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FCC TEST REPORT

Application No:	HR201880006
Applicant:	Orion Labs, Inc
Address of Applicant	208 Utah Street Suite 350 San Francisco California United States
Manufacturer:	Orion Labs, Inc
Address of Manufacturer	208 Utah Street Suite 350 San Francisco California United States
Factory:	Fujian Star-net CommunicationCo.,Ltd
Address of Factory	3F,Bldg 1,Star-Net Science-based Haixi Industrial Pack,No. 9 GaoxinRoad,MinhouCounty,Fuzhou, China
EUT Description:	Orion Sync
Model Name:	ROS-001-VZ
Trade Mark::	Orion Labs
FCC ID:	2ANZ3ROS001VZ
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR FCC Part 15, Subpart C 47 CFR FCC Part 15, Subpart E
Test Method	KDB 789033 D02 General UNII Test Procedures New Rules v02 FCC KDB 558074 D01 DTS Meas Guidance v05 KDB 662911 D01 Multiple Transmitter Output v02r01 KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 KDB 905462 D03 Client Without DFS New Rules v01r02 ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices
Date of Receipt:	2018/10/15
Date of Test:	2018/10/16 to 2018/11/22
Date of Issue:	2018/11/22
Test Result:	**PASS ***

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

Authorized Signature:

Derek Yang
Wireless Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00		2018/11/22		Original

Authorized for issue by:				
Tested By		Mike Hu **(Mike Hu) /Project Engineer**		2018/11/22 **Date**
Checked By		David Chen **(David Chen) /Reviewer**		2018/11/22 **Date**

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2 Test Summary

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
Emission Bandwidth	5150-5250	15.403(i) 15.407(a)(1)	No limit.	Clause 4.4 Clause 4.5	Pass
	5250-5350	15.403(i) 15.407(a)(2)			
	5470-5725	15.403(i) 15.407(a)(2)			
	5725-5850	15.403(i) 15.407(e)	≥ 500 kHz.		
Occupied Bandwidth	5150-5250	KDB 789033 D02§ D	No limit.		Pass
	5250-5350				
	5470-5725				
	5725-5850				
Duty Cycle	5150-5850	--	No limit.		Pass
Maximum Conducted Output Power	5150-5250	15.407(a)(1) 15.407(a)(4)	FCC < 250mW (avg during transmission)	Clause 4.3	
	5250-5350	15.407(a)(2) 15.407(a)(4)	<MIN{250mW,11dBm+10*lg(EBW)} (avg during transmission)		
	5470-5725	15.407(a)(2) 15.407(a)(4)	<MIN{250mW,11dBm+10*lg(EBW)} (avg during transmission)		
	5725-5850	15.407(a)(3)	< 1W (avg during transmission)		
maximum Power Spectral Density	5150-5250	15.407(a)(1) 15.407(a)(4)	<11dBm/MHz (avg during transmission)	Clause 4.6	
	5250-5350	15.407(a)(2) 15.407(a)(4)	<11dBm/MHz (avg during transmission)		
	5470-5725	15.407(a)(2) 15.407(a)(4)	<11dBm/MHz (avg during transmission)		
	5725-5850	15.407(a)(3) 15.407(a)(4)	<30dBm/500KHz (avg during transmission)		
Unwanted Emissions that	5150-5250	15.407(b)(1)	F<1GHz: §15.209/§7.2.5 limit (QP).	Clause 4.7	Pass

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Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
fall Outside of the Restricted Bands(Radiated)		15.407(b)(6) 15.407(b)(7) 15.209	F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.15-5.35 GHz). F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).		
	5250-5350	15.407(b)(2) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.25-5.35 GHz). F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).		
	5470-5750	15.407(b)(3) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.47-5.725 GHz). F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).		
	5725-5850	15.407(b)(4) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP) F≥1GHz &out-restricted:(QP) a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges. F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).		
Unwanted Emissions in the Restricted Bands (Radiated)	5150-5250 5250-5350 5470-5725 5725-5850	15.209	FCC: Part 15.209	Clause 4.8	Pass
AC Power Line Conducted Emissions	5150-5250 5250-5350 5470-5725 5725-5850	15.207	FCC:Part 15.207 conducted limit;	Clause 4.2	Pass
Frequency Stability	5150-5250 5250-5350	RSS-Gen, 6.11	----	Clause 4.9	Pass

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<table>
<tr><th>Test Item</th><th>Band</th><th>FCC Rule</th><th>Requirements</th><th>Test Result</th><th>Verdict</th></tr>
<tr><td></td><td>5470-5600
5650-5725
5725-5850</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Dynamic Frequency Selection</td><td>5250-5350
5470-5725</td><td>47 CFR Part 15, Subpart E 15.407</td><td>
<table>
<tr><th>Parameter</th><th>Value</th></tr>
<tr><td>Non-occupancy period</td><td>Minimum 30 minutes</td></tr>
<tr><td>Channel Availability Check Time</td><td>60 seconds</td></tr>
<tr><td>Channel Move Time</td><td>10 seconds
See Note 1.</td></tr>
<tr><td>Channel Closing Transmission Time</td><td>200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.
See Notes 1 and 2.</td></tr>
<tr><td>U-NII Detection Bandwidth</td><td>Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.</td></tr>
<tr><td colspan="2">Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.</td></tr>
</table>
</td><td>Clause 4.10</td><td>Pass</td></tr>
</table>

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3 General Information

3.1 Client Information

Applicant:	Orion Labs, Inc
Address of Applicant:	208 Utah Street Suite 350 San Francisco California United States
Manufacturer:	Orion Labs, Inc
Address of Manufacturer:	208 Utah Street Suite 350 San Francisco California United States
Factory:	Fujian Star-net CommunicationCo.,Ltd
Address of Factory:	3F,Bldg 1,Star-Net Science-based Haixi Industrial Pack,No. 9 GaoxinRoad,MinhouCounty,Fuzhou, China

3.2 General Description of EUT

EUT Description:	Orion Sync	
Model Name:	ROS-001-VZ	
Trade Mark:	Orion Labs	
Hardware Version:	RA15_MB P4	
Software Version:	7.1.2	
IEEE 802.11 WLAN Mode Supported	☒ 802.11a (20 MHz channel bandwidth) ; ☒ 802.11n (20 MHz channel bandwidth); ☒ 802.11n (40 MHz channel bandwidth); ☒ 802.11ac (20 MHz channel bandwidth); ☒ 802.11ac (40 MHz channel bandwidth); ☒ 802.11ac (80 MHz channel bandwidth),	
Operation Frequency:	All	fc = 5000 MHz + N * 5 MHz, where: -fc = “Operating Frequency” in MHz, -N = “Channel Number”.
	5150-5250 MHz (U-NII)	N = 36 to 48 with step of 4 for the 20 MHz channel bandwidth. N = 38 to 46 with step of 8 for the 40 MHz channel bandwidth. N = 42 for the 80 MHz channel bandwidth.
	5250-5350 MHz (U-NII)	N = 52 to 64 with step of 4 for the 20 MHz channel bandwidth. N = 54 to 62 with step of 8 for the 40 MHz channel bandwidth. N = 58 for the 80 MHz channel bandwidth.
	5470-5650 MHz (U-NII) (for FCC)	N = 100 to 128 with step of 4 for the 20 MHz channel bandwidth. N = 102 to 126 with step of 8 for the 40 MHz channel bandwidth. N = 106 to 122 with step of 16 for the 80 MHz channel bandwidth.
	5650-5725 MHz (U-NII)	N = 132 to 144 with step of 4 for the 20 MHz channel bandwidth. N = 134 to 142 with step of 8 for the 40 MHz channel bandwidth. N = 138 for the 80 MHz channel bandwidth.

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	5725-5850MHz(U-NII)	N = 149 to 165 with step of 4 for the 20 MHz channel bandwidth. N = 151 to 159 with step of 8 for the 40 MHz channel bandwidth. N = 155 for the 80 MHz channel bandwidth.
	* The 5580-5650MHz can not be used.	
Type of Modulation:	IEEE 802.11a: OFDM(BPSK/QPSK/16QAM/64QAM) IEEE 802.11n: OFDM(BPSK/QPSK/16QAM/64QAM) IEEE 802.11ac: OFDM(BPSK/QPSK/16QAM/64QAM/256QAM)	
DFS mode:	☐Master ☐ Slave with radar detection ☒Slave without radar detection	
Sample Type:	☒ Portable Device, ☐Module	
Antenna Type:	☐ External, ☒ Integrated	
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3	
Smart System	☒ SISO (for 802.11a/n/ac), ☐ MIMO (for 802.11n/ac), ☐ Diversity (for 802.11a) : Tx & Rx	
Antenna Gain:	3.8dBi,	
Power Supply	☒ AC/DC Adapter; ☐ PoE:; ☐ Other:	

Remark:

In FCC 15.31, for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table, and the selected channel to perform the test as below:

Frequency Range of Operation Operating Frequency Range (in each Band)	Number of Measurement Frequencies Required	Location of Measurement Frequency in Band of Operation
1 MHz or less	1	centre
1 MHz to 10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near centre

For UNII Band I:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5180
	The Middle channel	5200
	The Highest channel	5240
IEEE 802.11n/ac 40MHz	The Lowest channel	5190
	The Highest channel	5230
IEEE 802.11ac 80MHz	The Middle channel	5210

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For UNII Band II-A:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5260
	The Middle channel	5280
	The Highest channel	5320
IEEE 802.11n/ac 40MHz	The Lowest channel	5270
	The Highest channel	5310
IEEE 802.11ac 80MHz	The Middle channel	5290

For UNII Band II-C:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5500
	The Middle channel	5600
	The Highest channel	5720
IEEE 802.11n/ac 40MHz	The Lowest channel	5510
	The Middle channel	5670
	The Highest channel	5710
IEEE 802.11ac 80MHz	The Lowest channel	5530
	The Highest channel	5690

For UNII Band III:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5745
	The Middle channel	5785
	The Highest channel	5825
IEEE 802.11n/ac 40MHz	The Lowest channel	5755
	The Highest channel	5795
IEEE 802.11ac 80MHz	The Middle channel	5775

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3.3 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	55 % RH
Atmospheric Pressure:	101.32 KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

3.4 Description of Support Units

The EUT has been tested independent unit.

3.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch,
No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.
Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

3.6 Test Facility

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

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

3.7 Deviation from Standards

None.

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3.8 Abnormalities from Standard Conditions

None.

3.9 Other Information Requested by the Customer

None.

4 Test results and Measurement Data

4.1 Antenna Requirement

Test Requirement:	47 CFR Part 15 Section 15.203
The antenna is integrated antenna and no consideration of replacement. The best case gain of the antenna is 3.8dBi.	

4.2 Conducted Emissions

Test Requirement:	47 CFR Part 15 Section 15.407(b)		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	* Decreases with the logarithm of the frequency.		
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of		

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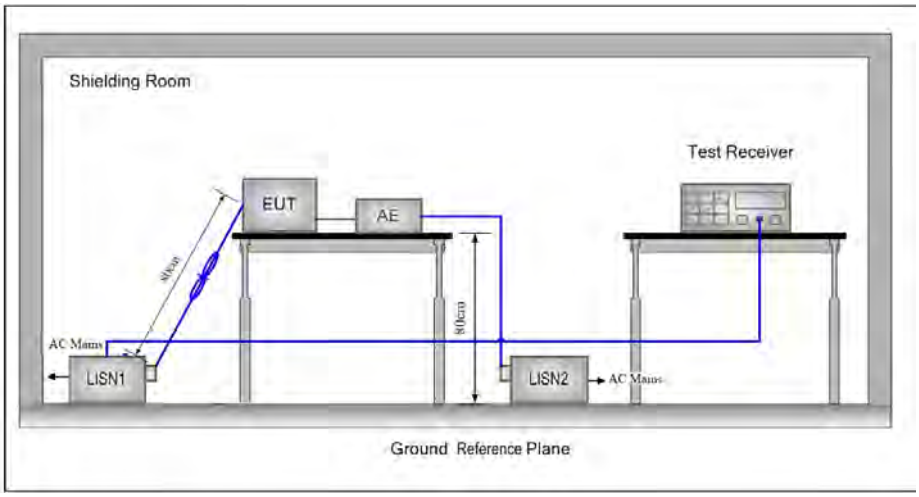
	equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate of 802.11a at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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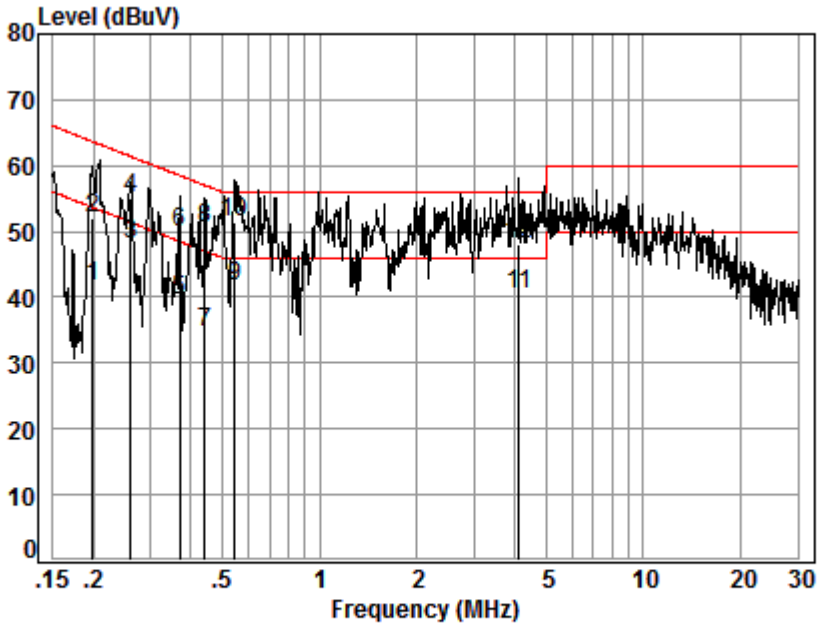
Live Line:



Site : Shielding Room
Condition: Line
Job No. : 80005
Test mode: e

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.20	0.02	9.66	32.12	41.80	53.67	-11.87	Average
2	0.20	0.02	9.66	42.36	52.04	63.67	-11.63	QP
3	0.26	0.03	9.67	38.22	47.92	51.42	-3.50	Average
4	0.26	0.03	9.67	45.46	55.16	61.42	-6.26	QP
5	0.37	0.05	9.67	29.73	39.45	48.52	-9.07	Average
6	0.37	0.05	9.67	40.09	49.81	58.52	-8.71	QP
7	0.44	0.06	9.67	25.08	34.81	47.02	-12.21	Average
8	0.44	0.06	9.67	40.68	50.41	57.02	-6.61	QP
9	0.55	0.06	9.67	31.92	41.65	46.00	-4.35	Average
10	0.55	0.06	9.67	41.67	51.40	56.00	-4.60	QP
11	4.14	0.16	9.72	30.47	40.35	46.00	-5.65	Average
12	4.14	0.16	9.72	38.21	48.09	56.00	-7.91	QP

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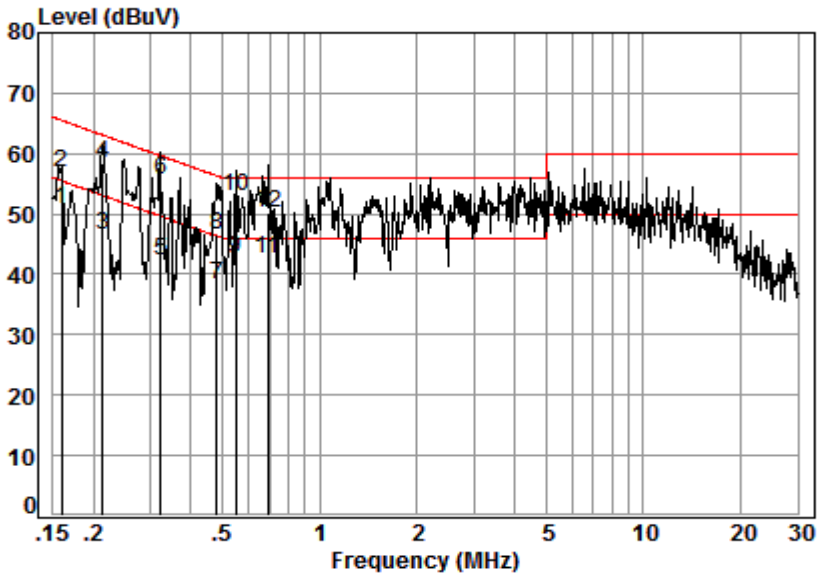
Neutral Line:



Site : Shielding Room
Condition: Neutral
Job No. : 80005
Test mode: e

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.16	0.01	9.63	41.24	50.88	55.52	-4.64	Average
2	0.16	0.01	9.63	47.27	56.91	65.52	-8.61	QP
3	0.21	0.02	9.64	36.83	46.49	53.05	-6.56	Average
4	0.21	0.02	9.64	48.78	58.44	63.05	-4.61	QP
5	0.32	0.04	9.64	32.66	42.34	49.66	-7.32	Average
6	0.32	0.04	9.64	45.85	55.53	59.66	-4.13	QP
7	0.48	0.06	9.64	28.54	38.24	46.32	-8.08	Average
8	0.48	0.06	9.64	36.94	46.64	56.32	-9.68	QP
9	0.55	0.06	9.64	32.92	42.62	46.00	-3.38	Average
10	0.55	0.06	9.64	43.15	52.85	56.00	-3.15	QP
11	0.69	0.07	9.65	32.77	42.49	46.00	-3.51	Average
12	0.69	0.07	9.65	40.53	50.25	56.00	-5.75	QP

Remarks:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

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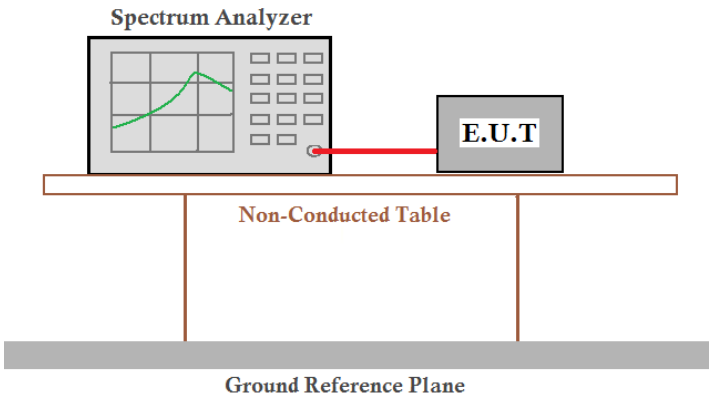
4.3 Conducted Output Power

Test Requirement:	47 CFR Part 15 Section 15.407(a)	
Test Method:	ANSI C63.10: 2013	
Test Setup:		
Test Instruments:	Refer to section 5.10 for details	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Through Pre-scan, find that 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT20); MCSAC0 of rate is the worst case of 802.11ac(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT80) Only the worst case is recorded in the report.	
Limit:	Frequency Band	Limit
	5150-5250MHz	Not exceed 250mW(24dBm)
	5250-5350MHz	The lesser of 250mW(24dBm) or 11+ 10logB
	5470-5725MHz	The lesser of 250mW(24dBm) or 11+ 10logB
	5725-5850MHz	Not exceed 1W(30dBm)
	*Where B is the 26dB emission bandwidth in MHz	
Test Results:	Pass	

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Measurement Data:

Test Mode	Test Channel	Frequency [MHz]	Antenna Port	Meas. Level (Cond.) [dBm]	Meas. Level (EIRP) [dBm]	Verdict
11A20	36	5180	ANT 1	9.33	13.13	PASS
	44	5220	ANT 1	9.58	13.38	PASS
	48	5240	ANT 1	9.95	13.75	PASS
	52	5260	ANT 1	10.51	14.31	PASS
	60	5300	ANT 1	11	14.8	PASS
	64	5320	ANT 1	10.5	14.3	PASS
	100	5500	ANT 1	11.67	15.47	PASS
	116	5580	ANT 1	12.11	15.91	PASS
	140	5700	ANT 1	12.03	15.83	PASS
	149	5745	ANT 1	12.3	16.1	PASS
	157	5785	ANT 1	12.26	16.06	PASS
	165	5825	ANT 1	12.36	16.16	PASS
11N20	36	5180	ANT 1	8.09	11.89	PASS
	44	5220	ANT 1	8.45	12.25	PASS
	48	5240	ANT 1	8.66	12.46	PASS
	52	5260	ANT 1	6.49	10.29	PASS
	60	5300	ANT 1	6.93	10.73	PASS
	64	5320	ANT 1	6.43	10.23	PASS
	100	5500	ANT 1	7.15	10.95	PASS
	116	5580	ANT 1	10.37	14.17	PASS
	140	5700	ANT 1	10.48	14.28	PASS
	149	5745	ANT 1	10.3	14.1	PASS
	157	5785	ANT 1	10.48	14.28	PASS
	165	5825	ANT 1	10.43	14.23	PASS
11N40	38	5190	ANT 1	8.55	12.35	PASS
	46	5230	ANT 1	8.91	12.71	PASS
	54	5270	ANT 1	8.11	11.91	PASS
	62	5310	ANT 1	8.5	12.3	PASS
	102	5510	ANT 1	9.71	13.51	PASS
	110	5550	ANT 1	9.81	13.61	PASS
	134	5670	ANT 1	9.65	13.45	PASS
	151	5755	ANT 1	9.94	13.74	PASS
	159	5795	ANT 1	9.98	13.78	PASS
11AC20	36	5180	ANT 1	9.06	12.86	PASS
	44	5220	ANT 1	9.34	13.14	PASS
	48	5240	ANT 1	9.55	13.35	PASS

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	52	5260	ANT 1	6.58	10.38	PASS
	60	5300	ANT 1	6.95	10.75	PASS
	64	5320	ANT 1	7.15	10.95	PASS
	100	5500	ANT 1	10.26	14.06	PASS
	116	5580	ANT 1	10.44	14.24	PASS
	140	5700	ANT 1	10.25	14.05	PASS
	149	5745	ANT 1	10.43	14.23	PASS
	157	5785	ANT 1	10.32	14.12	PASS
	165	5825	ANT 1	10.51	14.31	PASS
11AC40	38	5190	ANT 1	8.89	12.69	PASS
	46	5230	ANT 1	8.85	12.65	PASS
	54	5270	ANT 1	8.88	12.68	PASS
	62	5310	ANT 1	8.98	12.78	PASS
	102	5510	ANT 1	8.88	12.68	PASS
	110	5550	ANT 1	8.93	12.73	PASS
	134	5670	ANT 1	8.94	12.74	PASS
	151	5755	ANT 1	8.95	12.75	PASS
	159	5795	ANT 1	8.89	12.69	PASS
11AC80	42	5210	ANT 1	7.09	10.89	PASS
	58	5290	ANT 1	6.89	10.69	PASS
	106	5530	ANT 1	6.88	10.68	PASS
	122	5610	ANT 1	6.93	10.73	PASS
	155	5775	ANT 1	6.96	10.76	PASS

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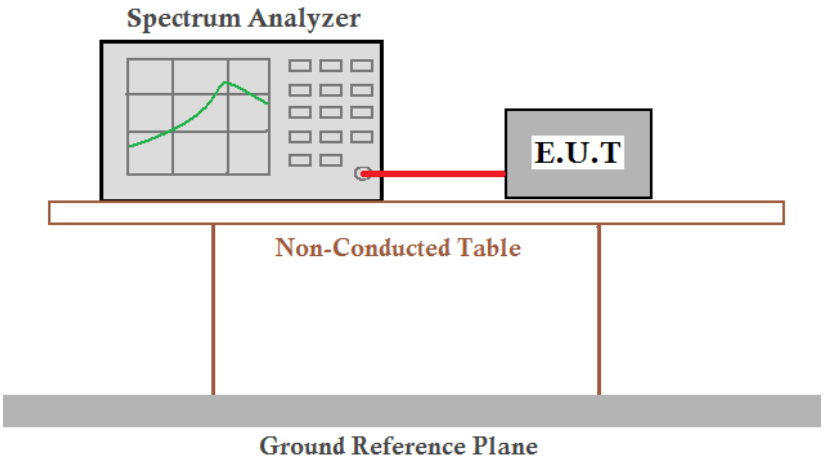
4.4 Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15 Section 15.407(a)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT20); MCSAC0 of rate is the worst case of 802.11ac(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT80). Only the worst case is recorded in the report.
Limit:	No restriction limits
Test Results:	Pass

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4.4.1 Measurement Data:

Test Mode	Test Channel	Frequency [MHz]	Antenna Port	26dB Emission Bandwidth [MHz]	Occupied Bandwidth [MHz]	Verdict
11A20	36	5180	ANT 1	21.14	16.66	PASS
	44	5220	ANT 1	21.14	16.66	PASS
	48	5240	ANT 1	21.10	16.66	PASS
	52	5260	ANT 1	21.18	16.58	PASS
	60	5300	ANT 1	21.26	16.62	PASS
	64	5320	ANT 1	21.18	17.92	PASS
	100	5500	ANT 1	21.06	16.66	PASS
	116	5580	ANT 1	21.14	16.62	PASS
	140	5700	ANT 1	21.06	16.62	PASS
11N20	36	5180	ANT 1	21.46	17.94	PASS
	44	5220	ANT 1	21.50	17.94	PASS
	48	5240	ANT 1	21.46	17.98	PASS
	52	5260	ANT 1	21.46	17.94	PASS
	60	5300	ANT 1	21.50	17.94	PASS
	64	5320	ANT 1	21.46	17.98	PASS
	100	5500	ANT 1	21.50	17.94	PASS
	116	5580	ANT 1	21.54	17.98	PASS
	140	5700	ANT 1	21.46	17.94	PASS
11N40	38	5190	ANT 1	39.96	36.28	PASS
	46	5230	ANT 1	39.64	36.36	PASS
	54	5270	ANT 1	39.72	36.28	PASS
	62	5310	ANT 1	39.64	36.36	PASS
	102	5510	ANT 1	39.72	36.28	PASS
	110	5550	ANT 1	39.64	36.28	PASS
	134	5670	ANT 1	39.72	36.36	PASS
11AC20	36	5180	ANT 1	21.54	17.98	PASS
	44	5220	ANT 1	21.54	17.98	PASS
	48	5240	ANT 1	21.50	17.98	PASS
	52	5260	ANT 1	21.50	17.98	PASS
	60	5300	ANT 1	21.50	17.94	PASS
	64	5320	ANT 1	21.50	17.98	PASS
	100	5500	ANT 1	21.70	18.02	PASS
	116	5580	ANT 1	21.66	17.98	PASS

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	140	5700	ANT 1	21.70	17.98	PASS
11AC40	38	5190	ANT 1	40.36	36.52	PASS
	46	5230	ANT 1	40.36	36.52	PASS
	54	5270	ANT 1	40.36	36.44	PASS
	62	5310	ANT 1	40.28	36.44	PASS
	102	5510	ANT 1	40.44	36.52	PASS
	134	5670	ANT 1	40.28	36.52	PASS
11AC80	42	5210	ANT 1	80.88	75.60	PASS
	58	5290	ANT 1	81.04	75.60	PASS
	106	5530	ANT 1	81.04	75.44	PASS
	122	5610	ANT 1	81.20	75.60	PASS

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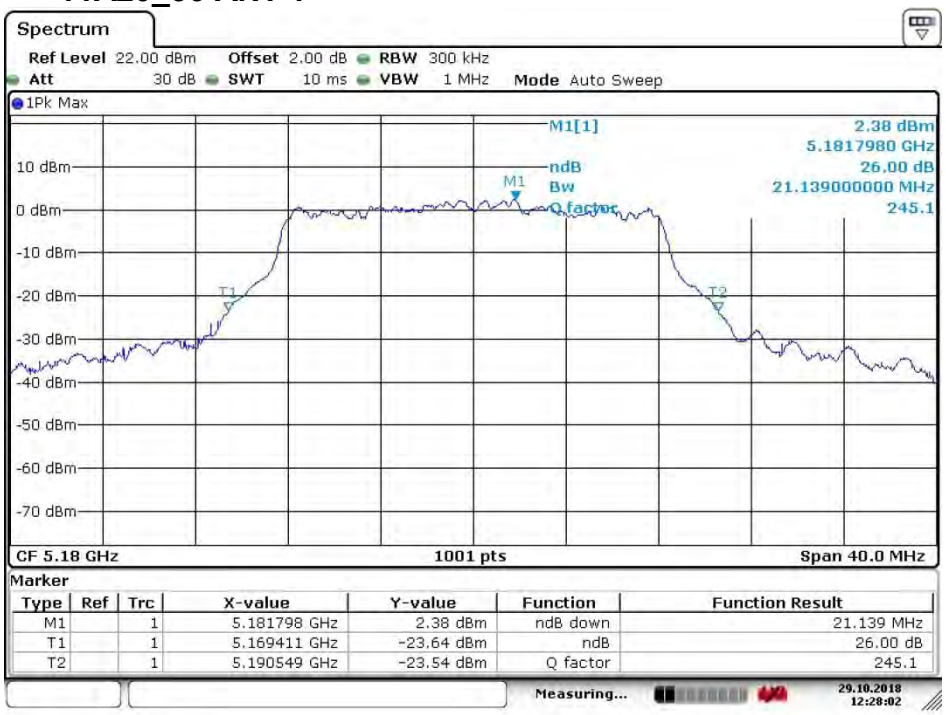
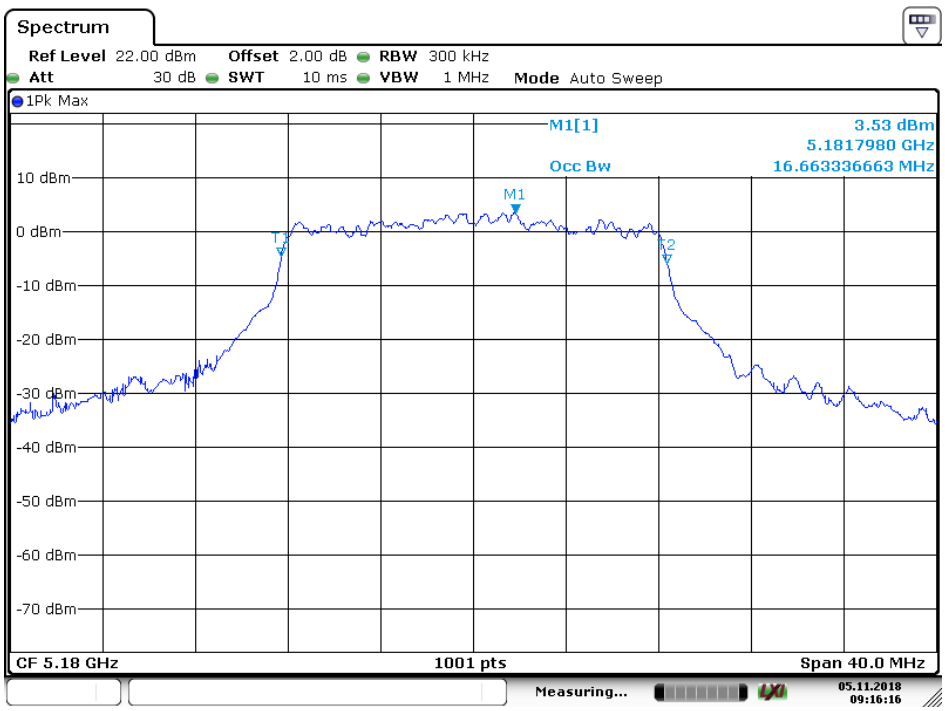
4.4.2 Plots for 26dB Emission Bandwidth & 99% Occupied Bandwidth

4.4.2.1 11A20_36 ANT 1



Date: 29.OCT.2018 12:28:02



Date: 5.NOV.2018 09:16:16

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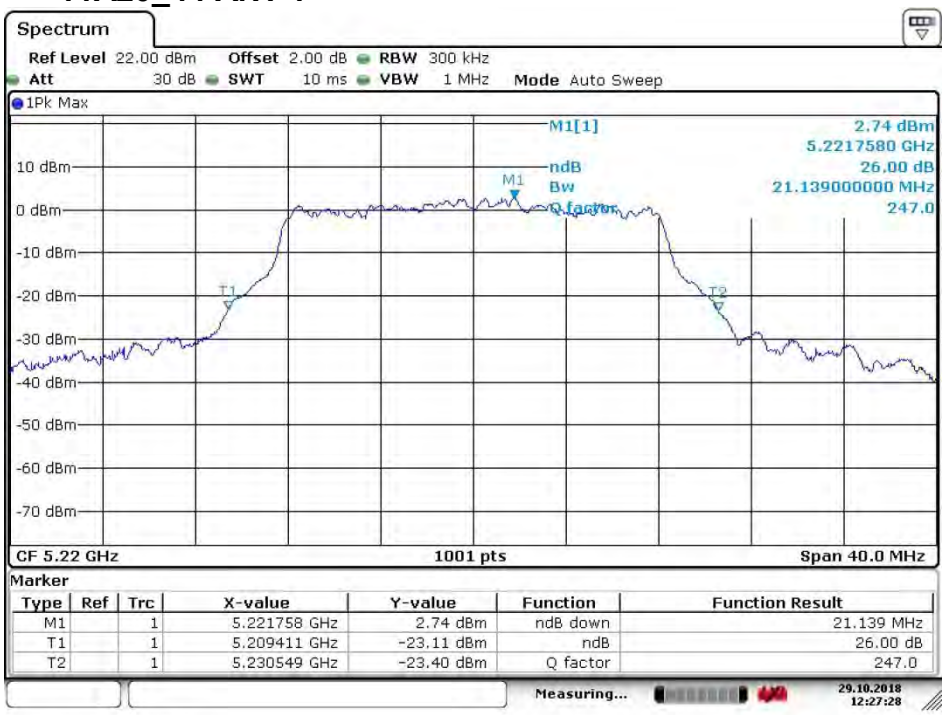
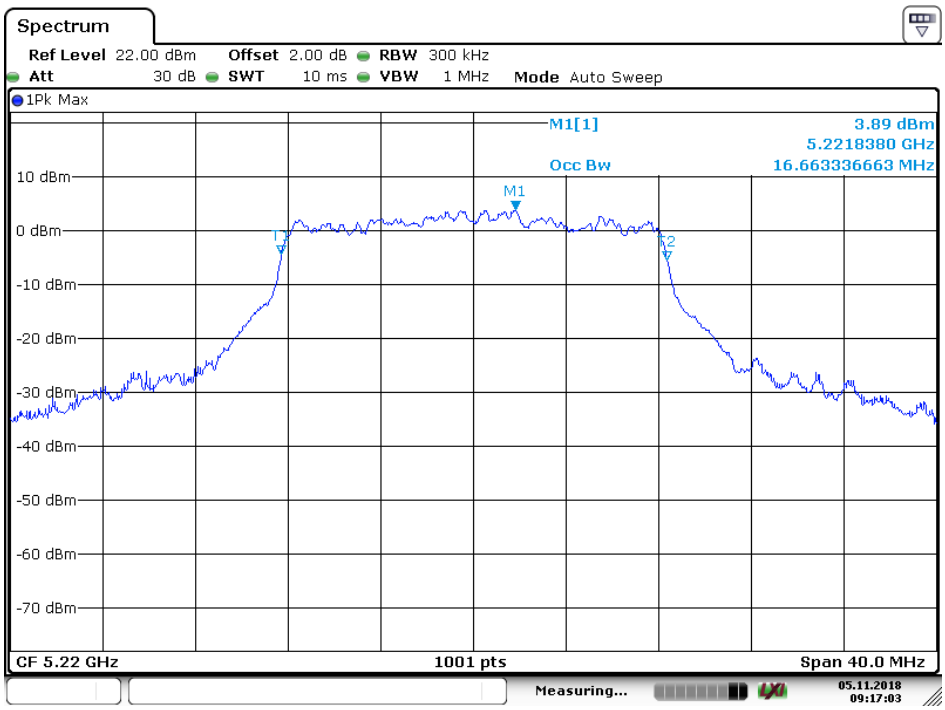
4.4.2.2 11A20_44 ANT 1



