TEST REPORT

Report No.:	BCTC2312909125-4E
Applicant:	MINIX Technology Limited
Product Name:	Mini PC
Test Model:	RIC SJ64-4W
Tested Date:	2023-11-30 to 2023-12-04
Issued Date:	2023-12-06

Shenzhen BCTC Technology Co., Ltd.

Product Name:	Mini PC
Trademark:	MINIX
Model/Type reference:	RIC SJ64-4W, RIC SJ64-8W, RIC SJ64-16W, RIC SJ64-4U, RIC SJ64-8U, RIC SJ64-16U, RIC SJ64-MB, RIC SJ64xxxxxxxxx (x can be 0-9, A-Z, a-z, "-", "_", "/" or blank for marketing purpose)
Prepared For:	MINIX Technology Limited
Address:	Unit 01, 15/F, Chevalier Commercial Center, No.8 Wang Hoi Road, Kowloon Bay, Kowloon, Hong Kong.
Manufacturer:	MINIX Technology Limited
Address:	Unit 01, 15/F, Chevalier Commercial Center, No.8 Wang Hoi Road, Kowloon Bay, Kowloon, Hong Kong.
Prepared By:	Shenzhen BCTC Technology Co., Ltd.
Address:	101M., Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang Community, Nanwan Street, Longgang District, Shenzhen, Guangdong, China
Sample Received Date:	2023-11-30
Sample tested Date:	2023-11-30 to 2023-12-04
Report No.:	BCTC2312909125-4E
Test Standards:	ETSI EN 301 893 V2.1.1 (2017-05)
Test Results:	PASS
Remark:	This is WIFI-5GHz band radio test report.

Tested by:

Kang Chen/ Project Handler

Approved by:

Sewen Guo/Reviewer

The test report is effective only with both signature and specialized stamp.This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Technology Co., Ltd, this report can't be reproduced except in full.The tested sample(s) and the sample information are provided by the client.

Table of Content

1. Version

Report No.	Issue Date	Description	Approved
BCTC2312909125-4E	2023-12-06	Original	Valid
Remark *: these modules have been tested and comply with EN301893 requirements, According to technical characteristic, only one item need retest for this device. For all other items' test results please reference original module's test report. Note*: On the basis of the original report (BCTC2304879606-1E), the application program of the product has been modified, adding WIFI 5G Band 1 and Band 4, the other remains unchanged, only need to carry out radiation detection, and other refer to the original report			

2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Nominal Centre frequencies	4.2.1	N/A*
2	Nominal Channel Bandwidth and Occupied Channel Bandwidth	4.2.2	N/A*
3	RF output power, Transmit Power Control (TPC) and Power Density	4.2.3	N/A*
4	Transmitter unwanted emissions outside the 5 GHz RLAN bands	4.2.4.1	N/A*
5	Transmitter unwanted emissions within the 5 GHz RLAN bands	4.2.4.2	PASS
6	Receiver spurious emissions	4.2.5	PASS
7	Dynamic Frequency Selection (DFS)	4.2.6	N/A
8	Adaptivity (Channel Access Mechanism)	4.2.7	N/A*
9	Receiver Blocking	4.2.8	N/A*
10	User Access Restrictions	4.2.9	N/A*

Note: N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.
Remark *: these modules have been tested and comply with EN301893 requirements, According to technical characteristic, only one item need retest for this device. For all other items' test results please reference original module's test report.

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	1×10^{-7}
RF power, conducted	± 1.0 dB
Duty Cycle and Tx-Sequence and Tx-Gap	±0.9
Occupied Channel Bandwidth	±2.3
Conducted spurious emission (30MHz-1GHz)	1.28 dB
Conducted spurious emission (1GHz-18GHz)	1.576 dB
Radiated Spurious emission (30MHz-1GHz)	4.30 dB
Radiated Spurious emission (1GHz-18GHz)	4.5 dB
Temperature	0.59 ℃
Humidity	5.3 %

