FCC and ISED Test Report

SECO S.p.A.
Wireless Network Device, Model: SYS-C60-LMC1

In accordance with FCC 47 CFR Part 15E, ISED RSS-247 and ISED RSS-GEN (5 GHz WLAN)

Prepared for: La Marzocco
Via La Torre 14/H
Loc. La Torre
50038
Scarperia (FI)
Italy

FCC ID: 2AZUJ-SYS-C60-LMC1 IC: 27093-SYSC60LMC1

COMMERCIAL-IN-CONFIDENCE

Document 75951487-07 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	10 June 2021

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15E, ISED RSS-247 and ISED-RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Anthony Hubbard	10 June 2021	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15E: 2019, ISED RSS-247: Issue 2 (2017-02) and ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

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Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	09-June-2021

Table 1

1.2 Introduction

Applicant	La Marzocco
Manufacturer	SECO S.p.A.
Model Number(s)	SYS-C60-LMC1
Serial Number(s)	210151871
Hardware Version(s)	SYS-C60-LMC1
Software Version(s)	HEDGEHOG 1.0
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15E: 2019 ISED RSS-247: Issue 2 (2017-02) ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019)
Order Number Date	200057729 24-February-2021
Date of Receipt of EUT	03-March-2021
Start of Test	10-March-2021
Finish of Test	13-March-2021
Name of Engineer(s)	Anthony Hubbard
Related Document(s)	ANSI C63.4 (2014) ANSI C63.10 (2013) KDB 996369 D04 Module Integration Guide v02

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15E and ISED RSS-247 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15E	RSS-247			
Configuration and Mode: 5 GHz WLAN					
2.1	15.407 (b) and 15.205	6.2	Spurious Radiated Emissions	Pass	Measurements as per KDB 996369 D04, clause 3.4 only.
2.2	15.407 (a)	6.2	ERP/EIRP Verification	Pass	Measurements as per KDB 996369 D04, clause 3.4 only.

Table 2

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Wireless Network device equipped with one Dual-Band Module–Wi-Fi, Bluetooth, and Bluetooth Low Energy (LE) and one LTE, WCDMA, GSM module.
Manufacturer:	SECO S.p.A. Via Achille Grandi, 20 - 52100 Arezzo, ITALY
Model:	SYS-C60-LMC1
Part Number:	
Hardware Version:	SYS-C60-LMC1
Software Version:	HEDGEHOG 1.0
FCC ID of the product under test – see guidance here	2AZUJ-SYS-C60-LMC1
IC ID of the product under test – see guidance here	27093-SYSC60LMC1

Table 3

Intentional Radiators

Technology	BT	WiFi	LTE FDD Band 12	GSM 850 /WCDMA FDD V / LTE FDD Band 5	LTE FDD Band 4	PCS1900 / WCDMA FDD II / LTE FDD Band 2	LTE FDD Band 7
Frequency Range (MHz to MHz)	2400-2483.5	2400-2483.5 5150-5250, 5250-5350, 5470-5725, 5725-5850	699-716	824-849	1710-1755	1850-1910	2500-2570
Conducted Declared Output Power (dBm)	11,7	17.3/18	25	35/25	25	32/25	25
Antenna Gain (dBi)	2.7	1.6	1.3	2.8	0.3	2.9	0.3
Supported Bandwidth(s) (MHz) (e.g 1 MHz, 20 MHz, 40 MHz)	1	20, 40, 80	1.4, 3, 5, 10	0.2	1.4, 3, 5, 10, 15, 20	0.2, 1.4, 3, 5, 10, 15, 20	5, 10, 15, 20
Modulation Scheme(s) (e.g GFSK, QPSK etc)	GFSK, π/4 DQPSK, 8DPSK	DSSS/ OFDM	QPSK/ QAM	GMSK/ QPSK/ QAM	QPSK/ QAM	GMSK/ QPSK/ QAM	QPSK/ QAM
ITU Emission Designator (see guidance here)	1M00GD	20M0GD	1M40GD 3M00GD 5M00GD 10M0GD	200KGD 1M40GD 3M00GD 5M00GD 10M0GD	1M40GD 3M00GD 5M00GD 10M0GD 15M0GD 20M0GD	200KGD 1M40GD 3M00GD 5M00GD 10M0GD 15M0GD 20M0GD	5M00GD 10M0GD 15M0GD 20M0GD
Bottom Frequency (MHz)	2402	5180	699.7	824.2	1710.7	1850.2	2502.5
Middle Frequency (MHz)	2440	5500	707.5	836.6	1732.6	1950.0	2535.0
Top Frequency (MHz)	2480	5825	715.3	848.8	1754.3	1909.8	2567.5

