EN 300 328 Test Report

Product Name : Blazepod
Model No. : Blazepod

Applicant : Play Coyotta
Address : 19 hazohar st. tel aviv

Date of Receipt : July. 18, 2018
Test Date : July. 19, 2018~ July. 31, 2018
Issued Date : Aug. 09, 2018
Report No. : 1872100R-RF-CE-P17V02
Report Version : V1.0

Test Report Certification

Issued Date : Aug. 09, 2018
Report No. : 1872100R-RF-CE-P17V02

Product Name	:	Blazepod
Applicant	:	Play Coyotta
Address	:	19 hazohar st. tel aviv
Manufacturer	:	Play Coyotta
Address	:	19 hazohar st. tel aviv, Israel
Model No.	:	Blazepod
EUT Voltage	:	DC 5V
Test Voltage		AC 230V/50Hz
Applicable Standard	:	ETSI EN 300 328 V2.1.1 (2016-11)
Test Result	:	Complied
Performed Location	:	DEKRA Testing & Certification (Suzhou) Co., Ltd. Corporation No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1872100R-RF-CE-P17V02	V1.0	Initial Issued Report	Aug. 09, 2018

1. General Information

1.1. EUT Description

Product Name	Blazepod
Model No.	Blazepod
EUT Voltage	DC 5V
Test Voltage	AC 230V/50Hz
Bluetooth	
BT Specification	Version 4.0
BT Frequency	2402~2480MHz
BT Channel Number	V4.0: 40
BT Channel Separation	V4.0: 2MHz
BT Type of Modulation	V4.0: GFSK
BT Data Rate	V4.0: 1Mbps(GFSK)
Channel Control	Auto
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

1.2. BT Antenna List

Model No.	N/A			
Antenna manufacturer	N/A			
Antenna Delivery	☒	1*TX+1*RX	☐ 2*TX+2*RX	☐ 3*TX+3*RX
Antenna technology	☒	SISO		
	☐	MIMO	☐	Basic
			☐	CDD
			☐	Sectorized
			☐	Beam-forming
Antenna Type	☐	External	☐	Dipole
			☐	Sectorized
	☒	Internal	☐	PIFA
			☒	PCB
			☐	Ceramic Chip Antenna
			☐	Metal plate type F antenna

Antenna Technology	Ant Gain (dBi)
☒ SISO	1.92

1.3. Channel List

Bluetooth Working Frequency of Each Channel: (For BLE)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz	03	2408 MHz
04	2410 MHz	05	2412 MHz	06	2414 MHz	07	2416 MHz
08	2418 MHz	09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz	15	2432 MHz
16	2434 MHz	17	2436 MHz	18	2438 MHz	19	2440 MHz
20	2442 MHz	21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz	27	2456 MHz
28	2458 MHz	29	2460 MHz	30	2462 MHz	31	2464 MHz
32	2466 MHz	33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz	39	2480 MHz

1.3. EUT Operational Condition

EUT Voltage	DC 5V		
Test Voltage	AC 230V/50Hz		
Extreme Temperature	Tnom (25℃)	Tmax (45℃)	Tmin (-25℃)

1.4. Mode of Operation

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT setting in continuously transmitting mode with maximum duty cycle using software, except for adaptivity test which is under streaming with different modes. See the different modes shown in this test report and defined as:

Test Mode Listed
Mode1: Transmit by BLE
Mode2: Receive by BLE
Mode3: Normal Receive by BLE
Note: 1. Regards to the frequency band operation: the lowest、middle and highest frequency of channel were selected to test for conducted, and the lowest, highest frequency channel for radiation spurious test. 2. The extreme test condition for temperature was determined by manufacturer, see Clause 1.4. 3. The reading values of all the test items contain cable loss. (Cable loss=0.5dB)

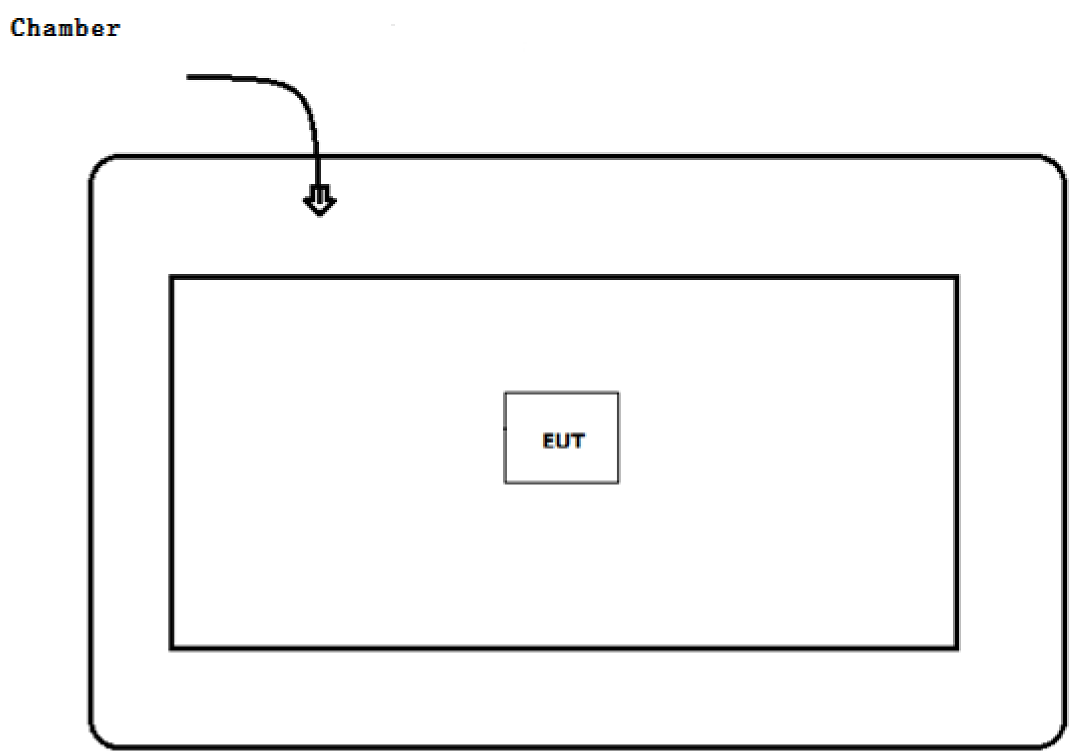
1.5 Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	N/A	N/A	N/A	N/A	N/A

1.6 Configuration of Tested System

Connection Diagram(Radiated set-up)



1.7 EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Select the transmission mode and test channel, then start test.

2 Technical Test

2.1 Test Information as required by ETSI EN 300 328 V2.1.1

a) The type of modulation used by the equipment:
☐ FHSS ☒ other forms of modulation
b) In case of FHSS modulation:
☐ In case of non-Adaptive Frequency Hopping equipment: The number of Hopping Frequencies: ………….. ☐ In case of Adaptive Frequency Hopping Equipment: The maximum number of Hopping Frequencies: ………….. The minimum number of Hopping Frequencies: ………….. ☐ The (average) Dwell Time: …………..
c) Adaptive / non-adaptive equipment:
☐non-adaptive Equipment ☒adaptive Equipment without the possibility to switch to a non-adaptive mode ☐adaptive Equipment which can also operate in a non-adaptive mode
d) In case of adaptive equipment:
The maximum Channel Occupancy Time implemented by the equipment: .... ms ☐The equipment has implemented an LBT based DAA mechanism ☐The equipment is Frame Based equipment ☒The equipment is Load Based equipment ☐The equipment can switch dynamically between Frame Based and Load Based equipment The CCA time implemented by the equipment: .... µs ☐The equipment has implemented a non-LBT based DAA mechanism ☐The equipment can operate in more than one adaptive mode
e) In case of non-adaptive Equipment:
The maximum RF Output Power (e.i.r.p.): ………. dBm The maximum (corresponding) Duty Cycle: ………. % Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared): ……… ……… ………

f) The worst case operational mode for each of the following tests:
RF Output Power : mode 1
Power Spectral Density : mode 1
Occupied Channel Bandwidth : mode 1
Transmitter unwanted emissions in the OOB domain : mode 1
Transmitter unwanted emissions in the spurious domain : mode 1
Receiver spurious emissions : mode 2
Receiver Blocking : mode 3
g) The different transmit operating modes (tick all that apply):
☒Operating mode 1: Single Antenna Equipment
☒ Equipment with only one antenna
☐Equipment with two diversity antennas but only one antenna active at any moment in time
☐Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)
☐Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
☐Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE: Add more lines if more channel bandwidths are supported.
☐Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
☐Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE: Add more lines if more channel bandwidths are supported.
h) In case of Smart Antenna Systems:
The number of Receive chains: ....
The number of Transmit chains: ....
☐symmetrical power distribution
☐asymmetrical power distribution
In case of beam forming, the maximum (additional) beam forming gain: .... dB
NOTE: The additional beam forming gain does not include the basic gain of a single antenna.
i) Operating Frequency Range(s) of the equipment:
Operating Frequency Range 1: ..2400......... MHz to ....2483.5.... MHz
Operating Frequency Range 2: .... MHz to .... MHz
NOTE: Add more lines if more Frequency Ranges are supported.
i) Operating Frequency Range(s) of the equipment:

Nominal Channel Bandwidth 1: ....2....... MHz Nominal Channel Bandwidth 2: .... MHz NOTE: Add more lines if more channel bandwidths are supported.
k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):
☒Stand-alone ☐Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment) ☐Plug-in radio device (Equipment intended for a variety of host systems)
l) The extreme operating conditions that apply to the equipment:
Normal operating conditions (if applicable): Operating temperature: …25… ° C Other (please specify if applicable): …… Extreme operating conditions: Operating temperature range: Minimum: …-25… ° C Maximum …45…° C Other (please specify if applicable): …… Minimum: …… Maximum …… Details provided are for the: ☒stand-alone equipment ☐combined (or host) equipment ☐test jig
m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:
Antenna Type: ☒Integral Antenna Antenna Gain: ......1.92..... dBi If applicable, additional beamforming gain (excluding basic antenna gain): .... dB ☐Temporary RF connector provided ☒No temporary RF connector provided ☐Dedicated Antennas (equipment with antenna connector) ☐Single power level with corresponding antenna(s) ☐Multiple power settings and corresponding antenna(s) Number of different Power Levels: .... Power Level 1: .... dBm Power Level 2: .... dBm Power Level 3: .... dBm NOTE 1: Add more lines in case the equipment has more power levels. NOTE 2: These power levels are conducted power levels (at antenna connector). For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains

(G) and the
resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: .... dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: .... dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: .... dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone Radio equipment or the nominal voltages of the combined (host)equipment or test jig in case of plug-in devices:

Details provided are for the:

☒stand-alone equipment

☐combined (or host) equipment

☐test jig

Supply Voltage

☐AC mains State AC voltage ……….. V

☒DC State DC voltage …… 5….. V

In case of DC, indicate the type of power source

☐Internal Power Supply

☐External Power Supply or AC/DC adapter ☐Battery ☐Other: ....
o) Describe the test modes available which can facilitate testing:
....
p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.): ... IEEE 802.11™ [i.3]
....
q) If applicable, the statistical analysis referred to in clause 5.3.1 q)
(to be provided as separate attachment)
r) If applicable, the statistical analysis referred to in clause 5.3.1 r)
(to be provided as separate attachment)
s) Geo-location capability supported by the equipment:
☐Yes ☐The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user. ☒No
t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):
....

