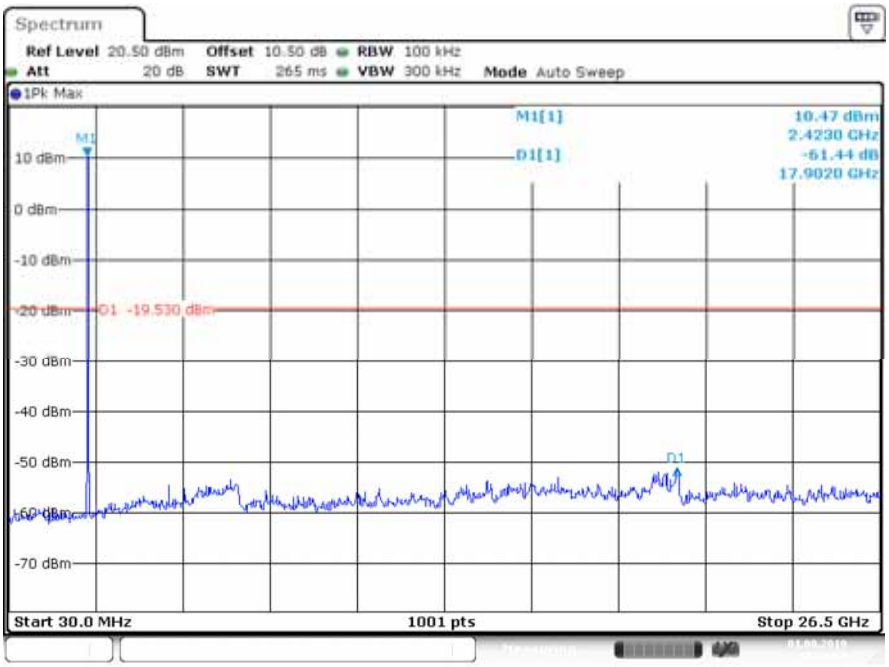
High Channel



Date: 1.AUG.2019 18:23:35

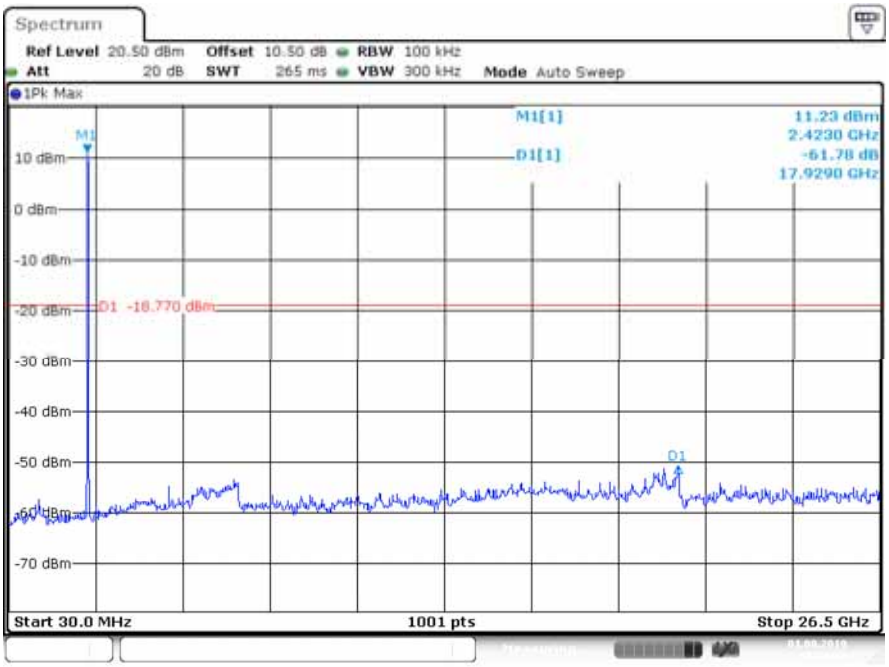
N20 Mode (Chain 0)

Low Channel



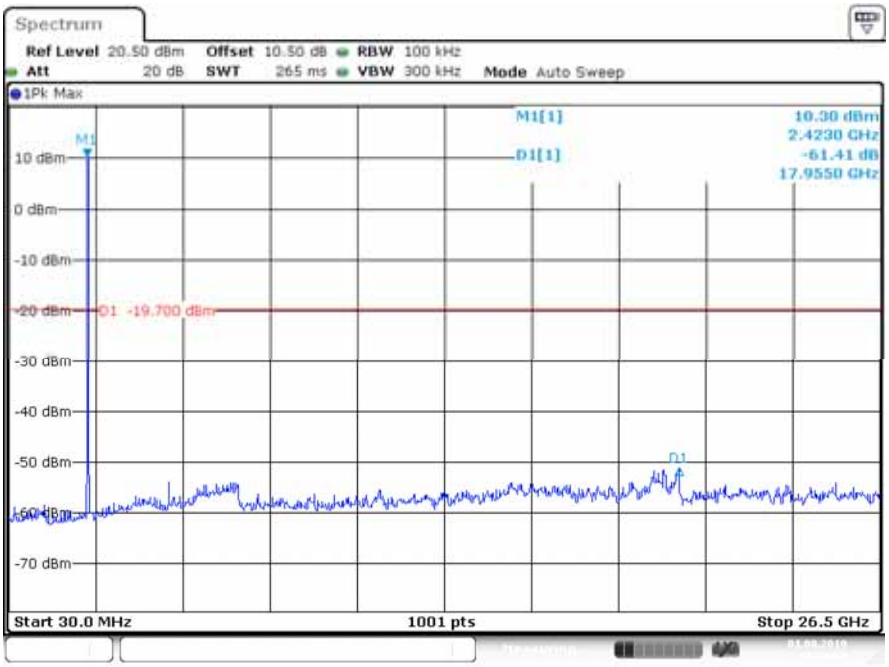
Date: 1.AUG.2019 18:24:09

Middle Channel



Date: 1.AUG.2019 18:24:26

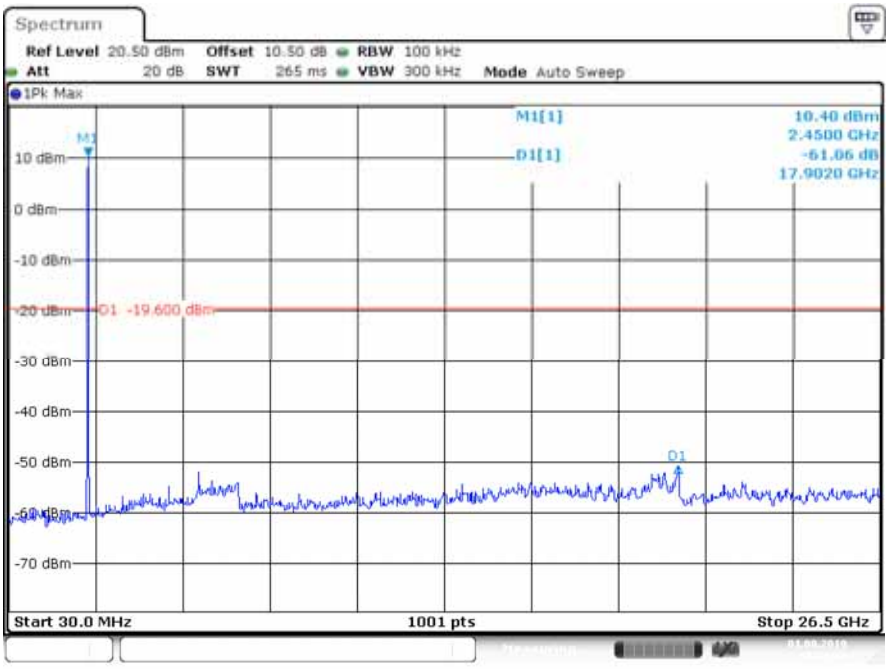
High Channel



Date: 1.AUG.2019 18:24:52

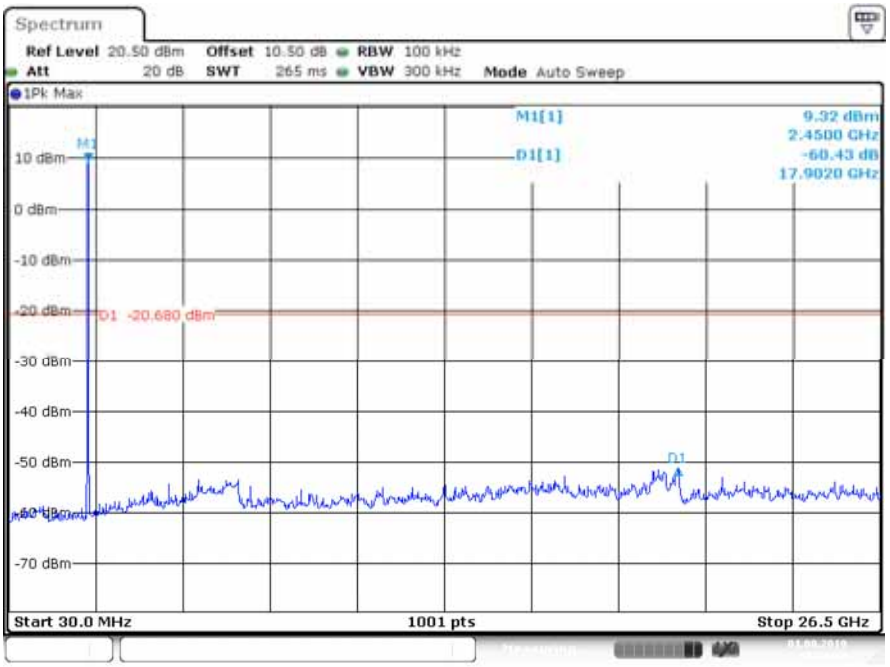
N20 Mode (Chain 1)

Low Channel



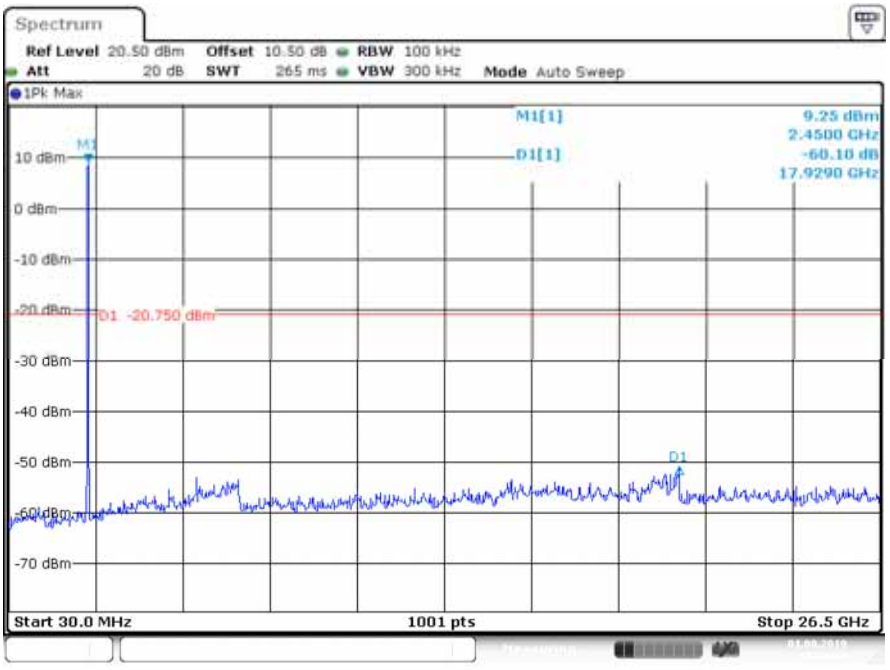
Date: 1.AUG.2019 18:25:16

Middle Channel



Date: 1.AUG.2019 18:26:03

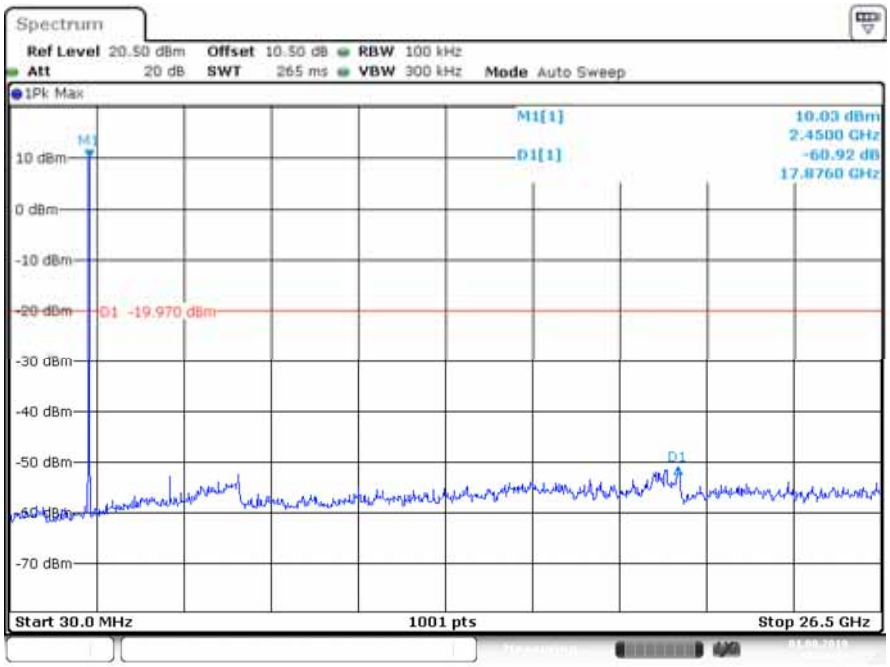
High Channel



Date: 1.AUG.2019 18:26:38

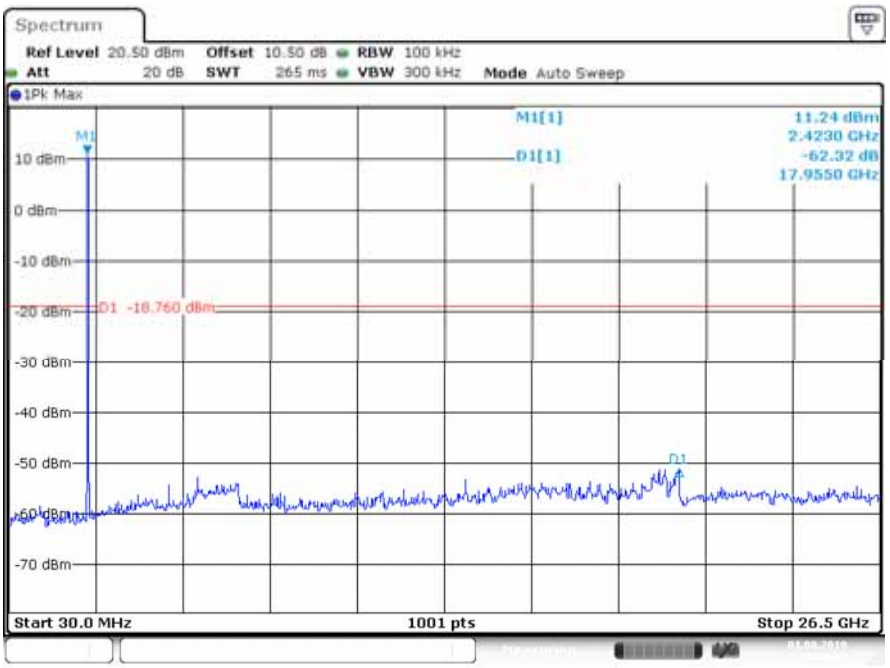
N20 Mode (Chain 2)

Low Channel



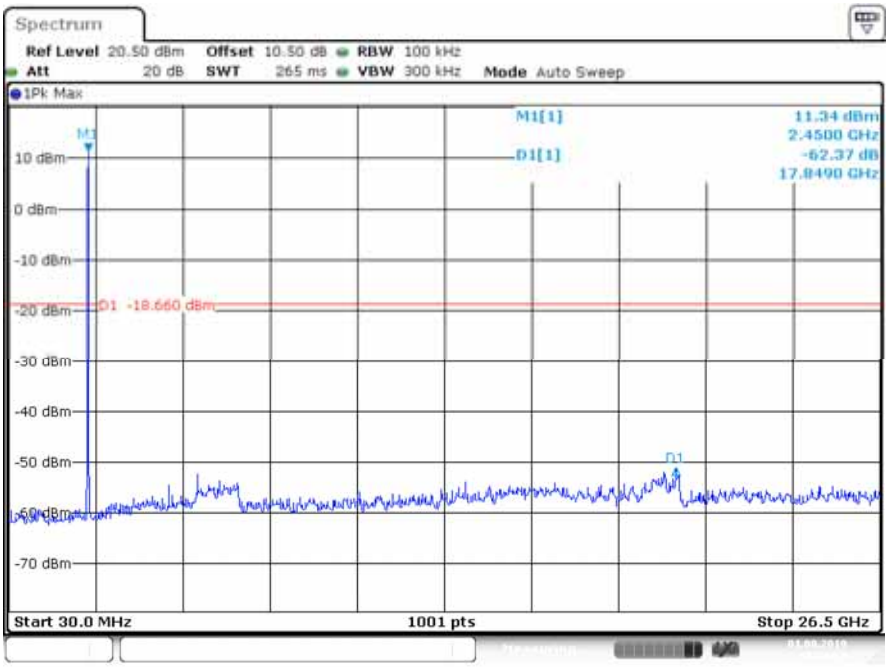
Date: 1.AUG.2019 18:27:13

Middle Channel



Date: 1.AUG.2019 18:27:37

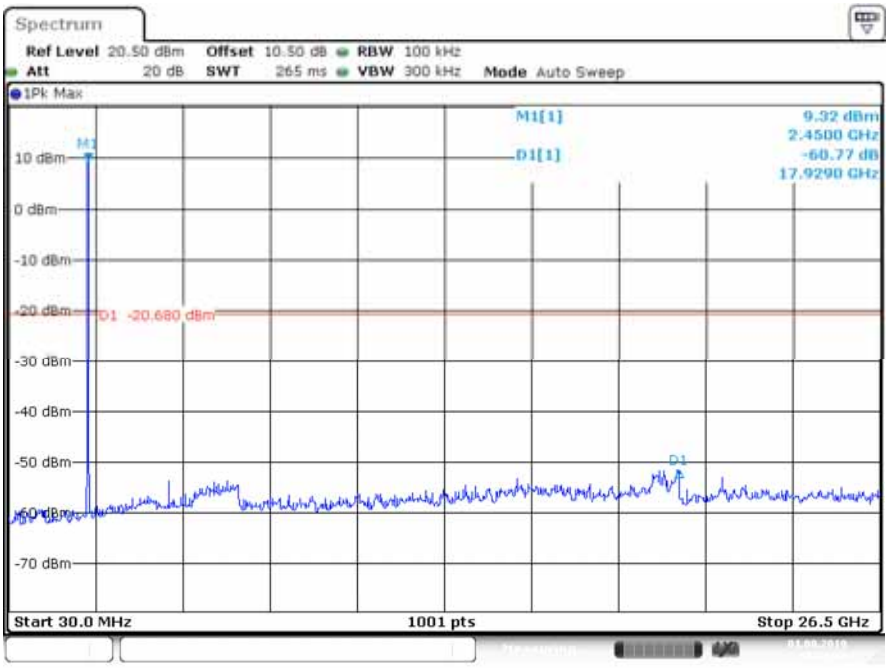
High Channel



Date: 1.AUG.2019 18:27:55

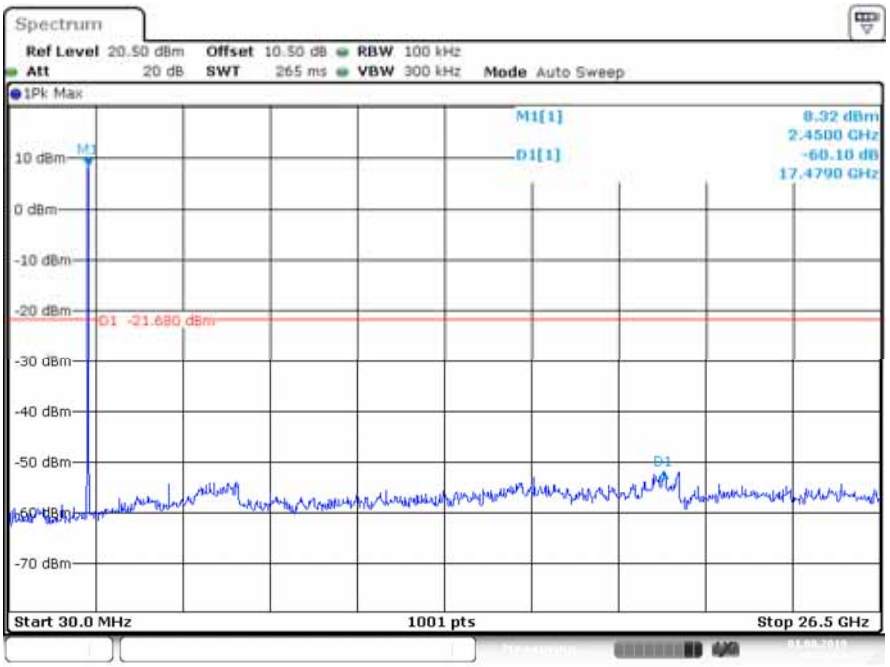
N40 Mode (Chain 0)

Low Channel



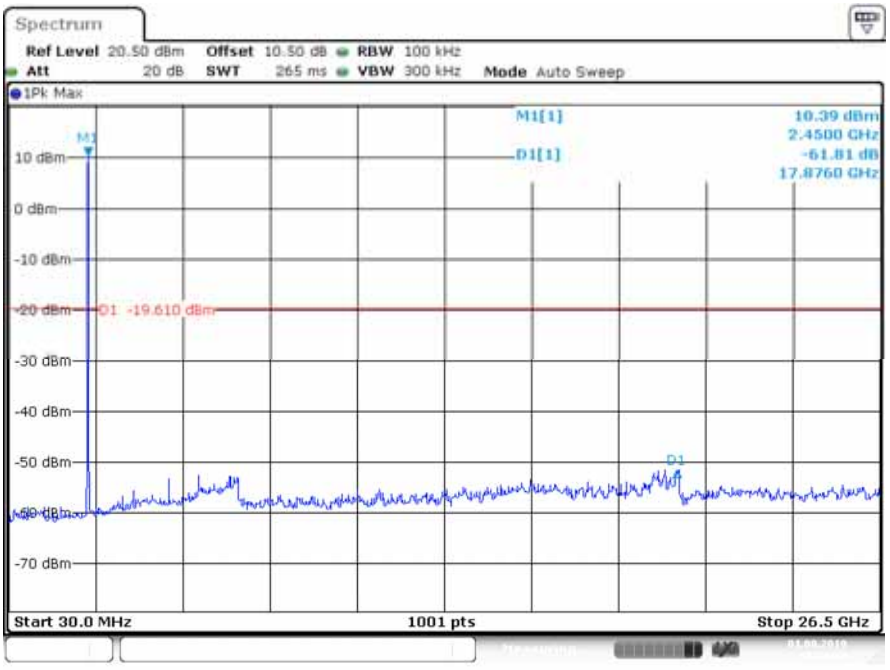
Date: 1.AUG.2019 18:32:36

Middle Channel



Date: 1.AUG.2019 18:32:59

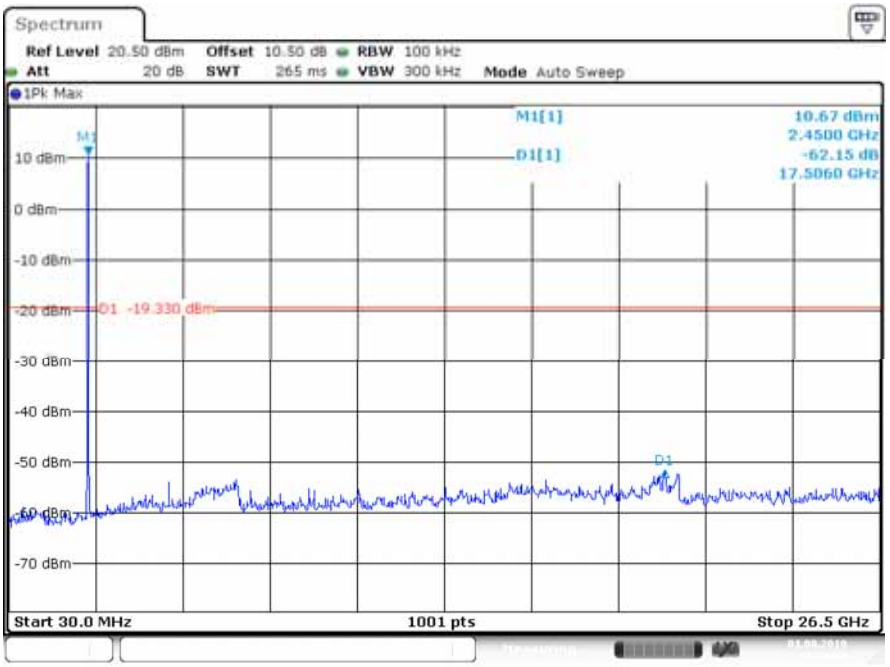
High Channel



Date: 1.AUG.2019 18:33:30

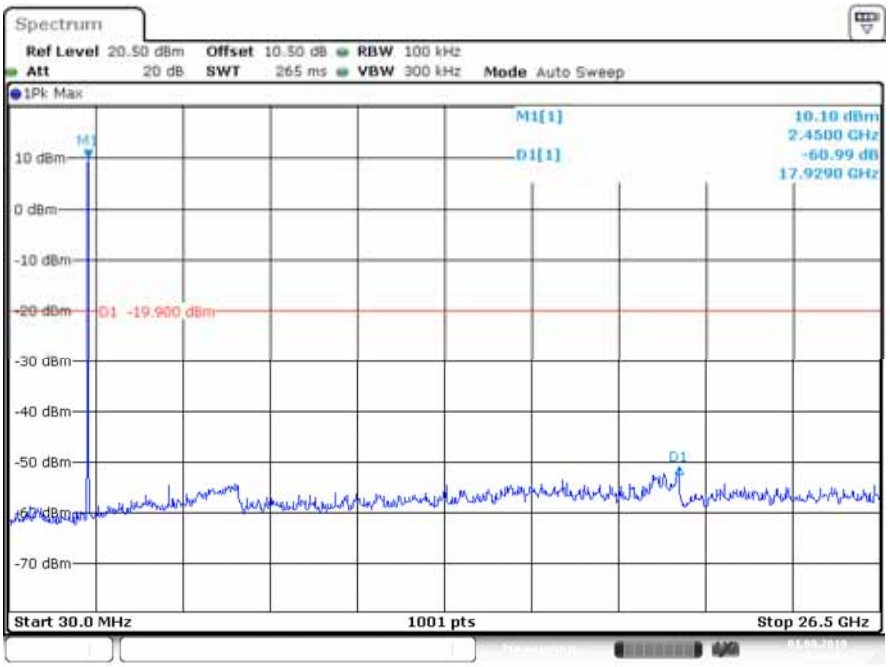
N40 Mode (Chain 1)

