TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 90

MEASUREMENT AND TEST REPORT

For

Nokia Shanghai Bell Co. Ltd.

No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China 201206

FCC ID: 2ADZR34003800FM201

Report Type:	**Product Type:**
Original Report	FastMile ABA

Test Engineer:	Hope Zhang
Report Number:	RSHA181115002-00C
Report Date:	2019-02-21
Reviewed By:	Oscar Ye RF Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Nokia Shanghai Bell Co. Ltd.
Tested Model:	3FE75114AAAA
Product Type:	FastMile ABA
Dimension:	318mm(L)*318mm（W）*56mm（H）
Power Supply:	DC 53 V from POE

Note 1: The device is a fixed customer premises equipment.

**All measurement and test data in this report was gathered from production sample serial number: 20180804002. (Assigned by the BACL. The EUT supplied by the applicant was received on 2018-08-04)*

Objective

This type approval report is prepared on behalf of *Nokia Shanghai Bell Co. Ltd.* in accordance with Part 2, Part 90 of the Federal Communication Commission's rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS submittal with FCC ID: 2ADZR34003800FM201.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 90 – Private Land Mobile Radio Service

Applicable Standards: TIA 603-D, ANSI 63.4-2014.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	5.91dB
	1GHz~6GHz	4.68dB
	6GHz~18GHz	4.92dB
	18GHz~40GHz	5.21dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a test mode which has been done in the factory.

Channel List

Frequency Band	Bandwidth	Channel		Frequency (MHz)
3650-3700MHz	5M	Low	56265	3652.5
		Middle	56490	3675.0
		High	56715	3697.5
	10M	Low	56290	3655.0
		Middle	56490	3675.0
		High	56690	3695.0
	15M	Low	56315	3657.5
		Middle	56490	3675.0
		High	56665	3692.5
	20M	Low	56340	3660.0
		Middle	56490	3675.0
		High	56640	3690.0

EUT Exercise Software

RF test tool: CMD

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

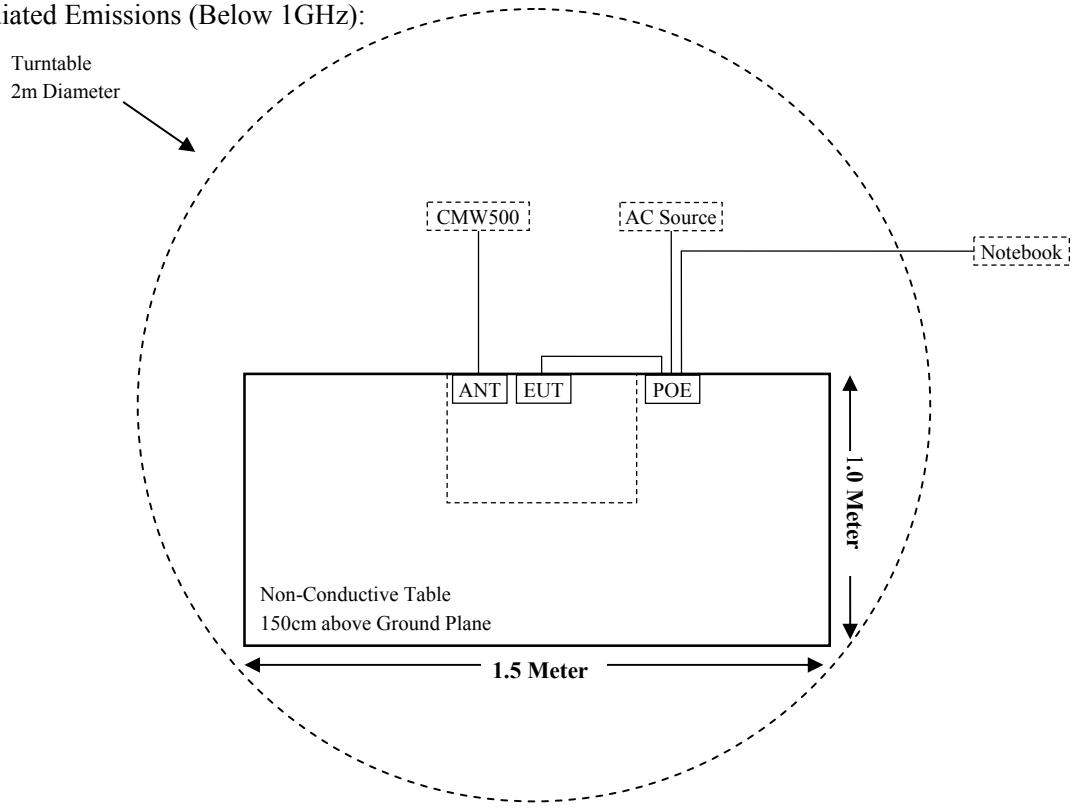
Manufacturer	Description	Model	Serial Number
SHENZHEN GOSPELL	POE Input: AC 100-240V, 50/60Hz, 0.75A Max Output: DC 53V, 0.6A	G0545-530-060-PSE1000	/
DELL	Notebook	GX620	D65874152
Aihuaixin Technology	Antenna	/	/
R & S	Wideband Radio Communication Tester	CMW500	104478

External I/O Cable

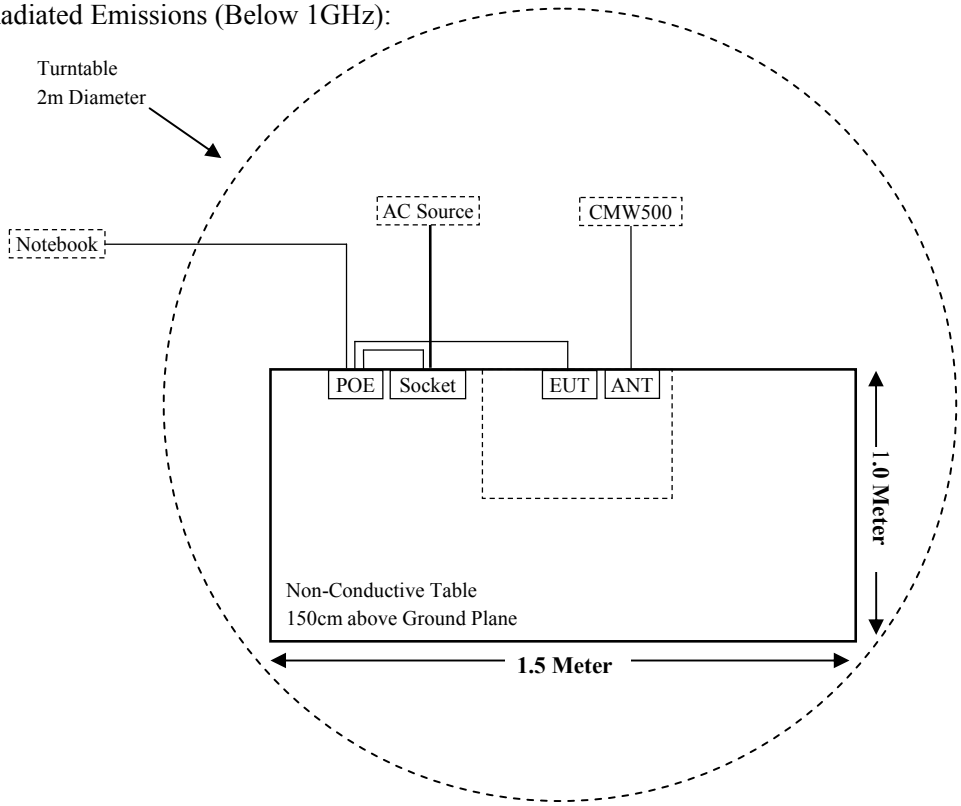
Cable Description	Length (m)	From Port	To
RJ45 Cable-1	3.0	EUT	POE
RJ45 Cable-2	15.0	POE	Notebook
Power Cable	1.0	POE	AC Source/Socket
Antenna Cable	1.2	Antenna	CMW500

Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Below 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1310 & § 2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliant
§ 2.1046; § 90.1321 (a)	RF Output Power	Compliant
§ 90.1321 (a)	Peak Power Spectral Density	Compliant
§ 2.1049; § 90.209	Occupied Bandwidth	Compliant
§ 2.1051; § 90.1323(a)	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053; § 90.1323(a)	Spurious Radiated Emissions	Compliant
§ 2.1055; § 90.213	Frequency stability	Compliant

Note: The EUT only can work under MIMO mode.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-12	2019-11-11
HP	Signal Generator	HP 8341B	2624A00116	2018-08-29	2019-08-28
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Sonoma Instrunent	Pre-amplifier	310N	171205	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-8	008	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2018-08-15	2019-08-14
R & S	Wideband Radio Communication Tester	CMW500	104478	2018-07-21	2019-07-20
Radiated Emission Test（Chamber 2#）					
HP	Signal Generator	HP 8341B	2624A00116	2018-08-29	2019-08-28
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-26	2019-08-25
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
ETS-LINDGREN	Horn Antenna	3116	2516	2016-12-12	2019-12-12
Mini-Circuits	Amplifier	ZVA-183W-S+	220701818	2018-05-20	2019-05-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2018-03-22	2019-03-21
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-16	016	2018-08-15	2019-08-14
R & S	Wideband Radio Communication Tester	CMW500	104478	2018-07-21	2019-07-20

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2018-09-21	2019-09-20
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2018-07-23	2019-07-22
Narda	Attenuator/6dB	10690812-2	26850-6	2018-01-10	2019-01-09
Narda	Attenuator/6dB	10690812-2	26850-6	2019-01-10	2020-01-09
R & S	Wideband Radio Communication Tester	CMW500	104478	2018-07-21	2019-07-20
Mini-Ciruits	Power splitter	ZFRSC-14-S+	SF019411452	2018-11-10	2019-11-09
BACL	Temperature & Humidity Chamber	BTH-150	30023	2018-10-10	2019-10-09
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2018-10-10	2019-10-09
Bell	RF Cable	/	/	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1310 & §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 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:

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

Calculated Data:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
Bluetooth	2402-2480	0.00	1.00	7.00	5.01	50	0.0002	1.0	0.0002
LTE	3652.5-3697.5	17.00	50.12	16.50	44.67	50	0.0713	1.0	0.0713

Note: Bluetooth and LTE can transmit simultaneously; the worst condition is Bluetooth & LTE, as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0002+0.0713=0.0715 < 1.0$$

Result: The device meet FCC MPE at 50 cm distance.

FCC §2.1046; §90.1321 (a) - RF OUTPUT POWER

Applicable Standards

FCC §2.1046 and §90.1321

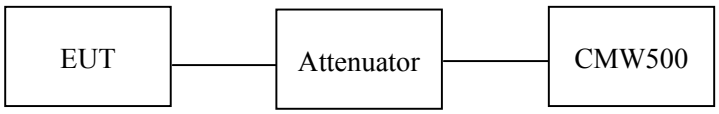
Limit

According to FCC §2.1046 and §90.1321：

(a) Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum.

Test Procedure

The EUT was connected to a CMW500 through a attenuator, the EUT power was adjusted to produce maximum output power as specified in the owner's manual, measurements were performed at the low, mid and high channels for each of the EUT's bandwidths and modulations.



Test Data

Environmental Conditions

Temperature:	23.2℃
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Hope Zhang on 2019-01-08.

LTE Band: 3650-3700MHz

Bandwidth	Modulation	Frequency	Maximum Conducted Output Power (dBm)		Total	Antenna Gain	EIRP	Limit
		(MHz)	Chain0	Chain1	(dBm)	(dBi)	(dBm)	(dBm)
5MHz	QPSK	3652.5	13.04	13.14	16.10	17	33.10	43.98
		3675.0	12.88	12.86	15.88	17	32.88	
		3697.5	12.76	12.47	15.63	17	32.63	
	16-QAM	3652.5	13.09	12.81	15.96	17	32.96	
		3675.0	12.97	12.76	15.88	17	32.88	
		3697.5	13.07	13.05	16.07	17	33.07	
10MHz	QPSK	3655.0	11.95	12.10	15.04	17	32.04	43.98
		3675.0	12.32	11.99	15.17	17	32.17	
		3695.0	11.99	12.13	15.07	17	32.07	
	16-QAM	3655.0	11.99	11.92	14.97	17	31.97	
		3675.0	12.05	11.75	14.91	17	31.91	
		3695.0	12.17	12.11	15.15	17	32.15	
15MHz	QPSK	3657.5	11.10	11.04	14.08	17	31.08	43.98
		3675.0	11.01	10.93	13.98	17	30.98	
		3692.5	10.87	10.68	13.79	17	30.79	
	16-QAM	3657.5	10.88	10.65	13.78	17	30.78	
		3675.0	10.93	10.59	13.77	17	30.77	
		3692.5	10.83	10.72	13.79	17	30.79	
20MHz	QPSK	3660.0	10.21	10.02	13.13	17	30.13	43.98
		3675.0	9.90	10.18	13.05	17	30.05	
		3690.0	9.81	9.93	12.88	17	29.88	
	16-QAM	3660.0	9.51	9.97	12.76	17	29.76	
		3675.0	9.89	10.19	13.05	17	30.05	
		3690.0	9.46	9.82	12.65	17	29.65	

Note: The total power is the power per 25MHz.

§90.1321 (a) - PEAK POWER SPECTRAL DENSITY

Applicable Standards

FCC§90.1321

Limit

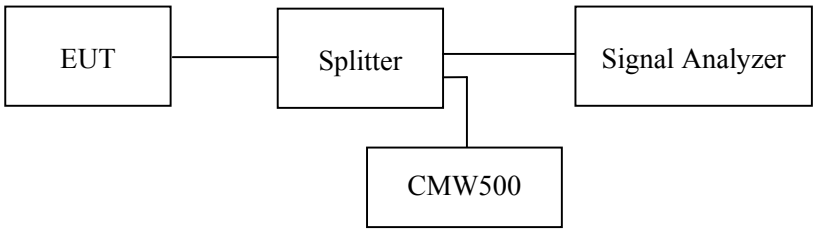
According to FCC §2.1046 and §90.1321：

(a) Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum.

Test Procedure

The EUT was connected to a CMW500 & signal analyzer through a splitter, the EUT power was adjusted to produce maximum output power as specified in the owner's manual, measurements were performed at the low, mid and high channels for each of the EUT's bandwidths and modulations.

The resolution bandwidth of the spectrum analyzer was set at 1MHz.



Test Data

Environmental Conditions

Temperature:	23.0℃-23.2℃
Relative Humidity:	51 %-53 %
ATM Pressure:	101.1kPa -101.3kPa

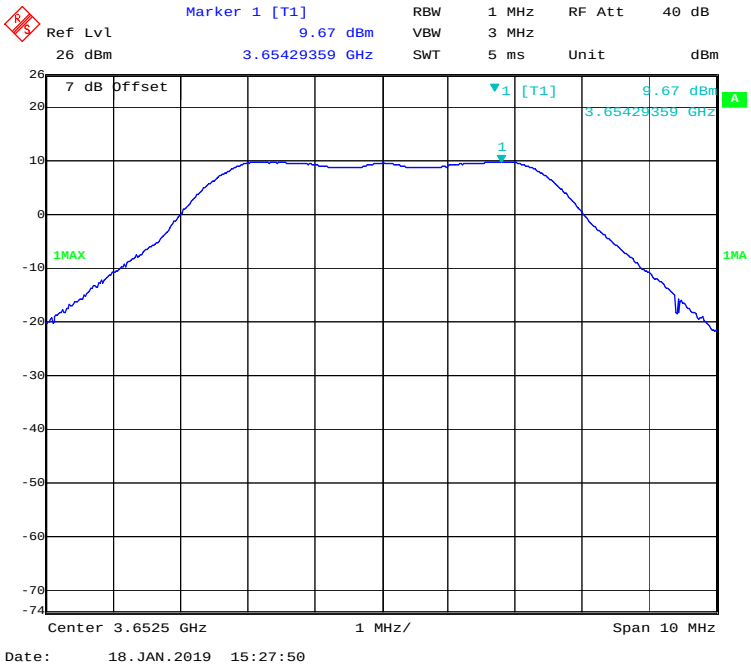
The testing was performed by Hope Zhang on 2019-01-18~2019-01-19.

LTE Band: 3650-3700MHz

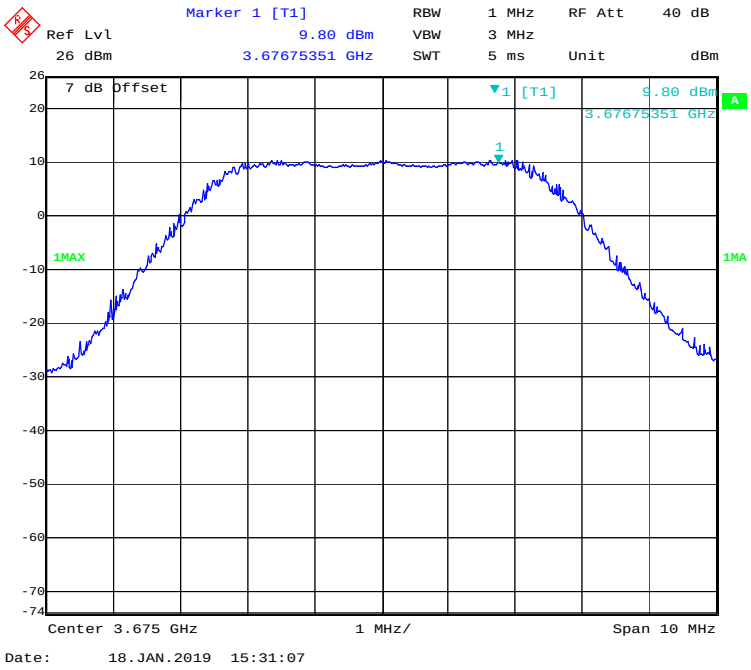
Bandwidth	Modulation	Frequency	Peak Power Density		Total	Antenna Gain	EIRP Power Density	Limit
		(MHz)	Chain0	Chain1	(dBm/MHz)	(dBi)	(dBm/MHz)	(dBm/MHz)
5MHz	QPSK	3652.5	9.67	9.24	12.47	17	29.47	30
		3675.0	9.80	9.27	12.55	17	29.55	
		3697.5	10.05	9.65	12.86	17	29.86	
	16-QAM	3652.5	9.70	10.21	12.97	17	29.97	
		3675.0	9.05	9.14	12.11	17	29.11	
		3697.5	9.92	10.03	12.99	17	29.99	
10MHz	QPSK	3655.0	9.45	9.42	12.45	17	29.45	30
		3675.0	9.25	9.16	12.22	17	29.22	
		3695.0	9.18	9.05	12.13	17	29.13	
	16-QAM	3655.0	9.50	9.67	12.60	17	29.60	
		3675.0	9.19	9.15	12.18	17	29.18	
		3695.0	9.30	9.50	12.41	17	29.41	
15MHz	QPSK	3657.5	6.80	6.80	9.81	17	26.81	30
		3675.0	6.86	6.84	9.86	17	26.86	
		3692.5	6.76	6.83	9.81	17	26.81	
	16-QAM	3657.5	7.00	6.79	9.91	17	26.91	
		3675.0	6.84	6.79	9.83	17	26.83	
		3692.5	6.69	6.82	9.77	17	26.77	
20MHz	QPSK	3660.0	5.92	6.15	9.05	17	26.05	30
		3675.0	5.94	5.95	8.96	17	25.96	
		3690.0	6.45	6.24	9.36	17	26.36	
	16-QAM	3660.0	6.07	6.03	9.06	17	26.06	
		3675.0	6.04	6.02	9.04	17	26.04	
		3690.0	6.18	6.37	9.29	17	26.29	

Please refer to the following plots

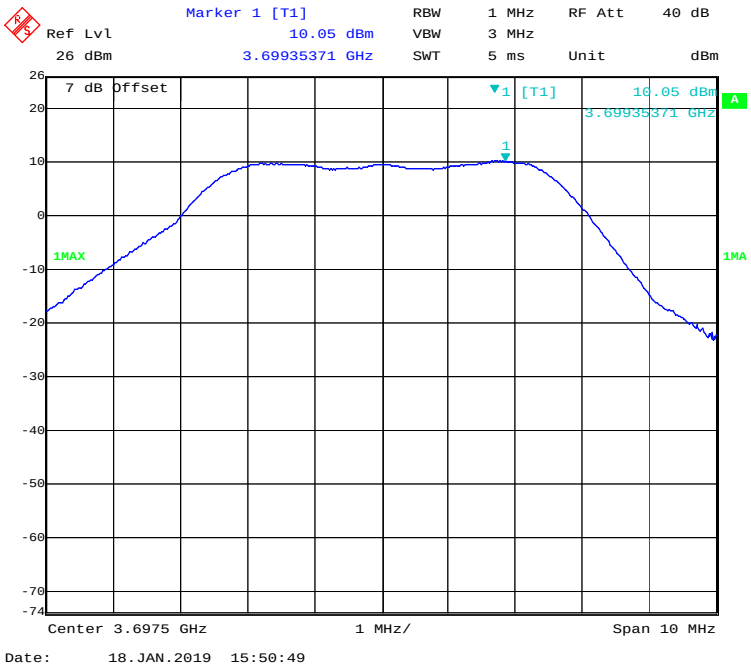
QPSK (5 MHz) - Peak Power Density, Chain0 Low channel



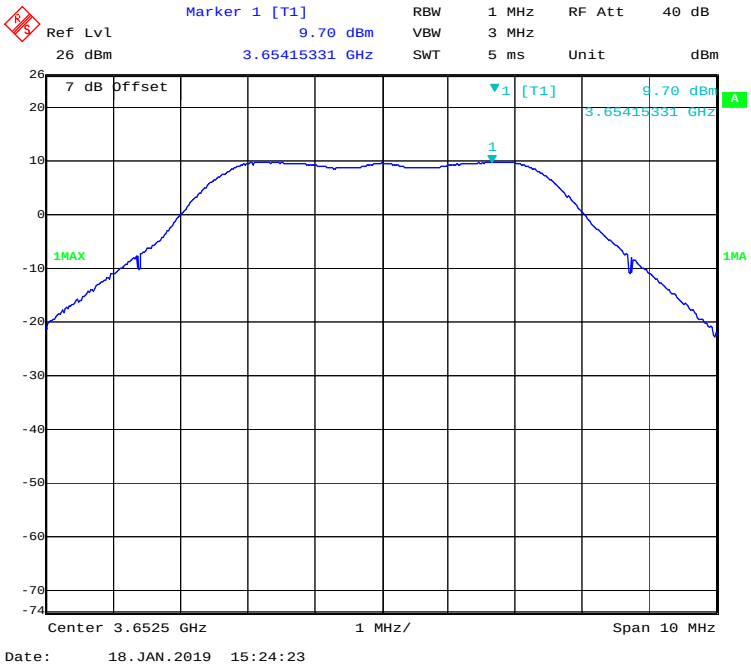
QPSK (5 MHz) - Peak Power Density, Chain0 Middle channel



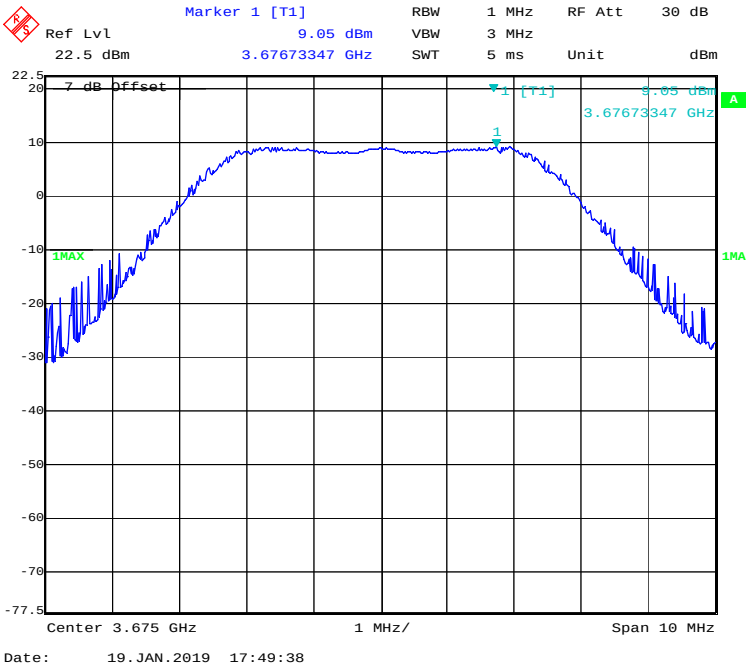
QPSK (5 MHz) - Peak Power Density, Chain0 High channel



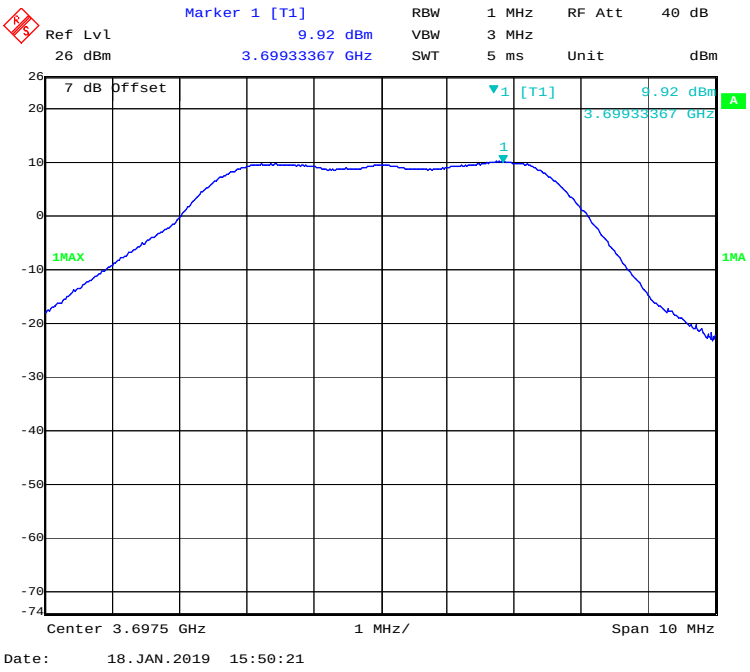
16-QAM (5 MHz) - Peak Power Density, Chain0 Low channel



