

SPECTRUM REPORT

(5GHz RLAN)

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

Standards: ETSI EN 301 893 V2.1.1 (2017-05)

Date of Receipt: 28 Mar, 2019

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

Date of 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.



Bruce Zhang
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.

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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
Radio Spectrum Matter (RSM) Part of Tx				
Centre frequencies	Clause 4.2.1	Clause 5.4.2	±20 ppm	PASS
Nominal Channel Bandwidth and Occupied Channel Bandwidth	Clause 4.2.2	Clause 5.4.3	>5MHz and 80%~100% Nominal Bandwidth	PASS
RF Output Power,EIRP	clause 4.2.3	Clause 5.4.4	Table 2	PASS
Power Spectrum Density	clause 4.2.3	Clause 5.4.4	Table 2	PASS
Transmitter unwanted emissions outside the 5 GHz RLAN bands	clause 4.2.4.1	clause 5.4.5	Table 4	PASS
Transmitter unwanted emissions within the 5 GHz RLAN bands	clause 4.2.4.2	clause 5.4.6	Figure 1	PASS
Dynamic Frequency Selection (DFS)	clause 4.2.6	clause 5.4.8.2.1.6	clause 4.2.6.2.5.2	N/A
Adaptivity (Channel AccessMechanism)	clause 4.2.7	clause 5.4.9	clause 4.2.7.3.3.3	PASS
User Access Restrictions	clause 4.2.9	clause 4.2.9	clause 4.2.9.2	PASS
Radio Spectrum Matter (RSM) Part of Rx				
Receiver spurious emissions	clause 4.2.5	clause 5.4.7	Table 5	PASS
Receiver Blocking	clause 4.2.8	clause 5.4.10	clause 4.2.8.4	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:	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
Operating Frequency:	Band 1: 5180MHz~5240MHz
Nominal Bandwidth	20MHz & 40MHz & 80MHz
Channel Spacing:	10MHz
Modulation:	OFDM
Max. E.I.R.P Power:	External antenna: 802.11a 15.18dBm, 802.11n(HT20) 14.17dBm, 802.11n(HT40) 12.90dBm, 802.11ac(HT20) 13.48dBm, 802.11ac(HT40) 12.10dBm, 802.11ac(HT80) 11.74dB Ceramic antenna: 802.11a 14.85dBm, 802.11n(HT20) 13.81dBm, 802.11n(HT40) 13.19dBm, 802.11ac(HT20) 13.93dBm, 802.11ac(HT40) 12.70dBm, 802.11ac(HT80) 10.82dB
Antenna Type:	Ceramic Antenna External antenna
Antenna Gain	Ceramic Antenna: 3.0 dBi External antenna A: 4.5 dBi External antenna B: 4.2 dBi
TPC:	Not support
Device Classification:	<input type="checkbox"/> Frame Based Equipment <input checked="" type="checkbox"/> Load Based Equipment
Power supply:	DC 3.3V
Remark:	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: <ol style="list-style-type: none"> 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. 2. Modules use different version of chip BLUE bean Qualcomm QCA9377-7 and RED bean Qualcomm QCA9377-3. 3. QCA9377-7 and QCA9377-3 only differs what interface it uses to connect to WIFI and BT. 4. BLUE bean QCA9377-7 uses USB2.0 for WIFI and USB1.1 for BT. 5. RED bean QCA9377-3 uses SDIO3.0 for WIFI and UART/PCM for

	<p>BT.</p> <p>6. Circuit design, layout components used and internal wiring for interface connection is different.</p> <p>7. Pinout for module is different</p>
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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.
Receiving mode:	Keep the EUT in receiving mode.
<p>We have verified the construction and function in typical operation. All the test items were carried out with the EUT in above test modes. And the test results are both the "worst case" and "worst setup" 6 Mbps for 802.11a, 6.5 Mbps for 802.11n(HT20), 13.5 Mbps for 802.11n(HT40), 27 Mbps for 802.11ac(HT80).</p>	

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
8devices	Test suite	Pi3B+SD	N/A	N/A

5.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%)
Radio Frequency	±10ppm
RF Power, Conducted	±1.5 dB
RF Power, Radiated	±4.44 dB
Spurious emission, Conducted	±3.0 dB
Temperature	±2°C
Humidity	±5 %
Time	±10%
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB

5.6 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

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.

