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Date: 8 January 2024

I.T.L. Product Testing Ltd.
FCC/ISED Radio Test Report

for

Orcam Technologies Ltd.

Equipment under test:

Portable Pen Scanner

Orcam Read 5G, Orcam Learn 5G

FCC ID: 2AAWI-READ2WAY

IC: 26513-READ2WAY

Tested by: _____
Netanel Y.

Approved by: _____
M. Zohar

This report concerns: Original Grant

Equipment type: FCC: (UNII) Unlicensed National Information Infrastructure TX
ISED: WLAN

Limits used: 47CFR15, Part 15, Subpart E, Section 15.407
RSS-247, Issue 3, August 2023, Section 5

Measurement procedure: RSS-Gen, Issue 5, April 2018
KDB 789033 D02 v02, ANSI C63.10:2013
RSS-Gen, Issue 5, April 2018.

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1 General Information

1.1 Administrative Information

Manufacturer:	Orcam Technologies Ltd.
Manufacturer's Address:	3 Kiryat HaMada St., Jerusalem 9777603, Israel
Equipment Under Test (E.U.T):	Portable Pen Scanner
Equipment number/PMN:	Orcam Read 5G, Orcam Learn 5G
Equipment Serial No.:	N/A
Equipment HVIN:	Orcam Read 5G: HW01 Orcam Learn 5G: FW01
Equipment FVIN:	Orcam Readv5G: HW01 Orcam Learn 5G: FW01
Date of Receipt of E.U.T:	14 August 2023
Start of Test:	14 August 2023
End of Test:	30 August 2023
Test Laboratory Location:	I.T.L. (Product Testing) Ltd. 3 Ha'oreg Street, Modi'in Maccabim Reut 7177909, Israel 1 Bat Sheva St., Lod 7120101, Israel

1.2 Test Laboratory

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. Department of Innovation, Science and Economic Development (ISED) Canada, CAB identifier: IL1002

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The EUT is a portable, pocket- sized smart pen scanner. It provides the most advanced solution for those who suffer from reading difficulties such as dyslexia.

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in KDB 789033 D02 v02, ANSI C63.10: 2013, and RSS-Gen. Radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Measurement Uncertainty

Conducted Emission
Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission
Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:

30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

1 GHz to 6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.19 dB

>6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.51 dB

2 System Test Configuration

2.1 Justification

1. The E.U.T. contains a WLAN approved transceiver at 2.4 GHz (FCC ID: 2AAWI-READ; IC: 26513-READ).
2. This report's purpose is to add the UNII 1 band (5.150–5.250 GHz), using one bandwidth 20 MHz.
3. Only the MCS0 data rate's worst-case results are shown.

2.2 EUT Exercise Software

No special exercise software was used.

2.3 Special Accessories

No special accessories were used

2.4 Equipment Modifications

Initially, the E.U.T failed in the Restricted Bands Spurious Emission tests. The applicant added a low-pass filter in the RF output port to resolve the issue.

2.5 Configuration of Tested System

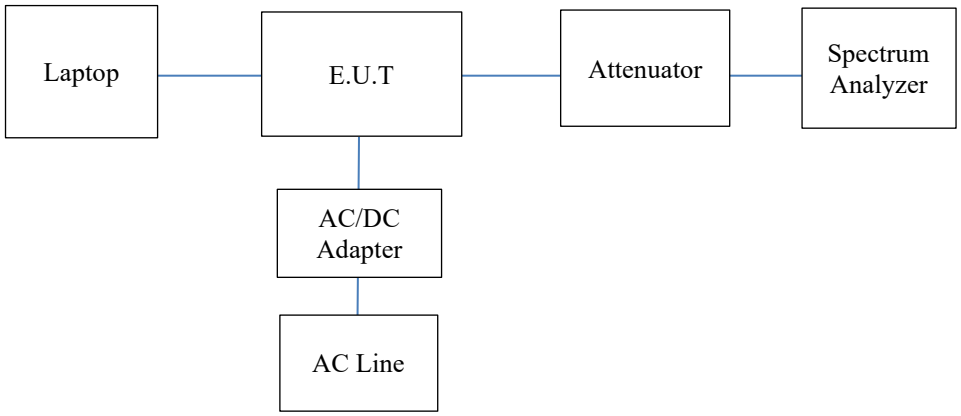


Figure 1. Configuration of Tested System – Conducted

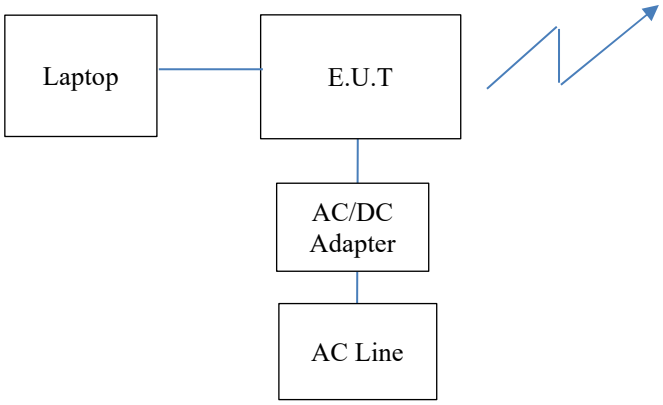


Figure 2. Configuration of Tested System - Radiated

3 Test Setup Photos

See a separate file.

4 Conducted Emission from AC Mains

4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207
RSS-Gen, Issue 5, Clause 8.8

4.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))

The E.U.T operation mode and test setup are as described in Section 2 of this report. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on a 0.8 meter high wooden table, 0.4 meter from the room's vertical wall. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T.

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver and are displayed on the receiver's spectrum display.

The E.U.T was evaluated in TX operation mode.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. bandwidth, using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Test Limit

Emission Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* *Decreases with the logarithm of the frequency.*

4.4 Test Results

JUDGEMENT: Pass

The details of the highest emissions are given in *Figure 3* to *Figure 6*.

Conducted Emission

E.U.T Description	Portable Pen Scanner
Type	Orcam Read 5G, Orcam Learn 5G
Serial Number:	N/A

Specification:	FCC Part 15, Subpart C
	RSS-Gen, Issue 5, Clause 8.8
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average
Power Operation	AC/DC Adapter

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	230 kHz	41.36	-21.08
2	Average	230 kHz	37.36	-15.08
1	Quasi Peak	350 kHz	40.58	-18.37
2	Average	350 kHz	33.34	-15.61
2	Average	526 kHz	33.10	-12.89
1	Quasi Peak	530 kHz	41.14	-14.86
1	Quasi Peak	738 kHz	32.00	-24.00
2	Average	738 kHz	21.34	-24.65
1	Quasi Peak	1.286 MHz	29.74	-26.25
2	Average	1.738 MHz	18.26	-27.73
1	Quasi Peak	2.646 MHz	30.23	-25.76
2	Average	2.67 MHz	19.53	-26.46
1	Quasi Peak	3.622 MHz	24.36	-31.63
2	Average	3.626 MHz	16.43	-29.56
2	Average	6.806 MHz	16.15	-33.84
1	Quasi Peak	6.87 MHz	25.76	-34.23
1	Quasi Peak	10.77 MHz	18.19	-41.80
2	Average	13.562 MHz	16.14	-33.85
1	Quasi Peak	25.782 MHz	15.57	-44.42
2	Average	25.946 MHz	10.46	-39.53

Figure 3. Detectors: Peak, Quasi-peak, Average

Specification:	FCC Part 15, Subpart C; RSS-Gen, Issue 5, Clause 8.8
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average
Power Operation	AC/DC Adapter

