

RESOLUCION 737 - SUBTEL

Fecha de publicación: 11/2/2025

Información Comercial

Nombre comercial del equipo

Código	Descripción
929002468801	Philips HueWCA 9W A60 E27
929002468804	Philips HueWCA 9W A60 E27 3set sw EU
929002468810	Philips HueWCA 9W A60 E27 2set EU

Fabricante: Signify (China) Investment Co., Ltd.

Importador o representante en Chile: SIGNIFY CHILENA S.A.

Domicilio: El Bosque Norte 0211, Las Condes - Santiago

Correo electrónico de contacto: tomas.aragona@signify.com

Sitio Web: philips-hue.com/es-cl

Características técnicas

Tipo de equipo	Lámpara Led
Marca	Hue
Modelo	929002468801 - 929002468804 - 92900246881
Módulo	EFR32RM21
Tecnología o modulación	GFSK (BLE), DSSS-OQPSK (Zigbee)
Frecuencias	BT: 2402-2480; ZigBee: 2405-2480 MHz
Ganancia de antena (dBi)	-0.7 dBi
P.I.R.E. (EIRP)	BT: 8,47 mW (9,28 dBm); ZigBee: 7,9 mW (8,98 dBm)

Declaración de conformidad

“El equipo previamente individualizado cumple con las disposiciones establecidas en la Norma Técnica de Equipos de alcance reducido, aprobada por la resolución exenta N° 1.985, de 2017, de la Subsecretaría de Telecomunicaciones.”

Firma del Importador/Responsable:

Nombre de quien firma: Tomás Aragona

Cargo: Representante Legal



/DO N° 105706/F60

- ANT.: 1. Ingreso SUBTEL N° 33862 de 11.03.2024.
2. Resolución Exenta N° 1985 de 2017, y sus modificaciones, de la Subsecretaría de Telecomunicaciones
3. Resolución Exenta N° 3.103 de 2012, de la Subsecretaría de Telecomunicaciones.
4. Resolución Exenta N° 470 de fecha 13.02.2013, que faculta a los jefes de División y de Departamento para firmar "Por Orden del Subsecretario de Telecomunicaciones" y delega las facultades que indica.

MAT.: Certifica equipo de alcance reducido.

DE: SUBSECRETARÍA DE TELECOMUNICACIONES

A: MBSERVICES

1. De acuerdo a la información proporcionada por documento de ANT. 1), esta Subsecretaría de Estado extiende el presente certificado para operar dentro del país, condicionado al estricto cumplimiento de lo señalado en letra(s) j.1) del artículo 1° de la norma señalada en ANT. 2):

- Tipo de Equipo : Philips HueWCA 9W A60 E27 (Lampara Led).
- Marca : HUE.
- Modelo(s) : 9290024688
- Fabricante : Signify (China) Investment Co., Ltd.
- Frecuencias de operación : BT: 2402-2480; ZigBee: 2405-2480 MHz.
- Potencia máxima radiada : BT: 8,47 mW (9,28 dBm); ZigBee: 7,9 mW (8,98 dBm).
- Restricciones : Estos equipos deben emplear técnicas de compartición de frecuencias.

2. El incumplimiento de lo dispuesto por el presente certificado, será sancionado de acuerdo a las disposiciones legales vigentes. Estos equipos no deberán provocar interferencias a servicios de concesionarias de telecomunicaciones y no estarán protegidos respecto de interferencias que eventualmente puedan recibir.

Saluda atentamente a Ud.,
Por orden del Subsecretario de Telecomunicaciones

DISTRIBUCIÓN:

- MBSERVICES: Laboratorio@mbservices.cl
- Oficina de Partes.

Francisco Javier Pizarro Sepulveda
Jefe División Fiscalización
26/03/2024 16:19



Test report No:
2110839R-RF-CE-P17V02

CE TEST REPORT

Product Name	LED Lamp
Trademark	PHILIPS
Model and /or type reference	9290024688,9290024689
Applicant's name / address	Signify (China) Investment Co., Ltd. Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233, China
Test method requested, standard	ETSI EN 300 328 V2.2.2 (2019-07)
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao/Project Engineer 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2021-02-09
Report Version	V1.0
Report template No	Template_EN 300 328-RF-V1.0