Low Channel



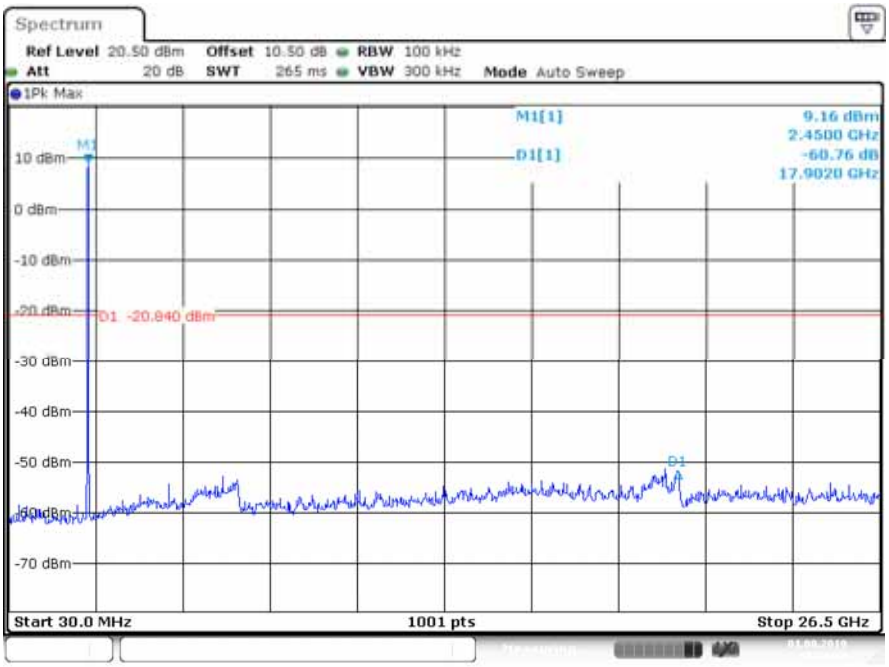
Date: 1.AUG.2019 18:34:18

Middle Channel



Date: 1.AUG.2019 18:34:35

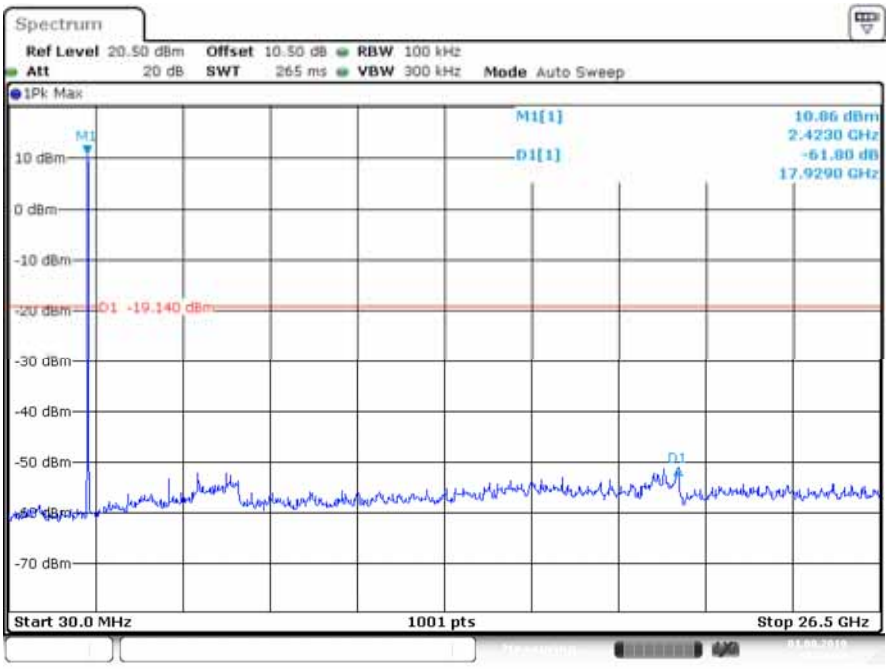
High Channel



Date: 1.AUG.2019 18:34:53

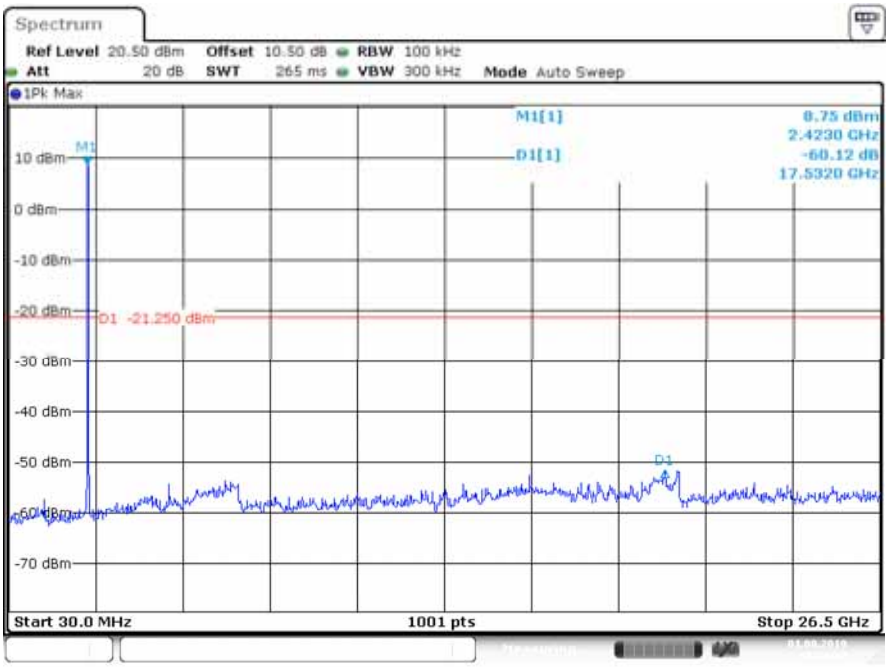
N40 Mode (Chain 2)

Low Channel



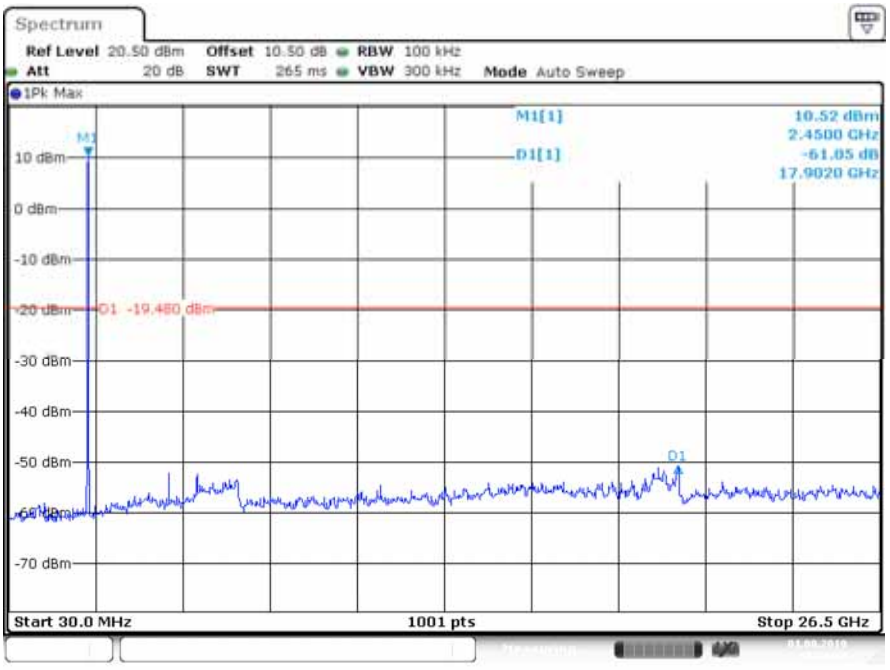
Date: 1.AUG.2019 18:36:10

Middle Channel



Date: 1.AUG.2019 18:36:27

High Channel



Date: 1.AUG.2019 18:37:04

9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

9.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 Test Procedure

The steps for the first option are as follows:

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

9.3 Environmental Conditions

Temperature:	25.3 °C
Relative Humidity:	44 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-07-17 ~ 2019-08-01.

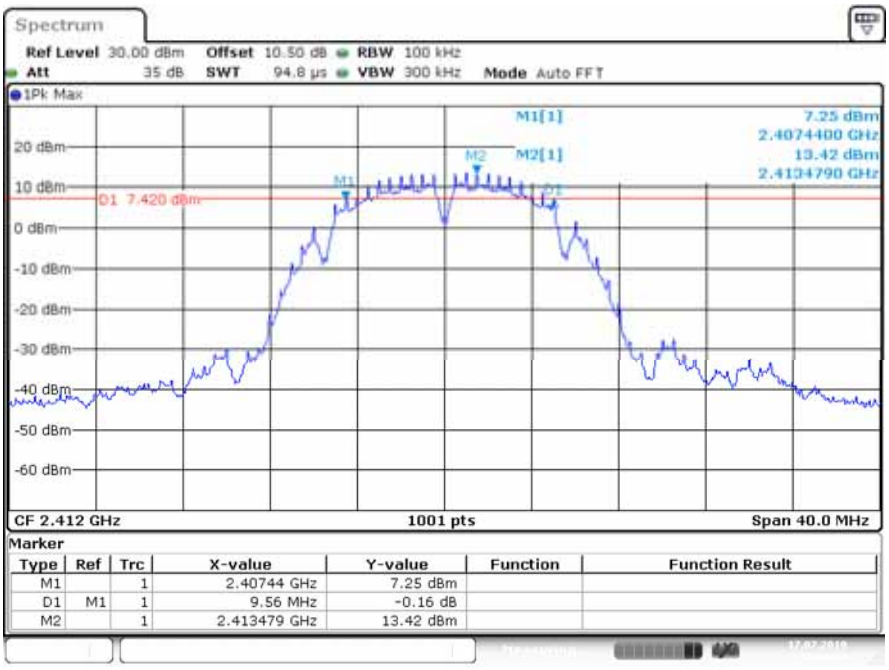
9.4 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)			Limit (kHz)	Result
		Chain 0	Chain 1	Chain 2		
B Mode						
Low	2412	9.56	9.52	9.08	> 500	PASS
Middle	2437	9.08	9.52	9.08	> 500	PASS
High	2462	9.08	9.08	9.56	> 500	PASS
G Mode						
Low	2412	16.36	16.36	16.4	> 500	PASS
Middle	2437	16.36	15.76	16.36	> 500	PASS
High	2462	16.36	16.32	16.4	> 500	PASS
N20 Mode						
Low	2412	17.6	17.6	17.6	> 500	PASS
Middle	2437	17.6	17.6	17.56	> 500	PASS
High	2462	17.64	17.56	17.6	> 500	PASS
N40 Mode						
Low	2422	35.92	35.12	36.32	> 500	PASS
Middle	2437	36.4	36.4	36.4	> 500	PASS
High	2452	36.32	36.32	36.32	> 500	PASS

Please refer to the following plots

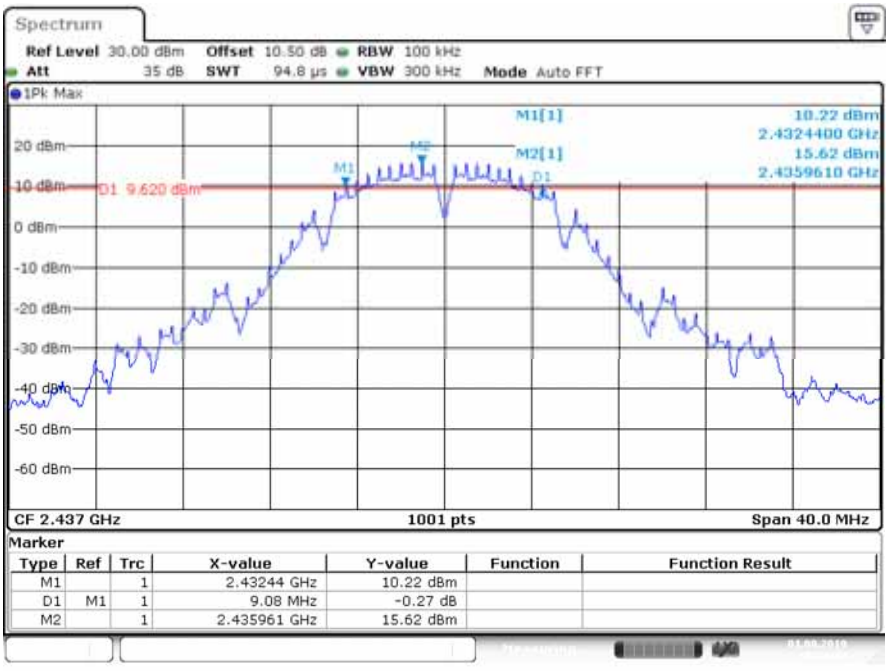
B Mode (Chain 0)

Low Channel



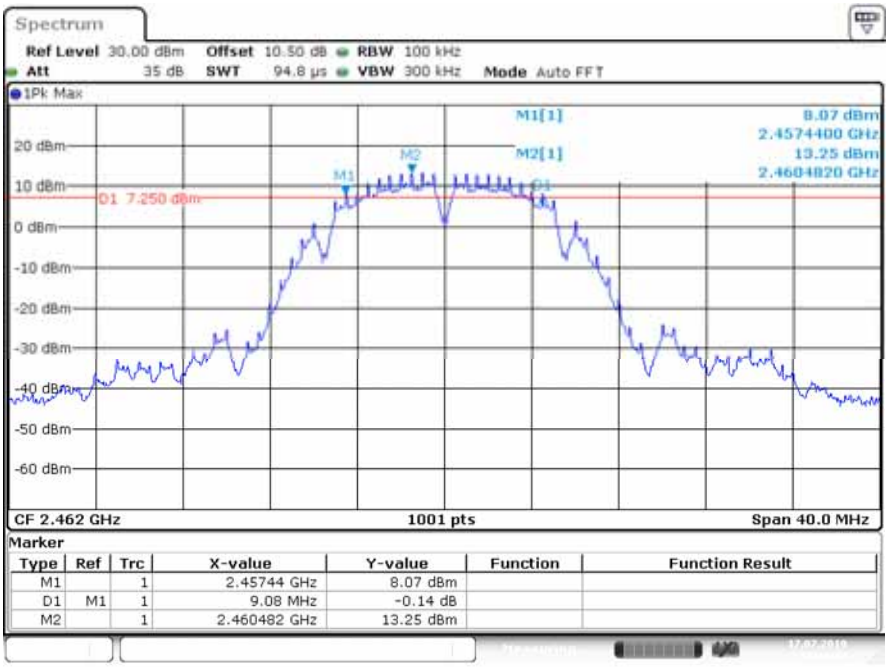
Date: 17.JUL.2019 10:16:10

Middle Channel



Date: 1.AUG.2019 15:47:24

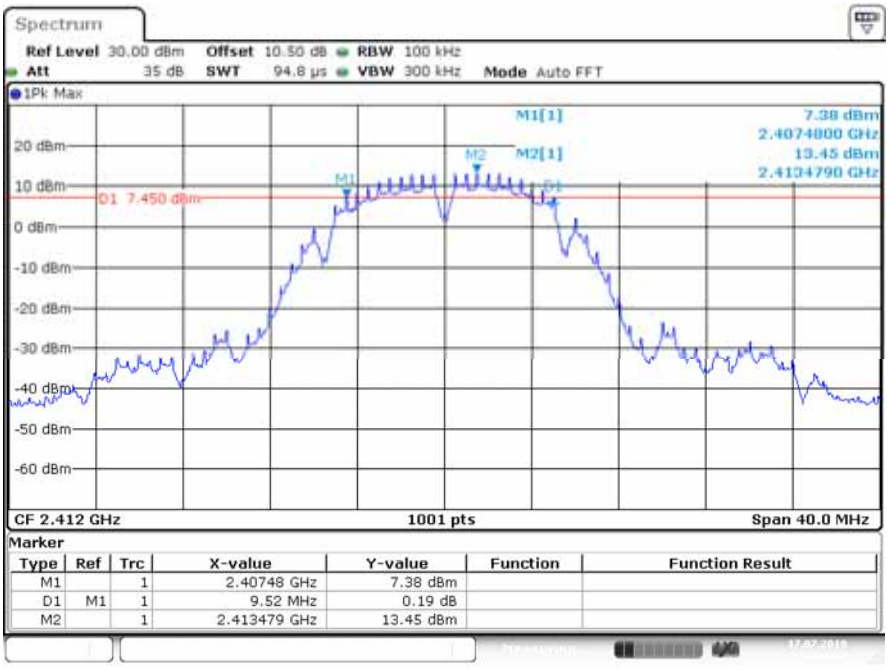
High Channel



Date: 17.JUL.2019 10:29:14

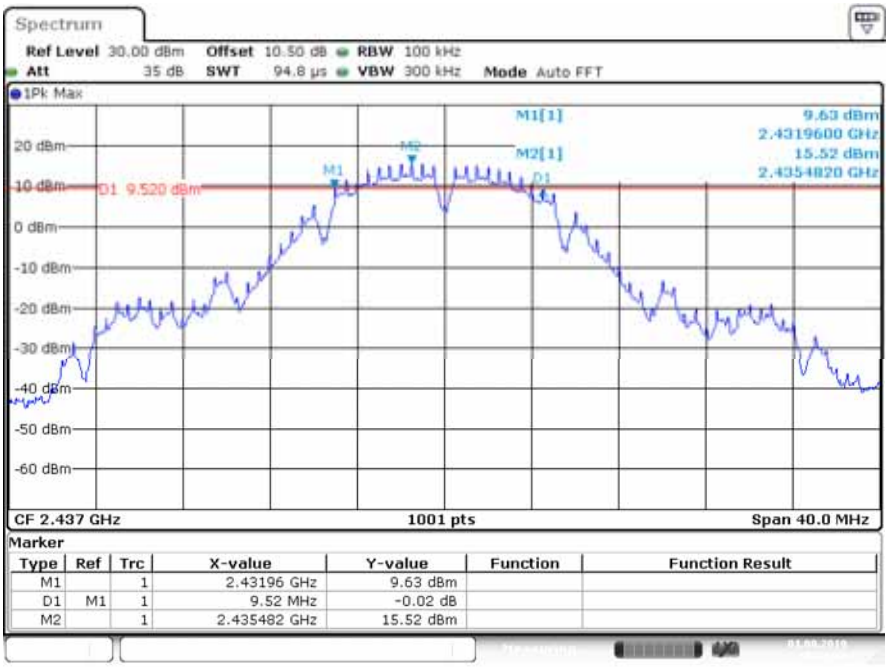
B Mode (Chain 1)

Low Channel



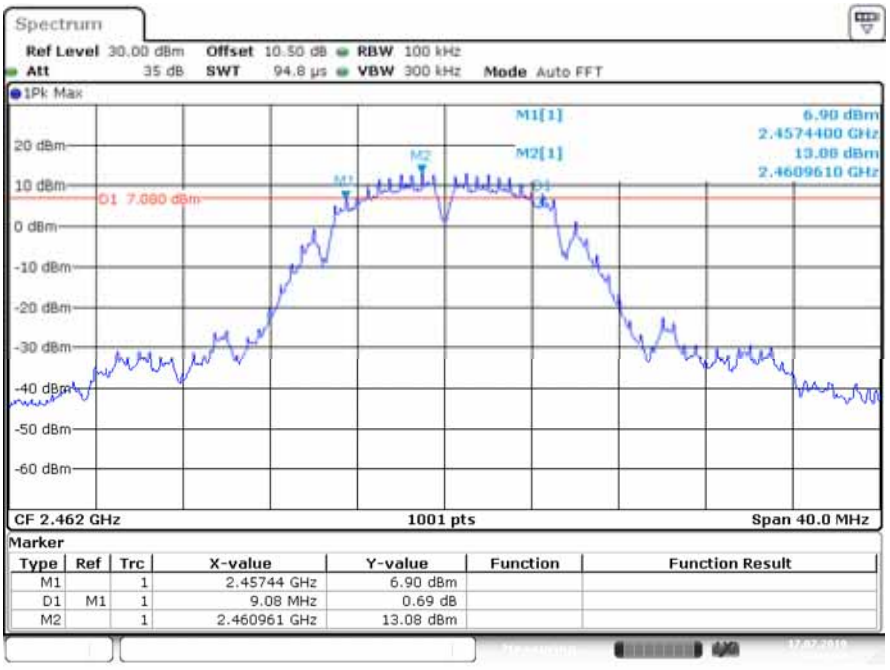
Date: 17.JUL.2019 16:29:17

Middle Channel



Date: 1.AUG.2019 15:45:27

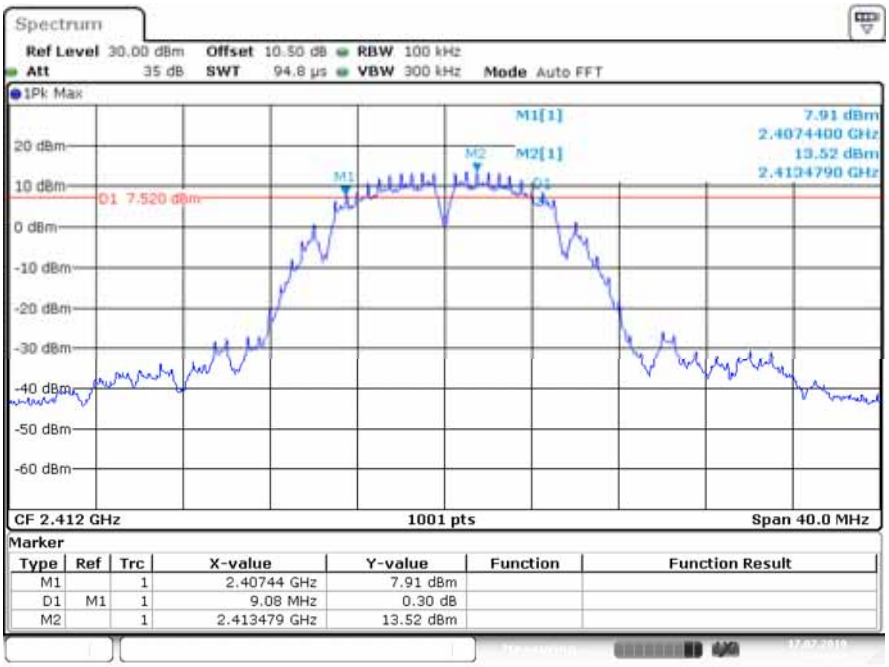
High Channel



Date: 17.JUL.2019 16:22:31

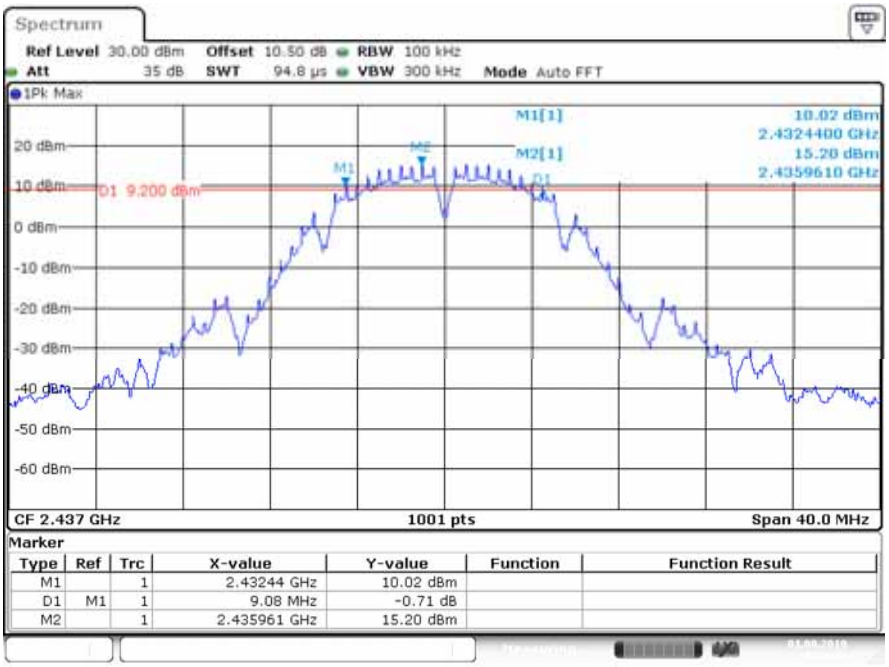
B Mode (Chain 2)

Low Channel



Date: 17.JUL.2019 16:32:52

Middle Channel



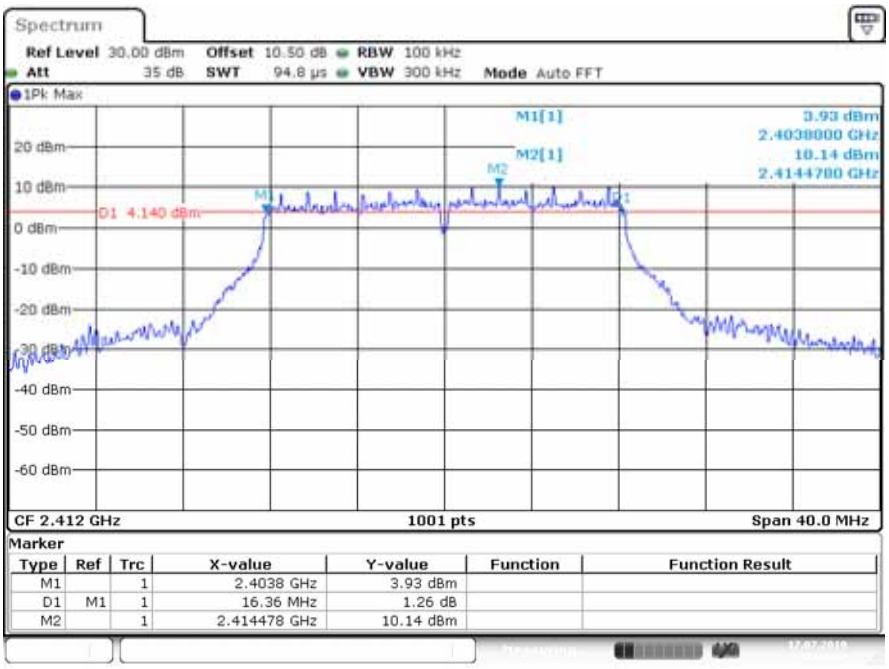
Date: 1.AUG.2019 15:39:46

High Channel

Date: 17.JUL.2019 16:39:09

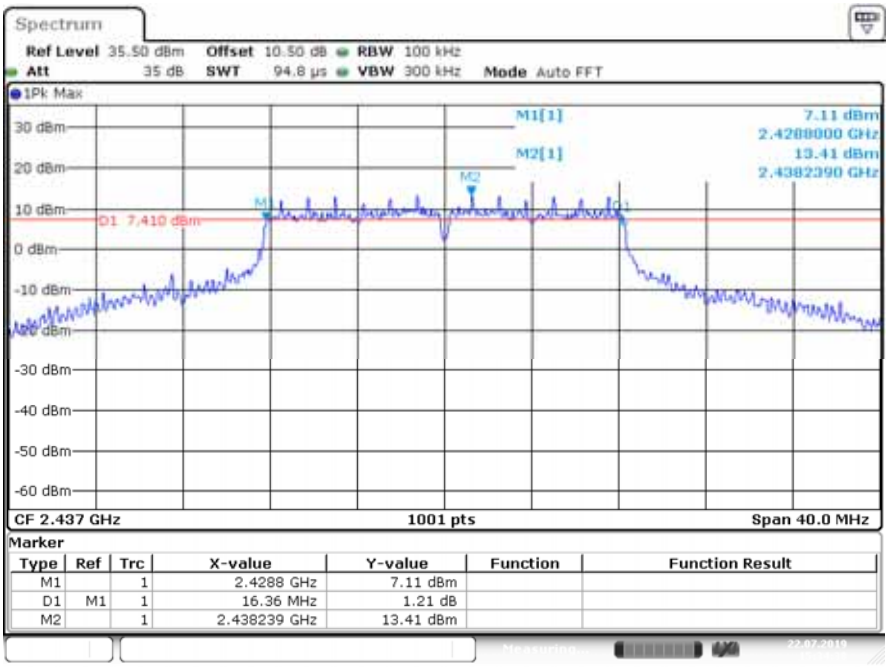
G Mode (Chain 0)