- **CNAS - Registration No.: CNAS L6048**

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.

- **A2LA - Registration No.: 4346.01**

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: <https://portal.a2la.org/scopepdf/4346-01.pdf>

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 Essential Radio Test Suites Specification in EN 301 893

6.1 Justification

The EUT and test equipment were configured for testing according to ETSI EN 301 893 V2.1.1 (2017-05). 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

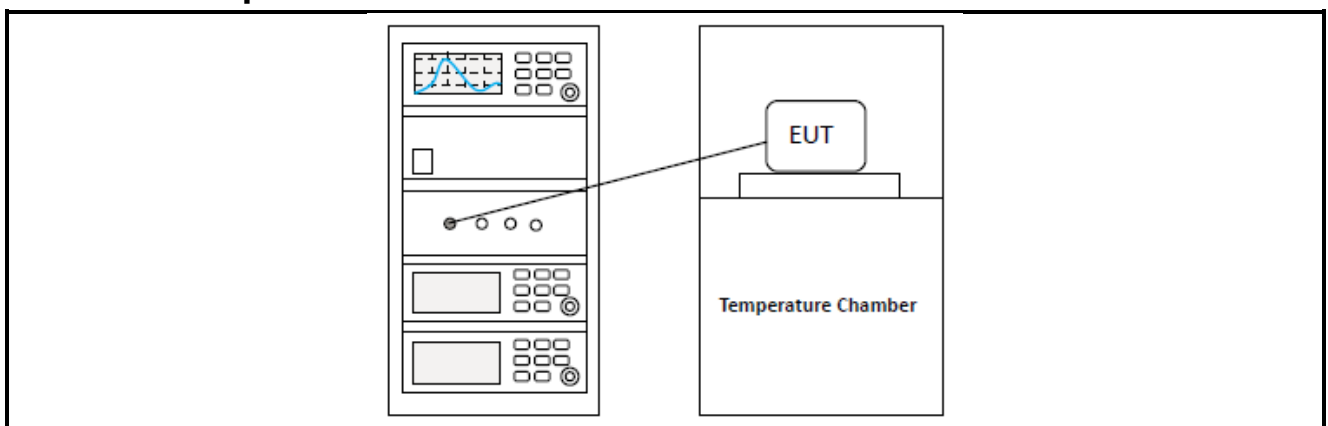
Channel List of 5150MHz ~ 5250MHz					
802.11a/n(HT20)/ac(HT20)		802.11n(HT40)/ac(HT40)		802.11ac(HT80)	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

Test plan of 5150MHz ~ 5250MHz													
Clause No.	Test Conditions			Test Channel No.			Mode				Test mode		
	NVNT	NVLT	NVHV	36	38	42	802.11a	802.11n/ac (HT20)	802.11n/ac (HT40)	802.11ac (HT80)	Tx	Rx	Normal
4.2.1	√	√	√	√	√	√	√	√	√	√	√		
4.2.2	√			√	√	√	√	√	√	√	√		
4.2.3	√	√	√	√	√	√	√	√	√	√	√		
4.2.3 ^{PSD}	√			√	√	√	√	√	√	√	√		
4.2.4.1	√			√		√	√	√	√	√	√		
4.2.4.2	√			√	√	√	√	√	√	√	√	√	
4.2.5	√			√	√	√	√	√	√	√			
4.2.6													
4.2.7	√			√	√	√	√	√	√	√			√
4.2.8	√			√	√	√	√	√	√	√		√	
4.2.9													

Note:

1. "√" means that this configuration is chosen for test.
2. "NVNT" means Normal Voltage Normal Temperature, "NVLT" means Normal Voltage Low Temperature, "NVHT" means Normal Voltage High Temperature.
3. Clause No.: "4.2.3^{PSD}" was Power Density test item.

