3.5 CONDUCTED EMISSION MEASUREMENT

3.5.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
0.15 ~ 0.5 0.5 ~ 5 5 ~ 30	Quasi-peak	Average
	66 to 56 56 60	56 to 46 46 50

NOTE: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.5.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	102749	Mar.28,24	Mar.27,26
ELEKTRA test software	Rohde&Schwarz	ELEKTRA	NA	N/A	N/A
LISN network	Rohde&Schwarz	ENV216	102640	Mar.28,24	Mar.27,26
CABLE	Rohde&Schwarz	W61.01	N/A	Apr.27,24	Apr.26,25
CABLE	Rohde&Schwarz	W601	N/A	Apr.27,24	Apr.26,25

NOTE:

1. The test was performed in CE shielded room.
2. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

3.5.3 TEST PROCEDURES

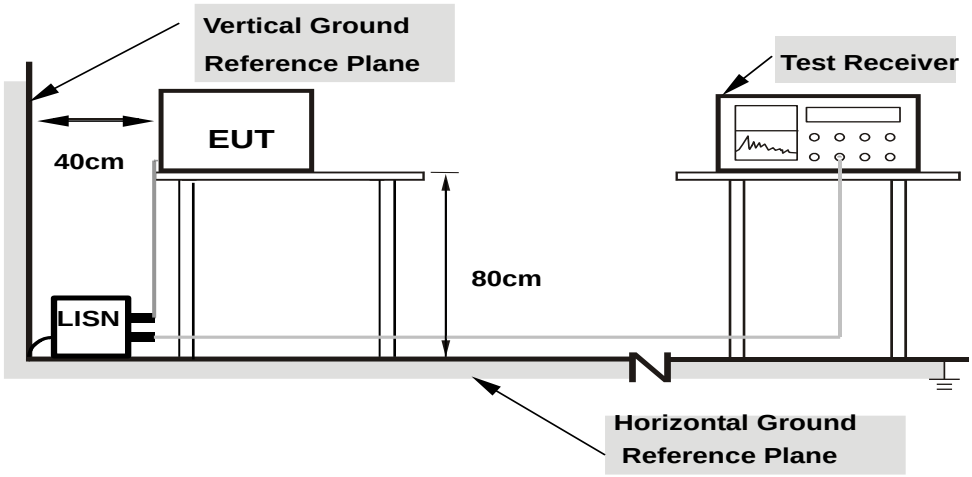
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

3.5.4 DEVIATION FROM TEST STANDARD

No deviation.

3.5.5 TEST SETUP



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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.5.6 EUT OPERATING CONDITIONS

Same as 3.1.7.

3.5.7 TEST RESULTS

CONDUCTED WORST-CASE DATA:

Frequency Range	150KHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	26deg. C, 51%RH
Tested By	Carl Xie		

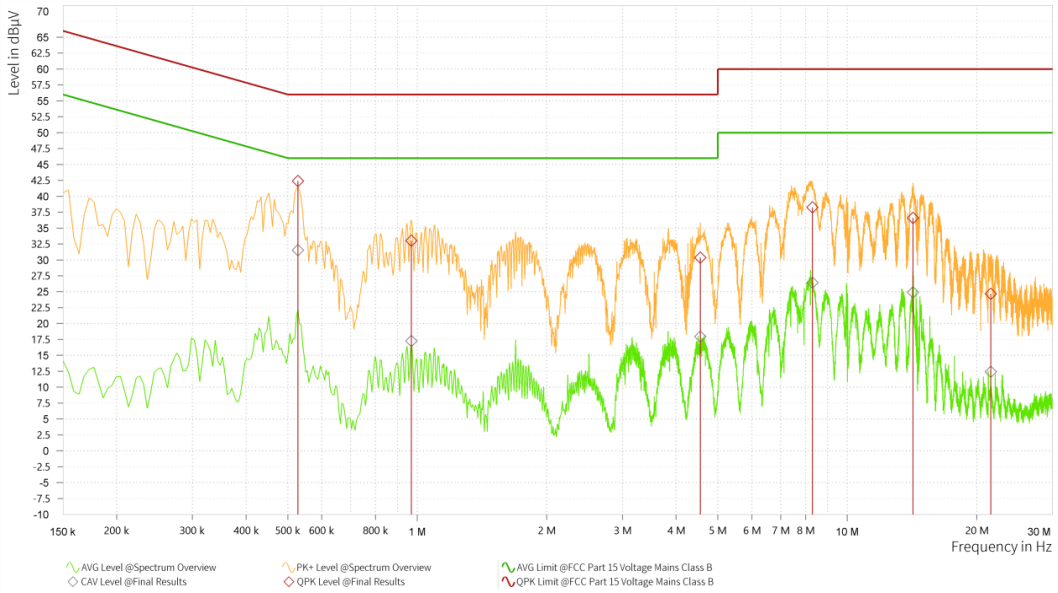
Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	CAV Level [dBµV]	CAV: AVG Limit [dBµV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]
1	0.524	46.00	56.00	10.00	40.69	46.00	5.31	11.75	L1	9.000
1	0.947	38.06	56.00	17.94	31.79	46.00	14.21	11.74	L1	9.000
1	2.864	32.65	56.00	23.35	23.63	46.00	22.37	11.77	L1	9.000
1	8.115	36.76	60.00	23.24	28.06	50.00	21.94	11.81	L1	9.000
1	15.563	28.92	60.00	31.08	17.98	50.00	32.02	11.85	L1	9.000
1	22.560	13.90	60.00	46.10	5.94	50.00	44.06	11.88	L1	9.000

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Limit value - Emission level
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.

Frequency Range	150KHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	26deg. C, 51%RH
Tested By	Carl Xie		

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	CAV Level [dBµV]	CAV: AVG Limit [dBµV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]
1	0.528	42.41	56.00	13.59	31.55	46.00	14.45	12.77	N	9.000
1	0.969	33.01	56.00	22.99	17.25	46.00	28.75	12.74	N	9.000
1	4.551	30.35	56.00	25.65	17.95	46.00	28.05	12.76	N	9.000
1	8.300	38.28	60.00	21.72	26.42	50.00	23.58	12.78	N	9.000
1	14.213	36.62	60.00	23.38	24.91	50.00	25.09	12.82	N	9.000
1	21.557	24.66	60.00	35.34	12.43	50.00	37.57	12.86	N	9.000

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Limit value - Emission level
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



3.6 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

3.6.1 LIMITS OF MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

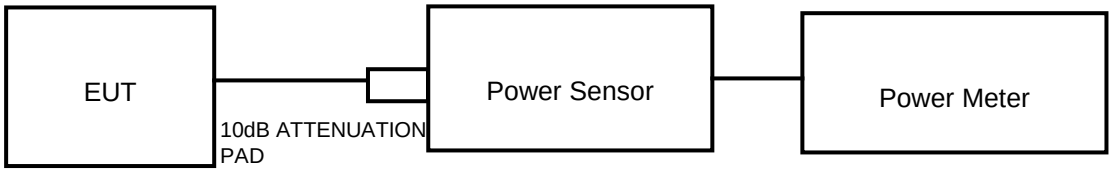
Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
	B	Indoor Access Point	1 Watt (30 dBm)
	√	Client devices	250mW (24 dBm)
U-NII-2A	√		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-2C	√		250mW (24 dBm) or 11 dBm+10 log B*
U-NII-3	√		1 Watt (30 dBm)

NOTE: Where B is the 26dB emission bandwidth in MHz.

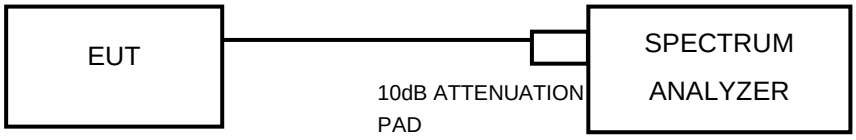
3.6.2 TEST SETUP

FOR POWER OUTPUT MEASUREMENT

802.11a, 802.11n/ac(20MHz), 802.11 n/ac(40MHz) ,802.11 ac (80MHz) TEST CONFIGURATION



FOR 26dB BANDWIDTH



3.6.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	R&S	ESW 44	101973	Mar.28,24	Mar.27,26
Open Switch and Control Unit	R&S	OSP-B157W8	100836	N/A	N/A
Vector Signal Generator	R&S	SMBV100B	102176	Mar.29,24	Mar.28,26
Signal Generator	R&S	SMB100A03	182185	Mar.29,24	Mar.28,26
WIDEBANDRADIO COMMUNICATION TESTER	R&S	CMW500	169399	Jun.19,24	Jun.18,26
Hygrothermograph	DELI	20210528	SZ015	Sep.06,22	Sep.05,24
Hygrothermograph	DELI	20210528	SZ015	Sep.05,24	Sep.04,26
PC	LENOVO	E14	HRSW0024	N/A	N/A
CABLE	R&S	J12J103539-00-1	SEP-03-20-069	Apr.27,24	Apr.26,25
CABLE	R&S	J12J103539-00-1	SEP-03-20-070	Apr.27,24	Apr.26,25
Test Software	EMC32	EMC32	N/A	N/A	N/A
Temperature Chamber	votsch	VT4002	58566078100050	May.30,24	May.29,26
Power Meter	R&S	NRX	102380	Mar.28,24	Mar.27,26
Power Meter probe	R&S	NRP6A	102942	Mar.28,24	Mar.27,26

NOTE:

1. The calibration interval of the above test instruments is 12 /24months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.

3.6.4 TEST PROCEDURE

FOR POWER MEASUREMENT

For 802.11a, 802.11n/ac/ax (20MHz), 802.11 n/ac/ax (40MHz) ,802.11 ac/ax (160MHz)

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

FOR 99 PERCENT OCCUPIED BANDWIDTH

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

FOR 26dB BANDWIDTH

1) Set RBW = approximately 1% of the emission bandwidth.
2) Set the VBW > RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

FOR 6dB BANDWIDTH

1. Set RBW = 100 kHz.

2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.6.5 DEVIATION FROM TEST STANDARD

No deviation.

3.6.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

3.6.7 TEST RESULTS

Please Refer to Appendix Of this test report.

3.7 MAXIMUM POWER SPECTRAL DENSITY MEASUREMENT

3.7.1 LIMITS OF MAXIMUM POWER SPECTRAL DENSITY MEASUREMENT

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
	√	Client devices	11dBm/ MHz
U-NII-2A	√		11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

3.7.2 TEST SETUP

3.7.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.7.4 TEST PROCEDURES

Using method SA-2(Band1/2/3)

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).
7) Record the max value

Using method SA-2 (Band4)

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 300 kHz, Set VBW ≥ 1 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Add 10 log(500kHz/RBW) to the test result. 10 log(500kHz/300KHZ) = 2.22dBm
7) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).
8) Record the max value

3.7.5 DEVIATION FROM TEST STANDARD

No deviation.

3.7.6 EUT OPERATING CONDITIONS

Same as 3.1.7.

3.7.7 TEST RESULTS

Please Refer to Appendix Of this test report.

3.8 AUTOMATICALLY DISCONTINUE TRANSMISSION

3.8.1 LIMIT OF AUTOMATICALLY DISCONTINUE TRANSMISSION

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information, or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

3.8.2 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.8.3 TEST RESULT

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving。 The EUT can detect the controlling of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.9 ANTENNA REQUIREMENTS

3.9.1 STANDARD APPLICABLE

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmits power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.9.2 ANTENNA CONNECTED CONSTRUCTION

An embedded-in antenna design is used.

3.9.3 ANTENNA GAIN

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit and PSD limit.

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

6 Appendix:

EMISSION BANDWIDTH

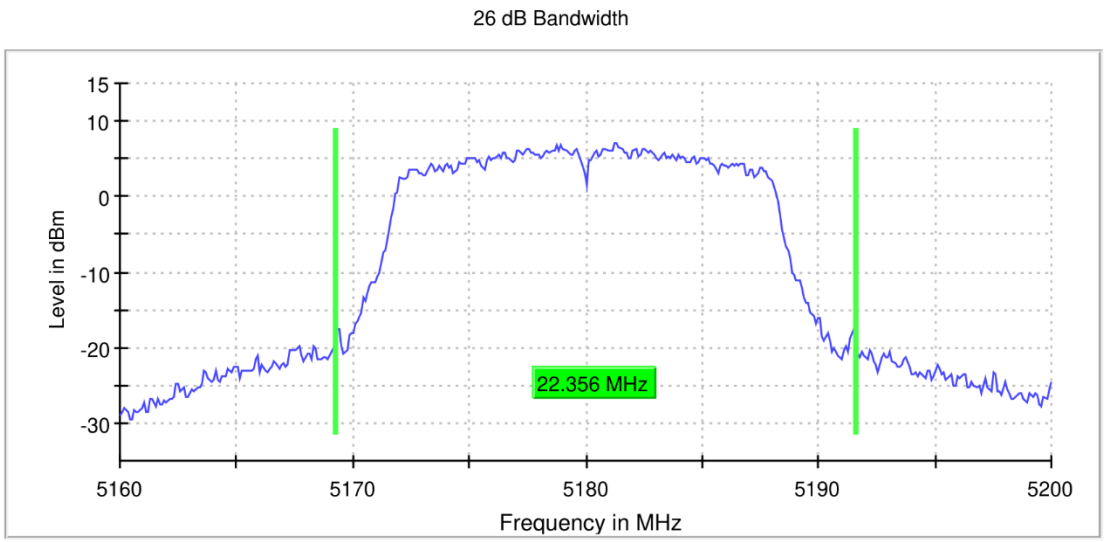
TEST RESULT

TestMode	Antenna	Frequency [MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	ANT4	5180	22.356	5169.223	5191.579	---	---
	ANT4	5200	20.852	5189.925	5210.777	---	---
	ANT4	5240	20.952	5229.223	5250.175	---	---
	ANT4	5260	20.251	5249.925	5270.176	---	---
	ANT4	5300	20.551	5289.524	5310.075	---	---
	ANT4	5320	20.952	5309.825	5330.777	---	---
	ANT4	5500	20.451	5489.724	5510.175	---	---
	ANT4	5580	20.251	5569.925	5590.176	---	---
	ANT4	5700	20.150	5689.925	5710.075	---	---
	ANT4	5720	21.855	5708.221	5730.076	---	---
	ANT4	5745	20.251	5734.925	5755.176	---	---
	ANT4	5785	20.551	5774.624	5795.175	---	---
	ANT4	5825	22.657	5814.624	5837.281	---	---
11N20	ANT4	5180	20.551	5169.825	5190.376	---	---
	ANT4	5200	20.551	5189.724	5210.275	---	---
	ANT4	5240	20.551	5229.724	5250.275	---	---
	ANT4	5260	20.451	5249.825	5270.276	---	---
	ANT4	5300	20.551	5289.724	5310.275	---	---
	ANT4	5320	20.652	5309.624	5330.276	---	---
	ANT4	5500	20.551	5489.724	5510.275	---	---
	ANT4	5580	20.451	5569.724	5590.175	---	---
	ANT4	5700	20.451	5689.825	5710.276	---	---
	ANT4	5720	20.551	5709.724	5730.275	---	---
	ANT4	5745	20.652	5734.724	5755.376	---	---
	ANT4	5785	20.551	5774.724	5795.275	---	---
	ANT4	5825	20.351	5814.825	5835.176	---	---
11N40	ANT4	5190	41.203	5169.549	5210.752	---	---
	ANT4	5230	40.602	5209.850	5250.452	---	---
	ANT4	5270	40.752	5249.699	5290.451	---	---

	ANT4	5310	40.602	5289.549	5330.151	---	---
	ANT4	5510	40.752	5489.549	5530.301	---	---
	ANT4	5550	40.602	5529.549	5570.151	---	---
	ANT4	5670	40.752	5649.699	5690.451	---	---
	ANT4	5710	40.301	5689.850	5730.151	---	---
	ANT4	5755	40.602	5734.699	5775.301	---	---
	ANT4	5795	40.451	5774.699	5815.150	---	---
11AC80	ANT4	5210	82.257	5169.122	5251.379	---	---
	ANT4	5290	82.759	5248.621	5331.380	---	---
	ANT4	5530	81.755	5489.122	5570.877	---	---
	ANT4	5610	82.257	5568.621	5650.878	---	---
	ANT4	5690	82.759	5648.621	5731.380	---	---
	ANT4	5775	82.759	5733.621	5816.380	---	---

