RF MEASUREMENT REPORT

FCC ID:	2BCCIQUADC2A
Applicant:	Senquip Pty Ltd
Product:	Senquip QUAD
Model No.:	QUAD-C2
Brand Name:	Senquip
FCC Rule(s):	Part 2, 22 (H), 24 (E), 27, 90
Result:	Complies
Received Date:	2023-12-28
Test Date:	2024-01-07~2024-01-11

Reviewed By: Sunny Sun

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2312RSU083-U1	V01	Initial Report	2024-03-06	Invalid
2312RSU083-U1	V02	Updated section 1.7	2024-03-25	Valid

CONTENTS

1. General Information

1.1. Applicant

Senquip Pty Ltd

Unit 3, 29 Shearwater Drive, Taylors Beach, NSW, 2316, Australia

1.2. Manufacturer

Senquip Pty Ltd

Unit 3, 29 Shearwater Drive, Taylors Beach, NSW, 2316, Australia

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong)				
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China				
	Laboratory Location (Suzhou - SIP)				
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐R-20025	☐G-20034	☐C-20020	☐T-20020
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen)				
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site – MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan)				
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: 3261				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	Senquip QUAD
Model No.	QUAD-C2
Brand Name	Senquip
EUT Identification No.	20231228Sample#07
Bluetooth Specification	Bluetooth V4.2 BLE only
Wi-Fi Specification	802.11b/g/n
Cat M1 Band	Band 2/4/5/12/13/26
Operating Temperature	-40 ~ 85°C
Power Type	External supply: 10 ~ 75Vdc, typical 12Vdc; 4 x AA Long-life lithium; Internal rechargeable backup battery: 3.7V, 1800mAh LiPo.
Integrated Modular Information	
Cellular Modular Information	Model Number: BG96 FCC ID: XMR201709BG96
Remark: 1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. 2. This device is based on the certification modular to assess the radiated spurious emission.	

1.5. Radio Specification under Testing

E-UTRA Specification	
Cat M1 Band	Band 2, 4, 5, 12, 13, 26
TX Frequency Range	Band 2: 1850 ~ 1910 MHz; Band 4: 1710 ~ 1755 MHz Band 5: 824 ~ 849 MHz; Band 12: 699 ~ 716 MHz Band 13: 777 ~ 787 MHz; Band 26: 814 ~ 849 MHz;
RX Frequency Range	Band 2: 1930 ~ 1990 MHz; Band 4: 2110 ~ 2155 MHz Band 5: 869 ~ 894 MHz; Band 12: 729 ~ 746 MHz Band 13: 746 ~ 756 MHz; Band 26: 859 ~ 894 MHz
Modulation	QPSK, 16QAM
Power Class	3

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
Cat M1 Band 2	1850 ~ 1910	Omni Antenna	0.42
Cat M1 Band 4	1710 ~ 1755		0.42
Cat M1 Band 5	824 ~ 849		2.11
Cat M1 Band 12	699 ~ 716		2.11
Cat M1 Band 13	777 ~ 787		2.11
Cat M1 Band 26	814~849		2.11

Note: All antenna information (Antenna type and Peak Gain) is provided by the manufacture.

1.7. EIRP

Technology	Frequency Band (MHz)	Max Conducted Power (dBm)	Antenna Gain (dBi)	Max EIRP/ERP (dBm)	Limit
Cat M1 Band 2	1850 ~ 1910	23.80	0.42	24.22	33
		23.93		24.35	
Cat M1 Band 4	1710 ~ 1755	22.43	0.42	22.85	30
		22.38		22.8	
Cat M1 Band 5	824 ~ 849	23.46	2.11	23.42	38.45
		23.84		23.80	
Cat M1 Band 12	699 ~ 716	23.40	2.11	23.36	34.77
		23.67		23.63	
Cat M1 Band 13	777 ~ 787	23.40	2.11	23.36	34.77
		23.91		23.87	
Cat M1 Band 26	814 ~ 849	23.14	2.11	23.10	38.45
		23.78		23.74	

Note: The Max Conducted Power extracted from the FCC certificate FCC ID ‘XMR201707BG96’.

