

TEST REPORT

Report No.: BCTC2409324172-7E

Applicant: Radxa Computer (Shenzhen) Co.,Ltd.

Product Name: Radxa ROCK 5B+

Test Model: Radxa ROCK 5B+ D16E0

Tested Date: 2024-09-20 to 2024-10-10

Issued Date: 2024-10-17

Shenzhen BCTC Testing Co., Ltd.



Product Name: Radxa ROCK 5B+

Trademark: 
Radxa ROCK 5B+ D16E0
Radxa ROCK 5B+ D4E0, Radxa ROCK 5B+ D8E0, Radxa ROCK 5B+ D24E0,
Model/Type reference: Radxa ROCK 5B+ D32E0, Radxa ROCK 5B+ D4E16, Radxa ROCK 5B+ D8E32,
Radxa ROCK 5B+ D16E64, Radxa ROCK 5B+ D24E128,
Radxa ROCK 5B+ D32E256

Prepared For: Radxa Computer (Shenzhen) Co.,Ltd.

Address: 1602, Smart Valley, tiezai Road, Gongle community, Xixiang, Baoan, Shenzhen

Manufacturer: Radxa Computer (Shenzhen) Co.,Ltd.

Address: 1602, Smart Valley, tiezai Road, Gongle community, Xixiang, Baoan, Shenzhen

Prepared By: Shenzhen BCTC Testing Co., Ltd.

Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road,
Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

Sample Received Date: 2024-09-20

Sample tested Date: 2024-09-20 to 2024-10-10

Issue Date: 2024-10-17

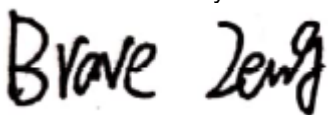
Report No.: BCTC2409324172-7E

Test Standards: ETSI EN 300 440 V2.2.1 (2018-07)

Test Results: PASS

Remark: This is WIFI-5.8GHz band radio test report.

Tested by:



Brave Zeng/ Project Handler

Approved by:



Zero Zhou/Reviewer

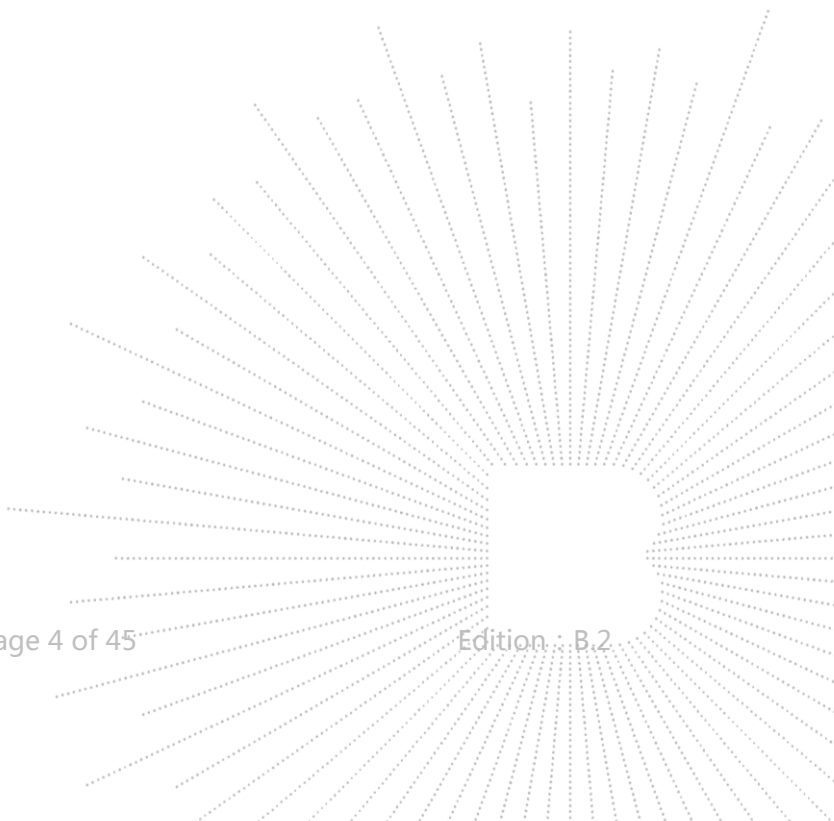
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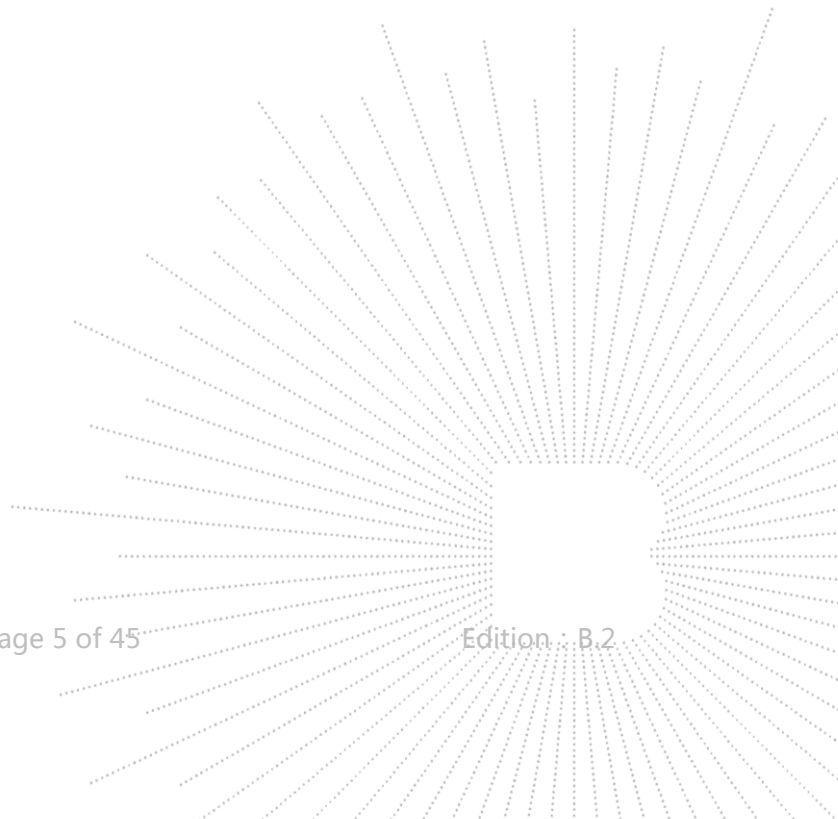
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(Note: N/A Means Not Applicable)



1. Version

Report No.	Issue Date	Description	Approved
BCTC2409324172-7E	2024-10-17	Original	Valid



2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No.	Results
Transmitter Parameters			
1	Equivalent isotropically radiated power (e.i.r.p.)	4.2.2	PASS
2	Permitted range of operating frequencies	4.2.3	PASS
3	Spurious radiation for transmitter	4.2.4	PASS
4	Duty Cycle	4.2.5.4	No Restriction
5	Additional requirements for FHSS equipment	4.2.6	N/A ¹
6	Adjacent channel selectivity	4.3.3	N/A ²
7	Blocking or desensitization	4.3.4	PASS
8	Spurious radiation for receiver	4.3.5	PASS
9	Spectrum access techniques	4.4	N/A ³
10	GBSAR antenna pattern	4.6.4	N/A ⁴
11	Limits for GBSAR	Annex I	N/A ⁴
This product is equipment Category 2 receivers Note ¹ :Applies to Equipment utilizing FHSS modulation Note ² :Applies to equipment Category 1 receivers Note ³ :Applies to Equipment which are not using duty cycle restrictions for media access Note ⁴ :Applies only GBSAR systems			

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

RF frequency	1 x 10 ⁻⁷
RF power, conducted	1.38dB
Conducted spurious emission (30MHz-1GHz)	1.28dB
Conducted spurious emission (1GHz-18GHz)	1.576dB
Radiated Spurious emission (30MHz-1GHz)	4.3dB
Radiated Spurious emission (1GHz-18GHz)	4.5dB
Temperature	0.59°C
Humidity	5.3%

4. Product Information And Test Setup

4.1 Product Information

Model/Type reference	Radxa ROCK 5B+ D16E0 Radxa ROCK 5B+ D4E0, Radxa ROCK 5B+ D8E0, Radxa ROCK 5B+ D24E0, Radxa ROCK 5B+ D32E0, Radxa ROCK 5B+ D4E16, Radxa ROCK 5B+ D8E32, Radxa ROCK 5B+ D16E64, Radxa ROCK 5B+ D24E128, Radxa ROCK 5B+ D32E256
Model differences:	All models are the same circuit and RF module, only the model name and memory size are different.
Hardware Version:	N/A
Software Version:	N/A
Type of Modulation:	WIFI(5.8GHz): IEEE 802.11a/n/ac HT20/ax HT20: 5745MHz-5825MHz IEEE 802.11n/ac HT40/ax HT40: 5755 MHz-5795MHz IEEE 802.11ac HT80/ax HT80: 5775MHz
Max. RF output power:	WIFI(5.8GHz): Antenna A: 9.66 dBm, Antenna B: 10.07 dBm, MIMO: 11.70 dBm
Type of Modulation:	WIFI(5.8GHz): DSSS, OFDM, OFDMA
Antenna installation:	WIFI(5.8GHz): FPC antenna WIFI(5.8GHz): Antenna A: 1.93 dBi, Antenna B: 1.93 dBi
Antenna Gain:	Remark: <input checked="" type="checkbox"/> The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. <input type="checkbox"/> The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.
Ratings:	DC 12V from adapter

Cable of Product

No.	Cable Type	Quantity	Provider	Length (m)	Shielded	Note
1	--	--	Applicant	---	Yes/No	With a ferrite ring in mid Detachable
2	--	--	BCTC	--	Yes/No	--

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
1.	Adapter	HP	TPN-LA22	---	---
2.	keyboard	Logitech	1641MG01DLZ8	---	---
3.	Mouse	Logitech	M-U0026	---	---
4.	Earphone	IHIP	SBGE1	---	---
5.	U disk	SanDisk	32G	---	---
6.	Router	HUAWEI	WS318	---	---
7.	HDMI Cable	Belkin	HDMI2.0	---	---
8.	Display	ChangHong	55DBK	---	---
9.	PC	Lenovo	TP00117D	---	---

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
149	5745	151	5755	153	5765	157	5785
159	5795	161	5805	165	5825		

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting(802.11a)	5745MHz	5785MHz	5825MHz
Transmitting(802.11n HT20)	5745MHz	5785MHz	5825MHz
Transmitting(802.11n HT40)	5755MHz	/	5795MHz
Transmitting(802.11ac HT20)	5745MHz	5785MHz	5825MHz
Transmitting(802.11ac HT40)	5755MHz	/	5795MHz
Transmitting(802.11ac HT80)	/	5775MHz	/
Transmitting(802.11ax HT20)	5745MHz	5785MHz	5825MHz
Transmitting(802.11ax HT40)	5755MHz	/	5795MHz
Transmitting(802.11ax HT80)	/	5775MHz	/
Receiving(802.11a)	5745MHz	5785MHz	5825MHz
Receiving(802.11n HT20)	5745MHz	5785MHz	5825MHz
Receiving(802.11n HT40)	5755MHz	/	5795MHz
Receiving(802.11ac HT20)	5745MHz	5785MHz	5825MHz
Receiving(802.11ac HT40)	5755MHz	/	5795MHz
Receiving(802.11ac HT80)	/	5775MHz	/
Receiving(802.11ax HT20)	5745MHz	5785MHz	5825MHz
Receiving(802.11ax HT40)	5755MHz	/	5795MHz
Receiving(802.11ax HT80)	/	5775MHz	/

4.6 Test Environment

1. Normal Test Conditions:

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Temperature(°C):	26
Test Voltage(DC):	12V

2. Extreme Test Conditions:

For tests at extreme temperatures, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.

For tests at extreme voltages, measurements shall be made over the extremes of the power source voltage range as declared by the manufacturer.

