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:	Mobilaris Companion WiFi
Model No. :	Mobilaris Companion WiFi
Customer:	Epiroc Rock Drills AB
Address:	Sundsbacken 6, 97242 Luleå, Sweden
Summary:	IN COMPLIANCE
Date of Reception:	19.4.2023
Date(s) of Test(s):	16.5.2023 – 16.8.2023

Tested by (Test Engineer)

Pekka Pulkkinen

Approved by (Technical Manager)

Jukka Rauma

Contents

Document Version History	Date of issue	Comments	Approved by
v0.1	3.11.2023	Initial version	
v1.0	22.11.2023	Approved version	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: Epiroc Rock Drills AB
Andreas Karvonen
phone: +46 923-668 80, email: andreas.karvonen@epiroc.com
Sundsbacken , 97242 Luleå, Sweden

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: Personal WiFi tag with rechargeable battery, capable of scanning BLE beacons

Test samples:

Sample number	Serial number	Manufacturer	DUT Type	Model	HW version	SW version	Comments
3121ER015	00104	ElectroTech Kalix AB	Personal WiFi tag	Mobilaris Companion WiFi	466F	WIFI=3.1.0.26, BLE=5.50.00	

Accessories / Monitoring devices:

Sample number	Serial number	Manufacturer	DUT Type	Model	HW version	SW version	Comments
G4CER044	NA	Nokia	USB Charger	AC-60E	NA	NA	
G4CER045	NA	NA	USB-A to USB-C cable	NA	NA	NA	

3. Configuration and Operation Modes

Operation Mode	Description
OM1	EUT on. WLAN 802.11 in RX mode. Power Supply: Battery powered.
OM2	EUT ON. WLAN 802.11 in RX mode. Power supply: Charging mode, 120 VAC/60Hz (all radios are in idle mode when charging).

4. Test sample description

Model	Mobilaris Companion WiFi	
Additional model(s)		
Brand name	Companion WiFi	
FCC ID	2A93V-466F	
IC	29959-466F	
Class	Class B	
Radio module 1	Type	WiFi
	Model	CC3235S
	Manufacturer	Texas Instruments
	FCC-ID	2A93V-466F
	IC	29959-466F
Antenna	Type	Integrated antenna
Radio module 2	Type	Bluetooth
	Model	CC2652P
	Manufacturer	Texas Instruments
	FCC-ID	2A93V-466F
	IC	29959-466F
Antenna	Type	Integrated antenna
Manufacturer	ElectroTech Kalix AB	

	Port		**Cable**	
	Name and description	Shielded	Specified max length [m]	Attached during test
Ports	USB-C port (used for charging)	☒		☐
		☐		☐
		☐		☐
		☐		☐
		☐		☐
Supplementary information to the ports				

	Voltage and Frequency		Reference poles		
			L1	N	PE
Rated power supply	☐	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	5 VDC via AC/DC adapter, 3.7 V DC rechargeable internal Lithium Battery	
Clock frequencies	2483.5 (Radio frequency)	
Other parameters		
Dimensions in cm (W x H x D)	58 x 91 x 17 mm	
Weight	86 g	
Mounting position	☐	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☒	Hand-held equipment
	☐	Other:

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)

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

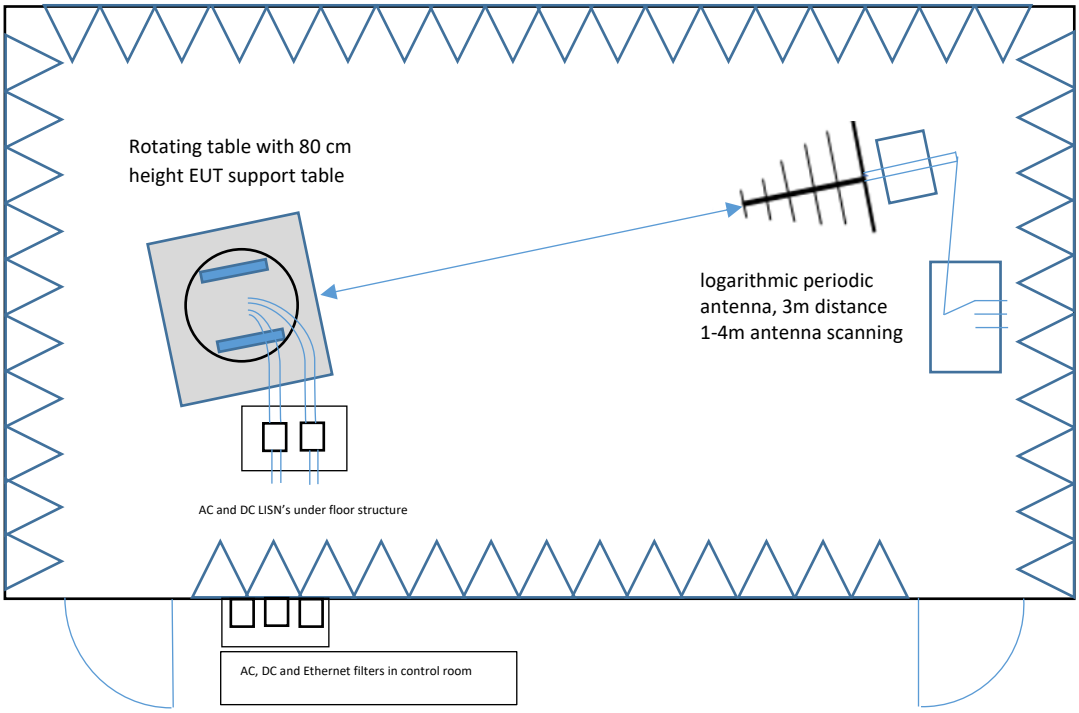
- linear polarized logarithmic periodic antenna for frequency range 30-1000 MHz
- and double-ridged horn antenna for the frequency range 1-18 GHz

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**.**

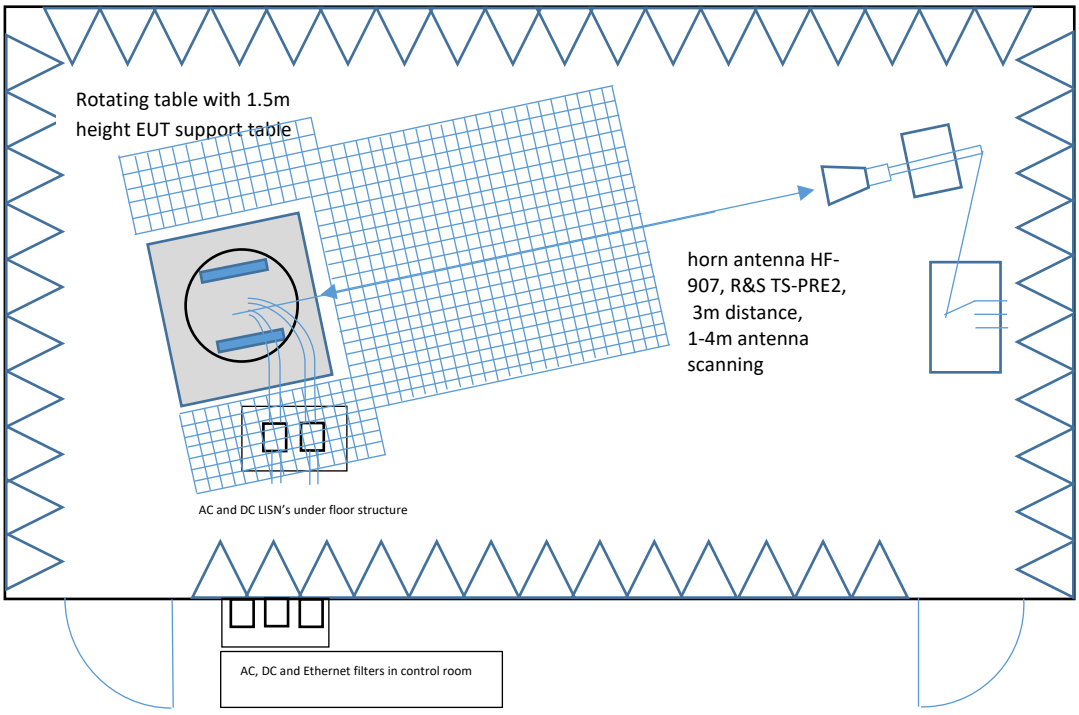
Measurement procedure

- 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
- for maximized values, final measurement was done with
    - quasi-peak detector for 30MHz to 1GHz frequency range
    - with Average detector for 1GHz to 18GHz frequency range

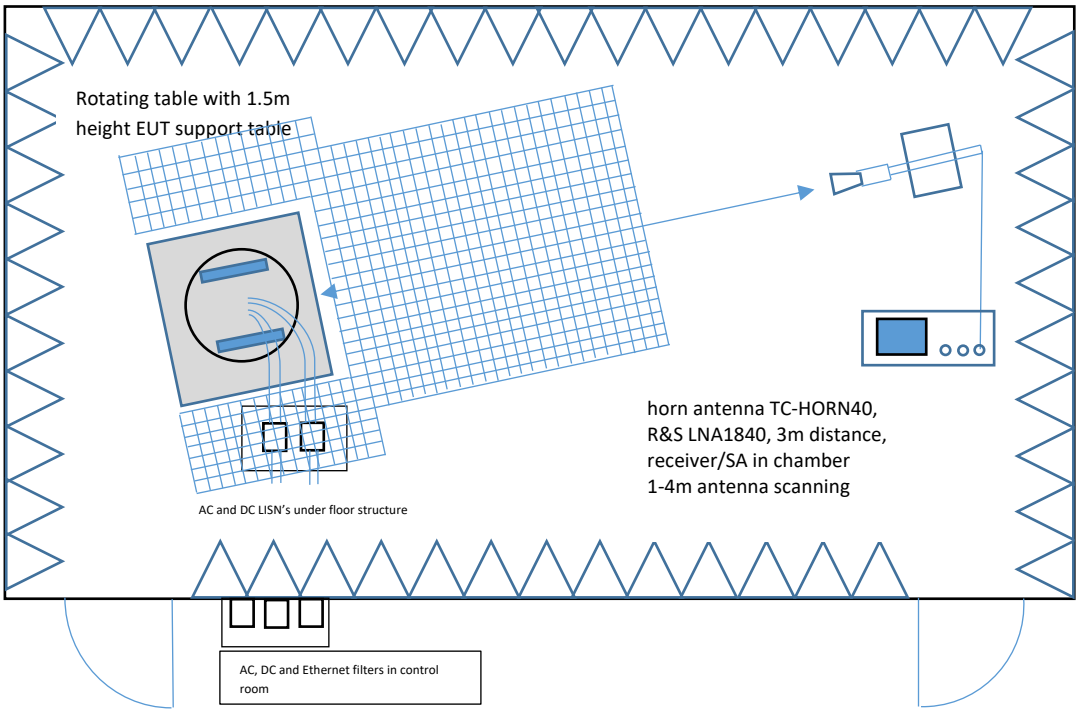
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



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



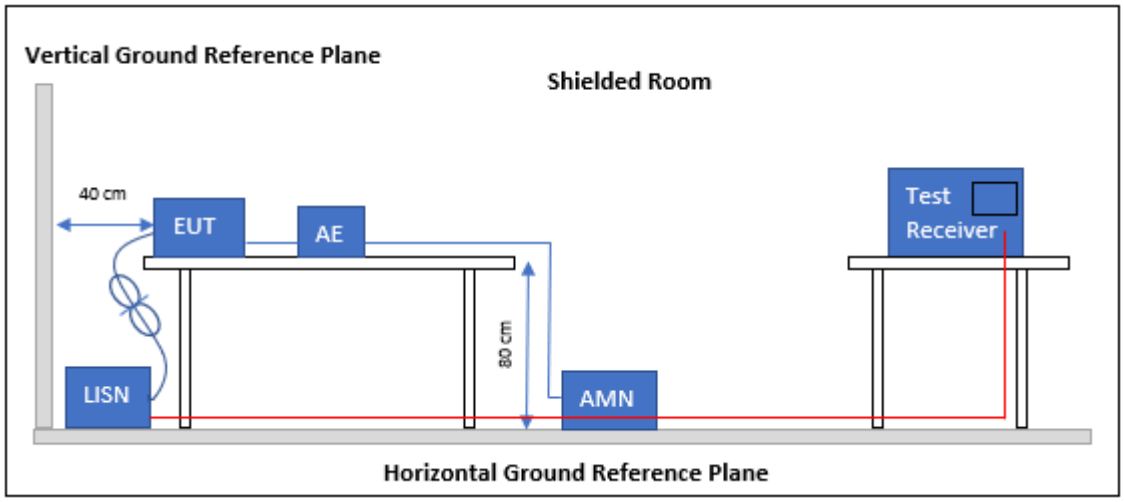
5.2. FCC subpart 15B and ICES-003, conducted emission test procedure