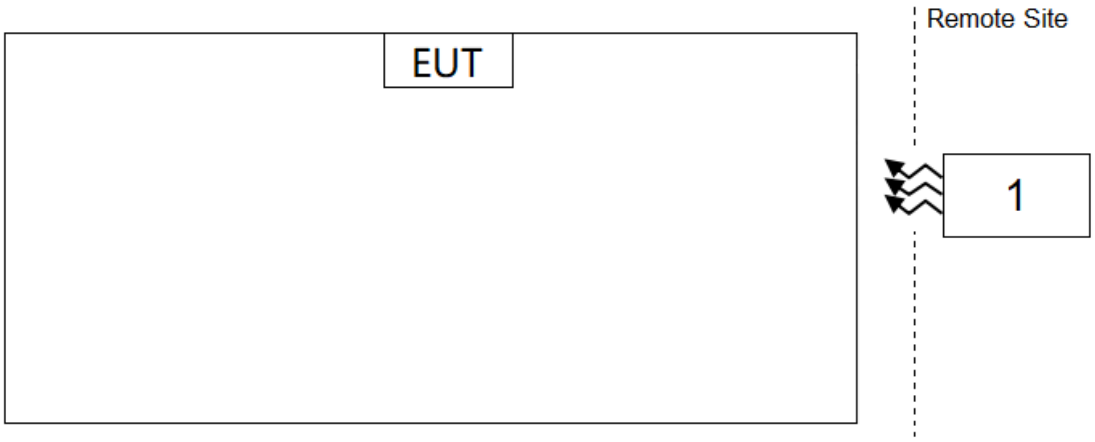
1.8. Test Methodology

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 22, Part 24, Part 27, Part 90

2. Test Configuration

2.1. Test System Connection Diagram



Product		Manufacturer	Model No.
1	Wideband Radio Communication Tester	R&S	CMW 500

2.2. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20% ~ 75%RH

3. Measuring Instrument

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
Communication Tester	R&S	CMW500	MRTSUE06881	1 year	2024-05-23	SIP-SR1
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2024-05-23	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06598	1 year	2024-11-04	SIP-AC2
Preamplifier	EMCI	EMC051845SE	MRTSUE06601	1 year	2024-11-02	SIP-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2024-10-09	SIP-AC2
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2024-10-23	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2024-11-03	SIP-AC2
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06647	1 year	2024-06-17	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06648	1 year	2024-10-21	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2024-12-21	SIP-AC2
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2024-02-26	SIP-AC2

Software	**Version**	**Function**
EMI V3	V 3.0.0	EMI Test Software
Controller_MF 7802BS	1.02	RE Antenna & Turntable

4. Decision Rules and Measurement Uncertainty

4.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.2. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT 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.

Radiated Emission Measurement	
The maximum measurement uncertainty is evaluated as:	
Coaxial:	9kHz~30MHz: 2.61dB
Coplanar:	9kHz~30MHz: 2.62dB
Horizontal:	30MHz~200MHz: 3.79dB
	200MHz~1GHz: 3.91dB
	1GHz~40GHz: 4.99dB
Vertical:	30MHz~200MHz: 4.06dB
	200MHz~1GHz: 5.21dB
	1GHz~40GHz: 4.90dB

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Test Result
2.1051, 22.917(a), 24.238(a) 27.53(c) (f) (g) (h), 90.691(a)	Spurious Emissions	Radiated	Pass

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Radiated Spurious Emission were presented the worst-case in the test report.
3) For radiated emission tests, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
4) Band 26 (814 ~ 849 MHz) overlaps the entire frequency range of LTE Band 5 (824 ~ 849 MHz). Therefore, test data provided in this report covers Band 5 as well as Band 26.

5.2. Radiated Spurious Emissions Measurement

5.2.1. Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

For LTE Band 13, For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (-40dBm/MHz) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50dBm) EIRP for discrete emissions of less than 700 Hz bandwidth.

E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters. The emission limit equal to 82.3dBμV/m or 55.3dBμV/m.

5.2.2. Test Procedure

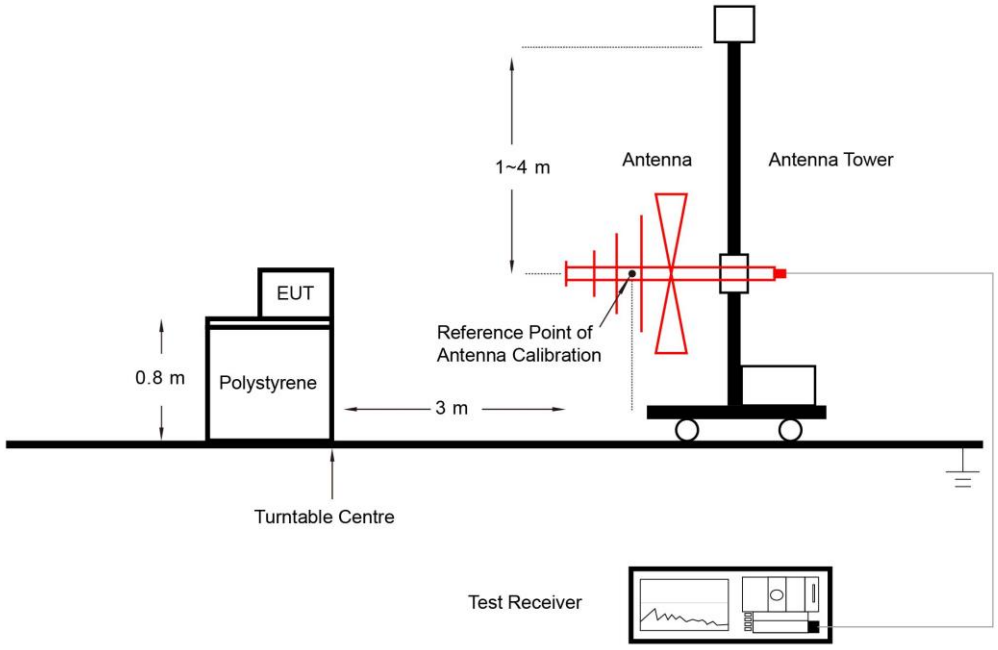
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.2.3. Test Setting

