Report No. E21115.00

Test Report
Electromagnetic Compatibility

Product	The device is a modulator for VSAT hub
Name and address of the applicant	NSSL Global Technologies AS Rolfsbuktveien 4B 1364 Fornebu Fornebu Norway
Name and address of the manufacturer	NSSL Global Technologies AS Rolfsbuktveien 4B 1364 Fornebu Fornebu Norway
Model	SatLink 8575 FLTx
Rating	1A 115V AC 60Hz
Trademark	Satlink
Serial number	2008260001
Additional information	The device will use e-Label for FCC
Tested according to	FCC CFR 47 Subpart 15B
Order number	437336
Tested in period	2021-05-27 – 2021-05-28
Issue date	2021-06-22
Name and address of the testing laboratory	**Nemko Group** Nemko AS Philip Pedersens vei 11, 1366 Lysaker, Norway TEL: +47 22 96 03 30 FAX: +47 22 96 05 50

An accredited technical test executed under the Norwegian accreditation scheme

Prepared by [Jan Gunnar Eriksen]

Approved by []

REPORT REVISIONS

Revision #	Date	Order #	Description
00	2021-06-22	437336	First issued

THIS REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATION(S) TESTED.

It is the manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is responsible to the authorities for any modifications made to the product, which result in non-compliance to the relevant regulations.

Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither is opinions expressed regarding model variants covered by the testing performed in this report.

Deviations from, additions to, or exclusions from the test specifications are described in “Testing Report Summary”.

DESCRIPTION OF TESTED ITEM(S)

Product description ..... :	The device is a modulator for VSAT hub

Model/type ..... :	SatLink 8575 FLTx
Serial number ..... :	2008260010
Operating voltage..... :	115 V AC 60 Hz
Maximum power/current..... :	1A
Insulation class ..... :	-
Highest clock frequency ..... :	300 MHz RF-DAC reference clock, FPGA core clock 1000 MHz ethernet
Hardware version ..... :	1.0
Software version ..... :	19.0.0

Mounting position..... :	☐ Table top equipment ☐ Wall/ceiling mounted equipment ☐ Floor standing equipment ☐ Handheld equipment ☒ Rack mounted equipment ☐ Console equipment ☐ Other:

INPUT/OUTPUT PORTS

Port name and description	Cable		
	Longer than 3m	Attached during test	Shielded
AC mains supply	☐	☒	☐
Signal port (ethernet)	☒	☒	☒
Signal port (Tx output)	☒	☒	☒
Signal port (10 MHz reference input)	☒	☒	☒
Signal port (1 pps reference input)	☒	☒	☒

OPERATING MODES

No.	Description	Applied for testing	
		Emissions	Immunity
1	Active mode generating signal to outdoor unit	☒	☐

ACCESSORIES USED DURING TEST

Description	Manufacturer	Type
Laptop PC	Generic (Dell)	Generic (Latitude E6430)

PHOTOS AND DRAWINGS

Copy of marking label..... :	
Photo of the test item ..... :	 Front view  Back view

OTHER INFORMATION

Modifications ..... :	None
Additional information ..... :	None

Note: This equipment has been tested with certain cable types and cable configurations. Any changes to these parameters when installed may influence on the EMC properties of this equipment.

