SIEMIC

CE2200

Statement of opinion with respect to the presumption of
Compliance of a product with the essential requirements of

R&TTE DIRECTIVE 1999/5/EC

Certificate Number	R-15090103
Certificate Holder	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Address	Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
Manufacturer	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Product Type/Description	Bluetooth 150Mbps Wireless N USB Module
Trade Name	LB-LINK
Model Number	BL-R8723RB1

Applied / Complied Harmonized Standards		Complied
R&TTE Directive 1999/5/EC, Article 3(1)(a) ■ Health & Safety	EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013 EN 62311: 2008	Y
R&TTE Directive 1999/5/EC, Article 3(1)(b) ■ EMC	EN 301 489-1 V1.9.2 , EN 301 489-17 V2.2.1	Y
R&TTE Directive 1999/5/EC, Article 3(2) ■ Radio	EN 300 328 V1.8.1	Y

Authorized By: Leslie Bai

Issue Date: September 1, 2015 Director of Certification

PS: This Certificate is Issued in Accordance with Annex IV of the R&TTE Directive 1999/5/EC and Is only valid in Conjunction with the Following Annex I.

775 Montague Expressway, Milpitas, CA 95035, USA
Tel: 408 526 1188, Fax: 408 526 1088,
Website: www.siemic.com, Email: info@siemic.com

Annex I of R&TTE EC Certificate

Certificate Number: R-15090103

Product Specifications	
Frequency Range	2412-2472MHz (WiFi) , 2402-2480MHz (Bluetooth) , 2402-2480MHz (BLE)
RF Output Power (EIRP)	14.10 dBm (WiFi) , 4.43 dBm (Bluetooth) , 2.02 dBm (BLE)
Type of Antenna	Integral Antenna
Modulation	OFDM,DSSS (WiFi) ,GFSK, π/4-DQPSK, 8DPSK(Bluetooth) , GFSK (BLE)
Mode of Operation(Simplex / Duplex)	Duplex
Duty Cycle	-
Comments (product class if applicable)	-Class 1

Technical Construction File

Test Report	
R&TTE Directive 1999/5/EC, Article 3(1)(a) ■ Health & Safety	ED150528298S , ED150528298H
R&TTE Directive 1999/5/EC, Article 3(1)(b) ■ EMC	ED150528298E
R&TTE Directive 1999/5/EC, Article 3(2) ■ Radio	ED150528298R1, ED150528298R2, ED150528298R3
User Manual	☒
Product Label	☒
Block Diagram	☒
Circuit Diagram	☒
BOM	☒
Declaration of Conformity	☒

Based on the evidence presented, our opinion in accordance with Annex IV of Council Directive 1999/5/EC on Radio Equipment and Telecommunications Equipment and the mutual recognition of their conformity is that the apparatus identified above complies with the requirements of that Directive stated above.

Note: Compliance with the above Directive does not guarantee the right to use the above mentioned equipment in any EU member state.
No configuration, other than described above, has been considered and is therefore not included in this certificate

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Tel: 408 526 1188 ; Fax : 408 5261088
Website: WWW.SIEMIC.COM , Email: Info@siemic.com
Please check the validation of this certificate at http://www.siemic.com/Pages/siemic_db/public/certverification.asp

ETSI EN 301 489-1 v 1.9.2: 2011/-17 v 2.2.1: 2012
EMISSION/IMMUNITY/HARMONICS/FLICKER COMPLIANCE

Test Report

For

Bluetooth 150Mbps Wireless N USB Module

Model No.: BL-R8723RB1

Trademark: LB-LINK

Report No.: ED150528298E

Issue Date: September 02, 2015

Prepared for

SHENZHEN BILIAN ELECTRONIC CO., LTD.
Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China

Prepared by

DONGGUAN EMTEK CO., LTD.
No.281,Guantai Road, Nancheng District,
Dongguan, Guangdong, China
TEL: 86-769-22807078
FAX: 86-769-22807079

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1. TEST RESULT CERTIFICATION

Applicant:	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Equipment Under Test:	Bluetooth 150Mbps Wireless N USB Module
Trade Mark:	LB-LINK
Model No.:	BL-R8723RB1
Input Rating:	DC From PC
Date of Test:	May 28, 2015 to June 27, 2015

APPLICABLE STANDARDS		
STANDARD	**TEST RESULT**	
ETSI EN 301 489-1 $_{V1.9.2}$	complied	
ETSI EN 301 489-17 $_{V2.2.1}$	complied	
Applicable Standard	**Class/Limit/Criterion**	**Test Result**
ETSI EN 301 489-1 $_{V1.9.2:}$ 2011		
EN 55022: 2010+AC: 2011	Class B	complied
IEC 61000-4-2: 2008	Criterion B	complied
IEC 61000-4-3: 2006+ A1: 2007+ A2: 2010	Criterion A	complied
Deviation from Applicable Standard		
None		

The above equipment was tested by DONGGUAN EMTEK CO., LTD. for compliance with the requirements set forth in ETSI EN 301 489-17 $V_{2.2.1}$:2012. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Reviewed and Approved by:

Approved By

Sam Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	ED150528298E

2. EUT DESCRIPTION

Details of technical specification, refers to the description in follows:

Product Name	Bluetooth 150Mbps Wireless N USB Module		
Model number	BL-R8723RB1		
Power Supply	DC From PC		
Technical Description			
Kind of Device	Bluetooth 4.0	Bluetooth 3.0+EDR	WiFi
Operation Frequency	2402-2480MHz		2412-2462MHz for 802.11b/g/n(HT20) ; 2422-2452MHz for 802.11n(HT40)
Modulation	GFSK	GFSK, π/4-DQPSK, 8DPSK	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n, DSSS with DBPSK/DQPSK/CCK for 802.11b;
Number of Channel	40	79	11 Channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Channel space	2MHz	1MHz	5MHz
Max RF Output Power	2.02dBm	4.43dBm	14.10dBm
Antenna Type	External antenna		
Antenna Gain	2 dBi		

3. TEST METHODOLOGY

As per table 1 of clause 7.1 of ETSI EN 301 489-1 V1.9.2, the measurement was performed under EUT combined condition during the tests. The ports on the ancillary left empty during the measurement in this report.

3.1 UNIT OF MEASUREMENT

Measurements of radiated interference are reported in terms of dB(uV/m) at a specified distance. The indicated readings on the Spectrum analyzers were converted to dB (uV/m) by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dB(uV).

The field strength is calculated by adding the Antenna Factor and Cable Factors and subtracting the Amplifier Gain from the measured reading. The following is a sample calculation:

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4dB/m and a Cable Factor of 1.1dB are added. The Amplifier Gain of 29 dB is subtracted, giving field strength of 32 dBuV/m. The 32-dBuV/m values was mathematically converted to its corresponding level in uV/m.

FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBuV/m

Note: *Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m*

3.2 ANTENNA

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 meters from the leading edge of the turntable.

3.3 DECISION OF FINAL TEST MODE

1. The following test mode was scanned during the preliminary test:

Mode 1: Normal

After the preliminary scan, the following test mode was found to produce the highest emission level.Then, the EUT configuration and cable configuration of the above highest emission mode was recorded for all final test items.

Modes: TX, RX

4. INSTRUMENT AND CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

FACILITIES AND ACCREDITATIONS

4.2 FACILITIES

Site Description

EMC Lab. : Accredited by CNAS, 2015.06.11
The certificate is valid until 2018.07.03
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006
The Certificate Registration Number is L3150

Accredited by TUV Rheinland, 2014.05.22
The certificate is valid until 2015.11.21
The Laboratory has been assessed according to the requirements ISO/IEC 17025: 2005

Accredited by FCC, June 18, 2014
The Certificate Number is 247565

Accredited by Industry Canada, February 19, 2014
The Certificate Number is 9444A.

Name of Firm : DONGGUAN EMTEK CO., LTD.

Site Location : No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

4.3 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5. SETUP OF EQUIPMENT UNDER TEST

5.1 SETUP CONFIGURATION OF EUT

Setup Diagram

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

5.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	Note
1	PC	Dell	OPTIRLEX 760	N/A	Support Equipment

Note: *All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.*

Grounding: *Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.*

5.3 TEST SETUP

The equipment under test was configured and operated in a manner to communicate continuously. EUT tends to maximize its emission characteristics in a typical application for conducted and radiated emission measurement. The RF module plus ancillary (stand alone unit) was evaluated as per table 1 of clause 7.1 of ETSI EN 301 489-1 V1.9.2: 2011. The transmitter was active during the conducted and radiated emission measurements.

6. ETSI EN 301 489-1/-17 REQUIREMENTS

6.1 RADIATED EMISSION LIMIT

Please refer to ETSI EN 301 489-1 Clause 8.2.3, Table 3 and EN 55022: 2010+AC: 2011 Clause 6, Table 6, Table 9,Class B

Limits for radiated disturbance Below 1GHz

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
30 ~ 230	3	40
230 ~ 1000	3	47
Note: (1) The smaller limit shall apply at the combination point between two frequency bands. (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.		

Limits for radiated disturbance Above 1GHz

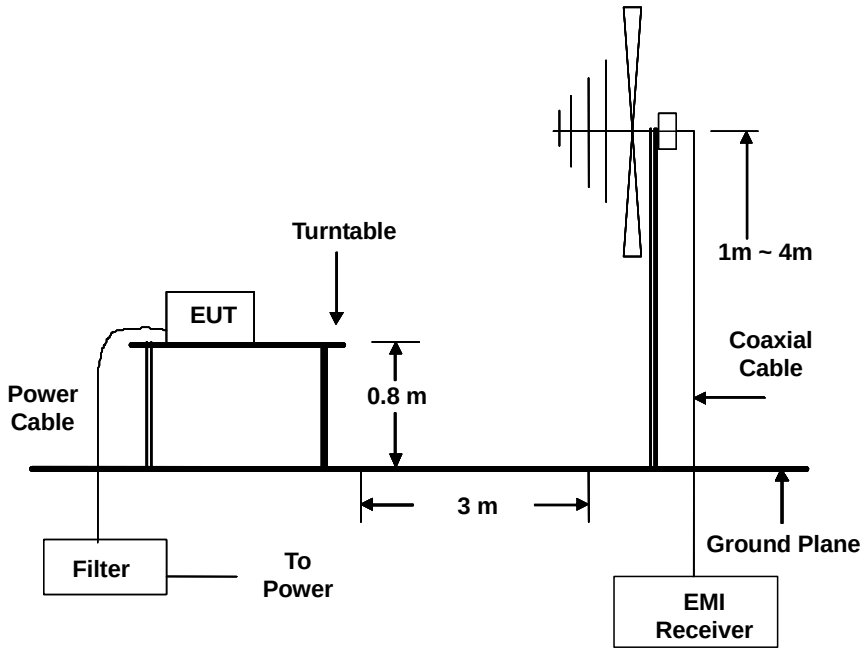
FREQUENCY (MHz)	DISTANCE (Meters)	Average Limit (dBμV/m)	Peak Limit (dBμV/m)
1000 ~ 3000	3	50	70
3000 ~ 6000	3	54	74
Note: The lower limit applies at the transition frequency.			

MEASUREMENT EQUIPMENT USED

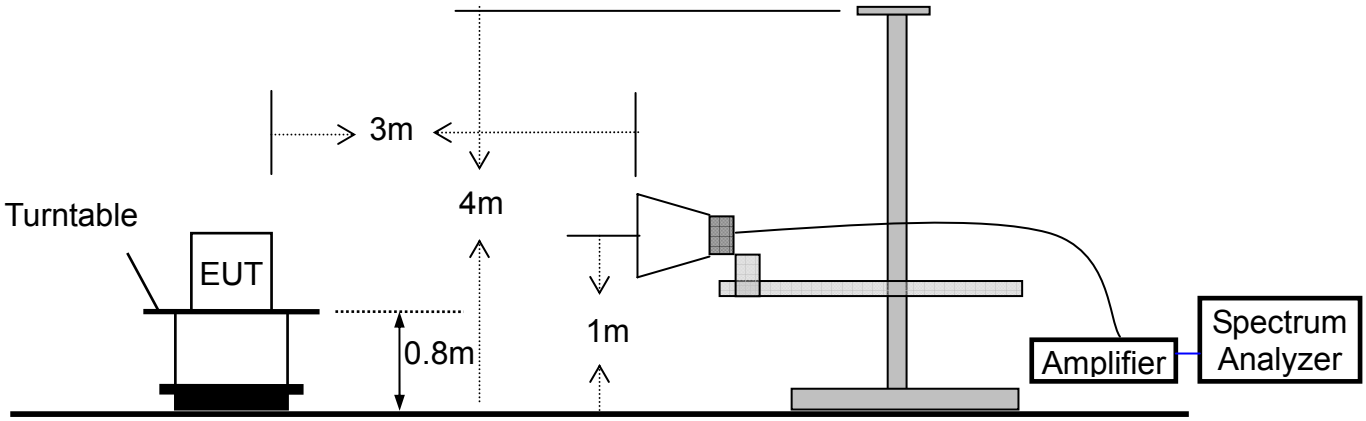
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	1166.5950.03	03/20/2015	1 Year
2.	Bilog Antenna	Schwarzbeck	VULB9163	000141	03/20/2015	1 Year
3.	Power Amplifier	CDS	RSU-M352	818	03/20/2015	1 Year
4.	Power Amplifier	HP	8447F	OPT H64	03/20/2015	1 Year
5.	Color Monitor	SUNSPO	SP-140A	N/A	03/20/2015	1 Year
6.	Single Line Filter	JIANLI	XL-3	N/A	03/20/2015	1 Year
7.	Single Phase Power Line Filter	JIANLI	DL-2X100B	N/A	03/20/2015	1 Year
8.	3 Phase Power Line Filter	JIANLI	DL-4X100B	N/A	03/20/2015	1 Year
9.	DC Power Filter	JIANLI	DL-2X50B	N/A	03/20/2015	1 Year
10.	Cable	Schwarzbeck	PLF-100	549489	03/20/2015	1 Year
11.	Cable	Rosenberger	CIL02	A0783566	03/20/2015	1 Year
12.	Cable	Rosenberger	RG 233/U	525178	03/20/2015	1 Year
13.	Signal Analyzer	Rohde & Schwarz	FSV30	103040	12/29/2014	1 Year
14.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1272	12/29/2014	1 Year
15.	Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	12/29/2014	1 Year
16.	Cable	H+S	CBL-26	N/A	12/29/2014	1 Year
17.	Cable	H+S	CBL-26	N/A	12/29/2014	1 Year
18.	Cable	H+S	CBL-26	N/A	12/29/2014	1 Year

Test Configuration

1) Radiated Emission Test Set-Up, Frequency Below 1000MHz



2) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.2.2 and EN 55022:2010+AC: 2011 Clause 6 for the measurement methods.

TEST RESULTS

No non-compliance noted.

Test Data

Please refer to the following pages:

Test Mode: TX (30-1000MHz)	**Tested by:** Andy
Test voltage: AC 230V/50Hz	**Test Distance:** 3m
Detector Function: Quasi-peak/Peak	**Test Results:** Passed

Polarization	Frequency MHz	Emission Level dBμV/m	Limits dBμV/m	Margin dB
Horizontal	65.8900	20.72	40.00	-19.28
	128.9400	23.86	40.00	-16.14
	215.2700	23.04	40.00	-16.96
	231.7600	23.18	47.00	-23.82
	409.2700	23.47	47.00	-23.53
	563.5000	24.13	47.00	-22.87
Vertical	112.4500	23.15	40.00	-16.85
	120.2100	29.28	40.00	-10.72
	128.9400	34.09	40.00	-5.91
	145.4300	29.90	40.00	-10.10
	157.0700	26.28	40.00	-13.72
	670.2000	26.47	47.00	-20.53

Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
3. *Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.*
4. *Measurements above show only up to 6 maximum emissions noted.*
5. *The IF bandwidth of SPA 30MHz to 1GHz was 100KHz.*

Test Mode: TX (Above 1GHz)	**Tested by:** Andy
Test voltage: AC 230V/50Hz	**Test Distance:** 3m
Detector Function: Peak+ AV	**Test Results:** Passed

Ant.Pol.	Frequency (MHz)	Emission Level(dBuV/m)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV	PK	AV	PK	AV
Horizontal	1305	58.06	36.25	70	50	-11.94	-13.75
	1954	57.42	37.42	70	50	-12.58	-12.58
	2014	59.26	38.01	70	50	-10.74	-11.99
	2635	60.15	33.05	70	50	-9.85	-16.95
	2948	62.04	36.24	70	50	-7.96	-13.76
	3124	61.72	35.15	74	54	-12.28	-18.85
Vertical	1563	58.06	36.29	70	50	-11.94	-13.71
	1935	54.62	35.74	70	50	-15.38	-14.26
	2106	56.24	39.04	70	50	-13.76	-10.96
	2654	55.16	35.15	70	50	-14.84	-14.85
	2971	58.04	38.04	70	50	-11.96	-11.96
	3148	60.26	36.73	70	50	-9.74	-13.27

6.2 AC MAINS LINE CONDUCTED EMISSION

LIMIT

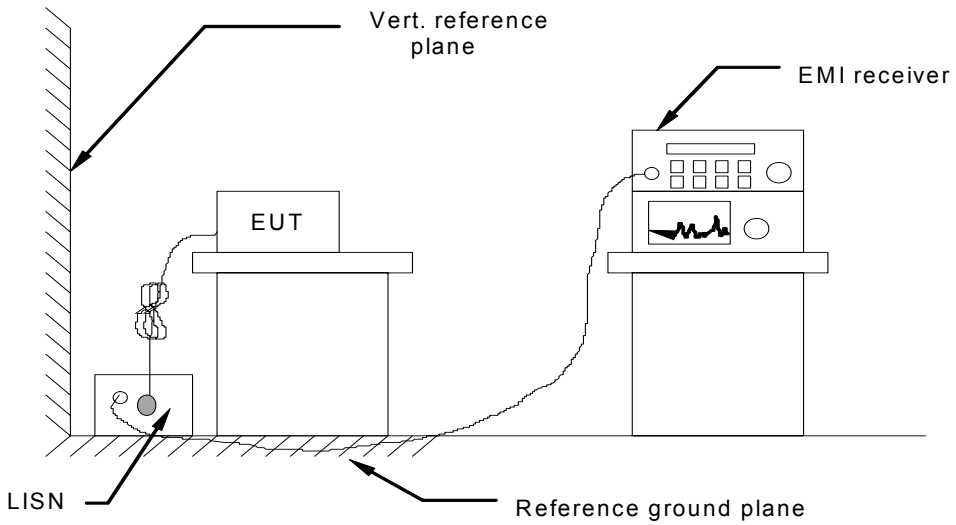
Please refer to ETSI EN 301 489-1 Clause 8.4.3, Table 8 and EN 55022: 2010+AC: 2011 Clause 5, Table 2, Class B

MEASUREMENT EQUIPMENT USED

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde&Schwarz	ESCS30	100018	03/20/2015	1 Year
2.	L.I.S.N.	Rohde&Schwarz	ENV216	100017	03/20/2015	1Year
3.	RF Switching Unit	CDS	RSU-M2	38401	03/20/2015	1Year

Remark: *Each piece of equipment is scheduled for calibration once a year.*

Test Configuration

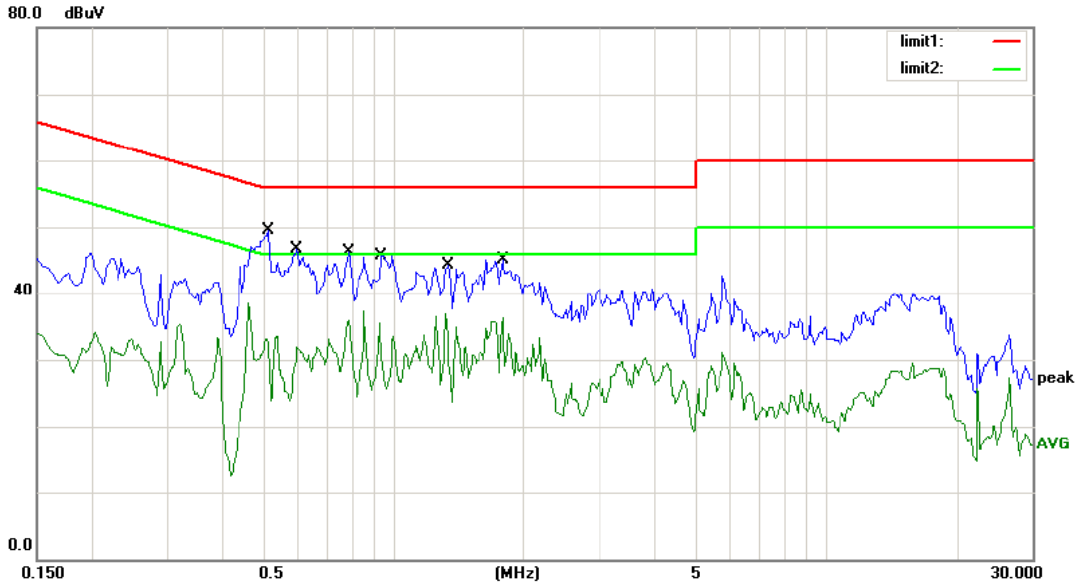


TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.4.2 and EN 55022: 2010+AC: 2011 Clause 5 for the measurement methods.

TEST RESULTS

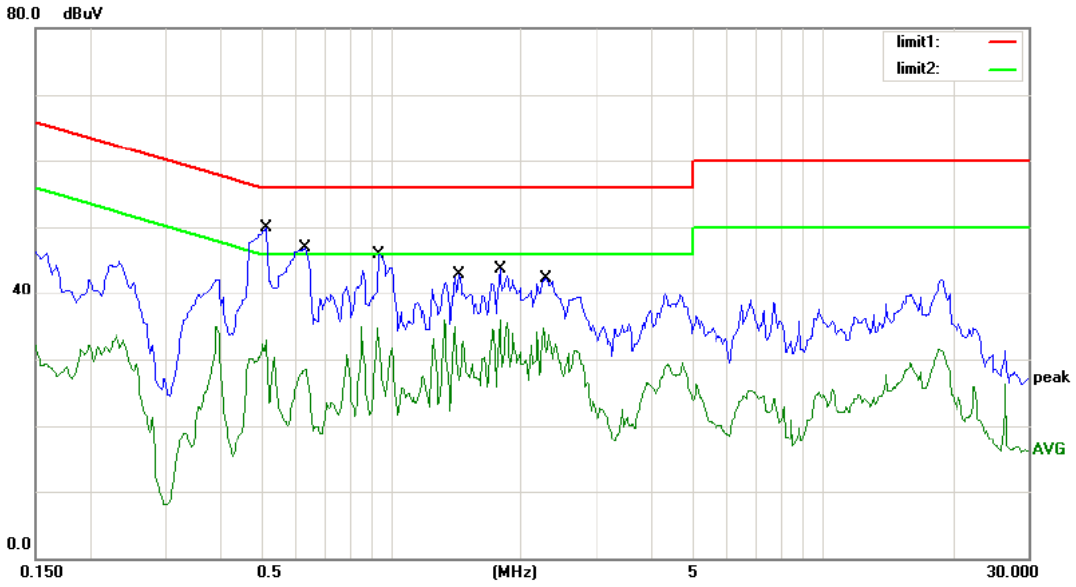
Pass.
Please refer to the following data.



Site site #1 Phase: L1 Temperature: 24
Limit: (CE)EN301489_QP Power: DC 5V Humidity: 55 %
Mode: WIFI Link
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.5144	47.85	0.00	47.85	56.00	-8.15	QP	
2		0.5144	33.51	0.00	33.51	46.00	-12.49	AVG	
3		0.6000	44.25	0.00	44.25	56.00	-11.75	QP	
4		0.6000	31.86	0.00	31.86	46.00	-14.14	AVG	
5		0.7890	44.74	0.00	44.74	56.00	-11.26	QP	
6		0.7890	37.39	0.00	37.39	46.00	-8.61	AVG	
7		0.9420	43.21	0.00	43.21	56.00	-12.79	QP	
8		0.9420	35.53	0.00	35.53	46.00	-10.47	AVG	
9		1.3425	42.14	0.00	42.14	56.00	-13.86	QP	
10		1.3425	36.94	0.00	36.94	46.00	-9.06	AVG	
11		1.7925	43.74	0.00	43.74	56.00	-12.26	QP	
12		1.7925	36.34	0.00	36.34	46.00	-9.66	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver.



Site site #1 Phase: N Temperature: 24

Limit: (CE)EN301489_QP Power: DC 5V Humidity: 55 %

Mode: WIFI Link

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.5144	47.52	0.00	47.52	56.00	-8.48	QP	
2		0.5144	32.86	0.00	32.86	46.00	-13.14	AVG	
3		0.6314	44.12	0.00	44.12	56.00	-11.88	QP	
4		0.6314	28.52	0.00	28.52	46.00	-17.48	AVG	
5		0.9420	43.52	0.00	43.52	56.00	-12.48	QP	
6		0.9420	34.78	0.00	34.78	46.00	-11.22	AVG	
7		1.4370	40.74	0.00	40.74	56.00	-15.26	QP	
8		1.4370	35.85	0.00	35.85	46.00	-10.15	AVG	
9		1.7924	41.74	0.00	41.74	56.00	-14.26	QP	
10		1.7924	35.87	0.00	35.87	46.00	-10.13	AVG	
11		2.2900	40.12	0.00	40.12	56.00	-15.88	QP	
12		2.2900	34.15	0.00	34.15	46.00	-11.85	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver.

6.3 ELECTROSTATIC DISCHARGE

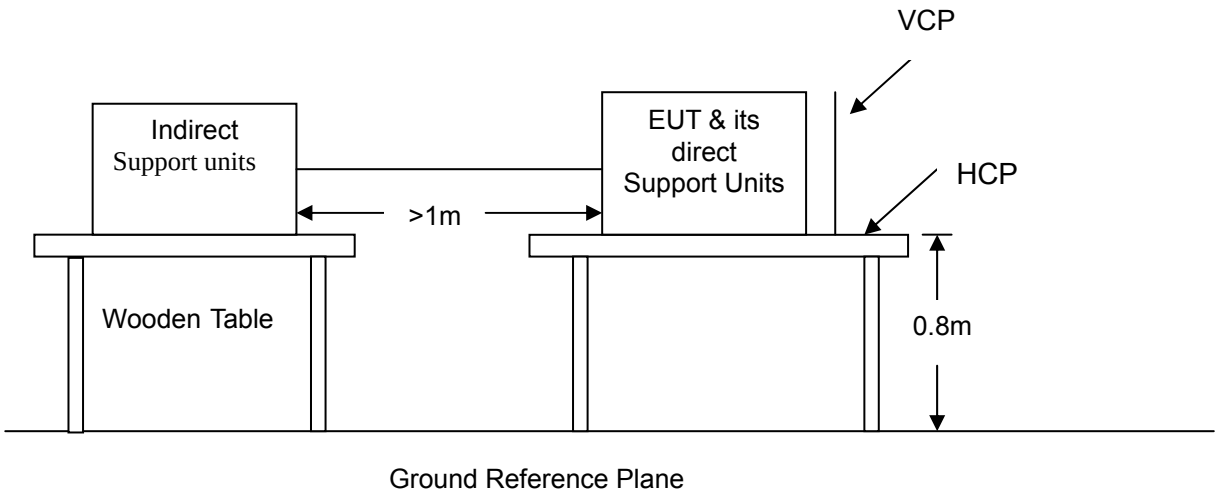
LIMIT

Please refer to IEC 61000-4-2.

MEASUREMENT EQUIPMENT USED

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	TESEQ AG	NSG437	EE166	3/16/2015	1 Year

Test Configuration



Ambient Condition of the Test Site			
Temperature	25°C	**Test Voltage**	DC 5V
Humidity	50%RH	**Tested by**	Andy
Pressure	1022mbar	**Ground Bond Resistance**	0.2 Ω

Test Procedure:

Please refer to ETSI EN 301 489-1 Clause 9.3.2 and IEC 61000-4-2 for the measurement.

TEST RESULTS

PASS (EUT continued to operate normally during test.)

Test Mode: TX, RX
Description of the Electrostatic Discharges (ESD)

Amount of discharge	Voltage	Coupling	Location	Result (Pass/Fail)
Mini 20 /Point	±2; 4; 8 kV	Air Discharge	Slot	Pass
Mini 20 /Point	±2; 4 kV	Contact Discharge	Metal, Port	Pass
Mini 20 /Point	± 2; 4 kV	Indirect Discharge HCP	HCP	Pass
Mini 20 /Point	±2; 4 kV	Indirect Discharge VCP	VCP	Pass

PERFORMANCE CRITERIA	
Criteria requested	☐ A / ☒ B / ☐ C
Criteria meet	☐ A / ☒ B / ☐ C

Performance & Result:

	During Test	After Test
☐ **Criteria A:**	Shall operate as intended May show degradation of performance (note 1) Shall be no loss of function Shall be no unintentional transmissions	Shall operate as intended Shall be no degradation of performance (note 2) Shall be no loss of function Shall be no loss of stored data or user programmable functions
☒ **Criteria B:**	May show loss of function (one or more) May show degradation of performance (note 1) No unintentional transmissions	Functions shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance (note 2) Shall be no loss of stored data or user programmable functions
☐ **Criteria C:**	May be loss of function (one or more)	Functions shall be recoverable by the operator Shall operate as intended after recovering Shall be no degradation of performance (note 2)

☒ ***PASS*** ☐ ***FAILED***
Observation: No unintentional transmission found during the tests.

