

Test Report

Product	Inductive Charger
Name and address of the applicant	Findmysheep AS Ulset NO-2512 Kvikne, NORWAY
Name and address of the manufacturer	Findmysheep AS Ulset NO-2512 Kvikne, NORWAY
Model	Lader FMS
Rating	24 VDC (Used external AC/DC Adapter)
Trademark	/
Serial number	822616
Additional information	Only for using with the E-bell
Tested according to	FCC Part 15.209 General Requirements for Intentional Radiators Industry Canada RSS-210, Issue 8 Low Power Licence-Exempt Radiocommunications Devices
Order number	270798
Tested in period	2014.09.01 – 2014.09.08 and 2015.04.23 – 2015.04.24
Issue date	2015.05.11
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway FCC No: 994405 IC OATS: 2040D-1 TEL: (+47) 22 96 03 30 FAX: (+47) 22 96 05 50
 Prepared by [Thomas Dangelé] Approved by [Frode Sveinsen]	
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1 INFORMATION

1.1 Test Item

Name :	Inductive Charger
FCC ID :	2ADX2-LADERFMS
Industry Canada ID :	/
Model/version :	Lader FMS
Serial number :	822616
Hardware identity and/or version:	311012AUA04 10W Pri 5 Charges BOM 0.32/PCB Rev B
Software identity and/or version :	WPC-ST-FMS-02 Rev 1.2
Frequency Range :	/
Tunable Bands :	No
Number of Channels :	One
Operating Modes :	Charging and Standby
Type of Modulation :	On-Off Keying
User Frequency Adjustment :	No
Rated Output Power :	N/A
Type of Power Supply :	24 V DC (Used External AC/DC Adapter)
Antenna Connector :	No
Desktop Charger :	No

Description of Test Item

The EUT is an inductive charger for E-Bell wireless sheep locators. Up to 5 E-Bell sheep locators can be charged simultaneously.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	21.1 – 22.1 °C
Relative humidity:	41 - 50 %
Normal test voltage:	120 V AC / 60Hz

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Thomas Dangle

1.4 Test Equipment

See list of test equipment in clause 4.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.209 and Industry Canada RSS-210 Issue 8.

Tests were performed in accordance with ANSI C63.4-2009.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m, 6m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

Equipment Code

☐ Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-GEN Issue 4 reference	Result
Supply Voltage Variations	15.31(e)	8	Pass
Antenna Requirement	15.203	6.12	Pass
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8	Pass
Occupied Bandwidth	15.209	6.6	Pass
The field strength of emission within the band	15.209	8.9	Pass
The field strength of emission outside the band	15.209	8.9	Pass

2.3 Description of modification for Modification Filing

Not applicable.

2.4 Comments

All ports were populated during spurious emission measurements.

Power supply variation within 85% to 115% of nominal value has no influence on measured values.

External AC Adaptor used during testing: I.T.E Power Supply, Model: CENB1090A2403F01

2.5 Family List Rational

Not Applicable.

3 TEST RESULTS

3.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

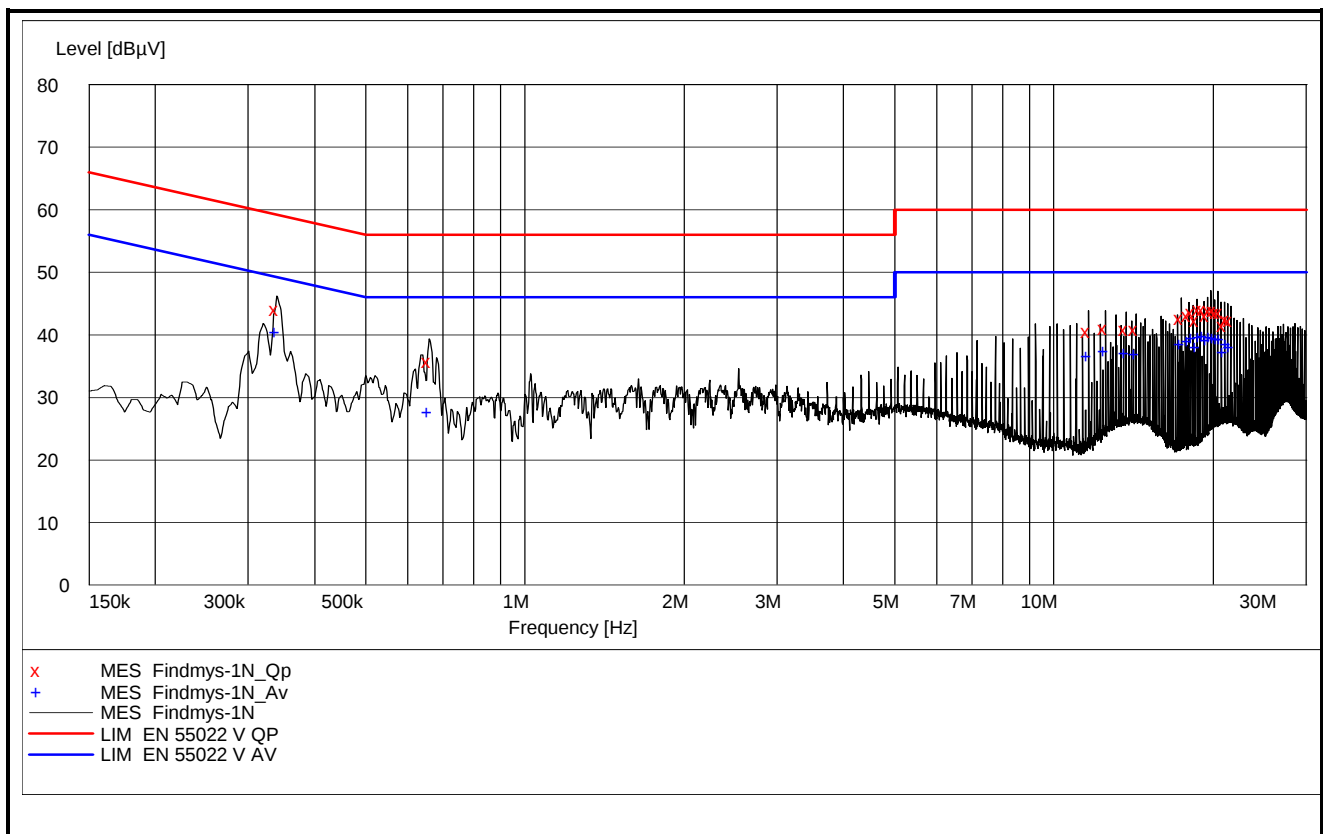
Test Performed By: Thomas Dangle

Date of Test: 2014.09.01

Measurement procedure: ANSI C63.4-2009 using 50 μ H/50 ohms LISN.

Test Results: Complies.

