Report No. 1-286345

Test Report

Product	Location Transmitter
Name and address of the applicant	Sonitor Technologies AS Drammensveien 288, 0283 Oslo, Norway
Name and address of the manufacturer	Sonitor Technologies AS Drammensveien 288, 0283 Oslo, Norway
Model	INF-B216, INF-B246-U, INF-B246-C, INF-B246-B
Rating	48V DC (Power over Ethernet)
Trademark	Sonitor Technlogies
Serial number	00000128
Additional information	This product contains 125 kHz RFID and 2.4 GHz Zigbee Module with Modular Approval (FCC ID: Y2NRC24XXHP; IC:9402A-RC24XXHP)
Tested according to	**FCC Part 15.209** Low Power Transceiver **Industry Canada RSS-210, Issue 8** Low Power Licence-Exempt Radiocommunications Devices
Order number	286345
Tested in period	2015.06.10 – 2015.06.11
Issue date	2015.10.02
Name and address of the testing laboratory	Nemko 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 [G.Suhanthakumar]	Approved by [Frode Sveiensen]

Template version: B

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1 INFORMATION

1.1 Test Item

Name :	Sonitor Technologies
FCC ID :	2AD7T21120150610
Industry Canada ID :	20330-21120150610
Model/version :	INF-B216, INF-B246-U, INF-B246-C, INF-B246-B
Serial number :	00000128
Hardware identity and/or version:	V1.2
Software identity and/or version :	Transmitter Main Board-2 FW: v0.5.0 Transmitter Power Board-2 FW: v0.3.4 and Radiocrafts FW:v1.0.19
Frequency Range :	123.8 kHz
Number of Channels :	1
Operating Modes :	TX
Type of Modulation :	The LF frequency of 125 kHz is modulated by on-off keying. On-off keying (OOK) denotes the simplest form of amplitude-shift keying (ASK) modulation. The data is transmitted in Manchester coding.
User Frequency Adjustment :	None
Type of Power Supply :	Power over Ethernet
Antenna Connector :	No, 2 pcs. Integral inductive loop antenna
Antenna Diversity Supported :	N/A
Desktop Charger :	N/A

Description of Test Item

The Sonitor Sense Location Transmitter is part of the Sonitor Sense Real time Locating System (RTLS) infrastructure, which is Sonitor's line of high definition ultrasound infrastructure units. The models that come with 123.8 kHz low frequency transmitter, transmit both low frequency and ultrasound that is received by the Sonitor tracking tags.

The Location Transmitters have a ZigBee module that is used to communicate with the infrastructure.

Exposure Evaluation

The EUT is designed to be fixed to a wall etc. and the user manual contains text that it shall be mounted with a separation distance of at least 20 cm from any humans. For the purposes of exposure evaluation this EUT is a mobile or fixed device.

The EUT is exempted from RF Exposure Evaluation to Industry Canada requirements since the output power complies with the power levels of section 2.5.2 of RSS-102 Issue 4.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	21.2 – 21.9 °C
Relative humidity:	41 – 43 %
Normal test voltage:	48 V DC (Power over Ethernet)

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G.Suhanthakumar

1.4 Test Equipment

See list of test equipment in clause 6.

1.5 Model Variants

The following model variations are using the same LF radio.

VA no.	Variant	Comment
1	INF-B246	LF radio is same.
2	INF-B216	LF radio is same.
3	INF-B246-C	LF radio is same.
4	INF-B246-U	LF radio is same.
5	INF-B246-B	LF radio is same.

The letters differentiate units with different shapes of ultrasound waveguides. Different kind of waveguide configurations are used to optimize the performance in different kind of spaces. The waveguides do not have any effect on the radio or ultrasound electronics or firmware

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.209, Industry Canada RSS-210 Issue 8 and RSS-GEN Issue 4.

Radiated tests were conducted in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

The radiated tests were made in a semi-anechoic chamber at measuring distances of 3m 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
DXT 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”.

2.2 Test Summary

Name of test	FCC Part 15 /18 reference	RSS-210 Issue 8 reference	Result
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8 (RSS-GEN)	Pass
Spurious Emissions (Radiated)	15.31 15.33 15.35 15.209(a)(d) 18.305	A8.5	Pass

[1] The tested equipment has integrated antennas only.

2.3 Description of modification for Modification Filing

Not applicable.

2.4 Comments

The measurements were done with the EUT powered by Power over Ethernet.

All ports were populated during spurious emission measurements.

2.5 Family List Rational

Not Applicable.

