Report No. 284966-1

Test Report

Product	RFID Transceiver Module
Name and address of the applicant	ASSA ABLOY Hospitality AS Anolitveien 1-3, 1400 Ski, Norway
Name and address of the manufacturer	ASSA ABLOY Hospitality AS Anolitveien 1-3, 1400 Ski, Norway
Model	LCU6334
Rating	4.5Vdc
Trademark	ASSA ABLOY
Serial number	/
Additional information	RFID -13.56MHz
Tested according to	**FCC Part 15.225** Low Power Transmitter **13.110 - 14.010 MHz Band** **Industry Canada RSS-210, Issue 8** Low Power Licence-Exempt Radiocommunications Devices
Order number	284966
Tested in period	2015.05.13 - 2015.05.27
Issue date	2015.07.30
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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ENTERPRISE NUMBER NO974404532

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1 INFORMATION

1.1 Test Item

Name :	ASSA ABLOY
FCC ID :	Y7V-0020507372
Industry Canada ID :	9514A-LCU6334
Model/version :	LCU6334
Serial number :	/
Hardware identity and/or version:	4825810-A-000
Software identity and/or version :	C3GR201N
Frequency Range :	13.553-13.567 MHz
Tunable Bands :	None
Number of Channels :	1
Operating Modes :	Transmitter
Type of Modulation :	ISO 14443-A
User Frequency Adjustment :	None
Type of Power Supply :	Primary battries 3x 1.5Vdc(4.5Vdc)
Antenna Connector :	Integral loop antenna
Antenna Diversity Supported :	None
Desktop Charger :	None

Description of Test Item

The tested EUT is a RFID transceiver Module. The EUT supports several RFID standards, ISO 14443-A, ISO 14443-B and ISO 15693. On a higher level it supports MIFARE communication and encryption.

The transceiver's oscillator is controlled by a 27.12MHz crystal.

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. MPE Calculation at 20 cm satisfying FCC requirements is submitted as a separate document.

The EUT is exempted from RF Exposure Evaluation to Industry Canada requirements since the output power complies with the power levels of section 2.5.1 of RSS-102 Issue 5.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	4.5Vdc

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 5.

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 15.225 and Industry Canada RSS-210 Issue 8.

Tests were performed in accordance with ANSI C63.4-2014 and KDB 55074 D01 DTS Measurment Guidance v02.

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 reference	RSS-210 Issue 8 & RSS-GEN Issue 4	Result
Supply Voltage Variations	15.31(e)	N/A	Complies [1]
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	NA [2]
Power-line Conducted Emission	15.207(c)	7.2.2 (RSS-GEN)	N/A [1]
Occupied Bandwidth	N/A	4.6.1 (RSS-GEN)	-
Peak Power Output	15.225(a)	A2.6	Complies
Band Emissions	15.225(b)(c)	A.2.6(b)(c)	Complies
Spurious Emissions (Radiated)	15.225 (d) 15.209	A2.6(d) 4.9 (RSS-GEN)	Complies
Frequency stability	15.225(e)	A2.6	Complies

[1] EUT is battery powered.

[2] Integral loop antenna

RSS Gen issue 4 covers section 7 & 6

RSS 210 issue 8 covers section A2.9

2.3 Description of modification for Modification Filing

Not applicable.

2.4 Comments

And the output level is set to maximum in the software.

The radiated measurements are tested on three axis.

Two fully charged primary batteries are used.

All ports were populated during spurious emission measurements.

2.5 Family List Rational

Not Applicable.