Low Channel



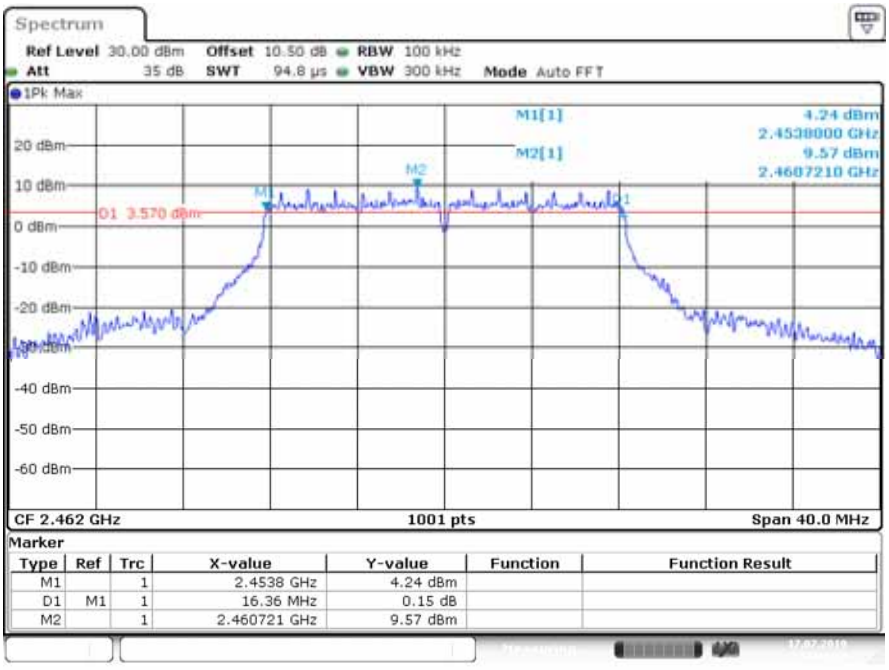
Date: 17.JUL.2019 15:21:31

Middle Channel



Date: 22.JUL.2019 15:34:38

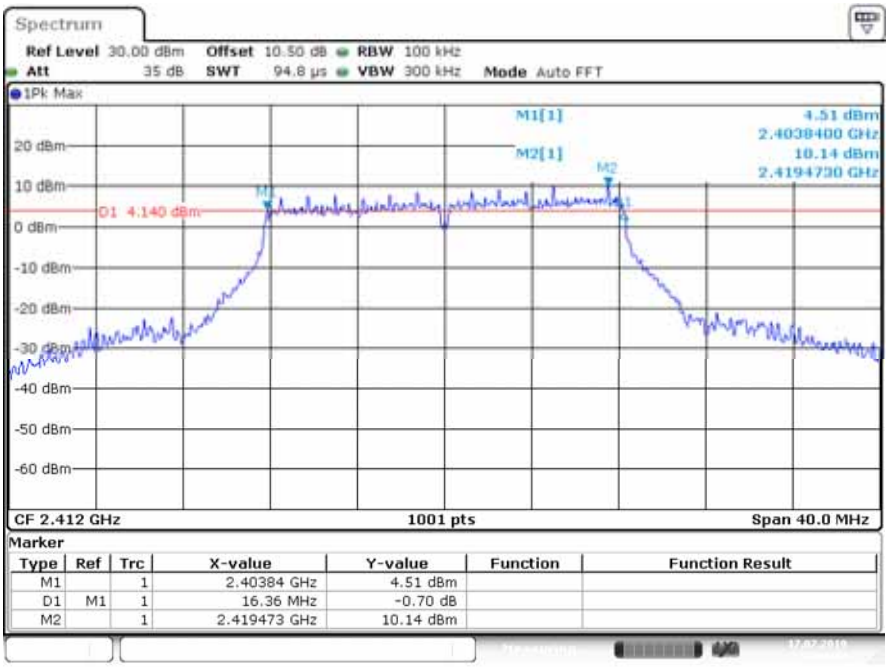
High Channel



Date: 17.JUL.2019 11:22:35

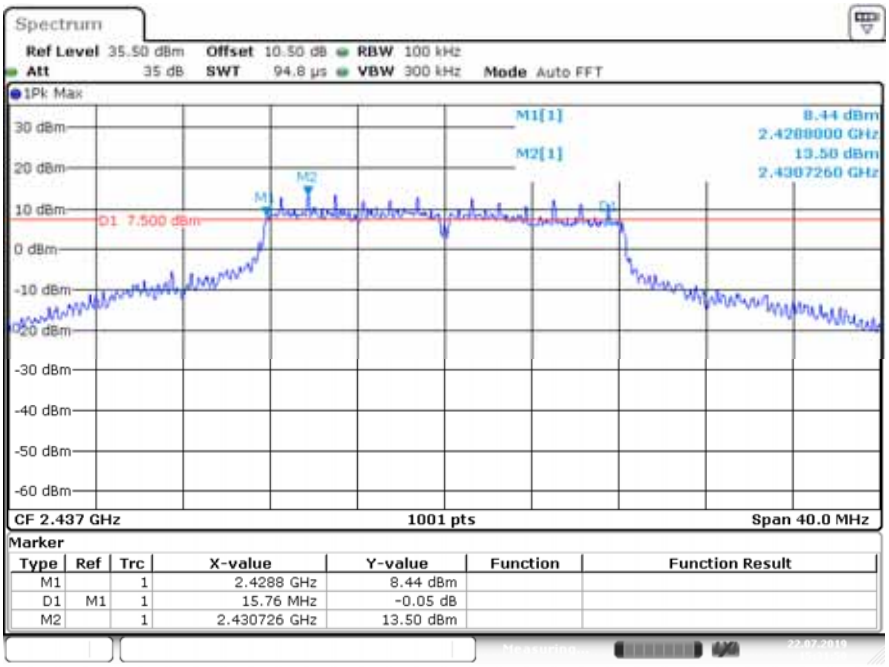
G Mode (Chain 1)

Low Channel



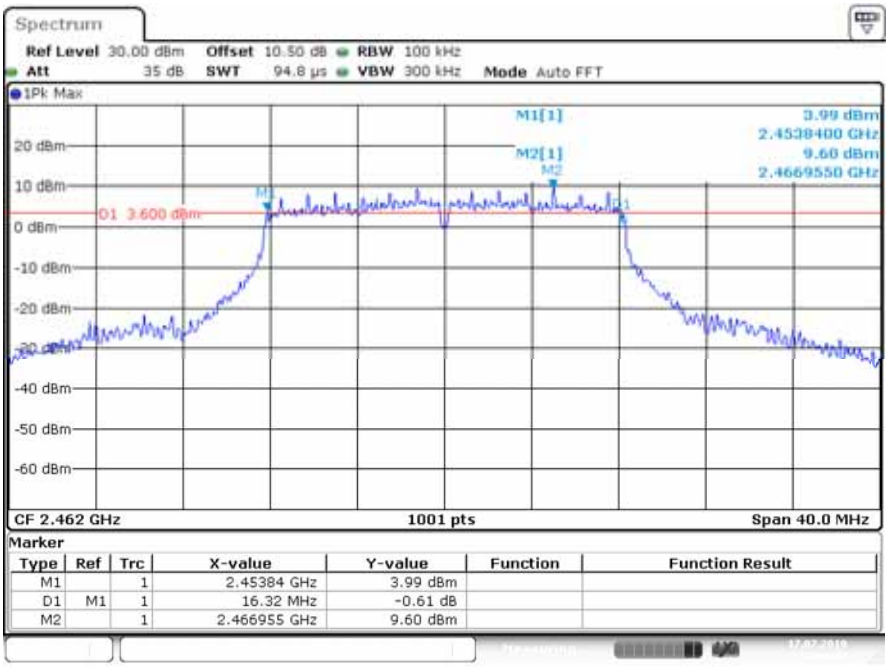
Date: 17.JUL.2019 16:14:40

Middle Channel



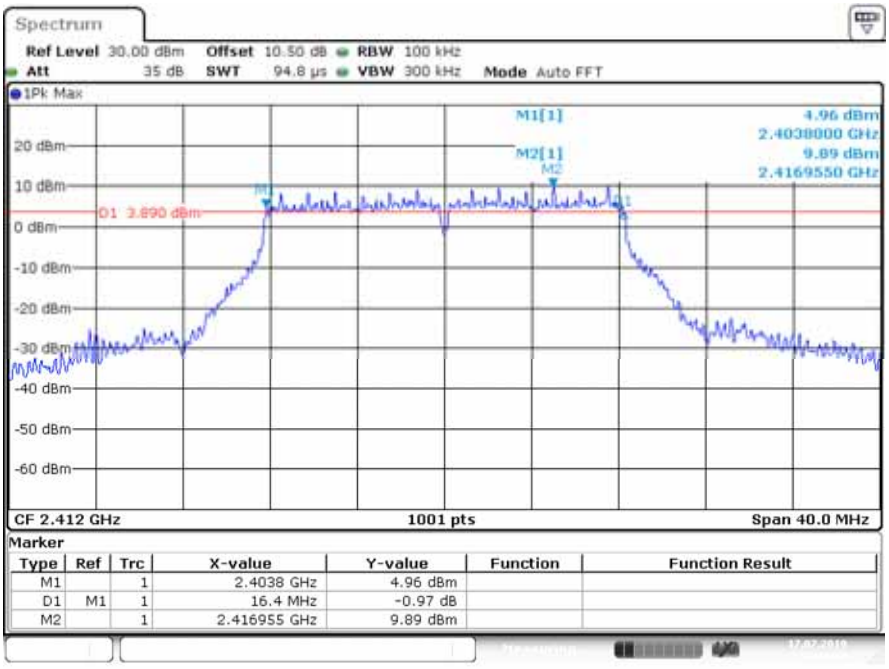
Date: 22.JUL.2019 15:31:51

High Channel

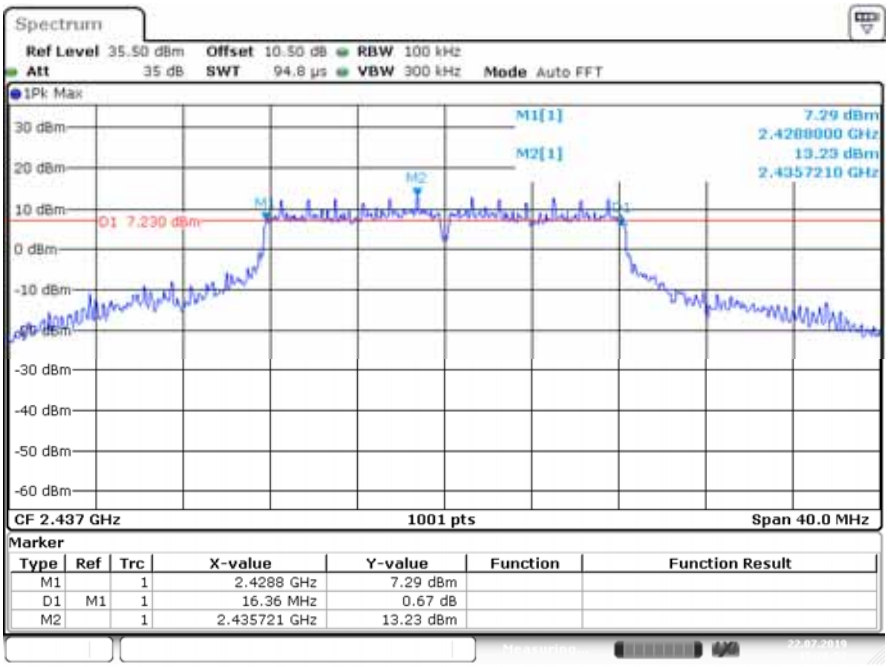


G Mode (Chain 2)

Low Channel

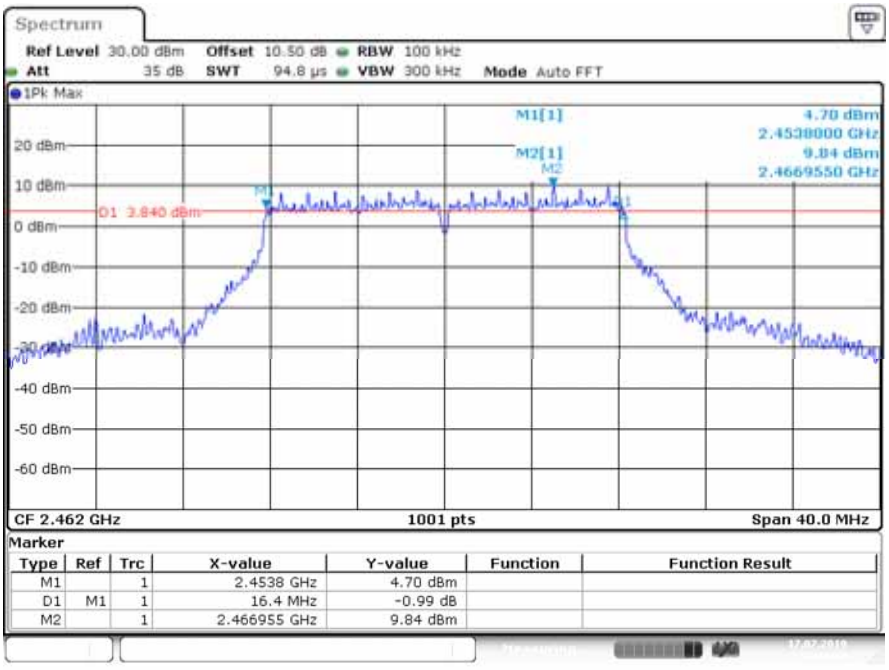


Middle Channel



Date: 22.JUL.2019 15:26:52

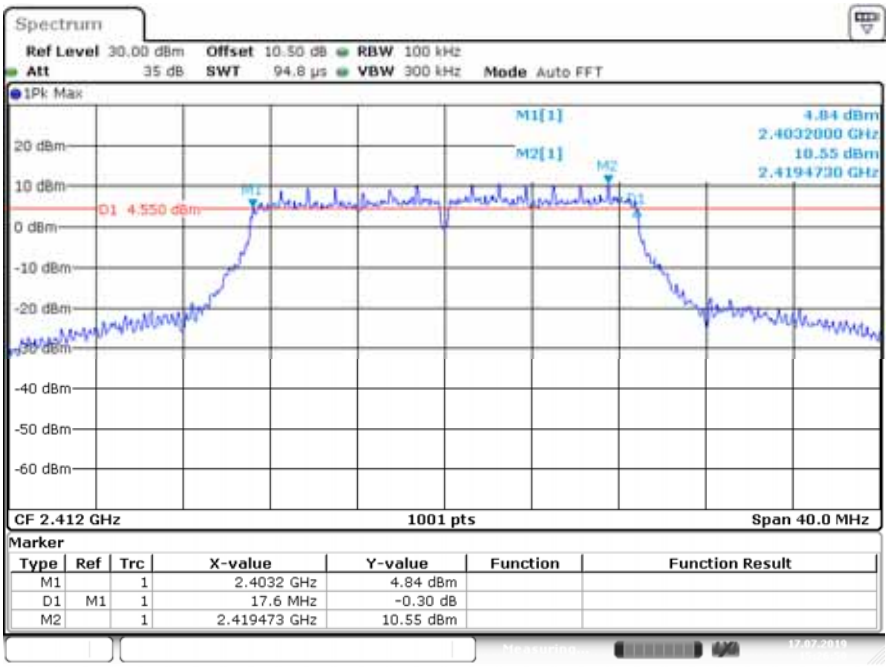
High Channel



Date: 17.JUL.2019 16:41:19

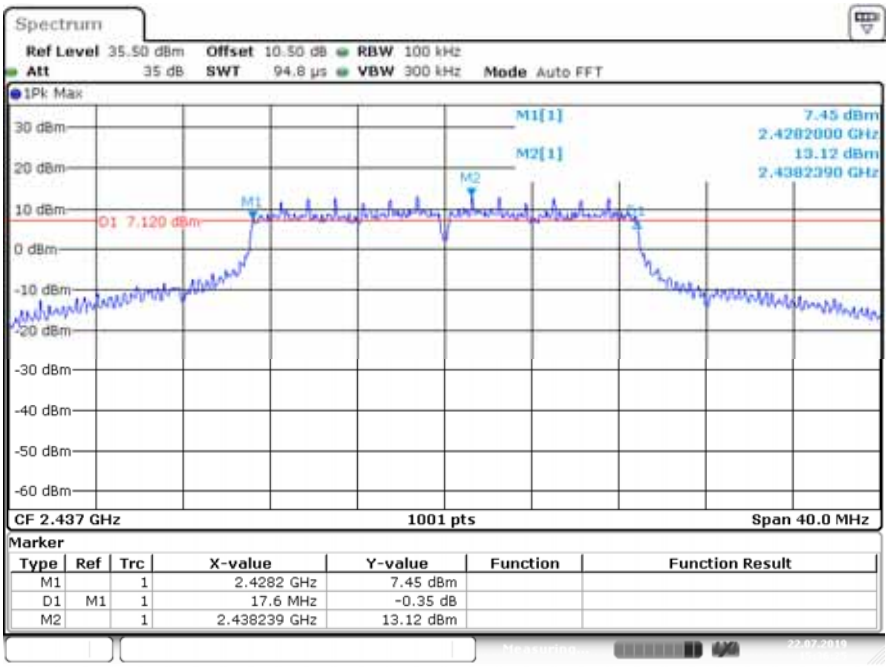
N20 Mode (Chain 0)

Low Channel



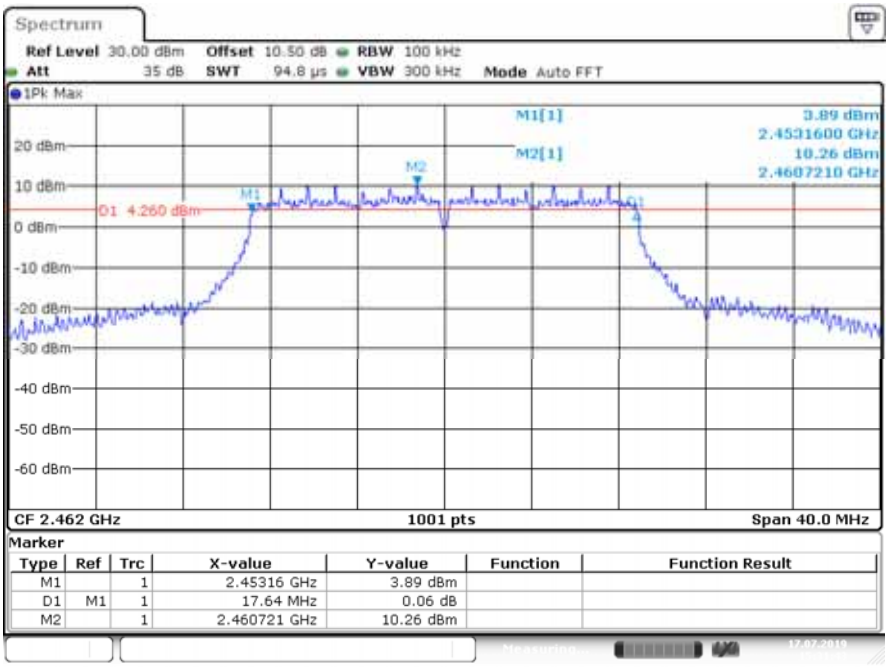
Date: 17.JUL.2019 15:26:51

Middle Channel



Date: 22.JUL.2019 15:36:26

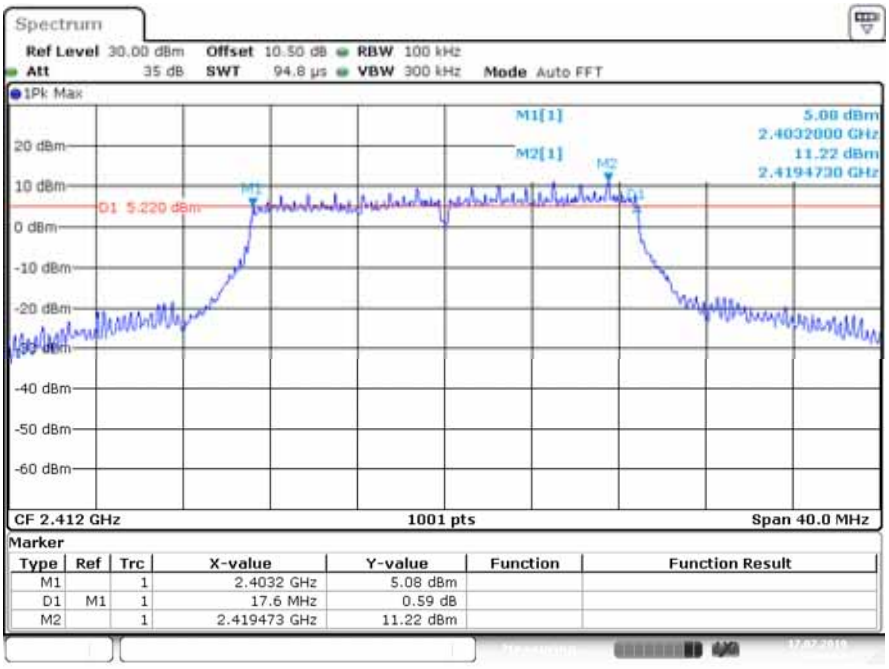
High Channel



Date: 17.JUL.2019 15:31:44

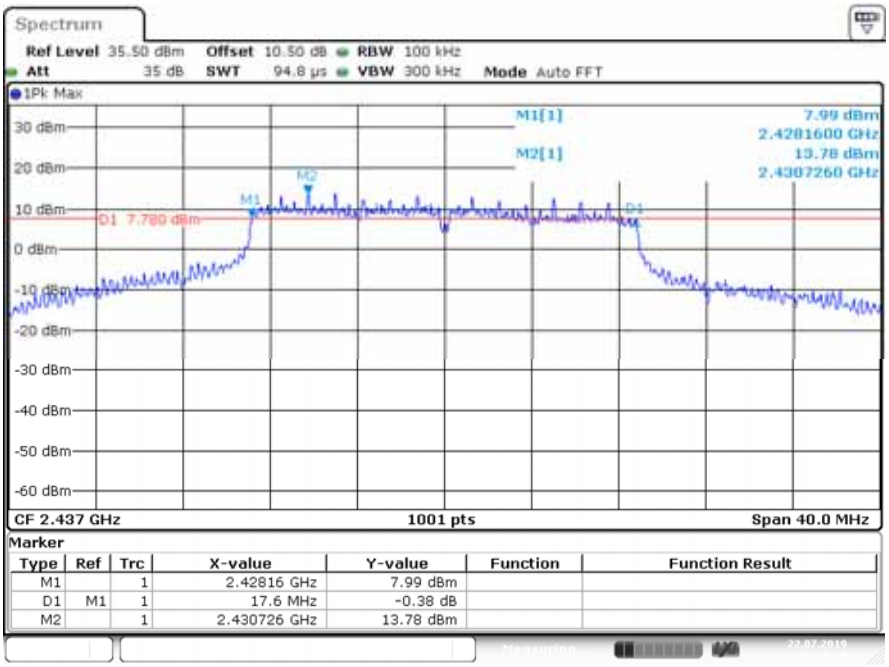
N20 Mode (Chain 1)

Low Channel



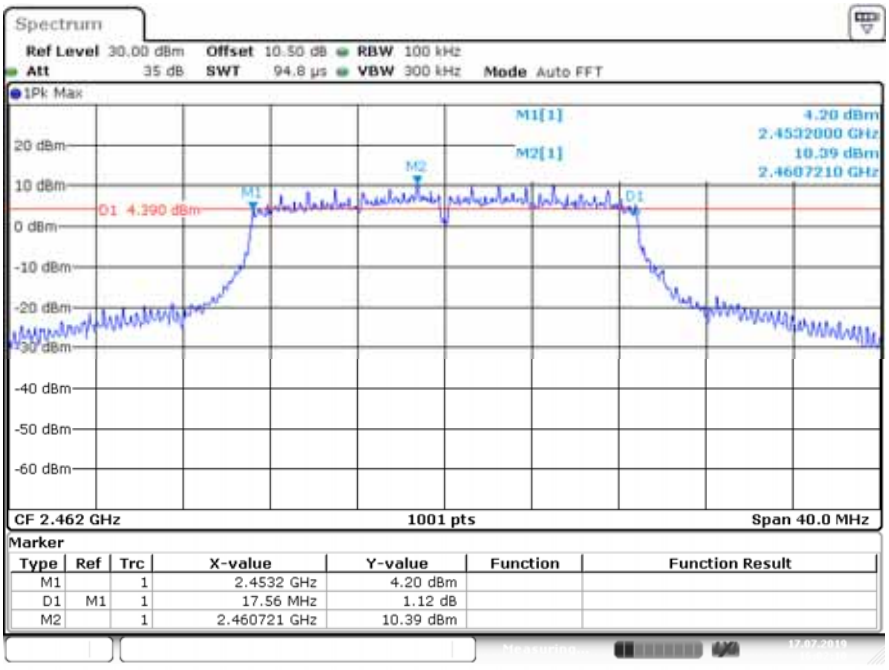
Date: 17.JUL.2019 16:07:57

Middle Channel



Date: 22.JUL.2019 15:30:19

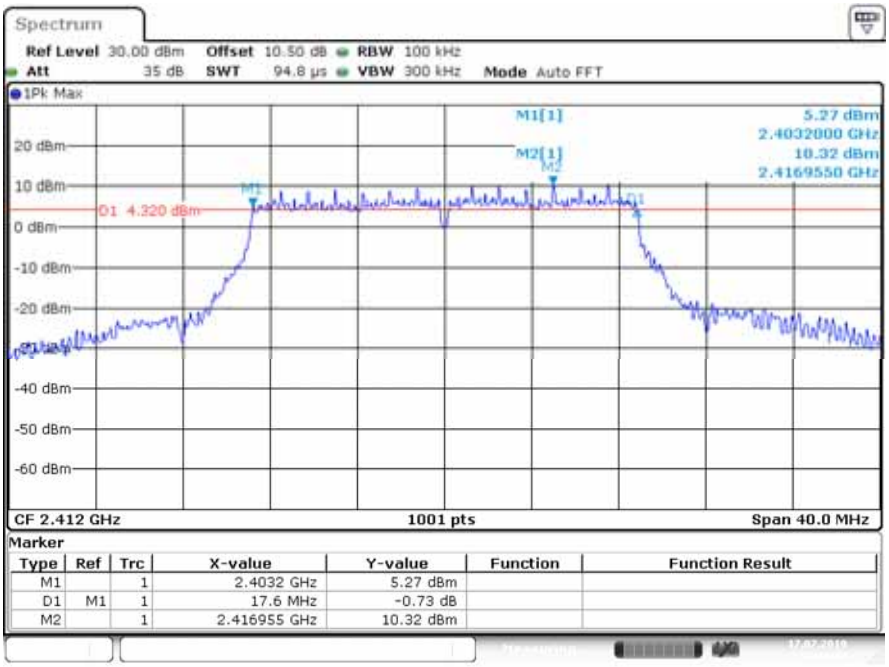
High Channel



Date: 17.JUL.2019 16:02:10

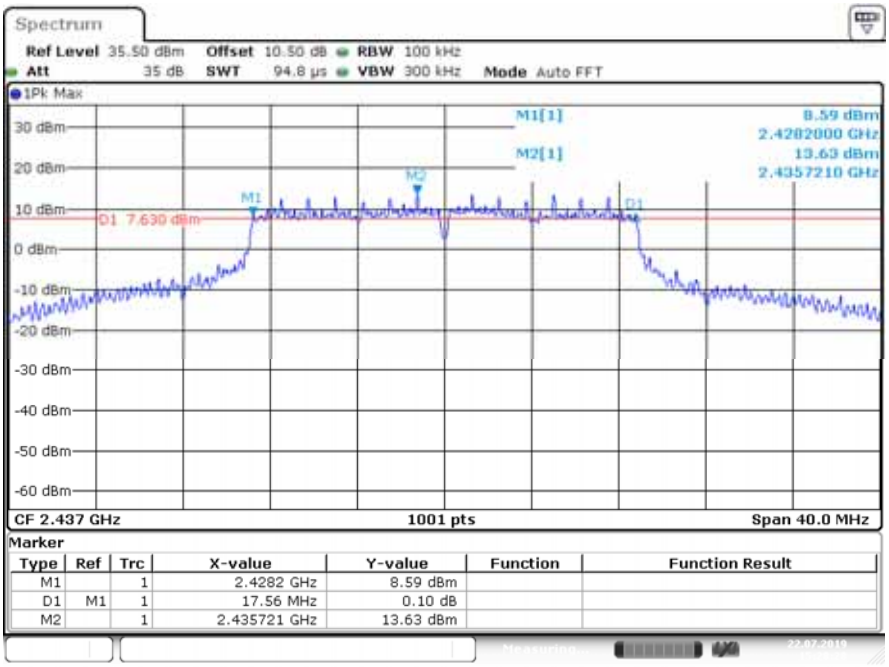
N20 Mode (Chain 2)

