FCC PART 15 SUBPART E TEST REPORT

for

Dual band 4X4:4 0utdoor Access Point (AP) with integrated/external antenna

Model No.: ion8/ion8e

FCC ID: 2AUISION8ION8E

of

Applicant: HFCL Limited
Address: 8, Commercial Complex, Masjid Moth, Greater Kailash - 2, New Delhi-110048, India

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: TW1477, TW0020, TW1072

Industry Canada filed test laboratory Reg. No. 20037

A2LA Accredited No.: 2732.01

Report No.: W6M21903-18922-C-54

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Registration number: W6M21903-18922-C-54
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1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.
The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.
Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.
Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.
The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that is performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.
The test report may only be reproduced or published in full.
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Specific Conditions:
Usage of the hereunder tested device in combination with other integrated or external antennas requires at least additional output power measurements, spurious emission measurements, conducted emission measurements (AC supply lines) and radio frequency exposure evaluations for each individual configuration performed, for certification by FCC.

Tester:

Date	WTS-Lab.	Name	Signature
December 27, 2019		Rick Chen	Rick Chen

Technical responsibility for area of testing:

Date	WTS	Name	Signature
December 27, 2019		Kevin Wang	Kevin Wang

1.2 Testing laboratory

1.2.1 Location

OATS
No.5-1, Lishui, Shuang Sing Village,
Wanli Dist., New Taipei City 207,
Taiwan (R.O.C.)
3 meter semi-anechoic chamber
No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)
TEL:886-2-6613-0228
FAX:886-2-2791-5046
Company
Worldwide Testing Services(Taiwan) Co., Ltd.
6F, NO. 58, LANE 188, RUEY-KUANG RD.
NEIHU, TAIPEI 114, TAIWAN R.O.C.
Tel : 886-2-66068877
Fax : 886-2-66068879

1.2.2 Details of accreditation status

Accredited testing laboratory
A2LA accredited number: 2732.01
FCC filed test laboratory Reg. No. TW1477, TW0020, TW1072
Industry Canada filed test laboratory Reg. No. 20037

Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd. :

Name:	./.
Accredited number:	./.
Street:	./.
Town:	./.
Country:	./.
Telephone:	./.
Fax:	./.

1.3 Details of approval holder

Name:	HFCL Limited
Street:	8, Commercial Complex, Masjid Moth, Greater Kailash - 2,
Town:	New Delhi-110048,
Country:	India
Telephone:	+91-9811096312
Fax:	./.

1.4 Application details

Date of receipt of test item:	August 28, 2019
Date of test:	from August 29, 2019 to December 25, 2019

1.5 General information of Test item

Type of test item:	Dual band 4X4:4 0utdoor Access Point (AP) with integrated/external antenna
Model Number:	ion8/ion8e
Brand Name:	io
Multi-listing model number:	ion8
Photos:	see Appendix

Technical data

Frequency band:	Band 1: 5.150 GHz-5.250 GHz, Band 4: 5.725 GHz-5.850 GHz

Band 1

802.11a:	Low Channel (CH36): 5180 MHz Middle Channel (CH44): 5220 MHz High Channel (CH48): 5240 MHz
802.11n 20MHz:	Low Channel (CH36): 5180 MHz Middle Channel (CH44): 5220 MHz High Channel (CH48): 5240 MHz
802.11n 40MHz:	Low Channel (CH38): 5190 MHz High Channel (CH46): 5230 MHz
802.11ac 80MHz:	CH42: 5210 MHz

Band 4

802.11a:	Low Channel (CH149): 5745 MHz Middle Channel (CH157): 5785 MHz High Channel (CH165): 5825 MHz
802.11n 20MHz:	Low Channel (CH149): 5745 MHz Middle Channel (CH157): 5785 MHz High Channel (CH165): 5825 MHz
802.11n 40MHz:	Low Channel (CH151): 5755 MHz High Channel (CH159): 5795 MHz
802.11ac 80MHz:	CH155: 5775 MHz

Registration number: W6M21903-18922-C-54
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Band 1

Numbers of channel:	802.11a: 4 channels 802.11n 20 MHz: 4 channels 802.11n 40 MHz: 2 channels 802.11ac 80 MHz: 1 channel

Band 4

Numbers of channel:	802.11a: 5 channels 802.11n20 MHz: 5 channels 802.11n 40 MHz: 2 channels 802.11ac 80 MHz: 1 channel
Operating modes:	Duplex
Type of modulation:	OFDM/DSSS
Fixed point to point operation:	Yes / No
Antenna:	Integrated antenna: Patch antenna External antenna: Rubber Duck antenna
Antenna gain:	ANT 1-ANT 4: 6 dBi (for Integrated antenna & External antenna)
Directional gain:	12.02 dBi
Power supply:	PoE 48Vd.c. Wherever power is mentioned as 48Vd.c. in this report, it refers to PoE 48Vd.c.

Band 1

Emission designator:	802.11a: 17M6D1D 802.11n 20 MHz: 18M6D1D 802.11n 40 MHz: 37M9D1D 802.11ac 80 MHz: 76M6D1D

Band 4

Emission designator:	802.11a: 17M0D1D 802.11n 20 MHz: 19M4D1D 802.11n 40 MHz: 40M2D1D D 802.11ac 80 MHz: 76M3D1D

Note: Tests were performed under worst case mode 802.11a 6 Mbps, 802.11n 20MHz(MCS0), 802.11n 40MHz(MCS0) and 802.11ac 80MHz(MCS0).

Registration number: W6M21903-18922-C-54
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Classification:

Fixed Device	☒
Mobile Device (Human Body distance ＞ 20cm)	☐
Portable Device (Human Body distance ＜ 20cm)	☐
Modular Radio Device	☐

Note: This device was functioned as a ☐Master ■Slave device during the DFS

Manufacturer: (if applicable)

Name:	HFCL Limited
Street:	Electronic Complex, Chambaghat,
Town:	Solan (H.P.)-173213, Himachal Pradesh,
Country:	India

		ANT 1	ANT 2	ANT 3	ANT 4
5.15 GHz~5.25 GHz	IEEE 802.11 a	Mode A	Mode A	Mode A	Mode A
	IEEE 802.11 n(20M)	Mode B	Mode B	Mode B	Mode B
	IEEE 802.11 n(40M)	Mode C	Mode C	Mode C	Mode C
	IEEE 802.11 ac(80M)	Mode D	Mode D	Mode D	Mode D
5.725 GHz~5.85GHz	IEEE 802.11 a	Mode E	Mode E	Mode E	Mode E
	IEEE 802.11 n(20M)	Mode F	Mode F	Mode F	Mode F
	IEEE 802.11 n(40M)	Mode G	Mode G	Mode G	Mode G
	IEEE 802.11 ac(80M)	Mode H	Mode H	Mode H	Mode H

Registration number: W6M21903-18922-C-54
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Transmitter	Unom
Antenna 1	
Band 1	
Mode A (OFDM)	
Power (ch 36 or A):	Conducted: 16.14 dBm
Power (ch 44 or B):	Conducted: 16.02 dBm
Power (ch 48 or C):	Conducted: 15.67 dBm
Mode B (OFDM)	
Power (ch 36 or A):	Conducted: 16.44 dBm
Power (ch 44 or B):	Conducted: 16.26 dBm
Power (ch 48 or C):	Conducted: 15.92 dBm
Mode C (OFDM)	
Power (ch 38 or A):	Conducted: 16.45 dBm
Power (ch 46 or B):	Conducted: 16.17 dBm
Mode D (OFDM)	
Power (ch 42 or A):	Conducted: 10.43 dBm
Band 4	
Mode E (OFDM)	
Power (ch 149 or A):	Conducted: 13.55 dBm
Power (ch 157 or B):	Conducted: 13.45 dBm
Power (ch 165 or C):	Conducted: 13.42 dBm
Mode F (OFDM)	
Power (ch 149 or A):	Conducted: 14.29 dBm
Power (ch 157 or B):	Conducted: 14.07 dBm
Power (ch 165 or C):	Conducted: 13.80 dBm
Mode G (OFDM)	
Power (ch 151 or A):	Conducted: 13.69 dBm
Power (ch 159 or B):	Conducted: 13.67 dBm
Mode H (OFDM)	
Power (ch 155 or A):	Conducted: 8.13 dBm
Antenna 2	
Band 1	
Mode A (OFDM)	
Power (ch 36 or A):	Conducted: 13.84 dBm
Power (ch 44 or B):	Conducted: 14.22 dBm
Power (ch 48 or C):	Conducted: 14.31 dBm

