Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-7901/19-01-06-A

Testing laboratory

CTC advanced GmbH
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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

Parrot Faurecia Automotive SAS
40 av. des terroirs de France
75012 Paris / FRANCE
Phone: +33 1 48 03 60 60
Contact: Benjamin Renoncourt
e-mail: benjamin.renoncourt@faurecia.com
Phone: +33 1 44 52 41 04

Manufacturer

Parrot Faurecia Automotive SAS
40 av. des terroirs de France
75012 Paris / FRANCE

Test standard/s

FCC - Title 47 CFR Part 15	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 5	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Head Unit with display**
Model name:	**ICU**
FCC ID:	**2AT94ICU**
IC:	**25374-ICU**
Frequency:	UNII bands: 5150 MHz to 5250 MHz; 5250 MHz to 5350 MHz; 5470 MHz to 5725 MHz; 5725 MHz to 5850 MHz
Technology tested:	WLAN
Antenna:	2 integrated antennas
Power supply:	12.0 V DC by car battery
Temperature range:	-40°C to +85°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

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Andreas Luckenbill
Lab Manager
Radio Communications & EMC

Test performed:

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2019.10.15 15:49:48 +02'00'

Mihail Dorongovskij
Lab Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report replaces the test report with the number 1-7901/19-01-06 and dated 2019-09-13.

2.2 Application details

Date of receipt of order:	2019-04-09
Date of receipt of test item:	2019-06-24
Start of test:	2019-06-25
End of test:	2019-08-22
Person(s) present during the test:	-/-

2.3 Test laboratories sub-contracted

None

3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 5	April 2018	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
UNII: KDB 789033 D02	v02r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E
ANSI C63.4-2014	-/-	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 662911 D01	v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada https://www.dakks.de/as/ast/d/D-PL-12076-01-04.pdf
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/as/ast/d/D-PL-12076-01-05.pdf

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests No tests under extreme environmental conditions required. No tests under extreme environmental conditions required.
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	12.0 V AC by external power supply No tests under extreme environmental conditions required. No tests under extreme environmental conditions required.

5 Test item

5.1 General description

Kind of test item	:	Head Unit with display
Type identification	:	ICU
HMN	:	-/-
PMN	:	ICU
HVIN	:	ICU
FVIN	:	-/-
S/N serial number	:	Rad. PF850310BA9C000017 Cond. PF850310BA9D000096
Hardware status	:	HW03
Software status	:	22.00
Frequency band	:	UNII bands: 5150 MHz to 5250 MHz; 5250 MHz to 5350 MHz; 5470 MHz to 5725 MHz; 5725 MHz to 5850 MHz
Type of radio transmission Use of frequency spectrum	: :	OFDM
Type of modulation	:	(D)BPSK, (D)QPSK, 16 – QAM, 64 – QAM, 256 – QAM
Number of channels	:	20 MHz: 24 40 MHz: 11 80 MHz: 5
Antenna	:	2 integrated antennas
Power supply	:	12.0 V DC by car battery
Temperature range	:	-40°C to +85°C

5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-7901/19-01-01_AnnexA
1-7901/19-01-01_AnnexB
1-7901/19-01-01_AnnexD

6 Sequence of testing

6.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

*)Note: The sequence will be repeated three times with different EUT orientations.

6.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

6.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

6.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

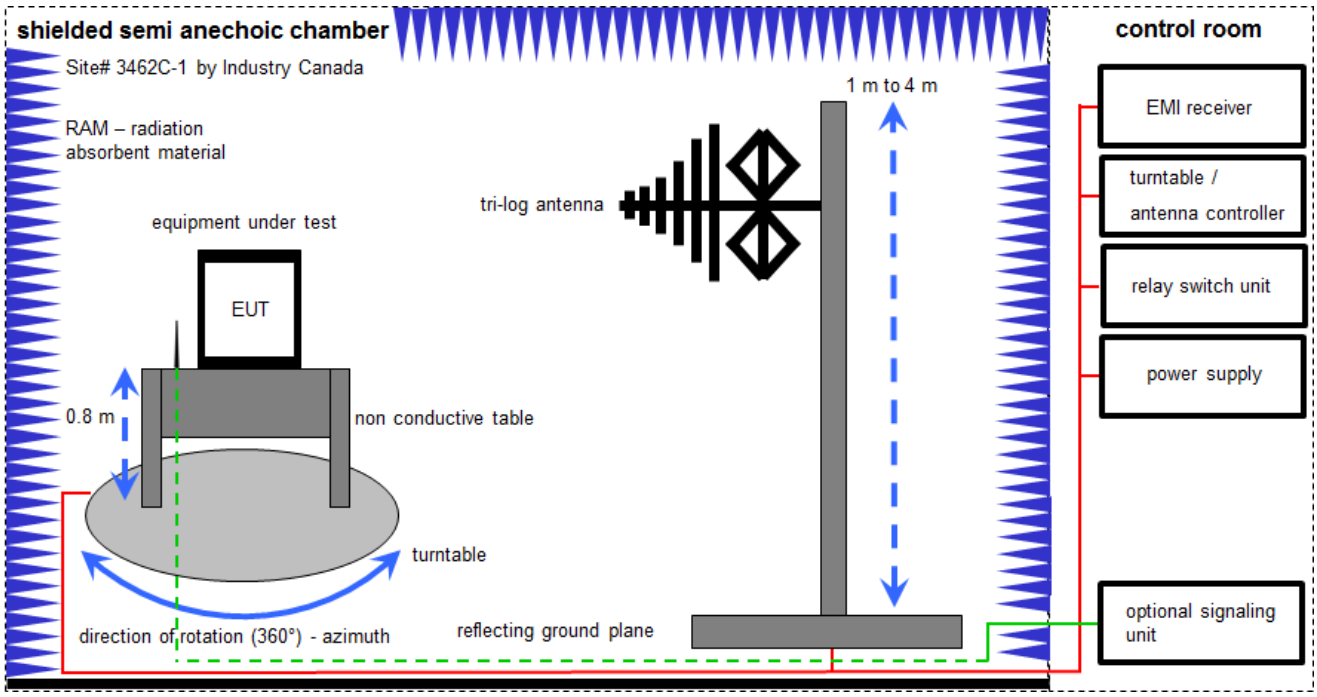
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter
EMC32 software version: 10.30.0

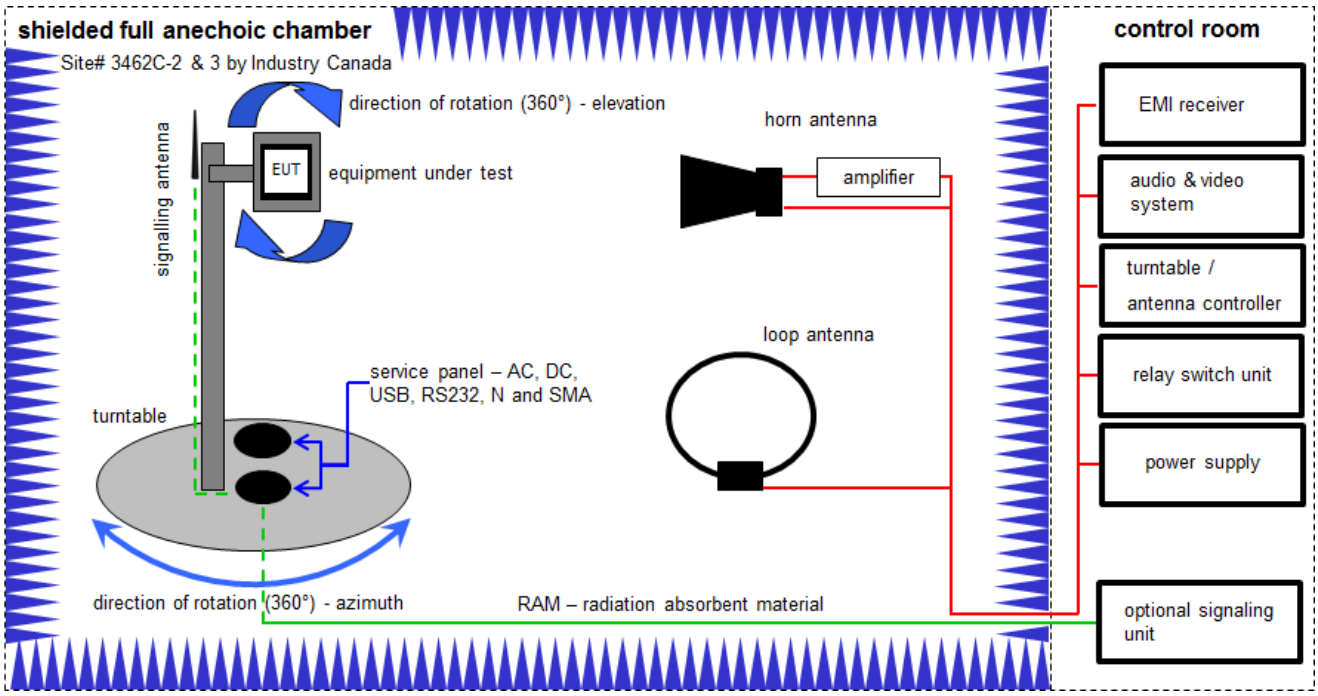
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Meßkabine 1	HF-Absorberhalle	MWB AG 300023	-/-	300000551	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	12.12.2018	11.12.2019
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	371	300003854	vlKl!	24.11.2017	23.11.2020
8	A	Power Supply DC	N5767A	Agilent Technologies	US14J1569P	300004851	vlKl!	13.12.2018	12.12.2020

7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter

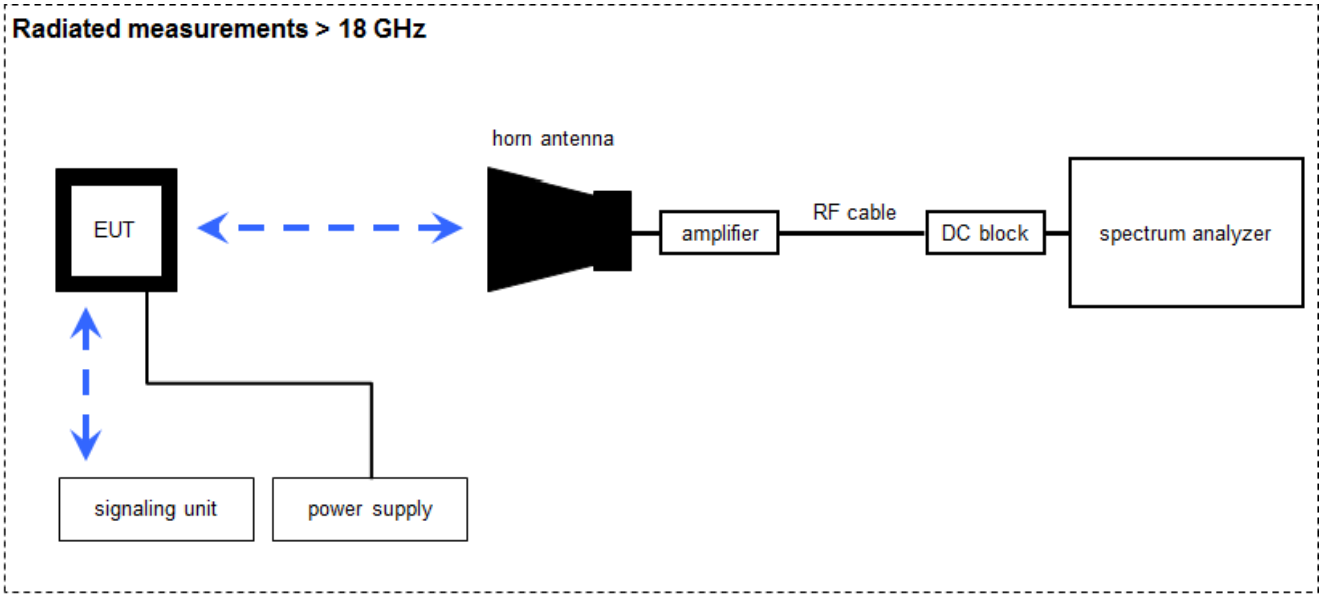
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
2	A, B	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
3	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3089	300000307	vIKI!	07.07.2017	06.07.2019
4	A, B	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	14.09.2018	13.12.2019
5	A	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
6	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
7	A	High Pass Filter	VHF-3500+	Mini Circuits	-/-	400000193	ne	-/-	-/-
8	A	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
9	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
10	A, B	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO	-/-	300004682	ne	-/-	-/-
11	A, B	PC	ExOne	F+W	-/-	300004703	ne	-/-	-/-
12	A	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-
13	B	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vIKI!	07.07.2017	06.07.2019
14	A, B	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	vIKI!	12.12.2017	11.12.2020

7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

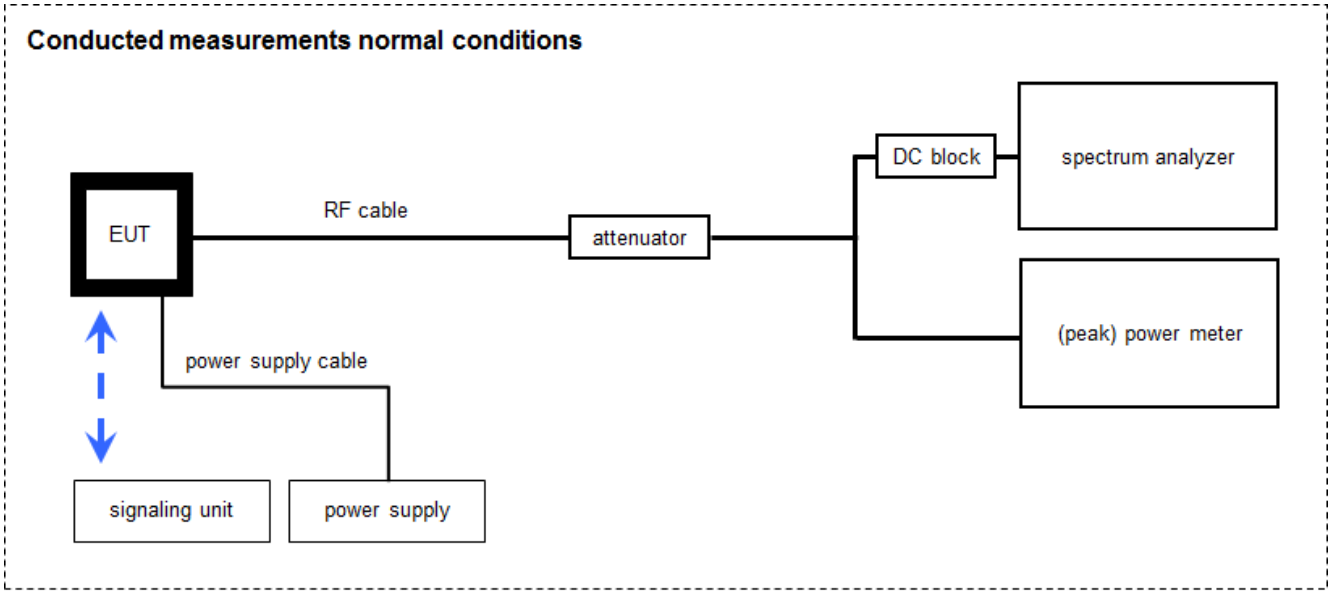
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP	00419	300002268	ev	-/-	-/-
2	A	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda	01096	300000486	vlKl!	13.12.2017	12.12.2019
3	A	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	82-16	300000510	vlKl!	13.12.2017	12.12.2019
4	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
5	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	17.12.2018	16.12.2019
6	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
7	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
8	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
9	A	DC Power Supply	HMP2020	Rohde & Schwarz	102850	300005517	vlKl!	14.12.2017	13.12.2019

7.4 Conducted measurements with peak power meter & spectrum analyzer



WLAN tester version: 1.1.13; LabView2015

OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

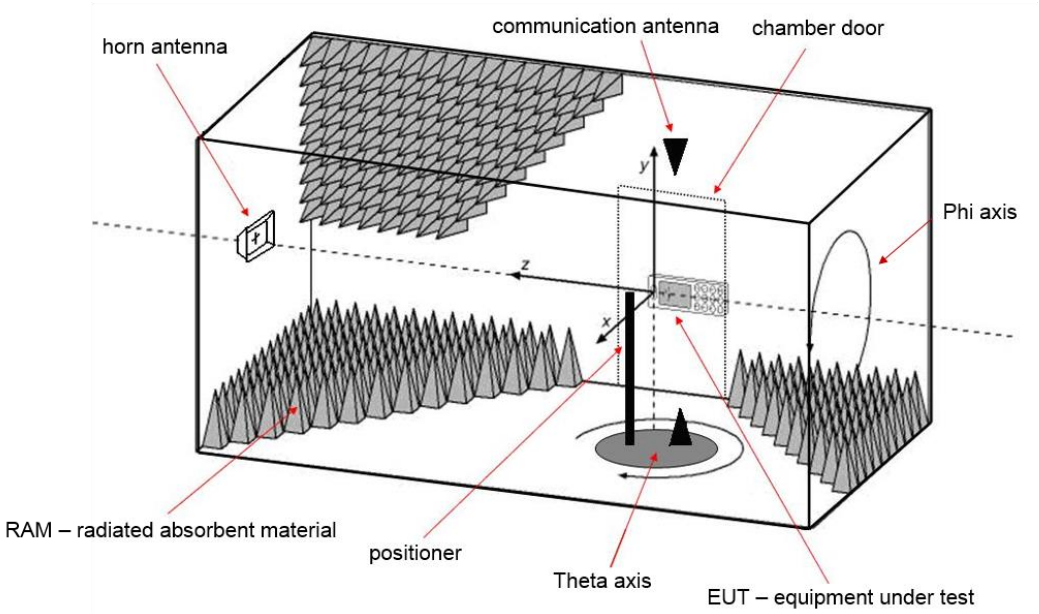
Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
2	A	Hygro-Thermometer	-/-, 5-45°C, 20-100%rF	Thies Clima	-/-	400000108	ev	11.05.2018	10.05.2020
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	17.12.2018	16.12.2019
4	A	PC Tester R005	Intel Core i3 3220/3,3 GHz, Prozessor	-/-	2V2403033A4523	300004589	ne	-/-	-/-
5	A	Teststand	Teststand Custom Sequence Editor	National Instruments GmbH	-/-	300004590	ne	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
7	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	-/-	400001186	ev	-/-	-/-
8	A	Synchron Power Meter	SPM-4	CTC	1	300005580	ev	-/-	-/-
9	A	DC-Blocker	WA7046	Weinschel Associates	-/-	400001310	ev	-/-	-/-
10	A	DC Power Supply	HMP2020	Rohde & Schwarz	102850	300005517	vlKI!	14.12.2017	13.12.2019

7.5 Shielded fully anechoic chamber

OTA – over the air performance



Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	CTIA-Chamber	CTIA-Chamber AMS 8500	ETS-Lindgren Finnland	-/-	300003327	ne	-/-	-/-
2	A	CTIA-Chamber - Positioning Equipment	CTIA-Chamber - Positioning Equipment	EMCO/2	-/-	300003328	ne	-/-	-/-
3	A	CTIA-Chamber - Software	CTIA-Chamber - Software	EMCO/2	-/-	300003328	ne	-/-	-/-
4	A	CTIA-Chamber - Antenna	3164-04	EMCO/2	00041915	300003328	ne	-/-	-/-
5	A	Spectrum Analyzer 9kHz - 30 GHz	FSP30	R&S	100623	300003464	vIKI!	13.12.2018	12.12.2020
6	A	Power Supply DC	NGSM 32/10	Rohde & Schwarz	3939	400000192	vIKI!	31.01.2017	30.01.2020

8 Measurement uncertainty

Measurement uncertainty		
Test case	**Uncertainty**	
Antenna gain	± 3 dB	
Power spectral density	± 1.15 dB	
Spectrum bandwidth	± 100 kHz (depends on the used RBW)	
Occupied bandwidth	± 100 kHz (depends on the used RBW)	
Maximum output power	± 1.15 dB conducted ± 3 dB radiated	
Minimum emissions bandwidth	± 100 kHz (depends on the used RBW)	
Band edge compliance radiated	± 3 dB	
Spurious emissions conducted	> 3.6 GHz	± 1.15 dB
	> 7 GHz	± 1.15 dB
	> 18 GHz	± 1.89 dB
	≥ 40 GHz	± 3.12 dB
Spurious emissions radiated below 30 MHz	± 3 dB	
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB	
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB	
Spurious emissions radiated above 12.75 GHz	± 4.5 dB	
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB	

9 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 247, Issue 2	See table	2019-10-15	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	C	NC	NA	NP	Remark
-/-	Output power verification (cond.)	Nominal	Nominal	-/-				-/-
-/-	Antenna gain	Nominal	Nominal	-/-				-/-
U-NII Part 15	Duty cycle	Nominal	Nominal	-/-				-/-
§15.407(a) RSS - 247 (6.2.1.1) RSS - 247 (6.2.2.1) RSS - 247 (6.2.3.1) RSS - 247 (6.2.4.1)	Maximum output power (conducted & radiated)	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(a) RSS - 247 (6.2.1.1) RSS - 247 (6.2.2.1) RSS - 247 (6.2.3.1) RSS - 247 (6.2.4.1)	Power spectral density	Nominal	Nominal	☐	☐	☐	☒	-/-
RSS - 247 (6.2.4.1)	Spectrum bandwidth 6dB bandwidth	Nominal	Nominal	☐	☐	☐	☒	-/-
§15.407(a) RSS - 247 (6.2.1.2)	Spectrum bandwidth 26dB bandwidth	Nominal	Nominal	☐	☐	☐	☒	-/-
RSS Gen clause 6.6	Spectrum bandwidth 99% bandwidth	Nominal	Nominal	-/-				-/-
§15.205 RSS - 247 (6.2.1.2) RSS - 247 (6.2.2.2) RSS - 247 (6.2.3.2) RSS - 247 (6.2.4.2)	Band edge compliance radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(b) RSS - 247 (6.2.1.2) RSS - 247 (6.2.2.2) RSS - 247 (6.2.3.2) RSS - 247 (6.2.4.2)	TX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.209(a) RSS-Gen	Spurious emissions radiated < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Spurious emissions conducted emissions < 30 MHz	Nominal	Nominal	☐	☐	☒	☐	-/-
§15.407 RSS - 247 (6.3)	DFS	Nominal	Nominal	☐	☐	☐	☒	-/-

Notes:

C:	Compliant	**NC:**	Not compliant	**NA:**	Not applicable	**NP:**	Not performed

10 Additional comments

Reference documents: Basic_Questions_to_Equipment_Under_Test__EUT__v2.pdf
Module test report: MDE_UBLOX_1828_FCCg.pdf

Special test descriptions: None

Configuration descriptions: Antenna 1 supports a-mode (SISO), n/ac HT20 (SISO and MIMO), n/ac HT20 (SISO and MIMO) and ac80-mode (SISO and MIMO)
Antenna 2 supports n/ac HT20 (MIMO), n/ac HT20 (MIMO) and ac80-mode (MIMO)
All radiated tests were performed with TX mode enabled on both antennas. For channels and power settings please see the tables below:

Channels with 20 MHz channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency								
channel	**36**	**40**	44	**48**	**52**	56	**60**	**64**
f_c / MHz	**5180**	**5200**	5220	**5240**	**5260**	5280	**5300**	**5320**
Power setting	**12**	**14**	14	**14**	**14**	14	**14**	**12**

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency											
channel	**100**	104	108	112	116	**120**	124	128	132	136	**140**
f_c / MHz	**5500**	5520	5540	5560	5580	**5600**	5620	5640	5660	5680	**5700**
Power setting	**11**	14	14	14	14	**14**	14	14	14	14	**11**

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency					
channel	**149**	153	**157**	161	**165**
f_c / MHz	**5745**	5765	**5785**	5805	**5825**
Power setting	**17**	17	**17**	17	**17**

Channels with 40 MHz channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency				
channel	**38**	**46**	**54**	**62**
f_c / MHz	**5190**	**5230**	**5270**	**5310**
Power setting	**10**	**13**	**13**	**12**

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency					
channel	**102**	110	**118**	126	**134**
f_c / MHz	**5510**	5550	**5590**	5630	**5670**
Power setting	**10**	14	**14**	14	**11**

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency		
channel	**151**	**159**
f_c / MHz	**5755**	**5795**
	17	**17**

Channels with 80 MHz channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency		
channel	**42**	**58**
f_c / MHz	**5210**	**5290**
Power setting	**10**	**10**

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency		
channel	**106**	**122**
f_c / MHz	**5530**	**5610**
Power setting	**9**	**9**

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency	
channel	**155**
f_c / MHz	**5775**
Power setting	**15**

Note: The channels used for the tests were marked in bold in the list.

Test mode:

☐ No test mode available.
Iperf was used to ping another device with the largest support packet size

☒ Special software is used.
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☐ Operating mode 1 (single antenna)

- *Equipment with 1 antenna,*
- *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
- *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*

☒ Operating mode 2 (multiple antennas, no beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*

☐ Operating mode 3 (multiple antennas, with beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.*
  In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

11 Measurement results

11.1 Identify worst case data rate

Measurement:

All modes of the module will be measured with an average power meter to identify the maximum transmission power on mid channel. In the case that only one or two channels are available, only these will be measured.

In further tests only the identified worst case modulation scheme or bandwidth will be measured.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace mode:	Max hold
Used test setup:	See chapter 6.4 – A
Measurement uncertainty:	See chapter 8

Results:

OFDM – mode	Modulation scheme / bandwidth					
	U-NII-1 & U-NII-2A		U-NII-2C		U-NII-3	
	Low channel	high channel	Low channel	high channel	Low channel	high channel
a – mode	6 Mbit/s	6 Mbit/s	6 Mbit/s	6 Mbit/s	6 Mbit/s	6 Mbit/s
n/ac HT20 – mode	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0
n/ac HT40 – mode	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0
ac80– mode	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0

11.2 Antenna gain

Description:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace mode:	Max. hold
Test setup:	See chapter 6.5 – A (radiated) See chapter 6.4 – A (conducted)
Measurement uncertainty:	See chapter 8

Limits:

Antenna Gain
6 dBi / > 6 dBi output power and power density reduction required

Results: Antenna 1

U-NII-1 (5150 MHz to 5250 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	16.6	-/-	15.8
Radiated power / dBm @ 3 MHz RBW	15.7	-/-	15.0
Gain / dBi (calculated)	-0.9	-/-	-0.8

U-NII-2A (5250 MHz to 5350 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	16.9	-/-	17.3
Radiated power / dBm @ 3 MHz RBW	14.6	-/-	13.2
Gain / dBi (calculated)	-2.3	-/-	-4.1

U-NII-2C (5470 MHz to 5725 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	18.8	18.6	18.3
Radiated power / dBm @ 3 MHz RBW	16.3	15.7	12.7
Gain / dBi (calculated)	-2.5	-2.9	-5.6

U-NII-3 (5725 MHz to 5850 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	18.5	17.1	18.1
Radiated power / dBm @ 3 MHz RBW	12.7	13.9	14.8
Gain / dBi (calculated)	-5.8	-3.2	-4.3

Results: Antenna 2

U-NII-1 (5150 MHz to 5250 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	19.1	-/-	17.7
Radiated power / dBm @ 3 MHz RBW	16.9	-/-	15.7
Gain / dBi (calculated)	-2.2	-/-	-2.0

U-NII-2A (5250 MHz to 5350 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	18.3	-/-	18.4
Radiated power / dBm @ 3 MHz RBW	15.5	-/-	14.6
Gain / dBi (calculated)	-2.8	-/-	-3.8

U-NII-2C (5470 MHz to 5725 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	18.7	17.6	16.5
Radiated power / dBm @ 3 MHz RBW	14.8	18.2	16.2
Gain / dBi (calculated)	-3.9	-0.6	-0.3

U-NII-3 (5725 MHz to 5850 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	17.5	15.2	15.7
Radiated power / dBm @ 3 MHz RBW	16.4	14.7	15.8
Gain / dBi (calculated)	-1.1	-0.5	0.1

11.3 Power verification

Description:

The measured power values from Chapter 11.4 are compared with the power values from the module test report MDE_UBLOX_1828_FCCg.pdf.

Measurement:

Measurement parameter	
According to: KDB789033 D02, E.2.e.	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	> EBW
Trace mode:	Max hold
Analyzer function	Band power / channel power Interval > 26 dB EBW
Used test setup:	See chapter 6.4 – A
Measurement uncertainty:	See chapter 8

Results: Antenna port 1

	Measured power [dBm]	Power from module test report [dBm]	Difference [dBm]
a-mode			
5180 MHz	10.2	11.3	-1.1
5200 MHz	11.9	13.5	-1.6
5240 MHz	12.6	13.5	-0.9
5260 MHz	12.6	13.8	-1.2
5300 MHz	11.1	13.9	-2.8
5320 MHz	9.0	11.8	-2.8
5500 MHz	9.3	10.6	-1.3
5600 MHz	11.3	13.2	-1.9
5700 MHz	10.6	10.0	0.6
5745 MHz	13.7	16.7	-3.0
5785 MHz	14.1	16.5	-2.4
5825 MHz	13.7	16.5	-2.8
n/ac HT20 mode			
5180 MHz	10.4	11.3	-0.9
5200 MHz	10.4	13.5	-3.1
5240 MHz	10.6	13.3	-2.7
5260 MHz	10.5	13.8	-3.3
5300 MHz	10.5	13.7	-3.2
5320 MHz	10.1	11.6	-1.5
5500 MHz	11.2	10.4	0.8
5600 MHz	13.7	13.1	0.6
5700 MHz	11.1	10.0	1.1
5745 MHz	16.6	16.5	0.1
5785 MHz	16.5	16.4	0.1
5825 MHz	16.1	16.5	-0.4
n/ac HT40 mode			
5190 MHz	6.7	9.8	-3.1
5230 MHz	9.4	12.6	-3.2
5270 MHz	9.0	12.9	-3.9
5310 MHz	7.8	11.7	-3.9
5510 MHz	6.5	8.5	-2.0
5590 MHz	10.1	12.8	-2.7
5670 MHz	10.0	9.5	0.5
5755 MHz	13.3	16.9	-3.6
5795 MHz	13.6	17.0	-3.4
ac80 mode			
5180 MHz	7.6	9.7	-2.1
5200 MHz	7.6	9.7	-2.1
5240 MHz	8.0	7.4	0.6
5260 MHz	8.1	7.2	0.9
5300 MHz	13.4	14.4	-1.0

Results: Antenna port 2

	Measured power [dBm]	Power from module test report [dBm]	Difference [dBm]
n/ac HT20 mode			
5180 MHz	11.5	11.2	0.3
5200 MHz	13.3	13.3	0.0
5240 MHz	13.5	13.4	0.1
5260 MHz	13.5	12.9	0.6
5300 MHz	13.6	12.8	0.8
5320 MHz	11.7	11.1	0.6
5500 MHz	10.2	10.5	-0.3
5600 MHz	12.5	13.4	-0.9
5700 MHz	10.1	10.0	0.1
5745 MHz	15.4	15.8	-0.4
5785 MHz	15.2	15.8	-0.6
5825 MHz	15.0	15.7	-0.7
n/ac HT40 mode			
5190 MHz	9.0	9.7	-0.7
5230 MHz	12.3	12.8	-0.5
5270 MHz	12.2	12.5	-0.3
5310 MHz	11.0	11.5	-0.5
5510 MHz	8.5	8.5	0.0
5590 MHz	12.0	12.8	-0.8
5670 MHz	9.0	9.6	-0.6
5755 MHz	11.9	16.7	-4.8
5795 MHz	12.2	16.4	-4.2
ac80 mode			
5180 MHz	8.7	9.6	-0.9
5200 MHz	8.9	9.2	-0.3
5240 MHz	6.8	7.0	-0.2
5260 MHz	6.9	6.6	0.3
5300 MHz	12.5	13.7	-1.2

11.4 Maximum output power

11.4.1 Maximum output power according to FCC requirements

Description:

Measurement of the maximum output power conducted

Measurement:

Measurement parameter	
According to: KDB789033 D02, E.2.e.	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	> EBW
Trace mode:	Max hold
Analyzer function	Band power / channel power Interval > 26 dB EBW
Used test setup:	See chapter 6.4 – A
Measurement uncertainty:	See chapter 8

Limits:

Radiated output power	Conducted output power for mobile equipment
Conducted power + 6 dBi antenna gain	250mW 5.150-5.250 GHz The lesser one of 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 26dB Bandwidth [MHz]) 1W 5.725-5.85 GHz

Results: Antenna port 1

	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	10.2	11.9	12.6
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
a	12.6	11.1	9.0
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	9.3	11.3	10.6
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	13.7	14.1	13.7

Results: Antenna port 1

	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	10.4	10.4	10.6
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
n/ac HT20	10.5	10.5	10.1
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	11.2	13.7	11.1
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	16.6	16.5	16.1

Results: Antenna port 1

n/ac HT40	**Maximum output power conducted [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel		Highest channel
	6.7		9.4
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel		Highest channel
	9.0		7.8
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	6.5	10.1	10.0
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel		Highest channel
	13.3		13.6

Results: Antenna port 1

ac80	**Maximum output power conducted [dBm]**
	U-NII-1 (5150 MHz to 5250 MHz)
	Middle channel
	7.6
	U-NII-2A (5250 MHz to 5350 MHz)
	Middle channel
	7.6
	U-NII-2C (5470 MHz to 5725 MHz)
	Lowest channel / Highest channel
	8.0 / 8.1
	U-NII-3 (5725 MHz to 5850 MHz)
	Middle channel
	13.4

Results: Antenna port 2

	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	11.5	13.3	13.5
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
n/ac HT20	13.5	13.6	11.7
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	10.2	12.5	10.1
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	15.4	15.2	15.0

Results: Antenna port 2

	Maximum output power conducted [dBm]	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Lowest channel	Highest channel
	9.0	12.3
	U-NII-2A (5250 MHz to 5350 MHz)	
	Lowest channel	Highest channel
n/ac HT40	12.2	11.0
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Middle channel	Highest channel
	8.5	12.0	9.0
	U-NII-3 (5725 MHz to 5850 MHz)	
	Lowest channel	Highest channel
	11.9	12.2

Results: Antenna port 2

ac80	**Maximum output power conducted [dBm]**	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	8.1	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	8.9	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	6.8	6.9
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	12.5	

Results: Antenna port 1+2 (calculated)

n/ac HT20	**Maximum output power conducted [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	14.0	15.1	15.3
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	15.3	15.3	14.0
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	13.7	16.2	13.6
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	19.1	18.9	18.6

Results: Antenna port 1+2 (calculated)

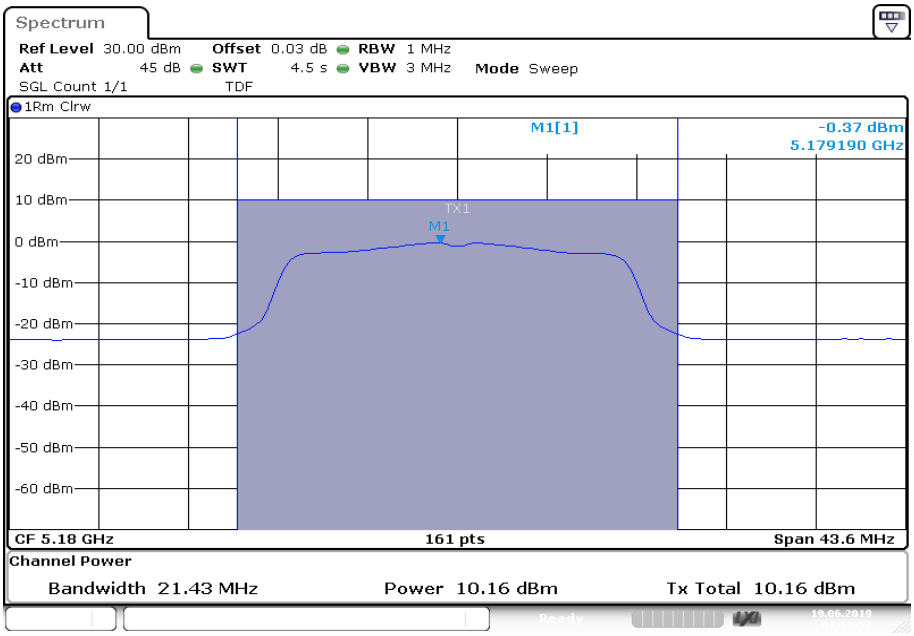
n/ac HT40	**Maximum output power conducted [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel		Highest channel
	11.0		14.1
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel		Highest channel
	13.9		12.7
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	10.6	14.2	12.5
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel		Highest channel
	15.7		16.0