INDEX

	page
Competences and Guarantees.....	5
General conditions.....	5
Environmental conditions.....	5
Possible test case verdicts	6
Abbreviations	6
Document History	7
Remarks and Comments	7
Used Equipment	8
Uncertainty.....	10
1 General Information.....	11
1.1 General Description of the Item(s).....	11
1.2 Antenna Information.....	12
1.3 Channel List	12
2 Description of Test Setup.....	13
2.1 Operating mode(s) used for tests.....	13
2.2 Auxiliary equipment / software for the EUT.....	13
2.3 Test Configuration / Block diagram used for tests	14
2.4 Testing process.....	15
3 Verdict summary section	16
3.1 Standards	16
3.2 Deviation(s) from the Standard(s) / Test Specification(s)	16
3.3 Overview of results.....	17
4 Test Results.....	18
4.1 RF Output Power	18
4.1.1 Limit.....	18
4.1.2 Test Setup.....	18
4.1.3 Test Procedure	19
4.1.4 Test Data	20
4.2 Power Spectral Density.....	21
4.2.1 Limit.....	21
4.2.2 Test Setup.....	21
4.2.3 Test Procedure	21
4.2.4 Test Data	23

4.3	Duty Cycle, Tx-sequence, Tx-gap.....	24
4.3.1	Limit.....	24
4.3.2	Test Setup.....	24
4.3.3	Test Procedure	24
4.3.4	Test Data	25
4.4	Medium Utilisation (MU) factor.....	26
4.4.1	Limit.....	26
4.4.2	Test Setup.....	26
4.4.3	Test Procedure	26
4.4.4	Test Data	27
4.5	Adaptivity.....	28
4.5.1	Limit.....	28
4.5.2	Test Setup.....	29
4.5.3	Test Procedure	30
4.5.4	Test Data	32
4.6	Occupied Channel Bandwidth.....	33
4.6.1	Limit.....	33
4.6.2	Test Setup.....	33
4.6.3	Test Procedure	33
4.6.4	Test Data	35
4.7	Transmitter unwanted emissions in the out-of-band domain	36
4.7.1	Limit.....	36
4.7.2	Test Setup.....	36
4.7.3	Test Setup.....	37
4.7.4	Test Data	39
4.8	Transmitter unwanted emissions in the spurious domain.....	40
4.8.1	Limit.....	40
4.8.2	Test Setup.....	41
4.8.3	Test Procedure	41
4.8.4	Test Data	44
4.9	Receiver Spurious Emissions	52
4.9.1	Limit.....	52
4.9.2	Test Setup.....	52
4.9.3	Test Procedure	53
4.9.4	Test Data	55
4.10	Receiver Blocking	63

4.10.1 Limit.....	63
4.10.2 Test Setup.....	64
4.10.3 Procedure	65
4.10.4 Test Data	67
5 Setup photo and EUT photo.....	68

COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Jan.25, 2021
Date (start test)	Jan.27, 2021
Date (finish test)	Feb.09, 2021

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2110839R-RF-CE-P17V02	V1.0	Initial issue of report.	2021-02-09

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with with ETSI EN 300 328 V2.2.2.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;
 - Chapter 1.3 Channel List.

USED EQUIPMENT

Keysight ETSI EN 300 328 / 301893 Test System / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
4TX MIMO Power Sensor	Keysight	U2063X	MY58000119	2020.02.11	2021.02.10
4TX MIMO Power Sensor	Keysight	U2063X	MY58000120	2020.02.11	2021.02.10
4TX MIMO Power Sensor	Keysight	U2063X	MY58000121	2020.02.12	2021.02.11
4TX MIMO Power Sensor	Keysight	U2063X	MY58000122	2020.02.12	2021.02.11
Adaptivity Test Unit	Agilent	N/A	11607310008	N/A	N/A
Rx PER Monitoring Unit	Agilent	N/A	11706190075	N/A	N/A

RF Output Power/ Power Spectral Density/ Occupied Channel Bandwidth/ Transmitter unwanted emissions in the out-of-band domain / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Keysight ETSI EN 300 328 / 301893 Test System	Agilent	N/A	N/A	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.08.15	2021.08.14
MAX Signal Analyzer	Keysight	N9020B	MY59050482	2020.11.25	2021.11.24
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2020.08.13	2021.08.12

Transmitter unwanted emissions in the spurious domain/ Receiver Spurious Emissions/ AC6

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.08.15	2021.08.14
PSG Analog S.G.	Agilent	E8257D	MY44321116	2020.08.15	2021.08.14
Preamplifier	Agilent	8449B	3008A02597	2020.06.09	2021.06.08
Bilog Antenna	Schaffner	CBL6112B	2932	2020.11.27	2021.11.26
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2020.02.19	2023.02.18
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2020.01.18	2021.01.17
Filter Banks	DEKRA	QTK-FB	AC6-FB	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	RF06	2020.08.13	2021.08.12
EMI Test Software	Dekra	-	-	-	-

