TEST REPORT

According to FCC specifications
Electromagnetic compatibility

Report Number. .....:	122-25986-1
Date of issue .....:	2022-06-07
Total number of pages.....:	45
Name of Testing Laboratory preparing the Report.....:	FORCE Technology Venlighedsvej 4 2970 Hørsholm DENMARK
Applicant's name .....:	Foss Analytical A/S
Address .....:	Nils Foss Alle 1 3400 Hillerød DENMARK
Test specification:	ANSI C63.10:2013
TRF template used:	IECEE OD-2020-F7:2020; ed. 2
Standards .....:	47 CFR Part 15, Subpart C (Specific rule part §15.225)
Test procedure .....:	DANAK
Test Report Form No. .....:	According to OD -2020, Clause 3.3
Test Report Form(s) Originator ....:	FORCE Technology
Master TRF.....:	Dated 2022-05 (according to 3.3.4)

This report is not valid unless signed by FORCE Technology.

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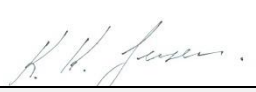
The authenticity of this Test Report and its contents can be verified by contacting FORCE Technology.

Test item description .....:	NIR measurement instrument	
Trademark or brand name.....:	NIRS™	
Manufacturer.....:	FOSS Analytical A/S	
Model/Type reference(s).....:	NIRS DA1650	
FCC Id	2AZ6M-DA1650	
Ratings .....:	12 VDC, max. 70 VA via external PSU 100-240 VAC, 50/60 Hz	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
Testing Laboratory:	FORCE Technology	
Testing location/ address.....:	Venlighedsvej 4 2970 Hørsholm DENMARK	
Tested by (name, function, signature).....:	Peter Wolf Frandsen Specialist EMC	
Approved by (name, function, signature)...:	Karsten Kruse Jensen Head of Department	

List of Attachments (including a total number of pages in each attachment): N/A

Summary of testing	
Tests performed (name of test and clause): **AC power-line conducted emission (6.2)** **Radiated emission below 30 MHz (6.4)** **Radiated emission 30 - 1000 MHz (6.5)** **Radiated emission above 1000 MHz (6.6)** **Frequency stability (6.8)** **Occupied bandwidth, 20 dB (6.9)** **Band edge (6.10)** **Field strength of fundamental**	**Testing location:** FORCE Technology Venlighedsvej 4 2970 Hørsholm DENMARK

Summary of compliance

☒ **The product fulfils the requirements of the following standard, with respect to the test listed above:**

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

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

Use of uncertainty of measurement for decisions on conformity (decision rule) :

The decision rule is inherent in the requested specification.

For additional information see 6.2.

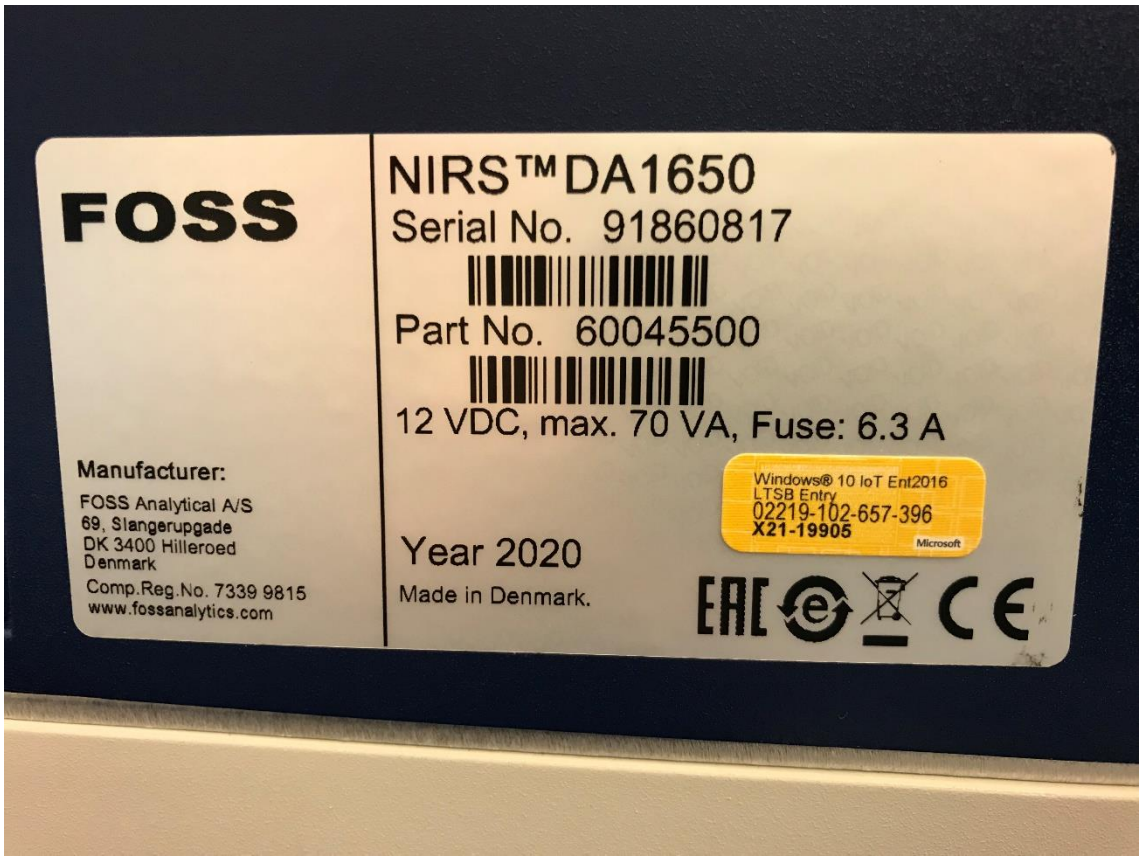
Information on uncertainty of measurement:

☒ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Calculations leading to the reported values are on file with the testing laboratory internal Quality Management System D4.

☐ **Statement not required by the standard used for type testing**

Copy of marking plate .....:	The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Possible test case verdicts:	
- test case does not apply to the test item .:	N/A (Not Applicable)
- test item does meet the requirement .....:	P (Pass)
- test item does not meet the requirement .:	F (Fail)
Date of receipt of test item .....:	2022-05-10
Date (s) of performance of tests .....:	2022-05-10 to 2022-05-20

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.
Note: Throughout this TRF, numerical data taken from IEC standards are using a comma as the decimal separator.
Throughout this report, the term "Test item" is used over terms such as Test object, EUT or DUT.

General product information (GPI) and other remarks:

The NIRS™ DA1650 uses near infrared technology to bring high accuracy NIR analysis into the feed mill or on-farm. Produce closer to specification and get a consistent final product quality.

Table of Contents:

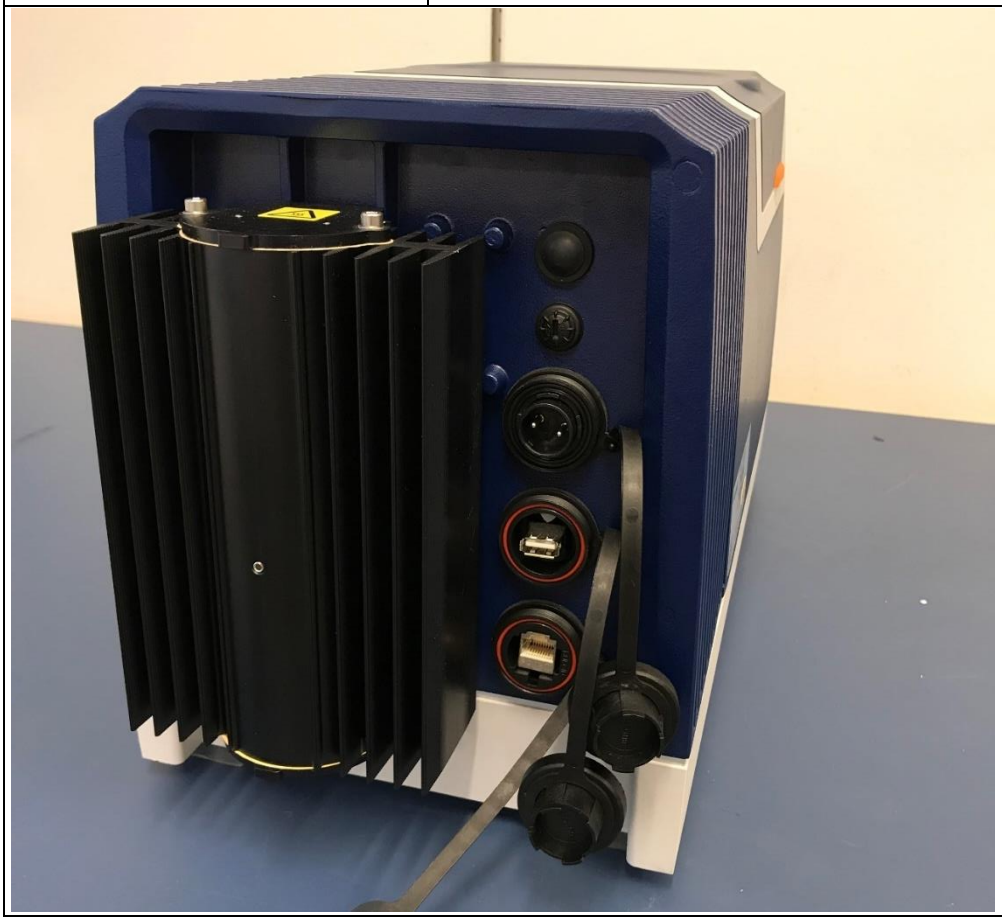
1 General description of test item

Note: The information in this section has been provided by the applicant.

1.1 Photo(s) of the test item

Photo 1.1.1 ..... :	*Test item 1 front*

Photo 1.1.2 ..... :	*Test item 1 rear*



1.2 Test item

No.	Test item name	Unique identification / type / description	Extent of test
1	*NIRS DA1650*	*Serial No. 91860817, Part No. 60045500*	*Tested in full*
Supplementary information: -			

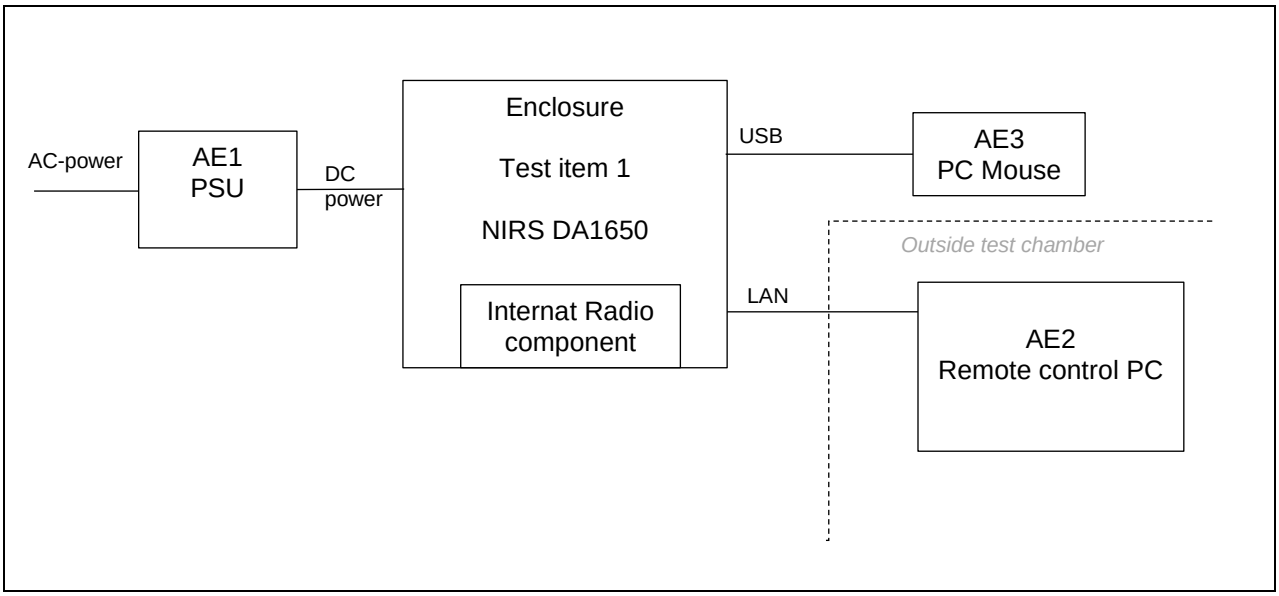
1.3 Port(s)

No.	Port Name	Type	Cable		
			Specified length in m	Attached during test	Shielded
1	Enclosure	Enclosure	-	-	-
2	DC power	DC mains	< 3	☒	–
3	LAN	Wired network port	+30	☒	☒
4	USB	USB port	< 3	☒	☒
5	Antenna	Antenna port – internal RFID	-	☒	–
6	AC-power	AC mains	-	☒	–
Supplementary information: Test item supplied by AUX AC/DC Adapter					

1.4 Power rating(s)

Power supply type ..... :	☒	AC, 1 phase – AE AC/DC adapter
	☒	Protective Earth
	☒	DC
Rated voltage ..... :	12 VDC	
Rated frequency ..... :	-	
Rated power ..... :	70 VA	

1.5 Configuration and Connections with Test item



1.6 Additional parameters

Radio type ..... :	13.56 MHz RFID	
Antenna	Internal / Non removeable	
Clock frequencies..... :	Highest generated internal clock frequency defined by manufacturer 1.6 GHz	
Other parameters ..... :	“NIA” (no information available)	
Software version ..... :	6.16.13.25	
Hardware version ..... :	91860817 (Serial no)	
Dimensions (W x H x D) ... :	230 x 530 x 280 mm	
Mounting position ..... :	☒	Table-top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☐	Other: *Click or tap here to enter text*

1.7 Operating mode(s)

No.	Abbreviation	Detailed description of the operating mode	Used for testing	
			Radiated & Conducted Emission	Radio parameter
1	Normal mode continuous measurement	Continues measurements with grain sample. Instrument running in full operation mode. Constant RFID TX on.	☒	☐
2	Normal mode single measurement	Continues measurements with grain sample. Instrument running in full operation mode. Constant RFID TX on.	☐	☒
Supplementary information: --				

1.8 Auxiliary equipment

Advice to the TRF User: Include accessories which are not to be considered test items.