6.4 RF ELECTROMAGNETIC FIELD

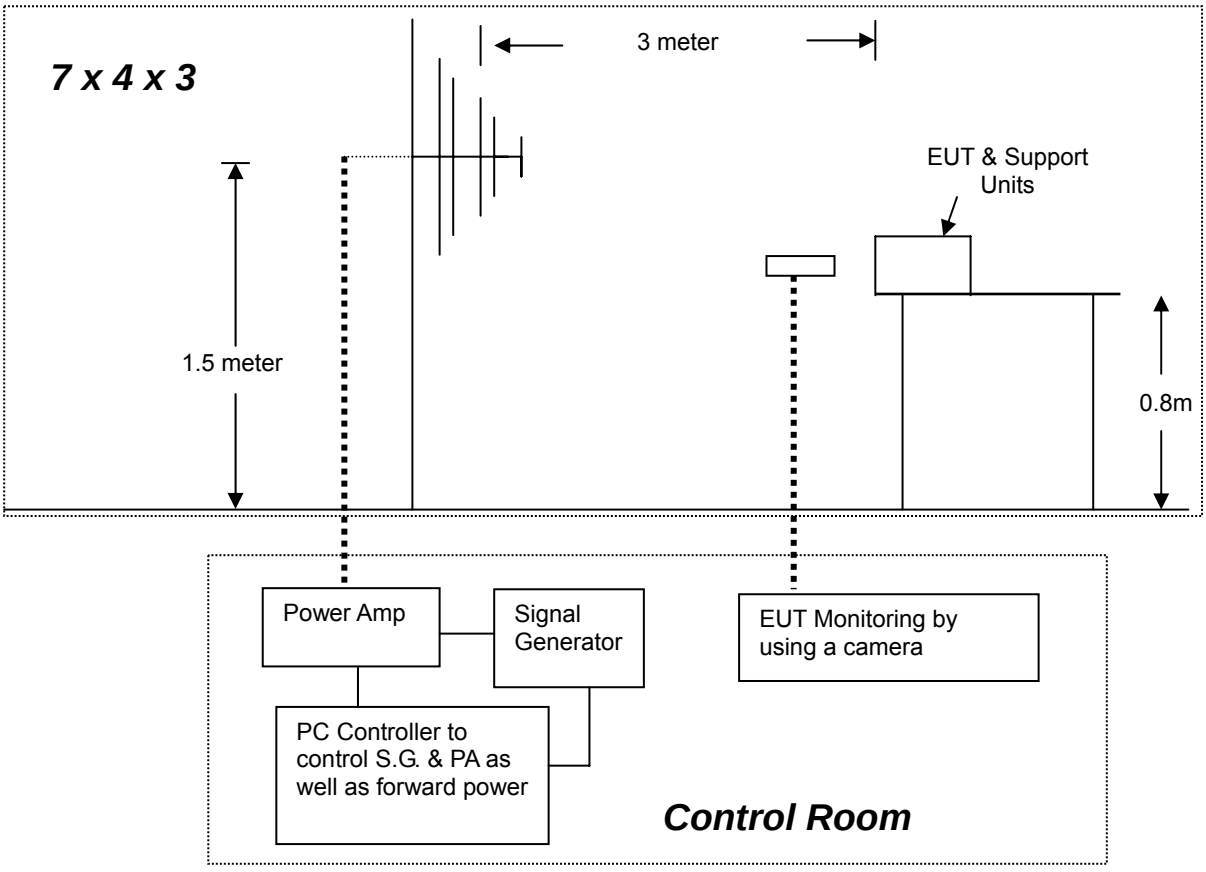
LIMIT

Please refer to IEC 61000-4-3.

MEASUREMENT EQUIPMENT USED

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Power Meter. Dual Channel	BOONTON	4232A	10539	3/20/2015	1 Year
2.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	3/20/2015	1 Year
3.	Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120 L3F	332	3/20/2015	1 Year
4.	Power Amplifier	PRANA	AP32MT215	N/A	3/20/2015	1 Year
5.	Power Amplifier	MILMEGA	AS0102-55	N/A	3/20/2015	1 Year
6.	Signal Generator	AEROFLEX	2023B	N/A	3/20/2015	1 Year
7.	Field Strength Meter	HOLADAY	HI-6005	N/A	3/20/2015	1 Year
8.	RS232 Fiber Optic Modem	HOLADAY	HI-4413P	N/A	3/20/2015	1 Year
9.	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	N/A	3/20/2015	1 Year

Test Configuration



Ambient Condition of the Test Site			
Temperature	25°C	**Test Voltage**	DC 5V
Humidity	50%RH	**Tested by**	Andy
Pressure	1022mbar		

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.2.2 and IEC 61000-4-3 for the measurement methods.

TEST RESULTS

PASS (EUT continued to operate normally during test)

Test Mode: TX, RX

Test conditions:

Test level : 3V/m unmodulated
Steps : 1 % of fundamental
Interfere signal : AM 80% 1KHz audio signal
Dwell Time : 3 sec

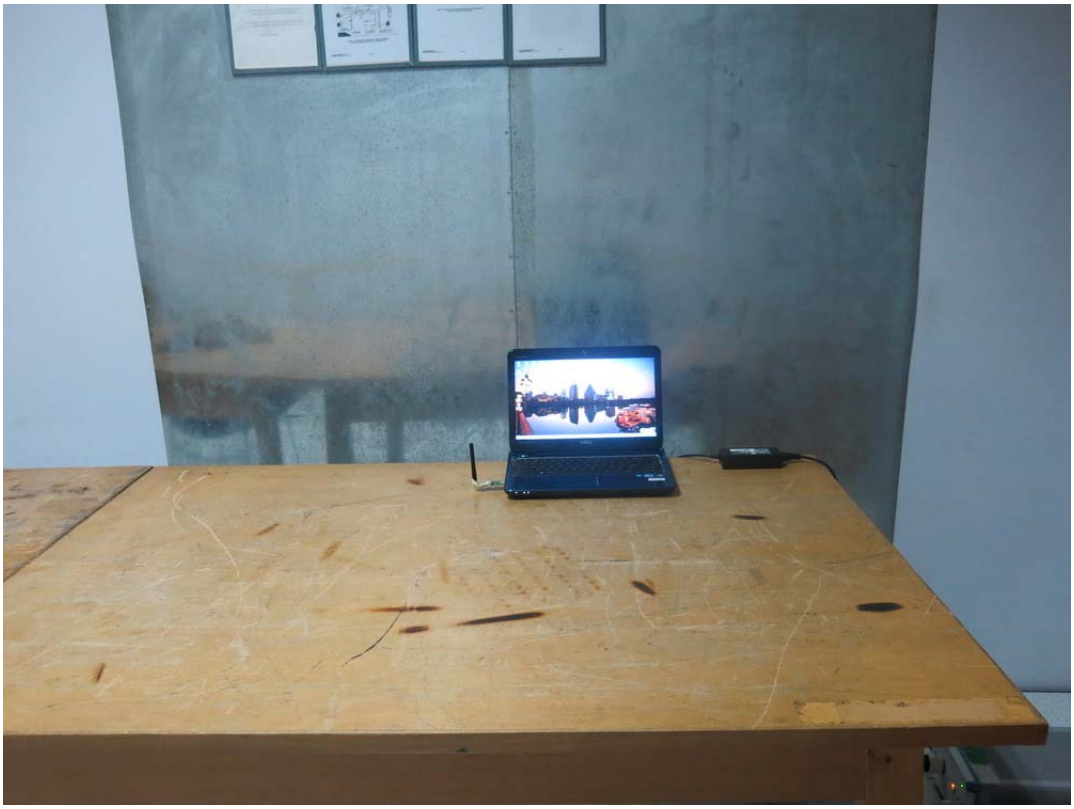
Result of Final Tests (Normal Modes)

	Freq. Range (MHz)	Field	Modulation	Polarity	Position (°)	Selection for the final test
1	80-1000	3V/m	Yes	H / V	Front	☒
	1400-2700	3V/m	Yes	H / V	Front	☒
2	80-1000	3V/m	Yes	H / V	Right	☒
	1400-2700	3V/m	Yes	H / V	Right	☒
3	80-1000	3V/m	Yes	H / V	Back	☒
	1400-2700	3V/m	Yes	H / V	Back	☒
4	80-1000	3V/m	Yes	H / V	Left	☒
	1400-2700	3V/m	Yes	H / V	Left	☒
Remark: 1. These test result outsourced to SHENZHEN EMTEK CO., LTD.						

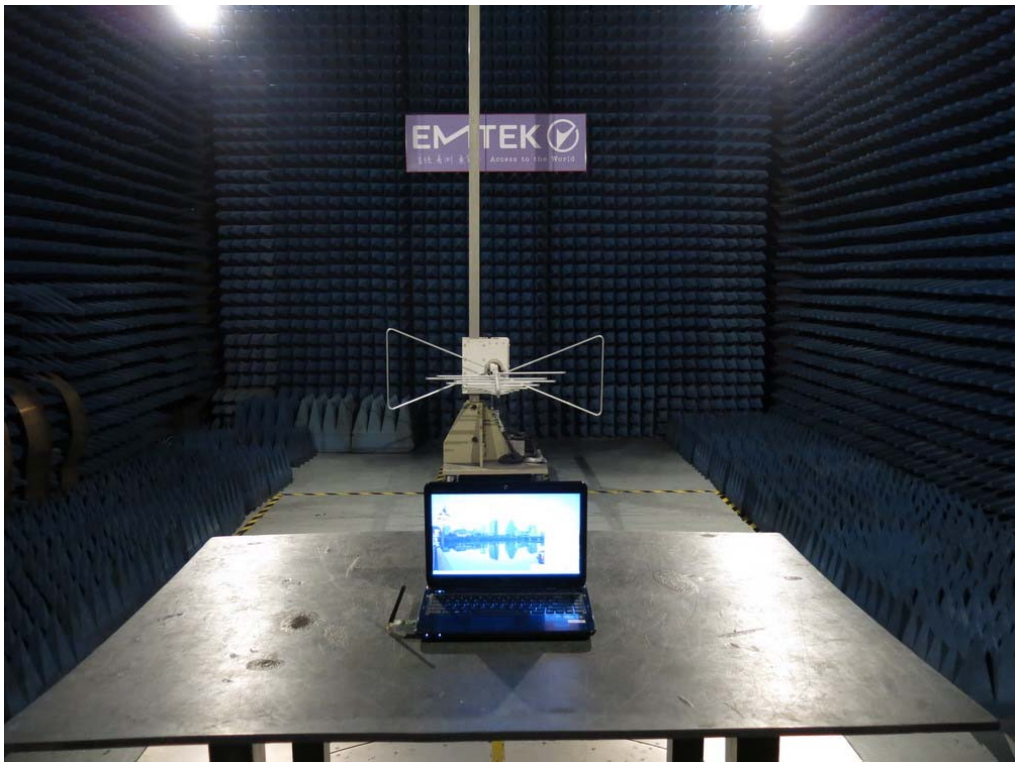
PERFORMANCE CRITERIA	
Criteria requested	☒ **A** / ☐ **B** / ☐ **C**
Criteria meet	☒ **A** / ☐ **B** / ☐ **C**

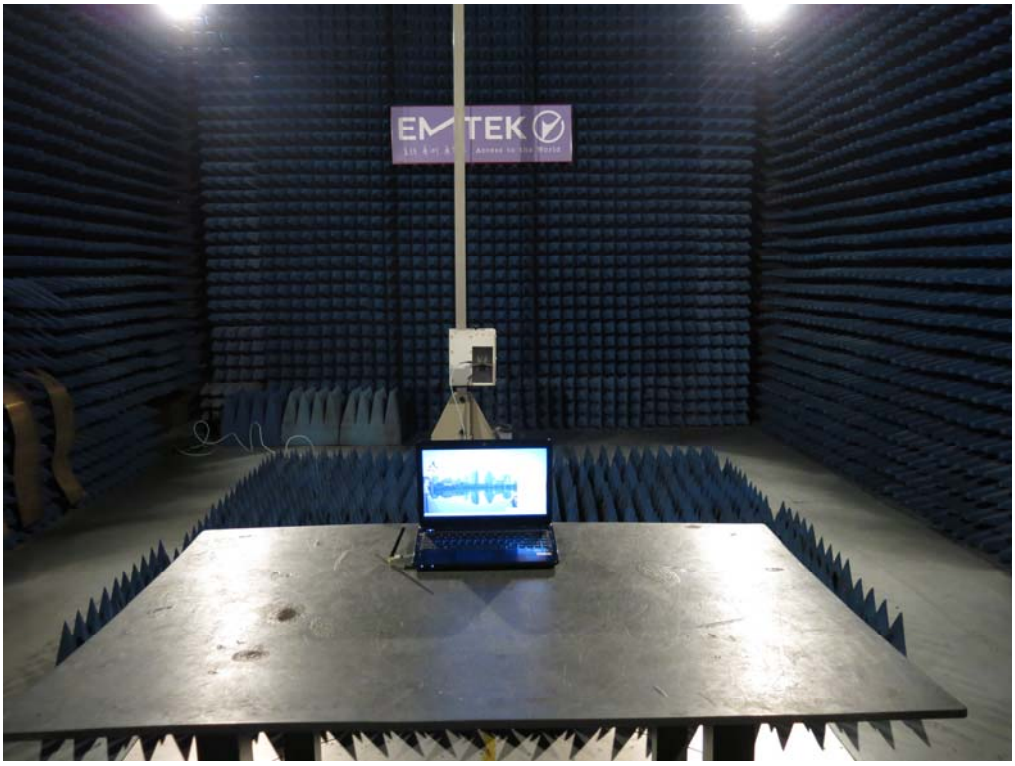
APPENDIX 1
PHOTOGRPHS OF TEST SETUP

LINE CONDUCTED EMISSION TEST



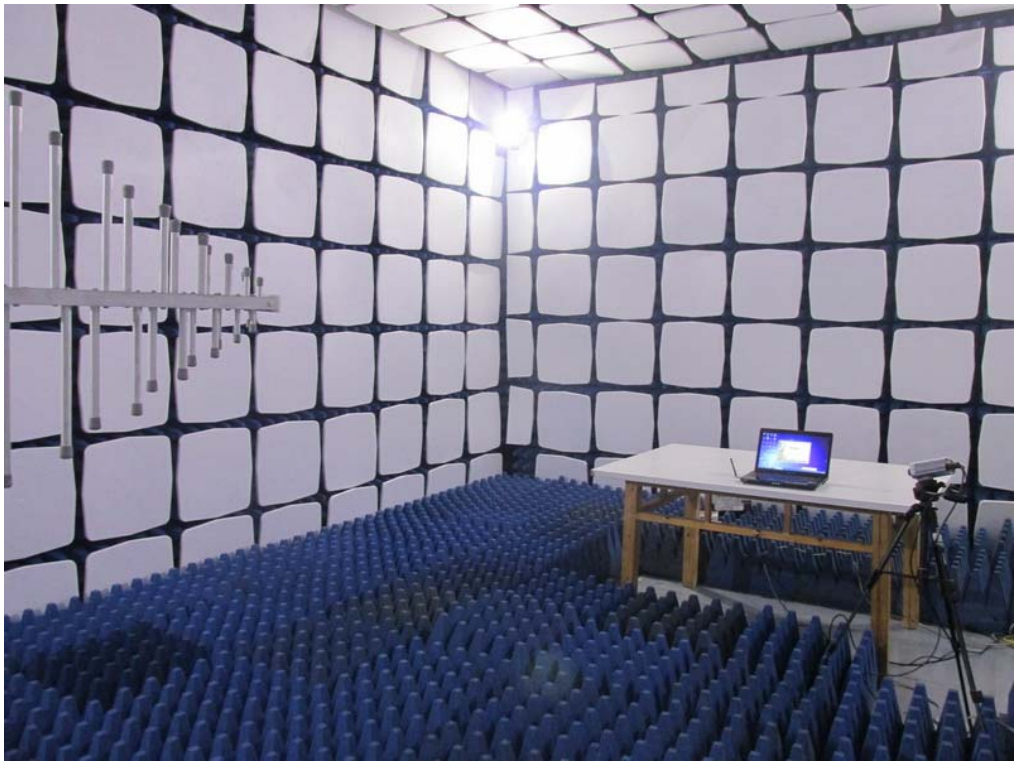
RADIATED EMISSION TEST



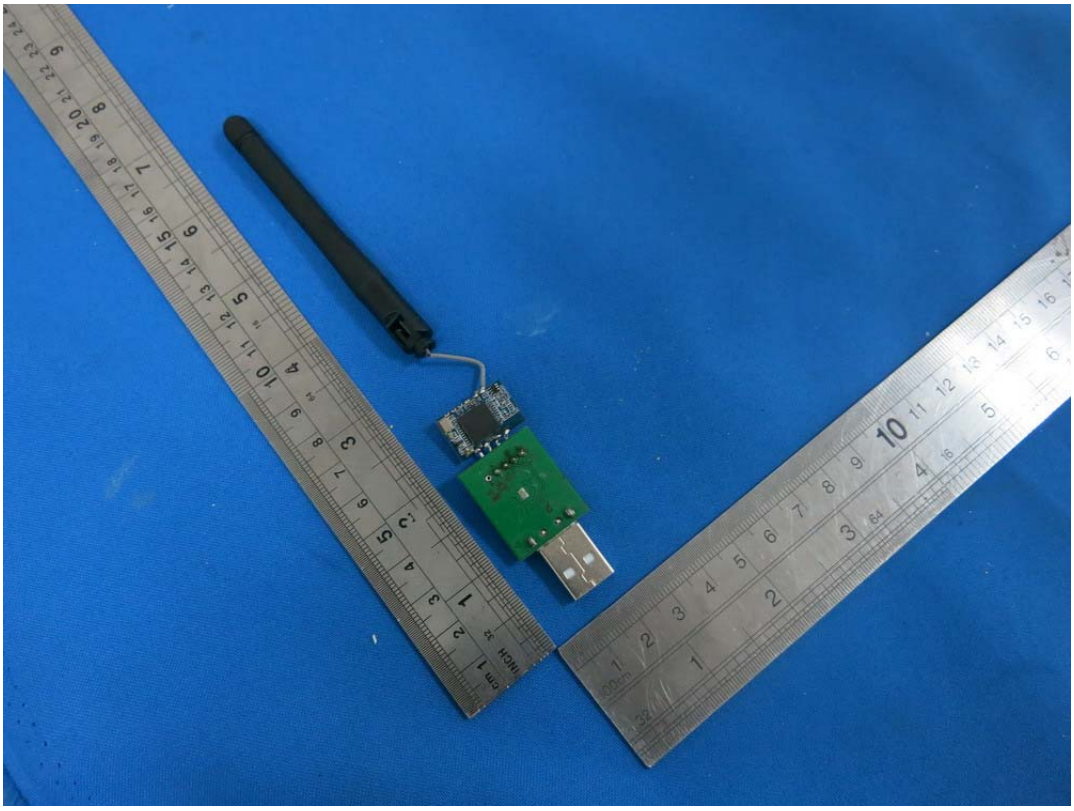


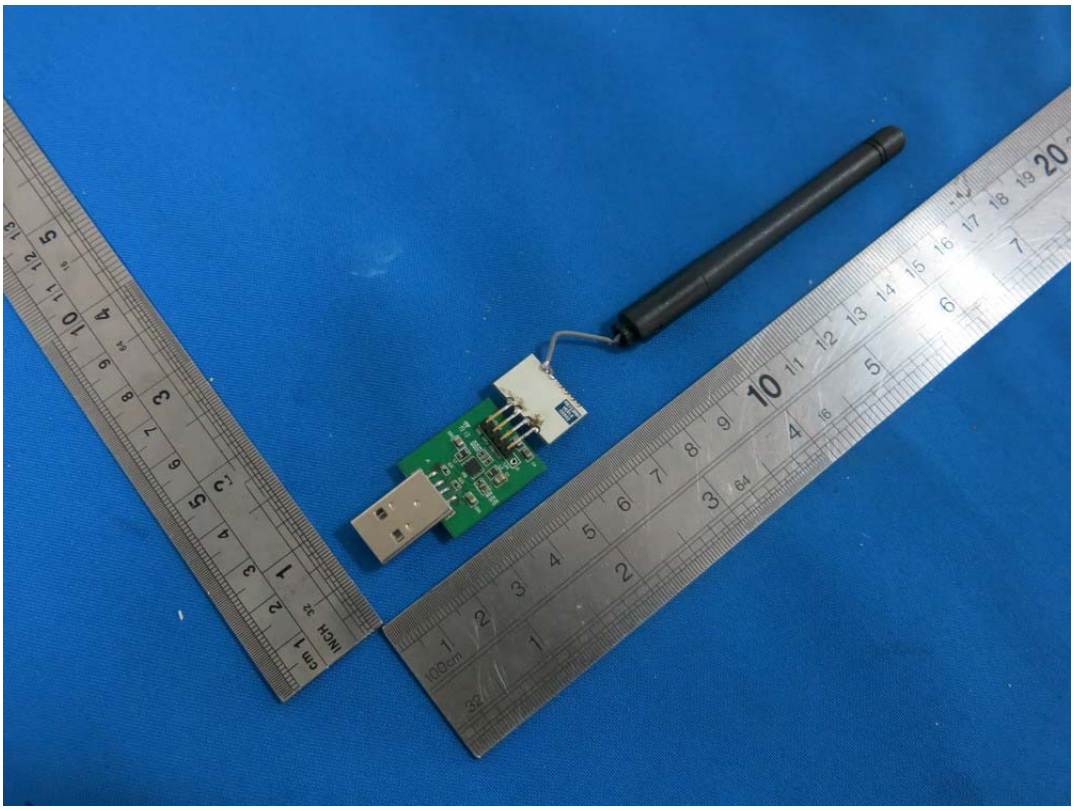
ELECTROSTATIC DISCHARGE TEST

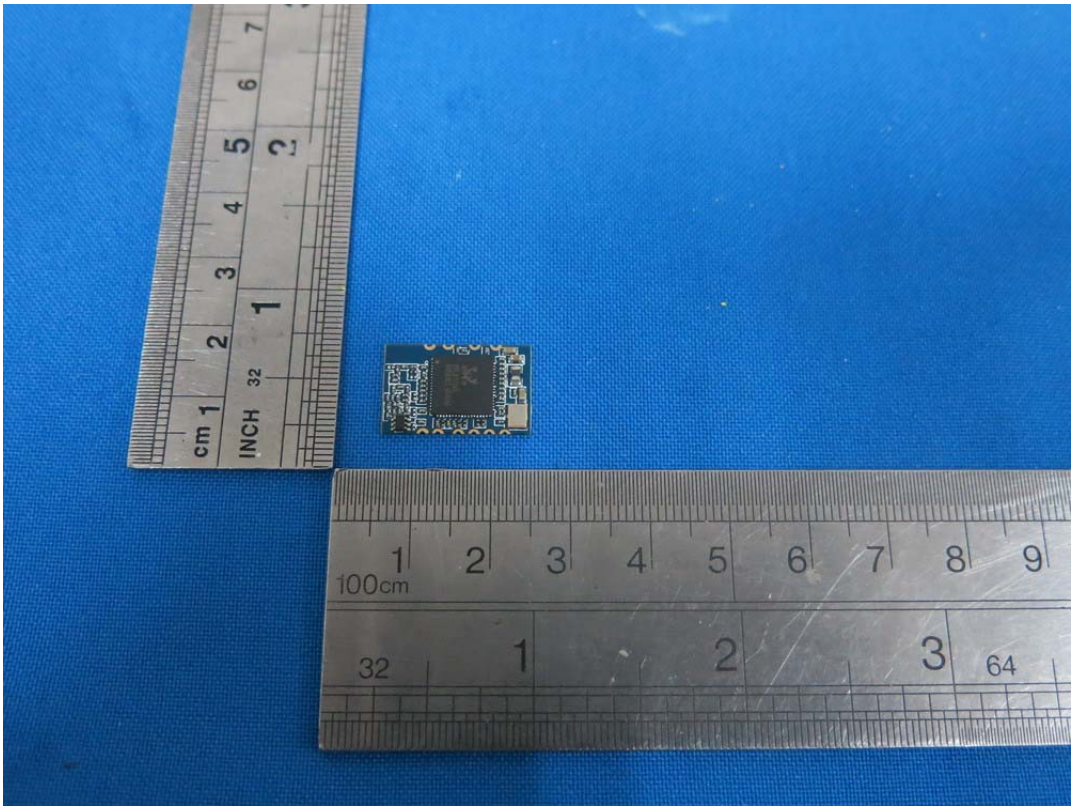
RADIATED ELECTROMAGNETIC FIELD TEST

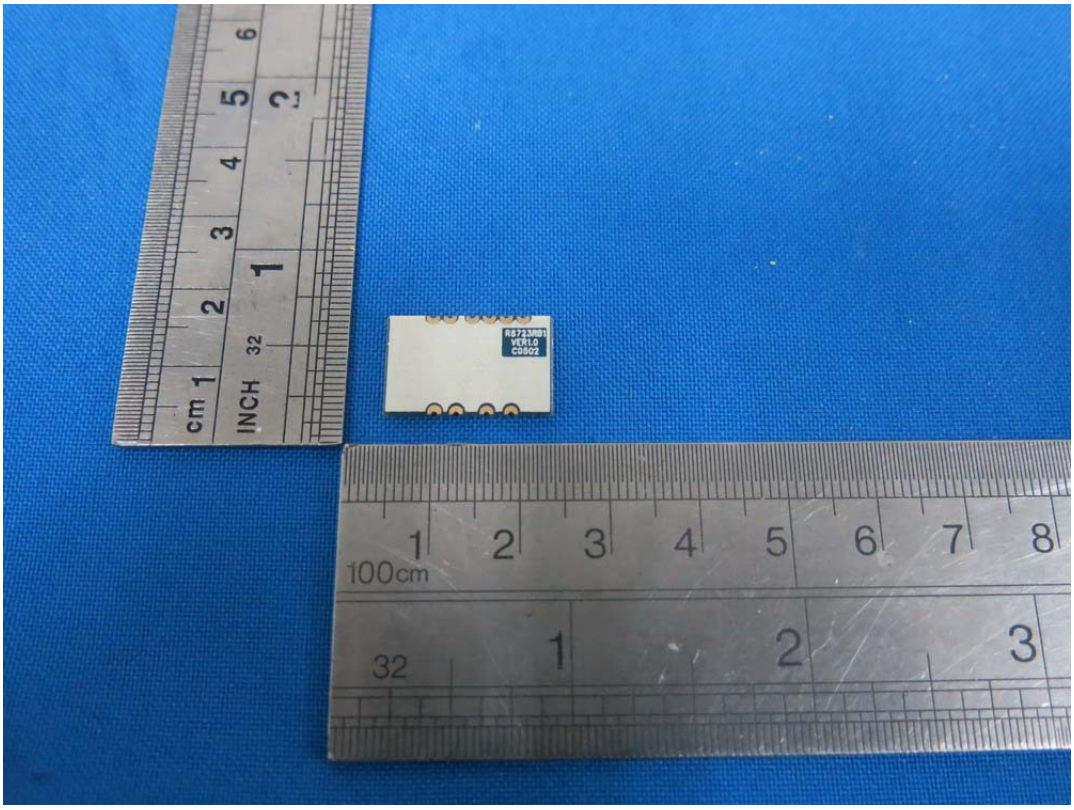


APPENDIX II
(Photos of EUT)






cm 1
INCH 32
100cm
32
64


cm 1
INCH 32
100cm
32

EMTEK
Access to the World

ETSI EN 300 328 V1.8.1: 2012

TEST REPORT

FOR

Bluetooth 150Mbps Wireless N USB Module

Model No.: BL-R8723RB1

Trademark: LB-LINK

Report No.: ED150528298R1

Issue Date: September 02, 2015

Prepared for

SHENZHEN BILIAN ELECTRONIC CO., LTD.
Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China

Prepared by

DONGGUAN EMTEK CO., LTD.
No.281,Guantai Road, Nancheng District,
Dongguan, Guangdong, China
TEL: 86-769-22807078
FAX: 86-769-22807079

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TABLE OF CONTENTS

TEST RESULT CERTIFICATION

Applicant	:	SHENZHEN BILIAN ELECTRONIC CO., LTD. Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
Manufacturer	:	SHENZHEN BILIAN ELECTRONIC CO., LTD. Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
EUT	:	Bluetooth 150Mbps Wireless N USB Module
Model No.	:	BL-R8723RB1
Trademark	:	LB-LINK

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 328 V1.8.1: 2012	PASS

The device described above is tested by DONGGUAN EMTEK CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and DONGGUAN EMTEK CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 300 328 V1.8.1: 2012 requirements.

Reviewed and Approved by:

Approved By

Sam Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	ED150528298R1

EUT DESCRIPTION

Product Name	Bluetooth 150Mbps Wireless N USB Module		
Model number	BL-R8723RB1		
Power Supply	DC From PC		
Technical Description			
Kind of Device	Bluetooth 4.0	Bluetooth 3.0+EDR	WiFi
Operation Frequency	2402-2480MHz		2412-2462MHz for 802.11b/g/n(HT20) ; 2422-2452MHz for 802.11n(HT40)
Modulation	GFSK	GFSK, π/4-DQPSK, 8DPSK	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n, DSSS with DBPSK/DQPSK/CCK for 802.11b;
Number of Channel	40	79	11 Channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Channel space	2MHz	1MHz	5MHz
Max RF Output Power	2.02dBm	4.43dBm	14.10dBm
Antenna Type	External Antenna		
Antenna Gain	2 dBi		

Note: *for more details, please refer to the User's manual of the EUT.*

SUMMARY OF TEST RESULT

Clause (EN 300 328)	Test Parameter	Verdict	Remark
4.3.2.1	RF Output Power	PASS	
4.3.2.2	Power Spectral Density	PASS	
4.3.2.3	Duty Cycle and Tx-Sequence and Tx-Gap	N/A	Only for non-adaptive equipment and RF Output Power>10dBm
4.3.2.4	Medium Utilisation(MU) Factor	N/A	Only for non-adaptive equipment and RF Output Power>10dBm
4.3.2.5	Adaptivity	PASS	Only for adaptive equipment and RF Output Power>10dBm
4.3.2.6	Occupied Channel Bandwidth	PASS	
4.3.2.7	Transmitter Unwanted Emission in the Out-of Band	PASS	
4.3.2.8	Transmitter Unwanted Emissions in the Spurious Domain	PASS	
4.3.2.9	Receiver Spurious Emissions	PASS	
4.3.2.10	Receiver Blocking	PASS	Only for adaptive equipment and RF Output Power>10dBm

Remark:
1. When determining the test conclusion, the Measurement Uncertainty of test has been considered.
2. N/A is an abbreviation for Not Applicable.

TEST METHODOLOGY

1.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

ETSI EN 300 328 – Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques: Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

1.2 MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/28/2016
Pre-Amplifier	HP	8447D	2944A07999	05/28/2016
Bilog Antenna	Schwarzbeck	VULB9163	142	05/28/2016
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/28/2016
Horn Antenna	Schwarzbeck	BBHA9120D	D143	05/28/2016
Cable	Schwarzbeck	AK9513	ACRX1	05/28/2016
Cable	Rosenberger	AK9513	FP2RX2	05/28/2016
Cable	Schwarzbeck	AK9513	CRPX1	05/28/2016
Cable	Schwarzbeck	AK9513	CRRX2	05/28/2016
RF Power Meter	BOONTON	4232A	10539	05/28/2016
Temp. / Humidity Chamber	Kingson	THS-M1	242	05/28/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	101045	05/28/2016
Vector Signal Generater	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Meter	Agilent	U2531A	N/A	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Power Sensor	Agilent	U2021XA	N/A	05/28/2016
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

1.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed. Only the worst case data were reported.

