Report No. 357969-02-R07

Test Report

Product	ID Reader walk by
Name and address of the applicant	DeLaval Gustav Delavals veg 15, SE-147021 Tumba, Sweden
Name and address of the manufacturer	BioControl AS Gautestadveien 75, N-1890 Rakkestad, Norway
Model	Delaval mini reader MIRW
Rating	12Vac
Trademark	DeLaval
Serial number	See page 3
Additional information	131.072 kHz & 134.2 kHz RFID
Tested according to	**FCC Part 15.209** Low Power Device **Industry Canada RSS-210, Issue 10** Low Power Licence-Exempt Radio Apparatus, Category I Equipment
Order number	357969
Tested in period	2018.08.27 ,2021.04.16 and 2021.05.24
Issue date	2021.11.15
Name and address of the testing laboratory	Nemko 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 ilac-MRA NORWEGIAN ACCREDITATION TEST 033 **An accredited technical test executed under the Norwegian accreditation scheme**

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

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ENTERPRISE NUMBER NO974404532

CONTENTS

1 INFORMATION

1.1 Test Item

Name	ID Reader Walk by
FCC ID	UCSMIRW
IC ID	6576A-MIRW
Model/version	Delaval mini reader MIRW
Serial number	Marked as “3579690003”
Hardware identity and/or version	-
Software identity and/or version	-
Frequency Range	131.072 – 134.2 kHz
Operating frequency	131.072 kHz & 134.2 kHz
Type of Modulation	Unmodulated CW signal
Output Power	0.79mW (PK) 0.39mW (AV) (EIRP, calculated using formula from KDB 412172)
User Frequency Adjustment	None
Type of Power Supply	12Vac 60Hz (Input voltage to stepdown transformer is 120Vac/60Hz)
Antenna Connector	No (integral loop antenna)
Antenna Diversity Supported	No

Description of Test Item

The test item is a RFID reader/transmitter that transmit a field with frequency either 131.1 kHz or 134.2 kHz. The reader is a transponder reader that is a part of a system and is controlled by a controller unit called alpro. The alpro can by commanded to change between 131.1 kHz and 134.2 kHz. The transmitted signal is an unmodulated CW signal.

1.2 Normal test conditions

Temperature:	**20 - 23 °C**
Relative humidity:	**40 - 50 %**
Normal test voltage:	**120V AC**

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 4.

1.5 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

1.6 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.

1.7 Comments

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, paragraph 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

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”.

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 10 RSS-Gen Issue 5 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(a)(d)	7.1, 7.2, 7.3 8.9, 8.10 (RSS-GEN)	6.3, 6.4	Complies

3 TEST RESULTS

3.1 Power-Line Conducted Emissions

FCC Part 15.107

ISED ICES-003 Issue 7

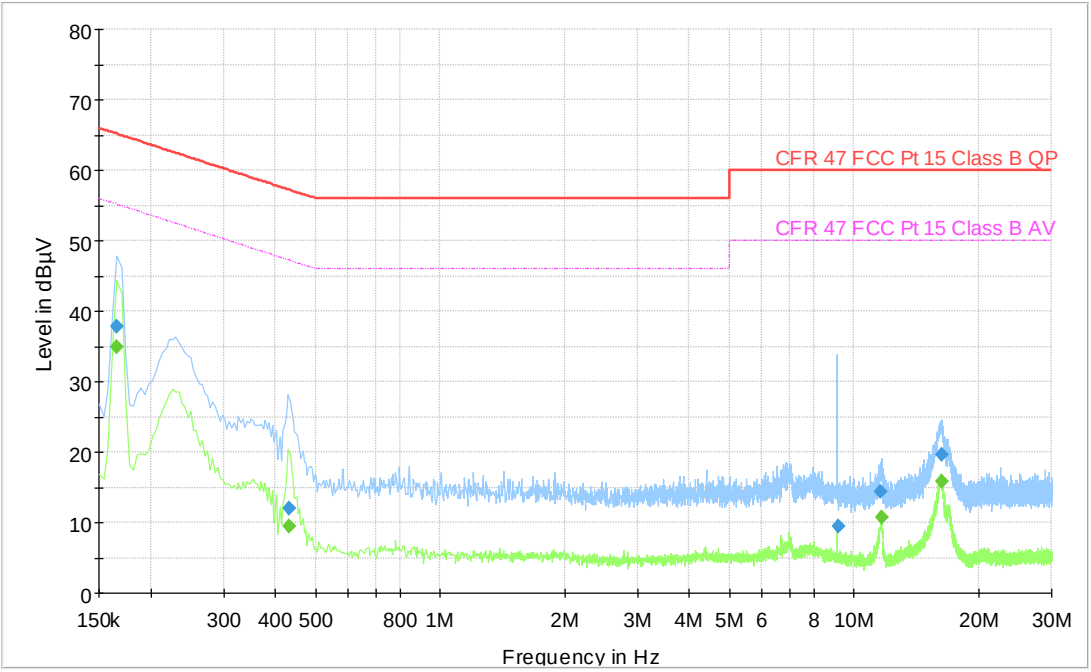
Measurement procedure: **ANSI C63.4-2014 using 50 µH/50 ohms LISN.**