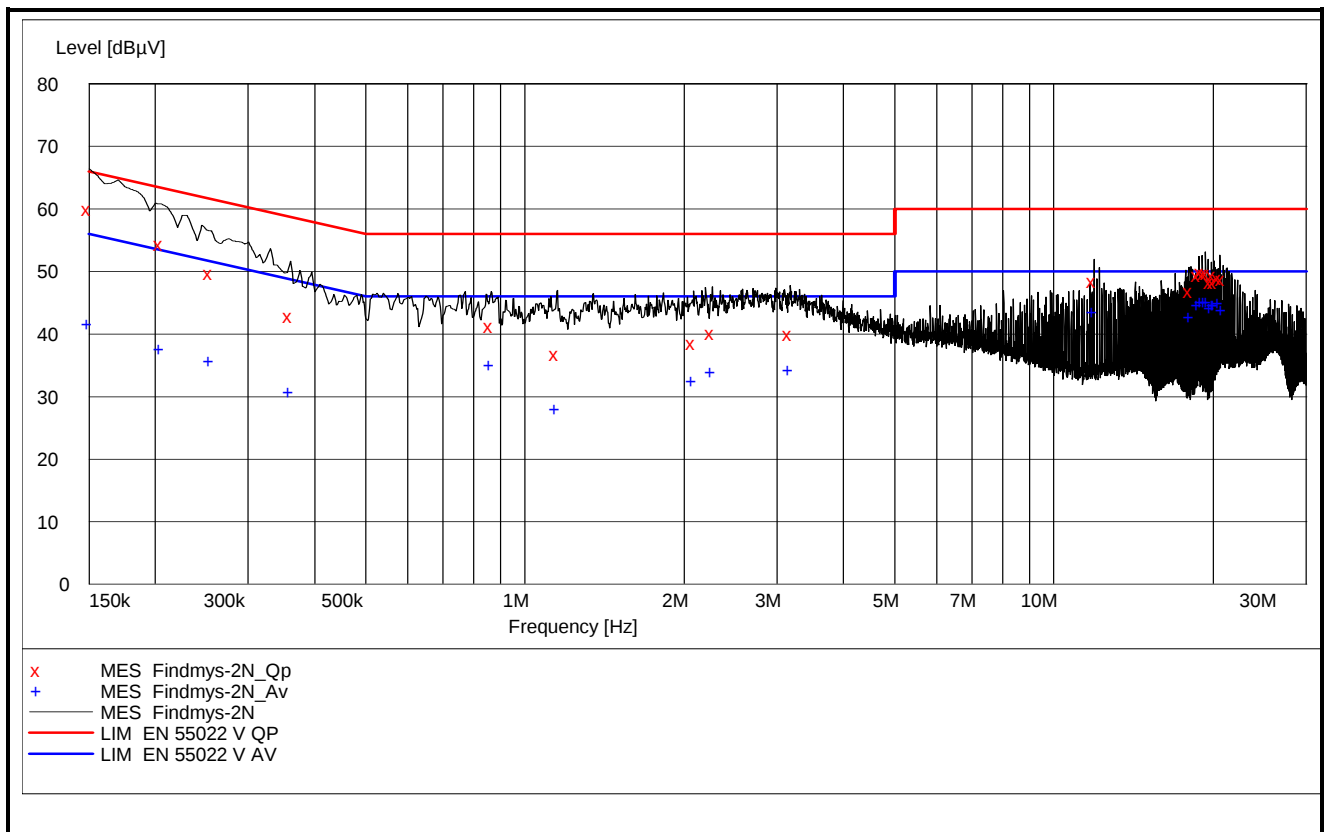
Measurement Data: See attached graph, (Peak detector).



EUT in standby – No charging

EUT in standby – No charging:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.340000	44.20	10.20	59.20	15.00	QP	L1	Pass
0.660000	35.80	10.20	56.00	20.20	QP	L1	Pass
11.625000	40.70	10.70	60.00	19.30	QP	N	Pass
12.520000	41.10	10.70	60.00	18.90	QP	N	Pass
13.715000	41.00	10.80	60.00	19.00	QP	L1	Pass
14.310000	40.90	10.80	60.00	19.10	QP	N	Pass
17.440000	42.70	11.00	60.00	17.30	QP	L1	Pass
18.035000	43.20	11.00	60.00	16.80	QP	N	Pass
18.335000	43.60	11.10	60.00	16.40	QP	L1	Pass
18.630000	42.40	11.10	60.00	17.60	QP	N	Pass
18.930000	44.10	11.20	60.00	15.90	QP	L1	Pass
19.230000	44.10	11.20	60.00	15.90	QP	N	Pass
19.525000	43.10	11.20	60.00	16.90	QP	L1	Pass
19.825000	44.00	11.20	60.00	16.00	QP	L1	Pass
20.125000	43.90	11.30	60.00	16.10	QP	N	Pass
20.420000	43.70	11.30	60.00	16.30	QP	L1	Pass
20.720000	43.60	11.30	60.00	16.40	QP	L1	Pass
21.015000	41.50	11.30	60.00	18.50	QP	N	Pass
21.315000	42.50	11.30	60.00	17.50	QP	N	Pass
21.615000	42.30	11.30	60.00	17.70	QP	N	Pass
0.340000	40.50	10.20	49.20	8.70	AV	L1	Pass
0.660000	27.60	10.20	46.00	18.40	AV	L1	Pass
11.625000	36.70	10.70	50.00	13.30	AV	N	Pass
12.520000	37.50	10.70	50.00	12.50	AV	N	Pass
13.715000	37.10	10.80	50.00	12.90	AV	L1	Pass
14.310000	37.00	10.80	50.00	13.00	AV	N	Pass
17.440000	38.50	11.00	50.00	11.50	AV	L1	Pass
18.035000	39.00	11.00	50.00	11.00	AV	N	Pass
18.335000	39.50	11.10	50.00	10.50	AV	L1	Pass
18.630000	38.10	11.10	50.00	11.90	AV	N	Pass
18.930000	39.70	11.20	50.00	10.30	AV	L1	Pass
19.230000	39.80	11.20	50.00	10.20	AV	N	Pass
19.525000	39.10	11.20	50.00	10.90	AV	L1	Pass
19.825000	39.70	11.20	50.00	10.30	AV	L1	Pass
20.125000	39.50	11.30	50.00	10.50	AV	N	Pass
20.420000	39.30	11.30	50.00	10.70	AV	L1	Pass
20.720000	39.30	11.30	50.00	10.70	AV	L1	Pass
21.015000	37.20	11.30	50.00	12.80	AV	N	Pass
21.315000	38.50	11.30	50.00	11.50	AV	N	Pass
21.615000	38.00	11.30	50.00	12.00	AV	N	Pass



EUT in operating mode – Charging with all five 'bells'