3 TEST RESULTS

3.1 Occupied Bandwidth

Para. No.: RSS-Gen

Test Performed By: G.Suhanthakumar	**Date of Test: 13-May-2015**

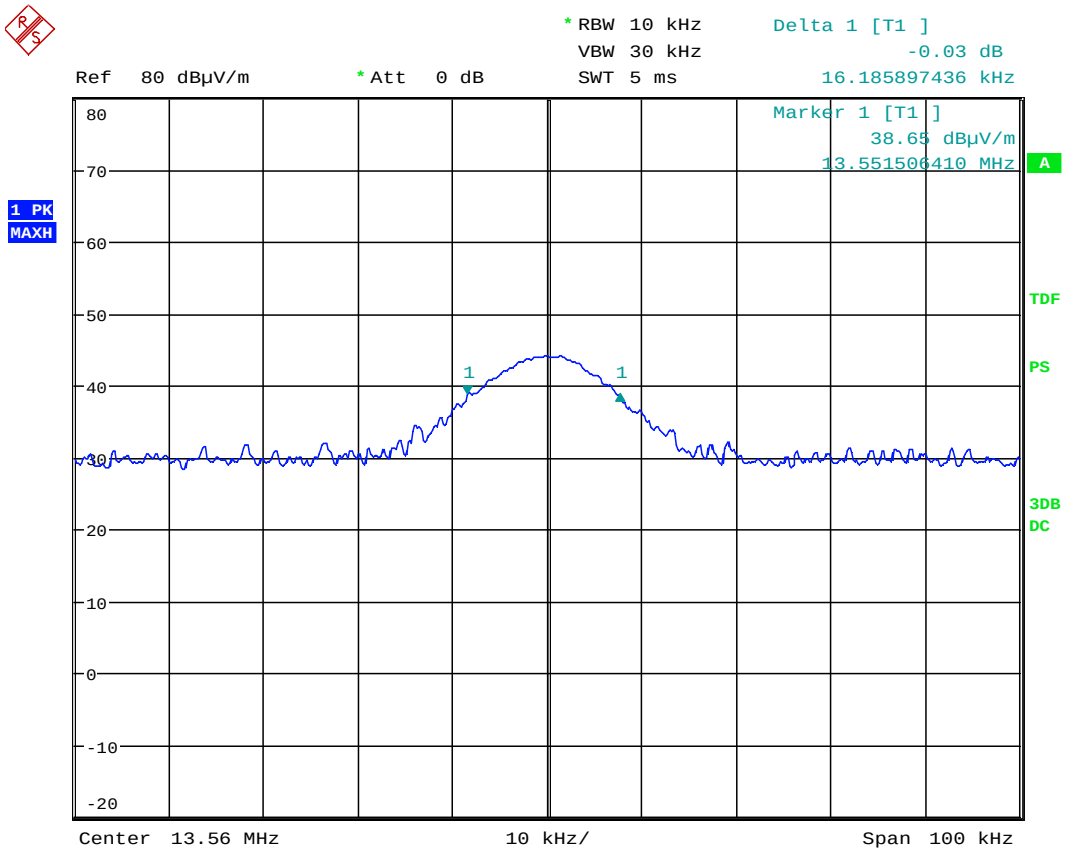
Test Results: Complies

Measurement Data:

OBW (kHz)
13.56MHz
16.2

Requirements:

For information only



Date: 13.MAY.2015 09:54:21

13.56MHz – OBW – 16.2kHz

3.2 Peak power output

Para. No.: 15.225 (a) / A2.9

Test Performed By: G.Suhanthakumar	**Date of Test: 13 May 2015**

Test Results: Complies

Measurement data:

Maximum field strength

RF channel	Measured PK value (dBµV/m) @ 10m	Distance Correction factor dB	Converted Limit @10m (dBµV/m)
13.56MHz	44.2	-19.5	103.5

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

Radiated measurements are performed at 10 m distance.

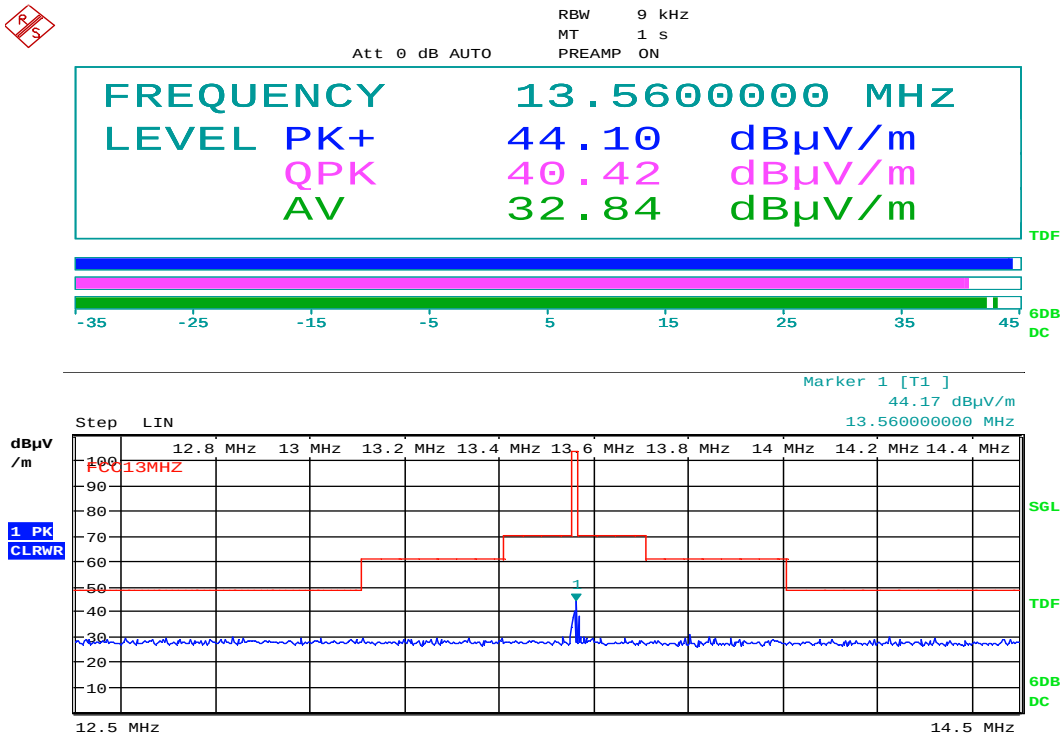
Detachable antenna?	☐ Yes	☒ No
If detachable, is the antenna connector non-standard?	☐ Yes	☐ No
Integral loop antenna		

New batteries were used.

Requirements:

The maximum field strength within band 13.553 – 13.567MHz at 30 meters shall be ≤ 84.0 dBµV/m (at 10 meters ≤ 103.5 dBµV/m)

(b) 334 microvolts/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz. (at 10 meters ≤ 70.0 dBµV/m)
(c) 106 microvolts/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz. (at 10 meters ≤ 60.0 dBµV/m)