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. Electromagnetic field measure (30 MHz – 1000 MHz)	PASS	
FCC 15.109 ICES-003, 3.2.2	Radiated emission. Electromagnetic field measure (1 GHz – 12,75 GHz)	PASS	
FCC 15.109 ICES-003, 3.2.2	Radiated emission. Electromagnetic field measure (12,75 GHz – 18 GHz)	PASS	
FCC 15.107 ICES-003, 3.2.1	Continuous conducted emission (150 kHz – 30 MHz)	PASS	
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 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

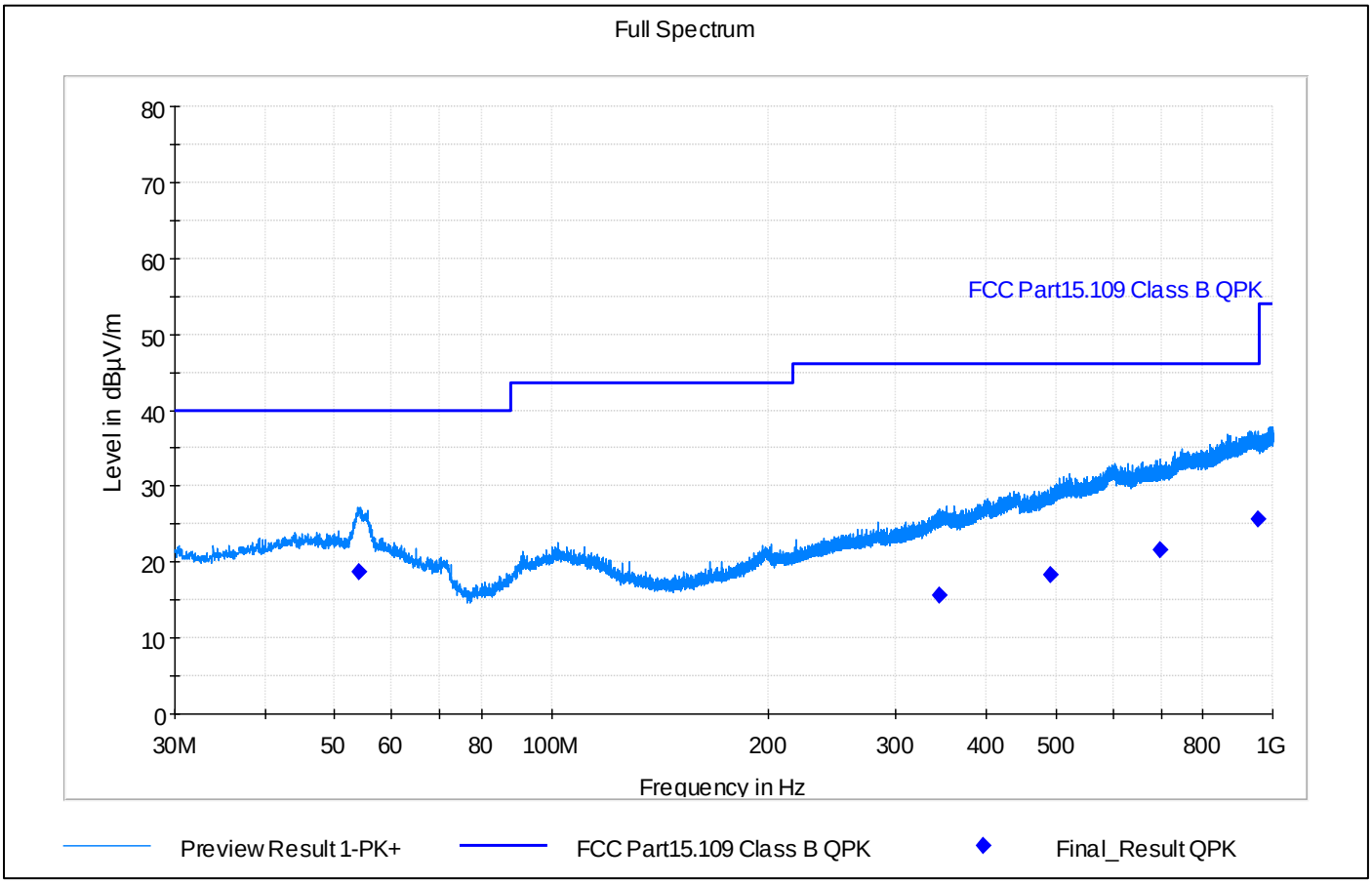
Frequency of emission MHz)	Average Limit for 3m		Peak Limit for 3m
	(microvolt/meter)	(dBuV/m)	(dBuV/m)
Above 1000	500	54	74
Frequencies above 1 GHz, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test, as per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

Tested sample(s): 321ER015
Operation mode(s) tested: OM1, OM2
Test results: PASS
Note:

Test data:

Operation mode(s)	Configuration	Test Verdict
OM1	Frequency Range: 30 MHz – 1GHz	PASS
OM1	Frequency Range: 1 – 18 GHz	PASS
OM2	Frequency Range: 30 MHz – 1GHz	PASS
OM2	Frequency Range: 1 – 18 GHz	PASS

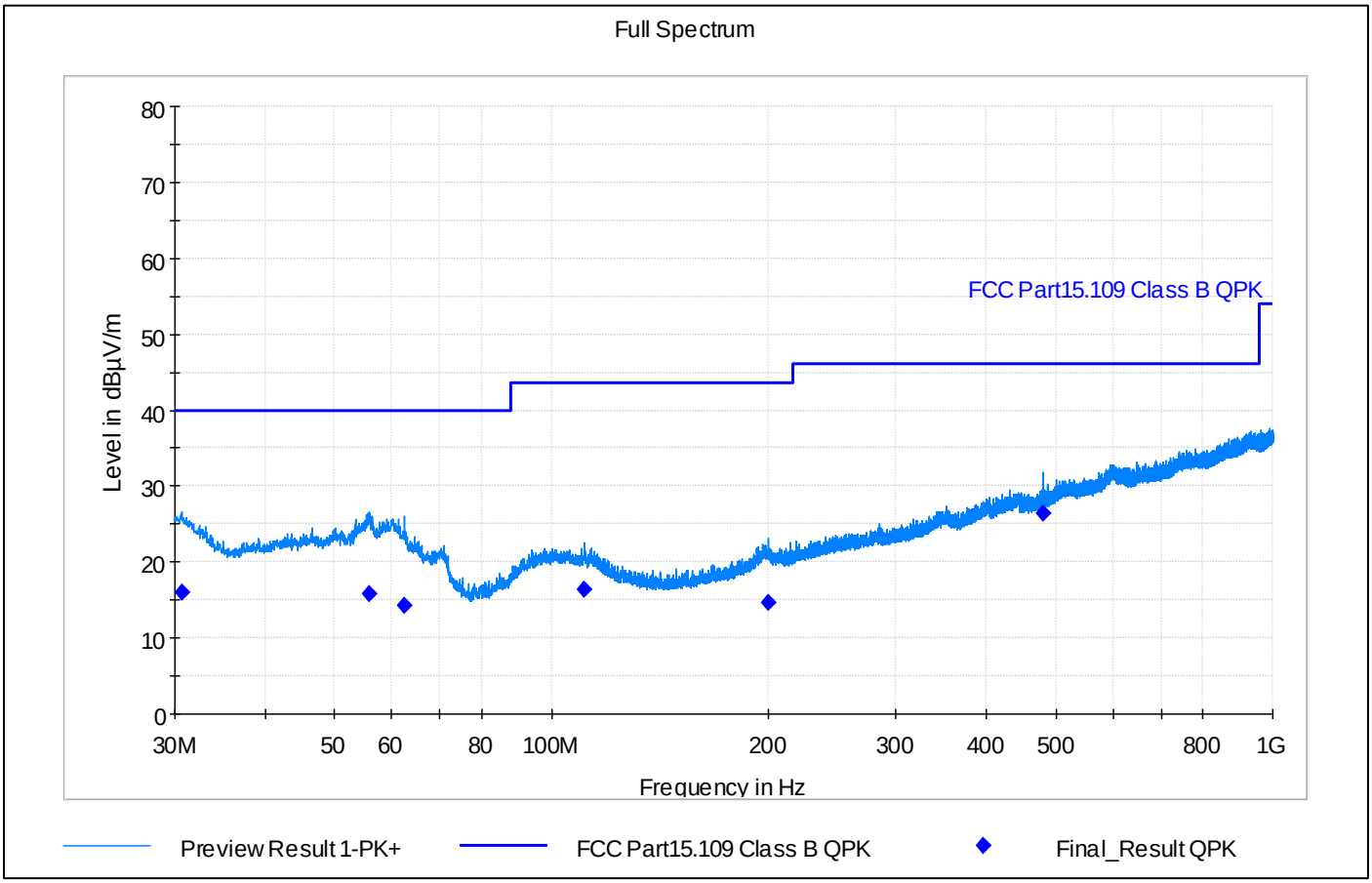
FCC part 15, subpart B Graph and final result table for 30 MHz – 1 GHz, OM1:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
54.090000	18.66	40.00	21.34	15000.0	120.000	115.0	V	257.0	0.0	20.9	PASS
345.420000	15.64	46.00	30.36	15000.0	120.000	158.0	H	103.0	0.0	24.2	PASS
491.820000	18.36	46.00	27.64	15000.0	120.000	331.0	V	292.0	0.0	27.0	PASS
697.200000	21.63	46.00	24.37	15000.0	120.000	396.0	H	37.0	0.0	30.5	PASS
953.460000	25.69	46.00	20.31	15000.0	120.000	188.0	H	163.0	0.0	34.0	PASS