EUT in operating mode – Charging:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.150000	60.00	10.10	66.00	6.00	QP	L1	Pass
0.205000	54.40	10.10	63.40	9.00	QP	L1	Pass
0.255000	49.70	10.10	61.60	11.90	QP	L1	Pass
0.360000	42.90	10.20	58.70	15.80	QP	N	Pass
0.865000	41.20	10.20	56.00	14.80	QP	N	Pass
1.150000	36.80	10.20	56.00	19.20	QP	N	Pass
2.085000	38.60	10.30	56.00	17.40	QP	N	Pass
2.260000	40.20	10.30	56.00	15.80	QP	N	Pass
3.175000	40.00	10.30	56.00	16.00	QP	N	Pass
11.935000	48.40	10.70	60.00	11.60	QP	N	Pass
18.160000	46.90	11.00	60.00	13.10	QP	L1	Pass
18.810000	49.50	11.10	60.00	10.50	QP	N	Pass
19.070000	49.80	11.20	60.00	10.20	QP	L1	Pass
19.330000	49.70	11.20	60.00	10.30	QP	L1	Pass
19.590000	49.70	11.20	60.00	10.30	QP	N	Pass
19.845000	48.30	11.20	60.00	11.70	QP	N	Pass
20.105000	49.40	11.30	60.00	10.60	QP	L1	Pass
20.190000	48.30	11.30	60.00	11.70	QP	L1	Pass
20.625000	49.00	11.30	60.00	11.00	QP	L1	Pass
20.885000	48.80	11.30	60.00	11.20	QP	L1	Pass
0.150000	41.60	10.10	56.00	14.40	AV	L1	Pass
0.205000	37.70	10.10	53.40	15.70	AV	L1	Pass
0.255000	35.60	10.10	51.60	16.00	AV	L1	Pass
0.360000	30.70	10.20	48.70	18.00	AV	N	Pass
0.865000	35.00	10.20	46.00	11.00	AV	N	Pass
1.150000	28.00	10.20	46.00	18.00	AV	N	Pass
2.085000	32.50	10.30	46.00	13.50	AV	N	Pass
2.260000	33.90	10.30	46.00	12.10	AV	N	Pass
3.175000	34.20	10.30	46.00	11.80	AV	N	Pass
11.935000	43.50	10.70	50.00	6.50	AV	N	Pass
18.160000	42.80	11.00	50.00	7.20	AV	L1	Pass
18.810000	44.60	11.10	50.00	5.40	AV	N	Pass
19.070000	45.20	11.20	50.00	4.80	AV	L1	Pass
19.330000	45.20	11.20	50.00	4.80	AV	L1	Pass
19.590000	45.10	11.20	50.00	4.90	AV	N	Pass
19.845000	44.20	11.20	50.00	5.80	AV	N	Pass
20.105000	44.60	11.30	50.00	5.40	AV	L1	Pass
20.190000	44.60	11.30	50.00	5.40	AV	L1	Pass
20.625000	44.90	11.30	50.00	5.10	AV	L1	Pass
20.885000	43.90	11.30	50.00	6.10	AV	L1	Pass

3.2 Occupied Bandwidth

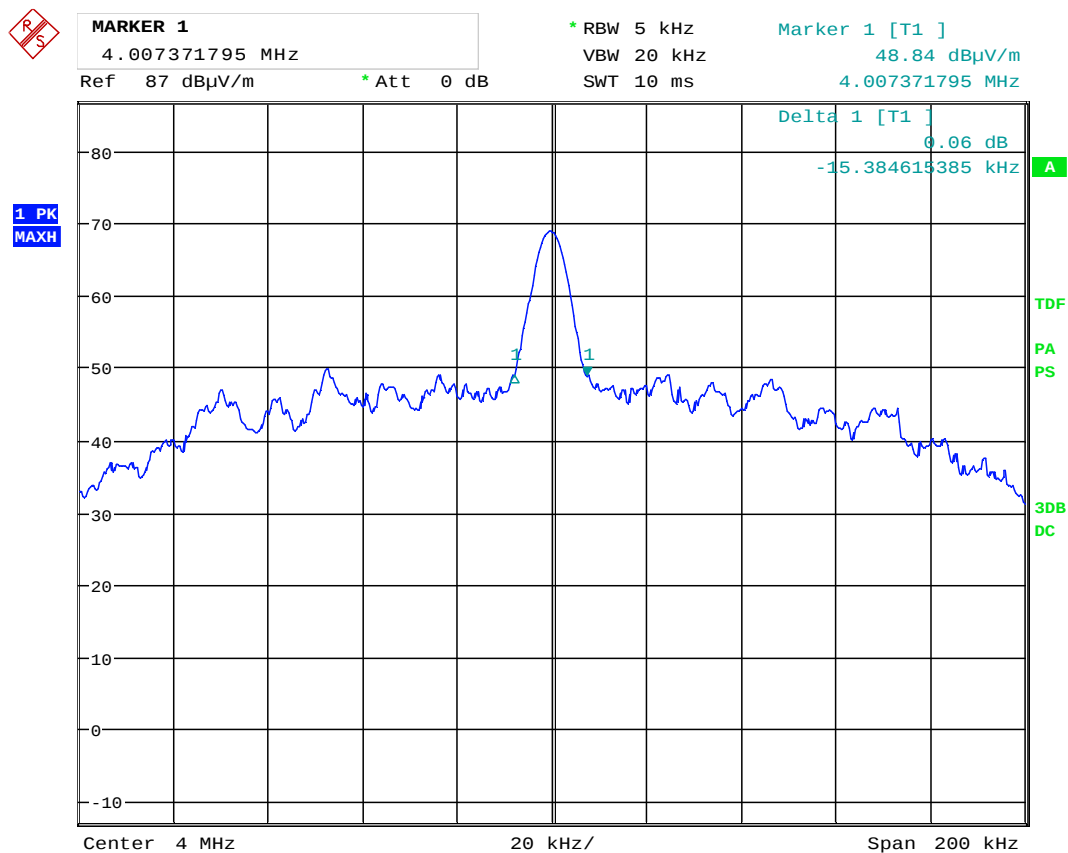
Measurement Data:

Number of RF Channels in use:	1
Channel Centre Frequencies:	4 MHz
BW Measured on Centre Channel	15.4 kHz

See attached plot.

Requirements:

No requirement for 20dB BW, reported for information only.



Date: 4.SEP.2014 12:04:29

20dB Bandwidth, measured at 1 meter distance

3.3 The field strength of emission within the band

Para. No.: 15.209

Test Performed By: Thomas Dangle	Date of Test: 2014.09.05 & 2015.04.24
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Test Results: Complies

Measurement Data:

Field strength of emission				
Carrier	Measured Field strength at 3 meters	With corr. factor	Limit at 30 meters	Margin
4.0 MHz	36.6 dBμV/m	-3.4 dBμV/m	29.5 dBμV/m	32.9 dB

Correction factor to 30m: $40 \log (3/30) = -40$ dB

Field strength with correction factor to 30m: $36.6 - 40.0 = -3.4$ dBμV/m

Measured with QP Detector.

