Report No. 2-311535

Test Report

Product	Radio Frequency Identification (RFID) 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	4827610CC1
Rating	4.5Vdc
Trademark	ASSA ABLOY
Serial number	/
Additional information	Radio Frequency Identification (RFID) -13.56MHz. This product contains BLE transceiver also with same FCC/IC ID. But never transmits simultaneously.
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	311535
Tested in period	2016.06.27 - 2016.07.01
Issue date	2017.02.08
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 Sveinsen]

Template version: B

CONTENTS

1 INFORMATION

1.1 Test Item

Name :	ASSA ABLOY
FCC ID :	Y7V-4827610CC1
Industry Canada ID :	9514A-4827610CC1
Model/version :	4827610CC1
Serial number :	/
Hardware identity and/or version:	4827610-B
Software identity and/or version :	C3GNemko.hcc
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 :	Primary batteries (AA) 3x 1.5Vdc(4.5Vdc)
Antenna Connector :	Integral loop antenna
Antenna Diversity Supported :	None
Desktop Charger :	None

Description of Test Item

The RFID transceiver module is located on PCB 1102, and is controlled by the main microcontroller located on PCB 1101, both located inside the LCU 5350.

It will communicate with a RFID card if the RFID card is held right in front of the RFID antenna (1103), that is also located inside the LCU 5350.

Theory of Operation

The RFID transceiver module supports several RFID standards, ISO 14443-A, ISO 14443-B and ISO 15693, working on 13.56MHz

On a higher level it supports MIFARE communication and encryption. The transceiver's oscillator is controlled by a 27.12MHz crystal.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	4.5Vdc (Primary battries 3x 1.5Vdc)

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 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

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)	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)	-
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 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: 2016-06-30

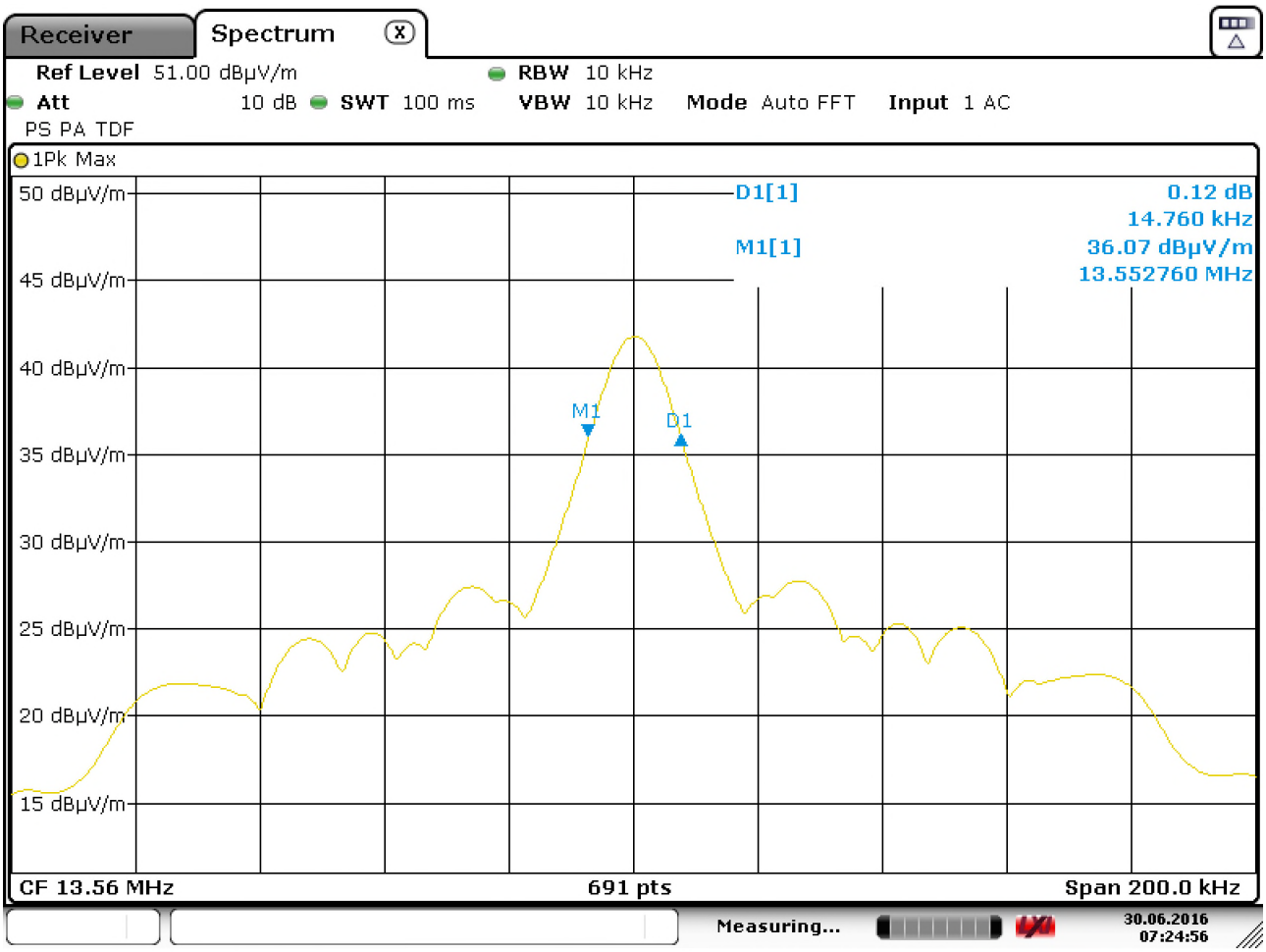
Test Results: Complies

Measurement Data:

