FCC REPORT
(UNII)

Applicant:	Autel Robotics Co., Ltd
Address of Applicant:	9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen, China

Equipment Under Test (EUT)

Product Name:	Dragon Fish Remote Control
Model No.:	DFRC-1
Trade Mark:	AUTEL
FCC ID:	2AGNTDFRC2409A
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	24 Aug., 2020
Date of Test:	25 Aug., to 27 Oct., 2020
Date of report issued:	03 Dec., 2020
Test Result:	PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Bruce Zhang
Laboratory Manager

2 Version

Version No.	Date	Description
00	*04 Nov., 2020*	*Original*
01	*03 Dec., 2020*	*Update ANT No.*

Tested by: Mike.ou ***Date:*** *03 Dec., 2020*

Test Engineer

Reviewed by: Winner Zhang ***Date:*** *03 Dec., 2020*

Project Engineer

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4 Test Summary

Test Item	Section in CFR 47	Test Result
Antenna requirement	15.203 & 15.407 (a)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.407 (a) (1) (iv) & (a) (3)	Pass
26dB Occupied Bandwidth	15.407 (a) (12)	Pass
6dB Emission Bandwidth	15.407(e)	Pass
Power Spectral Density	15.407 (a) (1) (iv) & (a) (3)	Pass
Band Edge	15.407(b)	Pass
Spurious Emission	15.407 (b) & 15.205 & 15.209	Pass
Frequency Stability	15.407(g)	Pass

Remark:

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *N/A: Not Applicable.*
3. *The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB (provided by the customer).*

Test Method:	*ANSI C63.10-2013* *KDB 789033 D02 General UNII Test Procedures New Rules v02r01*

5 General Information

5.1 Client Information

Applicant:	Autel Robotics Co., Ltd
Address:	9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen, China
Manufacturer:	Autel Robotics Co.,Ltd
Address:	9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen, China
Factory:	Autel Robotics Co.,Ltd
Address:	9th Floor, Bldg.B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen, China

5.2 General Description of E.U.T.

Product Name:	Dragon Fish Remote Control	
Model No.:	DFRC-1	
Operation Frequency:	Band 1: 5150MHz-5250MHz	Band 4: 5725MHz-5825MHz
Channel numbers:	Band 1: 802.11a/802.11n20: 4 Band 4: 802.11a/802.11n20: 5	
Channel separation:	20MHz: 802.11a/802.11n-HT20	
Modulation technology (IEEE 802.11a):	BPSK, QPSK, 16-QAM, 64-QAM	
Modulation technology (IEEE 802.11n):	BPSK, QPSK, 16-QAM, 64-QAM	
Data speed (IEEE 802.11a):	6Mbps, 9Mbps,12Mbps,18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps	
Data speed (IEEE 802.11n20):	MCS0: 6.5Mbps, MCS1:13Mbps,MCS2:19.5Mbps, MCS3:26Mbps, MCS4:39Mbps, MCS5:52Mbps, MCS6:58.5Mbps, MCS7:65Mbps	
Antenna Type:	ANT 1/2/3 Internal Antenna ANT 6 External Antenna	
Antenna gain:	Module 1： ANT 3: 5.2G Wi-Fi: 1.6 dBi, 5.8G Wi-F：-1.4 dBi ANT 6: 5.2G Wi-Fi: 4.8 dBi, 5.8G Wi-F：4.8 dBi Module 2： ANT 1: 5.2G Wi-Fi: 2.1 dBi, 5.8G Wi-F：2.3 dBi ANT 2: 5.2G Wi-Fi: 2.3 dBi, 5.8G Wi-F：2.4 dBi.	
Power supply:	Rechargeable Li-ion Battery DC11.4V-8.2Ah	
AC adapter:	Model: DF_CHARGER Input: AC100-240V, 50/60Hz, 4.0A Output 1/2/3: DC 26.4V, 7.0A	
Test Sample Condition:	The test samples were provided in good working order with no visible defects.	

Operation Frequency each of channel			
Band 1		Band 4	
802.11a/802.11n-HT20		802.11a/802.11n-HT20	
Channel	Frequency	Channel	Frequency
36	5180MHz	149	5745MHz
40	5200MHz	153	5765MHz
44	5220MHz	157	5785MHz
48	5240MHz	161	5805MHz
		165	5825MHz

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Operation Frequency each of channel			
Band 1		Band 4	
802.11a/802.11n-HT20		802.11a/802.11n-HT20	
Channel	Frequency	Channel	Frequency
Lowest	5180MHz	Lowest	5745MHz
Middle	5200MHz	Middle	5785MHz
Highest	5240MHz	Highest	5825MHz

5.3 Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Continuously transmitting mode	Keep the EUT in 100% duty cycle transmitting with modulation.
We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	
Per-scan all kind of data rate, and found the follow list were the worst case.	
Mode	Data rate
802.11a	6 Mbps
802.11n-HT20	6.5 Mbps

5.4 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
The EUT has been tested as an independent unit.				

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±1.60 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.6 Additions to, deviations, or exclusions from the method

No

5.7 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.

5.8 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

- **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf

5.9 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.
Address: No.110~116, Building B, Jinyuan Business Building, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

5.10 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2020	07-21-2021
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-07-2020	03-06-2021
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-22-2020	06-21-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-07-2020	03-06-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2020	06-21-2021
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2019	11-17-2020
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2020	03-06-2021
Pre-amplifier	CD	PAP-1G18	11804	03-07-2020	03-06-2021
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-05-2020	03-04-2021
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2019	11-17-2020
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-05-2020	03-04-2021
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-18-2019	11-17-2020
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-05-2020	03-04-2021
Signal Generator	R&S	SMR20	1008100050	03-05-2020	03-04-2021
RF Switch Unit	MWRFTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTEST	MTS8200	Version: 2.0.0.0		
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2020	03-06-2021
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2020	03-06-2021
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2020	03-06-2021
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-25-2019	09-24-2020
				09-25-2020	09-24-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-01-2019	10-31-2020
				11-01-2020	10-31-2021
Simulated Station	Rohde & Schwarz	CMW500	140493	07-22-2020	07-21-2021

Conducted Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-05-2020	03-04-2021
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-05-2020	03-04-2021
LISN	CHASE	MN2050D	1447	03-05-2020	03-04-2021
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2020	07-20-2021
Cable	HP	10503A	N/A	03-05-2020	03-04-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		

6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 E Section 15.203 /407(a)

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

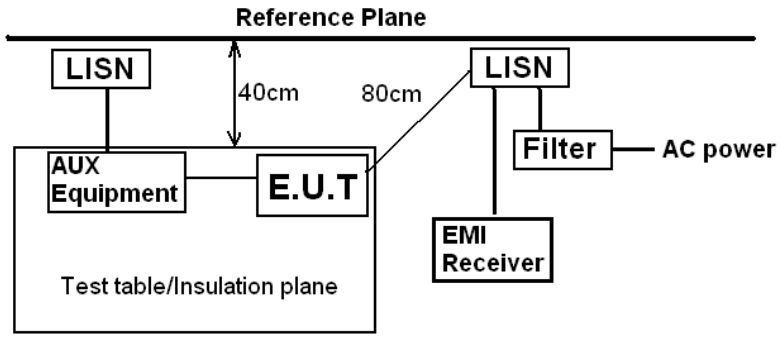
This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

E.U.T Antenna:	

The Wi-Fi antenna cannot replace by end-user, the best case gain of the antenna as bllow:

ANT No	ANT Gain	
	Band 1	Band 4
ANT 3	1.6dBi	-1.4dBi
ANT 6	4.8dBi	4.8dBi
ANT 1	2.1dBi	2.3dBi
ANT 2	2.3dBi	2.4dBi

6.2 Conducted Emission

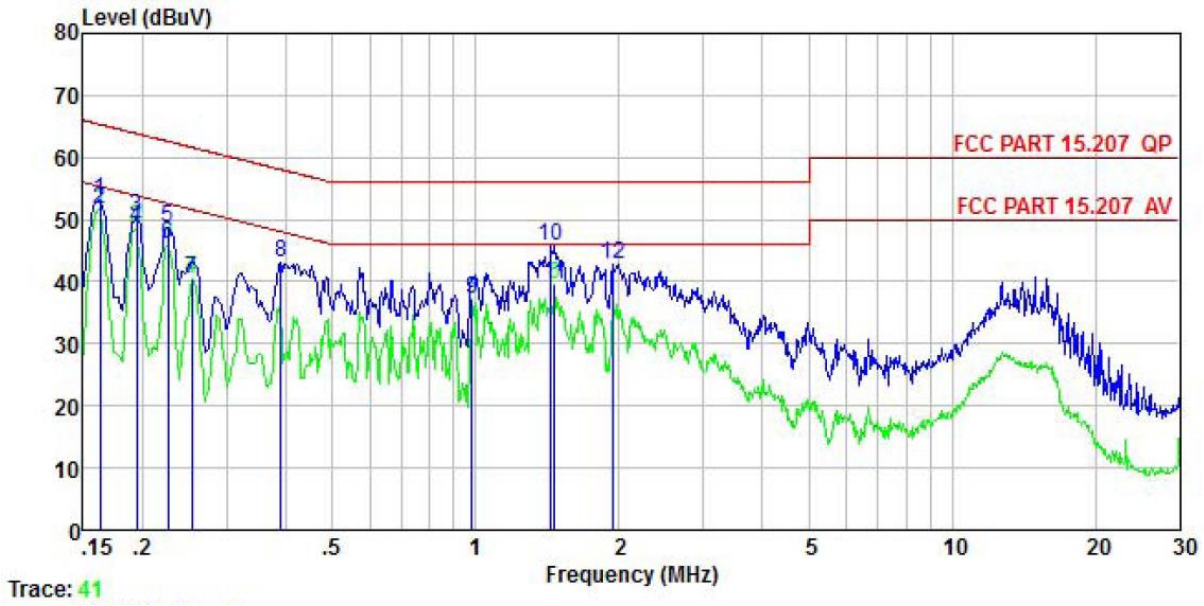
<table>
<tr><td>Test Requirement:</td><td colspan="3">FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="3">150kHz to 30MHz</td></tr>
<tr><td>Class / Severity:</td><td colspan="3">Class B</td></tr>
<tr><td>Receiver setup:</td><td colspan="3">RBW=9kHz, VBW=30kHz</td></tr>
<tr><td rowspan="6">Limit:</td><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td></td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>0.15-0.5</td></tr>
<tr><td>0.5-5</td><td>56</td><td>0.5-5</td></tr>
<tr><td>5-30</td><td>60</td><td>5-30</td></tr>
<tr><td colspan="3">* Decreases with the logarithm of the frequency.</td></tr>
<tr><td>Test procedure</td><td colspan="3">1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). It provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10(latest version) on conducted measurement.</td></tr>
<tr><td>Test setup:</td><td colspan="3"> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Instruments:</td><td colspan="3">Refer to section 5.10 for details</td></tr>
<tr><td>Test mode:</td><td colspan="3">Refer to section 5.3 for details.</td></tr>
<tr><td>Test results:</td><td colspan="3">Passed</td></tr>
</table>

Measurement Data:

Module 1:

Product name:	Dragon Fish Remote Control	**Product model:**	DFRC-1
Test by:	Mike	**Test mode:**	5G Wi-Fi Tx mode
Test frequency:	150 kHz ~ 30 MHz	**Phase:**	Line
Test voltage:	AC 120 V/60 Hz	**Environment:**	Temp: 22.5℃ Huni: 55%

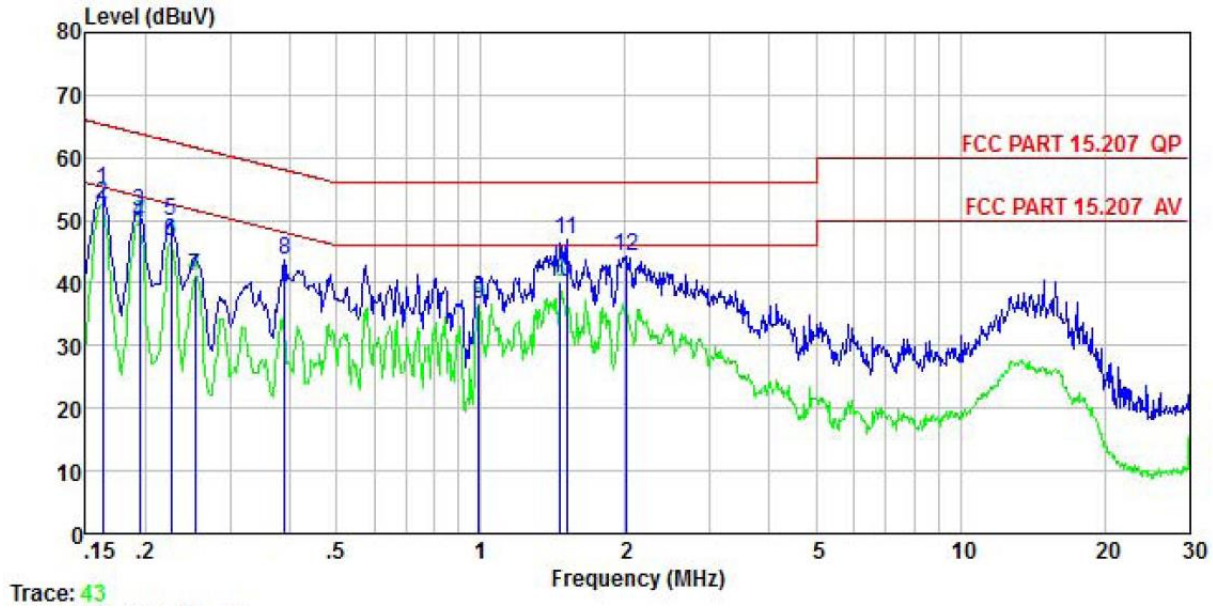


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.162	43.05	-0.58	-0.08	10.77	53.16	65.34	-12.18	QP
2	0.162	41.67	-0.58	-0.08	10.77	51.78	55.34	-3.56	Average
3	0.194	40.43	-0.59	-0.15	10.76	50.45	63.84	-13.39	QP
4	0.194	38.60	-0.59	-0.15	10.76	48.62	53.84	-5.22	Average
5	0.226	38.87	-0.58	-0.19	10.75	48.85	62.61	-13.76	QP
6	0.226	35.99	-0.58	-0.19	10.75	45.97	52.61	-6.64	Average
7	0.253	30.55	-0.57	-0.22	10.75	40.51	51.64	-11.13	Average
8	0.389	32.39	-0.49	0.34	10.72	42.96	58.08	-15.12	QP
9	0.984	26.46	-0.62	0.42	10.87	37.13	46.00	-8.87	Average
10	1.441	35.34	-0.56	0.05	10.92	45.75	56.00	-10.25	QP
11	1.464	29.14	-0.56	0.03	10.92	39.53	46.00	-6.47	Average
12	1.949	32.64	-0.51	-0.29	10.96	42.80	56.00	-13.20	QP

Notes:

1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Aux Factor + Cable Loss.*

Product name:	Dragon Fish Remote Control	Product model:	DFRC-1
Test by:	Mike	Test mode:	5G Wi-Fi Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%



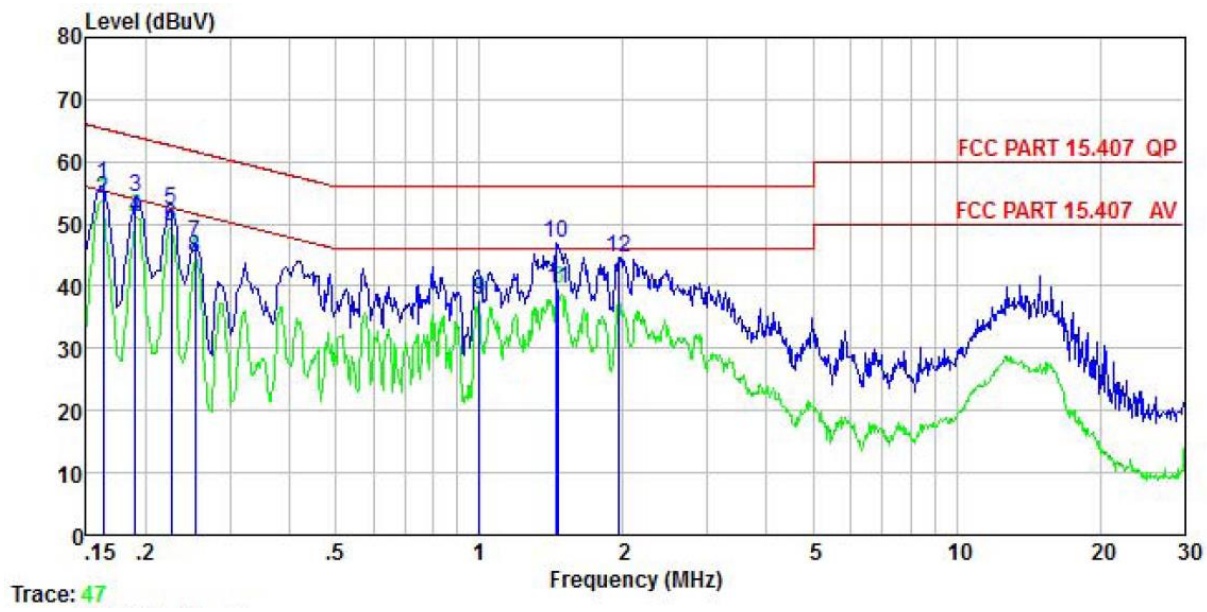
	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.162	44.74	-0.68	0.01	10.77	54.84	65.34	-10.50	QP
2	0.162	42.50	-0.68	0.01	10.77	52.60	55.34	-2.74	Average
3	0.194	41.33	-0.67	0.00	10.76	51.42	63.84	-12.42	QP
4	0.194	39.51	-0.67	0.00	10.76	49.60	53.84	-4.24	Average
5	0.226	39.80	-0.67	0.00	10.75	49.88	62.61	-12.73	QP
6	0.226	36.47	-0.67	0.00	10.75	46.55	52.61	-6.06	Average
7	0.253	30.95	-0.67	0.01	10.75	41.04	51.64	-10.60	Average
8	0.389	33.70	-0.63	-0.05	10.72	43.74	58.08	-14.34	QP
9	0.989	26.30	-0.68	0.08	10.87	36.57	46.00	-9.43	Average
10	1.464	29.75	-0.70	0.13	10.92	40.10	46.00	-5.90	Average
11	1.511	36.52	-0.70	0.13	10.92	46.87	56.00	-9.13	QP
12	2.012	33.93	-0.71	0.17	10.96	44.35	56.00	-11.65	QP

