

# SPECTRUM REPORT

## (FHSS)

**Applicant:** 8devices

**Address of Applicant:** Antakalnio 17, Vilnius, LT-10312, Lithuania

### Equipment Under Test (EUT)

**Product Name:** Broadband Digital Transmission System

**Model No.:** BLUE bean A, BLUE bean C, RED bean A, RED bean C

**Applicable standards:** ETSI EN 300 328 V2.1.1 (2016-11)

**Date of sample receipt:** 28 Mar, 2019

**Date of Test:** 29 Mar, to 26 May, 2019

**Date of report issue:** 27 May, 2019

**Test Result:** PASS\*

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.



Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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## 2 Version

Version No.	Date	Description
00	27 May, 2019	Original

**Tested by:**

*Mike.ou*

**Date:**

27 May, 2019

**Test Engineer**

**Reviewed by:**

*Wimer Zhang*

**Date:**

27 May, 2019

**Project Engineer**

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## 4 Test Summary

Test Items	Test Requirement	Test method	Limit/Severity	Result
<b>Radio Spectrum Matter (RSM) Part of Tx</b>				
RF Output Power	Clause 4.3.1.2	Clause 5.4.2.2.1.2	Clause 4.3.1.2.3	PASS
Duty Cycle, Tx-sequence, Tx-gap	Clause 4.3.1.3	Clause 5.4.2.2.1.3	Clause 4.3.1.3.3	N/A
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	Clause 4.3.1.4	Clause 5.4.4.2	Clause 4.3.1.4.3	PASS
Hopping Frequency Separation	Clause 4.3.1.5	Clause 5.4.5.2	Clause 4.3.1.5.3	PASS
Medium Utilisation (MU) factor	Clause 4.3.1.6	Clause 5.4.2.2.1.4	Clause 4.3.1.6.3	N/A
Adaptivity (Adaptive Frequency Hopping)	Clause 4.3.1.7	Clause 5.4.6.2	Clause 4.3.1.7	PASS
Occupied Channel Bandwidth	Clause 4.3.1.8	Clause 5.4.7.2	Clause 4.3.1.8.3	PASS
Transmitter unwanted emissions in the out-of-band domain	Clause 4.3.1.9	Clause 5.4.8.2	Clause 4.3.1.9.3	PASS
Transmitter unwanted emissions in the spurious domain	Clause 4.3.1.10	Clause 5.4.9.2	Clause 4.3.1.10.3	PASS
<b>Radio Spectrum Matter (RSM) Part of Rx</b>				
Receiver spurious emissions	Clause 4.3.1.11	Clause 5.4.10.2	Clause 4.3.1.11.3	PASS
Receiver Blocking	Clause 4.3.1.12	Clause 5.4.11.2	Clause 4.3.1.12.4	PASS
<p><i>Remark:</i>  <i>Tx: In this whole report Tx (or tx) means Transmitter.</i>  <i>Rx: In this whole report Rx (or rx) means Receiver.</i>  <i>Pass: Meet the requirement.</i>  <i>N/A: Not Applicable.</i></p>				

## 5 General Information

### 5.1 Client Information

Applicant:	8devices
Address:	Antakalnio 17, Vilnius, LT-10312, Lithuania
Manufacturer/Factory:	8devices
Address:	Antakalnio 17, Vilnius, LT-10312, Lithuania