2.2 Summary of Test Result for other than FHSS wide band modulation

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

Performed Test Item	Test Procedure	Adaptive		Non-Adaptive		Deviation
		(≥10dBm)	**(<10dBm)**	(≥10dBm)	(<10dBm)	
RF Output Power	Claus 5.4.2	Yes	**Yes**	Yes	Yes	No
Power Spectral Density	Claus 5.4.3	Yes	**Yes**	Yes	Yes	No
Duty cycle, Tx-Sequence, Tx-gap	Claus 5.4.2	N/A	**N/A**	Yes	N/A	N/A
Medium Utilisation (MU) factor	Claus 5.4.2	N/A	**N/A**	Yes	N/A	N/A
Adaptivity	Claus 5.4.6	Yes	**N/A**	N/A	N/A	N/A
Occupied Channel Bandwidth	Claus 5.4.7	Yes	**Yes**	Yes	Yes	No
Transmitter unwanted emissions in the out-of-band domain	Claus 5.4.8	Yes	**Yes**	Yes	Yes	No
Transmitter unwanted emissions in the spurious domain	Claus 5.4.9	Yes	**Yes**	Yes	Yes	No
Receiver Spurious Emissions	Claus 5.4.10	Yes	**Yes**	Yes	Yes	No
Receiver Blocking	Claus 5.4.11	Yes	**Yes**	Yes	Yes	No
Geo-location capability	N/A	N/A	**N/A**	N/A	N/A	N/A
Note 1: Test items is from Clause 4.3.2 of EN 300 328 V2.1.1 (2016-12). Note 2: The EUT don't have Geo-location capability.						

2.3 Measurement Uncertainty

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

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
Total RF Power, Conducted	±0.7dB
RF Power Density, Conducted	±2.5dB
Spurious Emissions, Conducted	±2.8dB
All emissions, Radiated	±5.2dB
Temperature	±0.5℃
Humidity	±1%
DC and Low Frequency Voltage	±2%

2.4 Test Environment

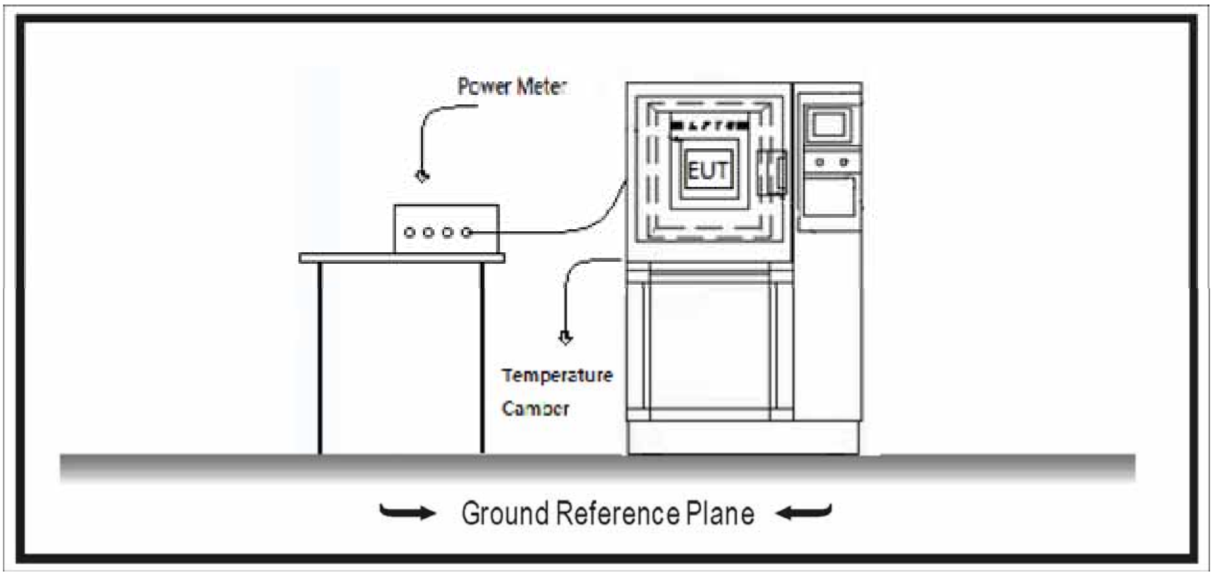
Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	51
Barometric pressure (mbar)	860-1060	950-1000

2.5 RF Output Power

2.6 Test Equipment

RF Output Power / TR-7				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Power Meter	Anritsu	ML2495A	0905006	2018.10.18
Power Sensor	Anritsu	MA2411B	0846014	2018.10.18
DC Power Supply	IDRC	CD-035-020PR	977272	2018.09.04
Programmable Temperature & Humidity Chamber	Gaoyu	TH-1P-B	WIT-05121302	2019.01.04
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
EN 300328 Test system (V3.160113)				
Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY54080020	2019.06.25
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY54110001	2019.06.25
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY53480008	2019.06.25
X-series USB Peak and Average Power Sensor	Agilent	U2021XA	MY54080019	2019.06.25
4 Ch.Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	TW54063507	N/A
4 Ch.Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	TW54063513	N/A
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

2.7 Test Setup

For Conducted Measurement


2.8 Limit

☐	For non-adaptive equipment using wide band modulations other than FHSS
The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.3.1 m). 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.	
☒	For adaptive equipment using wide band modulations other than FHSS
The maximum RF output power shall be 20 dBm.	

2.9 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.2.2.1.2	RF Output Power

Step 1

1,Use a fast power sensor suitable for 2,4 GHz and capable of minimum 1 MS/s.
2,Use the following settings:
(1)Sample speed 1 MS/s or faster
(2)The samples shall represent the RMS power of the signal.
(3)Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 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

1, For conducted measurements on devices with one transmit chain:
(1), 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.
2,For conducted measurements on devices with multiple transmit chains:
(1)Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
(2)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 500 ns.
(3)For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.

Step 3

Find the start and stop times of each burst in the stored measurement samples.
The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.
NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4

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

$$P_{burst} = \frac{1}{k}\sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number
Step 5
The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculation
Step 6
1,Add the (stated) antenna assembly gain "G" in dBi of the individual antenna 2, 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 clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

2.10Test Result

Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	RF Output Power
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit by BLE

Antenna Gain = 1.92dBi				
Test Conditions	Frequency (MHz)	Reading Values (dBm)	RF Output Power (dBm)	Limit (dBm)
Tnom (25℃)	2402	2.53	4.45	20
	2440	1.97	3.89	20
	2480	2.00	3.92	20
Tmax (45℃)	2402	2.34	4.26	20
	2440	1.79	3.71	20
	2480	1.87	3.79	20
Tmin (-25℃)	2402	2.86	4.78	20
	2440	2.17	4.09	20
	2480	2.30	4.22	20

Note1: RF Output Power= Reading Values + Antenna Gain.

Note 2: Measured power is the highest of all Pburst values.

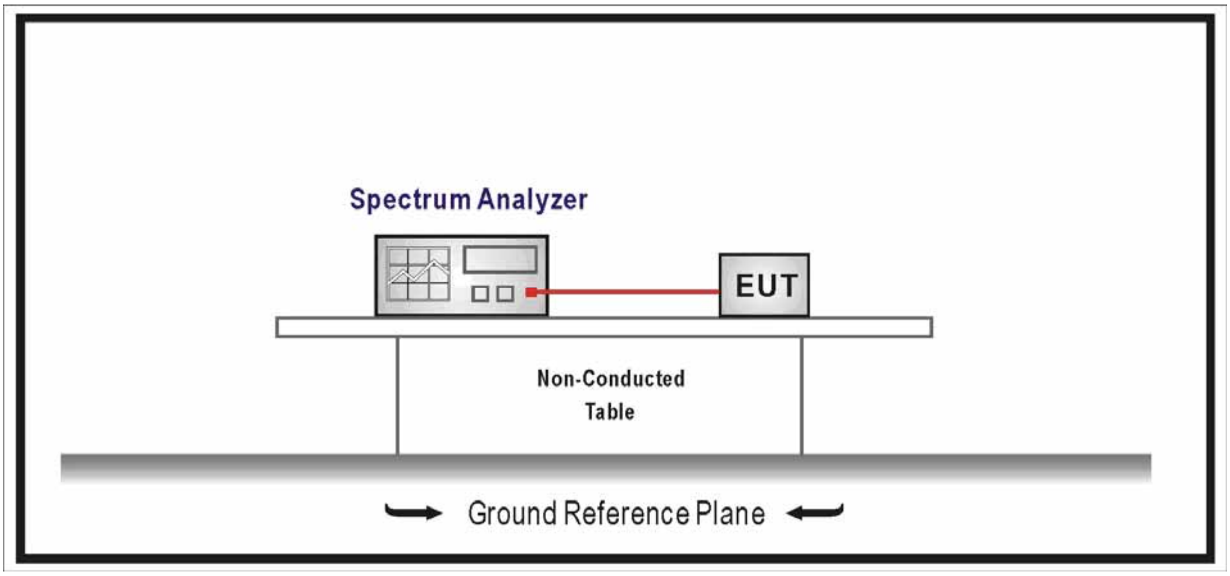
3 Power Spectral Density

3.1 Test Equipment

Power Spectral Density / TR-8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