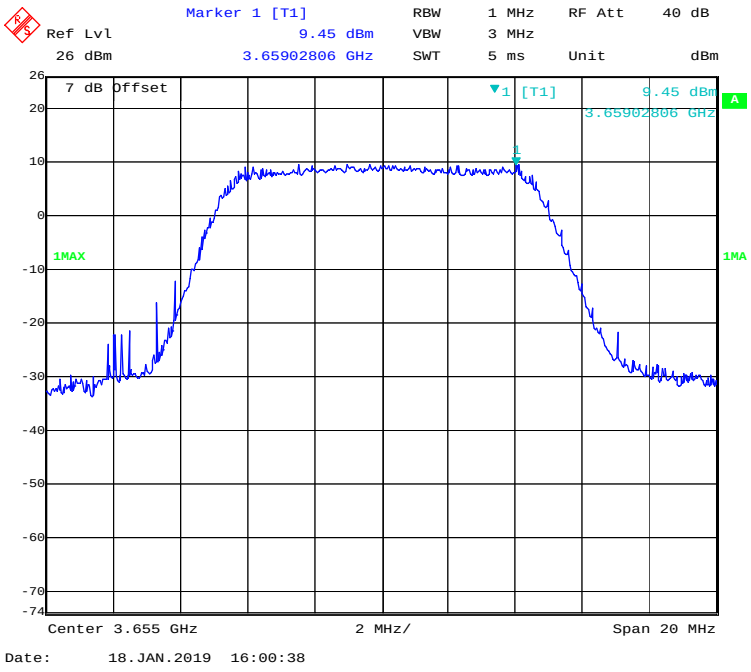
16-QAM (5 MHz) - Peak Power Density, Chain0 Middle channel



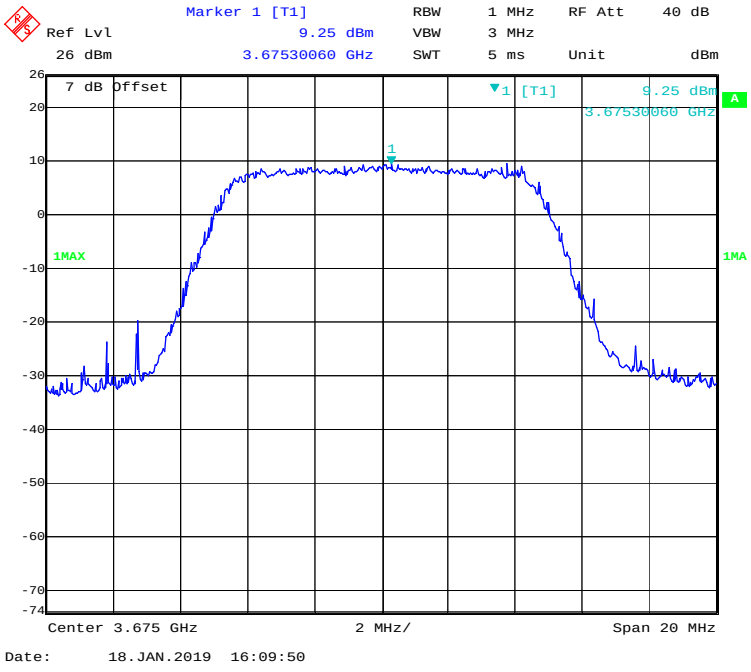
16-QAM (5 MHz) - Peak Power Density, Chain0 High channel



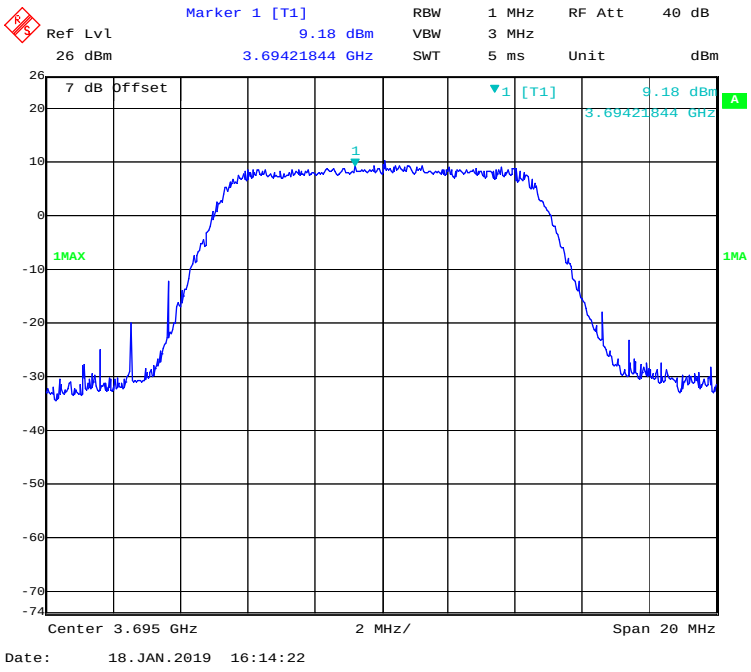
QPSK (10 MHz) - Peak Power Density, Chain0 Low channel



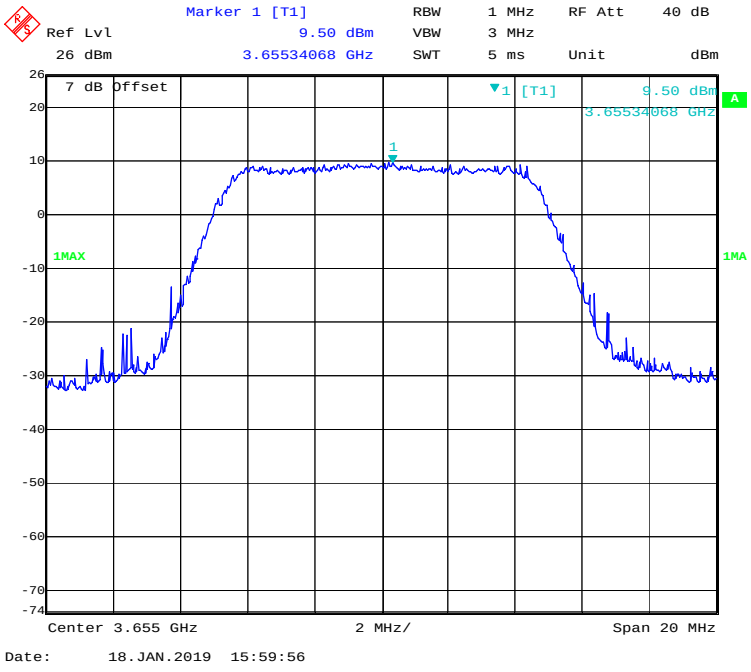
QPSK (10 MHz) - Peak Power Density, Chain0 Middle channel



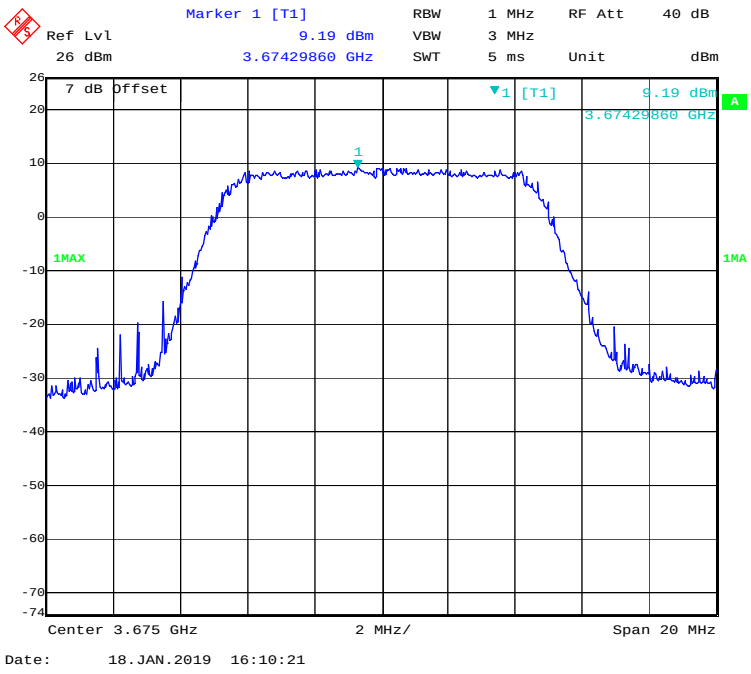
QPSK (10 MHz) - Peak Power Density, Chain0 High channel



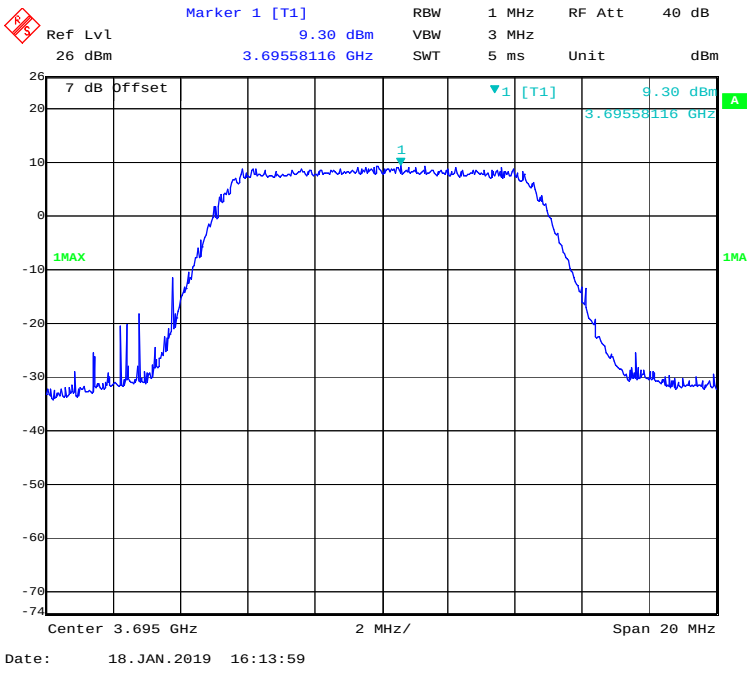
16-QAM (10 MHz) - Peak Power Density, Chain0 Low channel



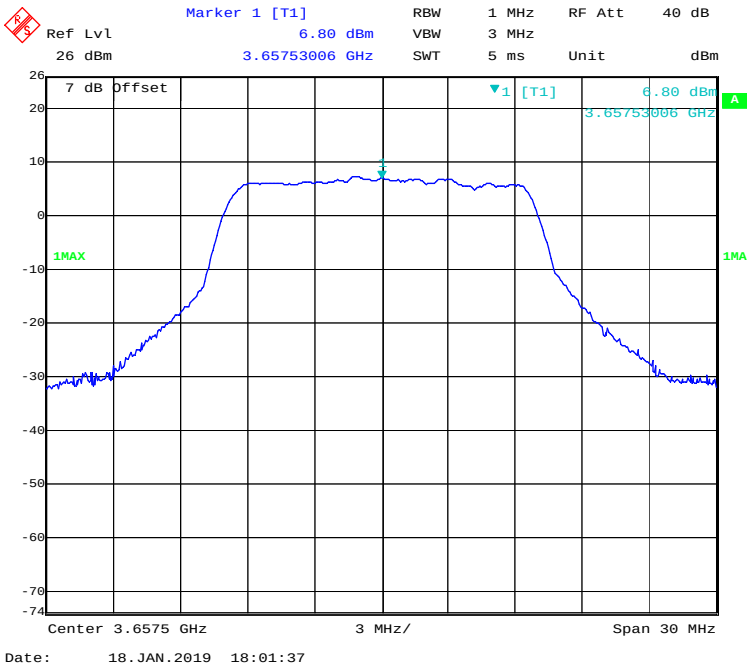
16-QAM (10 MHz) - Peak Power Density, Chain0 Middle channel



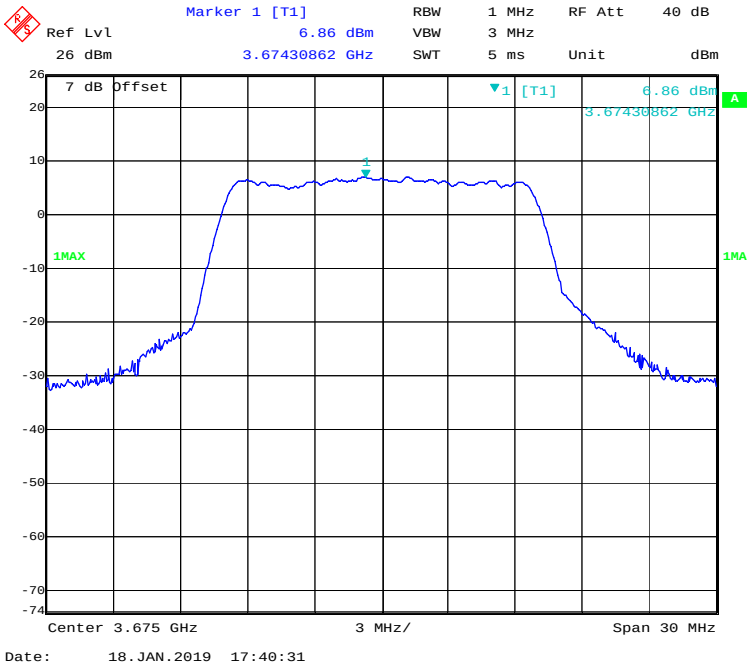
16-QAM (10 MHz) - Peak Power Density, Chain0 High channel



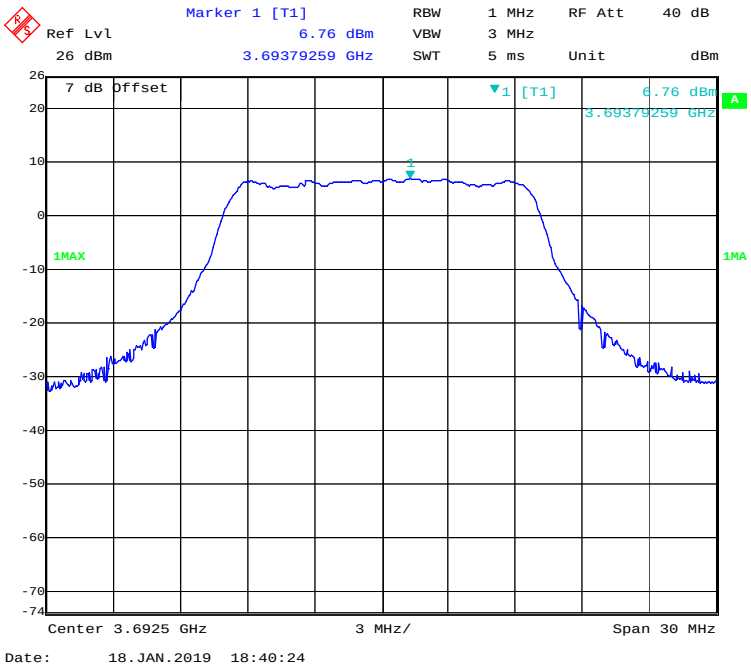
QPSK (15 MHz) - Peak Power Density, Chain0 Low channel



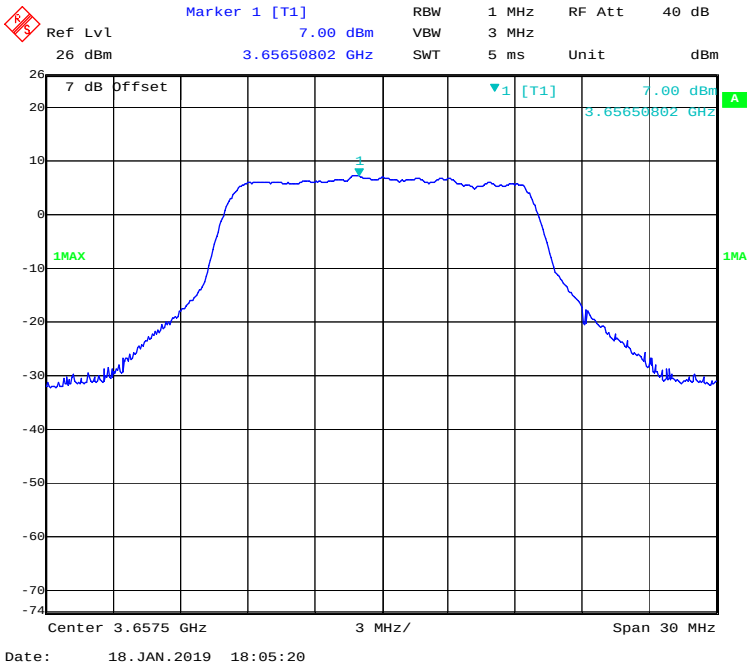
QPSK (15 MHz) - Peak Power Density, Chain0 Middle channel



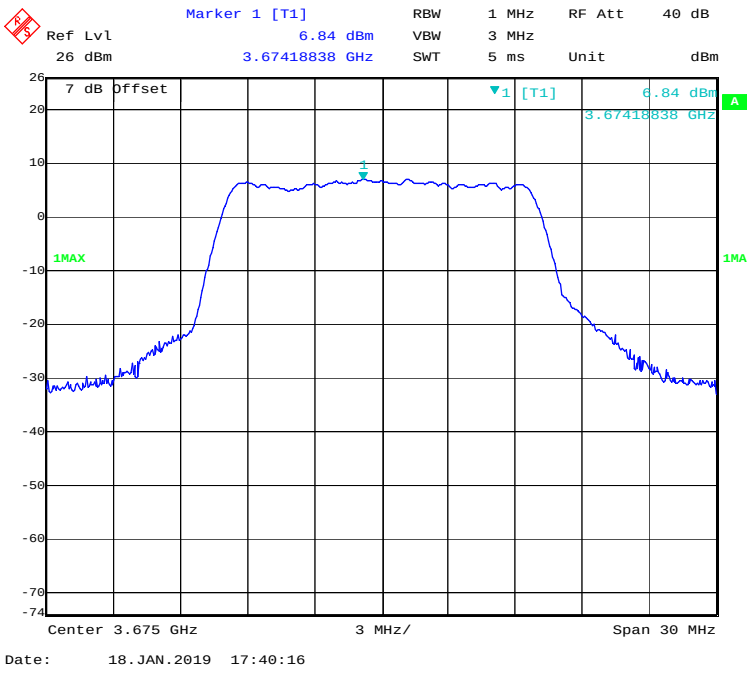
QPSK (15 MHz) - Peak Power Density, Chain0 High channel



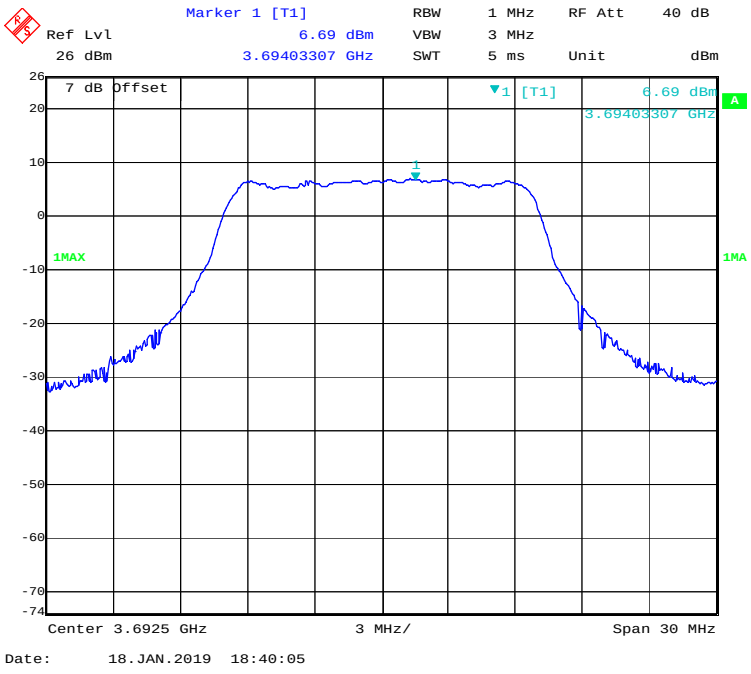
16-QAM (15 MHz) - Peak Power Density, Chain0 Low channel



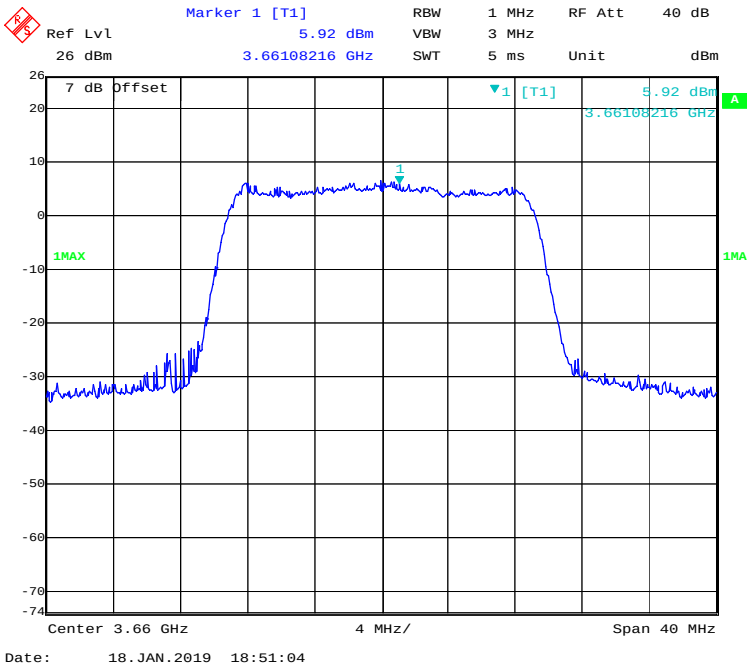
16-QAM (15 MHz) - Peak Power Density, Chain0 Middle channel



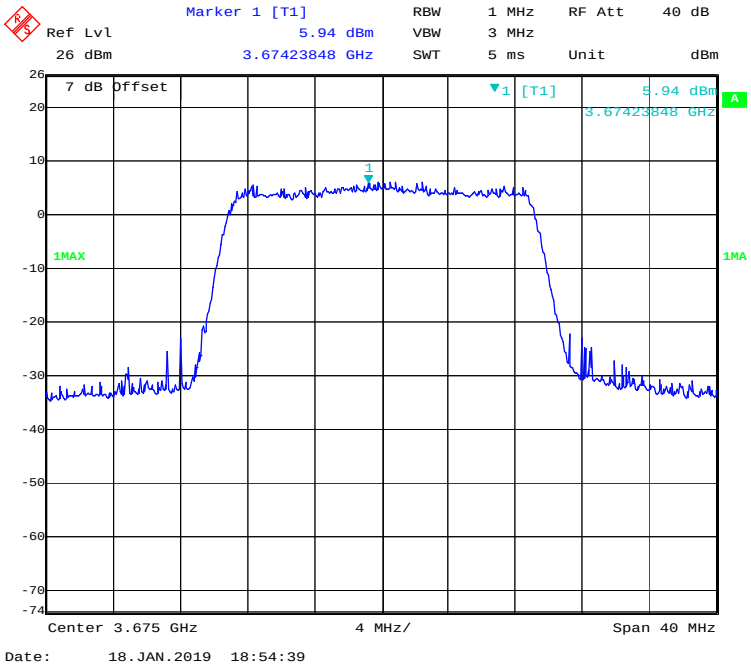
16-QAM (15 MHz) - Peak Power Density, Chain0 High channel



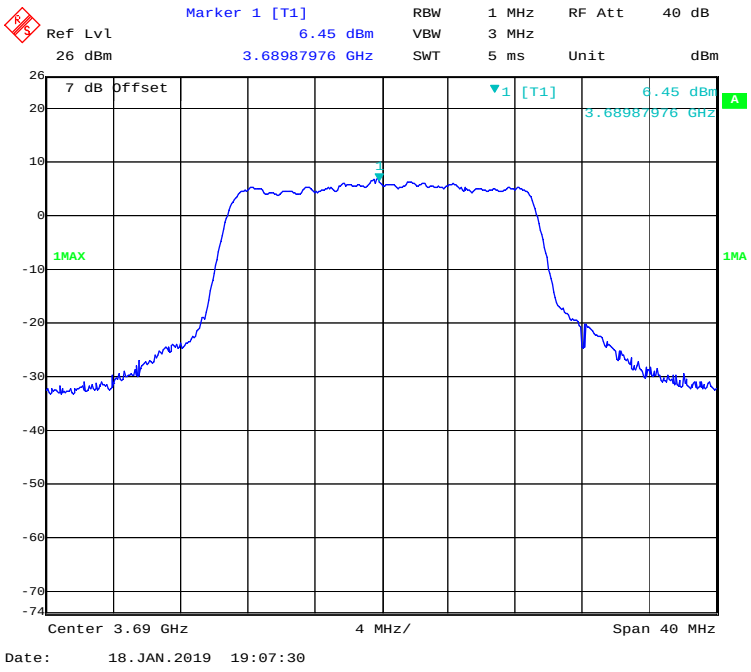
QPSK (20 MHz) - Peak Power Density, Chain0 Low channel



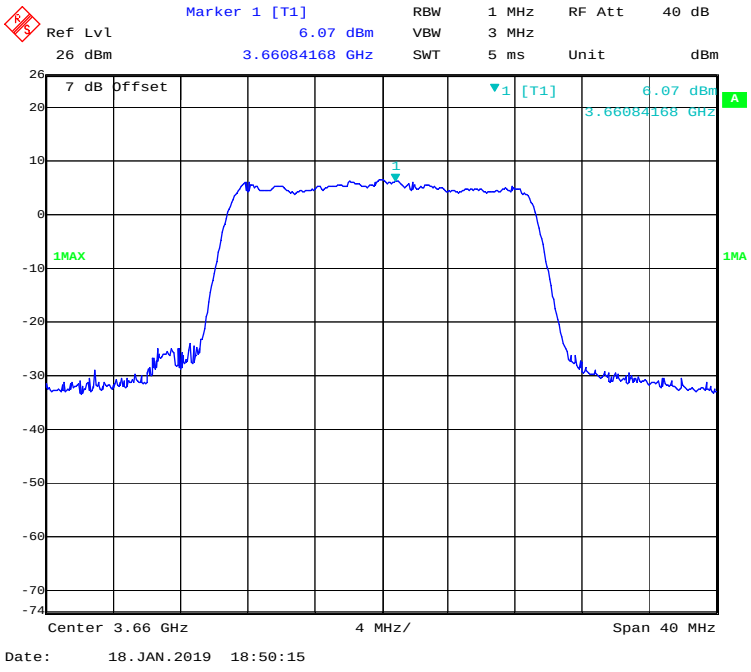
QPSK (20 MHz) - Peak Power Density, Chain0 Middle channel