Low Channel



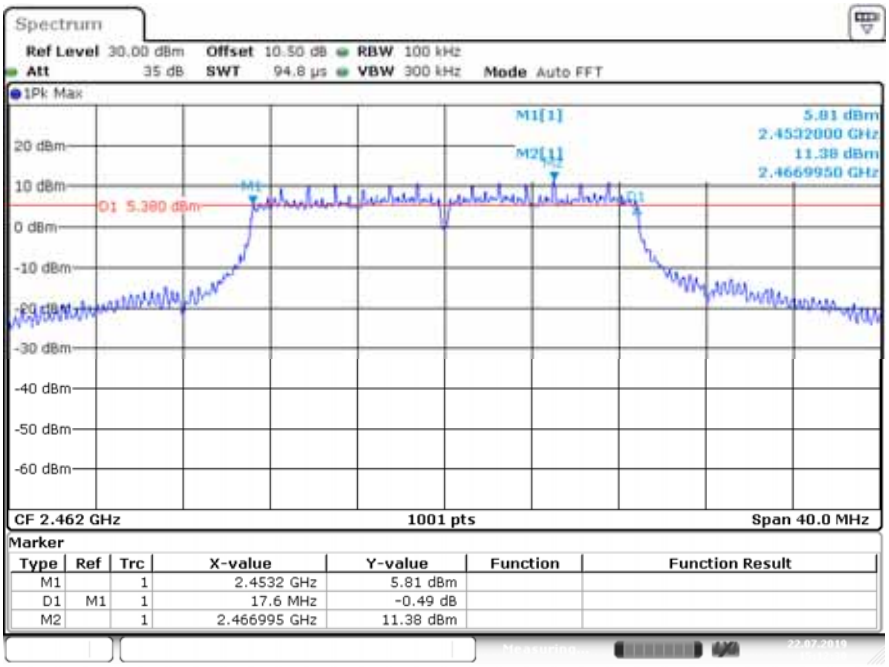
Date: 17.JUL.2019 16:49:44

Middle Channel



Date: 22.JUL.2019 15:28:28

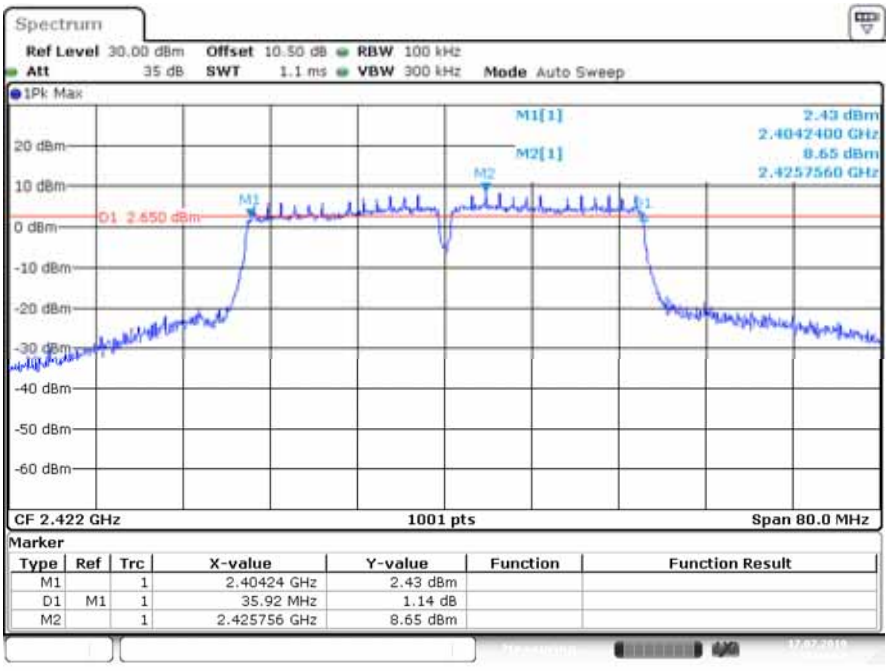
High Channel



Date: 22.JUL.2019 15:12:31

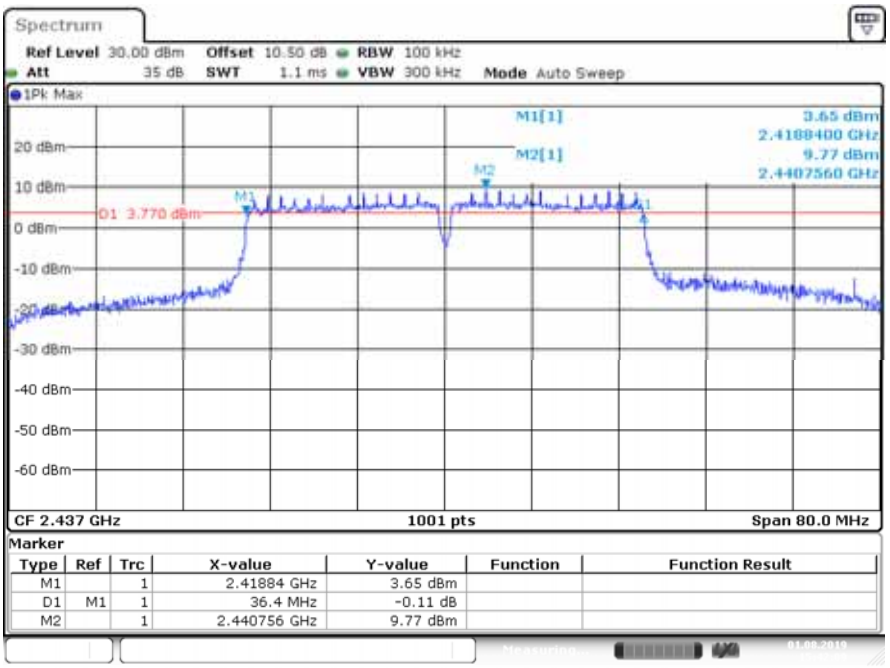
N40 Mode (Chain 0)

Low Channel



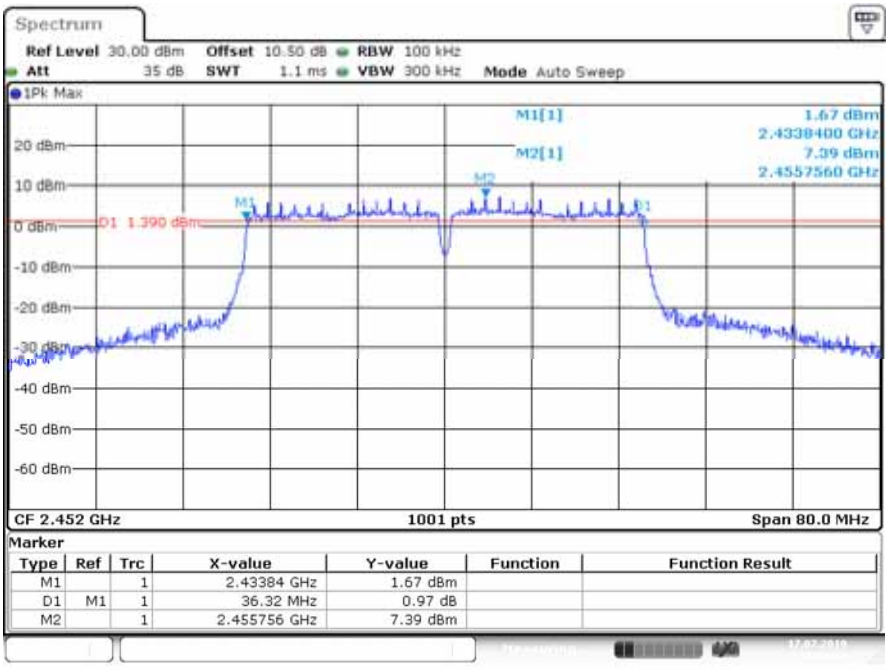
Date: 17.JUL.2019 15:38:51

Middle Channel



Date: 1.AUG.2019 15:42:09

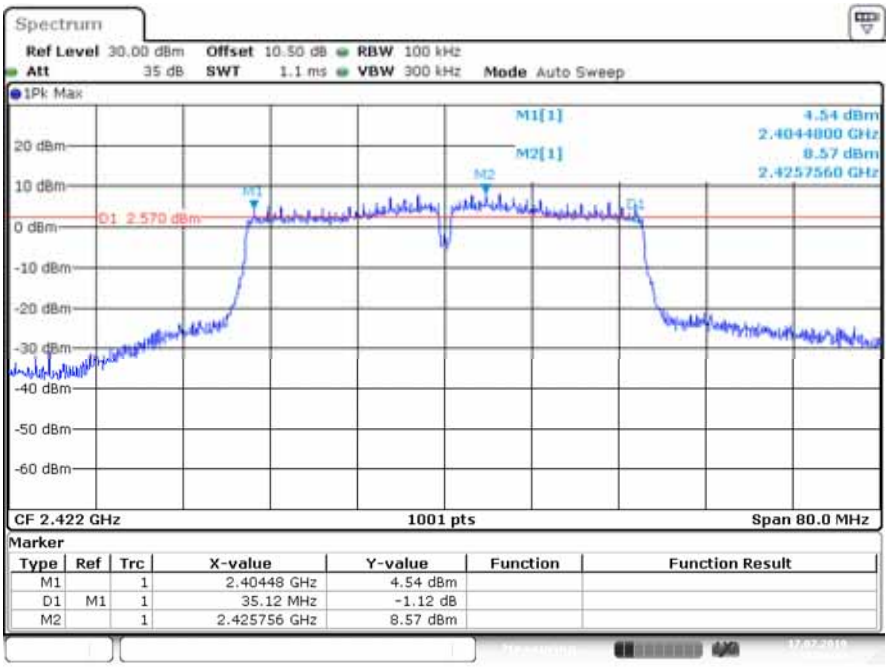
High Channel



Date: 17.JUL.2019 15:51:38

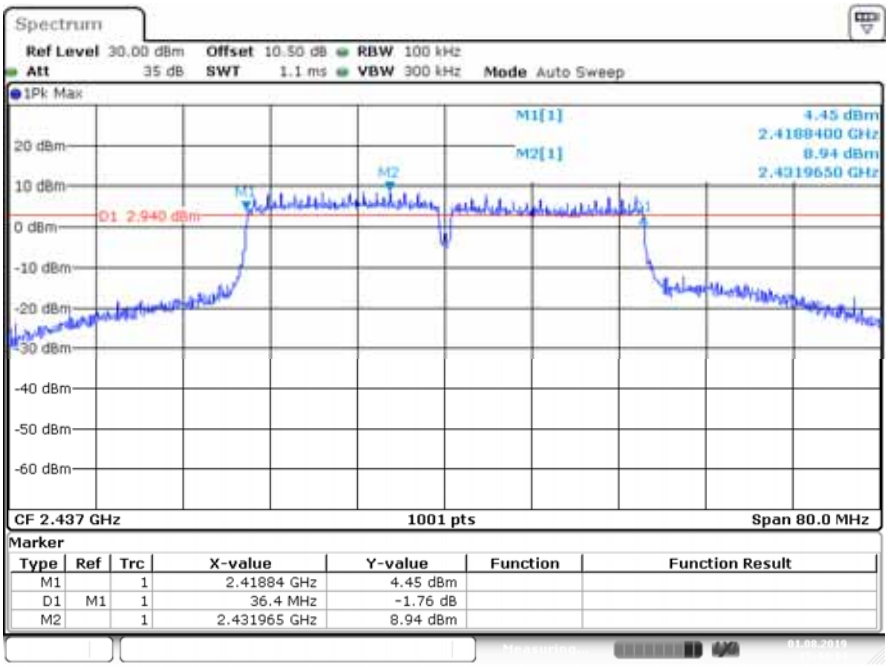
N40 Mode (Chain 1)

Low Channel



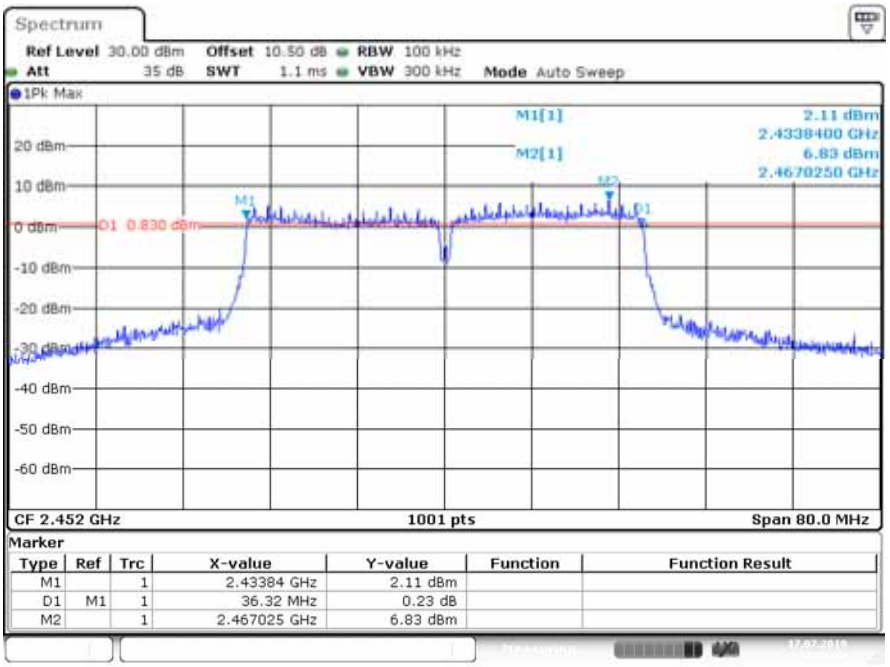
Date: 17.JUL.2019 15:59:33

Middle Channel



Date: 1.AUG.2019 15:44:15

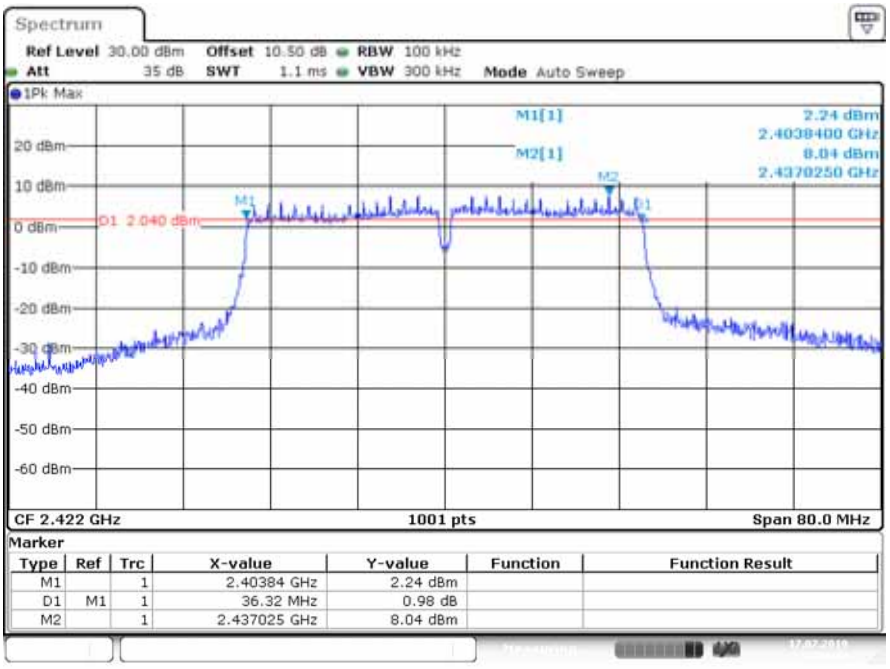
High Channel



Date: 17.JUL.2019 15:54:43

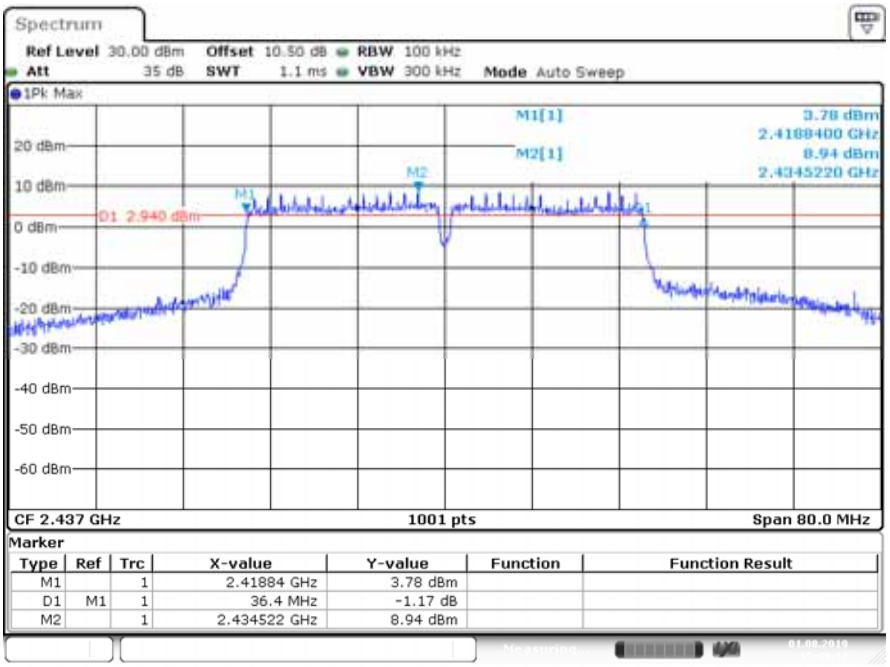
N40 Mode (Chain 2)

Low Channel



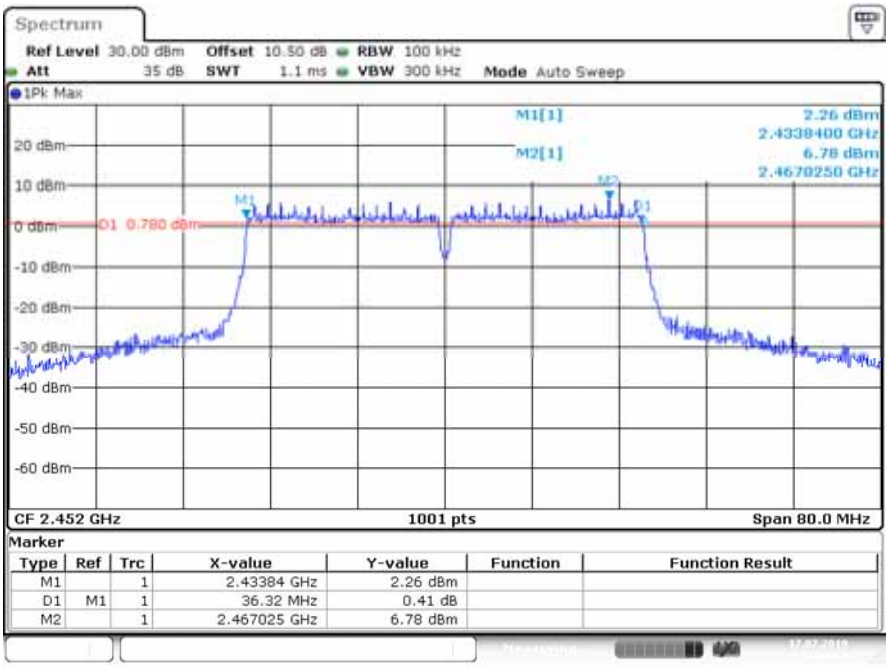
Date: 17.JUL.2019 16:56:49

Middle Channel



Date: 1.AUG.2019 15:49:13

High Channel



Date: 17.JUL.2019 17:06:58

10 FCC §15.247(b)(3) – Maximum Output Power

10.1 Applicable Standard

According to FCC §15.247(b) (3).

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

10.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

10.3 Environmental Conditions

Temperature:	25.1 ℃
Relative Humidity:	45 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-07-19.

10.4 Test Results

Conducted Average Output Power

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Power Chain 2 (dBm)	Total Power (dBm)	Duty Factor (dB)	Total Power With Duty Factor (dBm)	Total Power (W)	Limit (W)	Result
	B Mode									
Low	2412	22.51	21.72	21.89	26.82	0.04	26.86	0.485	1	PASS
Middle	2437	25.04	24.22	24.42	29.35	0.04	29.39	0.869	1	PASS
High	2462	22.37	21.78	22.01	26.83	0.04	26.87	0.486	1	PASS
	G Mode									
Low	2412	19.24	18.78	18.91	23.75	0.97	24.72	0.296	1	PASS
Middle	2437	23.87	23.18	23.27	28.22	0.97	29.19	0.830	1	PASS
High	2462	18.27	17.54	17.61	22.59	0.97	23.56	0.227	1	PASS
	N20 Mode									
Low	2412	21.69	21.1	21	26.05	0.27	26.32	0.429	1	PASS
Middle	2437	25.04	24.29	24.36	29.35	0.27	29.62	0.916	1	PASS
High	2462	19.74	18.7	18.85	23.89	0.27	24.16	0.261	1	PASS
	N40 Mode									
Low	2422	20.55	19.73	19.87	24.84	0.56	25.40	0.347	1	PASS
Middle	2437	22.69	21.82	21.85	26.91	0.56	27.47	0.558	1	PASS
High	2452	18.64	17.51	17.54	22.7	0.56	23.26	0.212	1	PASS

According to FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For power measurements on IEEE 802.11 devices, Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4.

The device have four antenna, so array gain is 0 dB.

11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

11.1 Applicable Standard

According to FCC §15.247(d).

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

11.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.3 Environmental Conditions

Temperature:	25.4 ℃
Relative Humidity:	47 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-07-17~2019-07-22

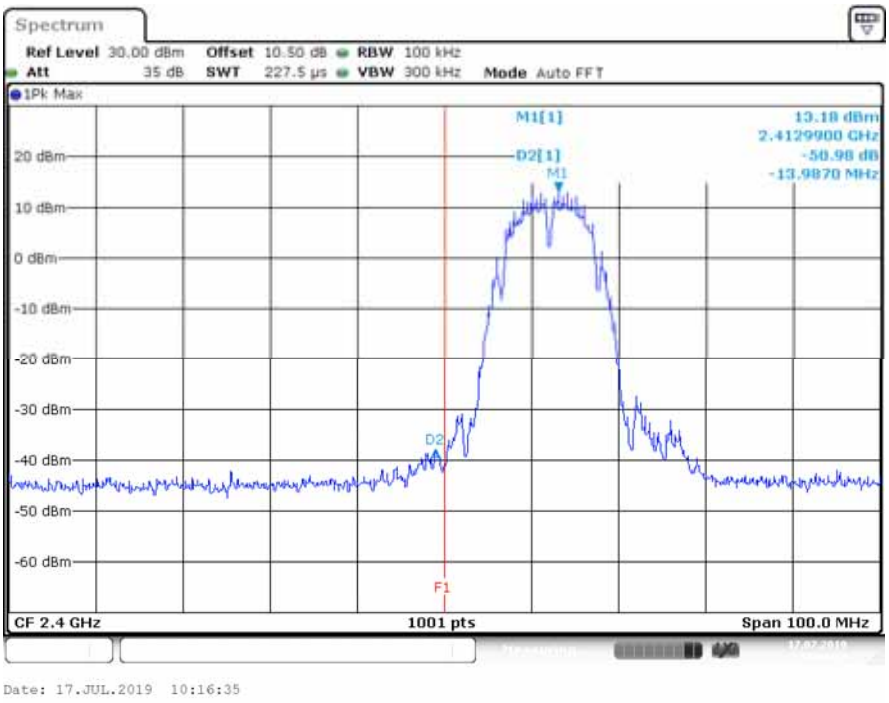
11.4 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)			Limit (dBc)	Result
		Chain 0	Chain 1	Chain 2		
B Mode						
Low	2412	50.98	43.79	48.33	≥ 30	PASS
High	2462	54.36	54.50	55.51	≥ 30	PASS
G Mode						
Low	2412	32.15	33.40	34.56	≥ 30	PASS
High	2462	41.79	43.64	41.69	≥ 30	PASS
N20 Mode						
Low	2412	31.43	30.41	33.64	≥ 30	PASS
High	2462	37.63	43.53	40.85	≥ 30	PASS
N40 Mode						
Low	2422	31.49	31.21	32.50	≥ 30	PASS
High	2452	34.36	32.85	37.92	≥ 30	PASS

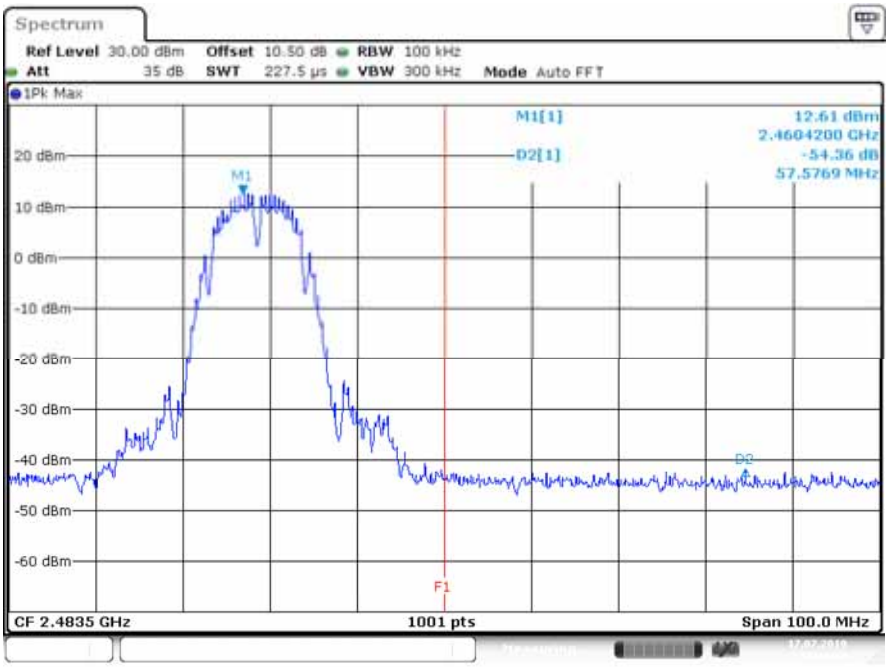
Please refer to the following plots.