3 TEST RESULTS

3.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: G.Suhanthakumar	**Date of Test: 2015.06.10**

Measurement procedure: **ANSI C63.4-2014 using 50 µH/50 ohms LISN.**

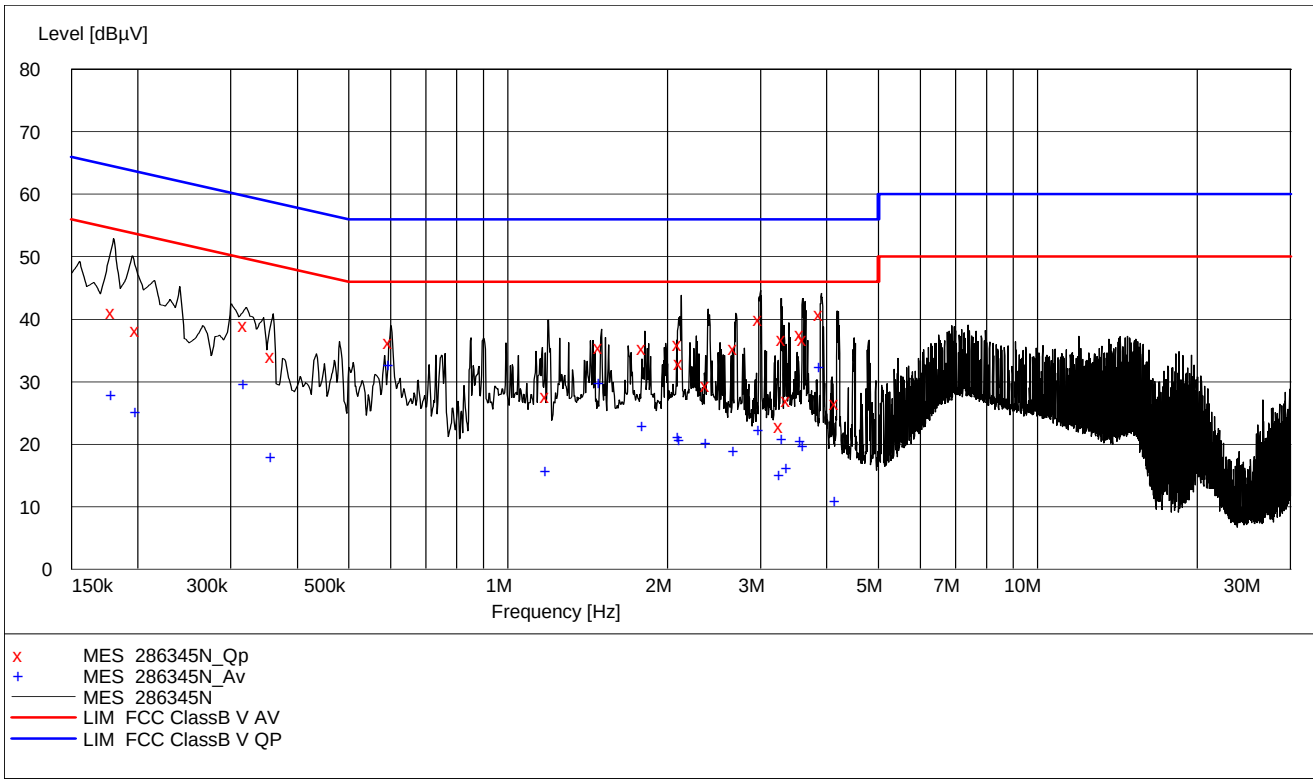
Test Results: **Complies.**

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

Tested EUT is supplied with PoE by a Dlink router. Power line conducted emission is measured on router using 120Vac, 60Hz.

D-Link Model: DGS-1008P, S/N. S30Z1F1000391

Highest measured value (L1 and N):



QP - Detector

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.180000	41.10	10.70	54.50	13.40	QP	L1	Pass
0.200000	38.20	10.70	53.60	15.40	QP	L1	Pass
0.320000	39.10	10.50	49.70	10.60	QP	L1	Pass
0.360000	34.10	10.40	48.70	14.60	QP	N	Pass
0.600000	36.40	10.20	46.00	9.60	QP	L1	Pass
1.190000	27.60	10.40	46.00	18.40	QP	N	Pass
1.500000	35.50	10.40	46.00	10.50	QP	N	Pass
1.810000	35.40	10.40	46.00	10.60	QP	L1	Pass
2.115000	36.10	10.40	46.00	9.90	QP	N	Pass
2.125000	32.90	10.40	46.00	13.10	QP	L1	Pass
2.385000	29.50	10.40	46.00	16.50	QP	L1	Pass
2.690000	35.40	10.40	46.00	10.60	QP	N	Pass
2.995000	40.00	10.40	46.00	6.00	QP	N	Pass
3.280000	23.00	10.40	46.00	23.00	QP	N	Pass
3.320000	36.80	10.40	46.00	9.20	QP	L1	Pass
3.385000	27.00	10.40	46.00	19.00	QP	L1	Pass
3.595000	37.70	10.40	46.00	8.30	QP	N	Pass
3.635000	36.80	10.40	46.00	9.20	QP	L1	Pass
3.905000	40.90	10.40	46.00	5.10	QP	L1	Pass
4.180000	26.50	10.50	46.00	19.50	QP	L1	Pass

