Radio Equipment Regulation 2017

COMPLIANCE TEST REPORT

Technical Statement of Conformity

in accordance with BS ETSI EN 300 328 V 2.2.2 (2019-07)

The product

Equipment Under Test	: BLE PTT
Model Number	: PTT-Z
Product Series	: PTT-U
Report Number	: HA229081-RF
Issue Date	: 01-DEC-2022
Test Result	: Compliance

is produced by

Mobility Sound Technology Ltd.

5F, NO.100, Jian 1st Road, ZhongHe Dist., New Taipei City #235, Taiwan

HongAn TECHNOLOGY CO., LTD.

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Contents

Verification

Applicant：	Mobility Sound Technology Ltd.
Address of Applicant：	5F, NO.100, Jian 1st Road, ZhongHe Dist., New Taipei City #235, Taiwan
Manufacturer：	Mobility Sound Technology Ltd.
Address of Manufacturer：	5F, NO.100, Jian 1st Road, ZhongHe Dist., New Taipei City #235, Taiwan
Trade Name：	MobilitySound
Equipment Under Test：	BLE PTT
Model Number：	PTT-Z
Serial Number：	PTT-U
Product Series：	N/A
Working Frequency：	Bluetooth : 2402~2480MHz
Rated Output Power：	Bluetooth: -4.44 dBm
Type of Modulation：	Bluetooth : GFSK Bluetooth LE
Sample Received Date：	18-NOV-2022
Test Standard：	BS ETSI EN 300 328 V2.2.2 (2019-07)

Deviations from standard test methods & any other specifications : NONE

Remark:

WE HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in BS ETSI EN 300 328 V 2.2.2 (2019-07), and the energy emitted by the device was founded to be within the limits applicable. We assume full responsibility for accuracy and completeness of these data.

Note:

1. This report details the results of the test carried out on one sample.
2. This report applies to the above sample only and shall not be reproduced in part without written approval of HongAn Technology Co., Ltd..

Documented by: Jody Peng **Date:** 2022-12-01

Jody Peng/ ADM. Dept Staff

Approved by: Eason.Hsieh **Date:** 2022-12-01

Eason Hsieh/ Approved Reviewer

List of Measurements

Technical requirements for other types of Wide Band modulation		
Sub Clause	**Parameter to be measured**	**Result**
Transmitter Parameters		
4.3.2.2	RF Output Power	Compliance
4.3.2.3	Power Spectral Density	Compliance
4.3.2.4	Duty Cycle, Tx-Sequence, Tx-gap (Non-adaptive equipment)	N/A
4.3.2.5	Medium Utilisation (MU) factor	N/A
4.3.2.6	Adaptivity (adaptive equipment using modulations other than FHSS)	N/A
4.3.2.7	Occupied Channel Bandwidth	Compliance
4.3.2.8	Transmitter unwanted emission in the OOB domain	Compliance
4.3.2.9	Transmitter unwanted emissions in the spurious domain	Compliance
Receiver Parameters		
4.3.2.10	Receiver Spurious Emissions	Compliance
4.3.2.11	Receiver Blocking	Compliance

Note:

1. These requirements do not apply for equipment with a maximum declared RF Output power of less than 10 dBm EIRP or for equipment when operating in a mode where the RF Output power is less than 10 dBm EIRP.

2. The clause numbers are referenced to BS ETSI EN 300 328 V2.2.2 (2019-07).

Summary of Test Result

☒**No deviations from the technical specifications were ascertained**

☐**There were deviations from the technical specifications ascertained**

Test Specification Clause	Test Case	Test Condition	Mode	Pass	Fail	N/A	NP	Remark
5.4.2	RF output power	NTC	GFSK	☒	☐	☐	☐	
		LT		☒	☐	☐	☐	
		HT		☒	☐	☐	☐	
5.4.3	Power Spectral Density	NTC	GFSK	☒	☐	☐	☐	
5.4.2	Duty Cycle, Tx-sequence, Tx- gap	NTC	GFSK	☐	☐	☒	☐	
5.4.2	Medium Utilisation (MU) factor	NTC	GFSK	☐	☐	☒	☐	
5.4.6	Adaptivity (adaptive equipment using modulations other than FHSS)	NTC	GFSK	☐	☐	☒	☐	
5.4.7	Occupied Channel Bandwidth	NTC	GFSK	☒	☐	☐	☐	
5.4.8	Transmitter unwanted emissions in the out-of-band domain	NTC	GFSK	☒	☐	☐	☐	
		LT		☒	☐	☐	☐	
		HT		☒	☐	☐	☐	
5.4.9	Transmitter unwanted emissions in the spurious domain (conducted & radiated)	NTC	GFSK	☒	☐	☐	☐	
5.3.10	Receiver spurious emissions (conducted & radiated)	NTC	GFSK	☒	☐	☐	☐	
5.4.11	Receiver Blocking	NTC	GFSK	☒	☐	☐	☐	

Remark:

1. The measurement uncertainty is not included in the test result.
2. Testing Data of this report is providing by Shenzhen CTA Testing Technology Co., Ltd. The report reference number is CTA22111800901.

1 General Description

1.1 Information of Applicant

Name : Mobility Sound Technology Ltd.

Address : 5F, NO.100, Jian 1st Road, ZhongHe Dist., New Taipei City #235, Taiwan

1.2 Information of Manufacturer

Name : Mobility Sound Technology Ltd.

Address : 5F, NO.100, Jian 1st Road, ZhongHe Dist., New Taipei City #235, Taiwan

1.3 Description of EUT

<table>
<tr><td>Equipment Under Test</td><td>:</td><td>BLE PTT</td></tr>
<tr><td>Model Number of EUT</td><td>:</td><td>PTT-Z</td></tr>
<tr><td>Product Series</td><td>:</td><td>PTT-U</td></tr>
<tr><td>Power Supply</td><td>:</td><td>Lithium battery: DC 3.0 V</td></tr>
<tr><td>Frequency Range</td><td>:</td><td>2402~2480 MHz</td></tr>
<tr><td>Number of Channels</td><td>:</td><td>BLE:40 Channels</td></tr>
<tr><td>Carrier Frequency of Each Channel</td><td>:</td><td>
<table>
<tr><td>00</td><td>2402</td><td>10</td><td>2422</td><td>20</td><td>2442</td><td>30</td><td>2462</td></tr>
<tr><td>01</td><td>2404</td><td>11</td><td>2424</td><td>21</td><td>2444</td><td>31</td><td>2464</td></tr>
<tr><td>02</td><td>2406</td><td>12</td><td>2426</td><td>22</td><td>2446</td><td>32</td><td>2466</td></tr>
<tr><td>03</td><td>2408</td><td>13</td><td>2428</td><td>23</td><td>2448</td><td>33</td><td>2468</td></tr>
<tr><td>04</td><td>2410</td><td>14</td><td>2430</td><td>24</td><td>2450</td><td>34</td><td>2470</td></tr>
<tr><td>05</td><td>2412</td><td>15</td><td>2432</td><td>25</td><td>2452</td><td>35</td><td>2472</td></tr>
<tr><td>06</td><td>2414</td><td>16</td><td>2434</td><td>26</td><td>2454</td><td>36</td><td>2474</td></tr>
<tr><td>07</td><td>2416</td><td>17</td><td>2436</td><td>27</td><td>2456</td><td>37</td><td>2476</td></tr>
<tr><td>08</td><td>2418</td><td>18</td><td>2438</td><td>28</td><td>2458</td><td>38</td><td>2478</td></tr>
<tr><td>09</td><td>2420</td><td>19</td><td>2440</td><td>29</td><td>2460</td><td>39</td><td>2480</td></tr>
</table>
</td></tr>
<tr><td>Antenna Specification</td><td>:</td><td>PCB Antenna/ Gain: -0.8 dBi</td></tr>
<tr><td>Modulation Technique</td><td>:</td><td>BLE : GFSK</td></tr>
<tr><td>Transmit Data Rate</td><td>:</td><td>BLE : 1Mbps</td></tr>
<tr><td>Specification</td><td>:</td><td>Dimensions : 3.29 cm (Ø) X 1.32 cm (H)
Weight : 10 g
Intended Function : The EUT is a BLE PTT.
Product Variance : The manufacturer declares that the series product is identical to the main test sample. For marketing reason, there are series numbers.</td></tr>
</table>

1.4 EUT Classification

Type of equipment:	☒	stand alone equipment
	☐	plug in radio equipment
	☐	combined equipment
Modulation types:	☒	Wide Band Modulation (None Hopping – e.g. DSSS, OFDM)
	☐	Frequency Hopping Spread Spectrum (FHSS)
Adaptive equipment:	☒	Yes, LBT-based
	☐	Yes, non-LBT-based
	☐	Yes (but can be disabled)
	☐	No
Antennas and transmit operating modes:	☒	Operating mode 1 (single antenna)
		Equipment with 1 antenna, Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used, Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)
	☐	Operating mode 2 (multiple antennas, no beamforming)
		Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without
	☐	Operating mode 3 (multiple antennas, with beamforming)
		Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming. In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