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

Measurement Data:

120V 60Hz:

Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line
0.166	37.82	---	65.16	27.34	1000	9	N
0.166	---	34.98	55.16	20.18	1000	9	N
0.432	---	9.53	47.21	37.68	1000	9	L1
0.432	11.98	---	57.21	45.23	1000	9	N
9.156	9.53	---	60.00	50.47	1000	9	L1
11.616	14.30	---	60.00	45.70	1000	9	L1
11.648	---	10.75	50.00	39.25	1000	9	L1
16.248	19.63	---	60.00	40.37	1000	9	N
16.264	---	15.88	50.00	34.12	1000	9	L1

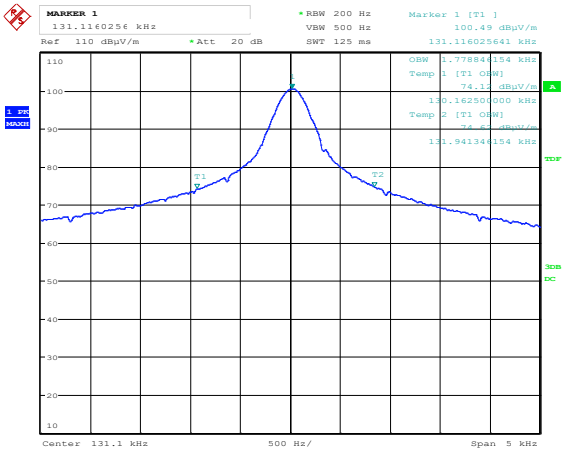
3.2 99% Occupied Bandwidth

ISED Canada RSS-GEN Issue 5, Clause 6.7

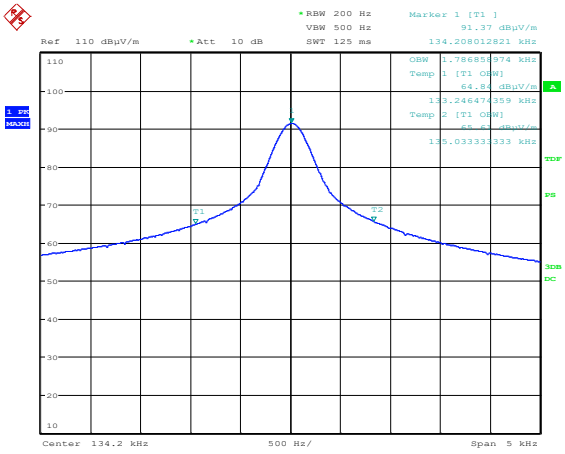
Measurement Data:

Measured 99% Bandwidth (kHz)	
131.1 kHz	**134.2 kHz**
1.78	**1.79**

Requirements: No requirements.



99% BW at 131.1 kHz



99% BW at 134.2 kHz

3.3 Radiated Emissions, 9 kHz – 30 MHz

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

ISED Canada RSS-GEN 8.9, 8.10

Test Results: Complies

Measurement Data:

Radiated emissions 9kHz - 30 MHz.