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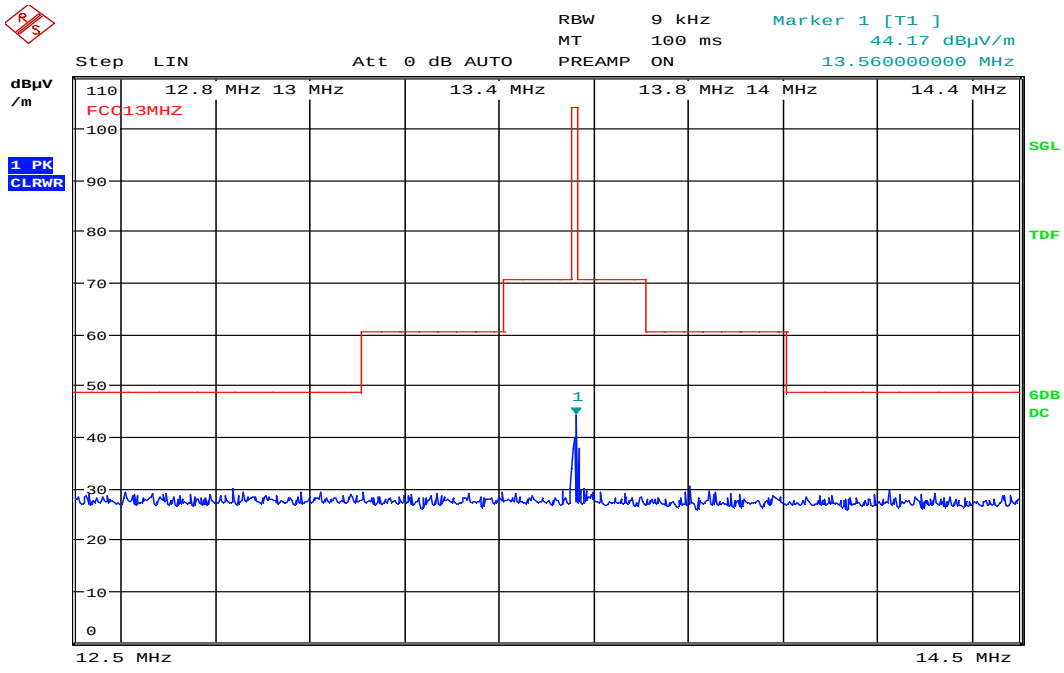


Date: 13.MAY.2015 10:02:56

Field strength at longitudinal polarization – 13.56MHz

3.3 Spurious emissions (radiated)

Para. No.: 15.209 / 15.225 (b,c,d) / A2.6 / 4.9

Test Performed By: G.Suhanthakumar	**Date of Test: 13.May.2015**

Test Results: Complies
Measurement Data:

Radiated Emissions with loop antenna, 9kHz – 30MHz
measured at a distance of 10m.

Measured with Peak Detector:

Frequency	Dist. corr. factor	Measured Field strength, Peak @ 10m	Duty cycle corr. factor	Calculated Field strength, Average @ 300m	Limit @ 300m	Margin
kHz	dB	dBµV/m	dB	dBµV/m	dBµV/m	dB
10	59.1	35.56	-0.36	-23.1	47.6	24.5
34.5	59.1	34.95	-0.36	-23.8	36.8	13.0

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

The above detected frequencies lies within the band 9 – 90kHz . The emission limit in this band is based on average detector.

The maximum is observed in longitudinal polarization

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

Duty Cycle Correction Factor Calculation:

RF duty cycle: Calculation according to RF burst Para 15.35 (c)

Measured Pulse train perod= 69 ms, First burst ON duration : 35.12 ms , 2nd & 3rd ON time: 2X 17.44ms=34.88

DC Correction factor = -20 x log((70 ms) / 73ms) = -0.36 dB

Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB

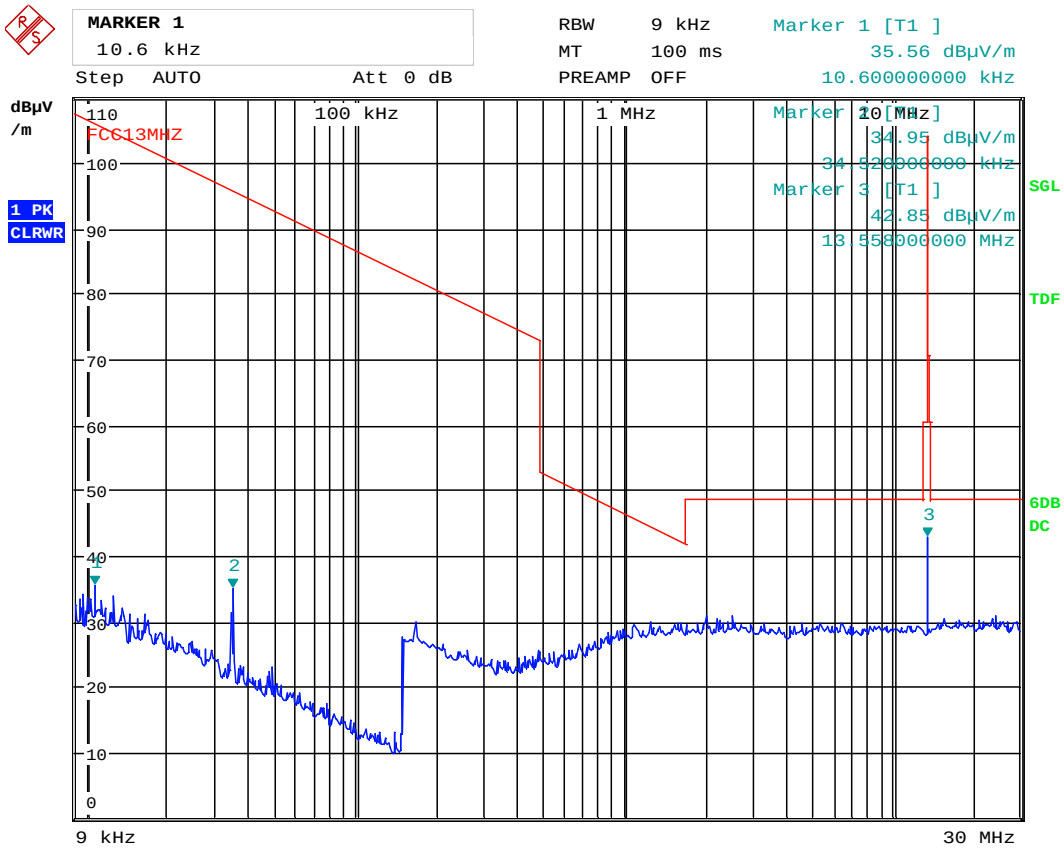
Requirement:

(d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Radiated emissions 9kHz – 30 MHz.

Detector: Peak

Measuring distance 10 m. The limit is corrected to 10m distance.



