EMC Test Report

According to

Title 47 CFR Part 15 Subpart B

ISED ICES-Gen Issue 1; Amendment 1 (February 2021)

ISED ICES-003 Issue 7

ANSI C63.4:2014+A1:2017

DUT Name:	KALLOS
Model No. :	KALLOS
Customer:	Intrex Inc
Address:	1896 Preston White Drive, 20191, Reston, VA, United States
Summary:	IN COMPLIANCE
Date of Reception:	5.9.2024
Date(s) of Test(s):	6.9.2024

Tested by (Test Engineer)

Pekka Pulkkinen

Approved by (Technical Manager)

Jukka Rauma

Contents

Document Version History	Date of issue	Comments	Approved by
v0.1	16.9.2024	Initial version	
v1.0	16.9.2024	Approved version	Jukka Rauma
v2.0	16.9.2024	EUT and test setup photos moved to separate Annex1.	Jukka Rauma

1. General Information

Test Engineer(s): Pekka Pulkkinen

Location:

Test Firm Name	Eurofins Electric & Electronics Finland Oy (EEEF)
Test Site	Yrttipellontie, Peltola
Address of Test Site	Yrttipellonte 6, 90230 Oulu, Finland
FCC Designation number	FI0008
FCC site registration number	771880
ISED number	29576
CAB Identifier	T290

Customer: Intrex Inc

1896 Preston White Drive, 20191, Reston, VA, United States

Ted Tzirimis

Tel : +17034833255

E-mail : ted@intrexis.com

Climate Conditions: Temperature: 15 - 35 °C

Air pressure: 860 - 1060 hPa

Humidity: 30-60 rH%

These limits were not exceeded during testing.

2. Test Samples

General description:

Product is a battery operated single wearable deice to provide nurse call, real-time location, fall detection and access control. Product is one device in Rythmos+ community system, safety and wellness solution for senior communities.

Test samples:

Sample number	Serial number	Manufacturer	DUT Type	Model	HW version	SW version	Comments
3941ER011	IMEI: 862729050361238	Intrex Inc	Wearable safety and wellness device	KALLOS	MRD_04	2024.03.1x.1	
3941ER015	423115913	Intrex Inc	Swap pad	Swap Pad	V1.1	v2.0.0	

Accessories / Monitoring devices:

Sample number	Serial number	Manufacturer	DUT Type	Model	HW version	SW version	Comments
3941ER018	C4H15240UN7PK84A0	Apple	Power adapter	A2347	NA	NA	20W
G4CER047		NA	USB-c to USB-C cable, 1.0m	NA	NA	NA	

3. Configuration and Operation Modes

Operation Mode	Description
OM1	EUT on placed on swap pad. Swap pad powered with AC/DC power supply (USB-C cable). Swap pad reading EUT's passive nFC tag with 0.4 ms interval.

4. Test sample description

Model	KALLOS	
Additional model(s)	KALLOS	
Brand name	Rythmos	
FCC ID	2AWYMKALLOS	
IC	31261-KALLOSNA01	
Class	Class B	
Radio module	Type	Bluetooth LE radio
	Model	nRF52832
	Manufacturer	Nordic Semiconductor
	FCC-ID	2AWYMKALLOS
	IC	31261-KALLOSNA01
Antenna	Type	Amphenol LDS, gain -8.95 dBi
Radio module	Type	Bluetooth LE radio
	Model	nRF5340
	Manufacturer	Nordic Semiconductor
	FCC-ID	2AWYMKALLOS
	IC	31261-KALLOSNA01
Antenna	Type	Amphenol LDS, gain -8.95 dBi
Radio module	Type	LTE radio module
	Model	BG77
	Manufacturer	Quectel
	FCC-ID	XMR201912BG77
	IC	10224A-201912BG77
Antenna	Type	Amphenol LDS, gain -7.4 dBi
Manufacturer	Intrex Inc 1896 Preston White Drive, 20191, Reston, VA, United States	