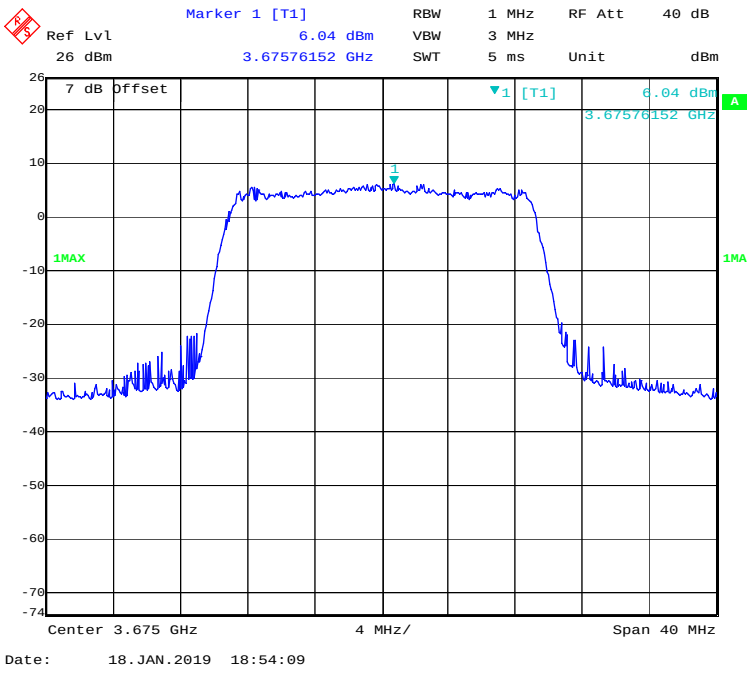
QPSK (20 MHz) - Peak Power Density, Chain0 High channel



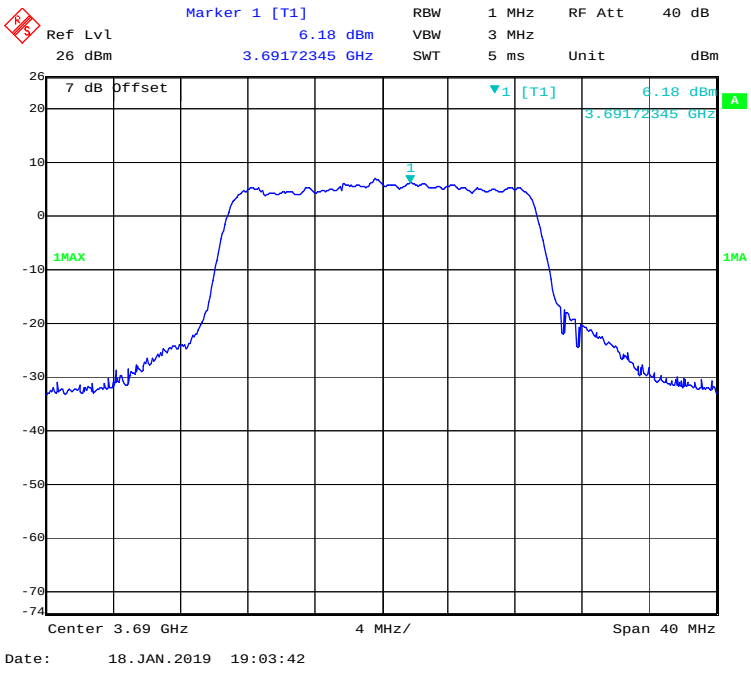
16-QAM (20 MHz) - Peak Power Density, Chain0 Low channel



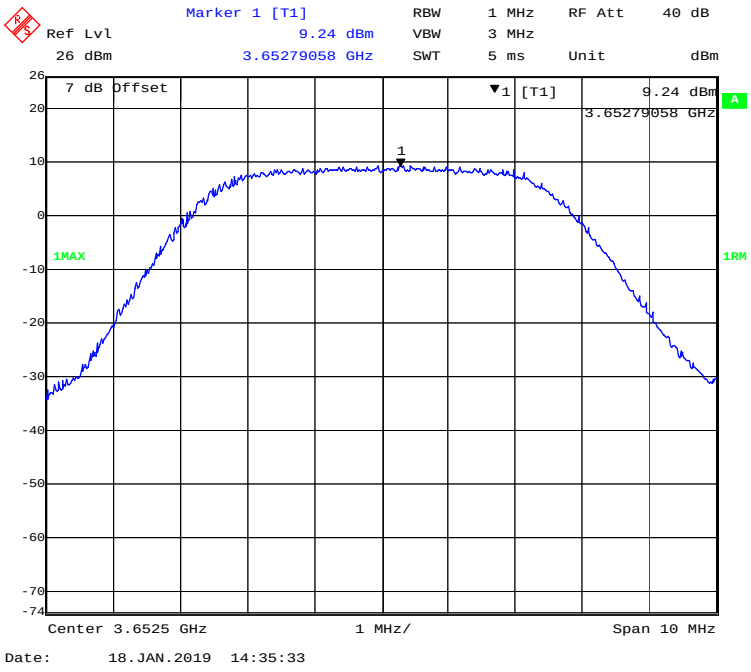
16-QAM (20 MHz) - Peak Power Density, Chain0 Middle channel



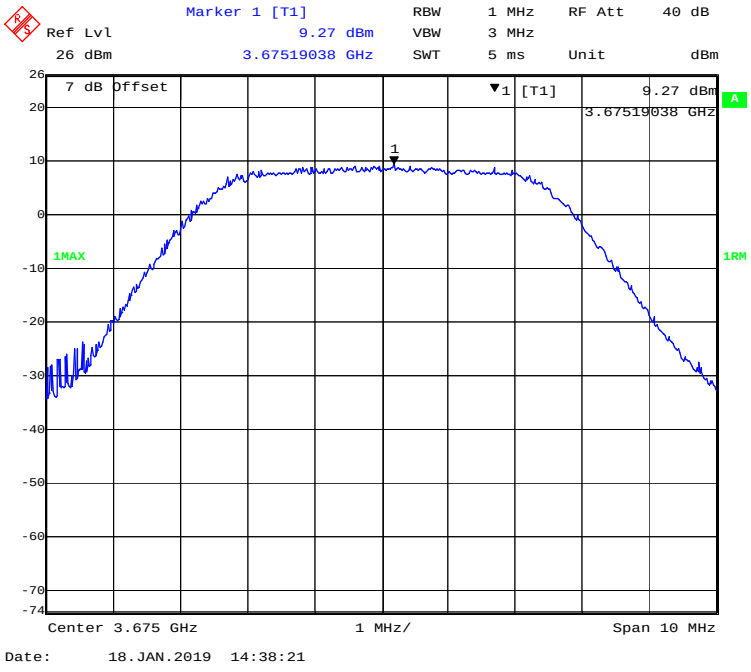
16-QAM (20 MHz) - Peak Power Density, Chain0 High channel



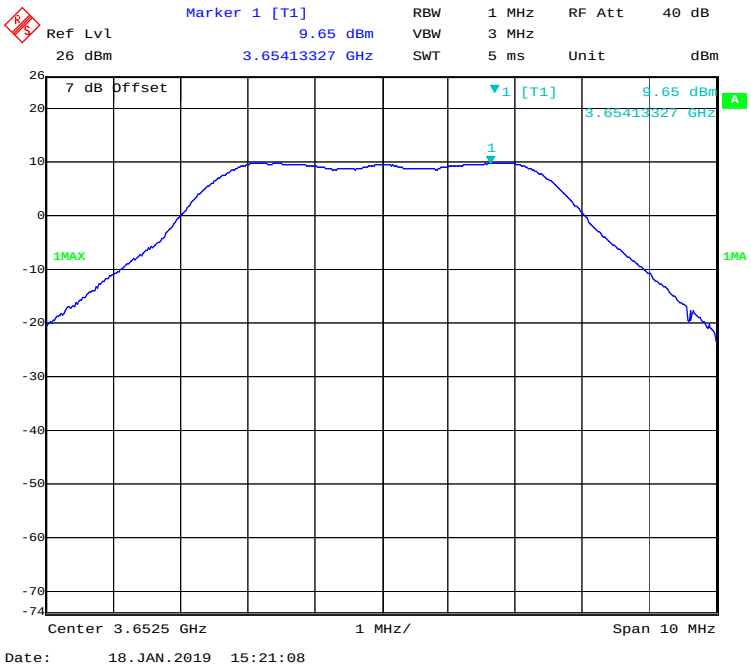
QPSK (5 MHz) - Peak Power Density, Chain1 Low channel



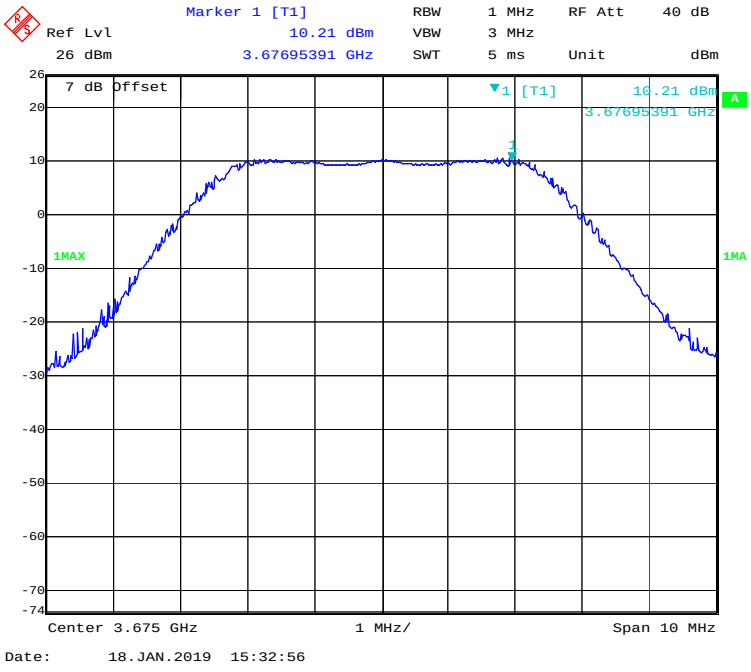
QPSK (5 MHz) - Peak Power Density, Chain1 Middle channel



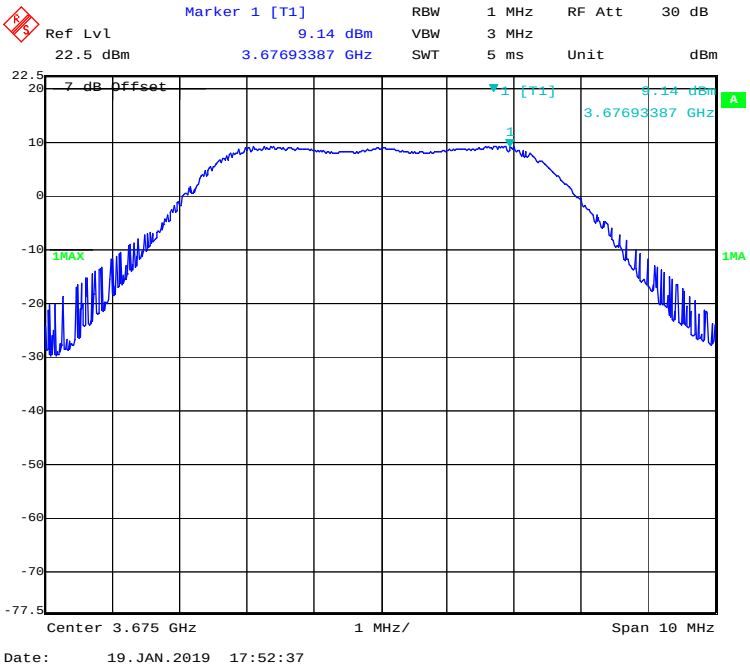
QPSK (5 MHz) - Peak Power Density, Chain1 High channel



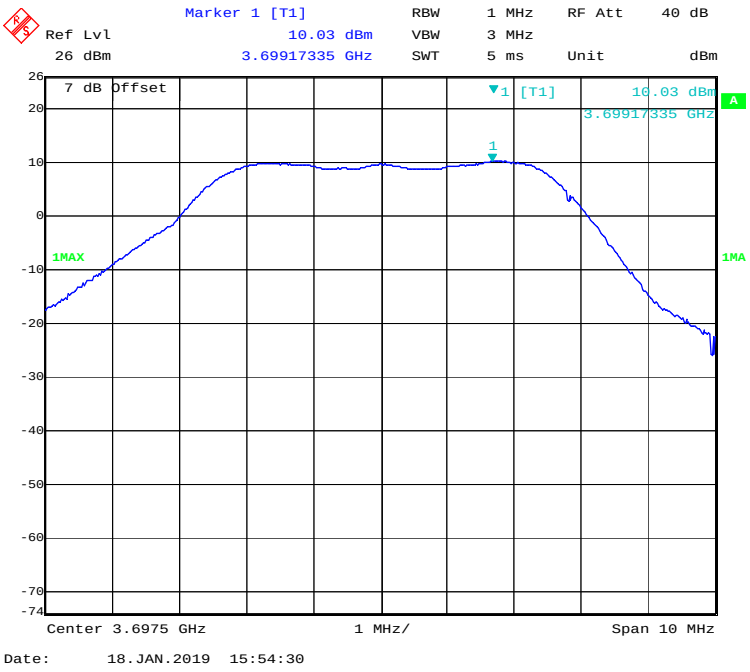
16-QAM (5 MHz) - Peak Power Density, Chain1 Low channel



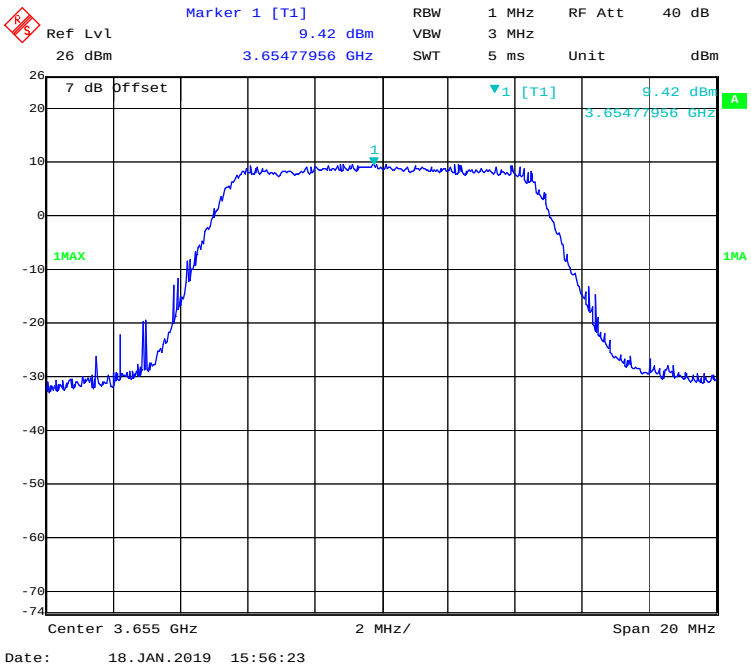
16-QAM (5 MHz) - Peak Power Density, Chain1 Middle channel



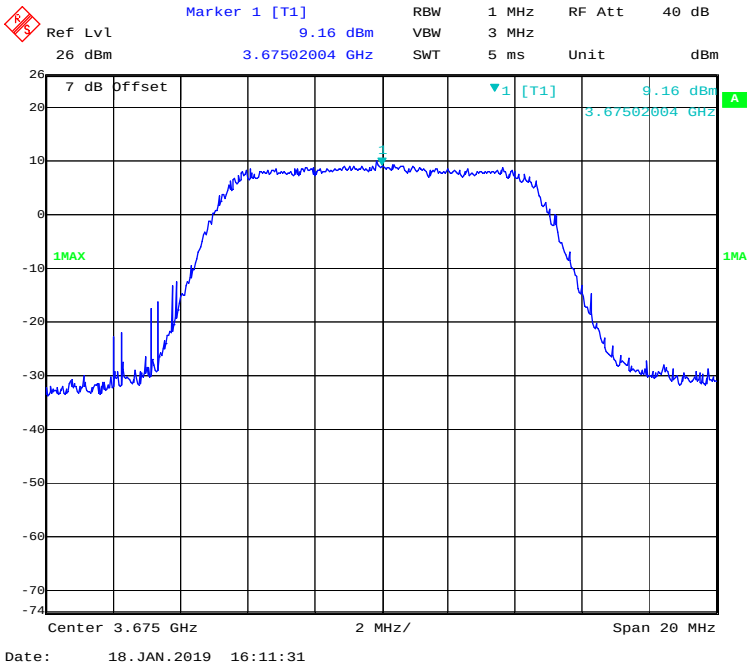
16-QAM (5 MHz) - Peak Power Density, Chain1 High channel



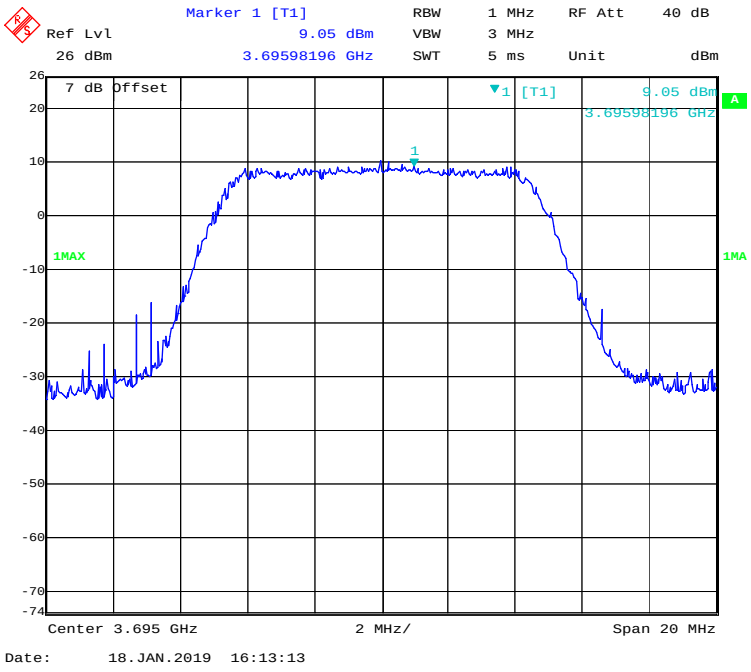
QPSK (10 MHz) - Peak Power Density, Chain1 Low channel



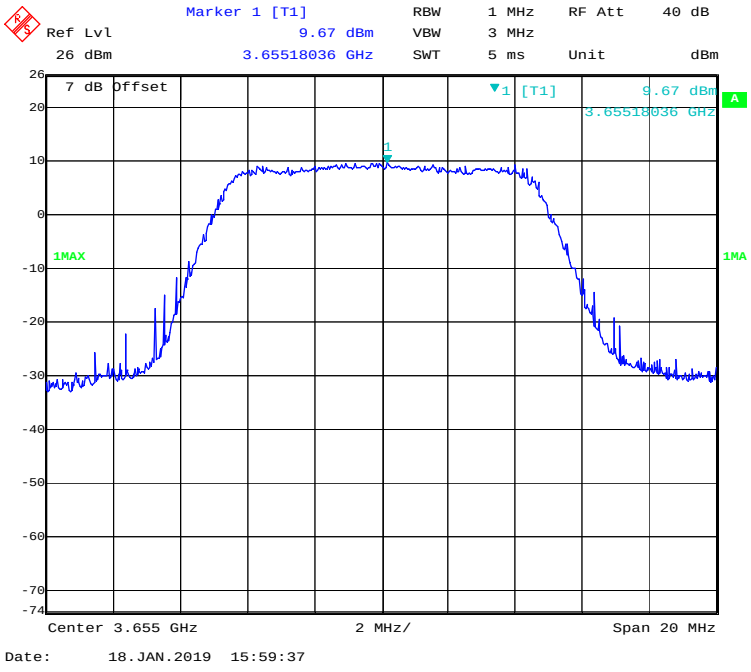
QPSK (10 MHz) - Peak Power Density, Chain1 Middle channel



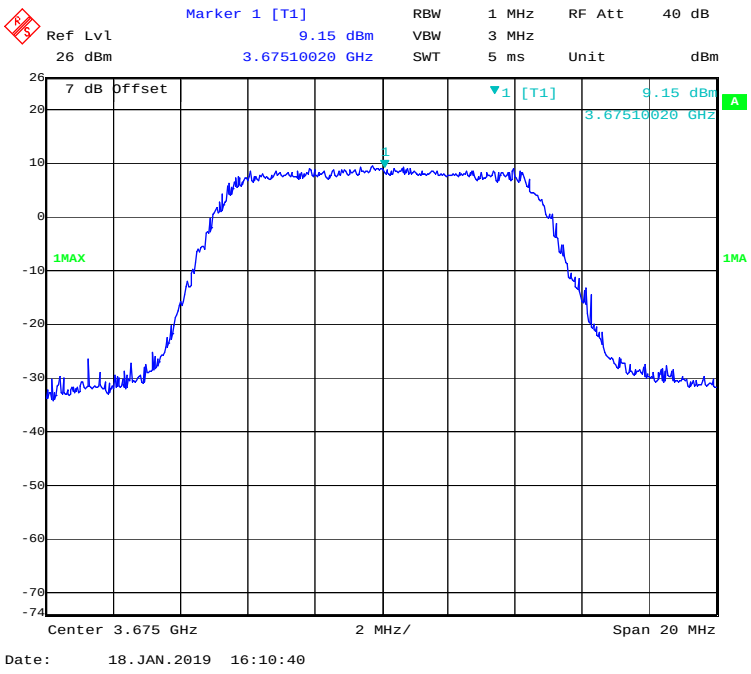
QPSK (10 MHz) - Peak Power Density, Chain1 High channel



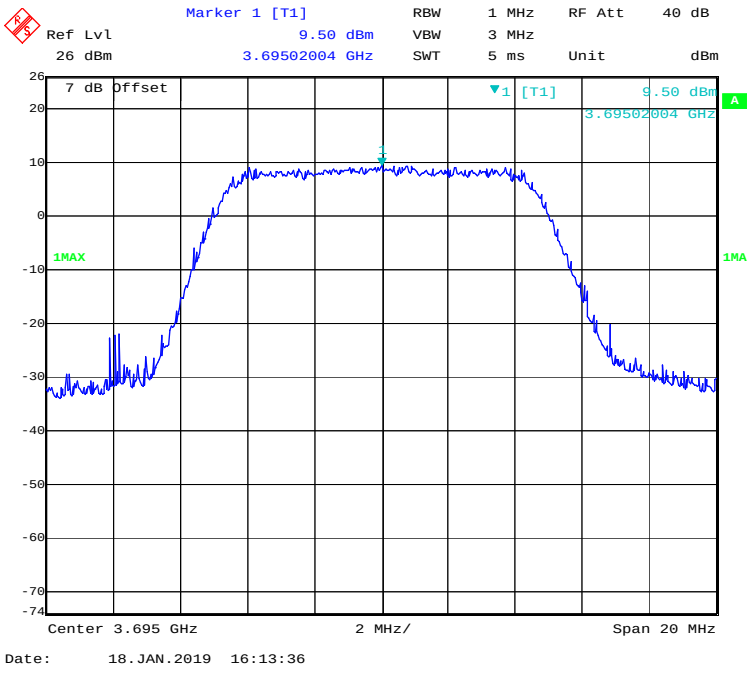
16-QAM (10 MHz) - Peak Power Density, Chain1 Low channel



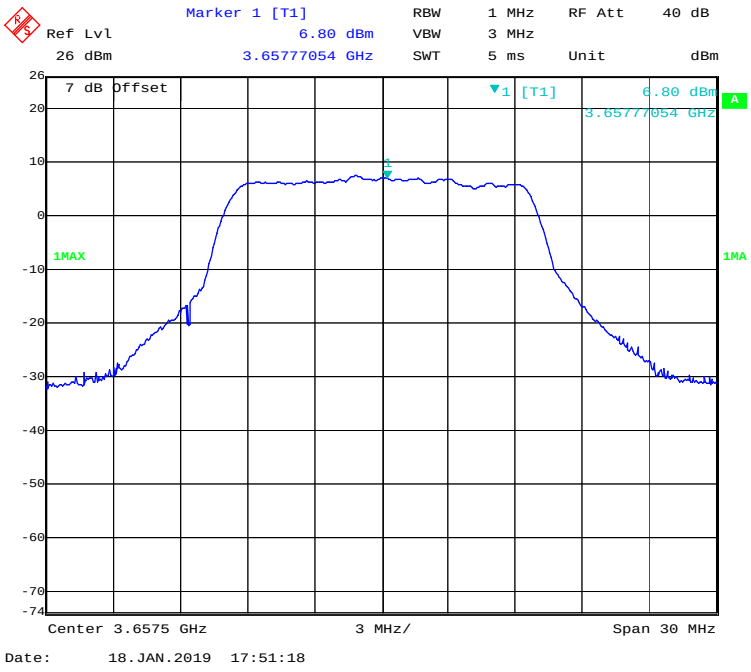
16-QAM (10 MHz) - Peak Power Density, Chain1 Middle channel



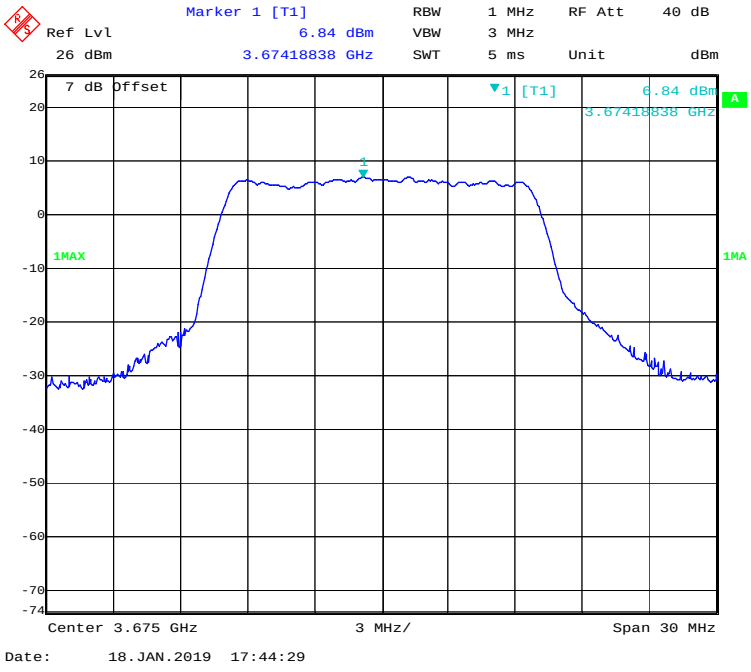
16-QAM (10 MHz) - Peak Power Density, Chain1 High channel