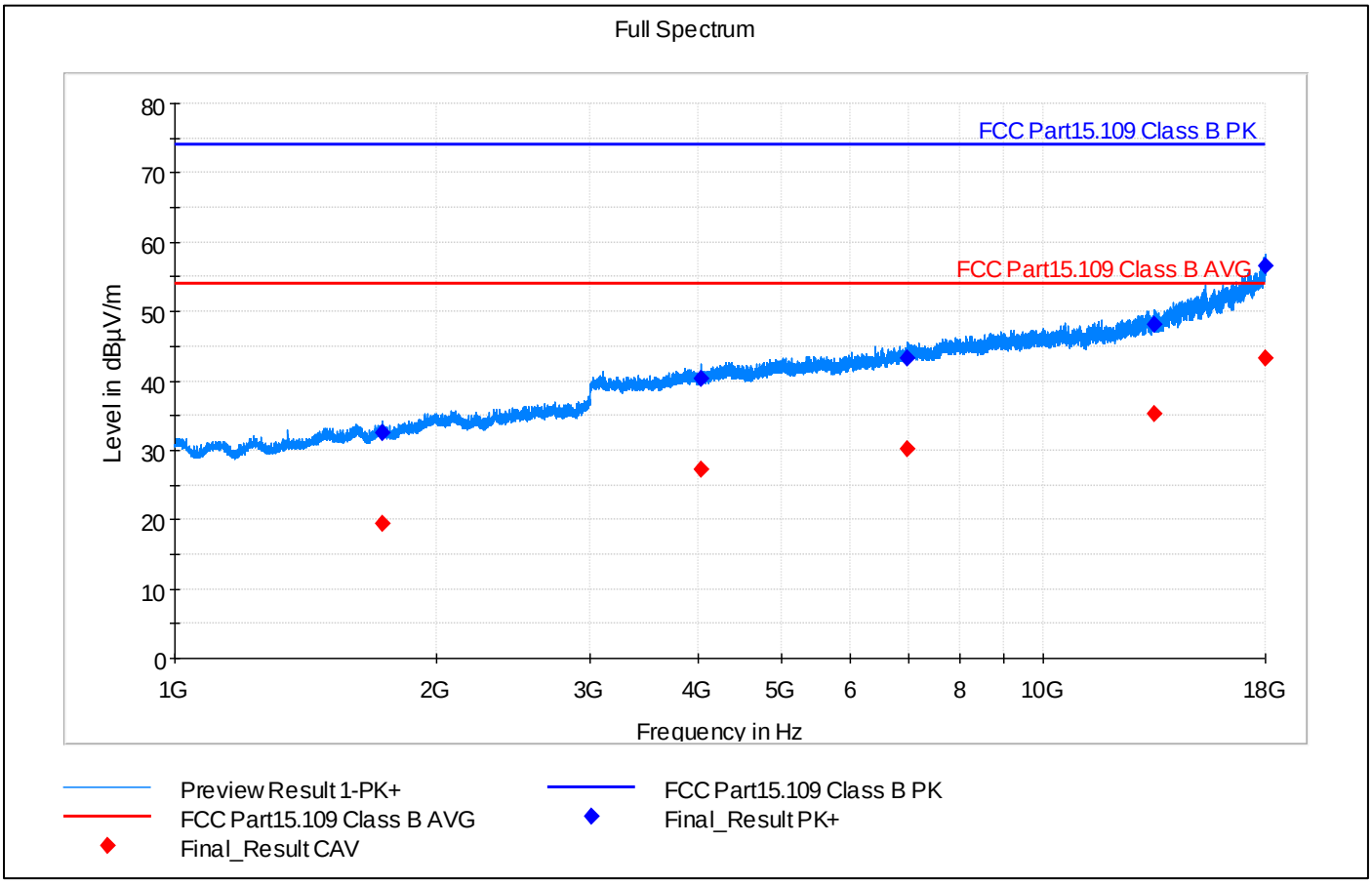
FCC part 15, subpart B Graph and final result table for 30 MHz – 1 GHz, OM2:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
30.660000	16.01	40.00	23.99	15000.0	120.000	120.0	V	157.0	0.0	17.1	PASS
55.950000	15.89	40.00	24.11	15000.0	120.000	109.0	V	333.0	0.0	20.6	PASS
62.520000	14.26	40.00	25.74	15000.0	120.000	141.0	V	241.0	0.0	19.4	PASS
110.790000	16.39	43.50	27.11	15000.0	120.000	198.0	V	152.0	0.0	19.1	PASS
199.980000	14.62	43.50	28.88	15000.0	120.000	108.0	V	171.0	0.0	20.3	PASS
480.000000	26.40	46.00	19.60	15000.0	120.000	100.0	H	139.0	0.0	26.7	PASS

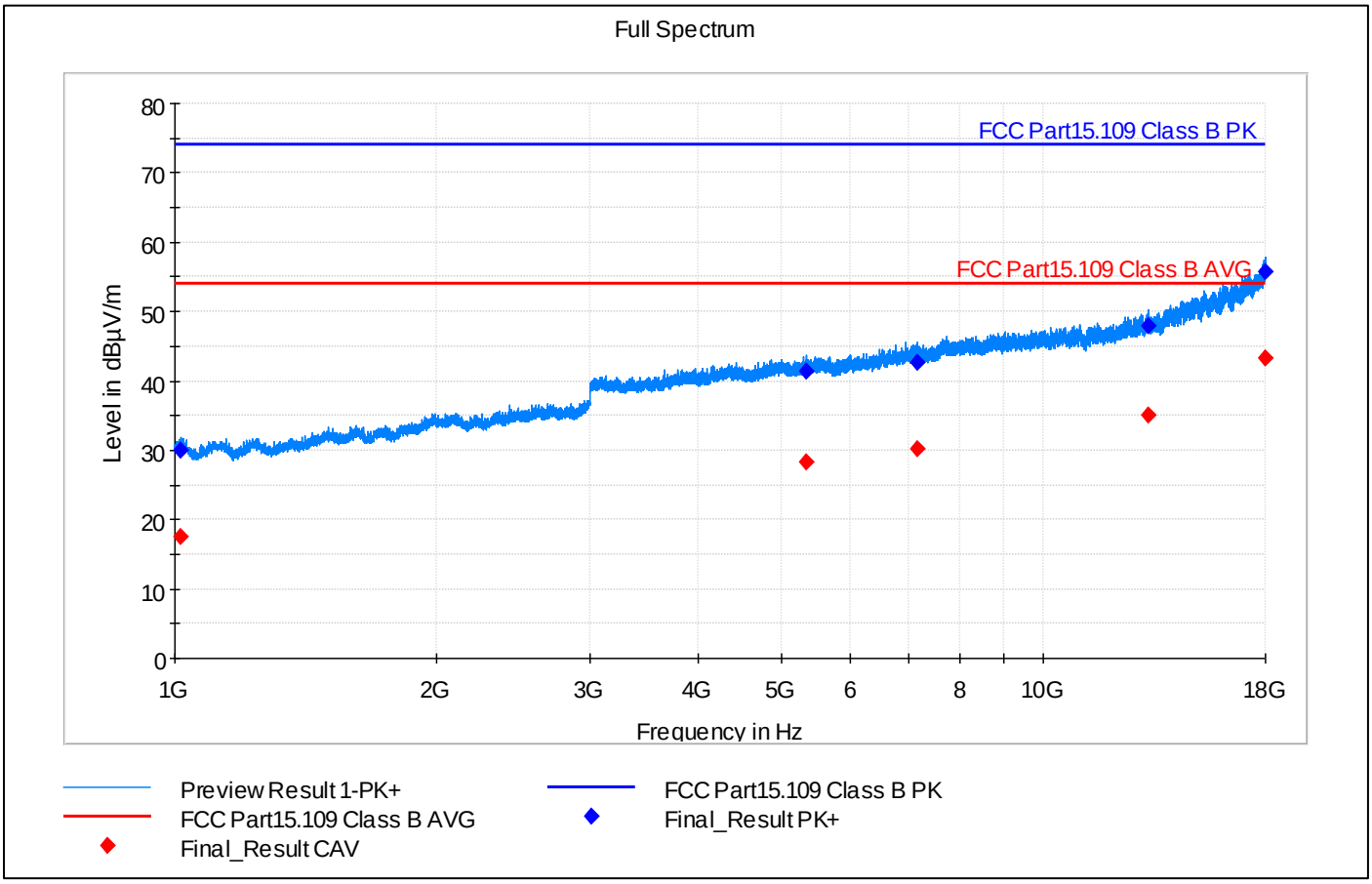
FCC part 15 subpart B, Graph and final result table for 1 GHz – 18 GHz, OM1:



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1735.500000	32.50	---	74.00	41.50	500.0	1000.000	146.0	H	221.0	-4.5	PASS
1735.500000	---	19.38	54.00	34.62	500.0	1000.000	146.0	H	221.0	-4.5	PASS
4040.250000	40.30	---	74.00	33.70	500.0	1000.000	153.0	V	39.0	8.1	PASS
4040.250000	---	27.20	54.00	26.80	500.0	1000.000	153.0	V	39.0	8.1	PASS
6961.750000	43.22	---	74.00	30.78	500.0	1000.000	117.0	V	316.0	14.4	PASS
6961.750000	---	30.27	54.00	23.73	500.0	1000.000	117.0	V	316.0	14.4	PASS
13417.500000	---	35.31	54.00	18.69	500.0	1000.000	180.0	H	112.0	25.5	PASS
13417.500000	48.18	---	74.00	25.82	500.0	1000.000	180.0	H	112.0	25.5	PASS
17986.000000	56.67	---	74.00	17.33	500.0	1000.000	389.0	H	335.0	38.7	PASS
17986.000000	---	43.32	54.00	10.68	500.0	1000.000	389.0	H	335.0	38.7	PASS

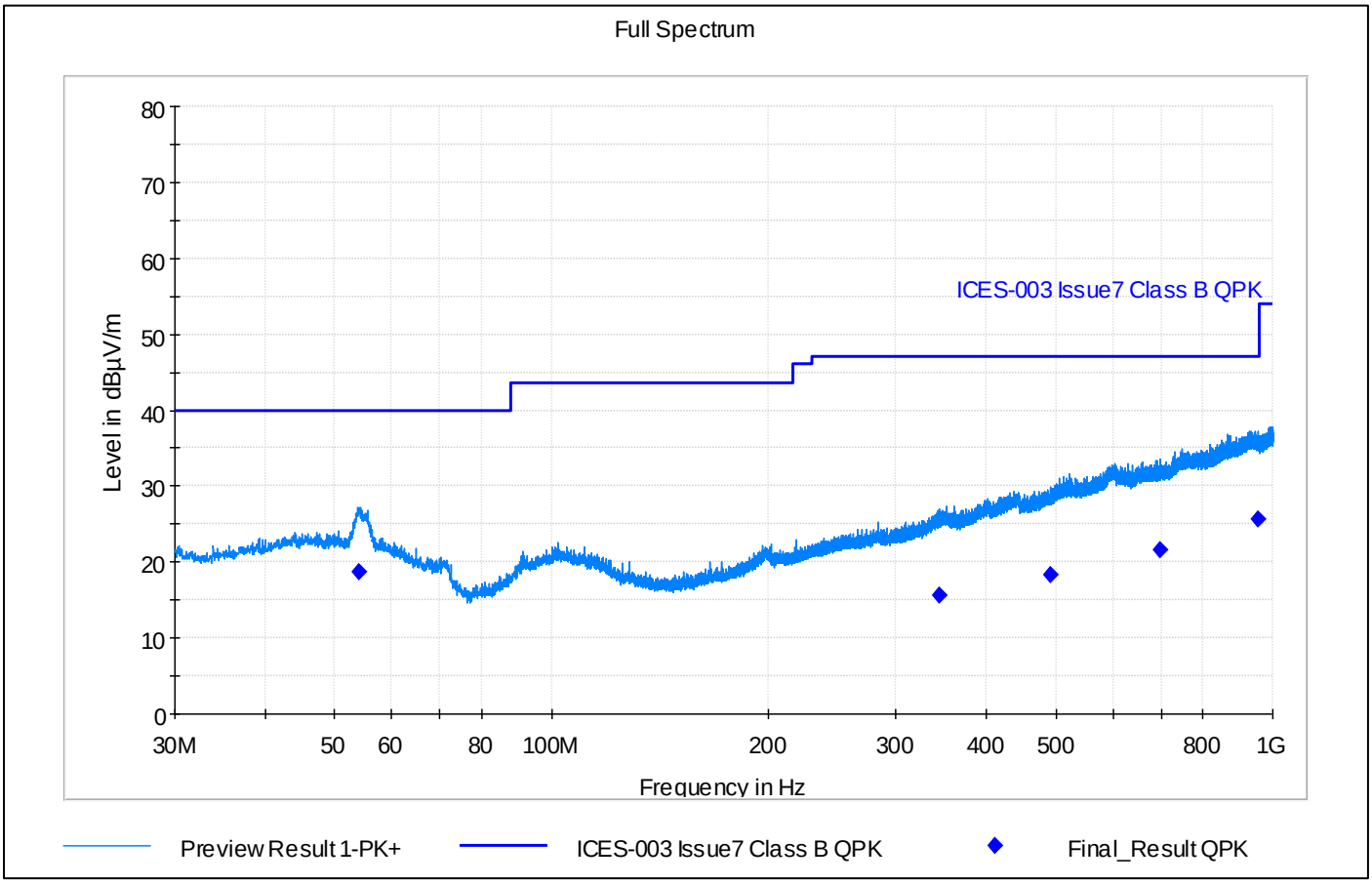
FCC part 15 subpart B, Graph and final result table for 1 GHz – 18 GHz, OM2:



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1017.500000	---	17.49	54.00	36.51	500.0	1000.000	98.0	H	200.0	-8.2	PASS
1017.500000	30.02	---	74.00	43.98	500.0	1000.000	98.0	H	200.0	-8.2	PASS
5336.250000	41.38	---	74.00	32.62	500.0	1000.000	265.0	H	-4.0	10.5	PASS
5336.250000	---	28.22	54.00	25.78	500.0	1000.000	265.0	H	-4.0	10.5	PASS
7164.250000	---	30.15	54.00	23.85	500.0	1000.000	184.0	H	221.0	14.8	PASS
7164.250000	42.55	---	74.00	31.45	500.0	1000.000	184.0	H	221.0	14.8	PASS
13200.500000	47.82	---	74.00	26.18	500.0	1000.000	391.0	H	15.0	25.5	PASS
13200.500000	---	35.13	54.00	18.87	500.0	1000.000	391.0	H	15.0	25.5	PASS
17968.250000	55.80	---	74.00	18.20	500.0	1000.000	400.0	H	275.0	38.6	PASS
17968.250000	---	43.24	54.00	10.76	500.0	1000.000	400.0	H	275.0	38.6	PASS

