
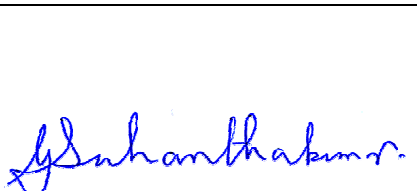
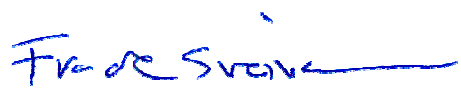


Test Report

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-B246-U, INF-B246-C, INF-B246-B	
Rating	48V DC (Power over Ethernet)	
Trademark	Sonitor Technologies	
Serial number	00000086	
Additional information	This product contains 123 - 127 kHz RFID and 2.4 GHz Zigbee Module with Modular Approval (FCC ID: Y2NRC24XXHP; IC:9402A-RC24XXHP) Previous FCC ID for this product: 2AD7T21120150610 Previous IC ID for this product: 20330-21120150610	
Tested according to	FCC Part 15.209 Low Power Transceiver Industry Canada RSS-210, Issue 8 Low Power Licence-Exempt Radiocommunications Devices	
Order number	296020	
Tested in period	2015.10.27	
Issue date	2015.12.21	
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 [G.Suhanthakumar]	 Approved by [Frode Sveinsen]
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Template version: B

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1 INFORMATION

1.1 Test Item

Name :	Sonitor Technologies
FCC ID :	2AD7T21115102701
Industry Canada ID :	20330-21115102701
Model/version :	INF-B246-U, INF-B246-C, INF-B246-B
Serial number :	0000086
Hardware identity and/or version:	V1.5
Software identity and/or version :	Transmitter Main Board-2 FW: v0.6.0 Transmitter Power Board-2 FW: v0.4.1 and Radiocrafts FW:v2.1.48
Frequency Range :	123 - 127 kHz
Number of Channels :	1
Operating frequency:	124.92kHz
Operating Modes :	TX
Type of Modulation :	The LF frequency of 123 - 127 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 (RTL5) infrastructure, which is Sonitor's line of high definition ultrasound infrastructure units. The models that come with 123 - 127 kHz low frequency transmitter, transmit both low frequency and ultrasound that is received by the Sonitor tracking tags.

The Location Transmitters also contains a ZigBee module that is used to communicate with the infrastructure, this module already have module certification.

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 persons. 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 5.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20 – 25 °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.Suhandhakumar

1.4 Test Equipment

See list of test equipment in clause 5.

1.5 Model Variants

The following model variations are using the same LF radio.

VA no.	Variant	Comment
1	INF-B246-C	LF radio is same.
2	INF-B246-U	LF radio is same.
3	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 traceable 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".

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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: 2015.10.27
------------------------------------	--------------------------

Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN.

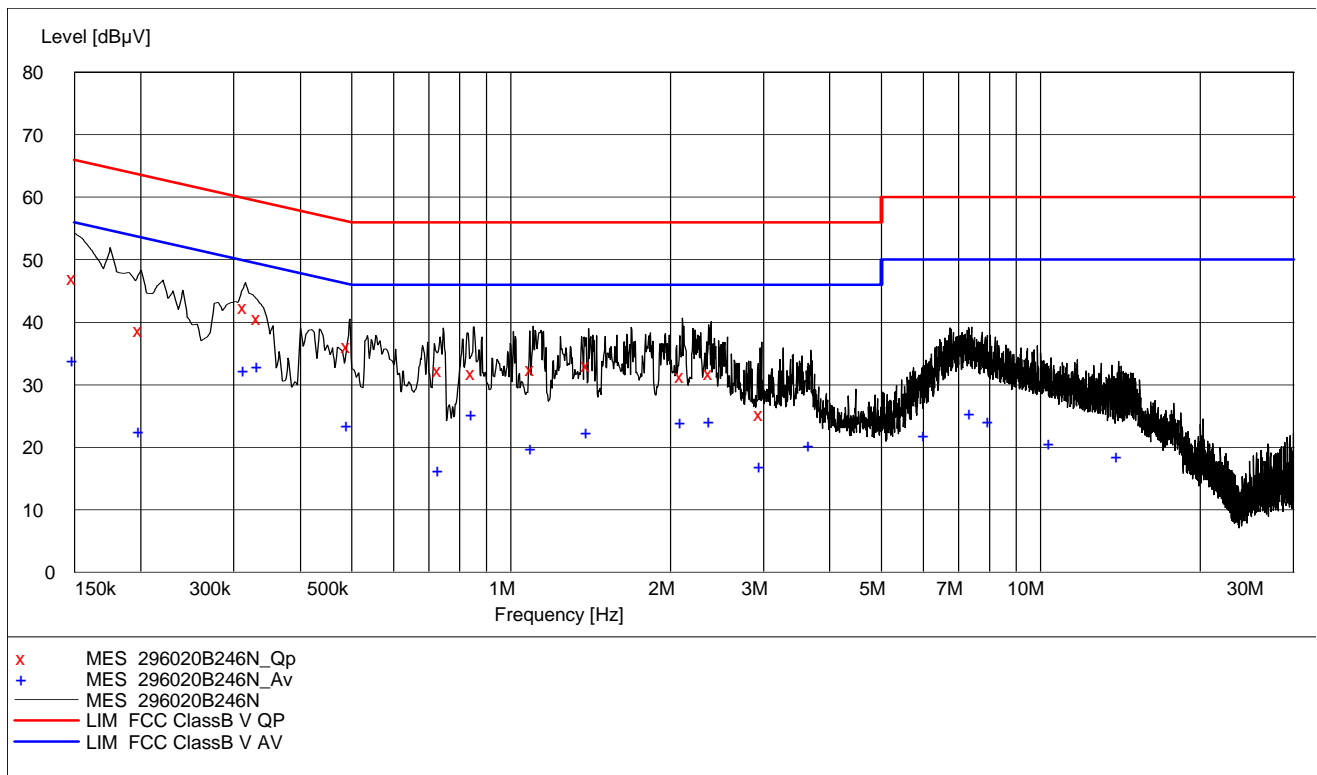
Test Results: Complies.