6.3 Test Setup Block



6.4 Test Results

6.4.1 Test Result Summary

Test Frequency Range: 5150MHz ~ 5250MHz				
Clause No.	Mode	Test Condition	Test Data	Verdict
4.2.1	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	NVNT	Appendix A – 5G Wi-Fi	Pass
		NVLT		
		NVHT		
4.2.2	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	NVNT	Appendix A – 5G Wi-Fi	Pass
4.2.3	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	NVNT	Appendix A – 5G Wi-Fi	Pass
		NVLT		
		NVHT		
4.2.3 ^{PSD}	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	NVNT	Appendix A – 5G Wi-Fi	Pass
4.2.4.1	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	NVNT	Appendix A – 5G Wi-Fi	Pass
4.2.4.2		NVNT	Appendix A – 5G Wi-Fi	Pass
4.2.5		NVNT	Appendix A – 5G Wi-Fi	Pass
4.2.6	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	N/A	See Section 6.4.2	Pass
4.2.7	802.11 a & n(HT20) & n(HT40) & ac(HT20)& ac(HT40) & ac(HT80)	NVNT	Appendix A – 5G Wi-Fi	Pass
4.2.8		NVNT	See Section 6.4.3	Pass
4.2.9	N/A	N/A	See Section 6.4.4	Pass

Note:

- “NVNT” means Normal Voltage Normal Temperature, “NVLT” means Normal Voltage Low Temperature, “NVHT” means Normal Voltage High Temperature.
- Clause No.: “4.2.3^{PSD}” was Power Density test item.
- Clause No. 4.2.3, 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 Dynamic Frequency Selection (DFS)

Requirement:	<p>Radar detection shall be used when operating on channels whose nominal bandwidth falls partly or completely within the frequency ranges 5 250 MHz to 5 350 MHz or 5 470 MHz to 5 725 MHz. This requirement applies to all types of RLAN devices regardless of the type of communication between these devices.</p> <p>Uniform Spreading is required across the frequency ranges 5 150 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz.</p> <p>Uniform Spreading is not applicable for equipment that only operates in the band 5 150 MHz to 5 250 MHz.</p>
Description:	<p>The EUT only operates in the band 5150 to 5250, so the DFS test is not required.</p>