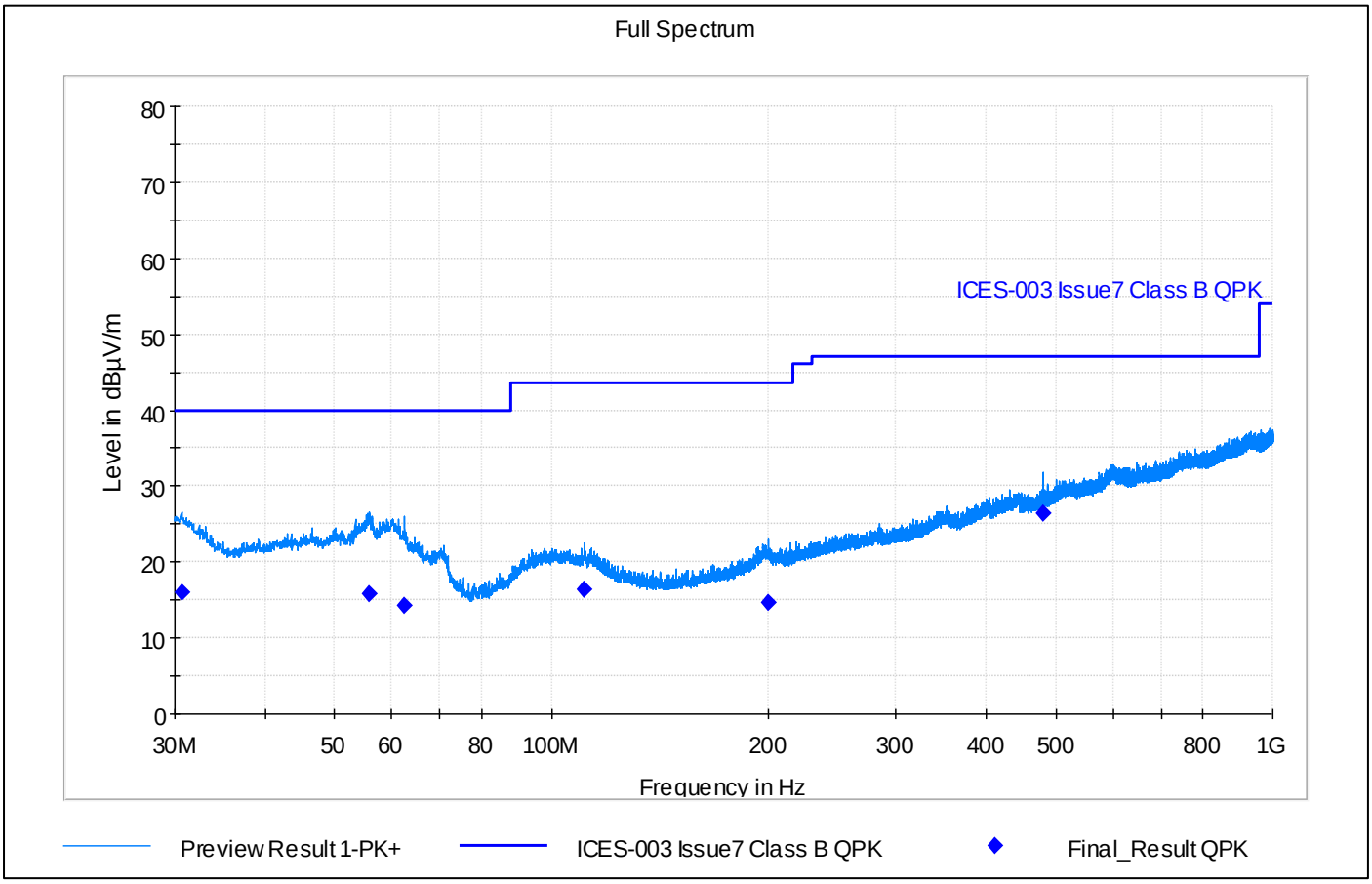
ICES-003, Graph and final result table for 30 MHz – 1 GHz, OM1:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
54.090000	18.66	40.00	21.34	15000.0	120.000	115.0	V	257.0	0.0	20.9	PASS
345.420000	15.64	47.00	31.36	15000.0	120.000	158.0	H	103.0	0.0	24.2	PASS
491.820000	18.36	47.00	28.64	15000.0	120.000	331.0	V	292.0	0.0	27.0	PASS
697.200000	21.63	47.00	25.37	15000.0	120.000	396.0	H	37.0	0.0	30.5	PASS
953.460000	25.69	47.00	21.31	15000.0	120.000	188.0	H	163.0	0.0	34.0	PASS

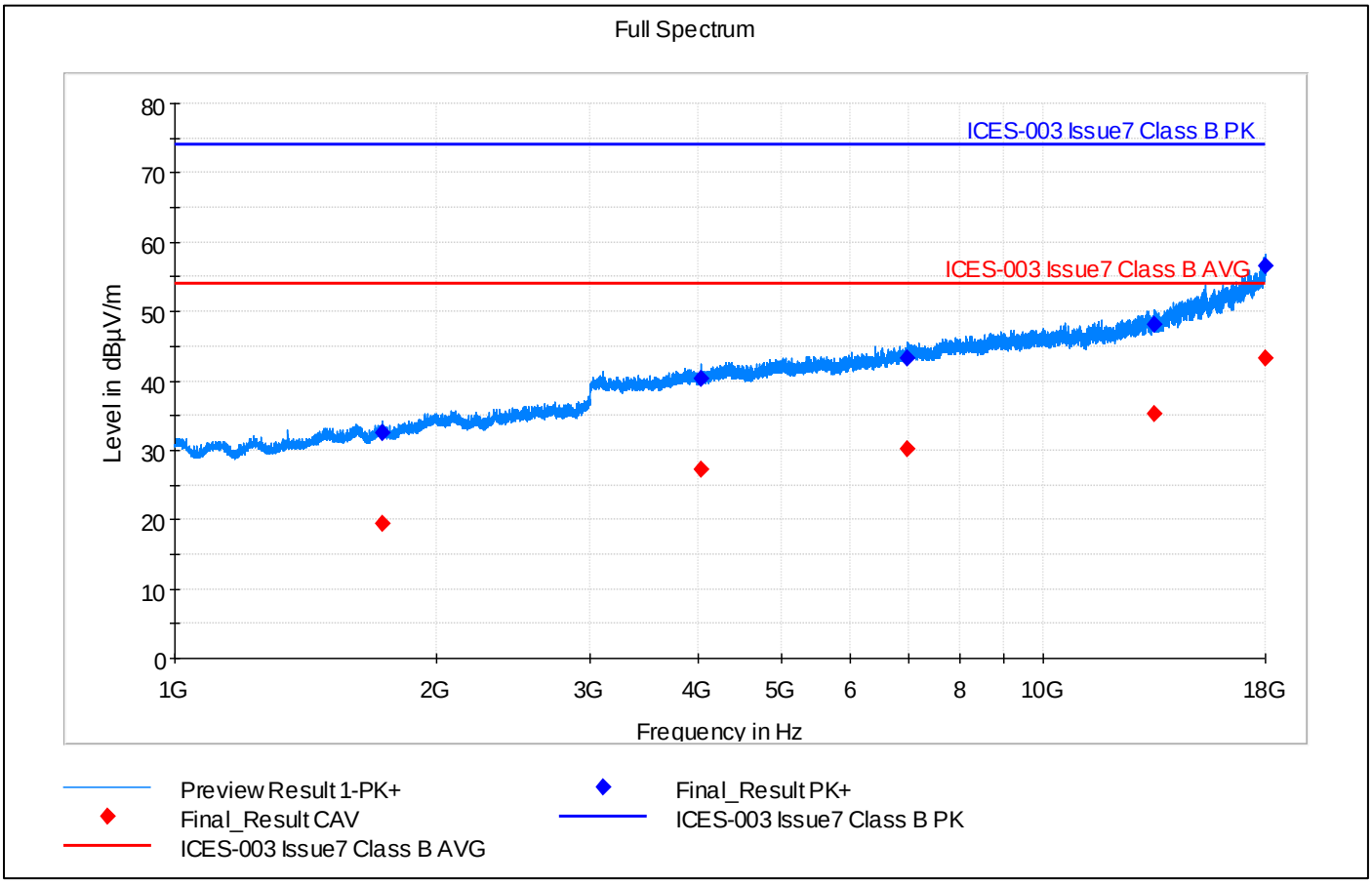
ICES-003, Graph and final result table for 30 MHz – 1 GHz, OM2:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
30.660000	16.01	40.00	23.99	15000.0	120.000	120.0	V	157.0	0.0	17.1	PASS
55.950000	15.89	40.00	24.11	15000.0	120.000	109.0	V	333.0	0.0	20.6	PASS
62.520000	14.26	40.00	25.74	15000.0	120.000	141.0	V	241.0	0.0	19.4	PASS
110.790000	16.39	43.50	27.11	15000.0	120.000	198.0	V	152.0	0.0	19.1	PASS
199.980000	14.62	43.50	28.88	15000.0	120.000	108.0	V	171.0	0.0	20.3	PASS
480.000000	26.40	47.00	20.60	15000.0	120.000	100.0	H	139.0	0.0	26.7	PASS

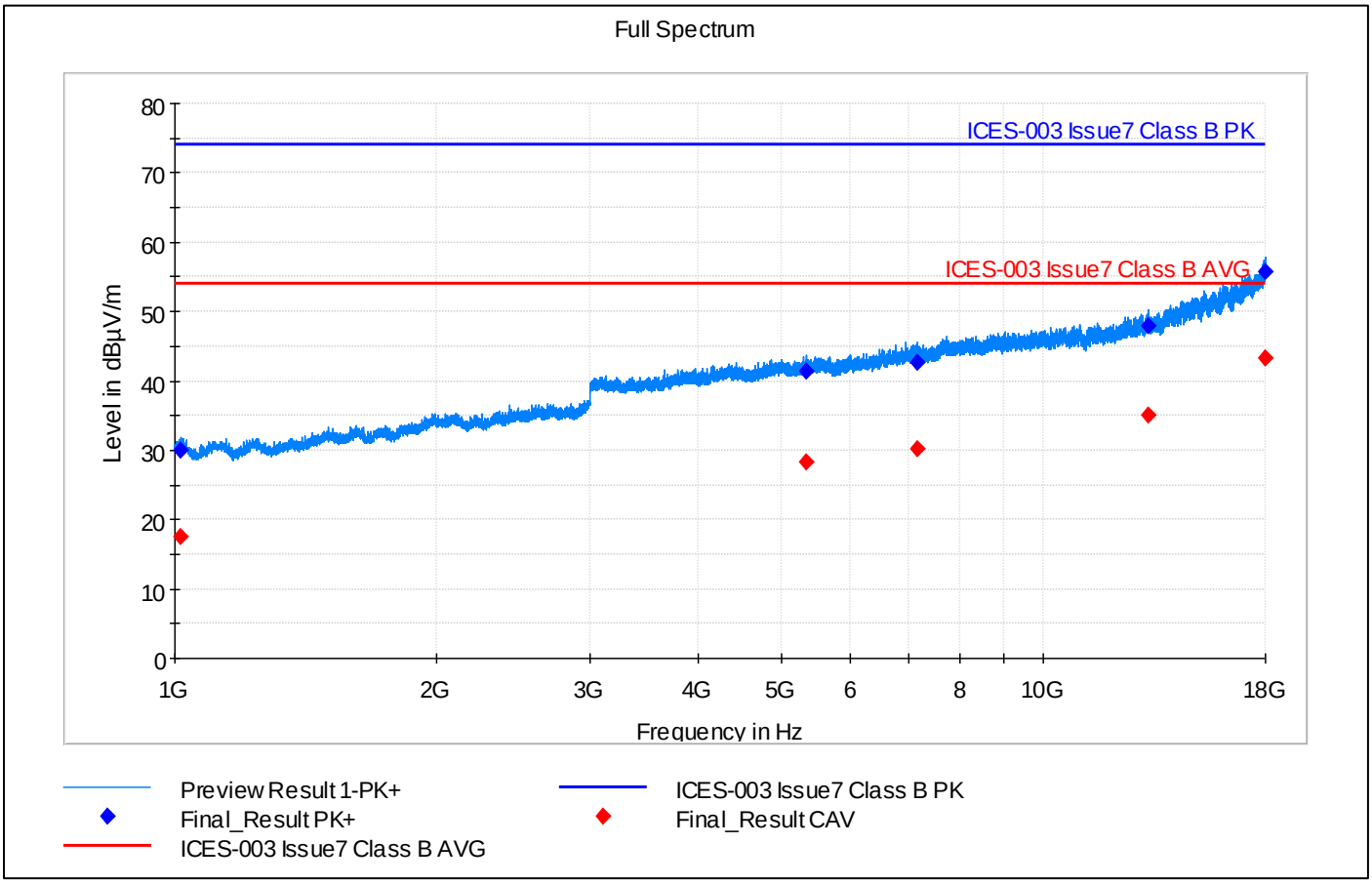
ICES-003, Graph and final result table for 1 GHz – 18 GHz, OM1:



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1735.500000	---	19.38	54.00	34.62	500.0	1000.000	146.0	H	221.0	-4.5	PASS
1735.500000	32.50	---	74.00	41.50	500.0	1000.000	146.0	H	221.0	-4.5	PASS
4040.250000	---	27.20	54.00	26.80	500.0	1000.000	153.0	V	39.0	8.1	PASS
4040.250000	40.30	---	74.00	33.70	500.0	1000.000	153.0	V	39.0	8.1	PASS
6961.750000	---	30.27	54.00	23.73	500.0	1000.000	117.0	V	316.0	14.4	PASS
6961.750000	43.22	---	74.00	30.78	500.0	1000.000	117.0	V	316.0	14.4	PASS
13417.500000	48.18	---	74.00	25.82	500.0	1000.000	180.0	H	112.0	25.5	PASS
13417.500000	---	35.31	54.00	18.69	500.0	1000.000	180.0	H	112.0	25.5	PASS
17986.000000	---	43.32	54.00	10.68	500.0	1000.000	389.0	H	335.0	38.7	PASS
17986.000000	56.67	---	74.00	17.33	500.0	1000.000	389.0	H	335.0	38.7	PASS

ICES-003, Graph and final result table for 1 GHz – 18 GHz, OM2:



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1017.500000	30.02	---	74.00	43.98	500.0	1000.000	98.0	H	200.0	-8.2	PASS
1017.500000	---	17.49	54.00	36.51	500.0	1000.000	98.0	H	200.0	-8.2	PASS
5336.250000	---	28.22	54.00	25.78	500.0	1000.000	265.0	H	-4.0	10.5	PASS
5336.250000	41.38	---	74.00	32.62	500.0	1000.000	265.0	H	-4.0	10.5	PASS
7164.250000	42.55	---	74.00	31.45	500.0	1000.000	184.0	H	221.0	14.8	PASS
7164.250000	---	30.15	54.00	23.85	500.0	1000.000	184.0	H	221.0	14.8	PASS
13200.500000	---	35.13	54.00	18.87	500.0	1000.000	391.0	H	15.0	25.5	PASS
13200.500000	47.82	---	74.00	26.18	500.0	1000.000	391.0	H	15.0	25.5	PASS
17968.250000	---	43.24	54.00	10.76	500.0	1000.000	400.0	H	275.0	38.6	PASS
17968.250000	55.80	---	74.00	18.20	500.0	1000.000	400.0	H	275.0	38.6	PASS

9. Conducted Emissions, AC mains power port

Reference: FCC 15.107, ICES-003, 3.2.1
Test method: ANSI C63.4:2014+A1:2017 Section 12

The applied limit for continuous conducted emission in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B, Secs. 15.107 & ICES-003 Issue 7

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

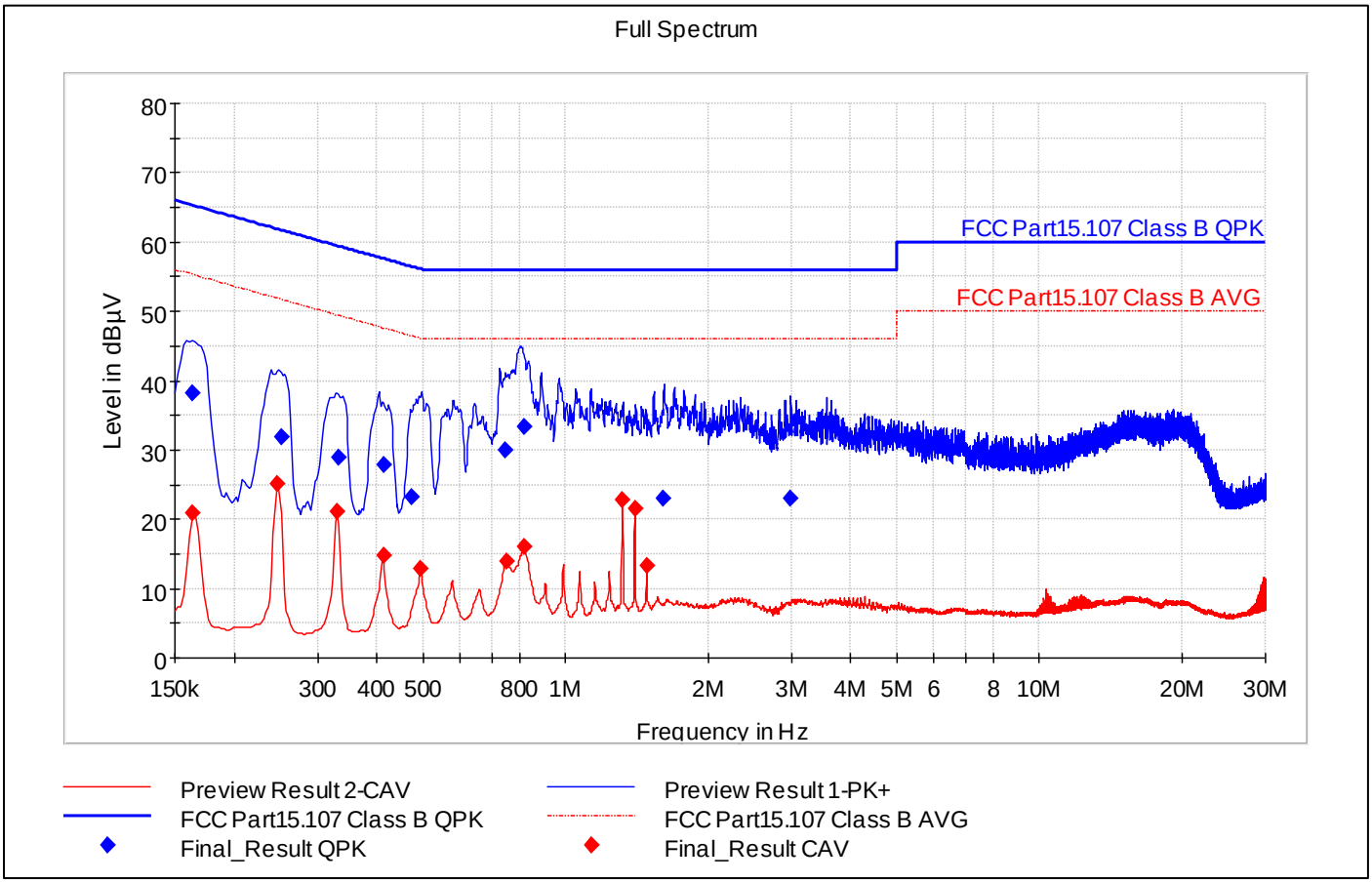
Limits:	Class B (dBuV)	
Frequency	Quasi peak limit	Average limit
0.15 – 0.50 MHz	66 to 56	56 to 46
0.50 – 5 MHz	56	46
5 – 30 MHz	60	50

Tested sample(s): 3121ER015
Operation mode(s) tested: OM2
Test results: PASS
Note:

Test data:

Operation mode(s)	Configuration	Test Verdict
OM2	Neutral wire noise.	PASS
OM2	Phase wire noise.	PASS

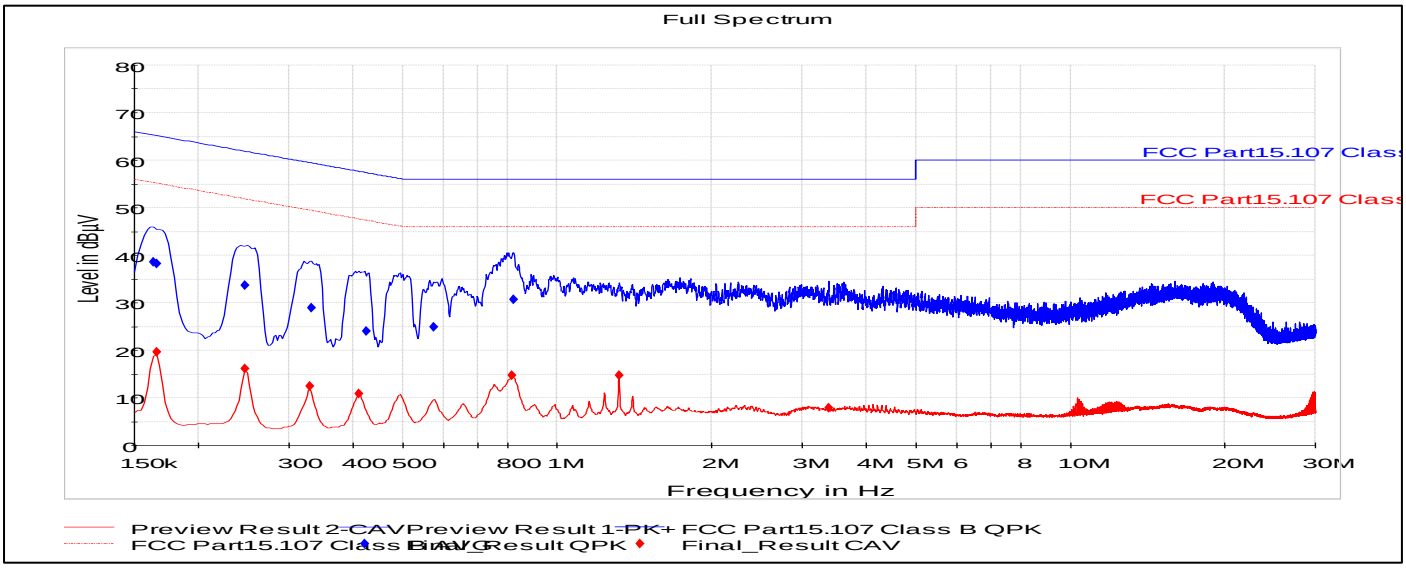
FCC part 15, subpart B, Graph and final result for frequency range 150kHz-30MHz, Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.163500	---	20.99	55.28	34.30	15000.0	9.000	N	ON	9.8	PASS
0.163500	38.28	---	65.28	27.00	15000.0	9.000	N	ON	9.8	PASS
0.246750	---	25.22	51.87	26.65	15000.0	9.000	N	ON	9.8	PASS
0.251250	31.98	---	61.72	29.74	15000.0	9.000	N	ON	9.8	PASS
0.330000	---	21.19	49.45	28.26	15000.0	9.000	N	ON	9.8	PASS
0.332250	28.85	---	59.39	30.55	15000.0	9.000	N	ON	9.8	PASS
0.413250	---	14.76	47.58	32.83	15000.0	9.000	N	ON	9.8	PASS
0.415500	27.80	---	57.54	29.74	15000.0	9.000	N	ON	9.8	PASS
0.474000	23.25	---	56.44	33.19	15000.0	9.000	N	ON	9.9	PASS
0.494250	---	12.89	46.10	33.20	15000.0	9.000	N	ON	9.9	PASS
0.748500	30.07	---	56.00	25.93	15000.0	9.000	N	ON	9.9	PASS
0.753000	---	13.92	46.00	32.08	15000.0	9.000	N	ON	9.9	PASS
0.818250	---	16.03	46.00	29.97	15000.0	9.000	N	ON	9.9	PASS
0.820500	33.30	---	56.00	22.70	15000.0	9.000	N	ON	9.9	PASS
1.320000	---	22.76	46.00	23.24	15000.0	9.000	N	ON	9.8	PASS
1.401000	---	21.47	46.00	24.53	15000.0	9.000	N	ON	9.8	PASS
1.484250	---	13.24	46.00	32.76	15000.0	9.000	N	ON	9.8	PASS
1.603500	22.97	---	56.00	33.03	15000.0	9.000	N	ON	9.8	PASS
2.976000	22.94	---	56.00	33.06	15000.0	9.000	N	ON	9.8	PASS