Blocking / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Keysight ETSI EN 300 328 / 301893 Test System	Agilent	N/A	N/A	N/A	N/A
Splitter/Combiner (Qty: 2)	Mini-Circuits	ZAPD-50W 4.2-6.0 GHz	NN256400424	N/A	N/A
10dB Directional Coupler	Agilent	87300C	MY44300299	N/A	N/A
Adaptivity Test Unit	Agilent	N/A	11607310008	N/A	N/A
Rx PER Monitoring Unit	Agilent	N/A	11706190075	N/A	N/A
Wideband Radio Communication Tester	R & S	CMW500	1201.0002K50- 158243-jb	2020.08.15	2021.08.14
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2020.08.15	2021.08.14
ESG Vector Signal Generator	Agilent	E4438C	MY49070163	2020.08.25	2021.08.24
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2020.08.13	2021.08.12

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The Uncertainties is complice with standard required as below.

Test item	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1,5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^\circ\text{C}$
Supply voltages	$\pm 3 \%$
Time	$\pm 5 \%$

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name	LED lamp
Model No.	9290024688,9290024689
Trademark	PHILIPS
Manufacturer	Signify (China) Investment Co., Ltd.
Manufacturer Address	Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233, China
Model differences	Two models are total same except for the lamp cap.

Wireless specification	Zigbee
Operating frequency range(s)	2 405 ~ 2 480 MHz
Type of Modulation	DSSS-OQPSK
Number of channel	16
Date Rate	250 kbps
Operating Temperature Range	-20 °C– 45 °C

Rated power supply	Voltage and Frequency	
	<input checked="" type="checkbox"/>	AC: 220 – 240 V, 50 / 60 Hz,
	<input type="checkbox"/>	AC: 100 – 240 V, 50 / 60 Hz
	<input type="checkbox"/>	DC: 12 V, 24 V, 12 / 24 V
	<input type="checkbox"/>	Battery:
Mounting position	<input type="checkbox"/>	Table top equipment
	<input checked="" type="checkbox"/>	Wall/Ceiling mounted equipment
	<input type="checkbox"/>	Floor standing equipment
	<input type="checkbox"/>	Hand-held equipment
	<input type="checkbox"/>	Other :Fixed installation equipment

1.2 Antenna Information

Antenna model / type number.....:	N/A		
Antenna serial number.....:	N/A		
Antenna Delivery	<input checked="" type="checkbox"/>	1TX + 1RX	
	<input type="checkbox"/>	2TX + 2RX	
	<input type="checkbox"/>	Others:.....	
Antenna technology	<input checked="" type="checkbox"/>	SISO	
	<input type="checkbox"/>	MIMO	<input type="checkbox"/> CDD
			<input type="checkbox"/> Beam-forming
Antenna Type	<input type="checkbox"/>	External	<input type="checkbox"/> Dipole
			<input type="checkbox"/> Sectorized
			<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> PCB	
	<input type="checkbox"/>	<input type="checkbox"/> Ceramic Chip	
	<input type="checkbox"/>	<input type="checkbox"/> Others.....	
	Antenna Gain	-0.7 dBi	

1.3 Channel List

Working Frequency of Each Channel: For Zigbee							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2 405 MHz	12	2 410 MHz	13	2 415 MHz	14	2 420 MHz
15	2 425 MHz	16	2 430 MHz	17	2 435 MHz	18	2 440 MHz
19	2 445 MHz	20	2 450 MHz	21	2 455 MHz	22	2 460 MHz
23	2 465 MHz	24	2 470 MHz	25	2 475 MHz	26	2 480 MHz

Note: The General Description of the Item , antenna information and Channel List for the EUT in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

Test Mode	Mode 1: Transmit by Zigbee
	Mode 2: Receive by Zigbee
	Mode 3: Normal operation

