

Test Report

Product	RFID Transponder Reader
Name and address of the applicant	DeLaval International AB Gustav Delavals väg 15, SE-14721 Tumba, Sweden
Name and address of the manufacturer	DeLaval International AB Gustav Delavals väg 15, SE-14721 Tumba, Sweden
Model	Multi rod reader
Rating	12Vac
Trademark	DeLaval
Serial number	/
Additional information	134.2kHz RFID
Tested according to	FCC Part 15.209 Digital Transmission Systems Industry Canada RSS-210, Issue 8 Low Power Licence-Exempt Radiocommunications Devices
Order number	298950
Tested in period	2015.12.07 - 2015.12.10
Issue date	2016.03.08
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
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Prepared by [G.Suhanthakumar] </div> <div style="text-align: center;">  Approved by [Frode Sveinsen] </div> </div>	
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1 INFORMATION

1.1 Test Item

Name :	RFID Transponder Reader
FCC ID :	UCS946556
IC :	6576A-946556
Model/version :	Multi rod reader
Serial number :	DJ280785FX
Hardware identity and/or version:	946556 81 V8
Software identity and/or version :	947216 05 V4
Frequency Range :	134.2 kHz
Operating frequency :	134.2 kHz
Type of Modulation :	Unmodulated CW signal
Output Power:	0.187 mW (Average, Radiated)
User Frequency Adjustment :	None
Type of Power Supply :	12 Vac 60Hz (Input voltage to stepdown transformer is 120Vac/60Hz)
Antenna Connector :	No (integral loop antenna)
Antenna Diversity Supported :	No

Description of Test Item

The Multirod is an inductive transponder reader for inductive loop system and operates on 134.2 kHz for animal identification.

1.2 Test Environment

1.2.1 Normal test condition

Temperature: 20 - 23 °C

Relative humidity: 40 - 50 %

Normal test voltage: 12 V AC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G.Suwanthakumar

1.4 Test Equipment

See list of test equipment in clause 4.

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. 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

DCD 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 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)	A8.5	Pass

2.3 Description of modification for Modification Filing

Not applicable.

2.4 Comments

All ports were populated during spurious emission measurements.

2.5 Family List Rational

Not Applicable.

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC §15.207(a)

Test Performed By: G.Suwanthakumar

Date of Test: 2015.12.08

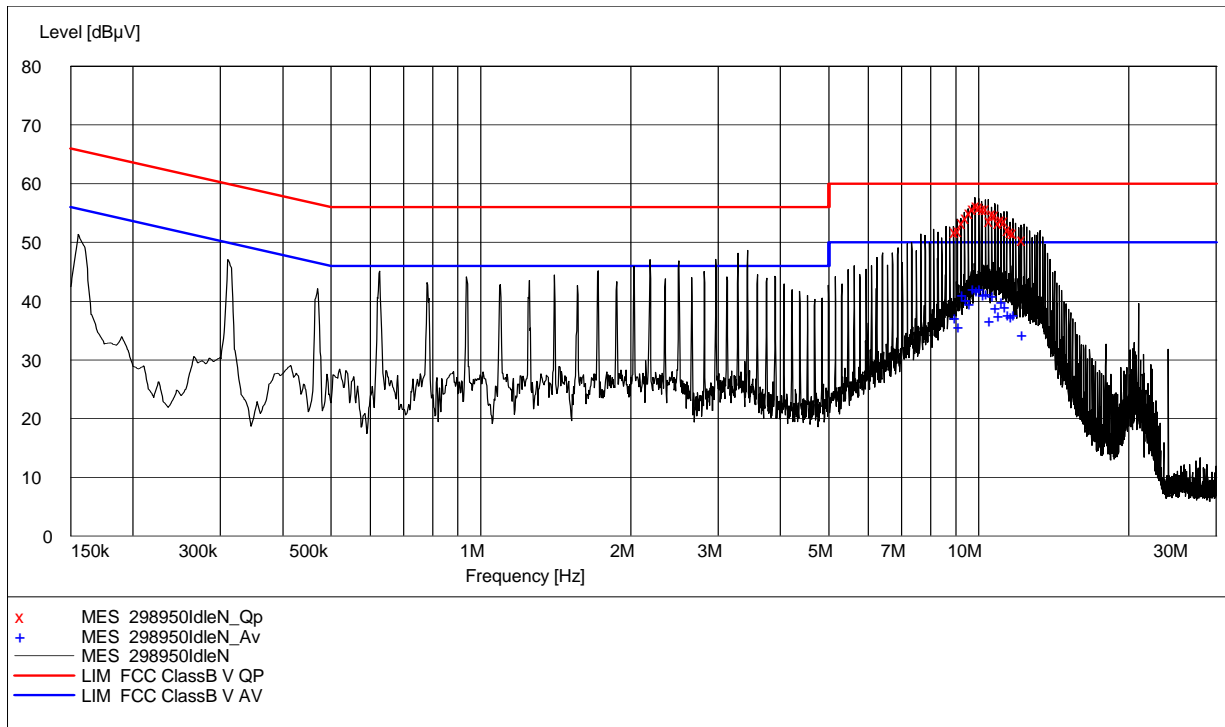
Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN.

Test Results: Complies

Measurement Data:

12V 60Hz:

Idle mode:



Note: This preview is a merged result of all peak detector measurements carried out on this product. This preview includes measurements on all lines, but shows only the worst level at each frequency. Any quasi-peak or average detector measurements are carried out at the "worst case" wire. ("x" = quasi-peak / "+" = average. Measurement data are presented below)

Quasi Peak Detector Data.

