Report No: 379541-03-R00

Test Report

Product	In Place ID Reader
Name and address of the applicant	DeLaval International AB Gustaf Delavals väg 15 P.O. Box 39 SE-147021 Tumba, SWEDEN
Name and address of the manufacturer	DeLaval International AB Gustaf Delavals väg 15 P.O. Box 39 SE-147021 Tumba, SWEDEN
Model	IPR
Rating	9.6 – 28.8 V_{DC}
Trademark	DeLaval
Serial number	See page 3
Additional information	LF RFID 134.2kHz
Tested according to	**FCC Part 15.209** Low Power Transmitter Below 1705 kHz **Industry Canada RSS-210, Issue 10** Low Power Licence-Exempt Radio Apparatus
Order number	379541
Tested in period	2019-10-14 to 2019-10-21 and 2021-04-27
Issue date	2021-11-03
Name and address of the testing laboratory	Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50

An accredited technical test executed under the Norwegian accreditation scheme

Prepared by [G.Suhanthakumar]	Approved by [Frode Sveinsen]

Template version: C

CONTENTS

1 INFORMATION

1.1 Test Item

Name	**DeLaval In-place ID Reader**
FCC ID	**UCSIPR**
IC ID	**6576A-IPR**
Model/version	**IPR**
Serial number	**Sample # 2 and #3**
Hardware identity and/or version	**HW 2150009407**
Software identity and/or version	**SW 2150013146**
Frequency Range	**TX: 134.2 kHz, RX: 95.0 – 138.0 kHz**
Operating frequency	**134.2 kHz**
Type of Modulation	**TX no modulation, RX modulated by transponder (BT: ON/OFF @ approx. 100 kHz, HDX 124.2 or 134.2 kHz, FDX AM)**
Field Strength	**0.85mW (EIRP, calculated using formula from KDB 412172)**
User Frequency Adjustment	**None**
Type of Power Supply	**Min: 9.6 V, Max 28.8 V (from Milking Point Controller, MPC680 12 VDC)**
Antenna Connector	**No (integral loop antenna)**
Antenna Diversity Supported	**No (separate antenna for TX and RX)**

Description of Test Item

IPR is a RFID reader. It transmits a near field with frequency 134.2kHz without modulation. When a passive tranponder is in range it generates power and sends its identification number to the IPR. The IPR transfers the data to the MPC which is a Milking Point Controller.

The IPR gets DC input power from the MPC680. The MPC receives 12 VAC 50-60Hz from the power network with a stepdown transformer 120 VAC 60Hz.

The following models are covered by this test report:

Model/Type	Part No.	Comment	Tested
IPR	**2150009407**	**Same hardware with software 2150013173**	**YES**
IPR	**2150009406**	**Same hardware with software 2150013171**	**NO**
IPR	**2150015681**	**Same hardware with software 2150017634**	**NO**
IPR	**2150015688**	**Same hardware with software 2150017634**	**NO**

1.2 Test condition

Temperature:	**20 - 25 °C**
Relative humidity:	**30 - 45 %**
Normal test voltage:	**12V - 24DC**

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Thomas Danglé/G.Suhanthakumar

1.4 Antenna Requirement

Is the antenna detachable? ☐ Yes ☒ No

If detachable, is the antenna connector non-standard? ☐ Yes ☐ No

Type of antenna connector: N/A

Ref. FCC §15.203

1.5 Worst-Case Configuration and Mode

Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

1.6 Comments

The measurements were done with the EUT powered by external power supply of 24 VDC and the external power supply was received 120 VAC/60Hz from an AC Power source. It was checked that the power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

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 15.209 and ISED Canada RSS-210, Issue 10 and RSS-GEN, Issue 5.

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

The radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10 m.

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”.

