

FCC Test Report

Report No.: RWAZ2023000811
Applicant: Shenzhen Neutop Optoelectronics Co., Ltd
Address: 502, BLDG 4, Pingshan minQi Technology Park, No. 65 Lishan Road, Pingshan Community, Taoyuan Street, Nanshan District, Shenzhen, China
Product Name: Projector
Product Model: BOOM 3
Multiple Models: BOOM03, F503, K501, K502 , K503, K504, K505
Trade Mark: N/A
FCC ID: 2BEGB-YX01
Standards: FCC CFR Title 47 Part 15E (§15.407)
Test Date: 2023-12-28 to 2024-01-29
Test Result: Complied
Issue Date: 2024-01-29

Reviewed by:

Frank Yin

Approved by:

Jacob Kong

Frank Yin
Project Engineer

Jacob Kong
Manager

Prepared by:

World Alliance Testing and Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China



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Revision History

Version No.	Issued Date	Description
00	2024-01-29	Original

Contents

1	General Information	4
1.1	Client Information	4
1.2	Product Description of EUT	4
1.3	Antenna information	4
1.4	Related Submittal(s)/Grant(s).....	5
1.5	Measurement Uncertainty	5
1.6	Laboratory Location.....	5
1.7	Test Methodology	5
2	Description of Measurement.....	6
2.1	Test Configuration.....	6
2.2	Test Auxiliary Equipment	7
2.3	Test Setup.....	8
2.4	Test Procedure	10
2.5	Measurement Method.....	11
2.6	Measurement Equipment	11
3	Test Results	13
3.1	Test Summary.....	13
3.2	Limit	14
3.3	AC Line Conducted Emissions Test Data.....	16
3.4	Radiated emission Test Data.....	18
3.5	RF Conducted Test Data	32
3.5.1	26dB/6dB Emission Bandwidth and 99% Occupied Bandwidth	32
3.5.2	Maximum conducted output power	33
3.5.3	Power Spectral Density.....	35
3.5.4	Duty Cycle	37
4	Test Setup Photo.....	57
5	E.U.T Photo	58

1 General Information

1.1 Client Information

Applicant:	Shenzhen Neutop Optoelectronics Co., Ltd
Address:	502, BLDG 4, Pingshan minQi Technology Park, No. 65 Lishan Road, Pingshan Community, Taoyuan Street, Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Neutop Optoelectronics Co., Ltd
Address:	502, BLDG 4, Pingshan minQi Technology Park, No. 65 Lishan Road, Pingshan Community, Taoyuan Street, Nanshan District, Shenzhen, China

1.2 Product Description of EUT

The EUT is a Projector that contains Classic Bluetooth(BDR/EDR), BLE, 2.4G and 5G WLAN radios, this report covers the full testing of the 5G WLAN radio.

Sample Serial number	1L-2 for CE&RE test, 1L-3 for RF test conducted test (assigned by WATC)
Sample Received Date	2023-12-21
Sample Status	Good Condition
Frequency Range	5150 MHz - 5250MHz 5725 MHz - 5850MHz
Maximum Conducted Output Power	5150 MHz - 5250MHz: 16.85dBm 5725 MHz - 5850MHz: 18.97dBm
Modulation Technology	OFDM
Spatial Streams	MIMO (2TX, 2RX)
Antenna Gain [#]	3dBi
Power Supply	AC 110-240V, 50/60Hz
Adapter Information	N/A
Modification	Sample No Modification by the test lab

1.3 Antenna information

15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
Device Antenna information:	
The Wi-Fi antenna is an internal antenna which cannot replace by end-user. Please see the product internal photos for details.	

1.4 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment Class: DSS, FCC ID: 2BEGB-YX01

FCC Part 15, Subpart C, Equipment Class: DTS, FCC ID: 2BEGB-YX01

1.5 Measurement Uncertainty

Parameter		Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
AC Power Lines Conducted Emissions		±3.14dB
Emissions, Radiated	Below 30MHz	±2.78dB
	Below 1GHz	±4.84dB
	Above 1GHz	±5.44dB
Emissions, Conducted		1.75dB
Conducted Power		0.74dB
Frequency Error		150Hz
Bandwidth		0.34%
Power Spectral Density		0.74dB
Note 1: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. Note 2: The Decision Rule is based on simple acceptance with ISO Guide 98-4:2012 Clause 8.2 (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)		

1.6 Laboratory Location

World Alliance Testing and Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Tel: +86-755-29691511, Email: qa@watc.com.cn

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 463912, the FCC Designation No. : CN5040.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0160.

1.7 Test Methodology

FCC CFR 47 Part 2

FCC CFR 47 Part 15

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2020

2 Description of Measurement

2.1 Test Configuration

Operating channels: (5150-5250MHz)					
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
36	5180	42	5210	48	5240
38	5190	44	5220	49	5250
40	5200	46	5230	/	/
According to ANSI C63.10-2020 chapter 5.6.1 Table 11 requirement, select lowest channel, middle channel, and highest channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:					
802.11a, 802.11n-HT20, 802.11ac-VHT20					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
36	5180	40	5200	48	5240
802.11n-HT40, 802.11ac-VHT40					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
38	5190	/	/	46	5230
802.11ac-VHT80					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
/	/	42	5210	/	/

Operating channels: (5725-5850MHz)					
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
149	5745	155	5775	161	5805
151	5755	157	5785	165	5825
153	5765	159	5795	/	/
According to ANSI C63.10-2020 chapter 5.6.1 Table 11 requirement, select lowest channel, middle channel, and highest channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:					
802.11a, 802.11n-HT20, 802.11ac-VHT20					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)

149	5745	157	5785	165	5825
802.11n-HT40, 802.11ac-VHT40					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
151	5755	/	/	159	5795
802.11ac-VHT80					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
/	/	155	5775	/	/

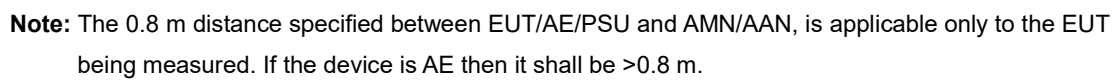
Test Mode:				
Transmitting mode:	Keep the EUT in continuous transmitting with modulation			
Exercise software [#] :	QA-tool 0.0.1.38			
5150-5250MHz Band				
Mode	Data rate	Powel Level Setting [#]		
		Low Channel	Middle Channel	High Channel
802.11a	6Mbps	12	12	12
802.11n-HT20	MCS0	12	12	12
802.11n-HT40	MCS0	17	17	17
802.11ac-VHT80	MCS0	17	17	17
5725-5850MHz Band				
Mode	Data rate	Powel Level Setting [#]		
		Low Channel	Middle Channel	High Channel
802.11a	6Mbps	1B	1B	1B
802.11n-HT20	MCS0	1E	1E	1E
802.11n-HT40	MCS0	1E	1E	1E
802.11ac-VHT80	MCS0	1C	1C	1C
The exercise software and the maximum power setting that provided by manufacturer.				

Worst-Case Configuration:
For AC power line conducted emission and radiated emission 9kHz-1GHz and above 18GHz were performed with the EUT transmits at the channel with highest output power as worst-case scenario.
According to manufacturer, the device support MIMO mode, all modes share the same power level setting under the same modulation. So the worst mode MIMO was selected to test
The ac vht20/ac vht40 were reduced test since the identical parameters with n-ht20/n-ht40.

2.2 Test Auxiliary Equipment

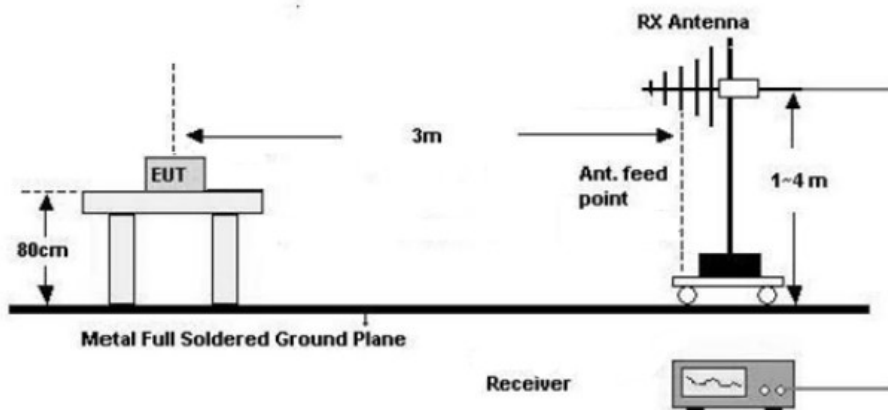
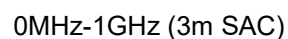
Manufacturer	Description	Model	Serial Number
/	/	/	/

1) Conducted emission measurement:

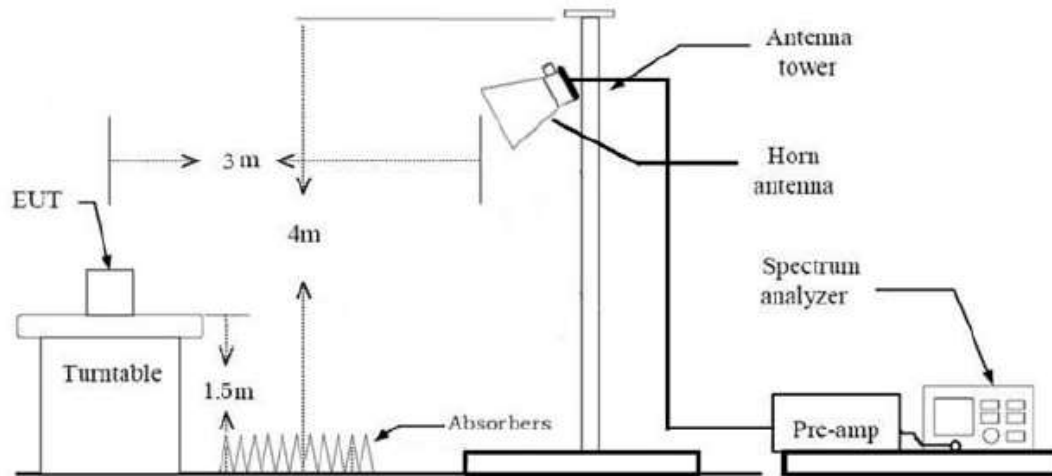


2) Radiated emission measurement:

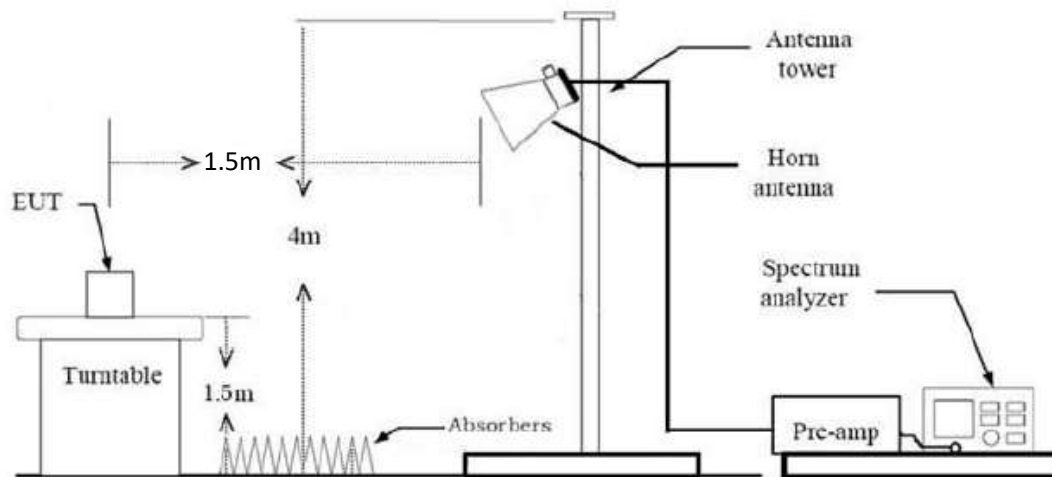
Below 30MHz (3m SAC)



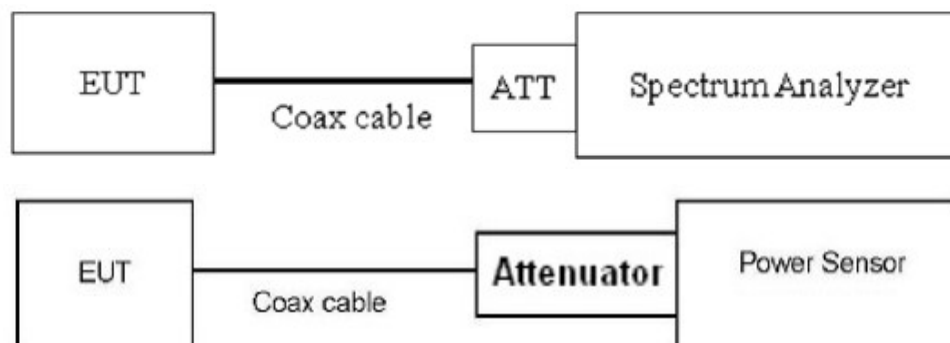
1GHz-18GHz(3m FAC)



Above 18GHz (3m FAC)



3) RF Conducted Test



2.4 Test Procedure

Conducted emission:

1. The E.U.T is placed on a non-conducting table 40cm from the vertical ground plane and 80cm above the horizontal ground plane (Please refer to the block diagram of the test setup and photographs).
2. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
3. Line conducted data is recorded for both Line and Neutral

Radiated Emission Procedure:

a) For below 30MHz

1. All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz- 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were $40 \cdot \log(\text{test distance} / \text{specification distance})$.
2. Loop antenna use, investigation was done on the three antenna orientations (parallel, perpendicular, ground-parallel)

b) For 30MHz-1GHz:

1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m.
2. EUT works in each mode of operation that needs to be tested. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.

c) For above 1GHz:

1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m (1-18GHz) and 1.5 m (above 18GHz).
2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.
3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
4. Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

RF Conducted Test:

1. The antenna port of EUT was connected to the RF port of the test equipment (Power Meter or

Spectrum analyzer) through Attenuator and RF cable.

2. The cable assembly insertion loss of 7.0dB (including 6.0 dB Attenuator and 1.0 dB cable) was entered as an offset in the power meter. Note: Actual cable loss was unavailable at the time of testing, therefore a loss of 1.0dB was assumed as worst case. This was later verified to be true by laboratory. (if the RF cable provided by client, the cable loss declared by client)
3. The EUT is keeping in continuous transmission mode and tested in all modulation modes.

2.5 Measurement Method

Description of Test	Measurement Method
AC Line Conducted Emissions	ANSI C63.10-2020 Section 6.2
Maximum Conducted Output Power	KDB 789033 D02 v02r01 section E.3. b)
Power Spectral Density	KDB 789033 D02 v02r01 section F
26 dB Emission Bandwidth	KDB 789033 D02 v02r01 section C.1
6 dB Emission Bandwidth	KDB 789033 D02 v02r01 section C.2
99% Occupied Bandwidth	KDB 789033 D02 v02r01 section D.
Unwanted Emissions	KDB 789033 D02 v02r01 section G.
Duty Cycle	KDB 789033 D02 v02r01 section B.

2.6 Measurement Equipment

Manufacturer	Description	Model	Management No.	Calibration Date	Calibration Due Date
AC Line Conducted Emission Test					
ROHDE& SCHWARZ	EMI TEST RECEIVER	ESR	101817	2023/7/3	2024/7/2
R&S	LISN	ENV216	101748	2023/8/1	2024/7/30
N/A	Coaxial Cable	NO.12	N/A	2023/7/3	2024/7/2
Farad	Test Software	EZ-EMC	Ver. EMEC-3A1	/	/
Radiated Emission Test					
R&S	EMI test receiver	ESR3	102758	2023/7/3	2024/7/2
ROHDE& SCHWARZ	SPECTRUM ANALYZER	FSV40-N	101608	2023/7/3	2024/7/2
SONOMA INSTRUMENT	Low frequency amplifier	310	186014	2023/7/12	2024/7/11
COM-POWER	preamplifier	PAM-118A	18040152	2023/8/21	2024/8/20

COM-POWER	Amplifier	PAM-840A	461306	2023/8/8	2024/8/7
ETS	Passive Loop Antenna	6512	29604	2023/7/7	2024/7/6
SCHWARZBECK	Log - periodic wideband antenna	VULB 9163	9163-872	2023/7/7	2024/7/6
Astro Antenna Ltd	Horn antenna	AHA-118S	3015	2023/7/6	2024/7/5
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2023/7/10	2024/7/9
Ducommun technologies	Horn Antenna	ARH-2823-02	1007726-03	2023/7/10	2024/7/9
Oulitong	Band Reject Filter	OBSF-5150-585 0-S	OE02104371	2023/9/15	2024/9/14
N/A	Coaxial Cable	N/A	NO.9	2023/8/8	2024/8/7
N/A	Coaxial Cable	N/A	NO.10	2023/8/8	2024/8/7
N/A	Coaxial Cable	N/A	NO.11	2023/8/8	2024/8/7
Audix	Test Software	E3	191218 V9	/	/
RF Conducted Test					
ROHDE& SCHWARZ	SPECTRUM ANALYZER	FSU-26	200680/026	2023/7/12	2024/7/11
ANRITSU	USB Power Sensor	MA24418A	12620	2023/7/12	2024/7/11
narda	6dB attenuator	603-06-1	N/A	2023/7/26	2024/7/25

Note: All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or International standards.