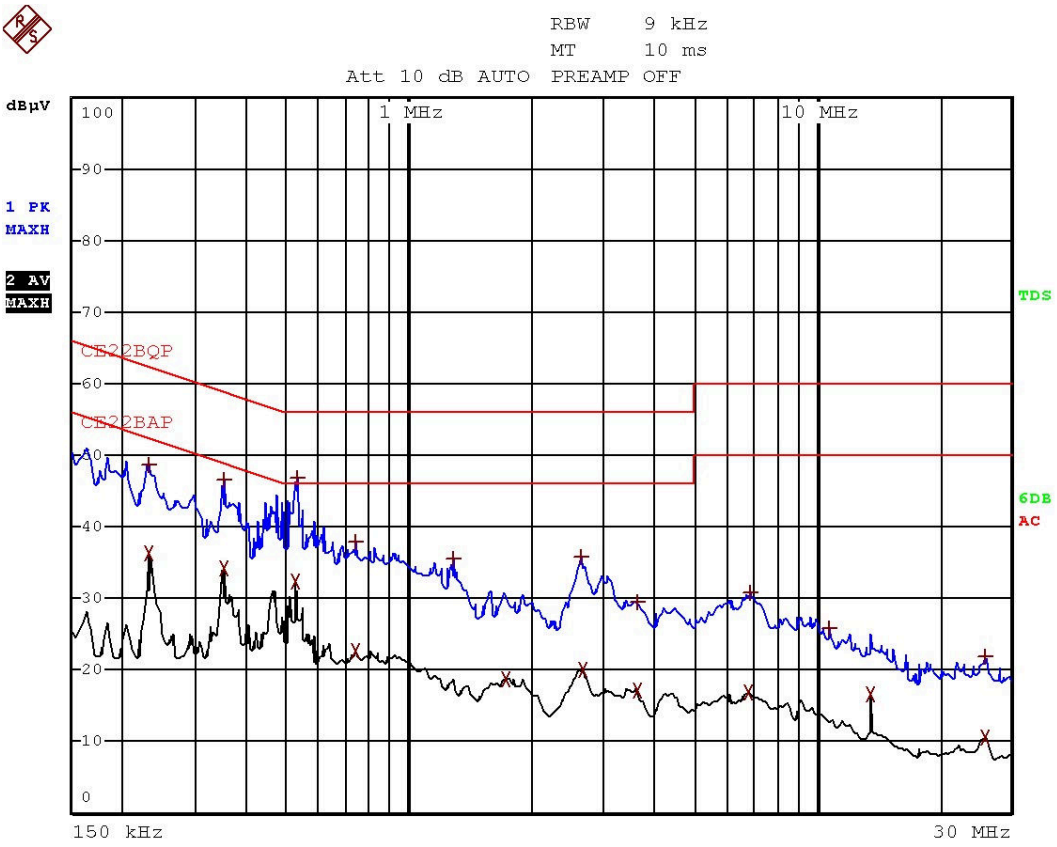


Figure 4. Detectors: Peak, Quasi-peak, Average

Specification:	FCC Part 15, Subpart C; RSS-Gen, Issue 5, Clause 8.8
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average
Power Operation	AC/DC Adapter

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	158 kHz	45.25	-20.31
2	Average	162 kHz	28.23	-27.12
2	Average	262 kHz	20.80	-30.56
1	Quasi Peak	270 kHz	35.51	-25.60
1	Quasi Peak	434 kHz	31.77	-25.39
2	Average	542 kHz	22.09	-23.90
2	Average	738 kHz	17.68	-28.31
1	Quasi Peak	746 kHz	28.35	-27.64
2	Average	1.526 MHz	14.90	-31.09
1	Quasi Peak	1.67 MHz	23.29	-32.71
2	Average	2.582 MHz	11.31	-34.68
1	Quasi Peak	3.118 MHz	17.72	-38.27
2	Average	4.226 MHz	11.13	-34.86
1	Quasi Peak	4.254 MHz	18.59	-37.40
1	Quasi Peak	7.522 MHz	20.63	-39.36
2	Average	7.542 MHz	12.79	-37.21
1	Quasi Peak	13.558 MHz	19.41	-40.58
2	Average	13.558 MHz	13.39	-36.60
2	Average	18.542 MHz	9.37	-40.62
1	Quasi Peak	26.346 MHz	14.13	-45.86

Figure 5. Detectors: Peak, Quasi-peak, Average

Specification:	FCC Part 15, Subpart C; RSS-Gen, Issue 5, Clause 8.8
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average
Power Operation	AC/DC Adapter

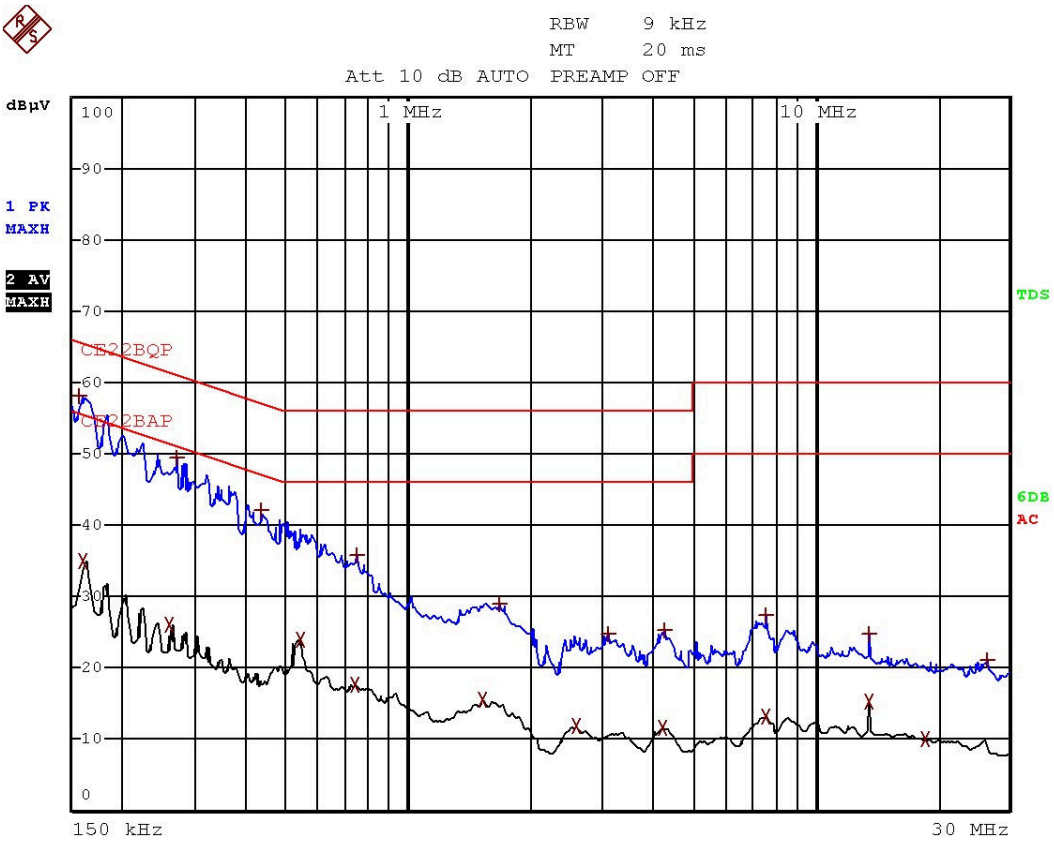


Figure 6 Detectors: Peak, Quasi-peak, Average

4.5 Test Equipment Used; Conducted Emission

I.T.L. #	Instrument	Manufacturer	Model	Serial No.	Last Cal.	Cal. Due
1044	LISN	Fischer	FCC-LISN-25A	128	Feb. 19, 23	Feb. 19, 24
1507	EMI Test Receiver	Rohde & Schwarz	ESCI7	100724	Feb 20, 2023	Feb 20, 2024
1833	15m coax cable	Huber Suhner	RG 214	-	NCR	NCR
1999	Variable Voltage Transformer	Yokoyama Electric Works Ltd.	SB-10	-	NCR	NCR
2151	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100055	Sep 26, 2023	Sep 26, 2024

Figure 7 Test Equipment Used

5 Occupied Bandwidth

5.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

RSS-Gen, Issue 5, Section 6.6

5.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 21.5dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW set to the range of 1% -5% of the OBW. The span was set to 1.5-5 times of the OBW.99% occupied bandwidth function was set on.