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	1 GHz
Lowest frequency generated or used in the device or on which the device operates or tunes	32.768 kHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

Table 5

DC Power Source

Nominal voltage:	24	V
Extreme upper voltage:	25.2	V
Extreme lower voltage:	22.8	V
Max current:	0.5	A

Table 6

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Table 7

Temperature

Minimum temperature:	5	°C
Maximum temperature:	32	°C

Table 8

Antenna Characteristics

Antenna connector ☒ Type: SMA MALE RP			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:	Dipole	Gain	2.9 dBi (@1900MHz)	dBi
For external antenna only: Standard Antenna Jack ☐ If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed ☒ Non-standard Antenna Jack ☒					

Table 9

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 10

I hereby declare that the information supplied is correct and complete.

Name: Tommaso Berna
Position held: Testing Manager
Date: 30/03/2021

1.5 Product Information

1.5.1 Technical Description

Wireless Network device equipped with one Dual-Band Module–Wi-Fi, Bluetooth, and Bluetooth Low Energy (LE) and one LTE, WCDMA, GSM module.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: SYS-C60-LMC1, Serial Number: 210151871			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 11

1.8 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 5 GHz WLAN		
Spurious Radiated Emissions	Anthony Hubbard	UKAS
ERP/EIRP Verification	Anthony Hubbard	UKAS

Table 12

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Spurious Radiated Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15E, Clause 15.407 (b) and 15.205
ISED RSS-247, Clause 6.2

2.1.2 Equipment Under Test and Modification State

SYS-C60-LMC1, S/N: 210151871 - Modification State 0

2.1.3 Date of Test

10-March-2021 to 12-March-2021

2.1.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6. Measurements were only performed over the frequency range specified in FCC Part 15.35(b) as required by KDB 996369 D04, clause 3.4. In addition, measurements were only performed on the worst case channel and modulation as identified in the modular test report.

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.5 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.2.

The plots shown are the characterisation of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

To determine the emission characteristic of the EUT above 18 GHz, the test antenna was swept over all faces of the EUT whilst observing a spectral display. The frequency of any emissions of interest was noted for formal measurement at the correct measurement distance of 1m. This procedure was repeated for all relevant transmit operating channels.

At a measurement distance of 1 meter the limit line was increased by 20*LOG(3/1) = 9.54 dB.

Where formal measurements have been necessary, the results have been presented in the emissions table.

2.1.5 Example Test Setup Diagram

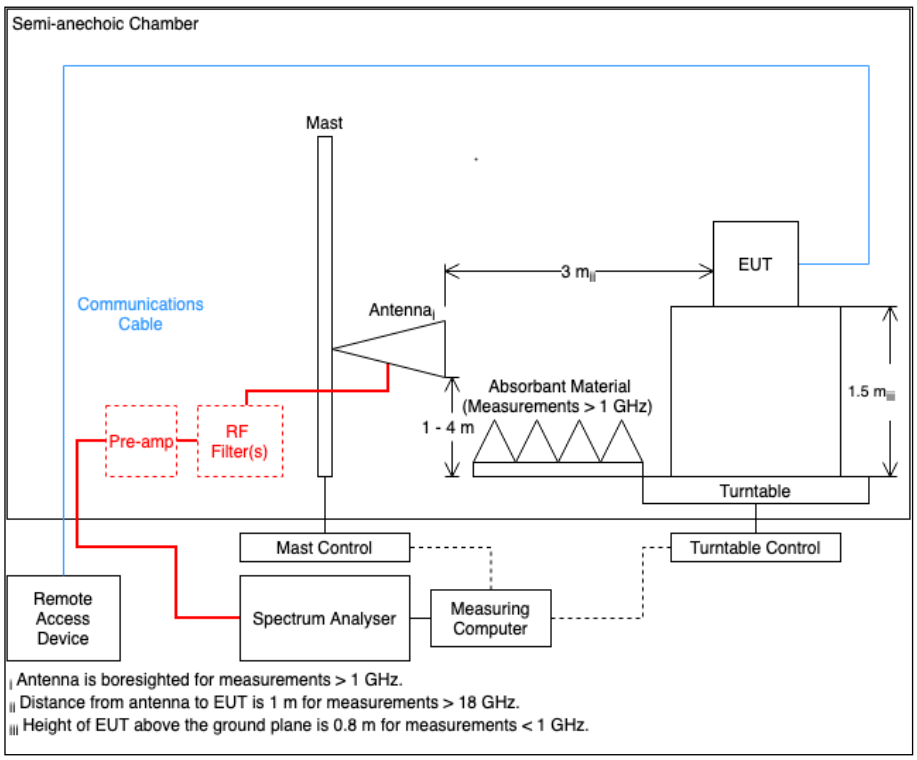

Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	22.4 °C
Relative Humidity	37.8 %

2.1.7 Test Results

5 GHz WLAN

Testing was performed on the Data Rate which resulted in the highest conducted output power. The Data Rate used during testing was 6 Mbps (802.11a).