AV-detector

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.180000	27.80	10.70	64.50	36.70	AV	L1	Pass
0.200000	25.10	10.70	63.60	38.50	AV	L1	Pass
0.320000	29.70	10.50	59.70	30.00	AV	L1	Pass
0.360000	18.00	10.40	58.70	40.70	AV	N	Pass
0.600000	32.60	10.20	56.00	23.40	AV	L1	Pass
1.190000	15.70	10.40	56.00	40.30	AV	N	Pass
1.500000	29.80	10.40	56.00	26.20	AV	N	Pass
1.810000	23.00	10.40	56.00	33.00	AV	L1	Pass
2.115000	21.20	10.40	56.00	34.80	AV	N	Pass
2.125000	20.70	10.40	56.00	35.30	AV	L1	Pass
2.385000	20.20	10.40	56.00	35.80	AV	L1	Pass
2.690000	18.90	10.40	56.00	37.10	AV	N	Pass
2.995000	22.20	10.40	56.00	33.80	AV	N	Pass
3.280000	15.10	10.40	56.00	40.90	AV	N	Pass
3.320000	20.80	10.40	56.00	35.20	AV	L1	Pass
3.385000	16.10	10.40	56.00	39.90	AV	L1	Pass
3.595000	20.50	10.40	56.00	35.50	AV	N	Pass
3.635000	19.70	10.40	56.00	36.30	AV	L1	Pass
3.905000	32.40	10.40	56.00	23.60	AV	L1	Pass
4.180000	10.90	10.50	56.00	45.10	AV	L1	Pass

3.2 Occupied Bandwidth

Test Performed By: G.Suhanthakumar	Date of Test: 2015.06.10

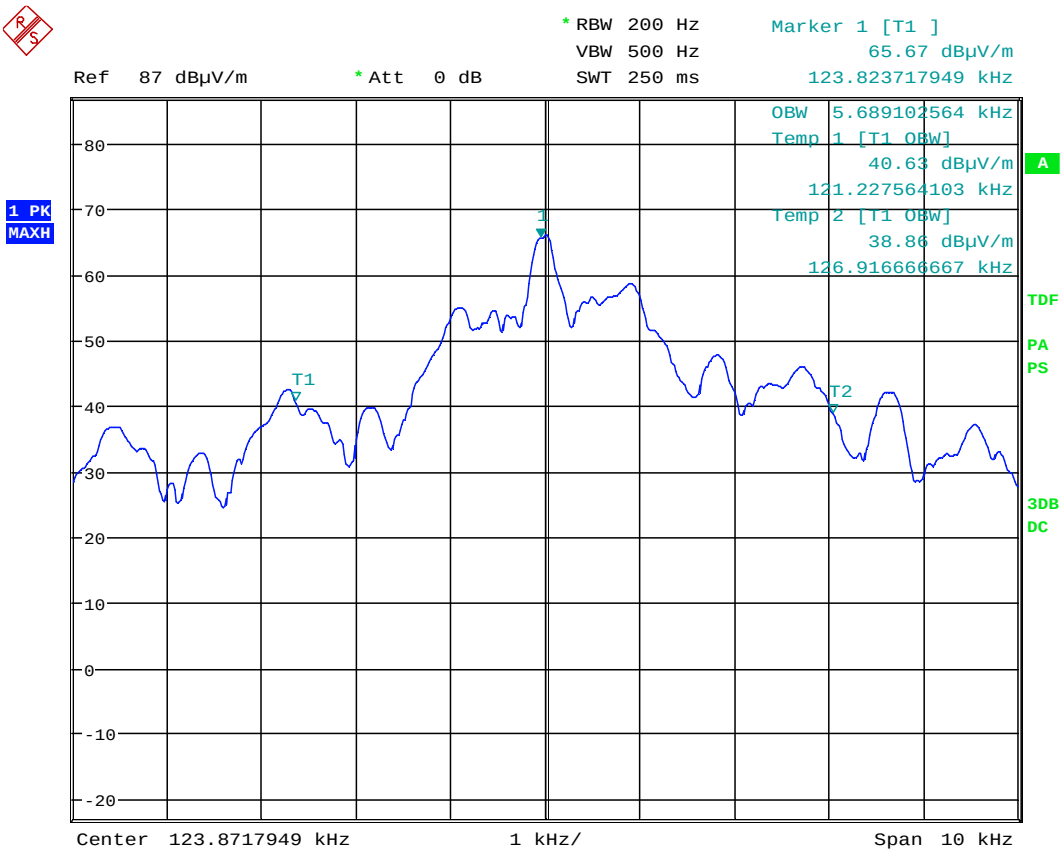
Test Results: Complies

Measurement Data:

Modulation type and bitrate	Occupied Bandwidth (kHz)		
	-	123.8 kHz	-
RFID	-	5.69	-

Occupied Bandwith is reported for information only.

