FORCE Technology Test Report

TEST Reg. no. 19

Radio parameter test of Nirs™ DS3 with Power supply unit according to FCC specifications

Performed for FOSS Analytical A/S

Project no.: 120-34264-3

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Title	Radio parameter test of Nirs™ DS3 with Power supply unit according to FCC specifications
Test object	Nirs™ DS3 with Power supply unit
Project no.	120-34264-3
Test period	11 March 2021 to 26 March 2021
Client	FOSS Analytical A/S Nils Foss Allé 1 3400 Hillerød Denmark Tel.: +45 7010 3370
Contact person	Henrik Egeberg Nielsen E-mail: hegn@foss.dk
Manufacturer	FOSS Analytical A/S
Specifications	47 CFR Part 15, Subpart B and C (Specific rule part §15.225)
Results	The test object was found to be in compliance with the specifications as listed in Section 1
Test personnel	Peter Wolf Frandsen Raqia Ibrahim Khalil
Test site	FORCE Technology, Venlighedsvej 4, 2970 Hørsholm, Denmark

Date 18 May 2021

Project Manager

Peter Wolf Frandsen
Specialist EMC
FORCE Technology

Responsible

Karsten Kruse Jensen
Head of department
FORCE Technology

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1. Summary of tests

Tests	Test methods	Rule Section	Results
Measurement of Conducted limits	ANSI C63.10:2013	47 CFR Part 15 B + C Subpart 15.107 & 15.207	Passed
Measurement of radiated emission / field strength of harmonics	ANSI C63.10:2013	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Passed
Measurement of 20 dB bandwidth/Occupied BW	ANSI C63.10:2013	47 CFR Part 15.215(c)	Passed
Measurement of band edge compliance	ANSI C63.10:2013	47 CFR Part 15.209 & 15.225	Passed
Measurement of field strength of fundamental	ANSI C63.10:2013	47 CFR Part 15.225	Passed
Frequency stability test	ANSI C63.10:2013	47 CFR Part 15.225	Passed

The given result is based on a shared risk principle with respect to the measurement uncertainty.

Conclusion

The test objects mentioned in this report meet the requirements of the standards stated below with respect to the test listed above.

- 47 CFR Part 15, Subpart B and C (Specific rule part §15.225)

The test results relate only to the objects tested.

2. Test objects and auxiliary equipment

2.1 Test objects

Photo 2.1.1 Test objects.

2.1.1 Test object 2.1.1

Name of test object	Nirs™ DS3
Model / type	Nirs™ DS3 Prototype 2
Part no.	-
Serial no.	91867268
Manufacturer	FOSS Analytical A/S
Supply voltage	24 VDC via external PSU 100-240 VAC, 50/60 Hz
Software version	8.12.0.173
Hardware version	Prototype
Cycle time	Continuously
Highest frequency generated or used	300 MHz
Comment	Include RFID radio module (13.56 MHz)
Received	Date: 10 March 2021 Status: Test object sampled and provided by customer

2.1.2 Test object 2.1.2

Name of test object	Power supply unit
Model / type	STD-24050
Part no.	-
Serial no.	1931000769
FCC ID	-
Manufacturer	ADAPTER TECH
Supply voltage	100-240 VAC 50/60 Hz
Software version	-
Hardware version	-
Cycle time	Continuously
Highest frequency generated or used	< 108 MHz
Comment	-
Received	Date: 10 March 2021 Status: Test object sampled and provided by customer

2.2 Auxiliary equipment

Photo 2.2.1 Auxiliary equipment.

2.2.1 Auxiliary equipment 2.2.1

Name of auxiliary equipment	LapTop PC
Model / type	Latitude E7240
Part no.	-
Serial no.	-
FCC ID	-
Manufacturer	Dell
Supply voltage	-
Highest frequency generated or used	-
Comment	Auxiliary equipment supplied by the client, who also has the responsibility for its correct function and setup. Only for monitoring, not part of the test object.

3. General test conditions

3.1 Test setup during test

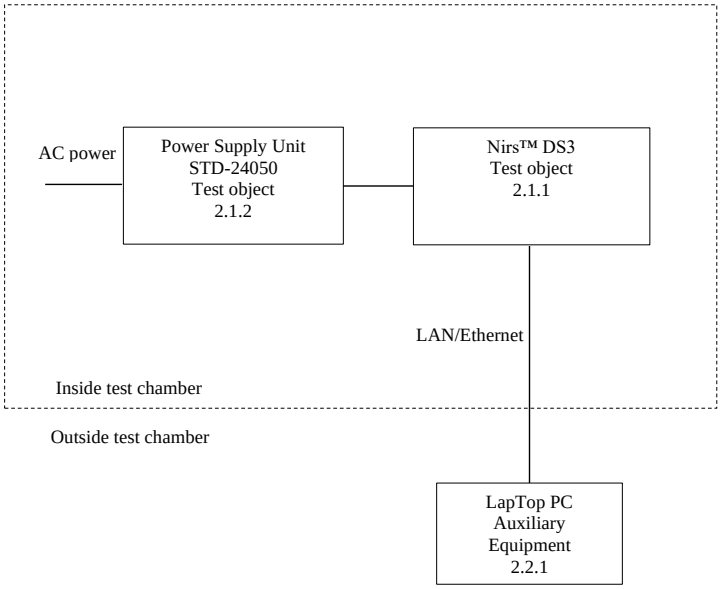


Figure 3.1.1 Block diagram of test objects with cables and auxiliary equipment, EMI test.

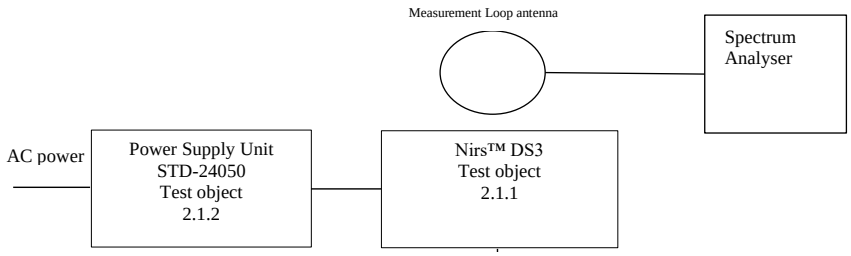


Figure 3.1.2 Block diagram of test objects with cables and measurement equipment Spectrum analyser tests.

3.1.1 Description of test setup

The test object was tested Stand-alone with external power supply, and with special test software for radio specification. For radiated emission measurement a RFID tag was attached.

The AUX LapTop PC was only used during radiated emissions measurements for monitoring of correct operation and termination of Ethernet cable.

3.1.2 Description and intended use of test object

Near Infrared analysis instrument with short range RFID (13.56 MHz) functionality designed for use in laboratory or feed mill for direct measurements of feed and forage samples in ground or unground form, for example direct measurement of pellets, focusing on all parameters.

3.1.3 Test modes during emission tests

In NIRS DS3, the RFID module transmit a constant carrier and with a mounted sample cup (RFID TAG), data is read in the TAG. The instrument does not perform any other activities than communication with the PC.

3.1.4 Nominal power consumption

<75 watt

3.1.5 Extreme test conditions

Extreme temperature range for test object: 0 °C to +40 °C.

Extreme temperature range during tests: -20 °C to +55 °C.

3.1.6 Modifications of the test object

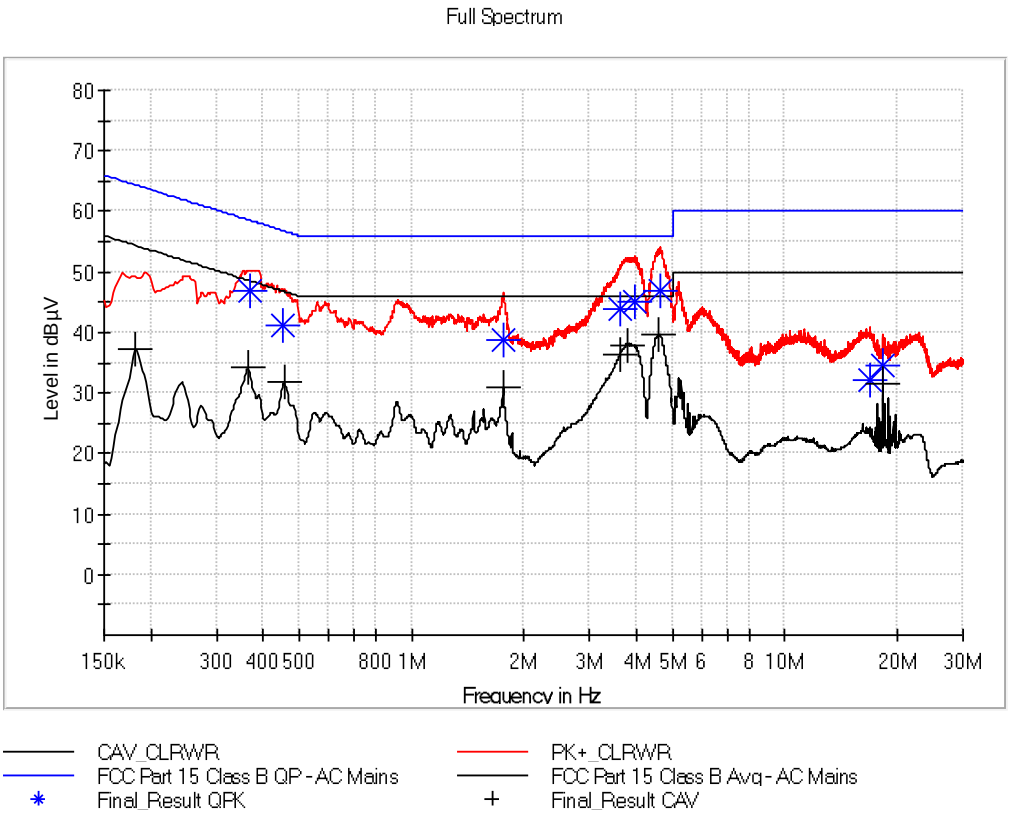
No	Modification
1	To comply with Measurement of Conducted limits a Ferrite was mounted on the AC mains port cable of power supply unit, type WE 742 727 33 MnZn. 

4. Test results

4.1 Measurement of radio frequency voltage on mains/conducted limits

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	CE-1
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	11 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.107 & 15.207	Frequency	0.15-30 MHz

Test method Characteristics	ANSI C63.4:2014 Artificial mains network: 50 Ω, 50 µH	Temperature Humidity	23 °C 39 % RH
Detector	Peak, CISPR average and QP	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49568 49900 49429 49043 29680 49457 29978 49999	Uncertainty	2.7 dB



Line under test Maximum of Line and Neutral

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	CE-2
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	11 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.107 & 15.207	Frequency	0.15-30 MHz

Test method Characteristics	ANSI C63.4:2014 Artificial mains network: 50 Ω, 50 µH	Temperature Humidity	23 °C 39 % RH
Detector	QP and CISPR average	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49568 49900 49429 49043 29680 49457 29978 49999	Uncertainty	2.7 dB

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Line	PE	Corr. (dB)
0.18	---	37.29	54.4	17.1	5000	L1	FLO	10.2
0.36	---	34.24	48.6	14.4	5000	L1	FLO	10.3
0.37	46.85	---	58.5	11.7	5000	N	FLO	10.2
0.45	41.31	---	56.9	15.6	5000	L1	FLO	10.3
0.46	---	31.87	46.8	14.9	5000	L1	FLO	10.3
1.76	38.83	---	56.0	17.2	5000	L1	FLO	10.7
1.76	---	30.96	46.0	15.0	5000	L1	FLO	10.7
3.61	43.81	---	56.0	12.2	5000	N	FLO	11.0
3.61	---	36.35	46.0	9.7	5000	N	FLO	11.0
3.77	---	37.92	46.0	8.1	5000	N	FLO	11.1
3.95	45.11	---	56.0	10.9	5000	N	FLO	11.1
4.61	---	39.58	46.0	6.4	5000	L1	FLO	11.2
4.63	46.93	---	56.0	9.1	5000	N	FLO	11.2
16.84	32.07	---	60.0	27.9	5000	N	FLO	12.4
18.24	34.48	---	60.0	25.5	5000	L1	FLO	12.7
18.24	---	31.40	50.0	18.6	5000	L1	FLO	12.7

Line under test Maximum of Line and Neutral

Test result The measured voltages were below the limit

Compliant Yes

Comments Mains voltage: 120 VAC 60 Hz.