Mode B (OFDM)

Power (ch 36 or A):	Conducted: 13.95 dBm
Power (ch 44 or B):	Conducted: 14.45 dBm
Power (ch 48 or C):	Conducted: 14.52 dBm

Mode C (OFDM)

Power (ch 38 or A):	Conducted: 16.14 dBm
Power (ch 46 or B):	Conducted: 15.98 dBm

Mode D (OFDM)

Power (ch 42 or A):	Conducted: 9.01 dBm

Band 4

Mode E (OFDM)

Power (ch 149 or A):	Conducted: 13.76 dBm
Power (ch 157 or B):	Conducted: 14.18 dBm
Power (ch 165 or C):	Conducted: 15.00 dBm

Mode F (OFDM)

Power (ch 149 or A):	Conducted: 14.70 dBm
Power (ch 157 or B):	Conducted: 14.15 dBm
Power (ch 165 or C):	Conducted: 14.66 dBm

Mode G (OFDM)

Power (ch 151 or A):	Conducted: 13.62 dBm
Power (ch 159 or B):	Conducted: 14.26 dBm

Mode H (OFDM)

Power (ch 155 or A):	Conducted: 8.53 dBm

Antenna 3
Band 1

Mode A (OFDM)

Power (ch 36 or A):	Conducted: 14.95 dBm
Power (ch 44 or B):	Conducted: 14.85 dBm
Power (ch 48 or C):	Conducted: 14.94 dBm

Mode B (OFDM)

Power (ch 36 or A):	Conducted: 15.20 dBm
Power (ch 44 or B):	Conducted: 15.29 dBm
Power (ch 48 or C):	Conducted: 15.23 dBm

Mode C (OFDM)

Power (ch 38 or A):	Conducted: 15.19 dBm
Power (ch 46 or B):	Conducted: 15.02 dBm

Mode D (OFDM)
Power (ch 42 or A): Conducted: 9.71 dBm

Band 4

Mode E (OFDM)
Power (ch 149 or A): Conducted: 13.75 dBm
Power (ch 157 or B): Conducted: 14.13 dBm
Power (ch 165 or C): Conducted: 14.53 dBm

Mode F (OFDM)
Power (ch 149 or A): Conducted: 14.71 dBm
Power (ch 157 or B): Conducted: 14.65 dBm
Power (ch 165 or C): Conducted: 14.49 dBm

Mode G (OFDM)
Power (ch 151 or A): Conducted: 13.76 dBm
Power (ch 159 or B): Conducted: 14.24 dBm

Mode H (OFDM)
Power (ch 155 or A): Conducted: 8.52 dBm

Antenna 4
Band 1

Mode A (OFDM)
Power (ch 36 or A): Conducted: 15.30 dBm
Power (ch 44 or B): Conducted: 15.49 dBm
Power (ch 48 or C): Conducted: 15.24 dBm

Mode B (OFDM)
Power (ch 36 or A): Conducted: 15.47 dBm
Power (ch 44 or B): Conducted: 15.77 dBm
Power (ch 48 or C): Conducted: 15.64 dBm

Mode C (OFDM)
Power (ch 38 or A): Conducted: 15.30 dBm
Power (ch 46 or B): Conducted: 15.42 dBm

Mode D (OFDM)
Power (ch 42 or A): Conducted: 10.24 dBm

Band 4

Mode E (OFDM)
Power (ch 149 or A): Conducted: 14.29 dBm
Power (ch 157 or B): Conducted: 13.94 dBm
Power (ch 165 or C): Conducted: 13.70 dBm

Mode F (OFDM)
Power (ch 149 or A): Conducted: 15.14 dBm
Power (ch 157 or B): Conducted: 14.62 dBm
Power (ch 165 or C): Conducted: 13.84 dBm

Mode G (OFDM)
Power (ch 151 or A): Conducted: 15.02 dBm
Power (ch 159 or B): Conducted: 13.55 dBm

Mode H (OFDM)
Power (ch 155 or A): Conducted: 8.87 dBm

Band 1 (5.15GHz~5.25GHz)

Combine	mW			dBm		
	Ch Low	Ch Mid	Ch High	Ch Low	Ch Mid	Ch High
802.11n 20MHz	137.24	141.70	137.37	21.37	21.51	21.38
802.11n 40MHz	152.19	--	147.63	21.82	--	21.69
802.11ac 80MHz	38.92	--	--	15.90	--	--

Band 4 (5.725GHz~5.85GHz)

Combine	mW			dBm		
	Ch Low	Ch Mid	Ch High	Ch Low	Ch Mid	Ch High
802.11n 20MHz	118.60	109.67	105.56	20.74	20.40	20.23
802.11n 40MHz	101.94	--	99.15	20.08	--	19.96
802.11ac 80MHz	28.45	--	--	14.54	--	--

1.6 Test standards

Technical standard : 47 CFR FCC Part 15 Subpart E § 15.407 (2018-10)

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

or

The deviations were ascertained in the course of the tests performed. ☐

2.2 Test environment

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Details of power supply: PoE 48Vd.c.
Wherever power is mentioned as 48Vd.c. in this report, it refers to PoE 48Vd.c.

Test item Name	Uncertainty
Estimation Result of Uncertainty of Conducted Emission	Expanded Uncertainty: AMN: 1.30 dB Voltage probe: 1.36 dB
Estimation Result of Uncertainty of Radiated Emission(3M)	Expanded Uncertainty: 0.009-30 MHz: 2.02 dB 30-1000 MHz: 3.49 dB 1-18 GHz: 3.01 dB 18-40 GHz: 2.43 dB
Estimation Result of Uncertainty of Bandwidth Measurement 20 dB Bandwidth, Occupied bandwidth, Channel bandwidth, Necessary Bandwidth	Expanded Uncertainty: 0.45 kHz
Estimation Result of Uncertainty of Conducted Output Power Measurement Output power	Expanded Uncertainty: 1.72 dB
Estimation Result of Uncertainty of Power Density Measurement Power density	Expanded Uncertainty: 1.73 dB
Estimation Result of Uncertainty of Band Edge Measurement	Expanded Uncertainty: 0.98 dBc
Estimation Result of Uncertainty of Conducted Spurious Emission Measurement Conducted spurious emission	Expanded Uncertainty: 1.726 dB
Estimation Result of Uncertainty of EIRP Measurement EIRP, ERP, Output power(dBm), Radiated spurious emission(dBm), Receiver spurious radiations (≥30 MHz)	Expanded Uncertainty: 30-200MHz: 2.50 dB 200-1000MHz: 2.50 dB 1-18GHz: 3.38 dB 18-40GHz: 3.04 dB

The decision rule is : Measurement uncertainty is not taken into account.

2.3 Test Equipment List

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 001	EMI TEST RECEIVER	ESHS10	842121/013	R&S	2019/6/4	2020/6/3
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 004	ZWEILEITER-V-NETZNACHBILDUNG TWO-LINE V-NETWORK	ESH3-Z5	840731/011	R&S	2019/11/1	2020/10/31
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2019/9/24	2020/9/23
ETSTW-CE 008	HF-EICHLEITUNG RF STEP ATTENUATOR 139dB DPSP	334.6010.02	844581/024	R&S	Function Test	
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2019/7/23	2020/7/22
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2019/10/3	2020/10/2
ETSTW-CE 028	MXE EMI Receiver	N9038A	MY53220110	Agilent	2019/7/18	2020/7/17
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2019/6/4	2020/6/3
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2019/5/29	2020/5/28
ETSTW-RE 012	TUNABLE BANDREJECT FILTER	D.C 0309	146	K&L	Function Test	
ETSTW-RE 013	TUNABLE BANDREJECT FILTER	D.C 0336	397	K&L	Function Test	
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2019/7/25	2020/7/24
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2019/7/22	2020/7/21
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	ETS-Lindgren	2019/4/2	2020/4/1
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2019/1/29	2020/1/28
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2019/4/23	2020/4/22
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2019/5/13	2020/5/12
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2019/2/27	2020/2/26
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2019/2/27	2020/2/26
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2019/2/27	2020/2/26
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2019/3/5	2020/3/4
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2019/2/27	2020/2/26
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2019/5/16	2020/5/15
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	Function Test	
ETSTW-RE 069	Double-Ridged Guide Horn Antenna	3117	00069377	ETS-Lindgren	Function Test	
ETSTW-RE 072	CELL SITE TEST SET	8921A	3339A00375	HP	2019/9/23	2020/9/22
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2019/9/18	2020/9/17
ETSTW-RE 091	Match Pad	MDCS1500	None	WOKEN	2019/5/9	2020/5/8
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2019/2/22	2020/2/21
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	T-0A023536	T-Power	Function test	

ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2019/1/14	2020/1/13
ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	Function test	
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2019/6/3	2020/6/2
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2019/8/8	2020/8/7
ETSTW-RE 126	5GHz Notch filter	5NSL12-5800/E221.3-O/O	1	K&L Microwave	2019/8/8	2020/8/7
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2019/2/26	2020/2/25
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circuits	2019/8/8	2020/8/7
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circuits	2019/8/8	2020/8/7
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-RE 142	Amplifier	8447D	2805A03378	Agilent	2019/5/16	2020/5/15
ETSTW-RE 147	Bi-log Hybrid Antenna	MCTD 2786B	BLB16M04005	ETC	2019/4/2	2020/4/1
ETSTW-RF 002	Electromagnetic field probe	LF-30	K-0007	STT	2019/5/27	2020/5/26
ETSTW-EMI 011	USB Compact Modulator	SFC-U	101689	R&S	2019/5/16	2020/5/15
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2019/3/5	2020/3/4
ETSTW-GSM 003	Radio Communication Analyzer	MT8820C	6201342073	Anritsu	2019/3/26	2020/3/25
ETSTW-GSM 004	Wideband Radio Communication Tester	CMW500	128092	R&S	2019/10/25	2020/10/24
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2019/1/14	2020/1/13
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2019/1/14	2020/1/13
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2019/1/14	2020/1/13
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2019/1/14	2020/1/13
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2019/9/12	2020/9/11
ETSTW-GSM 024	Radio Communication Analyzer	MT8821C	None	Anritsu	2019/3/5	2020/3/4
ETSTW-GSM 025	Band Reject Filter	BRM19835	001	Micro-Tronics	2019/8/9	2020/8/8
ETSTW-Cable 011	SMA to N type Cable	RGU-400	None	THERMAX	Pre-test Use NCR	
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 020	N TYPE Cable	OATS Cable 1	N30N30-L335-15M	JYE BAO CO.,LTD.	2019/7/2	2020/7/1
ETSTW-Cable 026	Microwave Cable	SUCOFLEX 104	279075	HUBER+SUHNER	2019/2/25	2020/2/24
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2019/5/14	2020/5/13
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2019/9/18	2020/9/17
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2019/9/18	2020/9/17
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104（S_Cable 9）	279067	HUBER+SUHNER	2019/2/25	2020/2/24
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2019/5/16	2020/5/15
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2019/6/6	2020/6/5

ETSTW-Cable 064	Microwave Cable	SUCOFLEX 104	MY28891	HUBER+SUHNER	2019/5/16	2020/5/15
ETSTW-Cable 066	SMA type cable	32022	None	ASTROLAB	2019/9/24	2020/9/23
ETSTW-Cable 071	N TYPE CABLE	EMCCFD400-NM-NM-25000	170239	EMCI	2019/6/6	2020/6/5
ETSTW-Cable 072	SMA type cable (8m)	SUCOFLEX 104	805800/4	HUBER+SUHNER	2019/5/16	2020/5/15
ETSTW-Cable 074	SMA type cable (2m)	SUCOFLEX 104	802563/4	HUBER+SUHNER	2019/5/16	2020/5/15
WTSTW-SW 002	EMI TEST SOFTWARE	EZ_EMC	None	Farad	Version ETS-03A1	
WTSTW-SW 006	EMI TEST SOFTWARE	e3	None	AUDIX	Version 9.161014	
WTSTW-SW 008	Signal studio	Agilent	None	AUDIX	Version 2.0.0.1	
ETSTW-TH 001	Thermohygrometer	608-H1	45204316	Testo	2019/9/9	2020/9/8
ETSTW-TH 002	Thermohygrometer	608-H1	45204317	Testo	2019/9/9	2020/9/8

2.4 Test Procedure

The test procedures are performed following the test stands ANSI STANDARD C63.10 and FCC 789033 D02 General UNII Test Procedures New Rules v01r04.

■ Minimum Emission Bandwidth for the band 5.150-5.250 GHz, 5.725-5.850 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) $\geqslant 3 \times$ RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

■ 99 Percent Occupied Bandwidth

The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section H)3)d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the 6-dB emission bandwidth to define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section E). However, the 6-dB bandwidth must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

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

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

■ Maximum conducted output power

(i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(ii) Set RBW = 1 MHz.
(iii) Set VBW ≥3 MHz.
(iv) Number of points in sweep ≥2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(v) Sweep time = auto.
(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

■ Power Density

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission.

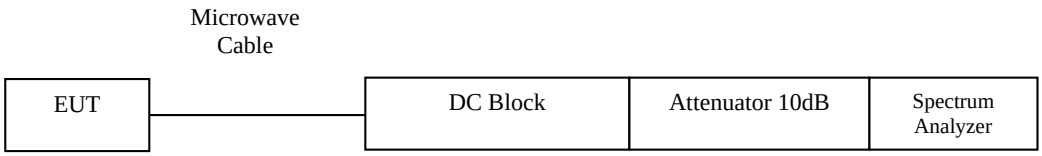
1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable:
   a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.
   b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1 MHz reference bandwidth.
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus

a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥1/T, where T is defined in section II.B.l.a).
b) Set VBW ≥3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHz is available on nearly all spectrum analyzers.

Conducted measurement test setup



3 Test results (enclosure)

Test case	Para. Number	Required	Test passed	Test failed
Peak Transmit Power	15.407(a)	☒	☒	☐
6-dB emission bandwidth	15.407(a)	☒	☒	☐
26-dB emission bandwidth	15.407(a)	☒	☒	☐
99 % Occupied Bandwidth	789033 D02 General UNII Test Procedures New Rules v01	☒	☒	☐
Peak Power Spectral Density	15.407(a)	☒	☒	☐
Undesirable emission limits	15.407(b)	☒	☒	☐
Radio Frequency Exposure	15.407(f)	☒	☒	☐
Transmit Power Control	15.407(h)	☐	☐	☐
Dynamic Frequency Selection (DFS)	15.407(h)	☐	☐	☐
Channel Move Time, Channel Closing Transmission Time	15.407(i)	☐	☐	☐
Radiated Emission from Receiver Part	15.109	☐	☐	☐
AC Conducted Emissions	15.207	☐	☐	☐

The following is intentionally left blank.

3.1 Peak Transmit Power, FCC 15.407 (a)

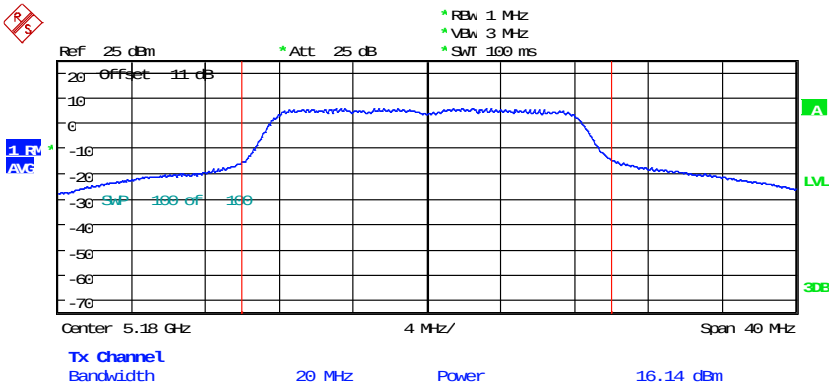
According to §15.407(a)

1. For the band 5.15-5.25 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 30 dBm (1 W) for master device and 24 dBm (250 mW) for mobile/portable client device.

2. For the band 5.25-5.35 GHz and 5.47-5.725 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 24 dBm (250 mW) or 11dBm + 10 log B, whichever is lower (B= 26-dB emission BW).