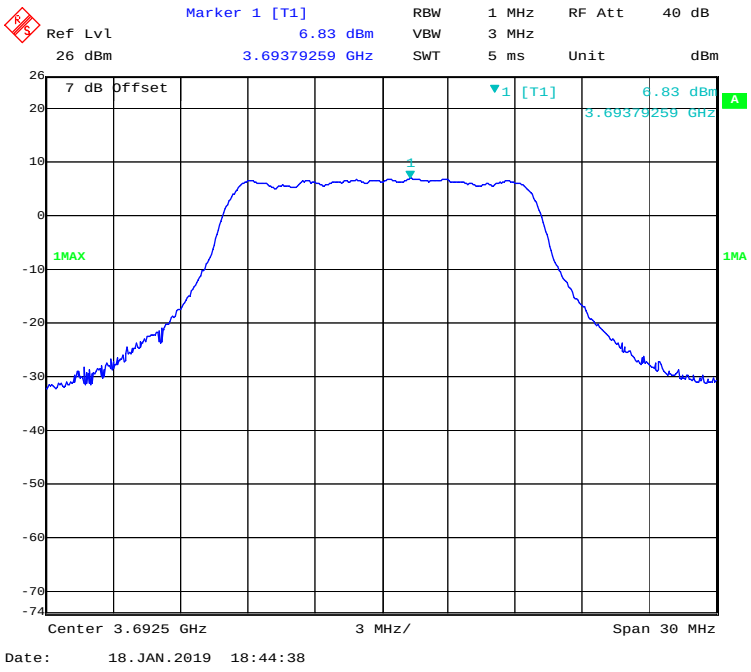
QPSK (15 MHz) - Peak Power Density, Chain1 Low channel



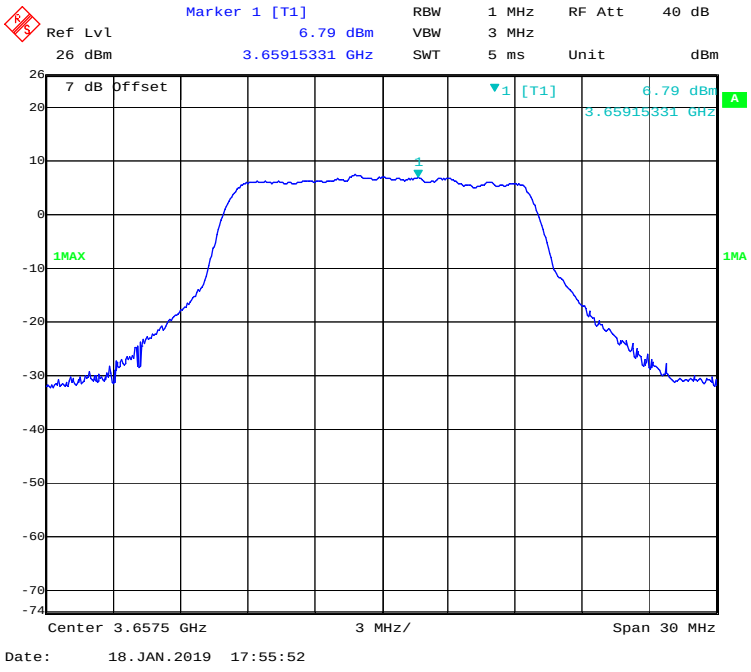
QPSK (15 MHz) - Peak Power Density, Chain1 Middle channel



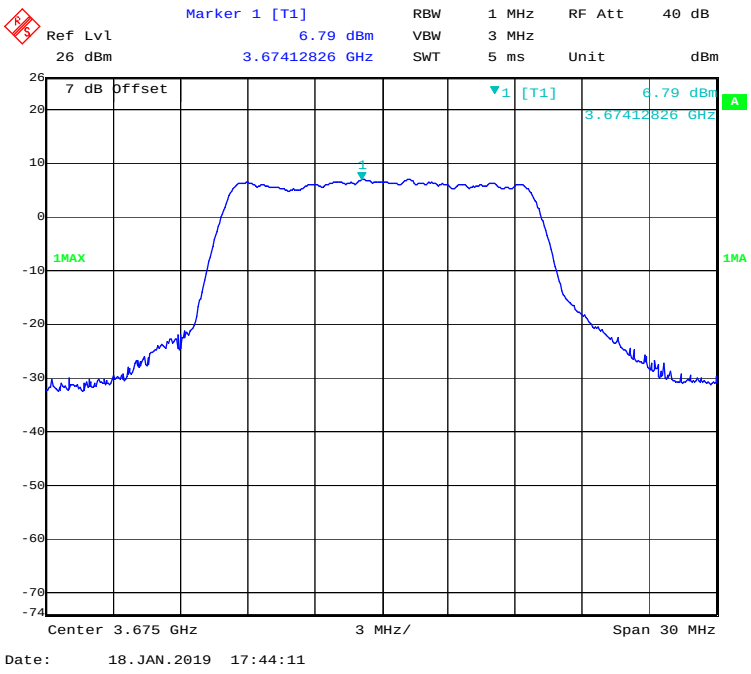
QPSK (15 MHz) - Peak Power Density, Chain1 High channel



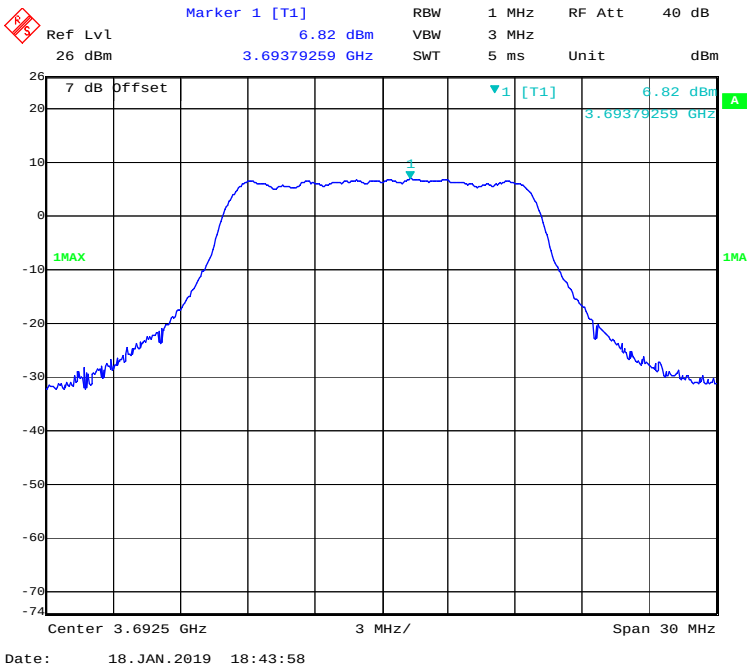
16-QAM (15 MHz) - Peak Power Density, Chain1 Low channel



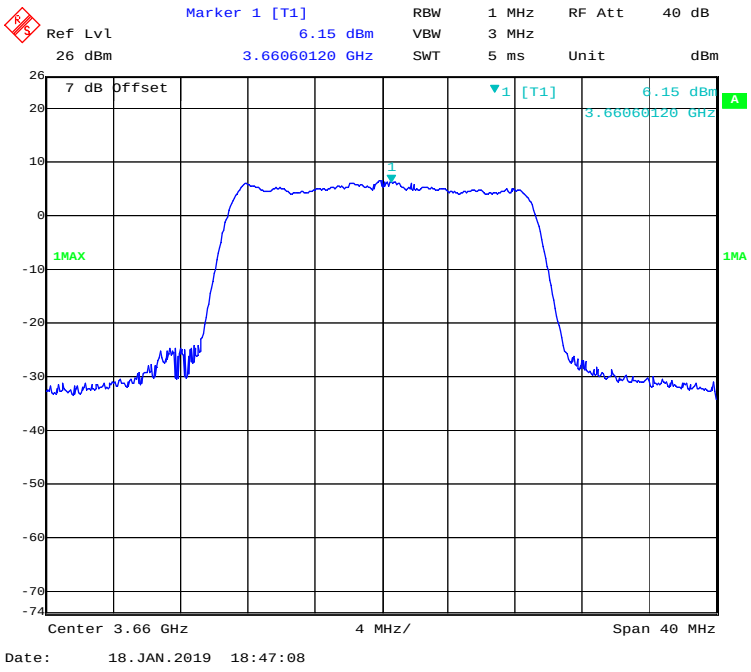
16-QAM (15 MHz) - Peak Power Density, Chain1 Middle channel



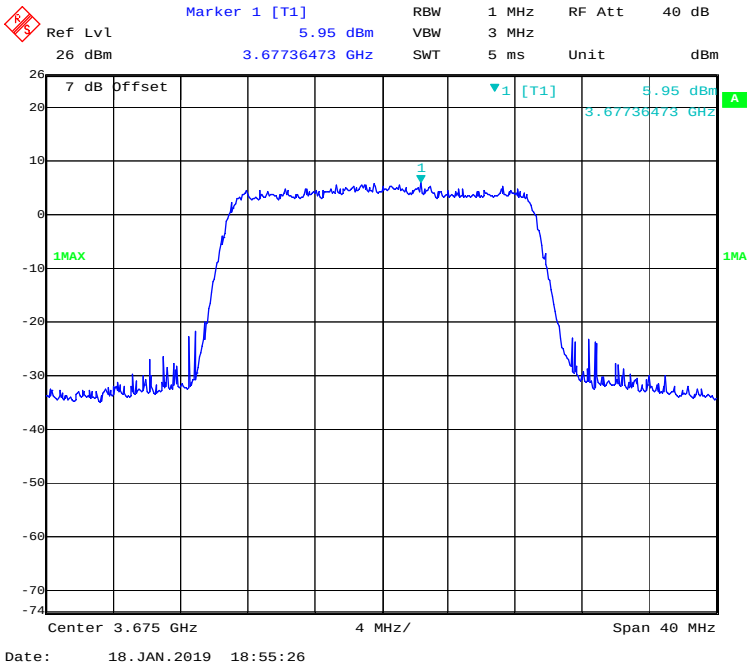
16-QAM (15 MHz) - Peak Power Density, Chain1 High channel



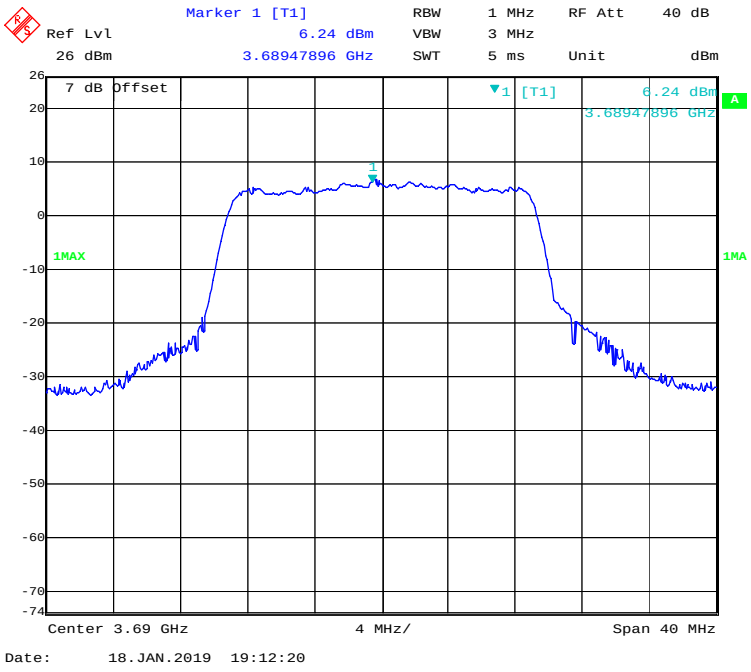
QPSK (20 MHz) - Peak Power Density, Chain1 Low channel



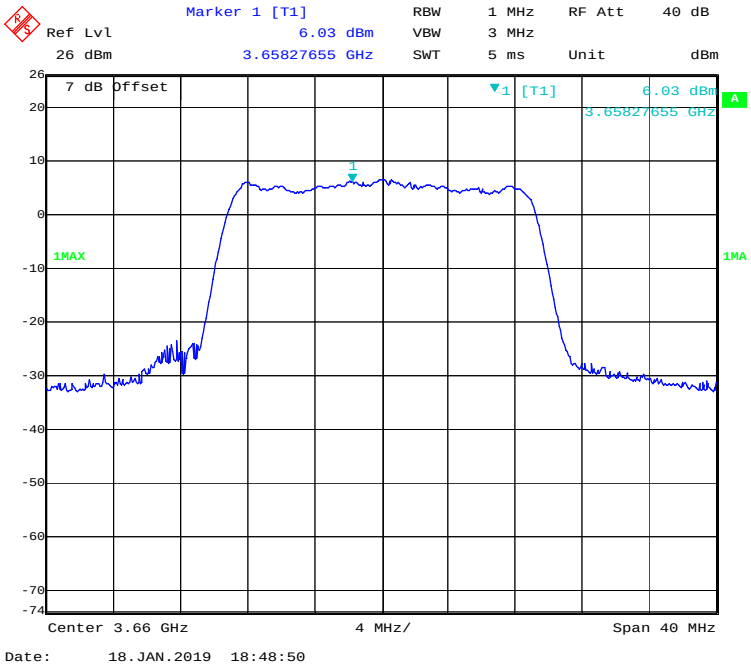
QPSK (20 MHz) - Peak Power Density, Chain1 Middle channel



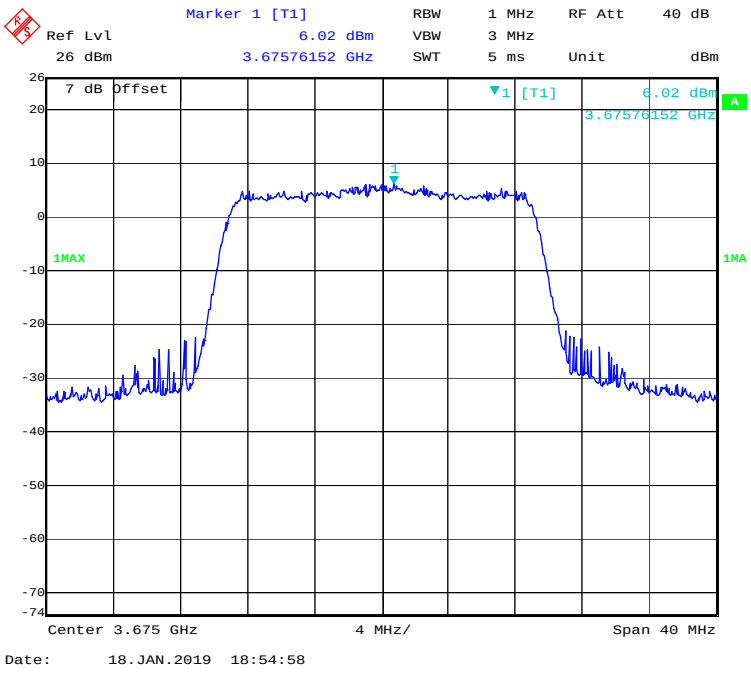
QPSK (20 MHz) - Peak Power Density, Chain1 High channel



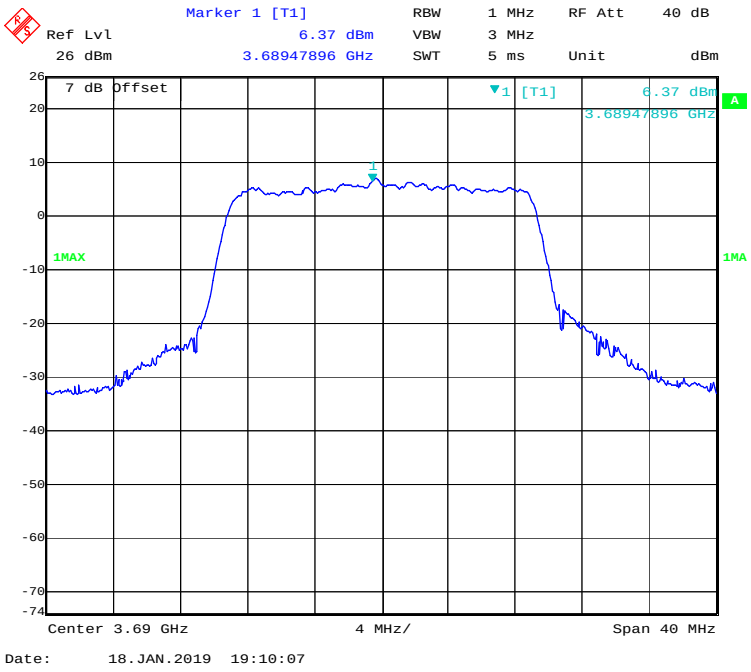
16-QAM (20 MHz) - Peak Power Density, Chain1 Low channel



16-QAM (20 MHz) - Peak Power Density, Chain1 Middle channel



16-QAM (20 MHz) - Peak Power Density, Chain1 High channel



FCC §2.1049, §90.209 - OCCUPIED BANDWIDTH

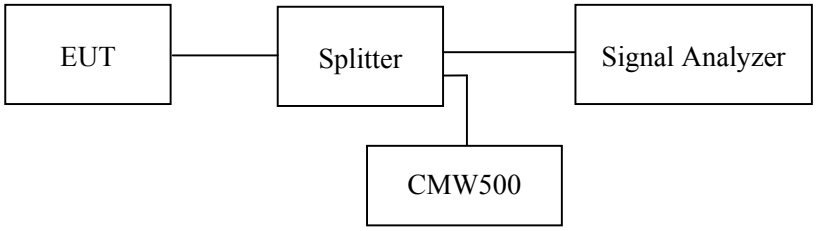
Applicable Standards

FCC 47 §2.1049 and §90.209.

Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 50 kHz (5MHz BW), 100 kHz (10MHz BW), 200 kHz (15MHz/20MHz BW), and the 99%&26dB bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	22.5℃
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Hope Zhang on 2019-01-18

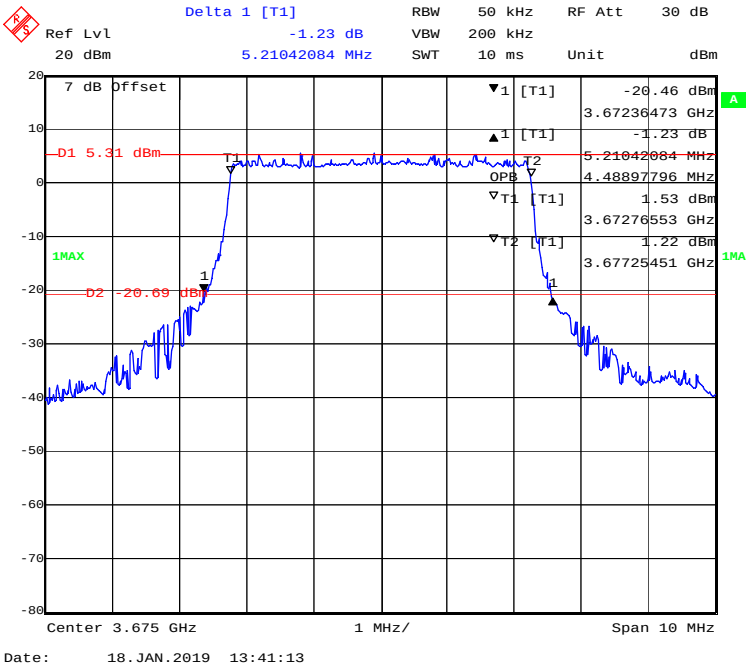
EUT operation mode: Transmitting

Test Result: Compliance.

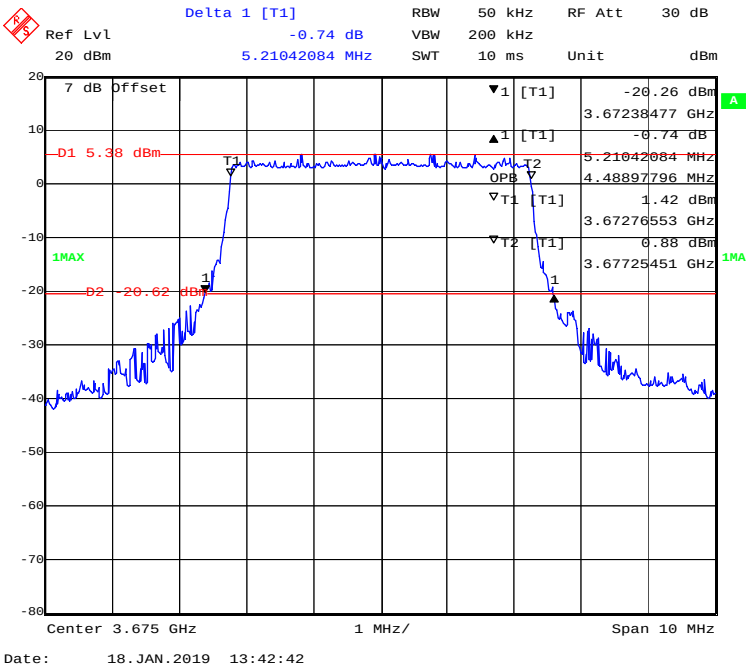
LTE Band: 3650-3700MHz

Test Bandwidth	Test Modulation	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		Chain0	Chain1	Chain0	Chain1
5M	QPSK	4.49	4.49	5.21	5.19
	16-QAM	4.49	4.49	5.21	5.14
10M	QPSK	8.94	8.98	9.74	9.86
	16-QAM	9.02	8.98	9.78	9.90
15M	QPSK	13.53	13.47	14.91	14.90
	16-QAM	13.47	13.47	14.85	14.96
20M	QPSK	17.96	17.96	18.92	19.08
	16-QAM	17.96	17.88	18.92	19.08

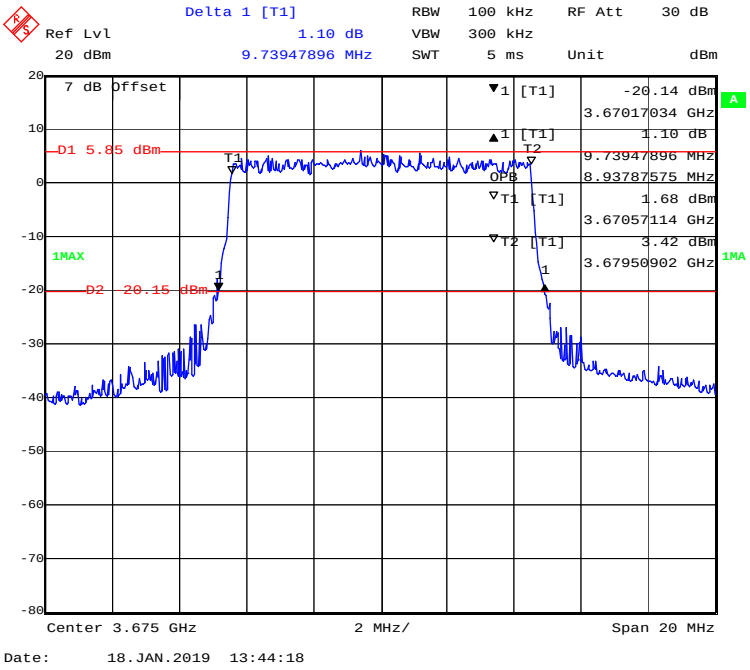
QPSK (5 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



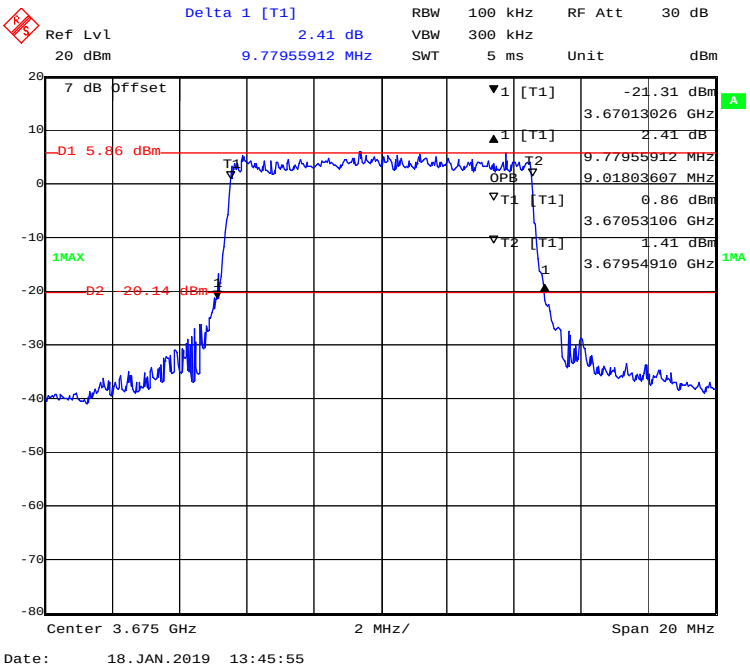
16-QAM (5 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



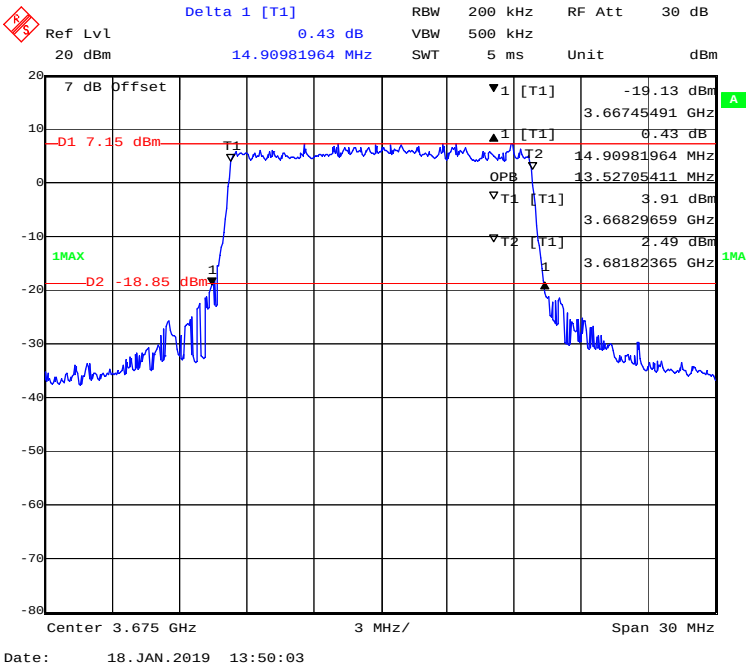
QPSK (10 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