3.2 Test Setup

For Conducted Measurement



3.3 Limit

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

3.4 Test Procedure

Test Method				
	References Rule		Chapter	Description
☒	ETSI EN 300 328 V2.1.1		5.4.3.2.1	Power Spectral Density
	☒	Option 1:	For equipment with continuous and non-continuous transmissions	
	☐	Option 2:	For equipment with continuous transmission capability or for equipment operating with a constant duty cycle	
Step 1				
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: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal For non-continuous signals, wait for the trace to stabilize. Save the data (trace data) set to a file.				
Step 2				
For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each sampling point (frequency domain), add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.				
Step 3				
Add up the values for power for all the samples in the file using the formula below. $P_{Sum} = \sum_{n=1}^{k} P_{sample}(n)$ with 'k' being the total number of samples and 'n' the actual sample number				
Step 4				
Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.4.2 and save the corrected data. The following formulas can be used: Ccorr=Psum-Pe.r.i.p. Psamplecorr(n)=Psample (n)-Ccorr with 'n' being the actual sample number				
Step 5				

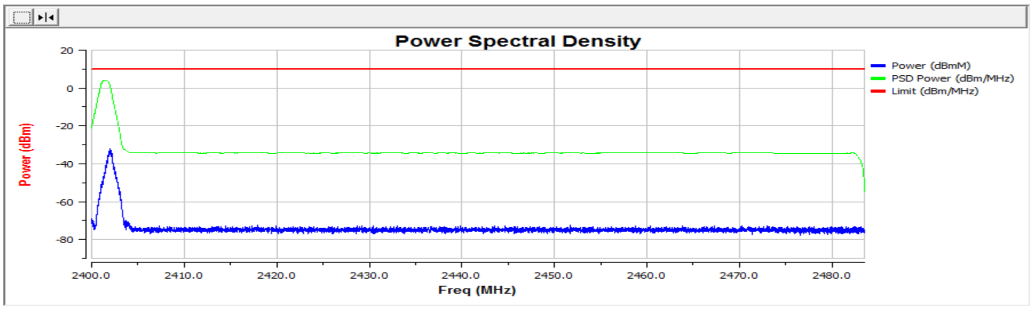
Starting from the first sample PSamplecorr(n) (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6
Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).
Step 7
Repeat step 6 until the end of the data set and record the 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 4.3.2.3.3, shall be recorded in the test report.

3.5 Test Result

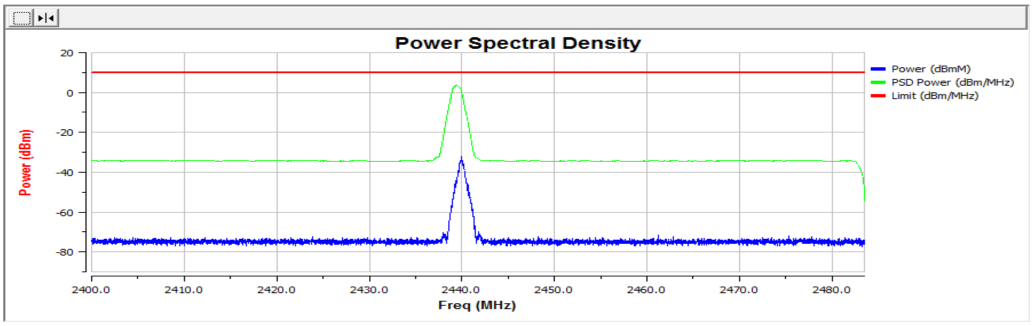
Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by BLE

Frequency (MHz)	Total Power Density (dBm/MHz)	Limit (dBm/MHz)
2402	4.07	10
2440	3.49	10
2480	3.53	10

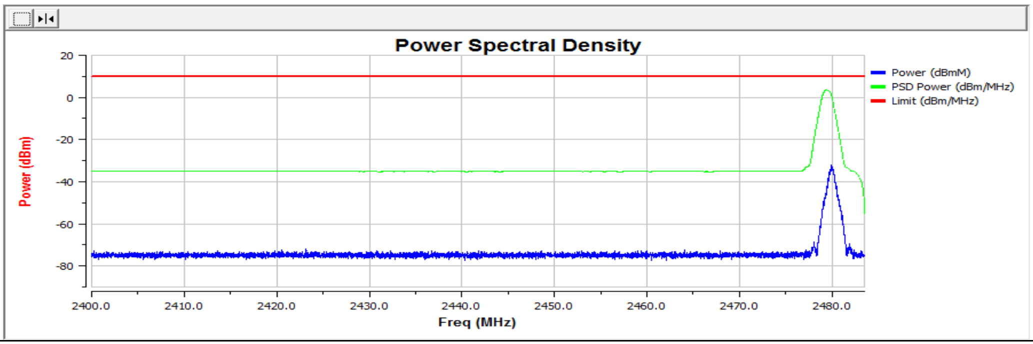
CH2402MHz



CH2440MHz



CH2480MHz



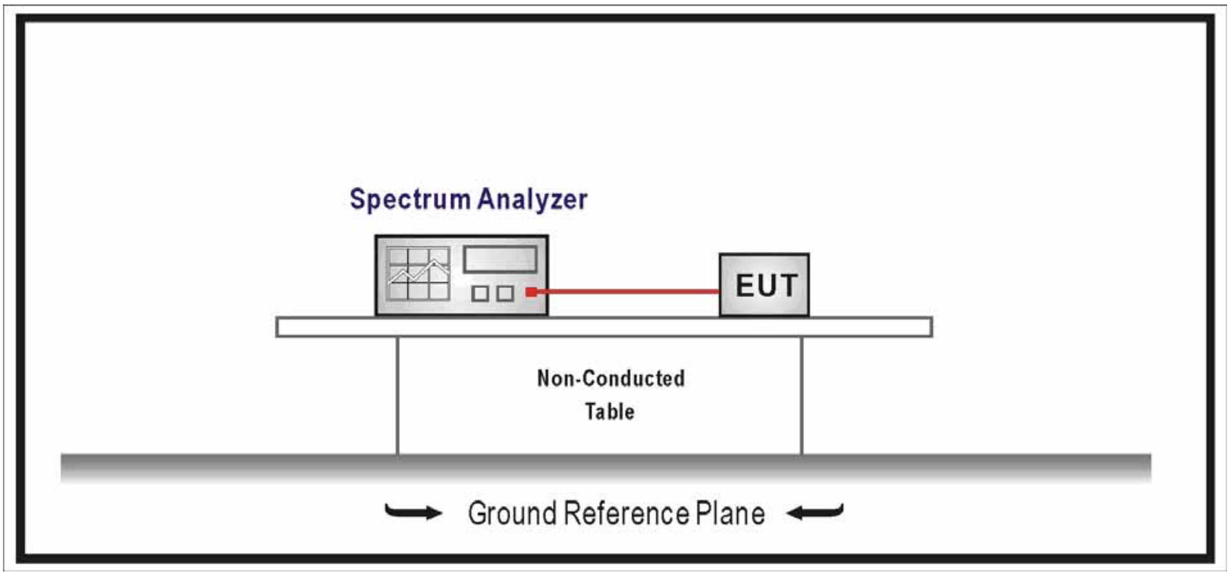
4 Duty Cycle, Tx-sequence, Tx-gap

4.1 Test Equipment

Duty Cycle, Tx-sequence, Tx-gap / TR-8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

4.2 Test Setup

For Conducted Measurement



4.3 Limit

☒ For non-adaptive equipment using wide band modulations other than FHSS
1,The Duty Cycle shall be equal to or less than the maximum value declared by the supplier. 2,The maximum Tx-sequence Time and the minimum Tx-gap Time shall be according to the formula below: 3,Maximum Tx-Sequence Time = Minimum Tx-gap Time = M where M is in the range of 3,5 ms to 10 ms.

4.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.2.2.1.3	Duty Cycle, Tx-sequence, Tx-gap

Step 1
1, Use the same stored measurement samples from the procedure described in clause 5.3.2.2.1.2. 2, The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples. In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.
Step 2
Between the saved start and stop times of each individual burst, calculate the TxOn time. Save these TxOn values.
Step 3
1, Duty Cycle is the sum of all TxOn times between the end of the first gap (which is the start of the first burst within the observation period) and the start of the last burst (within this observation period) divided by the observation period. The observation period is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. 2, 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 (N) as defined in clause 4.3.1.4.3 shall be assumed. 3, 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
1, Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2. 2, Identify any TxOff time that is equal to or greater than the minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3. These are the potential valid gap times to be further considered in this procedure. 3, Starting from the second identified gap, calculate the time from the start of this gap to the end of the preceding gap. This time is the Tx-sequence time for this transmission. Repeat this procedure until the last identified gap within the observation period is reached. 4, Any Tx-sequence time shall be less than or equal to the maximum range defined in clause 4.3.1.3.3 or clause 4.3.2.4.3 and followed by a Tx-gap time that is equal to or greater than its preceding Tx-sequence time. 5, A combination of consecutive Tx-sequence times and Tx-gap times followed by a Tx-gap time, which is at least as long as the duration of this combination, may be considered as a single

Tx-sequence time and in which case it shall comply with the limits defined in clause 4.3.1.3.3 or clause 4.3.2.4.3. 6, It shall be noted in the test report whether the UUT complies with the limits defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.

4.5 Test Result

Item Not applicable as below:
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.