Test Conditions	LTLV	LTHV	HTLV	HTHV
Temperature (°C)	0	0	35	35
Test Voltage (DC)	10.8	13.2	10.8	13.2

5. Test Facility And Test Instrument Used

5.1 Test Facility

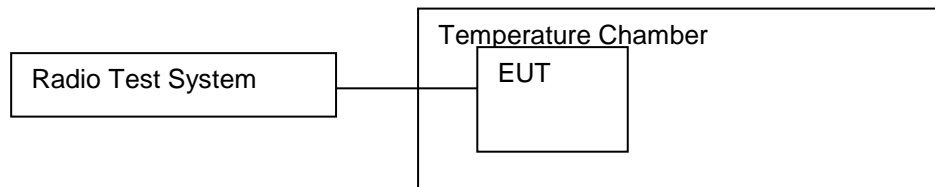
All measurement facilities used to collect the measurement data are located at 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	966 chamber	ChengYu	966 Room	966	May 15, 2023	May 14, 2026
2	Receiver	R&S	ESR3	102075	May 16, 2024	May 15, 2025
3	Receiver	R&S	ESRP	101154	May 16, 2024	May 15, 2025
4	Amplifier	Schwarzbeck	BBV9744	9744-0037	May 16, 2024	May 15, 2025
5	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	942	May 21, 2024	May 20, 2025
6	Loop Antenna	Schwarzbeck	FMZB1519B	00014	May 21, 2024	May 20, 2025
7	Amplifier	SKET	LAPA_01G18 G-45dB	SK2021040901	May 16, 2024	May 15, 2025
8	Horn Antenna	Schwarzbeck	BBHA9120D	1541	May 21, 2024	May 20, 2025
9	Preamplifier	MITEQ	TTA1840-35- HG	2034381	May 16, 2024	May 15, 2025
10	Horn antenna	Schwarzbeck	BBHA9170	00822	May 21, 2024	May 20, 2025
11	Spectrum Analyzer 9kHz-40GHz	R&S	FSP 40	100363	May 16, 2024	May 15, 2025
12	Software	Frad	EZ-EMC	FA-03A2 RE	\	\
13	Spectrum Analyzer	Keysight	N9020A	MY49100060	May 16, 2024	May 15, 2025
14	Signal Generator	Keysight	N5182B	MY56200519	May 16, 2024	May 15, 2025
15	Signal Generator	Keysight	83711B	US37100131	May 16, 2024	May 15, 2025
16	Communication test set	R&S	CMW500	126173	Nov. 13. 2023	Nov. 12, 2024
17	D.C. Power Supply	LongWei	TPR-6405D	\	Nov. 13. 2023	Nov. 12, 2024
18	Programmable constant temperature and humidity test chamber	DGBELL	BTKS5-150C	\	Jul. 01, 2023	Jun. 30, 2025
19	Radio frequency control box	MAIWEI	MW100-RFC B	\	\	\
20	Software	MAIWEI	MTS 8310	\	\	\

6. Equivalent Isotropically Radiated Power (E.I.R.P.)

6.1 Block Diagram Of Test Setup



6.2 Limit

25mW(14dBm)

6.3 Test Procedure

Step 1:

- using a suitable means, the output of the transmitter shall be coupled to a matched diode detector;
- the output of the diode detector shall be connected to the vertical channel of an oscilloscope;
- the combination of the diode detector and the oscilloscope shall be capable of faithfully reproducing the envelope peaks and the duty cycle of the transmitter output signal;
- the observed duty cycle of the transmitter (Tx on/(Tx on + Tx off)) shall be noted as x, ($0 < x < 1$) and recorded.

Step 2:

- the average output power of the transmitter shall be determined using a wideband, calibrated RF power meter with a matched thermocouple detector or an equivalent thereof and, where applicable, with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
- the e.i.r.p. shall be calculated from the above measured power output A, the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:
- $P = A + G + 10 \log (1/x)$;

CO. LTD.

6.4 Test Result

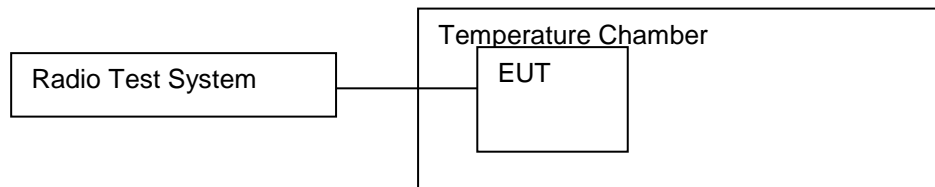
Modulation	Test conditions (Temperature)	Antenna	Low Channel		Middle Channel		High Channel	
			EIRP	Total EIRP	EIRP	Total EIRP	EIRP	Total EIRP
802.11a	NVNT	A	9.66	/	8.45	/	7.81	/
		B	10.07	/	8.92	/	7.63	/
	LTLV	A	9.32	/	8.39	/	7.48	/
		B	10.05	/	8.70	/	7.38	/
	LTHV	A	9.21	/	8.30	/	7.41	/
		B	9.77	/	8.61	/	7.05	/
	HTLV	A	9.35	/	8.21	/	7.49	/
		B	9.83	/	8.75	/	6.93	/
802.11n (HT20)	NVNT	A	8.03	11.58	7.49	10.63	6.34	9.59
		B	9.05		7.74		6.81	
	LTLV	A	7.66	11.36	7.43	10.57	6.13	9.39
		B	8.94		7.68		6.62	
	LTHV	A	7.22	10.99	7.29	10.43	5.93	9.15
		B	8.63		7.55		6.35	
	HTLV	A	7.92	11.26	7.36	10.44	6.31	9.52
		B	8.56		7.50		6.70	
	HTHV	A	7.52	10.88	7.11	10.17	6.04	9.27
		B	8.19		7.20		6.48	
802.11n (HT40)	NVNT	A	6.59	10.12	/	/	6.06	9.24
		B	7.57		/		6.39	
	LTLV	A	6.35	9.75	/	/	5.90	9.07
		B	7.10		/		6.21	
	LTHV	A	5.92	9.52	/	/	5.64	8.84
		B	7.02		/		6.00	
	HTLV	A	6.06	9.50	/	/	5.84	9.05
		B	6.88		/		6.22	
	HTHV	A	5.86	9.09	/	/	5.62	8.84
		B	6.29		/		6.03	
802.11ac (HT20)	NVNT	A	8.21	11.70	7.42	10.70	6.54	9.64
		B	9.12		7.95		6.71	
	LTLV	A	8.10	11.43	7.36	10.55	6.39	9.52
		B	8.71		7.72		6.62	
	LTHV	A	7.65	11.16	7.27	10.40	6.38	9.43
		B	8.59		7.51		6.46	
	HTLV	A	7.86	11.36	7.33	10.58	6.46	9.56
		B	8.79		7.80		6.63	
	HTHV	A	7.37	10.91	7.18	10.37	6.19	9.32
		B	8.38		7.52		6.42	
802.11ac	NVNT	A	6.95	10.00	/	/	5.65	9.05

(HT40)		B	7.03		/		6.40	
		A	6.49		/		5.49	
	LTLV	B	6.74	9.63	/	/	6.15	8.85
		A	6.45		/		5.41	
	LTHV	B	6.53	9.50	/	/	5.87	8.65
		A	6.28		/		5.36	
	HTLV	B	6.61	9.45	/	/	6.19	8.80
		A	6.13		/		5.23	
802.11ac (HT80)	NVNT	A	/	/	4.42	7.68	/	/
		B	/		4.91		/	
	LTLV	A	/	/	4.34	7.57	/	/
		B	/		4.76		/	
	LTHV	A	/	/	4.30	7.46	/	/
		B	/		4.60		/	
	HTLV	A	/	/	4.34	7.59	/	/
		B	/		4.81		/	
	HTHV	A	/	/	4.33	7.52	/	/
		B	/		4.68		/	
802.11ax (HT20)	NVNT	A	7.82	11.39	7.21	10.54	6.25	9.43
		B	8.88		7.82		6.58	
	LTLV	A	7.49	11.06	7.05	10.31	5.95	9.28
		B	8.54		7.53		6.57	
	LTHV	A	7.38	10.77	6.85	10.12	5.89	9.14
		B	8.11		7.37		6.35	
	HTLV	A	7.62	11.13	7.04	10.36	6.14	9.31
		B	8.57		7.64		6.46	
	HTHV	A	7.18	10.76	6.80	10.22	6.07	9.22
		B	8.25		7.59		6.34	
802.11ax (HT40)	NVNT	A	6.53	9.81	/	/	5.90	9.17
		B	7.05		/		6.40	
	LTLV	A	6.15	9.57	/	/	5.83	9.06
		B	6.94		/		6.26	
	LTHV	A	5.85	9.40	/	/	5.63	8.81
		B	6.87		/		5.97	
	HTLV	A	6.13	9.57	/	/	5.70	9.00
		B	6.96		/		6.27	
	HTHV	A	5.50	9.11	/	/	5.44	8.80
		B	6.63		/		6.12	
802.11ax (HT80)	NVNT	A	/	/	4.48	7.72	/	/
		B	/		4.92		/	
	LTLV	A	/	/	4.41	7.62	/	/
		B	/		4.80		/	
	LTHV	A	/	/	4.32	7.56	/	/
		B	/		4.75		/	
	HTLV	A	/	/	4.25	7.57	/	/
		B	/		/		/	

		B	/		4.84		/	
	HTHV	A	/	/	4.22	7.44	/	/
		B	/		4.64		/	
Limit			≤25mW (14dBm)					
Remark: P = A + G + Y,G=Antenna gain, x=100%								

7. Permitted Range Of Operating Frequencies

7.1 Block Diagram Of Test Setup



7.2 Limit

5725 MHz to 5875 MHz

7.3 Test Procedure

- put the spectrum analyser in video averaging mode with a minimum of 50 sweeps selected;
- select the lowest operating frequency of the equipment under test and activate the transmitter with modulation applied. The RF emission of the equipment shall be displayed on the spectrum analyser;
- using the marker of the spectrum analyser, find the lowest frequency below the operating frequency at which the spectral power density drops below the level given in clause 4.2.3. This frequency shall be recorded in the test report;
- select the highest operating frequency of the equipment under test and find the highest frequency at which the spectral power density drops below the value given in clause 4.2.3. This frequency shall be recorded in the test report;
- the difference between the frequencies measured in steps c) and d) is the operating frequency range. It shall be recorded in the test report.

7.4 Test Result

(Antenna A The Worst Data)
A MODE 5745MHz-5825MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5736.76	/	16.387
	/	5833.24	16.389
LTLV	5735.92	/	16.203
	/	5832.55	16.382
LTHV	5735.35	/	15.911
	/	5832.09	16.322
HTHV	5734.56	/	15.794
	/	5831.94	16.155
HTLV	5733.71	/	15.497
	/	5831.92	16.092

AC20 MODE 5745MHz-5825MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5736.08	/	17.536
	/	5833.88	17.535
LTLV	5735.85	/	17.428
	/	5833.15	17.334
LTHV	5734.92	/	17.389
	/	5833.02	17.121
HTHV	5734.71	/	17.381
	/	5832.10	16.861
HTLV	5734.35	/	17.167
	/	5831.92	16.660

AC40 MODE 5755MHz-5795MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5736.60	/	36.255
	/	5813.08	36.233
LTLV	5735.92	/	36.065
	/	5812.38	36.216
LTHV	5735.11	/	35.820
	/	5812.21	35.989
HTHV	5734.33	/	35.661
	/	5811.64	35.795
HTLV	5734.20	/	35.495
	/	5811.49	35.506

AC80 MODE 5775MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5736.92	/	76.168
	/	5813.24	76.457
LTLV	5736.74	/	76.156
	/	5813.06	76.447
LTHV	5735.75	/	75.946
	/	5812.77	76.338
HTHV	5735.27	/	75.909
	/	5812.23	76.258
HTLV	5734.73	/	75.612
	/	5812.02	76.115

AX20 MODE 5745MHz-5825MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5735.44	/	18.919
	/	5834.52	18.915
LTLV	5734.47	/	18.871
	/	5834.26	18.726
LTHV	5733.87	/	18.701
	/	5833.91	18.515
HTHV	5733.70	/	18.445
	/	5832.98	18.416
HTLV	5733.36	/	18.300
	/	5832.85	18.166

AX40 MODE 5755MHz-5795MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5735.80	/	37.866
	/	5814.04	37.882
LTLV	5734.92	/	37.778
	/	5813.96	37.771
LTHV	5734.23	/	37.769
	/	5813.46	37.599
HTHV	5733.35	/	37.562
	/	5813.04	37.576
HTLV	5733.06	/	37.299
	/	5812.94	37.282

AX80 MODE 5775MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5735.96	/	77.435
	/	5813.72	77.349
LTLV	5735.70	/	77.389
	/	5812.80	77.064
LTHV	5734.89	/	77.380
	/	5812.19	77.017
HTHV	5734.32	/	77.306
	/	5812.07	76.924
HTLV	5733.82	/	77.183
	/	5811.38	76.907