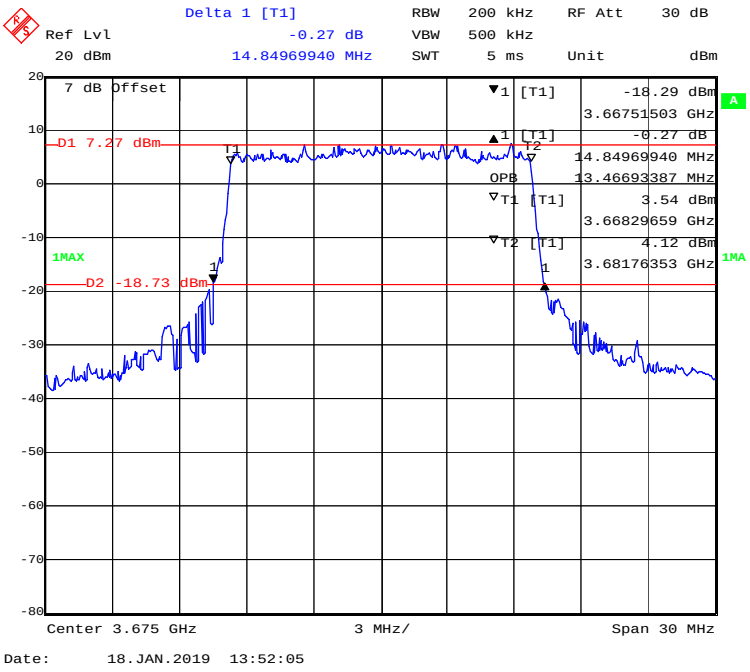
16-QAM (10 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



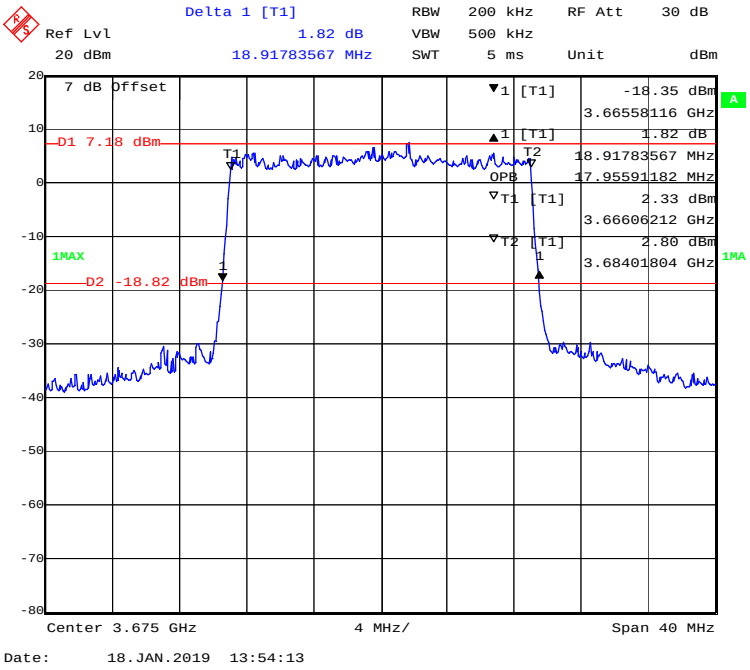
QPSK (15 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



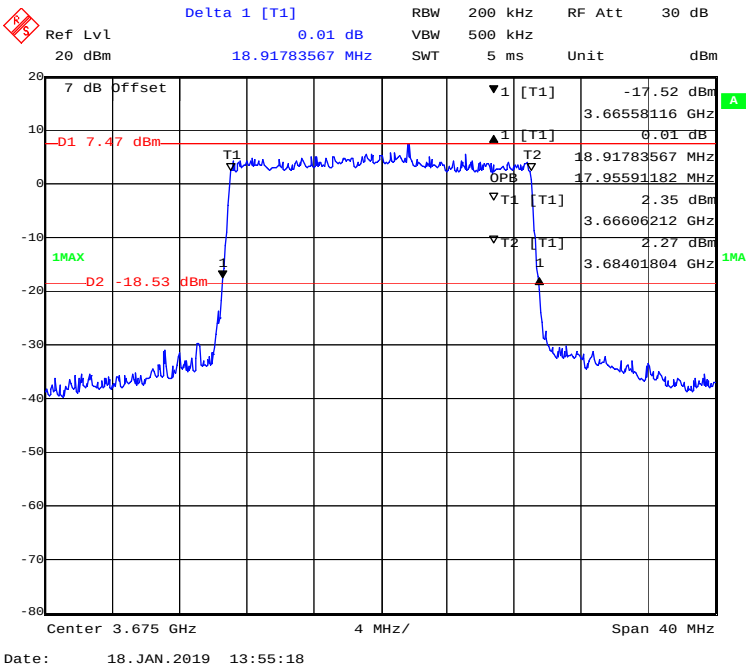
16-QAM (15 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



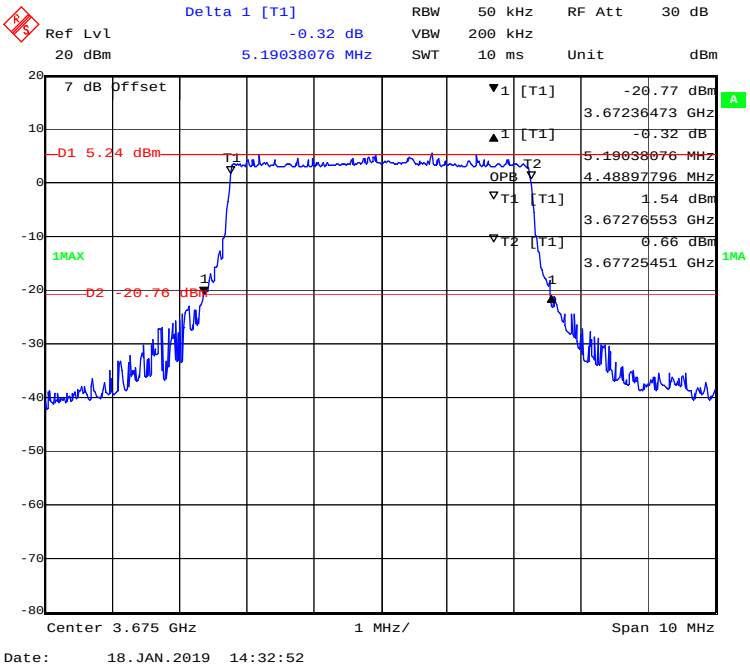
QPSK (20 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



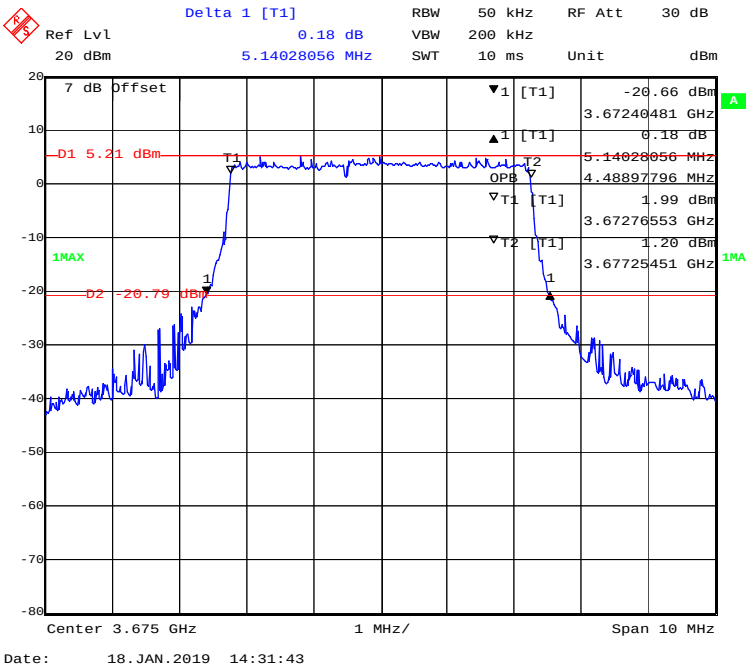
16-QAM (20 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain0 Middle channel



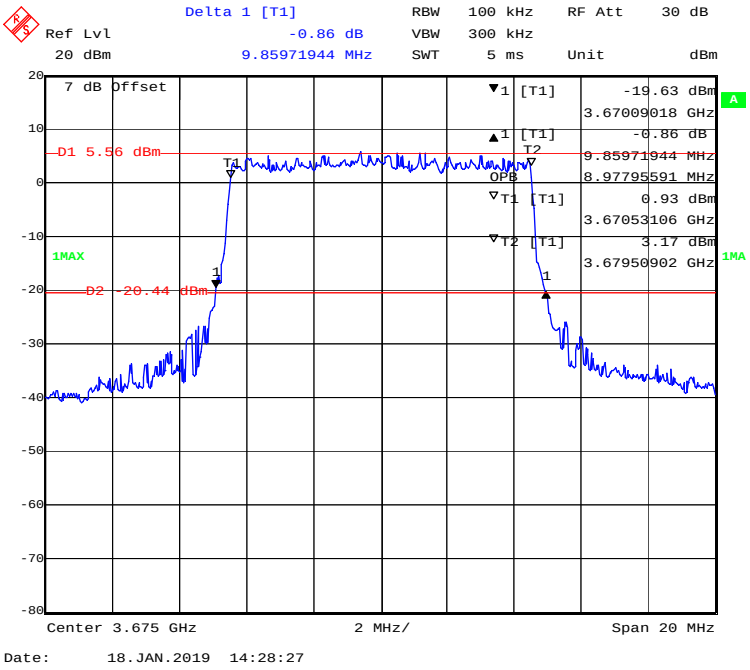
QPSK (5 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



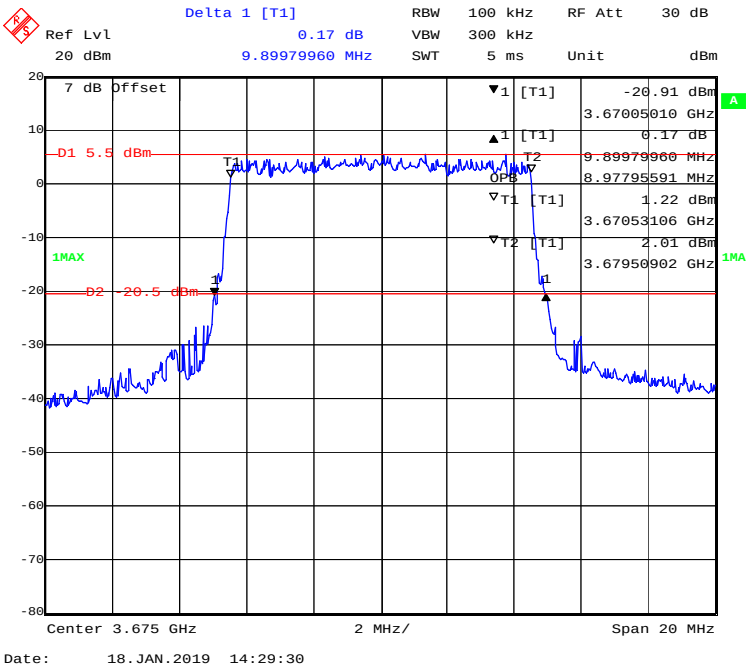
16-QAM (5 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



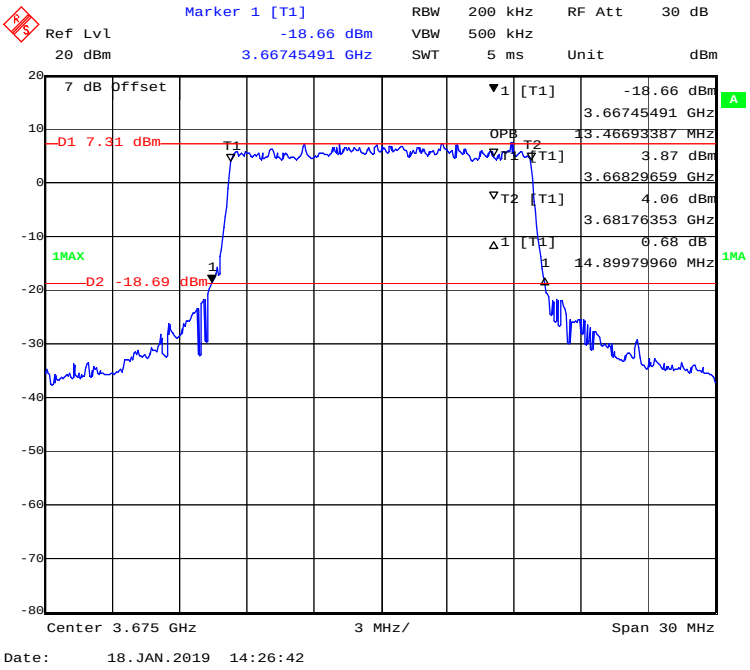
QPSK (10 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



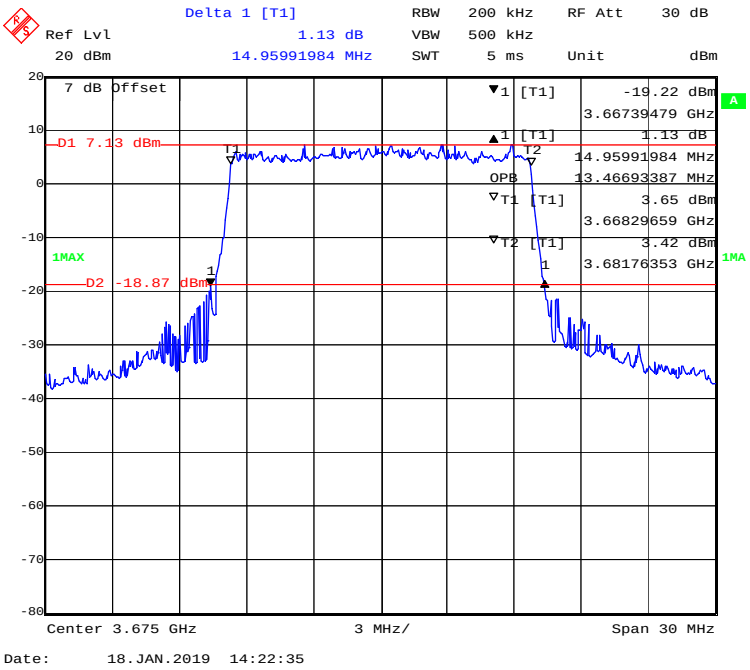
16-QAM (10 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



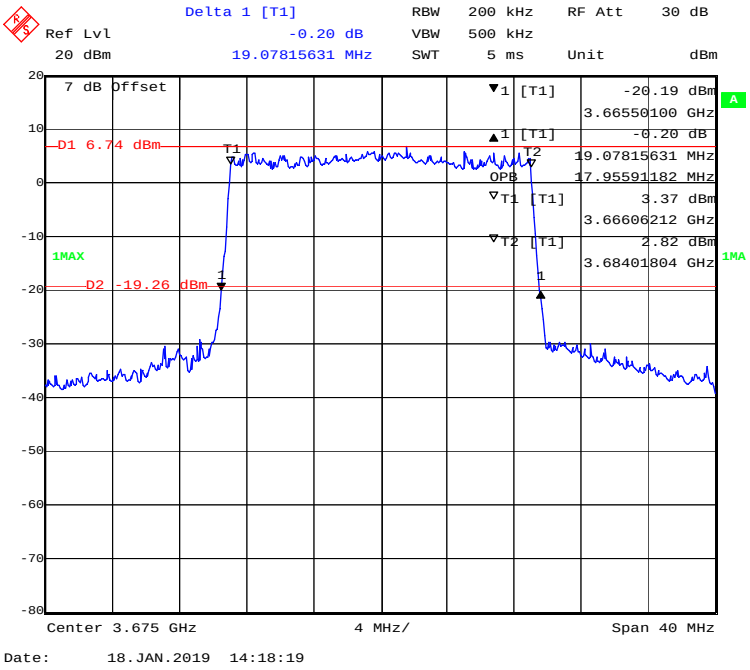
QPSK (15 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



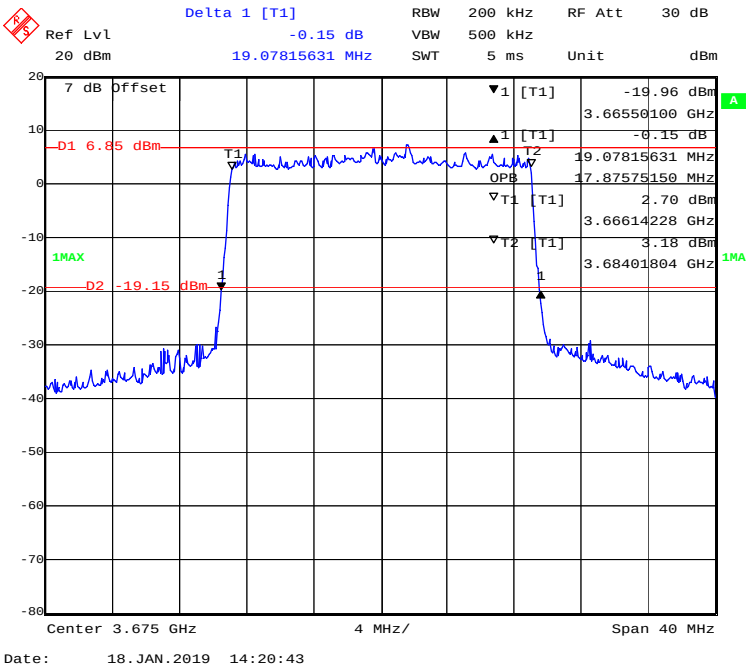
16-QAM (15 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



QPSK (20 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



16-QAM (20 MHz) - 99% Occupied Bandwidth &26dB Bandwidth, Chain1 Middle channel



FCC § 2.1051; § 90.1323 (a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standards

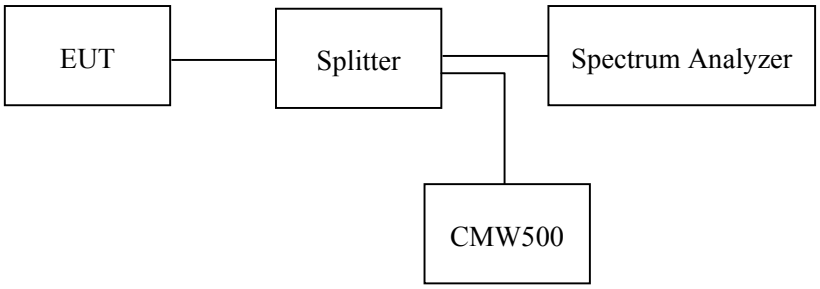
FCC §2.1051 and §90.1323(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

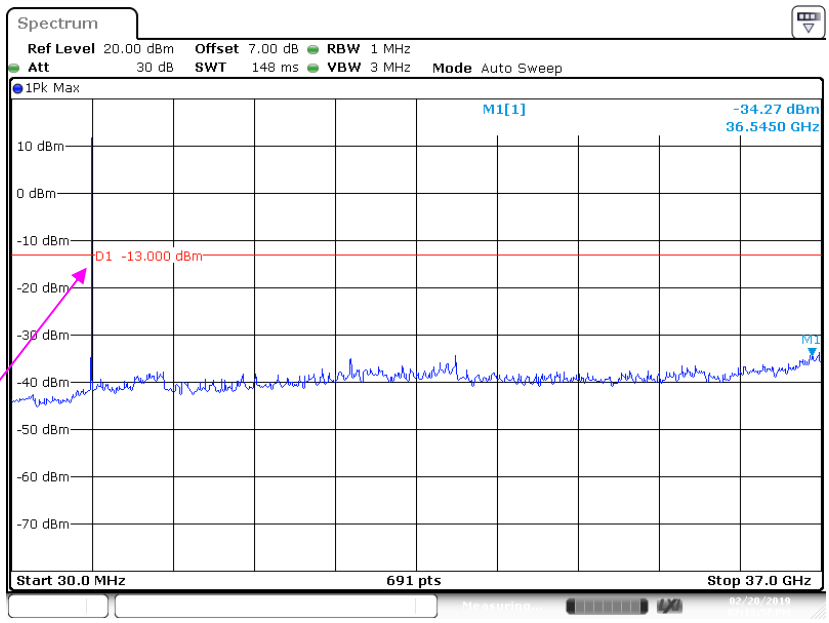
Environmental Conditions

Temperature:	23.2-24.0℃
Relative Humidity:	48-51 %
ATM Pressure:	101.0-101.3kPa

The testing was performed by Hope Zhang from 2019-01-05 to 2019-02-20.

EUT operation mode: Transmitting
Note: All the emissions are under the limit 3dB, so the MIMO mode also compliance the limit.
Test Result: Compliance.