6 dB BW (kHz)
13.56MHz
14.76

Requirements:

For information only



Date: 30.JUN.2016 07:24:56

13.56MHz – 6dB BW– 14.76kHz

3.2 Fundemental Field Strength

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

Test Performed By: G.Suhanthakumar	**Date of Test: 2016-06-27**

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	41.10	-19.5	103.5

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

Radiated measurements are performed at 10 m distance.

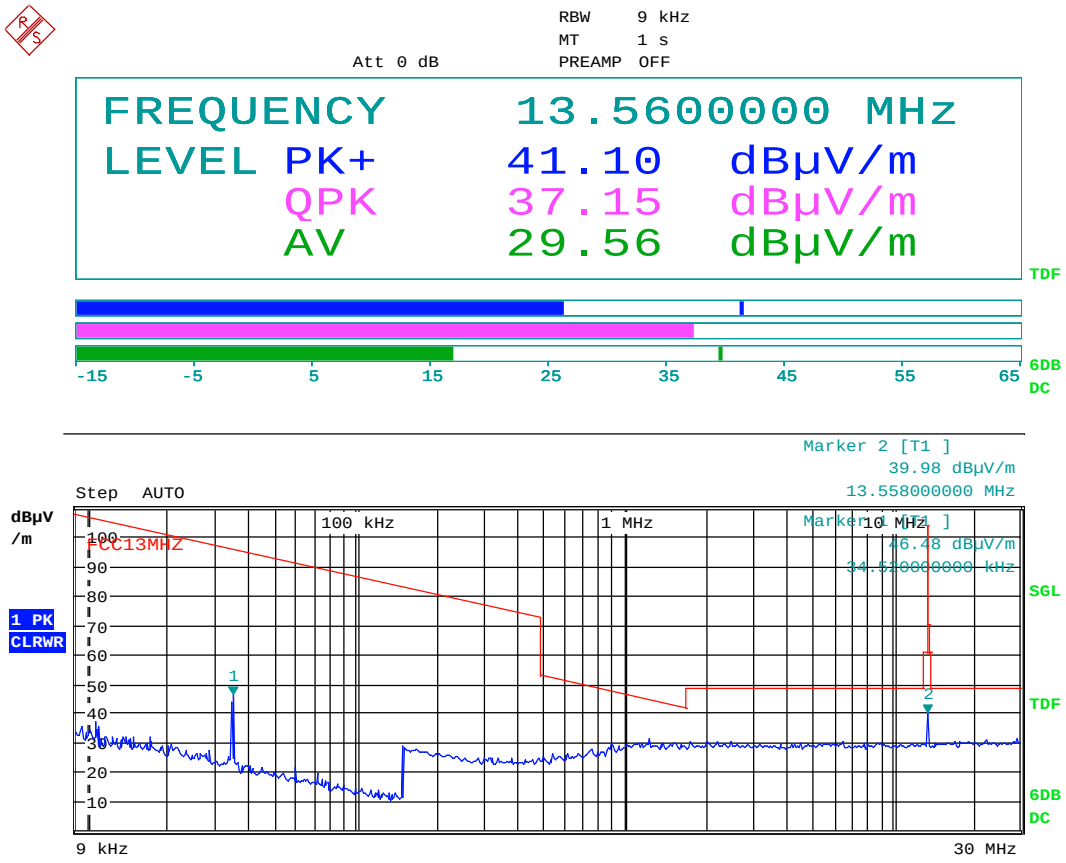
Detachable antenna?	☐ Yes	☒ No
If detachable, is the antenna connector non-standard?	☐ Yes	☐ No
Integral loop antenna		

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)



Date: 27.JUN.2016 17:50:32

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.Suhanthakumar	**Date of Test: 2016-06-27**

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”.