4. Product Information and Test Setup

4.1 Product Information

Model/Type reference:	RIC SJ64-4W, RIC SJ64-8W, RIC SJ64-16W, RIC SJ64-4U, RIC SJ64-8U, RIC SJ64-16U, RIC SJ64-MB, RIC SJ64xxxxxxxxxx (x can be 0-9, A-Z, a-z, "-", "_", "/" or blank for marketing purpose)	
Model differences:	These models are identical in circuitry and electrical, mechanical and physical construction; Only the appearance is different; We chose RIC SJ64-4W as the final test prototype	
Antenna installation:	External antenna	
Antenna Gain:	BT	0 dBi
	WiFi(2.4GHz)	0 dBi
	WiFi (5.1GHz):	0 dBi
	WiFi (5.8GHz):	0 dBi
Ratings:	AC 100-240V~50/60Hz	
Adapter:	Mode: NB-65B19 Input: 100-240VAC,50/60Hz, 1.6A Max Output: 19V/3.42A	

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.	---	---	---	---	---

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 Test Environment

1. Normal Test Conditions:

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Temperature(℃):	26
Test Voltage(AC):	AC 230V

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	LT	HT
Temperature (℃)	-10	35

5. Test Facility and Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Technology Co., Ltd. Address: 101M., Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang Community, Nanwan Street, Longgang 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

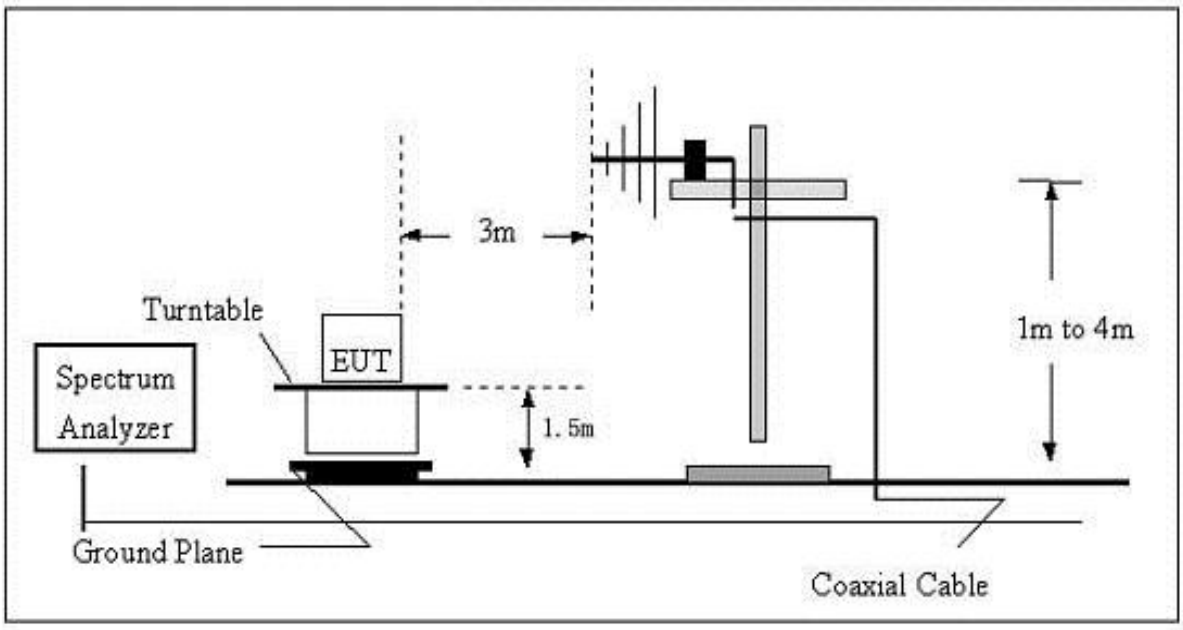
Radiated Emissions Test (966 Chamber)					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
966 chamber	ChengYu	966 Room	966	Aug.02, 2023	Aug.01, 2026
Loop Antenna	Schwarzbeck	FMZB1519B	014	May 15, 2023	May 14, 2024
Receiver	R&S	FSP 40	9K-40GHz	May 15, 2023	May 14, 2024
Horn Antenn (18GHz-40GHz)	Schwarzbeck	BBHA9170	00822	Jun. 04, 2023	Jun. 03, 2024
Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	May 15, 2023	May 14, 2024
Broadband antenna	SCHWHRZBECK	VULB9168	227	Sep.21, 2023	Sep.20, 2024
Receiver	R&S	ESR	1316	Sep.21, 2023	Sep.20, 2024
Preamplifier	SCHWHRZBECK	BBV9745	370	Sep.21, 2023	Sep.20, 2024
Horn antenna	SCHWARZBECK	BBHA 9120 D	2792	Sep.19, 2023	Sep.18, 2024
Preamplifier	EMC INSTRUMENTS CORPORATION	EMC0518A45 SEE	EMT-SZ2233	Sep.6, 2023	Sep.5, 2024
RF cable 3#	/	9M	18038626	Dec. 23, 2022	Dec. 22, 2023
RF cable 4#	SKET	5M	#10	Dec. 23, 2022	Dec. 22, 2023
RF cable 5#	/	10M	/	Sep.21, 2023	Sep.20, 2024
RF cable 6#	/	3M	/	Sep.21, 2023	Sep.20, 2024
Software	EZ-EMC	Ver.FA-03A2	/	/	/