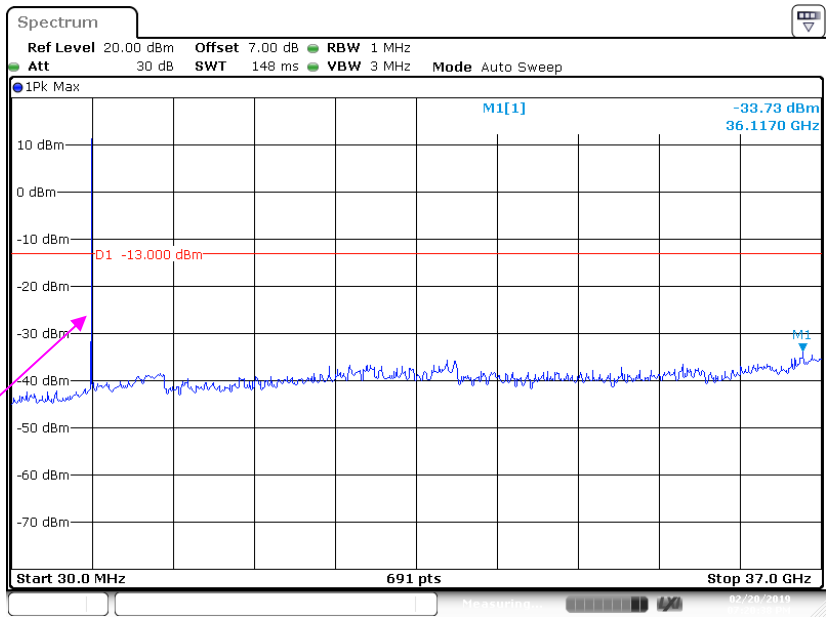
QPSK (5 MHz), Chain0 Middle Channel



Fundamental

Date: 20.FEB.2019 19:13:57

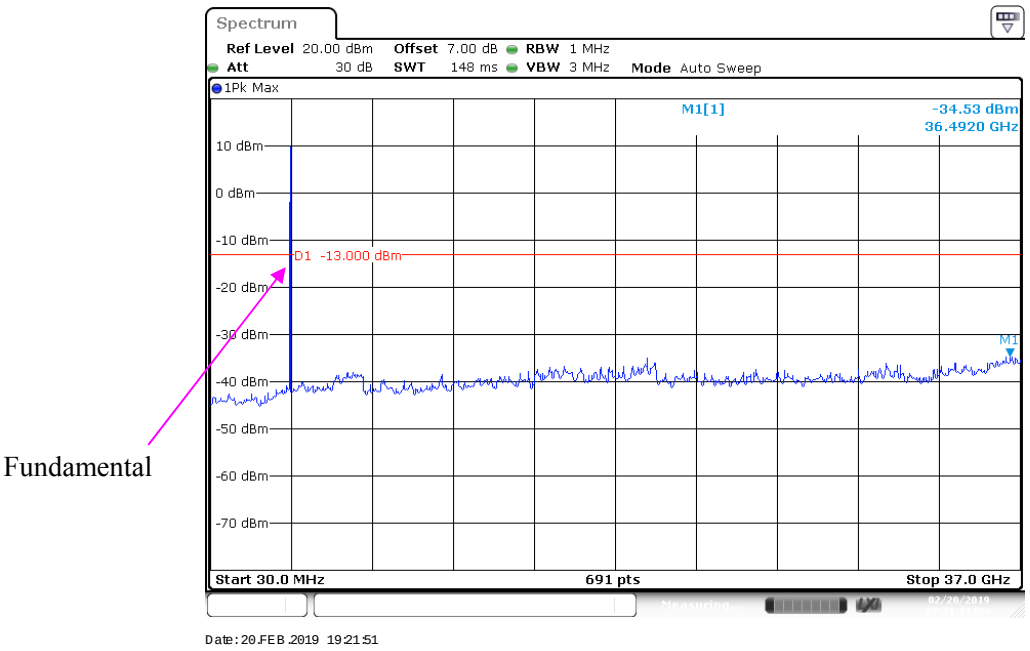
QPSK (10 MHz), Chain0 Middle Channel



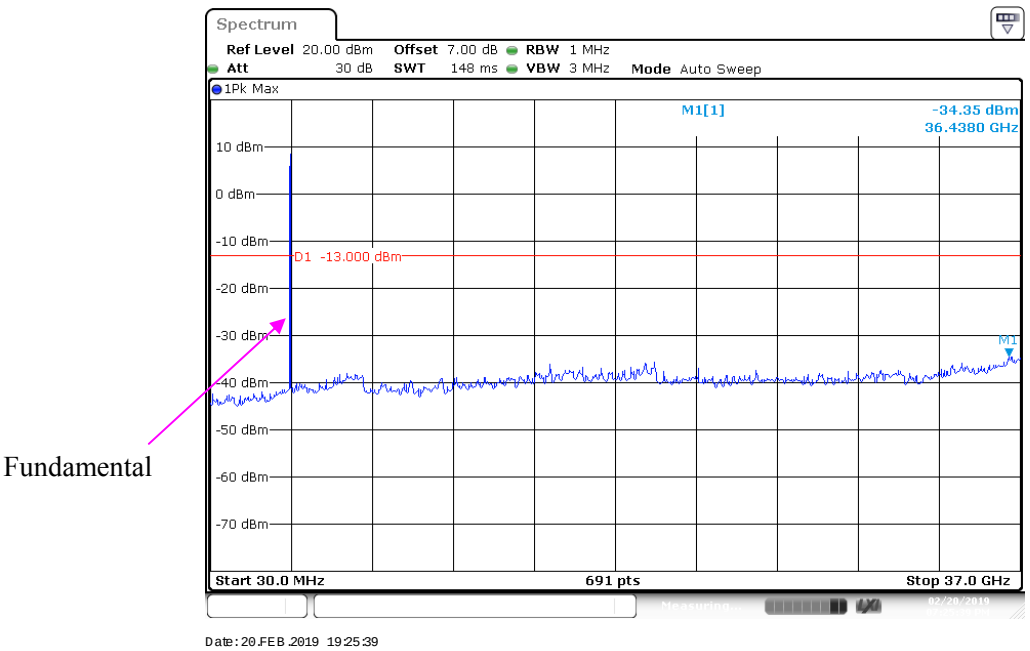
Fundamental

Date: 20.FEB.2019 19:20:38

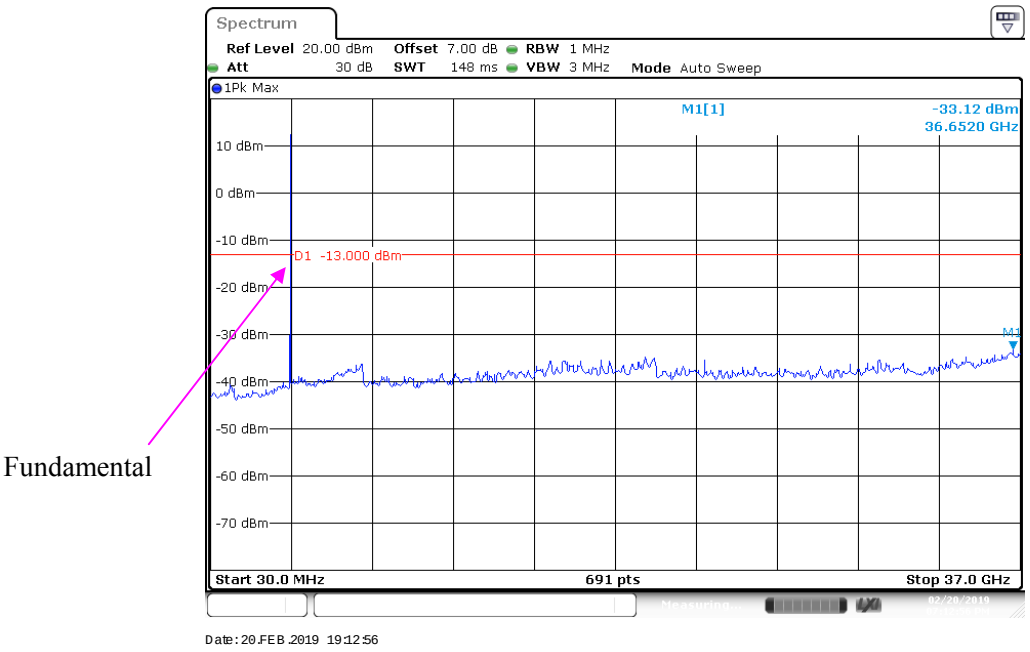
QPSK (15 MHz), Chain0 Middle Channel



QPSK (20 MHz), Chain0 Middle Channel

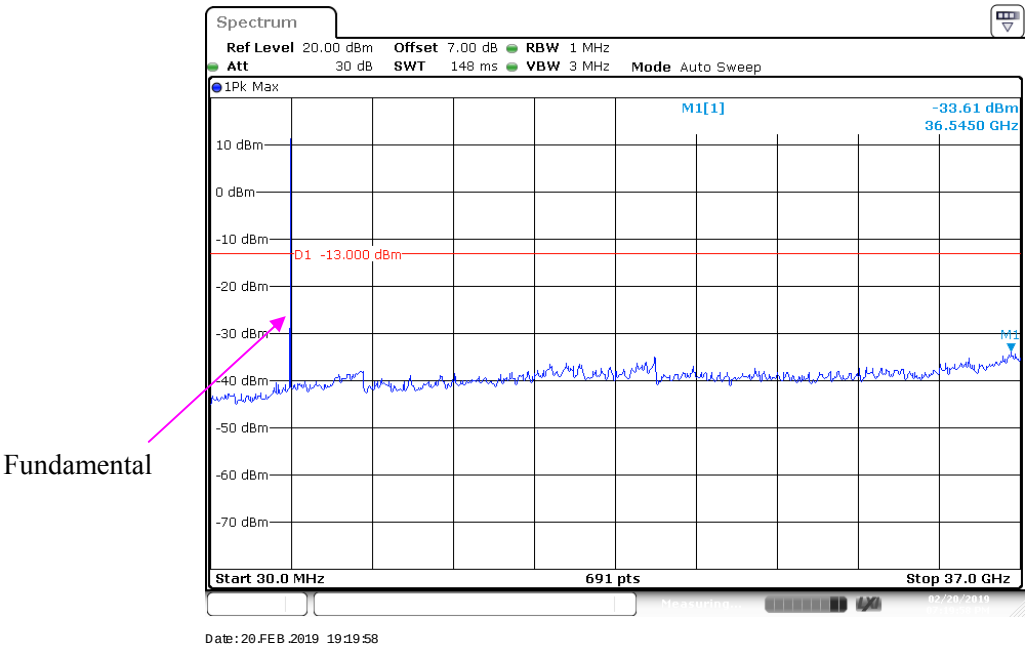


16-QAM (5 MHz), Chain0 Middle Channel



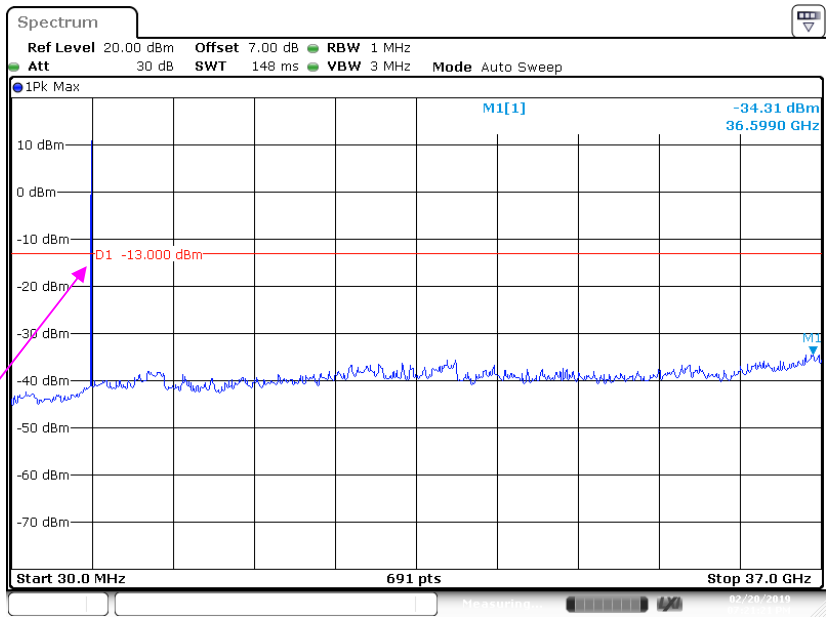
Fundamental

16-QAM (10 MHz), Chain0 Middle Channel



Fundamental

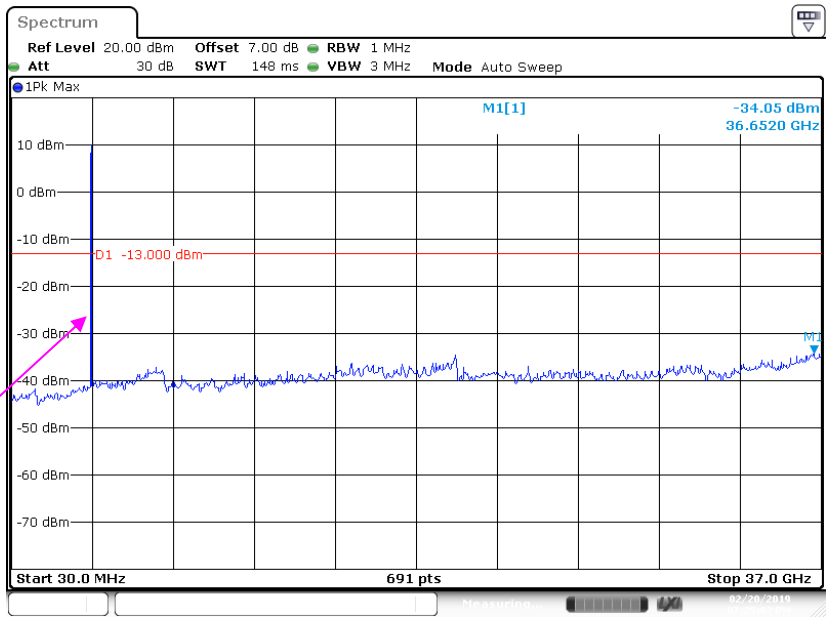
16-QAM (15 MHz), Chain0 Middle Channel



Fundamental

Date:20.FEB.2019 19:21:21

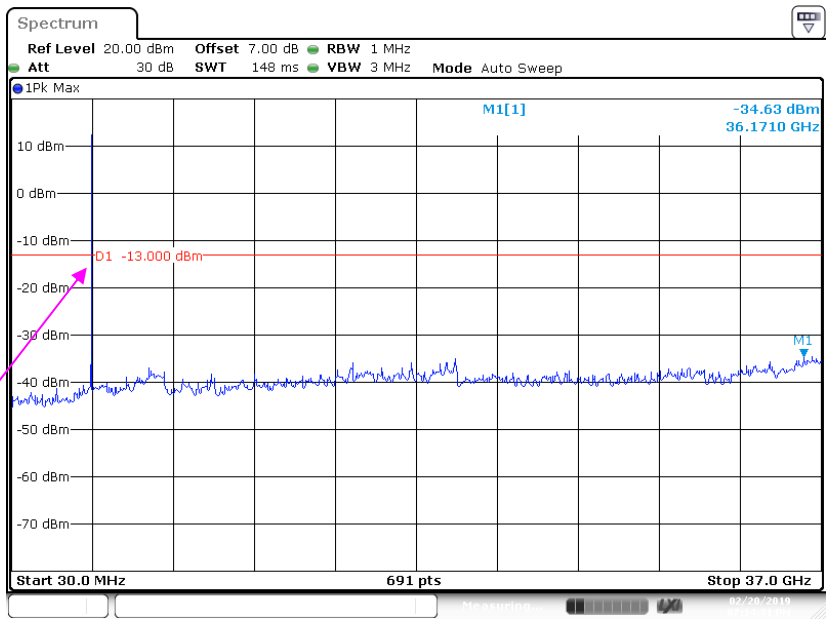
16-QAM (20 MHz), Chain0 Middle Channel



Fundamental

Date:20.FEB.2019 19:25:03

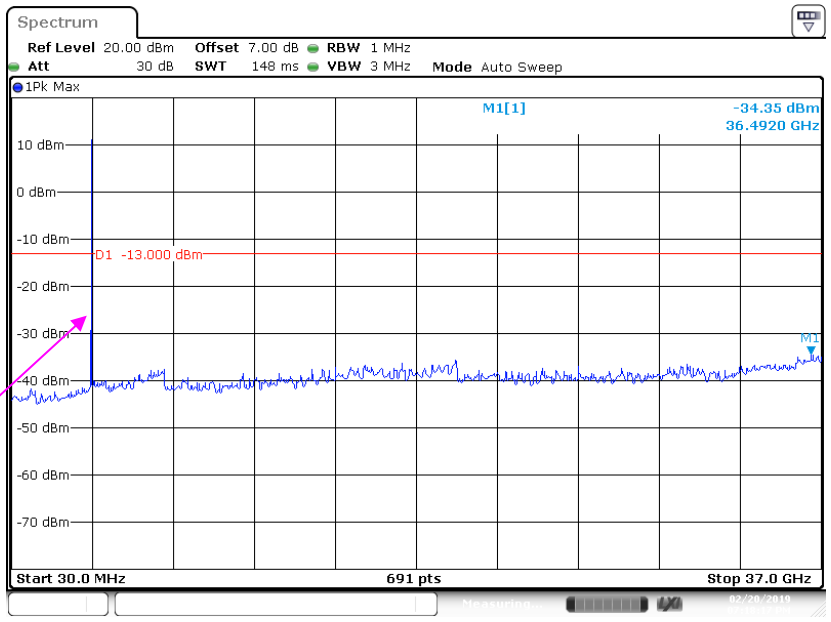
QPSK (5 MHz), Chain1 Middle Channel



Fundamental

Date:20.FEB.2019 19:14:31

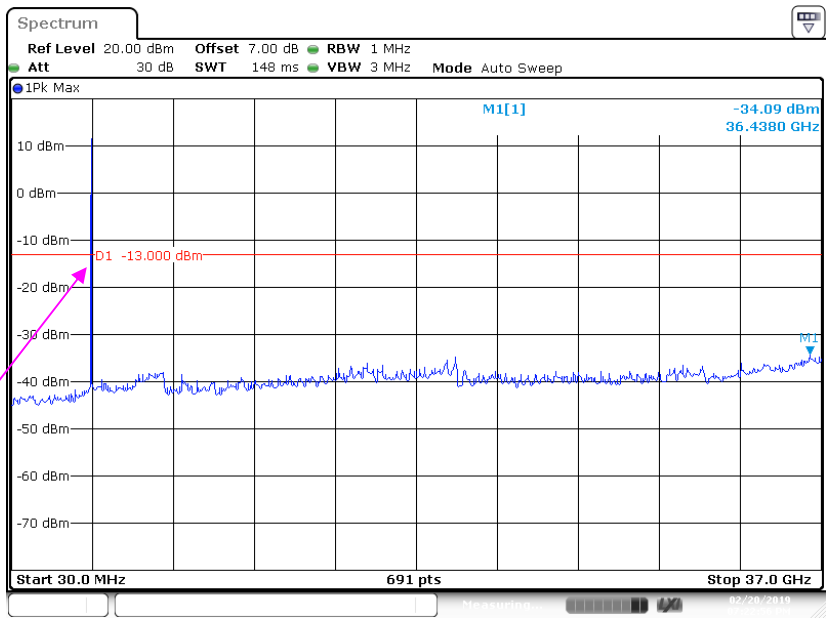
QPSK (10 MHz), Chain1 Middle Channel



Fundamental

Date:20.FEB.2019 19:18:17

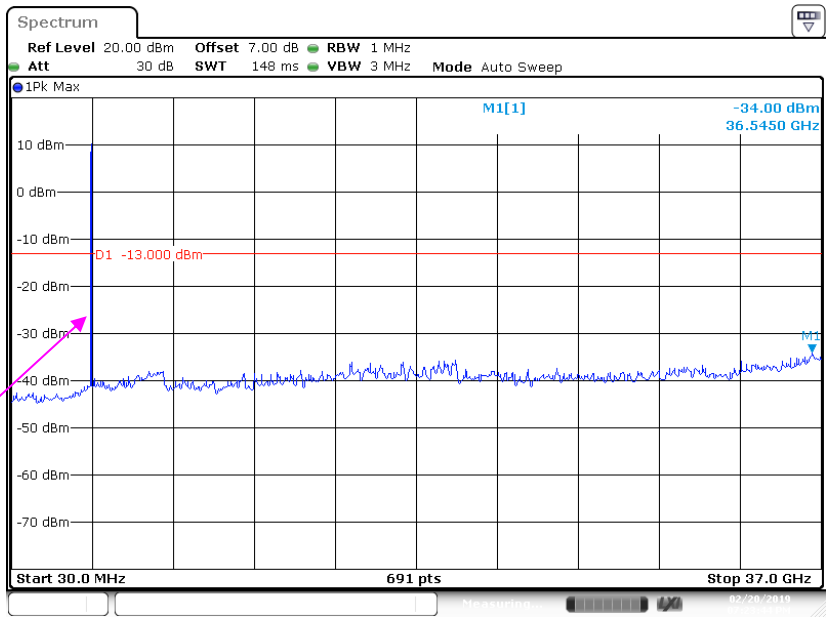
QPSK (15 MHz), Chain1 Middle Channel



Fundamental

Date: 20.FEB.2019 19:22:56

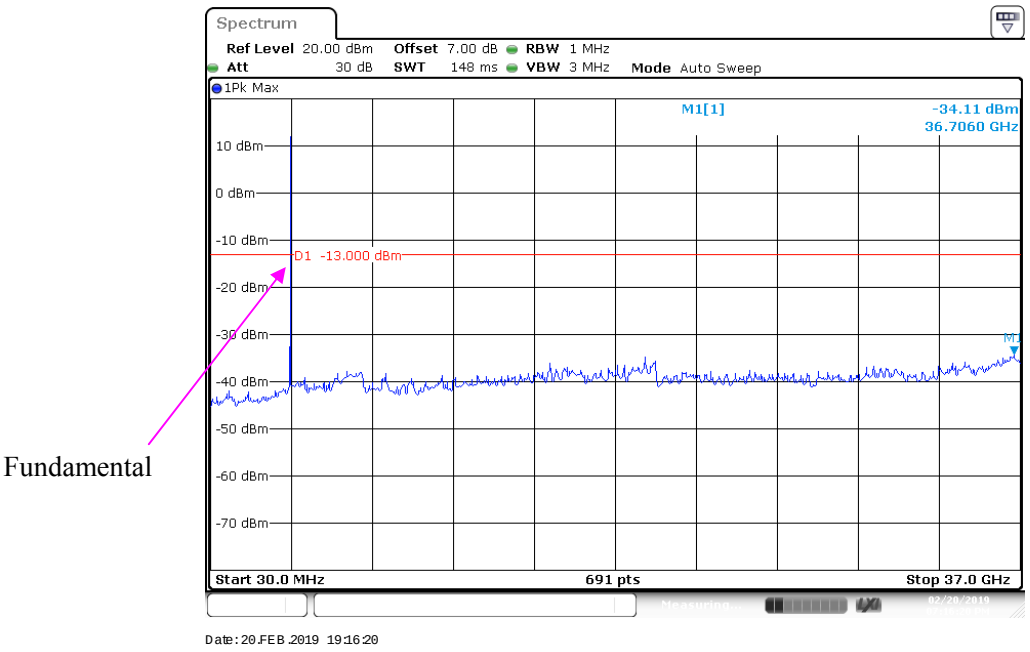
QPSK (20 MHz), Chain1 Middle Channel



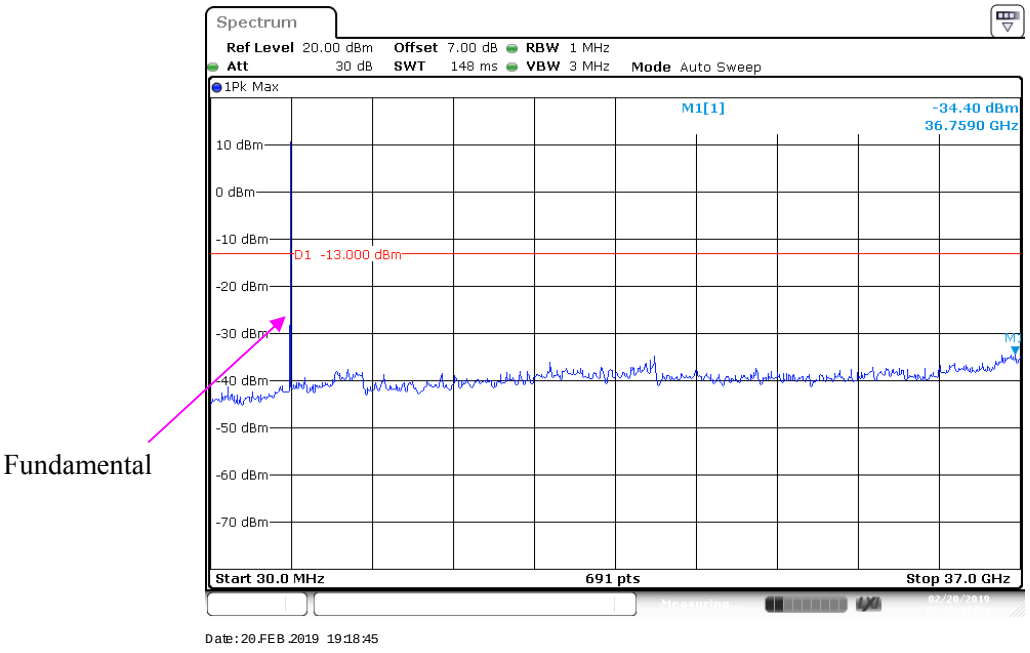
Fundamental

Date: 20.FEB.2019 19:23:45

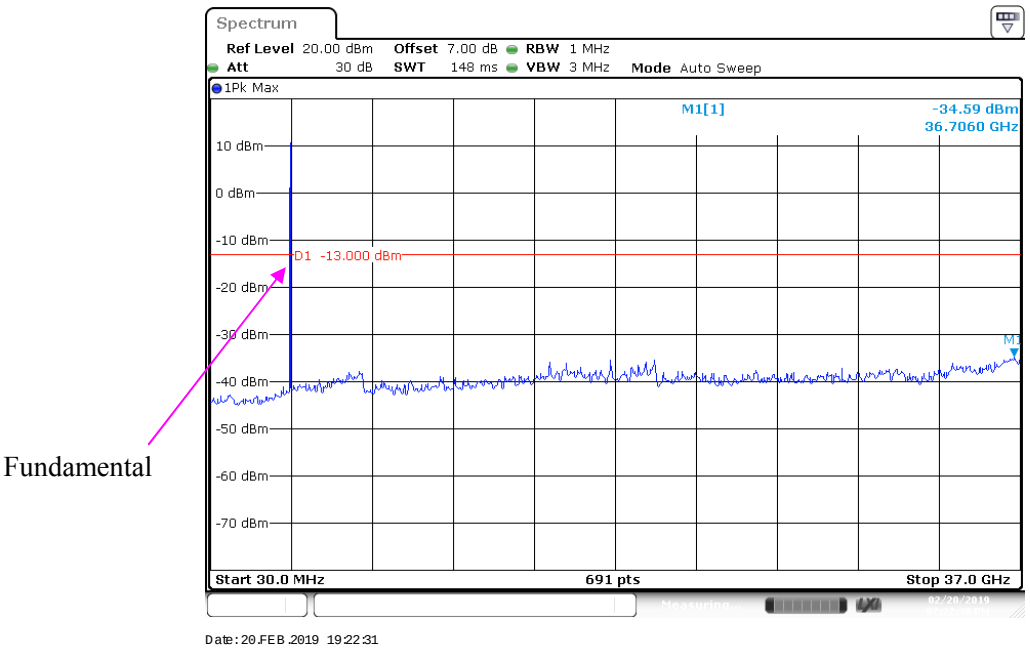
16-QAM (5 MHz), Chain1 Middle Channel



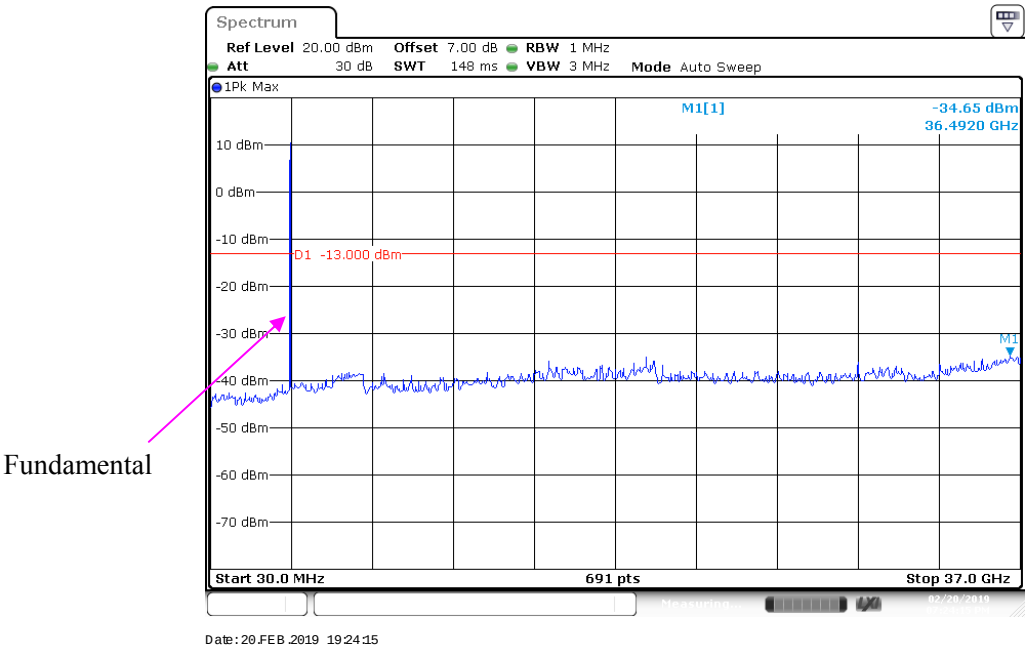
16-QAM (10 MHz), Chain1 Middle Channel



16-QAM (15 MHz), Chain1 Middle Channel

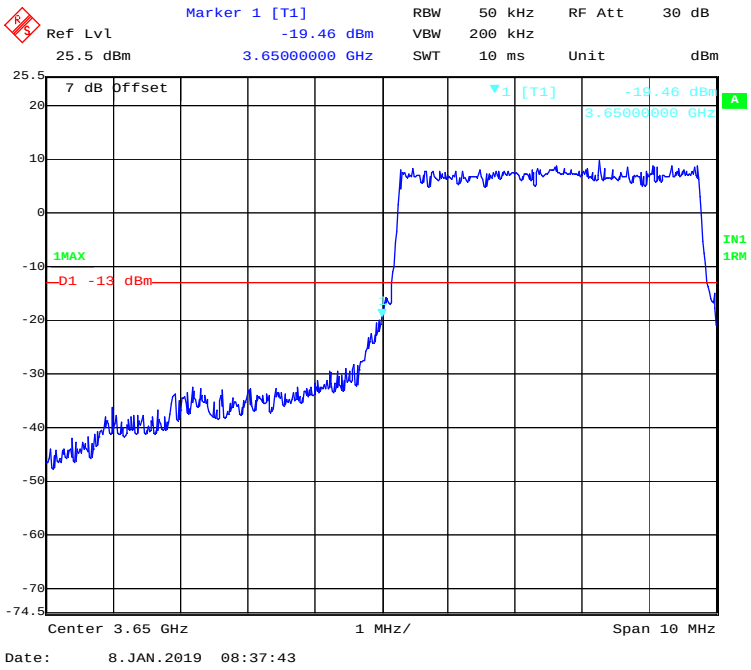


16-QAM (20 MHz), Chain1 Middle Channel

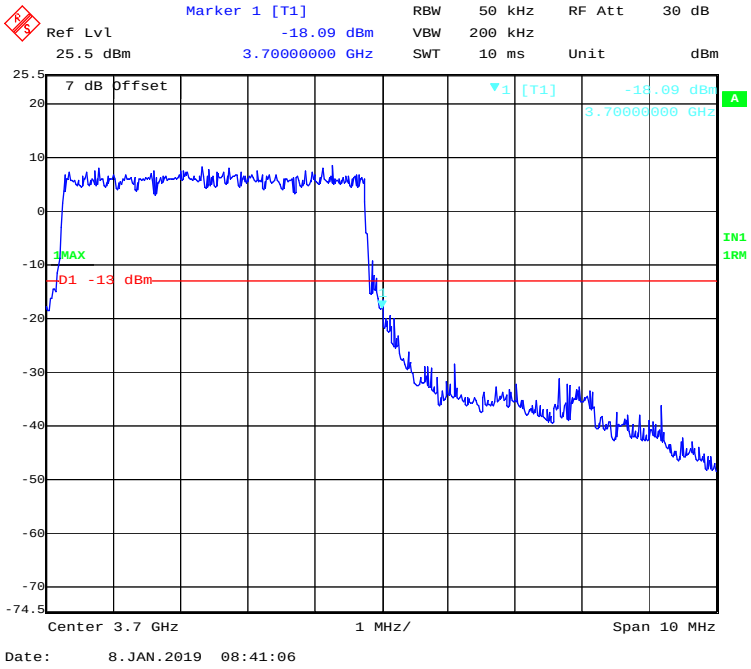


Band Edge:

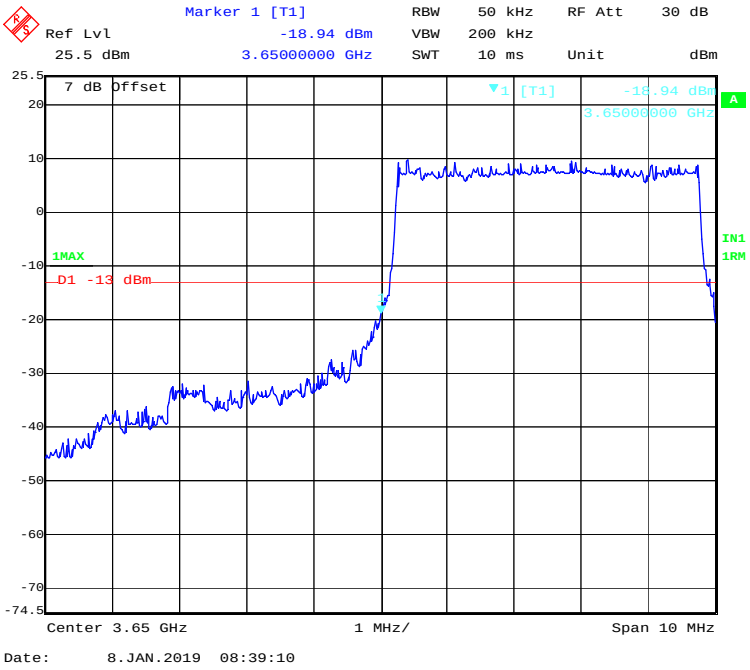
QPSK (5 MHz) –Chain0 Bandage-Left



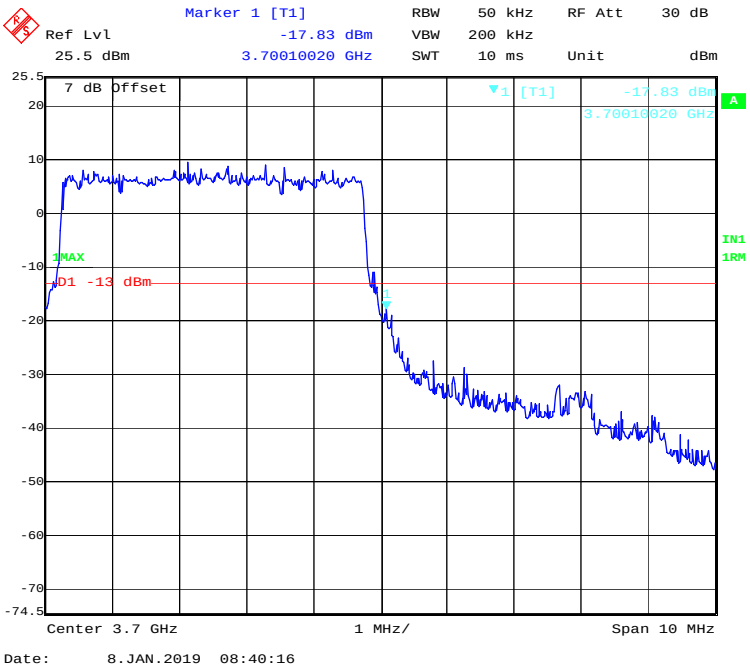
QPSK (5 MHz) –Chain0 Bandage-Right



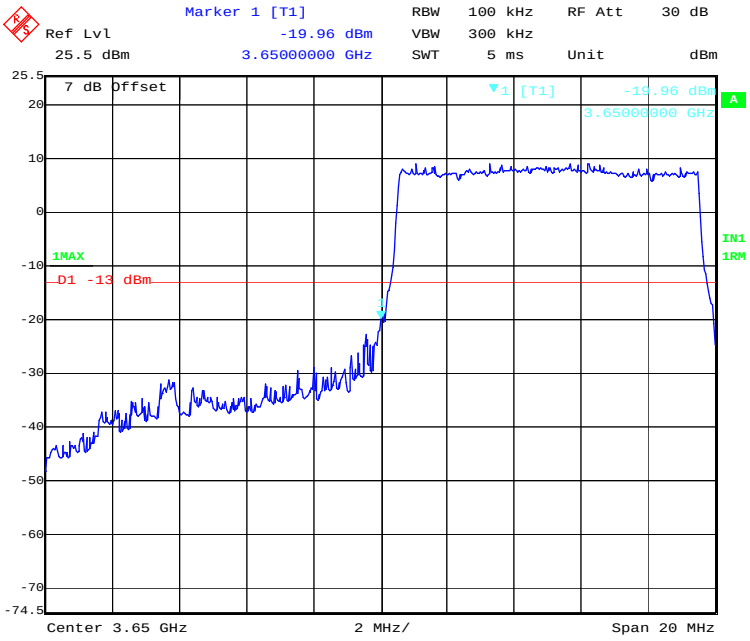
16-QAM (5 MHz) –Chain0 Bandage-Left



16-QAM (5 MHz) –Chain0 Bandage-Right

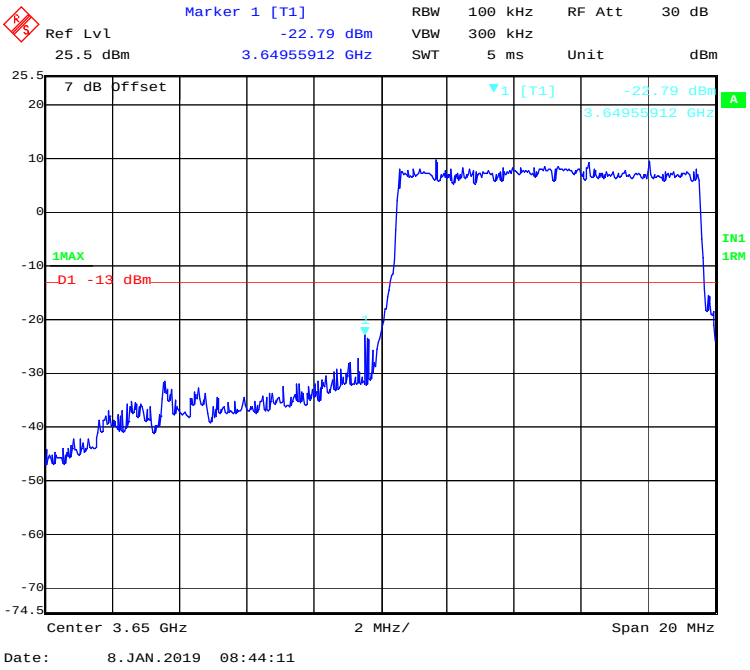


QPSK (10 MHz) –Chain0 Bandage-Left

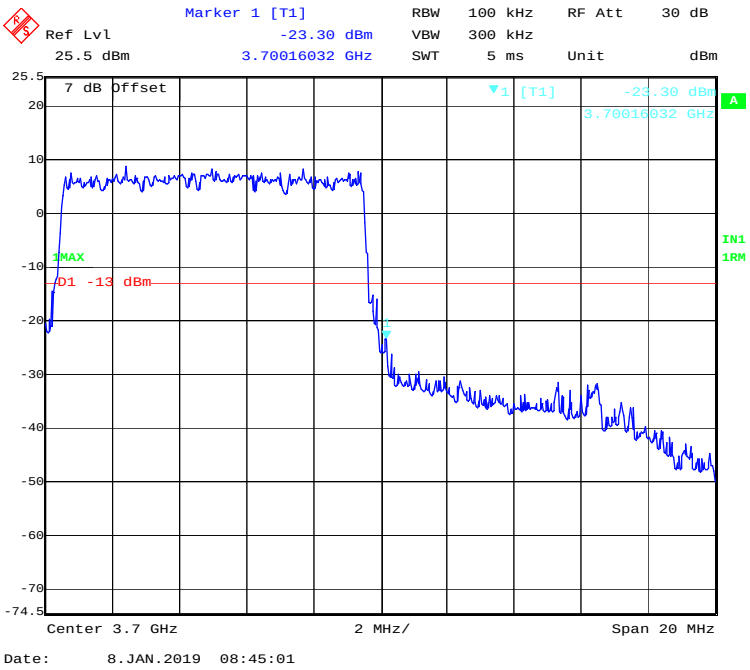


QPSK (10 MHz) –Chain0 Bandage-Right

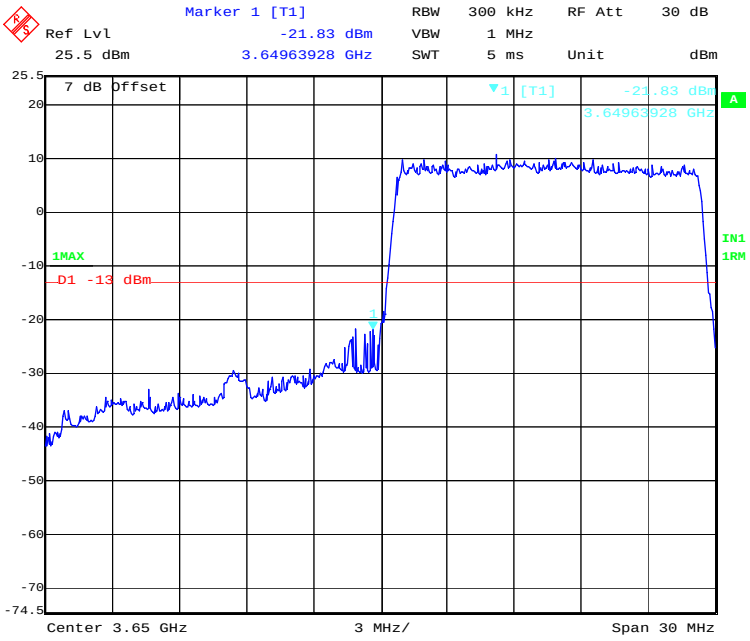
16-QAM (10 MHz) –Chain0 Bandage-Left



16-QAM (10 MHz) –Chain0 Bandage-Right

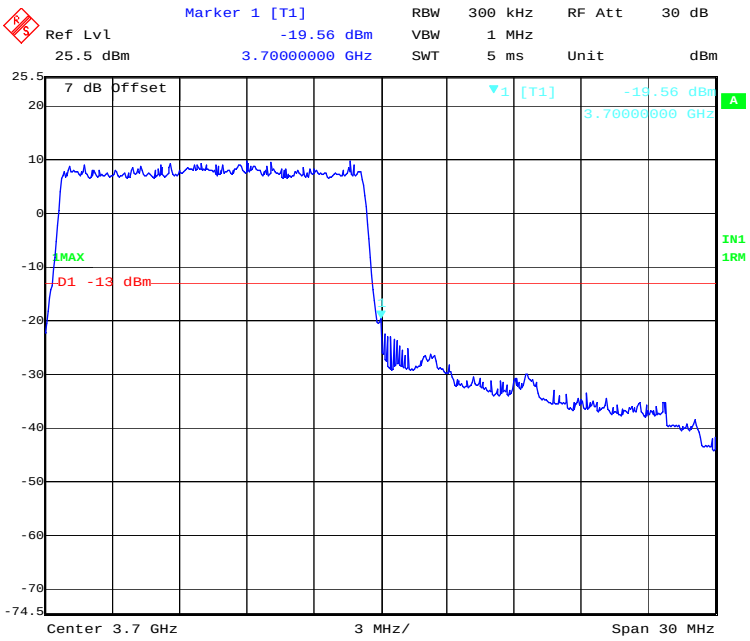


QPSK (15 MHz) –Chain0 Bandage-Left



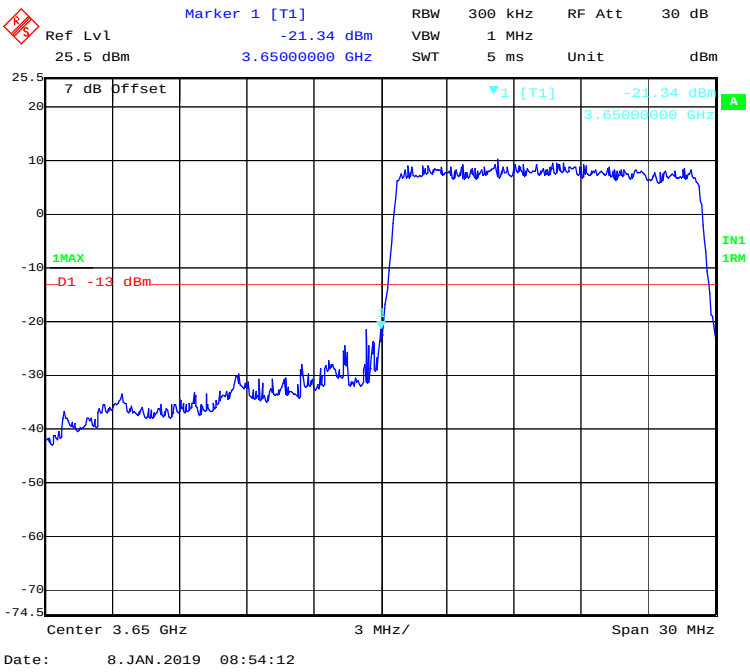
Date: 8.JAN.2019 08:53:43

QPSK (15 MHz) –Chain0 Bandage-Right

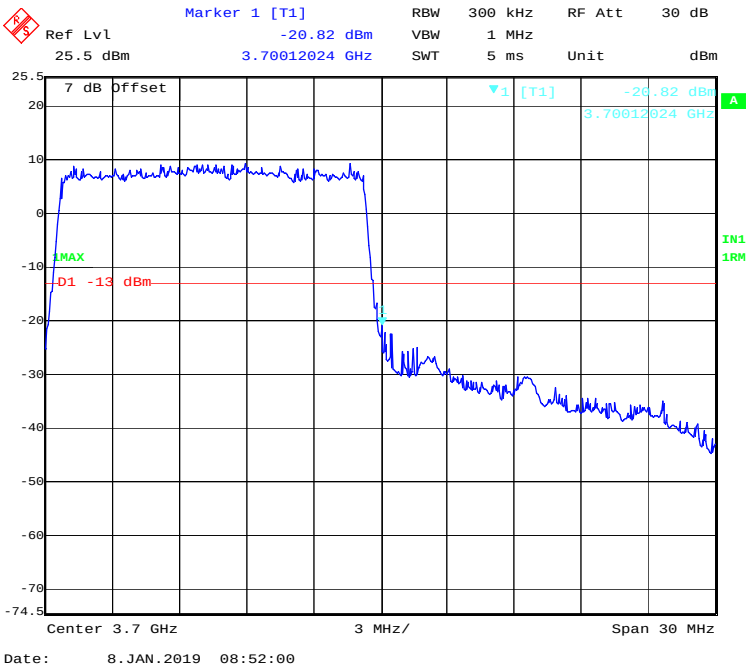


Date: 8.JAN.2019 08:51:19

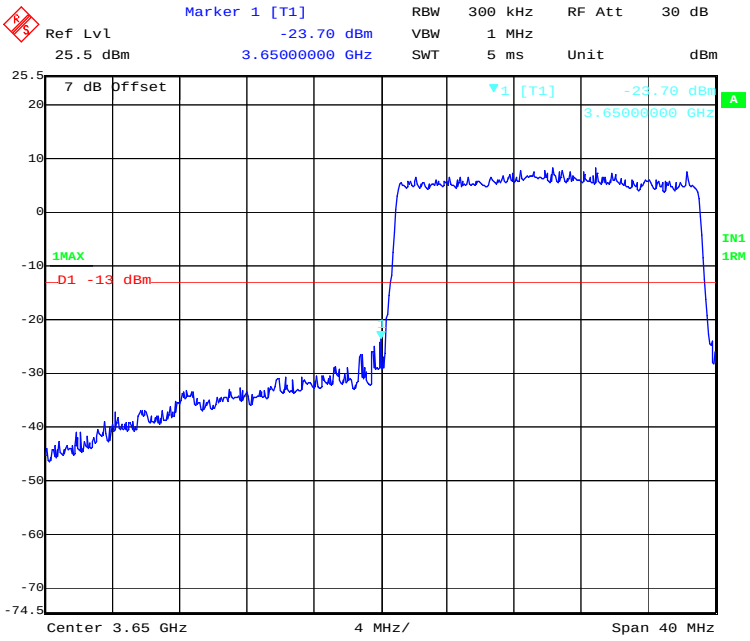
16-QAM (15 MHz) –Chain0 Bandage-Left



16-QAM (15 MHz) –Chain0 Bandage-Right

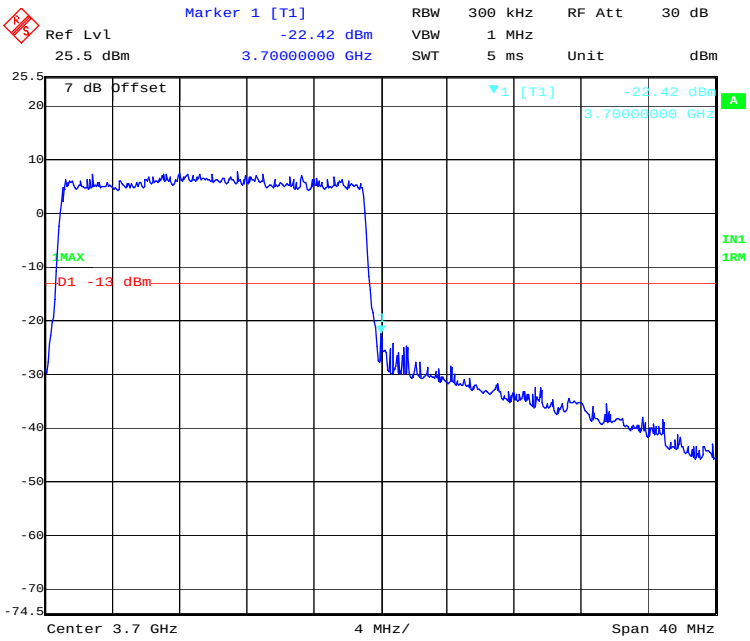


QPSK (20 MHz) –Chain0 Bandage-Left



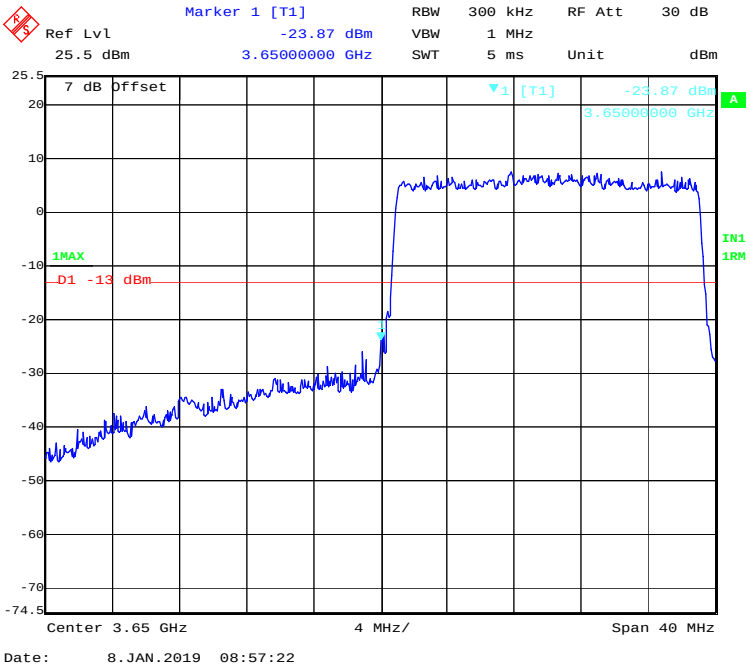
Date: 8.JAN.2019 08:55:13

QPSK (20 MHz) –Chain0 Bandage-Right

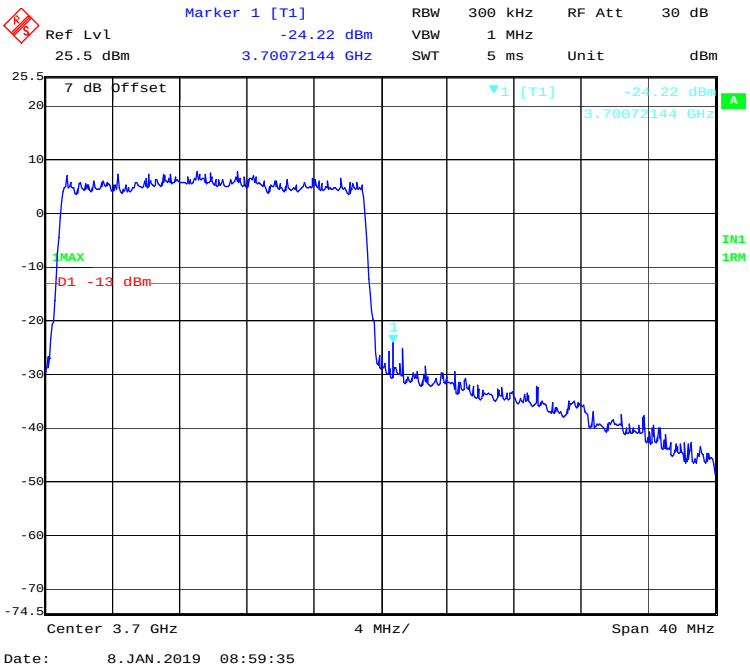


Date: 8.JAN.2019 08:58:59

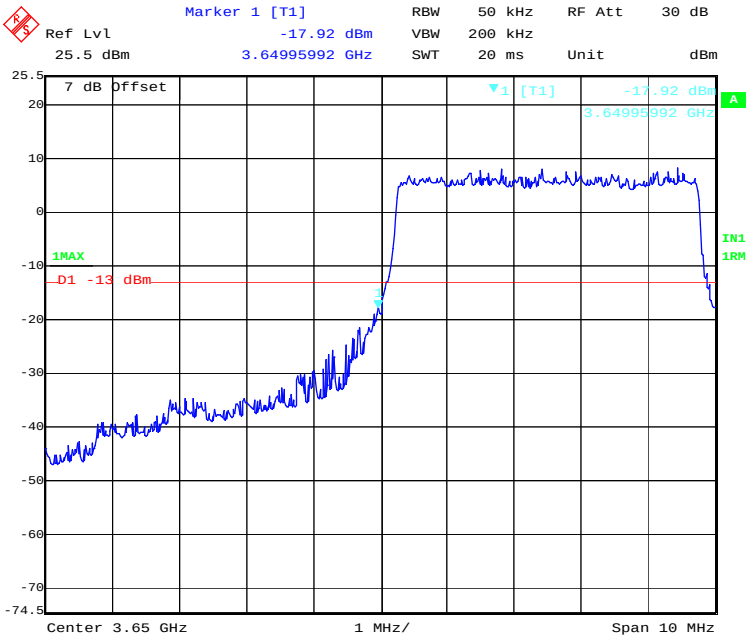
16-QAM (20 MHz) –Chain0 Bandage-Left



16-QAM (20 MHz) –Chain0 Bandage-Right

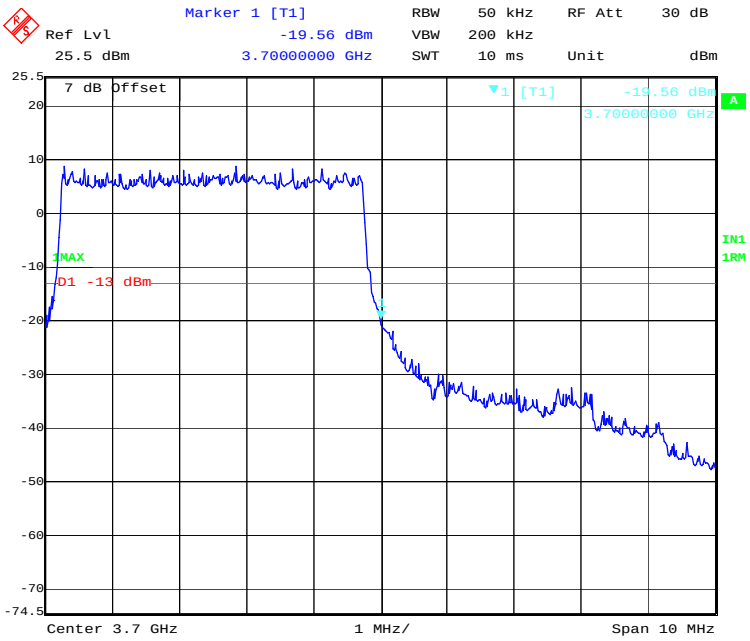


QPSK (5 MHz) –Chain1 Bandage-Left



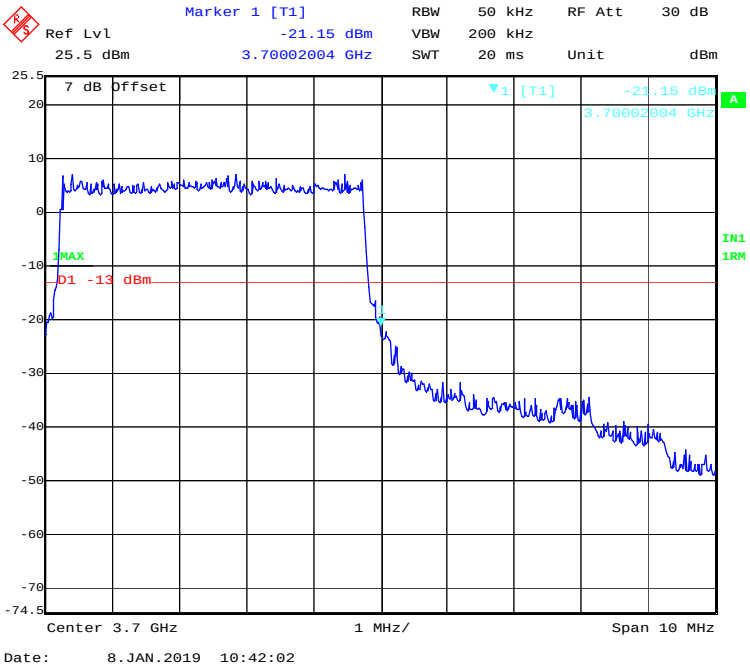
Date: 8.JAN.2019 10:39:39

QPSK (5 MHz) –Chain1 Bandage-Right

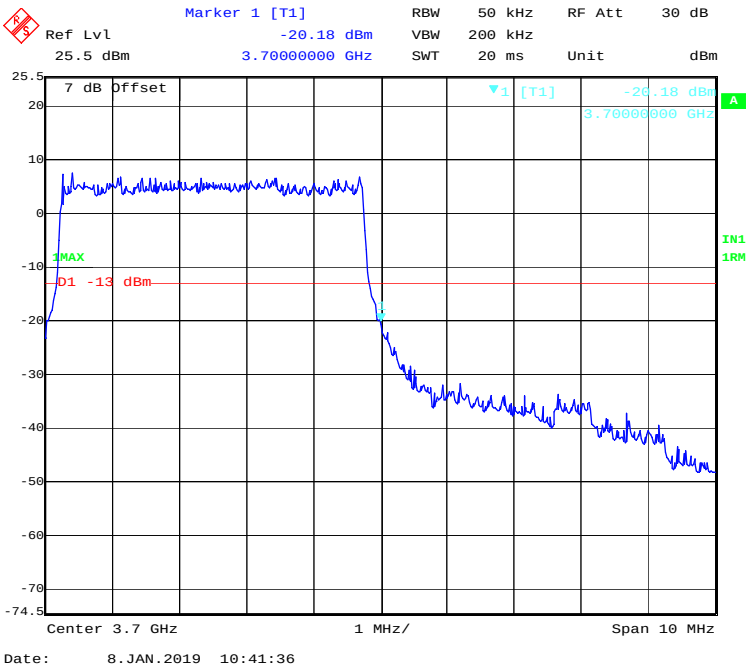


Date: 8.JAN.2019 11:16:31

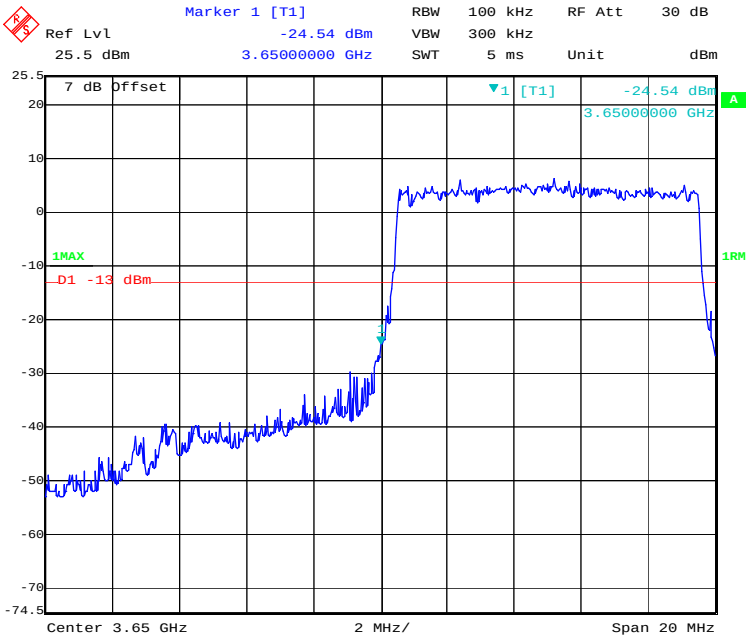
16-QAM (5 MHz) –Chain1 Bandage-Left



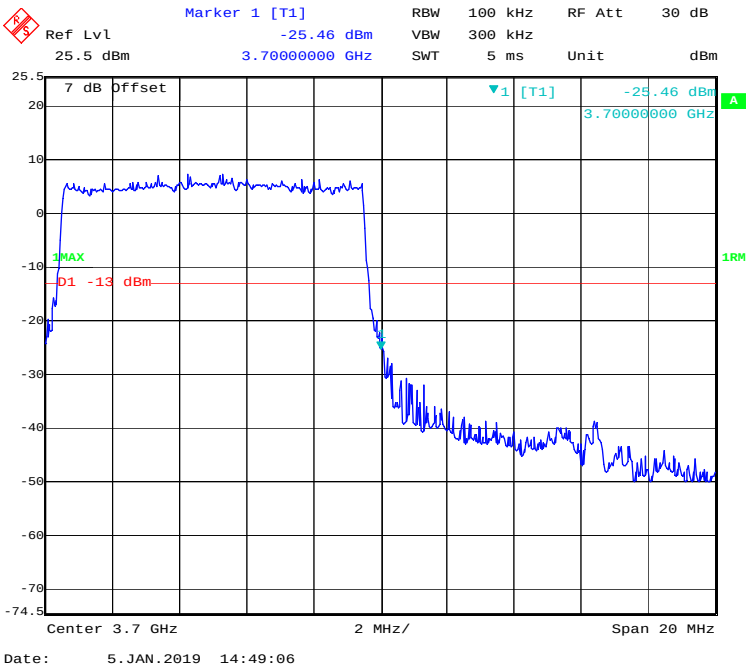
16-QAM (5 MHz) –Chain1 Bandage-Right



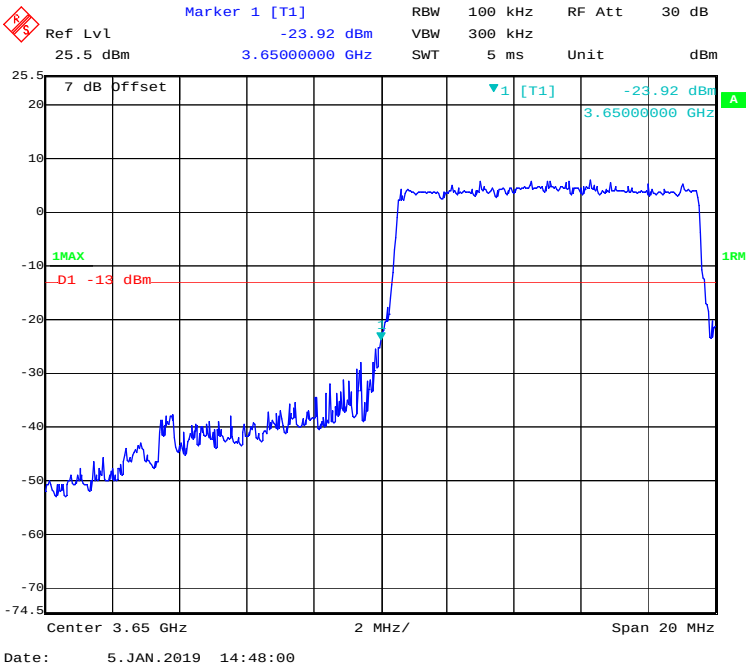
QPSK (10 MHz) –Chain1 Bandage-Left



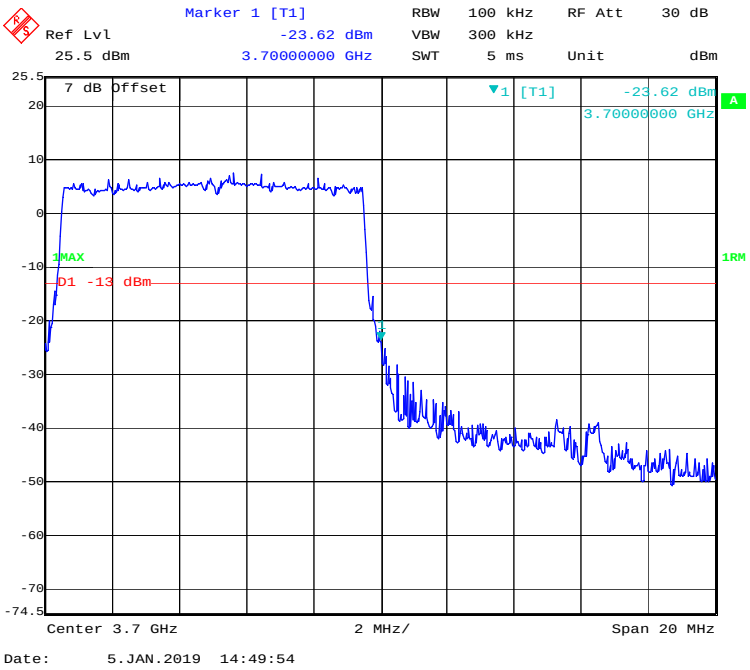
QPSK (10 MHz) –Chain1 Bandage-Right



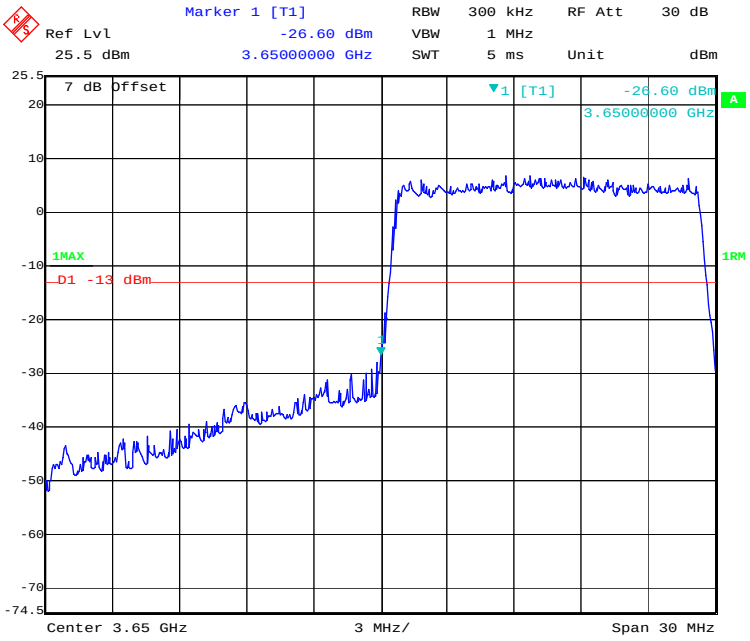
16-QAM (10 MHz) –Chain1 Bandage-Left



16-QAM (10 MHz) –Chain1 Bandage-Right

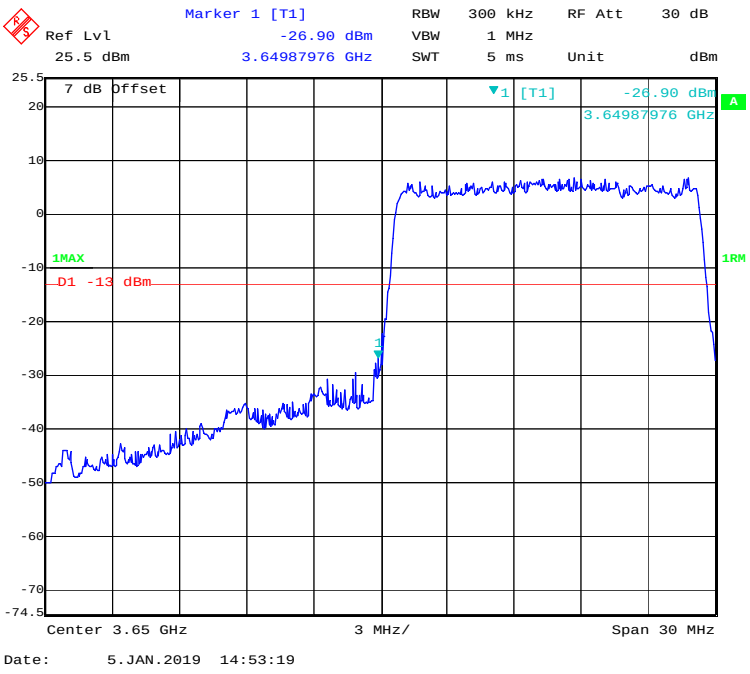


QPSK (15 MHz) –Chain1 Bandage-Left

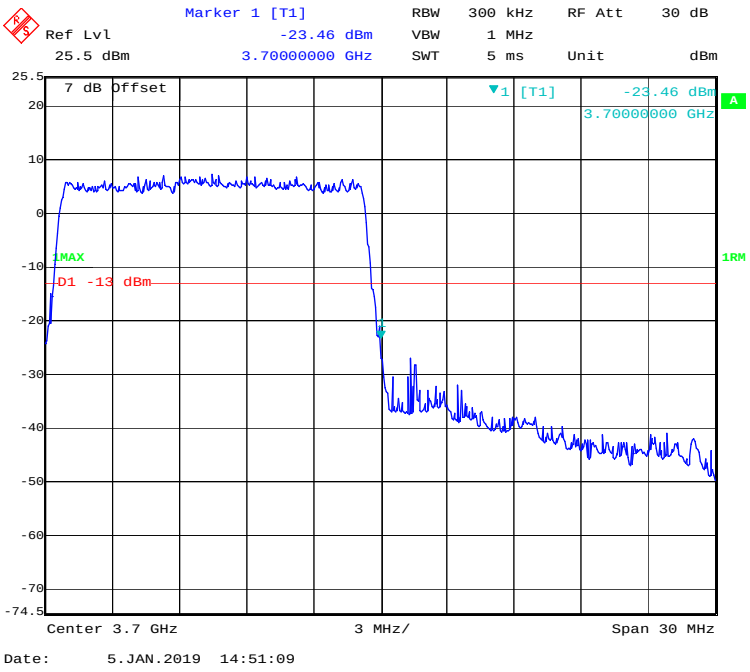


QPSK (15 MHz) –Chain1 Bandage-Right

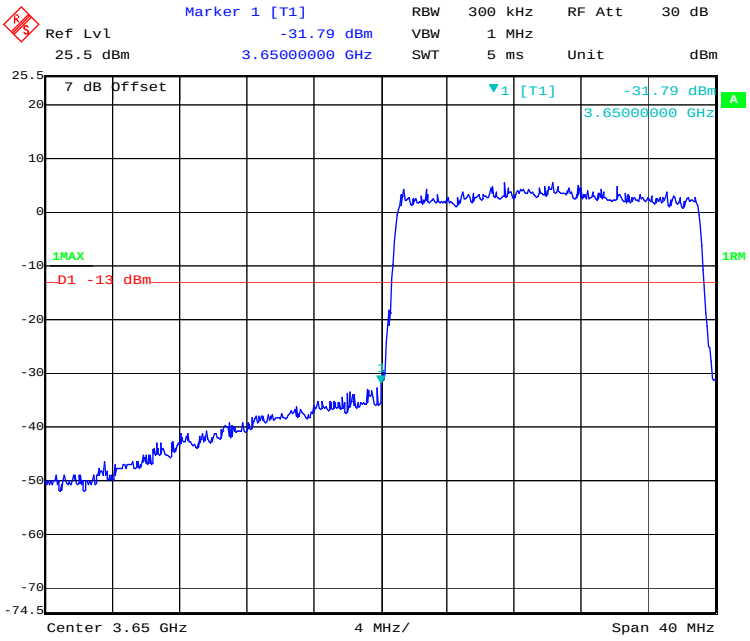
16-QAM (15 MHz) –Chain1 Bandage-Left



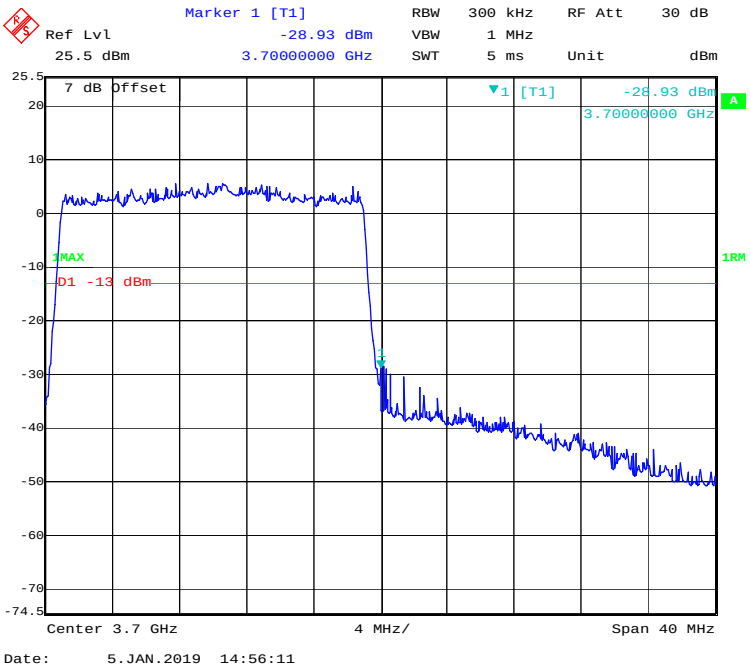
16-QAM (15 MHz) –Chain1 Bandage-Right



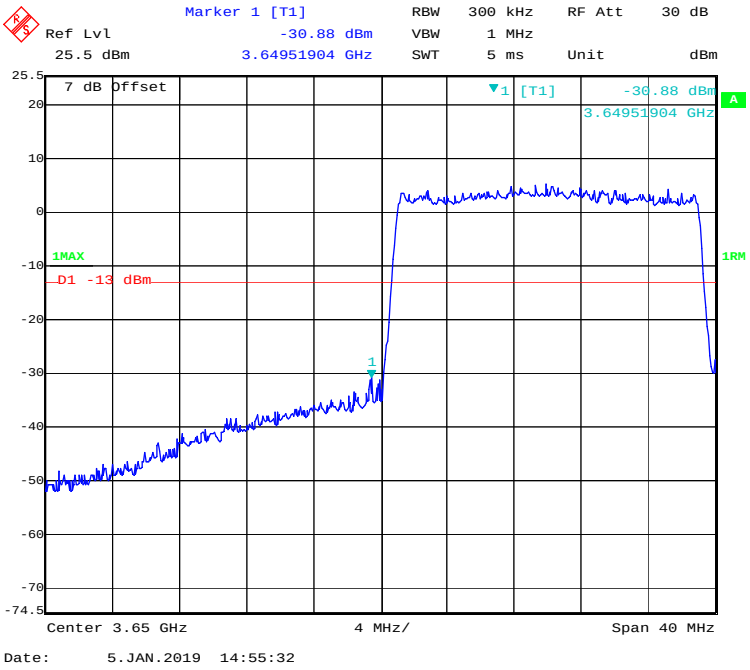
QPSK (20 MHz) –Chain1 Bandage-Left



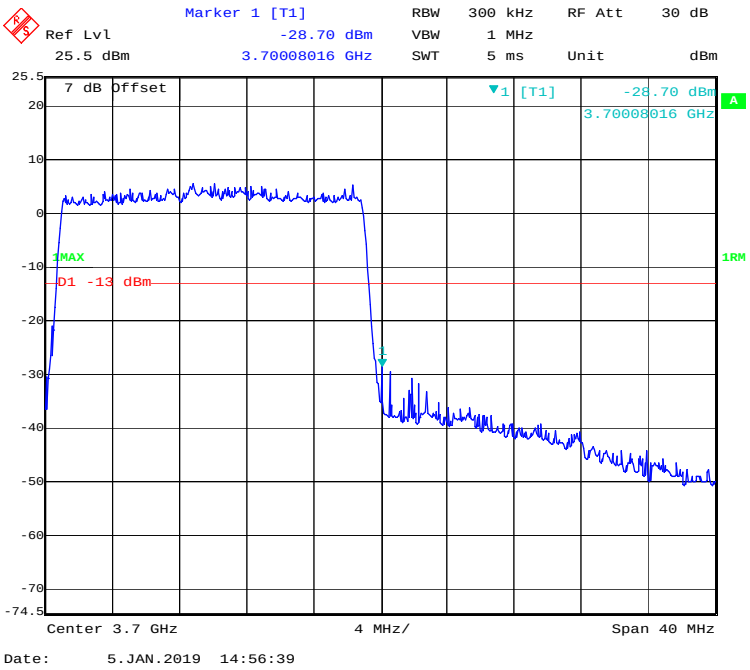
QPSK (20 MHz) –Chain1 Bandage-Right



16-QAM (20 MHz) –Chain1 Bandage-Left



16-QAM (20 MHz) –Chain1 Bandage-Right



FCC § 2.1053; § 90.1323 (a) - SPURIOUS RADIATED EMISSIONS

Applicable Standards

FCC § 2.1053 and §90.1323(a)

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious attenuation limit in dB =43+10 Log10 (power out in Watts)

Test Data

Environmental Conditions

Temperature:	23.2℃
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Hope Zhang on 2019-01-05.

Test mode: MIMO Transmitting (Pre-scan with all the bandwidth, and worse case as below)

30MHz~37GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
QPSK 5MHz Bandwidth Middle Channel										
500	48.28	252	2	H	-54.84	0.58	-1.95	-57.37	-13	44.37
500	47.35	142	256	V	-54.73	0.58	-1.95	-57.26	-13	44.26
7350	42.21	252	89	H	-49.18	1.74	10.13	-40.79	-13	27.79
7350	41.25	142	81	V	-50.37	1.74	10.13	-41.98	-13	28.98
11025	44.17	140	158	H	-40.68	2.04	12.37	-30.35	-13	17.35
11025	45.21	350	227	V	-39.14	2.04	12.37	-28.81	-13	15.81