1.5 Test Instruments

Test Equipment	Manufacturer	Model No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	2022/08/03	2023/08/02
LISN	R&S	ENV216	2022/08/03	2023/08/02
EMI Test Receiver	R&S	ESPI	2022/08/03	2023/08/02
EMI Test Receiver	R&S	ESCI	2022/08/03	2023/08/02
Spectrum Analyzer	Agilent	N9020A	2022/08/03	2023/08/02
Spectrum Analyzer	R&S	FSP	2022/08/03	2023/08/02
Vector Signal generator	Agilent	N5182A	2022/08/03	2023/08/02

Analog Signal Generator	R&S	SML03	2022/08/03	2023/08/02
Universal Radio Communication	CMW500	R&S	2022/08/03	2023/08/02
Temperature and humidity meter	Chigo	ZG-7020	2022/08/03	2023/08/02
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	2021/08/07	2024/08/06
Horn Antenna	Schwarzbeck	BBHA 9120D	2021/08/07	2024/08/06
Loop Antenna	Zhinan	ZN30900C	2021/08/07	2024/08/06
Horn Antenna	Beijing Hangwei Dayang	OBH100400	2021/08/07	2024/08/06
Amplifier	Schwarzbeck	BBV 9745	2022/08/03	2023/08/02
Amplifier	Taiwan chengyi	EMC051845B	2022/08/03	2023/08/02
Directional coupler	NARDA	4226-10	2022/08/03	2023/08/02
High-Pass Filter	XingBo	XBLBQ-GTA18	2022/08/03	2023/08/02
High-Pass Filter	XingBo	XBLBQ-GTA27	2022/08/03	2023/08/02
Automated filter bank	Tonscend	JS0806-F	2022/08/03	2023/08/02
Power Sensor	Agilent	U2021XA	2022/08/03	2023/08/02
Amplifier	Schwarzbeck	BBV9719	2022/08/03	2023/08/02

※ The test equipments used are calibrated and can be traced to National ITRI and International Standards.

1.6 Auxiliary Equipments

N/A

1.7 EUT SETUP

Remote from test scene

Note: The EUT has been tested as an independent unit.

1.8 Description of Test Mode

The EUT had been tested under the operating condition.

There are three channels have been tested as following:

Bluetooth	
Channel	Frequency (MHz)
Low	2402
Middle	2440
High	2480

Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

1.9 Condition of Power Supply

Power Condition	Voltage (V)
V nor	3.0

1.10 EUT Configuration

1. Setup the EUT as shown in Sec.1.4 Block Diagram.
2. Turn on the power of all equipments.
3. Activate the selected Final Test Mode.

1.11 Qualification of Test Facility

Company Name	:	Shenzhen CTA Testing Technology Co., Ltd.
Address	:	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community,Fuhai Street, Bao'an District, Shenzhen, China
A2LA-Lab Cert. No.	:	6534.01

Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Frequency error	25 Hz	(1)
Frequency range	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Adjacent and alternate channel power Conducted	1.20 dB	(1)
Conducted spurious emission	1.60 dB	(1)
Radiated spurious emission	2.20 dB	(1)
Intermodulation attenuation	1.00 dB	(1)
Maximum useable receiver sensitivity	2.80 dB	(1)
Co-channel rejection	2.80 dB	(1)
Adjacent channel selectivity	2.80 dB	(1)
Spurious response rejection	2.80 dB	(1)
Intermodulation response rejection	2.80 dB	(1)
Blcking or desensitization	2.80 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2 RF OUTPUT POWER

2.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

2.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.2.3)

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

This limit shall apply for any combination of power level and intended antenna assembly.

The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.

The equipment shall be operated under its worse case configuration (modulation, bandwidth, power, etc.) with respect to the requirement being tested. Measurement of multiple data sets may be required.

For systems using FHSS modulation, the measurements shall be performed during normal operation (hopping).

For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.

2.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.2.1.2.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Step 1:

- Use a fast power sensor suitable for 2.4 GHz and capable of 1 MS/s.
- Use the following settings: Sample speed 1 MS/s or faster.

The samples must represent the power of the signal.

Measurement duration: For non-adaptive equipment: equal to the observation period defined in clauses 4.3.1.3.2or 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.

NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:

- For conducted measurements on devices with one transmit chain:

Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.

- For conducted measurements on devices with multiple transmit chains:

Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports. Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.
For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.

Step 3:

- Find the start and stop times of each burst in the stored measurement samples.

NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB below the RMS burst power calculated in step 4.

Step 4:

- Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these Pburst values, as well as the start and stop times for each burst.

Step 5:

- The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

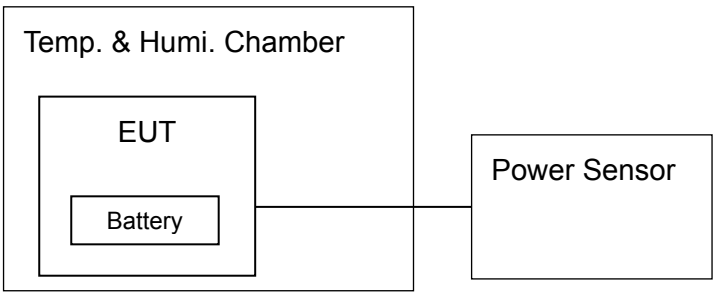
Step 6:

- Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
- If applicable, add the additional beamforming gain "Y" in dB.
- If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
- The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G + Y$$

- This value, which shall comply with the limit given in clauses 4.3.1.2.3 or 4.3.2.2.3, shall be recorded in the test report.

2.4 Test Configuration



2.5 Test Result

Compliance

The final test data are shown below.

Test Conditions		EIRP Power (dBm) / Bluetooth 1Mbps		
		Low	Mid	High
		EIRP	EIRP	EIRP
T_{nom}(25)°C	V_{nom}(3.0Vdc)	-4.51	-4.87	-5.32
T_{min}(-20)°C	V_{nom}(3.0Vdc)	-4.58	-4.93	-5.39
T_{max}(+40)°C	V_{nom}(3.0Vdc)	-4.44	-4.81	-5.26
Limit		20dBm		

3 POWER SPECTRAL DENSITY

3.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

3.2 Test Limit (ETSI EN 300 328 Sub-Clause 4.3.2.3.3)

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz

The Power Spectral Density is the mean equivalent isotropically radiated power (e.i.r.p.) spectral density during a transmission burst.

These measurements shall only be performed at normal test conditions.

The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded.

3.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.3.2.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

The transmitter shall be connected to a spectrum analyser and the Power Spectral Density as defined in clause 4.3.2.2 shall be measured and recorded.

Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
- Start Frequency: 2 400 MHz
- Stop Frequency: 2 483,5 MHz
- Resolution BW: 10 kHz
- Video BW: 30 kHz
- Sweep Points: > 8 350

NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.
- Detector: RMS
- Trace Mode: Max Hold
- Sweep time: Auto

For non-continuous signals, wait for the trace to be completed. Save the (trace) data set to a file.

Step 2:
For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.

Step 3:
Add up the values for amplitude (power) for all the samples in the file.

Step 4:

Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.4.2.

Step 5:

Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

Step 6:

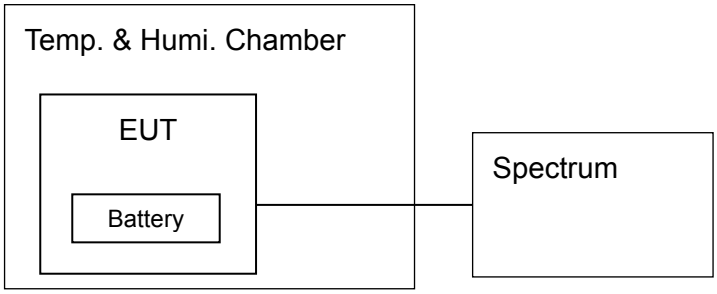
Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 5 (i.e. sample #2 to #101).

Step 7:

Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments.

From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.2, shall be recorded in the test report.