### 5.2 General Description of E.U.T.

Product Name:	Broadband Digital Transmission System
Model No.:	BLUE bean A, BLUE bean C, RED bean A, RED bean C
Hardware version:	BLUE bean A: 8dev_3201_4, BLUE bean C: 8dev_3200_3, RED bean A: 8dev_3301_3, RED bean C: 8dev_3301_4
Software version:	4.5.20.037
Operation Frequency:	2402MHz ~ 2480MHz
Channel number:	79
Channel separation:	1MHz
Modulation type:	Frequency Hopping Spread Spectrum (FHSS)
Equipment Type:	Adaptive equipment
Modulation Technology:	GFSK, $\pi/4$ DQPSK, 8DPSK
Max. E.I.R.P Power:	GFSK: 11.69dBm, $\pi/4$ : DQPSK: 10.57 dBm, 8DPSK: 9.47 dBm
Antenna Type:	Ceramic Antenna External antenna
Antenna gain:	Ceramic Antenna: 3.0 dBi External antenna A: 4.0 dBi External antenna B: 3.2 dBi
Power supply:	DC 3.3V
Remark:	<p>The No.: BLUE bean A and BLUE bean C, RED bean A and RED bean C identical inside, the electrical circuit design, layout, components used and internal wiring up to RF output. with only difference as follow:</p> <ol style="list-style-type: none"> <li>1. BLUE bean C and RED bean C RF output is connected to connector Murata HSC, BLUE bean A and RED bean A RF output is connected to connector Murata HSC and connected to antenna, to accommodate antenna PCB length is increased, antenna, antennas passive components and RF probe switch added to PCB.</li> <li>2. Modules use different version of chip BLUE bean Qualcomm QCA9377-7 and RED bean Qualcomm QCA9377-3.</li> <li>3. QCA9377-7 and QCA9377-3 only differs what interface it uses to connect to WIFI and BT.</li> <li>4. BLUE bean QCA9377-7 uses USB2.0 for WIFI and USB1.1 for BT.</li> <li>5. RED bean QCA9377-3 uses SDIO3.0 for WIFI and UART/PCM for BT.</li> <li>6. Circuit design, layout components used and internal wiring for interface connection is different.</li> <li>7. Pinout for module is different</li> </ol>

## 5.3 Test environment and mode

Operating Environment:	
Temperature:	Normal: 15°C ~ 35°C, Extreme: -20°C ~ +55°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	Nominal: 3.3Vdc, Extreme: Low 2.97Vdc, High 3.63Vdc
Test mode:	
Transmitting mode:	Keep the EUT in continuously transmitting mode with modulation.
Hopping mode:	Keep the EUT in normal hopping mode.
Receiving mode:	Keep the EUT in receiving mode.
We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation.	

## 5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
LENOVO	Laptop	SL510	2847A65	DoC
ULEFONE	Adapter	HJ-0503000K7-EU	N/A	N/A
baofeng	Test suite	Pi3B+SD	N/A	N/A

## 5.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%)
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3.0 dB
Unwanted Emissions, conducted	±3.0 dB
Temperature	±3 °C
Supply voltages	±3 %
Time	±5 %
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB

## 5.6 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>● <b>FCC - Registration No.: 727551</b> Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.</li> <li>● <b>IC - Registration No.: 10106A-1</b> The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.</li> <li>● <b>CNAS - Registration No.: CNAS L6048</b> Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.</li> <li>● <b>A2LA - Registration No.: 4346.01</b> This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <a href="https://portal.a2la.org/scopepdf/4346-01.pdf">https://portal.a2la.org/scopepdf/4346-01.pdf</a></li> </ul>
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## 5.7 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.  
 Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,  
 Bao'an District, Shenzhen, Guangdong, China  
 Tel: +86-755-23118282, Fax: +86-755-23116366  
 Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

## 5.8 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-18-2019	03-17-2020
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-18-2019	03-17-2020
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-18-2019	03-17-2020
Pre-amplifier	CD	PAP-1G18	11804	03-18-2019	03-17-2020
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-18-2019	03-17-2020
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-18-2019	03-17-2020
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-18-2019	03-17-2020
Signal Generator	R&S	SMR20	1008100050	03-18-2019	03-17-2020
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-18-2019	03-17-2020
Cable	MICRO-COAX	MFR64639	K10742-5	03-18-2019	03-17-2020
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-18-2019	03-17-2020
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS8200	Version: 2.0.0.0		