Results: Antenna port 1+2 (calculated)

ac80	**Maximum output power conducted [dBm]**
	U-NII-1 (5150 MHz to 5250 MHz)
	Middle channel
	10.9
	U-NII-2A (5250 MHz to 5350 MHz)
	Middle channel
	11.3
	U-NII-2C (5470 MHz to 5725 MHz)
	Lowest channel / Highest channel
	10.5 / 10.6
	U-NII-3 (5725 MHz to 5850 MHz)
	Middle channel
	16.0

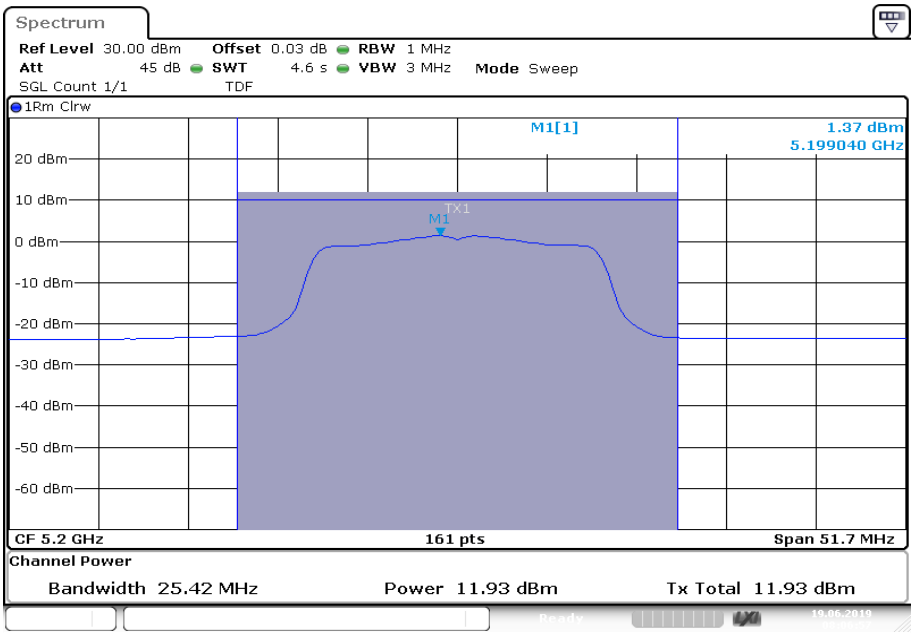
Plots: a – mode, Antenna port 1

Plot 1: U-NII-1; lowest channel



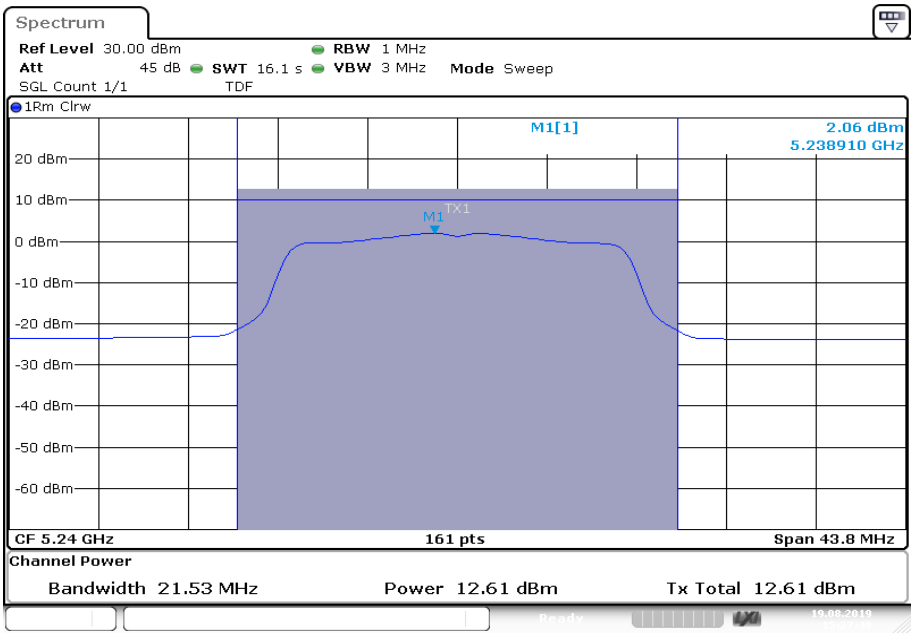
Date: 19.JUN.2019 07:52:52

Plot 2: U-NII-1; middle channel

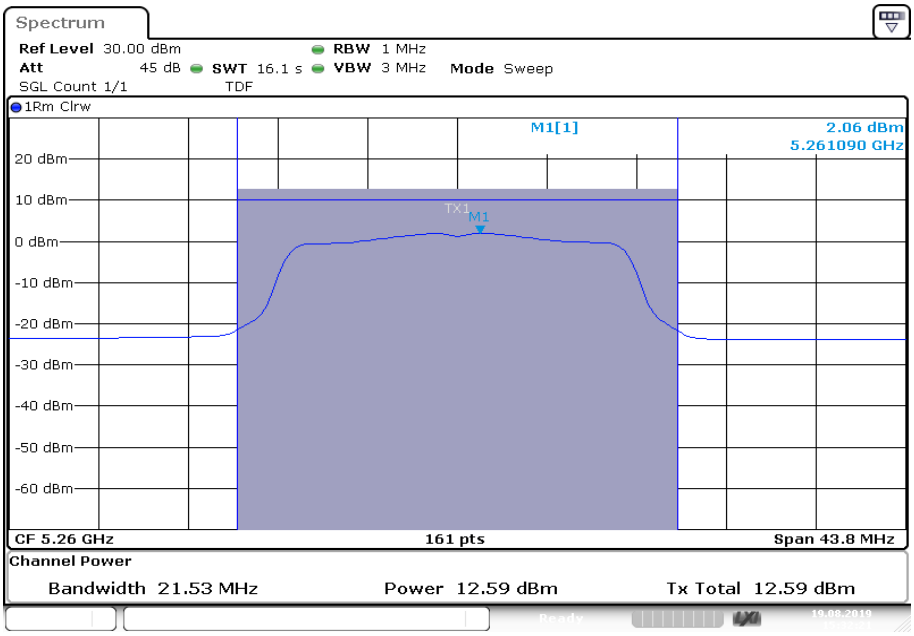


Date: 19.JUN.2019 08:06:57

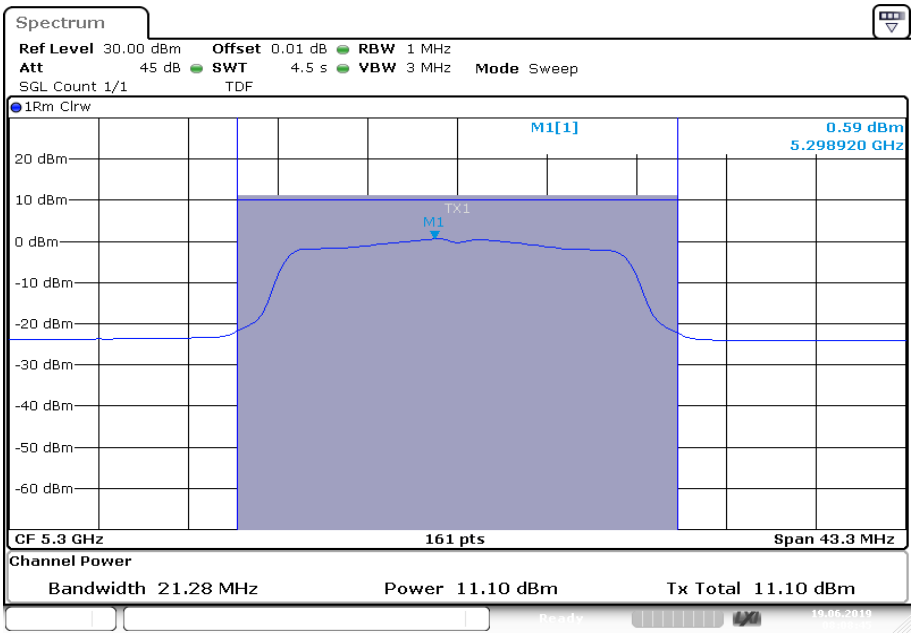
Plot 3: U-NII-1; highest channel



Plot 4: U-NII-2A; lowest channel

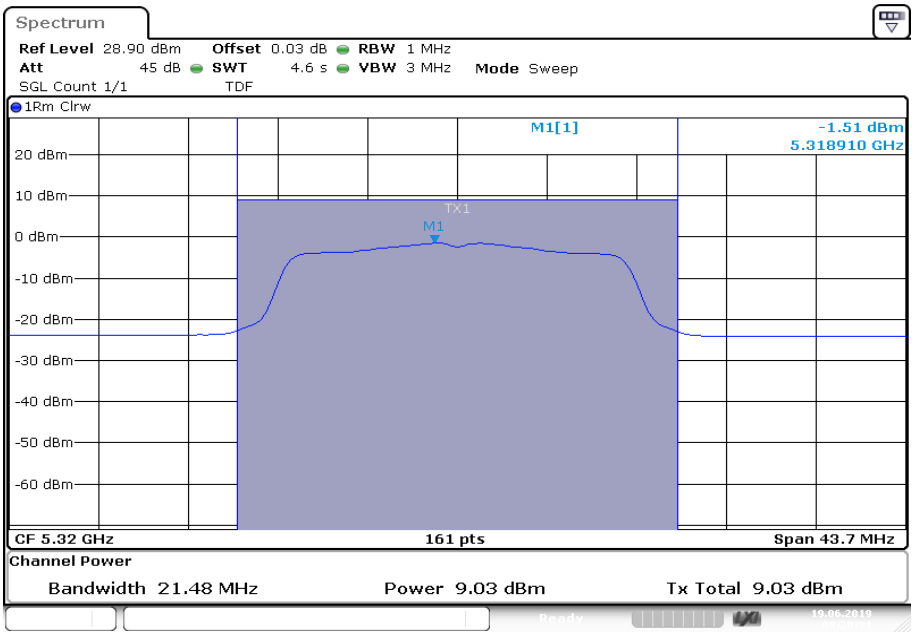


Plot 5: U-NII-2A; middle channel



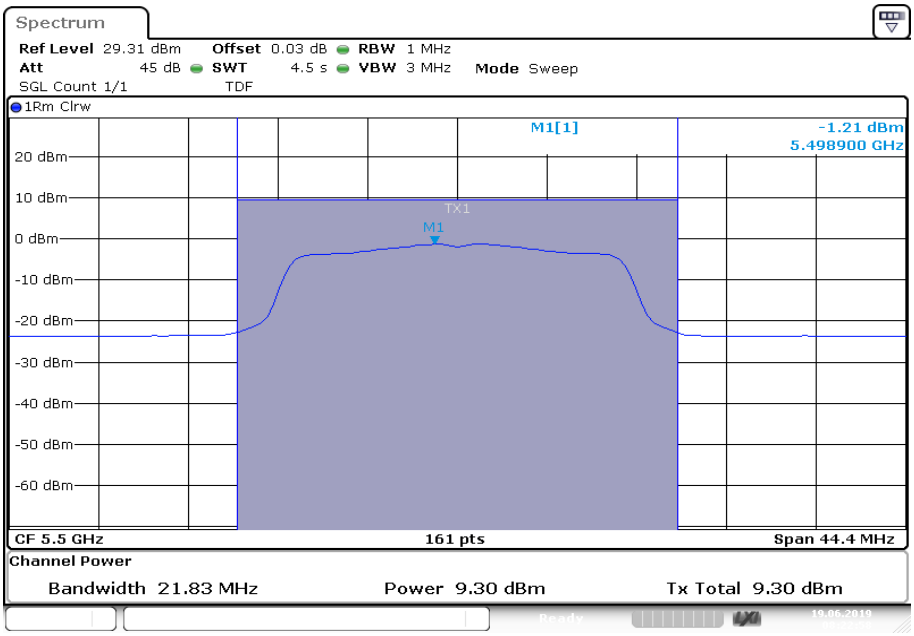
Date: 19.JUN.2019 08:08:45

Plot 6: U-NII-2A; highest channel



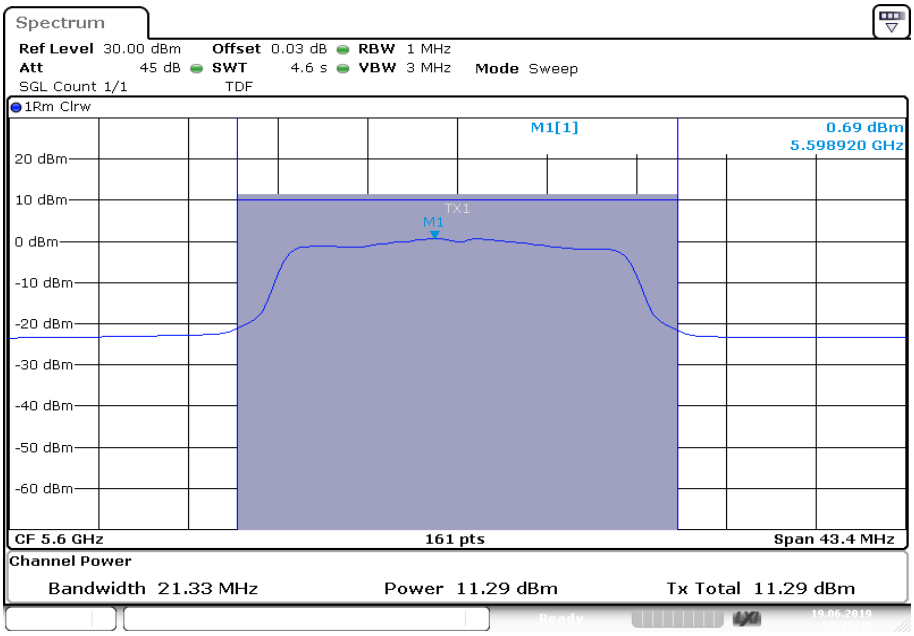
Date: 19.JUN.2019 08:20:31

Plot 7: U-NII-2C; lowest channel



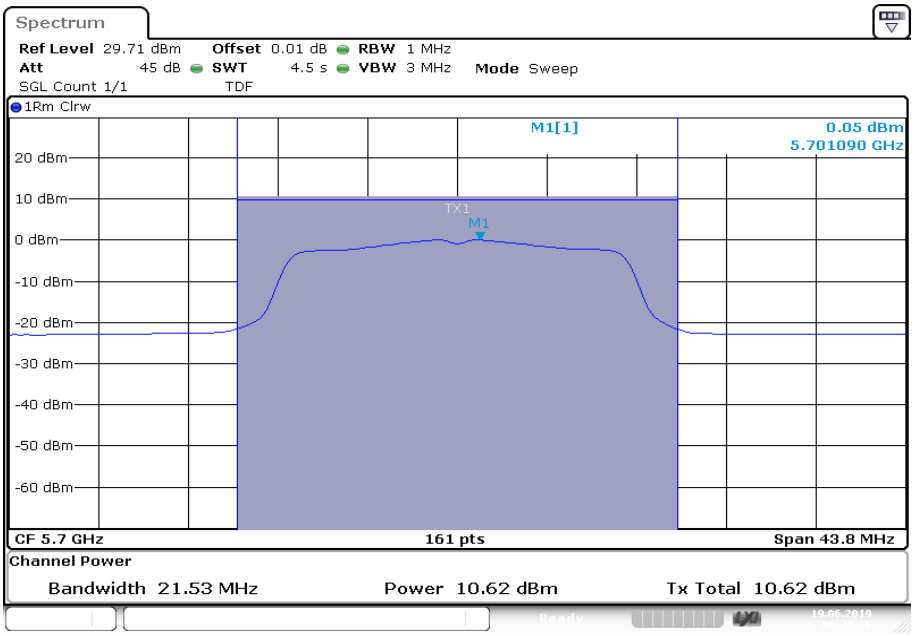
Date: 19.JUN.2019 08:22:58

Plot 8: U-NII-2C; middle channel



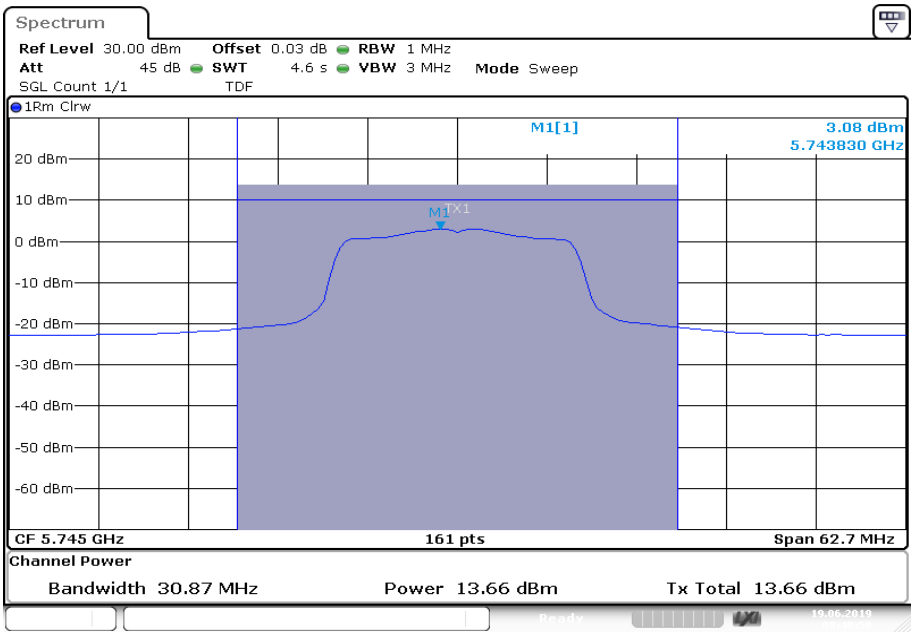
Date: 19.JUN.2019 08:35:48

Plot 9: U-NII-2C; highest channel



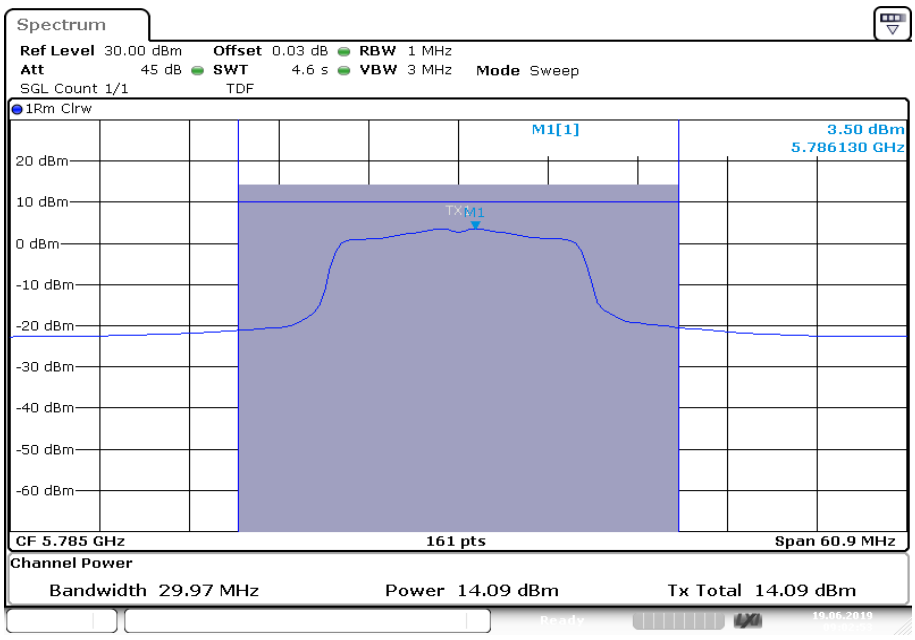
Date: 19.JUN.2019 08:47:26

Plot 10: U-NII-3; lowest channel



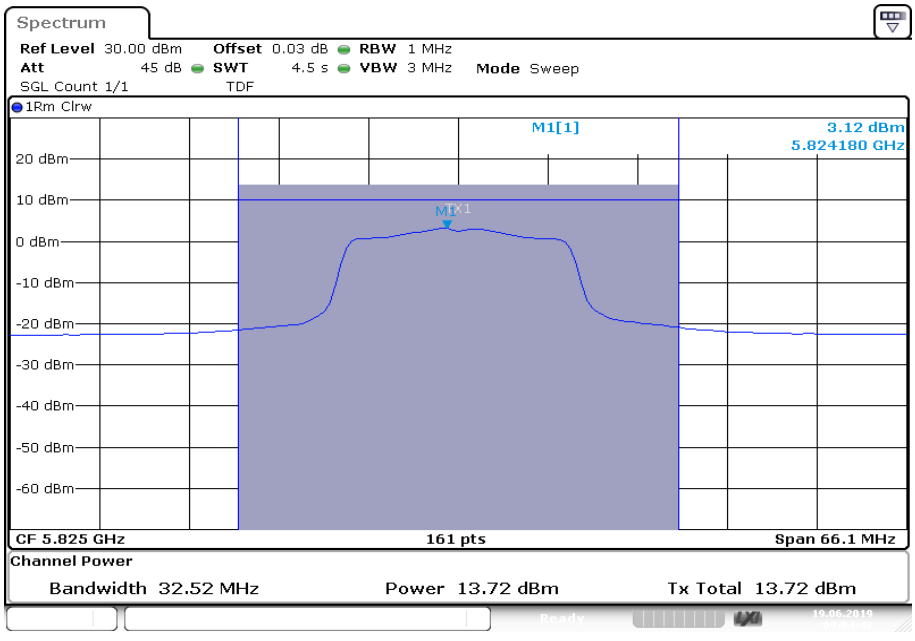
Date: 19.JUN.2019 08:48:50

Plot 11: U-NII-3; middle channel



Date: 19.JUN.2019 09:02:53

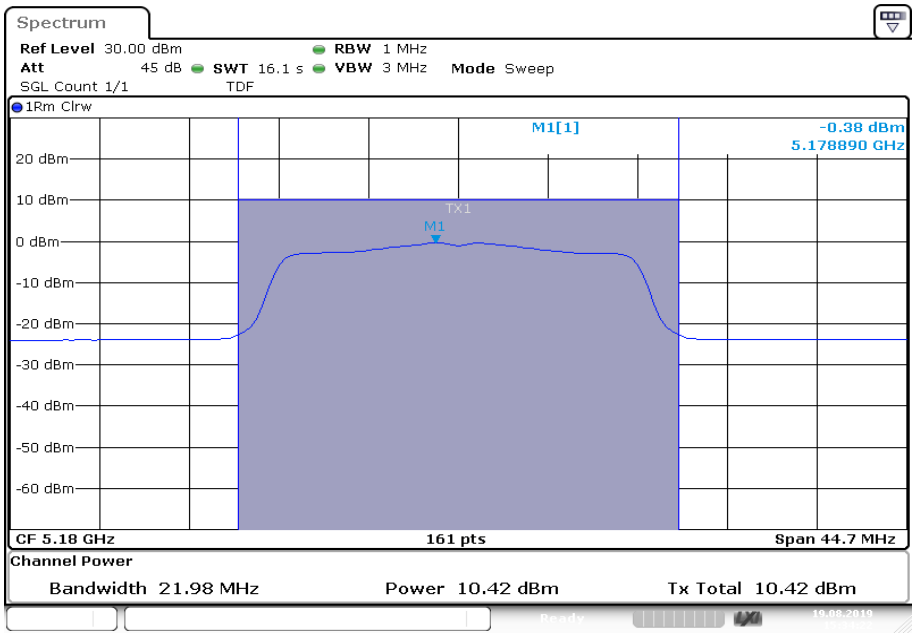
Plot 12: U-NII-3; highest channel



Date: 19.JUN.2019 09:04:42

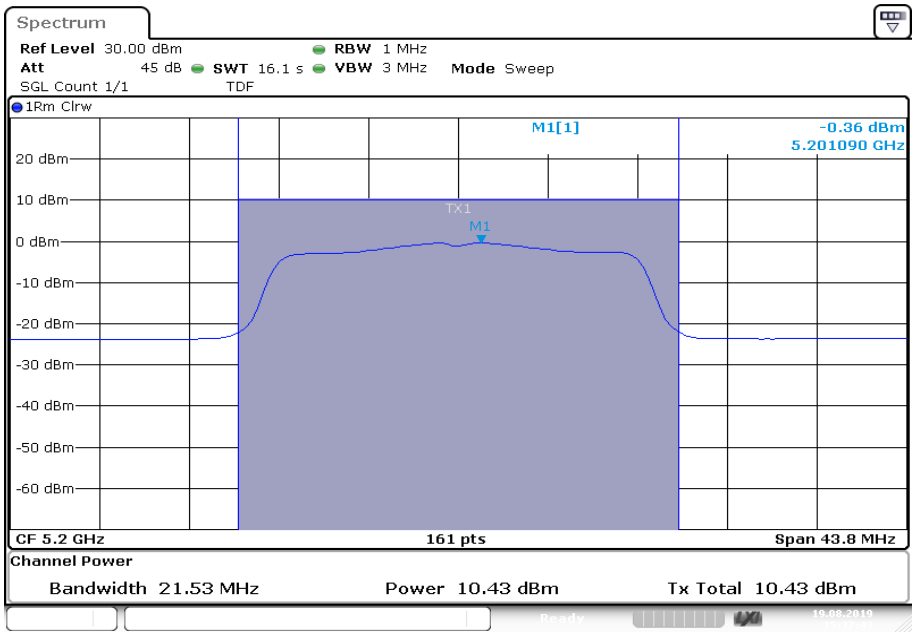
Plots: n/ac HT20 – mode, Antenna port 1

Plot 1: U-NII-1; lowest channel



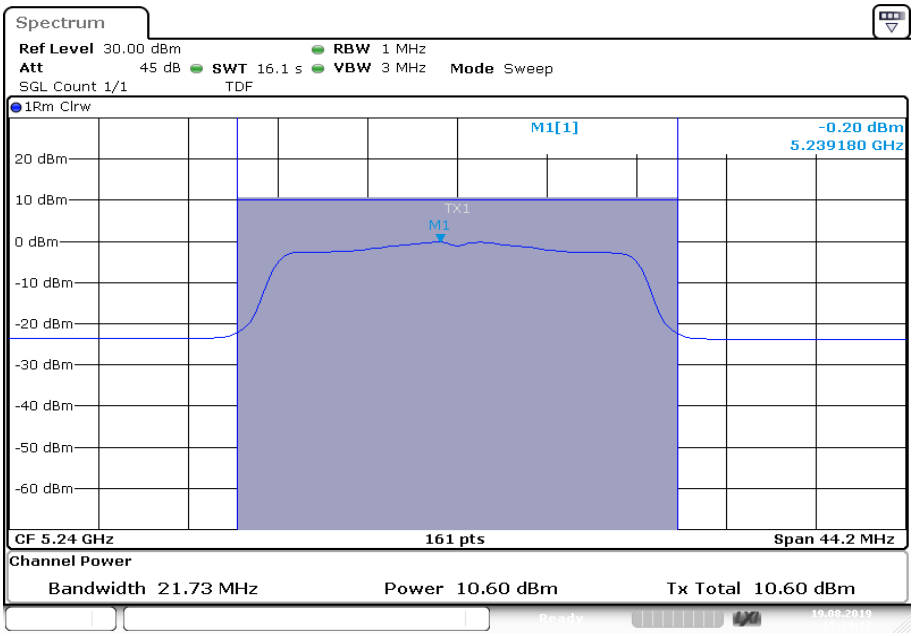
Date: 19.AUG.2019 15:34:22

Plot 2: U-NII-1; middle channel



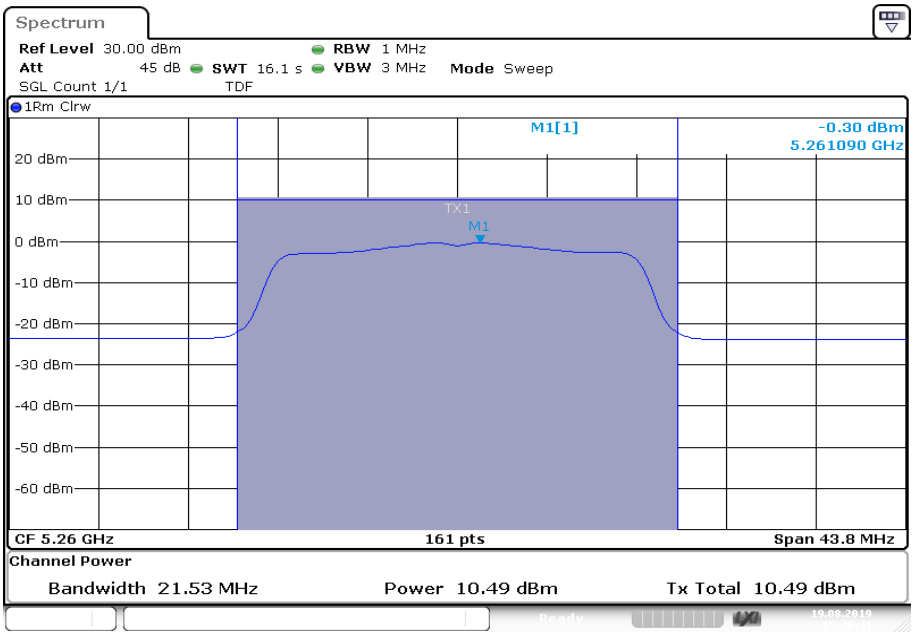
Date: 19.AUG.2019 15:37:43

Plot 3: U-NII-1; highest channel



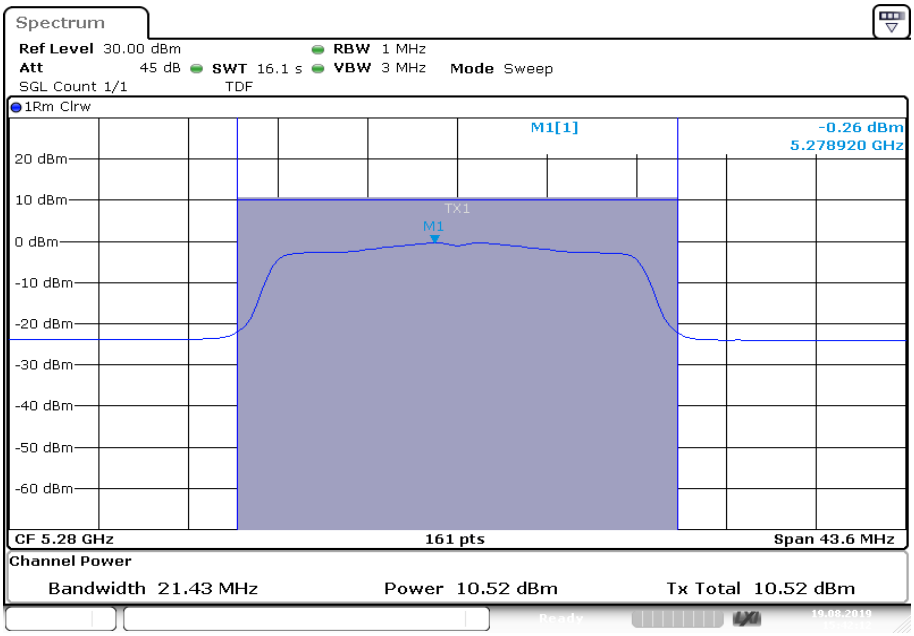
Date: 19.AUG.2019 15:39:13

Plot 4: U-NII-2A; lowest channel

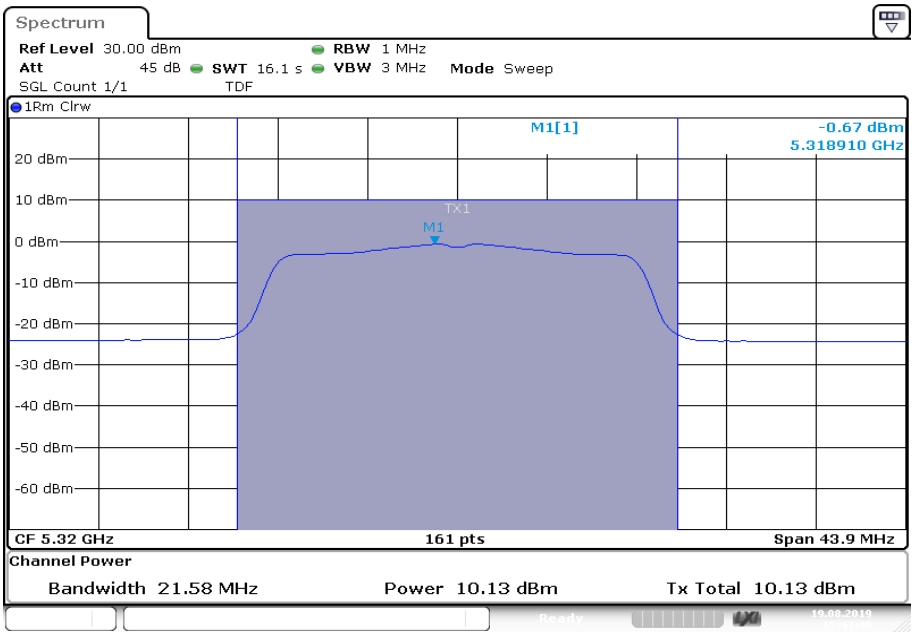


Date: 19.AUG.2019 15:40:41

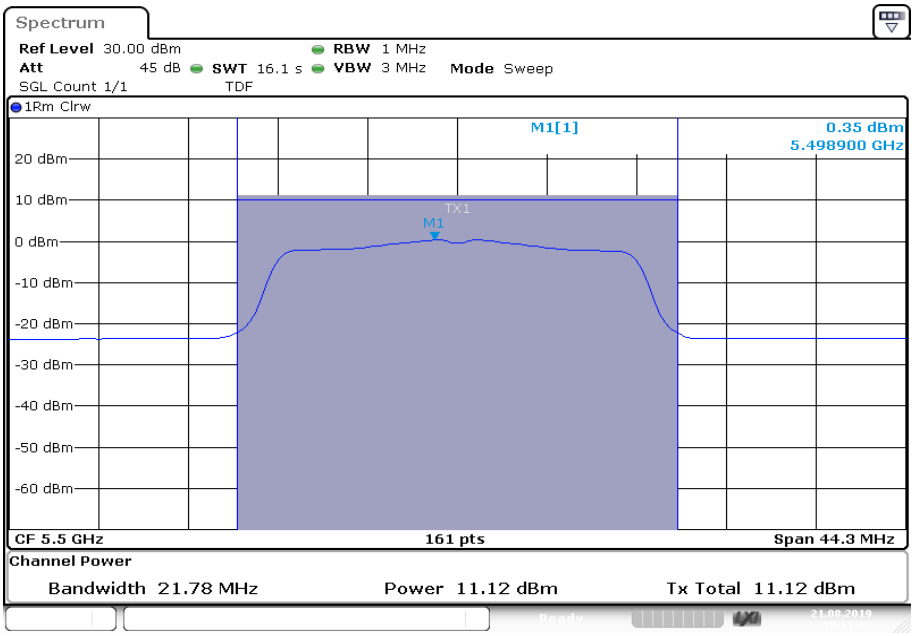
Plot 5: U-NII-2A; middle channel



Plot 6: U-NII-2A; highest channel

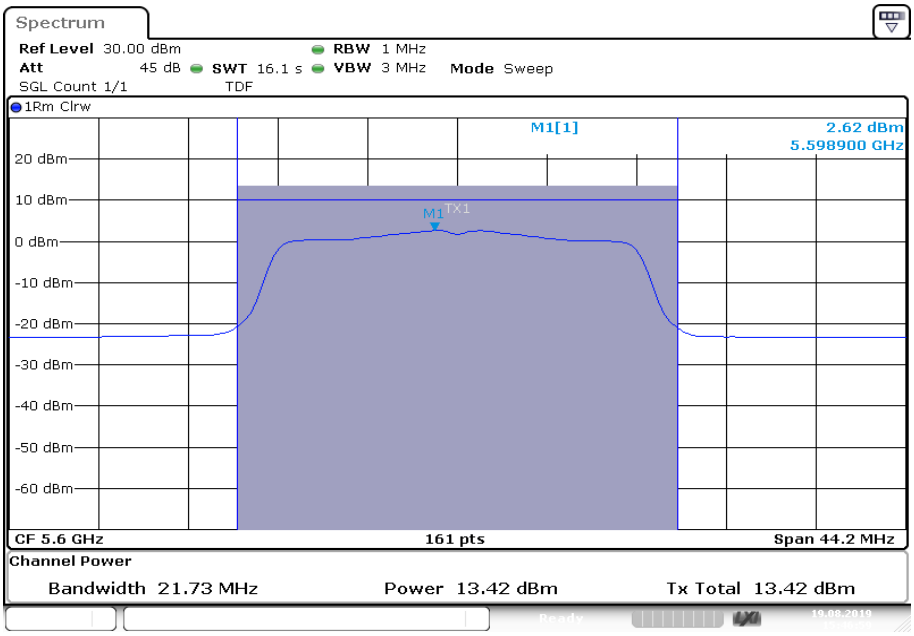


Plot 7: U-NII-2C; lowest channel



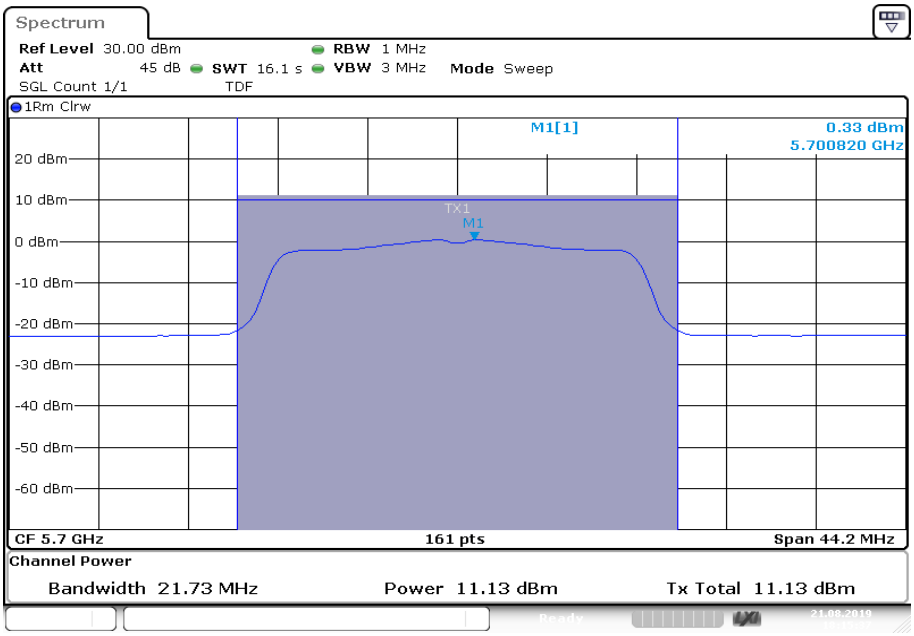
Date: 21.AUG.2019 18:11:08

Plot 8: U-NII-2C; middle channel



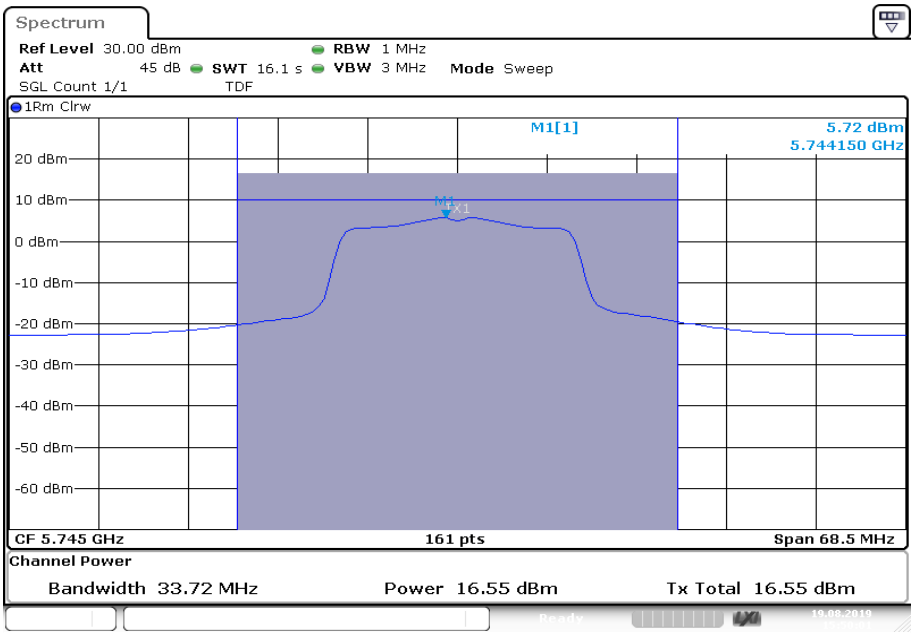
Date: 19.AUG.2019 15:46:59

Plot 9: U-NII-2C; highest channel



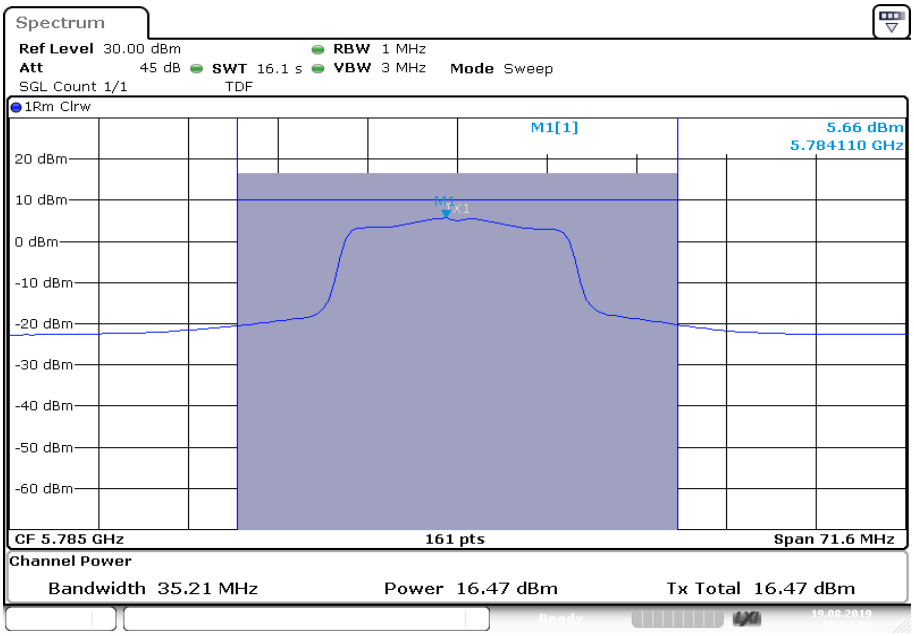
Date: 21.AUG.2019 18:15:38

Plot 10: U-NII-3; lowest channel



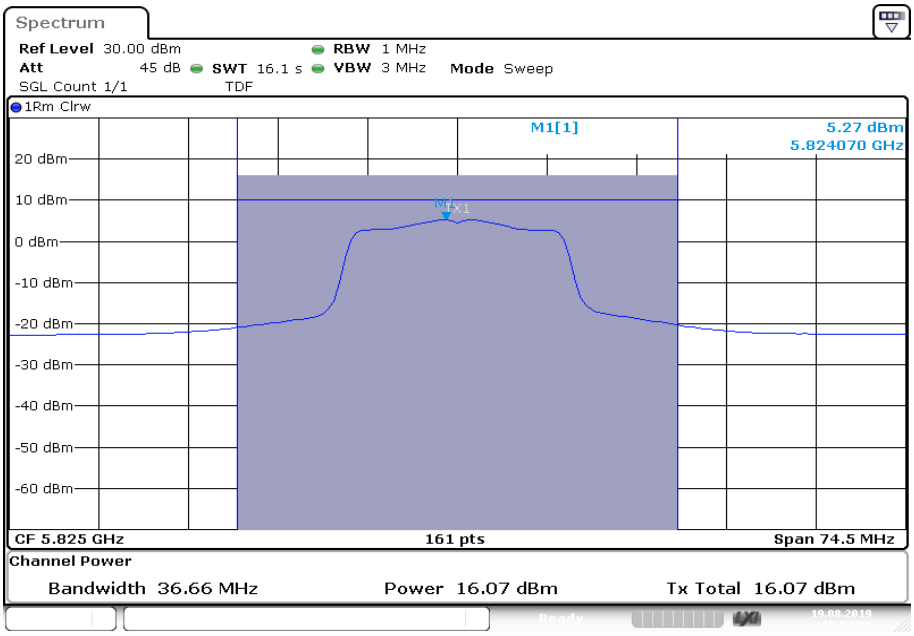
Date: 19.AUG.2019 15:50:01

Plot 11: U-NII-3; middle channel



Date: 19.AUG.2019 15:52:10

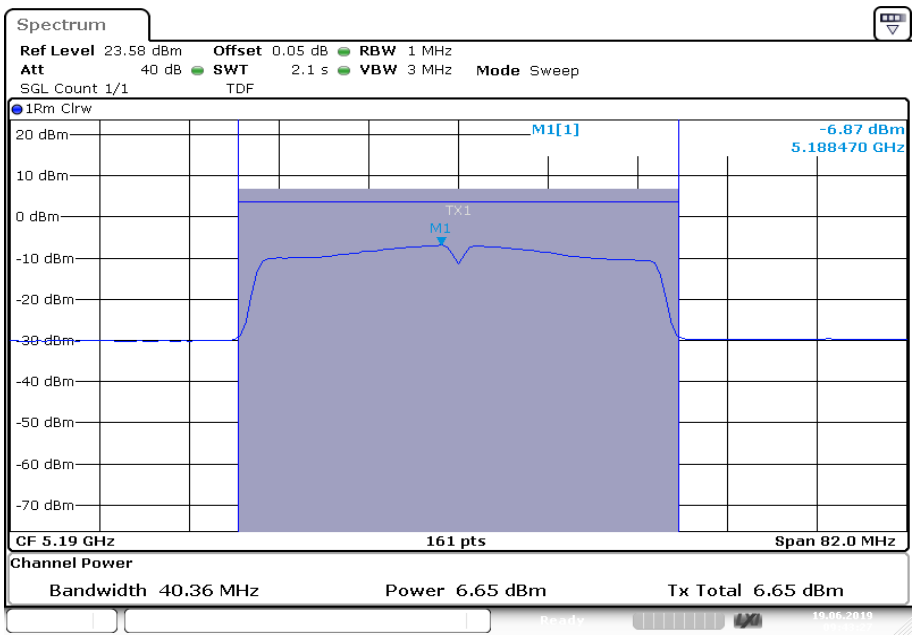
Plot 12: U-NII-3; highest channel



Date: 19.AUG.2019 15:54:20

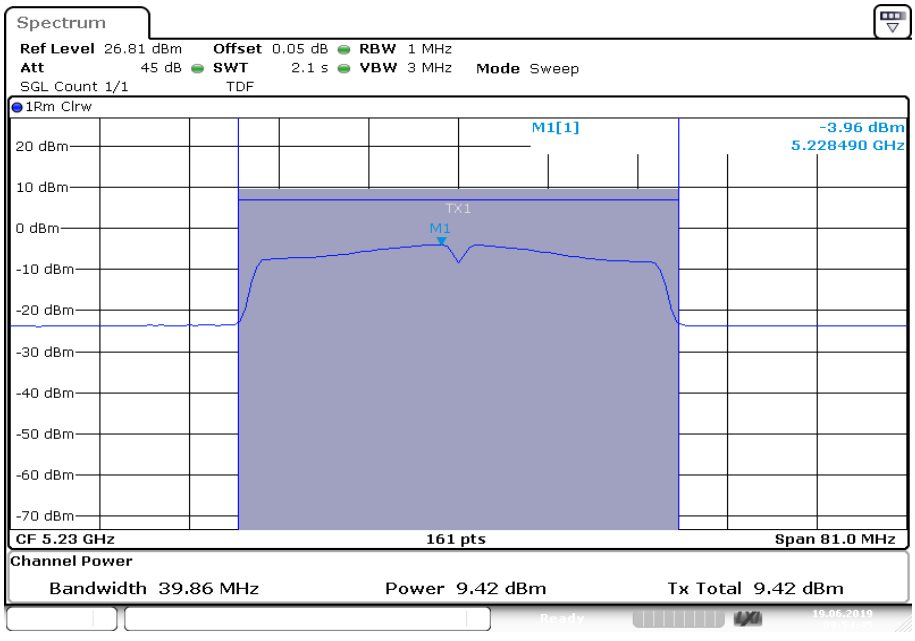
Plots: n/ac HT40 – mode, Antenna port 1

Plot 1: U-NII-1; lowest channel



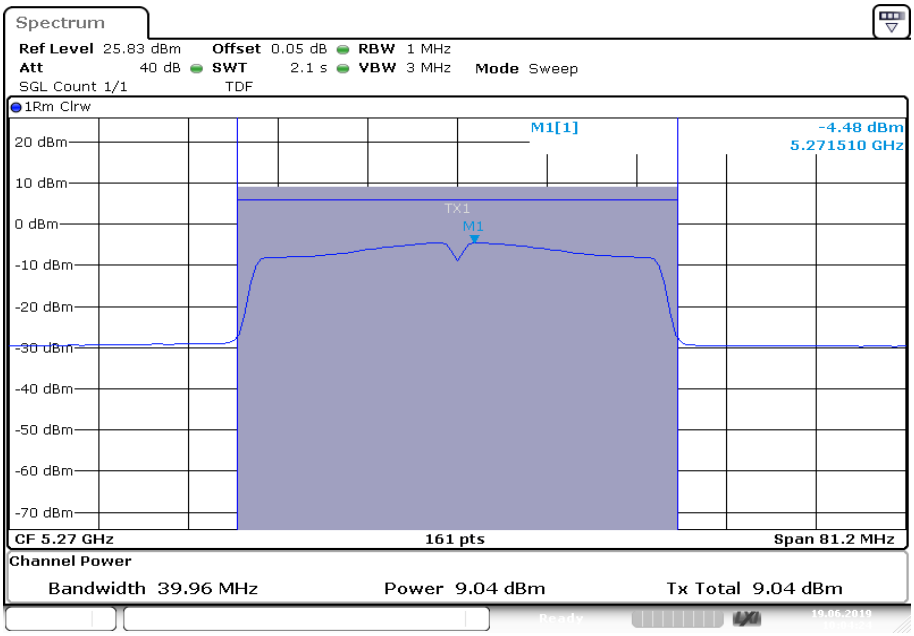
Date: 19.JUN.2019 09:43:27

Plot 2: U-NII-1; highest channel



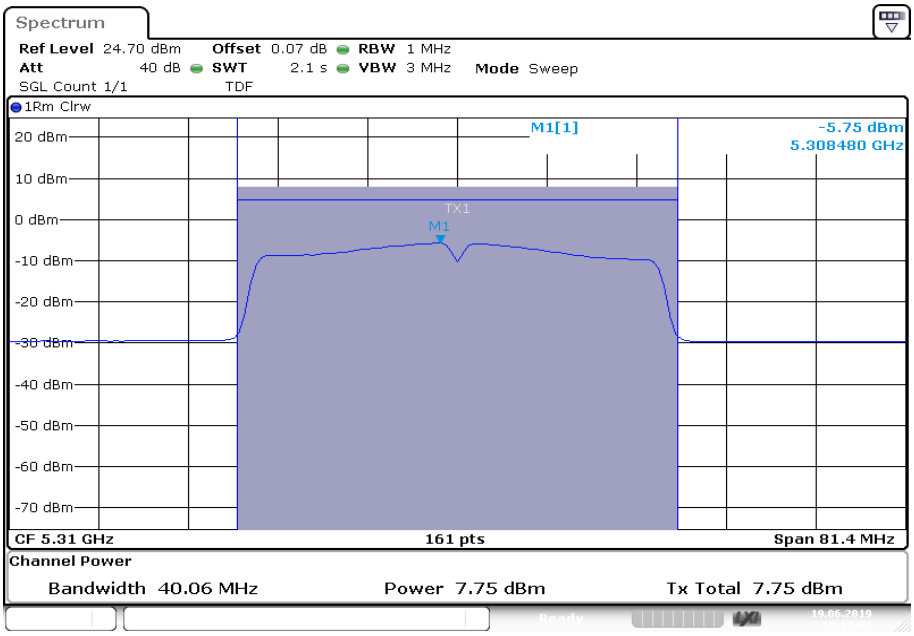
Date: 19.JUN.2019 09:54:45

Plot 3: U-NII-2A; lowest channel



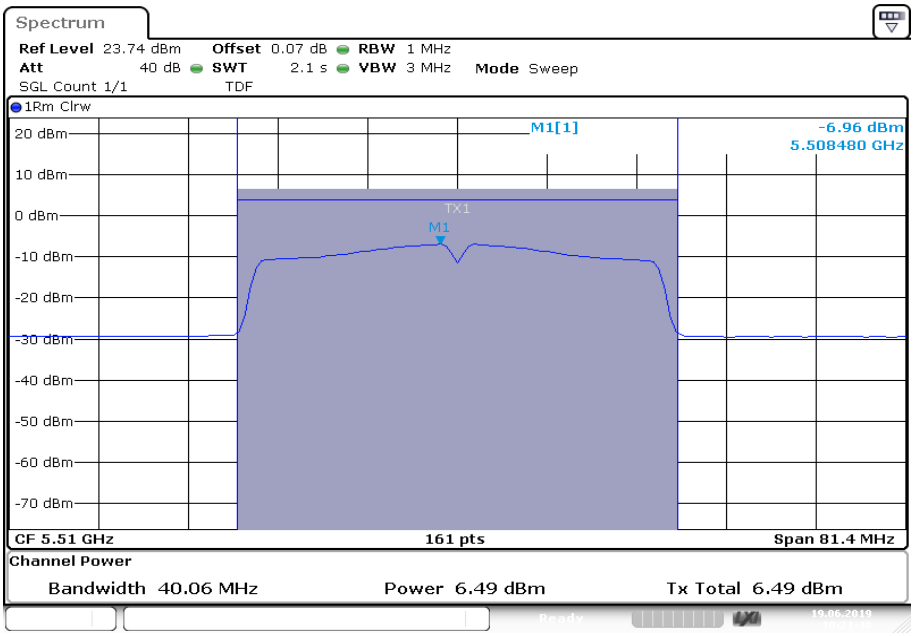
Date: 19.JUN.2019 10:04:24

Plot 4: U-NII-2A; highest channel



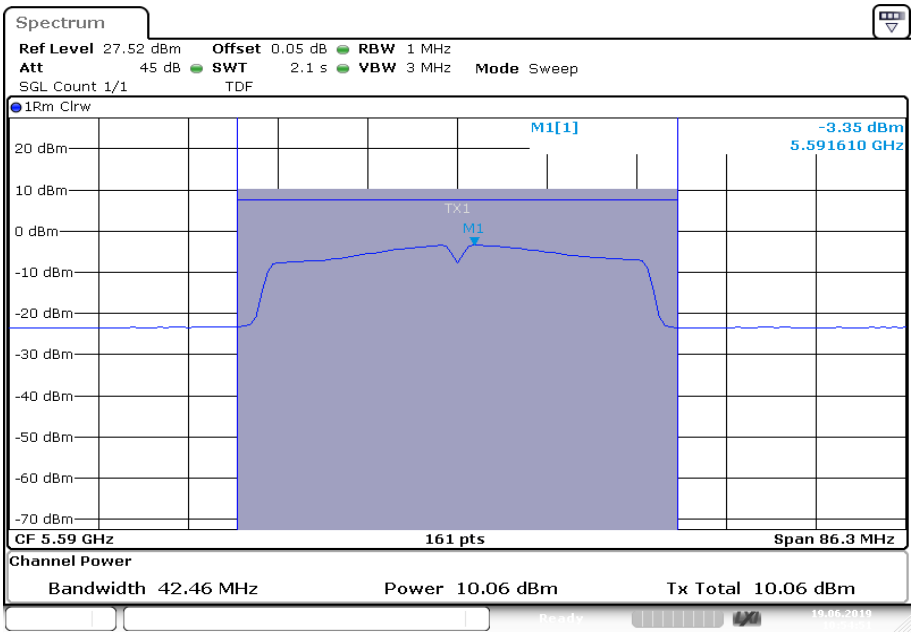
Date: 19.JUN.2019 10:17:03

Plot 5: U-NII-2C; lowest channel



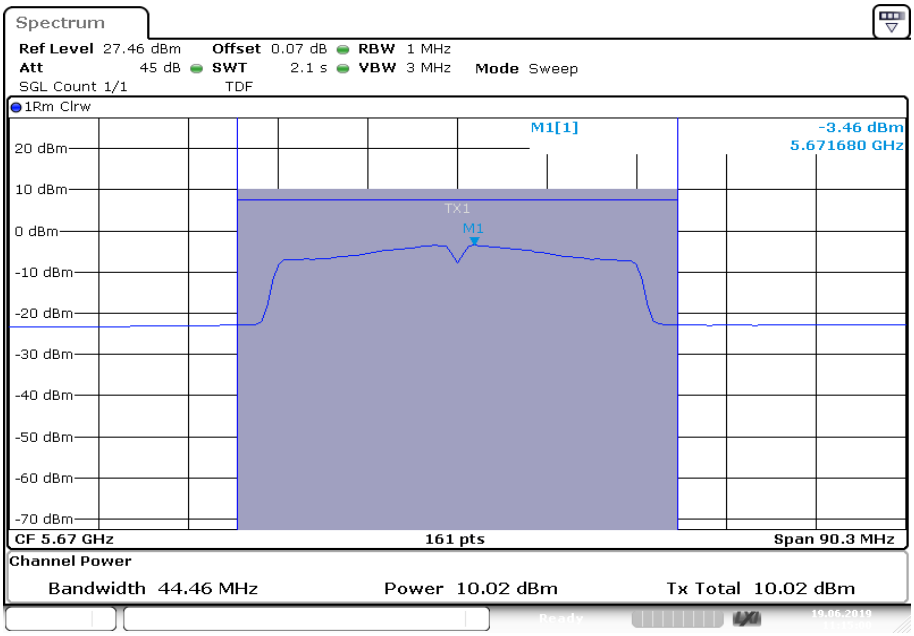
Date: 19.JUN.2019 10:21:48

Plot 6: U-NII-2C; middle channel



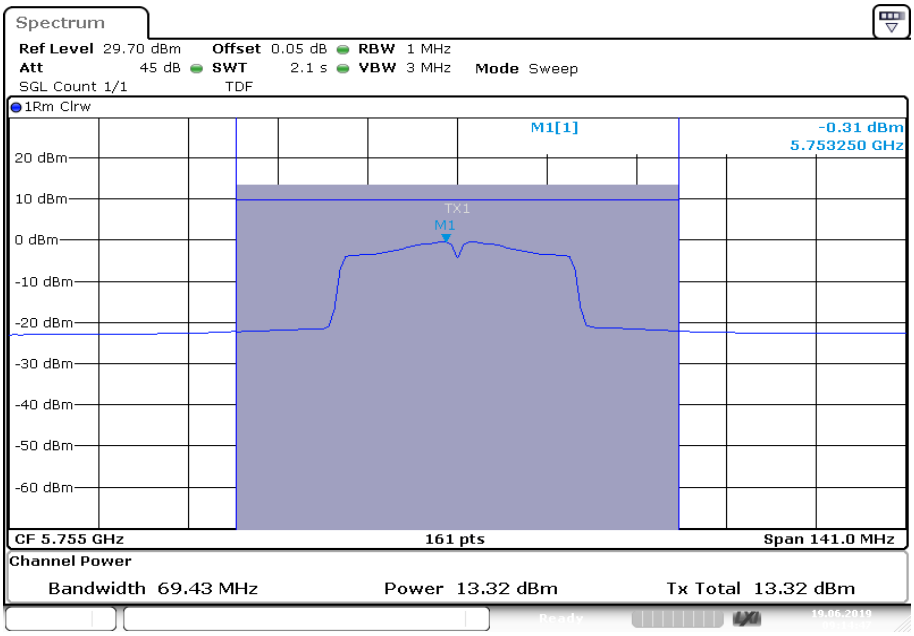