5.3 Test Limit

N/A

5.4 Test Results

Declared EBW	Operation Frequency	Reading
[MHz]	(MHz)	(MHz)
20	5180	17.77
20	5210	17.73
20	5240	17.80

Figure 8. Bandwidth Test Results

See additional information in Figure 9 to Figure 11

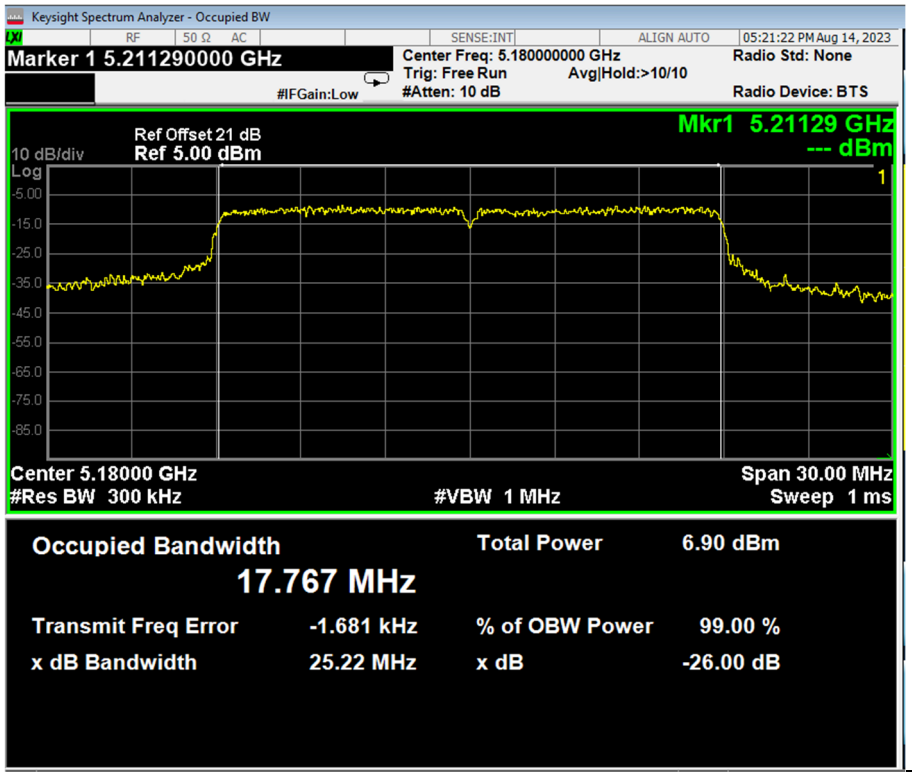


Figure 9. 5180.0 MHz, Occupied Bandwidth

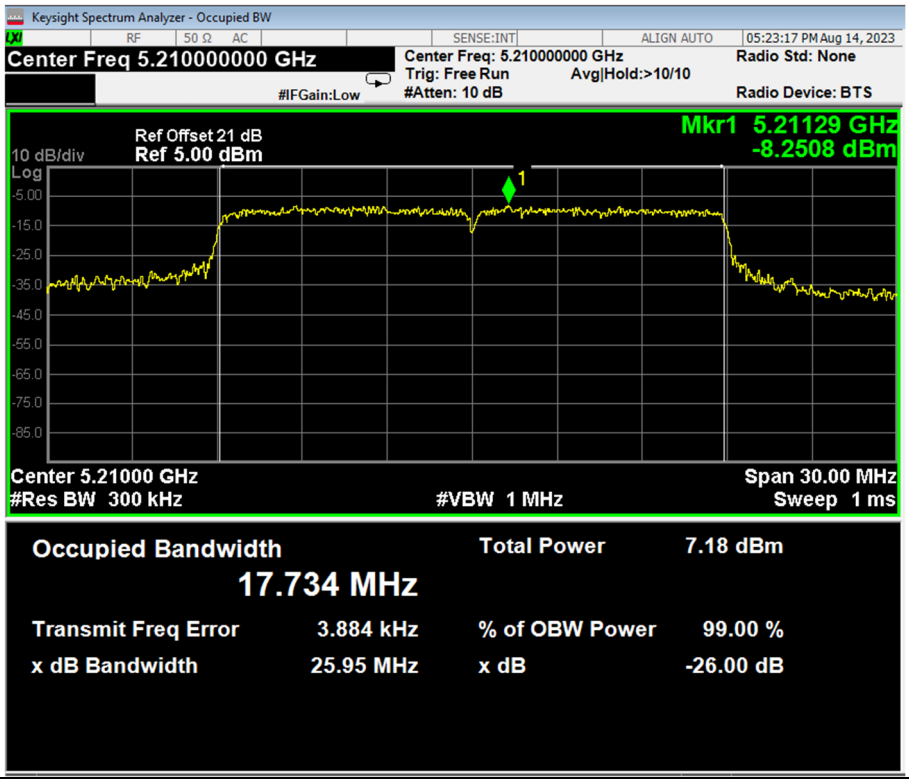


Figure 10. 5210.0 MHz, Occupied Bandwidth

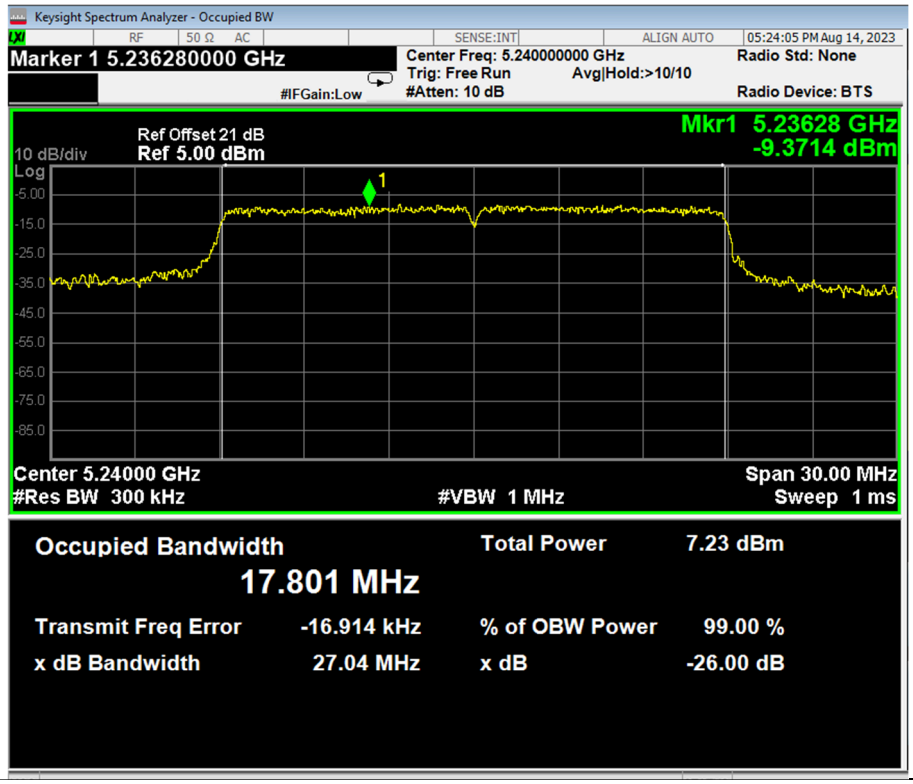


Figure 11. 5240.0MHz, Occupied Bandwidth

5.5 Test Equipment Used; Occupied Bandwidth

ITL #	Instrument	Manufacturer	Model	Serial No.	Last Calibration	Next Calibration
1499	Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	Feb 20, 2023	Feb 20, 2024
1778	Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS	1503-590 (05032006)	Aug. 9, 2023	Aug. 9, 2024
1848	20DB 2W DC-8.0GHz Attenuator	Microwave Midwest	ATT-0217-20-NNN-02	-	Jun 6, 2023	Jun 6, 2024

Figure 12 Test Equipment Used

6 26dB Bandwidth

6.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

RSS-Gen, Issue 5: 2014, Section 6.6

6.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 21 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW was set to the range of 1% of the EBW.