No.	AE Item Name	Type and description	Manufacturer (if not the same)
1	PSU	External power Supply	JET adapter Tech.
2	PC	External control PC	DELL
3	Mouse	External PC mouse	DELL
Supplementary information: -			

1.9 Photo(s) of Auxiliary equipment

Photo 1.9.1 .....:	*Auxiliary equipment 1: PSU*

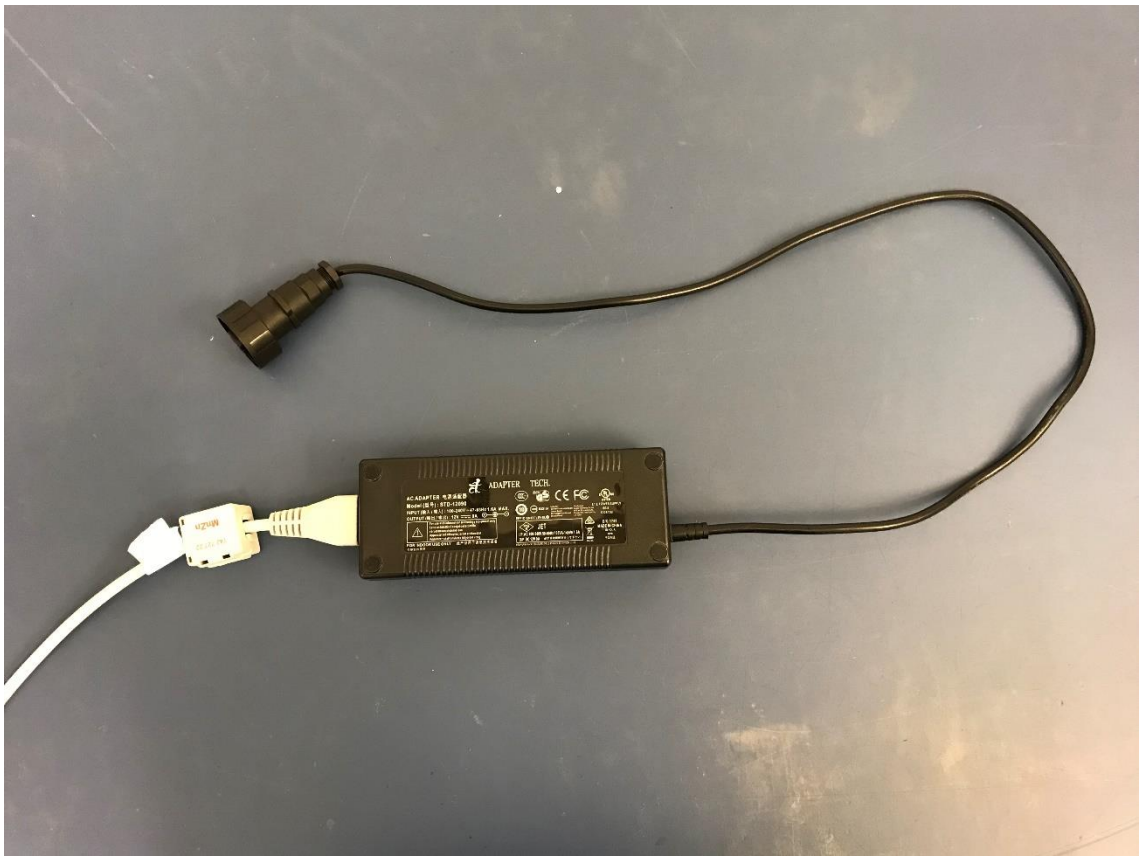


Photo 1.9.2 .....:	*Auxiliary equipment 2: PC*

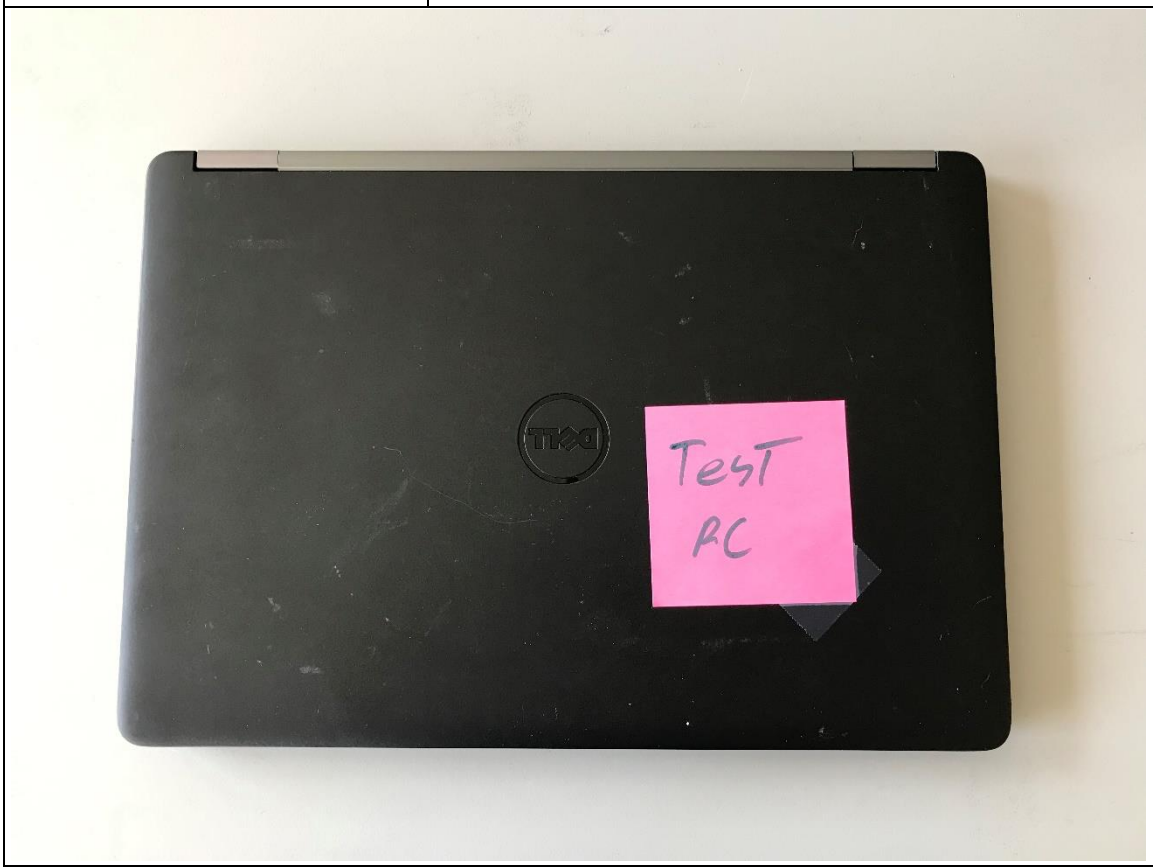


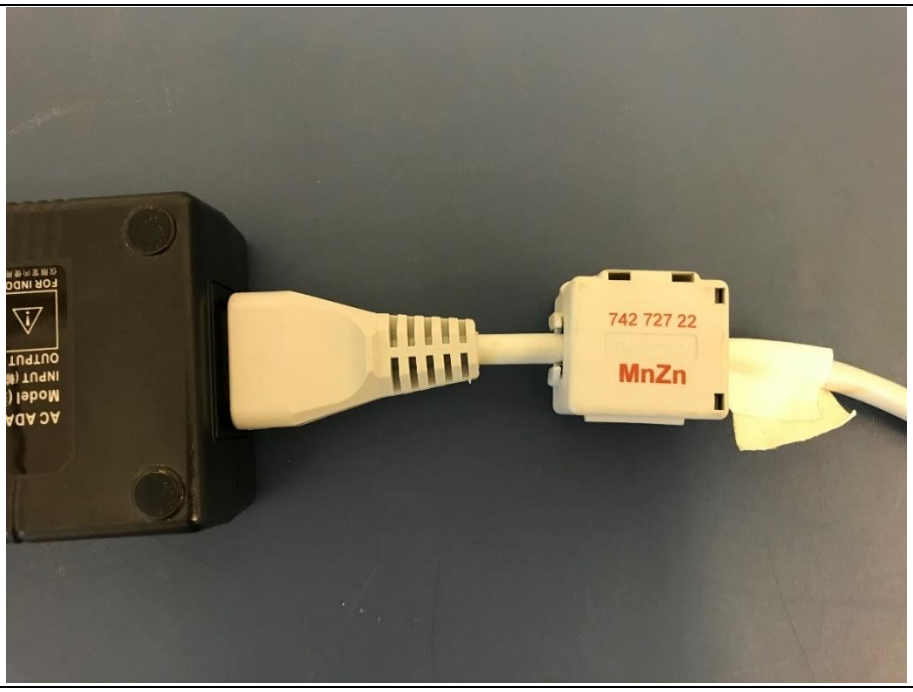
Photo 1.9.3 .....:	*Auxiliary equipment 3: Mouse*

1.10 Documents as provided by the applicant

No.	Document ref.	Type and description	Doc date
1	--	-	-
Supplementary information: -			

1.11 Modifications to the test item during testing

☐	No modifications done during testing	
☒	Modifications done during testing (see details below)	
No.	**Description of modification (if any)**	**Date of modification**
1	Ferrite mounted on AC mains cable to comply with AC power-line conducted emission limit. Type: WU 742 727 22	2022-05-10



Supplementary information: -

2 Verdict summary section

47 CFR Part 15, Subpart C (Specific rule part §15.225)				
Clause	**Requirement – Test case**	**FCC rule part**	**Test methods**	**Results**
4.1	Measurement of radio frequency voltage on mains / Conducted limits	47 CFR Part 15 B + C Subpart 15.107 & 15.207	ANSI C63.10:2013	Passed
4.2-4.4	Measurement of radiated emission / field strength of harmonics	47 CFR Part 15 B + C Subpart 15.109 & 15.209 47 CFR Part 15.225	ANSI C63.10:2013	Passed
4.5	Frequency stability	47 CFR Part 15.225	ANSI C63.10:2013	Passed
4.6	Measurement of occupied bandwidth	47 CFR Part 15.215(c)	ANSI C63.10:2013	Passed
4.7	Measurement of band edge	47 CFR Part 15.209 & 15.225	ANSI C63.10:2013	Passed
4.8	Measurement of field strength of fundamental	47 CFR Part 15.225	ANSI C63.10:2013	Passed
Note: The host product contains a radio component				

3 Test conditions

3.1 General

<table>
<tr><td rowspan="4">Environmental reference conditions.....:</td><td colspan="3">The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment.
The climatic conditions during the tests were within the following limits:</td></tr>
<tr><td>Temperature</td><td>Humidity (RH)</td><td>Atmospheric pressure</td></tr>
<tr><td>15 °C - 35 °C</td><td>30 % - 60 %</td><td>800 hPa - 1060 hPa</td></tr>
<tr><td colspan="3">If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.</td></tr>
<tr><td>Measurement uncertainties .....:</td><td colspan="3">For all measurements where guidance for the calculation of the instrumentation uncertainty of a measurement is specified in CISPR 16-4-2, the measurement instrumentation uncertainty has been calculated and applied in accordance with the standard.</td></tr>
</table>

3.2 Operational requirements during testing

The operation of the EUT shall conform to the following provisions:

a) The unlicensed wireless device shall be configured to operate at 100 % duty cycle. For systems incapable of supporting 100 % duty cycle, the unlicensed wireless device shall be operated using the maximum possible duty cycle, and this information shall be noted as such in the test report.

b) The unlicensed wireless device shall be tested operating at the highest transmit power allowed for each antenna configuration.

c) The system shall be tested with each modulation to identify the worst-case modulation that produces the highest level of emissions. Where a multi modulation scheme is used, justification for the single modulation chosen shall be provided in the test report.

d) The system shall be tested using the data rate that yields the highest fundamental emission levels for each modulation type. The data rate and rationale or supporting test data shall be included in the test reports.

e) For frequency hopping systems, the hopping sequence shall be stopped for certain test suites to allow for measurements on a single channel.

f) Where applicable, the device shall also be configured to transmit at the worst-case duty cycle under normal operating conditions to determine the average correction factor.

g) The software shall allow configuration and operation on all available unlicensed wireless device channels.

h) The software shall allow configuration and operation in the unmodulated carrier model, where applicable.

3.3 Test set-ups

Figure 3.3.1 .....:	Test set-up 1

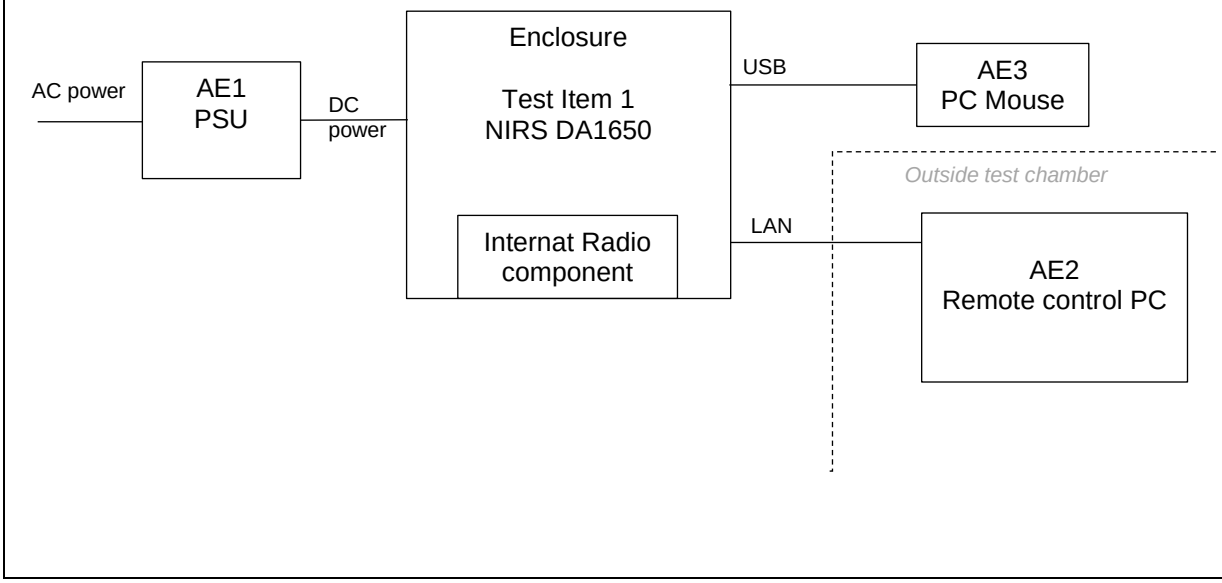
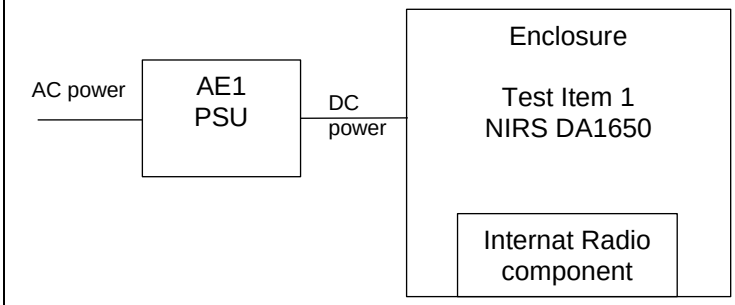