Date: 19.JUN.2019 10:54:51

Plot 7: U-NII-2C; highest channel



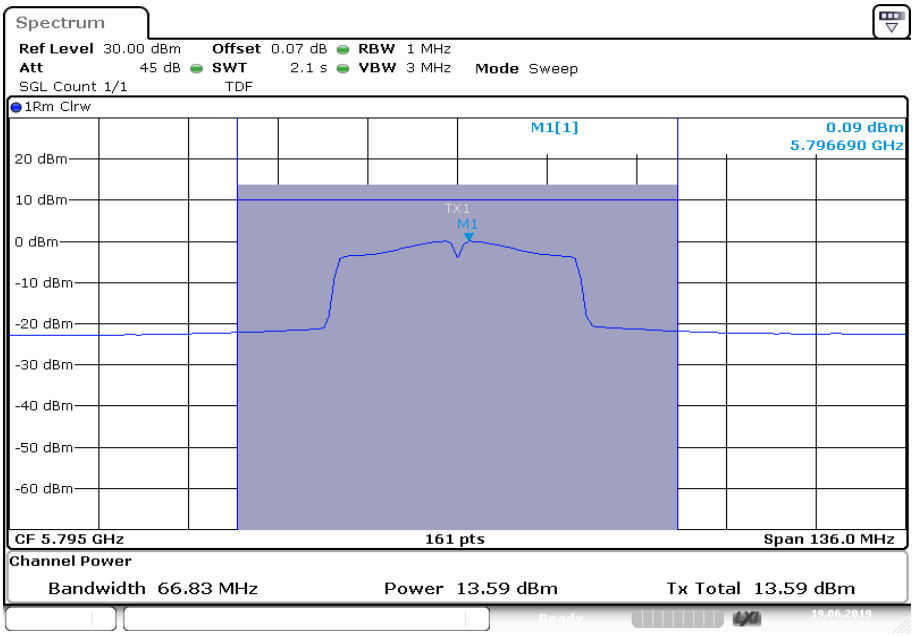
Date: 19.JUN.2019 11:15:00

Plot 8: U-NII-3; lowest channel



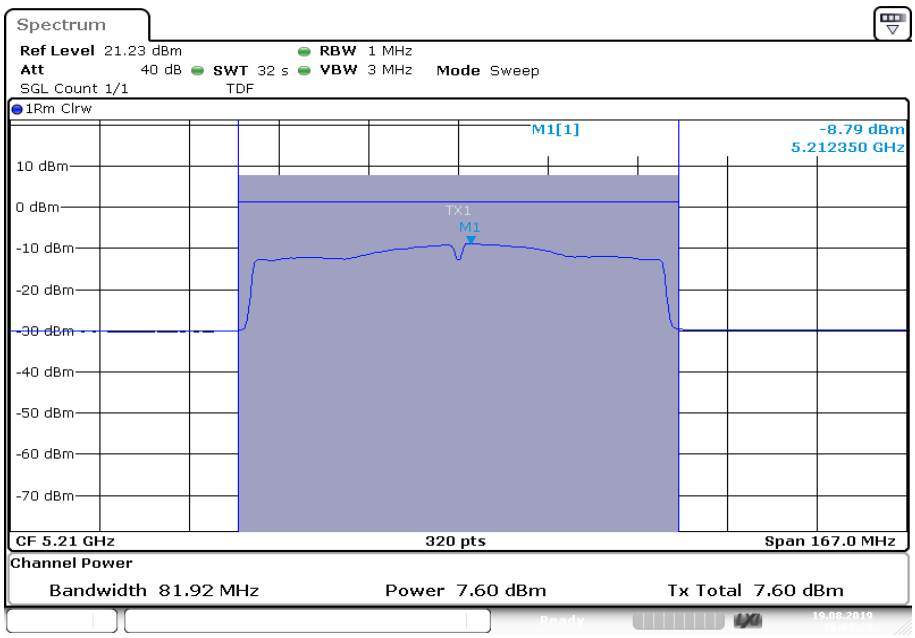
Date: 19.JUN.2019 09:14:47

Plot 9: U-NII-3; highest channel



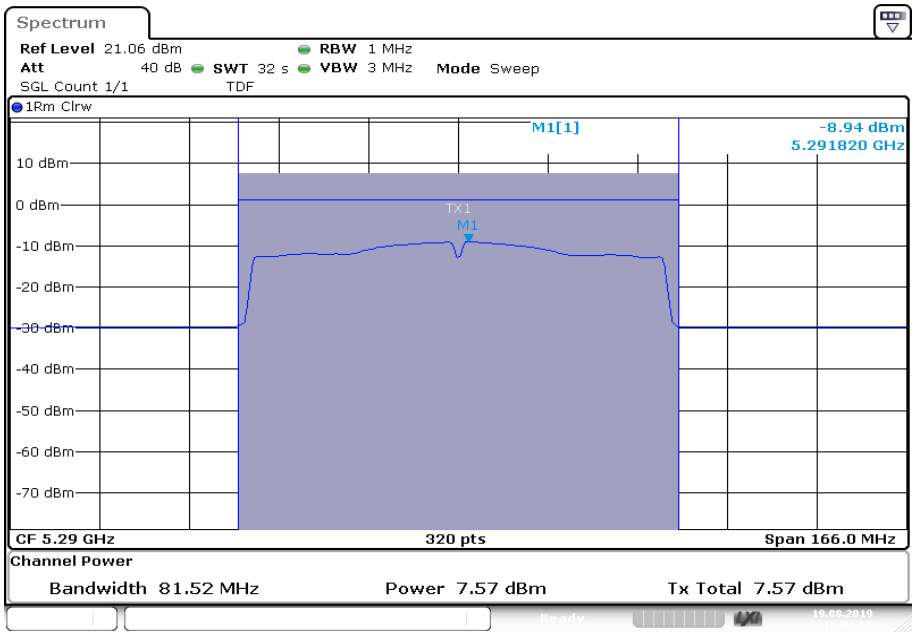
Plots: ac80– mode, Antenna port 1

Plot 1: U-NII-1; middle channel



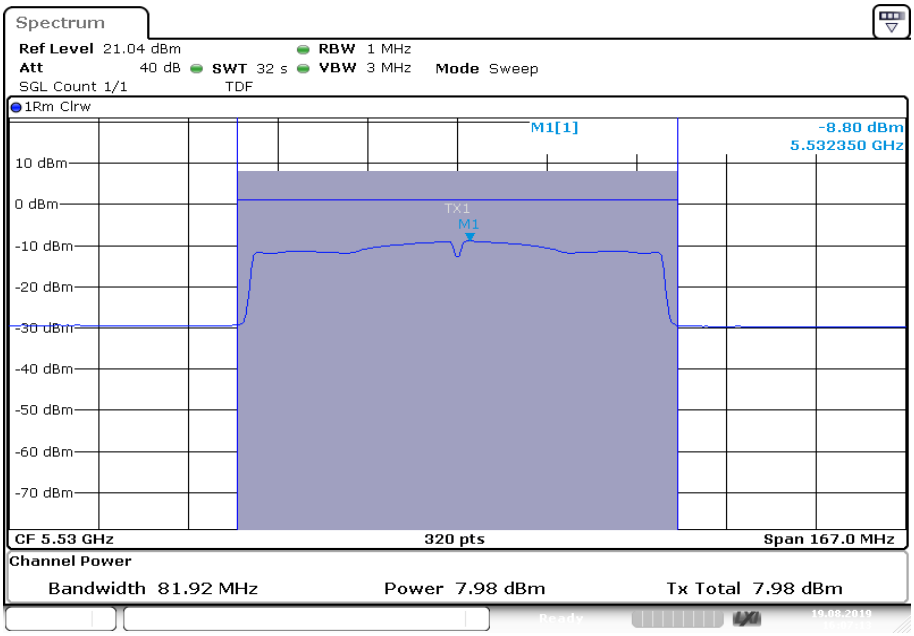
Date: 19.AUG.2019 16:02:28

Plot 2: U-NII-2A; middle channel



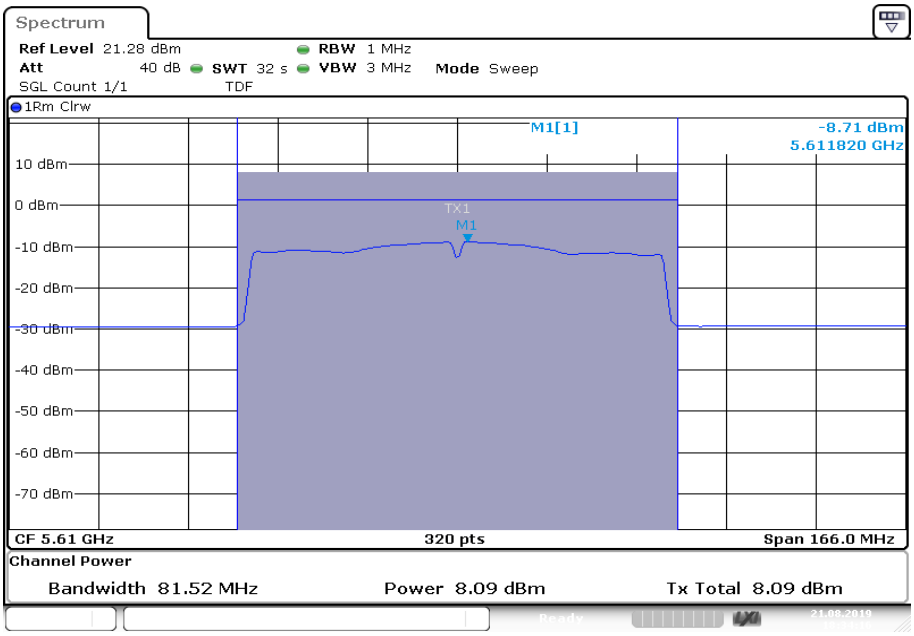
Date: 19.AUG.2019 16:04:56

Plot 3: U-NII-2C; lowest channel



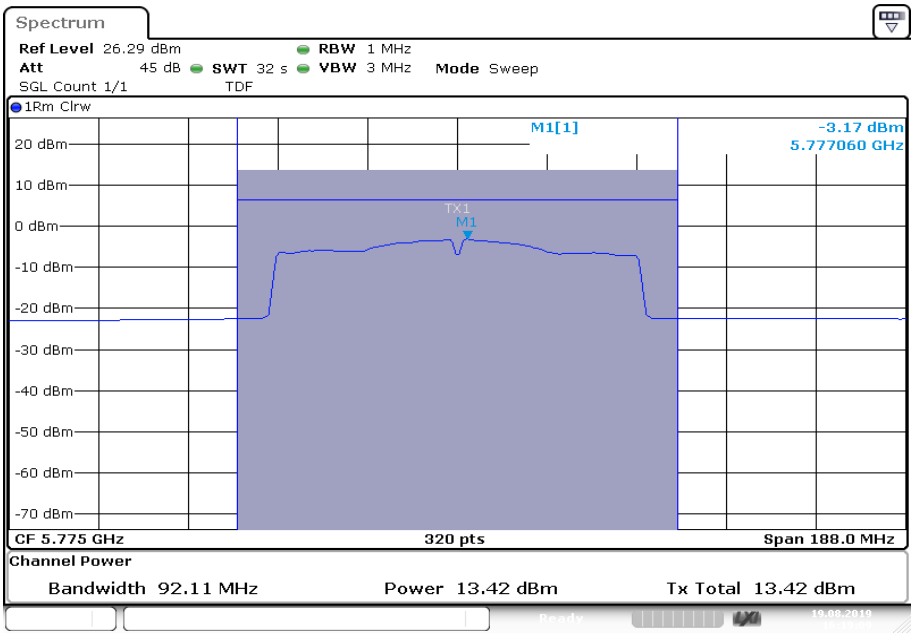
Date: 19.AUG.2019 16:07:13

Plot 4: U-NII-2C; highest channel



Date: 21.AUG.2019 18:34:16

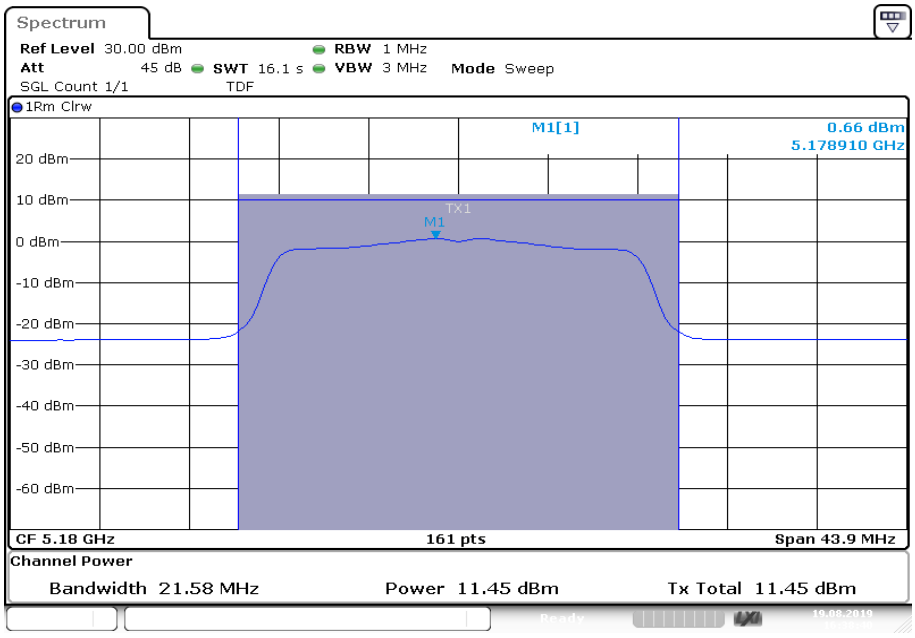
Plot 5: U-NII-3; middle channel



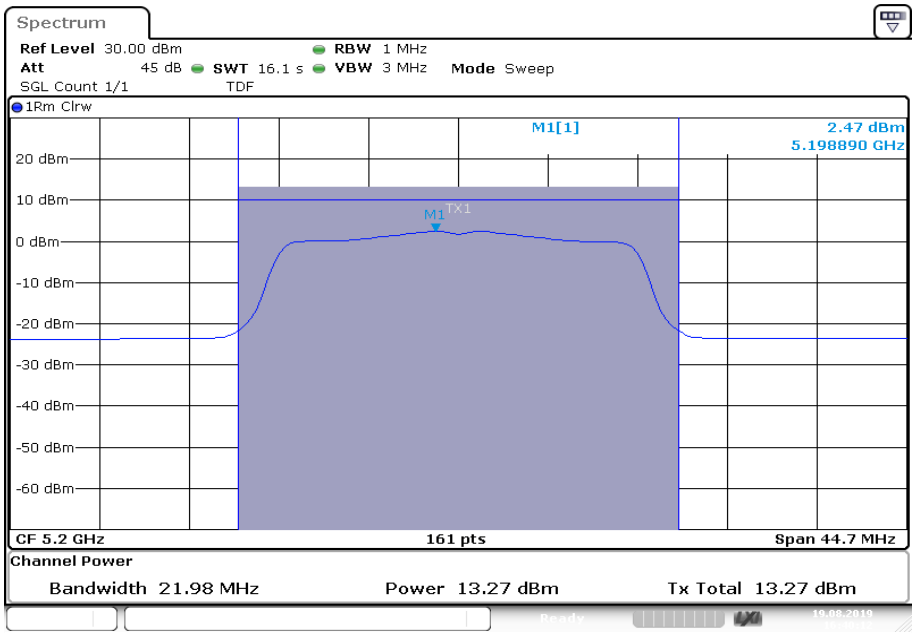
Date: 19.AUG.2019 16:19:09

Plots: n/ac HT20 – mode, Antenna port 2

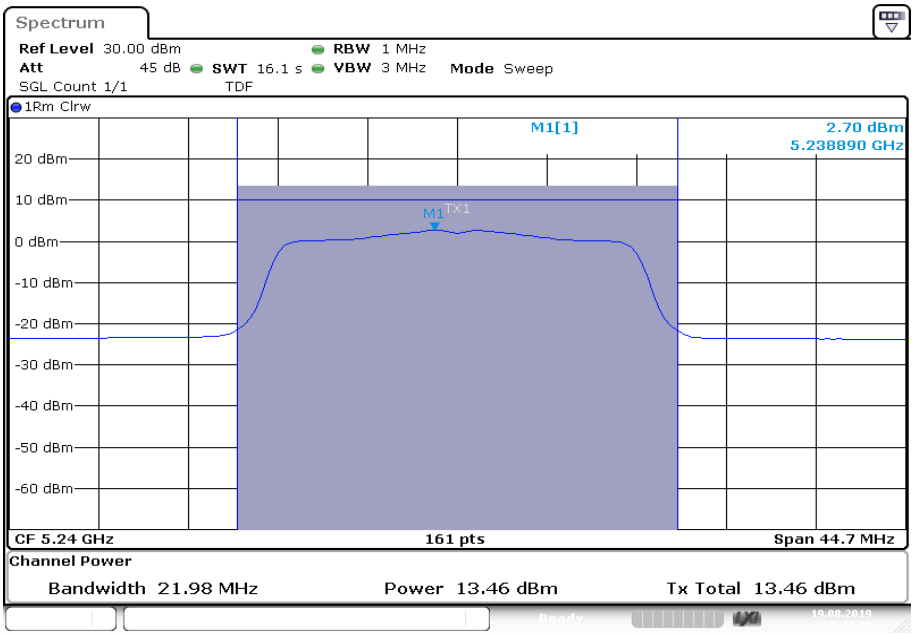
Plot 1: U-NII-1; lowest channel



Plot 2: U-NII-1; middle channel

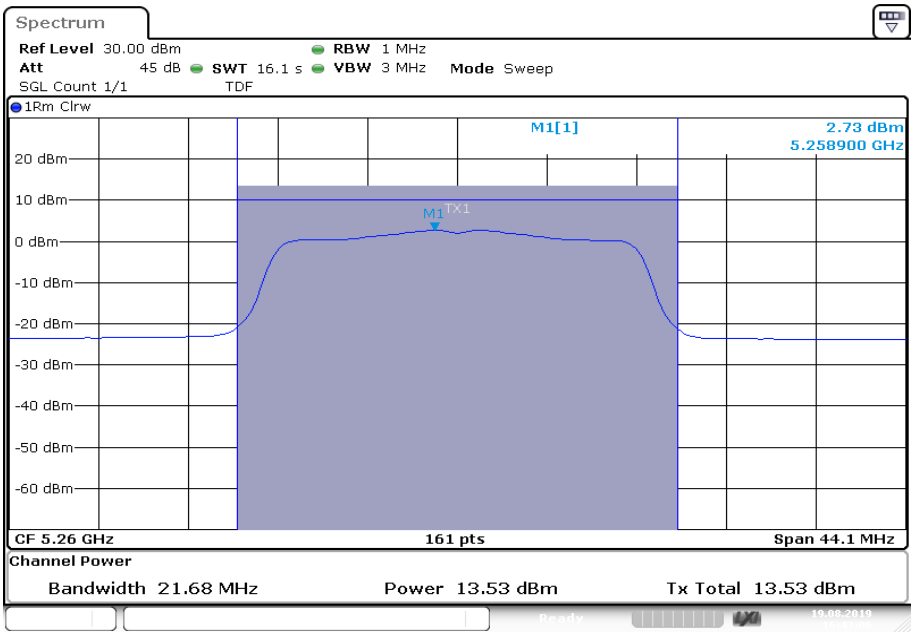


Plot 3: U-NII-1; highest channel



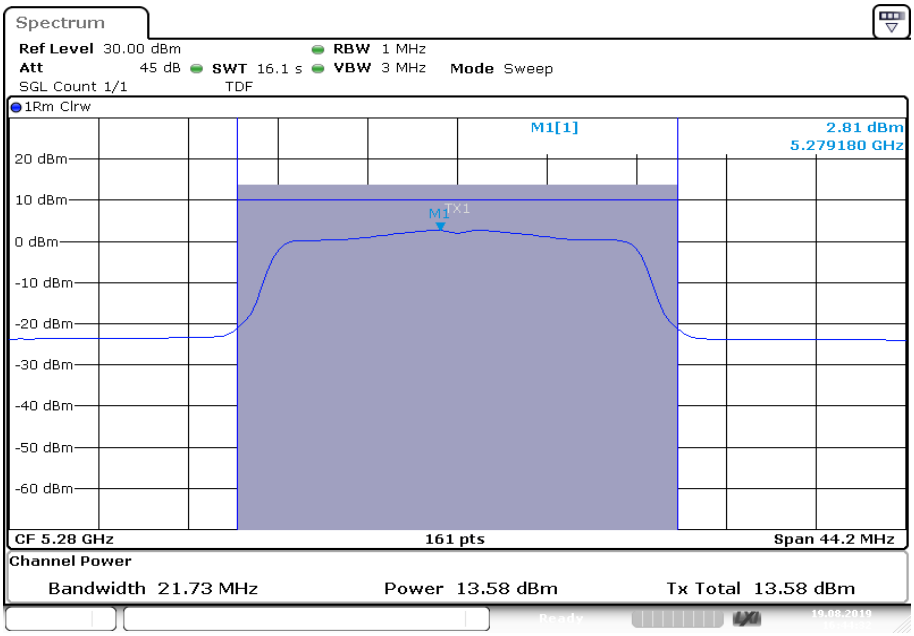
Date: 19.AUG.2019 16:41:37

Plot 4: U-NII-2A; lowest channel



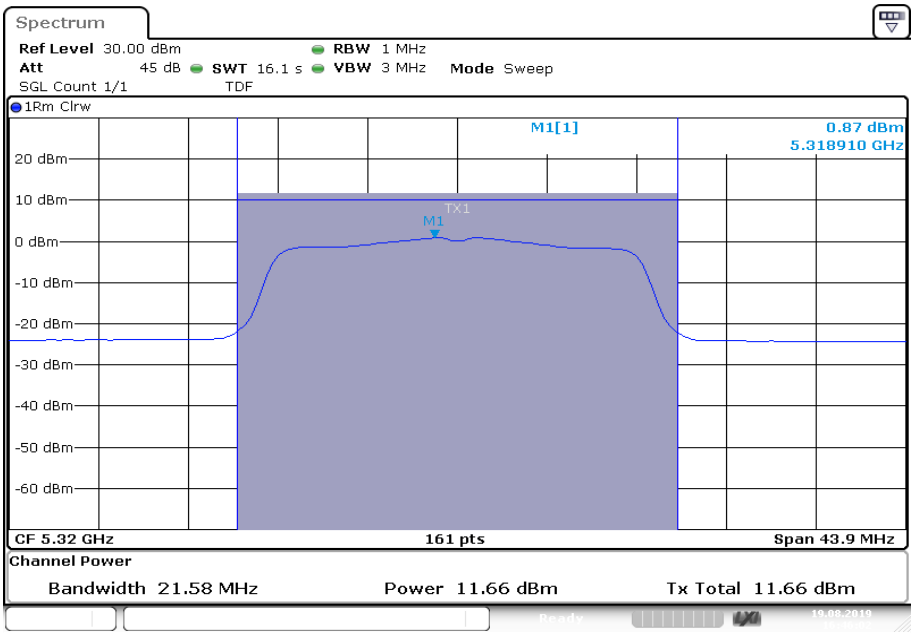
Date: 19.AUG.2019 16:43:06

Plot 5: U-NII-2A; middle channel



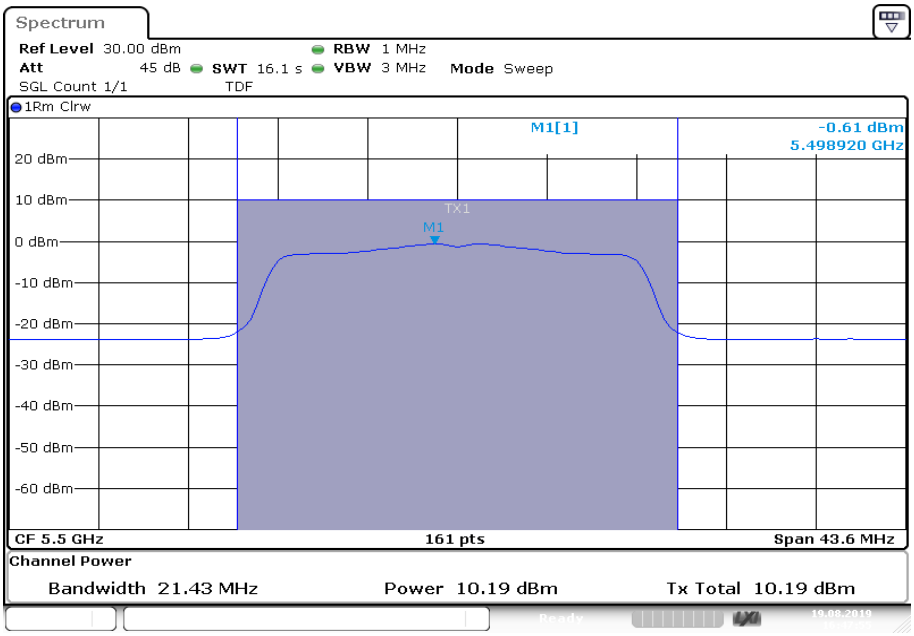
Date: 19.AUG.2019 16:44:32

Plot 6: U-NII-2A; highest channel



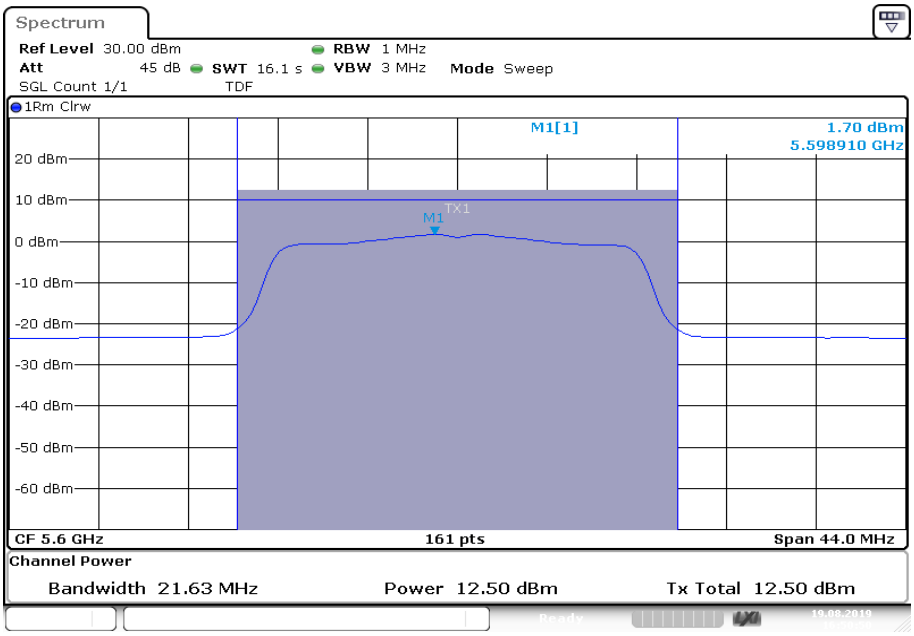
Date: 19.AUG.2019 16:46:02

Plot 7: U-NII-2C; lowest channel



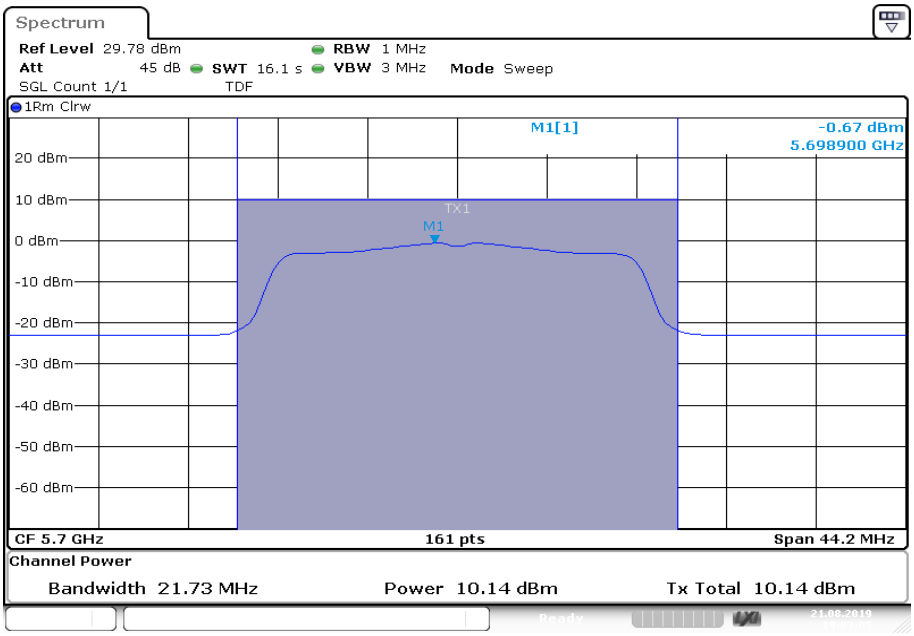
Date: 19.AUG.2019 16:47:55

Plot 8: U-NII-2C; middle channel



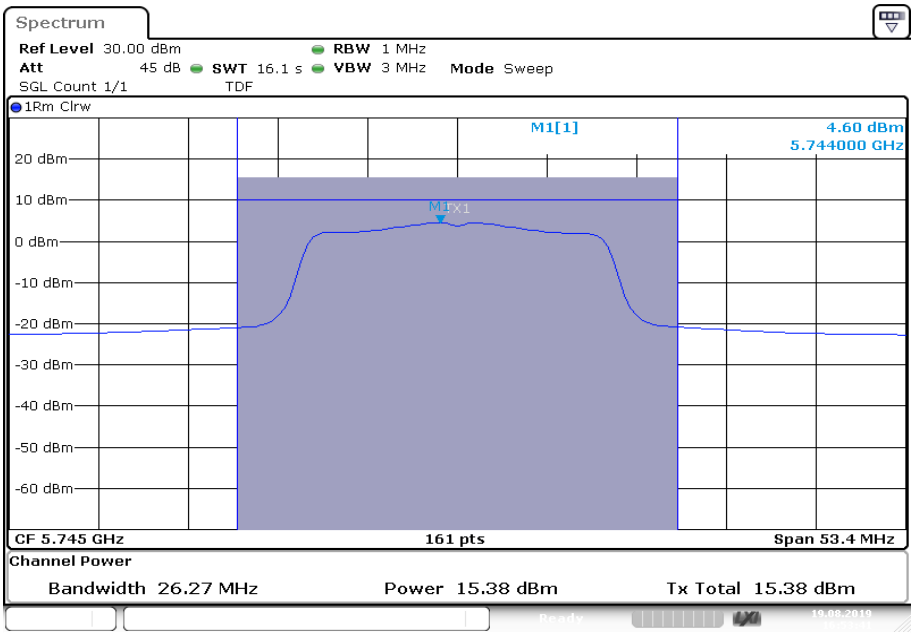
Date: 19.AUG.2019 16:50:50

Plot 9: U-NII-2C; highest channel



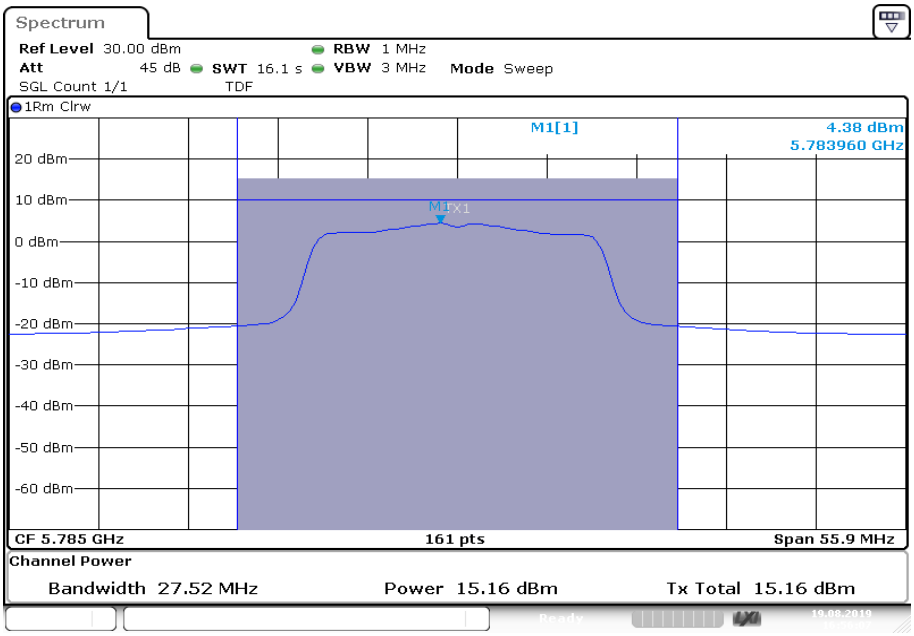
Date: 21.AUG.2019 19:03:06

Plot 10: U-NII-3; lowest channel



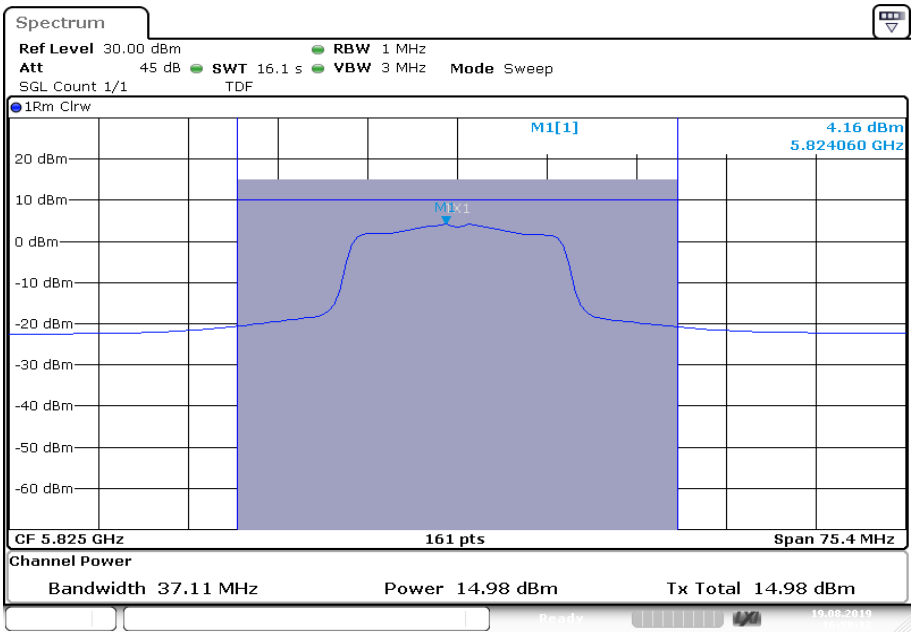
Date: 19.AUG.2019 16:53:41

Plot 11: U-NII-3; middle channel



Date: 19.AUG.2019 16:56:07

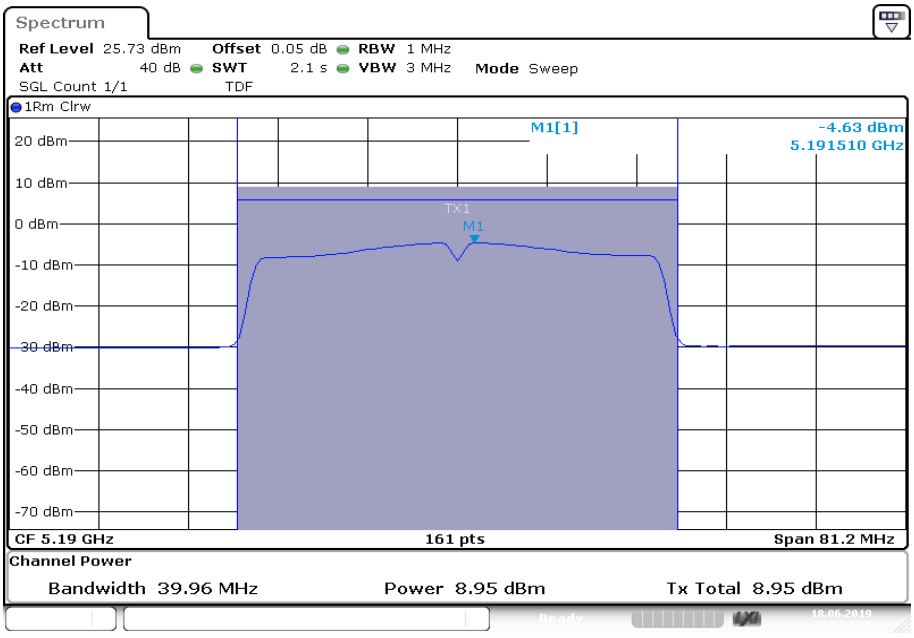
Plot 12: U-NII-3; highest channel



Date: 19.AUG.2019 16:58:12

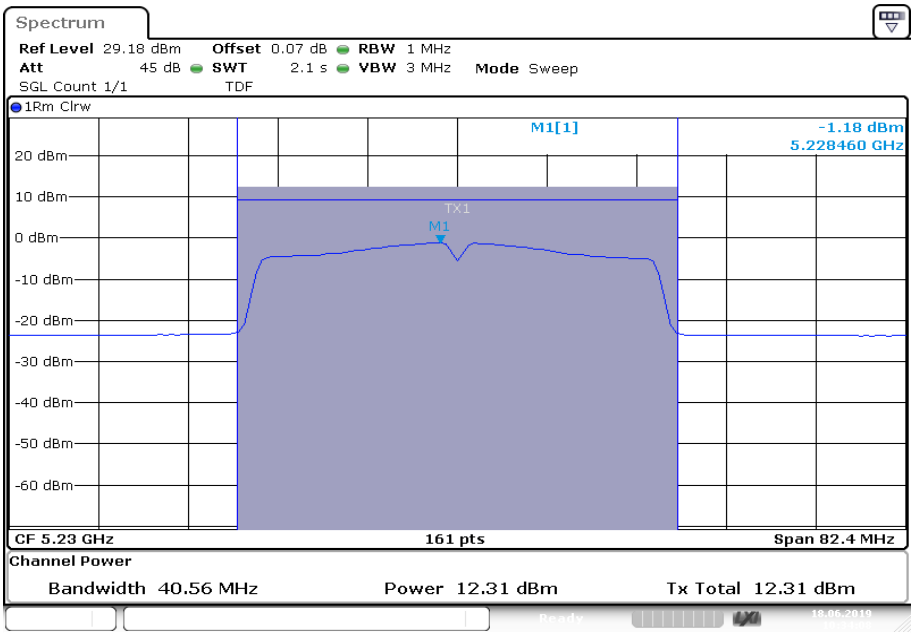
Plots: n/ac HT40 – mode, Antenna port 2

Plot 1: U-NII-1; lowest channel



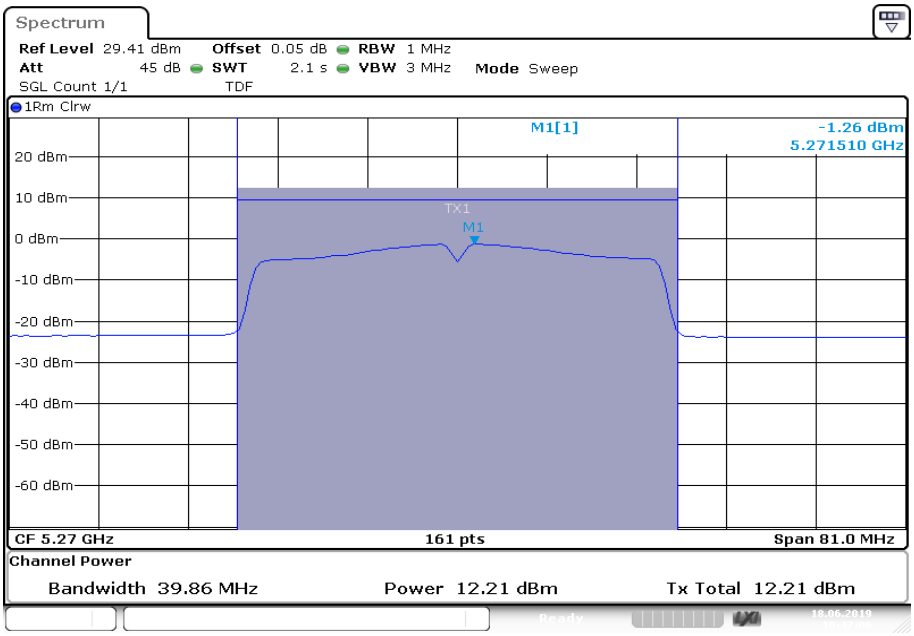
Date: 18.JUN.2019 10:23:55

Plot 2: U-NII-1; highest channel



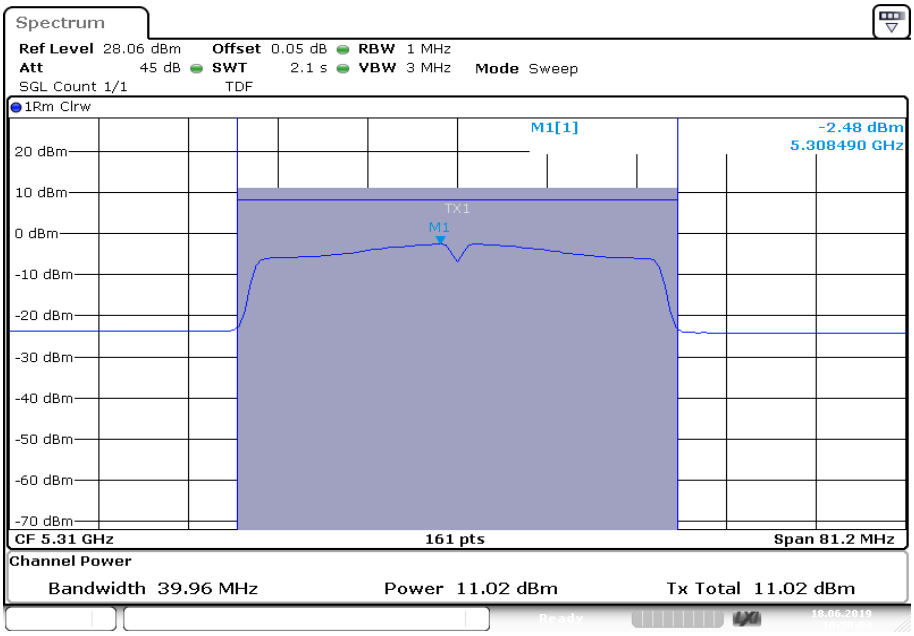
Date: 18.JUN.2019 10:34:09

Plot 3: U-NII-2A; lowest channel



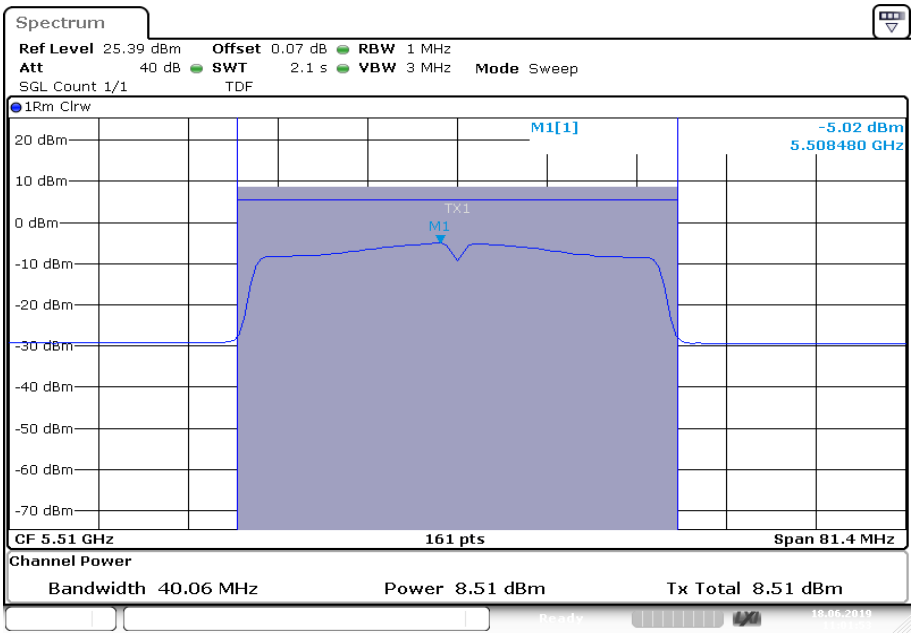
Date: 18.JUN.2019 10:47:07

Plot 4: U-NII-2A; highest channel



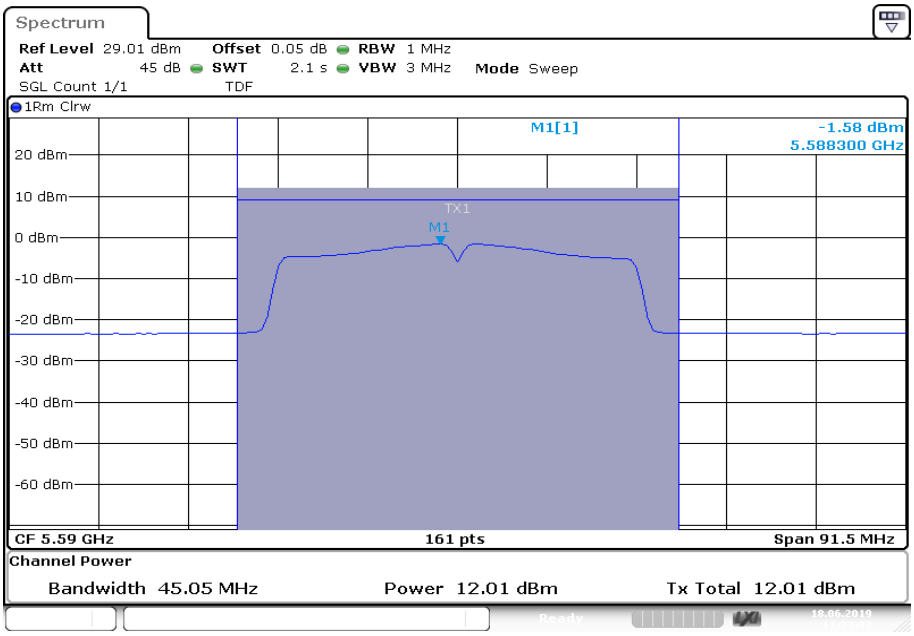
Date: 18.JUN.2019 10:50:05

Plot 5: U-NII-2C; lowest channel



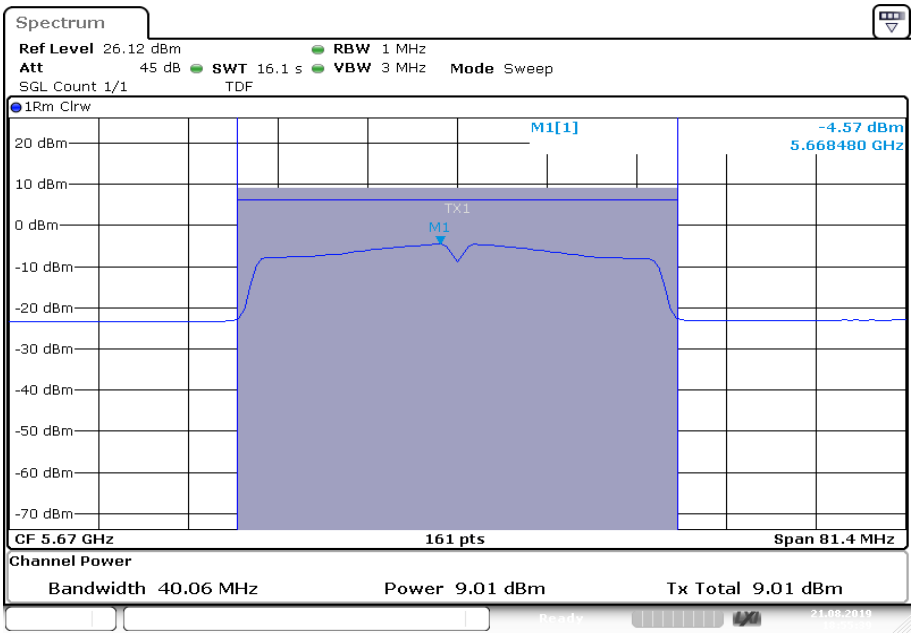
Date: 18.JUN.2019 11:01:54

Plot 6: U-NII-2C; middle channel



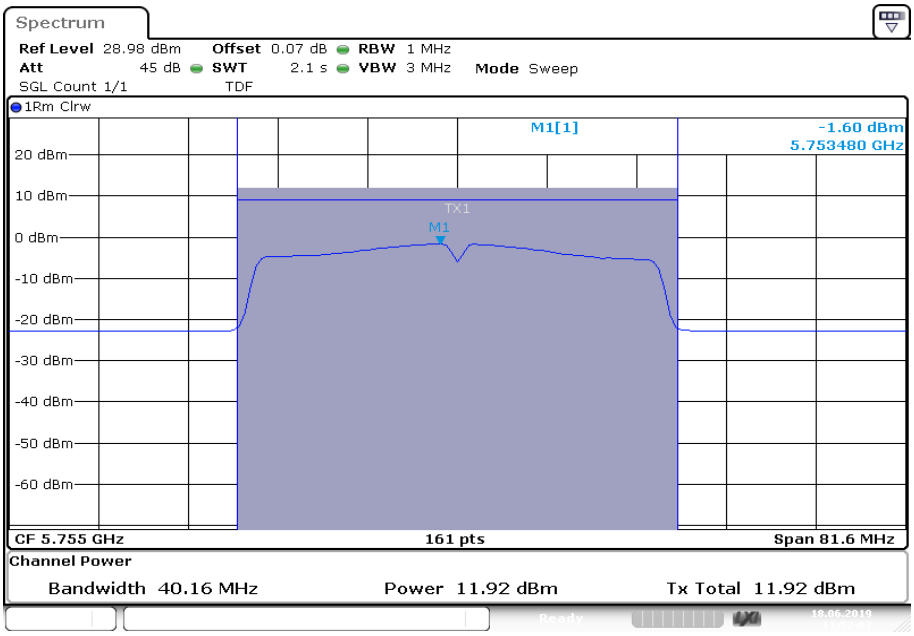
Date: 18.JUN.2019 11:23:34

Plot 7: U-NII-2C; highest channel



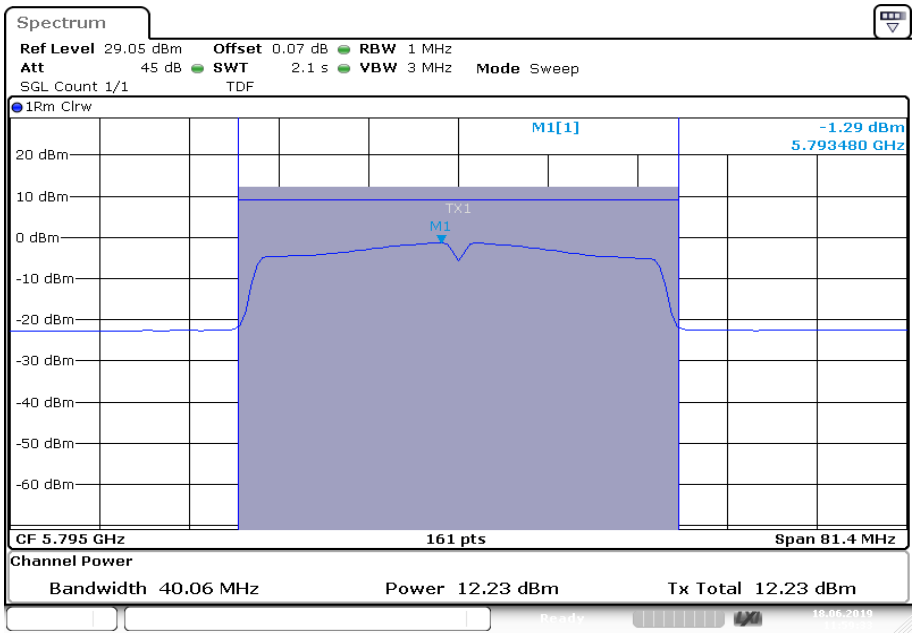
Date: 21.AUG.2019 18:55:40

Plot 8: U-NII-3; lowest channel



Date: 18.JUN.2019 11:52:04

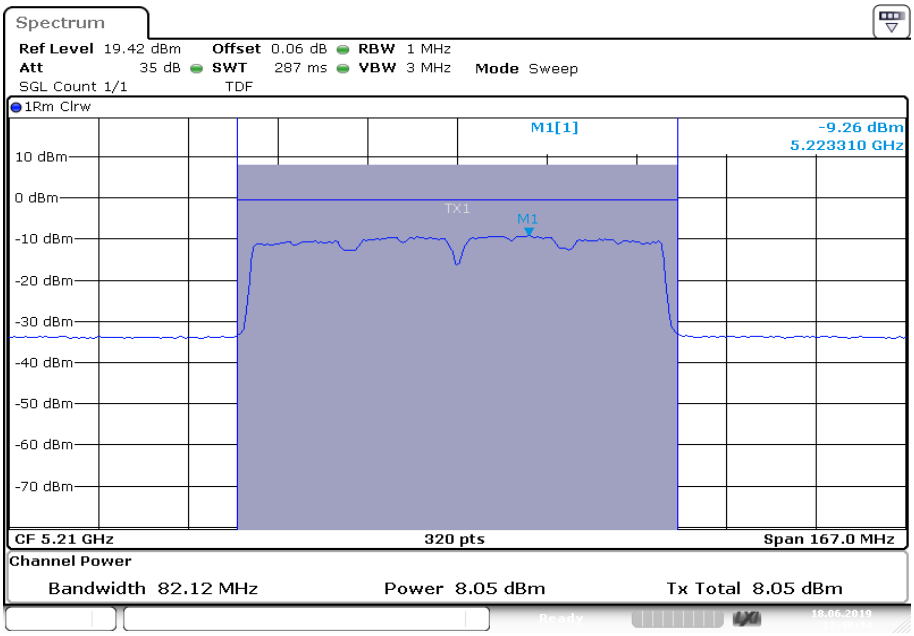
Plot 9: U-NII-3; highest channel



Date: 18.JUN.2019 11:59:34

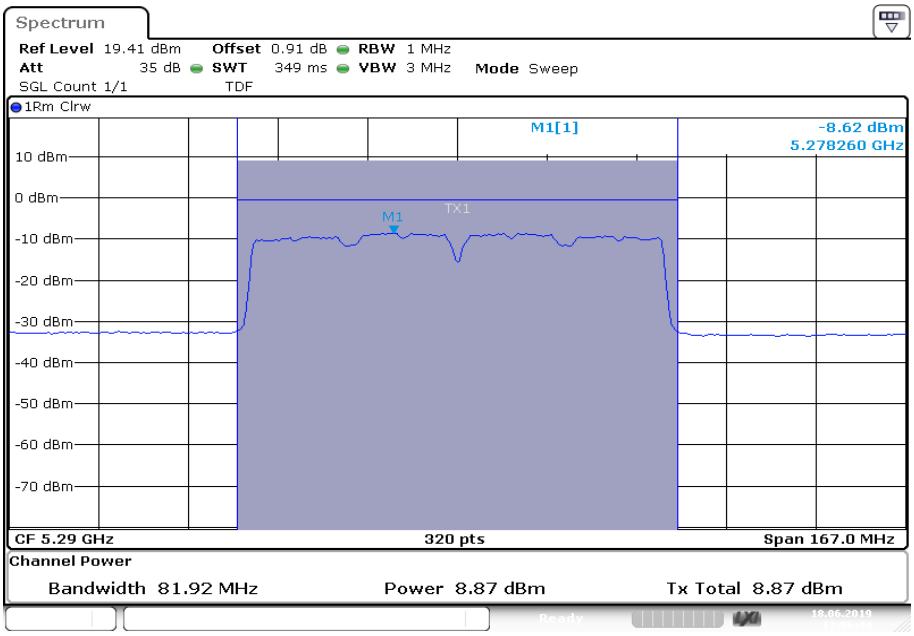
Plots: ac80– mode, Antenna port 2

Plot 1: U-NII-1; middle channel



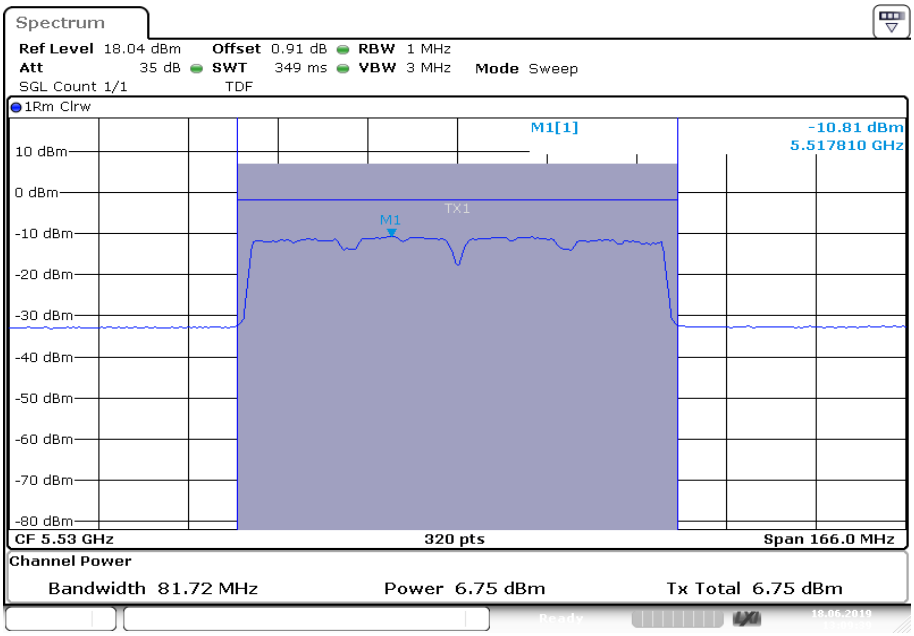
Date: 18.JUN.2019 12:48:44

Plot 2: U-NII-2A; middle channel



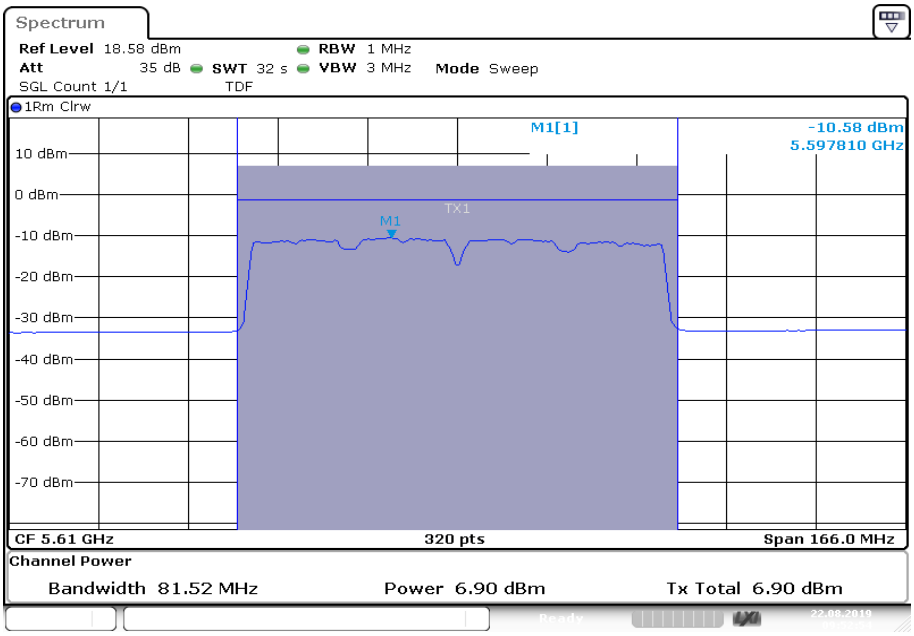
Date: 18.JUN.2019 13:06:44

Plot 3: U-NII-2C; lowest channel



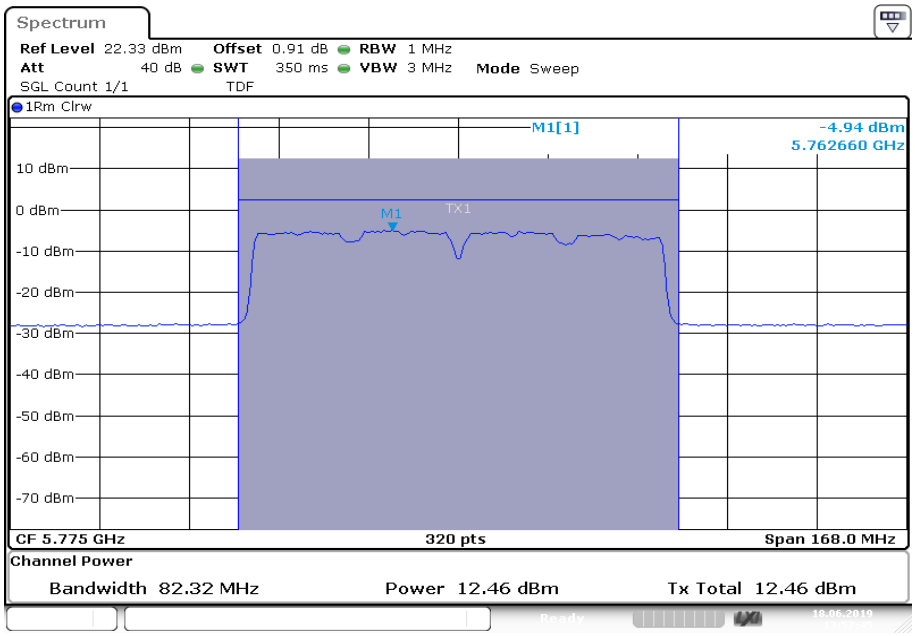
Date: 18.JUN.2019 13:09:39

Plot 4: U-NII-2C; highest channel