Ports	**Port**			**Cable**	
	Name and description		Shielded	Specified max length [m]	Attached during test
			☐		☐
			☐		☐
			☐		☐
			☐		☐
			☐		☐
Supplementary information to the ports					
Rated power supply	Voltage and Frequency			Reference poles	
				L1	N	PE
	☒	AC 230 V ☒ 50 Hz ☐ 60 Hz		☐	☐	☐
	☐	AC 240 V ☐ 50 Hz ☐ 60 Hz		☐	☐	☐
	☒	AC 110 V ☐ 50 Hz ☒ 60 Hz		☐	☐	☐
	☐	AC 100 V ☐ 50 Hz ☐ 60 Hz		☐	☐	☐
	☐	Other:		☐	☐	☐
	☐	DC:				
Rated Power	Battery powered: 3.7V					
Clock frequencies	Lowest: 32,786 kHz, highest: 2200 MHz					
Other parameters						
Dimensions in cm (W x H x D)	Diameter 4.5 cm, height 1.2 cm					
Weight	0,051 kg					
Mounting position	☐	Table top equipment				
	☐	Wall/Ceiling mounted equipment				
	☐	Floor standing equipment				
	☐	Hand-held equipment				
	☒	Other: Wearable device				

5. Test description

5.1. FCC subpart 15B and ICES-003, radiated emission test procedure

Radiated tests were performed in a semi-anechoic chamber that has met NSA requirements (4 dB tolerance) according to

- CISPR 16-1-4 Ed. 4.0 2019-01 Validation of a SAC (6.8) using the Reference Site Method (RSM) (6.6);
- ANSI C63.4a -2017 Validation of radiated emission test sites (30MHz – 1 GHz) (Annex D)

sVSWR requirements (1 -18 GHz) are met according to

- CISPR 16-1-4 Ed. 4.0 2019-01 SVSWR site validation – standard test procedure (7, 7.6)

3 different measurement antenna was used, located at a distance of 3 m.

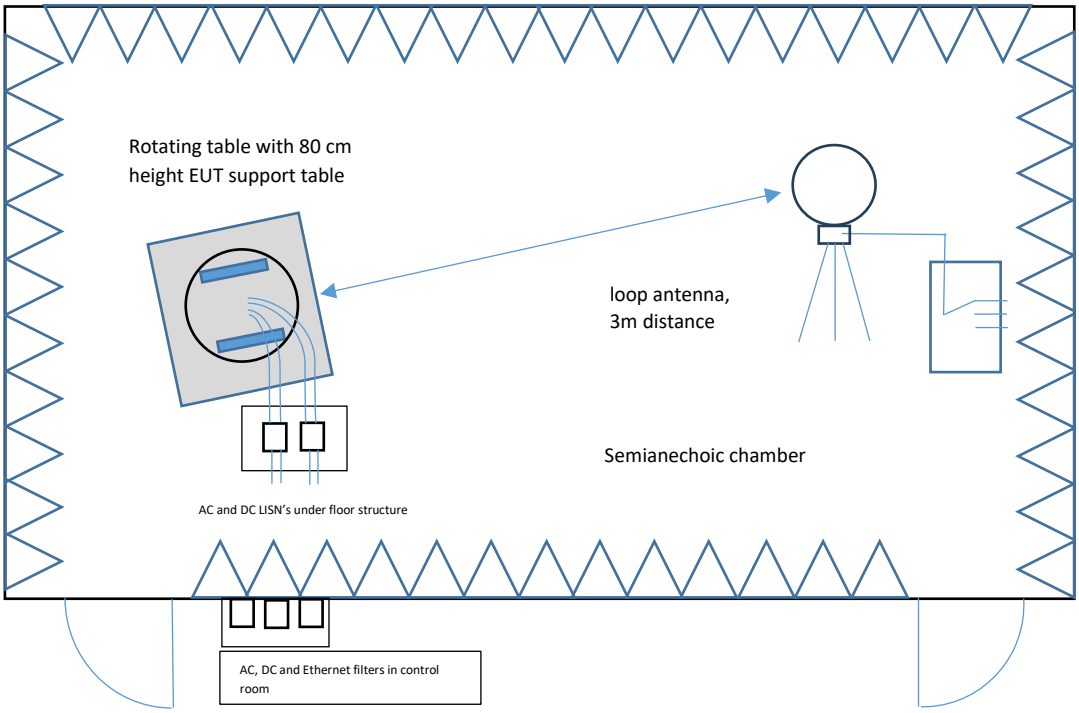
- active loop antenna for frequency range 9 kHz-30 MHz
- linear polarized logarithmic periodic antenna for frequency range 30-1000 MHz
- and double-ridged horn antenna for the frequency range 1-18 GHz