TEST ENVIRONMENT

Test laboratory ..... :	☒ KJELLER (Instituttveien 6, N-2007 Kjeller, Norway) ☐ LYSAKER (Philip Pedersens vei 11, N-1366 Lysaker, Norway)
Laboratory accreditation ..... :	NORWEGIAN ACCREDITATION TEST 033 **Norsk Akkreditering – TEST 033** P06 – Electromagnetic Compatibility
Environmental conditions ..... :	The climatic conditions during the tests are within limits specified by the manufacturer for the operation of the product and the test equipment. The climatic conditions during tests are within the following limits: **Ambient temperature:** 15 – 35 °C **Relative humidity:** 25 – 75 %RH **Atmospheric pressure:** 86 – 106 kPa If explicitly required by the test standard, or the requirements are tighter than the above; the climatic conditions are recorded and documented separately in this test report.
Calibration ..... :	All instruments used in the tests of this test report are calibrated and traceable to national or international standards. Between calibrations test set-ups are controlled and verified on a regular basis by intermediate checks to ensure, with 95% confidence that the instruments remain within their calibrated levels. The instrumentation accuracy is within limits agreed by the IECEE/CTL and defined by Nemko.
Measurement uncertainties ..... :	Uncertainty in EMC emission measurements stated in this report are calculated from the standard measurement uncertainties multiplied by the coverage factor k=2. It was determined in accordance with CISPR 16-4-2. The true value is in the corresponding interval with a probability of 95%. Uncertainties for continuous immunity tests are calculated based on the same principles as for EMC emission uncertainties. For Harmonics and Flicker measurements the measurement uncertainty is calculated based on the same principles as for EMC emission uncertainties. Uncertainties for transient immunity are kept within the requirements of the relevant basic standard. *Further information about measurement uncertainties is provided on request.*
Decision rules ..... :	As specified by CISPR 16-4-2; if our measurement uncertainty U_{LAB} is less than or equal to U_{CISPR} , compliance is deemed to occur if no measured disturbance level exceeds the limit hence “PASS” is indicated, and non-compliance is deemed to occur if any measured disturbance level exceeds the limits hence “FAIL” is indicated. For continuous immunity tests, uncertainties are not considered when applying the calibrated test levels. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen. For transient immunity tests, uncertainties are not considered if the test equipment is kept within the requirements of the relevant basic standard. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen. For Harmonics and Flicker measurements the measurement uncertainty is considered, and measurements are marked if necessary. In doing so, the associated uncertainty of measurement has been considered. *Further information about decision rules is provided on request.*

POWER SUPPLY CONDITIONS

The following nominal power supply conditions have been tested:

PC no.	Voltage	Frequency	Type	Ground terminal
PC1	115V	☐ AC 50Hz / ☒ AC 60Hz / ☐ DC	☐ 3AC / ☐ 3ACN / ☐ PoE	☒ PE / ☐ GND / ☐ None

☐ The power supply voltage has been selected after a maximum disturbance investigation over the product’s rated voltage range.
☐ Additional chassis grounding was applied.

TEST REPORT SUMMARY

APPLIED STANDARDS

Standards	Titles
FCC CFR 47 Subpart 15B	*Digital devices - Unintentinal radiators, Class A Digital Device*

TEST SUMMARY

Requirements – Tests	Reference standards	Verdict
Conducted Emissions, Class B	FCC CFR 47 Subpart 15B FCC Part 12.107 per ANSI C63.4-2014	PASS
Radiated Emissions (Below 1GHz), Class A	FCC CFR 47 Subpart 15B FCC Part 12.109 per ANSI C63.4-2014	PASS
Radiated Emissions (Above 1GHz), Class B	FCC CFR 47 Subpart 15B FCC Part 12.109 per ANSI C63.4-2014	PASS

PASS : Tested and complied with the requirements
FAIL : Tested and failed the requirements
N/A : Test not relevant to this specimen (evaluated by the test laboratory)
– : Test not performed (instructed by the applicant)
* : An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
# : A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

NOTES

Note 1: Product standards with dated references to basic standards may have been performed by Nemko AS according to the newest edition of the basic standard. This may impact the compliance criteria or technical performance of the test, still this is adequate as long as the test is expected to confirm compliance to the intention of the product standard. The table above lists the actual editions of the basic standards which have been used during testing.

Note 2: The choice of immunity test levels could be higher than those specified by the reference standards when we consider the nature of the specimen and its intended use or based on customer requests.

Test Results

CONDUCTED EMISSIONS

TEST DESCRIPTION

Method
The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up
The measurement was performed at the power supply terminal of the specimen. Nominal supply voltage was provided.
The specimen was energized and in normal operating mode during the measurement.