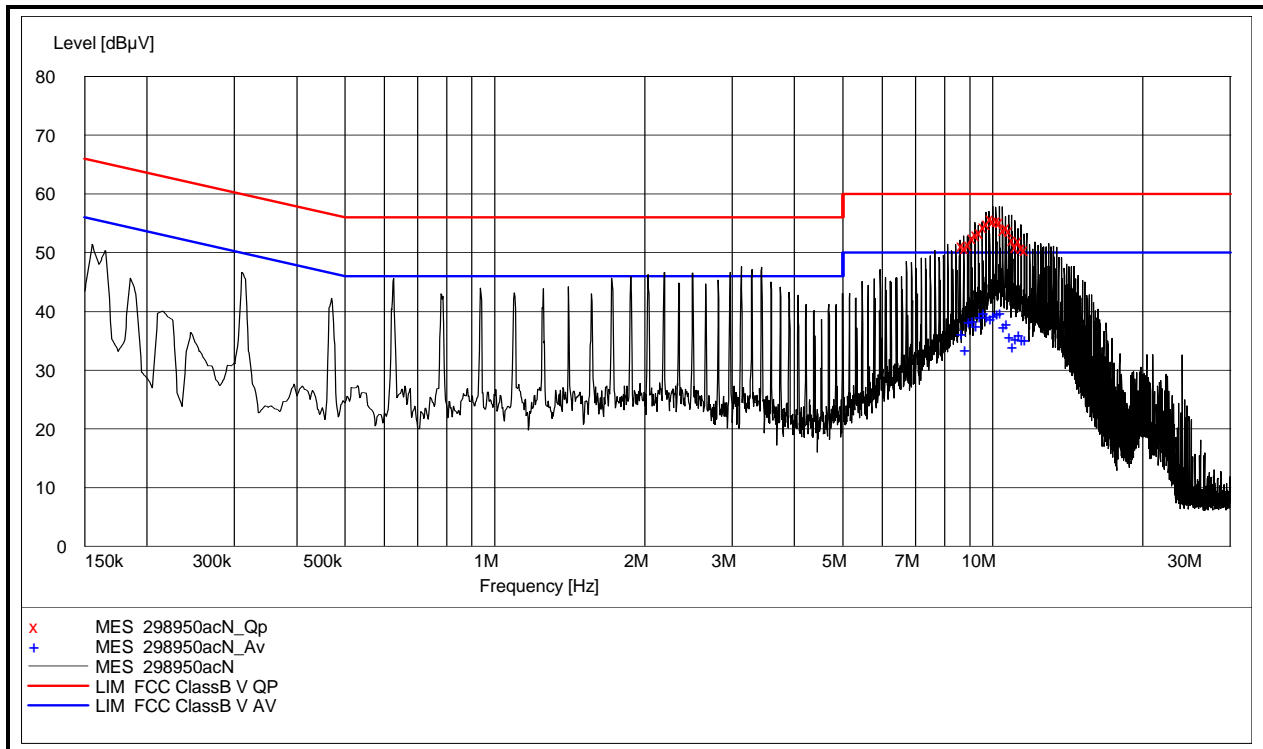
Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
9.055000	51.90	10.60	60.00	8.10	QP	N	Pass
9.210000	52.00	10.60	60.00	8.00	QP	N	Pass
9.370000	53.40	10.60	60.00	6.60	QP	N	Pass
9.525000	54.20	10.60	60.00	5.80	QP	L1	Pass
9.680000	55.10	10.60	60.00	4.90	QP	N	Pass
9.840000	55.70	10.60	60.00	4.30	QP	N	Pass
9.995000	56.40	10.60	60.00	3.60	QP	L1	Pass
10.150000	56.10	10.70	60.00	3.90	QP	L1	Pass
10.310000	55.80	10.70	60.00	4.20	QP	N	Pass
10.465000	55.80	10.70	60.00	4.20	QP	N	Pass
10.615000	53.70	10.70	60.00	6.30	QP	L1	Pass
10.775000	55.00	10.70	60.00	5.00	QP	L1	Pass
10.930000	54.70	10.70	60.00	5.30	QP	N	Pass
11.085000	53.50	10.70	60.00	6.50	QP	N	Pass
11.245000	54.00	10.70	60.00	6.00	QP	L1	Pass
11.400000	53.70	10.70	60.00	6.30	QP	L1	Pass
11.555000	52.20	10.70	60.00	7.80	QP	N	Pass
11.715000	51.90	10.70	60.00	8.10	QP	N	Pass
11.870000	51.70	10.70	60.00	8.30	QP	L1	Pass
12.335000	50.40	10.70	60.00	9.60	QP	L1	Pass

Average Detector Data:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
9.055000	37.30	10.60	50.00	12.70	AV	N	Pass
9.210000	35.70	10.60	50.00	14.30	AV	N	Pass
9.370000	41.20	10.60	50.00	8.80	AV	N	Pass
9.525000	40.30	10.60	50.00	9.70	AV	L1	Pass
9.680000	39.60	10.60	50.00	10.40	AV	N	Pass
9.840000	42.10	10.60	50.00	7.90	AV	N	Pass
9.995000	41.80	10.60	50.00	8.20	AV	L1	Pass
10.150000	42.20	10.70	50.00	7.80	AV	L1	Pass
10.310000	41.10	10.70	50.00	8.90	AV	N	Pass
10.465000	41.30	10.70	50.00	8.70	AV	N	Pass
10.615000	36.70	10.70	50.00	13.30	AV	L1	Pass
10.775000	40.90	10.70	50.00	9.10	AV	L1	Pass
10.930000	38.90	10.70	50.00	11.10	AV	N	Pass
11.085000	37.60	10.70	50.00	12.40	AV	N	Pass
11.245000	40.00	10.70	50.00	10.00	AV	L1	Pass
11.400000	39.10	10.70	50.00	10.90	AV	L1	Pass
11.555000	37.80	10.70	50.00	12.20	AV	N	Pass
11.715000	37.40	10.70	50.00	12.60	AV	N	Pass
11.870000	37.80	10.70	50.00	12.20	AV	L1	Pass
12.335000	34.40	10.70	50.00	15.60	AV	L1	Pass

12V 60Hz:

RFID reading mode:



Quasi Peak Detector Data.

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
8.745000	51.20	10.60	60.00	8.80	QP	N	Pass
8.895000	50.80	10.60	60.00	9.20	QP	N	Pass
9.055000	51.40	10.60	60.00	8.60	QP	L1	Pass
9.210000	52.60	10.60	60.00	7.40	QP	N	Pass
9.370000	53.20	10.60	60.00	6.80	QP	N	Pass
9.525000	53.40	10.60	60.00	6.60	QP	L1	Pass
9.680000	54.50	10.60	60.00	5.50	QP	L1	Pass
9.835000	55.00	10.60	60.00	5.00	QP	N	Pass
9.990000	55.80	10.60	60.00	4.20	QP	N	Pass
10.150000	55.60	10.70	60.00	4.40	QP	N	Pass
10.305000	55.60	10.70	60.00	4.40	QP	N	Pass
10.460000	55.40	10.70	60.00	4.60	QP	N	Pass
10.620000	53.90	10.70	60.00	6.10	QP	N	Pass
10.770000	54.30	10.70	60.00	5.70	QP	L1	Pass
10.925000	53.80	10.70	60.00	6.20	QP	N	Pass
11.080000	52.20	10.70	60.00	7.80	QP	N	Pass
11.245000	51.00	10.70	60.00	9.00	QP	L1	Pass
11.395000	52.10	10.70	60.00	7.90	QP	N	Pass
11.555000	50.80	10.70	60.00	9.20	QP	N	Pass
11.710000	50.50	10.70	60.00	9.50	QP	N	Pass

Average Detector Data:

Frequency [MHz]	Level [dBuV]	Af [dB]	Limit [dBuV]	Margin [dB]	Det	Position	Verdict [Pass/Fail]
8.745000	36.20	10.60	50.00	13.80	AV	N	Pass
8.895000	33.60	10.60	50.00	16.40	AV	N	Pass
9.055000	38.30	10.60	50.00	11.70	AV	L1	Pass
9.210000	38.50	10.60	50.00	11.50	AV	N	Pass
9.370000	37.70	10.60	50.00	12.30	AV	N	Pass
9.525000	39.20	10.60	50.00	10.80	AV	L1	Pass
9.680000	39.90	10.60	50.00	10.10	AV	L1	Pass
9.835000	39.10	10.60	50.00	10.90	AV	N	Pass
9.990000	38.80	10.60	50.00	11.20	AV	N	Pass
10.150000	39.30	10.70	50.00	10.70	AV	N	Pass
10.305000	39.70	10.70	50.00	10.30	AV	N	Pass
10.460000	39.90	10.70	50.00	10.10	AV	N	Pass
10.620000	37.40	10.70	50.00	12.60	AV	N	Pass
10.770000	37.90	10.70	50.00	12.10	AV	L1	Pass
10.925000	35.70	10.70	50.00	14.30	AV	N	Pass
11.080000	34.00	10.70	50.00	16.00	AV	N	Pass
11.245000	35.40	10.70	50.00	14.60	AV	L1	Pass
11.395000	36.00	10.70	50.00	14.00	AV	N	Pass
11.555000	35.20	10.70	50.00	14.80	AV	N	Pass
11.710000	35.20	10.70	50.00	14.80	AV	N	Pass

3.2 20 dB Bandwidth

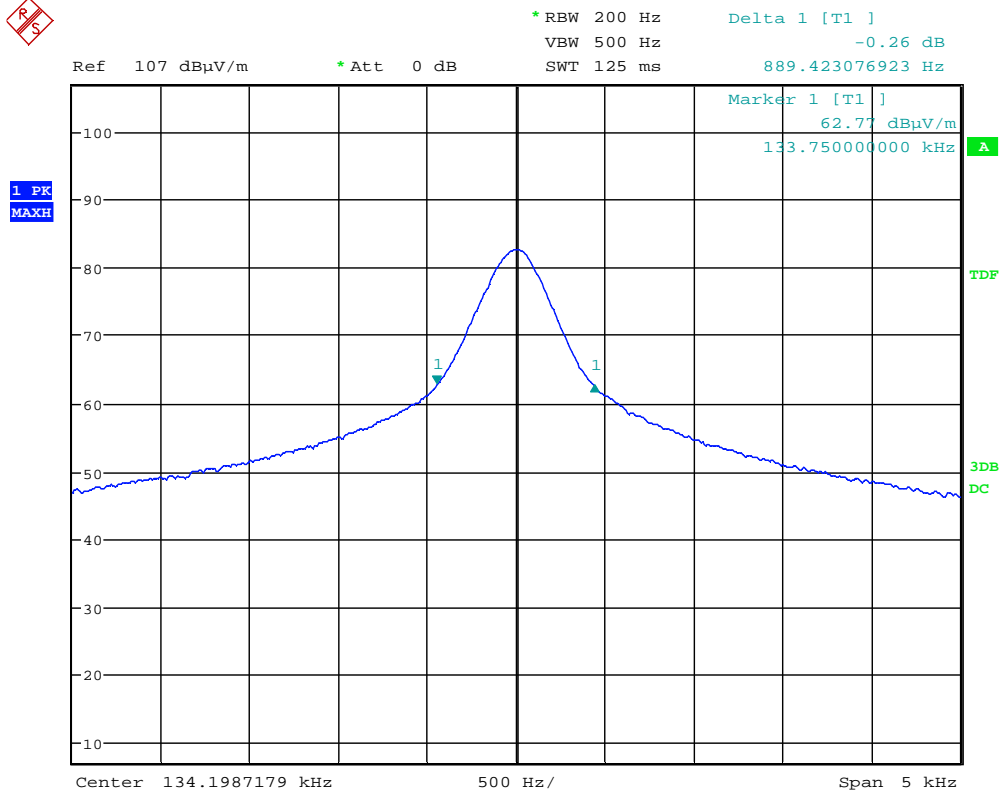
Test Performed By: G.Suwanthakumar

Date of Test: 2015.12.08

Measurement Data:

Measured 20 dB Bandwidth
134.2 kHz
889 Hz

Requirements: No requirements. Reported for information only.



Date: 8.DEC.2015 08:20:11

20 dB Bandwidth at 134.2 kHz

3.3 Spurious Emissions (Radiated)

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

Test Performed By: G.Suhandhakumar

Date of Test: 2015.12.08

Test Results: Complies

Measurement Data:

Radiated emissions 9 kHz - 30 MHz.

Detector: Average

Measuring distance 10m

Frequency kHz	Channel kHz	Measured Field Strength @10m (dBμV/m)	Detector	Limit @10m dBμV/m	Margin dB
134.2	134.2	77.52	AV	84.13	6.61

Radiated Power: 0.187 mW (Calculated from Field Strength value using the Free Field Formula)

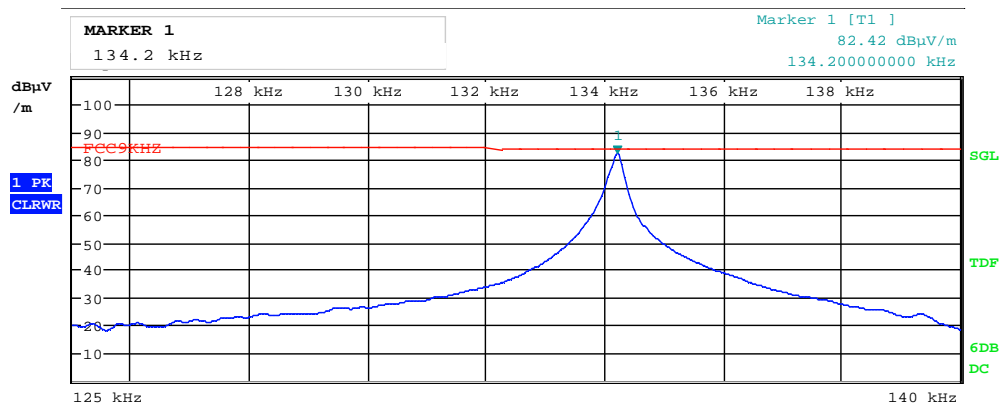
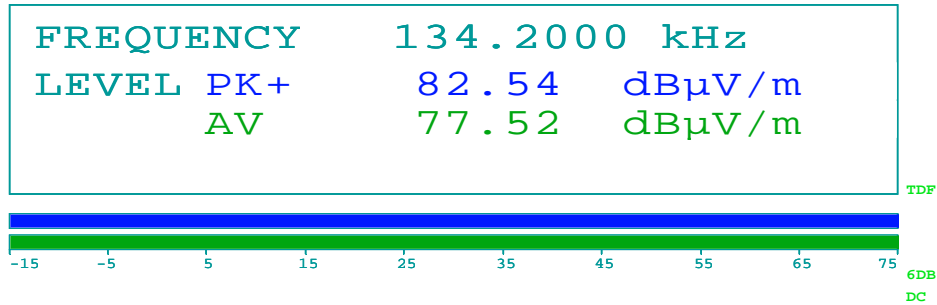
The limit line in the graph is corrected for 10m distance.