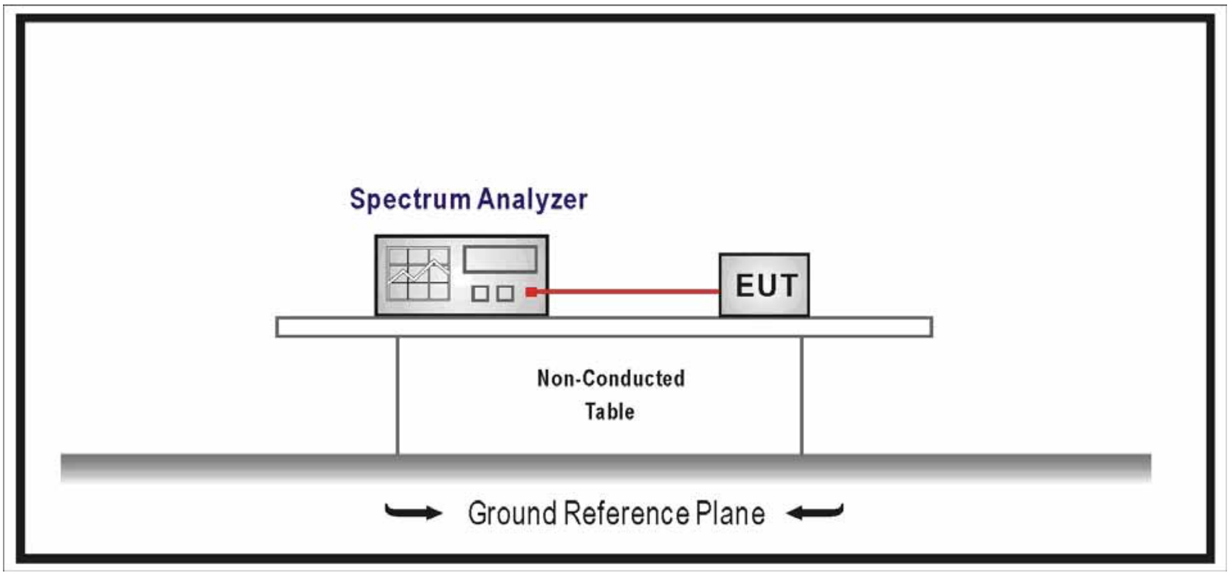
5 Medium Utilisation (MU) factor

5.1 Test Equipment

a				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

5.2 Test Setup

For Conducted Measurement



5.3 Limit

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

5.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.2.2.1.4	Medium Utilisation (MU) factor

Step 1
Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
Step 2
For each burst calculate the product of (Pburst/100 mW) and the TxOn time. NOTE 1: Pburst is expressed in mW. TxOn time is expressed in ms.
Step 3
Medium Utilization is the sum of all these products divided by the observation period (expressed in ms) which is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. This value, which shall comply with the limit given in clause 4.3.1.6.3 or clause 4.3.2.5.3, shall be recorded in the test report. NOTE 2: If operation without blacklisted frequencies is not possible, the power of the bursts on blacklisted hopping frequencies (for the calculation of the Medium Utilization) is assumed to be equal to the average value of the RMS power of the bursts on all active hopping frequencies.

5.5 Test Result

Item Not applicable as below:
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.

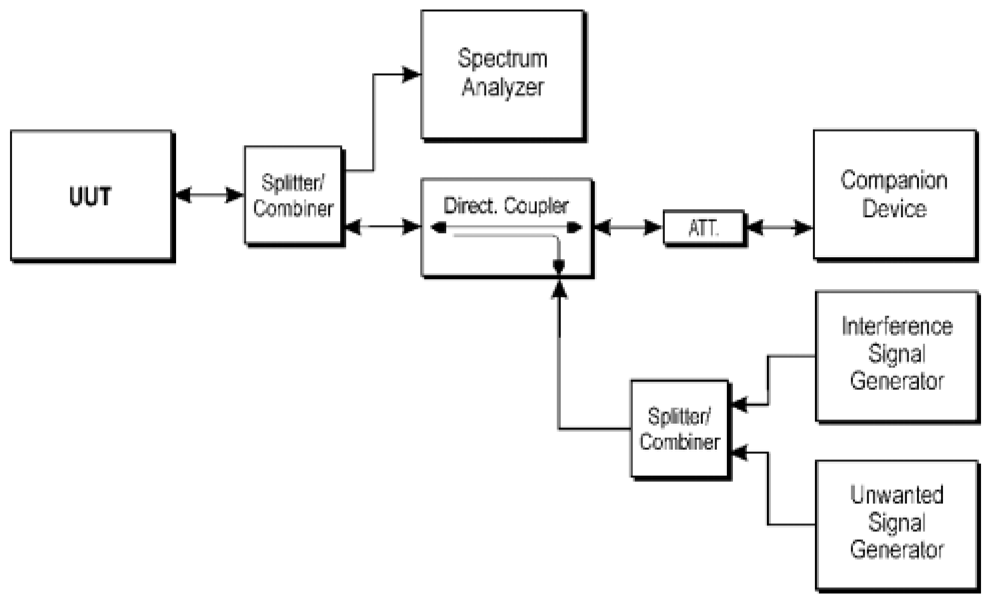
6 Adaptivity (Adaptive equipment using modulations other than FHSS)

6.1 Test Equipment

Adaptivity & Blocking / TR-8				
Instrument	Manufacturer	Type No.	Serial No	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
10dB Coaxial Coupler	Agilent	87300C	MY44300299	N/A
Splitter/Combiner (Qty: 2)	Mini-Circuits	ZAPD-50W 4.2-6.0 GHz	NN256400424	N/A
Splitter/Combiner (Qty: 2)	MCLI	PS3-7	4463/4464	N/A
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2019.02.03
ESG Vector Signal Generator	Agilent	E4438C	MY49070163	2019.02.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

6.2 Test Setup

For Conducted Measurement



6.3 Limit

☒	For adaptive equipment using wide band modulations other than FHSS	
	☐	Non-LBT based Detect and Avoid
		(1) The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel; (2) COT ≤ 40 ms; (3) Idle Period shall be minimum 5% of COT with a minimum of 100 μs; (4) Detection threshold level = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.); (5) To verify that the UUT is not resuming normal transmissions as long as the interference and unwanted signal are present, the monitoring time may need to be 60 s or more.
	☐	LBT based Detect and Avoid(Frame Based Equipment)
		(1) The CCA observation time shall be not less than 18 μs; (2) The CCA time used by the equipment shall be declared by the supplier; (3) COT = 1-10 ms; (4) Idle Period = 5% of COT; (5) Detection threshold level = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.); (6) To verify that the UUT is not resuming normal transmissions as long as the interference and unwanted signal are present, the monitoring time may need to be 60 s or more.
	☒	LBT based Detect and Avoid(Load Based Equipment)
		(1) The CCA observation time shall be not less than 18 μs; (2) Extended CCA time shall be between 18 μs and 160 μs; (3) COT ≤ 13ms; (4) Detection threshold level = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.); (5) To verify that the UUT is not resuming normal transmissions as long as the interference and unwanted signal are present, the monitoring time may need to be 60 s or more.
	☒	Short Control Signalling Transmissions:
		(1) Short Control Signalling Transmissions shall have a maximum duty cycle of 10% within an observation period of 50ms.
	☒	Unwanted signal
		Unwanted signal power≥-35dBm

6.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.6.2.1.4	Adaptivity

The different steps below define the procedure to verify the efficiency of the LBT based adaptive mechanism of equipment using wide band modulations other than FHSS. This method can be applied on Load Based Equipment and Frame Based Equipment.

Step 1

1, The UUT shall connect to a companion device during the test. The interference signal generator, the unwanted signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5 although the interference and unwanted signal generator do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of both the UUT and the companion device and it should be possible to distinguish between either transmission. In addition, the spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the unwanted signals..

2, Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.

Testing of Unidirectional equipment does not require a link to be established with a companion device.

3, The analyser shall be set as follows:

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

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

(3)Detector Mode: RMS

(4)Centre Frequency: Equal to the centre frequency of the operating channel

(5)Span: 0 Hz

(6)Sweep time: > maximum Channel Occupancy Time

(7)Trace Mode: Clear Write

(8)Trigger Mode: Video

Step 2

1, Configure the UUT for normal transmissions with a sufficiently high payload resulting in a minimum transmitter activity ratio (TxOn / (TxOn + TxOff)) of 0,3. Where this is not possible, the UUT shall be configured to the maximum payload possible.

2, For Frame Based Equipment, using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period

defined in clause 4.3.2.6.3.2.2 step 3). 3, For Load Based equipment, using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.3.2.3. For the purpose of testing Load Based Equipment referred to in the first paragraph of clause 4.3.2.6.3.2.3 (IEEE 802.11™ [i.3] or IEEE 802.15.4™ [i.4] equipment), the limits to be applied for the minimum Idle Period and the maximum Channel Occupancy Time are the same as defined for other types of Load Based Equipment (see clause 4.3.2.6.3.2.3 step 2) and step 3). The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3 step 1) and step 2).
Step 3: Adding the interference signal
An interference signal as defined in clause B.6 is injected on the current operating channel of the UUT. The power spectral density level (at the input of the UUT) of this interference signal shall be equal to the detection threshold defined in clause 4.3.2.6.3.2.2 step 5) (frame based equipment) or clause 4.3.2.6.3.2.3 step 5) (load based equipment).
Step 4: Verification of reaction to the interference signal
1, The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyser sweep to be triggered by the start of the interfering signal. 2, Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that: i) The UUT shall stop transmissions on the current operating channel. The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time defined in clause 4.3.2.6.3.2.2 (frame based equipment) or clause 4.3.2.6.3.2.3 (load based equipment). ii) Apart from Short Control Signalling Transmissions, there shall be no subsequent transmissions while the interfering signal is present. To verify that the UUT is not resuming normal transmissions as long as the interference signal is present, the monitoring time may need to be 60 s or more. iii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering signal is present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2. The verification of the Short Control Signalling transmissions may require the analyser settings to be changed (e.g. sweep time). iv) Alternatively, the equipment may switch to a non-adaptive mode.
Step 5: Adding the unwanted signal
1, With the interfering signal present, a 100 % duty cycle CW signal is inserted as the unwanted signal. The frequency and the level are provided in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.