The equipment under test was set up on a non-conductive support, 80 cm above the ground plane. EUT power supply LISN's for AC and DC were located under the ground reference plane. The field strength was calculated by adding correction factor to the measured level from the EMI receiver. This correction factor includes antenna factor, cable loss and pre-amplifier gain**.**

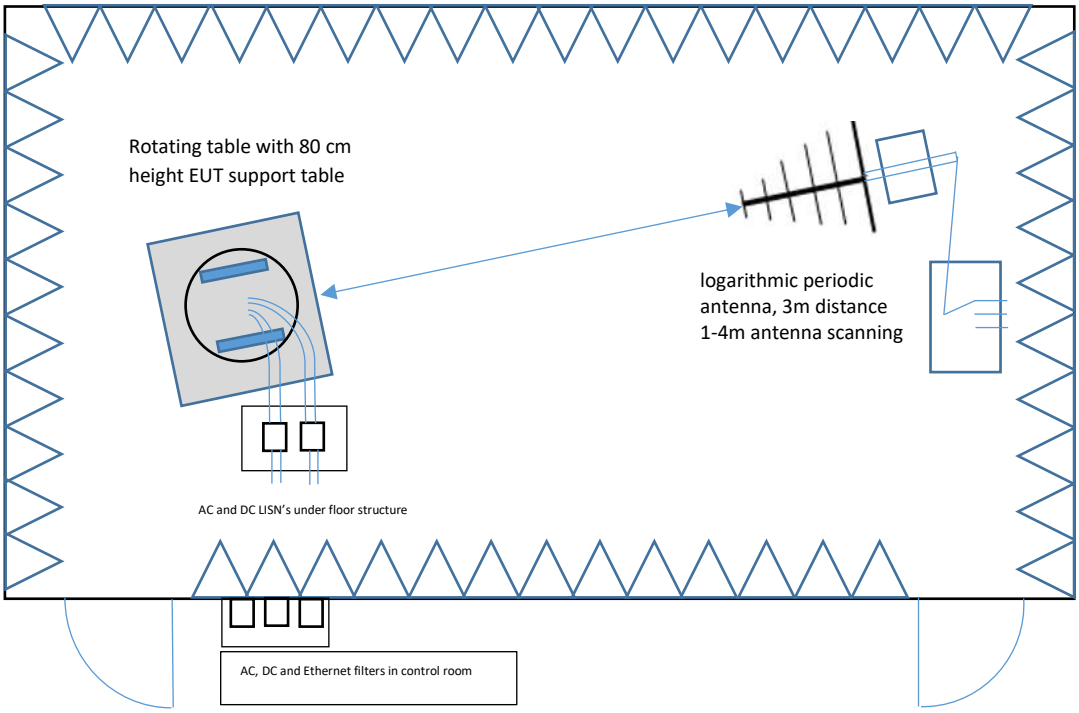
Measurement procedure

- EUT was set in a manner that is most representative of the equipment as typically used (i.e., as specified in the EUT instruction manual)
    - In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the orientation (attitude) having maximum or near-maximum emission level.
- in exploratory measurements for full frequency range
    - turntable was rotated with 45° steps (from 0° to 315°)
    - measurement was done in both vertical and horizontal antenna polarization with antenna height of 1m
    - measurement was done with peak detector to find the frequencies of maximum emissions and at least six highest peaks related to the limits were chosen
- these peak values were further maximized by scanning the turntable position 0 to 360 degrees and the antenna height 1 to 4m (antenna scanning only for frequency range 30 MHz – 18 GHz)
- for maximized values, final measurement was done with
    - quasi-peak detector for 9 kHz – 30 MHz frequency range
    - quasi-peak detector for 30MHz to 1GHz frequency range
    - with Average detector for 1GHz to 18GHz frequency range