3 Test Results

3.1 Test Summary

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a) §15.407 (b)(9)	AC Line Conducted Emissions	Compliance
§15.407 (a)(1)(iv),(3)(i)	Conducted Peak Output Power Power Spectral Density	Compliance
§15.407 (a)(12)	99% Occupied Bandwidth	Compliance
§15.407 (a)	26 dB Emission Bandwidth	Compliance
§15.407 (e)	6 dB Emission Bandwidth	Compliance
§15.205, §15.209, §15.407 (b)(1), (4), (9), (10)	Unwanted Emissions	Compliance
/	Duty Cycle	Report only

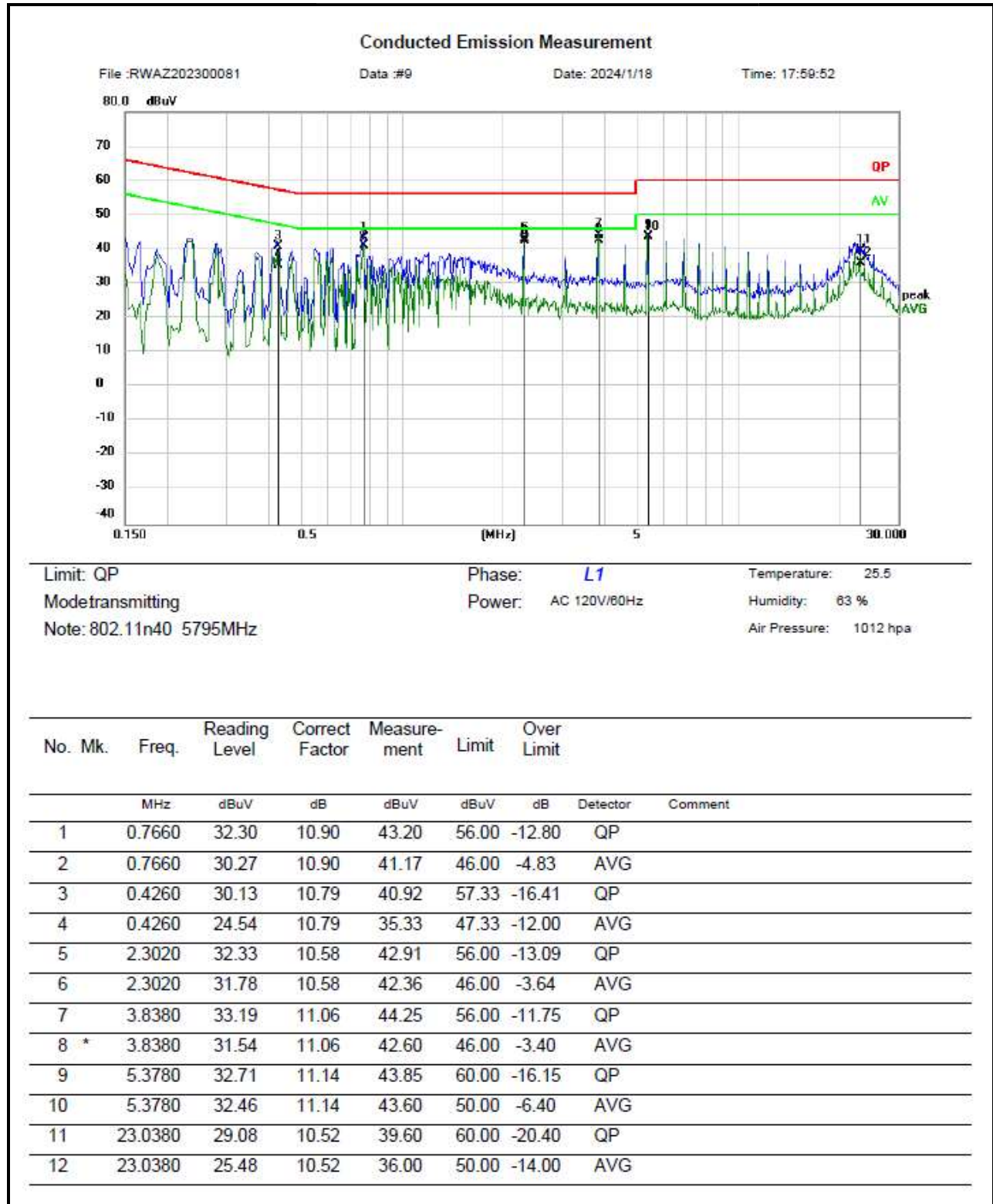
3.2 Limit

Test items	Limit
AC Power Line Conducted Emission	See details §15.207 (a)
Conducted Peak Output Power	For the band 5.150-5.250 GHz Band: For client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. For the band 5.725-5.895 GHz Band: For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, Fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
Power Spectral Density	
26dB Emission Bandwidth 99% Occupied Bandwidth	N/A
6dB Emission Bandwidth	Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Unwanted Emissions	For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of –27 dBm/MHz. For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of –27 dBm/MHz. For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of –27 dBm/MHz. For transmitters operating solely in the 5.725–5.850 GHz band: All emissions shall be limited to a level of –27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. The provisions of § 15.205 apply to intentional radiators operating under this section.
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3.3 AC Line Conducted Emissions Test Data

Test Date:	2024-01-18	Test By:	Lirou Li
Environment condition:	Temperature: 25.5°C; Relative Humidity:63%; ATM Pressure: 101.2kPa		



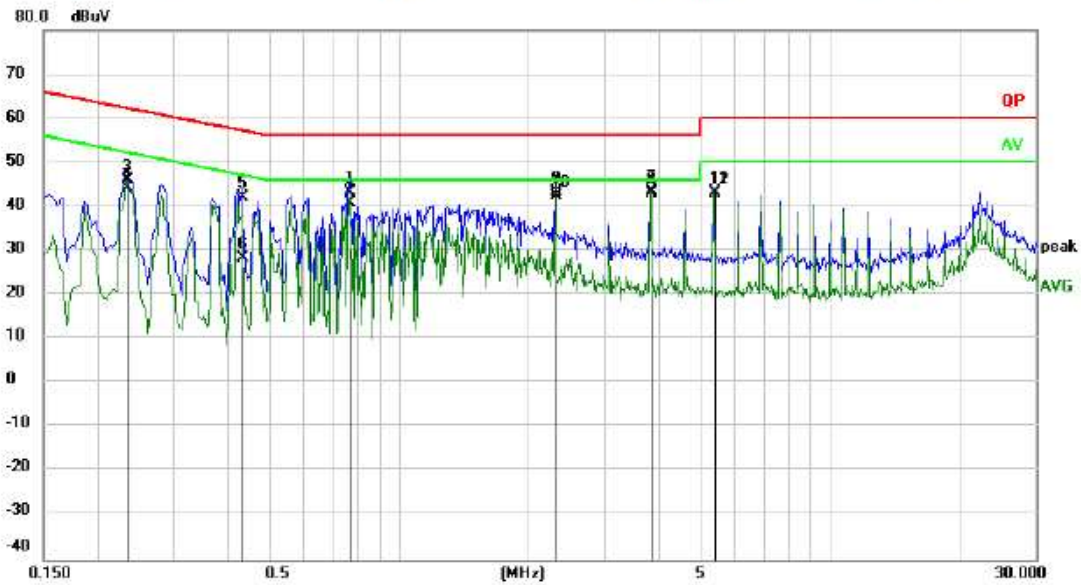
Conducted Emission Measurement

File :RWAZ202300081

Data :#10

Date: 2024/1/18

Time: 18:01:51



Limit: QP

Mode:transmitting

Note: 802.11n40 5795MHz

Phase: **N**

Power: AC 120V/60Hz

Temperature: 25.5

Humidity: 63 %

Air Pressure: 1012 hpa

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over Limit	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.7700	32.63	10.59	43.22	56.00	-12.78	QP
2		0.7700	30.23	10.59	40.82	46.00	-5.18	AVG
3		0.2340	35.55	10.45	46.00	62.31	-16.31	QP
4		0.2340	33.66	10.45	44.11	52.31	-8.20	AVG
5		0.4340	31.51	10.67	42.18	57.18	-15.00	QP
6		0.4340	17.70	10.67	28.37	47.18	-18.81	AVG
7		3.8420	33.14	10.43	43.57	56.00	-12.43	QP
8	*	3.8420	32.45	10.43	42.88	46.00	-3.12	AVG
9		2.3060	32.67	10.64	43.31	56.00	-12.69	QP
10		2.3060	31.77	10.64	42.41	46.00	-3.59	AVG
11		5.3780	32.69	10.58	43.27	60.00	-16.73	QP
12		5.3780	32.51	10.58	43.09	50.00	-6.91	AVG

Remark:

Measurement (dBuV)= Reading Level (dBuV) + Correct Factor(dB)

Correct Factor(dB)= LISN Voltage Division Factor (dB)+ Cable loss(dB)

Over Limit= Measurement – Limit

3.4 Radiated emission Test Data

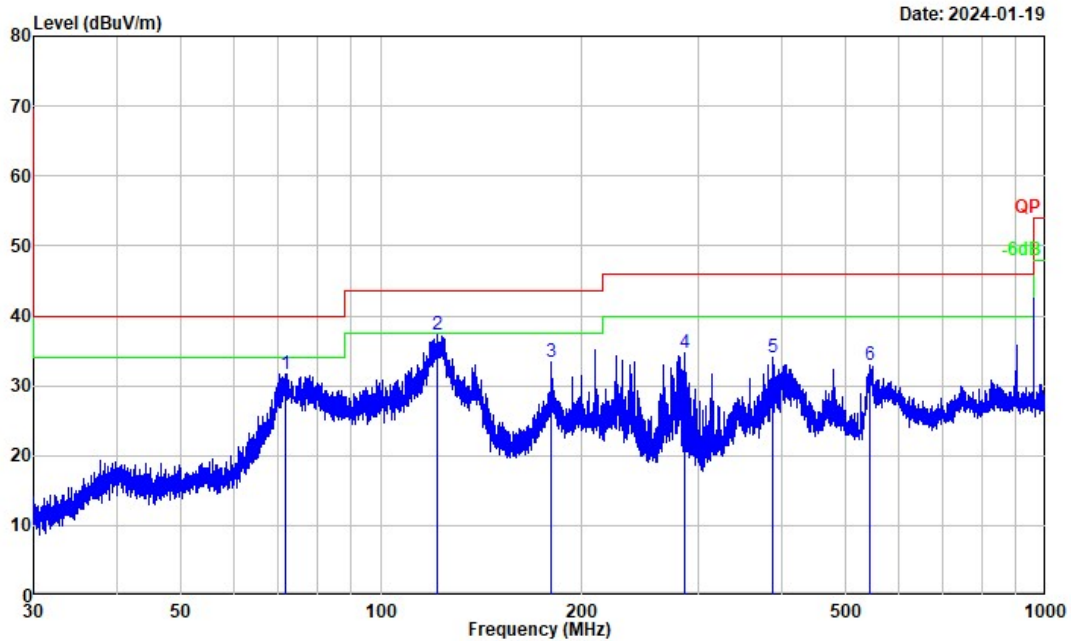
9 kHz-30MHz:

Test Date:	2024-01-18	Test By:	Bard Huang
Environment condition:	Temperature: 23.0°C; Relative Humidity:60%; ATM Pressure: 100.7kPa		

For radiated emissions below 30MHz, there were no emissions found within 20dB of limit.

30MHz-1GHz:

Test Date:	2024-01-19	Test By:	Bard Huang
Environment condition:	Temperature: 23.0°C; Relative Humidity:60%; ATM Pressure: 100.7kPa		

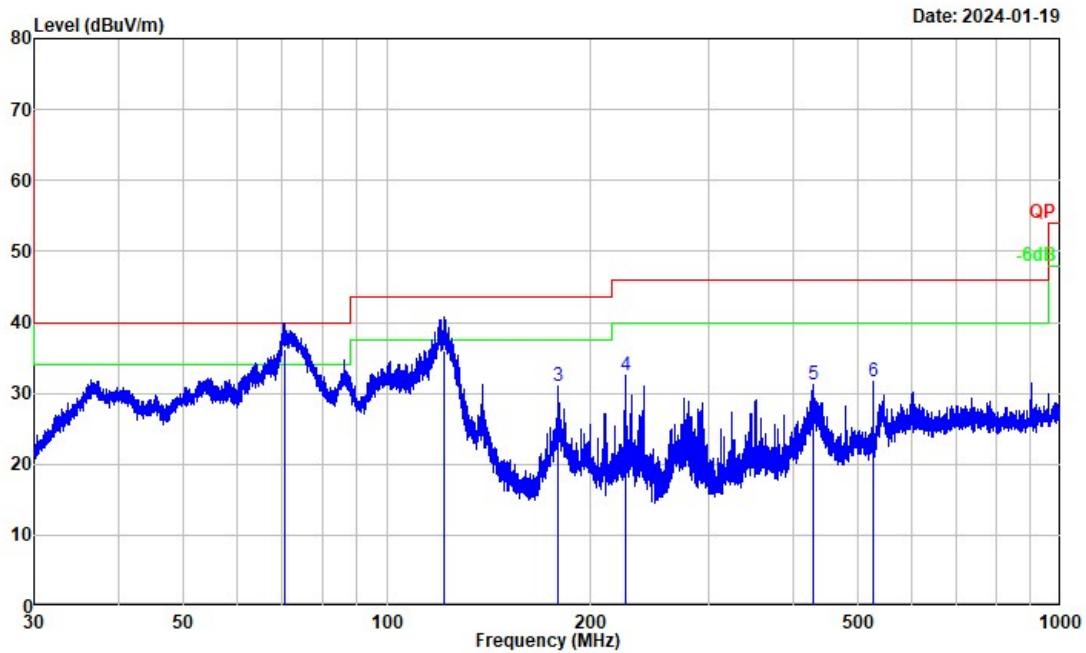


Project No. : RWAZ202300081
 Test Mode : Transmitting
 Test Voltage : AC 120V/60Hz
 Environment : 23.0°C/60%R.H./100.7kPa
 Tested by : Bard Huang
 Polarization : horizontal
 Remark : 802.11n40 5795MHz

--No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Detector

1	71.738	48.74	-17.02	31.72	40.00	-8.28	Peak
2	121.176	53.36	-16.09	37.27	43.50	-6.23	Peak
3	180.017	49.16	-15.71	33.45	43.50	-10.05	Peak
4	285.602	46.30	-11.71	34.59	46.00	-11.41	Peak
5	387.652	42.84	-8.90	33.94	46.00	-12.06	Peak
6	543.274	39.53	-6.48	33.05	46.00	-12.95	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain



Project No. : RWAZ202300081
 Test Mode : Transmitting
 Test Voltage : AC 120V/60Hz
 Environment : 23.0°C/60%R.H./100.7kPa
 Tested by : Bard Huang
 Polarization : vertical
 Remark : 802.11n40 5795MHz

--No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Detector
1	70.707	52.70	-16.60	36.10	40.00	-3.90	QP
2	121.762	52.10	-16.19	35.91	43.50	-7.59	QP
3	179.622	46.82	-15.71	31.11	43.50	-12.39	Peak
4	225.703	45.88	-13.30	32.58	46.00	-13.42	Peak
5	428.207	39.60	-8.29	31.31	46.00	-14.69	Peak
6	526.858	38.40	-6.74	31.66	46.00	-14.34	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain

Remark:

Level = Reading + Factor

Factor = Antenna factor + Cable loss – Amplifier gain

Margin = Level – Limit

Above 1GHz:

Test Date:	2023-12-28	Test By:	Bard Huang
Environment condition:	Temperature: 23.6°C; Relative Humidity:43%; ATM Pressure: 101.7kPa		

5150-5250MHz Band:

Frequency (MHz)	Reading level (dBμV)	Polar (H/V)	Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
802.11a							
Low Channel							
5150.000	37.12	horizontal	11.57	48.69	54.00	-5.31	Average
5150.000	48.47	horizontal	11.57	60.04	68.20	-8.16	Peak
5150.000	37.08	vertical	11.57	48.65	54.00	-5.35	Average
5150.000	50.79	vertical	11.57	62.36	68.20	-5.84	Peak
15540.000	37.54	horizontal	8.11	45.65	54.00	-8.35	Average
15540.000	46.22	horizontal	8.11	54.33	74.00	-19.67	Peak
15540.000	37.49	vertical	8.11	45.60	54.00	-8.40	Average
15540.000	46.84	vertical	8.11	54.95	74.00	-19.05	Peak
Middle Channel							
15600.000	45.66	horizontal	8.10	53.76	74.00	-20.24	Peak
15600.000	37.61	vertical	8.10	45.71	54.00	-8.29	Average
15600.000	46.75	vertical	8.10	54.85	74.00	-19.15	Peak
High Channel							
5350.000	37.25	horizontal	11.44	48.69	54.00	-5.31	Average
5350.000	48.00	horizontal	11.44	59.44	68.20	-8.76	Peak
5350.000	37.27	vertical	11.44	48.71	54.00	-5.29	Average
5350.000	49.58	vertical	11.44	61.02	68.20	-7.18	Peak
15720.000	45.22	horizontal	7.69	52.91	74.00	-21.09	Peak
15720.000	44.13	vertical	7.69	51.82	74.00	-22.18	Peak
802.11n20							
Low Channel							
5150.000	37.05	horizontal	11.57	48.62	54.00	-5.38	Average
5150.000	49.50	horizontal	11.57	61.07	68.20	-7.13	Peak