16-QAM 5MHz Bandwidth Middle Channel										
500	48.25	252	236	H	-61.61	0.58	-1.95	-63.41	-13	50.41
500	47.21	142	167	V	-66.3	0.58	-1.95	-68.1	-13	55.1
7350	38.24	252	205	H	-53.15	1.74	10.13	-44.76	-13	31.76
7350	37.98	142	123	V	-53.64	1.74	10.13	-45.25	-13	32.25
11025	43.86	140	263	H	-46.29	2.04	12.37	-35.96	-13	22.96
11025	42.13	350	112	V	-45.88	2.04	12.37	-35.55	-13	22.55

Note:
1) Absolute Level (dBm) = Submitted Level (dBm) - Cable loss (dB) + Antenna Gain (dBd/dBi)
2) Margin (dB) = Limit (dBm) - Absolute Level (dBm)
3)The limit is base on EIRP.

FCC § 2.1055; § 90.213 - FREQUENCY STABILITY

Applicable Standards

FCC § 2.1055 and§ 90.213

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

MINIMUM FREQUENCY STABILITY

[Parts per million (ppm)]

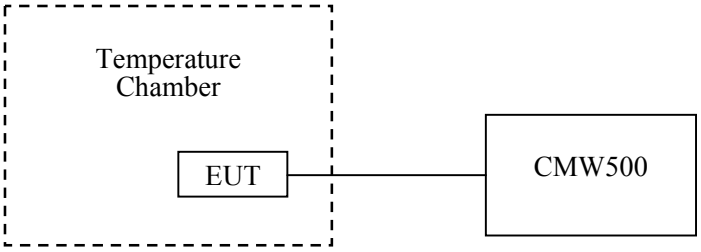
Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1][2][3]100	100	200
25-50	20	20	50
72-76	5		50
150-174	[5][11]5	[6]5	[4][6]50
216-220	1.0		1.0
220-222[12]	0.1	1.5	1.5
421-512	[7][11][14]2.5	[8]5	[8]5
806-809	[14]1.0	1.5	1.5
809-824	[14]1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	[14]0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928[13]	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	[9]300	300	300
Above 2450[10]			

[10]Except for DSRCS equipment in the 5850-5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5850-5925 MHz band is specified in subpart M of this part.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.



Test Data

Environmental Conditions

Temperature:	23.2℃
Relative Humidity:	51 %
ATM Pressure:	101.3kPa

The testing was performed by Hope Zhang on 2019-01-08

Test Result: Compliance.

Chain0:

LTE band (3650-3700MHz)

QPSK Middle Channel, fo =3675 MHz				
Temperature (℃)	**Power Supplied (V_{AC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	120	25	0.0068	Compliant
-20		25	0.0068	Compliant
-10		23	0.0063	Compliant
0		22	0.0060	Compliant
10		21	0.0057	Compliant
20		20	0.0054	Compliant
30		19	0.0052	Compliant
40		18	0.0049	Compliant
50		17	0.0046	Compliant
20	V min.= 102	23	0.0063	Compliant
20	V max.= 138	26	0.0071	Compliant

16-QAM Middle Channel, fo =3675 MHz				
Temperature (℃)	**Power Supplied (V_{AC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	120	25	0.0068	Compliant
-20		24	0.0065	Compliant
-10		23	0.0063	Compliant
0		22	0.0060	Compliant
10		21	0.0057	Compliant
20		20	0.0054	Compliant
30		19	0.0052	Compliant
40		19	0.0052	Compliant
50		19	0.0052	Compliant
20	V min.= 102	24	0.0065	Compliant
20	V max.= 138	26	0.0071	Compliant

Chain1:

LTE band (3650-3700MHz)

QPSK Middle Channel, fo =3675 MHz				
Temperature (℃)	**Power Supplied (V_{AC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	120	27	0.0073	Compliant
-20		25	0.0068	Compliant
-10		23	0.0063	Compliant
0		23	0.0063	Compliant
10		23	0.0063	Compliant
20		21	0.0057	Compliant
30		21	0.0057	Compliant
40		19	0.0052	Compliant
50		18	0.0049	Compliant
20	V min.= 102	23	0.0063	Compliant
20	V max.= 138	26	0.0071	Compliant

16-QAM Middle Channel, fo =3675 MHz				
Temperature (℃)	**Power Supplied (V_{AC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	120	24	0.0065	Compliant
-20		23	0.0063	Compliant
-10		21	0.0057	Compliant
0		21	0.0057	Compliant
10		20	0.0054	Compliant
20		18	0.0049	Compliant
30		17	0.0046	Compliant
40		17	0.0046	Compliant
50		16	0.0044	Compliant
20	V min.= 102	24	0.0065	Compliant
20	V max.= 138	26	0.0071	Compliant

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