Date: 29.OCT.2018 12:27:28



Date: 5.NOV.2018 09:17:03

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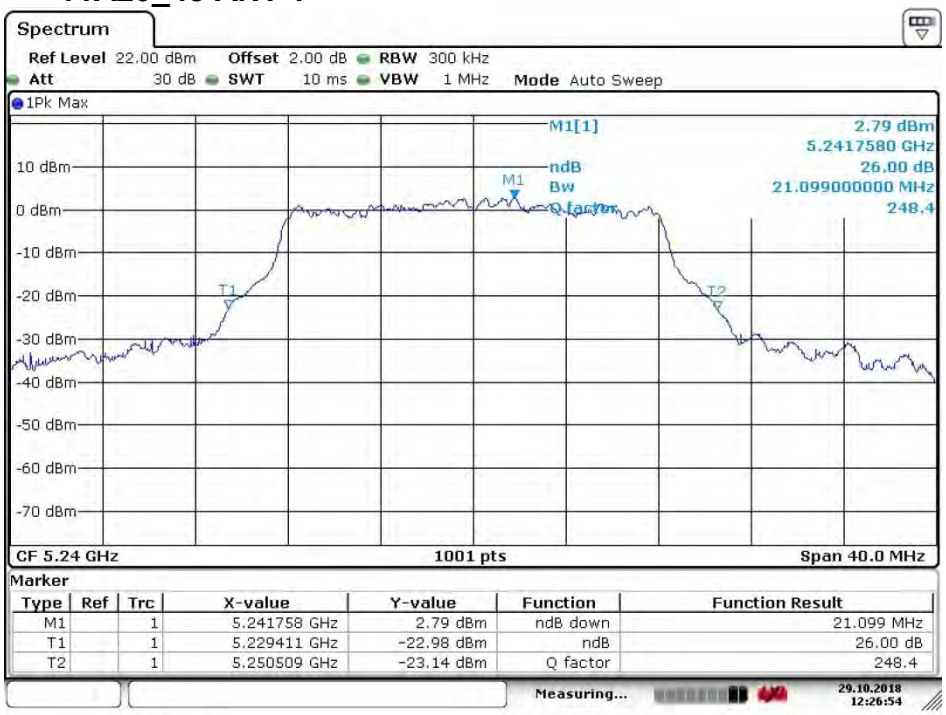
4.4.2.3 11A20_48 ANT 1



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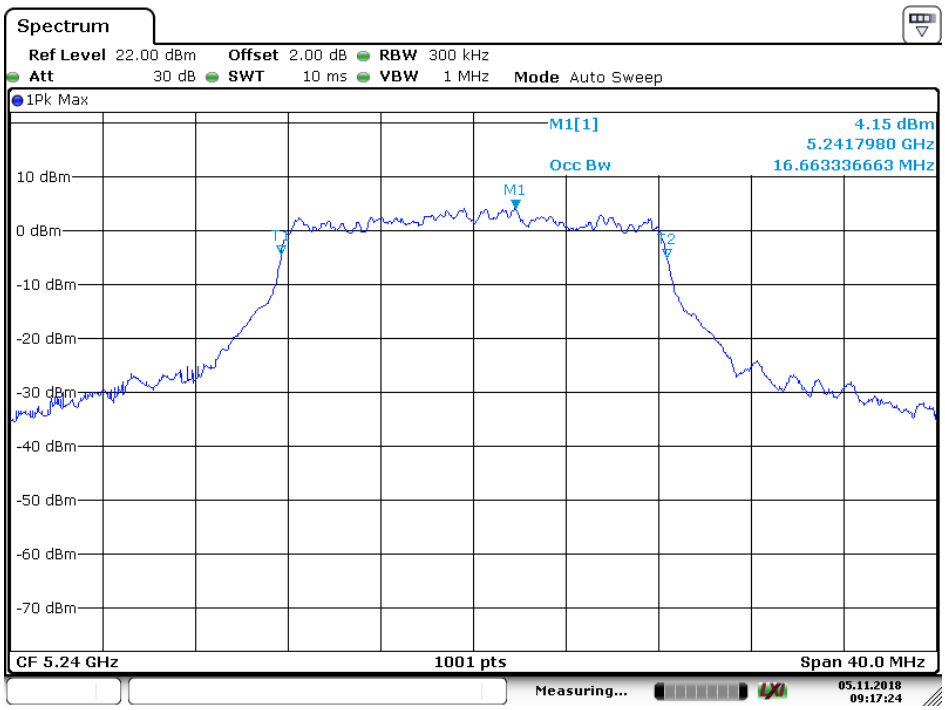

Date: 5.NOV.2018 09:17:24

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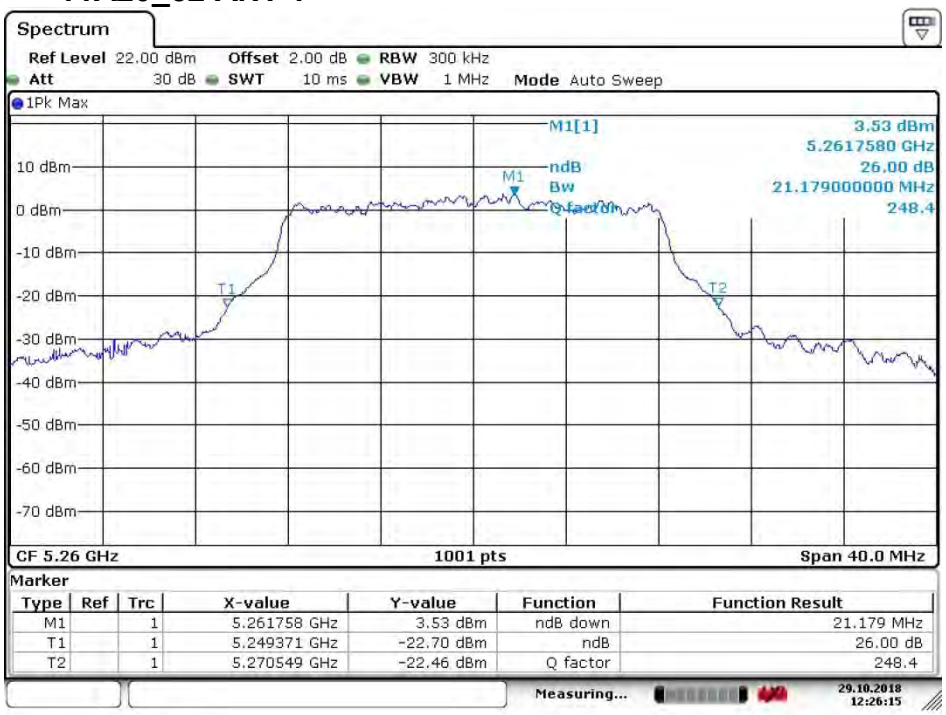
4.4.2.4 11A20_52 ANT 1



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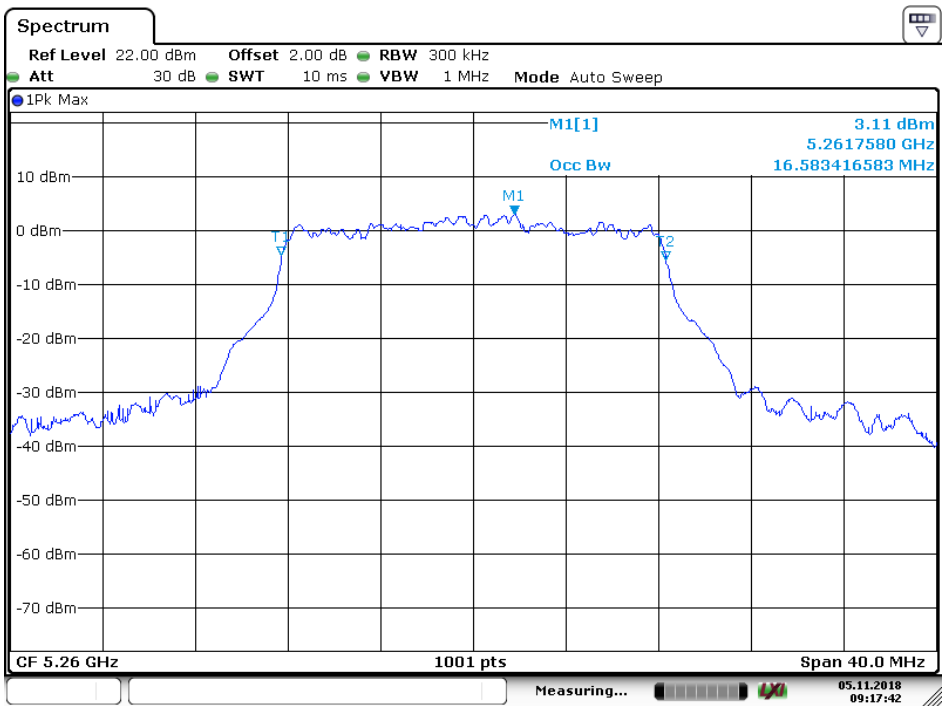

Date: 5.NOV.2018 09:17:43

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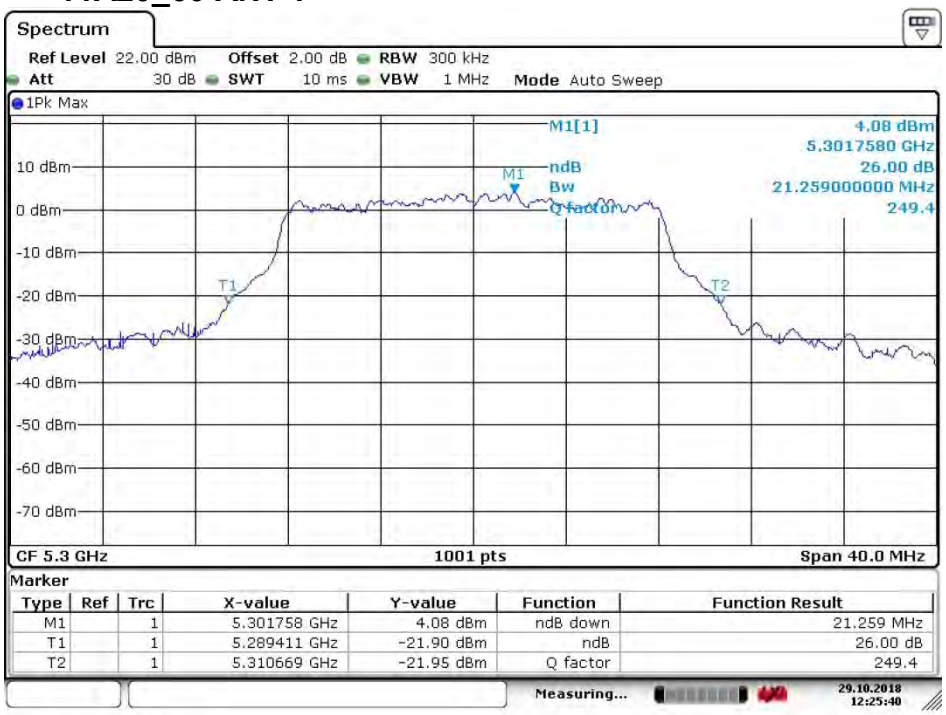
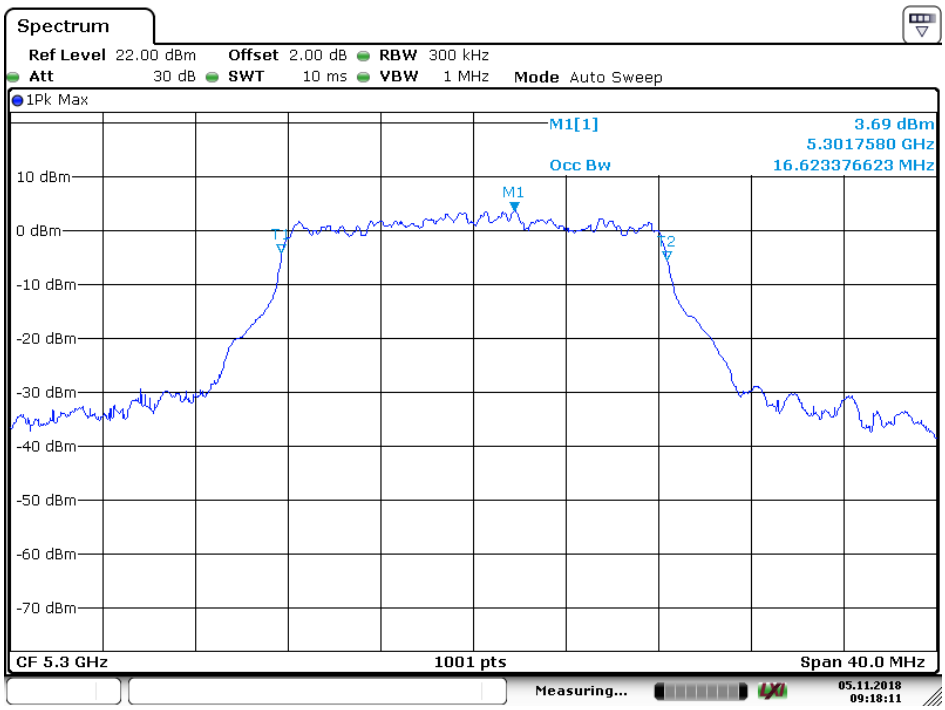
4.4.2.5 11A20_60 ANT 1



Date: 29.OCT.2018 12:25:41



Date: 5.NOV.2018 09:18:11

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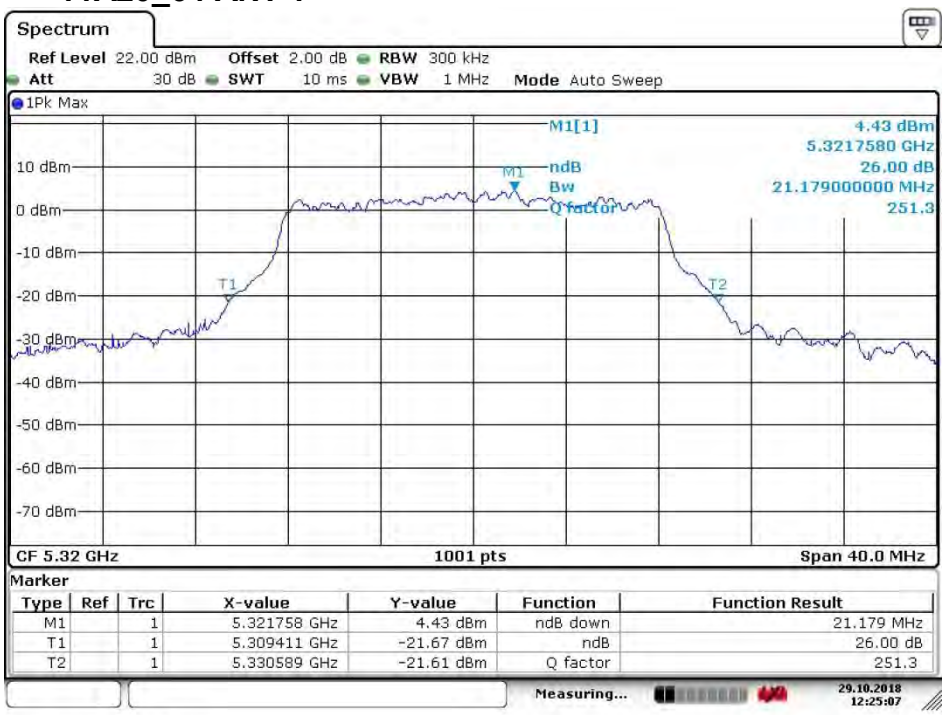
4.4.2.6 11A20_64 ANT 1



Date: 29.OCT.2018 12:25:07

Date: 13.NOV.2018 02:10:44

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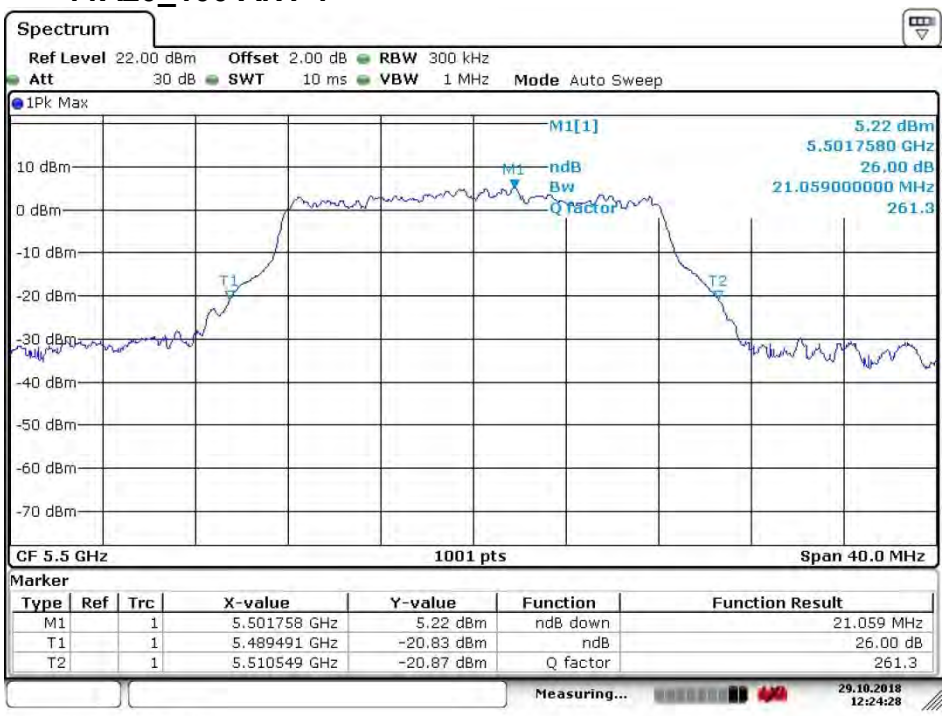
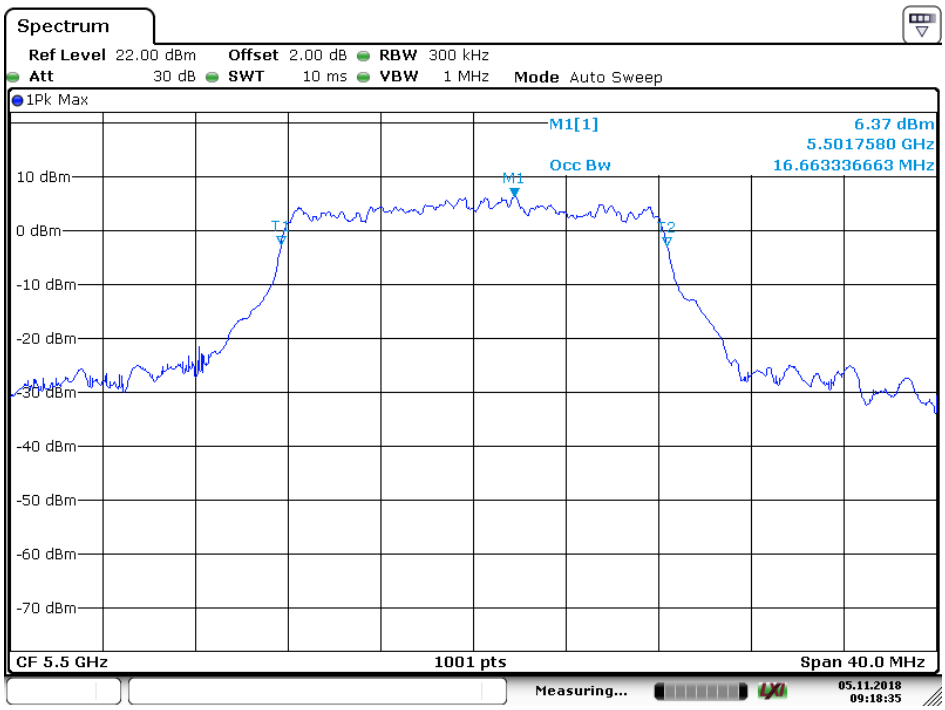
4.4.2.7 11A20_100 ANT 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.501758 GHz	5.22 dBm	ndB down	21.059 MHz
T1		1	5.489491 GHz	-20.83 dBm	ndB	26.00 dB
T2		1	5.510549 GHz	-20.87 dBm	Q factor	261.3

Date: 29.OCT.2018 12:24:29



Date: 5.NOV.2018 09:18:35

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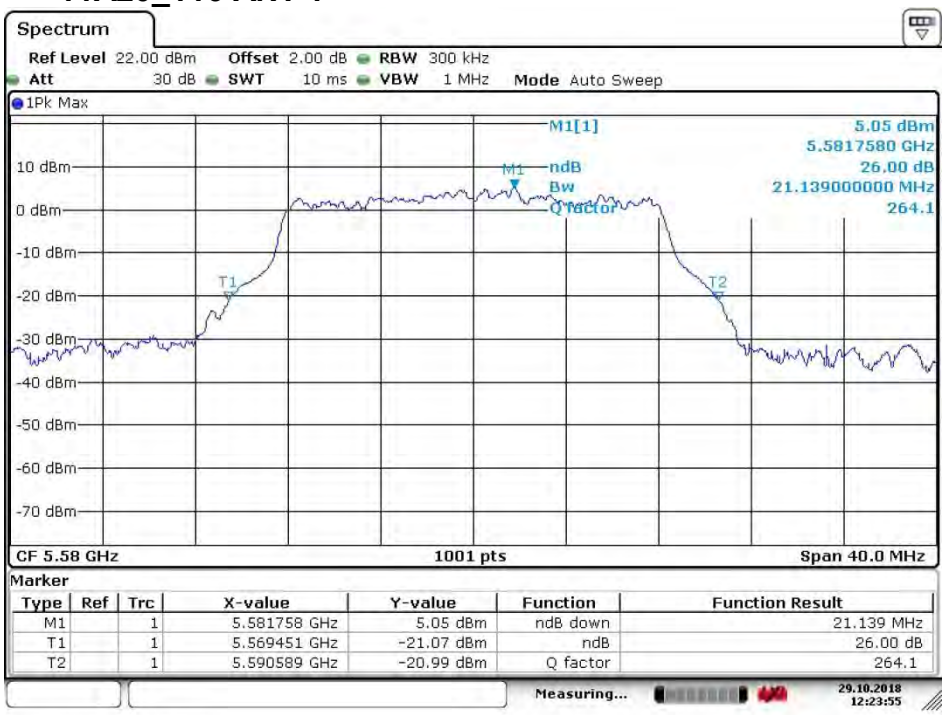
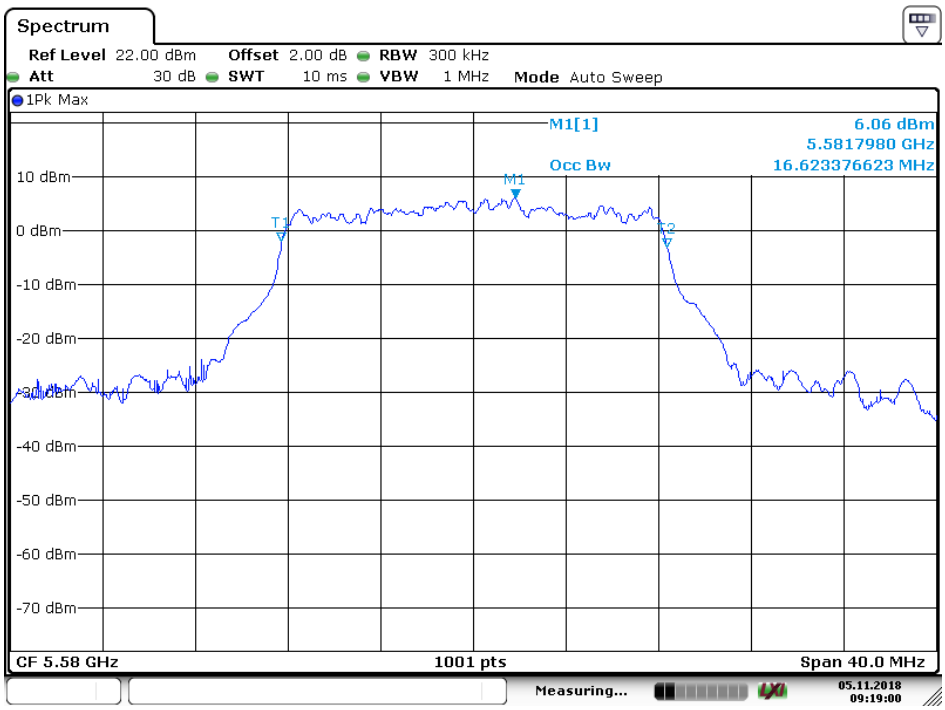
4.4.2.8 11A20_116 ANT 1



Date: 29.OCT.2018 12:23:55



Date: 5.NOV.2018 09:18:59

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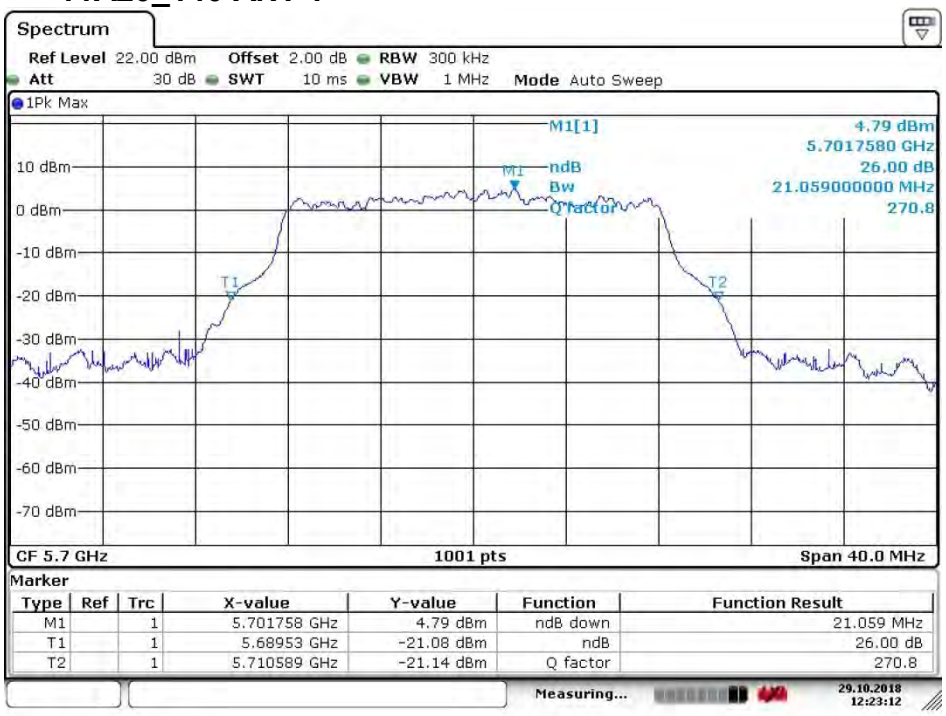
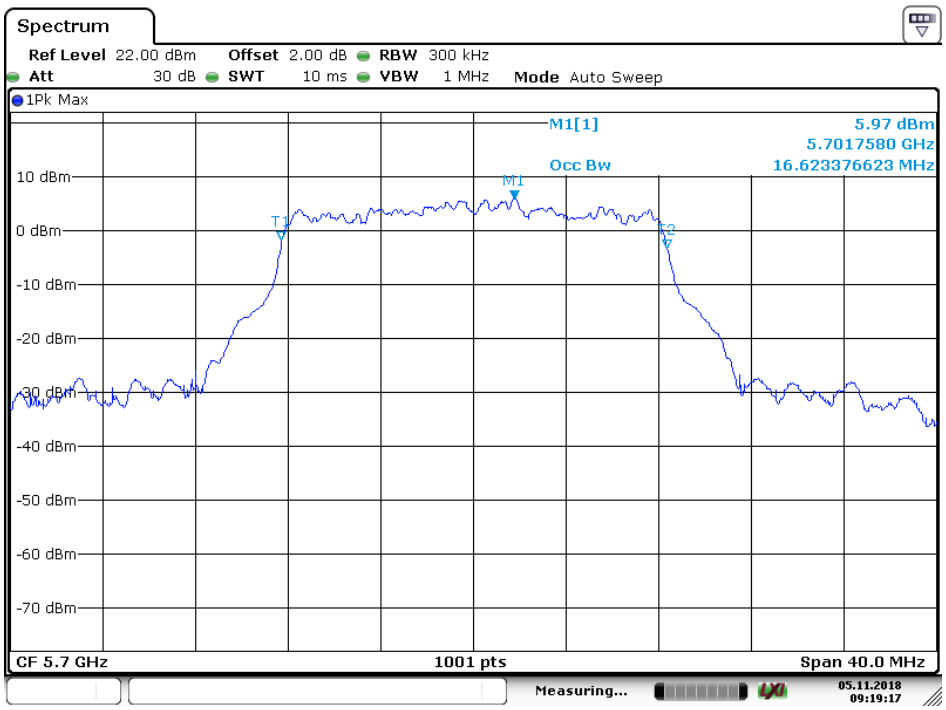
4.4.2.9 11A20_140 ANT 1



Date: 29.OCT.2018 12:23:13



Date:5.NOV.2018 09:19:17

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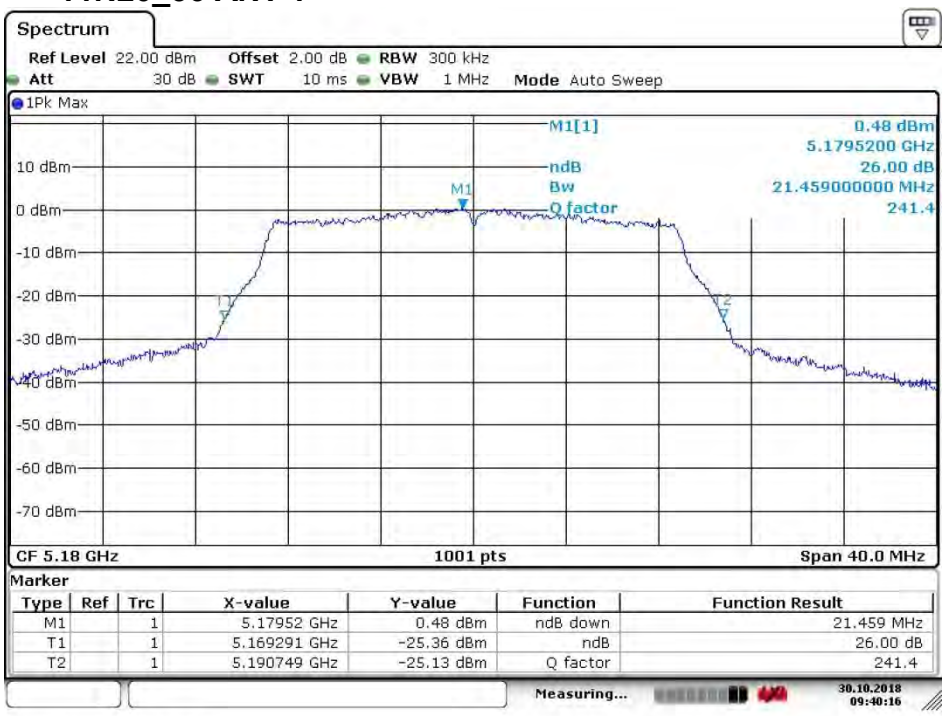
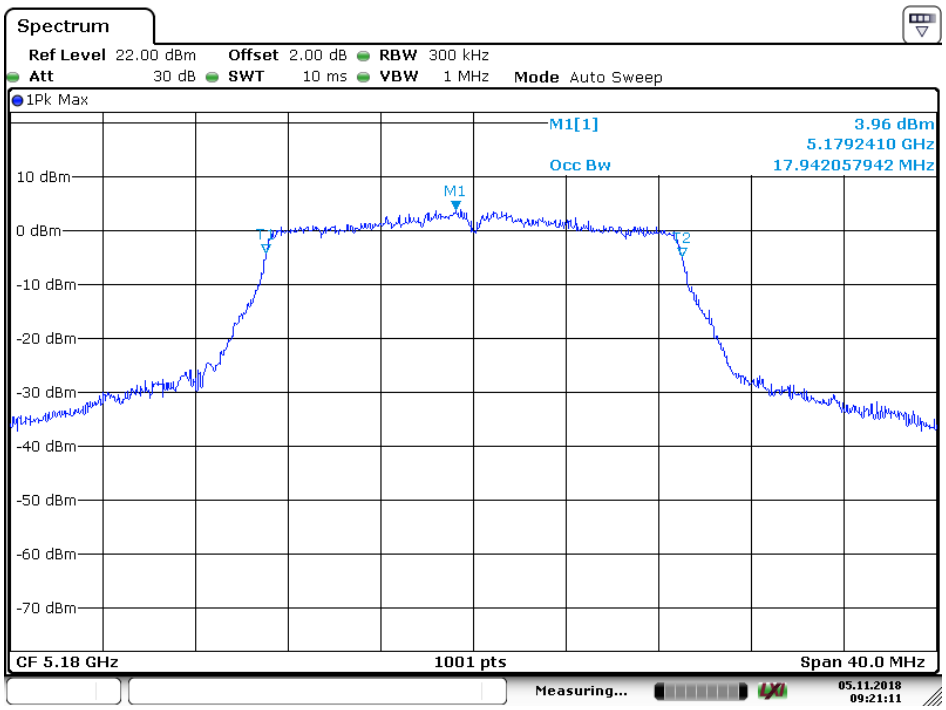
4.4.2.10 11N20_36 ANT 1



Date: 30.OCT.2018 09:40:16



Date: 5.NOV.2018 09:21:11

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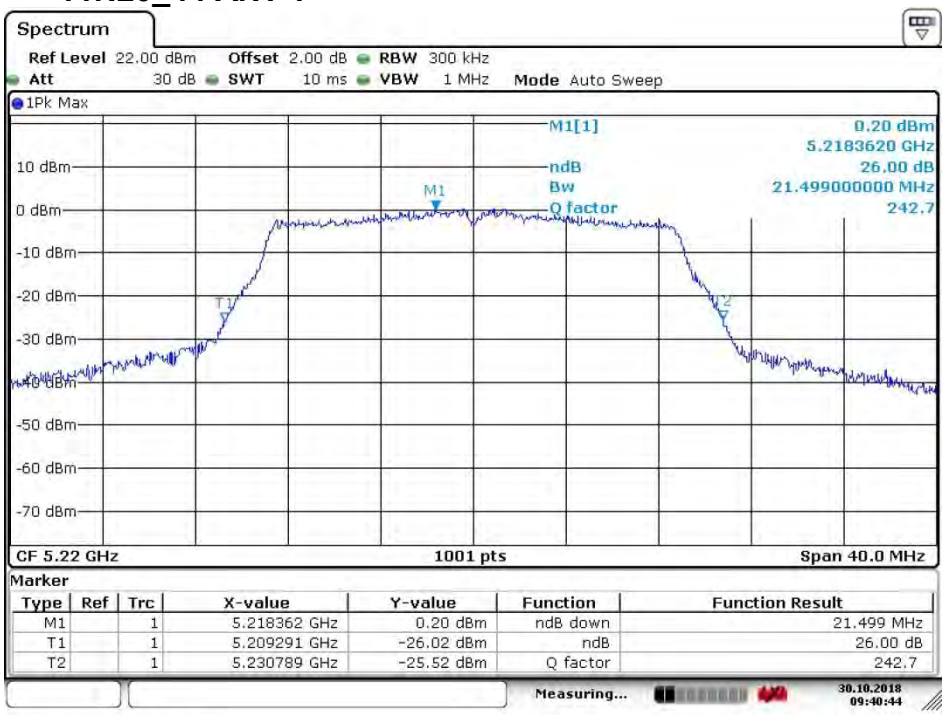
4.4.2.11 11N20_44 ANT 1



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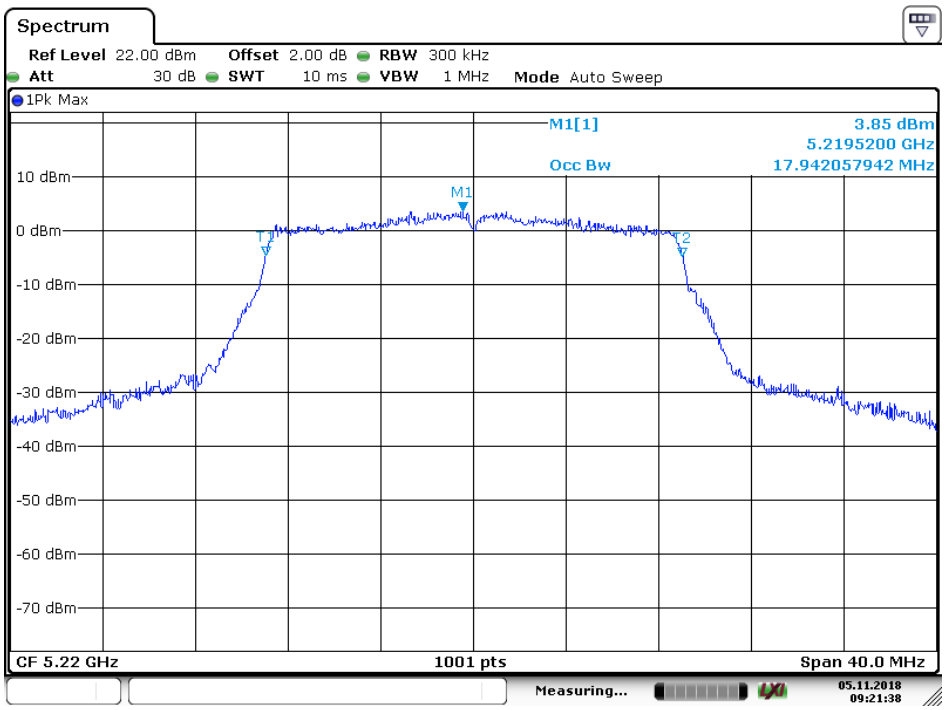