2.2 Accessories Information

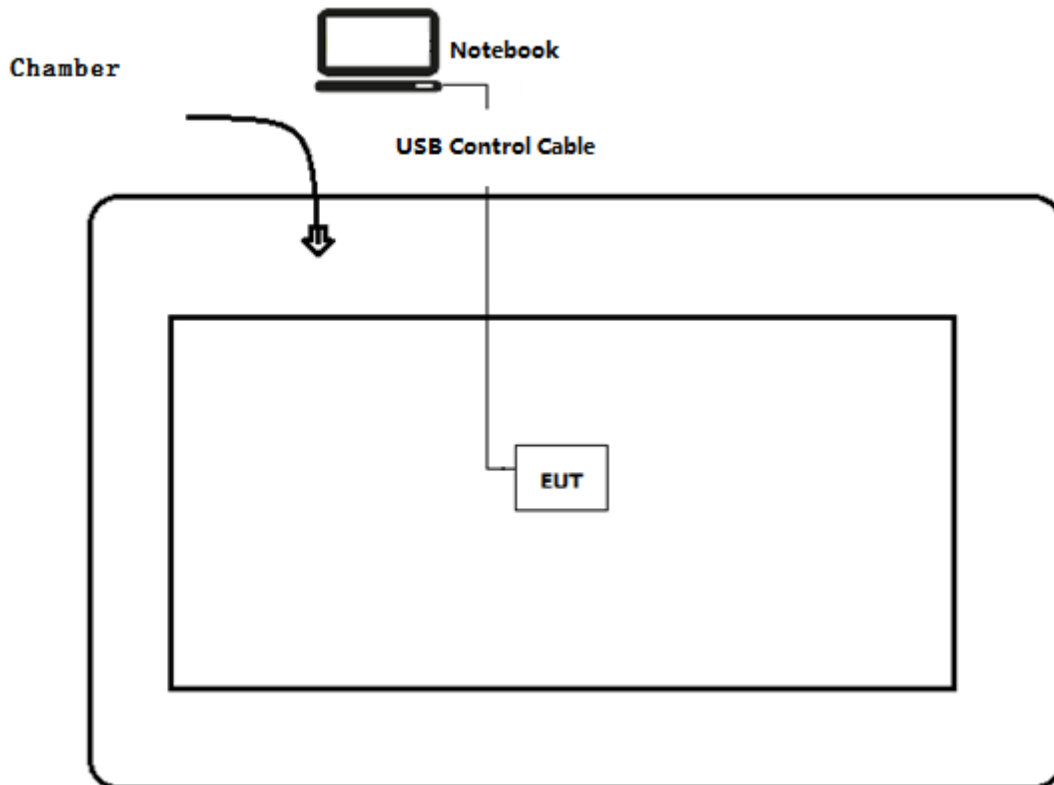
Accessories Information	Brand/model name	Cable		
		Length used during test [m]	Attached during test	Shielded
USB – serial port	N/A	10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

2.3 Auxiliary equipment / software for the EUT

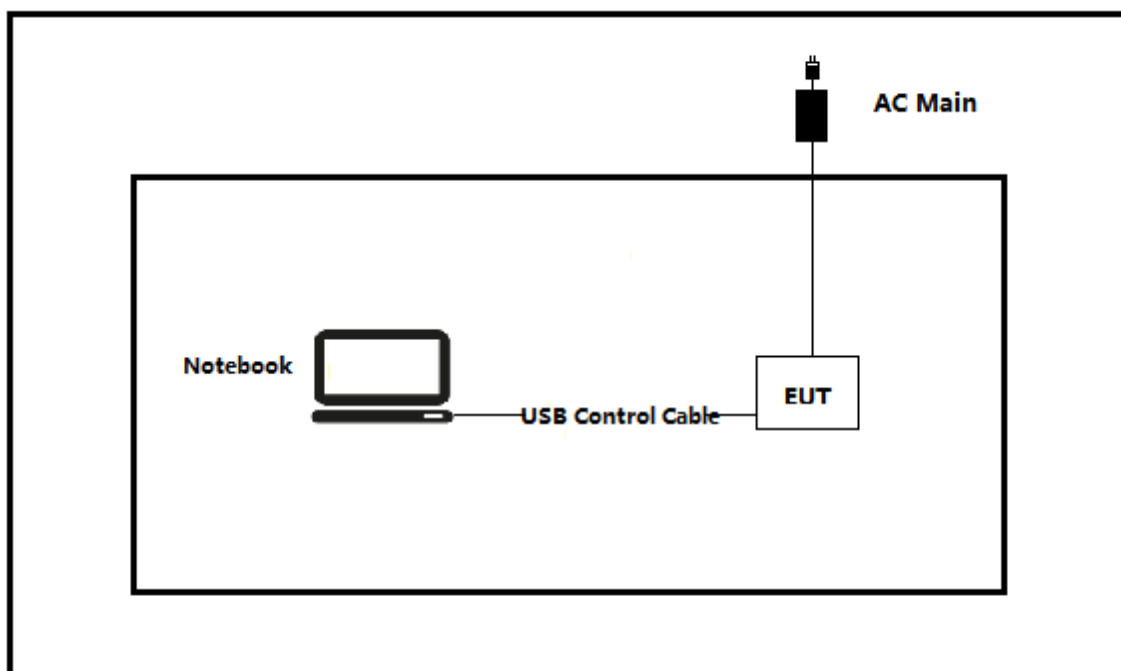
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	E470	Lenovo	N/A
software	Type / Version	Manufacturer	Supplied by
HueApprobationTool	V1.1.5.0	N/A	N/A