6.3 Test Limit

N/A

6.4 Test Results

Declared EBW	Operation Frequency	Reading
(MHz)	(MHz)	(MHz)
20.0	5180MHz	25.22 MHz
20.0	5210MHz	25.95 MHz
20.0	5240MHz	27.04 MHz

Figure 13. 26dB Bandwidth Test Results

See additional information in Figure 14 to Figure 16

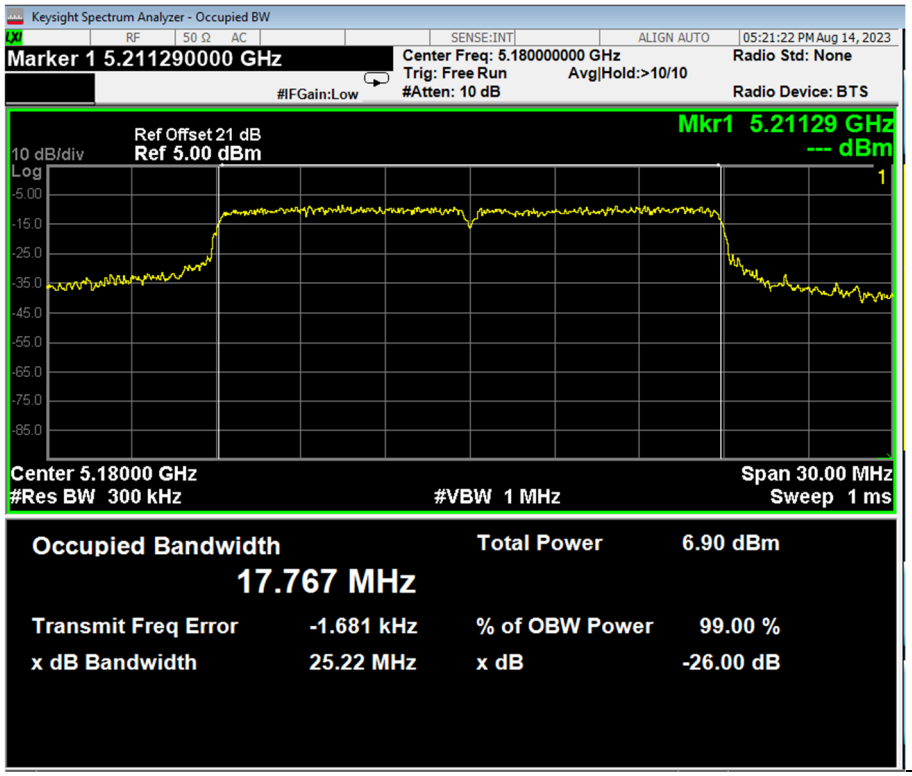


Figure 14. 5180.0 MHz, 26dB BW

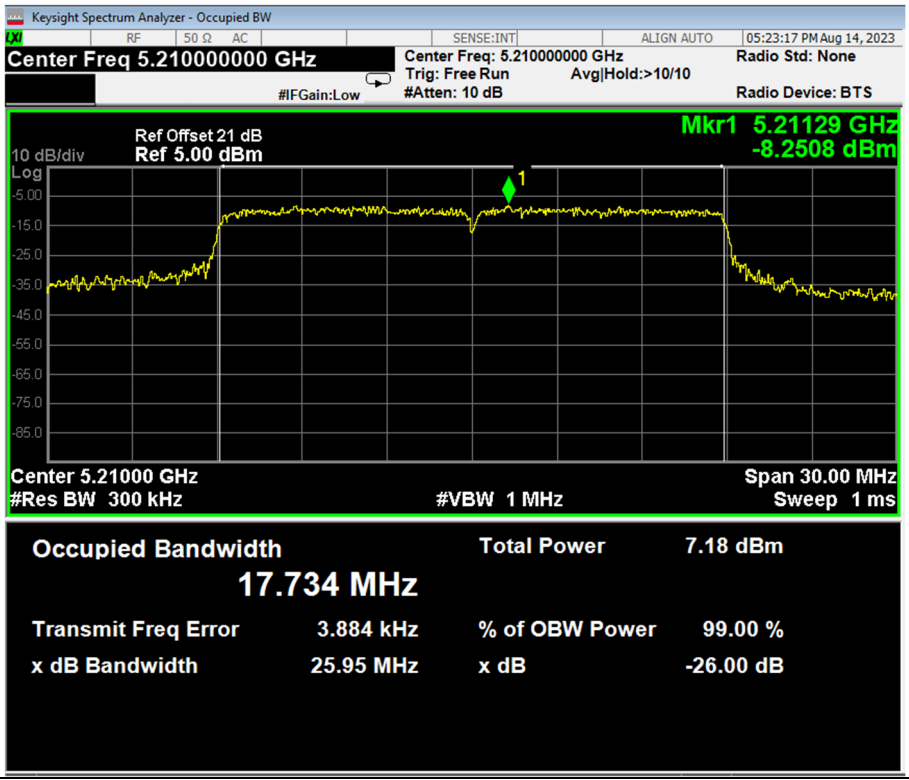


Figure 15. 5210.0 MHz, 26dB BW

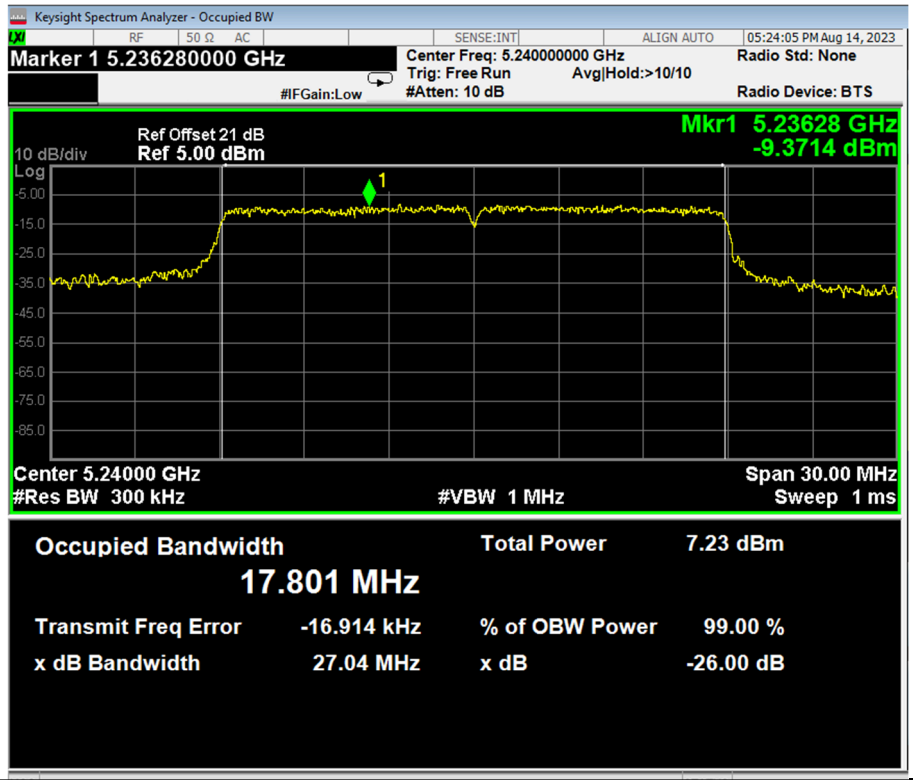


Figure 16. 5240.0 MHz, 26dB BW

6.5 Test Equipment Used; 26dB Bandwidth

ITL #	Instrument	Manufacturer	Model	Serial No.	Last Calibration	Next Calibration
1499	Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	Feb 20, 2023	Feb 20, 2024
1778	Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS	1503-590 (05032006)	Aug. 9, 2023	Aug. 9, 2024
1848	20DB 2W DC-8.0GHz Attenuator	Microwave Midwest	ATT-0217-20-NNN-02	-	Jun 6, 2023	Jun 6, 2024

Figure 17 Test Equipment Used

7 Maximum Conducted Output Power

7.1 Test Specification

FCC, Part 15, Subpart E, Section 407 (a)(1)(iv)

RSS-247, Issue 2, Section 6.2

7.2 Test Procedure

(Temperature (22°C)/ Humidity (57%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss=21 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.
Spectrum setting done according KDB 789033 d02 v02r01, method SA-2 instructions (section 2.d).