3.4 Test Configuration



3.5 Test Result

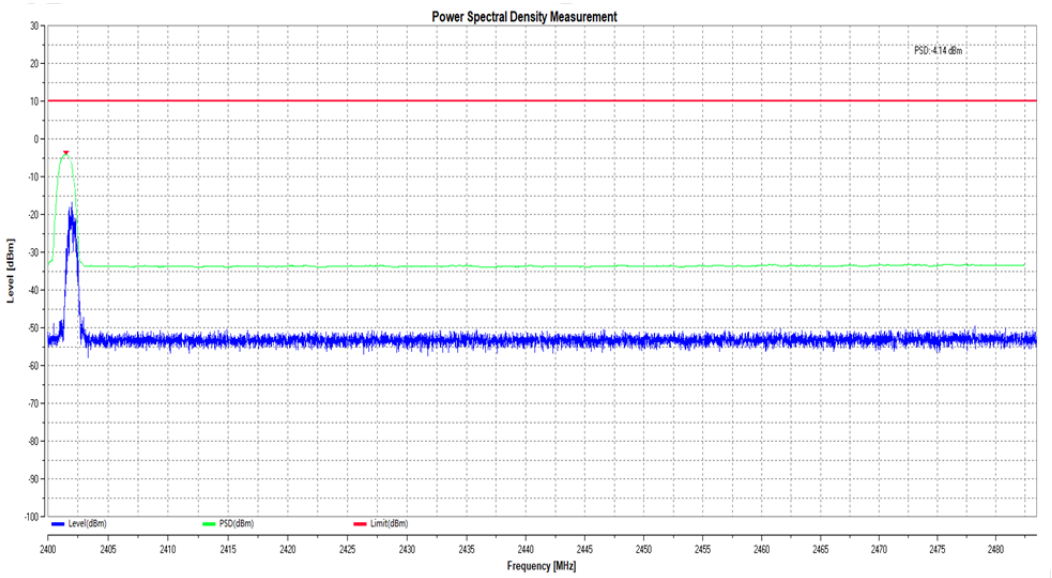
Compliance

The final test data are shown on the following page(s).

Test Conditions		Power Spectral Density (dBm/ MHz)		
		Low	Mid	High
		EIRP	EIRP	EIRP
T_{nom}(25)°C	BLE	-4.94	-5.36	-5.91
V_{nom}(3.0)V	--	--	--	--
	--	--	--	--
	--	--	--	--
Limit		10dBm/ MHz		

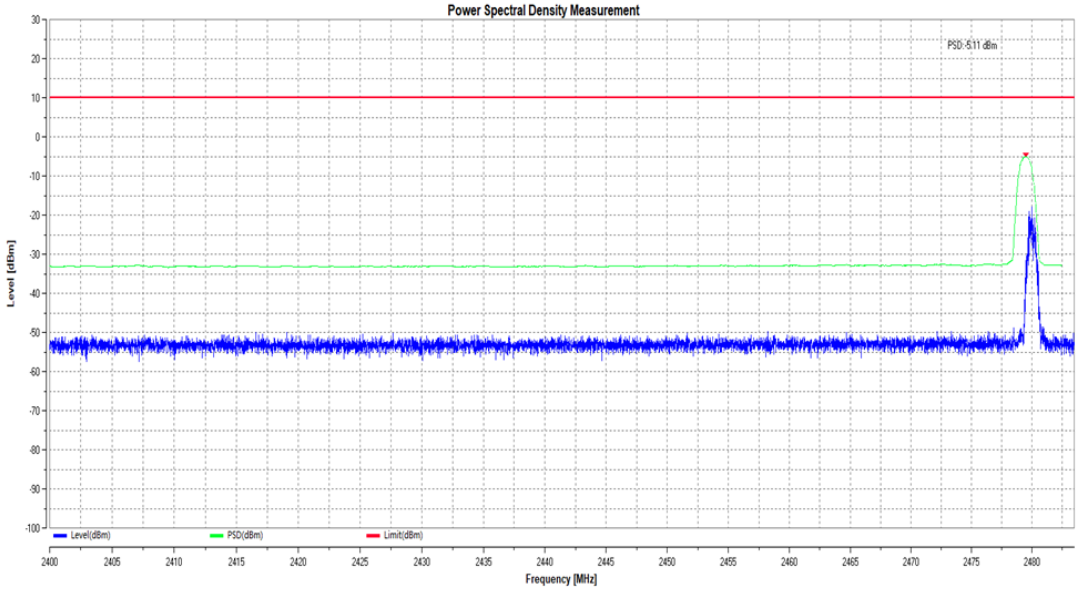
GFSK

CH00



CH19

CH39


Power Spectral Density Measurement
PSD:-5.11 dBm
Level [dBm]
Level(dBm)
PSD(dBm)
Limit(dBm)
Frequency [MHz]

4 Duty Cycle, Tx-Sequence, Tx-Gap (Not Apply)

4.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

4.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.4.3)

The Duty Cycle shall be equal to or less than the maximum value declared by the supplier.

The maximum Tx-sequence Time and the minimum Tx-gap Time shall be according to the formula below:

Maximum Tx-Sequence Time = Minimum Tx-gap Time = M where M is in the range of 3,5 ms to 10 ms.

Duty Cycle is defined as the ratio of the total transmitter 'on'-time to a 1 second observation period.

Tx-sequence is defined as a period in time during which a single or multiple transmissions may occur and which shall be followed by a Tx-gap.

Tx-gap is defined as a period in time during which no transmissions occur.

NOTE: The maximum Duty Cycle at which the equipment can operate, is declared by the supplier. These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non- adaptive mode. The equipment is using wide band modulations other than FHSS.

These requirements do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Medical devices requiring reverse compatibility with other medical devices placed on the market when earlier versions of the present document were harmonised, are allowed to have an operating mode in which they do not have to comply with the requirements for Duty Cycle, Tx-sequence and Tx-gap.

4.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.2.1.3.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.

The test procedure, which shall only be performed for non-adaptive systems and only to be performed at normal environmental conditions, shall be as follows:

Step 1:

● Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.1.

Step 2:

● Between the saved start and stop times of each individual burst, calculate the TxOn time. Save these TxOn values.

Between the saved stop and start times of two subsequent bursts, calculate the TxOff time. Save these TxOff values.

Step 3:

● Duty Cycle is the sum of all TxOn times divided by the observation period defined in clauses 4.3.1.3.1 or 4.3.2.4.1.

● For equipment using blacklisting, the TxOn time measured for a single (and active) hopping frequency shall be multiplied by the number of blacklisted frequencies. This value shall be added to the sum calculated in the previous bullet point. If the number of blacklisted frequencies cannot be determined, the minimum number of hopping frequencies as defined in clause 4.3.1.3.2 shall be assumed.

The above calculated value for Duty Cycle shall be recorded in the test report. This value shall be equal to or less than the maximum value declared by the supplier.

Step 4:

● Any TxOff time that is greater than the minimum Tx-gap time is considered a Tx-gap. The lowest Tx-gap time shall be recorded in the test report. The minimum Tx-gap time is defined in clauses 4.3.1.3.2 or 4.3.2.4.2.

The Tx-sequence time is the time between two subsequent Tx-gaps. The maximum Tx-sequence time shall be recorded in the test report. Any Tx-sequence shall be shorter than the value defined in clauses 4.3.1.3.2 or 4.3.2.4.2.

4.4 Test Result

N/A

This requirement do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p. So this requirement do not apply for EUT.Not applicable for this kind of EUT.

5 MEDIUM UTILISATION (MU) FACTOR

5.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

5.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.5.3)

For non-adaptive equipment using wide band modulations other than FHSS, the maximum Medium Utilisation factor shall be 10 %.

The Medium Utilisation (MU) factor is a measure to quantify the amount of resources (Power and Time) used by non-adaptive equipment. The Medium Utilisation factor is defined by the formula:

$$MU = (P/100\ mW) \times DC$$

where: MU is Medium Utilisation.

P is the RF output power as defined in clause 4.3.2.1.1 expressed in mW. DC is the Duty Cycle as defined in clause 4.3.2.3.1 expressed in %.

NOTE: The equipment may have dynamic behaviour with regard to duty cycle and corresponding power level. See clause 5.3.1 i).

This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.

In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Medical devices requiring reverse compatibility with other medical devices placed on the market when earlier versions of the present document were harmonised, are allowed to have an operating mode in which they have a Medium Utilisation above the limit defined in clause 4.3.2.4.2.

5.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.2.1.4.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Step 1:
● Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.1.

Step 2:

● For each burst calculate the product of (P_{burst}/100 mW) and the TxOn time. NOTE: Pburst is expressed in mW. TxOn time is expressed in ms.

Step 3:

● Medium Utilisation is the sum of all these products divided by the observation period (expressed in ms) which is defined in clauses 4.3.1.2.1 or 4.3.2.3.1. This value, which shall comply with the limit given in clauses 4.3.1.5.2 or 4.3.2.4.2, shall be recorded in the test report.

5.4 Test Result

N/A

This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode. In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10 dBm E.I.R.P.

6 ADAPTIVITY (adaptive equipment using modulations other than FHSS)

6.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

6.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.6)

The frequency range of the equipment is determined by the lowest and highest Non-LBT based Detect and Avoid

1.During normal operation,the equipment shall evaluate the presence of a singnal on its current operating channel.If it is determined that a signal is present with a level above the detection threshold defined in step 5 the channel shall be marked as 'unavallable'

2.The channel shall remain unavailable for a minimum time equal to 1 second after which the channel may be considered again as an ‘available’ channel;

3.COT ≤40 ms;

4.Idle Period = 5% of COT of the Channel Occupancy Time with a minimum of 100 μs; After this, the procedure as in step 1 needs to be repeated.

