

FCC PART 15.247

TEST REPORT

For

**Autel Robotics Co., Ltd.**

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**FCC ID: 2AGNTEVORC582409A**

<b>Report Type:</b> Original Report	<b>Product Type:</b> EVO series
<b>Report Number:</b>	RSZ171110005-00A
<b>Report Date:</b>	2018-02-12
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

The *Autel Robotics Co., Ltd.*'s product, model number: *EVO (FCC ID: 2AGNTEVORC582409A)* or the "EUT" in this report was a *EVO series*, which was measured approximately: 310 mm (L) × 230 mm (W) × 105 mm (H), rated with input voltage: DC 11.4 V powered by battery.

*\*All measurement and test data in this report was gathered from production sample serial number: 172482 (Assigned by BACL, shenzhen). The EUT supplied by the applicant was received on 2017-11-10.*

### Objective

This report is prepared on behalf of *Autel Robotics Co., Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

### Related Submittal(s)/Grant(s)

Submittal with the remote control unit of a system with FCC ID: 2AGNTEF7RC2409A.

### 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.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Measurement Uncertainty

Parameter		uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±1.5dB
Unwanted Emission, conducted		±1.5dB
Emissions, radiated	Below 1GHz	±4.70dB
	Above 1GHz	±4.80dB
Temperature		±1 °C
Supply voltages		±0.4%

### **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 382179, the FCC Designation No. : CN5001.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

For 2.4GHz: 3MHz, 5MHz, 10MHz mode, 65 channels are provided to testing

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2407.5	33	2439.5
2	2408.5	.....	.....
3	2409.5	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	64	2470.5
32	2438.5	65	2471.5

CH1, CH33, CH65 was tested.

For 2.4GHz: 20MHz mode, 51 channels are provided to testing

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412.5	26	2437.5
2	2413.5	.....	.....
3	2414.5	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	50	2461.5
25	2436.5	51	2462.5

CH1, CH26, CH51 was tested.

For 900MHz: 3MHz, 5MHz, 10MHz mode, 13 channels are provided to testing

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	909	8	916
2	910	9	917
3	911	10	918
4	912	11	919
5	913	12	920
6	914	13	921
7	915	/	/

CH1, CH7, CH13 was tested.

For 900MHz: 20MHz mode, 3 channels are provided to testing

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	914	3	916
2	915	/	/

CH1, CH2, CH3 was tested.

**Equipment Modifications**

No modification was made to the EUT tested.

**EUT Exercise Software**

“secureCRT” software was used during test.

For 2.4GHz band:

Antenna 03 or Antenna 04: MISO mode

Item	Data rate	Power level		
		Low channel	Middle channel	High channel
3M Mode	10 Mbps	17	17	17
5M Mode	10 Mbps	17	17	17
10M Mode	10 Mbps	17	17	17
20M Mode	20 Mbps	17	17	17

For 900MHz band:

Antenna 01 or Antenna 02: MISO mode

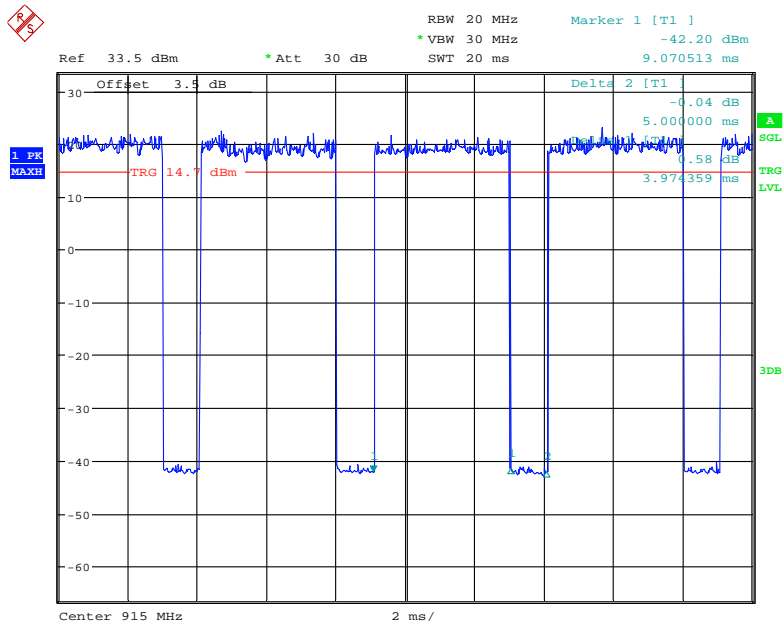
Item	Data rate	Power level		
		Low channel	Middle channel	High channel
3M Mode	10 Mbps	18	18	18
5M Mode	10 Mbps	18	18	18
10M Mode	10 Mbps	18	18	18
20M Mode	20 Mbps	18	18	18

**Duty cycle**

**For 900MHz Antenna 01 & 02:**

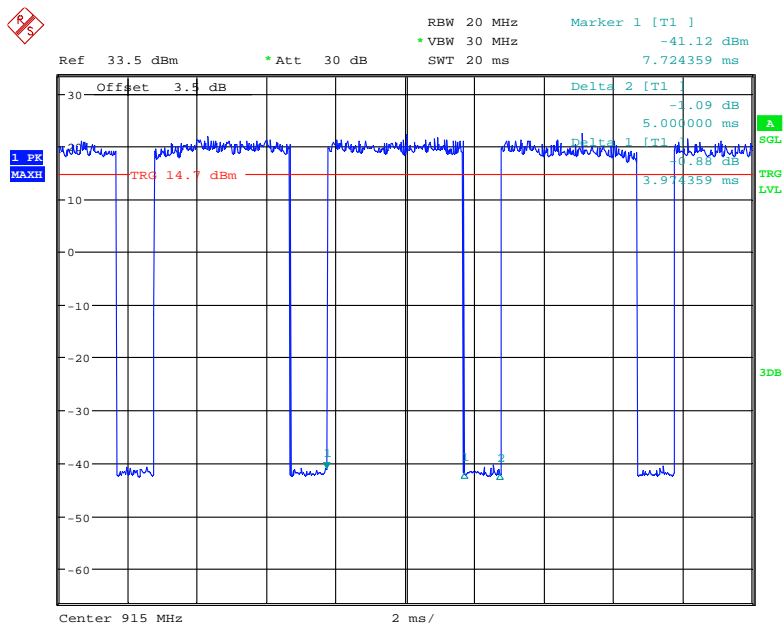
Item	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	10log(1/x)
3M Mode	79.48	3.974	0.25	1kHz	1.0
5M Mode	79.48	3.974	0.25	1kHz	1.0
10M Mode	80.12	4.006	0.25	1kHz	1.0
20M Mode	80.12	4.006	0.25	1kHz	1.0

### 3M Mode



Date: 12.JAN.2018 20:49:35

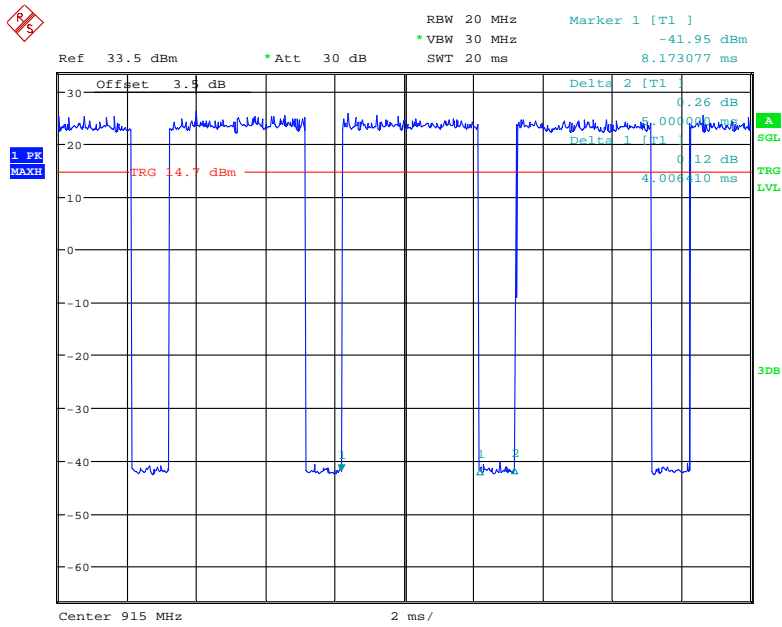
### 5M Mode



Date: 12.JAN.2018 20:47:51

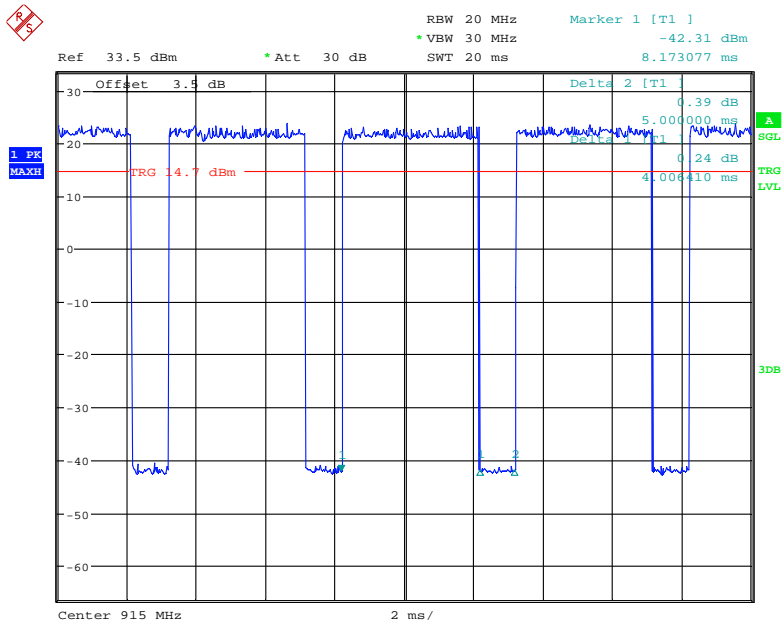


### 10M Mode



Date: 12.JAN.2018 20:50:49

### 20M Mode

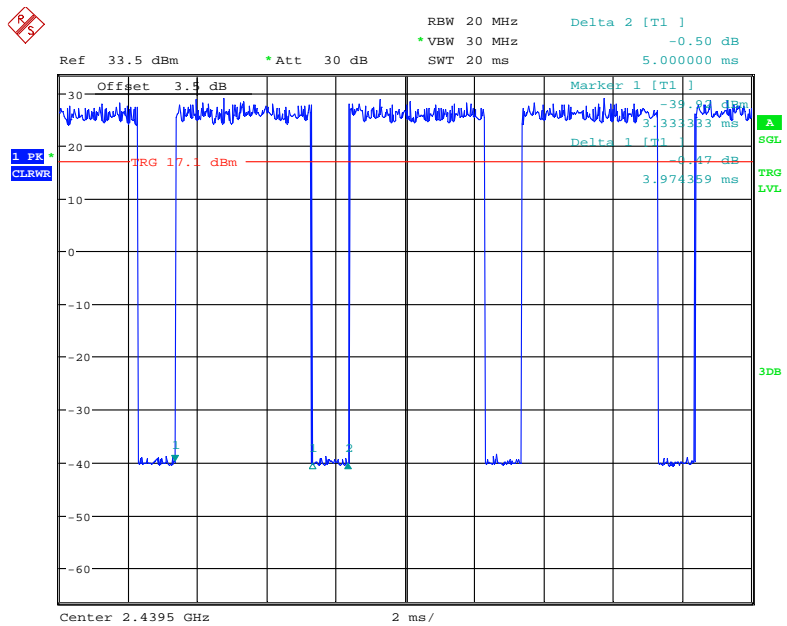


Date: 12.JAN.2018 20:43:03

**For 2.4GHz Antenna 03 & 04:**

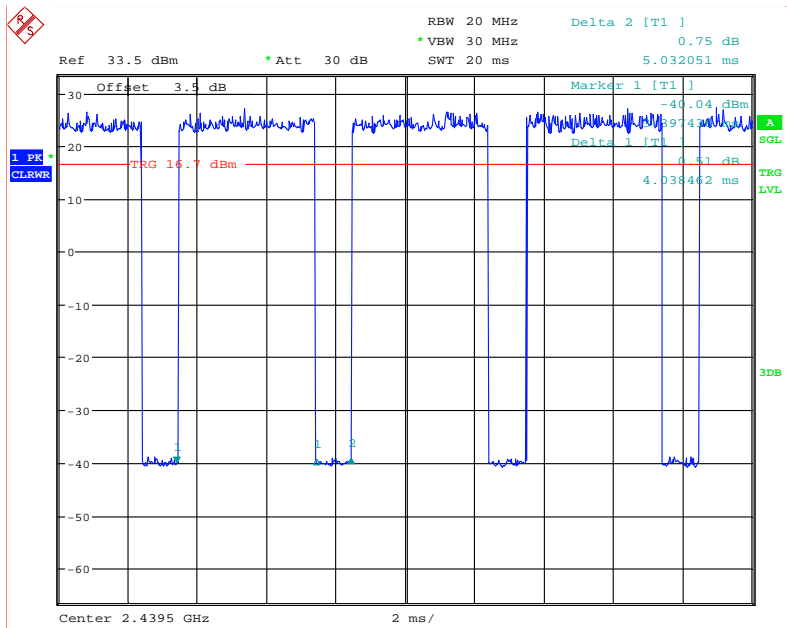
Item	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	10log(1/x)
3M Mode	79.48	3.974	0.25	1kHz	1.0
5M Mode	80.25	4.038	0.25	1kHz	1.0
10M Mode	79.61	4.006	0.25	1kHz	1.0
20M Mode	80.12	4.006	0.25	1kHz	1.0

**3M Mode**



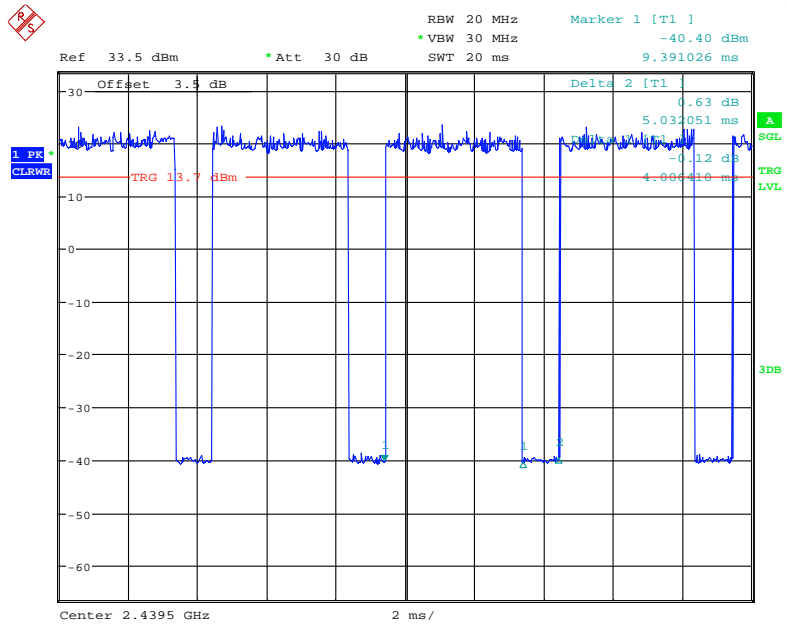
Date: 12.JAN.2018 17:30:24

### 5M Mode



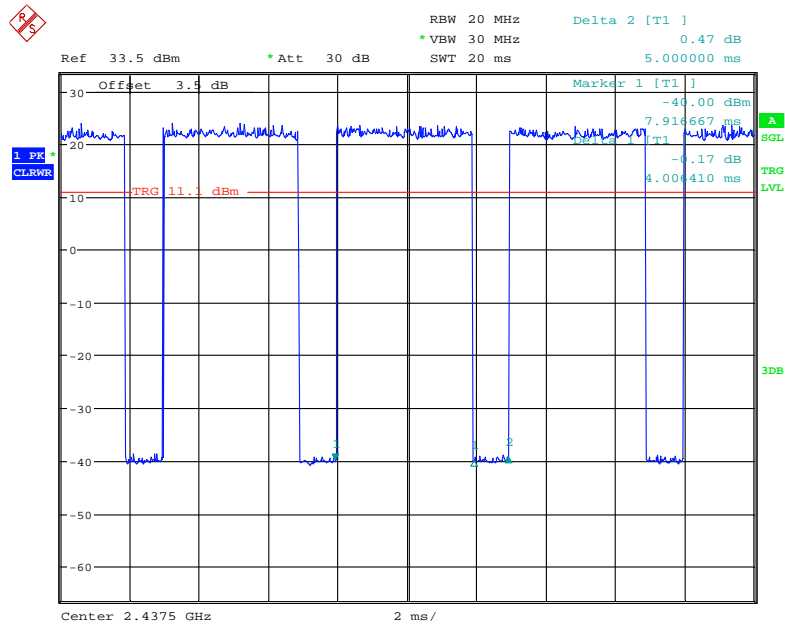
Date: 12.JAN.2018 17:32:47

### 10M Mode



Date: 12.JAN.2018 17:38:53

**20M Mode**



Date: 12.JAN.2018 17:41:56

**Support Equipment List and Details**

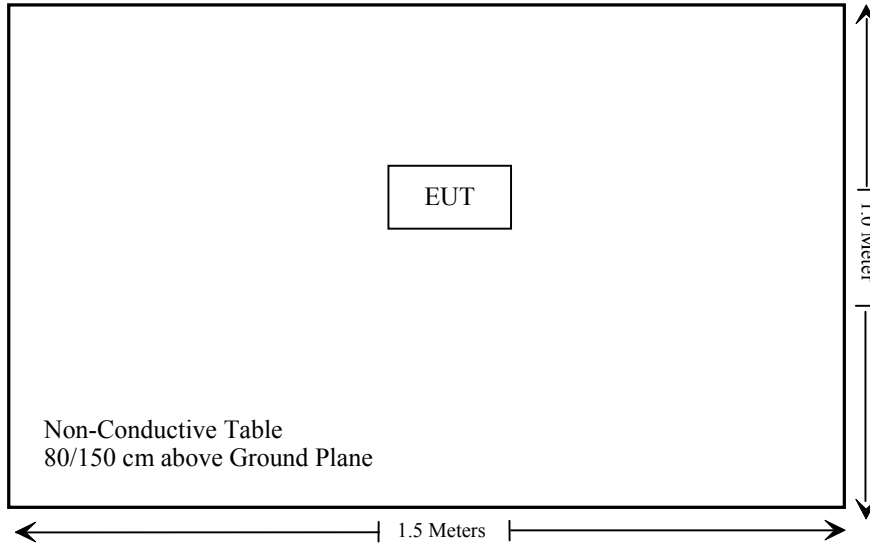
Manufacturer	Description	Model	Serial Number
/	Load Terminal	/	/

**External I/O Cable**

Cable Description	Length (m)	From Port	To
/	/	/	/

### Block Diagram of Test Setup

For Spurious Emissions:



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.247 (i) & §1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Not Applicable: This device is powered by battery only.

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test</b>					
A.H.System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-21
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2017-12-17	2020-12-16
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2017-12-07	2018-12-07
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	2	2017-11-19	2018-05-21
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
Sinoscite	Band Reject Filter	BSF2402-2480MN-0898-001	N/A	2017-05-21	2018-05-21
<b>RF Conducted Test</b>					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-05	2018-12-05
Ducommun technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22
Ducommun technologies	RF Cable	RG-214	4	2017-11-22	2018-05-22
WEINSCHL	3dB Attenuator	N/A	N/A	2017-11-23	2018-05-22
WEINSCHL	10dB Attenuator	5324	AU 3842	2017-11-22	2018-05-22

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

**FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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

**Result**

**Calculated Formulary:**

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

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)

Frequency Range (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
	(dBi)	(numeric)	(dBm)	(mW)			
2407.5 - 2471.5	2	1.58	25	316.23	20	0.100	1.00
2412.5 - 2462.5	2	1.58	24	251.19	20	0.079	1.00
909 - 921	1	1.26	24	251.19	20	0.063	0.61
914 - 916	1	1.26	25	316.23	20	0.079	0.61

Note: The conducted power is the tune-up power of the Max Conducted Peak Output Power.

To maintain compliance with the FCC’s RF exposure guidelines, place the equipment at least 20cm from nearby persons.



## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

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 exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has two internal PCB antennas arrangement for 2.4GHz and 900MHz, which were permanently attached and the antenna gain is 2.0dBi for 2.4GHz and 1.0dBi for 900MHz, fulfill the requirement of this section. Please refer to the EUT photos.

For the four antennas, one pair for 900MHz RF signal and the other pair for 2.4GHz RF signal. The two pairs of antennas do not work at the same time. And antennas use MISO mode in a pair of antennas, one antenna is used for transmitting signals and two antennas are used for receiving signals.

**Result:** Compliance.

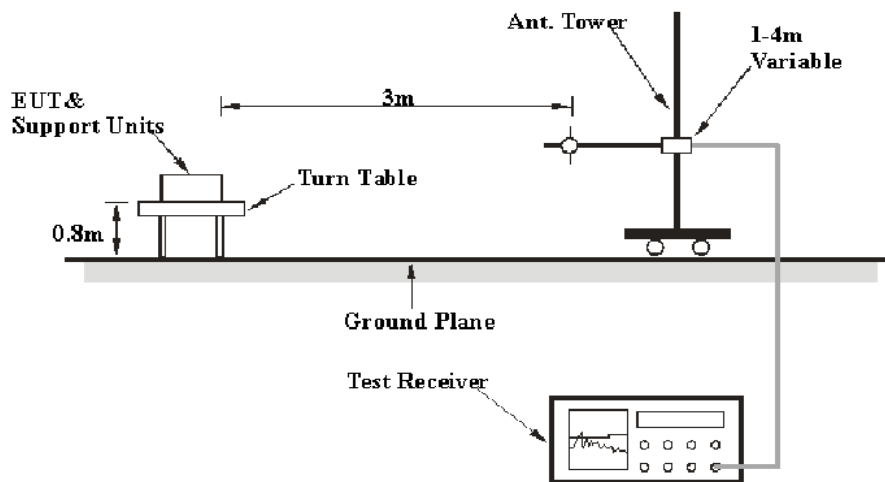
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

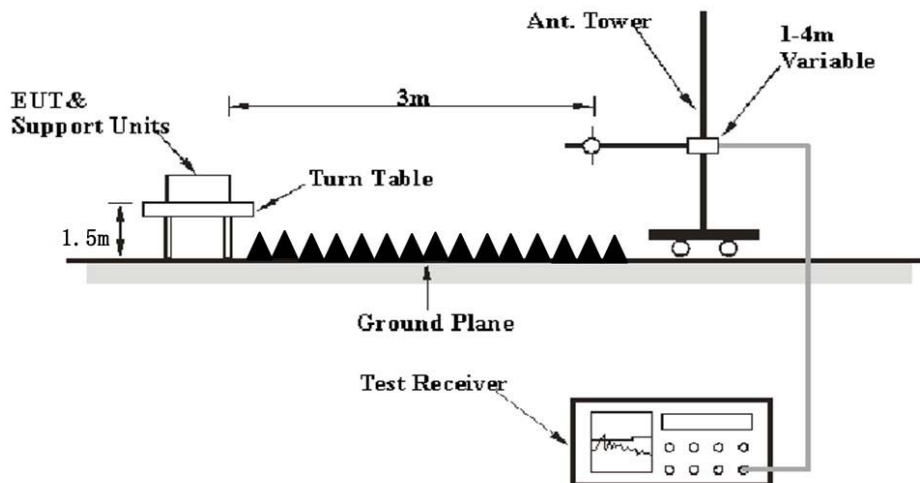
FCC §15.247 (d); §15.209; §15.205;

### EUT Setup

#### Below 1 GHz:



#### Above 1GHz:



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

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz <sup>Note 1</sup>	/	Ave.
	1MHz	> 1/T <sup>Note 2</sup>	/	Ave.

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

## Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{lim} + U_{cispr}$$

In BAACL,  $U_{(L_m)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

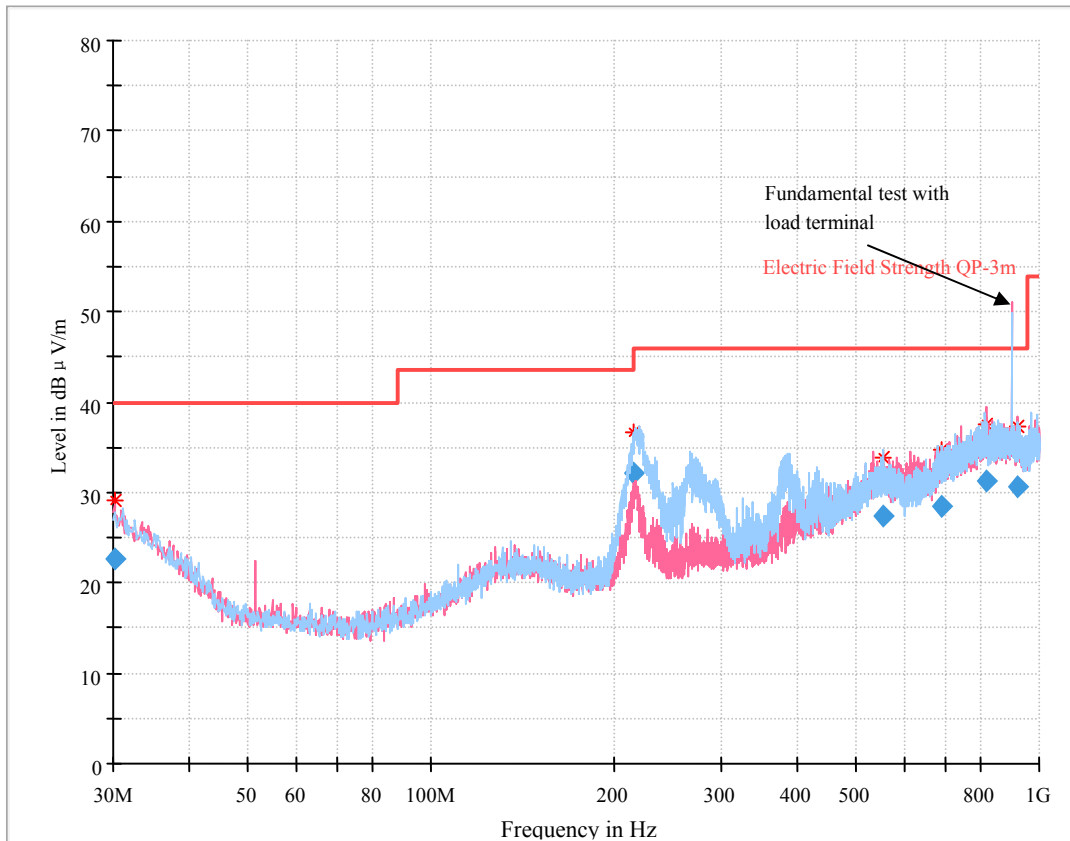
<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Vincent Zeng from 2018-01-15 to 2018-02-11.*

*EUT operation mode: Transmitting (Pre-scan with each antenna for 900MHz and 2.4GHz, and worst case as below)*

**For 900MHz:**

**30 MHz~1 GHz: (worst case for 20M Mode, Low channel)**



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
30.150187	22.65	119.0	V	24.0	0.2	40.00	17.35
215.894500	32.15	165.0	H	104.0	-6.5	43.50	11.35
553.126375	27.44	123.0	H	318.0	4.8	46.00	18.56
689.052625	28.56	275.0	H	261.0	6.2	46.00	17.44
821.214750	31.26	275.0	V	230.0	9.0	46.00	14.74
919.136500	30.68	105.0	V	189.0	9.1	46.00	15.32

**1 GHz - 10 GHz:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Low Channel (909 MHz) 3M Mode									
909	93.23	QP	182	1.4	H	9.4	102.63	/	/
909	92.26	QP	232	1.0	V	9.4	101.66	/	/
901.97	33.84	QP	204	2.2	H	9.6	43.44	82.63	39.19
901.97	33.98	QP	131	1.8	V	9.6	43.58	81.66	38.08
1818	57.56	PK	346	2.3	H	-4.87	52.69	74	21.31
1818	42.03	Ave.	346	2.3	H	-4.87	37.16	54	16.84
1818	58.19	PK	281	2.1	V	-4.87	53.32	74	20.68
1818	42.15	Ave.	281	2.1	V	-4.87	37.28	54	16.72
2727	43.47	PK	75	1.8	H	-0.01	43.46	74	30.54
2727	29.80	Ave.	75	1.8	H	-0.01	29.79	54	24.21
Middle Channel (915 MHz) 3M Mode									
915	94.03	QP	149	1.8	H	9.1	103.13	/	/
915	91.73	QP	189	2.1	V	9.1	100.83	/	/
1830	57.21	PK	49	2.2	H	-4.87	52.34	74	21.66
1830	42.07	Ave.	49	2.2	H	-4.87	37.20	54	16.80
1830	58.58	PK	109	2.1	V	-4.87	53.71	74	20.29
1830	43.10	Ave.	109	2.1	V	-4.87	38.23	54	15.77
High Channel (921 MHz) 3M Mode									
921	93.28	QP	235	1.2	H	8.9	97.33	/	/
921	90.26	QP	1	1.6	V	8.9	94.35	/	/
928.46	33.26	QP	155	1.8	H	9.6	40.80	77.33	36.53
928.46	34.23	QP	131	2.2	V	9.6	41.90	74.35	32.45
1842	58.26	PK	351	2.1	H	-4.87	53.39	74	20.61
1842	42.68	Ave.	351	2.1	H	-4.87	37.81	54	16.19
1842	58.41	PK	59	1.5	V	-4.87	53.54	74	20.46
1842	43.21	Ave.	59	1.5	V	-4.87	38.34	54	15.66
Low Channel (909 MHz) 5M Mode									
909	93.93	QP	182	1.4	H	9.4	103.33	/	/
909	90.99	QP	232	1	V	9.4	100.39	/	/
901.97	33.83	QP	204	2.2	H	9.6	43.43	83.33	39.90
901.97	35.07	QP	131	1.8	V	9.6	44.67	80.39	35.72
1818	61.89	PK	178	2.3	H	-4.87	57.02	74	16.98
1818	45.74	Ave.	178	2.3	H	-4.87	40.87	54	13.13
1818	61.97	PK	129	1.2	V	-4.87	57.10	74	16.90
1818	45.23	Ave.	129	1.2	V	-4.87	40.36	54	13.64

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Middle Channel (915 MHz) 5M Mode									
915	94.17	QP	149	1.8	H	9.1	103.27	/	/
915	94.64	QP	189	2.1	V	9.1	103.74	/	/
1830	60.33	PK	190	1.7	H	-4.87	55.46	74	18.54
1830	44.25	Ave.	190	1.7	H	-4.87	39.38	54	14.62
1830	60.94	PK	155	1.8	V	-4.87	56.07	74	17.93
1830	44.72	Ave.	155	1.8	V	-4.87	39.85	54	14.15
High Channel (921 MHz) 5M Mode									
921	93.10	QP	236	1.2	H	8.9	102.00	/	/
921	93.08	QP	10	1.6	V	8.9	101.98	/	/
928.46	34.77	QP	155	1.8	H	9.6	40.80	77.33	36.53
928.46	33.47	QP	131	2.2	V	9.6	41.90	74.35	32.45
1842	61.92	PK	249	1.7	H	-4.87	57.05	74	16.95
1842	45.26	Ave.	249	1.7	H	-4.87	40.39	54	13.61
1842	59.91	PK	164	2.3	V	-4.87	55.04	74	18.96
1842	44.21	Ave.	164	2.3	V	-4.87	39.34	54	14.66
Low Channel (909 MHz) 10M Mode									
909	90.07	QP	182	1.4	H	9.4	99.47	/	/
909	88.95	QP	232	1	V	9.4	98.35	/	/
901.97	52.92	QP	204	2.2	H	9.6	62.52	79.47	16.95
901.97	52.56	QP	131	1.8	V	9.6	62.16	78.35	16.19
1818	55.73	PK	261	1.8	H	-4.87	50.86	74	23.14
1818	38.69	Ave.	261	1.8	H	-4.87	33.82	54	20.18
1818	55.08	PK	8	1.8	V	-4.87	50.21	74	23.79
1818	38.51	Ave.	8	1.8	V	-4.87	33.64	54	20.36
Middle Channel (915 MHz) 10M Mode									
918	90.11	QP	149	1.8	H	9.1	99.21	/	/
918	89.08	QP	189	2.1	V	9.1	98.18	/	/
1830	56.38	PK	155	1.7	H	-4.87	51.51	74	22.49
1830	38.94	Ave.	155	1.7	H	-4.87	34.07	54	19.93
1830	55.74	PK	228	2.4	V	-4.87	50.87	74	23.13
1830	38.47	Ave.	228	2.4	V	-4.87	33.60	54	20.40

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (921 MHz) 10M Mode									
921	90.46	QP	235	1.2	H	8.9	97.33	/	/
921	89.86	QP	1	1.6	V	8.9	94.35	/	/
928.46	53.63	QP	155	1.8	H	9.6	40.80	77.33	36.53
928.46	54.12	QP	131	2.2	V	9.6	41.90	74.35	32.45
1842	55.47	PK	273	1.7	H	-4.87	50.60	74	23.40
1842	38.15	Ave.	273	1.7	H	-4.87	33.28	54	20.72
1842	55.20	PK	357	1.8	V	-4.87	50.33	74	23.67
1842	38.42	Ave.	357	1.8	V	-4.87	33.55	54	20.45
Low Channel (914 MHz) 20M Mode									
914	88.65	QP	240	1.2	H	9.1	97.75	/	/
914	87.42	QP	37	1.9	V	9.1	96.52	/	/
901.88	51.57	QP	186	2.6	H	9.6	61.17	77.75	16.58
901.88	51.01	QP	184	2.4	V	9.6	60.61	76.52	15.91
1828	50.92	PK	233	2.0	H	-4.87	46.05	74	27.95
1828	34.18	Ave.	233	2.0	H	-4.87	29.31	54	24.69
1828	51.78	PK	142	1.6	V	-4.87	46.91	74	27.09
1828	33.95	Ave.	142	1.6	V	-4.87	29.08	54	24.92
Middle Channel (915 MHz) 20M Mode									
915	87.91	QP	240	1.2	H	9.1	97.01	/	/
915	87.87	QP	37	1.9	V	9.1	96.97	/	/
1830	50.90	PK	179	2.0	H	-4.87	46.03	74	27.97
1830	34.71	Ave.	179	2.0	H	-4.87	29.84	54	24.16
1830	51.73	PK	216	2.1	V	-4.87	46.86	74	27.14
1830	33.95	Ave.	216	2.1	V	-4.87	29.08	54	24.92
High Channel (916 MHz) 20M Mode									
916	88.01	QP	240	1.2	H	9.1	97.11	/	/
916	87.64	QP	37	1.9	V	9.1	96.74	/	/
901.88	52.01	QP	186	2.6	H	9.6	61.61	77.11	15.50
901.88	51.77	QP	184	2.4	V	9.6	61.37	76.74	15.37
1832	50.89	PK	253	1.7	H	-4.87	46.02	74	27.98
1832	34.17	Ave.	253	1.7	H	-4.87	29.30	54	24.70
1832	51.67	PK	22	1.8	V	-4.87	46.80	74	27.20
1832	33.94	Ave.	22	1.8	V	-4.87	29.07	54	24.93