20dB BW of the charging frequency:

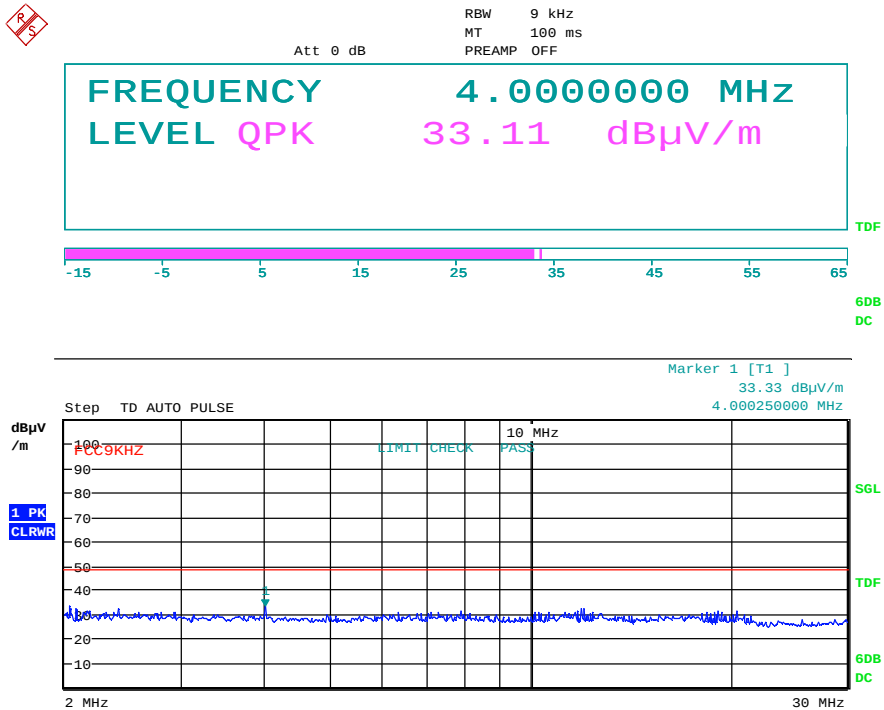
Measurement Data:

20dB BW with five E-bells	15 kHz
20dB BW with four E-bells	24 kHz

Requirements:

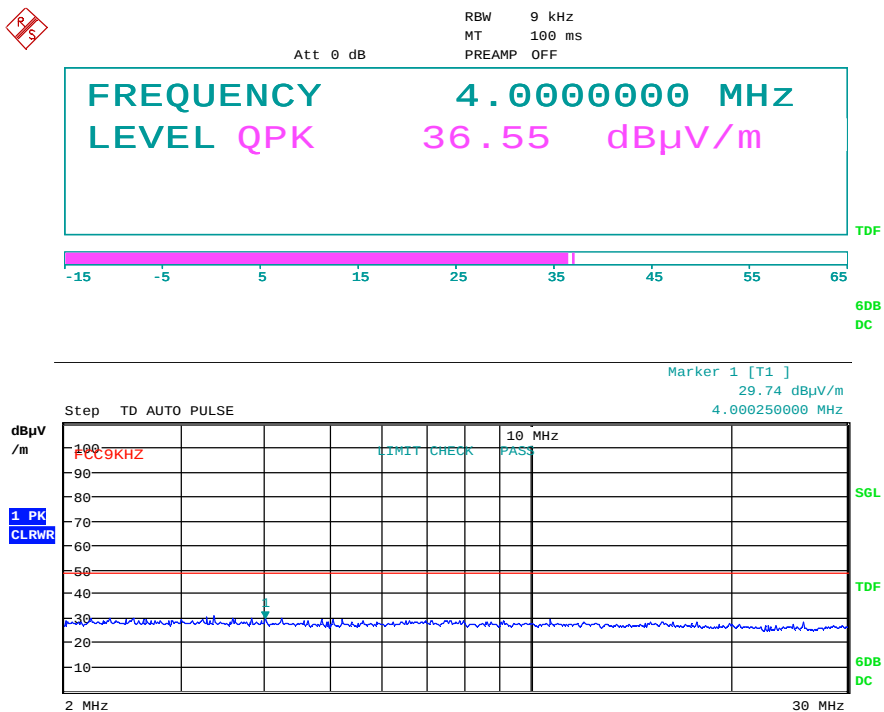
The EUT have been tested against the general radiated emissions limits in clause 15.209.

See attached graphs.