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
116.665	31.70	43.50	-11.80	Peak	350	100	Vertical	-
352.907	32.00	46.00	-14.00	Peak	5	110	Horizontal	-
791.988	35.25	46.00	-10.75	Peak	62	172	Horizontal	-

Table 13 - U-NII 3 - 5785 MHz – 30 MHz to 30 GHz

*No emissions were detected within 20 dB of the limit.

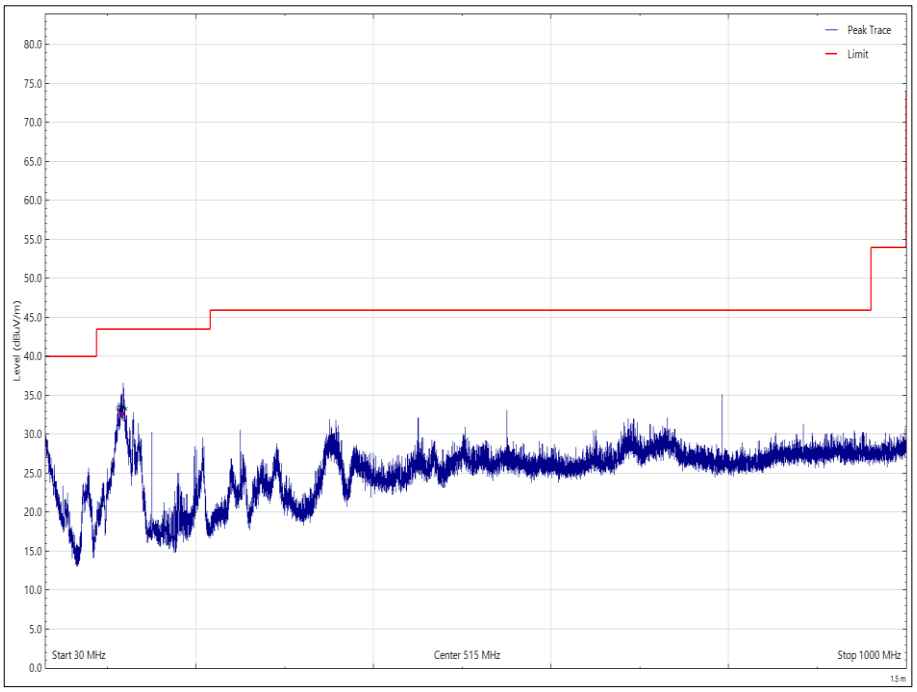

Figure 2 - U-NII 3 - 5785 MHz - 30 MHz to 1 GHz - Vertical

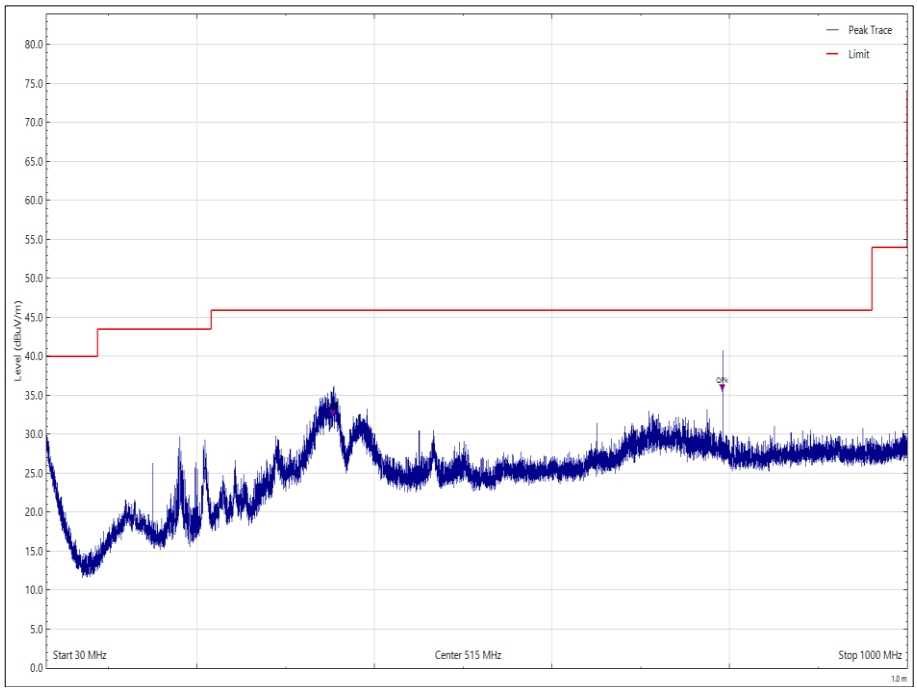

Figure 3 - U-NII 3 - 5785 MHz - 30 MHz to 1 GHz - Horizontal

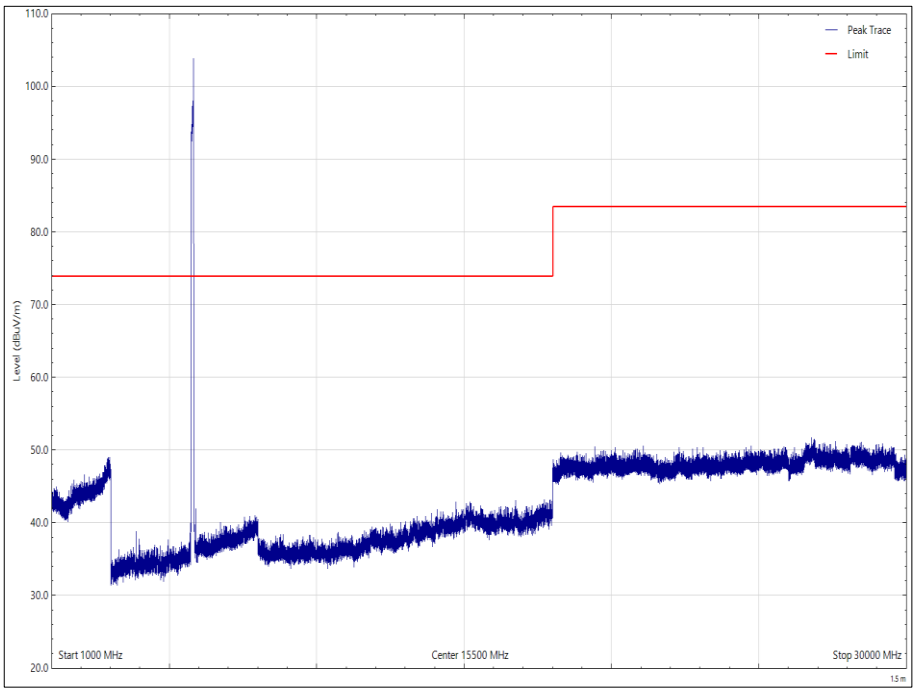

Figure 4 - U-NII 3 - 5785 MHz - 1 GHz to 30 GHz Peak - Vertical