2, The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating. 3, Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that: i) he UUT shall not resume normal transmissions on the current operating channel as long as both the interference and unwanted signals remain present. NOTE 6: To verify that the UUT is not resuming normal transmissions as long as the interference and unwanted signals are present, the monitoring time may need to be 60 s or more. ii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering and unwanted signals are present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2. The verification of the Short Control Signalling transmissions may require the analyser settings to be changed (e.g. sweep time).
Step 6: Removing the interference and unwanted signal
On removal of the interference and unwanted signals the UUT is allowed to start transmissions again on this channel; however, this is not a requirement and, therefore, does not require testing.
Step 7: Removing the interference and unwanted signal
Step 2 to step 6 shall be repeated for each of the frequencies to be tested.

6.5 Test Result

Item Not applicable as below:
This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment. In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P. Not applicable.

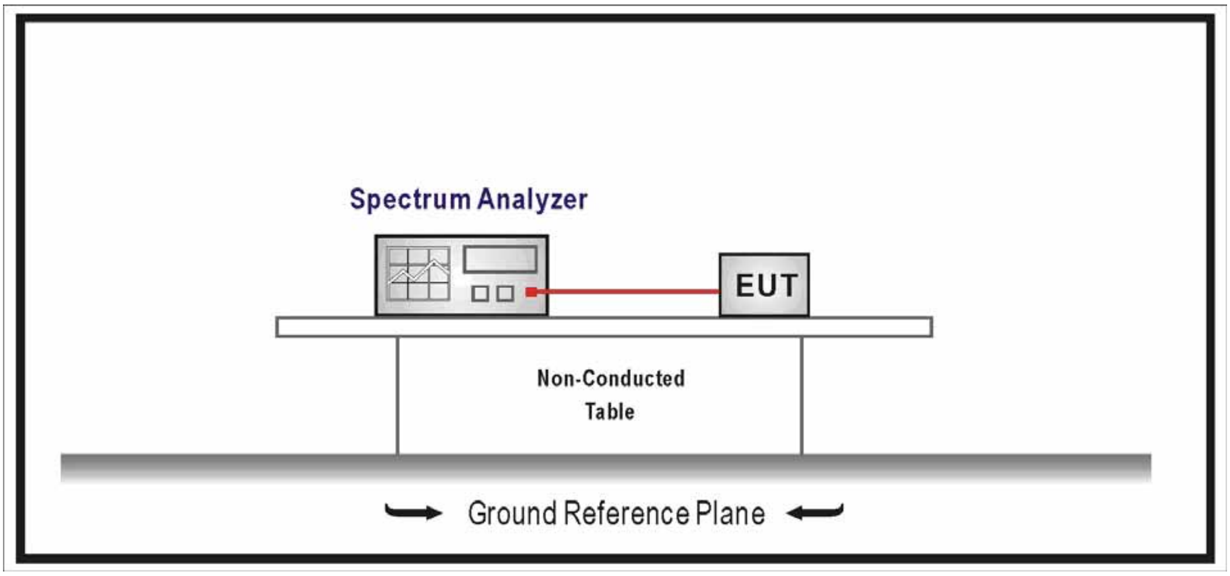
7 Occupied Channel Bandwidth

7.1 Test Equipment

Occupied Channel Bandwidth / TR-8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

7.2 Test Setup

For Conducted Measurement



7.3 Limit

☒	For adaptive equipment using wide band modulations other than FHSS
The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.	
☐	For Non-adaptive equipment using wide band modulations other than FHSS
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.	

7.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.7.2.1	Occupied Channel Bandwidth
Step 1			
1, Connect the UUT to the spectrum analyser and use the following settings (1),Centre Frequency: The centre frequency of the channel under test (2),Resolution BW: ~ 1 % of the span without going below 1 % (3),Video BW: 3 × RBW (4),Frequency Span for frequency hopping equipment: Lowest frequency separation that is used within the hopping sequence (5), Frequency Span for other types of equipment: 2 × Nominal Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel) (6), Detector Mode: RMS (7), Trace Mode: Max Hold (8), Sweep time: 1 s			
Step 2			
Wait for the trace to stabilize. 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.			

7.5 Test Result

Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	Occupied Channel Bandwidth
Test Mode	:	Mode 1: Transmit by BLE

Channel No.	Frequency (MHz)	99% Bandwidth (MHz)	Frequency near the operating band (MHz)	Result
00	2402	1.773	2401.082	Pass
39	2480	1.759	2480.843	Pass

Channel 00 (2402MHz)

Channel 39 (2480MHz)

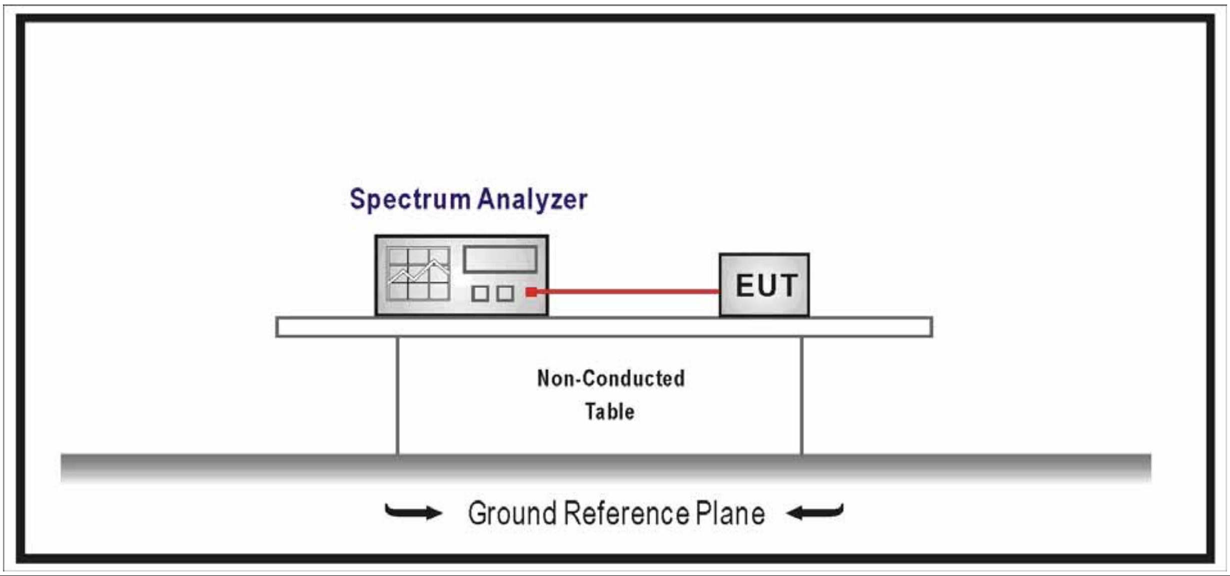
8 Transmitter unwanted emissions in the out-of-band domain

8.1 Test Equipment

Transmitter unwanted emissions in the out-of-band domain / TR-8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
DC Power Supply	IDRC	CD-035-020PR	977272	2018.09.04
Temperature & Humidity Chamber	Gaoyu	TH-1P-B	WIT-05121302	2019.01.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Power Splitter	Mini-Circuits	ZN4PD-642W-S+	SF344301603	N/A
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

8.2 Test Setup

For Conducted Measurement



8.3 Limit

☒	For adaptive equipment using wide band modulations other than FHSS
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 3. 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.	

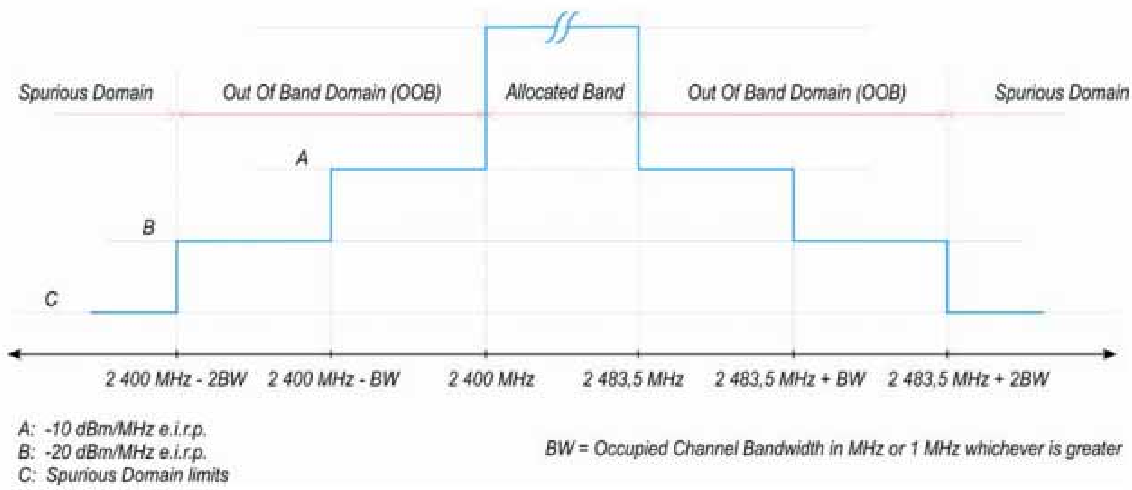


Figure 3: Transmit mask

8.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.8.2.1	Transmitter unwanted emissions in the out-of-band domain
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			
1, Connect the UUT to the spectrum analyser and use the following settings (1), Centre Frequency: 2 484 MHz (2), Span: 0 Hz (3), Resolution BW: 1 MHz (4), Video BW: 3 MHz (5), Detector Mode: RMS (6), Trace Mode: Max Hold			

(7), Sweep Mode: Continuous (8), Sweep Points: Sweep Time [s] / (1 μs) or 5 000 whichever is greater (9), Trigger Mode: Video trigger NOTE 1: In case video triggering is not possible, an external trigger source may be used. (10), Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power
Step 2(segment 2 483,5 MHz to 2 483,5 MHz + BW):
1, Adjust the trigger level to select the transmissions with the highest power level. 2,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. 3,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. 4,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. 5,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 (which means this may partly overlap with theprevious 1 MHz segment).
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 - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).
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 (which means this may partly overlap with the previous 1 MHz segment).