B Mode (Chain 0)

Band Edge, Left Side

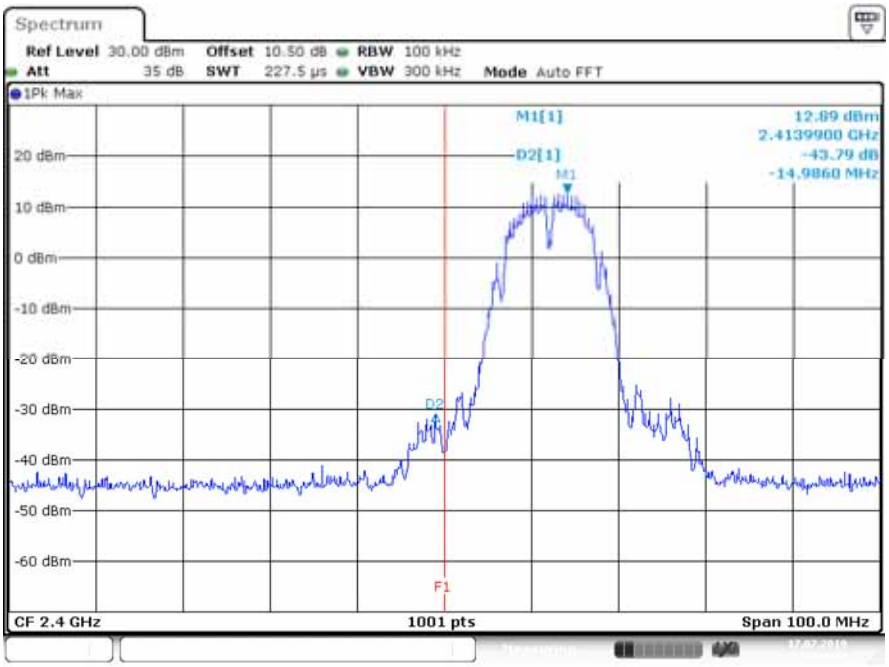


Band Edge, Right Side

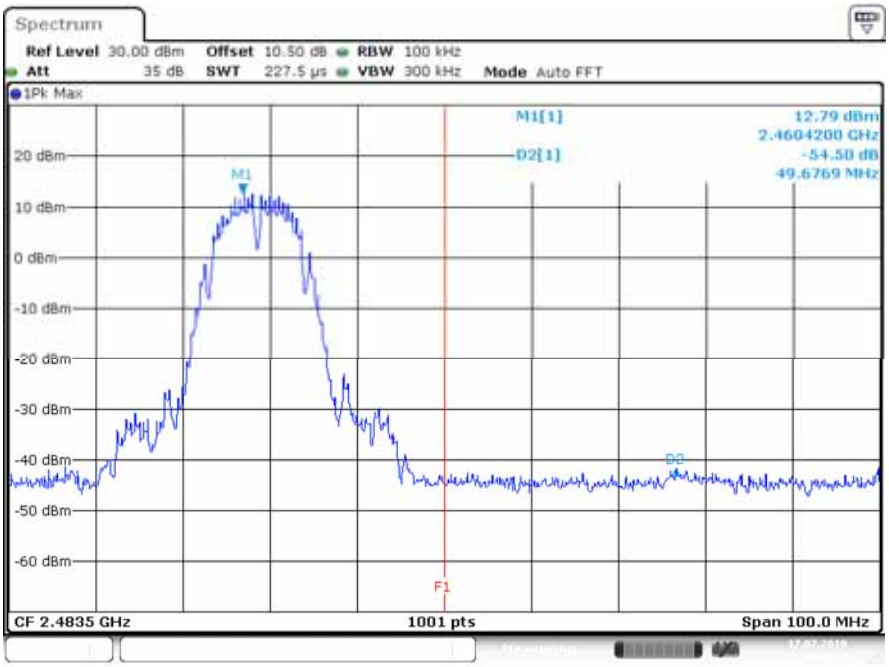


B Mode (Chain 1)

Band Edge, Left Side



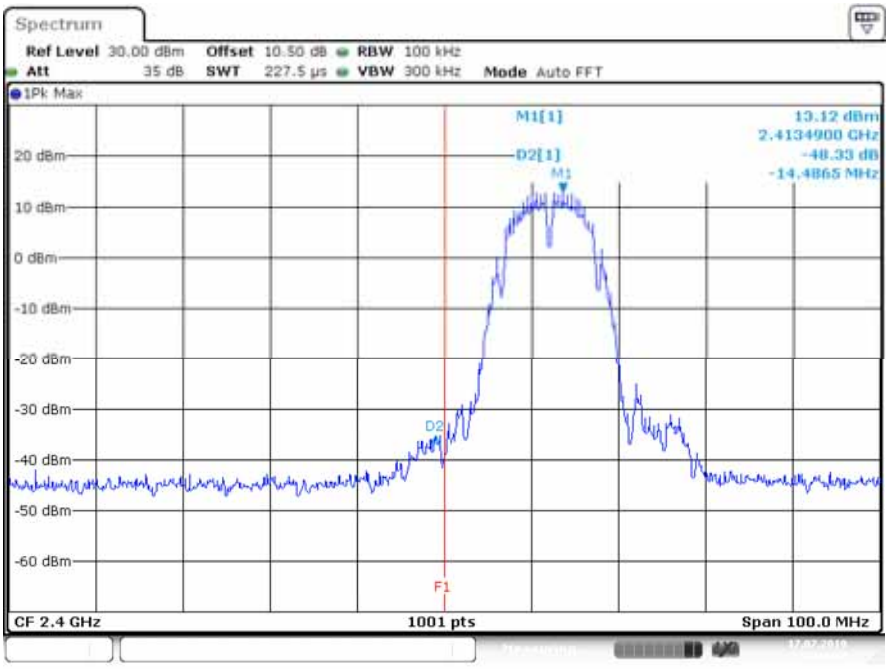
Band Edge, Right Side



Date: 17.JUL.2019 16:22:55

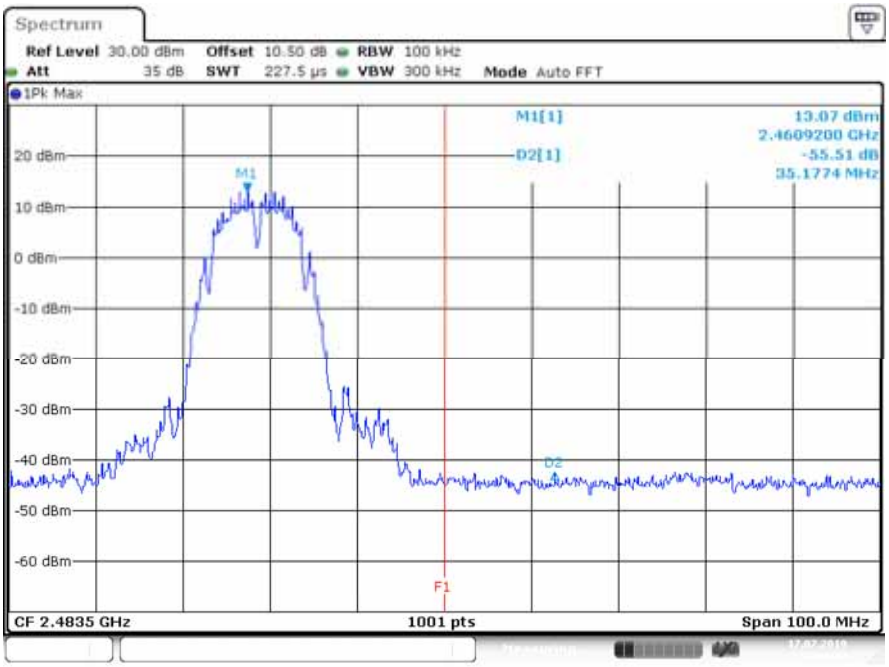
B Mode (Chain 2)

Band Edge, Left Side



Date: 17.JUL.2019 16:33:17

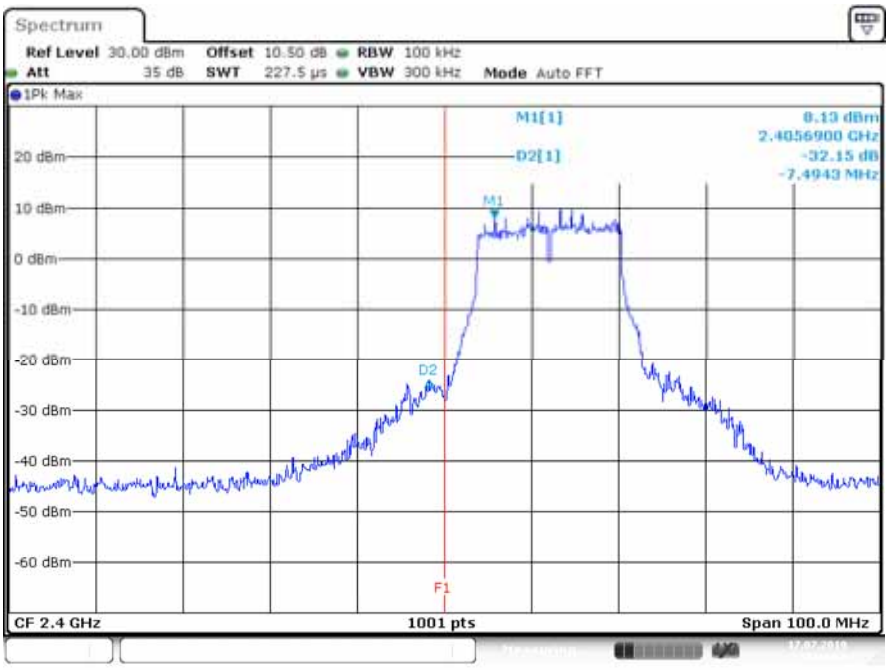
Band Edge, Right Side



Date: 17.JUL.2019 16:39:33

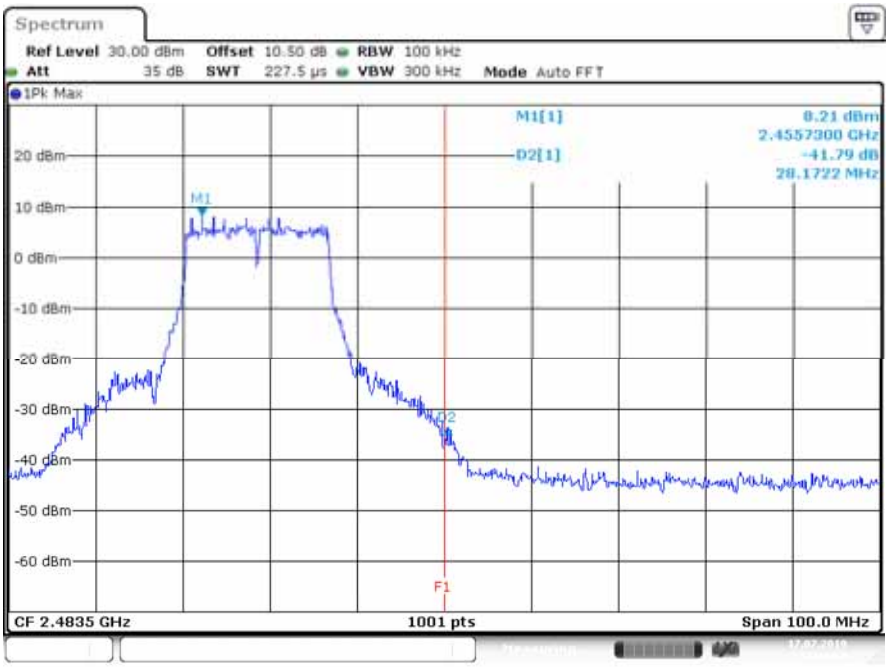
G Mode (Chain 0)

Band Edge, Left Side



Date: 17.JUL.2019 15:21:56

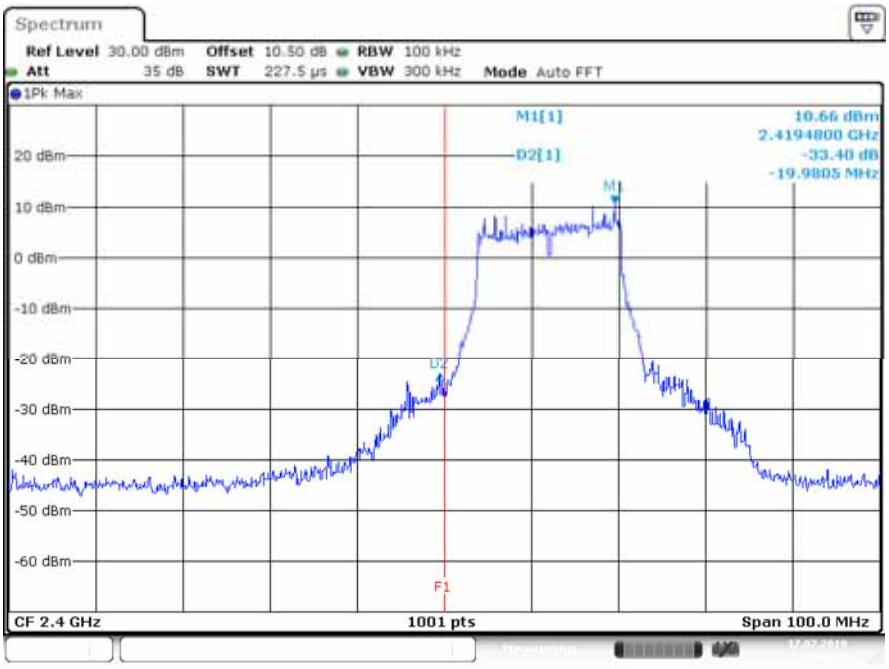
Band Edge, Right Side



Date: 17.JUL.2019 11:23:00

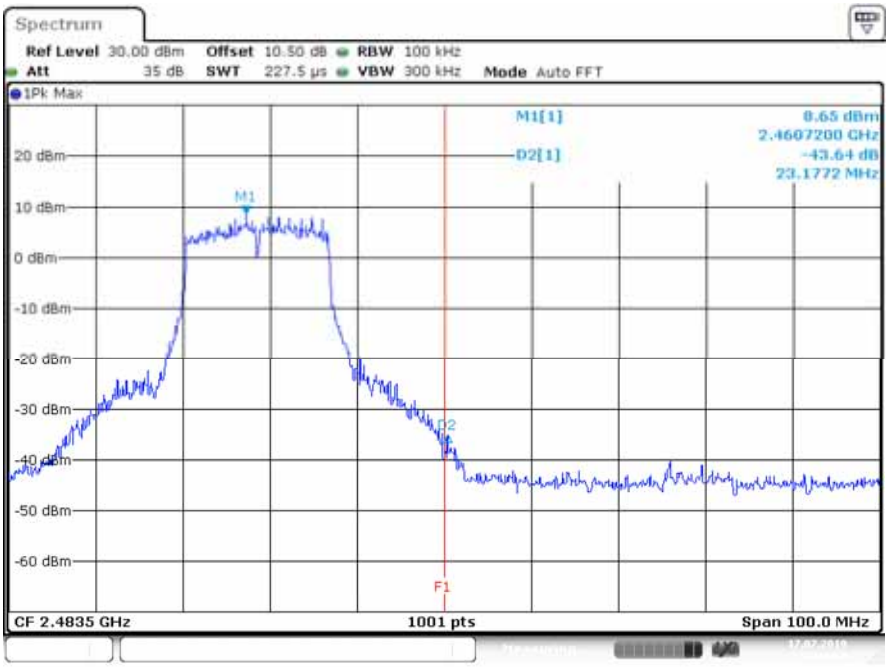
G Mode (Chain 1)

Band Edge, Left Side



Date: 17.JUL.2019 16:15:04

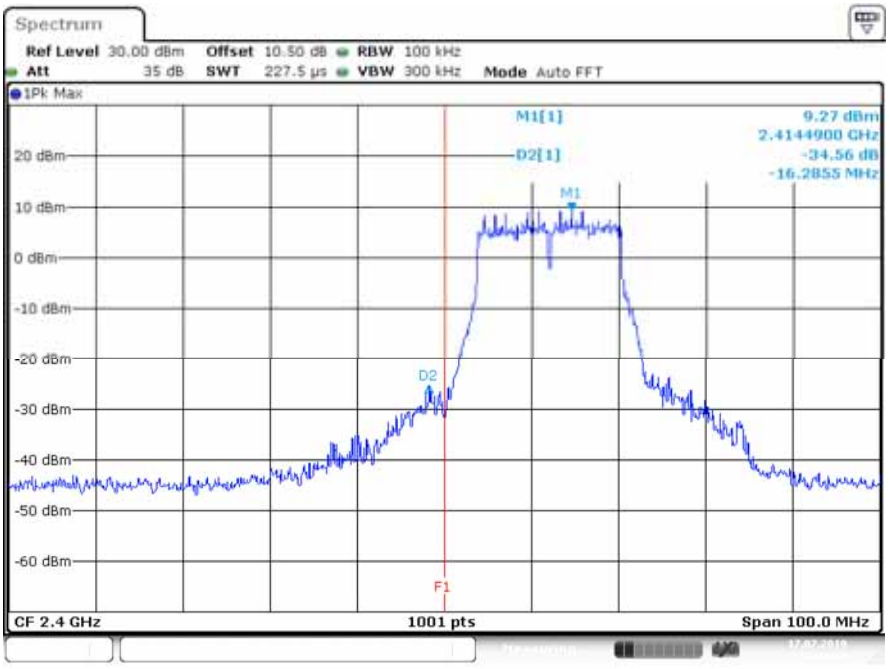
Band Edge, Right Side



Date: 17.JUL.2019 16:20:09

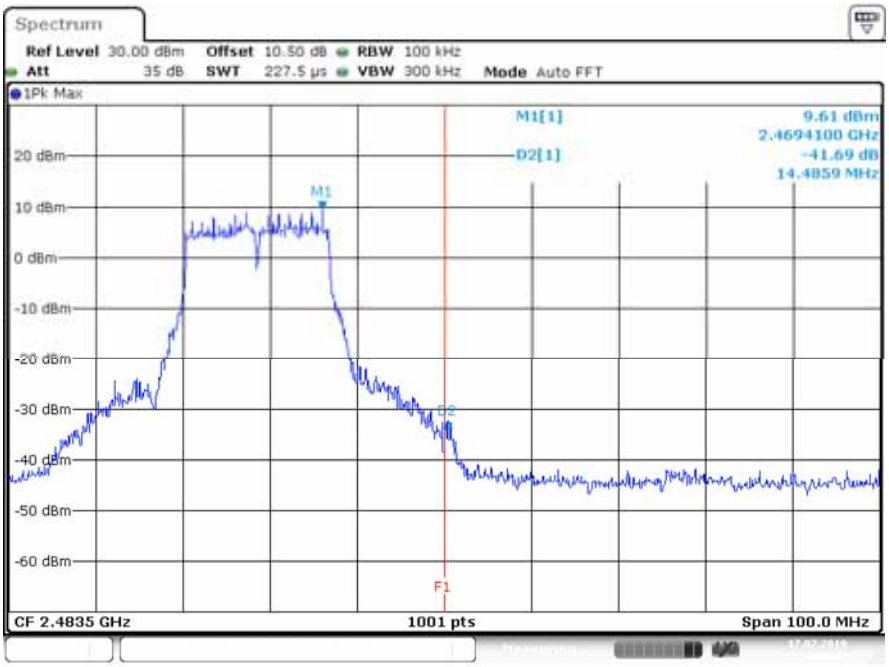
G Mode (Chain 2)

Band Edge, Left Side



Date: 17.JUL.2019 16:46:54

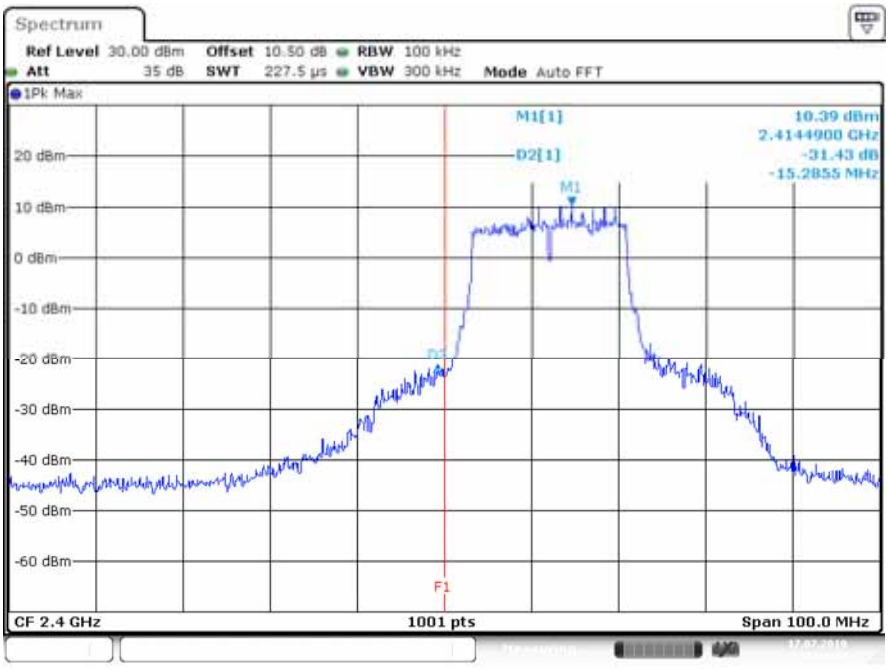
Band Edge, Right Side



Date: 17.JUL.2019 16:41:44

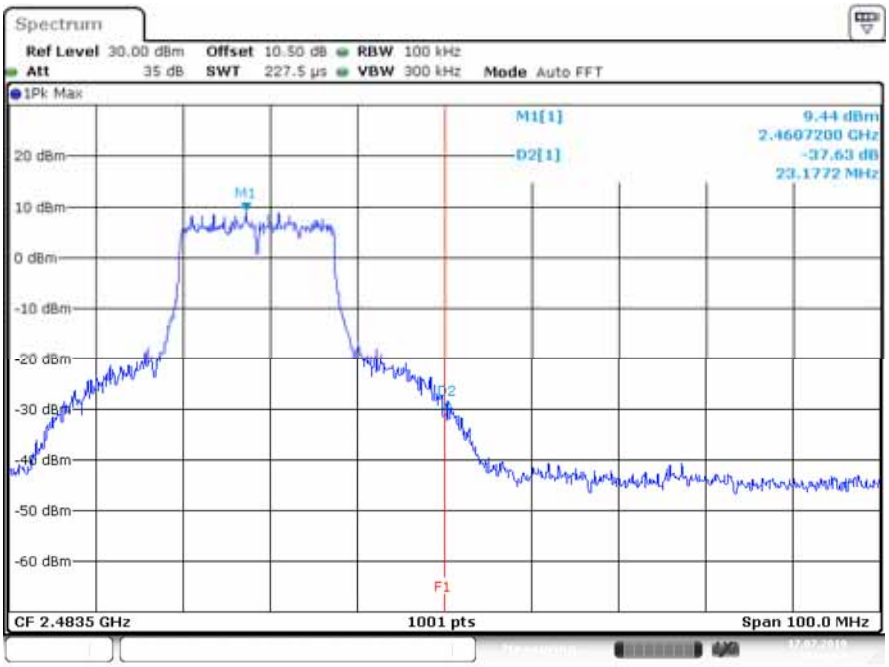
N20 Mode (Chain 0)

Band Edge, Left Side



Date: 17.JUL.2019 15:27:15

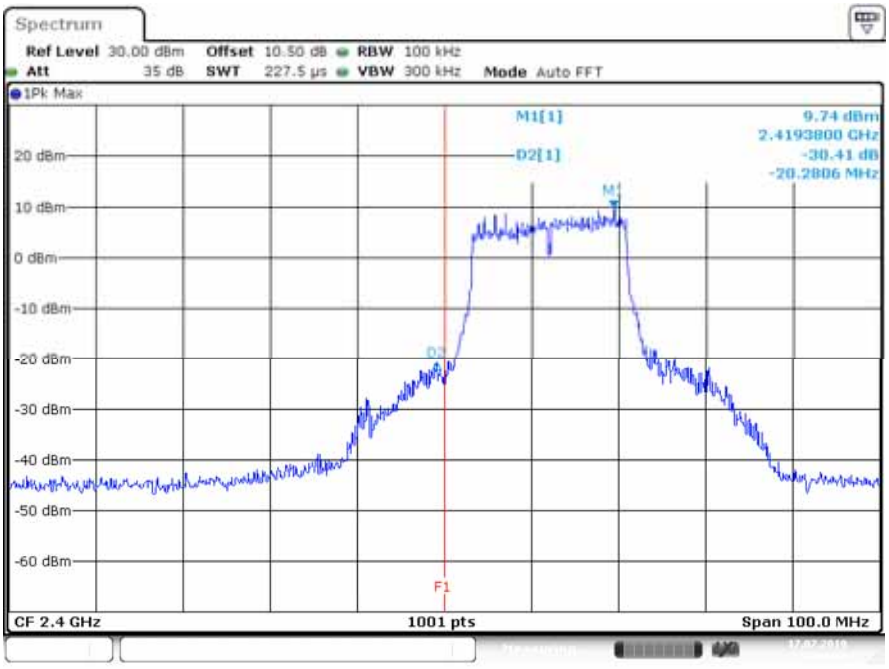
Band Edge, Right Side



Date: 17.JUL.2019 15:32:08

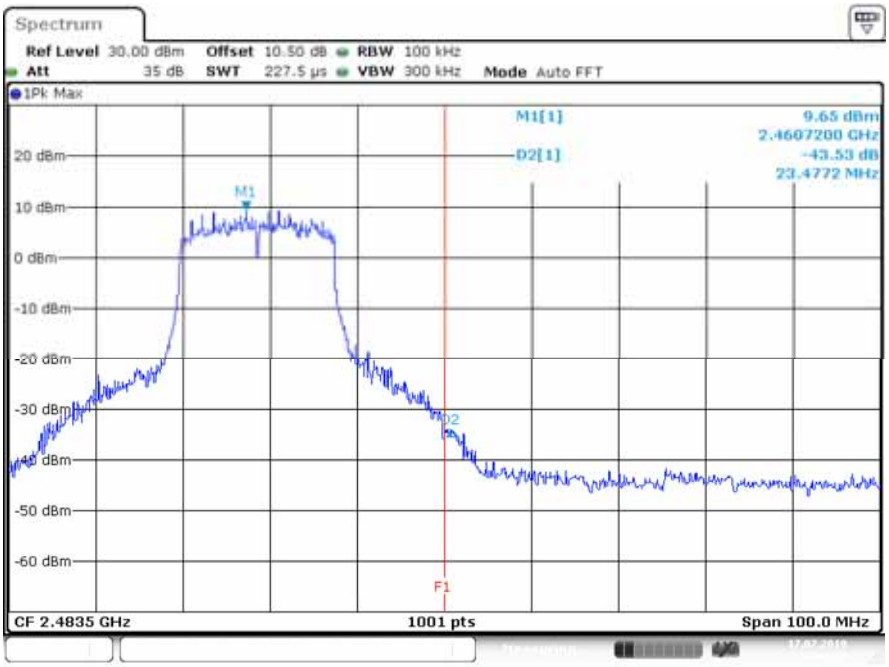
N20 Mode (Chain 1)

Band Edge, Left Side



Date: 17.JUL.2019 16:13:26

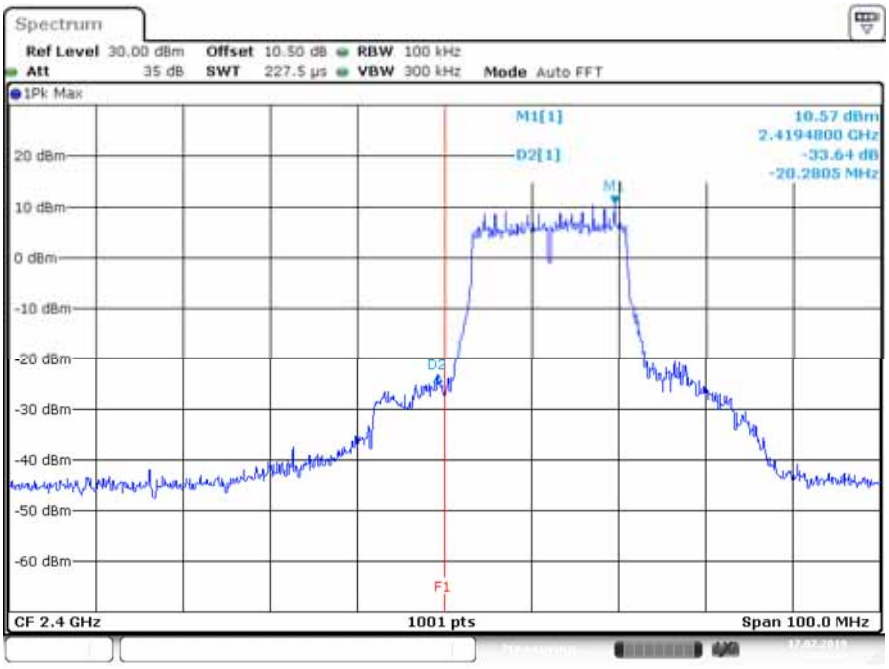
Band Edge, Right Side



Date: 17.JUL.2019 16:02:35

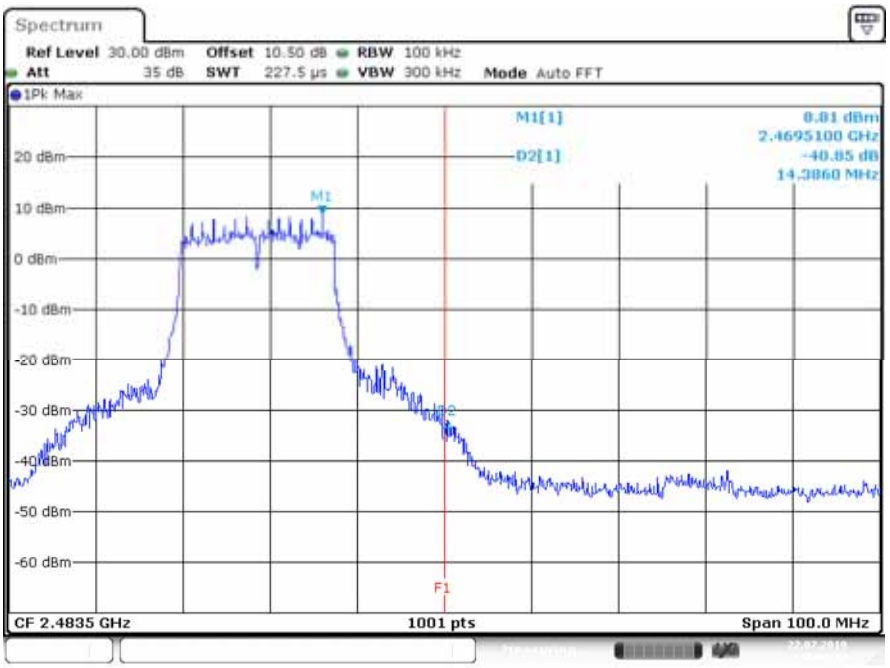
N20 Mode (Chain 2)