☐ The specimen and its cables were elevated 10 cm above a ground plane.
☐ The specimen and its cables were elevated 40 cm above a ground plane.
☒ The specimen and its cables were placed 40 cm from a vertical ground plane, 80 cm over ground plane.
☐ The specimen was mounted directly on, and bonded to a ground plane. Cables and auxiliary equipment were elevated by 1 cm

☒ The specimen was connected to an Artificial Mains Network (AMN) by its power supply cable, which was adjusted to 100cm length by folding.
☐ The specimen was connected to an Artificial Mains Network (AMN) by a 0.8 m shielded power supply cable directly connected to the AMN

Conditions
☐ Frequency range was 9kHz – 30MHz.
☐ Frequency range was 10kHz – 30MHz.
☒ Frequency range was 150kHz – 30MHz.

The measuring bandwidth is 200Hz in the frequency range 9 kHz – 150 kHz. Measurement was made with a 100 Hz step size and 100 ms dwell time.
The measuring bandwidth is 9 kHz in the frequency range 150 kHz – 30 MHz. Measurement was made with a 4.5 kHz step size and 20 ms dwell time.

Measurement uncertainty: ± 3.7 dB (9 kHz – 150 kHz); ± 3.3 dB (150 kHz – 30 MHz)

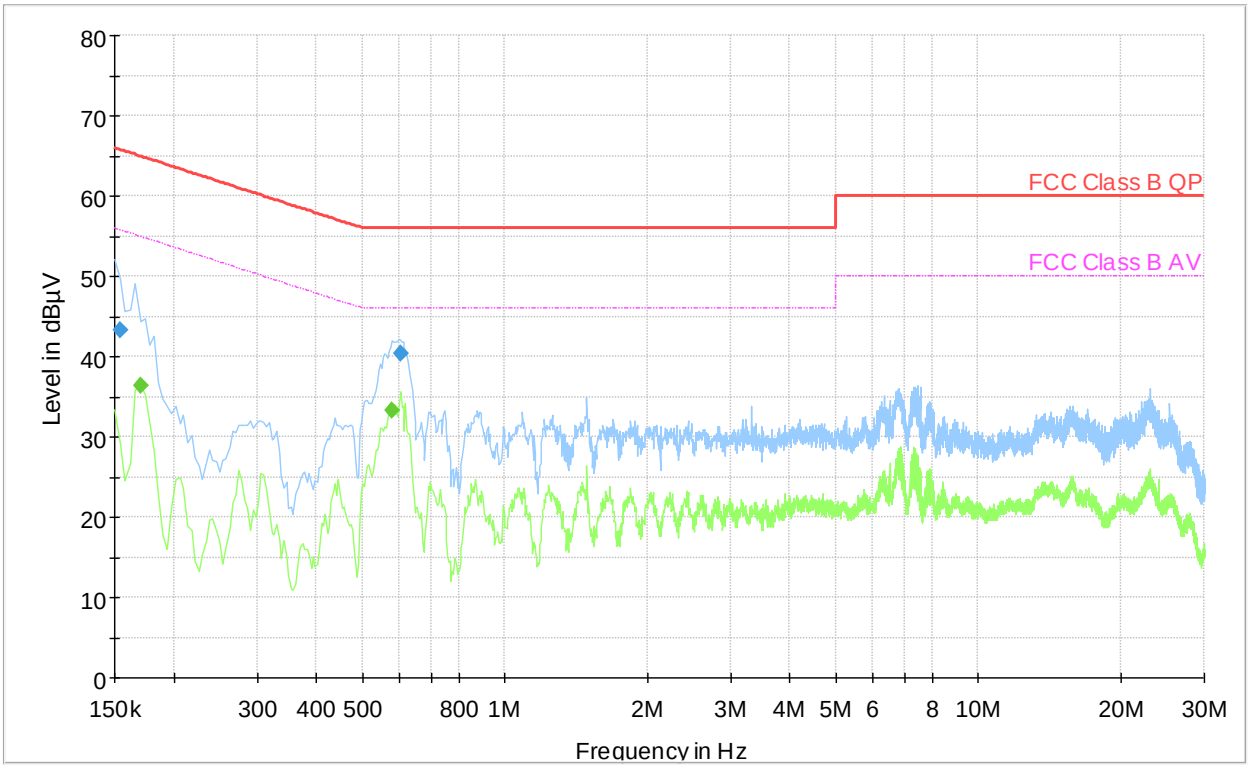
Instruments used during measurement

Instrument list: AMN: R&S / ENV216 (LR-1665) (11/2021)
EMI Receiver: R&S / ESCI 3 (N-4259) (10/2021)

Conformity

Verdict:	PASS
Test engineer:	Jan G Eriksen

EMISSION SPECTRUM



MEASUREMENT DATA