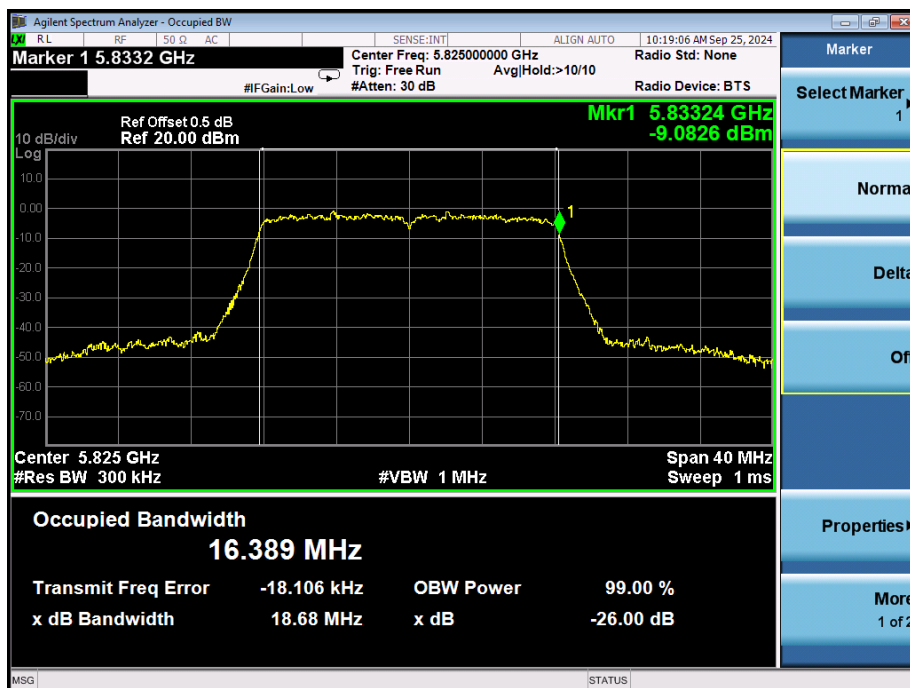
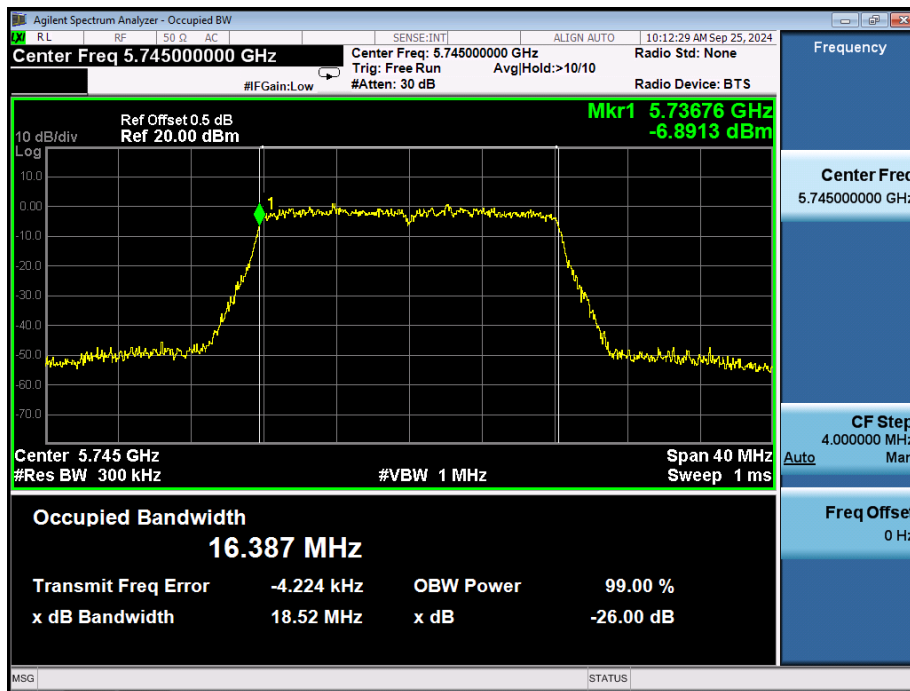
N20 MODE 5745MHz-5825MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5736.24	/	17.530
	/	5833.84	17.509
LTLV	5735.59	/	17.414
	/	5832.85	17.473
LTHV	5734.63	/	17.299
	/	5832.64	17.292
HTHV	5733.90	/	17.217
	/	5832.34	17.020
HTLV	5733.14	/	16.960
	/	5832.02	16.826

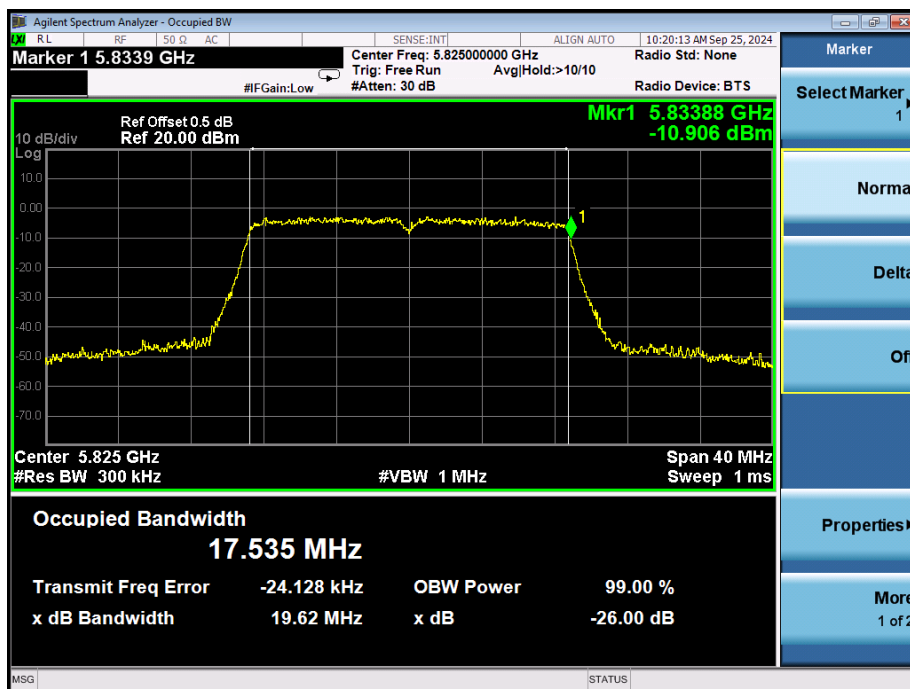
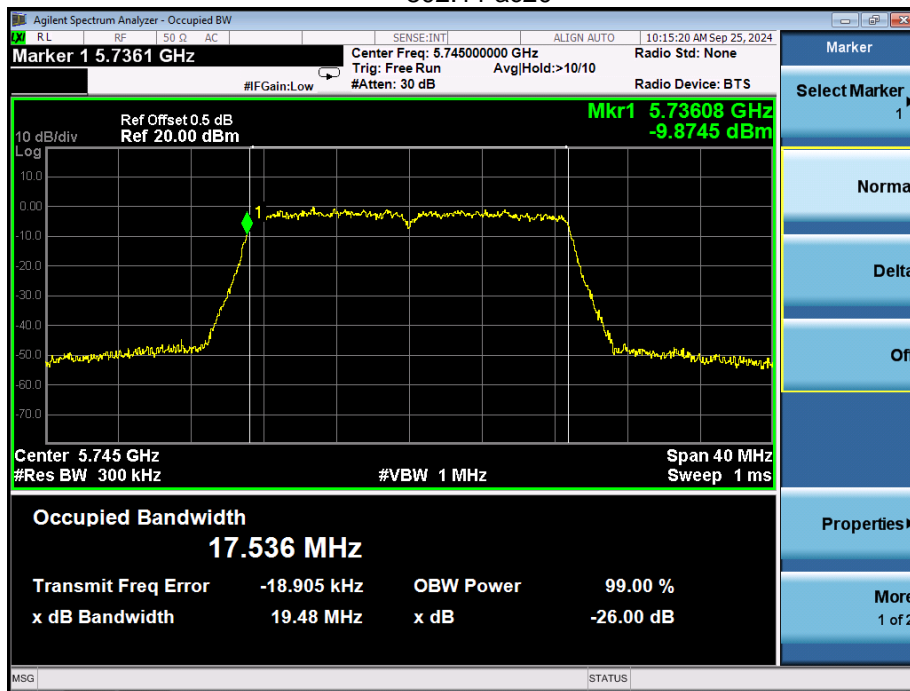
N40 MODE 5755MHz-5795MHz

Test Conditions	Frequencies (MHz) at -30dBm/30kHz (EIRP)		Occupied Channel (MHz)
	Lowest Frequency (fL)	Highest Frequency (fH)	
Normal	5736.76	/	36.236
	/	5813.08	36.210
LTLV	5736.70	/	35.984
	/	5812.98	36.031
LTHV	5736.12	/	35.720
	/	5812.69	35.990
HTHV	5735.93	/	35.453
	/	5812.55	35.754
HTLV	5735.19	/	35.172
	/	5812.20	35.593

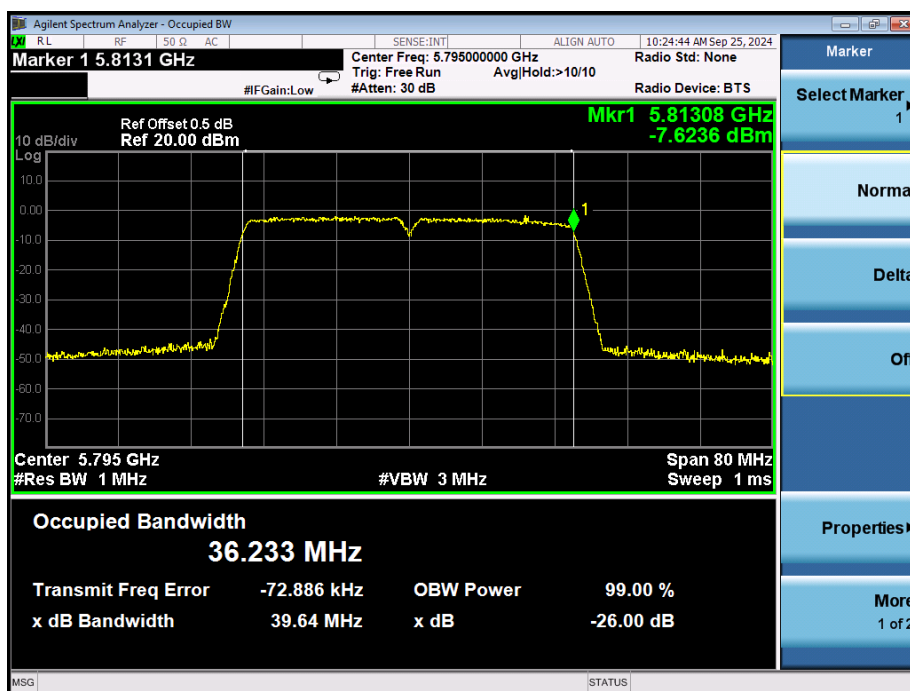
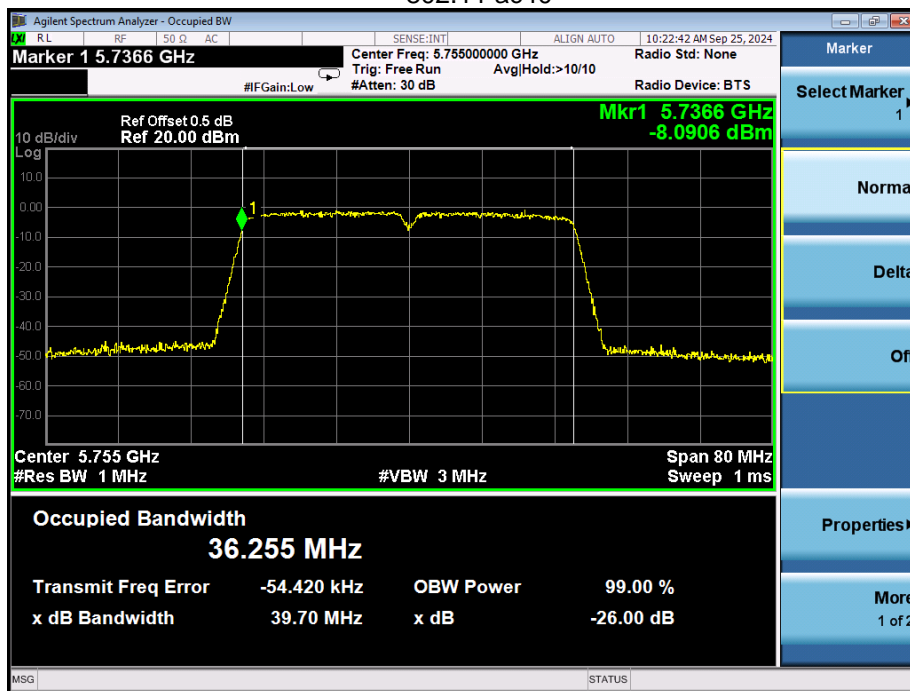
Test plots:
802.11 a



