

Test Report

Product	WiFi Cordless Phone with DECT and NFC		
Name and address of the applicant	Ascom Sweden AB Grimbodalen 2P.O.Box 8783 SE-40276 Goteborg,Sweden		
Name and address of the manufacturer	Ascom Sweden AB Grimbodalen 2P.O.Box 8783 SE-40276 Goteborg,Sweden		
Model	SH1-ABBA		
Rating	3.7Vdc , 5.63Wh (Li-Ion Rechargeble battery)		
Trademark	Ascom		
Serial number	T261062CKB		
Additional information	802.11a/b/g/n, DECT 6.0, NFC		
Tested according to	FCC Part 15.225 Low Power Transmitter 13.110 - 14.010 MHz Band Industry Canada RSS-210, Issue 9 Low Power Licence-Exempt Radiocommunications Devices		
Order number	324798		
Tested in period	2017.02.28 - 2017.03.01		
Issue date	2017.03.06		
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]			
This report shall not be reproduced except in full without the written approval of Nemko. Opinions and interpretations expressed within this report are not part of the current accreditation. This report was originally distributed electronically with digital signatures. For more information contact Nemko.			

CONTENTS

1	INFORMATION	3
1.1	Test Item.....	3
1.2	Test Environment.....	4
1.2.1	Normal test condition	4
1.3	Test Engineer(s)	4
1.4	Test Equipment.....	4
2	TEST REPORT SUMMARY	5
2.1	General	5
2.2	Test Summary	6
2.3	Description of modification for Modification Filing	6
2.4	Comments	6
2.5	Family List Rational	6
3	TEST RESULTS.....	7
3.1	Occupied Bandwidth.....	7
3.2	Fundamental Field Strength	9
3.3	Spurious emissions (radiated)	11
3.4	Transmitter Frequency Stability	15
4	Measurement Uncertainty	16
5	LIST OF TEST EQUIPMENT.....	17
6	BLOCK DIAGRAM	18
6.1	System set up for radiated measurements	18
6.2	Test Site Radiated Emission	19

1 INFORMATION

1.1 Test Item

Name :	Ascom
FCC ID :	BXZSH1B2
Industry Canada ID :	3724B-SH1B2
Model/version :	SH1-ABBA SH1-ABBB
Serial number :	T261062CKB
Hardware identity and/or version:	SH1-ABBA/PF
Software identity and/or version :	SW000639/8.0.0_beta
Frequency Range :	13.553-13.567 MHz
Tunable Bands :	None
Number of Channels :	1
Operating Modes :	Transmitter
Type of Modulation :	FSK
User Frequency Adjustment :	None
Type of Power Supply :	3.7Vdc (rechargeable battery)
Antenna Connector :	Integral loop antenna
Antenna Diversity Supported :	None

Description of Test Item

Professional Smartphone designed for mission critical communication.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	3.7Vdc

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 traceable 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 9.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

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

DXX 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".

Nemko Group authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any reproduction of parts of this report requires approval in writing from Nemko Group.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this report.

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 9 & RSS-GEN Issue 4	Result
Supply Voltage Variations	15.31(e)	N/A	Complies ¹
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	Complies
Power-line Conducted Emission	15.207(c)	7.2.2 (RSS-GEN)	N/A ¹
Occupied Bandwidth	N/A	4.6.1 (RSS-GEN)	N/A
Fundamental Field strength	15.225(a)	B.6(a)	Complies
Band Emissions	15.225(b)(c)	B.6(b)(c)	Complies
Spurious Emissions (Radiated)	15.225 (d) 15.209	B.6(d) 4.9 (RSS-GEN)	Complies
Frequency stability	15.225(e)	B.6	Complies

¹ EUT is battery powered.