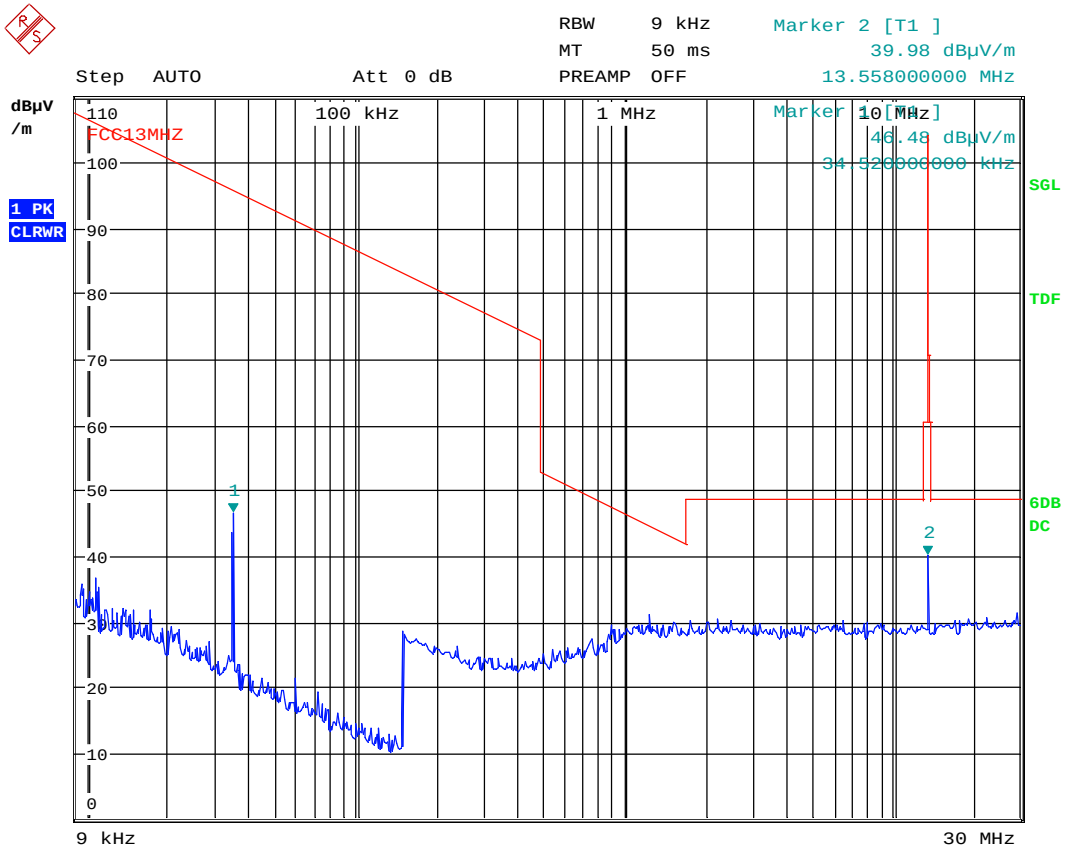
Duty Cycle Correction Factor Calculation:
RF duty cycle: Calculation according to RF burst Para 15.35 (c)
minimum DC Correction factor = -20 x log((124.1 ms) / 374.53ms) = -10.6 dB
Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB

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.

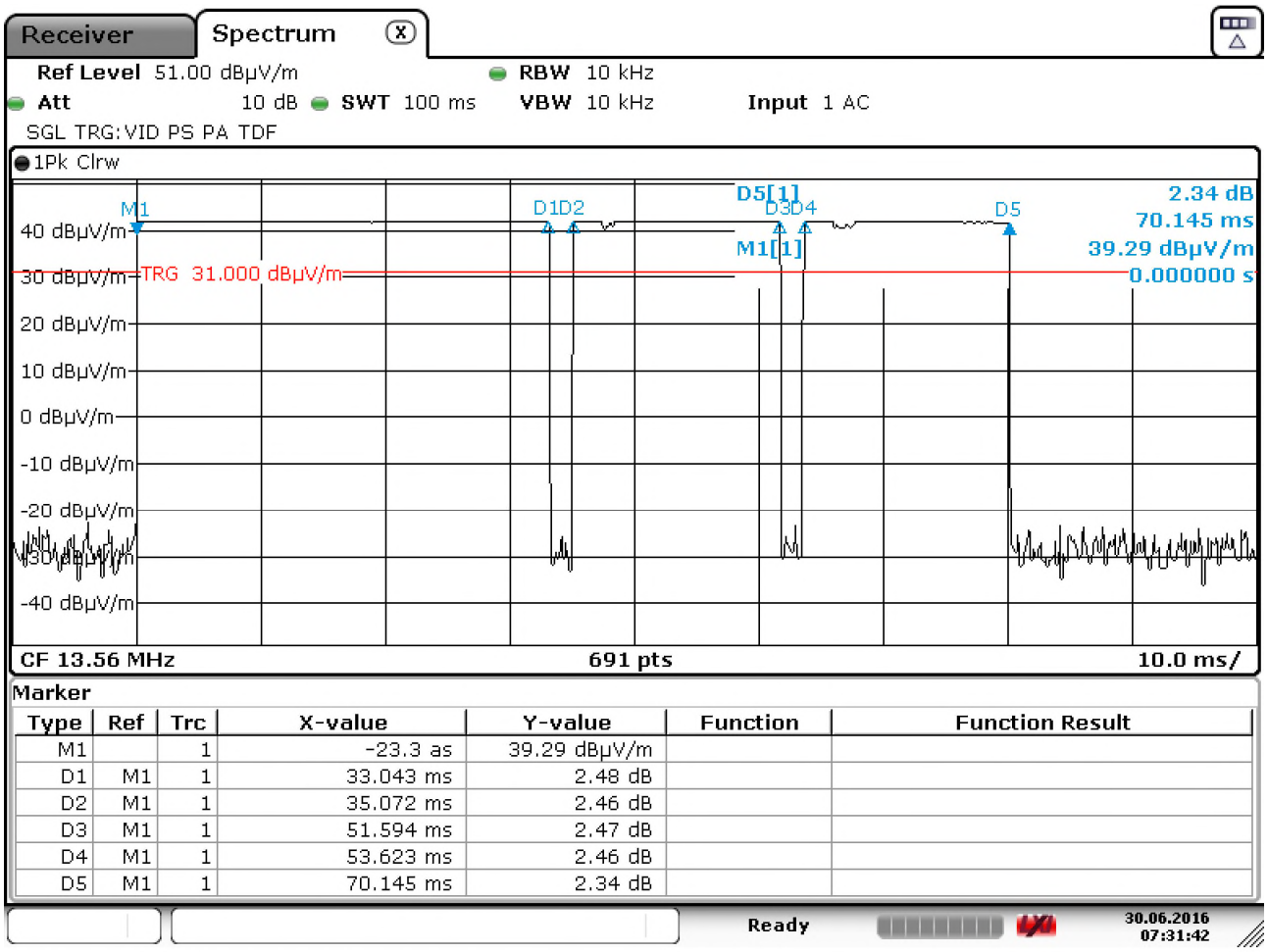
Radiated emissions 9kHz – 30 MHz.