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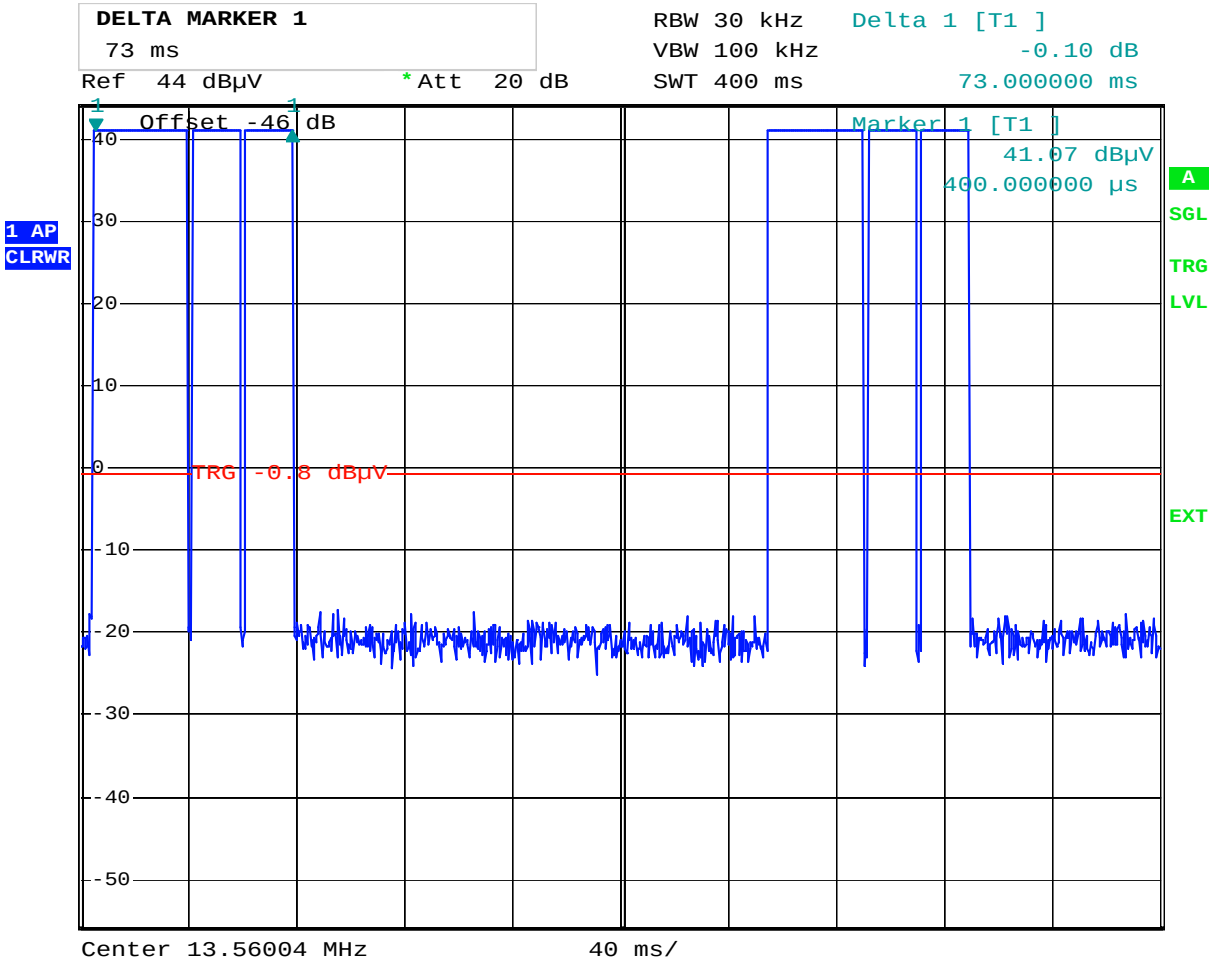

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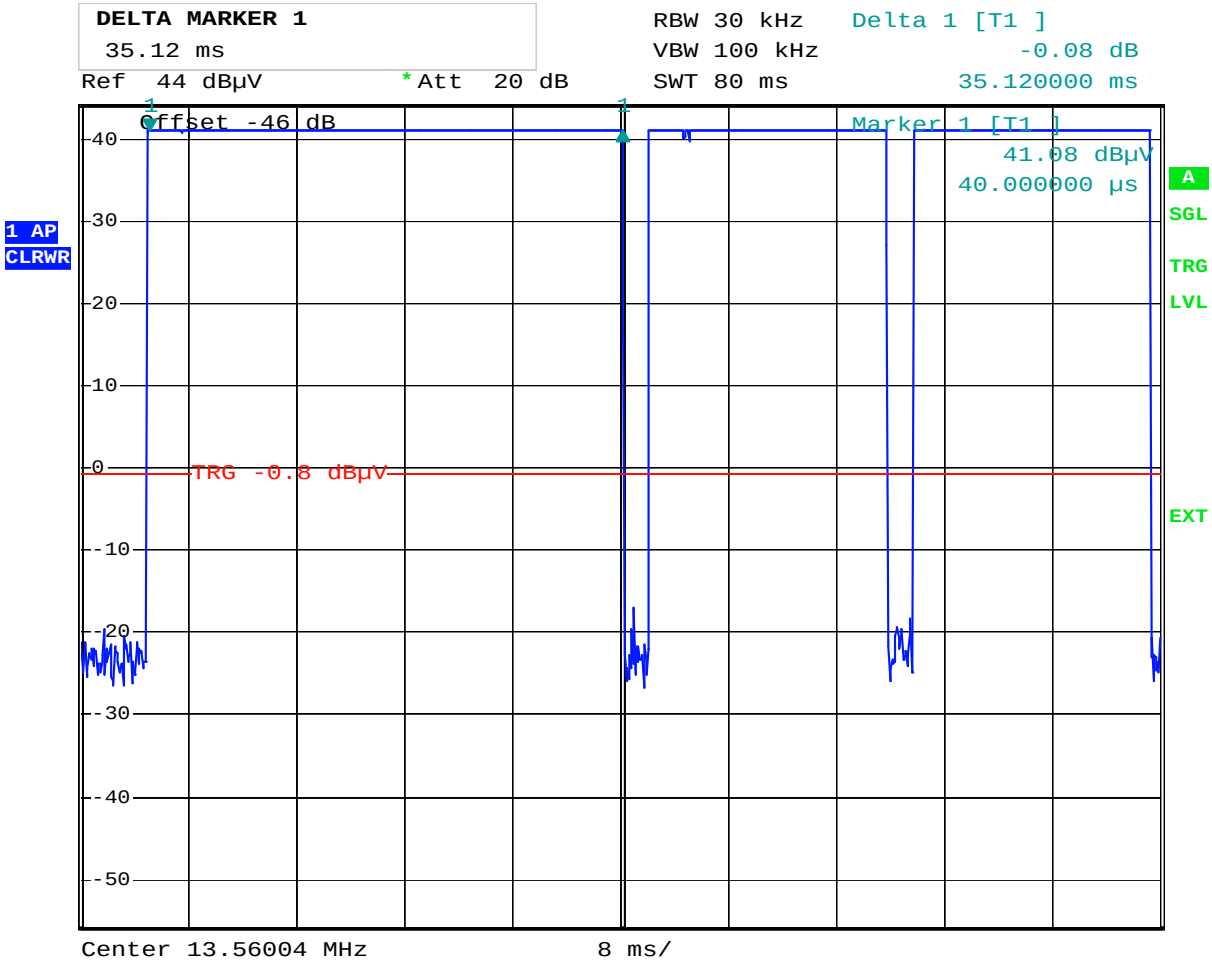
Pulse train period