7.3 FCC Test Limits

Operational Band U-NII 1:

For client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

7.4 ISED Test Limit

Operational Band U-NII 1:

For other devices, the maximum E.I.R.P. shall not exceed 200 mW or (10 + 10 logB) dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

7.5 Test Results

7.5.1 FCC

BW	Operation Frequency	Power Reading	Duty Cycle Factor	EIRP	Limit	Margin*
(MHz)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
20.0	5180	7.18	3	10.18	24.0	-13.82
	5210	7.21	3	10.21	24.0	-13.79
	5240	7.14	3	10.14	24.0	-13.86

Figure 18 Test Results, U-NII 1 - FCC

7.5.2 ISED

BW	Operation Frequency	Power Reading	Duty Cycle Factor	EIRP	Limit	Margin*
(MHz)	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
20.0	5180	7.18	3	10.18	22.5	-12.32
	5210	7.21	3	10.21	22.5	-12.29
	5240	7.14	3	10.14	22.5	-12.36

**Note : Limit determinates by ISED requirements and calculated by following: 10+10log (17.8MHz) =22.5 dBm*

Figure 19 Test Results, U-NII 1 - ISED

JUDGMENT: Pass

For additional information see Figure 20 to Figure 22

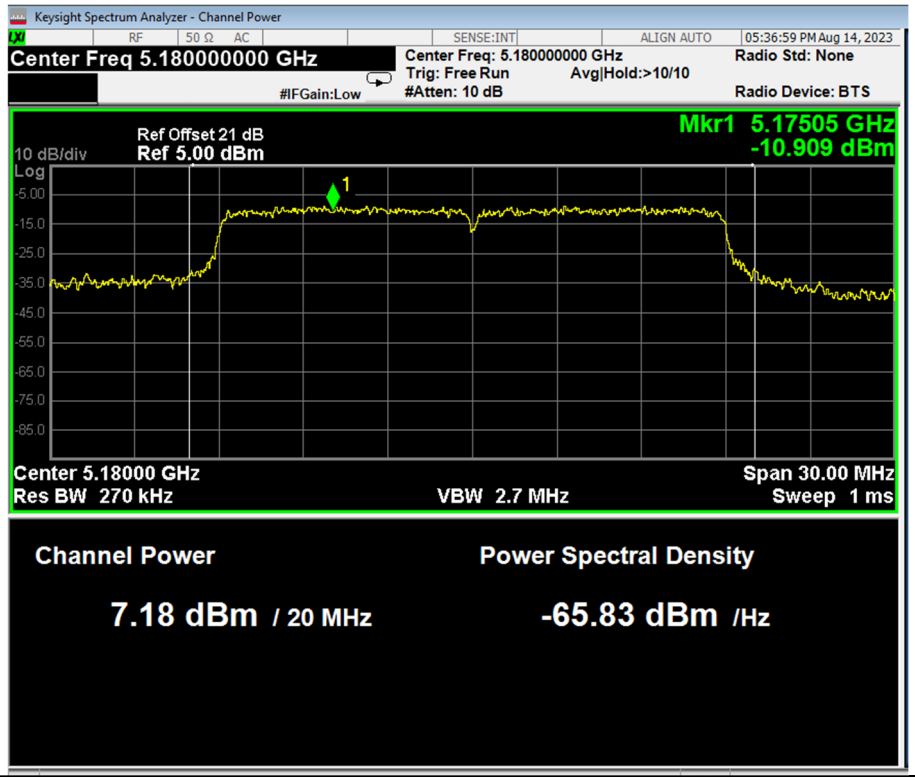


Figure 20. 5180.0MHz

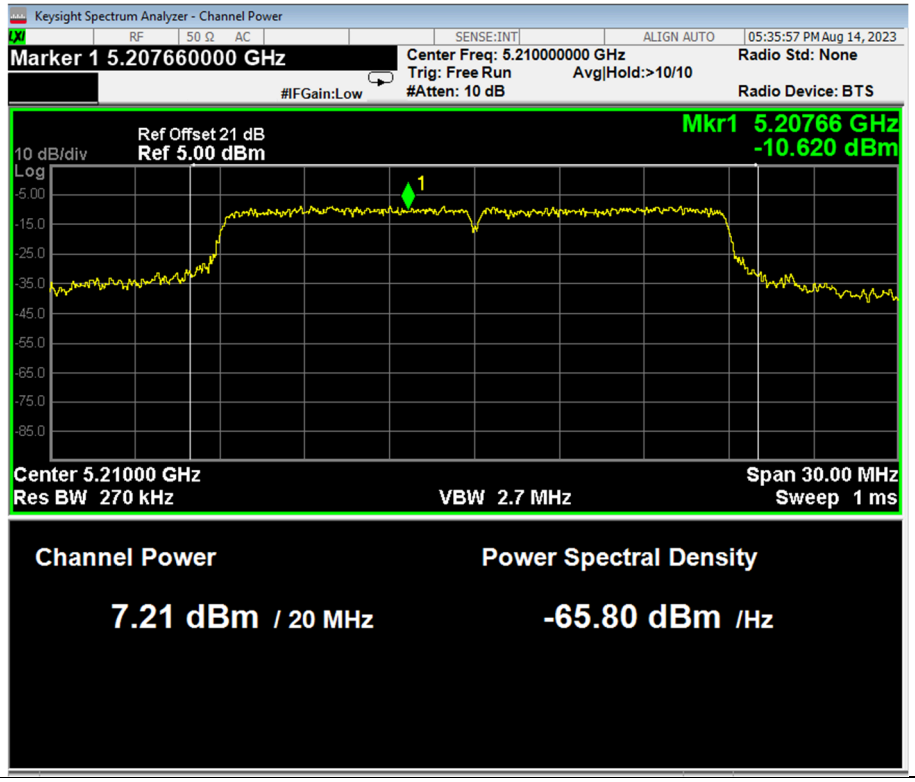


Figure 21. 5210.0MHz

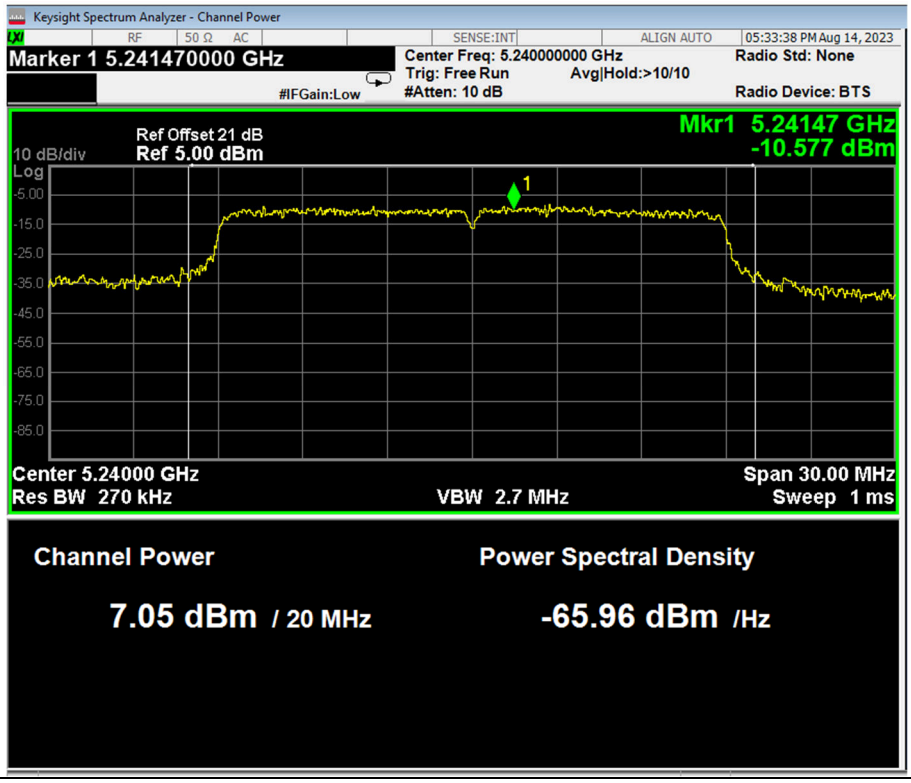


Figure 22. 5240.0MHz

7.6 Test Equipment Used; Maximum Peak Power Output

ITL #	Instrument	Manufacturer	Model	Serial No.	Last Calibration	Next Calibration
2163	Signal analyzer	Keysight	EXA signal analyzer N9010A	my51170071	Feb 13, 2022	Feb 13, 2024
1778	Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS	1503-590 (05032006)	Aug. 9, 2023	Aug. 9, 2024
1848	20DB 2W DC-8.0GHz Attenuator	Microwave Midwest	ATT-0217-20-NNN-02	-	Jun 6, 2023	Jun 6, 2024

Figure 23 Test Equipment Used

8 Maximum Power Spectral Density (PSD)

8.1 Test Specification

FCC, Part 15, Subpart E, Section 407(a)(1)(iv)

RSS-247, Issue 2, Section 6.2

8.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 21dB). Special attention was taken to prevent Spectrum Analyzer RF input overload. Spectrum setting done according KDB 789033 d02 v02r01 instructions (section F).

8.3 FCC Test Limits

Operational Band U-NII 1:

For devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1Mhz band. If transmitting antennas of directional gain greater than 6 dBi are used, maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.4 ISED Test Limit

Operational Band U-NII 1:

For devices in the 5.15-5.25 GHz band, the EIRP spectral density shall not exceed 10 dBm in any 1.0 MHz band.

8.5 Test Results Maximum Power Spectral Density

8.5.1 FCC

Operation Frequency	Max PSD Reading	Duty Cycle Factor	Conducted Total PSD	Limit*	Margin
(MHz)	(dBm/MHz)	(dB)	(dBm/MHz)	(dBm/MHz)	(dB)
5180.0	4.37	3	7.37	10	-2.63
5210.0	4.56	3	7.56	10	-2.44
5240.0	4.5	3	7.5	10	-2.5

**Note : Limit determinates by ISED requirements which is 10 dBm/MHz.*

Figure 24 Test Results

8.5.2 ISED

Operation Frequency	Max PSD Reading	Duty Cycle Factor	Conducted Total PSD	Limit*	Margin
(MHz)	(dBm/MHz)	(dB)	(dBm/MHz)	(dBm/MHz)	(dB)
5180.0	4.37	3	7.37	10	-2.63
5210.0	4.56	3	7.56	10	-2.44
5240.0	4.5	3	7.5	10	-2.5

**Note : Limit determinates by ISED requirements which is 10 dBm/MHz.*

Figure 25 Test Results

JUDGEMENT: Pass
For additional information see Figure 26 to Figure 28.

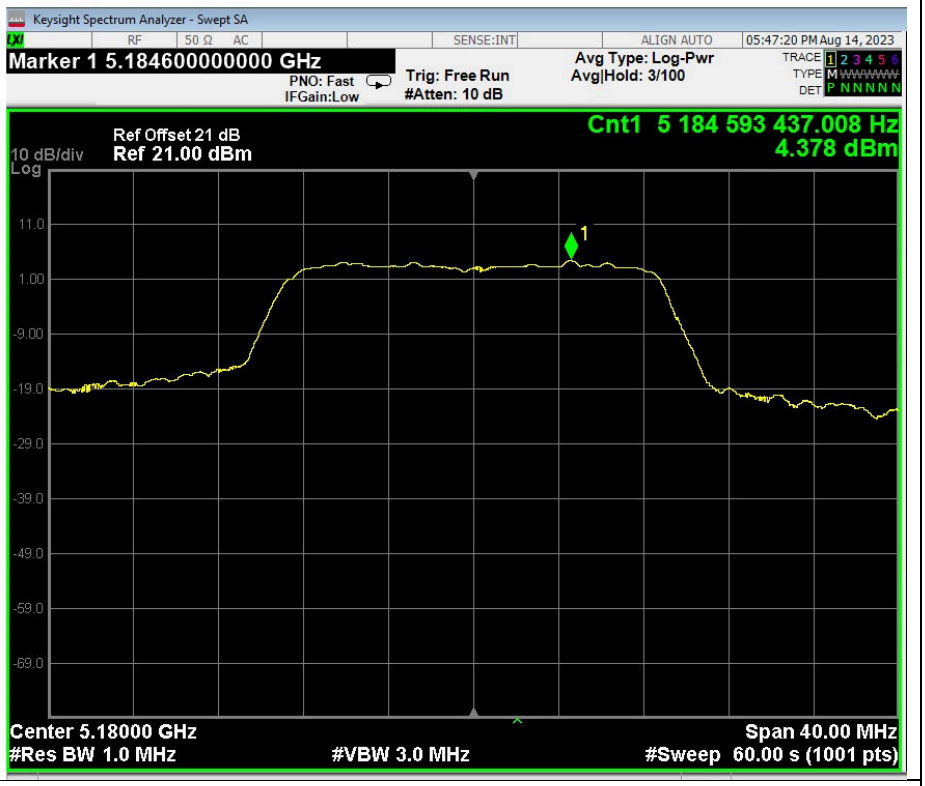


Figure 26. 5180.0MHz

Figure 27. 5220.0MHz

Figure 28. 5240.0MHz

8.6 Test Equipment Used; Transmitted Power Density

ITL #	Instrument	Manufacturer	Model	Serial No.	Last Calibration	Next Calibration
2163	Signal analyzer	Keysight	EXA signal analyzer N9010A	my51170071	Feb 13, 2022	Feb 13, 2024
1778	Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS	1503-590 (05032006)	Aug. 9, 2023	Aug. 9, 2024
1848	20DB 2W DC-8.0GHz Attenuator	Microwave Midwest	ATT-0217-20-NNN-02	-	Jun 6, 2023	Jun 6, 2024

Figure 29 Test Equipment Used

9 Band Edge

9.1 Test Specification

FCC, Part 15, Subpart E section 407(b)(1,8-11)
RSS-247 Issue 2:2017, Sections 3.3, 5.5, 6.2.1.2, 6.2.2.2, 6.2.3.2, 6.2.4.2.
RSS-248 Issue 1 November 19, 2021, Section 4.7.2(a,c,d)
RSS-Gen Issue 5, April 2018

9.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))
Testing was performed for both Radiated Emission for Emissions in the Non-Restricted Bands and in the Restricted Bands:
The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.

- For band edge emissions that fall near the restricted band, section II.G.1c was applied with measuring methods as described in section II.G.5 (b) and II.G.6 (Method AD) of KDB 789033 D02
- For band edge emissions that fall outside the restricted band, sections II.G.2c and 2diii were applied with measuring methods as described in section II.G.5 (b) of KDB 789033 D02

Evaluation was performed for 20.0 MHz BW transmissions.
The highest radiations are described in the tables below.