Conducted method:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-10-2018	11-09-2019
Vector Signal Generator	Agilent	N5182A	MY49060014	11-10-2018	11-09-2019
Signal Generator	R&S	SMR20	1008100050	03-18-2019	03-17-2020
Power Sensor	D.A.R.E	RPR3006W	15I00041SNO12	11-10-2018	11-09-2019
Power Sensor	D.A.R.E	RPR3006W	15I00041SNO54	11-10-2018	11-09-2019
Power Sensor	D.A.R.E	RPR3006W	17I00015SNO27	11-10-2018	11-09-2019
Power Sensor	D.A.R.E	RPR3006W	17I00015SNO28	11-10-2018	11-09-2019
RF Switch Unit	Ascentest	AT890-RFB	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS 8310	Version: 2.0.0.0		
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	11-10-2018	11-09-2019
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-10-2018	11-09-2019

## 6 Radio Technical Specification in ETSI EN 300 328

### 6.1 Justification

The EUT and test equipment were configured for testing according to ETSI EN 300 328 V2.1.1 (2016-11). The EUT was tested in the normal operating mode to represent worst-case results during the final qualification test.

### 6.2 Test Configuration of EUT

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
2	2404MHz	22	2424MHz	42	2444MHz	62	2464MHz
3	2405MHz	23	2425MHz	43	2445MHz	63	2465MHz
...	...	...	...	...	...	...	...
17	2419MHz	37	2439MHz	57	2459MHz	77	2479MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		

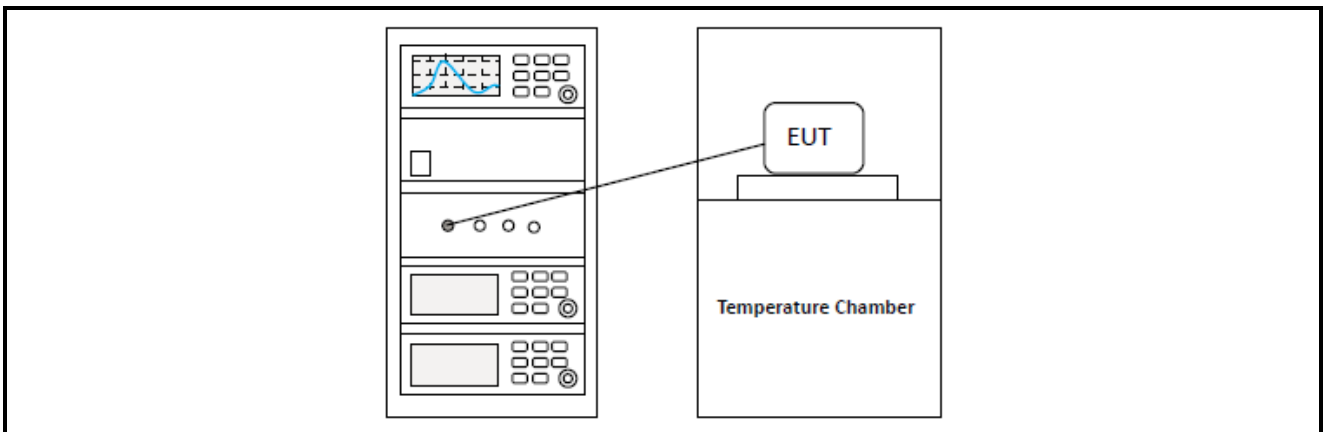
Remark: The EUT operation in above frequency list, and used test software to control the EUT for staying in continuous transmitting and receiving mode. Channel 0, 39 and 78 of Bluetooth were chosen for testing.

Clause No.	Test Conditions			Test Channel			Modulation			Test mode		
	NVNT	NVLT	NVHT	Low	Middle	High	GFSK	$\pi/4$ DQPSK	8DPSK	Tx	Hopping	Rx
4.3.1.2	√	√	√				√	√	√		√	
4.3.1.3												
4.3.1.4	√						√	√	√		√	
4.3.1.5	√						√	√	√		√	
4.3.1.6												
4.3.1.7	√			√		√	√	√			√	
4.3.1.8	√			√		√	√	√	√	√		
4.3.1.9	√						√	√	√		√	
4.3.1.10	√			√		√	√	√	√	√		
4.3.1.11	√			√		√	√	√	√			√
4.3.1.12	√										√	

Note:

- “√” means that this configuration is chosen for test.
- “NVNT” means Normal Voltage Normal Temperature, “NVLT” means Normal Voltage Low Temperature, “NVHT” means Normal Voltage High Temperature.