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.154	43.28	---	65.78	22.50	1000	9	N	OFF
0.170	---	36.28	54.96	18.68	1000	9	L1	OFF
0.580	---	33.31	46.00	12.69	1000	9	L1	OFF
0.604	40.39	---	56.00	15.61	1000	9	L1	OFF

RADIATED EMISSIONS (BELOW 1GHZ)

TEST DESCRIPTION

Method
The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up
The measurements were performed in a semi-anechoic chamber (SAC). Nominal supply voltage was provided.
The specimen was energized and in normal operating mode during the measurement.

☐ The specimen and its cables were elevated 10 cm above the site ground plane and placed in the centre of the turntable.
☒ The specimen and its cables were placed on a table 80 cm above the site ground plane and placed in the centre of the turntable.
☐ Ferrite clamps type CMAD were applied to cables leaving the test volume.
☐ A CDNE was applied to the power supply cable.

Antenna type = Hybrid bilog antenna
Antenna elevation = 100-400 cm above the ground reference plane.
Specimen rotation = 0-360º.

Frequency range:	Measurement distance:
☐ 30-300MHz	☐ 3m
☒ 30-1000MHz	☐ 5m
☐ Other:	☒ 10m

Conditions
The measuring bandwidth is 120 kHz in the frequency range 30 MHz – 1000 MHz. Frequency sweeps with RBW = 120 kHz and VBW = 1 MHz was applied with a sweep time of 20 ms (step size resolution < 60 kHz).

Measurement uncertainty: ± 4.9 dB (3m distance in SAC10); ± 4.6 dB (3m distance in SAC3); ± 4.6 dB (10m distance in SAC10)