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]
0.150000	47.10	10.70	66.00	18.90	QP	N	Pass
0.200000	38.70	10.70	63.60	24.90	QP	L1	Pass
0.315000	42.40	10.50	59.80	17.40	QP	N	Pass
0.335000	40.70	10.50	59.30	18.60	QP	N	Pass
0.495000	36.20	10.20	56.10	19.90	QP	N	Pass
0.735000	32.40	10.20	56.00	23.60	QP	L1	Pass
0.850000	31.80	10.30	56.00	24.20	QP	N	Pass
1.100000	32.50	10.40	56.00	23.50	QP	N	Pass
1.400000	33.10	10.40	56.00	22.90	QP	N	Pass
2.105000	31.40	10.40	56.00	24.60	QP	N	Pass
2.385000	31.90	10.40	56.00	24.10	QP	N	Pass
2.970000	25.20	10.40	56.00	30.80	QP	N	Pass

AV-detector

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
0.150000	33.90	10.70	56.00	22.10	AV	N	Pass
0.200000	22.50	10.70	53.60	31.10	AV	L1	Pass
0.315000	32.30	10.50	49.80	17.50	AV	N	Pass
0.335000	32.90	10.50	49.30	16.40	AV	N	Pass
0.495000	23.60	10.20	46.10	22.50	AV	N	Pass
0.735000	16.40	10.20	46.00	29.60	AV	L1	Pass
0.850000	25.20	10.30	46.00	20.80	AV	N	Pass
1.100000	19.90	10.40	46.00	26.10	AV	N	Pass
1.400000	22.40	10.40	46.00	23.60	AV	N	Pass
2.105000	24.00	10.40	46.00	22.00	AV	N	Pass
2.385000	24.20	10.40	46.00	21.80	AV	N	Pass
2.970000	17.00	10.40	46.00	29.00	AV	N	Pass
3.685000	20.30	10.40	46.00	25.70	AV	N	Pass
6.070000	22.00	10.50	50.00	28.00	AV	L1	Pass
7.415000	25.50	10.60	50.00	24.50	AV	L1	Pass
8.035000	24.20	10.60	50.00	25.80	AV	L1	Pass
10.450000	20.70	10.70	50.00	29.30	AV	L1	Pass
14.045000	18.60	10.80	50.00	31.40	AV	L1	Pass

3.2 Occupied Bandwidth

Test Performed By: G.Suhanthakumar	Date of Test: 2015.10.27
------------------------------------	--------------------------

Test Results: Complies

Measurement Data:

Modulation type and bitrate	Occupied Bandwidth (kHz)		
	-	124.92 kHz	-
RFID	-	5.29	-

Occupied Bandwidth is reported for information only.

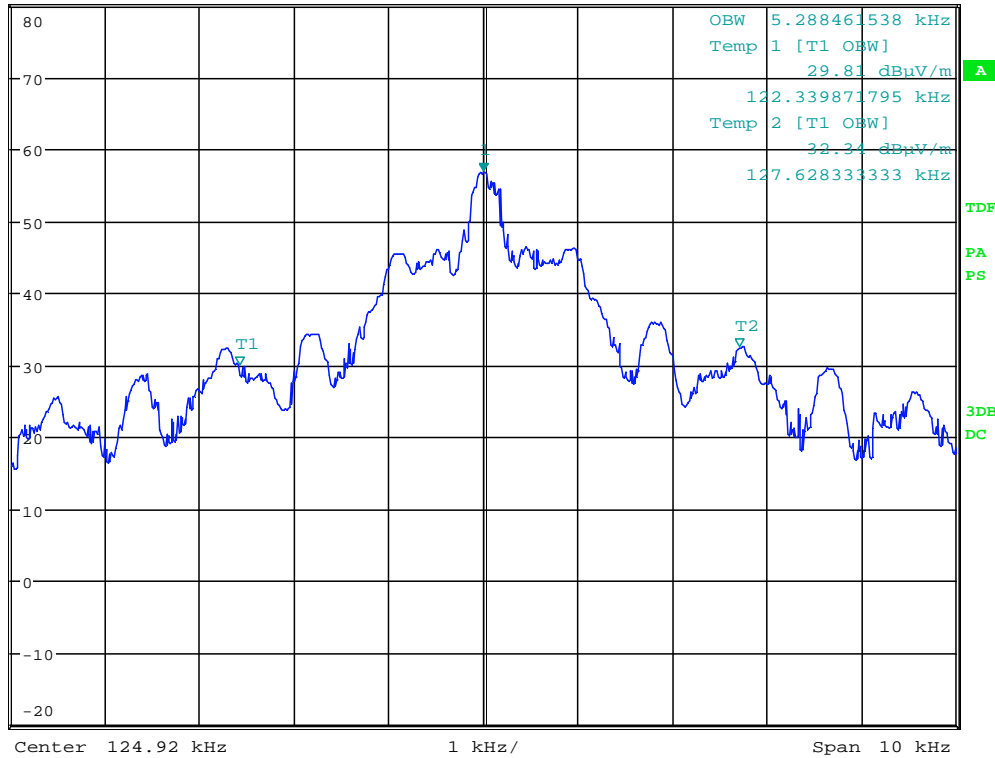
See attached plot.



MARKER 1
 124.92 kHz
 Ref 80 dBμV/m *Att 0 dB

*RBW 200 Hz
 VBW 500 Hz
 *SWT 1.8 s
 Marker 1 [T1]
 56.86 dBμV/m
 124.92000000 kHz

1 PK
 MAXH



Date: 27.OCT.2015 12:46:16

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: 2015.10.27
------------------------------------	--------------------------

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).

Calculated for 300 & 30 m :

Frequency	Distance m	Distance correction factor (dB)	Field Strength @10m (dB μ V/m)	Detector	Limit dB μ V/m	Margin dB
124.92 kHz	300	59.1	40.0	AV	84.8	44.8
2.5 MHz	30	19.1	23.8	QP	48.7	24.9
2.5 MHz	30	19.1	23.8	AV	42.6*	18.8

* Part 18.305 limit.

Measured duty-cycle during testing for complete pulse train was 56.76%, duty cycle for single bursts: 45%

The maximum is observed in transverse polarization.

Antenna factor, amplifier gain, chamber correction of -8.1 dB and cable loss are included in spectrum analyzer "Transducer factor".

See attached graphs.