5150.000	36.81	vertical	11.57	48.38	54.00	-5.62	Average
5150.000	49.11	vertical	11.57	60.68	68.20	-7.52	Peak
15540.000	37.57	horizontal	8.11	45.68	54.00	-8.32	Average
15540.000	46.33	horizontal	8.11	54.44	74.00	-19.56	Peak
15540.000	37.29	vertical	8.11	45.40	54.00	-8.60	Average
15540.000	47.73	vertical	8.11	55.84	74.00	-18.16	Peak
Middle Channel							
15600.000	45.54	horizontal	8.10	53.64	74.00	-20.36	Peak
15600.000	36.43	vertical	8.10	44.53	54.00	-9.47	Average
15600.000	46.92	vertical	8.10	55.02	74.00	-18.98	Peak
High Channel							
5350.000	36.84	horizontal	11.44	48.28	54.00	-5.72	Average
5350.000	48.00	horizontal	11.44	59.44	68.20	-8.76	Peak
5350.000	36.59	vertical	11.44	48.03	54.00	-5.97	Average
5350.000	48.28	vertical	11.44	59.72	68.20	-8.48	Peak
15720.000	43.98	horizontal	7.69	51.67	74.00	-22.33	Peak
15720.000	45.11	vertical	7.69	52.80	74.00	-21.20	Peak
802.11n40							
Low Channel							
5150.000	37.83	horizontal	11.57	49.40	54.00	-4.60	Average
5150.000	54.10	horizontal	11.57	65.67	68.20	-2.53	Peak
5150.000	37.60	vertical	11.57	49.17	54.00	-4.83	Average
5150.000	50.76	vertical	11.57	62.33	68.20	-5.87	Peak
15570.000	36.29	horizontal	8.11	44.40	54.00	-9.60	Average
15570.000	46.20	horizontal	8.11	54.31	74.00	-19.69	Peak
15570.000	45.77	vertical	8.11	53.88	74.00	-20.12	Peak
High Channel							
5350.000	36.82	horizontal	11.44	48.26	54.00	-5.74	Average
5350.000	47.95	horizontal	11.44	59.39	68.20	-8.81	Peak
5350.000	36.75	vertical	11.44	48.19	54.00	-5.81	Average
5350.000	48.50	vertical	11.44	59.94	68.20	-8.26	Peak
15576.290	47.22	horizontal	8.10	55.32	74.00	-18.68	Peak

15576.290	36.73	horizontal	8.10	44.83	54.00	-9.17	Average
15576.290	47.70	vertical	8.10	55.80	74.00	-18.20	Peak
15576.290	36.24	vertical	8.10	44.34	54.00	-9.66	Average
802.11ac80							
5150.000	41.31	horizontal	11.57	52.88	54.00	-1.12	Average
5150.000	50.28	horizontal	11.57	61.85	68.20	-6.35	Peak
5150.000	39.42	vertical	11.57	50.99	54.00	-3.01	Average
5150.000	49.16	vertical	11.57	60.73	68.20	-7.47	Peak
5350.000	37.21	horizontal	11.44	48.65	54.00	-5.35	Average
5350.000	48.87	horizontal	11.44	60.31	68.20	-7.89	Peak
5350.000	37.14	vertical	11.44	48.58	54.00	-5.42	Average
5350.000	47.82	vertical	11.44	59.26	68.20	-8.94	Peak
15630.000	45.83	horizontal	7.98	53.81	74.00	-20.19	Peak
15630.000	45.76	vertical	7.98	53.74	74.00	-20.26	Peak

Remark:

Corrected Amplitude= Reading level + corrected Factor

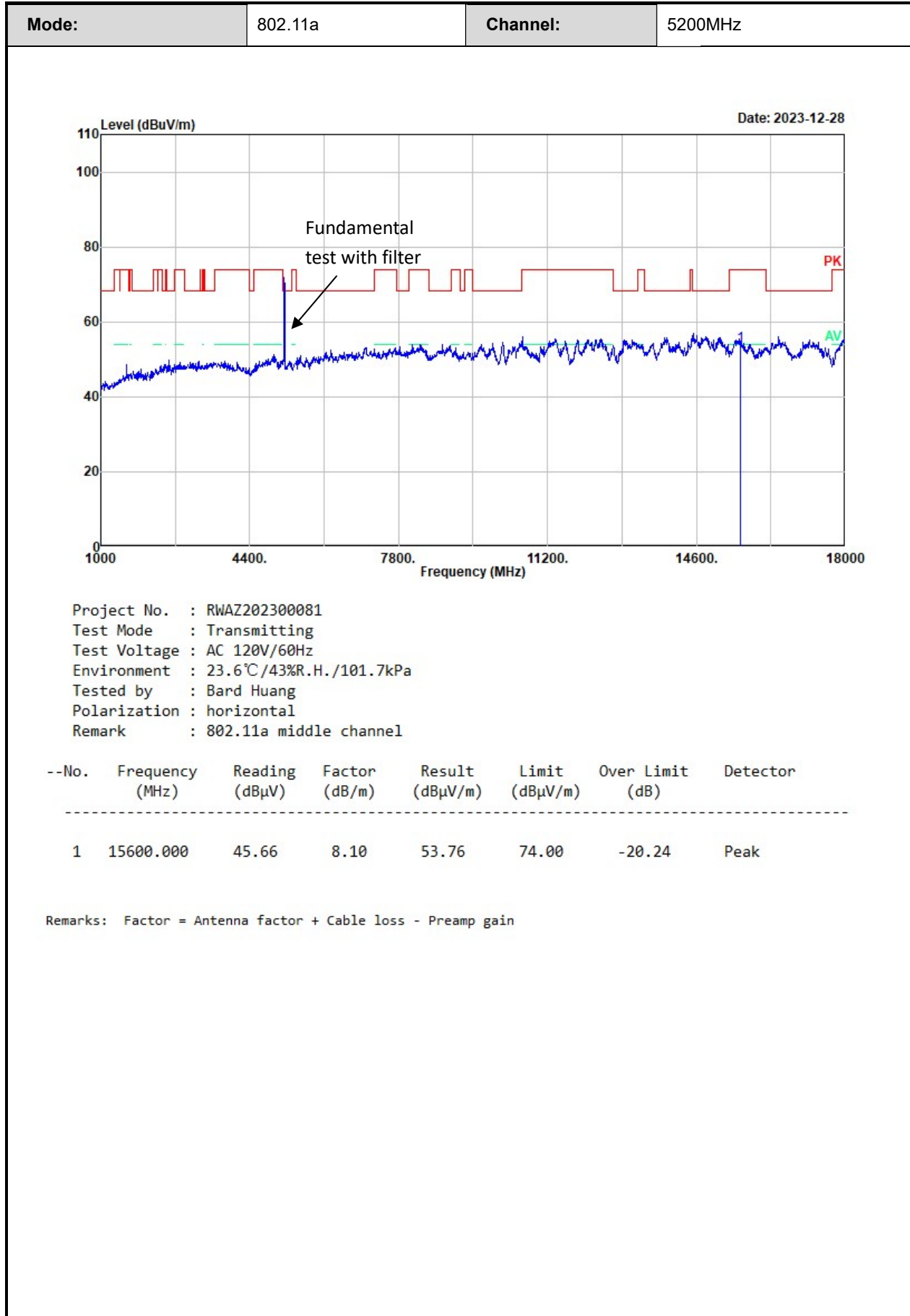
Corrected Factor = Antenna factor + Cable loss – Amplifier gain

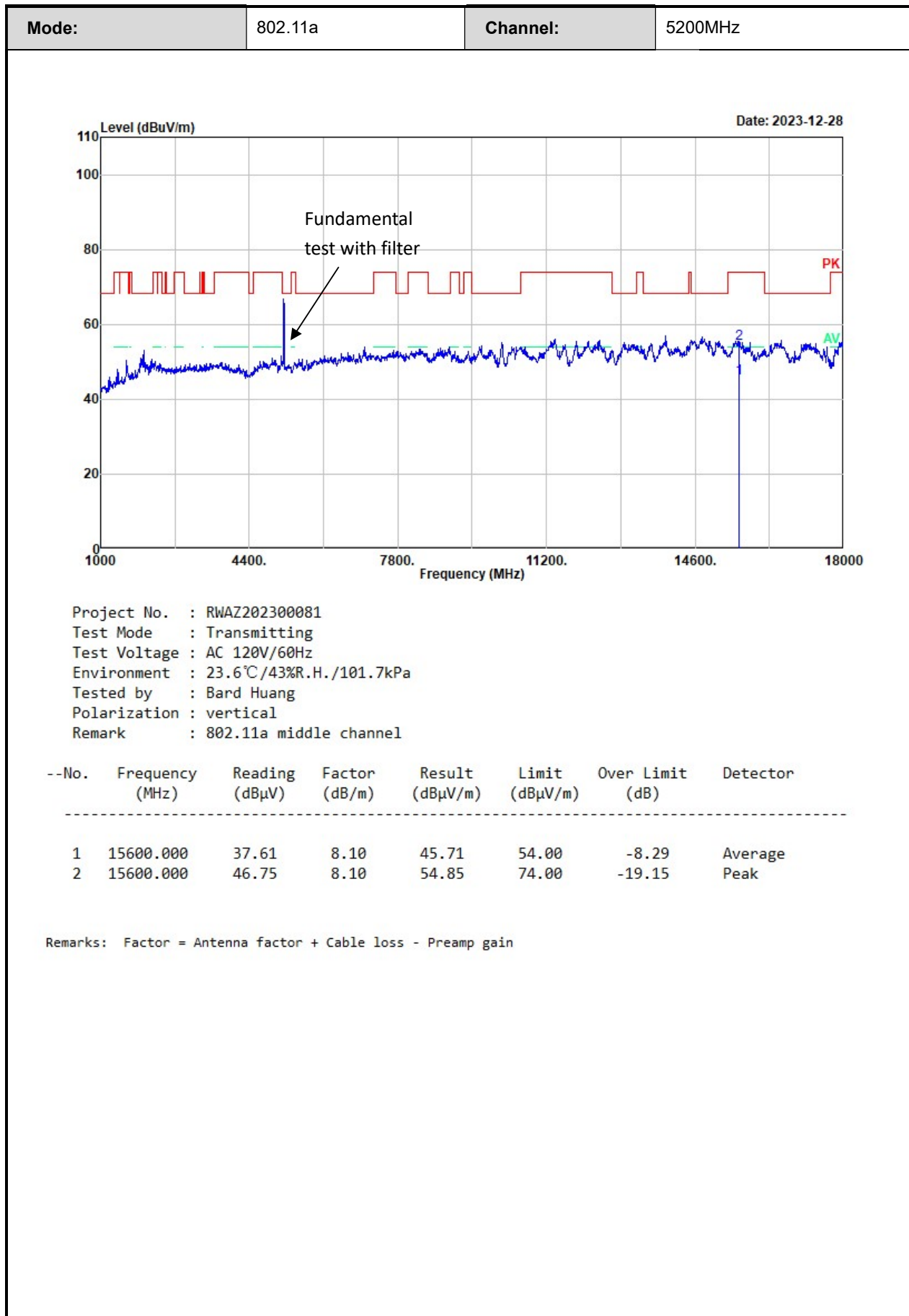
Margin = Corrected Amplitude – Limit

The emission levels of other frequencies that were lower than the limit 20dB, not show in test report.

For emissions in 18GHz-40GHz range, all emissions were investigated and in the noise floor level.

Test plot for example as below:





5725-5850MHz:

Frequency (MHz)	Reading level (dBμV)	Polar (H/V)	Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
802.11a							
Low Channel							
5633.217	50.03	horizontal	11.90	61.93	68.20	-6.27	Peak
5676.038	51.16	horizontal	11.96	63.12	87.51	-24.39	Peak
5702.551	50.08	horizontal	12.00	62.08	105.92	-43.84	Peak
5723.262	59.12	horizontal	12.03	71.15	118.24	-47.09	Peak
5636.918	50.98	vertical	11.91	62.89	68.20	-5.31	Peak
5689.445	50.60	vertical	11.98	62.58	97.42	-34.84	Peak
5709.955	50.23	vertical	12.01	62.24	107.99	-45.75	Peak
5724.862	54.26	vertical	12.03	66.29	121.89	-55.60	Peak
11490.000	45.32	horizontal	6.46	51.78	74.00	-22.22	Peak
11490.000	44.70	vertical	6.46	51.16	74.00	-22.84	Peak
Middle Channel							
11570.000	46.51	horizontal	6.52	53.03	74.00	-20.97	Peak
11570.000	45.67	vertical	6.52	52.19	74.00	-21.81	Peak
High Channel							
5854.352	48.80	horizontal	12.31	61.11	112.28	-51.17	Peak
5874.300	49.19	horizontal	12.38	61.57	105.40	-43.83	Peak
5923.549	48.37	horizontal	12.44	60.81	69.27	-8.46	Peak
5952.164	50.03	horizontal	12.40	62.43	68.20	-5.77	Peak
5854.077	48.15	vertical	12.31	60.46	112.90	-52.44	Peak
5874.300	48.27	vertical	12.38	60.65	105.40	-44.75	Peak
5923.549	49.00	vertical	12.44	61.44	69.27	-7.83	Peak
5931.253	50.40	vertical	12.43	62.83	68.20	-5.37	Peak
11650.000	45.49	horizontal	6.55	52.04	74.00	-21.96	Peak
11650.000	46.63	vertical	6.55	53.18	74.00	-20.82	Peak
802.11n20							
Low Channel							
5648.524	49.35	horizontal	11.91	61.26	68.20	-6.94	Peak

5682.041	50.52	horizontal	11.96	62.48	91.95	-29.47	Peak
5701.426	49.80	horizontal	12.00	61.80	105.60	-43.80	Peak
5724.187	61.11	horizontal	12.03	73.14	120.35	-47.21	Peak
5649.525	48.24	vertical	11.91	60.15	68.20	-8.05	Peak
5659.405	50.39	vertical	11.92	62.31	75.18	-12.87	Peak
5704.677	50.63	vertical	12.00	62.63	106.51	-43.88	Peak
5723.062	58.85	vertical	12.03	70.88	117.78	-46.90	Peak
11490.000	44.56	horizontal	6.46	51.02	74.00	-22.98	Peak
11490.000	45.02	vertical	6.46	51.48	74.00	-22.52	Peak
Middle Channel							
11570.000	45.48	horizontal	6.52	52.00	74.00	-22.00	Peak
11570.000	45.86	vertical	6.52	52.38	74.00	-21.62	Peak
High Channel							
5851.050	50.96	horizontal	12.31	63.27	119.80	-56.53	Peak
5857.379	50.31	horizontal	12.34	62.65	110.13	-47.48	Peak
5896.999	50.75	horizontal	12.47	63.22	88.88	-25.66	Peak
5932.629	50.39	horizontal	12.42	62.81	68.20	-5.39	Peak
5850.638	49.80	vertical	12.31	62.11	120.75	-58.64	Peak
5865.220	49.45	vertical	12.36	61.81	107.94	-46.13	Peak
5889.294	49.77	vertical	12.43	62.20	94.59	-32.39	Peak
5972.937	50.23	vertical	12.32	62.55	68.20	-5.65	Peak
11650.000	45.80	horizontal	6.55	52.35	74.00	-21.65	Peak
11650.000	46.78	vertical	6.55	53.33	74.00	-20.67	Peak
802.11n40							
Low Channel							
5622.886	50.00	horizontal	11.90	61.90	68.20	-6.30	Peak
5656.278	50.25	horizontal	11.92	62.17	72.86	-10.69	Peak
5718.935	55.80	horizontal	12.03	67.83	110.50	-42.67	Peak
5724.062	56.41	horizontal	12.03	68.44	120.06	-51.62	Peak
5604.127	50.26	vertical	11.91	62.17	68.20	-6.03	Peak
5677.039	50.23	vertical	11.96	62.19	88.25	-26.06	Peak
5719.310	54.50	vertical	12.03	66.53	110.61	-44.08	Peak