3. For the band 5.725-5.850 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 30 dBm (1 W).

ANT 1
5.15 GHz ~ 5.25 GHz



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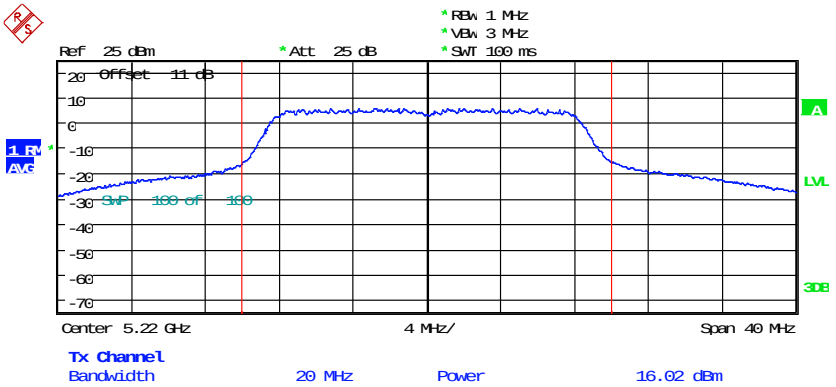
Registration number: W6M21903-18922-C-54
FCC ID: 2AUISION8ION8E



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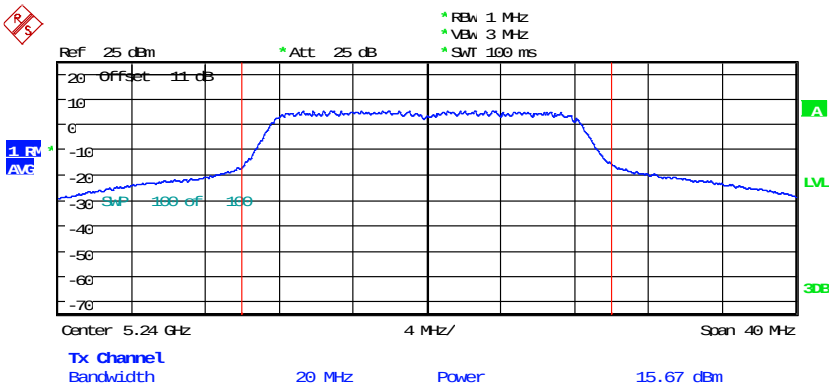

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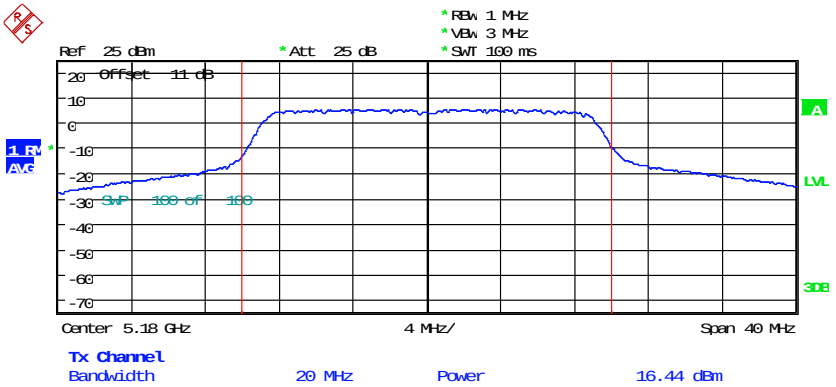

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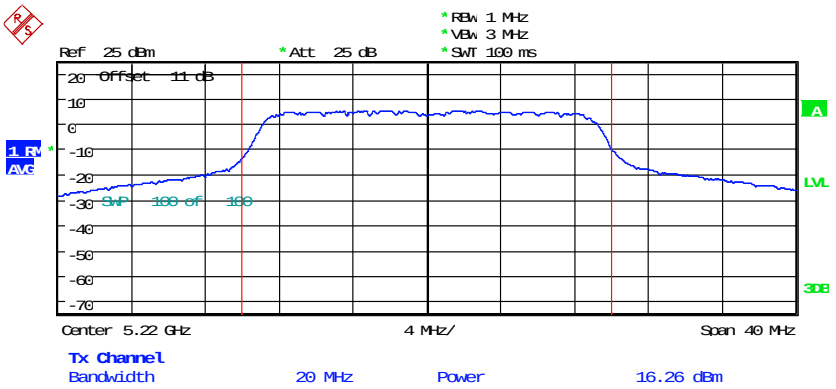

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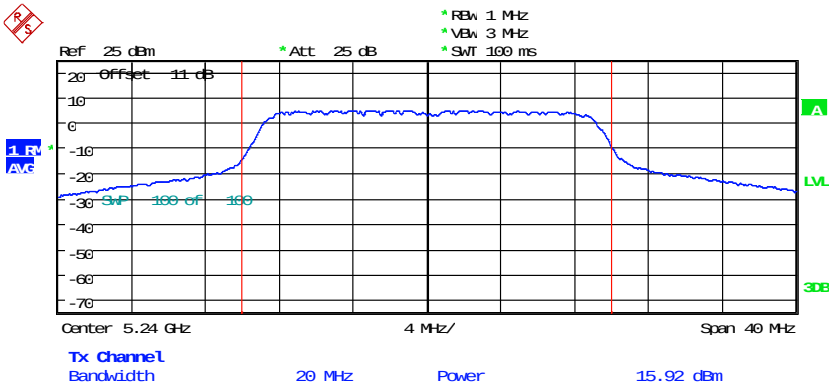

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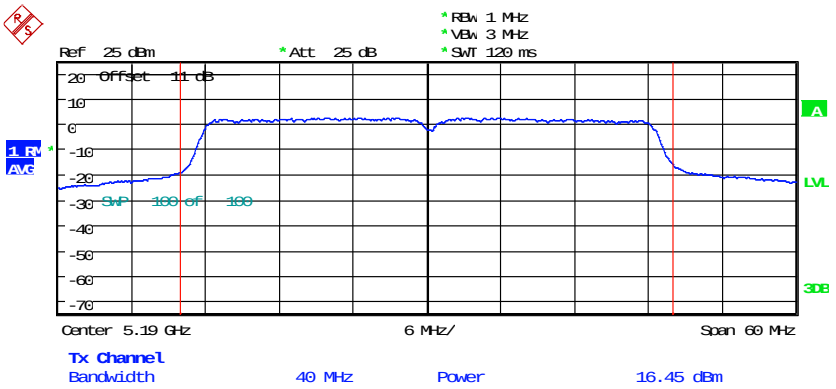

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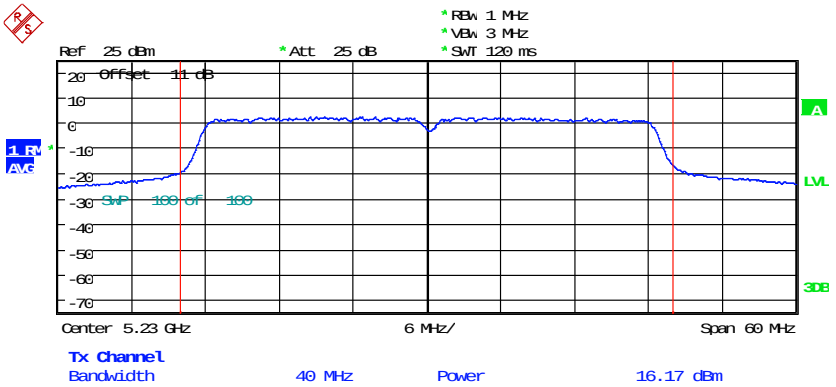

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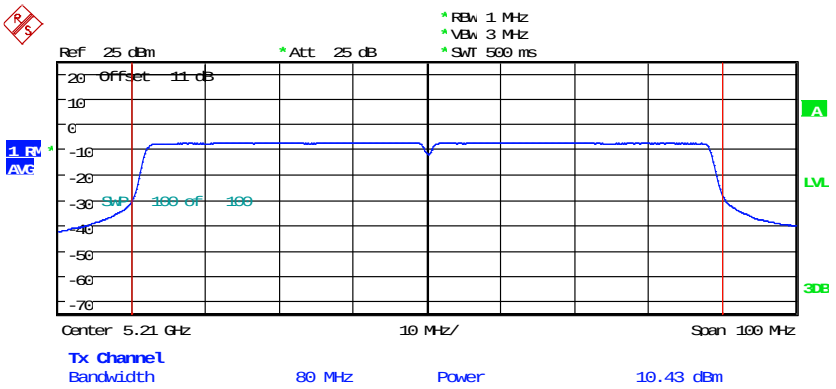

