

TEST REPORT
CFR 47, FCC Part 15, Subpart C and ISED
Intentional Radiators

Report Number: 123-32107-15 Rev. A

Date of issue: 2025-02-21

Total number of pages.....: 66

Name of Testing Laboratory
preparing the Report.....: FORCE Technology
Venlighedsvej 4
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DENMARK



Applicant's name: LIZN ApS
Address: Sindalsvej 34
8240 Risskov
DENMARK

Test specification: ANSI C63.10:2013
TRF template used: IECCE OD-2020-F7:2020; ed. 2
Standards: 47 CFR Part 15, Subpart C (Specific rule part §15.247)
ISED RSS-247, Issue 3, 2023
RSS-Gen:2018
Test procedure: DANAK

Test Report Form No.: According to OD -2020, Clause 3.3
Test Report Form(s) Originator: FORCE Technology
Master TRF.....: Dated 2022-06-02 (according to 3.3.4)

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Test item description	Over the counter hearing solution	
Trademark or brand name.....	LIZN	
Manufacturer.....	LIZN ApS	
Model/Type reference(s)	HP2L RED, HP2R RED, HP2L SAND, HP2R SAND, HP2L GRAY, HP2R GRAY	
FCC Id.....	FCC ID 2A8VD-HP2	
IC Id.....	IC: 33294-HP2	
Ratings	3.7 VDC, internally powered by re-chargeable battery	
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 (PWF), Specialist	
Approved by (name, function, signature) ...:	Karsten Kruse Jensen (KKJE), Senior Team Leader	

List of Attachments (including a total number of pages in each attachment): N/A
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Summary of testing	
Tests performed (name of test and clause from ANSI C63.10:2013): Radiated emission 30 - 1000 MHz (6.5) Radiated emission above 1000 MHz (6.6) Field strength of fundamental (6.6) BT Classic: (Basic Rate) Carrier frequency separation (7.8.2) Number of hopping frequencies (7.8.3) Time of occupancy (dwell time) (7.8.4) Output power test procedure for FHSS (7.8.5) Band-edge measurements for RF conducted emissions (7.8.6) Occupied bandwidth (7.8.7) Conducted spurious emissions test methodology (7.8.8) DTS: DTS bandwidth plus BW99% for Canada (11.8) Maximum peak conducted output power (11.9.1) Maximum power spectral density level in the fundamental emission (11.10) Emissions in nonrestricted frequency bands (11.11) Emissions in restricted frequency bands (11.12) Band-edge measurements (11.13)	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 §15.247) • ISED RSS-247, Issue 3, 2023 • RSS-Gen:2018 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**

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	2024-10-28
Date (s) of performance of tests	2024-10-28 to 2025-02-20
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 LIZN ApS over the counter (OTC) hearing solution, considered a medical device, consists of three elements. LIZN Hearpieces are an in-ear hearing aid, audio device and headset with Bluetooth for audio streaming only. The Hearpieces follow the Bluetooth 5.2 Standard and have only implemented the following ○ Bluetooth Protocol: • Bluetooth Classic – basic rate • Bluetooth Low energy (BLE) - 1 and 2 Mbit data rate. Hearpieces variants: • The specific product, HP2, exists in 6 variants • HP2L RED, HP2R RED, HP2L SAND, HP2R SAND, HP2L GRAY, HP2R GRAY • 2 different ear variants of ○ left (L) ○ Right (R) • 3 different color variants of ○ Sand ○ Gray ○ Red There are no electrical or mechanical differences aside from mirroring of the PCB's and plastics (left/right), the plastic pellets used in molding and the color of paint (color) with no electrically conductive properties. This report is a technical revision of report 123-32107-15, issued 2024-12-19. The following modifications have been made: Page 5 Date (s) of performance of tests updated Updated test results and photo: 4.7 Output power test procedure for FHSS (7.8.5) 4.12 Maximum peak conducted output power (11.9.1) 4.13 Maximum power spectral density level in the fundamental emission (11.10) New Calibration dates added 6 List of test equipment - Conducted antenna port measurements	

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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



Photo 1.1.2: Test item 2 PCB with BLE antenna replaced with SMA connector



1.2 Test item(s)

No.	Test item name	Unique identification / type / description	Extent of test
1	Left hearpiece, internally powered.	HP2L (#3, #5, #7)	Selected tests applied
2	Right hearpiece, internally powered.	HP2R (#1, #2, #4, #6)	Selected tests applied
3	Left hearpiece, internally powered.	HP2L, Special version with Antenna replaced with SMA connector	Selected tests applied
4	Right hearpiece, internally powered.	HP2R, Special version with Antenna replaced with SMA connector	Selected tests applied
Supplementary information: -			

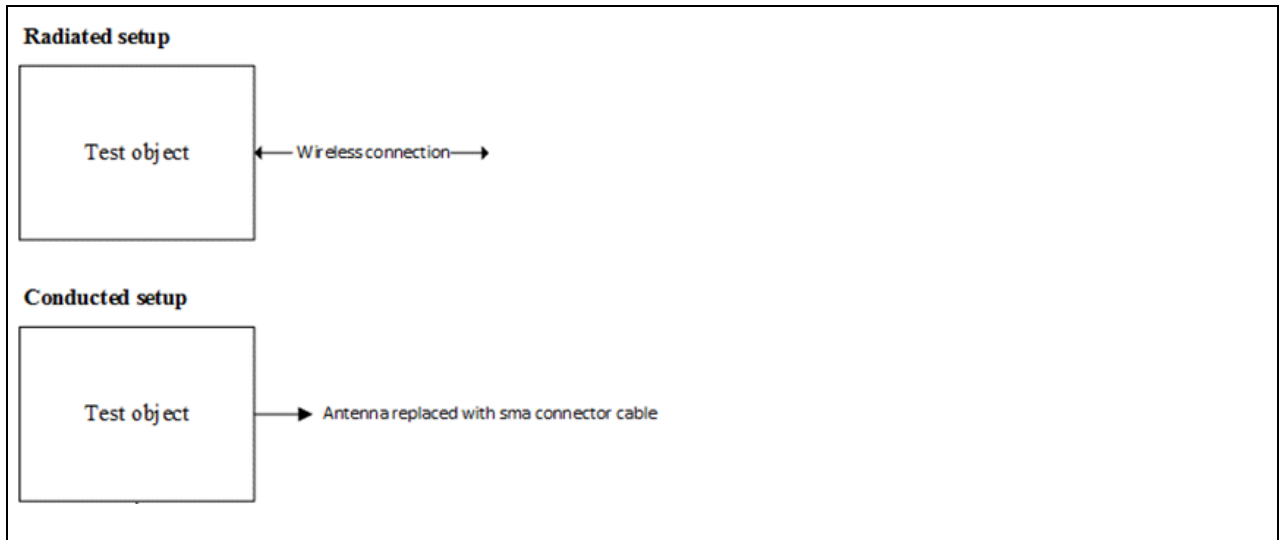
1.3 Port(s)

No.	Port Name	Type	Cable		
			Specified length in m	Attached during test	Shielded
1	Enclosure	-	-	☒	-
2	Antenna	-	-	☒ Note 1	-
3	Antenna SMA port	-	-	☒ Note 2	☒
4	Signal port	Charger, Programming	-	☒	-
Supplementary information: Note 1: Radiated test only Note 2: Conducted test only					

1.4 Power rating(s)

Power supply type..... :	☐	AC, 1 phase
	☐	AC, 2 phases
	☐	AC, 3 phases
	☐	Neutral
	☐	Protective Earth
	☐	DC
	☐	Battery, not rechargeable in the device
	☒	Battery, rechargeable in the device
Rated voltage	-	
Rated frequency	-	
Rated power	-	

1.5 Configuration and Connections with Test item



1.6 Additional parameters

Radio type	Bluetooth normal mode (Bluetooth Classic – Basic Rate) (FHSS) Bluetooth low energy (1 MHz and 2 MHz datarate) (DTS)	
Antenna	Internal	
Clock frequencies.....	2.4 GHz	
Software version	BT19189	
Hardware version	24A	
Dimensions (W x H x D)...	25 x 15 x 15 mm	
Mounting position	☐	Tabletop equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☒	Other: Body worn, tested as tabletop.

1.7 Operating mode(s)

No.	Abbreviation	Detailed description of the operating mode	Used for testing	
			Radiated and Conducted Emission	Radio Parameter
1	Tx1	For optimized radiated RF transmitter (Tx) emission testing BT Classic - Basic Rate - only one mode – optimized, see Note 1	☒	☐
2	Tx2-7	RF transmitter (Tx) emission testing, programmable, Note 1	☒	☐
3	Tx8-10	For optimized conducted RF transmitter (Tx) emission testing Antenna replaced with coaxial cable with SMA programmable, Note 1	☐	☒
4	Hopping	For the Bluetooth Classic hopping tests (At 79 channels) Antenna replaced with coaxial cable with SMA. Note 2	☐	☒

Supplementary information: All test modes were programmed with special SRD kit.

Note 1:

1. Test objects

BLE mode: (Six pieces programmable for radiated measurements and 3 pieces for RF conducted measurements)

a. Transmitters (Tx) frequencies

i. Program frequencies at data rate at 1 Mbit/s

1. flow,
2. fmiddle
3. fhigh

ii. Program frequencies at data rate at 2 Mbit/s

1. flow
2. fmiddle
3. fhigh

b. Continuous within 5 ms for at least 3 hours

c. Maximum power settings

d. Special software may be used to operate the equipment in these modes.

BT Classic - Basic Rate mode: (One piece for radiated measurements and one piece for RF conducted measurements)

e. Hopping between Transmitters (Tx) frequencies

i. flow, fmiddle and fhigh

1. modulation set to GFSK
2. data rate at 1 Mbit/s

f. Continuous within 25 ms for at least 3 hours

g. Maximum power settings

h. Special software may be used to operate the equipment in these modes.

i. Repeat above (b)

Note 2:

1. Hopping (One piece)

Hopping between all channels continuously

1.8 Auxiliary equipment

No.	AE Item Name	Type and description	Manufacturer (If not the same)
1	PC	Only used during programming of the test item	Lenovo
2	Programme kit	Only used during programming of the test item	-
Supplementary information: -			

1.9 Modifications to the test item during testing

☒	No modifications done during testing
☐	Modifications done during testing (see details below)
Supplementary information: -	

2 Verdict summary section

USA: 47 CFR Part 15, Subpart C (Specific rule part §15.247) Canada: ISSED RSS-247, Issue 3, 2023				
Test methods Clause	Requirement – Test case	FCC rule parts ISED Standards	Test methods	Results
6.2	Measurement of radio frequency voltage on mains / Conducted limits	47 CFR Part 15 C Subpart 15.207 RSS-Gen:2018	ANSI C63.10:2013	N/A Note 1
6.5 & 6.6	Measurement of radiated emission / field strength of harmonics	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
6.9	Measurement of occupied bandwidth	47 CFR Part 15.215(c)	ANSI C63.10:2013	P
6.10	Measurement of band edge	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
6.6	Measurement of field strength of fundamental	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.2	Carrier frequency separation	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.3	Number of hopping frequencies	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.4	Time of occupancy (dwell time)	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.5	Output power test procedure for FHSS	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.6	Band-edge measurements for RF conducted emissions	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.7	Occupied bandwidth	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
7.8.8	Conducted spurious emissions test methodology	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
11.8	DTS bandwidth plus BW99% for Canada	RSS-247:2023	ANSI C63.10:2013	P
11.9.1	Maximum peak conducted output power	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
11.10	Maximum power spectral density level in the fundamental emission	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
11.11	Emissions in nonrestricted frequency bands	47 CFR Part 15.209 47 CFR Part 15.247	ANSI C63.10:2013	P

		RSS-247:2023		
11.12	Emissions in restricted frequency bands	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
11.13	Band-edge measurements	47 CFR Part 15.209 47 CFR Part 15.247 RSS-247:2023	ANSI C63.10:2013	P
Supplementary information: Note 1 - No mains supply				

3 Test conditions

3.1 General

Environmental reference conditions.....:	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:		
	Temperature	Humidity (RH)	Atmospheric pressure
	15 °C – 35 °C	30 % - 60 %	800 hPa – 1060 hPa
	If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.		
Measurement uncertainties	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.		

3.2 Operational requirements during testing

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

- 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.
- The unlicensed wireless device shall be tested operating at the highest transmit power allowed for each antenna configuration.
- 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.
- 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.
- For frequency hopping systems, the hopping sequence shall be stopped for certain test suites to allow for measurements on a single channel.
- 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.
- The software shall allow configuration and operation on all available unlicensed wireless device channels.
- The software shall allow configuration and operation in the unmodulated carrier model, where applicable.

3.3 Test setups

Figure 3.3.1	Test setup 1: Radiated test
--------------------	-----------------------------

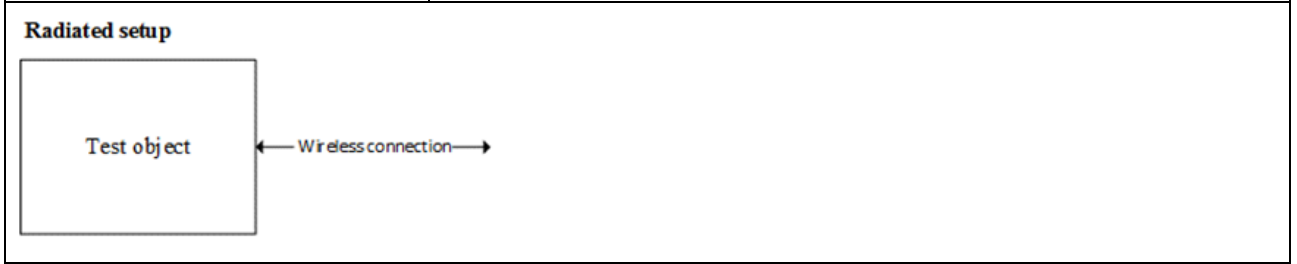
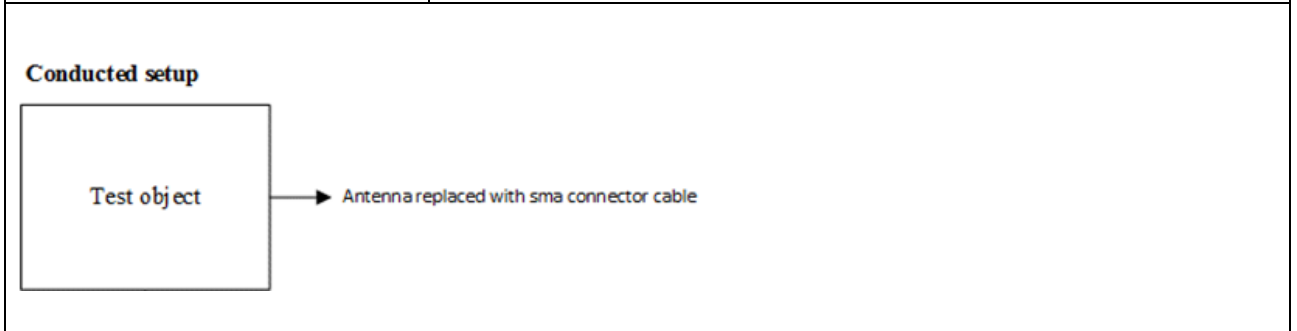


Figure 3.3.2	Test setup 2: Conducted with SMA connector
--------------------	--



4 Emission**4.1 Measurement of AC power-line conducted emission (N/A)**

Name..... :	-
Date..... :	-
Rationale for verdict N/A	No AC mains power port

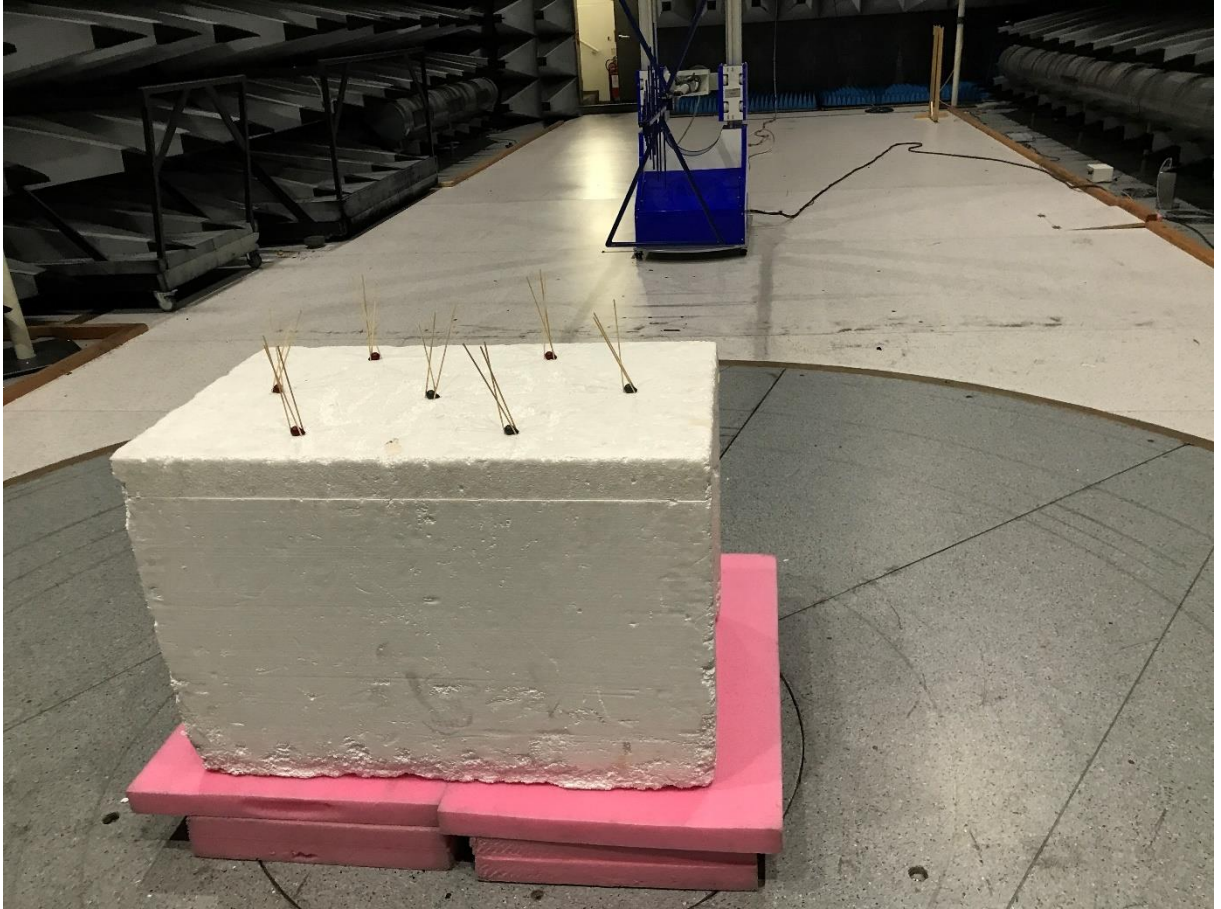
4.2 Measurement of radiated emission 30 - 1000 MHz (6.5 & 11.11)

Name..... :	Peter Wolf Frandsen (PWF)	
Date..... :	2024-10-31	
Rationale for verdict N/A..... :	-	

Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit class..... :	☒	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.247
	☐	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.249
	☐	Other:
Test setup description..... :	☒	Equipment on a table 80 cm height
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other (e.g., height of pallet):
Supplementary test setup description..... :	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.	
Test method applied..... :	☒	SAC with measurement distance [m]: 3
	☐	FAR with measurement distance [m]:
Supplementary information..... :	BT Classic, BLE 1 MHz and BLE 2 MHz bundle test	

Photo 4.2.1: Measurement of Radiated emission 30 - 1000 MHz

a. High angle front view of EUT and AE on setup 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, 2
Operating mode no(s) ref. cl. 1.7 :	1 (BT Classic - Basic Rate hopping 20 ms), 2 BLE modes
Test setup 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)
30.12	22.94	40.00	17.06	15000	120	258.0	H	206.0	27.5
96.00	13.17	43.50	30.33	15000	120	100.0	V	142.0	18.4
213.27	11.80	43.50	31.70	15000	120	320.0	V	39.0	19.4
445.50	27.18	46.00	18.82	15000	120	228.0	H	-32.0	27.5
693.00	29.03	46.00	16.97	15000	120	344.0	V	-1.0	32.7
904.89	29.51	46.00	16.49	15000	120	158.0	H	276.0	36.1

The result is calculated by adjusting the receiver reading with the correction factor.

Correction factor (dB) = Antenna factor (dB) + Cable loss (dB) + Attenuation (dB) + Pre-amp gain (dB)

Tabulated Result terms:

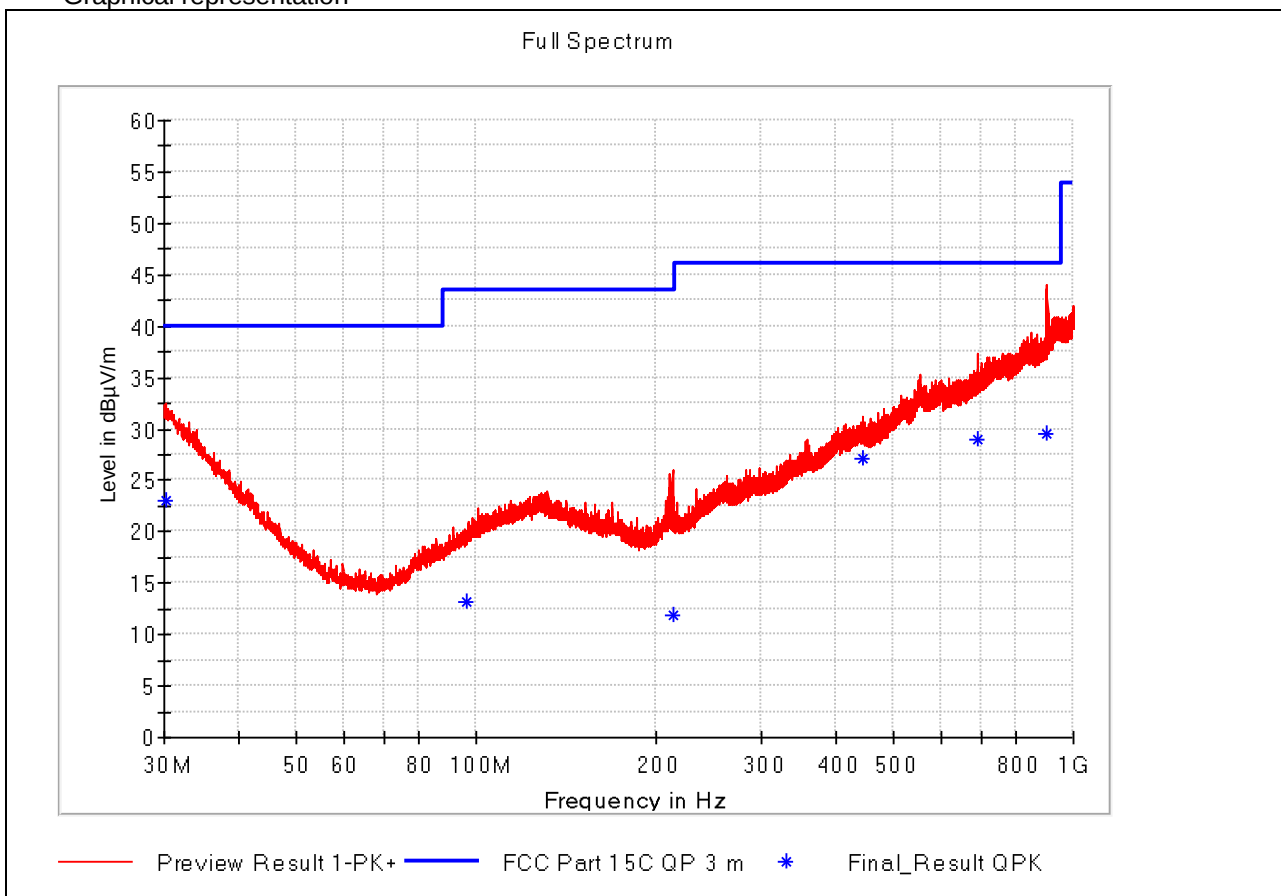
Field strength = QuasiPeak (dBμV/m)

Correction factor = Corr. (dB)

Note: The test software state attenuation as a positive value and amplification as a negative value.