Detection threshold level = -70dBm/MHz + (20dBm – Pout e.i.r.p)/1MHz (Pout in dBm);

LBT based Detect and Avoid (Frame Based Equipment):

1.Minimum Clear Channel Assessment (CCA) time ≥18 us;

2.The equipment is allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4(If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.);

3.COT = 1~10 ms; Idle Period = 5% of COT;

4.Control frames are allowed but data frames are not allowed;CCA≤COT,

5..Detection threshold level = -70dBm/MHz + (20dBm – Pout e.i.r.p)/1MHz (Pout in dBm);

LBT based Detect and Avoid (Load Based Equipment):

1.Minimum Clear Channel Assessment (CCA) time ≥18 us;

2.The equipment is allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4(If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.);

3.COT ≤13ms, after which the device shall perform a new CCA as described in step 1

4.Control frames are allowed but data frames are not allowed;CCA≤COT;

5.Detection threshold level = -70dBm/MHz + (20dBm – Pout e.i.r.p)/1MHz (Pout in dBm).

Unwanted Signal

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in clause 4.3.2.6.2 (non-LBT based DAA) or clause 4.3.2.6.3 (LBT based DAA) in the presence of a blocking signal with characteristics as provided in below.

6.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.6.2.1.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

RBW: ≥Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used) (10MHz)

VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)(10MHz)

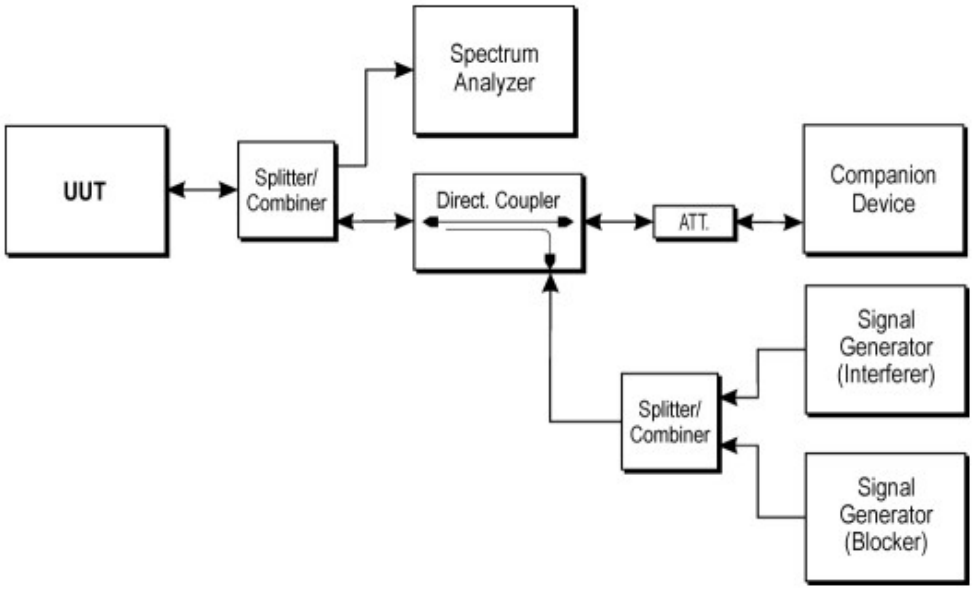
Detector Mode: RMS

Centre Frequency: Equal to the centre frequency of the operating channel

Span: 0 Hz

Sweep time: > Channel Occupancy Time of the UUT Trace Mode: Clear/Write

6.4 Test Setup



6.5 Test Result

N/A

This requirement do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p. So this requirement do not apply for EUT.

7 OCCUPIED CHANNEL BANDWIDTH

7.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

7.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.7.3)

The Occupied Channel Bandwidth shall fall completely within the band given in clause 1.

In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

This requirement applies to all types of equipment using wide band modulations other than FHSS The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs).

For systems using FHSS modulation and which have overlapping channels, special software might be required to force the UUT to hop or transmit on a single Hopping Frequency.

The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range. The frequencies on which the test were performed shall be recorded.

If the equipment can operate with different Occupied Channel Bandwidths (e.g. 20 MHz and 40 MHz), than each channel bandwidth shall be tested separately.

7.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.7.2.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
- Centre Frequency: The centre frequency of the channel under test
- Resolution BW: ~ 1 % of the span without going below 1 %
- Video BW: 3 × RBW
- Frequency Span: 2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: RMS

Trace Mode: Max Hold

Step 2:
Wait until the trace is completed.
Find the peak value of the trace and place the analyser marker on this peak.

Step 3:

Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

NOTE: Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

7.4 Test Result

Compliance

Bluetooth 1Mbps (worst case)				
Test Condition		Frequency (MHz)		
		FL(T1)	FH(T2)	99%BW
T_{nom}(25)ºC	BLE (LOW)	2401.4869	2402.5192	1.0323
V_{nom}(3.0)Vdc	BLE (HIGH)	2479.4851	2480.5197	1.0346

BLE (low)

BLE (high)

8 TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

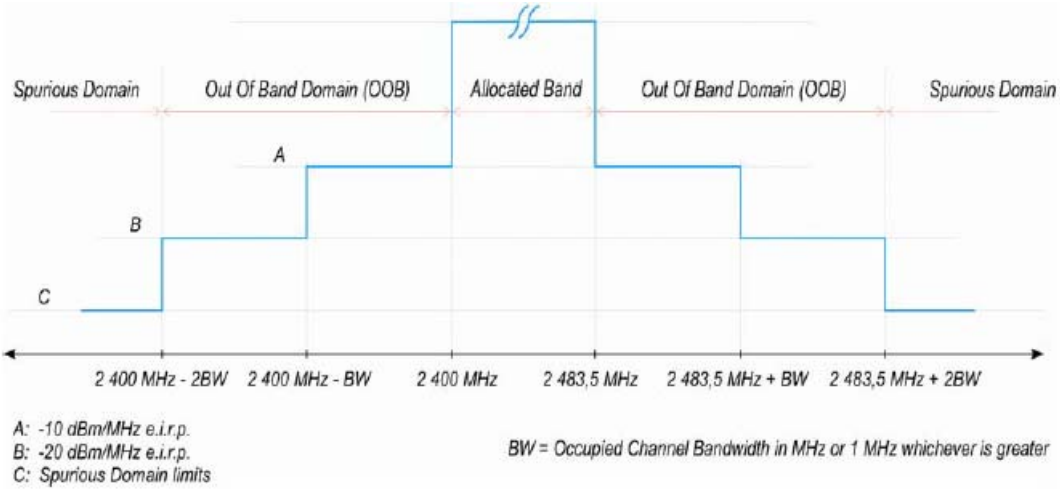
8.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

8.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.8.3)

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1.

NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.6.



Transmitter unwanted emissions in the out-of-band domain are emissions when the equipment is in Transmit mode, on frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious.

These measurements have to be performed at normal environmental conditions and shall be repeated at the extremes of the operating temperature range.

In the case of equipment intended for use with an integral antenna and where no external (temporary) antenna connectors are provided, a test fixture as described in clause B.3 may be used to perform relative measurements at the extremes of the operating temperature range.

For systems using FHSS modulation, the measurements shall be performed during normal operation (hopping).

For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded. The equipment shall be configured to operate under its worst case situation with respect to output power. If the equipment can operate with different Occupied Channel Bandwidths (e.g. 20 MHz and 40 MHz), than each channel bandwidth shall be tested separately.

8.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.8.2.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.

Step 1:

Connect the UUT to the spectrum analyser and use the following settings:

● Centre Frequency: The centre frequency of the channel under test Centre Frequency: 2 484 MHz

Span: 0 Hz

Resolution BW: 1 MHz

Filter mode: Channel filter

Video BW: 3 MHz

Detector Mode: RMS

Trace Mode: Clear / Write

Sweep Mode: Continuous

Sweep Points: 5 000

Trigger Mode: Video trigger

NOTE 1: In case video triggering is not possible, an external trigger source may be used. Sweep Time: Suitable to capture one transmission burst

Step 2: (segment 2 483,5 MHz to 2 483,5 MHz + BW)

● Adjust the trigger level to select the transmissions with the highest power level.

● For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.

● Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.

Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.

● Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3: (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW)

● Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre

frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz.

Step 4: (segment 2 400 MHz - BW to 2 400 MHz)

● Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

Step 5: (segment 2 400 MHz - 2BW to 2 400 MHz - BW)

● Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

Step 6:

● In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figures 1 or 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

● In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figures 1 or 3.