Notes:

1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Aux Factor + Cable Loss.*

Module 2:

Product name:	Dragon Fish Remote Control	**Product model:**	DFRC-1
Test by:	Mike	**Test mode:**	5G Wi-Fi Tx mode
Test frequency:	150 kHz ~ 30 MHz	**Phase:**	Line
Test voltage:	AC 120 V/60 Hz	**Environment:**	Temp: 22.5℃ Huni: 55%

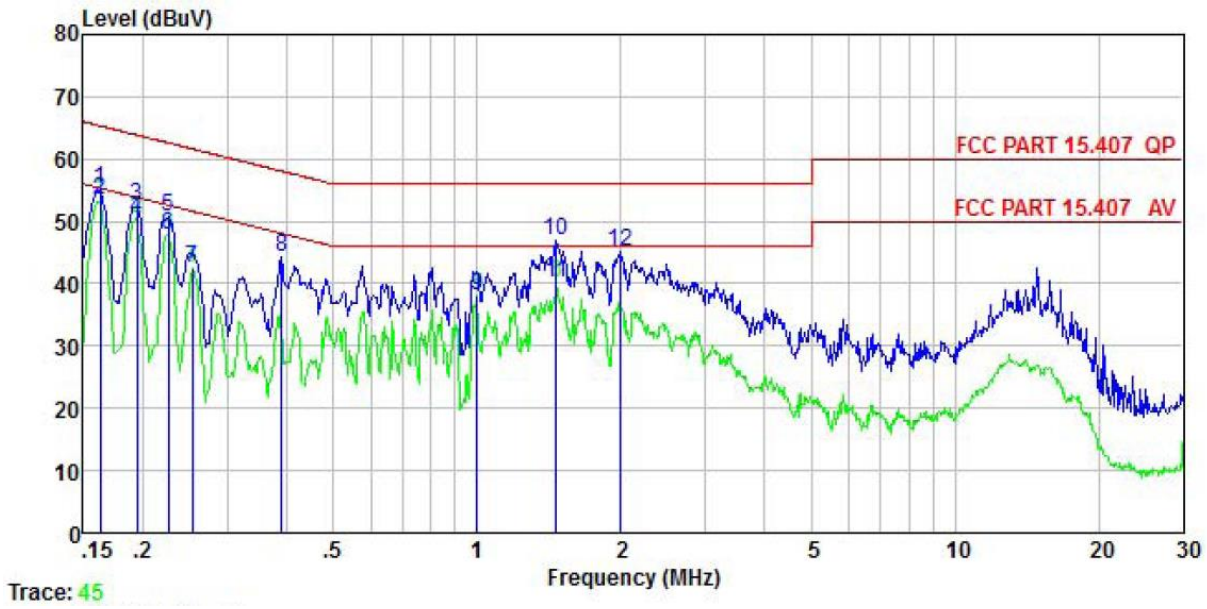


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.162	46.22	-0.58	-0.08	10.77	56.33	65.34	-9.01	QP
2	0.162	43.88	-0.58	-0.08	10.77	53.99	55.34	-1.35	Average
3	0.190	44.19	-0.59	-0.14	10.76	54.22	64.02	-9.80	QP
4	0.190	40.99	-0.59	-0.14	10.76	51.02	54.02	-3.00	Average
5	0.226	42.18	-0.58	-0.19	10.75	52.16	62.61	-10.45	QP
6	0.226	39.53	-0.58	-0.19	10.75	49.51	52.61	-3.10	Average
7	0.253	36.87	-0.57	-0.22	10.75	46.83	61.64	-14.81	QP
8	0.253	34.71	-0.57	-0.22	10.75	44.67	51.64	-6.97	Average
9	1.000	27.02	-0.62	0.46	10.87	37.73	46.00	-8.27	Average
10	1.449	36.58	-0.56	0.05	10.92	46.99	56.00	-9.01	QP
11	1.464	29.07	-0.56	0.03	10.92	39.46	46.00	-6.54	Average
12	1.959	34.35	-0.51	-0.30	10.96	44.50	56.00	-11.50	QP

Notes:

4. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
5. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
6. *Final Level =Receiver Read level + LISN Factor + Aux Factor + Cable Loss.*

Product name:	Dragon Fish Remote Control	Product model:	DFRC-1
Test by:	Mike	Test mode:	5G Wi-Fi Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Huni: 55%

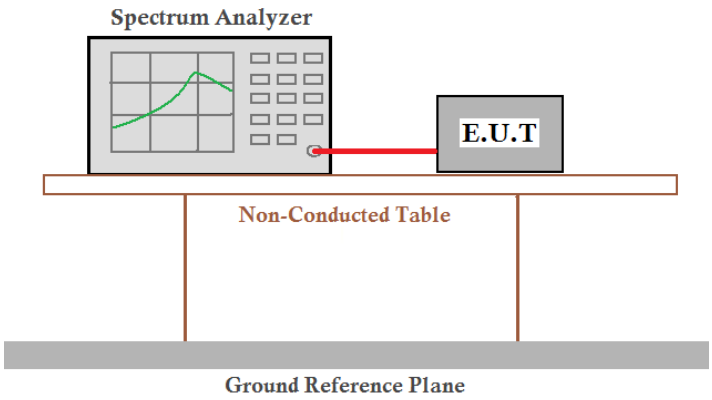


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.162	45.14	-0.68	0.01	10.77	55.24	65.34	-10.10	QP
2	0.162	43.36	-0.68	0.01	10.77	53.46	55.34	-1.88	Average
3	0.194	42.38	-0.67	0.00	10.76	52.47	63.84	-11.37	QP
4	0.194	40.53	-0.67	0.00	10.76	50.62	53.84	-3.22	Average
5	0.226	40.64	-0.67	0.00	10.75	50.72	62.61	-11.89	QP
6	0.226	37.73	-0.67	0.00	10.75	47.81	52.61	-4.80	Average
7	0.253	32.56	-0.67	0.01	10.75	42.65	51.64	-8.99	Average
8	0.389	34.36	-0.63	-0.05	10.72	44.40	58.08	-13.68	QP
9	1.000	27.68	-0.68	0.08	10.87	37.95	46.00	-8.05	Average
10	1.464	36.58	-0.70	0.13	10.92	46.93	56.00	-9.07	QP
11	1.464	29.89	-0.70	0.13	10.92	40.24	46.00	-5.76	Average
12	2.001	34.80	-0.71	0.17	10.96	45.22	56.00	-10.78	QP

Notes:

4. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
5. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
6. *Final Level =Receiver Read level + LISN Factor + Aux Factor + Cable Loss.*

6.3 Conducted Output Power

Test Requirement:	FCC Part15 E Section 15.407 (a) (1) (iv) & (a) (3)
Limit:	Band 1: 24dBm Band 4: 30dBm
Test setup:	
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

Module 1:

Band 1						
Mode	Test CH	Ant. Port	Conducted Output power(dBm)	Total power (dBm)	Limit (dBm)	Result
802.11a	Lowest	ANT3	16.13	/	24.0	Pass
		ANT6	16.76	/		
	Middle	ANT3	16.19	/	24.0	Pass
		ANT6	16.87	/		
	Highest	ANT3	16.38	/	24.0	Pass
		ANT6	16.98	/		
802.11n20 (MIMO)	Lowest	ANT3	15.98	19.38	23.64	Pass
		ANT6	16.73			
	Middle	ANT3	16.23	19.56	23.64	Pass
		ANT6	16.84			
	Highest	ANT3	16.39	19.65	23.64	Pass
		ANT6	16.87			

Remark:

1. *Because transmit signals are correlated,* Directional gain = $10\log[(10^{(G1/20)}+10^{(G2/20)}+\ldots+10^{GN/20})^2/N_{ANT}]$ *,So the Directional gain=10* log[(10^(1.6/20) + 10^(4.8/20))^2/2]=*6.36dBi*
2. *The directional Gain of antenna is* greater *than 6 dBi, so the limit of power is 23.64 dBm.*

Band 4						
Mode	Test CH	Ant. Port	Conducted Output power(dBm)	Total power (dBm)	Limit (dBm)	Result
802.11a	Lowest	ANT3	15.16	/	30.00	Pass
		ANT6	14.43	/		
	Middle	ANT3	15.22	/	30.00	Pass
		ANT6	14.88	/		
	Highest	ANT3	15.40	/	30.00	Pass
		ANT6	15.08	/		
802.11n20 (MIMO)	Lowest	ANT3	15.34	17.94	30.00	Pass
		ANT6	14.48			
	Middle	ANT3	15.25	18.00	30.00	Pass
		ANT6	14.71			
	Highest	ANT3	15.39	18.24	30.00	Pass
		ANT6	15.06			

Remark:

1. *Because transmit signals are correlated,* Directional gain = $10\log[(10^{(G1/20)}+10^{(G2/20)}+\ldots+10^{GN/20})^2/N_{ANT}]$ *,So the Directional gain=10* log[(10^(-1.4/20) + 10^(4.8/20))^2/2]=*5.25dBi*
2. *The directional Gain of antenna is less than 6 dBi, so the limit of power is 30.00 dBm.*

Module 2:

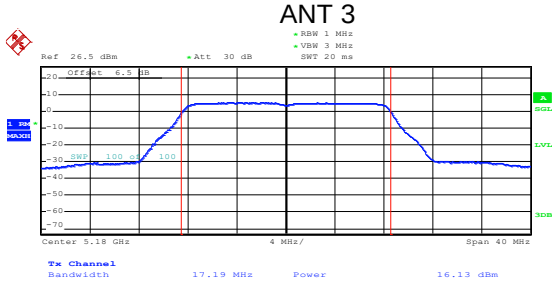
Band 1						
Mode	Test CH	Ant. Port	Conducted Output power(dBm)	Total power (dBm)	Limit (dBm)	Result
802.11a	Lowest	ANT1	9.48	/	24.0	Pass
		ANT2	10.19	/		
	Middle	ANT1	9.66	/	24.0	Pass
		ANT2	10.15	/		
	Highest	ANT1	9.59	/	24.0	Pass
		ANT2	10.20	/		
802.11n20 (MIMO)	Lowest	ANT1	9.77	12.95	24.0	Pass
		ANT2	10.11			
	Middle	ANT1	9.63	12.85	24.0	Pass
		ANT2	10.04			
	Highest	ANT1	9.63	12.91	24.0	Pass
		ANT2	10.16			
Remark: *1. Because transmit signals are correlated,* Directional gain = $10\log[(10^{(G1/20)}+10^{(G2/20)}+\ldots+10^{GN/20})^2/N_{ANT}]$ *,So the Directional gain=10* $\log[(10^{(2.1/20)}+10^{(2.3/20)})^2/2]$*=5.21dBi* *2. The directional Gain of antenna is less than 6 dBi, so the limit of power is 24 dBm.*						

Band 4						
Mode	Test CH	Ant. Port	Conducted Output power(dBm)	Total power (dBm)	Limit (dBm)	Result
802.11a	Lowest	ANT1	11.80	/	30.00	Pass
		ANT2	10.30	/		
	Middle	ANT1	11.33	/	30.00	Pass
		ANT2	10.49	/		
	Highest	ANT1	10.40	/	30.00	Pass
		ANT2	9.59	/		
802.11n20	Lowest	ANT1	11.84	14.71	30.00	Pass
		ANT2	11.55			
	Middle	ANT1	11.23	13.91	30.00	Pass
		ANT2	10.55			
	Highest	ANT1	10.31	12.83	30.00	Pass
		ANT2	9.26			
Remark: *1. Because transmit signals are correlated,* Directional gain = $10\log[(10^{(G1/20)}+10^{(G2/20)}+\ldots+10^{GN/20})^2/N_{ANT}]$ *,So the Directional gain=10* $\log[(10^{(2.3/20)}+10^{(2.4/20)})^2/2]$*=5.36dBi* *2. The directional Gain of antenna is less than 6 dBi, so the limit of power is 30.00 dBm.*						

Test plot as follows (module 1): Band 1

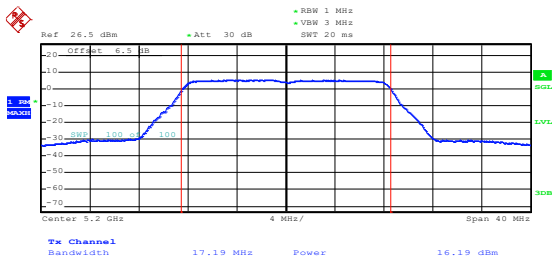
802.11a

ANT 3



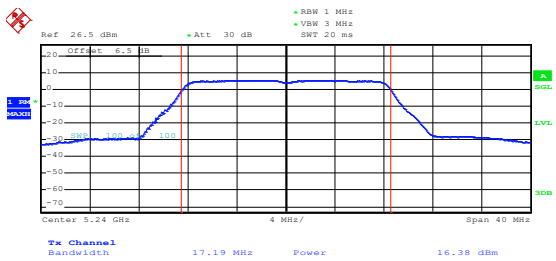
Date: 20.OCT.2020 19:28:39

Lowest channel



Date: 20.OCT.2020 19:28:49

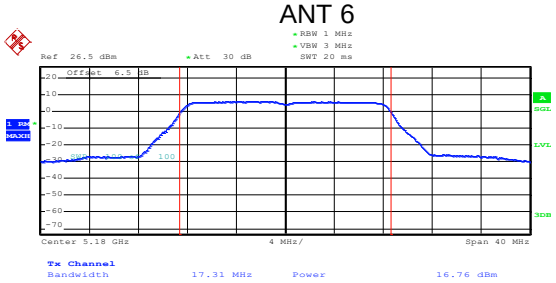
Middle channel



Date: 20.OCT.2020 19:28:59

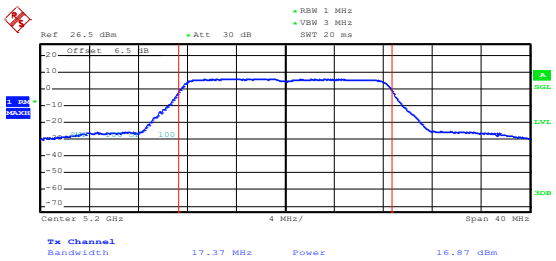
Highest channel

ANT 6



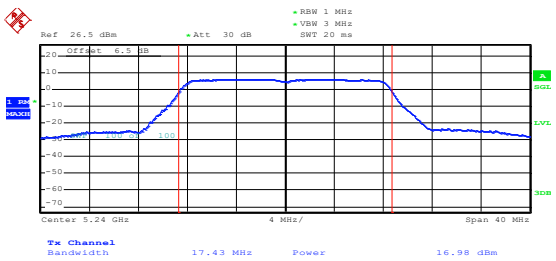
Date: 20.OCT.2020 19:19:26

Lowest channel



Date: 20.OCT.2020 19:19:09

Middle channel

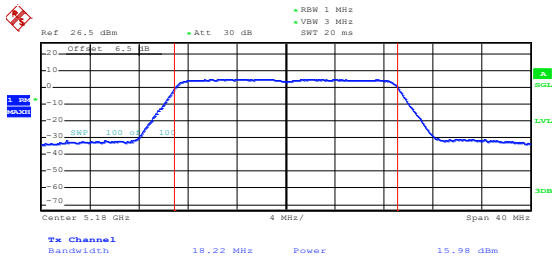


Date: 20.OCT.2020 19:18:50

Highest channel

802.11n(HT20)

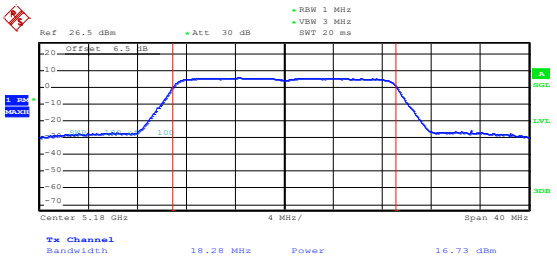
ANT 3



Date: 20.OCT.2020 19:28:22

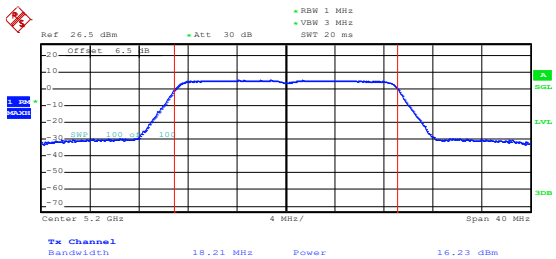
Lowest channel

ANT 6



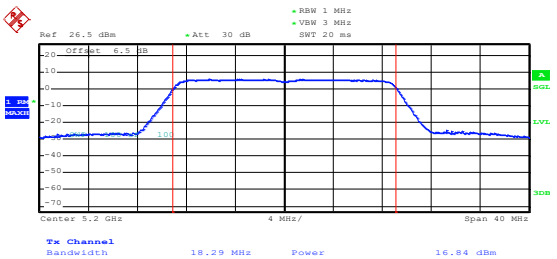
Date: 20.OCT.2020 19:19:44

Lowest channel



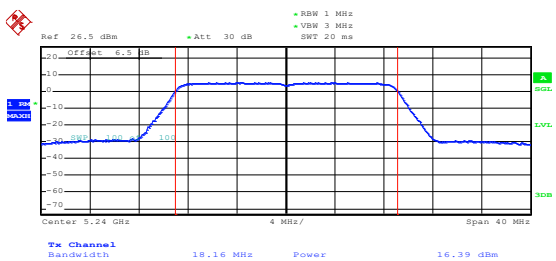
Date: 20.OCT.2020 19:28:08

Middle channel



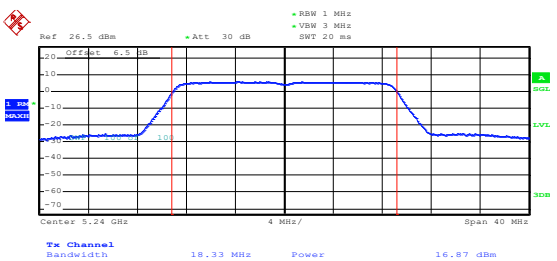
Date: 20.OCT.2020 19:20:03

Middle channel



Date: 20.OCT.2020 19:27:52

Highest channel



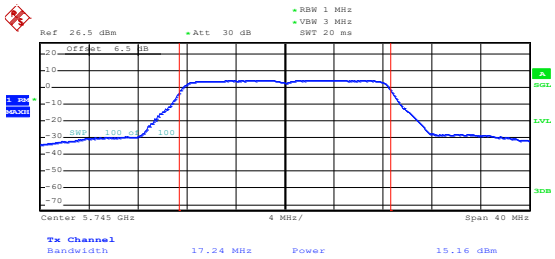
Date: 20.OCT.2020 19:20:19

Highest channel

Band 4:

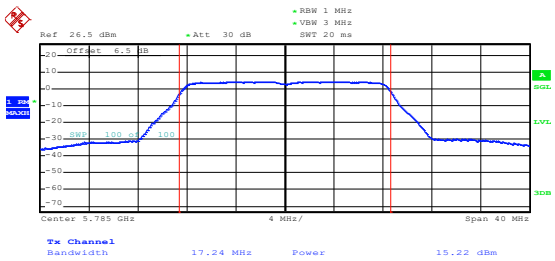
802.11a

ANT 3



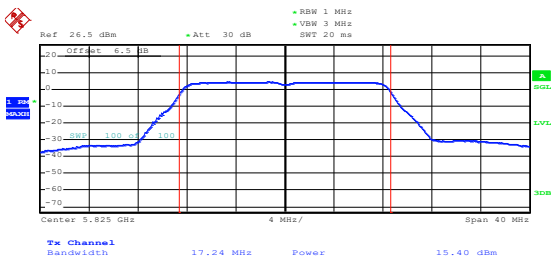
Date: 20.OCT.2020 20:55:56

Lowest channel



Date: 20.OCT.2020 20:55:43

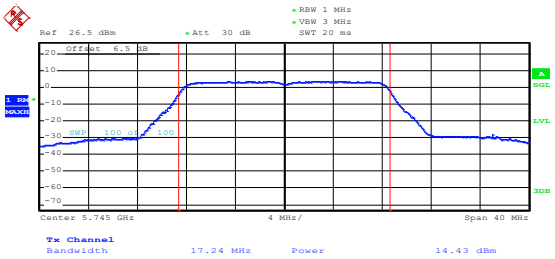
Middle channel



Date: 20.OCT.2020 20:55:33

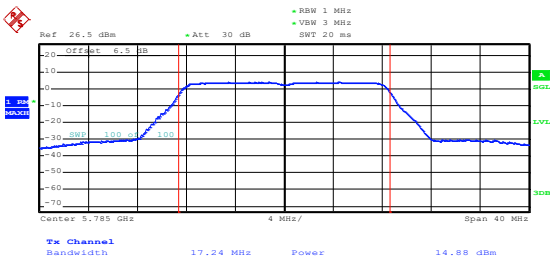
Highest channel

ANT 6



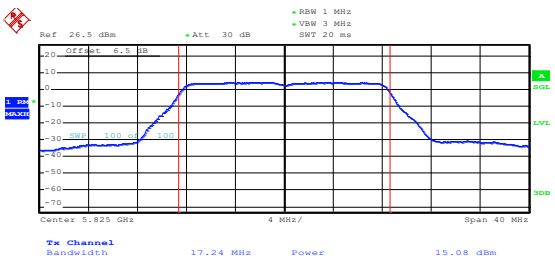
Date: 20.OCT.2020 20:56:42

Lowest channel



Date: 20.OCT.2020 20:56:58

Middle channel

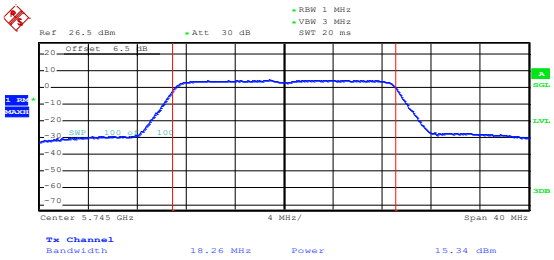


Date: 20.OCT.2020 20:57:07

Highest channel

802.11n(HT20)

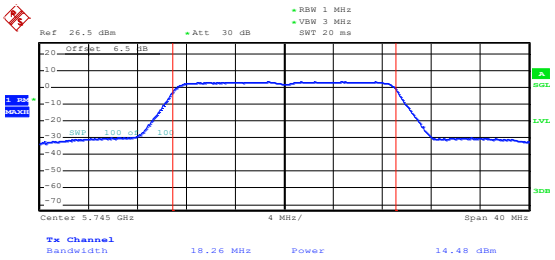
ANT 3



Date: 20.OCT.2020 20:54:52

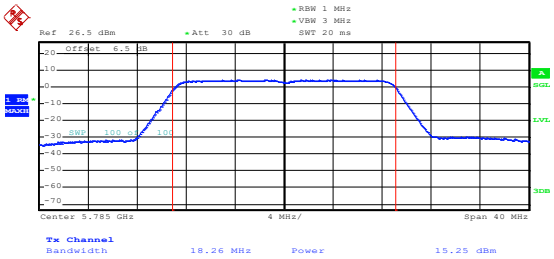
Lowest channel

ANT 6



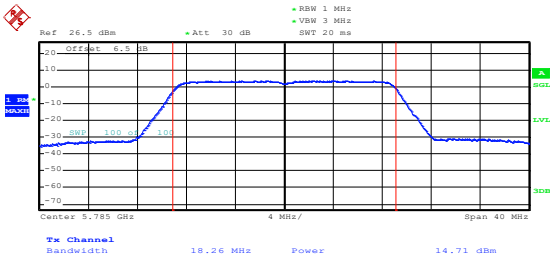
Date: 20.OCT.2020 20:57:48

Lowest channel



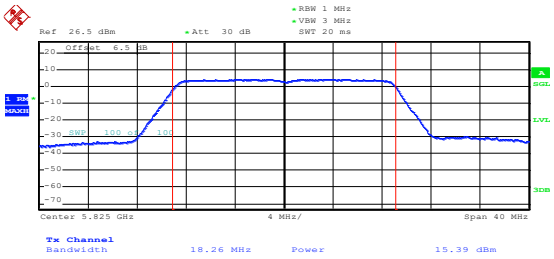
Date: 20.OCT.2020 20:55:08

Middle channel



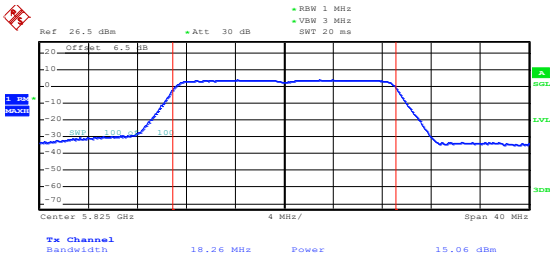
Date: 20.OCT.2020 20:57:35

Middle channel



Date: 20.OCT.2020 20:55:16

Highest channel



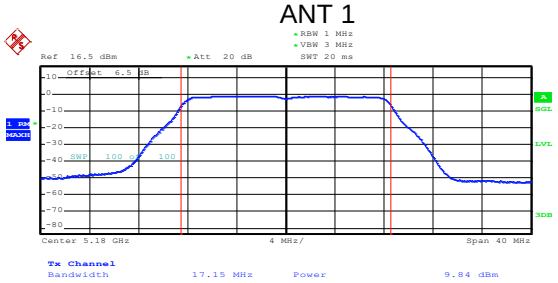
Date: 20.OCT.2020 20:57:25

Highest channel

(Module 2): Band 1

802.11a

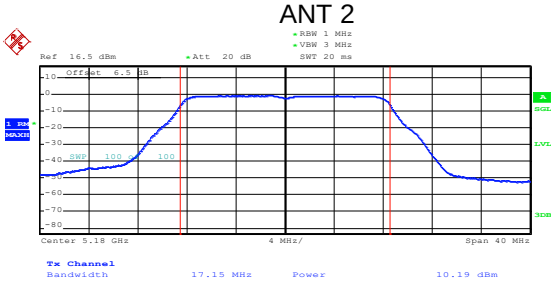
ANT 1



Date: 12.NOV.2020 19:47:47

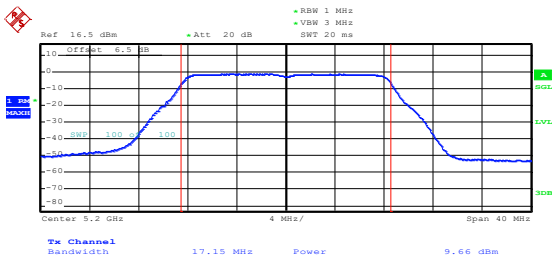
Lowest channel

ANT 2



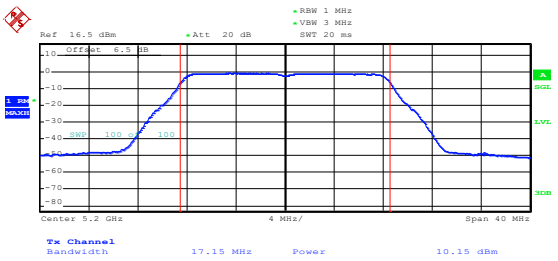
Date: 12.NOV.2020 20:02:41

Lowest channel



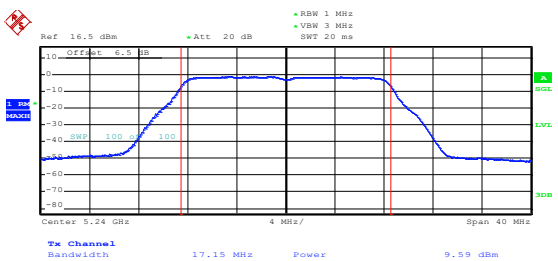
Date: 12.NOV.2020 19:47:59

Middle channel



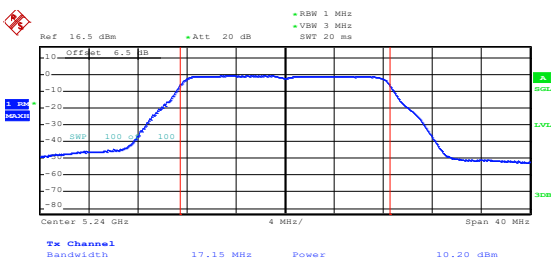
Date: 12.NOV.2020 20:02:51

Middle channel



Date: 12.NOV.2020 19:48:12

Highest channel

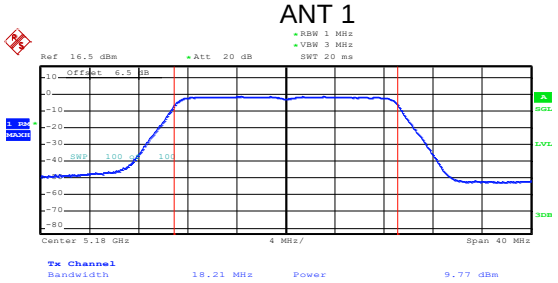


Date: 12.NOV.2020 20:03:05

Highest channel

802.11n(HT20)

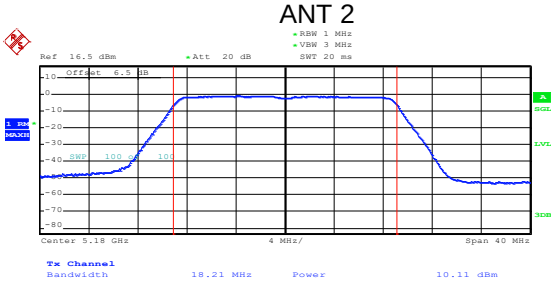
ANT 1



Date: 12.NOV.2020 19:48:56

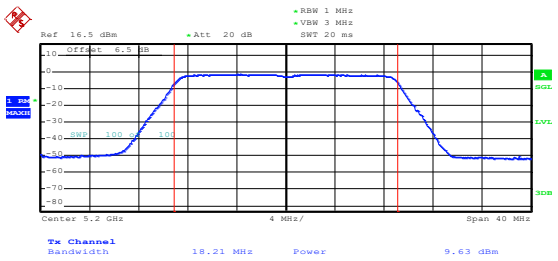
Lowest channel

ANT 2



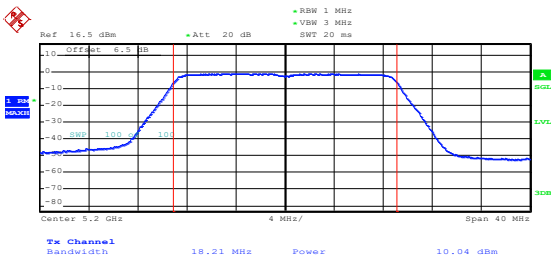
Date: 12.NOV.2020 20:02:17

Lowest channel



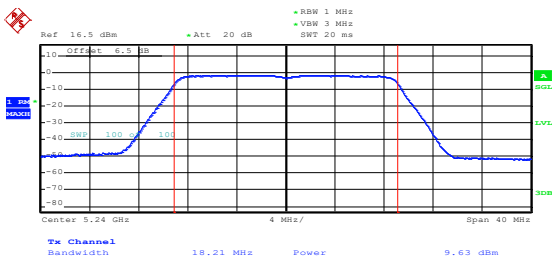
Date: 12.NOV.2020 19:48:44

Middle channel



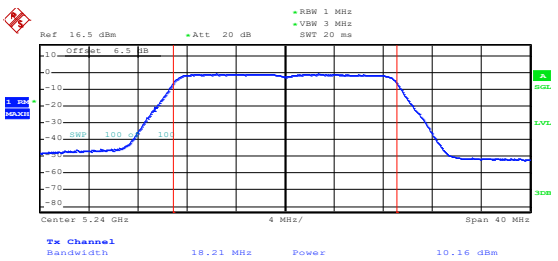
Date: 12.NOV.2020 20:02:05

Middle channel



Date: 12.NOV.2020 19:48:32

Highest channel



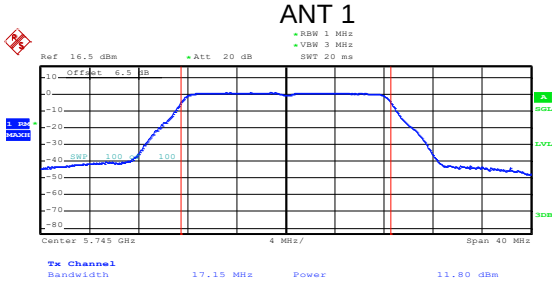
Date: 12.NOV.2020 20:01:53

Highest channel

Band 4:

802.11a

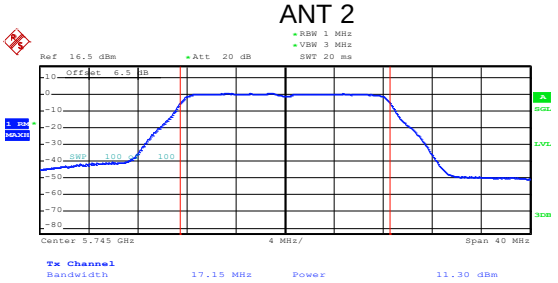
ANT 1



Date: 12.NOV.2020 21:11:05

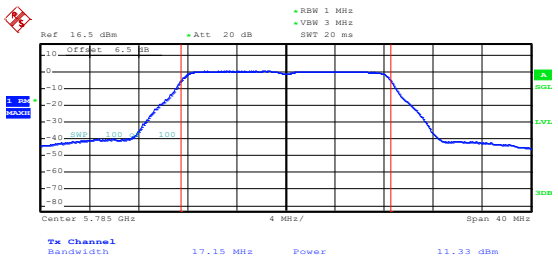
Lowest channel

ANT 2



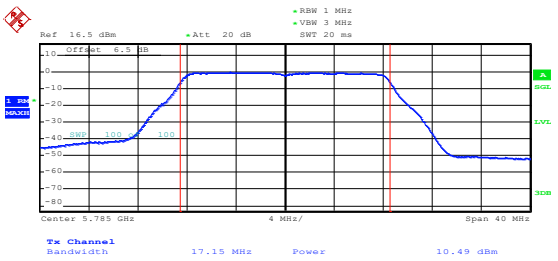
Date: 12.NOV.2020 20:56:20

Lowest channel



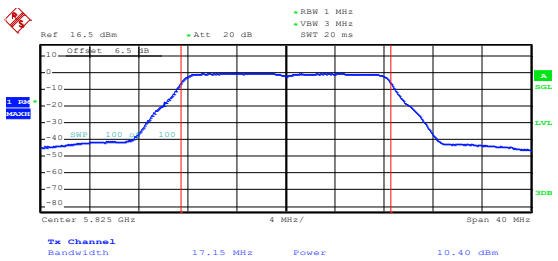
Date: 12.NOV.2020 21:11:15

Middle channel



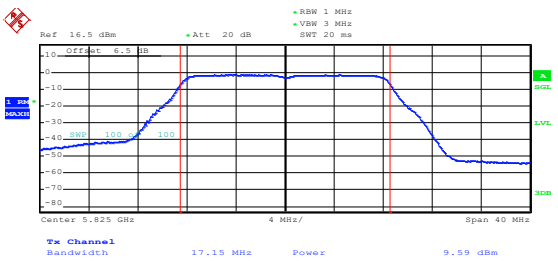
Date: 12.NOV.2020 20:56:04

Middle channel



Date: 12.NOV.2020 21:11:28

Highest channel

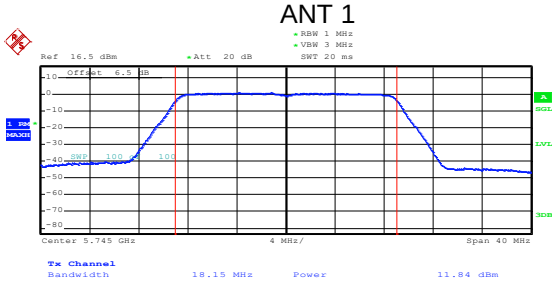


Date: 12.NOV.2020 20:55:51

Highest channel

802.11n(HT20)