Date: 5.NOV.2018 09:21:38

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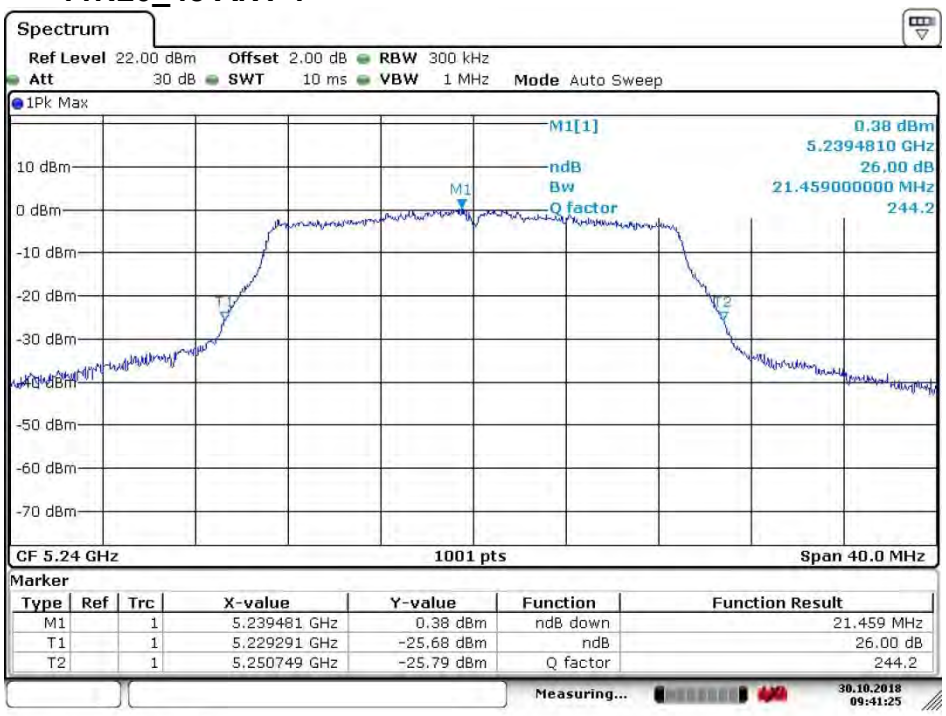
4.4.2.12 11N20_48 ANT 1



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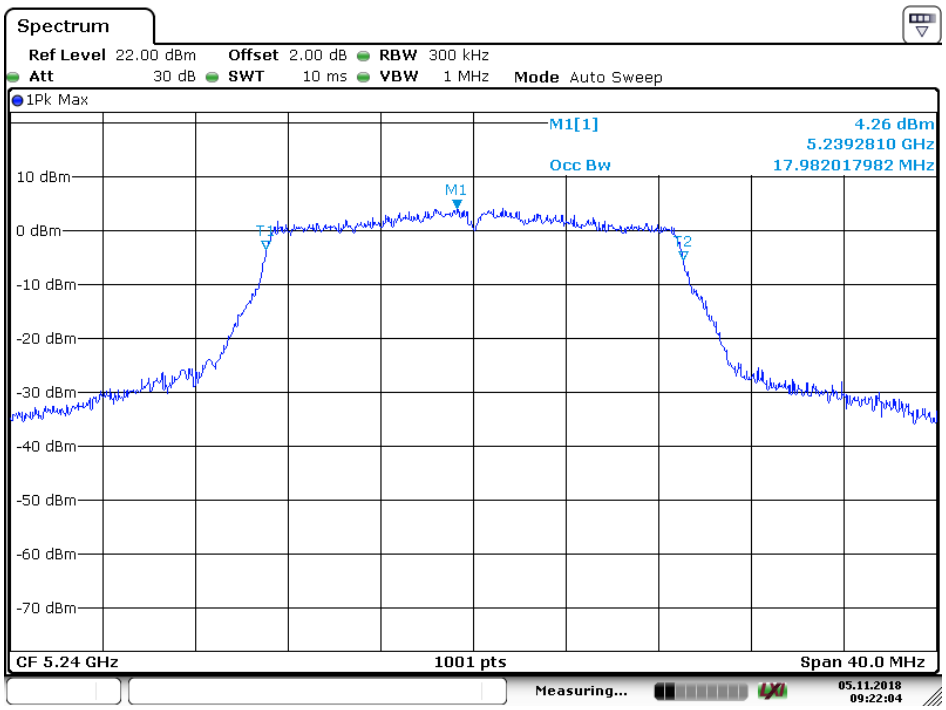

Date: 5.NOV.2018 09:22:05

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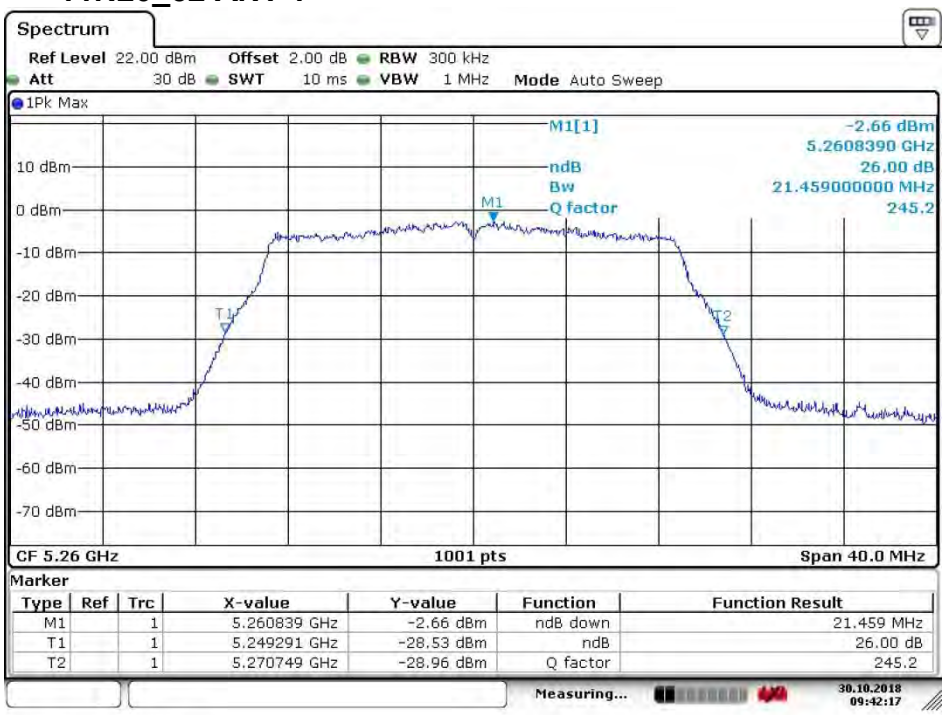
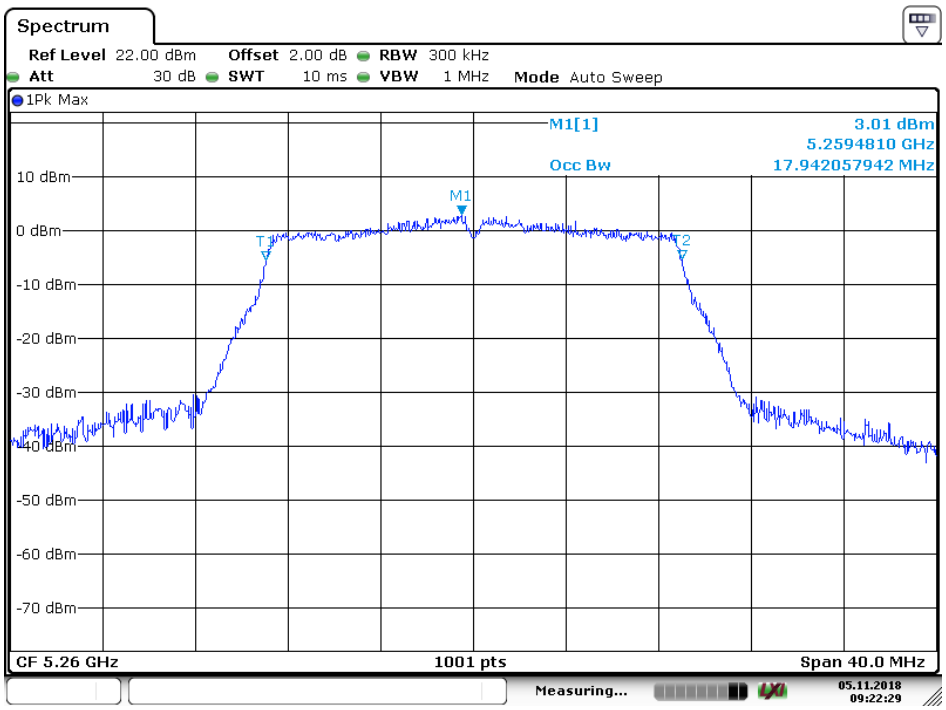
4.4.2.13 11N20_52 ANT 1



Date: 30.OCT.2018 09:42:17



Date: 5.NOV.2018 09:22:30

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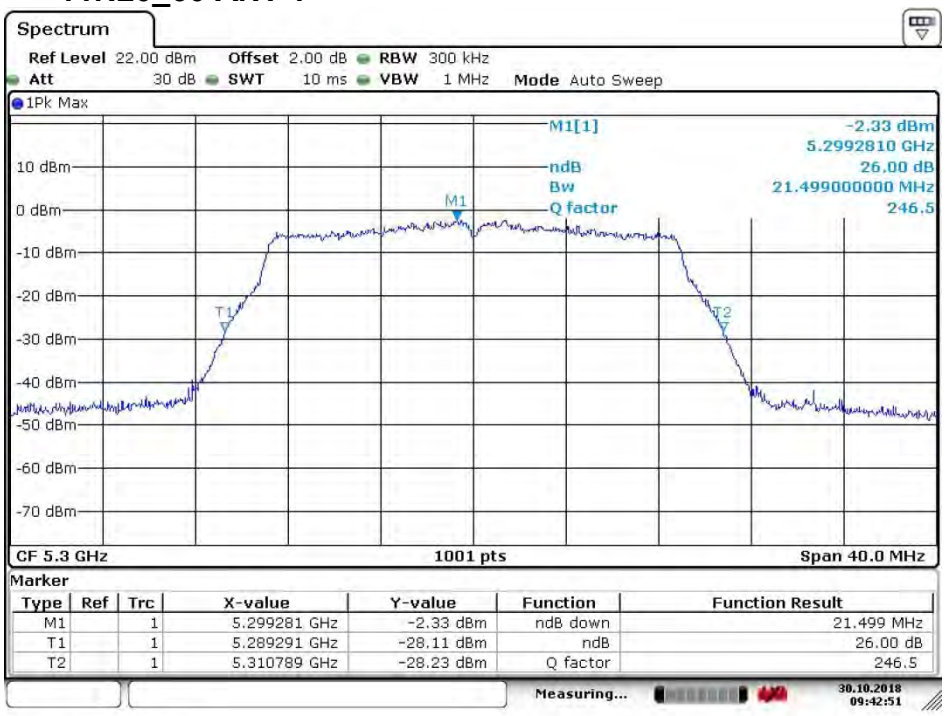
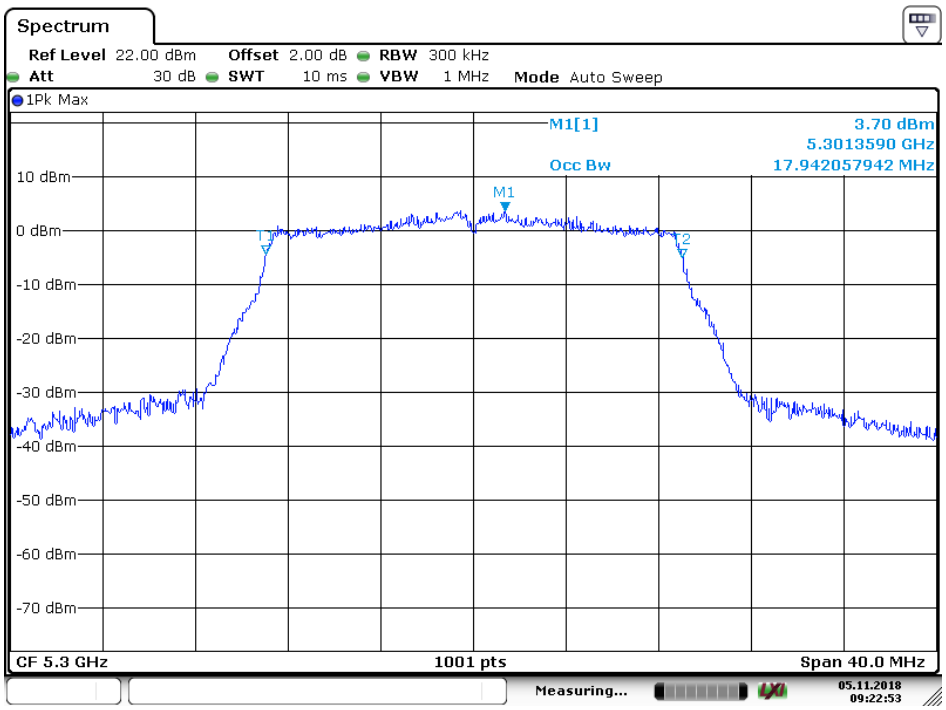
4.4.2.14 11N20_60 ANT 1



Date: 30.OCT.2018 09:42:51



Date: 5.NOV.2018 09:22:53

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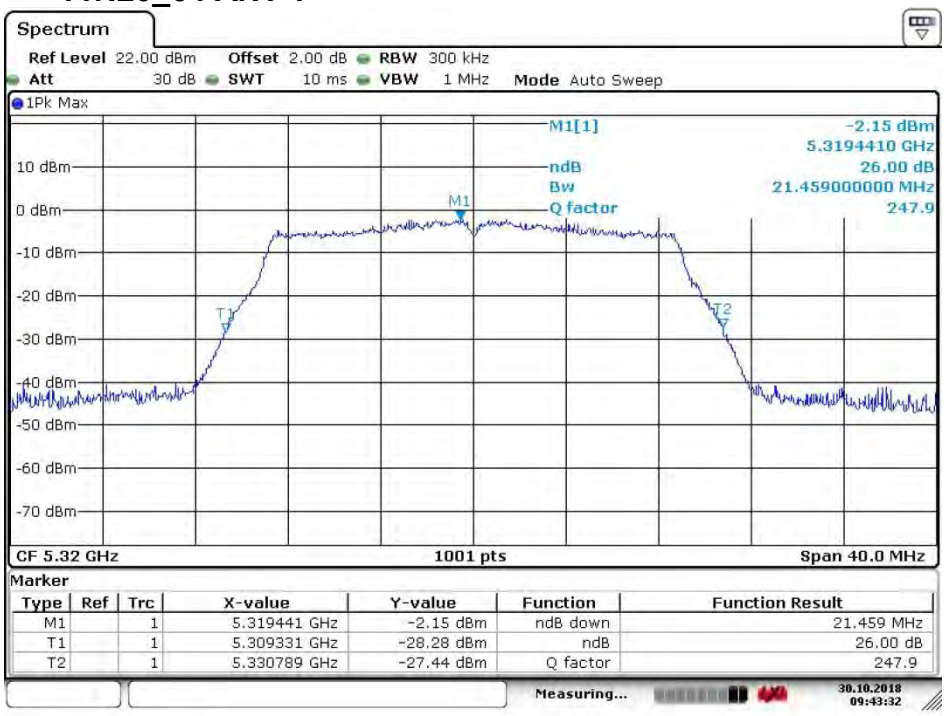
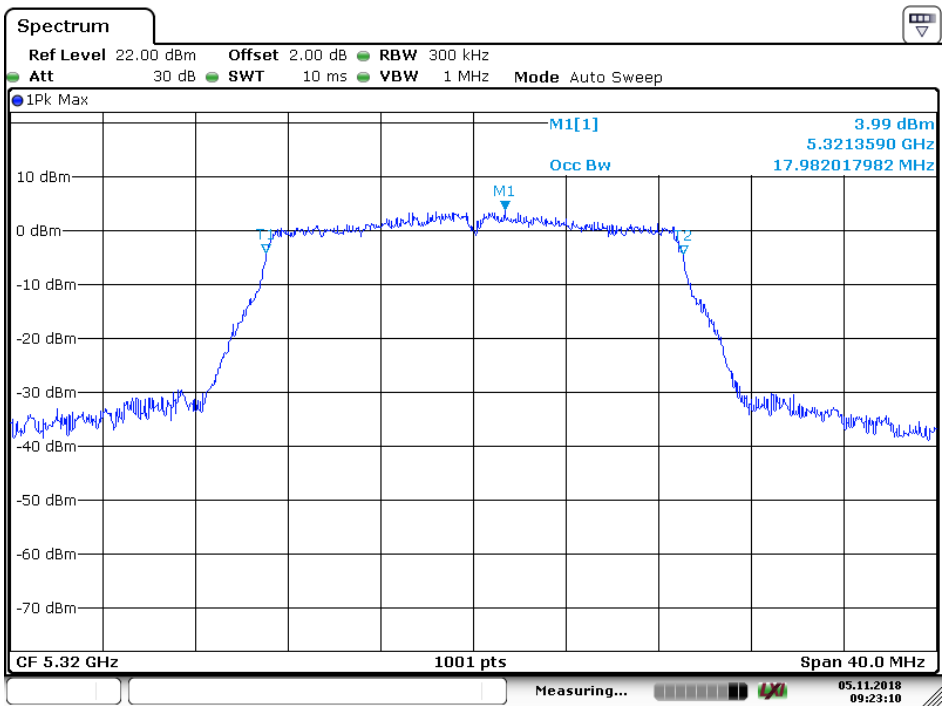
4.4.2.15 11N20_64 ANT 1



Date: 30.OCT.2018 09:43:31



Date: 5.NOV.2018 09:23:11

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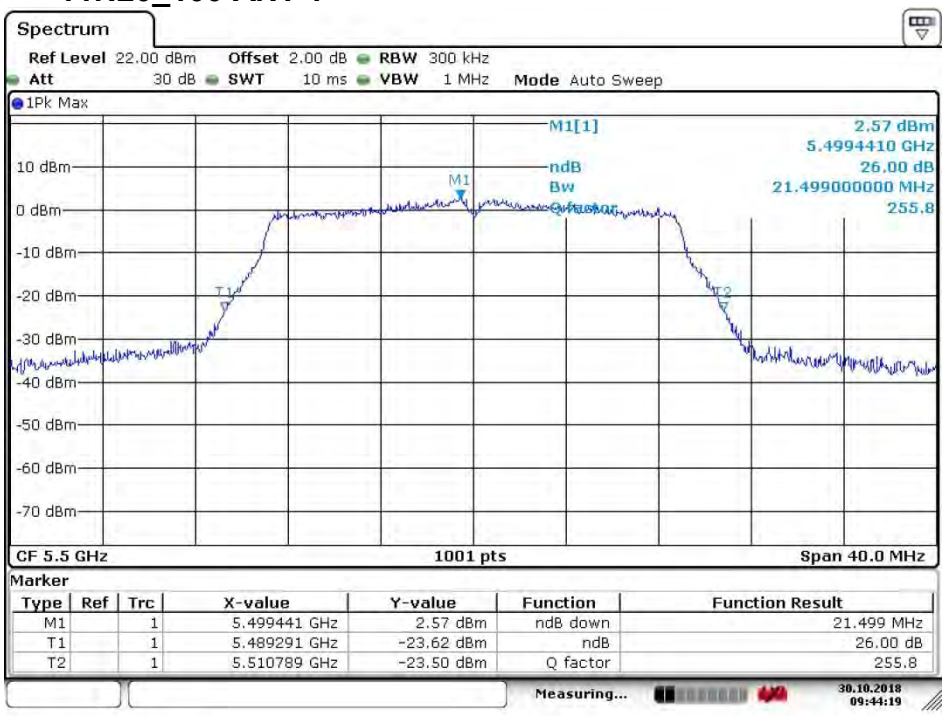
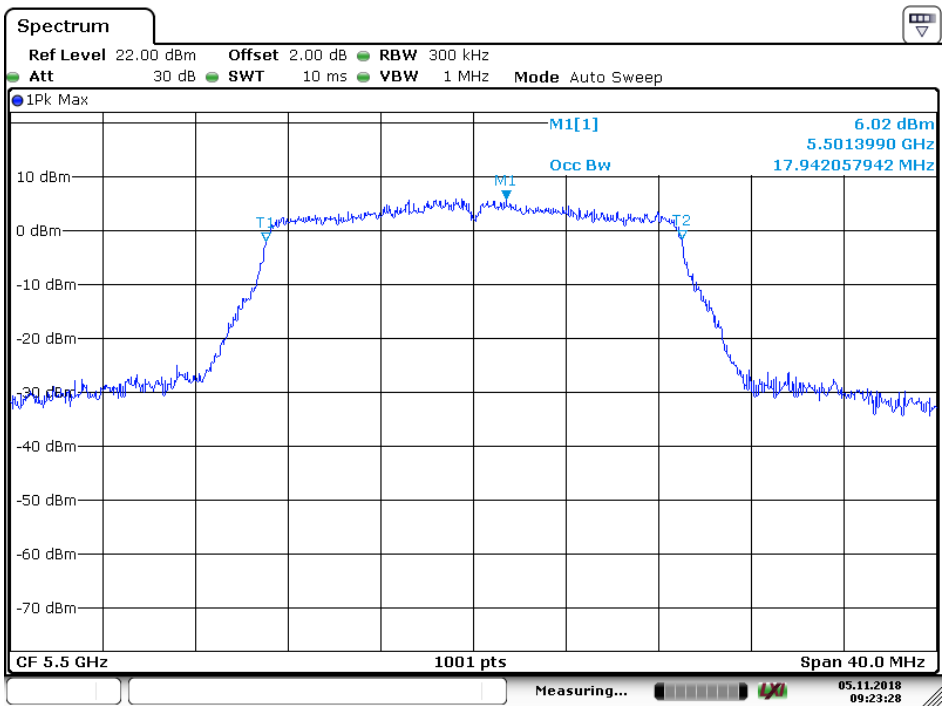
4.4.2.16 11N20_100 ANT 1



Date: 30.OCT.2018 09:44:19



Date: 5.NOV.2018 09:23:29

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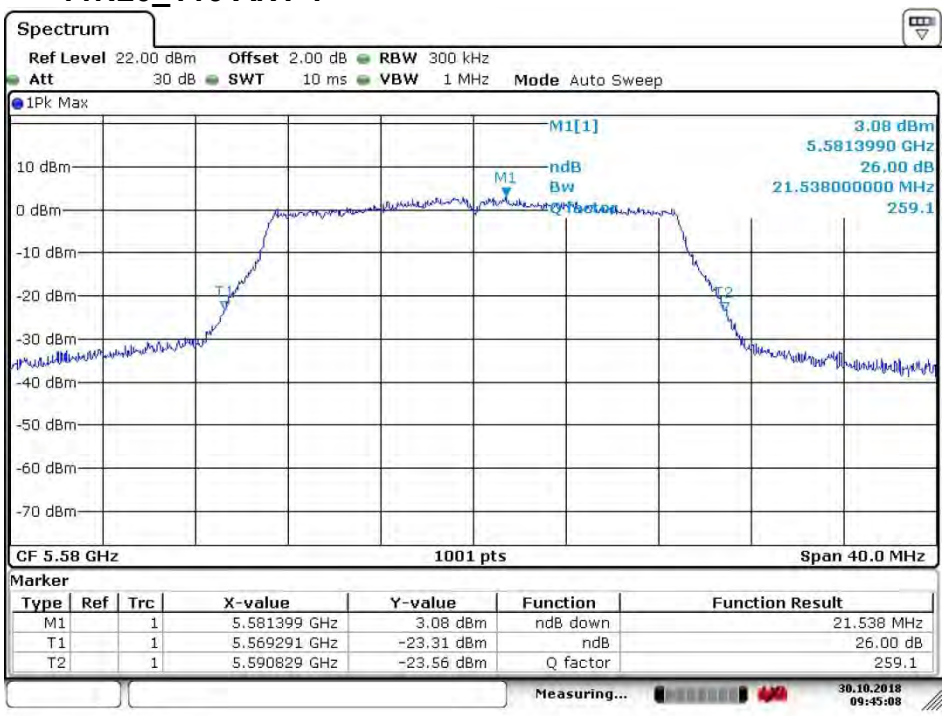
4.4.2.17 11N20_116 ANT 1



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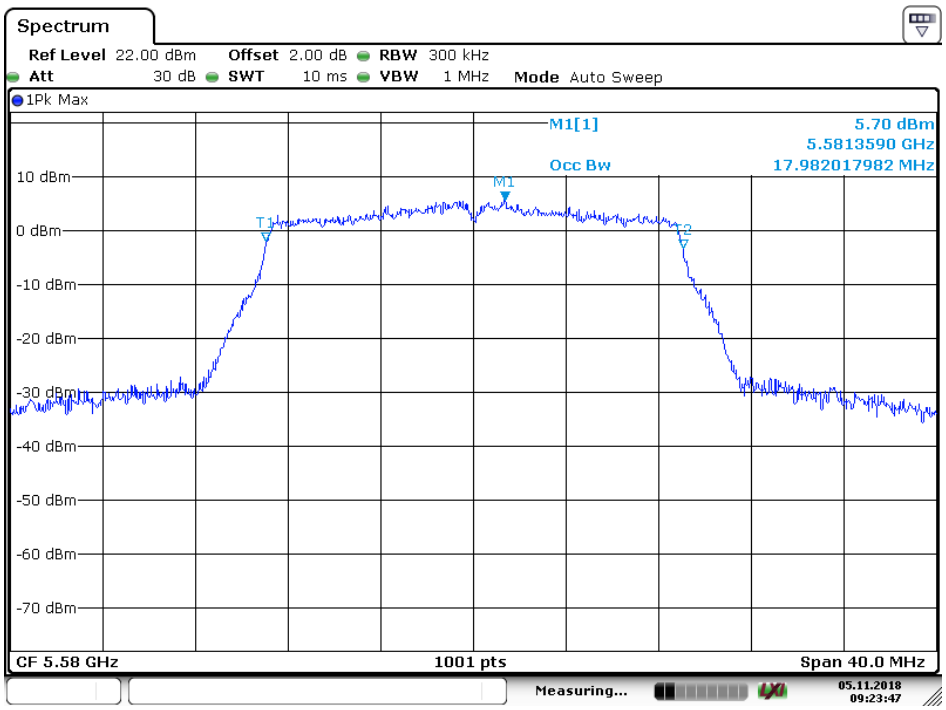

Date: 5.NOV.2018 09:23:47

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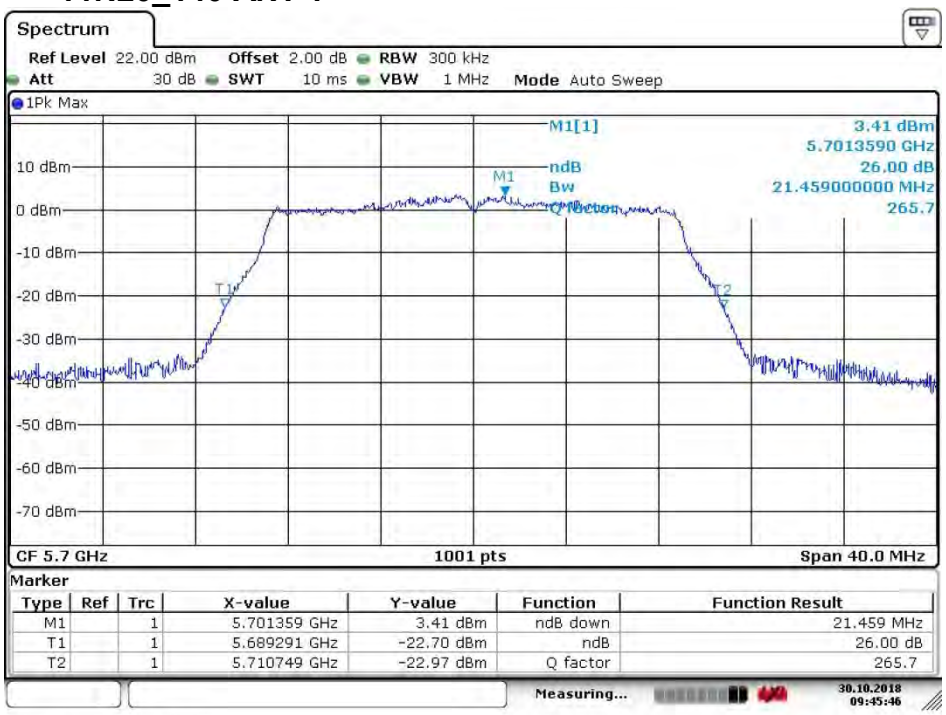
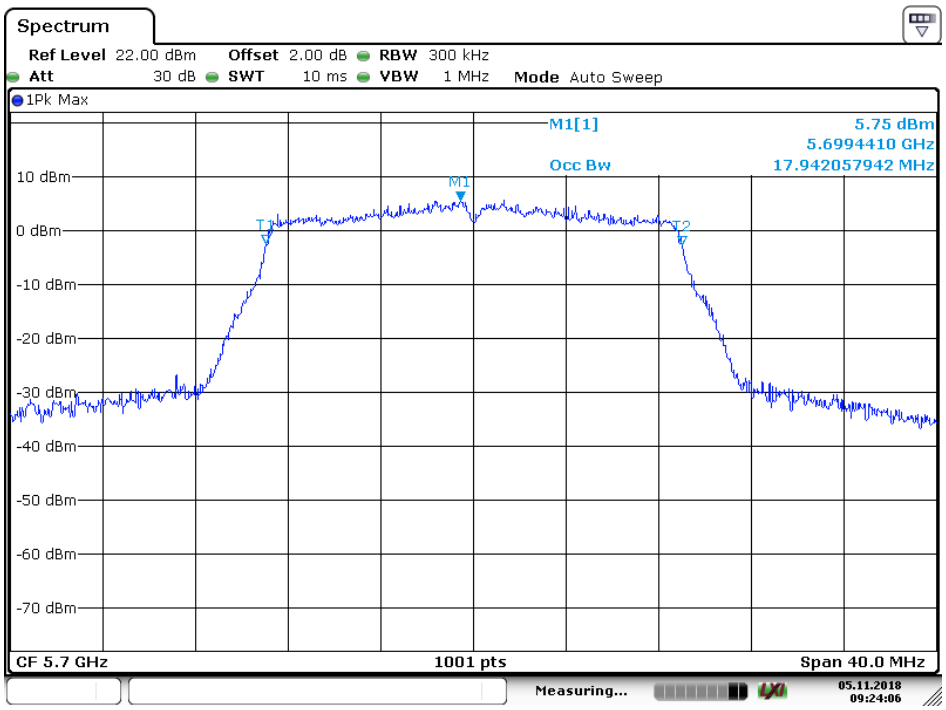
4.4.2.18 11N20_140 ANT 1



Date: 30.OCT.2018 09:45:47



Date: 5.NOV.2018 09:24:06

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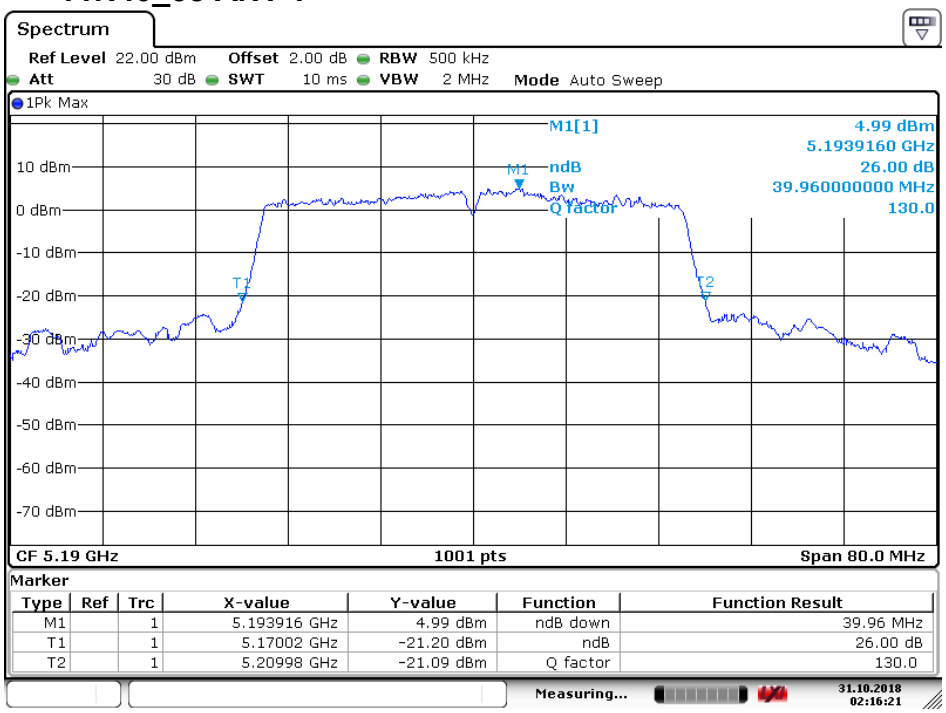
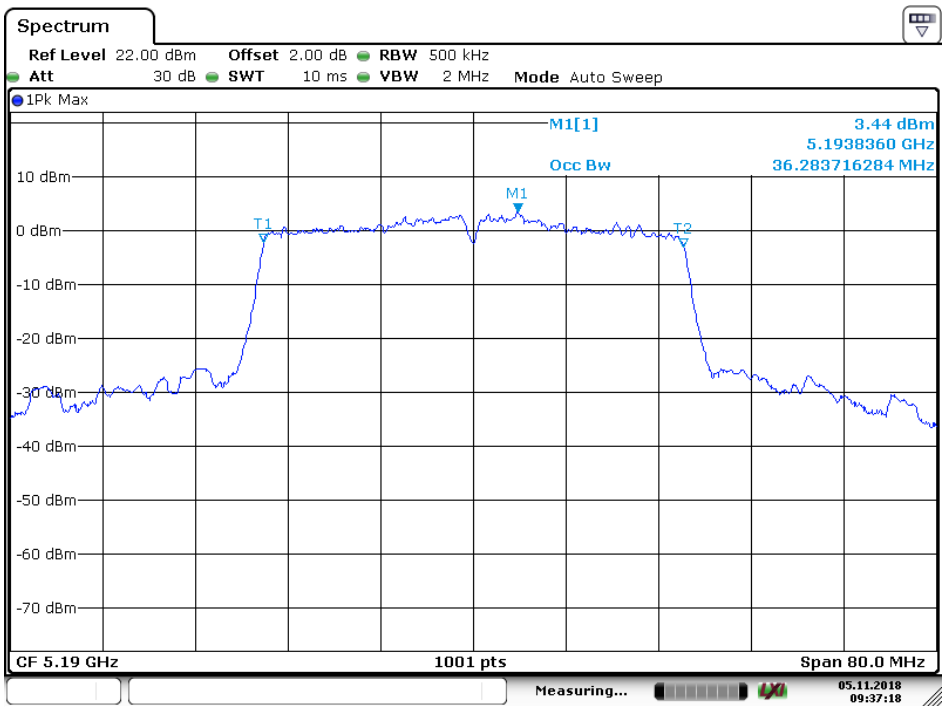
4.4.2.19 11N40_38 ANT 1