See attached plot.



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Occupied Bandwidth

3.3 Spurious Emissions (Radiated)

Para. No.: 15.31, 15.33, 15.35, 15.209 (a) (d & Part 18.305

Test Performed By: G.Suhanthakumar	**Date of Test: 2015.06.11**

Test Results: Complies

Measurement Data:

Radiated emissions 9 kHz - 30 MHz.

Detector: Average

Measuring distance 10 m, measured with Peak detector.

See attached graph.

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

Measured @10m:

Frequency	**Measured Field Strength @10m (dBµV/m)**	**Detector**	**Limit @10m dBµV/m**	**Margin dB**
123.8 kHz	37.6	AV	78.5	40.9
29.8 MHz	17.1	AV	49.5	32.4

Calculated for 300 & 30 m :

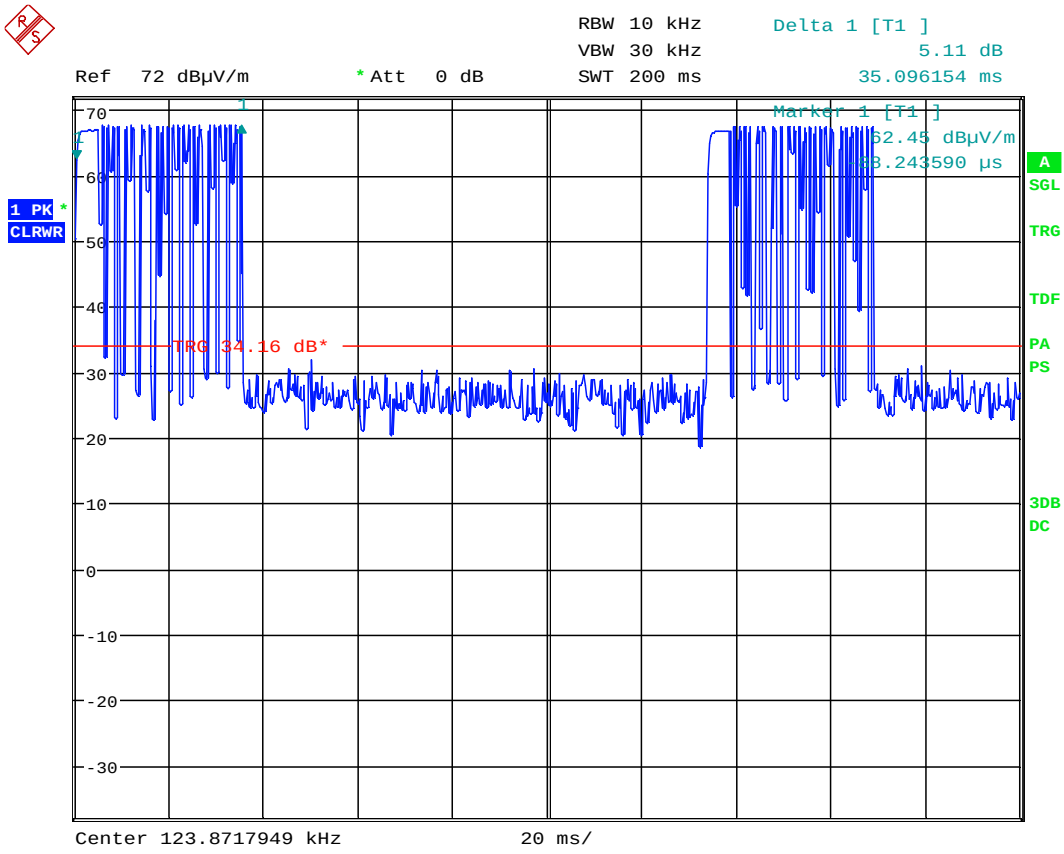
Frequency MHz	**Distance m**	**Calculated Field Strength (dBµV/m)**	**Detector**	**Limit dBµV/m**	**Margin dB**
123.8 kHz	300	-21.9	AV	19.0	40.9
29.8 MHz	30	-2.4	AV	30.0	32.4

The limit line in the graph is corrected for 10 m distance.

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer “Transducer factor”.

See attached graphs.

Measured duty-cycle during testing was 26%. Actual duty-cycle will not be more than 14%.