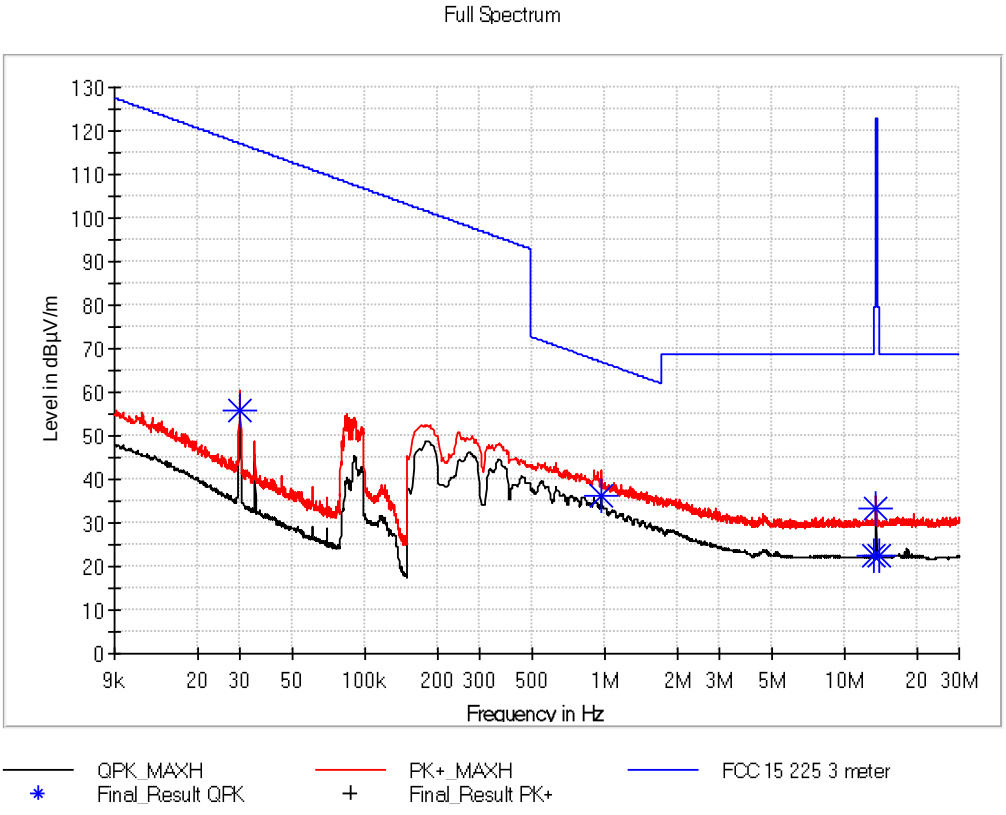
Photo 4.1.1 Test setup regarding measurement of radio frequency voltage on mains/ conducted limits.

Photo 4.1.2 Test setup regarding measurement of radio frequency voltage on mains/ conducted limits.

4.2 Measurement of radiated emission (below 30 MHz)

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-1
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	0.009-30 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

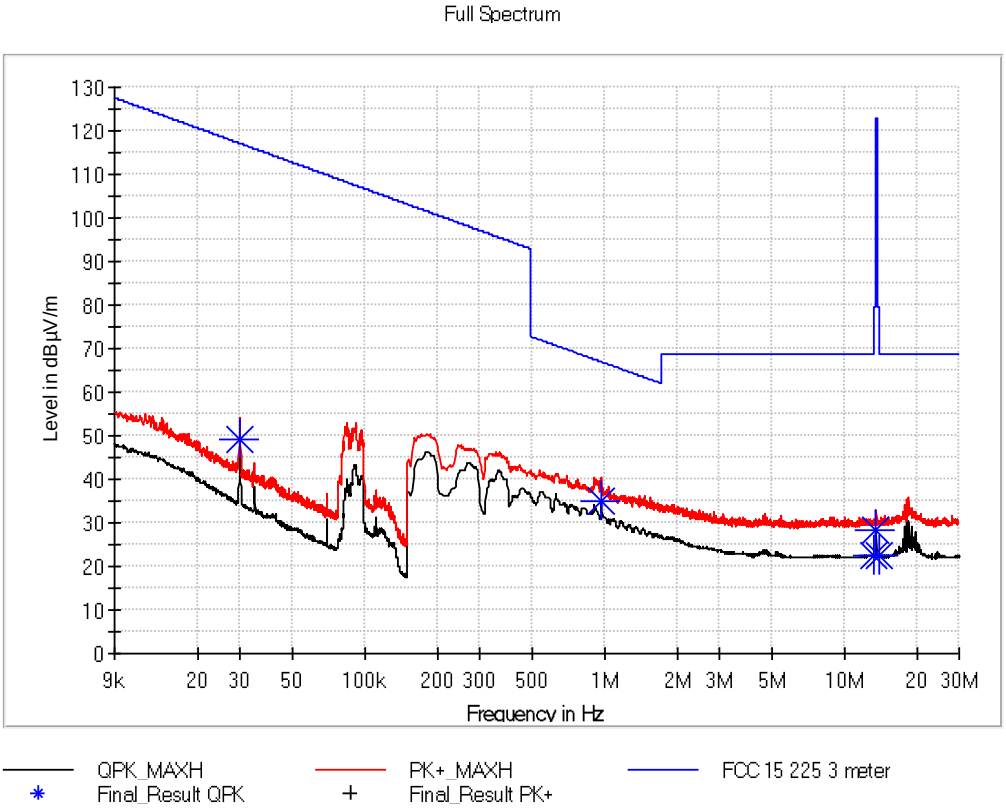


Comments Continuous Tx - normal modulation

X-Axis

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-2
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	0.009-30 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

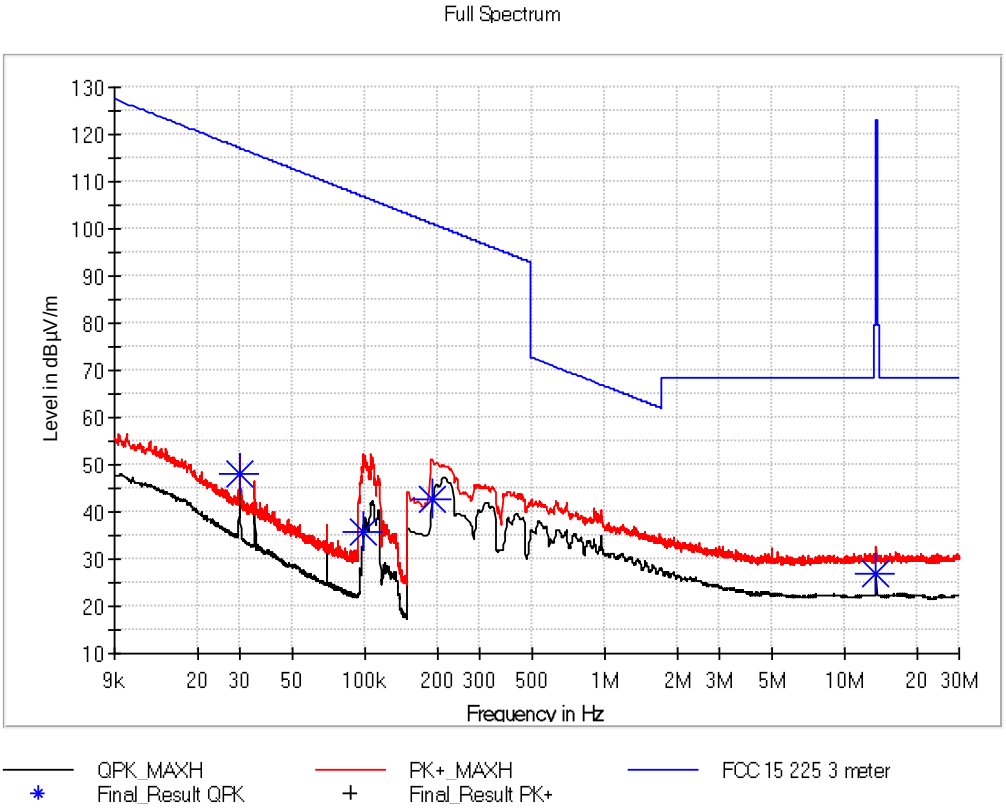


Comments Continuous Tx - normal modulation

Y-Axis

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-3
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	0.009-30 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB



Comments Continuous Tx - normal modulation

Z-Axis

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-4
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	0.009-30 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Quasi peak	Bandwidth	0.2/9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

X-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.03	55.64	117.1	61.5	15000	0.2	100.0	V	41	20.7
0.97	36.28	66.9	30.7	15000	9	100.0	V	128	20.4
13.11	22.41	79.6	57.2	15000	9	100.0	V	45	20.8
13.56	33.51	123.0	89.5	15000	9	100.0	V	-7	20.8
14.01	22.42	68.6	46.2	15000	9	100.0	V	-7	20.8

Y-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.03	49.11	117.2	68.1	15000	0.2	100.0	V	321	20.7
0.97	34.81	66.9	32.1	15000	9	100.0	V	187	20.4
13.11	22.38	79.6	57.2	15000	9	100.0	V	-22	20.8
13.56	28.27	123.0	94.7	15000	9	100.0	V	83	20.8
14.01	22.50	68.6	46.1	15000	9	100.0	V	180	20.8

Z-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.02995	48.24	117.1	68.9	15000	0.2	100.0	V	136	20.7
0.09830	35.90	106.8	70.9	15000	0	100.0	V	271	20.5
0.19050	42.75	101.1	58.4	15000	9	100.0	V	278	20.4
13.56000	27.10	123.0	95.9	15000	9	100.0	V	4	20.8

Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth. Test voltage: External power supply at 120 VAC 60 Hz. The calculation of the correction of the limit lines from 30/300 meter to 3 meters: Limit2 = Limit1 + 40 * Log (D1 / D2). This is done according to FCC Part 15, Section 31.

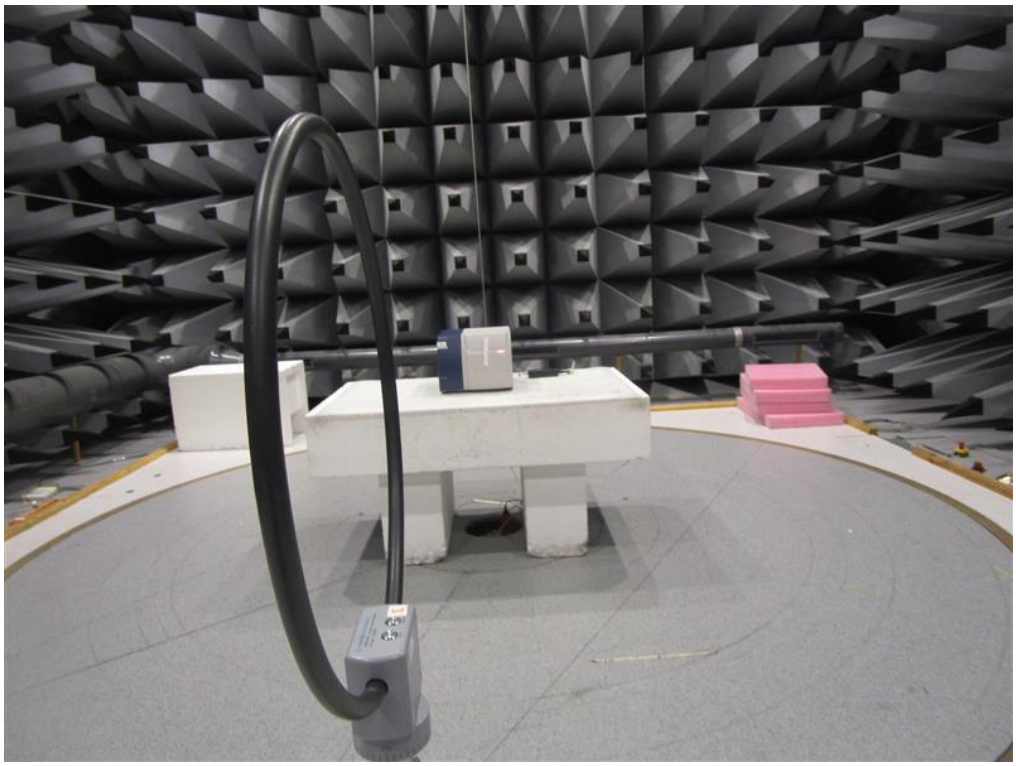


Photo 4.2.1 Test setup regarding measurement of radiated emission (below 30 MHz).