Date: 22.AUG.2019 09:52:55

Plot 5: U-NII-3; middle channel



Date: 18.JUN.2019 13:57:45

11.4.2 Maximum output power according to IC requirements

Description:

Measurement of the maximum output power conduced + radiated

Measurement:

Measurement parameter	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ 3 MHz
Span:	> EBW
Trace mode:	Max hold
Analyzer function	Band power / channel power Interval > 99% OBW
Used test setup:	See chapter 6.4 – A
Measurement uncertainty:	See chapter 8

Limits:

Radiated output power	Conducted output power for mobile equipment
The lesser one of 200 mW or 10 dBm + 10 log Bandwidth 5.150-5.250 GHz 1 W or 17 dBm + 10 log Bandwidth 5.250-5.350 GHz 1 W or 17 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 99% Bandwidth [MHz]) Conducted power + 6dBi antenna gain 5.725-5.825 GHz	The lesser one of 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 99% Bandwidth [MHz]) 1W 5.725-5.825 GHz

Results: Antenna port 1

a	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	10.1	11.9	12.6
	Radiated (calculated – see chapter antenna gain)		
	9.2	11.1	11.8
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	12.5	11.0	9.0
	Radiated (calculated – see chapter antenna gain)		
	10.2	8.7	4.9
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	9.2	10.9	10.6
	Radiated (calculated – see chapter antenna gain)		
	6.7	9.0	5.0
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	13.6	14.1	13.7
	Radiated (calculated – see chapter antenna gain)		
	7.8	10.9	9.4

Results: Antenna port 1

n/ac HT20	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	10.4	10.4	10.6
	Radiated (calculated – see chapter antenna gain)		
	9.5	9.6	9.8
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	10.5	10.5	10.1
	Radiated (calculated – see chapter antenna gain)		
	8.2	8.2	6.0
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	11.1	13.3	11.1
	Radiated (calculated – see chapter antenna gain)		
	8.6	10.4	5.5
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	16.5	16.5	16.0
	Radiated (calculated – see chapter antenna gain)		
	10.7	13.3	11.7

Results: Antenna port 1

n/ac HT40	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel		Highest channel
	Conducted		
	6.7		9.4
	Radiated (calculated – see chapter antenna gain)		
	5.8		8.6
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel		Highest channel
	Conducted		
	9.0		7.7
	Radiated (calculated – see chapter antenna gain)		
	6.7		3.6
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	6.5	10.0	9.9
	Radiated (calculated – see chapter antenna gain)		
	4.0	7.1	4.3
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel		Highest channel
	Conducted		
	13.2		13.5
	Radiated (calculated – see chapter antenna gain)		
	7.4		9.2

Results: Antenna port 1

ac80	**Maximum output power [dBm]**	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	Conducted	
	7.5	
	Radiated (calculated – see chapter antenna gain)	
	6.7	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	Conducted	
	7.5	
	Radiated (calculated – see chapter antenna gain)	
	5.2	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	Conducted	
	7.9	8.1
	Radiated (calculated – see chapter antenna gain)	
	5.4	5.2
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	Conducted	
	13.3	
	Radiated (calculated – see chapter antenna gain)	
	10.1	

Results: Antenna port 2

n/ac HT20	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	11.4	13.2	13.4
	Radiated (calculated – see chapter antenna gain)		
	9.2	11.2	11.4