Detector: Peak

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

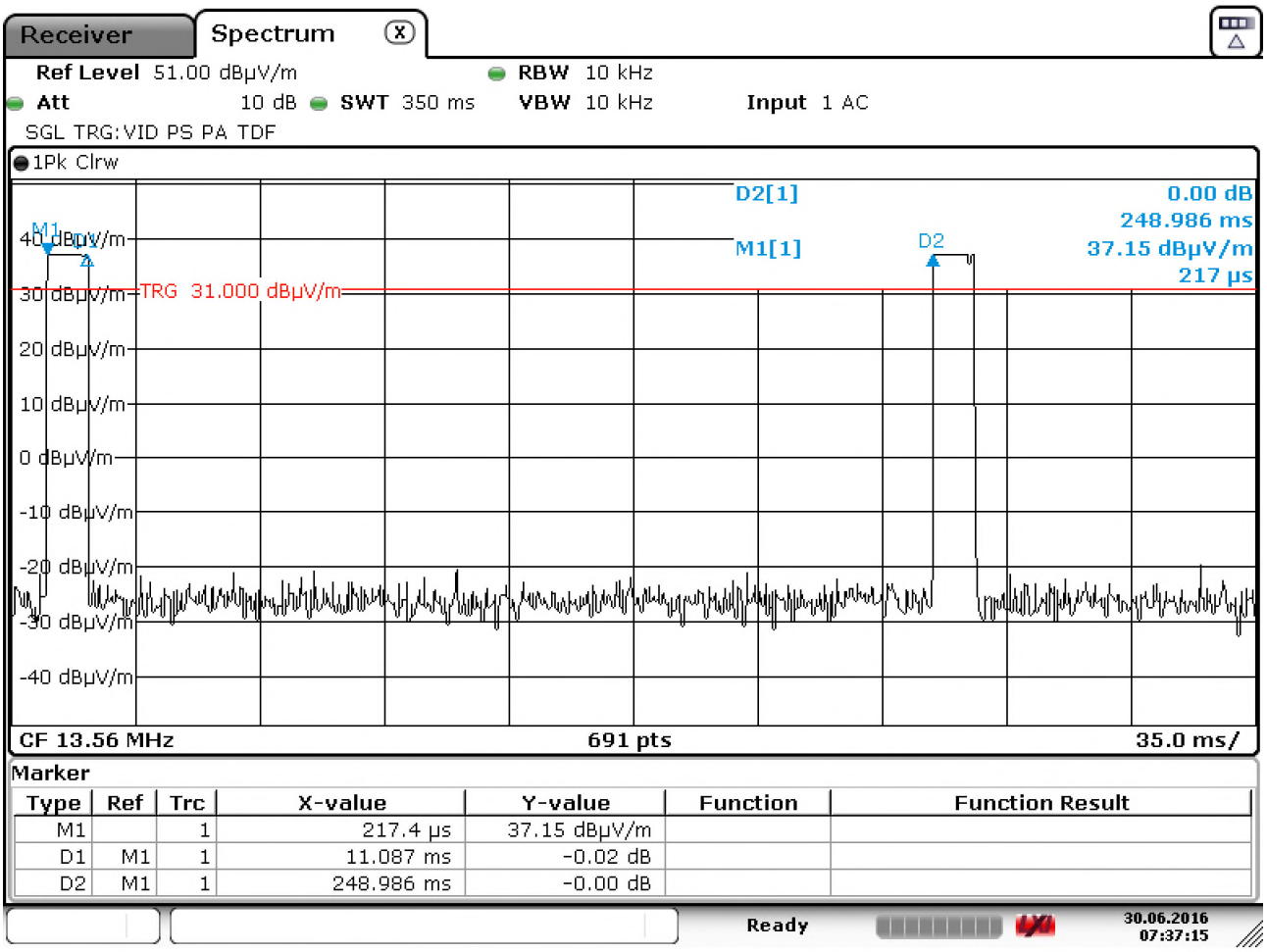


Date: 27.JUN.2016 17:49:39



Date: 30.JUN.2016 07:31:43

Pulse train period during card waiting (duty cycle: 29.4%)
First burst ON OFF time during card waiting(Duty cycle: 94.2%)