Figure 3.3.2 .....:	Test set-up 2



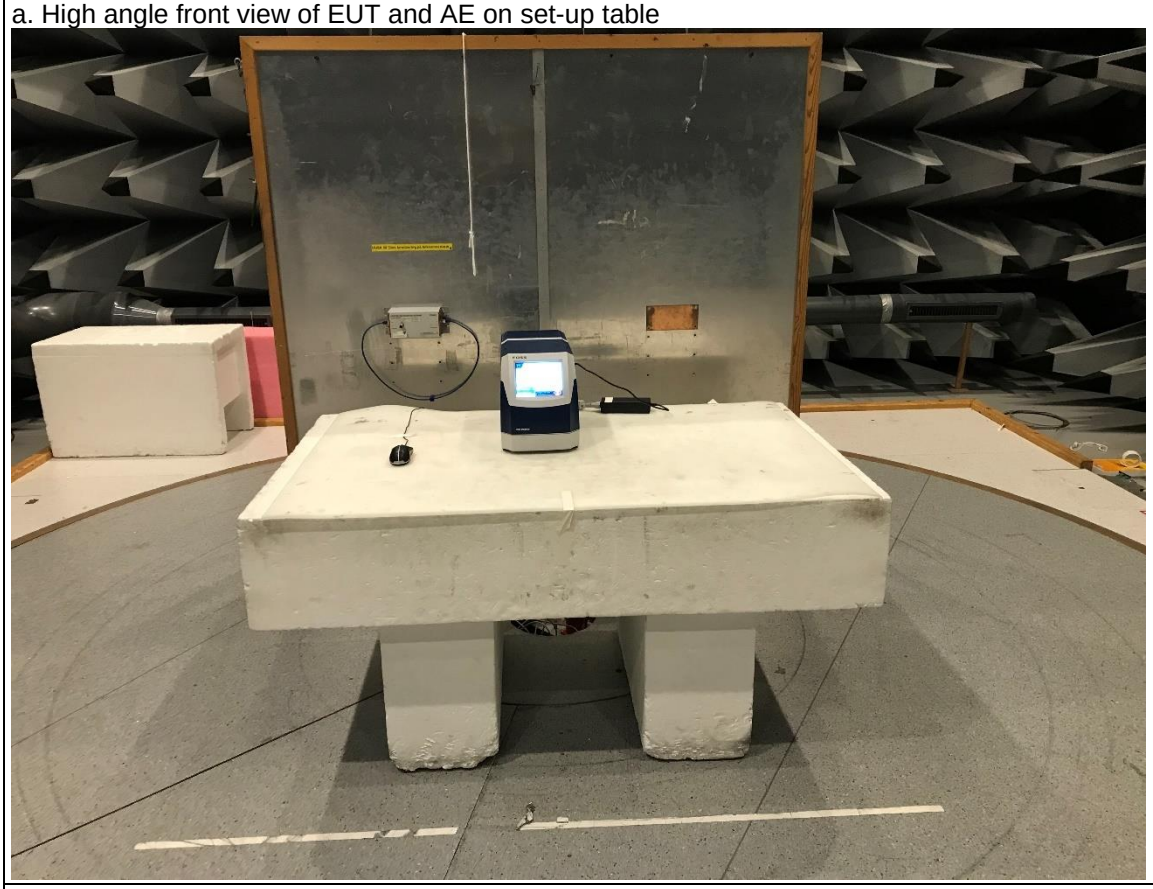
4 Emission

4.1 Measurement of AC power-line conducted emission

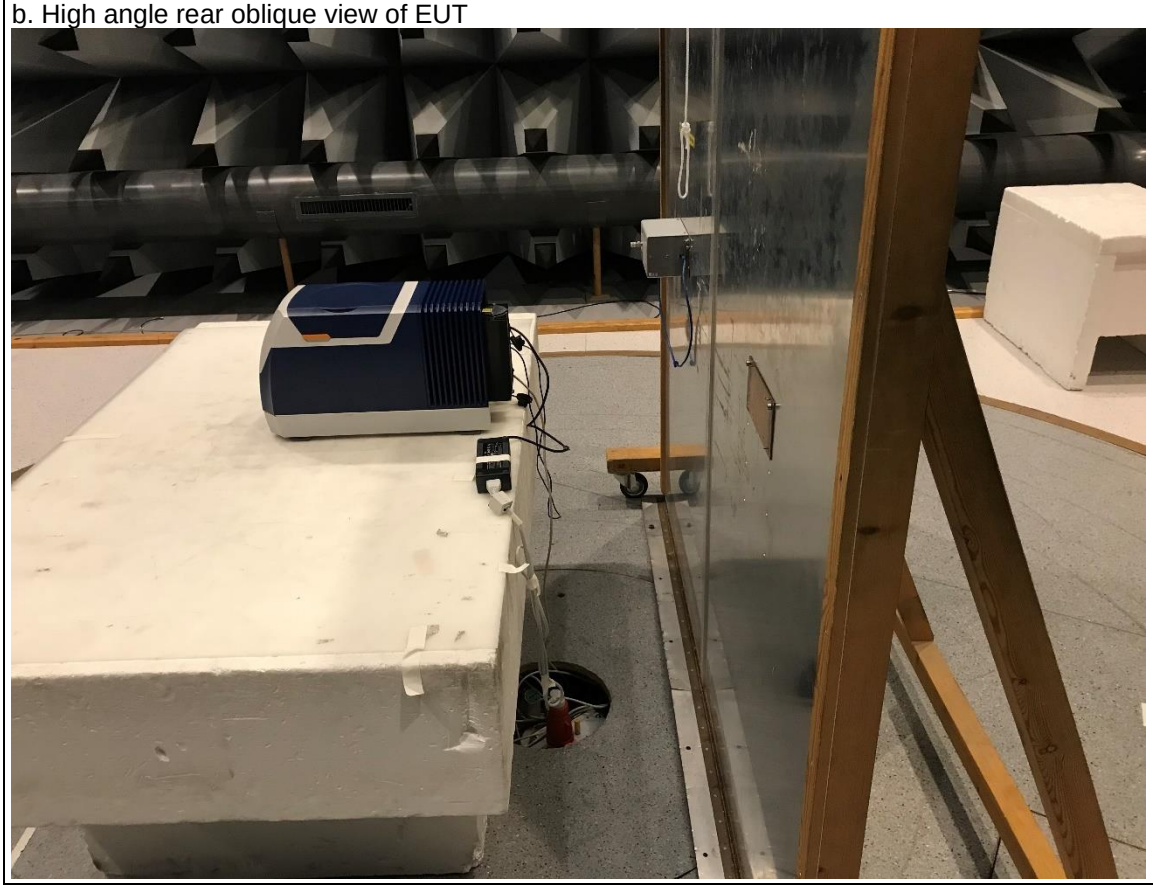
Name..... :	Peter Wolf Frandsen	
Date..... :	2022-05-10	
Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit class or environment:	☐	Class A according to applied standard
	☐	Class B according to applied standard
	☒	Limit according to 47 CFR Part 15 C Subpart 15.207
	☐	Other:
Test set-up description..... :	☒	40 cm distance to vertical ground plane, 80 cm over ground plane
	☐	Floor standing equipment set-up (10 cm over ground plane)
	☐	Other:
	☐	Artificial hand applied
Supplementary test set-up description..... :	If the EUT is normally operated with a ground (safety) connection, then the EUT shall be connected to the ground at the LISN through a conductor provided in the lead from the ac power to the LISN. The excess length of the power cord between the EUT and the LISN receptacle shall be folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. The system shall be arranged in one typical equipment arrangement for the test.	
Test method applied..... :	☒	Artificial mains network (AMN): 50 Ω, 50 μH
	☐	Other:
Supplementary information ..... :	AC power-line conducted emission measurements shall be made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz, to determine the line-to-ground radio-noise voltage that is conducted from all of the EUT current-carrying power input terminals that are directly (or indirectly via separate transformers or power supplies) connected to a public power network. These measurements may also be required between 9 kHz and 150 kHz. If the EUT normally receives power from another device that in turn connects to the public utility ac power lines, measurements shall be made on that device with the EUT in operation to demonstrate that the device continues to comply with the appropriate limits while providing the EUT with power. If the EUT is operated only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines (600 VAC or less) to operate the EUT (such as an adapter), then ac power-line conducted measurements are not required.	

Photo 4.1.1 .....:	Measurement of AC power-line conducted emission

a. High angle front view of EUT and AE on set-up table



b. High angle rear oblique view of EUT

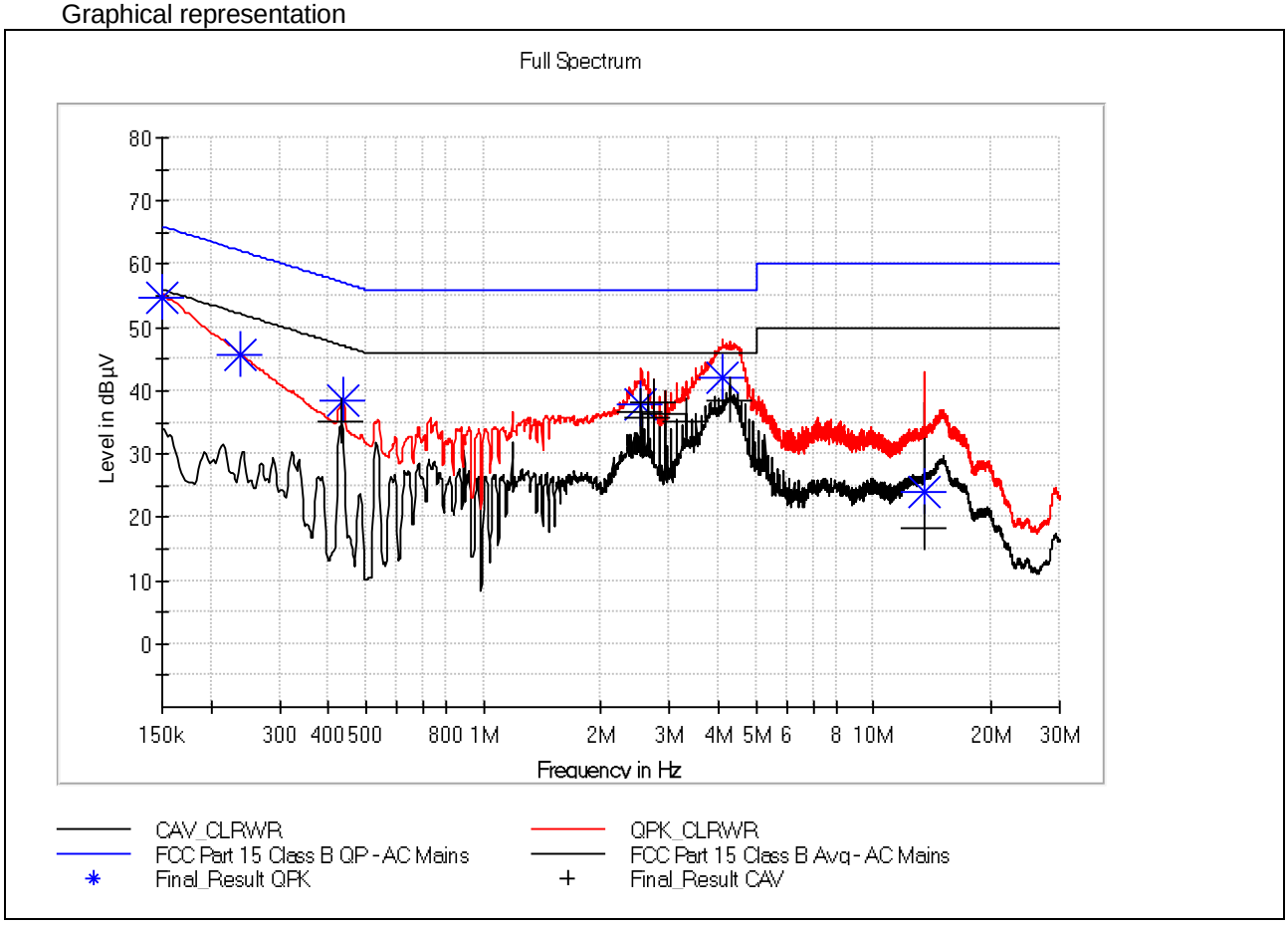


Test results for AC power-line conducted emission	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	1

Tabulated Results summary

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.15	54.75	---	66.0	11.2	15000	9	L1	FLO	10.2
0.24	45.54	---	62.2	16.6	15000	9	L1	FLO	10.2
0.43	---	35.09	47.2	12.1	15000	9	L1	FLO	10.3
0.44	38.43	---	57.1	18.7	15000	9	L1	FLO	10.3
2.54	---	36.64	46.0	9.4	15000	9	N	FLO	10.9
2.54	37.81	---	56.0	18.2	15000	9	N	FLO	10.9
2.64	---	35.84	46.0	10.2	15000	9	N	FLO	10.9
2.74	---	38.15	46.0	7.9	15000	9	N	FLO	10.9
2.93	---	36.21	46.0	9.8	15000	9	N	FLO	11.0
3.32	---	35.21	46.0	10.8	15000	9	N	FLO	11.0
4.10	41.99	---	56.0	14.0	15000	9	N	FLO	11.1
4.30	---	38.46	46.0	7.5	15000	9	N	FLO	11.2
13.55	---	18.16	50.0	31.8	15000	9	N	FLO	12.2
13.55	24.01	---	60.0	36.0	15000	9	N	FLO	12.2

Graphical representation



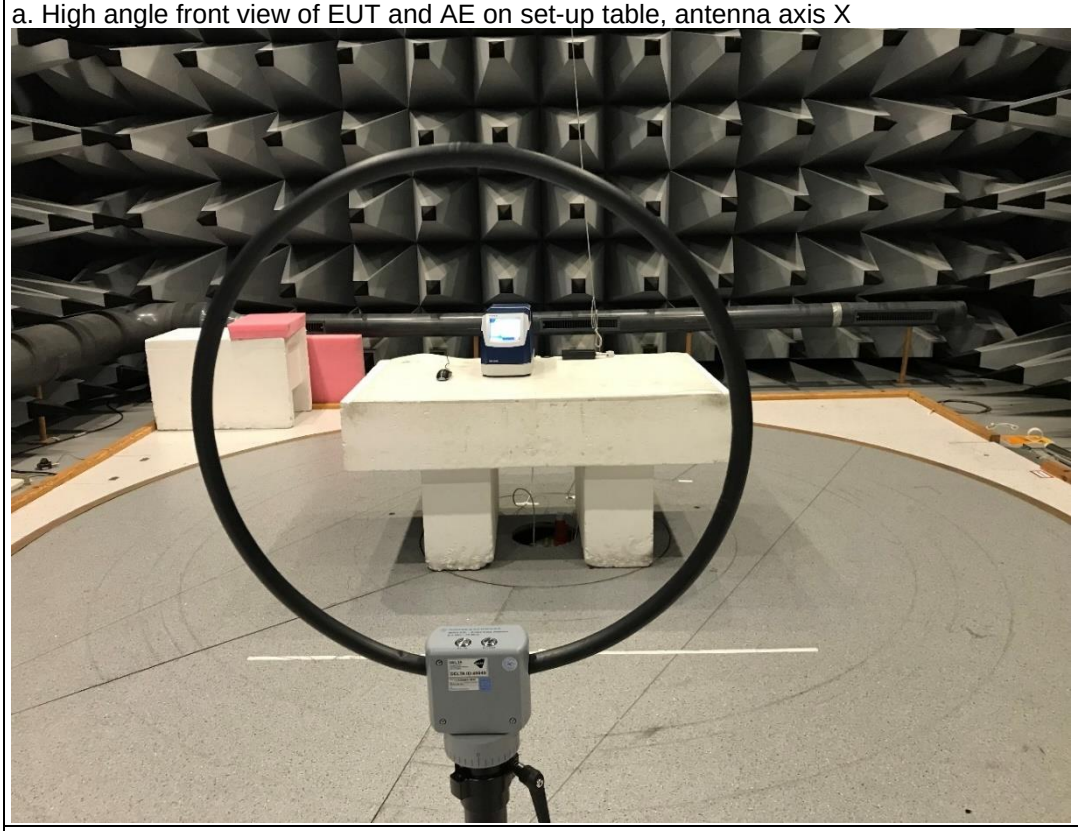
4.2 Measurement of radiated emission below 30 MHz (Magnetic field)

Name..... :	Peter Wolf Frandsen
Date..... :	2022-05-10
Rationale for verdict N/A ..... :	-

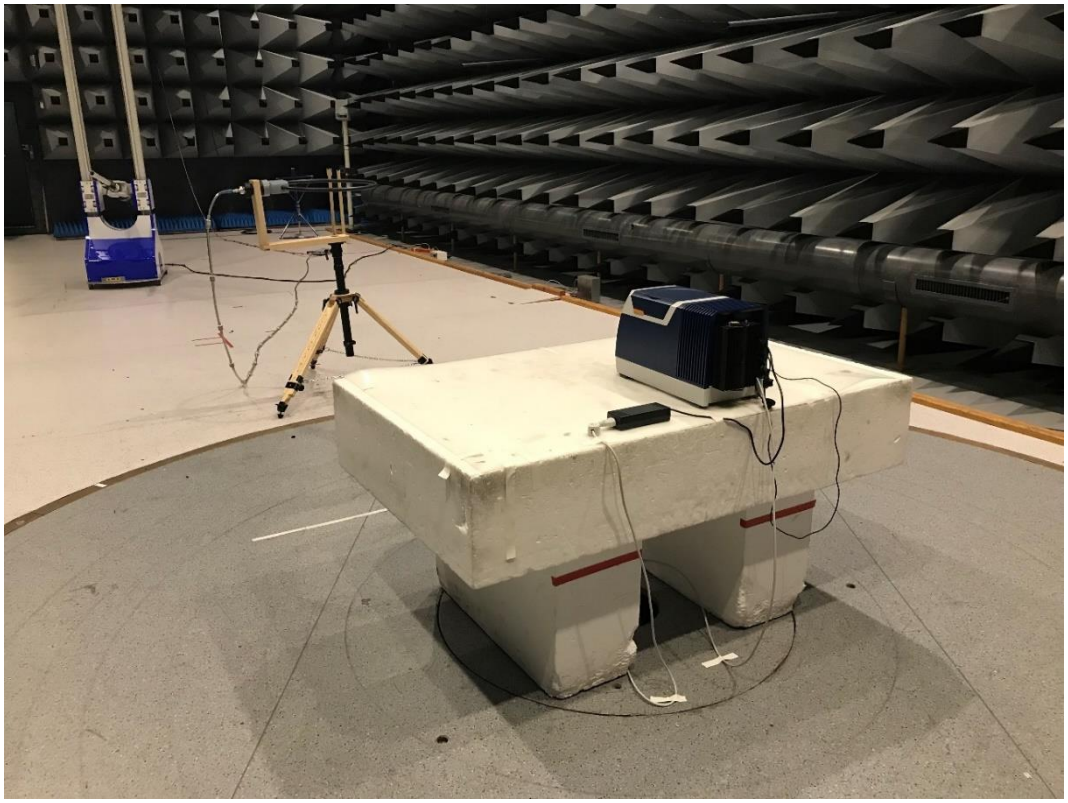
Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit class..... :	☐	Class A according to applied standard
	☐	Class B according to applied standard
	☒	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.225
	☐	Other:
Test set-up description..... :	☒	Equipment on a table 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other:
Supplementary test set-up description..... :	Any controlling device (e.g., notebook, laptop, or desktop computer) shall be positioned such that it shall not significantly influence the measurement results. External antenna(s) shall be positioned for maximum radiated emissions. EUTs with integral antennas shall be evaluated in their normal orientation. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center, forming a bundle 30 cm to 40 cm long.	
Test method applied..... :	☒	Active loop antennas, as specified in ANSI C63.2 and/or CISPR 16-1-4:2010.
	☒	SAC with measurement distance [m]: 3
Supplementary information ..... :	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 .....:	Measurement of radiated emission below 30 MHz (Magnetic field)

a. High angle front view of EUT and AE on set-up table, antenna axis X



b. High angle rear oblique view of EUT, antenna axis Z



c. High angle front view of EUT and AE on set-up table, antenna axis Y

Test results for radiated emission below 30 MHz (Magnetic field)	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	1