Detector: Peak

Measuring distance 10m

Measured Frequency kHz	Carrier Frequency kHz	Measured Field Strength @10m dBµV/m	Detector	Duty cycle correction dB	Calculated AV Value dBµV/m	Limit @10m dBµV/m	Margin dB
131.1	131.1	83.67	PK	-1.94	81.73	84.33	2.6
134.2	134.2	83.56	PK	-1.94	81.62	84.13	2.51

Duty Cycle Correction Factor Calculation:

Duty Cycle Correction factor = -20 x log (50+30)ms/100ms) = -1.94 dB

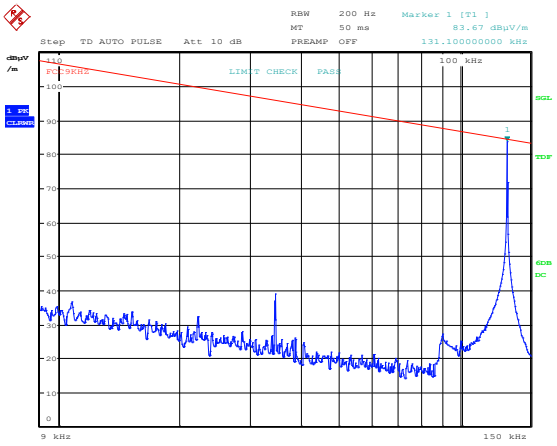
Maximum allowed Duty Cycle Correction: 20 dB

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

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

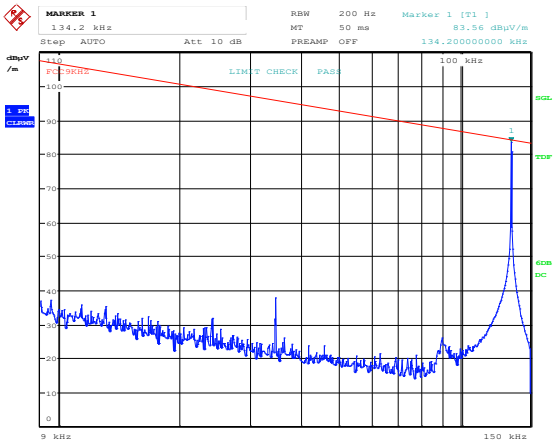
Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer “Transducer factor”.

See attached graphs.



Date: 13.MAY.2021 07:18:47

Peak detector, 131.1kHz , 9kHz - 30MHz @10m



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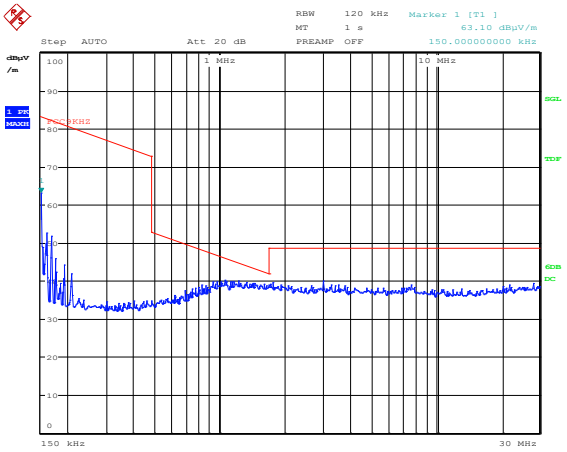
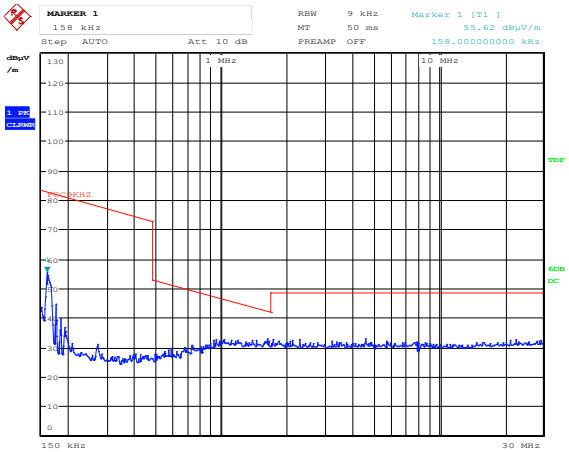
Peak detector, 134.2 kHz, 9kHz -30MHz @10m