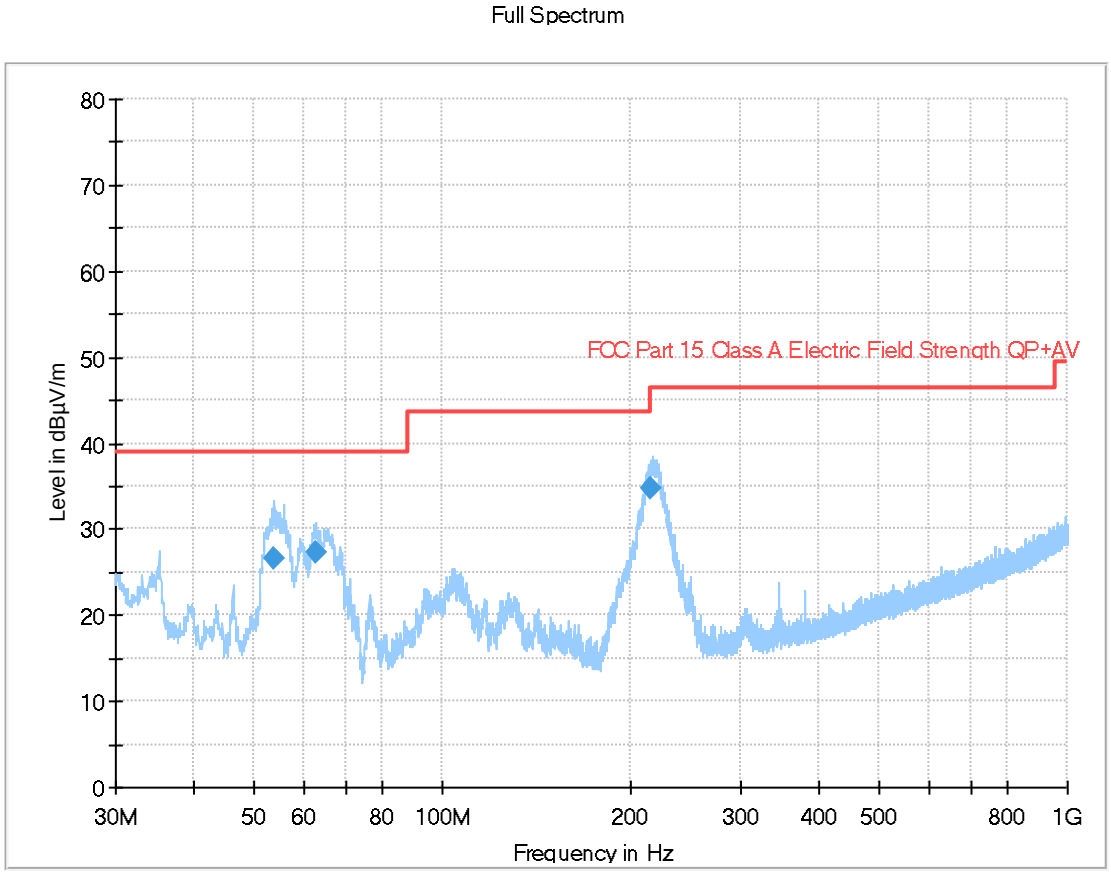
Instruments used during measurement

Instrument list:
Antenna, bilog: Sunol / JB3 (N-4525) (02/2022)
EMI Receiver: R&S / ESU40 (LR-1639) (02/2022)
Preamplifier: Sonoma / 310N (LR-1686) (07/2021)

Conformity

Verdict:	PASS
Test engineer:	Jan G Eriksen

EMISSION SPECTRUM



MEASUREMENTS DATA

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
53.678583	26.51	39.00	12.49	1000.0	120.000	204.0	V	45.0
62.858994	27.20	39.00	11.80	1000.0	120.000	272.0	V	211.0
216.069917	34.65	46.40	11.75	1000.0	120.000	370.0	H	242.0

RADIATED EMISSIONS (ABOVE 1GHZ)

TEST DESCRIPTION

Method
The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up
Nominal supply voltage was provided. The specimen was energized and in normal operating mode during the measurement.

☒ The measurements were performed in a semi-anechoic chamber (SAC3) (calibrated volume: D=2.0m / H=2.0m).
☐ The measurements were performed in a semi-anechoic chamber (SAC10) (calibrated volume: D=1.5m / H=2.0m).
☐ The measurements were performed in a fully anechoic room (FAR) (calibrated volume: D=1.2m / H=2.0m).

☐ The specimen and its cables were elevated 10 cm above the site ground plane, and placed in the centre of the turntable.
☒ The specimen and its cables were placed on a table 80 cm above the site ground plane, and placed in the centre of the turntable.

The reference ground plane was covered with ferrite absorbers in the reflecting area between the specimen and the measuring antenna.

Measurement distance = ☒ 3m.
Antenna elevation = fixed at centre of specimen height.
Specimen rotation = 0-360º.

Measurements were performed with a double-ridged guide horn antenna.

Frequency range:	Highest internal frequency of specimen:
☐ 1-2 GHz	☐ Below 108MHz
☐ 1-5 GHz	☐ Between 108MHz and 500MHz
☒ 1-6 GHz	☐ Between 500MHz and 1000MHz
☐ 1-12 GHz	☐ Above 1000MHz

The measuring bandwidth is 1 MHz in the above frequency range. Frequency sweeps with RBW = 1 MHz and VBW = 1 MHz was applied with a sweep time of 100 ms (proper segmentation of the frequency range was applied to obtain step size resolution < 500 kHz).