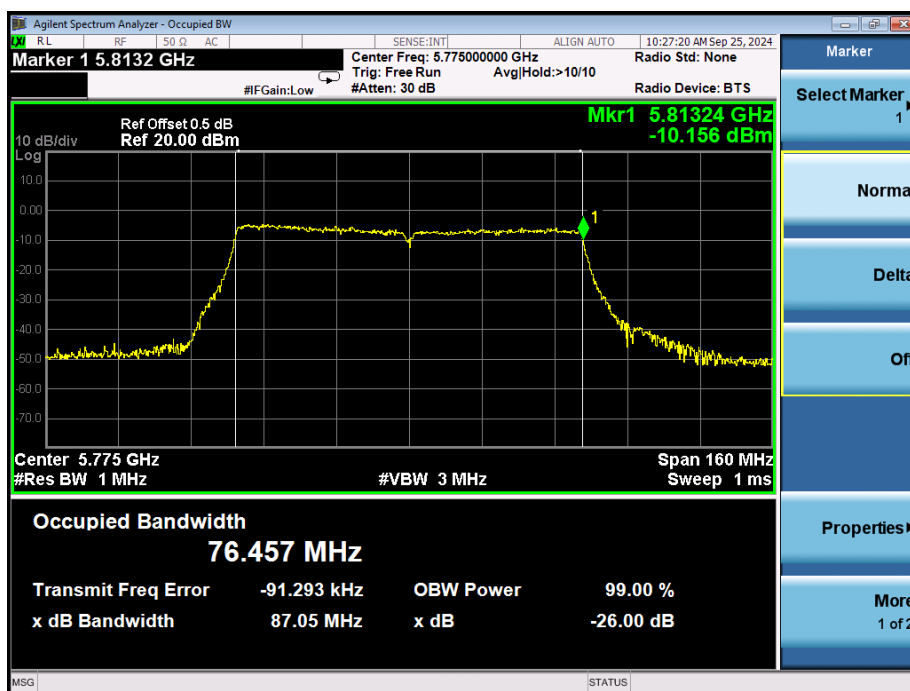
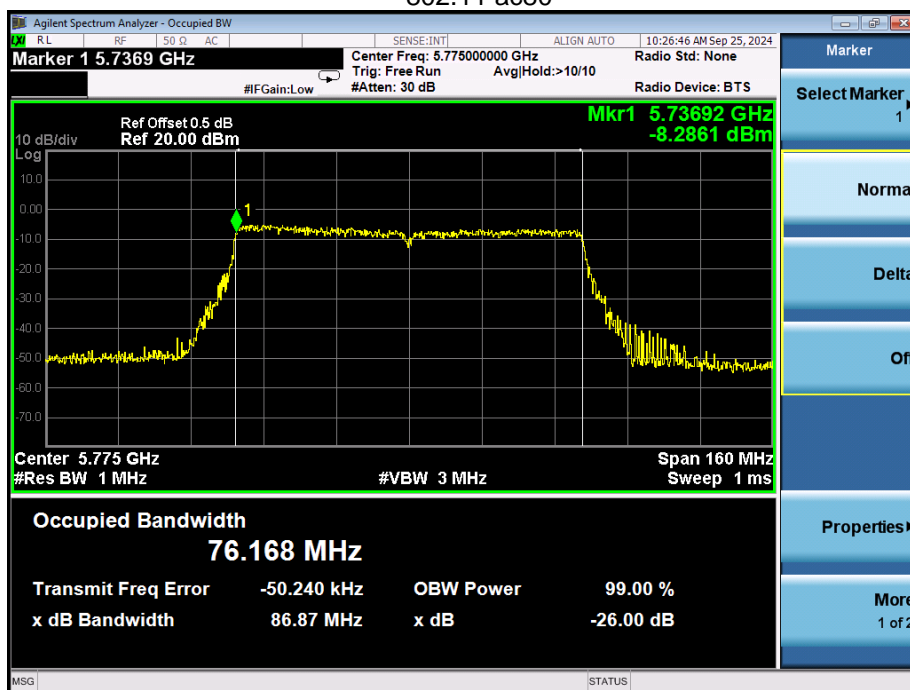
802.11 ac20



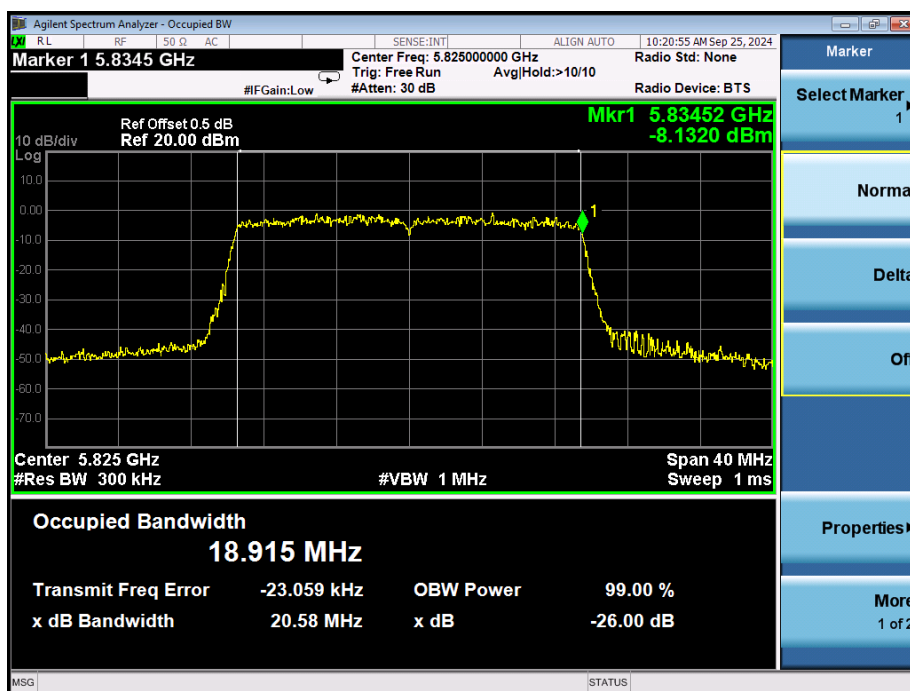
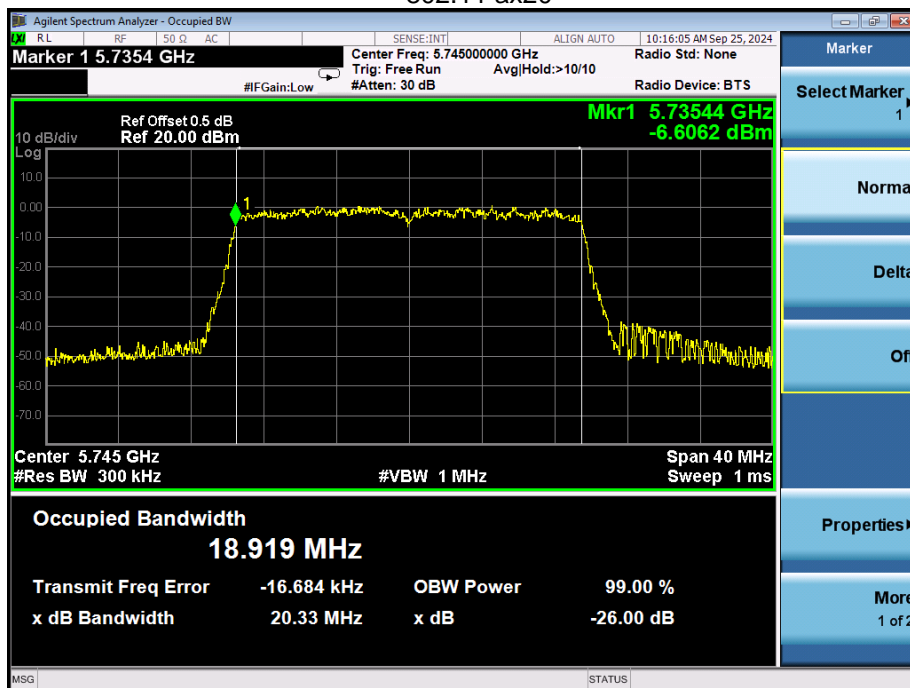
802.11 ac40



802.11 ac80

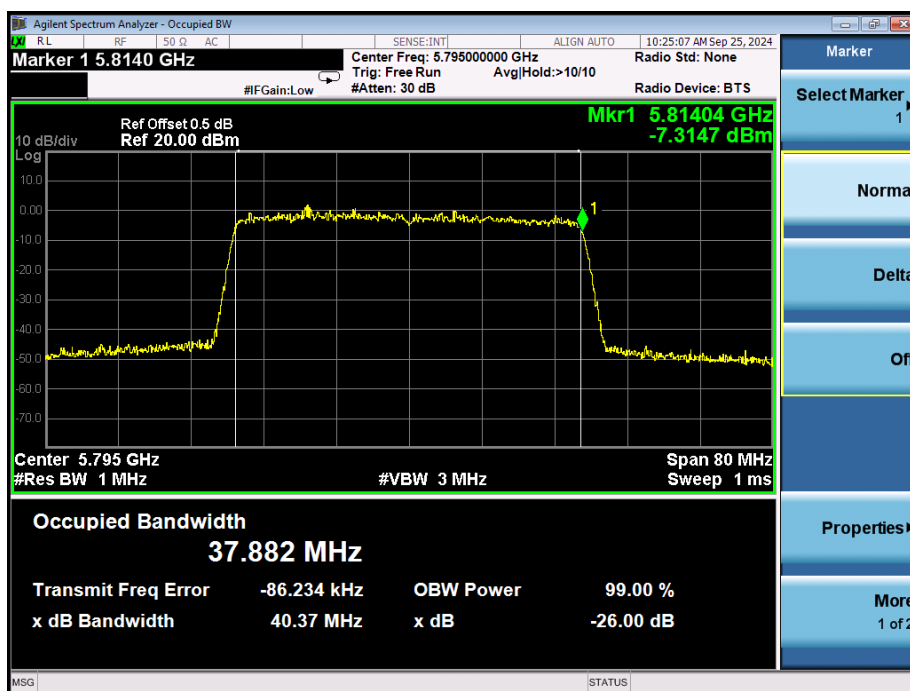
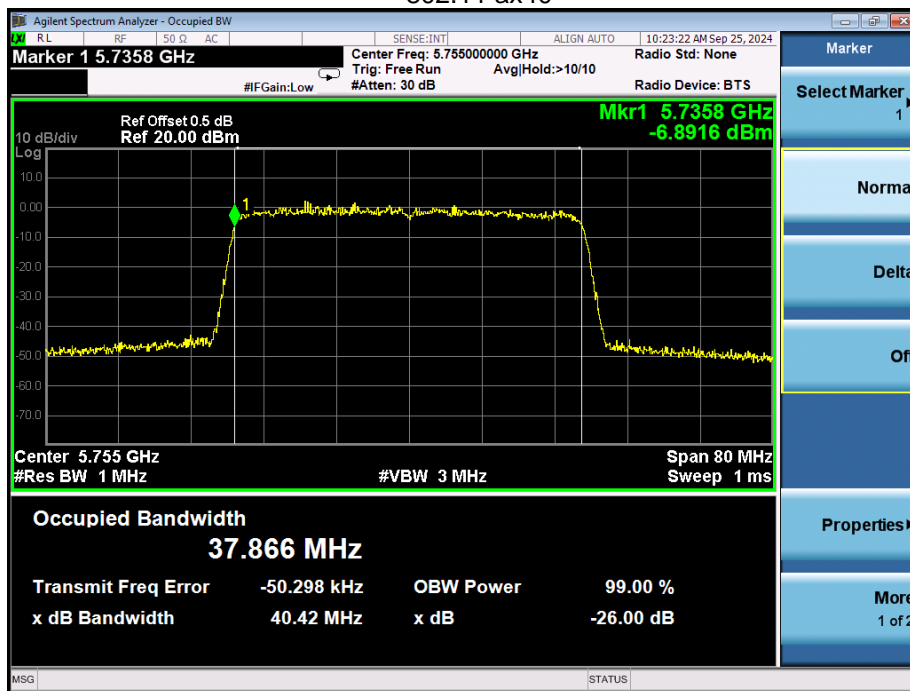