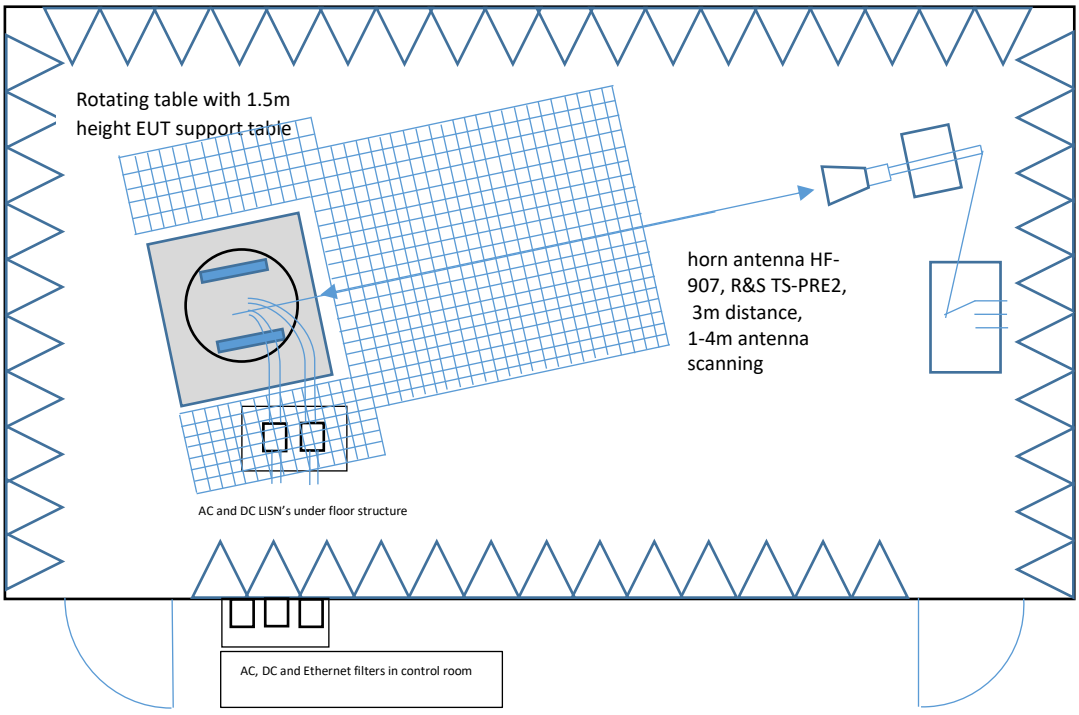
Radiated measurements setup from 9 kHz – 30 MHz



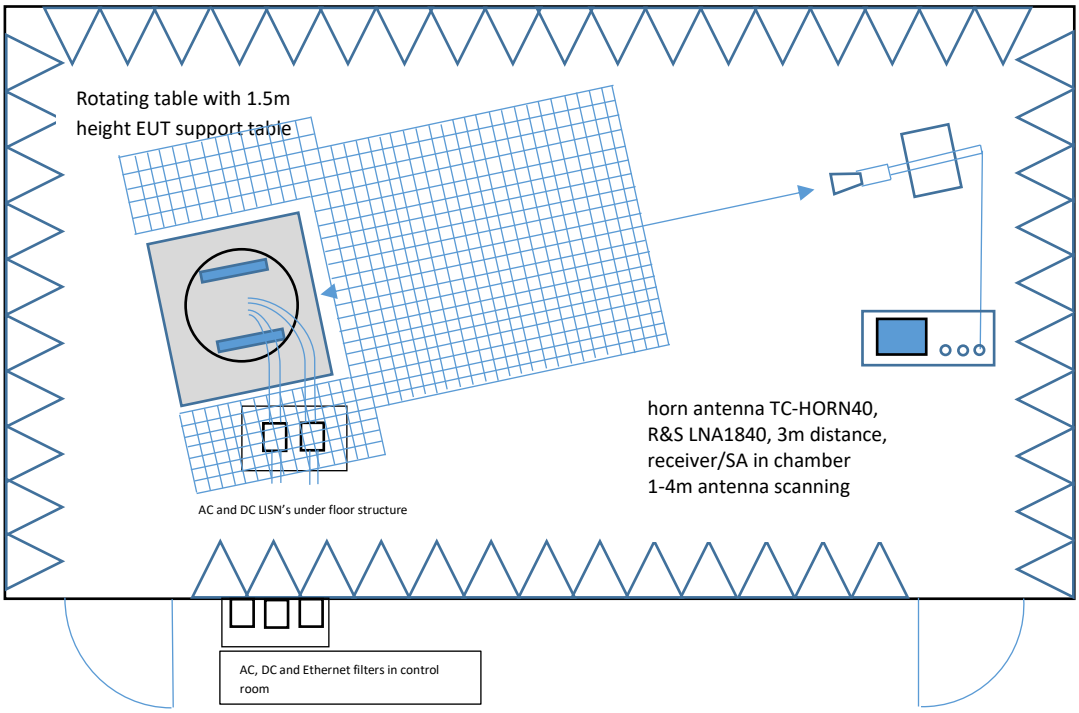
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