² Integral loop antenna

RSS Gen issue 4 covers section 7 & 6

RSS 210 issue 9 covers section B.6

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 secondary 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: 2017-03-01

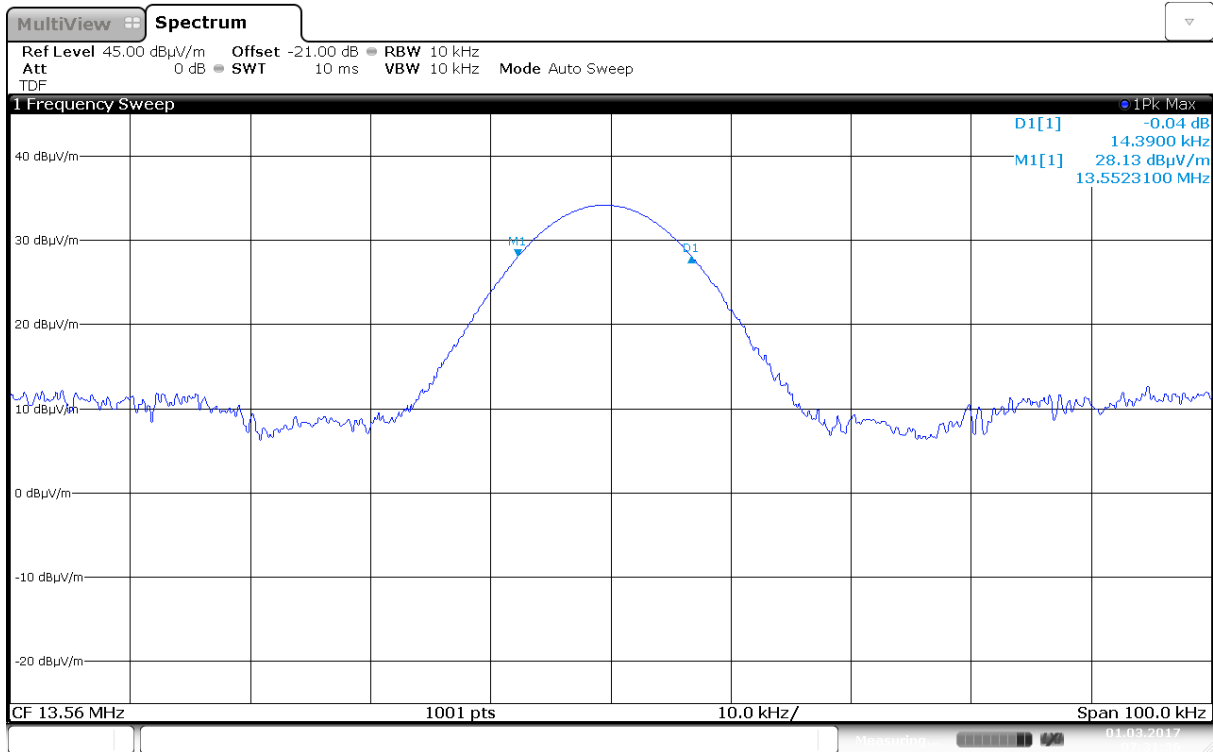
Test Results: Complies

Measurement Data:

6 dB BW (kHz)
13.56MHz
14.39

Requirements:

For information only



13.56MHz – 6dB BW– 14.39kHz

3.2 Fundamental Field Strength

Para. No.: 15.225 (a) / B.6 (a)

Test Performed By: G.Suwanthakumar

Date of Test: 2017-02-28

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	35.92	-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:

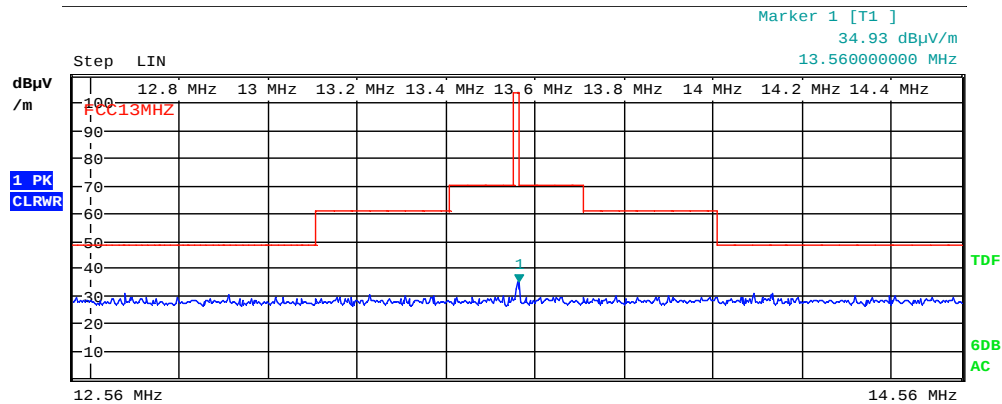
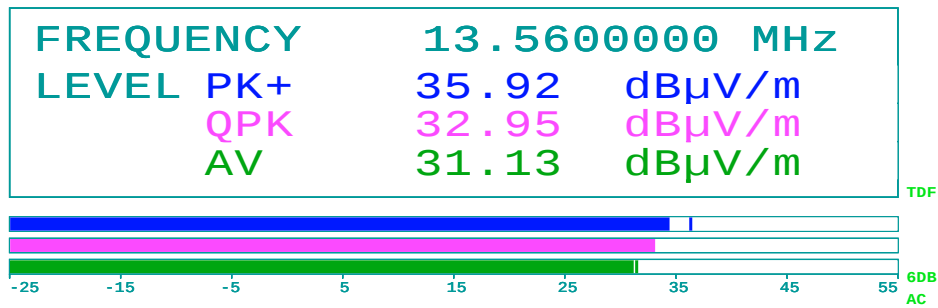
The maximum field strength within band 13.553 – 13.567MHz at 30 meters shall be ≤ 84.0 dBμV/m (at 10 meters ≤ 103.5 dBμV/m)

(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)



Att 10 dB AUTO RBW 9 kHz
MT 1 s
PREAMP ON



Date: 28.FEB.2017 15:49:35

Field strength at longitudinal polarization – 13.56MHz

3.3 Spurious emissions (radiated)

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

Test Performed By: G.Suwanthakumar	Date of Test: 2017-02-28
------------------------------------	--------------------------

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
/	/	/	/	/	/	> 30

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

The above detected frequencies are within the band 9 – 90 kHz. 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)

minimum DC Correction factor = $-20 \times \log((124.1 \text{ ms}) / 374.53 \text{ ms}) = -10.6 \text{ dB}$

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

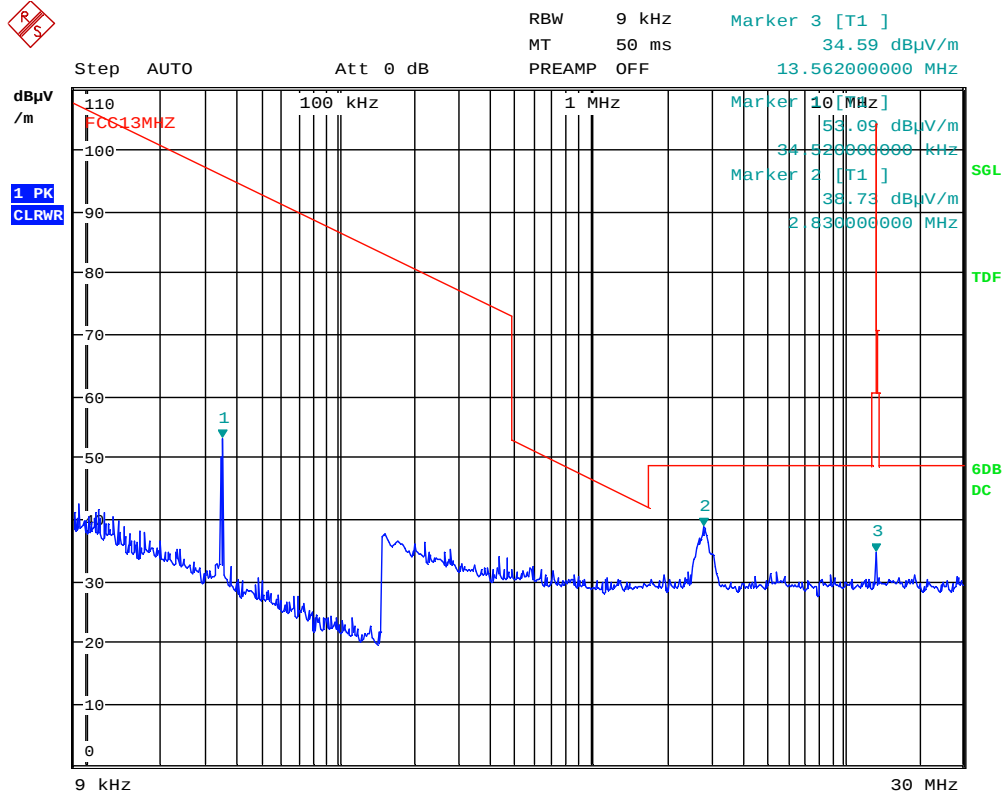
Requirement:

(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.

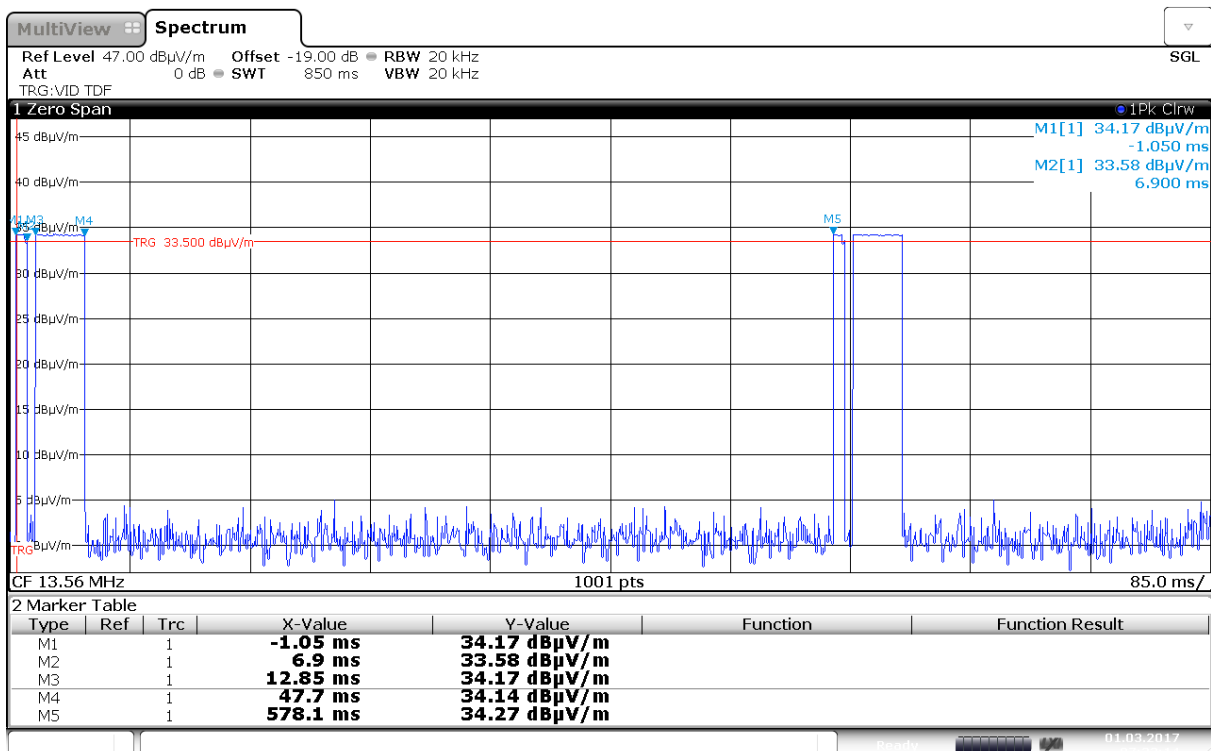
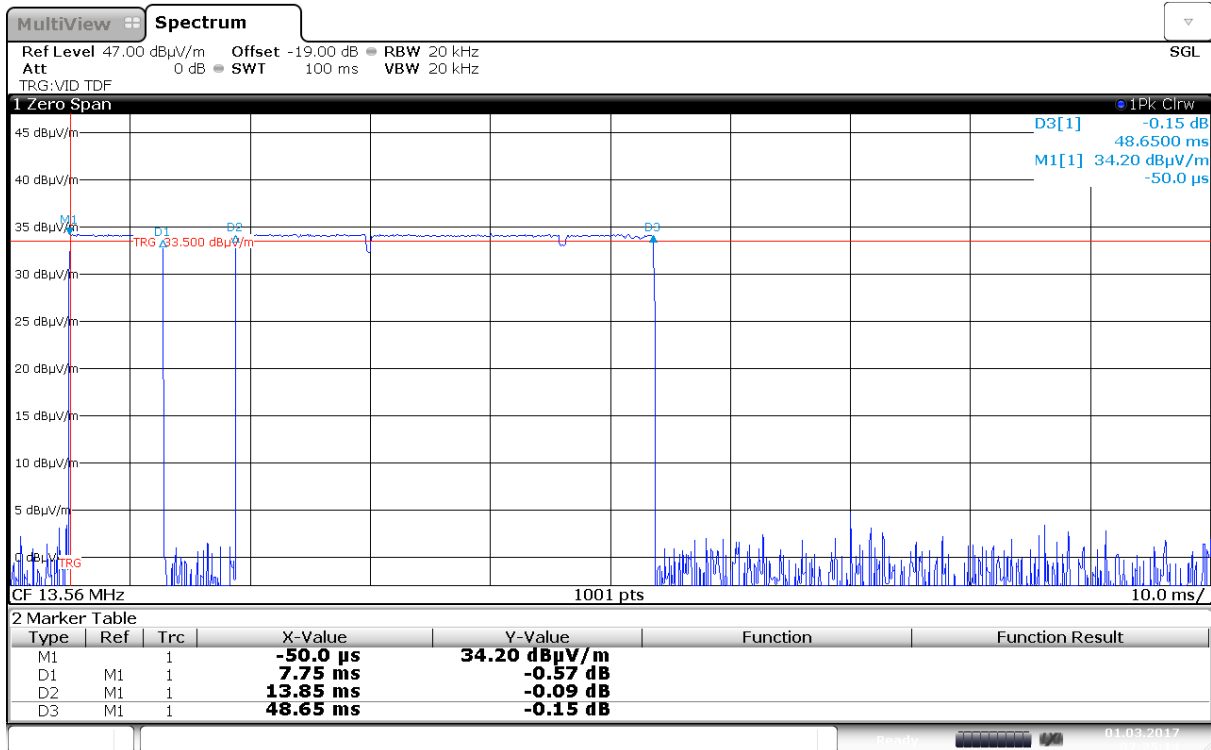
Radiated emissions 9kHz – 30 MHz.