Tabulated Results summary

X-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
0.61	47.56	70.9	23.3	15000	9	100.0	87	20.4
1.72	29.46	68.6	39.1	15000	9	100.0	29	20.5
2.02	42.69	68.6	25.9	15000	9	100.0	315	20.5
2.30	41.96	68.6	26.6	15000	9	100.0	270	20.5
2.49	33.49	68.6	35.1	15000	9	100.0	270	20.5
3.57	32.67	68.6	35.9	15000	9	100.0	179	20.5
13.56	16.94	124.0	107.1	15000	9	100.0	85	20.8

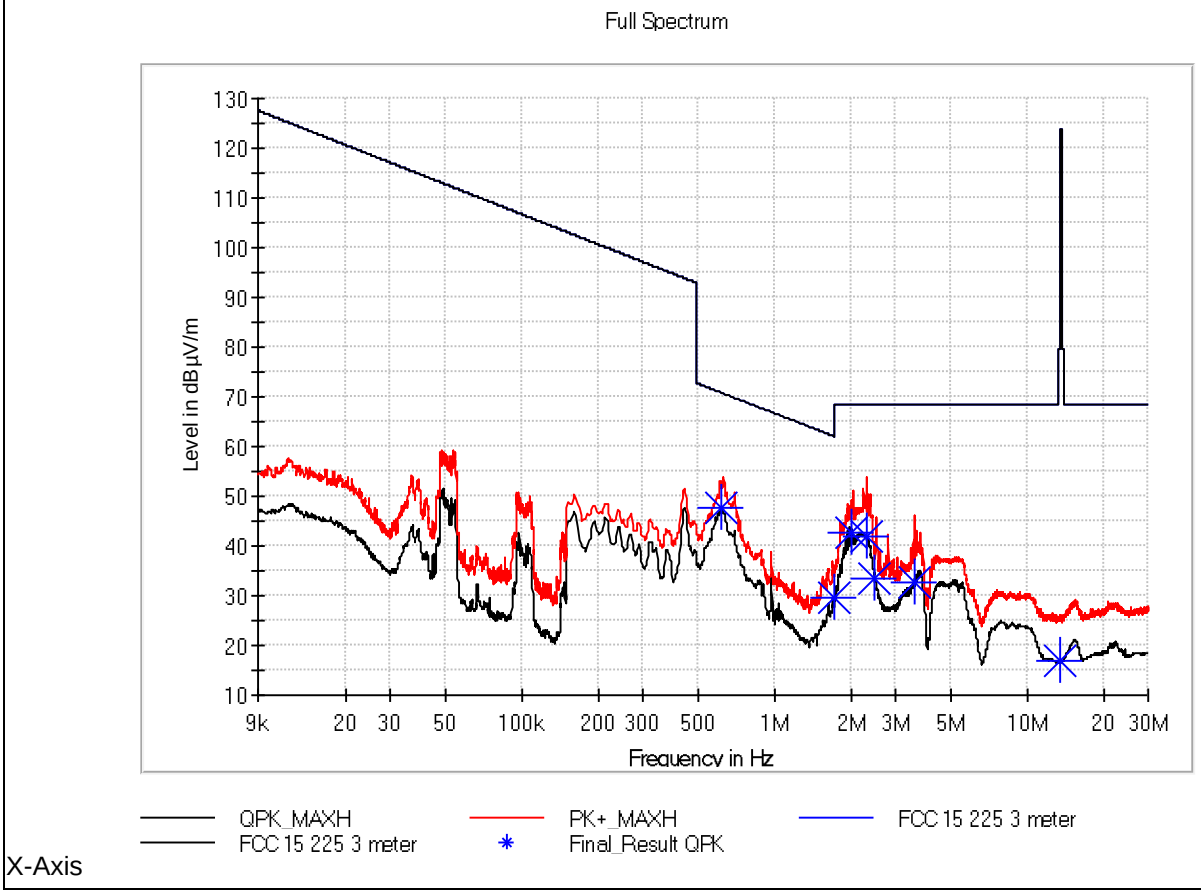
Y-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
0.48	35.39	93.1	57.8	15000	9	100.0	91	20.4
0.58	38.60	71.3	32.7	15000	9	100.0	165	20.4
0.92	31.25	67.4	36.2	15000	9	100.0	97	20.4
0.97	33.40	66.9	33.5	15000	9	100.0	93	20.4
1.56	26.34	62.9	36.5	15000	9	100.0	94	20.5
13.56	22.25	124.0	101.8	15000	9	100.0	118	20.8
21.18	24.47	68.6	44.1	15000	9	100.0	225	20.8

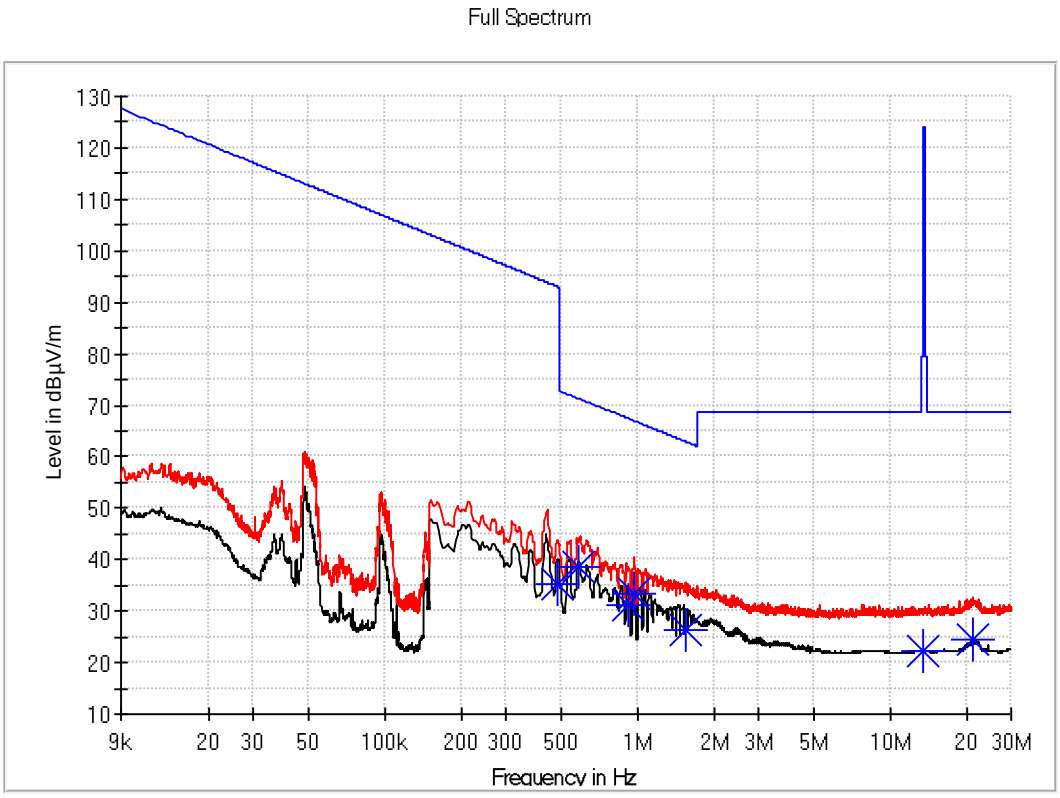
Z-Axis

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
0.44	48.54	93.9	45.4	15000	9	100.0	104	20.4
0.48	38.90	93.1	54.2	15000	9	100.0	46	20.4
0.87	42.77	67.9	25.1	15000	9	100.0	225	20.4
1.68	31.06	62.2	31.2	15000	9	100.0	46	20.5
2.63	33.01	68.6	35.6	15000	9	100.0	65	20.5
8.68	21.89	68.6	46.7	15000	9	100.0	90	20.7
13.56	24.59	124.0	99.4	15000	9	100.0	303	20.8
16.16	22.00	68.6	46.6	15000	9	100.0	135	20.8

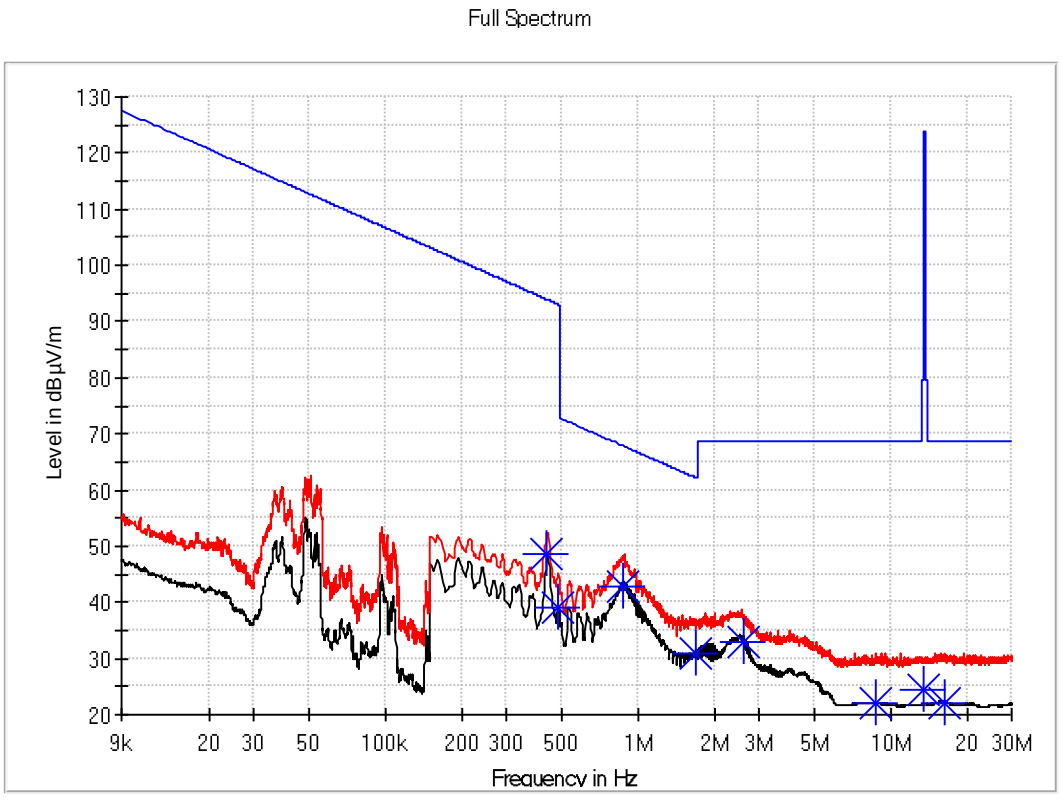
Graphical representation



X-Axis


Full Spectrum
Level in dBµV/m
130
120
110
100
90
80
70
60
50
40
30
20
10
9k
20
30
50
100k
200
300
500
1M
2M
3M
5M
10M
20
30M
Frequency in Hz
QPK_MAXH
PK+_MAXH
FCC 15 225 3 meter
Final_Result QPK

Y-Axis


Full Spectrum
Level in dBµV/m
130
120
110
100
90
80
70
60
50
40
30
20
9k
20
30
50
100k
200
300
500
1M
2M
3M
5M
10M
20
30M
Frequency in Hz
QPK_MAXH
PK+_MAXH
FCC 15 225 3 meter
Final_Result QPK

Z-Axis

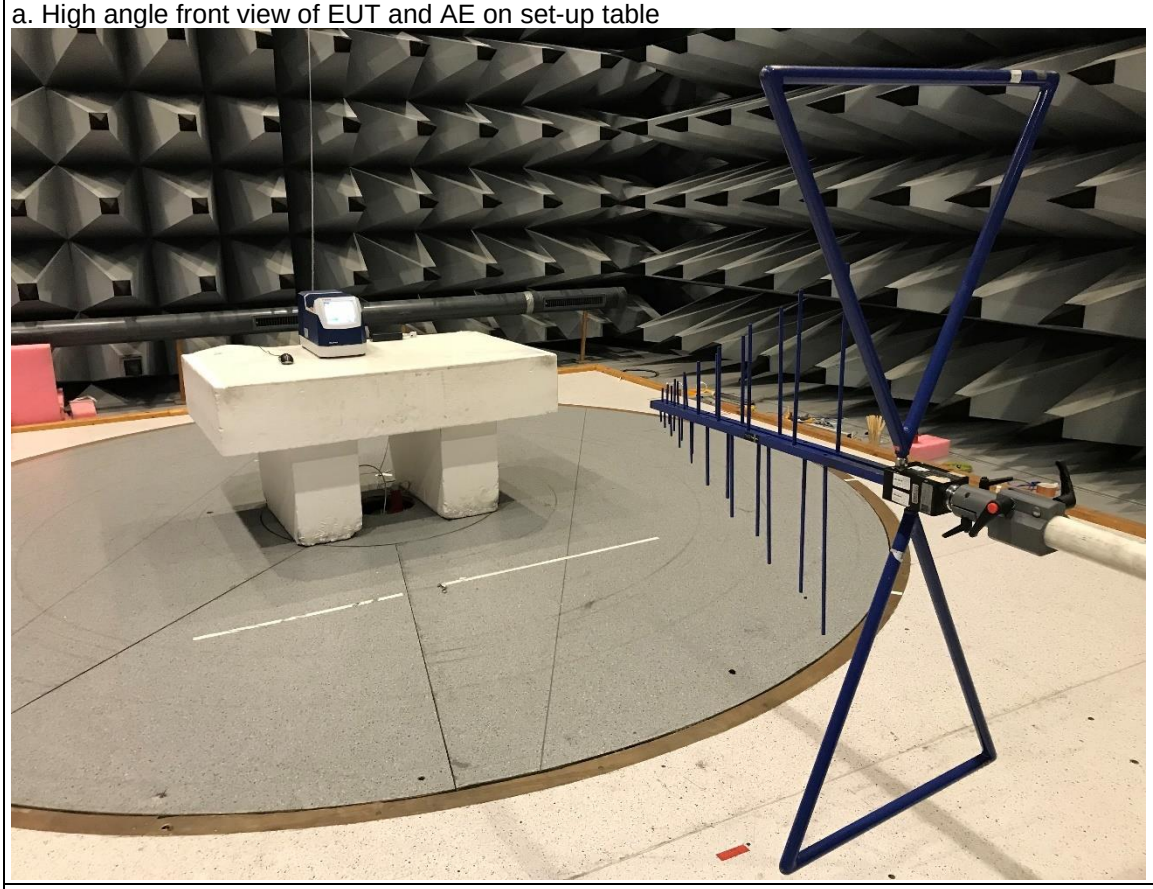
4.3 Measurement of radiated emission 30 - 1000 MHz

Name..... :	Peter Wolf Frandsen
Date..... :	2022-05-10
Rationale for verdict N/A ..... :	-