RF Conducted Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Spectrum Analyzer	Keysight	N9020A	MY51287403	Sep.6, 2023	Sep.5, 2024
Signal Generator	Keysight	N5182A	MY50144088	Sep.6, 2023	Sep.5, 2024
Power Sensor	MWRFtest	MW100-RFCB	\	Sep.6, 2023	Sep.5, 2024
Radio frequency control box	MWRFtest	MW100-RFCB	\	\	\
Software	Frad	EZ-EMC	FA-03A2 RE	\	\
Software	Keysight	Keysight.ETSL Test system	1.02.05	\	\
D.C. Power Supply	LongWei	D-41747 Viersen	6230316	Sep.21, 2023	Sep.20, 2024
Communication test set	R&S	CMW500	157483	Sep.6, 2023	Sep.5, 2024
Programmable constant temperature and humidity test chamber	Auchno	OJN-9606-408 L	19120183	Sep.6, 2023	Sep.5, 2024

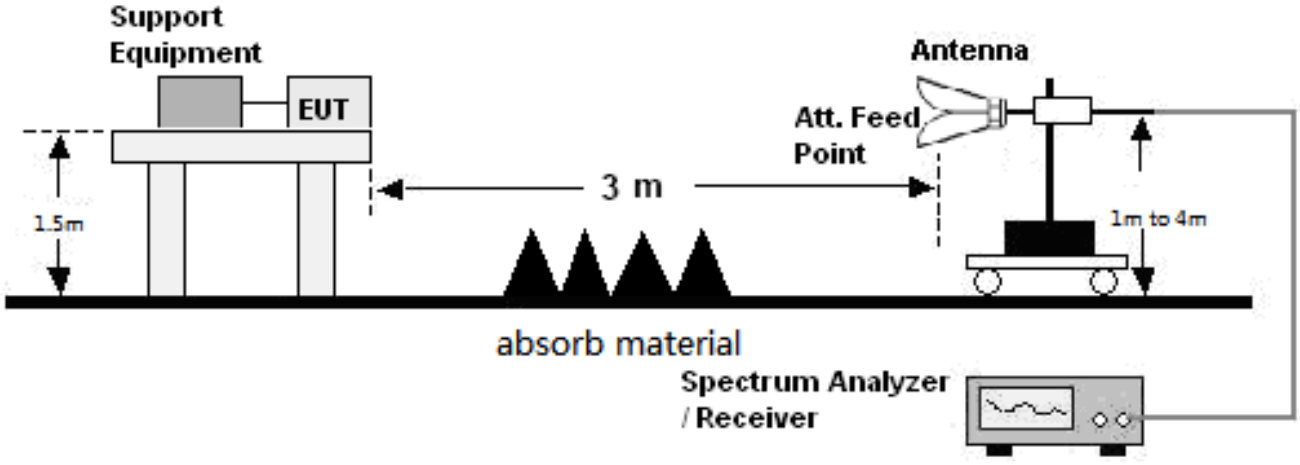
6. Transmitter Unwanted Emissions In The Spurious Domain