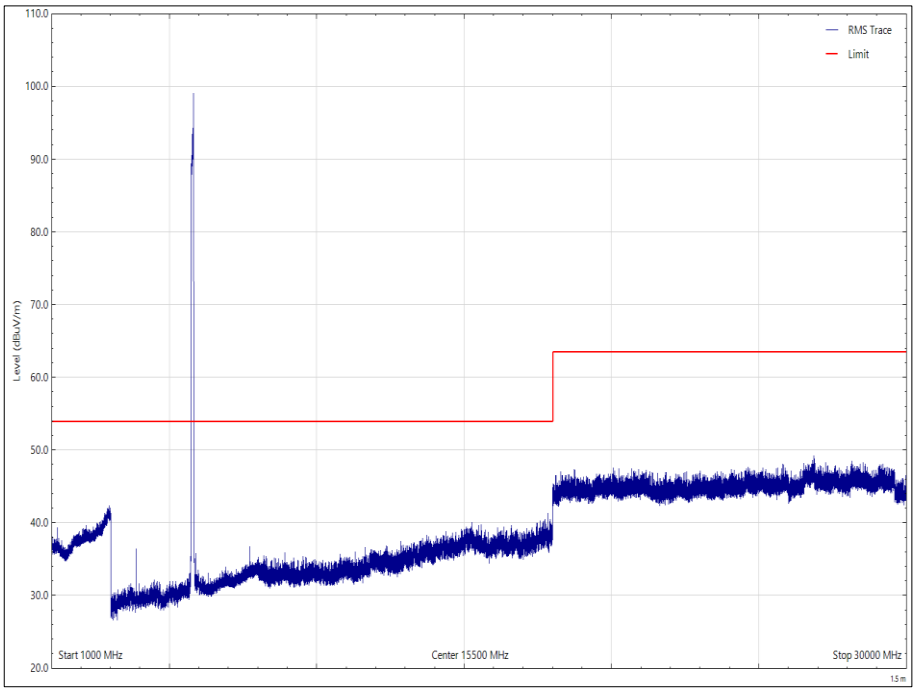

Figure 5 - U-NII 3 - 5785 MHz - 1 GHz to 30 GHz RMS - Vertical

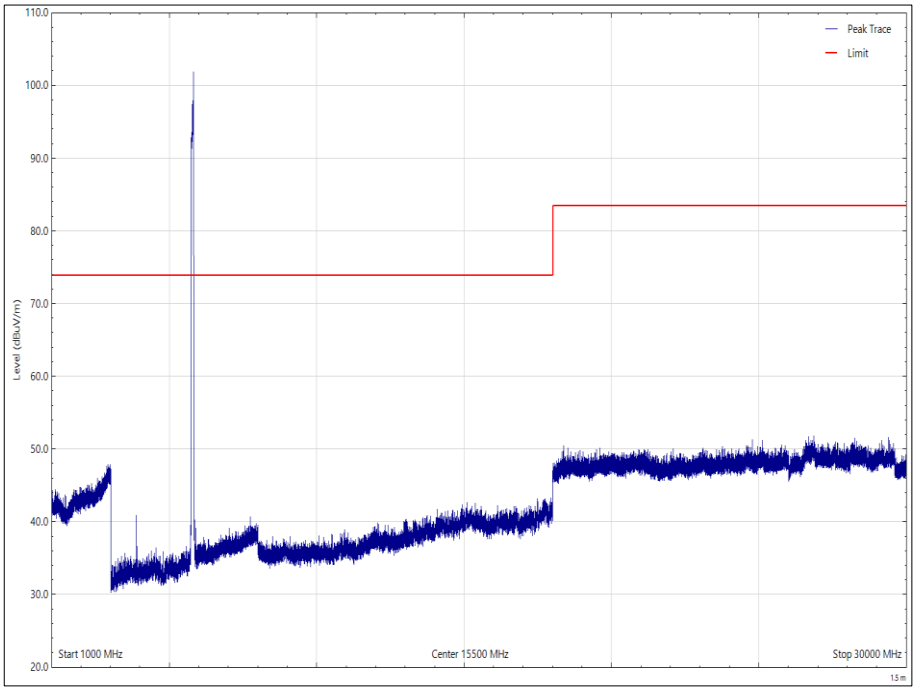

Figure 6 - U-NII 3 - 5785 MHz - 1 GHz to 30 GHz Peak - Horizontal

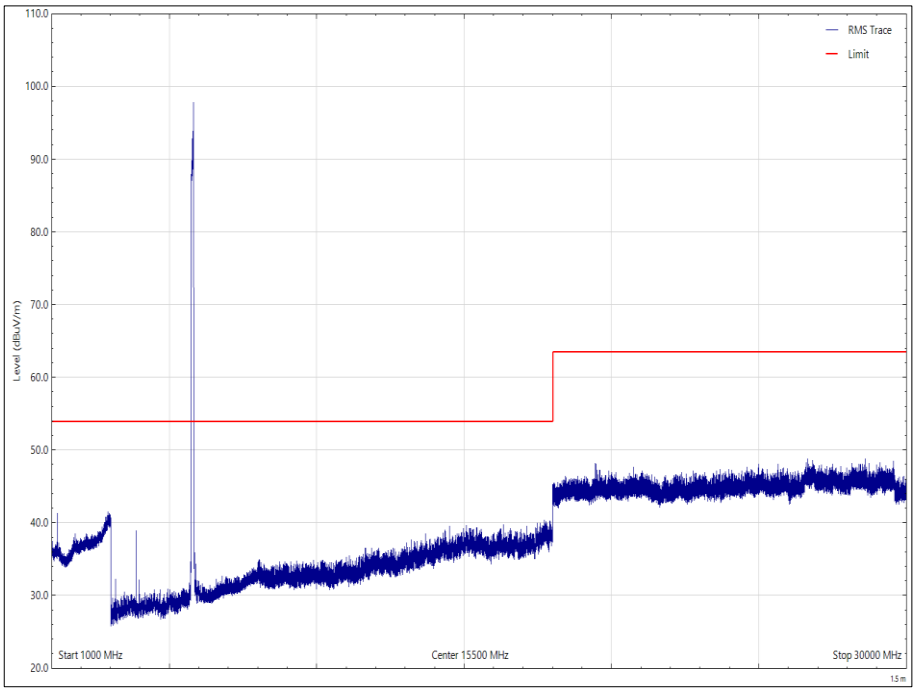