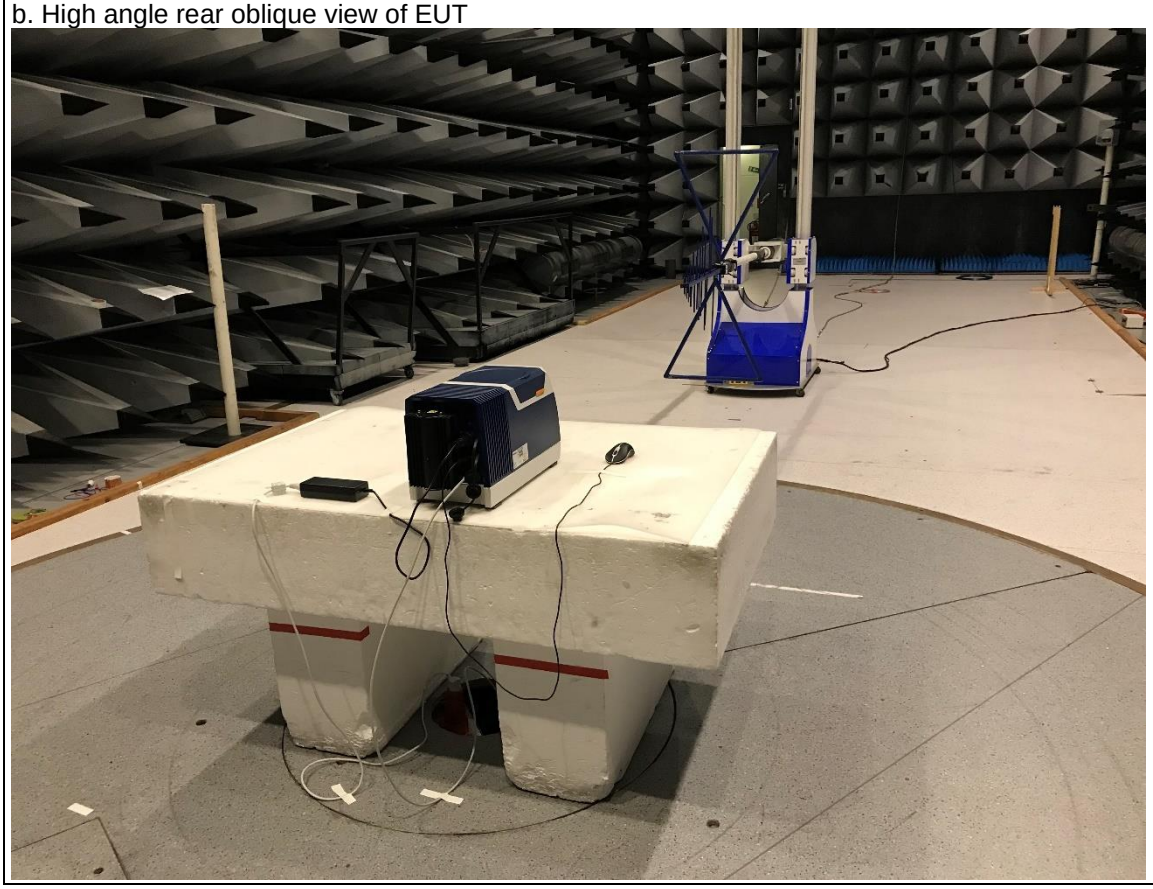
Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit class..... :	☐	Class A according to applied standard
	☐	Class B according to applied standard
	☒	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.225
	☐	Other:
Test set-up description..... :	☒	Equipment on a table 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other (e.g. height of pallet):
Supplementary test set-up description..... :	-	
Test method applied..... :	☒	SAC with measurement distance [m]: 3
	☐	FAR with measurement distance [m]:
Supplementary information ..... :	Measurements were made in semi-anechoic chamber that complies to CISPR 16. Preliminary (peak) measurements. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak detector below 1GHz) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	

Photo 4.3.1 .....:	Measurement of Radiated emission 30 - 1000 MHz

a. High angle front view of EUT and AE on set-up table



b. High angle rear oblique view of EUT

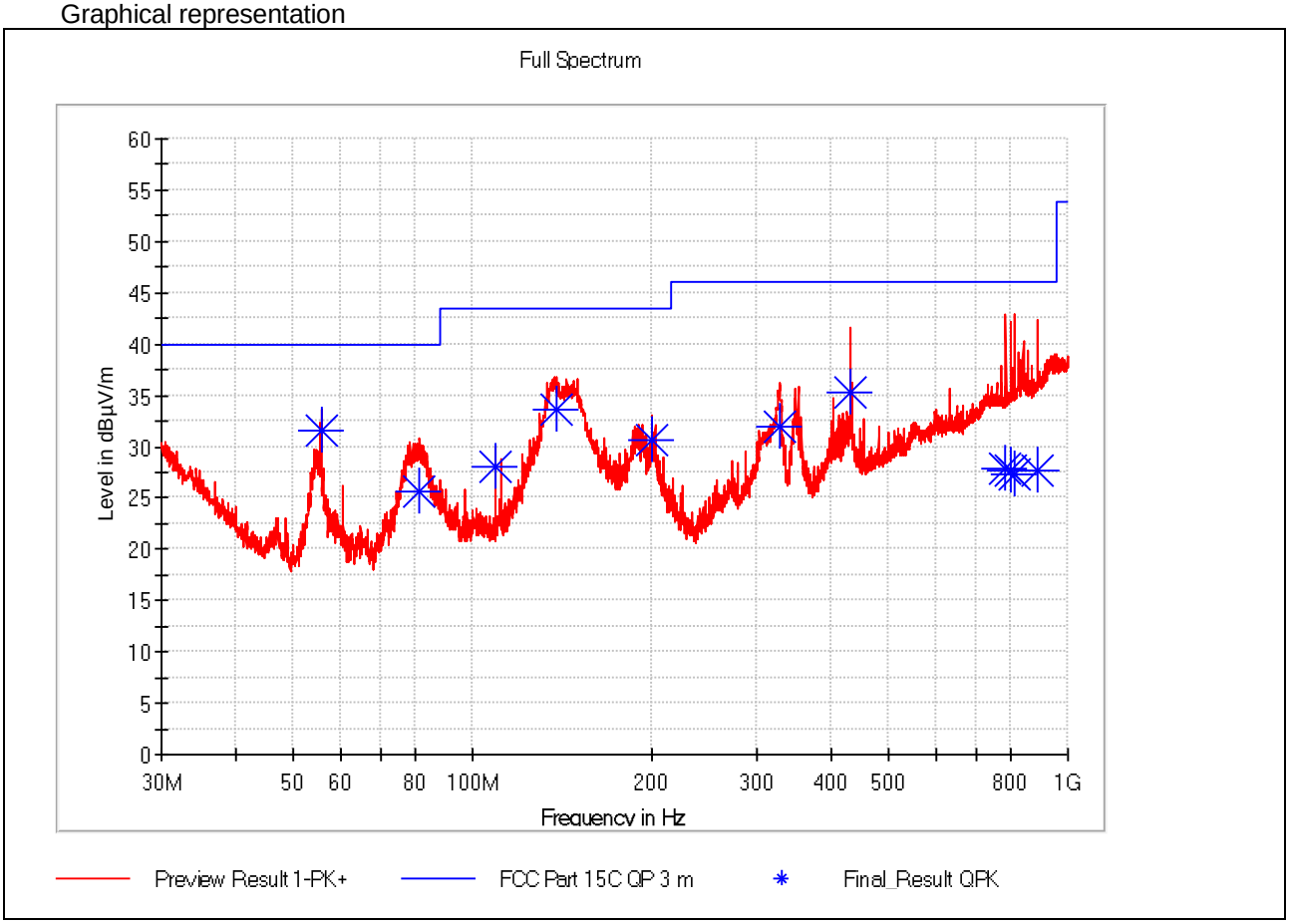


Test results for Radiated emission 30 - 1000 MHz	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	1

Tabulated Results summary

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
55.62	31.66	40.0	8.3	15000	120	281.0	H	258	14.7
81.21	25.56	40.0	14.4	15000	120	107.0	V	12	15.5
109.05	27.97	43.5	15.5	15000	120	257.0	H	269	19.3
138.39	33.68	43.5	9.8	15000	120	202.0	H	78	19.8
200.01	30.62	43.5	12.9	15000	120	111.0	H	59	18.2
328.71	31.94	46.0	14.1	15000	120	103.0	H	44	23.4
429.84	35.34	46.0	10.7	15000	120	144.0	V	178	26.1
786.51	27.87	46.0	18.1	15000	120	295.0	H	263	32.8
800.07	27.75	46.0	18.3	15000	120	191.0	H	279	33.0
813.63	27.32	46.0	18.7	15000	120	121.0	H	227	33.4
891.15	27.77	46.0	18.2	15000	120	216.0	V	268	34.3

Graphical representation



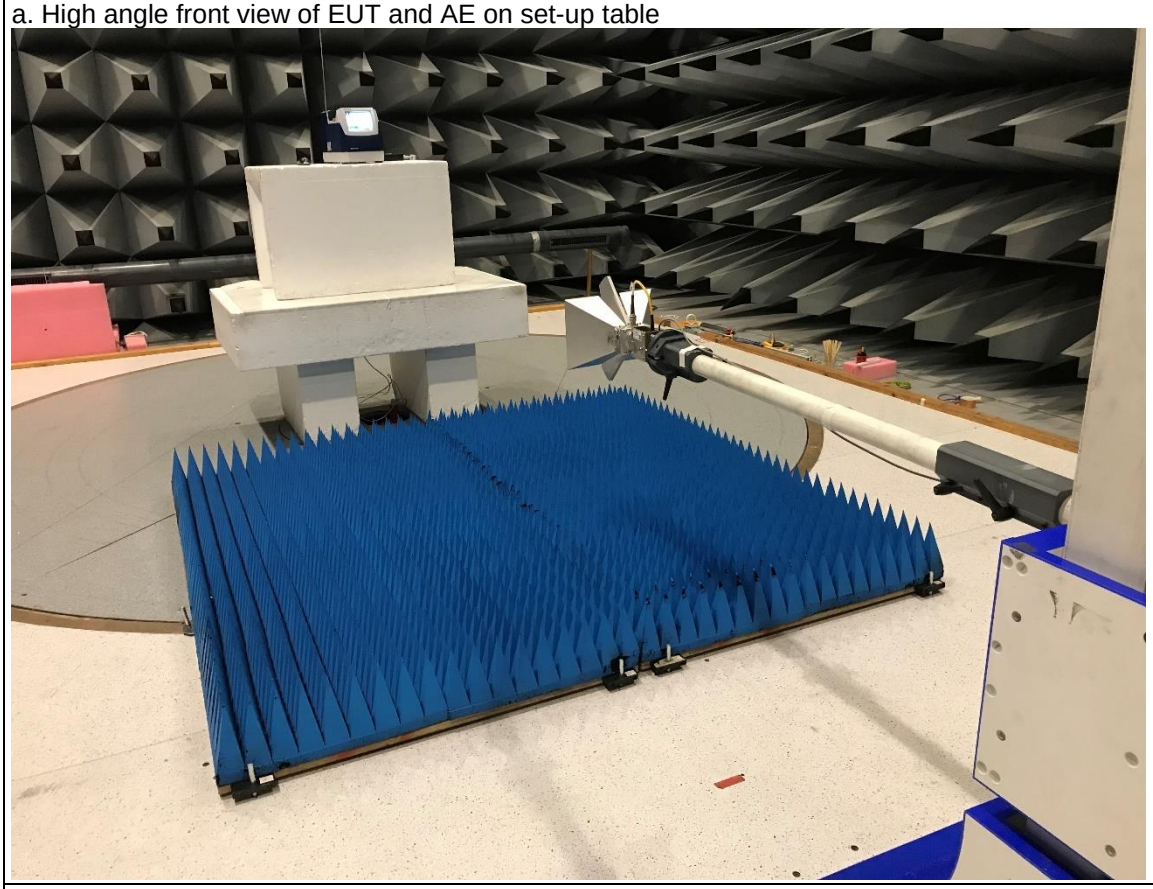
4.4 Measurement of radiated emission above 1000 MHz

Name..... :	Peter Wolf Frandsen
Date..... :	2022-05-10
Rationale for verdict N/A ..... :	-

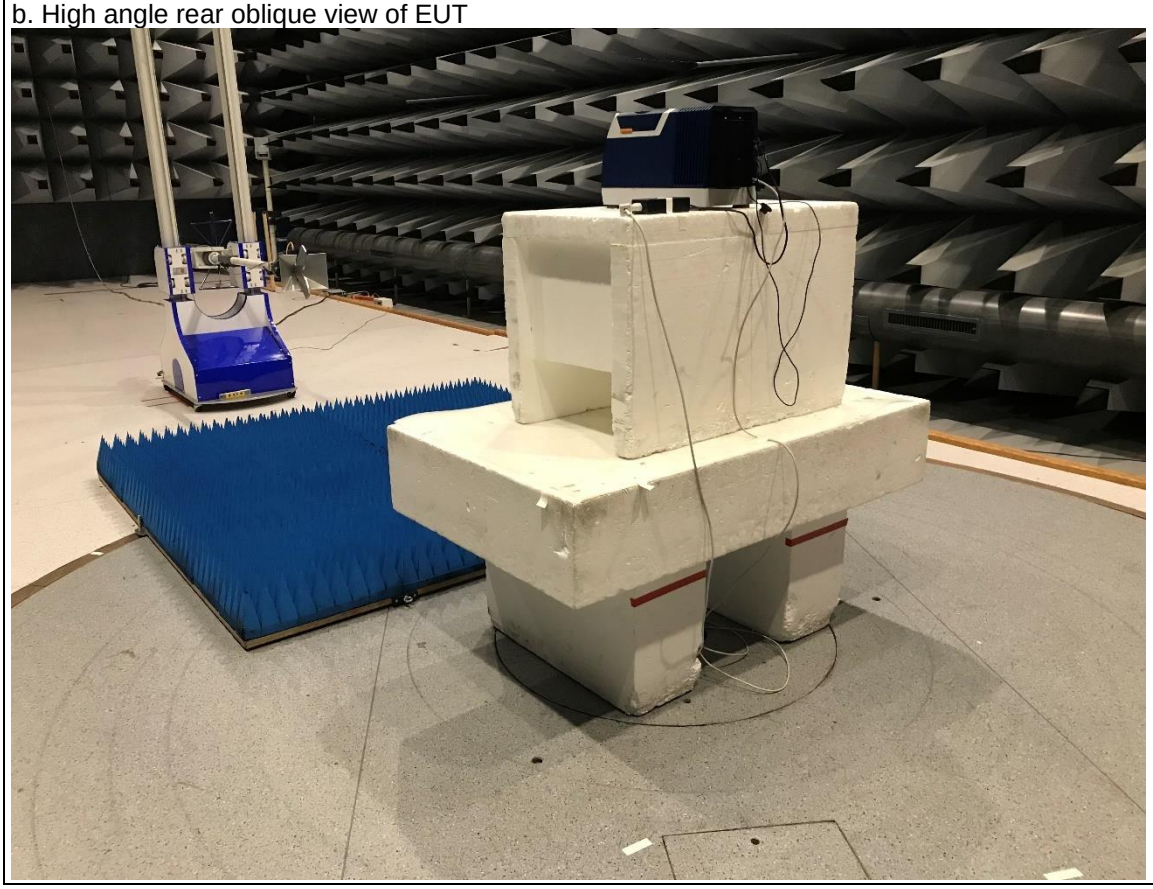
Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit class..... :	☐	Class A according to applied standard
	☐	Class B according to applied standard
	☒	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.225
	☐	Other:
Test set-up description..... :	☒	Equipment on a table 150 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other (e.g. height of pallet):
Supplementary test set-up description..... :	-	
Test method applied..... :	☒	FSOATS CISPR 16-2-3 with measurement distance [m]: 3
	☐	FAR with measurement distance [m]:
Supplementary information ..... :	Measurements were made in FAR or FSOATS Site that complies to CISPR 16. Preliminary (peak and average) measurements. The EUT was rotated 360°, spaced by 15°, with the receive antenna located in horizontal and vertical polarities. Final measurements (peak and average detector above 1GHz) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, and antenna tilting, where applicable.	

