PHOENIX TESTLAB
Königswinkel 10
32825 Blomberg, Germany
Phone: +49 (0) 52 35 / 95 00-0
Fax: +49 (0) 52 35 / 95 00-10
office@phoenix-testlab.de
www.phoenix-testlab.de

Test Report

Report Number:

F200549E1

Equipment under Test (EUT):

Tag for indoor localization
SmartAntenna / WTag

Applicant:

BeSpoon SAS

Manufacturer:

BeSpoon SAS

ilac-MRA DAkkS Deutsche Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

[1] **ANSI C63.10-2013**, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

[2] **FCC CFR 47 Part 15**, Radio Frequency Devices

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test.
The complete test results are presented in the following.

Test engineer:	Paul NEUFELD		07.12.2020
	Name	Signature	Date
Authorized reviewer:	Bernward ROHDE		07.12.2020
	Name	Signature	Date

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

This test report is valid in hardcopy form as well as in electronic form.

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1 Identification

1.1 Applicant

Name:	BeSpoon SAS
Address:	17 rue du lac Saint-André - Savoie Technolac – BP10402 73372 Le Bourget du Lac
Country:	France
Name for contact purposes:	Mr. JEAN-MARIE ANDRE
Phone:	+33 458 82 88 86
eMail Address:	fla@bespoon.com
Applicant represented during the test by the following person:	---

1.2 Manufacturer

Name:	BeSpoon SAS
Address:	17 rue du lac Saint-André - Savoie Technolac – BP10402 73372 Le Bourget du Lac
Country:	France
Name for contact purposes:	Mr. JEAN-MARIE ANDRE
Phone:	+33 458 82 88 86
eMail Address:	fla@bespoon.com
Applicant represented during the test by the following person:	---

1.3 Test Laboratory

The tests were carried out by:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Accreditation designation number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment Under Test)

Test object: *	Tag for indoor localization
Type / PMN: *	omlox SmartAntenna / omlox WTag
FCC ID: *	2AVYU-OMLOX-ST
Serial number (SmartAntenna radiated): *	1910154B0040002B
Serial number (SmartAntenna antenna port conducted): *	1910154B00400029
Serial number (WTag radiated + antenna port conducted): *	1910154B003002F0
PCB identifier: *	OMLOX WTAG 1910154B00400036 OMLOX SmartAntenna 1910154B00400036
Hardware version: *	Rev F
Software version: *	3.0.3

Note: PHOENIX Testlab GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

Bluetooth LE frequencies				
Channel 00	RX	2402 MHz	TX	2402 MHz
Channel 19	RX	2440 MHz	TX	2440 MHz
Channel 39	RX	2480 MHz	TX	2480 MHz

1.5 Technical Data of Equipment

Fulfills specifications: *	Bluetooth 4.2 low energy only					
Antenna type: *	Internal PCB antenna					
Radio chip: *	Nordic nRF52840					
Antenna name: *	ANT					
Antenna gain: *	2 dBi					
Antenna connector: *	None					
Supply voltage EUT (Smart Antenna - USB): *	U_{nom}=	5.0 V DC	U_{min}=	3.1 V DC	U_{max}=	5.5 V DC
Supply voltage EUT (WTag – internal battery): *	U_{nom}=	3.7 V DC	U_{min}=	3.0 V DC	U_{max}=	4.2 V DC
Type of modulation: *	GFSK					
Operating frequency range:*	2402 – 2480 MHz					
Number of channels: *	40					
Temperature range: *	-10 °C to 55 °C					
Lowest / highest internal frequency: *	32 kHz / 4500 MHz					

* Declared by the applicant

Equipment used for testing	
Cables (connected to the EUT): *1	USB cable (~ 1 m)
USB AC/DC adaptor: *2	ETA0U83EWE by SAMSUNG
Microwave coaxial connector probe for swg with switch *1	MXHQ87WA3000
Laptop PC:*2	Fujitsu Lifebook S751 (PM No. 201036)

*1 Provided by the applicant
*2 Provided by the laboratory

1.6 Dates

Date of receipt of test sample:	03.08.2020
Start of test:	03.08.2020
End of test:	26.08.2020

2 Operational States

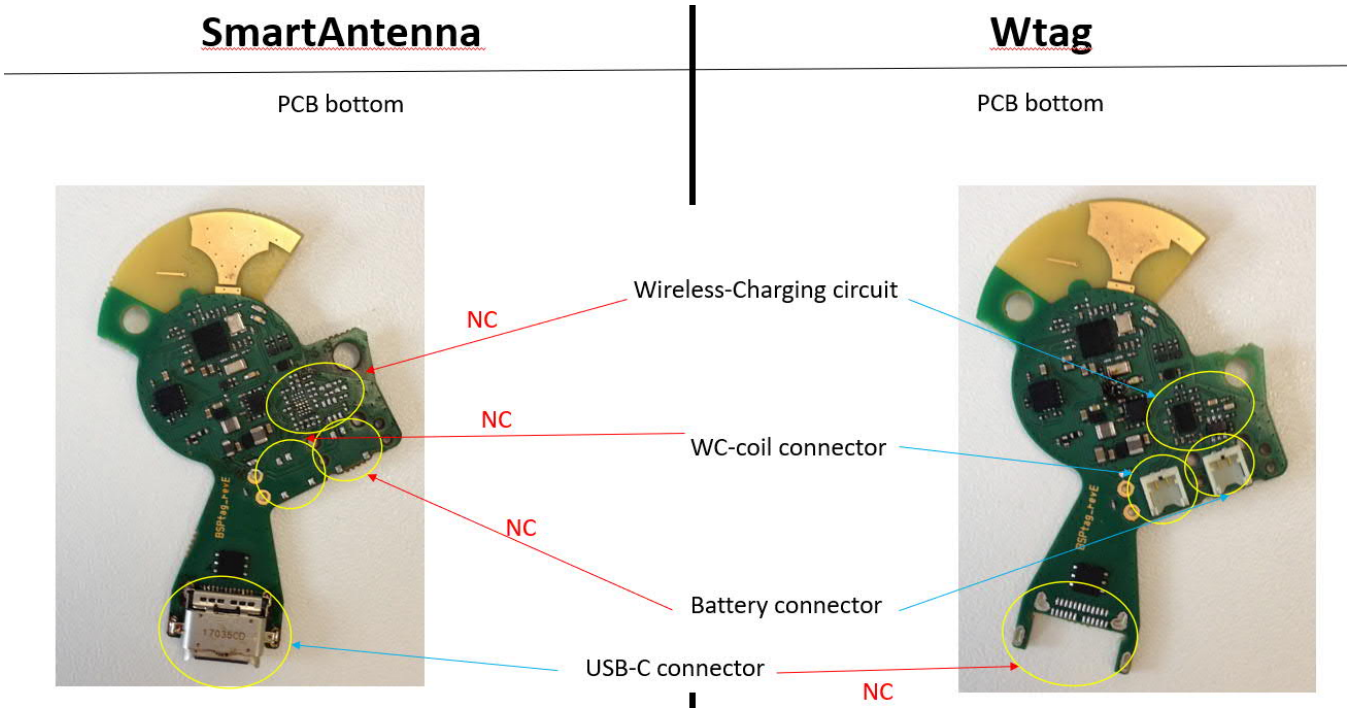
The EUTs are UWB markers with Bluetooth capability. The function of the EUTs is spatial indoor positioning with the aid of received UWB signals, transmitted by indoor UWB transmitters called anchors. The BLE connection is used for data transfer between the EUTs and the anchors.

For this test, two different EUTs shall be tested and certified using the same FCC ID. The RF part, located on the top side of the PCB, is the same for both devices. The difference between bot EUT is the back side of the PCB, where the power supply is located.

The SmartAntenna power supply contains of a USB type C interface. The battery connector, the wireless charging unit and the wireless coil connector are not assembled on the PCB. Also, the EUT does not contain a coil for wireless charging.

The WTag power supply contains of a battery connector, a wireless charging unit, a wireless coil connector and a coil for wireless charging. The USB type C interface is not assembled on this PCB

The photograph below shows the difference between bot power supply side of both PCBs:



The test modes at the SmartAntenna EUT were set using a USB cable connected to a laptop PC. Using a terminal program, the test modes were set for the tests.

The test modes at the WTag EUT were set, using an EUT with a special test firmware, which was provided by the applicant. By connecting the EUT to a wireless charging cradle, the test modes could by cycled.

During the tests the SmartAntenna was supplied with 5 V DC via a USB cable and the WTag with 3.7 V DC by the internal battery.

Maximum power Settings for all measurements:

Modulation	Power setting ch. 0 - 39
GFSK, 1 Mbps	2 dBm

Operation mode	Description of the operation mode	EUT	mode	channel	Modulation	Data rate / Mbps
1	Continuous transmitting on 2402 MHz	SmartAntenna	BLE	0	GFSK	1 Mbps
2	Continuous transmitting on 2440 MHz	SmartAntenna	BLE	19	GFSK	1 Mbps
3	Continuous transmitting on 2480 MHz	SmartAntenna	BLE	39	GFSK	1 Mbps
4	Continuous transmitting on 2402 MHz	WTag	BLE	0	GFSK	1 Mbps
5	Continuous transmitting on 2440 MHz	WTag	BLE	19	GFSK	1 Mbps
6	Continuous transmitting on 2480 MHz	WTag	BLE	39	GFSK	1 Mbps
7	Normal mode	SmartAntenna	BLE	Hopping	GFSK	1 Mbps

3 Additional Information

All tests were performed with unmodified samples.