**Note:**

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

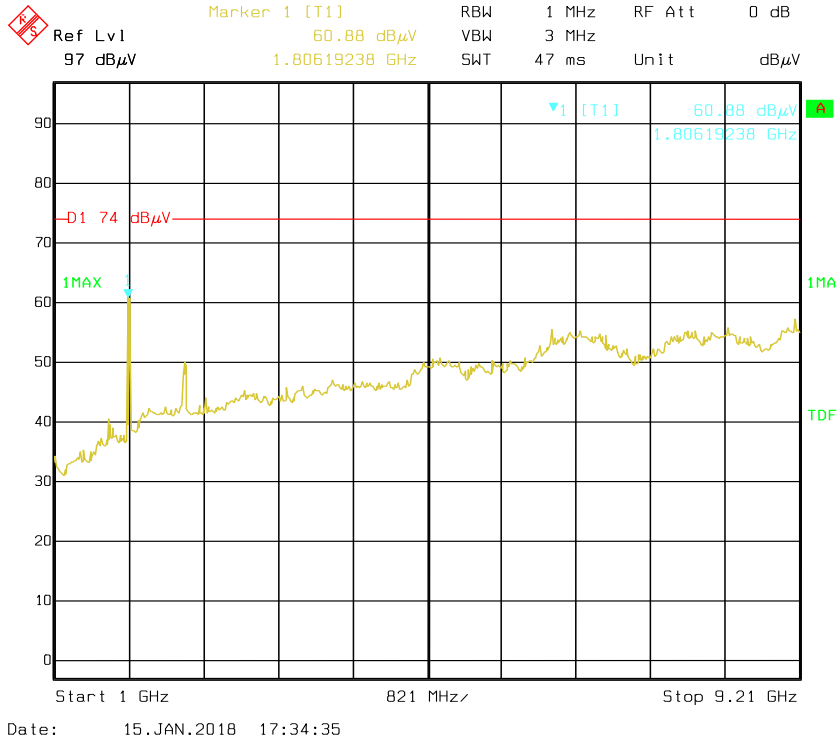
Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

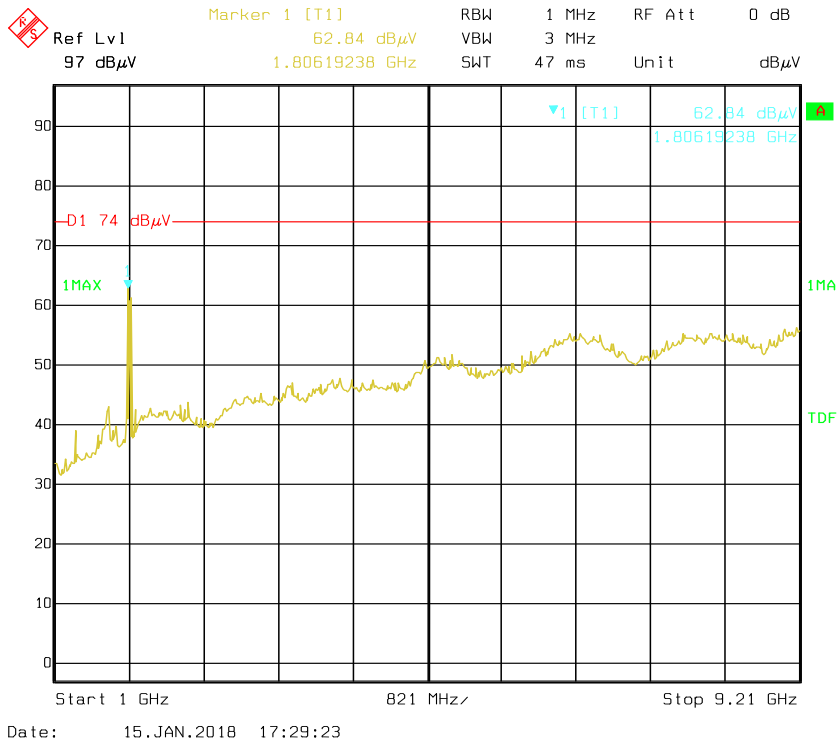


Pre-scan with 3M Mode, Low channel for Peak

Horizontal

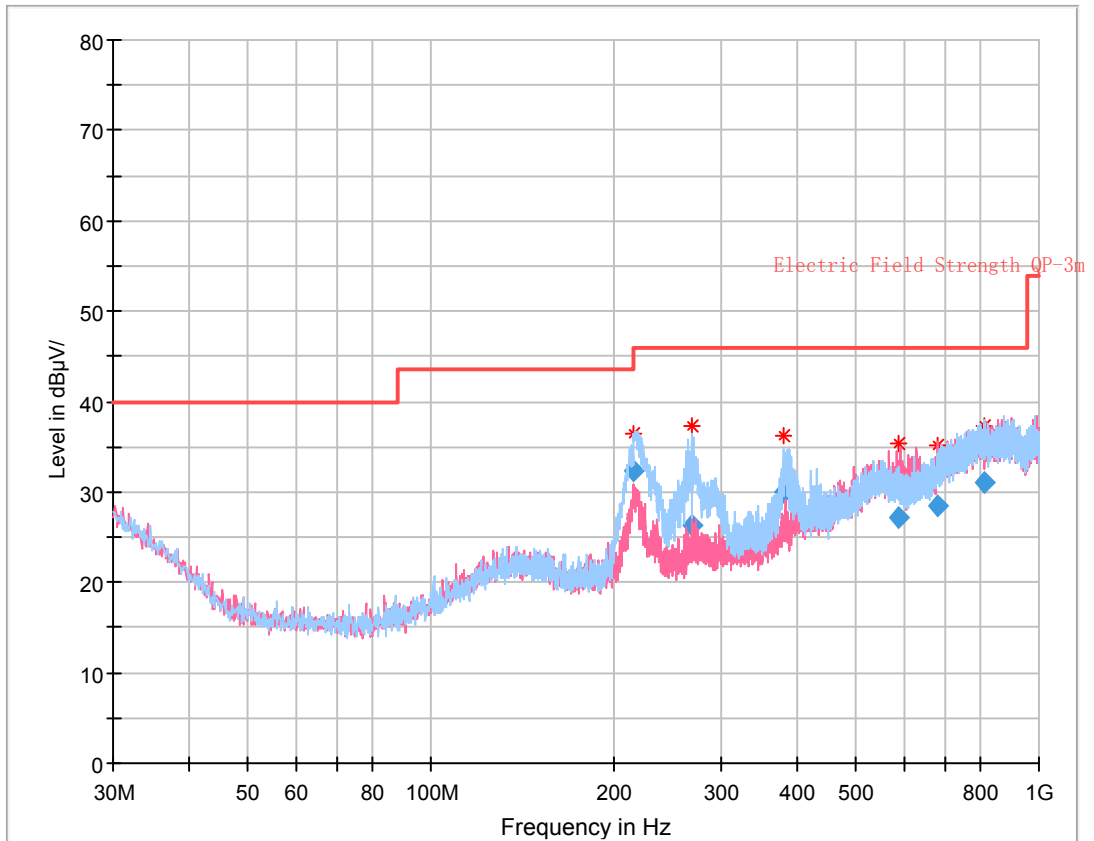


Vertical



**For 2.4GHz:**

**30 MHz~1 GHz: (worst case for 3M Mode, Middle channel)**



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
215.932500	32.26	154.0	H	114.0	-6.5	43.50	11.24
267.921875	26.39	100.0	H	202.0	-4.0	46.00	19.61
380.073625	29.87	105.0	H	99.0	-1.0	46.00	16.13
589.751375	27.24	112.0	V	122.0	3.8	46.00	18.76
681.737625	28.48	400.0	V	0.0	5.8	46.00	17.52
811.945375	31.10	122.0	H	24.0	9.0	46.00	14.90

**1 GHz - 25 GHz:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
3M Mode									
Low Channel (2407.5 MHz)									
2407.50	78.69	PK	90	1.7	H	33.92	112.61	/	/
2407.50	57.10	Ave.	90	1.7	H	33.92	91.02	/	/
2407.50	83.94	PK	232	1.7	V	33.92	117.86	/	/
2407.50	63.01	Ave.	232	1.7	V	33.92	96.93	/	/
2379.69	27.68	PK	154	1.1	V	33.92	61.60	74	12.40
2379.69	14.24	Ave.	154	1.1	V	33.92	48.16	54	5.84
2489.63	27.04	PK	241	1.3	V	34.08	61.12	74	12.88
2489.63	13.45	Ave.	241	1.3	V	34.08	47.53	54	6.47
4815.00	46.25	PK	44	2.3	V	5.84	52.09	74	21.91
4815.00	31.69	Ave.	44	2.3	V	5.84	37.53	54	16.47
7222.50	55.24	PK	30	1.8	V	14.00	69.24	74	4.76
7222.50	36.84	Ave.	30	1.8	V	14.00	50.84	54	3.16
Middle Channel (2439.5MHz)									
2439.50	78.73	PK	337	2.0	H	33.92	112.65	/	/
2439.50	57.39	Ave.	337	2.0	H	33.92	91.31	/	/
2439.50	84.57	PK	228	1.2	V	33.92	118.49	/	/
2439.50	63.14	Ave.	228	1.2	V	33.92	97.06	/	/
4879.00	47.03	PK	355	2.0	V	6.21	53.24	74	20.76
4879.00	32.75	Ave.	355	2.0	V	6.21	38.96	54	15.04
7318.50	53.54	PK	65	2.3	V	13.60	67.14	74	6.86
7318.50	35.72	Ave.	65	2.3	V	13.60	49.32	54	4.68
High Channel (2471.5 MHz)									
2471.50	78.39	PK	0	2.1	H	34.08	112.47	/	/
2471.50	57.76	Ave.	0	2.1	H	34.08	91.84	/	/
2471.50	84.69	PK	354	1.6	V	34.08	118.77	/	/
2471.50	63.41	Ave.	354	1.6	V	34.08	97.49	/	/
2372.26	27.89	PK	132	2.0	H	33.92	61.81	74	12.19
2372.26	14.21	Ave.	132	2.0	H	33.92	48.13	54	5.87
2483.76	27.27	PK	357	2.1	H	34.08	61.35	74	12.65
2483.76	13.58	Ave.	357	2.1	H	34.08	47.66	54	6.34
4943.00	45.32	PK	186	2.1	V	6.21	51.53	74	22.47
4943.00	30.44	Ave.	186	2.1	V	6.21	36.65	54	17.35
7414.50	54.18	PK	136	1.9	V	13.02	67.20	74	6.80
7414.50	36.90	Ave.	136	1.9	V	13.02	49.92	54	4.08

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
5M Mode									
Low Channel (2407.5 MHz)									
2407.50	78.64	PK	127	1.9	H	33.92	112.56	/	/
2407.50	57.12	Ave.	127	1.9	H	33.92	91.04	/	/
2407.50	86.31	PK	38	1.3	V	33.92	120.23	/	/
2407.50	64.41	Ave.	38	1.3	V	33.92	98.33	/	/
2372.00	29.31	PK	225	1.9	V	33.92	63.23	74	10.77
2372.00	15.20	Ave.	225	1.9	V	33.92	49.12	54	4.88
2484.41	28.02	PK	352	1.3	V	34.08	62.10	74	11.90
2484.41	13.42	Ave.	352	1.3	V	34.08	47.50	54	6.50
4815.00	47.08	PK	69	2.1	V	5.84	52.92	74	21.08
4815.00	32.65	Ave.	69	2.1	V	5.84	38.49	54	15.51
7222.50	56.24	PK	317	2.3	V	14.00	70.24	74	3.76
7222.50	37.74	Ave.	317	2.3	V	14.00	51.74	54	2.26
Middle Channel (2439.5MHz)									
2439.50	79.26	PK	14	2.0	H	33.92	113.18	/	/
2439.50	58.10	Ave.	14	2.0	H	33.92	92.02	/	/
2439.50	85.97	PK	17	2.3	V	33.92	119.89	/	/
2439.50	64.42	Ave.	17	2.3	V	33.92	98.34	/	/
4879.00	47.06	PK	303	2.2	V	6.21	53.27	74	20.73
4879.00	32.85	Ave.	303	2.2	V	6.21	39.06	54	14.94
7318.50	56.62	PK	102	1.3	V	13.60	70.22	74	3.78
7318.50	37.45	Ave.	102	1.3	V	13.60	51.05	54	2.95
High Channel (2471.5 MHz)									
2471.50	79.63	PK	92	1.3	H	34.08	113.71	/	/
2471.50	58.74	Ave.	92	1.3	H	34.08	92.82	/	/
2471.50	86.89	PK	292	1.2	V	34.08	120.97	/	/
2471.50	64.32	Ave.	292	1.2	V	34.08	98.40	/	/
2372.00	27.80	PK	220	2.0	V	33.92	61.72	74	12.28
2372.00	14.09	Ave.	220	2.0	V	33.92	48.01	54	5.99
2484.41	34.40	PK	317	1.5	V	34.08	68.48	74	5.52
4943.00	46.96	PK	275	2.3	V	6.21	53.17	74	20.83
4943.00	32.08	Ave.	275	2.3	V	6.21	38.29	54	15.71
7414.50	56.70	PK	351	1.9	V	13.02	69.72	74	4.28
7414.50	37.89	Ave.	351	1.9	V	13.02	50.91	54	3.09

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
10M Mode									
Low Channel (2407.5 MHz)									
2407.50	73.84	PK	1	1.5	H	33.92	107.76	/	/
2407.50	51.70	Ave.	1	1.5	H	33.92	85.62	/	/
2407.50	82.17	PK	237	1.0	V	33.92	116.09	/	/
2407.50	60.85	Ave.	237	1.0	V	33.92	94.77	/	/
2378.69	28.11	PK	226	1.1	V	33.92	62.03	74	11.97
2378.69	14.09	Ave.	226	1.1	V	33.92	48.01	54	5.99
2489.67	27.46	PK	128	1.7	V	34.08	61.54	74	12.46
2489.67	13.45	Ave.	128	1.7	V	34.08	47.53	54	6.47
4815.00	43.19	PK	89	2.2	V	5.84	49.03	74	24.97
4815.00	29.58	Ave.	89	2.2	V	5.84	35.42	54	18.58
7222.50	49.21	PK	142	1.7	V	14.00	63.21	74	10.79
7222.50	32.21	Ave.	142	1.7	V	14.00	46.21	54	7.79
Middle Channel (2439.5MHz)									
2439.50	73.26	PK	210	1.9	H	33.92	107.18	/	/
2439.50	51.20	Ave.	210	1.9	H	33.92	85.12	/	/
2439.50	80.89	PK	33	1.9	V	33.92	114.81	/	/
2439.50	59.12	Ave.	33	1.9	V	33.92	93.04	/	/
4879.00	44.62	PK	355	1.5	V	6.21	50.83	74	23.17
4879.00	29.45	Ave.	355	1.5	V	6.21	35.66	54	18.34
7318.50	49.06	PK	75	1.3	V	13.60	62.66	74	11.34
7318.50	32.34	Ave.	75	1.3	V	13.60	45.94	54	8.06
High Channel (2471.5 MHz)									
2471.50	75.01	PK	228	1.6	H	34.08	109.09	/	/
2471.50	52.43	Ave.	228	1.6	H	34.08	86.51	/	/
2471.50	81.80	PK	339	1.1	V	34.08	115.88	/	/
2471.50	59.71	Ave.	339	1.1	V	34.08	93.79	/	/
2360.03	27.84	PK	344	1.9	V	33.92	61.76	74	12.24
2360.03	14.12	Ave.	344	1.9	V	33.92	48.04	54	5.96
2489.67	36.59	PK	249	1.9	V	34.08	70.67	74	3.33
2489.67	17.39	Ave.	249	1.9	V	34.08	51.47	54	2.53
4943.00	44.27	PK	346	1.5	V	6.21	50.48	74	23.52
4943.00	29.46	Ave.	346	1.5	V	6.21	35.67	54	18.33
7414.50	48.47	PK	197	1.7	V	13.02	61.49	74	12.51
7414.50	32.18	Ave.	197	1.7	V	13.02	45.20	54	8.80

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.247/205/209	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
20M Mode									
Low Channel (2412.5 MHz)									
2412.50	71.54	PK	34	2.0	H	33.92	105.46	/	/
2412.50	50.60	Ave.	34	2.0	H	33.92	84.52	/	/
2412.50	78.75	PK	36	1.3	V	33.92	112.67	/	/
2412.50	57.09	Ave.	36	1.3	V	33.92	91.01	/	/
2388.47	36.36	PK	347	2.3	V	33.92	70.28	74	3.72
2388.47	17.03	Ave.	347	2.3	V	33.92	50.95	54	3.05
2489.69	27.69	PK	169	2.0	V	34.08	61.77	74	12.23
2489.69	13.46	Ave.	169	2.0	V	34.08	47.54	54	6.46
4825.00	43.38	PK	88	1.7	V	5.84	49.22	74	24.78
4825.00	29.69	Ave.	88	1.7	V	5.84	35.53	54	18.47
7237.50	46.35	PK	139	1.4	V	14.00	60.35	74	13.65
7237.50	31.85	Ave.	139	1.4	V	14.00	45.85	54	8.15
Middle Channel (2437.5MHz)									
2437.50	74.10	PK	11	2.0	H	33.92	108.02	/	/
2437.50	51.36	Ave.	11	2.0	H	33.92	85.28	/	/
2437.50	79.63	PK	60	2.4	V	33.92	113.55	/	/
2437.50	56.63	Ave.	60	2.4	V	33.92	90.55	/	/
4875.00	43.97	PK	108	2.5	V	6.21	50.18	74	23.82
4875.00	29.37	Ave.	108	2.5	V	6.21	35.58	54	18.42
7312.50	48.63	PK	157	1.5	V	13.60	62.23	74	11.77
7312.50	32.14	Ave.	157	1.5	V	13.60	45.74	54	8.26
High Channel (2462.5 MHz)									
2462.50	73.40	PK	294	1.7	H	34.08	107.48	/	/
2462.50	51.46	Ave.	294	1.7	H	34.08	85.54	/	/
2462.50	79.12	PK	168	1.9	V	34.08	113.20	/	/
2462.50	56.39	Ave.	168	1.9	V	34.08	90.47	/	/
2374.62	28.02	PK	7	1.6	V	33.92	61.94	74	12.06
2374.62	14.21	Ave.	7	1.6	V	33.92	48.13	54	5.87
2484.32	35.70	PK	232	1.0	V	34.08	69.78	74	4.22
2484.32	17.33	Ave.	232	1.0	V	34.08	51.41	54	2.59
4925.00	43.96	PK	165	1.1	V	6.21	50.17	74	23.83
4925.00	29.85	Ave.	165	1.1	V	6.21	36.06	54	17.94
7387.50	48.16	PK	57	1.4	V	13.02	61.18	74	12.82
7387.50	32.86	Ave.	57	1.4	V	13.02	45.88	54	8.12

**Note:**

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

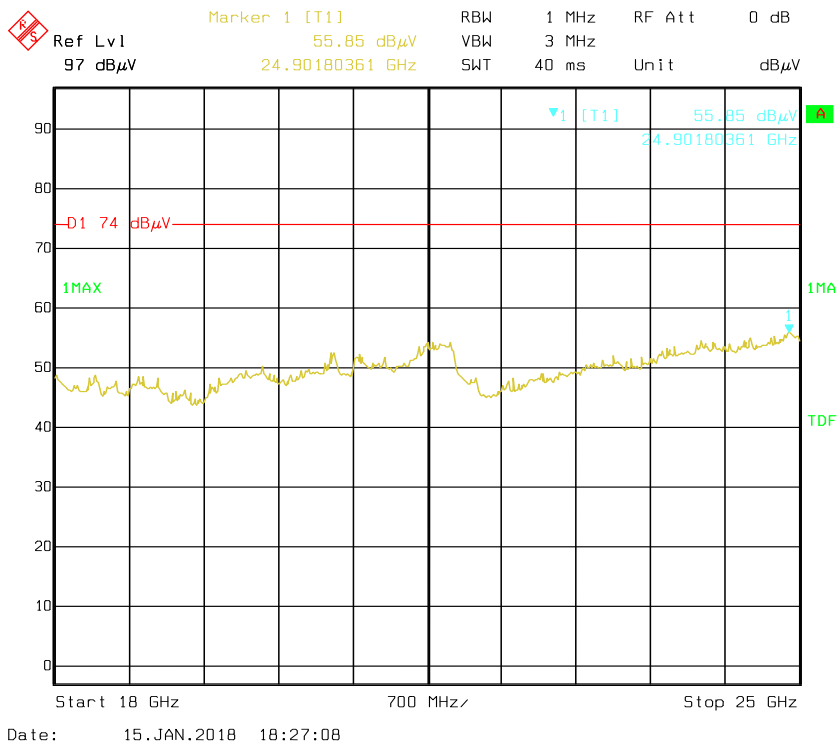
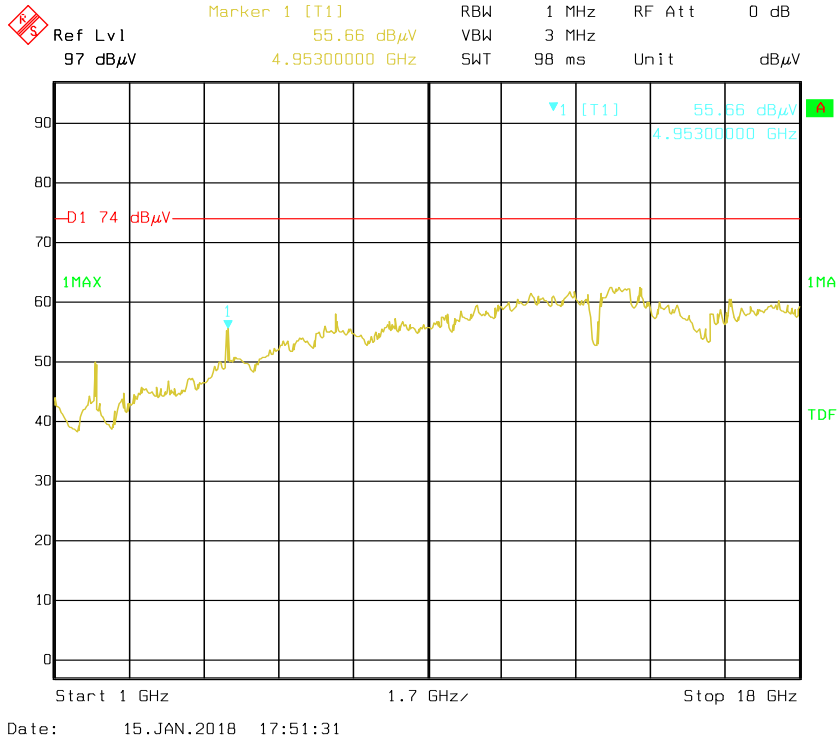
Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

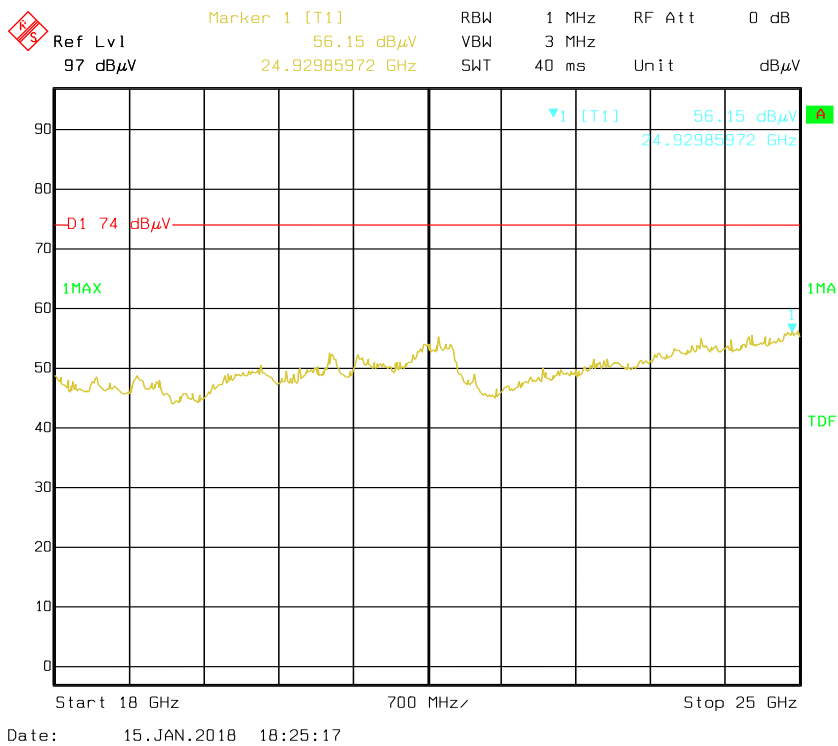
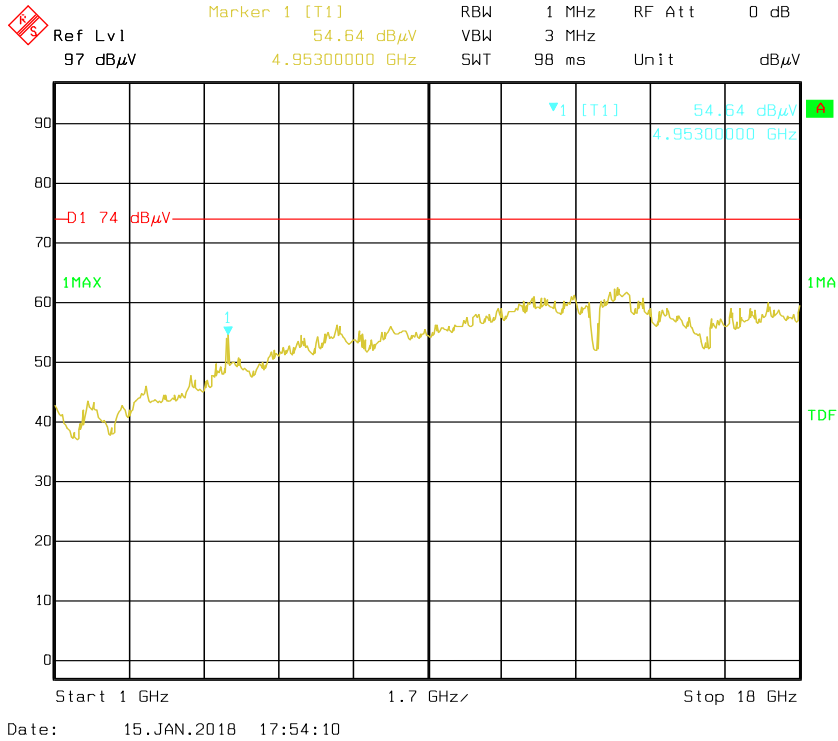
And for the pre-scan is performed with the 2400-2483.5MHz band filter.

Pre-scan with 3M Mode, Middle channel for Peak

Horizontal

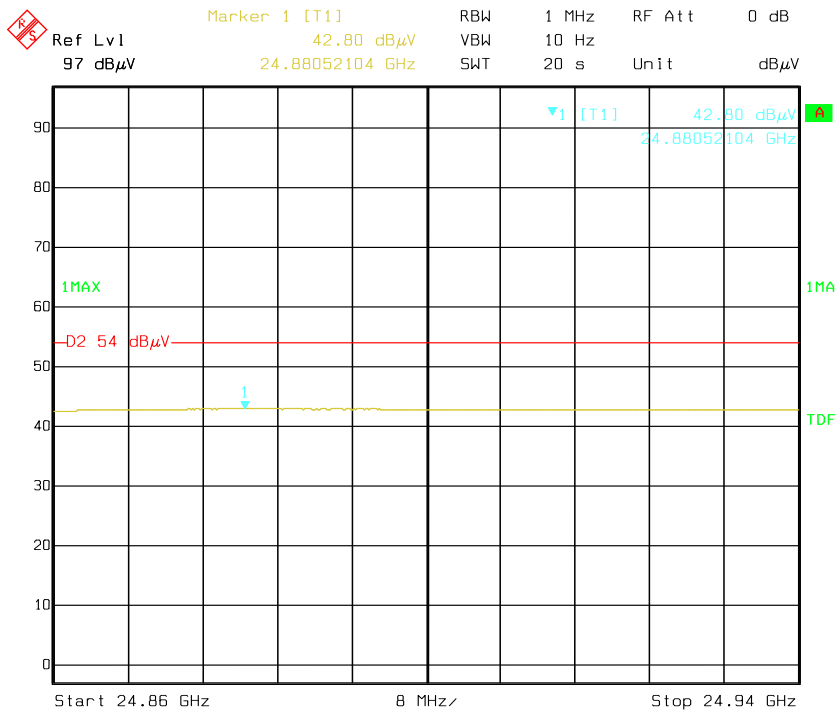
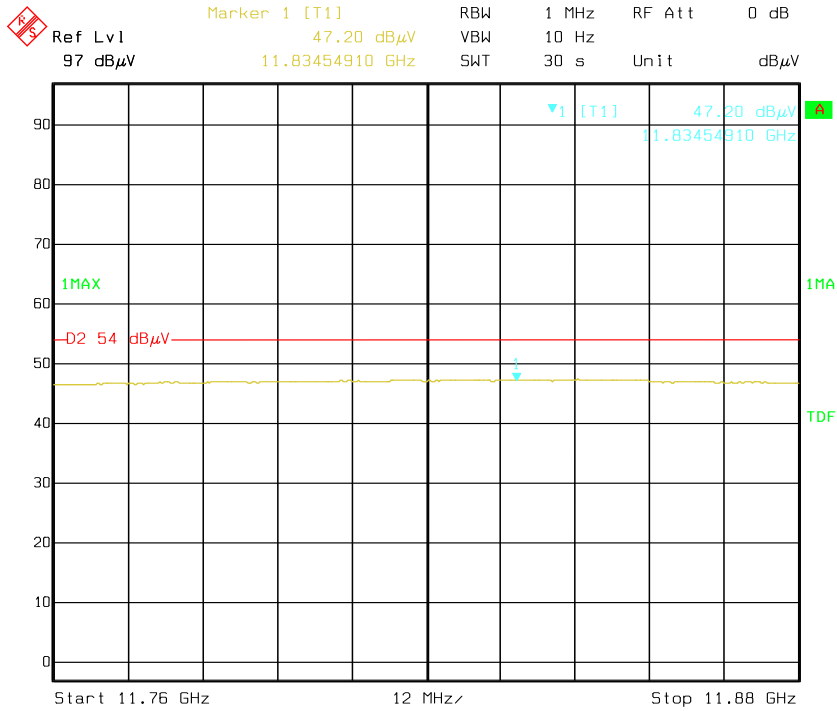


### Vertical

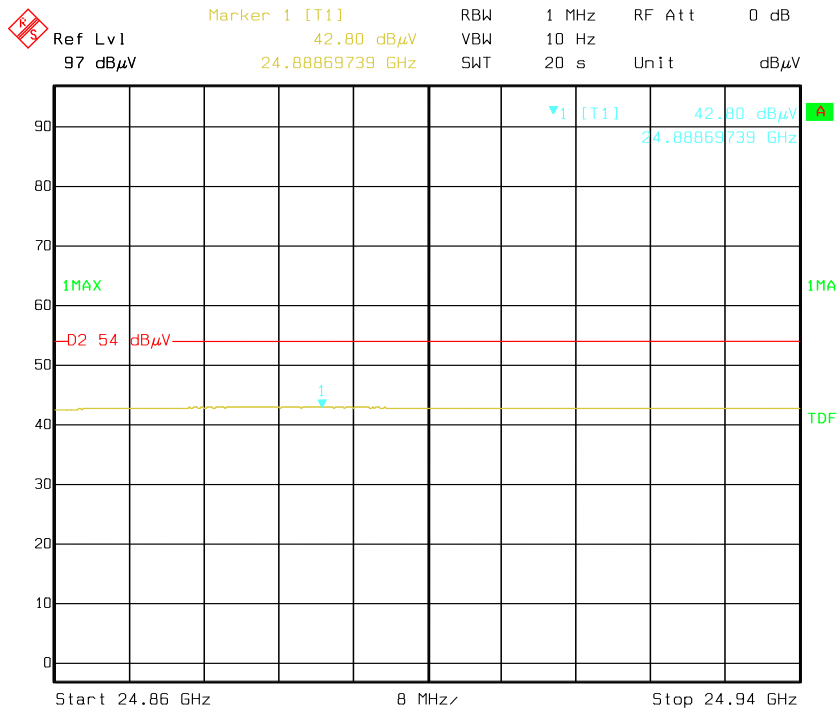
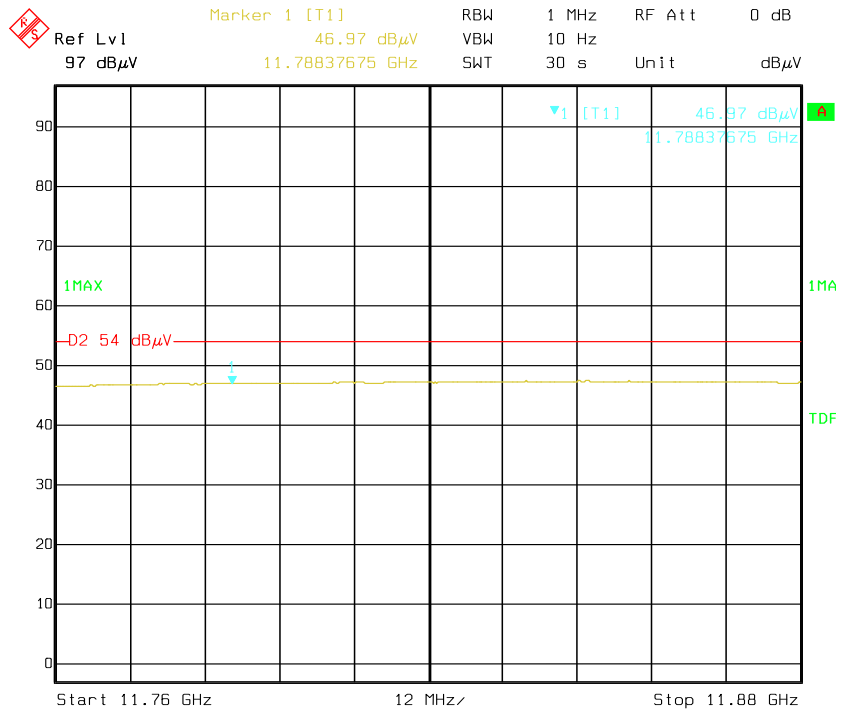




**For Average**



**Vertical**



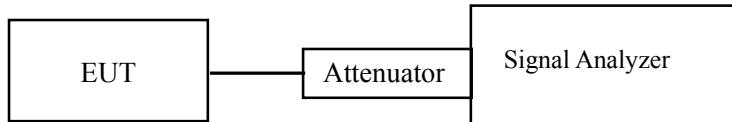
## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### Applicable Standard

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.

### 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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



### Test Data

#### Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Vincent Zeng on 2018-01-12.*

**Test Result:** Pass.

Please refer to the following table and plots.