Date: 24.APR.2015 07:57:59

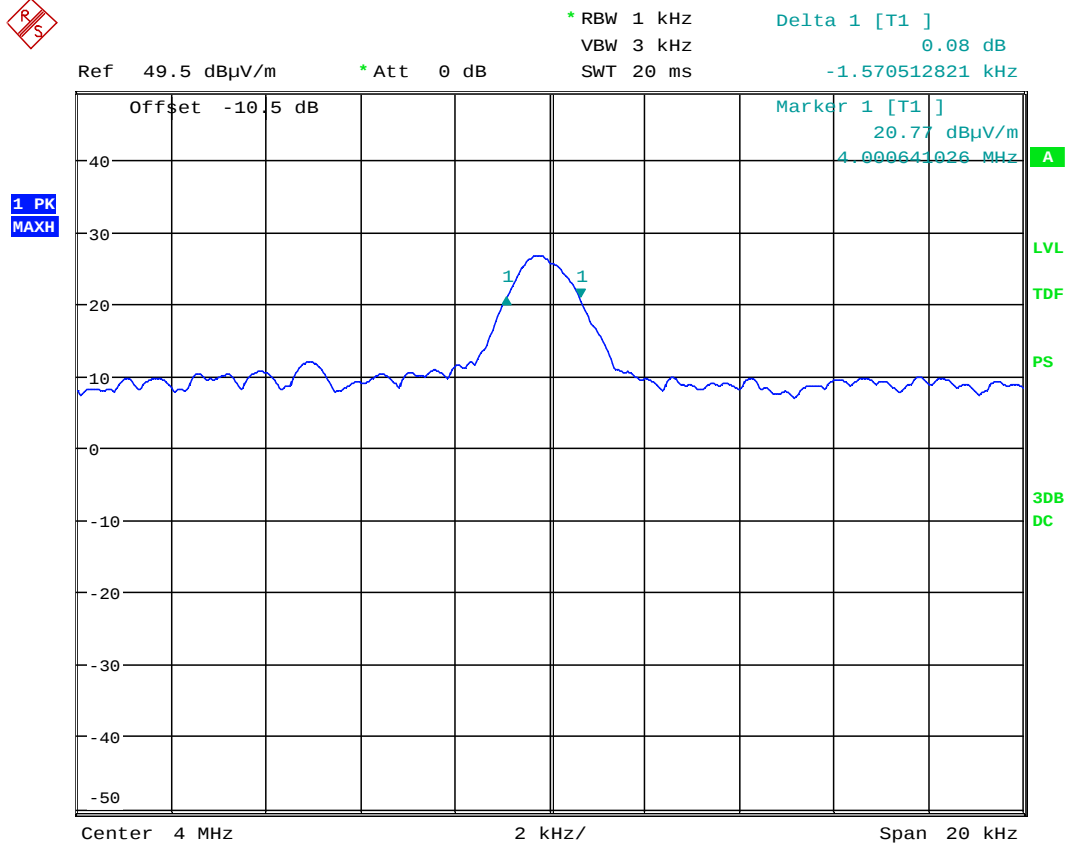
Longitudinal antenna position



Date: 24.APR.2015 08:02:05

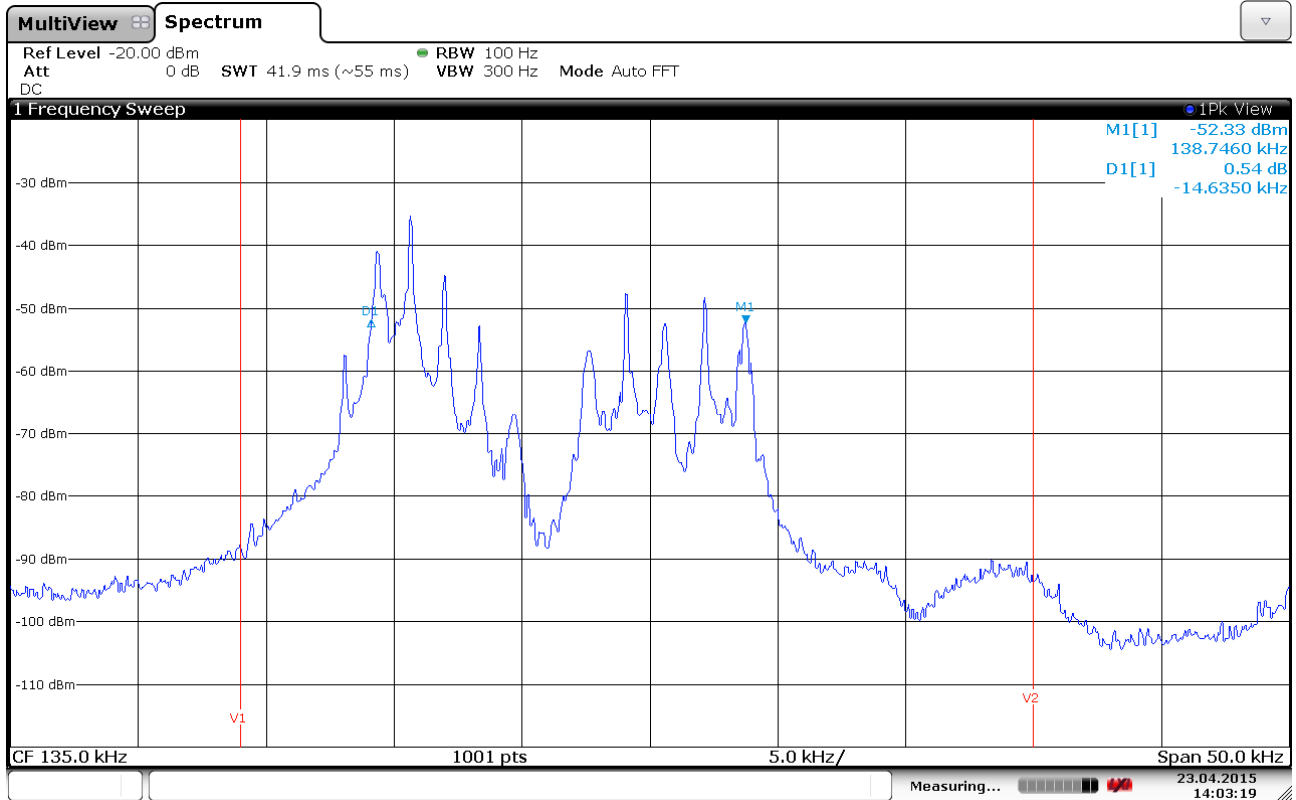
Transversal antenna position

Measured with CISPR quasi-peak detector at 3 meter distance

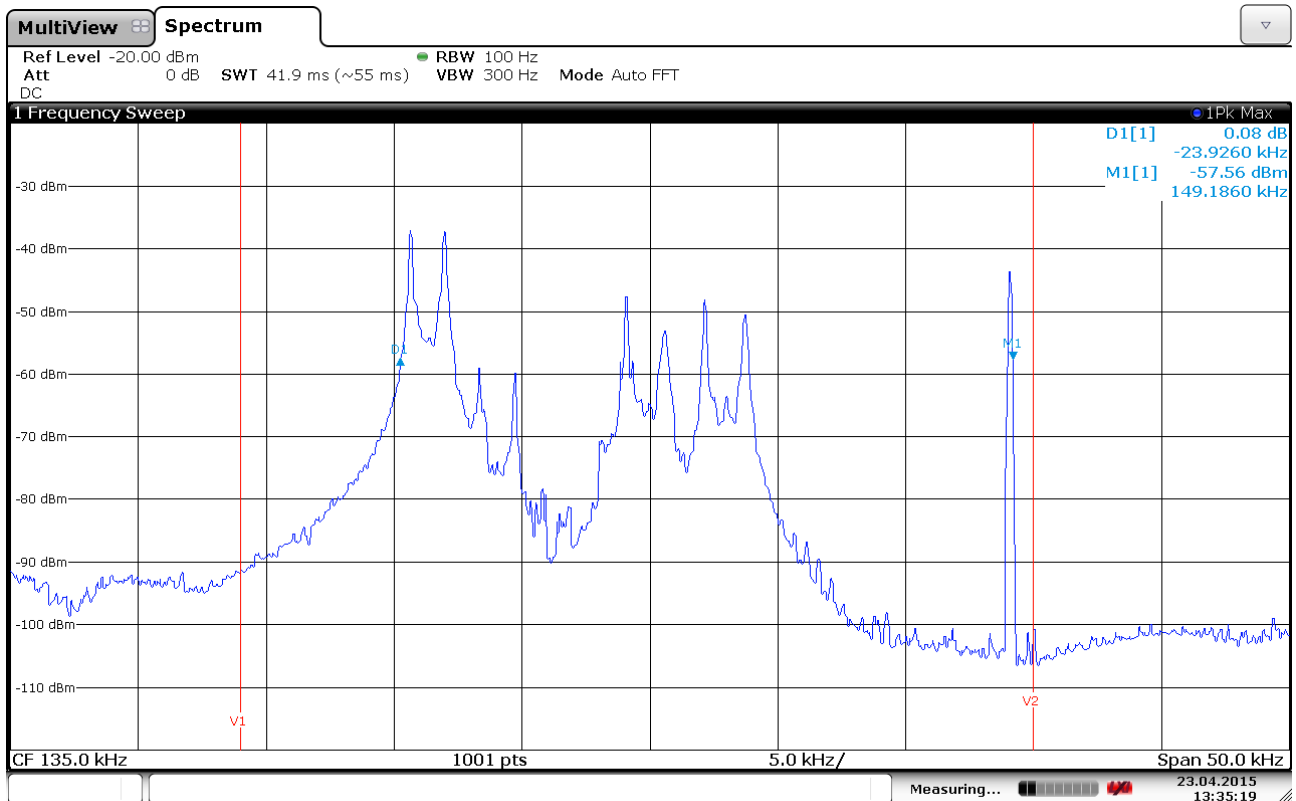


Date: 5.SEP.2014 13:11:22

6 dB BW measured at 3 meter distance



20 dB BW measured with five E-bells



20 dB BW measured with four E-bells

3.4 The field strength of emission outside the band

Para. No.: 15.209(a)

Test Performed By: Thomas Dangle	Date of Test: 2014.09.03 & 2015.04.24
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Test Results: Complies

Requirements:

The emission from an intentional radiator shall not exceed the field strength levels specified in the §15.209 (a) table.

Radiated emissions 9 kHz-30 MHz.