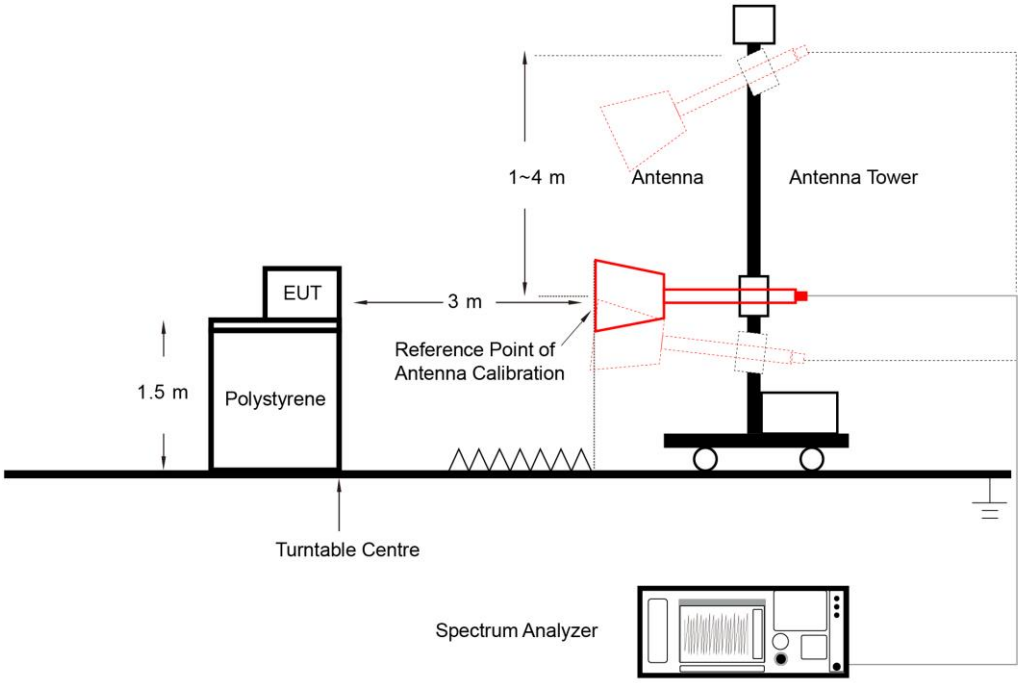
1. RBW = 1MHz
2. VBW ≥ 3*RBW
3. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.2.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.2.5. Test Result

Test Site	SIP-AC2	Test Engineer	Justin Guo
Test Date	2024-01-07~2024-01-11	Test Band	CAT M Band 2, 1RB, QPSK

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
400.1	3.0	21.3	24.3	82.3	-58.0	Quasi-peak	Horizontal
480.1	5.6	23.4	29.0	82.3	-53.3	Quasi-peak	Horizontal
129.9	5.3	16.9	22.2	82.3	-60.1	Quasi-peak	Vertical
228.4	8.1	15.3	23.4	82.3	-58.9	Quasi-peak	Vertical
5547.5	63.7	-3.3	60.4	82.3	-21.9	Peak	Horizontal
9772.0	55.2	1.3	56.5	82.3	-25.8	Peak	Horizontal
3703.0	67.1	-7.3	59.8	82.3	-22.5	Peak	Vertical
9772.0	57.8	1.3	59.1	82.3	-23.2	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Test Site	SIP-AC2	Test Engineer	Justin Guo
Test Date	2024-01-07~2024-01-11	Test Band	CAT M Band 4, 1RB, QPSK