6.1 Block Diagram Of Test Setup

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



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



6.2 Limits

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz/300KHz
47 MHz to 74 MHz	-54 dBm	100 kHz/300KHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz/300KHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz/300KHz
118 MHz to 174 MHz	-36 dBm	100 kHz/300KHz
174 MHz to 230 MHz	-54 dBm	100 kHz/300KHz
230 MHz to 470 MHz	-36 dBm	100 kHz/300KHz
470 MHz to 862 MHz	-54 dBm	100 kHz/300KHz
862 MHz to 1 GHz	-36 dBm	100 kHz/300KHz
1 GHz to 5.15 GHz	-30 dBm	1 MHz/3MHz
5.35 GHz to 5.47 GHz	-30 dBm	1 MHz/3MHz
5.725 GHz to 26 GHz	-30 dBm	1 MHz/3MHz

6.3 Test Procedure

Please refer to ETSI EN 301 893 (V2.1.1) 5.4.5.1 & 5.4.5.2 for the measurement methods.

The UUT shall be connected to a spectrum analyser capable of RF power measurements.

If possible, the UUT shall be set to continuous transmit (duty cycle = 1) for the duration of this test.

If continuous transmit is not possible, the UUT should be configured to operate at its maximum duty cycle.

- Pre-scan

The test procedure below shall be used to identify potential unwanted emissions of the UUT.

Step 1:

• The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in 4.2.4.1.2, table 4.

Step 2:

• The unwanted emissions over the range 30 MHz to 1 000 MHz shall be identified.

• Spectrum analyser settings:

- Resolution bandwidth: 100 kHz

- Video bandwidth: 300 kHz

- Detector mode: Peak

- Trace Mode: Max Hold

- Sweep Points: ≥ 9 970

- Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT.

NOTE 1: E.g. for non continuous transmissions, if the UUT is using a test sequence as described in clause 5.1.2.1 (transmitter on + off time of 2 ms), then the sweep time has to be greater than 4 ms per 100 kHz.

• Allow the trace to stabilize. Any emissions identified that are higher than the "applicable limit - 6 dB", shall

be individually measured using the procedure in4.2.4.1.2, table 4 and compared to the limits given in clause 4.2.4.1.2, table 4.

Step 3:

• The unwanted emissions over the range 1 GHz to 26 GHz shall be identified.

• Spectrum analyser settings:

- Resolution bandwidth: 1 MHz

- Video bandwidth: 3 MHz

- Detector mode: Peak

- Trace Mode: Max Hold

- Sweep points: 25 000

NOTE 2: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented. - Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT.

NOTE 3: E.g. for non continuous transmissions, if the UUT is using a test sequence as described in clause 5.1.2.1 (transmitter on + off time of 2 ms), then the sweep time has to be greater than 4 ms per 1 MHz.

• Allow the trace to stabilize. Any emissions identified that are higher than the "applicable limit - 6 dB", shall be individually measured using the procedure in 4.2.4.1.2, table 4 and compared to the limits given in clause 4.2.4.1.2, table 4.

- Measurement of the emissions identified during the pre-scan

The limits for unwanted emissions in clause 4.2.4.1 refer to average power levels.

The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above.

The signal to noise ratio shall be sufficient to allow an accurate measurement.

Continuous transmit signals:

For continuous transmit signals, a simple measurement using the RMS detector of the spectrum analyser is permitted.

The measured values shall be recorded and compared with the limits in clause 4.2.4.1.2, table 4.

Non-continuous transmit signals:

For non-continuous transmit signals, the measurement shall be made only over the "on" part of the burst.

Step 1:

• The level of the emissions shall be measured in the time domain, using the following spectrum analyser settings:

- Centre Frequency: Frequency of emission identified during the pre-scan

- RBW: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)

- VBW: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)

- Frequency Span: 0 Hz

- Sweep mode: Single Sweep

- Sweep Time: Suitable to capture one transmission burst. Additional measurements may be needed to identify the length of the transmission burst. In case of continuous signals, the Sweep Time shall be set to 30 ms

- Sweep points: Sweeptime [µs] / 1 µs with a maximum of 30 000

- Trigger: Video (burst signals) or Manual (continuous signals)

- Detector: RMS

- Trace Mode: Clear/Write

Step 2:

Adjust the trigger level to select the transmissions with the highest power level.

Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function. If the spurious emission to be measured is a continuous signal, the measurement window shall be set to match the start and stop times of the sweep.

Select RMS power to be measured within the selected window and note the result which is the RMS power of this particular spurious emission. Compare this value with the applicable limit provided by clause 4.2.4.1.2, table 4.

Repeat this procedure for every emission identified during the pre-scan. The values and corresponding frequencies shall be recorded.

In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements shall be repeated for each of the active transmit chains. Comparison with the applicable limits shall be done using either of the options given below:

• Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added and

compared with the limits provided by table 4 in clause 4.2.4.1.2.

• Option 2: the results for each of the transmit chains shall be individually compared with the limits provided by table 4 in clause 4.2.4.1.2 after these limits have been reduced by 10 × log10 (Tch) (number of active transmit chains).

6.4 Test Results

All modes have been tested and reports show data in the worst mode
Test Mode: Transmitting 802.11n20 (worst case)

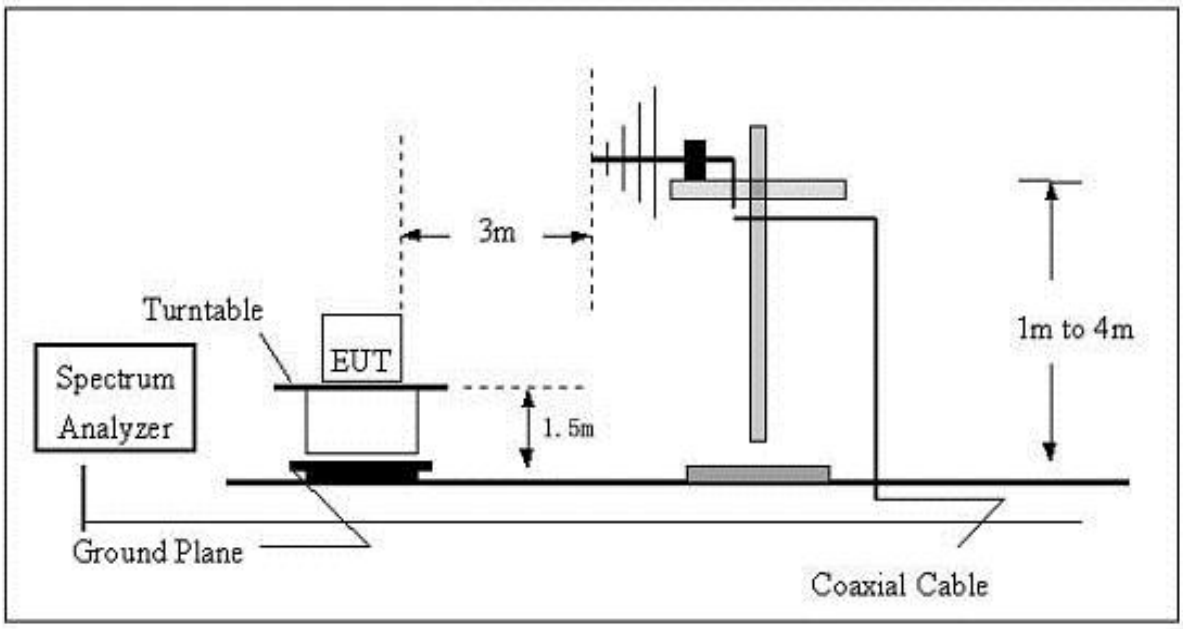
Frequency	Receiver Reading	Turn table Angle	RX Antenna		Correct	Absolute Level	Result	
			Height	Polar	Factor		Limit	Margin
(MHz)	(dBm)	Degree	(m)	(H/V)	(dBm)	(dBm)	(dBm)	(dB)
802.11n20 low channel								
532.16	-54.94	136	1.6	H	-16.32	-71.27	-54	-17.27
532.16	-49.73	84	1.1	V	-16.32	-66.05	-54	-12.05
10360.00	-42.02	360	1.7	H	3.66	-38.36	-30	-8.36
10360.00	-41.23	247	1.6	V	3.66	-37.57	-30	-7.57
15540.00	-57.38	137	1.4	H	8.54	-48.84	-30	-18.84
15540.00	-59.60	255	1.7	V	8.54	-51.06	-30	-21.06
802.11n20 high channel								
532.16	-54.40	312	1.8	H	-16.32	-70.72	-54	-16.72
532.16	-49.00	275	1.9	V	-16.32	-65.32	-54	-11.32
10480.00	-42.80	41	1.2	H	3.91	-38.89	-30	-8.89
10480.00	-40.31	267	1.8	V	3.91	-36.40	-30	-6.40
15720.00	-57.51	97	1.3	H	8.68	-48.83	-30	-18.83
15720.00	-60.07	42	1.2	V	8.68	-51.39	-30	-21.39