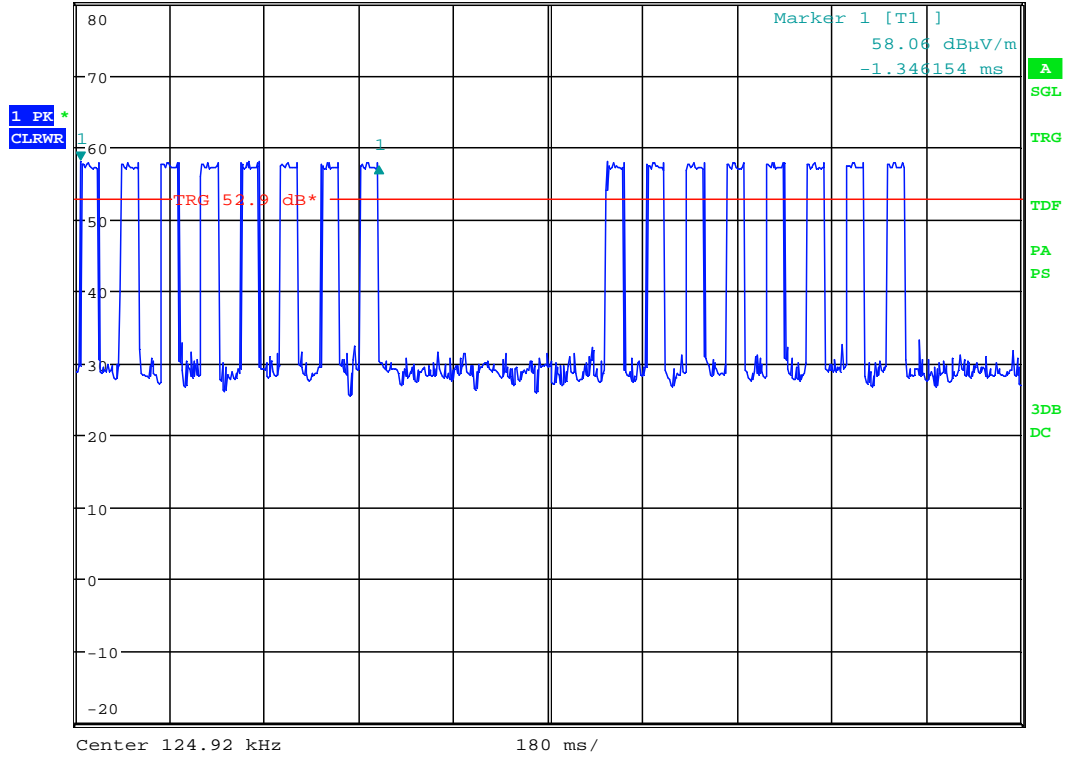
Requirement:

- (d) The emission limits shown in the above table are based on measurements employing a CISPR QuasiPeak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.



RBW 10 kHz Delta 1 [T1]
 VBW 30 kHz -0.93 dB
 SWT 1.8 s 568.269231 ms

Ref 80 dB μ V/m *Att 0 dB



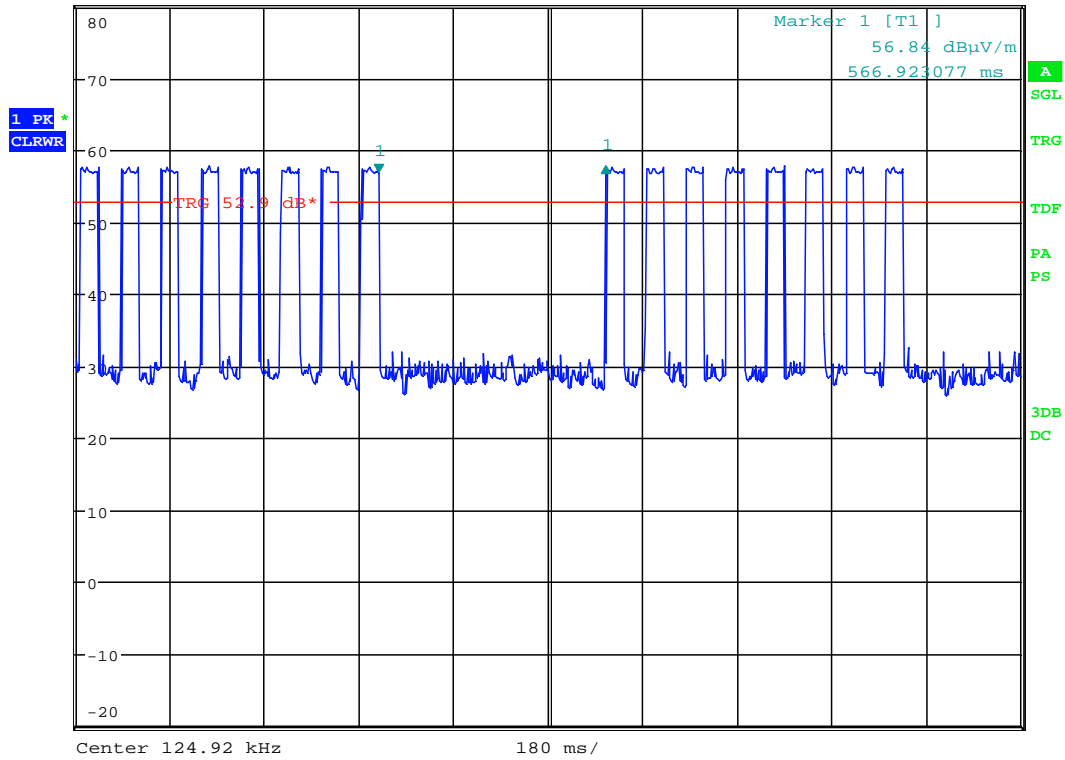
Date: 27.OCT.2015 12:34:55

ON time for 8 bursts (puls period)