802.11 ax20



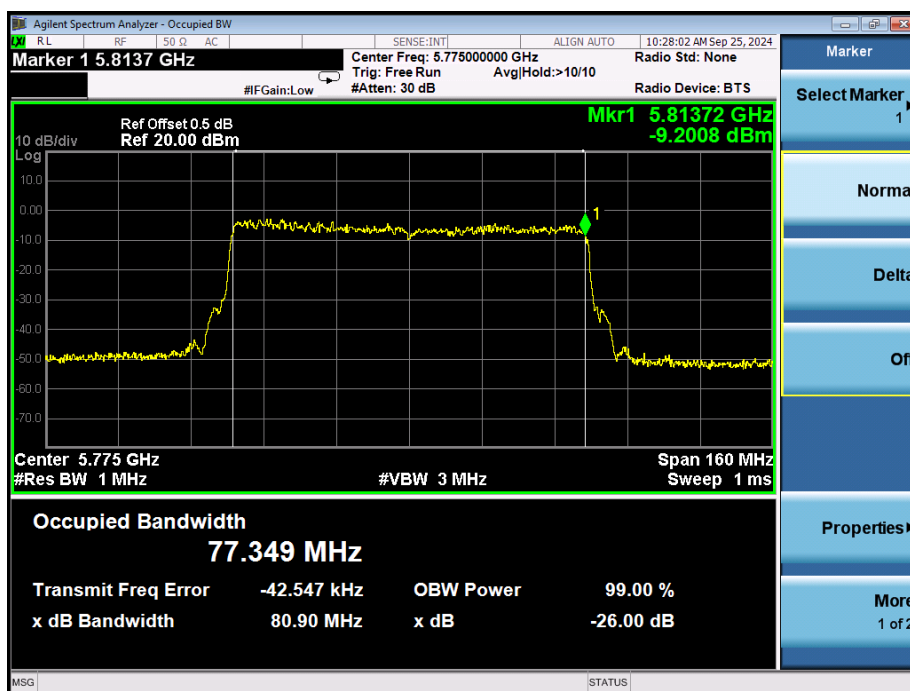
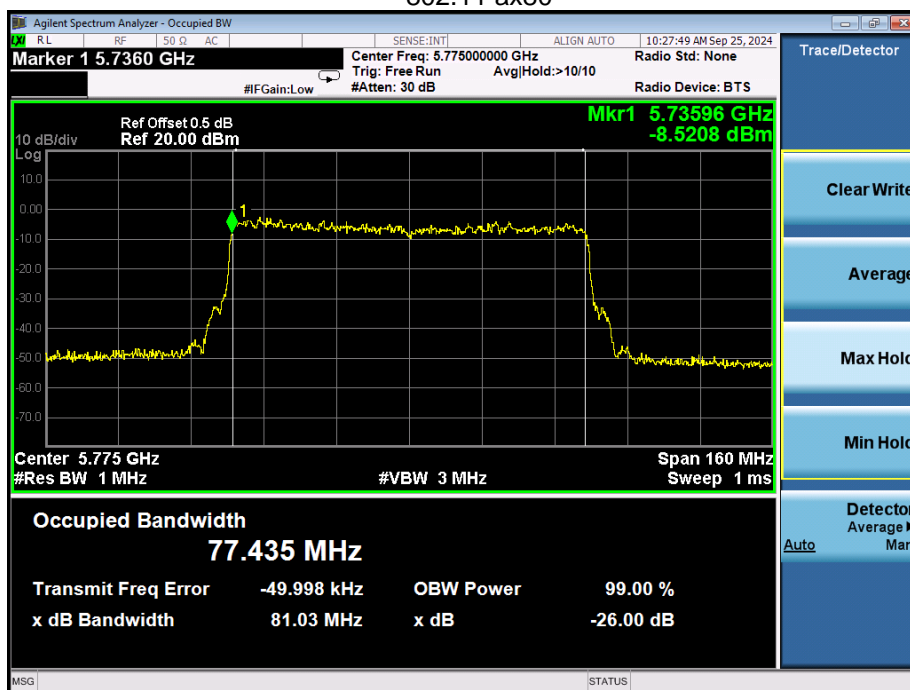
CO., LTD.

802.11 ax40

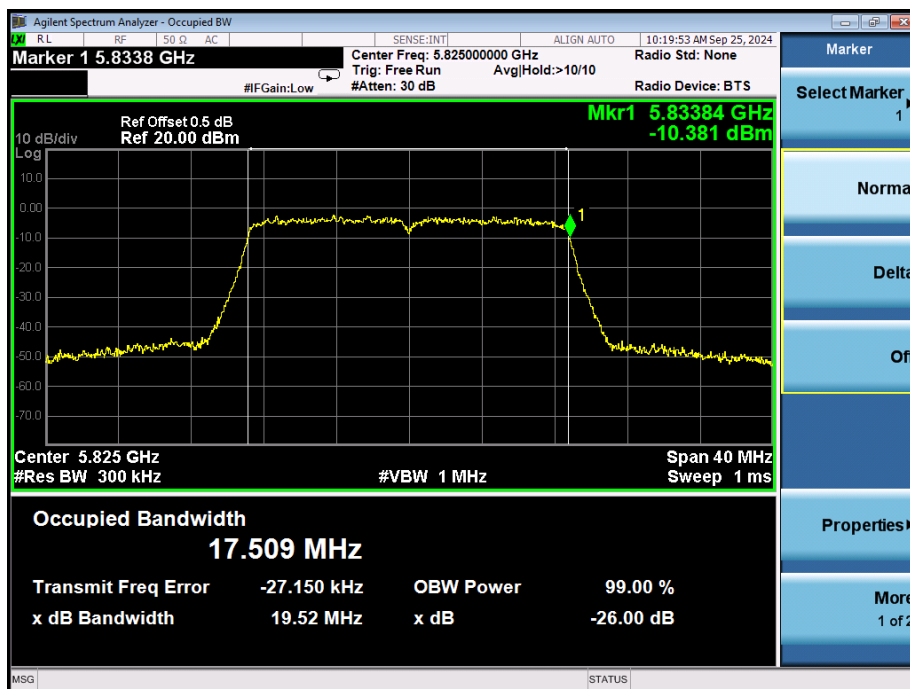
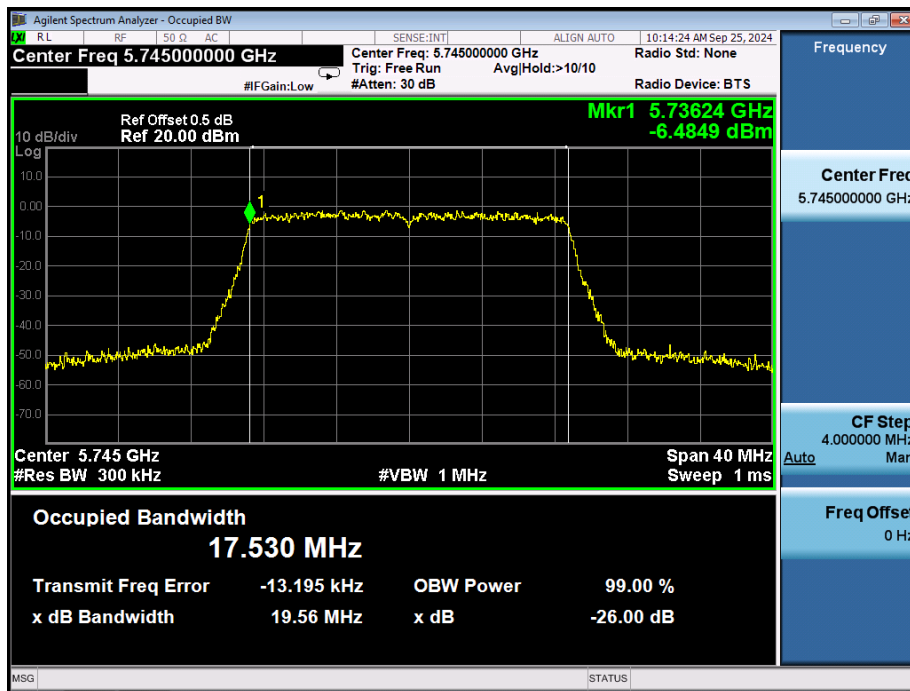


SHENZHEN

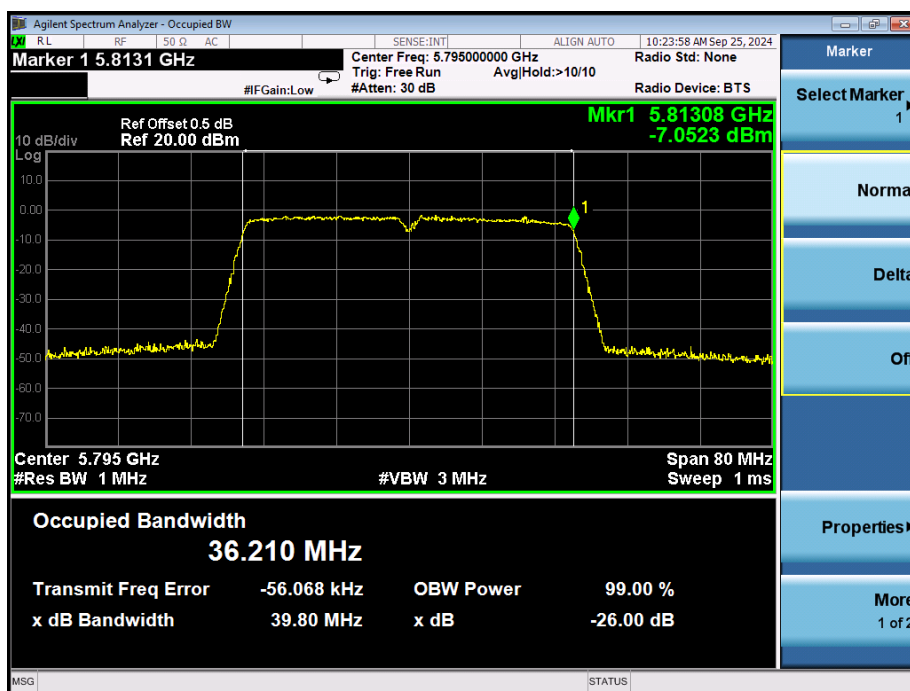
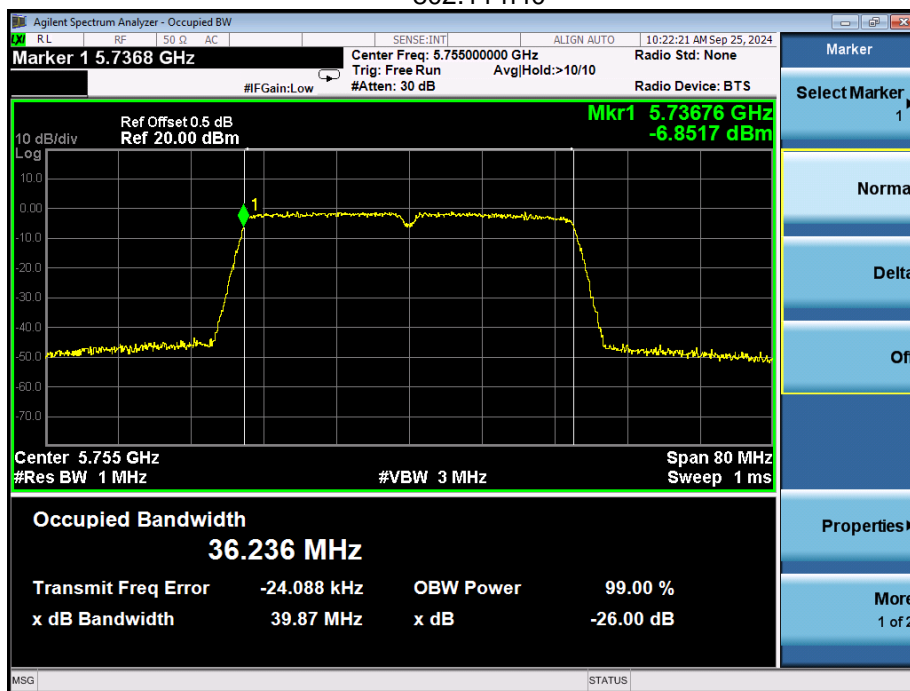
802.11 ax80



802.11 n20



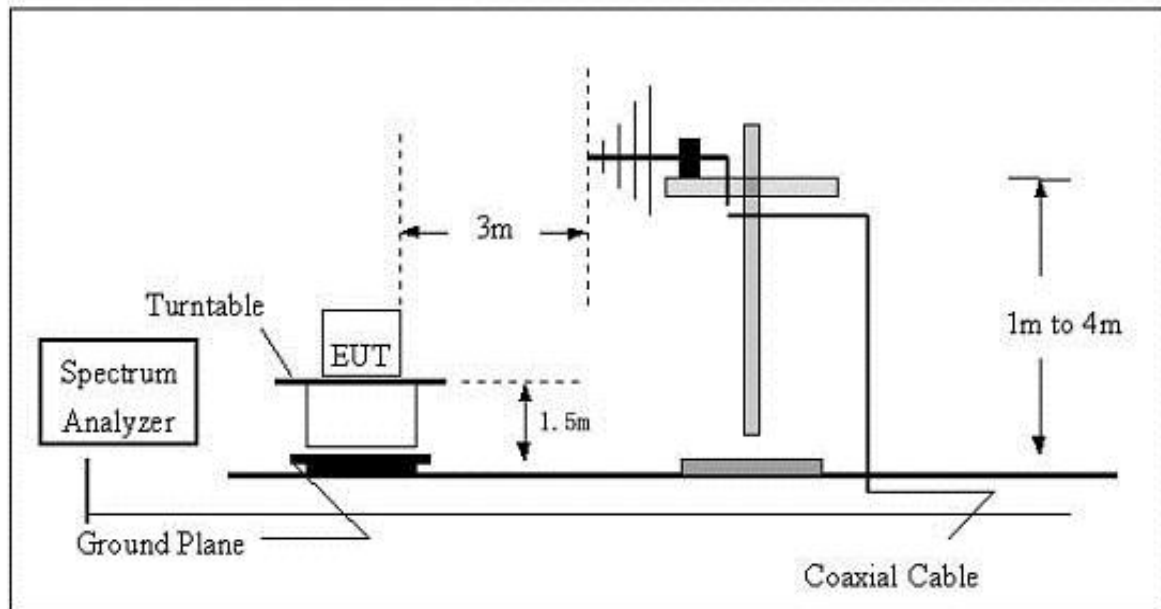
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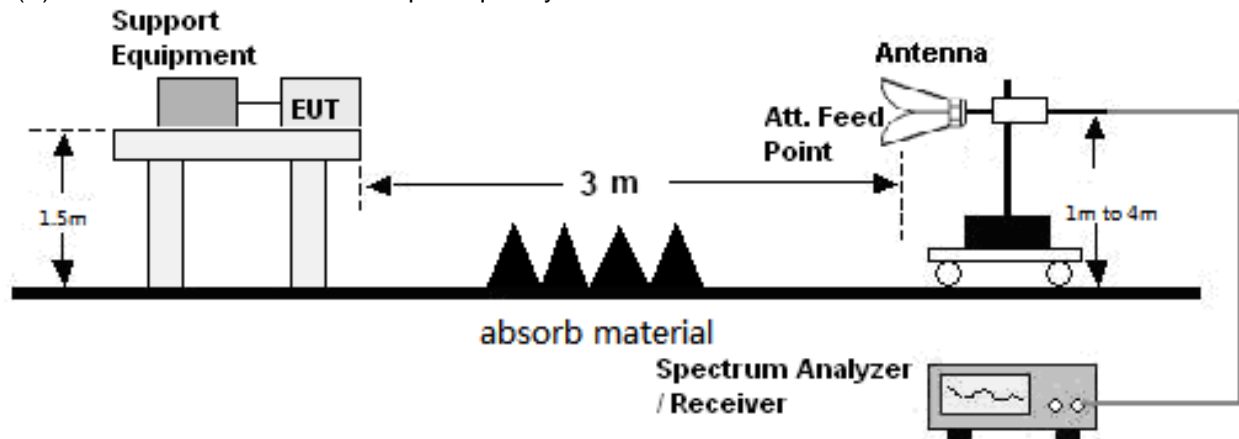
8. Spurious Emissions For Transmitter

8.1 Block Diagram Of Test Setup

(A) Radiated Emission Test Set-Up Frequency Below 1GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1GHz.