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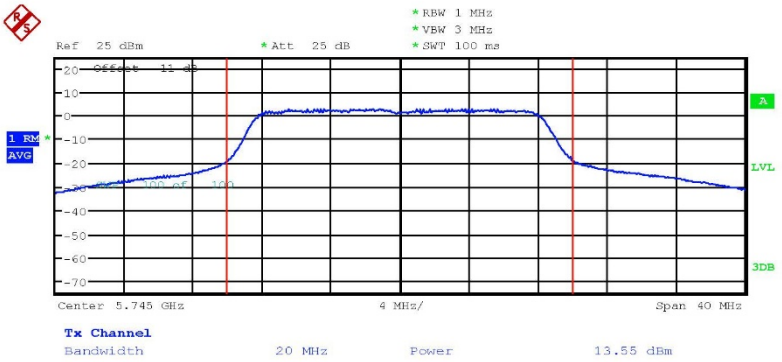
5.725 GHz ~ 5.85 GHz



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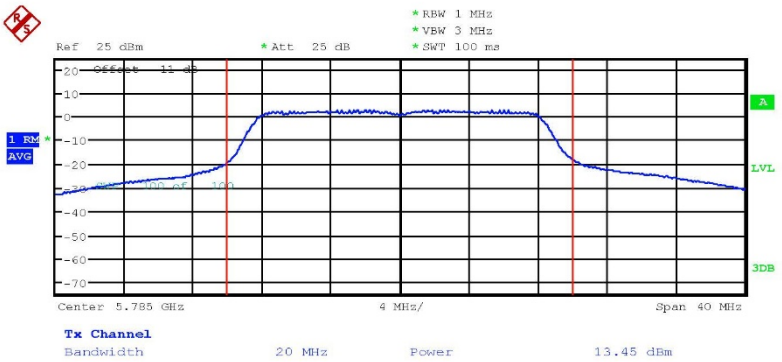

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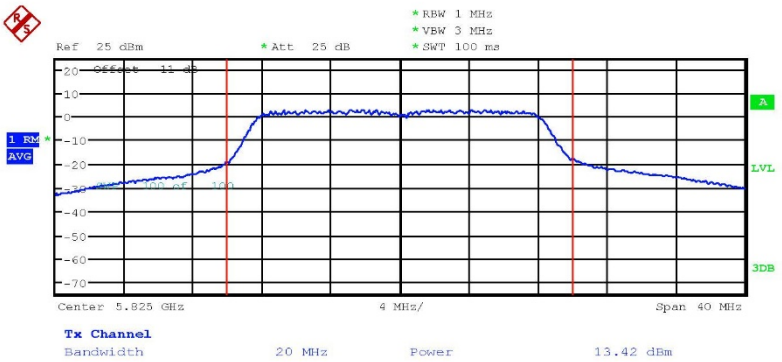

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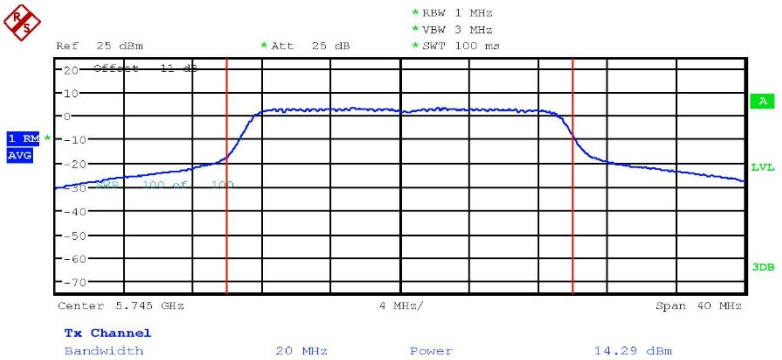

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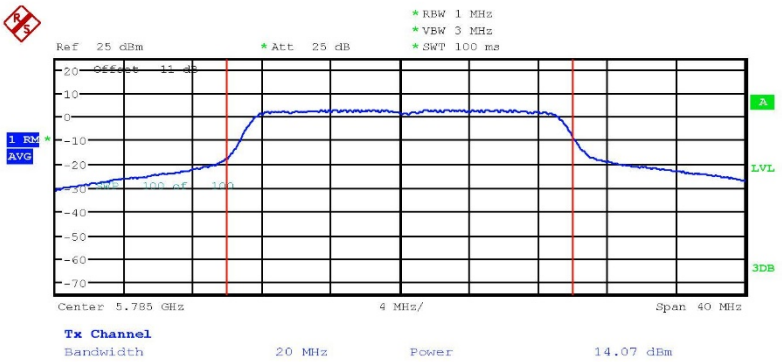

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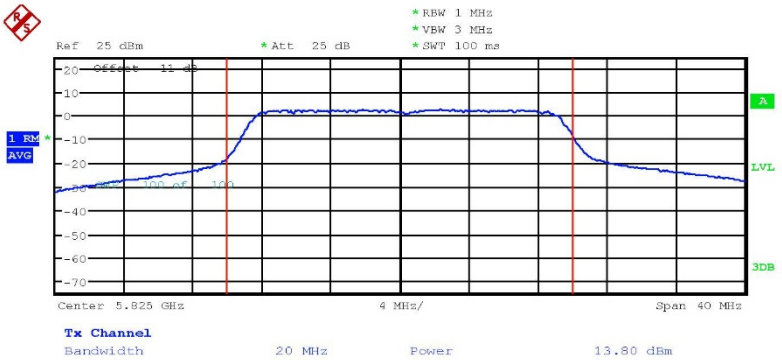

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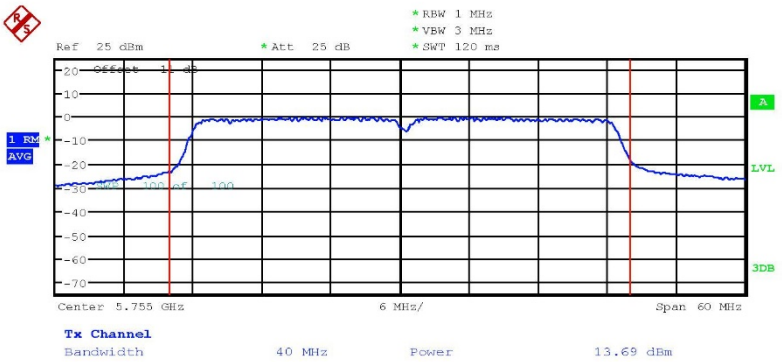

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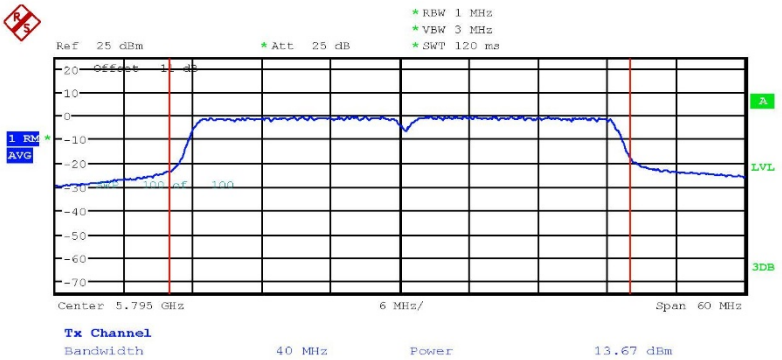

MAXIMUM CONDUCTED POWER ANT1_11n40CH159

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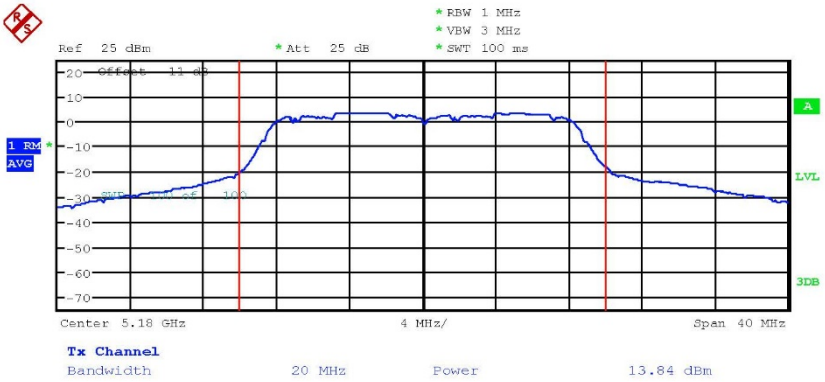
ANT 2
5.15 GHz ~ 5.25 GHz