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

See attached graphs.

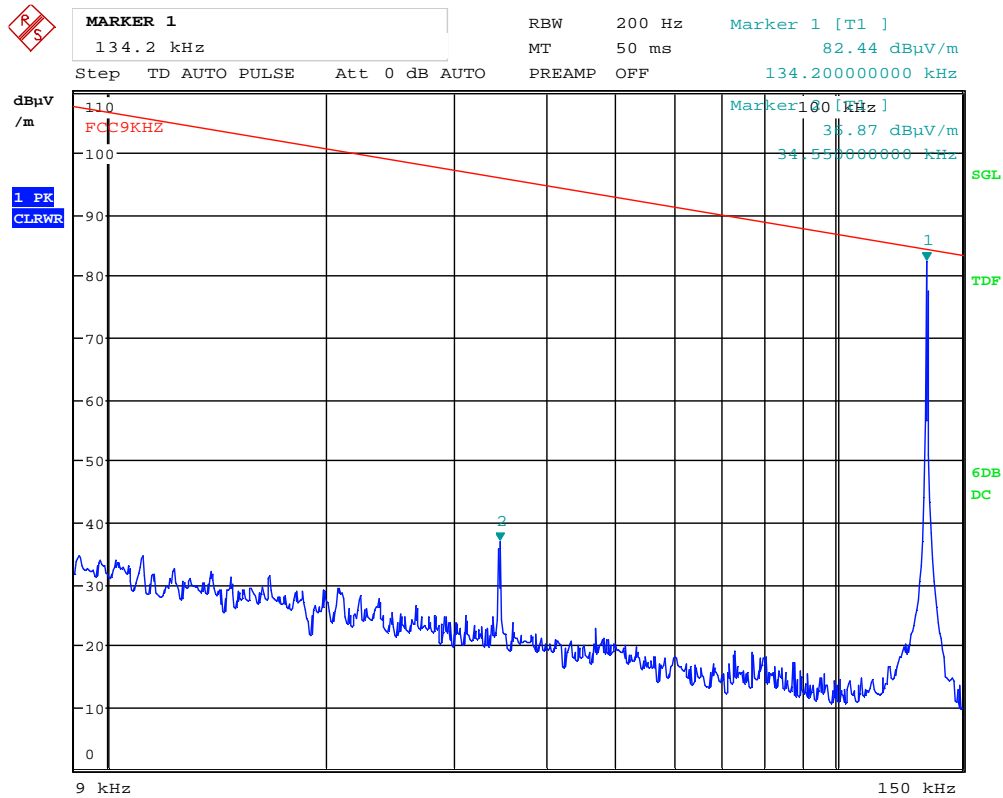


Att 0 dB AUTO RBW 200 Hz
MT 5 s
PREAMP OFF



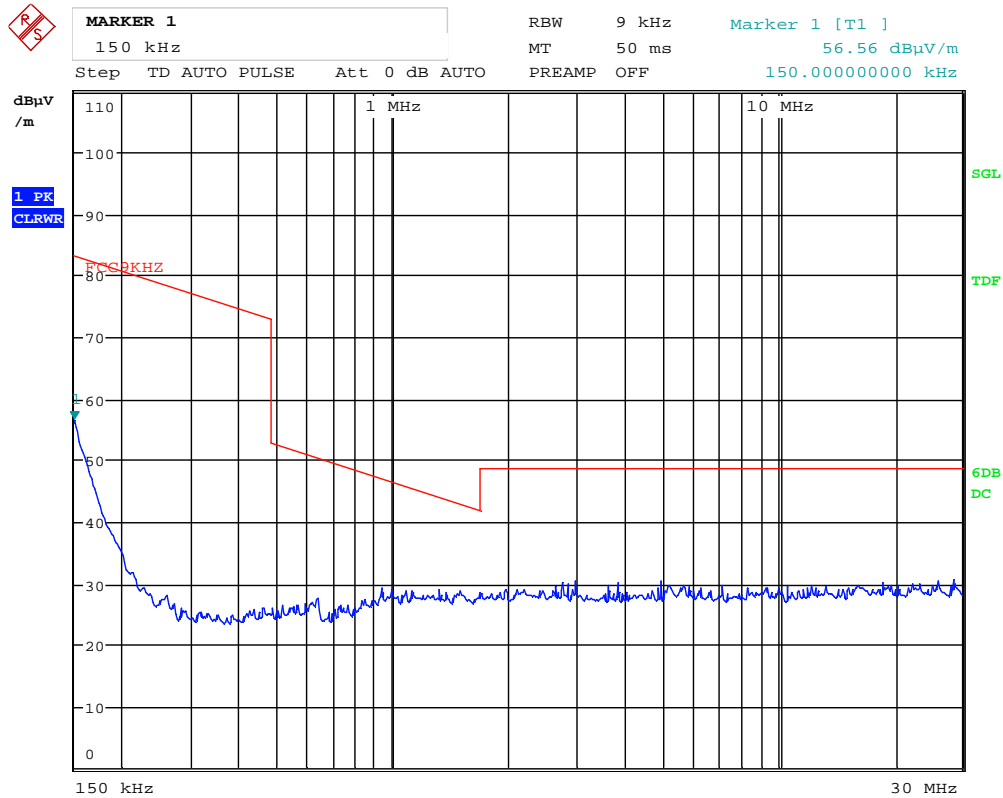
Date: 8.DEC.2015 08:38:36

Average detector – 134.2kHzkHz @10m



Date: 8.DEC.2015 08:32:58

134.2kHz; Radiated Emissions, 9 kHz – 150kHz @10m – Peak scan



Date: 8.DEC.2015 08:35:50

134.2 kHz; Radiated Emissions, 0.15 - 30MHz @10m – Peak scan



MARKER 1

34.52 kHz

RBW 9 kHz

Marker 1 [T1]