Measuring distance 10 m, measured with Peak-scan and then quasi-peak at single spot frequencies.

Limit is converted to 10 m using 40 dB/decade according to 15.31 (f) (2).

Tested in both standby mode and charging mode with four and five E-bells.

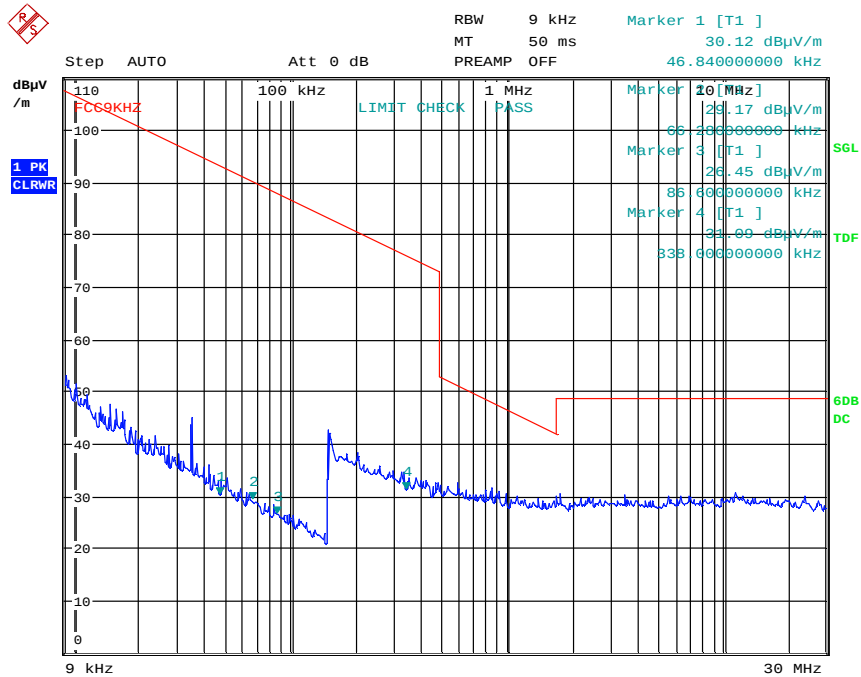
Measurement Data:

Frequency	Operational condition	Measured Field strength at 10 m		With correction factor	Limit FCC15.209	Margin
		dBµV/m				
kHz		Peak	Quasi-peak	dBµV/m	dBµV/m	dB
63.72	Charging	59.9	/	0.9	31.5	30.6
125.72	Charging	49.6	/	-9.4	25.6	35.0
150.0	Charging	50.0	/	-9.0	24.1	33.1
738.0	Charging	/	29.7	10.7	30.2	19.5
1630	Charging	/	27.7	8.7	23.4	14.7

Correction factor to 300m: $40 \log (10/300) = -59 \text{ dB}$

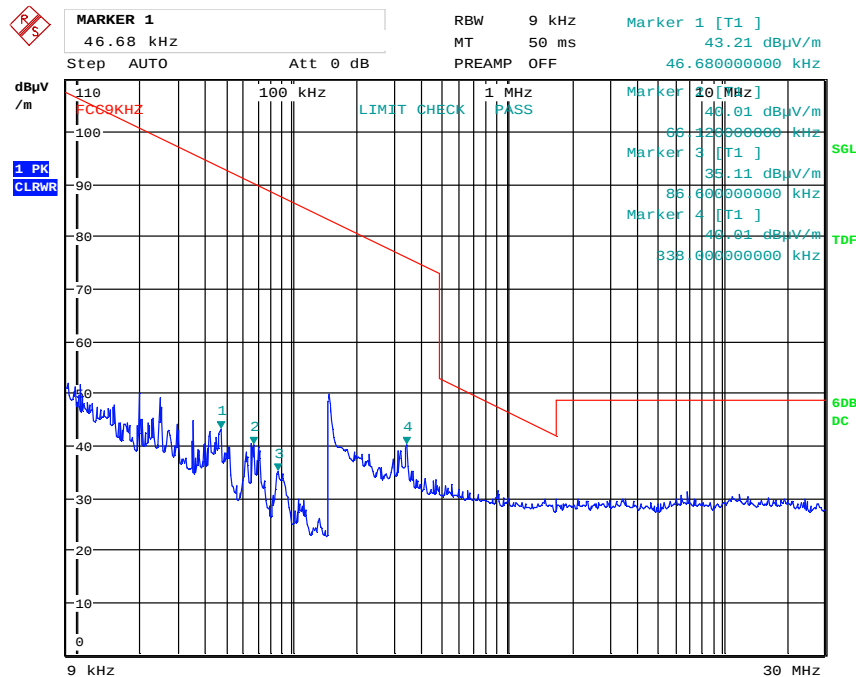
Correction factor to 30m: $40 \log (10/30) = -19 \text{ dB}$

See attached graphs.