Figure 7 - U-NII 3 - 5785 MHz - 1 GHz to 30 GHz RMS - Horizontal

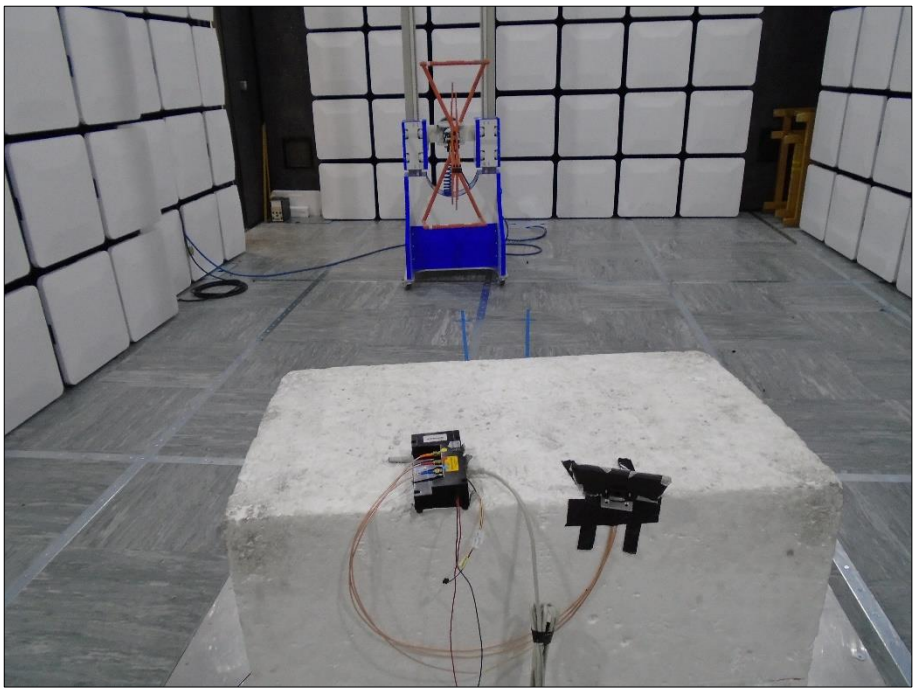

Figure 8 - Test Setup - 30 MHz to 1 GHz

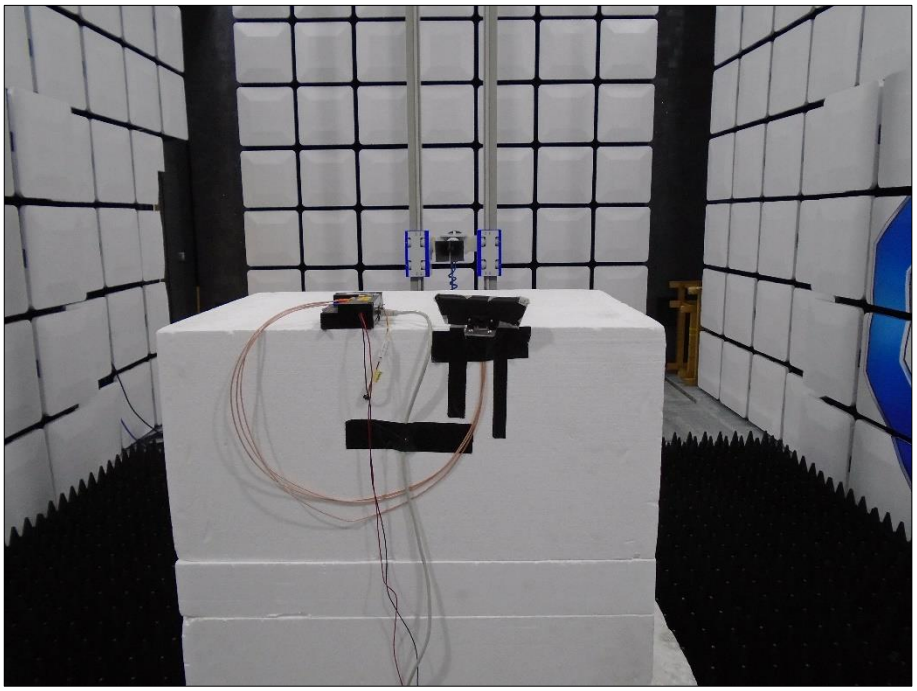

Figure 9 - Test Setup - 1 GHz to 8 GHz

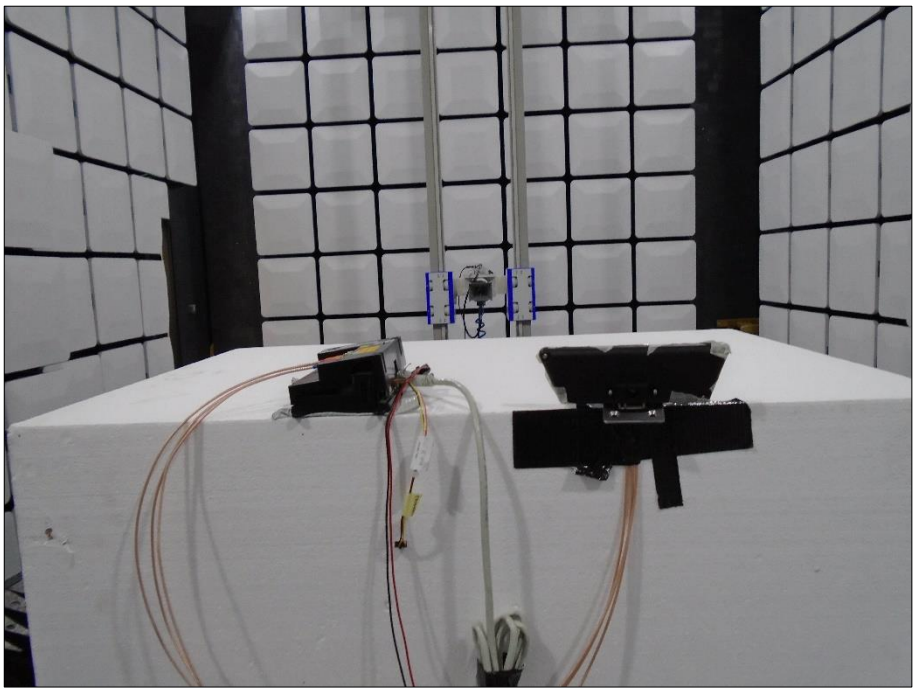

Figure 10 - Test Setup - 8 GHz to 18 GHz