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
400.1	7.9	21.3	29.2	82.3	-53.1	Quasi-peak	Horizontal
480.1	1.8	23.4	25.2	82.3	-57.1	Quasi-peak	Horizontal
30.5	5.2	17.0	22.2	82.3	-60.1	Quasi-peak	Vertical
129.9	6.1	16.9	23.0	82.3	-59.3	Quasi-peak	Vertical
3422.5	77.4	-11.9	65.5	82.3	-16.8	Peak	Horizontal
5131.0	71.4	-6.7	64.7	82.3	-17.6	Peak	Horizontal
3422.5	74.0	-11.9	62.1	82.3	-20.2	Peak	Vertical
5131.0	65.7	-6.7	59.0	82.3	-23.3	Peak	Vertical
Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m) Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).							

Test Site	SIP-AC2	Test Engineer	Justin Guo
Test Date	2024-01-07~2024-01-11	Test Band	CAT M Band 5/26, 1RB, QPSK (824 ~849 MHz)

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
480.1	3.6	23.4	27.0	82.3	-55.3	Quasi-peak	Horizontal
660.0	11.5	26.4	37.9	82.3	-44.4	Quasi-peak	Horizontal
660.0	14.1	26.4	40.5	82.3	-41.8	Quasi-peak	Vertical
989.8	10.9	30.9	41.8	82.3	-40.5	Quasi-peak	Vertical
2472.0	73.6	-13.5	60.1	82.3	-22.2	Average	Horizontal
4120.0	72.6	-9.3	63.3	82.3	-19.0	Peak	Horizontal
1648.0	77.0	-17.2	59.8	82.3	-22.5	Peak	Vertical
2472.0	81.4	-13.5	67.9	82.3	-14.4	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Test Site	SIP-AC2	Test Engineer	Justin Guo
Test Date	2024-01-07~2024-01-11	Test Band	CAT M Band 12, 1RB, QPSK

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
612.0	7.2	26.8	34.0	82.3	-48.3	Quasi-peak	Horizontal
981.6	7.3	30.8	38.1	82.3	-44.2	Quasi-peak	Horizontal
868.6	3.4	30.3	33.7	82.3	-48.6	Quasi-peak	Vertical
983.5	7.5	30.8	38.3	82.3	-44.0	Quasi-peak	Vertical
1399.0	72.0	-16.6	55.4	82.3	-26.9	Peak	Horizontal
2099.0	84.6	-14.8	69.8	82.3	-12.5	Peak	Horizontal
2099.0	78.6	-14.8	63.8	82.3	-18.5	Peak	Vertical
2795.5	68.7	-12.8	55.9	82.3	-26.4	Peak	Vertical
Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m) Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).							

Test Site	SIP-AC2	Test Engineer	Justin Guo
Test Date	2024-01-07~2024-01-11	Test Band	CAT M Band 13, 1RB, QPSK

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Middle Channel							
265.7	7.6	17.5	25.1	82.3	-57.2	Quasi-peak	Horizontal
921.4	5.6	30.2	35.8	82.3	-46.5	Quasi-peak	Horizontal
152.7	7.6	18.3	25.9	82.3	-56.4	Quasi-peak	Vertical
861.3	7.5	30.1	37.6	82.3	-44.7	Quasi-peak	Vertical
1560.0	66.8	-16.9	49.9	55.3	-5.4	Average	Horizontal
2340.5	70.5	-13.5	57.0	82.3	-25.3	Average	Horizontal
1560.0	70.2	-16.9	53.3	55.3	-2.0	Average	Vertical
2340.5	67.0	-13.5	53.5	82.3	-28.8	Average	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Test Site	SIP-AC2	Test Engineer	Justin Guo
Test Date	2024-01-07~2024-01-11	Test Band	CAT M Band 26, 1RB, QPSK (814 ~824 MHz)

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
651.8	8.7	26.4	35.1	82.3	-47.2	Quasi-peak	Horizontal
671.2	7.9	26.5	34.4	82.3	-47.9	Quasi-peak	Horizontal
651.8	8.1	26.4	34.5	82.3	-47.8	Quasi-peak	Vertical
977.7	9.2	30.7	39.9	82.3	-42.4	Quasi-peak	Vertical
1628.0	68.8	-17.1	51.7	82.3	-30.6	Peak	Horizontal
2444.0	79.4	-13.8	65.6	82.3	-16.7	Peak	Horizontal
1628.0	82.7	-17.1	65.6	82.3	-16.7	Peak	Vertical
2444.0	72.5	-13.8	58.7	82.3	-23.6	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Appendix B - Test Setup Photograph

Refer to “2312RSU083-UT” file.

Appendix C - EUT Photograph

Refer to “2312RSU083-UE” file.

The End