The EUT contains also an UWB transceiver, which will be certified under another FCC 47 CFR Part 15 section. The measurement results for this rule section are documented under PHOENIX TESTLAB GmbH test report reference F200549E2 and 200550E2. Object of this test report is the Bluetooth Low Energy part of the EUT only.

The in-band and unrestricted band-edge tests were performed using a Microwave coaxial connector probe for swg with switch (type: MXHQ87WA3000) cable, which enabled measurement of the RF signal for the antenna.

The test was performed completely on the SmartAntenna. The WTag was only partially tested.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	Status	Refer page
Maximum conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	Passed	10 et seq
DTS Bandwidth / 99% Bandwidth	2400.0 - 2483.5	15.247 (a) (2)	Passed	14 et seq
Average Power Spectral Density	2400.0 - 2483.5	15.247 (e)	Passed	17 et seq
Band edge compliance	2400.0 - 2483.5	15.247 (d) 15.205 (a) 15.209 (a)	Passed	19 et seq.
Maximum unwanted emissions	0.009 – 26,500	15.247 (d) 15.205 (a) 15.209 (a)	Passed	25 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	Passed	37 et seq.
Antenna Requirement	-	15.203 15.247 (b)	Passed*1	-

*1 Fixed Antenna, gain below 6 dBi, no power reduction necessary.

5 Results

5.1 Duty cycle

Since the EUT was tested with continuous transmission without gaps, not duty cycle measurement was necessary.

5.2 Maximum conducted output power

5.2.1 Method of measurement

The EUT was measured conducted on a sample with a temporary antenna connector, which was provided by the applicant.

Acceptable measurement configurations

Procedure 11.9.2.2.2 in [1] was used for the following test.

Method AVGSA-1 uses trace averaging with the EUT transmitting at full power throughout each sweep. The procedure for this method is as follows:

a) Set span to at least 1.5 times the OBW.
b) Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ [3 × RBW]. d) Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto. f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
g) If transmit duty cycle < 98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at the maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run.”
h) Trace average at least 100 traces in power averaging (rms) mode.
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

The measurement was performed at the upper and lower end and the middle of the assigned frequency band.

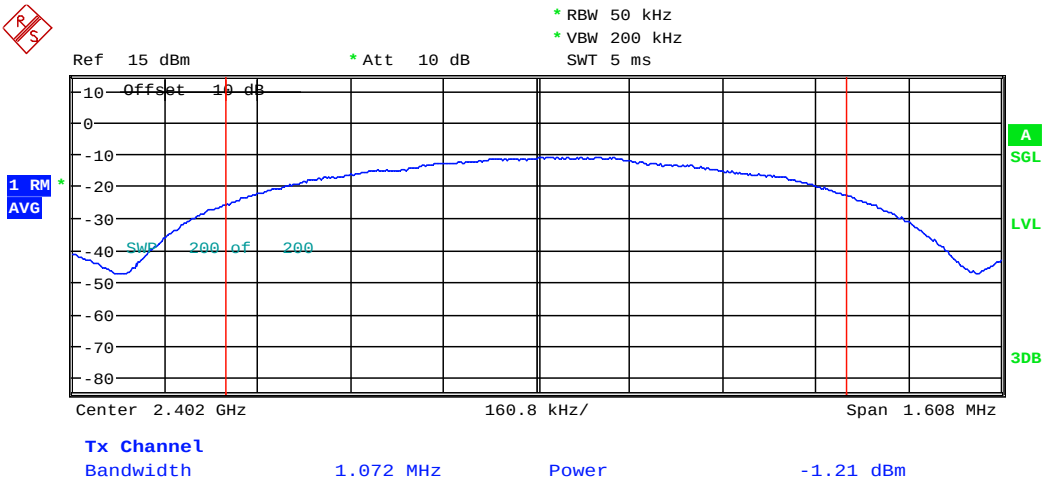
5.2.2 Test results

Ambient temperature	22 °C

Relative humidity	62 %

The plot below shows the worst case result. All other results are submitted in the table below

200550_AvOutpPwr_BTLE_BT1.wmf: Maximum output power measured on channel 0 (operation mode 4):



The antenna gain is below 6 dBi, therefore no conducted output limit reduction is necessary.

Operation mode		Frequency [MHz]	Reading [dBm]	DC Corr. [dB]	Corr. Reading [dBm]	Margin [dB]	Limit [dBm]
1	GFSK	2402	-1.9	0.0	-1.9	31.9	30
2	GFSK	2440	-2.1	0.0	-2.1	32.9	30
3	GFSK	2480	-2.4	0.0	-2.4	32.4	30
4	GFSK	2402	-1.2	0.0	-1.2	31.2	30
5	GFSK	2440	-1.4	0.0	-1.4	31.4	30
6	GFSK	2480	-1.6	0.0	-1.6	31.6	30
Measurement uncertainty				+/- 2.7 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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5.3 Maximum peak conducted output power

5.3.1 Method of measurement

The EUT was measured conducted on a sample with a temporary antenna connector, which was provided by the applicant.

Acceptable measurement configurations

Procedure 11.9.1.1 in [1] was used for the following test.

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level. The measurement was performed at the upper and lower end and the middle of the assigned frequency band.

The measurement was performed at the upper and lower end and the middle of the assigned frequency band.

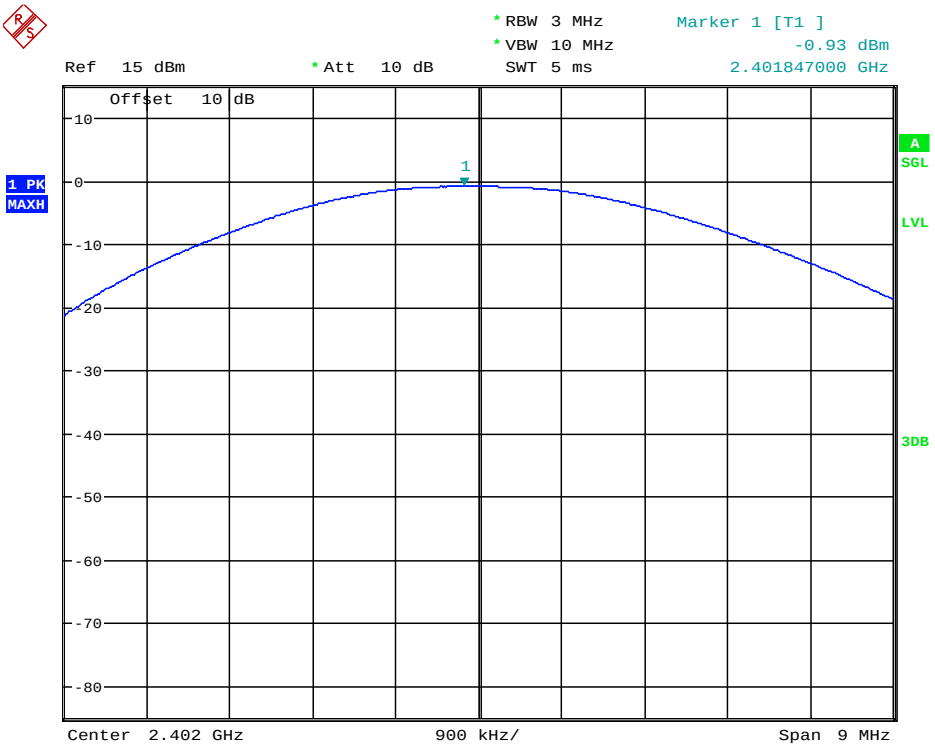
5.3.2 Test results

Ambient temperature	22 °C

Relative humidity	62 %

The plot below shows the worst-case result. All other results are submitted in the table below

200550_MaxPeakPwr_BTLE_BT1.wmf: Maximum output power measured on channel 0 (operation mode 4):



The antenna gain is below 6 dBi, therefore no conducted output limit reduction is necessary.

Operation mode		Frequency [MHz]	Reading [dBm]	DC Corr. [dB]	Corr. Reading [dBm]	Margin [dB]	Limit [dBm]
1	GFSK	2402	-1.7	0.0	-1.7	31.7	30
2	GFSK	2440	-1.9	0.0	-1.9	31.9	30
3	GFSK	2480	-2.2	0.0	-2.2	32.2	30
4	GFSK	2402	-0.9	0.0	-0.9	30.9	30
5	GFSK	2440	-1.1	0.0	-1.1	31.1	30
6	GFSK	2480	-1.4	0.0	-1.4	31.4	30

Test: Passed

Test equipment (refer to chapter 6)

27, 28, 29

5.4 DTS Bandwidth / 99% Bandwidth

5.4.1 Method of measurement

The EUT was measured conducted on a sample with a temporary antenna connector, which was provided by the applicant.