2.2 Test Summary

Name of test	FCC Part 15 Reference	RSS-Gen Issue 5 RSS-210 Issue 10 ICES-003 Issue 7 Reference	ANSI C63.10-2013 Reference	Result
Power Line Conducted Emission	15.107(a) 15.207(a)	3.2 (ICES-003) 8.8 (RSS-GEN)	7.3 (C63.4-2014) 6.2	Complies
Spurious Emissions (Radiated)	15.31 15.33 15.35 15.205 15.209	7.1, 7.2, 7.3 8.9, 8.10 (RSS-GEN)	6.3, 6.4, 6.5, 6.6, 6.10	Complies

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.107 (a)

ISED RSS-GEN Issue 5, Clause 7.2/8.8

Measurement procedure: **ANSI C63.4-2014 using 50 μH/50 ohms LISN.**

Test Results: **Complies with Class B Limits.**

Measurement Data:

Highest measured value (L1 and N):

The IPR gets DC input power from the MPC680.
The MPC receives 12 VAC 50-60Hz from the power network with a stepdown transformer 120 VAC 60Hz.

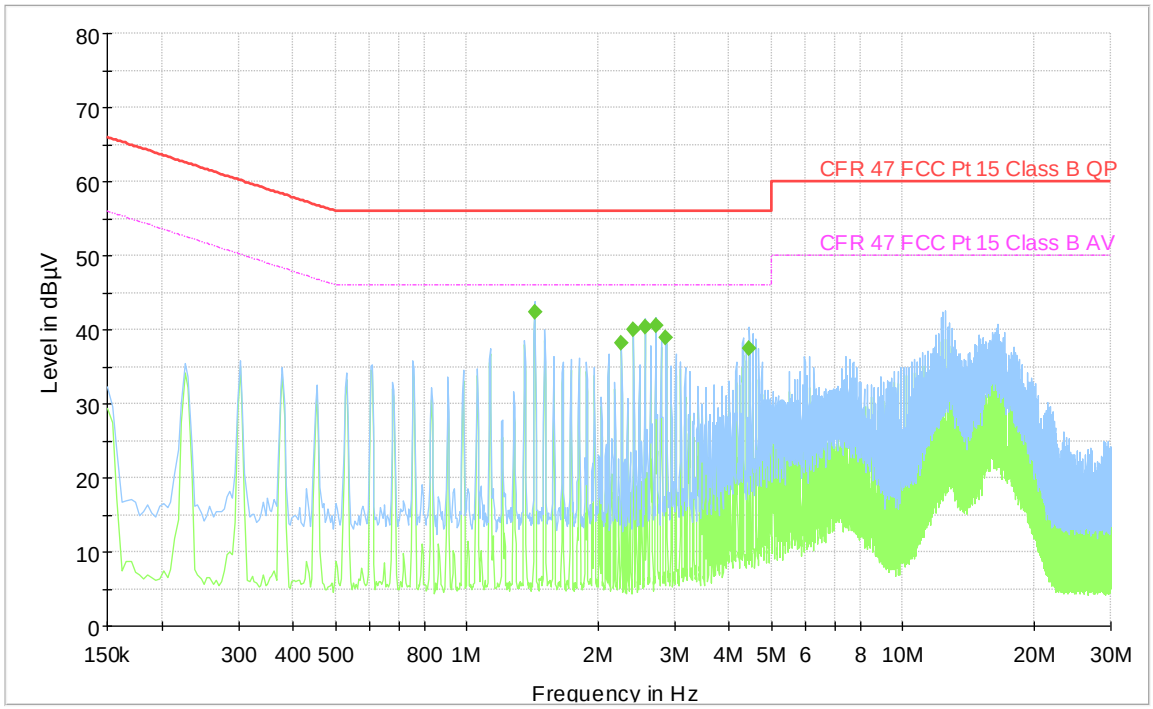
Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line
1.436	---	42.42	46.00	3.58	1000	9	N
2.264	---	38.09	46.00	7.91	1000	9	L1
2.416	---	39.95	46.00	6.05	1000	9	N
2.568	---	40.34	46.00	5.66	1000	9	N
2.716	---	40.62	46.00	5.38	1000	9	N
2.868	---	38.83	46.00	7.17	1000	9	N
4.452	---	37.39	46.00	8.61	1000	9	L1

Class B Limits:

Frequency of Emission	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5 MHz	66 to 56*	56 to 46*
0.5 -5 MHz	56	46
5 – 30 MHz	60	50