8.2 Limits

Table 3: Spurious emissions

Frequency ranges	47 MHz to 74 MHz 87,5 MHz to 108 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies ≤ 1 000 MHz	Frequencies > 1 000 MHz
State			
Operating	4 nW	250 nW	1 μW
Standby	2 nW	2 nW	20 nW

8.3 Test Procedure

30MHz ~ 1GHz:

- The Product was placed on the nonconductive turntable 1.5m above the ground in a full anechoic chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

- The Product was placed on the non-conductive turntable 1.5 m above the ground in a full anechoic chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

8.4 Test Results

All modes have been tested and reports show data in the worst mode

Test Mode: 802.11n20(ANT A)

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Correct Factor	Absolute Level	Result	
			Height	Polar			Limit	Margin
(MHz)	(dBm)	Degree	(m)	(H/V)	(dB)	(dBm)	(dBm)	(dB)
802.11n20 low channel								
568.16	-34.04	45	1.0	H	-27.89	-61.93	-54	-7.93
568.16	-33.50	12	1.1	V	-27.89	-61.40	-54	-7.40
11490.00	-39.66	279	1.6	H	-8.79	-48.45	-30	-18.45
11490.00	-41.06	39	1.6	V	-8.79	-49.85	-30	-19.85
17235.00	-54.70	305	1.0	H	-3.18	-57.88	-30	-27.88
17235.00	-52.97	338	1.8	V	-3.18	-56.15	-30	-26.15
802.11n20 Mid channel								
568.16	-33.34	347	1.2	H	-27.89	-61.24	-54	-7.24
568.16	-33.07	140	1.1	V	-27.89	-60.97	-54	-6.97
11570.00	-40.00	310	1.7	H	-8.86	-48.86	-30	-18.86
11570.00	-41.36	311	1.3	V	-8.86	-50.22	-30	-20.22
17355.00	-54.77	156	1.9	H	-2.52	-57.29	-30	-27.29
17355.00	-53.50	189	1.4	V	-2.52	-56.02	-30	-26.02
802.11n20 high channel								
568.16	-33.75	212	1.2	H	-27.89	-61.65	-54	-7.65
568.16	-34.03	46	1.1	V	-27.89	-61.92	-54	-7.92
11650.00	-39.98	154	1.9	H	-8.92	-48.90	-30	-18.90
11650.00	-41.27	57	1.6	V	-8.92	-50.19	-30	-20.19
17475.00	-54.70	354	1.5	H	-1.86	-56.56	-30	-26.56
17475.00	-53.14	211	1.5	V	-1.86	-55.00	-30	-25.00

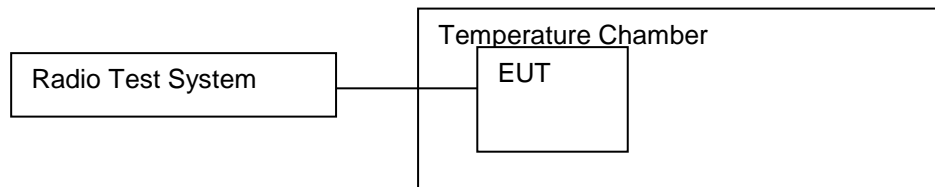
Remark:

Absolute Level = Receiver Reading + Factor

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

9. TX Duty Cycle

9.1 Block Diagram Of Test Setup



9.2 Limit

No Restriction

9.3 Test Procedure

An assessment of the overall Duty Cycle shall be made for a representative period of Tobs over the observation bandwidth Fobs. Unless otherwise specified, Tobs is 1 hour and the observation bandwidth Fobs is the operational frequency band.

The representative period shall be the most active one in normal use of the device. As a guide "Normal use" is considered as representing the behaviour of the device during transmission of 99 % of the [emissions] generated during its operational lifetime.

Procedures such setup, commissioning, and maintenance are not considered part of normal operation.

For manual operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmitter remains on until the trigger is released or the device is manually reset. The manufacturer shall also give a description of the application

for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and compare to the limit in table 4.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

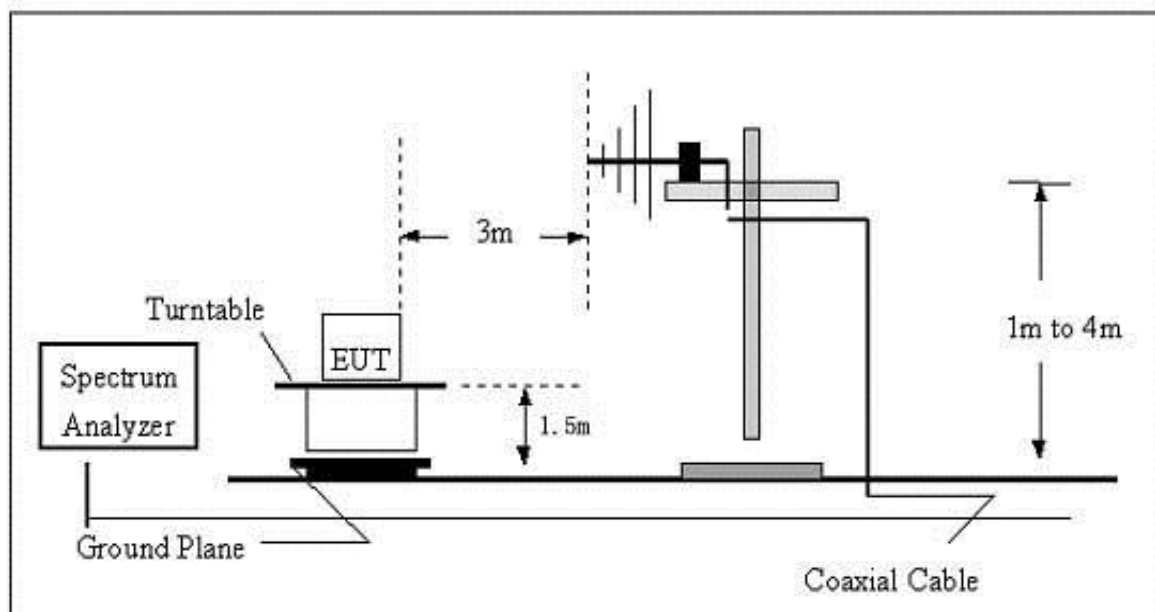
9.4 Test Result

For generic use devices operating at frequency range 5725-5875MHz, according to ETSI EN 300 440 V2.2.1 (2018-07), the duty cycle is no restriction.

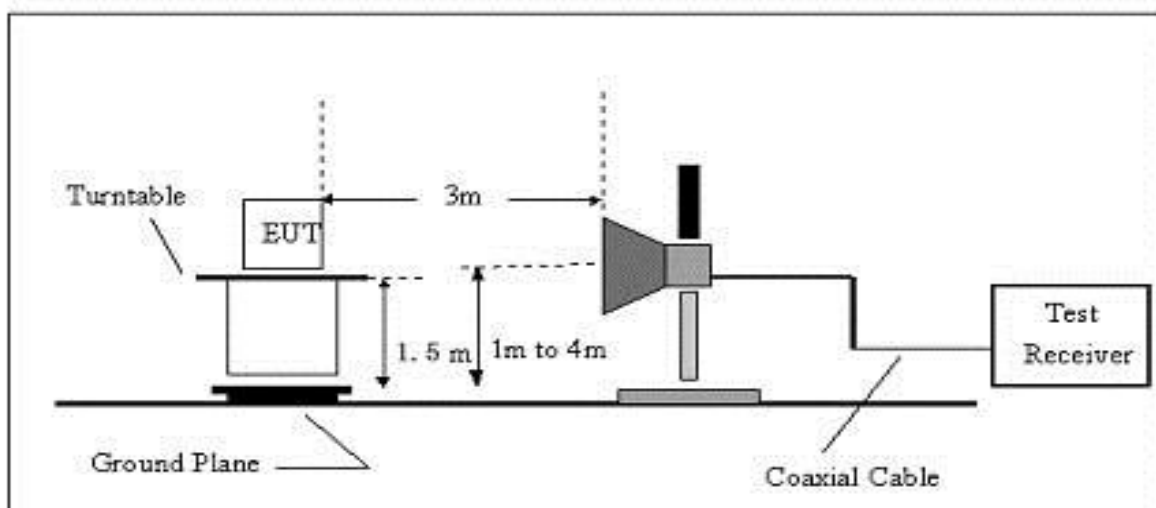
10. Spurious Emissions For Receiver

10.1 Block Diagram Of Test Setup

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



10.2 Limits

According to the Final draft ETSI EN 300 440 V2.2.1 (2018-05) Section 4.3.5.4, the power of any spurious emission shall not exceed 2 nW in the range 25 MHz to 1 GHz and shall not exceed 20 nW on frequencies above 1 GHz.

10.3 Test Procedure

30MHz ~ 1GHz:

- The Product was placed on the nonconductive turntable 1.5m above the ground in a full anechoic chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

- The Product was placed on the non-conductive turntable 1.5 m above the ground in a full anechoic chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

10.4 Test Results

All modes have been tested and reports show data in the worst mode

Test Mode: 802.11a (ANT A)

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Correct Factor	Absolute Level	Result	
			Height	Polar			Limit	Margin
(MHz)	(dBm)	Degree	(m)	(H/V)	(dB)	(dBm)	(dBm)	(dB)
802.11a low channel								
276.50	-34.04	181	1.8	H	-29.23	-63.27	-57.00	-6.27
276.50	-35.84	142	1.9	V	-29.23	-65.07	-57.00	-8.07
2969.63	-35.48	58	1.5	H	-23.69	-59.17	-47.00	-12.17
2969.63	-34.19	175	1.9	V	-23.69	-57.88	-47.00	-10.88
802.11a Mid channel								
276.50	-33.94	187	1.6	H	-29.23	-63.17	-57.00	-6.17
276.50	-36.39	29	1.1	V	-29.23	-65.61	-57.00	-8.61
2969.63	-36.29	2	1.9	H	-23.69	-59.99	-47.00	-12.99
2969.63	-33.86	140	1.3	V	-23.69	-57.56	-47.00	-10.56
802.11a high channel								
276.50	-34.41	189	1.6	H	-29.23	-63.64	-57.00	-6.64
276.50	-35.17	43	1.1	V	-29.23	-64.40	-57.00	-7.40
2969.63	-35.62	135	1.0	H	-23.69	-59.31	-47.00	-12.31
2969.63	-33.83	162	1.5	V	-23.69	-57.52	-47.00	-10.52