Sample calculation: 22.94 dBμV/m (field strength) = -4.56 dBμV (receiver reading) + 27.5 dB (Correction factor)

Graphical representation



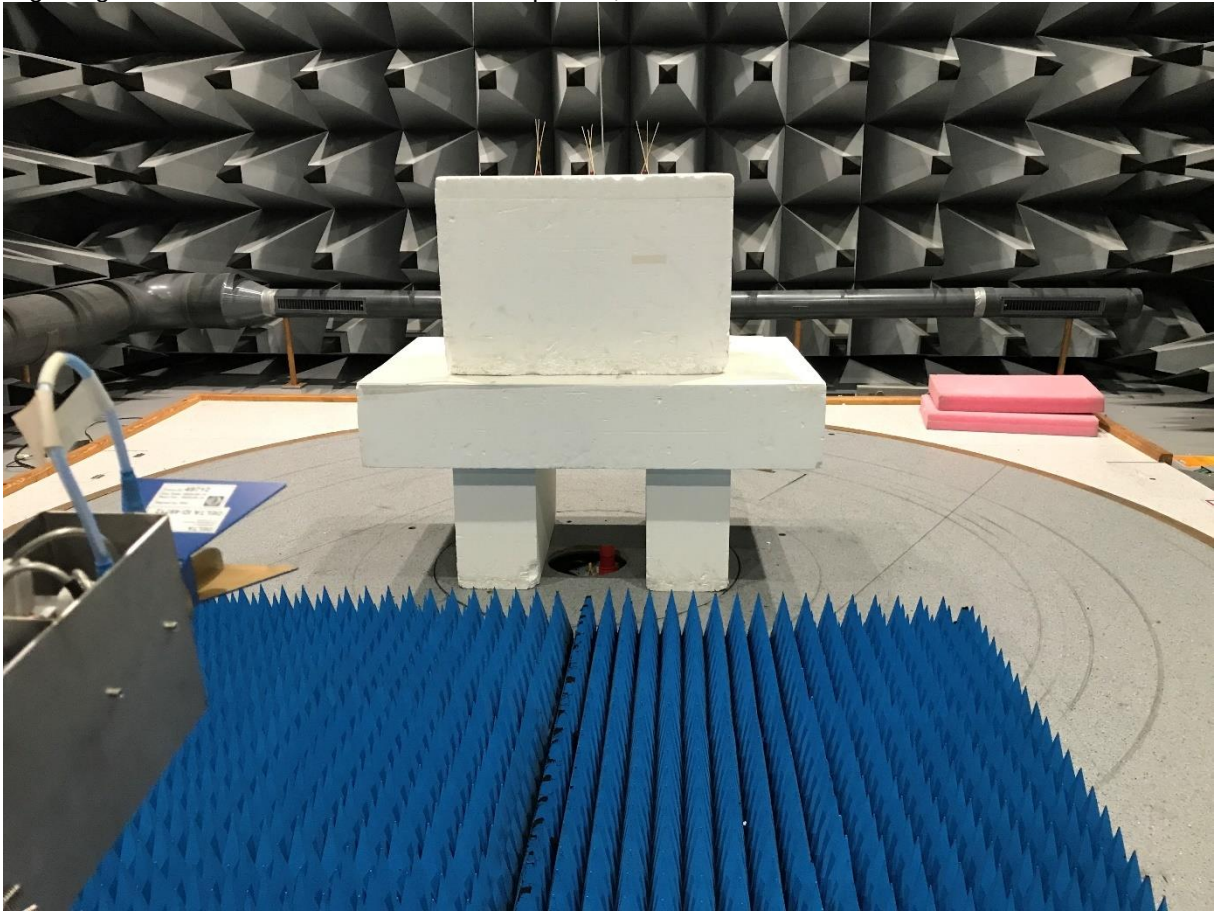
4.3 Measurement of radiated emission above 1000 MHz (6.6 & 11.11)

Name..... :	Peter Wolf Frandsen (PWF)	
Date..... :	2024-10-29	
Rationale for verdict N/A..... :	-	

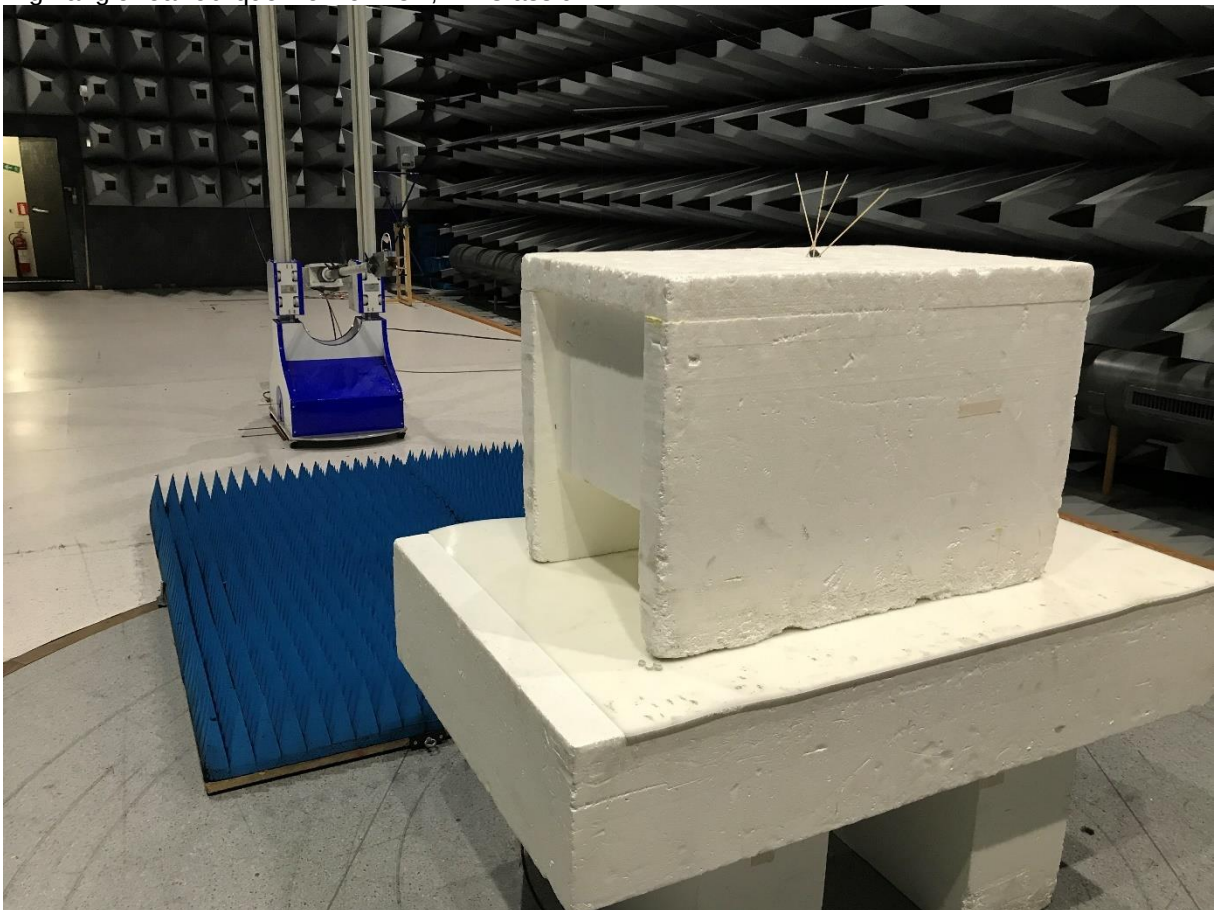
Test location (stand)..... :	Hørsholm EMIRUM	
Applied limit class..... :	☒	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.247
	☐	Limit according to 47 CFR Part 15 C Subpart 15.209 and Subpart 15.249
	☐	Other:
Test setup description..... :	☒	Equipment on a table 150 cm height with absorber-lined floor
	☐	Equipment on the floor (isolated from ground plane)
	☐	Other (e.g., height of pallet):
Supplementary test setup description..... :	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.	
Test method applied..... :	☒	FSOATS CISPR 16-2-3 with measurement distance [m]: 3
	☐	FAR with measurement distance [m]:
Measurement above 1 GHz: Dimension of the line tangent to the EUT volume (beam width)..... :	☐	Not applicable
	☒	Value of w: 2.67 m at 2 GHz
Supplementary information..... :	Separate test for BT Classic, BLE 1 MHz and BLE 2 MHz	

Photo 4.3.1: Measurement of radiated emission above 1000 MHz

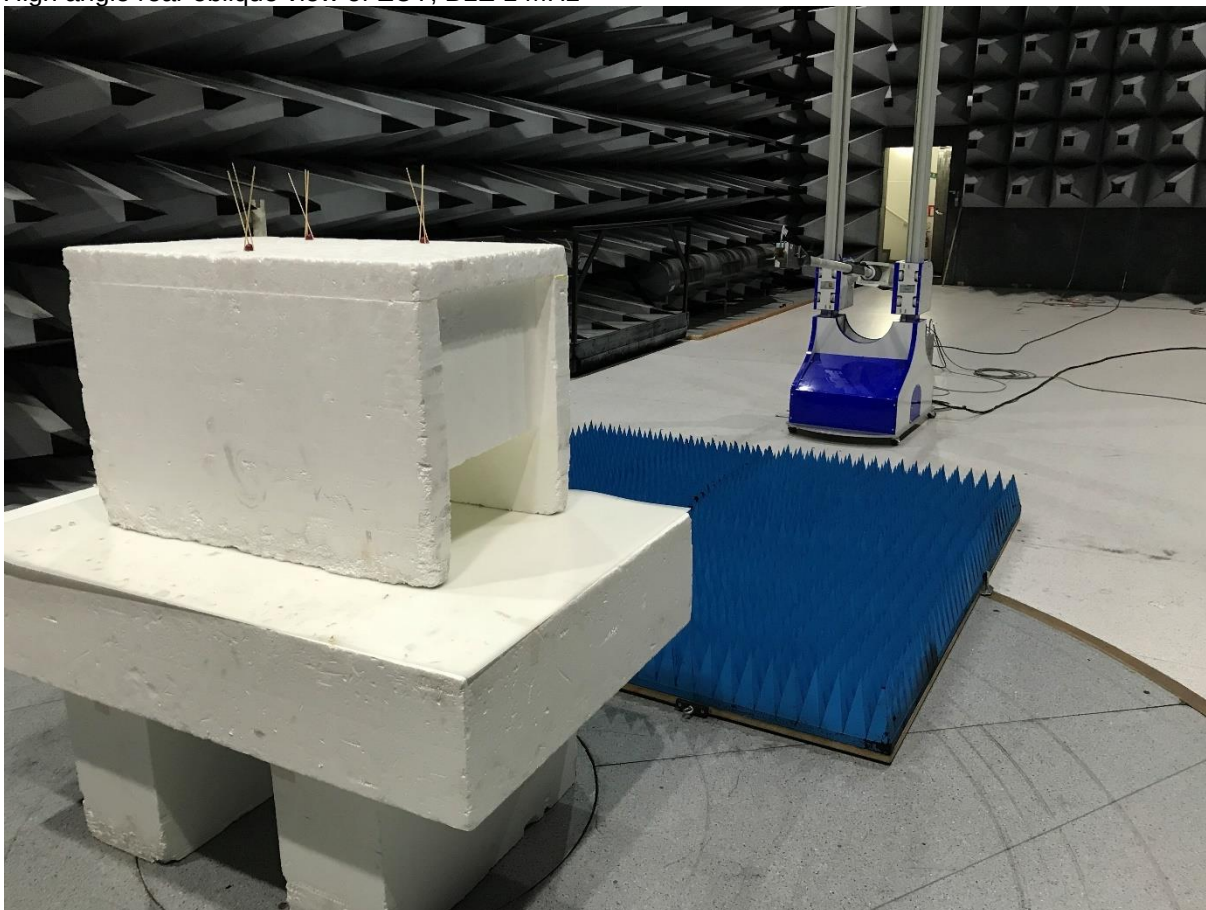
a. High angle front view of EUT and AE on setup table, BLE



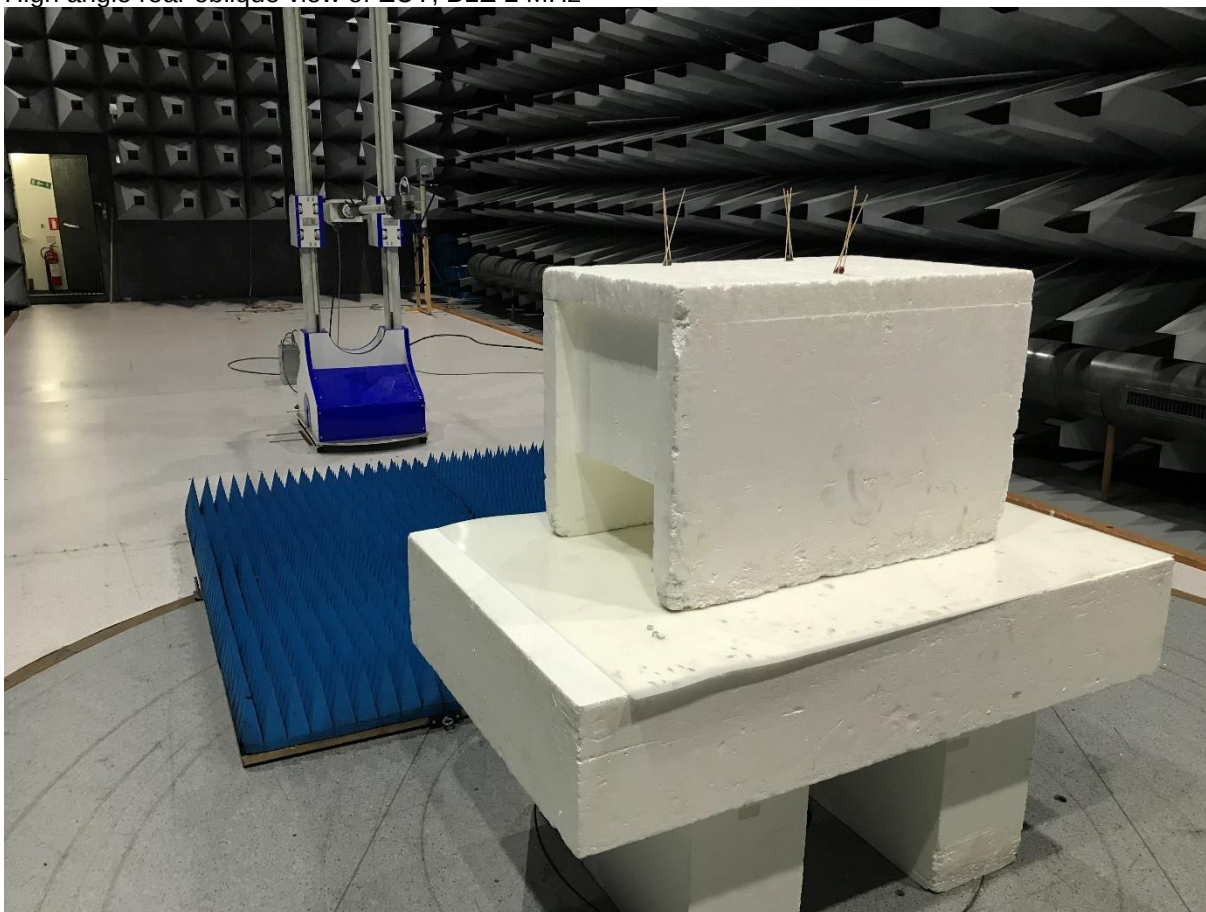
b. High angle rear oblique view of EUT, BT Classic



c. High angle rear oblique view of EUT, BLE 1 MHz



d. High angle rear oblique view of EUT, BLE 2 MHz



Test results for radiated emission above 1000 MHz

Test item no(s) ref. cl. 1.2 : #1.0

Operating mode no(s) ref. cl. 1.7 : 1 (BT Classic - Basic Rate hopping 20 ms)

Test setup 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)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.00	---	83.00	IN-BAND	IN-BAND	100	1000	340.0	V	246.0	8.5
2402.00	94.09	---	IN-BAND	IN-BAND	100	1000	100.0	V	314.0	8.5
2438.00	95.28	---	IN-BAND	IN-BAND	100	1000	164.0	V	311.0	8.5
2438.00	---	80.45	IN-BAND	IN-BAND	100	1000	151.0	V	295.0	8.5
2480.00	---	87.13	IN-BAND	IN-BAND	100	1000	297.0	V	258.0	8.6
2480.00	95.76	---	IN-BAND	IN-BAND	100	1000	108.0	V	316.0	8.6
4804.00	50.90	---	73.90	23.00	100	1000	297.0	V	208.0	-19.7
4804.00	---	42.81	53.90	15.89	100	1000	100.0	V	265.0	-19.7
4876.00	---	40.34	53.90	17.40	100	1000	108.0	V	45.0	-19.4
4876.00	50.81	---	73.90	23.09	100	1000	284.0	V	50.0	-19.4
4960.00	---	39.56	53.90	16.40	100	1000	100.0	V	309.0	-19.3
4960.00	51.06	---	73.90	22.84	100	1000	149.0	V	291.0	-19.3
7206.00	54.69	---	73.90	19.21	100	1000	293.0	H	75.0	-13.5
7206.00	---	45.43	53.90	13.63	100	1000	249.0	H	75.0	-13.5
7314.00	---	39.21	53.90	14.69	100	1000	100.0	H	299.0	-12.9
7314.00	52.14	---	73.90	21.76	100	1000	350.0	V	2.0	-12.9
7440.00	54.77	---	73.90	19.13	100	1000	230.0	H	45.0	-11.8
7440.00	---	45.44	53.90	12.29	100	1000	297.0	H	70.0	-11.8

The result is calculated by adjusting the receiver reading with the correction factor.

Correction factor (dB) = Antenna factor (dB) + Cable loss (dB) + Attenuation (dB) + Pre-amp gain (dB)

Tabulated Result terms:

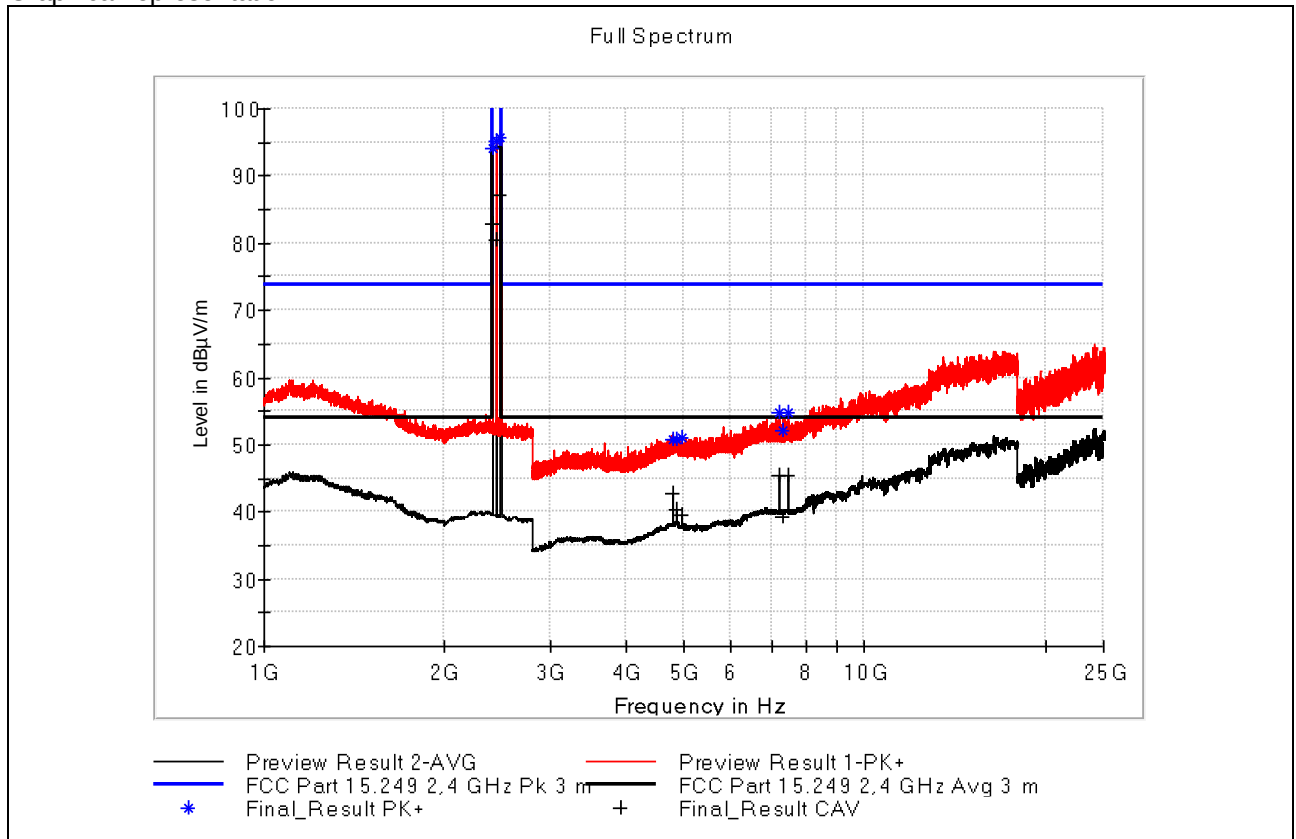
Field strength = MaxPeak (dBμV/m) and CAverage (dBμV/m)

Correction factor = Corr. (dB)

Note: The test software state attenuation as a positive value and amplification as a negative value.

Sample calculation: 83.00 dBμV/m (field strength) = 74.5 dBμV (receiver reading) + 8.5 dB (Correction factor)

Graphical representation



Test results for radiated emission above 1000 MHz

Test item no(s) ref. cl. 1.2	#2,#3,#4
Operating mode no(s) ref. cl. 1.7 :	2 (BLE - 1 MHz - 1ms)
Test setup no(s) ref. cl. 3.3	2

Tabulated Results summary

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.00	94.72	---	IN-BAND	IN-BAND	100	1000	136.0	H	210.0	8.5
2402.00	---	92.71	IN-BAND	IN-BAND	100	1000	135.0	H	210.0	8.5
2438.00	---	94.53	IN-BAND	IN-BAND	100	1000	155.0	H	178.0	8.5
2438.00	95.28	---	IN-BAND	IN-BAND	100	1000	152.0	H	189.0	8.5
2480.00	96.40	---	IN-BAND	IN-BAND	100	1000	149.0	V	141.0	8.6
2480.00	---	95.42	IN-BAND	IN-BAND	100	1000	150.0	V	142.0	8.6
7313.50	---	41.49	53.90	12.41	100	1000	136.0	V	132.0	-12.9
9607.00	---	45.21	53.90	8.69	100	1000	100.0	H	181.0	-4.4
14413.25	---	50.92	53.90	2.98	100	1000	108.0	V	-31.0	2.0

Rule part 15.247

The result is calculated by adjusting the receiver reading with the correction factor.

Correction factor (dB) = Antenna factor (dB) + Cable loss (dB) + Attenuation (dB) + Pre-amp gain (dB)

Tabulated Result terms:

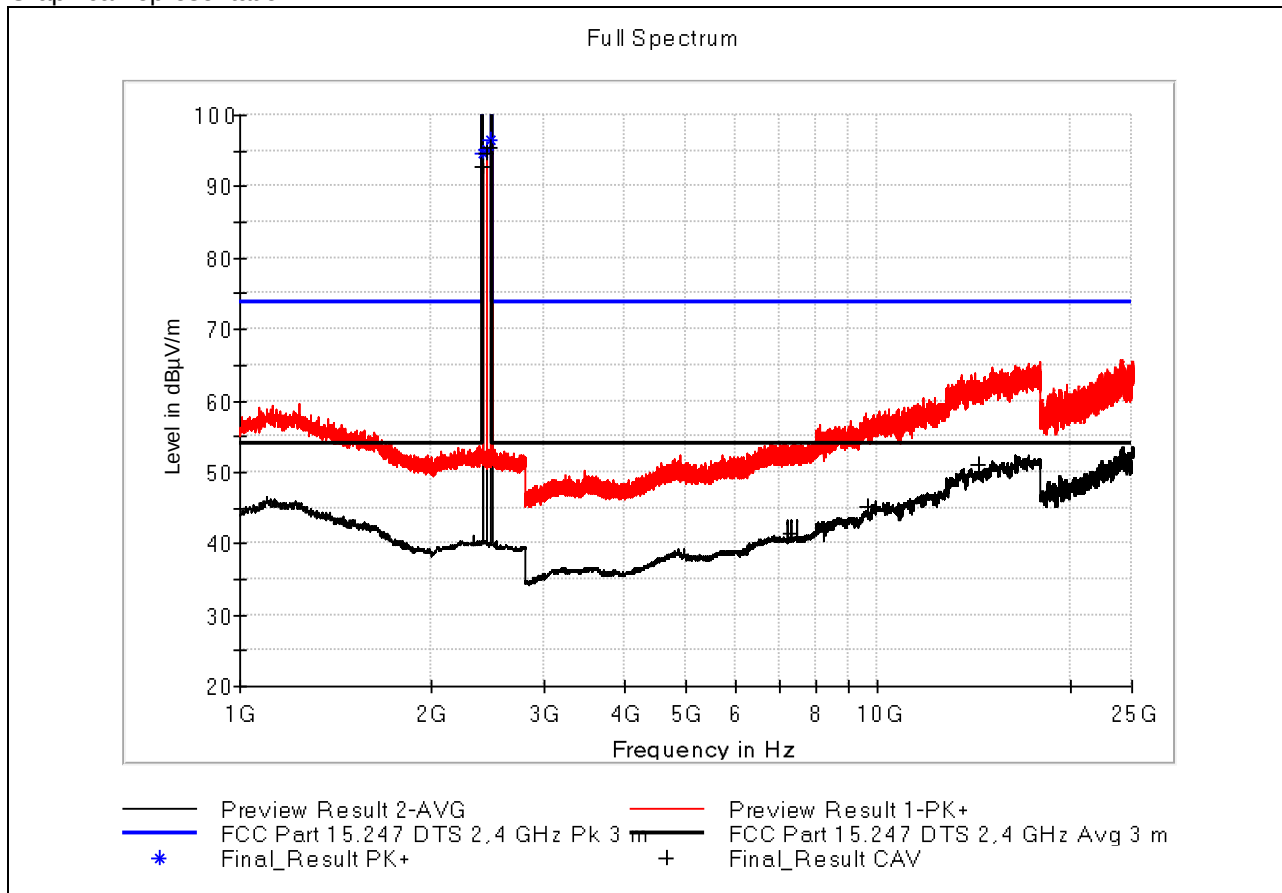
Field strength = MaxPeak (dBμV/m) and CAverage (dBμV/m)

Correction factor = Corr. (dB)

Note: The test software state attenuation as a positive value and amplification as a negative value.