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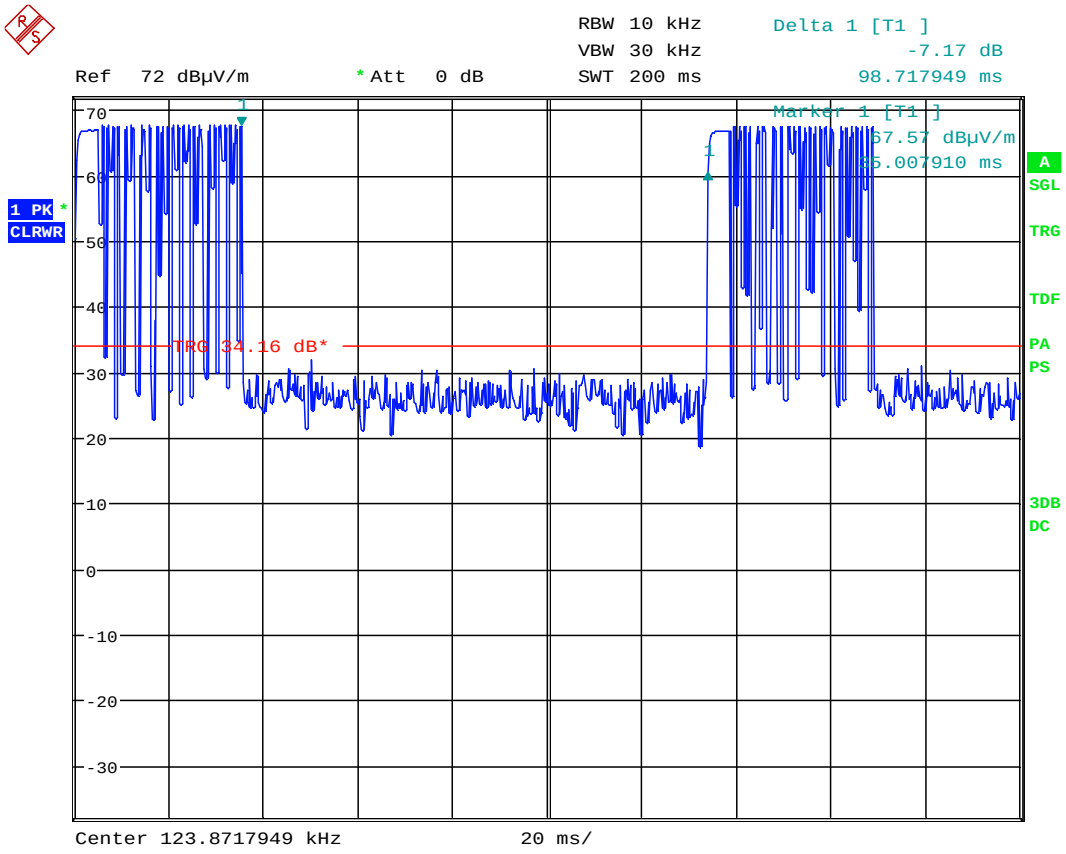
ON time



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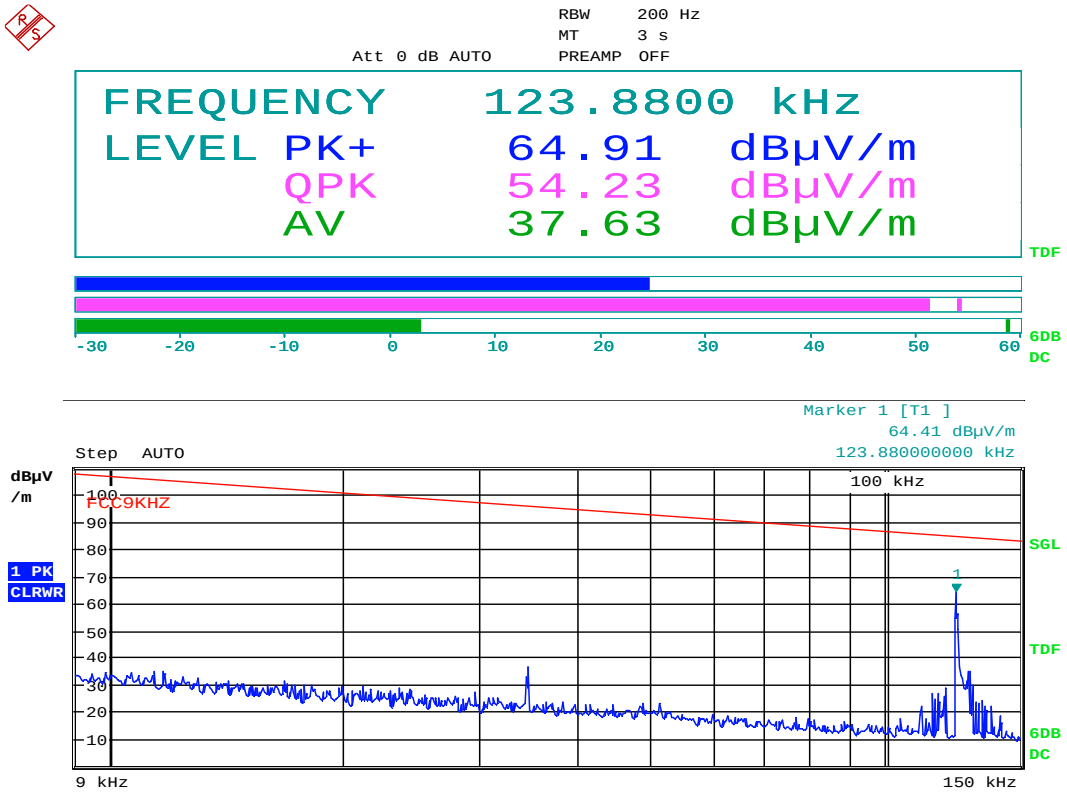