### 6.3 Test Setup Block





## 6.4 Test Results

### 6.4.1 Test Result Summary

Clause No.	Modulation	Test Condition	Test Data	Verdict
4.3.1.2	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	Appendix A - BT	Pass
		NVLT		
		NVHT		
4.3.1.3	N/A	N/A	N/A	N/A
4.3.1.4	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	Appendix A - BT	Pass
4.3.1.5	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	Appendix A - BT	Pass
4.3.1.6	N/A	N/A	N/A	N/A
4.3.1.7	GFSK & $\pi/4$ DQPSK	NVNT	Appendix A - BT	Pass
4.3.1.8	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	Appendix A - BT	Pass
4.3.1.9	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	Appendix A - BT	Pass
4.3.1.10	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	See Section 6.4.2	Pass
4.3.1.11	GFSK & $\pi/4$ DQPSK & 8DPSK	NVNT	See Section 6.4.3	Pass
4.3.1.12	Mormal hopping mode	NVNT	See Section 6.4.4	Pass

*Note:*

1. "NVNT" means Normal Voltage Normal Temperature, "NVLT" means Normal Voltage Low Temperature, "NVHT" means Normal Voltage High Temperature.
2. During the test, pre-scan all modulation mode, found DH5, 2-DH5 and 3-DH5 modulation mode were worse case mode. so only reflects test data of worst modulation mode.
3. Clause No. 4.3.1.2, Clause No. 4.3.1.9, Clause No. 4.3.1.10 and Clause No. 4.3.1.11 test Ceramic Antenna, External antenna A and, External antenna B. others Test Items pre-scan all antenna, found External antenna A were worse case mode. so only reflects test data of worse case mode.

## 6.4.2 Transmitter unwanted emissions in the spurious domain

Ceramic Antenna:

GFSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.16	-54.00	Pass
501.18	V	-64.93		
46.18	V	-56.28	-36.00	
154.28	V	-58.16		
4804.00	V	-48.37	-30.00	
55.03	Horizontal	-69.26	-54.00	
326.74	H	-57.32		
45.22	H	-62.89	-36.00	
326.74	H	-68.40		
4804.00	H	-49.07	-30.00	
GFSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.24	-54.00	Pass
501.18	V	-64.98		
46.18	V	-56.34	-36.00	
154.28	V	-58.17		
4960.00	V	-48.32	-30.00	
55.03	Horizontal	-69.19	-54.00	
326.74	H	-57.38		
45.22	H	-62.89	-36.00	
326.74	H	-68.24		
4960.00	H	-49.11	-30.00	

<b><math>\pi/4</math> DQPSK: The lowest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.36	-54.00	Pass
501.18	V	-64.86		
46.18	V	-56.54	-36.00	
154.28	V	-58.57		
4804.00	V	-48.46	-30.00	
55.03	Horizontal	-69.29		
326.74	H	-57.58	-54.00	
45.22	H	-62.91		
326.74	H	-68.43	-36.00	
4804.00	H	-49.25		
<b><math>\pi/4</math> DQPSK: The highest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-63.98	-54.00	Pass
501.18	V	-64.86		
46.18	V	-56.87	-36.00	
154.28	V	-59.31		
4960.00	V	-49.06	-30.00	
55.03	Horizontal	-69.32		
326.74	H	-57.83	-54.00	
45.22	H	-62.94		
326.74	H	-68.43	-36.00	
4960.00	H	-49.56		

8DPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.42	-54.00	Pass
501.18	V	-64.89		
46.18	V	-56.58	-36.00	
154.28	V	-58.64		
4804.00	V	-48.59	-30.00	
55.03	Horizontal	-69.48		
326.74	H	-57.56	-54.00	
45.22	H	-62.98		
326.74	H	-68.51	-36.00	
4804.00	H	-49.09		
8DPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.82	-54.00	Pass
501.18	V	-65.06		
46.18	V	-56.84	-36.00	
154.28	V	-58.79		
4960.00	V	-48.65	-30.00	
55.03	Horizontal	-69.92		
326.74	H	-57.83	-54.00	
45.22	H	-62.77		
326.74	H	-68.98	-36.00	
4960.00	H	-49.89		