RBW 10 kHz Delta 1 [T1]
 VBW 30 kHz 0.78 dB
 SWT 1.8 s 432.692308 ms

Ref 80 dB μ V/m *Att 0 dB



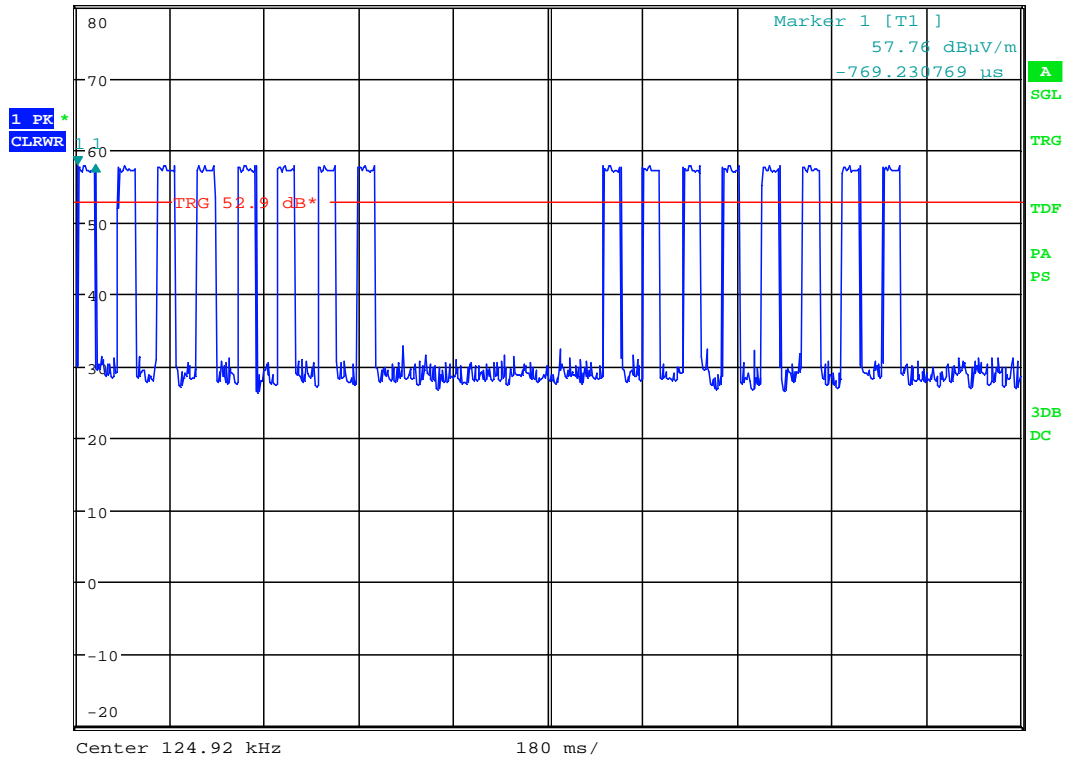
Date: 27.OCT.2015 12:33:07

Off time between 8 bursts (between puls period)