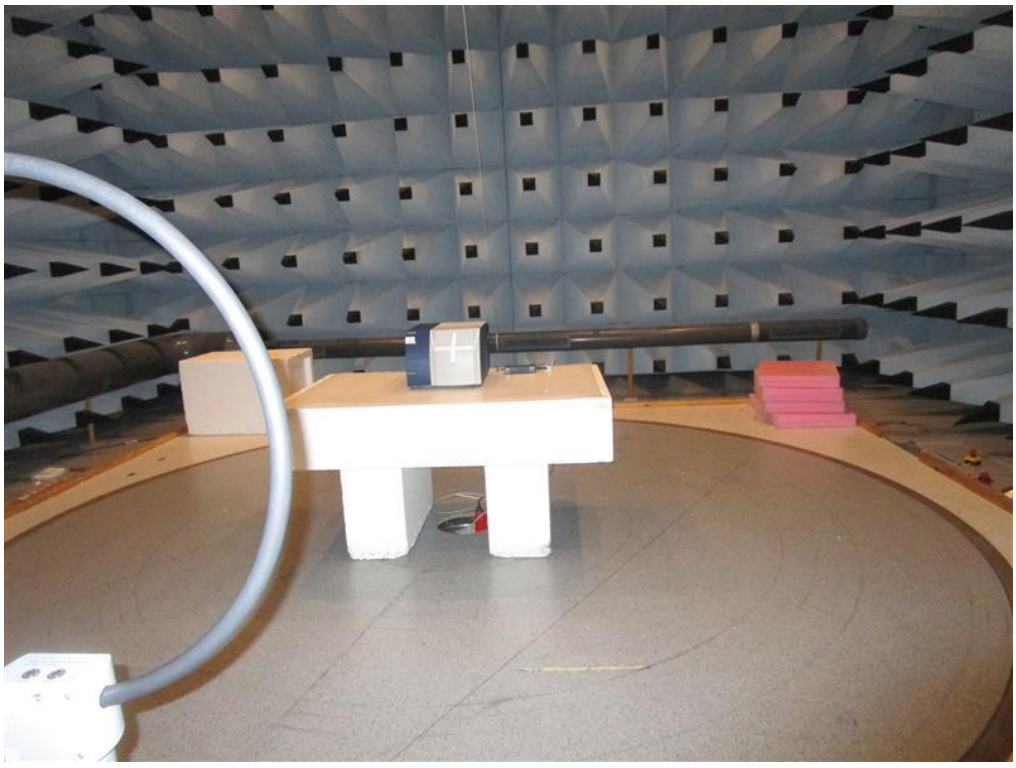


Photo 4.2.2 Test setup regarding measurement of radiated emission (below 30 MHz).

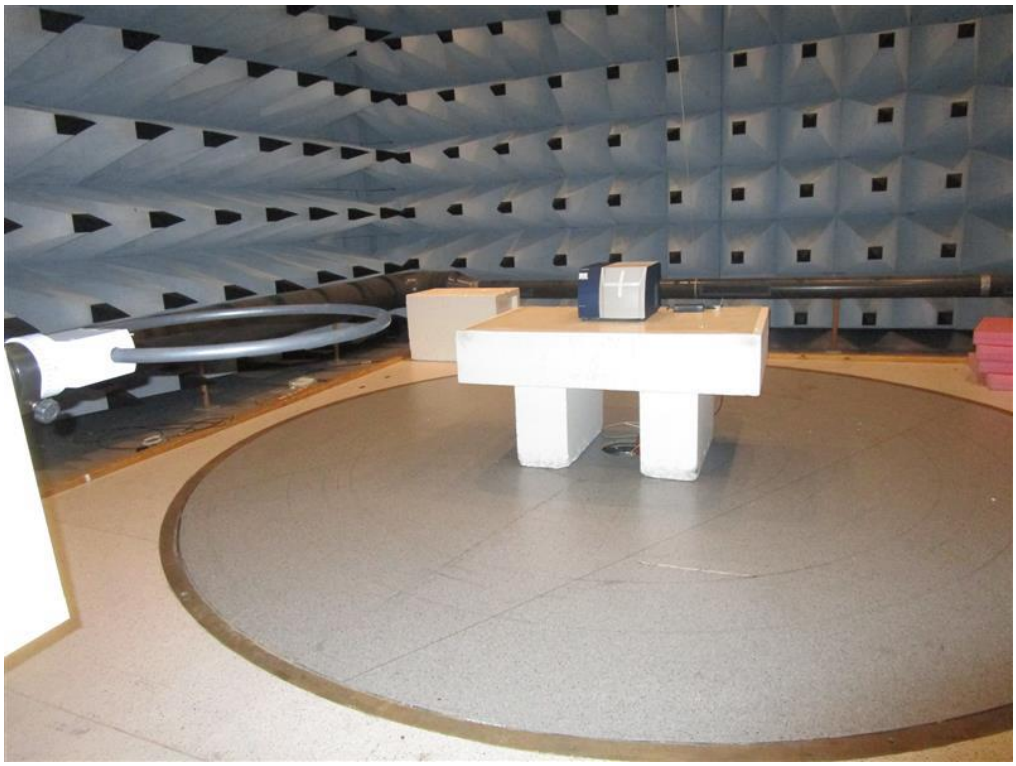
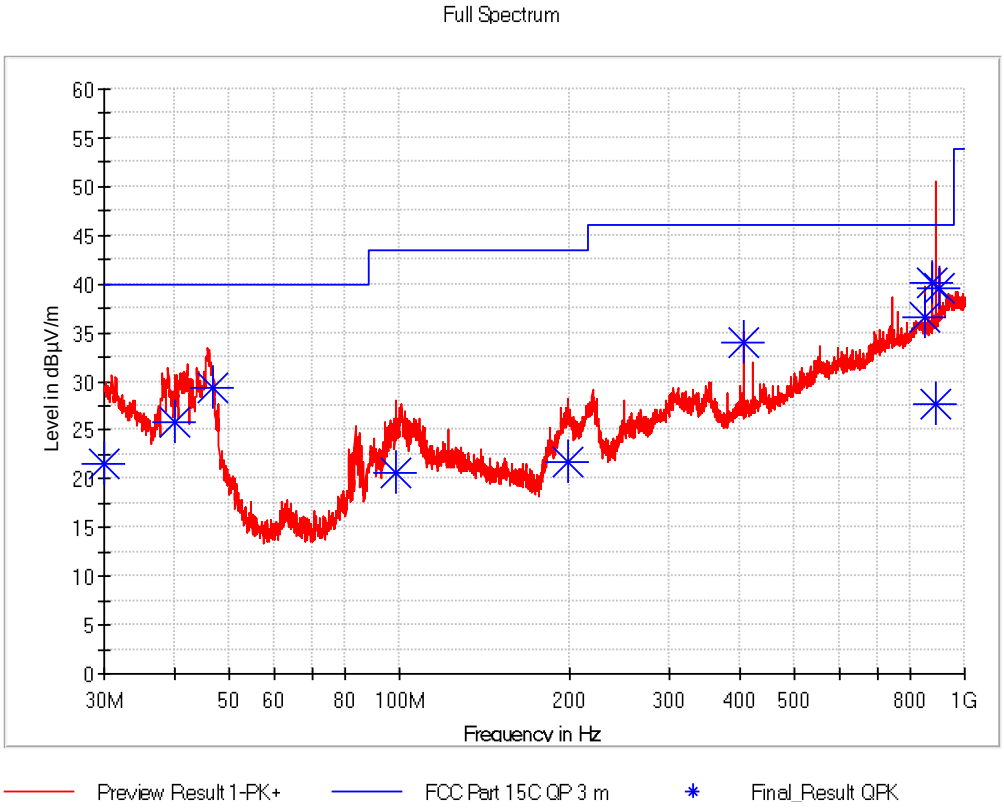


Photo 4.2.3 Test setup regarding measurement of radiated emission (below 30 MHz).

4.3 Measurement of radiated emission (below 1 GHz)

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-5
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	11 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49900 29797 49808 49704 49590 49817 49674 29953 49999	Uncertainty	6.3 dB



Comments Continuous Tx - normal modulation.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-6
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	11 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49900 29797 49808 49704 49590 49817 49674 29953 49999	Uncertainty	6.3 dB

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.03	21.57	40.0	18.4	15000	224.0	H	143	26.7
40.11	25.78	40.0	14.2	15000	100.0	V	-12	20.2
46.56	29.31	40.0	10.7	15000	100.0	V	273	17.3
98.43	20.55	43.5	23.0	15000	124.0	V	287	18.6
198.93	21.77	43.5	21.7	15000	100.0	V	313	18.4
406.80	34.08	46.0	11.9	15000	103.0	V	54	25.7
849.99	36.55	46.0	9.4	15000	100.0	V	-2	34.3
875.01	40.19	46.0	5.8	15000	100.0	V	3	34.2
890.13	27.75	46.0	18.2	15000	168.0	V	183	34.7
900.00	39.60	46.0	6.4	15000	100.0	V	-2	35.0

Test result: The measured field strengths are below the limit

Test Port: Enclosure

Test frequency: 13.56 MHz

Test mode: Continuous Tx - normal modulation

Condition: Normal

Compliant: Yes

Comments: Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

Test voltage: External power supply at 120 VAC 60 Hz.

The calculation of the correction of the limit lines from 30/300 meter to 3 meters: Limit2 = Limit1 + 40 * Log (D1 / D2).

This is done according to FCC Part 15, Section 31.

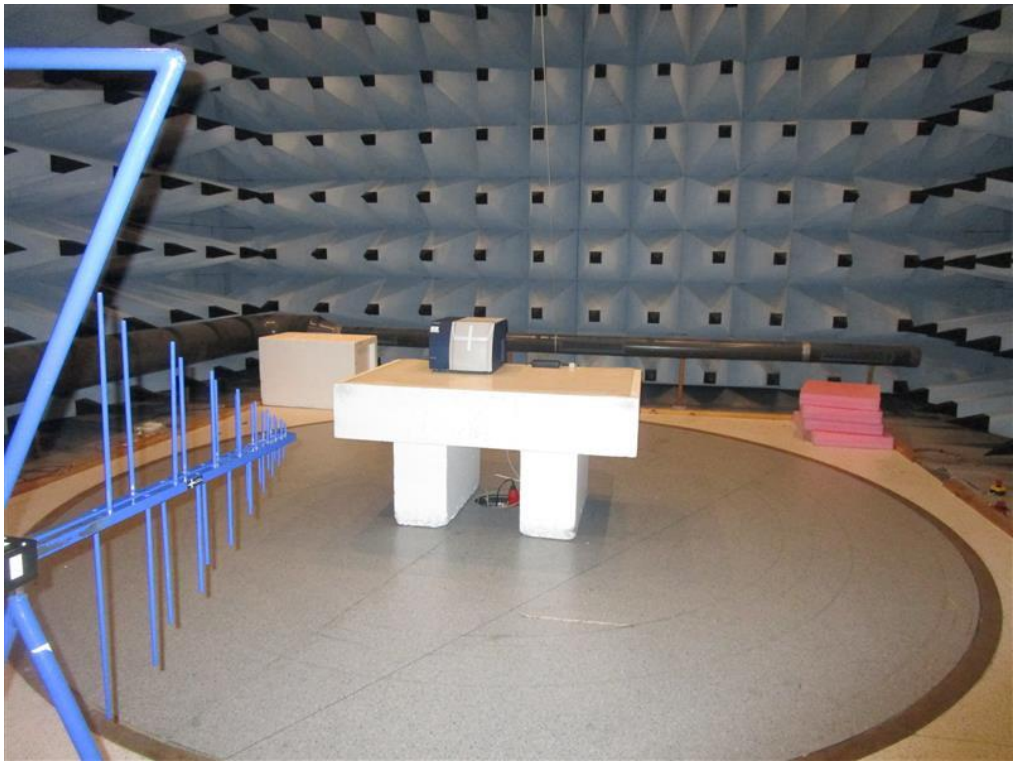


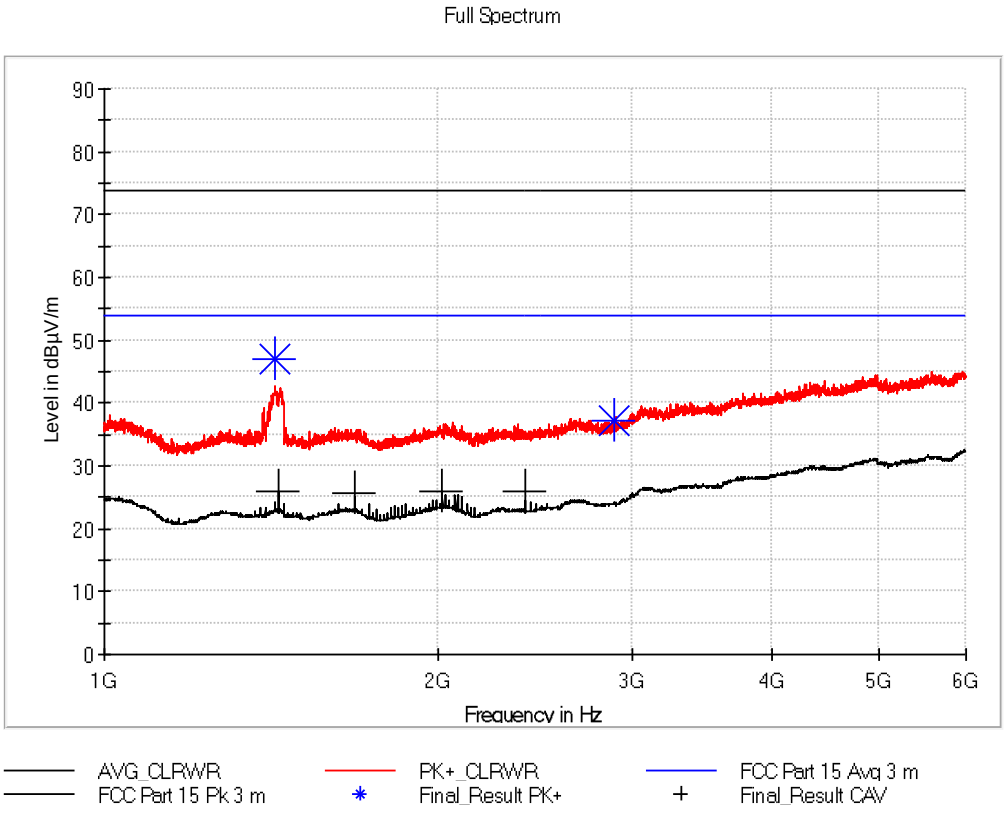
Photo 4.3.1 Test setup regarding measurement of radiated emission (below 1 GHz).