Sample calculation: 94.72 dBμV/m (field strength) = 86.22 dBμV (receiver reading) + 8.5 dB (Correction factor)

Graphical representation



Test results for radiated emission above 1000 MHz

Test item no(s) ref. cl. 1.2	#5,#6,#7
Operating mode no(s) ref. cl. 1.7 :	2 (BLE - 2 MHz - 1 ms)
Test setup 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)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.00	---	91.32	IN-BAND	IN-BAND	10	1000	221.0	H	0.0	8.5
2402.00	92.85	---	IN-BAND	IN-BAND	10	1000	219.0	H	0.0	8.5
2438.00	---	95.13	IN-BAND	IN-BAND	10	1000	150.0	H	178.0	8.5
2438.00	96.30	---	IN-BAND	IN-BAND	10	1000	150.0	H	179.0	8.5
2480.00	---	95.38	IN-BAND	IN-BAND	10	1000	150.0	V	181.0	8.6
2480.00	96.67	---	IN-BAND	IN-BAND	10	1000	149.0	V	179.0	8.6
7438.75	---	44.23	53.90	9.67	10	1000	339.0	H	334.0	-11.8
9750.25	---	45.56	53.90	8.34	10	1000	293.0	H	275.0	-3.8
14625.00	---	49.83	53.90	4.07	10	1000	108.0	H	180.0	1.2

The result is calculated by adjusting the receiver reading with the correction factor.

Correction factor (dB) = Antenna factor (dB) + Cable loss (dB) + Attenuation (dB) + Pre-amp gain (dB)

Tabulated Result terms:

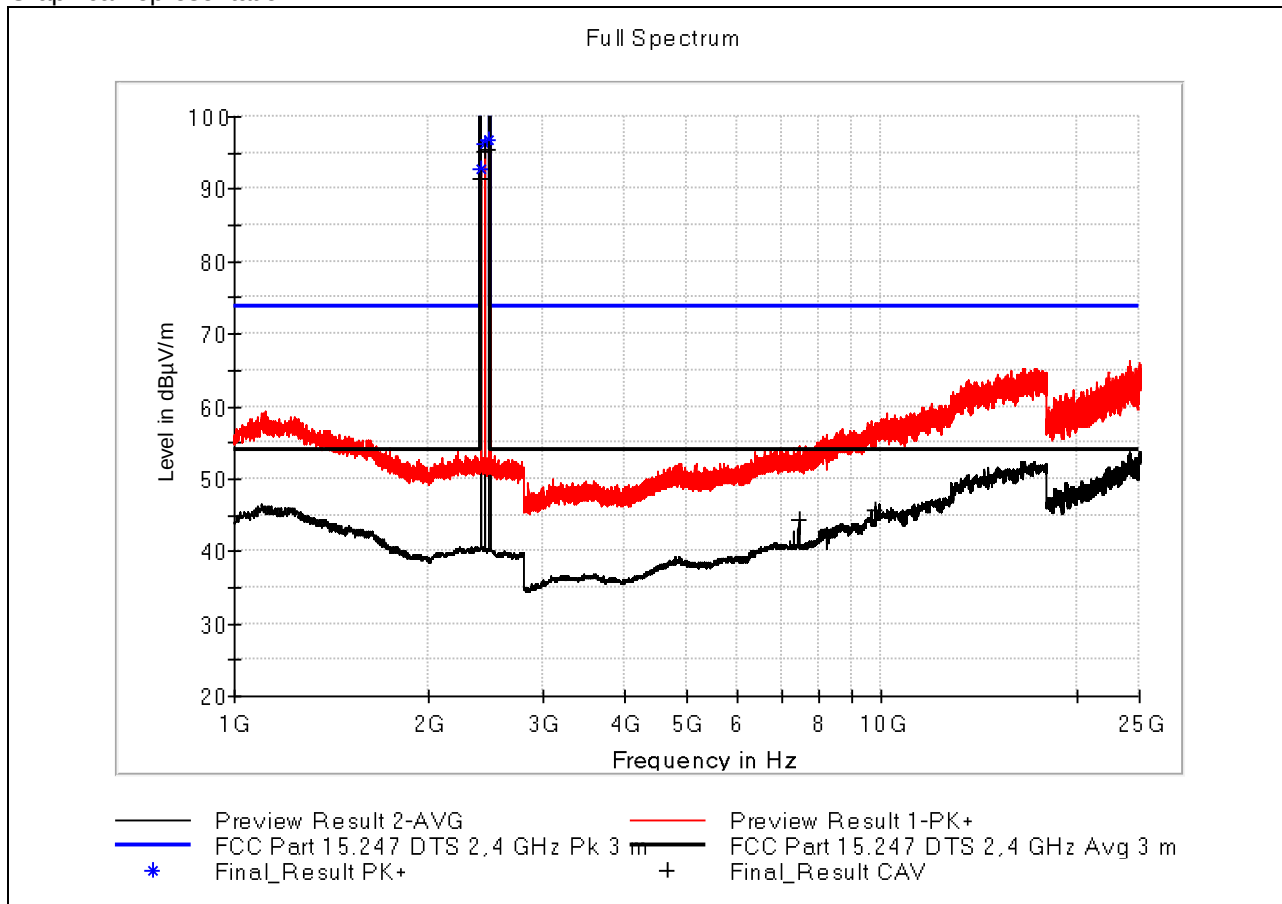
Field strength = MaxPeak (dBμV/m) and CAverage (dBμV/m)

Correction factor = Corr. (dB)

Note: The test software state attenuation as a positive value and amplification as a negative value.

Sample calculation: 91.32 dBμV/m (field strength) = 82.82 dBμV (receiver reading) + 8.5 dB (Correction factor)

Graphical representation



4.4 Carrier frequency separation (7.8.2)

Name	Peter Wolf Frandsen (PWF)
Date	2024-11-22 and 2024-11-29
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM4
Applied limit	☒ Limit according to 47 CFR Part 15 C Subpart 15.247
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	The EUT shall have its hopping function enabled.
Test method applied	☒ 7.8.2 Carrier frequency separation
	☐ Other:
Supplementary information	-

Photo 4.4.1	Measurement of Carrier Frequency Separation
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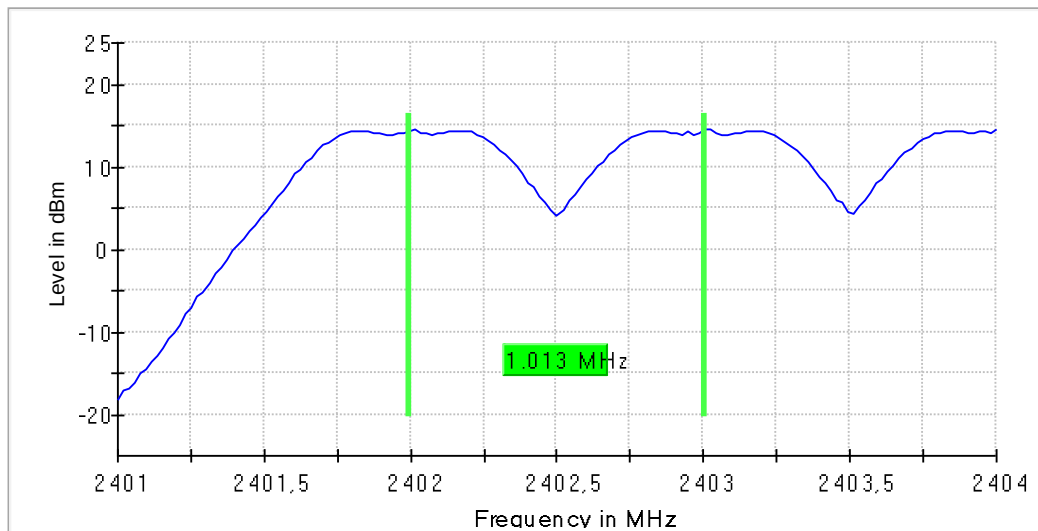
Test results for Carrier Frequency Separation

Test item no(s) ref. cl. 1.2	3, 4
Operating mode no(s) ref. cl. 1.7 :	4 - BT Classic - Basic Rate mode
Test setup no(s) ref. cl. 3.3	2

Tabulated Results summary

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2402.000000	1.012988	0.666667	---	2401.993506	2403.006494

Graphical representation



4.5 Number of hopping frequencies (7.8.3)

Name	Peter Wolf Frandsen (PWF)
Date	2024-11-22
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM4
Applied limit	☒ Limit according to 47 CFR Part 15 C Subpart 15.247
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	The EUT shall have its hopping function enabled.
Test method applied	☒ 7.8.3 Number of hopping frequencies
	☐ Other:
Supplementary information	-

Photo 4.5.1	Measurement of Number of hopping frequencies
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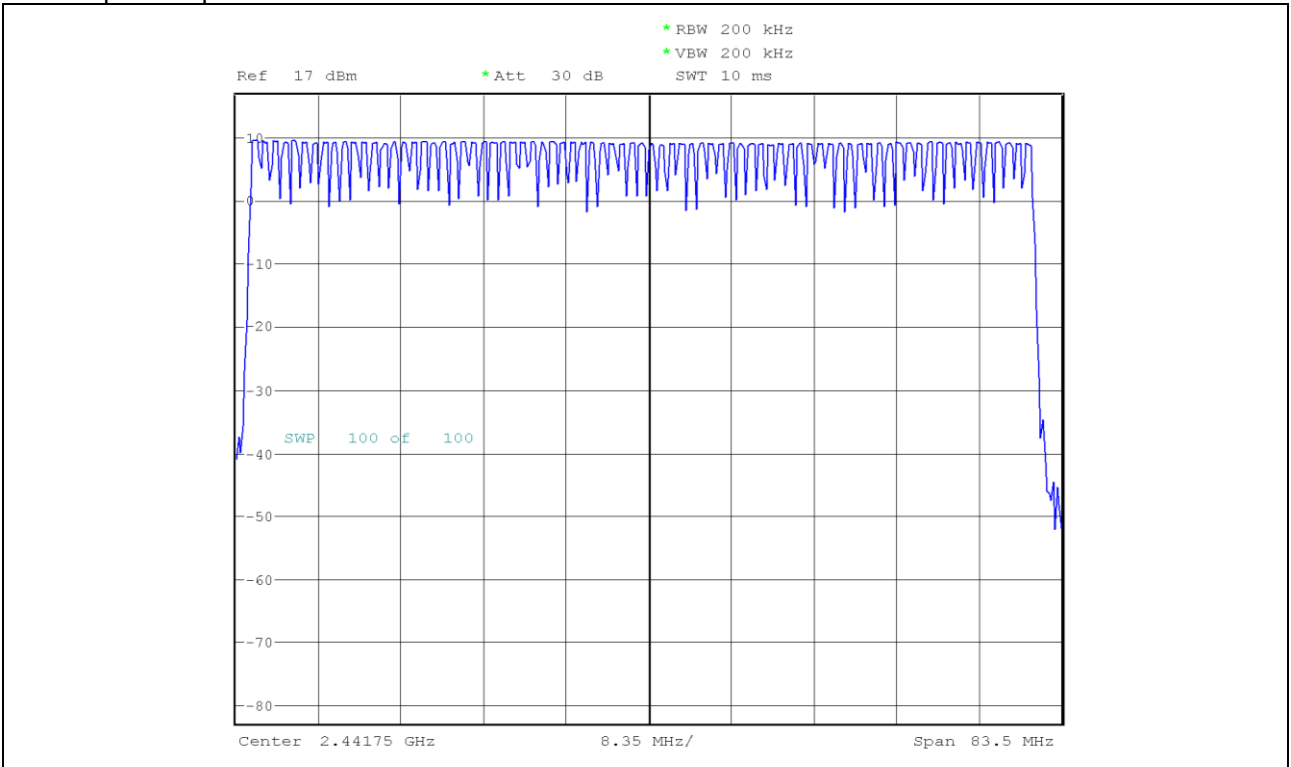
Test results for Number of hopping frequencies

Test item no(s) ref. cl. 1.2	SMA L or R
Operating mode no(s) ref. cl. 1.7 :	4 - BT Classic - Basic Rate mode
Test setup no(s) ref. cl. 3.3	2

Tabulated Results summary

Channels	Limit Min	Limit Max	Result
79	15	---	PASS

Graphical representation



4.6 Time of occupancy (dwell time) (7.8.4)

Name	Peter Wolf Frandsen (PWF)
Date	2024-11-28
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM4
Applied limit	☒ Limit according to 47 CFR Part 15 C Subpart 15.247
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	The EUT shall have its hopping function enabled.
Test method applied	☒ 7.8.4 Time of occupancy (dwell time)
	☐ Other:
Supplementary information	-

Photo 4.6.1	Measurement of Time of occupancy (dwell time)
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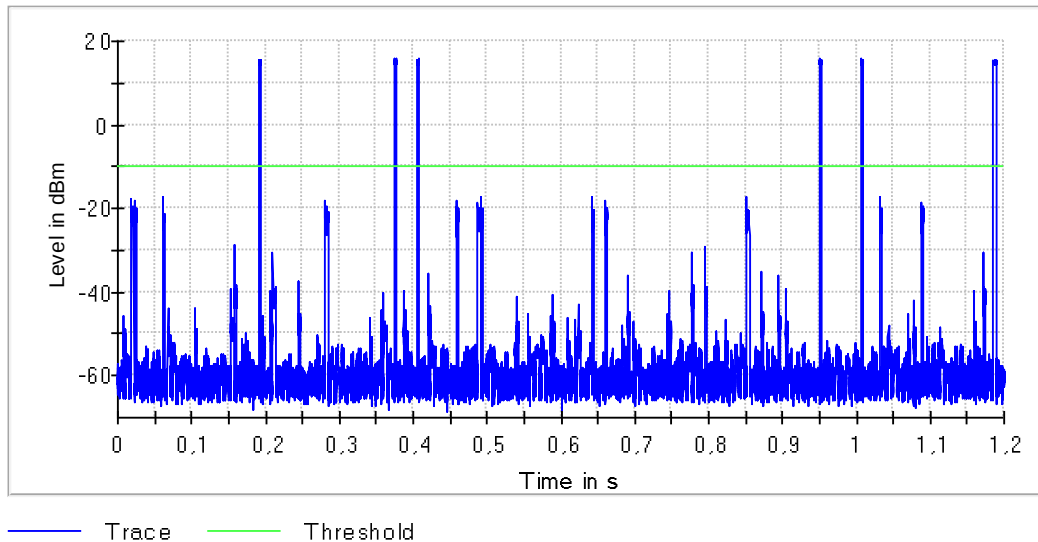
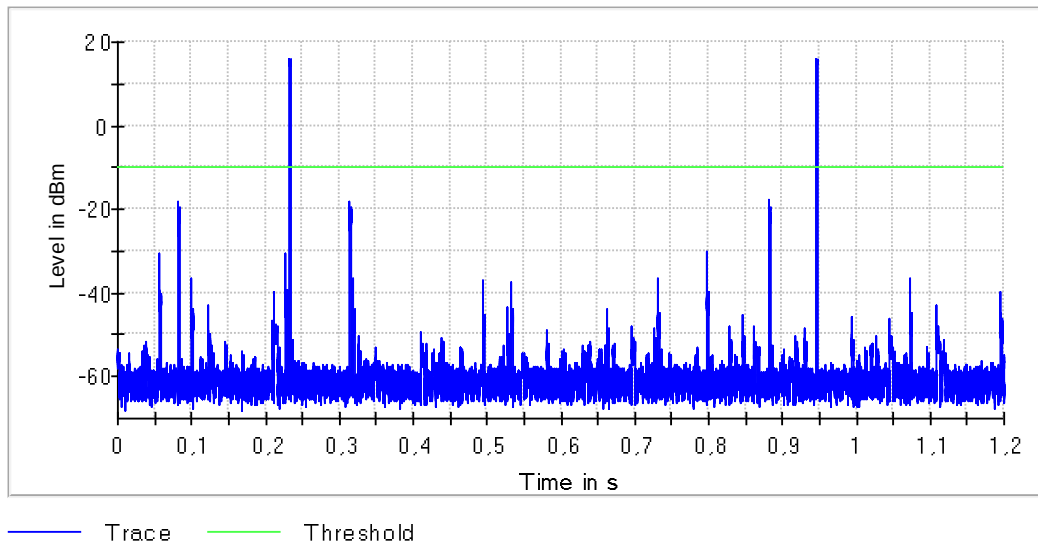
Test results for Time of occupancy (dwell time)

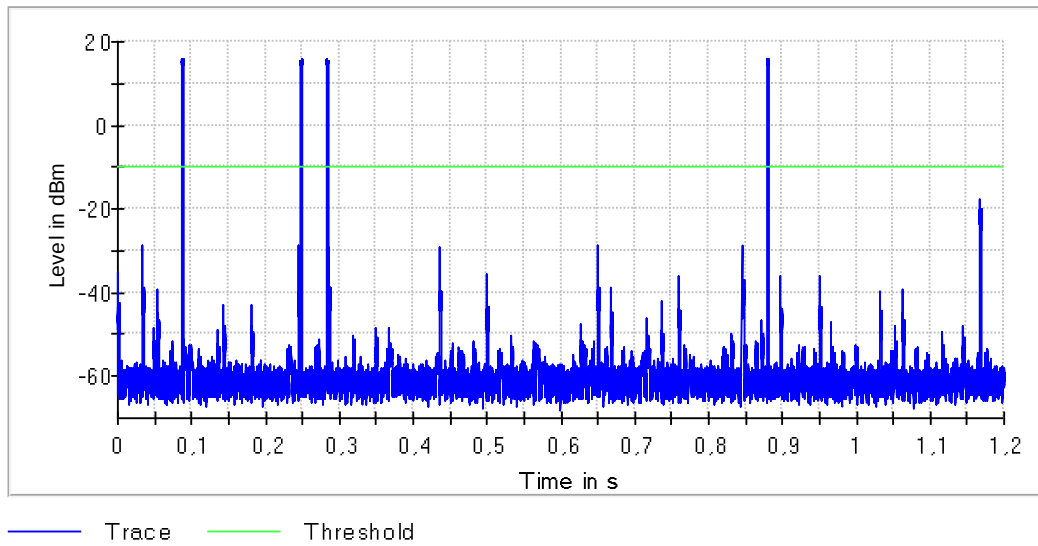
Test item no(s) ref. cl. 1.2	SMA L or R
Operating mode no(s) ref. cl. 1.7 :	4 - BT Classic - Basic Rate mode
Test setup no(s) ref. cl. 3.3	2

Tabulated Results summary

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)	Result
2402.000000	5.840	400.000	0.000	-10.0	PASS
2438.000000	17.560	400.000	0.000	-10.0	PASS
2480.000000	11.760	400.000	0.000	-10.0	PASS

Graphical representation



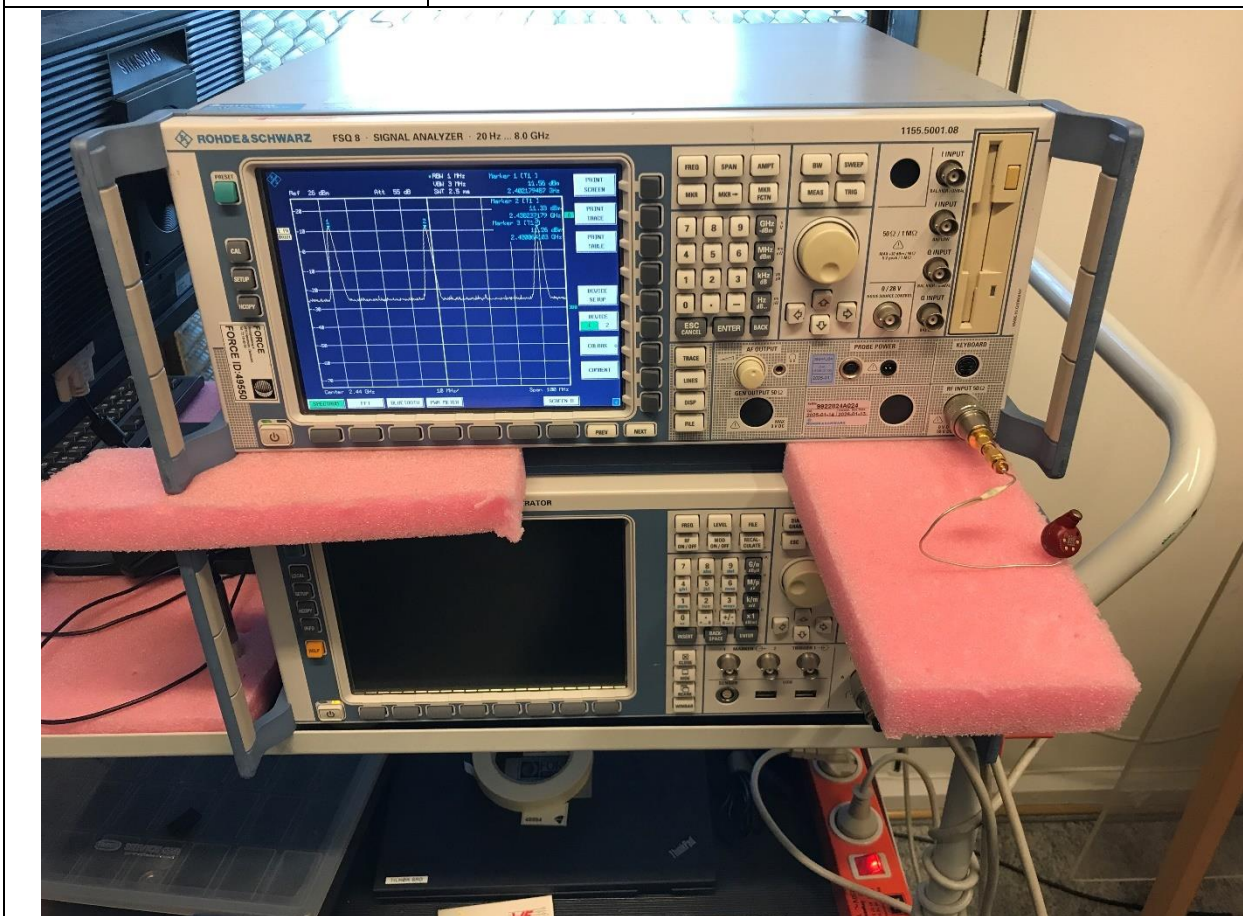


4.7 Output power test procedure for FHSS (7.8.5)

Name	Peter Wolf Frandsen (PWF)
Date	2025-02-20
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM2
Applied limit	☒ Limit according to 47 CFR Part 15 C Subpart 15.247
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test.
Test method applied	☒ 7.8.5 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices73
	☒ Other:
Supplementary information	Hopping on 3 channels