5724.062	56.62	vertical	12.03	68.65	120.06	-51.41	Peak
11510.000	46.44	horizontal	6.48	52.92	74.00	-21.08	Peak
11510.000	44.92	vertical	6.48	51.40	74.00	-22.60	Peak
High Channel							
5852.151	50.32	horizontal	12.31	62.63	117.29	-54.66	Peak
5860.956	49.98	horizontal	12.34	62.32	109.13	-46.81	Peak
5897.411	50.12	horizontal	12.47	62.59	88.58	-25.99	Peak
5956.841	49.81	horizontal	12.39	62.20	68.20	-6.00	Peak
5853.665	48.18	vertical	12.31	60.49	113.84	-53.35	Peak
5865.495	49.40	vertical	12.36	61.76	107.86	-46.10	Peak
5883.792	50.07	vertical	12.41	62.48	98.67	-36.19	Peak
5938.131	49.82	vertical	12.42	62.24	68.20	-5.96	Peak
11590.000	46.83	horizontal	6.53	53.36	74.00	-20.64	Peak
11590.000	45.89	vertical	6.53	52.42	74.00	-21.58	Peak
802.11ac80							
5607.379	50.04	horizontal	11.91	61.95	68.20	-6.25	Peak
5692.671	57.75	horizontal	11.99	69.74	99.80	-30.06	Peak
5717.684	62.09	horizontal	12.03	74.12	110.15	-36.03	Peak
5723.187	63.93	horizontal	12.03	75.96	118.07	-42.11	Peak
5637.269	50.20	vertical	11.91	62.11	68.20	-6.09	Peak
5691.045	52.91	vertical	11.98	64.89	98.60	-33.71	Peak
5711.181	56.55	vertical	12.01	68.56	108.33	-39.77	Peak
5720.936	54.22	vertical	12.03	66.25	112.93	-46.68	Peak
5850.500	59.32	horizontal	12.31	71.63	121.06	-49.43	Peak
5872.787	54.35	horizontal	12.37	66.72	105.82	-39.10	Peak
5919.560	50.51	horizontal	12.45	62.96	72.21	-9.25	Peak
5931.391	50.23	horizontal	12.43	62.66	68.20	-5.54	Peak
5851.050	50.27	vertical	12.31	62.58	119.80	-57.22	Peak
5864.670	51.30	vertical	12.35	63.65	108.09	-44.44	Peak
5908.830	50.27	vertical	12.46	62.73	80.13	-17.40	Peak
5930.703	50.64	vertical	12.43	63.07	68.20	-5.13	Peak
11550.000	45.82	horizontal	6.50	52.32	74.00	-21.68	Peak

11550.000	45.67	vertical	6.50	52.17	74.00	-21.83	Peak
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Remark:

Corrected Amplitude= Reading level + corrected Factor

Corrected Factor = Antenna factor + Cable loss – Amplifier gain

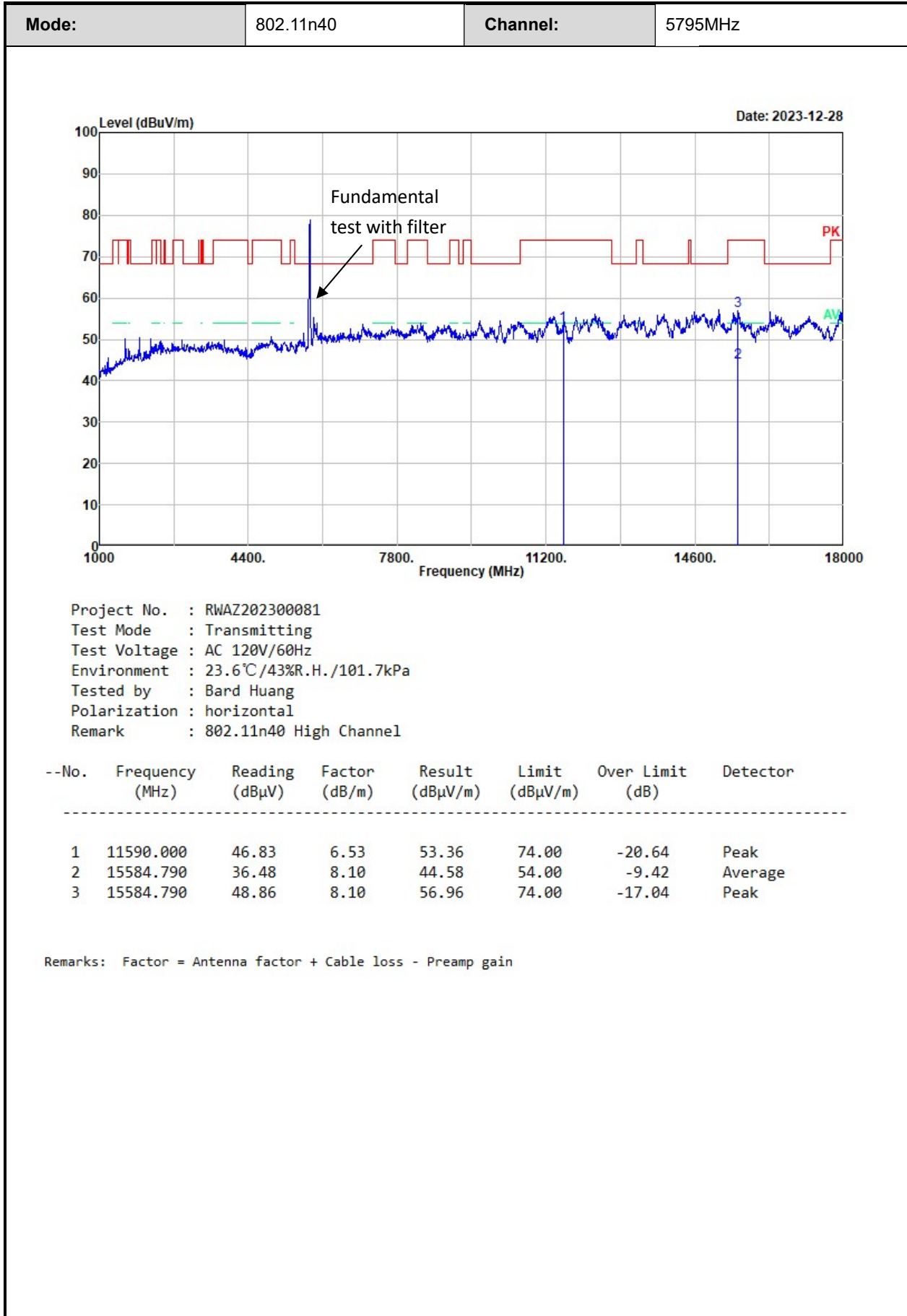
Margin = Corrected Amplitude – Limit

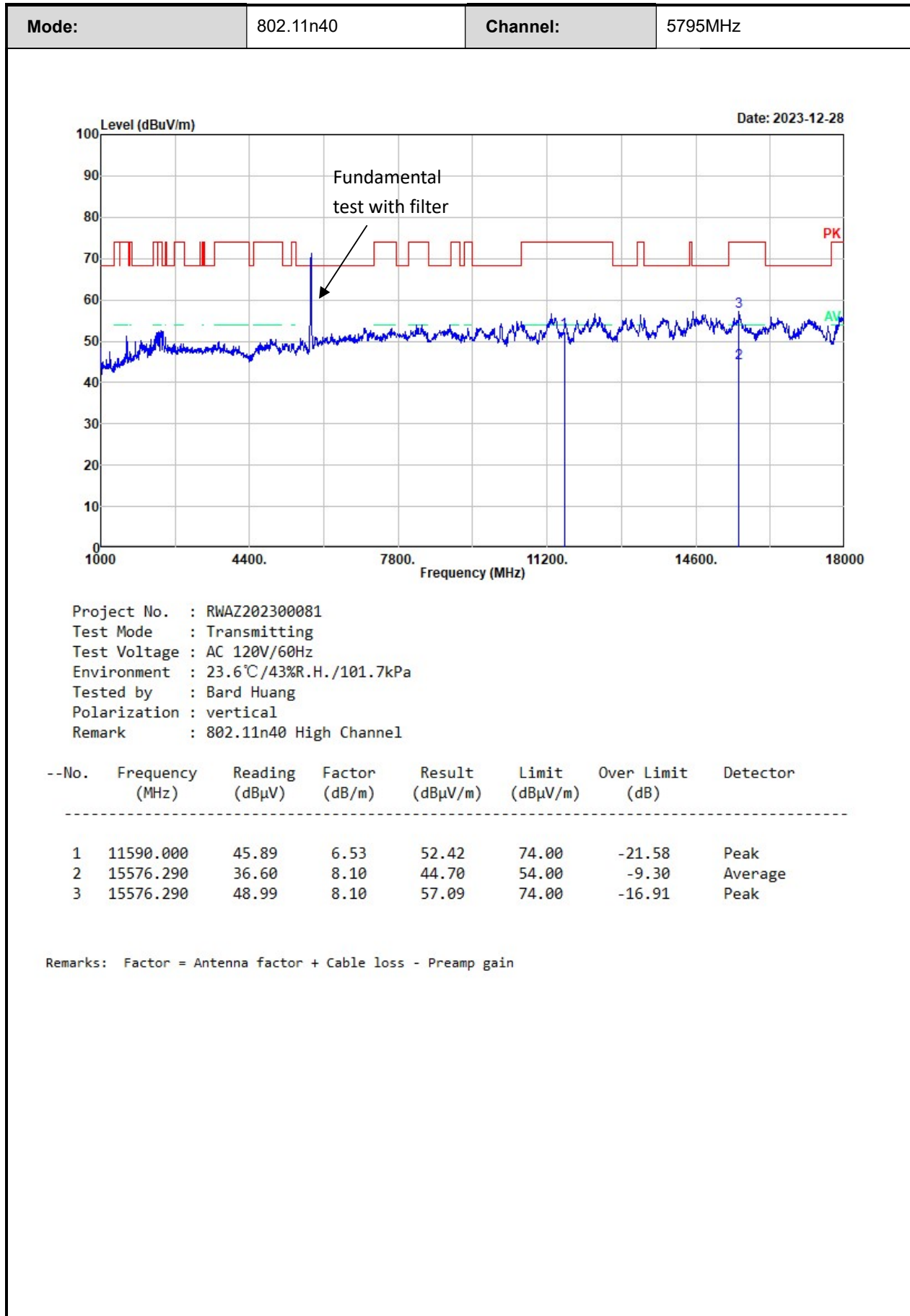
For the test result of Peak below the Peak limit more than 20dB, which can compliance with the average limit, just the Peak level was recorded.

The emission levels of other frequencies that were lower than the limit 20dB, not show in test report.

For emissions in 18GHz-40GHz range, all emissions were investigated and in the noise floor level.

Test plot for example as below:





3.5 RF Conducted Test Data

Test Date:	2024-01-09~2024-01-29	Test By:	Baylor Li
Environment condition:	Temperature: 22.3~24.5°C; Relative Humidity: 49~55%; ATM Pressure: 101.4~102.8kPa		

3.5.1 26dB/6dB Emission Bandwidth and 99% Occupied Bandwidth

Test Mode	Antenna	Channel	26dB BW [MHz]	99% OBW [MHz]
802.11a	Ant1	5180	20.480	16.800
		5200	20.240	16.800
		5240	20.400	16.880
	Ant2	5180	20.560	16.880
		5200	20.320	16.960
		5240	20.400	16.800
802.11n HT20	Ant1	5180	20.640	17.760
		5200	20.800	17.760
		5240	20.640	17.760
	Ant2	5180	20.400	16.800
		5200	20.480	16.880
		5240	20.400	16.880
802.11n HT40	Ant1	5190	40.800	36.320
		5230	40.320	36.320
	Ant2	5190	40.640	36.320
		5230	40.800	36.480
802.11ac VHT80	Ant1	5210	81.920	75.520
	Ant2	5210	81.280	75.520
Note: the device not operate with any part of OBW fall within U-NII 2A band				

Test Mode	Antenna	Channel	6dB BW [MHz]	99% OBW [MHz]	6dB BW Limit [MHz]	Verdict
802.11a	Ant1	5745	15.200	16.880	0.5	Pass
		5785	15.200	16.800	0.5	Pass
		5825	15.200	16.960	0.5	Pass
	Ant2	5745	15.200	17.040	0.5	Pass
		5785	15.200	17.040	0.5	Pass
		5825	15.360	16.960	0.5	Pass
802.11n HT20	Ant1	5745	15.200	18.000	0.5	Pass
		5785	15.200	17.920	0.5	Pass
		5825	15.200	17.920	0.5	Pass
	Ant2	5745	15.200	18.320	0.5	Pass
		5785	15.200	18.160	0.5	Pass

		5825	15.200	18.080	0.5	Pass
802.11n HT40	Ant1	5755	35.200	36.480	0.5	Pass
		5795	35.360	36.480	0.5	Pass
	Ant2	5755	35.040	36.960	0.5	Pass
		5795	34.880	36.640	0.5	Pass
802.11ac VHT80	Ant1	5775	75.520	75.520	0.5	Pass
	Ant2	5775	75.200	75.840	0.5	Pass
Note: the device not operate with any part of OBW fall within U-NII 2C band						

3.5.2 Maximum conducted output power

Test Mode	Antenna	Channel [MHz]	Result [dBm]	Limit [dBm]	Verdict
802.11a	Ant1	5180	10.30	24	Pass
		5200	10.21	24	Pass
		5240	10.21	24	Pass
	Ant2	5180	10.66	24	Pass
		5200	10.54	24	Pass
		5240	10.31	24	Pass
	Total	5180	13.49	24	Pass
		5200	13.39	24	Pass
		5240	13.27	24	Pass
802.11n HT20	Ant1	5180	10.11	24	Pass
		5200	10.14	24	Pass
		5240	10.00	24	Pass
	Ant2	5180	10.50	24	Pass
		5200	10.39	24	Pass
		5240	10.13	24	Pass
	Total	5180	13.32	24	Pass
		5200	13.28	24	Pass
		5240	13.08	24	Pass
802.11n HT40	Ant1	5190	13.73	24	Pass
		5230	13.59	24	Pass
	Ant2	5190	13.94	24	Pass
		5230	13.72	24	Pass
	Total	5190	16.85	24	Pass
		5230	16.67	24	Pass
802.11ac VHT80	Ant1	5210	13.13	24	Pass
	Ant2	5210	13.30	24	Pass
	Total	5210	16.23	24	Pass

Test Mode	Antenna	Channel [MHz]	Result [dBm]	Limit [dBm]	Verdict
802.11a	Ant1	5745	14.84	30	Pass
		5785	15.02	30	Pass
		5825	14.86	30	Pass
	Ant2	5745	14.13	30	Pass
		5785	14.50	30	Pass
		5825	14.70	30	Pass
	Total	5745	17.51	30	Pass
		5785	17.78	30	Pass
		5825	17.79	30	Pass
802.11n HT20	Ant1	5745	15.78	30	Pass
		5785	15.75	30	Pass
		5825	15.72	30	Pass
	Ant2	5745	15.59	30	Pass
		5785	15.83	30	Pass
		5825	16.10	30	Pass
	Total	5745	18.70	30	Pass
		5785	18.80	30	Pass
		5825	18.92	30	Pass
802.11n HT40	Ant1	5755	15.83	30	Pass
		5795	15.84	30	Pass
	Ant2	5755	15.78	30	Pass
		5795	16.08	30	Pass
	Total	5755	18.82	30	Pass
		5795	18.97	30	Pass
802.11ac VHT80	Ant1	5755	14.95	30	Pass
	Ant2	5755	14.85	30	Pass
	Total	5755	17.91	30	Pass

3.5.3 Power Spectral Density

Test Mode	Antenna	Channel [MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Verdict
802.11a	Ant1	5180	0.04	11	Pass
		5200	-0.07	11	Pass
		5240	-0.07	11	Pass
	Ant2	5180	0.38	11	Pass
		5200	0.26	11	Pass
		5240	0.20	11	Pass
	Total	5180	3.22	11	Pass
		5200	3.11	11	Pass
		5240	3.08	11	Pass
802.11n HT20	Ant1	5180	-0.31	11	Pass
		5200	-0.37	11	Pass
		5240	-0.37	11	Pass
	Ant2	5180	0.05	11	Pass
		5200	-0.07	11	Pass
		5240	-0.26	11	Pass
	Total	5180	2.88	11	Pass
		5200	2.79	11	Pass
		5240	2.70	11	Pass
802.11n HT40	Ant1	5190	0.27	11	Pass
		5230	0.37	11	Pass
	Ant2	5190	0.60	11	Pass
		5230	0.37	11	Pass
	Total	5190	3.45	11	Pass
		5230	3.38	11	Pass
802.11ac VHT80	Ant1	5210	-3.30	11	Pass
	Ant2	5210	-3.20	11	Pass
	Total	5210	-0.24	11	Pass
Note: Method SA-1 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 was used.					