RBW 10 kHz Delta 1 [T1]
 VBW 30 kHz -0.00 dB
 SWT 1.8 s 33.269231 ms

Ref 80 dB μ V/m *Att 0 dB



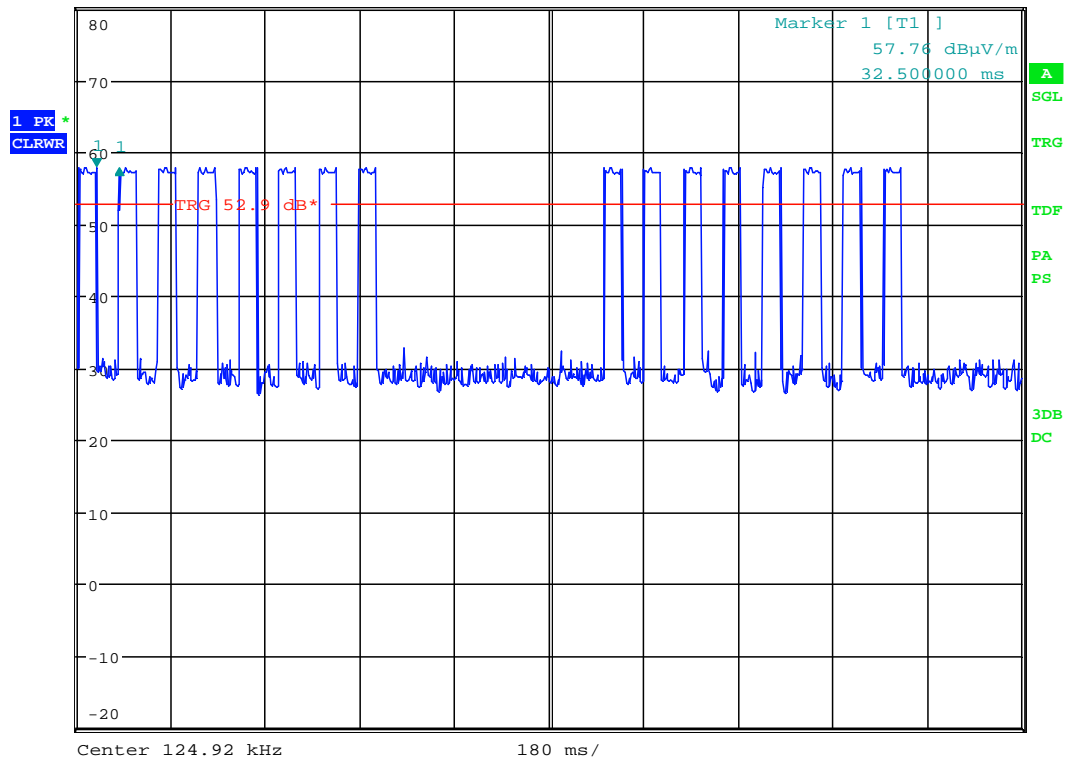
Date: 27.OCT.2015 12:39:56

On time for single burst



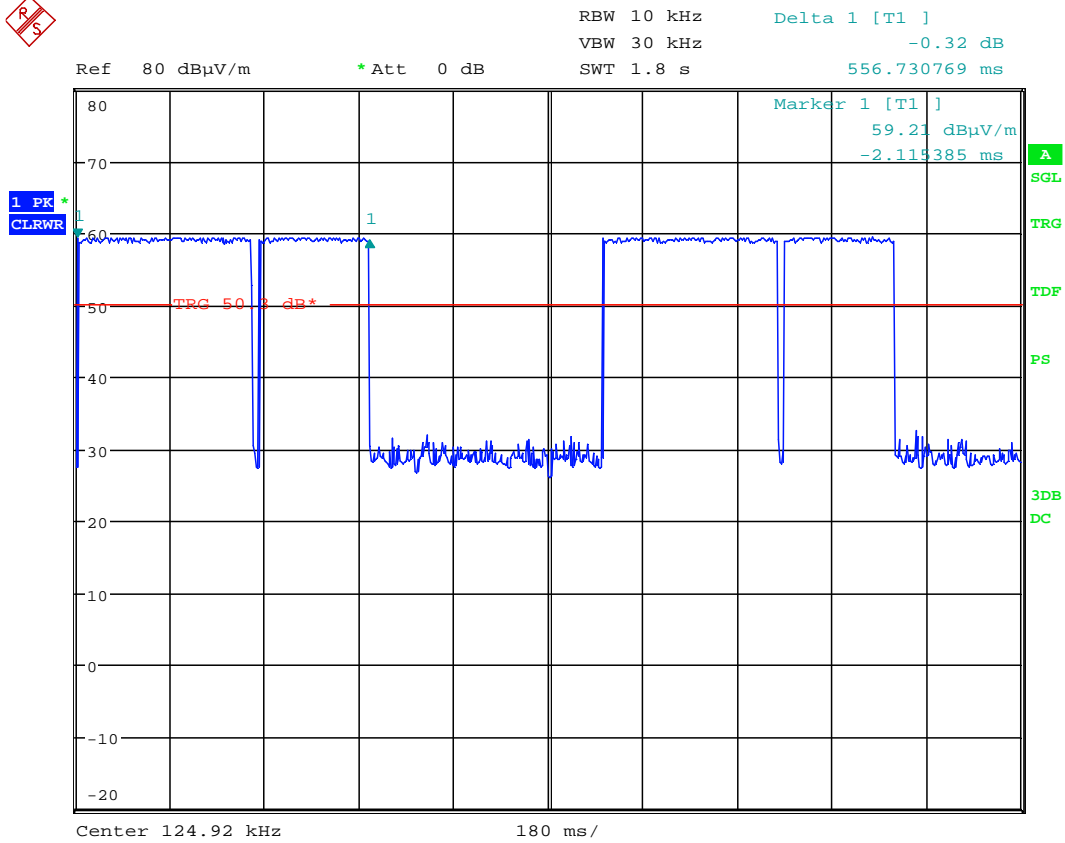
RBW 10 kHz Delta 1 [T1]
 VBW 30 kHz -0.15 dB
 SWT 1.8 s 43.269231 ms