Photo 4.3.2 Test setup regarding measurement of radiated emission (below 1 GHz).

4.4 Measurement of radiated emission (above 1 GHz)

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-7
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	23 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	1-6 GHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m.	Temperature Humidity	24 °C 26 % RH
Detector	Peak and average	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49730 49674 29953 49999	Uncertainty	4.9 dB



Comments Continuous Tx - normal modulation.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-8
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	23 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	Frequency	1-6 GHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	24 °C 26 % RH
Detector	Peak and average	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49730 49674 29953 49999	Uncertainty	4.9 dB

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1427.75	46.94	---	53.9	7.0	15000	189.0	V	15	-1.4
1437.50	---	26.02	73.9	47.9	15000	192.0	V	-3	-1.4
1681.50	---	25.57	73.9	48.3	15000	168.0	V	347	0.4
2020.50	---	25.99	73.9	47.9	15000	250.0	V	-3	2.9
2400.25	---	26.09	73.9	47.8	15000	179.0	V	347	3.7
2889.25	37.34	---	53.9	16.6	15000	146.0	H	8	5.1

Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 120 VAC 60 Hz. The calculation of the correction of the limit lines from 30/300 meter to 3 meters: Limit2 = Limit1 + 40 * Log (D1 / D2). This is done according to FCC Part 15, Section 31.

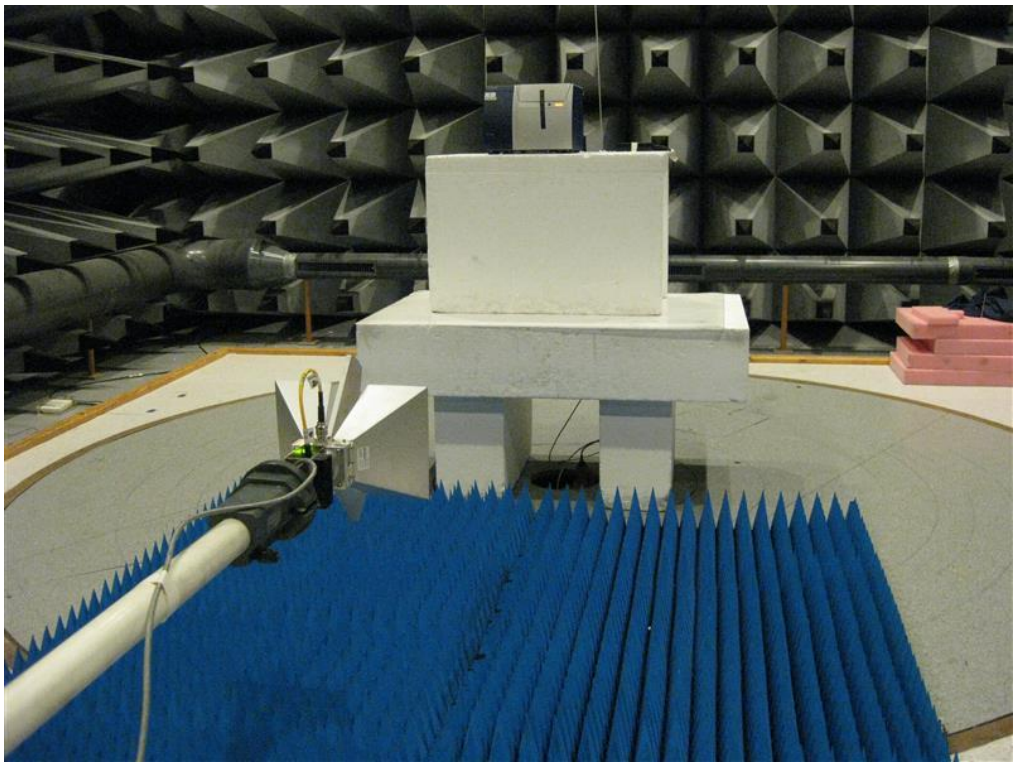


Photo 4.4.1 Test setup regarding measurement of radiated emission (above 1 GHz) .

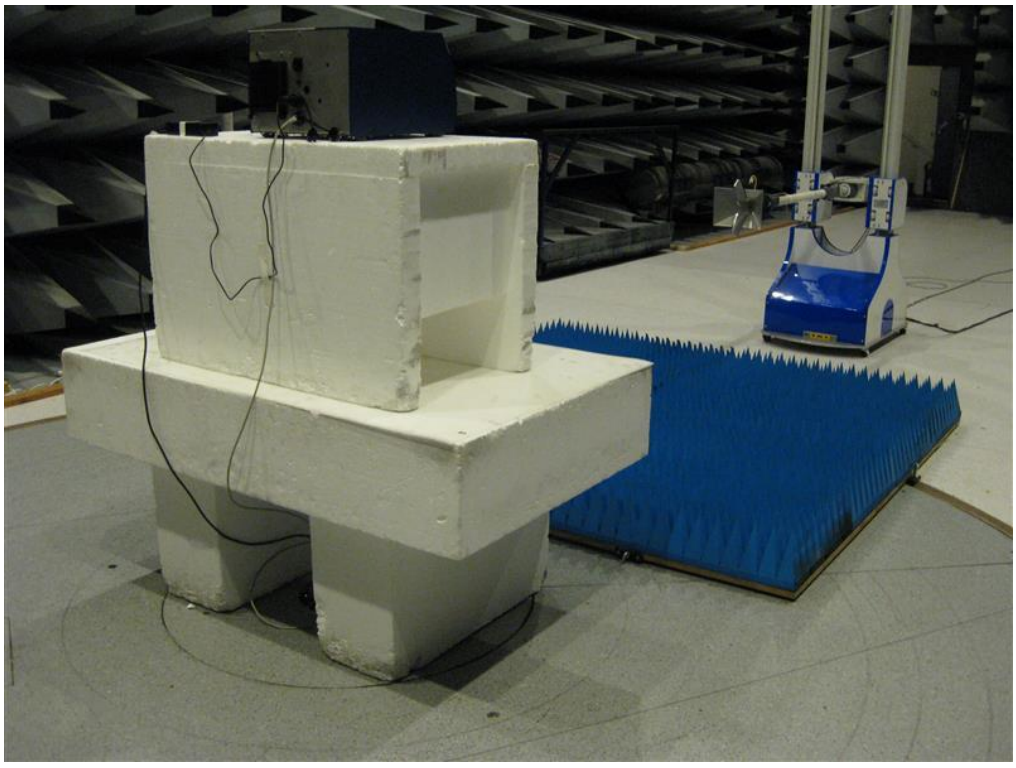
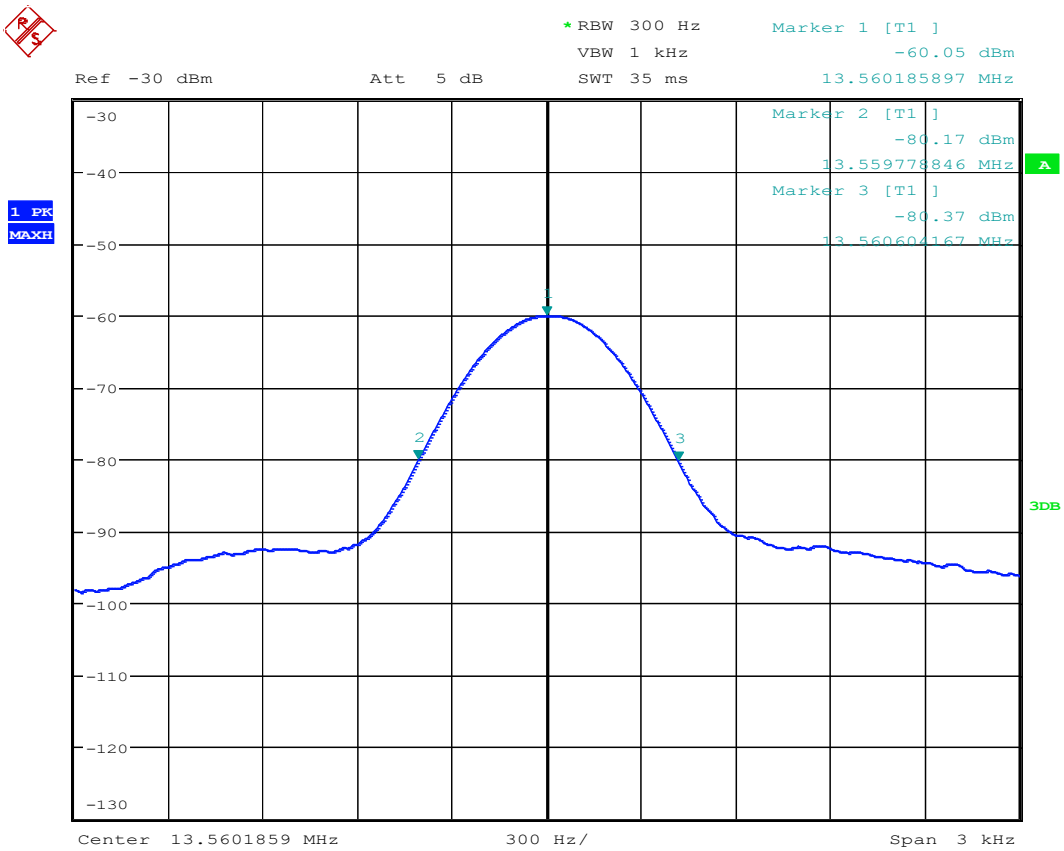


Photo 4.4.2 Test setup regarding measurement of radiated emission (above 1 GHz).