*Decreases with the logarithim of the frequency

Full Spectrum



120Vac/60Hz

3.2 Occupied Bandwidth (99% BW)

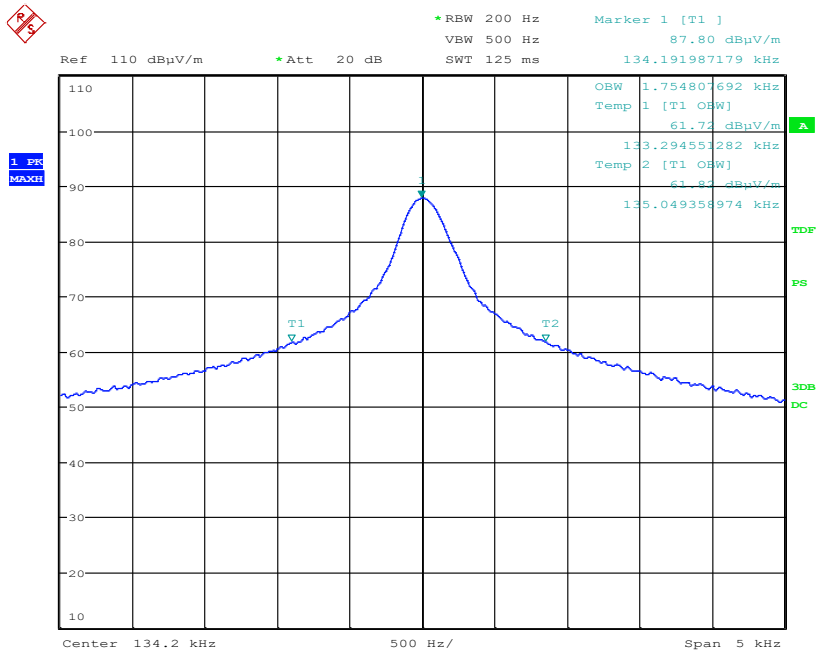
ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 / 7.8.3

Measurement Data:

Occupied Bandwidth (99% BW)	1.755 kHz

Requirements: No requirement for 99% BW, reported for information only.



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99% OBW with FDX transponder

3.3 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED (MHz)	FCC (GHz)	ISED (GHz)
0.090-0.110		**0.96-1.24** **1.3-1.427**	**0.96-1.427**
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		**2.69-2.9**	**2.655-2.9**
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		**3.6-4.4**	**3.5-4.4**
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 **123-138**	**108-138**	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

3.4 Radiated Emissions, 9 kHz – 30 MHz

FCC Part 15.31, 15.33, 15.35, 15.209 (a) (d)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Detector: Average

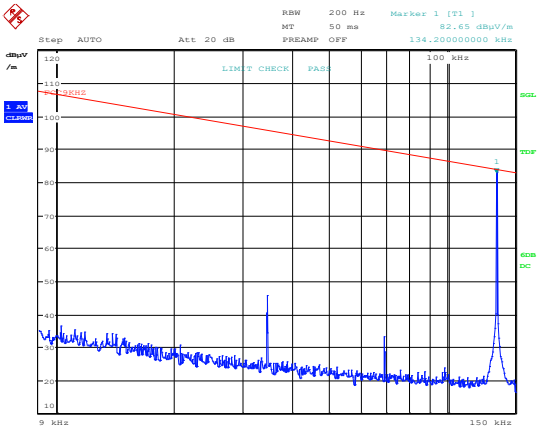
Measuring distance 10m

With tranponder	Frequency kHz	Measured Field Strength @10m dBµV/m	Detector	Limit @10m dBµV/m	Margin dB
B	134.2	82.65	AV	84.13	1.48
HDX		83.06	AV	84.13	1.01
FDX		83.97	AV	84.13	0.16

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

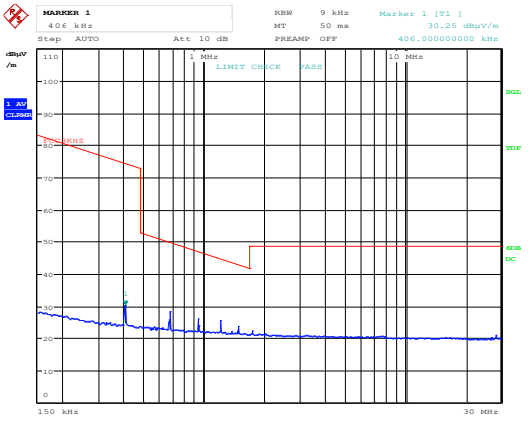
Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer “Transducer factor”.