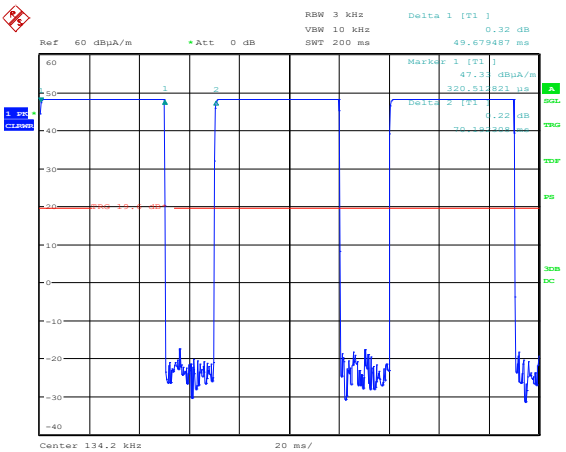
Date: 27.AUG.2018 11:05:06

131.1kHz; Radiated Emissions, 0.15 - 30MHz @10m – Peak



Date: 27.AUG.2018 12:15:05

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



Date: 27.AUG.2018 09:18:38

Duty cycle ON and OFF time with transponder

3.4 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 Canada (MHz)	FCC (GHz)	ISED Canada (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.

3.5 Radiated Emissions, 30 – 1000 MHz

FCC Part 15.209

ISED Canada RSS-GEN Issue 5, Clause 8.9

Measurement Result: Complies with Class A Limits

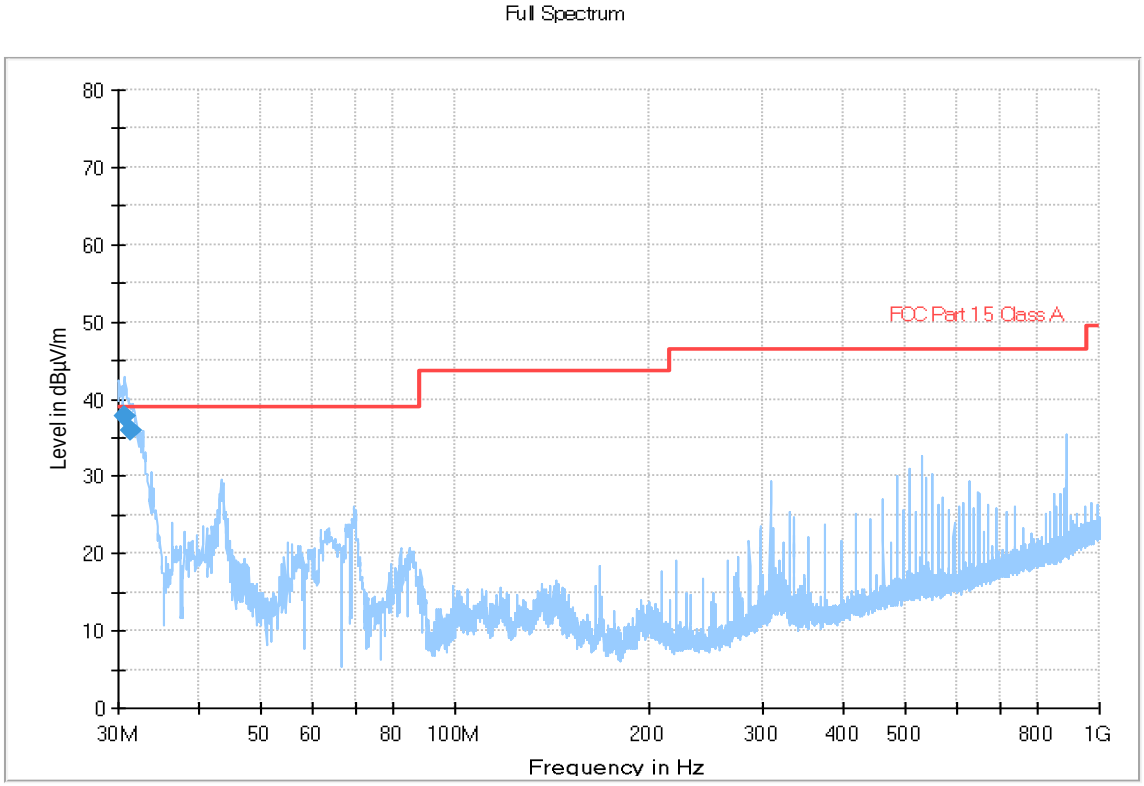
Detector: Peak

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 – 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)	Corr. (dB)
30.563478	37.80	39.00	1.20	1000.0	120.000	112.0	V	32.0	-10.8
31.312200	36.02	39.00	2.98	1000.0	120.000	117.0	V	294.0	-11.5