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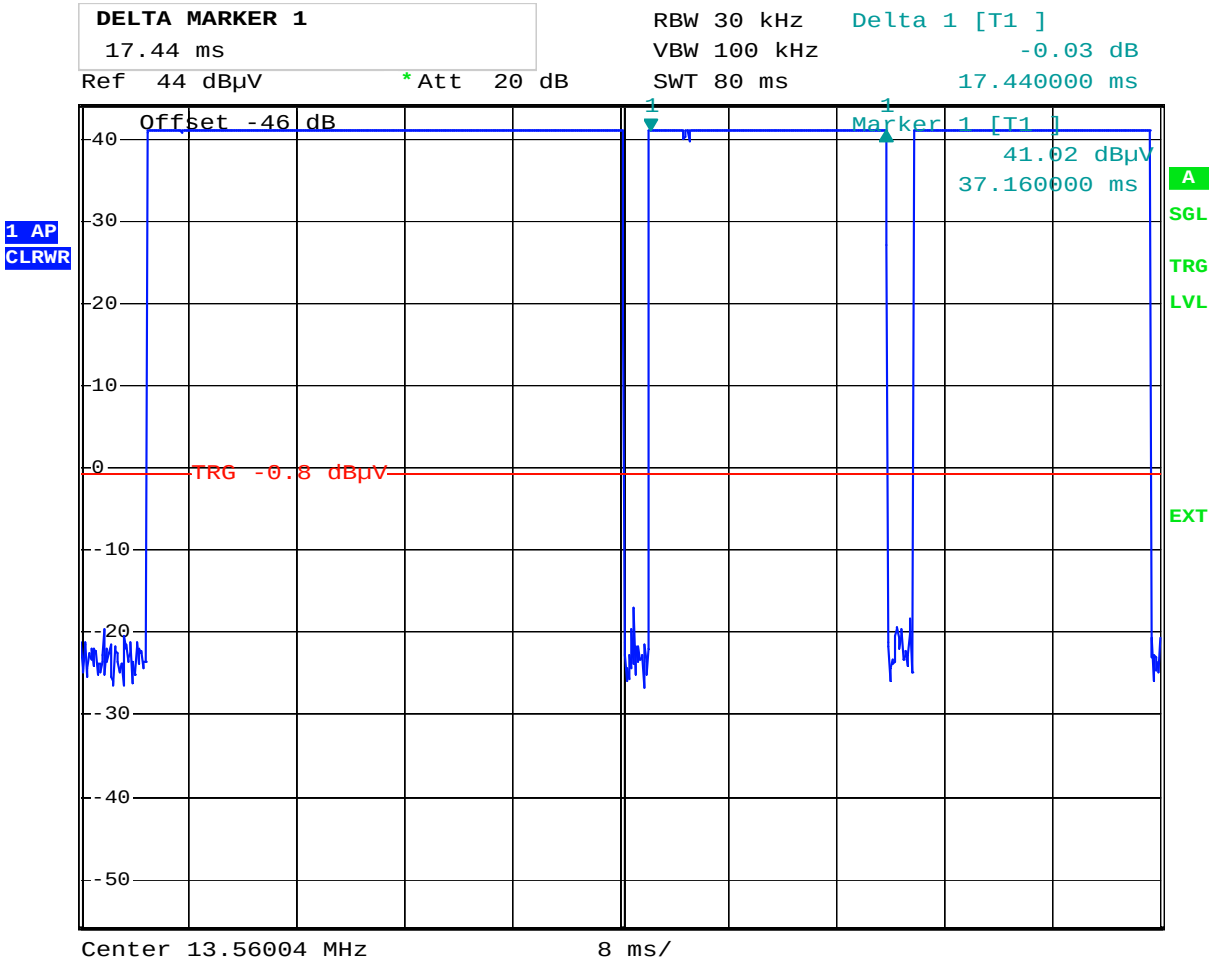
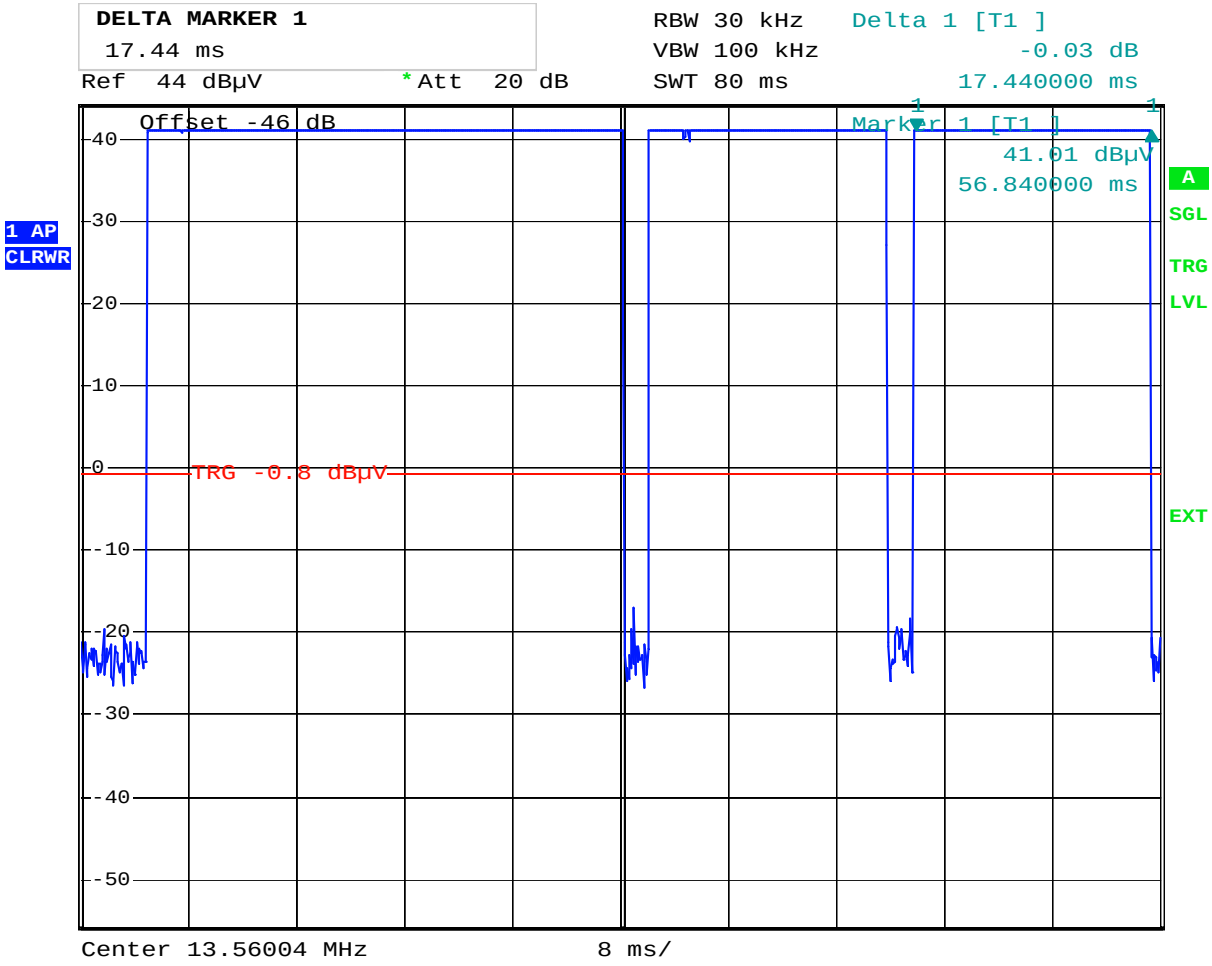
First burst ON time