TEST GRAPHS

11A_ANT4_5180



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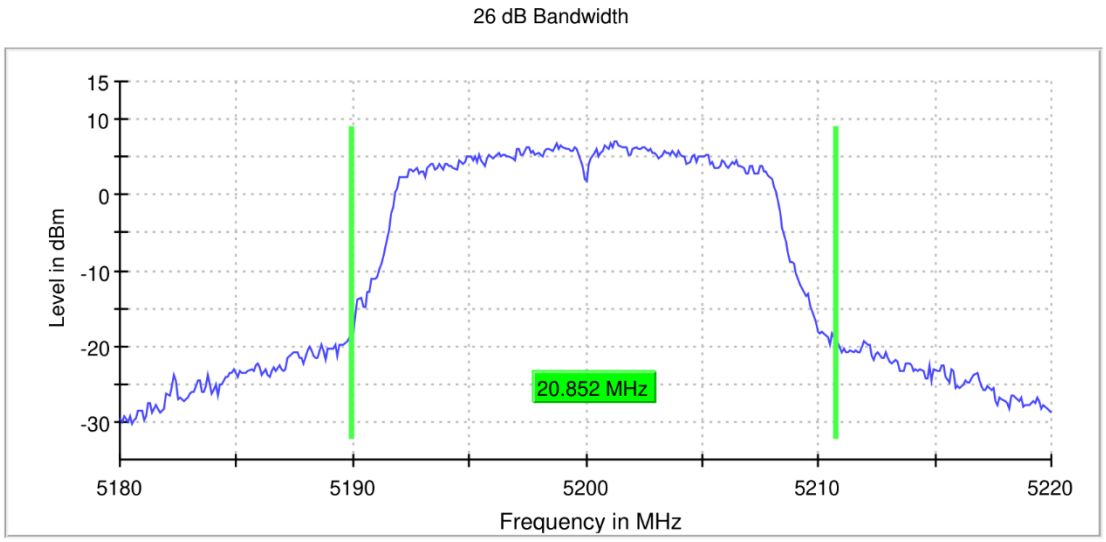

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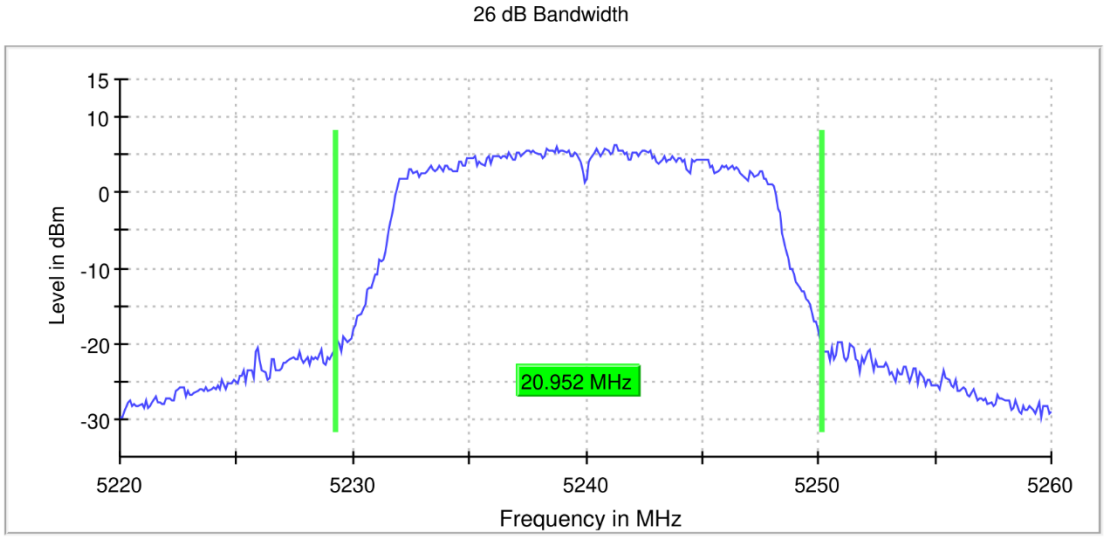
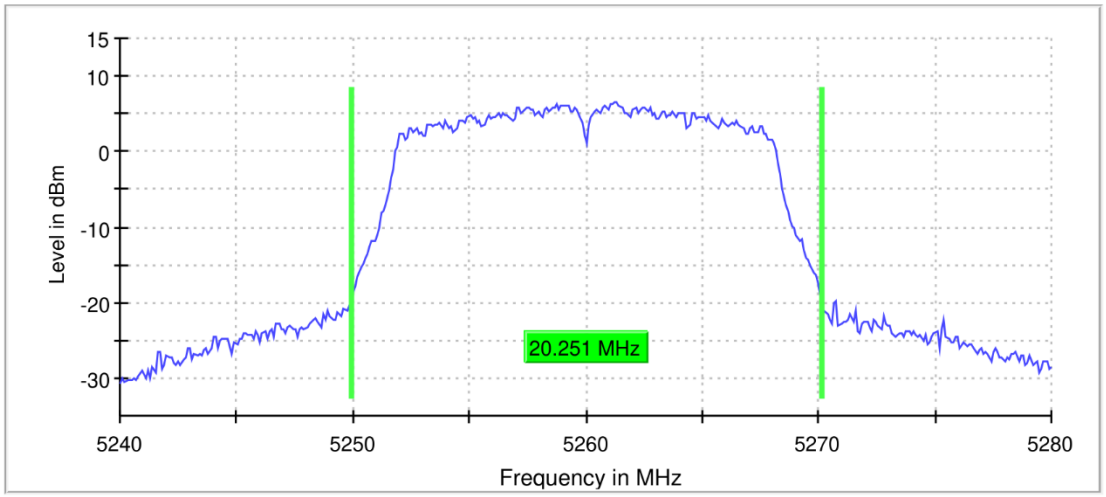
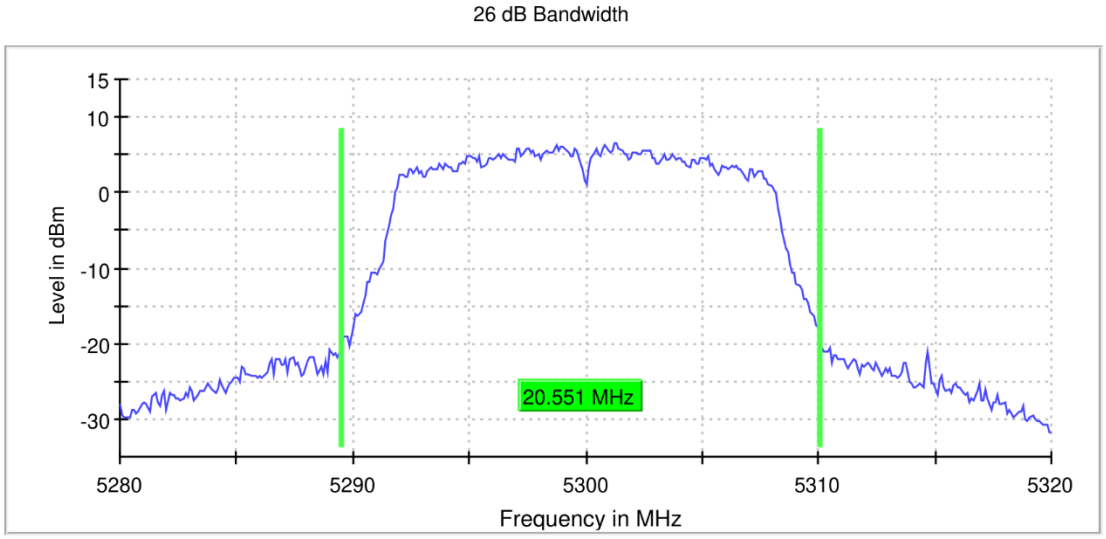


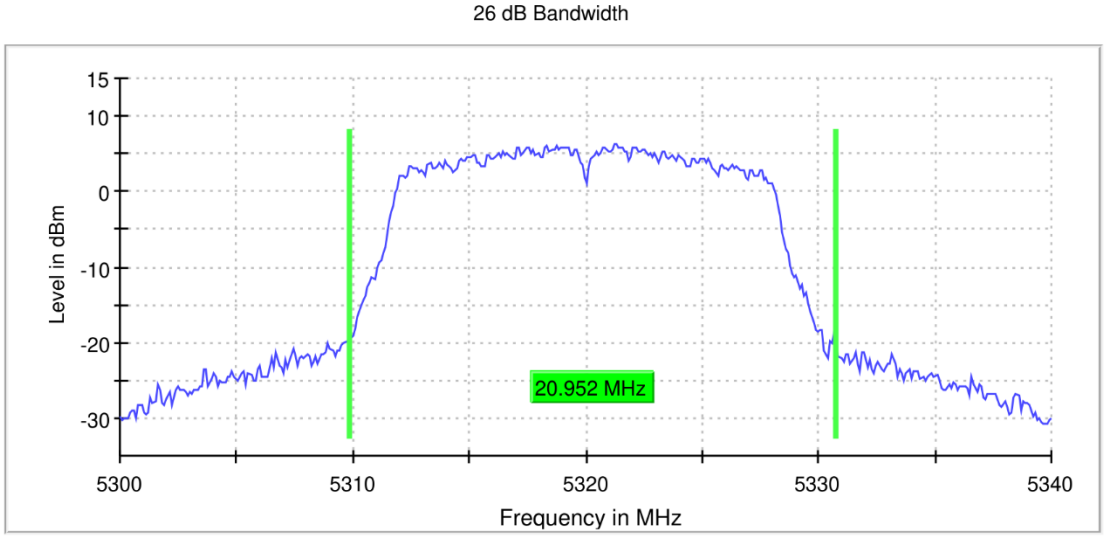
11A _ANT4_5260



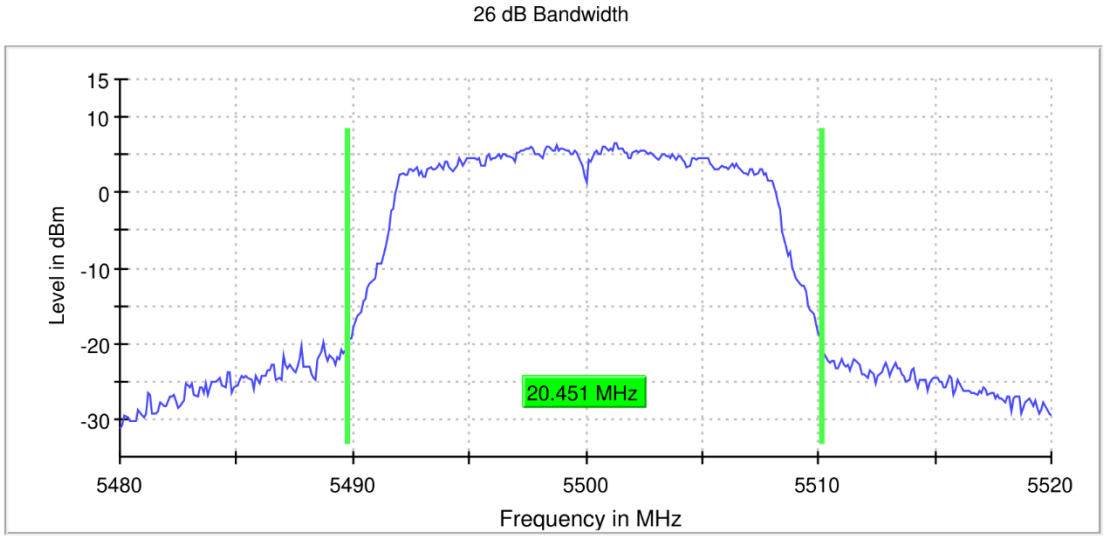
11A _ANT4_5300



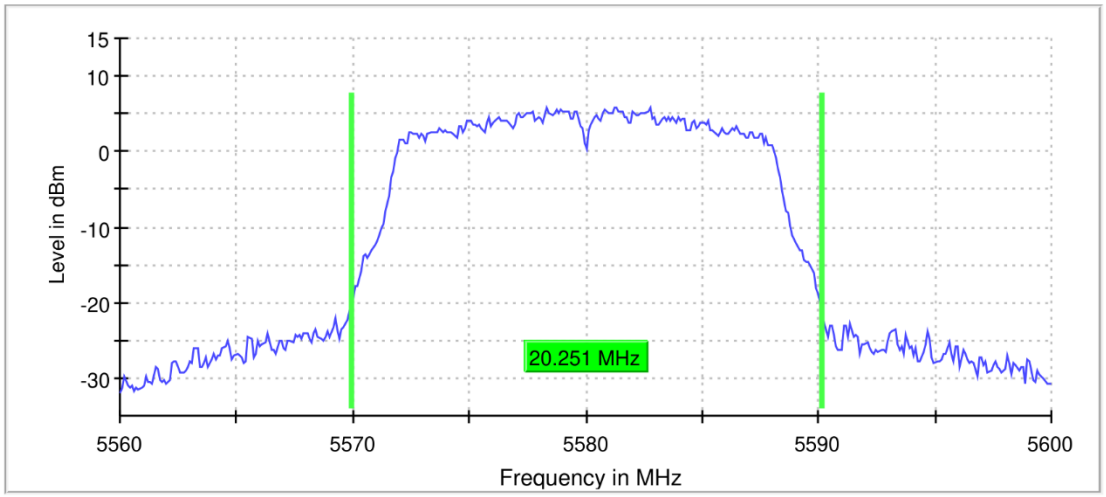
11A _ANT4_5320



11A _ANT4_5500



11A _ANT4_5580



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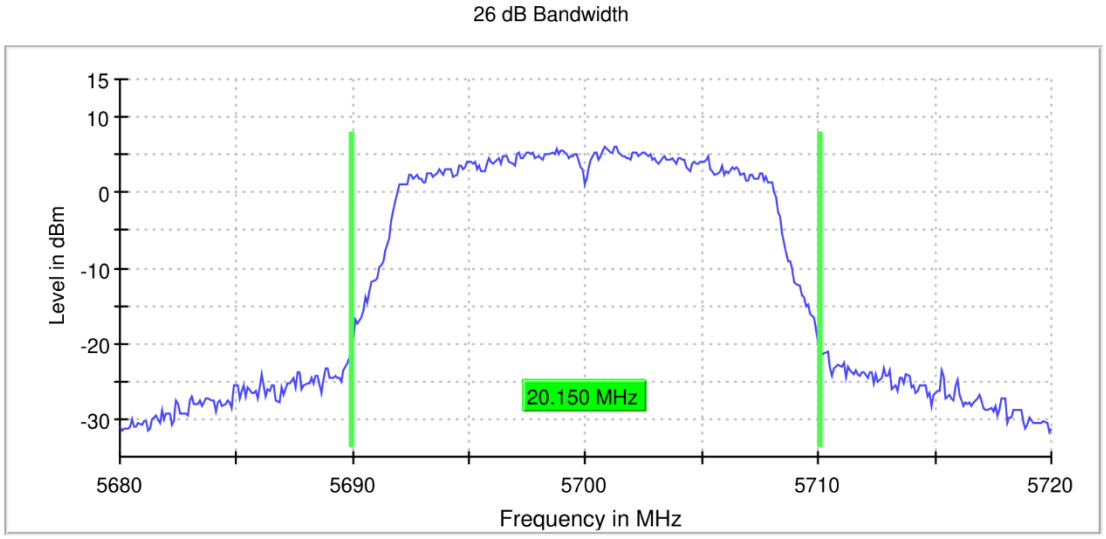