FACILITIES AND ACCREDITATIONS

1.4 FACILITIES

All measurement facilities used to collect the measurement data are located at No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.5 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

1.6 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description		
EMC Lab.	:	Accredited by CNAS, 2015.06.11 The certificate is valid until 2018.07.03 The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006 The Certificate Registration Number is L3150 Accredited by TUV Rheinland , 2014.05.22 The certificate is valid until 2015.11.21 The Laboratory has been assessed according to the requirements ISO/IEC 17025: 2005 Accredited by FCC, June 18, 2014 The Certificate Number is 247565 Accredited by Industry Canada, February 19, 2014 The Certificate Number is 9444A.
Name of Firm	:	DONGGUAN EMTEK CO., LTD.
Site Location	:	No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

1.7 TEST SYSTEM UNCERTAINTY

Maximum measurement uncertainty of the test system

Test Parameter	measurement uncertainty
RF Output Power	±1.0%
Power Spectral Density	±0.9%
Duty Cycle and Tx-Sequence and Tx-Gap	±1.3%
Medium Utilisation Factor	±1.5%
Occupied Channel Bandwidth	±2.3%
Transmitter Unwanted Emission in the Out-of Band	±1.2%
Transmitter Unwanted Emissions in the Spurious Domain	±2.7%
Receiver Spurious Emissions	±2.7%
Temperature	±3.2%
Humidity	±2.5%

ETSI EN 300 328 REQUIREMENTS

1.8 RF OUTPUT POWER

LIMIT

EN 300 328 Clause 4.3.2.1

The Maximum RF Output Power <= 100 mW (20 dBm) (EIRP) at both Normal and Extreme conditions.

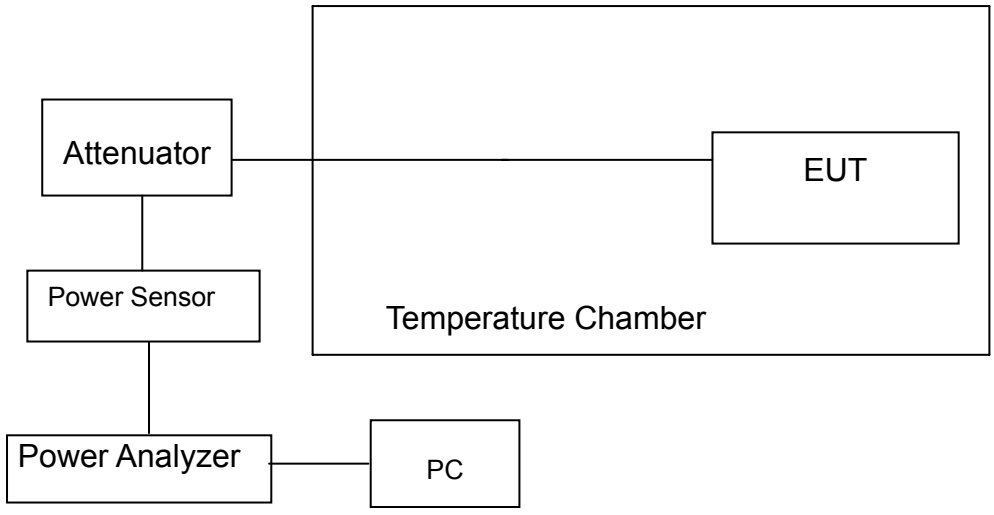
MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Power Sensor	Agilent	U2021A	N/A	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

The test procedure shall be as follows:

Step 1:
Use a fast power sensor suitable for 2.4 GHz and capable of 1 MS/s.
Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples must represent the power of the signal.
- Measurement duration: For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.
NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:
For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.
- For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.

Step 3:
Find the start and stop times of each burst in the stored measurement samples.
NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB below the RMS burst power calculated in step 4.

Step 4:
Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these P burst values, as well as the start and stop times for each burst.

Step 5:
The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:
Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain G shall be used.
The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G$$

Step 7:
The measurement shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded. FHSS equipment

shall be made to hop continuously to each of these three frequencies separately. These measurements shall be performed at normal and extreme test conditions.

TEST RESULT

Temperature: Refer to the following table **Test Date:** February 08, 2015

Humidity: 55 % RH **Tested by:** Andy

Test Conditions			Transmitter Power (dBm)				
			Temp (25)°C	Temp (-20)°C		Temp (55)°C	
Modes	Channel	Volt / Power	230V	230V	230V	230V	230V
☒ 802.11b	2412MHz	RMS	14.10	13.25	12.04	13.04	13.64
	2442 MHz	RMS	13.90	14.02	13.42	13.62	13.25
	2472 MHz	RMS	13.25	13.48	13.48	12.42	12.16
☒ 802.11g	2412MHz	RMS	11.81	10.74	12.4	10.06	10.42
	2442 MHz	RMS	11.90	10.62	10.46	10.48	11.68
	2472 MHz	RMS	11.38	10.58	11.36	11.03	11.04
☒ 802.11n (HT20)	2412MHz	RMS	10.73	10.43	10.45	10.57	10.62
	2442 MHz	RMS	10.19	9.92	10.62	10.00	9.72
	2472 MHz	RMS	9.90	9.83	9.48	9.54	9.06
☒ 802.11n (HT40)	2422MHz	RMS	10.25	9.16	10.11	9.24	9.68
	2442 MHz	RMS	9.92	9.84	9.49	9.72	9.48
	2462 MHz	RMS	9.59	9.69	9.36	9.62	9.55
Limit			<= 20dBm				
Verdict			PASS	PASS	PASS	PASS	PASS

1.9 POWER SPECTRAL DENSITY

LIMIT

ETSI EN 300 328 clause 4.3.2.2

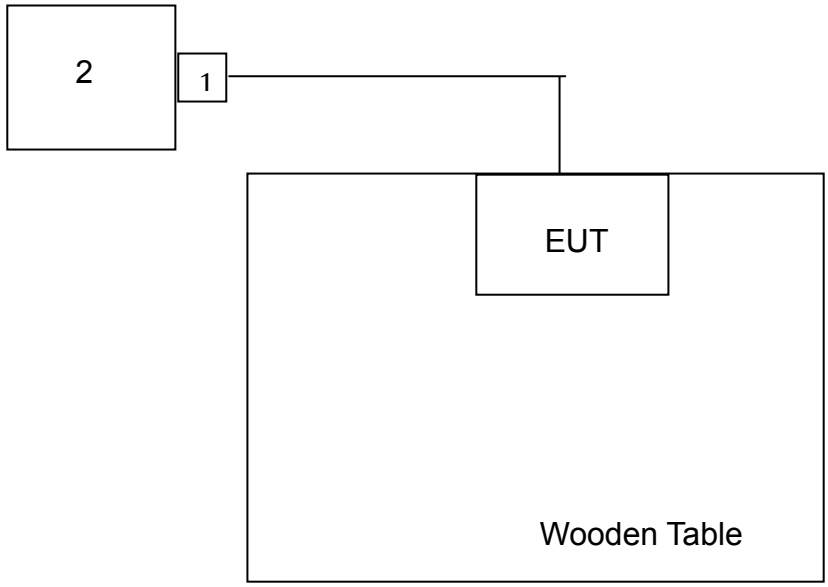
For equipment using wide band modulations other than FHSS(e.g. DSSS, OFDM, etc.), the maximum e.i.r.p. spectral power density shall be limited to –20dBW (10mW) per MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



1. *Spectrum analyzer*
2. *Bias-tee*

TEST Procedure

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.3 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.3.2 for the measurement method.

The test procedure shall be as follows:
Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
• Start Frequency: 2 400 MHz
• Stop Frequency: 2 483,5 MHz
• Resolution BW: 10 kHz
• Video BW: 30 kHz
• Sweep Points: > 8 350
NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.
• Detector: RMS
• Trace Mode: Max Hold
• Sweep time: Auto
For non-continuous signals, wait for the trace to be completed. Save the (trace) data set to a file.
Step 2:
For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.
Step 3:
Add up the values for amplitude (power) for all the samples in the file.
Step 4:
Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2.
Step 5:
Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6:
Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 5 (i.e. sample #2 to #101).
Step 7:
Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments.
From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.2.2, shall be recorded in the test report.

The measurement shall be performed at the lowest ,the middle and the highest channel on which the equipment can operate.

TEST RESULTS

Temperature:	25°C	**Test Date:**	February 08, 2015
Humidity:	55 % RH	**Tested by:**	Andy

Test Condition		Measured Data (dBm/MHz)	Limit (dBm/MHz)	Verdict
☒802.11b	2412MHz	1.20	<=10	PASS
	2442 MHz	1.07	<=10	PASS
	2472 MHz	0.91	<=10	PASS
☒802.11g	2412MHz	-0.81	<=10	PASS
	2442 MHz	-0.91	<=10	PASS
	2472 MHz	-0.97	<=10	PASS
☒802.11n (HT20)	2412MHz	-1.12	<=10	PASS
	2442 MHz	-1.10	<=10	PASS
	2472 MHz	-1.11	<=10	PASS
☒802.11n (HT40)	2422MHz	-4.32	<=10	PASS
	2442 MHz	-3.89	<=10	PASS
	2462 MHz	-4.33	<=10	PASS

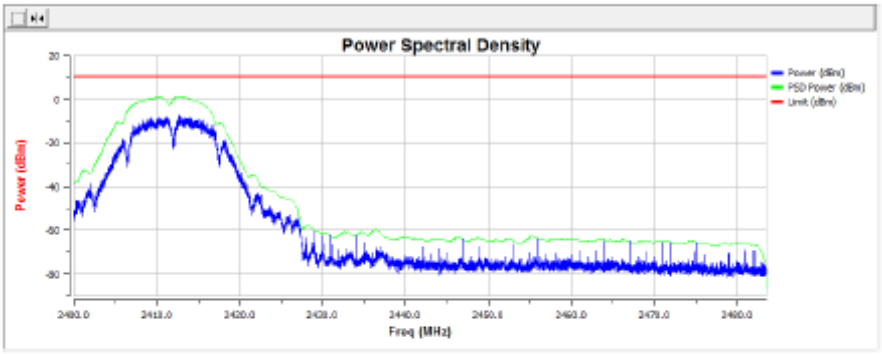
Remarks:
Steps for determining the Peak Power Density

1. *Remove the EUT's antenna and the directly connected to the spectrum analyzer with appropriate cable with connector and attenuator/DC block.*
2. *Observation is made under the continue operation by the PEAK detector mode, by taking all the factor into account and yield the Peak Power Density.*

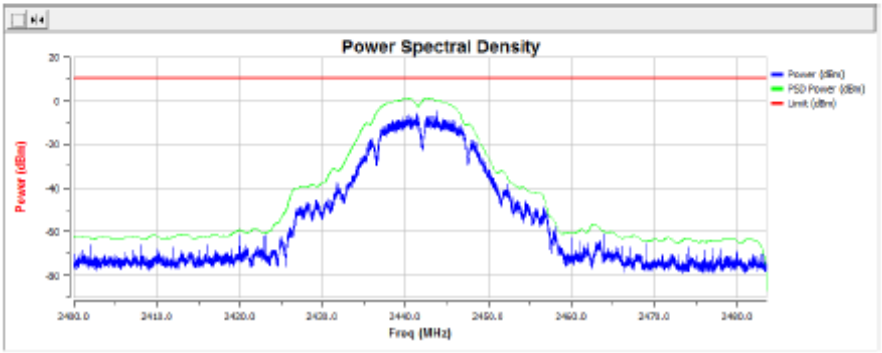
Test Plot

Test Mode: IEEE 802.11b

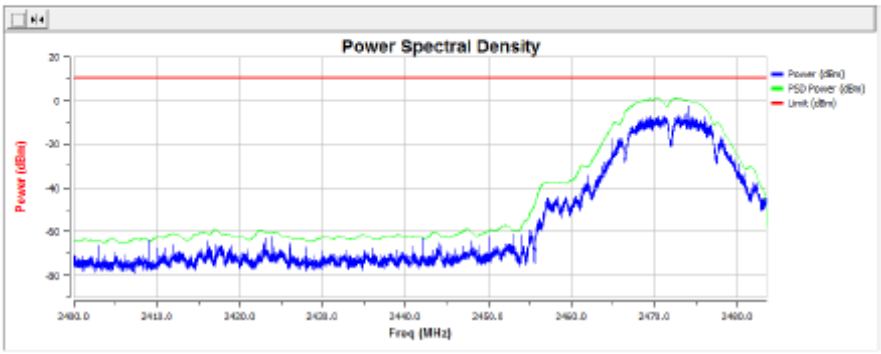
Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Low-2412	1.20	<10	Pass



Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Mid-2437	1.07	<10	Pass

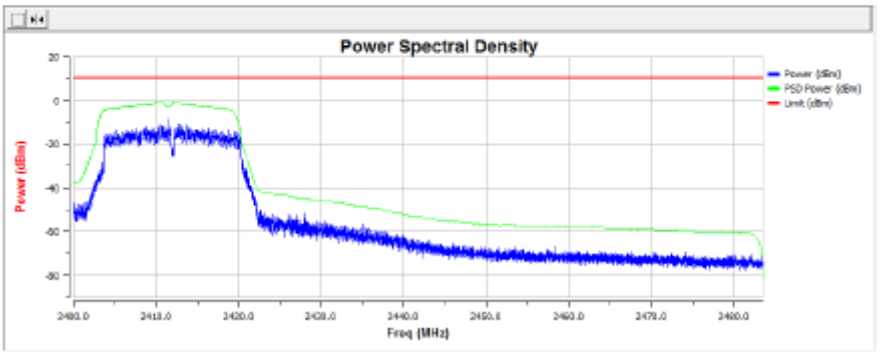


Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH High-2472	0.91	<10	Pass

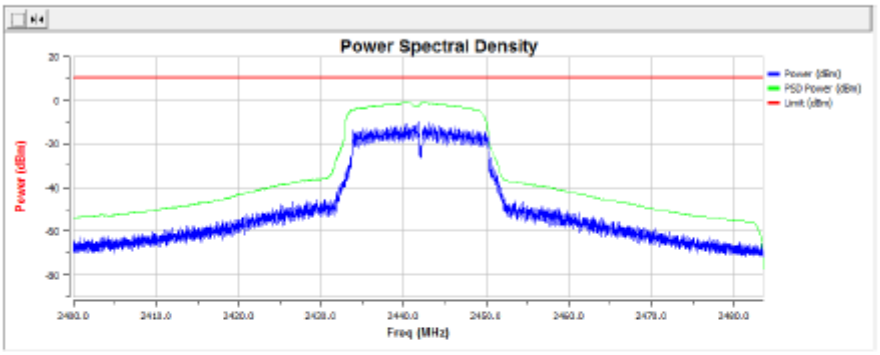


Test Mode: IEEE 802.11g

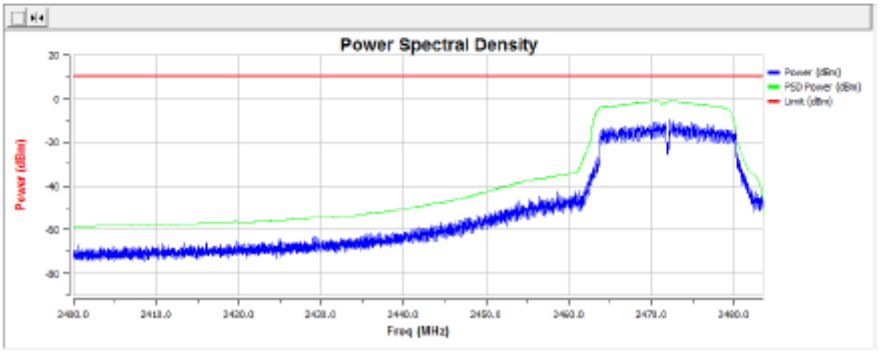
Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Low-2412	-0.81	<10	Pass



Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Mid-2437	-0.91	<10	Pass

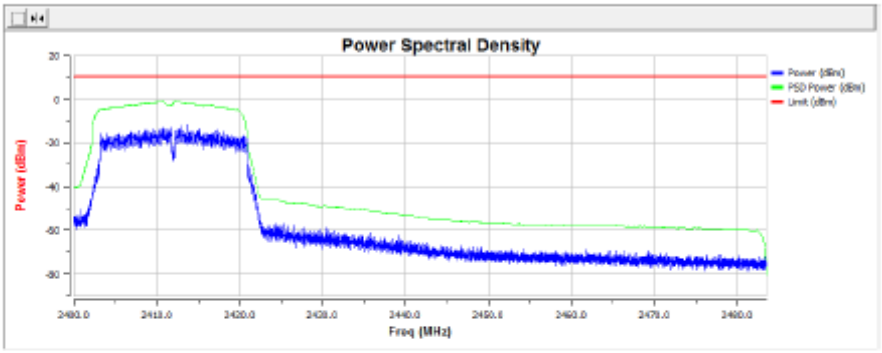


Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH High-2472	-0.97	<10	Pass

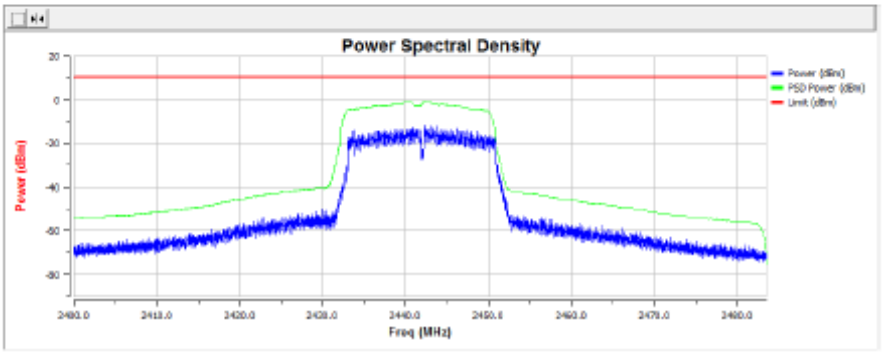


Test Mode: IEEE 802.11n(HT20)

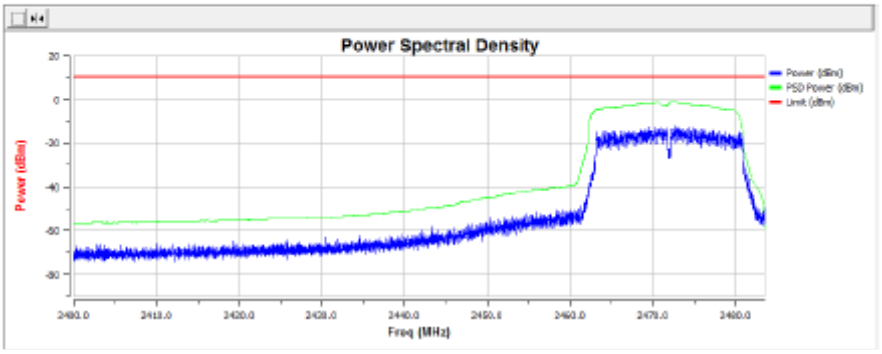
Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Low-2412	-1.12	<10	Pass



Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Mid-2437	-1.00	<10	Pass

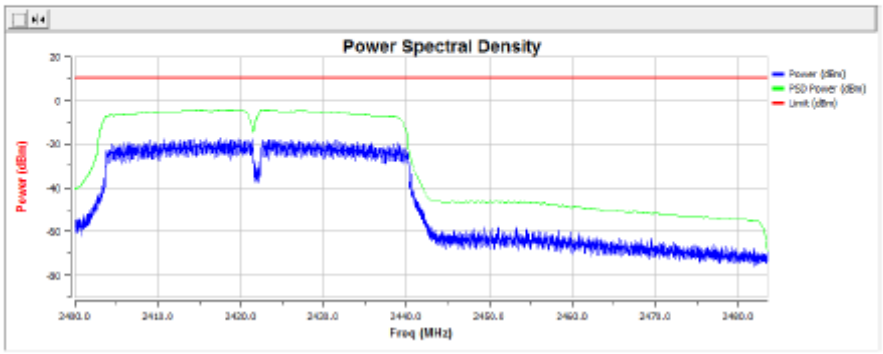


Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH High-2472	-1.11	<10	Pass

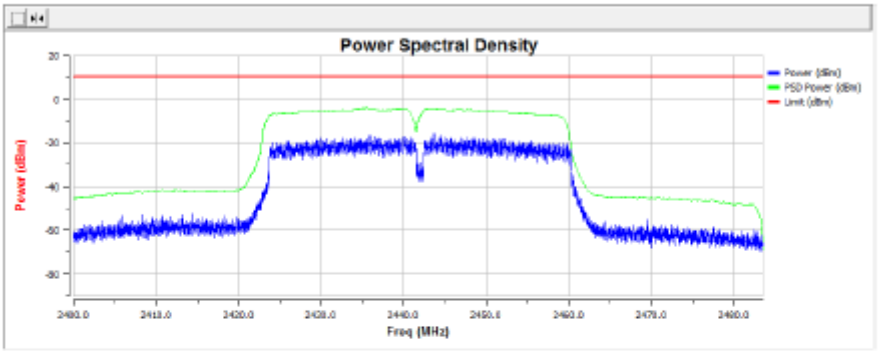


Test Mode: IEEE 802.11n(HT40)

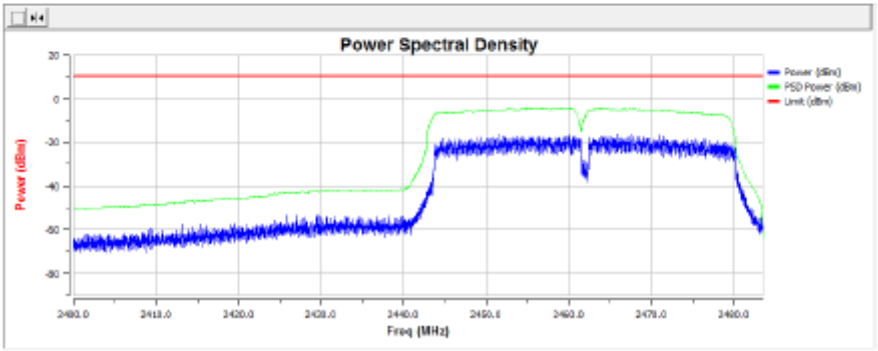
Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Low-2422	-4.32	<10	Pass



Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH Mid-2437	-3.89	<10	Pass



Channel	Max Power Spectral Density Level (dBm)	Limit (dBm/MHz)	Status
CH High-2462	-4.33	<10	Pass



1.10 DUTY CYCLE AND TX-SEQUENCE AND TX-GAP

LIMIT

ETSI EN 300 328 clause 4.3.2.3

The requirement apply to non-adaptive equipment or to adaptive equipment when operating in a non-adapter mode

These requirement do not apply for equipment with a maximum declared RF output power level of less than 10 dBm(EIRP) or for equipment when operating in a mode where the RF output power is less than 10 dBm(EIRP);

the maximum duty cycle is less than 1;

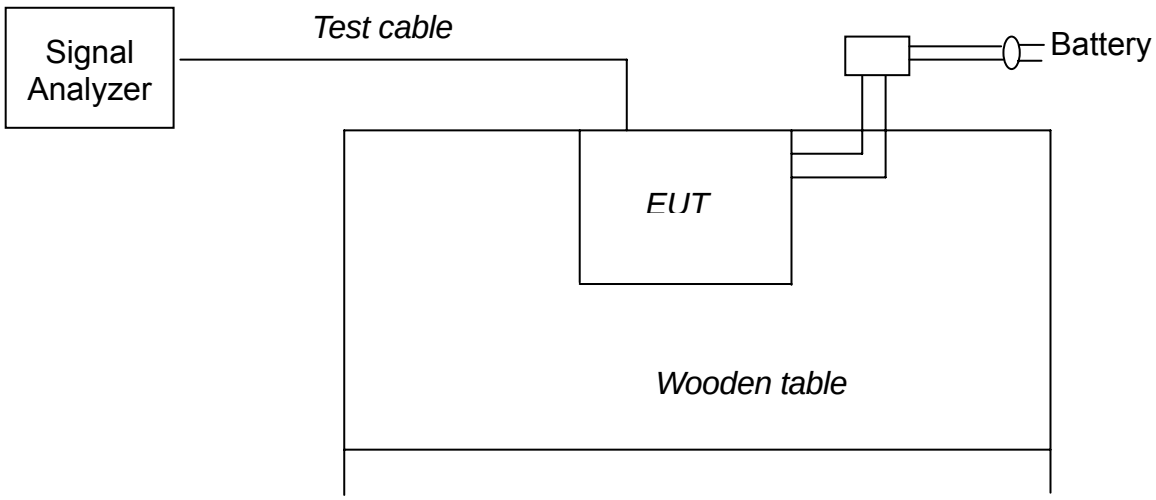
the maximum Tx-sequence time and minimum Tx-gap time shall be 5ms.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Vector Signal Generator	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2.1.2 for the measurement method.

Use a fast power sensor suitable 2.4GHz and sample speed 1Ms/s or faster.
Between the save start and stop times of each individual burst ,calculate the TxOn time ,save these TxOn values
Between the save stop and start times of two subsequent burst ,calculate the TxOff time ,save these TxOff values
Duty cycle is the sum of all TxOn times divided by the observation period
For equipment using blacklisting ,the TxOn time measured for a single hopping frequency shall be multiplied by the number of blacklisted frequency . this value shall be add up to the sum calculated in the previous bullet point . if the number of blacklisted frequencies cannot be determined ,the minimum number of hopping frequencies shall be assumed.
The above calculated value for duty cycle shall be recorded in the report
Any TxOff time that is greater than the minimum Tx-gap time is considered a Tx-gap .the lowest Tx-gap time shall be recorded in the report
The Tx-sequence time is the time between two subsequent Tx-gaps, the maximum Tx-sequence time shall be recorded in the report.

The measurement shall be performed during normal operation (hopping)

TEST RESULTS

Not Applicable

Because EUT is an adaptive equipment, according to standard EN300 328,
Duty cycle, Tx-Sequence, Tx-gap is only applicable for non-adaptive equipment.

1.11 MEDIUM UTILISATION FACTOR

LIMIT

ETSI EN 300 328 clause 4.3.2.4

This requirement apply to non-adaptive mode or adaptive equipment 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(EIRP) or for equipment when operating in a mode where the RF output power is less than 10 dBm(EIRP)

For non-adaptive equipment using wide band modulations other than FHSS, the Maximum Medium Utilization Factor shall be 10%.

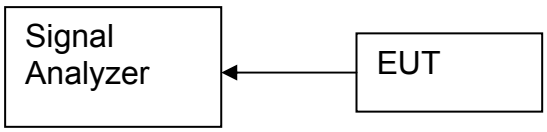
MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2.1.3 for the measurement method.
   Use a fast power sensor suitable for 2.4GHz and capable of 1Ms/s
   According to RF output power test procedure, measure the maximum RF output power
   According to duty cycle test procedure, measure the duty cycle and Tx-On and Tx-Off
   For each burst, calculate the product of (Pburst/100mW) and the Tx-On time
   NOTE: Pburst is expressed in mW,TxOn time is expressed in ms.
   Medium utilisation is the sum of all these products divided by the observation period (expressed in ms) . this value shall be recorded in the test report.

TEST RESULTS

Not Applicable

Because EUT is an adaptive equipment, according to standard EN300 328, Medium Utilisation is only applicable for non-adaptive equipment.

1.12 OCCUPIED CHANNEL BANDWIDTH

LIMIT

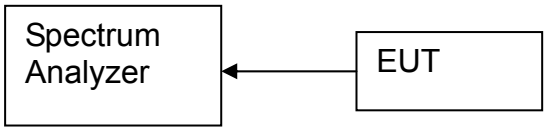
The requirement applies to all types of equipment using wide band modulation other than FHSS
The occupied channel bandwidth is the bandwidth that contains 99% of the power of the signal
The occupied channel bandwidth for each hopping frequency shall fall completely within the band given in the clause 1.
For non-adaptive frequency hopping systems with EIRP greater than 10 dBm, the Occupied Channel Bandwidth shall be less than 5MHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328(V1.8.1) clause 5.3.8.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.8.2 for the measurement method.

STEP 1:Connect the antenna to the spectrum analyzer and use the following setting
Centre Frequency : the centre frequency of the channel under test
Resolution Bandwidth: 30kHz, Video Bandwidth: 100kHz
Frequency Span: 2 nominal bandwidth
Detector Mode : RMS Trace Mode: max hold
Step 2: When the trace is completed, capture the trace and find the peak value and place the analyzer marker on this peak
Step 3: Use the 99% bandwidth function of the spectrum analyzer to measure the Occupied Channel Bandwidth of the EUT.

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

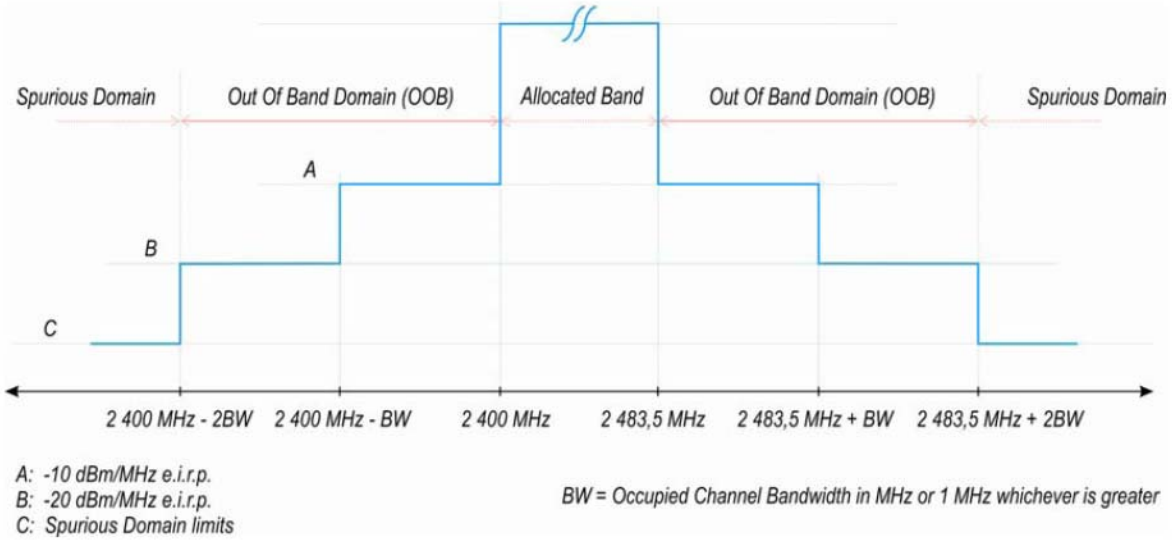
TEST RESULTS

Test Condition		Measured Data (MHz)	Verdict
☒802.11b	2412MHz	13.390	PASS
	2472 MHz	13.776	PASS
☒802.11g	2412MHz	17.295	PASS
	2472 MHz	17.556	PASS
☒802.11n(HT20)	2412MHz	17.944	PASS
	2472 MHz	18.018	PASS
☒802.11n(HT40)	2422MHz	36.350	PASS
	2462 MHz	36.503	PASS

1.13 TRANSMITTER UNWANTED EMISSION IN THE OUT-OF BAND

LIMIT

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the limits of the mask given in below figure.