Date: 27.MAY.2015 11:07:17

Second burst ON time



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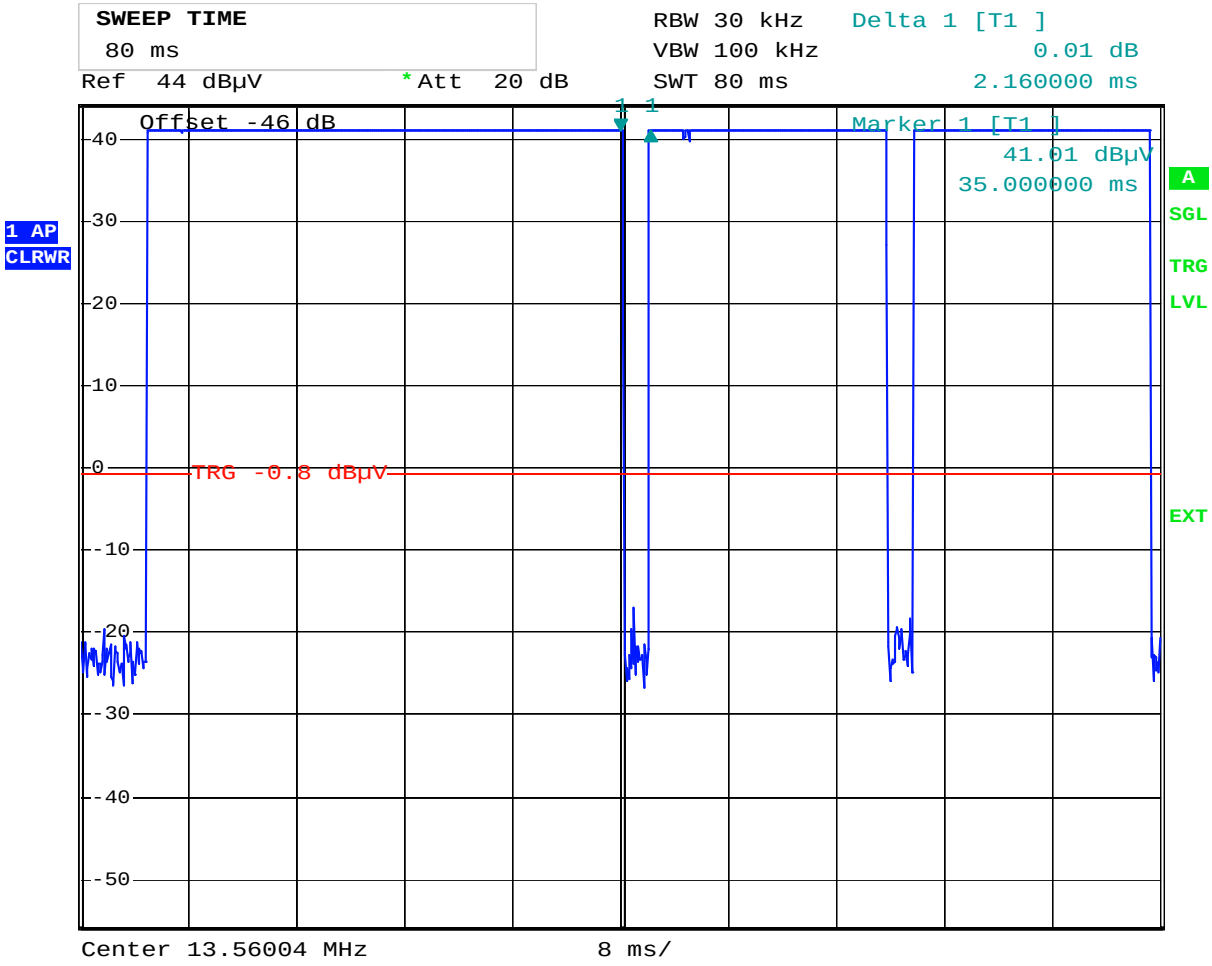
Third busrt ON time