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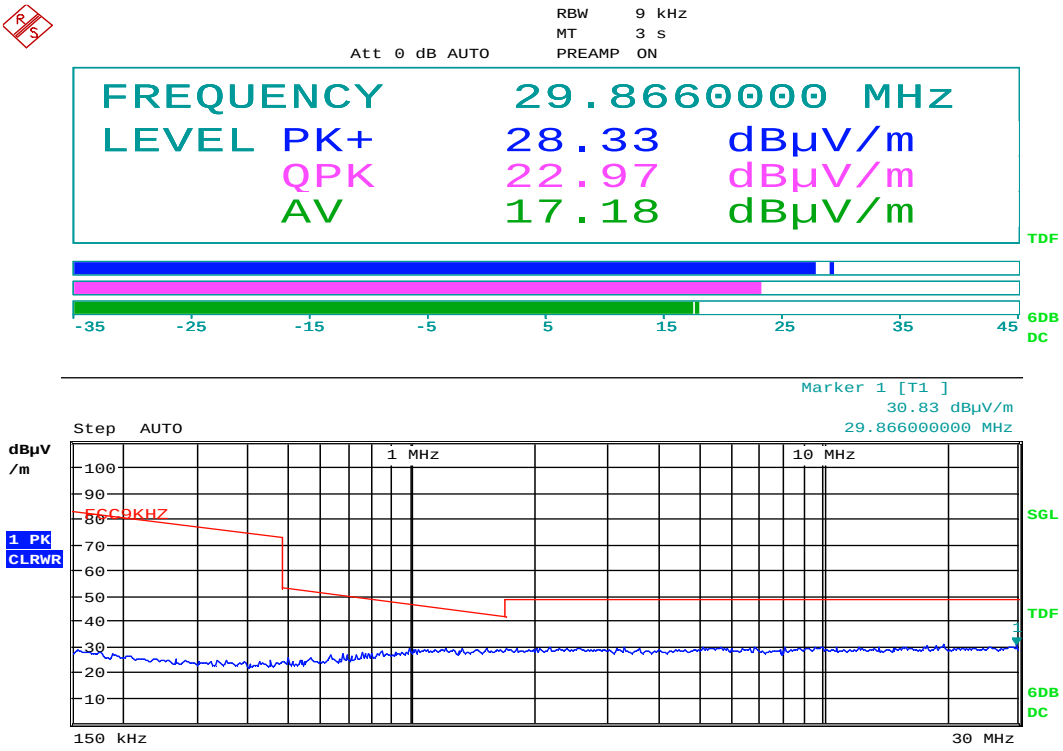
9 kHz – 150 kHz