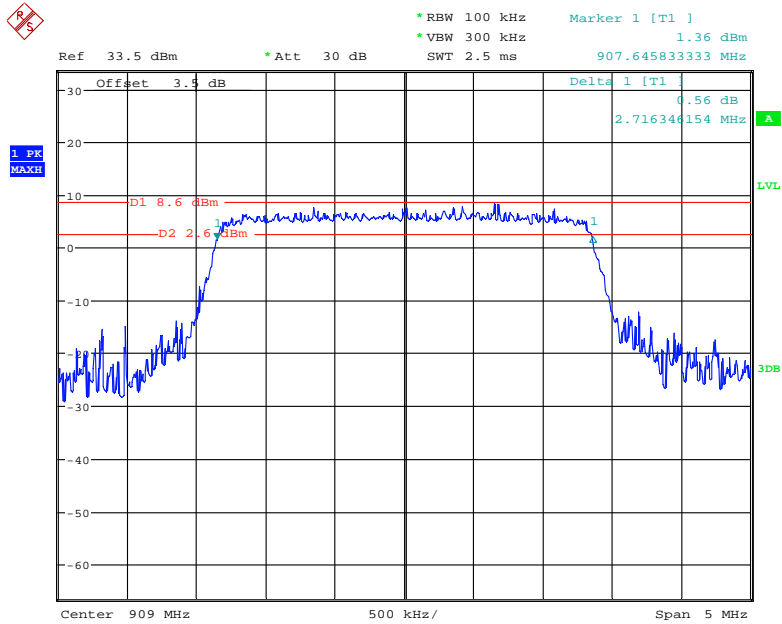
*EUT operation mode: Transmitting*

**For 900MHz Antenna 01:**

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
3M Mode			
Low	909	2.716	≥500
Middle	915	2.700	≥500
High	921	2.724	≥500
5M Mode			
Low	909	4.567	≥500
Middle	915	4.535	≥500
High	921	4.551	≥500
10M Mode			
Low	909	9.071	≥500
Middle	915	9.038	≥500
High	921	9.071	≥500
20M Mode			
Low	914	18.141	≥500
Middle	915	18.141	≥500
High	916	18.141	≥500

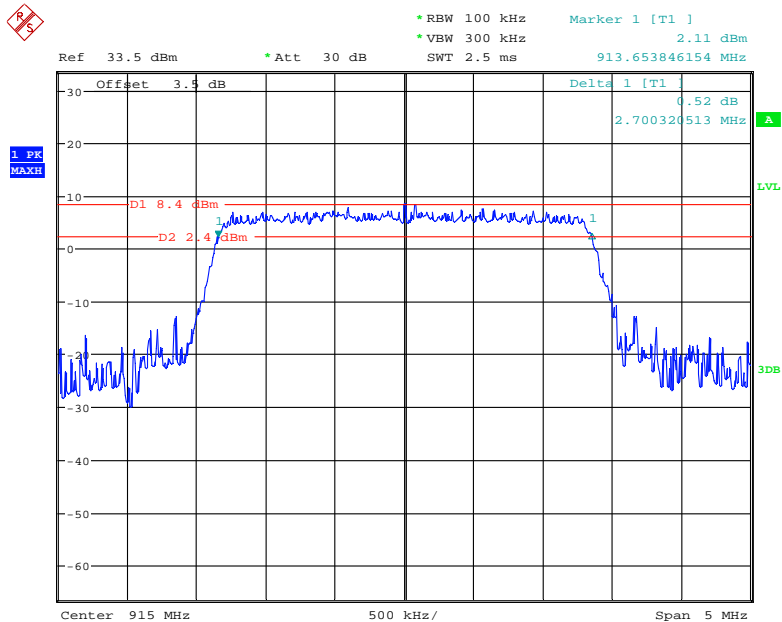
### 3M Mode

#### Low Channel



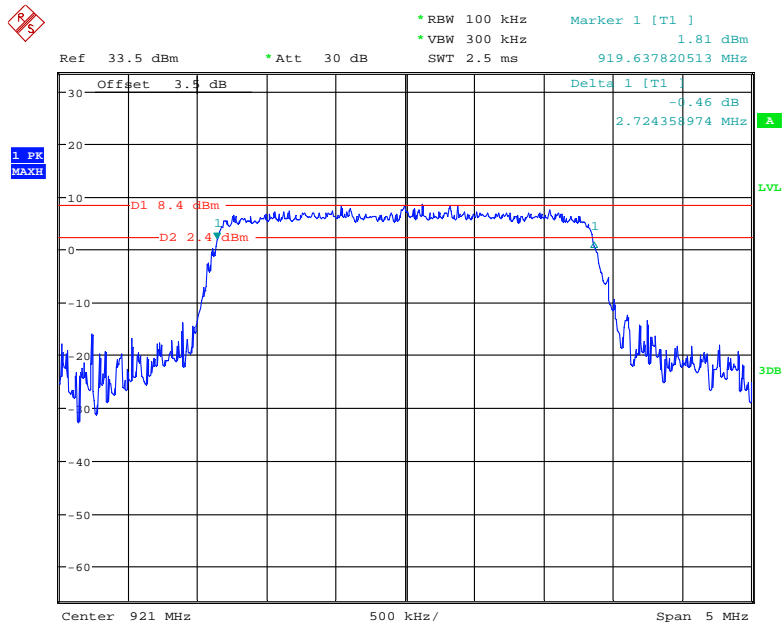
Date: 12.JAN.2018 21:45:40

#### Middle Channel



Date: 12.JAN.2018 21:39:08

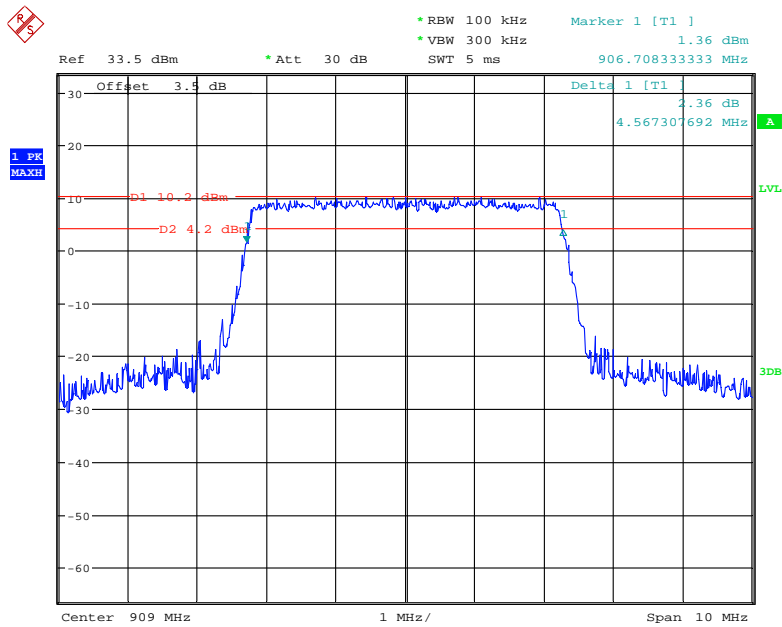
### High Channel



Date: 12.JAN.2018 21:49:23

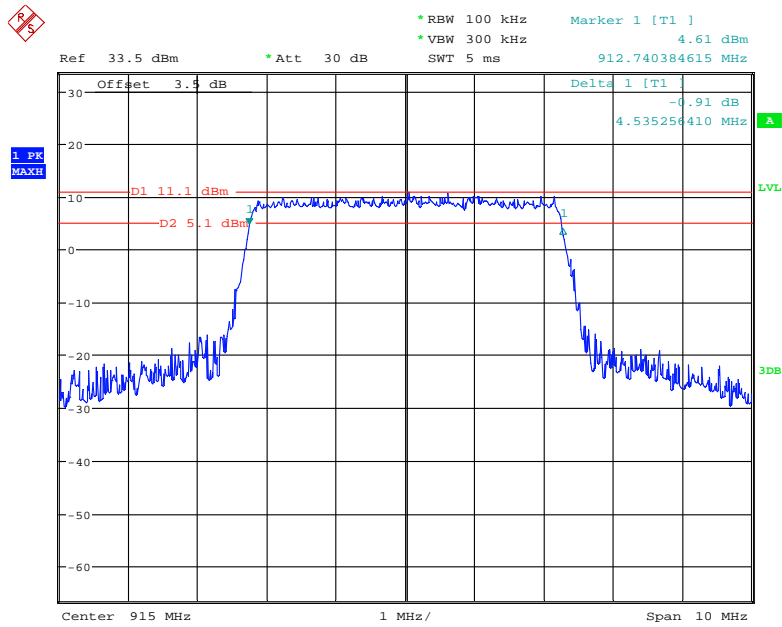
### 5M Mode

### Low Channel



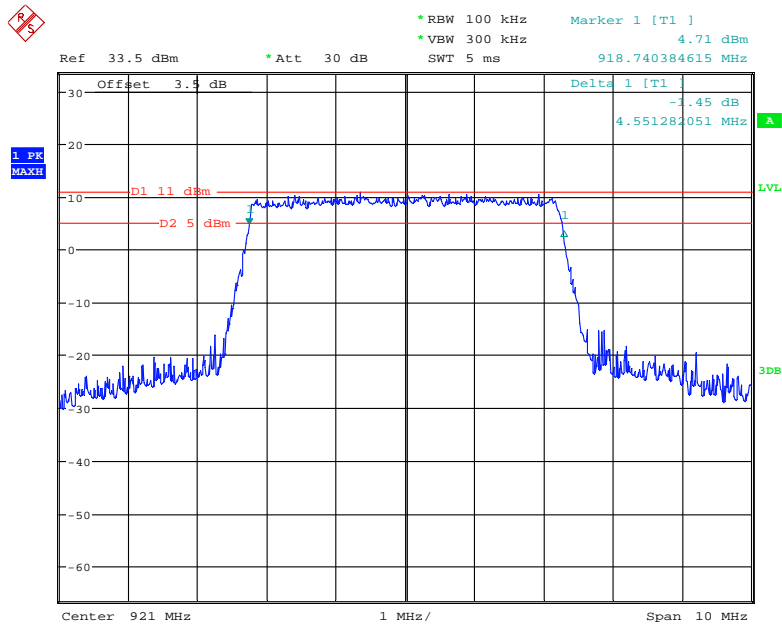
Date: 12.JAN.2018 22:10:01

### Middle Channel



Date: 12.JAN.2018 22:12:19

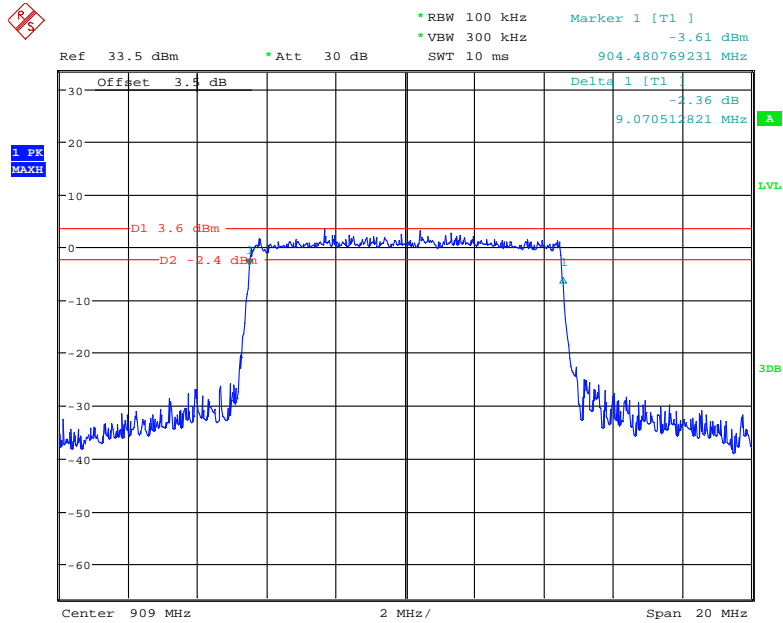
### High Channel



Date: 12.JAN.2018 22:16:04

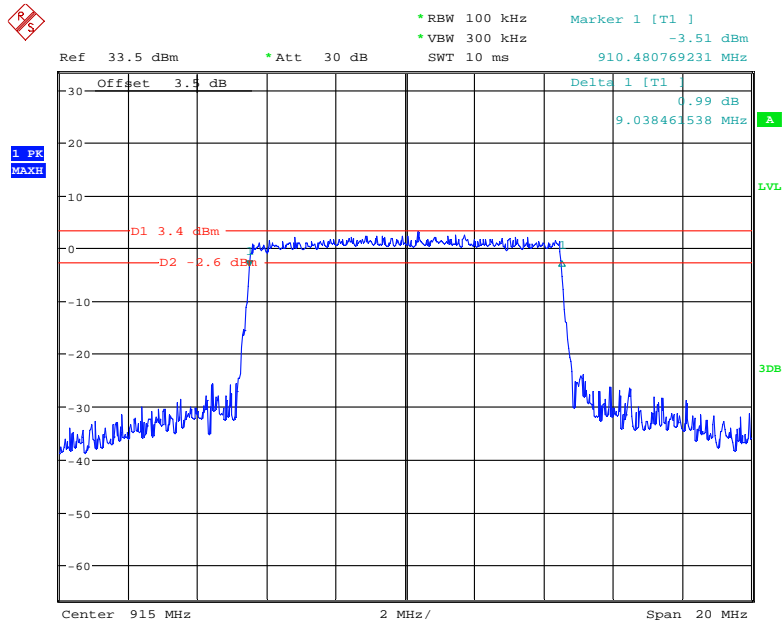
### 10M Mode

### Low Channel



Date: 12.JAN.2018 21:09:14

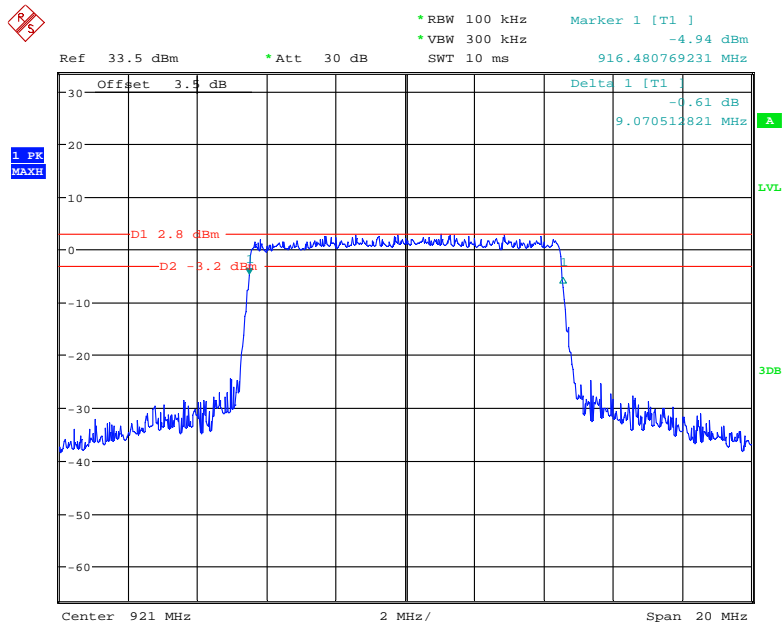
### Middle Channel



Date: 12.JAN.2018 20:57:06



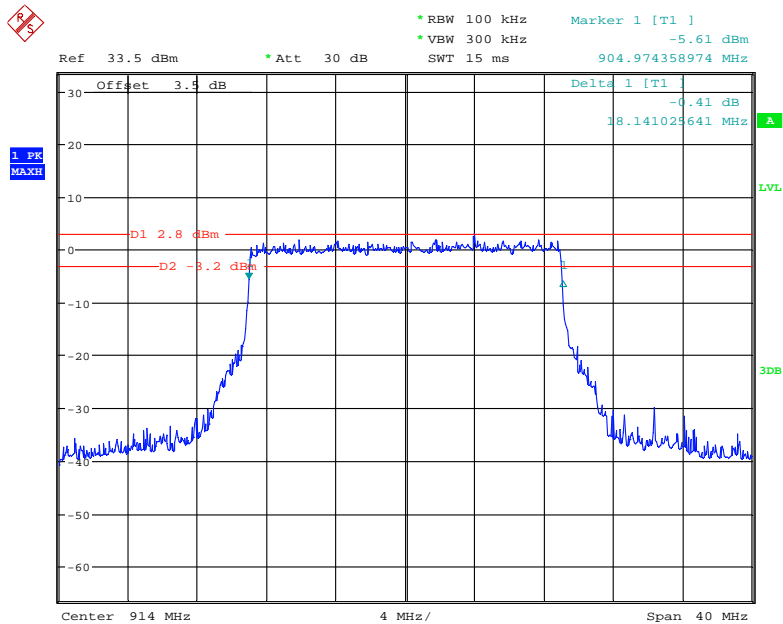
### High Channel



Date: 12.JAN.2018 21:13:25

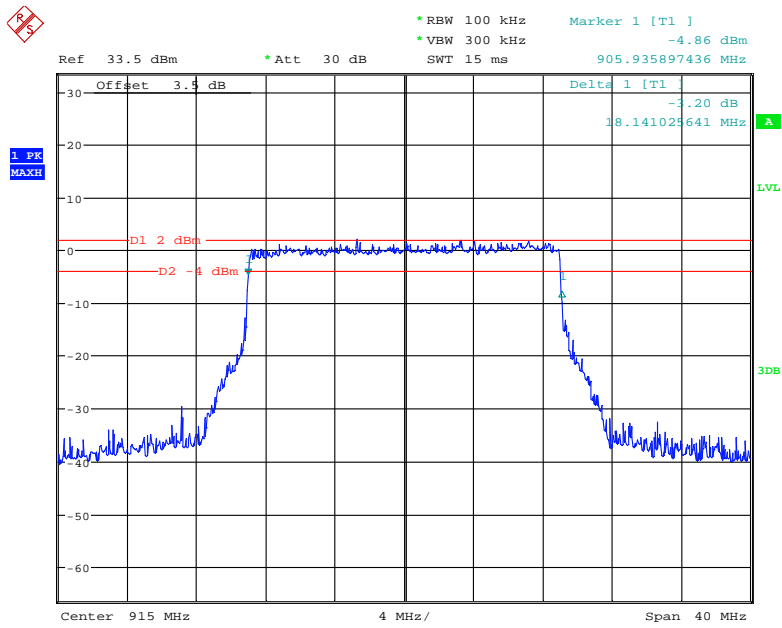
### 20M Mode

### Low Channel



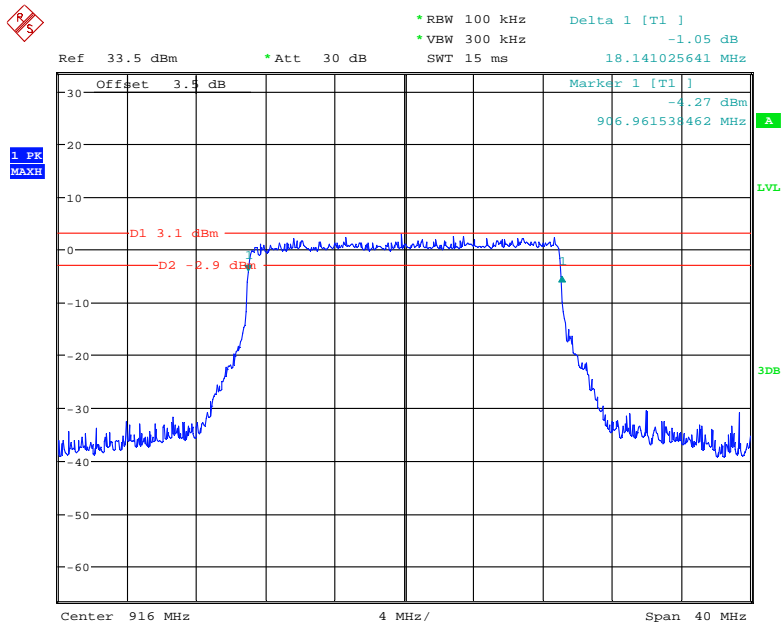
Date: 12.JAN.2018 19:50:13

### Middle Channel



Date: 12.JAN.2018 19:51:26

### 20M High Channel



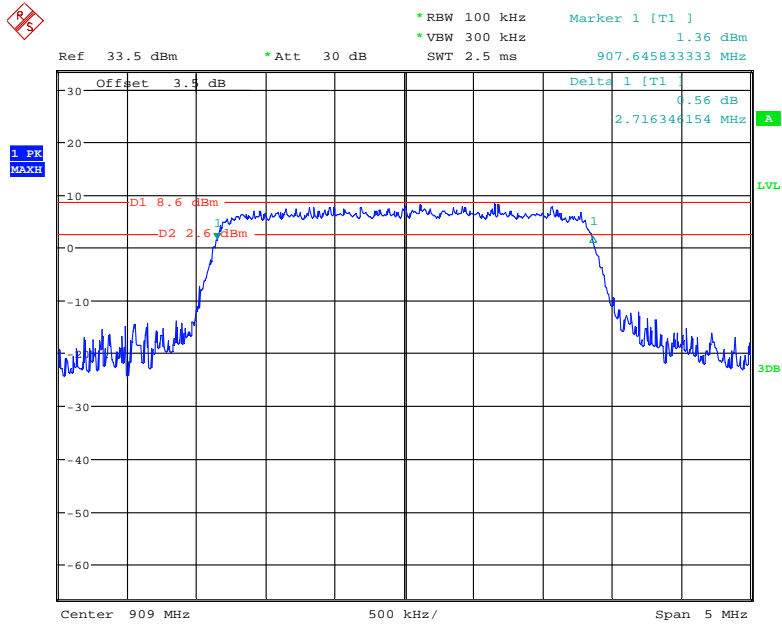
Date: 12.JAN.2018 19:45:59

**For 900MHz Antenna 02:**

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
3M Mode			
Low	909	2.716	≥500
Middle	915	2.700	≥500
High	921	2.724	≥500
5M Mode			
Low	909	4.519	≥500
Middle	915	4.535	≥500
High	921	4.551	≥500
10M Mode			
Low	909	9.038	≥500
Middle	915	9.038	≥500
High	921	9.071	≥500
20M Mode			
Low	914	18.141	≥500
Middle	915	18.141	≥500
High	916	18.141	≥500