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	13.5	13.5	11.6
	Radiated (calculated – see chapter antenna gain)		
	10.7	10.7	7.8
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	10.1	12.4	10.1
	Radiated (calculated – see chapter antenna gain)		
	6.2	11.8	9.8
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	15.3	15.1	14.9
	Radiated (calculated – see chapter antenna gain)		
	14.2	14.6	15.0

Results: Antenna port 2

n/ac HT40	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	8.9	12.2	
	Radiated (calculated – see chapter antenna gain)		
	6.7	10.2	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	12.2	11.0	
	Radiated (calculated – see chapter antenna gain)		
	9.4	7.2	
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	8.5	11.9	9.0
	Radiated (calculated – see chapter antenna gain)		
	4.6	11.3	8.7
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	11.9	12.2	
	Radiated (calculated – see chapter antenna gain)		
	10.8	12.3	

Results: Antenna port 2

ac80	**Maximum output power [dBm]**	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	Conducted	
	8.0	
	Radiated (calculated – see chapter antenna gain)	
	6.0	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	Conducted	
	8.9	
	Radiated (calculated – see chapter antenna gain)	
	6.1	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	Conducted	
	6.7	6.9
	Radiated (calculated – see chapter antenna gain)	
	2.8	6.3
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	Conducted	
	12.4	
	Radiated (calculated – see chapter antenna gain)	
	12.5	

Results: Antenna port 1+2 (calculated)

n/ac HT20	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	13.9	15.0	15.2
	Radiated (calculated – see chapter antenna gain)		
	12.4	13.5	13.7
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	15.3	15.3	13.9
	Radiated (calculated – see chapter antenna gain)		
	12.6	12.6	10.0
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	13.6	15.9	13.6
	Radiated (calculated – see chapter antenna gain)		
	10.6	14.2	11.2
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	19.0	18.9	18.5
	Radiated (calculated – see chapter antenna gain)		
	15.8	17.0	16.7

Results: Antenna port 1+2 (calculated)

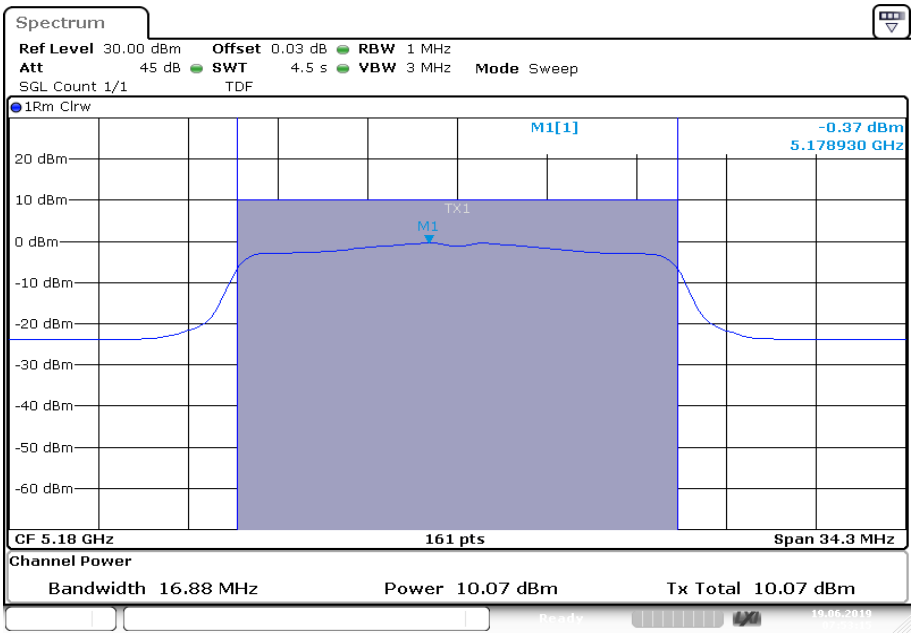
n/ac HT40	**Maximum output power [dBm]**		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel		Highest channel
	Conducted		
	11.0		14.0
	Radiated (calculated – see chapter antenna gain)		
	9.3		12.5
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel		Highest channel
	Conducted		
	13.9		12.7
	Radiated (calculated – see chapter antenna gain)		
	11.3		8.8
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	10.6	14.1	12.5
	Radiated (calculated – see chapter antenna gain)		
	7.3	12.7	10.1
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel		Highest channel
	Conducted		
	15.6		15.9
	Radiated (calculated – see chapter antenna gain)		
	12.4		14

Results: Antenna port 1+2 (calculated)

ac80	**Maximum output power [dBm]**	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	Conducted	
	10.8	
	Radiated (calculated – see chapter antenna gain)	
	9.4	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	Conducted	
	11.3	
	Radiated (calculated – see chapter antenna gain)	
	8.7	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	Conducted	
	10.4	10.6
	Radiated (calculated – see chapter antenna gain)	
	7.3	8.8
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	Conducted	
	15.9	
	Radiated (calculated – see chapter antenna gain)	
	14.5	