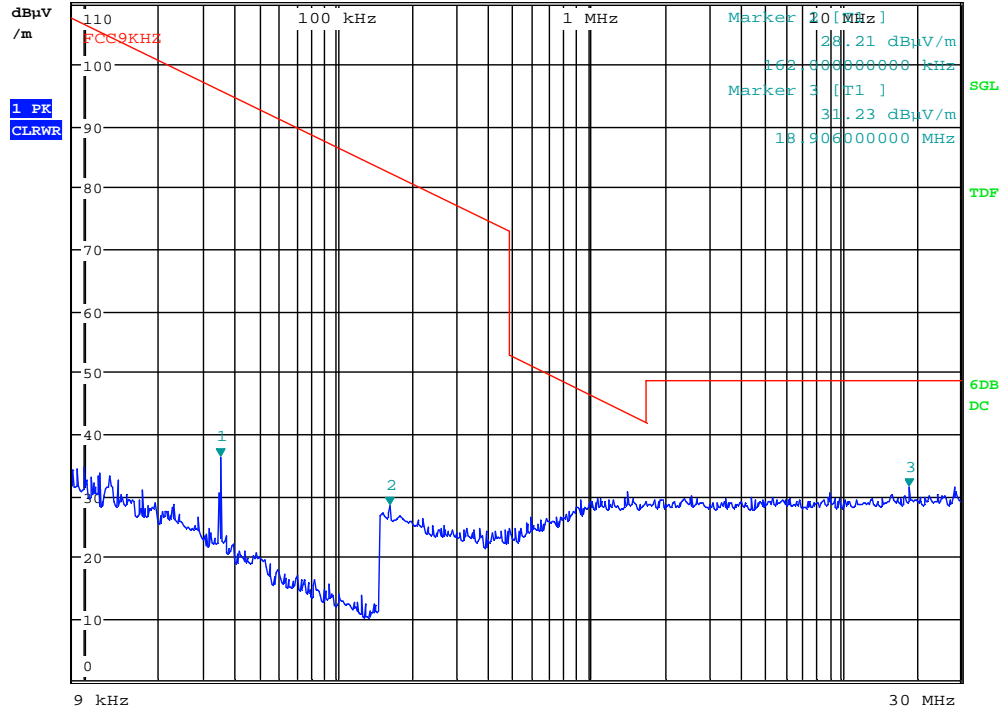
MT 100 ms

36.14 dBµV/m

Step AUTO Att 0 dB

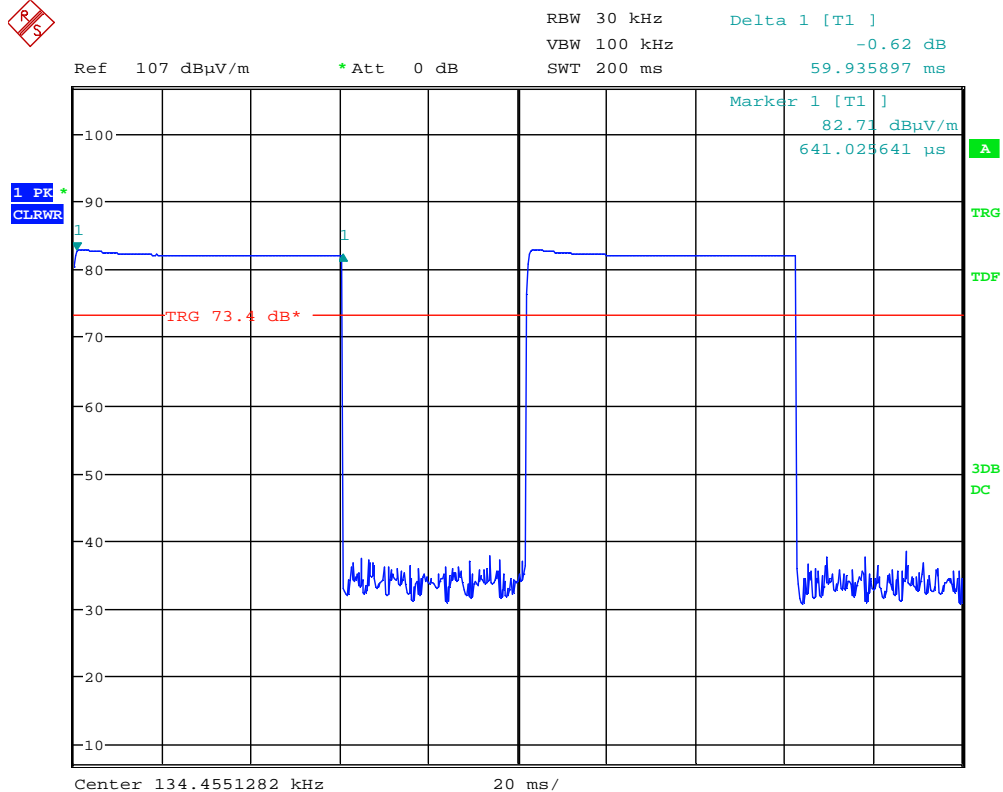
PREAMP OFF

34.52000000 kHz



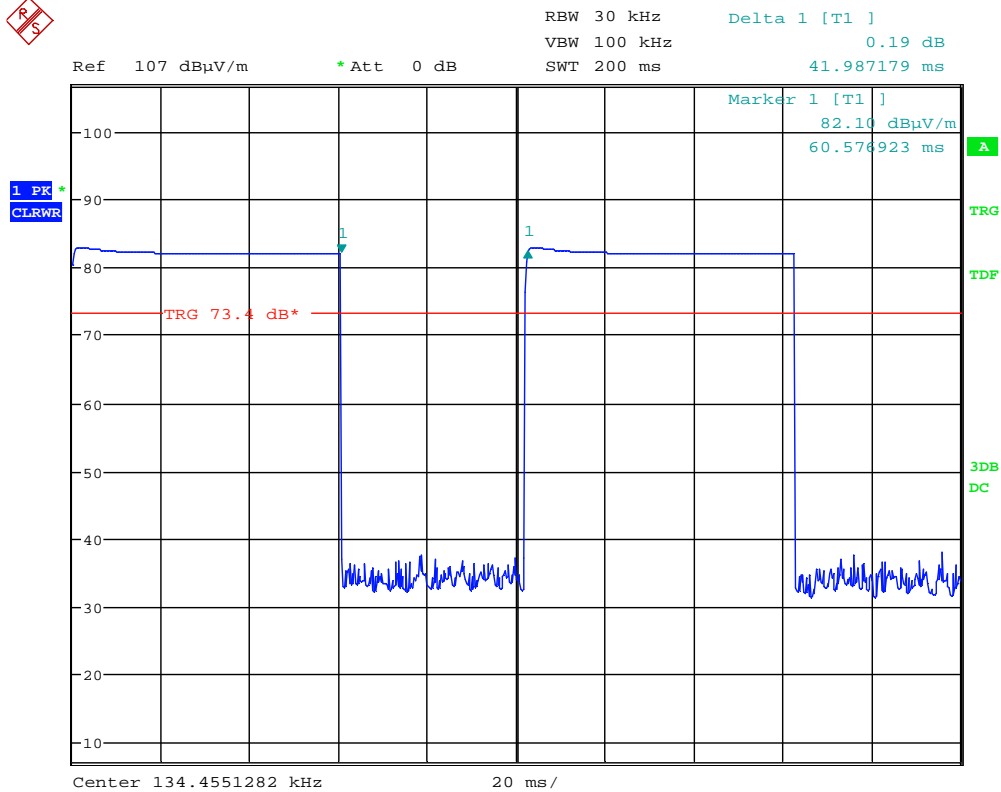
Date: 8.DEC.2015 09:38:12

Idle mode : Radiated Emissions, 0.009 - 30MHz @10m – Peak scan



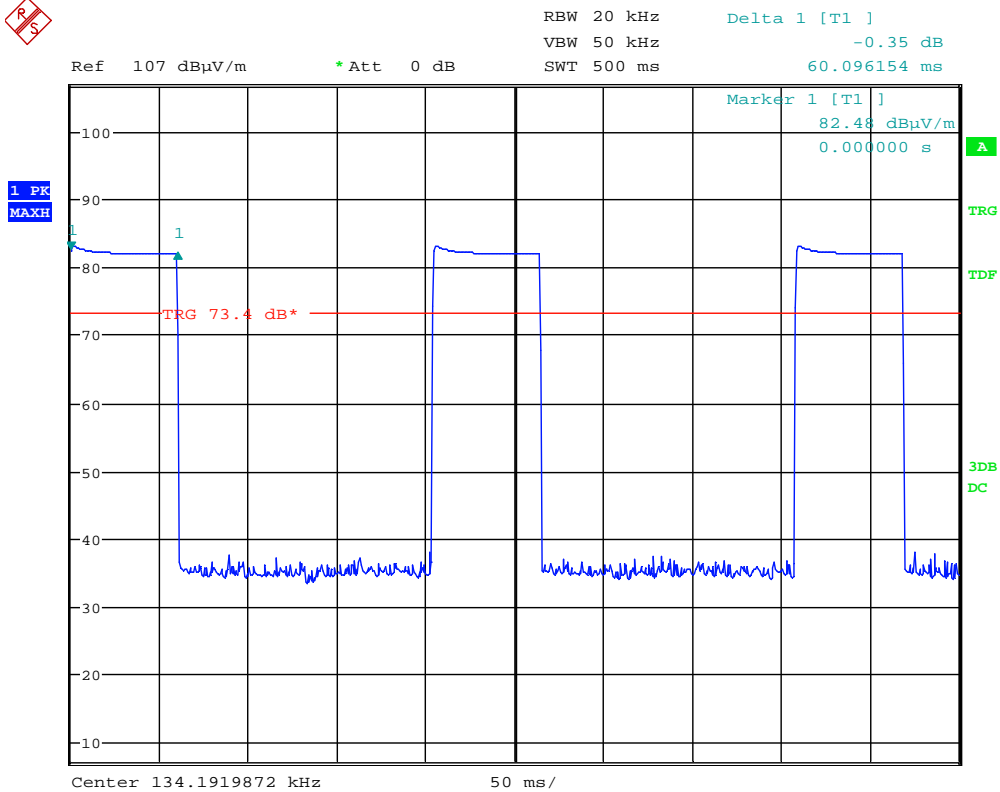