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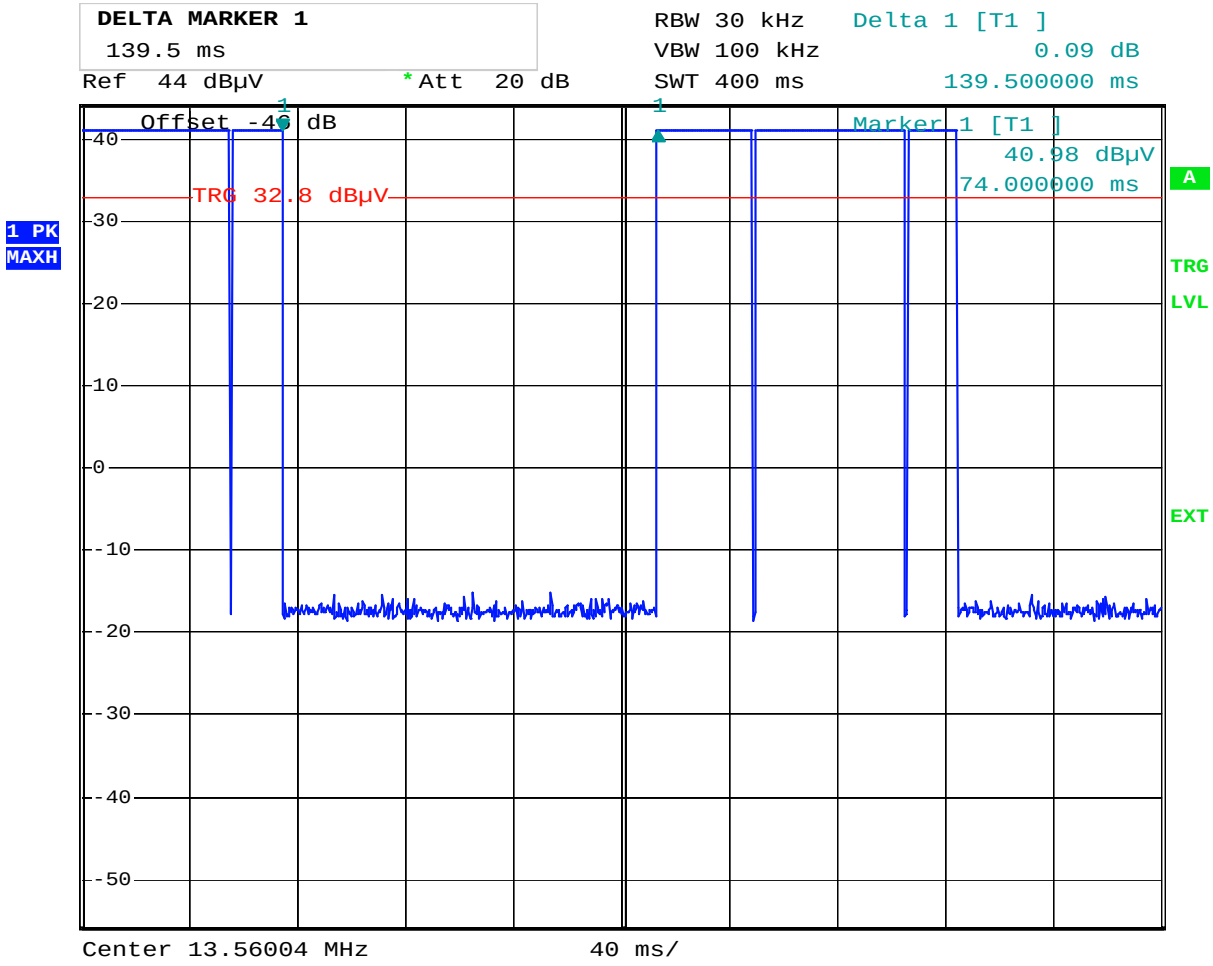
OFF time between the bursts



