SIMULTANEOUSLY TRANSMISSION AND CO-LOCATION TEST REPORT

For

WIFI Module

FCC MODEL NUMBER: SI04B, SI04* (*: A ~ Z, or Blank)
ISED MODEL NUMBER: SI04B

FCC ID: 2AFG6-SI04B
IC: 22166-SI04B

REPORT NUMBER: 4790929065-1-RF-3

ISSUE DATE: August 10, 2023

Prepared for

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Revision History

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V0	August 10, 2023	Initial Issue	

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	Guangzhou Shirui Electronics Co., Ltd.
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Manufacturer Information

Company Name:	Guangzhou Shirui Electronics Co., Ltd.
Address:	192 Kezhu Road, Scientech Park, guangzhou Economic Technology Development District, Guangzhou, China

EUT Information

EUT Name:	WIFI Module
FCC&ISED Model:	SI04B
FCC Series Model:	SI04* (*: A ~ Z, or Blank)
Model difference:	Refer to section 5.1
Sample Received Date:	July 13, 2023
Sample Status:	Normal
Sample ID:	5161650
Date of Tested:	July 24, 2023 to August 10, 2023

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OFS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Radiated Emission (Included Fundamental Emission) (1 GHz to 40 GHz)	5.78 dB (1 GHz-18 GHz)
	5.23dB (18 GHz-26 GHz)
	5.64 dB (26 GHz-40 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	WIFI Module
FCC&ISED Model	SI04B
FCC Series Model	SI04* (*: A ~ Z, or Blank)
Model difference	SI04* (*: A ~ Z, or Blank) has the same technical construction including circuit diagram, PCB Layout, components, and component layout, all electrical construction, and mechanical construction with SI04B. The difference lies only in the model number and market. All these changes do not degrade the unwanted emissions of the certified product.
Power Supply	DC 12 V

5.2. THE TEST CASE CONFIGURATIONS

Note: The EUT have two wireless modules, one is called module SKI.WB8821CU.1 and the other one called module SKI.W7613E.1.

Simultaneously Transmission Conditions:

Co-Location Conditions:

Condition	Technology (Module SKI.W7613E.1)	Technology (Module SKI.WB8821CU.1)		Support (YES/NO)
1	WLAN (5G) MIMO	WLAN (2.4G) SISO	WLAN (5G) SISO	YES
2	WLAN (5G) SISO	WLAN (2.4G) SISO	WLAN (5G) SISO	YES

Note: For SKI.W7613E.1 model, we have pre-test the SISO mode and MIMO mode, only the worst data for MIMO mode were recorded in the report. All the Conditions have been tested, only the worst data for Condition 1 was recorded in the report.

For the detailed test description, please refer to the below report number:

Wireless Module	Technology	Report Number
Module SKI.W7613E.1	WLAN(5G)	4790929065-6-RF-1
Module SKI.WB8821CU.1	WLAN (5G)	4790929065-1-RF-2
	WLAN (2.4G)	4790929065-1-RF-1