See attached plots.



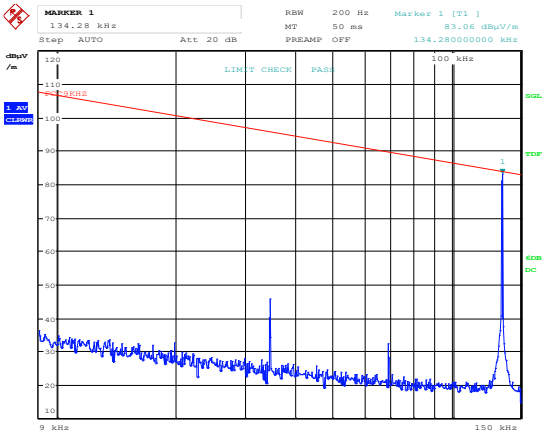
Date: 17.OCT.2019 15:35:23

With B-transponder, Average detector, 9 kHz - 150 kHz @10m



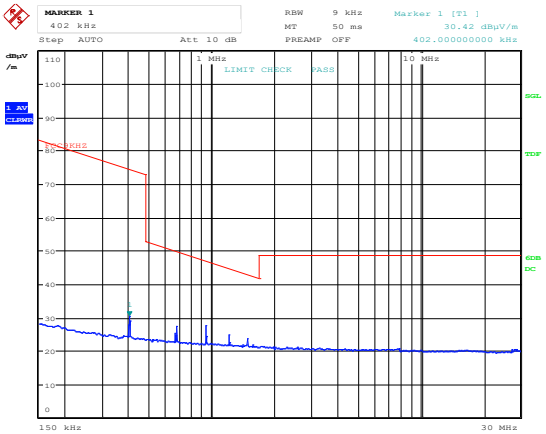
Date: 17.OCT.2019 15:55:55

With B-transponder, Average detector, 150 kHz -30 MHz @10m



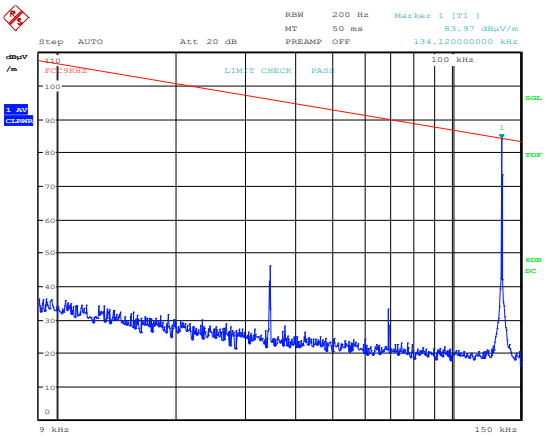
Date: 17.OCT.2019 15:39:00

With HDX-transponder, Average detector, 9 kHz - 150 kHz @10m



Date: 17.OCT.2019 15:48:16

With HDX-transponder, Average detector, 150 kHz - 30 MHz @10m



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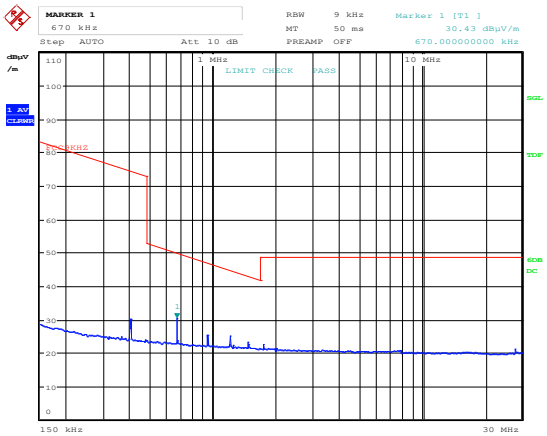
With FDX-transponder, Average detector, 9 kHz - 150 kHz @10m