Second burst ON OFF time during card waiting (Duty cycle: 89.1%)
Third burst ON OFF time during card waiting (Duty cycle: 6.9%)



Date: 30.JUN.2016 07:37:16

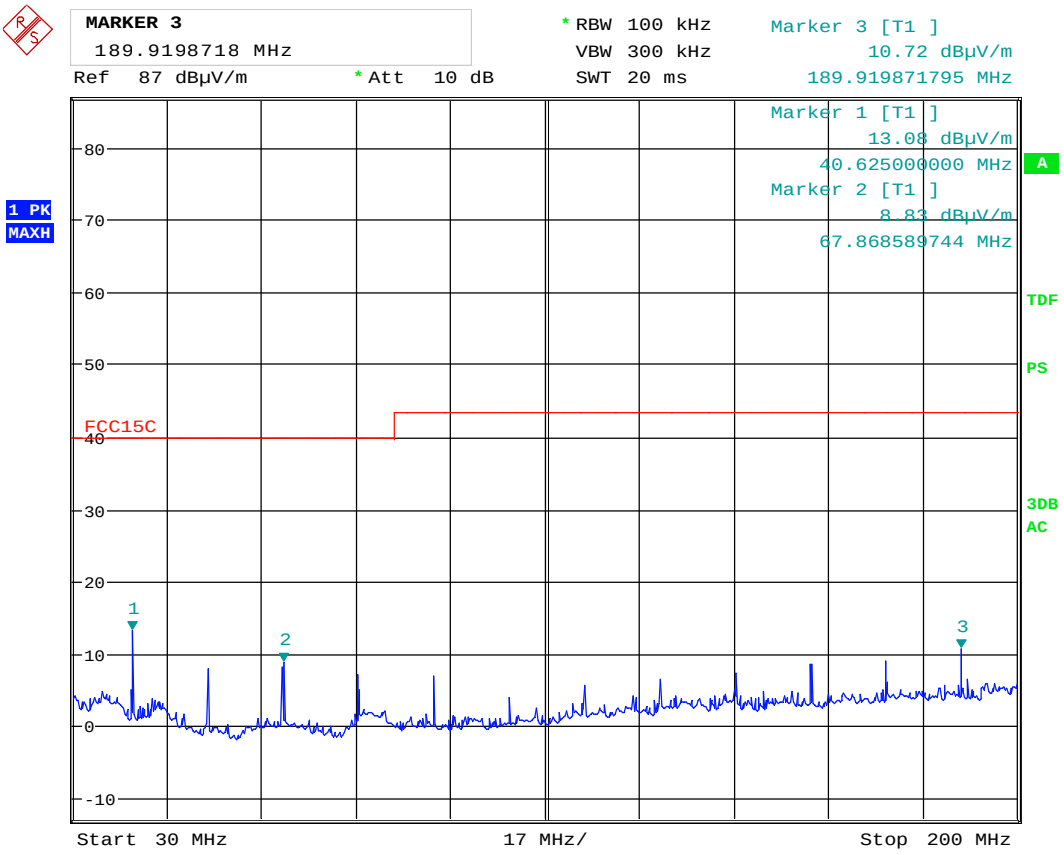
Car reading mode.

Radiated emissions 30 – 1000 MHz.