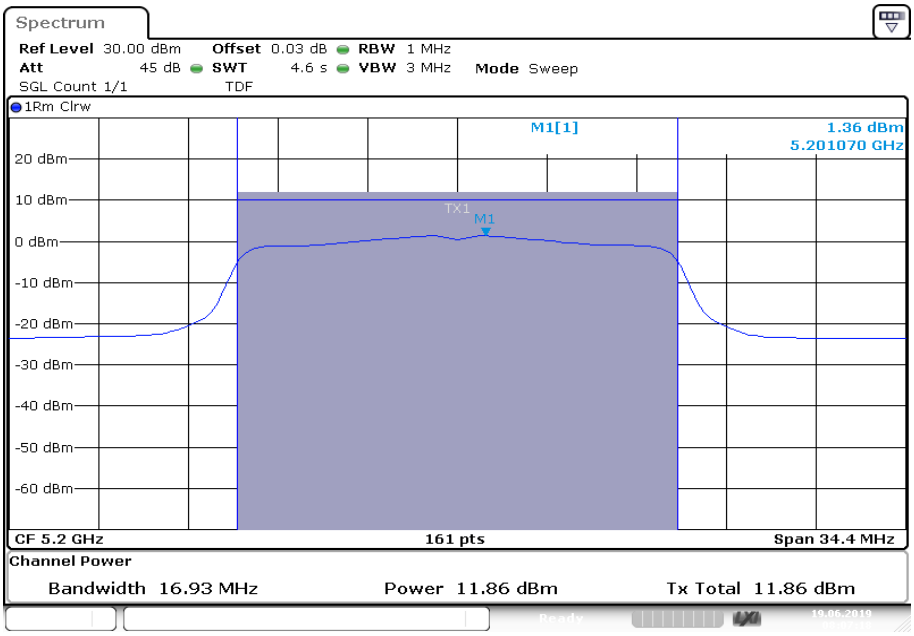
Plots: a – mode, Antenna port 1

Plot 1: U-NII-1; lowest channel



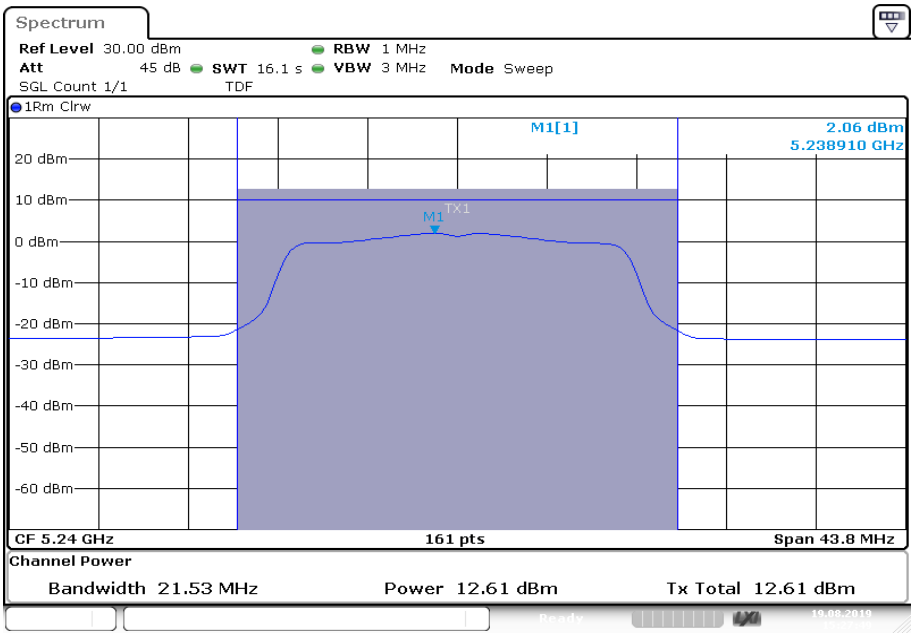
Date: 19.JUN.2019 07:53:15

Plot 2: U-NII-1; middle channel



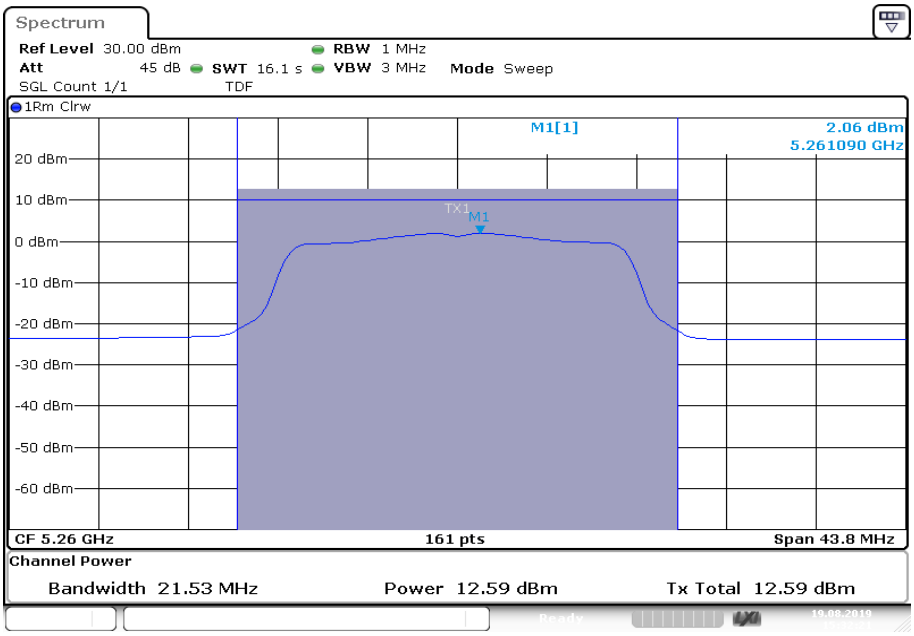
Date: 19.JUN.2019 08:07:17

Plot 3: U-NII-1; highest channel



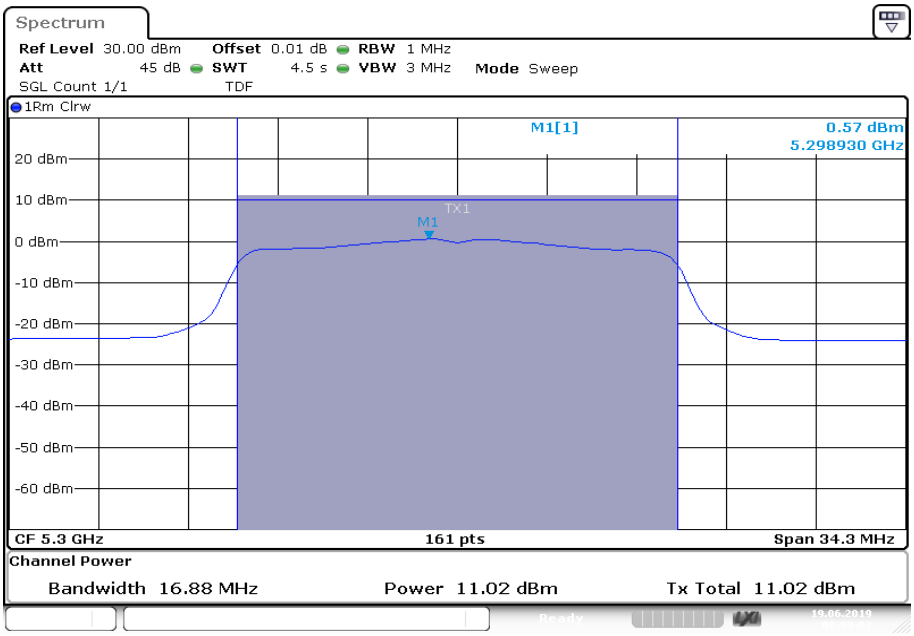
Date: 19.AUG.2019 15:27:49

Plot 4: U-NII-2A; lowest channel



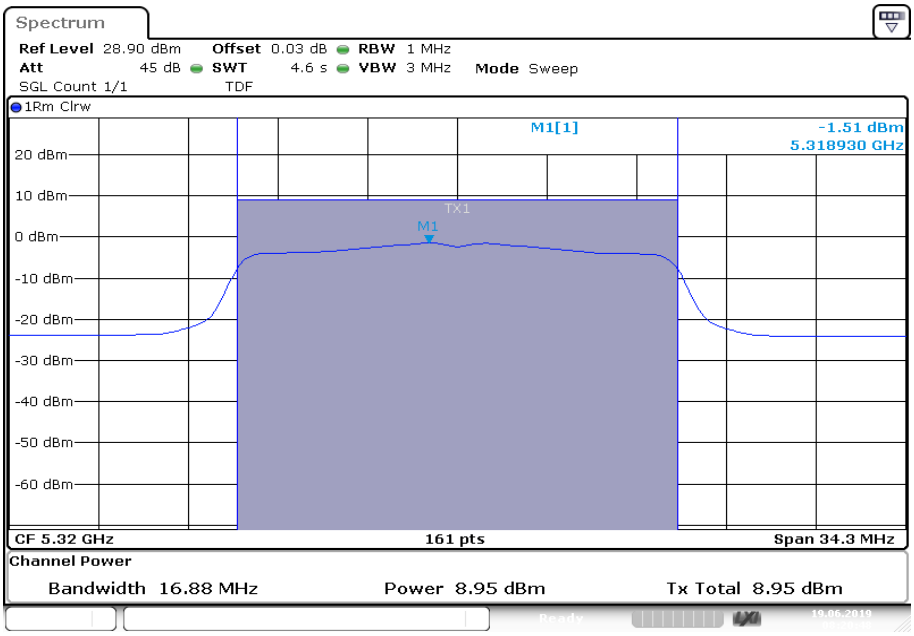
Date: 19.AUG.2019 15:32:20

Plot 5: U-NII-2A; middle channel



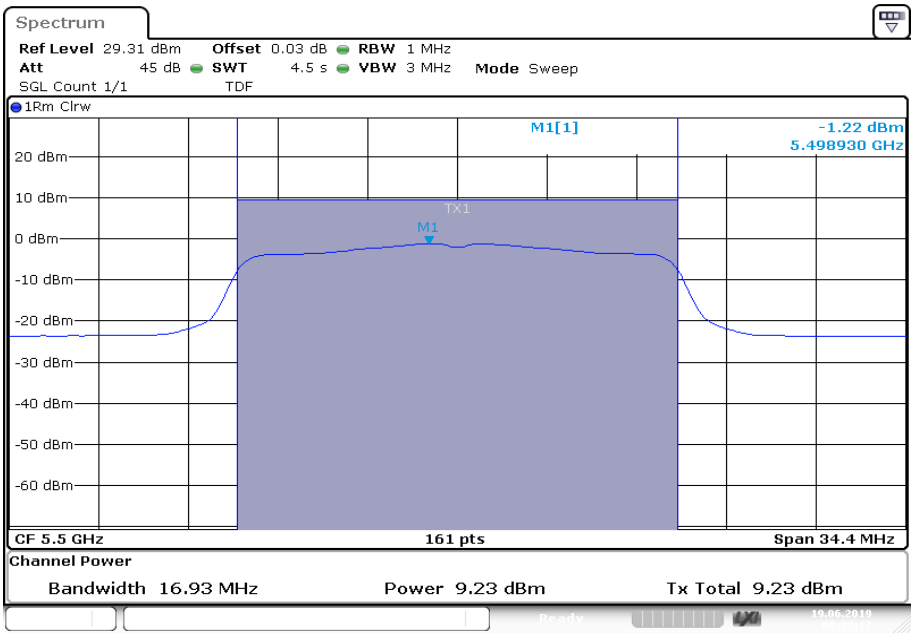
Date: 19.JUN.2019 08:09:02

Plot 6: U-NII-2A; highest channel



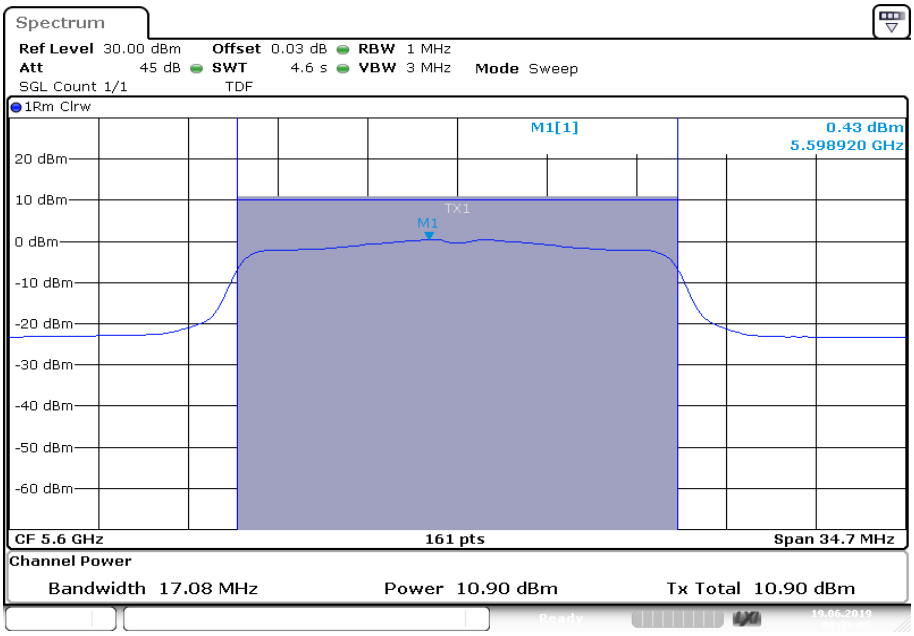
Date: 19.JUN.2019 08:20:48

Plot 7: U-NII-2C; lowest channel



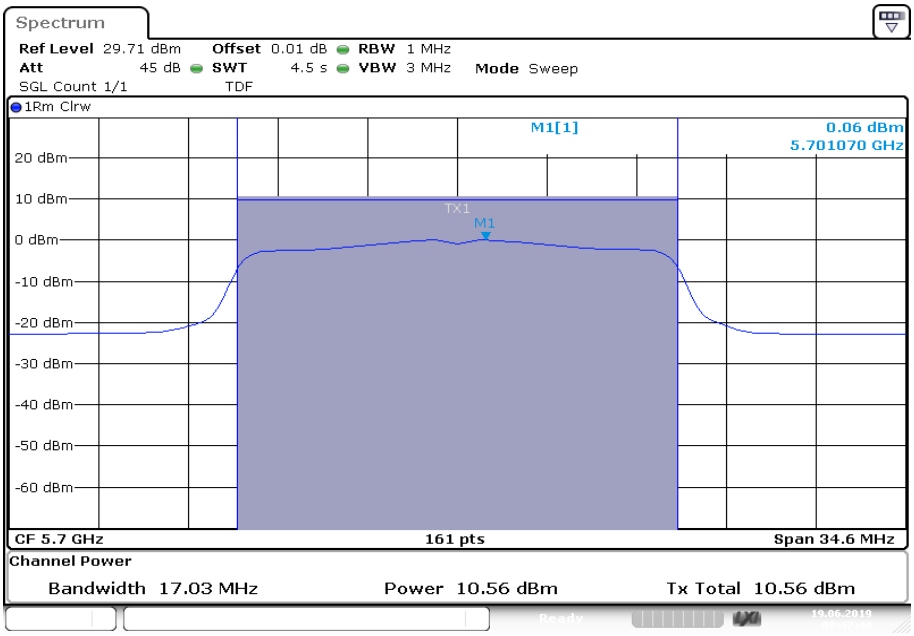
Date: 19.JUN.2019 08:23:17

Plot 8: U-NII-2C; middle channel



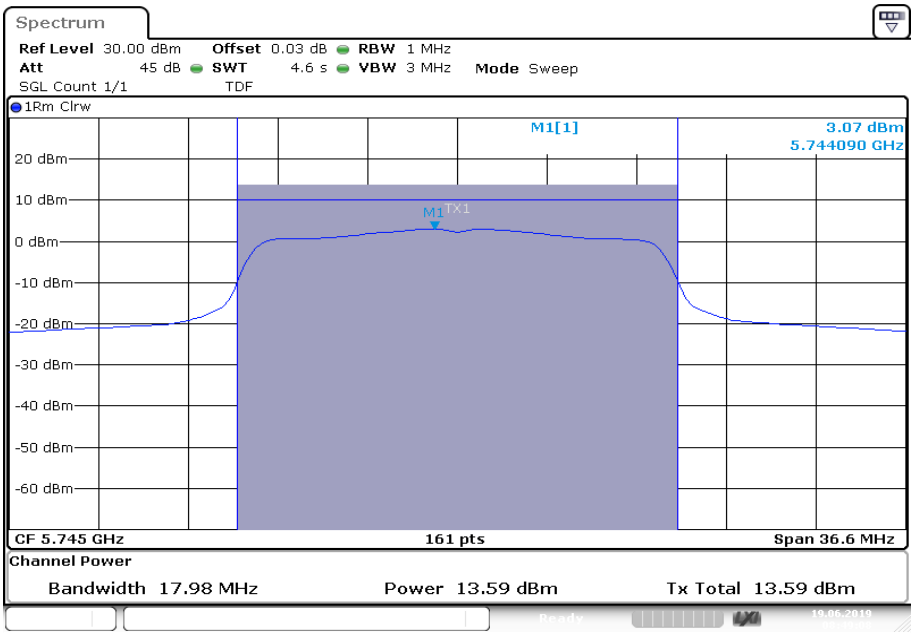
Date: 19.JUN.2019 08:36:05

Plot 9: U-NII-2C; highest channel



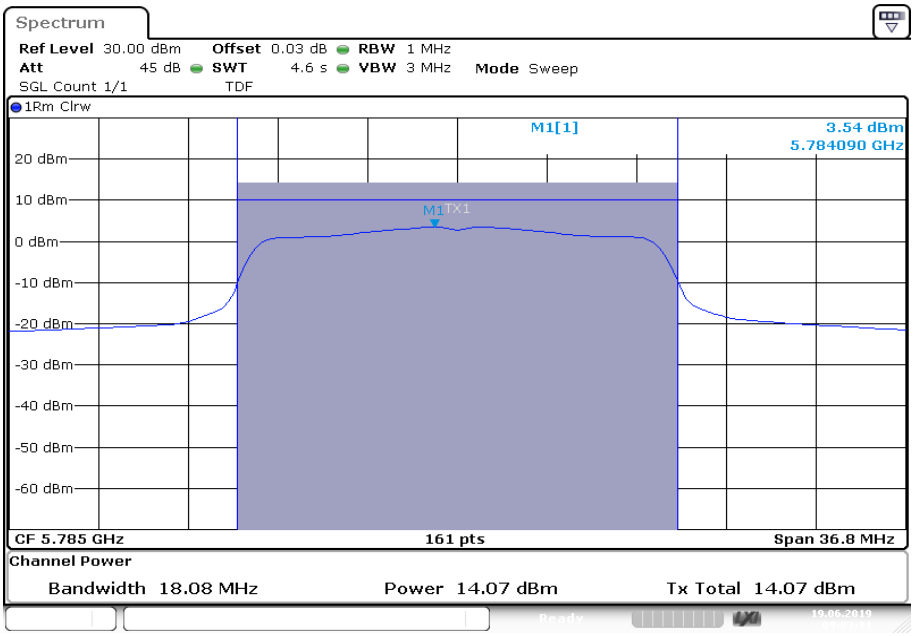
Date: 19.JUN.2019 08:47:44

Plot 10: U-NII-3; lowest channel



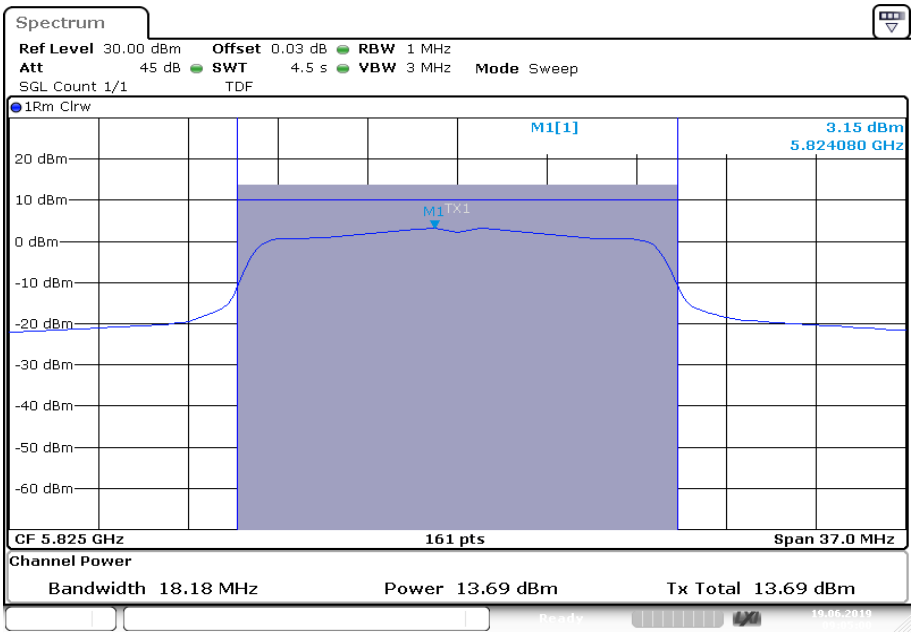
Date: 19.JUN.2019 08:49:08

Plot 11: U-NII-3; middle channel



Date: 19.JUN.2019 09:03:11

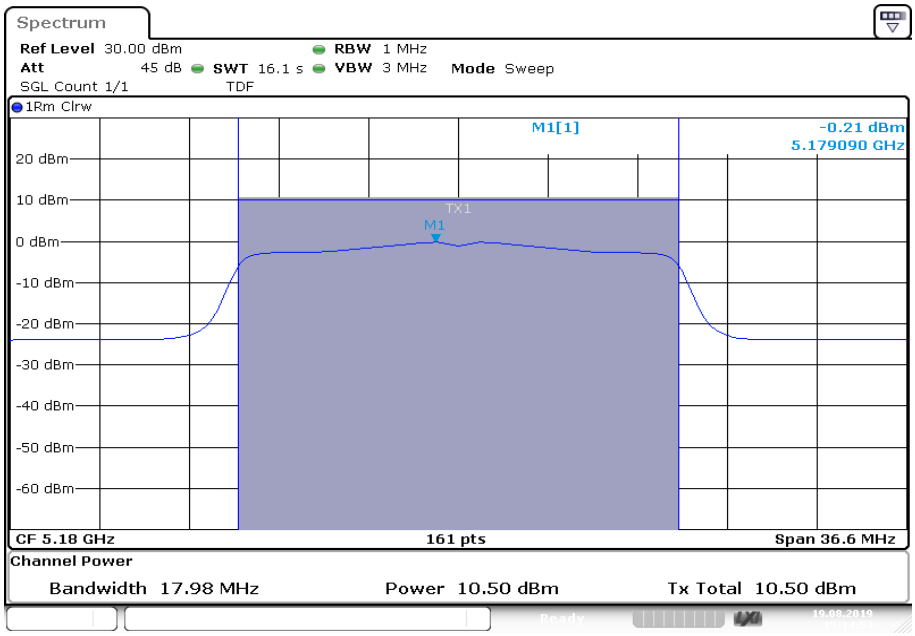
Plot 12: U-NII-3; highest channel



Date: 19.JUN.2019 09:05:00

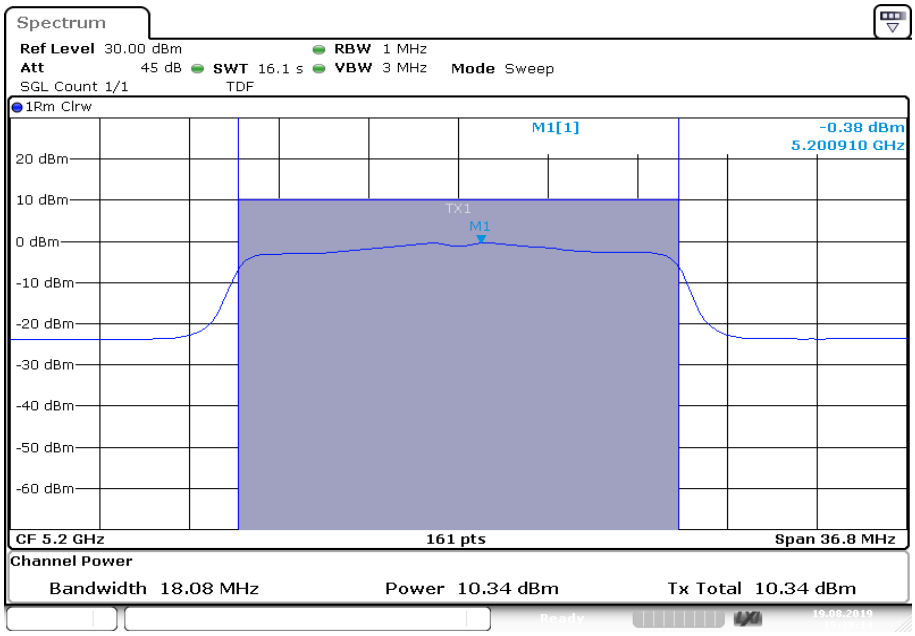
Plots: n/ac HT20 – mode, Antenna port 1

Plot 1: U-NII-1; lowest channel



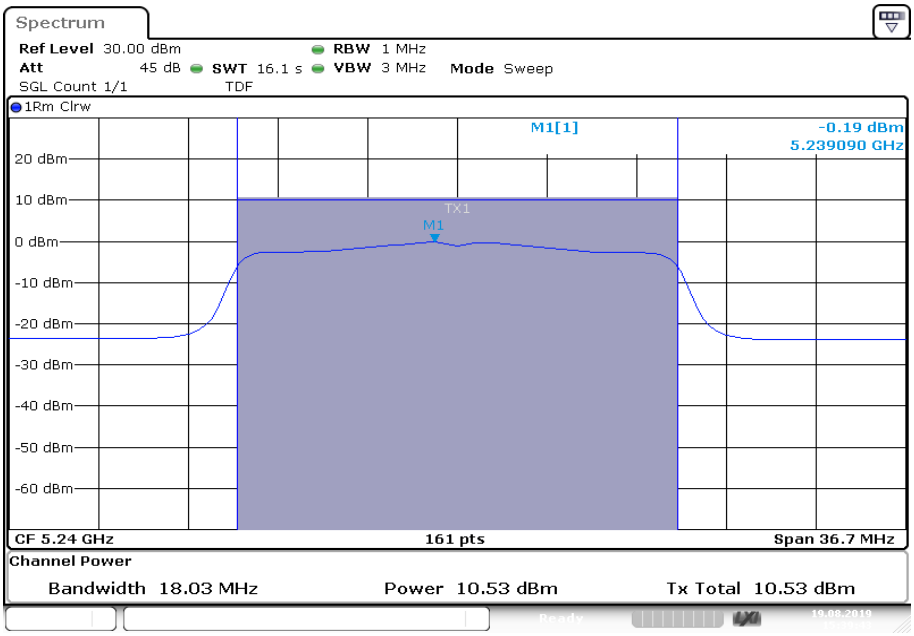
Date: 19.AUG.2019 15:34:54

Plot 2: U-NII-1; middle channel



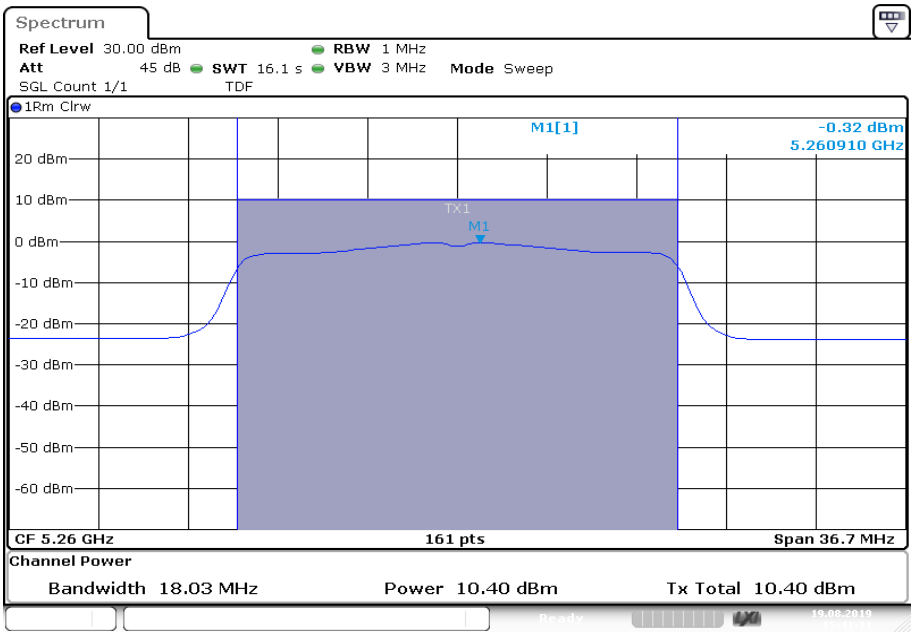
Date: 19.AUG.2019 15:38:14

Plot 3: U-NII-1; highest channel



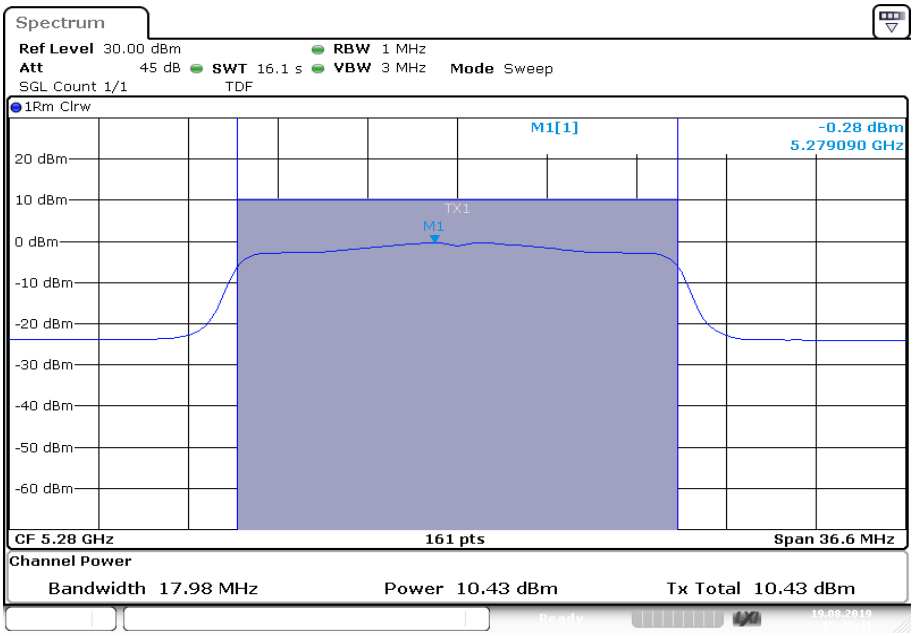
Date: 19.AUG.2019 15:39:43

Plot 4: U-NII-2A; lowest channel



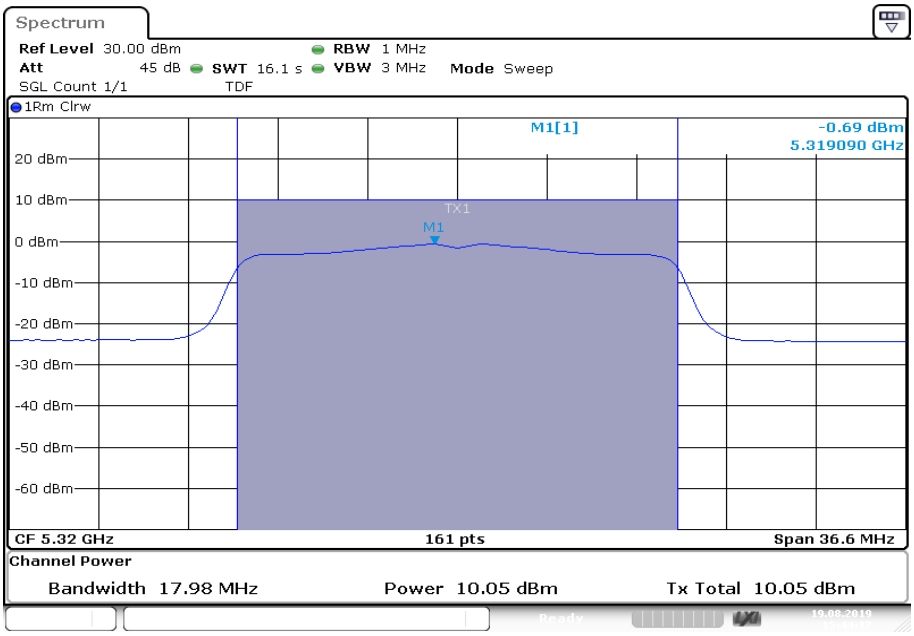
Date: 19.AUG.2019 15:41:11

Plot 5: U-NII-2A; middle channel



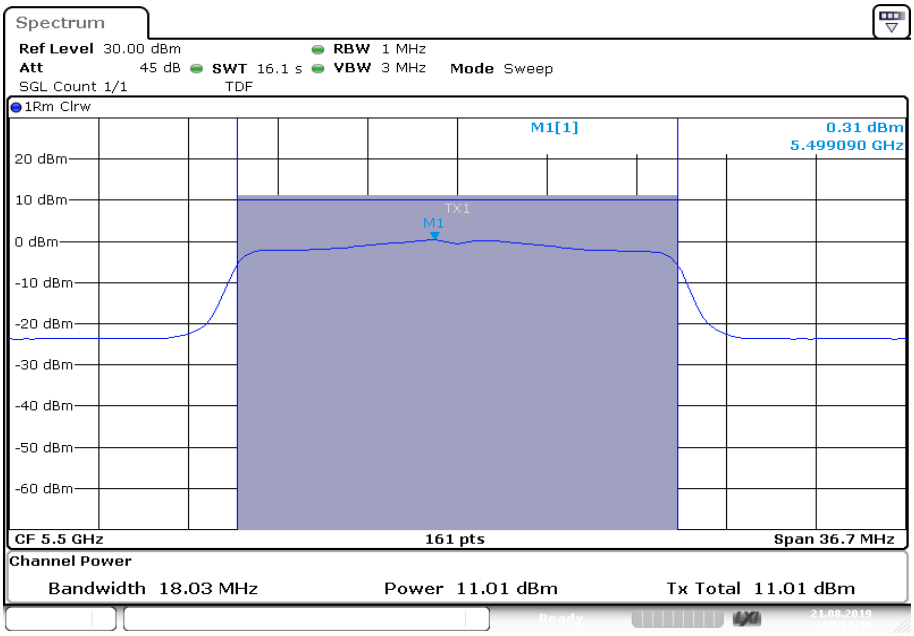
Date: 19.AUG.2019 15:42:41

Plot 6: U-NII-2A; highest channel



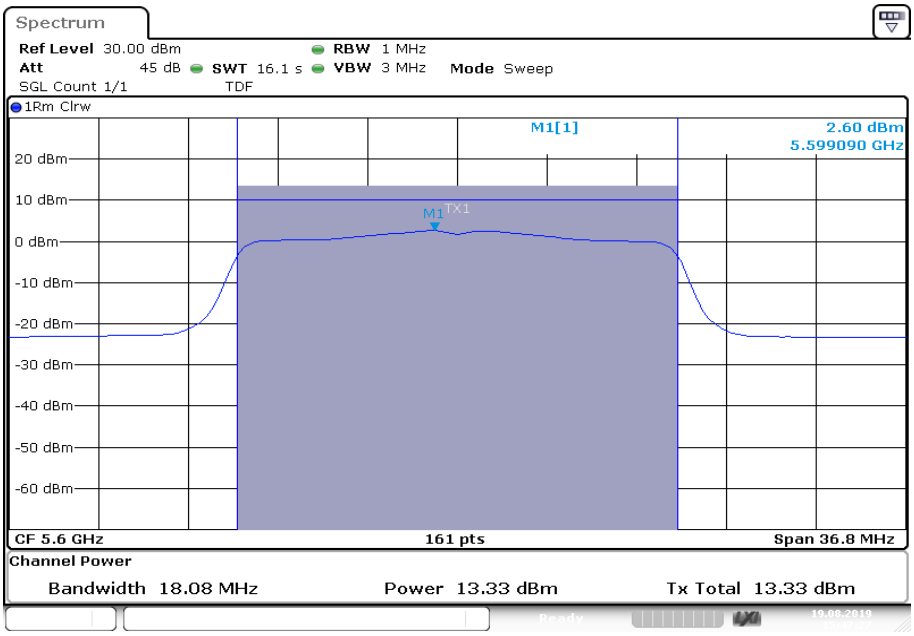
Date: 19.AUG.2019 15:44:17

Plot 7: U-NII-2C; lowest channel



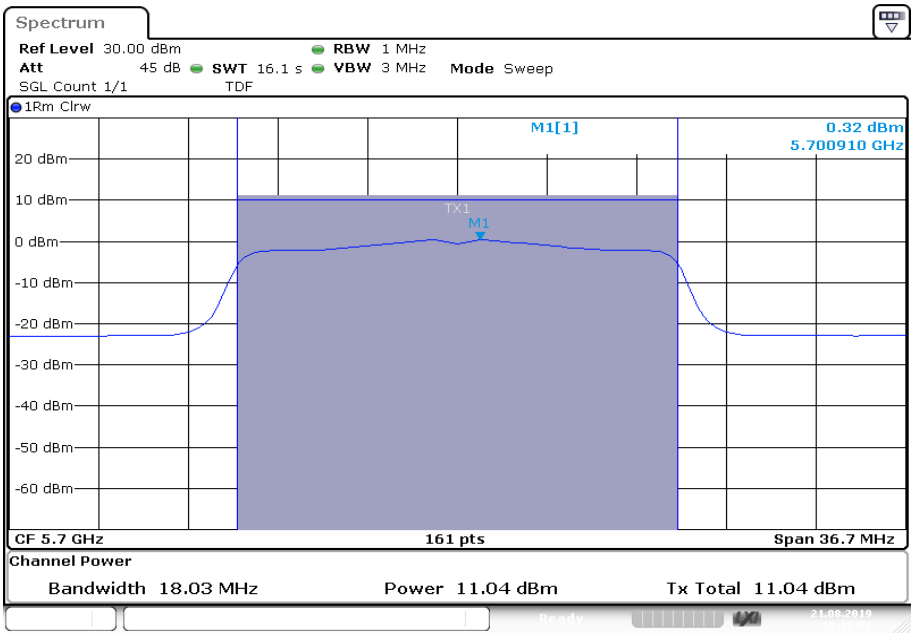
Date: 21.AUG.2019 18:11:40

Plot 8: U-NII-2C; middle channel



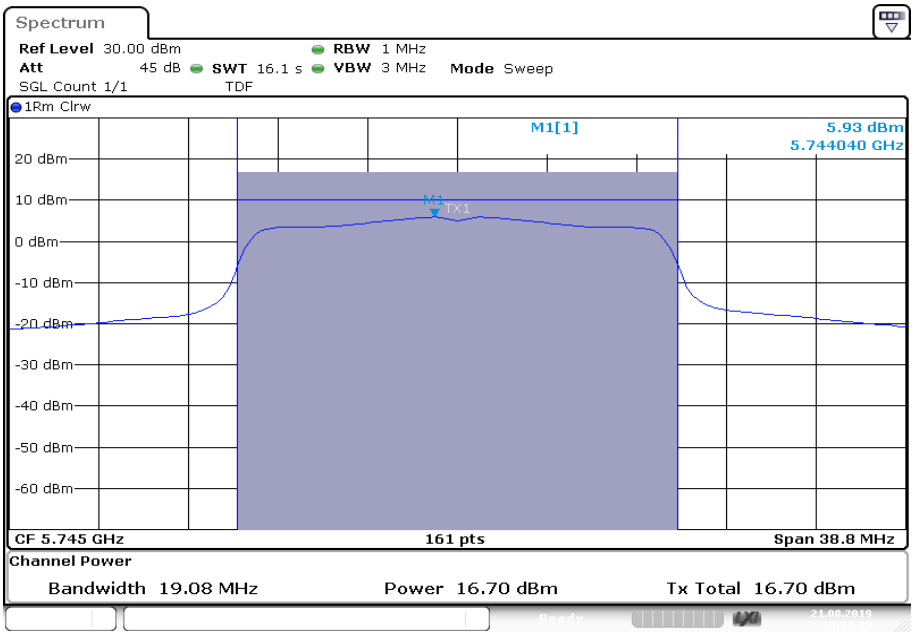
Date: 19.AUG.2019 15:47:26

Plot 9: U-NII-2C; highest channel