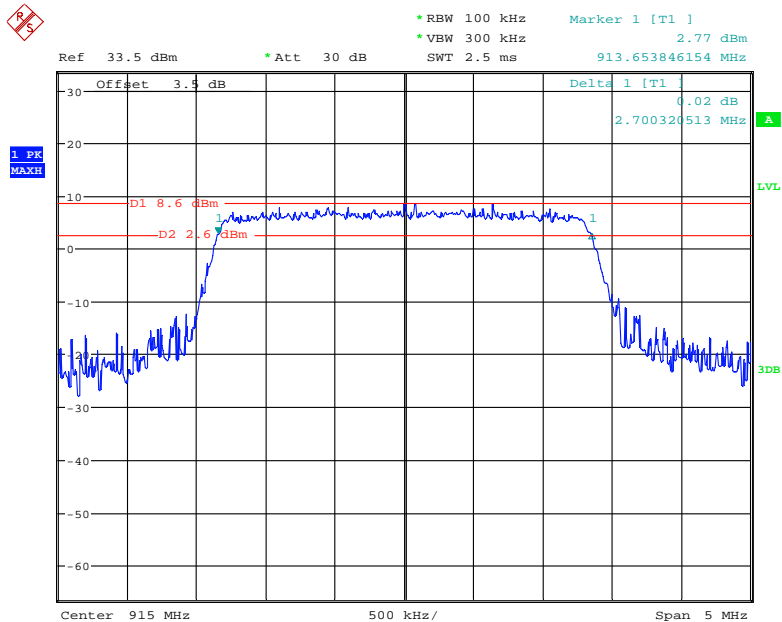
### 3M Mode

#### Low Channel



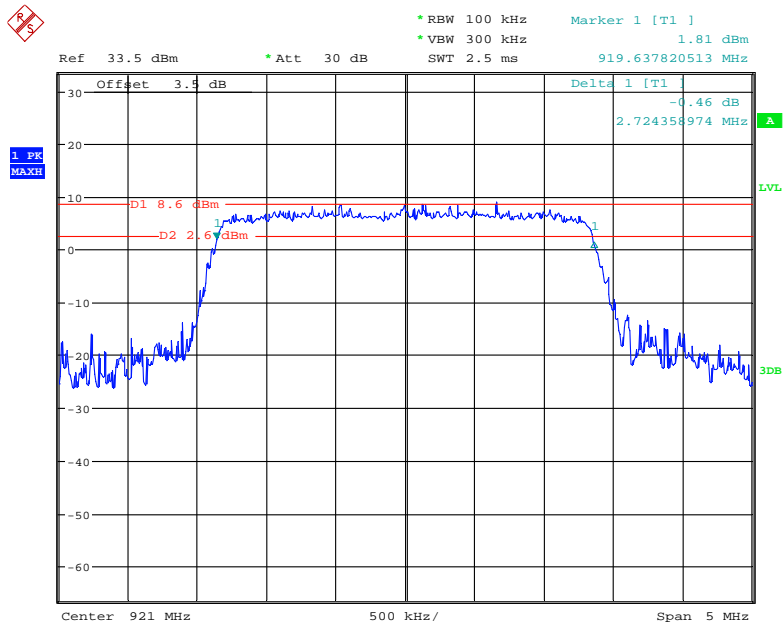
Date: 12.JAN.2018 21:48:19

#### Middle Channel



Date: 12.JAN.2018 21:40:46

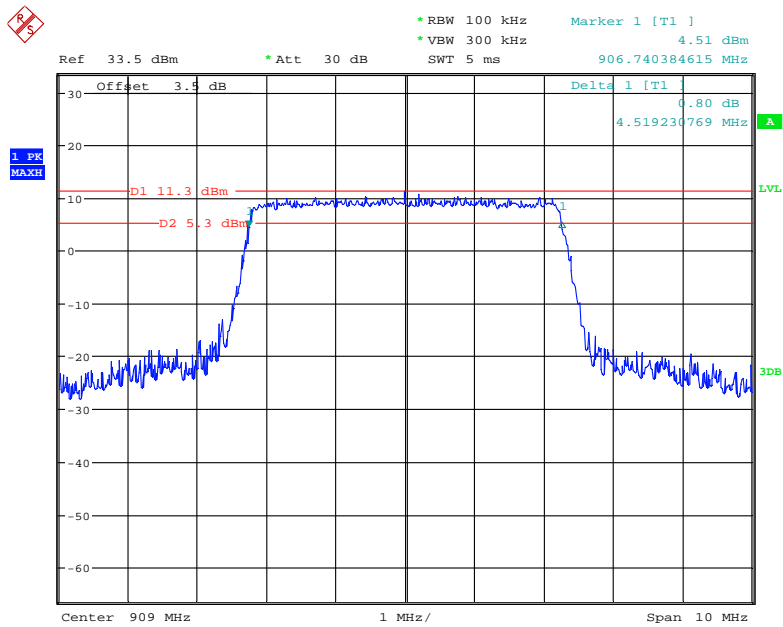
### High Channel



Date: 12.JAN.2018 21:49:56

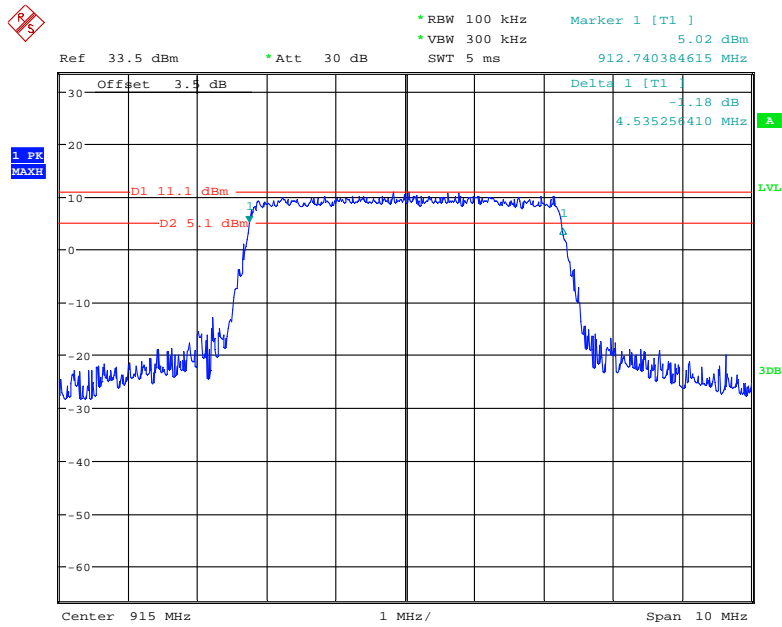
### 5M Mode

### Low Channel



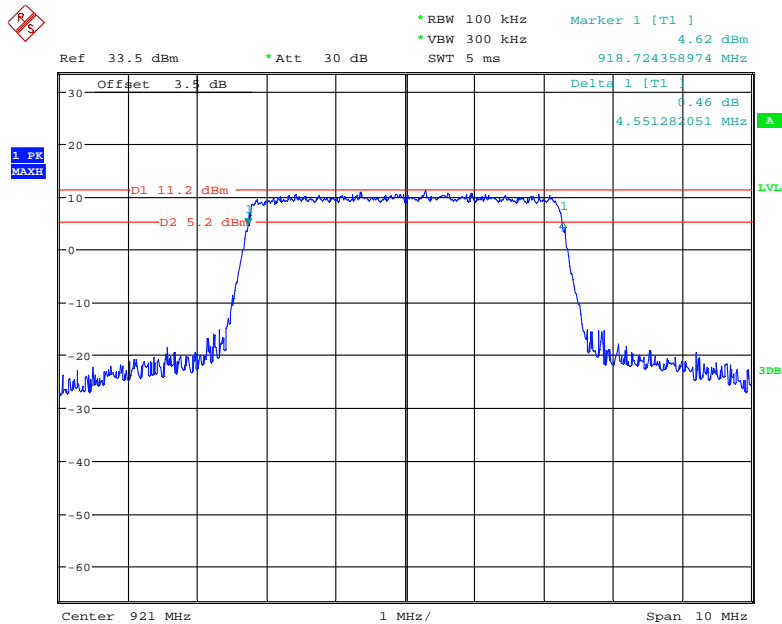
Date: 12.JAN.2018 22:11:02

### Middle Channel



Date: 12.JAN.2018 22:13:01

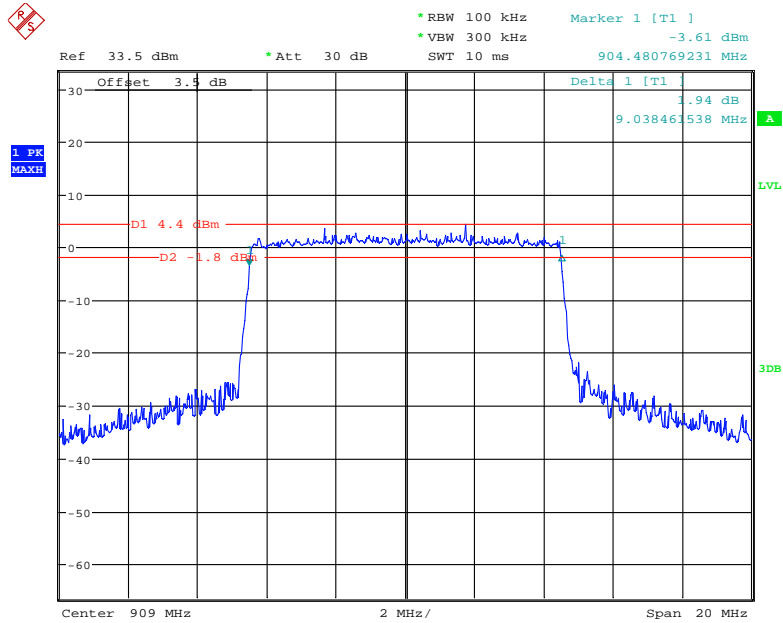
### High Channel



Date: 12.JAN.2018 22:19:36

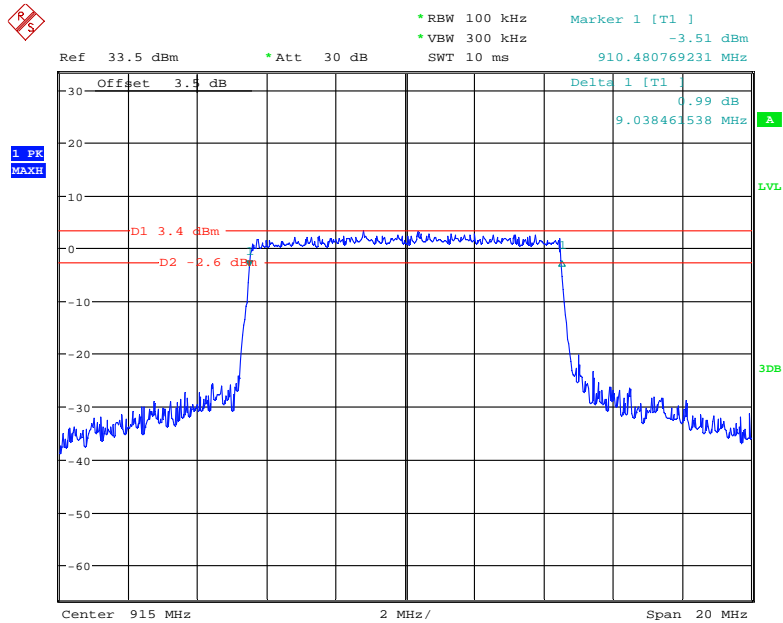
### 10M Mode

### Low Channel



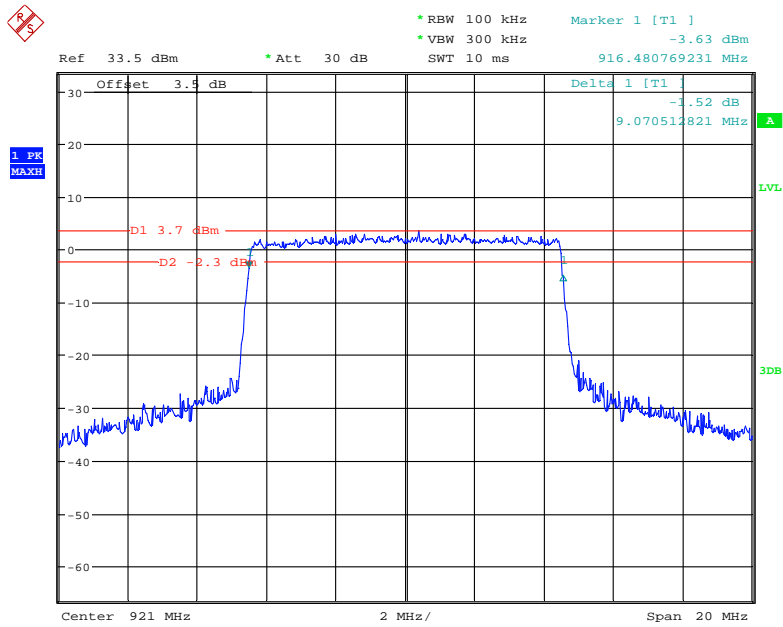
Date: 12.JAN.2018 21:11:36

### Middle Channel



Date: 12.JAN.2018 20:58:30

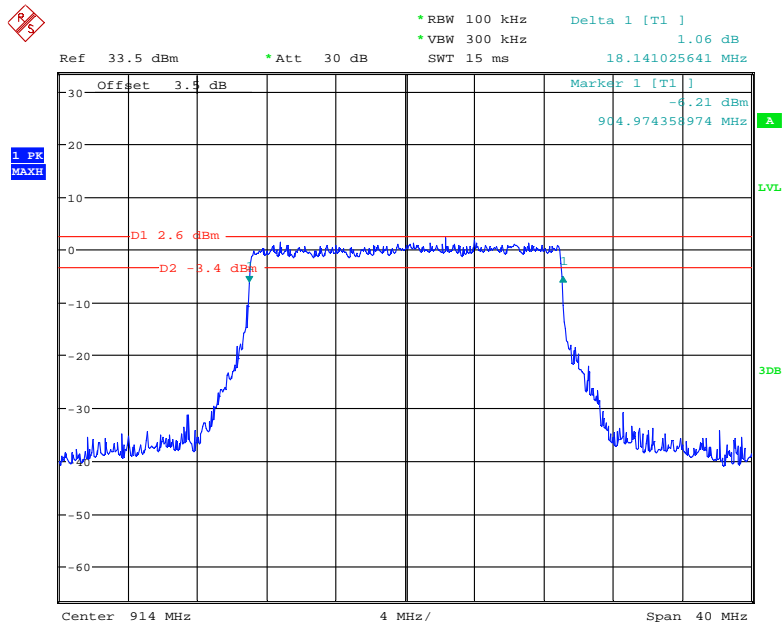
### High Channel



Date: 12.JAN.2018 21:16:57

### 20M Mode

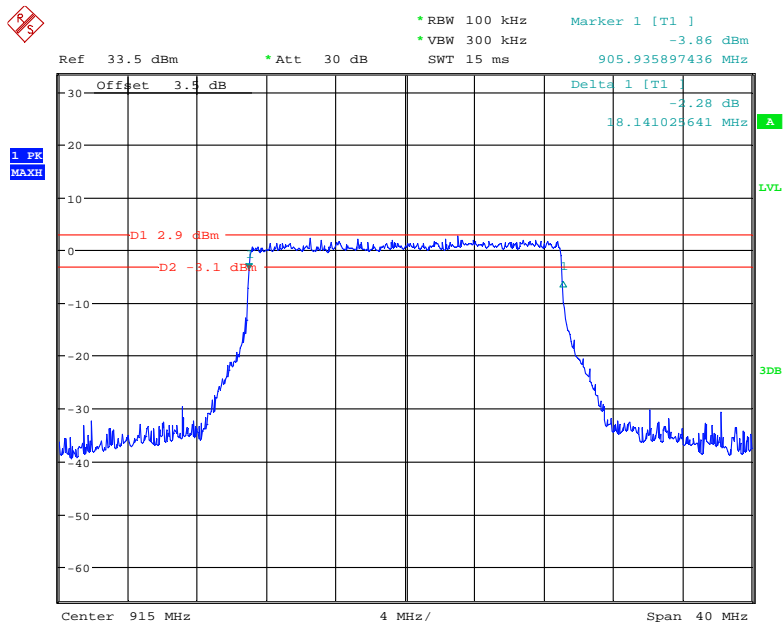
### Low Channel



Date: 12.JAN.2018 19:48:45

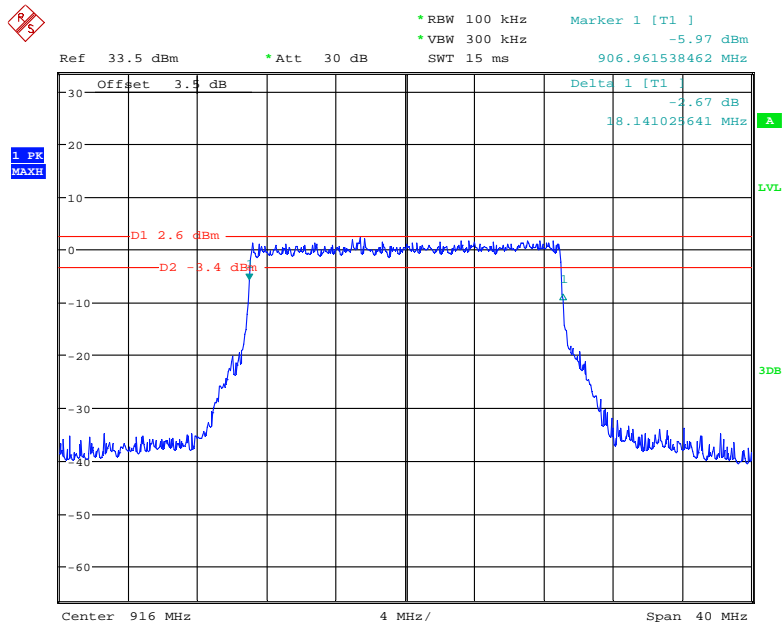


### Middle Channel



Date: 12.JAN.2018 19:54:41

### High Channel

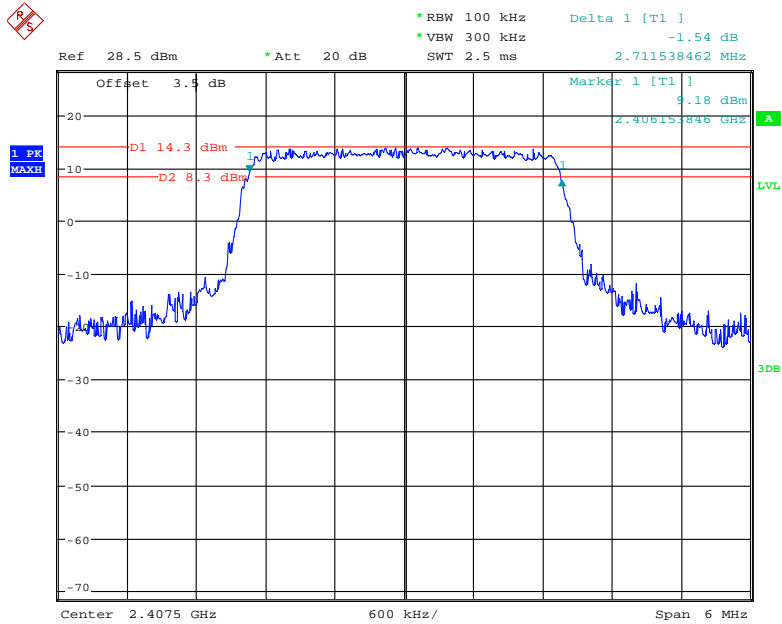


Date: 12.JAN.2018 19:47:31

**For 2.4GHz Antenna 03:**

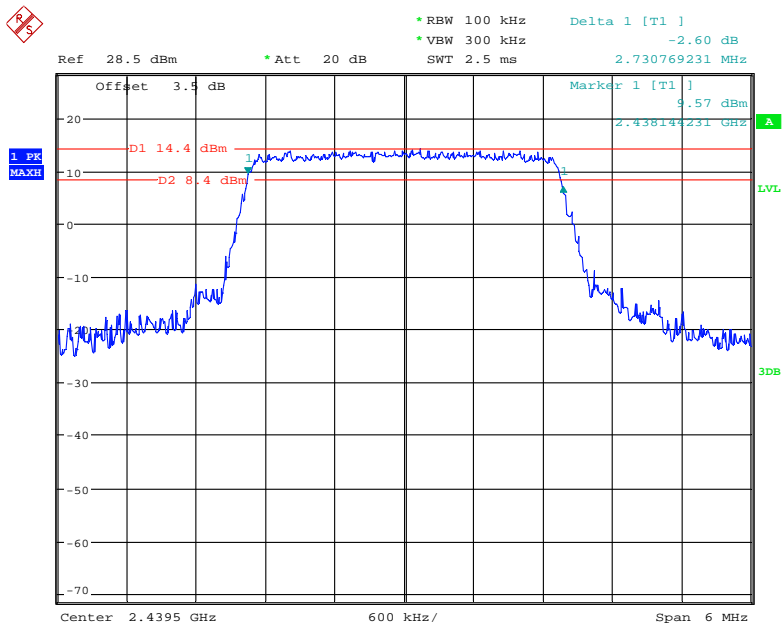
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
3M Mode			
Low	2407.5	2.712	≥500
Middle	2439.5	2.731	≥500
High	2471.5	2.712	≥500
5M Mode			
Low	2407.5	4.535	≥500
Middle	2439.5	4.519	≥500
High	2471.5	4.535	≥500
10M Mode			
Low	2407.5	8.974	≥500
Middle	2439.5	9.006	≥500
High	2471.5	9.006	≥500
20M Mode			
Low	2412.5	18.077	≥500
Middle	2437.5	18.077	≥500
High	2462.5	18.061	≥500

### 3M Mode Low Channel



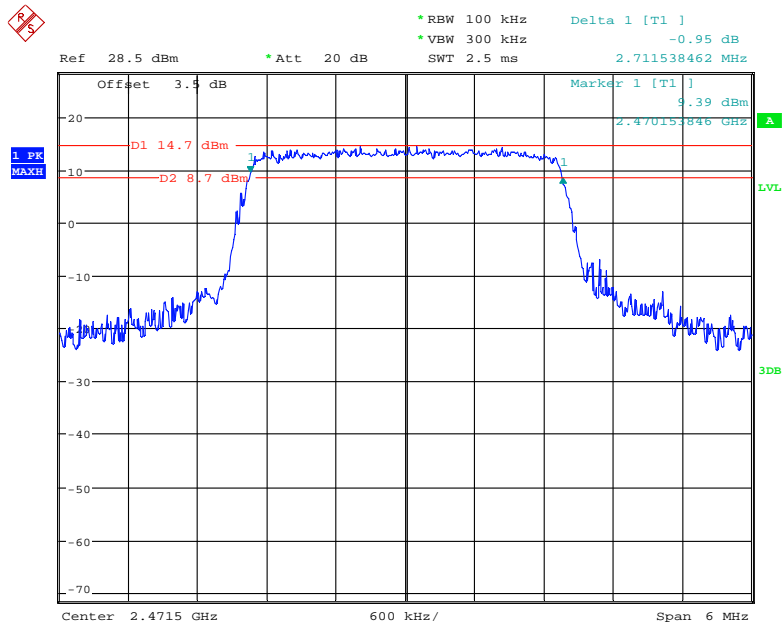
Date: 12.JAN.2018 17:16:52

### Middle Channel



Date: 12.JAN.2018 17:19:11

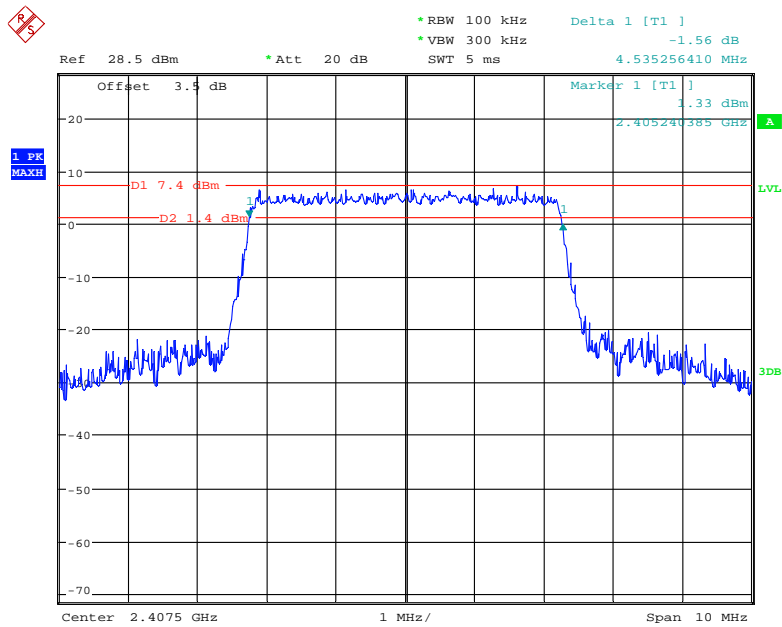
### High Channel



Date: 12.JAN.2018 17:22:26

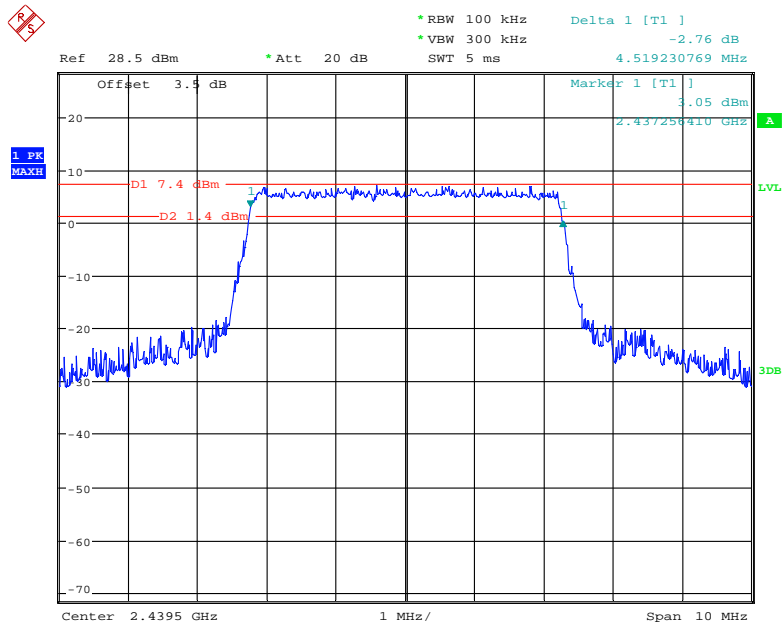
### 5M Mode

### Low Channel



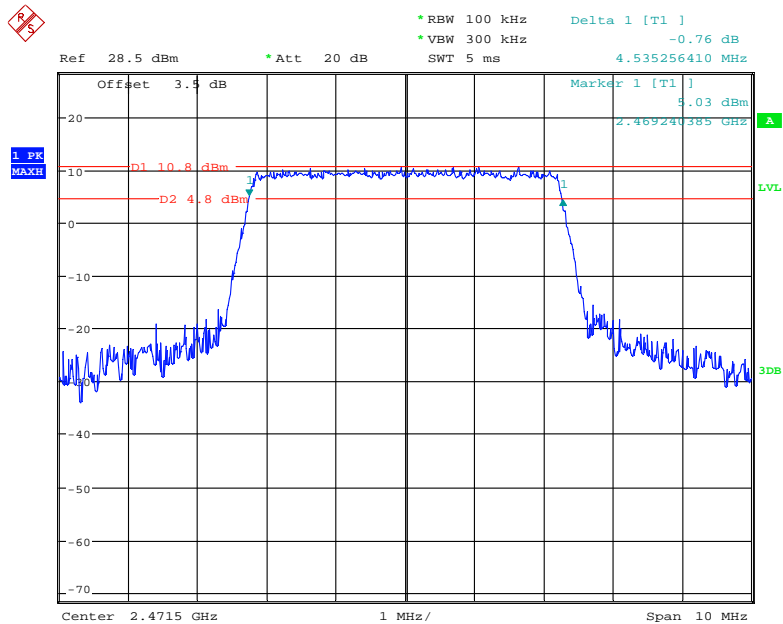
Date: 12.JAN.2018 17:07:17

### Middle Channel



Date: 12.JAN.2018 17:06:12

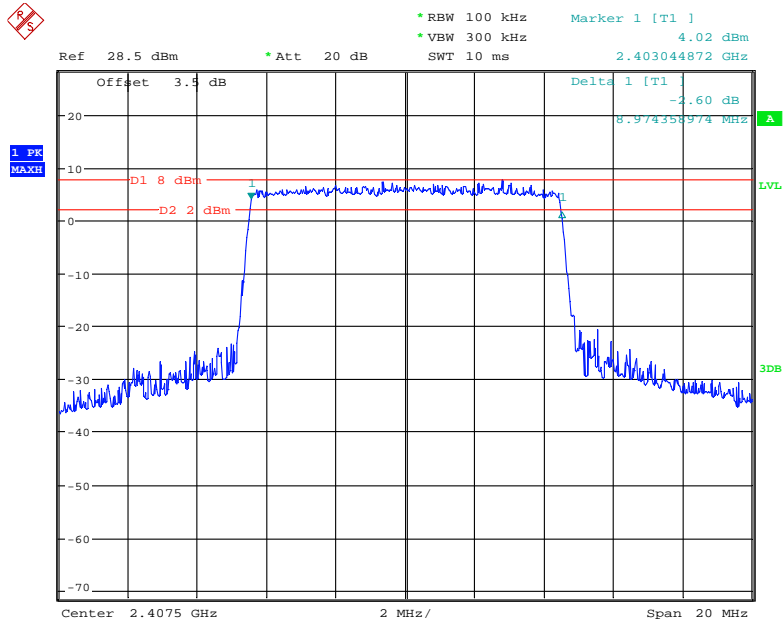
### High Channel



Date: 12.JAN.2018 17:02:15

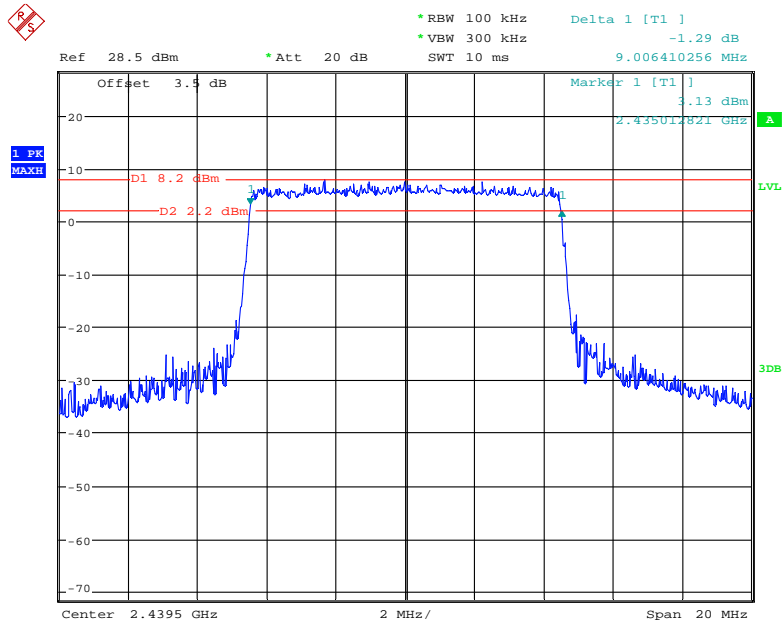
### 10M Mode

### Low Channel



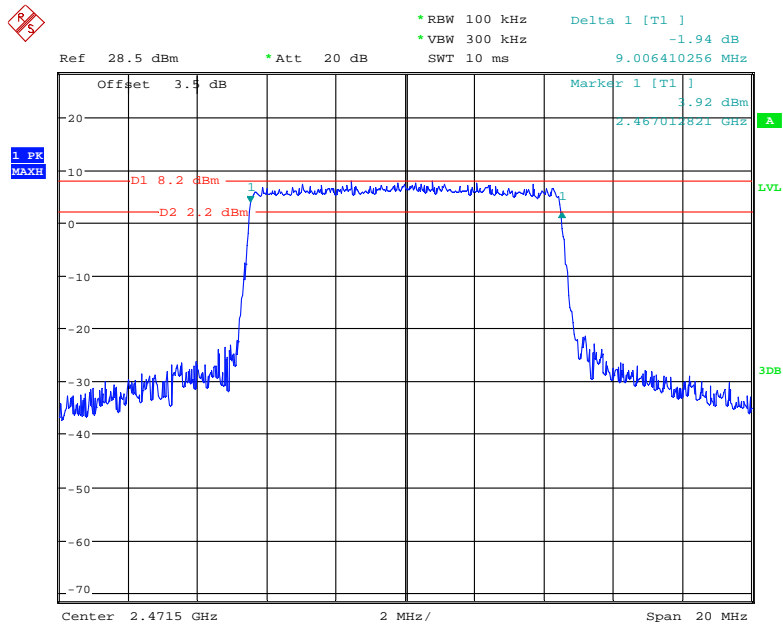
Date: 12.JAN.2018 16:43:04

### Middle Channel



Date: 12.JAN.2018 16:45:35

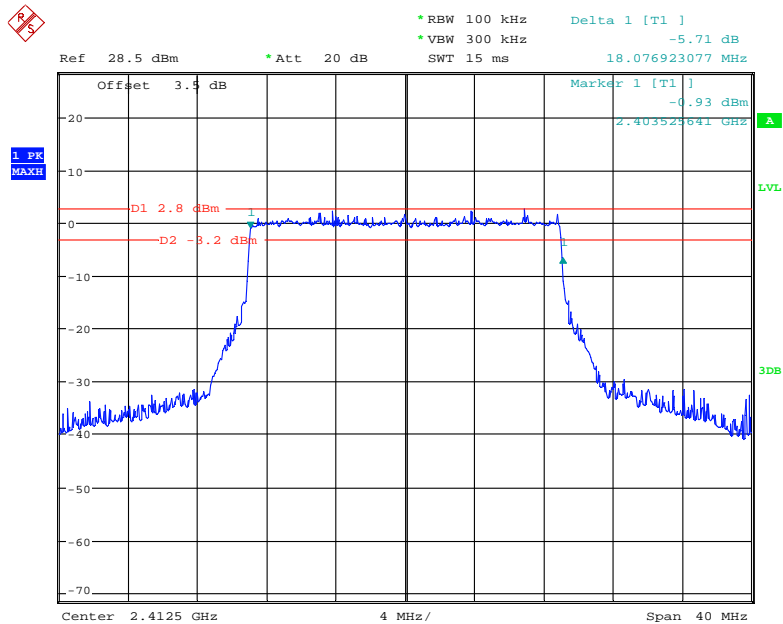
### High Channel



Date: 12.JAN.2018 16:37:30

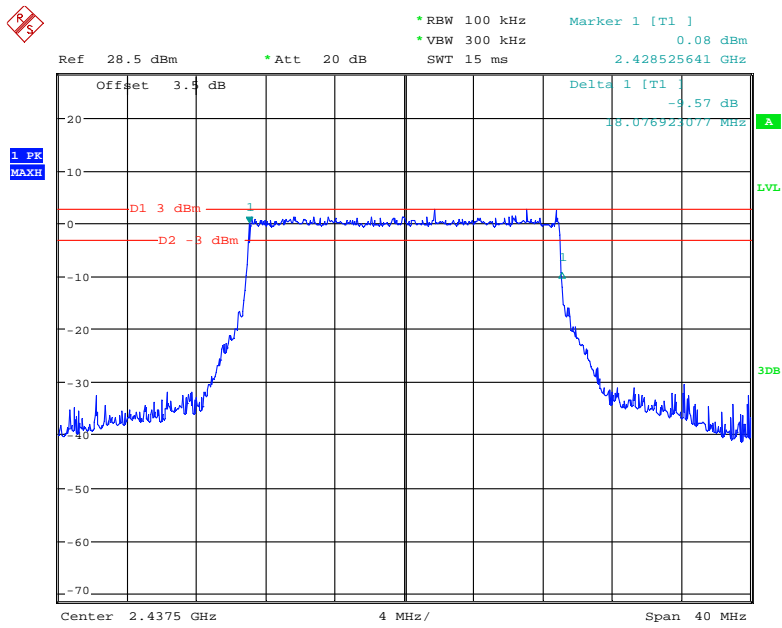
### 20M Mode

### Low Channel



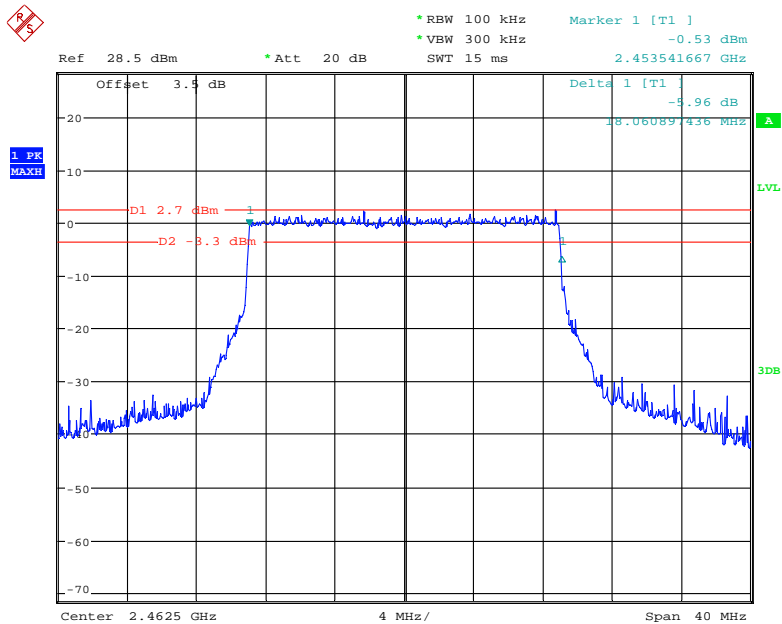
Date: 12.JAN.2018 16:26:56

### Middle Channel



Date: 12.JAN.2018 16:23:13

### High Channel



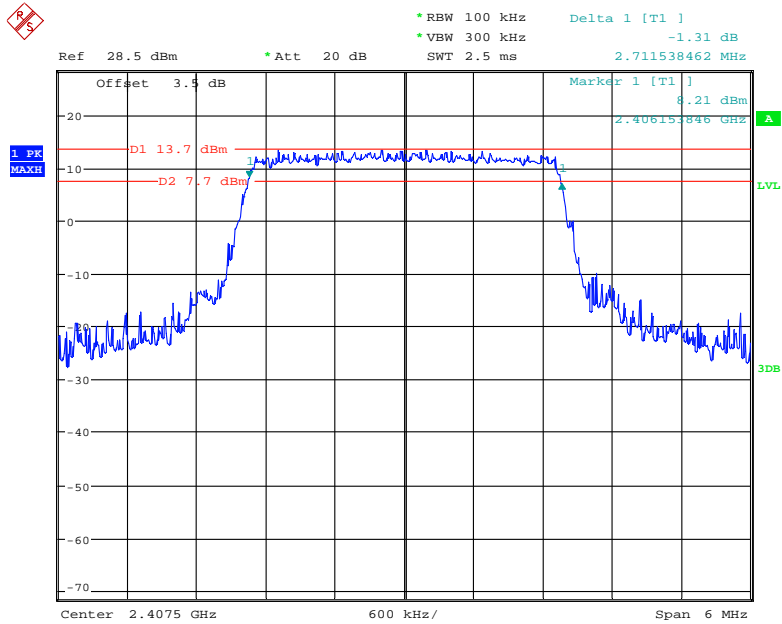
Date: 12.JAN.2018 16:20:30



**For 2.4GHz Antenna 04:**

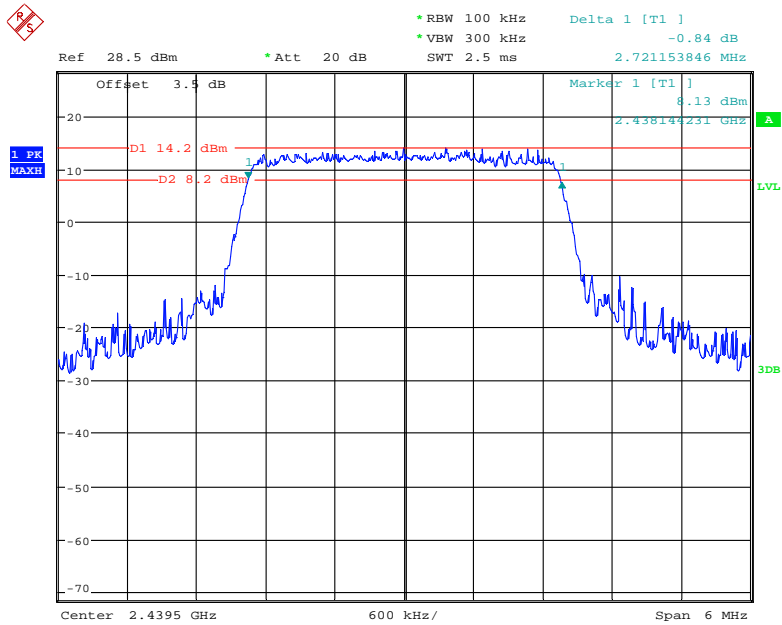
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)
3M Mode			
Low	2407.5	2.712	≥500
Middle	2439.5	2.712	≥500
High	2471.5	2.731	≥500
5M Mode			
Low	2407.5	4.519	≥500
Middle	2439.5	4.519	≥500
High	2471.5	4.535	≥500
10M Mode			
Low	2407.5	9.038	≥500
Middle	2439.5	9.038	≥500
High	2471.5	9.038	≥500
20M Mode			
Low	2412.5	18.077	≥500
Middle	2437.5	18.141	≥500
High	2462.5	18.077	≥500