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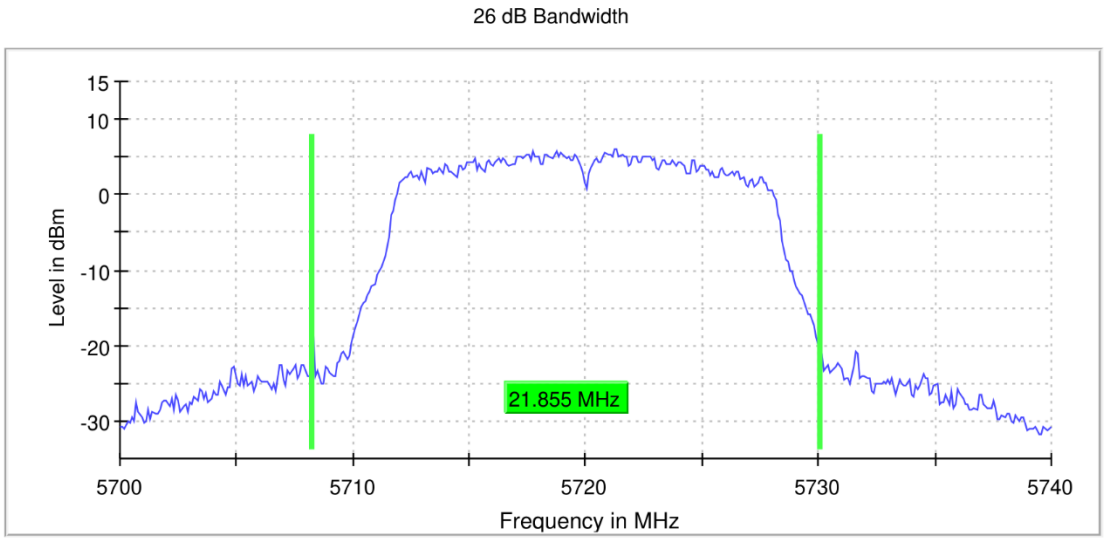

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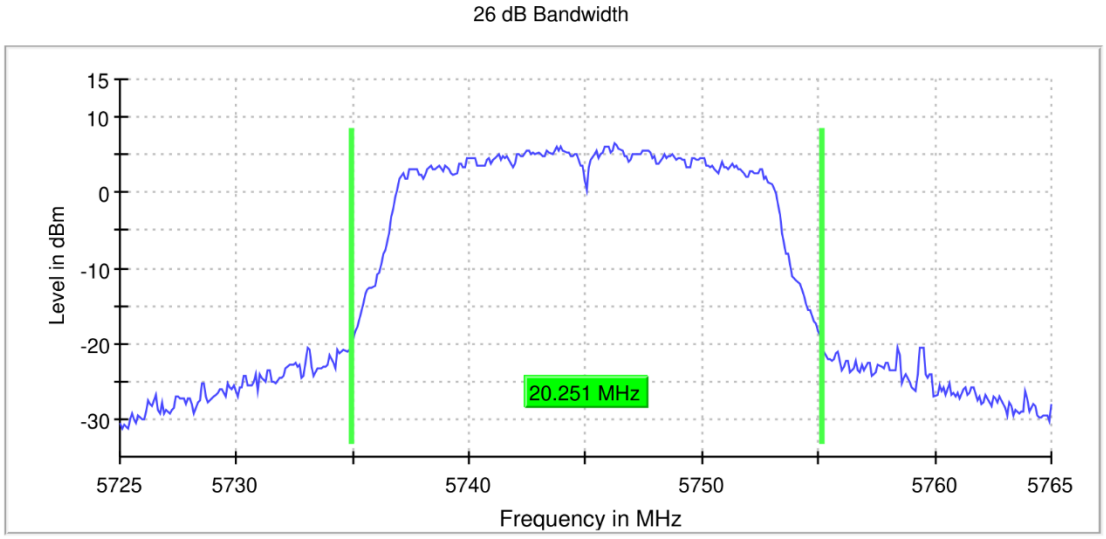

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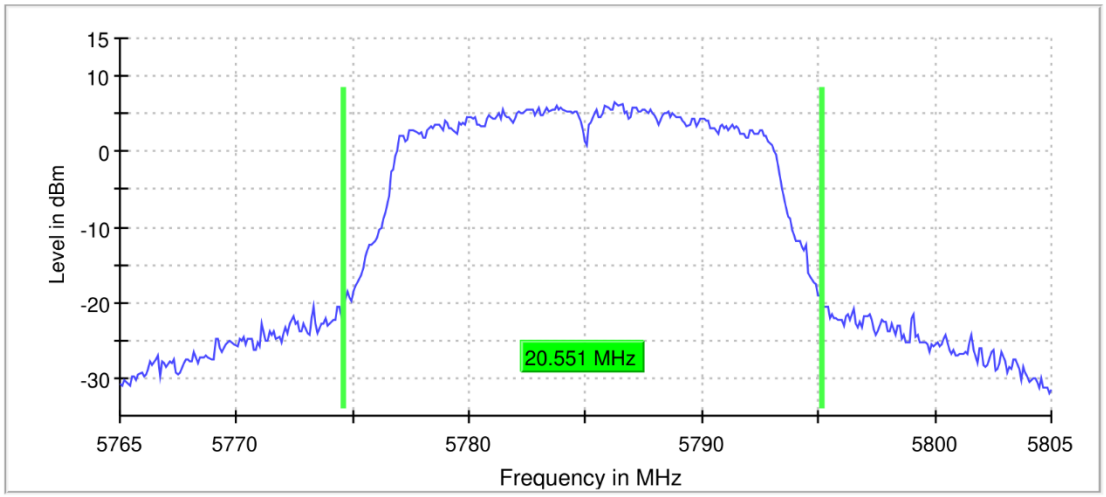

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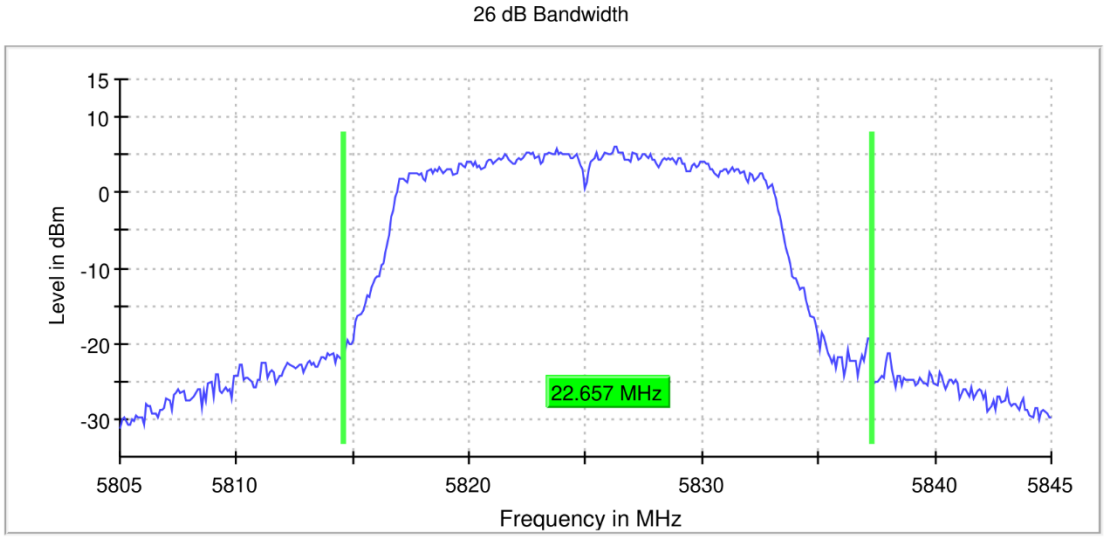

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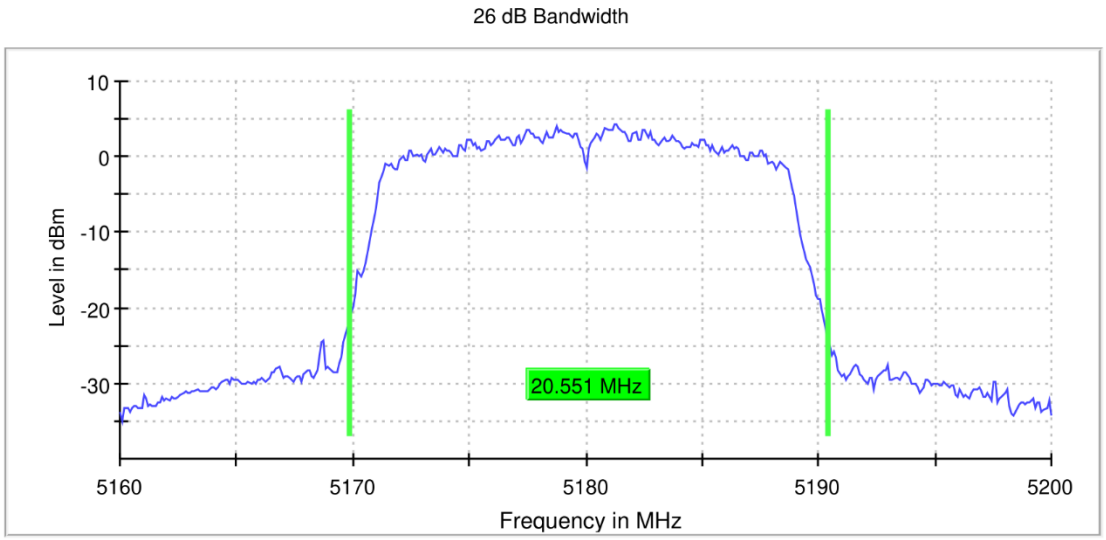
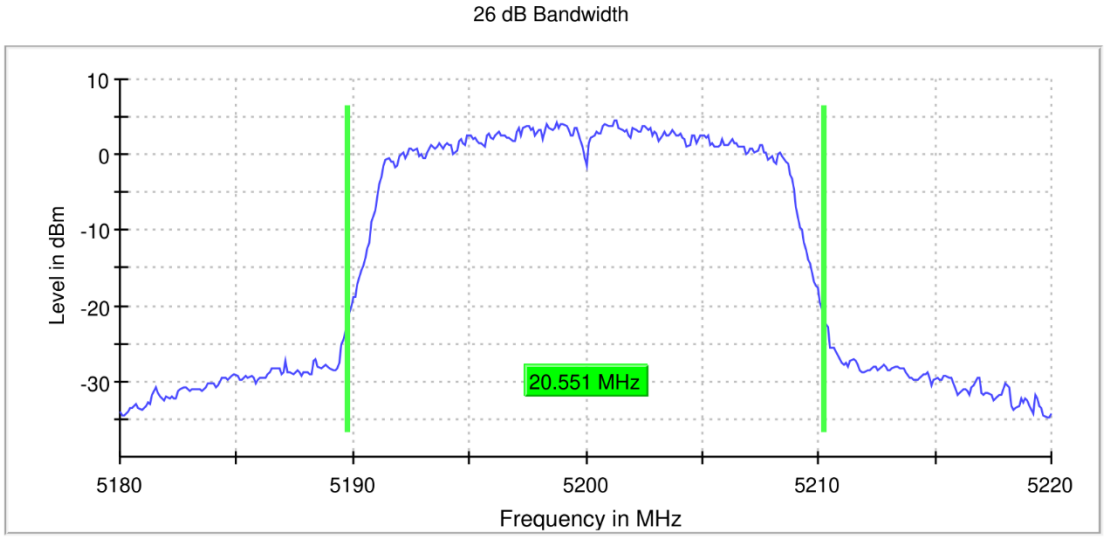
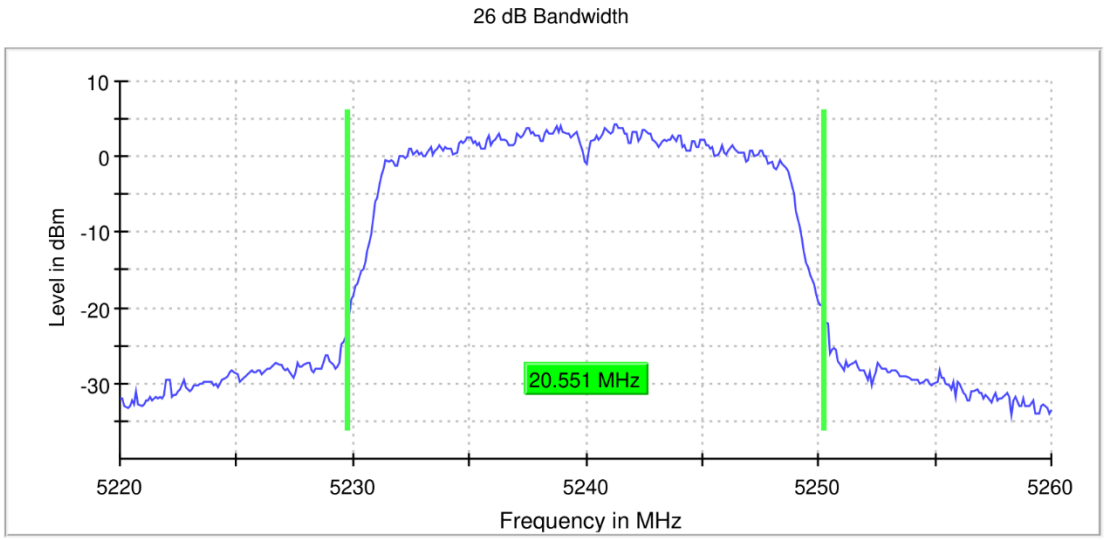