Date: 31.OCT.2018 02:16:21



Date: 5.NOV.2018 09:37:18

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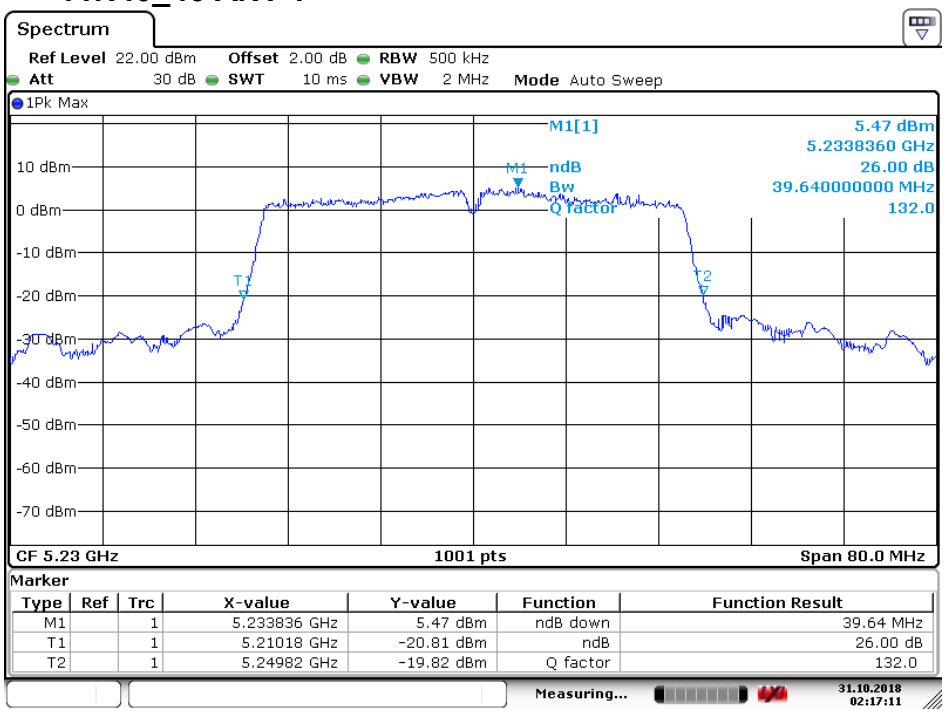
4.4.2.20 11N40_46 ANT 1



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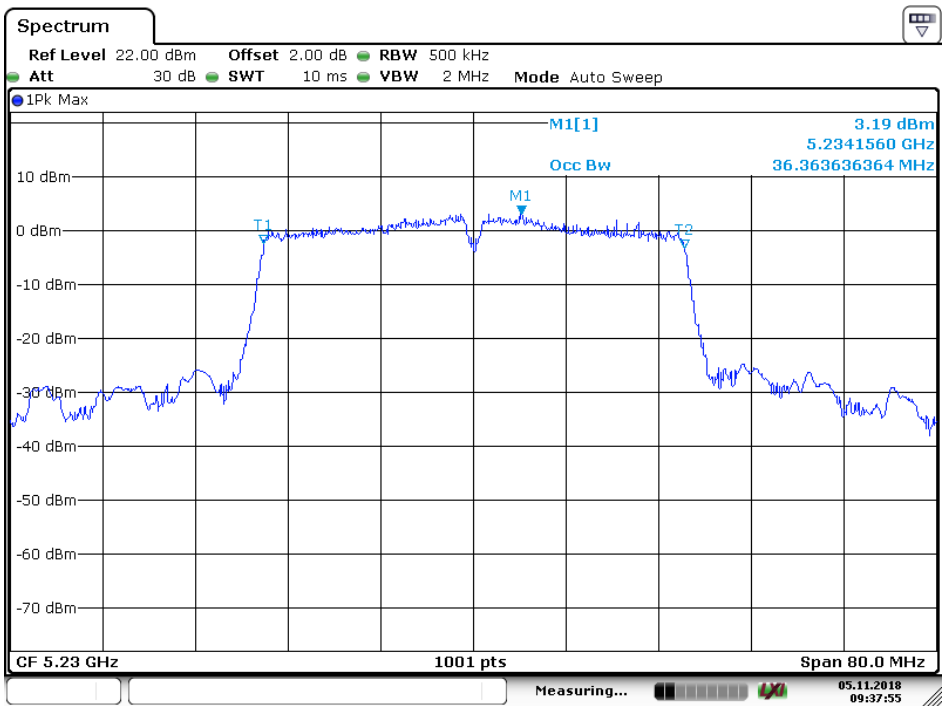

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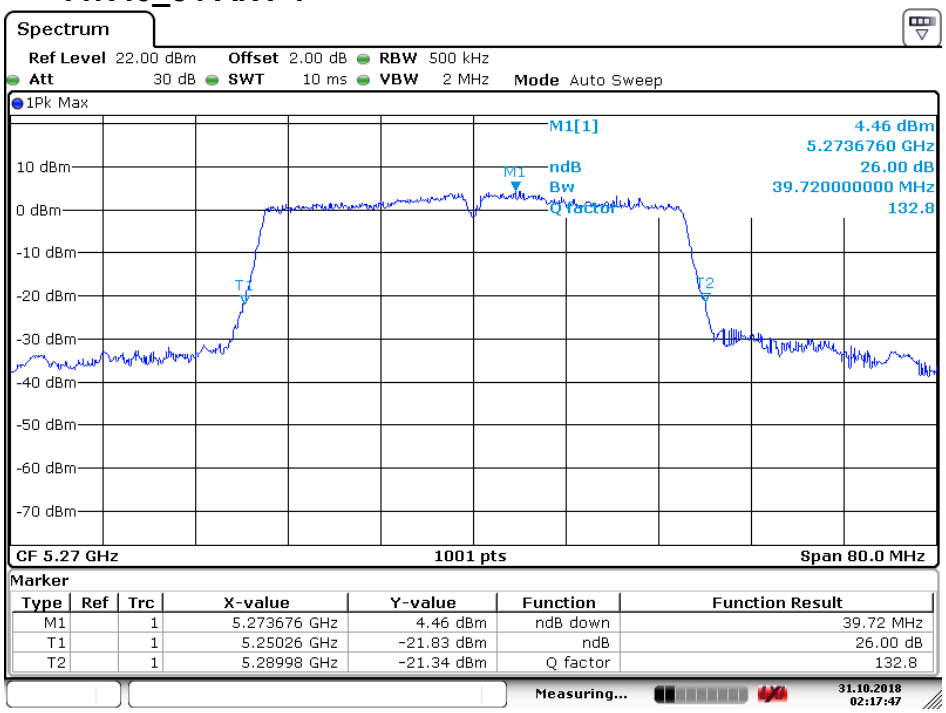
4.4.2.21 11N40_54 ANT 1



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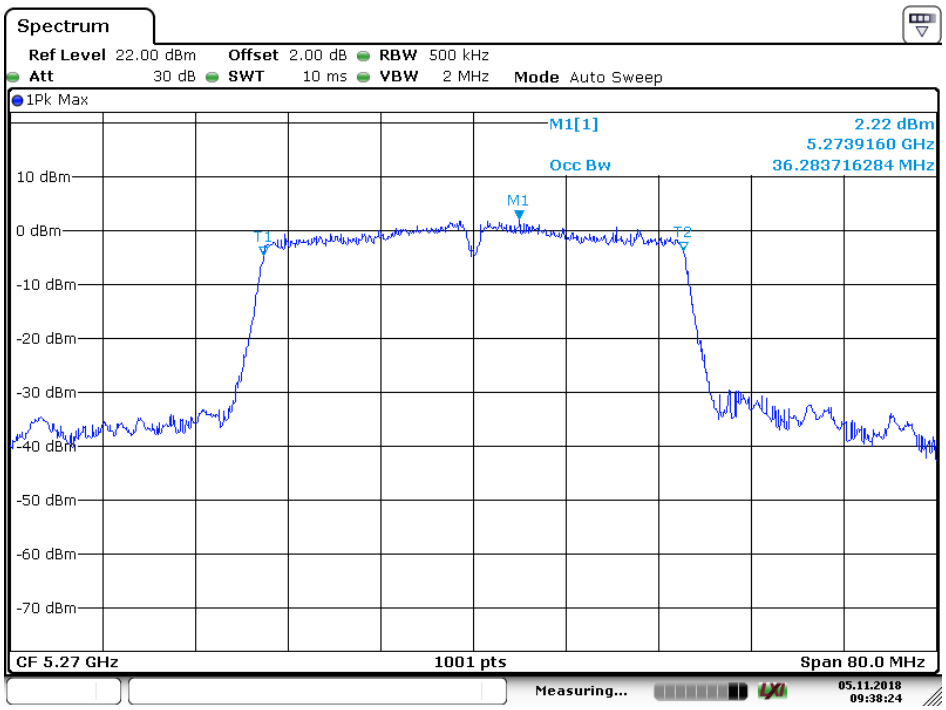

Date: 5.NOV.2018 09:38:24

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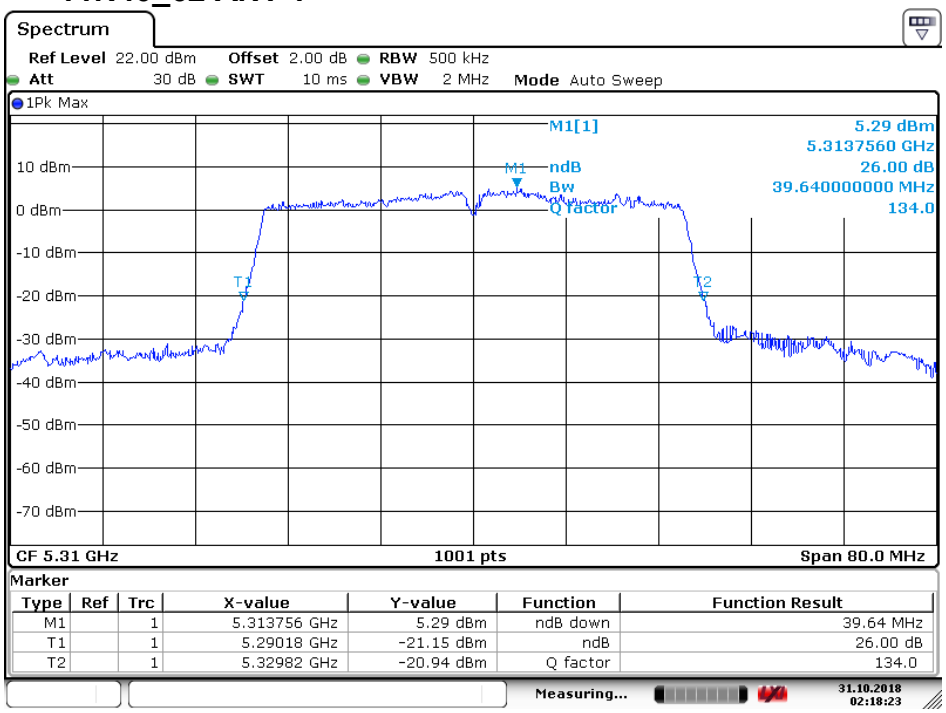
4.4.2.22 11N40_62 ANT 1



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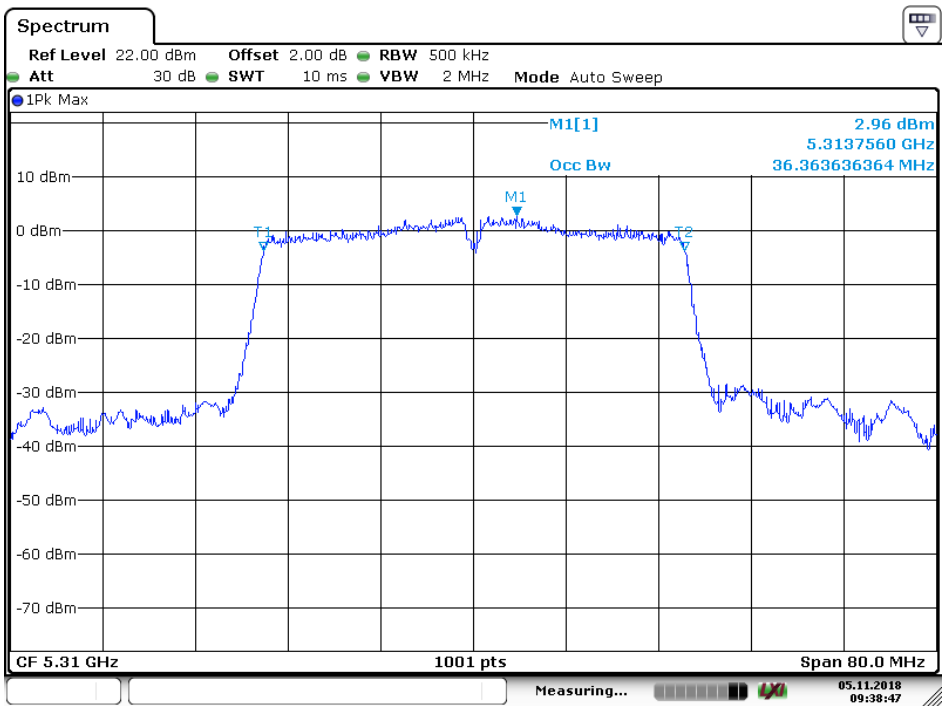

Date: 5.NOV.2018 09:38:48

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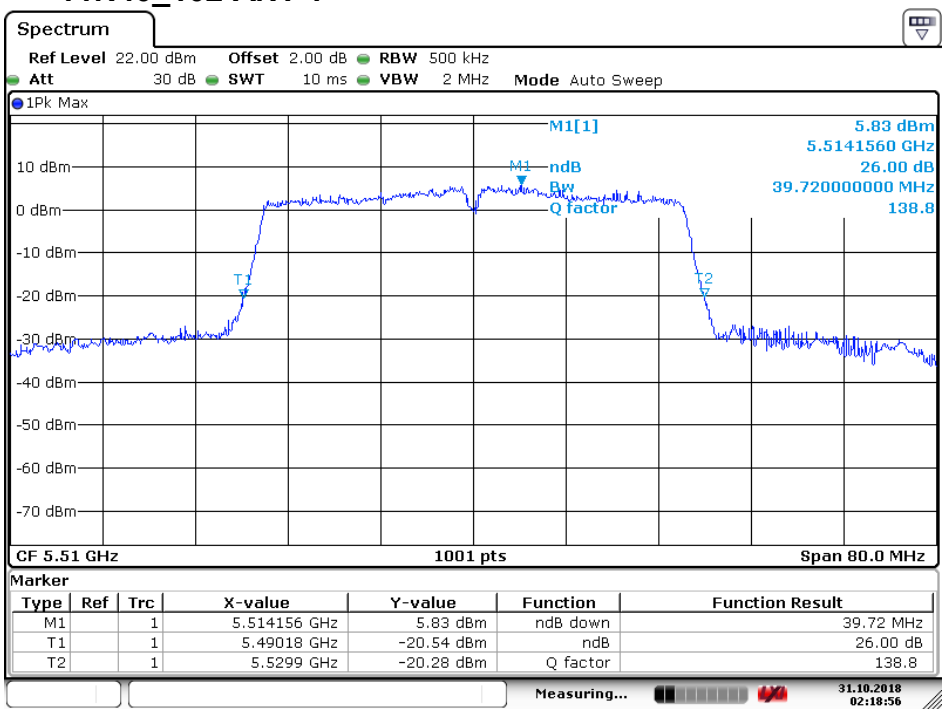
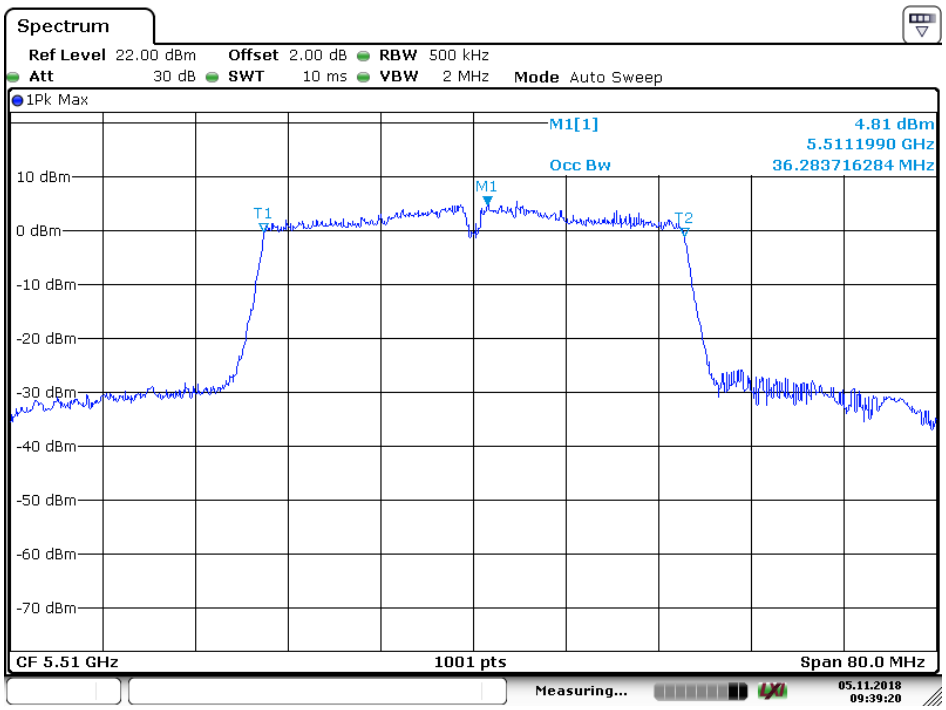
4.4.2.23 11N40_102 ANT 1



Date: 31.OCT.2018 02:18:57



Date: 5.NOV.2018 09:39:21

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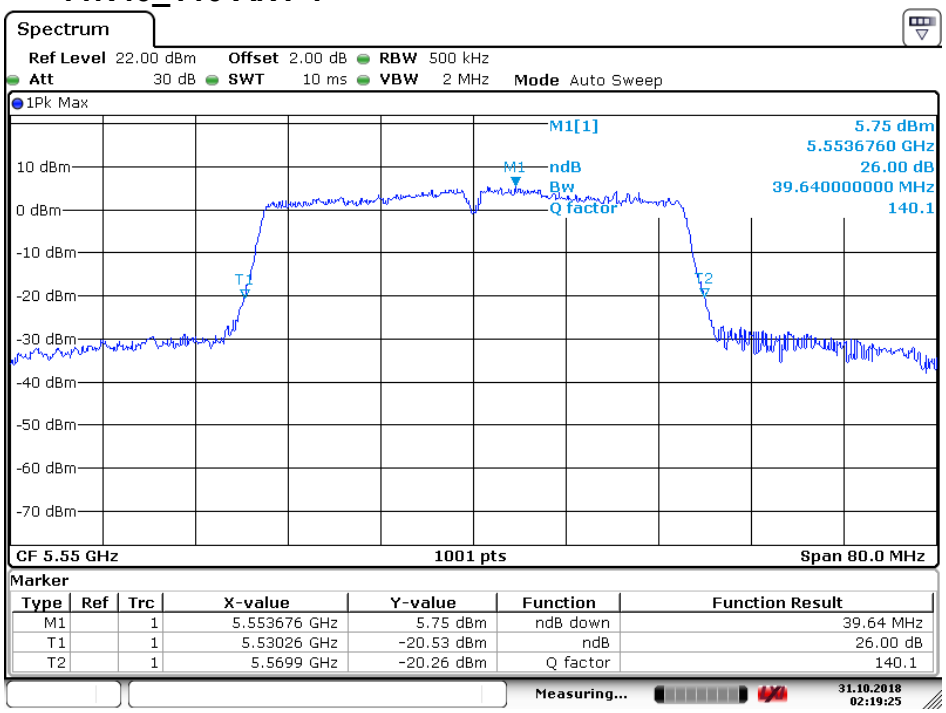
4.4.2.24 11N40_110 ANT 1



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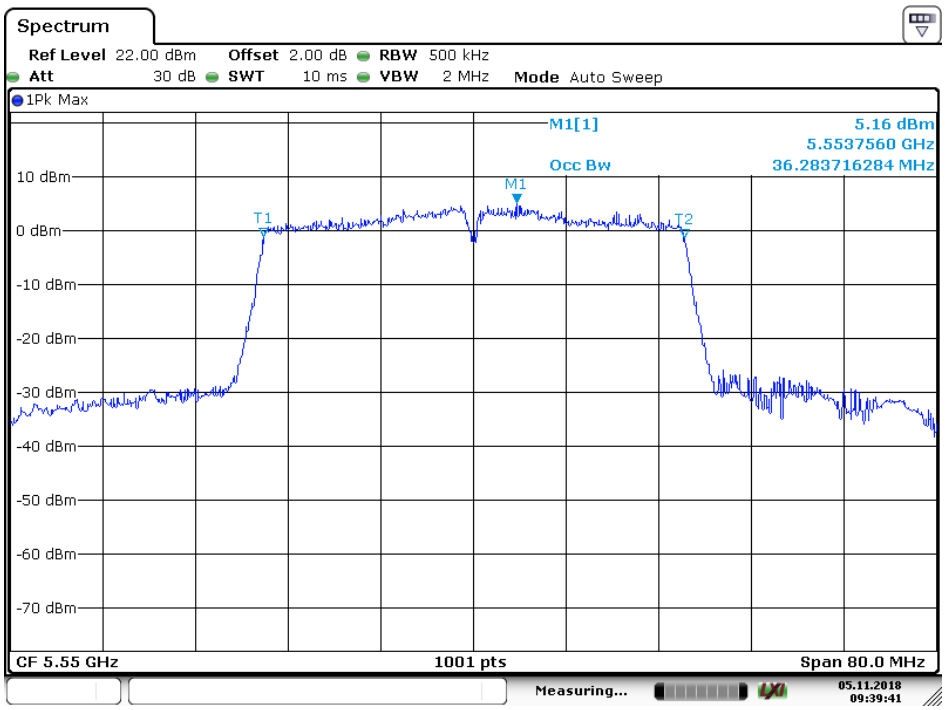

Date:5.NOV.2018 09:39:41

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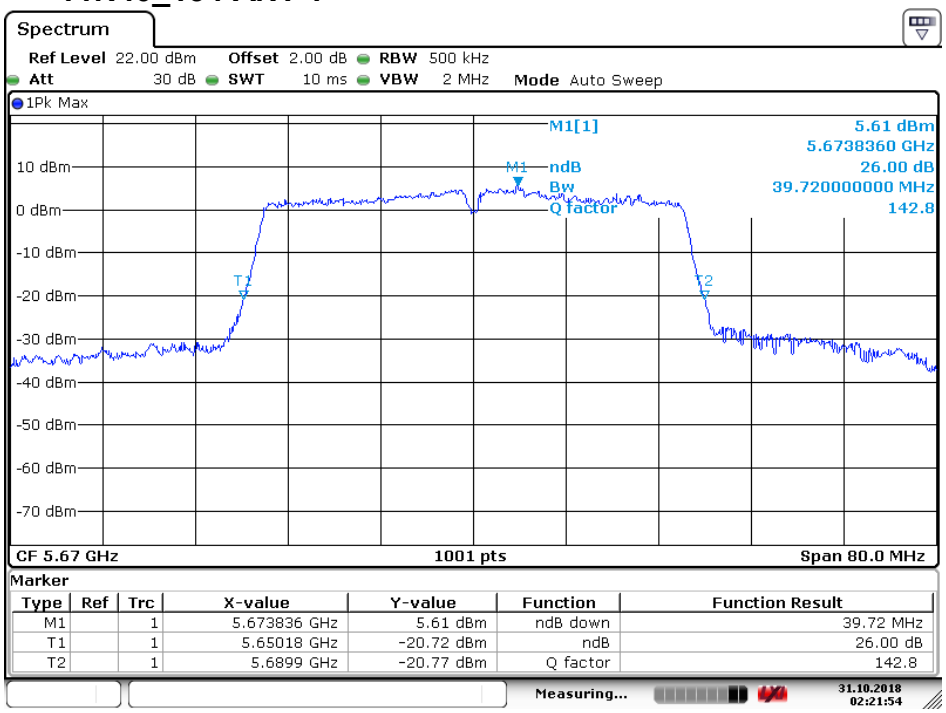
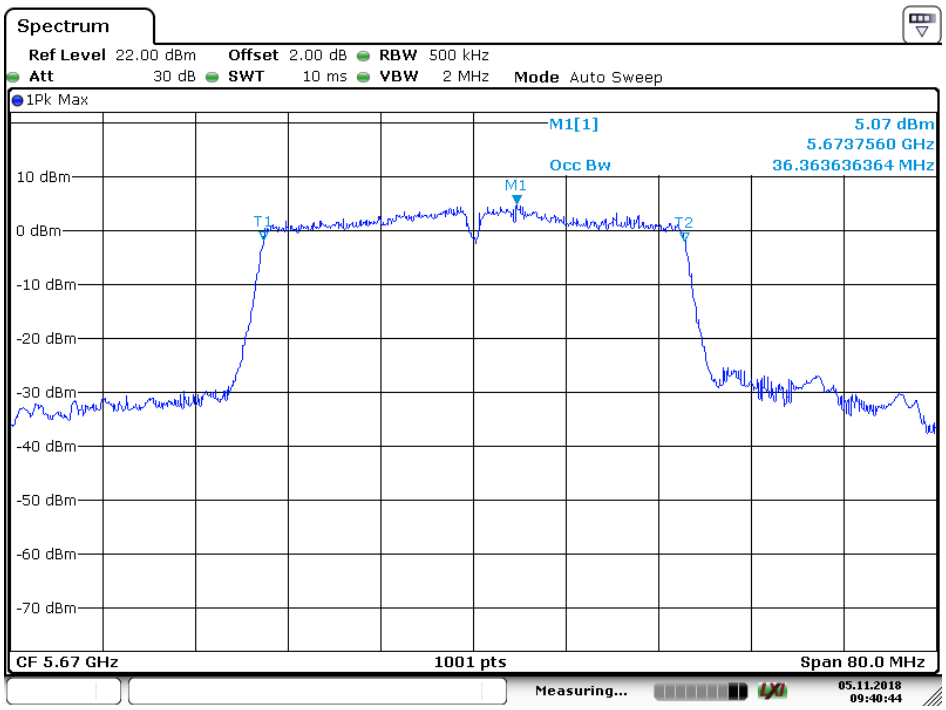
4.4.2.25 11N40_134 ANT 1



Date: 31.OCT.2018 02:21:55



Date: 5.NOV.2018 09:40:44

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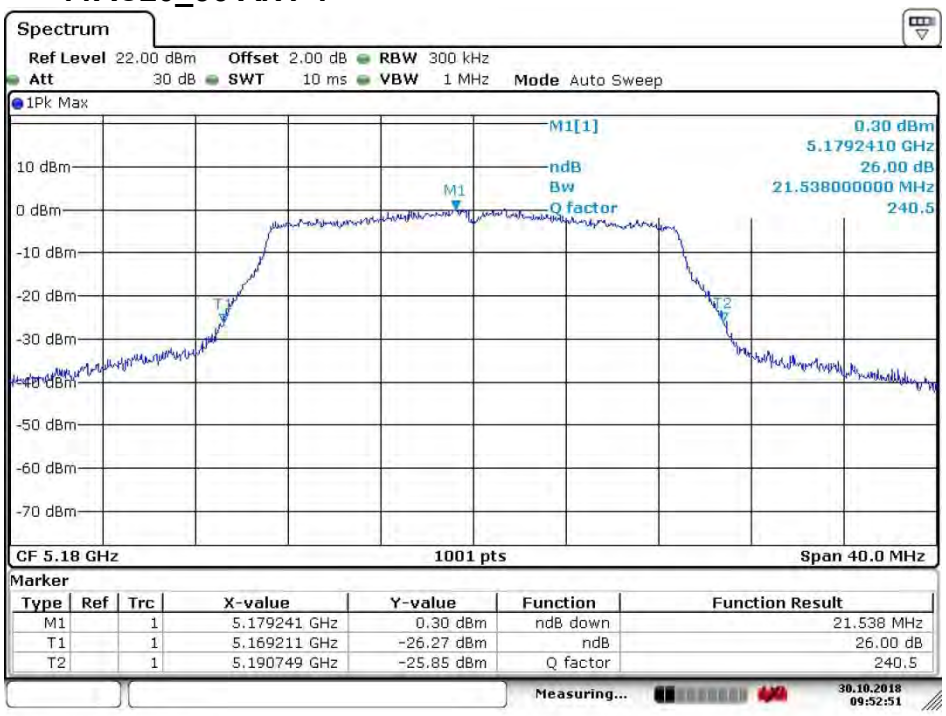
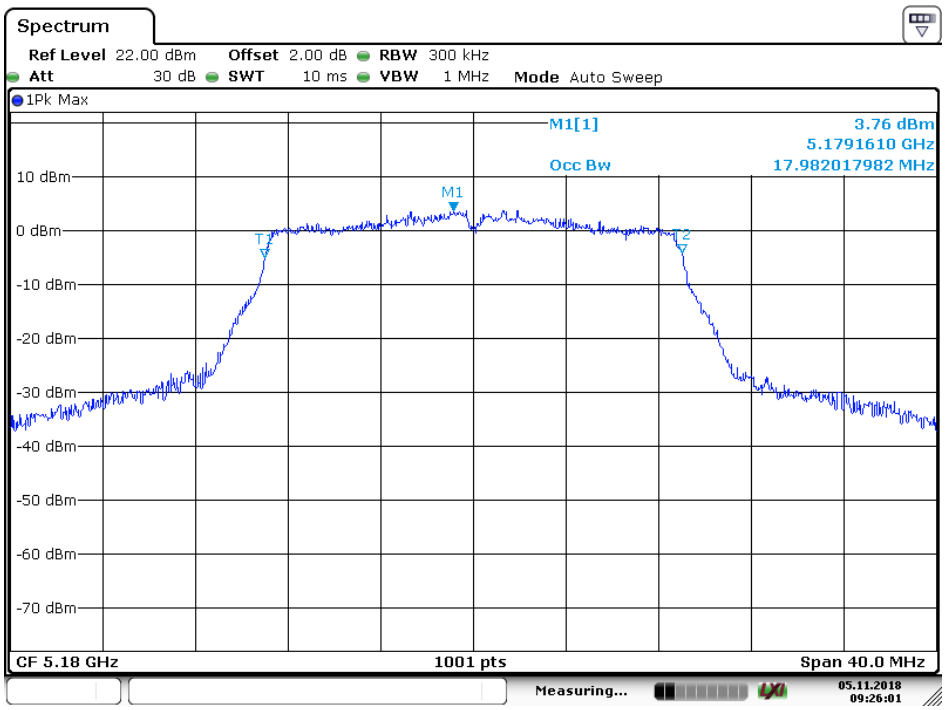
4.4.2.26 11AC20_36 ANT 1



Date: 30.OCT.2018 09:52:51



Date: 5.NOV.2018 09:26:02

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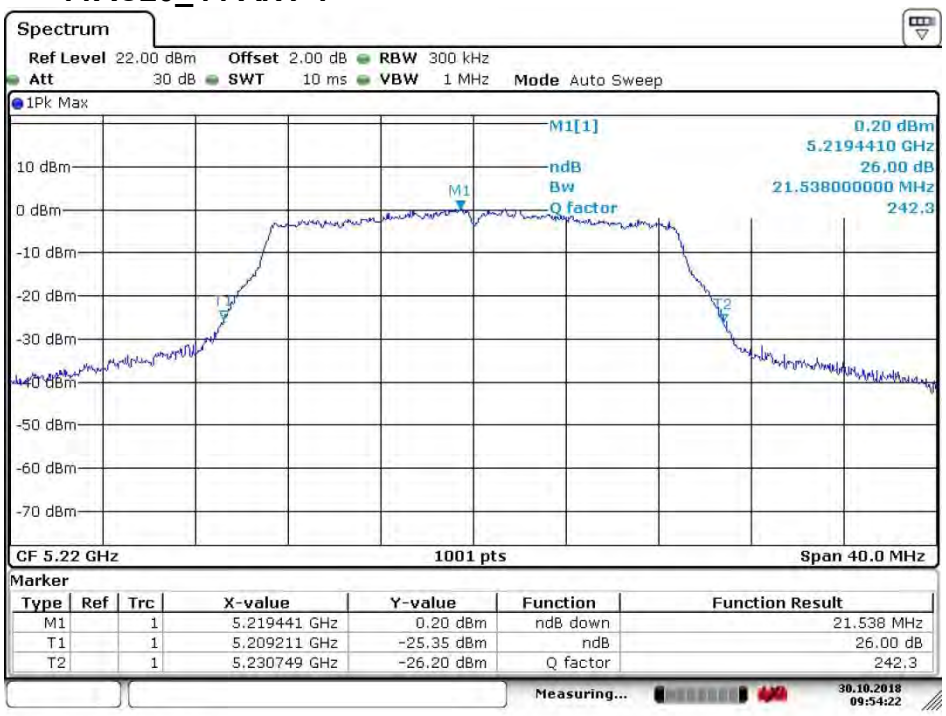
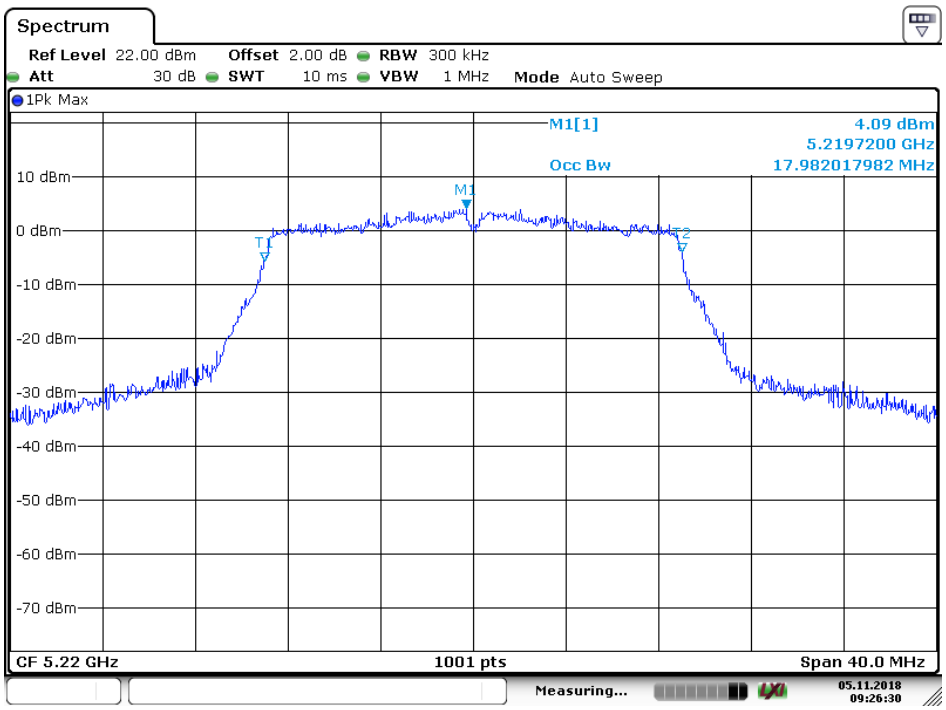
4.4.2.27 11AC20_44 ANT 1