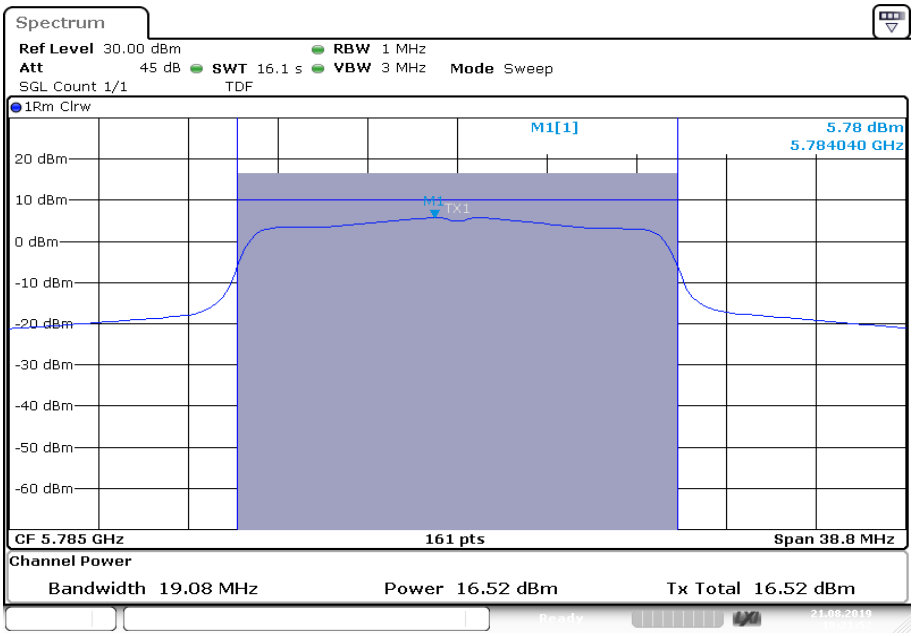
Date: 21.AUG.2019 18:16:09

Plot 10: U-NII-3; lowest channel



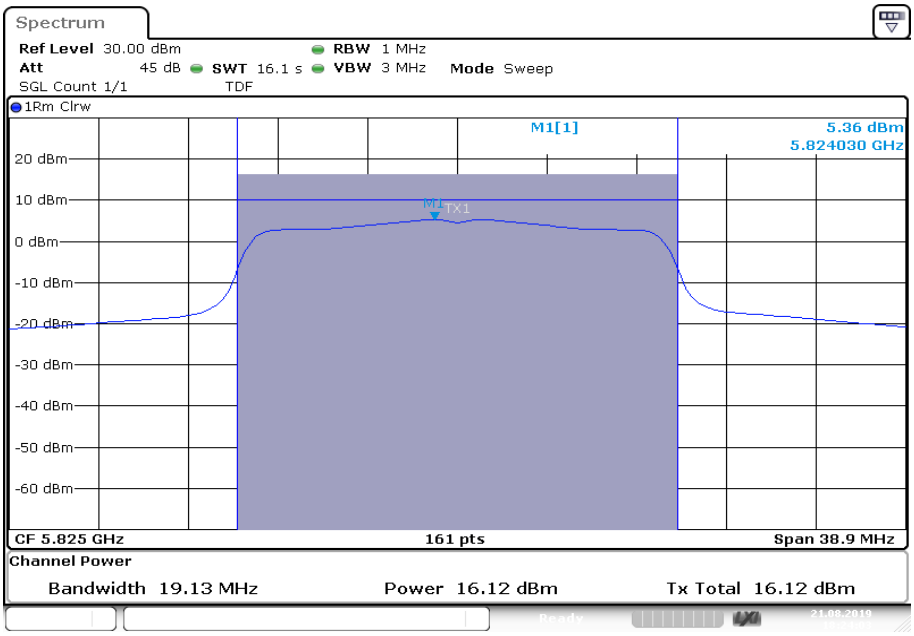
Date: 21.AUG.2019 18:19:35

Plot 11: U-NII-3; middle channel



Date: 21.AUG.2019 18:21:53

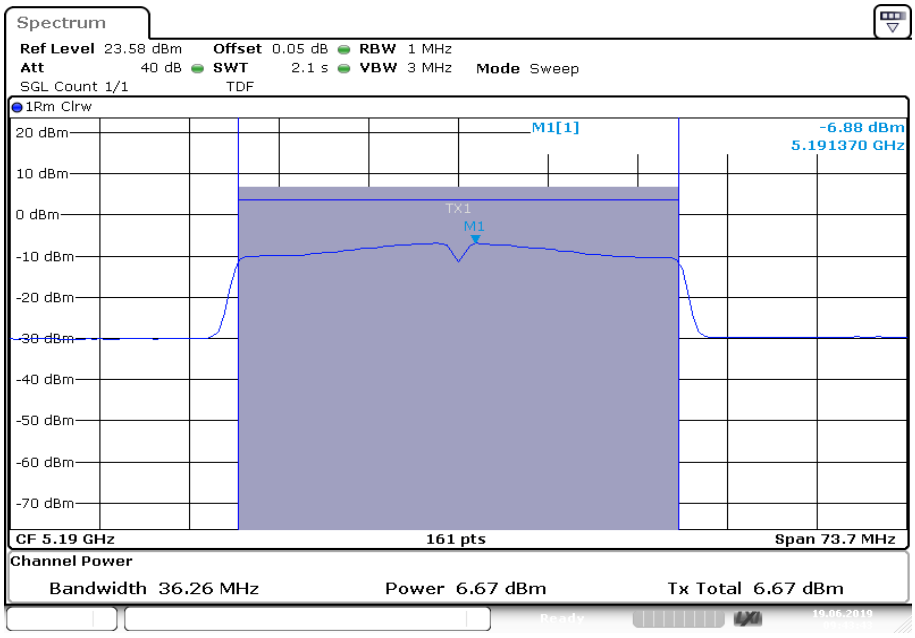
Plot 12: U-NII-3; highest channel



Date: 21.AUG.2019 18:24:04

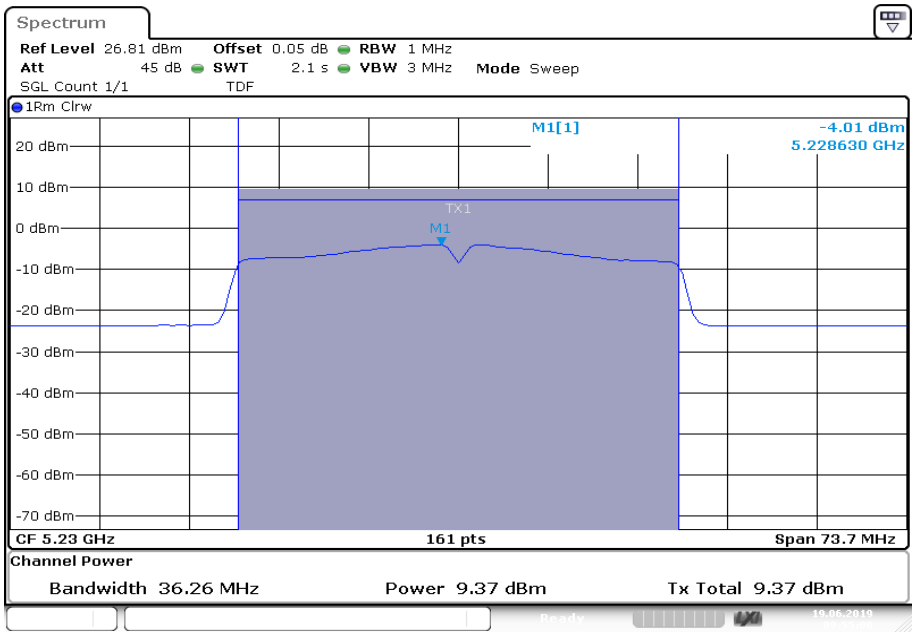
Plots: n/ac HT40 – mode, Antenna port 1

Plot 1: U-NII-1; lowest channel



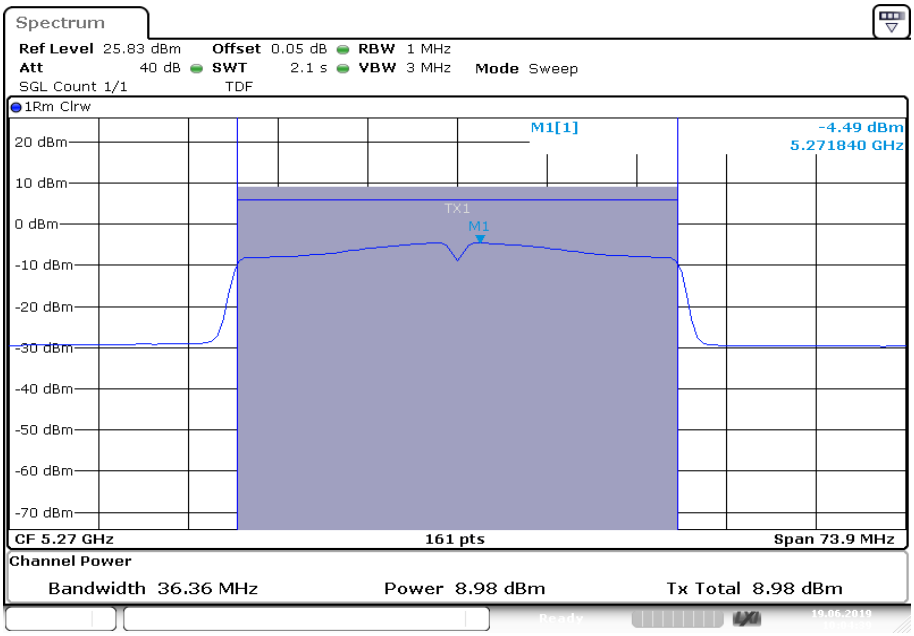
Date: 19.JUN.2019 09:43:43

Plot 2: U-NII-1; highest channel

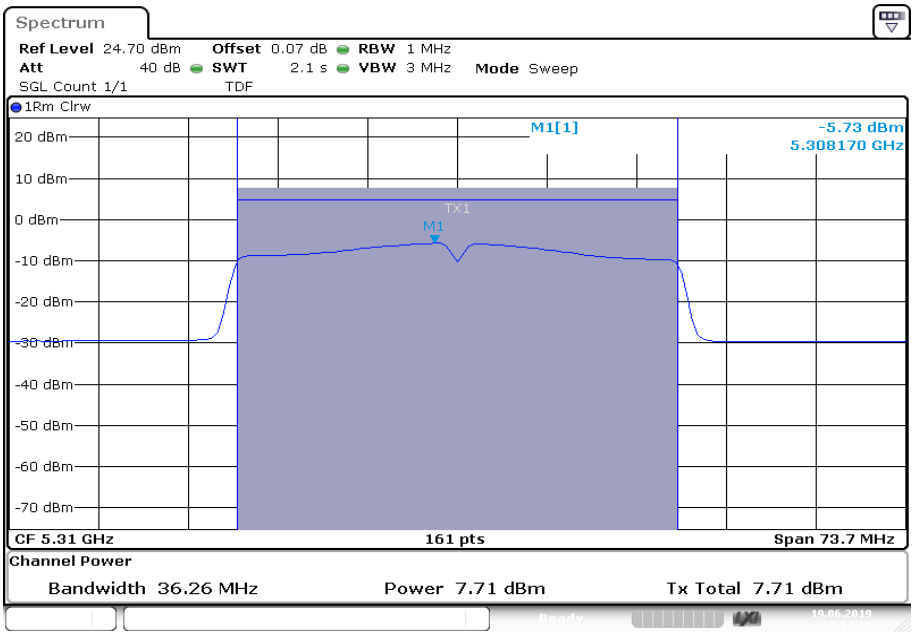


Date: 19.JUN.2019 09:55:00

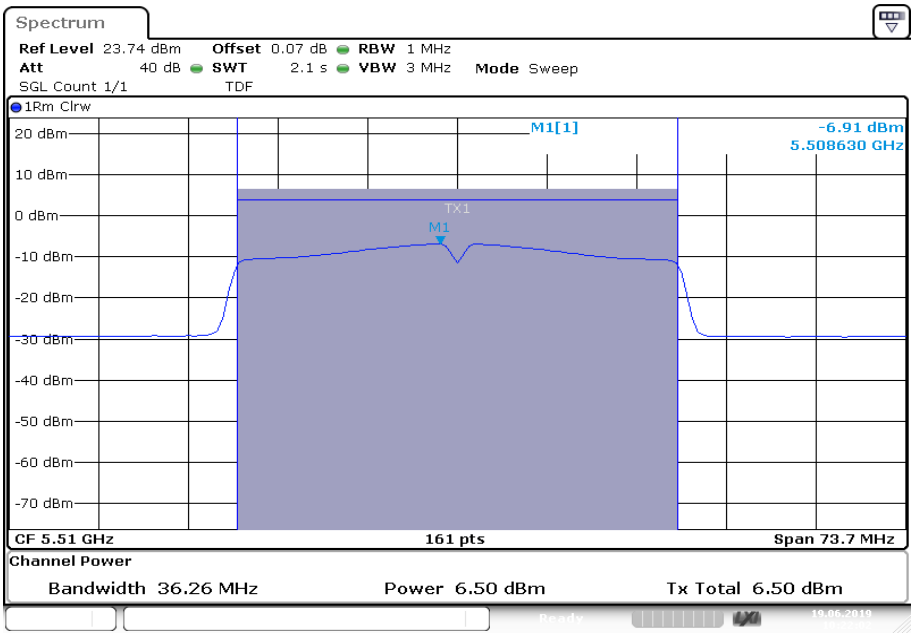
Plot 3: U-NII-2A; lowest channel



Plot 4: U-NII-2A; highest channel

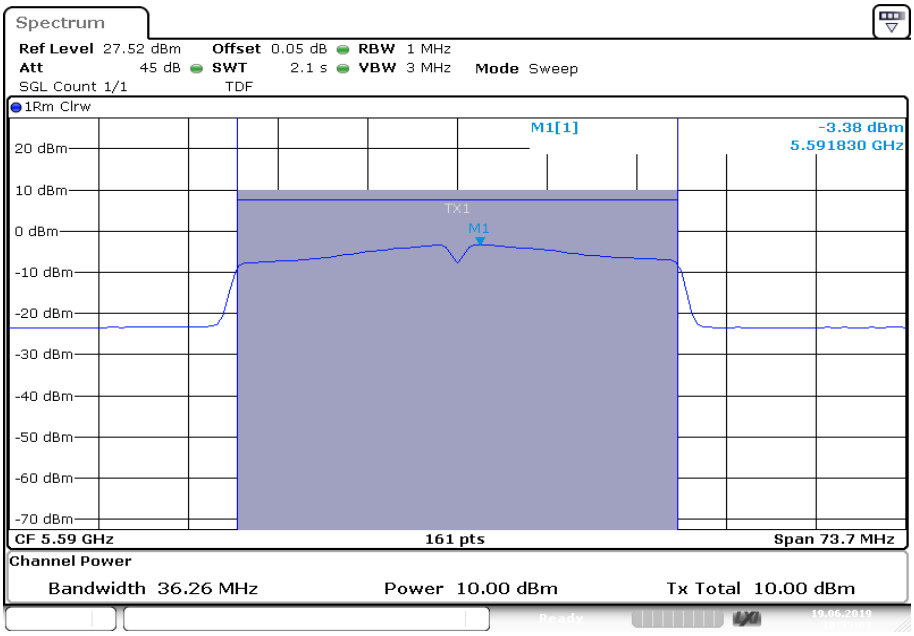


Plot 5: U-NII-2C; lowest channel



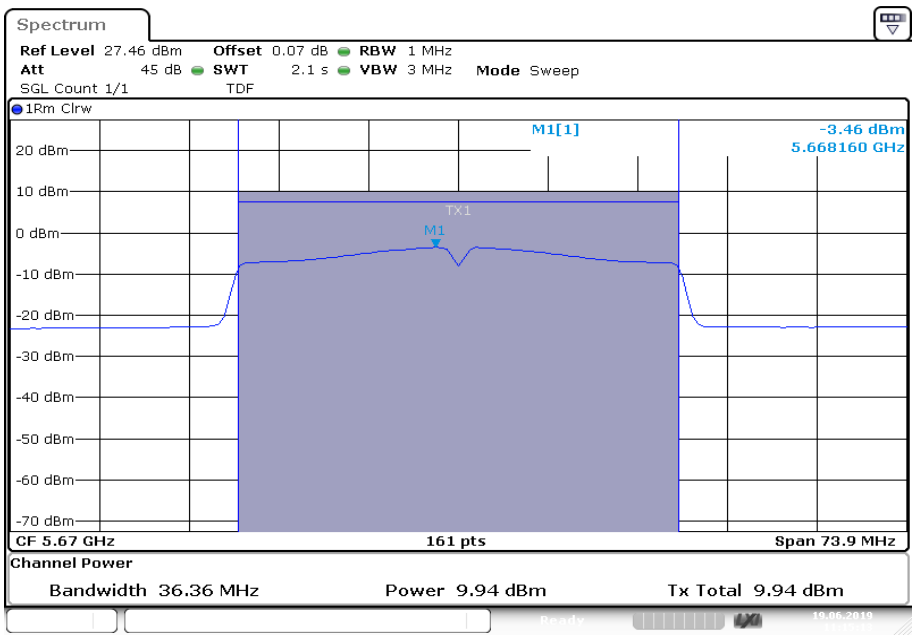
Date: 19.JUN.2019 10:22:02

Plot 6: U-NII-2C; middle channel



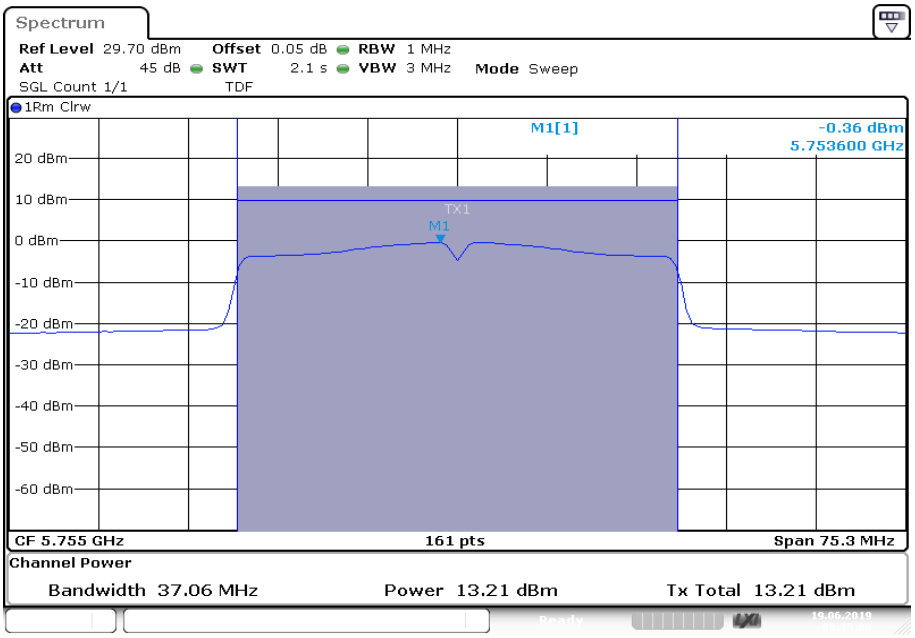
Date: 19.JUN.2019 10:55:03

Plot 7: U-NII-2C; highest channel



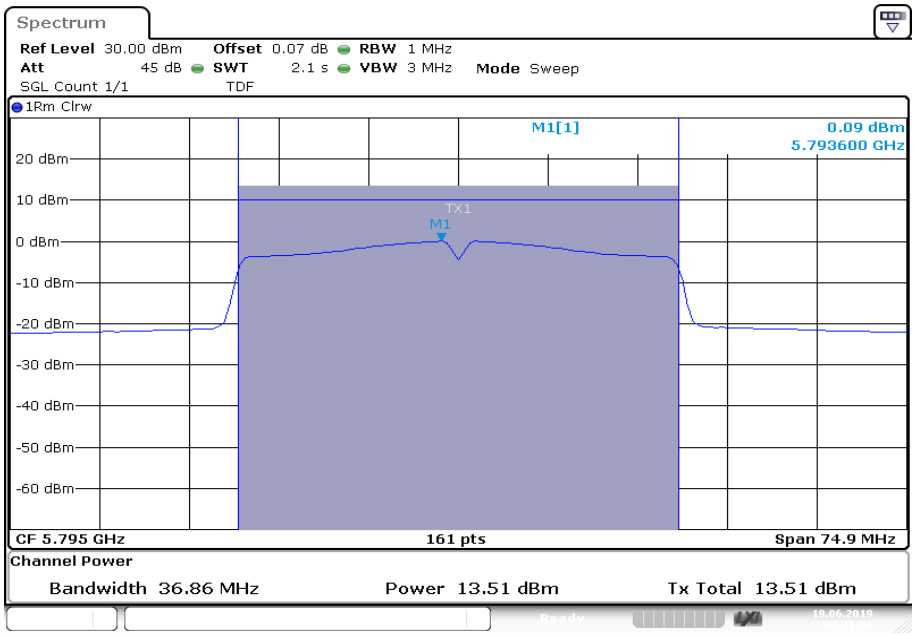
Date: 19.JUN.2019 11:15:13

Plot 8: U-NII-3; lowest channel



Date: 19.JUN.2019 09:15:00

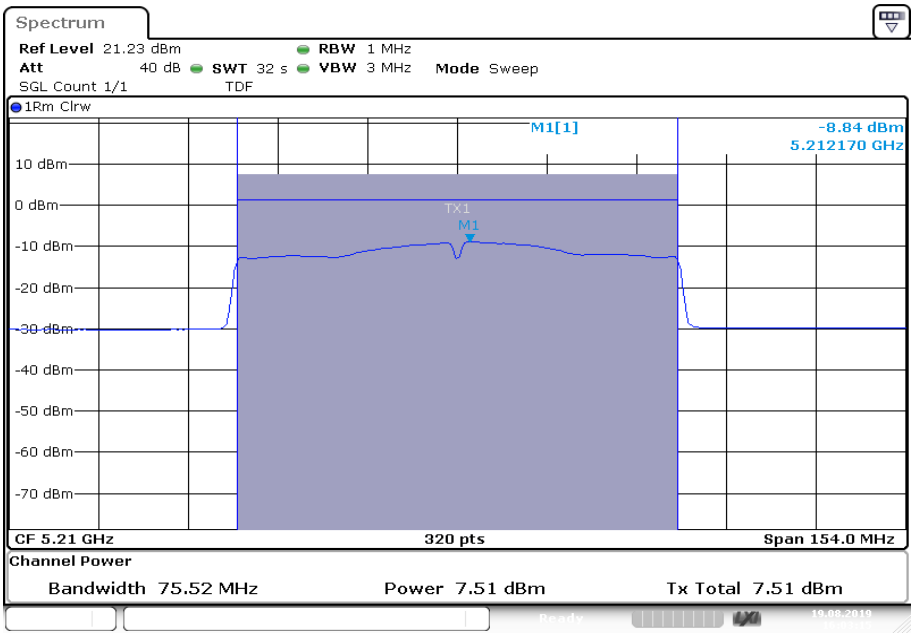
Plot 9: U-NII-3; highest channel



Date: 19.JUN.2019 09:25:36

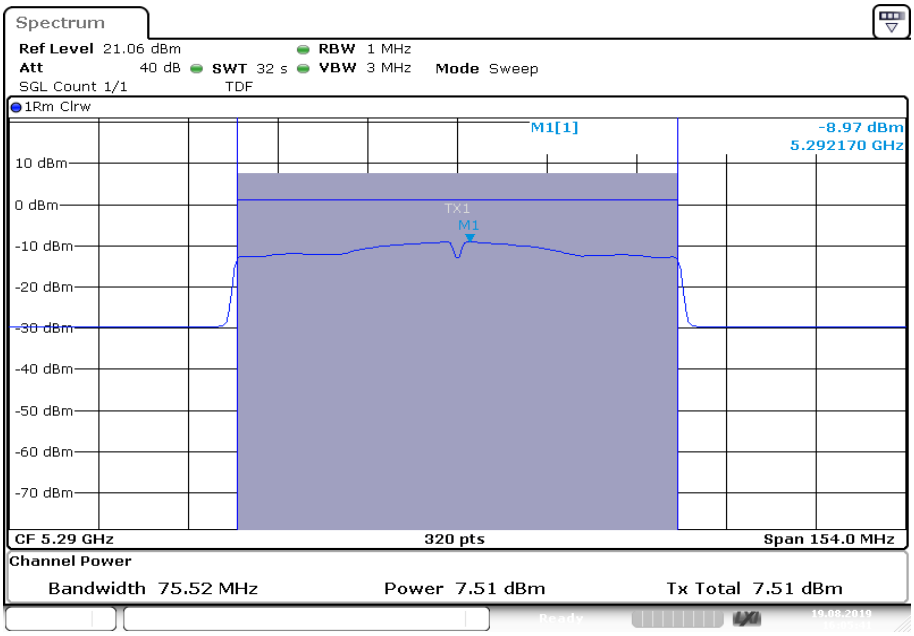
Plots: ac80– mode, Antenna port 1

Plot 1: U-NII-1; middle channel



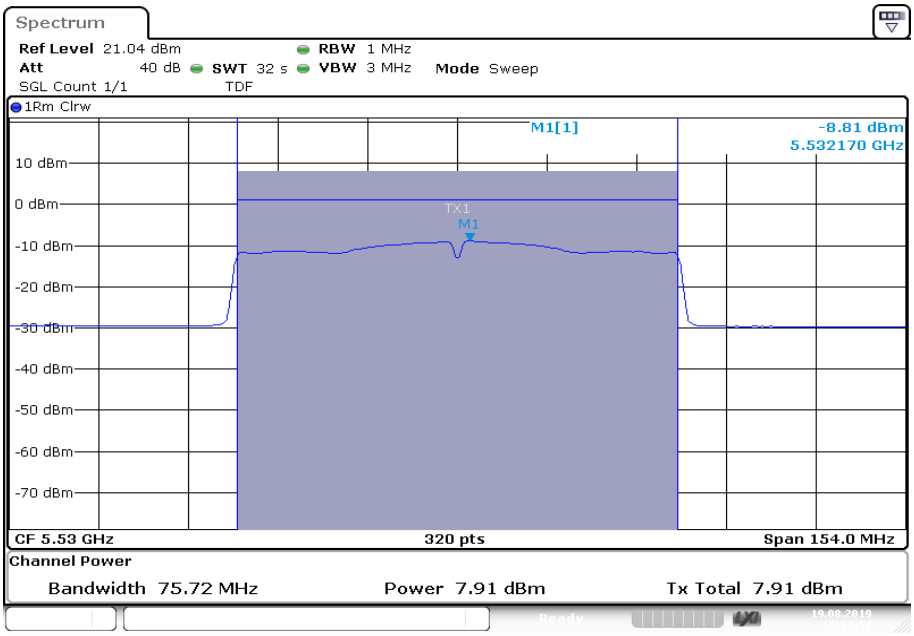
Date: 19.AUG.2019 16:03:15

Plot 2: U-NII-2A; middle channel



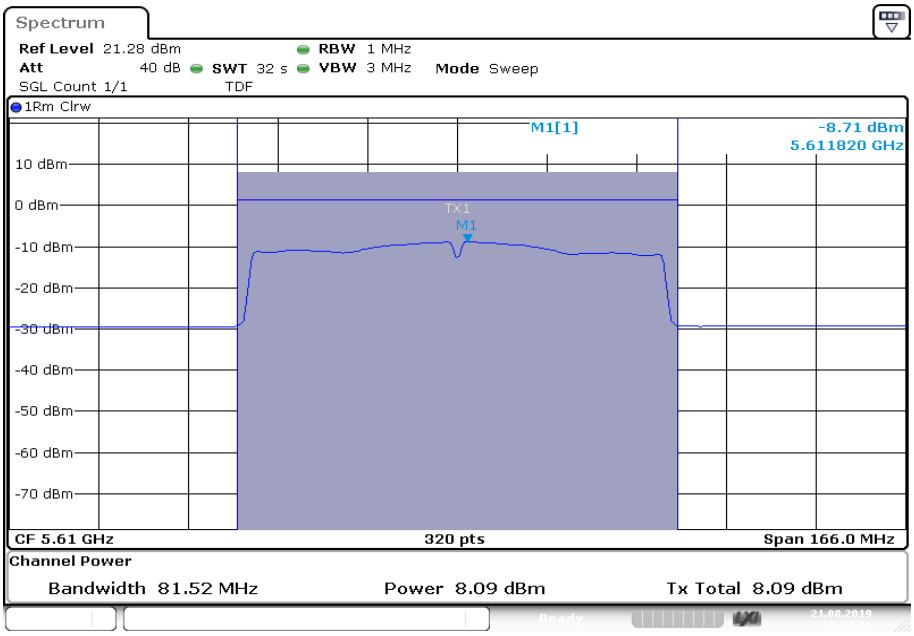
Date: 19.AUG.2019 16:05:41

Plot 3: U-NII-2C; lowest channel



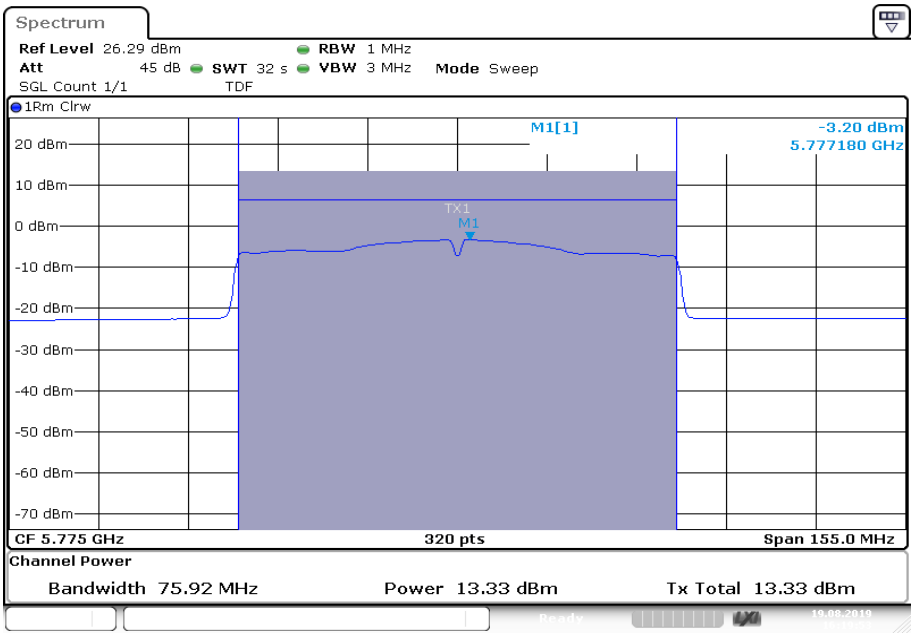
Date: 19.AUG.2019 16:07:57

Plot 4: U-NII-2C; highest channel



Date: 21.AUG.2019 18:34:16

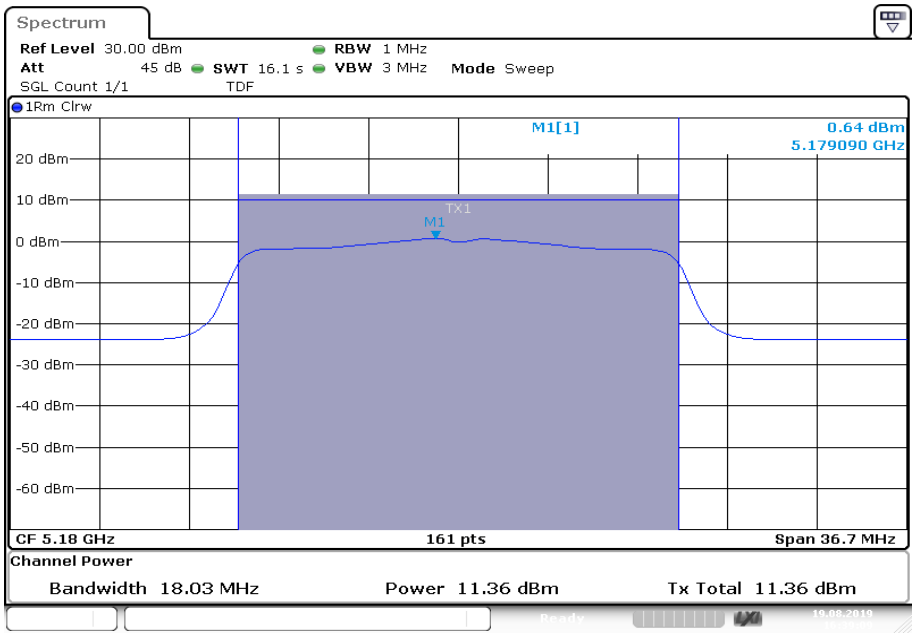
Plot 5: U-NII-3; middle channel



Date: 19.AUG.2019 16:19:53

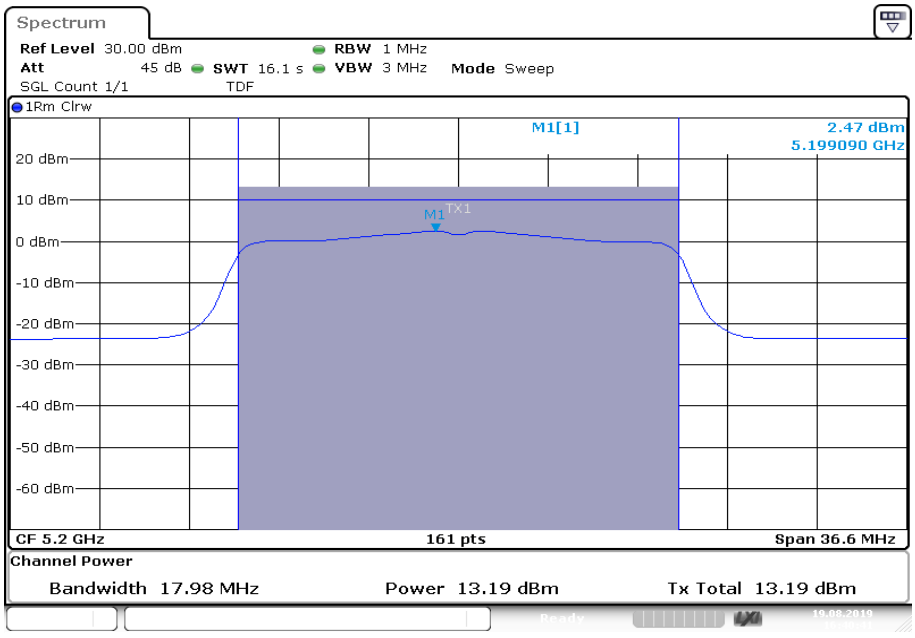
Plots: n/ac HT20 – mode, Antenna port 2

Plot 1: U-NII-1; lowest channel



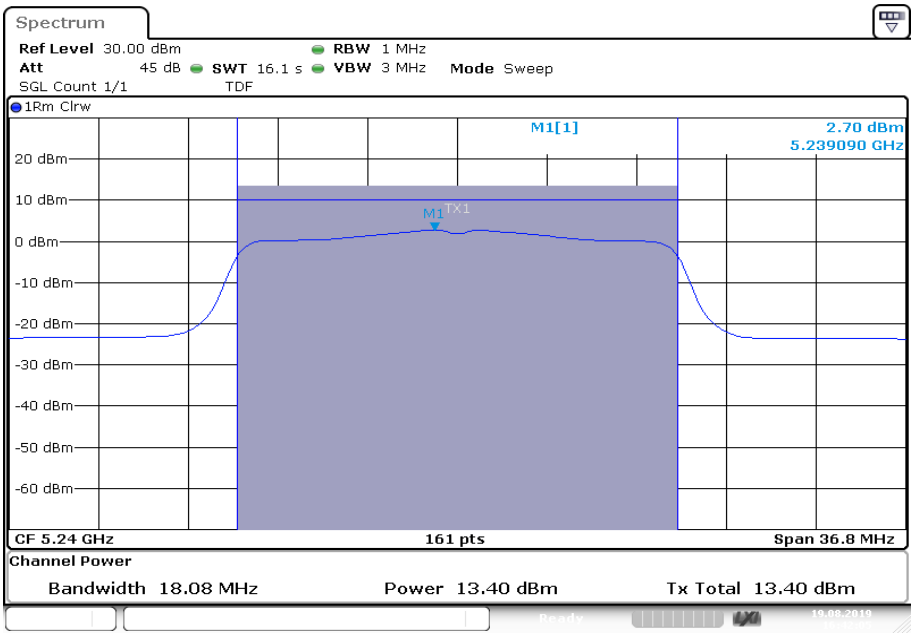
Date: 19.AUG.2019 16:39:09

Plot 2: U-NII-1; middle channel



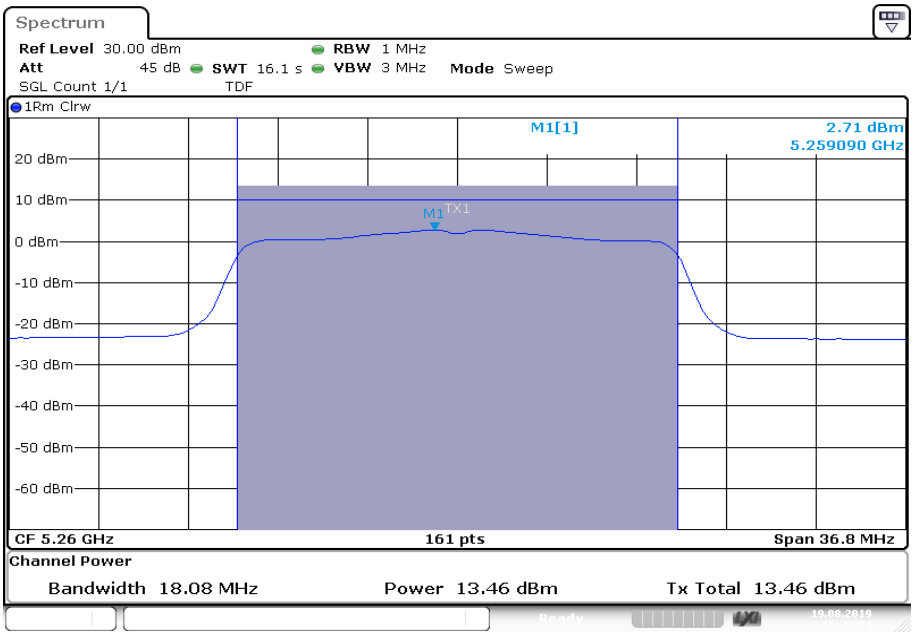
Date: 19.AUG.2019 16:40:41

Plot 3: U-NII-1; highest channel



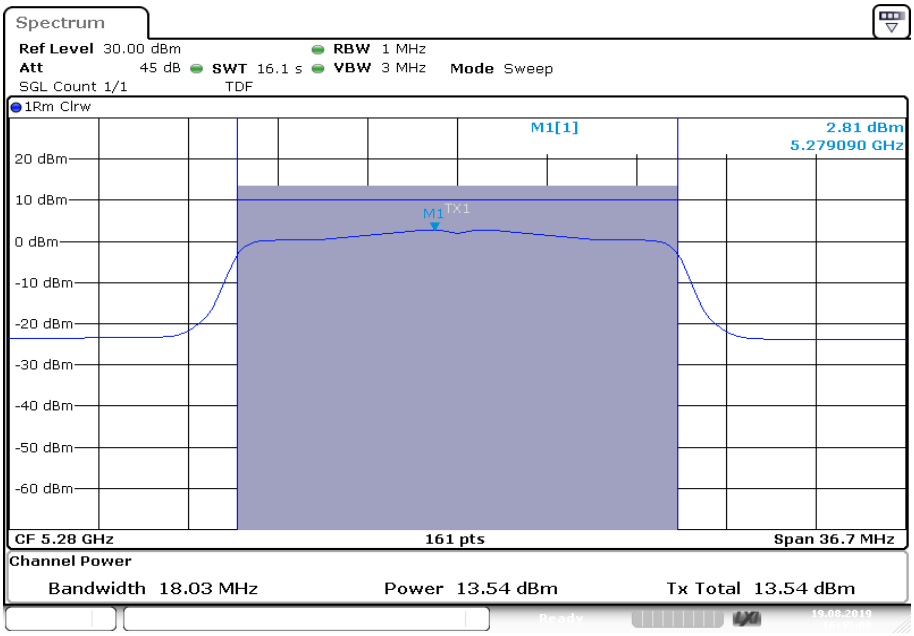
Date: 19.AUG.2019 16:42:05

Plot 4: U-NII-2A; lowest channel