6. MEASURING INSTRUMENT AND SOFTWARE USED

Radiated Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Oct.17, 2022	Oct.16, 2023
Hybrid Log Periodic Antenna	TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024
Preamplifier	HP	8447D	2944A09099	Oct.17, 2022	Oct.16, 2023
EMI Measurement Receiver	R&S	ESR26	101377	Oct.17, 2022	Oct.16, 2023
Horn Antenna	TDK	HRN-0118	130940	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Oct.17, 2022	Oct.16, 2023
Horn Antenna	Schwarzbeck	BBHA9170	697	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-2	TRS-307-00003	Oct.17, 2022	Oct.16, 2023
Preamplifier	TDK	PA-02-3	TRS-308-00002	Oct.17, 2022	Oct.16, 2023
Loop antenna	Schwarzbeck	1519B	00008	Dec.14, 2021	Dec.13, 2024
Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Oct.17, 2022	Oct.16, 2023
Preamplifier	Mini-Circuits	ZX60-83LN-S+	SUP01202035	Oct.17, 2022	Oct.16, 2023
High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec.01,2022	Nov.30,2023
Highpass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	4	Dec.01,2022	Nov.30,2023
Band Reject Filter	Wainwright	WRCJV12-5695-5725-5850-5880-40SS	4	Dec.01,2022	Nov.30,2023
Band Reject Filter	Wainwright	WRCJV20-5120-5150-5350-5380-60SS	2	Dec.01,2022	Nov.30,2023
Band Reject Filter	Wainwright	WRCJV20-5440-5470-5725-5755-60SS	1	Dec.01,2022	Nov.30,2023
Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec.01,2022	Nov.30,2023
Band Reject	Wainwright	WRCD5-	1	Dec.01,2022	Nov.30,2023

Filter		1879-1879.85-1880.15-1881-40SS			
Notch Filter	Wainwright	WHJ10-882-980-7000-40SS	1	Dec.01,2022	Nov.30,2023
Software					
Description			Manufacturer	Name	Version
Test Software for Radiated Emissions			Farad	EZ-EMC	Ver. UL-3A1

7. RADIATED TEST RESULTS

LIMITS

Refer to CFR 47 FCC §15.205, §15.209 and §15.407 (b).

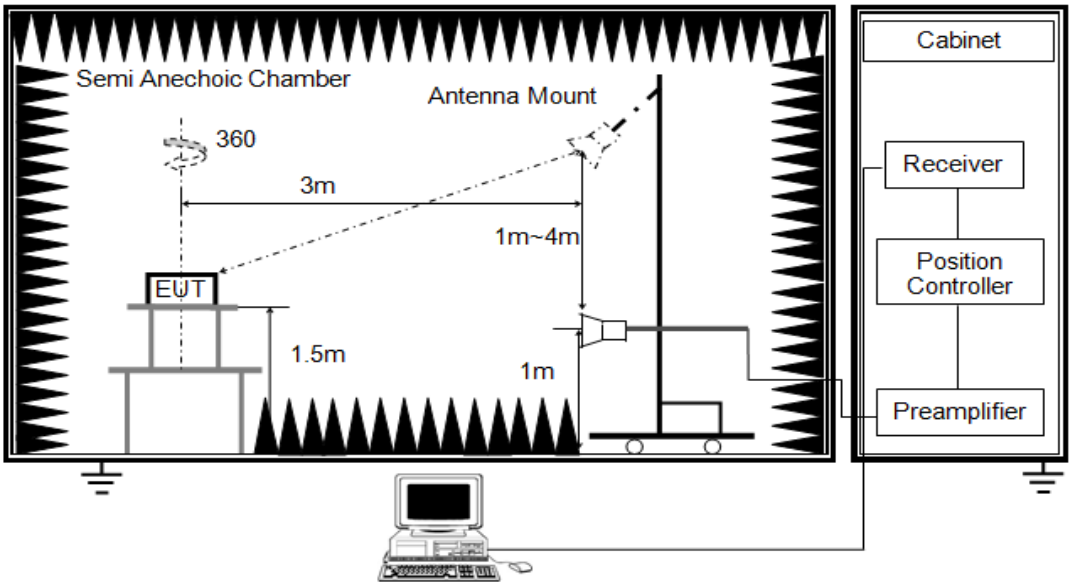
Refer to ISED RSS-GEN Clause 8.9, Clause 8.10 and ISED RSS-247 6.2.

Emissions radiated outside of the specified frequency bands above 30MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

Limits of unwanted/undesirable emission out of the restricted bands refer to CFR 47 FCC §15.407 (b) and ISED RSS-247 6.2.