Date: 30.OCT.2018 09:54:22



Date: 5.NOV.2018 09:26:31

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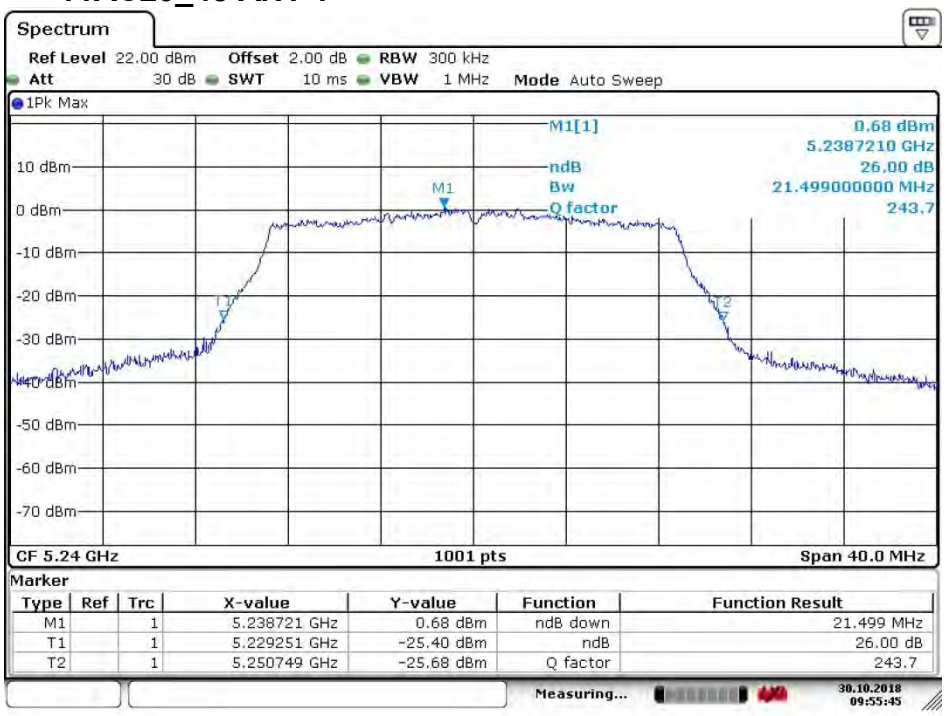
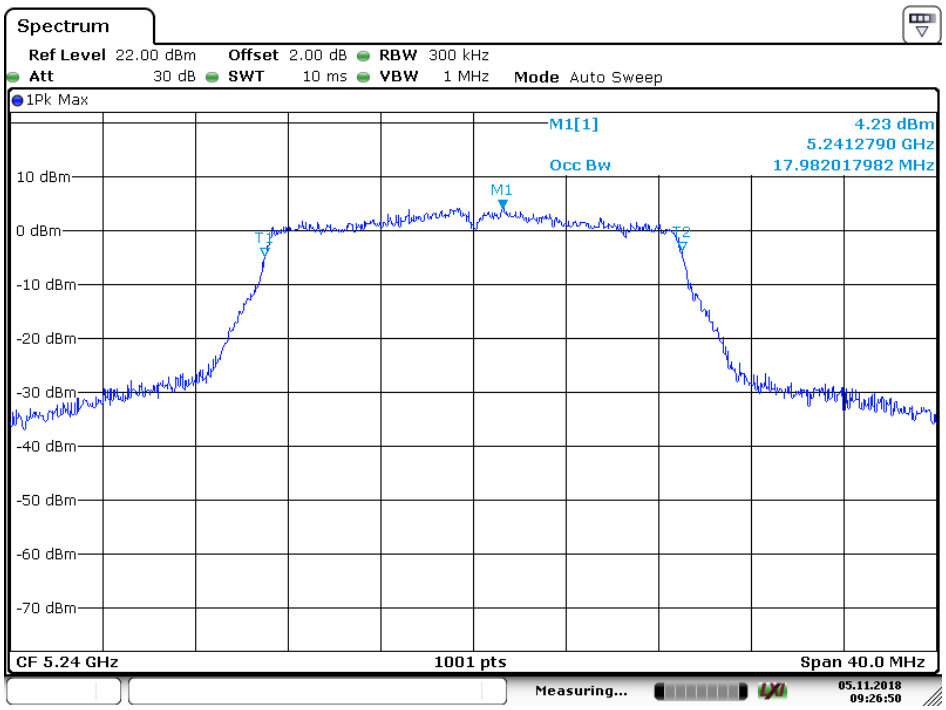
4.4.2.28 11AC20_48 ANT 1



Date: 30.OCT.2018 09:55:46



Date: 5.NOV.2018 09:26:50

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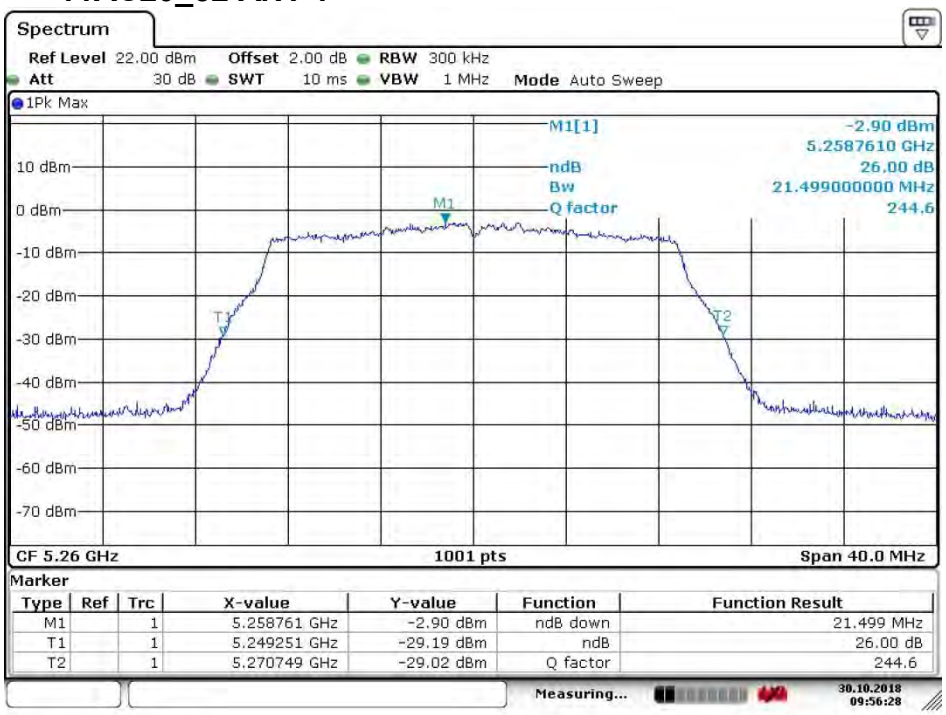
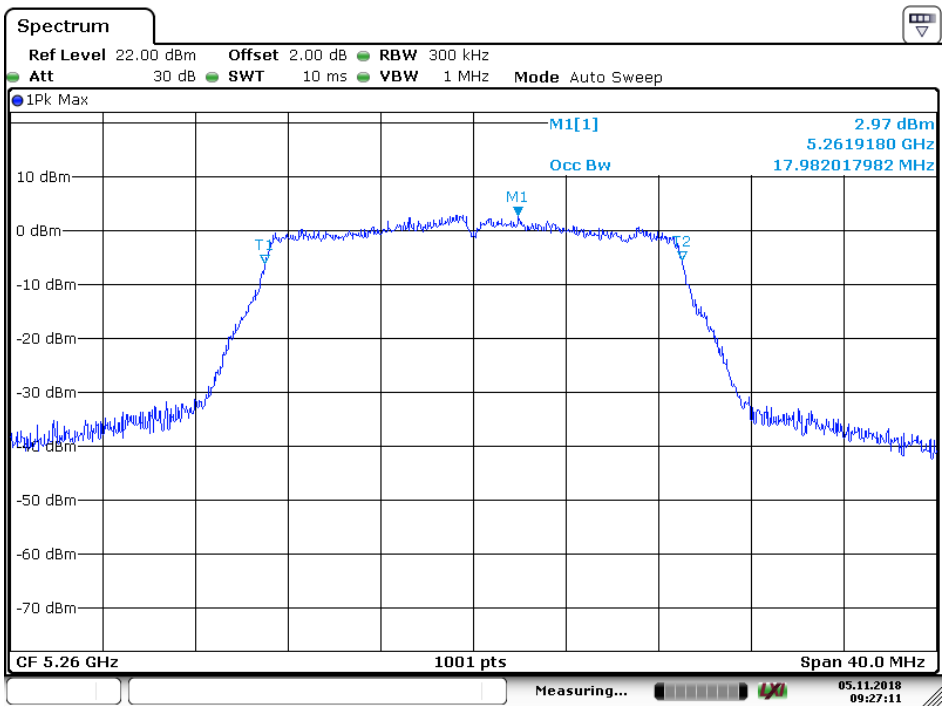
4.4.2.29 11AC20_52 ANT 1



Date: 30.OCT.2018 09:56:29



Date: 5.NOV.2018 09:27:12

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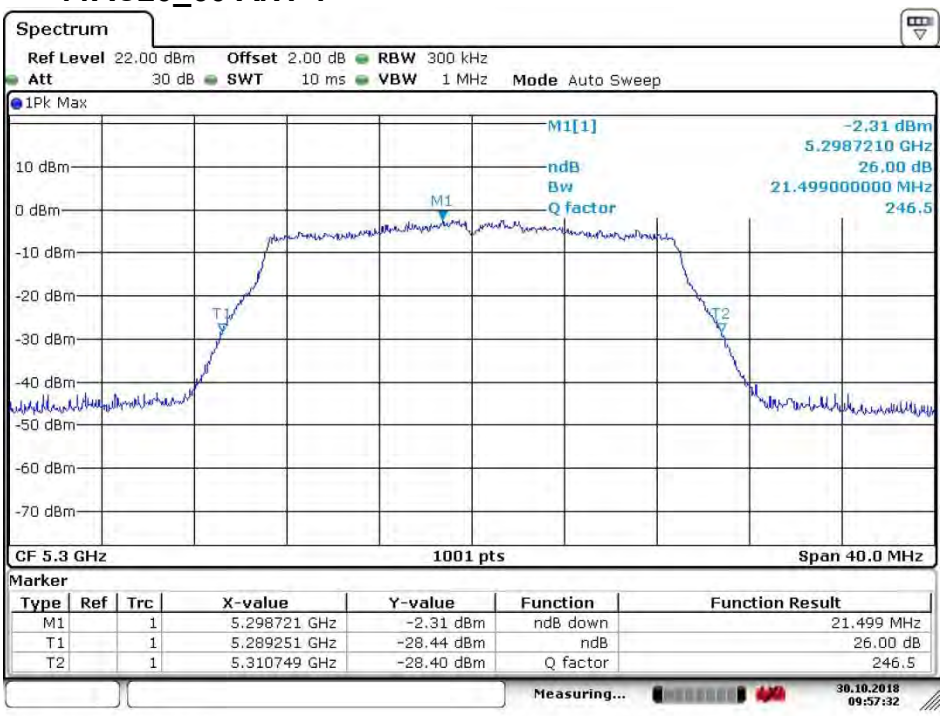
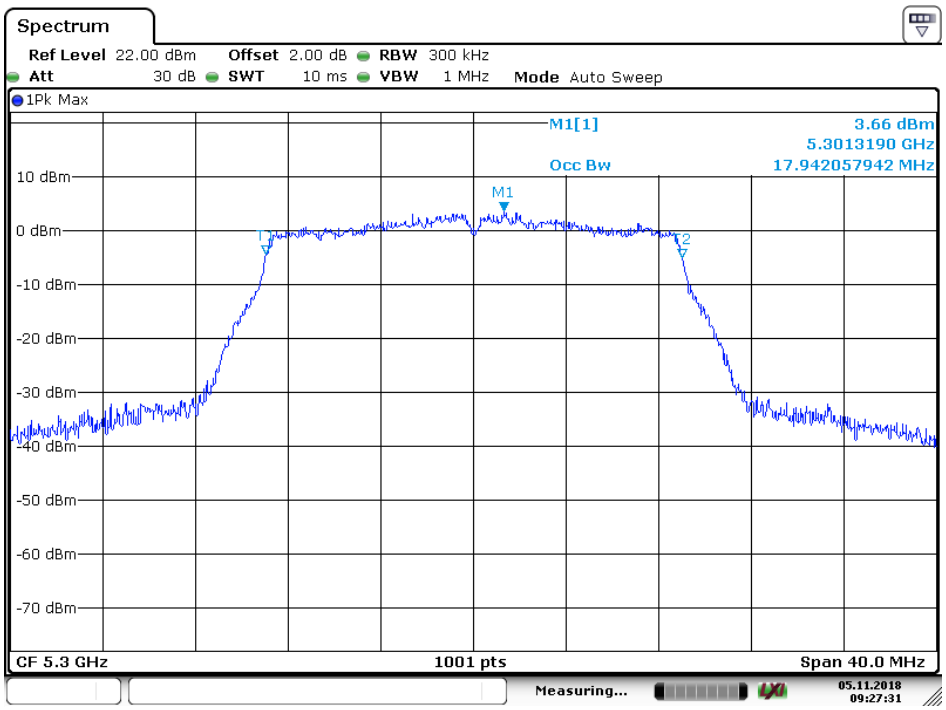
4.4.2.30 11AC20_60 ANT 1



Date: 30.OCT.2018 09:57:33



Date: 5.NOV.2018 09:27:31

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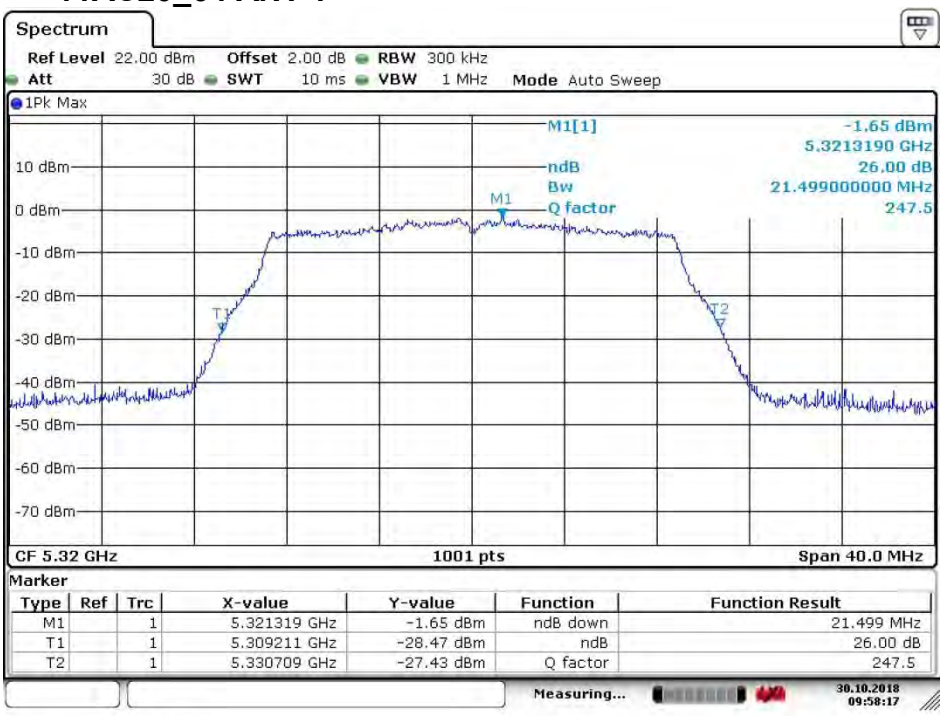
4.4.2.31 11AC20_64 ANT 1



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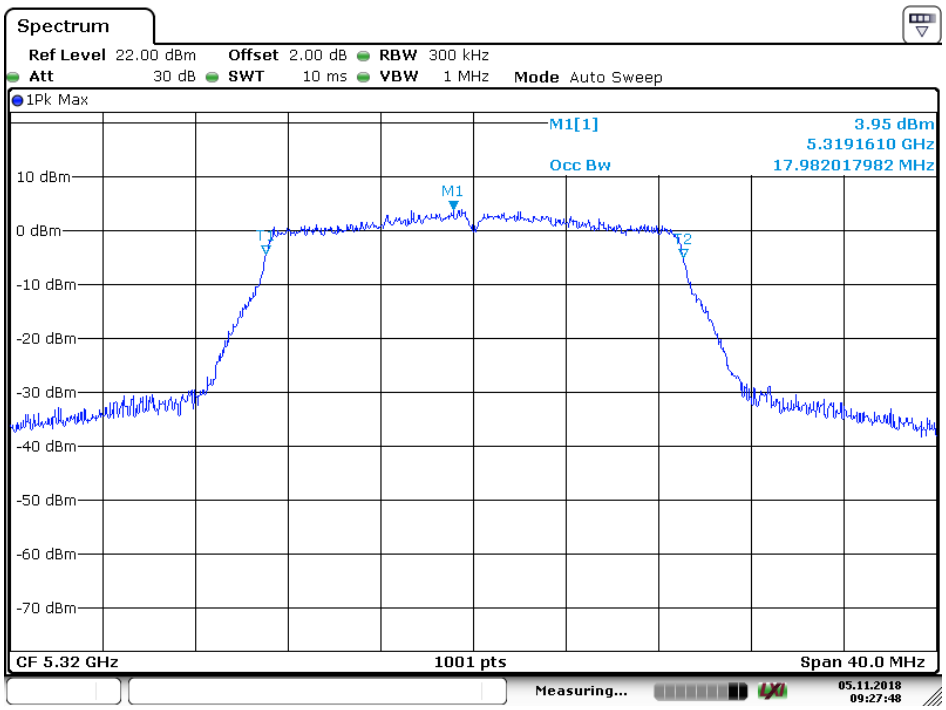

Date: 5.NOV.2018 09:27:49

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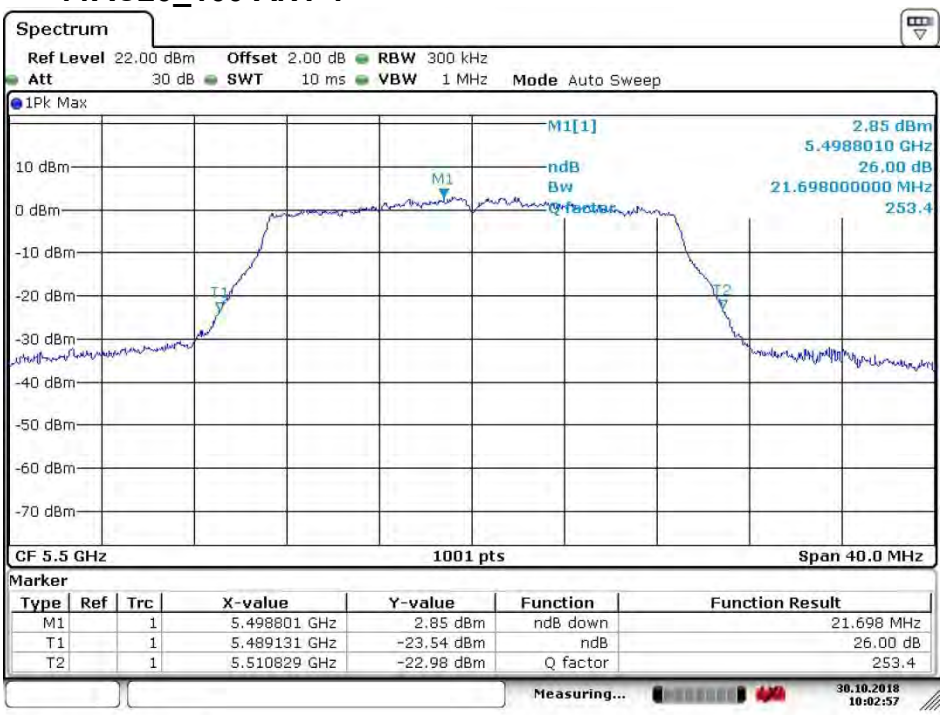
4.4.2.32 11AC20_100 ANT 1



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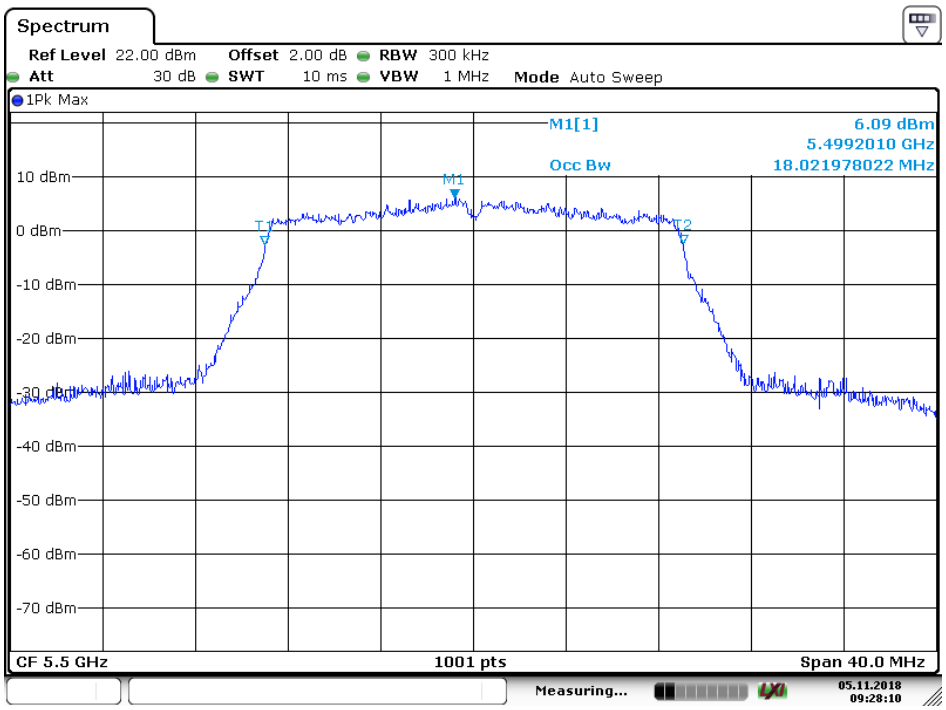

Date: 5.NOV.2018 09:28:11

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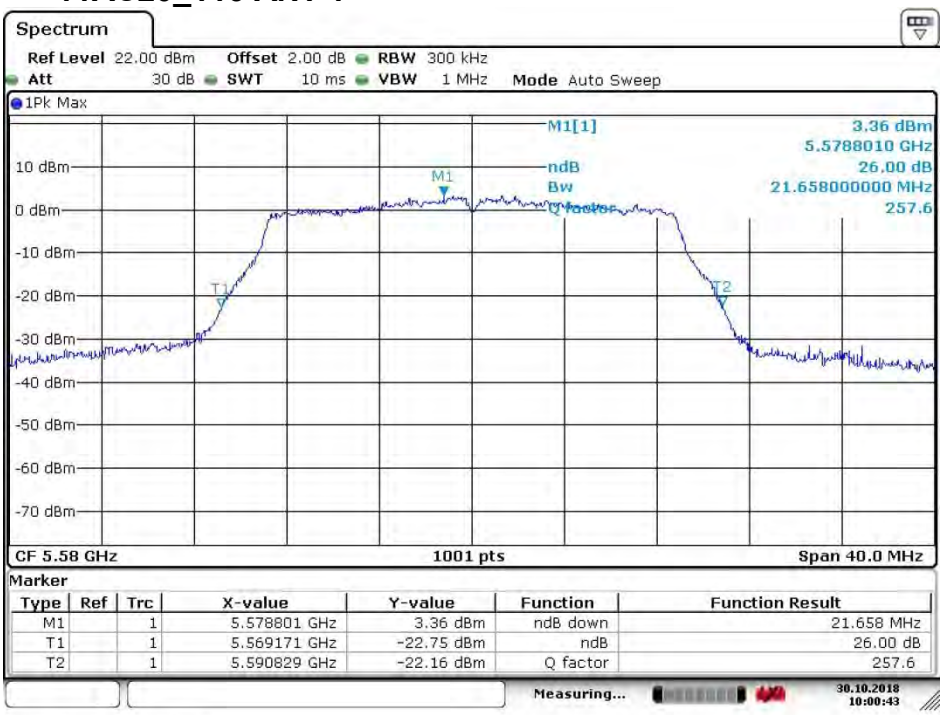
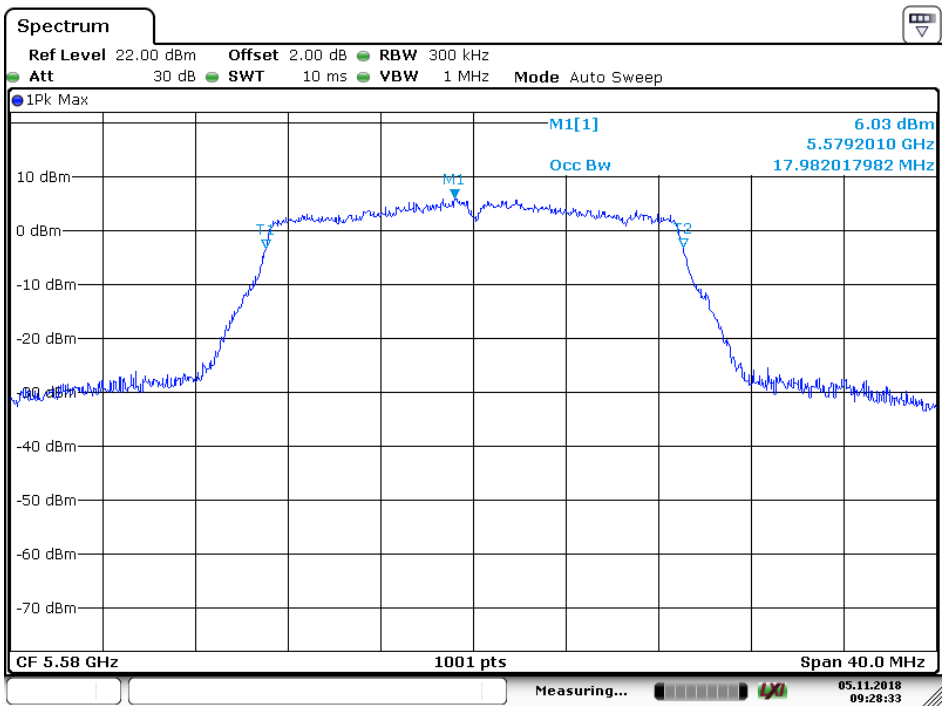
4.4.2.33 11AC20_116 ANT 1



Date: 30.OCT.2018 10:00:44



Date: 5.NOV.2018 09:28:34

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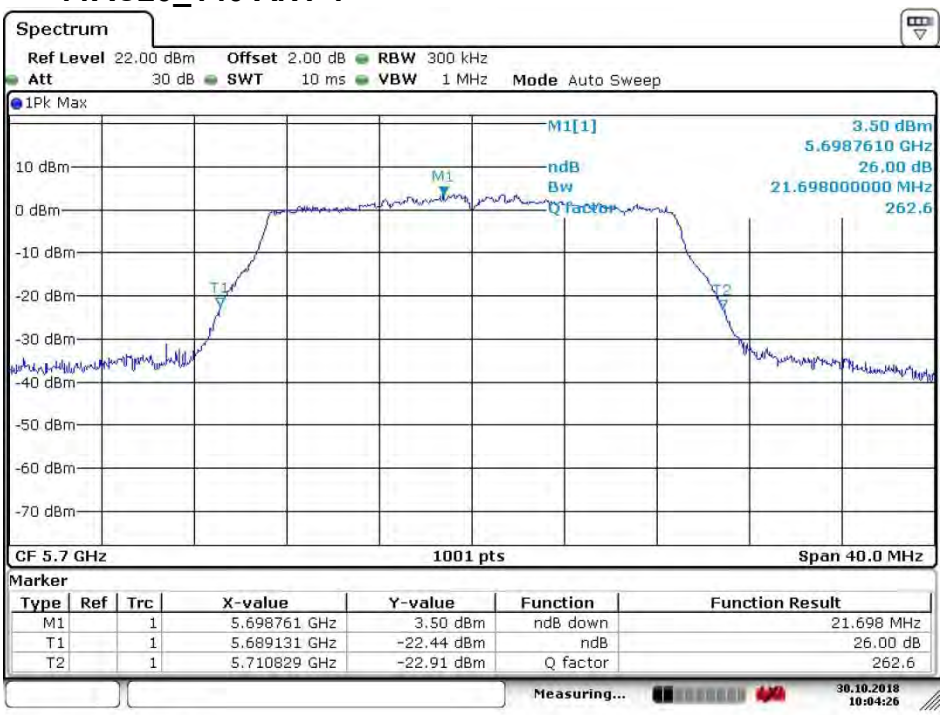
4.4.2.34 11AC20_140 ANT 1



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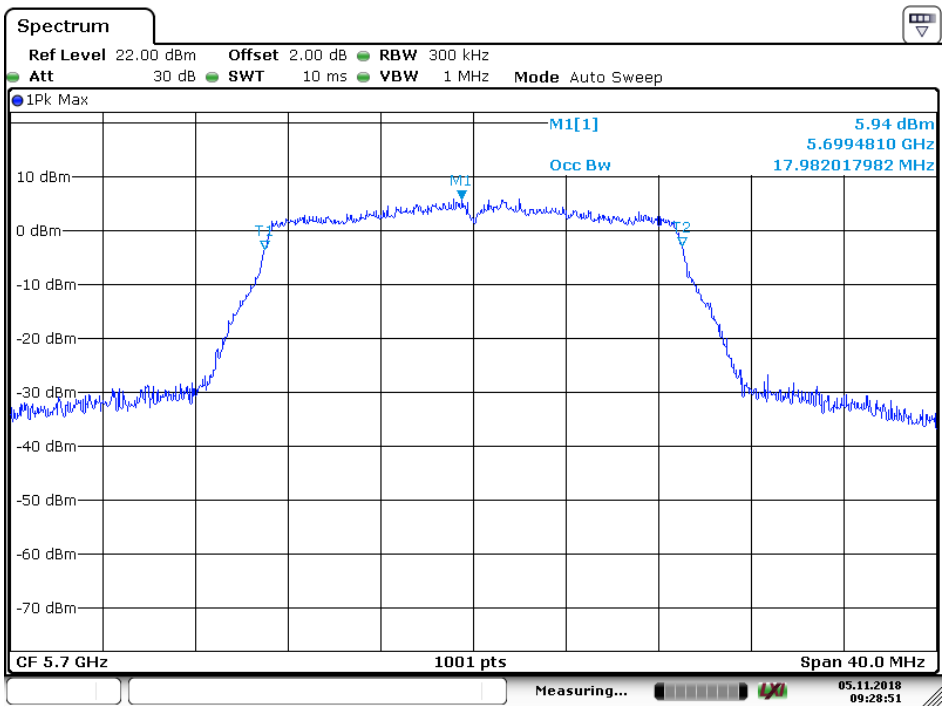

Date: 5.NOV.2018 09:28:51

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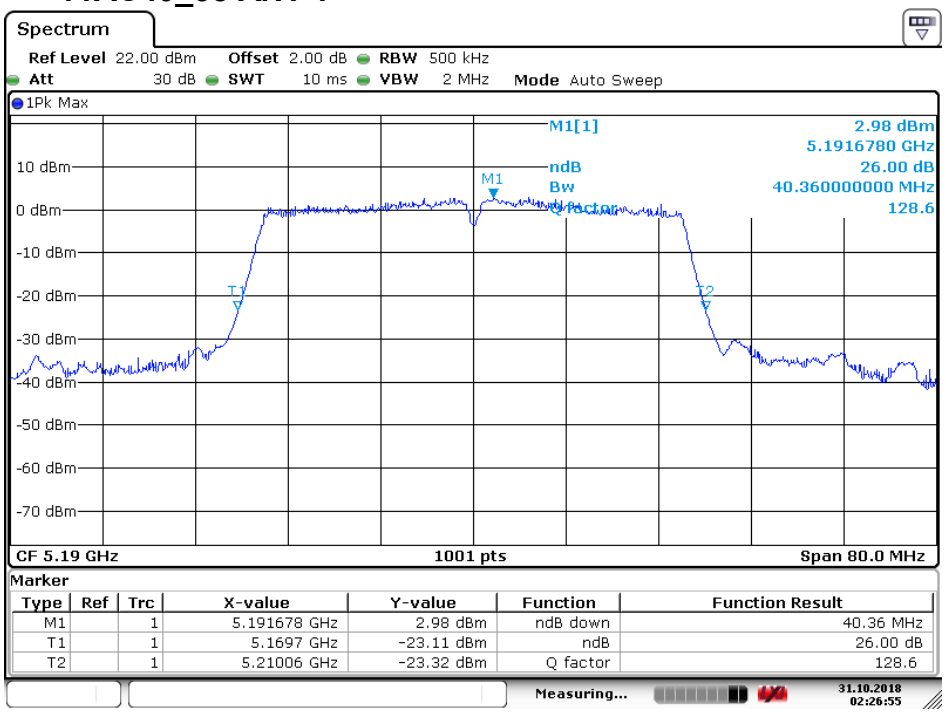
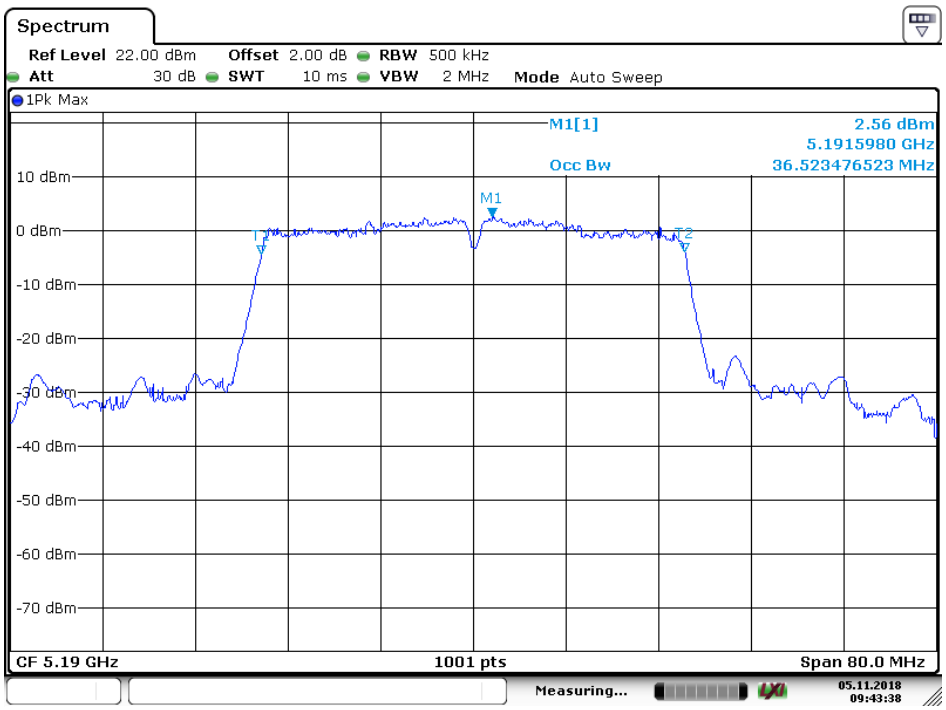
4.4.2.35 11AC40_38 ANT 1



Date: 31.OCT.2018 02:26:56



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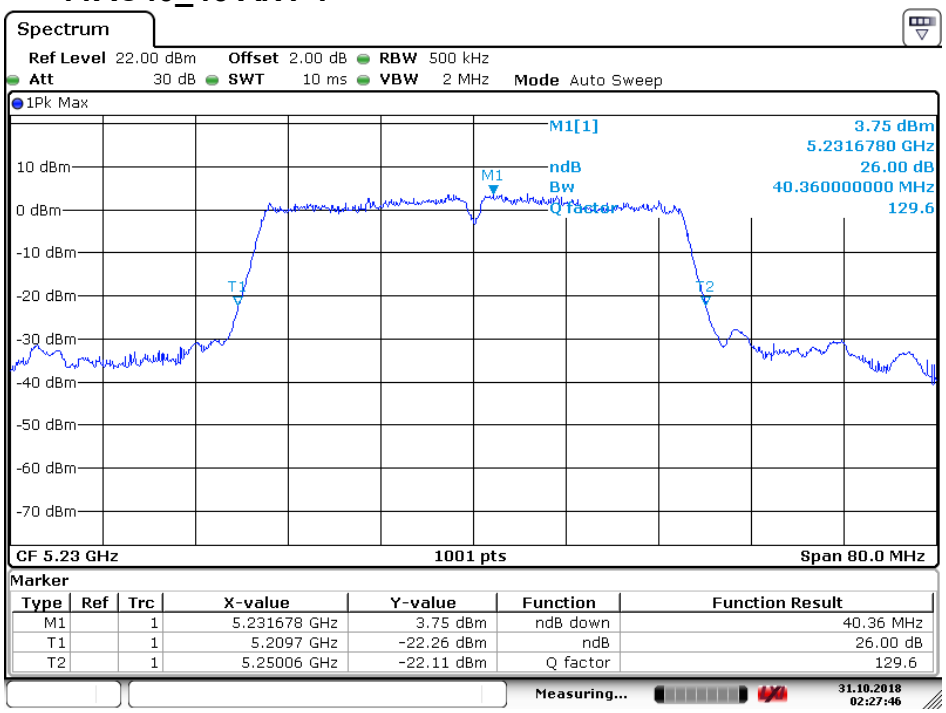
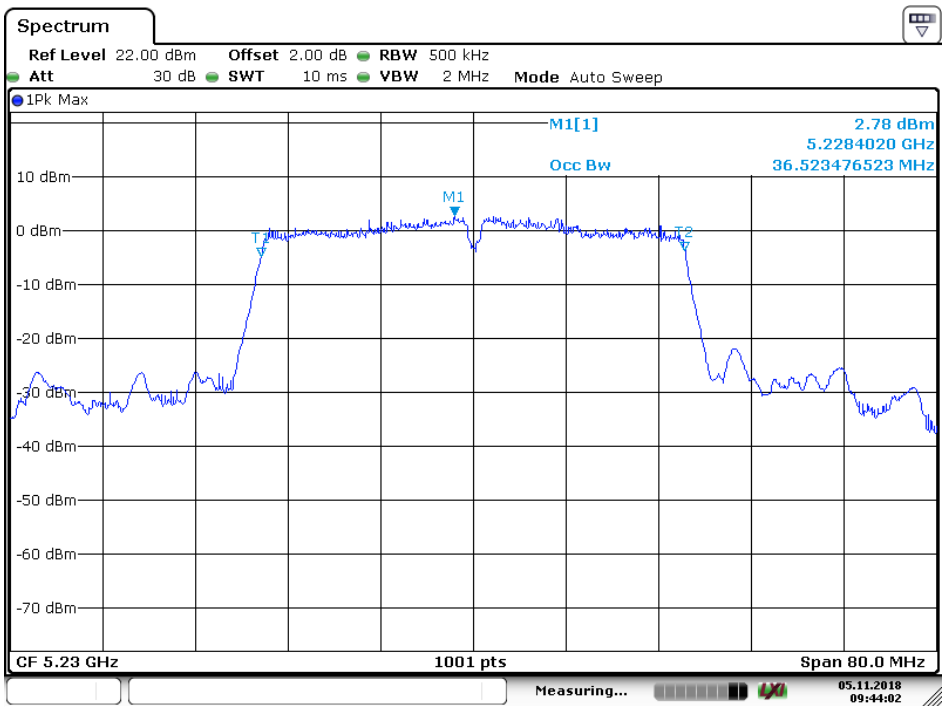
4.4.2.36 11AC40_46 ANT 1