Remark:
Absolute Level = Receiver Reading + Factor
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Margin= Absolute Level- Limit

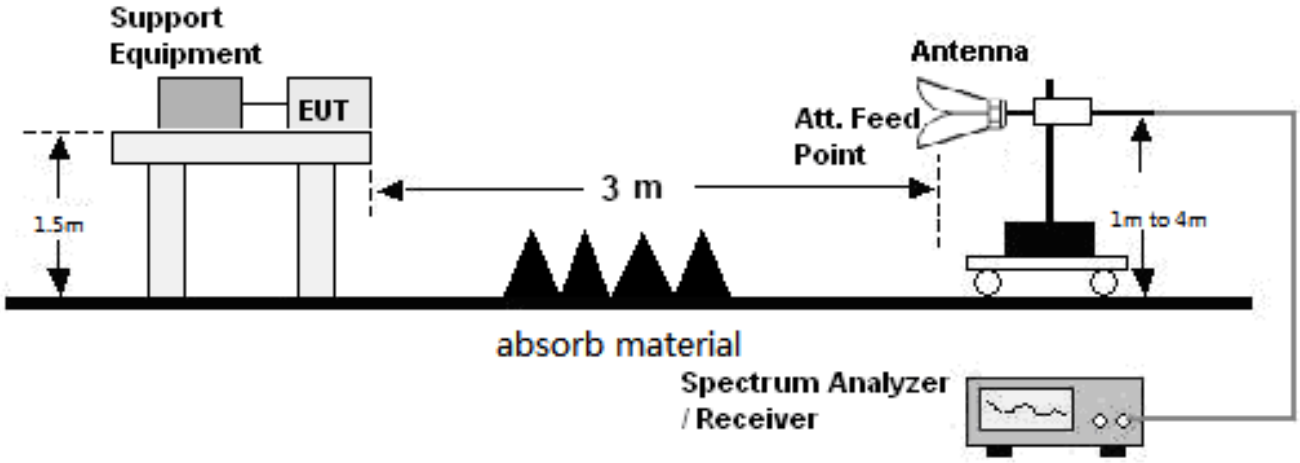
7. Receiver Spurious Emissions

7.1 Block Diagram Of Test Setup

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



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



7.2 Limits

Frequency(MHz)	Limit
30-1000	-57dBm
1000-26000	-47dBm

7.3 Test Procedure

Please refer to ETSI EN 301 893 (V2.1.1) clause 5.4.7.2 for the measurement methods.

- Pre-scan

The test procedure below shall be used to identify potential receiver spurious emissions of the UUT.

Step 1:

• The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in clause 4.6.2, table 4.

Step 2:

• The emissions shall be measured over the range 30 MHz to 1 000 MHz.

• Spectrum analyser settings:

- Resolution bandwidth: 100 kHz

- Video bandwidth: 300 kHz

- Detector mode: Peak

- Trace Mode: Max Hold

- Sweep Points: ≥ 9 700

> For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented. For spectrum analysers capable of supporting twice this number of sweep points, the frequency adjustment in clause 5.4.7.2.1.2 (step 1, last bullet) may be omitted.

- Sweep time: Auto

• Wait for the trace to stabilize. Any emissions identified that have a margin of less than 6 dB with respect to the limits given in clause 4.2.5.2, table 5, shall be individually measured using the procedure in clause 5.4.7.2.1.2 and compared to the limits given in clause 4.2.5.2, table 5.