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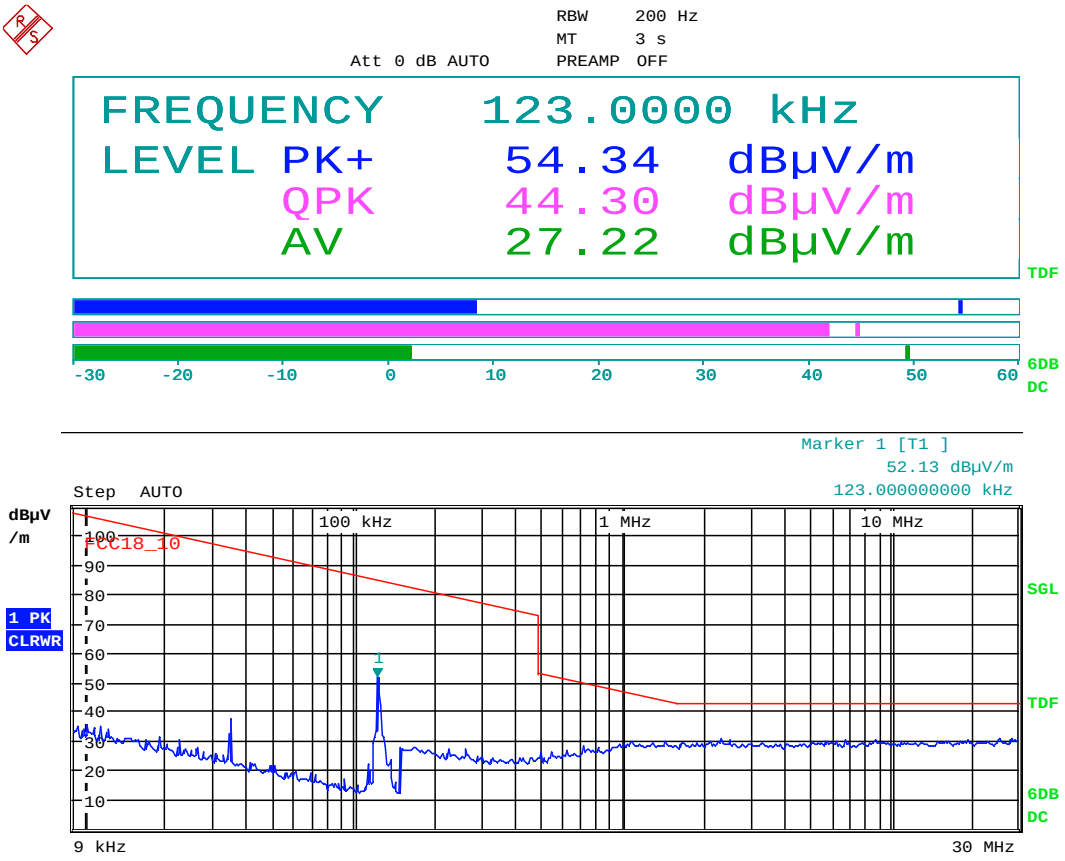
150 kHz – 30 MHz



Date: 10.JUN.2015 10:35:23

Part 18.305 : 9 kHz - 30 MHz @ 10m

Radiated emission 30 – 1000 MHz.

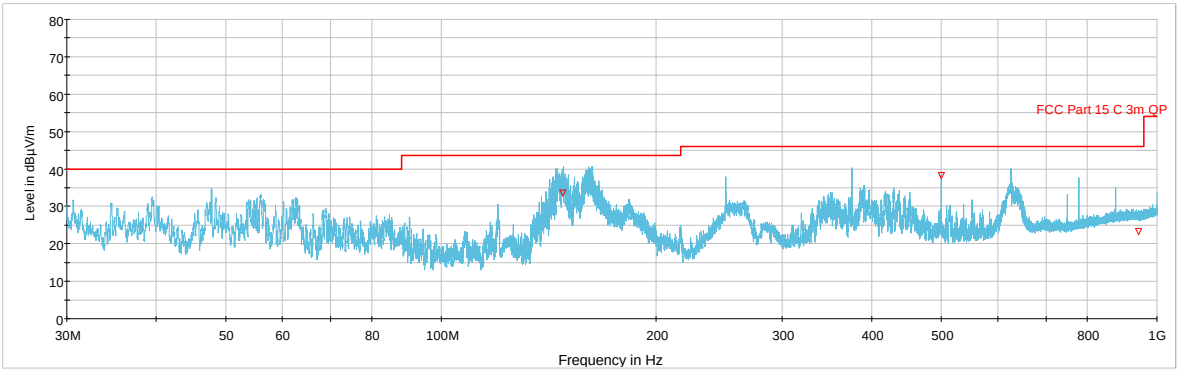
Detector: Quasi-Peak

Measuring distance 3m .

Tested in all active mode.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
148.129700	33.55	43.50	9.95	1000.0	120.000	111.0	V	103.0	-10.9
500.011800	38.23	46.00	7.77	1000.0	120.000	214.0	H	121.0	-4.0
943.204600	23.28	46.00	22.72	1000.0	120.000	111.0	V	45.0	2.7

See attached graphs.



30 – 1000MHz

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		**Uncertainty**
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	**< 3.6 GHz**	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	**< 1 GHz**	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	**Frequency**	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

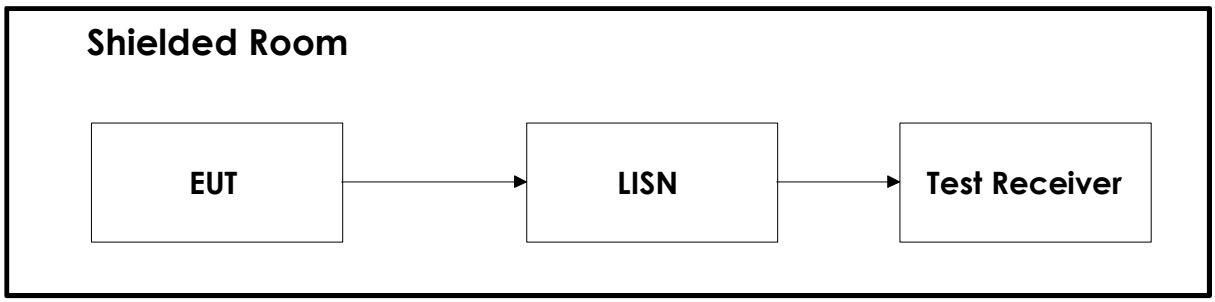
5 LIST OF TEST EQUIPMENT

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.