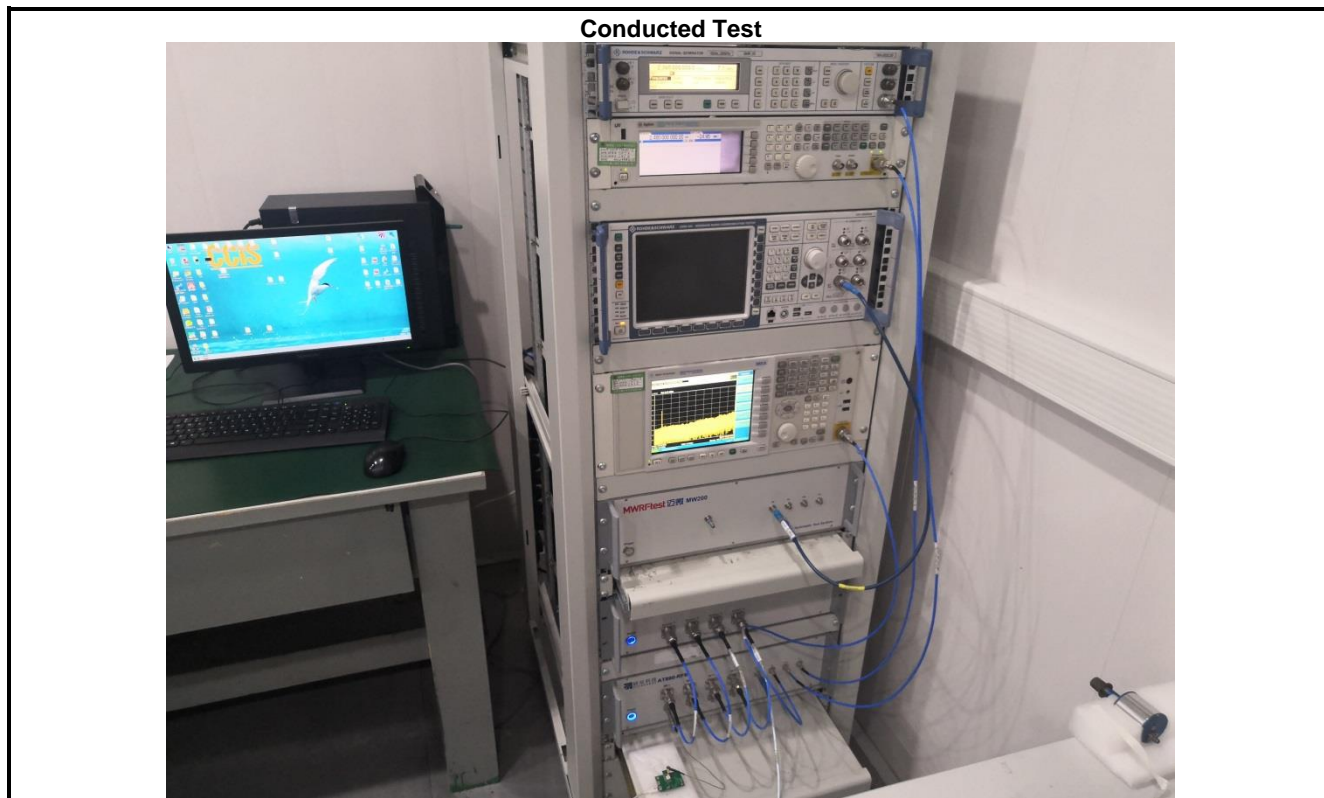
6.4.3 Receiver Blocking

Test Frequency Range: 5150MHz ~ 5250MHz					
802.11a					
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER measurement level (%)	PER Limit (%)	Results
-81.00 (Pmin+6dBm)	5100	-59	2	10	Pass
-81.00 (Pmin+6dBm)	4900	-53	3	10	Pass
	5000		5		
	5975		3		
<i>Note:</i> 1. The minimum performance criterion shall be PER less than or equal to 10 %. 2. Manufacturer declared the sensitivity level is -87 dBm.					
802.11n(HT40)					
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER measurement level (%)	PER Limit (%)	Results
-81.00 (Pmin+6dBm)	5100	-59	3	10	Pass
-81.00 (Pmin+6dBm)	4900	-53	2	10	Pass
	5000		5		
	5975		4		
<i>Note:</i> 1. The minimum performance criterion shall be PER less than or equal to 10 %. 2. Manufacturer declared the sensitivity level is -87 dBm.					
802.11ac(HT80)					
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER measurement level (%)	PER Limit (%)	Results
-81.00 (Pmin+6dBm)	5100	-59	3	10	Pass
-81.00 (Pmin+6dBm)	4900	-53	3	10	Pass
	5000		5		
	5975		4		
<i>Note:</i> 1. The minimum performance criterion shall be PER less than or equal to 10 %. 2. Manufacturer declared the sensitivity level is -87 dBm.					

6.4.4 User Access Restrictions

Requirement:	The equipment shall be so constructed that settings (hardware and/or software) related to DFS shall not be accessible to the user if changing those settings result in the equipment no longer being compliant with the DFS requirements in clause 4.2.6.
Description:	The EUT has no radar detection function and the manufacturer will restrict access for the user to change certain hardware and/or software settings of the equipment.

7 Test Setup Photos



8 EUT photos

Refer to the report No.: CCISE190310301

-- End of report--