4.5 Measurement of 20 dB bandwidth/occupied BW

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-1
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	22 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15.215(c)		

Test method Characteristics	ANSI C63.10:2013 6.9.2 Occupied bandwidth—relative measurement procedure	Temperature Humidity	21 °C 32 % RH
Test equipm.	EMC room 4 Hørsholm 49550 49634 29246	Uncertainty	1.1 dB
SA Settings	RBW: 300 Hz VBW: 1 kHz SPAN: 3 kHz DET: Peak CF: Operating freq. Trace: Max. hold		



Comments Operating frequency: 13.56 MHz.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-2
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	22 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15.215(c)		

Test method Characteristics	ANSI C63.10:2013 6.9.2 Occupied bandwidth—relative measurement procedure	Temperature Humidity	21 °C 32 % RH
Test equipm.	EMC room 4 Hørsholm 49550 49634 29246	Uncertainty:	1.1 dB
SA Settings	RBW: 300 Hz VBW: 1 kHz SPAN: 3 kHz DET: Peak CF: Operating freq. Trace: Max. hold		

Operating frequency [MHz]	Low frequency [MHz]	High frequency [MHz]	20 dB bandwidth (20 dBc) [kHz]	Remarks
13.560158	13.559778	13.560504	0.8	
Note 1:				

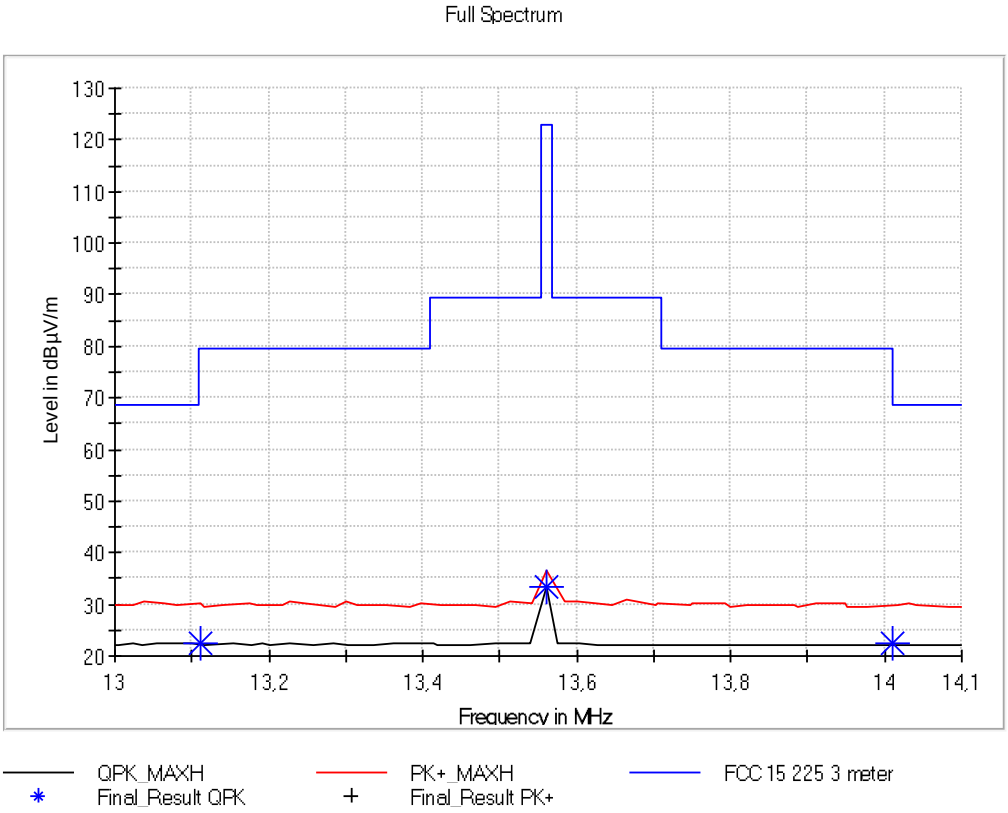
Band edge criteria	20 dB bandwidth
Test result	The measured 20 dBc bandwidth were within the limit
Test port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	Test voltage: External power supply at 120 VAC 60 Hz. Relative Loop antenna measurement, distance < 10 cm.

Photo 4.5.1 Test setup regarding measurement of 20 dB bandwidth/occupied BW.

4.6 Measurement of radiated band edge compliance

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-3
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.209 & 15.225	Frequency	0.009-30 MHz

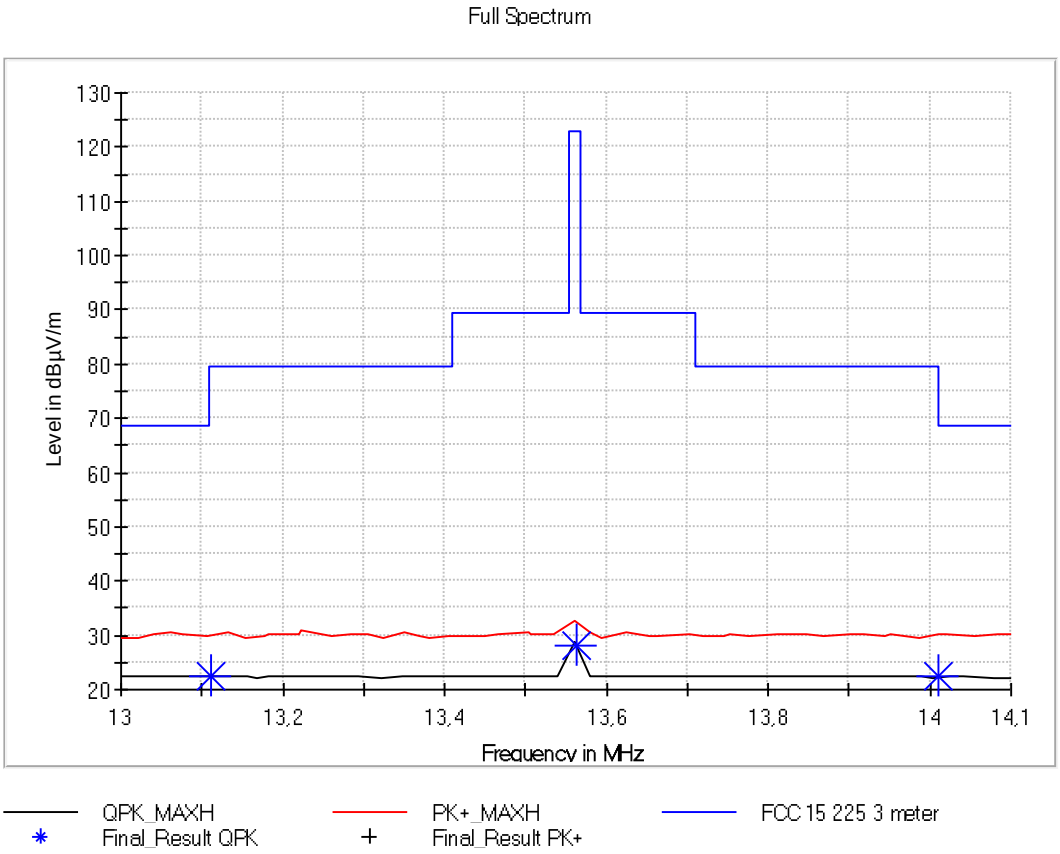
Test method Characteristics	ANSI C63.10:2013 Select text Complete search, antenna distance 3 m.	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB



Comments Operating frequency: 13.56 MHz

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-4
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.209 & 15.225	Frequency	0.009-30 MHz

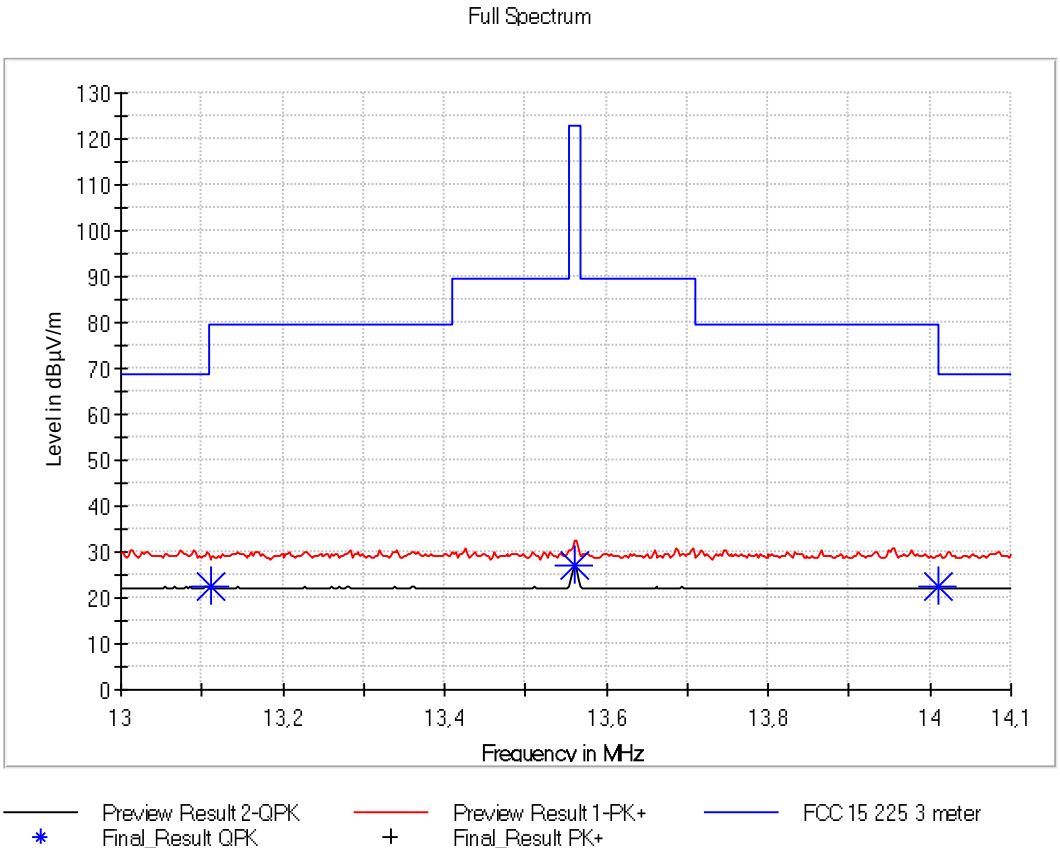
Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m.	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB



Comments Operating frequency: 13.56 MHz.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-5
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.209 & 15.225	Frequency	0.009-30 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m.	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB



Comments Operating frequency: 13.56 MHz.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-6
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.209 & 15.225	Frequency	0.009-30 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

X-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.11	22.41	79.6	57.2	15000	9	100.0	V	45	20.8
13.56	33.51	124.0	90.5	15000	9	100.0	V	-7	20.8
14.01	22.42	68.6	46.2	15000	9	100.0	V	-7	20.8

Y-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.11	22.38	79.6	57.2	15000	9	100.0	V	-22	20.8
13.56	28.27	124.0	95.7	15000	9	100.0	V	83	20.8
14.01	22.50	68.6	46.1	15000	9	100.0	V	180	20.8

Z-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.11	22.32	79.6	57.3	15000	9	100.0	V	2	20.8
13.56	27.15	124.0	96.8	15000	9	100.0	V	0	20.8
14.01	22.38	68.6	46.2	15000	9	100.0	V	35	20.8

Test result	The measured band edge was below the limit
Test Port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal

Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. Test voltage: External power supply at 120 VAC 60 Hz. The calculation of the correction of the limit lines from 30/300 meter to 3 meters: Limit2 = Limit1 + 40 * Log (D1 / D2). This is done according to FCC Part 15, Section 31.

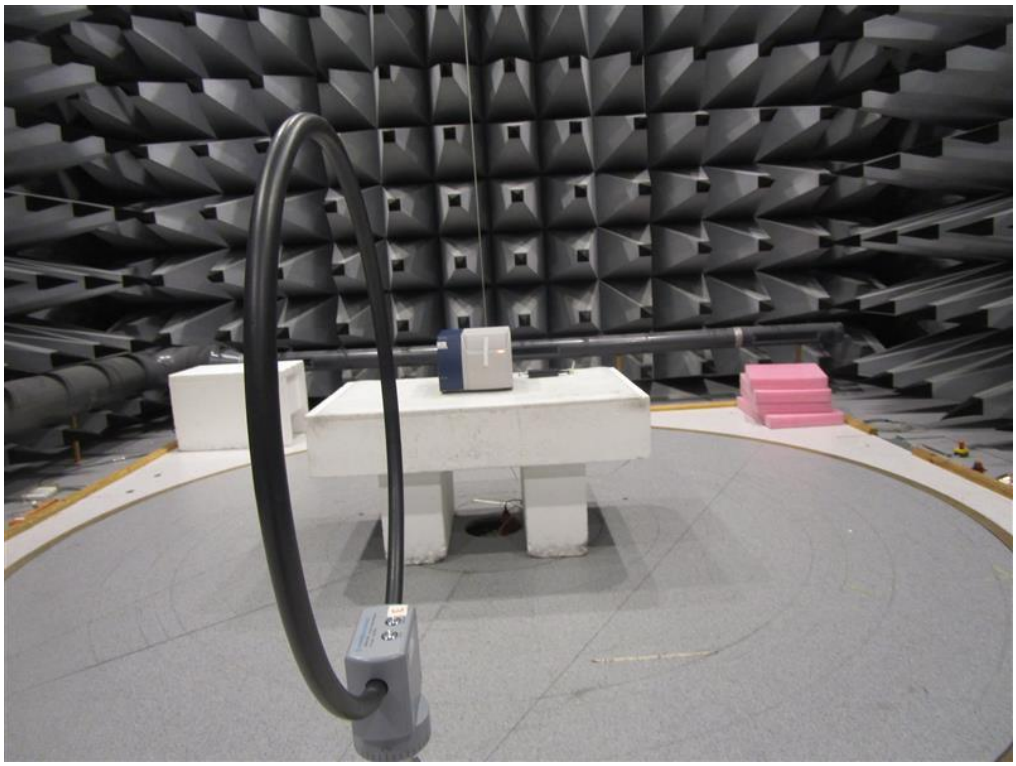


Photo 4.6.1 Test setup regarding measurement of radiated emission (below 30 MHz).