Date: 8.DEC.2015 08:16:22

Duty cycle ON time without transponder



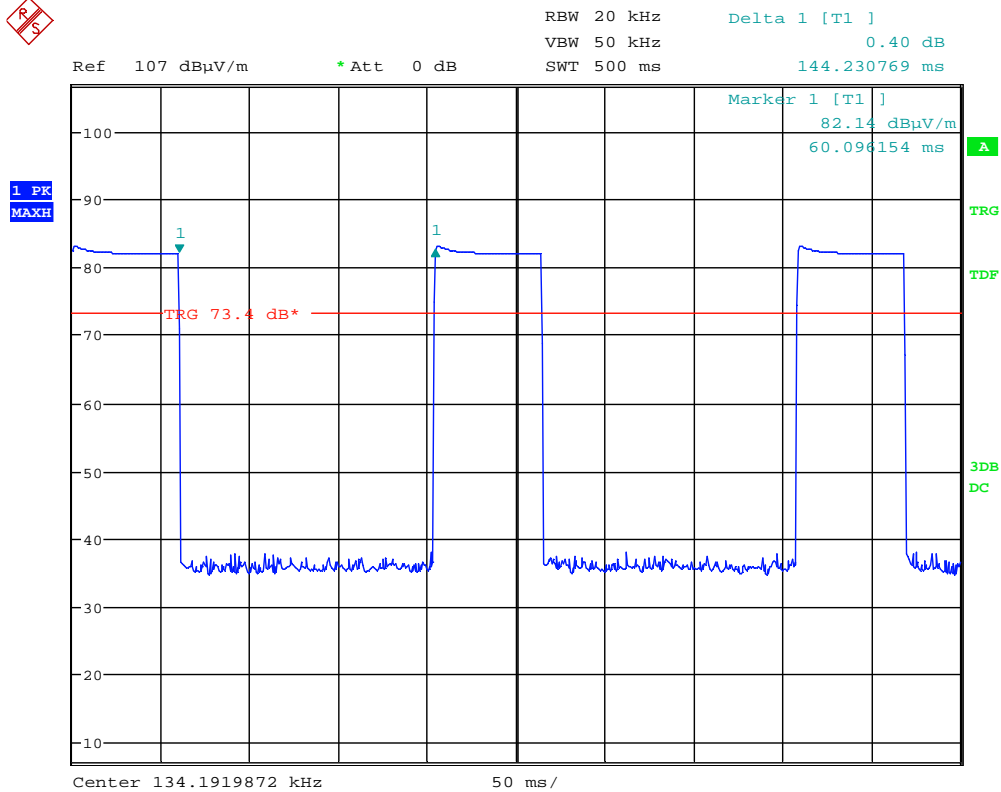
Date: 8.DEC.2015 08:17:05

Duty cycle OFF time without transponder



Date: 8.DEC.2015 08:44:07

Duty cycle ON time with transponder



Date: 8.DEC.2015 08:44:42

Duty cycle OFF time with transponder

Radiated emission 30 – 1000 MHz.