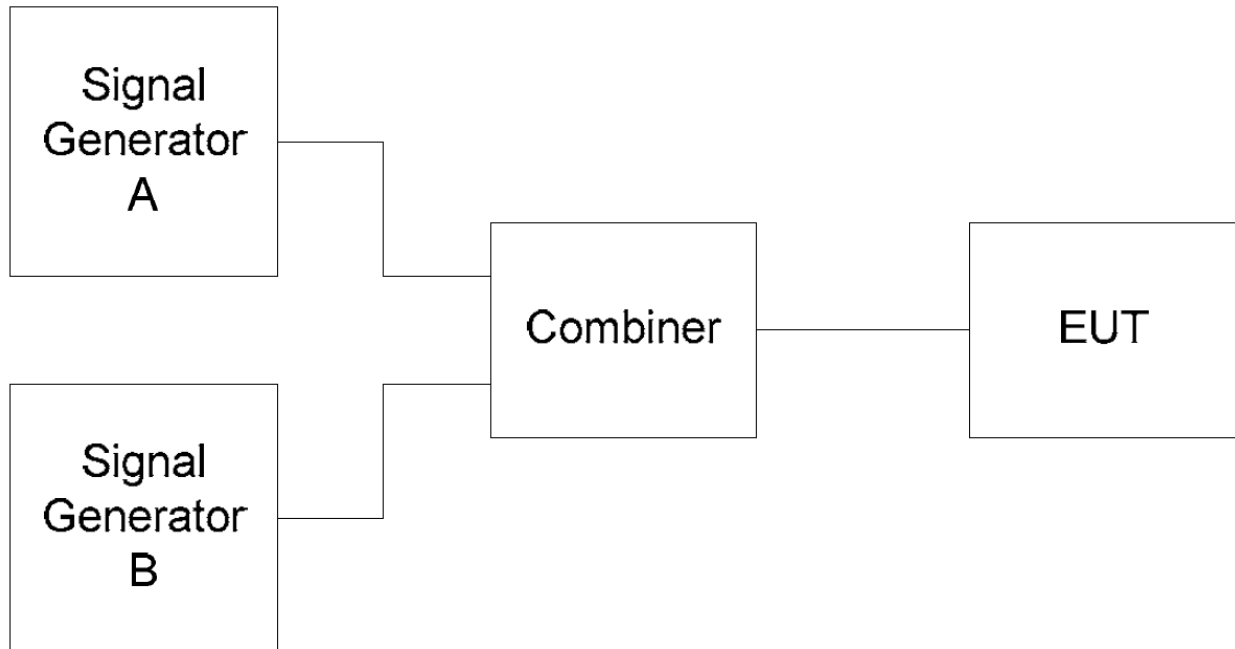
Remark:

Absolute Level = Receiver Reading + Factor

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

11. Blocking Or Desensitization

11.1 Block Diagram Of Test Setup



11.2 Limit

The adjacent channel selectivity of the equipment under specified conditions shall not be less than -30 dBm + k. The correction factor, k, is as follows:

Table 6: Limits for blocking or desensitization

Receiver category	Limit
1	-30 dBm + k
2	-45 dBm + k
3	-60 dBm + k

The correction factor, k, is as follows:

$$k = -20\log f - 10\log BW$$

Where:

-f is the frequency in GHz;

-BW is the occupied bandwidth in MHz.

The factor k is limited within the following:

$$-40 \text{ dB} < k < 0 \text{ dB}.$$

The measured blocking level shall be stated in the test report.

11.3 Test Procedure

This measurement shall be conducted under normal conditions.

Two signal generators A and B shall be connected to the receiver via a combining network to the receiver, either:

- a) via a test fixture or a test antenna to the receiver integrated, dedicated or test antenna; or
- b) directly to the receiver permanent or temporary antenna connector.

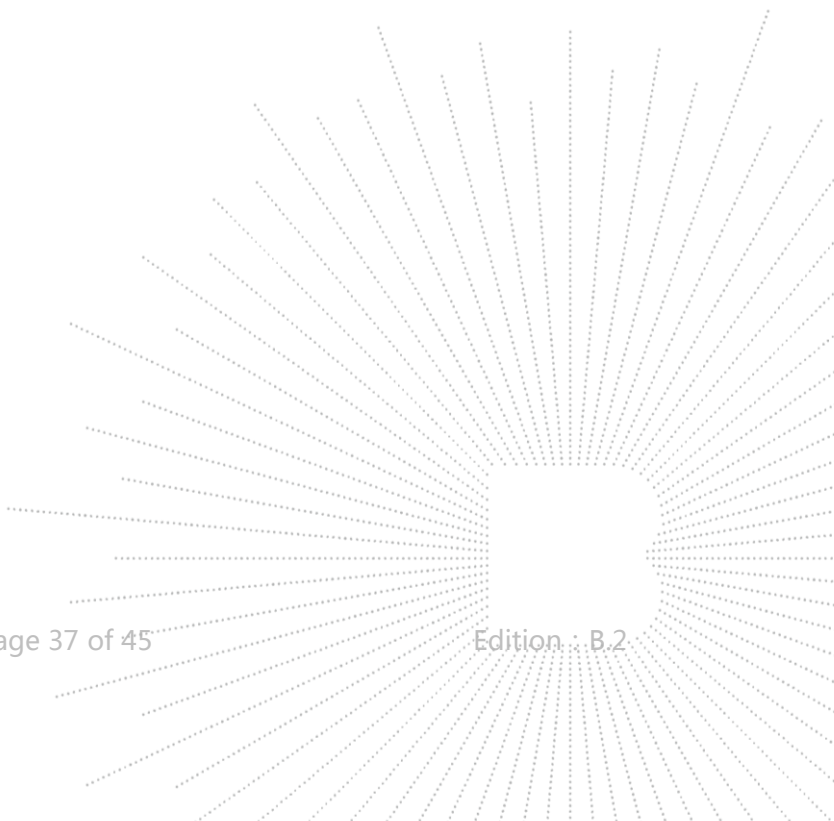
The method of coupling to the receiver shall be stated in the test report.

Signal generator A shall be at the nominal frequency of the receiver, with normal modulation of the wanted signal. Signal generator B shall be unmodulated and shall be adjusted to a test frequency at approximately 10 times, 20 times and 50 times of the occupied bandwidth above upper band edge of occupied bandwidth. Initially signal generator B shall be switched off and using signal generator A the level which still gives sufficient response shall be established. The output level of generator A shall then be increased by 3 dB. Signal generator B is then switched on and adjusted until the wanted criteria are met. This level shall be recorded.

The measurement shall be repeated with the test frequency for signal generator B at 10 times, 20 times and 50 times of the occupied bandwidth below the lower band edge of the occupied bandwidth.

The blocking or desensitization shall be recorded as the level in dBm of lowest level of the unwanted signal (generator B).

For tagging systems (e.g. RF identification, anti-theft, access control, location and similar systems) signal generator A may be replaced by a physical tag positioned at 70 % of the measured system range in metres. In this case, the blocking or desensitization shall be recorded as the ratio in dB of lowest level of the unwanted signal (generator B) resulting in a non-read of the tag, to the declared sensitivity of the receiver +3 dB.



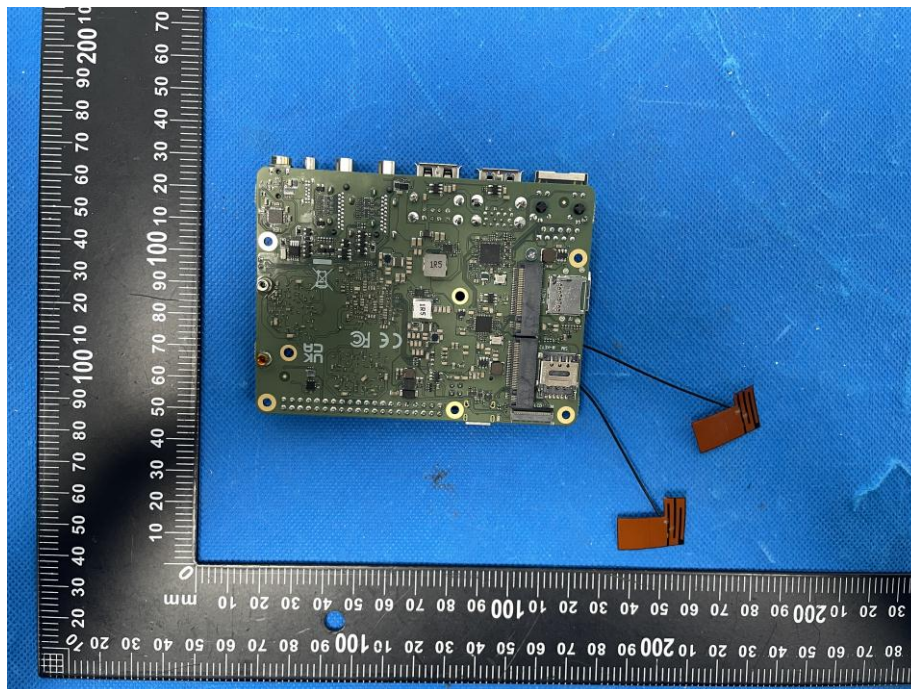
11.4 Test Result

The Worst mode 802.11a (Ant A)

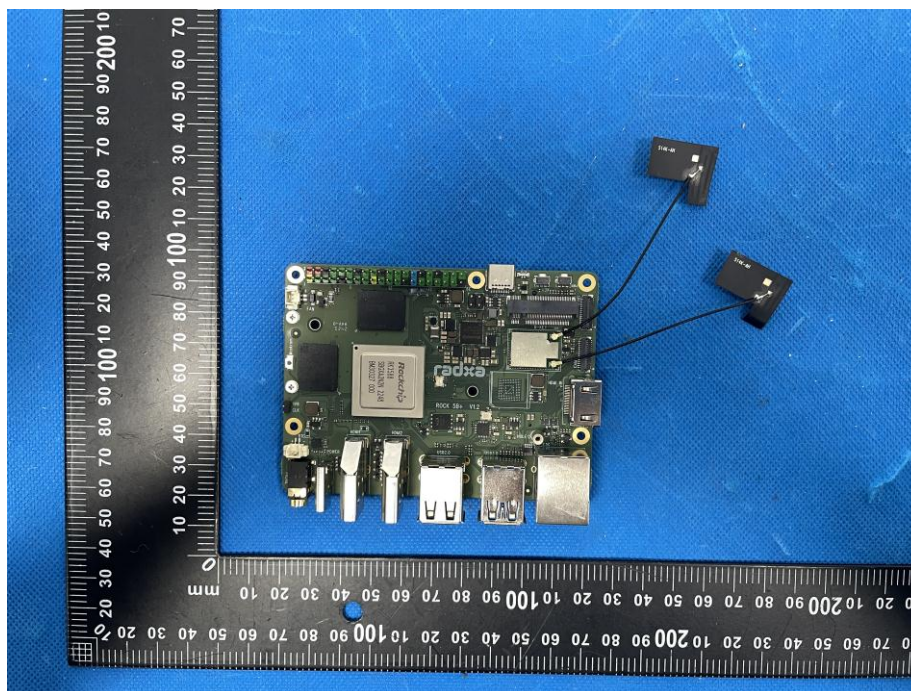
Receiver category 2				
Channel Frequency (MHz)	unwanted test signal Frequency	Signal generator B (Level) (dBm)	Limit (dBm)	Margin (dB)
5745	Centre Frequency – 10*BW	-63.00	-72.33	-9.33
	Centre Frequency + 10*BW	-63.00		-9.33
	Centre Frequency – 20*BW	-59.00		-13.33
	Centre Frequency + 20*BW	-60.00		-12.33
	Centre Frequency – 50*BW	-43.00		-29.33
	Centre Frequency + 50*BW	-42.00		-30.33
5825	Centre Frequency – 10*BW	-65.00	-72.45	-7.45
	Centre Frequency + 10*BW	-61.00		-11.45
	Centre Frequency – 20*BW	-56.00		-16.45
	Centre Frequency + 20*BW	-57.00		-15.45
	Centre Frequency – 50*BW	-44.00		-28.45
	Centre Frequency + 50*BW	-43.00		-29.45
Receiver BW=16.384MHz; K _{5745MHz} =-20log 5.745 -10log16.384=-27.33 K _{5825MHz} =-20log 5.825 -10log16.384=-27.45				