9.3 FCC Test Limits

9.3.1 UNII1,2

Operating Band (GHz)	Limit	Tested frequency (GHz)	Up band edge (non-restricted band) (dBm)	Low band edge (restricted band) (dBm)
5.15-5.25	All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz	5.1459	N/A	• Peak: -21.2 dBm (74 dBuV/m @3m) • Avg : -41.2 dBm (54 dBuV/m @3m)

*The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

9.4 Test Results

Judgement: PASS
The EUT met the above requirements specification.

9.4.1 Band edge emissions

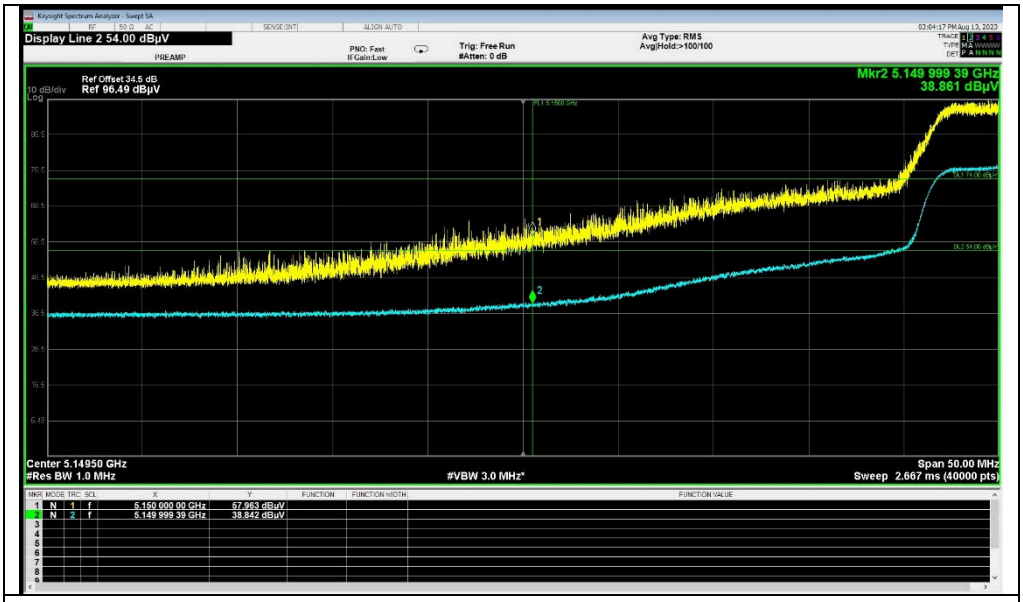


Figure 30: 5.18 GHz, rest. band, peak + avg. (vertical)

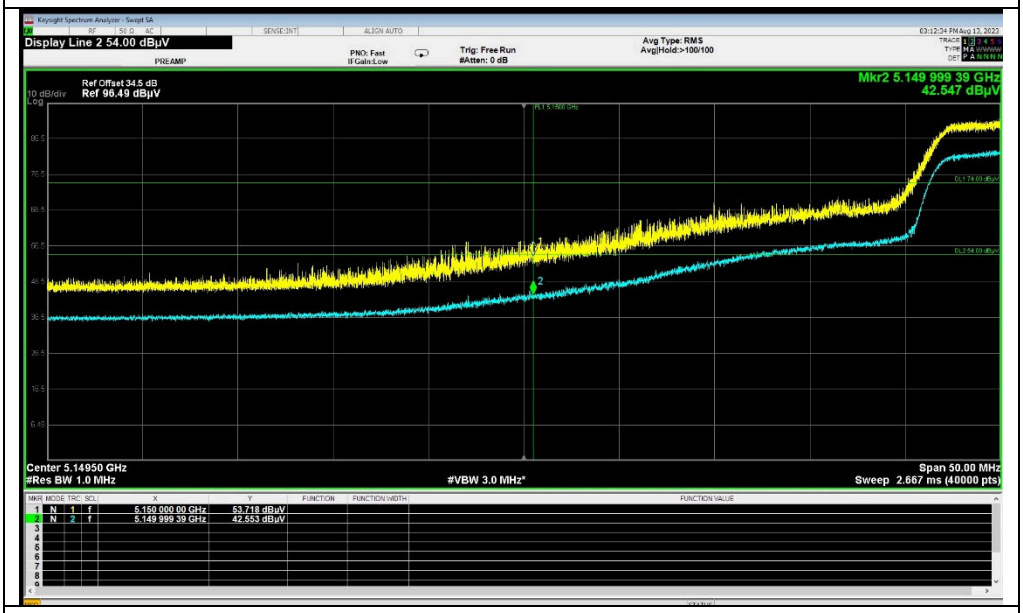


Figure 31: 5.18 GHz, rest. band, peak + avg. (horizontal)

9.5 Test Instrumentation used, Band Edge

I.T.L. #	Instrument	Manufacturer	Model	Serial No.	Last Calibration	Next Calibration
2163	Signal analyzer	Keysight	EXA signal analyzer N9010A	my51170071	13-Feb-22	13-Feb-24
1778	Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS	1503-590 (05032006)	Aug. 9, 2023	Aug. 9, 2024
1856	Horn Antenna	EMCO	3115	9702-511	25-May-21	25-May-24

Figure 32 Test Equipment Used

10 Undesirable/Unwanted Emissions

10.1 Test Specification

Part 15, Subpart E, 15.407(b)
RSS-247, Issue 2, Section 6.2.4.2, RSS-Gen, Issue 5: 2018, Section 8.9

10.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))
Testing was performed for both Radiated Emission for Emissions in the Non-Restricted Bands and in the Restricted Bands:

For measurements between 0.009-30MHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 0.009-30MHz was scanned.

For measurements between 30-1000MHz:
The E.U.T was placed in the chamber on a remote-controlled turntable.
The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and the distance between the E.U.T and the testing antenna was 3 meters.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 30 MHz-1000 MHz was scanned.

For measurements between 1-40GHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 1.0-40.0 GHz was scanned.

The highest radiations are described in the tables below.

10.3 FCC/ISED Test Limits

Operation frequency band	Frequency ranges from band edge	EIRP limit	EIRP limit
	(MHz)	(dBm/MHz)	(dBµV/m/ MHz@3m)
UNII1	N/A	-27.0.0	68.2

Figure 33 FCC and ISED Non-Restricted Band Limits

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBµV/m)	Field strength* (dBµV/m) @ 3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

Figure 34 FCC Restricted Band Limits

Frequency (MHz)	Magnetic Field strength (microampere/meter)	Measurement distance (meters)	Magnetic Field strength (dBµA/m)	Magnetic Field strength* (dBµA/m) @ 3m
0.009-0.490	6.37/F(kHz)	300	-3.0-(-37.7)	77.0-42.2
0.490-1.705	63.7/F(kHz)	30	-17.7-(-28.5)	22.3-11.4
1.705-30.0	0.08	30	-21.9	18.0
Frequency (MHz)	**Field strength (microvolts/meter)**	**Measurement distance (meters)**	**Field strength (dBµV/m)**	**Field strength* (dBµV/m) @ 3m**
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

Figure 35 ISED Restricted Band Limits

10.4 Test Results

JUDGEMENT: Pass

Radiated Emission

E.U.T Description Portable Pen Scanner
Type Orcam Read 5G, Orcam Learn 5G
Serial Number: N/A