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1GHz)		
Frequency Range (MHz)	EIRP Limit	Field Strength Limit (dBuV/m) at 3 m
5150~5250 MHz	PK: -27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz		
5470~5725 MHz		
5725~5850 MHz	PK: -27 (dBm/MHz) *1 PK: 10 (dBm/MHz) *2 PK: 15.6 (dBm/MHz) *3 PK: 27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK: 105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK: 122.2 (dBμV/m) *4
Note: *1 beyond 75 MHz or more above of the band edge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

Above 1GHz



The setting of the spectrum analyser

RBW	1MHz
VBW	PEAK: 3MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 11.11 and 11.12.

2. The testing follows the guidelines in KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 section II.G.3 ~ II.G.6.

2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

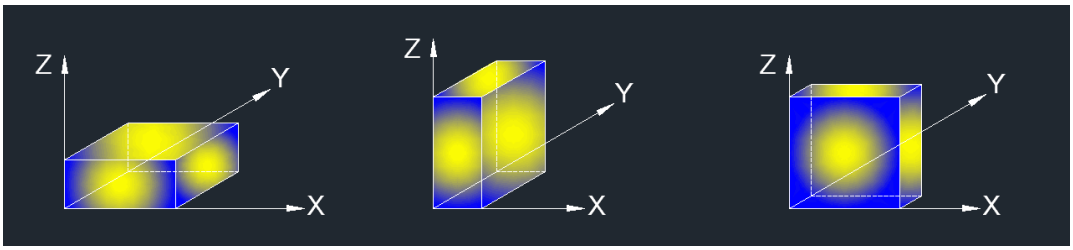
3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements.

X axis, Y axis, Z axis positions:



Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	65%
Atmosphere Pressure	101kPa	Test Voltage	AC 120 V, 60 Hz

RESULTS

Note: For spurious emissions below 1 GHz and above 18 GHz, pre-scan had done for both condition 1 and 2, the test results are almost the same as other no-co-location modes and no worse emission was found during tested, so do no show in this report.