Photo 4.4.1.....:	Measurement of radiated emission above 1000 MHz

a. High angle front view of EUT and AE on set-up table



b. High angle rear oblique view of EUT

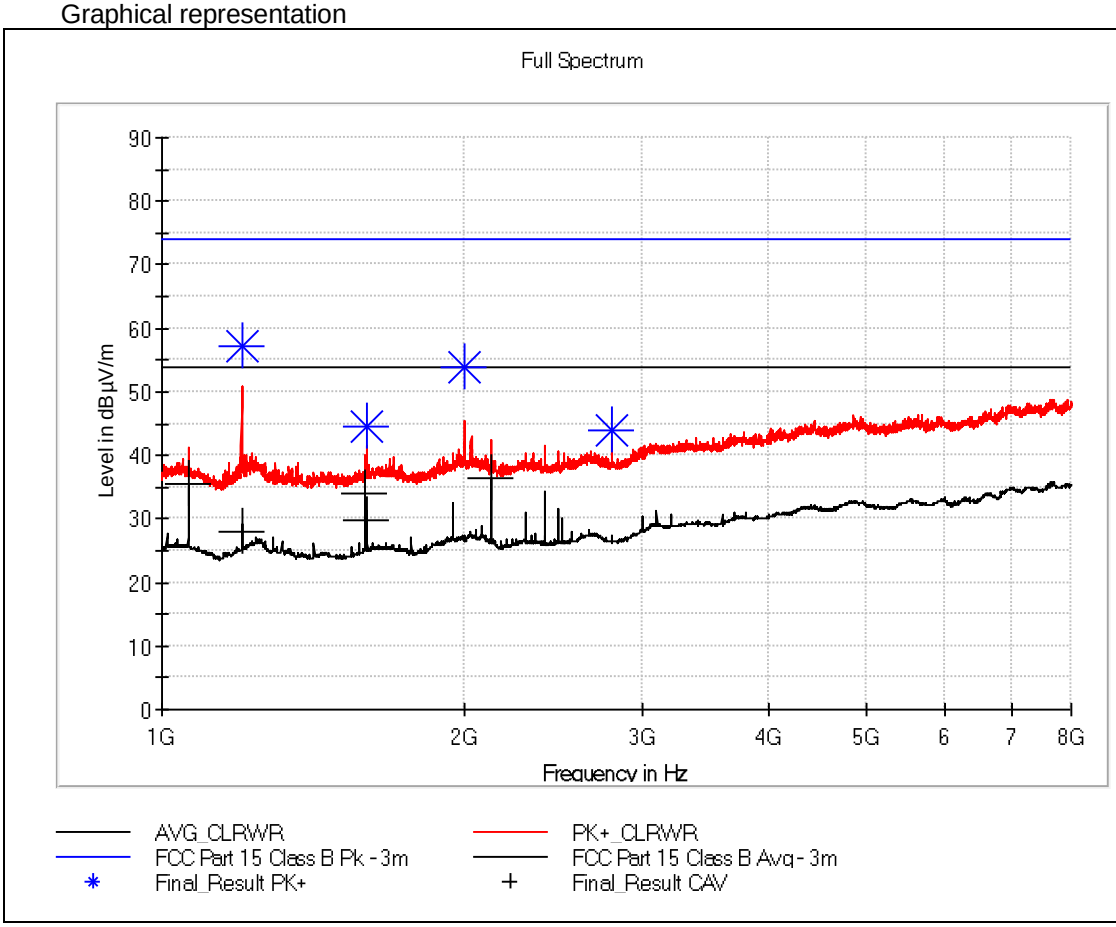


Test results for radiated emission above 1000 MHz	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	1

Tabulated Results summary

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1062.00	---	35.66	53.9	18.2	15000	1000	106.0	H	222	-1.8
1200.00	57.28	---	73.9	16.6	15000	1000	382.0	H	-12	-2.0
1200.00	---	28.12	53.9	25.8	15000	1000	190.0	V	332	-2.0
1593.00	---	33.99	53.9	19.9	15000	1000	100.0	V	187	0.2
1599.75	44.59	---	73.9	29.3	15000	1000	195.0	V	223	0.3
1600.00	---	29.88	53.9	24.0	15000	1000	182.0	V	228	0.3
2000.00	53.79	---	73.9	20.1	15000	1000	263.0	H	41	3.2
2124.00	---	36.32	53.9	17.6	15000	1000	304.0	V	127	3.3
2800.25	43.96	---	73.9	29.9	15000	1000	400.0	V	46	5.6

Graphical representation

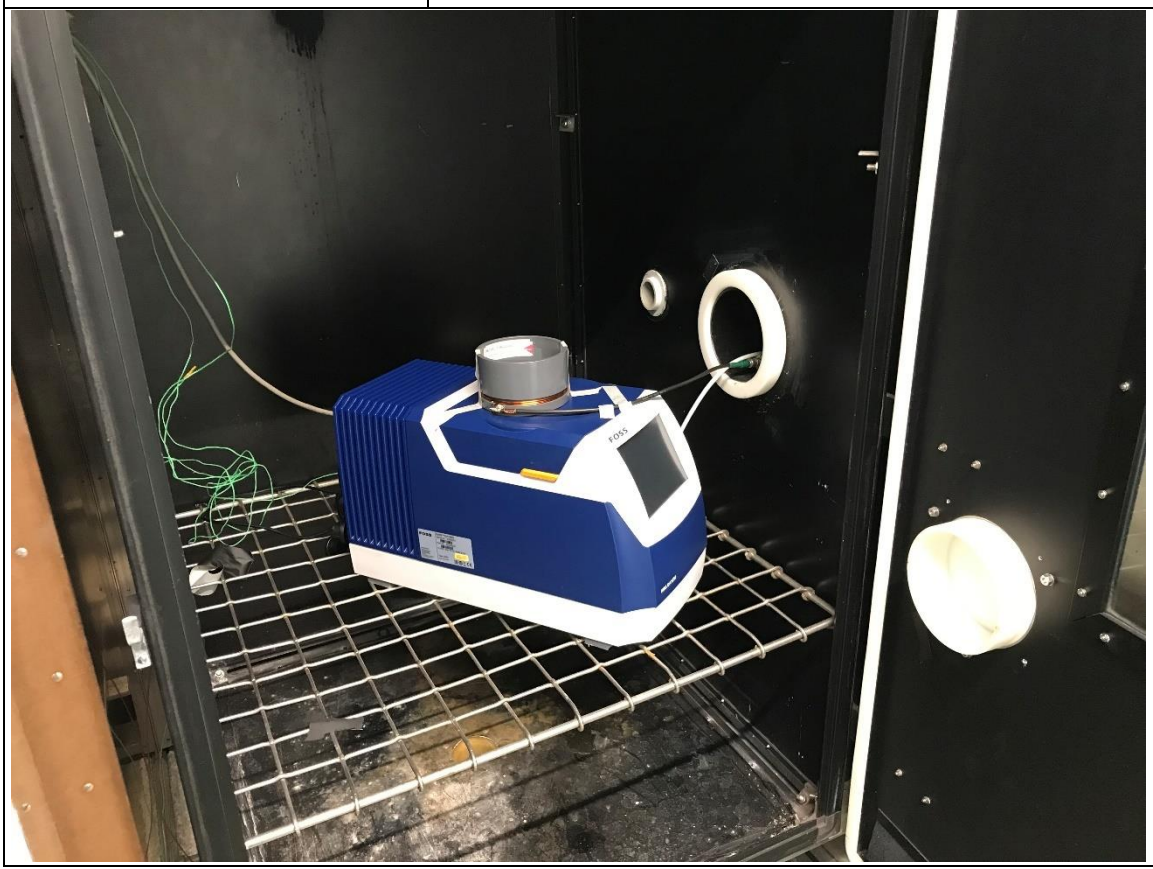


4.5 Measurement of frequency stability

Name ..... :	Peter Wolf Frandsen
Date ..... :	2022-05-19 to 2022-05-20
Rationale for verdict N/A ..... :	-

Test location (stand) ..... :	Hørsholm EMCRUM1 and climate chamber VKF 875-3	
Applied limit ..... :	☒	±0.01% of the operating frequency according to 47 CFR Part 15.225:
	☐	Other:
Test set-up description ..... :	☒	EUT place inside an environmental temperature chamber.
	☒	Relative Loop antenna measurement, distance < 10 cm.
	☐	Other:
Supplementary test set-up description ..... :	The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.	
Test method applied ..... :	☒	6.8.1 Frequency stability with respect to ambient
	☒	6.8.2 Frequency stability when varying supply voltage
	☐	Other:
Supplementary information ..... :	Ambient room temperature (+15 °C to +25 °C). EUT is switched OFF during temperature stabilization.	

Photo 4.5.1 ..... :	Measurement of frequency stability




Chamber
Humidity
DELTA EPO3 43089
"Chamber og Humidity reset" er inaktiv.
Ledningerne er kortsluttet på bagsiden.
DELTA VKF875-3

Test results for frequency stability	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	2

Tabulated Results summary

Operating frequency Measurement [MHz]	Frequency Drift [kHz]	Limit [kHz] Note 1	Temperature [°C]	Remarks
13.560500	-0.77	±1.356	-20	Passed, note 2
13.560500	-0.77	±1.356	-10	Passed, note 2
13.560495	-0.72	±1.356	0	Passed
13.560428	-0.05	±1.356	+10	Passed
13.560423	Reference Freq.	-	+20	Passed
13.560375	+0.48	±1.356	+30	Passed
13.560350	+0.73	±1.356	+40	Passed
13.560341	+0.82	±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: Internal EUT stability test failed, transmitter ON, temperature outside EUT temperature range.

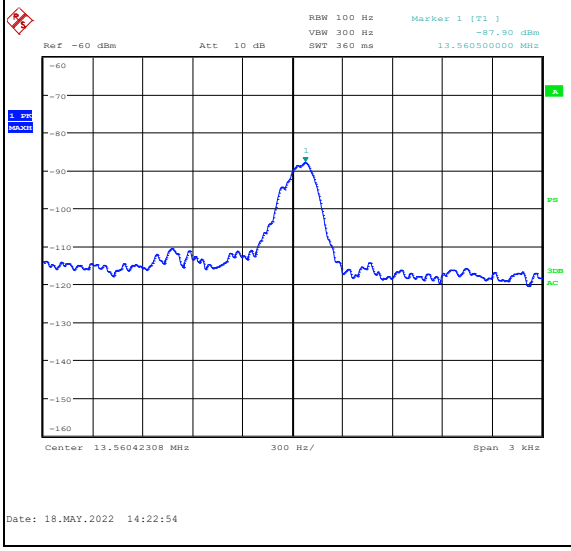
Operating frequency Measurement [MHz]	Frequency Drift [kHz]	Limit [kHz] Note 1	Supply voltage [VAC]	Remarks
13.560447	0	±1.356	102 V, 60 Hz	Passed
13,560447	Reference Freq.	-	120 V, 60 Hz	Passed
13.560452	-0.05	±1.356	138 V, 60 Hz	Passed

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

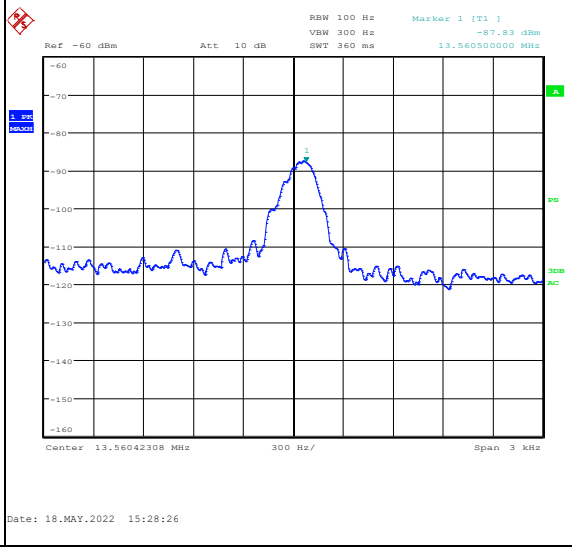
Graphical representation

Frequency stability with respect to ambient temperature

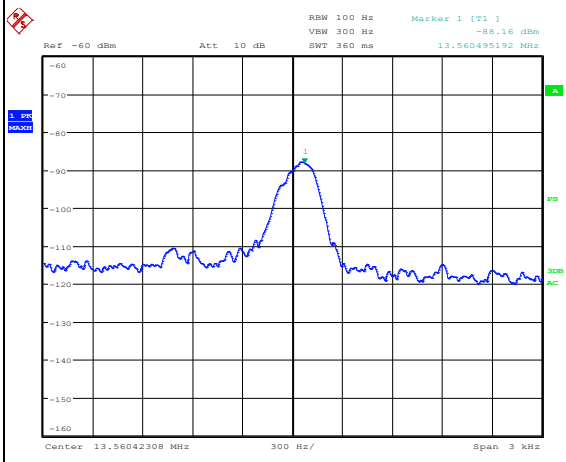
-20°C



-10°C

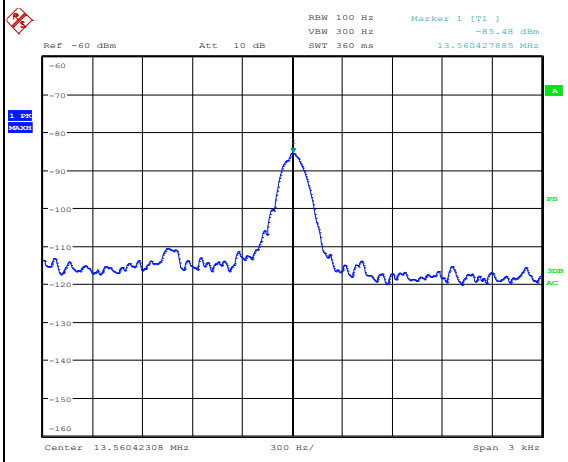


0°C



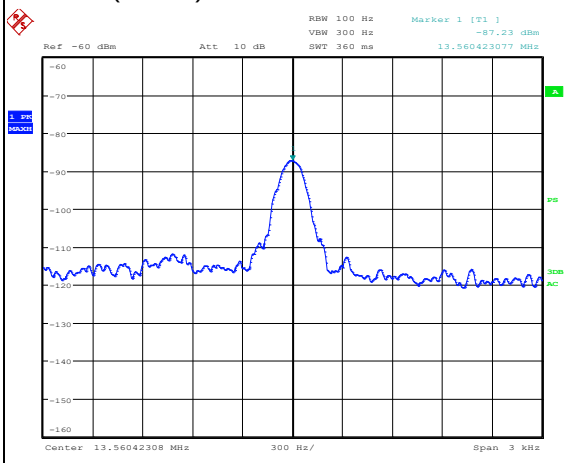
Date: 19.MAY.2022 08:43:03

+10°C



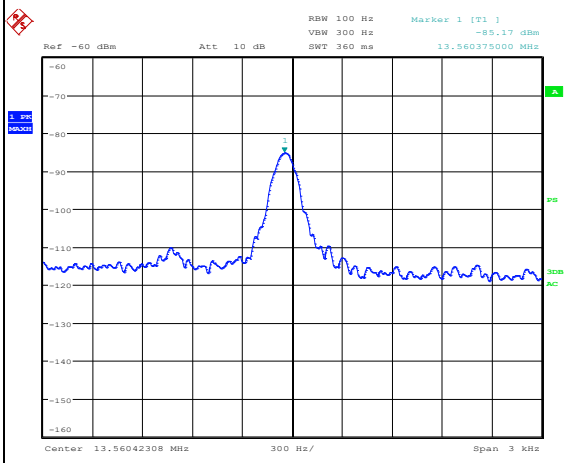
Date: 20.MAY.2022 10:02:46

Ambient (+20°C) 120 V 60 Hz



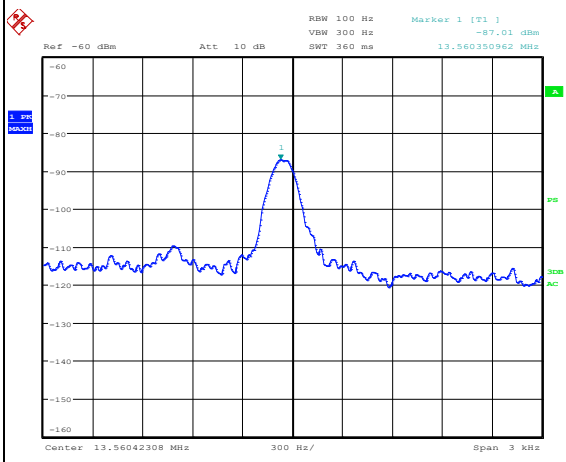
Date: 18.MAY.2022 10:26:02

+30°C



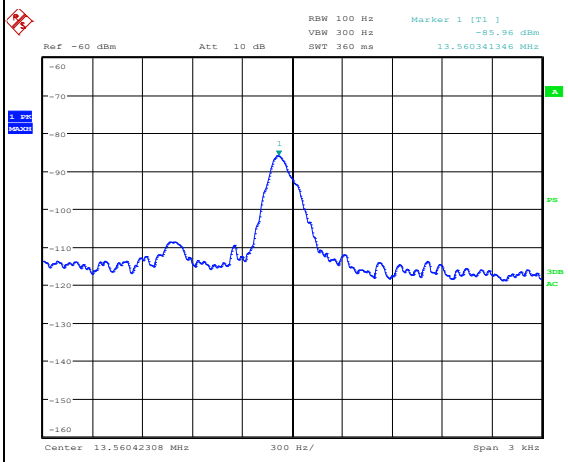
Date: 19.MAY.2022 14:24:49

+40°C

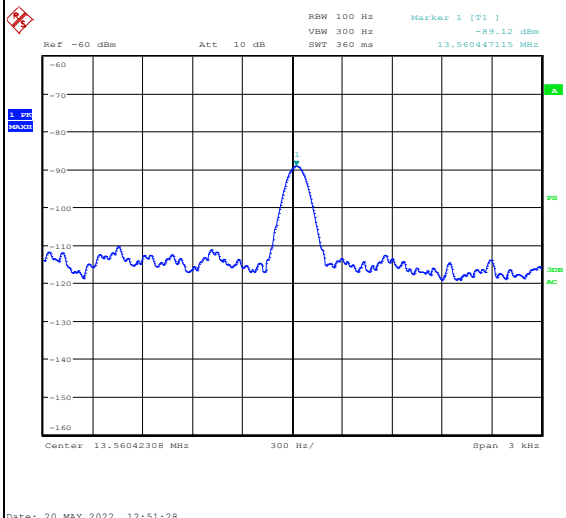
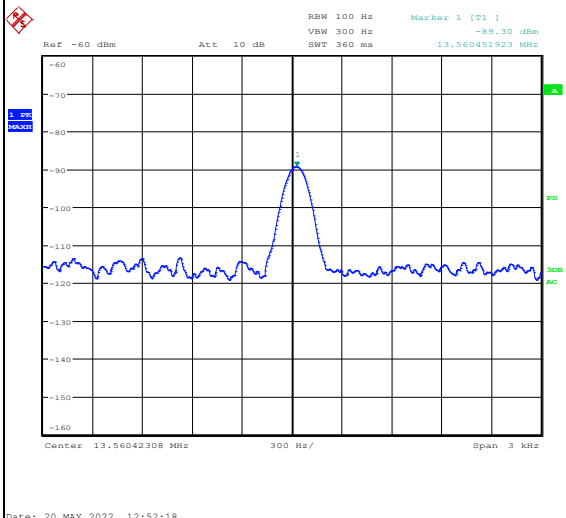