Photo 4.7.1 Measurement of Output power test procedure for FHSS



Test results for Output power test procedure for FHSS

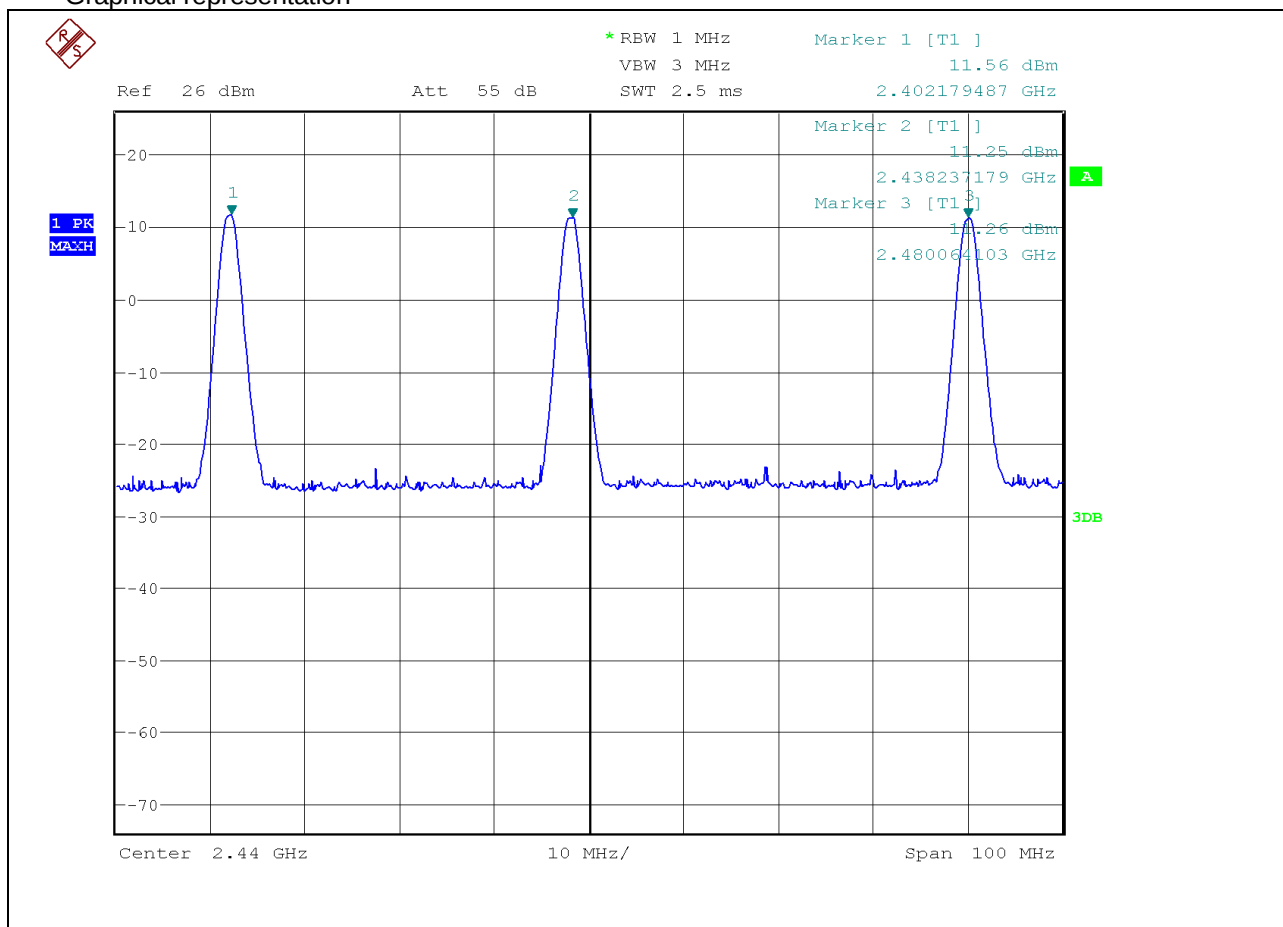
Test item no(s) ref. cl. 1.2	SMA L or R
Operating mode no(s) ref. cl. 1.7 :	3 - BT Classic - Basic Rate mode
Test setup no(s) ref. cl. 3.3	2

Tabulated Results summary

Peak output power

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402	11.56	21.0	PASS
2438	11.25	21.0	PASS
2480	11.26	21.0	PASS

Graphical representation



4.8 Band-edge measurements for RF conducted and radiated emissions (7.8.6)

Name	Peter Wolf Frandsen (PWF)
Date	2024-11-22
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCRUM4
Applied limit	☒ Limit according to 47 CFR Part 15.209, 15.247 & RSS-247:2023 ☐ Limit according to 47 CFR Part 15.209 & 15.249 ☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector. ☐ Other:
Supplementary test setup description	-
Test method applied	☒ 7.8.6 Band-edge measurements for RF conducted emissions ☒ 6.10 Band-edge testing (DTS: 6.10.5.1) ☐ Other:
Supplementary information	-

Photo 4.8.1	Measurement of Band-edge measurements for RF conducted emissions. Photo for radiated emission, see Photo 4.3.1
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Test results for Band-edge measurements for RF conducted emissions	
Test item no(s) ref. cl. 1.2	1, 2, 3, 4
Operating mode no(s) ref. cl. 1.7 :	3 - BT Classic - Basic Rate mode and BLE modes
Test setup no(s) ref. cl. 3.3	2

4.8.1 BT Classic

Tabulated Results summary

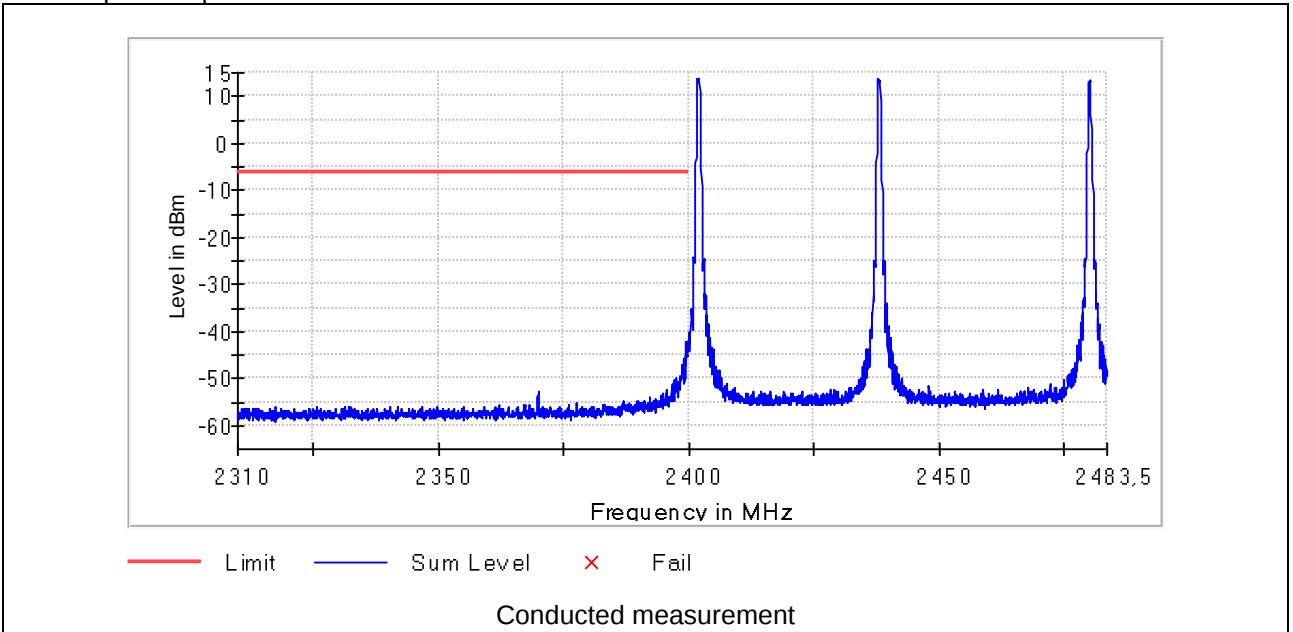
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.950000	-41.6	35.4	-6.2	PASS
2399.850000	-42.0	35.8	-6.2	PASS
2399.900000	-42.0	35.8	-6.2	PASS
2399.800000	-42.1	35.9	-6.2	PASS
2399.550000	-42.1	35.9	-6.2	PASS
2399.500000	-42.6	36.4	-6.2	PASS
2399.750000	-42.8	36.6	-6.2	PASS
2399.700000	-42.9	36.7	-6.2	PASS
2399.650000	-43.5	37.3	-6.2	PASS
2399.400000	-45.0	38.8	-6.2	PASS
2399.600000	-45.4	39.2	-6.2	PASS
2399.300000	-45.5	39.3	-6.2	PASS
2399.100000	-45.8	39.6	-6.2	PASS
2399.350000	-45.8	39.6	-6.2	PASS
2398.900000	-46.8	40.6	-6.2	PASS

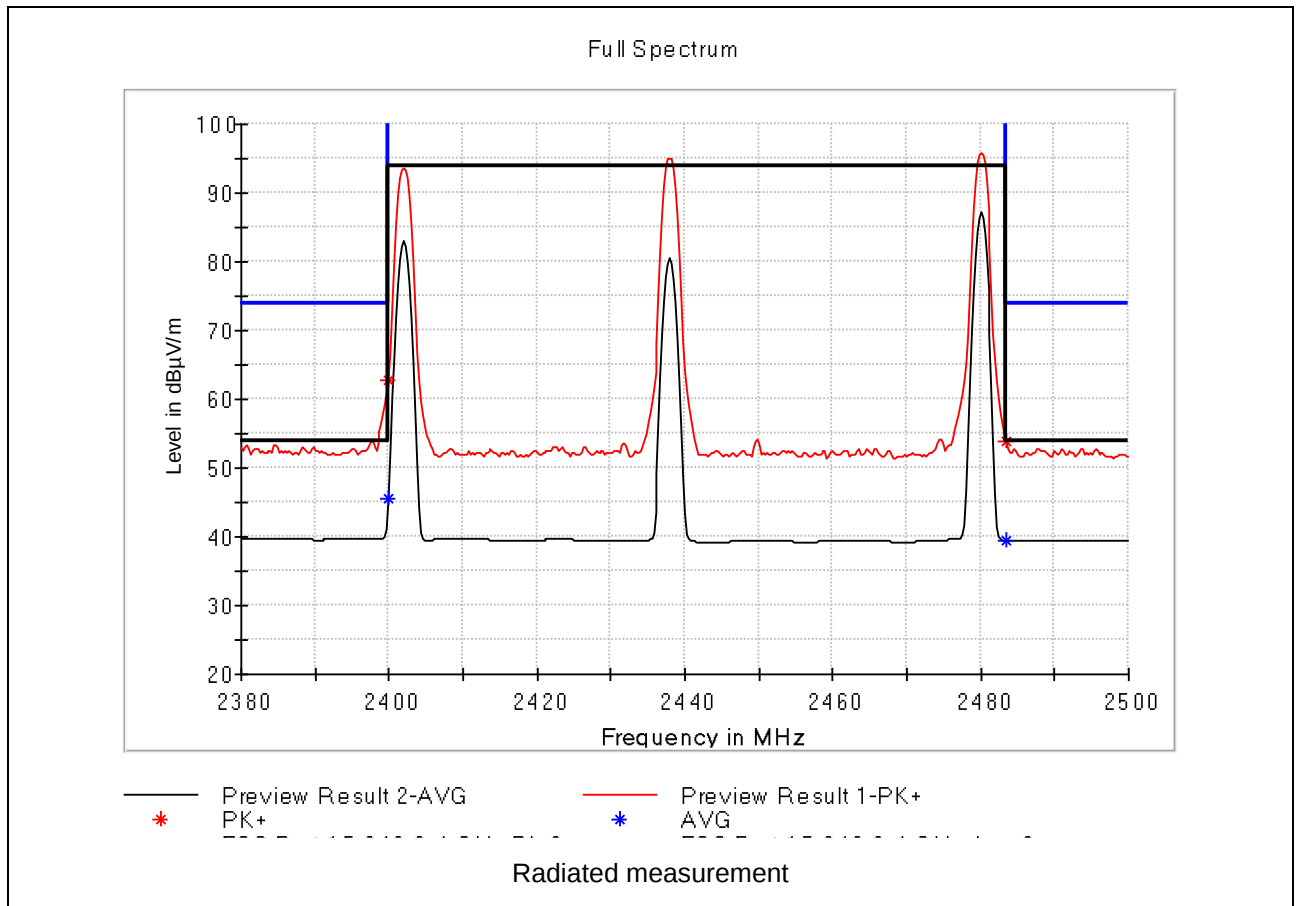
Note:
 Conducted measurement Band Edge low
 Measured Inband Peak at 2402 MHz: 13.8 dBm
 Limit: 13.8 dBm - 20 dBc = -6.2 dBm
 RBW= 100 kHz
 VBW= 300 kHz

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Corr. (dB/m)
2400.00	---	45.49	53.90	8.41	100	1000	150.0	V	8.5
2400.00	62.90	---	73.90	11.00	100	1000	150.0	V	8.5
2483.50	---	39.43	53.90	14.47	100	1000	150.0	V	8.6
2483.50	53.91	---	73.90	19.99	100	1000	150.0	V	8.6

Note: Radiated measurement

Graphical representation





4.8.2 BLE 1 MHz

Tabulated Results summary

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.950000	-42.6	35.8	-6.9	PASS
2399.900000	-42.7	35.9	-6.9	PASS
2399.850000	-44.6	37.7	-6.9	PASS
2399.750000	-44.7	37.9	-6.9	PASS
2399.800000	-44.8	37.9	-6.9	PASS
2399.700000	-44.8	38.0	-6.9	PASS
2399.600000	-45.1	38.2	-6.9	PASS
2399.500000	-45.3	38.5	-6.9	PASS
2399.550000	-45.5	38.7	-6.9	PASS
2399.650000	-45.6	38.7	-6.9	PASS
2399.450000	-46.7	39.8	-6.9	PASS
2399.400000	-47.5	40.7	-6.9	PASS
2399.350000	-48.2	41.4	-6.9	PASS
2399.250000	-48.6	41.8	-6.9	PASS
2398.600000	-49.0	42.1	-6.9	PASS

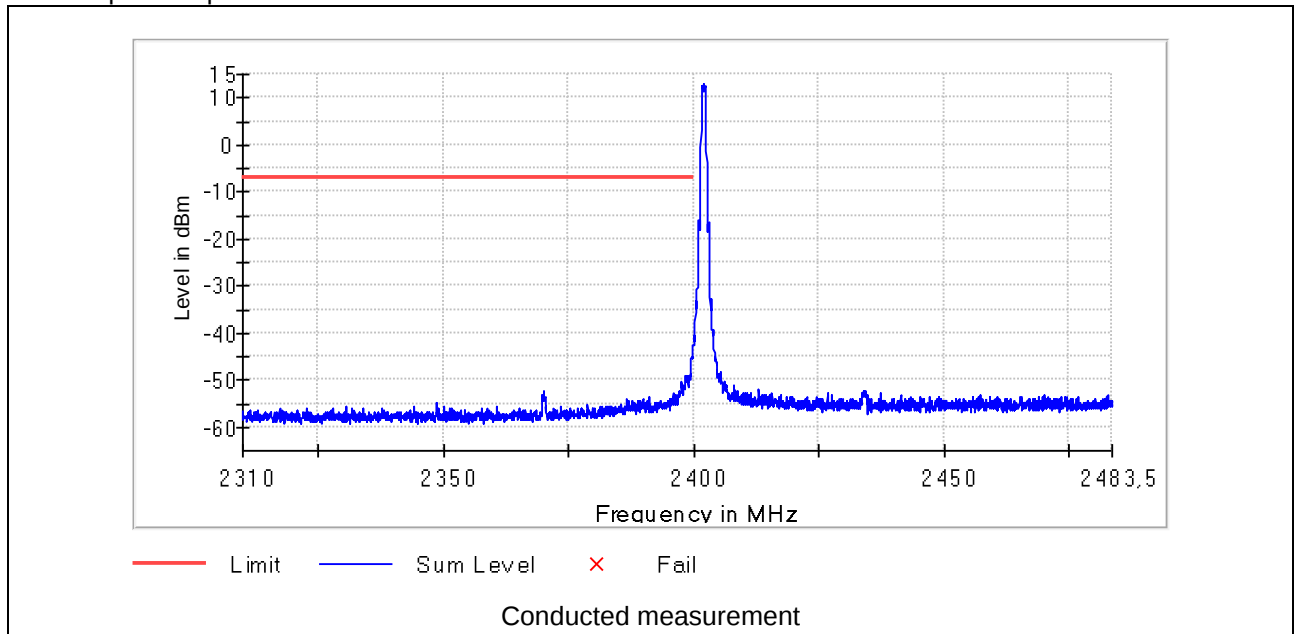
Note:

Conducted measurement Band Edge low
 Measured Inband Peak at 2402 MHz: 13.1 dBm
 Limit: 13.1 dBm - 20 dBc = -6.9 dBm
 RBW= 100 kHz
 VBW= 300 kHz

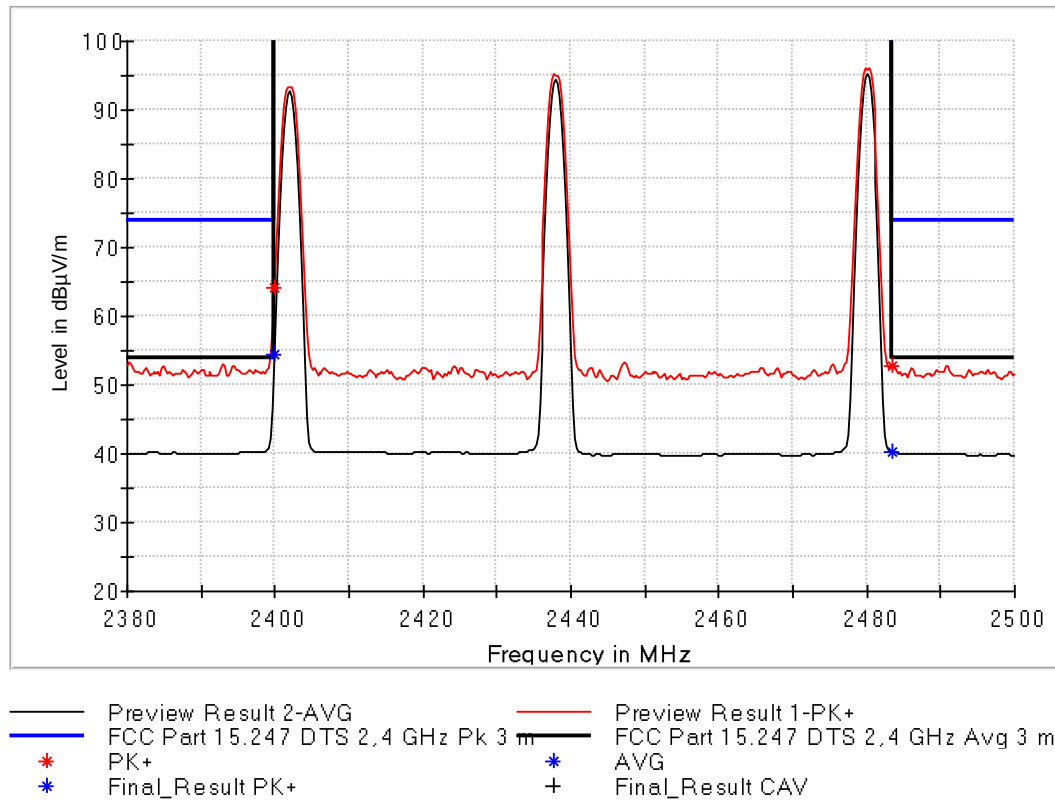
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Corr. (dB/m)
2400.00	---	54.32	53.90	-0.42	100	1000	150.0	H	8.5
2400.00	64.26	---	73.90	9.64	100	1000	150.0	H	8.5
2483.50	---	40.22	53.90	13.68	100	1000	150.0	H	8.6
2483.50	52.84	---	73.90	21.06	100	1000	150.0	V	8.6

Note: Radiated measurement

Graphical representation



Full Spectrum



Radiated measurement

4.8.3 BLE 2 MHz

Tabulated Results summary

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.950000	-22.2	13.7	-8.5	PASS
2399.900000	-22.7	14.2	-8.5	PASS
2399.850000	-24.7	16.2	-8.5	PASS
2399.800000	-27.6	19.1	-8.5	PASS
2399.750000	-28.8	20.3	-8.5	PASS
2399.700000	-31.5	23.0	-8.5	PASS
2399.650000	-32.6	24.1	-8.5	PASS
2399.600000	-33.5	25.0	-8.5	PASS
2399.550000	-34.3	25.8	-8.5	PASS
2399.500000	-34.5	26.0	-8.5	PASS
2399.100000	-34.5	26.0	-8.5	PASS
2399.050000	-34.7	26.3	-8.5	PASS
2399.150000	-35.0	26.6	-8.5	PASS
2399.450000	-35.5	27.0	-8.5	PASS
2398.950000	-36.2	27.7	-8.5	PASS

Note:

Conducted measurement Band Edge low

Measured Inband Peak at 2402 MHz: 11.5 dBm

Limit: 11.5 dBm - 20 dBc = -8.5 dBm

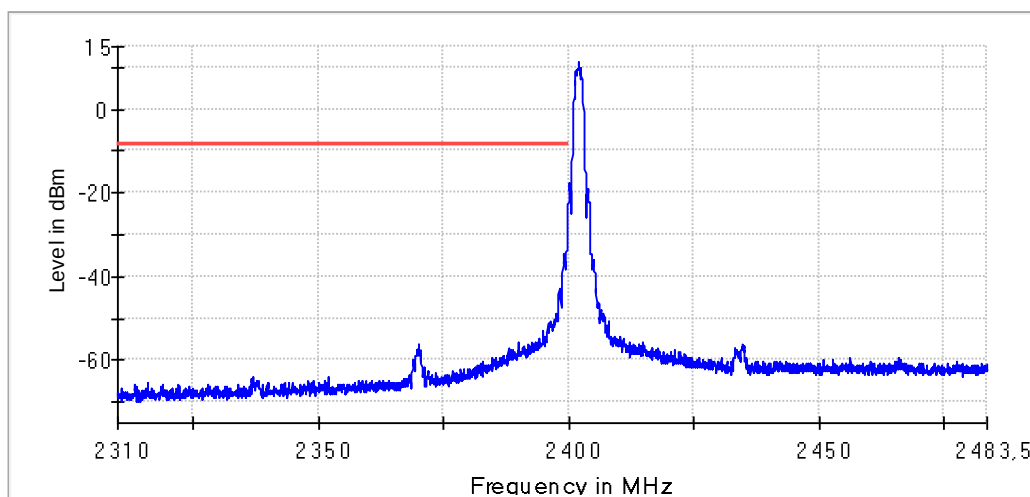
RBW= 100 kHz

VBW= 300 kHz

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Corr. (dB/m)
2400.00	---	66.54	53.90	-12.64	100	1000	150.0	H	8.5
2400.00	73.37	---	73.90	0.53	100	1000	150.0	H	8.5
2483.50	---	44.58	53.90	9.32	100	1000	150.0	V	8.6
2483.50	55.86	---	73.90	18.04	100	1000	150.0	V	8.6

Note: Radiated measurement

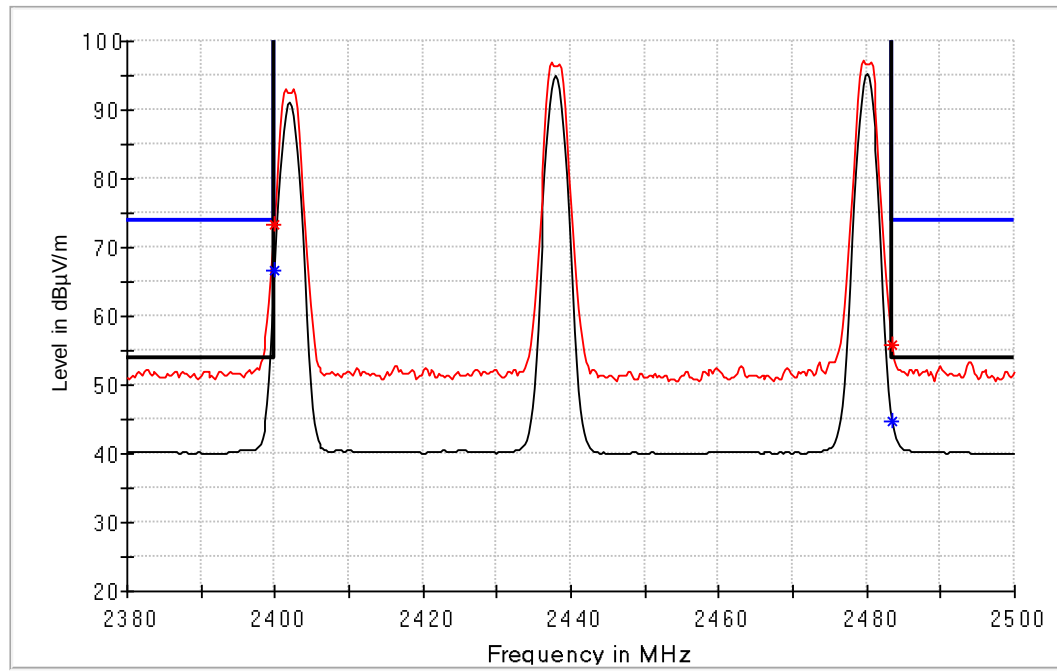
Graphical representation



— Limit — Sum Level × Fail

Conducted measurement

Full Spectrum



—	Preview Result 2-AVG	—	Preview Result 1-PK+
—	FCC Part 15.247 DTS 2,4 GHz Pk 3 m	—	FCC Part 15.247 DTS 2,4 GHz Avg 3 m
*	PK+	*	AVG
*	Final_Result PK+	+	Final_Result CAV