### 3M Mode Low Channel



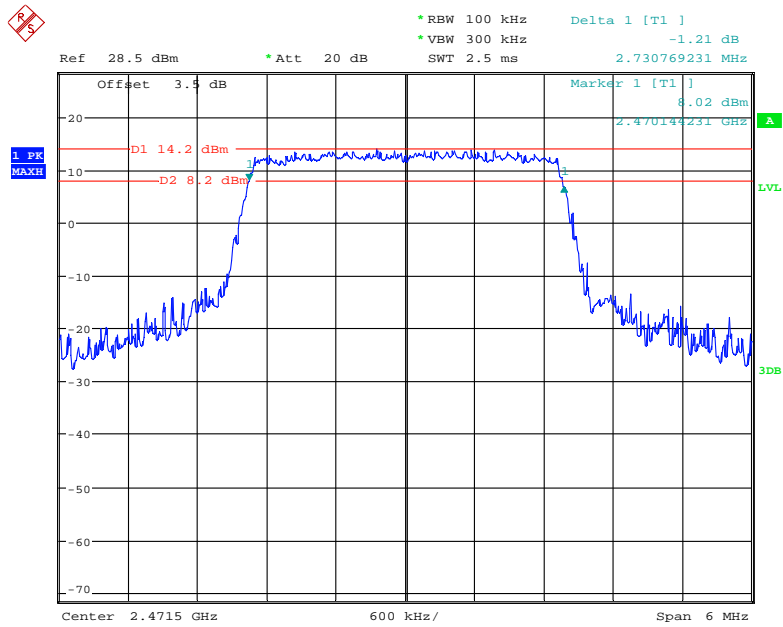
Date: 12.JAN.2018 17:14:14

### Middle Channel



Date: 12.JAN.2018 17:20:39

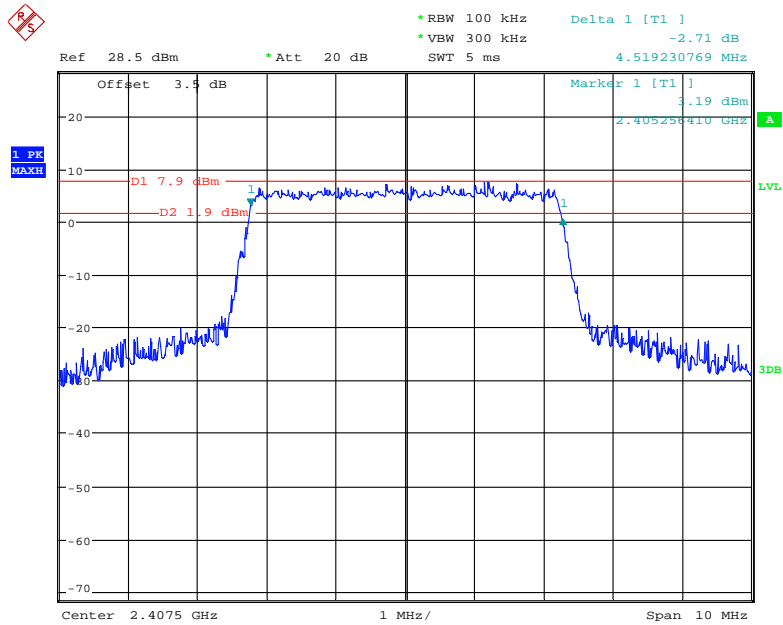
### High Channel



Date: 12.JAN.2018 17:21:44

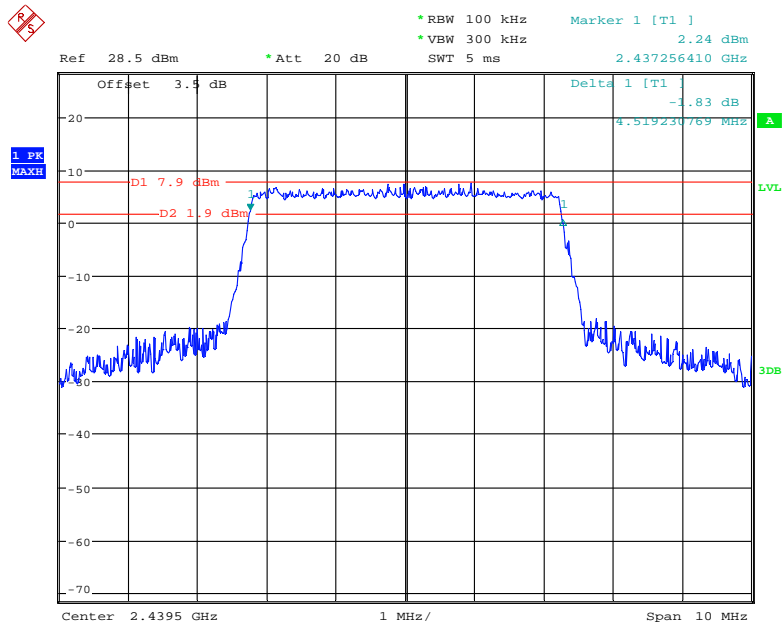
### 5M Mode

### Low Channel



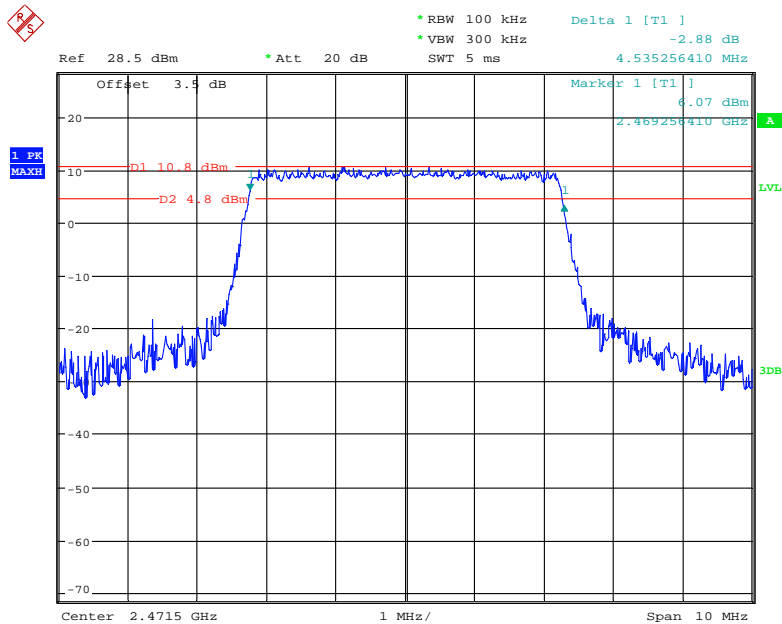
Date: 12.JAN.2018 17:08:01

### Middle Channel



Date: 12.JAN.2018 17:05:04

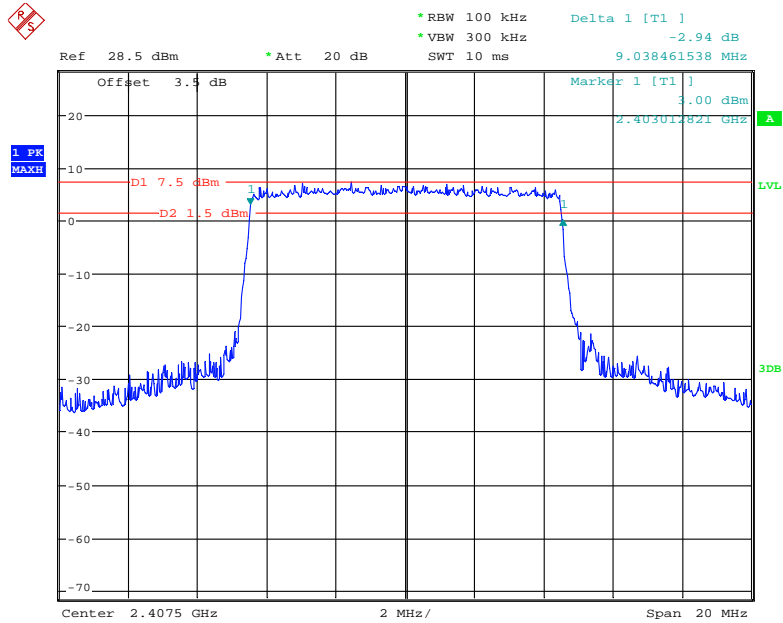
### High Channel



Date: 12.JAN.2018 17:26:26

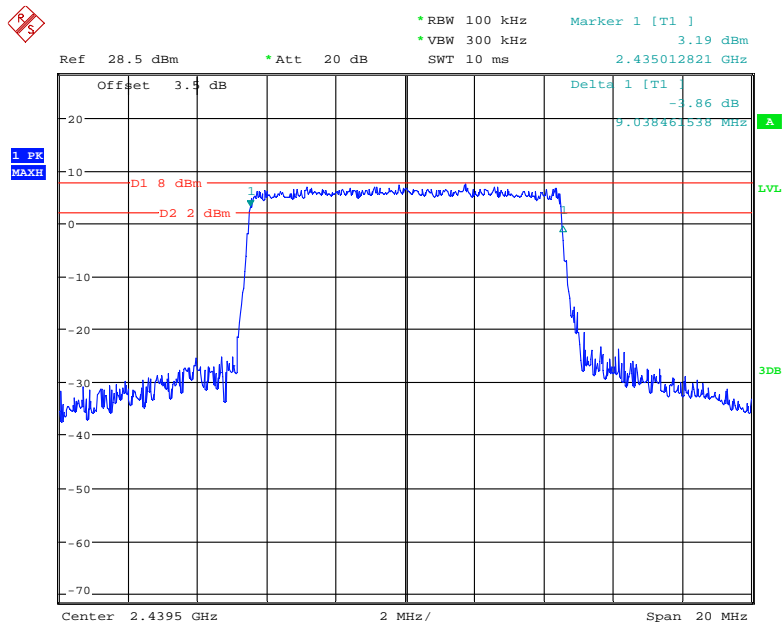
### 5M Mode

### Low Channel



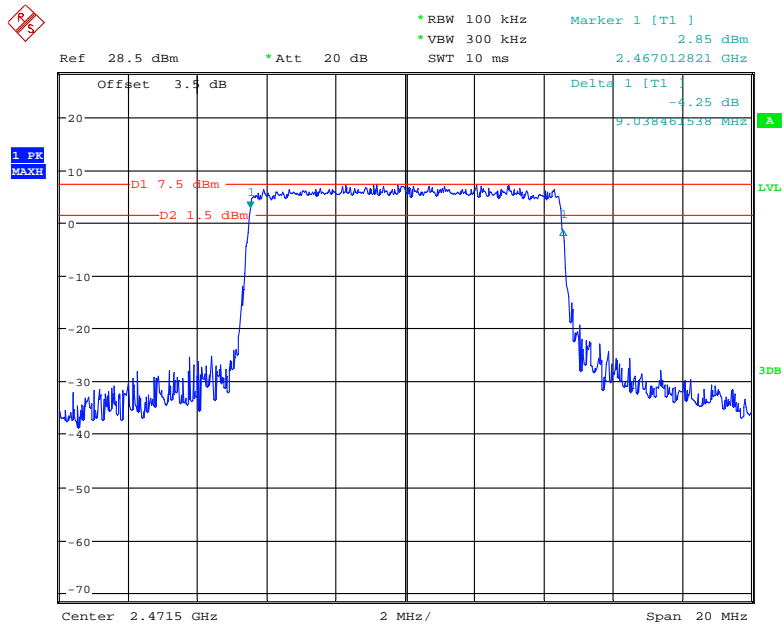
Date: 12.JAN.2018 16:44:16

### Middle Channel



Date: 12.JAN.2018 16:38:48

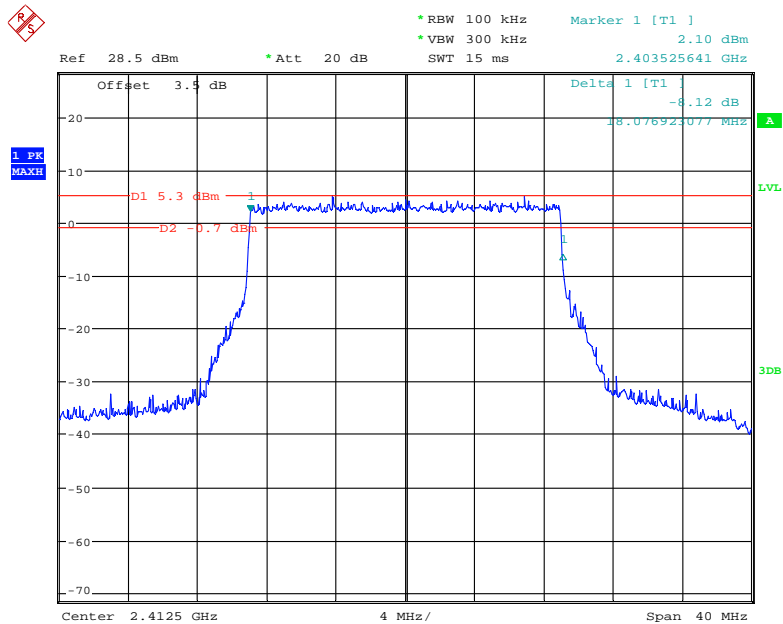
### High Channel



Date: 12.JAN.2018 16:36:05

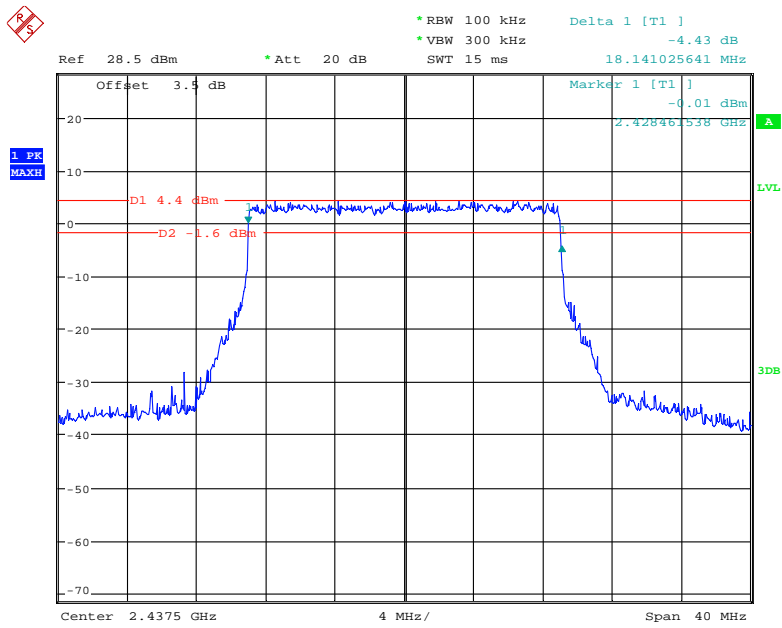
### 20M Mode

### Low Channel



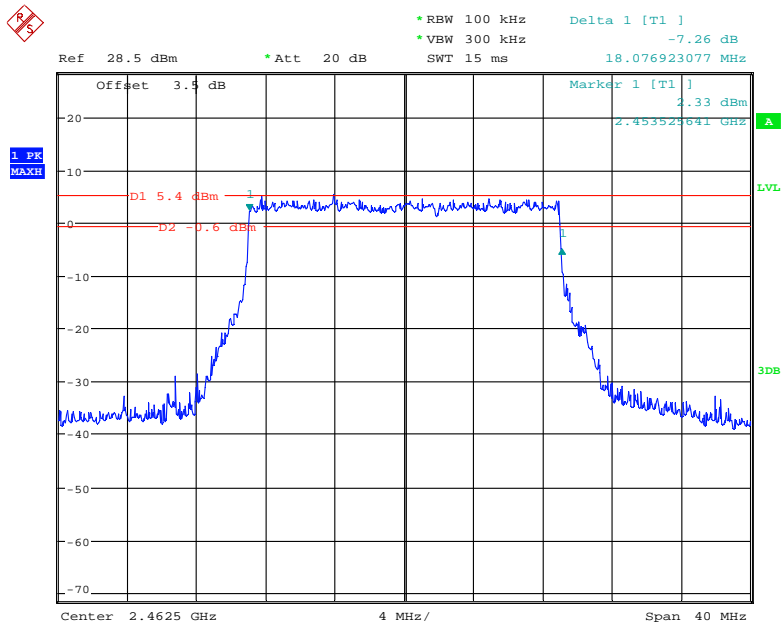
Date: 12.JAN.2018 16:51:44

### Middle Channel



Date: 12.JAN.2018 16:53:10

### High Channel



Date: 12.JAN.2018 16:55:23

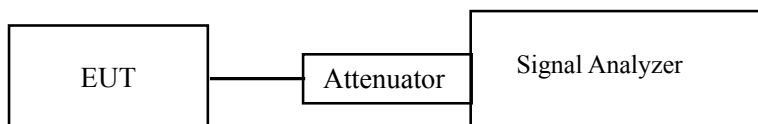
## **FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER**

### **Applicable Standard**

According to FCC §15.247(b) (3), for 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.

### **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 one test equipment.
3. Add a correction factor to the display.



### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Vincent Zeng on 2018-01-10.*

*EUT operation mode: Transmitting*



**For 900MHz:**

Channel	Frequency (MHz)	Max Conducted Peak Output Power	Max Conducted Peak Output Power	Limit (dBm)
		Antenna 01 (dBm)	Antenna 02 (dBm)	
3M Mode				
Low	909	22.88	22.90	30
Middle	915	22.79	22.72	30
High	921	22.65	22.78	30
5M Mode				
Low	909	20.36	20.30	30
Middle	915	22.84	22.81	30
High	921	22.54	22.86	30
10M Mode				
Low	909	23.12	23.19	30
Middle	915	23.00	23.04	30
High	921	23.03	23.00	30
20M Mode				
Low	914	24.23	24.30	30
Middle	915	22.97	22.94	30
High	916	22.34	22.36	30

**For 2.4GHz:**

Channel	Frequency (MHz)	Max Conducted Peak Output Power	Max Conducted Peak Output Power	Limit (dBm)
		Antenna 03 (dBm)	Antenna 04 (dBm)	
3M Mode				
Low	2407.5	22.68	22.72	30
Middle	2439.5	24.58	23.09	30
High	2471.5	22.81	22.95	30
5M Mode				
Low	2407.5	22.54	22.71	30
Middle	2439.5	23.20	23.12	30
High	2471.5	22.78	22.89	30
10M Mode				
Low	2407.5	23.19	22.99	30
Middle	2439.5	23.54	23.56	30
High	2471.5	23.40	23.39	30
20M Mode				
Low	2412.5	23.46	23.44	30
Middle	2437.5	23.45	23.57	30
High	2462.5	23.44	23.35	30

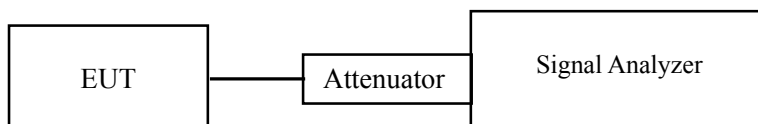
## **FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE**

### **Applicable Standard**

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)).

### **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.



### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Vincent Zeng from 2018-02-10 to 2018-02-12.*

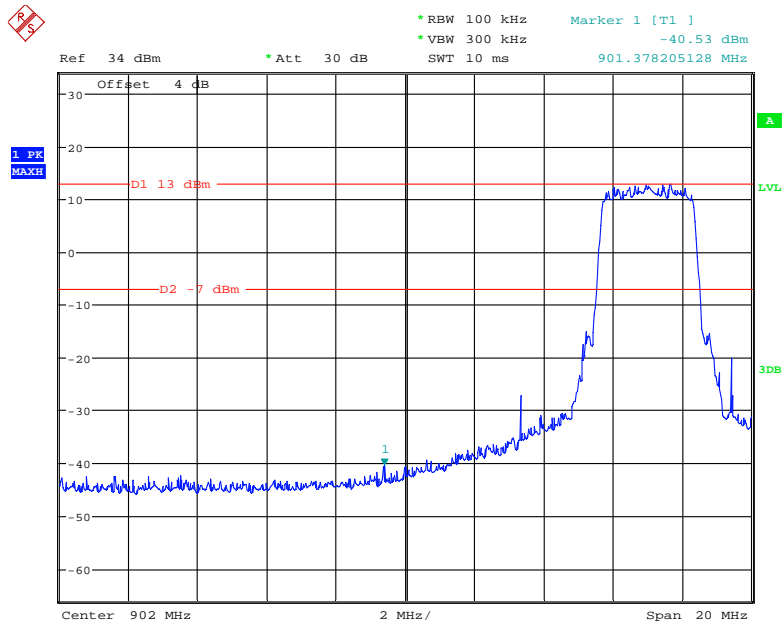
*EUT operation mode: Transmitting*

**Test Result:** Compliance

Please refer to the following plots.