Detector: Peak

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



Date: 28.FEB.2017 15:20:54



Duty cycle: Card waiting mode.

duty cycle: 7%

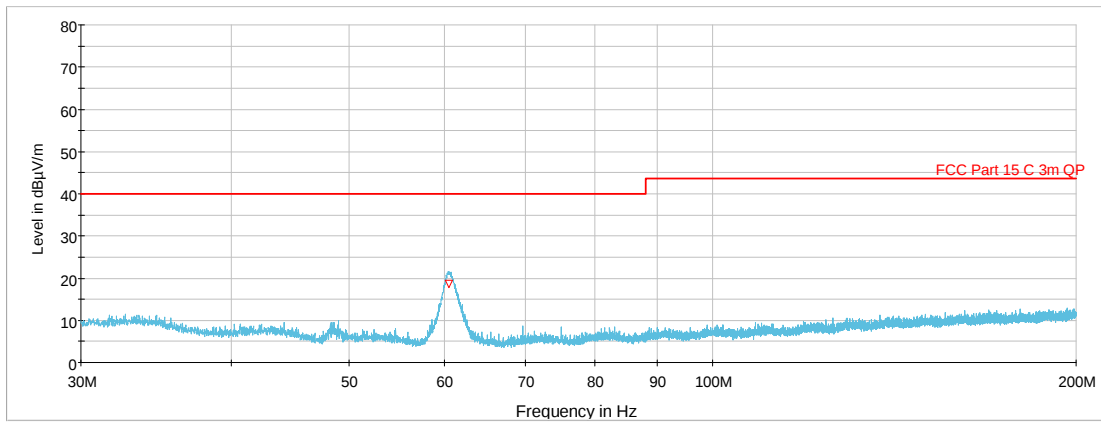
Radiated emissions 30 – 1000 MHz.