Band Edge, Left Side



Date: 17.JUL.2019 16:51:23

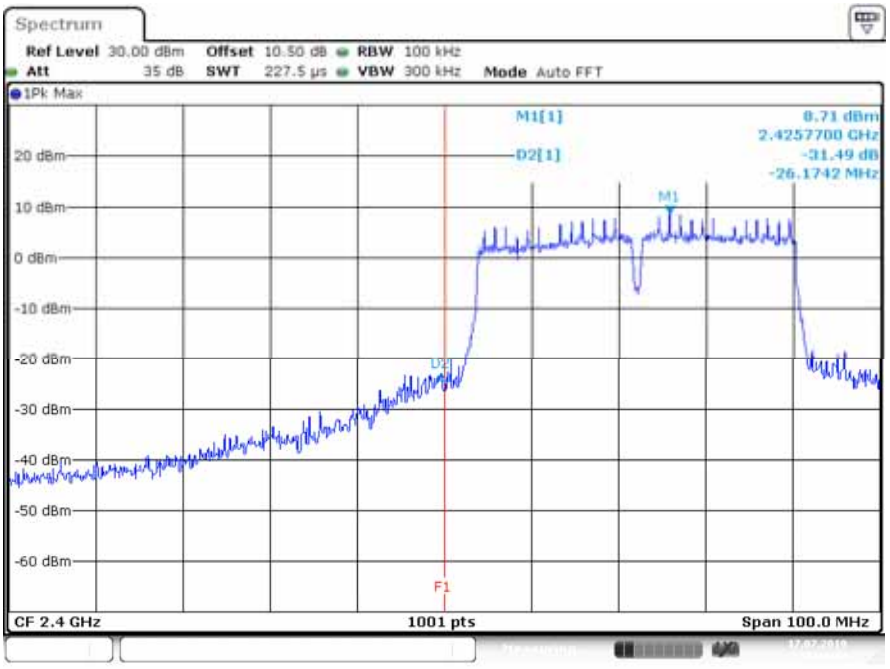
Band Edge, Right Side



Date: 22.JUL.2019 15:05:24

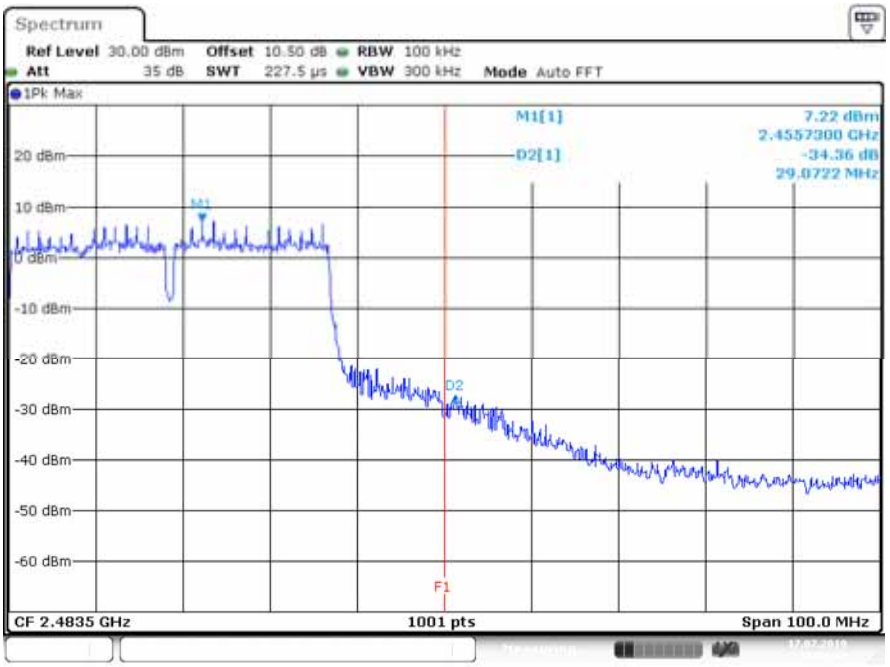
N40 Mode (Chain 0)

Band Edge, Left Side



Date: 17.JUL.2019 15:37:50

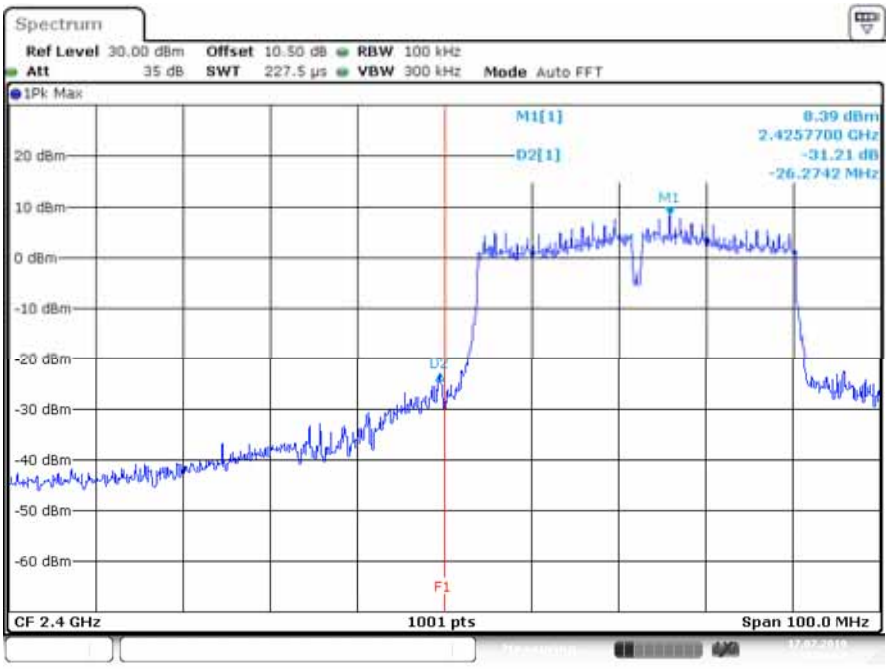
Band Edge, Right Side



Date: 17.JUL.2019 15:52:03

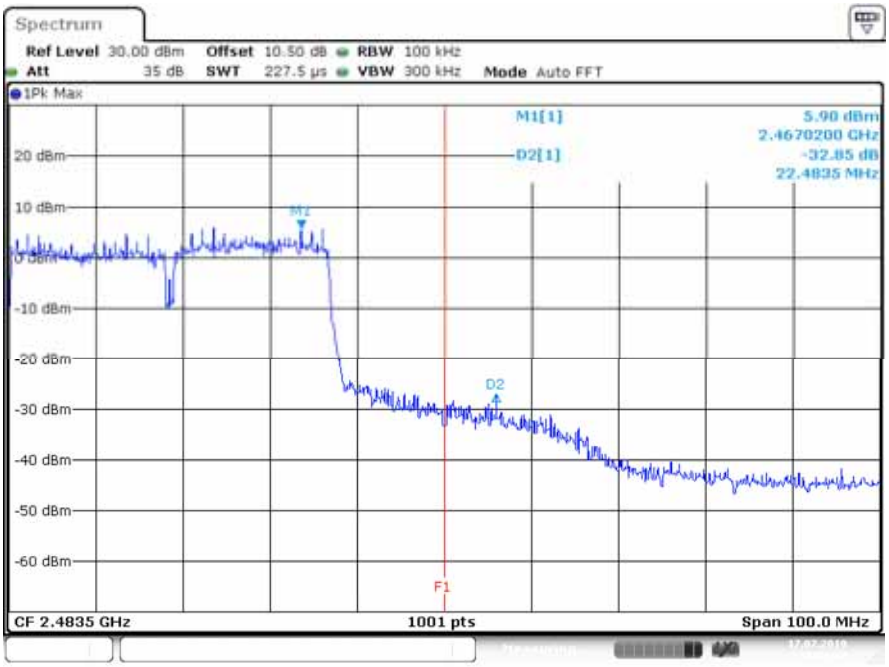
N40 Mode (Chain 1)

Band Edge, Left Side



Date: 17.JUL.2019 15:59:58

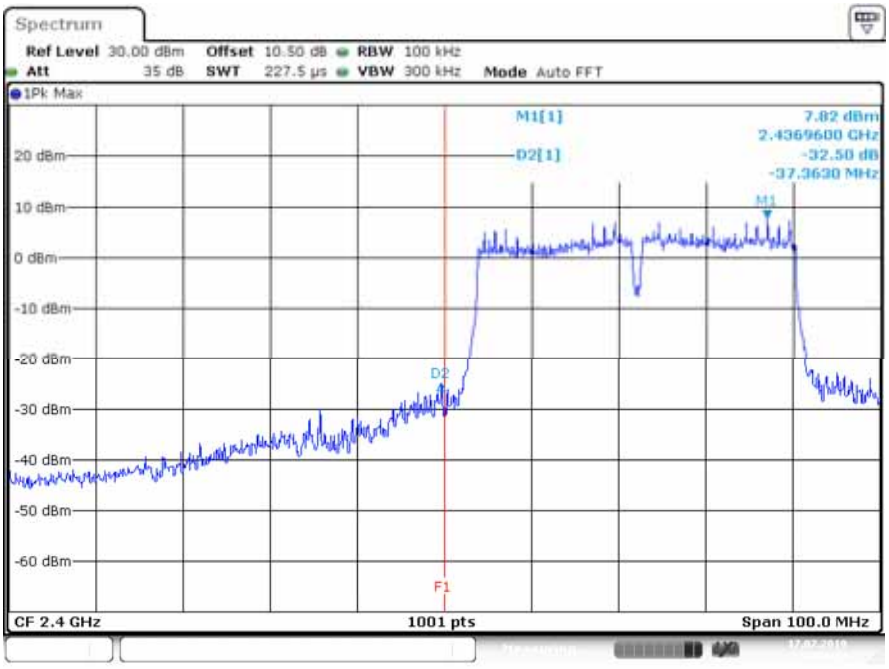
Band Edge, Right Side



Date: 17.JUL.2019 15:55:07

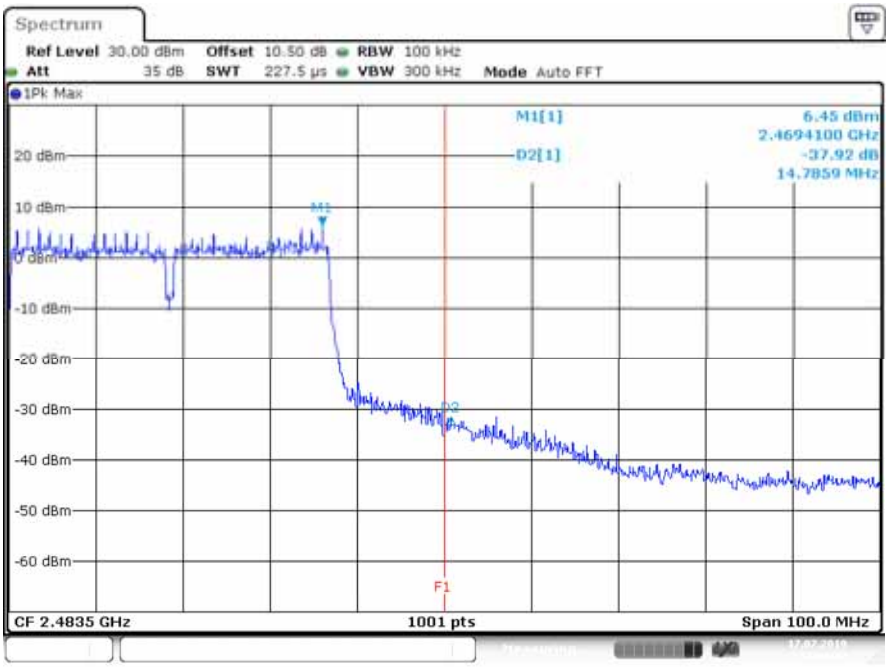
N40 Mode (Chain 2)

Band Edge, Left Side



Date: 17.JUL.2019 16:57:14

Band Edge, Right Side



12 FCC §15.247(e) – Power Spectral Density

12.1 Applicable Standard

According to FCC §15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

12.2 Test Procedure

According to ANSI C63.10-2013

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

12.3 Environmental Conditions

Temperature:	25.3 ℃
Relative Humidity:	44 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-7-17~2019-8-01.

12.4 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)				Limit (dBm/ 3kHz)	Result
		Chain 0	Chain 1	Chain 2	Total		
B Mode							
Low	2412	0.82	-0.32	0.70	5.2	8	PASS
Middle	2437	3.28	3.22	3.03	7.95	8	PASS
High	2462	-0.50	0.59	0.95	5.16	8	PASS
G Mode							
Low	2412	-3.51	-4.18	-3.87	0.93	8	PASS
Middle	2437	-0.77	-1.08	-1.24	3.75	8	PASS
High	2462	-4.20	-4.37	-4.44	0.44	8	PASS
N20 Mode							
Low	2412	-2.12	-2.37	-2.25	2.53	8	PASS
Middle	2437	0.00	0.11	0.91	5.13	8	PASS
High	2462	-2.00	-2.47	-2.37	2.5	8	PASS
N40 Mode							
Low	2422	-4.03	-4.70	-5.21	0.15	8	PASS
Middle	2437	-4.40	-4.29	-4.19	0.48	8	PASS
High	2452	-6.40	-6.40	-6.45	-1.65	8	PASS

The device is a master device. Use the 3 antenna , Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, …, GN dBi, per KDB 662911 D01 Multiple Transmitter Output v02r01, for

Power spectral density (PSD) measurements on the devices:

Array Gain = 10 log[(10G1 /20 + 10G2 /20 + … + 10GN /20)2 /NANT] dBi.

So:

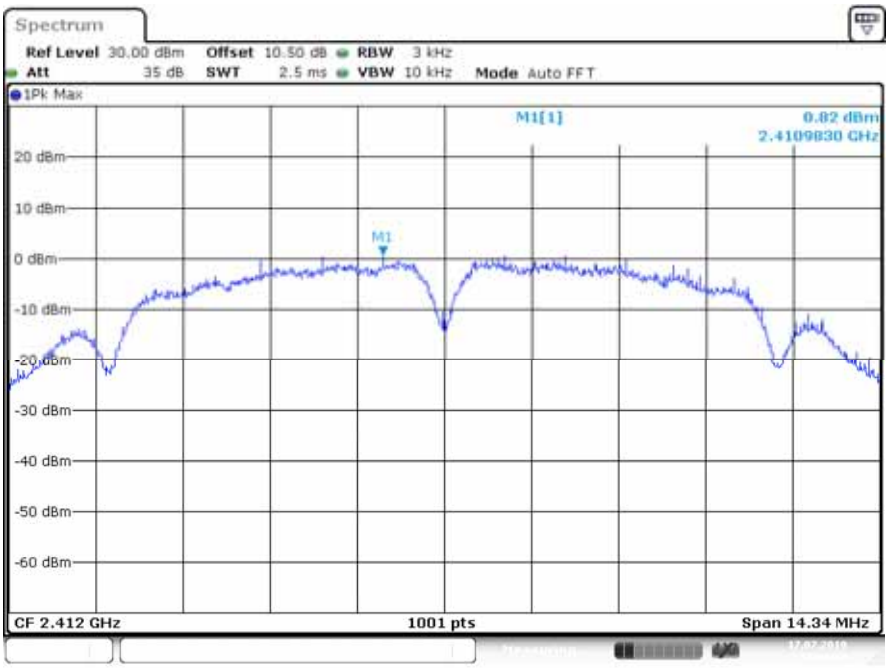
Directional gain = 4.86 dBi

The Power density Limit was reduce 0 dB

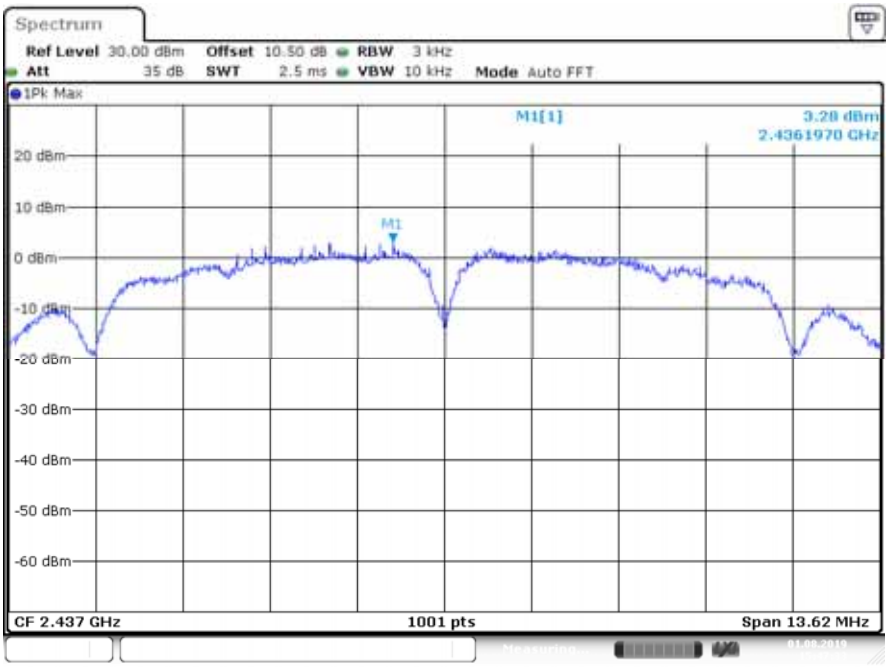
Please refer to the following plots

B Mode (Chain 0)

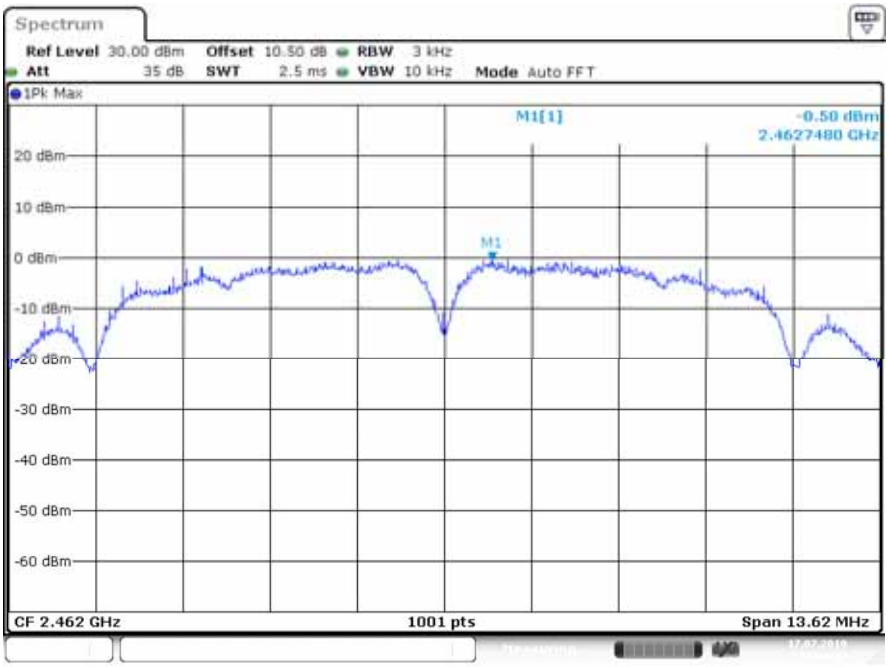
Low Channel



Middle Channel

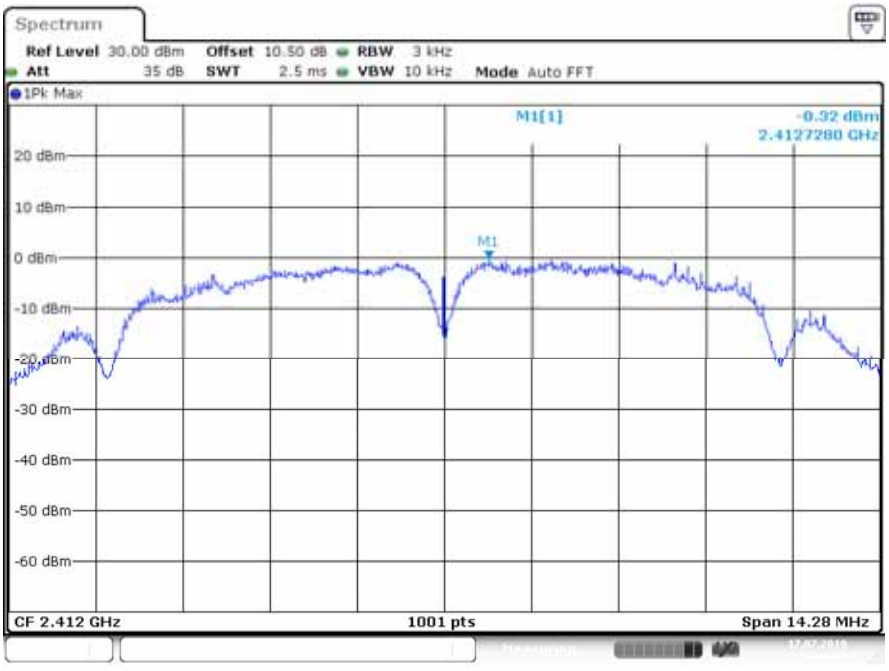


High Channel

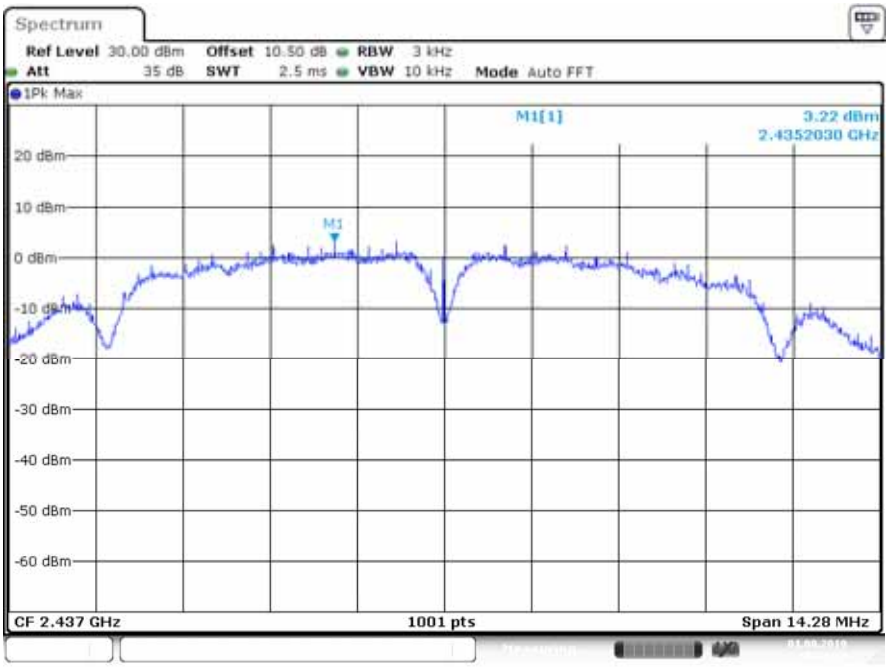


B Mode (Chain 1)

Low Channel

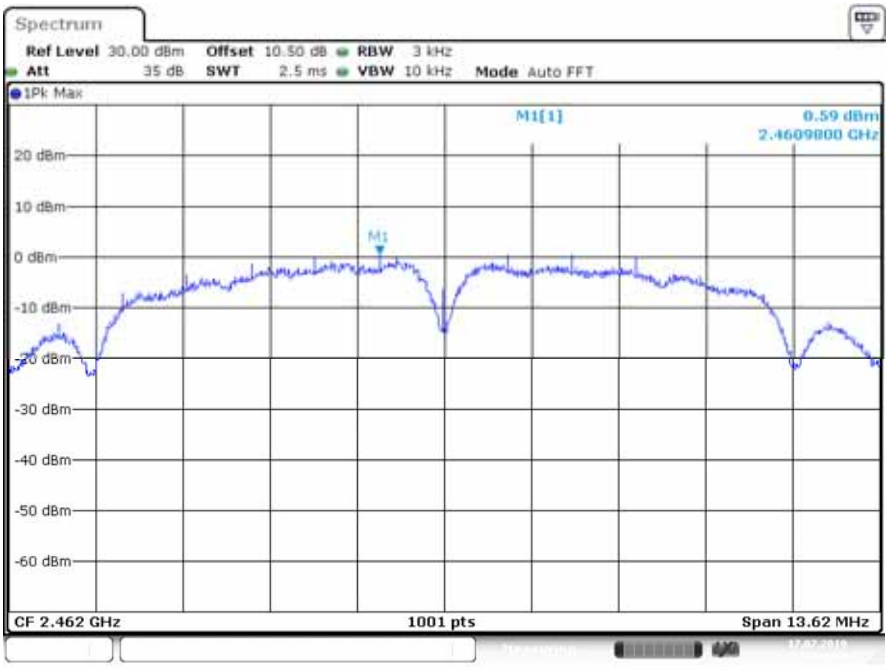


Middle Channel



Date: 1.AUG.2019 15:45:36

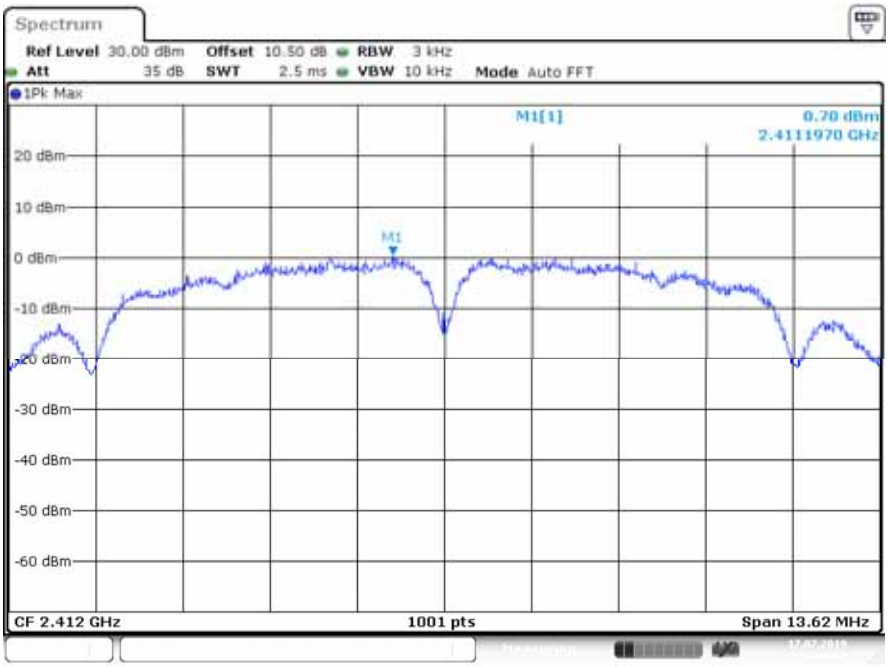
High Channel



Date: 17.JUL.2019 16:22:40

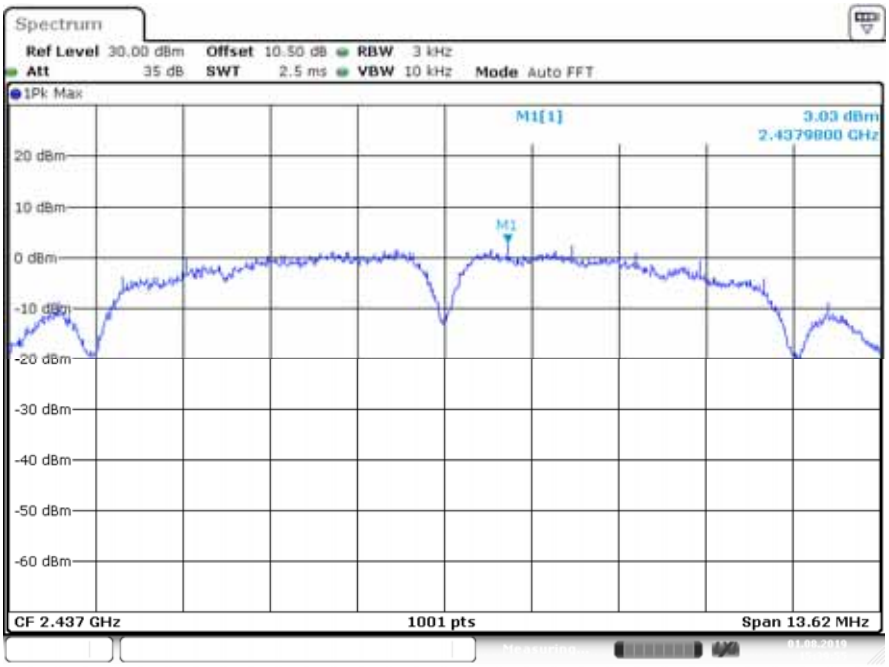
B Mode (Chain 2)