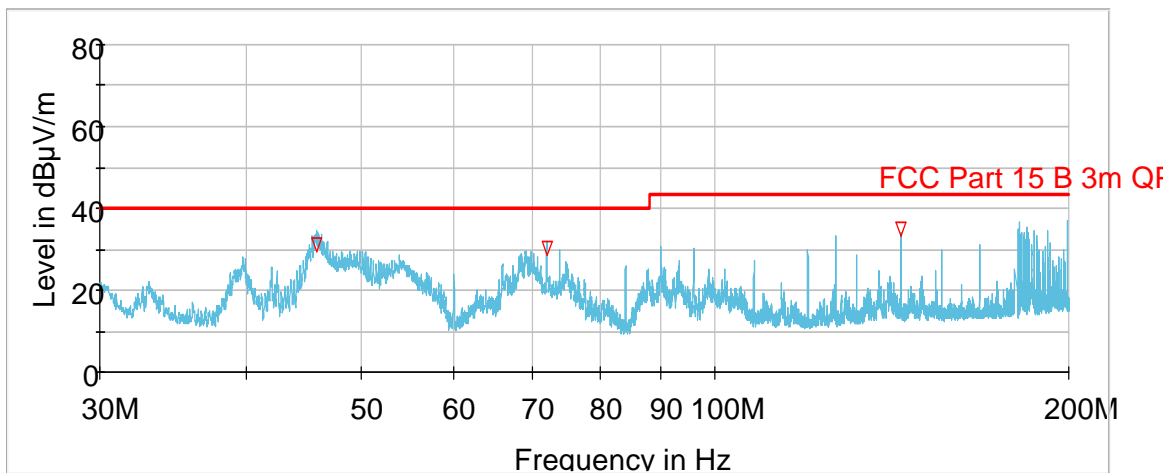
Detector: Peak

Measuring distance at 3m.

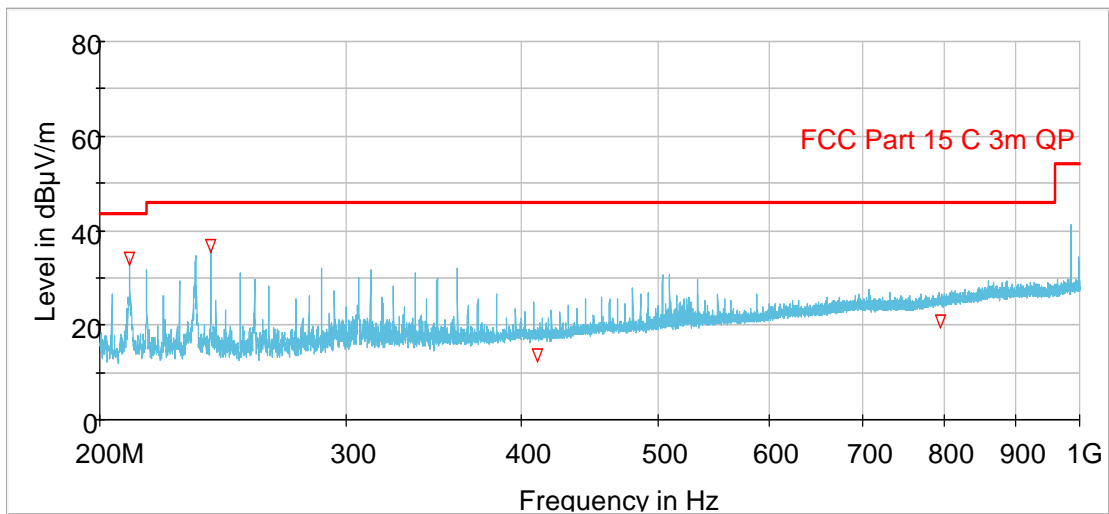
All values are below the limit even when measured with Peak Detector.

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

See attached graphs.



Radiated Emissions, 30 – 200 MHz, VP and HP, @3m



Radiated Emissions, 200 - 1000 MHz, VP and HP, @3m

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.891550	31.17	40.00	8.83	1000.0	120.000	114.0	V	179.0	-14.2
72.000500	30.31	40.00	9.69	1000.0	120.000	252.0	H	244.0	-15.3
144.001150	34.95	43.50	8.55	1000.0	120.000	132.0	H	220.0	-11.1
210.002500	34.21	43.50	9.29	1000.0	120.000	110.0	V	210.0	-12.4
240.003400	36.61	46.00	9.39	1000.0	120.000	136.0	H	127.0	-11.3
410.349500	13.68	46.00	32.32	1000.0	120.000	161.0	V	336.0	-5.9
795.454200	20.87	46.00	25.13	1000.0	120.000	130.0	V	260.0	1.1

Radiated Emissions, 1-6 GHz

1-6 GHz measured at a distance of 3 m

All values are below the average limit even when measured with Peak Detector.

Peak detector

Frequency GHz	Field Strength @3m dB μ V/m	Detector	Limit dB μ V/m	Margin dB
9.59	53.84	Pk	74	20.16
-	-	-	-	-

Average detector

Frequency GHz	Field Strength @3m dB μ V/m	Detector	Limit dB μ V/m	Margin dB
9.59	-	Av	54	-
-	-	Av	54	-

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

See attached graphs.



MARKER 1
9.596153846 GHz

* RBW 1 MHz

Marker 1 [T1]