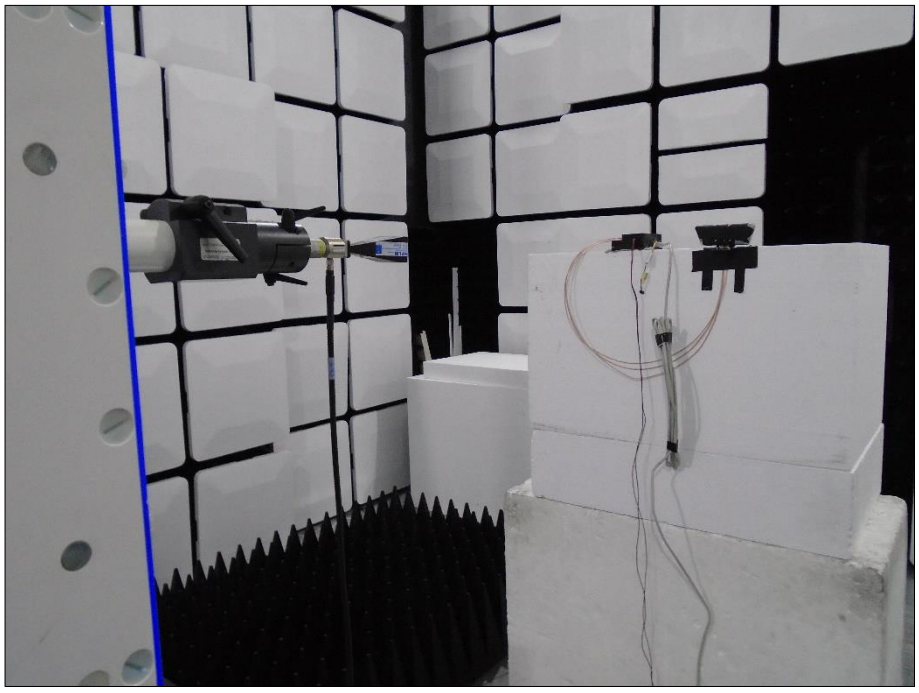

Figure 11 – Test Setup – 18 GHz to 30 GHz

FCC 47 CFR Part 15, Limit Clause 15.407(b)(1)(2)(3)(4)

Emissions not falling within the restricted bands listed in FCC 47 CFR Part 15.209:

For transmitters operating in the 5.15-5.25 GHz band: ≤-27 dBm/MHz outside 5150-5350 MHz.