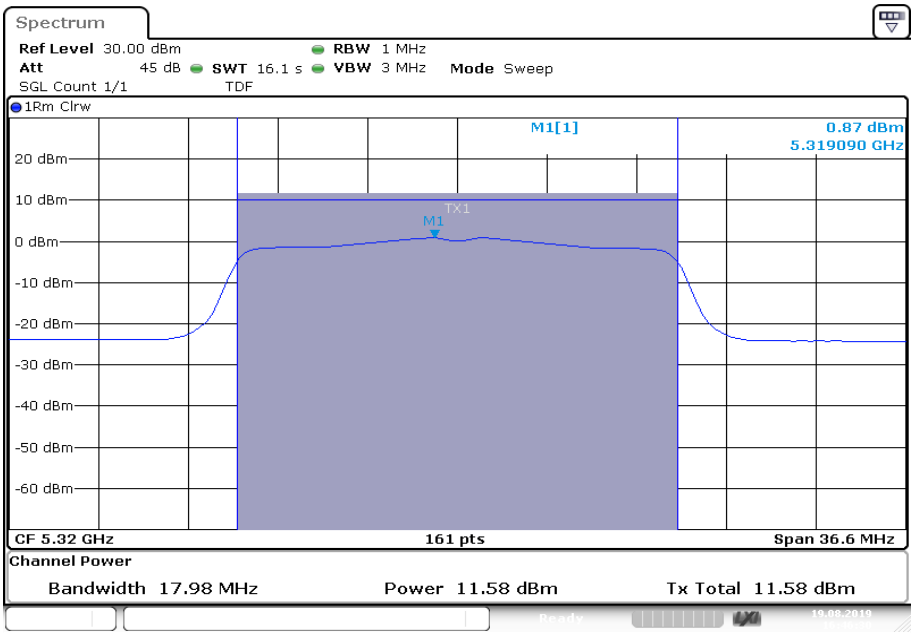
Date: 19.AUG.2019 16:43:34

Plot 5: U-NII-2A; middle channel



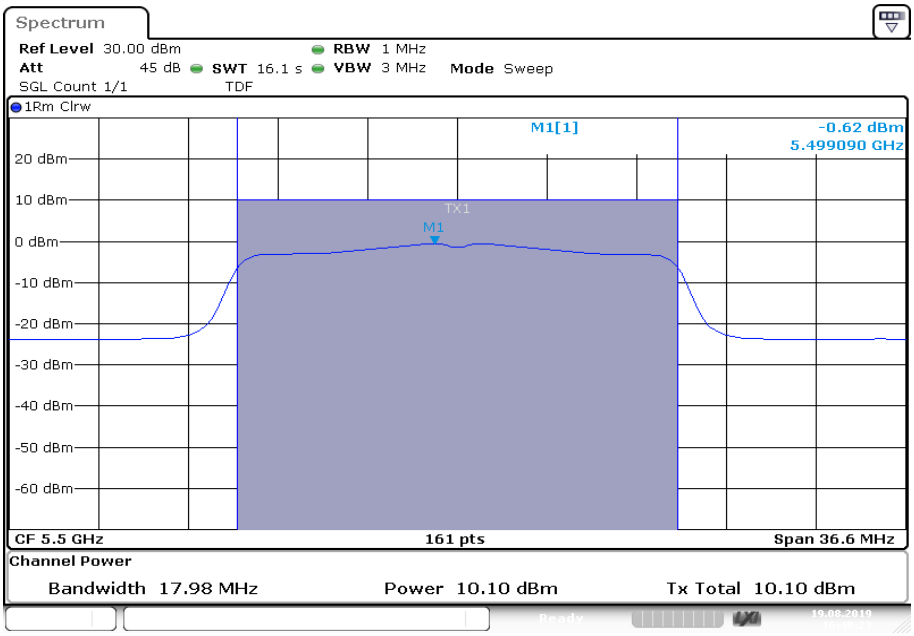
Date: 19.AUG.2019 16:45:00

Plot 6: U-NII-2A; highest channel



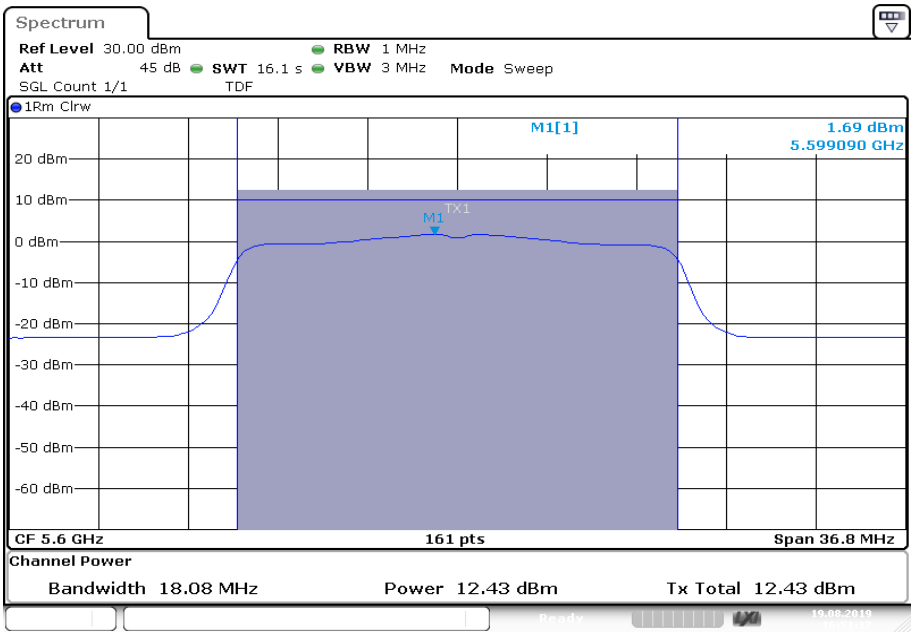
Date: 19.AUG.2019 16:46:30

Plot 7: U-NII-2C; lowest channel



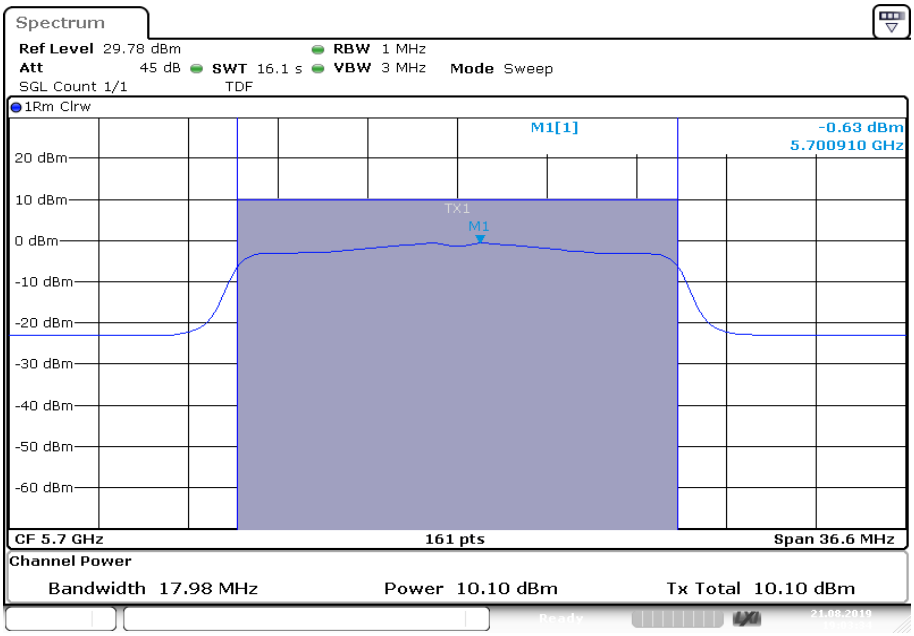
Date: 19.AUG.2019 16:48:22

Plot 8: U-NII-2C; middle channel



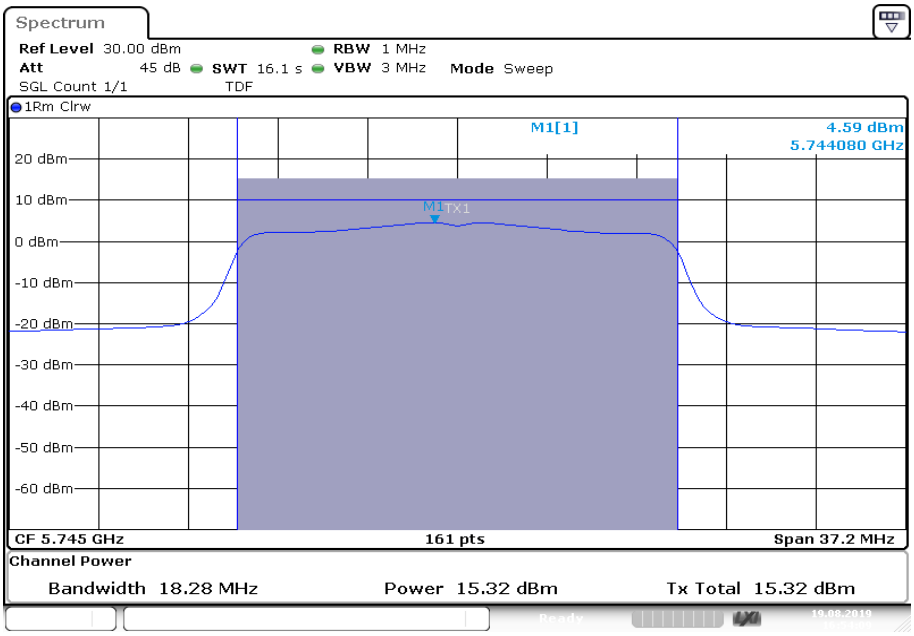
Date: 19.AUG.2019 16:51:17

Plot 9: U-NII-2C; highest channel



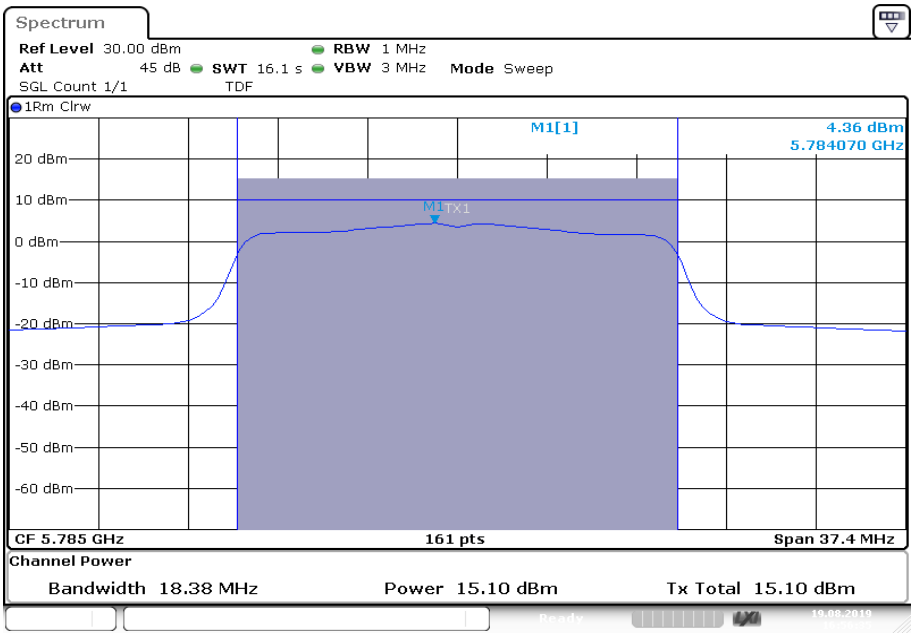
Date: 21.AUG.2019 19:03:35

Plot 10: U-NII-3; lowest channel



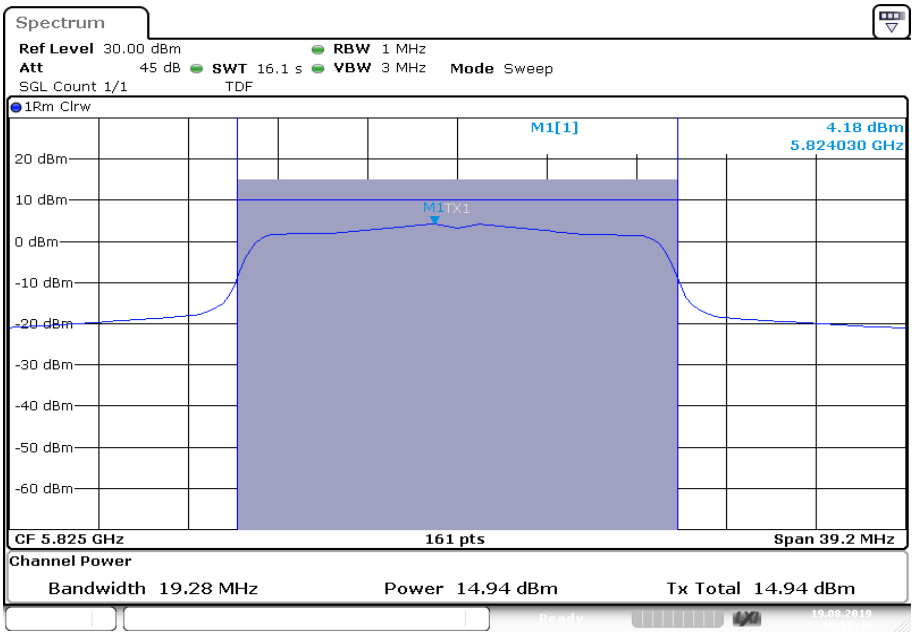
Date: 19.AUG.2019 16:54:09

Plot 11: U-NII-3; middle channel



Date: 19.AUG.2019 16:56:35

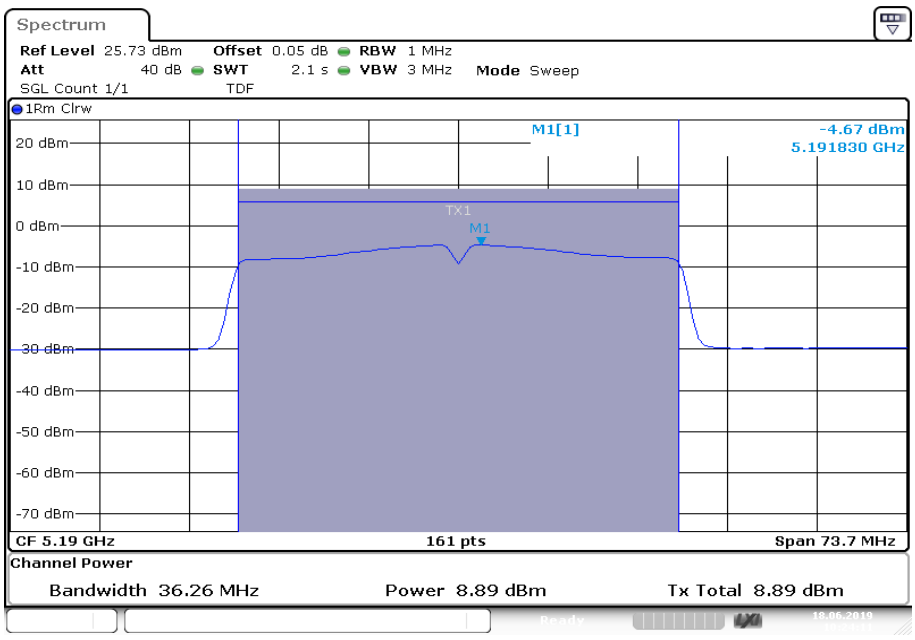
Plot 12: U-NII-3; highest channel



Date: 19.AUG.2019 16:58:40

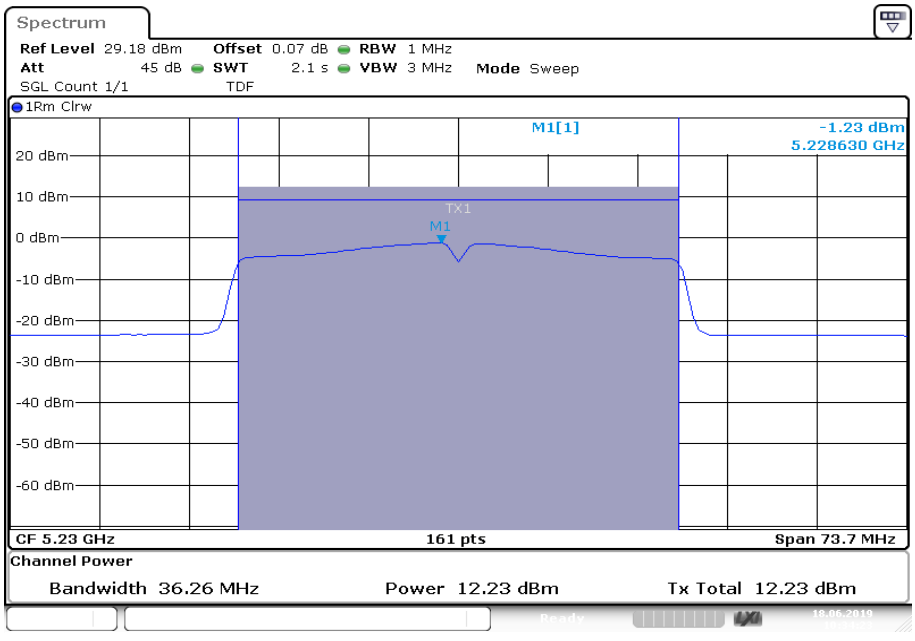
Plots: n/ac HT40 – mode, Antenna port 2

Plot 1: U-NII-1; lowest channel



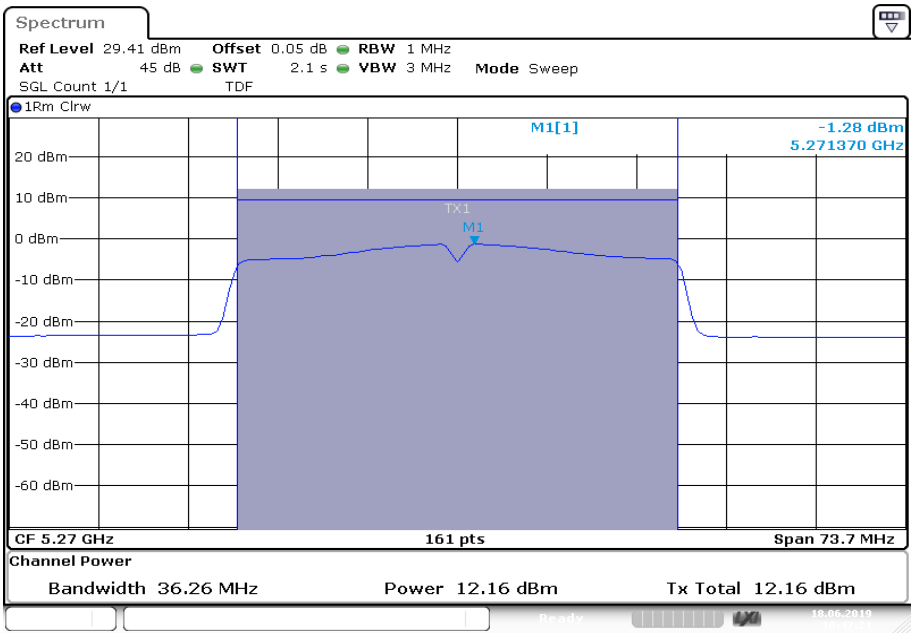
Date: 18.JUN.2019 10:24:11

Plot 2: U-NII-1; highest channel



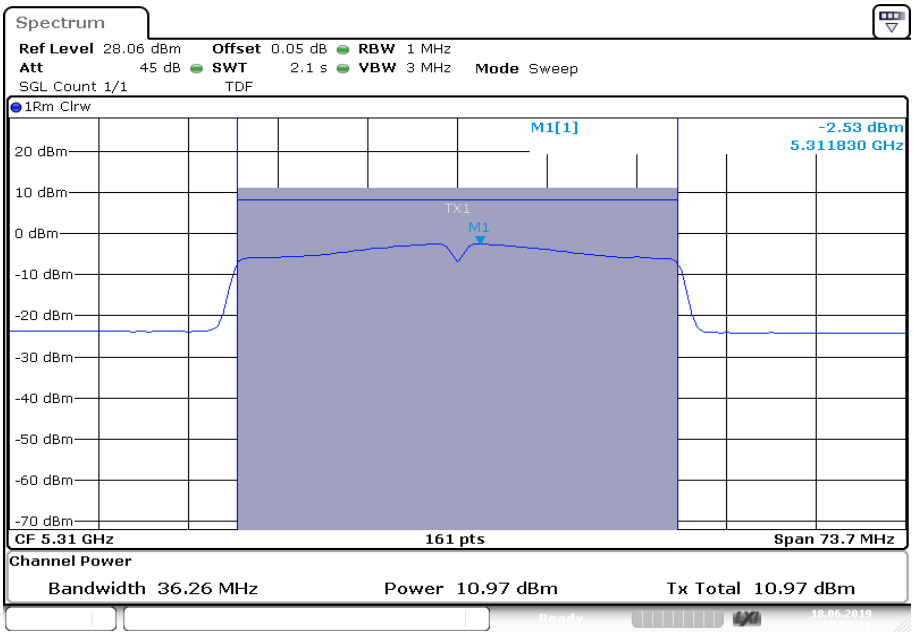
Date: 18.JUN.2019 10:34:24

Plot 3: U-NII-2A; lowest channel



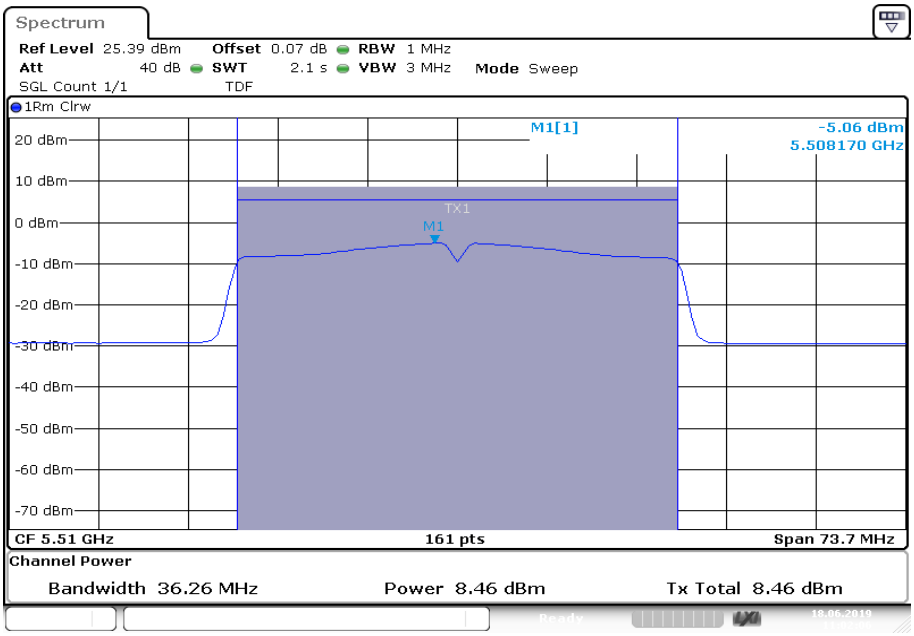
Date: 18.JUN.2019 10:47:21

Plot 4: U-NII-2A; highest channel



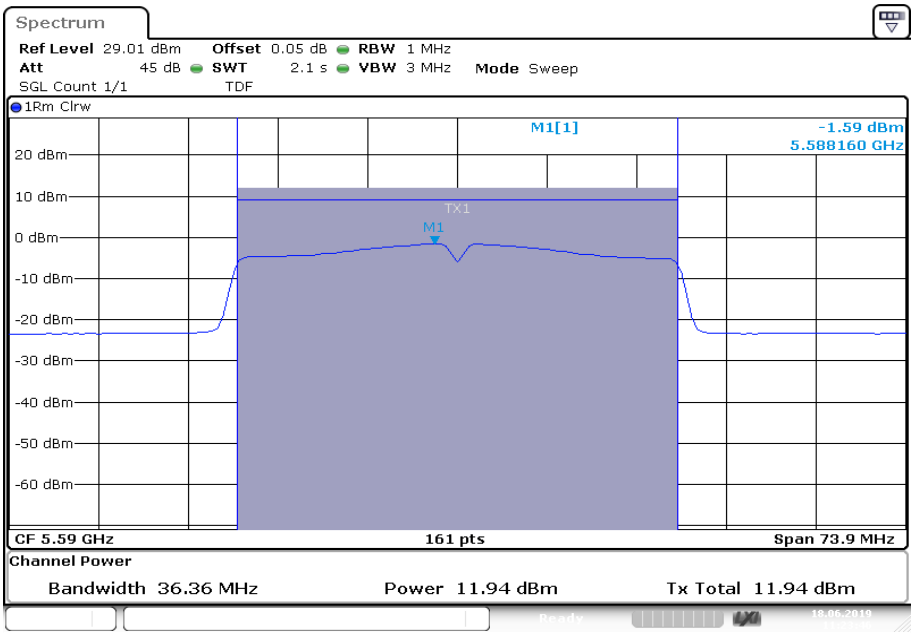
Date: 18.JUN.2019 10:50:19

Plot 5: U-NII-2C; lowest channel



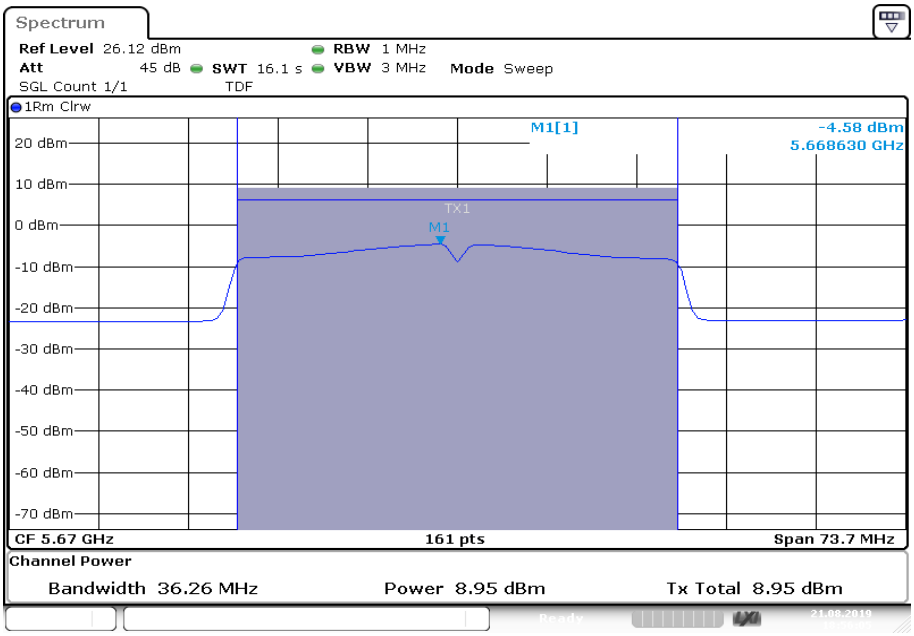
Date: 18.JUN.2019 11:02:07

Plot 6: U-NII-2C; middle channel



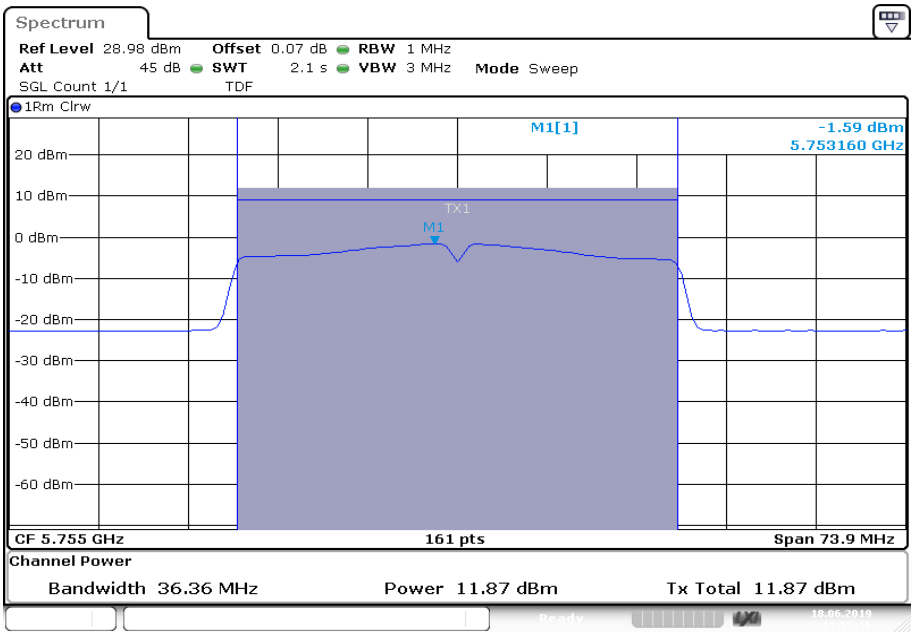
Date: 18.JUN.2019 11:23:46

Plot 7: U-NII-2C; highest channel



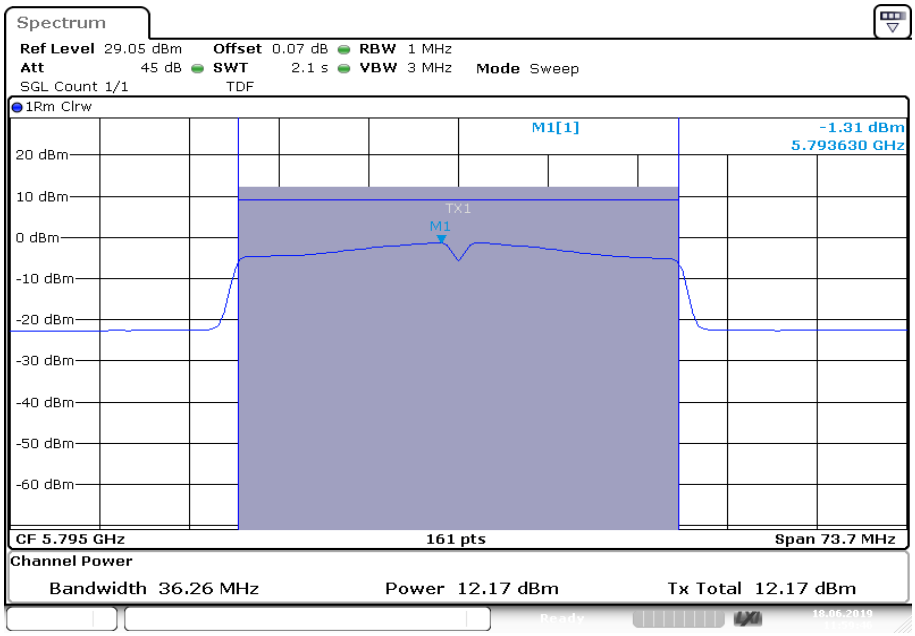
Date: 21.AUG.2019 18:56:06

Plot 8: U-NII-3; lowest channel



Date: 18.JUN.2019 11:52:17

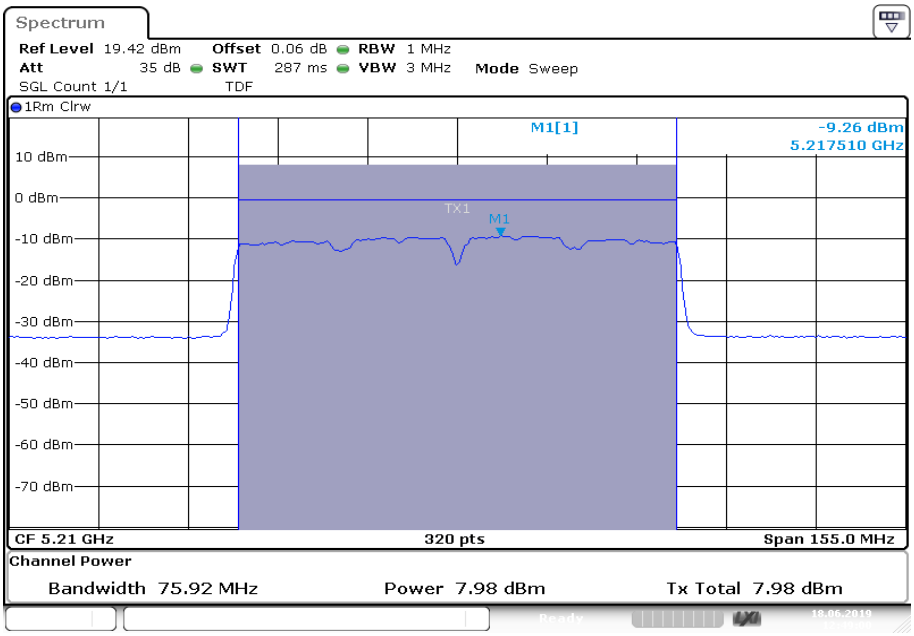
Plot 9: U-NII-3; highest channel



Date: 18.JUN.2019 11:59:46

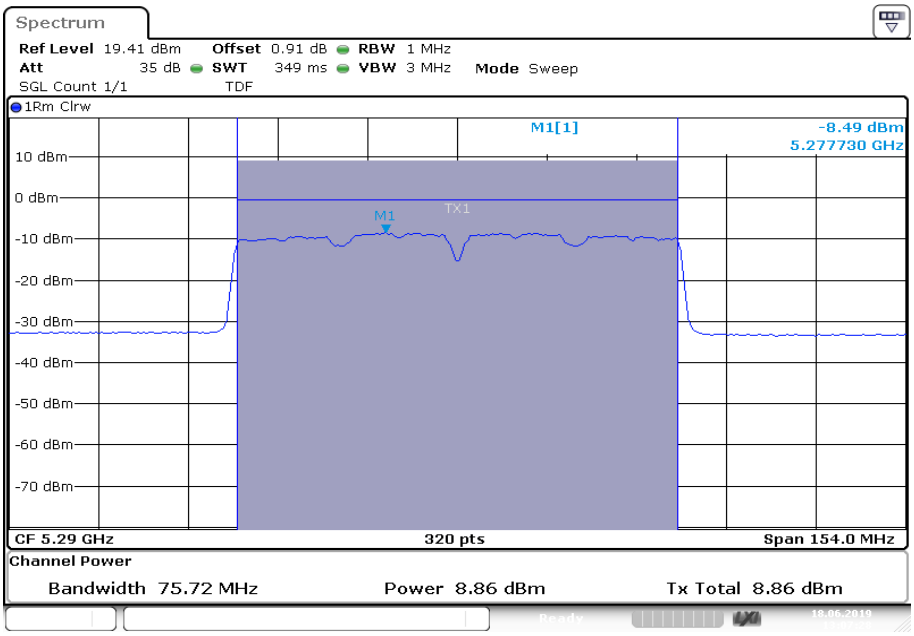
Plots: ac80– mode, Antenna port 2

Plot 1: U-NII-1; middle channel



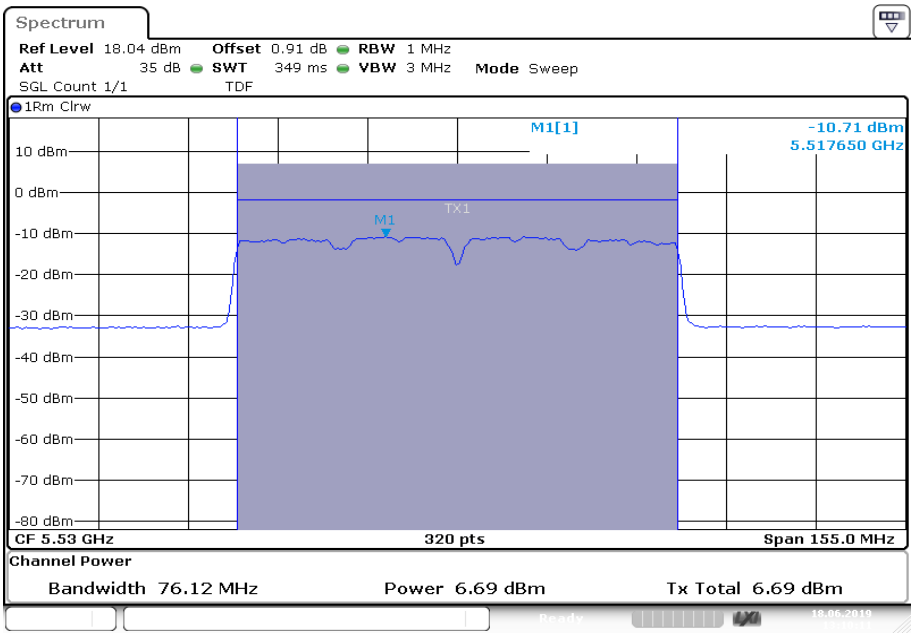
Date: 18.JUN.2019 12:49:01

Plot 2: U-NII-2A; middle channel



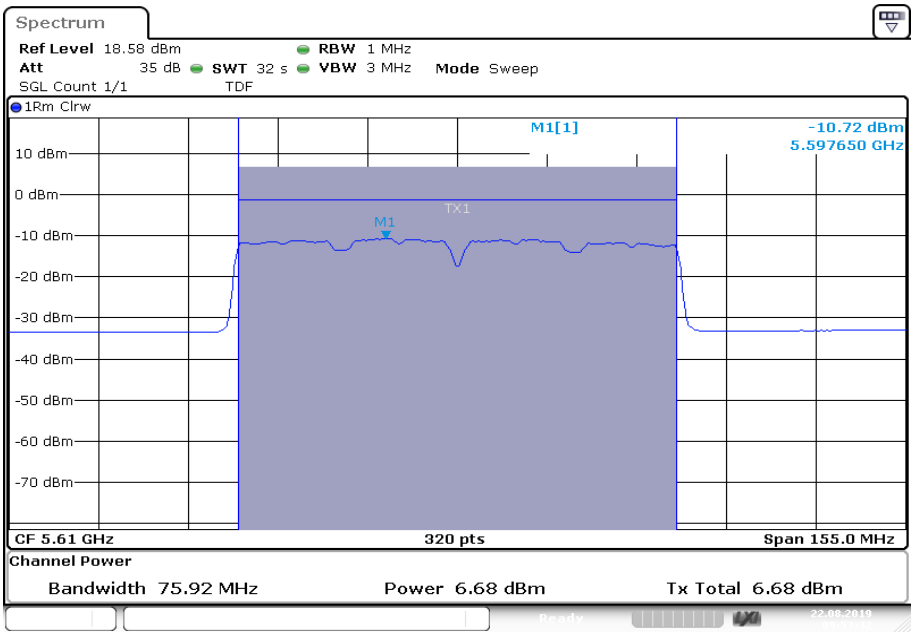
Date: 18.JUN.2019 13:07:28

Plot 3: U-NII-2C; lowest channel



Date: 18.JUN.2019 13:10:12

Plot 4: U-NII-2C; highest channel



Date: 22.AUG.2019 09:53:43