Acceptable measurement configurations

The measurement for the DTS bandwidth procedure refers to part 11.8.1 of document [1].

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) ≥ 3 x RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

The following procedure was used for measuring the 99 % bandwidth:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

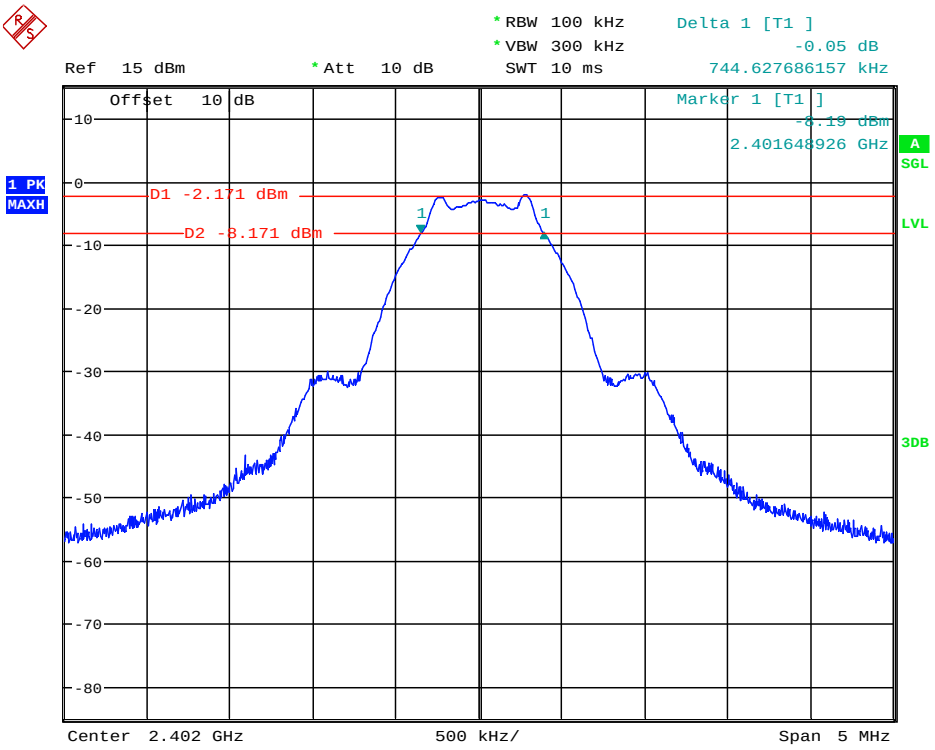
- The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
- Step a) through step c) might require iteration to adjust within the specified range.
- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labelled. Tabular data maybe reported in addition to the plot(s).

5.4.2 Test result

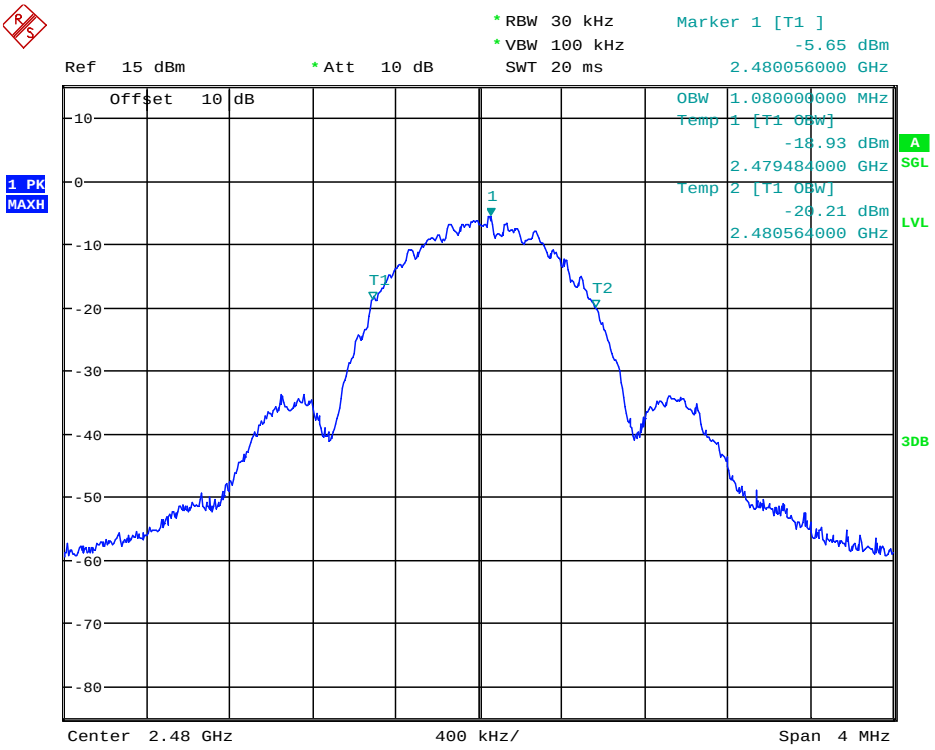
Ambient temperature	22 °C	Relative humidity	59 %

The plots show an exemplary measurement result for the worst documented case. The other results are listed in the following tables.

200549_6dB-BW_BTLE_BT1.wmf: 6-dB Bandwidth (operation mode 1):



200549_99%BW_BTLE_BTLE39.wmf: 99% Bandwidth (operation mode 3):



Operation Mode		Center Frequency [MHz]	Minimum 6-dB Bandwidth Limit [MHz]	6 dB Bandwidth [MHz]	99 % Bandwidth [MHz]	Result
1	GFSK	2402	0.5	0.745	1.068	Passed
2	GFSK	2440	0.5	0.747	1.076	Passed
3	GFSK	2480	0.5	0.757	1.080	Passed
4	GFSK	2402	0.5	0.770	1.072	Passed
5	GFSK	2440	0.5	0.745	1.072	Passed
6	GFSK	2480	0.5	0.750	1.080	Passed
Measurement uncertainty				$8.94*10^{-8}$		

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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5.5 Average Power Spectral Density

5.5.1 Method of measurement

The EUT was measured conducted on a sample with a temporary antenna connector, which was provided by the applicant.

Acceptable measurement configurations

The measurement procedure refers to part 11.10.5 of document [1].

Method AVGPSD-2 uses trace averaging across ON and OFF times of the EUT transmissions, followed by duty cycle correction.

The following procedure is applicable when the EUT cannot be configured to transmit continuously (i.e., D < 98%), when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than ±2%):

- Measure the duty cycle (D) of the transmitter output signal as described in 11.6.
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
- Set VBW ≥ [3 × RBW].
- Detector = power averaging (rms) or sample detector (when rms not available).
- Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
- Sweep time = auto couple.
- Do not use sweep triggering; allow sweep to “free run.”
- Employ trace averaging (rms) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- Add [10 log (1 / D)], where D is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time.
- If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

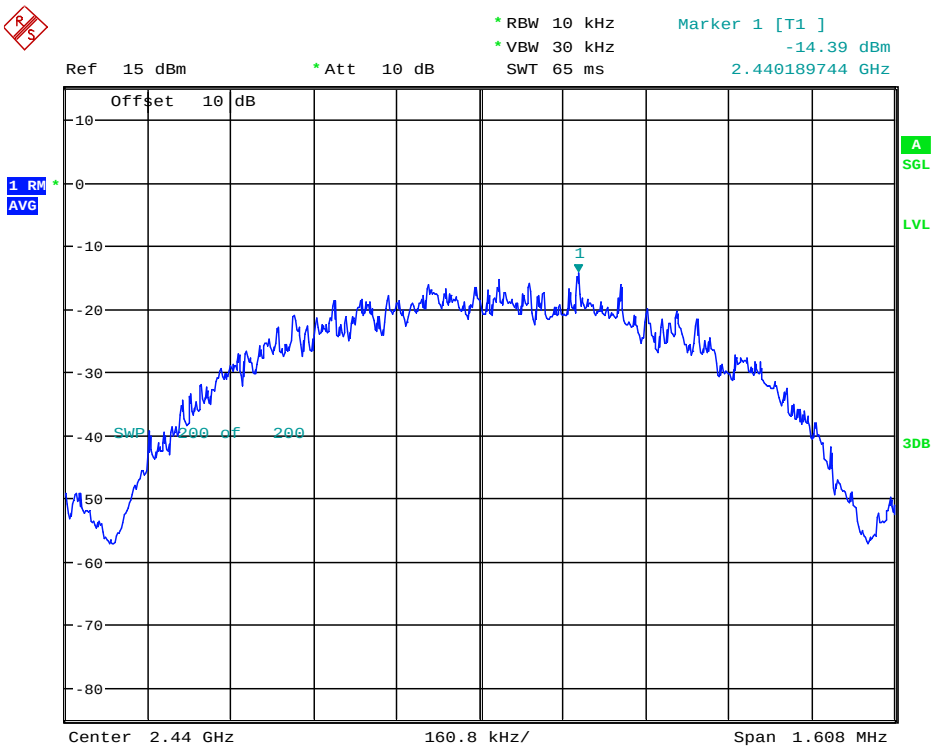
The measurement was performed at the upper and lower end and the middle of the assigned frequency band.