Low Channel



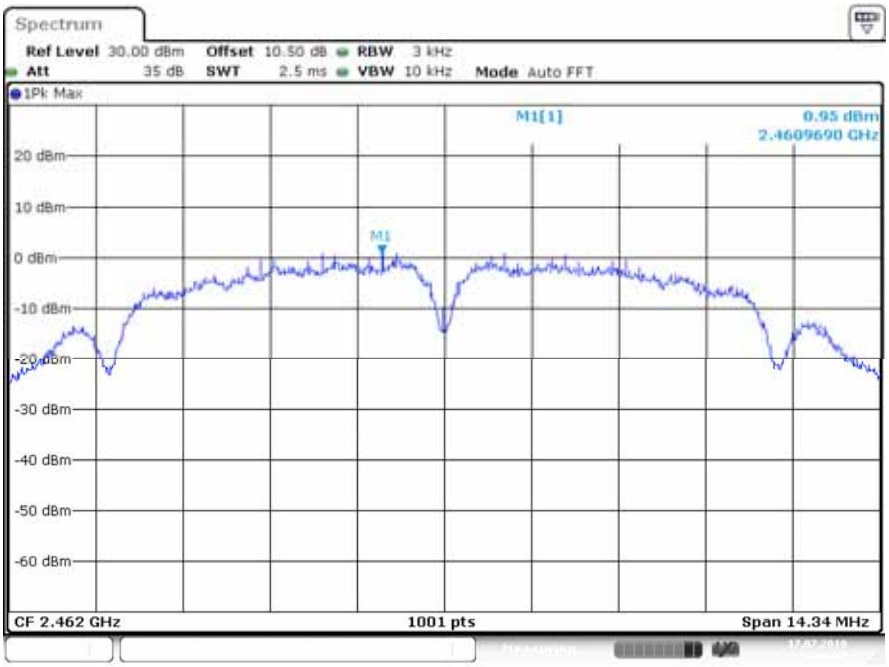
Date: 17.JUL.2019 16:33:01

Middle Channel



Date: 1.AUG.2019 15:39:55

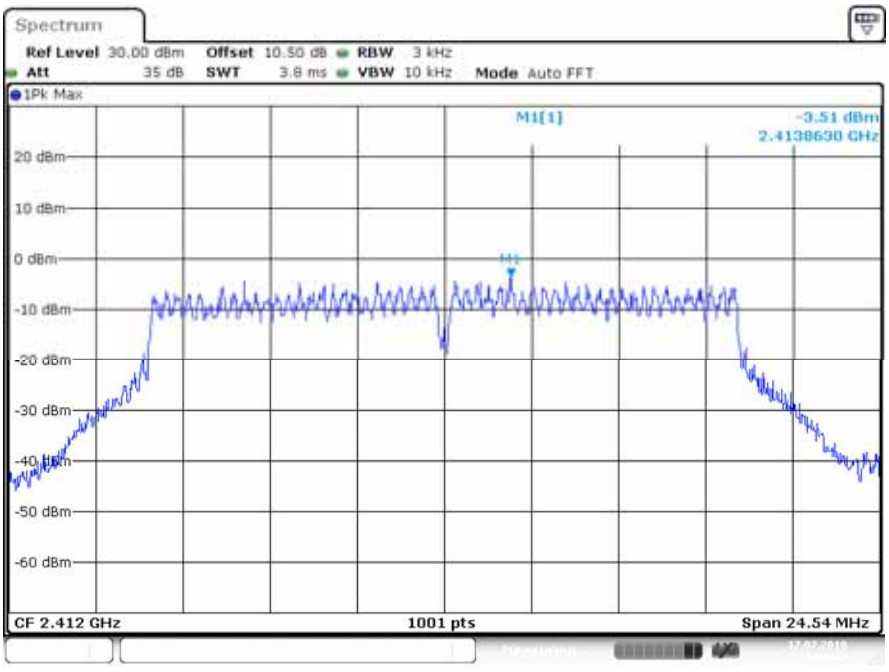
High Channel



Date: 17.JUL.2019 16:39:18

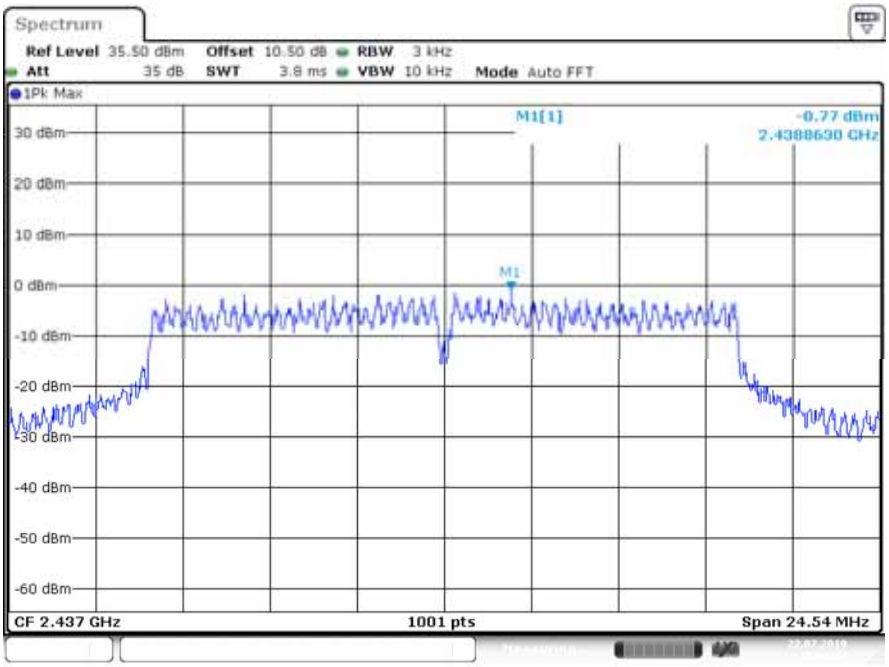
G Mode (Chain 0)

Low Channel

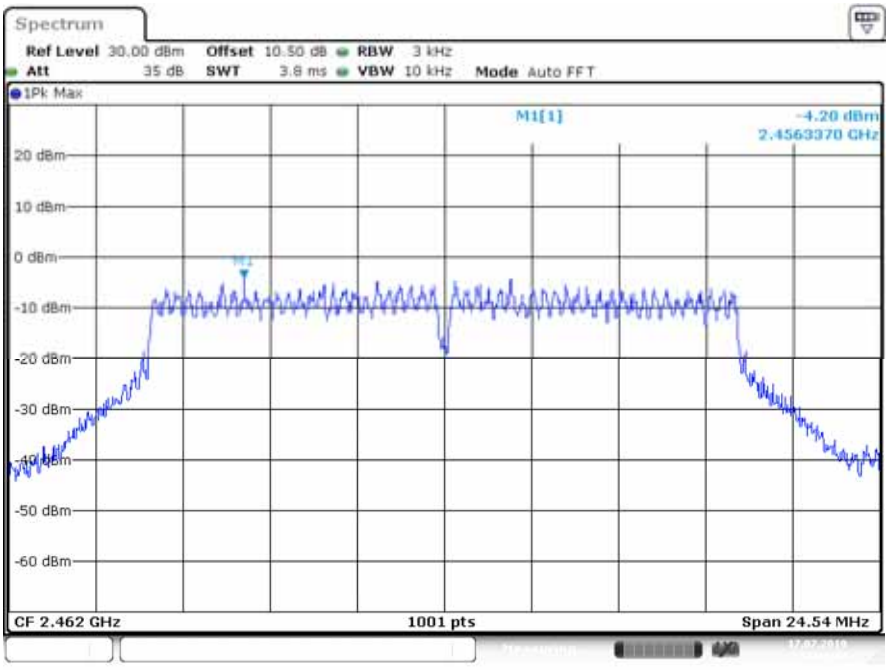


Date: 17.JUL.2019 15:21:40

Middle Channel

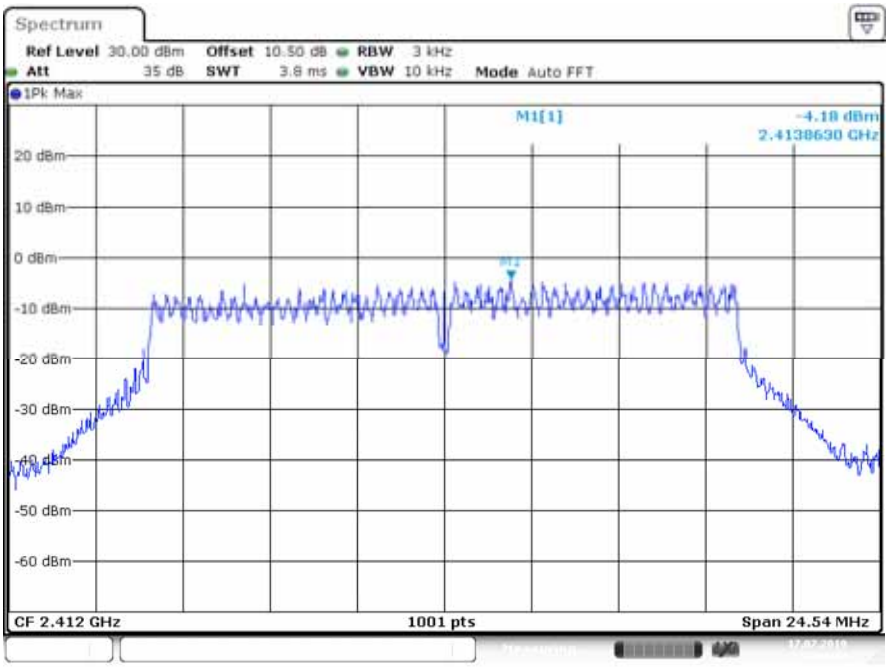


High Channel

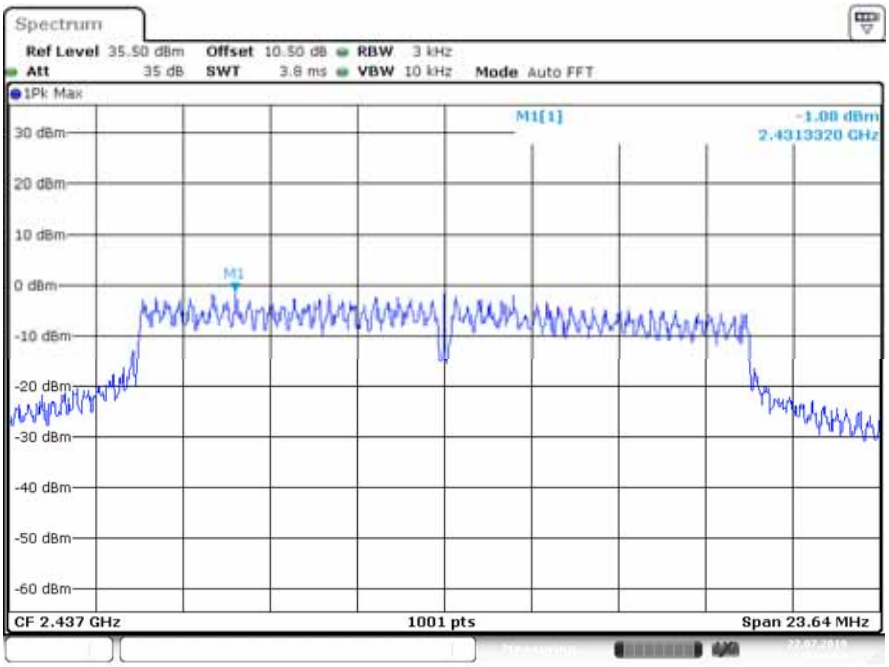


G Mode (Chain 1)

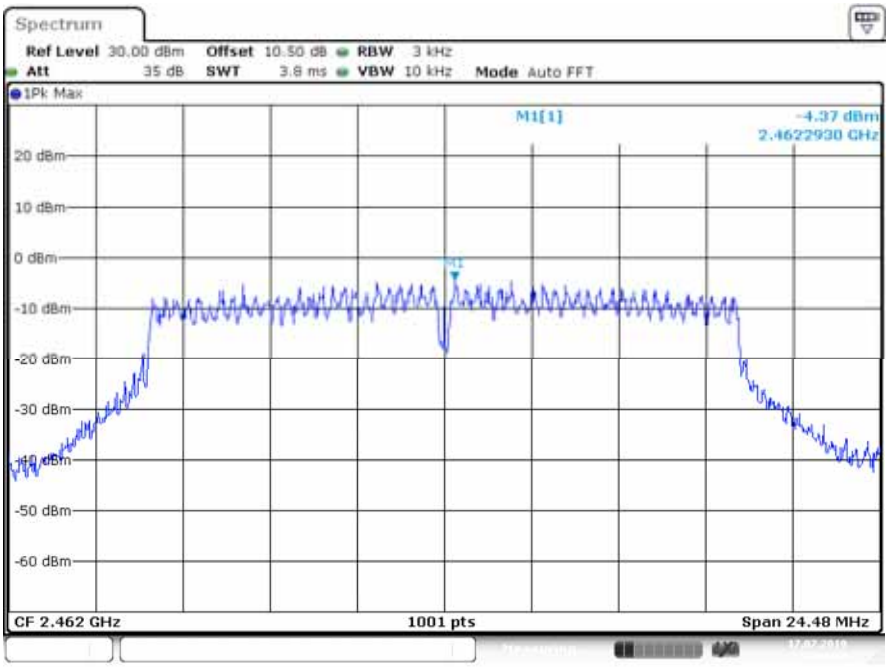
Low Channel



Middle Channel

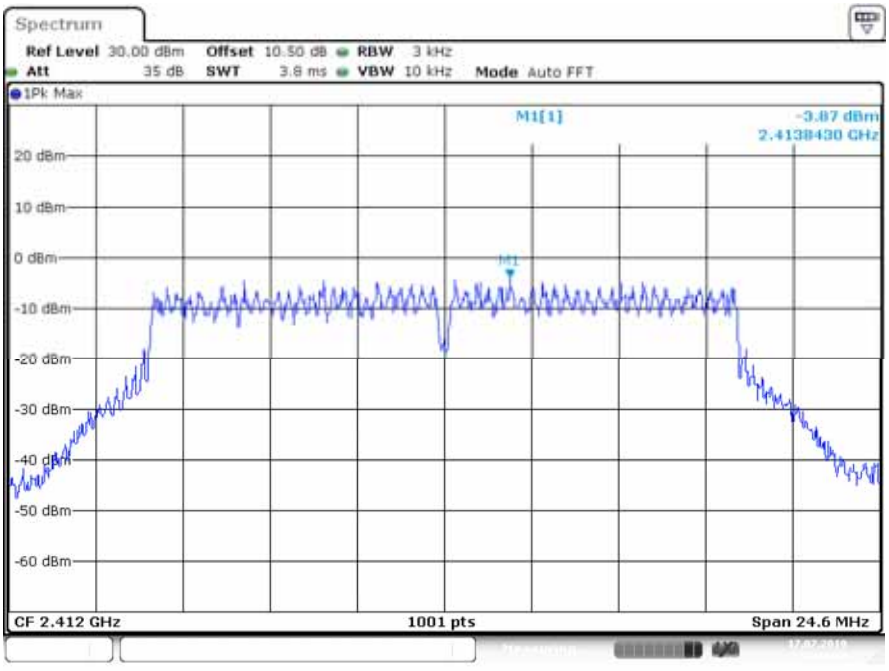


High Channel

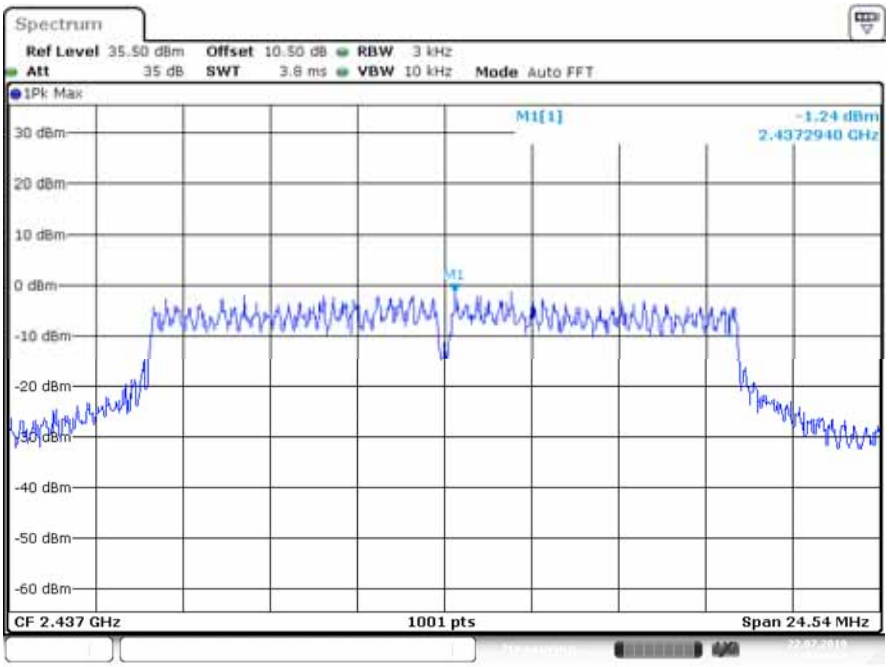


G Mode (Chain 2)

Low Channel

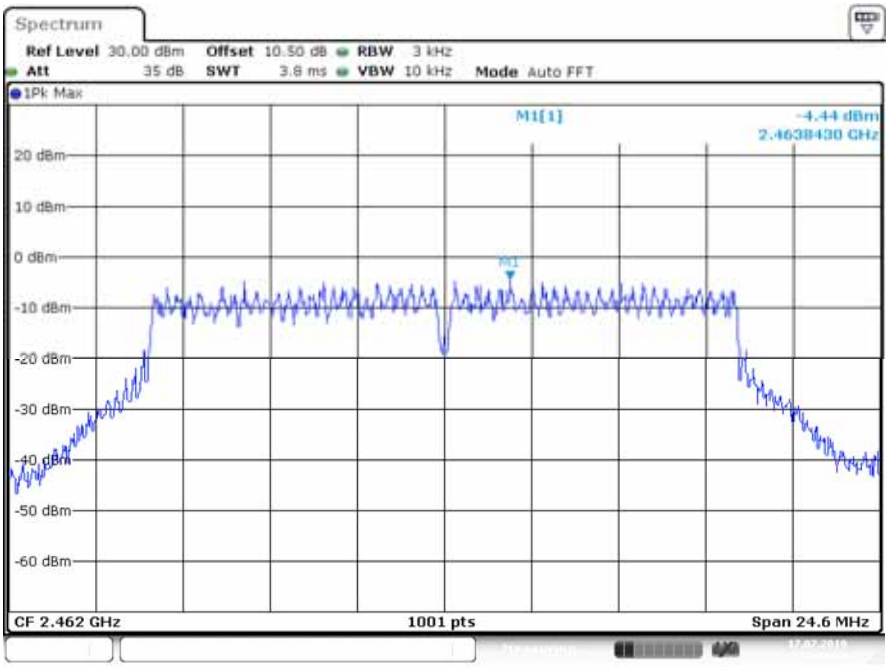


Middle Channel



Date: 22.JUL.2019 15:27:01

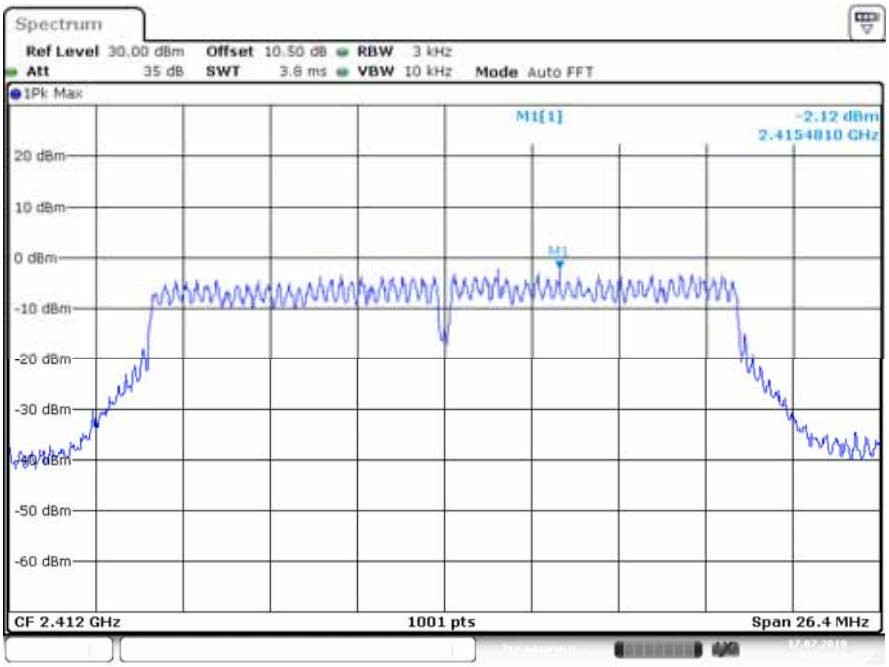
High Channel



Date: 17.JUL.2019 16:41:28

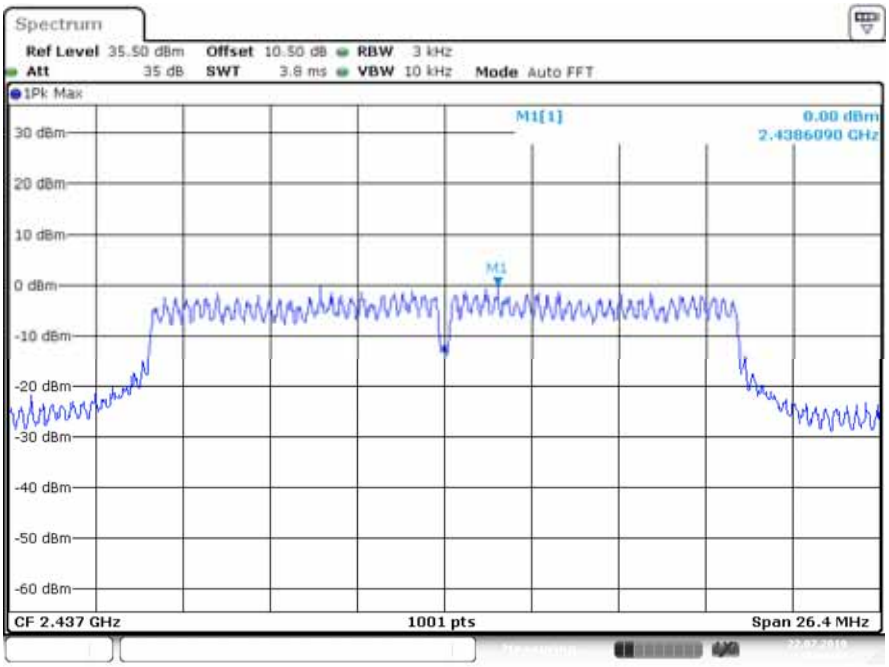
N20 Mode (Chain 0)