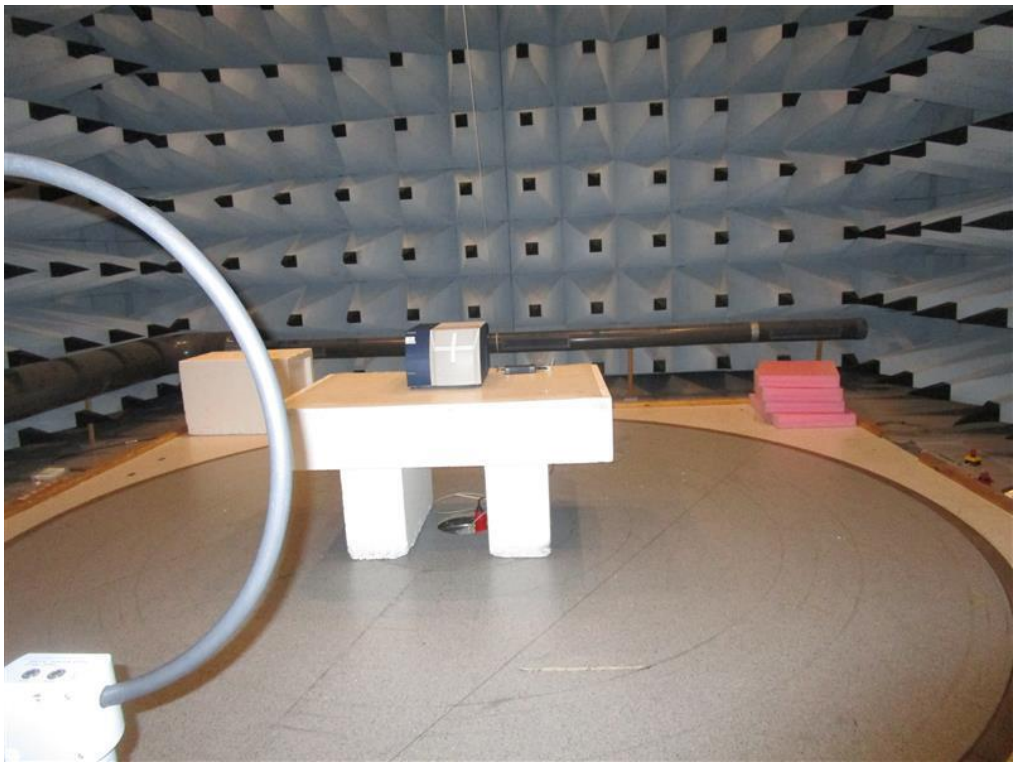


Photo 4.6.2 Test setup regarding measurement of radiated emission (below 30 MHz).

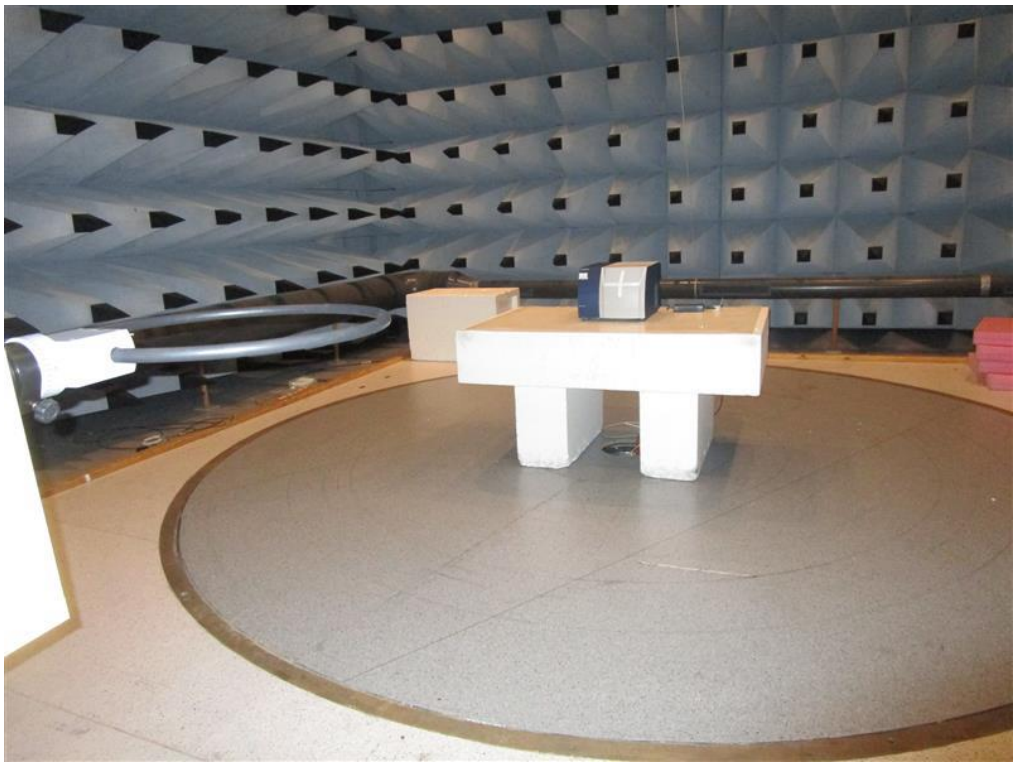
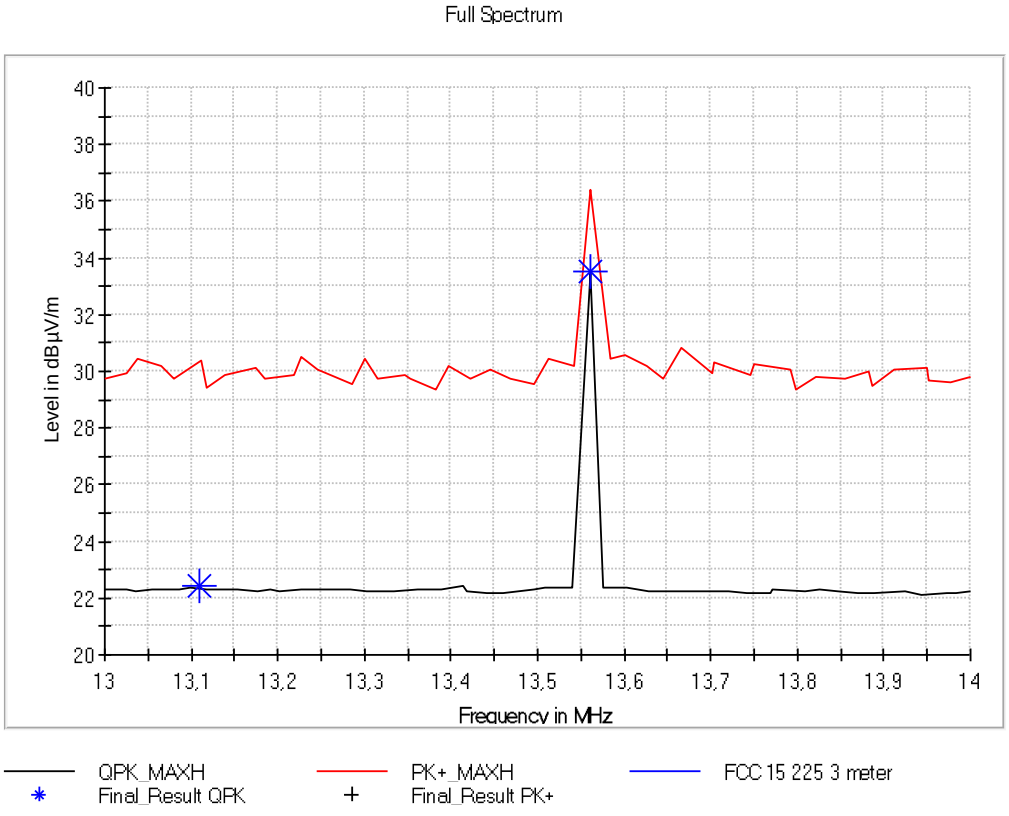


Photo 4.6.3 Test setup regarding measurement of radiated emission (below 30 MHz).

4.7 Measurement of field strength of fundamental

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-9
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.225		

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

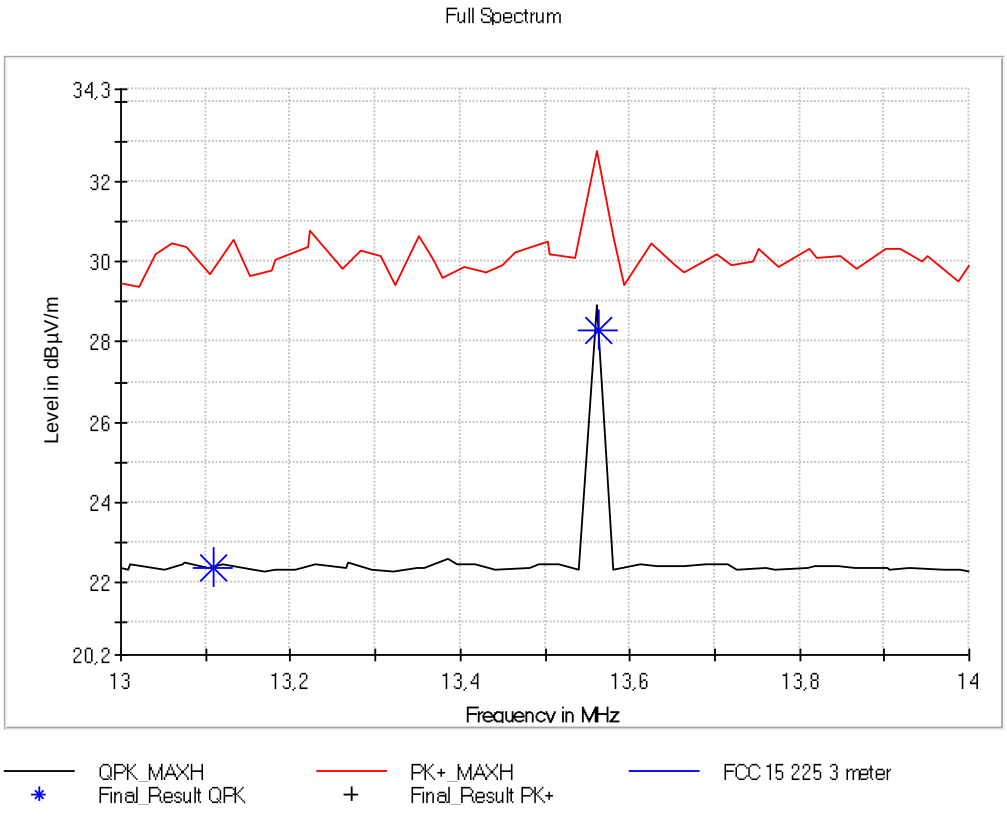


Comments Continuous Tx - normal modulation

X-Axis.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-10
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.225		

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

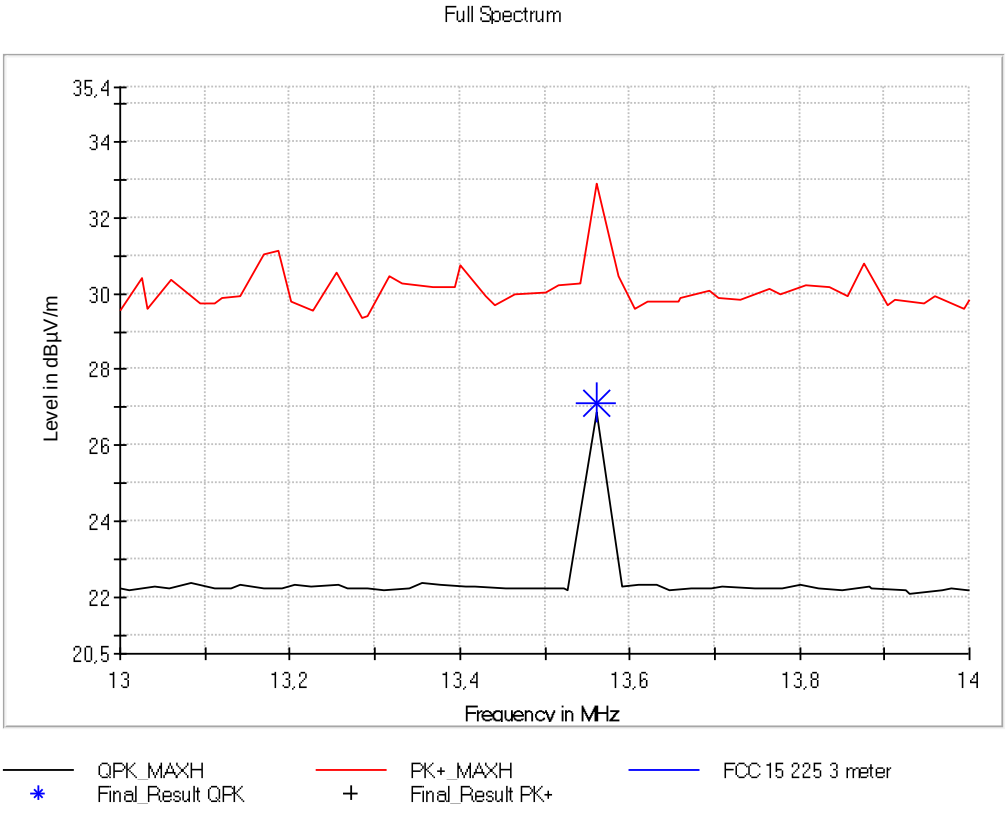


Comments Continuous Tx - normal modulation

Y-Axis.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-11
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.225		