5.5.2 Test result

Ambient temperature	22 °C	Relative humidity	59 %

The plots show an exemplary measurement result for the worst documented case. The other results are listed in the following tables.

200550_AVPwrSpecDens_BTLE_BTLE19.wmf: Average Power Spectral Density (operation mode 5):



Operation Mode		Peak Frequency [MHz]	AvPSD Reading [dBm/10 kHz]	Duty Cycle Corr. [dB]	Corr. Reading [dBm /10 kHz]	Margin [dB]	AvPSD Limit [dBm/3kHz]
1	GFSK	2402.147	-17.7	0.0	-17.7	25.7	8
2	GFSK	2440.061	-17.2	0.0	-17.2	25.2	8
3	GFSK	2479.961	-17.0	0.0	-17.0	25.0	8
4	GFSK	2401.920	-16.6	0.0	-16.6	24.6	8
5	GFSK	2440.190	-14.4	0.0	-14.4	22.4	8
6	GFSK	2479.916	-17.5	0.0	-17.5	25.5	8
Measurement uncertainty					+/- 2.7 dB		

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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5.6 Peak Power Spectral Density

5.6.1 Method of measurement

The EUT was measured conducted on a sample with a temporary antenna connector, which was provided by the applicant.

Acceptable measurement configurations

The measurement procedure refers to part 11.10.2 of document [1].

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

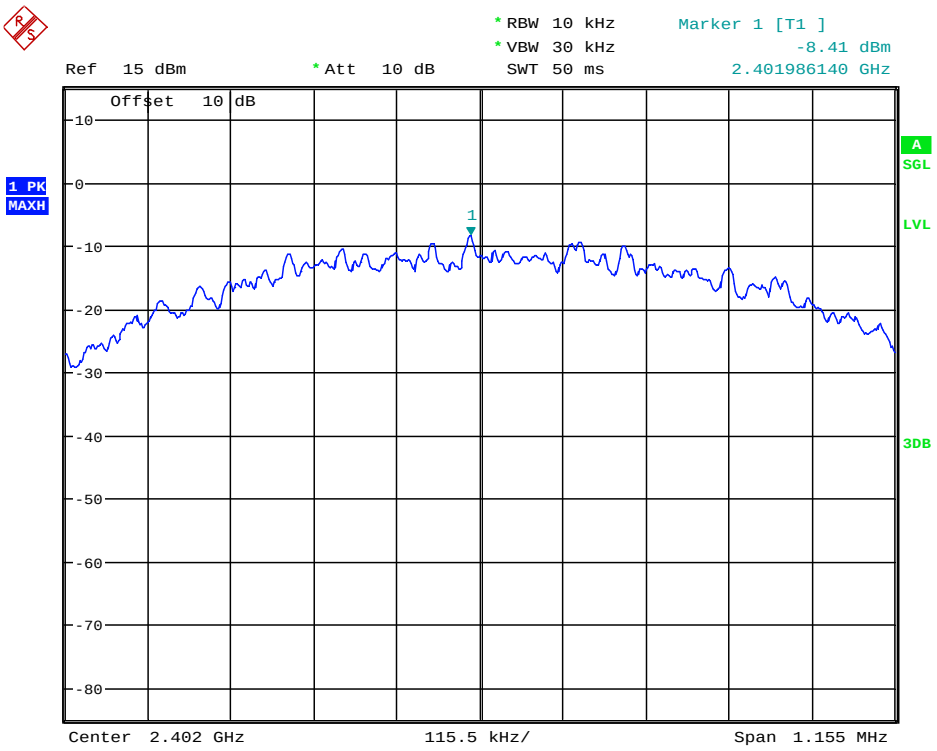
The measurement was performed at the upper and lower end and the middle of the assigned frequency band.

5.6.2 Test result

Ambient temperature	22 °C	Relative humidity	59 %

The plots show an exemplary measurement result for the worst documented case. The other results are listed in the following tables.

200550_PwrSpecDens_BTLE_BT1.wmf: Peak Power Spectral Density (operation mode 4):



Operation Mode		Peak Frequency [MHz]	PkPSD Reading [dBm/10 kHz]	Duty Cycle Corr. [dB]	Corr. Reading [dBm /10 kHz]	Margin [dB]	PkPSD Limit [dBm/3kHz]
1	GFSK	2401.872	-10.7	0.0	-10.7	18.7	8
2	GFSK	2440.062	-9.9	0.0	-9.9	17.9	8
3	GFSK	2479.964	-9.8	0.0	-9.8	17.8	8
4	GFSK	2401.986	-8.4	0.0	-8.4	16.4	8
5	GFSK	2440.020	-8.9	0.0	-8.9	16.9	8
6	GFSK	2480.128	-9.8	0.0	-9.8	17.8	8

Test: Passed

Test equipment (refer to chapter 6)

27, 28, 29

5.7 Band-edge compliance

5.7.1 Method of measurement (band edges next to unrestricted bands (radiated))

The EUT was measured conducted on a sample with a temporary antenna connector, which was provided by the applicant.

Acceptable measurement configurations

The measurement procedure refers to part 11.11.2 and 11.11.3 of document [1].

Measurement Procedure Reference – Reference Level:

- RBW = 100 kHz.
- VBW ≥ 300 kHz.
- Set the span to ≥ 1.5 times the DTS Bandwidth.
- Detector = Peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilise.
- Use the peak marker function to determine the the maximum PSD level.

Measurement Procedure – Unwanted Emissions

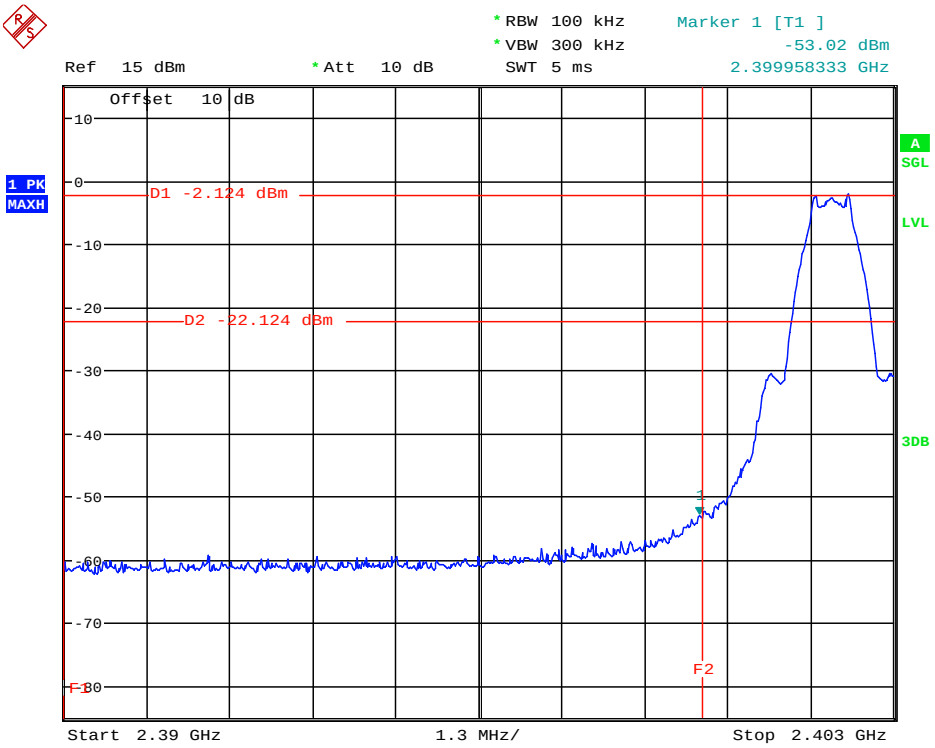
- Set the center frequency and span to encompass the frequency range to be measured.
- RBW = 100 kHz.
- VBW ≥ 300 kHz.
- Detector = Peak.
- Ensure that the number of measurement points ≥ span/RBW.
- Sweep time = auto couple.
- Trace Mode = max hold.
- Allow the trace to stabilise.
- Use the peak marker function to determine the maximum amplitude level.

The measurement procedure at the band edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were be encompassed by the span. After trace stabilization, the maximum peak was be determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20 dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

The measurement were performed at the lower end of the 2.4 GHz band.