3.6 Radiated Emissions, 1-5 GHz

FCC Part 15.209

ISED Canada RSS-GEN Issue 5, Clause 8.9

1-5 GHz measured at 3m

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

Peak detector

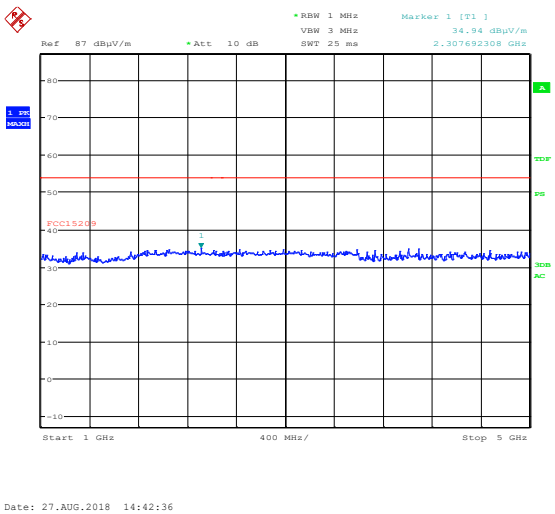
Frequency GHz	Field Strength @3m dBµV/m	Detector	Limit dBµV/m	Margin dB
2.3	34.94	Pk	74	39.1

Average detector

Frequency GHz	Field Strength @3m dBµV/m	Detector	Limit dBµV/m	Margin dB
2.3	-	Av	54	-

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

See attached plot.



Date: 27.AUG.2018 14:42:36

Radiated Emissions, 1 – 5 GHz, VP/HP

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	LR1639	2018.03	2019.03
2	HFH2-Z2	Loop antenna	Rohde & Schwarz	LR1660	2016.11	2019.11
3	3117-PA	Antenna horn	ETS-Lindgren	LR 1717	2017.05	2019.05
4	JB3	Antenna Bilog	Sunol Sciences Inc.	N-4525	2017.11	2019.11
5	310N	Pre-amplifier	Sonoma	LR 1686	2018.07	2019.07
6	Model 87 V	Multimeter	Fluke	LR 1597	2018.02	2020.02
7	6812B	AC Power source	Agilent	LR 1515	2017.09	2019.09

2021-04.16

No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1	ESCI 3	EMI Receiver	Rohde & Schwarz	N-4259	2021.10	2022.10
2	ENV216	Two-Line V-Network	Rohde & Schwarz	LR 1665	2019.11	2021.11
6	Model 87 V	Multimeter	Fluke	LR 1597	2020.02	2022.02
7	6812B	AC Power source	Agilent	LR 1515	2020.04	2022.04

2021-05-20

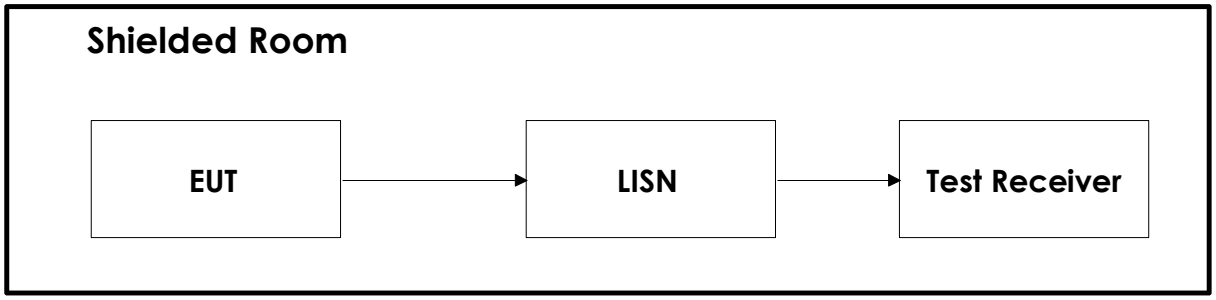
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2021.02	2023.02
2	HFH2-Z2	Loop antenna	Rohde & Schwarz	LR1660	2019.06	2021.06
3	6812B	AC Power source	Agilent	LR 1515	2020.04	2022.04