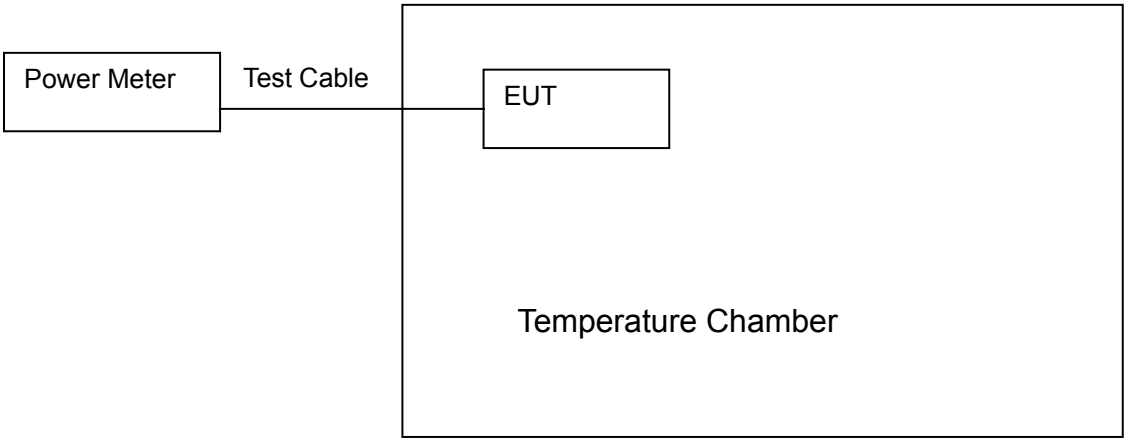


MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CAL DUE.
Vector Signal Generater	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.9.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) Annex B and C for the measurement methods.

The antenna shall be connected to the spectrum analyzer of RF power measurement and use the following settings

Step 1: Resolution bandwidth: 1MHz, Video bandwidth: 3MHz, Detector mode: RMS
Trace mode: Clear/Write, Sweep point: 5000, Span :0Hz ;Sweep Mode: Continuous
Centre frequency: 2484MHz , Trigger Mode: Video Trigger

Step 2: Adjust the trigger level to select the transmissions with the highest power level
Set a window to match the start and end of the burst and in which the RMS power shall be measured using the time domain power function
Select RMS power to be measure within the selected window and note the result which is the RMS power within this 1MHz segment (2483,5MHz to 2484,5MHz). Compare this value with the applicable limit provided by the mask

Step3:Change the centre frequency of the analyser to 2484MHz +BW and perform the measurement for the first 1MHz segment within range 2483,5MHz +BW to 2483,5MHz+2BW.
Increase the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .
The centre frequency of the last 1MHz segment shall be set to 2483,5MHz +2BW-0,5MHz.

Step4:Change the centre frequency of the analyser to 2399,5MHz and perform the measurement for the first 1MHz segment within range 2400MHz -BW to 2400MHz.
Reduce the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .
The centre frequency of the last 1MHz segment shall be set to 2400MHz -2BW+0,5MHz.

Step5:Change the centre frequency of the analyser to 2399,5MHz-BW and perform the measurement for the first 1MHz segment within range 2400MHz -2BW to 2400MHz-BW.
Reduce the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .

The centre frequency of the last 1MHz segment shall be set to 2400MHz -2BW+0,5MHz.

Step6: 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 1MHz segment and compare with the limits provided by the mask . if more than one antenna assembly is intended for this power setting , the antenna with the highest gain shall be considered

For smart antenna systems, 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 .

The measurement shall be performed at the lowest, the middle and the highest channel on which the equipment can operate.

TEST RESULTS

All the modulation modes were tested, the data of the worst mode are described in following pages.

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Test Segment (MHz)			
Ambient	$V_{AC\ nom}$ 230V	2400-2*BW to 2400-BW	-47.11	-20	-27.11
T_{min} -20°C	$V_{AC\ nom}$ 230V		-52.05	-20	-32.05
H_{min} 0%	$V_{AC\ nom}$ 230V		-56.42	-20	-36.42
T_{max} +55°C	$V_{AC\ nom}$ 230V		-56.59	-20	-36.59
H_{max} 50%	$V_{AC\ nom}$ 230V		-55.69	-20	-35.69
Ambient	$V_{AC\ nom}$ 230V	2400-BW to 2400	-36.89	-10	-26.89
T_{min} -20°C	$V_{AC\ nom}$ 230V		-38.05	-10	-28.05
H_{min} 0%	$V_{AC\ nom}$ 230V		-38.54	-10	-28.54
T_{max} +55°C	$V_{AC\ nom}$ 230V		-41.79	-10	-31.79
H_{max} 50%	$V_{AC\ nom}$ 230V		-48.85	-10	-38.85
Ambient	$V_{AC\ nom}$ 230V	2483.5 to 2483.5+BW	-37.39	-10	-27.39
T_{min} -20°C	$V_{AC\ nom}$ 230V		-38.92	-10	-28.92
H_{min} 0%	$V_{AC\ nom}$ 230V		-42.34	-10	-32.34
T_{max} +55°C	$V_{AC\ nom}$ 230V		-44.35	-10	-34.35
H_{max} 50%	$V_{AC\ nom}$ 230V		-50.84	-10	-40.84
Ambient	$V_{AC\ nom}$ 230V	2483.5+BW to 2483.5+2*BW	-47.21	-20	-27.21
T_{min} -20°C	$V_{AC\ nom}$ 230V		-56.26	-20	-36.26
H_{min} 0%	$V_{AC\ nom}$ 230V		-56.46	-20	-36.46
T_{max} +55°C	$V_{AC\ nom}$ 230V		-56.65	-20	-36.65
H_{max} 50%	$V_{AC\ nom}$ 230V		-56.08	-20	-36.08

1.14 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

LIMIT

The transmitter unwanted emissions in the spurious domain shall not exceed the values in tables in the indicated bands:

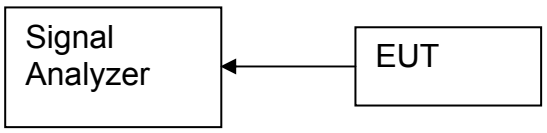
Frequency Range	Maximum power ERP(<=1GHz) ERP(>GHz)	bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87.5 MHz	-36dBm	100kHz
87.5MHz to118 MHz	-54dBm	100kHz
118 MHz to174MHz	-36dBm	100kHz
174MHz to 230MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 862 MHz	-54dBm	100kHz
862 MHz to1 GHz	-36dBm	100kHz
1GHz to12.75 GHz	-30dBm	1MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.10.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.10.2 for the measurement methods.

The antenna shall be connected to a spectrum analyzer of RF power measurements
Step 1: the unwanted emission over the range 30MHz to 1000MHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :100kHz , video bandwidth :300kHz
Detector mode :Peak trace mode: Maxhold Sweep point :>=9970, sweep time:200ms
Step 2: the unwanted emission over the range 1GHz to 12.75GHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :1MHz , Video bandwidth :3MHz
Detector mode :Peak Trace mode: Maxhold Sweep point :>=11750, sweep time:200ms

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

Test Mode: IEEE 802.11b				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
483.345	-65.45	-54.00	-11.45	Pass
704.116	-65.11	-54.00	-11.11	Pass
733.684	-65.92	-54.00	-11.92	Pass
762.234	-64.95	-54.00	-10.95	Pass
772.932	-64.66	-54.00	-10.66	Pass
789.014	-65.6	-54.00	-11.60	Pass

Test Mode: IEEE 802.11g				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
498.125	-64.08	-54.00	-10.08	Pass
522.148	-63.59	-54.00	-9.59	Pass
529.426	-65.82	-54.00	-11.82	Pass
632.028	-65.29	-54.00	-11.29	Pass
663.541	-65.17	-54.00	-11.17	Pass
705.189	-65.45	-54.00	-11.45	Pass

Test Mode: IEEE 802.11n(HT20)				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
498.056	-63.25	-54.00	-9.25	Pass
502.369	-64.15	-54.00	-10.15	Pass
516.248	-65.53	-54.00	-11.53	Pass
556.239	-65.72	-54.00	-11.72	Pass
593.017	-66.23	-54.00	-12.23	Pass
632.179	-65.6	-54.00	-11.60	Pass

Test Mode: IEEE 802.11n(HT40)				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
489.129	-65.45	-54.00	-11.45	Pass
500.175	-65.11	-54.00	-11.11	Pass
523.459	-65.92	-54.00	-11.92	Pass
532.746	-64.95	-54.00	-10.95	Pass
569.158	-64.66	-54.00	-10.66	Pass
600.495	-65.6	-54.00	-11.60	Pass

1.15 RECEIVER SPURIOUS EMISSIONS

LIMIT

The level of spurious emissions shall be measured as, either:

1. Their power in specified load (conducted spurious emissions); and
2. Their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
3. Their effective radiated power when radiated by cabinet and antenna.

The spurious emissions of the receiver shall not exceed the values in tables in the indicated bands:

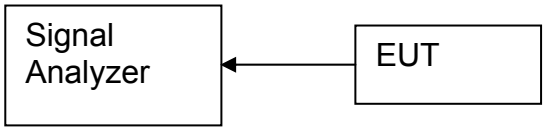
Frequency Range	Maximum power (ERP)	Measurement Width
30 MHz to 1 GHz	-57 dBm	100kHz
1 GHz to 12.75 GHz	-47 dBm	1MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.11.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.11.2 for the measurement methods.

The antenna shall be connected to a spectrum analyzer of RF power measurements

Step 1: the unwanted emission over the range 30MHz to 1000MHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :100kHz , video bandwidth :300kHz
Detector mode :Peak trace mode: Maxhold Sweep point :>=9970, sweep time: auto
Step 2: the unwanted emission over the range 1GHz to 12.75GHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :1MHz , Video bandwidth :3MHz

Detector mode :Peak Trace mode: Maxhold Sweep point :>=25000, sweep time: auto

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

Test Mode: IEEE 802.11b				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
365.159	-70.48	-57.00	-13.48	Pass
375.059	-71.56	-57.00	-14.56	Pass
400.129	-72.04	-57.00	-15.04	Pass
423.564	-72.46	-57.00	-15.46	Pass
435.426	-73.05	-57.00	-16.05	Pass
465.924	-65.6	-57.00	-8.60	Pass

Test Mode: IEEE 802.11g				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
425.159	-70.29	-57.00	-13.29	Pass
435.152	-71.42	-57.00	-14.42	Pass
455.026	-72.03	-57.00	-15.03	Pass
469.195	-73.59	-57.00	-16.59	Pass
476.271	-74.02	-57.00	-17.02	Pass
524.169	-75.49	-57.00	-18.49	Pass

Test Mode: IEEE 802.11n(HT20)				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
469.172	-69.42	-57.00	-12.42	Pass
476.258	-70.14	-57.00	-13.14	Pass
486.147	-71.25	-57.00	-14.25	Pass
500.348	-72.41	-57.00	-15.41	Pass
513.226	-73.26	-57.00	-16.26	Pass
522.462	-74.59	-57.00	-17.59	Pass

Test Mode: IEEE 802.11n(HT40)				
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Verdict
523.148	-70.42	-57.00	-13.42	Pass
536.245	-71.59	-57.00	-14.59	Pass
551.042	-72.54	-57.00	-15.54	Pass
564.195	-73.59	-57.00	-16.59	Pass
576.426	-73.64	-57.00	-16.64	Pass
584.946	-74.55	-57.00	-17.55	Pass

1.16 ADAPTIVITY AND RECEIVER BLOCKING

LIMIT OF ADAPTIVITY AND BLOCKING

Only for adaptive equipment and RF output power >=10dBm(ERP)

- For LBT based Detect and avoid equipment shall comply with the following requirement

Load Based Equipment not using any of the mechanisms referenced above shall comply with the following minimum set of requirements:

1) Before a transmission or a burst of transmissions, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 20 μs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5) below. If the equipment finds the channel to be clear, it may transmit immediately.

2) If the equipment finds the channel occupied, it shall not transmit on this channel. The equipment shall perform an Extended CCA check in which the channel is observed for the duration of a random factor R multiplied by the CCA observation time. R defines the number of clear idle slots resulting in a total Idle Period that needs to be observed before initiation of the transmission. The value of R shall be randomly selected in the range 1. q every time an Extended CCA is required and the value stored in a counter. The value of q is selected by the manufacturer in the range 4.32. The counter is decremented every time a CCA slot is considered to be 'unoccupied'. When the counter reaches zero, the equipment may transmit.

3)The total time that an equipment makes use of a RF channel is defined as the Channel Occupancy Time. This Channel Occupancy Time shall be less than (13/32) × q ms, with q as defined in 2) above, after which the device shall perform the Extended CCA described in 1) above.

4)The equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately proceed with the transmission of management and control frames (e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of transmissions by the equipment without a new CCA shall not exceed the maximum channel occupancy time as defined in 3) above.

5)The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). For power levels below 20 dBm e.i.r.p., the CCA threshold level may be relaxed to TL = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm).

- Short control signaling transmissions

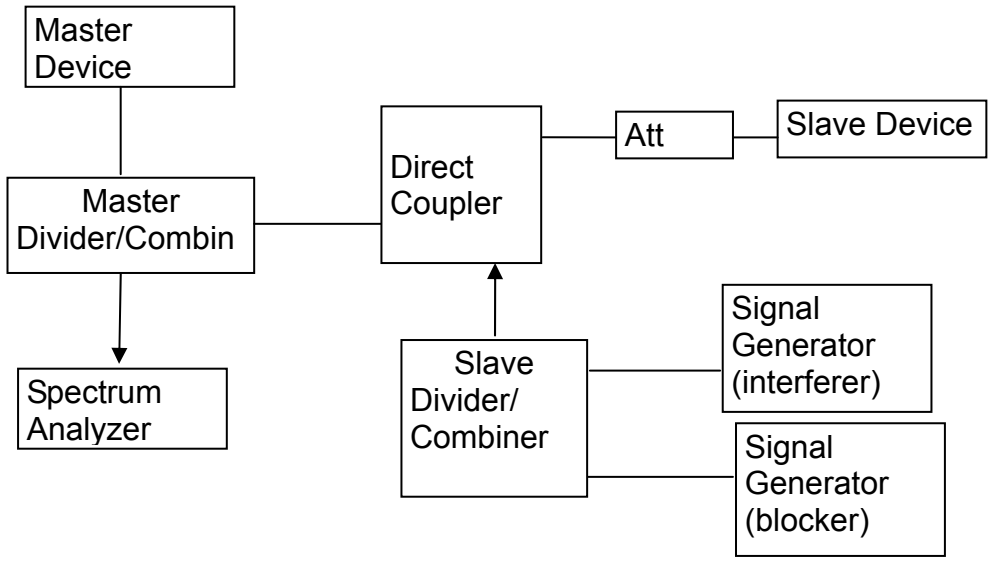
Short control signaling transmissions of adaptive equipment using wide band modulations shall have a maximum duty cycle of 10 % within an observation period of 50ms.

MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Vector Signal Generator	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



Remarks*:*
The Signal Analyzer could be connected to a monopole antenna or directly connected to the EUT through divider, if the EUT has already employing an antenna connector.

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.7.2 for the measurement method.

The EUT may connect to a companion device during the test, the interference signal generator, the blocking signal generator, the spectrum analyzer , the EUT and the companion device are connected using direction coupler and divider. Although the interference and blocking signal generators do not generate any signal at the point in time, the spectrum analyzer is used to monitor the transmissions of the EUT in response to the interfering and the blocking signals.
Step1:The analyzer shall be set as follows

RBW: >=Occupied Channel Bandwidth; Filter type: Channel Filter; VBW:RBW
Centre Frequency: tested frequency; Span: 0Hz; Sweep Time: 20ms ;
Trace Mode: clear/write; Trigger Mode: Video.
Step2: configure the EUT for normal transmission with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the hopping frequency.
Step3:add the interference signal
A 100% duty cycle interference signal is injected centred on the hopping frequency being tested. This interference signal shall be a band limited noise signal which has a flat power spectrum density and shall have a bandwidth greater than the occupied channel bandwidth of the EUT
Step4:Verfication of reaction to the interference signal
The spectrum analyzer shall be used to monitor the transmissions of the EUT on the selected hopping frequency with the interfering signal injected. This may require the spectrum analyzer sweep to be triggered by the start of the interfering signal.
Step5:adding the blocking signal
With the interfering signal preset ,a 100% duty cycle CW signal is inserted as the blocking signal, the frequency and the level are provided in table3 if clause 4.3.1.10.2
Repeat step4 to verify that the EUT does not resume any normal transmissions on the hopping frequency being investigated.
Step6: removing the interference and blocking signal
On removal of the interference and blocking signal ,the EUT is allowed to re-include any channel previously marked as unavailable ;

The steps 2 to steps 6 shall be repeated for each of the hopping frequencies to be tested.

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

The EUT is belong to load based equipment and it don’t using any of the mechanisms referenced.

TEST RESULTS

All of the modes were tested the data of the worst mode are recorded in the following pages.

Minimum Clear Channel Assessment (CCA) time

MODULATION MODE	DATA RATE	NOMINAL BANDWIDTH	TEST FREQUENCY	CCA (us)	LIMIT (us)	TEST RESULT
802.11b	1Mbps	20MHz	2412	500	>20	PASS
			2472	500	>20	PASS
802.11g	6Mbps	20MHz	2412	500	>20	PASS
			2472	500	>20	PASS
802.11n(HT20)	MCS0	20MHz	2412	500	>20	PASS
			2472	500	>20	PASS
802.11n(HT40)	MCS0	40MHz	2422	500	>20	PASS
			2462	500	>20	PASS

Channel Occupancy Time(C.O.T)

MODULATION MODE	DATA RATE	NOMINAL BANDWIDTH	TEST FREQUENCY	C.O.T (ms)	LIMIT	TEST RESULT
802.11b	1Mbps	20MHz	2412	0.30	<2.03ms	PASS
			2472	0.30	<2.03ms	PASS
802.11g	6Mbps	20MHz	2412	0.42	<2.03ms	PASS
			2472	0.43	<2.03ms	PASS
802.11n(HT20)	MCS0	20MHz	2412	0.26	<2.03ms	PASS
			2472	0.24	<2.03ms	PASS
802.11n(HT40)	MCS0	40MHz	2422	0.53	<2.03ms	PASS
			2462	0.56	<2.03ms	PASS
NOTE: 1.COT time Limit= (13/32) * q (q=5)						

Extended CCA time

MODULATION MODE	DATA RATE	NOMINAL BANDWIDTH	TEST FREQUENCY	Extended CCA (us)	Limit (us)	TEST RESULT
802.11b	1Mbps	20MHz	2412	116	>100	PASS
			2472	294	>100	PASS
802.11g	6Mbps	20MHz	2412	233	>100	PASS
			2472	244	>100	PASS
802.11n(HT20)	MCS0	20MHz	2412	225	>100	PASS
			2472	284	>100	PASS
802.11n(HT40)	MCS0	40MHz	2422	278	>100	PASS
			2462	305	>100	PASS
NOTE: 1. Extended CCA time Limit= R*CCA; (R=5)						

Short Control Signaling Transmission (S.C.S.T)

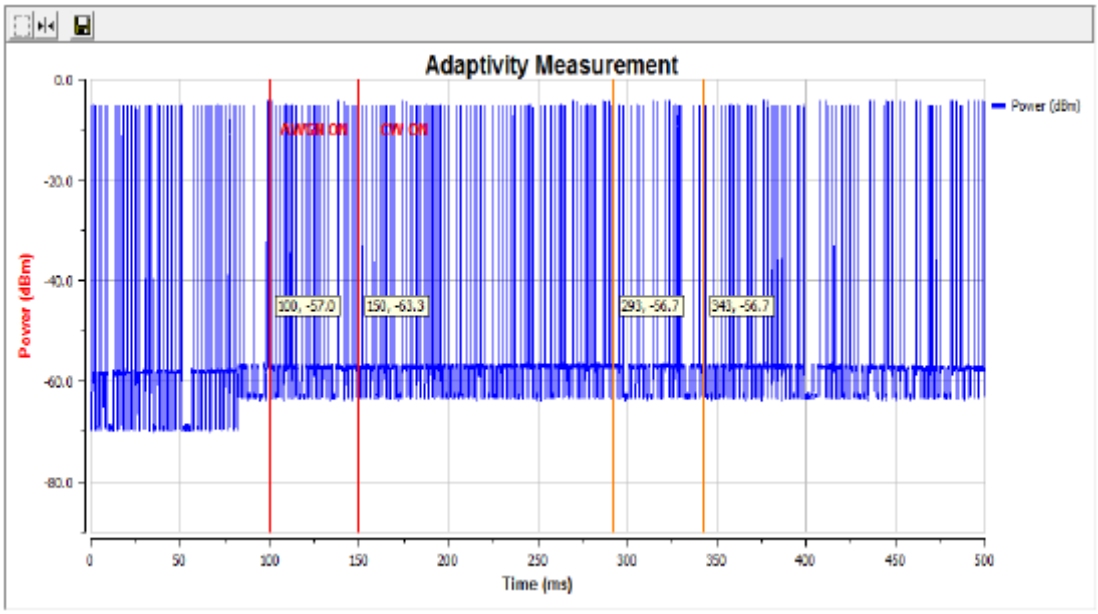
MODULATION MODE	DATA RATE	NOMINAL BANDWIDTH	TEST FREQUENCY	S.C.S.T	LIMIT	TEST RESULT
802.11b	1Mbps	20MHz	2412	3.48	<5ms	PASS
			2472	3.23	<5ms	PASS
802.11g	6Mbps	20MHz	2412	2.56	<5ms	PASS
			2472	2.68	<5ms	PASS
802.11n(HT20)	MCS0	20MHz	2412	2.47	<5ms	PASS
			2472	3.12	<5ms	PASS
802.11n(HT40)	MCS0	40MHz	2422	3.06	<5ms	PASS
			2462	3.35	<5ms	PASS
S.C.S.T: means short control Signaling transmission NOTE: N/A means not applicable						

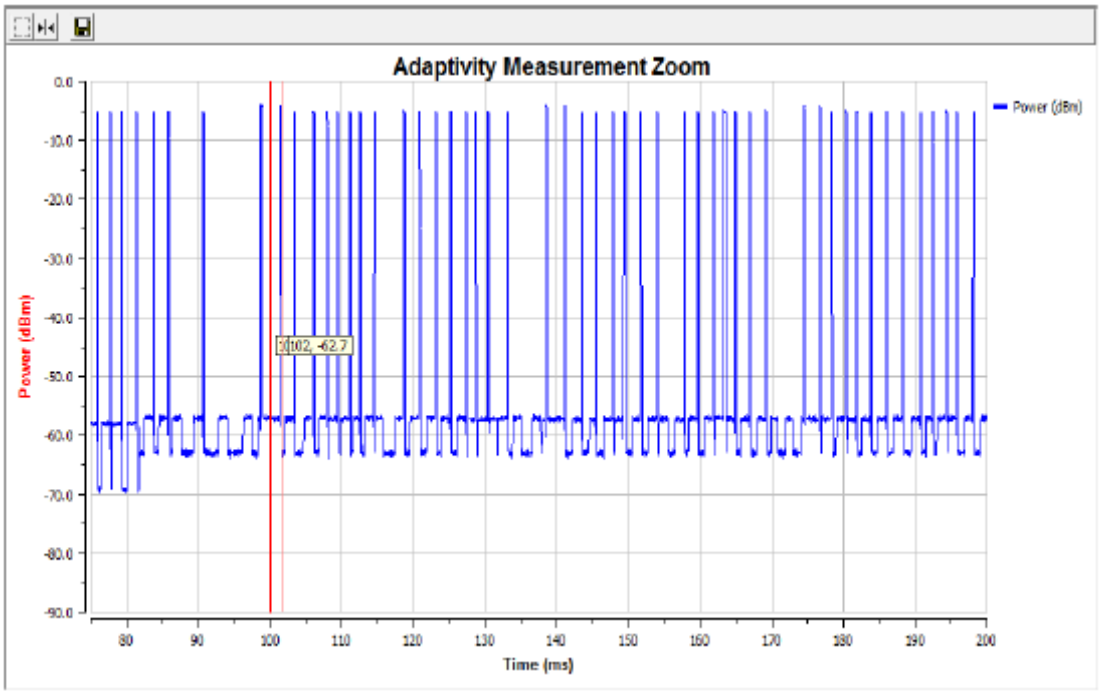
CCA threshold level

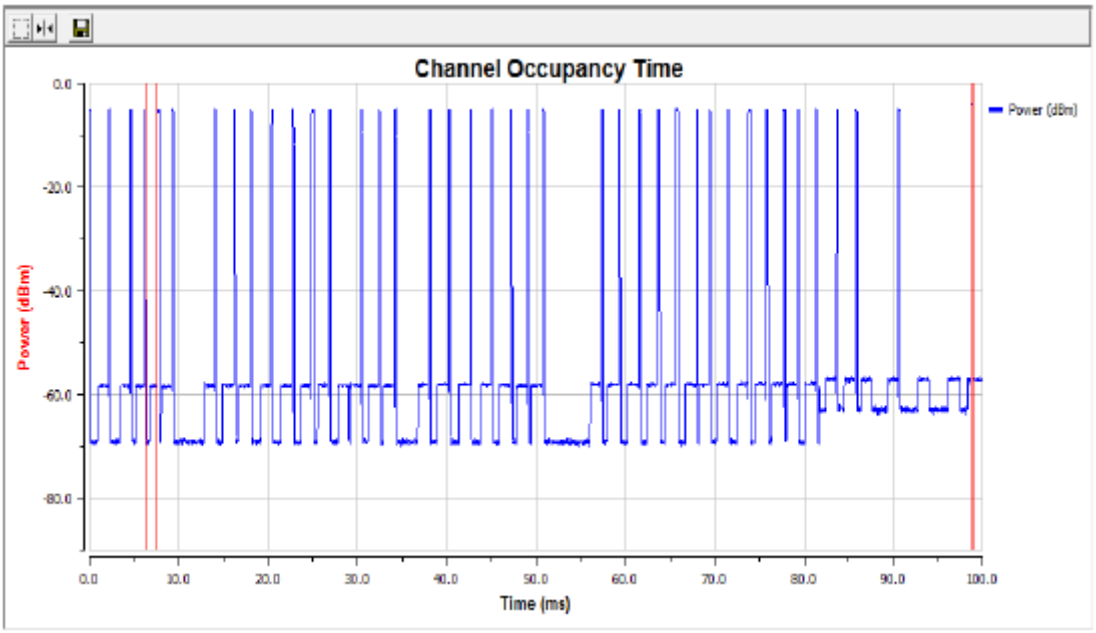
MODULATION MODE	DATA RATE	NOMINAL BANDWIDTH	TEST FREQUENCY	CCA level (dBm)	CCA threshold LIMIT(dBm)	TEST RESULT
802.11b	1Mbps	20MHz	2412	-66.59	-70dBm/MHz+ 20-Pout	PASS
			2472	-67.43	-70dBm/MHz+ 20-Pout	PASS
802.11g	6Mbps	20MHz	2412	-63.11	-70dBm/MHz+ 20-Pout	PASS
			2472	-64.03	-70dBm/MHz+ 20-Pout	PASS
802.11n(HT20)	MCS0	20MHz	2412	-63.21	-70dBm/MHz+ 20-Pout	PASS
			2472	-63.87	-70dBm/MHz+ 20-Pout	PASS
802.11n(HT40)	MCS0	40MHz	2422	-63.01	-70dBm/MHz+ 20-Pout	PASS
			2462	-63.62	-70dBm/MHz+ 20-Pout	PASS

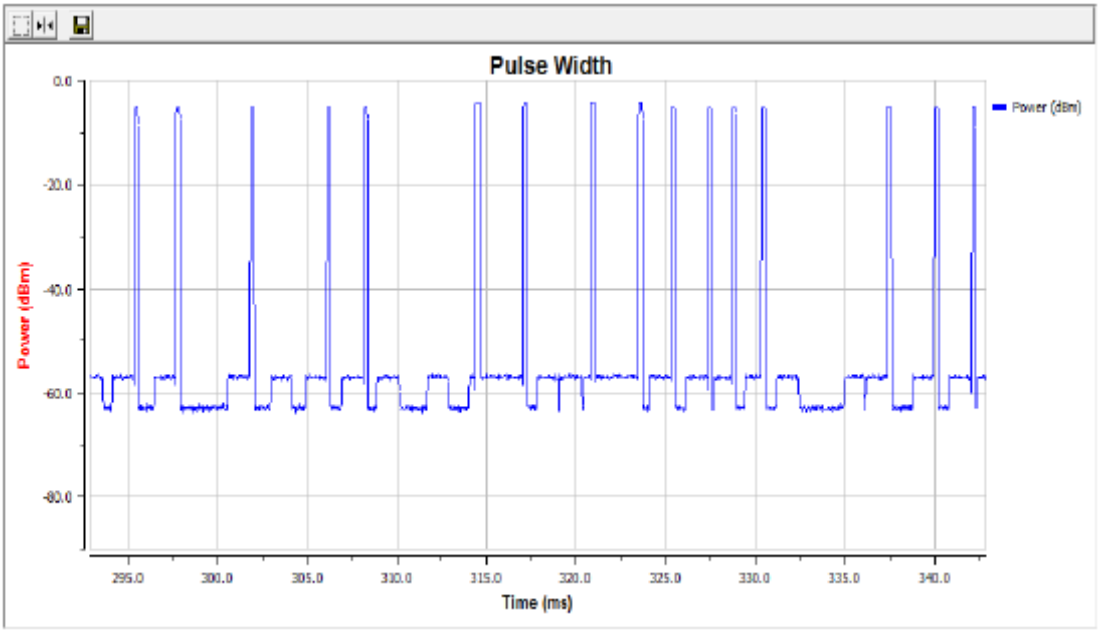
The data of the worst mode are described in the following pages

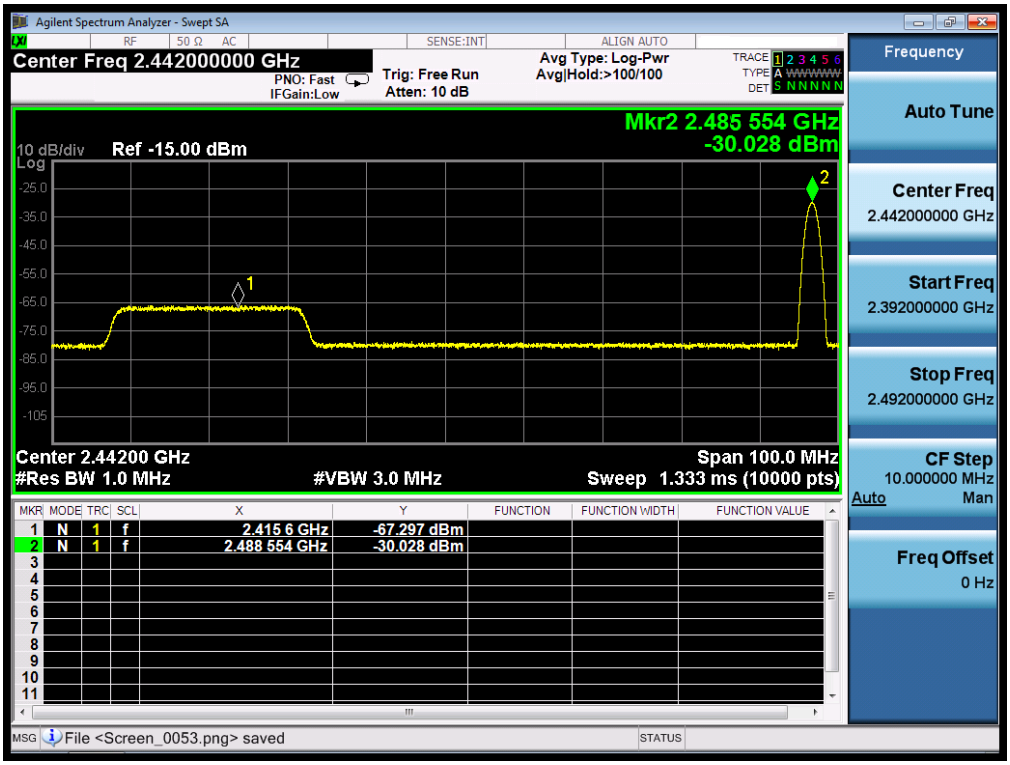
AWGN Interference Level (dBm)	-18.00
Block Signal Level (dBm)	-2.00
Max COT Time (ms)	0.30
Interference Start Time (ms)	100.00
Minimum Idle Time (ms)	1.26
Suggested COT (ms)	
Duty Cycle (%)	7.60
Pulse Width (ms)	3.48


Adaptivity Measurement
Power (dBm)
Time (ms)
100, -57.0
150, -63.3
293, -56.7
343, -56.7


Adaptivity Measurement Zoom
Power (dBm)
Time (ms)
102, -62.7


Channel Occupancy Time
Power (dBm)
0.0
-20.0
-40.0
-60.0
-80.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
Time (ms)
Power (dBm)


Pulse Width
Power (dBm)
0.0
-20.0
-40.0
-60.0
-80.0
295.0
300.0
305.0
310.0
315.0
320.0
325.0
330.0
335.0
340.0
Time (ms)
Power (dBm)


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.442000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr2 2.485 554 GHz
-30.028 dBm
10 dB/div
Log
Ref -15.00 dBm
Center 2.44200 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 100.0 MHz
Sweep 1.333 ms (10000 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.415 6 GHz -67.297 dBm
2 N 1 f 2.488 554 GHz -30.028 dBm
File <Screen_0053.png> saved
Frequency
Auto Tune
Center Freq
2.442000000 GHz
Start Freq
2.392000000 GHz
Stop Freq
2.492000000 GHz
CF Step
10.000000 MHz
Auto
Man
Freq Offset
0 Hz

EMTEK
Access to the World

ETSI EN 300 328 V1.8.1: 2012

TEST REPORT

FOR

Bluetooth 150Mbps Wireless N USB Module

Model No.: BL-R8723RB1

Trademark: LB-LINK

Report No.: ED150528298R2

Issue Date: September 02, 2015

Prepared for

SHENZHEN BILIAN ELECTRONIC CO., LTD.
Building B1, Zhongxing Industrial Zone, Juling, Jutang Community,
Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China

Prepared by

DONGGUAN EMTEK CO., LTD.
No.281,Guantai Road, Nancheng District,
Dongguan, Guangdong, China
TEL: 86-769-22807078
FAX: 86-769-22807079

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TEST RESULT CERTIFICATION

Applicant	:	SHENZHEN BILIAN ELECTRONIC CO., LTD. Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
Manufacturer	:	SHENZHEN BILIAN ELECTRONIC CO., LTD. Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
EUT	:	Bluetooth 150Mbps Wireless N USB Module
Model No.	:	BL-R8723RB1
Trademark	:	LB-LINK

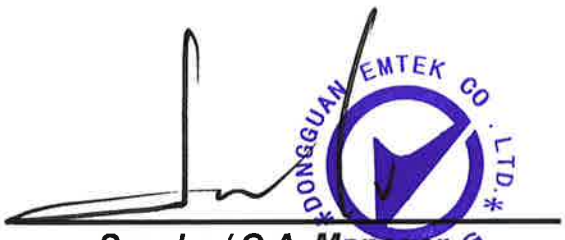
Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 328 V1.8.1: 2012	PASS

The device described above is tested by DONGGUAN EMTEK CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and DONGGUAN EMTEK CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 300 328 V1.8.1: 2012 requirements.