External Antenna A:

GFSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.66	-54.00	Pass
501.18	V	-64.97		
46.18	V	-56.32	-36.00	
154.28	V	-58.57		
4804.00	V	-48.83	-30.00	
55.03	Horizontal	-69.42	-54.00	
326.74	H	-57.74		
45.22	H	-62.91	-36.00	
326.74	H	-68.43		
4804.00	H	-49.11	-30.00	
GFSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.28	-54.00	Pass
501.18	V	-64.79		
46.18	V	-56.35	-36.00	
154.28	V	-58.28		
4960.00	V	-48.43	-30.00	
55.03	Horizontal	-69.27	-54.00	
326.74	H	-57.46		
45.22	H	-62.91	-36.00	
326.74	H	-68.36		
4960.00	H	-49.08	-30.00	

<b><math>\pi/4</math> DQPSK: The lowest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.45	-54.00	Pass
501.18	V	-64.89		
46.18	V	-56.64	-36.00	
154.28	V	-58.35		
4804.00	V	-48.53	-30.00	
55.03	Horizontal	-69.29		
326.74	H	-57.64	-54.00	
45.22	H	-62.87		
326.74	H	-68.73	-36.00	
4804.00	H	-49.65		
<b><math>\pi/4</math> DQPSK: The highest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-63.85	-54.00	Pass
501.18	V	-64.43		
46.18	V	-56.67	-36.00	
154.28	V	-59.81		
4960.00	V	-49.82	-30.00	
55.03	Horizontal	-69.53		
326.74	H	-57.21	-54.00	
45.22	H	-62.37		
326.74	H	-68.51	-36.00	
4960.00	H	-49.67		

8DPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.86	-54.00	Pass
501.18	V	-64.84		
46.18	V	-56.56	-36.00	
154.28	V	-58.67		
4804.00	V	-48.92	-30.00	
55.03	Horizontal	-69.48		
326.74	H	-57.57	-54.00	
45.22	H	-62.99		
326.74	H	-68.54	-36.00	
4804.00	H	-49.12		
8DPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.79	-54.00	Pass
501.18	V	-65.11		
46.18	V	-56.86	-36.00	
154.28	V	-58.73		
4960.00	V	-48.69	-30.00	
55.03	Horizontal	-69.98		
326.74	H	-57.64	-54.00	
45.22	H	-62.32		
326.74	H	-68.78	-36.00	
4960.00	H	-49.89		

External Antenna B:

GFSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.73	-54.00	Pass
501.18	V	-64.96		
46.18	V	-56.34	-36.00	
154.28	V	-58.51		
4804.00	V	-48.89	-30.00	
55.03	Horizontal	-69.46	-54.00	
326.74	H	-57.72		
45.22	H	-62.84	-36.00	
326.74	H	-68.37		
4804.00	H	-48.06	-30.00	
GFSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.12	-54.00	Pass
501.18	V	-64.35		
46.18	V	-56.53	-36.00	
154.28	V	-58.54		
4960.00	V	-48.38	-30.00	
55.03	Horizontal	-69.62	-54.00	
326.74	H	-57.72		
45.22	H	-62.35	-36.00	
326.74	H	-68.36		
4960.00	H	-49.06	-30.00	



<b><math>\pi/4</math> DQPSK: The lowest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.34	-54.00	Pass
501.18	V	-64.93		
46.18	V	-56.46	-36.00	
154.28	V	-58.38		
4804.00	V	-48.65	-30.00	
55.03	Horizontal	-69.28		
326.74	H	-57.75	-54.00	
45.22	H	-62.89		
326.74	H	-68.34	-36.00	
4804.00	H	-49.86		
<b><math>\pi/4</math> DQPSK: The highest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-63.77	-54.00	Pass
501.18	V	-64.65		
46.18	V	-56.67	-36.00	
154.28	V	-59.89		
4960.00	V	-49.84	-30.00	
55.03	Horizontal	-69.37		
326.74	H	-57.28	-54.00	
45.22	H	-62.46		
326.74	H	-68.58	-36.00	
4960.00	H	-49.64		

8DPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.83	-54.00	Pass
501.18	V	-64.58		
46.18	V	-56.57	-36.00	
154.28	V	-58.89		
4804.00	V	-48.98	-30.00	
55.03	Horizontal	-69.48		
326.74	H	-57.54	-54.00	
45.22	H	-62.79		
326.74	H	-68.38	-36.00	
4804.00	H	-49.07		
8DPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
106.01	Vertical	-64.71	-54.00	Pass
501.18	V	-65.14		
46.18	V	-56.75	-36.00	
154.28	V	-58.38		
4960.00	V	-48.46	-30.00	
55.03	Horizontal	-69.98		
326.74	H	-57.59	-54.00	
45.22	H	-62.35		
326.74	H	-68.84	-36.00	
4960.00	H	-49.83		

## 6.4.3 Receiver spurious emissions

Ceramic Antenna

GFSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-58.44	-57.00	Pass
250.30	V	-60.19		
4804.00	V	-58.96	-47.00	
54.84	Horizontal	-64.78	-57.00	
501.18	H	-59.30		
4804.00	H	-59.64	-47.00	
GFSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-58.48	-57.00	Pass
250.30	V	-60.23		
4960.00	V	-59.03	-47.00	
54.84	Horizontal	-64.74	-57.00	
501.18	H	-59.31		
4960.00	H	-59.82	-47.00	

$\pi/4$ DQPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.21	-57.00	Pass
250.30	V	-60.34		
4804.00	V	-59.13	-47.00	
54.84	Horizontal	-64.87	-57.00	
501.18	H	-59.36		
4804.00	H	-59.02	-47.00	
$\pi/4$ DQPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.24	-57.00	Pass
250.30	V	-60.37		
4960.00	V	-59.08	-47.00	
54.84	Horizontal	-64.36	-57.00	
501.18	H	-59.38		
4960.00	H	-59.14	-47.00	

8DPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.37	-57.00	Pass
250.30	V	-60.19		
4804.00	V	-59.24	-47.00	
54.84	Horizontal	-64.38	-57.00	
501.18	H	-59.36		
4804.00	H	-59.28	-47.00	
8DPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.32	-57.00	Pass
250.30	V	-60.16		
4960.00	V	-59.08	-47.00	
54.84	Horizontal	-64.32	-57.00	
501.18	H	-59.38		
4960.00	H	-59.22	-47.00	

External Antenna A:

GFSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-58.81	-57.00	Pass
250.30	V	-60.53		
4804.00	V	-58.94	-47.00	
54.84	Horizontal	-64.38	-57.00	
501.18	H	-59.36		
4804.00	H	-59.69	-47.00	
GFSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-58.83	-57.00	Pass
250.30	V	-60.26		
4960.00	V	-59.15	-47.00	
54.84	Horizontal	-64.79	-57.00	
501.18	H	-59.37		
4960.00	H	-59.89	-47.00	

<b><math>\pi/4</math> DQPSK: The lowest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.26	-57.00	Pass
250.30	V	-60.34		
4804.00	V	-59.85	-47.00	
54.84	Horizontal	-64.39	-57.00	
501.18	H	-59.42		
4804.00	H	-59.27	-47.00	
<b><math>\pi/4</math> DQPSK: The highest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.29	-57.00	Pass
250.30	V	-60.36		
4960.00	V	-59.14	-47.00	
54.84	Horizontal	-64.38	-57.00	
501.18	H	-59.56		
4960.00	H	-59.37	-47.00	

8DPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.53	-57.00	Pass
250.30	V	-60.16		
4804.00	V	-59.37	-47.00	
54.84	Horizontal	-64.39	-57.00	
501.18	H	-59.52		
4804.00	H	-59.58	-47.00	
8DPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.43	-57.00	Pass
250.30	V	-60.19		
4960.00	V	-59.81	-47.00	
54.84	Horizontal	-64.35	-57.00	
501.18	H	-59.46		
4960.00	H	-59.37	-47.00	

External Antenna B:

GFSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.79	-57.00	Pass
250.30	V	-60.56		
4804.00	V	-58.92	-47.00	
54.84	Horizontal	-64.58	-57.00	
501.18	H	-59.37		
4804.00	H	-59.46	-47.00	
GFSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-58.94	-57.00	Pass
250.30	V	-60.83		
4960.00	V	-59.38	-47.00	
54.84	Horizontal	-64.46	-57.00	
501.18	H	-59.59		
4960.00	H	-59.82	-47.00	



<b><math>\pi/4</math> DQPSK: The lowest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.34	-57.00	Pass
250.30	V	-60.86		
4804.00	V	-59.45	-47.00	
54.84	Horizontal	-64.72	-57.00	
501.18	H	-59.64		
4804.00	H	-59.51	-47.00	
<b><math>\pi/4</math> DQPSK: The highest channel</b>				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.59	-57.00	Pass
250.30	V	-60.38		
4960.00	V	-59.43	-47.00	
54.84	Horizontal	-64.56	-57.00	
501.18	H	-59.59		
4960.00	H	-59.37	-47.00	

8DPSK: The lowest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.58	-57.00	Pass
250.30	V	-60.24		
4804.00	V	-59.46	-47.00	
54.84	Horizontal	-64.82	-57.00	
501.18	H	-59.59		
4804.00	H	-59.52	-47.00	
8DPSK: The highest channel				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	Polarization	Level(dBm)		
154.82	Vertical	-59.48	-57.00	Pass
250.30	V	-60.26		
4960.00	V	-59.83	-47.00	
54.84	Horizontal	-64.49	-57.00	
501.18	H	-59.85		
4960.00	H	-59.67	-47.00	