Radiated measurements setup from 18 GHz to 26 / 40 GHz:



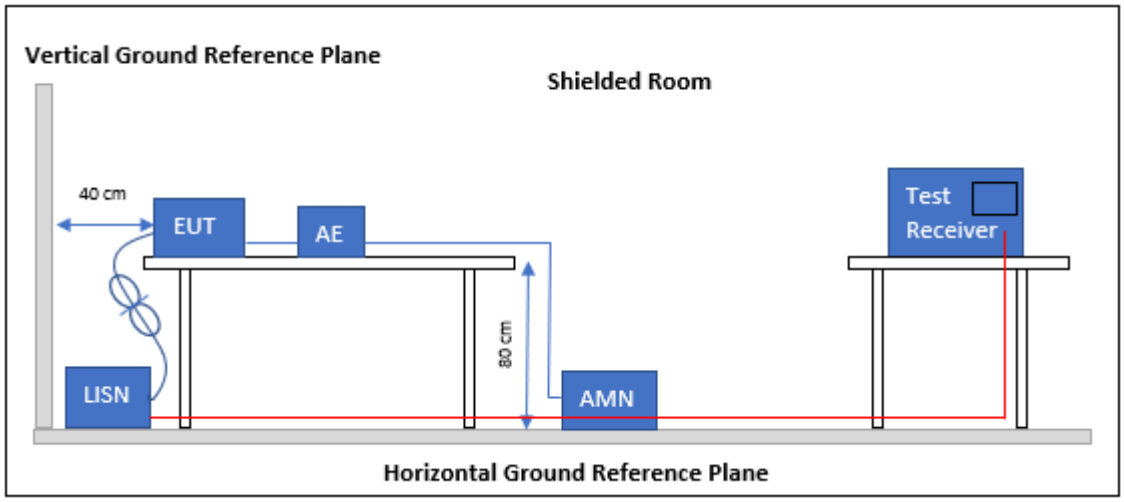
5.2. FCC subpart 15B and ICES-003, conducted emission test procedure

The equipment under test was set up on a non-conductive support, 80 cm above the ground plane and 40 cm distance of vertical ground plane. Test setup is described in pictures below.

Measurement procedure

- EUT was operated in a range of typical modes of operation, with typical cable positions, and with a typical system equipment configuration and arrangement
- in exploratory measurements for full frequency range
    - measurement was done with peak and average detector to find the frequencies of maximum emissions for each current-carrying conductor of each power cord associated with the EUT and at least six highest peaks related to the limits were chosen per conductor
    - the one configuration and arrangement and mode of operation that produces the highest emissions related to the limit across all the measured conductors was recorded.
- for this configuration and its maximized values, final measurement for each current-carrying conductor was done with quasi-peak detector and average detector

Conducted emission test setup



6. Uncertainties

6.1. Emission measurement uncertainties

Description	Expanded Uncertainty (k=2)
AC conducted emission	2,24
Radiated emission ≤ 1 GHz	4,62
Radiated emission > 1 GHz	5,72