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Peak and quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB



Comments Continuous Tx - normal modulation

Z-Axis.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	RE_Spur-12
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	12 Mar. 2021
Client	FOSS Analytical A/S	Initials	RIK
Specification	47 CFR Part 15.225		

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	23 °C 39 % RH
Detector	Quasi peak	Bandwidth	9 kHz
Test equipm.	EMI room Hørsholm 49900 49704 49590 49817 49949 49999 29953	Uncertainty	2.7 dB

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.56	**33.51**	**124.0**	**90.5**	**15000**	**100.0**	**X**	**-7**	**20.8**
13.56	**28.27**	**124.0**	**95.7**	**15000**	**100.0**	**Y**	**83**	**20.8**
13.56	**27.10**	**124.0**	**96.9**	**15000**	**100.0**	**Z**	**4**	**20.8**

Test result: The measured field strengths are below the limit

Test Port: Enclosure

Test frequency: 13.56 MHz

Test mode: Continuous Tx - normal modulation

Condition: Normal

Compliant: Yes

Comments: Final maximal measurements by variation of turntable azimuth.

Test voltage: External power supply at 120 VAC 60 Hz.

The calculation of the correction of the limit lines from 30/300 meter to 3 meters: Limit2 = Limit1 + 40 * Log (D1 / D2).

This is done according to FCC Part 15, Section 31.

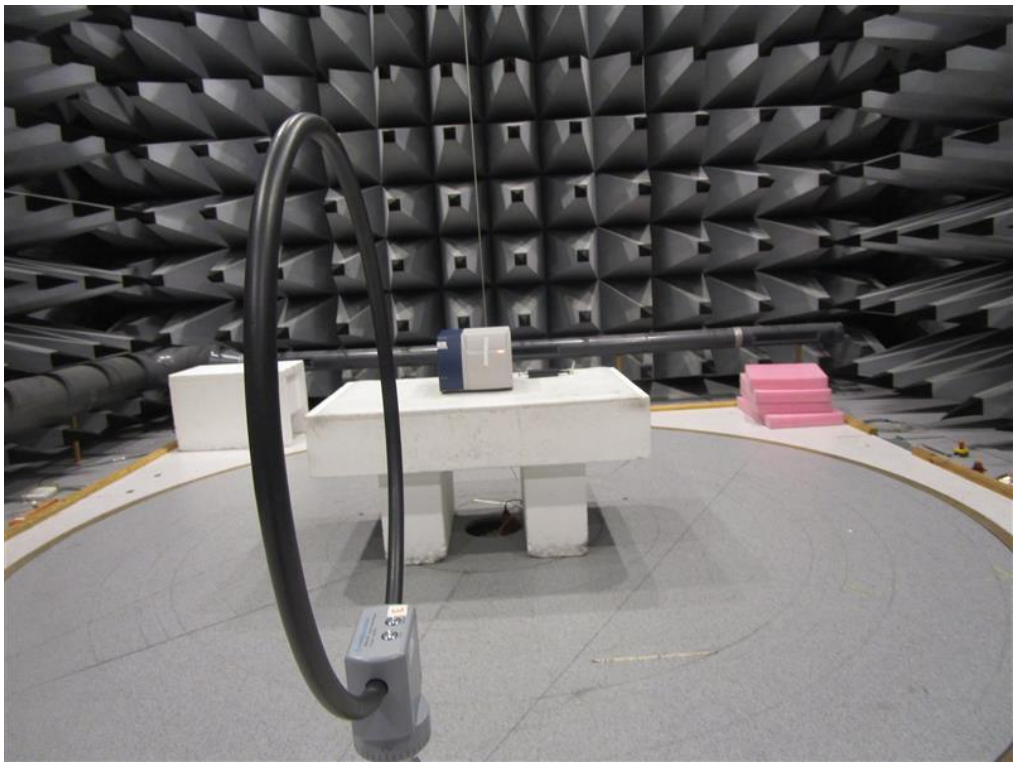


Photo 4.7.1 Test setup regarding measurement of radiated emission (below 30 MHz).

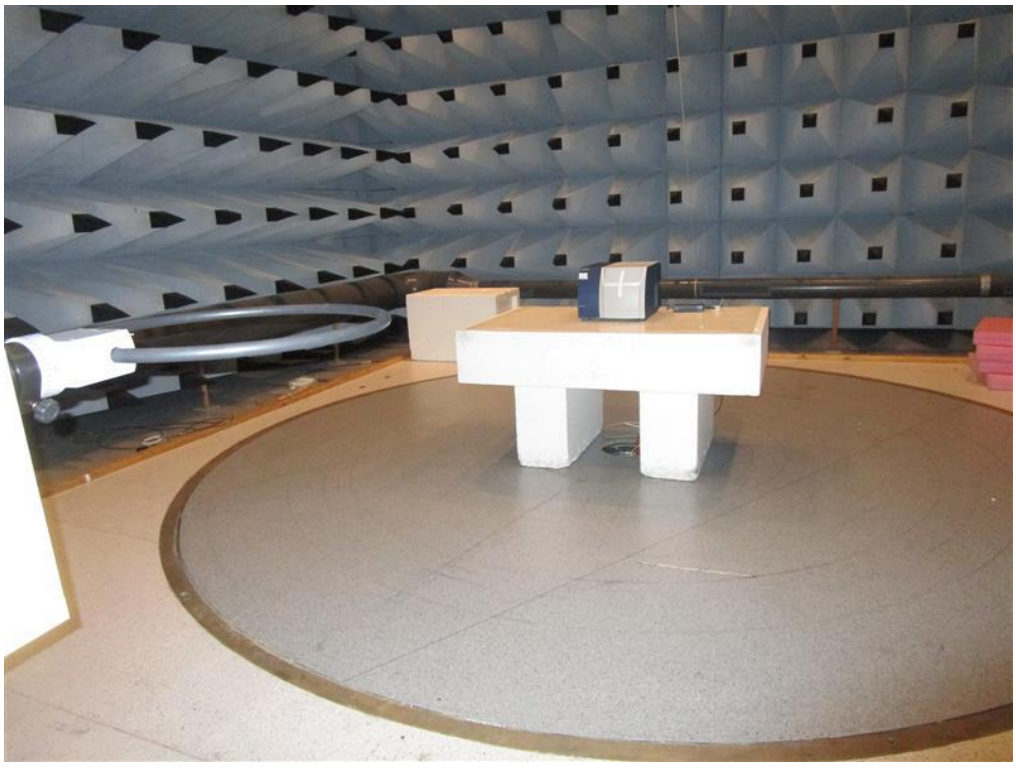


Photo 4.7.2 Test setup regarding measurement of radiated emission (below 30 MHz).

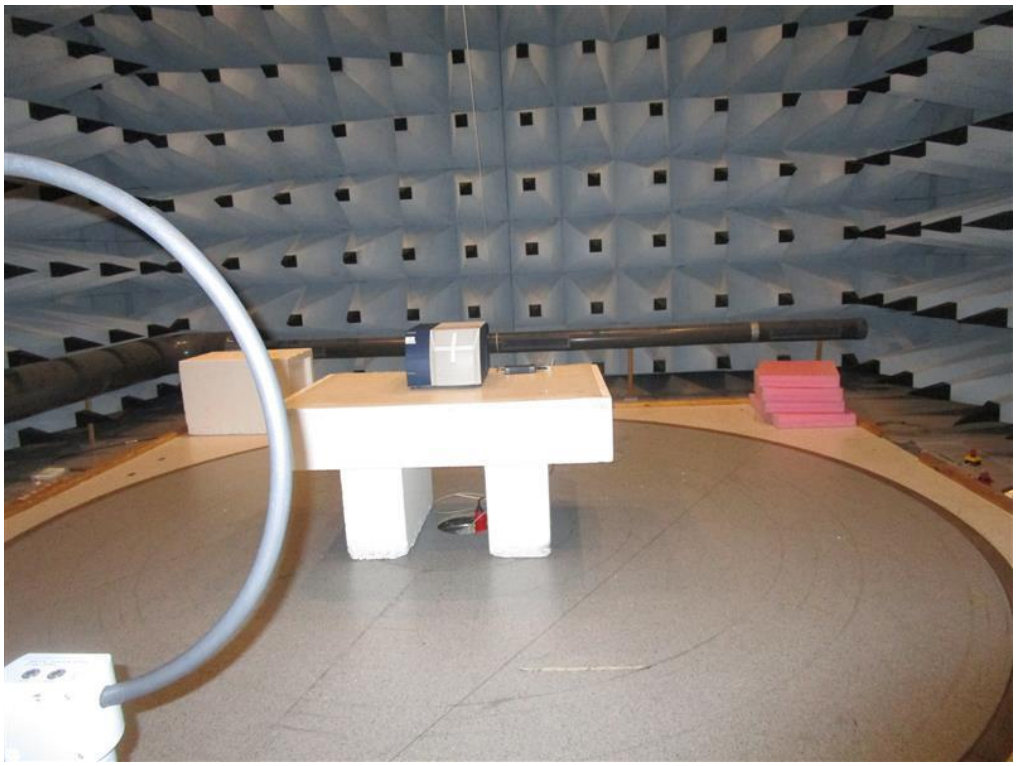
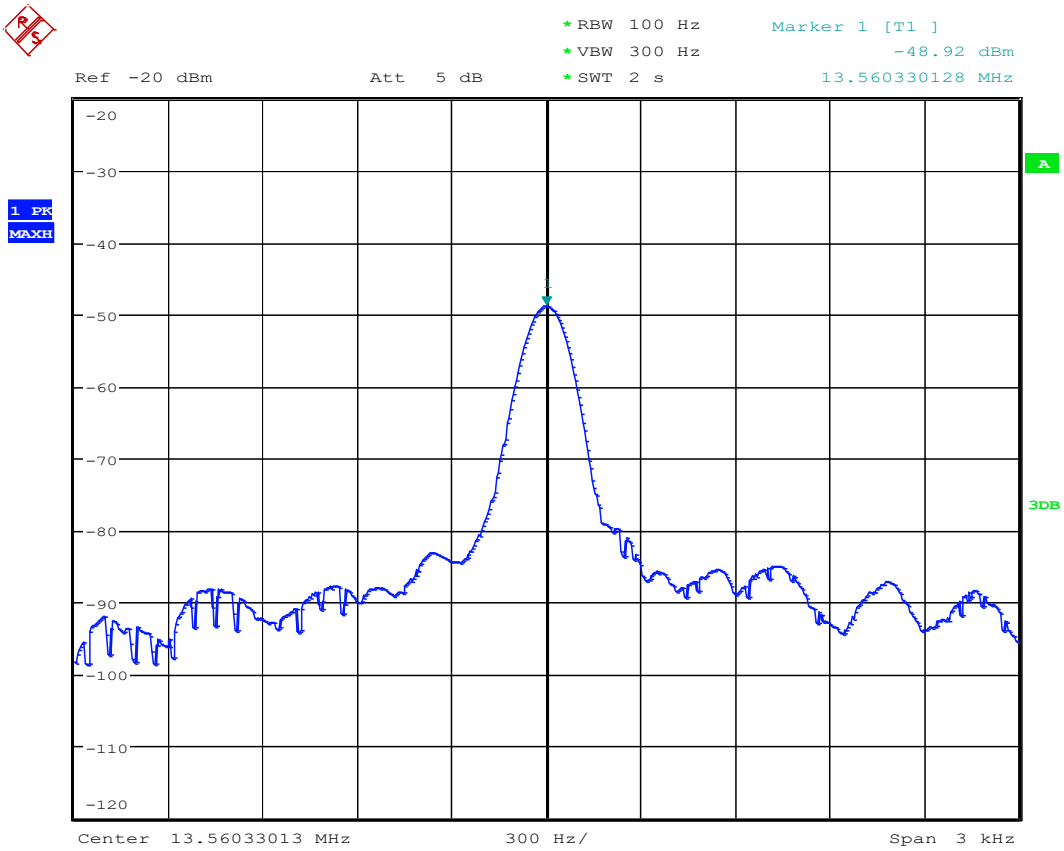


Photo 4.7.3 Test setup regarding measurement of radiated emission (below 30 MHz).