Date: 19.MAY.2022 13:31:59

+50°C



Date: 19.MAY.2022 12:27:25

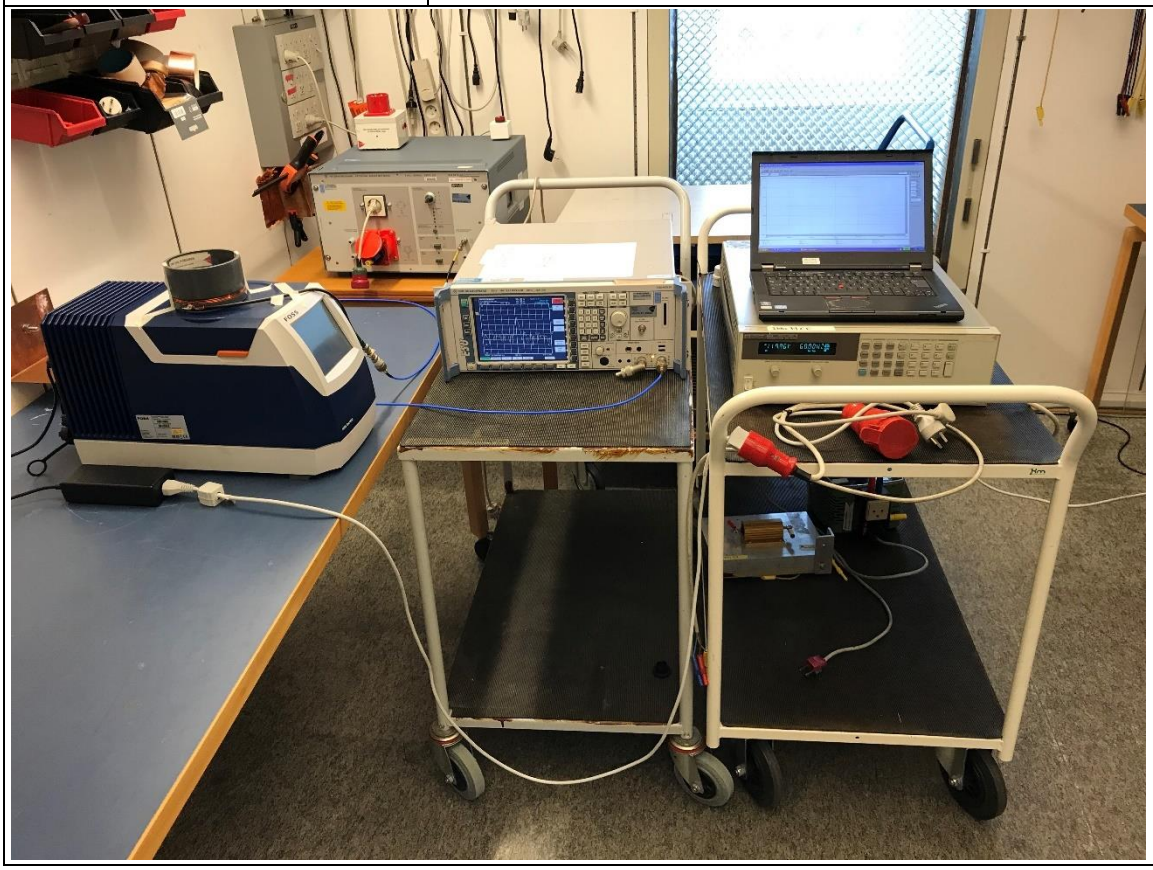
Frequency stability when varying supply voltage	
85%  	115% 

4.6 Measurement of occupied bandwidth

Name ..... :	Peter Wolf Frandsen
Date ..... :	2022-05-20
Rationale for verdict N/A ..... :	-

Test location (stand) ..... :	Hørsholm EMCRUM1	
Applied limit ..... :	☐	6 dB bandwidth
	☒	20 dB bandwidth according to 47 CFR Part 15.215(c)
	☐	26 dB bandwidth
	☐	Other:
Test set-up description ..... :	☒	Relative Loop antenna measurement, distance < 10 cm.
	☐	Other:
Supplementary test set-up description ..... :	A spectrum analyzer was used for the measurements, the video bandwidth was set to a value at least three times greater than the IF bandwidth of the measuring instrument to avoid the introduction of unwanted amplitude smoothing. Video filtering is not used during occupied bandwidth tests.	
Test method applied ..... :	☒	6.9.2 Occupied bandwidth—relative measurement procedure
	☐	6.9.3 Occupied bandwidth—power bandwidth (99%) measurement procedure
	☐	Other:
Supplementary information ..... :	-	

Photo 4.6.1 ..... :	Measurement of occupied bandwidth

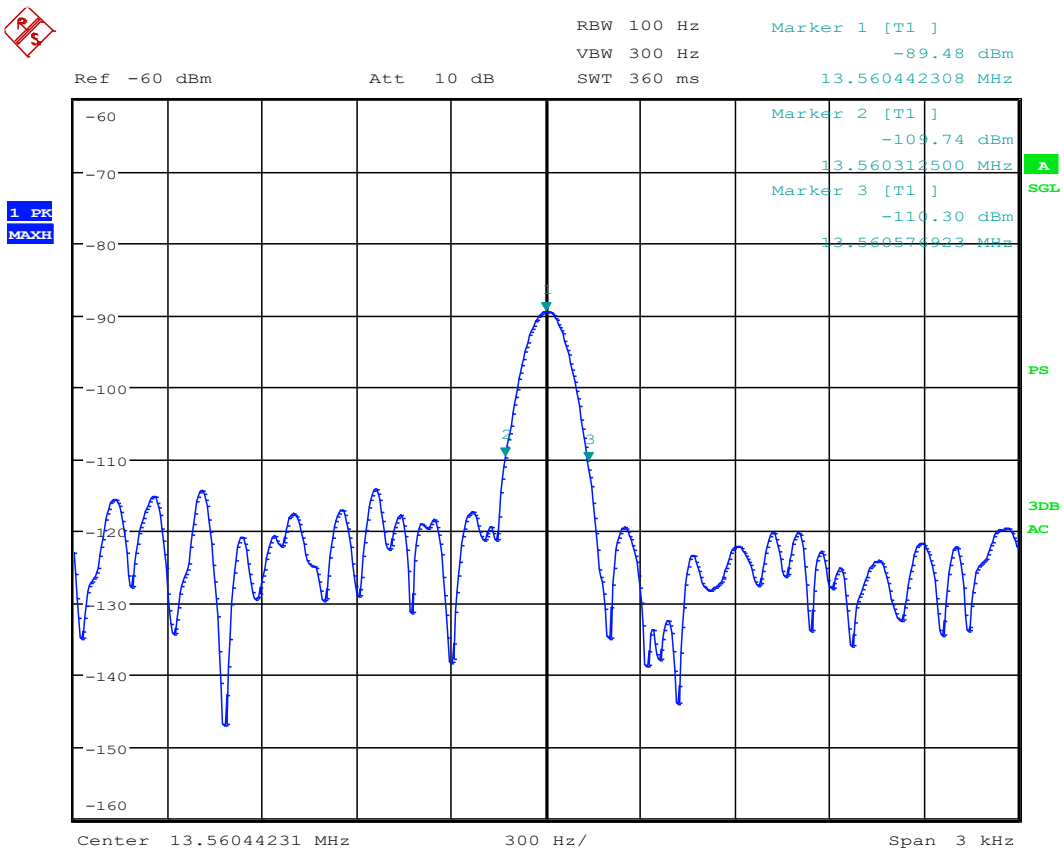


Test results for occupied bandwidth	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	2

Tabulated Results summary

Operating frequency [MHz]	Low frequency [MHz]	High frequency [MHz]	20 dB bandwidth (20 dBc) [kHz]	Remarks
13.560442	13.560313	13.560577	0.264	Passed
Note 1:				

Graphical representation


RBW 100 Hz
VBW 300 Hz
SWT 360 ms
Marker 1 [T1]
-89.48 dBm
13.560442308 MHz
Marker 2 [T1]
-109.74 dBm
13.560312500 MHz
Marker 3 [T1]
-110.30 dBm
13.560576923 MHz
Ref -60 dBm
Att 10 dB
1 PK
MAXH
A
SGL
PS
3DB
AC
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
Center 13.56044231 MHz
300 Hz/
Span 3 kHz
Date: 20.MAY.2022 13:01:23

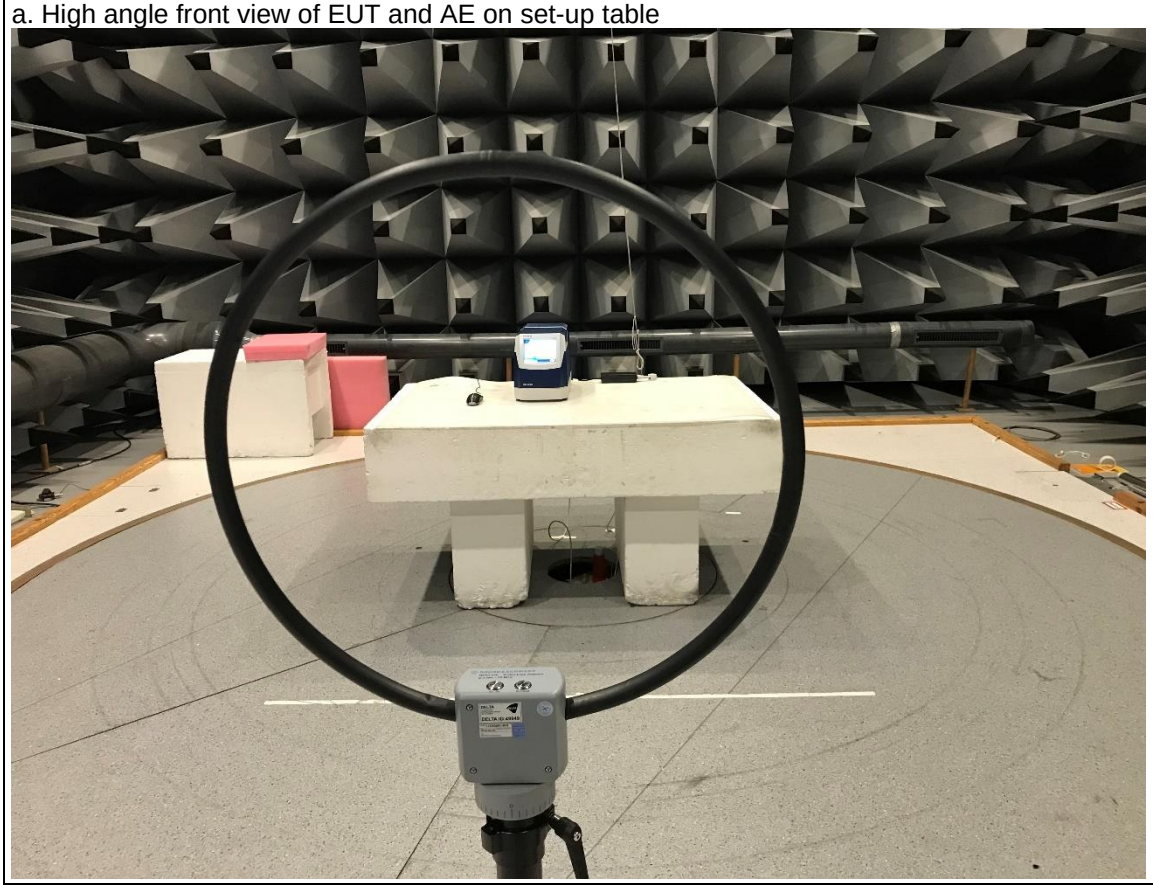
4.7 Measurement of band edge

Name ..... :	Peter Wolf Frandsen
Date ..... :	2022-05-10
Rationale for verdict N/A ..... :	-

Test location (stand) ..... :	Hørsholm EMIRUM	
Applied limit ..... :	☒	Band edges according to 47 CFR Part 15.209 & 15.225:
	☐	Other:
Test set-up description ..... :	☒	Equipment on a table 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other:
Supplementary test set-up description ..... :	-	
Test method applied ..... :	☒	6.10.5 Restricted-band band-edge measurements
	☐	6.10.6 Marker-delta method
	☐	Other:
Supplementary information ..... :	-	

Photo 4.7.1 ..... :	Measurement of band edge

a. High angle front view of EUT and AE on set-up table



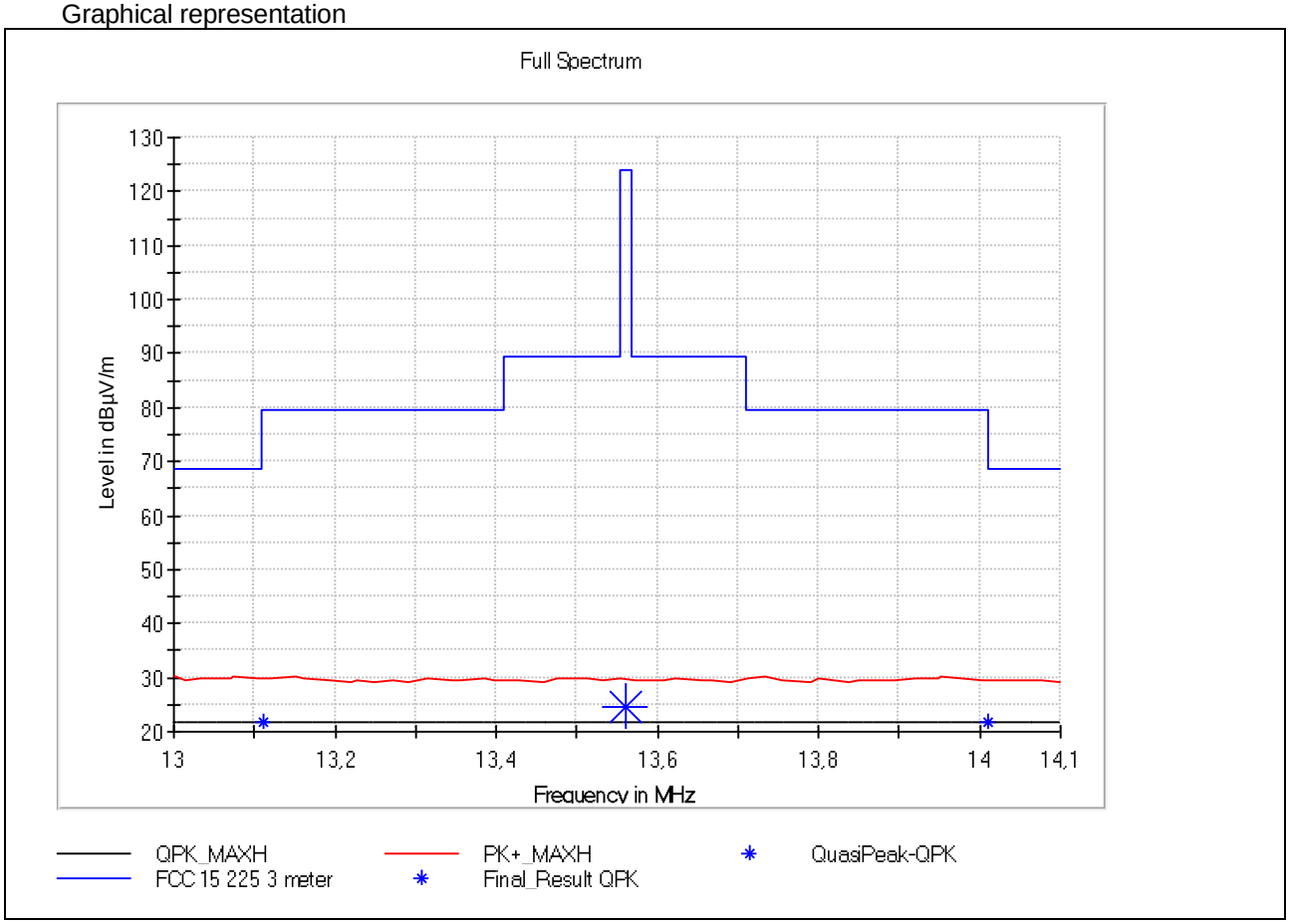
b. High angle rear oblique view of EUT

Test results for band edge	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	1