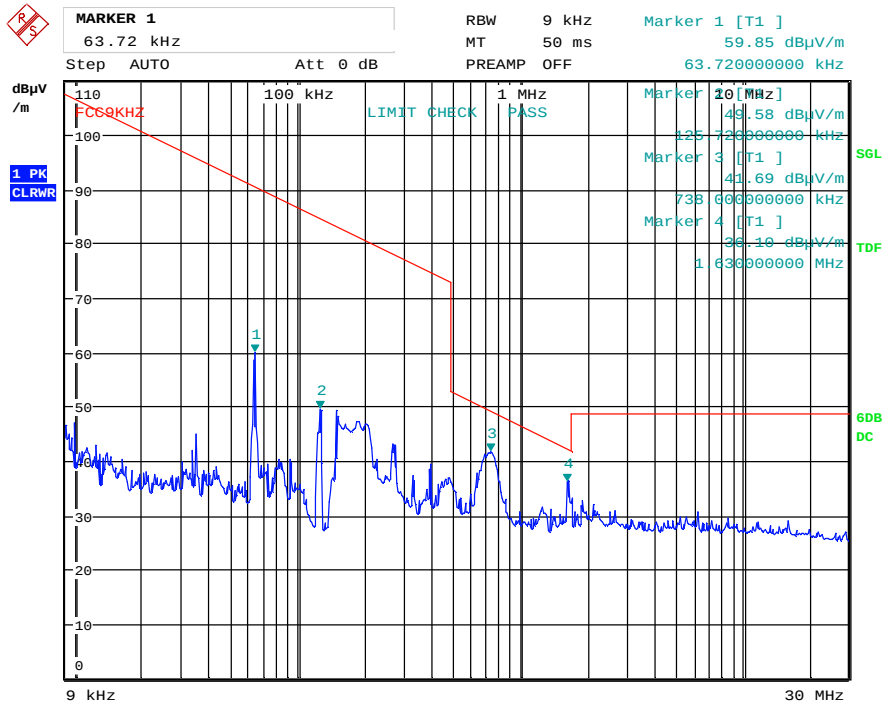
Date: 3.SEP.2014 13:17:57

Standby mode – Transversal antenna position – Peak scan



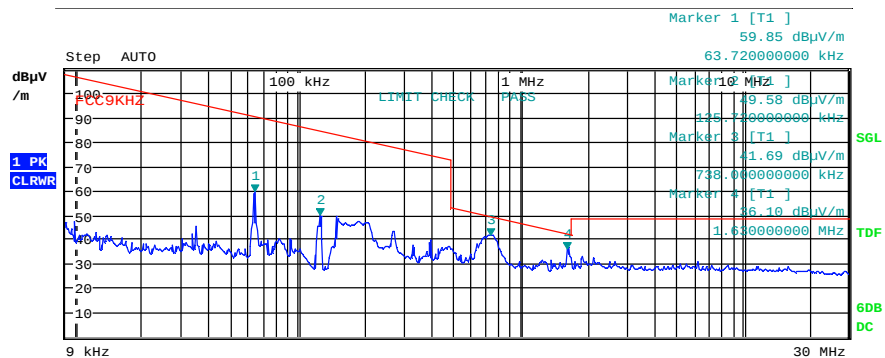
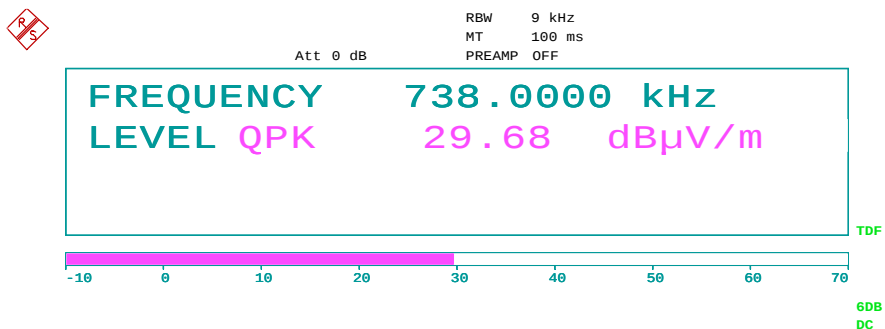
Date: 3.SEP.2014 13:07:39

Standby mode – Longitudinal antenna position – Peak scan



Date: 24.APR.2015 07:34:29

Charging mode – Longitudinal antenna position – Peak scan



Date: 24.APR.2015 07:47:01

738.0 kHz with QP detector



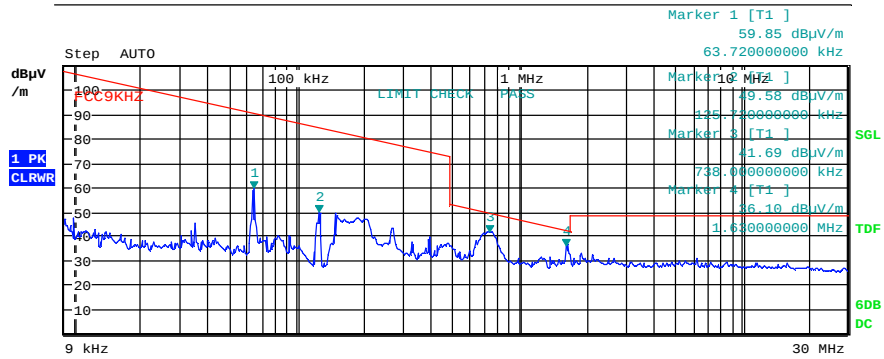
Att 0 dB
RBW 9 kHz
MT 100 ms
PREAMP OFF

FREQUENCY 1.6300000 MHz
LEVEL QPK 27.67 dBμV/m



TDF

6dB
DC



Date: 24.APR.2015 07:48:15

1.63 MHz with QP detector

Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3 meter according to CISPR 22.

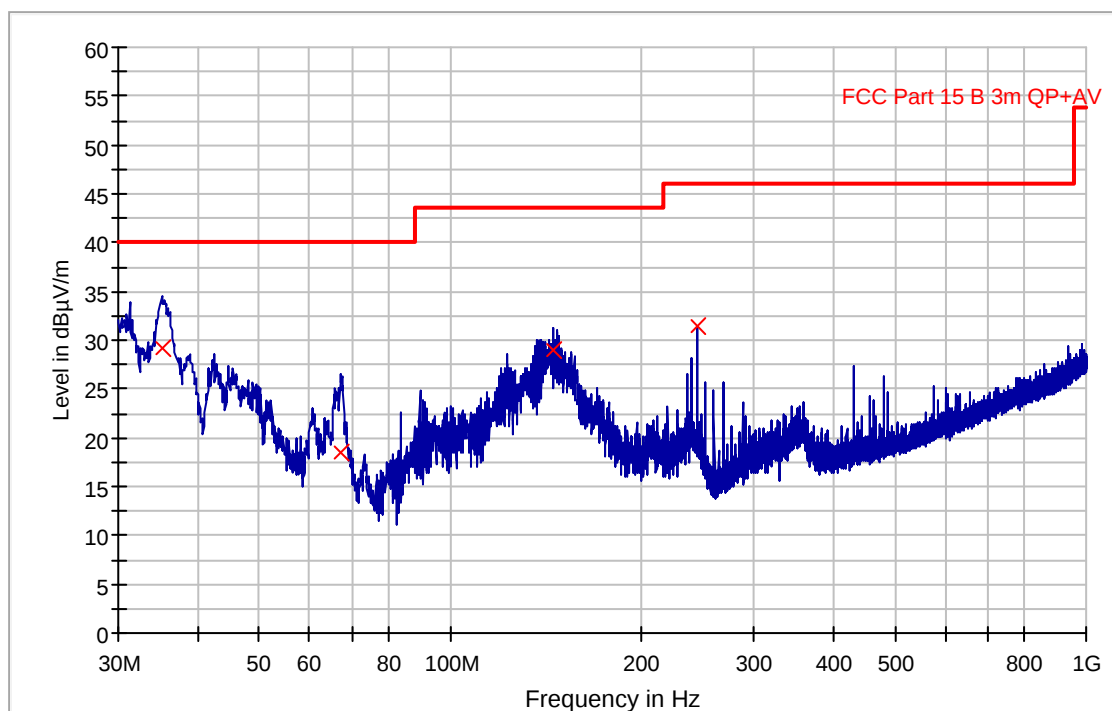
Tested in both standby mode and charging mode with maxium 5 bells.