Specifications: FCC, Part 15, Subpart E, Section 15.407(b)(1-7)
RSS-247, Sections 6.2.1(2), 6.2.2(2), 6.2.3(2), 6.2.4(2)
Antenna Polarization: Horizontal/Vertical Frequency Range: 9kHz to 40.0 GHz
Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
5180	10360	V	56.42	68.2	-11.78	-	-	-
	10360	H	57.36	68.2	-10.84	-	-	-
	15540	V	54.59	74	-19.41	45.59	54	-8.41
	15540	H	54.53	74	-19.47	45.44	54	-8.56
5210	10420	V	56.90	68.2	-11.30	-	-	-
	10420	H	55.42	68.2	-12.78	-	-	-
	15630	V	55.61	74	-18.39	45.41	54	-8.59
	15630	H	54.53	74	-19.47	45.80	54	-8.20
5240	10480	V	56.17	68.2	-12.03	-	-	-
	10480	H	56.43	68.2	-11.78	-	-	-
	15720	V	55.90	74	-18.10	45.84	54	-8.16
	15720	H	56.21	74	-17.79	45.74	54	-8.26

Figure 36. Radiated Emission Results

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

10.5 Test Instrumentation Used, Emissions in Non Restricted Frequency Bands

I.T.L. #	Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
1175	Spectrum Analyzer	HP	8564E	3442A00275	Feb 28, 2023	Feb 28, 2024
2163	Signal analyzer	Keysight	EXA signal analyzer N9010A	my51170071	Feb 13, 2022	Feb 13, 2024
1180	EMI Receiver	HP(Agilent)	8542E	3906A00276	Feb 20, 2023	Feb 20, 2024
1181	RF Filter	HP(Agilent)	85420E	3705A00248	Feb 20, 2023	Feb 20, 2024
1075	Active Loop Antenna	EMCO	6502	2950	Jul 5, 2022	Aug. 31 2023
1366	Horn Antenna	EMCO	3115	9702-511	May 25, 2021	May 25, 2024
1353	Horn Antenna	ARA	SWH-28	1007	Nov 2, 2021	Nov 2, 2024
1777	LNA Horn Antenna amplifier Ka band	OSR Electronics (Serge)	PE9850R-20	J202021732	Sep 22, 2022	Sep 22, 2025
1037	Low Noise Amplifier 16-30 GHz	Sophia Wireless	LNA28-B	232	Aug. 9, 2023	Aug. 9, 2024
1778	Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS	1503-590 (05032006)	Aug. 9, 2023	Aug. 9, 2024
1998	Band pass filter (9GHz to 18GHz)	OSR	0	0	Oct 1, 2023	Oct 1, 2024
1783	20 cm Cable for KA Band Antenna	Rhophase Microwave	01536 263440 (A1673)	A1673	Jun. 7, 2023	Jun. 7, 2024
2210	Semi Anechoic Chamber	Frankonia Group	SAC-3	0	May 23, 2023	May 23, 2024

Figure 37 Test Equipment Used

10.6 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors", using the following equation:

FS = RA + AF + CF – PA*

FS: Field Strength [dBµv/m]

RA: Receiver Amplitude [dBµv]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

PA: Low Noise Amplifier (Pre-amplifier) Amplification

* External pre-amplifiers are used only in few set-ups

Example: FS = 30.7 dBµV (RA) + 14.0 dB (AF) + 0.9 dB (CF) – 20 dB (PA)= 25.6 dBµV

11 Antenna Gain/Information[1]

Antenna gain: 4.3 dBi; Antenna connection: RP-SMA

11.1 Test Specification

FCC, Part 15, Subpart B. section 212 (a)(iv)

11.2 Test Limit

The modular transmitter must comply with the antenna and transmission system requirements of §§15.203, 15.204(b) and 15.204(c). The antenna must either be permanently attached or employ a “unique” antenna coupler (at all connections between the module and the antenna, including the cable).

11.3 Test Results

Judgment: Pass

[1] The information was provided by the customer. I.T.L. Product Testing is not responsible its validity.

12 RF Exposure/Safety

See a separate file.

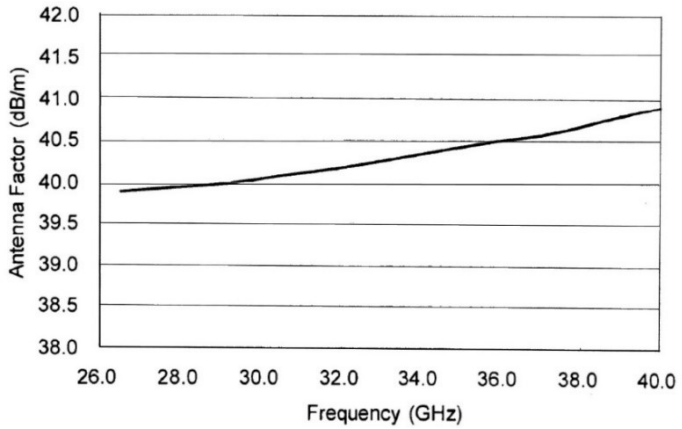
13 Appendix A - Correction Factors

ITL # 1075: Active Loop Antenna						
Frequency (MHz)	**MAF (dBs/m)**	**AF (dB/m)**		**Frequency (MHz)**	**MAF (dBs/m)**	**AF (dB/m)**
0.01	-33.1	18.4		2.0	-40.0	11.5
0.02	-37.2	14.3		3.0	-40.0	11.5
0.03	-38.2	13.3		4.0	-40.1	11.4
0.05	-39.8	11.7		5.0	-40.2	11.3
0.1	-40.1	11.4		6.0	-40.4	11.1
0.2	-40.3	11.2		7.0	-40.4	11.1
0.3	-40.3	11.2		8.0	-40.4	11.1
0.5	-40.3	11.2		9.0	-40.5	11.0
0.7	-40.3	11.2		10.0	-40.5	11.0
1.0	-40.1	11.4		20.0	-41.5	10.0

ITL # 1366: Horn Antenna				
Frequency (GHz)	**AF (dB/m)**		**Frequency (GHz)**	**AF (dB/m)**
0.75	25		9.5	38
1.0	23.5		10.0	38.5
1.5	26.0		10.5	38.5
2.0	29.0		11.0	38.5
2.5	27.5		11.5	38.5
3.0	30.0		12.0	38.0
3.5	31.5		12.5	38.5
4.0	32.5		13.0	40.0
4.5	32.5		13.5	41.0
5.0	33.0		14.0	40.0
5.5	35.0		14.5	39.0
6.0	36.5		15.0	38.0
6.5	36.5		15.5	37.5
7.0	37.5		16.0	37.5
7.5	37.5		16.5	39.0
8.0	37.5		17.0	40.0
8.5	38.0		17.5	42.0
9.0	37.5		18.0	42.5

ITL # 1353: Horn Antenna (@ 3m distance)			
Frequency (GHz)	**Measured antenna factor (dB/m)**	**Frequency (GHz)**	**Measured antenna factor (dB/m)**
18	32.4	22.5	33.0
18.5	32.0	23	33.1
19	32.3	23.5	33.8
19.5	32.4	24	33.5
20	32.3	24.5	33.5
20.5	32.8	25	33.8
21	32.8	25.5	33.9
21.5	32.7	26	34.2
22	33.1	26.5	34.7

ITL # 1777: 26.5-40 GHz Horn Antenna



ITL # 1778: low loss RF cable	
Frequency (GHz)	**Loss (dB)**
10.0	-2.3
20.0	-3.5
30.0	-4.5
40.0	-6.0

ITL # 2199 Trilog Broadband Antenna 30MHz-1GHz + RF cables				
Frequency (MHz)	**Measured antenna factor (dB/m)**		**Frequency (MHz)**	**Measured antenna factor (dB/m)**
30.00	14.30		80.00	11.10
40.00	16.20		90.00	13.40
50.00	17.40		100.00	15.20
60.00	16.30		150.00	11.40
70.00	13.00		200.00	14.10
80.00	11.10		300.00	16.10
90.00	13.40		400.00	18.10
100.00	15.20		500.00	19.50
150.00	11.40		600.00	21.10
30.00	14.30		700.00	22.50
40.00	16.20		800.00	23.50
50.00	17.40		900.00	24.70
60.00	16.30		1000.00	25.50
70.00	13.00			

End of Report