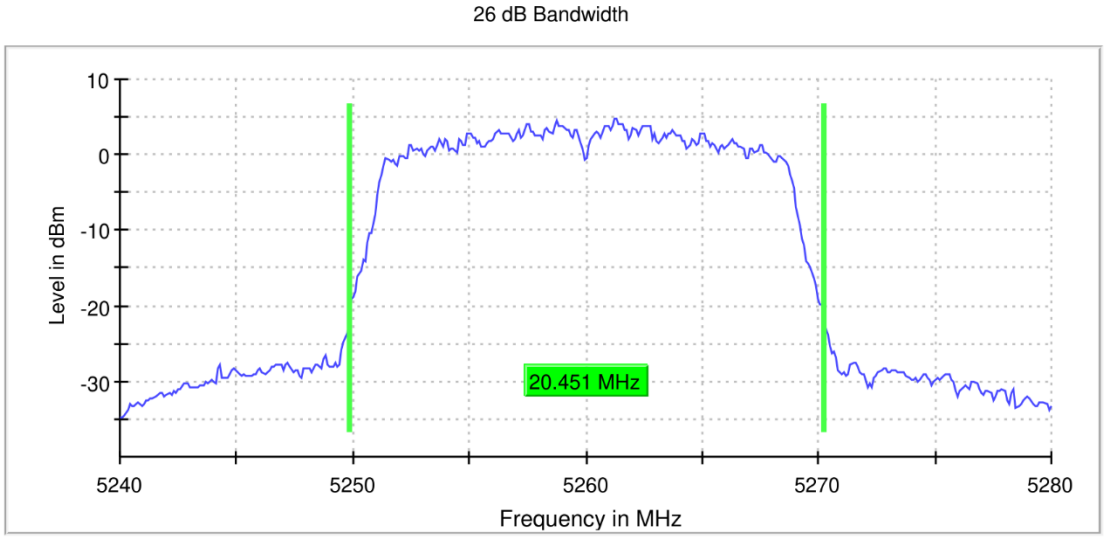
11N20 _ANT4_5200



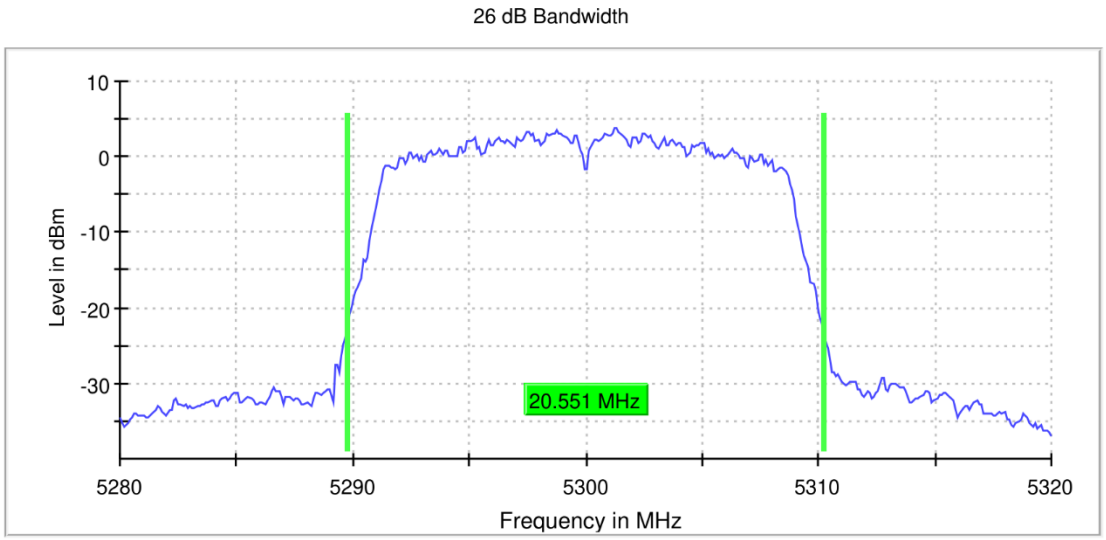
11N20 _ANT4_5240



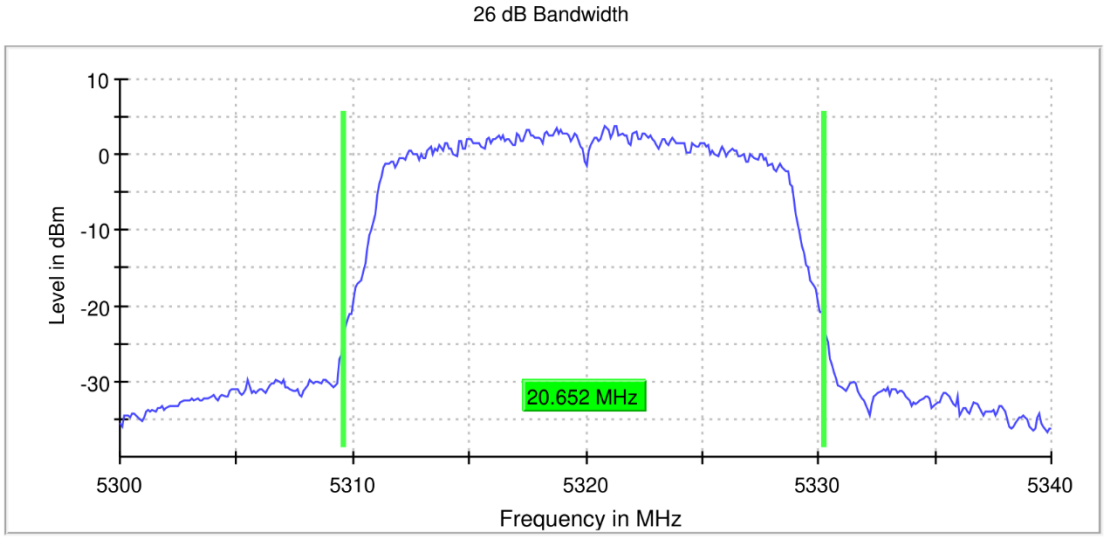
11N20 _ANT4_5260



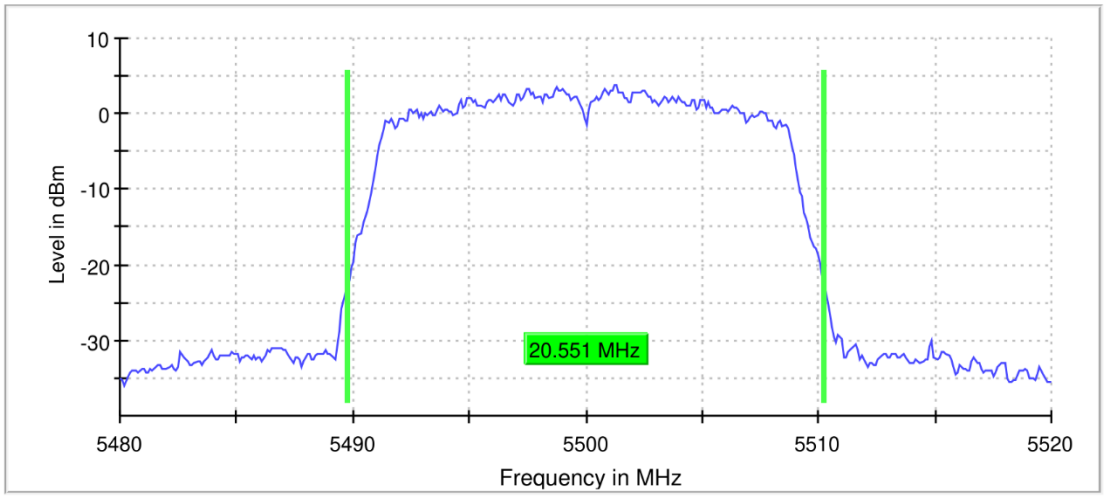
11N20_ANT4_5300



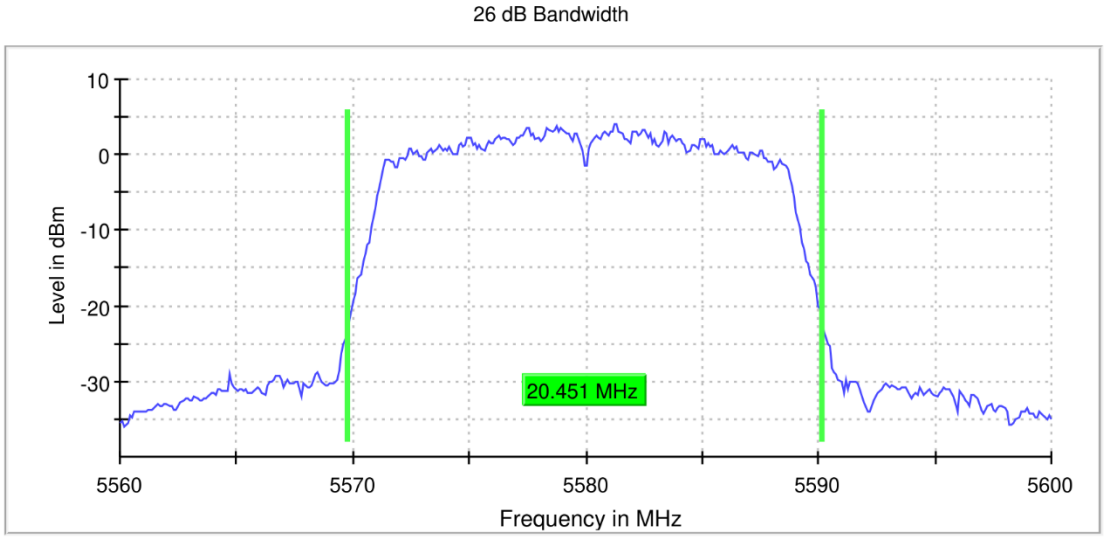
11N20 _ANT4_5320



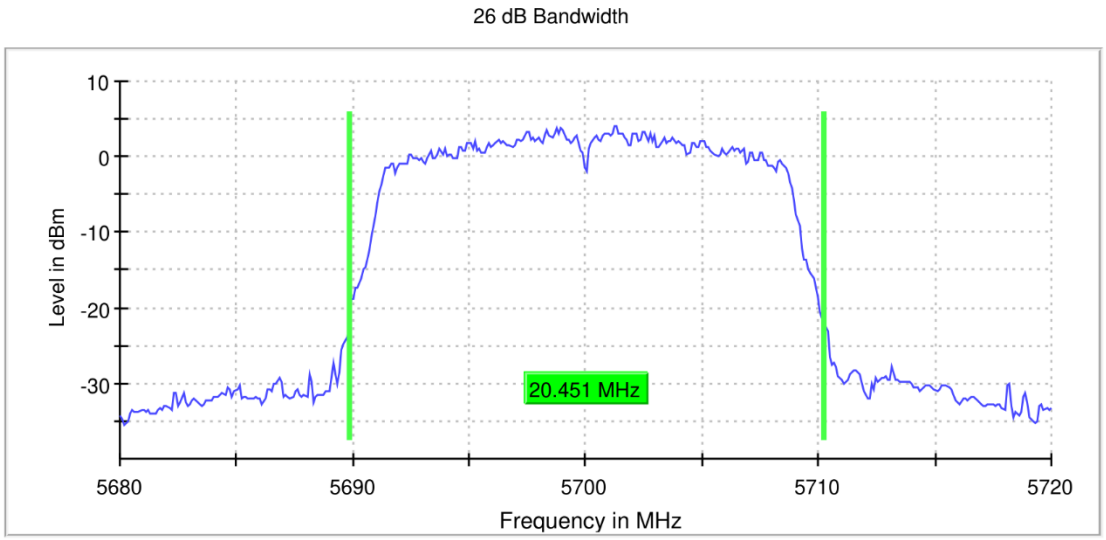
11N20 _ANT4_5500



11N20_ANT4_5580



11N20_ANT4_5700



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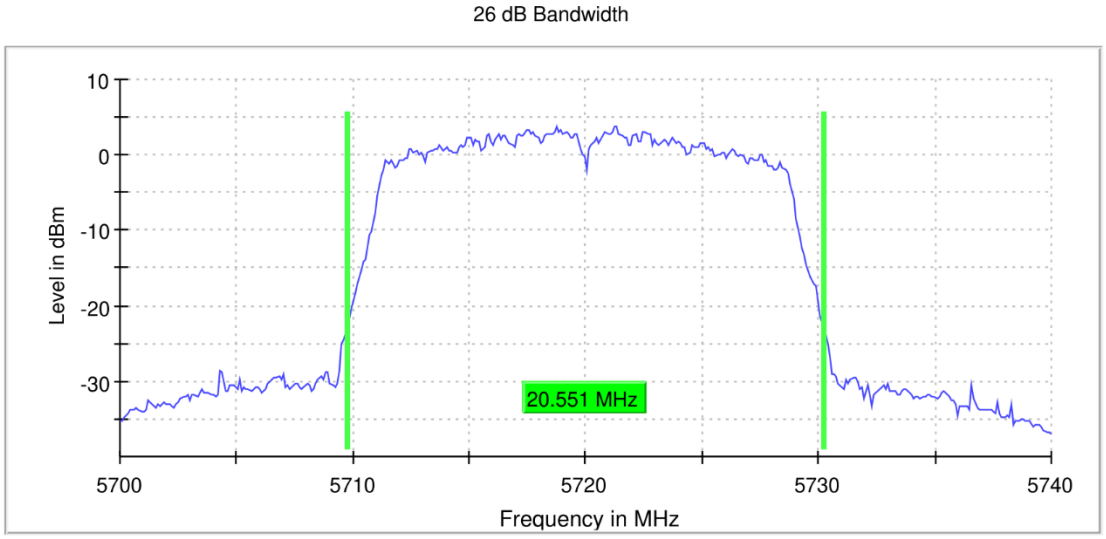
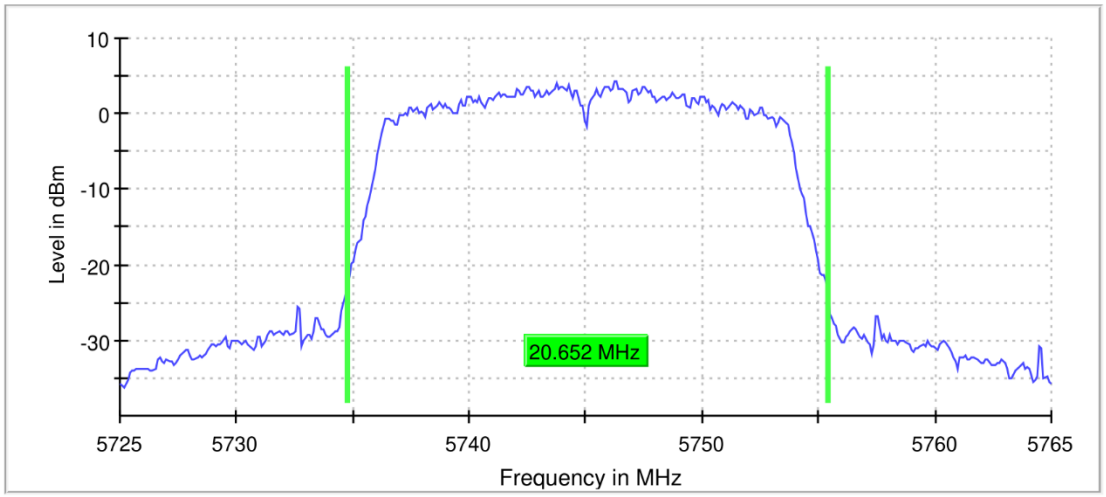
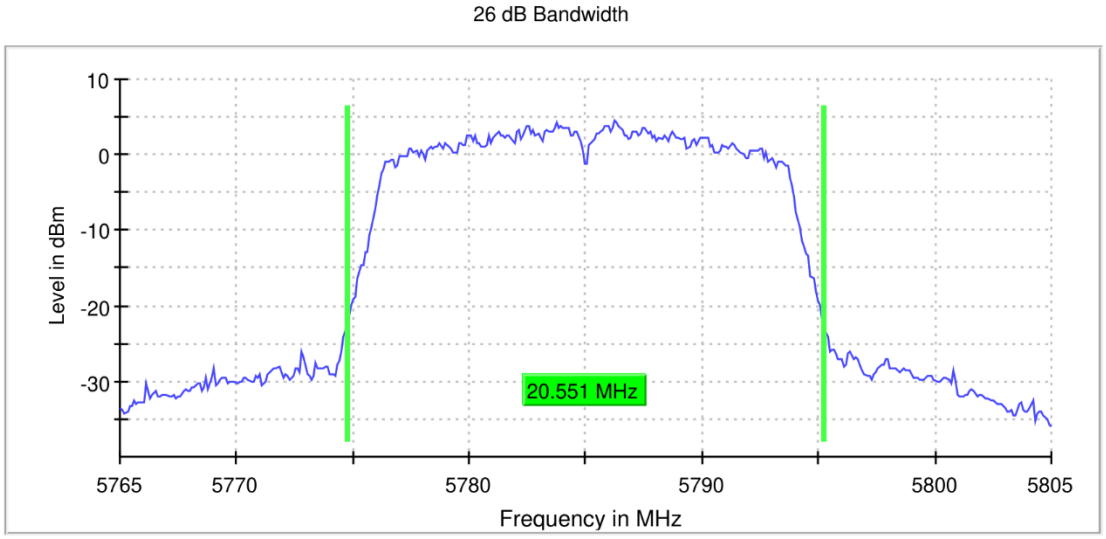