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With FDX-transponder, Average detector, 150 kHz - 30 MHz @10m

3.5 Radiated Emission, 30 – 1000 MHz

FCC Part 15.109 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.4-2014

Test Results: Complies with Class A Limits

Measurement Data:

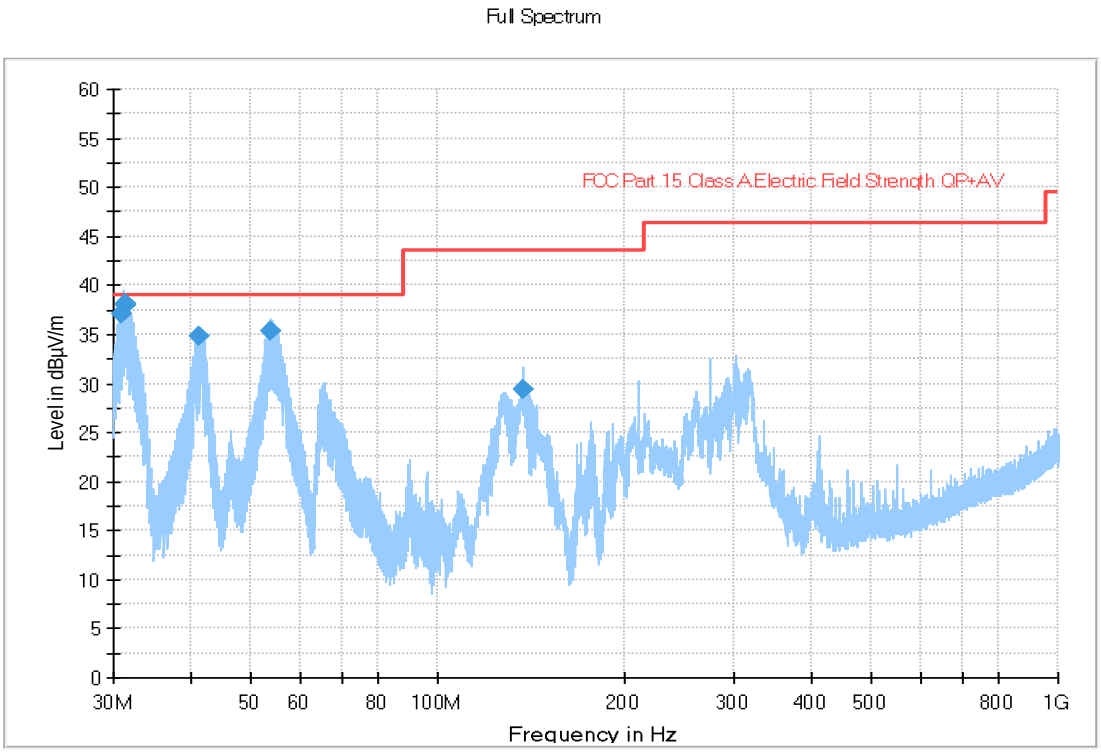
Detector: Peak (found frequencies were measured with Quasi-Peak Detector)