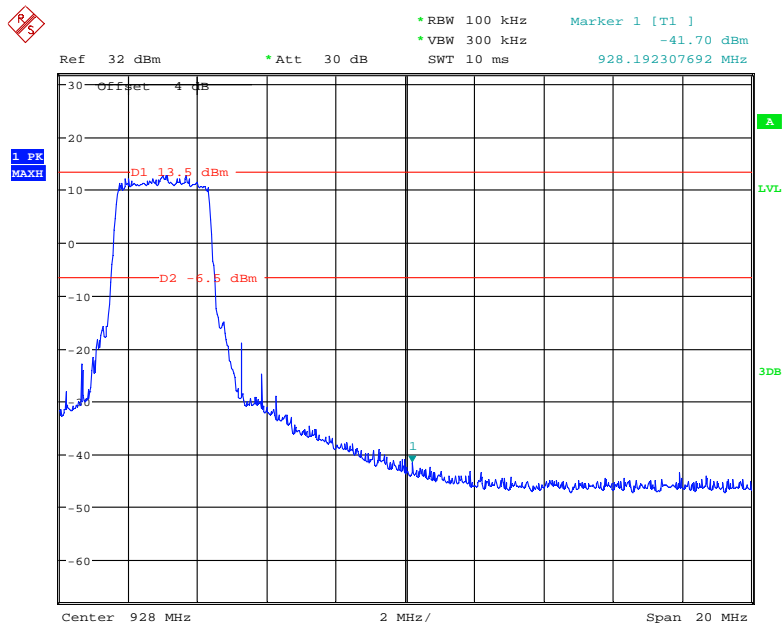
For 900MHz Antenna 01

3M Mode: Band Edge, Left Side



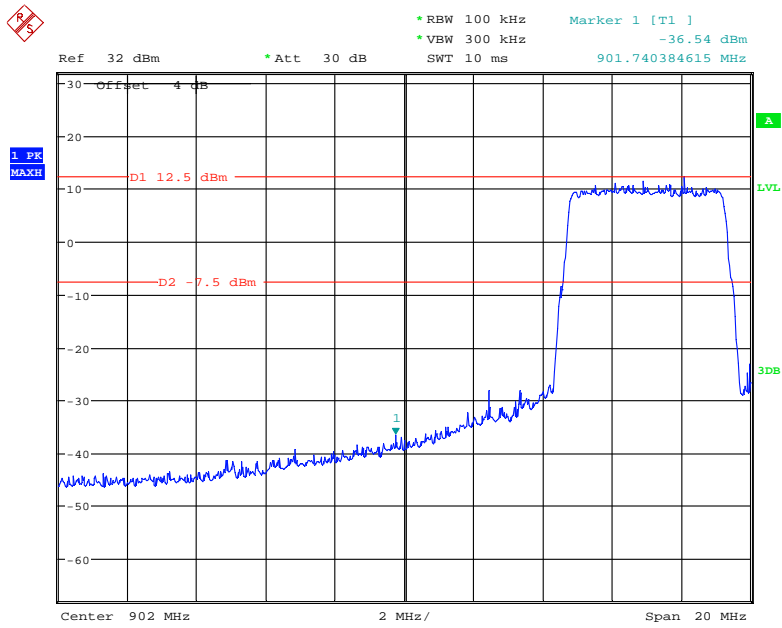
Date: 11.FEB.2018 13:55:41

3M Mode: Band Edge, Right Side



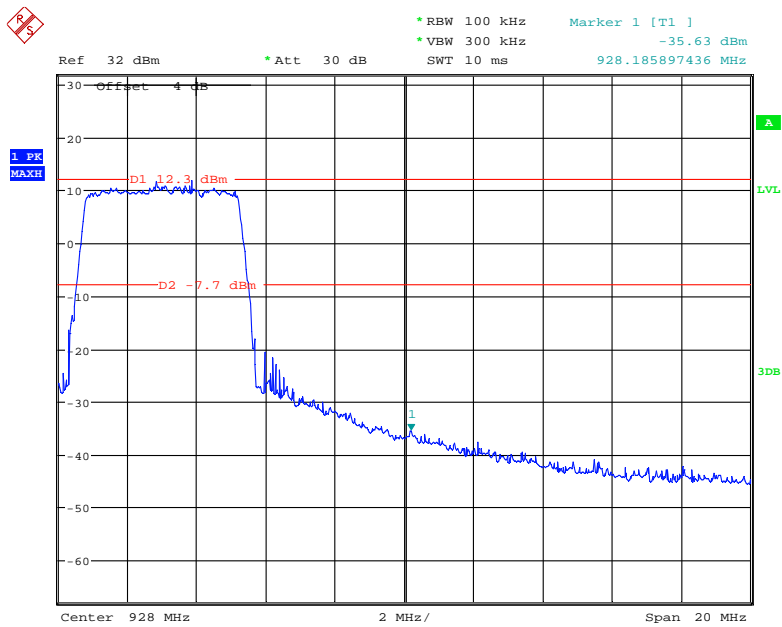
Date: 11.FEB.2018 13:22:40

### 5M Mode: Band Edge, Left Side



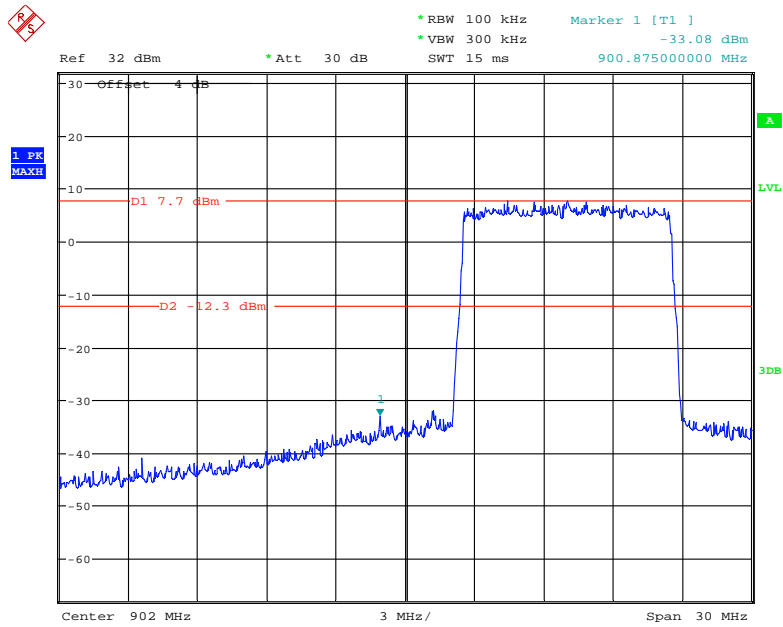
Date: 11.FEB.2018 11:40:20

### 5M Mode: Band Edge, Right Side



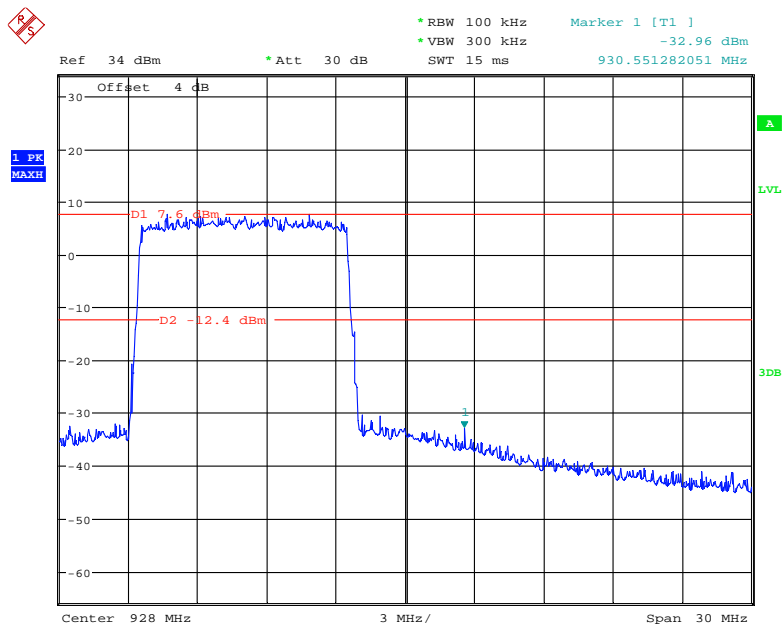
Date: 11.FEB.2018 13:20:06

### 10M Mode: Band Edge, Left Side



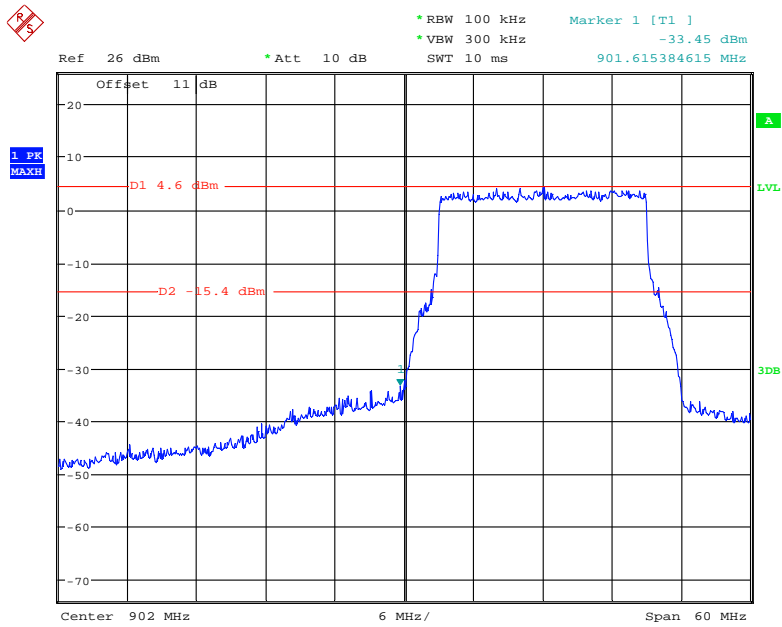
Date: 11.FEB.2018 11:37:33

### 10M Mode: Band Edge, Right Side



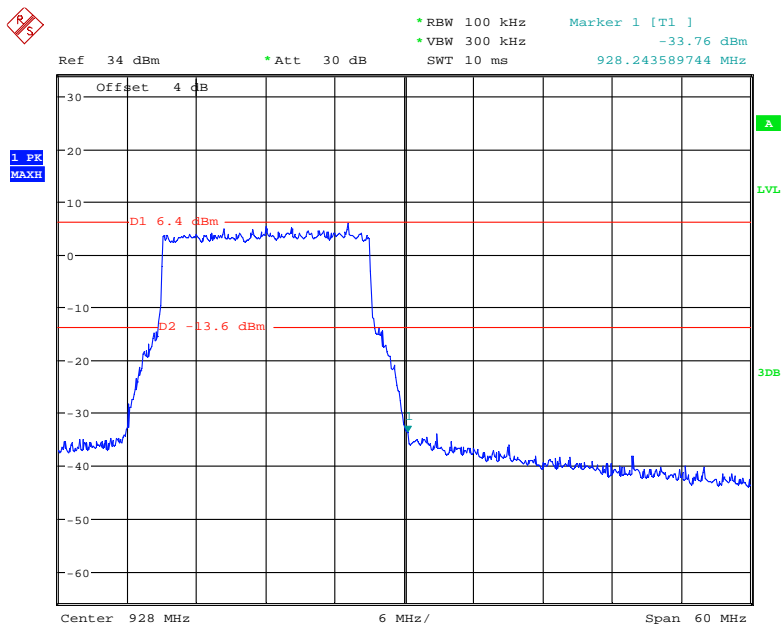
Date: 11.FEB.2018 11:09:42

### 20M Mode: Band Edge, Left Side



Date: 12.FEB.2018 17:09:02

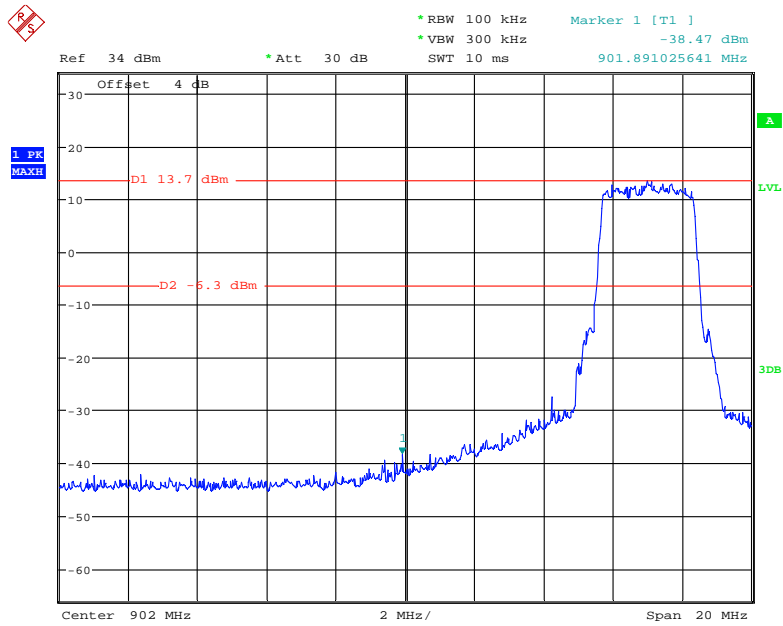
### 20M Mode: Band Edge, Right Side



Date: 11.FEB.2018 11:07:11

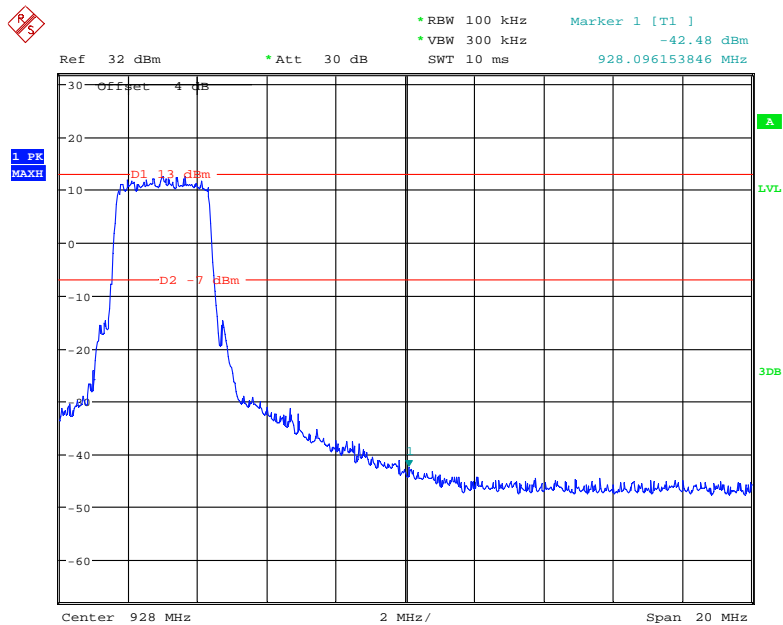
For 900MHz Antenna 02

3M Mode: Band Edge, Left Side



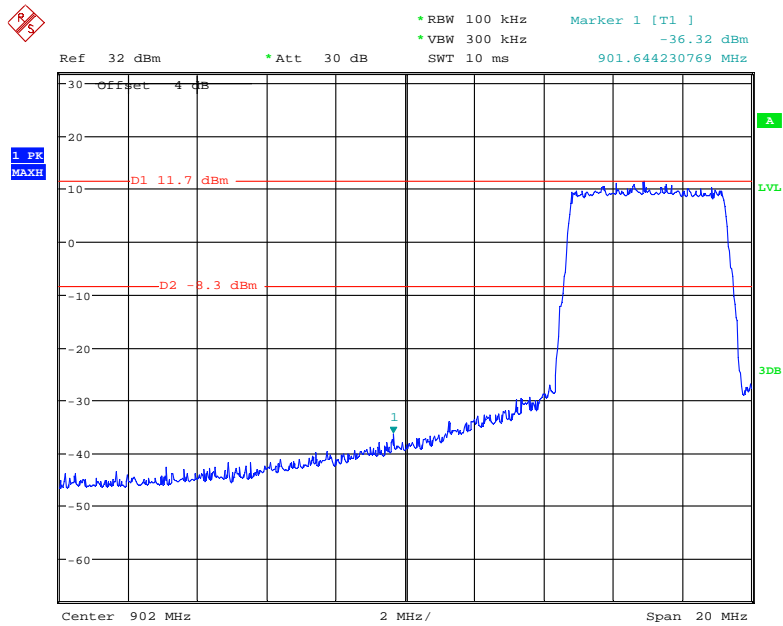
Date: 11.FEB.2018 13:49:53

3M Mode: Band Edge, Right Side



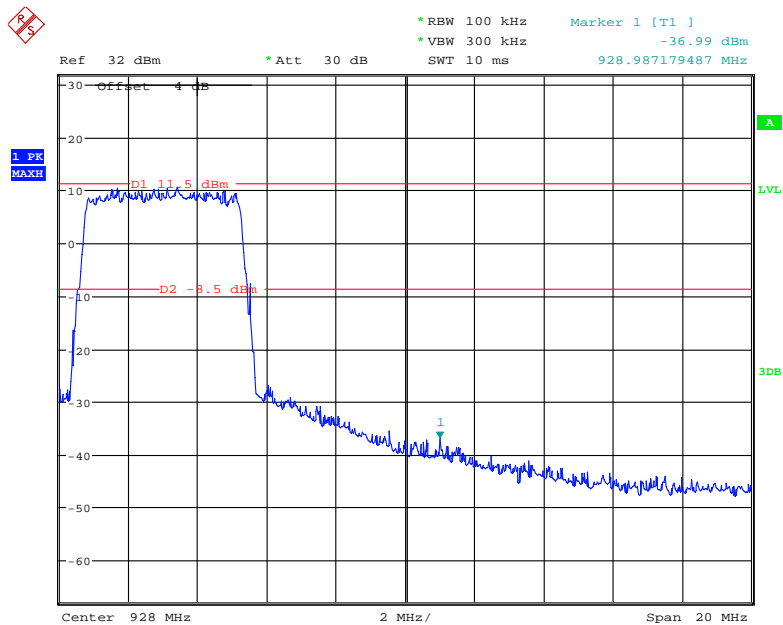
Date: 11.FEB.2018 13:24:57

### 5M Mode: Band Edge, Left Side



Date: 11.FEB.2018 11:42:48

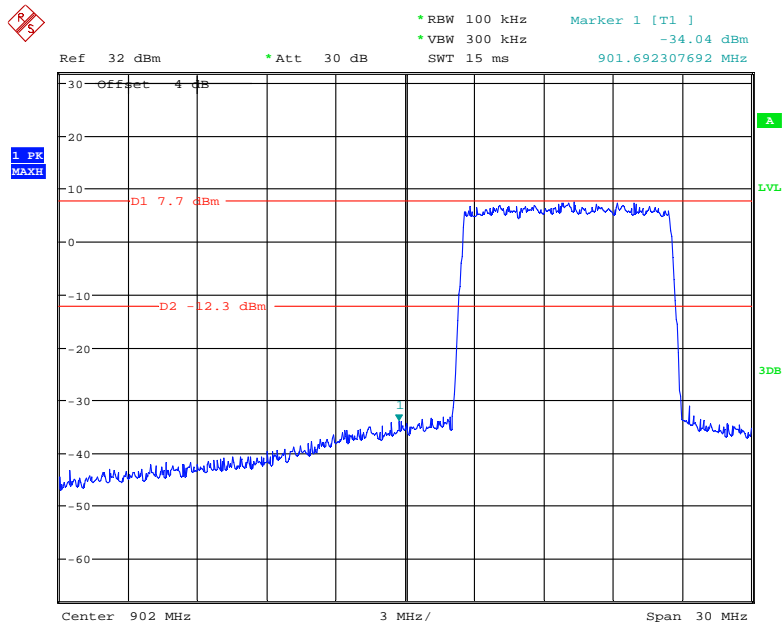
### 5M Mode: Band Edge, Right Side



Date: 11.FEB.2018 13:13:32

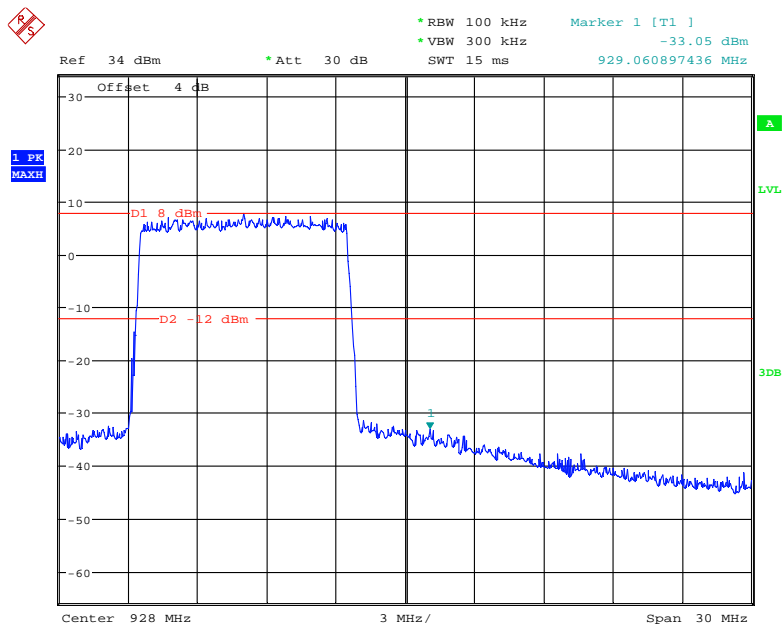


### 10M Mode: Band Edge, Left Side



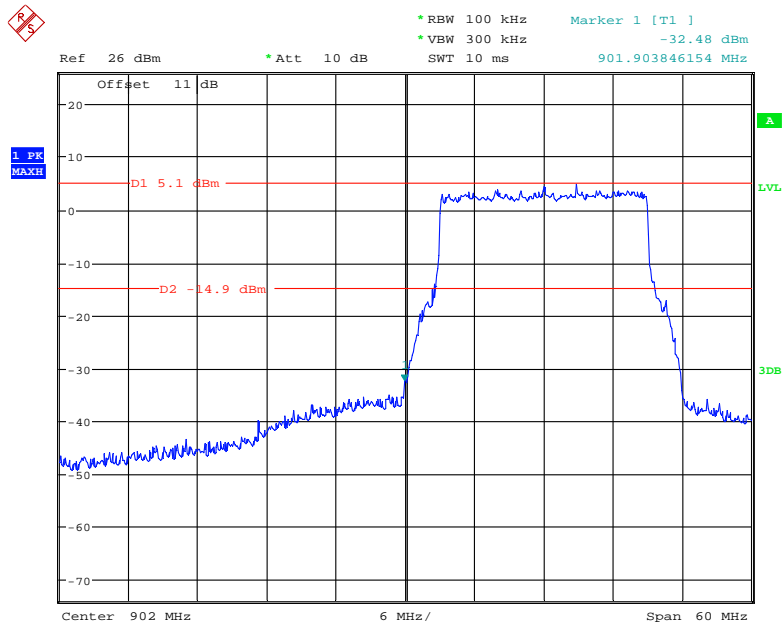
Date: 11.FEB.2018 11:34:16

### 10M Mode: Band Edge, Right Side



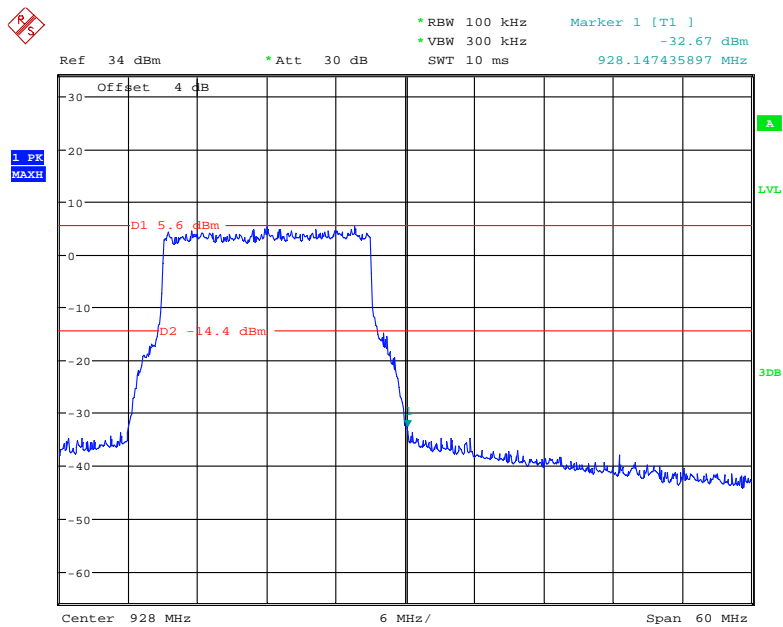
Date: 11.FEB.2018 11:13:08

### 20M Mode: Band Edge, Left Side



Date: 12.FEB.2018 17:10:35

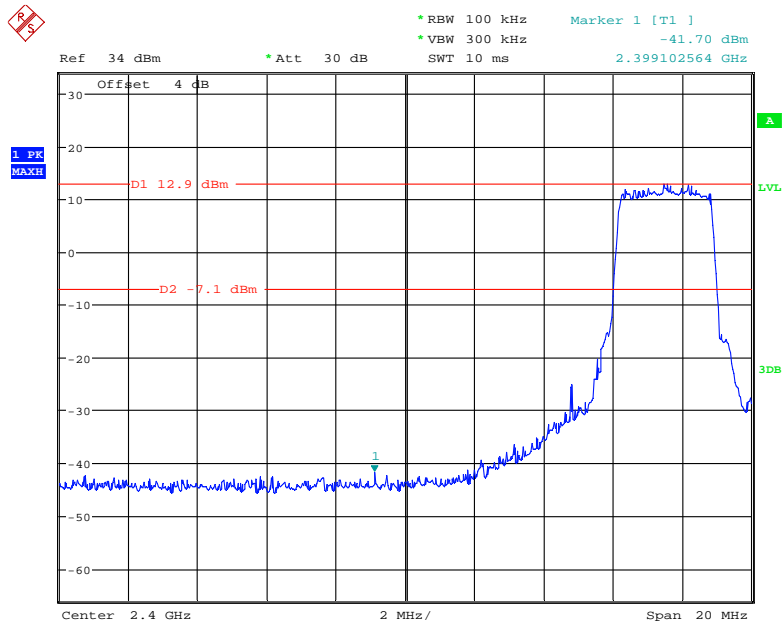
### 20M Mode: Band Edge, Right Side



Date: 11.FEB.2018 11:04:57

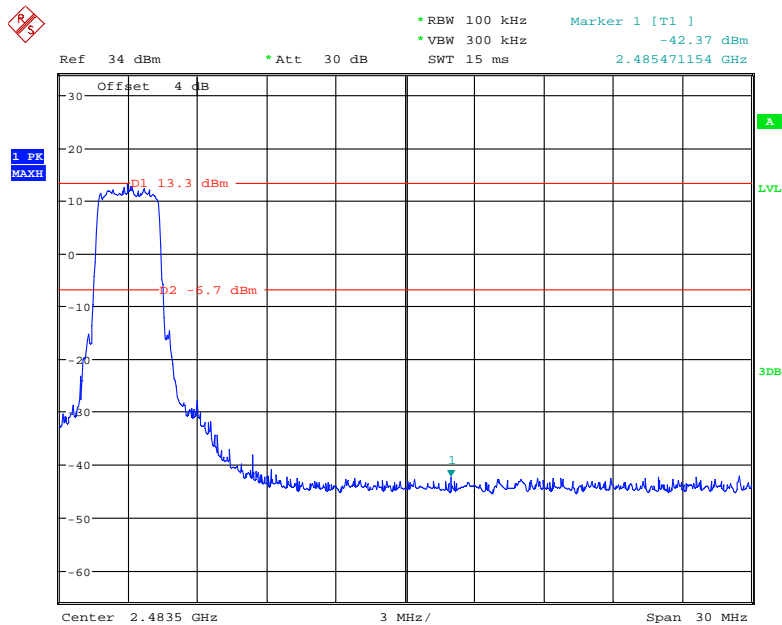
For 2.4GHz Antenna 03

3M Mode: Band Edge, Left Side



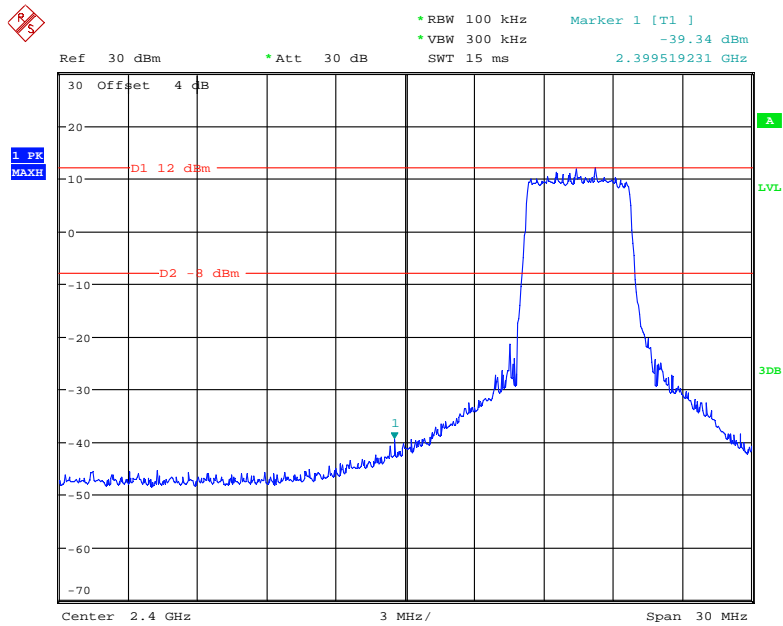
Date: 10.FEB.2018 16:51:30

3M Mode: Band Edge, Right Side



Date: 10.FEB.2018 17:15:59

### 5M Mode: Band Edge, Left Side



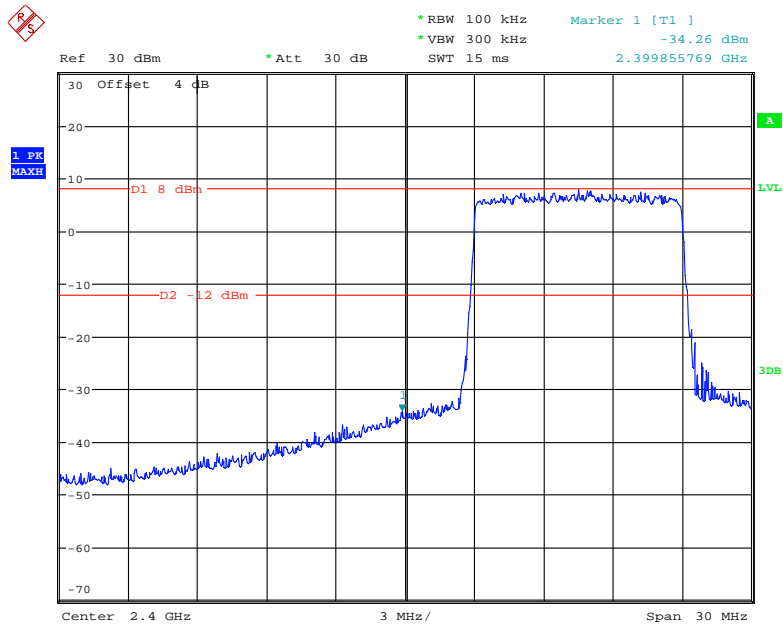
Date: 10.FEB.2018 17:46:02

### 5M Mode: Band Edge, Right Side



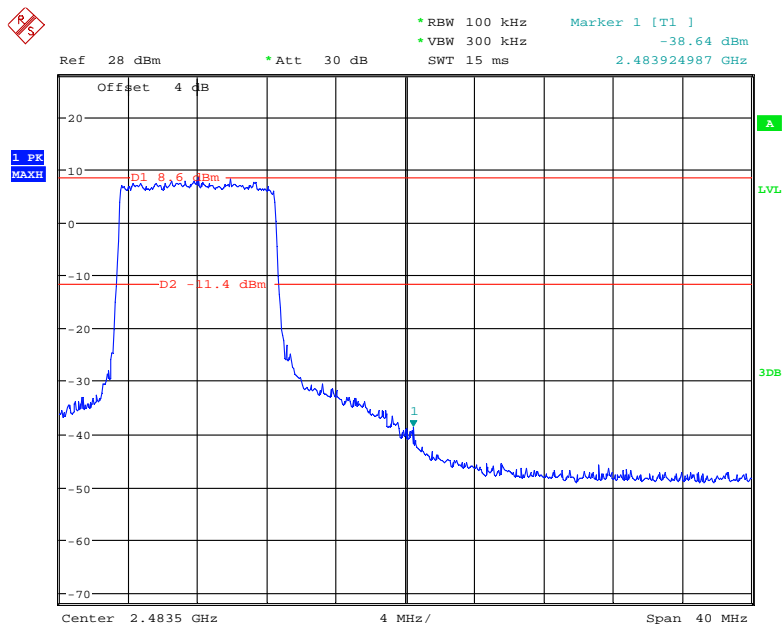
Date: 10.FEB.2018 17:25:12

### 10M Mode: Band Edge, Left Side



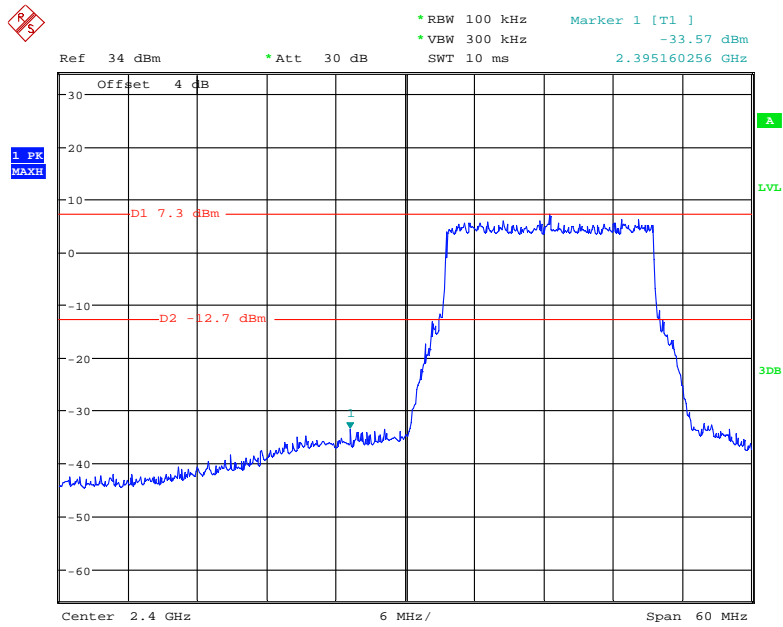
Date: 10.FEB.2018 17:47:47

### 10M Mode: Band Edge, Right Side



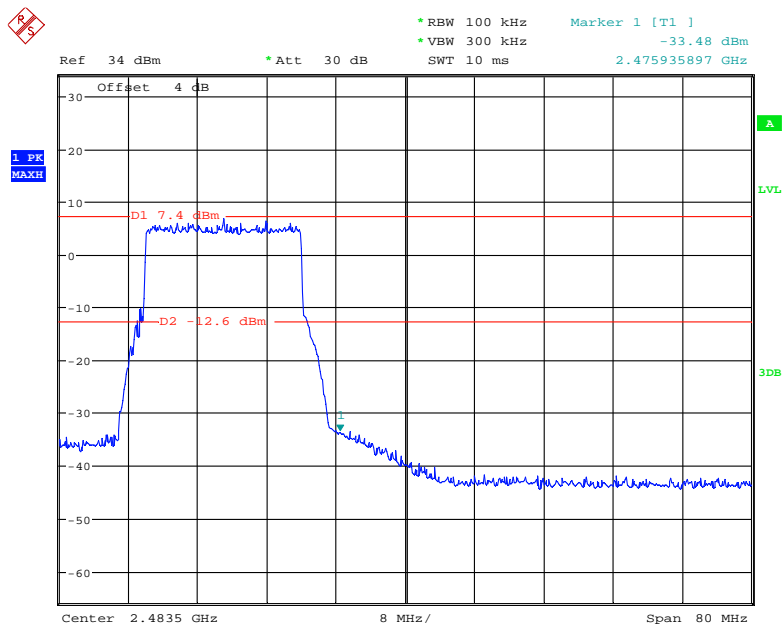
Date: 11.FEB.2018 09:26:14

### 20M Mode: Band Edge, Left Side



Date: 11.FEB.2018 10:03:18

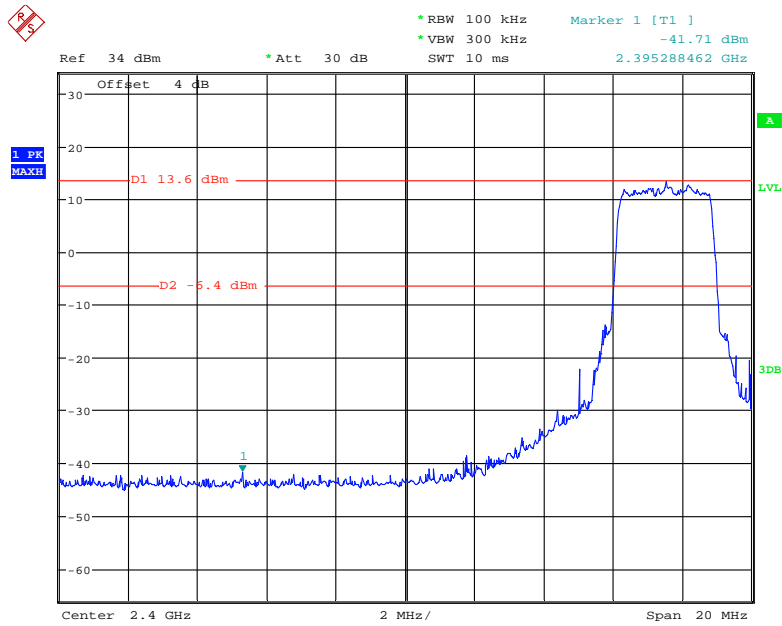
### 20M Mode: Band Edge, Right Side



Date: 11.FEB.2018 10:10:18

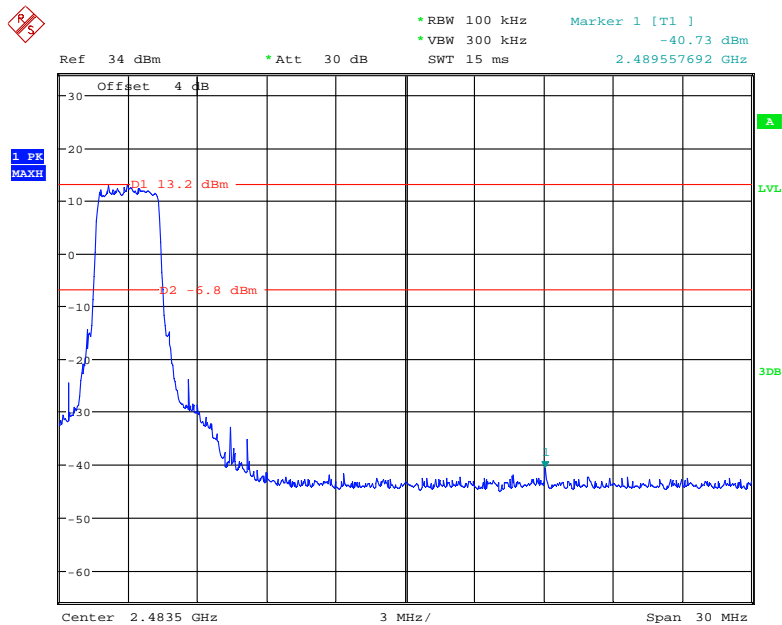
For 2.4GHz Antenna 04

3M Mode: Band Edge, Left Side



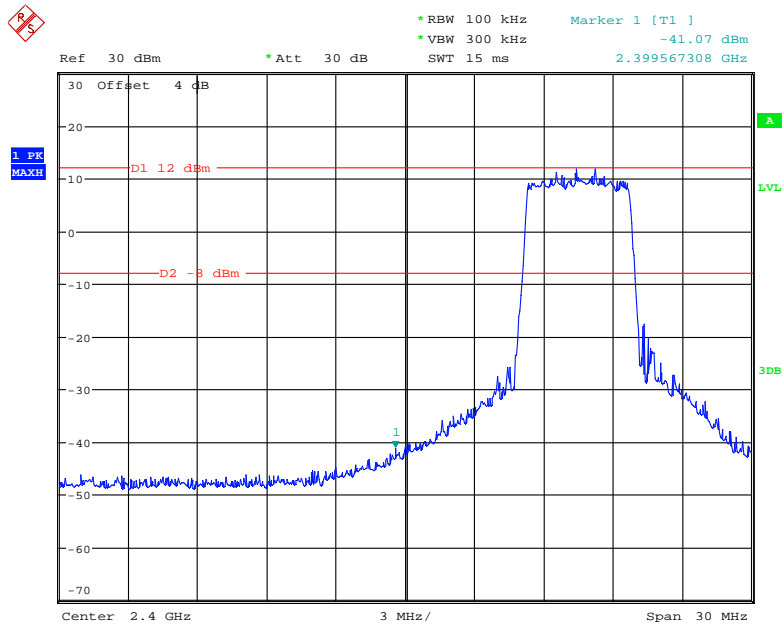
Date: 10.FEB.2018 16:53:35

3M Mode: Band Edge, Right Side



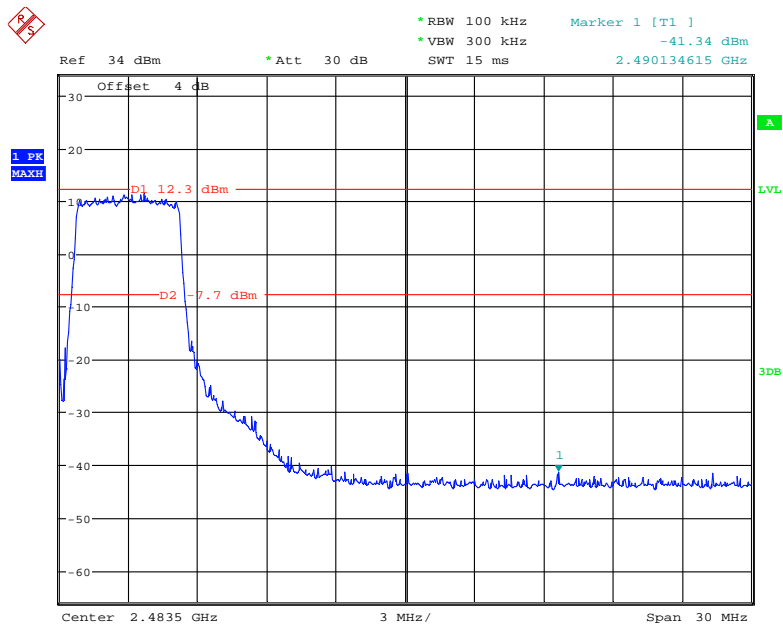
Date: 10.FEB.2018 17:21:18

### 5M Mode: Band Edge, Left Side



Date: 10.FEB.2018 17:43:47

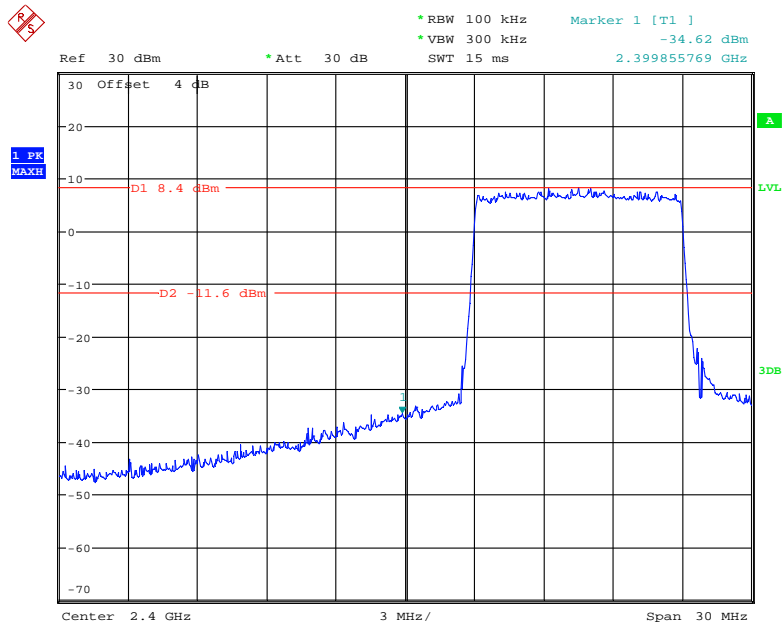
### 5M Mode: Band Edge, Right Side



Date: 10.FEB.2018 17:23:49

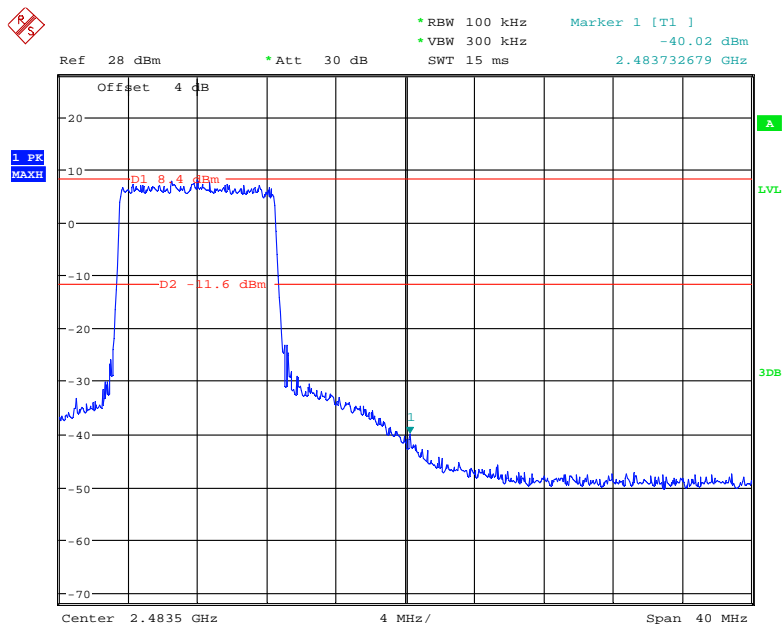


### 10M Mode: Band Edge, Left Side



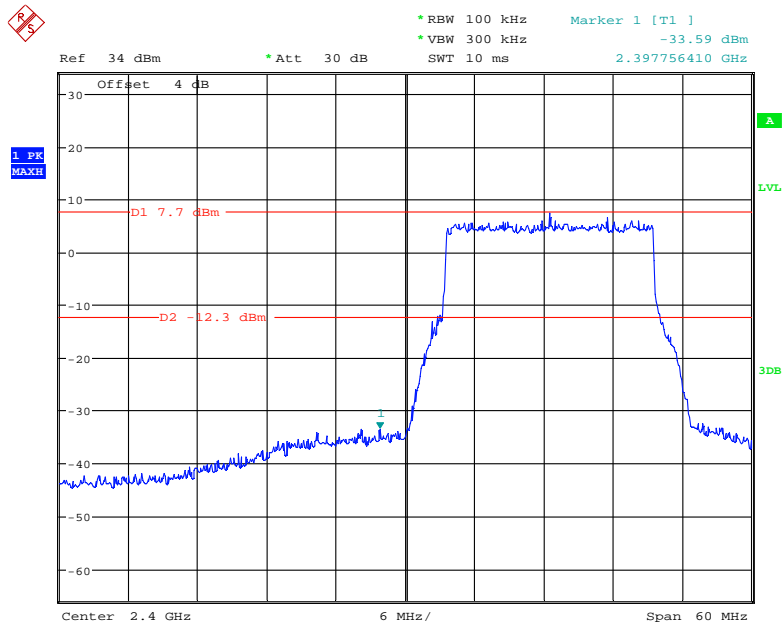
Date: 10.FEB.2018 17:50:02

### 10M Mode: Band Edge, Right Side



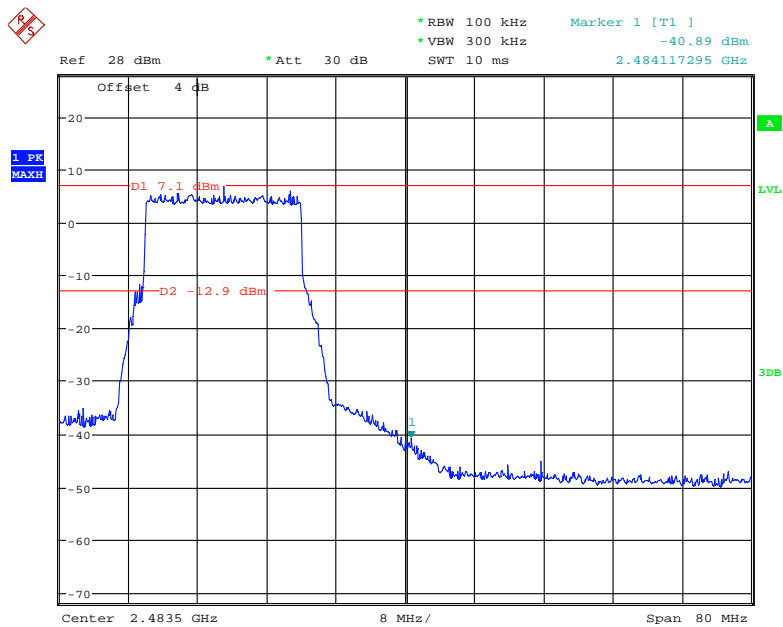
Date: 11.FEB.2018 09:31:40

### 20M Mode: Band Edge, Left Side



Date: 11.FEB.2018 10:07:24

### 20M Mode: Band Edge, Right Side



Date: 11.FEB.2018 09:33:30

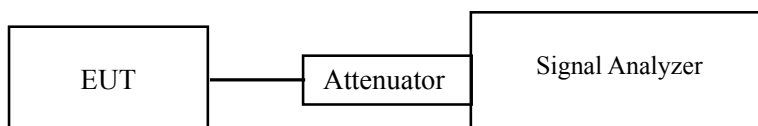
## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

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.

### Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
3. Set the VBW  $\geq 3 \times \text{RBW}$ .
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



### Test Data

#### Environmental Conditions

<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Vincent Zeng from 2018-02-10 to 2018-02-11.

EUT operation mode: Transmitting

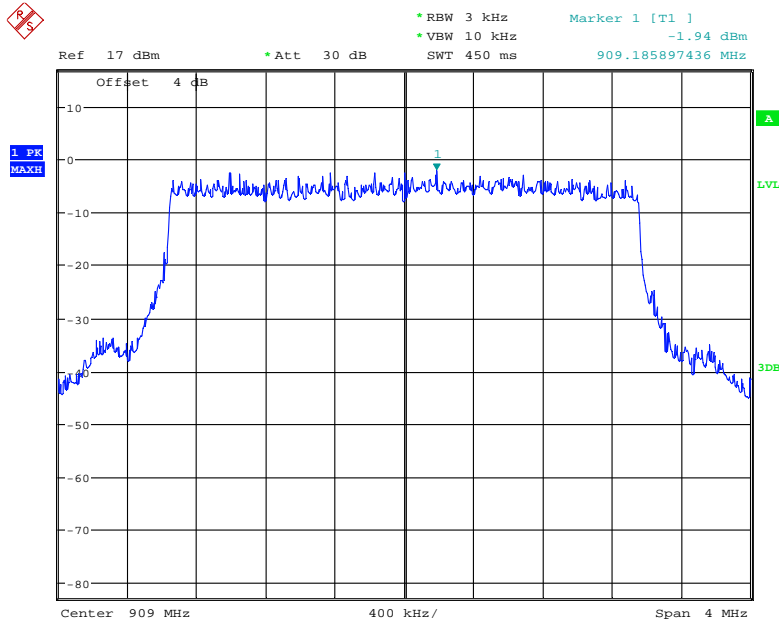
**Test Result:** Pass

**For 900MHz:**

Channel	Frequency (MHz)	Antenna 01 (dBm/3kHz)	Antenna 02 (dBm/3kHz)	Limit (dBm/3kHz)
3M Mode				
Low	909	-1.94	-2.17	≤8
Middle	915	-2.90	-2.80	≤8
High	921	-2.47	-1.86	≤8
5M Mode				
Low	909	2.80	-3.33	≤8
Middle	915	-2.92	-2.53	≤8
High	921	-2.70	-2.76	≤8
10M Mode				
Low	909	-2.63	-3.46	≤8
Middle	915	-3.60	-2.96	≤8
High	921	-3.35	-3.63	≤8
20M Mode				
Low	914	-3.73	-2.96	≤8
Middle	915	-3.56	-3.35	≤8
High	916	-2.97	-3.31	≤8