Detector: PK

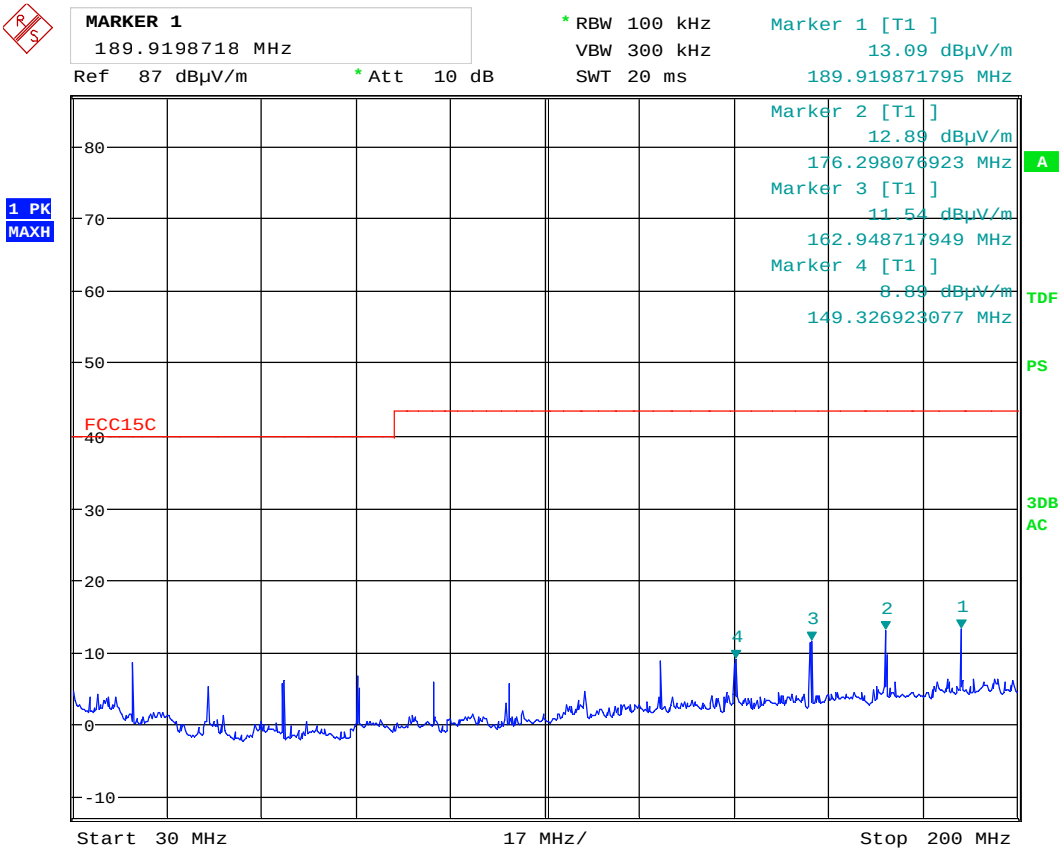
Measuring distance 3 m.

The graph shows peak scan and highest values.