Tabulated Results summary

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	21.73	79.6	57.9	15000	9	100.0	Z	135	20.8
13.56	28.74	124.0	95.3	15000	9	100.0	Z	303	20.8
14.01	21.66	68.6	46.9	15000	9	100.0	Z	45	20.8

Graphical representation



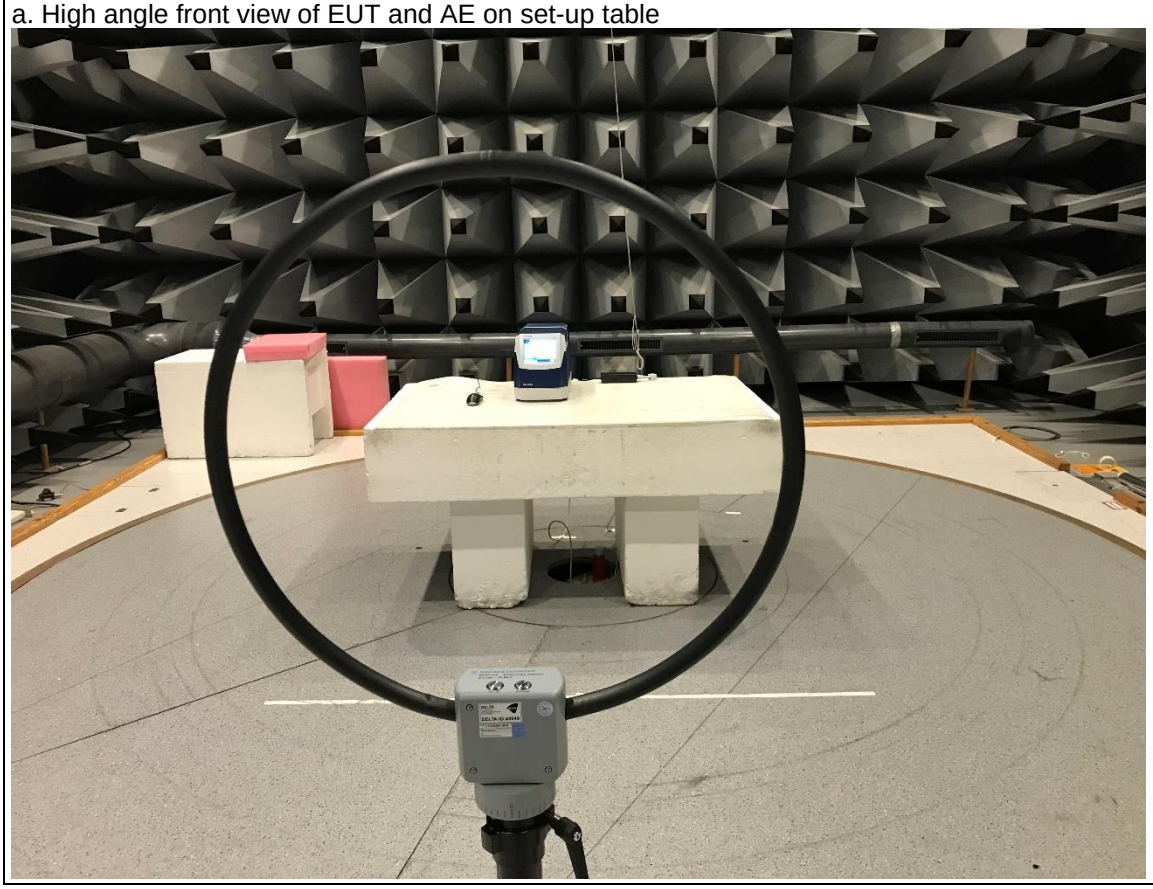
4.8 Measurement of field strength of fundamental

Name..... :	Peter Wolf Frandsen
Date..... :	2022-05-10
Rationale for verdict N/A ..... :	-

Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit..... :	☒	Limit of field strength of fundamental according to 47 CFR Part 15.225
	☐	Other:
Test set-up description..... :	☒	Equipment on a table 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other:
Supplementary test set-up description..... :	-	
Test method applied..... :	☒	Active loop antennas, as specified in ANSI C63.2 and/or CISPR 16-1-4:2010.
	☒	SAC with measurement distance [m]: 3
	☐	Other:
Supplementary information ..... :	-	

Photo 4.8.1 .....:	Measurement of field strength of fundamental

a. High angle front view of EUT and AE on set-up table



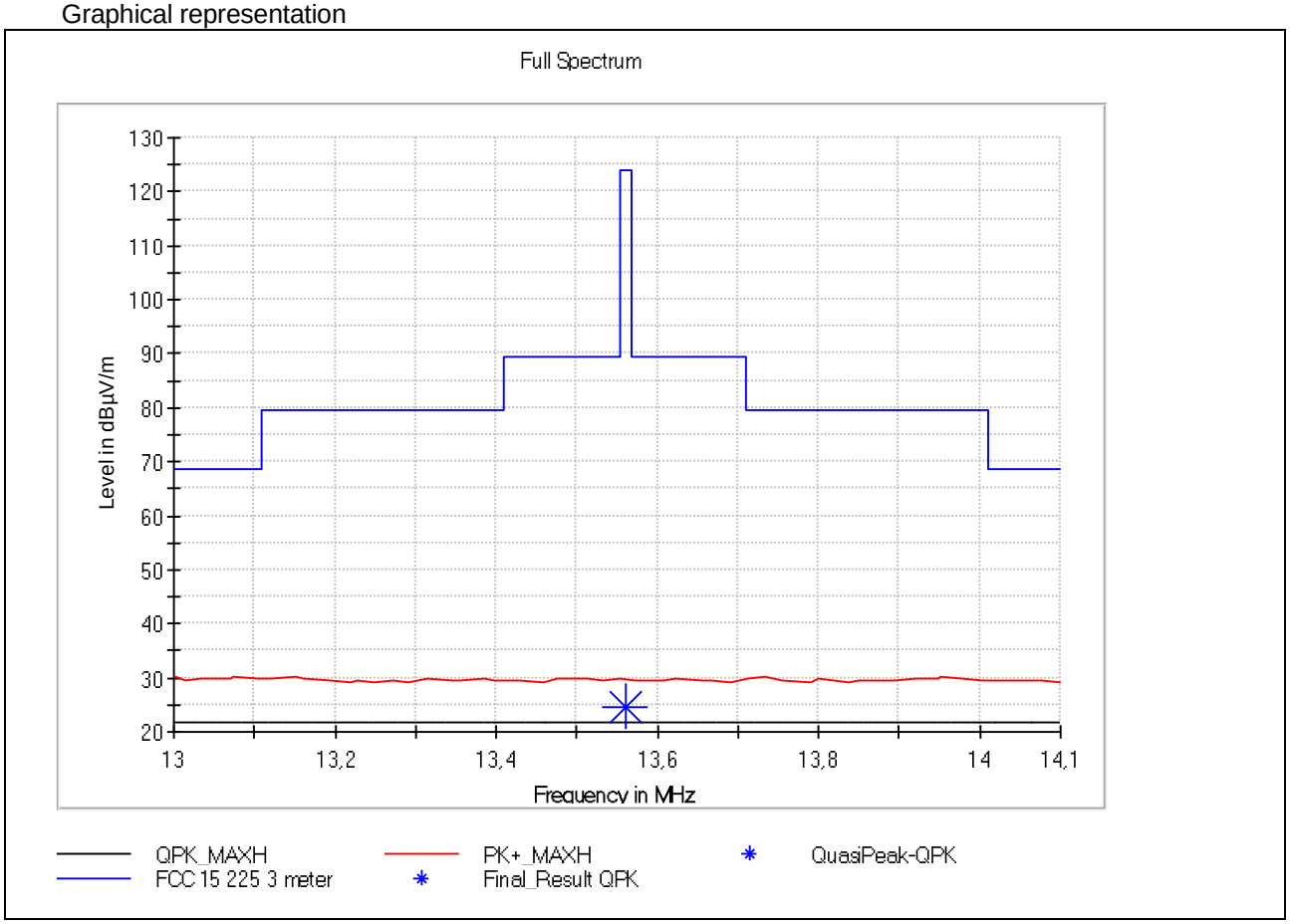
b. High angle rear oblique view of EUT

Test results for field strength of fundamental	
Test item no(s) ref. cl. 1.2 ..... :	1
Operating mode no(s) ref. cl. 1.6 :	1
Test set-up no(s) ref. cl. 3.3 ..... :	1

Tabulated Results summary

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.56	24.59	124.0	99.4	15000	9	100.0	V	303	20.8

Graphical representation



5 Measurement instrumentation uncertainties and decision rule

5.1 Measurement uncertainty

Where relevant, the following measurement instrumentation uncertainty levels have been estimated for tests performed on the apparatus:

Test method	Calculated expanded uncertainty U_{Lab}		$U_{CISPR/ETSI}$
	Aarhus	**Hørsholm**	
AC power-line conducted emission (6.2)	2.68	2.68	3.4
Radiated emission below 30 MHz (6.4)	4.64	2.65	3.3
Radiated emission 30 - 1000 MHz (6.5)	5.72 / 5.56	6.15 / 4.9	6.3
Radiated emission above 1000 MHz (6.6)	4.2	4.9	5.2
Antenna port conducted signals (6.7)	1.7	1.7	±1.5
Frequency stability (6.8)	0.3 Hz	0.3 Hz	±1 ppm
Occupied bandwidth, 20 dB (6.9)	1.7	1.7	±1.5
Band edge (6.10)	1.7	1.7	±1.5
Field strength of fundamental	4.64	2.65	6.3
Environment measurements			
Temperature	1°C	< 1°C	1°C

5.2 Decision rule

1) General

When reporting statement compliance (e.g. Pass / Fail) the following general decision rules are applied where relevant.

International guidelines for Decision rules are amongst other given in

· The BIMP JCGM 106 "Evaluation of measurement data – The role of measurement uncertainty in conformity assessment" section 8 and

· The attached ILAC G8 "Guidelines on Decision Rules and Statements of Conformity" section 4

· IEC Guide 115 "Application of measurement uncertainty to conformity assessment activities in the electrotechnical sector in the IECEE CB Scheme"

1.1) Other Decision rules

Other decision rules may be applied according to

· Customers own decision rules

· Applicable Directives, e.g. essential requirement of MDD

· Requirement of an authority

· Applicable Legislation

Such decision rules shall be agreed upon with the client in the quotation documents.

2) Decision Rule

A decision rule describes how measurement uncertainty is accounted for when stating conformity with a specified requirement.

Note: Decision rule may be referred to as criterion for compliance

ISO 17025 cl. 3.7

2.1) General Testing

The general approach for application of decision rules is given in the ILAC Guide 8.

The laboratories aim at applying standards, which include "guard banded" test limits. I.e. the applied test limit(s) inherent in the applicable test requirement includes concerns on measurement uncertainty in relation to the decision of compliance.

Specific decision rules may be given in the individual test procedures or standards.

Clients' acceptance of decision rules is agreed upon in per terms of delivery in the quotation documents.

Rationale for applicable decision rules for specific areas are given below.

2.2) Rules / Criteria for compliance - EMC Testing - Emission

The test standards for electromagnetic emission testing state use of "shared risk" for the decision of compliance. Given test limits take Measuring Uncertainty (MU) into account.

The laboratory reports as follows:

The test standards state, that the given requirement for compliance, i.e., test limits, include consideration of MU, in case the MU is within the allowed MU given in U_{CISPR}

1) If the MU is within the max U_{CISPR} any decision of compliance (P/F) shall not include the MU

2) If the MU exceed the max U_{CISPR} any decision of compliance (P/F) shall include the added MU.

Reporting

The measured value and its MU are reported. Compliance with requirement is reported based on the measured values.

6 List of test equipment

AC power-line conducted emission (6.2):

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp.
49429	CABLE 2m N-Nangle	Generic	RG214U	28-01-2022	28-01-2023
29680	IMPULSE VOLTAGE LIMITER (N)	ROHDE & SCHWARZ	ESH3/Z2	12-01-2022	12-01-2023
29978	CABLE#34, RG 223, 40 m, COND. EMISSION, ROOM 5	SUHNER	RG 223/U	28-01-2022	28-01-2023
49043	COAXIAL SWITCH ROOM 5 (EMI)	RLC ELECTRONICS	SM-3-N	28-01-2022	28-01-2023
49457	CABLE 3m BNC-BNC	SUHNER	RG 223/U	28-01-2022	28-01-2023
49568	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2/Z5	11-01-2022	11-01-2023
49900	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESW26	13-01-2022	13-01-2023
49999	EMC32-Software EMIroom	ROHDE & SCHWARZ	Ver. 10.40.10	N/A	N/A

Radiated emission below 30 MHz (6.4), Band edge (6.10), Field strength of fundamental:

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp.
29953	ANTENNA TOWER/TURNTABLE CONTROLLER	EMCO	2090	N/A	N/A
49590	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2022	02-02-2023
49704	CABLE 3 m SMA-N	SUHNER	SUCOFLEX104	02-02-2022	02-02-2023
49817	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2022	02-02-2023
49900	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESW26	13-01-2022	13-01-2023
49949	Active loop antenna	ROHDE & SCHWARZ	4110.2002.02	12-05-2021	12-05-2022
49999	EMC32-Software EMIroom	ROHDE & SCHWARZ	Ver. 10.40.10	N/A	N/A

Radiated emission 30 - 1000 MHz (6.5):

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp.
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	16-08-2021	16-08-2023
29953	ANTENNA TOWER/TURNTABLE CONTROLLER	EMCO	2090	N/A	N/A
49590	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2022	02-02-2023
49674	MATURO CONTROLLER	MATURO	NCD	N/A	N/A
49704	CABLE 3 m SMA-N	SUHNER	SUCOFLEX104	02-02-2022	02-02-2023
49817	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2022	02-02-2023
49900	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESW26	13-01-2022	13-01-2023
49999	EMC32-Software EMIroom	ROHDE & SCHWARZ	Ver. 10.40.10	N/A	N/A

Radiated emission above 1000 MHz (6.6):

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp.
29953	ANTENNA TOWER/TURNTABLE CONTROLLER	EMCO	2090	N/A	N/A
49590	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2022	02-02-2023
49674	MATURO CONTROLLER	MATURO	NCD	N/A	N/A
49704	CABLE 3 m SMA-N	SUHNER	SUCOFLEX104	02-02-2022	02-02-2023

49730	1-18 GHz. HORN ANTENNA.	ROHDE & SCHWARZ	4070.7000.02	01-09-2021	01-09-2023
49741	Amplifier 0.8-18 GHz	Miteq	AFS4-00501800-40-20P-6	02-02-2022	02-02-2023
49817	CABLE, LOW-LOSS uWAVE CABLE, N-N, 8.0 m "EMI"	SUHNER	SUCOFLEX 104 PB	02-02-2022	02-02-2023
49900	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESW26	13-01-2022	13-01-2023
49999	EMC32-Software EMIroom	ROHDE & SCHWARZ	Ver. 10.40.10	N/A	N/A

Frequency stability (6.8), Occupied bandwidth, 20 dB (6.9):

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp.
29141	RADIATING LOOP	EC	MIL-STD 462	N/A	N/A
49555	Måleinstrument	ROHDE & SCHWARZ	ESU26	01-02-2022	01-02-2023
49644	SF104PE/11SMA451/11SMA-451/2500mm	HUBNER & SUHNER	N/A	10-06-2021	10-06-2022

End of report