Measuring distance 10m

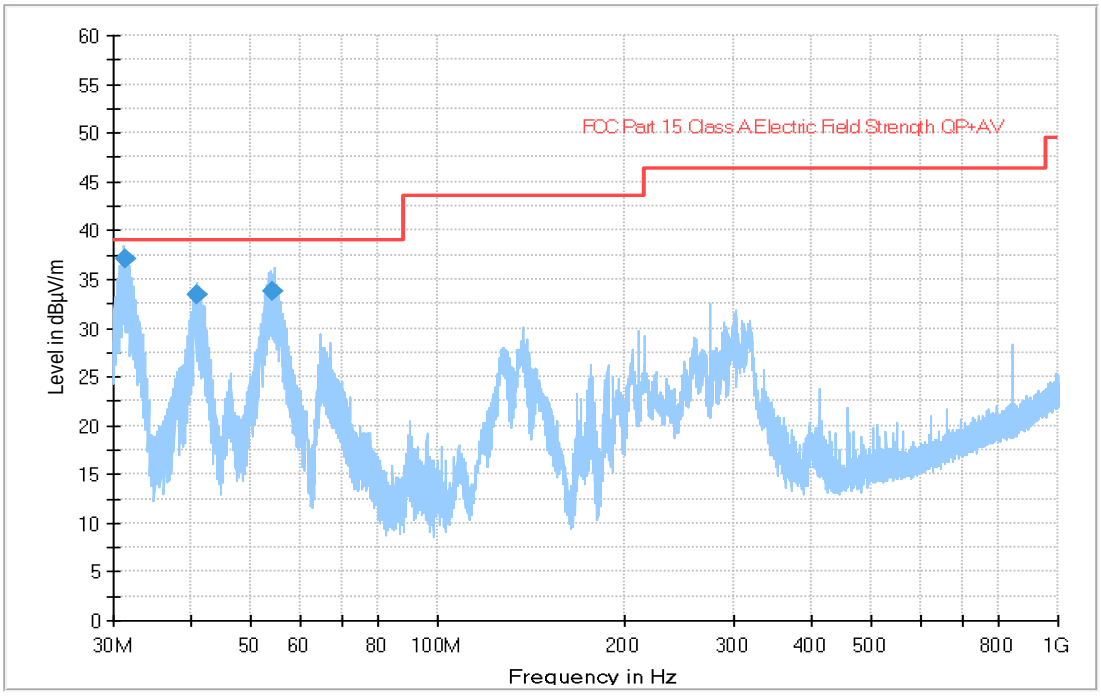
See attached plots.

Requirements/Limit

FCC	Part 15.109	
ISED	RSS-GEN Issue 5, Clause 8.9	
Frequency	Radiated Emissions, Class A limit @10 meters	
30 – 88 MHz	90 µV/m	39.1 dBµV/m
88 – 216 MHz	150 µV/m	43.5 dBµV/m
216 – 960 MHz	210 µV/m	46.4 dBµV/m
960 – 1000 MHz	300 µV/m	49.5 dBµV/m
	Limits above are with Quasi Peak Detector	