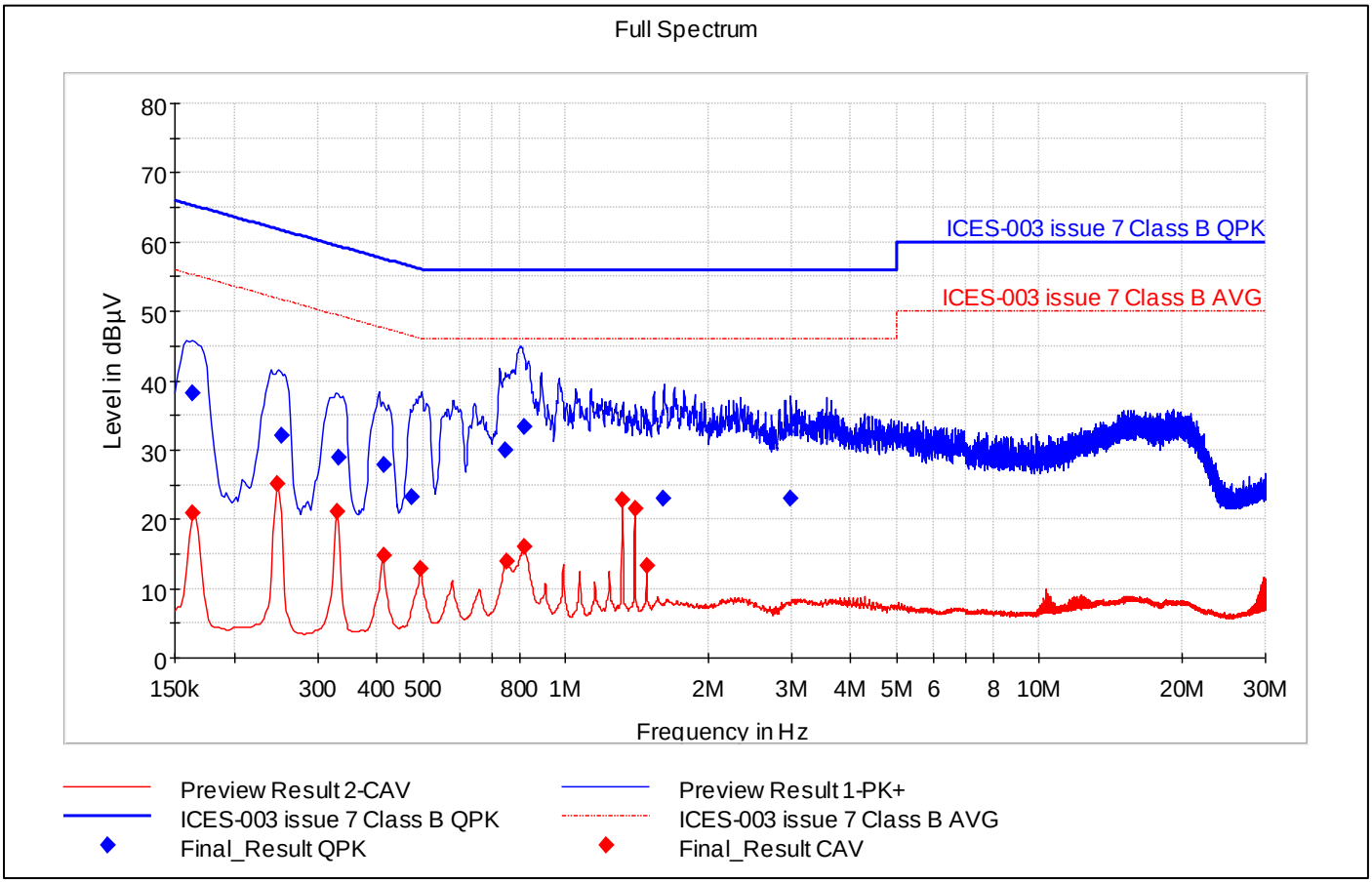
FCC part 15, subpart B, Graph and final result for frequency range 150kHz-30MHz, Phase



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.163500	38.54	---	65.28	26.74	15000.0	9.000	L1	ON	9.8	PASS
0.165750	---	19.60	55.17	35.57	15000.0	9.000	L1	ON	9.8	PASS
0.165750	38.33	---	65.17	26.84	15000.0	9.000	L1	ON	9.8	PASS
0.246750	---	16.15	51.87	35.72	15000.0	9.000	L1	ON	9.8	PASS
0.246750	33.70	---	61.87	28.17	15000.0	9.000	L1	ON	9.8	PASS
0.330000	---	12.46	49.45	36.99	15000.0	9.000	L1	ON	9.8	PASS
0.332250	29.00	---	59.39	30.39	15000.0	9.000	L1	ON	9.8	PASS
0.411000	---	10.94	47.63	36.69	15000.0	9.000	L1	ON	9.9	PASS
0.424500	24.00	---	57.36	33.36	15000.0	9.000	L1	ON	9.9	PASS
0.575250	24.89	---	56.00	31.11	15000.0	9.000	L1	ON	9.9	PASS
0.816000	---	14.79	46.00	31.21	15000.0	9.000	L1	ON	9.9	PASS
0.822750	30.69	---	56.00	25.31	15000.0	9.000	L1	ON	9.9	PASS
1.320000	---	14.79	46.00	31.21	15000.0	9.000	L1	ON	9.8	PASS
3.381000	---	7.81	46.00	38.19	15000.0	9.000	L1	ON	9.9	PASS

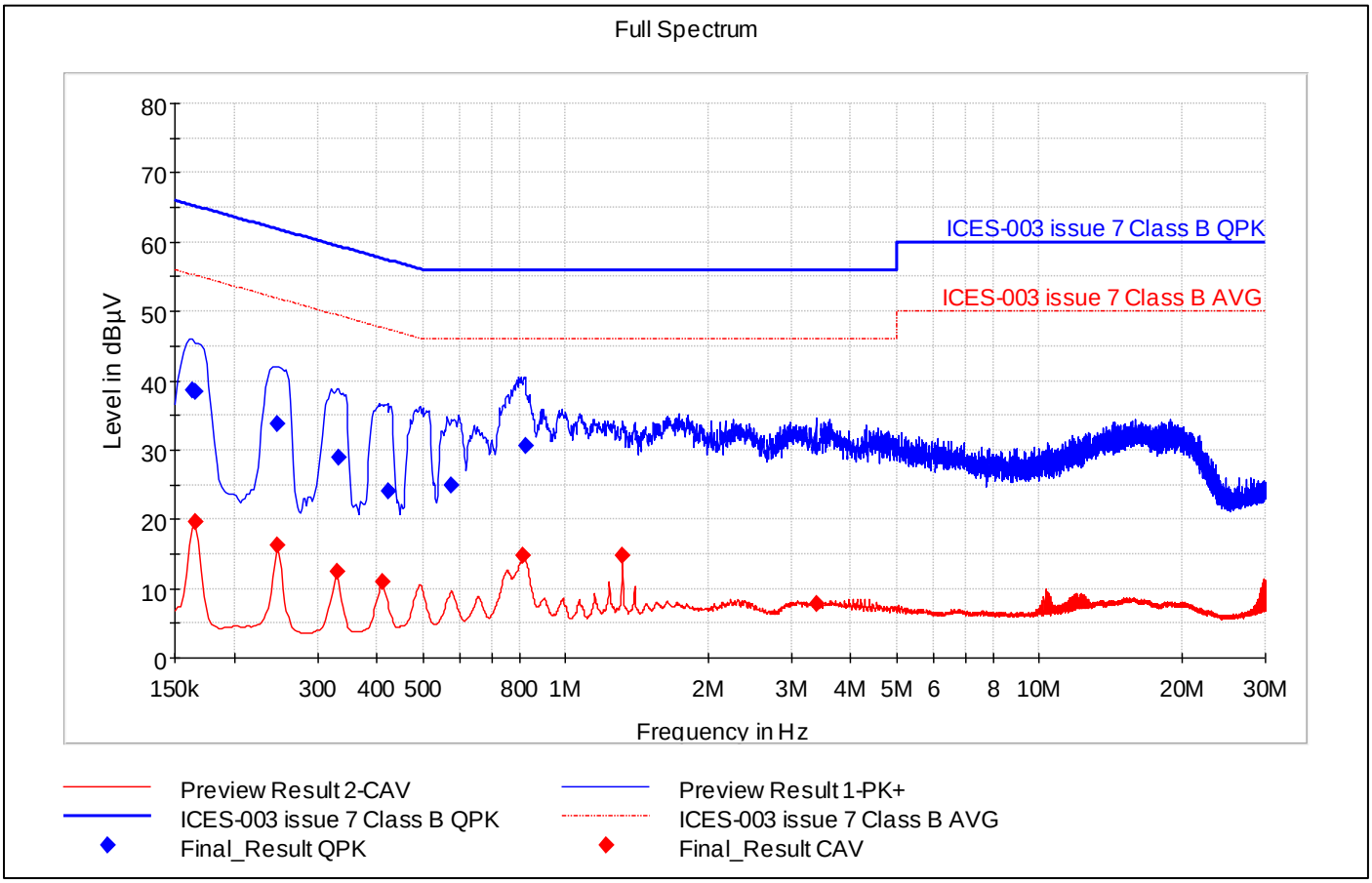
ICES-003, Graph and final result for frequency range 150kHz-30MHz, Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.163500	38.28	---	65.28	27.00	15000.0	9.000	N	ON	9.8	PASS
0.163500	---	20.99	55.28	34.30	15000.0	9.000	N	ON	9.8	PASS
0.246750	---	25.22	51.87	26.65	15000.0	9.000	N	ON	9.8	PASS
0.251250	31.98	---	61.72	29.74	15000.0	9.000	N	ON	9.8	PASS
0.330000	---	21.19	49.45	28.26	15000.0	9.000	N	ON	9.8	PASS
0.332250	28.85	---	59.39	30.55	15000.0	9.000	N	ON	9.8	PASS
0.413250	---	14.76	47.58	32.83	15000.0	9.000	N	ON	9.8	PASS
0.415500	27.80	---	57.54	29.74	15000.0	9.000	N	ON	9.8	PASS
0.474000	23.25	---	56.44	33.19	15000.0	9.000	N	ON	9.9	PASS
0.494250	---	12.89	46.10	33.20	15000.0	9.000	N	ON	9.9	PASS
0.748500	30.07	---	56.00	25.93	15000.0	9.000	N	ON	9.9	PASS
0.753000	---	13.92	46.00	32.08	15000.0	9.000	N	ON	9.9	PASS
0.818250	---	16.03	46.00	29.97	15000.0	9.000	N	ON	9.9	PASS
0.820500	33.30	---	56.00	22.70	15000.0	9.000	N	ON	9.9	PASS
1.320000	---	22.76	46.00	23.24	15000.0	9.000	N	ON	9.8	PASS
1.401000	---	21.47	46.00	24.53	15000.0	9.000	N	ON	9.8	PASS
1.484250	---	13.24	46.00	32.76	15000.0	9.000	N	ON	9.8	PASS
1.603500	22.97	---	56.00	33.03	15000.0	9.000	N	ON	9.8	PASS
2.976000	22.94	---	56.00	33.06	15000.0	9.000	N	ON	9.8	PASS