Reviewed and Approved by:

Approved By



Sam Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	ED150528298R2

EUT DESCRIPTION

Product Name	Bluetooth 150Mbps Wireless N USB Module		
Model number	BL-R8723RB1		
Power Supply	DC From PC		
Technical Description			
Kind of Device	Bluetooth 4.0	Bluetooth 3.0+EDR	WiFi
Operation Frequency	2402-2480MHz		2412-2462MHz for 802.11b/g/n(HT20) ; 2422-2452MHz for 802.11n(HT40)
Modulation	GFSK	GFSK, π/4-DQPSK, 8DPSK	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n, DSSS with DBPSK/DQPSK/CCK for 802.11b;
Number of Channel	40	79	11 Channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Channel space	2MHz	1MHz	5MHz
Max RF Output Power	2.02dBm	4.43dBm	14.10dBm
Antenna Type	External Antenna		
Antenna Gain	2 dBi		

Channel List:

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

Note:

1. Test of channel was included the lowest middle and highest frequency in highest data rate and to perform the test, then record on this report.

SUMMARY OF TEST RESULT

Clause (EN 300 328)	Test Parameter	Verdict	Remark
4.3.2.1	RF Output Power	PASS	
4.3.2.2	Power Spectral Density	PASS	
4.3.2.3	Duty Cycle and Tx-Sequence and Tx-Gap	N/A	Only for non-adaptive equipment and RF Output Power>10dBm
4.3.2.4	Medium Utilisation(MU) Factor	N/A	Only for non-adaptive equipment and RF Output Power>10dBm
4.3.2.5	Adaptivity	N/A	Only for adaptive equipment and RF Output Power>10dBm
4.3.2.6	Occupied Channel Bandwidth	PASS	
4.3.2.7	Transmitter Unwanted Emission in the Out-of Band	PASS	
4.3.2.8	Transmitter Unwanted Emissions in the Spurious Domain	PASS	
4.3.2.9	Receiver Spurious Emissions	PASS	
4.3.2.10	Receiver Blocking	N/A	Only for adaptive equipment and RF Output Power>10dBm

Remark:
1. When determining the test conclusion, the Measurement Uncertainty of test has been considered.
2. N/A is an abbreviation for Not Applicable.

TEST METHODOLOGY

1.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

ETSI EN 300 328 – Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques: Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

1.2 MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/28/2016
Pre-Amplifier	HP	8447D	2944A07999	05/28/2016
Bilog Antenna	SCHWARZBECK	VULB9163	142	05/28/2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170399	05/28/2016
Horn Antenna	SCHWARZBECK	BBHA9120D	D143	05/28/2016
Cable	SCHWARZBECK	AK9513	ACRX1	05/28/2016
Cable	SCHWARZBECK	AK9515E	FP2RX2	05/28/2016
Cable	SCHWARZBECK	AK9513	CRPX1	05/28/2016
Cable	SCHWARZBECK	AK9513	CRRX2	05/28/2016
RF Power Meter	BOONTON	4232A	10539	05/28/2016
Temp. / Humidity Chamber	Kingson	THS-M1	242	05/28/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	101045	05/28/2016
Vector Signal Generater	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Sensor	Agilent	U2021A	N/A	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

1.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed. Only the worst case data were reported.

FACILITIES AND ACCREDITATIONS

1.4 FACILITIES

All measurement facilities used to collect the measurement data are located at No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.5 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

1.6 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab. : Accredited by CNAS, 2015.06.11
The certificate is valid until 2018.07.03
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006
The Certificate Registration Number is L3150

Accredited by TUV Rheinland , 2014.05.22
The certificate is valid until 2015.11.21
The Laboratory has been assessed according to the requirements ISO/IEC 17025: 2005

Accredited by FCC, June 18, 2014
The Certificate Number is 247565

Accredited by Industry Canada, February 19, 2014
The Certificate Number is 9444A.

Name of Firm : DONGGUAN EMTEK CO., LTD.
Site Location : No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

SETUP OF EQUIPMENT UNDER TEST

1.7 TEST SYSTEM SETTING

Setting	Value
Modulating	GFSK
Adaptive	No
Number Of Transmission Chain	1
Antenna Gain	0dBi
Beamforming Gain	0dB
Nominal Channel Bandwidth	2M
Maximum EIRP	2.02dBm
Frequency Low	2402MHz
Frequency Mid	2440MHz
Frequency High	2480MHz

1.8 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model No.	Note
1	N/A			

Notes:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

ETSI EN 300 328 REQUIREMENTS

1.9 RF OUTPUT POWER

LIMIT

EN 300 328 Clause 4.3.2.1

The Maximum RF Output Power <= 100 mW (20 dBm) (EIRP) at both Normal and Extreme conditions.

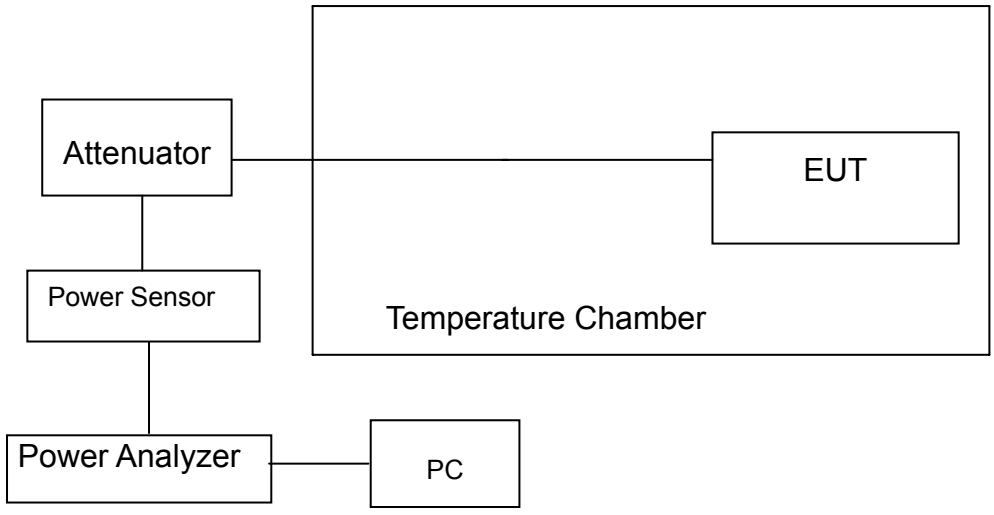
MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Power Sensor	Agilent	U2021A	N/A	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

The test procedure shall be as follows:

Step 1:
Use a fast power sensor suitable for 2.4 GHz and capable of 1 MS/s.
Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples must represent the power of the signal.
- Measurement duration: For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.
NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:
For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.
- For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.

Step 3:
Find the start and stop times of each burst in the stored measurement samples.
NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB below the RMS burst power calculated in step 4.

Step 4:
Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these P burst values, as well as the start and stop times for each burst.

Step 5:
The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:
Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain G shall be used.
The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G$$

Step 7:
The measurement shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded. FHSS equipment

shall be made to hop continuously to each of these three frequencies separately. These measurements shall be performed at normal and extreme test conditions.

TEST RESULT

Operation Mode:	GFSK	**Test Date:**	June 15, 2015
Temperature:	Refer to the following table	**Tested by:**	Andy
Humidity:	55 % RH		

Test Conditions	Transmitter Power (dBm)				
	Temp (25)°C	Temp (-20)°C		Temp (55)°C	
Channel	230V	207V	253V	207V	253V
2402MHz	1.23	1.03	-1.35	1.40	1.42
2442 MHz	1.19	1.06	0.98	0.95	0.92
2480 MHz	**2.02**	1.69	1.57	1.68	1.35
Limit	<= 20dBm				
Verdict	PASS	PASS	PASS	PASS	PASS

1.10 POWER SPECTRAL DENSITY

LIMIT

ETSI EN 300 328 clause 4.3.2.2

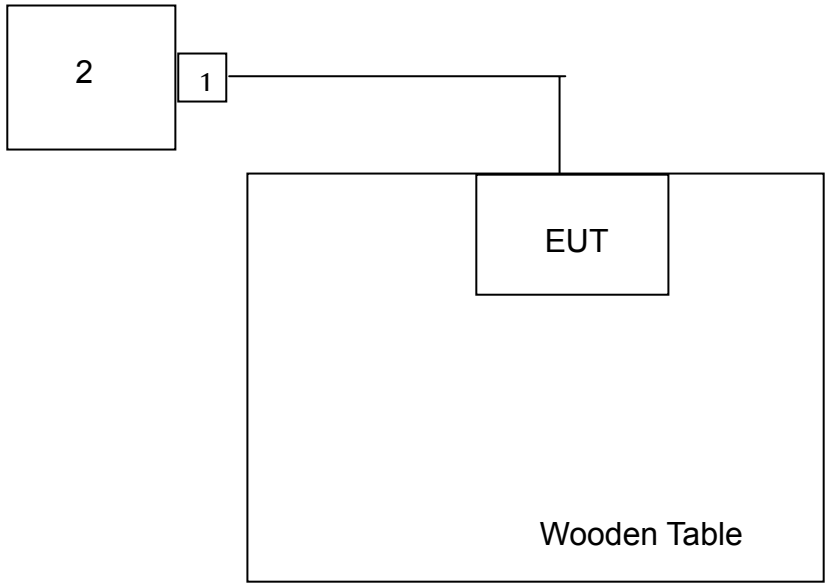
For equipment using wide band modulations other than FHSS(e.g. DSSS, OFDM, etc.), the maximum e.i.r.p. spectral power density shall be limited to –20dBW (10mW) per MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



1. *Spectrum analyzer*
2. *Bias-tee*

TEST Procedure

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.3 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.3.2 for the measurement method.

The test procedure shall be as follows:
Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
• Start Frequency: 2 400 MHz
• Stop Frequency: 2 483,5 MHz
• Resolution BW: 10 kHz
• Video BW: 30 kHz
• Sweep Points: > 8 350
NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.
• Detector: RMS
• Trace Mode: Max Hold
• Sweep time: Auto
For non-continuous signals, wait for the trace to be completed. Save the (trace) data set to a file.
Step 2:
For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.
Step 3:
Add up the values for amplitude (power) for all the samples in the file.
Step 4:
Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2.
Step 5:
Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6:
Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 5 (i.e. sample #2 to #101).
Step 7:
Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments.
From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.2.2, shall be recorded in the test report.

The measurement shall be performed at the lowest ,the middle and the highest channel on which the equipment can operate.

TEST RESULTS

Operation Mode:	GFSK	**Test Date:**	June 15, 2015
Temperature:	25°C	**Tested by:**	Andy
Humidity:	55 % RH		

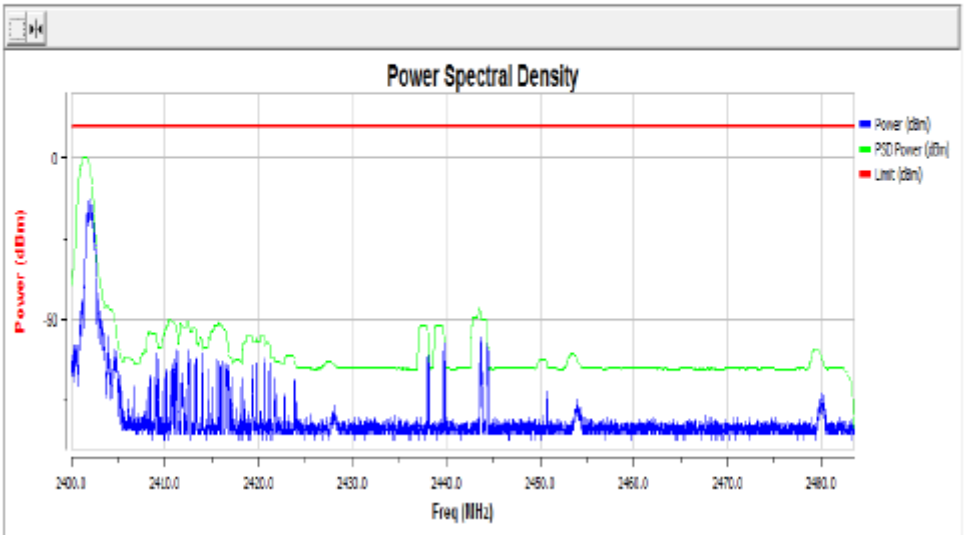
TEST CONDITION		Measured data (dBm/MHz)	Limited (dBm/MHz)
Measured Power Density	2402MHz	0.27	10
	2440MHz	0.28	10
	2480MHz	0.27	10

Remarks:
Steps for determining the Peak Power Density

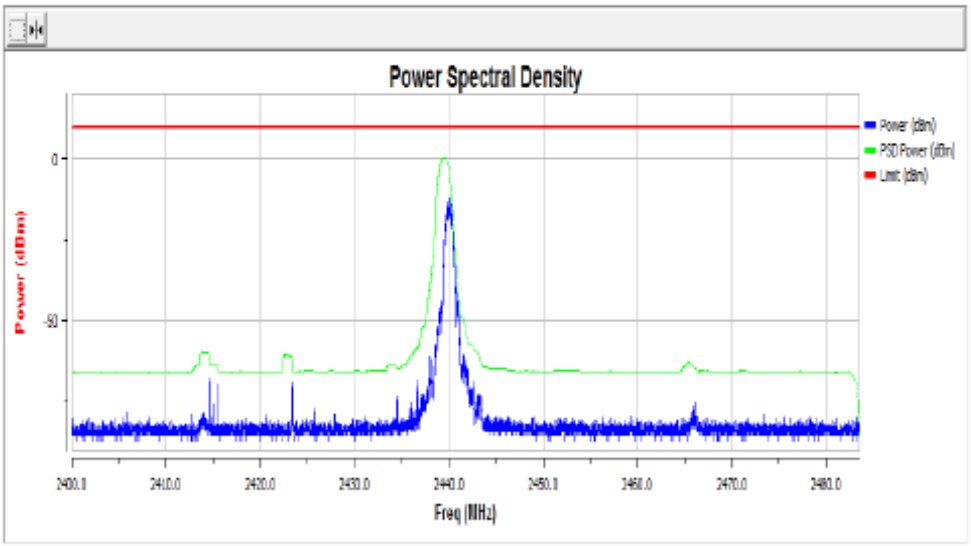
1. *Remove the EUT's antenna and the directly connected to the spectrum analyzer with appropriate cable with connector and attenuator/DC block.*
2. *Observation is made under the continue operation by the PEAK detector mode, by taking all the factor into account and yield the Peak Power Density.*

Test Plot

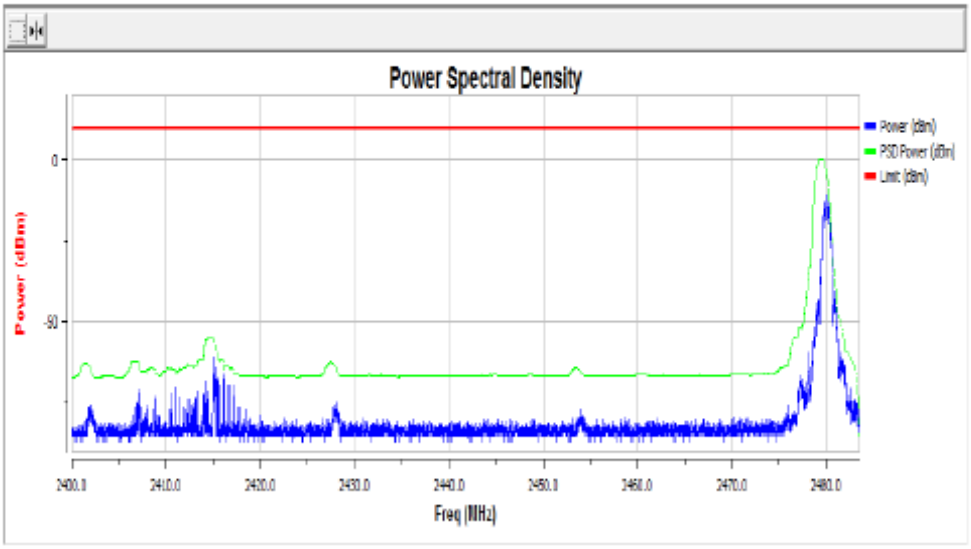
Channel	Max Power Spectral Density Level (dBm)
CH Low-2402	0.27



Channel	Max Power Spectral Density Level (dBm)
CH High-2440	0.28



Channel	Max Power Spectral Density Level (dBm)
CH High-2480	0.27



1.11 DUTY CYCLE AND TX-SEQUENCE AND TX-GAP

LIMIT

ETSI EN 300 328 clause 4.3.2.3

The requirement apply to non-adaptive equipment or to adaptive equipment when operating in a non-adapter mode

These requirement do not apply for equipment with a maximum declared RF output power level of less than 10 dBm(EIRP) or for equipment when operating in a mode where the RF output power is less than 10 dBm(EIRP);

the maximum duty cycle is less than 1;

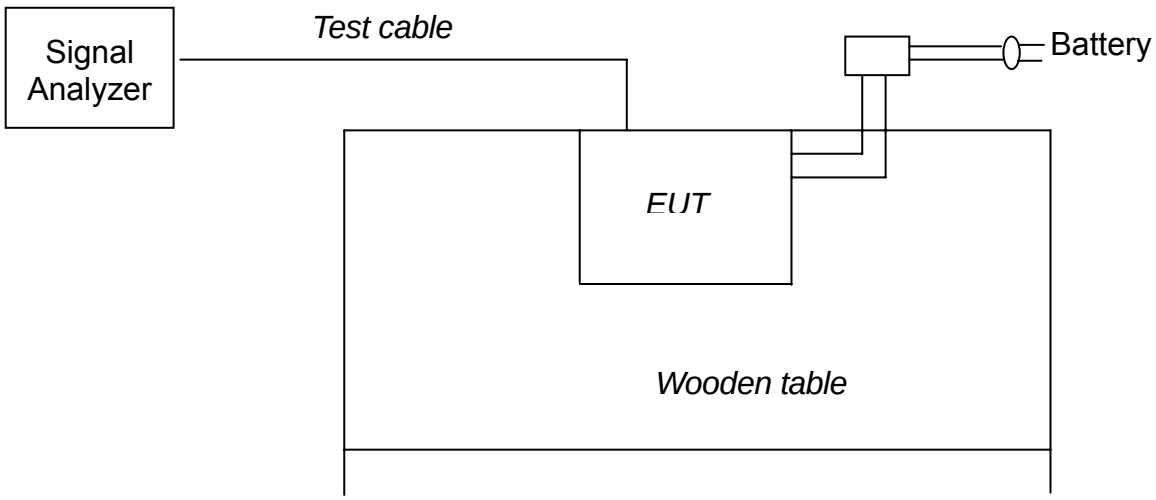
the maximum Tx-sequence time and minimum Tx-gap time shall be 5ms.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Vector Signal Generator	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2.1.2 for the measurement method.

Use a fast power sensor suitable 2.4GHz and sample speed 1Ms/s or faster.
Between the save start and stop times of each individual burst ,calculate the TxOn time ,save these TxOn values
Between the save stop and start times of two subsequent burst ,calculate the TxOff time ,save these TxOff values
Duty cycle is the sum of all TxOn times divided by the observation period
For equipment using blacklisting ,the TxOn time measured for a single hopping frequency shall be multiplied by the number of blacklisted frequency . this value shall be add up to the sum calculated in the previous bullet point . if the number of blacklisted frequencies cannot be determined ,the minimum number of hopping frequencies shall be assumed.
The above calculated value for duty cycle shall be recorded in the report
Any TxOff time that is greater than the minimum Tx-gap time is considered a Tx-gap .the lowest Tx-gap time shall be recorded in the report
The Tx-sequence time is the time between two subsequent Tx-gaps, the maximum Tx-sequence time shall be recorded in the report.

The measurement shall be performed during normal operation (hopping)

TEST RESULTS

Not Applicable

Because RF Output power of EUT is less than10dBm, according to standard EN300328, Duty cycle, Tx-Sequence, Tx-gap is not required.

1.12 MEDIUM UTILISATION FACTOR

LIMIT

ETSI EN 300 328 clause 4.3.2.4

This requirement apply to non-adaptive mode or adaptive equipment 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(EIRP) or for equipment when operating in a mode where the RF output power is less than 10 dBm(EIRP)

For non-adaptive equipment using wide band modulations other than FHSS, the Maximum Medium Utilization Factor shall be 10%.

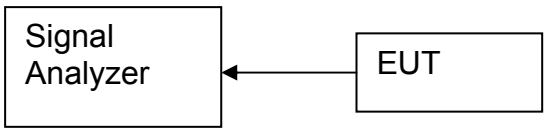
MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2.1.3 for the measurement method.
   Use a fast power sensor suitable for 2.4GHz and capable of 1Ms/s
   According to RF output power test procedure, measure the maximum RF output power
   According to duty cycle test procedure, measure the duty cycle and Tx-On and Tx-Off
   For each burst, calculate the product of (Pburst/100mW) and the Tx-On time
   NOTE: Pburst is expressed in mW,TxOn time is expressed in ms.
   Medium utilisation is the sum of all these products divided by the observation period (expressed in ms) . this value shall be recorded in the test report.

TEST RESULTS

Not Applicable

Because RF Output power of EUT is less than10dBm, according to standard EN300328, Medium Utilisation is not required.

1.13 OCCUPIED CHANNEL BANDWIDTH

LIMIT

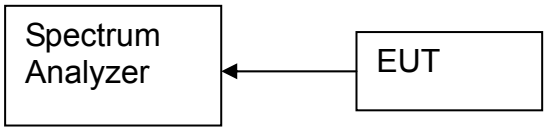
The requirement applies to all types of equipment using wide band modulation other than FHSS
The occupied channel bandwidth is the bandwidth that contains 99% of the power of the signal
The occupied channel bandwidth for each hopping frequency shall fall completely within the band given in the clause 1.
For non-adaptive frequency hopping systems with EIRP greater than 10 dBm, the Occupied Channel Bandwidth shall be less than 5MHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328(V1.8.1) clause 5.3.8.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.8.2 for the measurement method.

STEP 1:Connect the antenna to the spectrum analyzer and use the following setting
Centre Frequency : the centre frequency of the channel under test
Resolution Bandwidth: 30kHz, Video Bandwidth: 100kHz
Frequency Span: 2 nominal bandwidth
Detector Mode : RMS Trace Mode: max hold
Step 2: When the trace is completed, capture the trace and find the peak value and place the analyzer marker on this peak
Step 3: Use the 99% bandwidth function of the spectrum analyzer to measure the Occupied Channel Bandwidth of the EUT.

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

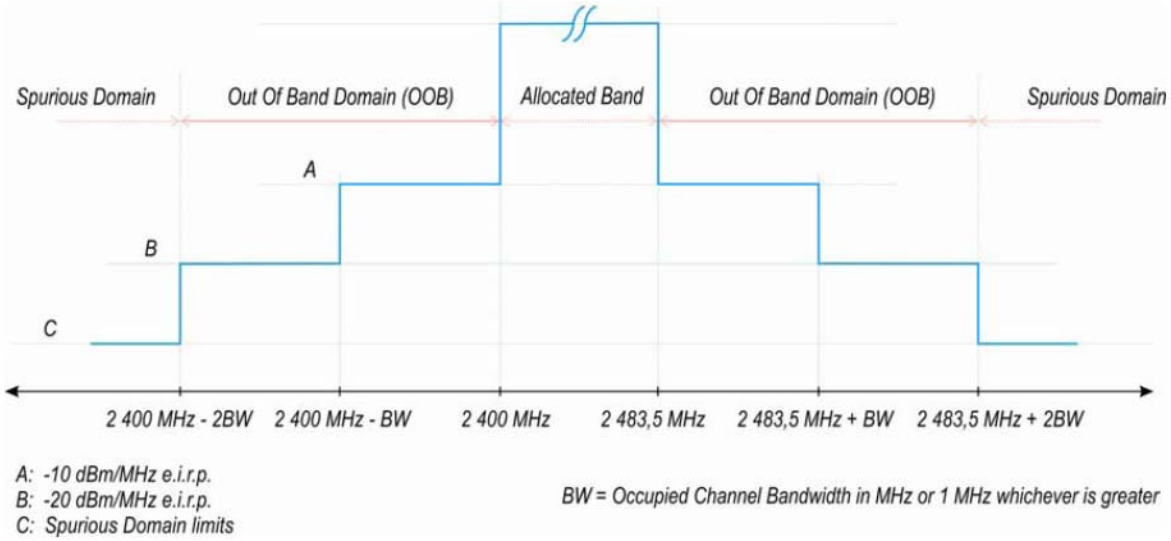
TEST RESULTS

Frequency (MHz)	99% Bandwidth Result (MHz)	Limited (MHz)	Verdict
2402 MHz	1.024	<=5	PASS
2480 MHz	1.020	<=5	PASS

1.14 TRANSMITTER UNWANTED EMISSION IN THE OUT-OF BAND

LIMIT

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the limits of the mask given in below figure.

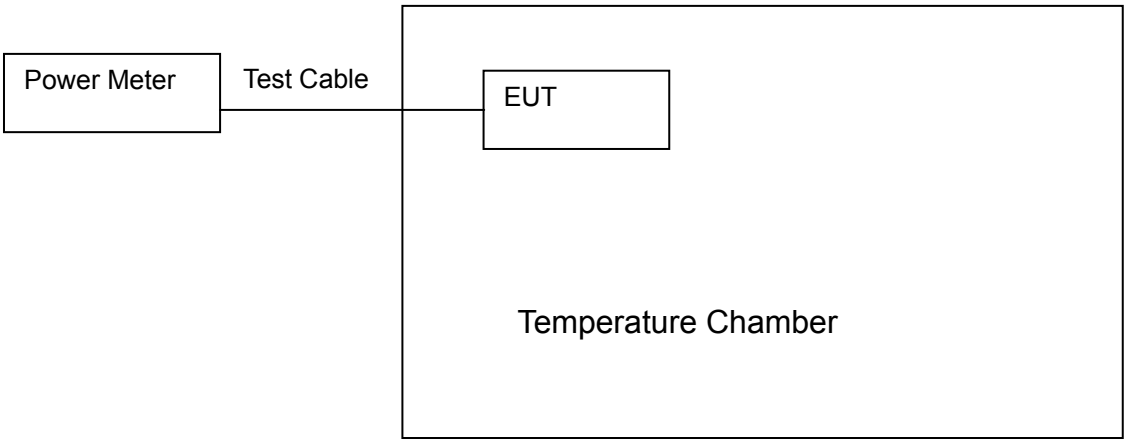


MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CAL DUE.
Vector Signal Generater	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.9.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) Annex B and C for the measurement methods.