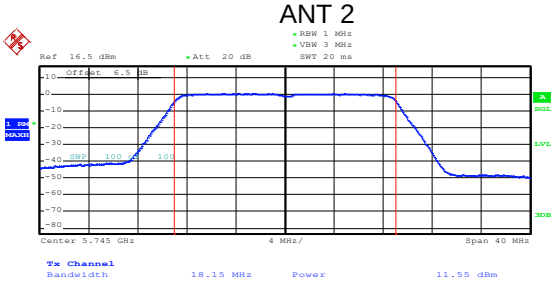
ANT 1



Date: 12.NOV.2020 21:12:16

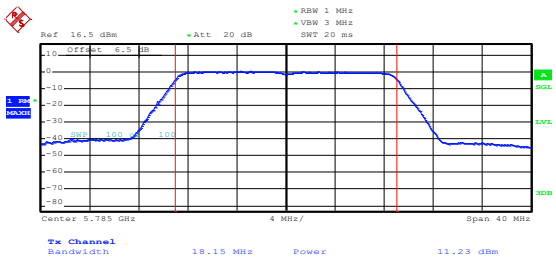
Lowest channel

ANT 2



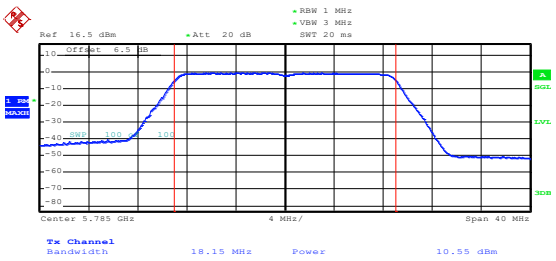
Date: 12.NOV.2020 20:55:06

Lowest channel



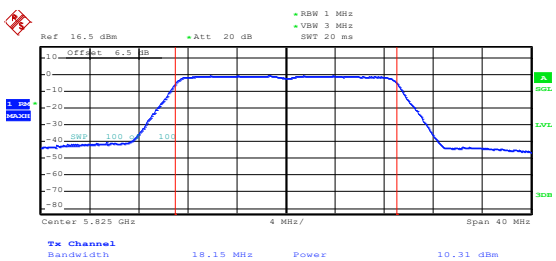
Date: 12.NOV.2020 21:12:04

Middle channel



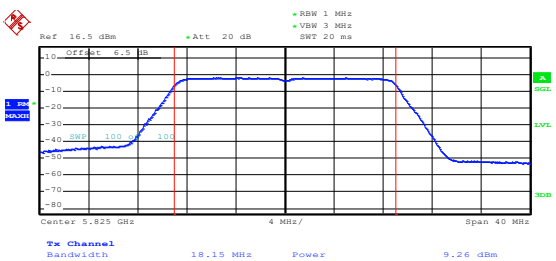
Date: 12.NOV.2020 20:55:21

Middle channel



Date: 12.NOV.2020 21:11:54

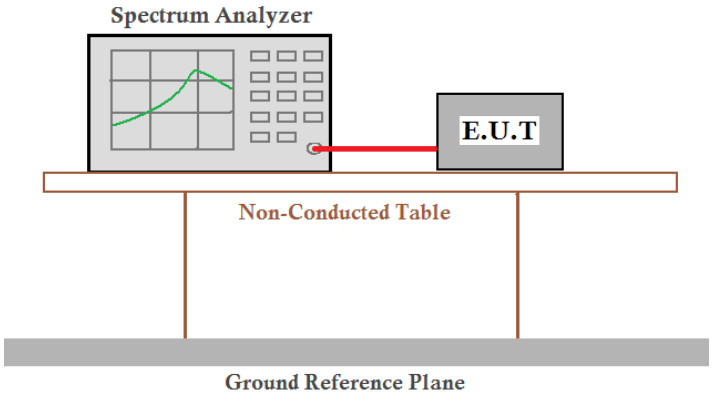
Highest channel



Date: 12.NOV.2020 20:55:32

Highest channel

6.4 Occupy Bandwidth

Test Requirement:	FCC Part15 E Section 15.407 (a) (12) and Section 15.407 (e)
Limit:	Band 1/4: N/A (26dB Emission Bandwidth and 99% Occupy Bandwidth) Band 4: >500kHz (6dB Bandwidth)
Test setup:	
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

Module 1:

Band 1:

Test Channel	26dB Emission Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 3	ANT 6	ANT 3	ANT 6		
Lowest	21.18	21.34	21.42	21.71	N/A	PASS
Middle	21.44	21.48	21.53	21.57		
Highest	19.37	19.82	19.60	19.64		
Test Channel	99% Occupy Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 3	ANT 6	ANT 3	ANT 6		
Lowest	17.19	17.31	18.22	18.28	N/A	PASS
Middle	17.19	17.37	18.21	18.29		
Highest	17.19	17.43	18.26	18.33		

Band 4:

Test Channel	26dB Emission Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 3	ANT 6	ANT 3	ANT 6		
Lowest	21.64	21.19	21.47	21.56	N/A	PASS
Middle	21.34	21.51	21.49	21.50		
Highest	21.55	21.38	21.59	21.54		
Test Channel	99% Occupy Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 3	ANT 6	ANT 3	ANT 6		
Lowest	17.24	17.24	18.26	18.26	N/A	PASS
Middle	17.24	17.24	18.26	18.26		
Highest	17.24	17.24	18.26	18.26		
Test Channel	6dB Emission Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 3	ANT 6	ANT 3	ANT 6		
Lowest	16.48	16.56	17.76	17.76	>500kHz	PASS
Middle	16.48	16.56	17.76	17.76		
Highest	16.56	16.56	17.76	17.84		

Module 2:
Band 1:

Test Channel	26dB Emission Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 1	ANT 2	ANT 1	ANT 2		
Lowest	21.50	21.49	21.63	21.64	N/A	PASS
Middle	21.49	21.42	21.81	21.66		
Highest	19.49	19.98	20.25	20.35		
Test Channel	99% Occupy Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 1	ANT 2	ANT 1	ANT 2		
Lowest	17.15	17.15	18.21	18.21	N/A	PASS
Middle	17.15	17.15	18.21	18.21		
Highest	17.15	17.15	18.21	18.21		

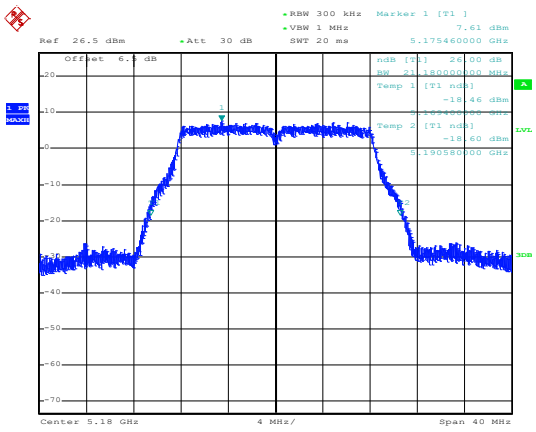
Band 4:

Test Channel	26dB Emission Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 1	ANT 2	ANT 1	ANT 2		
Lowest	21.59	21.53	21.61	21.86	N/A	PASS
Middle	21.29	21.42	21.60	21.75		
Highest	21.35	21.33	21.55	21.69		
Test Channel	99% Occupy Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 1	ANT 2	ANT 1	ANT 2		
Lowest	17.15	17.15	18.15	18.15	N/A	PASS
Middle	17.15	17.15	18.15	18.15		
Highest	17.15	17.15	18.15	18.15		
Test Channel	6dB Emission Bandwidth (MHz)				Limit	Result
	802.11a		802.11n(HT20)			
	ANT 1	ANT 2	ANT 1	ANT 2		
Lowest	16.56	16.56	17.76	17.76	>500kHz	PASS
Middle	16.56	16.56	17.76	17.76		
Highest	16.56	16.56	17.76	17.76		

Test plot as follows:
(Module 1) Band 1 ANT3:

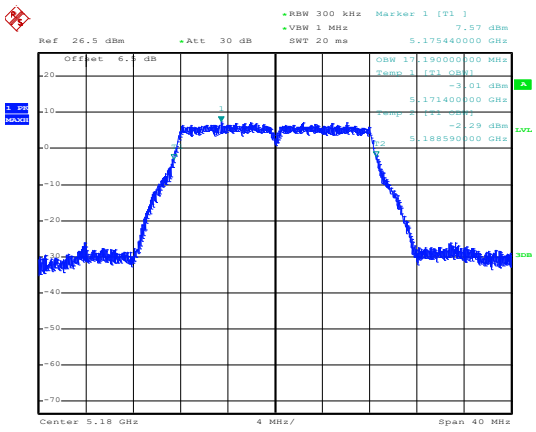
802.11a

26 dB EBW



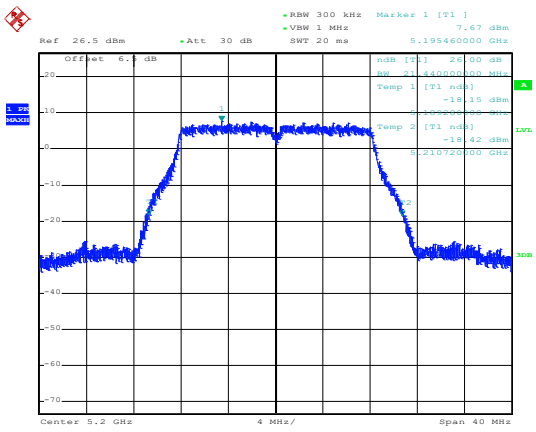
Date: 20.OCT.2020 19:23:59

99% OBW

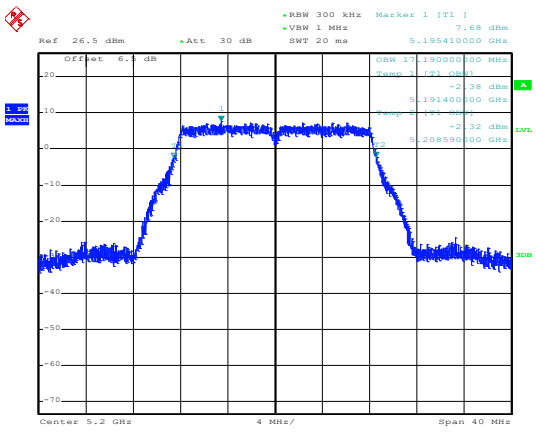


Date: 20.OCT.2020 19:24:12

Lowest channel

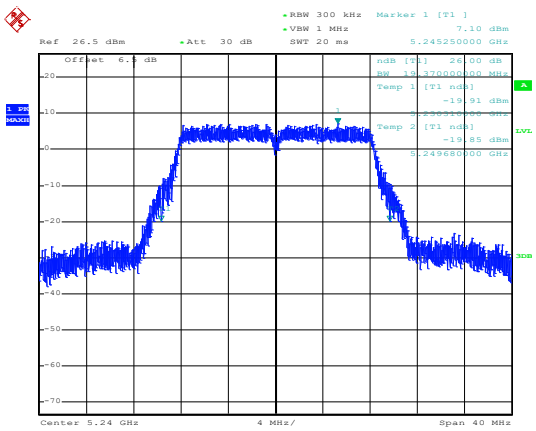


Date: 20.OCT.2020 19:23:48

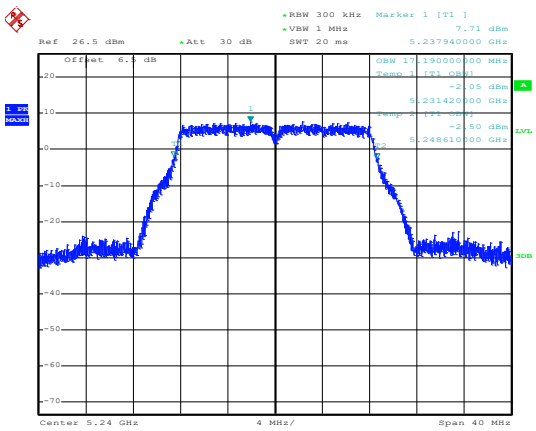


Date: 20.OCT.2020 19:23:40

Middle channel



Date: 20.OCT.2020 19:23:06

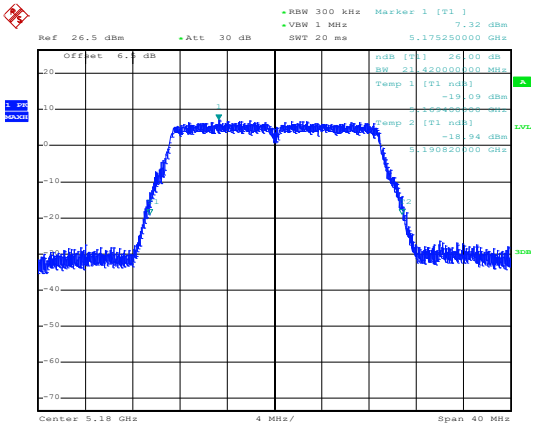


Date: 20.OCT.2020 19:23:25

Highest channel

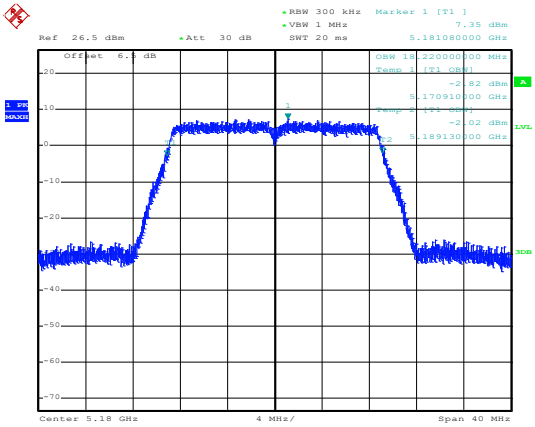
802.11n(HT20)

26 dB EBW



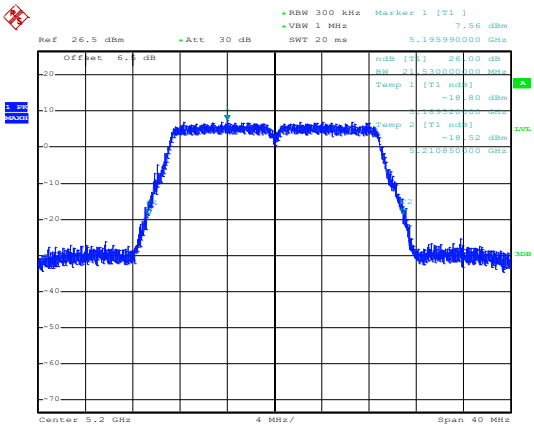
Date: 20.OCT.2020 19:24:46

99% OBW

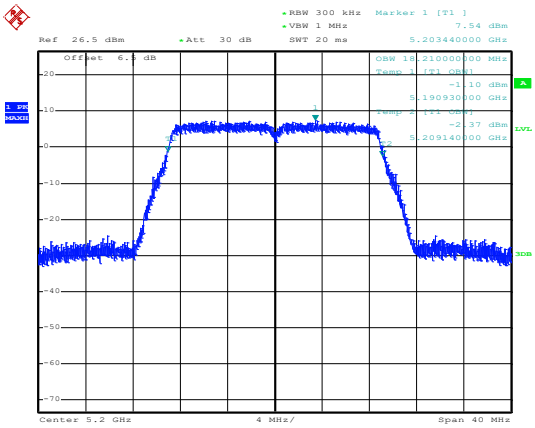


Date: 20.OCT.2020 19:24:38

Lowest channel

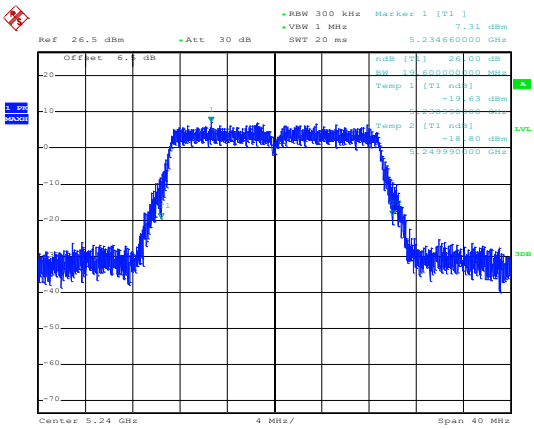


Date: 20.OCT.2020 19:24:58

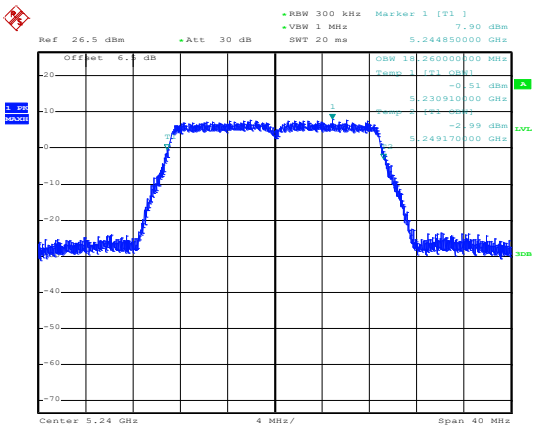


Date: 20.OCT.2020 19:25:11

Middle channel



Date: 20.OCT.2020 19:26:32



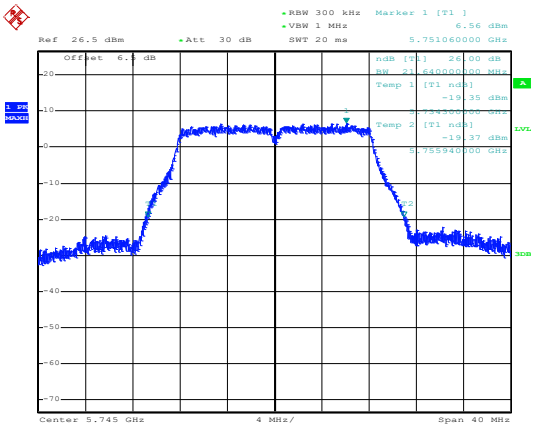
Date: 20.OCT.2020 19:25:31

Highest channel

(Module 1) Band 4 ANT3:

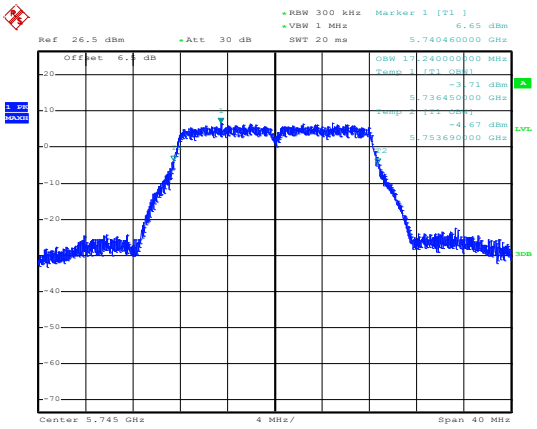
802.11a

26 dB EBW



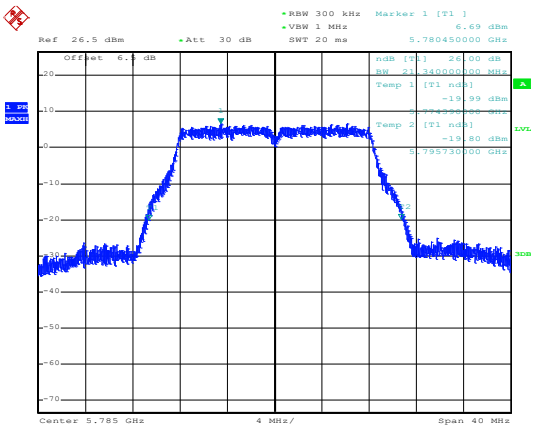
Date: 20.OCT.2020 20:51:28

99% OBW

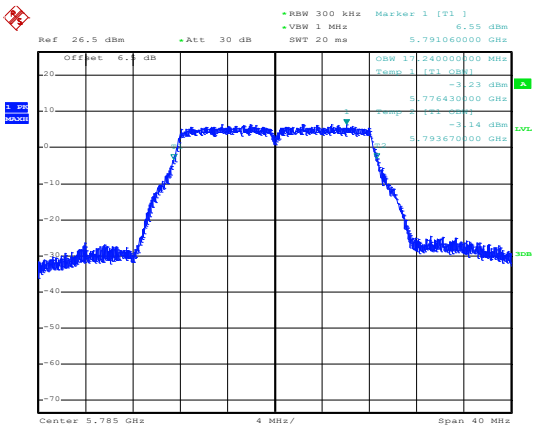


Date: 20.OCT.2020 20:51:13

Lowest channel

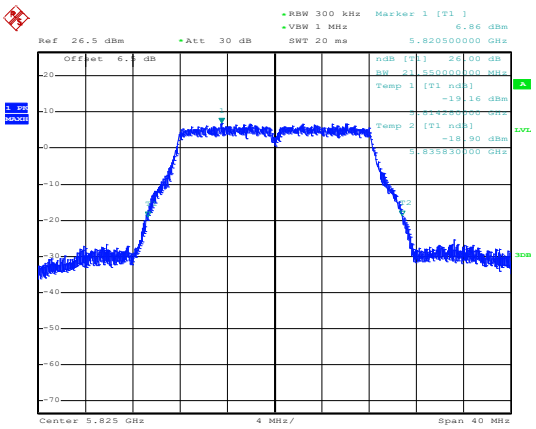


Date: 20.OCT.2020 20:51:37

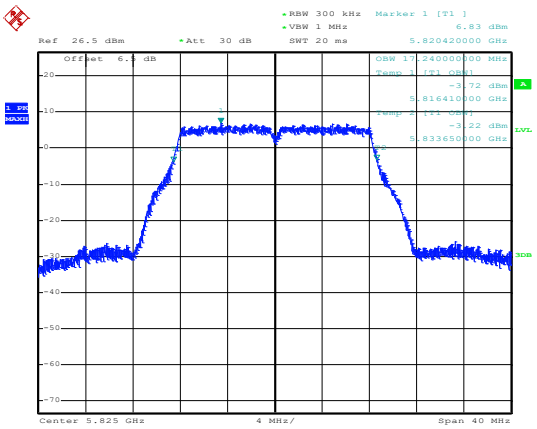


Date: 20.OCT.2020 20:52:21

Middle channel



Date: 20.OCT.2020 20:52:50

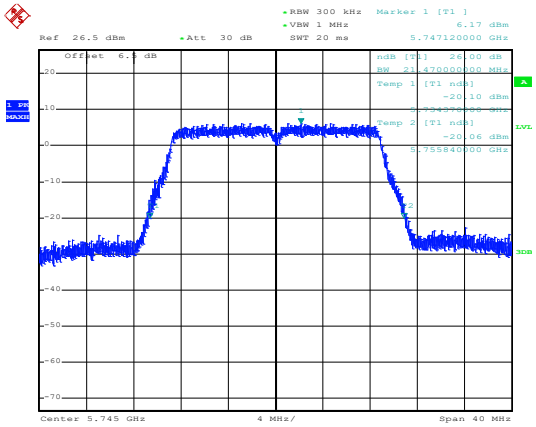


Date: 20.OCT.2020 20:52:41

Highest channel

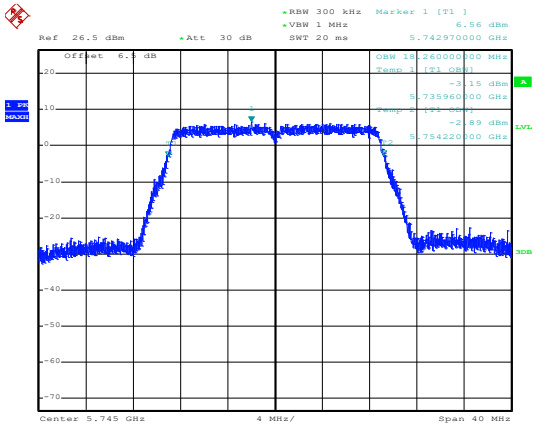
802.11n(HT20)

26 dB EBW



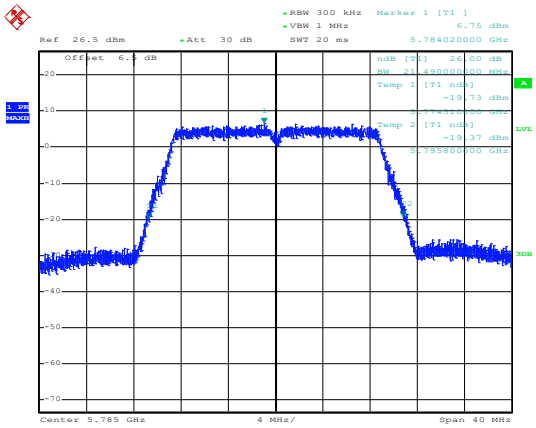
Date: 20.OCT.2020 20:54:05

99% OBW

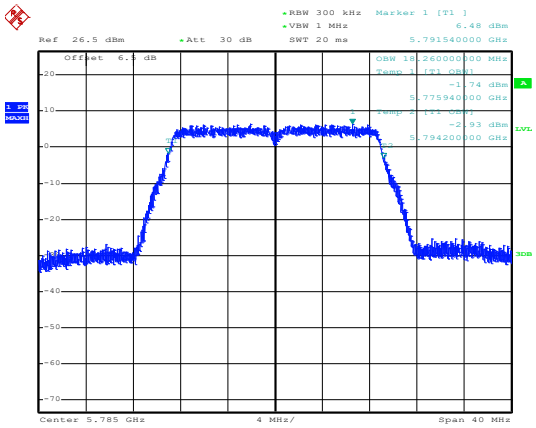


Date: 20.OCT.2020 20:54:18

Lowest channel

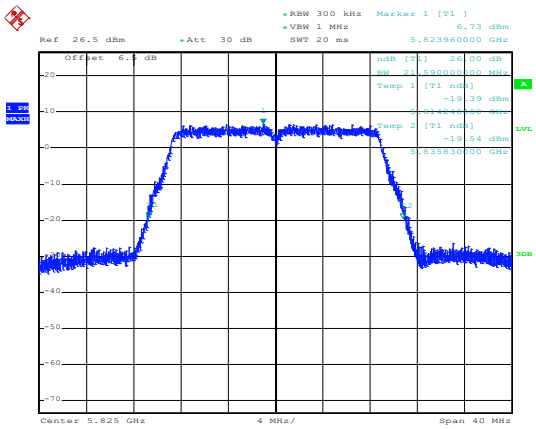


Date: 20.OCT.2020 20:53:57

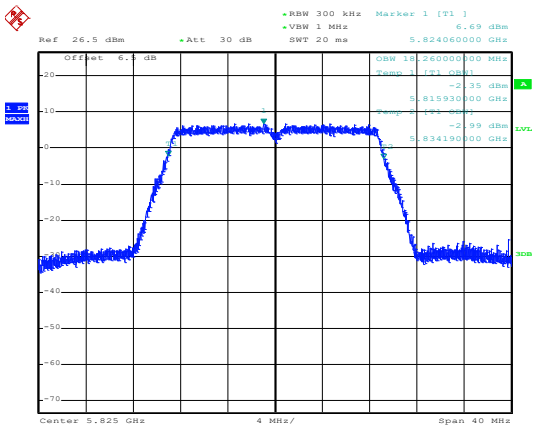


Date: 20.OCT.2020 20:53:49

Middle channel



Date: 20.OCT.2020 20:53:07

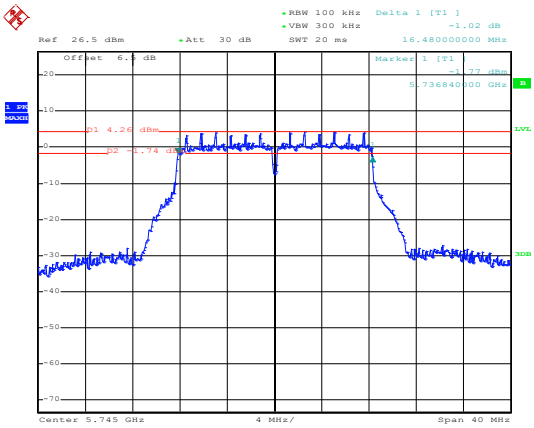


Date: 20.OCT.2020 20:53:34

Highest channel

6dB BW

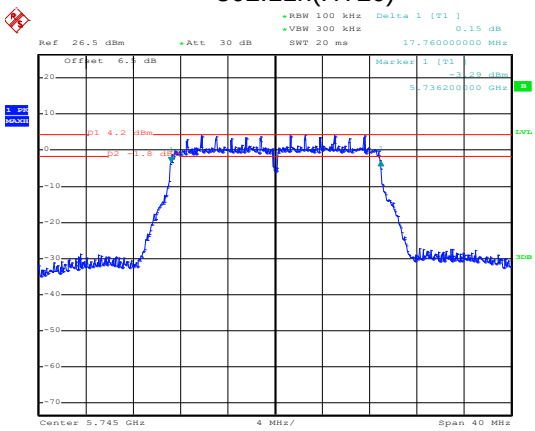
802.11a



Date: 15.OCT.2020 22:28:11

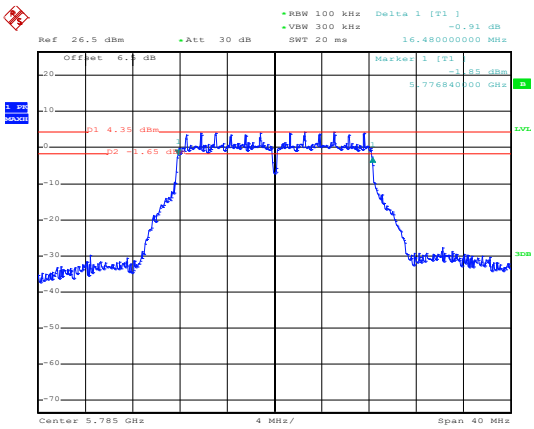
Lowest channel

802.11n(HT20)



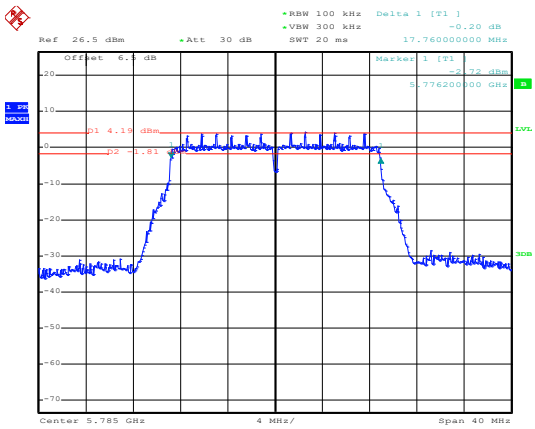
Date: 15.OCT.2020 22:28:55

Lowest channel



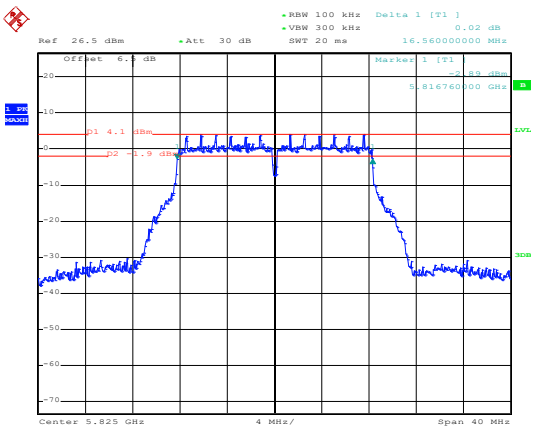
Date: 15.OCT.2020 22:27:35

Middle channel



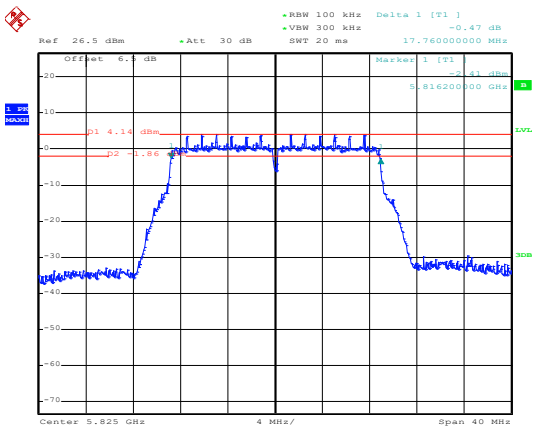
Date: 15.OCT.2020 22:29:31

Middle channel



Date: 15.OCT.2020 22:27:04

Highest channel



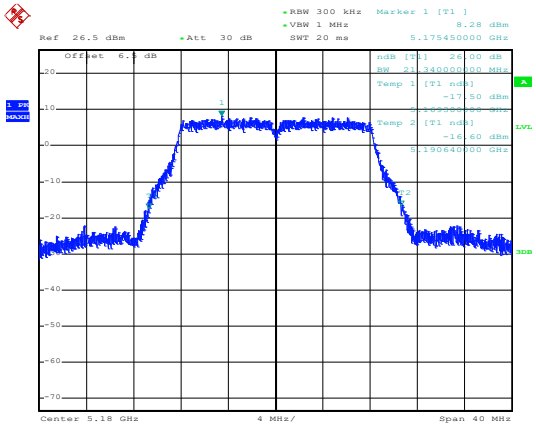
Date: 15.OCT.2020 22:30:08

Highest channel

(Module 1) Band 1 ANT6:

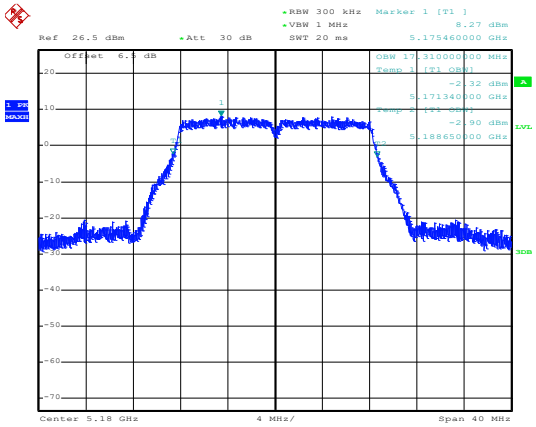
802.11a

26 dB EBW



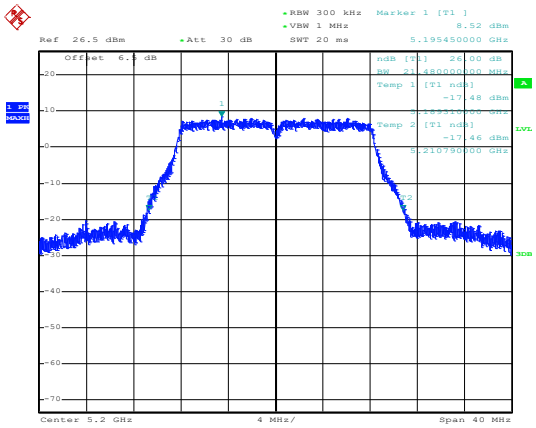
Date: 20.OCT.2020 19:12:52

99% OBW

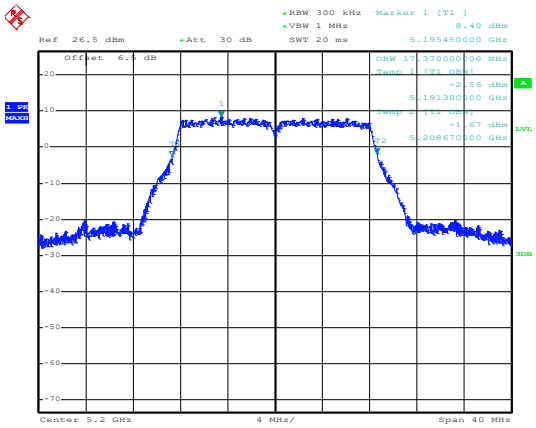


Date: 20.OCT.2020 19:13:08

Lowest channel

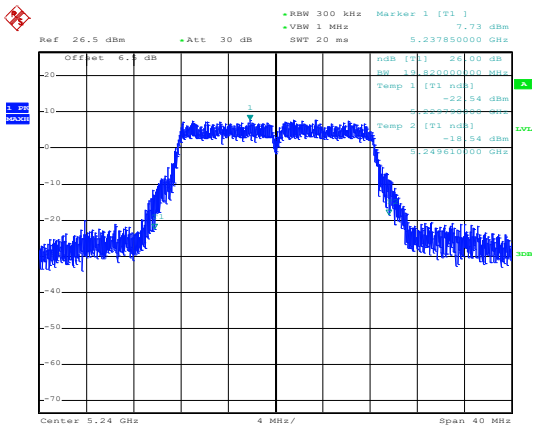


Date: 20.OCT.2020 19:12:41

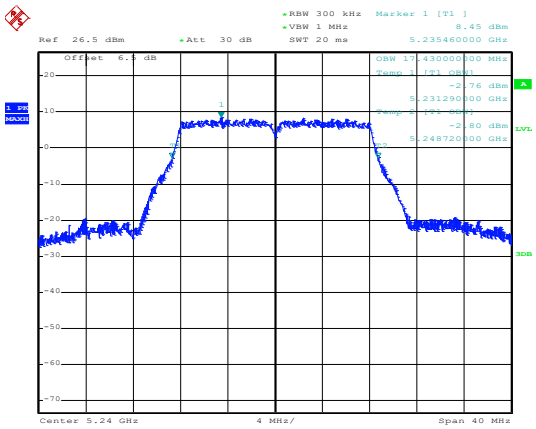


Date: 20.OCT.2020 19:12:29

Middle channel



Date: 20.OCT.2020 19:11:29

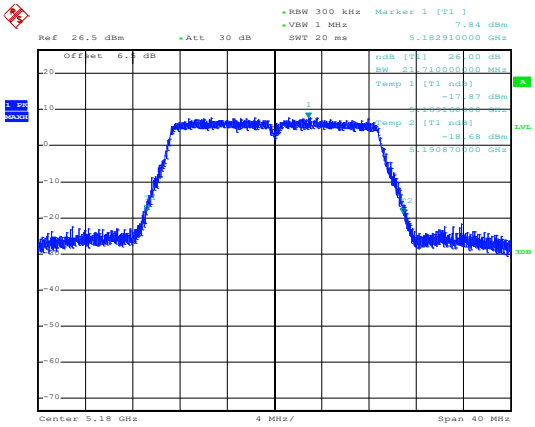


Date: 20.OCT.2020 19:11:55

Highest channel

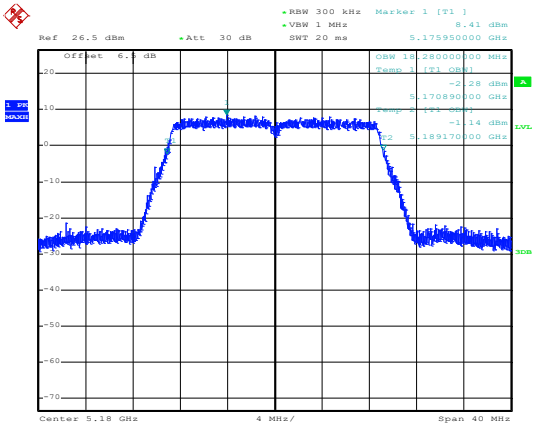
802.11n(HT20)

26 dB EBW



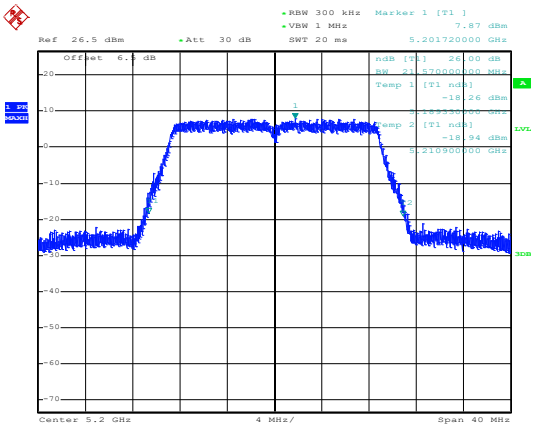
Date: 20.OCT.2020 19:13:52

99% OBW

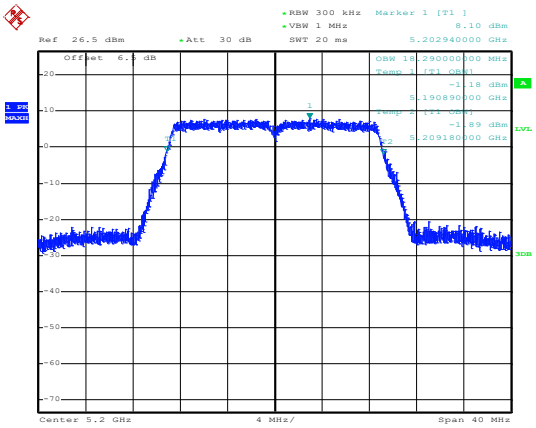


Date: 20.OCT.2020 19:13:40

Lowest channel

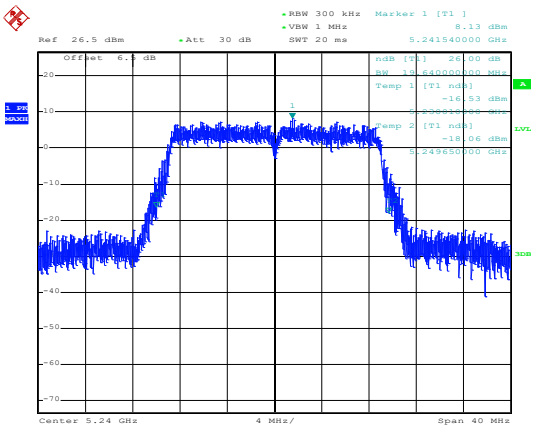


Date: 20.OCT.2020 19:14:02

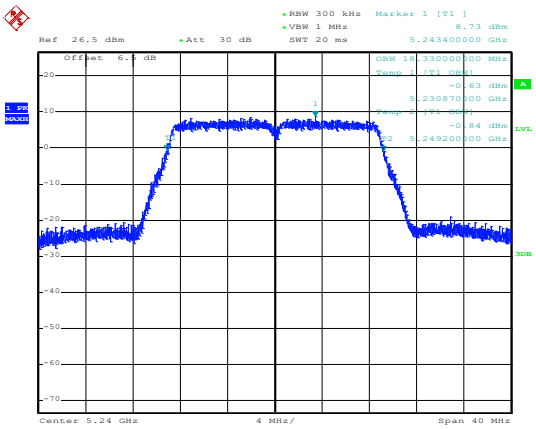


Date: 20.OCT.2020 19:14:20

Middle channel



Date: 20.OCT.2020 19:17:02



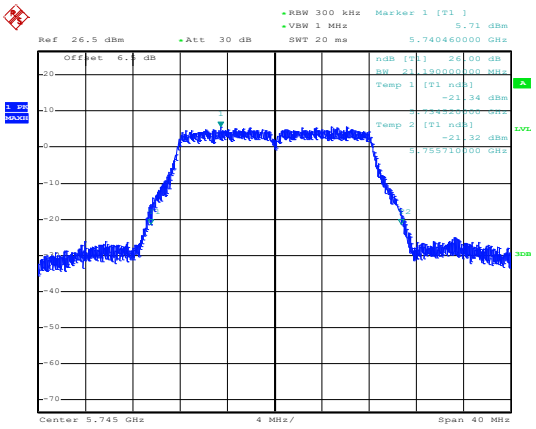
Date: 20.OCT.2020 19:14:43

Highest channel

(Module 1) Band 4 ANT 6:

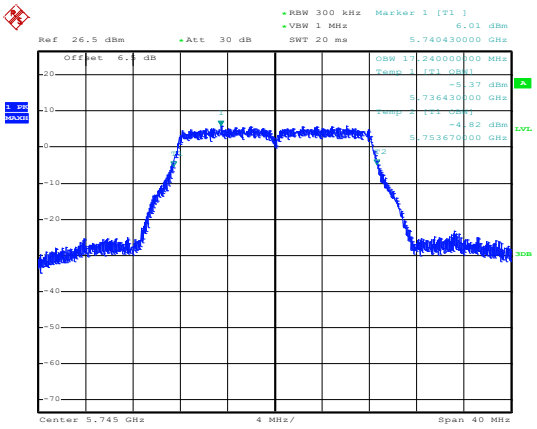
802.11a

26 dB EBW



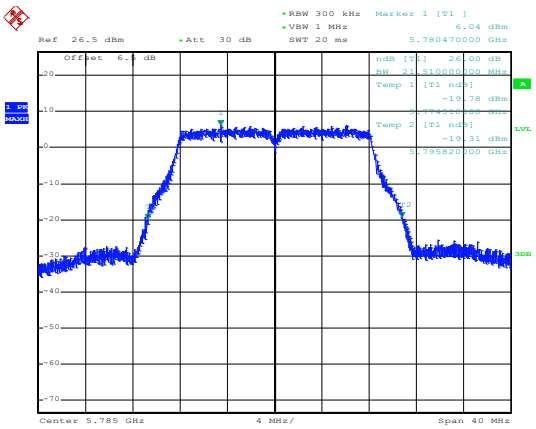
Date: 20.OCT.2020 21:00:47

99% OBW

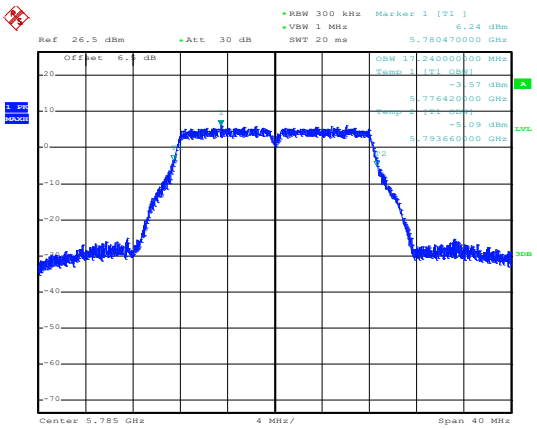


Date: 20.OCT.2020 21:01:00

Lowest channel

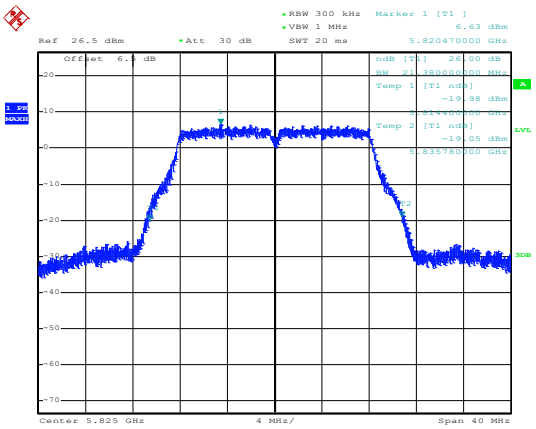


Date: 20.OCT.2020 21:00:35

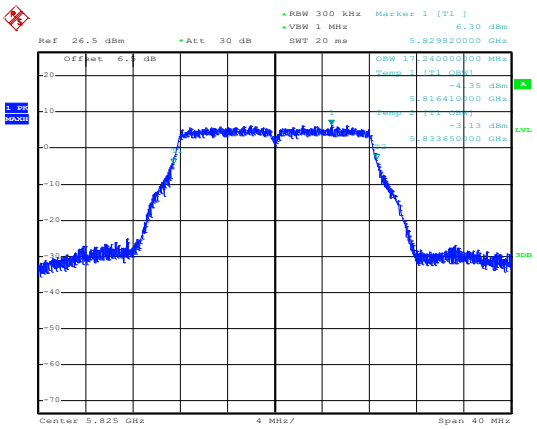


Date: 20.OCT.2020 21:00:22

Middle channel



Date: 20.OCT.2020 20:59:52

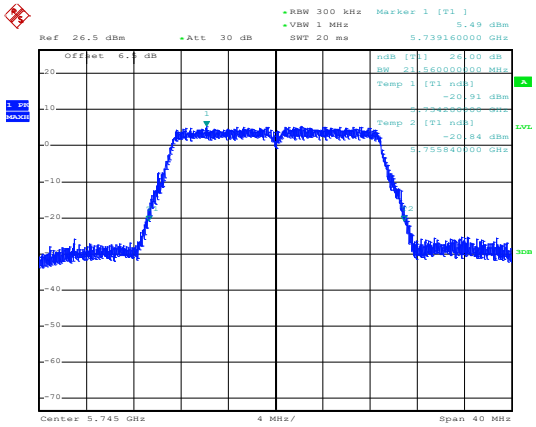


Date: 20.OCT.2020 21:00:04

Highest channel

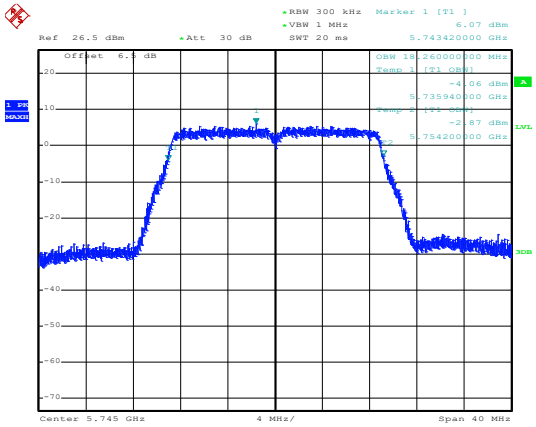
802.11n(HT20)

26 dB EBW



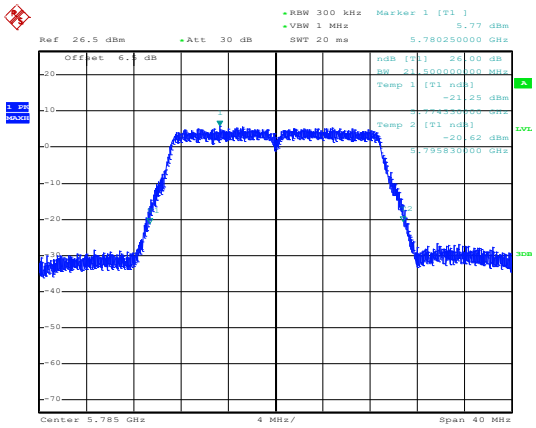
Date: 20.OCT.2020 20:58:37

99% OBW

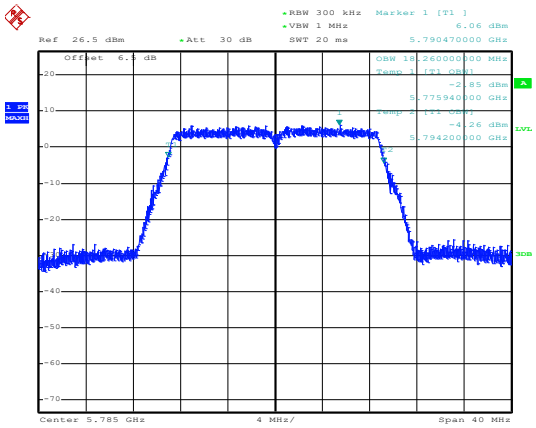


Date: 20.OCT.2020 20:58:27

Lowest channel

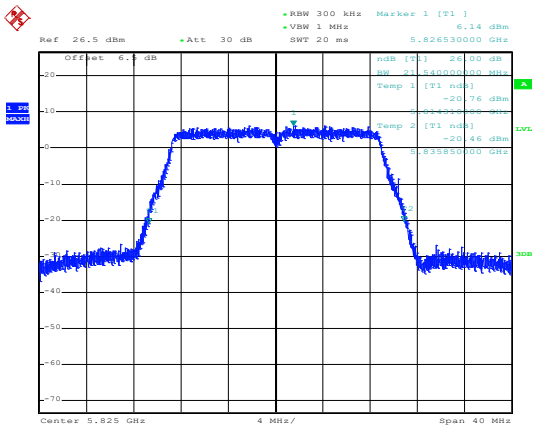


Date: 20.OCT.2020 20:58:50

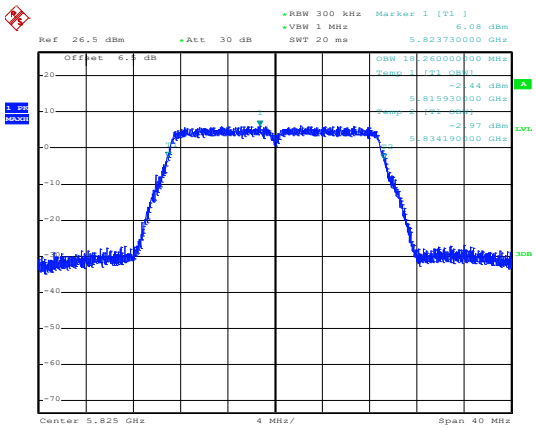


Date: 20.OCT.2020 20:59:06

Middle channel



Date: 20.OCT.2020 20:59:36

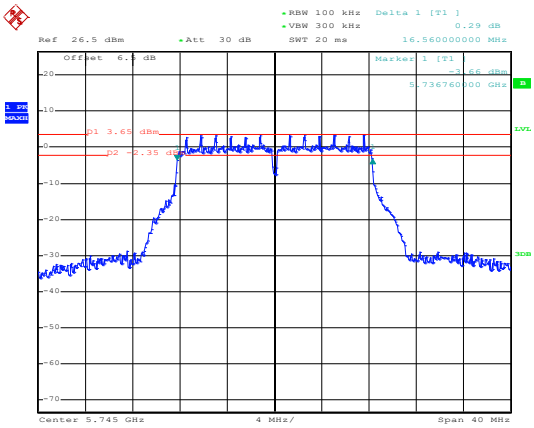


Date: 20.OCT.2020 20:59:26

Highest channel

6dB BW

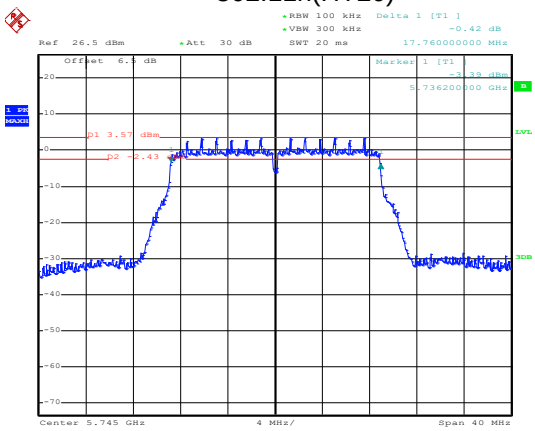
802.11a



Date: 15.OCT.2020 23:09:10

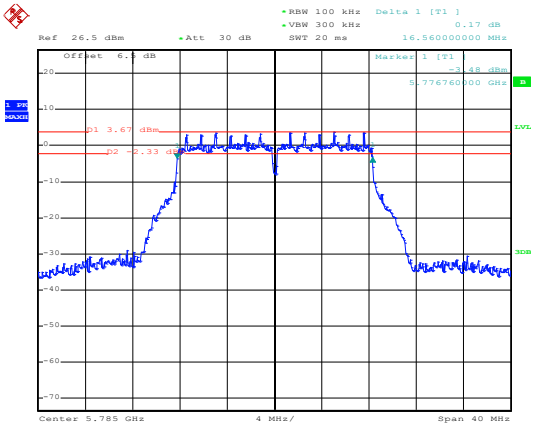
Lowest channel

802.11n(HT20)