Date: 31.OCT.2018 02:27:47



Date: 5.NOV.2018 09:44:03

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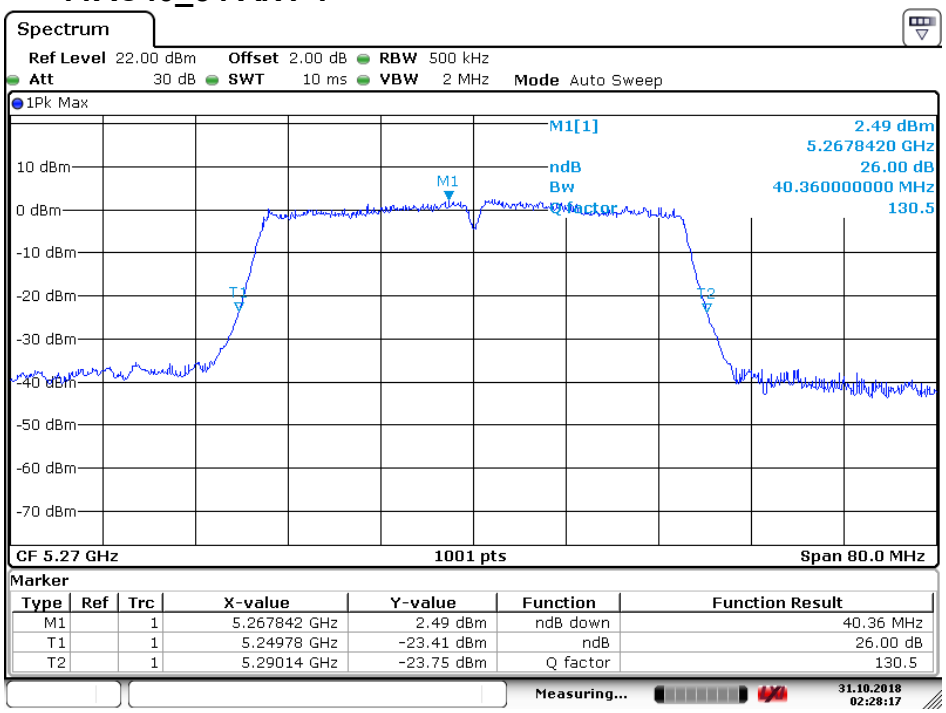
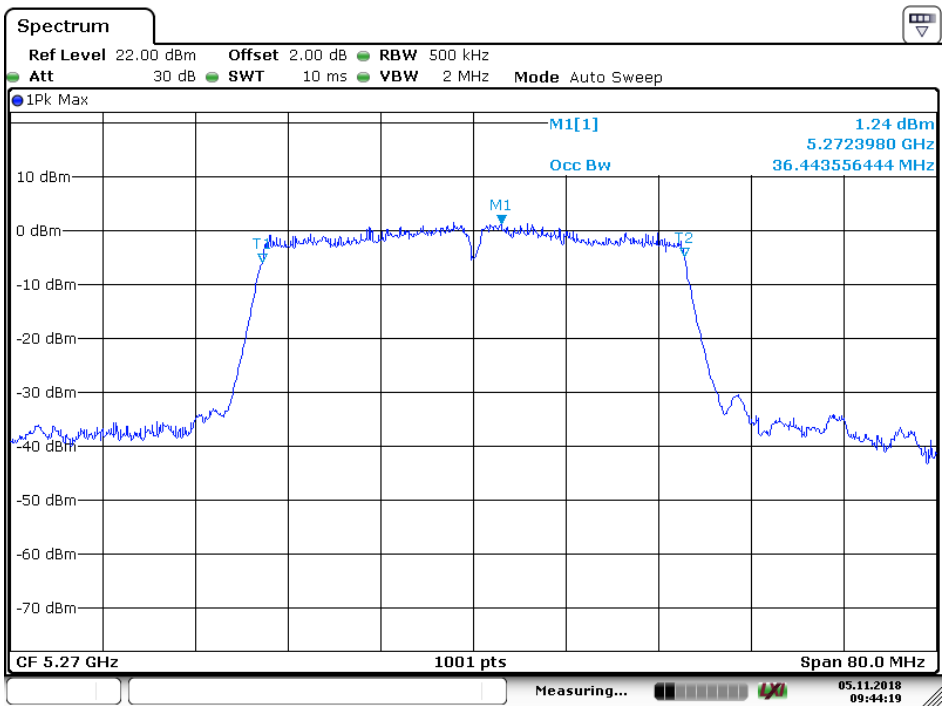
4.4.2.37 11AC40_54 ANT 1



Date: 31.OCT.2018 02:28:18



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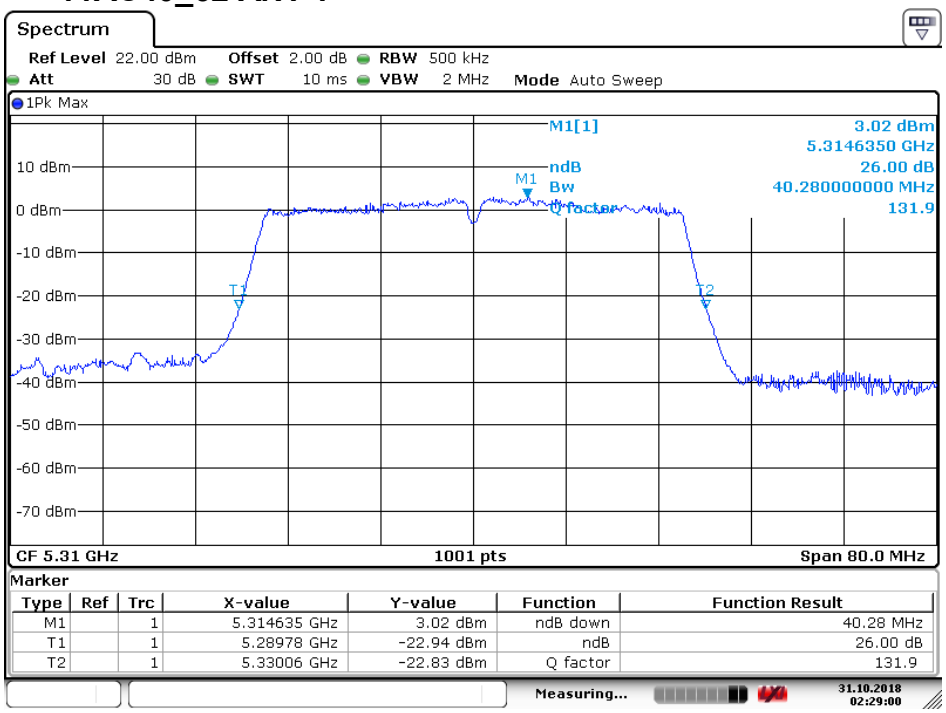
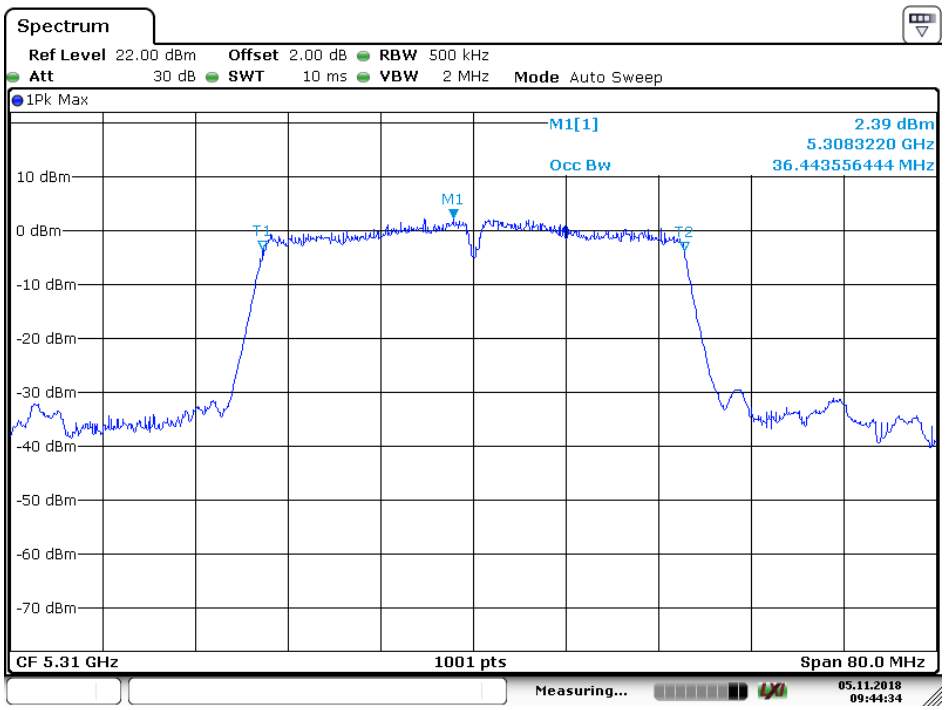
4.4.2.38 11AC40_62 ANT 1



Date: 31.OCT.2018 02:29:00



Date: 5.NOV.2018 09:44:34

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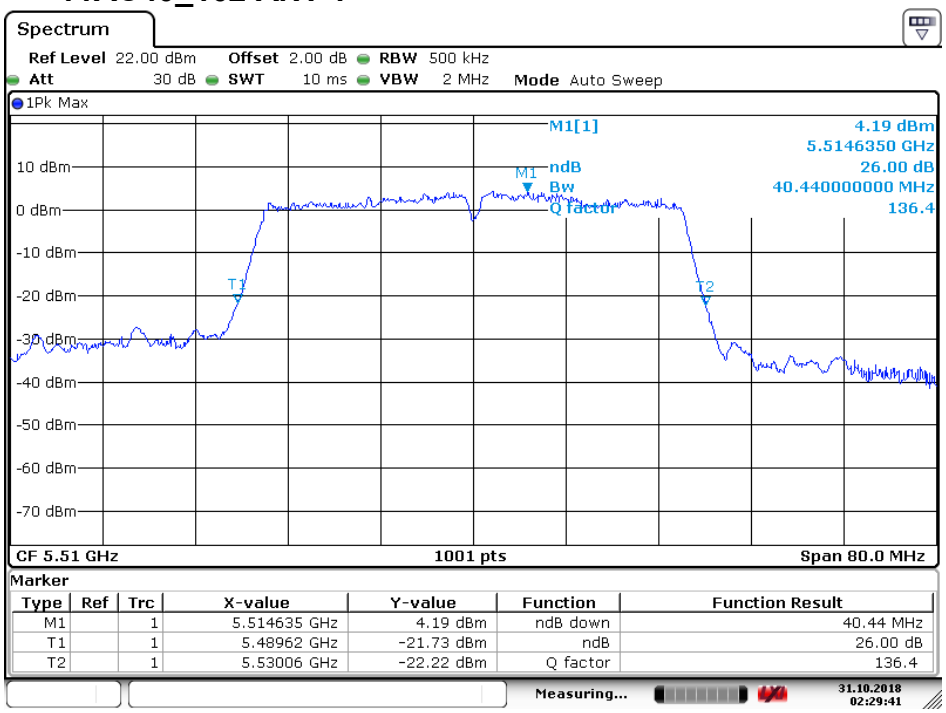
4.4.2.39 11AC40_102 ANT 1



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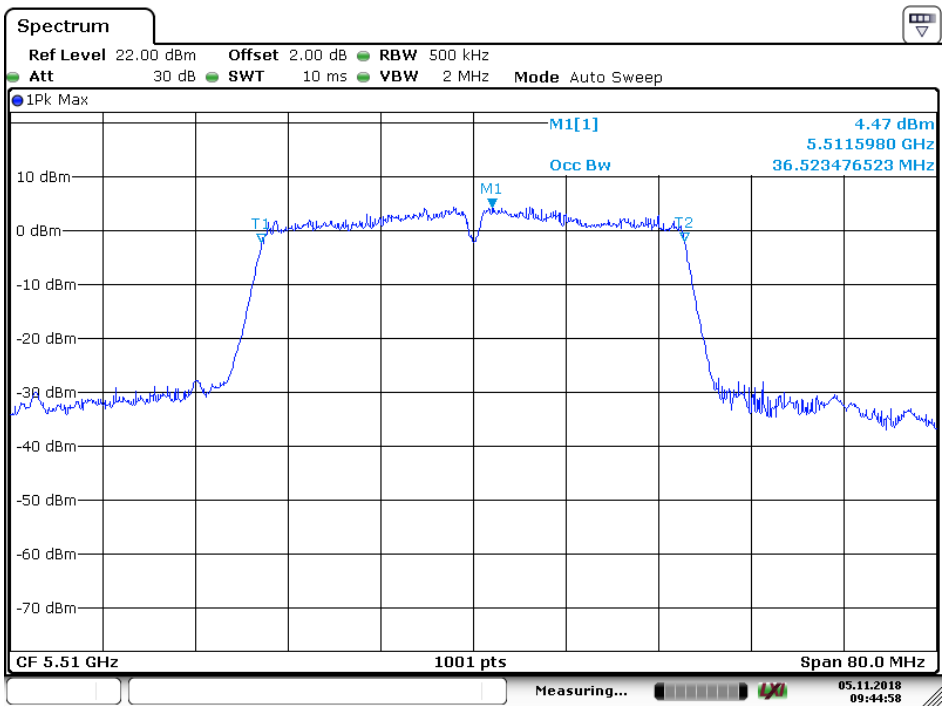

Date: 5.NOV.2018 09:44:59

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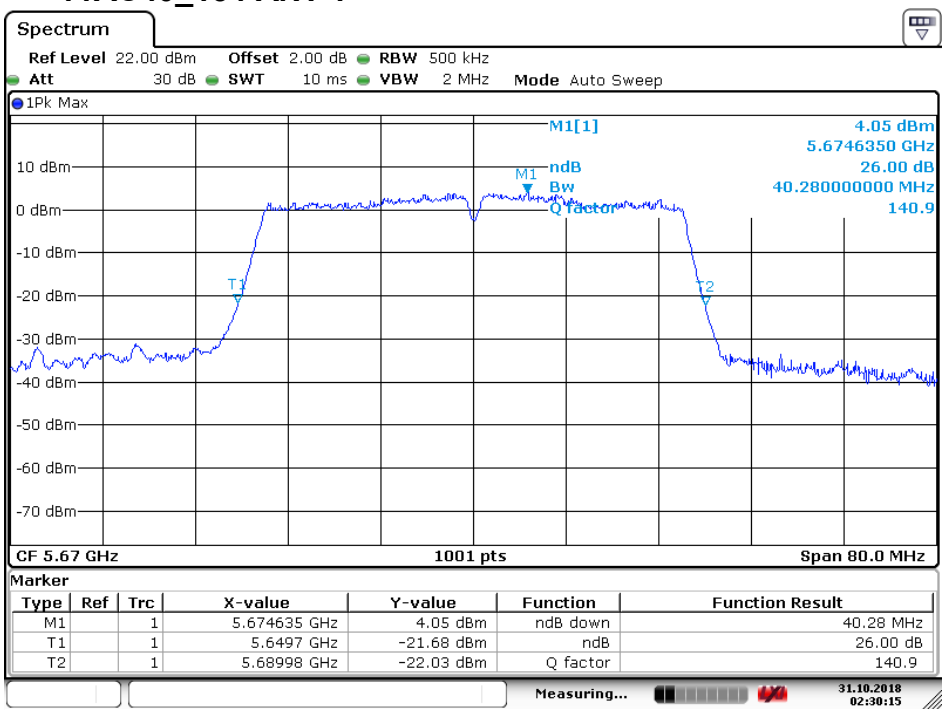
4.4.2.40 11AC40_134 ANT 1



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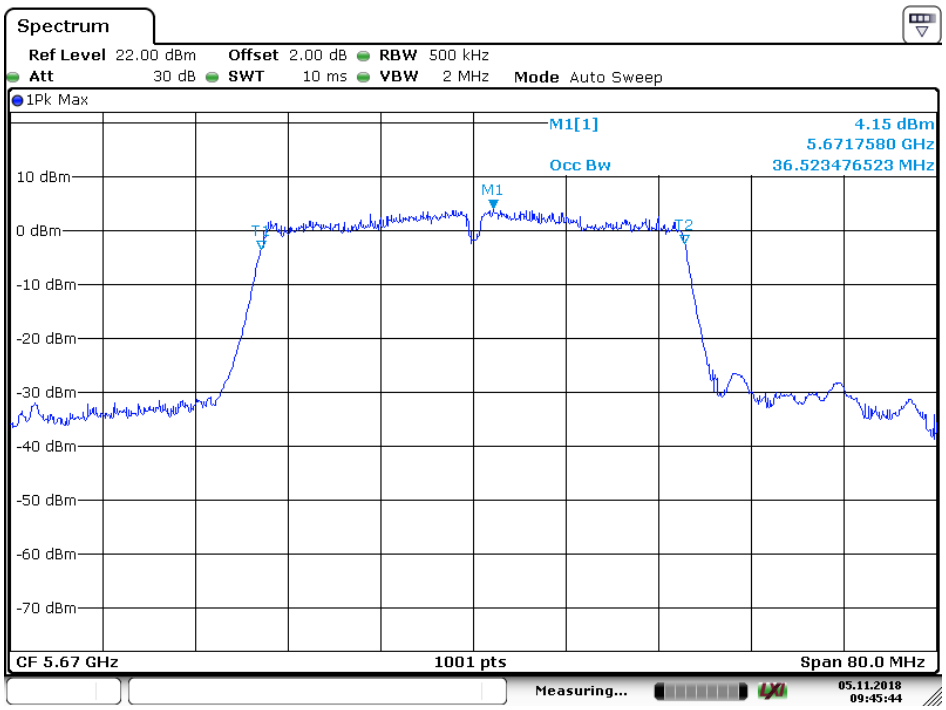

Date: 5.NOV.2018 09:45:44

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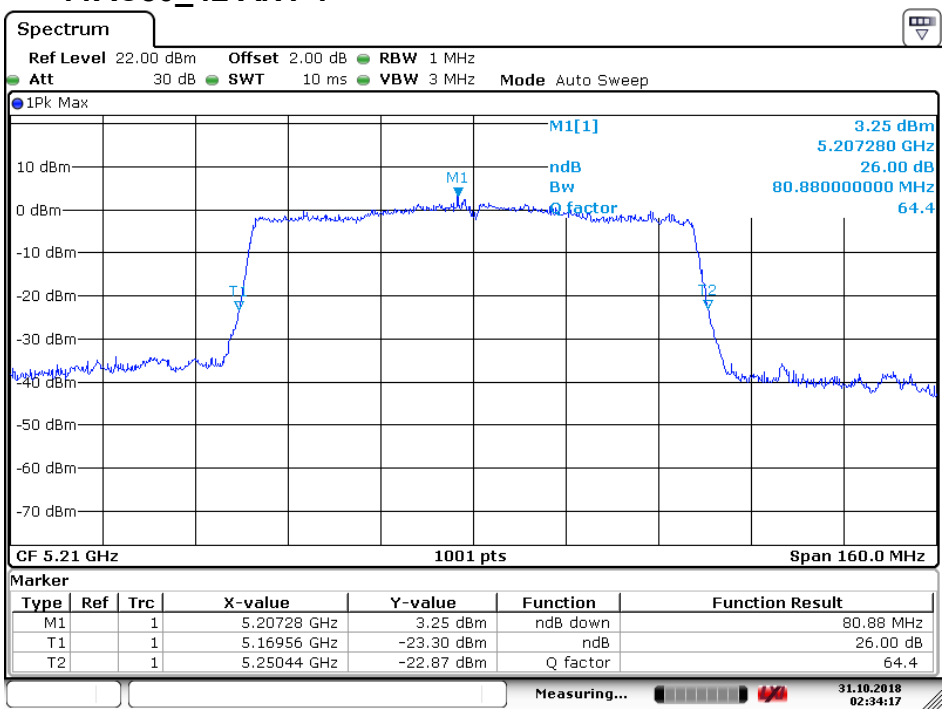
4.4.2.41 11AC80_42 ANT 1



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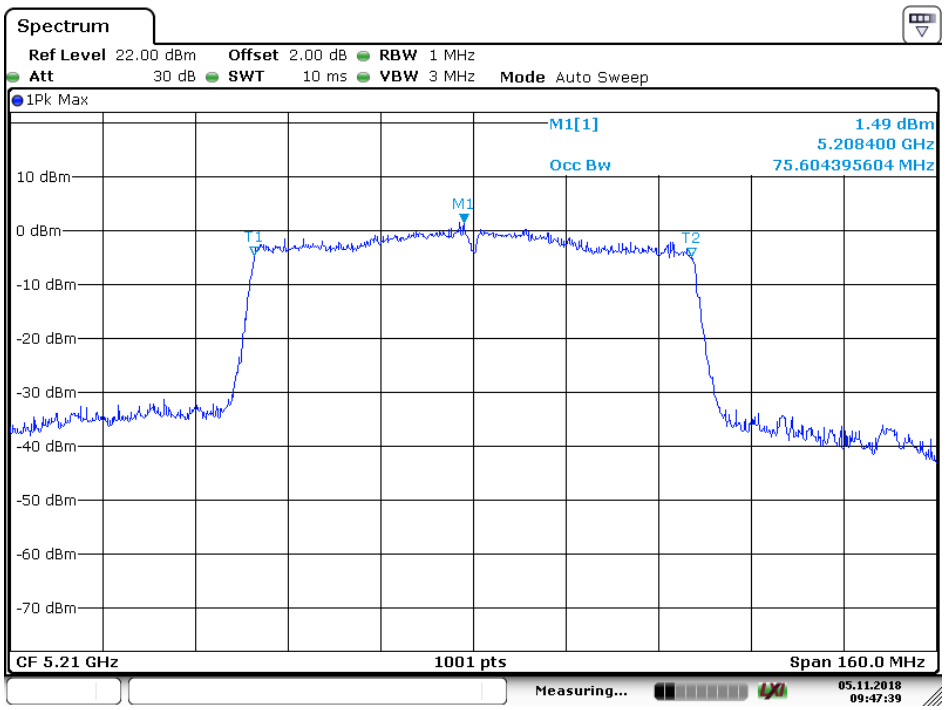

Date: 5.NOV.2018 09:47:40

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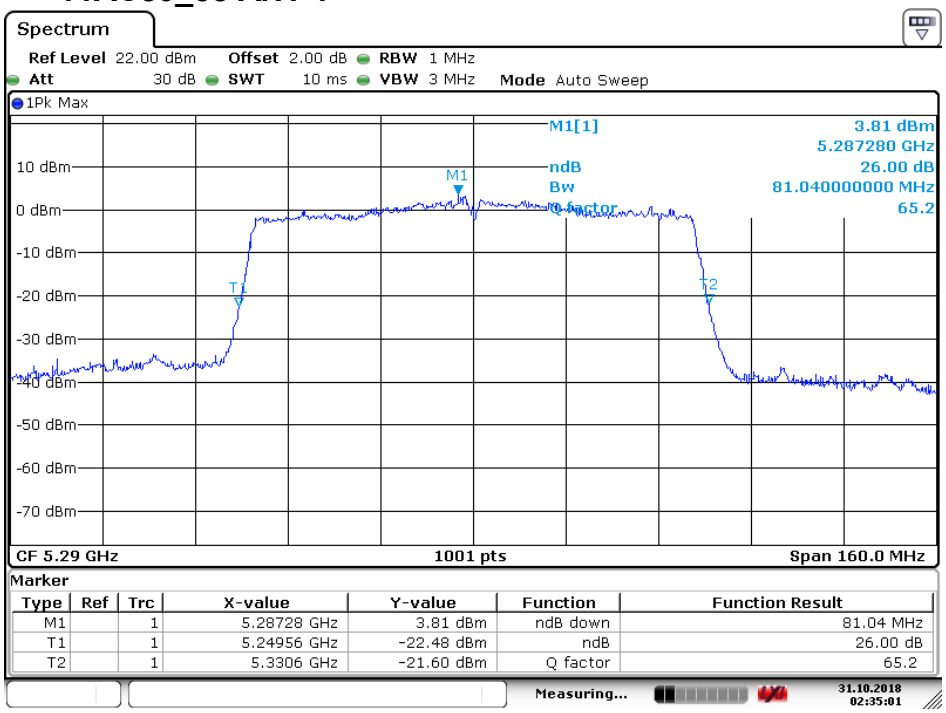
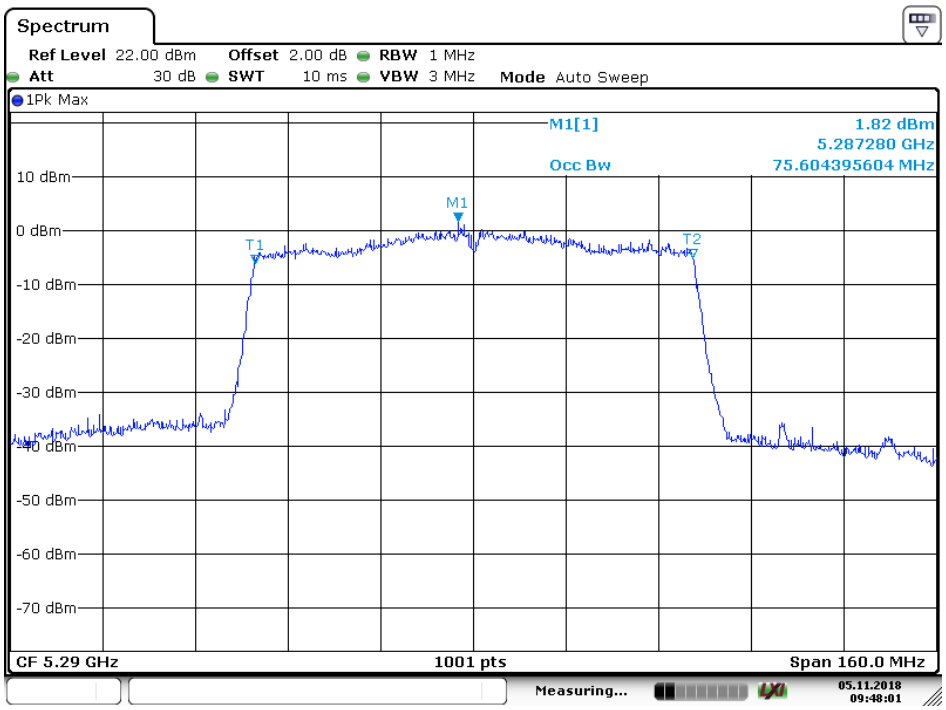
4.4.2.42 11AC80_58 ANT 1



Date: 31.OCT.2018 02:35:01



Date: 5.NOV.2018 09:48:01

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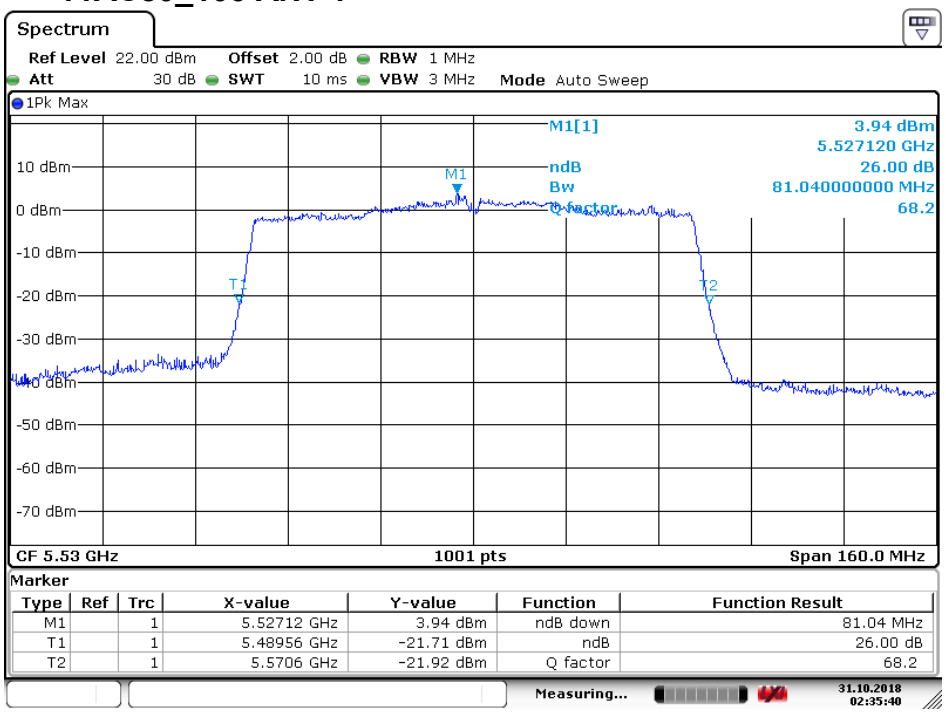
4.4.2.43 11AC80_106 ANT 1



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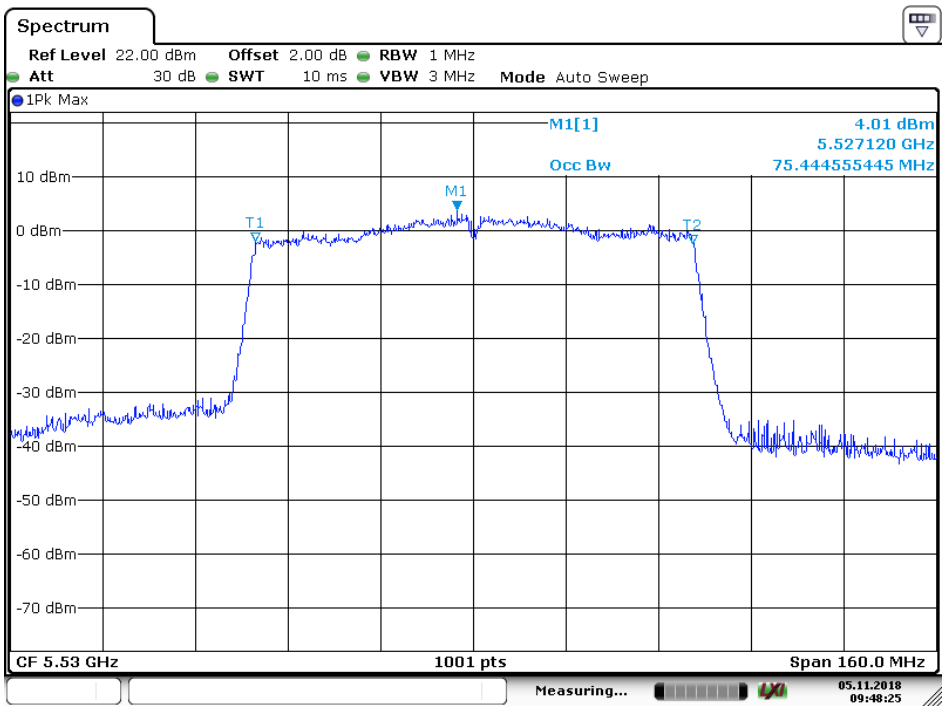

Date: 5.NOV.2018 09:48:25

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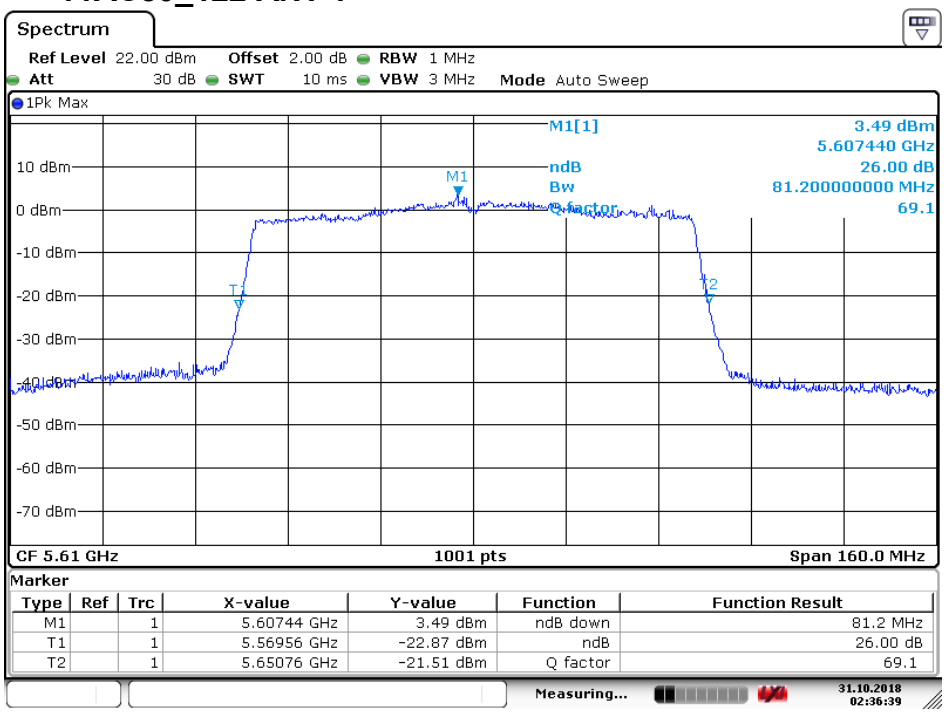
4.4.2.44 11AC80_122 ANT 1



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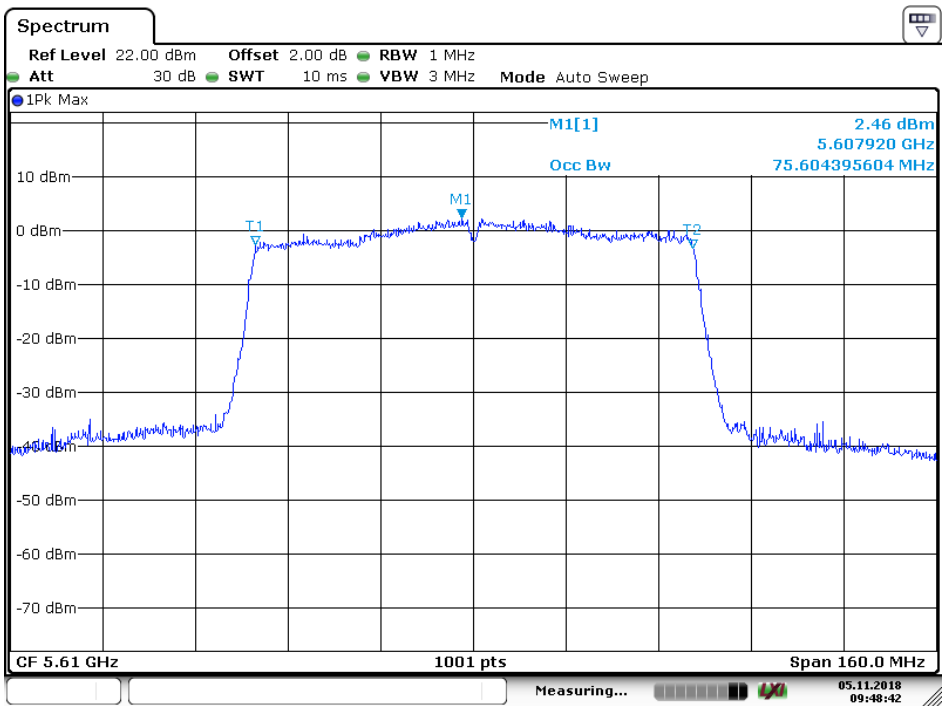