2.4 Test Configuration / Block diagram used for tests

Test setup Diagram- Radiated Emission Test



Test setup Diagram- Conducted test



2.5 Testing process

1	Setup the EUT as shown in Section 2.4
2	Execute the software HueApprobationTool on the notebook.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
ETSI EN 300 328 V2.2.2	2019	Wideband transmission systems;Data transmission equipment operating in the 2,4 GHz band;Harmonised Standard for access to radio spectrum
--	--	--
--	--	--
--	--	--

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

No deviation

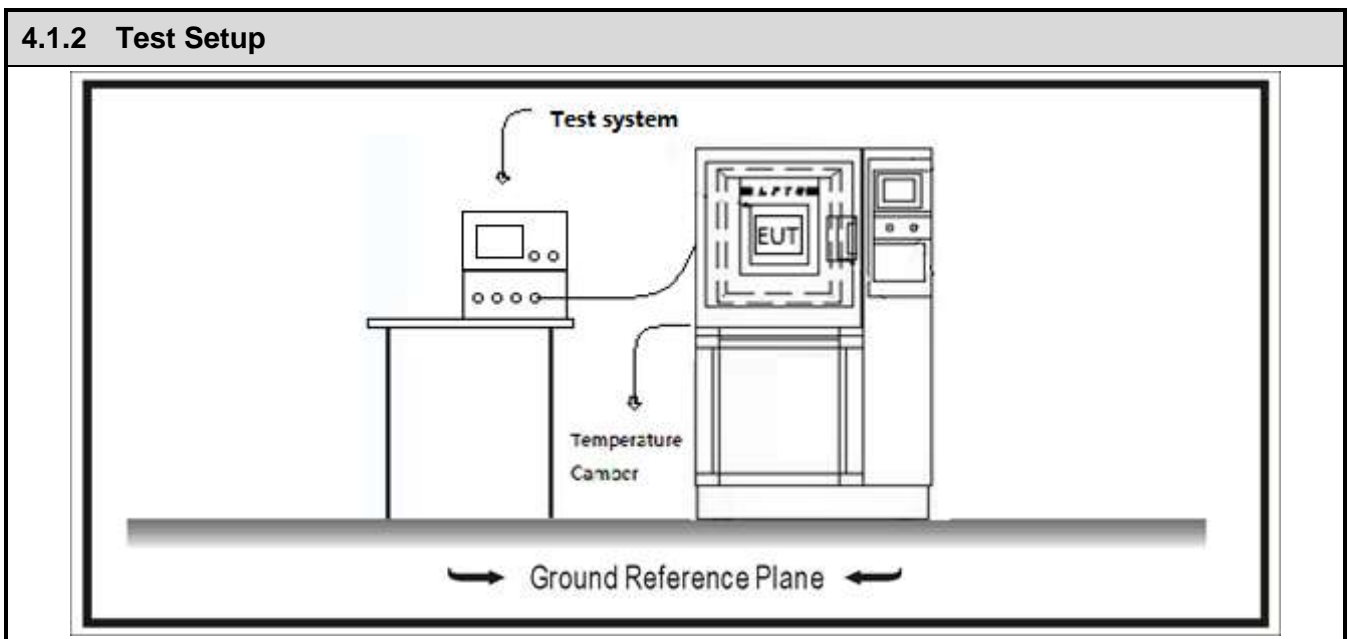
3.3 Overview of results

Test Item – ETSI EN 300 328 V2.2.2						
Performed Test Item	Test Procedure	Adaptive		Non-Adaptive		Verdict
		(≥10dBm)	(<10dBm)	(≥10dBm)	(<10dBm)	
RF Output Power	Claus 5.4.2	Yes	Yes	Yes	Yes	PASS
Power Spectral Density	Claus 5.4.3	Yes	Yes	Yes	Yes	PASS
Duty cycle, Tx-Sequence, Tx-gap	Claus 5.4.2	N/A	N/A	Yes	N/A	N/A
Medium Utilisation (MU) factor	Claus 5.4.2	N/A	N/A	Yes	N/A	N/A
Adaptivity	Claus 5.4.6	Yes	N/A	N/A	N/A	N/A
Occupied Channel Bandwidth	Claus 5.4.7	Yes	Yes	Yes	Yes	PASS
Transmitter unwanted emissions in the out-of-band domain	Claus 5.4.8	Yes	Yes	Yes	Yes	PASS
Transmitter unwanted emissions in the spurious domain	Claus 5.4.9	Yes	Yes	Yes	Yes	PASS
Receiver Spurious Emissions	Claus 5.4.10	Yes	Yes	Yes	Yes	PASS
Receiver Blocking	Claus 5.4.11	Yes	Yes	Yes	Yes	PASS
Geo-location capability	N/A	N/A	N/A	N/A	N/A	N/A
<u>Supplementary information:</u>						
1) Geo-location capability should be implemented by manufacturer.						