Option 2: the limits provided by the mask given in figures 1 or 3 shall be reduced by 10 x log10(Ach) and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits

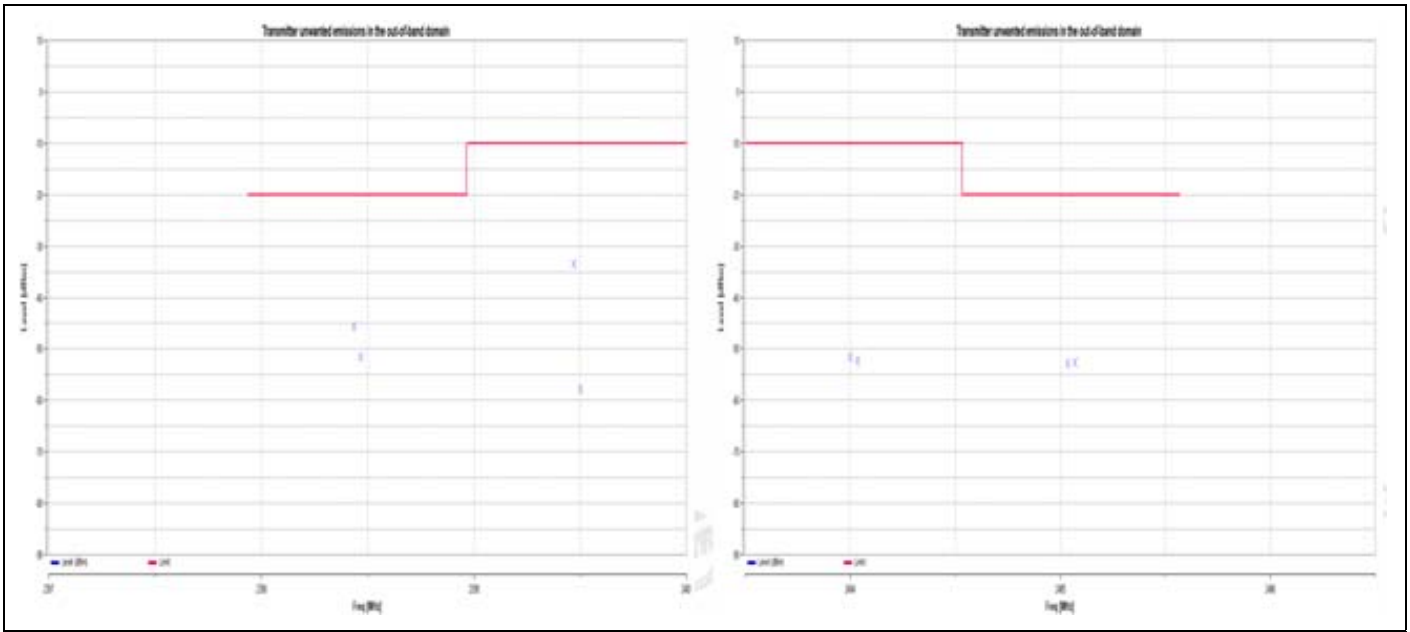
NOTE 2: Ach refers to the number of active transmit chains.

8.4 Test Result

Compliance

GFSK						
Test conditions		Frequency range (MHz)		Level (dBm)	Limit (dBm)	Result
Voltage (V)	Temperature (℃)	Start	Stop			
3.00	25	2400-2OBW	2400-OBW	*	-20	Pass
		2400-OBW	2400	*	-10	Pass
		2484	2484+OBW	*	-10	Pass
		2484+OBW	2484+2OBW	*	-20	Pass
	-20	2400-2OBW	2400-OBW	*	-20	Pass
		2400-OBW	2400	*	-10	Pass
		2484	2484+OBW	*	-10	Pass
		2484+OBW	2484+2OBW	*	-20	Pass
	40	2400-2OBW	2400-OBW	*	-20	Pass
		2400-OBW	2400	*	-10	Pass
		2484	2484+OBW	*	-10	Pass
		2484+OBW	2484+2OBW	*	-20	Pass

Note:* Radiant level is far less than the limit, has more than 20 dB margin



BLE (low)	BLE (high)

9 TRANSMITTER SPURIOUS EMISSIONS

9.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

9.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.9.3)

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (>1 GHz))	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87.5 MHz	-36 dBm	100 kHz
87.5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain as indicated in figure 1 when the equipment is in Transmit mode.

These measurements shall only be performed at normal test conditions.

For systems using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. When this is not possible, the measurement shall be performed during normal operation (hopping). For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded.

The equipment shall be configured to operate under its worst case situation with respect to output power.

If the equipment can operate with different Occupied Channel Bandwidths (e.g. 20 MHz and 40 MHz), then the equipment shall be configured to operate under its worst case situation with respect to spurious emissions.

9.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.9.2.1.

Measurement	
☒ Conducted measurement	☒ Radiated measurement

In case of conducted measurements, the radio equipment shall be connected to the measuring

equipment via a suitable attenuator.

The spectrum in the spurious domain (see figures 1 or 3) shall be searched for emissions that exceed the limit values given in tables 1 or 4 or that come to within 6 dB below these limits. Each occurrence shall be recorded.

Pre-scan

The test procedure below shall be used to identify potential unwanted emissions of the UUT.

Step 1:

The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in tables 1 or 4.

Step 2:

The emissions over the range 30 MHz to 1 000 MHz shall be identified. Spectrum analyser settings:

- Resolution bandwidth: 100 kHz
- Video bandwidth: 300 kHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points: ≥ 9 970

NOTE 1: For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.

- Sweep time:

For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT.

For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequency in different hopping sequences.

Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.3.10.2.1.2 and compared to the limits given in tables 1 or 4.

Step 3:

The emissions over the range 1 GHz to 12,75 GHz shall be identified. Spectrum analyser settings:

- Resolution bandwidth: 1 MHz
- Video bandwidth: 3 MHz
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points: ≥ 11 750

NOTE 2: For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.

- Sweep time:

For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently

long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT.

For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequency in different hopping sequences.

Allow the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.3.9.2.1.2 and compared to the limits given in tables 1 or 4.

Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.3.9.2.1.2.

Step 4:

In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the steps 2 and 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identifyemissions during this pre-scan need to be reduced with 10 × log10 (Ach) (number of active transmit chains).

Measurement of the emissions identified during the pre-scan

The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above.

Step 1:

The level of the emissions shall be measured using the following spectrum analyser settings:

- Centre Frequency: Frequency of emission identified during the pre-scan
- Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
- Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
- Frequency Span: Wide enough to capture each individual emission indentified during the pre-scan
- Sweep mode: Continuous
- Sweep time: Auto
- Trigger: Free run
- Detector: RMS
- Trace Mode: Max Hold

Step 2:

In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the step 1 needs to be repeated for each of the active transmit chains (Ach).

The trace data for each transmit chain has to be recorded.

Sum the power in each of the traces for each individual frequency bin.

Step 3:

Use the marker function to find the highest peak within the measurement trace and record its value and its frequency.

Step 4:

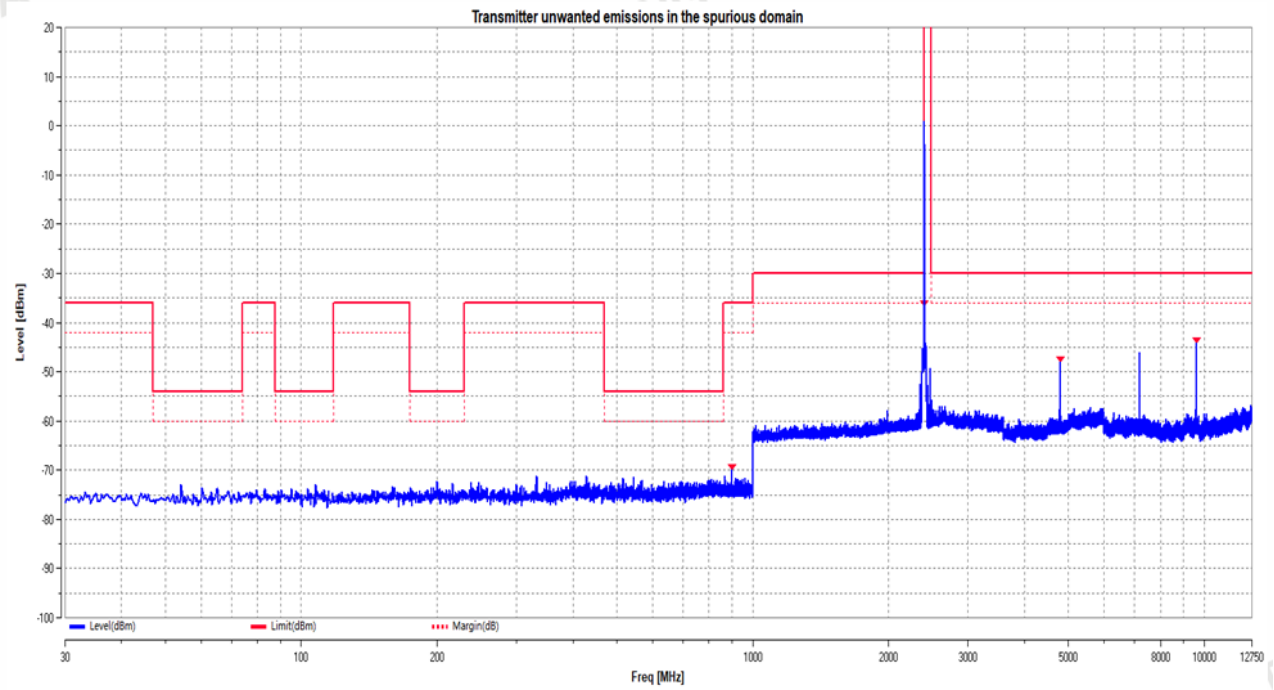
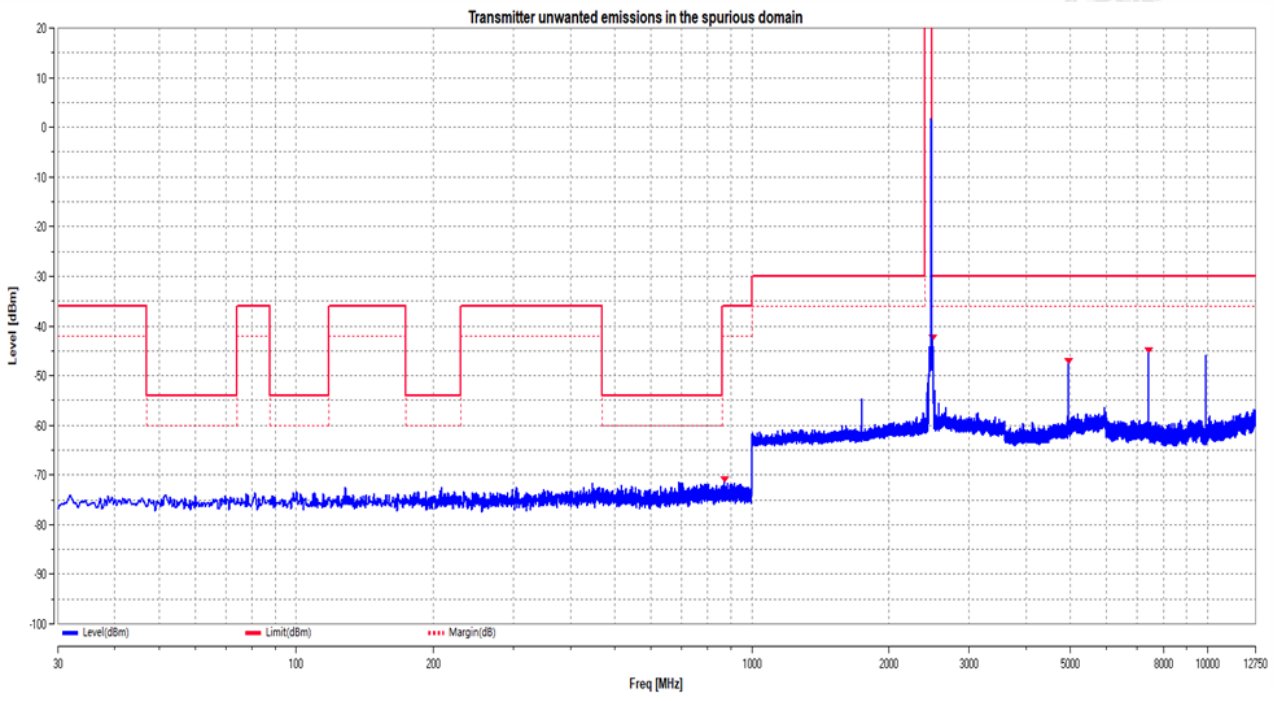
The measured values shall be compared to the limits defined in tables 1 and 4.

9.4 Test Result

Compliance

The final test data are shown on the following page(s).

Radiated Spurious Emission Data					
Test Conditions		Frequency (MHz)	Transmitter unwanted emission in spurious domain (dBm)	Testing Antenna Polarity	Limit (dBm)
T_{nom}(25)°C V_{nom}(3.0)Vdc 30 to 1000 MHz	1Mbps (Low)	4804.00	-49.13	Horizontal	-30
	1Mbps (High)	4960.00	-49.35	Vertical	-30
T_{nom}(25)°C V_{nom}(3.0)Vdc 1 to 12.75 GHz	1Mbps (Low)	7206.00	-51.20	Vertical	-30
	1Mbps (High)	7440.00	-51.54	Vertical	-30

Conducted Spurious Emission Data

BLE (low)

BLE (high)

10 RECEIVER SPURIOUS RADIATION

10.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

10.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.10.3)

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (>1GHz))
30 MHz ~ 1 GHz	-57 dBm
1 GHz ~ 12.75 GHz	-47 dBm

These measurements shall only be performed at normal test conditions. Testing shall be performed when the equipment is in a receive-only mode.

For systems using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded. For systems using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. These frequencies shall be recorded. When disabling the normal hopping is not possible, the measurement shall be performed during normal operation (hopping).

10.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.10.2.1.

Measurement	
☒ Conducted measurement	☒ Radiated measurement

The same as described in section 9.3.