5.7.2 Test result (band edges next to unrestricted bands (radiated))

200549_BandEdgeUnrestr_BTLE_BT1.wmf: Radiated band-edge compliance at an unrestricted band-edge operation mode 1):



Operation Mode		Tx Frequency [MHz]	Emission Frequency [MHz]	Reference Level [dBm]	Limit [dBm]	Emission Level [dBm]	Margin [dB]	Result
1	GFSK	2402	2399.958	-2.12	-22.12	-53.02	30.90	Passed
4	GFSK	2402	2400.000	-1.74	-21.74	-53.86	32.12	Passed

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

27, 28, 29

5.7.3 Method of measurement (band edges next to restricted bands (radiated))

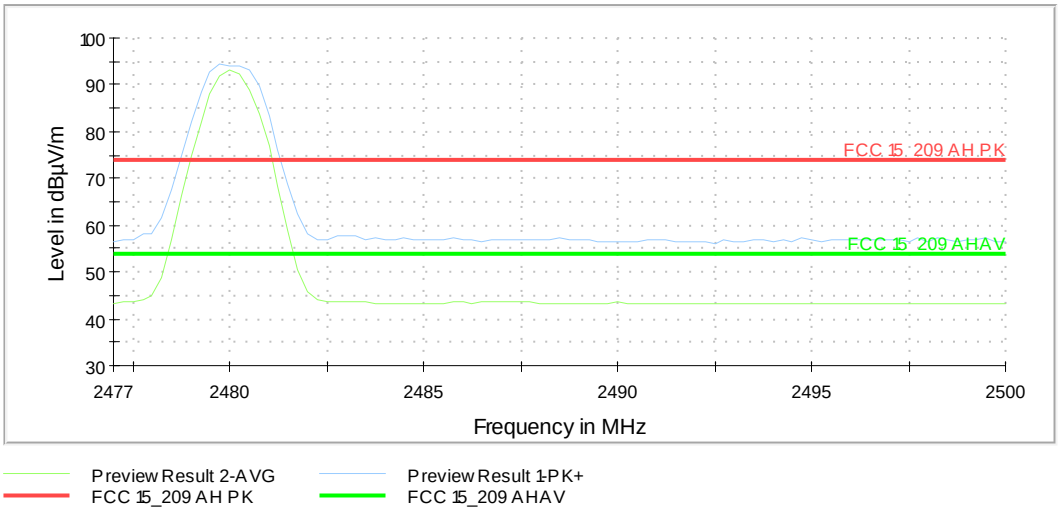
The EUT was measured radiated in the anechoic chamber using the procedures described in 5.8.1.

Acceptable measurement configurations

The same measurement configurations as described in 5.8.1. were used for the preview and final measurement.

5.7.4 Test result (band edges next to restricted bands (radiated))

200550_ch39_Tx_1-4G: radiated band-edge compliance at a restricted band-edge (operation mode 6):



Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2387.500	---	31.39	54.00	22.61	V	15.0	150.0	33.2
2387.500	43.69	---	74.00	30.31	V	15.0	150.0	33.2
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the upper end of the assigned frequency band (operation mode 3)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2486.750	---	31.78	54.00	22.22	H	0.0	60.0	33.4
2486.750	45.20	---	74.00	28.80	H	0.0	60.0	33.4
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the lower end of the assigned frequency band (operation mode 4)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2383.500	---	31.57	54.00	22.43	H	312.0	30.0	33.2
2383.500	43.57	---	74.00	30.43	H	312.0	30.0	33.2
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the upper end of the assigned frequency band (operation mode 6)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2856.250	---	33.65	54.00	20.35	H	56.0	0.0	35.4
2856.250	45.73	---	74.00	28.27	H	56.0	0.0	35.4
Measurement uncertainty				+2.2 dB / -3.6 dB				

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

7 – 14, 17, 18, 28, 29

5.8 Maximum unwanted emissions

5.8.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a semi-anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 1 GHz.
- A preliminary and final measurement was carried out in semi-anechoic chamber with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a semi-anechoic chamber with a variable antenna distance and height in the frequency range above 1 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range above 1 GHz.

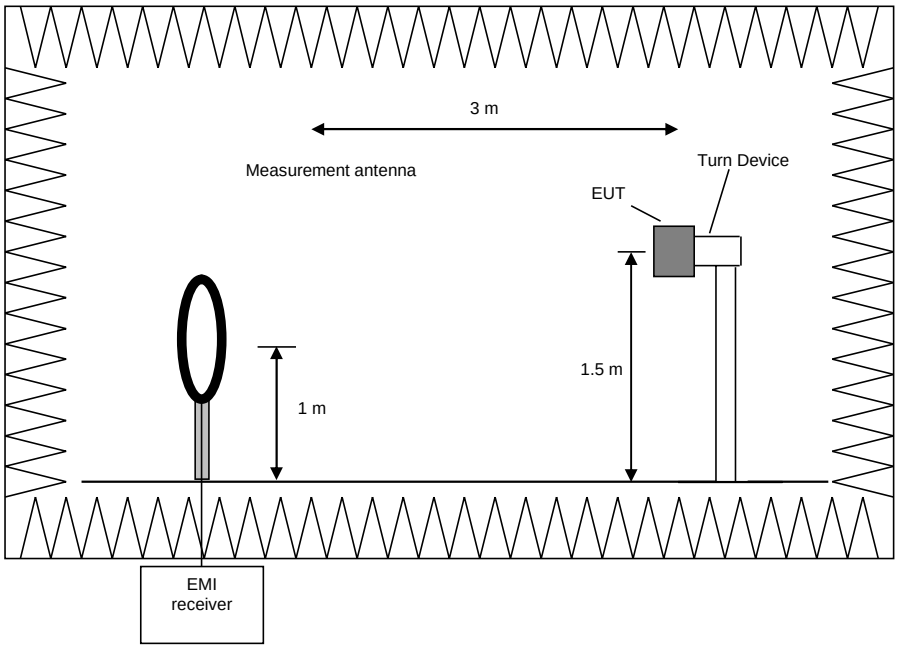
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meters. Table top devices will set up on a non-conducting turn device on the height of 1.5m. Floor-standing devices will be placed directly on the turntable/ground plane. The set-up of the Equipment under test will be in accordance to [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to found the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	10 kHz



Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

Prescans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.
The following procedure will be used:

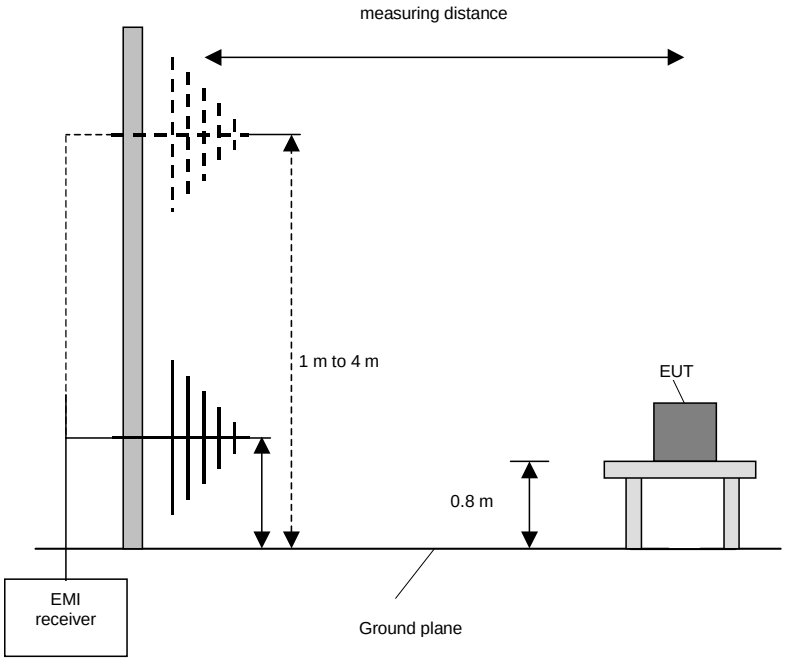
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Repeat 1) to 3) with the vertical and the ground-parellel polarisation of the measuring antenna.
5. Make a hardcopy of the spectrum.
6. The steps before are performed using a test software, which saves the worst-case positions and values for each Antenna and azimuth of the turntable.

Preliminary and final measurement (30 MHz to 1 GHz)

A preliminary and final measurement in a semi-anechoic chamber with reflective ground plane will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

1) Measure the frequency range 30 MHz to 1 GHz at an antenna height of 1 m and a EUT azimuth of 6 °.
2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
3) Rotate the Turntable by 30 ° and repeat 2) until an azimuth of 366 ° is reached.
4) Repeat 1) to 3) for the other orthogonal antenna polarization.
5) Move the antenna and the turntable to the position where the maximum values are detected.
6) Measure while moving the antenna slowly +/- 1 m.
7) Set the antenna to the position where the maximum value is found.
8) Measure while moving the turntable +/- 45 °.
9) Set the turntable to the azimuth where the maximum value is found.
10) Measure with Final detector (QP and AV) and note the value.
11) Repeat 5) to 10) for each final frequency.
12) Repeat 1) to 11) for each orthogonal axes of the EUT (if the EUT is a module and might be used in a handheld equipment application).
13) The steps before are performed using a test software, which saves the worst-case positions and values for each Antenna and azimuth of the turntable.