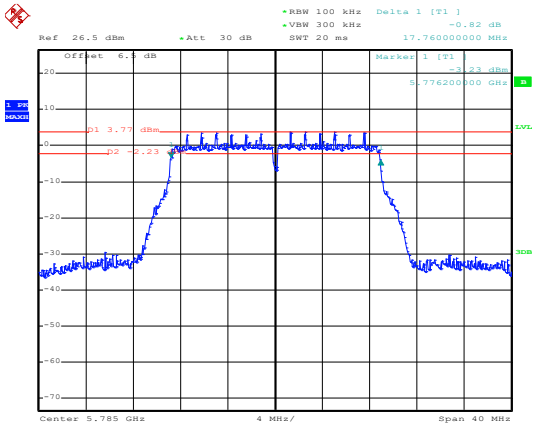
Date: 15.OCT.2020 23:05:40

Lowest channel



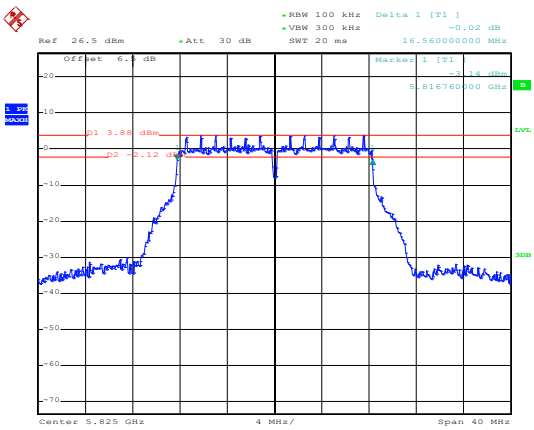
Date: 15.OCT.2020 23:09:43

Middle channel



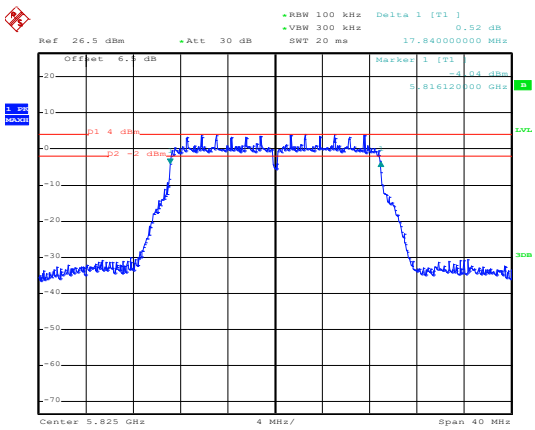
Date: 15.OCT.2020 23:06:05

Middle channel



Date: 15.OCT.2020 23:10:16

Highest channel



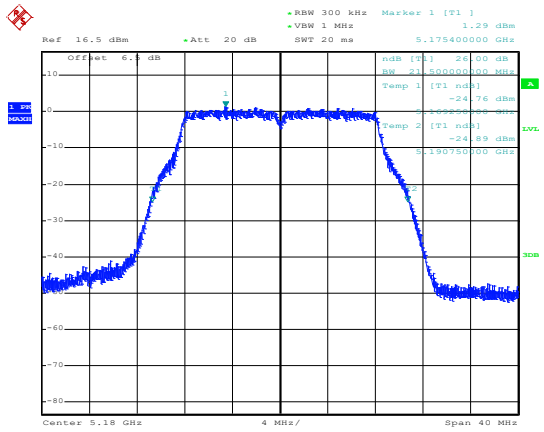
Date: 15.OCT.2020 23:06:34

Highest channel

(Module 2) Band 1 ANT1:

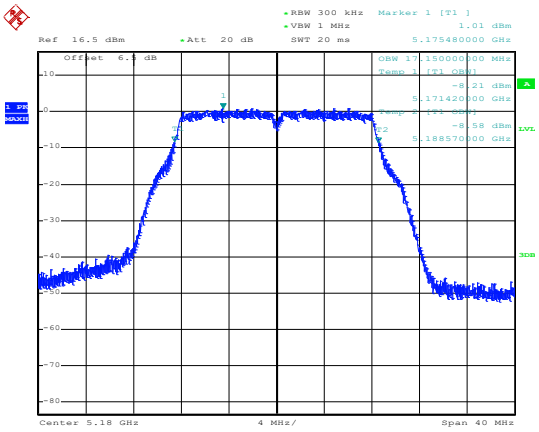
802.11a

26 dB EBW



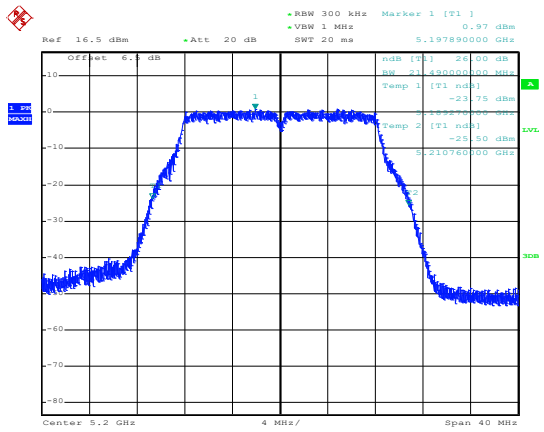
Date: 12.NOV.2020 19:40:23

99% OBW

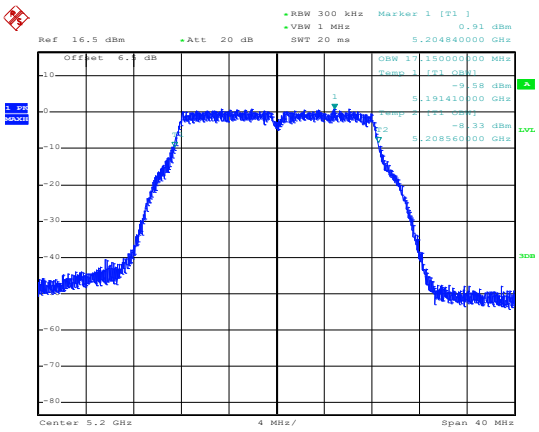


Date: 12.NOV.2020 19:40:05

Lowest channel

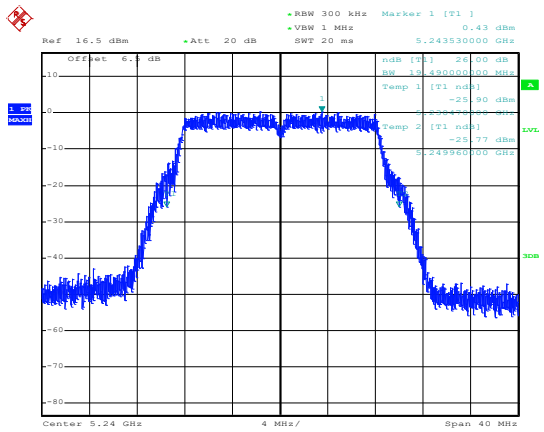


Date: 12.NOV.2020 19:40:34

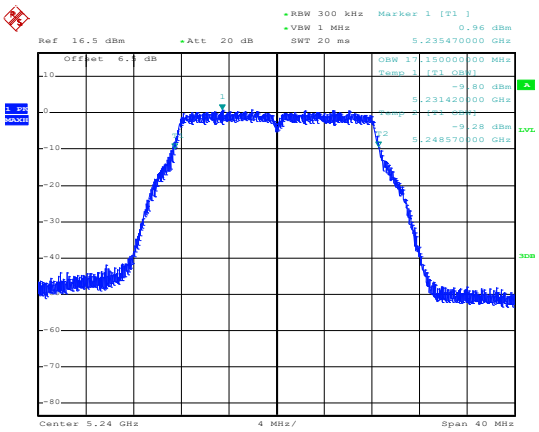


Date: 12.NOV.2020 19:41:06

Middle channel



Date: 12.NOV.2020 21:03:31

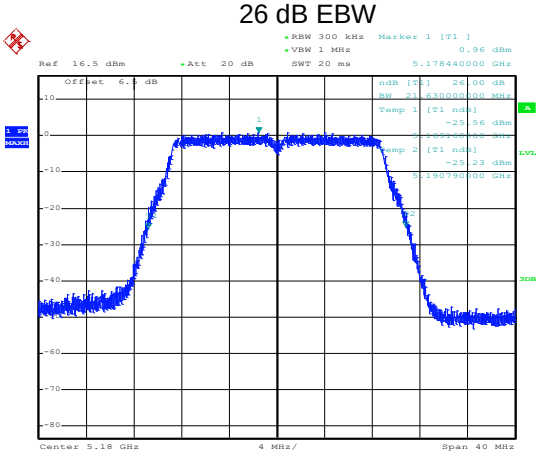


Date: 12.NOV.2020 19:41:21

Highest channel

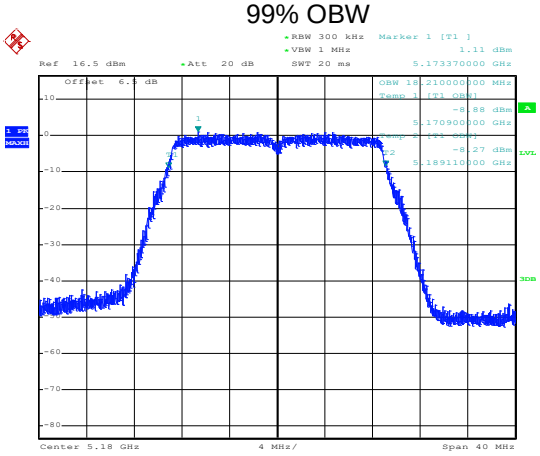
802.11n(HT20)

26 dB EBW



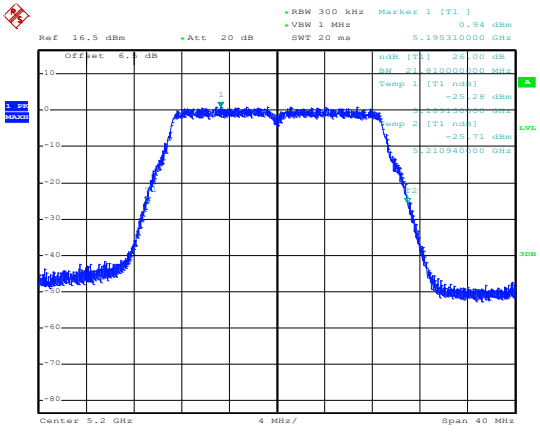
Date: 12.NOV.2020 19:43:16

99% OBW

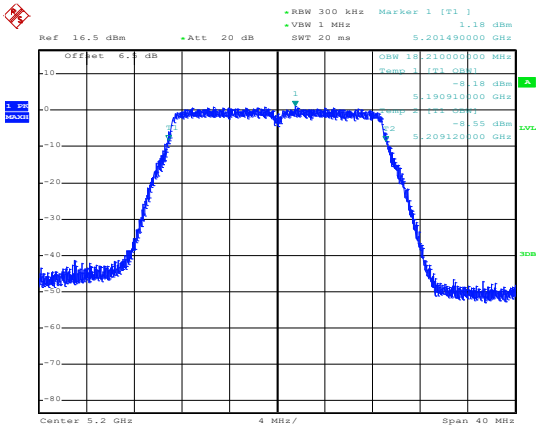


Date: 12.NOV.2020 19:43:29

Lowest channel

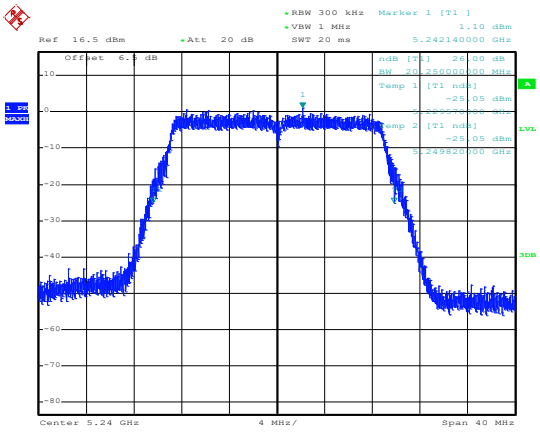


Date: 12.NOV.2020 19:43:04

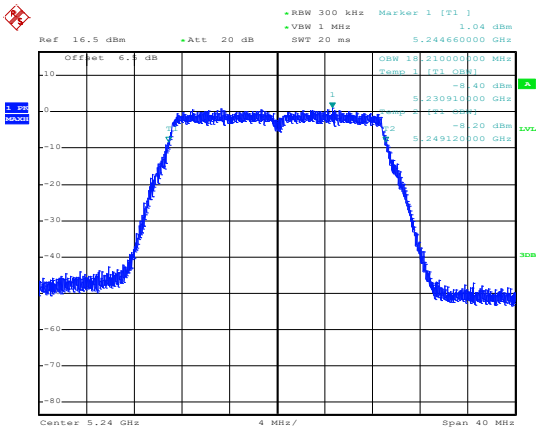


Date: 12.NOV.2020 19:42:50

Middle channel



Date: 12.NOV.2020 21:02:12



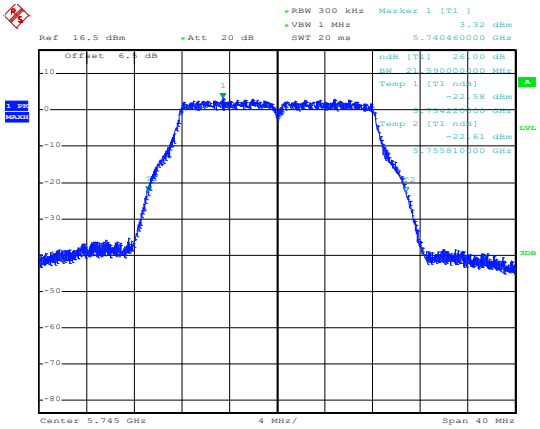
Date: 12.NOV.2020 19:42:29

Highest channel

(Module 2)Band 4 ANT1:

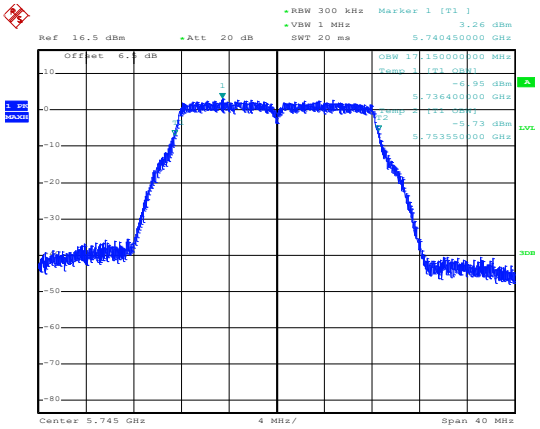
802.11a

26 dB EBW



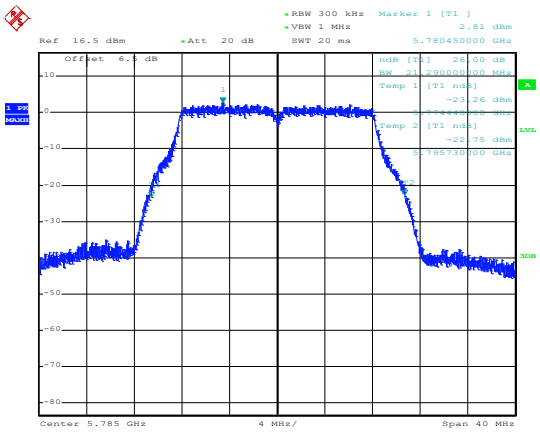
Date: 12.NOV.2020 21:03:51

99% OBW

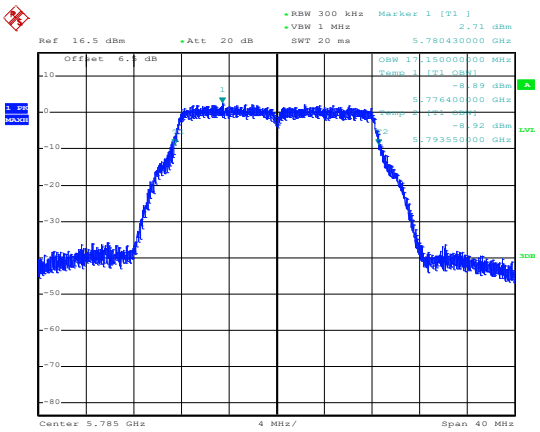


Date: 12.NOV.2020 21:04:09

Lowest channel

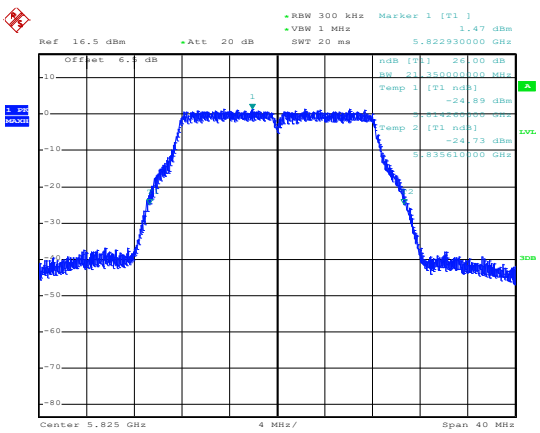


Date: 12.NOV.2020 21:04:29

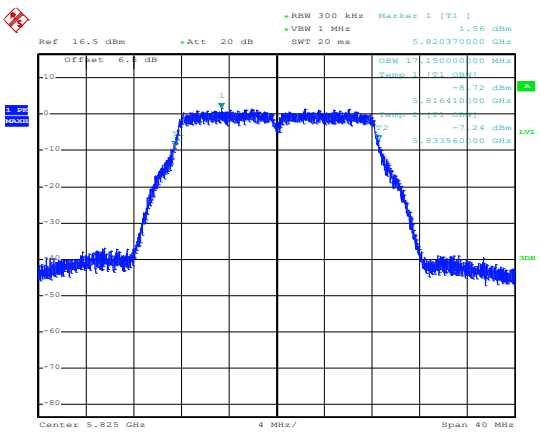


Date: 12.NOV.2020 21:04:20

Middle channel



Date: 12.NOV.2020 21:04:43

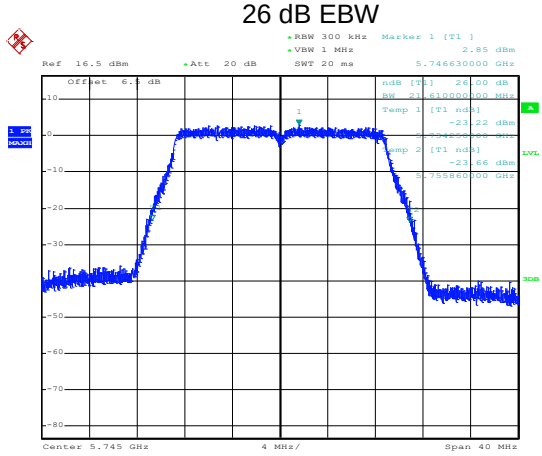


Date: 12.NOV.2020 21:04:54

Highest channel

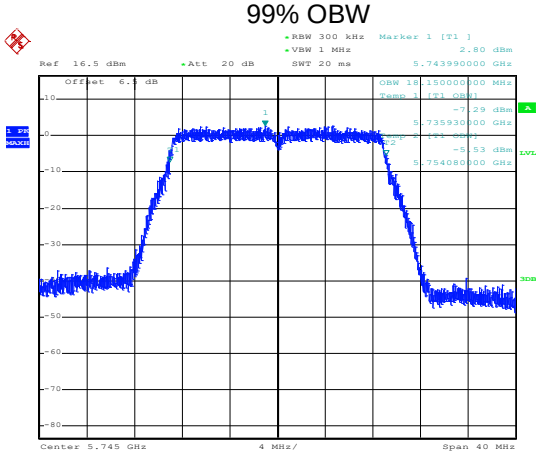
802.11n(HT20)

26 dB EBW



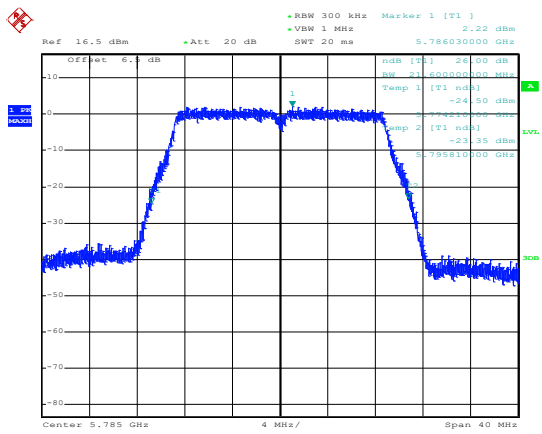
Date: 12.NOV.2020 21:06:38

99% OBW

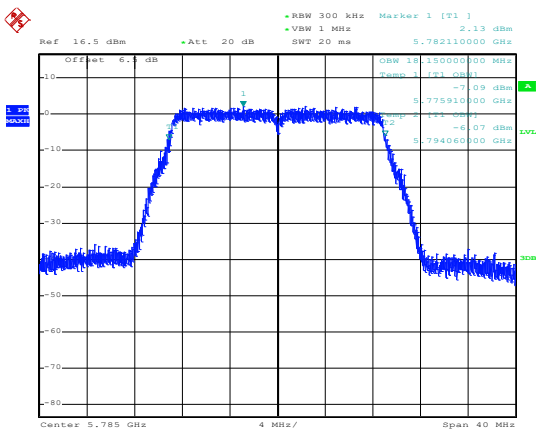


Date: 12.NOV.2020 21:06:28

Lowest channel

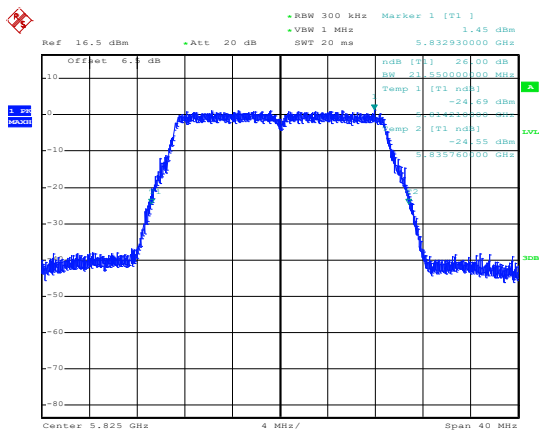


Date: 12.NOV.2020 21:05:28

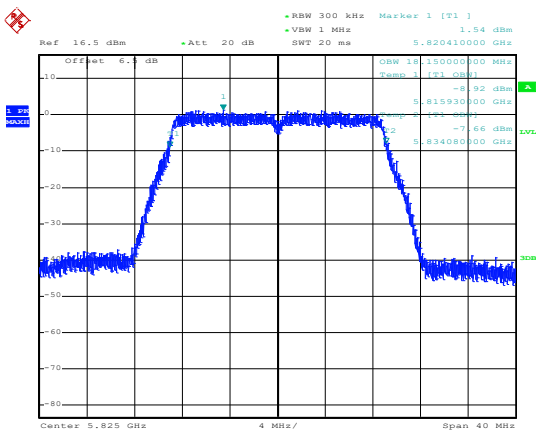


Date: 12.NOV.2020 21:05:38

Middle channel



Date: 12.NOV.2020 21:05:19

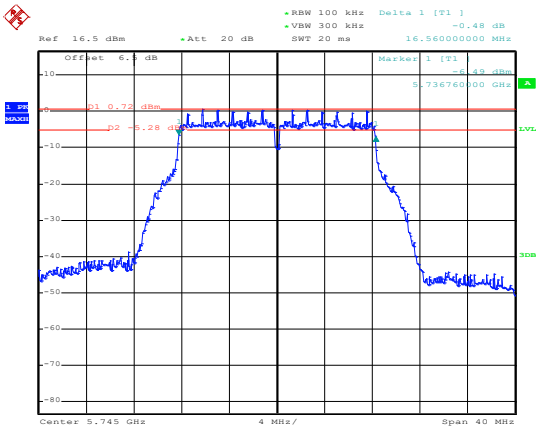


Date: 12.NOV.2020 21:05:11

Highest channel

6dB BW

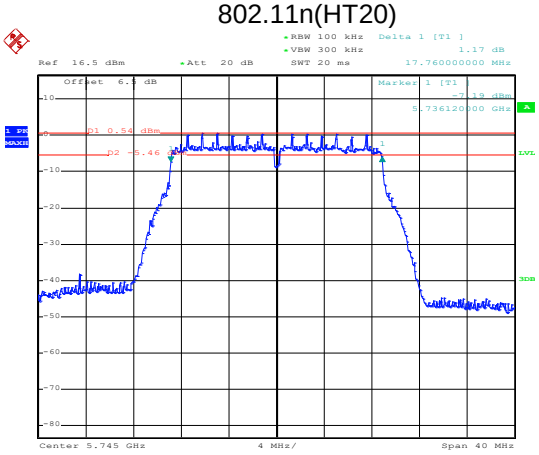
802.11a



Date: 12.NOV.2020 21:10:24

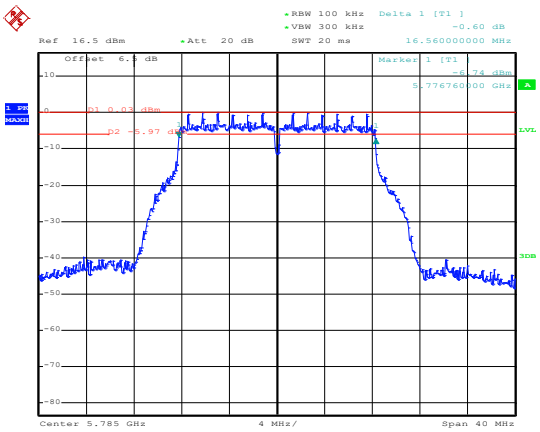
Lowest channel

802.11n(HT20)



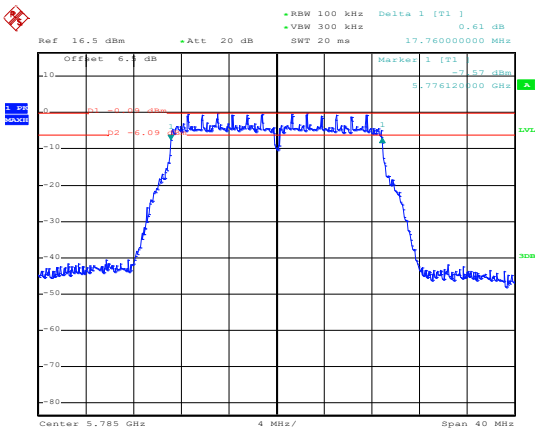
Date: 12.NOV.2020 21:07:22

Lowest channel



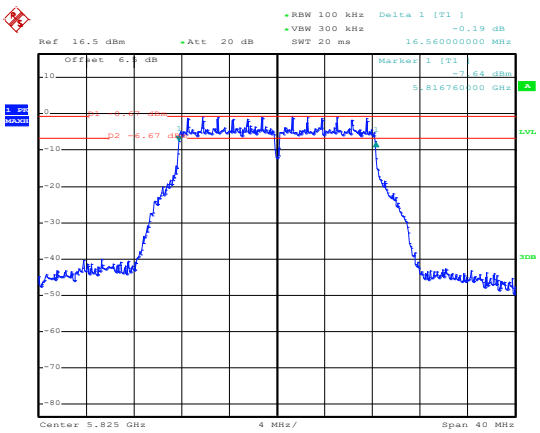
Date: 12.NOV.2020 21:09:52

Middle channel



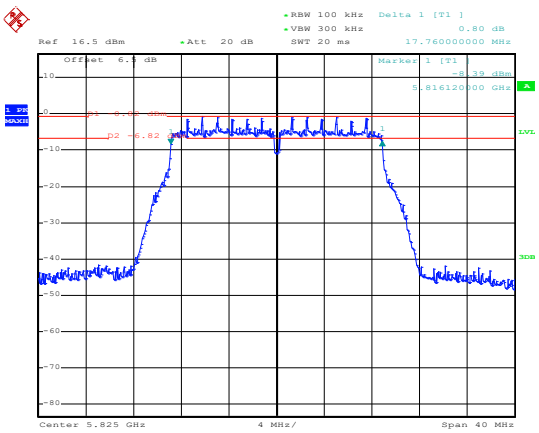
Date: 12.NOV.2020 21:07:50

Middle channel



Date: 12.NOV.2020 21:09:00

Highest channel



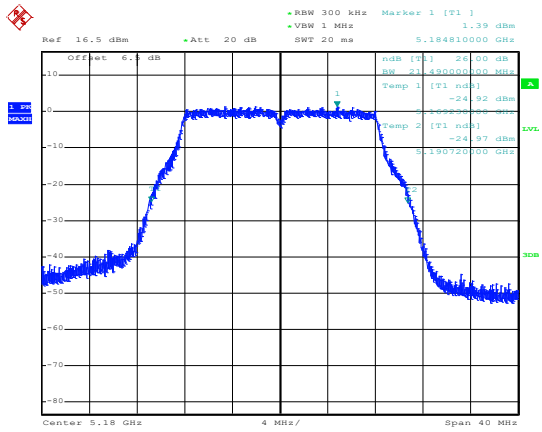
Date: 12.NOV.2020 21:08:21

Highest channel

(Module 2) Band 1 ANT2:

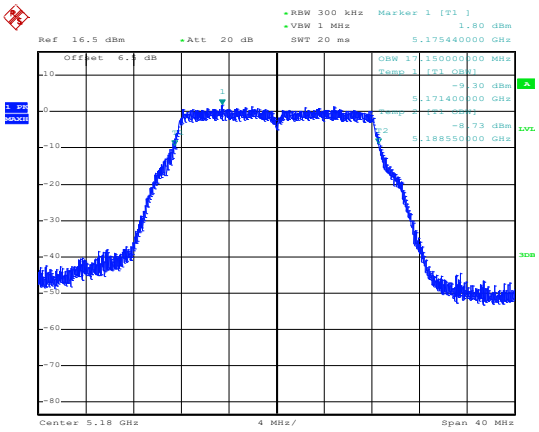
802.11a

26 dB EBW



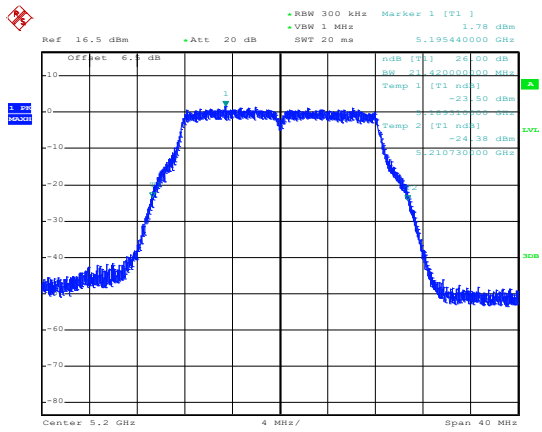
Date: 12.NOV.2020 19:59:34

99% OBW

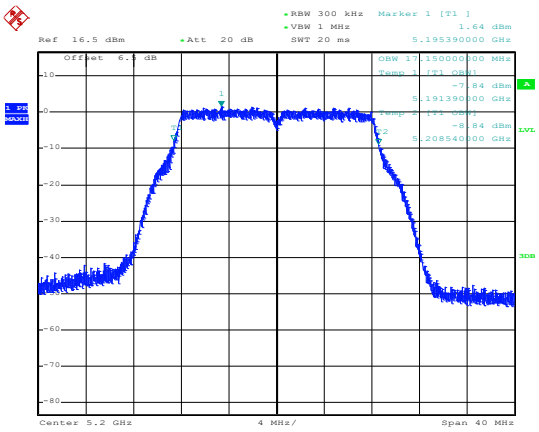


Date: 12.NOV.2020 19:59:25

Lowest channel

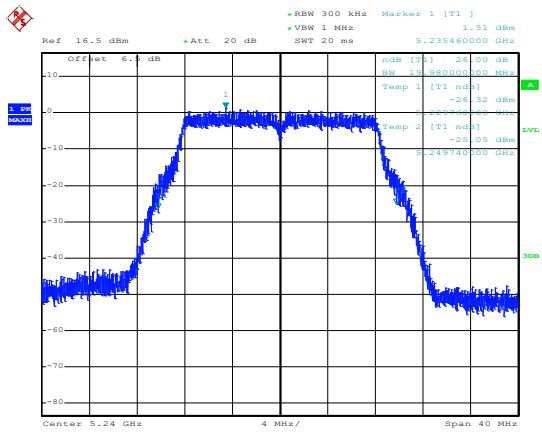


Date: 12.NOV.2020 19:58:43

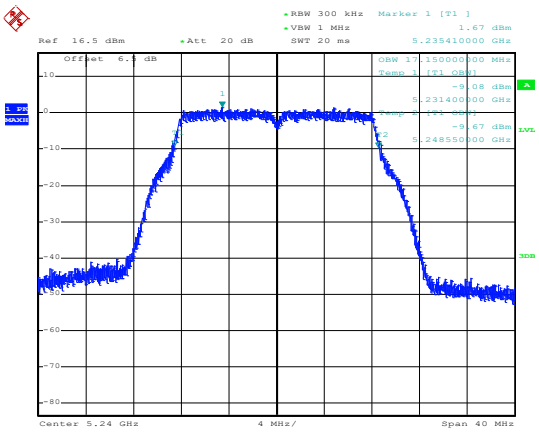


Date: 12.NOV.2020 19:58:57

Middle channel



Date: 12.NOV.2020 20:45:49



Date: 12.NOV.2020 19:58:23

Highest channel