Test Mode	Antenna	Channel [MHz]	Result [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
802.11a	Ant1	5745	1.18	30	Pass
		5785	1.36	30	Pass
		5825	1.39	30	Pass
	Ant2	5745	1.17	30	Pass
		5785	1.55	30	Pass
		5825	1.79	30	Pass
	Total	5745	4.19	30	Pass
		5785	4.47	30	Pass
		5825	4.60	30	Pass
802.11n HT20	Ant1	5745	2.33	30	Pass
		5785	2.39	30	Pass
		5825	2.37	30	Pass
	Ant2	5745	2.35	30	Pass
		5785	2.61	30	Pass
		5825	2.84	30	Pass
	Total	5745	5.35	30	Pass
		5785	5.51	30	Pass
		5825	5.62	30	Pass
802.11n HT40	Ant1	5755	-0.38	30	Pass
		5795	-0.30	30	Pass
	Ant2	5755	-0.49	30	Pass
		5795	-0.20	30	Pass
	Total	5755	2.58	30	Pass
		5795	2.76	30	Pass
802.11ac VHT80	Ant1	5755	-4.60	30	Pass
	Ant2	5755	-4.81	30	Pass
	Total	5755	-1.69	30	Pass

3.5.4 Duty Cycle

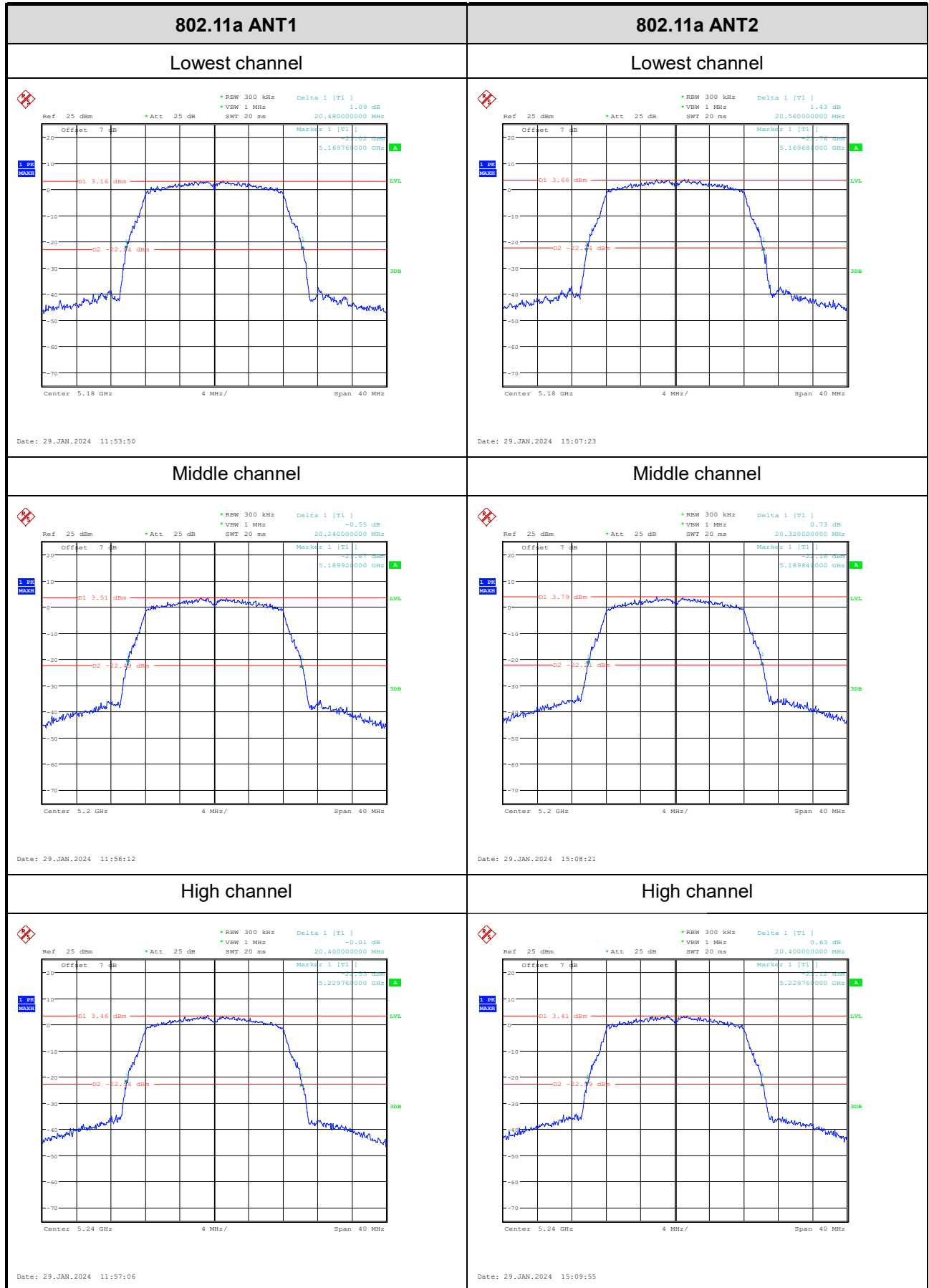
Test Mode	Antenna	Ton (ms)	Ton+off (ms)	Duty Cycle [%]	1/T[kHz]	VBW setting* [Hz]
802.11a	Ant1	1.417	1.465	96.72	0.706	1000
802.11n HT20	Ant1	1.314	1.368	96.05	0.761	1000
802.11n HT40	Ant1	0.649	0.709	91.54	1.541	2000
802.11ac VHT80	Ant1	0.197	0.261	75.48	5.076	10000

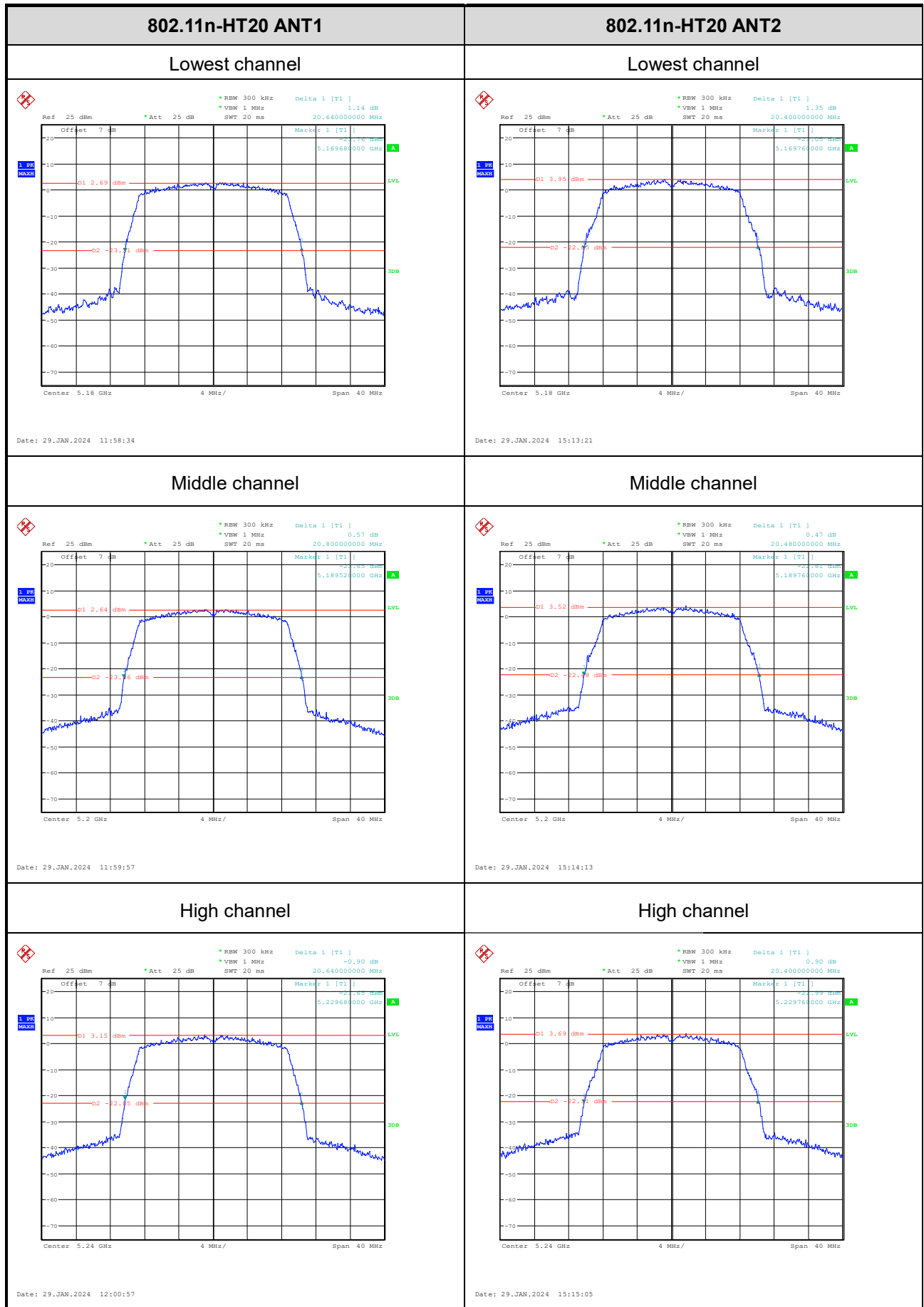
Note: test only performed on antenna 1.

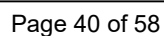
Note*: Radiated emission test with average value, the Spectrum analyzer VBW setting information.

Test Plots:

26dB Emission Bandwidth:

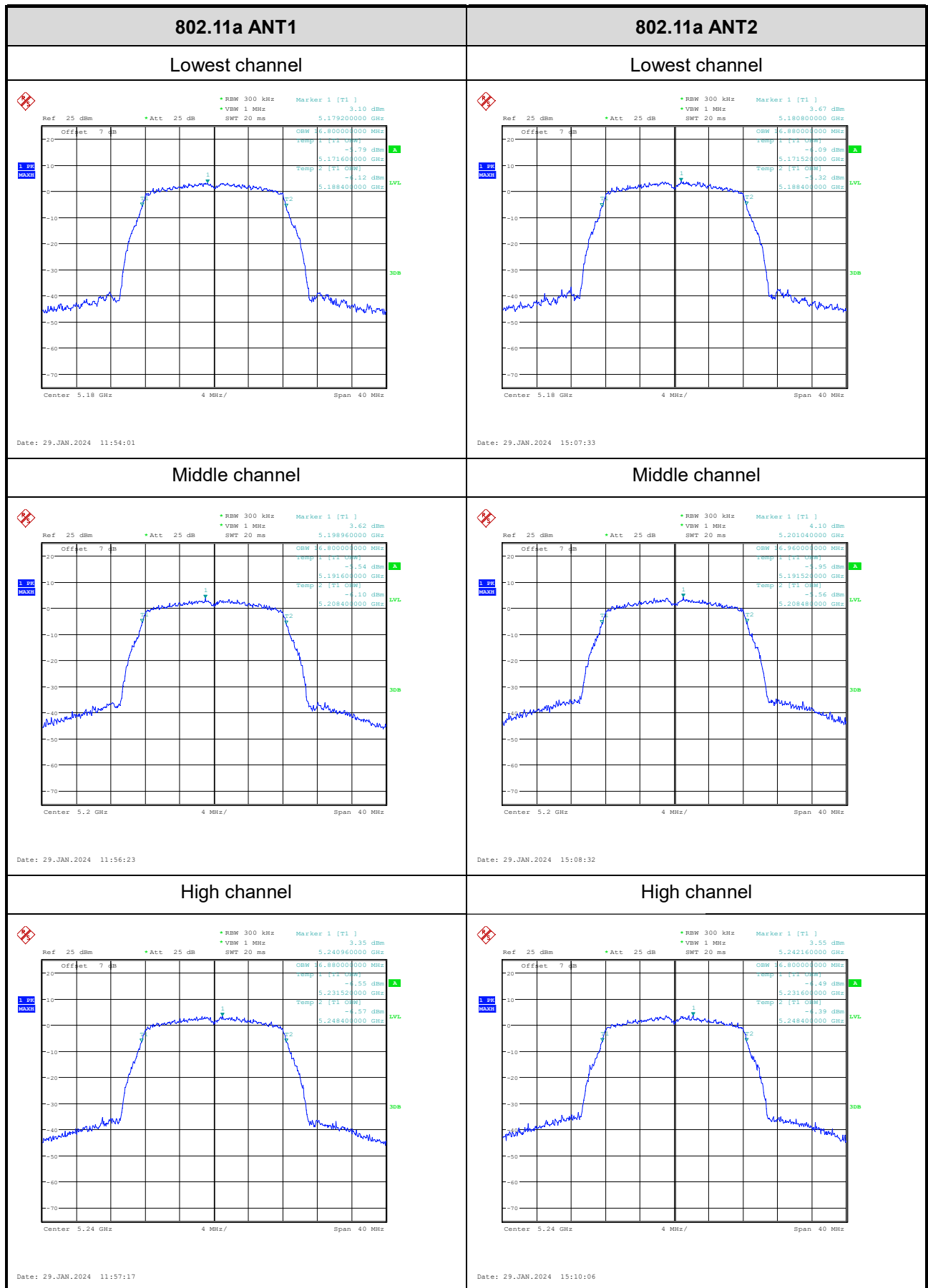


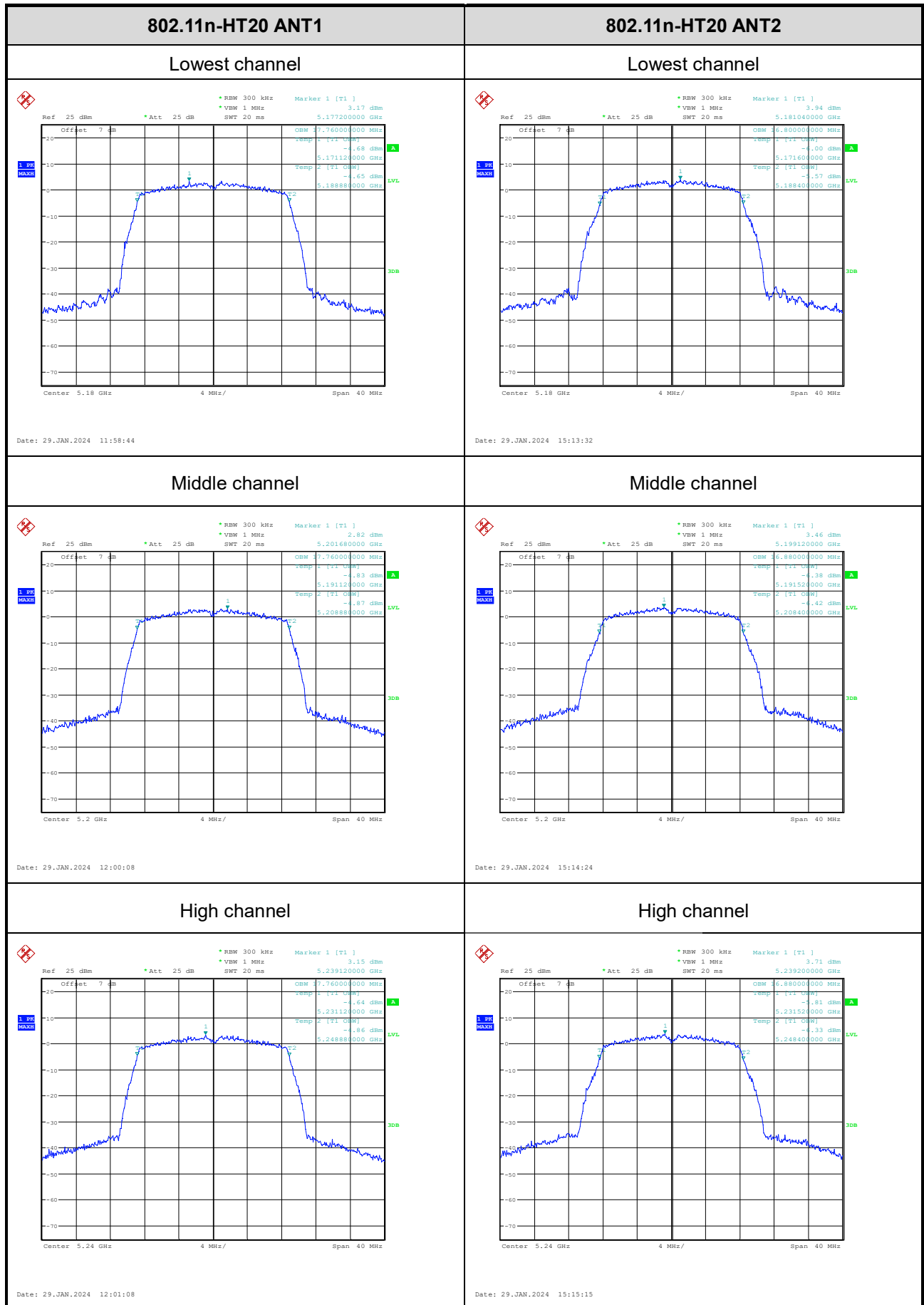


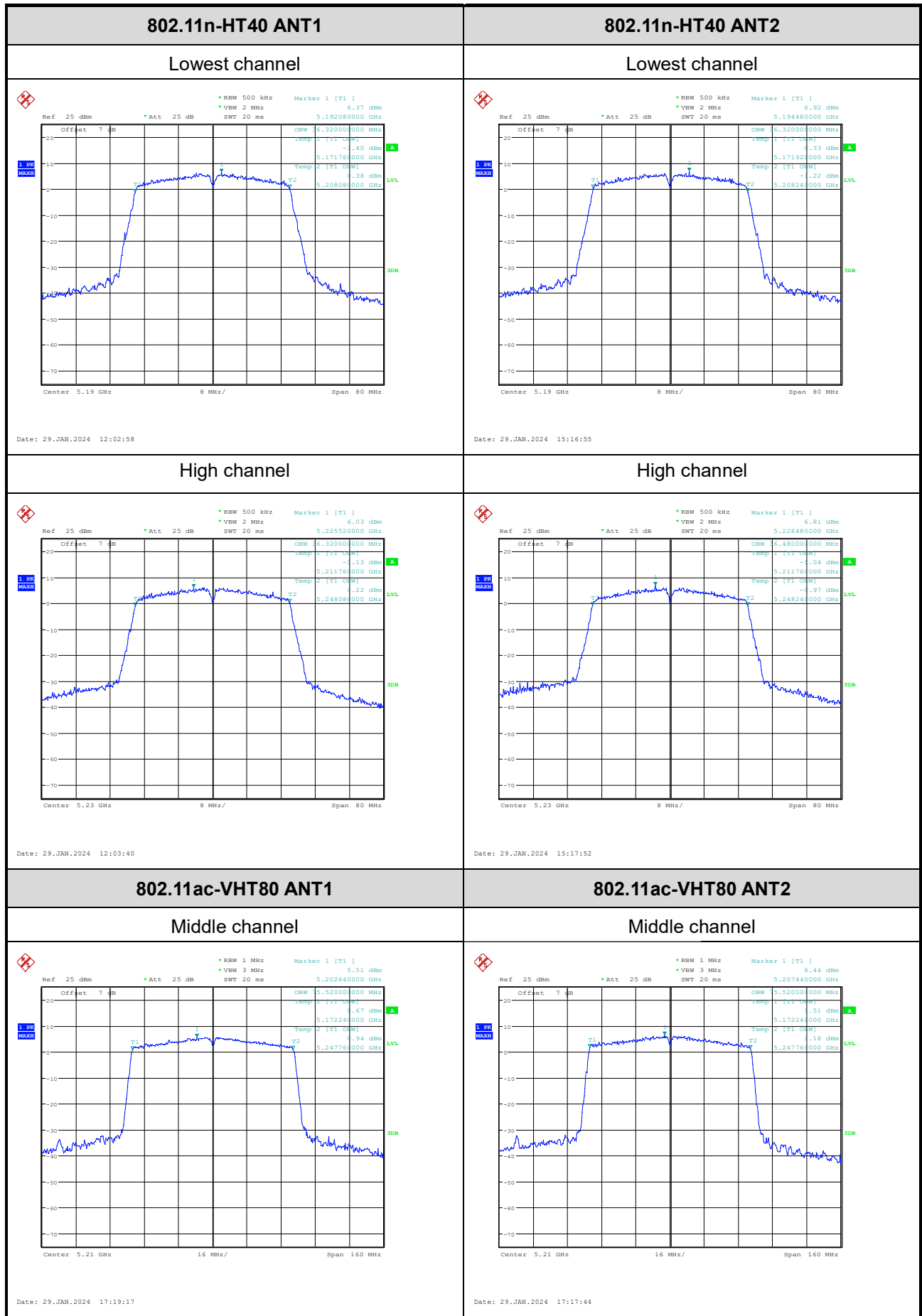


99% Occupied Bandwidth

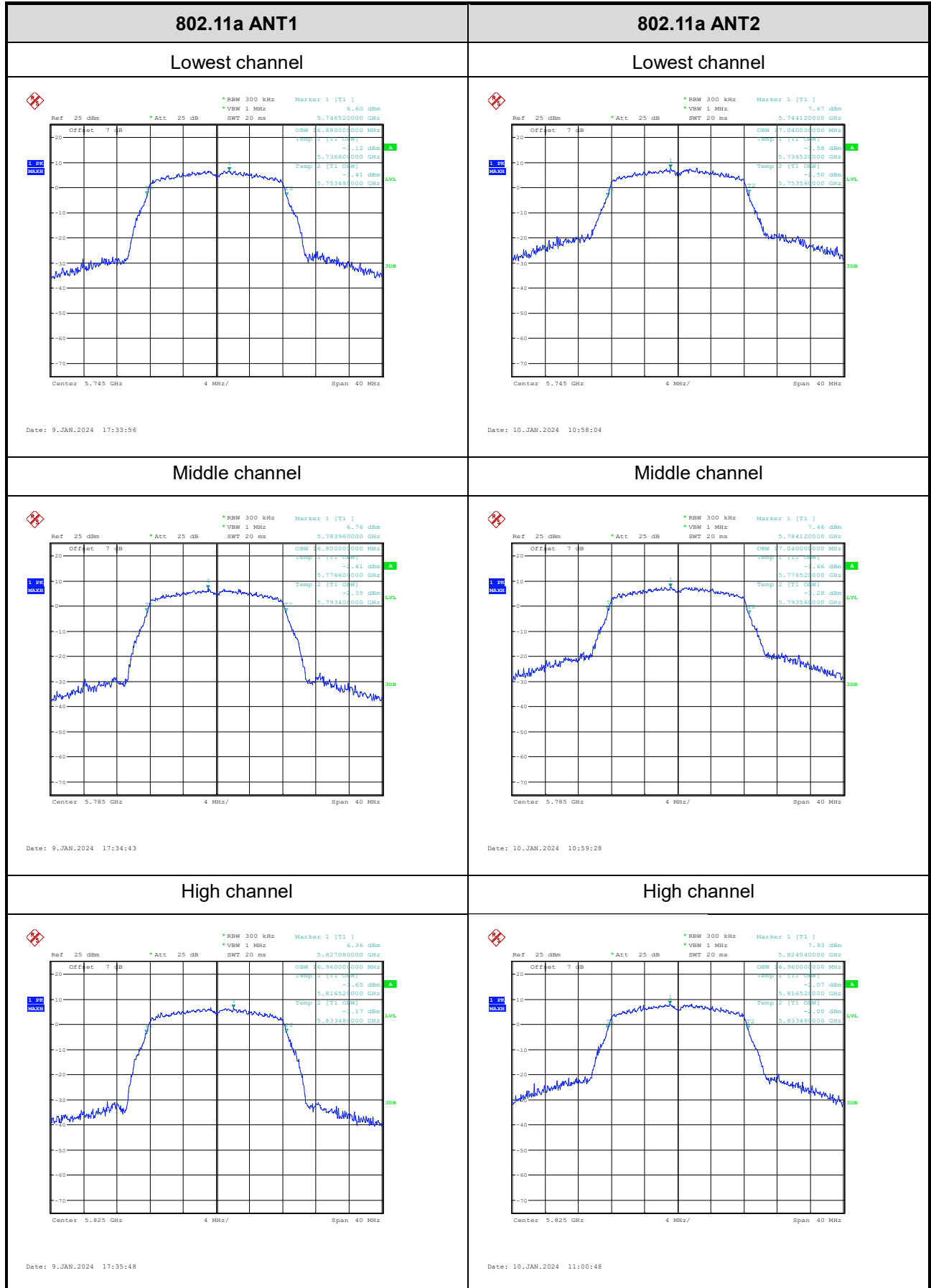
5150-5250MHz:

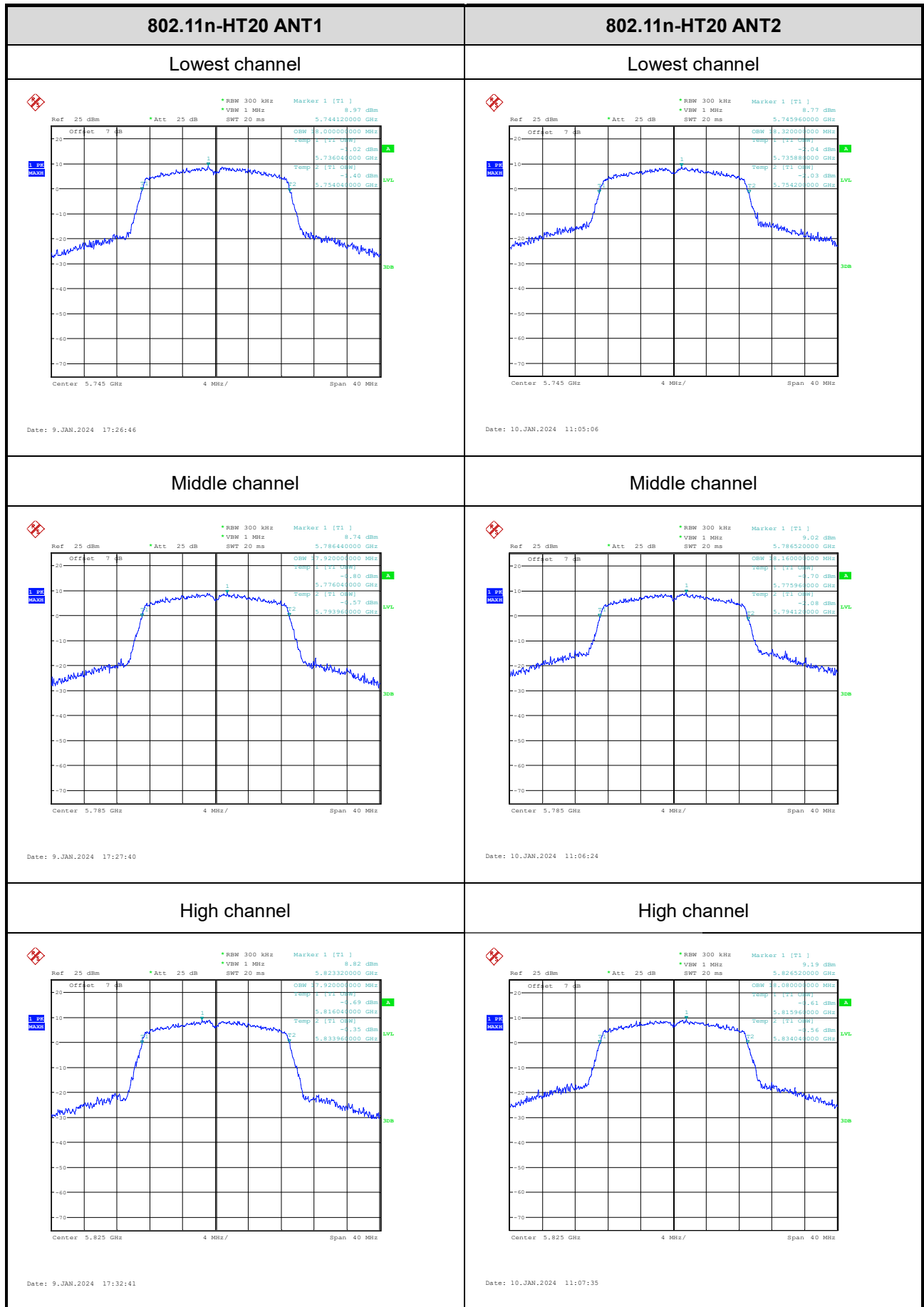


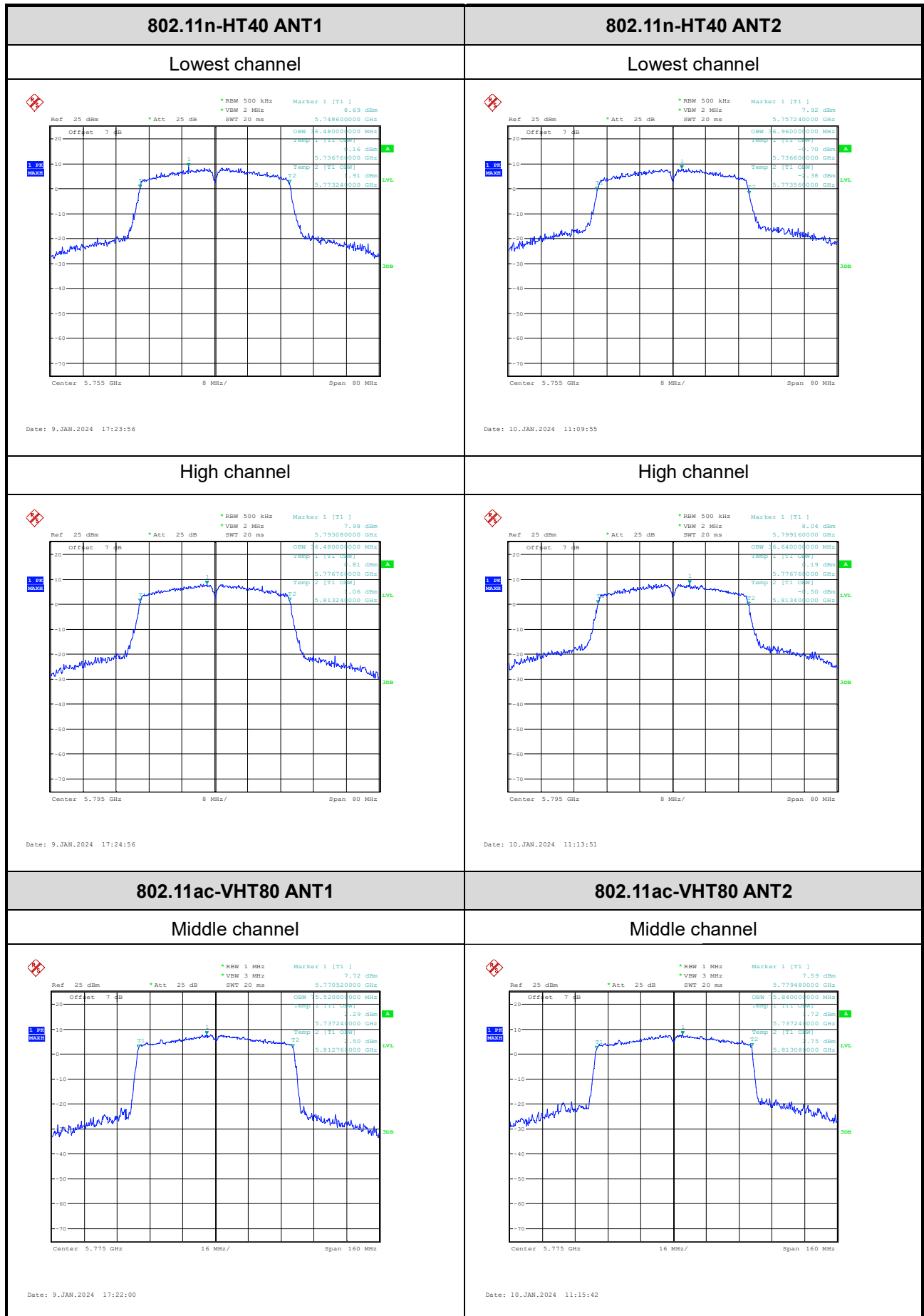




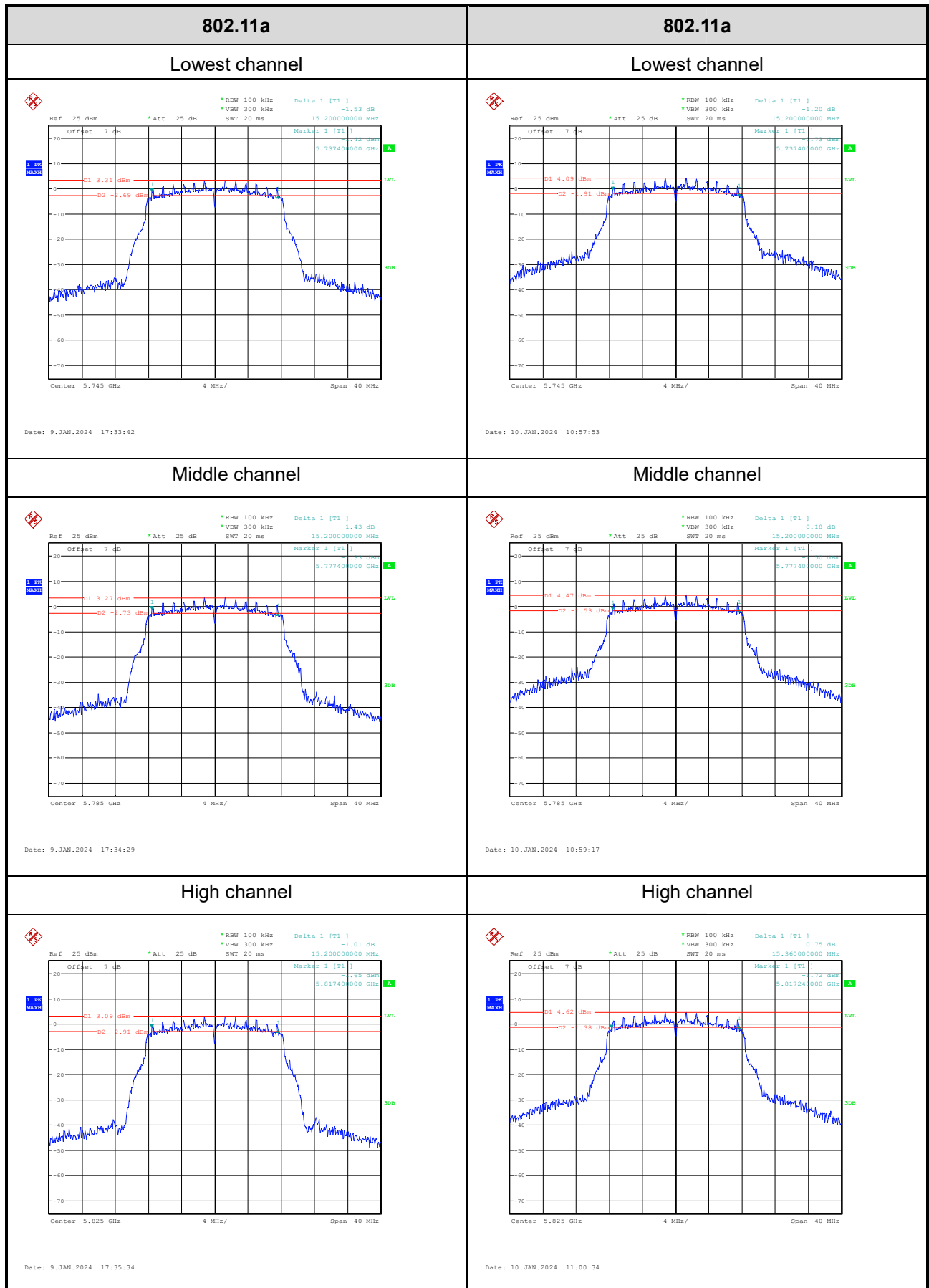
5725-5850MHz:

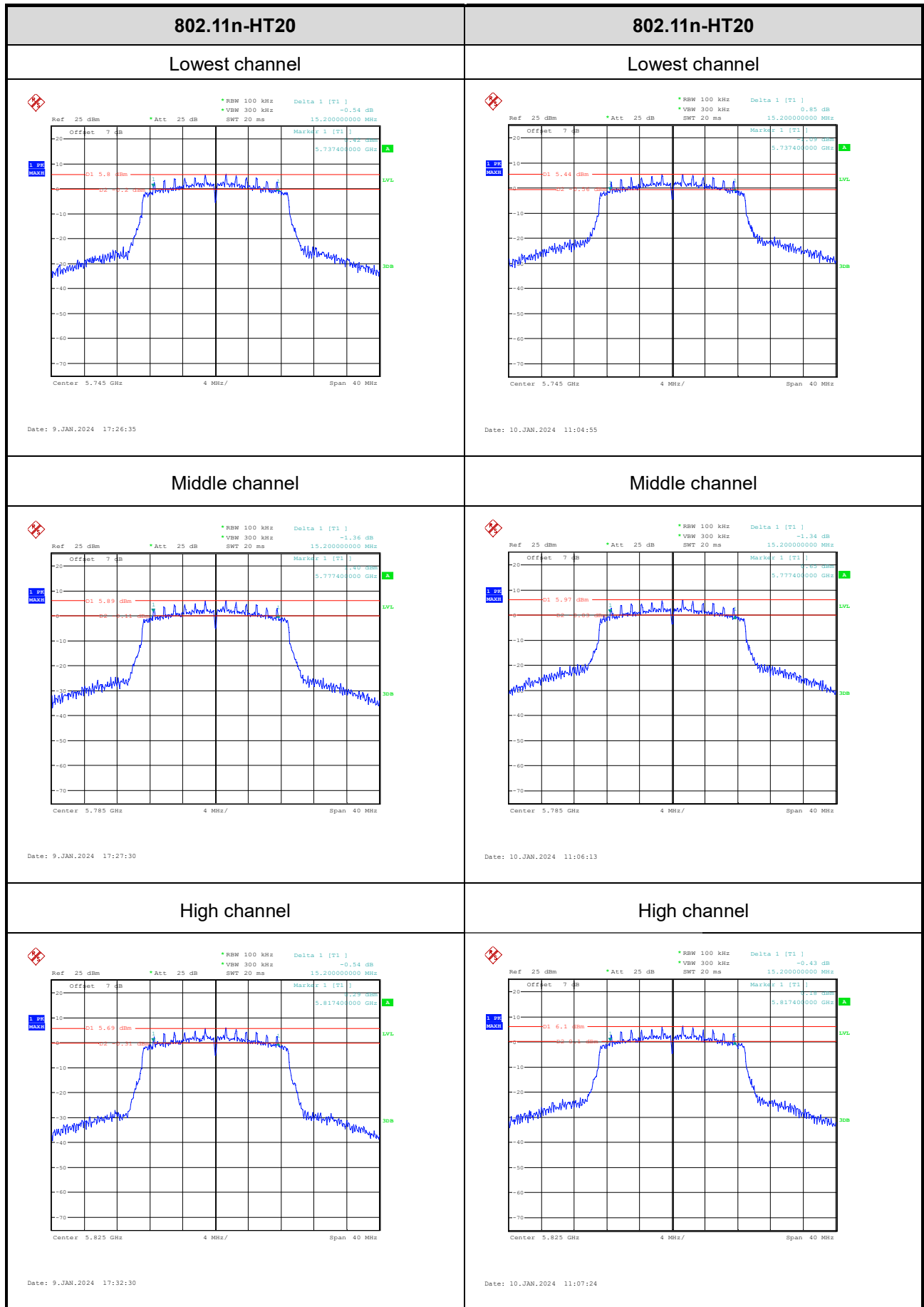


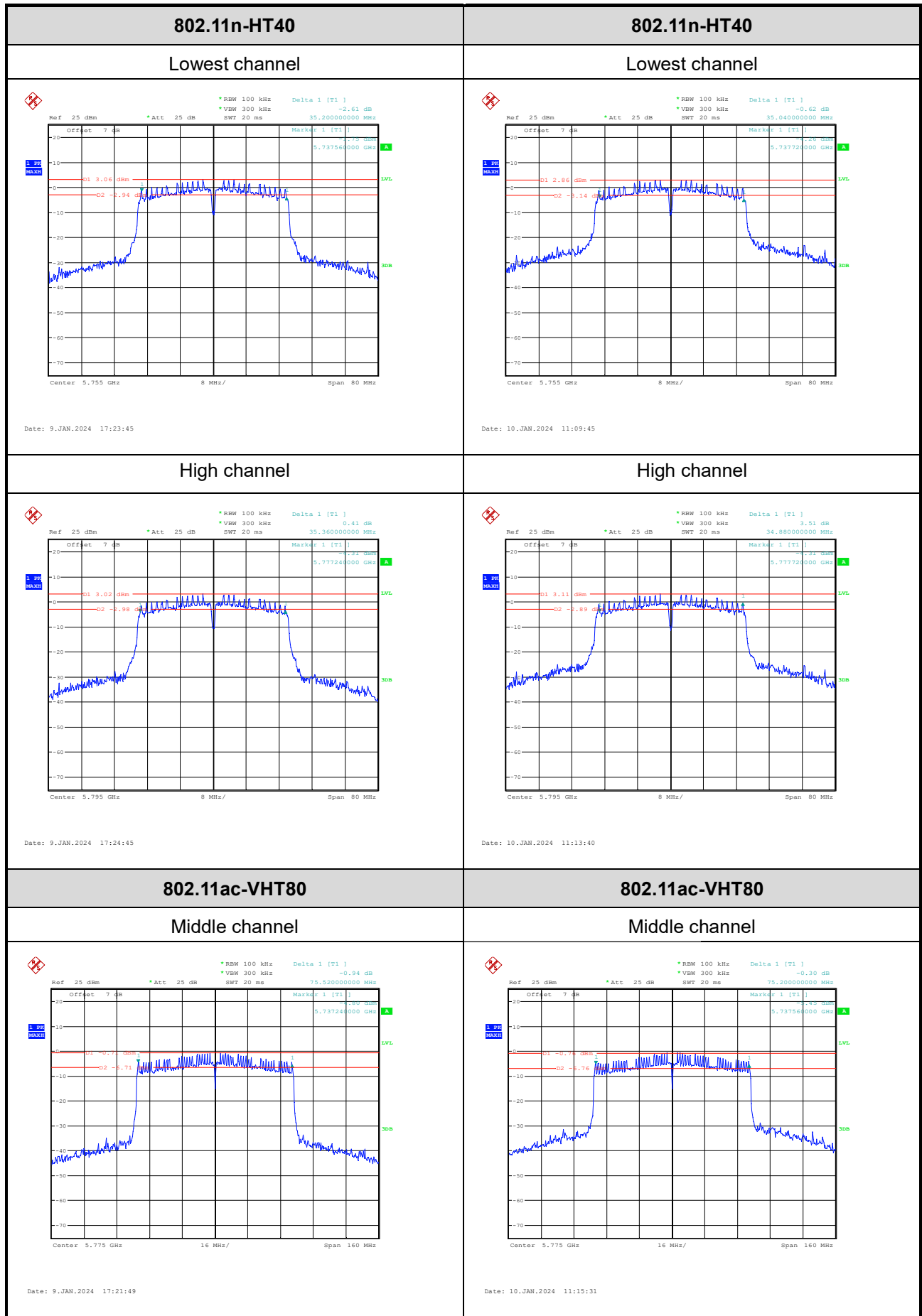




6dB Emission Bandwidth:

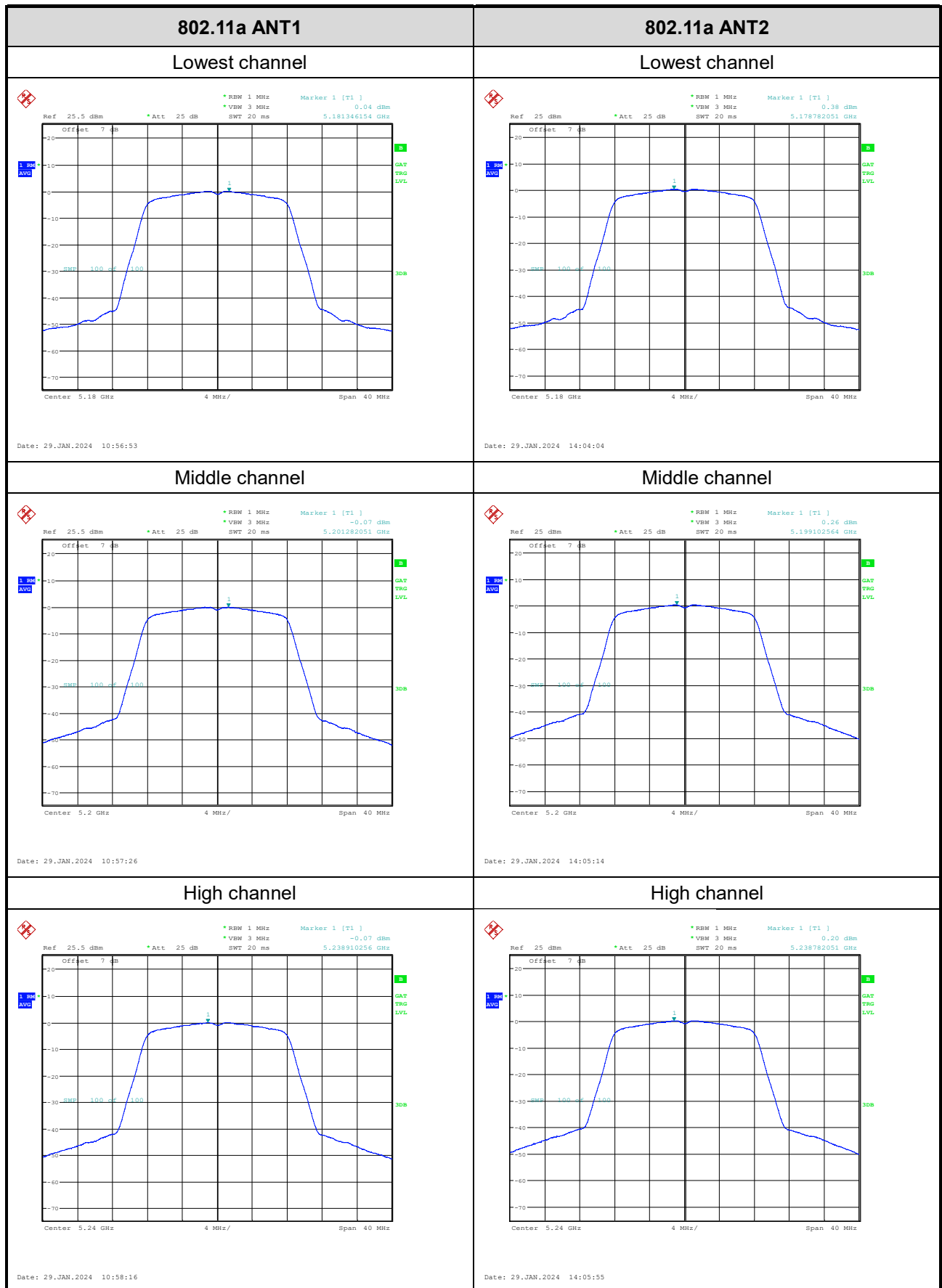


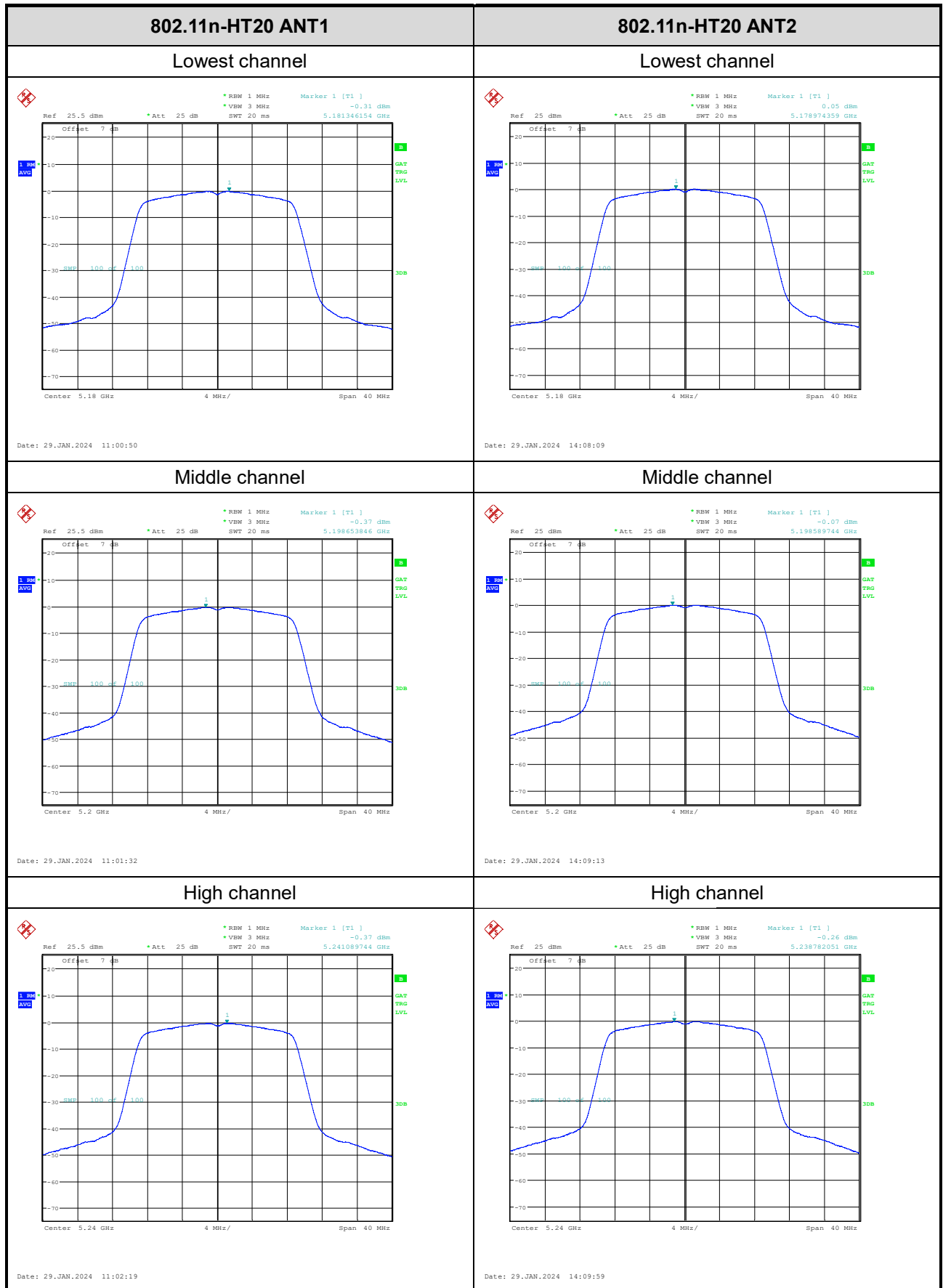


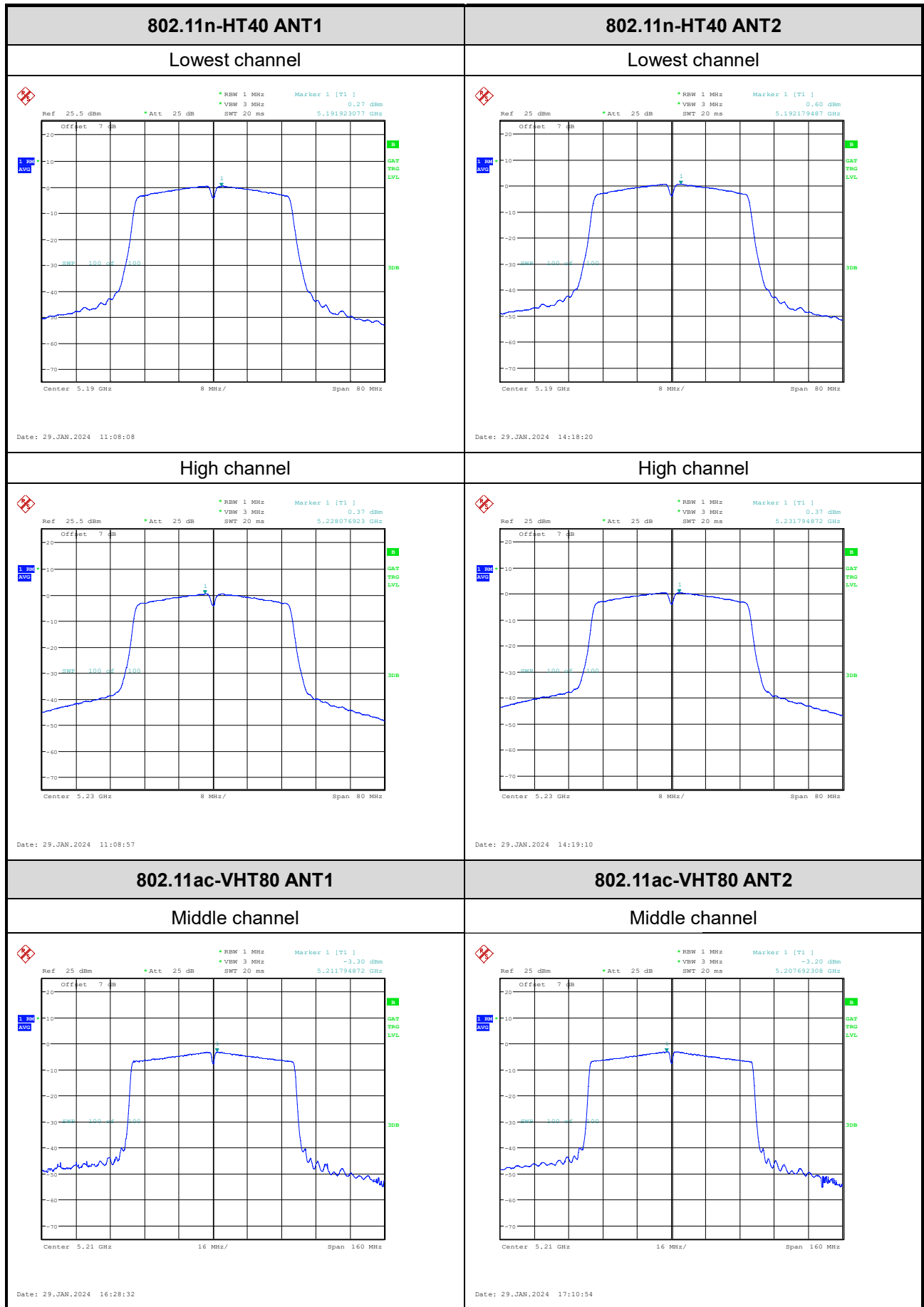


Power Spectral Density

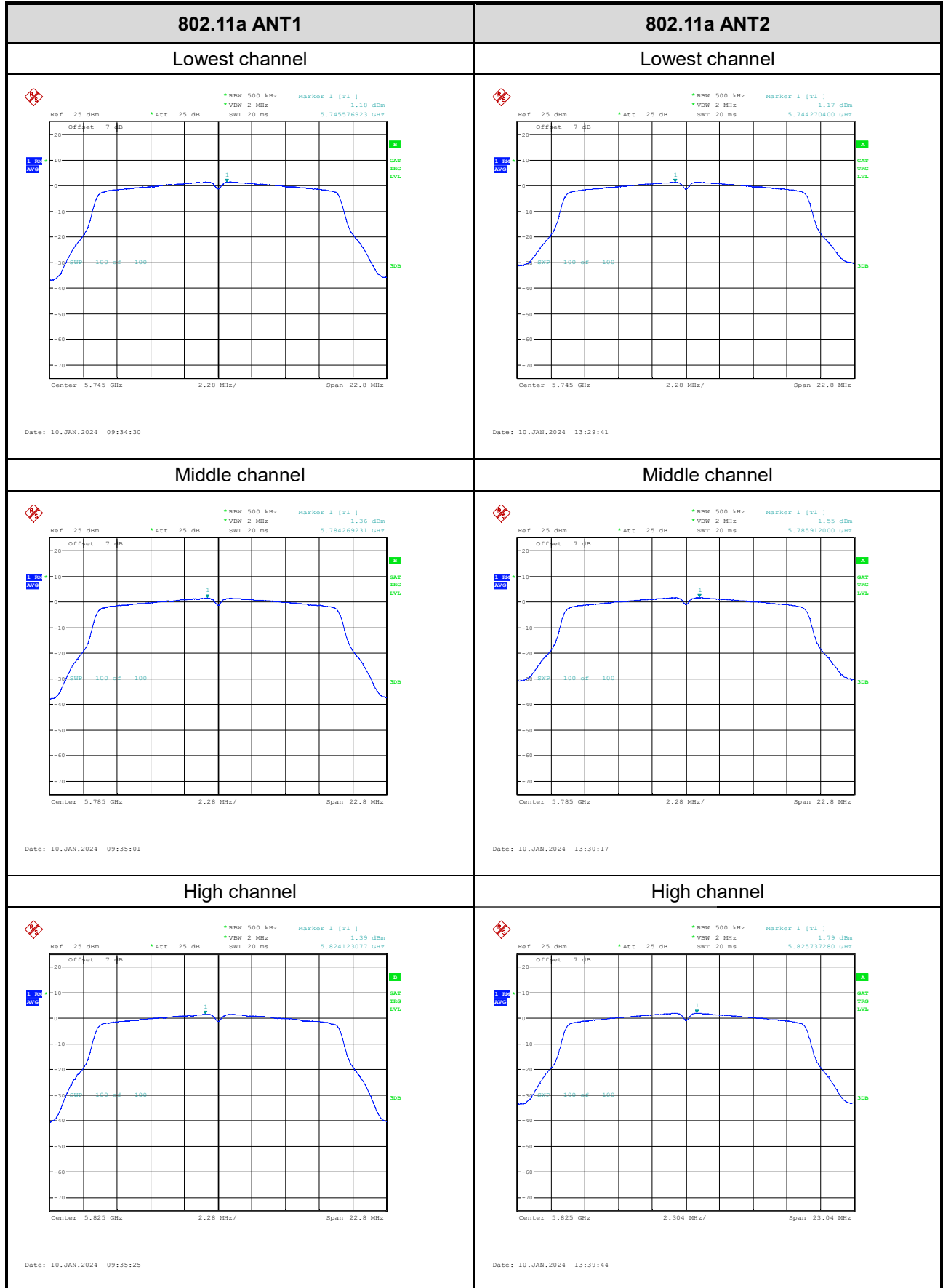
5150-5250MHz:

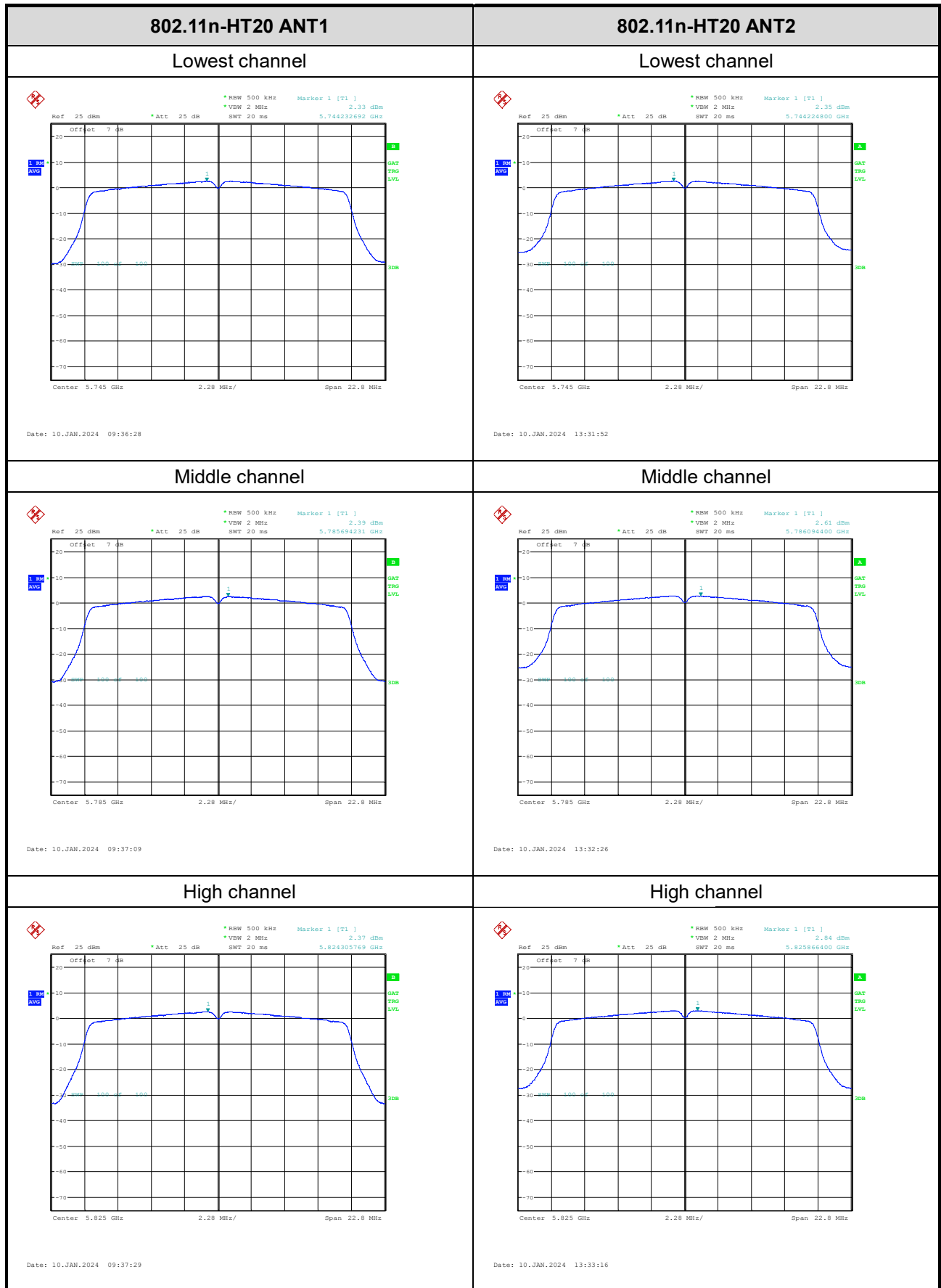


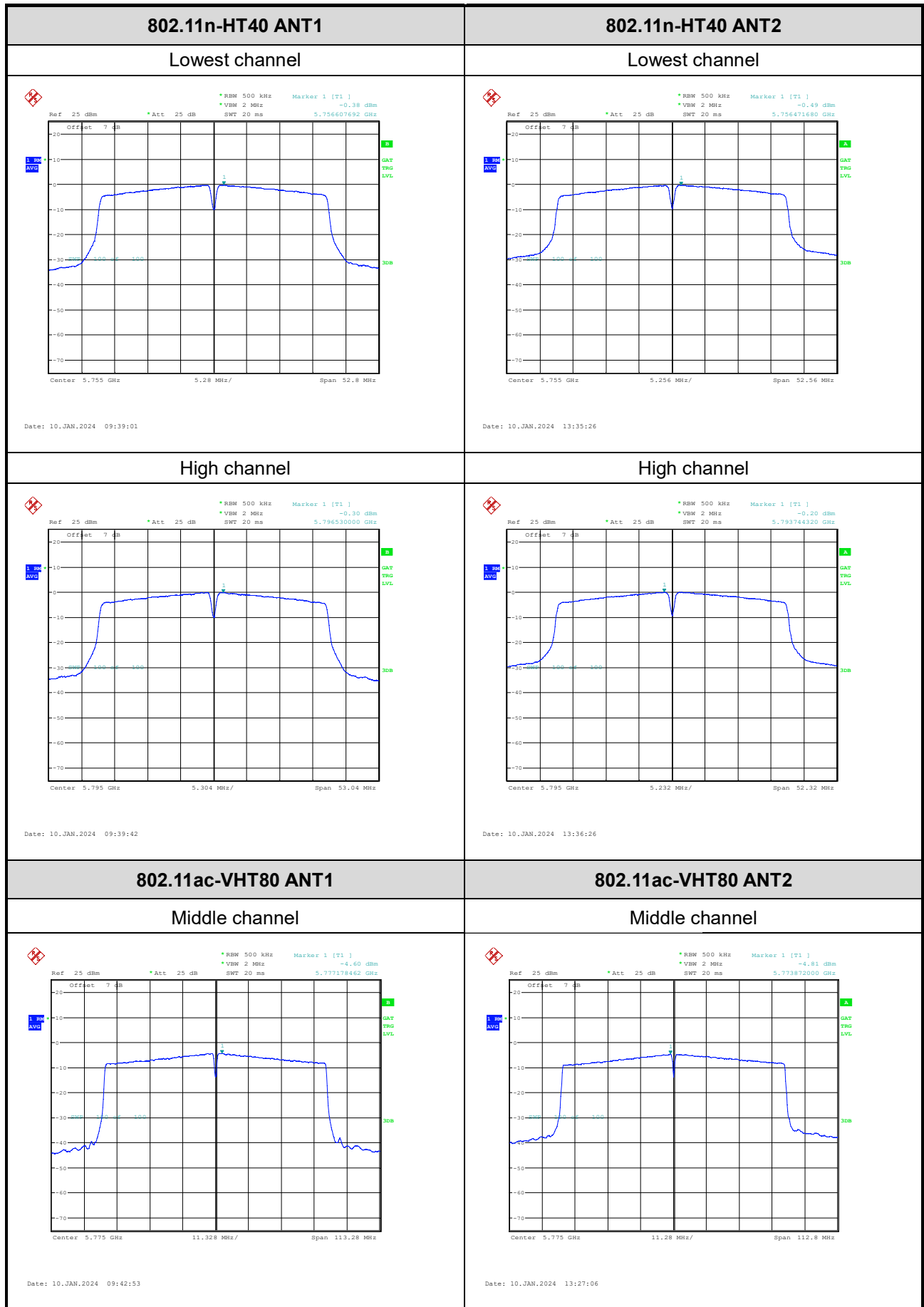




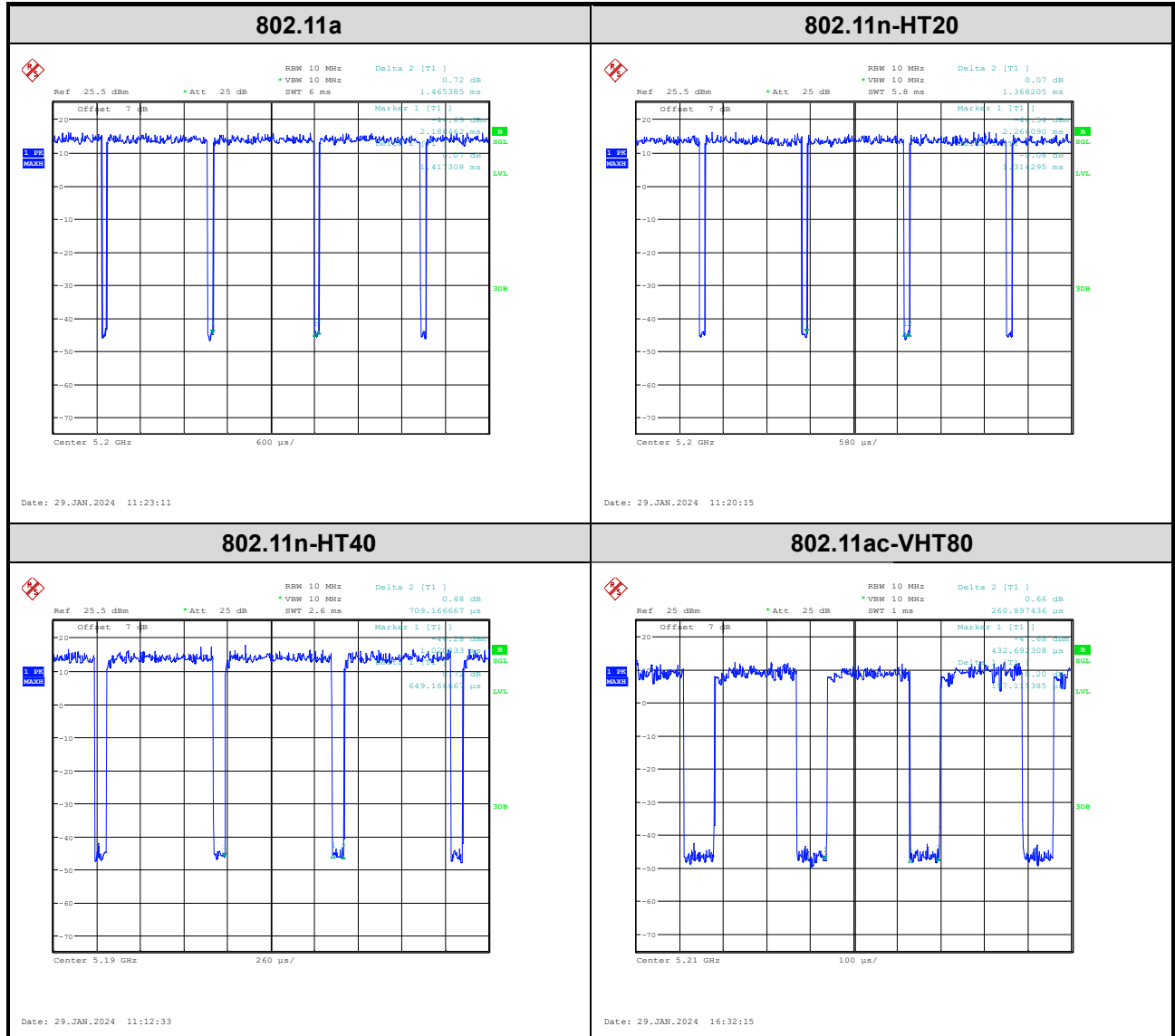
5725-5850MHz:







Duty Cycle



4 Test Setup Photo

Please refer to the attachment RWAZ202300081 Test Setup photo.

5 E.U.T Photo

Please refer to the attachment RWAZ202300081 BOOM 3 External photo and RWAZ202300081 BOOM 3 Internal photo.

---End of Report---