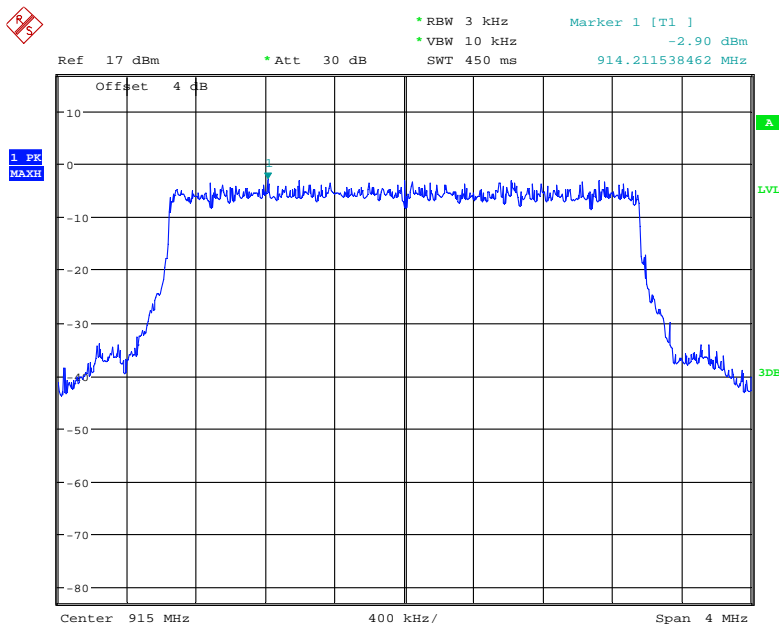
Antenna 01

Power Spectral Density, 3M Mode Low Channel



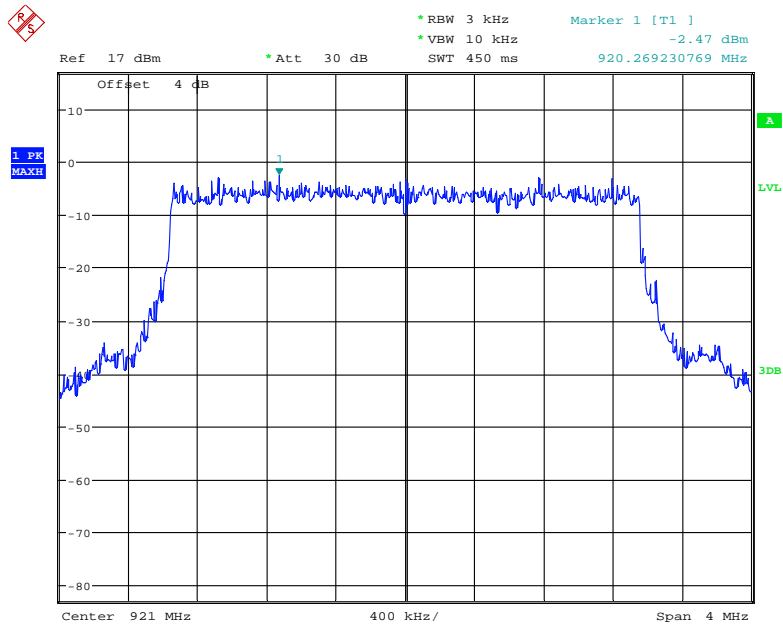
Date: 11.FEB.2018 13:44:32

Power Spectral Density, 3M Mode Middle Channel



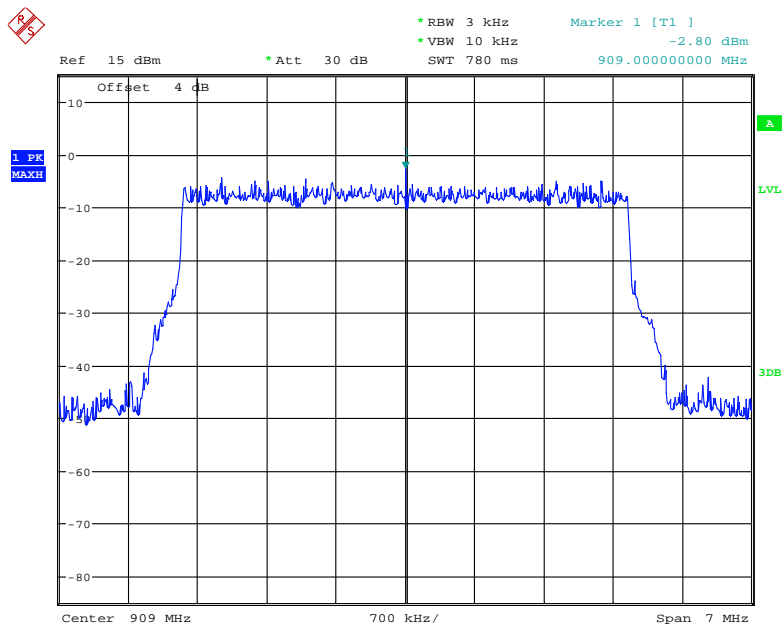
Date: 11.FEB.2018 13:37:29

### Power Spectral Density, 3M Mode High Channel



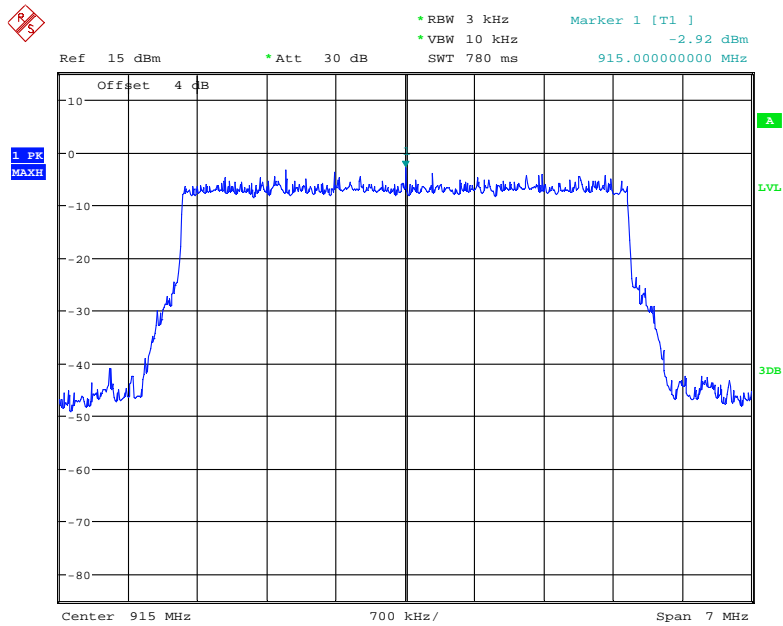
Date: 11.FEB.2018 13:27:28

### Power Spectral Density, 5M Mode Low Channel



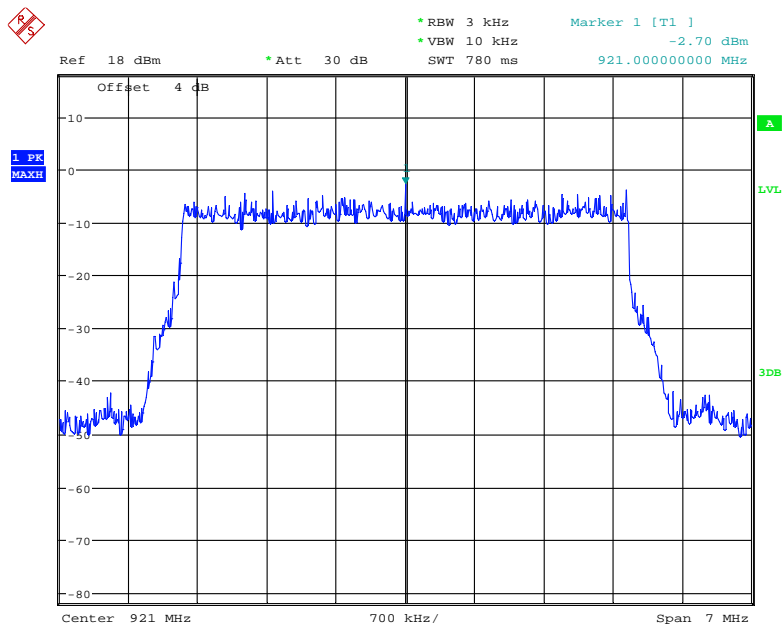
Date: 11.FEB.2018 11:46:29

### Power Spectral Density, 5M Mode Middle Channel



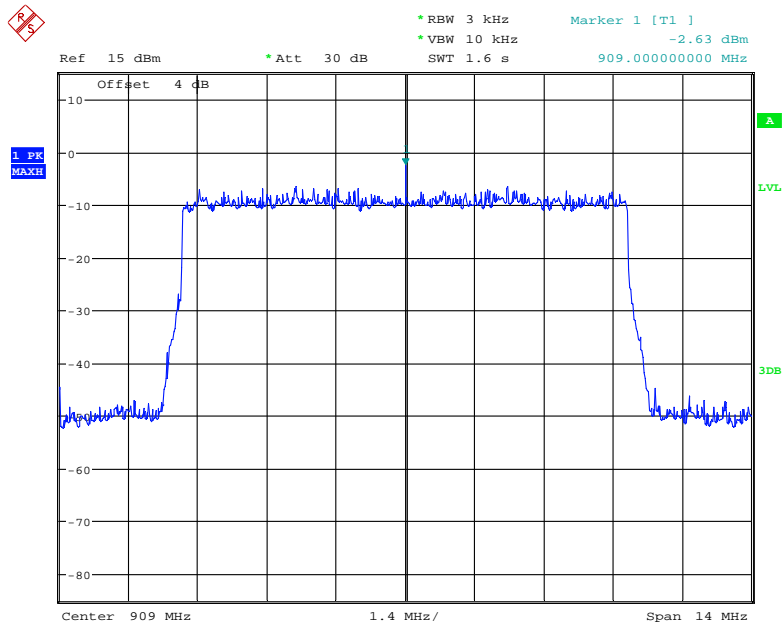
Date: 11.FEB.2018 11:55:20

### Power Spectral Density, 5M Mode High Channel



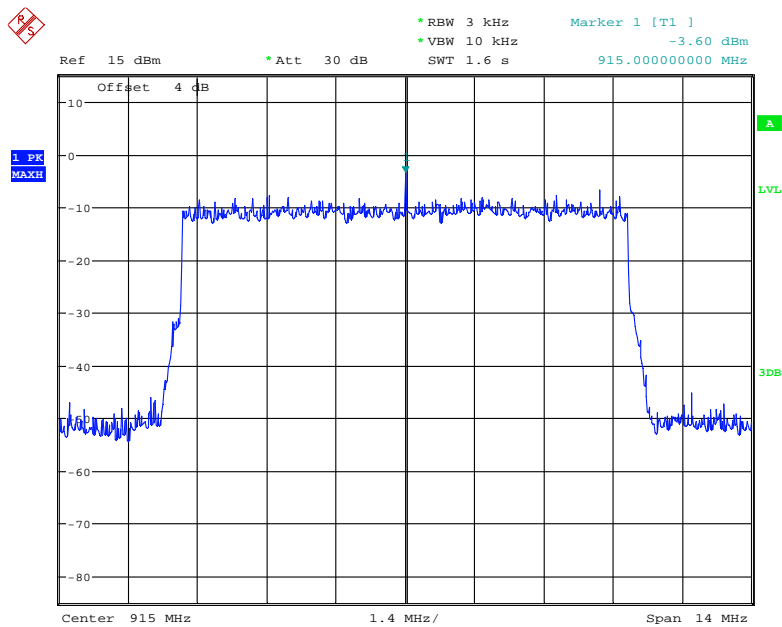
Date: 11.FEB.2018 13:08:47

### Power Spectral Density, 10M Mode Low Channel



Date: 11.FEB.2018 11:30:12

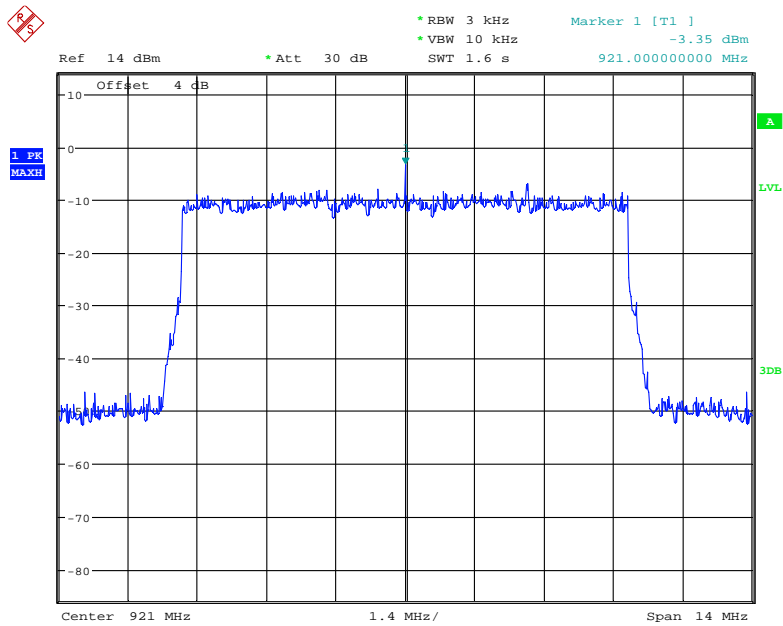
### Power Spectral Density, 10M Mode Middle Channel



Date: 11.FEB.2018 11:24:06

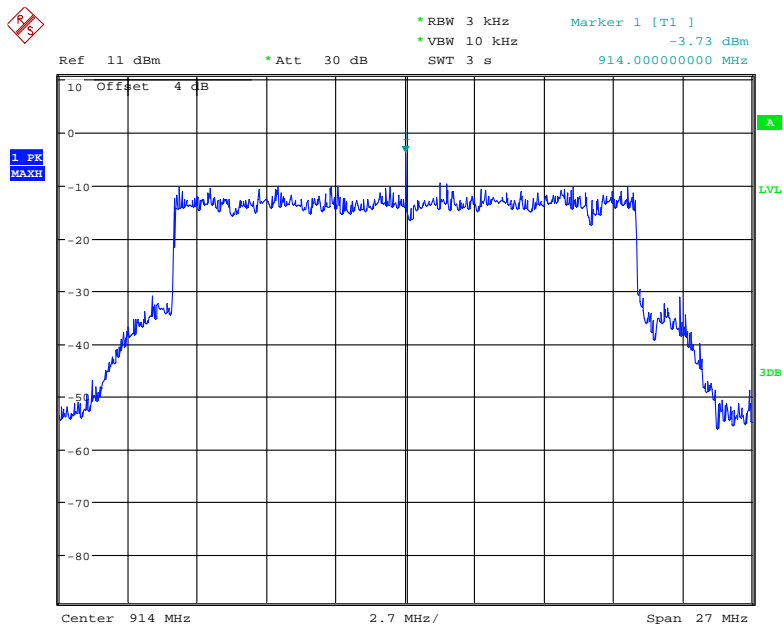


### Power Spectral Density, 10M Mode High Channel



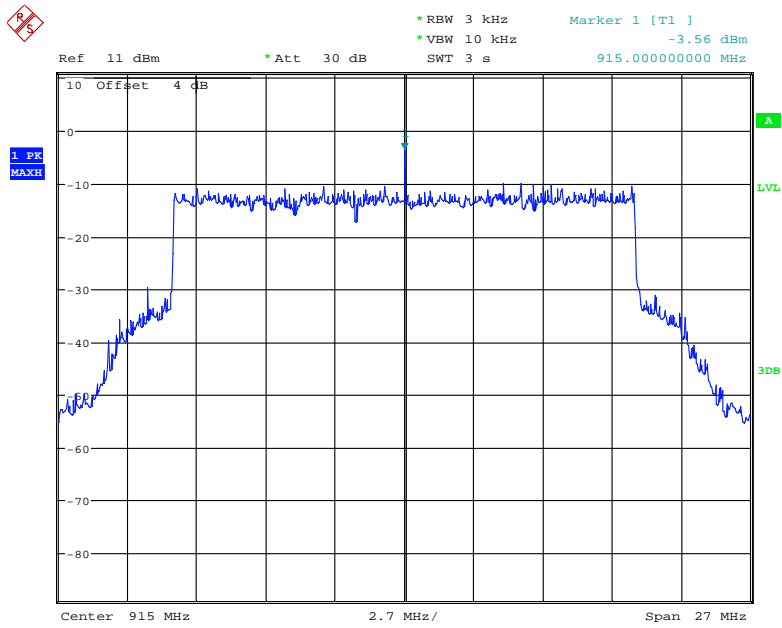
Date: 11.FEB.2018 11:16:19

### Power Spectral Density, 20M Mode Low Channel



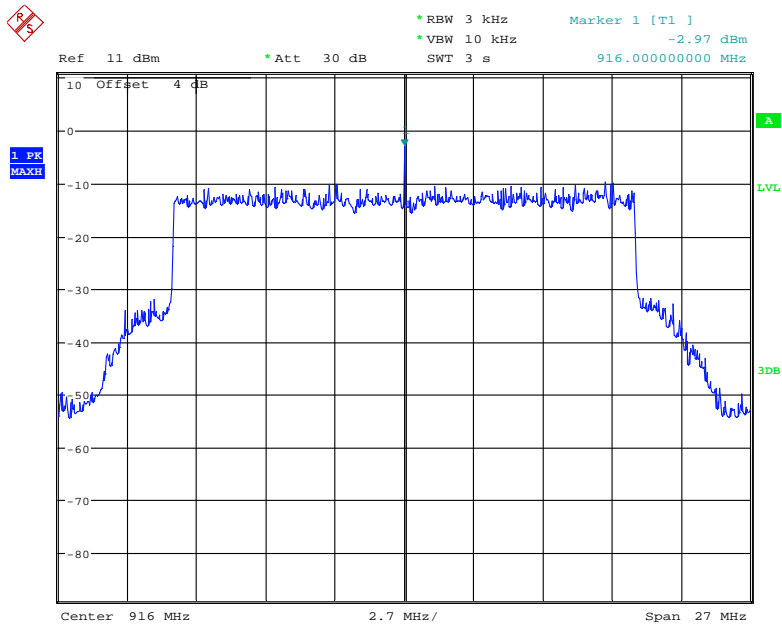
Date: 11.FEB.2018 10:43:06

### Power Spectral Density, 20M Mode Middle Channel



Date: 11.FEB.2018 10:41:28

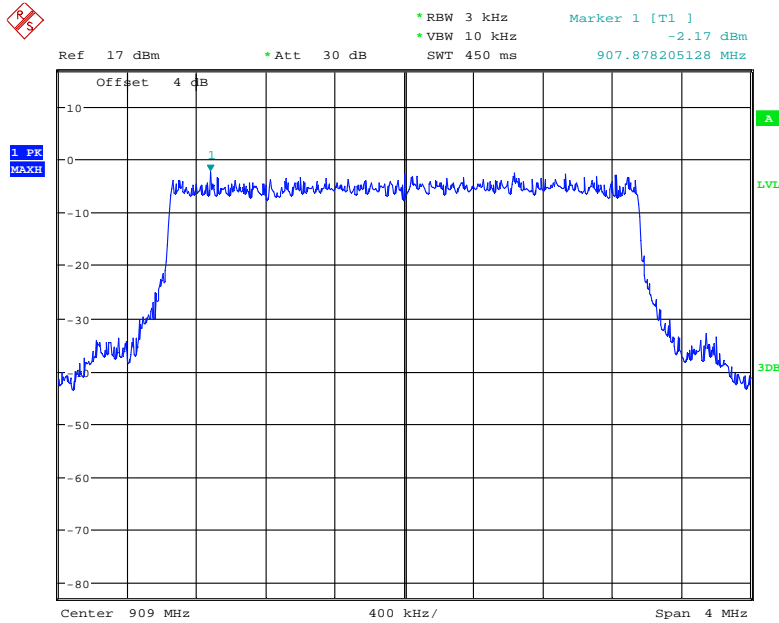
### Power Spectral Density, 20M High Channel



Date: 11.FEB.2018 11:00:53

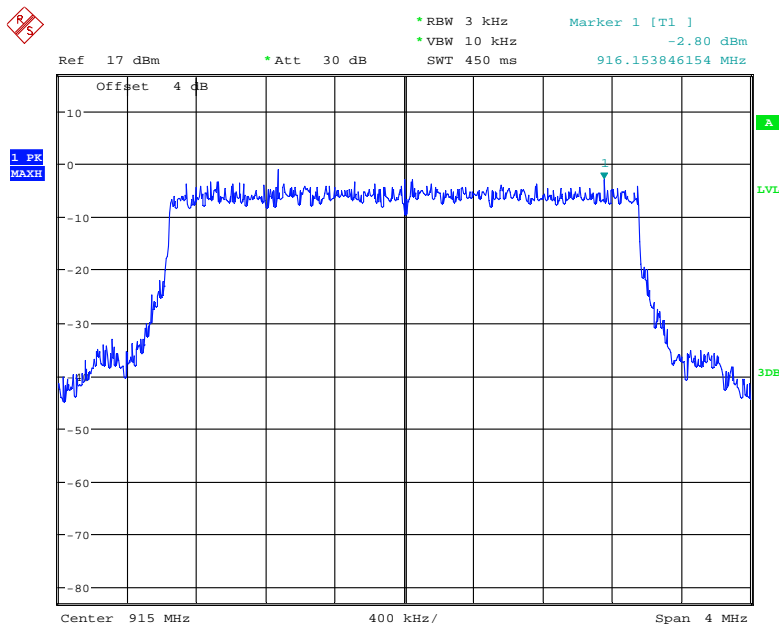
Antenna 02

Power Spectral Density, 3M Mode Low Channel



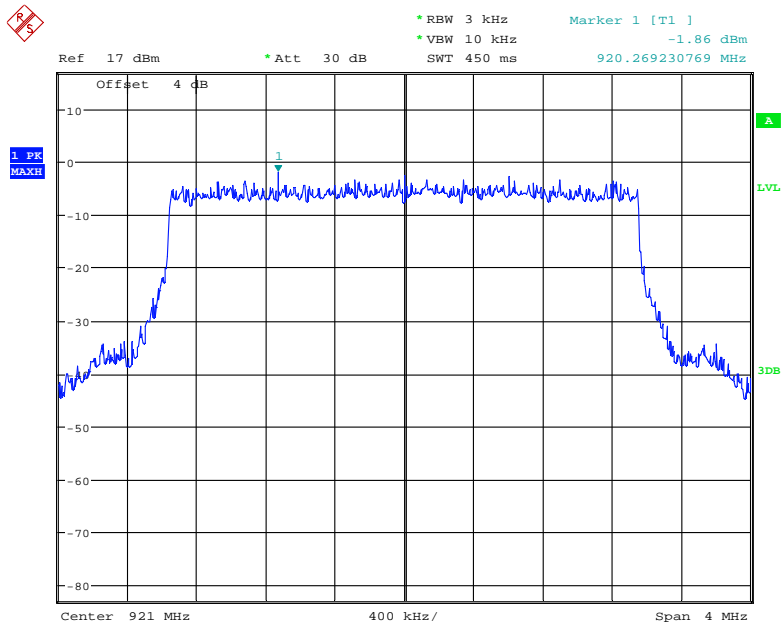
Date: 11.FEB.2018 13:41:28

Power Spectral Density, 3M Mode Middle Channel



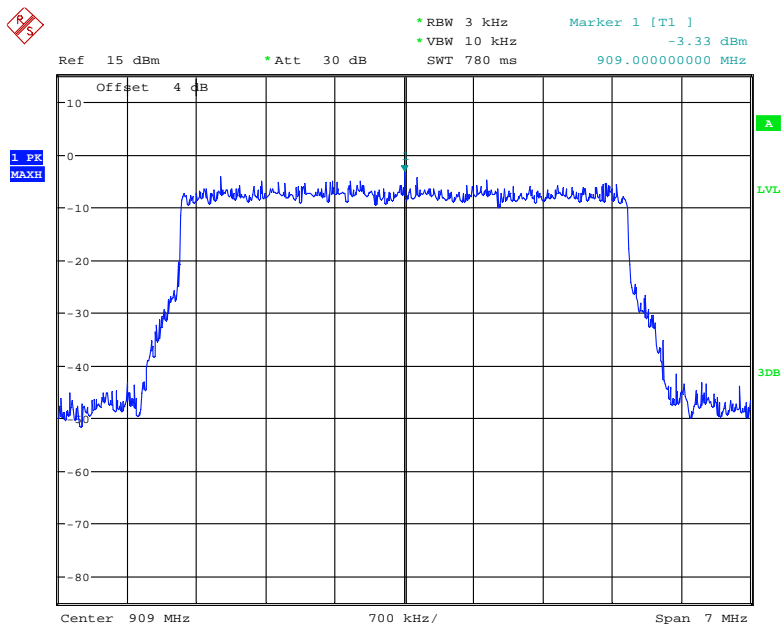
Date: 11.FEB.2018 13:39:31

### Power Spectral Density, 3M Mode High Channel



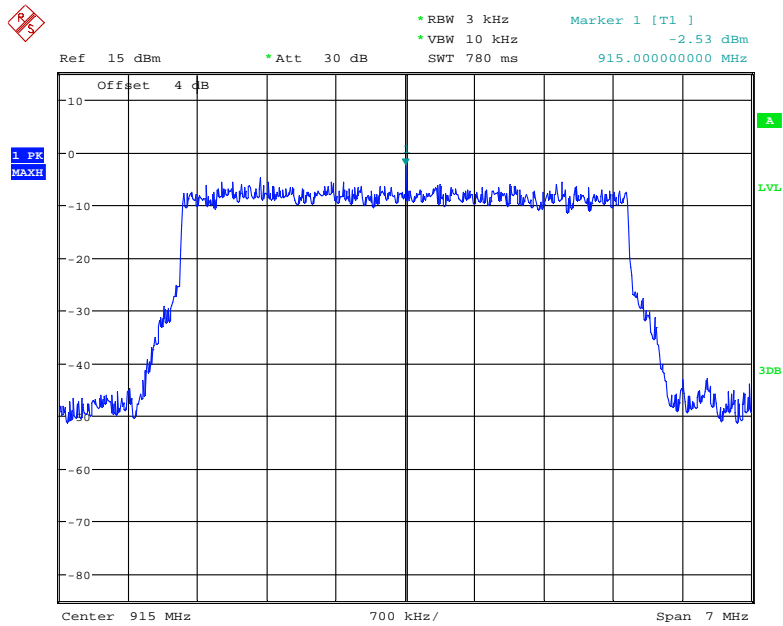
Date: 11.FEB.2018 13:25:51

### Power Spectral Density, 5M Mode Low Channel



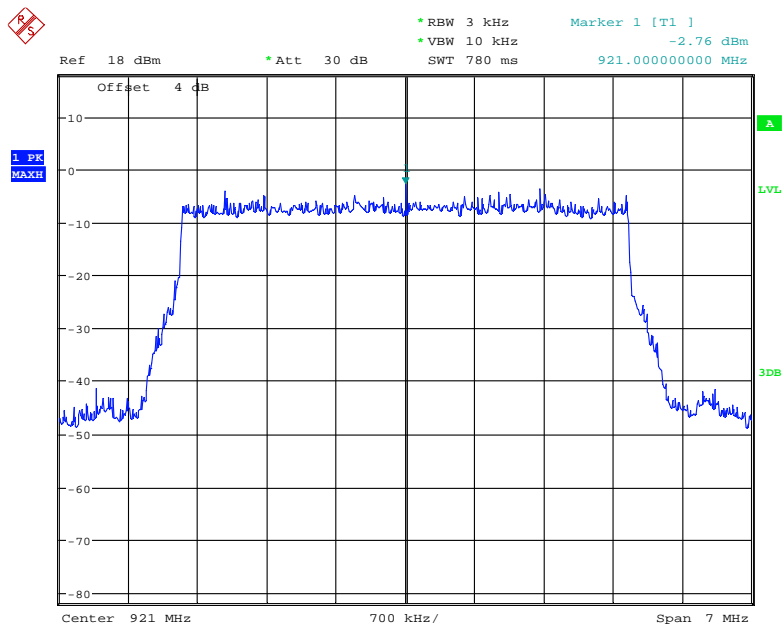
Date: 11.FEB.2018 11:49:09

### Power Spectral Density, 5M Mode Middle Channel



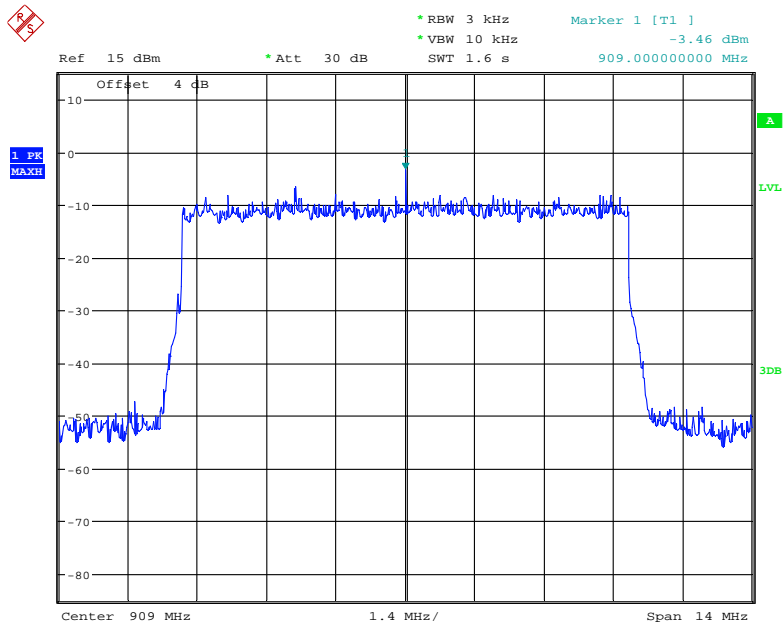
Date: 11.FEB.2018 11:50:21

### Power Spectral Density, 5M Mode High Channel



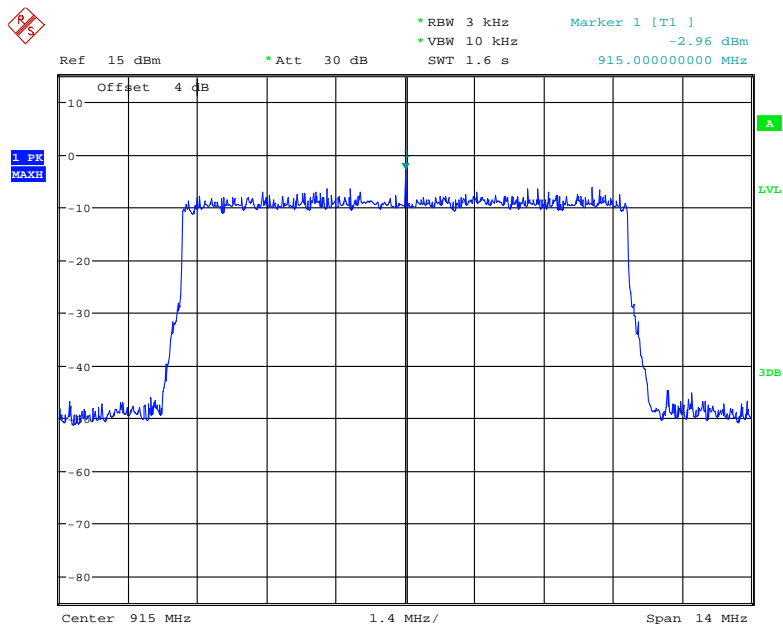
Date: 11.FEB.2018 13:12:05

### Power Spectral Density, 10M Mode Low Channel



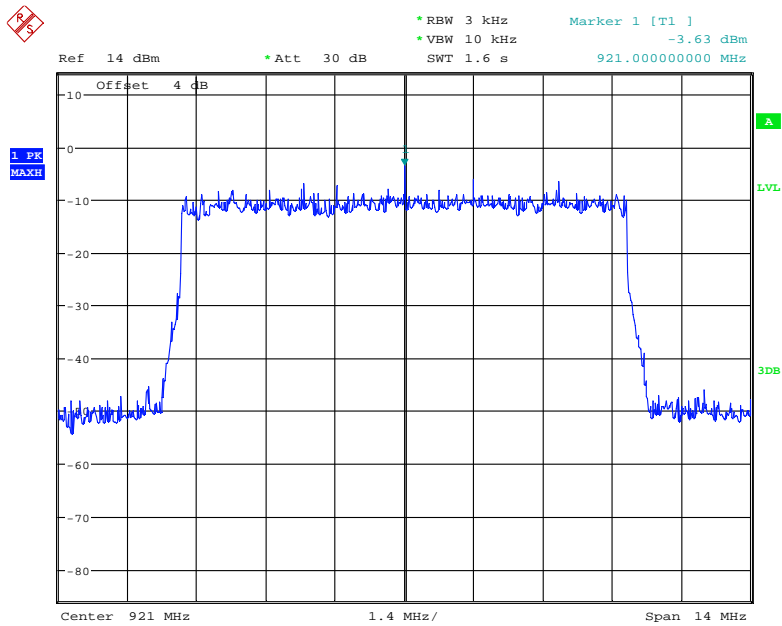
Date: 11.FEB.2018 11:28:14

### Power Spectral Density, 10M Mode Middle Channel



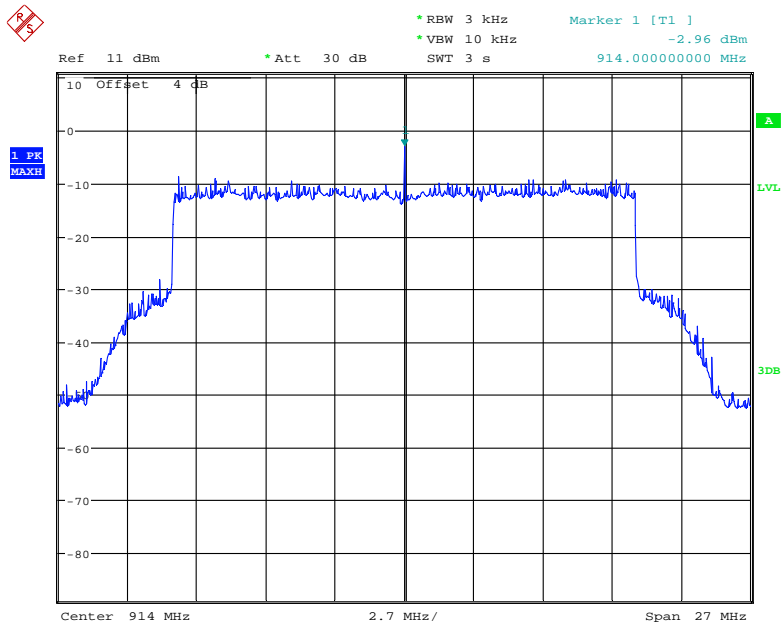
Date: 11.FEB.2018 11:26:54

### Power Spectral Density, 10M Mode High Channel



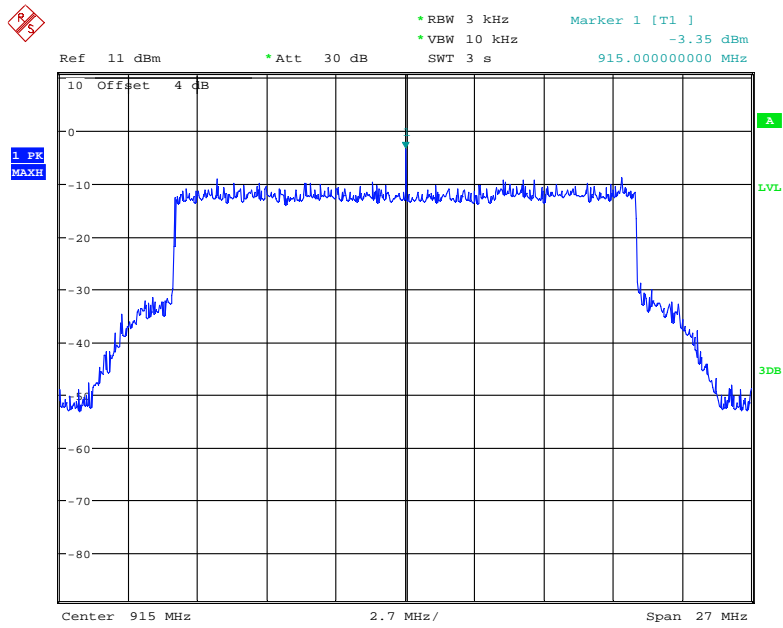
Date: 11.FEB.2018 11:13:53

### Power Spectral Density, 20M Mode Low Channel



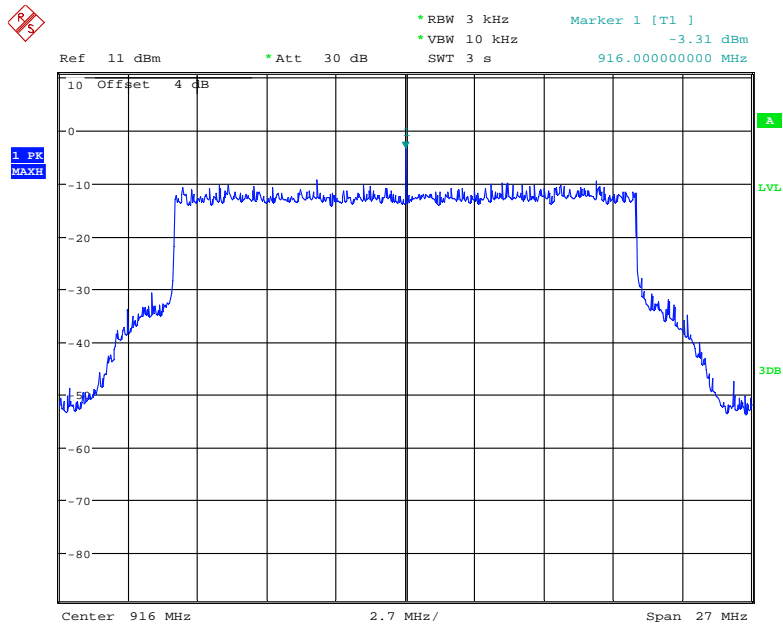
Date: 11.FEB.2018 10:47:43

### Power Spectral Density, 20M Mode Middle Channel



Date: 11.FEB.2018 10:34:27

### Power Spectral Density, 20M Mode High Channel



Date: 11.FEB.2018 10:57:13

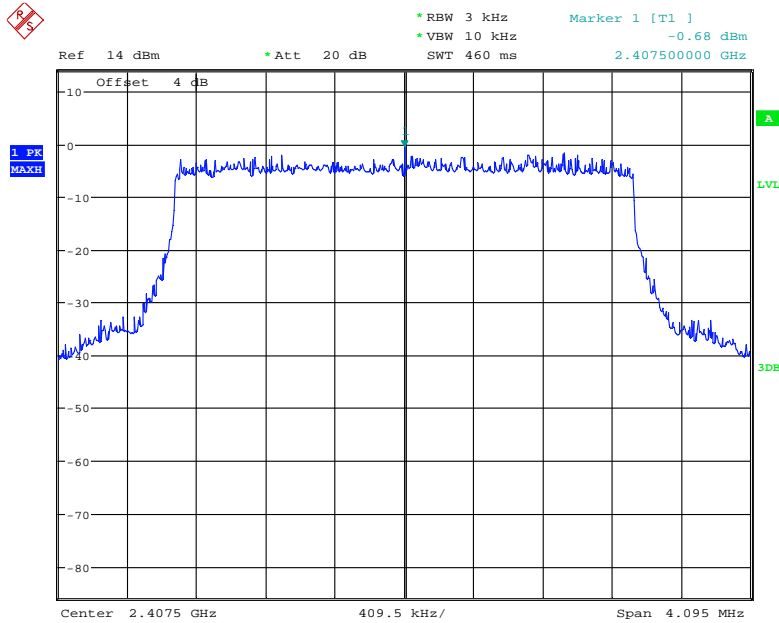


**For 2.4GHz:**

Channel	Frequency (MHz)	Antenna 03 (dBm/3kHz)	Antenna 04 (dBm/3kHz)	Limit (dBm/3kHz)
3M Mode				
Low	2407.5	-0.68	-1.00	≤8
Middle	2439.5	-0.57	-1.30	≤8
High	2471.5	-0.86	-1.12	≤8
5M Mode				
Low	2407.5	-0.97	-1.25	≤8
Middle	2439.5	-1.71	-1.39	≤8
High	2471.5	-1.66	-1.93	≤8
10M Mode				
Low	2407.5	-1.64	-2.41	≤8
Middle	2439.5	-1.70	-1.56	≤8
High	2471.5	-1.36	-1.48	≤8
20M Mode				
Low	2412.5	-1.61	-1.35	≤8
Middle	2437.5	-1.52	-1.33	≤8
High	2462.5	-1.80	-1.73	≤8