Low Channel



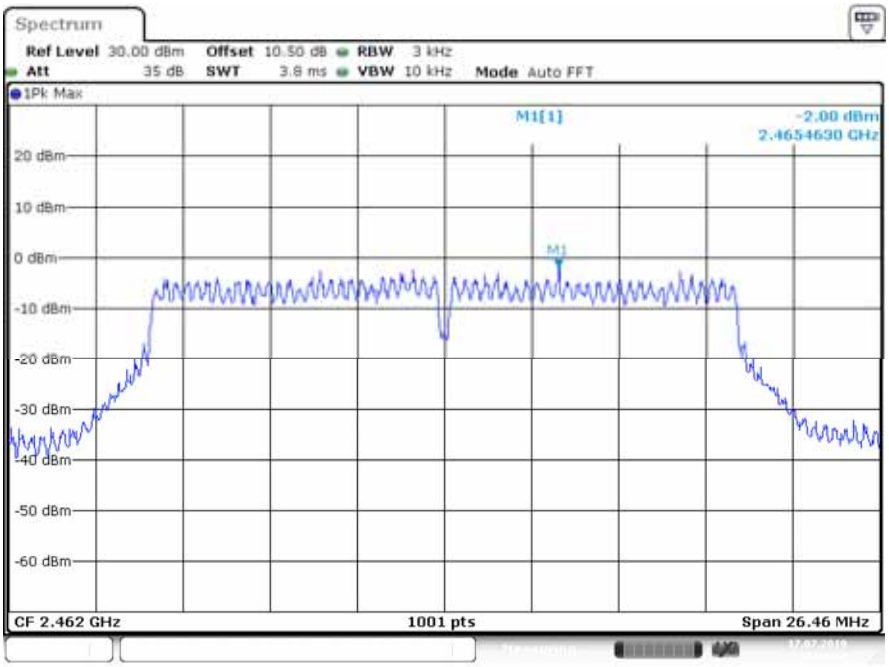
Date: 17.JUL.2019 15:26:59

Middle Channel



Date: 22.JUL.2019 15:36:35

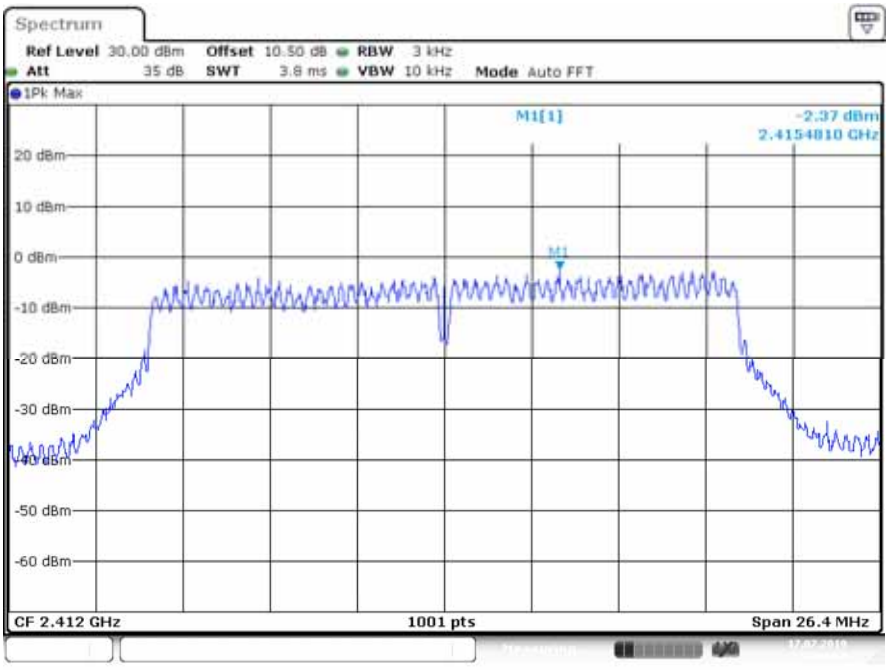
High Channel



Date: 17.JUL.2019 15:31:53

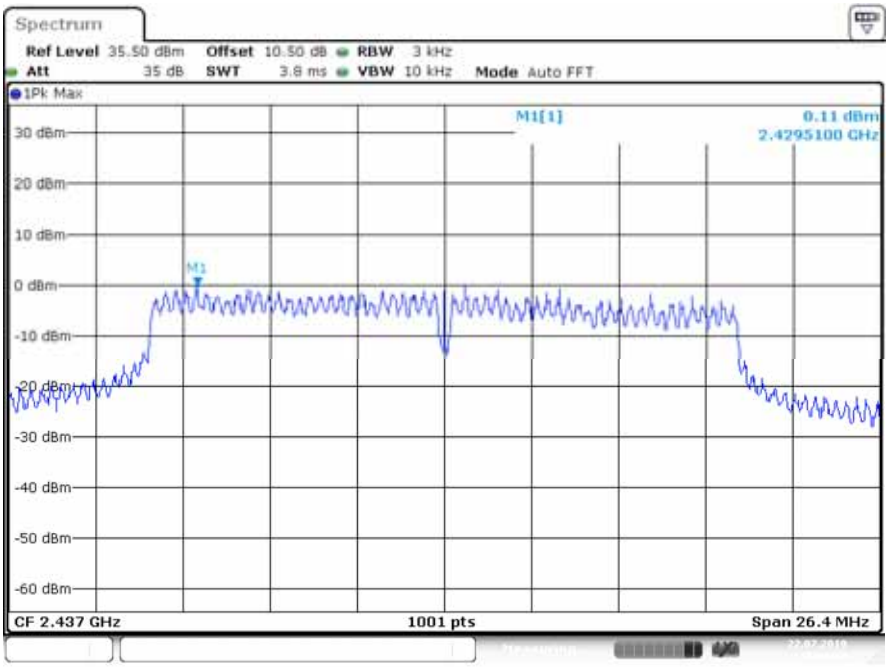
N20 Mode (Chain 1)

Low Channel



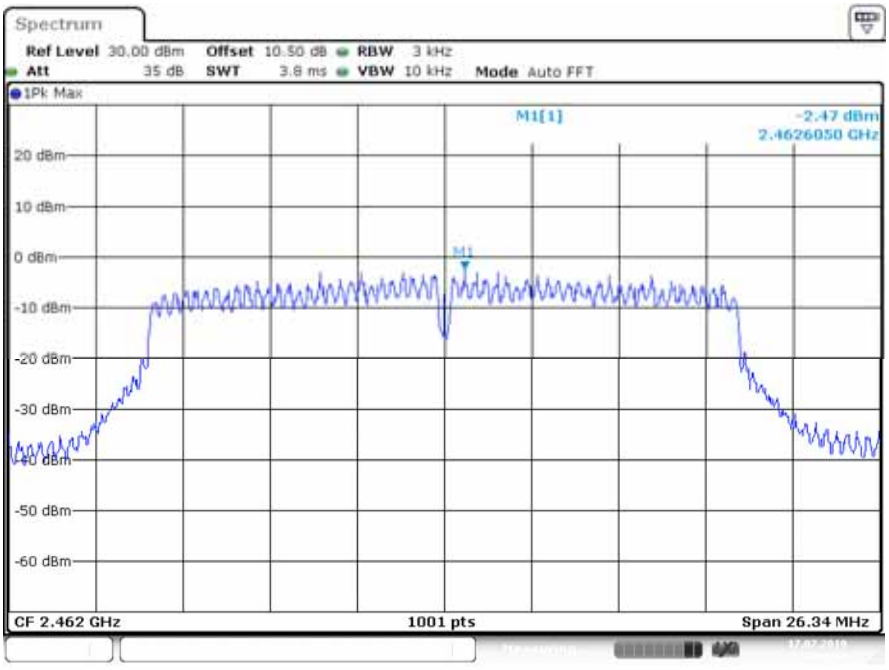
Date: 17.JUL.2019 16:08:06

Middle Channel



Date: 22.JUL.2019 15:30:28

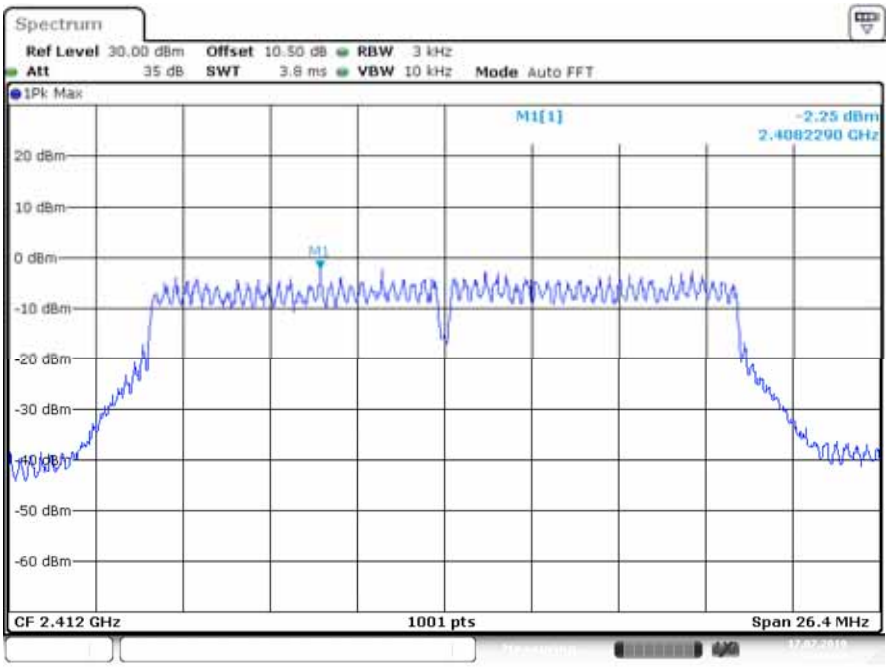
High Channel



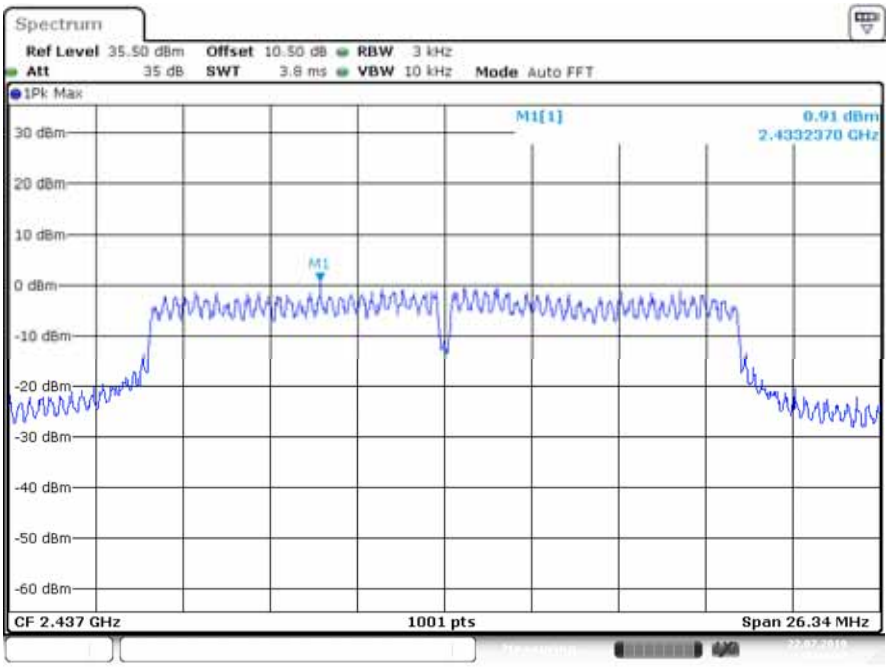
Date: 17.JUL.2019 16:02:19

N20 Mode (Chain 2)

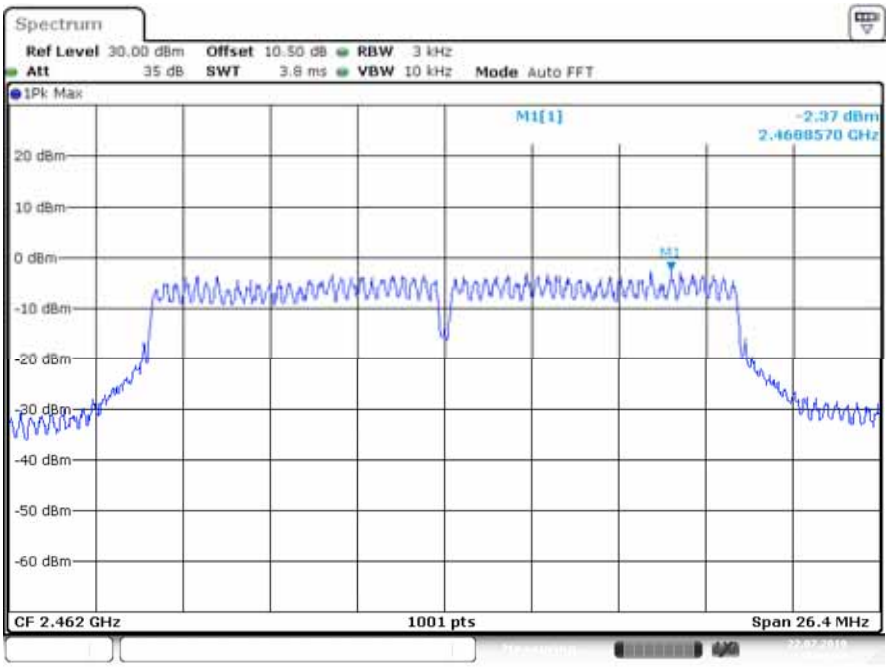
Low Channel



Middle Channel



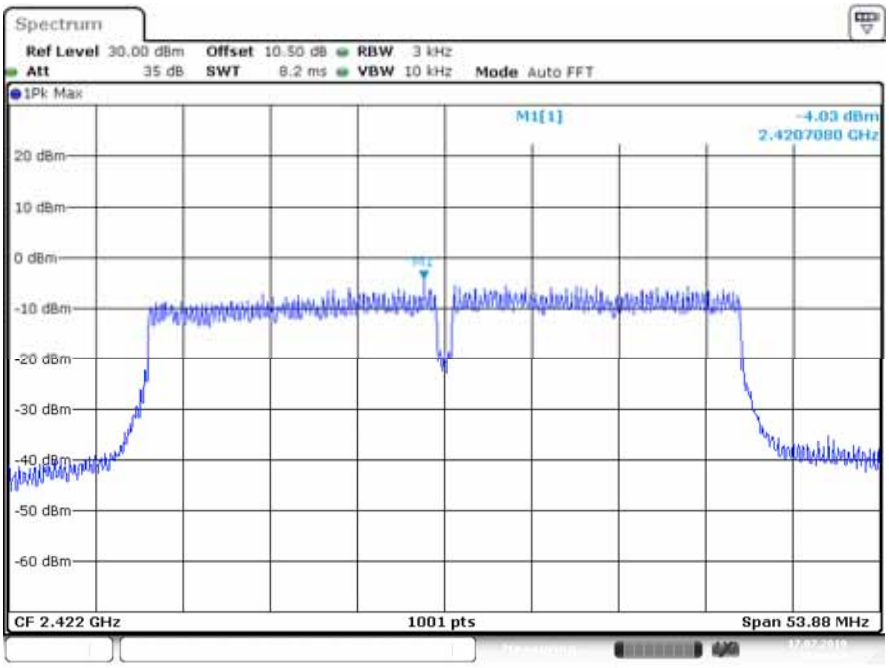
High Channel



Date: 22.JUL.2019 15:12:40

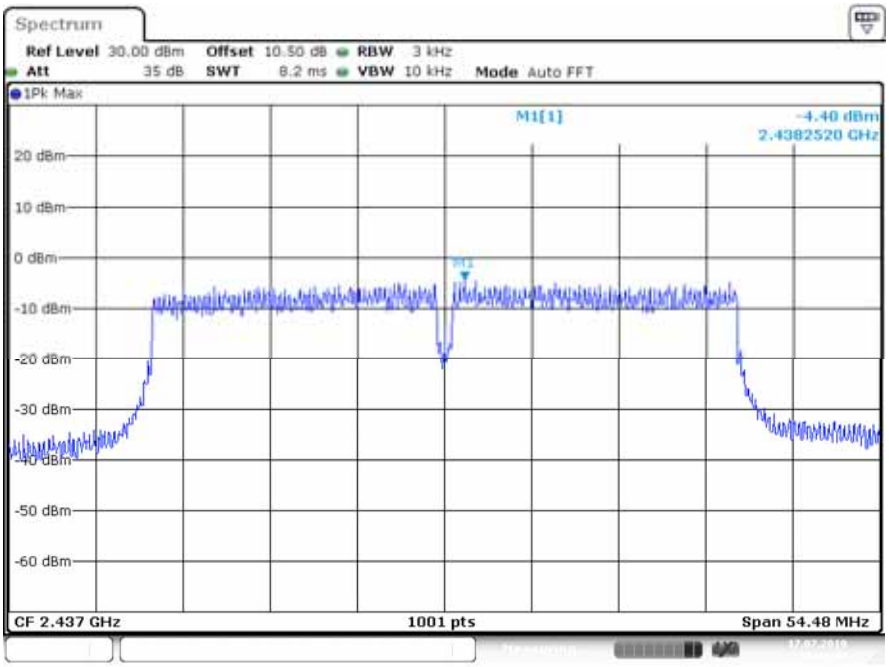
N40 Mode (Chain 0)

Low Channel



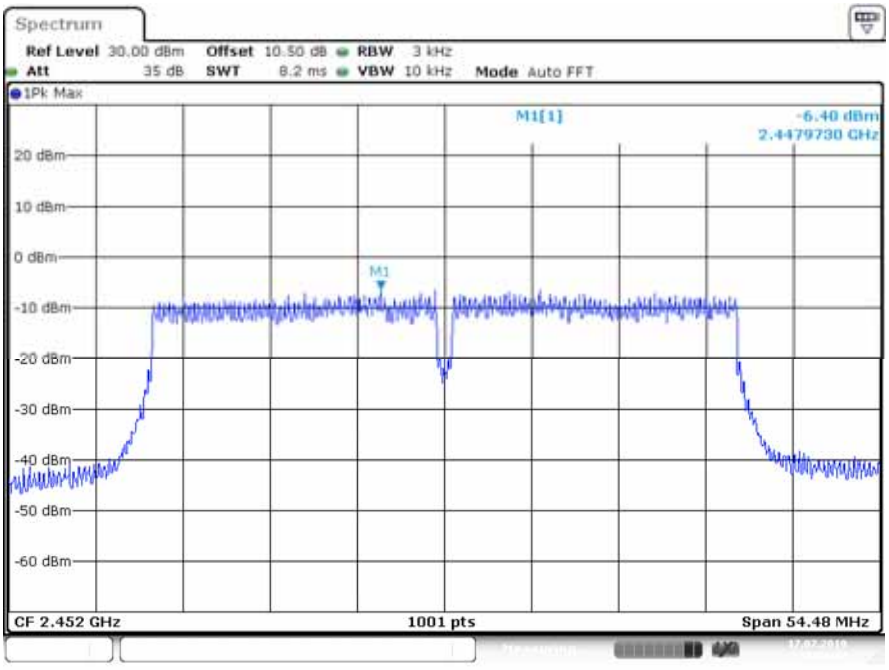
Date: 17.JUL.2019 15:39:00

Middle Channel



Date: 17.JUL.2019 15:42:44

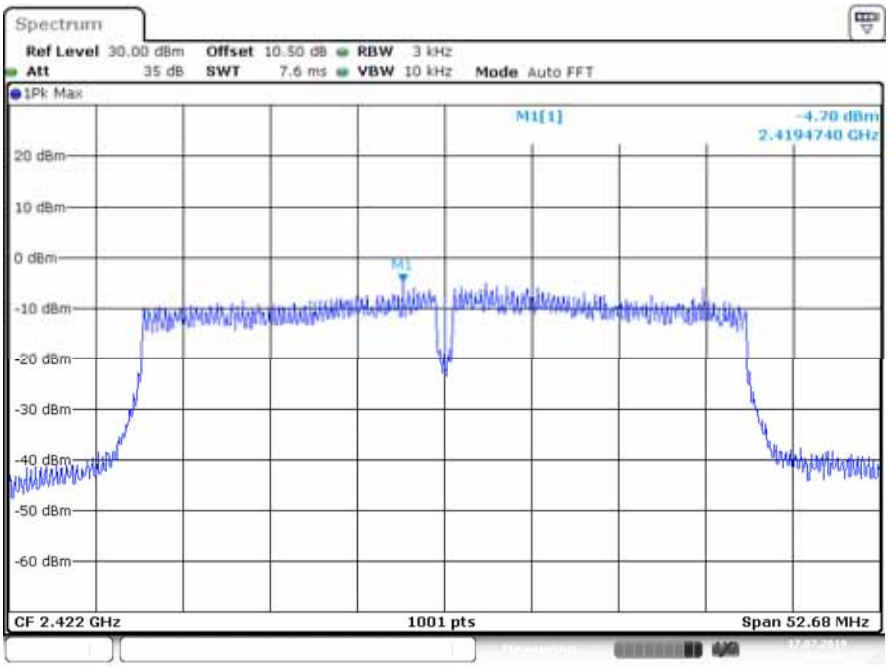
High Channel



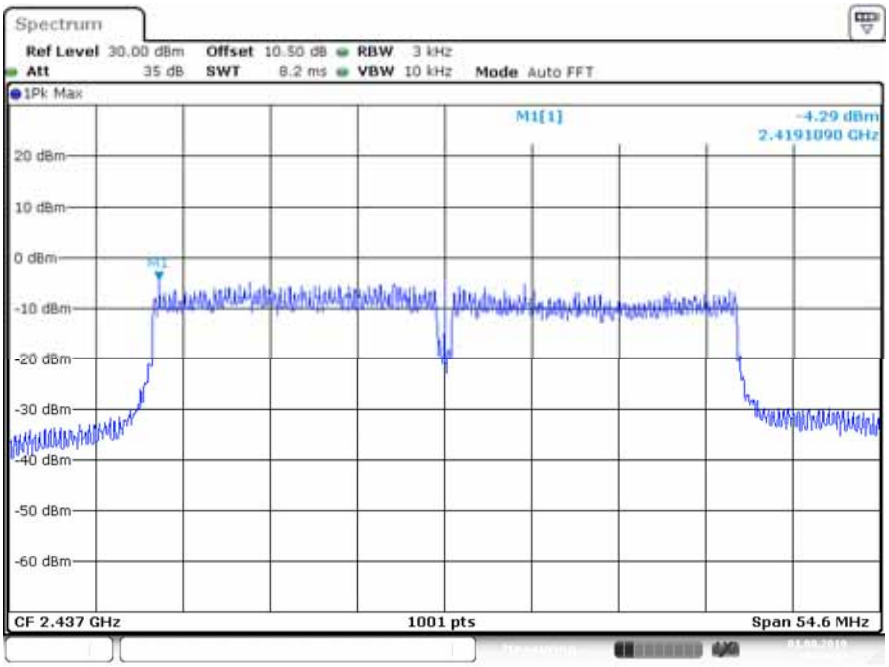
Date: 17.JUL.2019 15:51:47

N40 Mode (Chain 1)

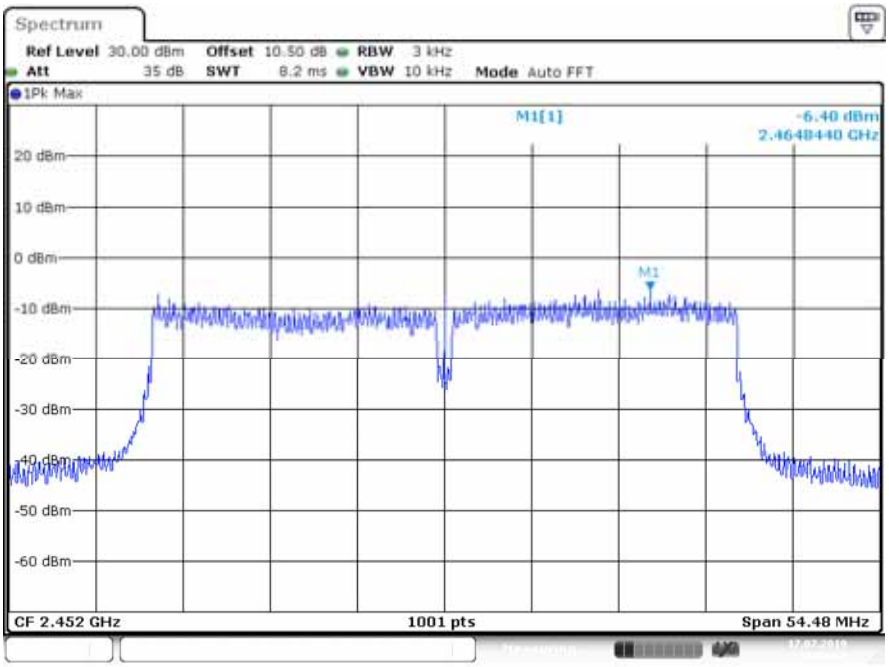
Low Channel



Middle Channel

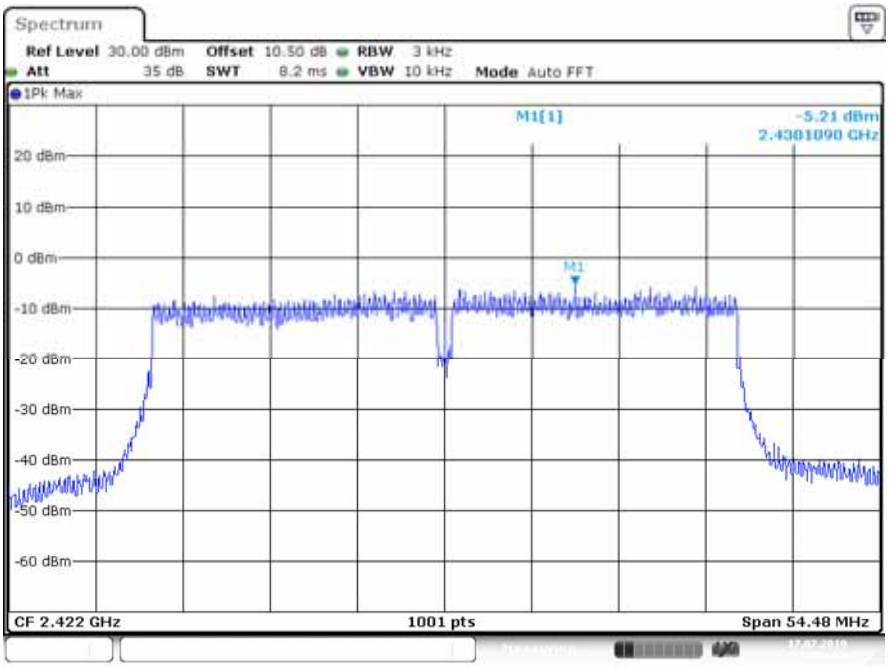


High Channel

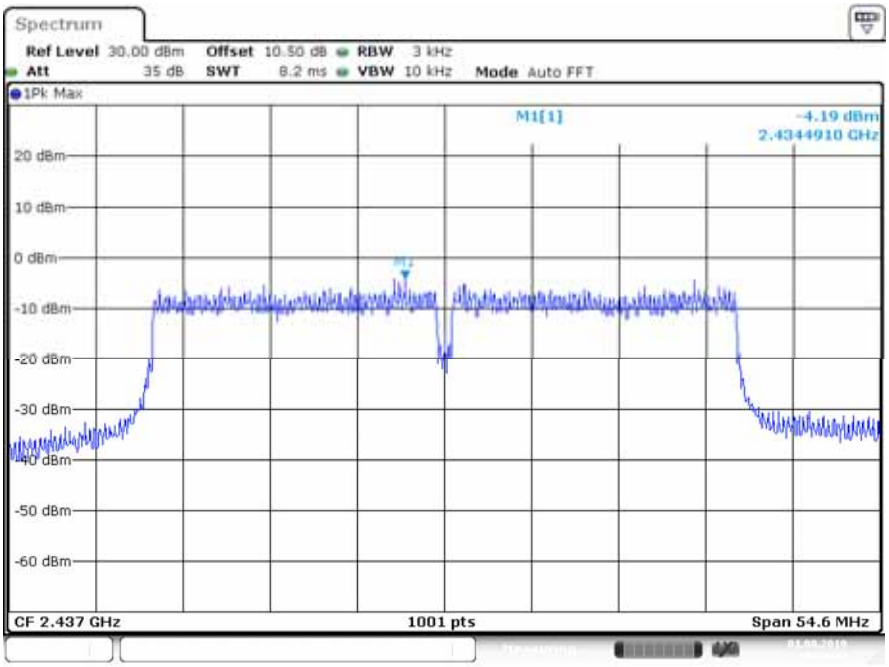


N40 Mode (Chain 2)

Low Channel

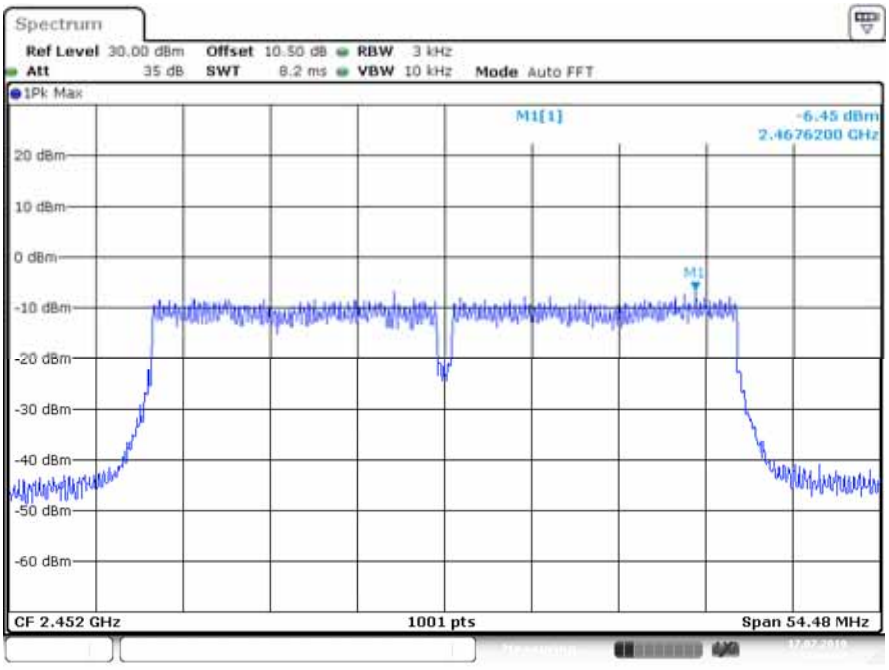


Middle Channel



Date: 1.AUG.2019 15:49:22

High Channel



Date: 17.JUL.2019 17:07:07

******* END OF REPORT *******