Date: 5.NOV.2018 09:48:43

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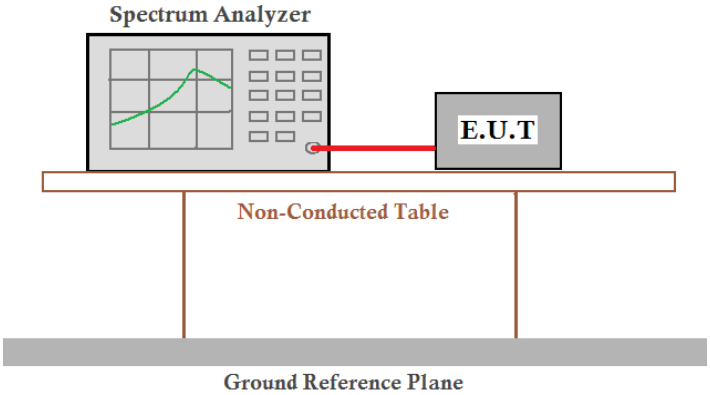
4.5 6dB Emission Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15 Section 15.407(e)
Test Method:	ANSI C63.10: 2013
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT20); MCSAC0 of rate is the worst case of 802.11ac(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT80). Only the worst case is recorded in the report.
Limit:	Frequency Band: 5725-5850MHz Limit: At lease 500kHz
Test Results:	Pass

Test Mode	Test Channel	Frequency [MHz]	ANT	6dB Emission Bandwidth [MHz]	Occupied Bandwidth [MHz]	Verdict
11A20	149	5745	ANT 1	16.36	16.66	PASS
	157	5785	ANT 1	16.36	16.66	PASS
	165	5825	ANT 1	16.36	16.62	PASS
11N20	149	5745	ANT 1	17.42	17.94	PASS
	157	5785	ANT 1	17.66	17.94	PASS
	165	5825	ANT 1	17.74	17.94	PASS
11N40	151	5755	ANT 1	36.28	36.36	PASS
	159	5795	ANT 1	36.20	36.36	PASS
11AC20	149	5745	ANT 1	17.66	18.02	PASS
	157	5785	ANT 1	17.62	18.02	PASS
	165	5825	ANT 1	17.70	17.98	PASS
11AC40	151	5755	ANT 1	36.44	36.52	PASS
	159	5795	ANT 1	35.96	36.44	PASS
11AC80	155	5775	ANT 1	75.60	75.44	PASS

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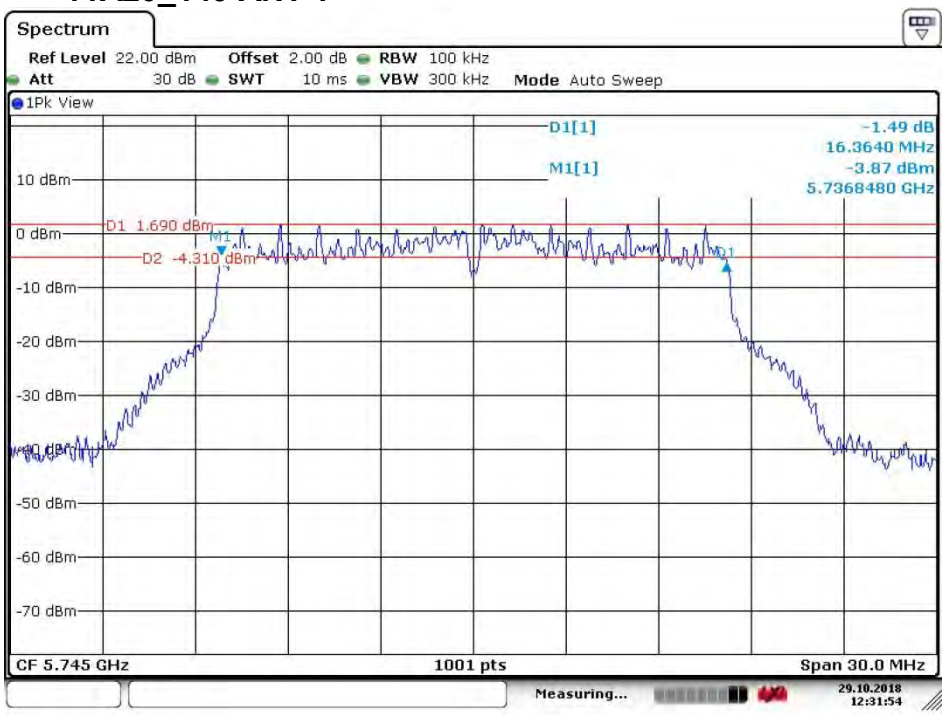
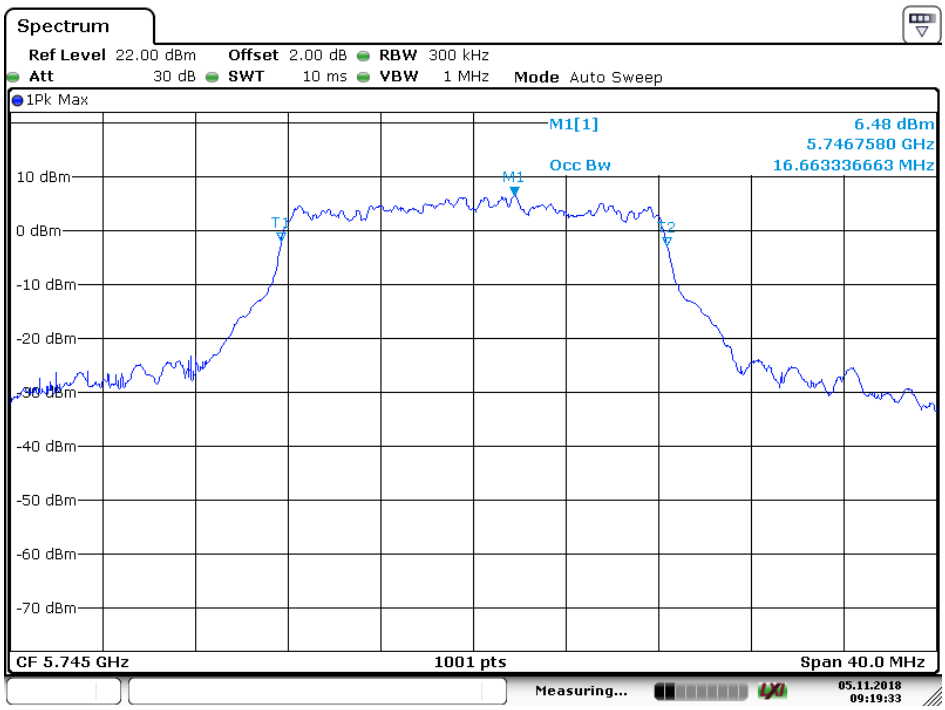
4.5.1 Plots for 6dB Emission Bandwidth & 99% Occupied Bandwidth

4.5.1.1 11A20_149 ANT 1



Date: 29.OCT.2018 12:31:55



Date: 5.NOV.2018 09:19:34

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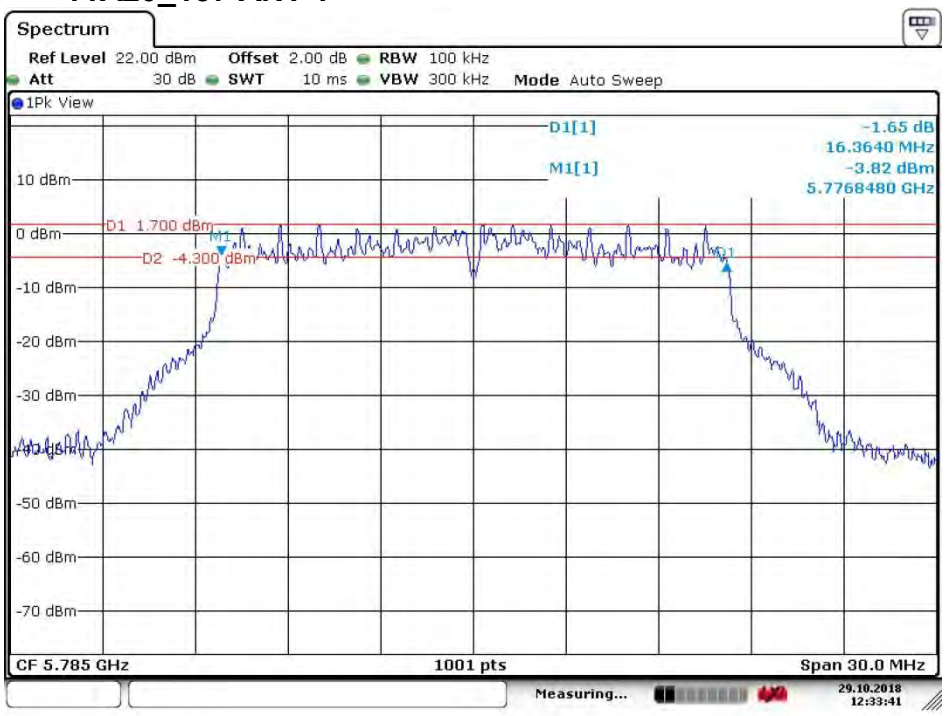
4.5.1.2 11A20_157 ANT 1



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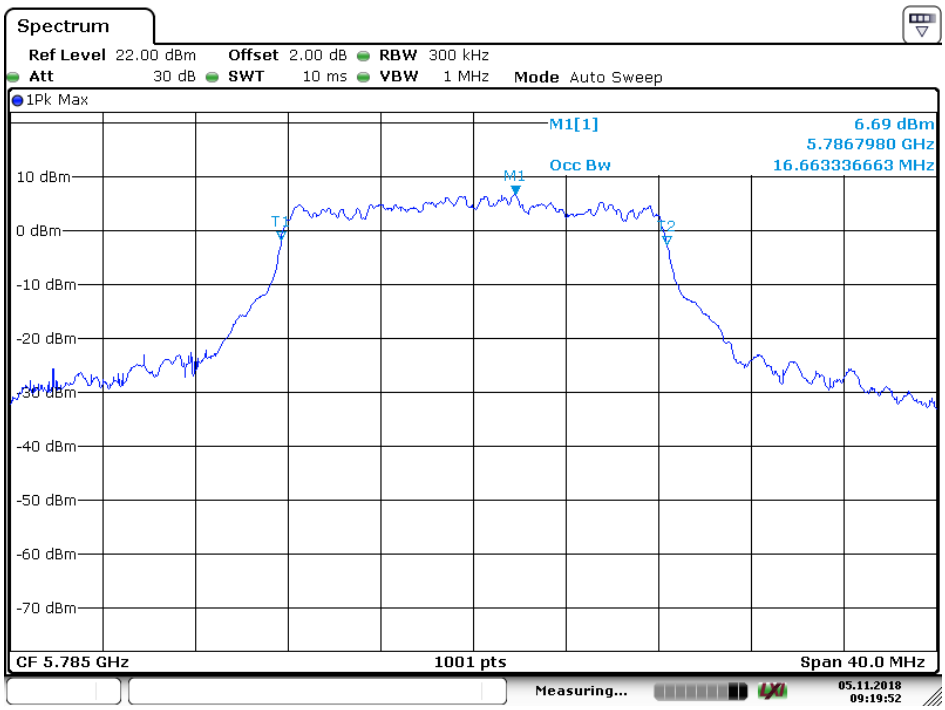

Date: 5.NOV.2018 09:19:52

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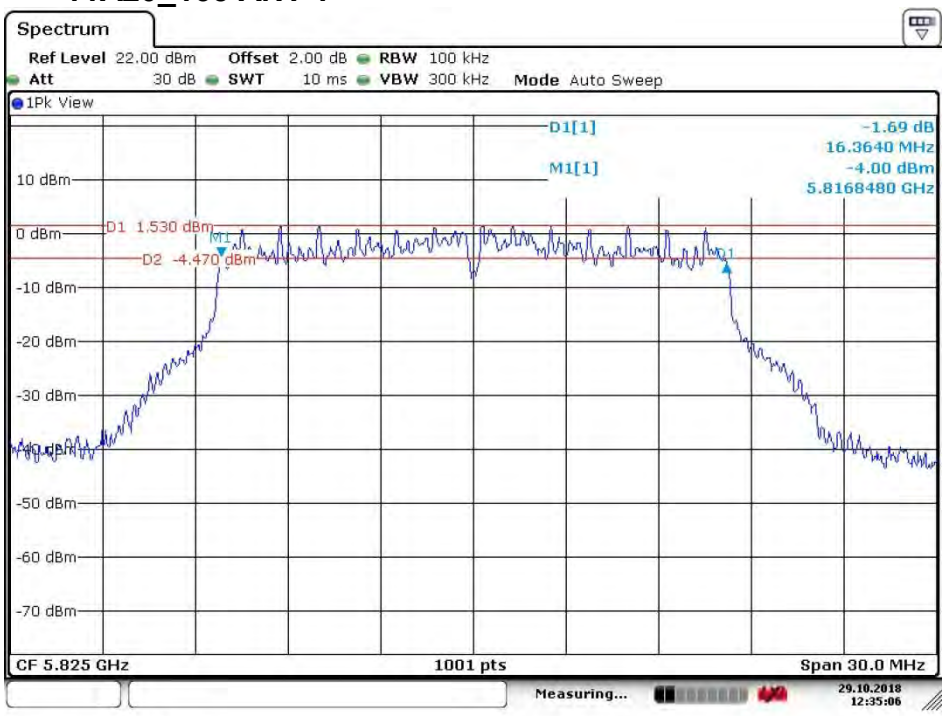
4.5.1.3 11A20_165 ANT 1



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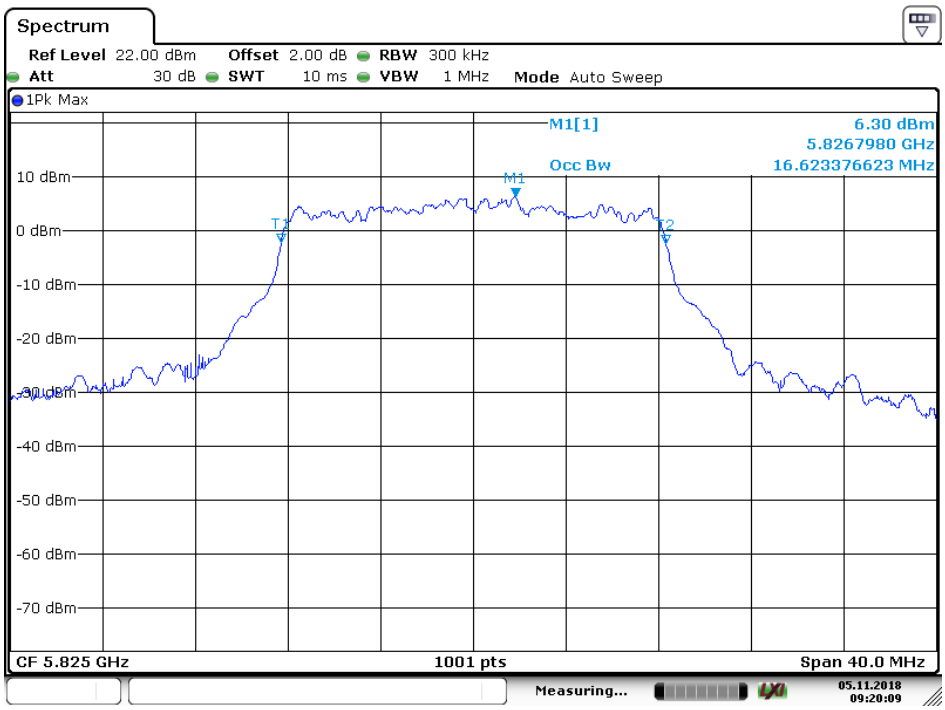

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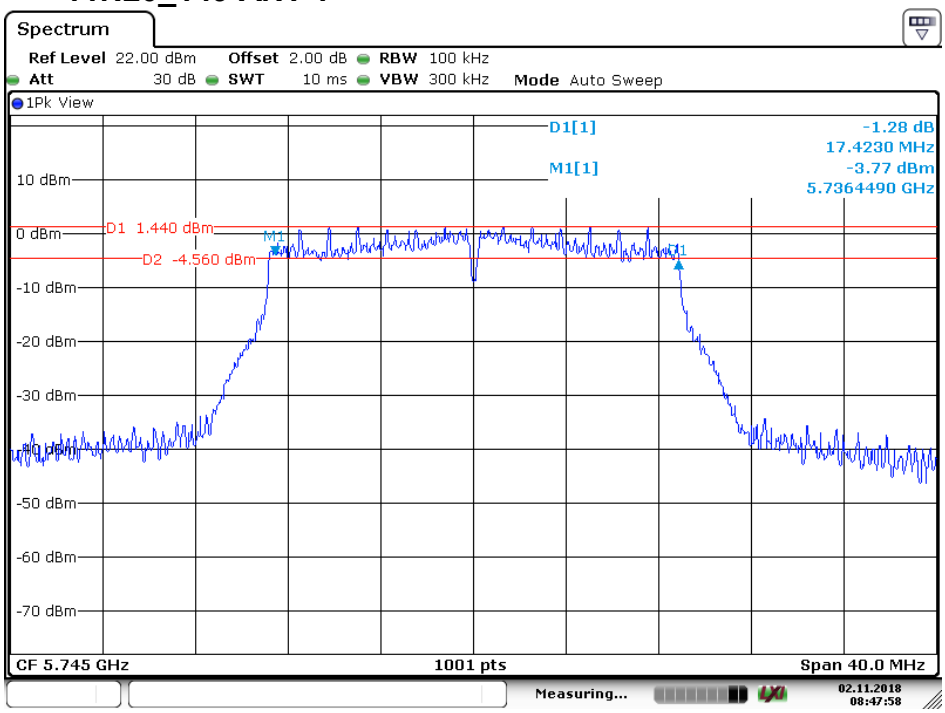
4.5.1.4 11N20_149 ANT 1



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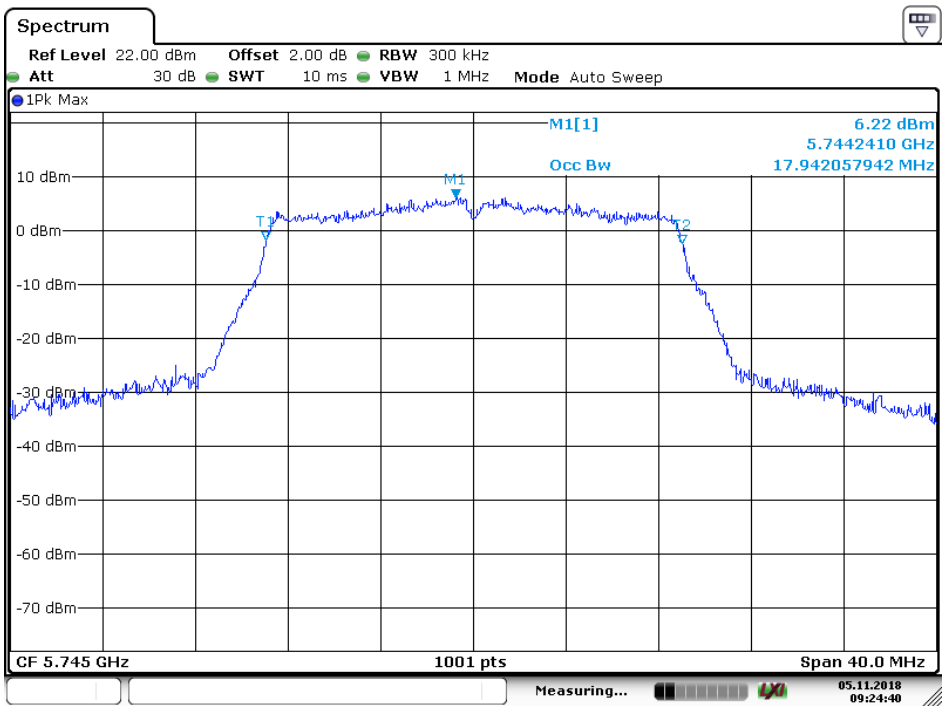

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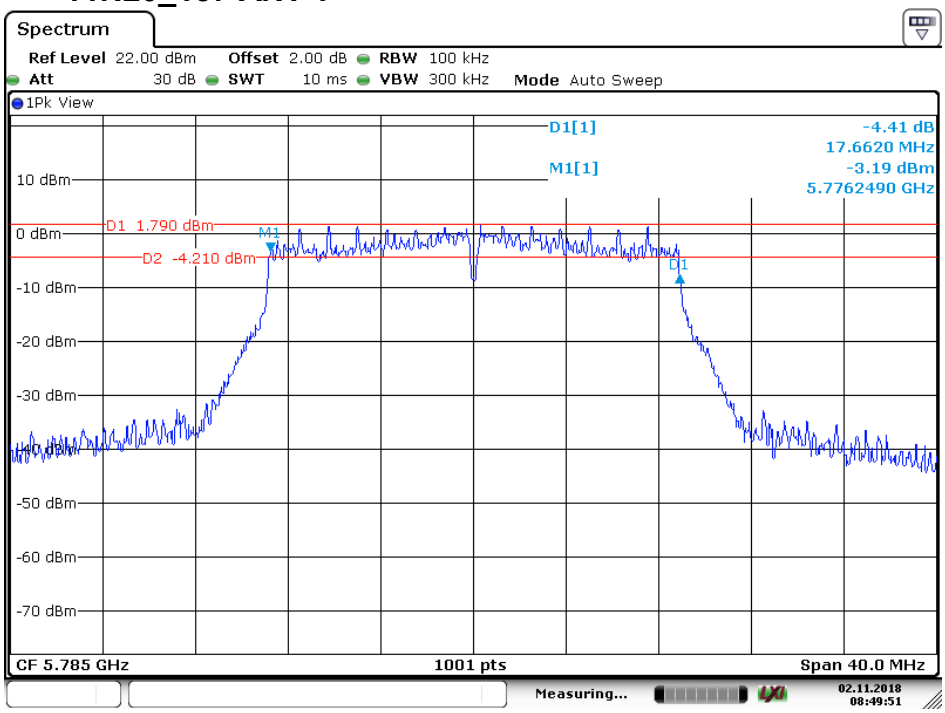
4.5.1.5 11N20_157 ANT 1



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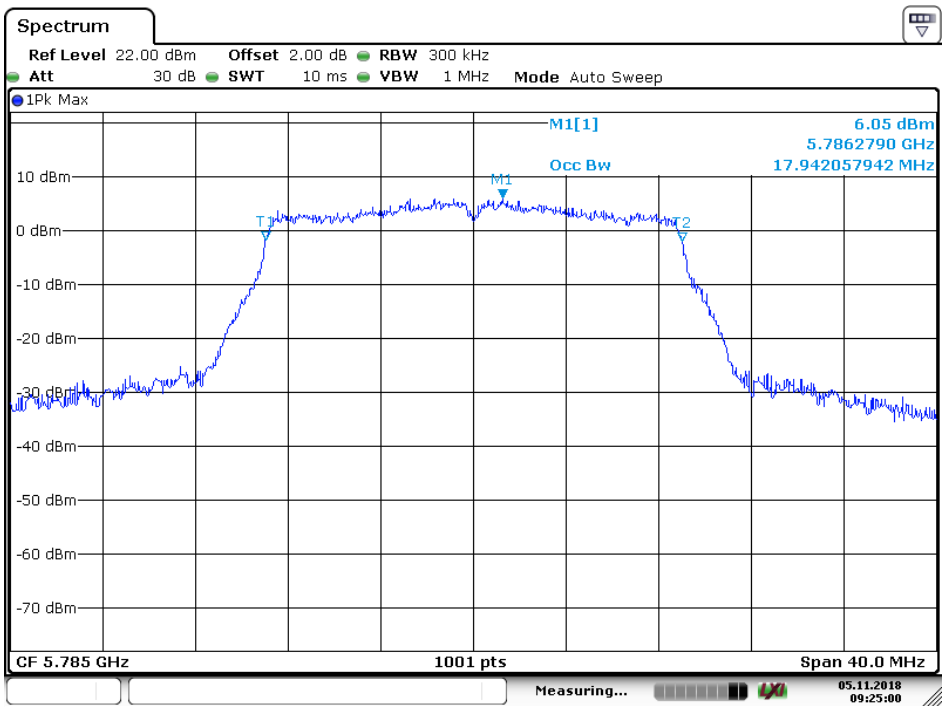

Date: 5.NOV.2018 09:25:00

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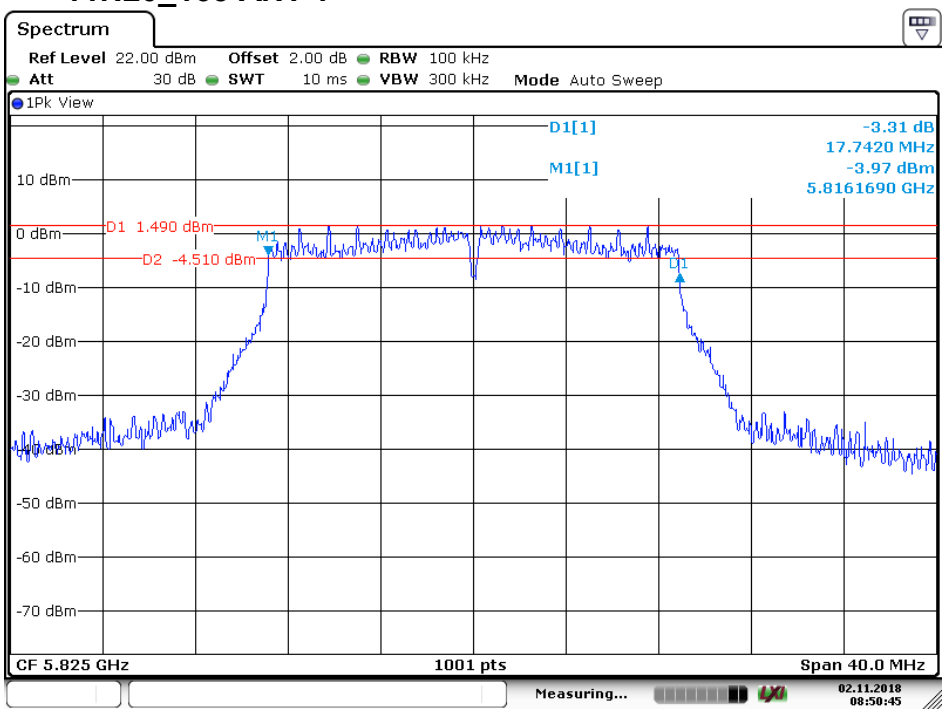
4.5.1.6 11N20_165 ANT 1



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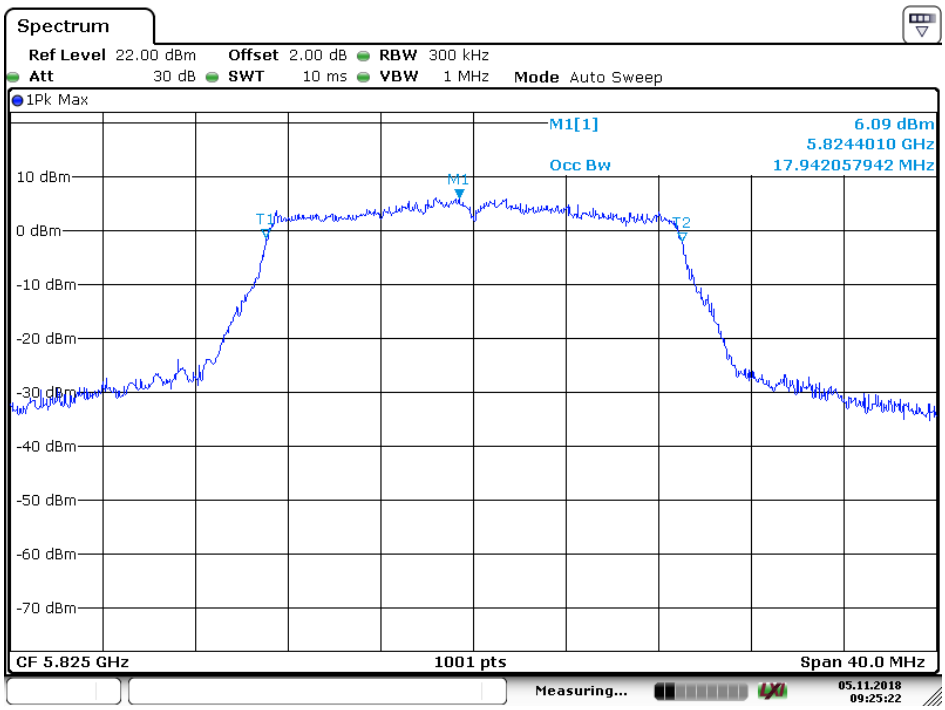

Date: 5.NOV.2018 09:25:22

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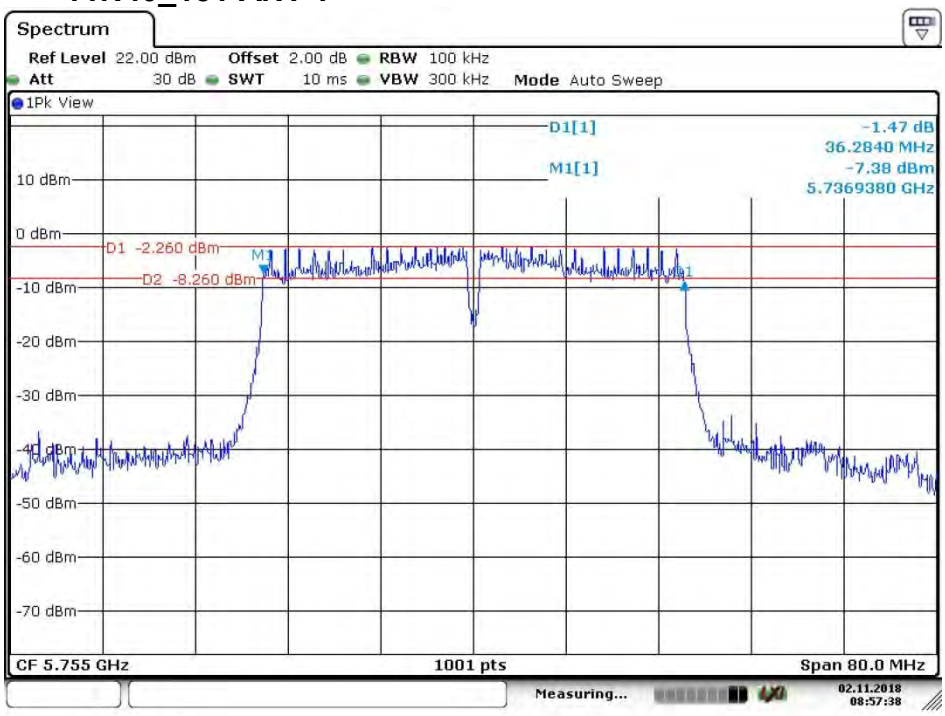
4.5.1.7 11N40_151 ANT 1



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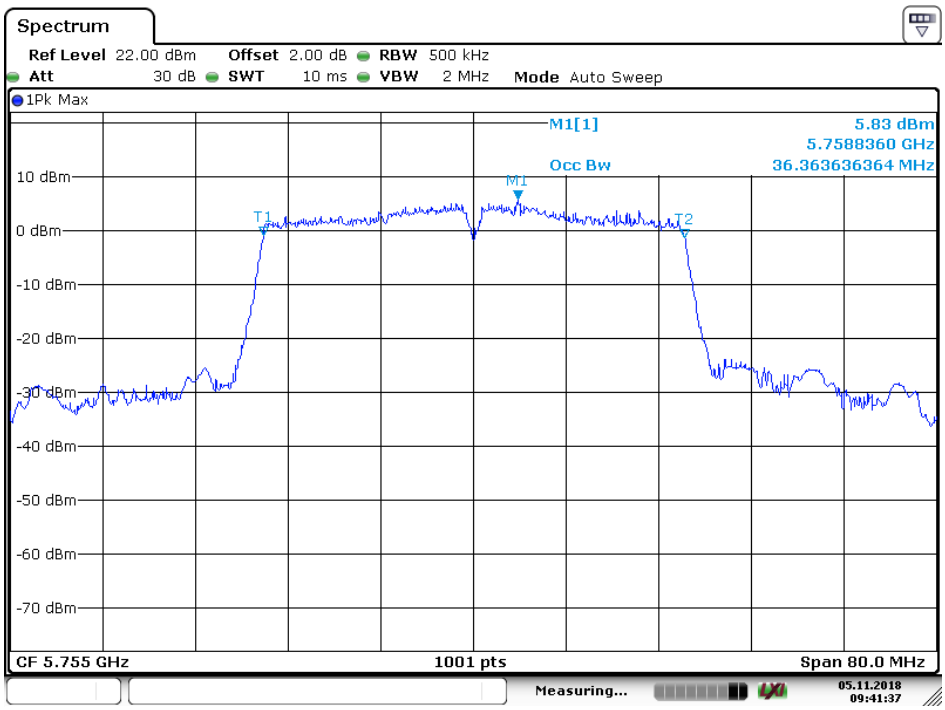

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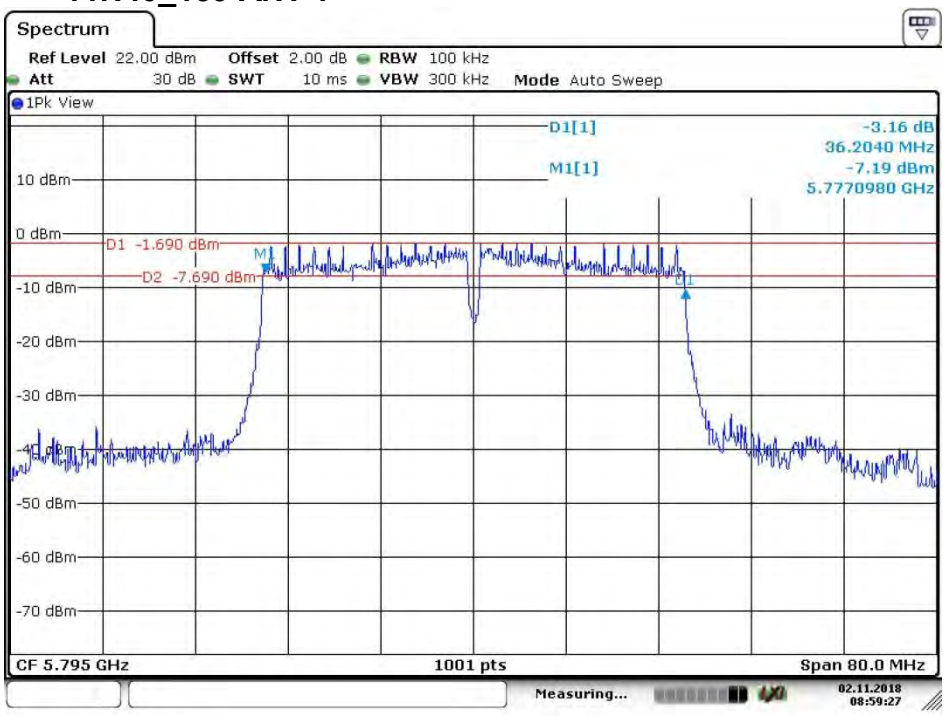
4.5.1.8 11N40_159 ANT 1



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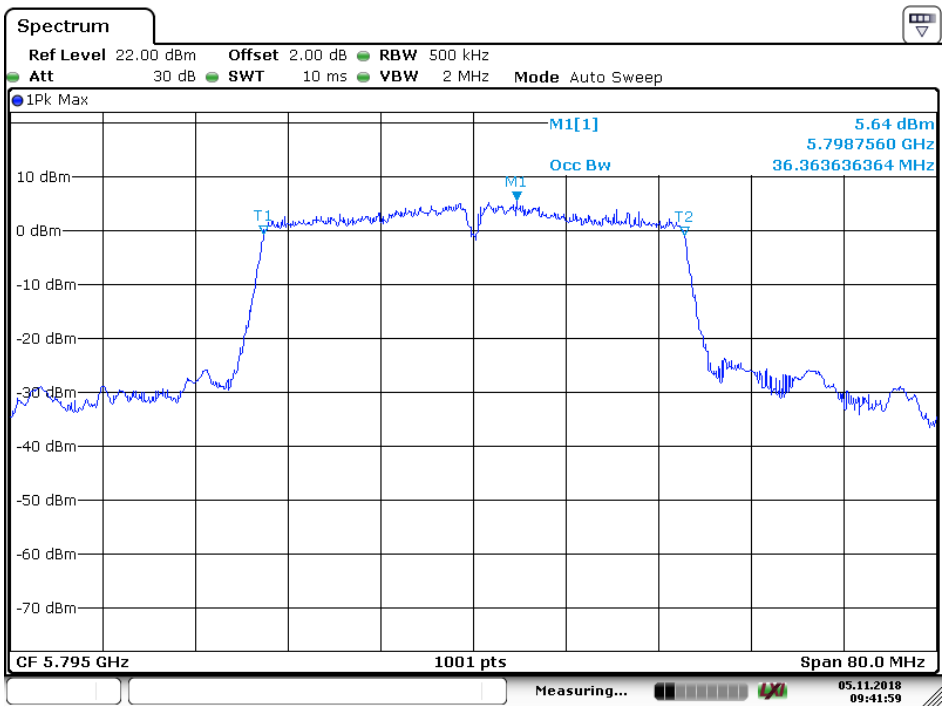