Date: 27.MAY.2015 11:00:14

OFF time between pulse train

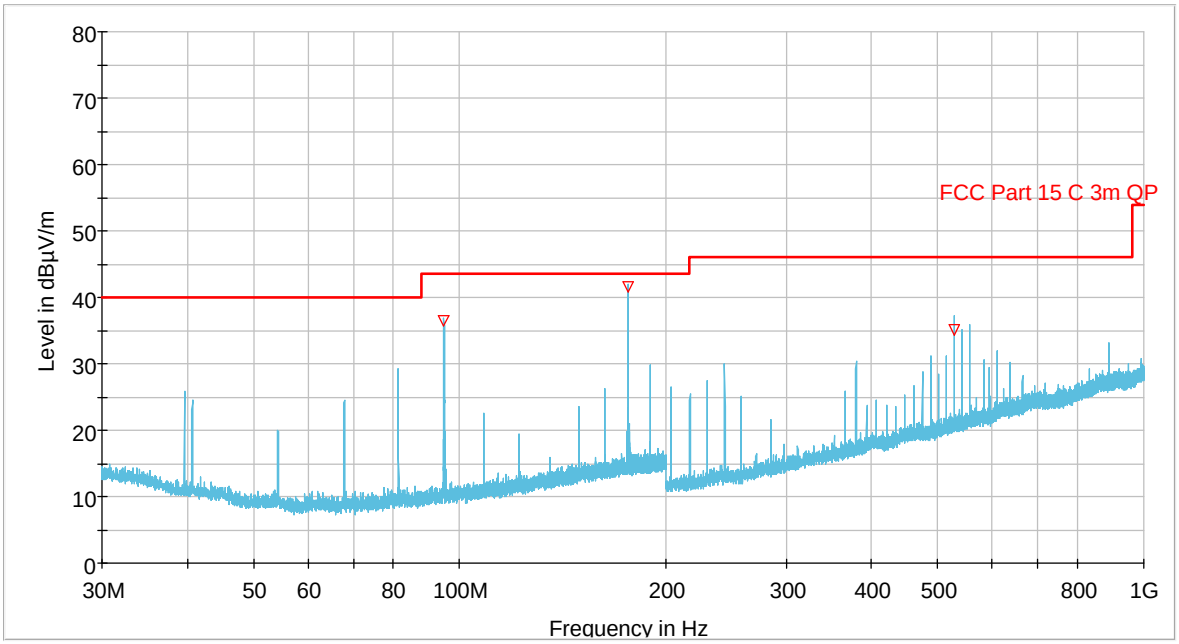
Radiated emissions 30 – 1000 MHz.

Detector: QP

Measuring distance 3 m.

The graph shows peak scan and highest values.

FCC Pt15 Class C 30-1000 MHz 3m



30 - 1000MHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
94.919900	36.40	43.50	7.10	1000.0	120.000	173.0	H	75.0	-14.1
176.280100	41.55	43.50	1.95	1000.0	120.000	188.0	H	264.0	-9.9
528.840950	35.06	46.00	10.94	1000.0	120.000	113.0	V	1.0	-3.3

3.4 Transmitter Frequency Stability

Para. No.: 15.225(e)/A2.6

Test Performed By: G.Suhanthakumar	**Date of Test: 27-May-2015**

Measurement Data:

Temperature	Given Frequency (MHz)	Measured value (MHz)	Deviation (%)
+50 ° C	13.56	13.56000	0.0
+40 ° C	13.56	13.56001	-0.0007
+30 ° C	13.56	13.56002	-0.0002
+20 ° C	13.56	13.56005	-0.0004
+10 ° C	13.56	13.560045	-0.0003
+0 ° C	13.56	13.560075	-0.0006
-10 ° C	13.56	13.560085	-0.0006
-20 ° C	13.56	13.560055	-0.0004

Supply voltage:4.5Vdc (fully charged battery)

Requirement:

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage.

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

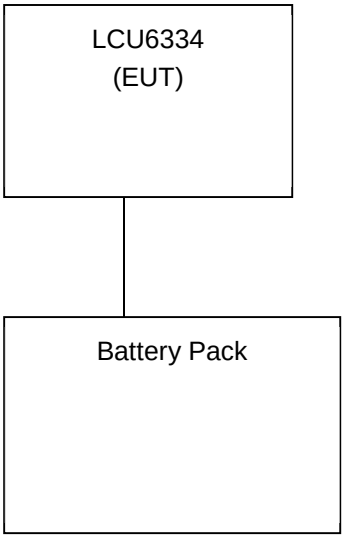
5 LIST OF TEST EQUIPMENT

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.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2014.11	2015.11
2.	6810.17A	Attenuator	Suhner	LR 1137	2015.03.26	2017.03.26
3.	87V	Multimeter, Digital	Fluke	N4672	2014.09.17	2015.09.17
4.	HL223	Antenna log.per	Rohde & Schwarz	LR 1261	2013.12.05	2016.12.05
5.	HK116	Antenna biconic	Rohde & Schwarz	LR 1260	2013.12.05	2016.12.05
6.	LNA6900	Amplifier, low noise	Teseq	LR1593	2014.07	2015.07
7.	FSP 30	Spectrum analyser	R &S	LR 1505	2013.09	2015.09
8.	VC4060	Climatic chamber Temp	Vøtsch	LR 1435	2015.03.16	2016.03.16
9.	A 10-B	Rubidium	Quartzlock	LR 1386	2014.02	2016.02
10.	FA210A1010 003030	Microwave cable	Rosenberger	LR1566	Cal b4 use	
11.	3115	Antenna horn	EMCO	LR 1226	2013.10	2018.10
12.	017	Power Supply	Oltronix	B300	Cal b4 use	
13.	HFH2-Z4	Antenna Inductive Probe	R & S	LR 1100	Cal b4 use	

6 BLOCK DIAGRAM

6.1 System set up for radiated measurements



Test equipment: 1,3,4,5,6

6.2 Test Site Radiated Emission