Ref 80 dB μ V/m *Att 0 dB



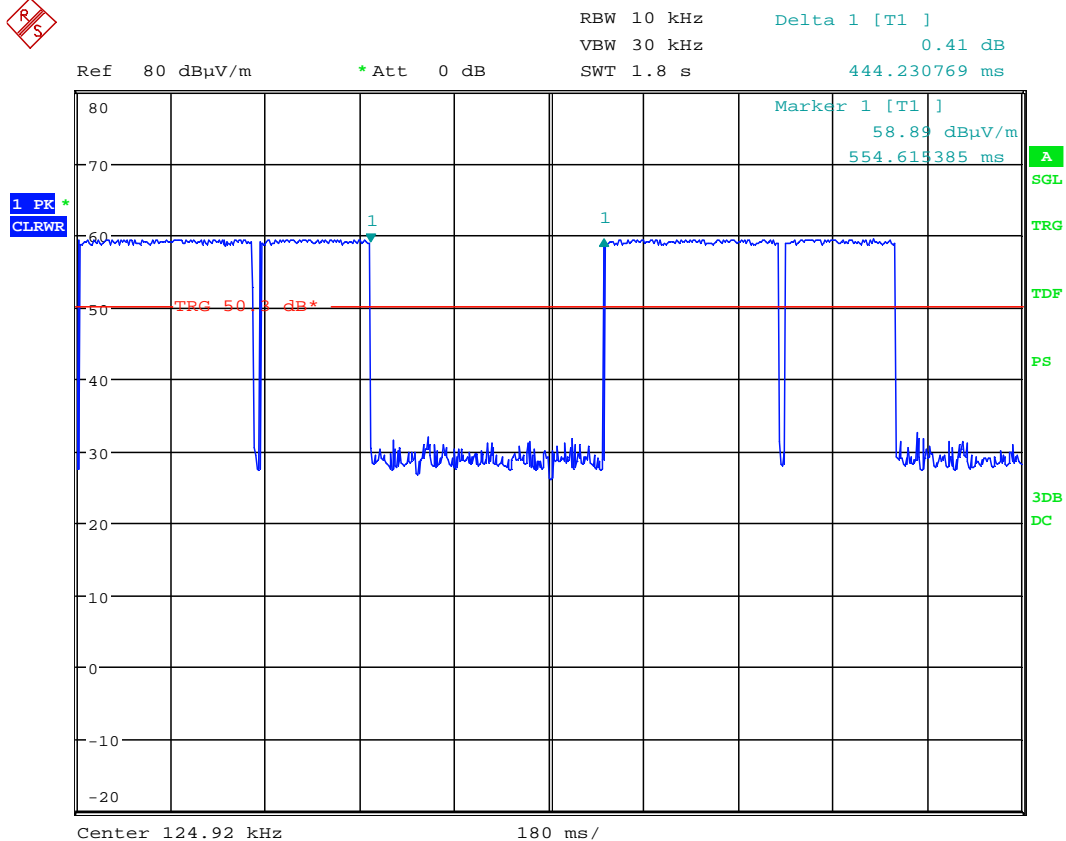
Date: 27.OCT.2015 12:40:46

Off time for single burst



Date: 27.OCT.2015 13:23:00

Puls type 2: ON time

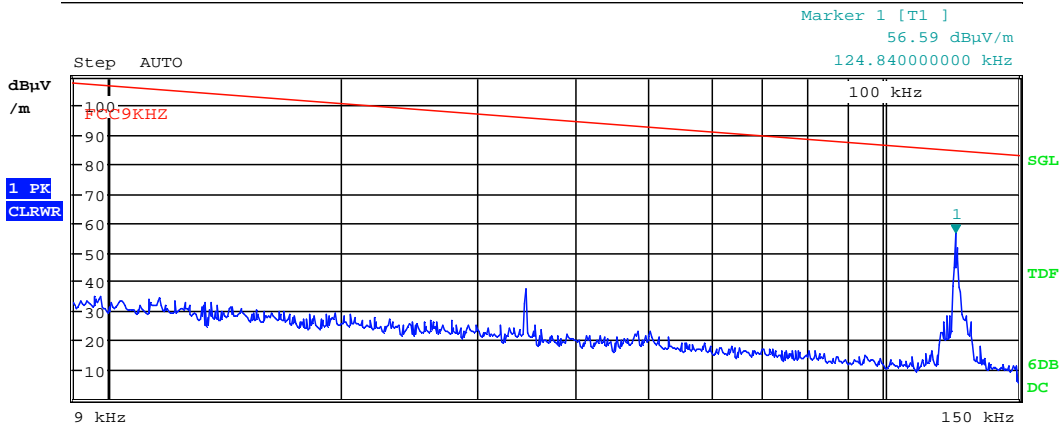
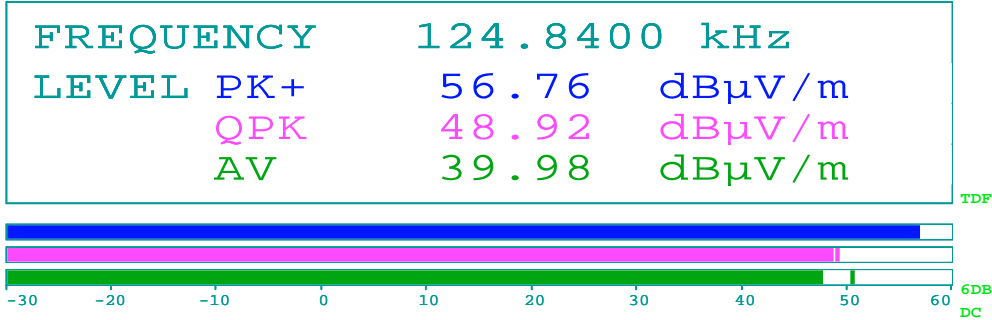


Date: 27.OCT.2015 13:23:43

Puls type 2: off time



Att 0 dB AUTO RBW 200 Hz
 MT 3 s
 PREAMP OFF

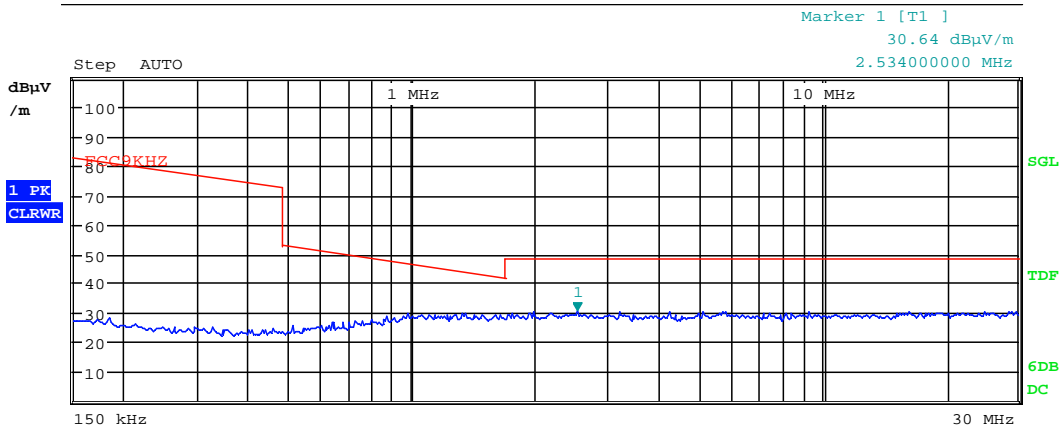
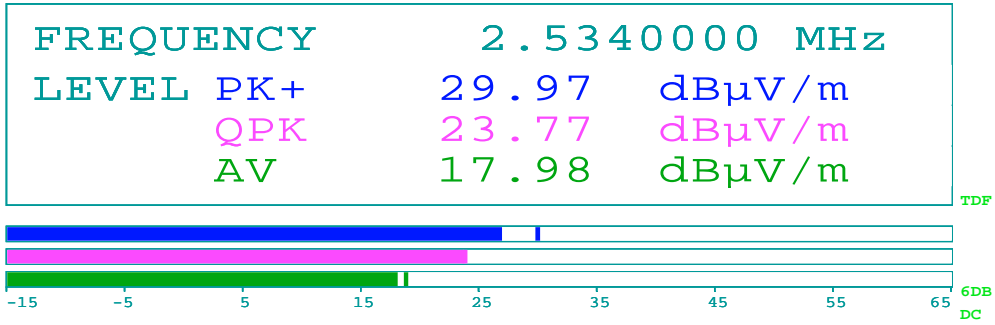