4 TEST RESULTS

4.1 RF Output Power	VERDICT: PASS
----------------------------	----------------------

4.1.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS
The maximum RF output power shall be 20 dBm.	
<input checked="" type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS
The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.4.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.	

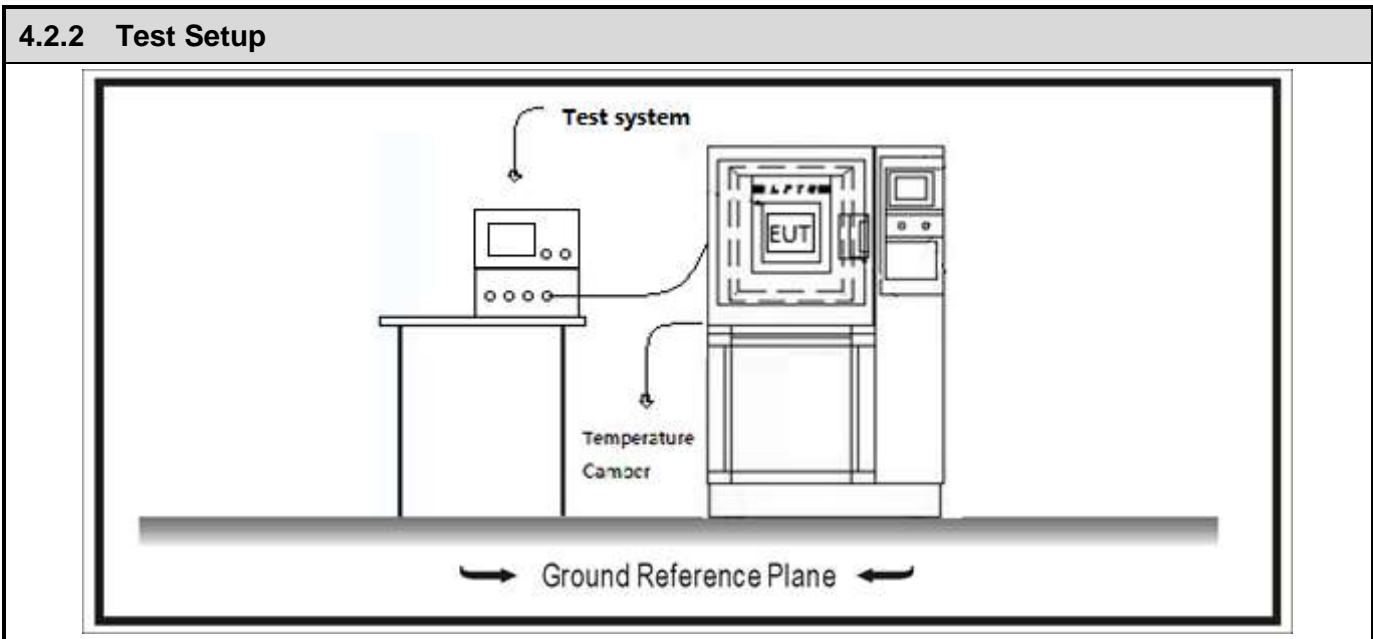


4.1.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.2.2.1.2	RF Output Power
Step 1		
<p>1, Use a fast power sensor with a minimum sensitivity of -40 dBm and capable of minimum 1 MS/s</p> <p>2, Use the following settings:</p> <p>(1) Sample speed 1 MS/s or faster</p> <p>(2) The samples shall represent the RMS power of the signal.</p> <p>(3) Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.</p> <p>Note 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.</p>		
Step 2		
<p>1, For conducted measurements on devices with one transmit chain:</p> <p>(1), Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.</p> <p>2, For conducted measurements on devices with multiple transmit chains:</p> <p>(1) Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.</p> <p>(2) Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500 ns.</p> <p>(3) For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.</p>		
Step 3		
<p>Find the start and stop times of each burst in the stored measurement samples.</p> <p>The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.</p> <p>NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.</p>		
Step 4		
<p>Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these P_{burst} values, as well as the start and stop times for each burst.</p> $P_{burst} = \frac{1}{k} \sum_{n=1}^k P_{sample}(n)$ <p>with 'k' being the total number of samples and 'n' the actual sample number</p>		
Step 5		
<p>The highest of all P_{burst} values (value "A" in dBm) will be used for maximum e.i.r.p. calculation</p>		
Step 6		
<p>1, Add the (stated) antenna assembly gain "G" in dBi of the individual antenna</p> <p>2, If applicable, add the additional beamforming gain "Y" in dB.</p> <p>If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.</p> <p>The RF Output Power (P) shall be calculated using the formula: P = A + G + Y</p> <p>This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.</p>		