Radiated measurement

4.9 Occupied bandwidth (7.8.7 & 11.8)

Name	Peter Wolf Frandsen (PWF)	
Date	2024-11-22 and 2024-11-29	
Rationale for verdict N/A	-	

Test location (stand)	Hørsholm EMCUM4	
Applied limit	☒	6 dB bandwidth 47 CFR Part 15.247(a)(2) (DTS)
	☒	20 dB bandwidth according to 47 CFR Part 15.215(c)
	☒	99% emission bandwidth according to RSS-Gen:2018 clause 6.7
	☐	Other:
Test setup description	☒	Conducted measurement performed on SMA connector.
	☐	Other:
Supplementary test setup 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. For occupied bandwidth measurements, use the procedure in 6.9.2.	
Test method applied	☒	6.9.2 Occupied bandwidth—relative measurement procedure
	☒	6.9.3 Occupied bandwidth—power bandwidth (99%) measurement procedure
	☒	Other: 11.8 DTS bandwidth option 1
Supplementary information	RBW= 100 kHz VBW= 300 kHz	

Photo 4.9.1 Measurement of occupied bandwidth



Test results for occupied bandwidth	
Test item no(s) ref. cl. 1.2	3,4
Operating mode no(s) ref. cl. 1.7 :	3 - BT Classic - Basic Rate mode and BLE modes
Test setup no(s) ref. cl. 3.3	2

4.9.1 BT Classic

Tabulated Results summary

20 dB bandwidth according to 47 CFR Part 15.215(c)

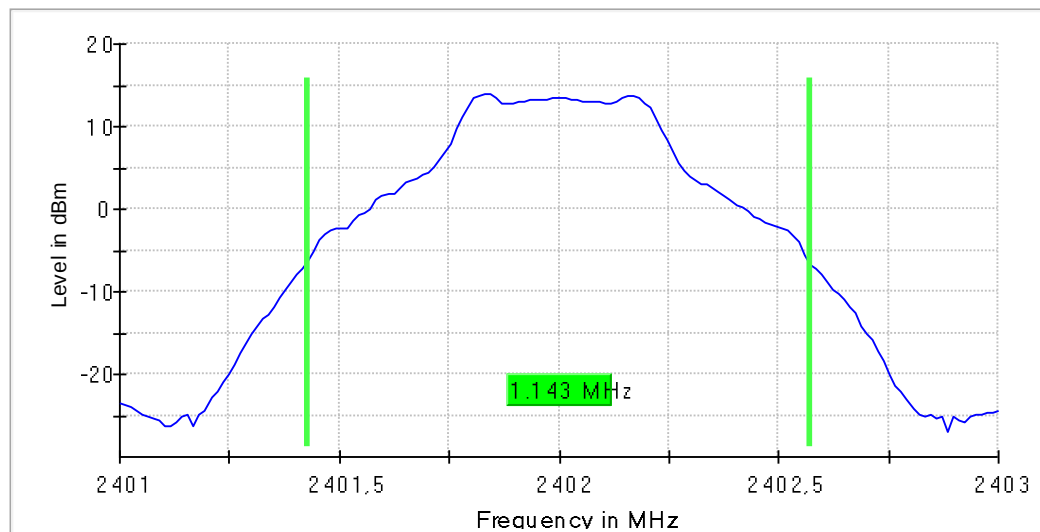
Test item Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	1.142858	2401.428571	2402.571429	Passed
2438	1.142858	2437.428571	2438.571429	Passed
2480	1.142858	2479.428571	2480.571429	Passed

99% emission bandwidth according to RSS-Gen:2019 clause 6.7

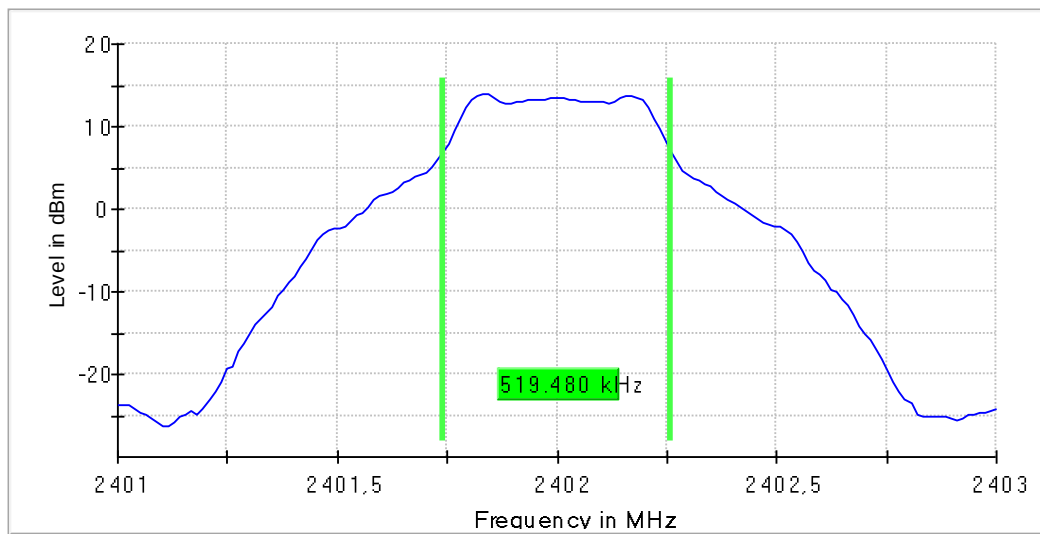
Test item frequency (MHz)	Bandwidth (99%) (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	0.9711	2401.509	2402.481	Passed
2438	0.9615	2437.514	2443.848	Passed
2480	0.9663	2479.514	2480.481	Passed

Graphical representation

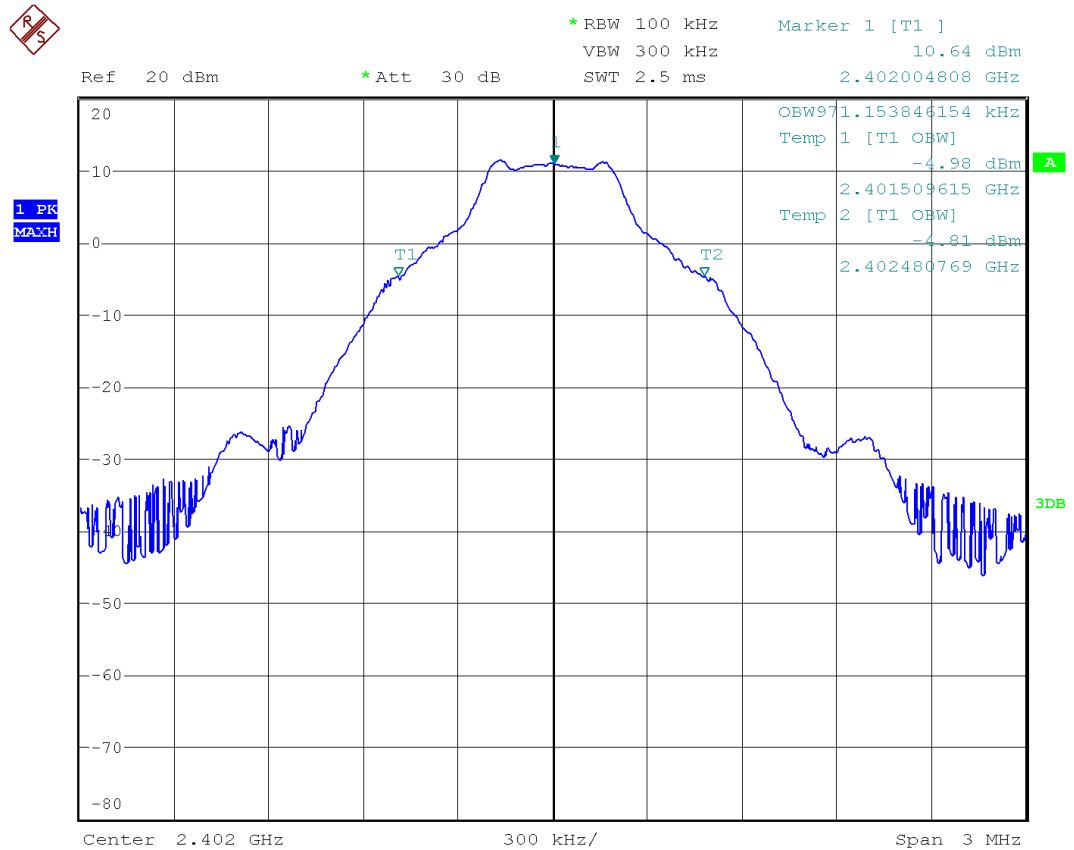
20 dB bandwidth according to 47 CFR Part 15.215(c)



6 dB bandwidth according to 47 CFR Part 15.215(c)



99% emission bandwidth according to RSS-Gen:2019 clause 6.7



4.9.2 BLE 1 MHz

Tabulated Results summary

20 dB bandwidth according to 47 CFR Part 15.215(c)

Test item Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	1.298702	2401.350649	2402.649351	Passed
2438	1.298702	2437.350649	2438.649351	Passed
2480	1.298702	2479.350649	2480.649351	Passed

6 dB bandwidth according to 47 CFR Part 15.215(c)

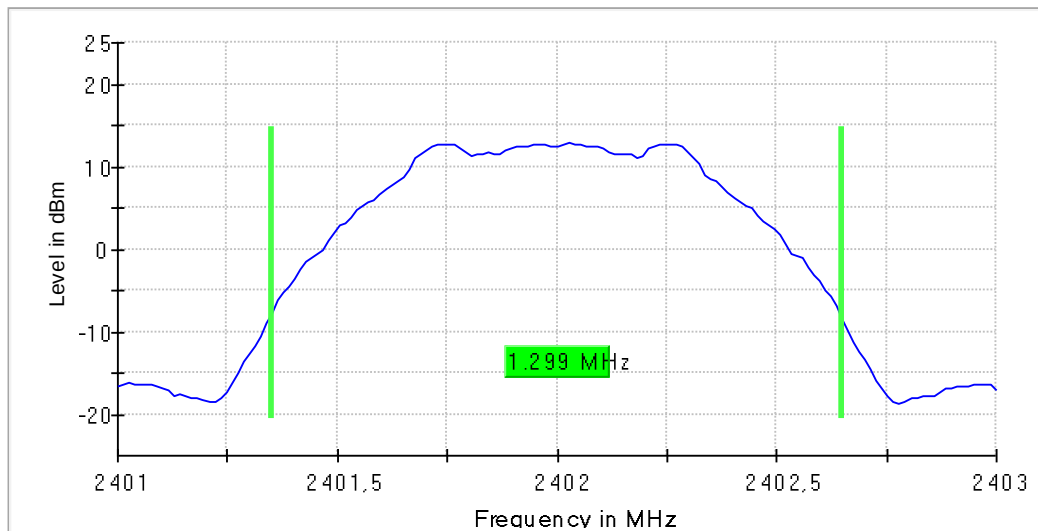
Test item Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	0.805194	2401.597403	2402.402597	Passed
2438	0.805194	2437.597403	2438.402597	Passed
2480	0.792207	2479.597403	2480.389610	Passed

99% emission bandwidth according to RSS-Gen:2019 clause 6.7

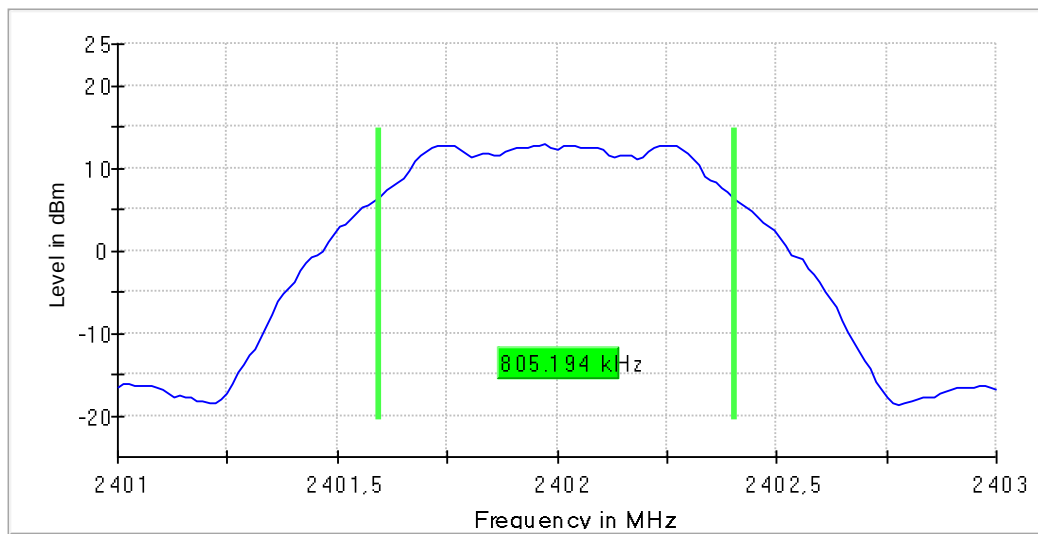
Test item frequency (MHz)	Bandwidth (99%) (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	1.0769	2401.457	2402.534	Passed
2438	1.0769	2437.457	2438.534	Passed
2480	1.0769	2479.457	2480.534	Passed

Graphical representation

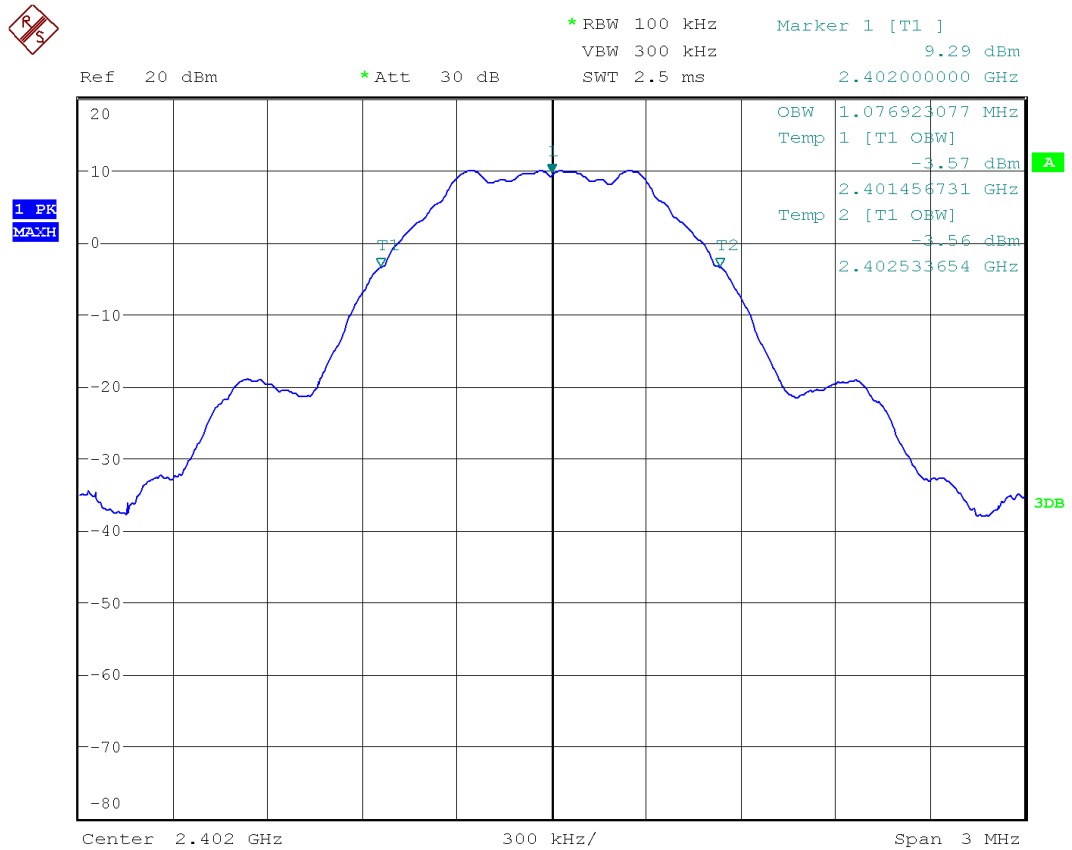
20 dB bandwidth according to 47 CFR Part 15.215(c)



6 dB bandwidth according to 47 CFR Part 15.215(c)



99% emission bandwidth according to RSS-Gen:2019 clause 6.7



4.9.3 BLE 2 MHz

Tabulated Results summary

20 dB bandwidth according to 47 CFR Part 15.215(c)

Test item Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	2.467532	2400.753247	2403.220779	Passed
2438	2.467532	2436.779221	2439.246753	Passed
2480	2.467532	2478.779221	2481.246753	Passed

6 dB bandwidth according to 47 CFR Part 15.215(c)

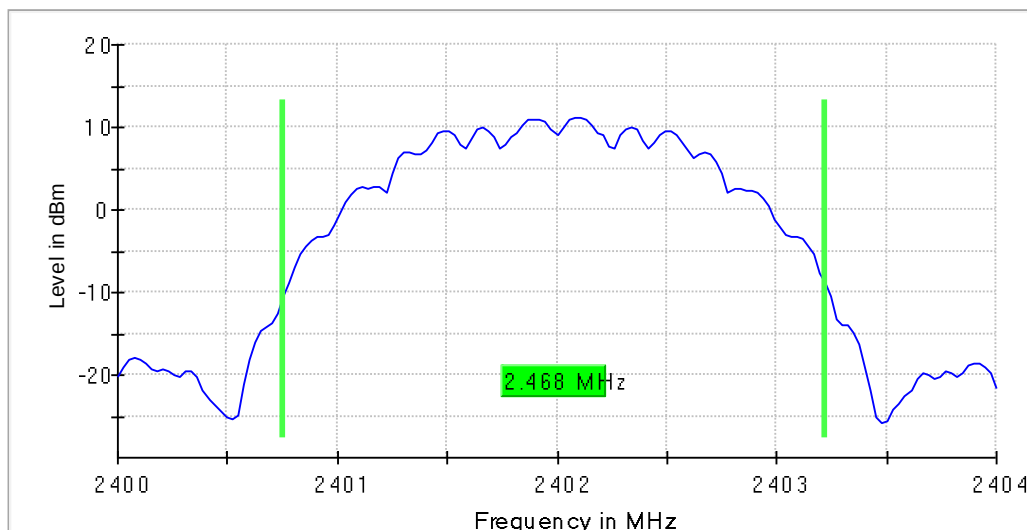
Test item Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	1.506494	2401.246753	2402.753247	Passed
2438	1.506494	2437.246753	2438.753247	Passed
2480	1.506494	2479.246753	2480.753247	Passed

99% emission bandwidth according to RSS-Gen:2019 clause 6.7

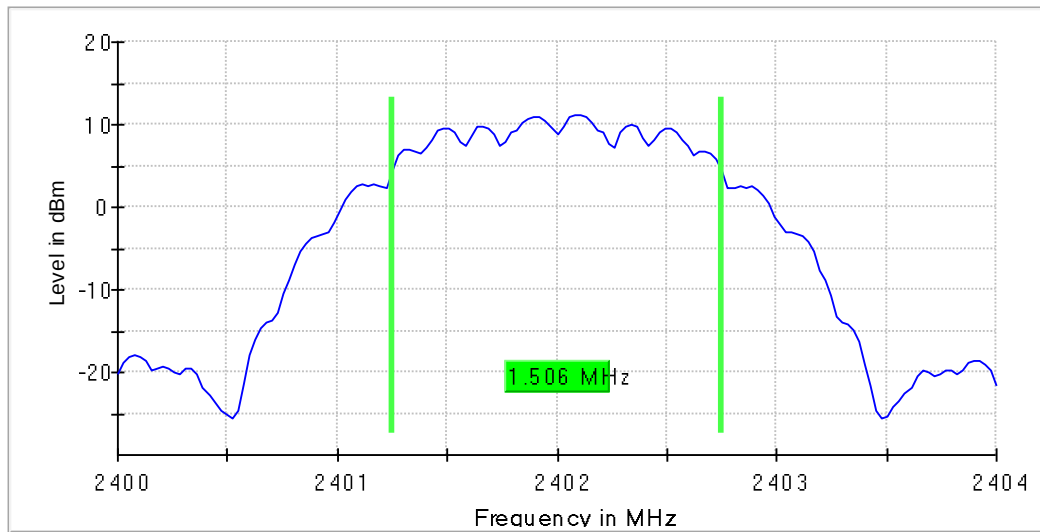
Test item frequency (MHz)	Bandwidth (99%) (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
2402	2.1346	2400.933	2403.067	Passed
2438	2.1346	2436.933	2439.067	Passed
2480	2.1250	2478.933	2481.058	Passed

Graphical representation

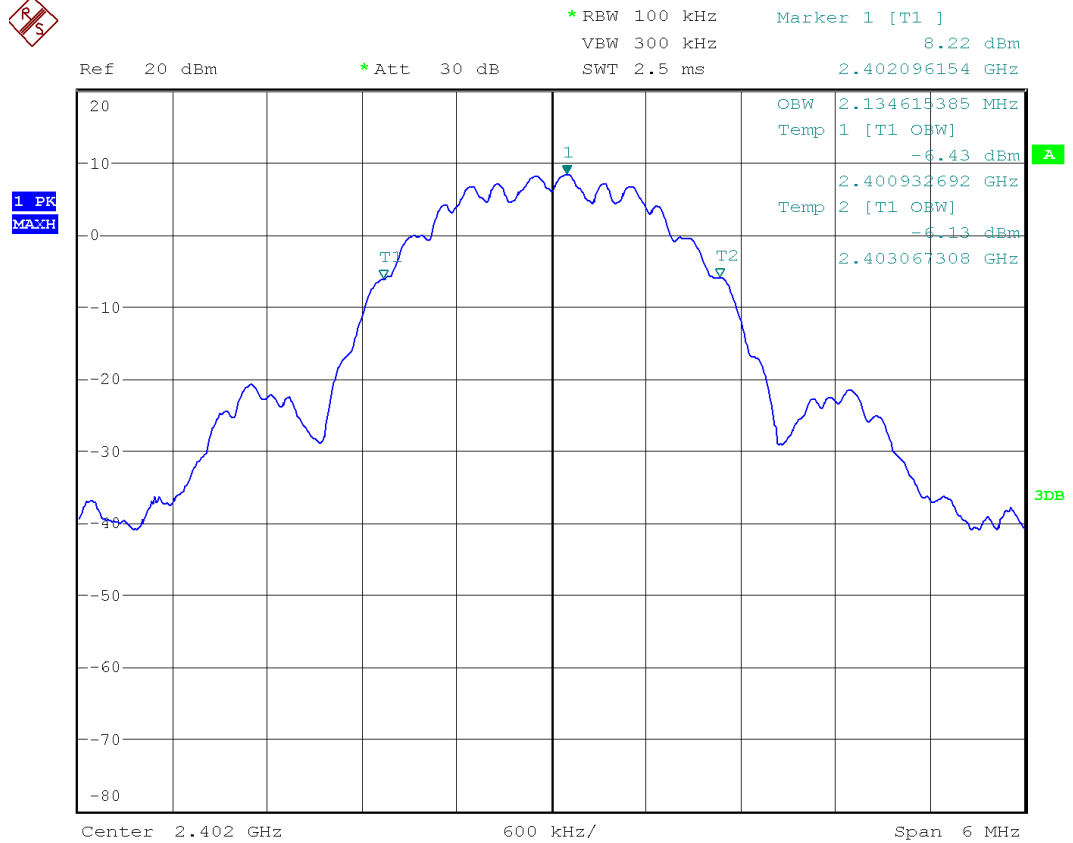
20 dB bandwidth according to 47 CFR Part 15.215(c)



6 dB bandwidth according to 47 CFR Part 15.215(c)



99% emission bandwidth according to RSS-Gen:2019 clause 6.7

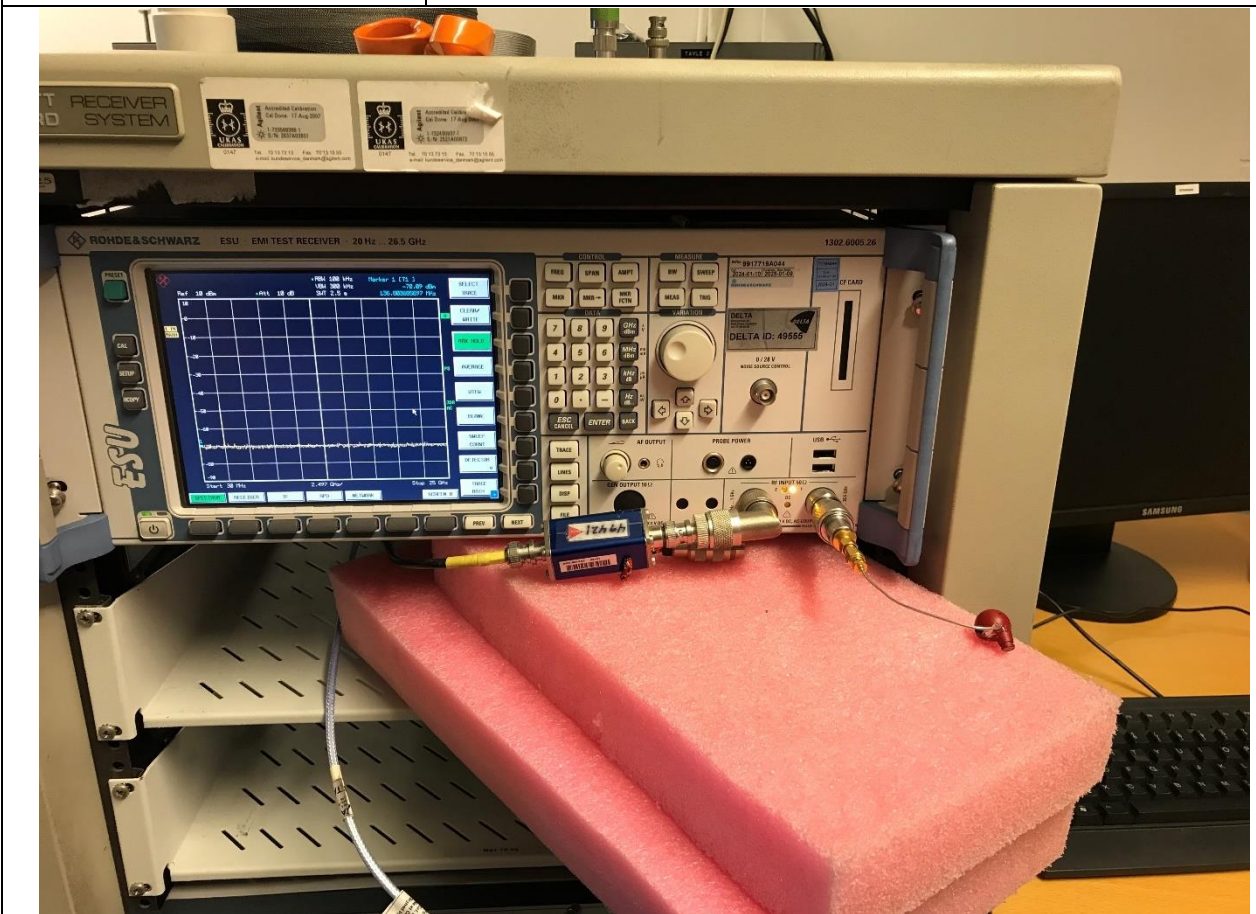


4.11 Conducted spurious emissions test methodology (7.8.8)

Name	Peter Wolf Frandsen (PWF)
Date	2024-11-29
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM4
Applied limit	☒ 20 dB below the highest in-band level.
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector.
Test method applied	☒ 7.8.8 Conducted spurious emissions test methodology
	☐ Other:
Supplementary information	Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers.