Date: 27.OCT.2015 13:07:18

9 kHz – 150 kHz



Att 0 dB AUTO RBW 9 kHz
 MT 3 s
 PREAMP OFF

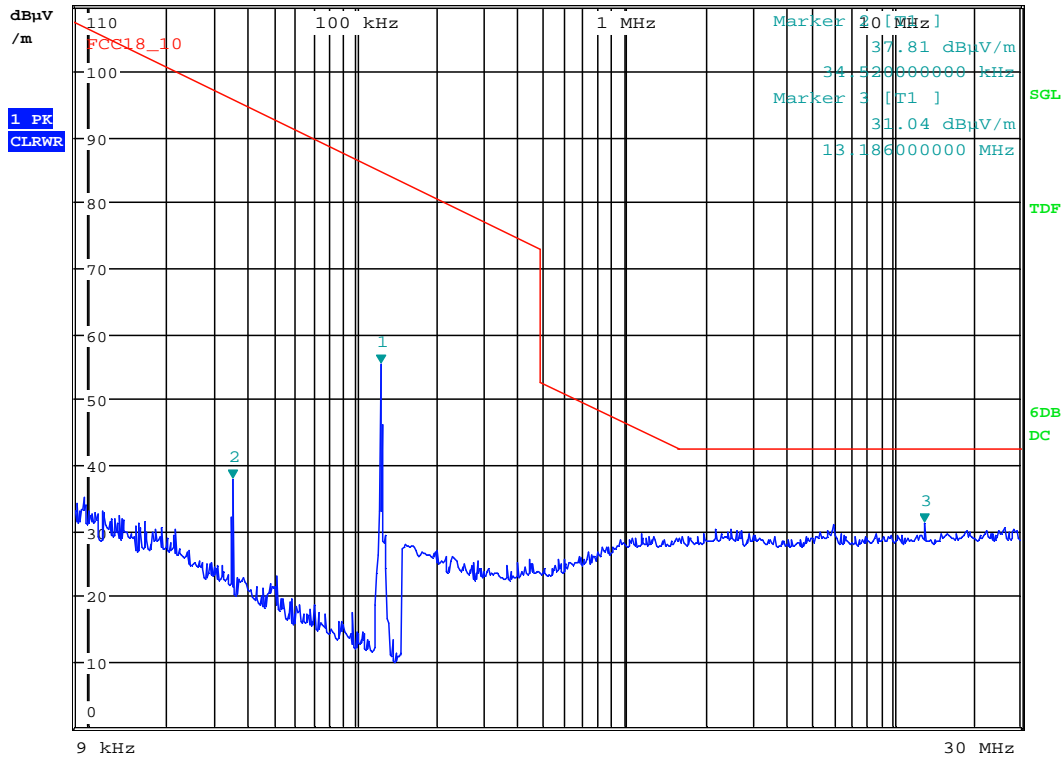


Date: 27.OCT.2015 13:15:07

150 kHz – 30 MHz



MARKER 1
 124.92 kHz
 Step AUTO Att 10 dB AUTO PREAMP ON
 RBW 9 kHz Marker 1 [T1]
 MT 50 ms 55.39 dBµV/m
 124.92000000 kHz



Date: 27.OCT.2015 12:56:44

Part 18.305 : 9 kHz - 30 MHz @ 10m

Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3m

Tested in all active mode

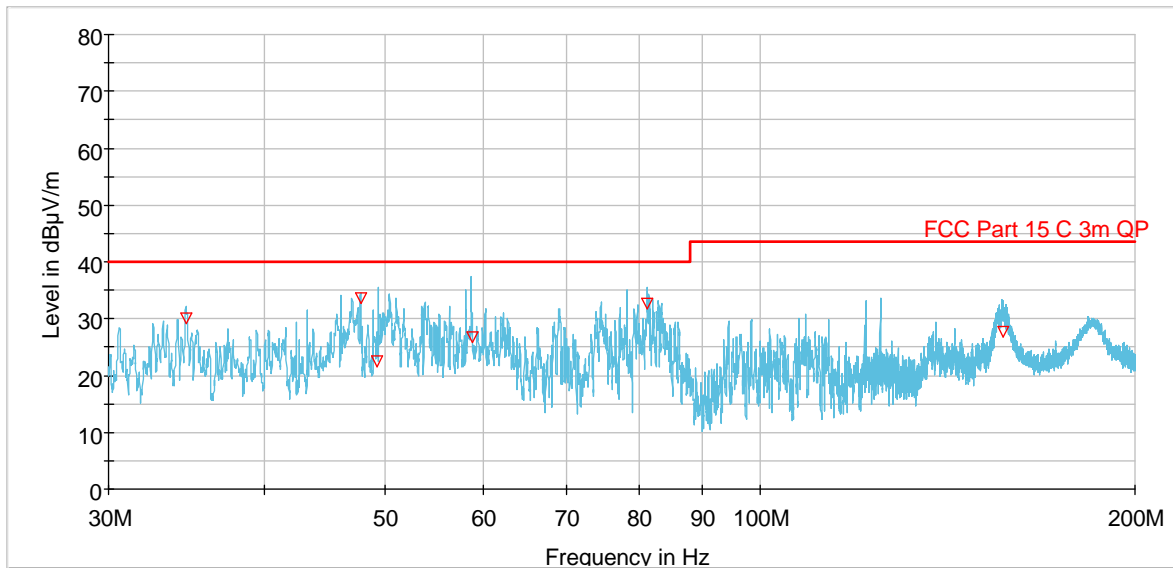
30 – 200MHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.669700	30.14	40.00	9.86	1000.0	120.000	100.0	V	1.0	-11.9
47.800500	33.65	40.00	6.35	1000.0	120.000	110.0	V	278.0	-14.6
49.327250	22.45	40.00	17.55	1000.0	120.000	100.0	V	4.0	-14.8
58.791050	26.81	40.00	13.19	1000.0	120.000	110.0	V	9.0	-15.5
81.234000	32.72	40.00	7.28	1000.0	120.000	110.0	V	139.0	-14.7
156.619350	27.76	43.50	15.74	1000.0	120.000	116.0	V	97.0	-10.5

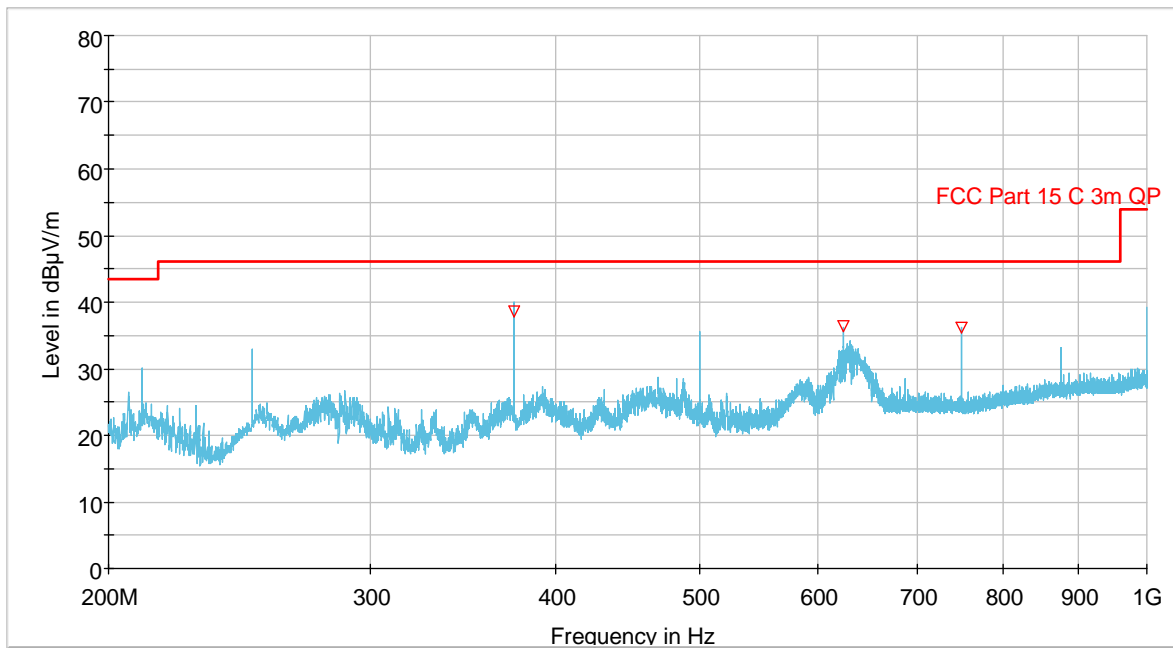
200 - 1000MHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
375.009350	38.62	46.00	7.38	1000.0	120.000	132.0	V	186.0	-7.0
625.016400	36.32	46.00	9.68	1000.0	120.000	110.0	V	94.0	-1.2
750.019550	36.24	46.00	9.76	1000.0	120.000	100.0	H	117.0	0.3