Step 6 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):
1,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 figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. 2,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: (1),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 figure 1 or figure 3. (2)Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by 10 × 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. It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

8.5 Test Result

Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	Transmitter unwanted emissions in the out-of-band domain
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit by BLE

Antenna Gain =1.92dBi				
Frequency (MHz)	Test Conditions (℃)	Reading Values (dBm/MHz)	Max measured Values (dBm/MHz)	Limit (dBm/MHz)
2400–2BW~2400-BW	25	-62.50	-60.58	-20
2400–BW~2400	25	-55.81	-53.89	-10
2483.5~2483.5+BW	25	-62.60	-60.68	-10
2483.5+BW~2483.5+2BW	25	-62.66	-60.74	-20
Maximum measured values = Reading Values + Antenna Gain.				

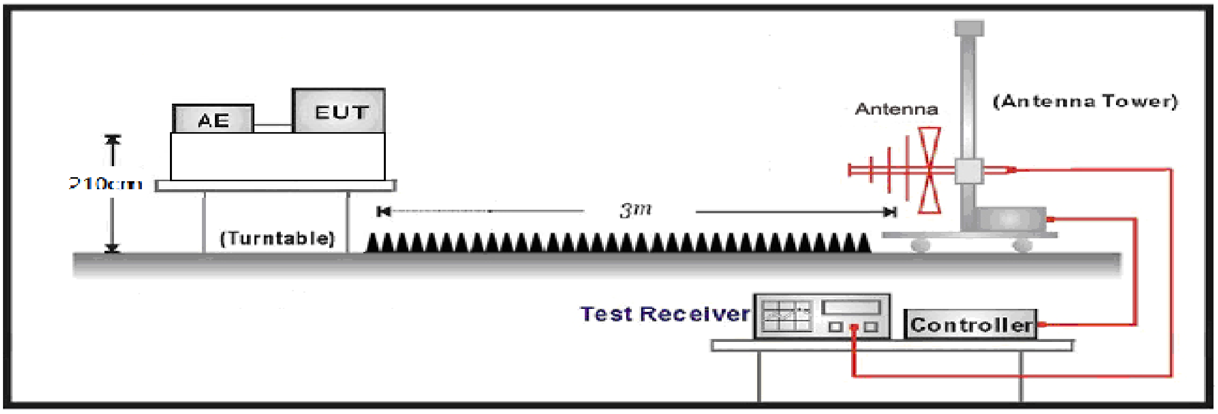
9 Transmitter unwanted emissions in the spurious domain

9.1 Test Equipment

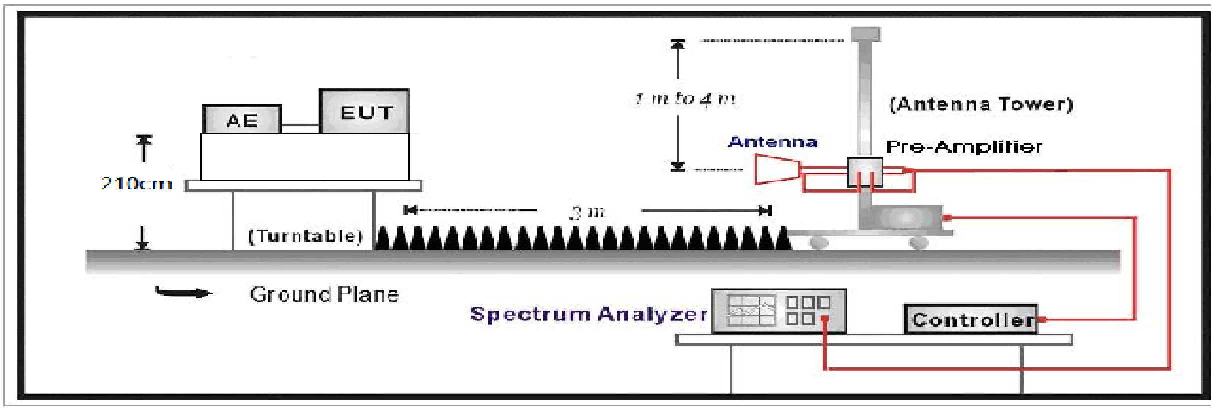
Transmitter unwanted emissions in the spurious domain / TR-8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
Spectrum Analyzer	Agilent	E4440A	MY49420184	2019.02.03
PSG Analog S.G.	Agilent	E8257D	MY44321116	2019.03.10
Preamplifier	chengyi	EMC012645SE	980262	2019.06.13
Bilog Antenna	Schaffner	CBL6112B	2932	2018.09.24
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2019.07.26
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2019.03.06
Filter Banks	QuieTek	QTK-FB	AC6-FB	2019.05.03
Temperature/Humidity Meter	zhichen	ZC1-2	AC6-TH	2019.01.04
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

9.2 Test Setup

☒ Transmitter unwanted emissions in the spurious domain / AC-6 (Below 1G)



☒ Transmitter unwanted emissions in the spurious domain / AC-6 (Above 1G)



9.3 Limit

☒ For adaptive equipment using wide band modulations other than FHSS

Frequency Range	Maximum power E.R.P. (≤ 1GHz) E.I.R.P. (> 1GHz)	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

9.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.9.2.2	Radiated measurement

Step 1

The sensitivity of the measurement set-up should be such that the noise floor is at least 12 dB below the limits given in table 1 or table 4.

Step 2

The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

(1),Resolution bandwidth: 100 kHz

(2),Video bandwidth: 300 kHz

(3),Filter type: 3 dB (Gaussian)

(4),Detector mode: Peak

(5),Trace Mode: Max Hold

(6),Sweep Points: ≥ 19 400

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

(7)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, on any channel.

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 any of the hopping frequencies.

NOTE 2: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser could be used.

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 5.4.9.2.1.3 and compared to the limits given in table 1 or table 4

Step 3

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

(1),Resolution bandwidth: 1 MHz

(2),Video bandwidth: 3 MHz

(3),Filter type: 3 dB (Gaussian)

		(4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 23 500 NOTE 3: For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented. (7)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, on any channel. 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 any of the hopping frequencies. NOTE 4: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser could be used. 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 5.4.9.2.1.3 and compared to the limits given in table 1 or table 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 5.4.9.2.1.3.
		Step 4
		In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 and step 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identify emissions 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. This method assumes the spectrum analyser has a Time Domain Power function
		Step 1
		The level of the emissions shall be measured using the following spectrum analyser settings: (1),Measurement Mode: Time Domain Power (2),Centre Frequency: Frequency of the emission identified during the pre-scan (3),Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz) (4),Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)

		(5),Frequency Span: Zero Span (6),Sweep mode: Single Sweep (7),Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power (8),Sweep points: Sweep time [μs] / (1 μs) with a maximum of 30 000 (9),Trigger: Video (burst signals) or Manual (continuous signals) (10),Detector: RMS
		Step 2
		Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.
		Step 3
		In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 needs to be repeated for each of the active transmit chains (Ach). Sum the measured power (within the observed window) for each of the active transmit chains.
		Step 4
		The value defined in step 3 shall be compared to the limits defined in tables 1 and 4.

9.5 Test Result

Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	Transmitter unwanted emissions in the spurious domain
Test Site	:	AC-6
Test Mode	:	Mode 1: Transmit by BLE

Mode 1: Transmit by BLE					
Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Over Limit (dB)	Detector
(2402MHz)					
136.9	H	-72.3	-36	-36.3	PK
118.9	V	-72.8	-36	-36.8	PK
274.8	H	-71.3	-36	-35.3	PK
253.3	V	-74.2	-36	-38.2	PK
4804.0	H	-55.2	-30.0	-25.2	PK
4804.0	V	-55.5	-30.0	-25.5	PK
7206.0	H	-49.6	-30.0	-19.6	PK
7206.0	V	-50.2	-30.0	-20.2	PK
(2480MHz)					
143.0	H	-74.7	-36	-38.7	PK
148.2	V	-72.0	-36	-36.0	PK
361.8	H	-70.3	-36	-34.3	PK
369.6	V	-70.8	-36	-34.8	PK
4960.0	H	-54.8	-30.0	-24.8	PK
4960.0	V	-55.8	-30.0	-25.8	PK
7440.0	H	-49.3	-30.0	-19.3	PK
7440.0	V	-50.4	-30.0	-20.4	PK