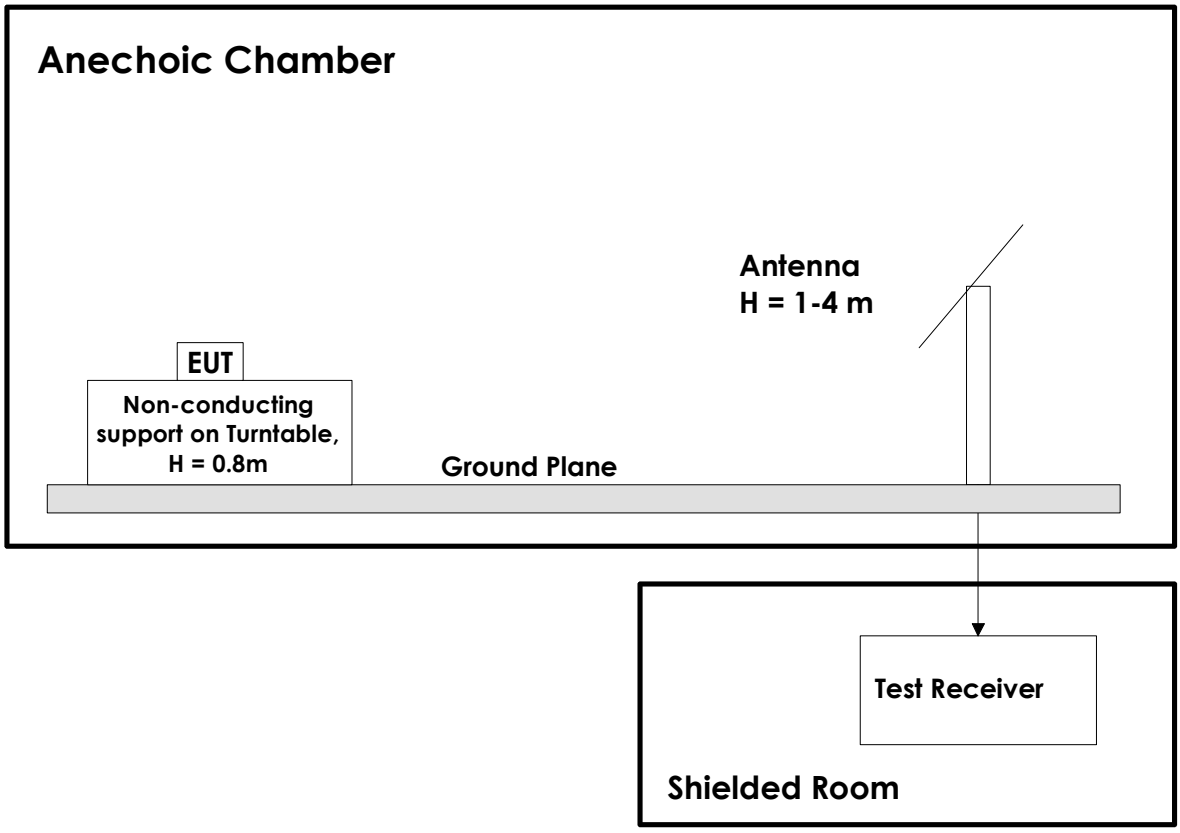
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2014.11	2015.11
2.	HFH2-Z2	Loop antenna	Rohde & Schwarz	LR1660	2014.10	2017.10
3.	3115	Antenna horn	EMCO	LR 1330	2010.08	2017.08
4.	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2015.12
5.	HL223	Log Periodic antenna	Rohde & Schwarz	LR 1261	2013.12	2015.12
6.	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2014.11	2015.11
7.	LNA6900	Pre-amplifier	Teseq	LR 1593	2014.07	2015.07
8.	Model 87 V	Multimeter	Fluke	LR 1600	2014.10	2015.10
9.	ESH3-Z5	AMN	Rohde & Schwarz	LR 1076	2014.10	2016.10
10.	ESHS 10	EMI receiver	Rohde & Schwarz	N -3528	2014.06	2016.06
11.	ESH3-Z2	Puls Limiter	Rohde & Schwarz	LR 1074	2014.07	2017.07
12.	6812B	AC power source	Agilent	LR 1515	2013.10	2015.10

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



Revision history

Version	Date	Comment	Sign
1.0	2015.09.01	Version for TCB review	GNS
1.1	2015.09.09	Corrections after TCB review	FS
1.2	2015.10.02	Added all model numbers	FS