4.1.4 Test Data					
Test Mode	Test Conditions	Frequency (MHz)	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)
Mode 1	Tnom (25 °C)	2 405	9.14	8.44	≤20
		2 445	8.74	8.04	≤20
		2 480	9.33	8.63	≤20
	Tmax (45 °C)	2 405	8.75	8.05	≤20
		2 445	8.43	7.73	≤20
		2 480	8.99	8.29	≤20
	Tmin (-20 °C)	2 405	9.45	8.75	≤20
		2 445	9.11	8.41	≤20
		2 480	9.68	8.98	≤20
Note 1: EIRP=Measured power+Antenna gain					
Note 2: The antenna gain please refer to clause 1.2					

4.2 Power Spectral Density	VERDICT: PASS
-----------------------------------	----------------------

4.2.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
The maximum Power Spectral Density is limited to 10dBm per MHz.	



4.2.3 Test Procedure			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.3.2.1	Power Spectral Density
<input checked="" type="checkbox"/>	Option 1:	For equipment with continuous and non-continuous transmissions	
<input type="checkbox"/>	Option 2:	For equipment with continuous transmission capability or for equipment operating with a constant duty cycle	

Step 1

1, Connect the UUT to the spectrum analyzer 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 analyzers not supporting this number of sweep points, the frequency band may be segmented.
 Detector: RMS Trace Mode: Max Hold
 Sweep time: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal
 For non-continuous signals, wait for the trace to stabilize.
 Save the data (trace data) set to a file.

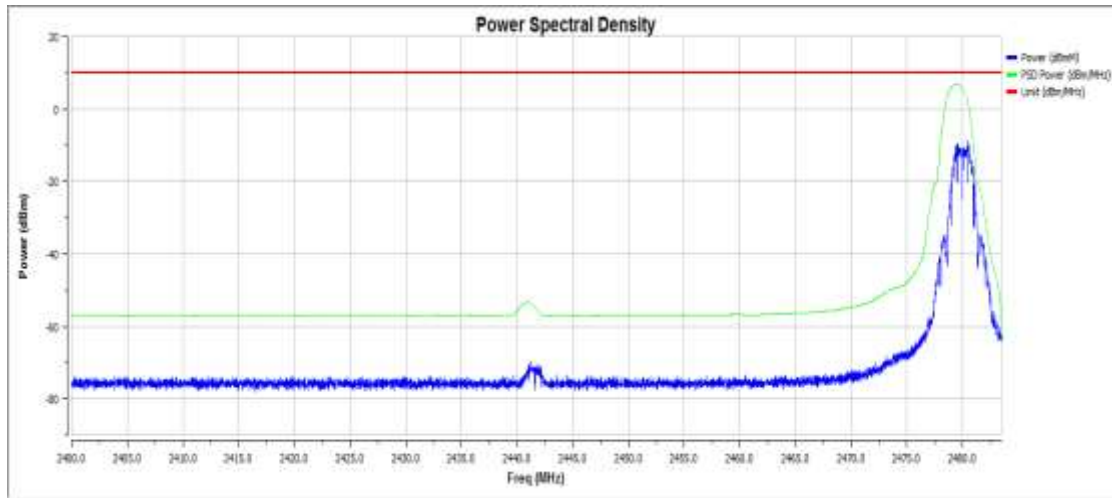
Step 2
For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each sampling point, add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.
Step 3
Add up the values for power for all the samples in the file using the formula below. $P_{Sum} = \sum_{n=1}^k P_{sample}(n)$ with 'k' being the total number of samples and 'n' the actual sample number
Step 4
Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.4.2 and save the corrected data. The following formulas can be used: $C_{corr} = P_{sum} - P_{e.i.r.p.} \quad P_{samplecorr}(n) = P_{sample}(n) - C_{corr}$ with 'n' being the actual sample number
Step 5
Starting from the first sample $P_{Samplecorr}(n)$ (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6
Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).
Step 7
Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments. From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