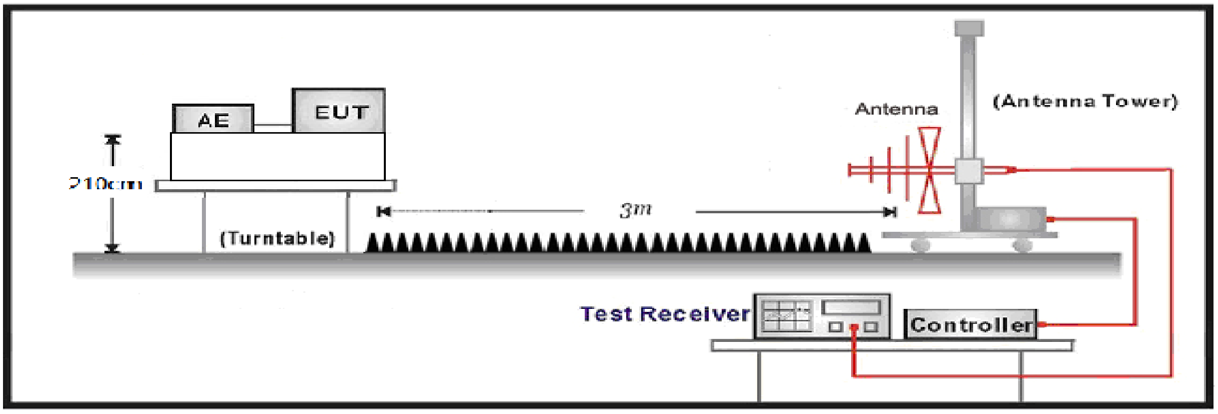
10 Receiver Spurious Emissions

10.1Test Equipment

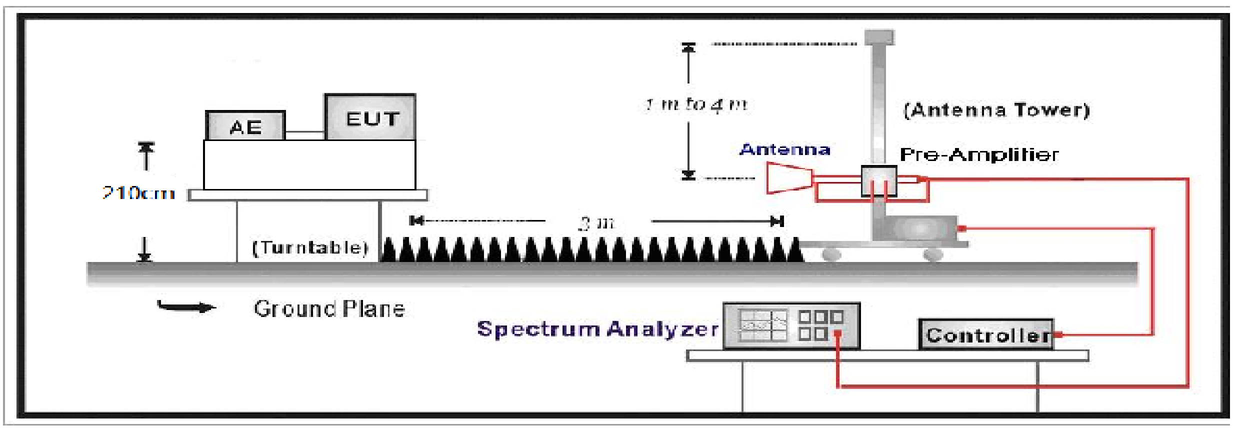
Receiver Spurious Emissions / AC-6				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
Spectrum Analyzer	Agilent	E4440A	MY49420184	2019.02.03
PSG Analog S.G.	Agilent	E8257D	MY44321116	2019.03.10
Preamplifier	chengyi	EMC012645SE	980262	2019.06.13
Bilog Antenna	Schaffner	CBL6112B	2932	2018.09.24
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2019.07.26
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2019.03.06
Filter Banks	QuieTek	QTK-FB	AC6-FB	2019.05.03
Temperature/Humidity Meter	zhichen	ZC1-2	AC6-TH	2019.01.04
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

10.2Test Setup

☒ Receiver Spurious Emissions (Below 1G)



☒ Receiver Spurious Emissions (Above1G)



10.3Limit

☒ For adaptive equipment using wide band modulations other than FHSS

Spurious emissions limits for receivers		
Frequency Range	Maximum power E.R.P. (≤ 1GHz) E.I.R.P. (> 1GHz)	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

10.4Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.10.2.2	Radiated measurement

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 table 2 or table 5.

Step 2

The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

(1),Resolution bandwidth: 100 kHz

(2),Video bandwidth: 300 kHz

(3),Filter type: 3 dB (Gaussian)

(4),Detector mode: Peak

(5),Trace Mode: Max Hold

(6),Sweep Points: ≥ 19 400

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

(7)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, on any channel.

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 any of the hopping frequencies.

NOTE 2: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser could be used.

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 5.4.10.2.1.3 and compared to the limits given in table 2 or table 5

Step 3

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

(1),Resolution bandwidth: 1 MHz

(2),Video bandwidth: 3 MHz

(3),Filter type: 3 dB (Gaussian)

		(4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 23 500 NOTE 3: For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented. (7),Sweep time: Auto Wait for 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 5.4.10.2.1.3 and compared to the limits given in table 2 or table 5. 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 5.4.10.2.1.3. 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 5.4.9.2.1.3 and compared to the limits given in table 1 or table 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 5.4.9.2.1.3.
		Step 4
		In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 and step 3 need to be repeated for each of the active receive chains (Ach)The limits used to identify emissions during this pre-scan need to be reduced with 10 × log10 (Ach) (number of active receive 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. This method assumes the spectrum analyser has a Time Domain Power function
		Step 1
		The level of the emissions shall be measured using the following spectrum analyser settings: (1),Measurement Mode: Time Domain Power (2),Centre Frequency: Frequency of the emission identified during the pre-scan (3),Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz) (4),Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz) (5),Frequency Span: Zero Span

		(6),Sweep mode: Single Sweep (7),Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power (8),Sweep points: Sweep time [µs] / (1 µs) with a maximum of 30 000 (9),Trigger: Video (burst signals) or Manual (continuous signals) (10),Detector: RMS
		Step 2
		Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.
		Step 3
		In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 needs to be repeated for each of the active receive chains (Ach).Sum the measured power (within the observed window) for each of the active receive chains
		Step 4
		The value defined in step 3 shall be compared to the limits defined in tables 2 and 5.

10.5 Test Result

Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	Receiver spurious emissions
Test Site	:	AC-6
Test Mode	:	Mode 2: Receive by BLE

Mode 2: Receive by BLE					
Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Over Limit (dB)	Detector
(2402MHz)					
113.9	H	-71.6	-57	-14.6	PK
128.3	V	-70.1	-57	-13.1	PK
311.3	H	-74.3	-57	-17.3	PK
338.1	V	-72.2	-57	-15.2	PK
1124.0	H	-59.9	-47	-12.9	PK
1197.0	V	-53.4	-47	-9.4	PK
2210.1	H	-54.4	-47	-8.4	PK
2301.6	V	-56.2	-47	-9.2	PK
(2480MHz)					
87.5	H	-74.4	-57	-17.4	PK
96.9	V	-70.8	-57	-13.8	PK
292.5	H	-72.2	-57	-15.2	PK
296.7	V	-72.7	-57	-15.7	PK
1429.7	H	-54.4	-47	-8.4	PK
1479.9	V	-57.1	-47	-10.1	PK
2403.1	H	-53.9	-47	-7.9	PK
2530.6	V	-54.5	-47	-9.5	PK

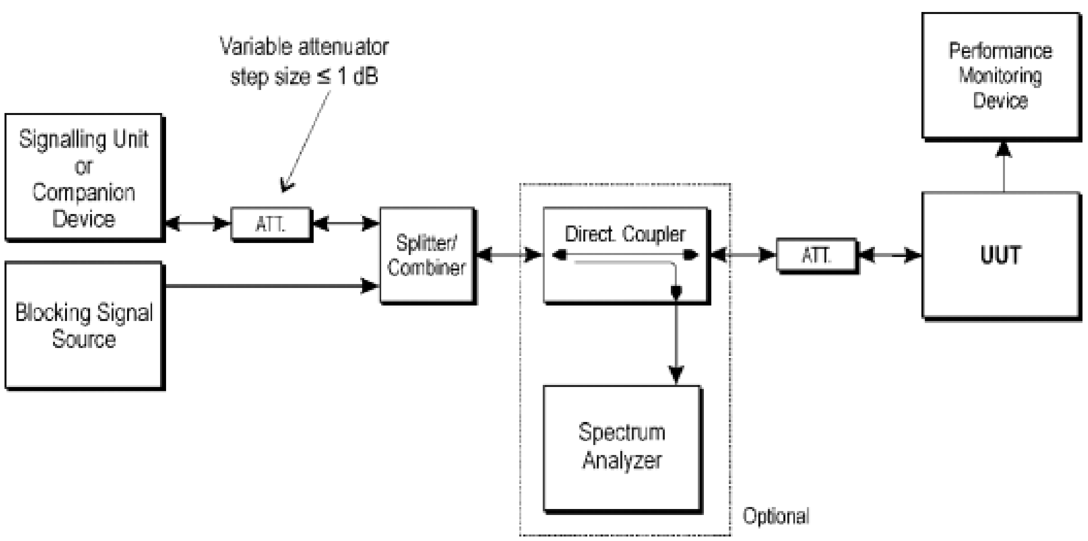
11 Receiver Blocking

11.1 Test Equipment

Receiver Blocking / TR-8				
Instrument	Manufacturer	Type No.	Serial No	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.02.03
10dB Coaxial Coupler	Agilent	87300C	MY44300299	N/A
Splitter/Combiner (Qty: 2)	Mini-Circuits	ZAPD-50W 4.2-6.0 GHz	NN256400424	N/A
Bluetooth Test Set	Anritsu	MT8852B	0906001	2018.10.16
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2019.02.03
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2019.04.10
Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

11.2 Test Setup

For Conducted Measurement



11.3 Limit

☒ Receiver categories

☐ Receiver category 1

Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW

NOTE 1: P_{min} is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

☒ Receiver category 2

Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-57	CW
P_{min} + 6 dB	2 300 2 583,5	-47	CW

NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

☐ Receiver category 3

Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 12 dB	2 380 2 503,5	-57	CW
P_{min} + 12 dB	2 300 2 583,5	-47	CW

NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

11.4 Test Procedure

Test Method			
	References Rule	Chapter	Description
☒	ETSI EN 300 328 V2.1.1	5.4.11.2.1	Receiver Blocking

For systems using multiple receive chains only one chain (antenna port) need to be tested. All other receiver inputs shall be terminated.

Figure 6 shows the test set-up which can be used for performing the receiver blocking test

The procedure in step 1 to step 6 below shall be used to verify the receiver blocking requirement as described in clause 4.3.1.12 or clause 4.3.2.11.

Table 6, table 7 and table 8 in clause 4.3.1.12.4 contain the applicable blocking frequencies and blocking levels for each of the receiver categories for testing Receiver Blocking on frequency hopping equipment.

Table 14, table 15 and table 16 in clause 4.3.2.11.4 contain the applicable blocking frequencies and blocking levels for each of the receiver categories for testing Receiver Blocking on equipment using wide band modulations other than FHSS.

Step 1

For non-frequency hopping equipment, the UUT shall be set to the lowest operating channel

Step 2

The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.

Step 3

With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is Pmin.

This signal level (Pmin) is increased by the value provided in the table corresponding to the receiver category and type of equipment.

Step 4

The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is met.