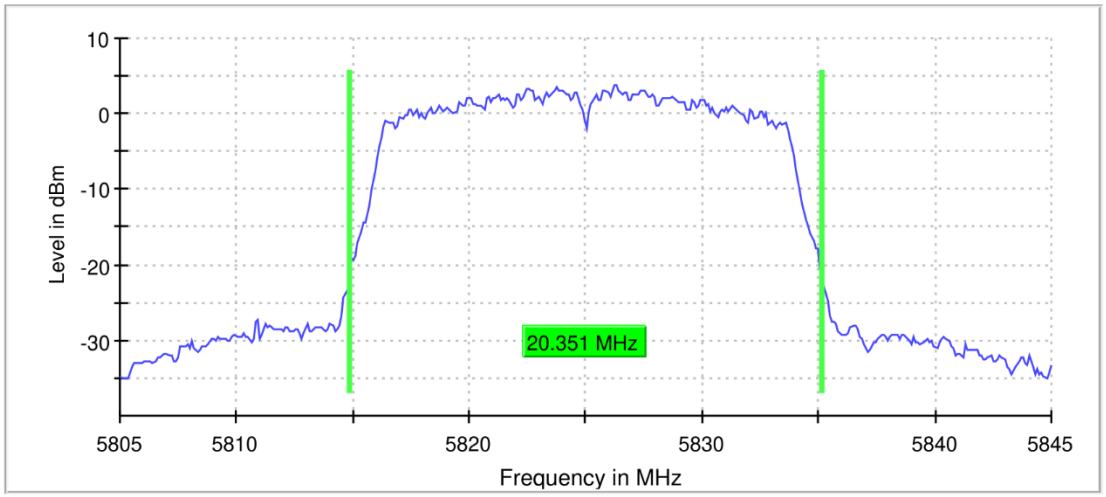
11N20 _ANT4_5745



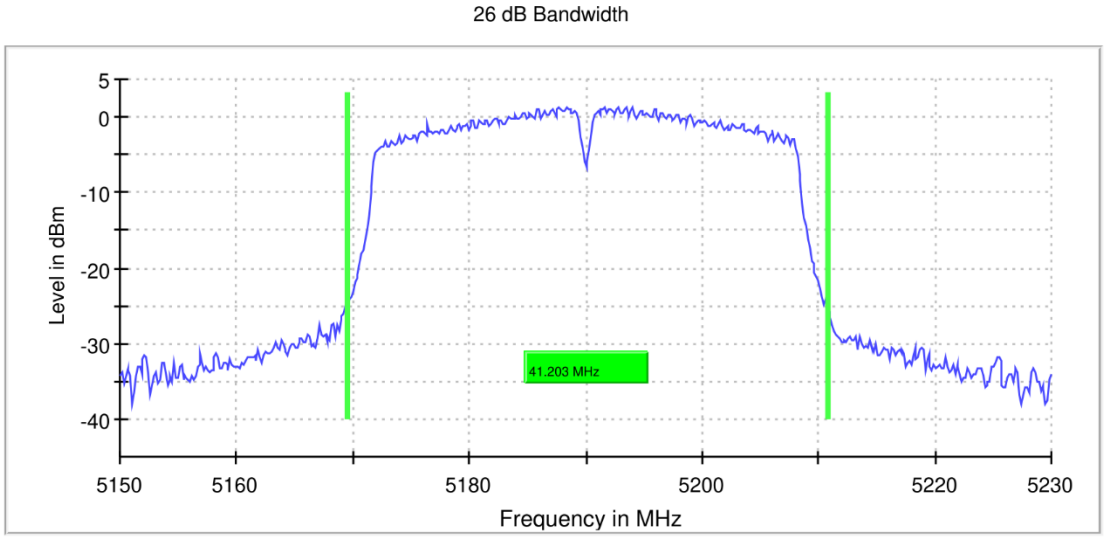
11N20 _ANT4_5785



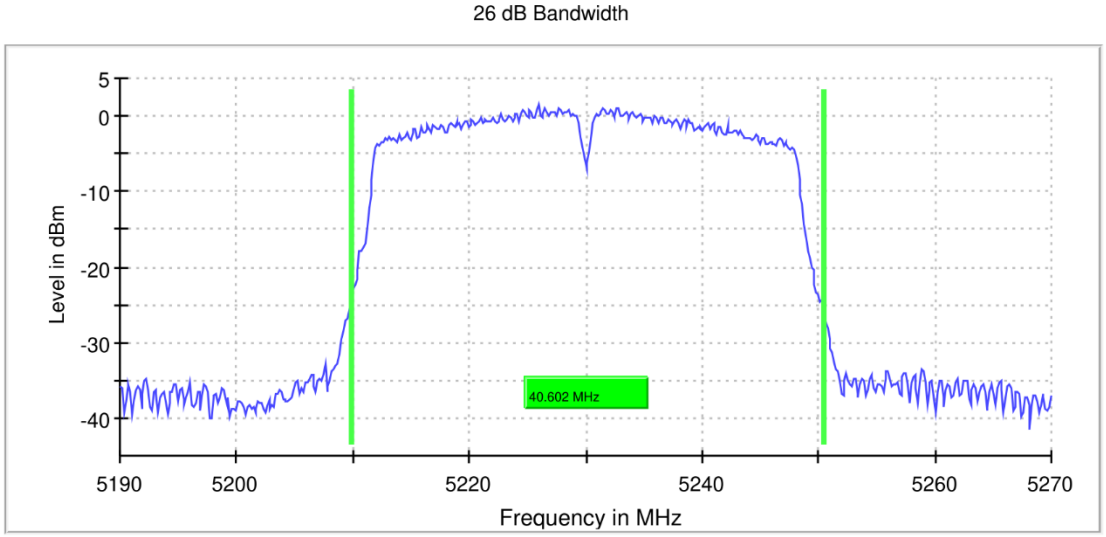
11N20 _ANT4_5825



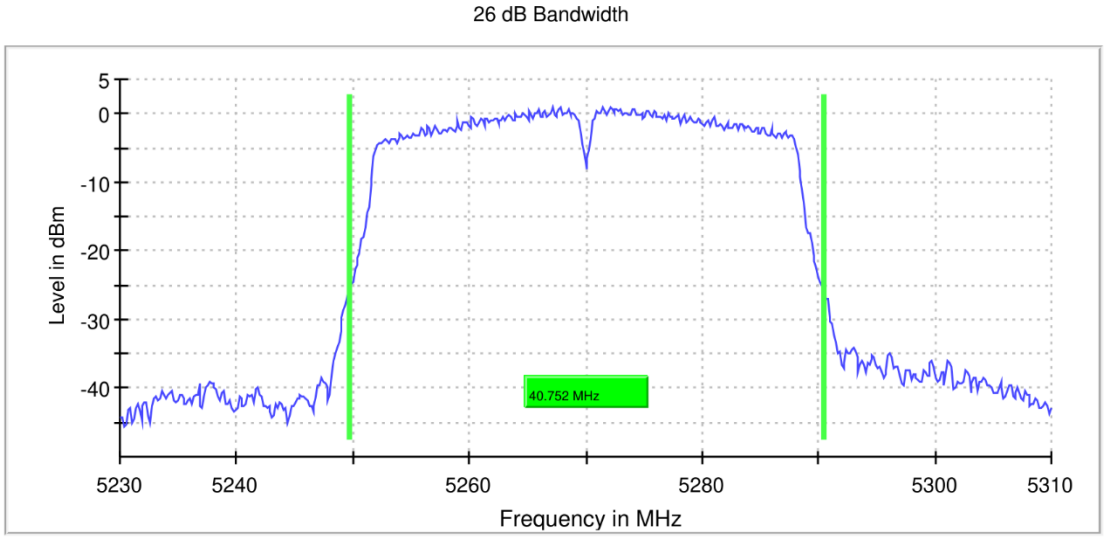
11N40 _ANT4_5190



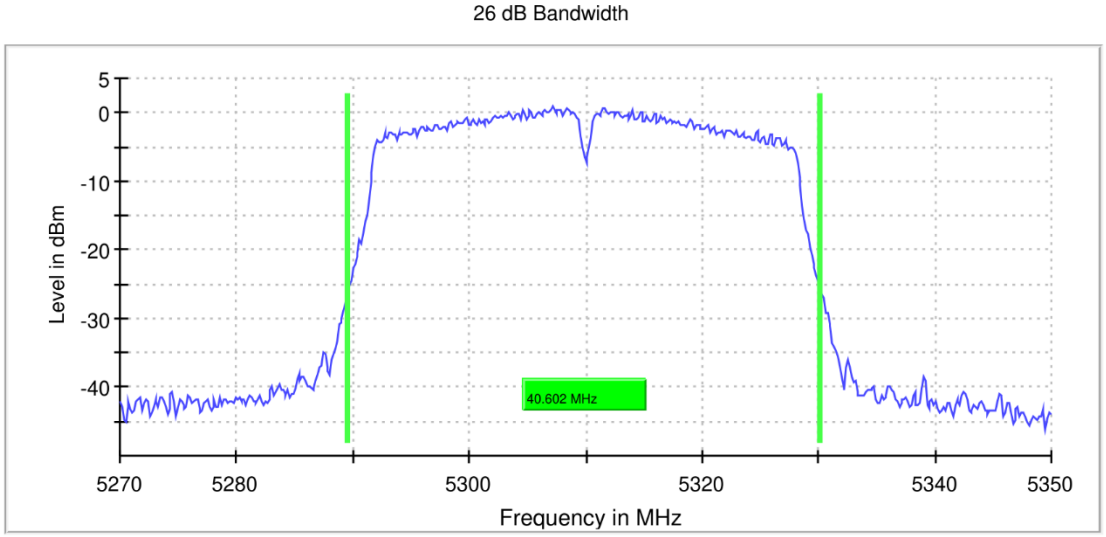
11N40 _ANT4_5230



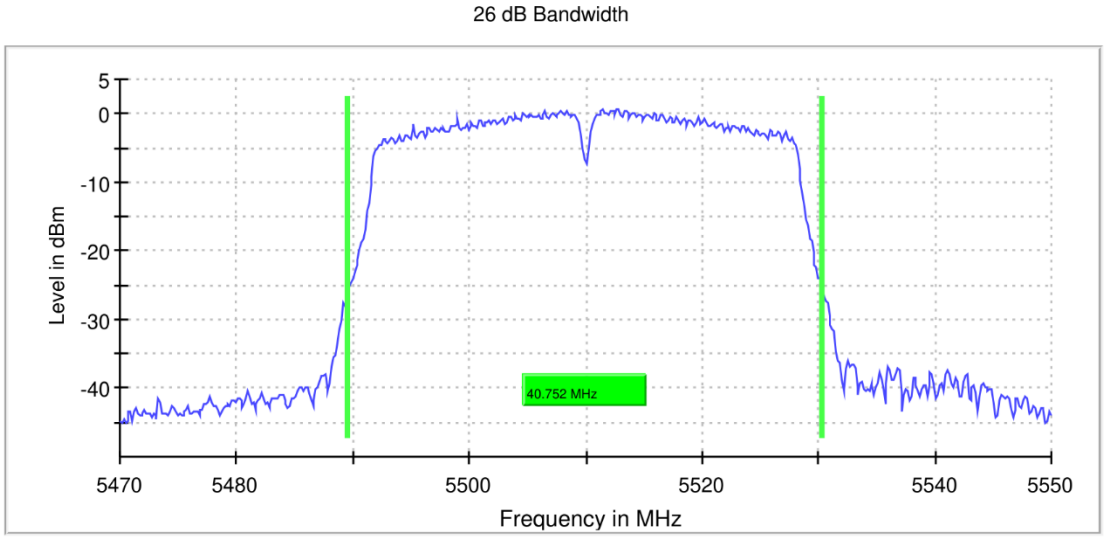
11N40 _ANT4_5270



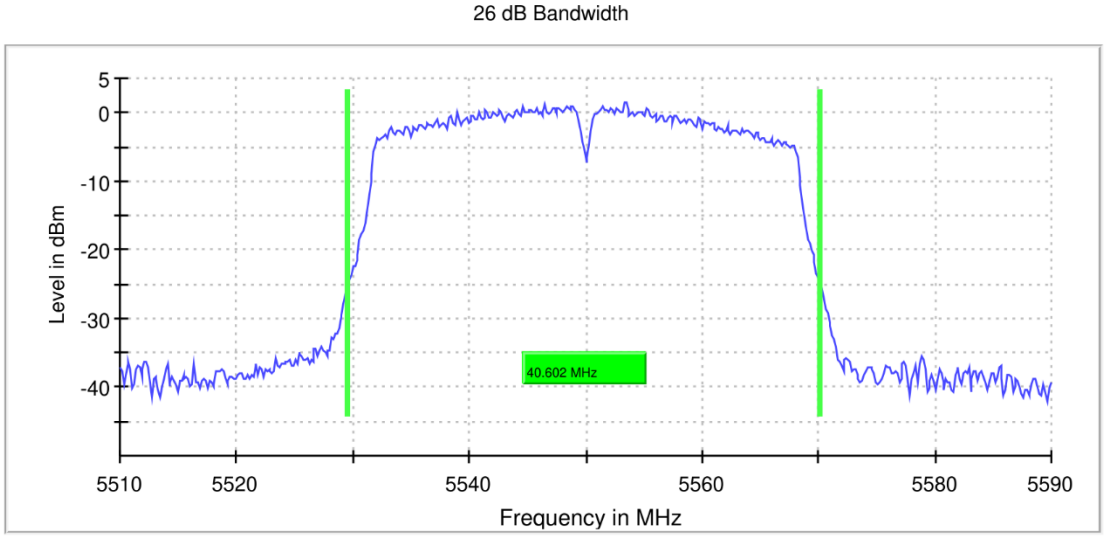
11N40 _ANT4_5310



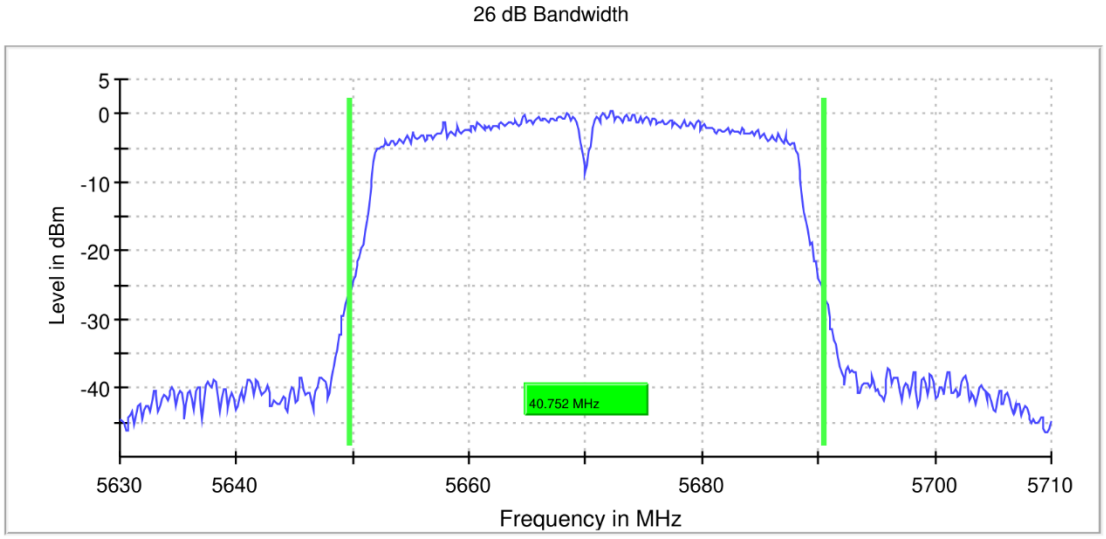
11N40 _ANT4_5510



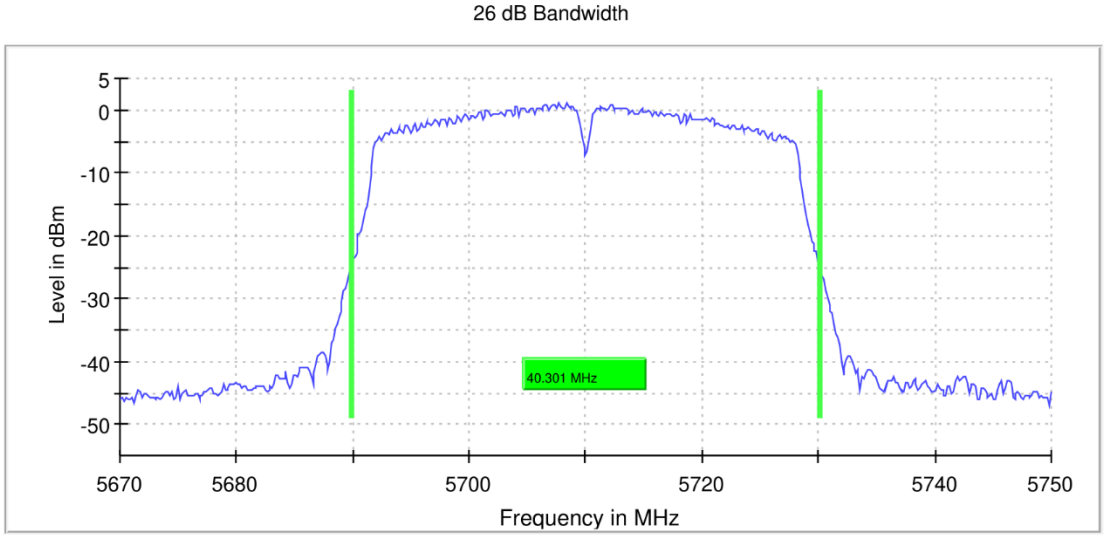
11N40 _ANT4_5550



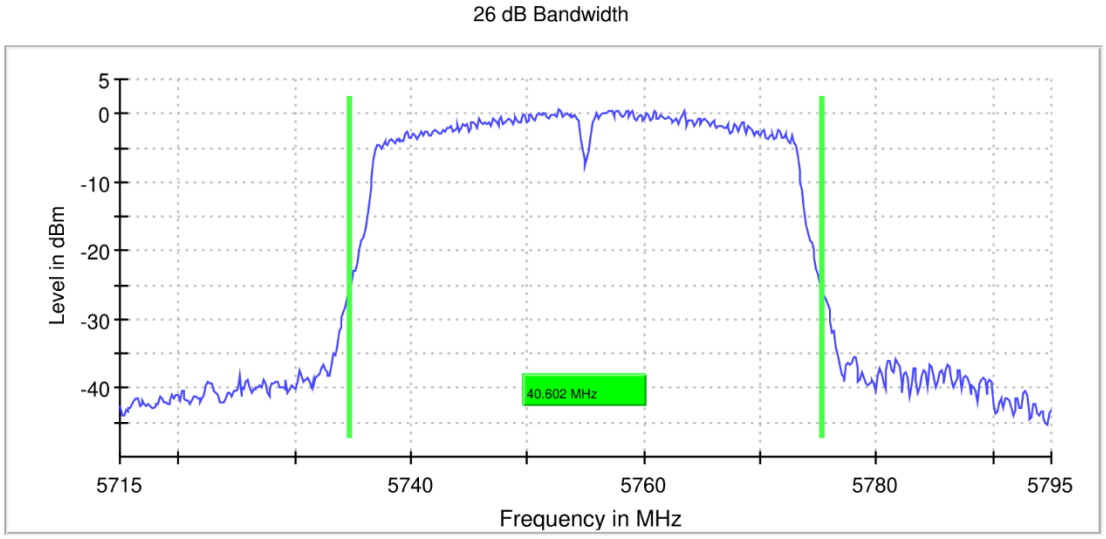
11N40 _ANT4_5670



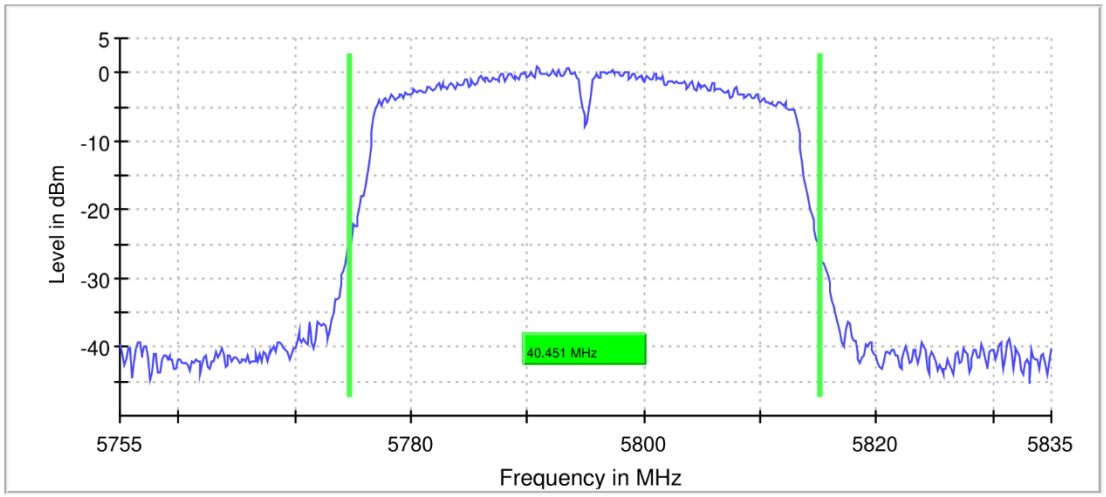
11N40 _ANT4_5710



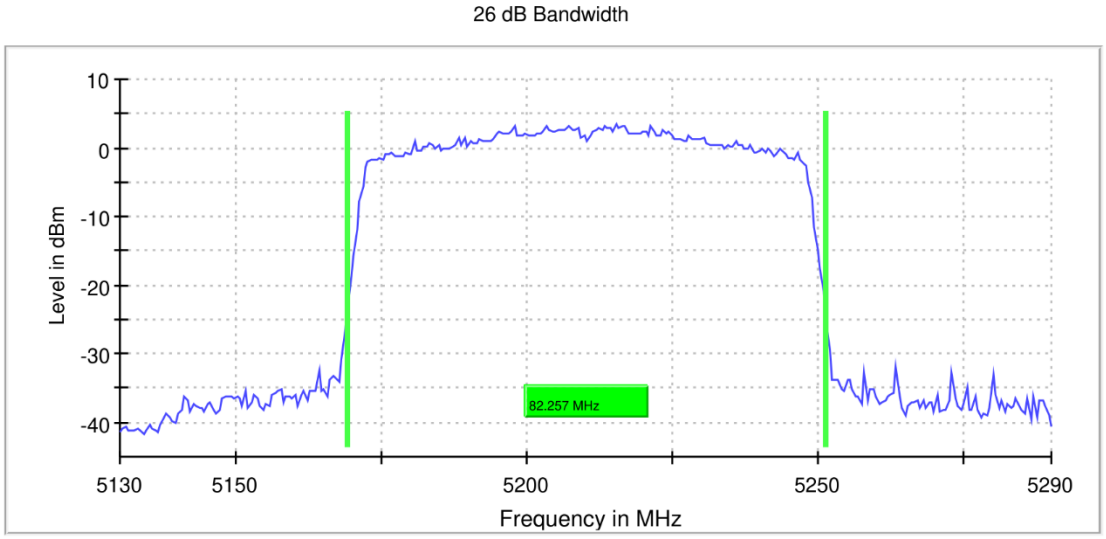
11N40 _ANT4_5755



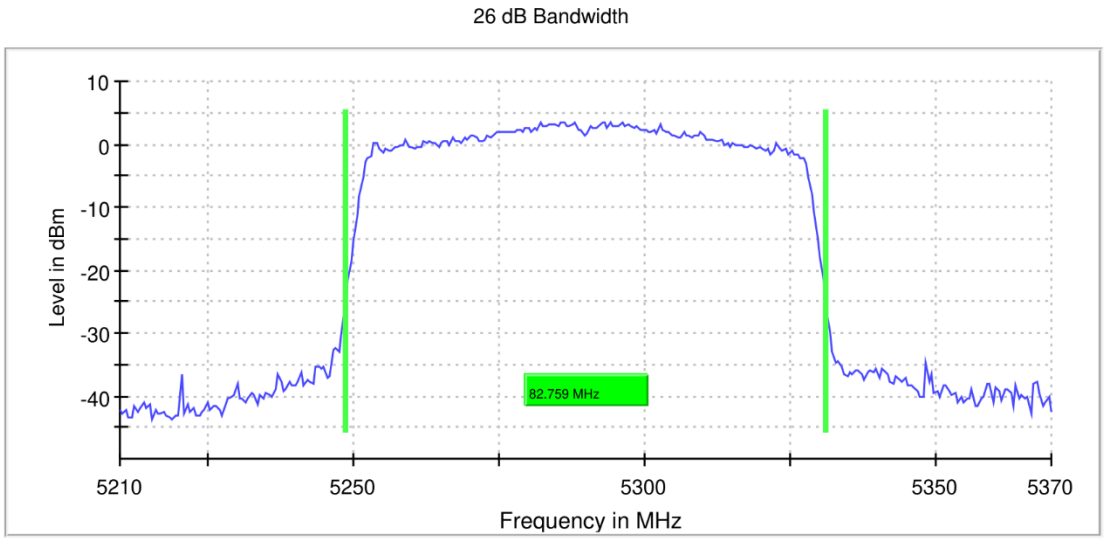
11N40 _ANT4_5795



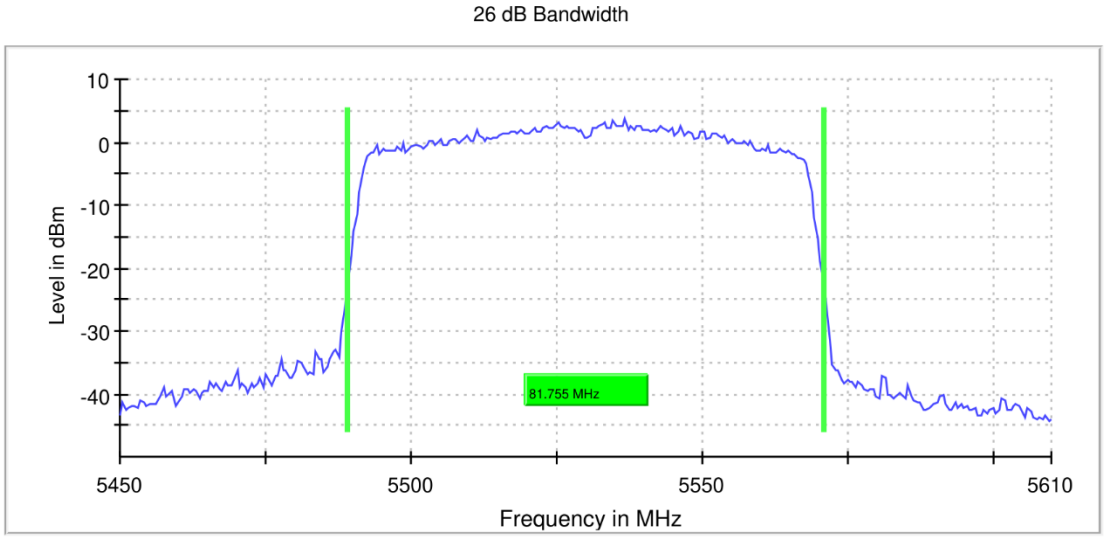
11AC80 _ANT4_5210



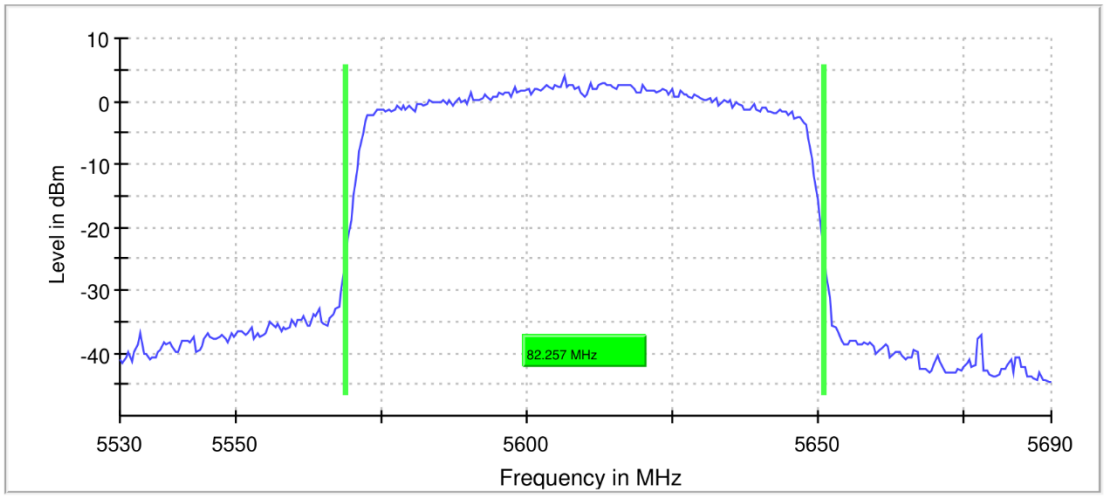
11AC80 _ANT4_5290



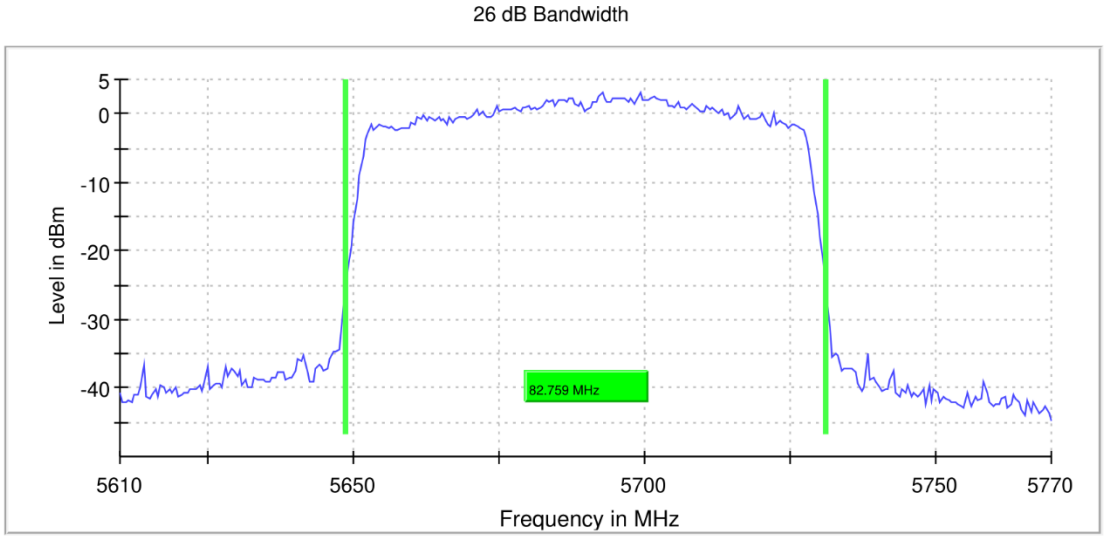
11AC80 _ANT4_5530



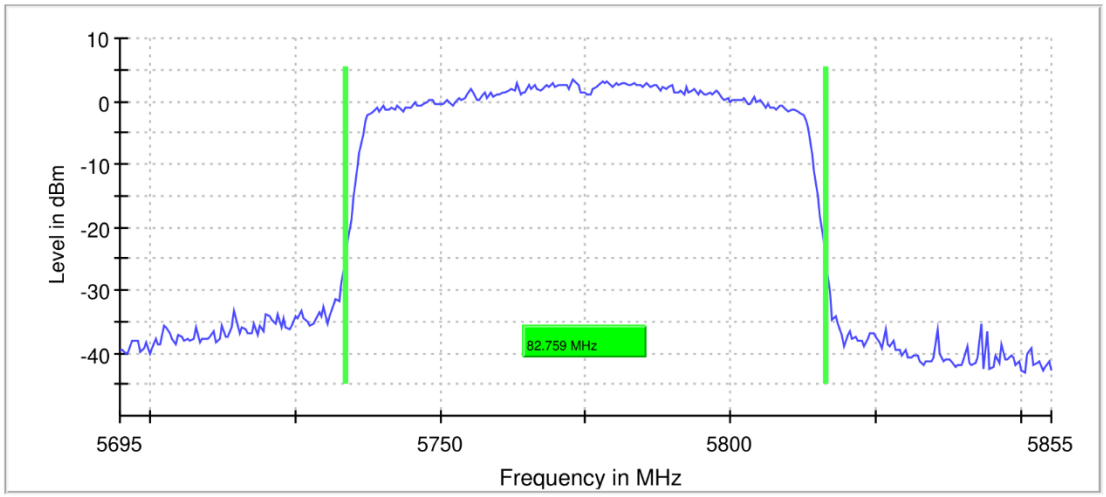
11AC80 _ANT4_5610



11AC80 _ANT4_5690



11AC80 _ANT4_5775



20M

RBW200 KHz

VBW 1 MHz

40M

RBW500 KHz

VBW 2 MHz

80M

RBW 1.000 MHz

VBW 3.000 MHz

OCCUPIED CHANNEL BANDWIDTH

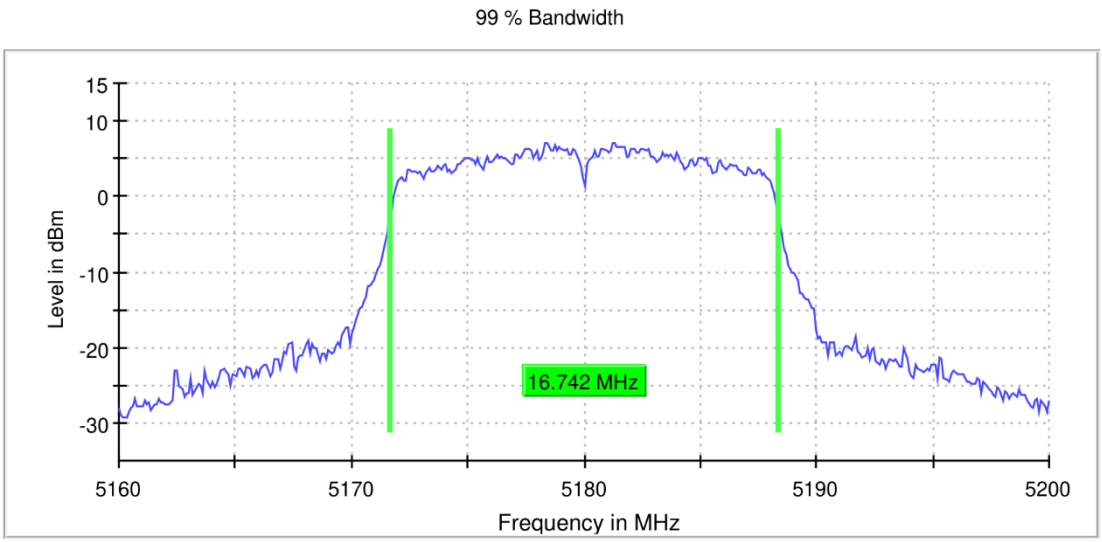
TEST RESULT

TestMode	Antenna	Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	ANT4	5180	16.742	5171.629	5188.371	---	---
	ANT4	5200	16.642	5191.729	5208.371	---	---
	ANT4	5240	16.742	5231.629	5248.371	---	---
	ANT4	5260	16.642	5251.729	5268.371	---	---
	ANT4	5300	16.642	5291.629	5308.271	---	---
	ANT4	5320	16.642	5311.629	5328.271	---	---
	ANT4	5500	16.541	5491.729	5508.270	---	---