Photo 4.11.1: Measurement of Conducted spurious emissions

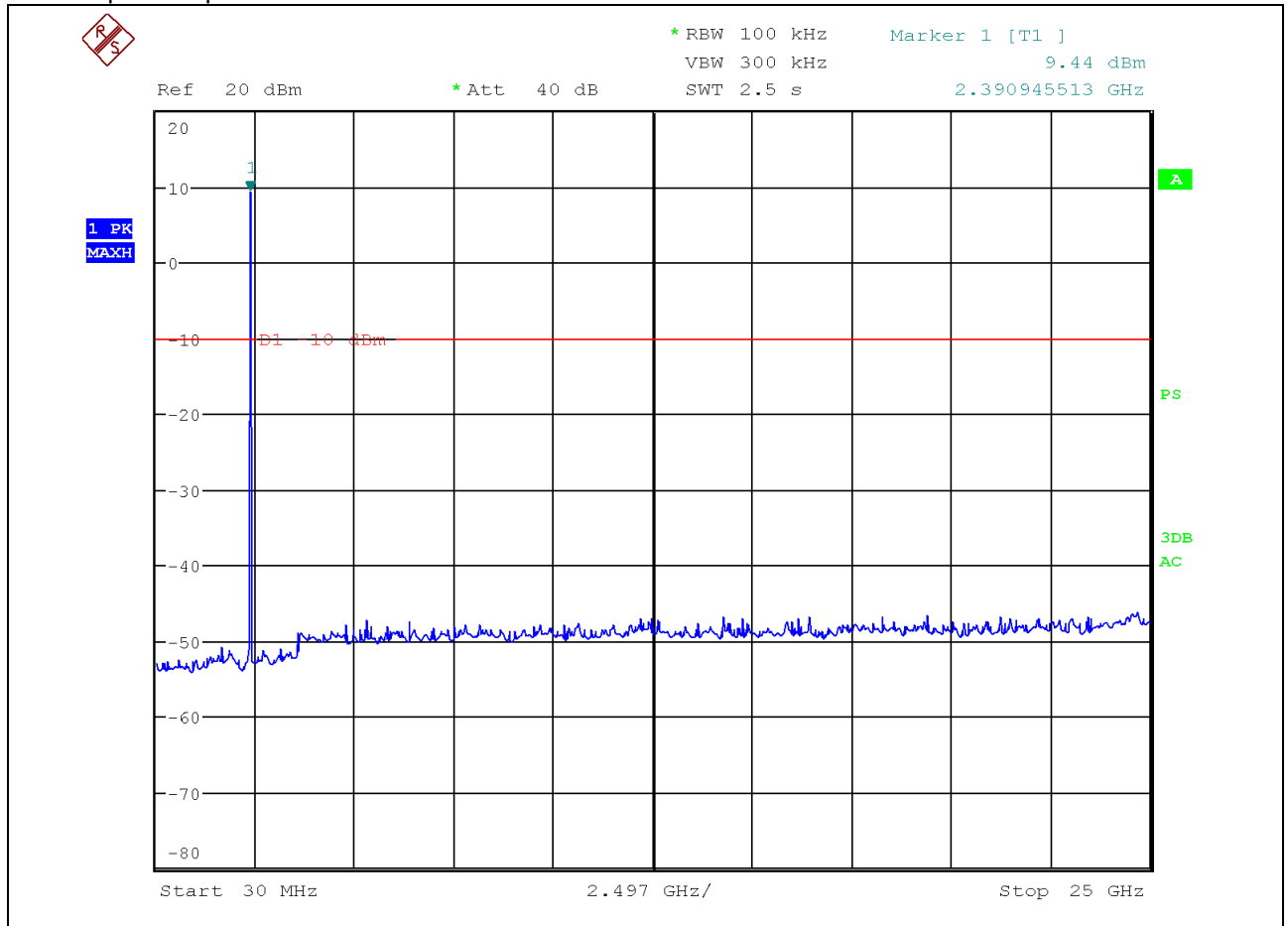


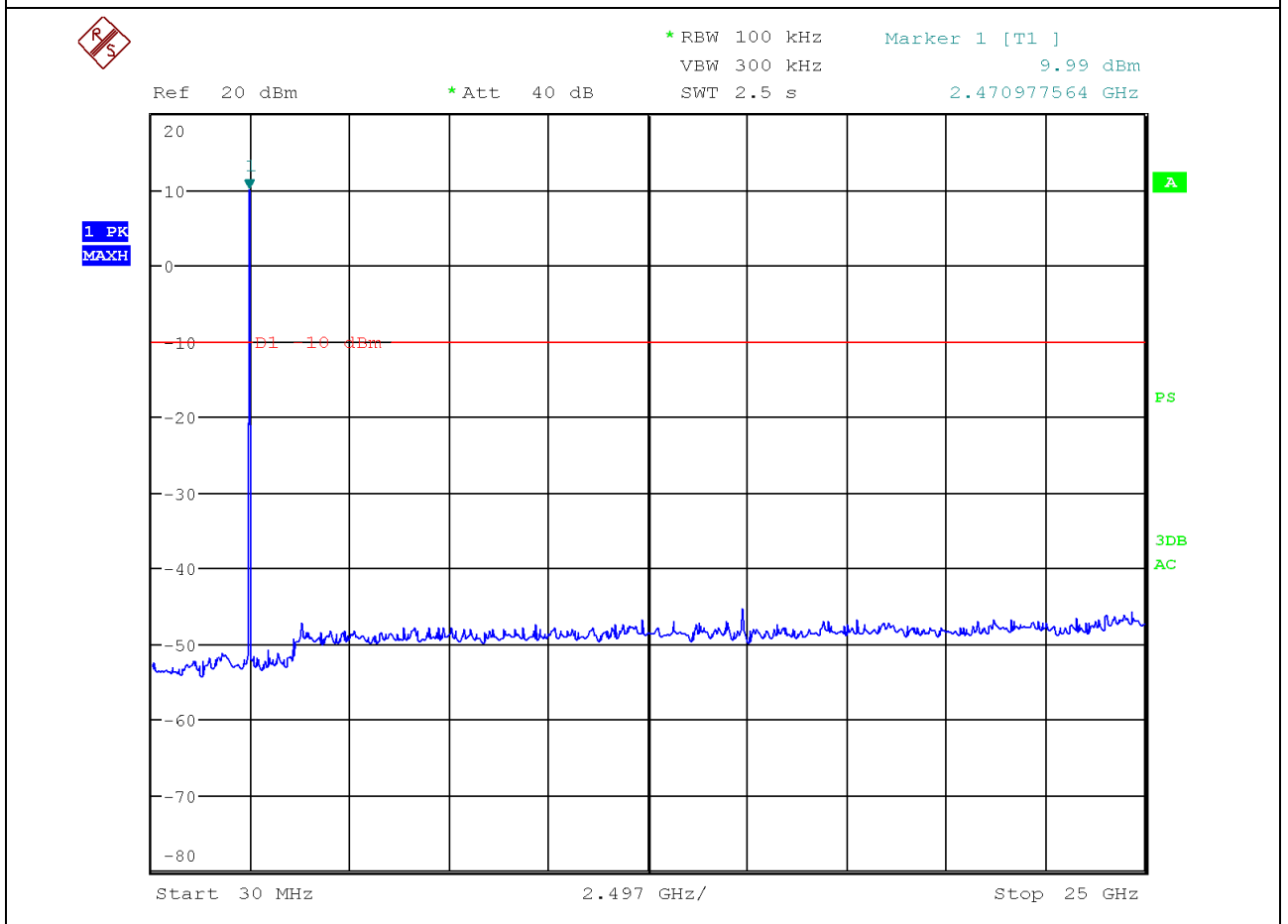
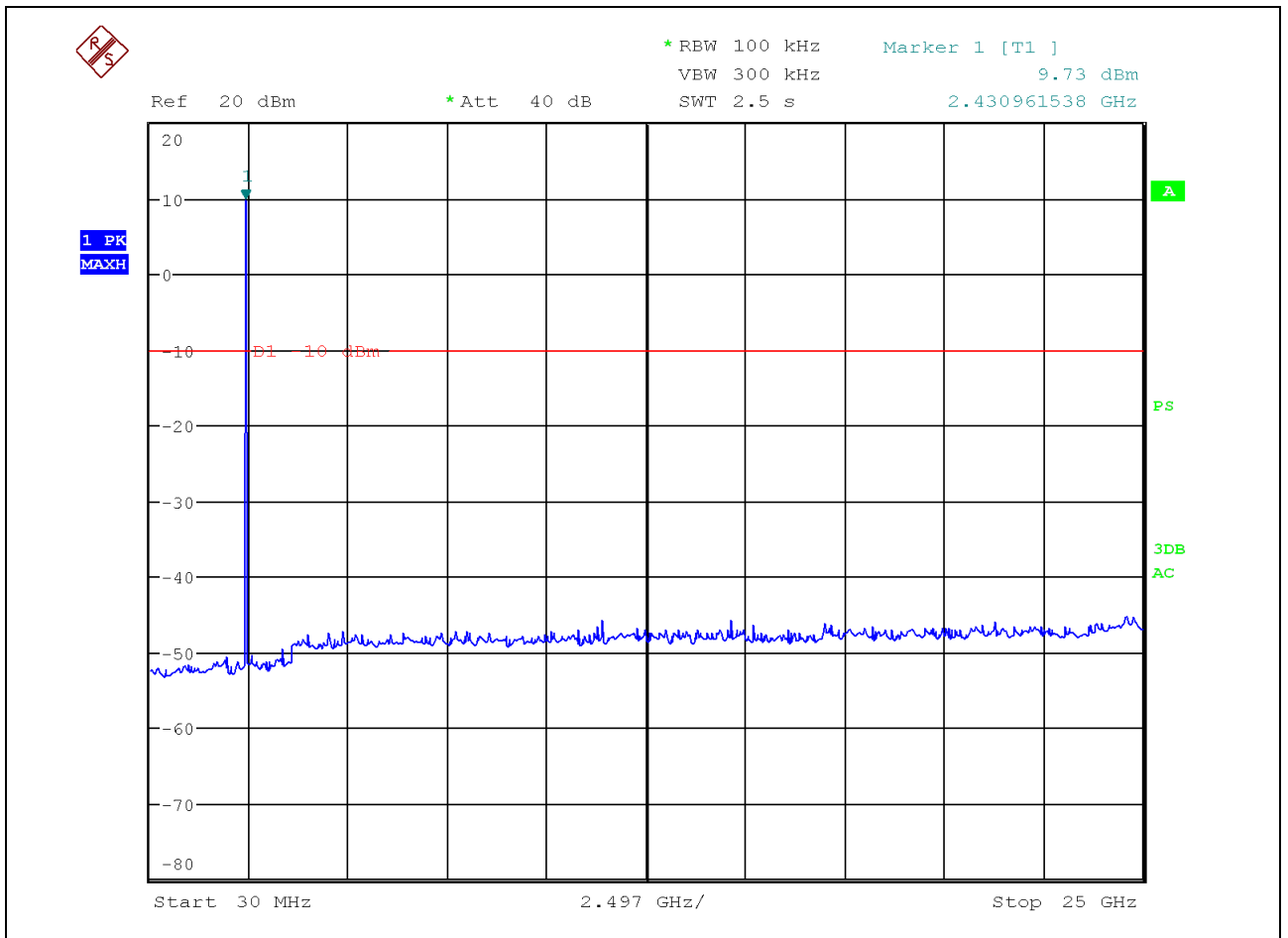
Test results for Conducted spurious emissions

Test item no(s) ref. cl. 1.2 : 3, 4

Operating mode no(s) ref. cl. 1.7 : 3 - BT Classic - Basic Rate mode

Test setup no(s) ref. cl. 3.3 : 2

Graphical representation

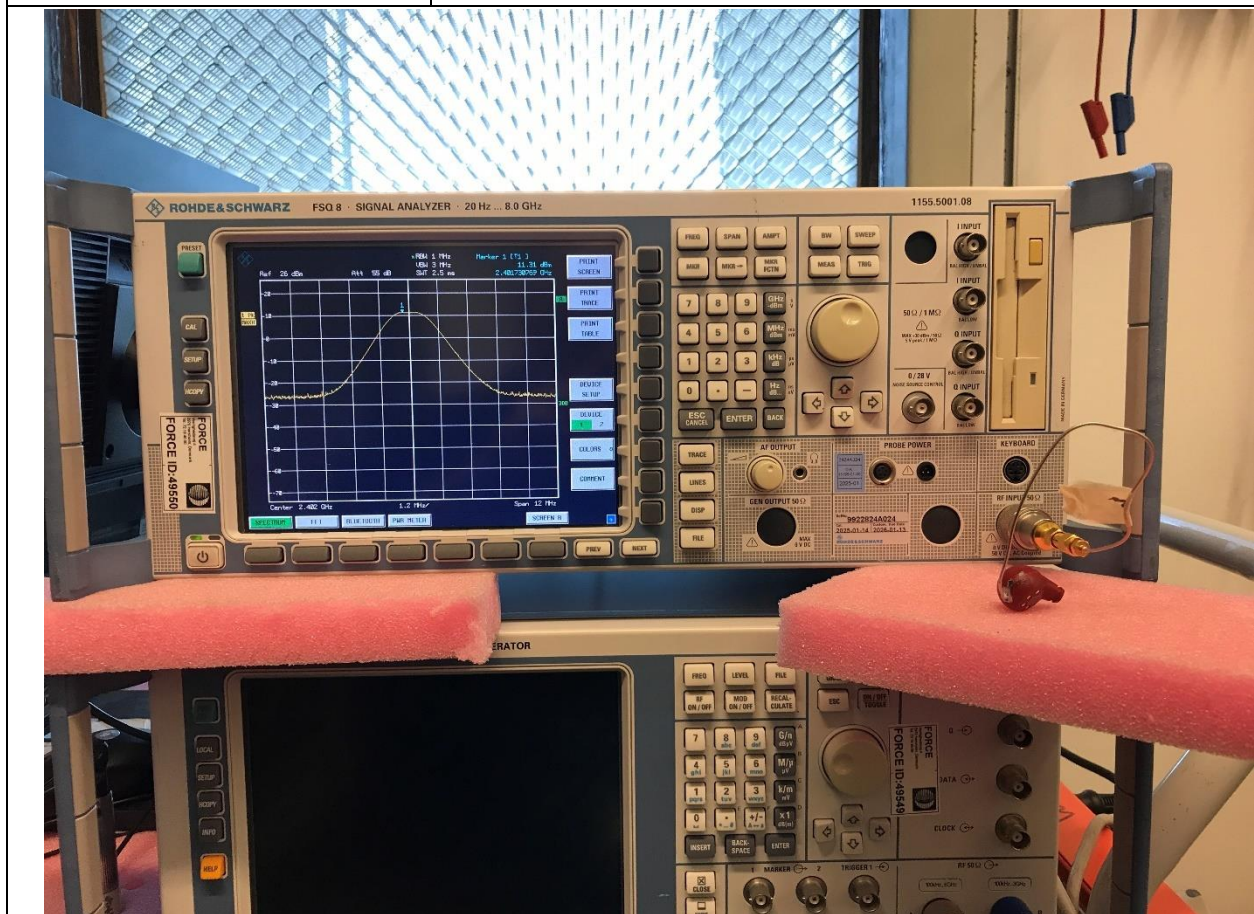


4.12 Maximum peak conducted output power (11.9.1)

Name	Peter Wolf Frandsen (PWF)
Date	2025-02-20
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM2
Applied limit	☒ Limit according to 47 CFR Part 15 C Subpart 15.247
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	RBW $\geq$ DTS bandwidth
Test method applied	☒ 11.9.1 Maximum peak conducted output power
	☐ Other:
Supplementary information	-

Photo 4.12.1 Measurement of Maximum peak conducted output power (DTS)



Test results for Maximum peak conducted output power (DTS)

Test item no(s) ref. cl. 1.2	3, 4
Operating mode no(s) ref. cl. 1.7 :	3 - BLE modes
Test setup no(s) ref. cl. 3.3	2