ICES-003, Graph and final result for frequency range 150kHz-30MHz, Phase



Final_Result

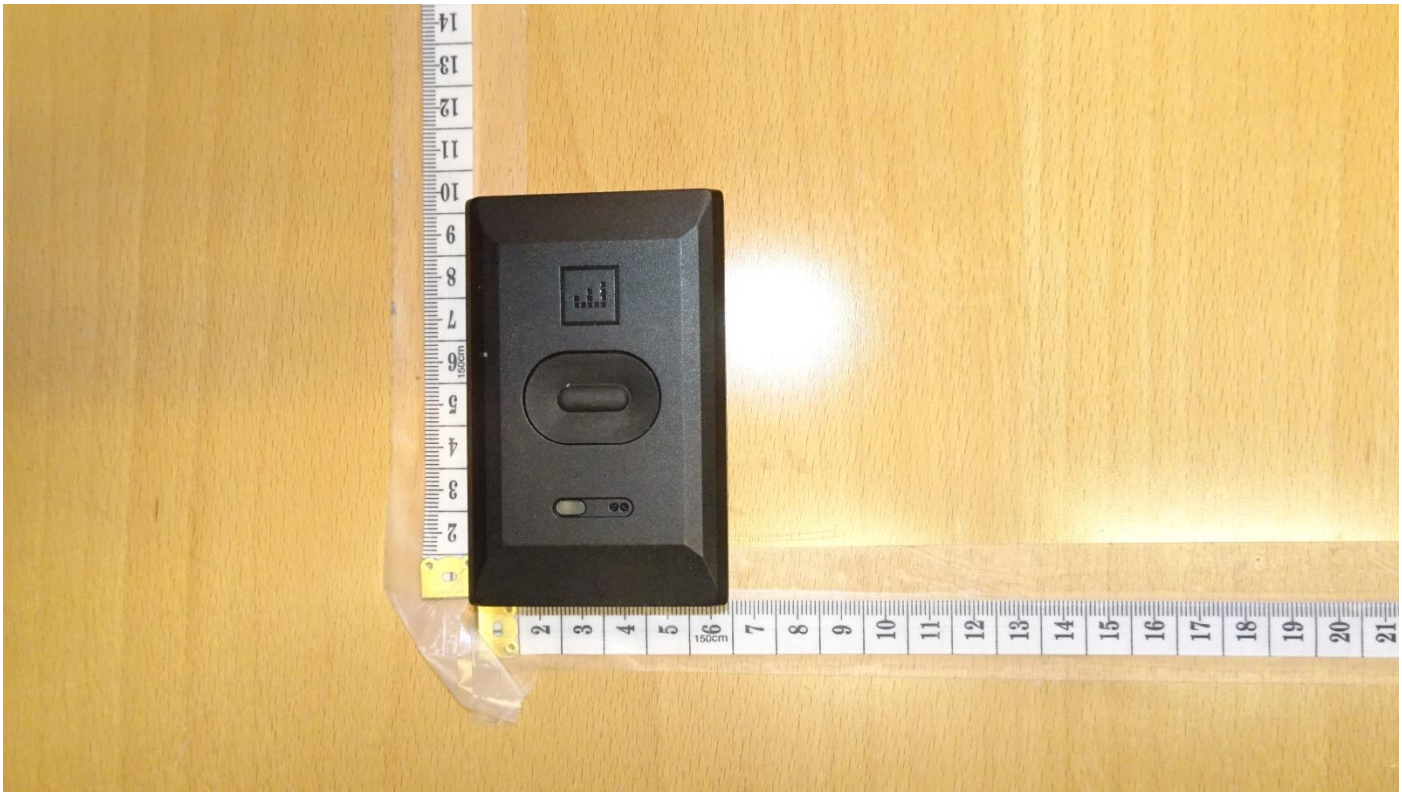
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.163500	38.54	---	65.28	26.74	15000.0	9.000	L1	ON	9.8	PASS
0.165750	38.33	---	65.17	26.84	15000.0	9.000	L1	ON	9.8	PASS
0.165750	---	19.60	55.17	35.57	15000.0	9.000	L1	ON	9.8	PASS
0.246750	33.70	---	61.87	28.17	15000.0	9.000	L1	ON	9.8	PASS
0.246750	---	16.15	51.87	35.72	15000.0	9.000	L1	ON	9.8	PASS
0.330000	---	12.46	49.45	36.99	15000.0	9.000	L1	ON	9.8	PASS
0.332250	29.00	---	59.39	30.39	15000.0	9.000	L1	ON	9.8	PASS
0.411000	---	10.94	47.63	36.69	15000.0	9.000	L1	ON	9.9	PASS
0.424500	24.00	---	57.36	33.36	15000.0	9.000	L1	ON	9.9	PASS
0.575250	24.89	---	56.00	31.11	15000.0	9.000	L1	ON	9.9	PASS
0.816000	---	14.79	46.00	31.21	15000.0	9.000	L1	ON	9.9	PASS
0.822750	30.69	---	56.00	25.31	15000.0	9.000	L1	ON	9.9	PASS
1.320000	---	14.79	46.00	31.21	15000.0	9.000	L1	ON	9.8	PASS
3.381000	---	7.81	46.00	38.19	15000.0	9.000	L1	ON	9.9	PASS

10.Test Equipment List

Radiated and conducted emission test equipment

New ID	Manufacturer	Equipment type	Description	Serial	Calibration information	Next calibration
G4C217	Rohde & Schwarz	HF907	Double-Ridged Waveguide Horn Antenna 800MHz-18GHz	100164	4.11.2020	4.11.2023
G4C265	Rohde & Schwarz	ESW26	EMI test receiver	101324	29.6.2023	29.6.2024
G4C273	Frankonia	ALX-4000E	Broadband Antenna, 25MHz-4GHz with 6dB (50-A-MFN-06) att.	00816+1531	11.11.2020	11.11.2023
G4C298	Rohde & Schwarz	CMW500	Wideband radio communication tester	170980	29.6.2023	29.6.2024
G4C503	Rohde & Schwarz	ESIB26	EMI Test Receiver 20Hz... 26.5GHz	100263	9.7.2021	9.7.2023
G4C515	Rohde & Schwarz	ENV216	Two-line V-Network LISN	101472	15.5.2023	15.5.2024