Preliminary and final measurement (1 GHz to 40 GHz)

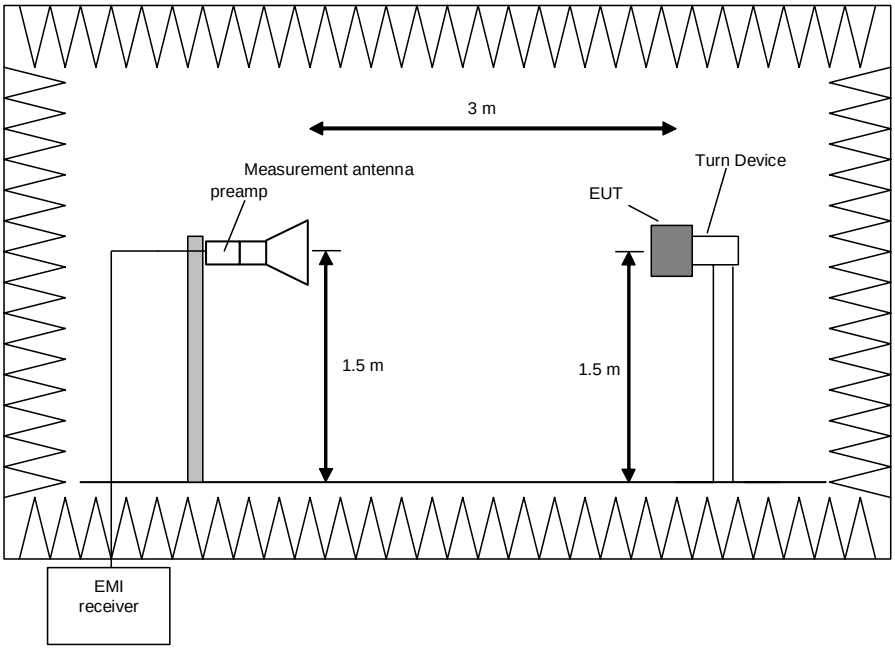
This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting turn device on the height of 1.5m. The set-up of the Equipment under test will be in accordance to [1].

Preliminary measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30° steps according 6.6.5.4 in [1].

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 25 / 26.5 GHz	100 kHz
26.5 GHz to 40 GHz	100 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 1 to 40 GHz.
The following procedure will be used:

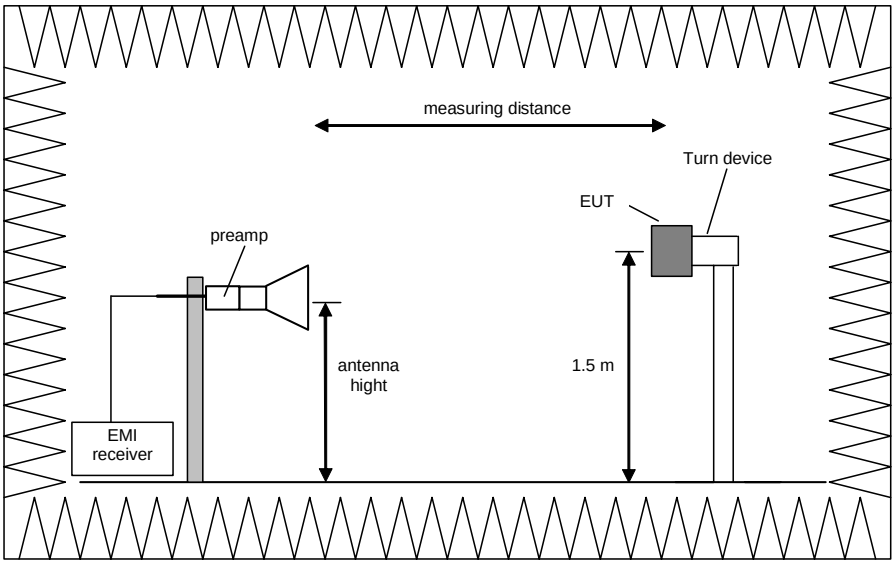
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarisation of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarisation, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

Final measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed by rotating the turntable through 0 to 360° in the worst-case EUT orientation which was obtained during the preliminary measurements.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	1 MHz
4 GHz to 12 GHz	1 MHz
12 GHz to 18 GHz	1 MHz
18 GHz to 25 / 26.5 GHz	1 MHz
26.5 GHz to 40 GHz	1 MHz



Procedure of measurement:

The measurements were performed in the frequency ranges 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 25 /26.5 GHz and 26.5 GHz to 40 GHz.
The following procedure will be used:

1) Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
2) Set the measurement antenna polarisation to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
3) Set the spectrum analyser to EMI mode with peak and average detector activated.
4) Rotate the turntable from 0° to 360° to find the TT Pos. that produces the highest emissions.
5) Note the highest displayed peak and average values
6) Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.

5.8.2 Test results (radiated emissions) – Emissions with internal antenna from 9 kHz – 26.5 GHz

5.8.2.1 Preliminary radiated emission measurement 9 kHz – 26.5 GHz

Ambient temperature	22 °C	Relative humidity	59 %

Position of EUT: The EUT was set-up on an EUT turn device of a height of 1.5 m for f > 1 GHz and f < 30 MHz. The distance between EUT and antenna was 3 m.

For the test for 30 MHz < f < 1 GHz on the open area test site the EUT was placed on a table with the height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Only the plot of the worst-case emission is submitted below.

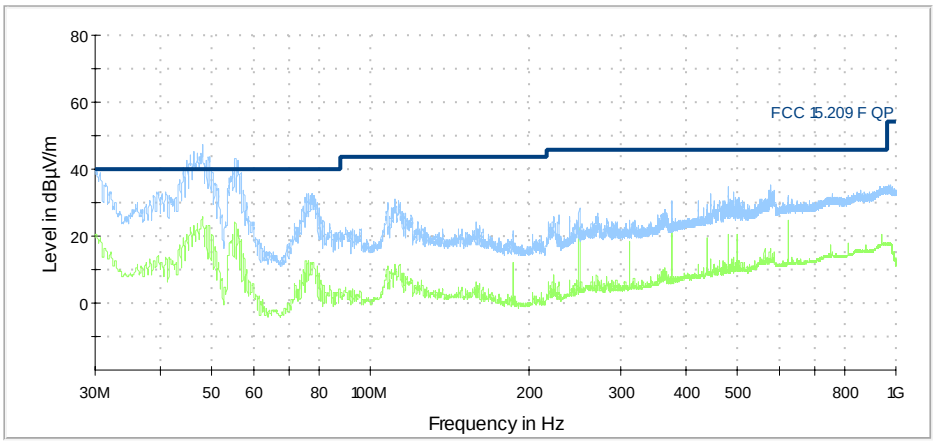
Remark: Since there were no differences in the spectrum for 30 MHz < f < 1 GHz, only one representative plot is submitted below.

Since no significant emissions were found during the preliminary measurement for f < 30 MHz, no final measurement was performed and no plot is submitted below.

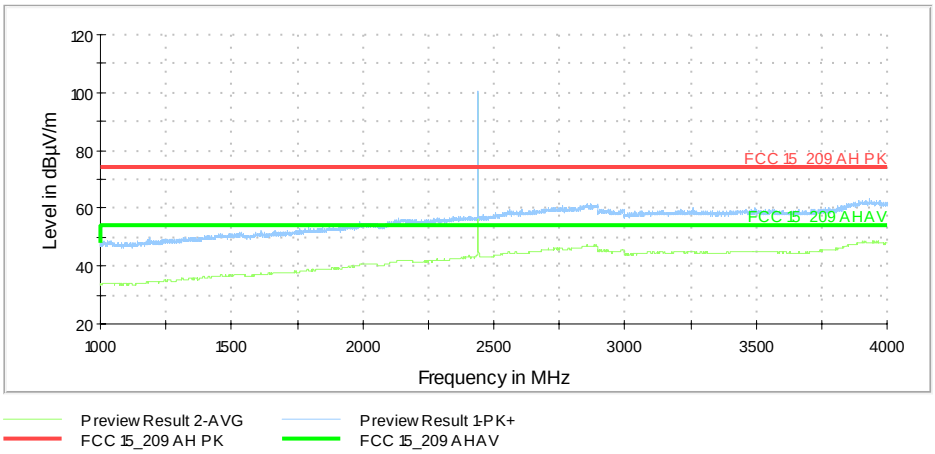
Only the SmartAntenna was measured completely. Only spot checks were performed for the WTag

Plots of the worst case transmitter spurious emissions

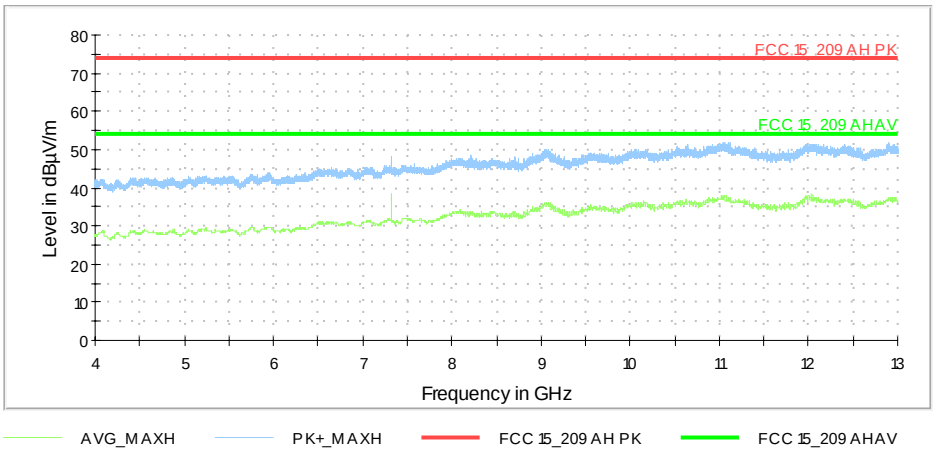
200549_30M-1G_ch19: Spurious emissions from 30 MHz to 1 GHz (operation mode 2):