	ANT4	5580	16.541	5571.729	5588.270	---	---
	ANT4	5700	16.642	5691.729	5708.371	---	---
	ANT4	5720	16.642	5711.629	5728.271	---	---
	ANT4	5745	16.541	5736.729	5753.270	---	---
	ANT4	5785	16.541	5776.729	5793.270	---	---
	ANT4	5825	16.541	5816.729	5833.270	---	---
11N20	ANT4	5180	17.744	5171.128	5188.872	---	---
	ANT4	5200	17.644	5191.228	5208.872	---	---
	ANT4	5240	17.744	5231.128	5248.872	---	---
	ANT4	5260	17.744	5251.128	5268.872	---	---
	ANT4	5300	17.744	5291.128	5308.872	---	---
	ANT4	5320	17.644	5311.128	5328.772	---	---
	ANT4	5500	17.744	5491.128	5508.872	---	---
	ANT4	5580	17.644	5571.228	5588.872	---	---
	ANT4	5700	17.644	5691.228	5708.872	---	---
	ANT4	5720	17.644	5711.128	5728.772	---	---
	ANT4	5745	17.644	5736.228	5753.872	---	---
	ANT4	5785	17.644	5776.228	5793.872	---	---
	ANT4	5825	17.744	5816.128	5833.872	---	---
11N40	ANT4	5190	36.364	5171.818	5208.182	---	---
	ANT4	5230	36.364	5211.818	5248.182	---	---
	ANT4	5270	36.364	5251.818	5288.182	---	---
	ANT4	5310	36.364	5291.818	5328.182	---	---
	ANT4	5510	36.364	5491.818	5528.182	---	---

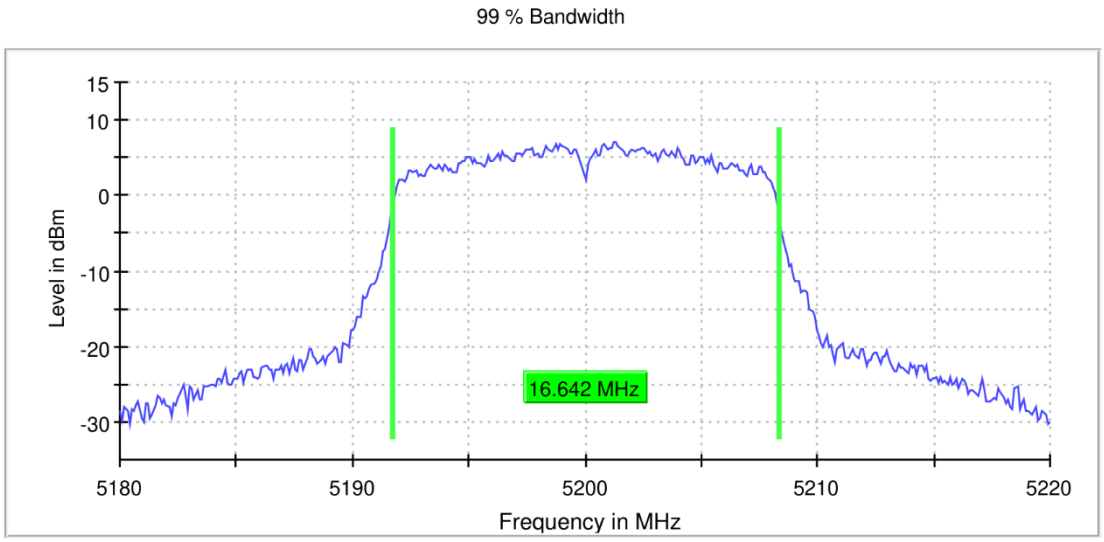
	ANT4	5550	36.364	5531.818	5568.182	---	---
	ANT4	5670	36.364	5651.818	5688.182	---	---
	ANT4	5710	36.364	5691.818	5728.182	---	---
	ANT4	5755	36.364	5736.818	5773.182	---	---
	ANT4	5795	36.364	5776.818	5813.182	---	---
11AC80	ANT4	5210	75.737	5172.132	5247.869	---	---
	ANT4	5290	75.737	5252.132	5327.869	---	---
	ANT4	5530	75.737	5492.132	5567.869	---	---
	ANT4	5610	75.737	5572.132	5647.869	---	---
	ANT4	5690	75.737	5652.132	5727.869	---	---
	ANT4	5775	75.737	5737.132	5812.869	---	---