Step 3:

• The emissions shall now be measured over the range 1 GHz to 26 GHz.

• Spectrum analyser settings:

- Resolution bandwidth: 1 MHz

- Video bandwidth: 3 MHz

- Detector mode: Peak

- Trace mode: Max Hold

- Sweep Points: ≥ 25 000

> For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented. For spectrum analysers capable of supporting twice this number of sweep points, the frequency adjustment in clause 5.4.7.2.1.2 (step 1, last bullet) may be omitted.

- Sweep time: Auto

• Wait for the trace to stabilize. Any emissions identified that have a margin of less than 6 dB with respect to the limits given in clause 4.2.5.2, table 5, shall be individually measured using the procedure in clause 5.4.7.2.1.2 and compared to the limits given in clause 4.2.5.2, table 5.

- Measurement of the emissions identified during the pre-scan

The limits for receiver spurious emissions in clause 4.2.5 refer to average power levels.

The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyser has a Time Domain Power function.

Step 1:

The level of the emissions shall be measured using the following spectrum analyser settings:

- Measurement Mode: Time Domain Power

- Centre Frequency: Frequency of the emission identified during the pre-scan

- Resolution Bandwidth: 100 kHz (emissions < 1 GHz) / 1 MHz (emissions > 1 GHz)

- Video Bandwidth: 300 kHz (emissions < 1 GHz) / 3 MHz (emissions > 1 GHz)

- Frequency Span: Zero Span

- Sweep mode: Single Sweep

- Sweep time: 30 ms

- Sweep points: ≥ 30 000

- Trigger: Video (for burst signals) or Manual (for continuous signals)

- Detector: RMS

Adjust the centre frequency (fine tune) to capture the highest level of one burst of the emission to be measured.This fine tuning can be omitted for spectrum analysers capable of supporting twice this number of sweep points required in step 2 and step 3 from the pre-scan procedure in clause 5.4.7.2.1.1.

Step 2:

Set a window where the start and stop indicators match the start and end of the burst with the highest level and

record the value of the power measured within this window.

If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to the start and stop times of the sweep.

Step 3:

In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 shall be repeated for each of the active receive chains.

Sum the measured power (within the observed window) for each of the active receive chains.

Step 4: The value defined in step 3 shall be compared to the limits defined in clause 4.2.5.2, table 5.

7.4 Test Results

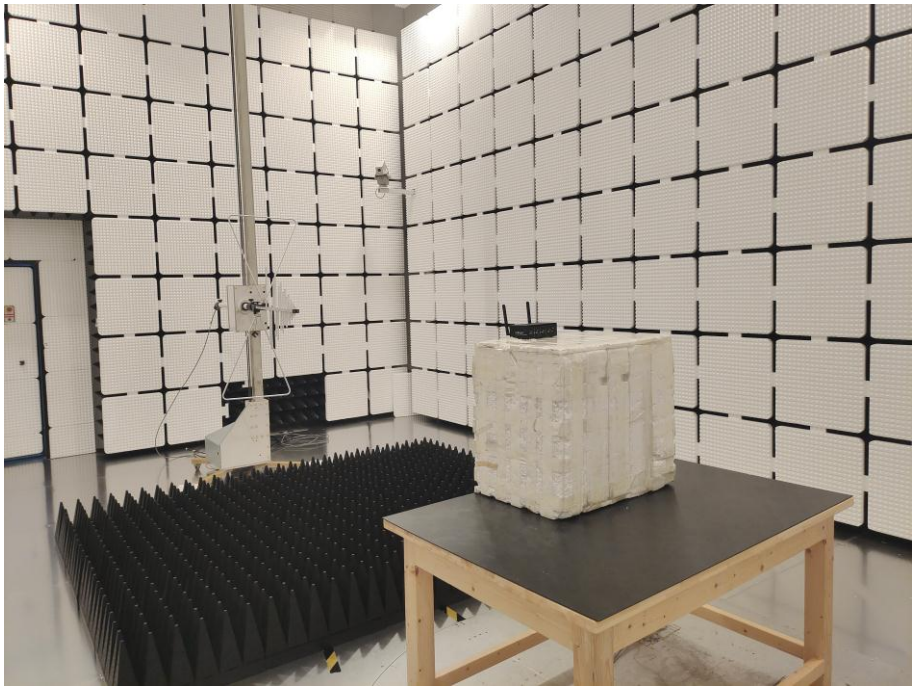
All modes have been tested and reports show data in the worst mode
Test Mode: Transmitting 802.11n20 (worst case)