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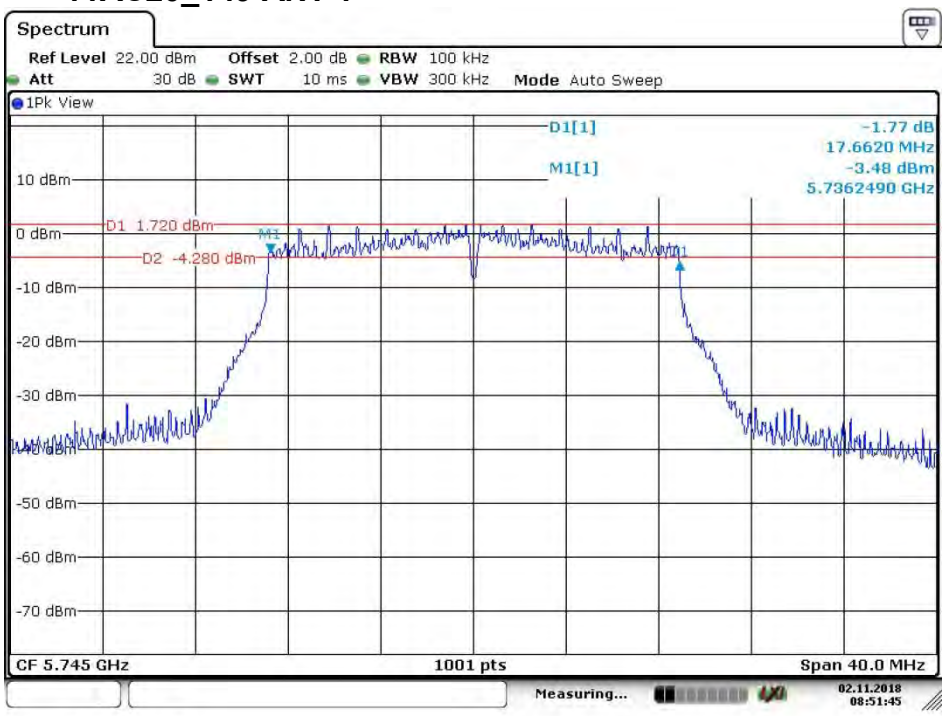
4.5.1.9 11AC20_149 ANT 1



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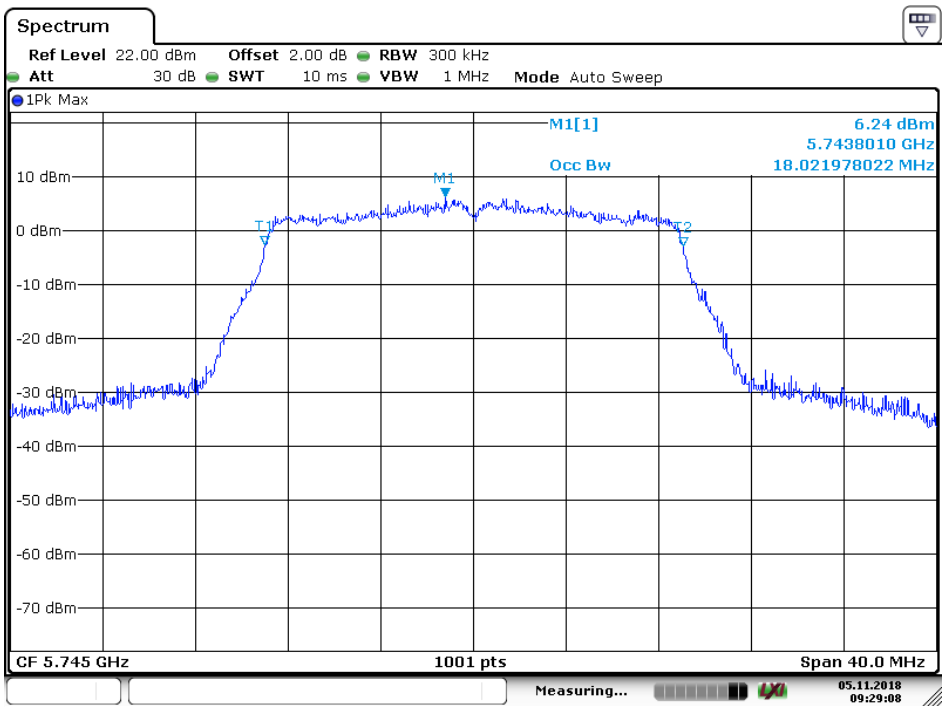

Date: 5.NOV.2018 09:29:08

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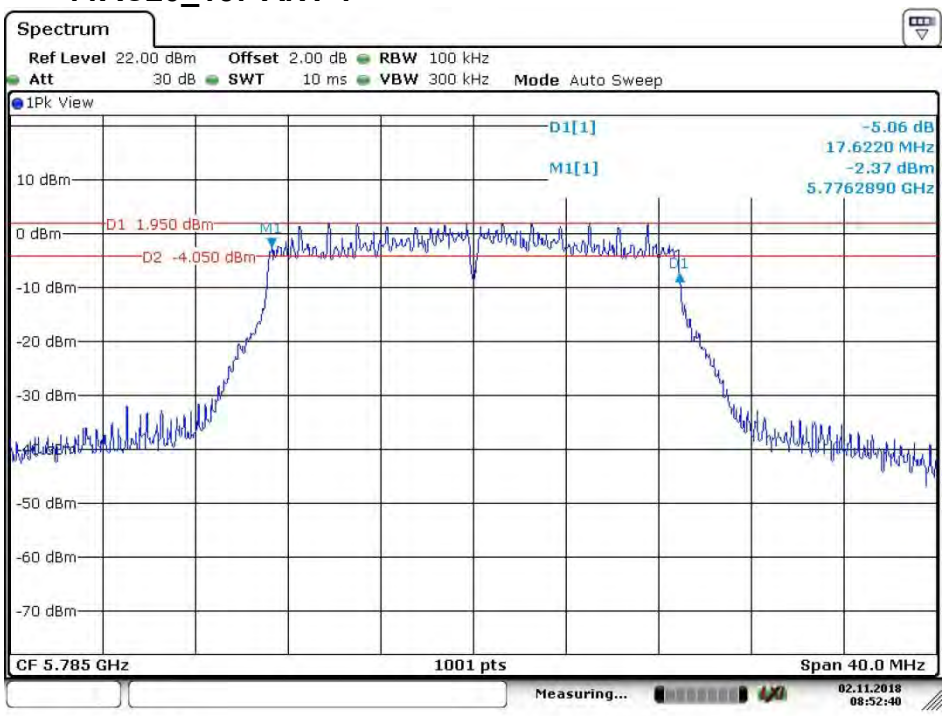
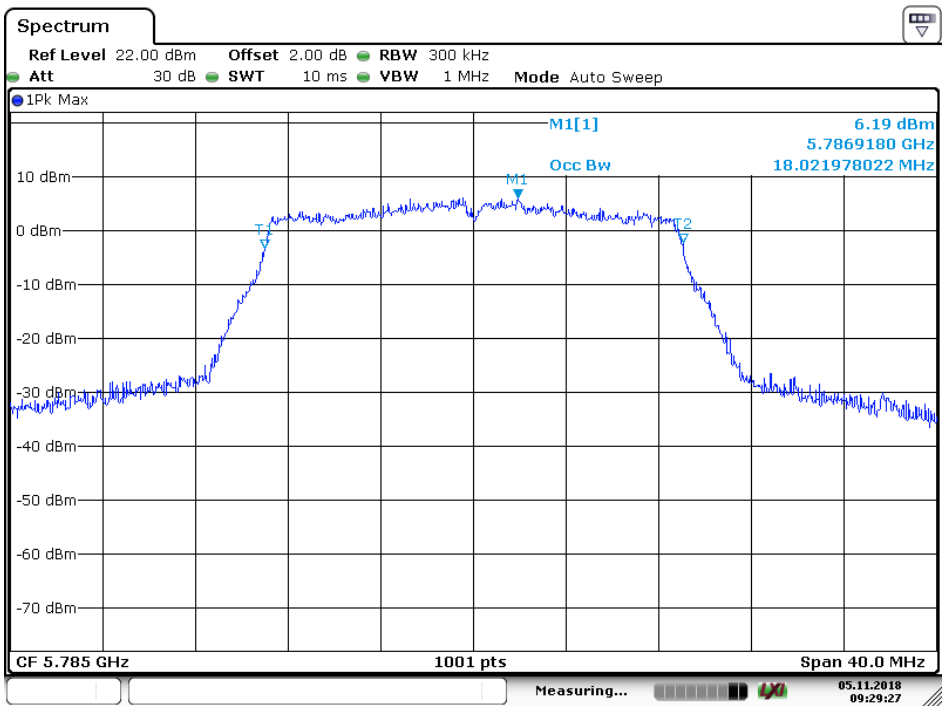
4.5.1.10 11AC20_157 ANT 1



Date: 2.NOV.2018 08:52:40



Date: 5.NOV.2018 09:29:28

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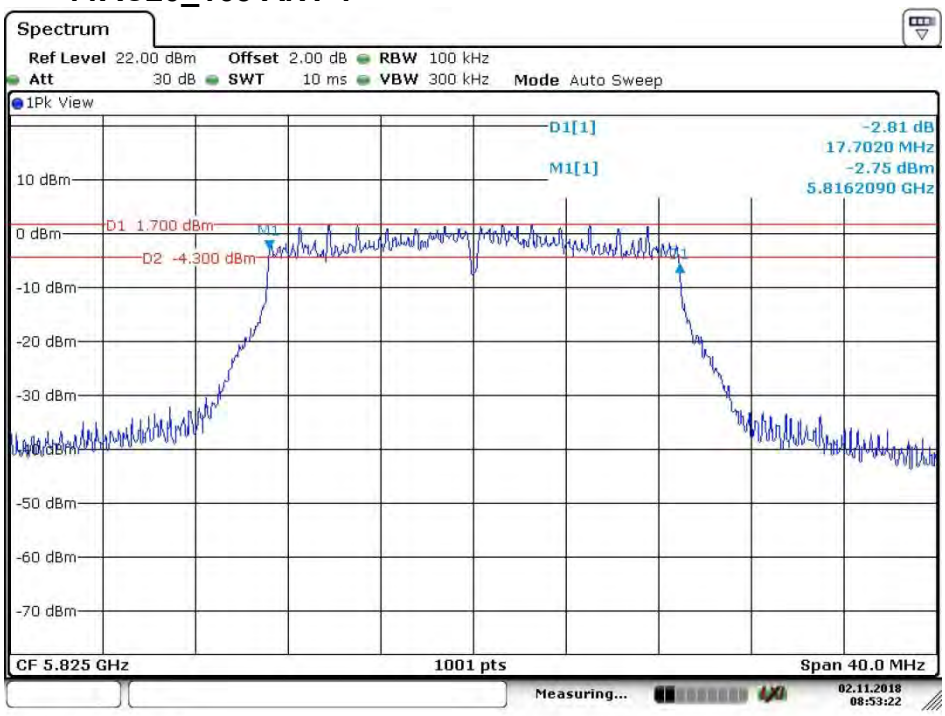
4.5.1.11 11AC20_165 ANT 1



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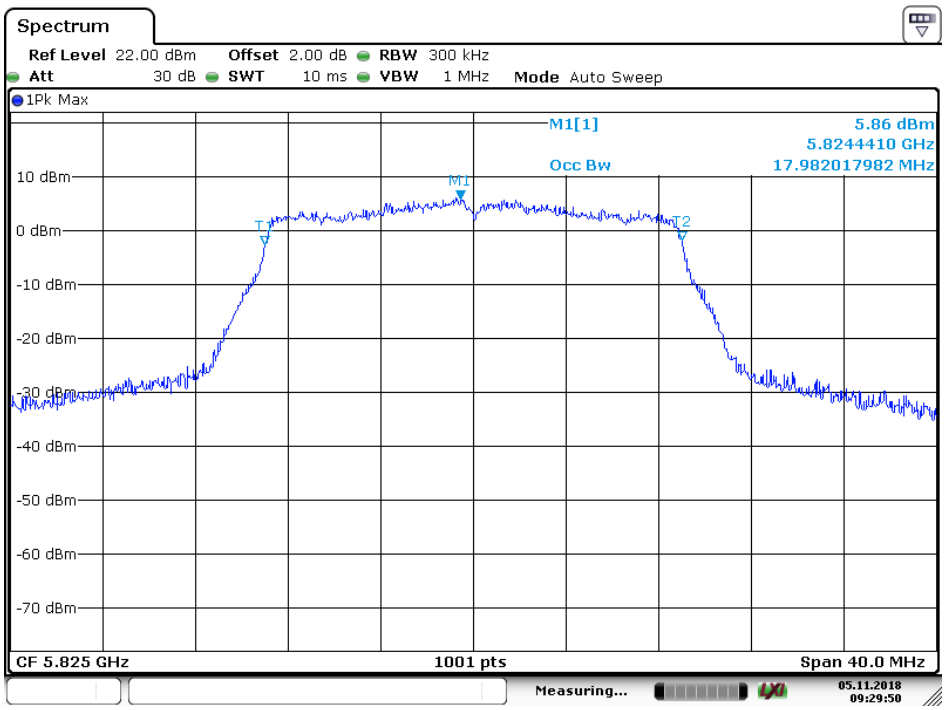

Date: 5.NOV.2018 09:29:49

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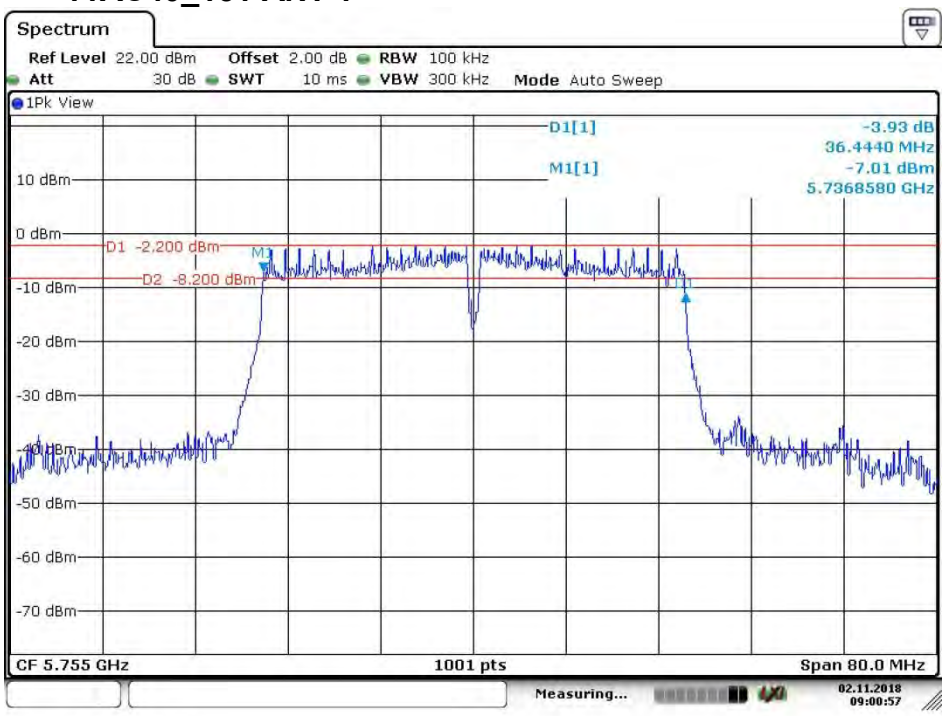
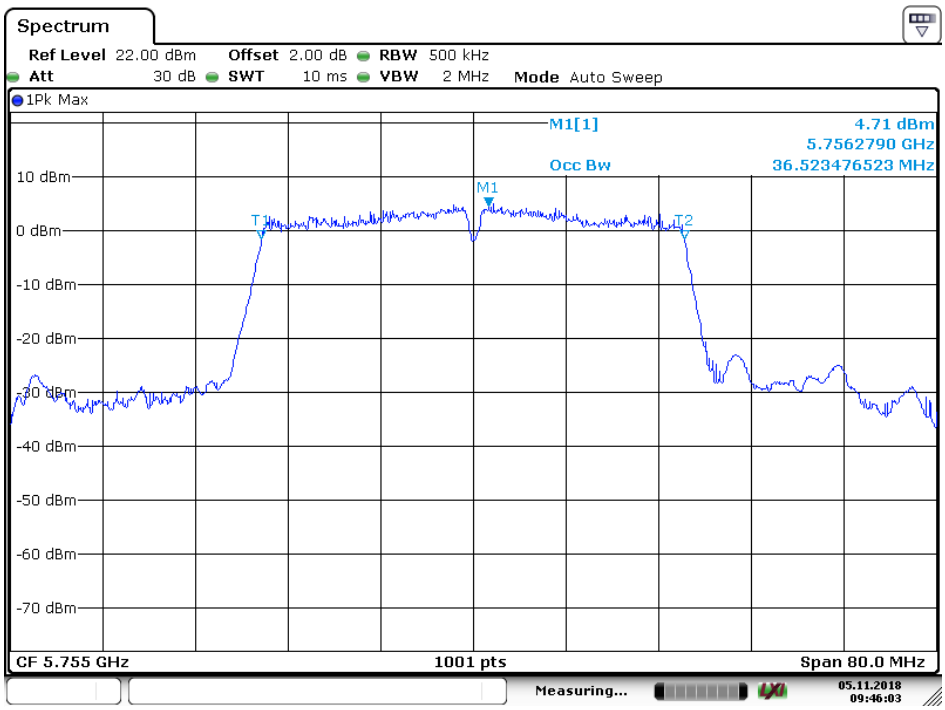
4.5.1.12 11AC40_151 ANT 1



Date: 2.NOV.2018 09:00:57



Date: 5.NOV.2018 09:46:03

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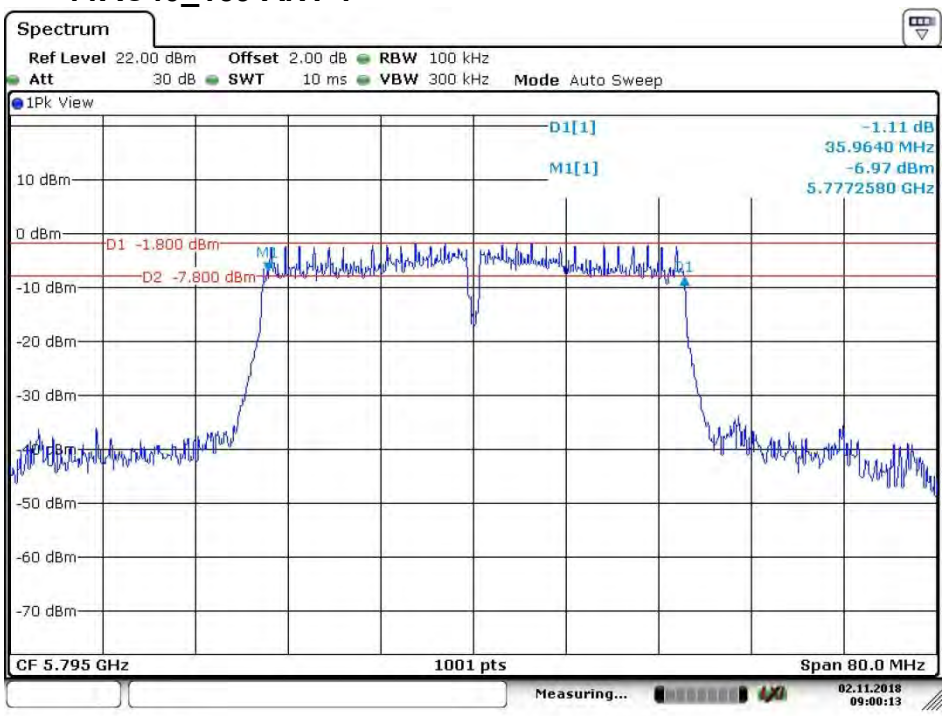
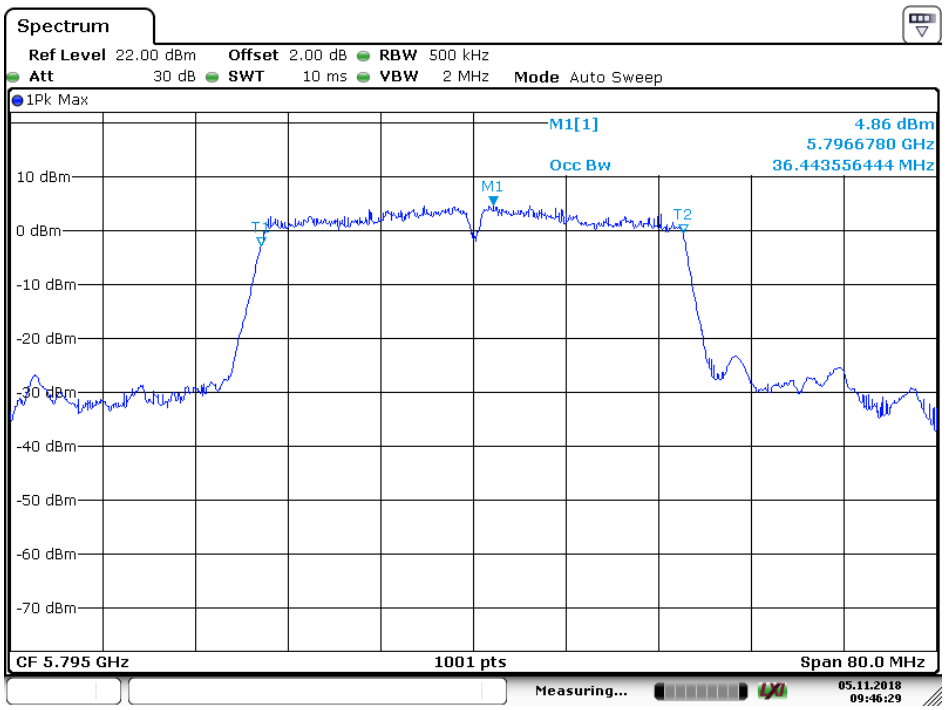
4.5.1.13 11AC40_159 ANT 1



Date: 2.NOV.2018 09:00:13



Date: 5.NOV.2018 09:46:30

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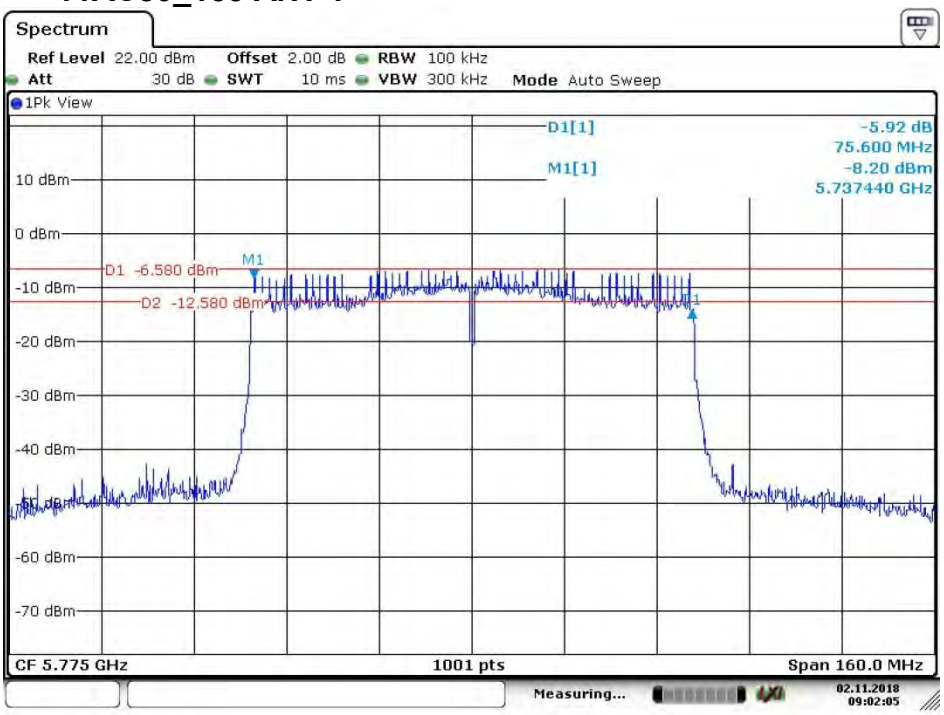
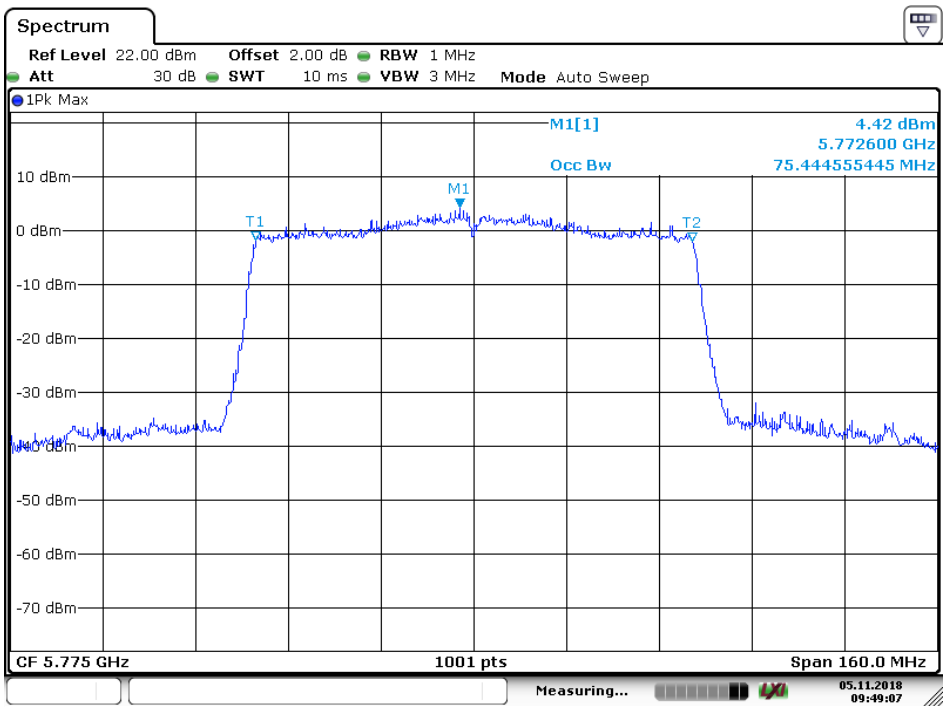
4.5.1.14 11AC80_155 ANT 1



Date: 2.NOV.2018 09:02:05



Date: 5.NOV.2018 09:49:07

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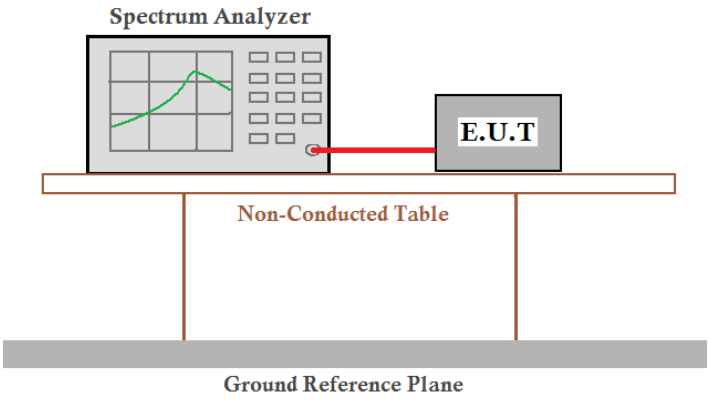
4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15 Section 15.407(a)	
Test Method:	ANSI C63.10: 2013	
Test Setup:		
Test Instruments:	Refer to section 5.10 for details	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT20); MCSAC0 of rate is the worst case of 802.11ac(HT40); MCSAC0 of rate is the worst case of 802.11ac(HT80). Only the worst case is recorded in the report.	
Limit:	Frequency Band	Limit
	5150-5250MHz	The power spectral density less than 11dBm/1MHz
	5250-5350MHz	The power spectral density less than 11dBm/1MHz
	5470-5725MHz	The power spectral density less than 11dBm/1MHz
	5725-5850MHz	The power spectral density less than <30dBm/500KHz
Test Results:	Pass	

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Measurement Data: Test Mode	Test Channel	Frequency [MHz]	Meas. Level (Cond.) [dBm/MHz]	Verdict
11A20	36	5180	1.49	PASS
	44	5220	1.27	PASS
	48	5240	1.15	PASS
	52	5260	0.34	PASS
	60	5300	0.77	PASS
	64	5320	0.72	PASS
	100	5500	4.04	PASS
	116	5580	4.47	PASS
	140	5700	4.94	PASS
	149	5745	3.41	PASS
	157	5785	3.73	PASS
	165	5825	3.88	PASS
11N20	36	5180	0.42	PASS
	44	5220	0.35	PASS
	48	5240	-0.10	PASS
	52	5260	-1.17	PASS
	60	5300	-0.56	PASS
	64	5320	-0.47	PASS
	100	5500	2.79	PASS
	116	5580	3.22	PASS
	140	5700	3.79	PASS
	149	5745	2.04	PASS
	157	5785	2.88	PASS
	165	5825	2.48	PASS
11N40	38	5190	-2.74	PASS
	46	5230	-3.40	PASS
	54	5270	-4.62	PASS
	62	5310	-4.60	PASS
	102	5510	0.10	PASS
	110	5550	-0.17	PASS
	134	5670	0.29	PASS
	151	5755	-1.18	PASS
	159	5795	-0.67	PASS
11AC20	36	5180	0.41	PASS
	44	5220	0.19	PASS
	48	5240	4.13	PASS
	52	5260	-1.13	PASS
	60	5300	-0.21	PASS
	64	5320	-0.45	PASS
	100	5500	2.92	PASS
	116	5580	3.40	PASS
	140	5700	3.80	PASS
	149	5745	2.04	PASS
	157	5785	2.60	PASS
	165	5825	3.10	PASS
11AC40	38	5190	-2.95	PASS
	46	5230	-3.16	PASS
	54	5270	-4.74	PASS
	62	5310	-4.00	PASS

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	102	5510	-0.55	PASS
	110	5550	-0.35	PASS
	134	5670	0.12	PASS
	151	5755	-1.01	PASS
	159	5795	-0.94	PASS
11AC80	42	5210	-8.55	PASS
	58	5290	-9.28	PASS
	106	5530	-5.39	PASS
	122	5610	-5.13	PASS
	155	5775	-5.88	PASS

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4.6.1 Test plots

4.6.1.1 11A20_36 ANT 1

Date: 2.NOV.2018 09:04:26

4.6.1.2 11A20_44 ANT 1

Date: 2.NOV.2018 09:04:44

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4.6.1.3 11A20_48 ANT 1

Date: 2.NOV.2018 09:05:23

4.6.1.4 11A20_52 ANT 1

Date: 2.NOV.2018 09:05:39

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4.6.1.5 11A20_60 ANT 1

Date: 2.NOV.2018 09:05:54

4.6.1.6 11A20_64 ANT 1

Date: 2.NOV.2018 09:06:44

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4.6.1.7 11A20_100 ANT 1

Date: 2.NOV.2018 09:07:21

4.6.1.8 11A20_116 ANT 1

Date: 2.NOV.2018 09:07:39

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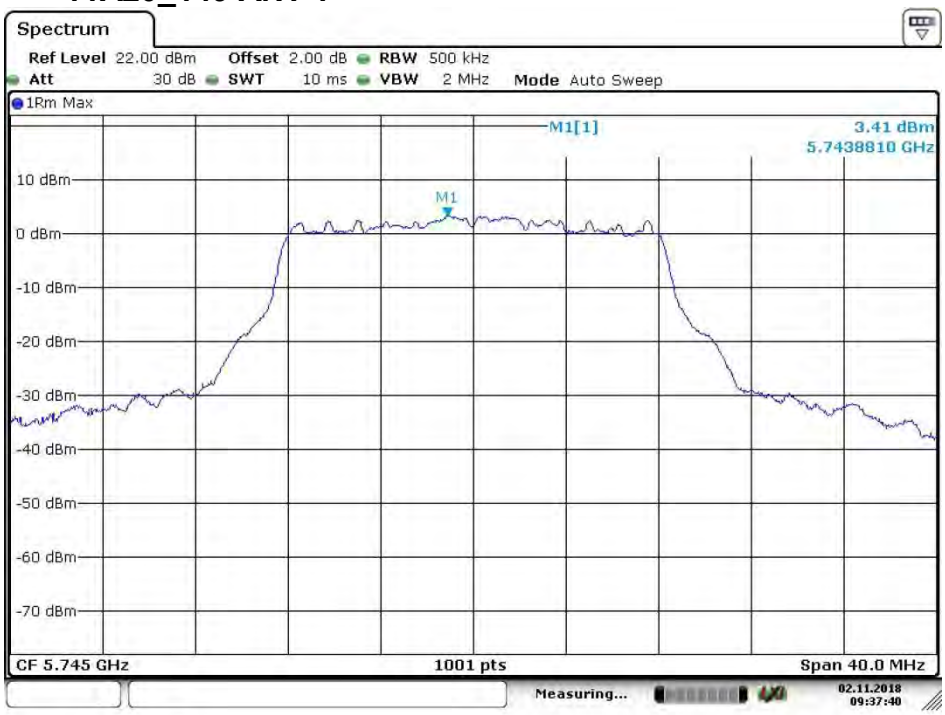
4.6.1.9 11A20_140 ANT 1

Date: 2.NOV.2018 09:07:56

4.6.1.10 11A20_149 ANT 1



Date: 2.NOV.2018 09:37:40

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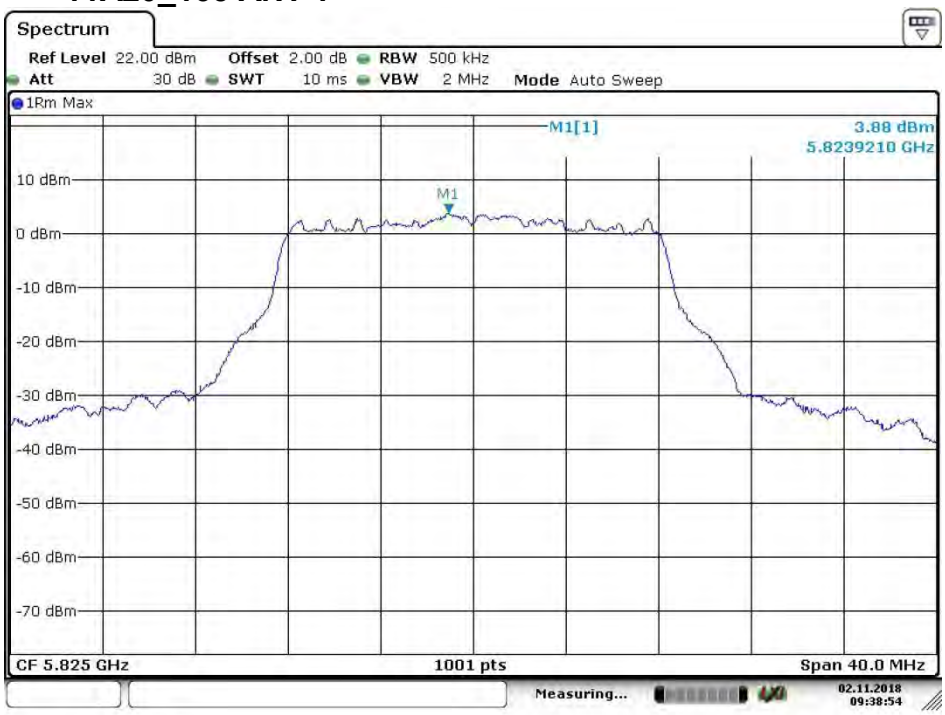
4.6.1.11 11A20_157 ANT 1

Date: 2.NOV.2018 09:38:35

4.6.1.12 11A20_165 ANT 1



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4.6.1.13 11N20_36 ANT 1

Date: 2.NOV.2018 09:14:28

4.6.1.14 11N20_44 ANT 1

Date: 2.NOV.2018 09:15:07

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