VBW 3 MHz

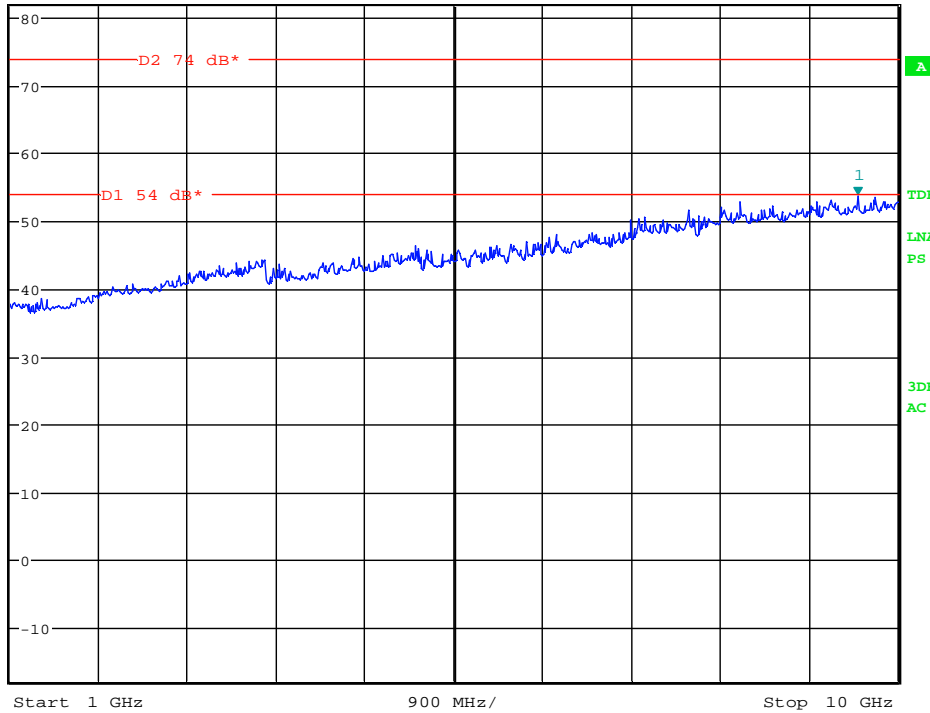
53.81 dBuV/m

SWT 55 ms

9.596153846 GHz

Ref 82 dBuV/m * Att 10 dB

1 PK
MAXH



Date: 10.DEC.2015 10:48:04

HP: 1 - 6GHz

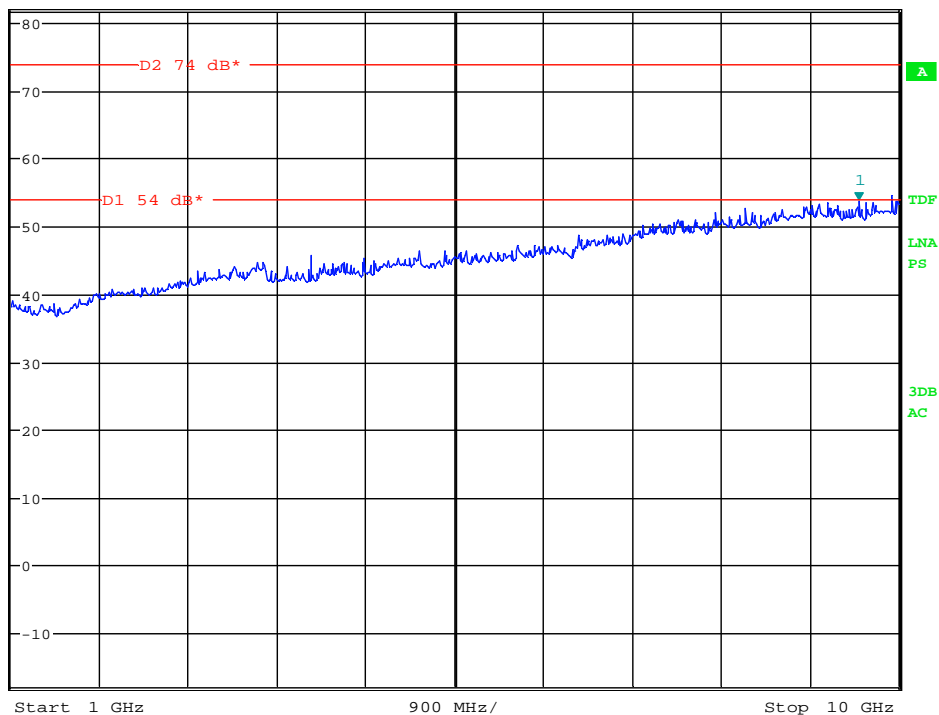


MARKER 1
9.596153846 GHz
Ref 82 dBμV/m

* RBW 1 MHz
VBW 3 MHz
SWT 55 ms

Marker 1 [T1]
53.84 dBμV/m
9.596153846 GHz

1 PK
MAXH



Date: 10.DEC.2015 10:47:24

VP: 1 – 6GHz

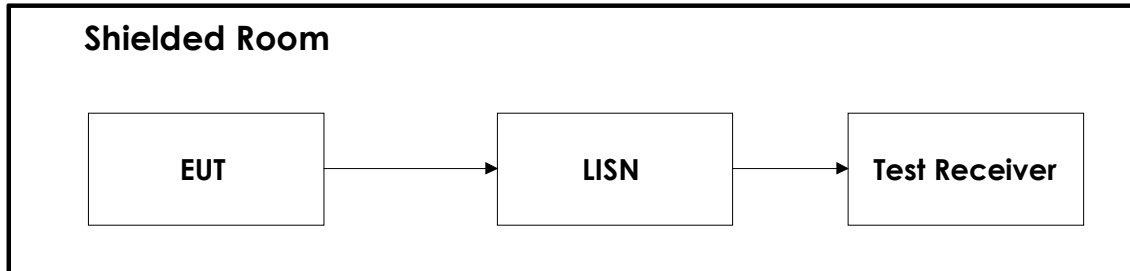
4 LIST OF TEST EQUIPMENT

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.

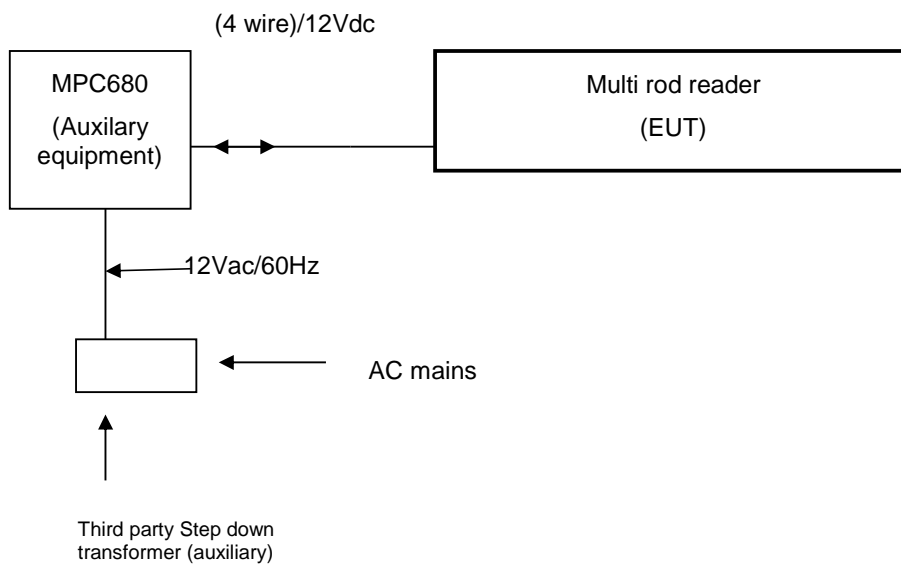
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2015.11	2016.11
2.	HFH2-Z2	Loop antenna	Rohde & Schwarz	LR1660	2014.10	2017.10
3.	3115	Antenna horn	EMCO	LR 1330	2010.08	2017.08
4.	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2016.12
5.	HL223	Log Periodic antenna	Rohde & Schwarz	LR 1261	2013.12	2016.12
6.	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2015.09	2016.09
7.	LNA6900	Pre-amplifier	Teseq	LR 1593	2015.10	2016.10
8.	Model 87 V	Multimeter	Fluke	LR 1597	2015.10	2016.10
9.	C10001ix	Power analyser	California Instruments	LR 1549	2015.04	2017.04

5 BLOCK DIAGRAM

5.1 Power Line Conducted Emission



5.2 Test Setup Radiated Emission



Revision history

Version	Date	Comment	Sign
1.0	2016.02.17	Test report	FS
2.0	2016.03.08	Revised	gns