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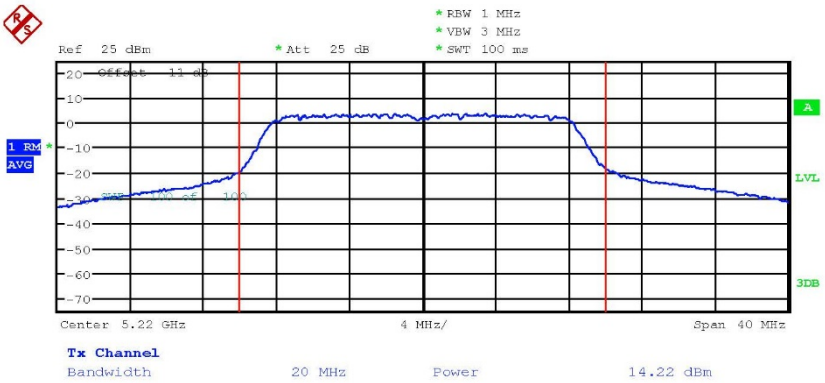

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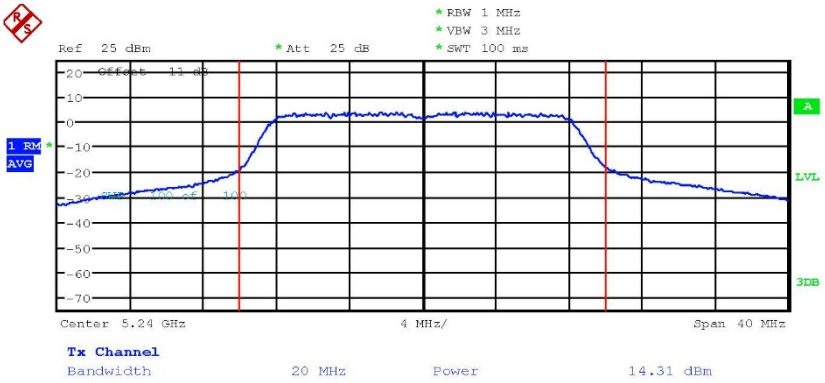

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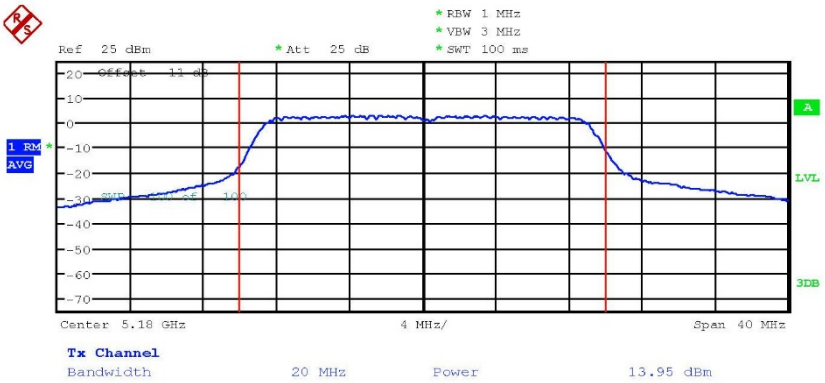

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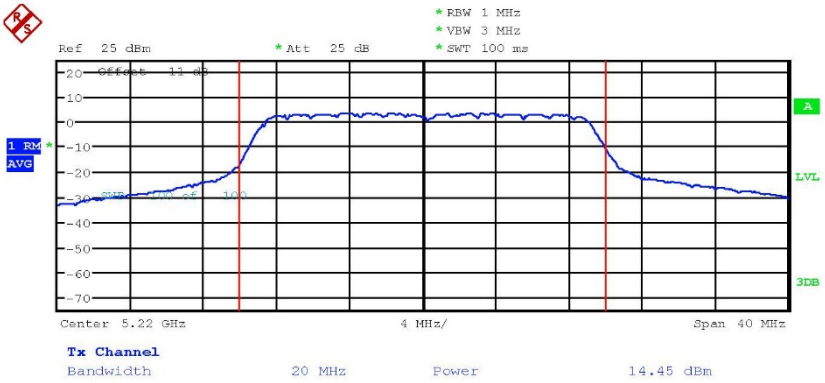

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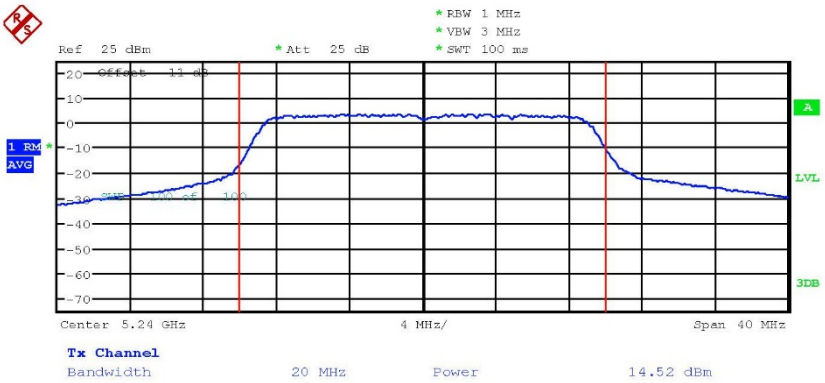

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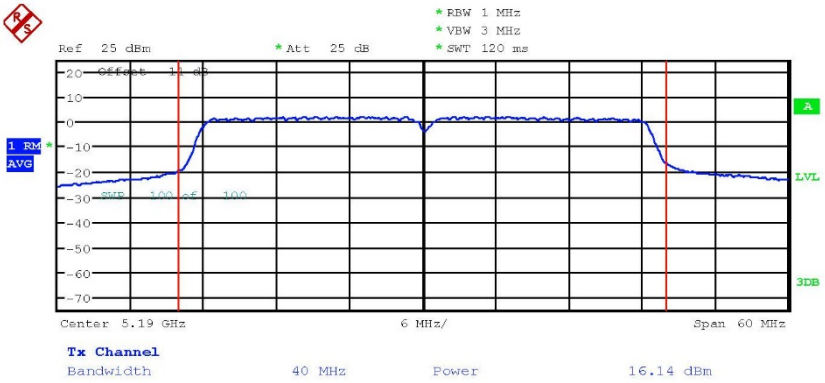

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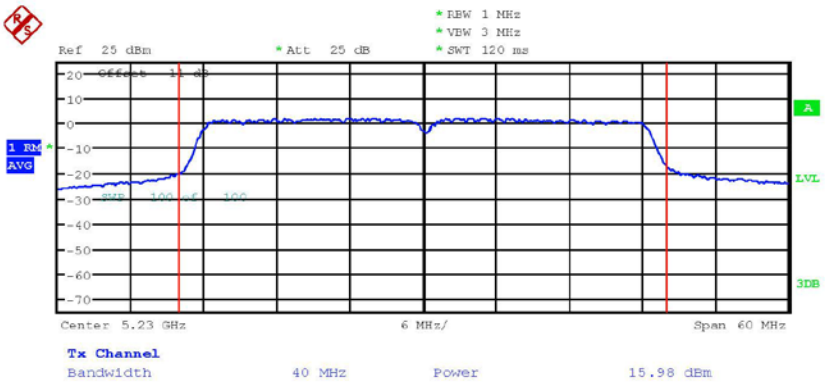