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Correct	Absolute Level	Result	
			Height	Polar	Factor		Limit	Margin
(MHz)	(dBm)	Degree	(m)	(H/V)	(dBm)	(dBm)	(dBm)	(dB)
802.11n20 low channel								
423.15	-54.78	205	2.0	H	-17.26	-72.04	-57.00	-15.04
423.15	-54.77	352	1.0	V	-17.26	-72.03	-57.00	-15.03
3095.87	-49.34	59	1.4	H	-16.42	-65.76	-47.00	-18.76
3095.87	-51.51	143	1.1	V	-16.42	-67.93	-47.00	-20.93
802.11 n20 high channel								
423.15	-54.65	146	1.2	H	-17.26	-71.91	-57.00	-14.91
423.15	-53.99	5	1.1	V	-17.26	-71.25	-57.00	-14.25
3095.87	-48.60	31	1.1	H	-16.42	-65.01	-47.00	-18.01
3095.87	-50.95	24	1.9	V	-16.42	-67.36	-47.00	-20.36

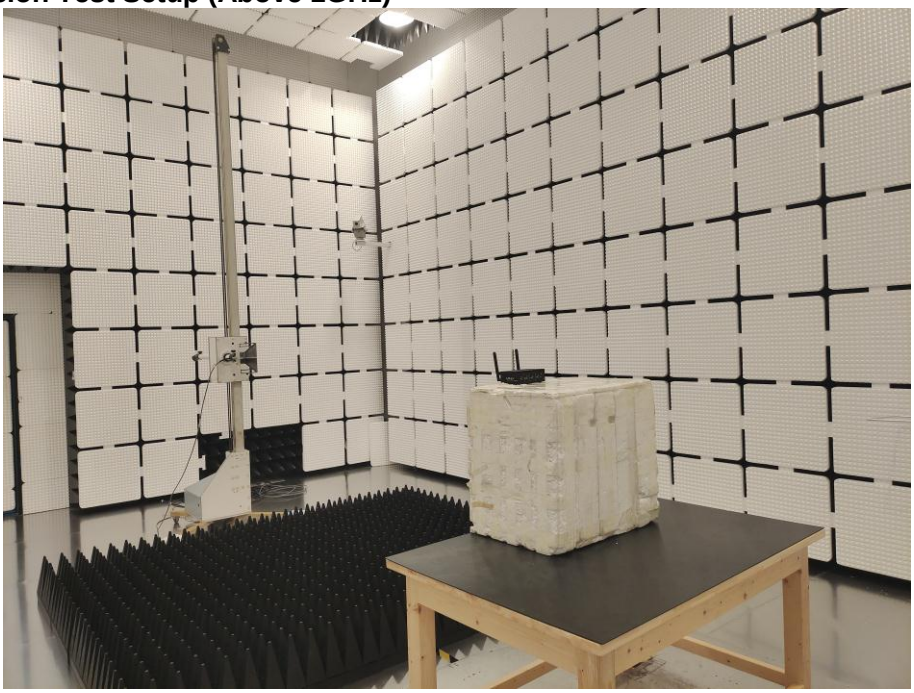
Remark:
Absolute Level = Receiver Reading + Factor
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Margin= Absolute Level- Limit

8. EUT Test Setup Photographs

Spurious Emission Test Setup (Below 1GHz)



Spurious Emission Test Setup (Above 1GHz)



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:
101M., Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang Community, Nanwan Street, Longgang District, Shenzhen, Guangdong, China

TEL：400-788-9558

P.C.: 518116

FAX：0755-33229357

Website：http://www.chnbctc.com

E-Mail：bctc@bctc-lab.com.cn

※※※※※ **END** ※※※※※