Detector: PK

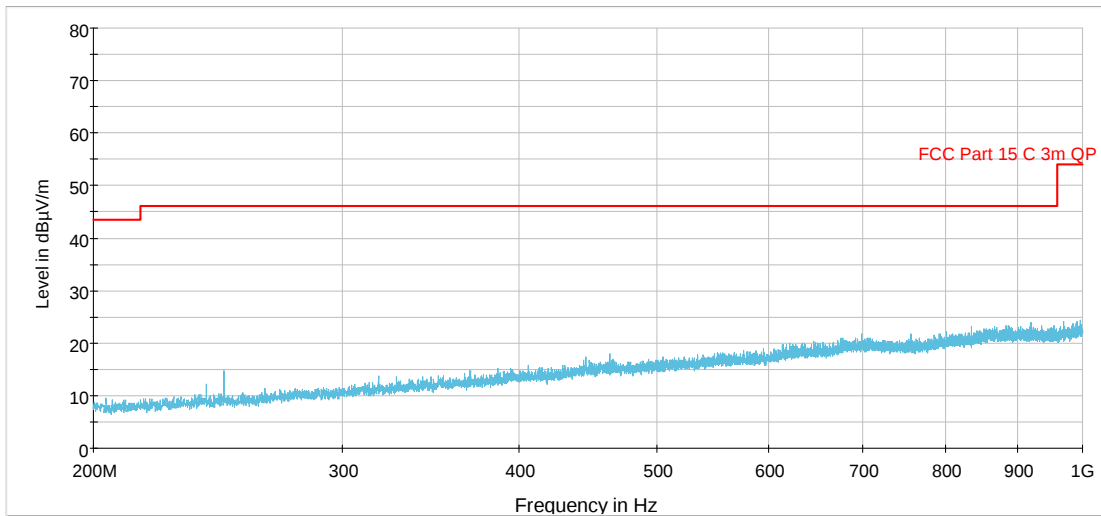
Measuring distance 3 m.

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
60.539	18.54	40.00	21.46	1000.0	120.000	100.0	V	249	-28.8

The graph shows peak scan and highest values.



Card waiting mode: 30 - 200MHz (PK scan)



Card waiting mode: 200 - 1000MHz (PK scan)

3.4 Transmitter Frequency Stability

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

Test Performed By: G.Suhandhakumar

Date of Test: 2017-03-01

Measurement Data:

Temperature	Given Frequency (MHz)	Measured value (MHz)	Deviation (%)
+50 ° C	13.56	13.55945020	-0.00041052
+40 ° C	13.56	13.55948475	-0.00015574
+30 ° C	13.56	13.55950614	0.00000198
+20 ° C	13.56	13.55950587	0.00000000
+10 ° C	13.56	13.55948443	-0.00015809
+0 ° C	13.56	13.55952626	0.00015036
-10 ° C	13.56	13.55957278	0.00049345
-20 ° C	13.56	13.55960880	0.00075909

Supply voltage: 3.7Vdc (fully charged battery)

Requirement:

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ ($\pm 100\%$) 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