For transmitters operating in the 5.25-5.35 GHz band: ≤-27 dBm/MHz outside 5150-5350 MHz.

For transmitters operating in the 5.47-5.725 GHz band: ≤-27 dBm/MHz outside 5470-5725 MHz

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Emissions within the restricted bands listed in FCC 47 CFR Part 15.209:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 to 0.490	2400/F(kHz)	300
0.490 to 1.705	24000/F(kHz)	30
1.705 to 30	30	30
30 to 88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960	500	3

Table 14 - Radiated Emissions Limit Table (FCC)

ISED RSS-247, Limit Clause 6.2.1.2, 6.2.2.2, 6.2.3.2 and 6.2.4.2 and ISED RSS-GEN, Limit Clause 8.9

Emissions not falling within the restricted bands listed in ISED RSS-GEN, Clause 8.10:

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB.

For transmitters with operating frequencies in the bands 5250-5350 MHz and 5470-5725 MHz, all emissions outside the band 5250-5350 MHz and 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

Devices operating in the band 5725-5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

Emissions not falling within the restricted bands listed in Industry Canada RSS-GEN, Clause 8.10:

Frequency (MHz)	Field Strength (µV/m)
0.009 to 0.490	2400/F(kHz)
0.490 to 1.705	24000/F(kHz)
1.705 to 30	30
30 to 88	100
88 to 216	150
216 to 960	200

Table 15 - Radiated Emissions Limit Table (ISEDC)

2.1.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	27-Jul-2022
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287	24	14-Oct-2022
Pre-Amplifier, (8 GHz to 18 GHz)	Phase One	PS04-0086	1533	12	05-Feb-2022
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	18-Feb-2022
Power Supply	Hewlett Packard	6104A	1948	-	O/P Mon
Multimeter	Fluke	177	3833	12	14-Dec-2021
Band Reject Filter - 5.775 GHz	Wainwright	WRCJV10-5700-5735-5815-5850-50SS	5077	12	12-Nov-2021
EmX Emissions Software	TUV SUD	V2.1.1	5125	-	Software
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5350	12	21-Sep-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5382	12	18-Feb-2022
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5418	12	22-Jun-2021
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5428	12	15-Oct-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	18-Mar-2021
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5511	12	03-Apr-2021
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5512	12	03-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5514	12	01-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5515	12	01-Apr-2021
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5519	12	24-Mar-2021
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5610	12	22-Sep-2021
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast TAM 4.0-P	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023

Table 16

TU - Traceability Unscheduled

2.2 ERP/EIRP Verification

2.2.1 Specification Reference

FCC 47 CFR Part 15E, Clause 15.407 (a)
ISED RSS-247, Clause 6.2

2.2.2 Equipment Under Test and Modification State

SYS-C60-LMC1, S/N: 210151871 - Modification State 0

2.2.3 Date of Test

13-March-2021

2.2.4 Test Method

The following test was performed to check the fundamental of the integrated module was not adversely affected when integrated into the host device as required by KDB 996369 D04, clause 3.4.

This test was performed in accordance with ANSI C63.10 clause 6.3 and clause 12.3.2.5 (SA-2A).

2.2.5 Environmental Conditions

Ambient Temperature	21.7 °C
Relative Humidity	34.0 %

2.2.6 Test Results

5 GHz WLAN

The worst-case mode was identified as:

20 MHz Bandwidth, 5785 MHz (CH157), 802.11a, 6 Mbps

Frequency (MHz)	Result	Limit	Unit
5785	6.98	36.00	dBm

Table 17 - EIRP Verification Results

2.2.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Power Supply	Hewlett Packard	6104A	1948	-	O/P Mon
Multimeter	Fluke	177	3833	12	14-Dec-2021
EmX Emissions Software	TUV SUD	V2.1.1	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESW44	5382	12	18-Feb-2022
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5428	12	15-Oct-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	18-Mar-2021
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5519	12	24-Mar-2021
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast TAM 4.0-P	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023

Table 18

TU - Traceability Unscheduled

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
ERP/EIRP Verification	± 3.2 dB

Table 19

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.