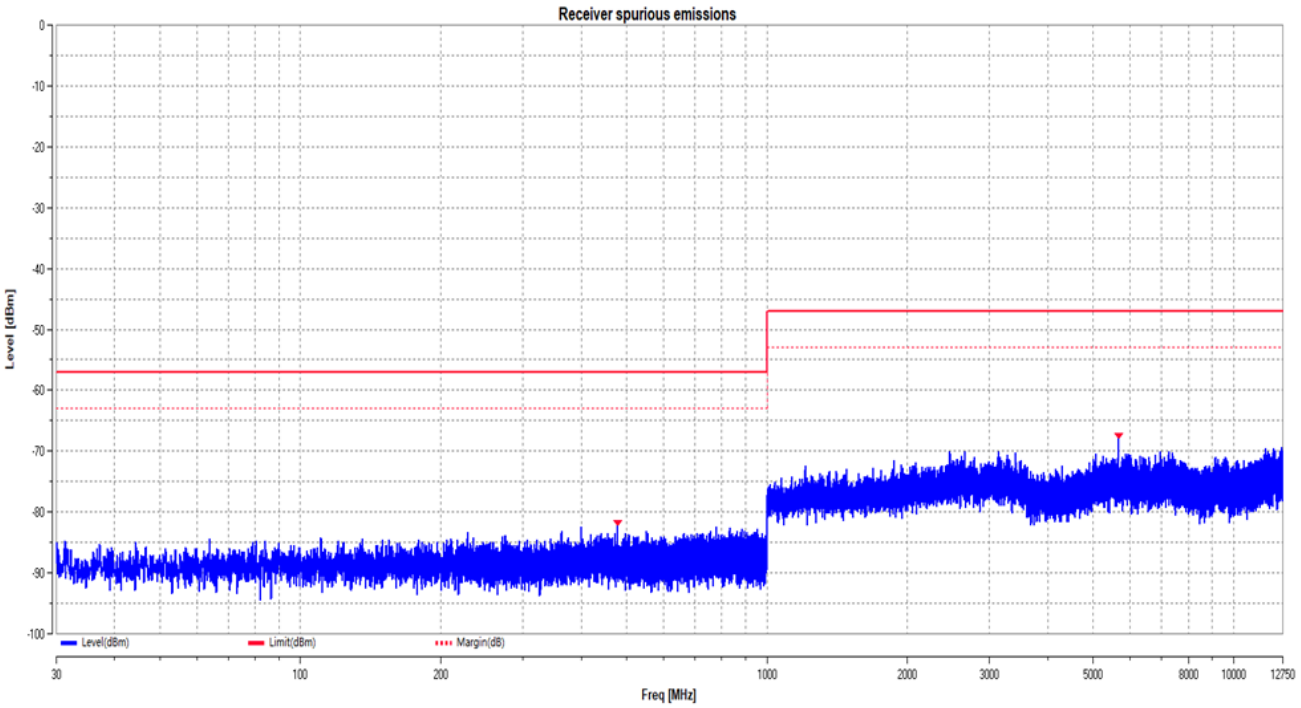
10.4 Test Result

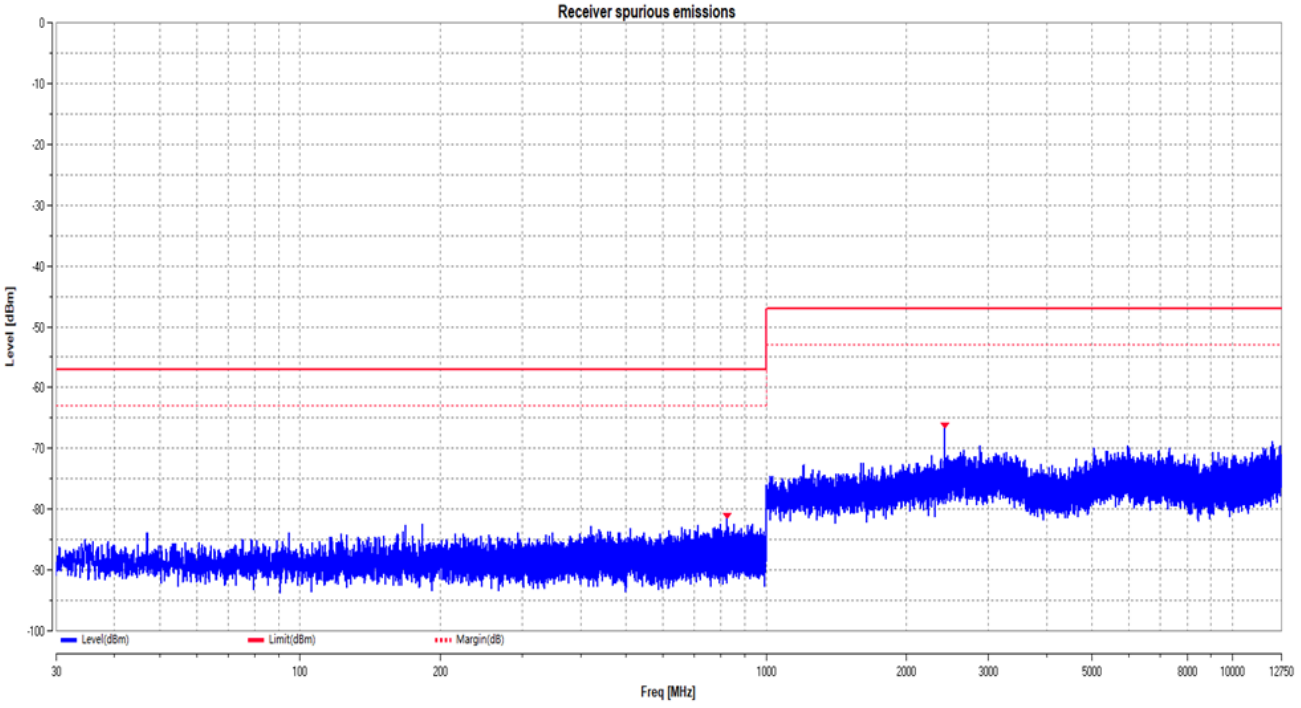
Compliance

The final test data are shown on the following page(s).

Radiated Spurious Emission Data					
Test Conditions Bluetooth		Frequency (MHz)	Transmitter unwanted emission in spurious domain (dBm)	Testing Antenna Polarity	Limit (dBm)
T_{nom}(25)°C V_{nom}(3.0)Vac 30 to 1000 MHz	1Mbps (Low)	69.41	-72.43	Vertical	-54
	1Mbps (High)	78.12	-73.57	Vertical	-54
T_{nom}(25)°C V_{nom}(3.0)Vac 1 to 12.75 GHz	1Mbps (Low)	372.19	-73.18	Horizontal	-30
	1Mbps (High)	269.51	-75.26	Horizontal	-30

Conducted Spurious Emission Data





11 RECEIVER BLOCKING

11.1 Test Instruments

Refer to Sec. 1.4 Test Instruments.

11.2 Limit (ETSI EN 300 328 Sub-Clause 4.3.2.11.4)

While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in follow.

Receiver Category 1

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Category 2

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 3

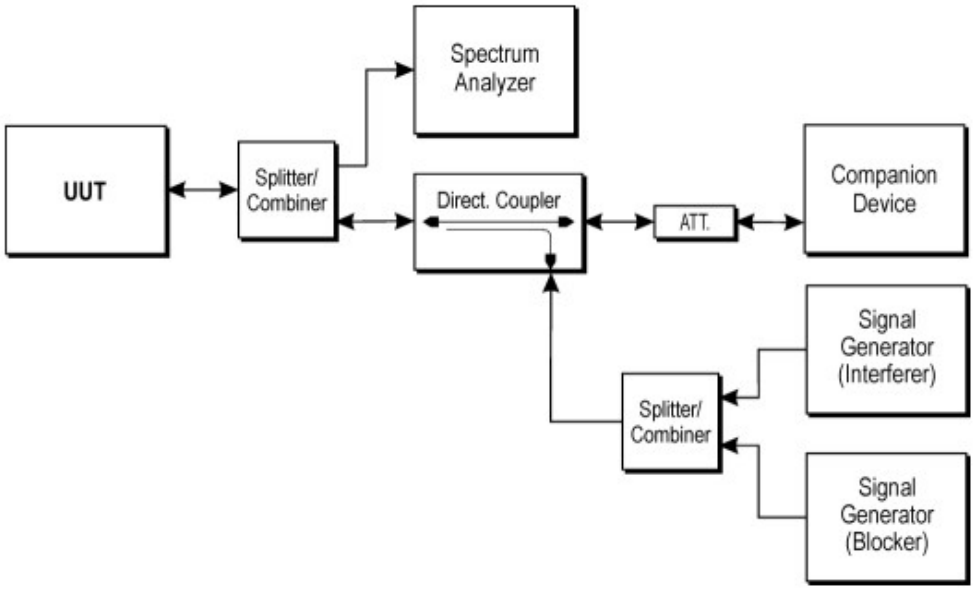
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

11.3 Test Procedures

Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.11.2.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

11.4 Test Configuration



11.5 Test Result

Compliance

The final test data are shown on the following page(s).

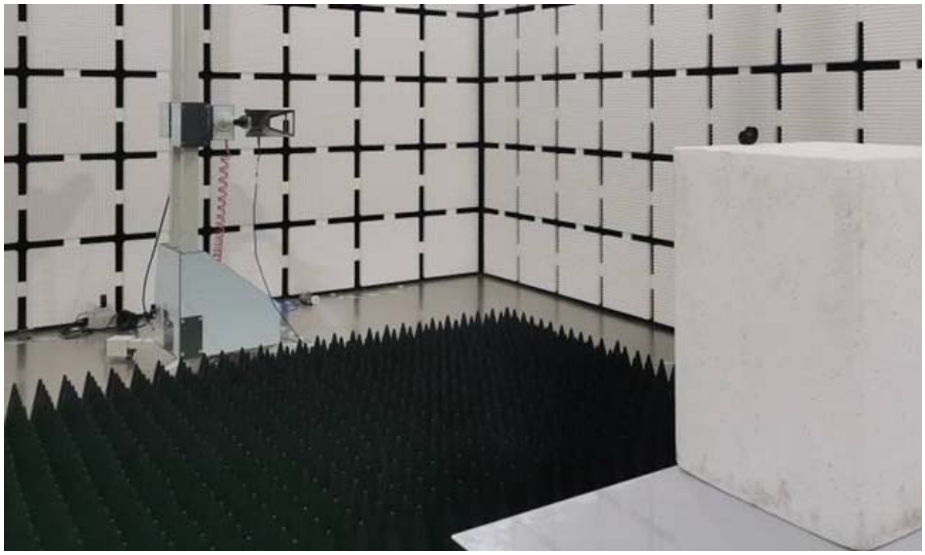
According to section 2.5, The Power of the EUT is less than 0dB. So, it belongs to Receiver category 3.

Test frequency	2402MHz		Test mode	Normal link	
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Limit(PER)	test value(PER)	Result
-139 dBm + 10 × log10(OCBW) + 20	2380	-34	10%	2%	PASS
	2504		10%	4%	PASS
	2300		10%	3%	PASS
	2584		10%	5%	PASS

Test frequency	2480MHz		Test mode	Normal link	
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Limit(PER)	test value(PER)	Result
-139 dBm + 10 × log10(OCBW) + 20 dB	2380	-34	10%	3%	PASS
	2504		10%	5%	PASS
	2300		10%	3%	PASS
	2584		10%	2%	PASS