The antenna shall be connected to the spectrum analyzer of RF power measurement and use the following settings

Step 1: Resolution bandwidth: 1MHz, Video bandwidth: 3MHz, Detector mode: RMS
Trace mode: Clear/Write, Sweep point: 5000, Span :0Hz ;Sweep Mode: Continuous
Centre frequency: 2484MHz , Trigger Mode: Video Trigger

Step 2: Adjust the trigger level to select the transmissions with the highest power level
Set a window to match the start and end of the burst and in which the RMS power shall be measured using the time domain power function
Select RMS power to be measure within the selected window and note the result which is the RMS power within this 1MHz segment (2483,5MHz to 2484,5MHz). Compare this value with the applicable limit provided by the mask

Step3:Change the centre frequency of the analyser to 2484MHz +BW and perform the measurement for the first 1MHz segment within range 2483,5MHz +BW to 2483,5MHz+2BW.
Increase the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .
The centre frequency of the last 1MHz segment shall be set to 2483,5MHz +2BW-0,5MHz.

Step4:Change the centre frequency of the analyser to 2399,5MHz and perform the measurement for the first 1MHz segment within range 2400MHz -BW to 2400MHz.
Reduce the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .
The centre frequency of the last 1MHz segment shall be set to 2400MHz -2BW+0,5MHz.

Step5:Change the centre frequency of the analyser to 2399,5MHz-BW and perform the measurement for the first 1MHz segment within range 2400MHz -2BW to 2400MHz-BW.
Reduce the centre frequency in 1MHz steps and repeat the measurements to cover

this whole range .

The centre frequency of the last 1MHz segment shall be set to 2400MHz -2BW+0,5MHz.

Step6: 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 1MHz segment and compare with the limits provided by the mask . if more than one antenna assembly is intended for this power setting , the antenna with the highest gain shall be considered

For smart antenna systems, 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 .

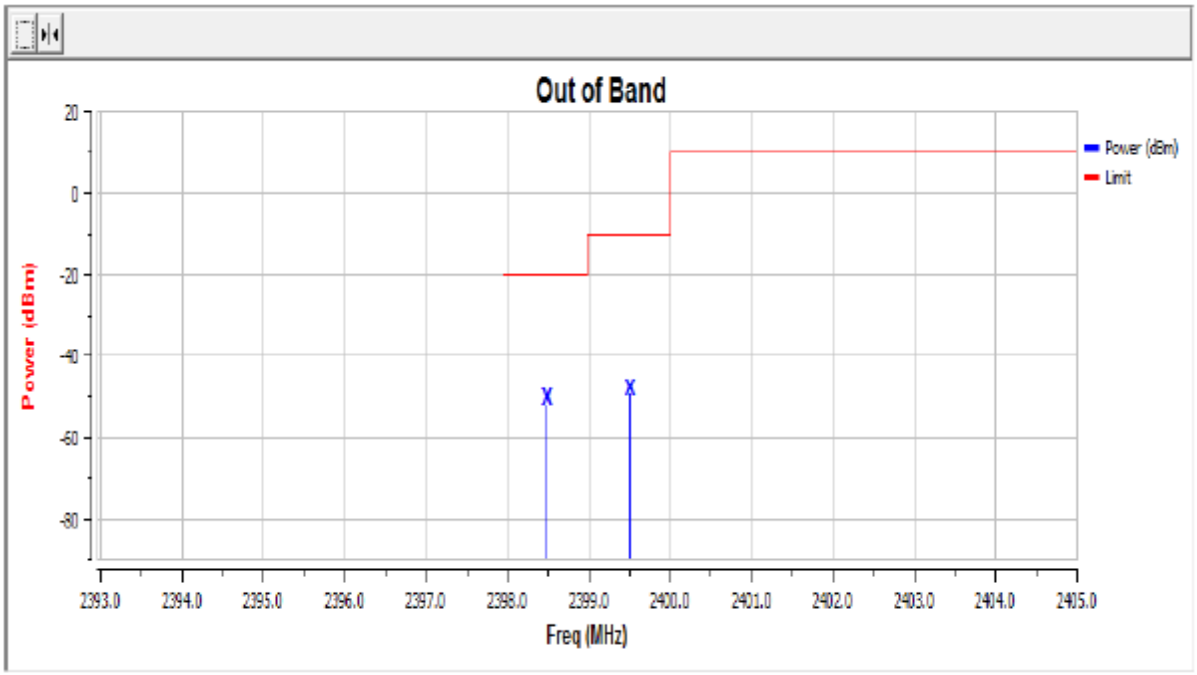
The measurement shall be performed at the lowest, the middle and the highest channel on which the equipment can operate.

TEST RESULTS

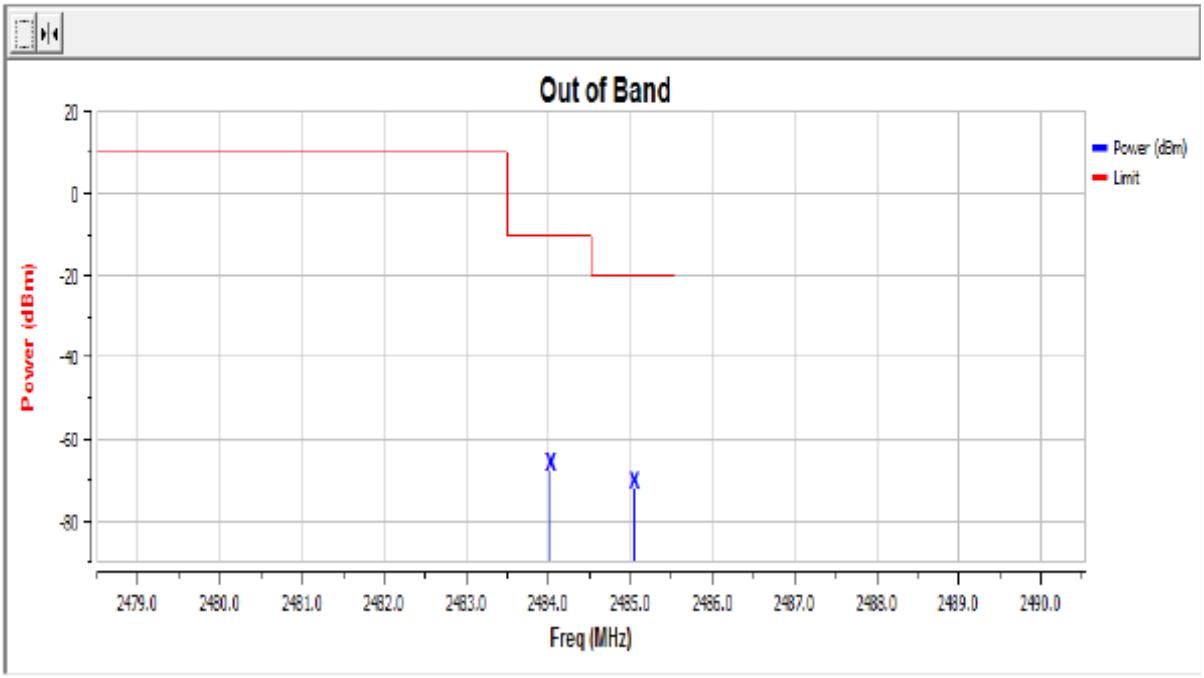
PASS.

Test Plot

Channel	Antenna	Freq(MHz)	Level	Limit
CH Low-2402	Antenna 1	2399.5	-49.34	-10
CH Low-2402	Antenna 1	2398.478	-51.9	-20



Channel	Antenna	Freq(MHz)	Level	Limit
CH High-2480	Antenna 1	2484.02	-67.42	-10
CH High-2480	Antenna 1	2485.04	-72.07	-20



1.15 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

LIMIT

The transmitter unwanted emissions in the spurious domain shall not exceed the values in tables in the indicated bands:

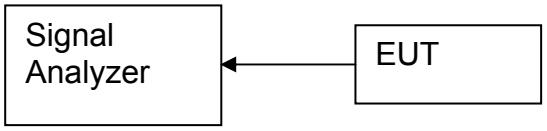
Frequency Range	Maximum power ERP(<=1GHz) ERP(>GHz)	bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87.5 MHz	-36dBm	100kHz
87.5MHz to118 MHz	-54dBm	100kHz
118 MHz to174MHz	-36dBm	100kHz
174MHz to 230MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 862 MHz	-54dBm	100kHz
862 MHz to1 GHz	-36dBm	100kHz
1GHz to12.75 GHz	-30dBm	1MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.10.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.10.2 for the measurement methods.

The antenna shall be connected to a spectrum analyzer of RF power measurements
Step 1: the unwanted emission over the range 30MHz to 1000MHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :100kHz , video bandwidth :300kHz
Detector mode :Peak trace mode: Maxhold Sweep point :>=9970, sweep time:200ms
Step 2: the unwanted emission over the range 1GHz to 12.75GHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :1MHz , Video bandwidth :3MHz
Detector mode :Peak Trace mode: Maxhold Sweep point :>=11750, sweep time:200ms

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

Test Mode: GFSK **Tested by:** Andy
Ambient temperature: 25°C **Relative humidity:** 53.7 % RH **Date:** June 15, 2015

Freq (MHz)	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
181.970	-70.57	-54.00	-16.57	Pass
188.002	-71.16	-54.00	-17.16	Pass
199.969	-69.77	-54.00	-15.77	Pass
200.066	-70.07	-54.00	-16.07	Pass
207.947	-66.44	-54.00	-12.44	Pass
208.044	-66.41	-54.00	-12.41	Pass

1.16 RECEIVER SPURIOUS EMISSIONS

LIMIT

The level of spurious emissions shall be measured as, either:

1. Their power in specified load (conducted spurious emissions); and
2. Their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
3. Their effective radiated power when radiated by cabinet and antenna.

The spurious emissions of the receiver shall not exceed the values in tables in the indicated bands:

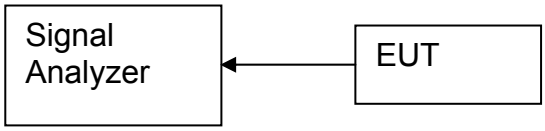
Frequency Range	Maximum power (ERP)	Measurement Width
30 MHz to 1 GHz	-57 dBm	100kHz
1 GHz to 12.75 GHz	-47 dBm	1MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.11.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.11.2 for the measurement methods.

The antenna shall be connected to a spectrum analyzer of RF power measurements

Step 1: the unwanted emission over the range 30MHz to 1000MHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :100kHz , video bandwidth :300kHz
Detector mode :Peak trace mode: Maxhold Sweep point :>=9970, sweep time: auto
Step 2: the unwanted emission over the range 1GHz to 12.75GHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :1MHz , Video bandwidth :3MHz

Detector mode :Peak Trace mode: Maxhold Sweep point :>=25000, sweep time: auto

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

Test Mode: GFSK **Tested by:** Andy
Ambient temperature: 25°C **Relative humidity:** 53.7 % RH **Date:** June 15, 2015

Freq (MHz)	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
2412.000	-62.71	-47.00	-15.71	Pass
2414.000	-61.75	-47.00	-14.75	Pass
5699.000	-62.73	-47.00	-15.73	Pass
6666.000	-62.54	-47.00	-15.54	Pass
9602.000	-60.69	-47.00	-13.69	Pass
9603.000	-62.19	-47.00	-15.19	Pass

1.17 ADAPTIVITY AND RECEIVER BLOCKING

LIMIT OF ADAPTIVITY AND BLOCKING

Only for adaptive equipment and RF output power >=10dBm(ERP)

- For non-LBT based Detect and avoid equipment shall comply with the following requirement

The unavailable channel shall remain unavailable for a minimum time equal to 1s after which the channel may be considered again as an “available” channel.

The Channel Occupancy Time shall be less than 40ms . each such transmission sequence shall be followed with an idle period of minimum 5% of the channel occupancy time with a minimum of 100us,after this, the procedure need to repeated.

The detection threshold shall be proportional to the transmit power of the transmitter:

For a 20dBm(ERP)transmitter the detection threshold level shall be equal to or lower than -70dBm/MHz at the input to the receiver.

For power level below 20dBm(ERP),the detection threshold level may be relaxed to TL=-70dBm/MHz+20-Pout(ERP)

- For LBT based Detect and avoid equipment shall comply with the following requirement

The Clear Channel Assessment check observation time shall be not less than 20us.

The Channel Occupancy Time shall be less than 60ms followed by an idle period of at least 5% of the channel occupancy time used in the equipment for the current fixed frame period

The detection threshold for the CCA shall be proportional to the transmit power of the transmitter:

For a 20dBm(ERP)transmitter the CCA threshold level(TL) shall be equal to or lower than -70dBm/MHz at the input to the receiver.

For power level below 20dBm(ERP),the CCA threshold level may be relaxed to TL=-70dBm/MHz+20-Pout(ERP)

- Short control signalling transmissions

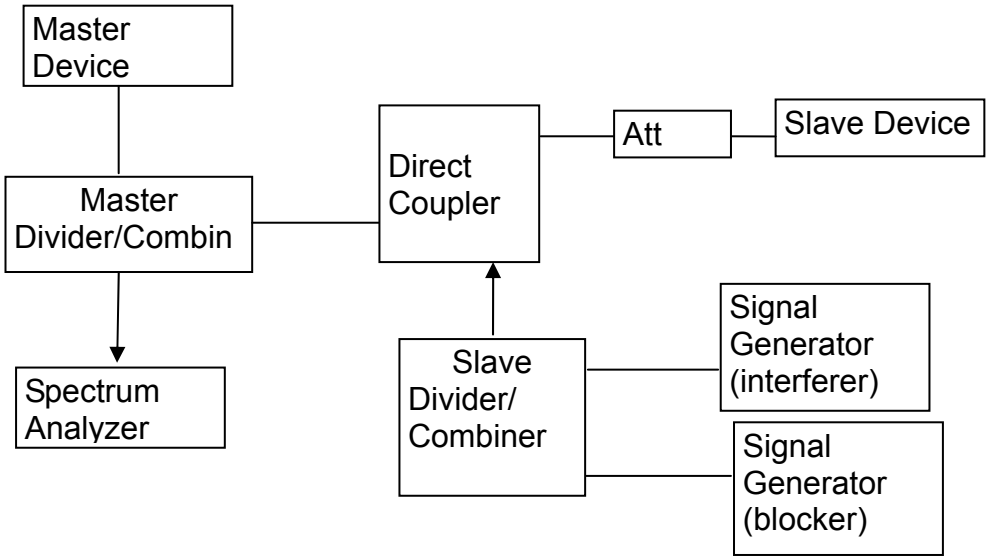
Short control signalling transmissions of adaptive equipment using wide band modulations shall have a maximum duty cycle of 10 % within an observation period of 50ms.

MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Vector Signal Generator	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Signal Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



***Remarks**:*
The Signal Analyzer could be connected to a monopole antenna or directly connected to the EUT through divider, if the EUT has already employing an antenna connector.

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.7.2 for the measurement method.

The EUT may connect to a companion device during the test, the interference signal generator, the blocking signal generator, the spectrum analyzer , the EUT and the companion device are connected using direction coupler and divider. Although the interference and blocking signal generators do not generate any signal at the point in time, the spectrum analyzer is used to monitor the transmissions of the EUT in response to the interfering and the blocking signals.
Step1:The analyzer shall be set as follows
RBW: >=Occupied Channel Bandwidth; Filter type: Channel Filter; VBW:RBW
Centre Frequency: tested frequency; Span: 0Hz; Sweep Time: 20ms ;
Trace Mode: clear/write; Trigger Mode: Video.
Step2: configure the EUT for normal transmission with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the hopping frequency.
Step3:add the interference signal

A 100% duty cycle interference signal is injected centred on the hopping frequency being tested. This interference signal shall be a band limited noise signal which has a flat power spectrum density and shall have a bandwidth greater than the occupied channel bandwidth of the EUT
Step4:Verfication of reaction to the interference signal
The spectrum analyzer shall be used to monitor the transmissions of the EUT on the selected hopping frequency with the interfering signal injected. This may require the spectrum analyzer sweep to be triggered by the start of the interfering signal.
Step5:adding the blocking signal
With the interfering signal preset ,a 100% duty cycle CW signal is inserted as the blocking signal, the frequency and the level are provided in table3 if clause 4.3.1.10.2
Repeat step4 to verify that the EUT does not resume any normal transmissions on the hopping frequency being investigated.
Step6: removing the interference and blocking signal
On removal of the interference and blocking signal ,the EUT is allowed to re-include any channel previously marked as unavailable ;

The steps 2 to steps 6 shall be repeated for each of the hopping frequencies to be tested.

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

Not Applicable

Because RF Output power of EUT is less than10dBm, according to standard EN300328, Duty cycle, Tx-Sequence, Tx-gap is not required.

EMTEK
Access to the World

ETSI EN 300 328 V1.8.1: 2012

TEST REPORT

FOR

Bluetooth 150Mbps Wireless N USB Module

Model No.: BL-R8723RB1

Trademark: LB-LINK

Report No.: ED150528298R3

Issue Date: September 02, 2015

Prepared for

SHENZHEN BILIAN ELECTRONIC CO., LTD.
Building B1, Zhongxing Industrial Zone, Juling, Jutang Community,
Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China

Prepared by

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TEST RESULT CERTIFICATION

Applicant	:	SHENZHEN BILIAN ELECTRONIC CO., LTD. Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
Manufacturer	:	SHENZHEN BILIAN ELECTRONIC CO., LTD. Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
EUT	:	Bluetooth 150Mbps Wireless N USB Module
Model No.	:	BL-R8723RB1
Trademark	:	LB-LINK

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 328 V1.8.1: 2012	PASS

The device described above is tested by DONGGUAN EMTEK CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and DONGGUAN EMTEK CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 300 328 V1.8.1: 2012 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of *DONGGUAN EMTEK CO., LTD.*

Reviewed and Approved by:

Approved By

Sam Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	ED150528298R3

EUT DESCRIPTION

Product Name	Bluetooth 150Mbps Wireless N USB Module		
Model number	BL-R8723RB1		
Power Supply	DC From PC		
Technical Description			
Kind of Device	Bluetooth 4.0	Bluetooth 3.0+EDR	WiFi
Operation Frequency	2402-2480MHz		2412-2462MHz for 802.11b/g/n(HT20) ; 2422-2452MHz for 802.11n(HT40)
Modulation	GFSK	GFSK, π/4-DQPSK, 8DPSK	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n, DSSS with DBPSK/DQPSK/CCK for 802.11b;
Number of Channel	40	79	11 Channels for 802.11b/g/n(HT20) 7 Channels for 802.11n(HT40)
Channel space	2MHz	1MHz	5MHz
Max RF Output Power	2.02dBm	4.43dBm	14.10dBm
Antenna Type	External Antenna		
Antenna Gain	2 dBi		

Note: *for more details, please refer to the User's manual of the EUT.*

SUMMARY OF TEST RESULT

Clause (EN 300 328)	Test Parameter	Verdict	Remark
4.3.1.1	RF Output Power	PASS	
4.3.1.2	Duty Cycle and Tx-Sequence and Tx-Gap	N/A	Only for non-adaptive equipment and RF Output Power>10dBm
4.3.1.3	Dwell Time and Minimum Frequency Occupation	PASS	
4.3.1.3	Hopping Frequency Sequence	PASS	
4.3.1.4	Hopping Frequency Separation	PASS	
4.3.1.5	Medium Utilisation Factor	N/A	Only for non-adaptive equipment and RF Output Power>10dBm
4.3.1.6	Adaptivity	N/A	Only for adaptive equipment and RF Output Power>10dBm
4.3.1.7	Occupied Channel Bandwidth	PASS	
4.3.1.8	Transmitter Unwanted Emission in the Out-of Band	PASS	
4.3.1.9	Transmitter Unwanted Emissions in the Spurious Domain	PASS	
4.3.1.10	Receiver Spurious Emissions	PASS	
4.3.1.11	Receiver Blocking	N/A	Only for non-adaptive equipment and RF Output Power>10dBm

Remark:
1. When determining the test conclusion, the Measurement Uncertainty of test has been considered.
2. N/A is an abbreviation for Not Applicable.

TEST METHODOLOGY

1.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

ETSI EN 300 328 – Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques: Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

1.2 MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/28/2016
Pre-Amplifier	HP	8447D	2944A07999	05/28/2016
Bilog Antenna	Schwarzbeck	VULB9163	142	05/28/2016
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/28/2016
Horn Antenna	Schwarzbeck	BBHA9120D	D143	05/28/2016
Cable	Schwarzbeck	AK9513	ACRX1	05/28/2016
Cable	Rosenberger	N/A	FP2RX2	05/28/2016
Cable	Schwarzbeck	AK9513	CRPX1	05/28/2016
Cable	Schwarzbeck	AK9513	CRRX2	05/28/2016
RF Power Meter	BOONTON	4232A	10539	05/28/2016
Temp. / Humidity Chamber	Kingson	THS-M1	242	05/28/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	101045	05/28/2016
Vector Signal Generater	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Meter	Agilent	U2531A	N/A	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Power Sensor	Agilent	U2021XA	N/A	05/28/2016
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

1.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition. so those data rates (1Mbps GFSK; 2Mbps pi/4-DQPSK modulation; 3Mbps 8DQPSK modulation) were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

FACILITIES AND ACCREDITATIONS

1.4 FACILITIES

All measurement facilities used to collect the measurement data are located at No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.5 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

1.6 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description		
EMC Lab.	:	Accredited by CNAS, 2015.06.11 The certificate is valid until 2018.07.03 The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006 The Certificate Registration Number is L3150 Accredited by TUV Product Service Group 2011.07.05 Accredited by TUV Rheinland Shenzhen 2011.05.12 The certificate is valid until 2012.11.12 The Laboratory has been assessed according to the requirements ISO/IEC 17025: 2005 Accredited by FCC, June 18, 2014 The Certificate Number is 247565 Accredited by Industry Canada, February 19, 2014 The Certificate Number is 9444A.
Name of Firm	:	DONGGUAN EMTEK CO., LTD.
Site Location	:	No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

1.7 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model No.	Series No.	Note
1	N/A				

Notes:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

ETSI EN 300 328 REQUIREMENTS

1.8 RF OUTPUT POWER

LIMIT

EN 300 328 Clause 4.3.1.1

The Maximum RF Output Power <= 100 mW (20 dBm) (EIRP) at both Normal and Extreme conditions.

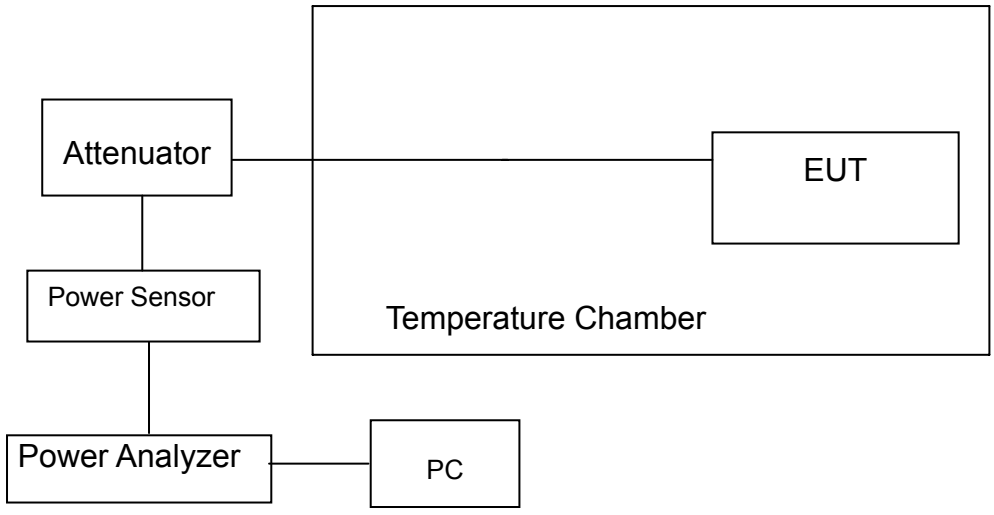
MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Power Sensor	Agilent	U2021A	N/A	05/28/2016
Power Analyzer	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2 for the measurement method.

The test procedure shall be as follows:

Step 1:
Use a fast power sensor suitable for 2.4 GHz and capable of 1 MS/s.
Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples must represent the power of the signal.
- Measurement duration: For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.
NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:
For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.
- For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.

Step 3:
Find the start and stop times of each burst in the stored measurement samples.
NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB below the RMS burst power calculated in step 4.

Step 4:
Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these P burst values, as well as the start and stop times for each burst.

Step 5:
The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:
Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain G shall be used.
The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G$$

Step 7:
The measurement shall be repeated at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded. FHSS equipment shall be made to hop continuously to each of these three frequencies separately. These measurements shall be performed at normal and extreme test conditions.

Test Result

Test Conditions			Transmitter Power (dBm)				
			Temp (25)°C	Temp (-20)°C		Temp (55)°C	
Modes	Channel	Volt / Power	230V	207V	253V	207V	253V
GFSK	2402MHz	RMS	**4.43**	2.16	4.08	2.04	2.13
	2441 MHz	RMS	3.58	2.22	3.11	3.03	3.24
	2480 MHz	RMS	2.77	3.11	2.13	3.12	2.23
π/4-DQPSK	2402MHz	RMS	3.29	1.13	3.21	2.18	3.12
	2441 MHz	RMS	2.42	3.18	1.24	1.16	1.31
	2480 MHz	RMS	1.44	2.24	3.15	2.24	4.28
8DPSK	2402MHz	RMS	3.53	2.21	4.19	3.22	2.26
	2441 MHz	RMS	2.58	1.16	1.24	1.26	1.27
	2480 MHz	RMS	1.60	3.19	4.06	4.14	3.13
Limit			<= 20dBm				
Verdict			PASS	PASS	PASS	PASS	PASS

1.9 DUTY CYCLE AND TX-SEQUENCE AND TX-GAP

LIMIT

ETSI EN 300 328 clause 4.3.1.2

The requirement apply to non-adaptive equipment or to adaptive equipment when operating in a non-adapter mode

These requirement do not apply for equipment with a maximum declared RF output power level of less than 10 dBm(EIRP) or for equipment when operating in a mode where the RF output power is less than 10 dBm(EIRP);

the maximum duty cycle is less than 1;

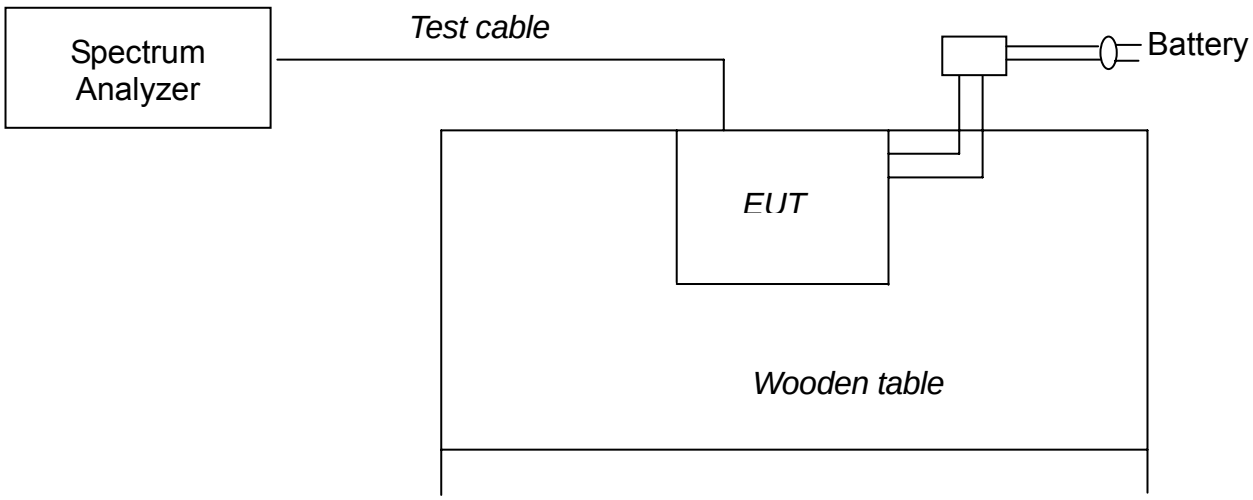
the maximum Tx-sequence time and minimum Tx-gap time shall be 5ms.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Vector Signal Generator	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Meter	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2.1.2 for the measurement method.

Use a fast power sensor suitable 2.4GHz and sample speed 1Ms/s or faster.
Between the save start and stop times of each individual burst ,calculate the TxOn time ,save these TxOn values
Between the save stop and start times of two subsequent burst ,calculate the TxOff time ,save these TxOff values
Duty cycle is the sum of all TxOn times divided by the observation period
For equipment using blacklisting ,the TxOn time measured for a single hopping frequency shall be multiplied by the number of blacklisted frequency . this value shall be add up to the sum calculated in the previous bullet point . if the number of blacklisted frequencies cannot be determined ,the minimum number of hopping frequencies shall be assumed.
The above calculated value for duty cycle shall be recorded in the report
Any TxOff time that is greater than the minimum Tx-gap time is considered a Tx-gap .the lowest Tx-gap time shall be recorded in the report
The Tx-sequence time is the time between two subsequent Tx-gaps, the maximum Tx-sequence time shall be recorded in the report.

The measurement shall be performed during normal operation (hopping)

TEST RESULTS

Not Applicable

Because RF Output power of EUT is less than10dBm, according to standard EN300328, Duty cycle, Tx-Sequence, Tx-gap is not required.

1.10 DWELL TIME AND MINIMUM FREQUENCY OCCUPATION

LIMIT

ETSI EN 300 328 clause 4.3.1.3

The requirement applies to all types of frequency hopping equipment.

- For non-adaptive frequency hopping system

The accumulated Dwell Time on any hopping frequency shall not be greater than 15ms within any period of 15ms multiplied by the minimum number of hopping frequency (N)

Non-adaptive medical devices are allowed to have an operating mode in which the maximum dwell time is 400ms

The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

The hopping sequences shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum hopping frequency separation in MHz

- For adaptive frequency hopping system

The maximum accumulated Dwell Time on any hopping frequency shall be 400ms within any period of 400ms multiplied by the minimum number of hopping frequency (N)

The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

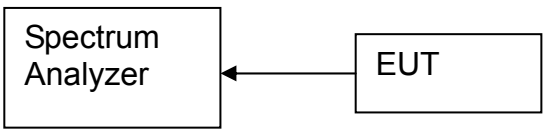
The hopping sequences shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum hopping frequency separation in MHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.4.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.4.2 for the measurement method.