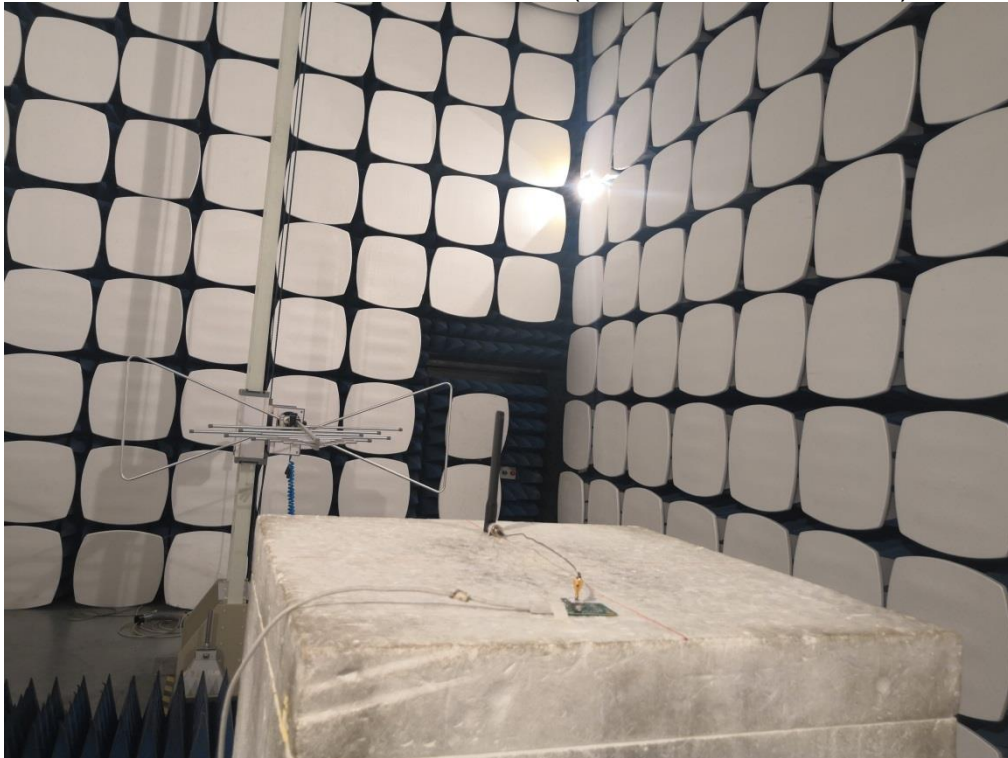
## 6.4.4 Receiver Blocking

Test mode : hopping					
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm)	PER measurement level (%)	PER Limit (%)	Results
-79.00 (Pmin+6dBm)	2380	-53	5	10	Pass
	2503.5		4		
-79.00 (Pmin+6dBm)	2300	-47	6	10	Pass
	2330		3		
	2360		6		
-79.00 (Pmin+6dBm)	2523.5	-47	6	10	Pass
	2553.5		5		
	2583.5		3		
	2613.5		4		
	2643.5		2		
	2673.5		3		

**NOTE:**  
 (1) The minimum performance criterion shall be PER less than or equal to 10 %.  
 (2) Manufacturer declared the sensitivity level is -85 dBm.  
 (3) The EUT belongs to receiver category 1 equipment.

## 7 Test setup photo

Radiated Emission Below 1GHz (for External antenna A)



Radiated Emission Above 1GHz (for External antenna A)



Radiated Emission Below 1GHz (for External antenna B)



Radiated Emission Above 1GHz (for External antenna B)





Radiated Emission Below 1GHz (for Ceramic Antenna)



Radiated Emission Above 1GHz (for Ceramic Antenna)



## 8 EUT Constructional Details

Reference to the test report No.: CCISE190310301

## ANNEX Application form for testing

In accordance with EN 300 328 V2.1.1, clause 5.4.1, the following information is provided by the supplier.

**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: 79  
The minimum number of Hopping Frequencies: 79
- The Dwell Time: 0.344s
- The Minimum Channel Occupation Time: 2.89ms

**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 Channel Occupancy Time implemented by the equipment: 0.269 ms

- The equipment has implemented an LBT based DAA mechanism
  - In case of equipment using modulation different from FHSS:
    - 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:       $\mu$ s
- The value q as referred to in clause 4.3.2.5.2.2.2: .....
- The equipment has implemented an 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 GFSK
- Power Spectral Density N/A
- Duty cycle, Tx-Sequence, Tx-gap .....
- Dwell time, Minimum Frequency Occupation & Hopping Sequence (only for FHSS equipment)  
0.344s, 2.89ms, 79 channels
- Hopping Frequency Separation (only for FHSS equipment) 8DPSK
- Medium Utilisation N/A
- Adaptivity & Receiver Blocking GFSK
- Occupied Channel Bandwidth 8DPSK
- Transmitter unwanted emissions in the OOB domain  $\pi/4$ DQPSK
- Transmitter unwanted emissions in the spurious domain GFSK
- Receiver spurious emissions GFSK

**g) The different transmit operating modes (tick all that apply):**

- Operating mode 1: Single Antenna Equipment
- Equipment with only 1 antenna
- Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
- Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 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 Occupied Channel Bandwidth 1
  - High Throughput (> 1 spatial stream) using Occupied 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 Occupied Channel Bandwidth 1
  - High Throughput (> 1 spatial stream) using Occupied 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 beam forming gain: .....

NOTE: 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: 2402 MHz to 2480 MHz
- Operating Frequency Range 2: ..... MHz to..... MHz

NOTE: Add more lines if more Frequency Ranges are supported.

**j) Occupied Channel Bandwidth(s):**

- Occupied Channel Bandwidth 1: 1.194 MHz
- Occupied 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)
- Other.....

**l) The extreme operating conditions that apply to the equipment:**

Operating temperature range: -20 ° C to +55 ° C

Operating voltage range: 2.97 V to 3.63 V  AC  DC

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
- Ceramic Antenna Gain: 3.0 dBi
- External Antenna A Gain: 4.0 dBi
- External Antenna B Gain: 3.2 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			

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			

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			

**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 3.3 V

In case of DC, indicate the type of power source

- Internal Power Supply
- External Power Supply
- Battery
- Other: .....

**o) Describe the test modes available which can facilitate testing:**

Hopping mode and continuous transmitting mode control in engineer mode.

**p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], proprietary, etc.):**

Bluetooth