7. Summary

Title 47 CFR 15B, ISED ICES-003 Issue 7			
Reference	Requirement – Test case	Verdict	Remark
FCC 15.109 ICES-003, 3.2.2	Radiated emission. Magnetic field measure (9 kHz – 30 MHz)	PASS	
FCC 15.109 ICES-003, 3.2.2	Radiated emission. Electromagnetic field measure (30 MHz – 1000 MHz)	PASS	
FCC 15.109 ICES-003, 3.2.2	Radiated emission. Electromagnetic field measure (1 GHz – 18 GHz)	N/R	
FCC 15.107 ICES-003, 3.2.1	Continuous conducted emission (150 kHz – 30 MHz)	N/R	
The DUT has been tested and passes the FCC Part 15 Subpart B without any mofications.		Yes	
Possible test case verdicts PASS = Test object meet the requirements FAIL = Test object does not meet the requirements N/T = Required by standard but not tested N/R = Not required by standard for the test object			

8. Radiated Emissions

Reference: FCC 15.109, ICES-003, 3.2.2
Test method: ANSI C63.4:2014+A1:2017 Section 8

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B, Secs. 15.109 & ICES-003 Issue 7, section 3.2.2.

FCC part 15, subpart B

Limits, Class B	Quasi-peak Limit	
Frequency of emission (MHz)	microvolt/meter	dBuV/m (@3m)
0.009-0.49	2400/f(kHz) (@300m)	128.5-93.8
0.49-1.705	24000/f(kHz) (@30m)	73.8-63
1.705-30	30 (@30m)	69.5

Limits, Class B	Quasi-peak Limit for 3m	
Frequency of emission (MHz)	microvolt/meter	dBuV/m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

ICES-003, Issue 7

Limits, Class B	Quasi-peak Limit for 3m	
Frequency of emission (MHz)	microvolt/meter	dBuV/m
30-88	100	40
88-216	150	43.5
216-230	200	46
230-960	223	47
Above 960	500	54

FCC part 15, subpart B and ICES-003, Issue 7

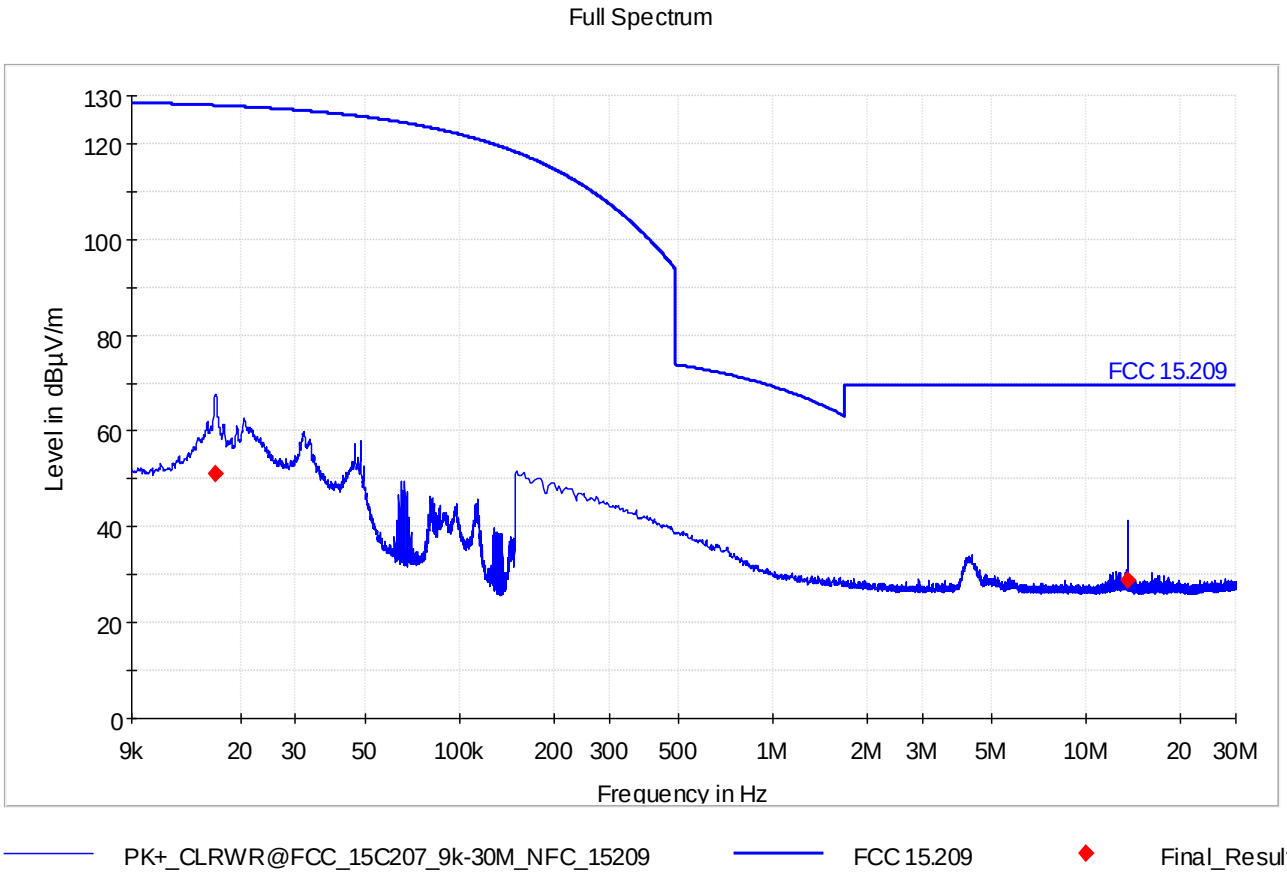
Frequency of emission	Average Limit for 3m		Peak Limit for 3m
MHz)	(microvolt/meter)	(dBuV/m)	(dBuV/m)
Above 1000	500	54	74
Frequencies above 1 GHz, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test, as per §15.35(b			