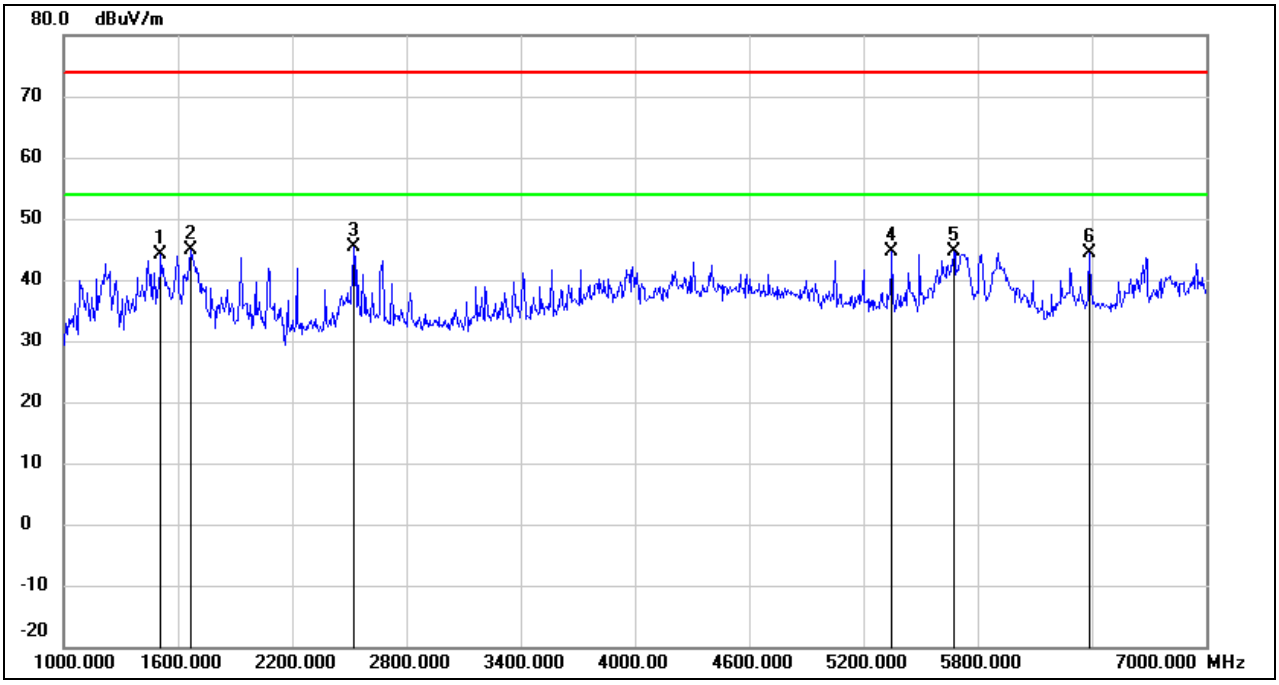
7.1. WORST-CASE TEST RESULTS

7.1.1. CONDITION 1

MODULE SKI.WB8821CU.1 802.11n HT20 MODE HIGH CHANNEL & 802.11ac VHT80 MODE UNII-3 LOW CHANNEL & MODULE SKI.W7613E.1 802.11ac VHT80 MIMO MODE UNII-3 BAND LOW CHANNEL

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, HORIZONTAL)