Measurement uncertainty: ± 5.1 dB

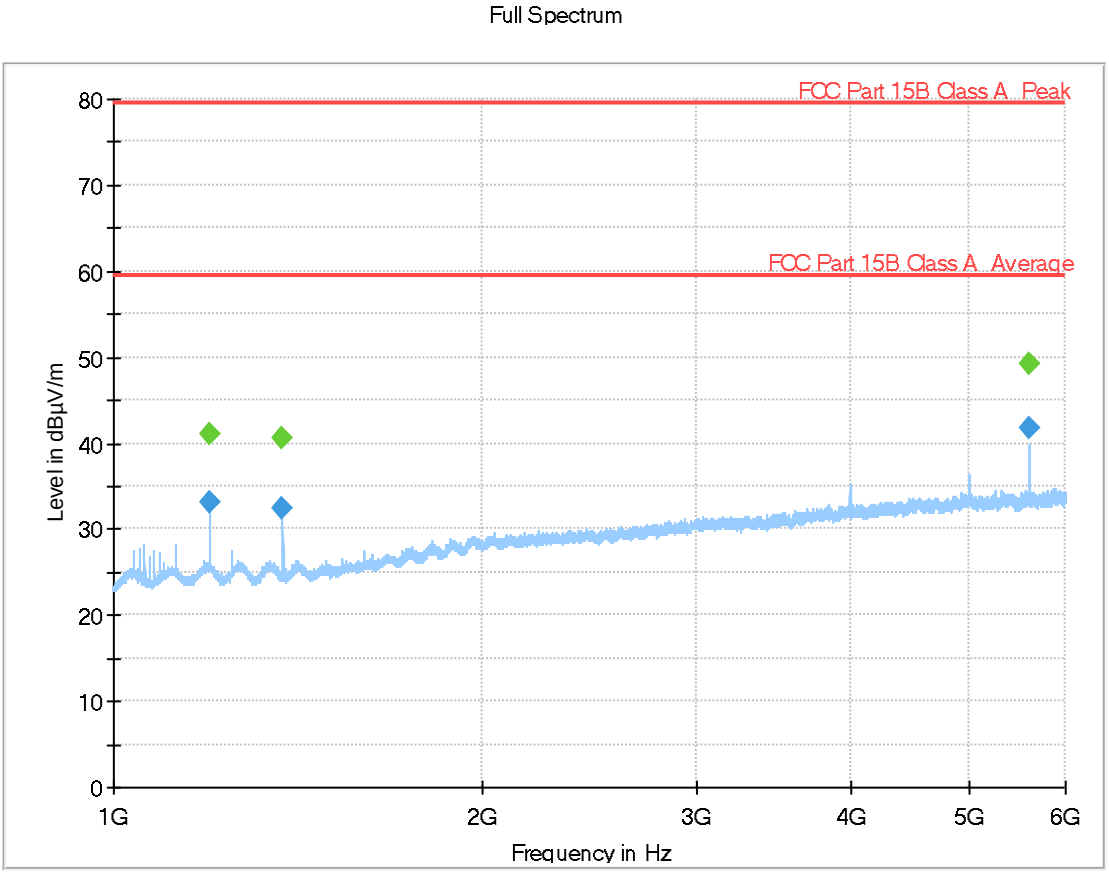
Instruments used during measurement

Instrument list:
Antenna Horn: ETS / 3117 (LR-1717) (N/A)
EMI Receiver: R&S / ESU40 (LR-1639) (02/2022)
Preamplifier: ETS / 3117-PA (LR-1757) (08/2021)