4.12.1 BLE 1 MHz

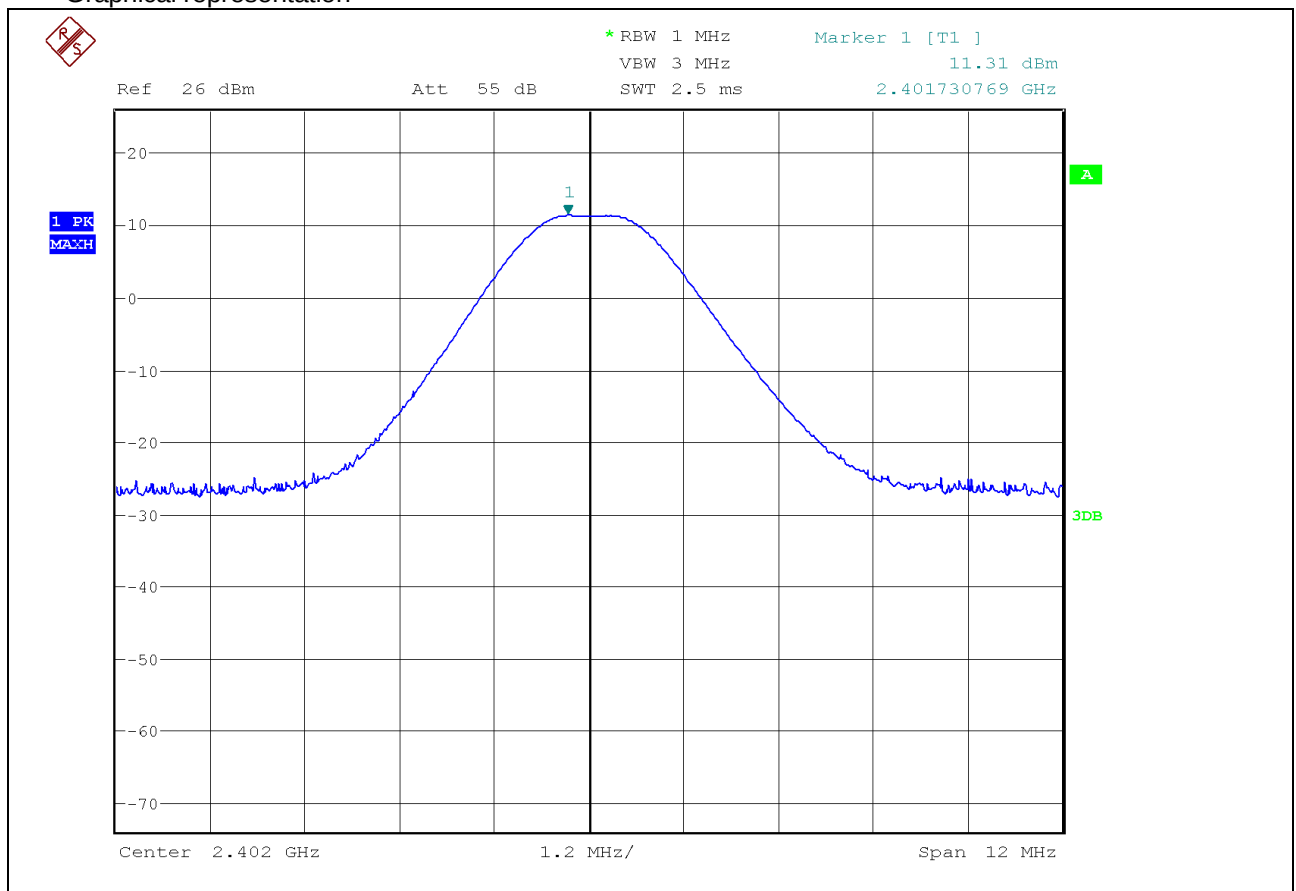
Tabulated Results summary

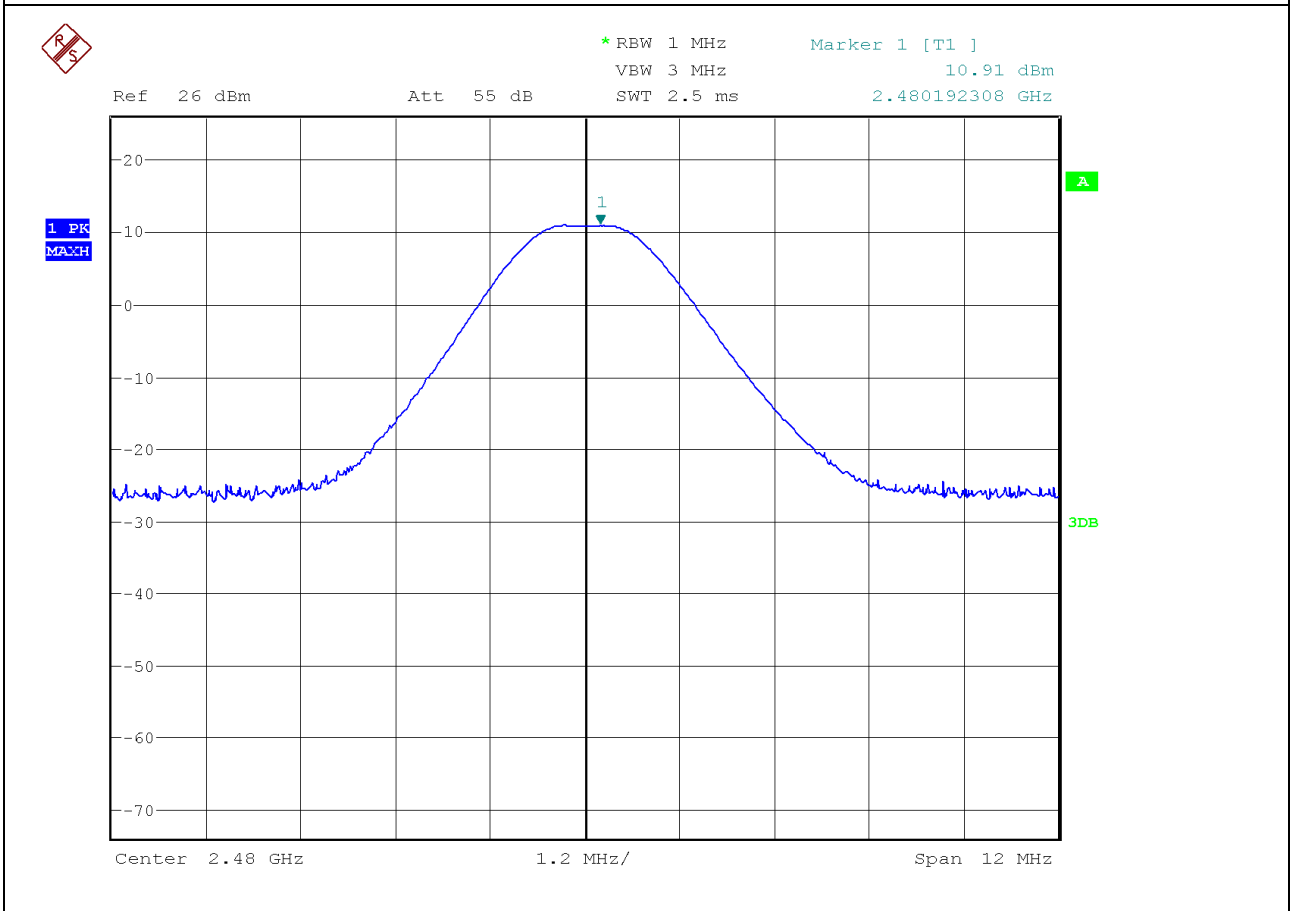
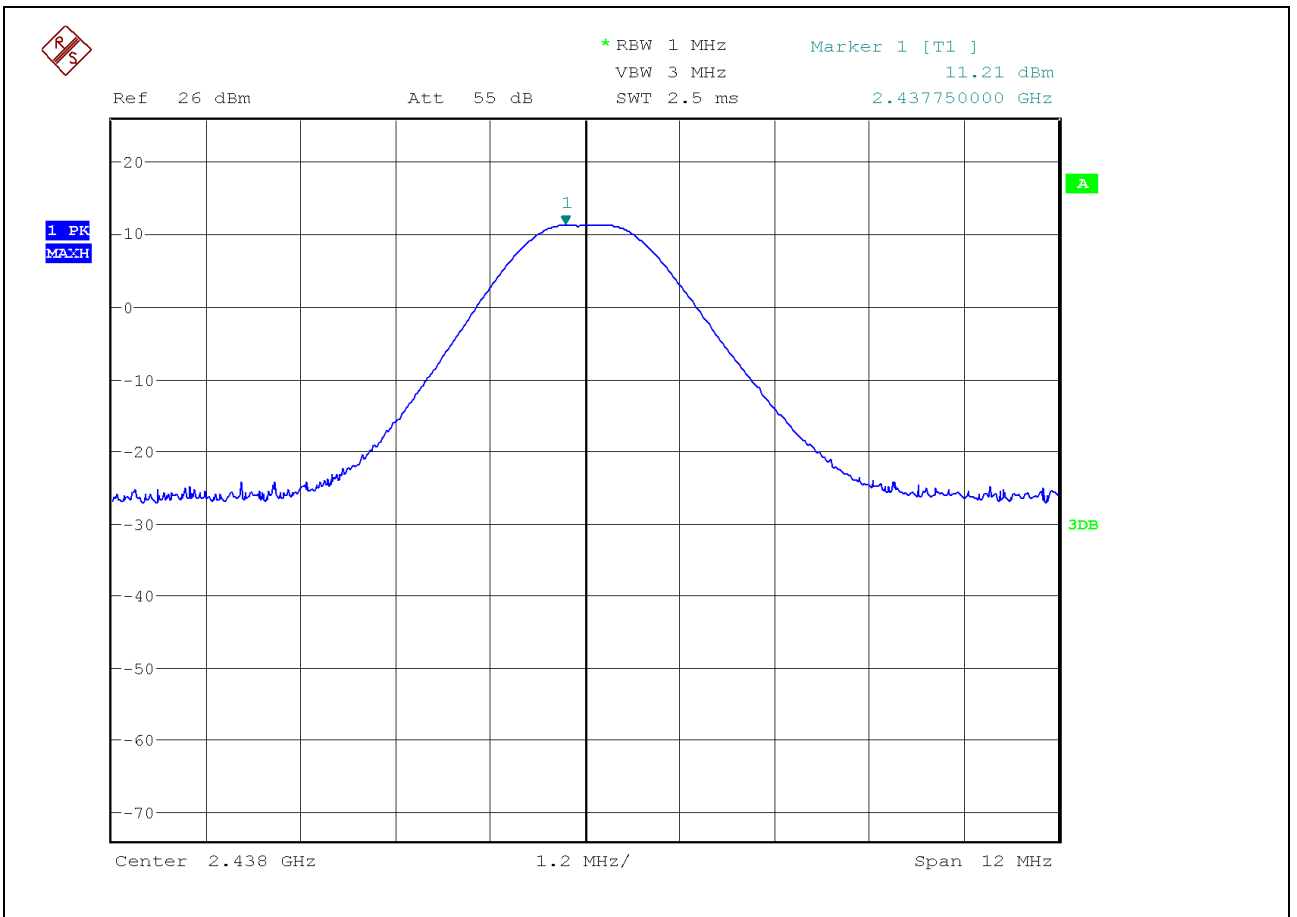
Peak output power

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402	11.31	30.0	PASS
2438	11.21	30.0	PASS
2480	10.91	30.0	PASS

RBW: 1 MHz
VBW: 3 MHz

Graphical representation





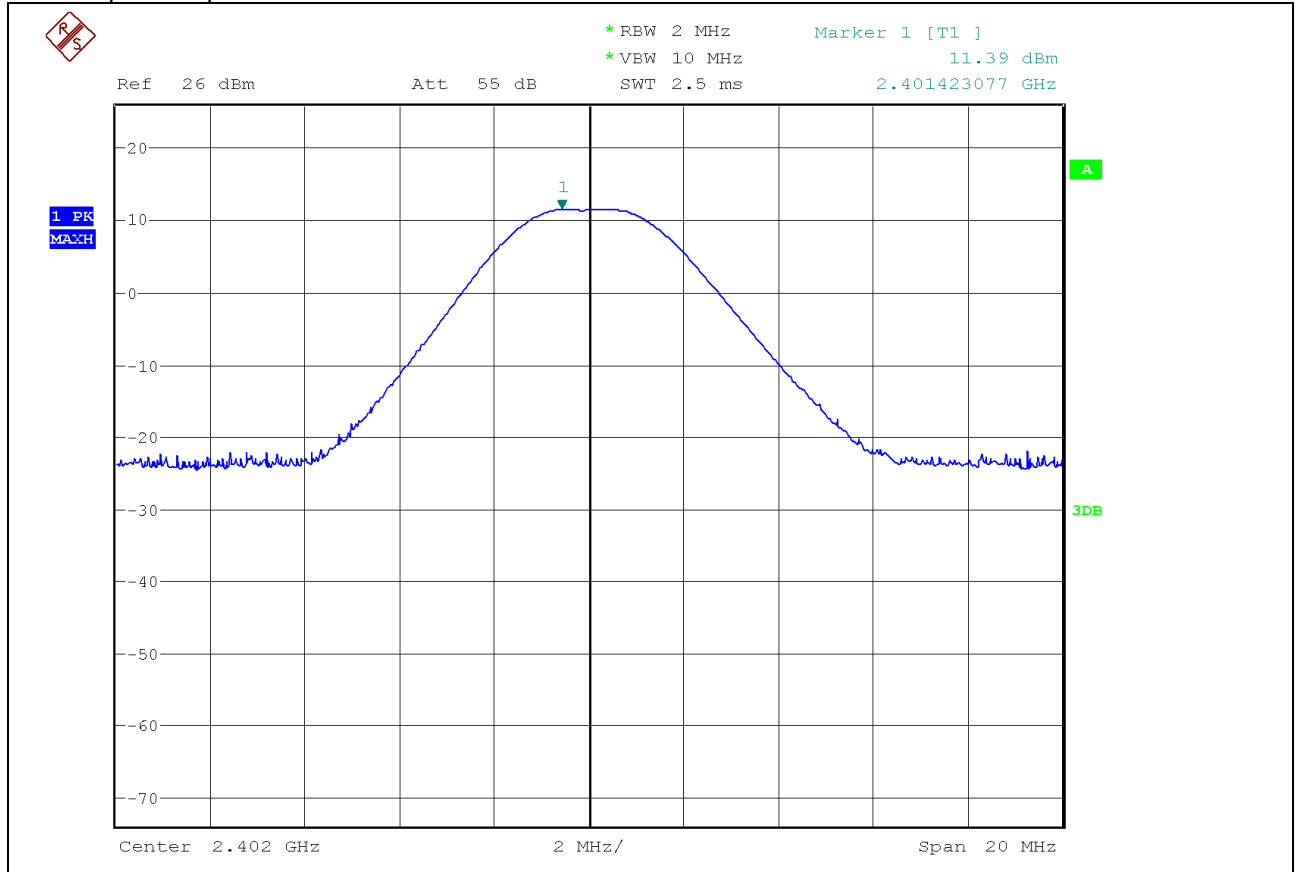
4.12.2 BLE 2 MHz

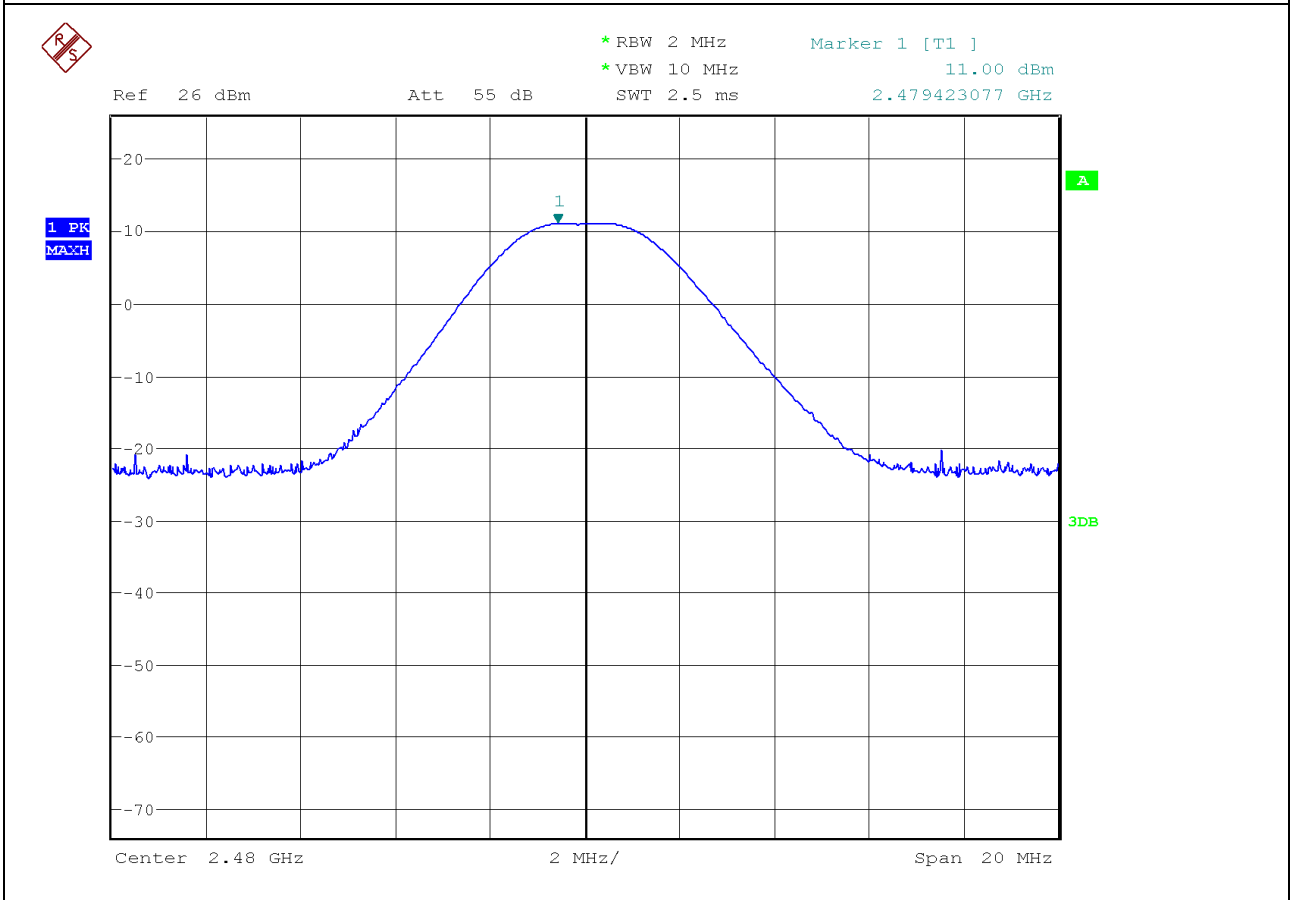
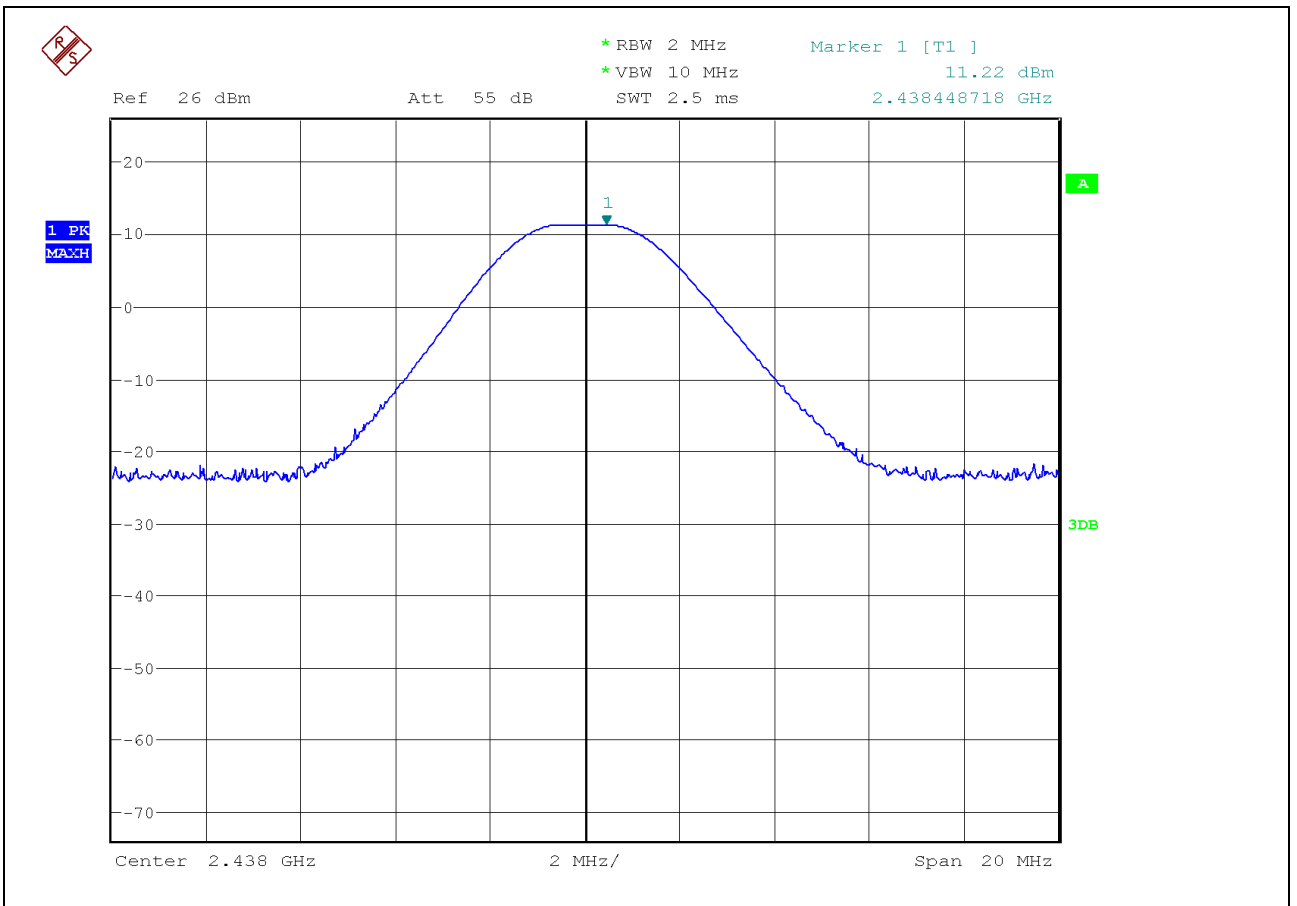
Tabulated Results summary

Peak output power

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402	11.39	30.0	PASS
2438	11.22	30.0	PASS
2480	11.00	30.0	PASS
RBW: 2 MHz VBW: 10MHz			

Graphical representation



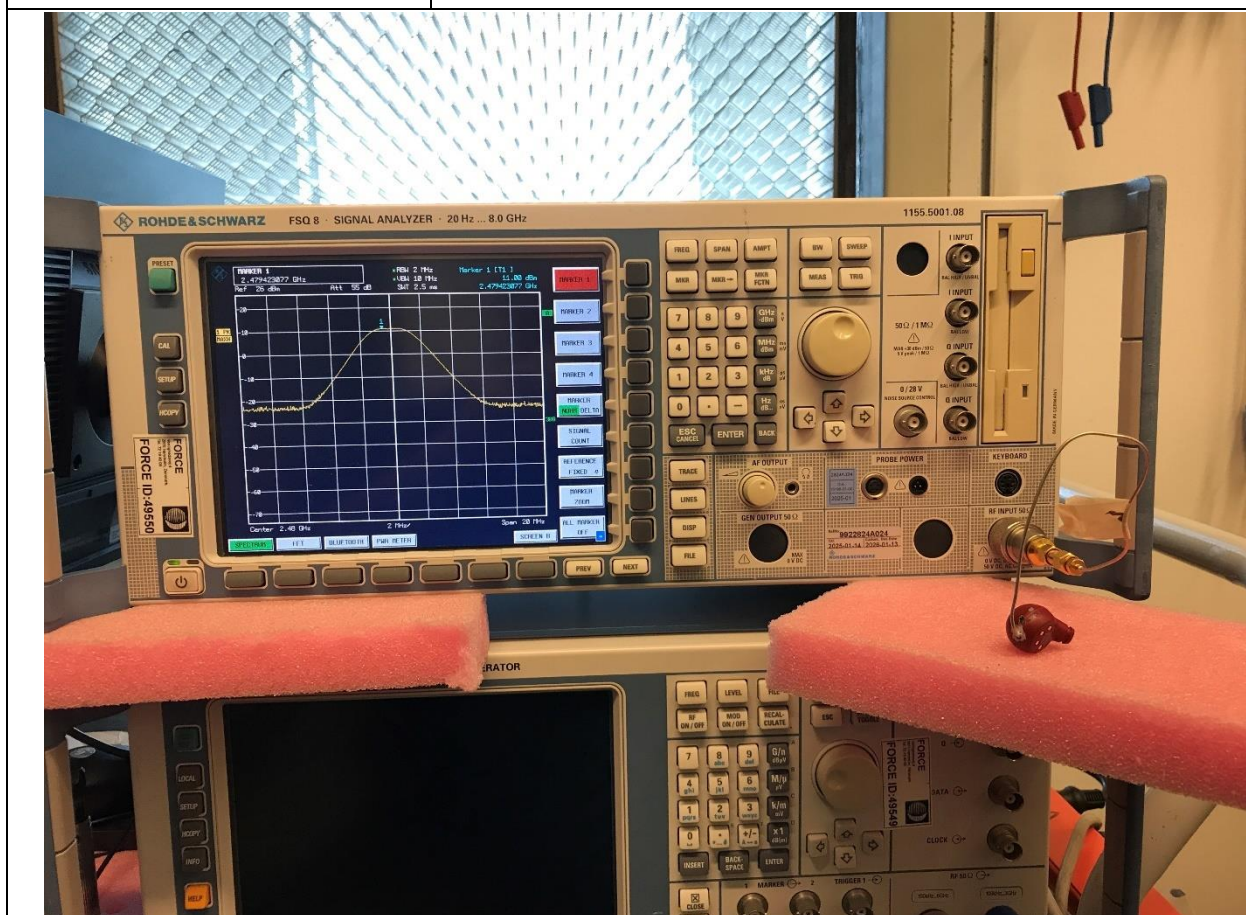


4.13 Maximum power spectral density level in the fundamental emission (11.10)

Name	Peter Wolf Frandsen (PWF)
Date	2025-02-20
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMCUM2
Applied limit	☒ Limit according to 47 CFR Part 15 C Subpart 15.247
	☐ Other:
Test setup description	☒ Conducted measurement performed on SMA connector.
	☐ Other:
Supplementary test setup description	-
Test method applied	☒ 11.10 Maximum power spectral density level in the fundamental emission
	☐ Other:
Supplementary information	-

Photo 4.13.1: Measurement of Maximum power spectral density level in the fundamental emission

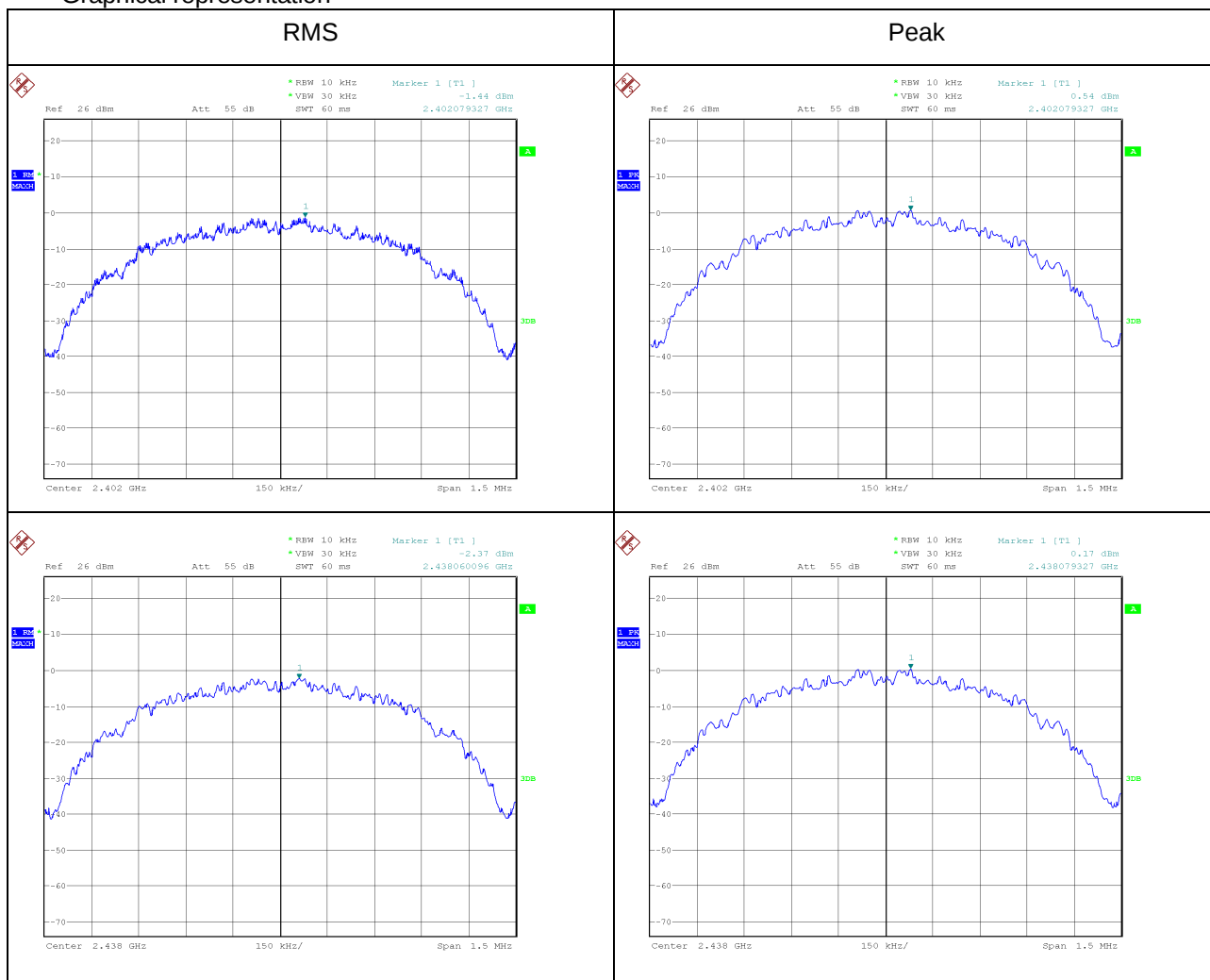


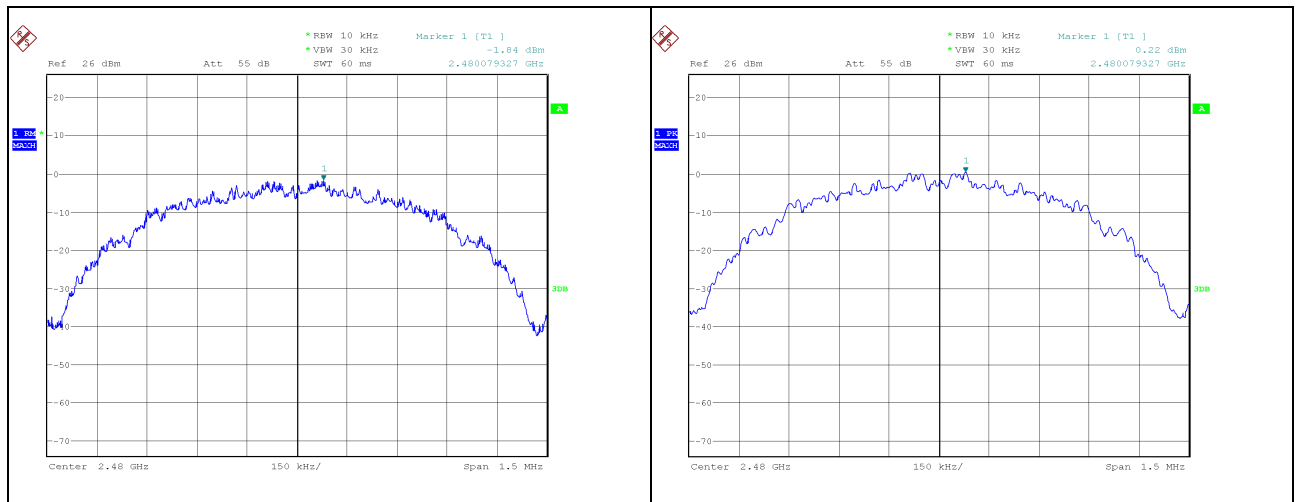
Test results for Maximum power spectral density level in the fundamental emission