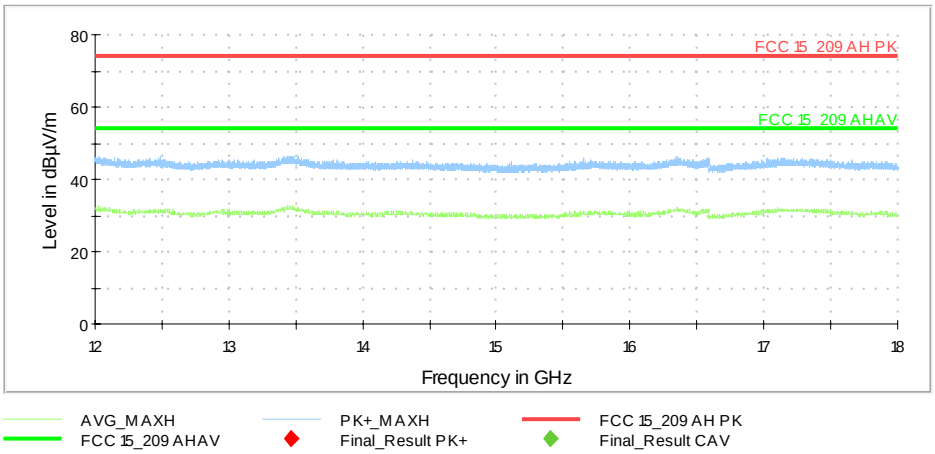
200549_ch19_0dBm_1-4G: Spurious emissions from 1 GHz to 4 GHz (operation mode 2)



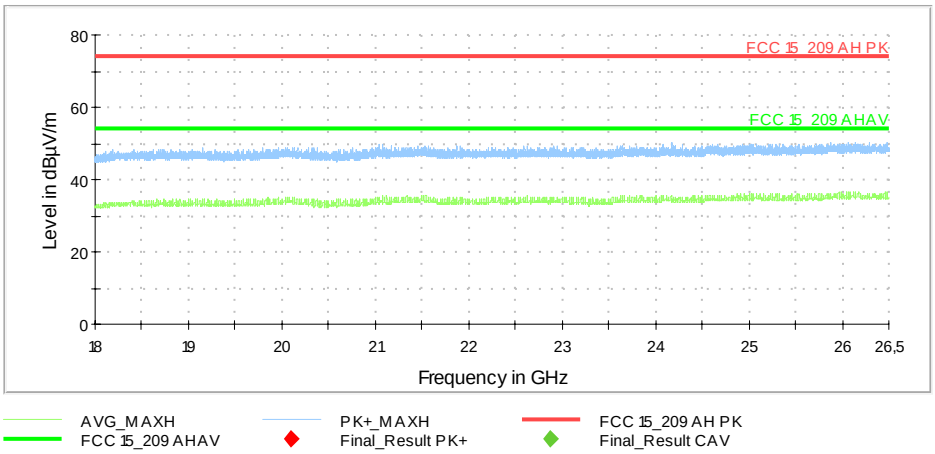
200550_ch19_Tx_4-12G: Spurious emissions from 4 GHz to 12 GHz (operation mode 5):



200549_ch0_0dBm_12-18G: Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



200549_ch0_0dBm_18-26,5G: Spurious emissions from 18 GHz to 26.5 GHz (operation mode 1):



5.8.2.2 Final radiated measurements

Smart Antenna, modes 1 – 3, 30 MHz – 1 GHz (no difference detected when comparing channels)

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Meas. Time [ms]	Bandwidth [kHz]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
30.680000	36.13	40.00	3.87	1000.0	120.000	100.0	V	277.0	27.1
45.570000	39.86	40.00	0.14	1000.0	120.000	100.0	V	110.0	19.3
46.230000	39.25	40.00	0.75	1000.0	120.000	100.0	V	131.0	18.9
46.970000	40.76	73.18*	32.42	1000.0	100.000	100.0	V	181.0	18.5
48.020000	42.95	73.18*	30.23	1000.0	100.000	100.0	V	262.0	17.9
49.410000	39.80	40.00	0.20	1000.0	120.000	100.0	V	311.0	17.0
55.400000	34.95	40.00	5.05	1000.0	120.000	103.0	V	1.0	13.8
56.090000	31.93	40.00	8.07	1000.0	120.000	103.0	V	1.0	13.5
Measurement uncertainty					+2.2 dB / -3.6 dB				

* Unrestricted band, therefore only 20 dBc attenuation required. The limit was calculated using the in band signal level measured with 100 kHz RBW and calculated as radiated value using a correction factor of 95.3 dB as described in 10.3.9 of [1]

WTag, modes 4 - 6, 30 MHz – 1 GHz (no difference detected when comparing channels)

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Meas. Time [ms]	Bandwidth [kHz]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
35.650000	19.90	40.00	20.10	1000.0	120.000	103.0	V	310.0	24.8
35.920000	19.28	40.00	20.72	1000.0	120.000	103.0	V	161.0	24.7
562.510000	23.69	46.00	22.31	1000.0	120.000	395.0	H	331.0	28.5
924.840000	23.78	46.00	22.22	1000.0	120.000	150.0	H	354.0	33.0
929.080000	23.84	46.00	22.17	1000.0	120.000	210.0	H	277.0	33.2
940.110000	24.28	46.00	21.72	1000.0	120.000	350.0	H	188.0	33.7
Measurement uncertainty					+2.2 dB / -3.6 dB				

Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
2338.000	---	34.33	54.00	19.67	H	197.0	150.0	33.1
2338.000	46.27	---	74.00	27.73	H	197.0	150.0	33.1
2370.000	---	31.52	54.00	22.48	H	232.0	150.0	33.1
2370.000	44.04	---	74.00	29.96	H	232.0	150.0	33.1
2402.000	---	100.53	54.00	-46.54	H	207.0	150.0	33.3
2402.000	101.33	---	74.00	-27.33	H	207.0	150.0	33.3
2466.000	---	33.04	54.00	20.96	H	1.0	150.0	33.5
2466.000	44.93	---	74.00	29.07	H	1.0	150.0	33.5
4804.250	---	30.44	54.00	23.56	H	318.0	120.0	-2.1
4804.250	41.77	---	74.00	32.23	H	318.0	120.0	-2.1
7206.000	---	31.40	54.00	22.60	H	137.0	90.0	3.9
7206.000	43.06	---	74.00	30.94	H	137.0	90.0	3.9
12040.750	---	36.45	54.00	17.55	V	196.0	150.0	7.4
12040.750	48.79	---	74.00	25.21	V	196.0	150.0	7.4
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the middle of the assigned frequency band (operation mode 2)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
2376.000	---	37.34	54.00	16.66	H	208.0	150.0	33.1
2376.000	47.11	---	74.00	26.89	H	208.0	150.0	33.1
2440.000	---	99.74	54.00	-45.74	H	206.0	150.0	33.5
2440.000	100.60	---	74.00	-26.60	H	206.0	150.0	33.5
3935.250	---	40.81	54.00	13.19	V	92.0	30.0	39.5
3935.250	52.88	---	74.00	21.12	V	92.0	30.0	39.5
4880.250	---	30.96	54.00	23.04	H	342.0	120.0	-1.8
4880.250	41.92	---	74.00	32.08	H	342.0	120.0	-1.8
7320.000	---	34.98	54.00	19.02	H	124.0	90.0	4.6
7320.000	46.13	---	74.00	27.87	H	124.0	90.0	4.6
9041.000	---	34.84	54.00	19.16	H	216.0	60.0	8.9
9041.000	46.83	---	74.00	27.17	H	216.0	60.0	8.9
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the upper end of the assigned frequency band (operation mode 3)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
2352.000	---	35.04	54.00	18.96	H	216.0	150.0	33.2
2352.000	45.08	---	74.00	28.92	H	216.0	150.0	33.2
2480.000	---	97.99	54.00	-43.99	H	150.0	0.0	33.4
2480.000	98.81	---	74.00	-24.81	H	150.0	0.0	33.4
3963.500	---	40.77	54.00	13.23	H	0.0	150.0	39.3
3963.500	52.53	---	74.00	21.47	H	0.0	150.0	39.3
4960.250	---	30.74	54.00	23.26	H	302.0	90.0	-2.0
4960.250	41.38	---	74.00	32.62	H	302.0	90.0	-2.0
7439.500	---	34.34	54.00	19.66	H	316.0	90.0	4.9
7439.500	46.12	---	74.00	27.88	H	316.0	90.0	4.9
12440.250	---	35.84	54.00	18.16	V	321.0	60.0	6.6
12440.250	48.54	---	74.00	25.46	V	321.0	60.0	6.6
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the lower end of the assigned frequency band (operation mode 4)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
2383.500	---	31.57	54.00	22.43	H	312.0	30.0	33.2
2383.500	43.57	---	74.00	30.43	H	312.0	30.0	33.2
2402.000	---	95.93	54.00	-41.93	H	100.0	90.0	33.3
2402.000	96.72	---	74.00	-22.72	H	100.0	90.0	33.3
3918.250	---	40.78	54.00	13.22	H	114.0	120.0	39.5
3918.250	52.89	---	74.00	21.11	H	114.0	120.0	39.5
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the middle of the assigned frequency band (operation mode 5)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
7320.000	---	36.77	54.00	17.23	H	294.0	90.0	4.6
7320.000	46.67	---	74.00	27.33	H	294.0	90.0	4.6
Measurement uncertainty				+2.2 dB / -3.6 dB				