Conformity

Verdict:	PASS
Test engineer:	Jan G Eriksen

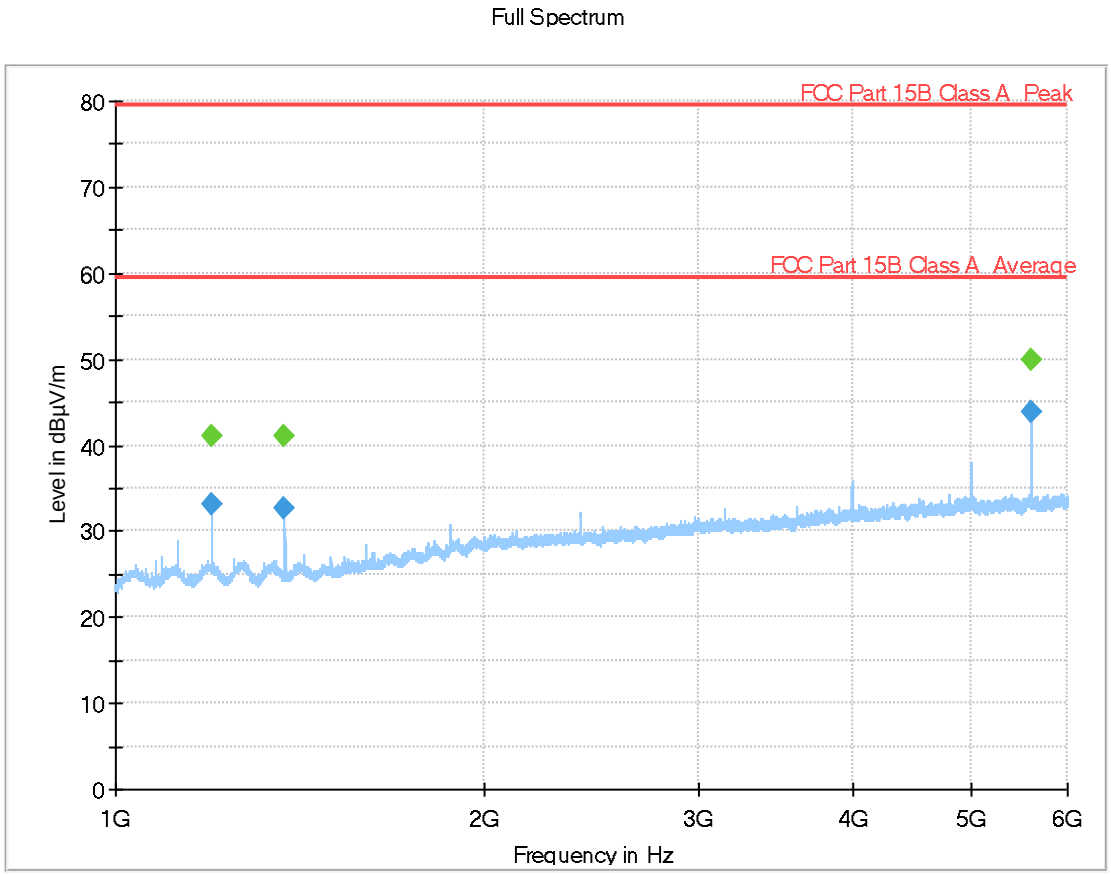
EMISSION SPECTRUM (HORIZONTAL POLARIZATION)



MEASUREMENTS DATA

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1199.916333	---	41.0	79	38.0	1000	1000	100.0	V
1199.916333	33.1	---	59	25.9	1000	1000	100.0	V
1374.983333	32.5	---	59	26.5	1000	1000	100.0	V
1374.983333	---	40.6	79	38.4	1000	1000	100.0	V
5599.960000	41.8	---	59	17.2	1000	1000	100.0	V
5599.960000	---	49.3	79	29.7	1000	1000	100.0	V

EMISSION SPECTRUM (VERTICAL POLARIZATION)