Step1:The output of the transmitter shall be connected to a spectrum analyzer. The analyser shall be set as follows Centre frequency : equal to the hopping frequency being investigated Frequency Span: 0Hz; RBW: 50% of the Occupied Channel Bandwidth; VBW:=RBW; Detector mode: RMS; Sweep Point: 30000; Trace Mode: Clear/Write; Trigger:Free Run Sweep Time: equal to the dwell time multiple by minimum number of hopping frequencies(N);
Step2: indentify the data points related to the frequency being investigated by applying a threshold
Step3: the result in step2 is the accumulated Dwell Time which shall comply with the limit provided in clauses 4.3.1.3.2.1
Step4: make the following changes on the analyser and repeat step2
Sweep time : 4×dwell time×actual number of hopping frequencies in use
The result shall be compared to the limit for the minimum frequency occupation time defined in clause 4.3.1.3.2.1
Step5: make the following changes on the analyser: Start frequency:2400MHz; stop frequency: 2483.5MHz; RBW: 50% of the Occupied Channel Bandwidth; VBW:=RBW; Detector mode: RMS; Sweep Time: Auto; Trace Mode: Maxhold; Trigger: Free Run
When the trace has completed, indentify the number of hopping frequencies used by the hopping sequence. The result shall be compared to the limit (N) defined in clauses 4.3.1.3.2.1
Step6: for adaptive systems, using the lowest and highest -20dB points from the total spectrum envelope obtained in step5, it shall be verified whether the system uses 70% of the band specified in clause 1.
The measurement shall be performed during normal operation (hopping)

TEST RESULTS

Worst Case-Modulation Type: GFSK, Data Rate: 1Mbps

TEST CONDITION			Dwell Time Per Hop (ms)	Minimun Number of Hop Frequency	400msX minimum number of hopping frequencies (s)	maximum accumulated dwell time (ms)	Limited (ms)
Dwell Time	2402MHz	DH 5	0.40	79	31.6	128.00	<=400
	2441MHz	DH 5	1.66	79	31.6	265.60	<=400
	2480MHz	DH 5	2.91	79	31.6	308.46	<=400
Verdict			PASS				
Measurement uncertainty(%)			+2.3/-2.4				

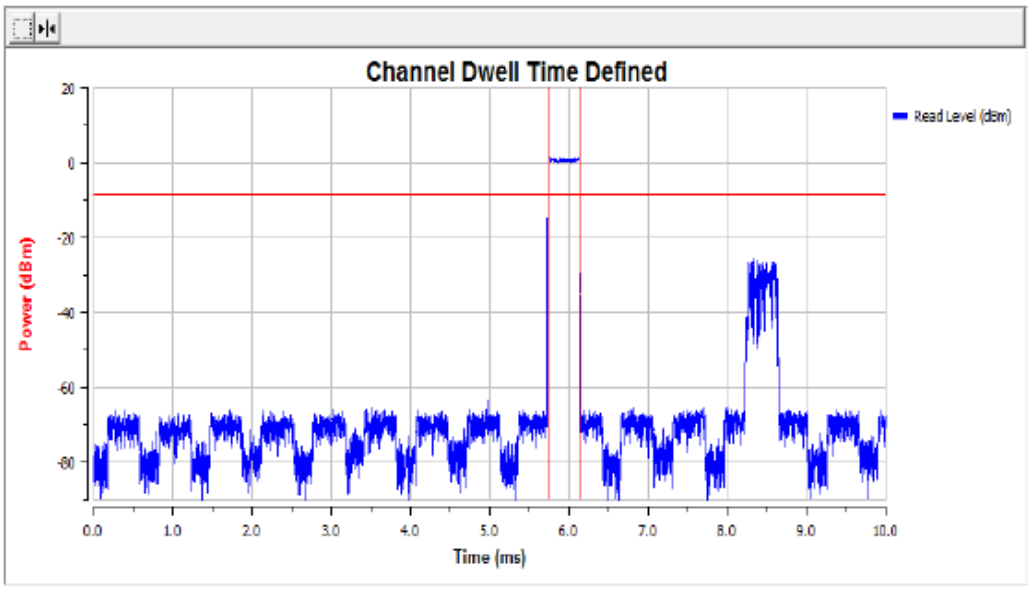
Worst Case-Modulation Type: GFSK, Data Rate: 1Mbps

TEST CONDITION			Dwell Time Per Hop (ms)	Actual Number of Hop Frequency(N)	[4*Dwell time per hop*N] (ms)	Number of hop in [4*Dwell time per hop*N]	Minimum Number of Hopping Limit in [4*Dwell time per hop*N] (ms)	Limited (ms)
Minimum Frequency Occupation	2402MHz	DH 5	0.40	79	512	4	1	>=400
	2441MHz	DH 5	1.66	79	1062.4	4	1	>=400
	2480MHz	DH 5	2.91	79	1242.57	4	1	>=400
Verdict			PASS					
Measurement uncertainty(%)			+2.3/-2.4					

Test Plot:

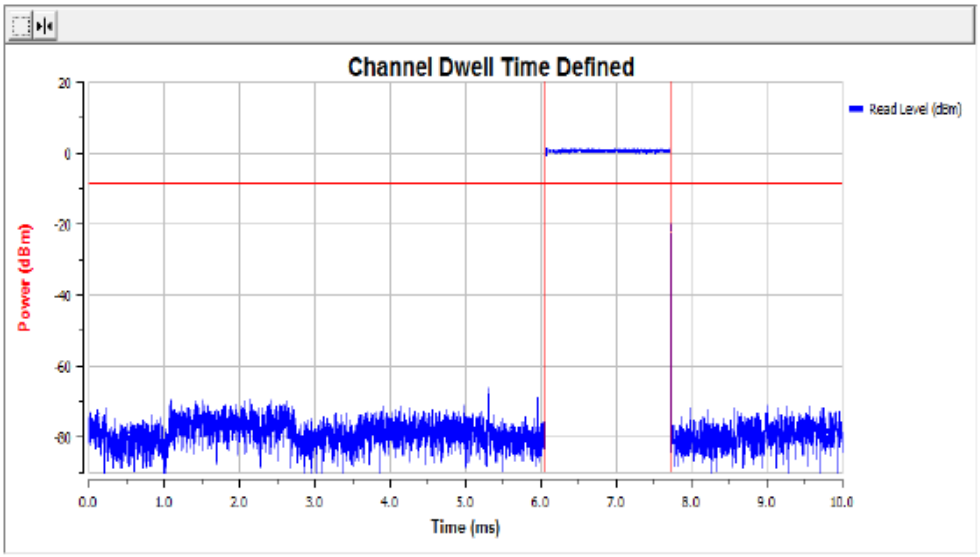
GFSK(1M) DH1:CH Low-2402:

Length of Transimission Time (ms)	0.40	-
Dwell Time (ms)	128	Pass
Minimum Frequency Occupation (ms)	512	Pass



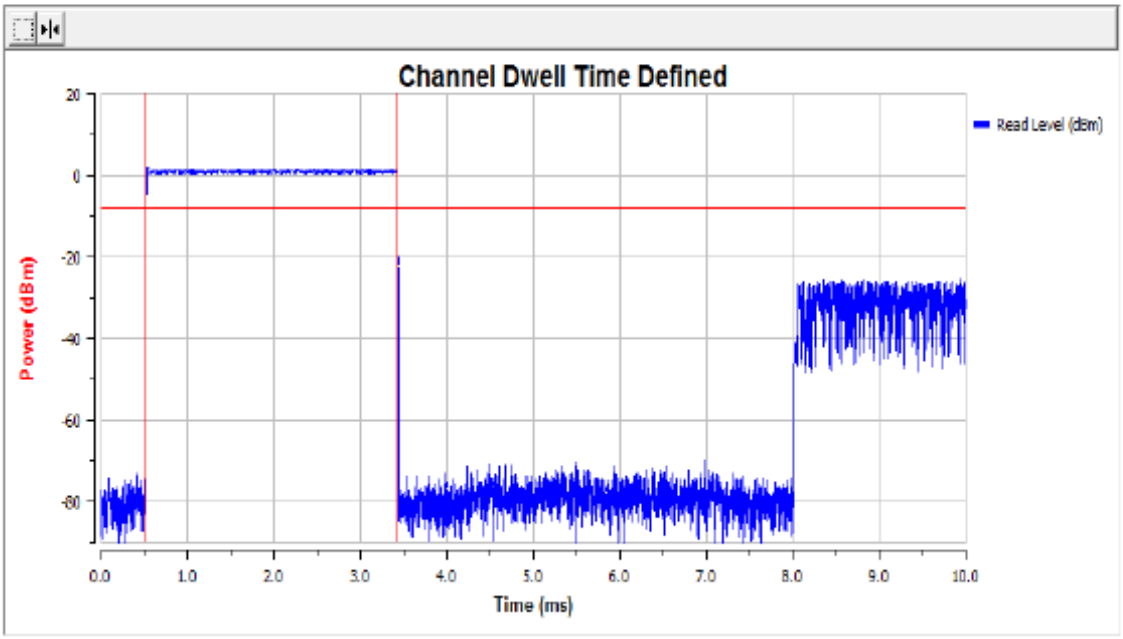
GFSK(1M) DH3:CH Low-2402:

Length of Transimission Time (ms)	1.66	-
Dwell Time (ms)	265.6	Pass
Minimum Frequency Occupation (ms)	1062.4	Pass



GFSK(1M) DH5:CH Low-2402:

Length of Transimission Time (ms)	2.91	-
Dwell Time (ms)	308.46	Pass
Minimum Frequency Occupation (ms)	1242.57	Pass



1.11 HOPPING FREQUENCY SEQUENCE

LIMIT

ETSI EN 300 328 clause 4.3.1.3

The requirement applies to all types of frequency hopping equipment.

- For non-adaptive frequency hopping system

The hopping sequences shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum hopping frequency separation in MHz

- For adaptive frequency hopping system

Adaptive frequency hopping systems shall be capable of operating over a minimum of 70% of the band specified in clause1.

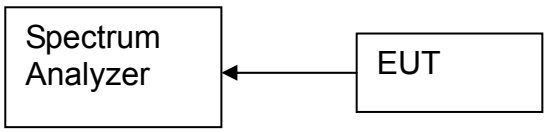
The hopping sequences shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum hopping frequency separation in MHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.4.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.4.2 for the measurement method.

Step1:The output of the transmitter shall be connected to a spectrum analyser
The analyser shall be set as follows
Centre frequency : equal to the hopping frequency being investigated
Frequency Span: 0Hz; RBW: 50% of the Occupied Channel Bandwidth; VBW:=RBW;
Detector mode: RMS; Sweep Point: 30000; Trace Mode: Clear/Write; Trigger:Free Run
Sweep Time: equal to the dwell time multiple by minimum number of hopping frequencies(N);
Step2: indentify the data points related to the frequency being investigated by applying a threshold
Step3: the result in step2 is the accumulated Dwell Time which shall comply with the limit provided in clauses 4.3.1.3.2.1
Step4: make the following changes on the analyser and repeat step2
Sweep time :4×dwell time×actual number of hopping frequencies in use
The result shall be compared to the limit for the minimum frequency occupation time defined in clause 4.3.1.3.2.1
Step5:make the following changes on the analyser:
Start frequency:2400MHz; stop frequency: 2483.5MHz;
RBW: 50% of the Occupied Channel Bandwidth; VBW:=RBW;
Detector mode: RMS; Sweep Time: Auto; Trace Mode: Maxhold; Trigger: Free Run
When the trace has completed, indentify the number of hopping frequencies used by the hopping sequence. The result shall be compared to the limit (N) defined in clauses 4.3.1.3.2.1
Step6:for adaptive systems, using the lowest and highest -20dB points from the total spectrum envelope obtained in step5, it shall be verified whether the system uses 70% of the band specified in clause 1.

The measurement shall be performed during normal operation (hopping)

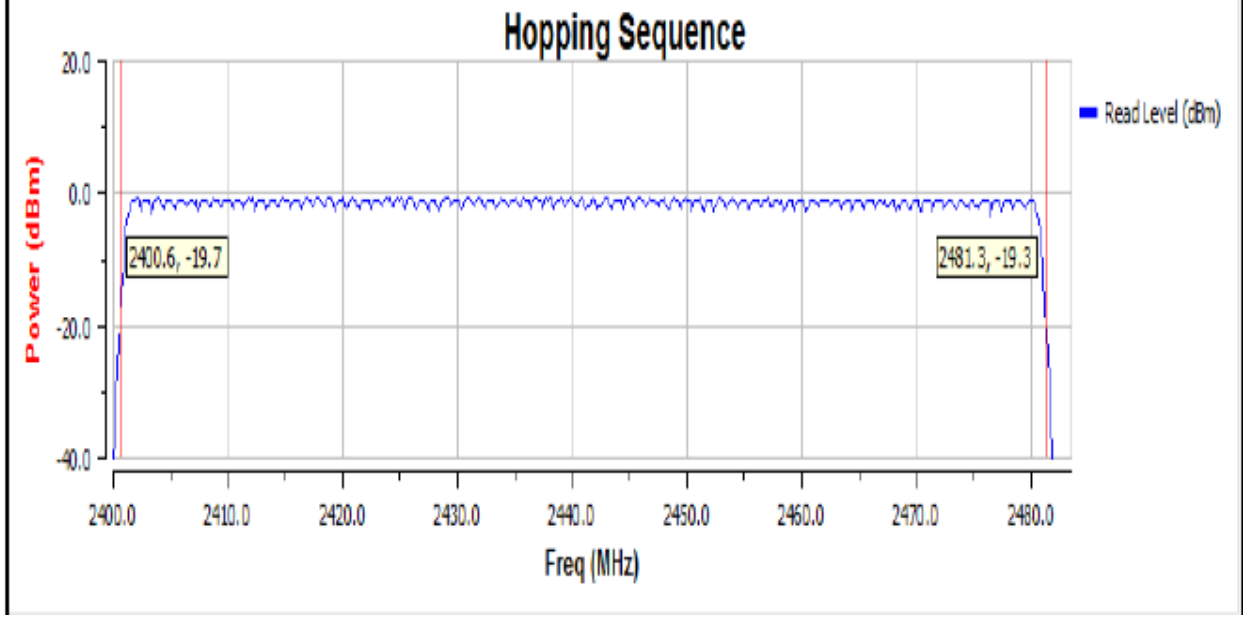
TEST RESULTS

Worst Case-Modulation Type: GFSK, Data Rate: 1Mbps

Frequency Band	Number of Hopping Frequencies (N)		Limit	Result
2400MHz – 2483.5MHz	80		15	Pass
	-20dB Points Occupied Bandwidth	**Minimum Hopping Range (%)**	**Minimum Hopping Range Limit** (%)	**Result**
	80.72MHz	96.67%	70%	Pass

Test Plot:

Hopping Sequence (MHz)	80.72
Hopping Number	80



1.12 HOPPING FREQUENCY SEPARATION

LIMIT

ETSI EN 300 328 clause 4.3.1.4

The requirement applies to all types of frequency hopping equipment.

- For non-adaptive frequency hopping system

The minimum Hopping Frequency Separation shall be equal to Occupied Bandwidth of a single hop, with a minimum separation of 100kHz

- For adaptive frequency hopping system

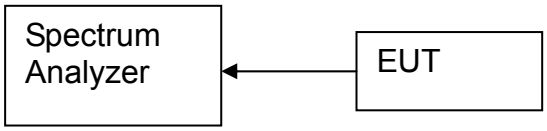
The minimum Hopping Frequency Separation shall be 100kHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.5.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.5.2 for the measurement method.

Step1:The output of the transmitter shall be connected to a spectrum analyser
The analyser shall be set as follows
Centre frequency : centre frequency of the two adjacent hopping frequencies
Frequency Span: sufficient to see the complete power envelope of bith hopping frequencies; RBW: 1% of the Span; VBW:3RBW;
Detector mode: RMS; Trace Mode:Maxhold; Sweep Time: auto;
Step2:use the marker function of the analyser to define the lower and the upper -20dBr points for the both hopping frequencies F1 and F2. This will result in $F1_L$ and $F1_H$ for the hopping frequency F1 and $F2_L$ and $F2_H$ for hopping frequencies F2.
Step3:Calculate the centre frequencies $F1_c$ and $F2_c$ for both hopping frequencies using the formulas below. $F1_c=(F1_L + F1_H)/2$, $F2_c=(F2_L + F2_H)/2$

Calculate the -20dBr channel bandwidth (BWchan) using the formula below. BWchan= $F1_H - F1_L$.

Calculate the hopping separation(F_{hs}) using the formula below. $F_{hs}= F2_c - F1_c$

Compare the measured hopping frequency separation with the limit defined in clause 4.3.1.4.2. In addition, for non-adaptive frequency hopping equipment, the hopping frequency separation shall be equal to or greater than the -20dBr channel bandwidth or F_{hs}>= BWchan
For adaptive systems, in case of overlapping channels which will prevent the definition of -20dBr reference points $F1_H$ and $F2_L$, a higher reference level (e.g. -10dBr or -6dBr) may be chosen to define the reference points $F1_L$: $F1_H$; $F2_L$: $F2_H$
Alternatively, special test software may be used to:
Force the EUT to hop or transmit on a single hopping frequency by which the -20dBr reference points can be measured separately for the 2 adjacent hopping frequencies; and
Force the EUT to operate without modulation by which the centre frequencies $F1_C$ and $F2_C$ can be measured directly.

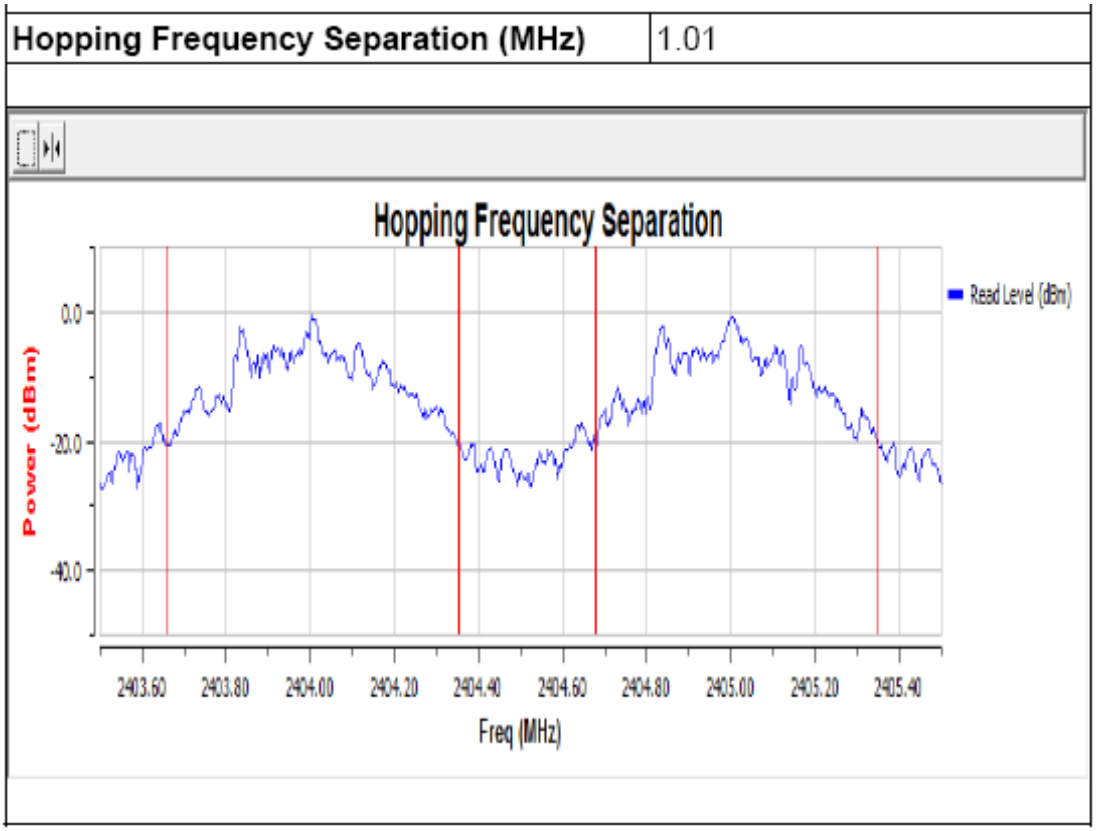
The measurement shall be performed during normal operation (hopping)

TEST RESULTS

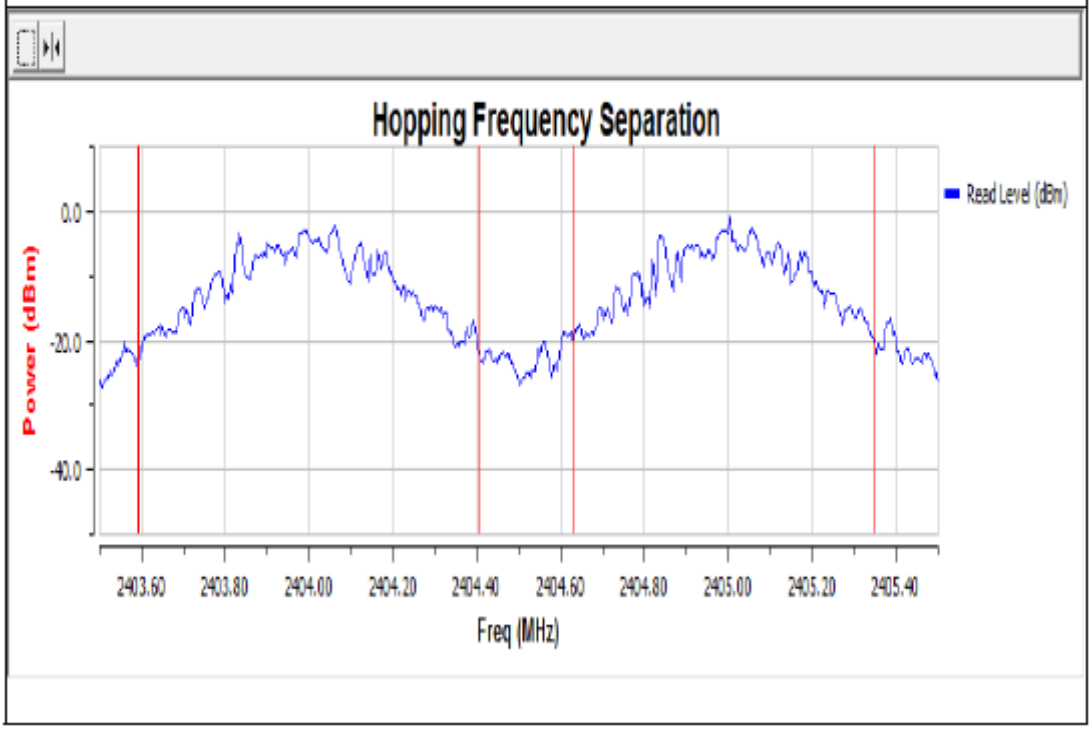
Worst Case-Modulation Type: GFSK, Data Rate: 1Mbps

Test Channel (MHz)	Channel Separation (KHz)	Limit (KHz)
2402	1010	100
2441	990	100
2480	970	100

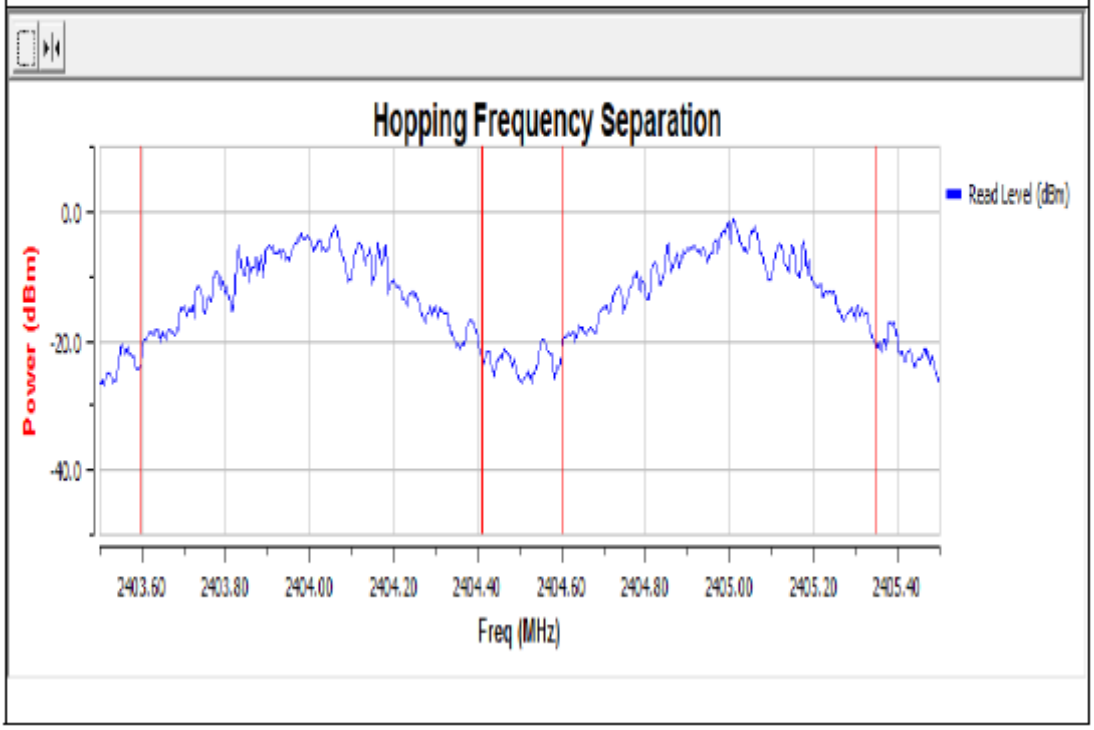
Test Plot:



Hopping Frequency Separation (MHz)	0.99



Hopping Frequency Separation (MHz)	0.97



1.13 MEDIUM UTILISATION FACTOR

LIMIT

ETSI EN 300 328 clause 4.3.1.5

This requirement apply to non-adaptive mode or adaptive equipment 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(EIRP) or for equipment when operating in a mode where the RF output power is less than 10 dBm(EIRP)

For non-adaptive equipment using wide band modulations other than FHSS, the Maximum Medium Utilization Factor shall be 10%.

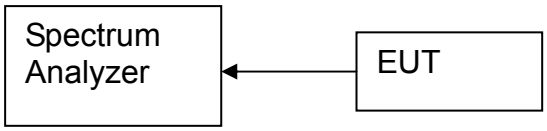
MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION

Temperature and Voltage Measurement (under normal and extreme test conditions)



Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.2.2.1.3 for the measurement method.

   Use a fast power sensor suitable for 2.4GHz and capable of 1Ms/s
   According to RF output power test procedure, measure the maximum RF output power
   According to duty cycle test procedure, measure the duty cycle and Tx-On and Tx-Off
   For each burst, calculate the product of (Pburst/100mW) and the Tx-On time
   NOTE: Pburst is expressed in mW,TxOn time is expressed in ms.
   Medium utilisation is the sum of all these products divided by the observation period (expressed in ms) . this value shall be recorded in the test report.

TEST RESULTS

Not Applicable

Because RF Output power of EUT is less than10dBm, according to standard EN300328, Medium Utilisation is not required.

1.14 OCCUPIED CHANNEL BANDWIDTH

LIMIT

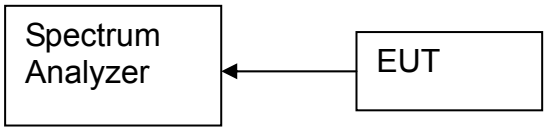
The requirement applies to all types of equipment using wide band modulation other than FHSS
The occupied channel bandwidth is the bandwidth that contains 99% of the power of the signal
The occupied channel bandwidth for each hopping frequency shall fall completely within the band given in the clause 1.
For non-adaptive frequency hopping systems with EIRP greater than 10 dBm, the Occupied Channel Bandwidth shall be less than 5MHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328(V1.8.1) clause 5.3.8.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.8.2 for the measurement method.

STEP 1:Connect the antenna to the spectrum analyzer and use the following setting
Centre Frequency : the centre frequency of the channel under test
Resolution Bandwidth: 100kHz, Video Bandwidth: 300kHz
Frequency Span: 2 nominal bandwidth
Detector Mode : RMS Trace Mode: max hold
Step 2: When the trace is completed, capture the trace and find the peak value and place the analyzer marker on this peak
Step 3: Use the 99% bandwidth function of the spectrum analyzer to measure the Occupied Channel Bandwidth of the EUT.

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

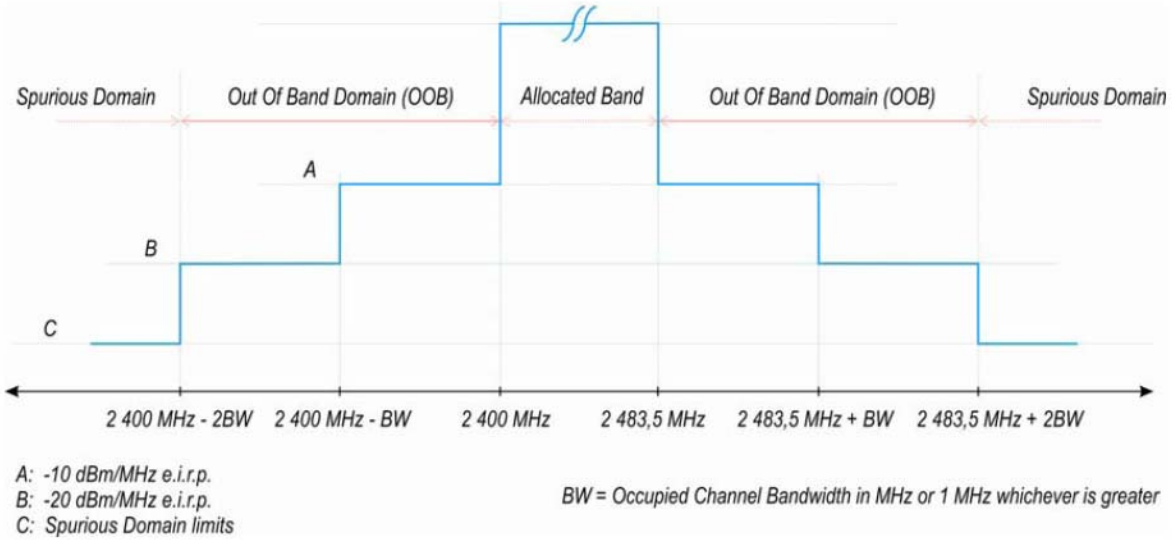
Worst Case-Modulation Type: GFSK, Data Rate: 1Mbps

Frequency (MHz)	99% Bandwidth Result (MHz)	Limited (MHz)	Verdict
2402 MHz	0.82	<=5	PASS
2480 MHz	0.824	<=5	PASS

1.15 TRANSMITTER UNWANTED EMISSION IN THE OUT-OF BAND

LIMIT

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the limits of the mask given in below figure.