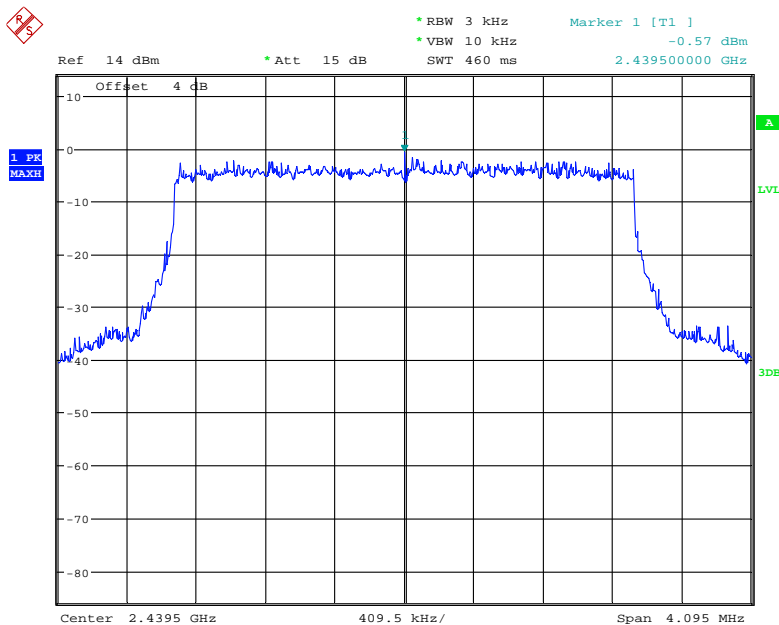
Antenna 03

Power Spectral Density, 3M Mode Low Channel



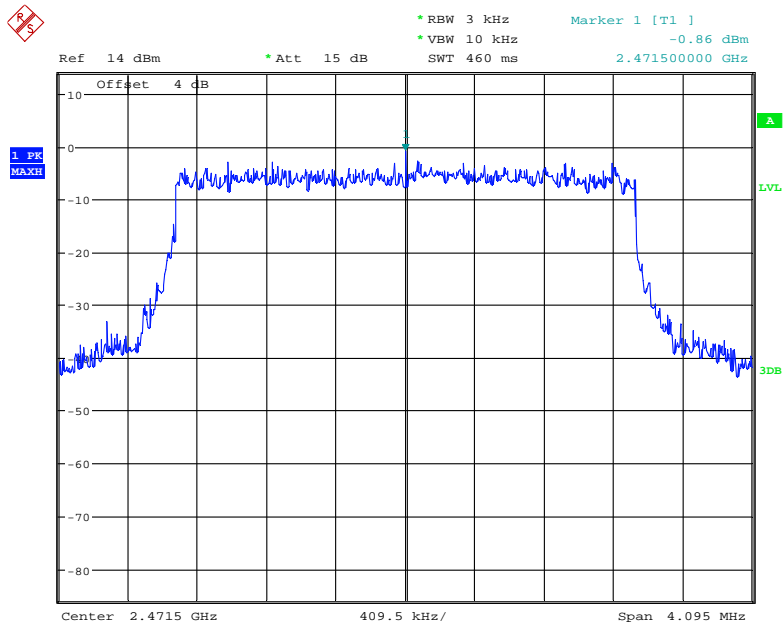
Date: 10.FEB.2018 16:43:09

Power Spectral Density, 3M Mode Middle Channel



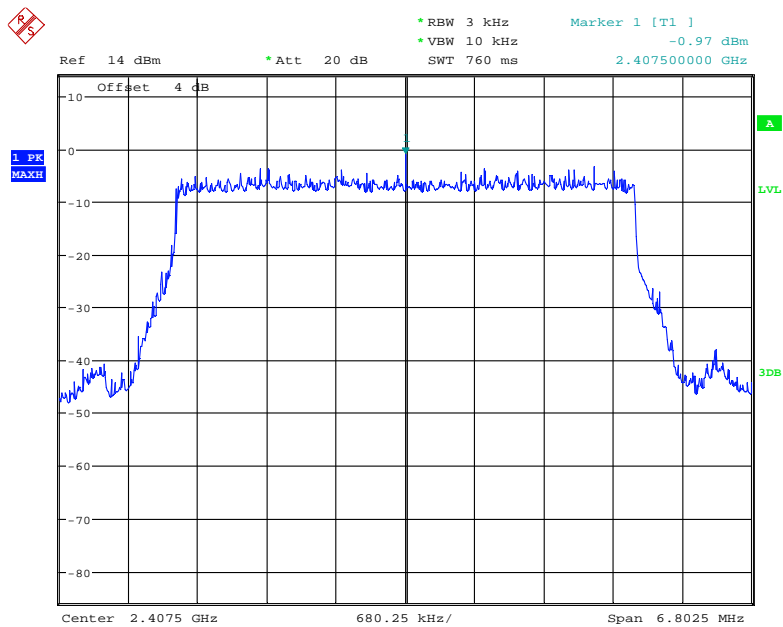
Date: 10.FEB.2018 17:05:23

### Power Spectral Density, 3M Mode High Channel



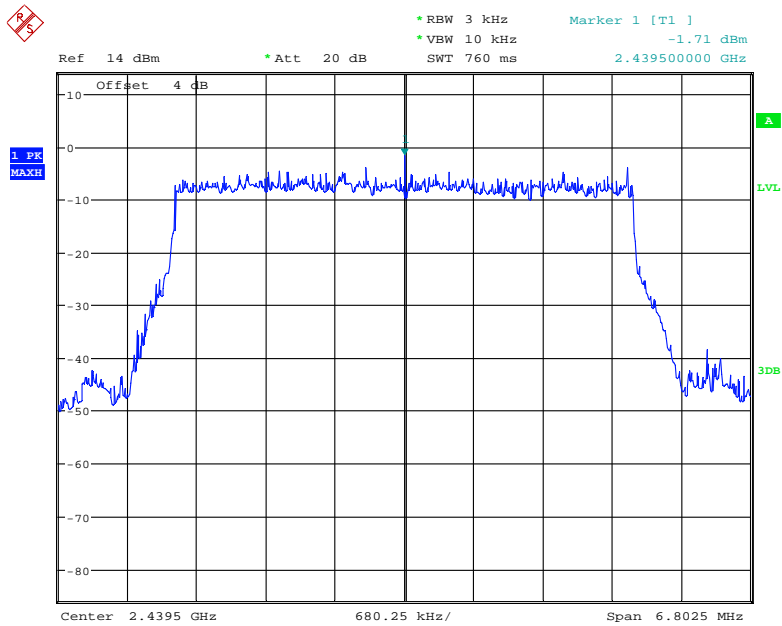
Date: 10.FEB.2018 17:07:45

### Power Spectral Density, 5M Mode Low Channel



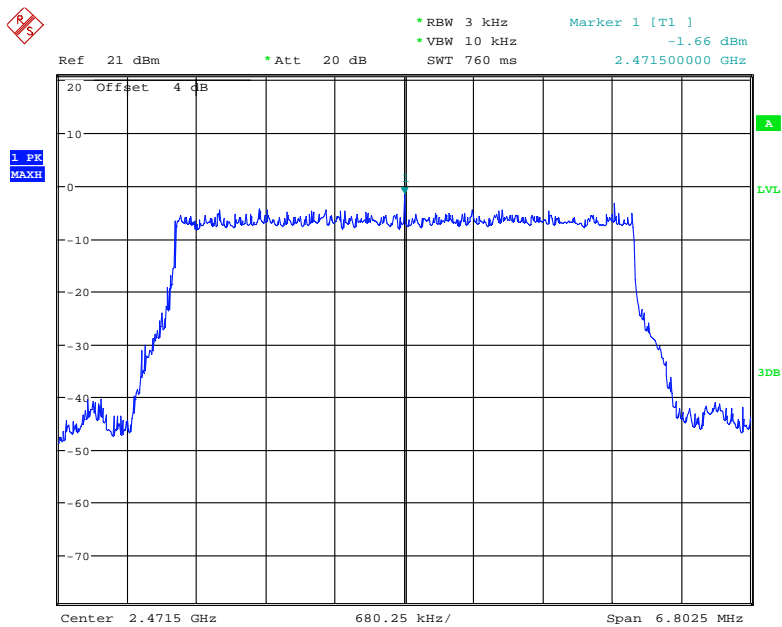
Date: 10.FEB.2018 17:40:05

### Power Spectral Density, 5M Mode Middle Channel



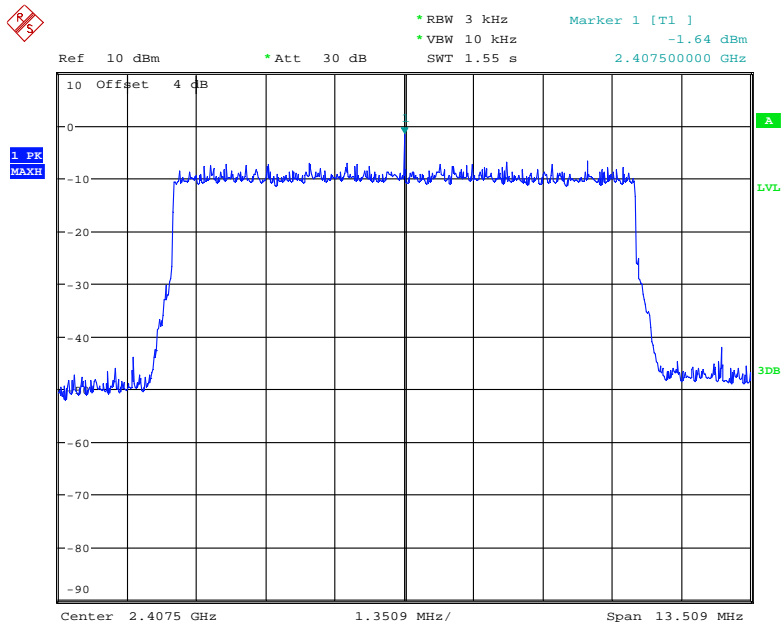
Date: 10.FEB.2018 17:33:24

### Power Spectral Density, 5M Mode High Channel



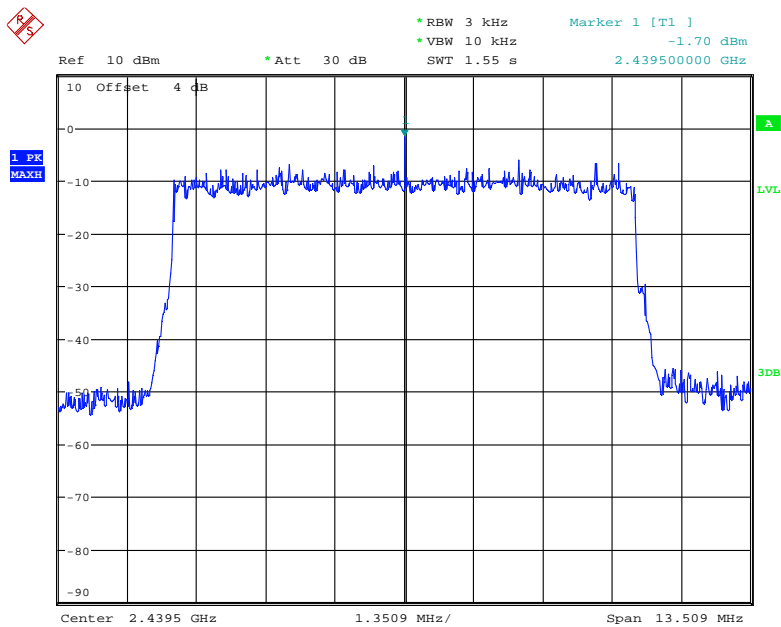
Date: 10.FEB.2018 17:28:09

### Power Spectral Density, 10M Mode Low Channel



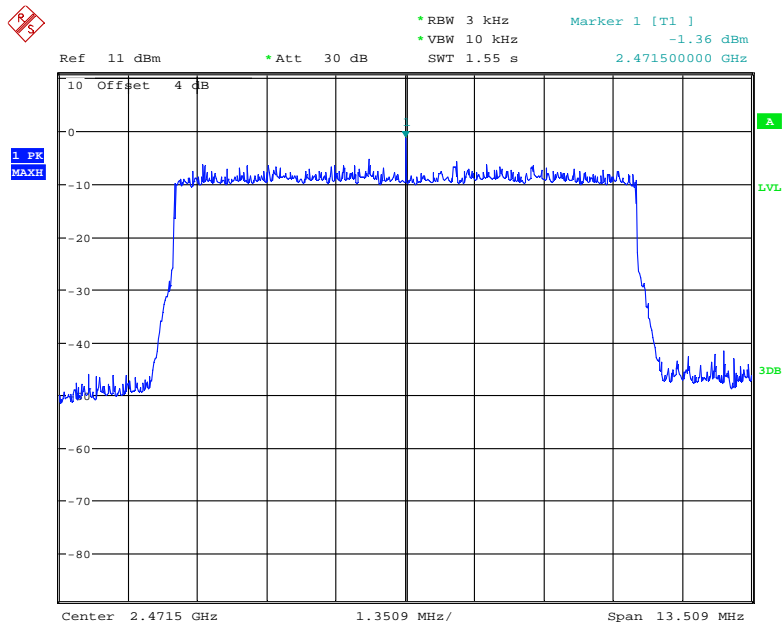
Date: 10.FEB.2018 17:55:12

### Power Spectral Density, 10M Mode Middle Channel



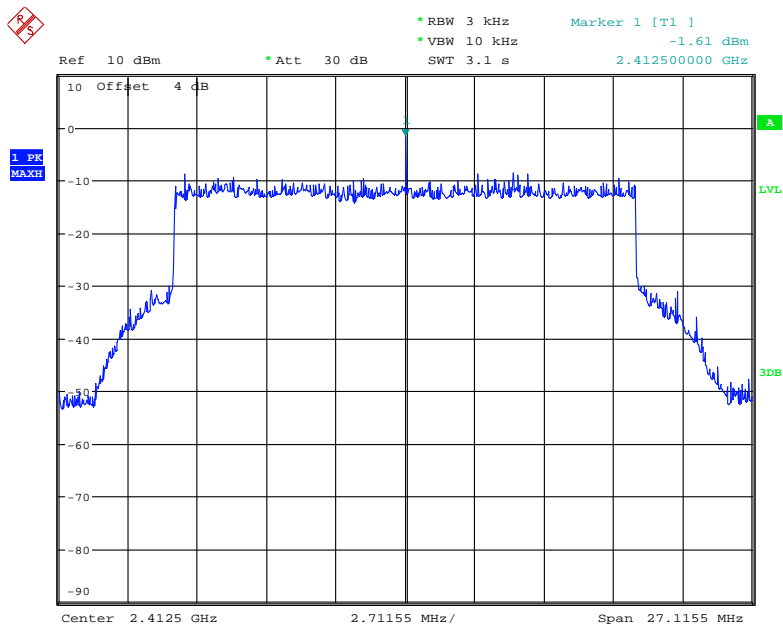
Date: 10.FEB.2018 17:57:36

### Power Spectral Density, 10M Mode High Channel



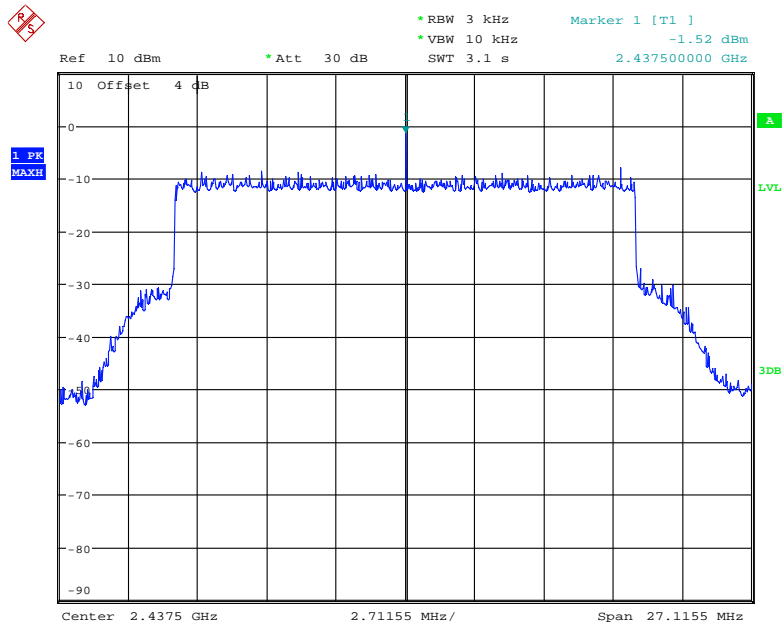
Date: 11.FEB.2018 09:23:35

### Power Spectral Density, 20M Mode Low Channel



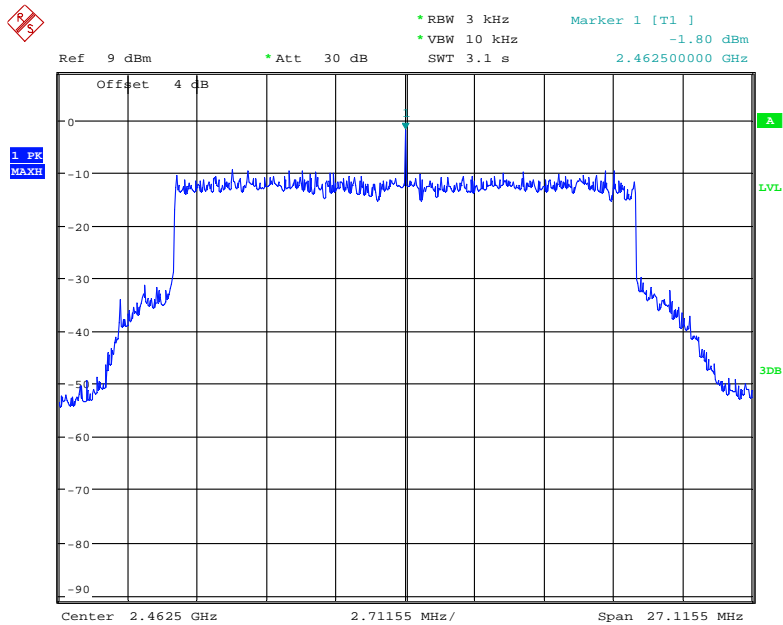
Date: 11.FEB.2018 09:55:51

### Power Spectral Density, 20M Mode Middle Channel



Date: 11.FEB.2018 09:54:10

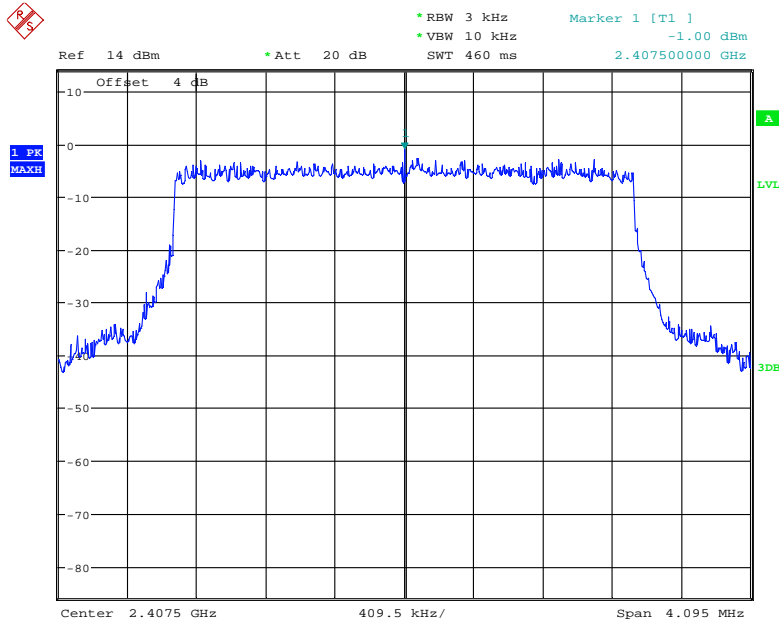
### Power Spectral Density, 20M Mode High Channel



Date: 11.FEB.2018 09:38:03

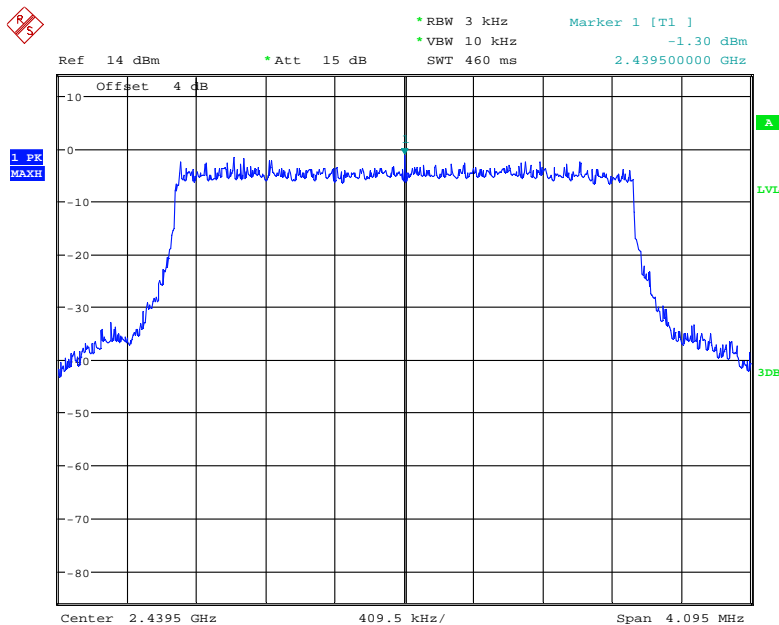
Antenna 04

Power Spectral Density, 3M Mode Low Channel



Date: 10.FEB.2018 16:39:58

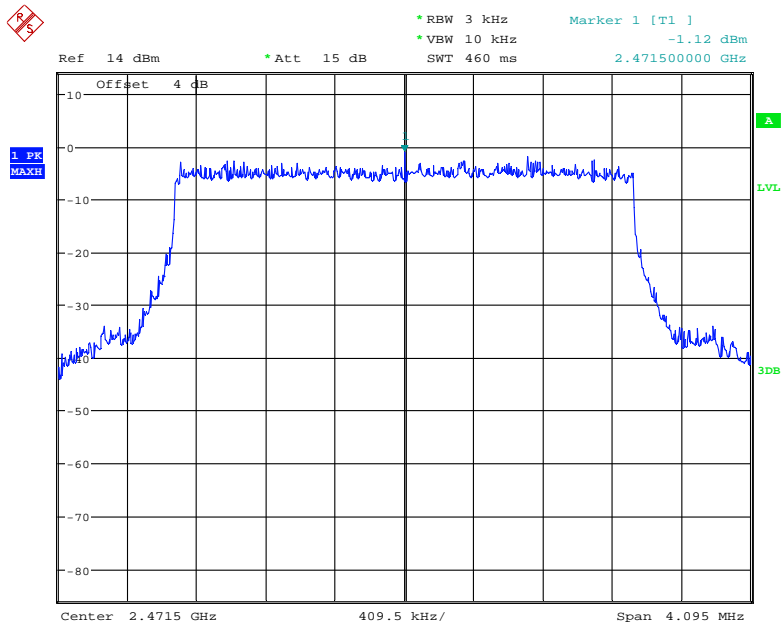
Power Spectral Density, 3M Mode Middle Channel



Date: 10.FEB.2018 17:00:54

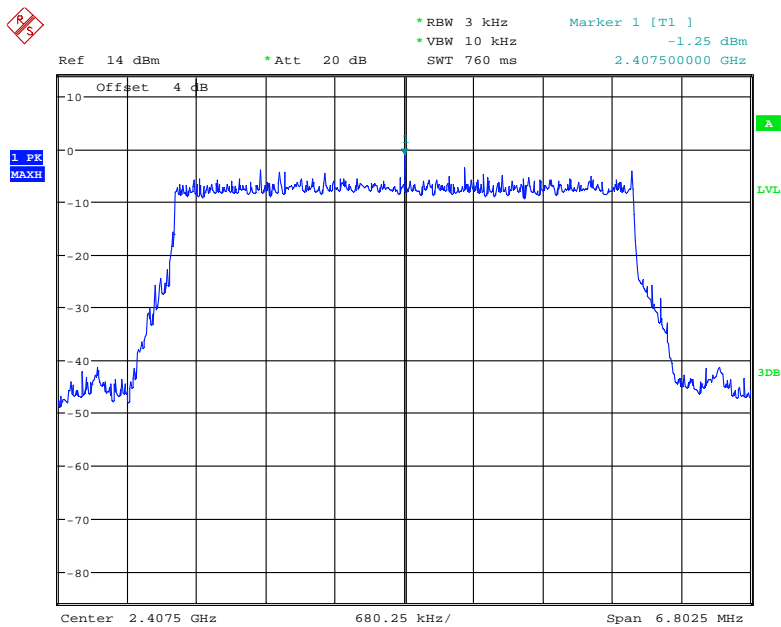


### Power Spectral Density, 3M Mode High Channel



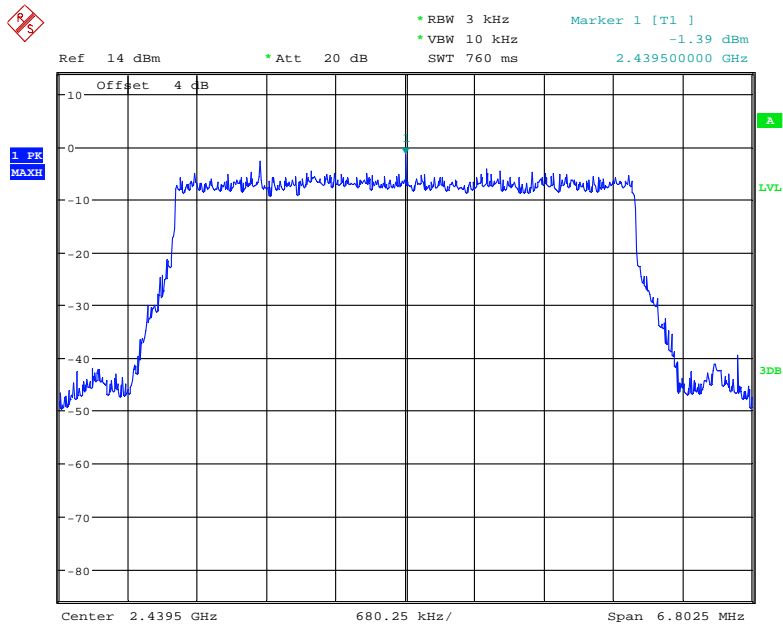
Date: 10.FEB.2018 17:09:43

### Power Spectral Density, 5M Mode Low Channel



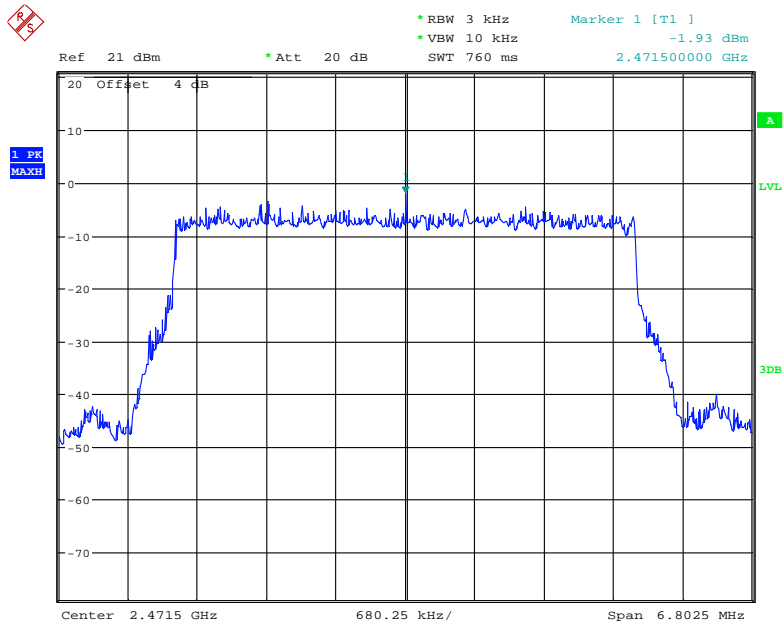
Date: 10.FEB.2018 17:37:22

### Power Spectral Density, 5M Mode Middle Channel



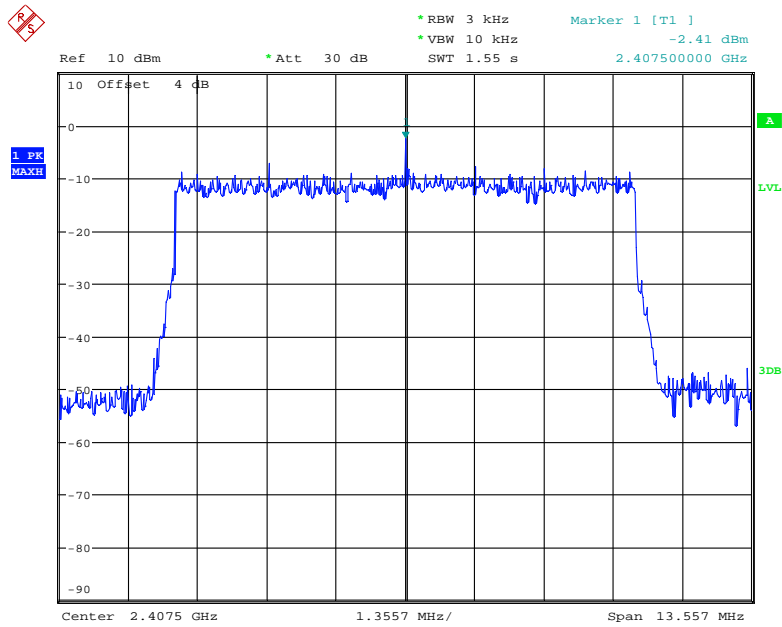
Date: 10.FEB.2018 17:35:50

### Power Spectral Density, 5M Mode High Channel



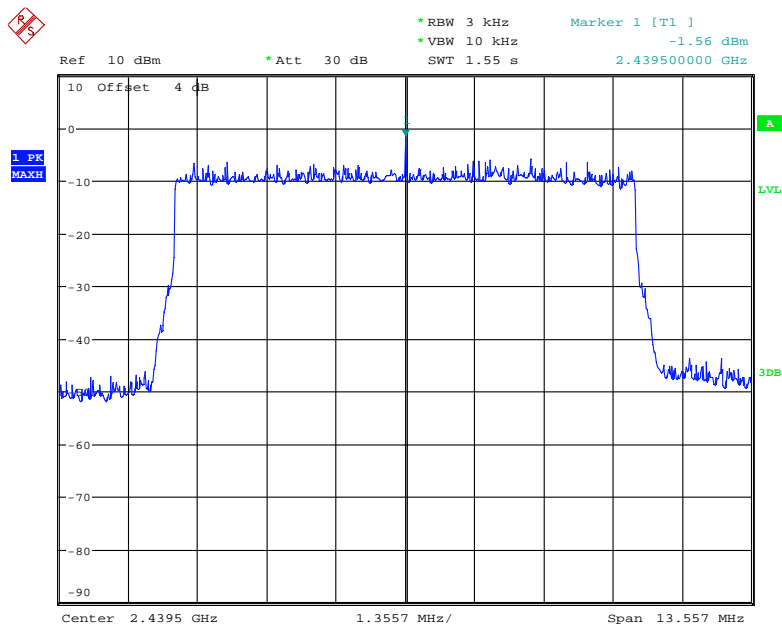
Date: 10.FEB.2018 17:26:07

### Power Spectral Density, 10M Mode Low Channel



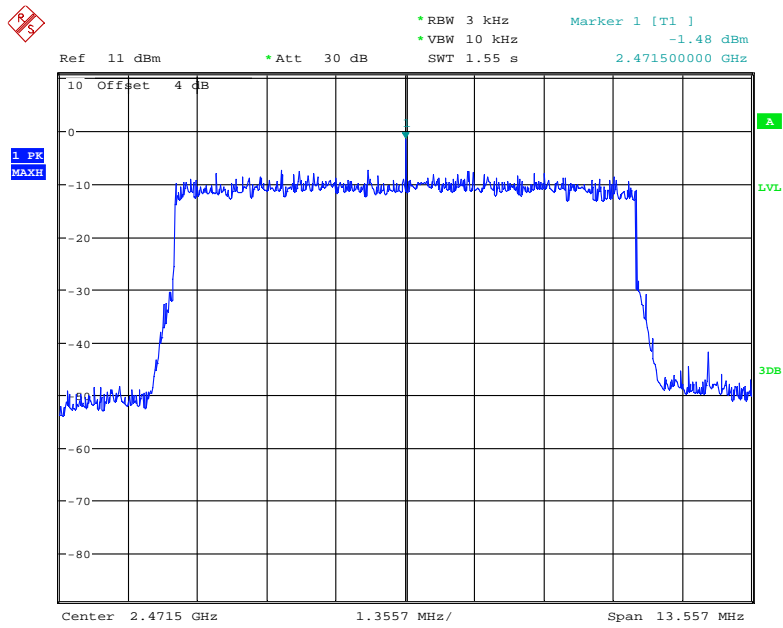
Date: 10.FEB.2018 17:52:51

### Power Spectral Density, 10M Mode Middle Channel



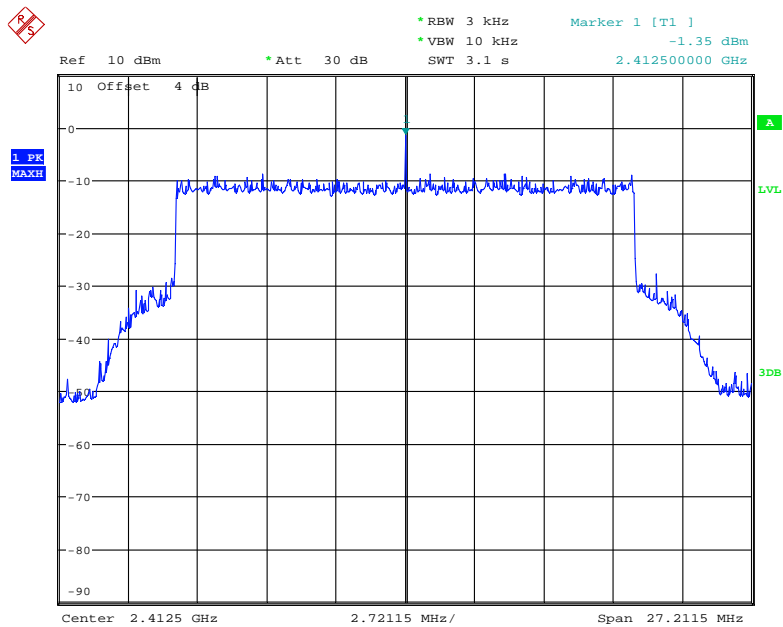
Date: 10.FEB.2018 17:59:14

### Power Spectral Density, 10M Mode High Channel



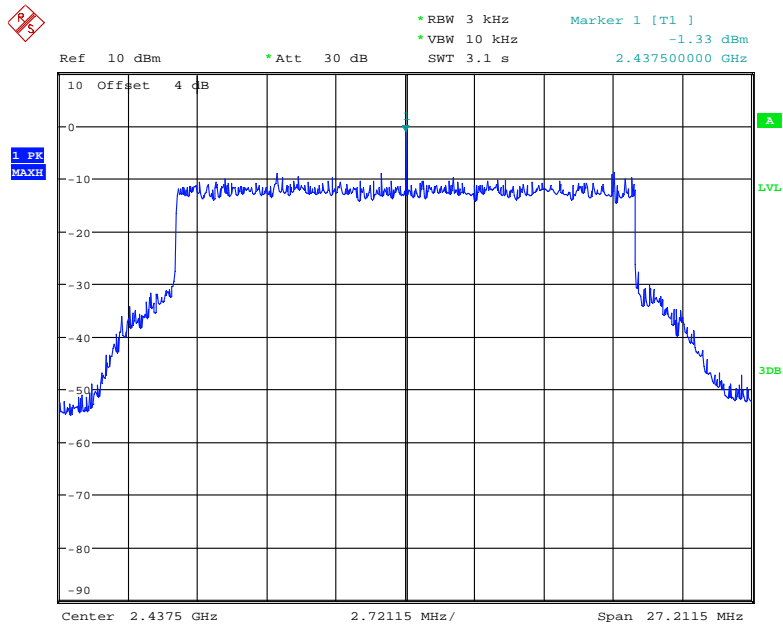
Date: 11.FEB.2018 09:19:01

### Power Spectral Density, 20M Mode Low Channel



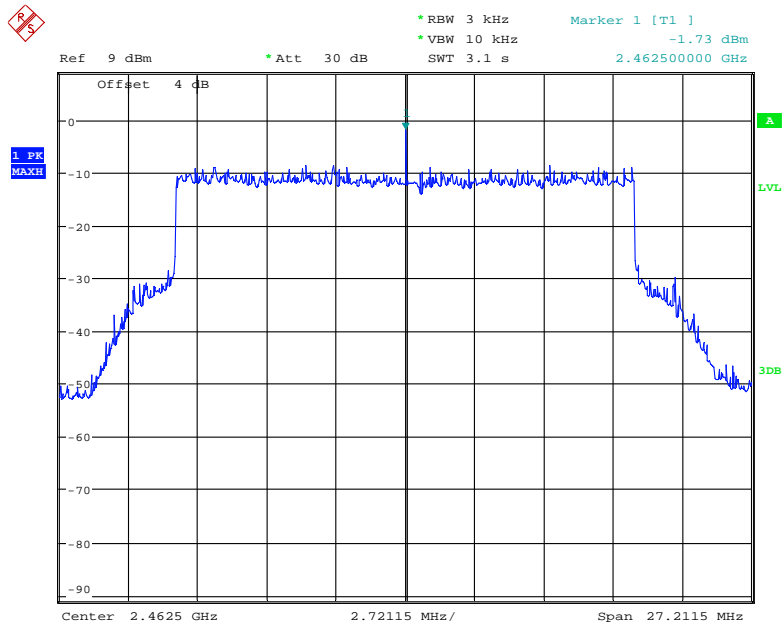
Date: 11.FEB.2018 09:58:02

### Power Spectral Density, 20M Mode Middle Channel



Date: 11.FEB.2018 09:51:05

### Power Spectral Density, 20M Mode High Channel



Date: 11.FEB.2018 09:41:05

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