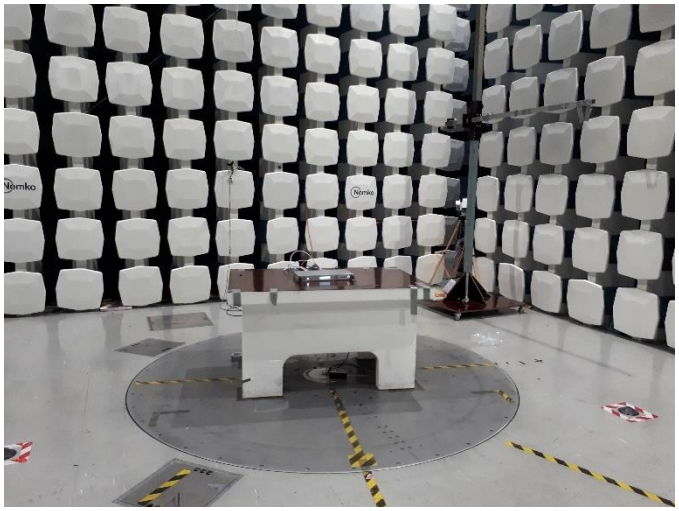
MEASUREMENTS DATA

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m) Class A	Margin (dB) Class A	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1199.994000	33.1	---	59	25.9	1000	1000	100.0	V
1199.994000	---	41.0	79	38.0	1000	1000	100.0	V
1375.057000	32.6	---	59	26.4	1000	1000	100.0	V
1375.057000	---	41.1	79	37.9	1000	1000	100.0	V
5599.986000	---	49.8	79	29.2	1000	1000	100.0	V
5599.986000	43.9	---	59	15.1	1000	1000	100.0	V

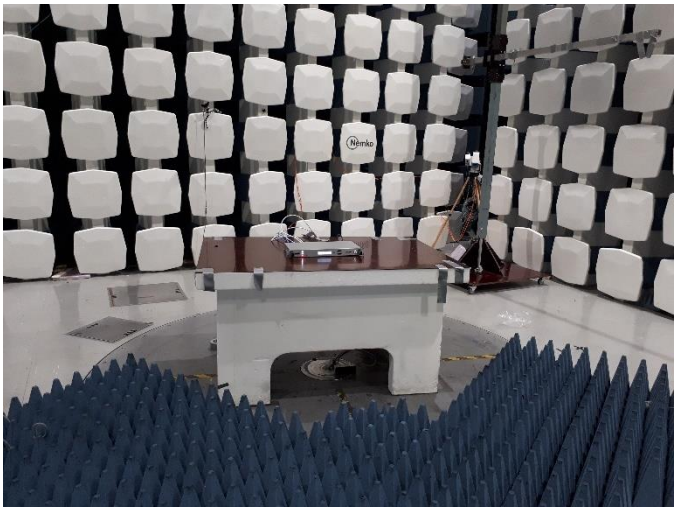
Annexes

PHOTOS

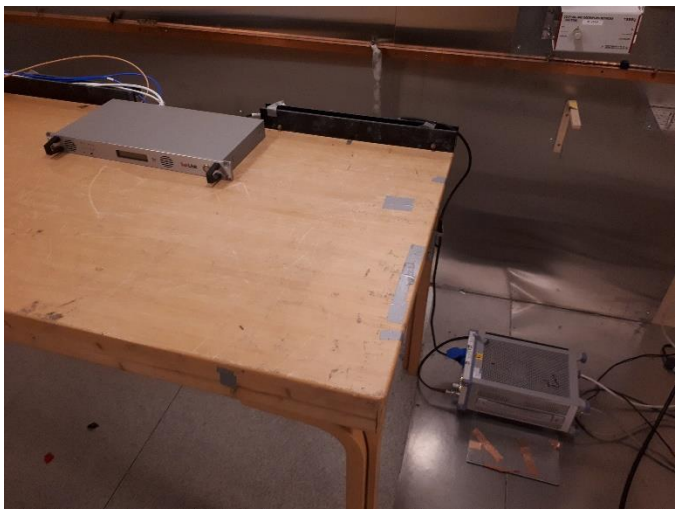
Test set-up for EMC emissions measurements



Measurements below 1 GHz



Measurements above 1 GHz



Conducted emissions