TEST GRAPHS

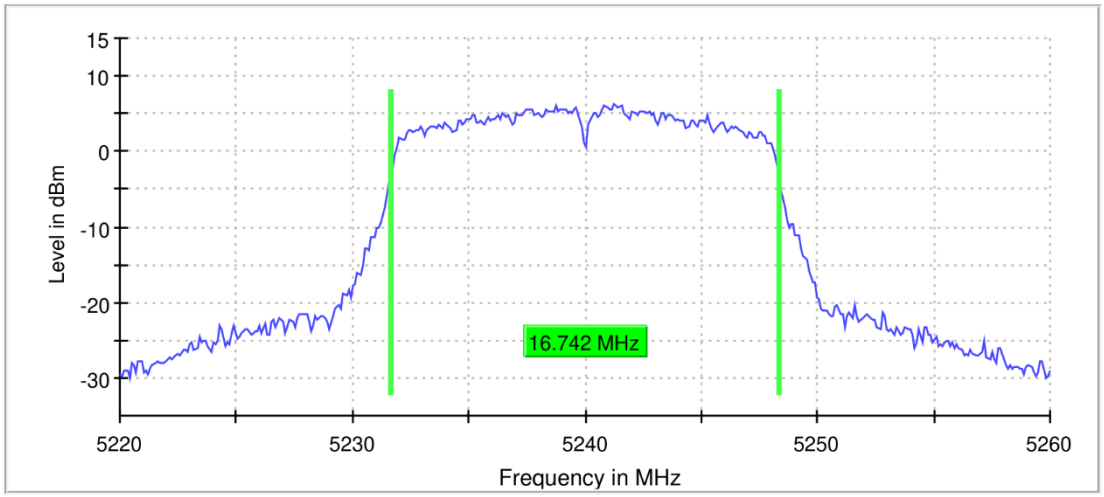
11A_ANT4_5180



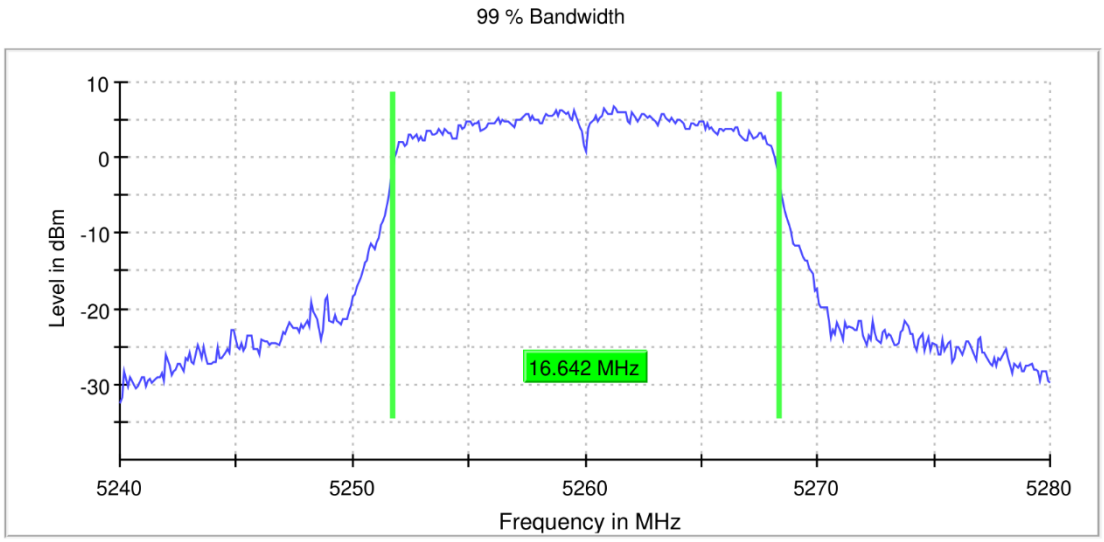
11A _ANT4_5200



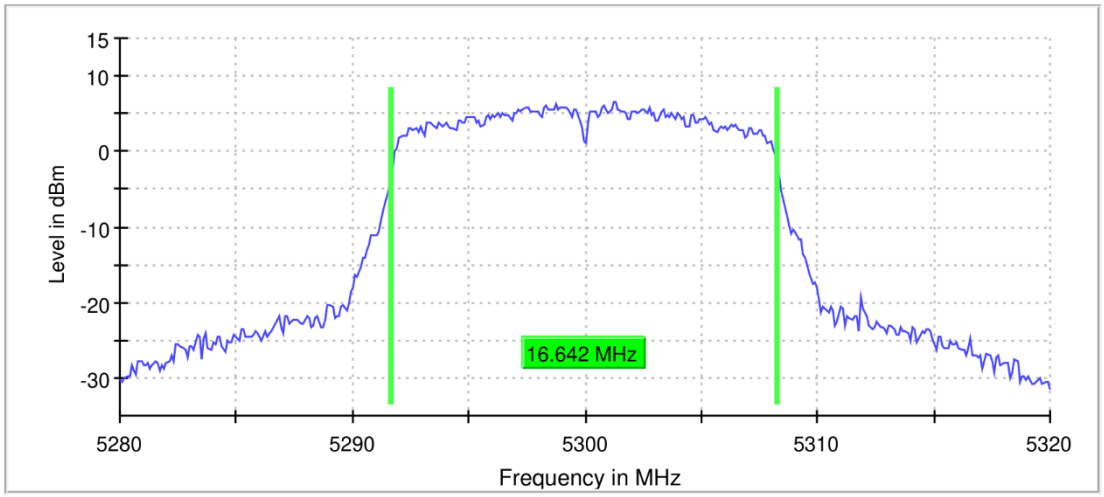
11A _ANT4_5240



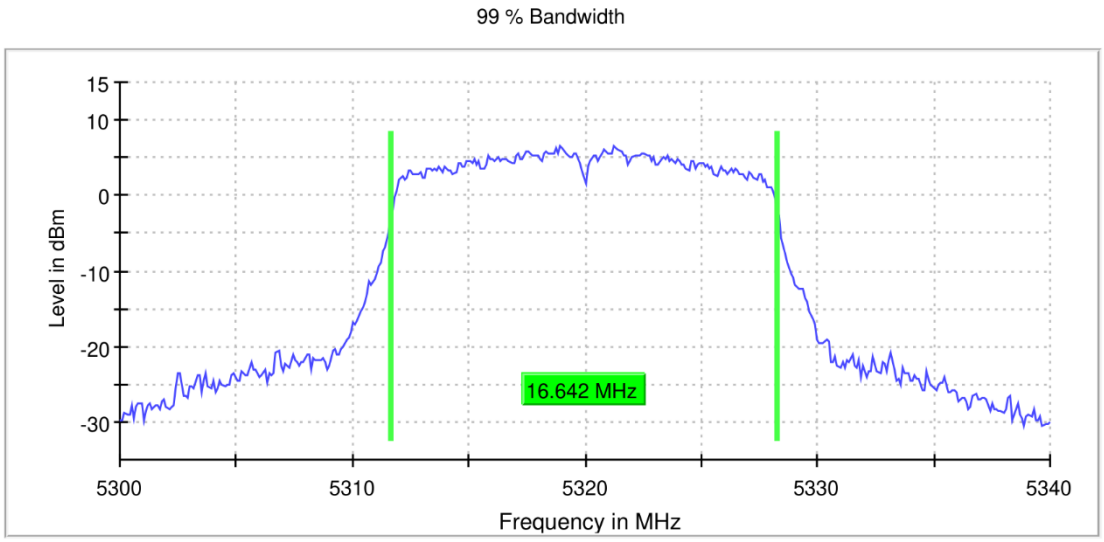
11A _ANT4_5260



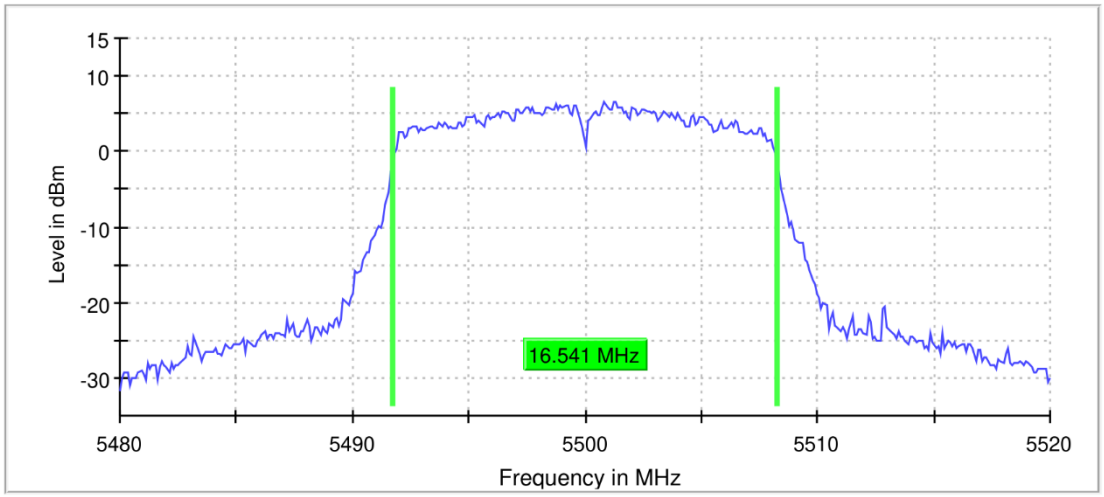
11A _ANT4_5300



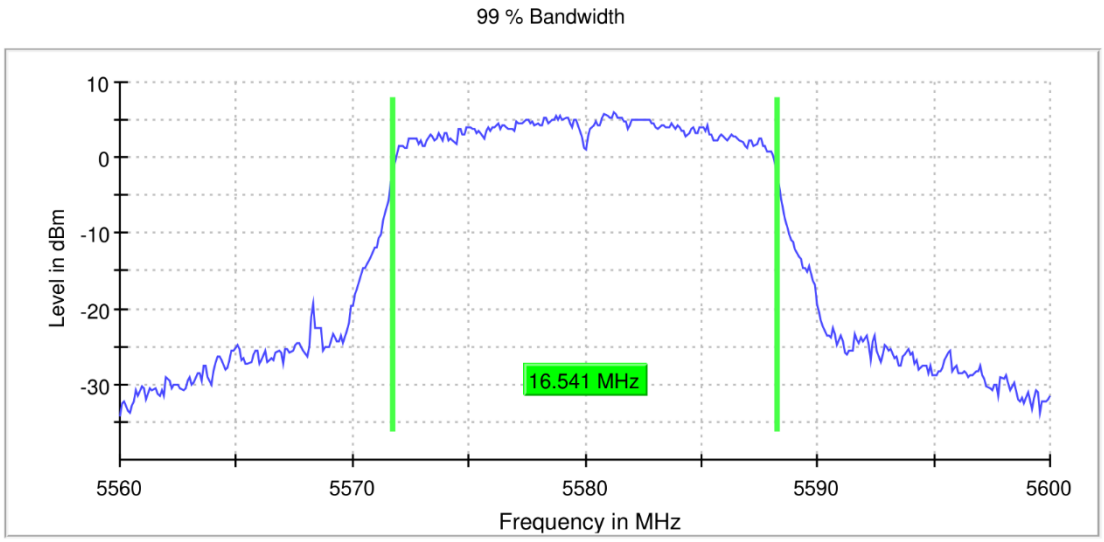
11A _ANT4_5320



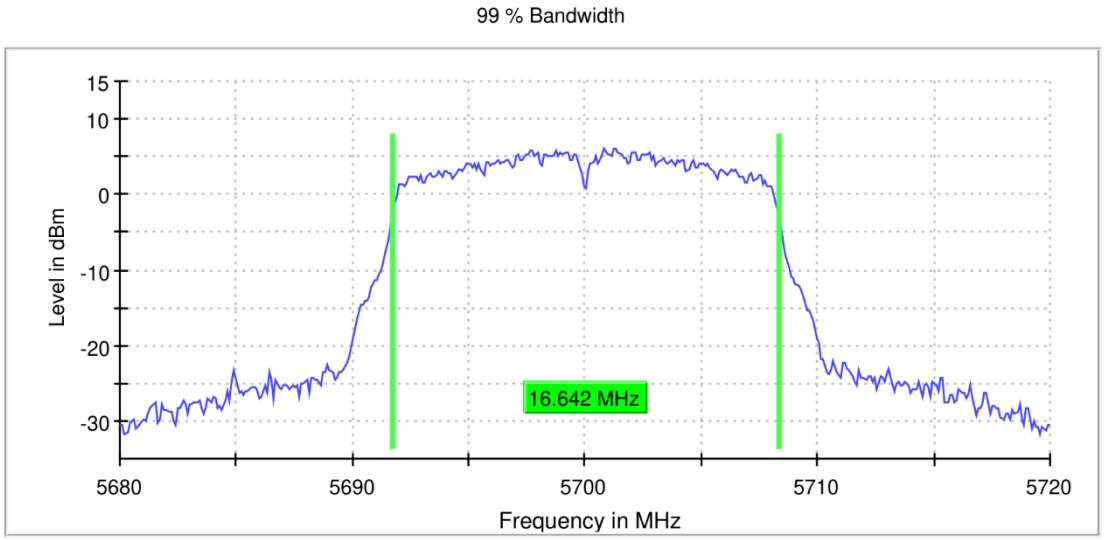
11A _ANT4_5500