Revision history

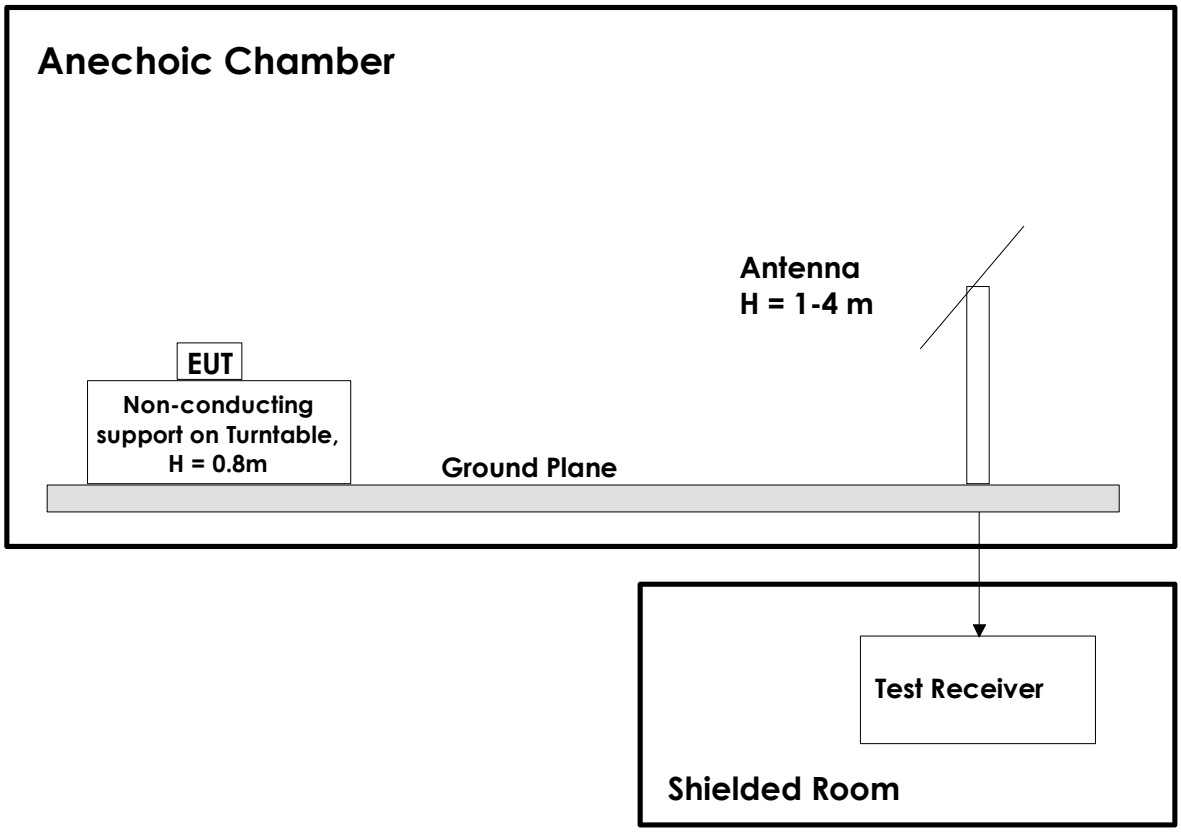
Revision	Date	Comment	Sign
00	2020.03.16	First version	gns
01	2021.01.20	Updated FCC ID	FS
02	2021.02.24	Uncertainty table is included	gns
03	2021.04.16	Power line conducted measurement was done for class B limit	gns
04	2021.05.27	Peak detector is used at 131/134 kHz and average is calculated using DC	gns
05	2021.09.21	Peak detector is used at 131/134 kHz and average is calculated using DC	gns
06	2021.11.01	Radiated output power corrected in page 3	gns
07	2021.11.15	Editorial correction in page 10	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.