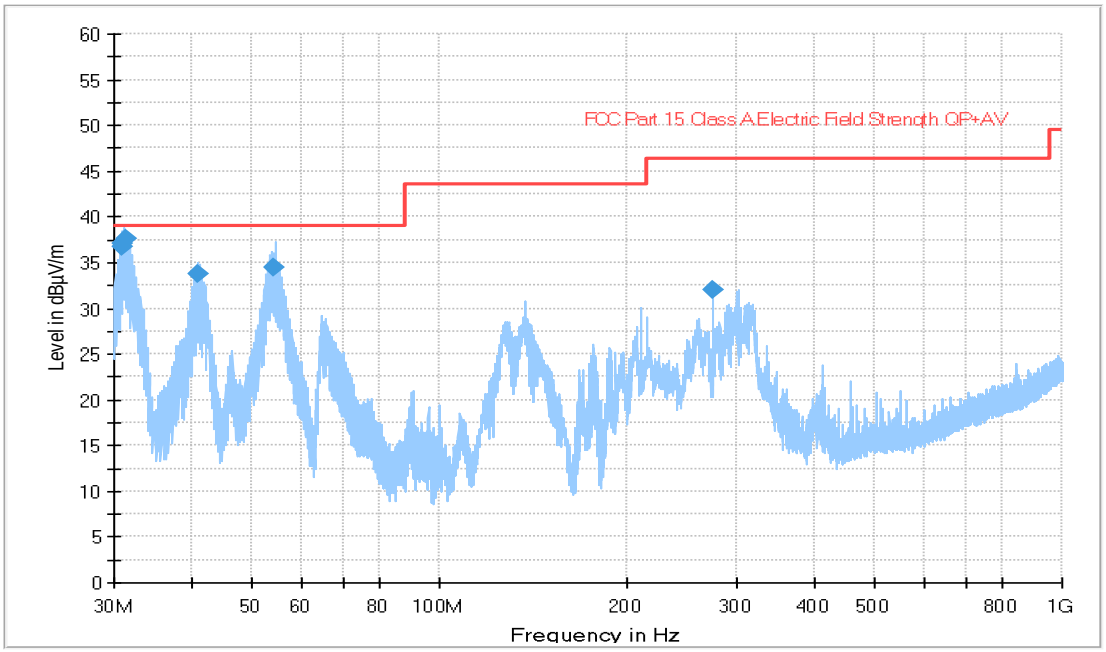


With B-transponder, Radiated Emissions, 30 – 1000 MHz, VP and HP, @10m



With HDX-transponder, Radiated Emissions, 30 – 1000 MHz, VP and HP, @10m

Full Spectrum



With FDX-transponder, Radiated Emissions, 30 – 1000 MHz, VP and HP, @10m

With B-transponder, Radiated Emissions, 30 – 1000 MHz, VP and HP, @10m

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.998950	37.02	39.00	1.98	1000.0	120.000	135.0	V	41.0
31.266794	37.94	39.00	1.06	1000.0	120.000	123.0	V	356.0
31.267339	38.21	39.00	0.79	1000.0	120.000	100.0	V	29.0
41.197994	34.83	39.00	4.17	1000.0	120.000	261.0	V	15.0
53.812300	35.28	39.00	3.72	1000.0	120.000	282.0	V	264.0
137.415556	29.41	43.50	14.09	1000.0	120.000	124.0	V	155.0

With HDX-transponder, Radiated Emissions, 30 – 1000 MHz, VP and HP, @10m

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.267944	37.06	39.00	1.94	1000.0	120.000	128.0	V	26.0
40.928206	33.48	39.00	5.52	1000.0	120.000	229.0	V	33.0
54.349083	33.75	39.00	5.25	1000.0	120.000	320.0	V	2.0

With FDX-transponder, Radiated Emissions, 30 – 1000 MHz, VP and HP, @10m

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.998744	36.77	39.00	2.23	1000.0	120.000	117.0	V	71.0
30.998850	37.15	39.00	1.85	1000.0	120.000	103.0	V	331.0
31.267389	37.61	39.00	1.39	1000.0	120.000	104.0	V	300.0
40.929456	33.82	39.00	5.18	1000.0	120.000	217.0	V	13.0
54.349383	34.45	39.00	4.55	1000.0	120.000	257.0	V	262.0
274.830922	32.07	46.40	14.33	1000.0	120.000	332.0	H	2.0

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.

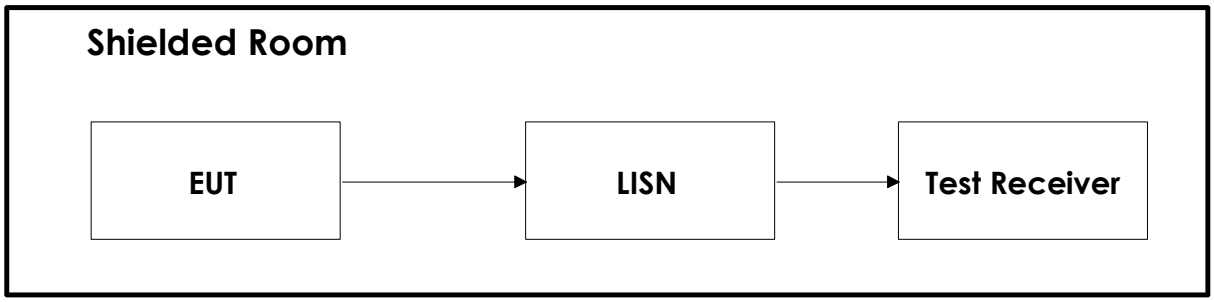
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1	ESU40	EMI Receiver	Rohde&Schwarz	LR-1639	2019.01	2020.01
2	HFH2-Z2	Loop antenna	Rohde&Schwarz	LR-1660	2016.11	2019.11
3	JB3	Antenna Bilog	Sunol Sciences	N-4525	2017.11	2019.11
4	310N	Pre-amplifier	Sonoma Inst.	LR-1686	2019.07	2020.07
5	ESR7	EMI Receiver	Rohde&Schwarz	LR-1675	2019.01 2021.01	2021.01 2022.01
6	ENV216	AMN	Rohde&Schwarz	LR-1665	2017.11 2019.11	2019.11 2022.11
7	Model 87 V	Multimeter	Fluke	LR-1597	2018.02 2020.02	2020.02 2022.02
8	6812B	AC Power source	Agilent	LR-1515	2019.03 2020.04	2020.03 2022.04