4.8 Measurement of Frequency stability

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-7
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	26 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15.225		

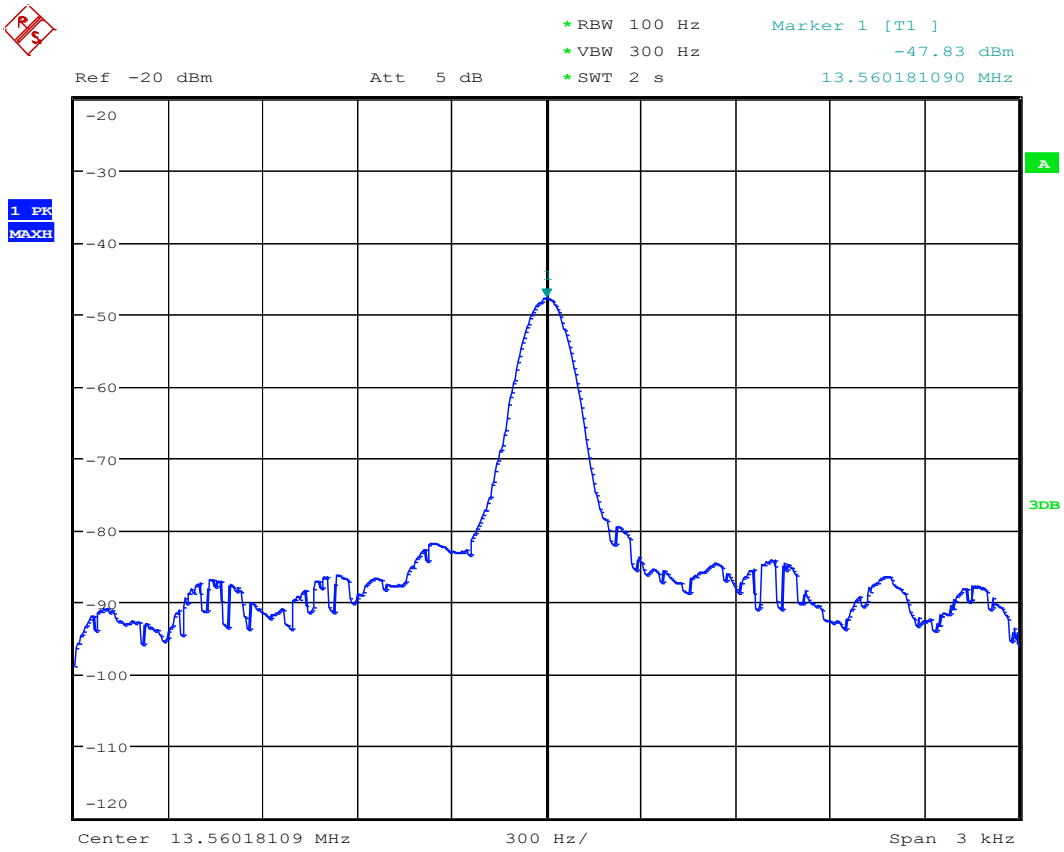
Test method Characteristics	ANSI C63.10:2013 6.8.1 Frequency stability with respect to ambient	Temperature	-20 °C
Test equipm.	Climatic chamber EVFGT-47 49550 49634 29246	Uncertainty	1.1 dB
SA Settings	RBW: 100 Hz VBW: 300 Hz SPAN: 2 kHz DET: Peak CF: OF Trace: Max. hold		



Comments Operating frequency: 13.56 MHz.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-8
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	26 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15.225		

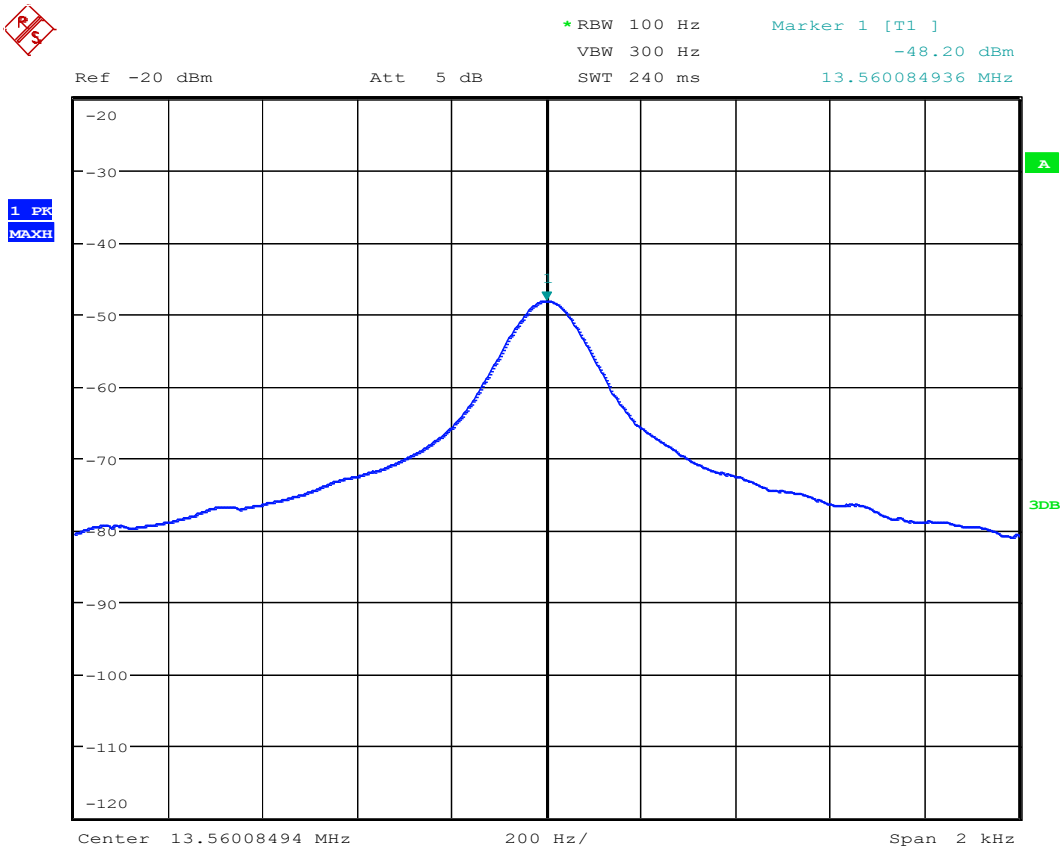
Test method Characteristics	ANSI C63.10:2013 6.8.1 Frequency stability with respect to ambient	Temperature	+22 °C
Test equipm.	Climat chamber VKF875-3 49550 49634 29246	Uncertainty	1.1 dB
SA Settings	RBW: 100 Hz VBW: 300 Hz SPAN: 2 kHz DET: Peak CF: OF Trace: Max. hold		



Comments Operating frequency: 13.56 MHz.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-1
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	26 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15.225		

Test method Characteristics	ANSI C63.10:2013 6.8.1 Frequency stability with respect to ambient	Temperature	+50 °C
Test equipm.	Climat chamber VKF875-3 49550 49634 29246	Uncertainty	1.1 dB
SA Settings	RBW: 100 Hz VBW: 300 Hz SPAN: 2 kHz DET: Peak CF: OF Trace: Max. hold		



Comments Operating frequency: 13.56 MHz.

Test object	Combination of 2.1.1: Nirs™ DS3 2.1.2: Power supply unit	Sheet	PROF-9
Type	See section 2	Project no.	120-34264-3
Serial no.	See section 2	Date	26 Mar. 2021
Client	FOSS Analytical A/S	Initials	PWF
Specification	47 CFR Part 15.225		

Test method Characteristics	ANSI C63.10:2013 6.8.1 Frequency stability with respect to ambient		
Test equipm.	Climat chamber VKF875-3 49550 49634 29246	Uncertainty:	1.1 dB
SA Settings	RBW: 100 Hz VBW: 300 Hz SPAN: 2 kHz DET: Peak Trace: Max. hold		

Operating frequency Measurement [MHz]	Frequency Drift [kHz]	Limit [kHz] Note 1	Temperature [°C]	Remarks
13.560331	-0.15	±1.356	-20	Passed
13.560325	-0.144	±1.356	0	Passed
13.560181	Reference Freq.	-	+22	Passed
13.560085	+0.096	±1.356	+50	Passed

Note 1: The limit is ±0.01% of the operating frequency. Limit= ±0.0001*13.559434 MHz ~ ±1.356 kHz

Note 2: The EUT was not able to start up transmitting – the device could not be activated.

Test result	The measured frequency stability was within the limit
Test port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal and extreme
Compliant	Yes
Comments	Relative Loop antenna measurement, distance < 10 cm.

Photo 4.8.1 Test setup regarding measurement of Frequency stability.


Photo 4.8.2 Test setup regarding measurement of Frequency stability.

5. National registrations and accreditations

5.1 DANAK Accreditation

Organization: Danish Accreditation and Metrology Fund - DANAK, see www.danak.dk and www.ilac.org

Registration Number: 19

Area Number: C

DANAK is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement). The MRA includes the Australian NATA and Canadian SCC.

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 913950

Facilities: EMC room 2 Hørsholm (EMC-2)
EMC room 3 Hørsholm (EMC-3)
EMC room 4 Hørsholm (EMC-4)
EMI room Hørsholm (EMC-5)

5.3 VCCI Registrations

Organization: Voluntary Control Council for Interference by Information Technology, Japan

Member Number: 910

Facilities:

EMC room 3 Hørsholm (EMC-3):	C-12532 and T-11548
EMI room Hørsholm (EMC-5):	R-11180, C-10706 T-11550 and G-10470

5.4 IC Registrations

Organization: Industry Canada, Certification and Engineering Bureau

Registration Number: IC4187A-5

Facilities: EMI room Hørsholm (EMC-5)

6. List of instruments

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp.
29246	MAGNETIC LOOP ANTENNA	EC	-	N/A	N/A
29680	IMPULSE VOLTAGE LIMITER (N)	ROHDE & SCHWARZ	ESH3/Z2	15-01-2021	15-01-2022
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	26-07-2019	26-07-2021
29953	ANTENNA TOWER/TURNTABLE CONTROLLER	EMCO	2090	N/A	N/A
29978	CABLE#34, RG 223, 40 m, COND. EMISSION, ROOM 5	SUHNER	RG 223/U	02-02-2021	02-02-2022
49043	COAXIAL SWITCH ROOM 5 (EMI)	RLC ELECTRONICS	SM-3-N	02-02-2021	02-02-2022
49429	CABLE 2m N-Nangle	-	RG214U	02-02-2021	02-02-2022
49457	CABLE 3m BNC-BNC	SUHNER	RG 223/U	02-02-2021	02-02-2022
49550	SIGNAL ANLYZER	ROHDE & SCHWARZ	FSQ8	01-02-2021	01-02-2022
49568	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2/Z5	14-01-2021	14-01-2022
49590	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2021	02-02-2022
49634	CABLE 2 m BNC-BNCm BNC-BNC	SUHNER	RG 223/U	02-12-2020	02-12-2021
49674	MATURO CONTROLLER	MATURO	NCD	N/A	N/A
49704	CABLE 3 m SMA-N	SUHNER	SUCOFLEX104	02-02-2021	02-02-2022
49730	1-18 GHz. HORN ANTENNA.	ROHDE & SCHWARZ	4070.7000.02	27-07-2019	27-07-2021
49808	ATTENUATOR, DC-12.4GHz, 6 dB	HUBER-SUHNER	6806.17A	26-07-2019	26-07-2021
49817	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2021	02-02-2022
49900	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESW26	11-02-2021	11-02-2022
49949	Active loop antenna	ROHDE & SCHWARZ	4110.2002.02	09-12-2019	09-12-2021
49999	EMC32-Software EMIroom	ROHDE & SCHWARZ	Ver. 10.40.10	N/A	N/A