12. EUT Photographs

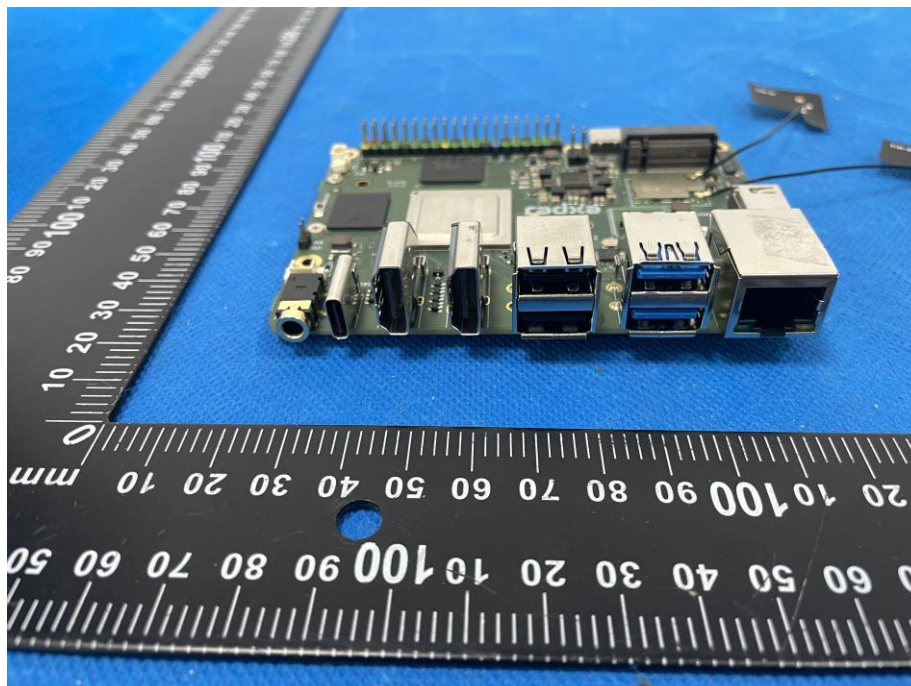
EUT Photo 1



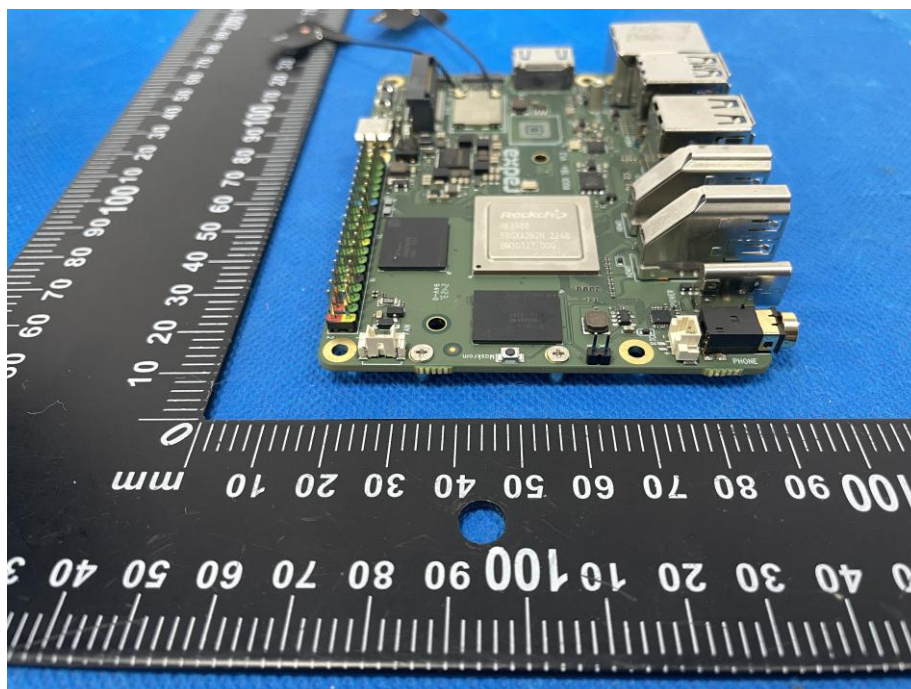
EUT Photo 2



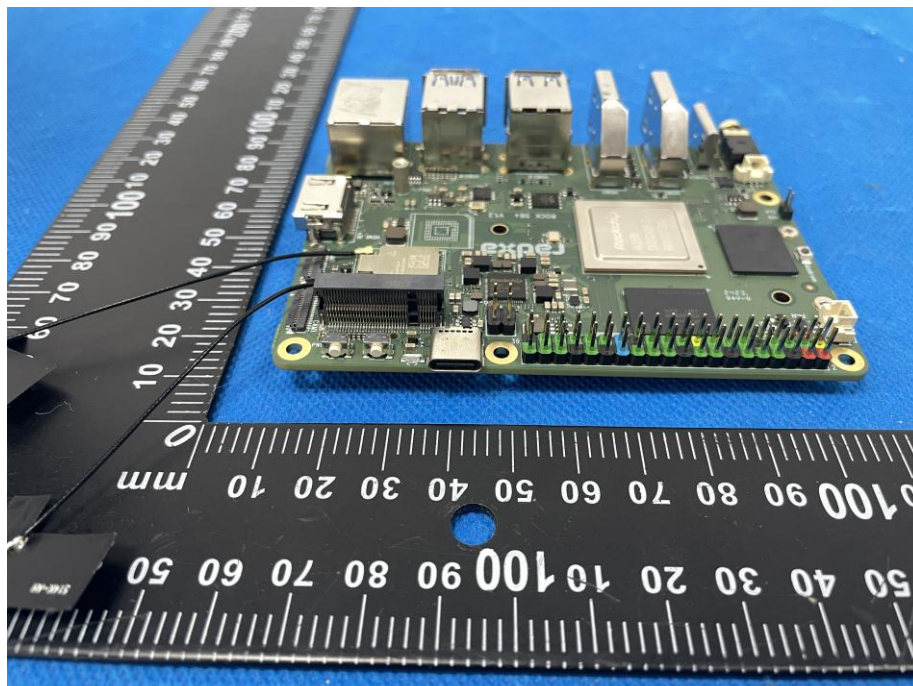
EUT Photo 3



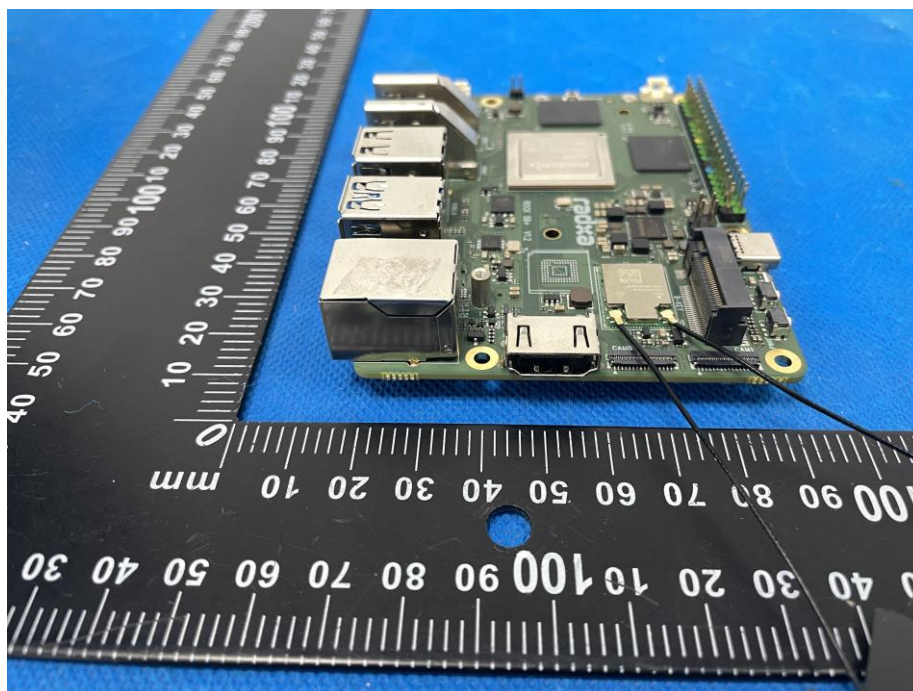
EUT Photo 4



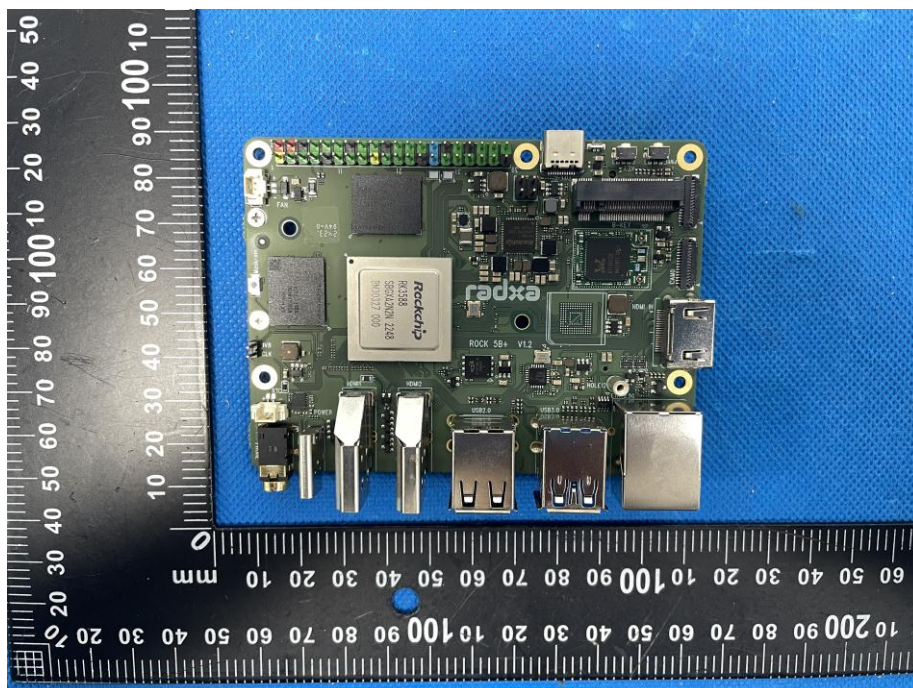
EUT Photo 5



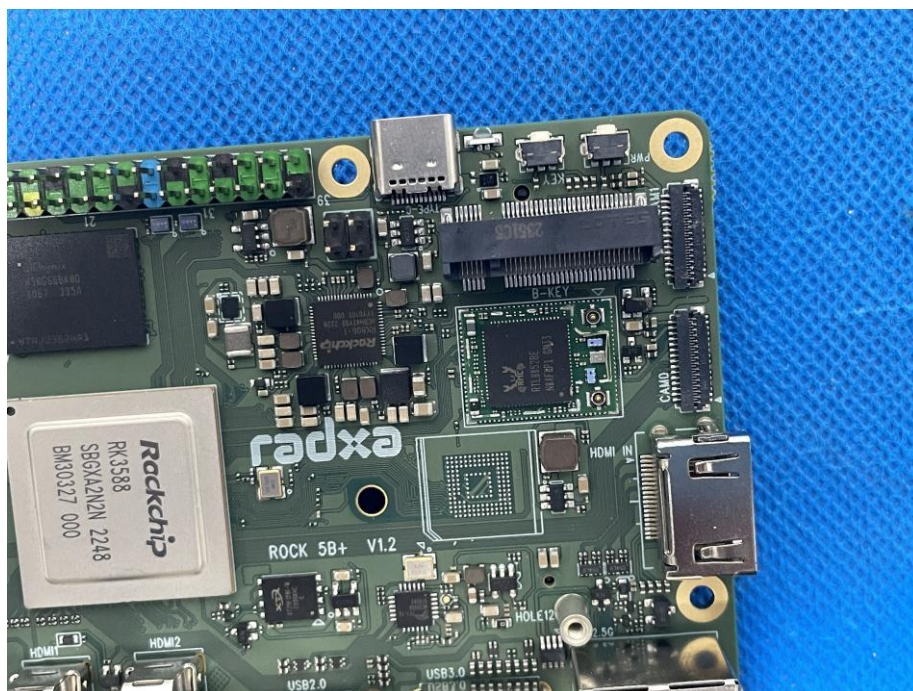
EUT Photo 6



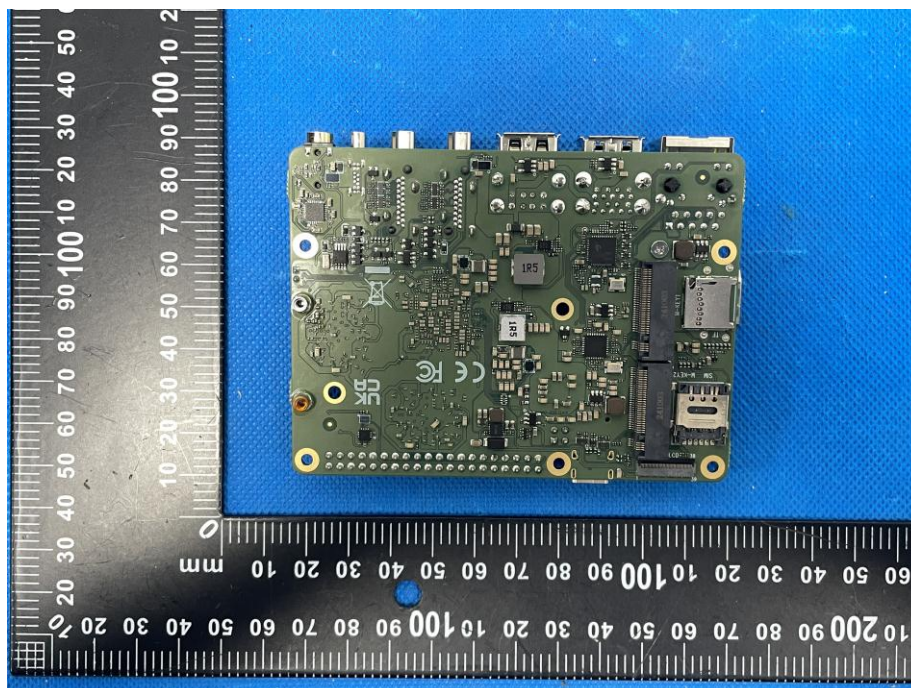
EUT Photo 7



EUT Photo 8



EUT Photo 9



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13. EUT Test Setup Photographs

Spurious emissions



STATEMENT

1. The equipment lists are traceable to the national reference standards.
2. The test report can not be partially copied unless prior written approval is issued from our lab.
3. The test report is invalid without the "special seal for inspection and testing".
4. The test report is invalid without the signature of the approver.
5. The test process and test result is only related to the Unit Under Test.
6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.
7. The quality system of our laboratory is in accordance with ISO/IEC17025.
8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: <http://www.chnbctc.com>

Consultation E-mail: bctc@bctc-lab.com.cn

Complaint/Advice E-mail: advice@bctc-lab.com.cn

***** END *****