Transmitter operates at the upper end of the assigned frequency band (operation mode 6)

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
2480.000	---	93.20	54.00	-39.20	H	107.0	90.0	33.4
2480.000	94.01	---	74.00	-20.01	H	107.0	90.0	33.4
2856.250	---	33.65	54.00	20.35	H	56.0	0.0	35.4
2856.250	45.73	---	74.00	28.27	H	56.0	0.0	35.4
3918.250	---	40.77	54.00	13.23	V	259.0	0.0	39.5
3918.250	53.15	---	74.00	20.85	V	259.0	0.0	39.5
Measurement uncertainty				+2.2 dB / -3.6 dB				

TEST EQUIPMENT USED FOR THE TEST:
7 – 26, 30 - 36

5.9 Conducted emissions on power supply lines (150 kHz to 30 MHz)

Ambient temperature	20 °C	Relative humidity	52 %

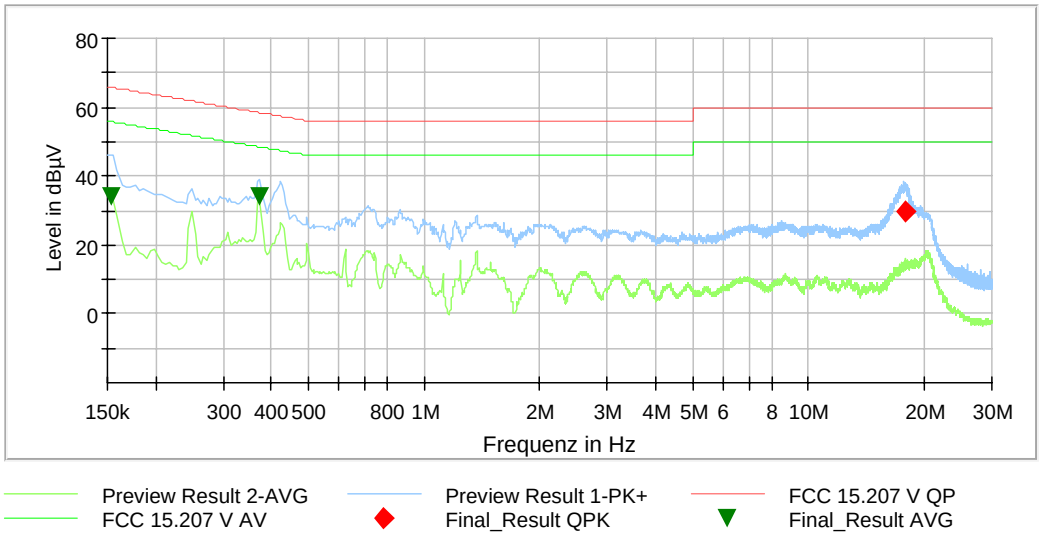
Position of SmartAntenna: For this test, the EUT was operated in normal mode (operation mode 7). The EUT was connected to an ancillary device “Satellite Assistant UWB 656 BeSpoon” by BLE connection. The connection was monitored on a laptop PC provided by the applicant. A local webserver on the laptop running “BeSpoon Loc Server” was used to monitor the connection between EUT an ancillary device.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: Measurement performed with US 120V/60Hz.
For the test an AC/DC Adaptor from SAMSUNG model ETA0U83EWE was used, which had an output voltage of 5.0 V DC.

The curves in the diagram only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by “♦” and the average measured points by “▼”.



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Transducer (dB)
0.153600	---	34.36	55.80	21.44	5000.0	9.000	L1	GND	9.8
0.373200	---	34.33	48.43	14.10	5000.0	9.000	L1	GND	9.9
17.781000	29.86	---	60.00	30.14	5000.0	9.000	L1	GND	10.9
Measurement uncertainty				+2.76 dB / -2.76 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
1 – 7

6 Test equipment and ancillaries used for tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. Due
1	Shielded chamber M4	-	Albatross Projects	B83117-C6439-T262	480662	Calibration not necessary	
2	EMI Receiver	ESIB 26	Rohde & Schwarz	1088.7490	481182	12.02.2020	02.2022
3	LISN	NSLK8128	Schwarzbeck	8128155	480058	11.02.2020	02.2022
4	High pass filter	HR 0.13-5ENN	FSY Microwave	DC 0109 SN 002	480340	Calibration not necessary	
5	EMI Software	ES-K1	Rohde & Schwarz	-	480111	Calibration not necessary	
6	Power supply AC	AC6803A AC Quelle 2000VA	Keysight	JPVJ002509	482350	Calibration not necessary	
7	EMI Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
8	HF-Cable	Sucoflex 104	Huber+Suhner	517406	482391	Calibration not necessary	
9	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Calibration not necessary	
10	Signal & Spectrum Analyzer	ESW44	Rohde & Schwarz	101635	482467	18.02.2020	02.2022
11	Controller	MCU	Maturo	MCU/043/971107	480832	Calibration not necessary	
12	Turntable	DS420HE	Deisel	420/620/80	480315	Calibration not necessary	
13	Antenna support	AS615P	Deisel	615/310	480187	Calibration not necessary	
14	Antenna (Log.Per.)	HL050	Rohde & Schwarz	100438	481170	09.10.2017	10.2020
15	Standard Gain Horn 11.9 GHz – 18 GHz	18240-20	Flann Microwave	483	480294	Calibration not necessary	
16	Standard Gain Horn 17.9 GHz – 26.7 GHz	20240-20	Flann Microwave	411	480297	Calibration not necessary	
17	RF-cable No. 3	Sucoflex 106B	Huber&Suhner	500234/6B	482644	Calibration not necessary	
18	RF-cable No. 40	Sucoflex 106B	Huber&Suhner	SF106B/11N/11N/1500MM	482125	Calibration not necessary	
19	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	14.02.2020	02.2022
21	RF-cable 2 m	KPS-1533-800-KPS	Insulated Wire	-	480302	Calibration not necessary	
22	RF cable 36	Sucoflex 106B	Suhner	500003/6B / Kabel 36	481680	Calibration not necessary	
23	Preamplifier 100 MHz - 16 GHz	AFS6-00101600-23-10P-6-R	Narda MITEQ	2011215	482333	13.02.2020	07.2022
24	Preamplifier	JS3-12001800-16-5A	Miteq	571667	480343	13.02.2020	02.2022
25	Preamplifier	JS3-18002600-20-5A	Miteq	658697	480342	13.02.2020	02.2022
26	4 GHz High Pass Filter	WHKX4.0/18G-8SS	Wainwright Instruments	1	480587	Calibration not necessary	
27	Spectrum Analyser	FSU46	Rohde & Schwarz	200125	480956	13.02.2020	03.2021
28	Power Supply	TOE8752-32 (DC)	Toellner Electronic Inst.	31566	480010	Calibration not necessary	
29	Multimeter	971A	Hewlett Packard	JP39009358	480721	16.01.2020	01.2021

30	Semi anechoic chamber	M276	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
31	Antenna mast	BAM4.5-P-10kg	maturo	222/2612.01	483225	Calibration not necessary	
32	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
33	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
34	Software	EMC32	Rohde & Schwarz	ID: 1300.7010.12-100970-Be	482972	Calibration not necessary	
35	Antenne (Bilog)	CBL6111D	Schaffner	22921	480674	27.03.2018	03.2021
36	EMI Testreceiver	ESW	Rohde & Schwarz	101828	482979	12.04.2019	04.2021

7 Test site Validation

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4-2017	19.09.2019	09.2021
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	19.09.2019	09.2022
Fully anechoic chamber M20	480303	1 -18 GHz	SVSWR	CISPR 16-1-4 Amd. 1	13.07.2018	07.2021
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	06.11.2018	11.2020

8 Report History

Report Number	Date	Comment
F200549E1	07.12.2020	Initial Test Report

9 List of Annexes

ANNEX A TEST SETUP PHOTOS 14 pages