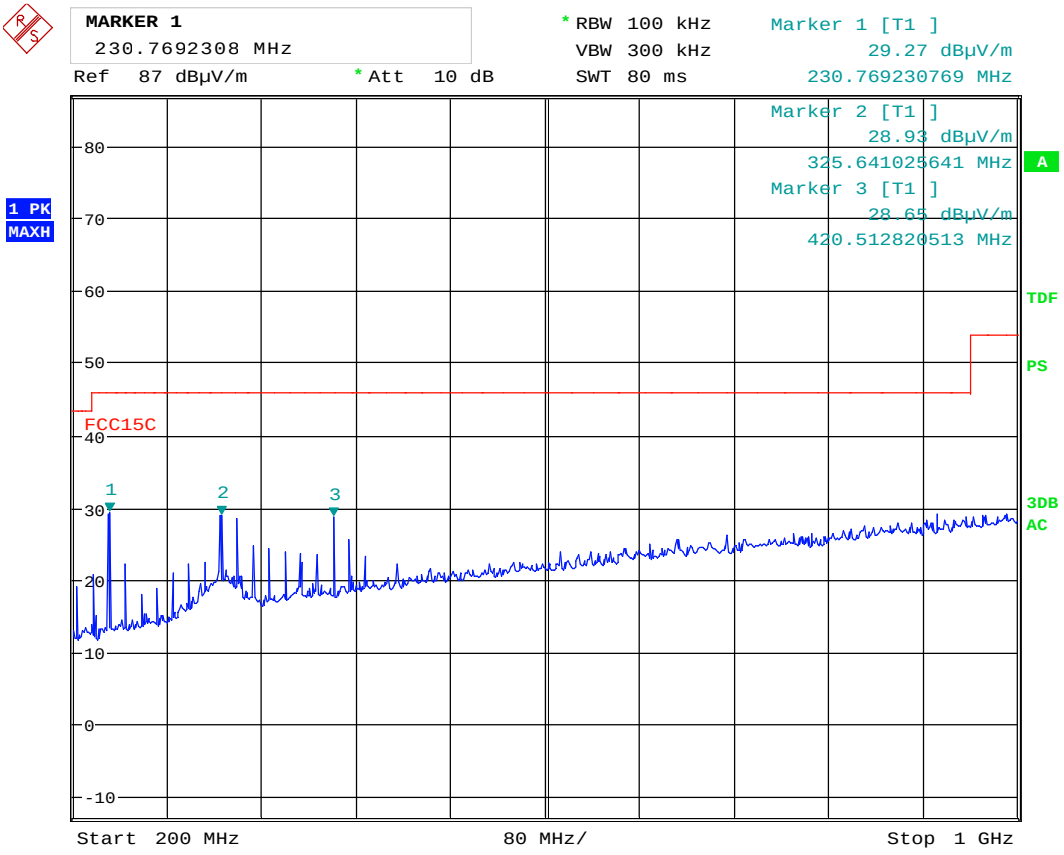
Date: 27.JUN.2016 16:35:28

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



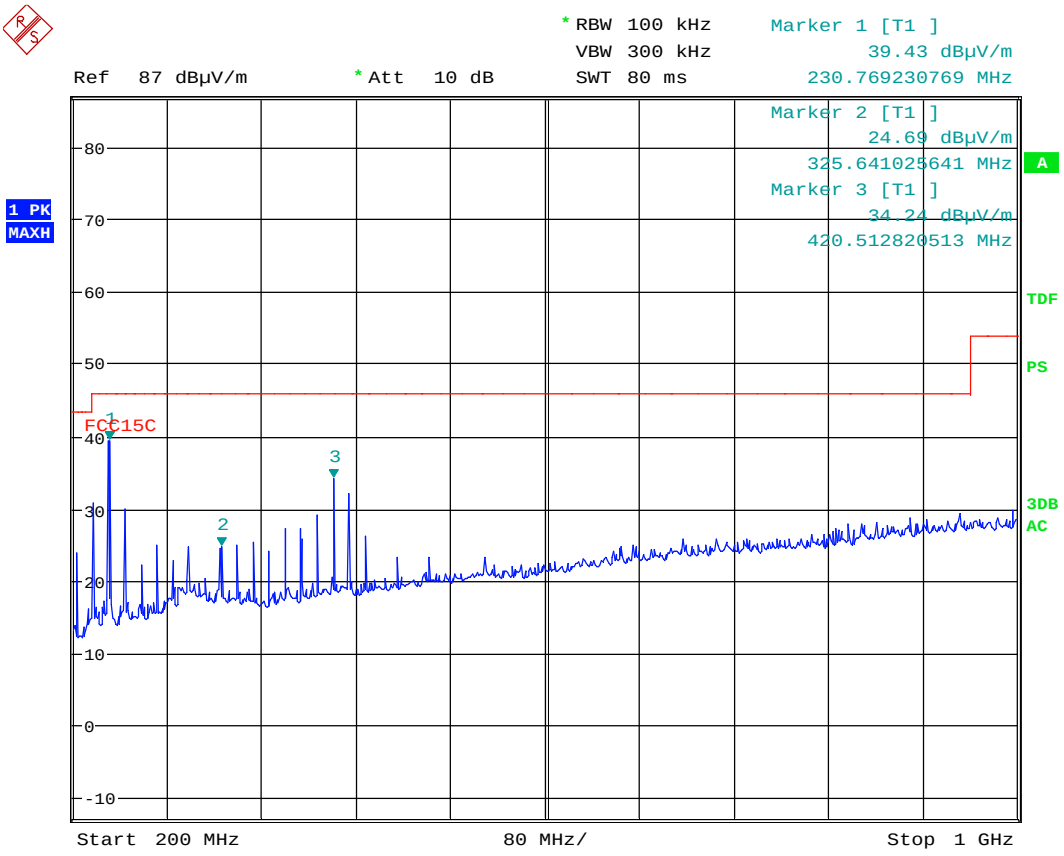
Date: 27.JUN.2016 16:37:55

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



Date: 27.JUN.2016 16:43:11

Card waiting mode: VP, 200 1000MHz (PK scan)



Date: 27.JUN.2016 16:45:19

Card waiting mode: HP, 200 1000MHz (PK scan)

3.4 Transmitter Frequency Stability

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

Test Performed By: G.Suhanthakumar	Date of Test: 2016-06-30

Measurement Data:

Temperature	Given Frequency (MHz)	Measured value (MHz)	Deviation (%)
+50 ° C	13.56	13.56020288	-0.00000347
+40 ° C	13.56	13.56020286	-0.00000361
+30 ° C	13.56	13.56020285	-0.00000383
+20 ° C	13.56	13.56020335	**0.00000000**
+10 ° C	13.56	13.56020285	-0.00000369
+0 ° C	13.56	13.56020337	0.00000015
-10 ° C	13.56	13.56020338	0.00000022
-20 ° C	13.56	13.56020289	-0.00000339

Supply voltage:4.5Vdc (fully charged battery)

Requirement:

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% (±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