1-7 GHz

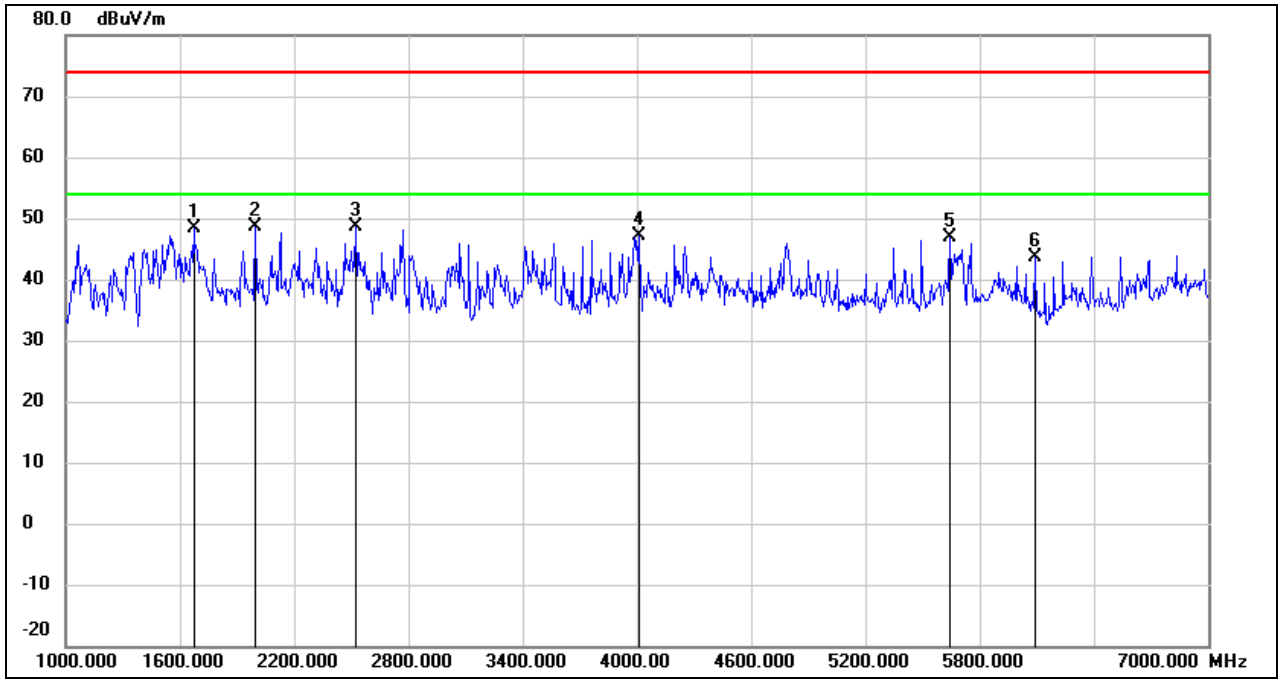


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1510.000	56.93	-12.68	44.25	74.00	-29.75	peak
2	1666.000	56.97	-12.16	44.81	74.00	-29.19	peak
3	2524.000	53.73	-8.42	45.31	74.00	-28.69	peak
4	5350.000	44.46	0.25	44.71	74.00	-29.29	peak
5	5674.000	43.60	0.92	44.52	74.00	-29.48	peak
6	6388.000	41.13	3.30	44.43	74.00	-29.57	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, VERTICAL)

1-7 GHz

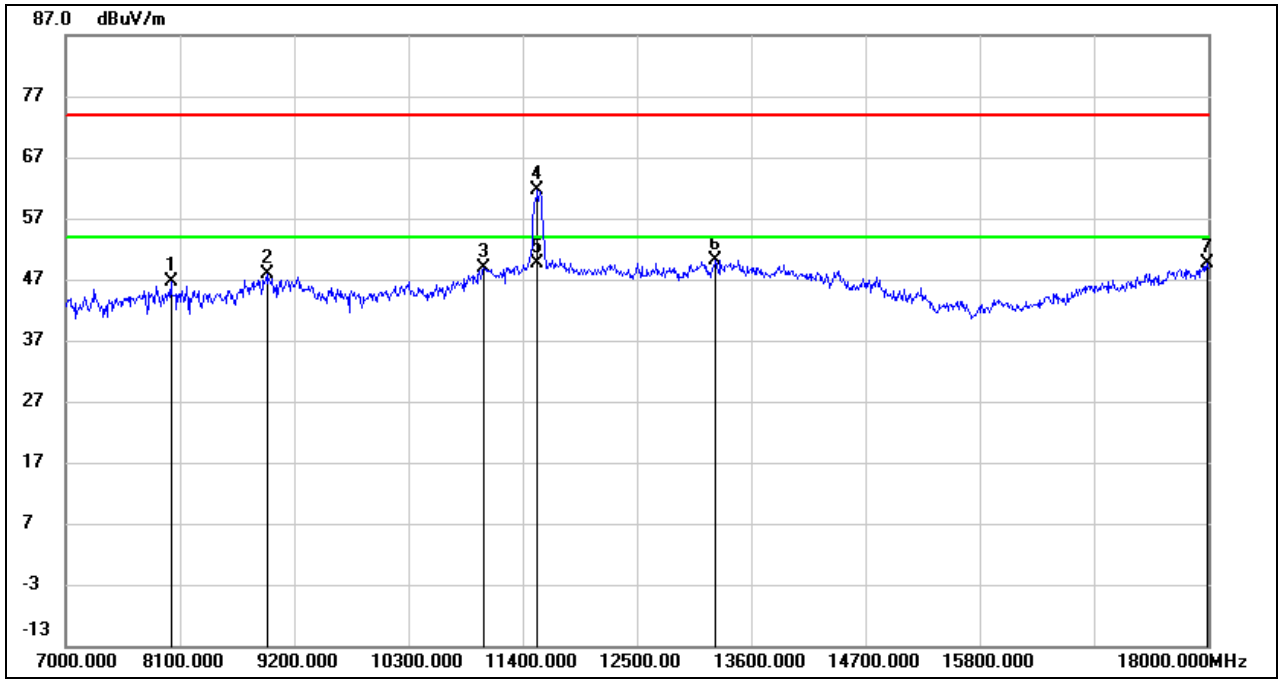


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1672.000	60.52	-12.15	48.37	74.00	-25.63	peak
2	1996.000	59.59	-11.07	48.52	74.00	-25.48	peak
3	2524.000	57.14	-8.42	48.72	74.00	-25.28	peak
4	4012.000	51.51	-4.43	47.08	74.00	-26.92	peak
5	5644.000	46.02	0.82	46.84	74.00	-27.16	peak
6	6088.000	41.48	2.18	43.66	74.00	-30.34	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, HORIZONTAL)