Appendix A: DUT Photographs

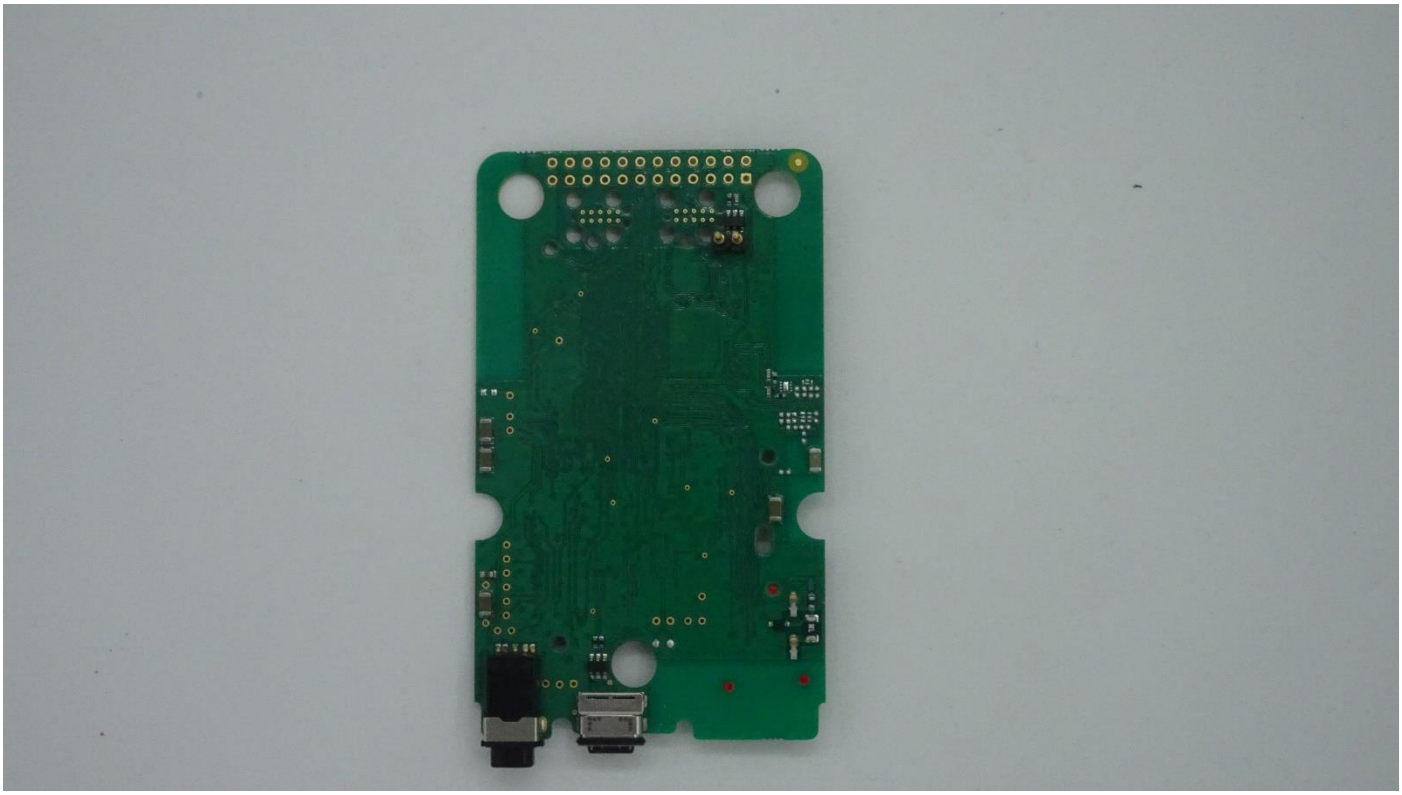


Picture 1 External pictures, top side

Picture 2 External pictures, bottom side

Picture 3 External pictures, ports

Picture 4 Internal pictures, PCB top

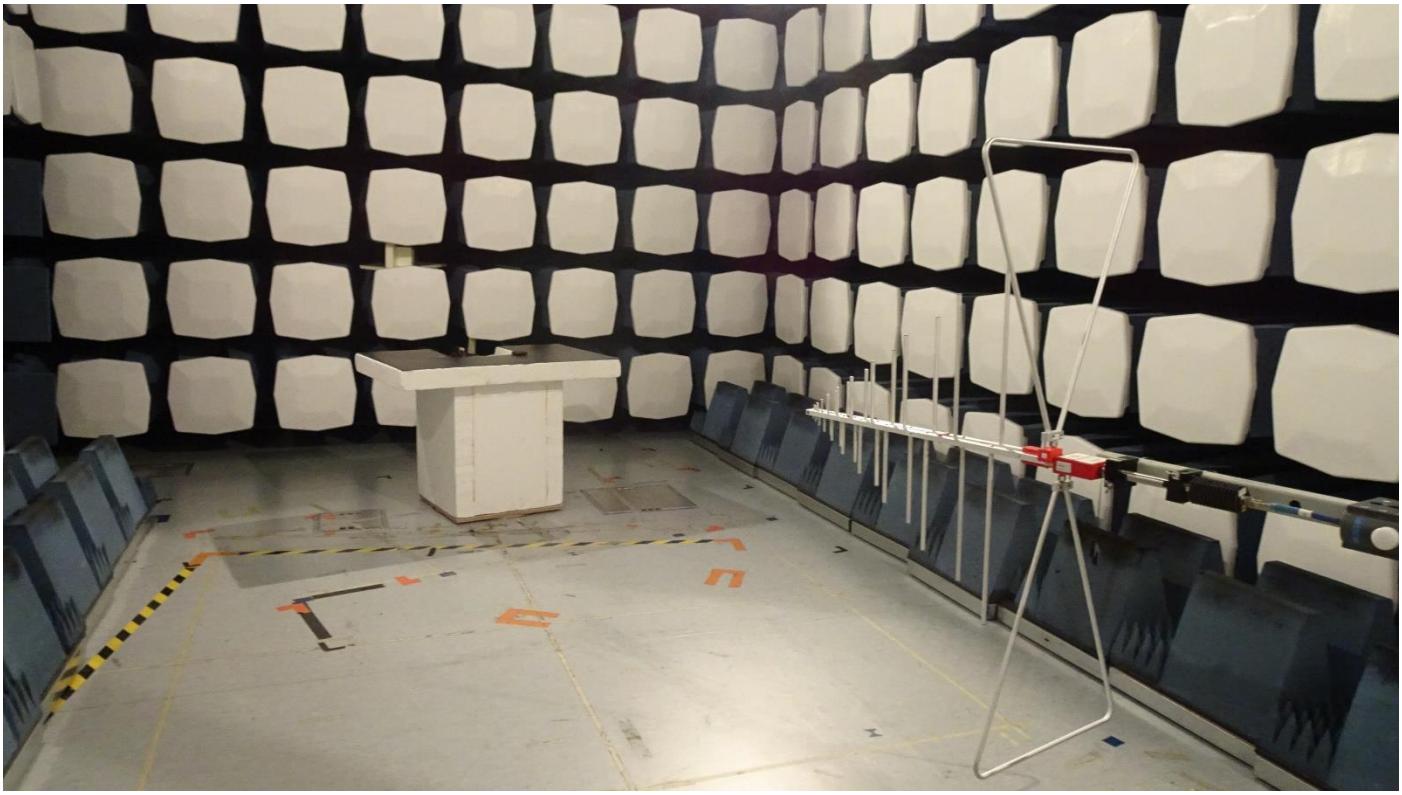


Picture 5 Internal pictures, PCB bottom

Picture 6 Internal pictures, Battery cover

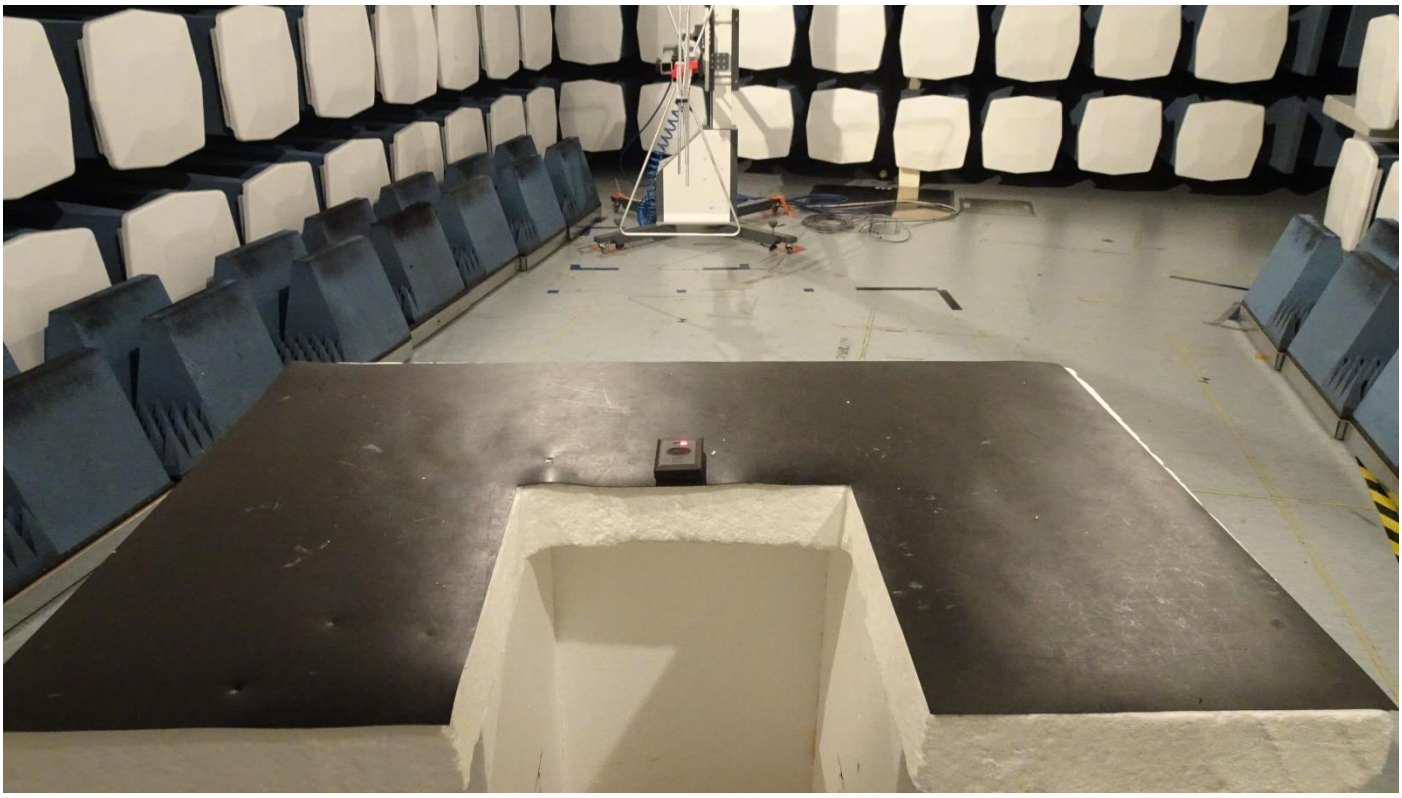
Picture 7 Internal pictures, Top cover

Appendix B: Test Setup Photographs

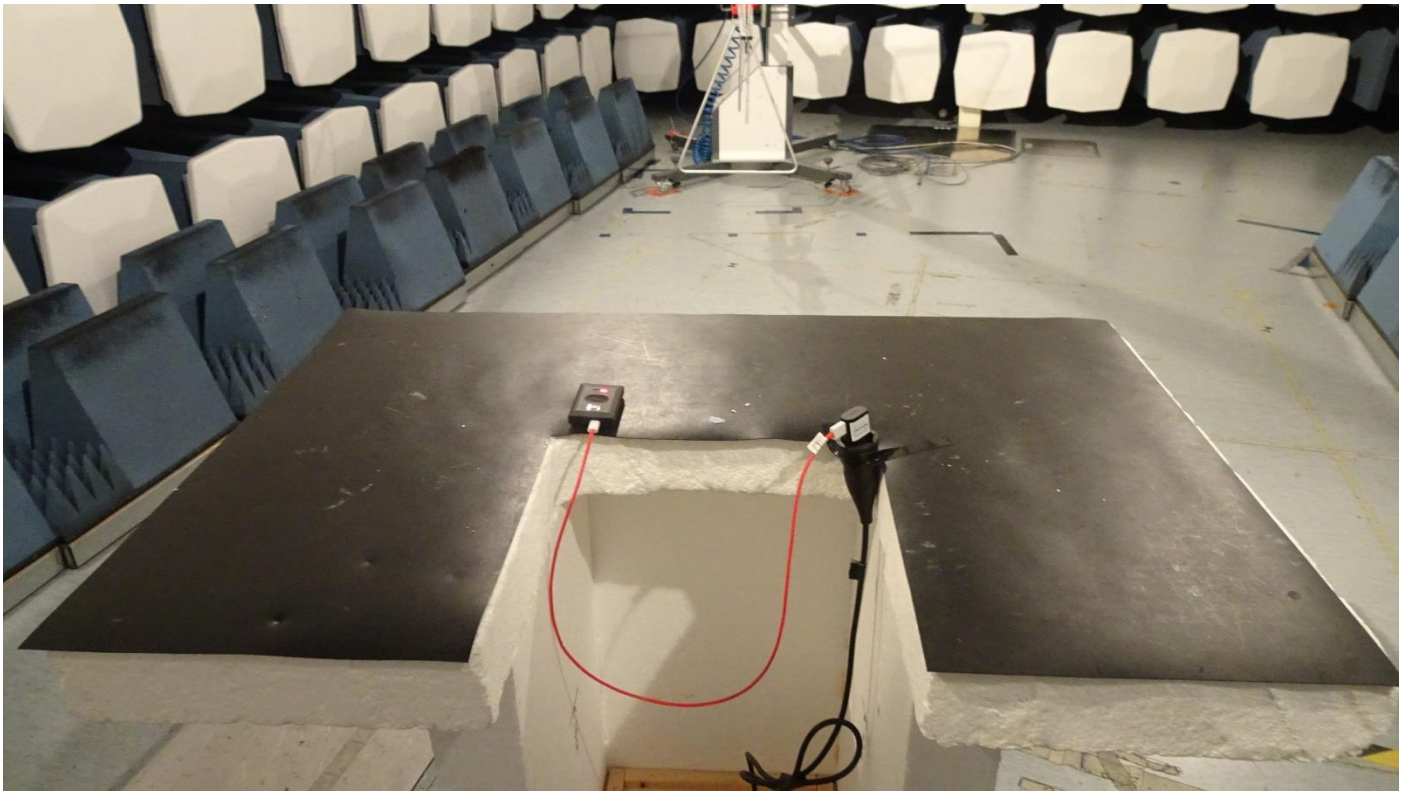


Picture 8 Radiated emission pictures, all

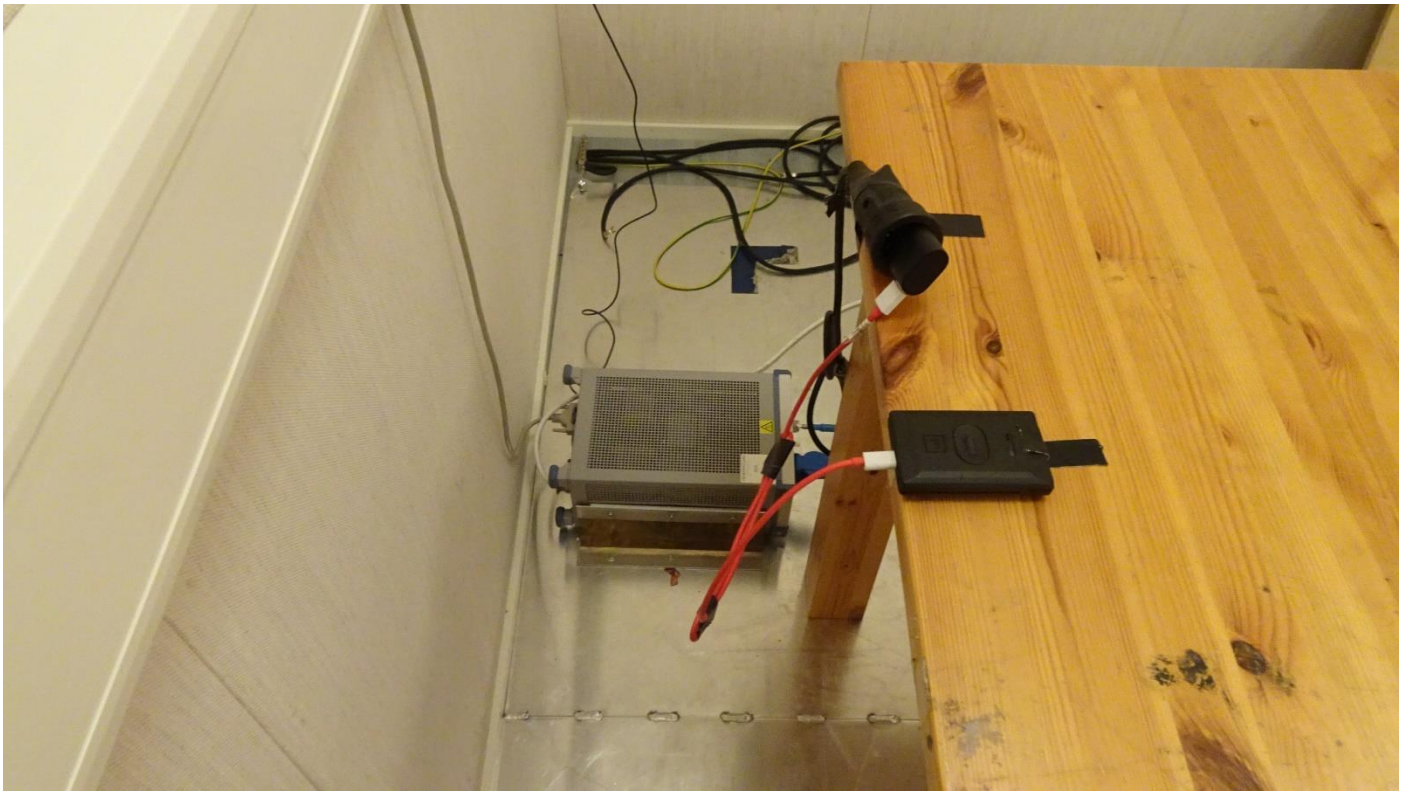
Picture 9 Radiated emission pictures, front view



Picture 10 Radiated emission pictures, back view OM1



Picture 11 Radiated emission pictures, back view OM2



Picture 12 Conducted emission pictures