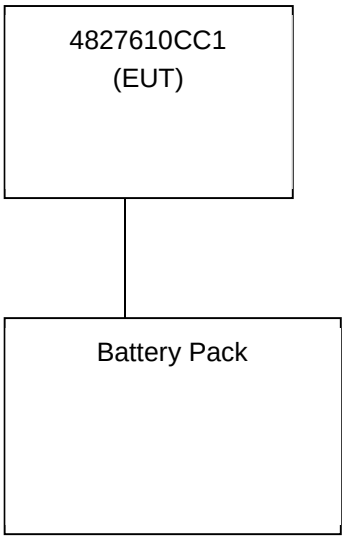
5 LIST OF TEST EQUIPMENT

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	LR1639	2015.11	2016.11
2.	6810.17A	Attenuator	Suhner	LR 1137	2015.03.26	2017.03.26
3.	87V	Multimeter, Digital	Fluke	N4672	2015.09.17	2016.09.17
4.	HFH2-Z2	Antenna, Loop	Rohde & Schwarz	LR1660	2015.10	2016.10
5.	HL223	Antenna log.per	Rohde & Schwarz	LR 1261	2013.12.05	2016.12.05
6.	HK116	Antenna biconic	Rohde & Schwarz	LR 1260	2013.12.05	2016.12.05
7.	310N	Amplifier, low noise	Sonoma	LR11686	2016.05	2017.05
8.	ESR	Spectrum analyser	R &S	LR 11675	2015.12	2017.12
9.	VC4060	Climatic chamber Temp	Vøtsch	LR 1435	2016.03	2017.03.
10.	A 10-B	Rubidium	Quartzlock	LR 1386	2016.02	2017.02
11.	FA210A1010 003030	Microwave cable	Rosenberger	LR1566	Cal b4 use	
12.	3115	Antenna horn	EMCO	LR 1226	2013.10	2018.10
13.	017	Power Supply	Oltronix	B300	Cal b4 use	
14.	HFH2-Z4	Antenna Inductive Probe	R & S	LR 1100	Cal b4 use	

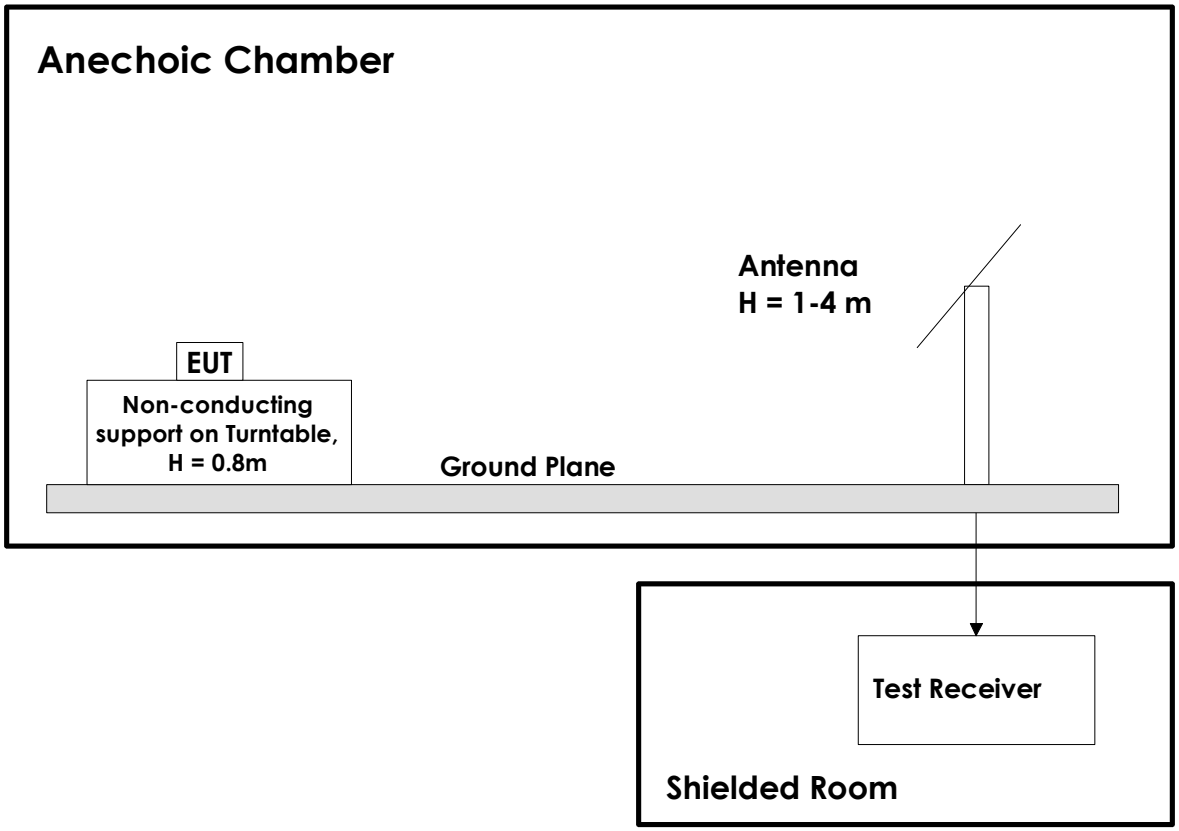
6 BLOCK DIAGRAM

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
00	2016.09.13	311535	First version	GNS
01	2016.11.10	311535	Corrected IDs and model no.	FS
02	2017.02.08	311535	Corrected RSS210 references & frequency stability	GNS