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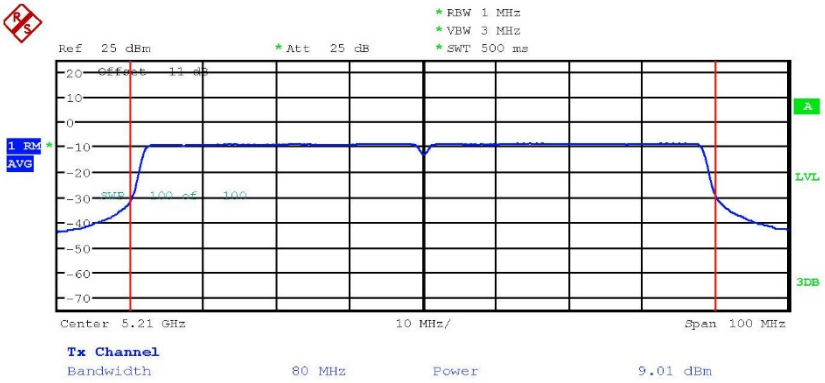
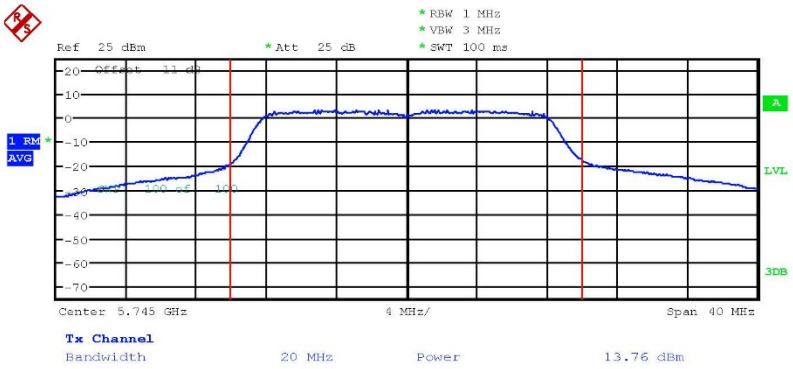


MAXIMUM CONDUCTED POWER ANT2_11ac80CH42

Date: 16.NOV.2019 19:50:23

Registration number: W6M21903-18922-C-54
FCC ID: 2AUISION8ION8E

5.725 GHz ~ 5.85 GHz



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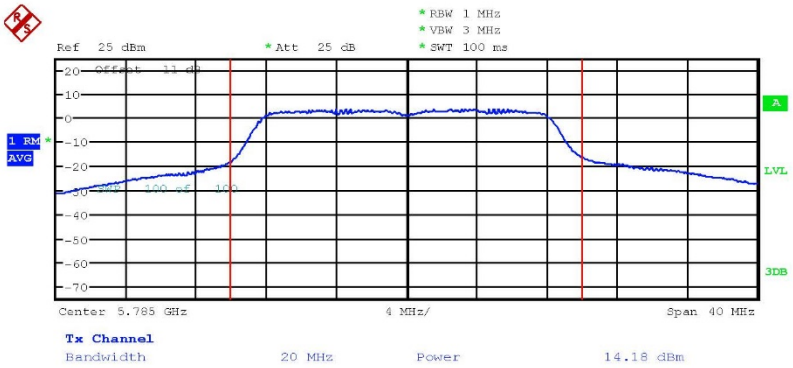
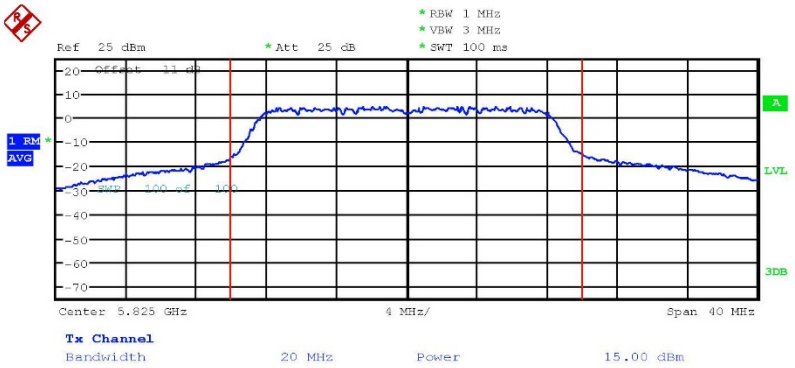
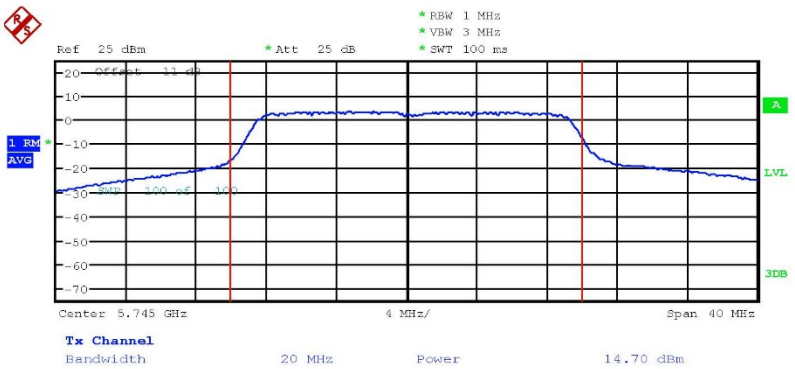