12 Photographs of the Tests

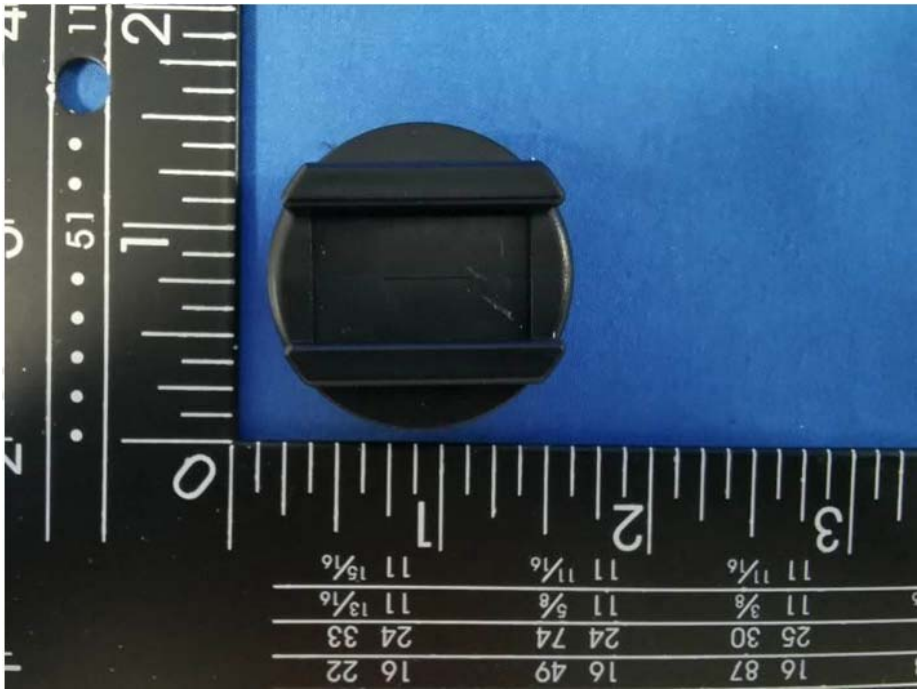
Front view of below 1GHz



Front view of above 1GHz

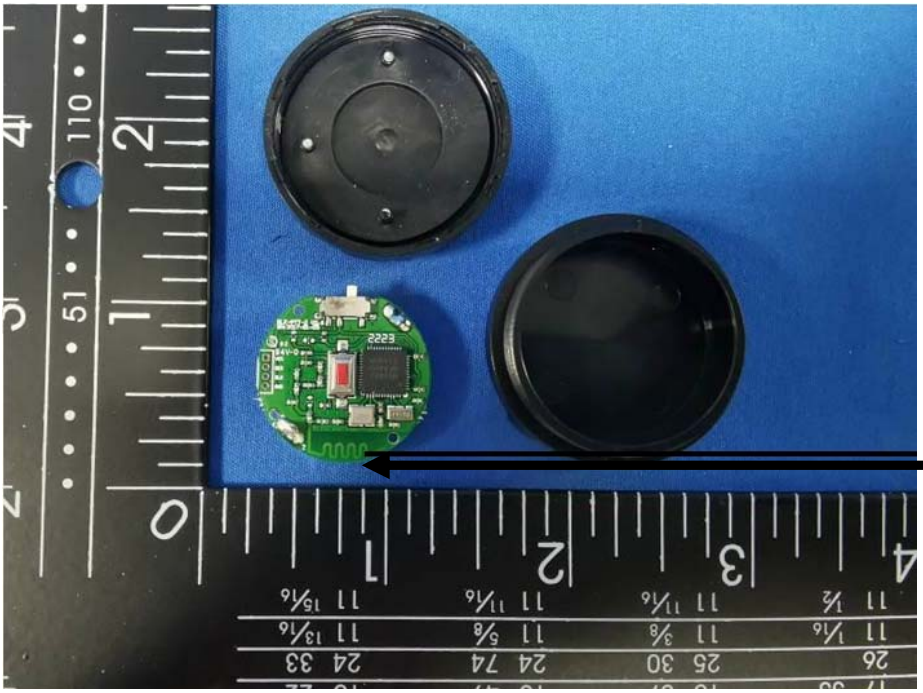
13 Photographs of the EUT

View of the EUT 1

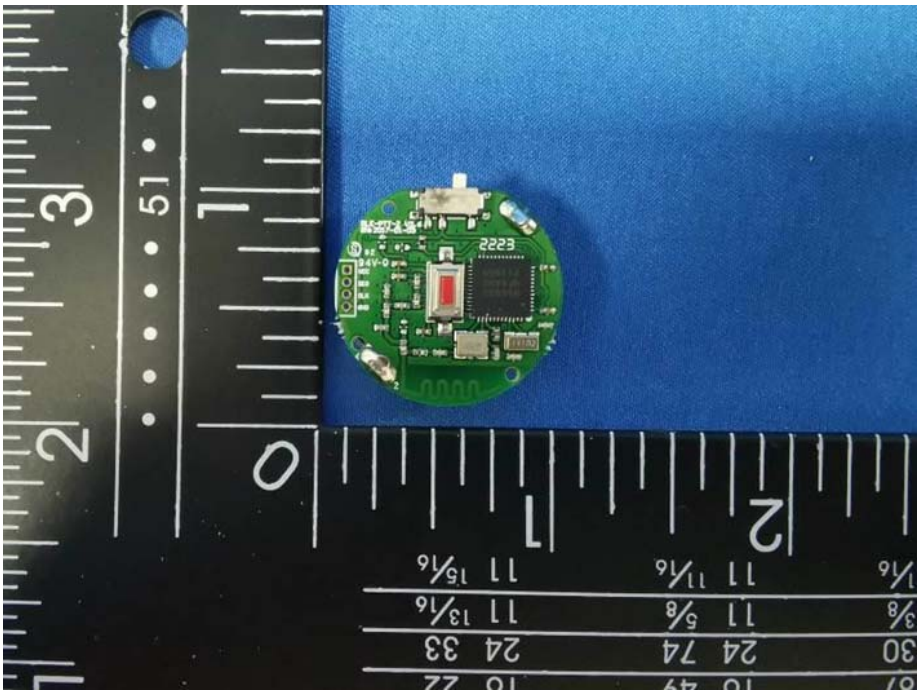


View of the EUT 2

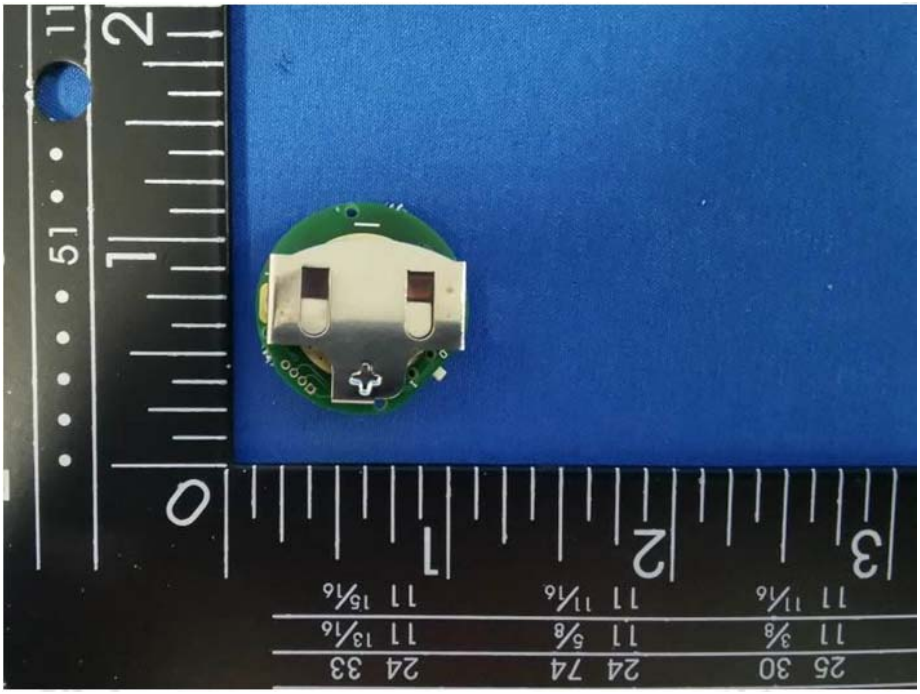
View of the EUT 3



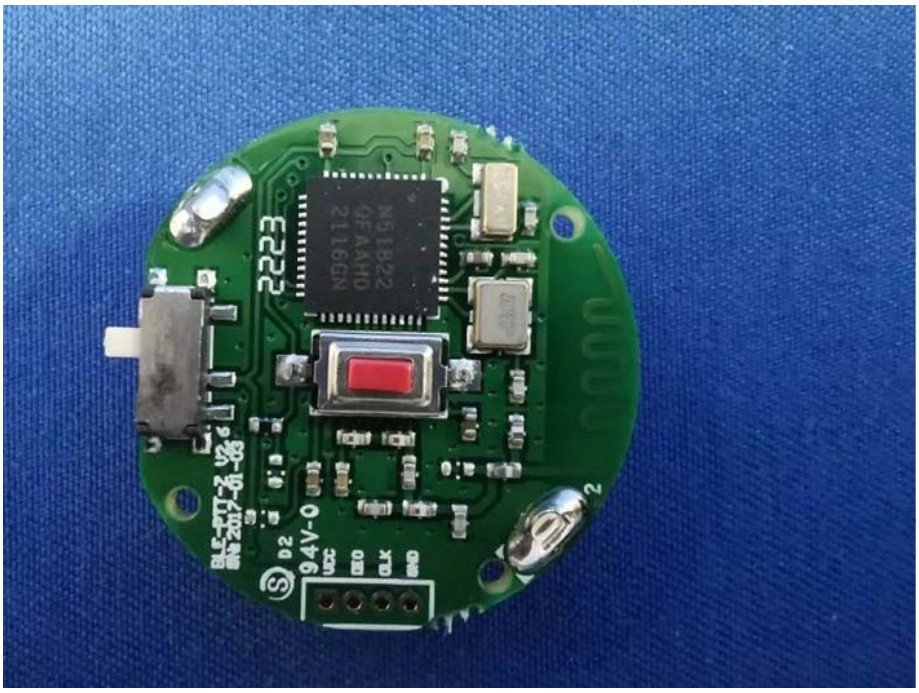
Inside View



Front View of the PCB



Rear View of the PCB



Closer View of the PCB