Tested sample(s): 3941ER011
Operation mode(s) tested: OM1
Test results: PASS
Note:

Test data:

Operation mode(s)	Configuration	Test Verdict
OM1	3941ER011 + 3941ER015 + 3941ER018 + G4CER047	PASS

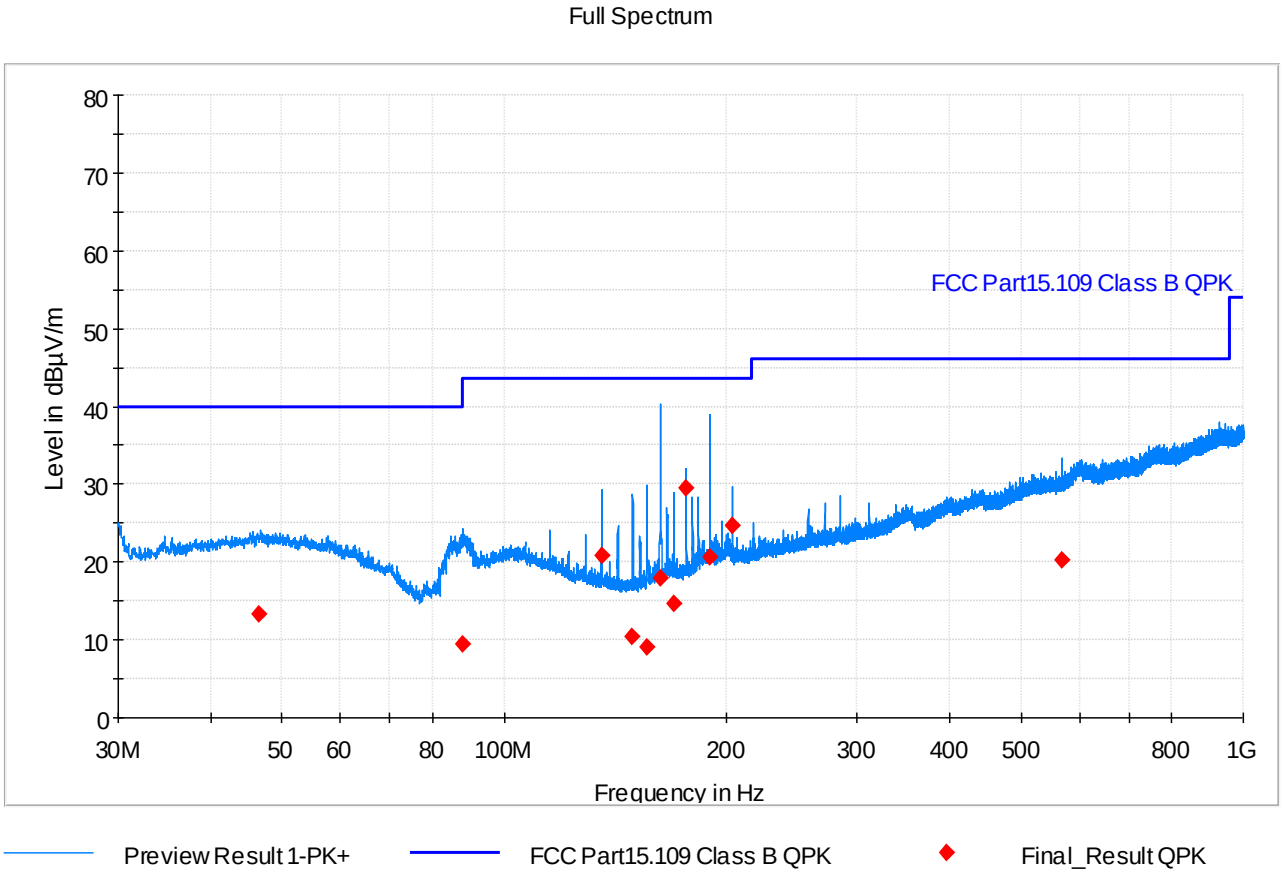
FCC part 15 subpart B & ICES-003, Graph and final result table for 9 kHz – 30 MHz, OM1:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
0.016650	51.21	127.95	76.74	15000.0	0.200	100.0	H	97.0	20.3	PASS
13.560000	28.97	69.50	40.53	15000.0	9.000	100.0	H	53.0	19.7	PASS