MAXIMUM CONDUCTED POWER ANT2_11aCH157
Date: 15.NOV.2019 17:42:51



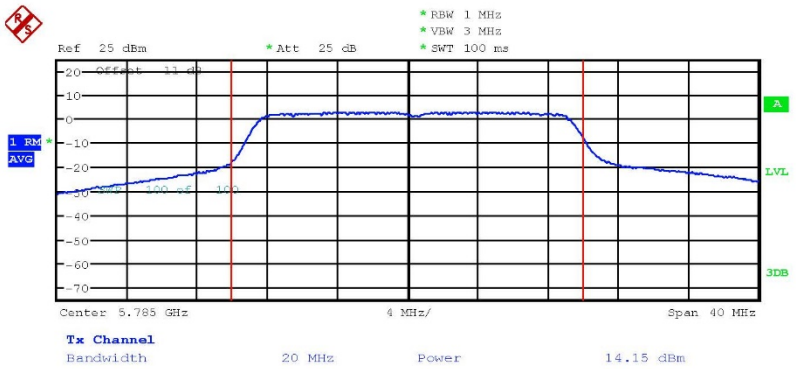
MAXIMUM CONDUCTED POWER ANT2_11aCH165

Date: 15.NOV.2019 19:48:38



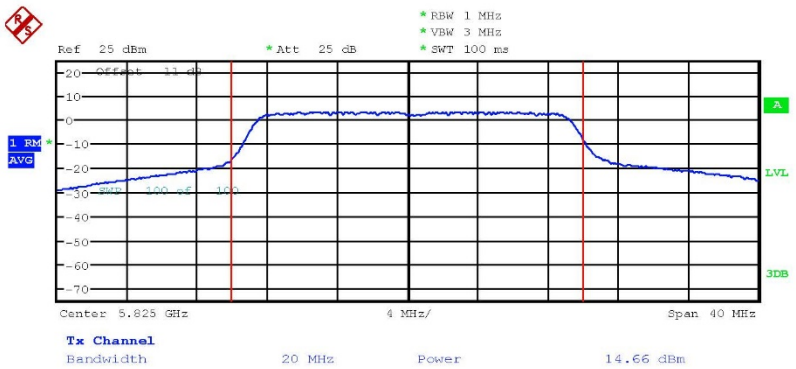
MAXIMUM CONDUCTED POWER ANT2_11n20CH149

Date: 15.NOV.2019 20:31:56



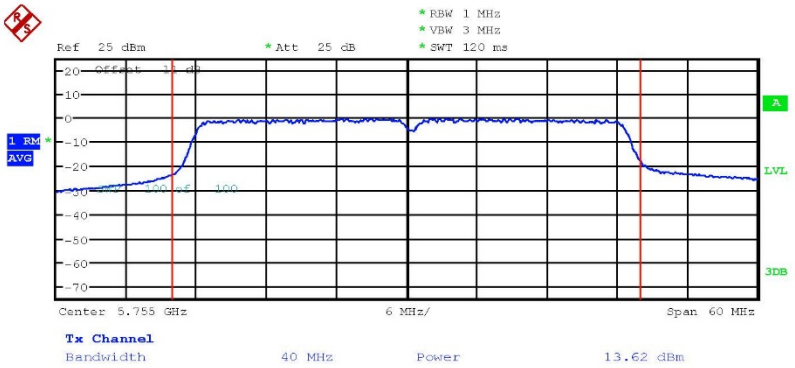
MAXIMUM CONDUCTED POWER ANT2_11n20CH157

Date: 15.NOV.2019 20:38:28



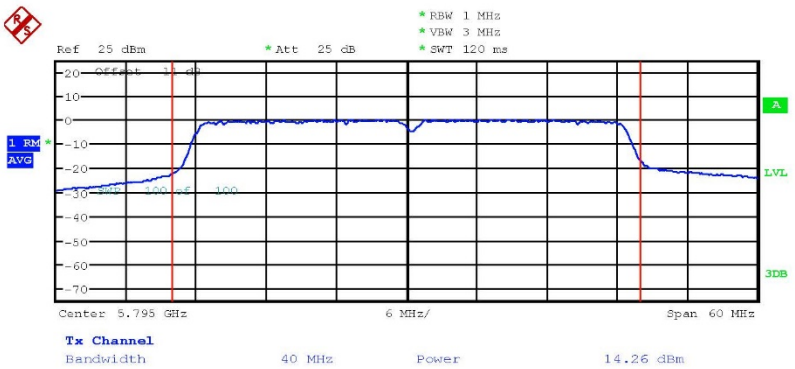
MAXIMUM CONDUCTED POWER ANT2_11n20CH165

Date: 15.NOV.2019 20:56:47



MAXIMUM CONDUCTED POWER ANT2_11n40CH151

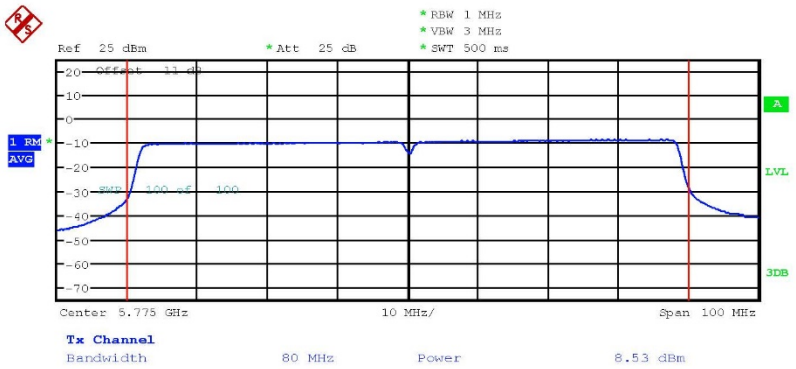
Date: 15.NOV.2019 21:11:30



MAXIMUM CONDUCTED POWER ANT2_11n40CH159

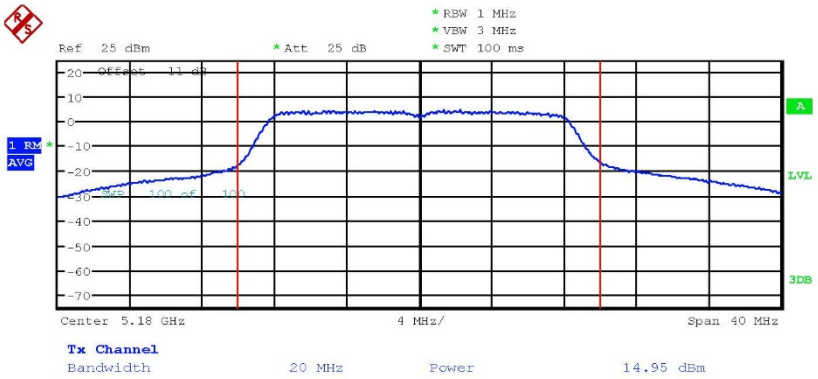
Date: 15.NOV.2019 21:13:01

Registration number: W6M21903-18922-C-54
FCC ID: 2AUISION8ION8E

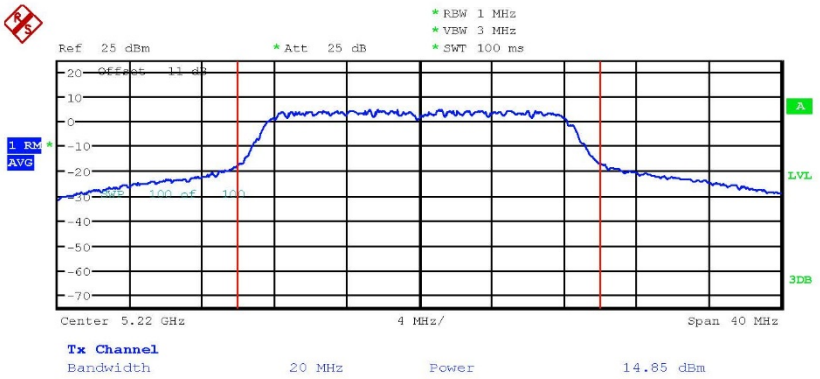


MAXIMUM CONDUCTED POWER ANT2_11ac80CH155
Date: 15.NOV.2019 21:38:24

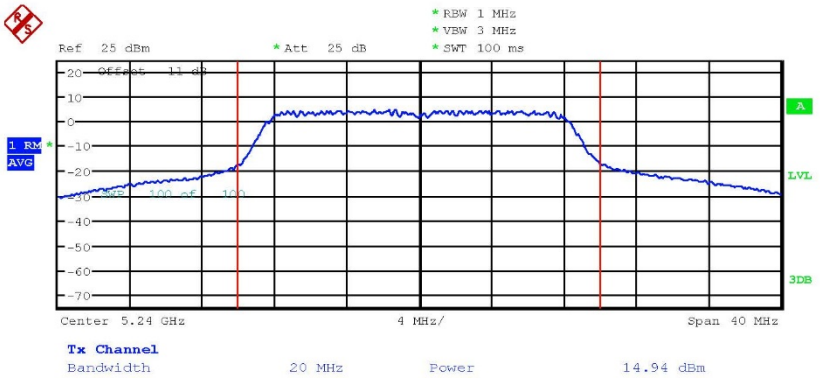
ANT 3
5.15 GHz ~ 5.25 GHz



MAXIMUM CONDUCTED POWER ANT3_11aCH36
Date: 15.NOV.2019 17:14:44

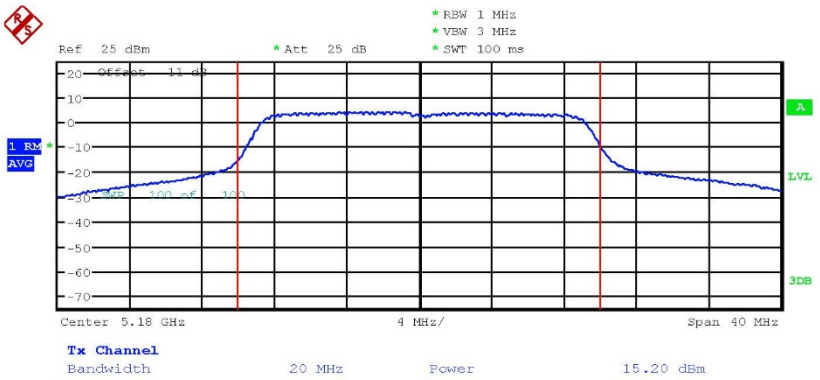


MAXIMUM CONDUCTED POWER ANT3_11aCH44
Date: 15.NOV.2019 17:19:45

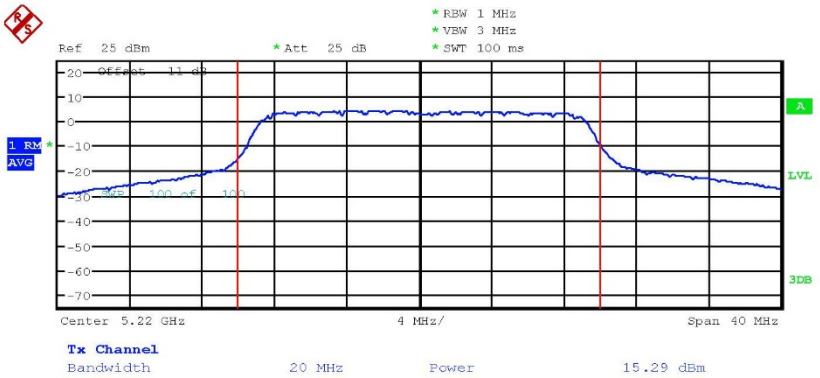


MAXIMUM CONDUCTED POWER ANT3_11aCH48
Date: 15.NOV.2019 17:21:30

Registration number: W6M21903-18922-C-54
FCC ID: 2AUISION8ION8E



MAXIMUM CONDUCTED POWER ANT3_11n20CH36
Date: 15.NOV.2019 16:30:37



MAXIMUM CONDUCTED POWER ANT3_11n20CH44
Date: 15.NOV.2019 16:32:08