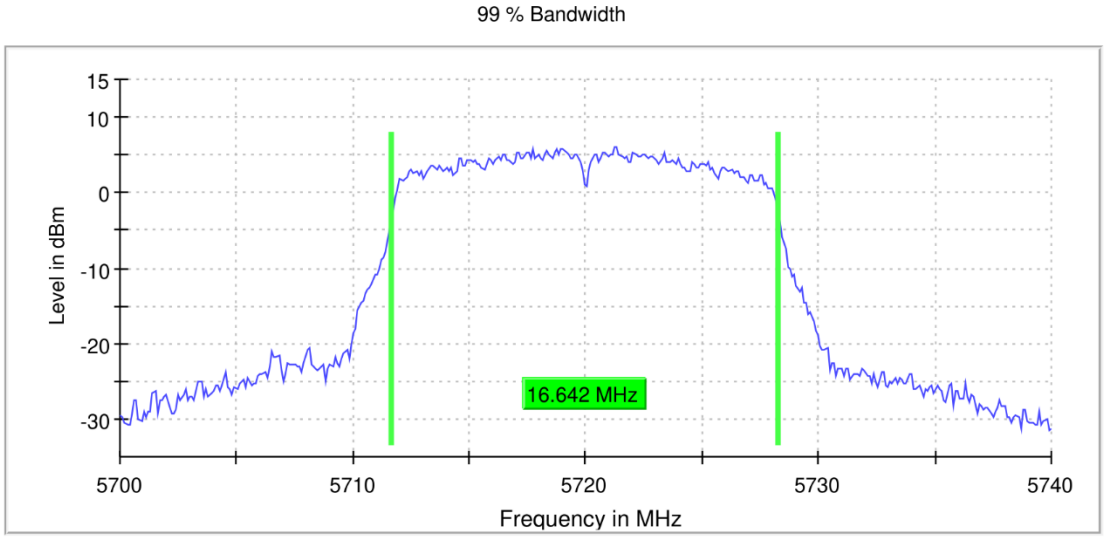
11A _ANT4_5580



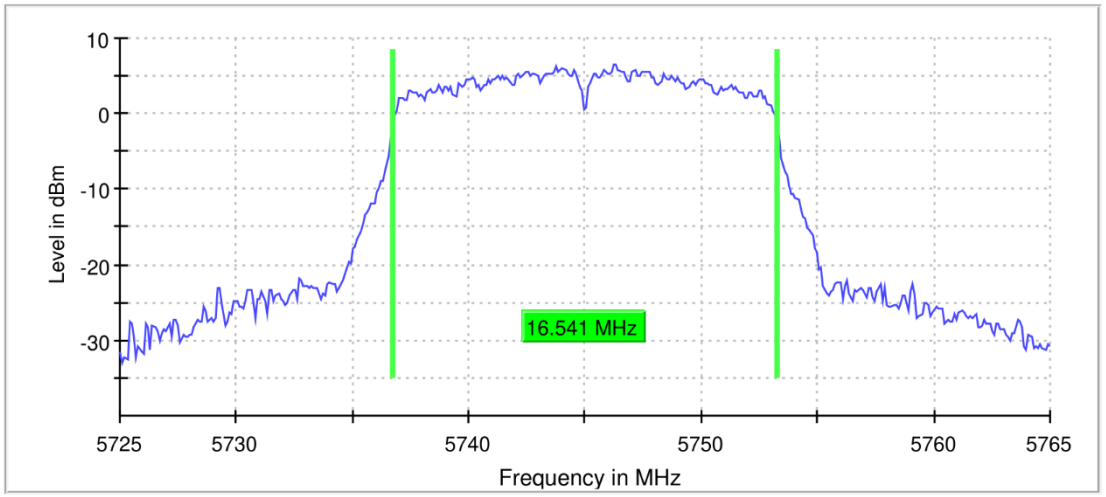
11A _ANT4_5700



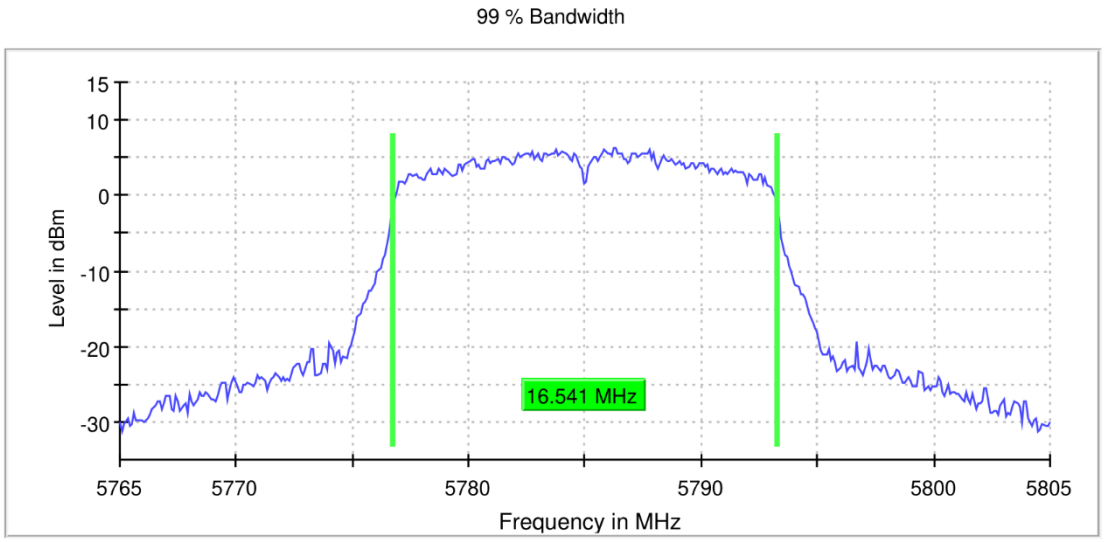
11A _ANT4_5720



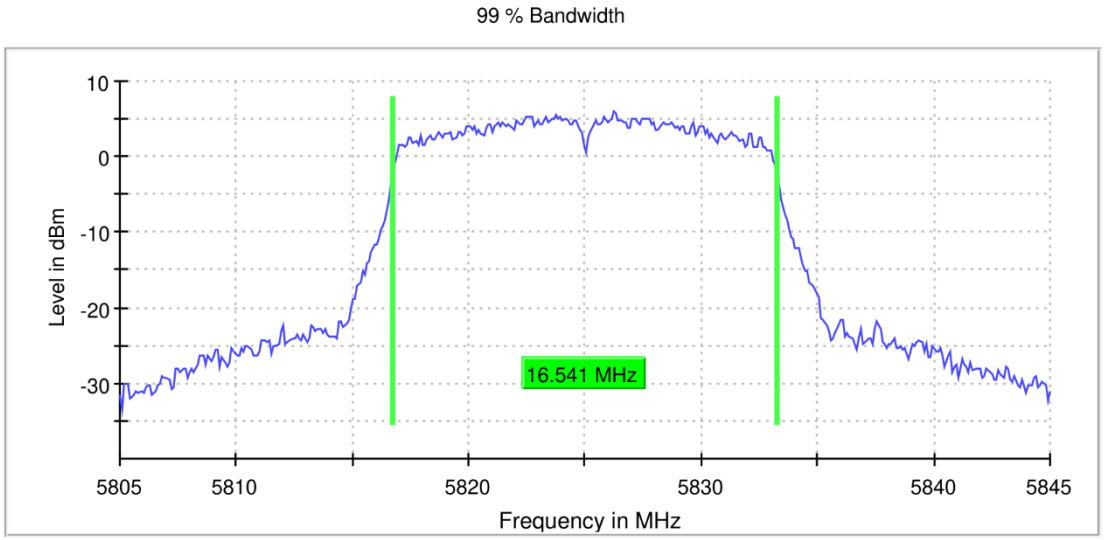
11A _ANT4_5745



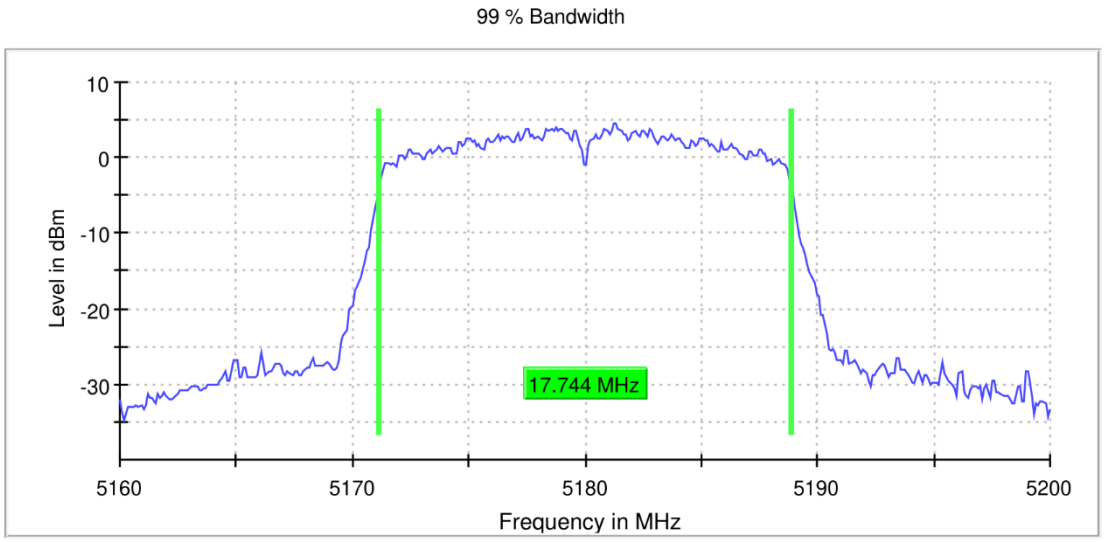
11A _ANT4_5785



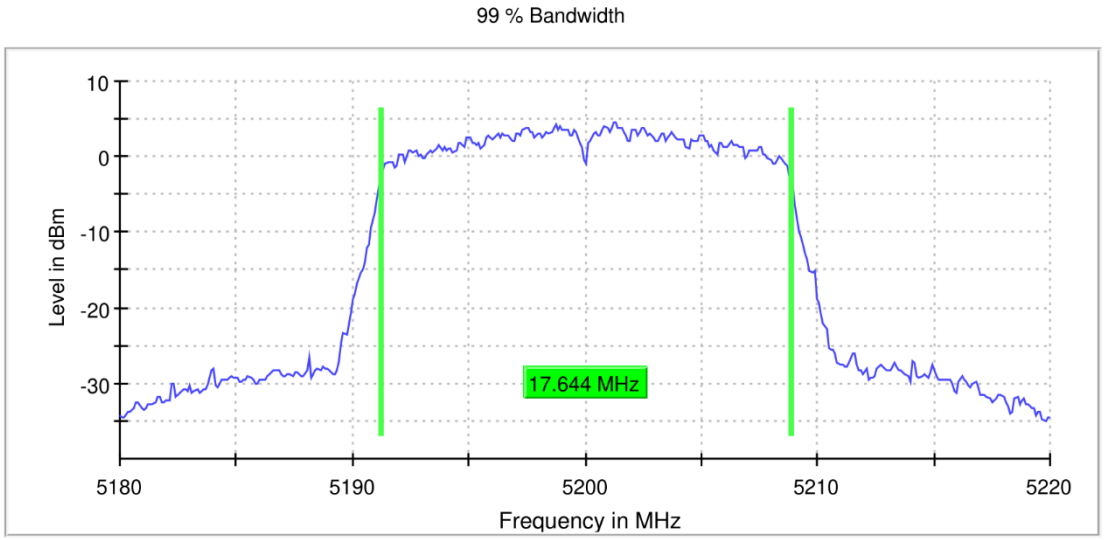
11A_ANT4_5825



11N20_ANT4_5180



11N20 _ANT4_5200



11N20 _ANT4_5240