7-18 GHz

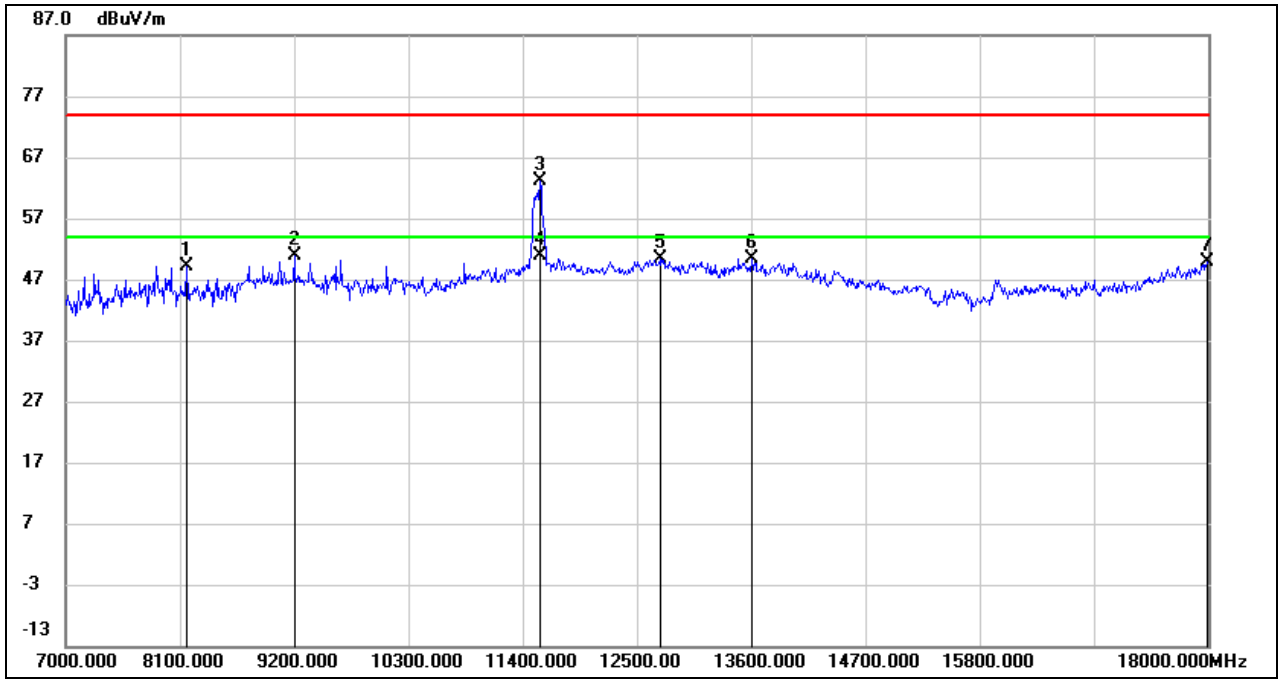


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	8012.000	40.09	6.44	46.53	74.00	-27.47	peak
2	8936.000	37.97	9.90	47.87	74.00	-26.13	peak
3	11026.000	33.96	14.82	48.78	74.00	-25.22	peak
4	11543.000	44.68	16.84	61.52	74.00	-12.48	peak
5	11543.000	32.75	16.84	49.59	54.00	-4.41	AVG
6	13259.000	30.52	19.58	50.10	74.00	-23.90	peak
7	17989.000	23.70	26.04	49.74	74.00	-24.26	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.1.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

SPURIOUS EMISSIONS (WORST-CASE CONFIGURATION, VERTICAL)