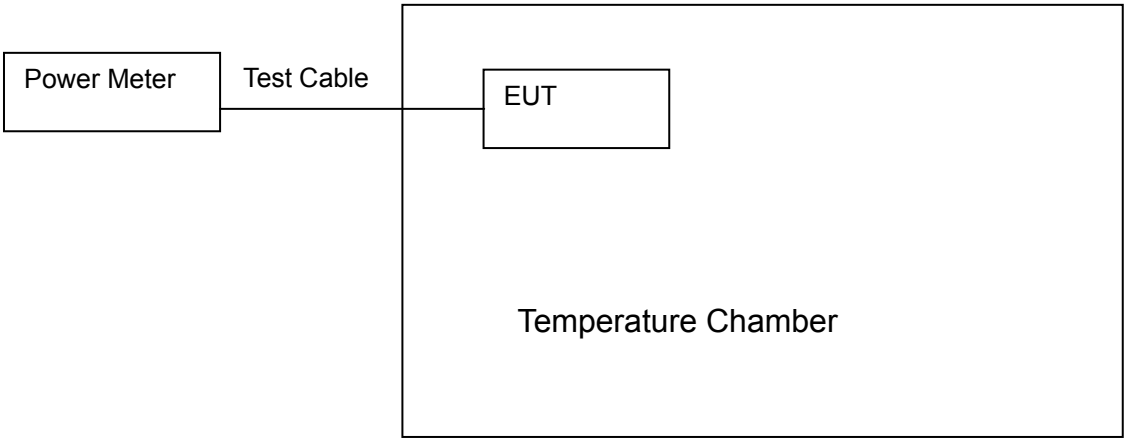


MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CAL DUE.
Vector Signal Generater	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Meter	Agilent	PS-X10-100	N/A	05/28/2016
Temperature Chamber	ESPEC	EL-02KA	12107166	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.9.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) Annex B and C for the measurement methods.

The antenna shall be connected to the spectrum analyzer of RF power measurement and use the following settings

Step 1: Resolution bandwidth: 1MHz, Video bandwidth: 3MHz, Detector mode: RMS
Trace mode: Clear/Write, Sweep point: 5000, Span :0Hz ;Sweep Mode: Continuous
Centre frequency: 2484MHz , Trigger Mode: Video Trigger

Step 2: Adjust the trigger level to select the transmissions with the highest power level
Set a window to match the start and end of the burst and in which the RMS power shall be measured using the time domain power function
Select RMS power to be measure within the selected window and note the result which is the RMS power within this 1MHz segment (2483,5MHz to 2484,5MHz). Compare this value with the applicable limit provided by the mask

Step3:Change the centre frequency of the analyser to 2484MHz +BW and perform the measurement for the first 1MHz segment within range 2483,5MHz +BW to 2483,5MHz+2BW.
Increase the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .
The centre frequency of the last 1MHz segment shall be set to 2483,5MHz +2BW-0,5MHz.

Step4:Change the centre frequency of the analyser to 2399,5MHz and perform the measurement for the first 1MHz segment within range 2400MHz -BW to 2400MHz.
Reduce the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .
The centre frequency of the last 1MHz segment shall be set to 2400MHz -2BW+0,5MHz.

Step5:Change the centre frequency of the analyser to 2399,5MHz-BW and perform the measurement for the first 1MHz segment within range 2400MHz -2BW to 2400MHz-BW.
Reduce the centre frequency in 1MHz steps and repeat the measurements to cover this whole range .

The centre frequency of the last 1MHz segment shall be set to 2400MHz -2BW+0,5MHz.
Step6: 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 1MHz segment and compare with the limits provided by the mask . if more than one antenna assembly is intended for this power setting , the antenna with the highest gain shall be considered

For smart antenna systems, 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 .

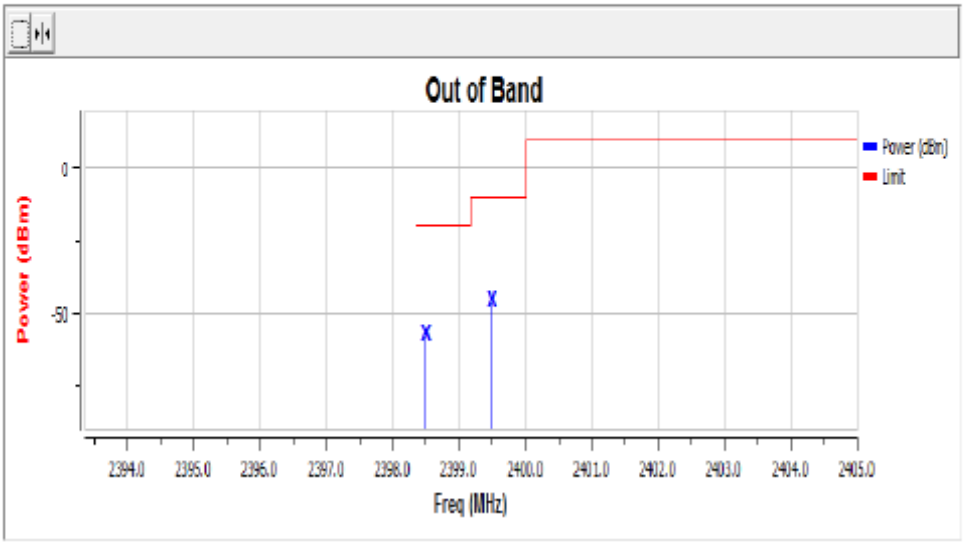
The measurement shall be performed at the lowest, the middle and the highest channel on which the equipment can operate.

TEST RESULTS

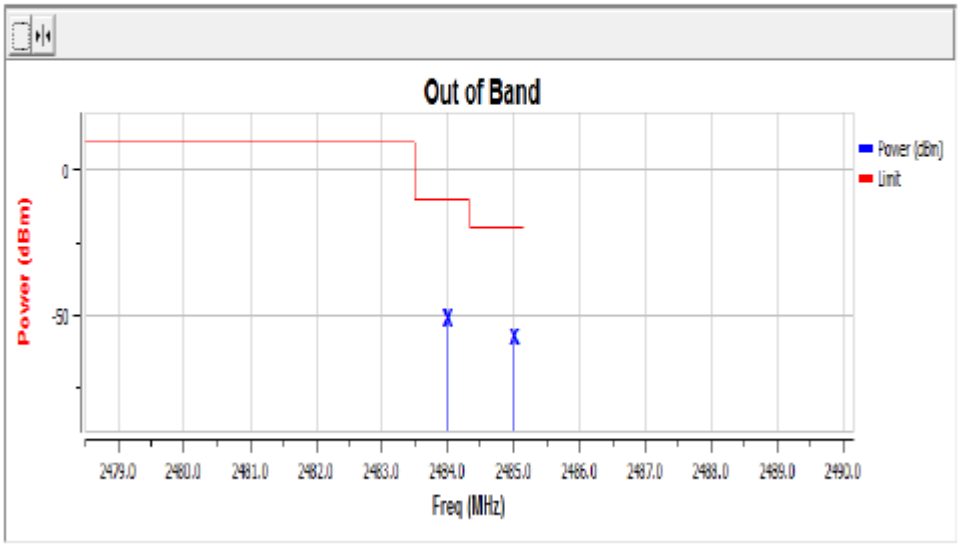
PASS.

Worst Case-Modulation Type: GFSK, Data Rate: 1Mbps

Channel	Antenna	Freq(MHz)	Level	Limit
CH Low-2402	Antenna 1	2399.5	-47.05	-10
CH Low-2402	Antenna 1	2398.5	-58.32	-20



Channel	Antenna	Freq(MHz)	Level	Limit
CH High-2480	Antenna 1	2484	-52.68	-10
CH High-2480	Antenna 1	2485	-58.9	-20



1.16 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

LIMIT

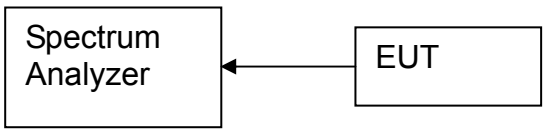
The transmitter unwanted emissions in the spurious domain shall not exceed the values in tables in the indicated bands:

Frequency Range	Maximum power ERP(<=1GHz) ERP(>GHz)	bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87.5 MHz	-36dBm	100kHz
87.5MHz to118 MHz	-54dBm	100kHz
118 MHz to174MHz	-36dBm	100kHz
174MHz to 230MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 862 MHz	-54dBm	100kHz
862 MHz to1 GHz	-36dBm	100kHz
1GHz to12.75 GHz	-30dBm	1MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.10.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.10.2 for the measurement methods.

The antenna shall be connected to a spectrum analyzer of RF power measurements
Step 1: the unwanted emission over the range 30MHz to 1000MHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :100kHz , video bandwidth :300kHz
Detector mode :Peak trace mode: Maxhold Sweep point :>=9970, sweep time:200ms
Step 2: the unwanted emission over the range 1GHz to 12.75GHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :1MHz , Video bandwidth :3MHz
Detector mode :Peak Trace mode: Maxhold Sweep point :>=11750, sweep time:200ms

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

All the modulation modes were tested, the data of the worst mode are recorded in the following pages and the others modulation methods do not exceed the limits.

Worst Test Mode: GFSK **Tested by:** Andy
Ambient temperature: 25°C **Relative humidity:** 53.7 % RH **Date:** June 15, 2015

Frequency (MHz)	Emission level (dBm)	Limit (dBm)	Margin(dB)	Verdict
809.989	-74.06	-54.00	-20.06	PASS
813.686	-73.10	-54.00	-19.10	PASS
817.286	-74.18	-54.00	-20.18	PASS
823.318	-72.77	-54.00	-18.77	PASS
823.415	-73.48	-54.00	-19.48	PASS
831.004	-74.19	-54.00	-20.19	PASS

1.17 RECEIVER SPURIOUS EMISSIONS

LIMIT

The level of spurious emissions shall be measured as, either:

1. Their power in specified load (conducted spurious emissions); and
2. Their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
3. Their effective radiated power when radiated by cabinet and antenna.

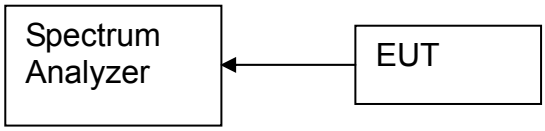
The spurious emissions of the receiver shall not exceed the values in tables in the indicated bands:

Frequency Range	Maximum power (ERP)	Measurement Width
30 MHz to 1 GHz	-57 dBm	100kHz
1 GHz to 12.75 GHz	-47 dBm	1MHz

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.11.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.11.2 for the measurement methods.

The antenna shall be connected to a spectrum analyzer of RF power measurements

Step 1: the unwanted emission over the range 30MHz to 1000MHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :100kHz , video bandwidth :300kHz
Detector mode :Peak trace mode: Maxhold Sweep point :>=9970, sweep time: auto
Step 2: the unwanted emission over the range 1GHz to 12.75GHz shall be identified
Spectrum analyzer setting:
Resolution bandwidth :1MHz , Video bandwidth :3MHz

Detector mode :Peak Trace mode: Maxhold Sweep point :>=25000, sweep time: auto

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

All the modulation modes were tested, the data of the worst mode are recorded in the following pages and the others modulation methods do not exceed the limits.

Worst Test Mode: GFSK **Tested by:** Andy

Ambient temperature: 25°C **Relative humidity:** 53.7 % RH **Date:** June 15, 2015

Frequency (MHz)	Emission level (dBm)	Limit (dBm)	Margin(dB)	Verdict
340.361	-68.82	-57.00	-11.82	PASS
340.458	-68.88	-57.00	-11.88	PASS
341.334	-68.62	-57.00	-11.62	PASS
341.431	-63.71	-57.00	-6.71	PASS
346.685	-66.74	-57.00	-9.74	PASS
346.782	-66.91	-57.00	-9.91	PASS

1.18 ADAPTIVITY AND RECEIVER BLOCKING

LIMIT OF ADAPTIVITY AND BLOCKING

Only for adaptive equipment and RF output power >=10dBm(ERP)

- For non-LBT based Detect and avoid equipment shall comply with the following requirement

The unavailable channel shall remain unavailable for a minimum time equal to 1s after which the channel may be considered again as an “available” channel.

The Channel Occupancy Time shall be less than 40ms . each such transmission sequence shall be followed with an idle period of minimum 5% of the channel occupancy time with a minimum of 100us,after this, the procedure need to repeated.

The detection threshold shall be proportional to the transmit power of the transmitter:

For a 20dBm(ERP)transmitter the detection threshold level shall be equal to or lower than -70dBm/MHz at the input to the receiver.

For power level below 20dBm(ERP),the detection threshold level may be relaxed to TL=-70dBm/MHz+20-Pout(ERP)

- For LBT based Detect and avoid equipment shall comply with the following requirement

The Clear Channel Assessment check observation time shall be not less than 20us.

The Channel Occupancy Time shall be less than 60ms followed by an idle period of at least 5% of the channel occupancy time used in the equipment for the current fixed frame period

The detection threshold for the CCA shall be proportional to the transmit power of the transmitter:

For a 20dBm(ERP)transmitter the CCA threshold level(TL) shall be equal to or lower than -70dBm/MHz at the input to the receiver.

For power level below 20dBm(ERP),the CCA threshold level may be relaxed to TL=-70dBm/MHz+20-Pout(ERP)

- Short control signalling transmissions

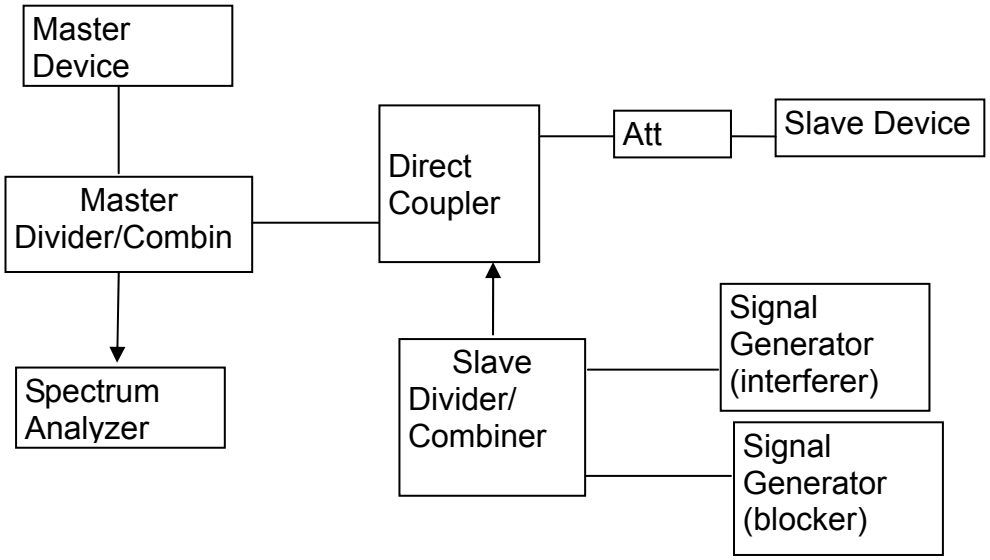
Short control signalling transmissions of adaptive equipment using wide band modulations shall have a maximum duty cycle of 10 % within an observation period of 50ms.

MEASUREMENT EQUIPMENT USED

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Vector Signal Generator	Agilent	N5182B	My53050553	05/28/2016
Analog Signal Generator	Agilent	N5171B	My53050878	05/28/2016
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Meter	Agilent	PS-X10-100	N/A	05/28/2016
Spectrum Analyzer	Agilent	N9010A	My53470879	05/28/2016
Power Meter	Agilent	PS-X10-100	N/A	05/28/2016
Notebook	ASUS	P45V	N/A	N/A

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



***Remarks**:*
The Spectrum Analyzer could be connected to a monopole antenna or directly connected to the EUT through divider, if the EUT has already employing an antenna connector.

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.8.1) clause 5.3.7.2 for the measurement method.

The EUT may connect to a companion device during the test, the interference signal generator, the blocking signal generator, the spectrum analyzer , the EUT and the companion device are connected using direction coupler and divider. Although the interference and blocking signal generators do not generate any signal at the point in time, the spectrum analyzer is used to monitor the transmissions of the EUT in response to the interfering and the blocking signals.
Step1:The analyzer shall be set as follows
RBW: >=Occupied Channel Bandwidth; Filter type: Channel Filter; VBW:RBW
Centre Frequency: tested frequency; Span: 0Hz; Sweep Time: 20ms ;
Trace Mode: clear/write; Trigger Mode: Video.
Step2: configure the EUT for normal transmission with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the hopping frequency.

Step3:add the interference signal
A 100% duty cycle interference signal is injected centred on the hopping frequency being tested. This interference signal shall be a band limited noise signal which has a flat power spectrum density and shall have a bandwidth greater than the occupied channel bandwidth of the EUT
Step4:Verfication of reaction to the interference signal
The spectrum analyzer shall be used to monitor the transmissions of the EUT on the selected hopping frequency with the interfering signal injected. This may require the spectrum analyzer sweep to be triggered by the start of the interfering signal.
Step5:adding the blocking signal
With the interfering signal preset ,a 100% duty cycle CW signal is inserted as the blocking signal, the frequency and the level are provided in table3 if clause 4.3.1.10.2
Repeat step4 to verify that the EUT does not resume any normal transmissions on the hopping frequency being investigated.
Step6: removing the interference and blocking signal
On removal of the interference and blocking signal ,the EUT is allowed to re-include any channel previously marked as unavailable ;

The steps 2 to steps 6 shall be repeated for each of the hopping frequencies to be tested.

The measurement shall be performed at the lowest and the highest channel on which the equipment can operate.

TEST RESULTS

Not Applicable

Because RF Output power of EUT is less than10dBm, according to standard EN300328, Duty cycle, Tx-Sequence, Tx-gap is not required.

EMTEK
Access to the World

THE TEST REPORT

For

SHENZHEN BILIAN ELECTRONIC CO., LTD.

Bluetooth 150Mbps Wireless N USB Module

Model No.: BL-R8723RB1

Prepared for	:	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Address	:	Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
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Report No.	:	ED150528298H
Date of Test	:	May 28, 2015 to June 27, 2015
Date of Report	:	September 02, 2015

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Description Page

TEST REPORT DESCRIPTION

Applicant	:	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Manufacturer	:	SHENZHEN BILIAN ELECTRONIC CO., LTD.
EUT	:	Bluetooth 150Mbps Wireless N USB Module
Model No.	:	BL-R8723RB1
Input Rating	:	DC From PC

Test Procedure Used:

EN62311: 2008

The device described above is tested by DONGGUAN EMTEK CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. This report shows the EUT to be technically compliant with the EN62311: 2008 requirements. The test results are contained in this report and DONGGUAN EMTEK CO., LTD. is assumed full responsibility for the accuracy and completeness of these tests.

This report applies to above tested sample only and shall not be reproduced in part without written approval of DONGGUAN EMTEK CO., LTD.

Date of Test : May 28, 2015 to June 27, 2015

Prepared by : Ivy Huang

Ivy Huang/Editor

Reviewer : Alan He

Alan He/Supervisor

Approved & Authorized Signer : *DONGGUAN EMTEK CO., LTD.* TESTING

Sam Lv/Manager

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Version	/	ED150528298H

1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	:	Bluetooth 150Mbps Wireless N USB Module
Model Number	:	BL-R8723RB1
Trademark	:	LB-LINK
Applicant	:	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Address	:	Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
Manufacturer	:	SHENZHEN BILIAN ELECTRONIC CO., LTD.
Address	:	Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan Street, Bao'an, Shenzhen, Guangdong, P.R.China
Date of received	:	May 28, 2015
Date of Test	:	May 28, 2015 to June 27, 2015

1.2 Test Facility

Site Description

EMC Lab. : Accredited by CNAS, 2015.06.11
The certificate is valid until 2018.07.03
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01: 2006
The Certificate Registration Number is L3150

Accredited by TUV Rheinland , 2014.05.22
The certificate is valid until 2015.11.21
The Laboratory has been assessed according to the requirements ISO/IEC 17025: 2005

Accredited by FCC, June 18, 2014
The Certificate Number is 247565

Accredited by Industry Canada, February 19, 2014
The Certificate Number is 9444A.

Name of Firm : DONGGUAN EMTEK CO., LTD.
Site Location : No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

2. GENERAL PRODUCT INFORMATION

2.1 Basic Restriction

The essential requirements of Directive 99/5/EC in the article 3.1(a) and the limits must be taken from Council Recommendation 99/519/EC for General Population or form the ICNIRP Guidelines for Occupational Exposure. EN 62479:2010 Generic standard to demonstrate the compliance of low power electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields. The average power of EUT is less than 20mW then comply with basic restriction (1999/519/EC) without test.

2.2 Table for Filed Antenna

Antenna Type	Gain (dBi)
External Antenna	2

3. TEST RESULT

3.1. EMF Exposure Measurement

3.1.1 Limit

Basic Restrictions

Council Recommendation 99/519/EC Annex II
Basic restrictions for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz)

Frequency range	Magnetic flux density (mT)	Current density (mA/m^2) (rms)	Whole body average SAR (W/kg)	Localized SAR (head and trunk) (W/kg)	Localized SAR (limbs) (W/kg)	Power density, S (W/m^2)
0Hz	40	-	-	-	-	-
>0-1Hz	-	8	-	-	-	-
1–4Hz	-	8/f	-	-	-	-
4Hz–1000Hz	-	2	-	-	-	-
1000Hz–100kHz	-	f/500	-	-	-	-
100kHz–10MHz	-	f/500	0.08	2	4	-
10MHz–10GHz	-	-	0.08	2	4	-
10GHz–300GHz	-	-	-	-	-	10

Note:
1. f is the frequency in Hz.
2. The basic restriction on the current density is intended to protect against acute exposure effects on central nervous system tissues in the head and trunk of the body and includes a safety factor. The basic restrictions for ELF fields are based on established adverse effects on the central nervous system. Such acute effects are essentially instantaneous and there is no scientific justification to modify the basic restrictions for exposure of short duration. However, since the basic restriction refers to adverse effects on the central nervous system, this basic restriction may permit higher current densities in body tissues other than the central nervous system under the same exposure conditions.
3. Because of electrical inhomogeneity of the body, current densities should be averaged over a cross section of 1 cm^2 perpendicular to the current direction.
4. For frequencies up to 100kHz, AV current density values can be obtained by multiplying the rms value by$\sqrt{2}$ (=1.414). For pulses of duration tp the equivalent frequency to apply in the basic restrictions should be calculated as-1/(2tp).
5. For frequencies up to 100kHz and for pulsed magnetic fields, the maximum current density associated with the pulses can be calculated from the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density can then be compared with the appropriate basic restriction.
6. All SAR values are to be averaged over any six-minute period.
7. Localised SAR averaging Mass is any 10g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure. These 10g of tissue are intended to be a mass of contiguous tissue with nearly homogeneous electrical properties. In specifying a contiguous mass of tissue, it is recognized that this concept can be used in computational dissymmetry but may present

difficulties for direct physical measurements. A simple geometry such as cubic tissue mass can be used provided that the calculated dissymmetric quantities have conservative values relative to the exposure guidelines.

8. For pulses of duration tp the equivalent frequency to apply in the basic restrictions should be calculated an=1/(2tp). Additionally, for pulsed exposures, in the frequency rage 0.3 to 10GHz and for localized exposure of the head, in order to limit and avoid auditory effects caused by thermoplastic expansion, an additional basic restriction is recommended. This is that the SA should not exceed 2mJ kg-1 averaged over 10g of tissue.

Reference Levels

Council Recommendation 99/519/EC Annex III
Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300GHz)

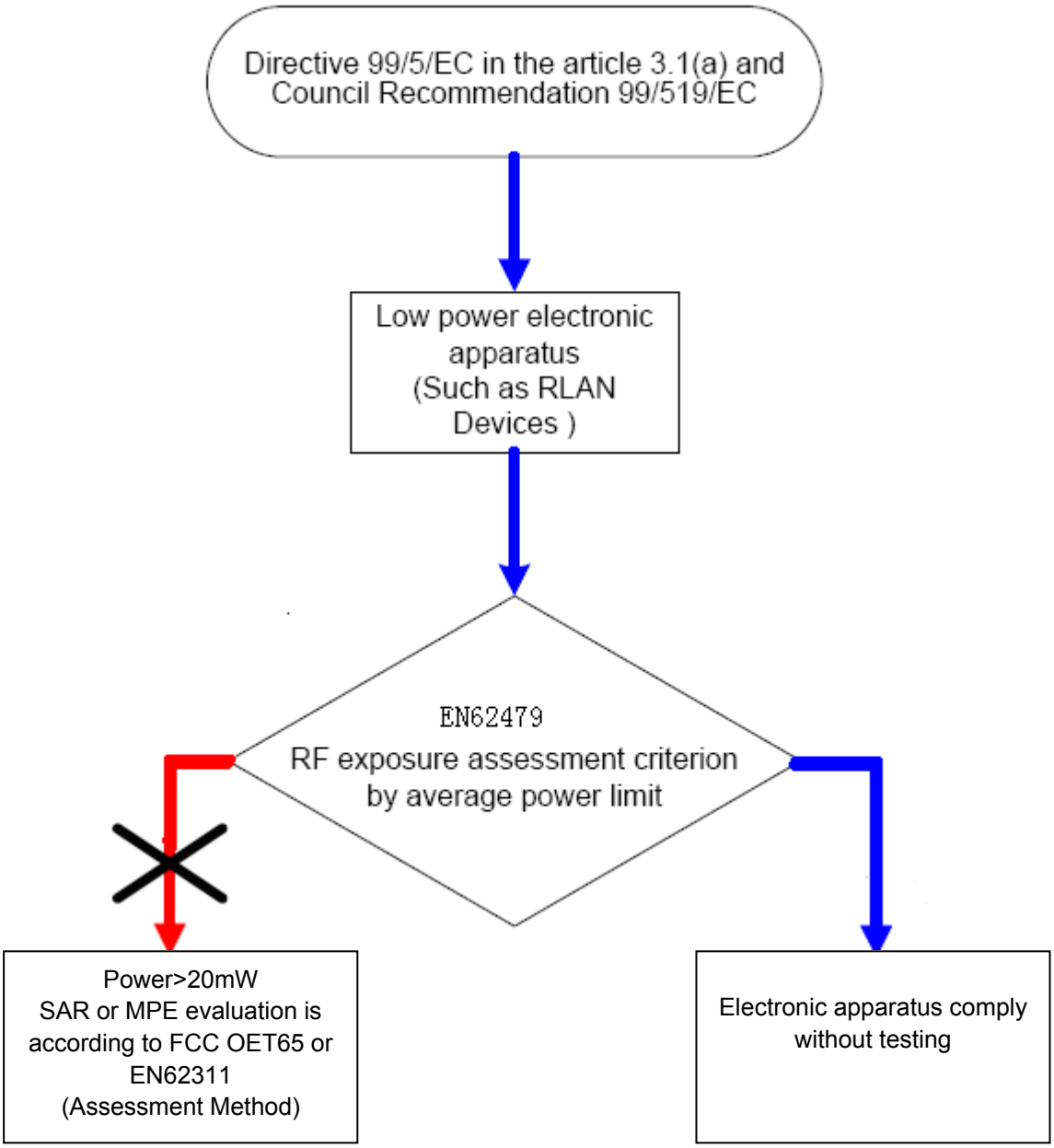
Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density Seq (W/m2)
0-1 Hz	-	3.2×10^4	4×10^4	-
1-8 Hz	10000	$3.2\times10^4/f^2$	$4\times10^4/f^2$	-
8-25 Hz	10000	4000/f	5000/f	-
0.025-0.8 kHz	250/f	4/f	5/f	-
0.8-3 kHz	250/f	5	6.25	-
3-150 kHz	87	5	6.25	-
0.15-1 MHz	87	0.73/f	0.92/f	-
1-10 MHz	$87/f^{1/2}$	0.73/f	0.92/f	-
10-400 MHz	28	0.073	0.095	2
400-2000 MHz	$1.375\ f^{1/2}$	$0.0037\ f^{1/2}$	$0.0046\ f^{1/2}$	f/200
2-300 GHz	61	0.16	0.2	10

Notes:

1. As indicated in the frequency range column.
2. For frequencies between 100kHz and 10 GHz, Seq, E2, H2 and B2 are to averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E2, H2, and B2 are averaged over any 68/1.05-minute period(in GHz).
4. No E-field value is provided for frequencies<1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

3.1.2. Evaluation Routine

Low Power Electronic Apparatus for RF exposure evaluation routine



3.1.3. EMF Exposure Levels Calculated

3.2 Detailed results

3.2.1 Summary of Results

Modulation Type	Limit (W/ m²)	Result (W/ m²)	Verdict
802.11b	10	0.022790	pass
802.11g	10	0.014715	
802.11n(HT20)	10	0.011501	
802.11n(HT40)	10	0.006994	

3.2.2 Measurement of RF conducted Power

Modulation Type	Power (dBm)
802.11b	14.10
802.11g	11.90
802.11n(H20)	10.73
802.11n(H40)	10.25

3.2.3 MPE Evaluation

S =PG* Duty factor / 4πR²
P = AV Power Input to antenna (Watts)
G =Antenna Gain (numeric)
R = distance to the center of radiation of antenna (in meter) = 0.20 m
Note:
1) P (Watts)=(10 ^ (dBm /10))/1000
2) G (Antenna gain in numeric) = 10^ (Antenna gain in dBi /10)
3) π=3.142

1) The maximum power density at a distance of 0.2 m for BT is shown as below:

Antenna Gain(dBi)	Antenna Gain (numeric)	Output Power (dBm)	Output Power (W)	Duty factor	Calculated RF Exposure (W/ m²)	Limit (W/ m²)
2	1.58	14.10	36.22	1	0.022790	10
2	1.58	11.90	23.39	1	0.014715	10
2	1.58	10.73	18.28	1	0.011501	10
2	1.58	10.25	11.12	1	0.006994	10

2) The maximum power density at a distance of 0.2 m for BLE is shown as below:

Antenna Gain(dBi)	Antenna Gain (numeric)	Output Power (dBm)	Output Power (W)	Duty factor	Calculated RF Exposure (W/ m²)	Limit (W/ m²)
2	1.58	14.10	36.22	1	0.022790	10
2	1.58	11.90	23.39	1	0.014715	10
2	1.58	10.73	18.28	1	0.011501	10
2	1.58	10.25	11.12	1	0.006994	10

3) The maximum power density at a distance of 0.2 m for WIFI is shown as below:

Antenna Gain(dBi)	Antenna Gain (numeric)	Output Power (dBm)	Output Power (W)	Duty factor	Calculated RF Exposure (W/ m²)	Limit (W/ m²)
2	1.58	14.10	36.22	1	0.022790	10
2	1.58	11.90	23.39	1	0.014715	10
2	1.58	10.73	18.28	1	0.011501	10
2	1.58	10.25	11.12	1	0.006994	10

3.2.5 Measurement Uncertainty

Extended Uncertainty (k=2) 95% 0.5dB

END OF REPORT