Measurement Data:

Frequency	Operational condition	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz		$\text{dB}\mu\text{V}/\text{m}$	metres	$\text{dB}\mu\text{V}/\text{m}$	dB
35.18	Standby	29.1	3	40.0	10.9
67.17	Standby	18.5	3	40.0	21.5
145.34	Standby	28.9	3	43.5	14.6
243.99	Standby	31.4	3	46.0	14.6
132.06	Charging	36.1	3	43.5	7.4
140.36	Charging	36.8	3	43.5	6.7
287.95	Charging	20.6	3	46.0	25.4
812.42	Charging	28.0	3	46.0	18.0

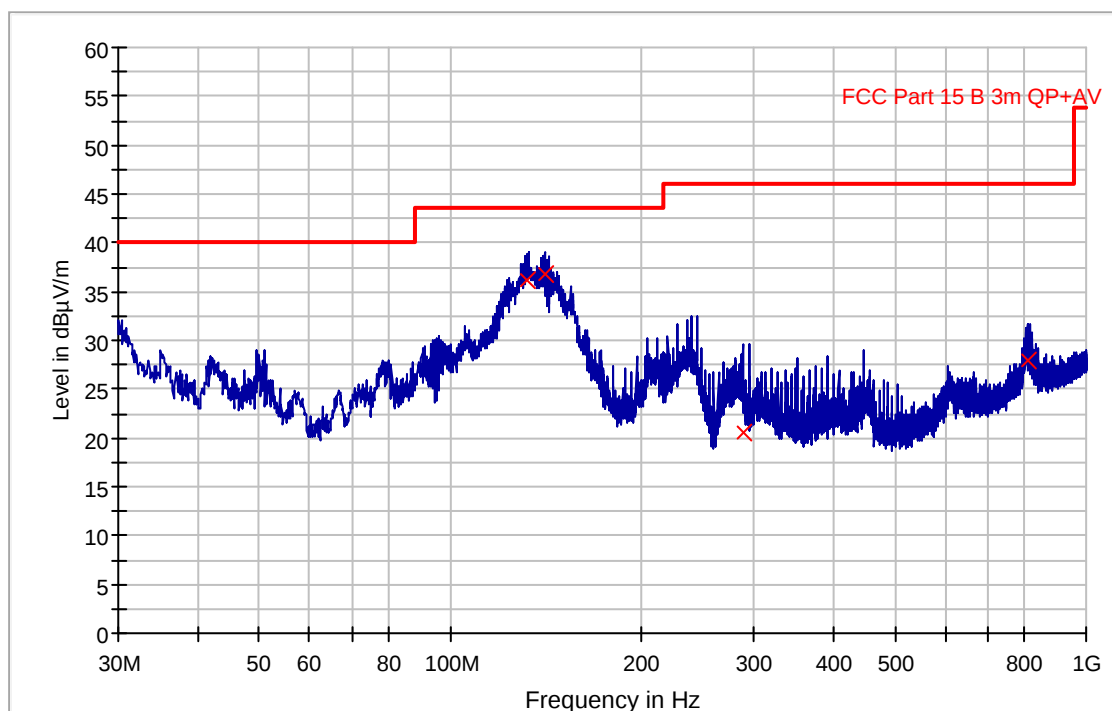
See attached graphs.

FCC Pt15 Class B 30-1000M 3m



Standby mode

FCC Pt15 Class B 30-1000M 3m



Charging mode

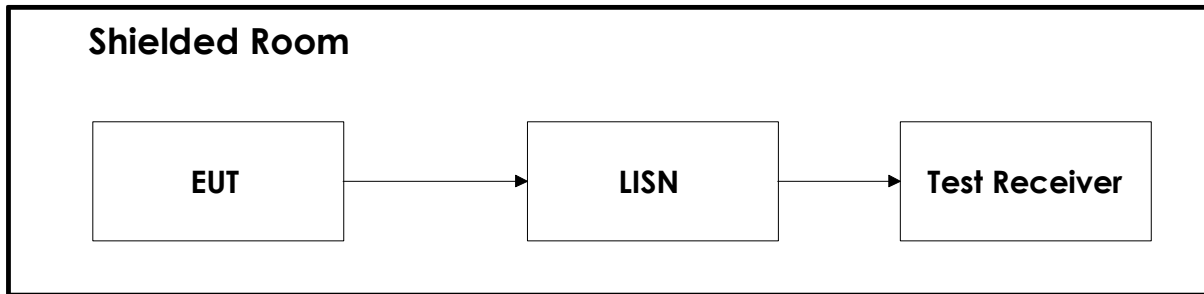
4 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	ESU40	Measuring Receiver	Rohde & Schwarz	LR-1639	2014.09	2015.09
2	JB3	BiLog Antenna	Sunol Sciences	N-4525	2014.12	2016.12
3	LNA 6900	Preamplifier	Teseq	LR-1593	2014.07	2016.07
4	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR-285	2013.12	2016.12
5	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR-1660	2014.10	2016.10
6	HP-6812B	AC Power Source/Analyzer	Agilent	LR-1515	2014.10	2015.10
7	FSW	Spectrum analyzer	Rohde & Schwarz	LR-1640	2014.09	2015.09
8	Type 7334-1	Loop sensor	Solar electronics	N-3969	N/A	
9	ESH3-Z5	AMN	Rohde & Schwarz	N-3403	2014.09	2016.09
10	ESHS-10	EMI Receiver	Rohde & Schwarz	N-3528	2014.09	2015.06
11	Model 87V	Multimeter	Fluke	LR-1599	2014.10	2016.10

5 BLOCK DIAGRAM

5.1 Power Line Conducted Emission



5.2 Test Site Radiated Emission