7-18 GHz

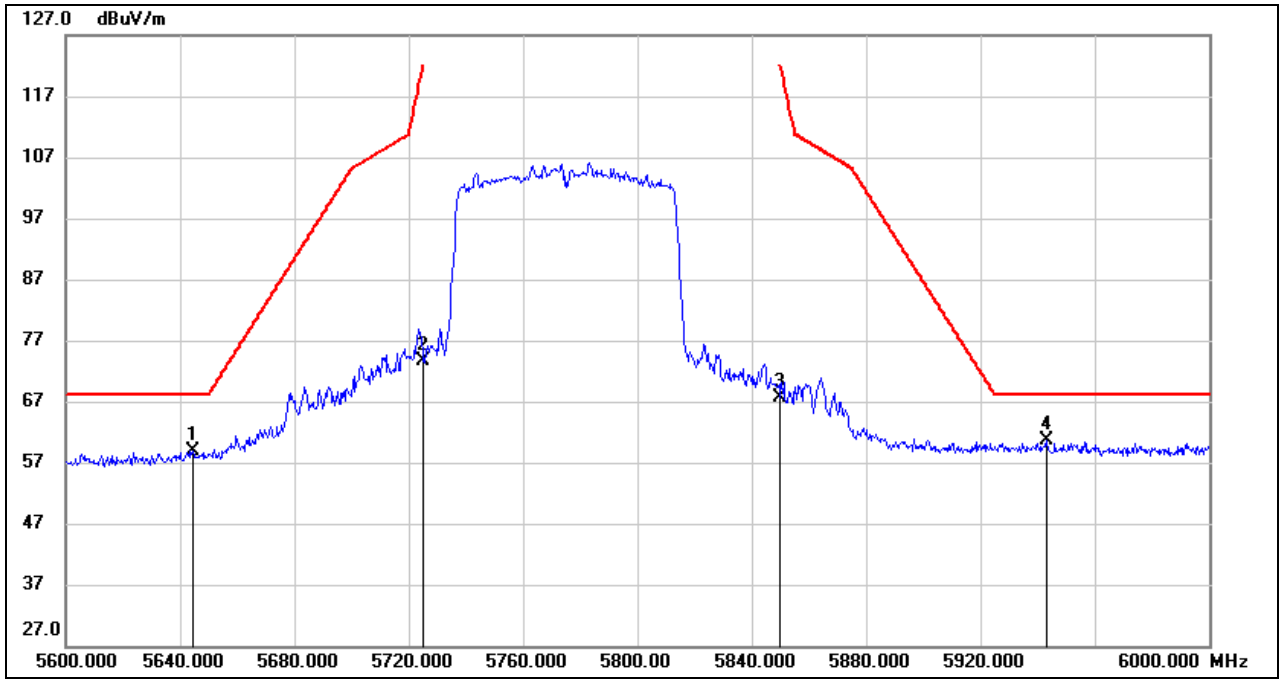


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	8166.000	42.67	6.58	49.25	74.00	-24.75	peak
2	9200.000	40.45	10.46	50.91	74.00	-23.09	peak
3	11565.000	46.20	16.89	63.09	74.00	-10.91	peak
4	11565.000	34.04	16.89	50.93	54.00	-3.07	AVG
5	12720.000	32.34	18.09	50.43	74.00	-23.57	peak
6	13611.000	29.39	20.92	50.31	74.00	-23.69	peak
7	17989.000	23.75	26.04	49.79	74.00	-24.21	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for HPF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

RESTRICTED BANDEDGE (WORST-CASE CONFIGURATION, VERTICAL)

PEAK



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5644.400	17.93	41.04	58.97	68.20	-9.23	peak
2	5725.000	32.48	41.27	73.75	122.20	-48.45	peak
3	5850.000	26.09	41.60	67.69	122.20	-54.51	peak
4	5943.200	18.67	41.84	60.51	68.20	-7.69	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

END OF REPORT