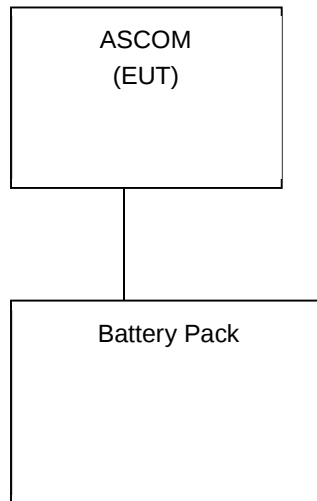
5 LIST OF TEST EQUIPMENT

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	LR 1639	2016.11	2017.11
2.	6810.17A	Attenuator	Suhner	LR 1137	2015.03	2017.03
3.	87V	Multimeter, Digital	Fluke	LR 1599	2016.10	2018.10
4.	HFH2-Z2	Antenna, Loop	Rohde & Schwarz	LR1660	2015.10	2017.10
5.	HL223	Antenna log.per	Rohde & Schwarz	LR 1261	2013.12	2017.12
6.	HK116	Antenna biconic	Rohde & Schwarz	LR 1260	2013.12.	2017.12
7.	310N	Amplifier, low noise	Sonoma	LR11686	2016.05	2017.05
8.	FSW43	Spectrum analyser	R & S	LR 1690	2016.07	2018.07
9.	VC4060	Climatic chamber Temp	Vøtsch	LR 1435	2016.03	2017.03.
10.	FA210A1010003030	Microwave cable	Rosenberger	LR 1566	Cal b4 use	
11.	B300	Power Supply	Oltronix	LR 017	Cal b4 use	
12.	HFH2-Z4	Antenna Inductive Probe	R & S	LR 1100	Cal b4 use	

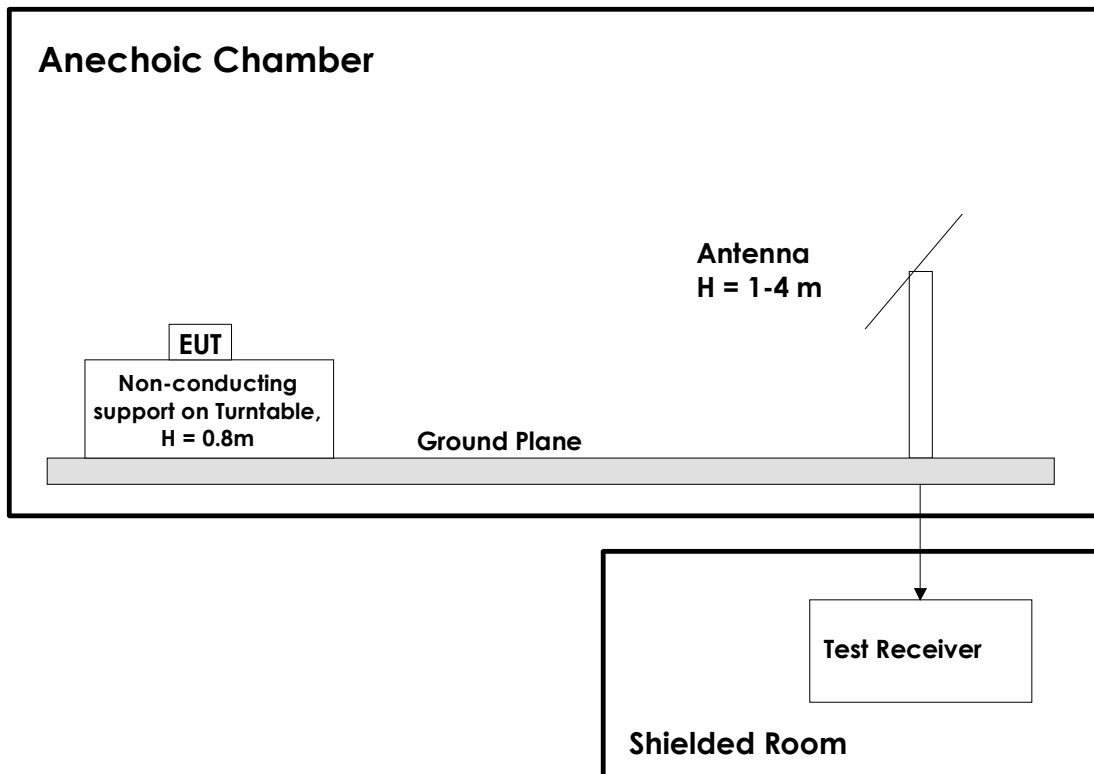
6 BLOCK DIAGRAM

6.1 System set up for radiated measurements



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

6.2 Test Site Radiated Emission



Revision history

Revision #	Date	Order #	Comment	Sign
01	2017.05.05	324798	First version	GNS