FCC part 15 subpart B & ICES-003, Graph and final result table for 30 MHz – 1 GHz, OM1:



Final_Result

Frequency (MHz)	QuasiPeak	Limit (dBµV/	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation	Corr. (dB/m	Comment
46.590000	13.39	40.00	26.61	15000.0	120.000	325.0	H	46.0	0.0	21.0	PASS
87.990000	9.46	40.00	30.54	15000.0	120.000	118.0	V	22.0	0.0	16.6	PASS
135.570000	20.79	43.50	22.71	15000.0	120.000	102.0	V	202.0	0.0	16.3	PASS
149.100000	10.40	43.50	33.10	15000.0	120.000	152.0	V	185.0	0.0	16.2	PASS
156.060000	9.13	43.50	34.37	15000.0	120.000	142.0	V	162.0	0.0	16.5	PASS
162.840000	17.88	43.50	25.62	15000.0	120.000	126.0	V	177.0	0.0	17.0	PASS
169.590000	14.60	43.50	28.90	15000.0	120.000	178.0	H	238.0	0.0	17.2	PASS
176.280000	29.42	43.50	14.08	15000.0	120.000	111.0	V	67.0	0.0	17.4	PASS
189.750000	20.68	43.50	22.82	15000.0	120.000	121.0	V	65.0	0.0	18.8	PASS
203.400000	24.76	43.50	18.74	15000.0	120.000	106.0	V	37.0	0.0	19.7	PASS
569.610000	20.31	46.00	25.69	15000.0	120.000	340.0	V	252.0	0.0	28.4	PASS

9. Test Equipment List

Radiated emission test equipment

New ID	Manufacturer	Equipment type	Description	Serial	Calibration information	Next calibration
G4C265	Rohde & Schwarz	ESW26	EMI test receiver	101324	26.7.2024	26.7.2025
G4C273	Frankonia	ALX-4000E	Broadband Antenna, 25MHz-4GHz with 6dB (50-A-MFN-06) att.	00816+1531	22.1.2024	22.1.2027
EQM22-M29-004034	Schwarzbeck	FMZB 1519B	Active Loop Antenna 9kHz-30MHz	00095	04/2022	04/2025

10.Photographs

EUT and test setup photos are in Annex1.