Step 5

Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

Step 6

For non-frequency hopping equipment, repeat step 2 to step 5 with the UUT operating at the highest operating channel

11.5 Test Result

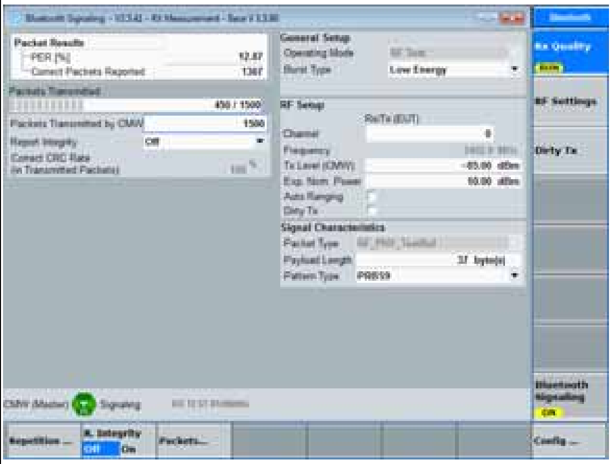
Product	:	Blazepod
Model No.	:	Blazepod
Test Item	:	Receiver spurious emissions
Test Mode	:	Mode3: Normal Receive by BLE

Antenna Gain = 1.92dBi

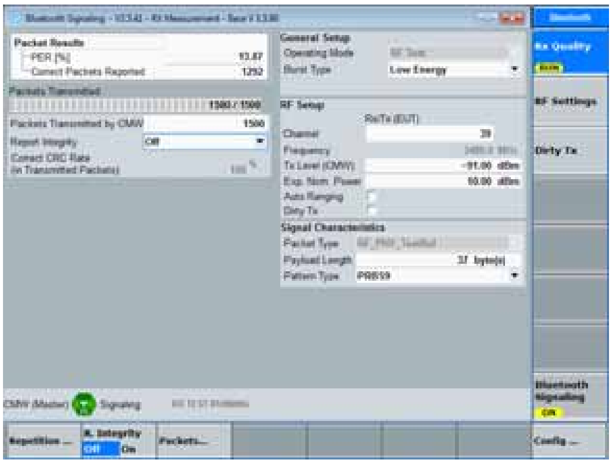
Test Mode	Frequency	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PER injection blocking signal (%)	PER Limit (%)
Mode 3	2402	2380	-55.08	0	10
		2503.5	-55.08	0.13	10
		2300	-45.08	0	10
		2583.5	-45.08	0	10
	2480	2380	-55.08	0	10
		2503.5	-55.08	0.07	10
		2300	-45.08	0	10
		2583.5	-45.08	0.07	10

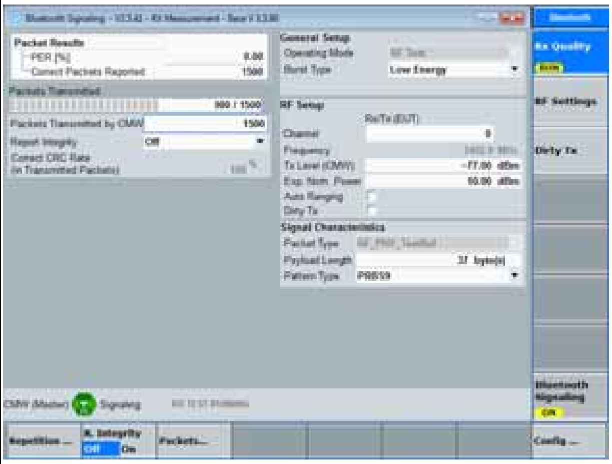
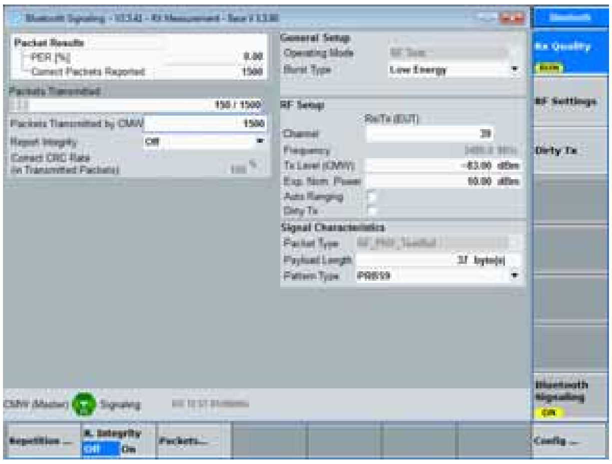
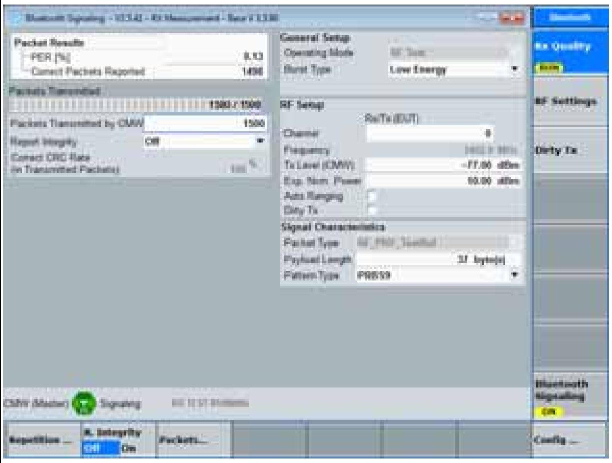
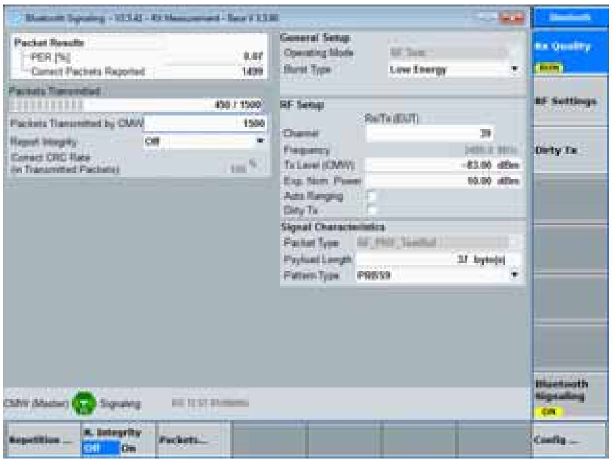
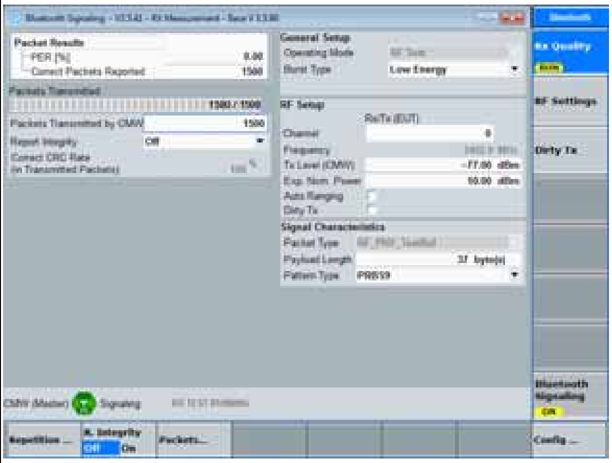
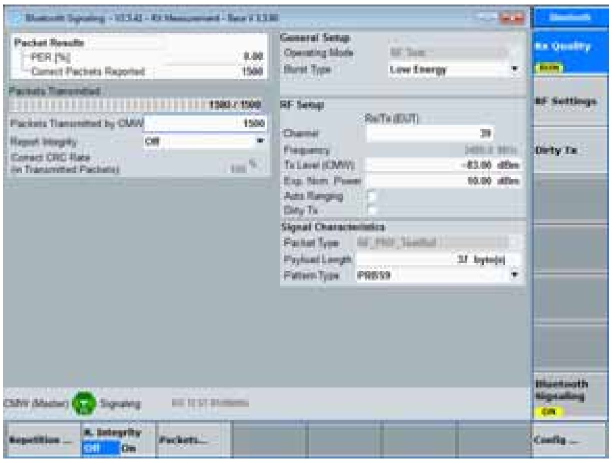
Wanted signal level = Pmin + 6dB

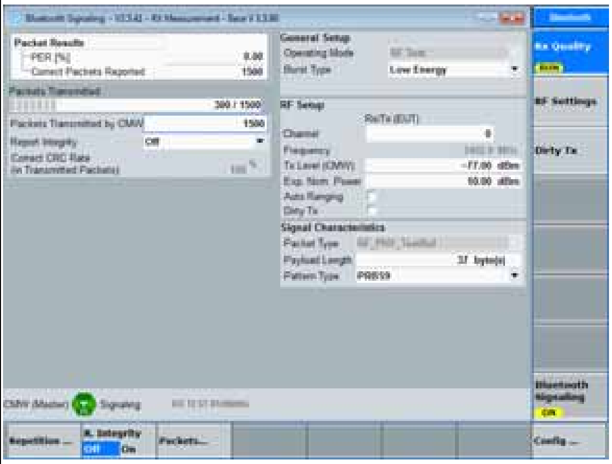
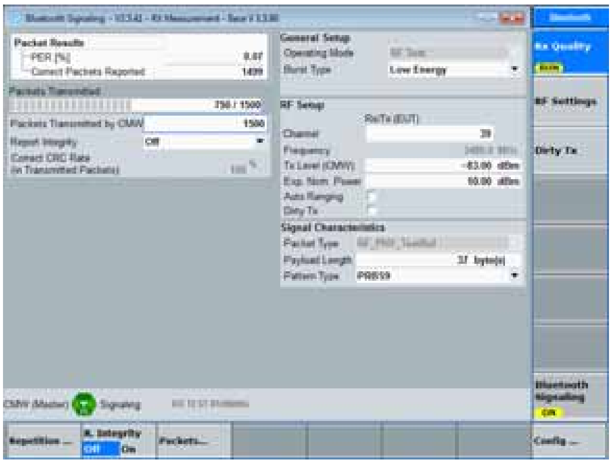
Pmin at 2402MHz



Pmin at 2480MHz



Interface Single at 2380MHz of 2402MHz 	Interface Single at 2380MHz of 2480MHz 
Interface Single at 2503.5MHz of 2402MHz 	Interface Single at 2503.5MHz of 2480MHz 
Interface Single at 2300MHz of 2402MHz 	Interface Single at 2300MHz of 2480MHz 

Interface Single at 2583.5MHz of 2402MHz	Interface Single at 2583.5MHz of 2480MHz
	

The End