Test item no(s) ref. cl. 1.2	3, 4
Operating mode no(s) ref. cl. 1.7 :	1, 2, 3
Test setup no(s) ref. cl. 3.3	2

4.13.1 BLE 1 MHz
Tabulated Results summary

DUT Frequency (MHz)	PSD (dBm) RMS	PSD (dBm) Peak	Limit Max (dBm)	Result
2402	-1.44	0.54	8.0	PASS
2438	-2.37	0.17	8.0	PASS
2480	-1.84	0.22	8.0	PASS
RBW: 10 kHz VBW: 30 kHz				

Graphical representation


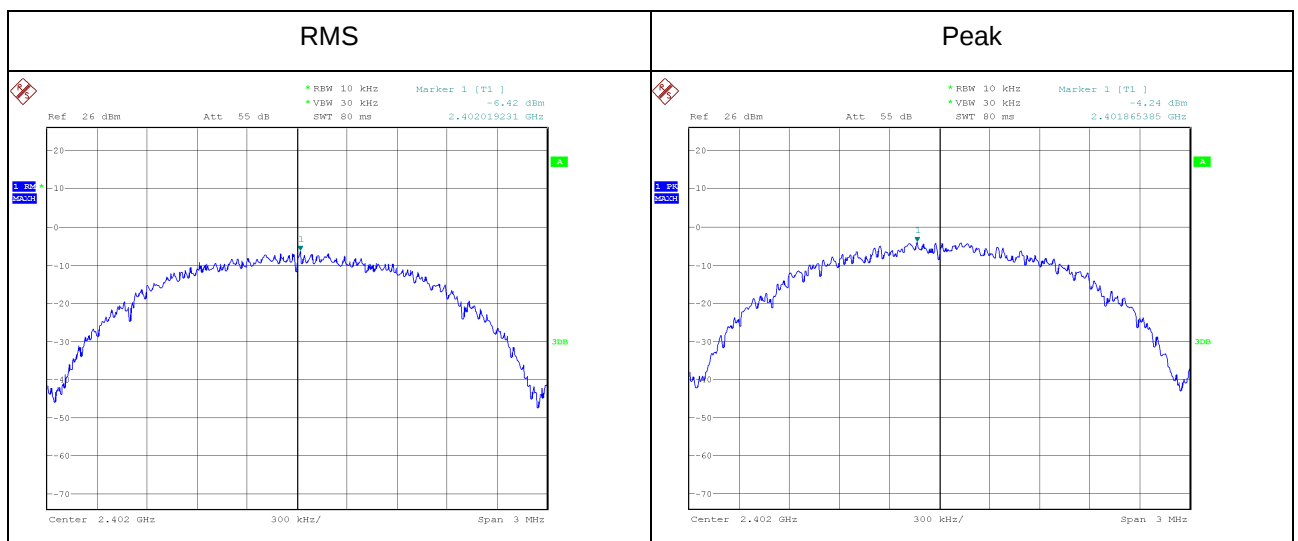


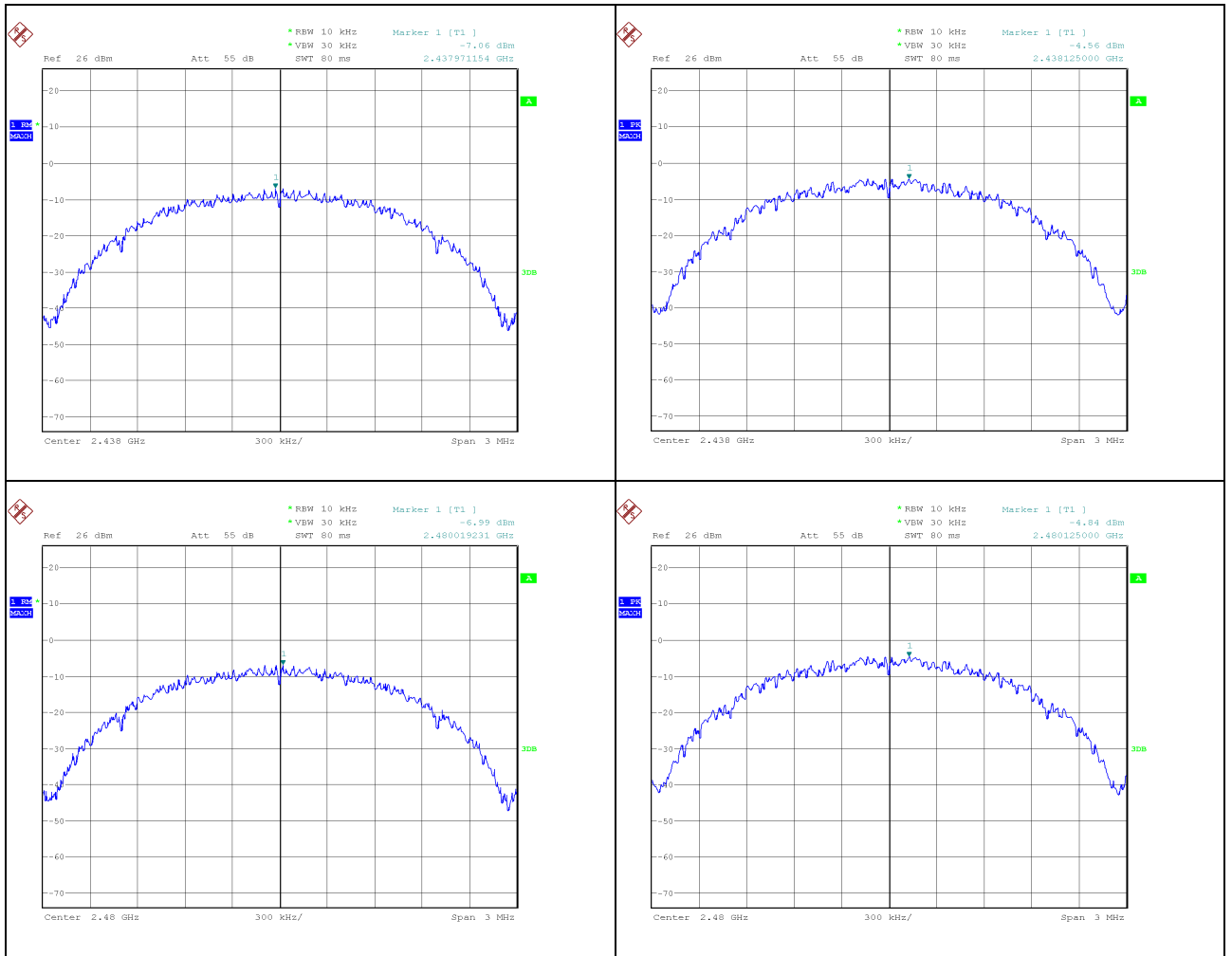
4.13.2 BLE 2 MHz

Tabulated Results summary

DUT Frequency (MHz)	PSD (dBm) RMS	PSD (dBm) Peak	Limit Max (dBm)	Result
2402	-6.42	-4.24	8.0	PASS
2438	-7.06	-4.56	8.0	PASS
2480	-6.99	-4.84	8.0	PASS
RBW: 10 kHz VBW: 30 kHz				

Graphical representation





4.14 Measurement of field strength of fundamental (6.6 & 11.13)

Name	Peter Wolf Frandsen (PWF)
Date	2024-10-29
Rationale for verdict N/A	-

Test location (stand)	Hørsholm EMIRUM
Applied limit class	☒ Limit of field strength of fundamental according to 47 CFR Part 15.247
	☐ Limit of field strength of fundamental according to 47 CFR Part 15.249
	☐ Other:
Test setup description	☒ Equipment on a table 150 cm height
	☐ Equipment on the floor (isolated from ground plane)
	☐ Other:
Supplementary test setup description	Emissions in restricted frequency bands
Test method applied	☒ FSOATS CISPR 16-2-3 with measurement distance [m]: 3
	☐ Other:
Supplementary information	Measured radiated during 4.3

Photo 4.14.1	Measurement of field strength of fundamental Separate test for BT Classic, BLE 1 MHz and BLE 2 MHz
See section 4.3	

Test results for field strength of fundamental

Test item no(s) ref. cl. 1.2	1, 2
Operating mode no(s) ref. cl. 1.7 :	1 (BT Classic - Basic Rate hopping 20 ms), 2 BLE modes
Test setup no(s) ref. cl. 3.3	1

Tabulated Results summary

BT Classic

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.00	---	83.00	IN-BAND	IN-BAND	100	1000	340.0	V	246.0	8.5
2402.00	94.09	---	IN-BAND	IN-BAND	100	1000	100.0	V	314.0	8.5
2438.00	95.28	---	IN-BAND	IN-BAND	100	1000	164.0	V	311.0	8.5
2438.00	---	80.45	IN-BAND	IN-BAND	100	1000	151.0	V	295.0	8.5
2480.00	---	87.13	IN-BAND	IN-BAND	100	1000	297.0	V	258.0	8.6
2480.00	95.76	---	IN-BAND	IN-BAND	100	1000	108.0	V	316.0	8.6

BLE 1 MHz

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.00	94.72	---	IN-BAND	IN-BAND	100	1000	136.0	H	210.0	8.5
2402.00	---	92.71	IN-BAND	IN-BAND	100	1000	135.0	H	210.0	8.5
2438.00	---	94.53	IN-BAND	IN-BAND	100	1000	155.0	H	178.0	8.5
2438.00	95.28	---	IN-BAND	IN-BAND	100	1000	152.0	H	189.0	8.5
2480.00	96.40	---	IN-BAND	IN-BAND	100	1000	149.0	V	141.0	8.6
2480.00	---	95.42	IN-BAND	IN-BAND	100	1000	150.0	V	142.0	8.6

BLE 2 MHz

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.00	---	91.32	IN-BAND	IN-BAND	10	1000	221.0	H	0.0	8.5
2402.00	92.85	---	IN-BAND	IN-BAND	10	1000	219.0	H	0.0	8.5
2438.00	---	95.13	IN-BAND	IN-BAND	10	1000	150.0	H	178.0	8.5
2438.00	96.30	---	IN-BAND	IN-BAND	10	1000	150.0	H	179.0	8.5
2480.00	---	95.38	IN-BAND	IN-BAND	10	1000	150.0	V	181.0	8.6
2480.00	96.67	---	IN-BAND	IN-BAND	10	1000	149.0	V	179.0	8.6

The result is calculated by adjusting the receiver reading with the correction factor.

Correction factor (dB) = Antenna factor (dB) + Cable loss (dB) + Attenuation (dB) + Pre-amp gain (dB)

Tabulated Result terms:

Field strength = MaxPeak (dBμV/m) and CAverage (dBμV/m)

Correction factor = Corr. (dB)

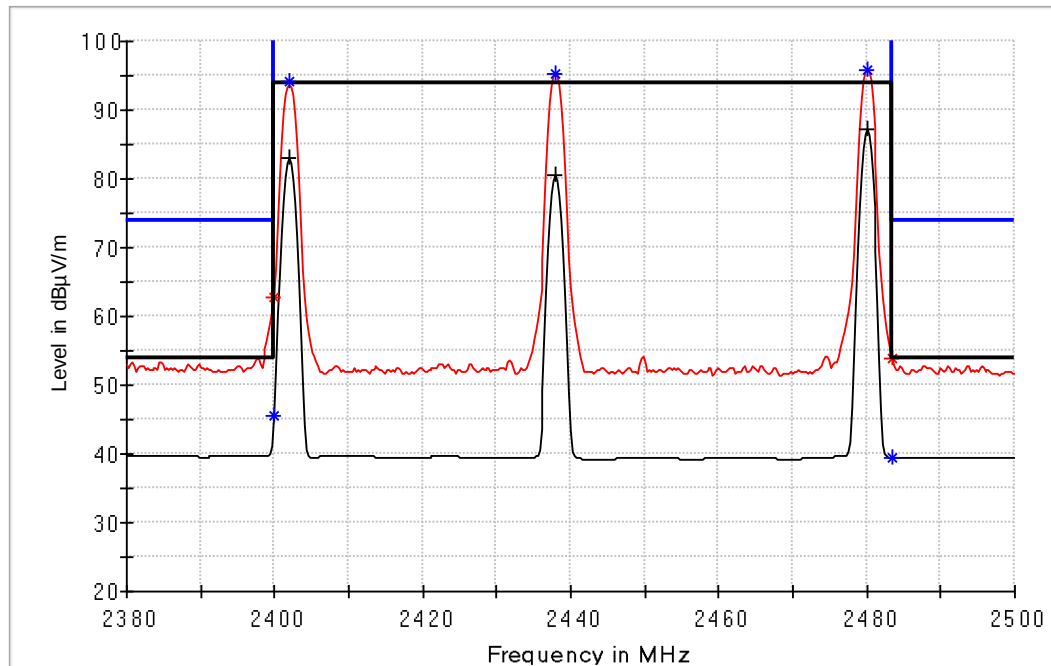
Note: The test software state attenuation as a positive value and amplification as a negative value.

Sample calculation: 83.00 dBμV/m (field strength) = 74.5 dBμV (receiver reading) + 8.5 dB (Correction factor)

Graphical representation

BT Classic

Full Spectrum

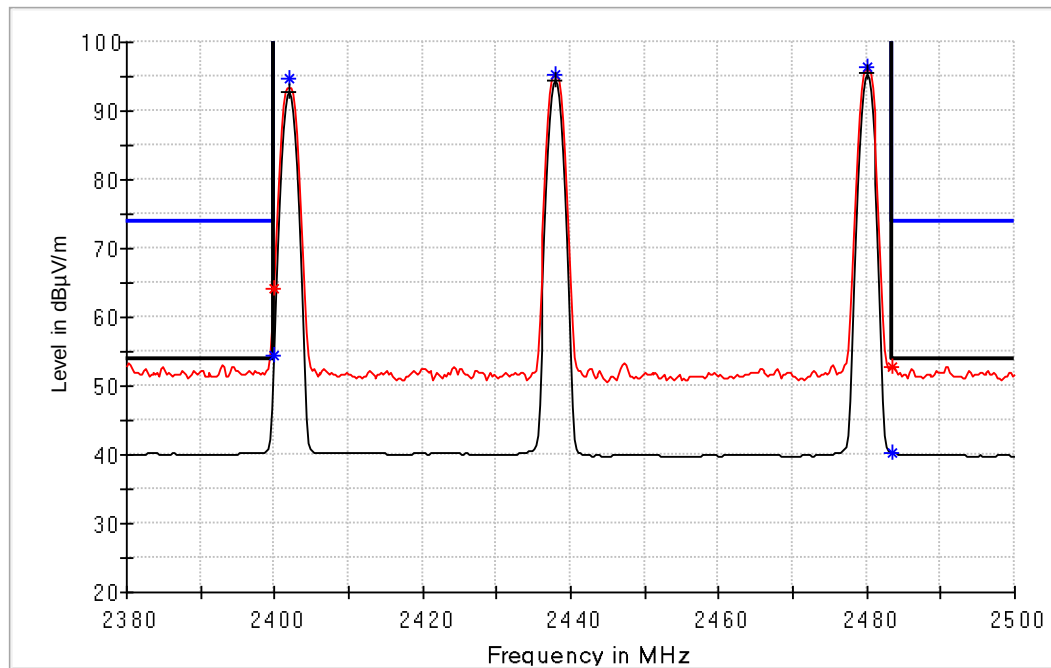


— Preview Result 2-AVG
 * PK+
 — FCC Part 15.249 2,4 GHz Pk 3 m
 * Final_Result PK+

— Preview Result 1-PK+
 * AVG
 — FCC Part 15.249 2,4 GHz Avg 3 m
 + Final_Result CAV

BLE 1 MHz

Full Spectrum

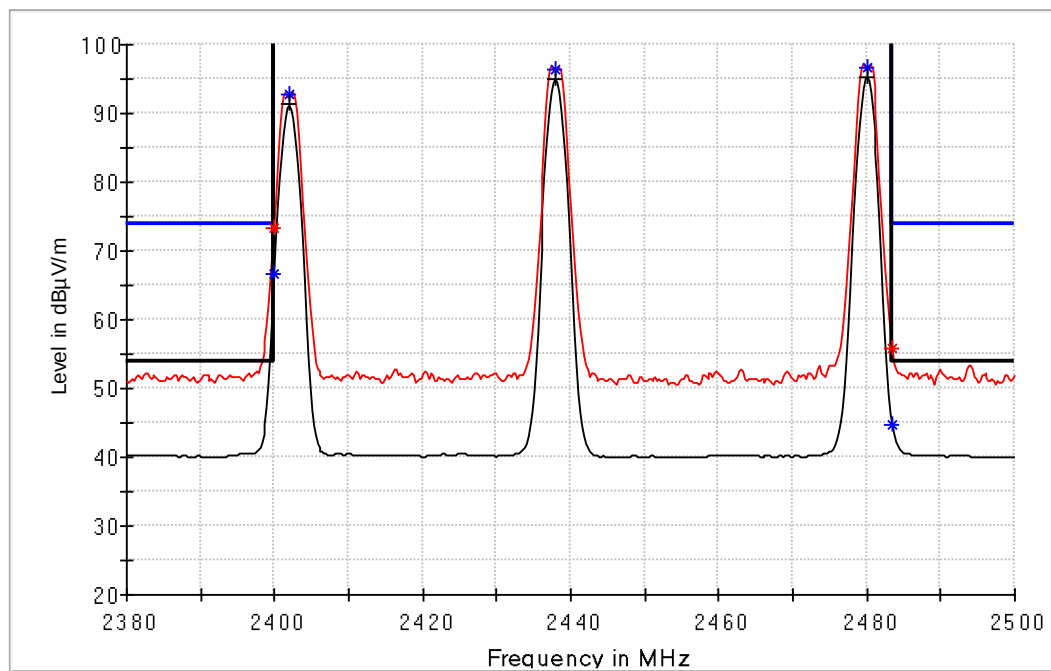


— Preview Result 2-AVG
 — FCC Part 15.247 DTS 2,4 GHz Pk 3 m
 * PK+
 * Final_Result PK+

— Preview Result 1-PK+
 * AVG
 — FCC Part 15.247 DTS 2,4 GHz Avg 3 m
 + Final_Result CAV

BLE 2 MHz

Full Spectrum



— Preview Result 2-AVG
— FCC Part 15.247 DTS 2,4 GHz Pk 3 m
* PK+
* Final_Result PK+
— Preview Result 1-PK+
— FCC Part 15.247 DTS 2,4 GHz Avg 3 m
* AVG
+ Final_Result CAV

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}	
	Aarhus	Hørsholm
AC power-line conducted emission (6.2)	2.68	2.68
Radiated emission below 30 MHz (6.4)	4.64	2.65
Radiated emission 30 - 1000 MHz (6.5)	5.72 / 5.56	6.15 / 4.9
Radiated emission above 1000 MHz (6.6)	4.2	4.9
Field strength of fundamental (6.6)	4.2	4.9
Conducted antenna port measurements	1.7	1.7

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 IECCE 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

Conducted spurious emissions test:

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp
49555	EMI Measuring Receiver	Rohde & Schwarz	ESU26	2024-01-10	2025-02-09

Radiated emission 30 - 1000 MHz (6.5):

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp
29797	Bilog Antenna, 30-2000 MHz	Chase Electronics Ltd.	CBL 6111A	2023-09-04	2025-09-03
49590	Cable, Low-Loss uWave, N-N, 8.0 m "EMI"	Suhner	SUCOFLEX 104 PB	2024-05-07	2025-05-07
49704	Cable 3 m SMA-N	Suhner	SUCOFLEX104	2024-05-07	2025-05-07
49808	Attenuator, DC-12.4GHz, 6 dB	Huber & Suhner	6806.17A	2023-09-04	2025-09-03
49817	Cable, Low-Loss uWave, N-N, 8.0 m "EMI"	Suhner	Sucoflex 104 PB	2024-03-25	2025-03-25
49900	Spectrum Analyzer / Measurement Receiver	Rohde & Schwarz	ESW26	2024-01-09	2025-02-08
49999	EMC32-Software EMIroom	Rohde & Schwarz	Ver. 10.60.20	N/A	N/A

Radiated emission above 1000 MHz (6.6), Field strength of fundamental (6.6):

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp
29953	Antenna Tower/Turntable Controller	EMCO	2090	N/A	N/A
49625	SRD Coax Switch Matrix Used in 1 - 26 GHz Antenna systems	DELTA	SRD Coax Switch Matrix Used in 1 - 26 GHz SRD Antenna system	2024-06-04	2025-06-04
49674	Maturo Controller	Maturo	NCD	N/A	N/A
49712	Dual Ridge Horn Antenna--1GHz-26GHz (2GHz-26GHz)	Satimo	SH2000	2023-08-16	2025-08-15
49869	Cable 3 m PC3.5 M-F Sucoflex 126	Huber & Suhner	Sucoflex 126	2024-06-04	2025-06-04
49870	Cable 13 m PC3.5 M-M Sucoflex 126EA	Huber & Suhner	Sucoflex 126EA	2024-06-04	2025-06-04
49900	Spectrum Analyzer / Measurement Receiver	Rohde & Schwarz	ESW26	2024-01-09	2025-02-08
49955	Cable 7 m PC3.5 MALE-MALE Sucoflex 126EA	Huber & Suhner	SF126EA/11PC35/11PC35/7000MM	2024-05-03	2025-05-03
49999	EMC32-Software EMIroom	Rohde & Schwarz	Ver. 10.60.20	N/A	N/A

Conducted antenna port measurements

No	Category/Action	Manufacturer	Type no	Cal. date	Cal. exp
49550	Signal Analyzer	Rohde & Schwarz	FSQ8	2024-01-10 2025-01-14	2025-02-09 2026-01-13
49732	RF-Powermeter for SRD Power Measurement	Rohde & Schwarz	OSP120 INCL. B157	2024-01-29	2025-01-28
49994	EMC32-Software SRD setup	Rohde & Schwarz	Ver. 10.40.10	2024-09-16	2025-09-16

End of report