Revision history

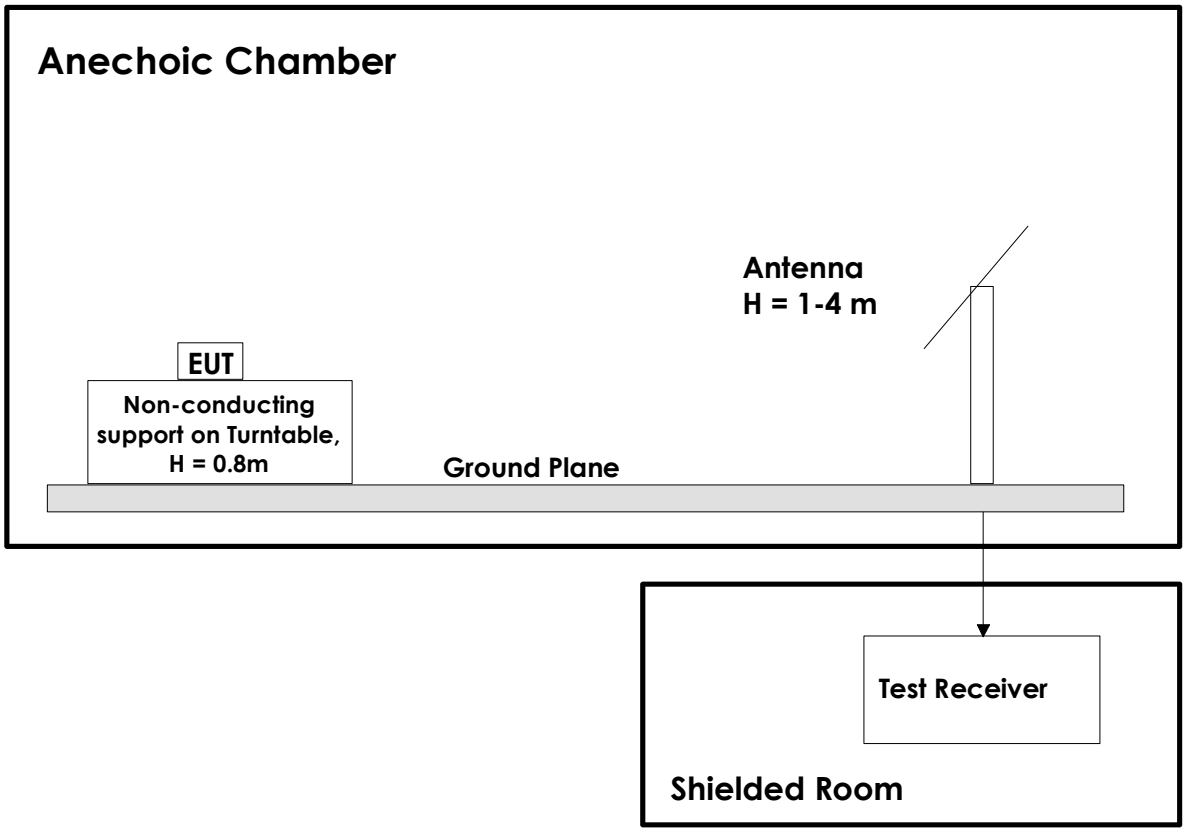
Revision	Date	Comment	Sign
00	2021-11-03	First version	TD/gns

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



This test setup is used for all radiated emissions tests.

For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m.

Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna.

All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers.

A pre-amplifier is used for all measurements above 30 MHz.