See attached graphs.



30 – 200MHz



200 - 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

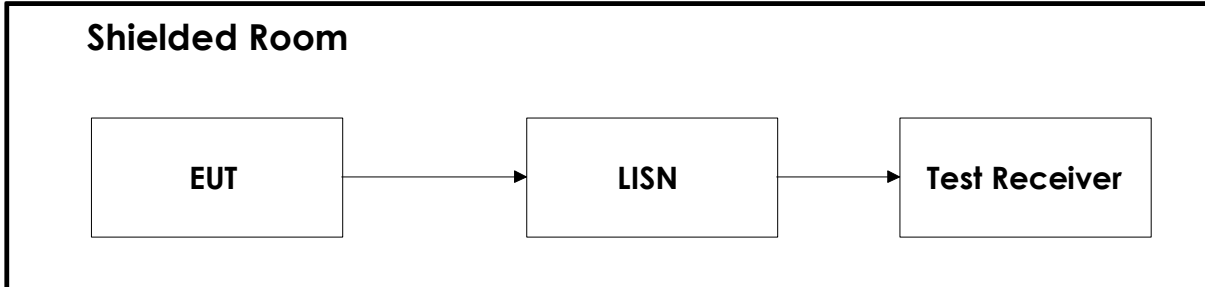
5 LIST OF TEST EQUIPMENT

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.

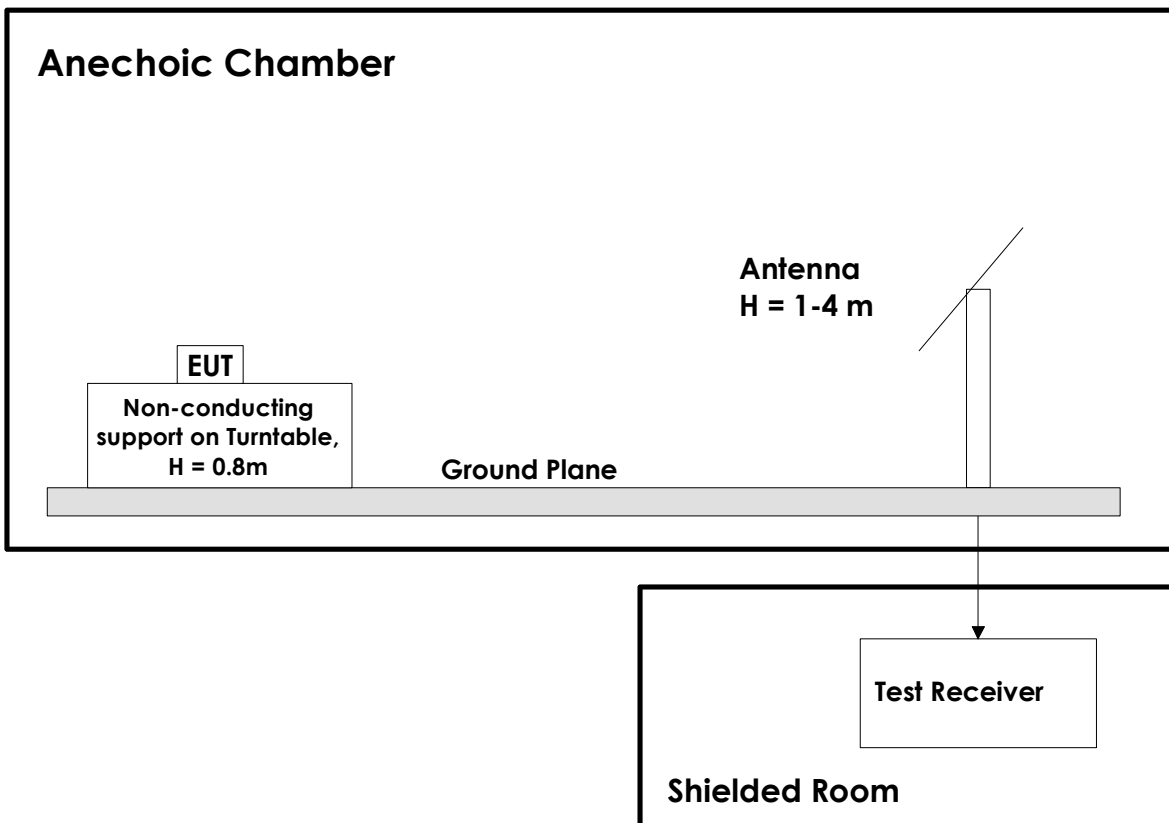
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2014.11	2015.11
2.	HFH2-Z2	Loop antenna	Rohde & Schwarz	LR1660	2014.10	2017.10
3.	3115	Antenna horn	EMCO	LR 1330	2010.08	2017.08
4.	HK116	Biconical Antenna	Rohde & 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	2015.09	2016.09
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	2015.10.27	Version for TCB review	GNS
1.1	2015.10.27	Editorial correction	FS
1.2	2015.12.21	Corrections after TCB review	FS