4.2.4 Test Data

Test Mode	Test Conditions	Frequency (MHz)	Power Spectral Density (dBm/MHz)	Limit (dBm)
Mode 1	Tnom (25 °C)	2 405	6.80	≦ 10
		2 440	6.38	≦ 10
		2 480	6.92	≦ 10

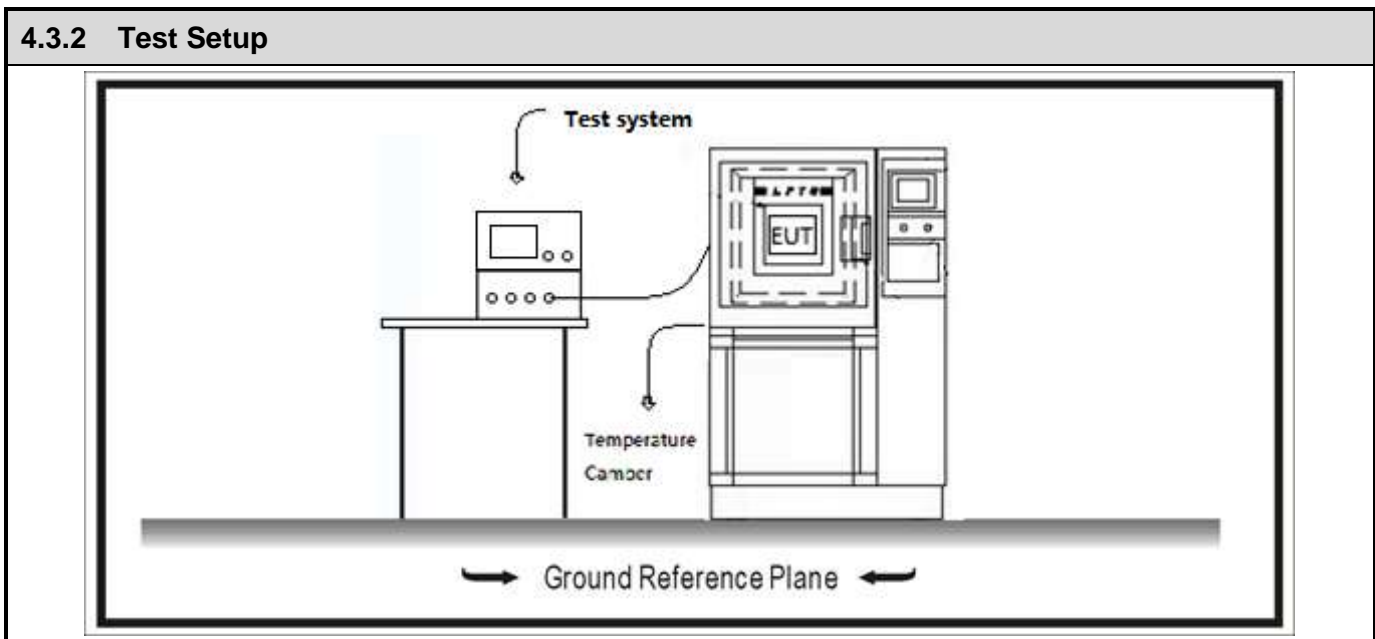
Note: The worst data as below.

Mode 1: Transmit at 2480 MHz by Zigbee



4.3 Duty Cycle, Tx-sequence, Tx-gap	VERDICT: N/A
--	---------------------

4.3.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS / For non-adaptive equipment using wide band modulations other than FHSS and EIRP lower than 10dBm.
N/A	
<input checked="" type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS and EIRP higher than 10dBm.
<p>1, The Duty Cycle shall be equal to or less than the maximum value declared by the supplier.</p> <p>2, The maximum Tx-sequence Time and the minimum Tx-gap Time shall be according to the formula below:</p> <p>3, Maximum Tx-Sequence Time = Minimum Tx-gap Time = M</p> <p>where M is in the range of 3,5 ms to 10 ms.</p>	



4.3.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.2.2.1.3	Duty Cycle, Tx-sequence, Tx-gap
Step 1		
<p>1, Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.</p> <p>2, The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples. In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.</p>		
Step 2		
Between the saved start and stop times of each individual burst, calculate the TxOn time. Save these TxOn values.		

Step 3

Duty Cycle is the sum of all TxOn times between the end of the first gap (which is the start of the first burst within the observation period) and the start of the last burst (within this observation period) divided by the observation period. The observation period is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2.

Step 4

- 1, For FHSS equipment using blacklisting, the TxOn time measured for a single (and active) hopping frequency shall be multiplied by the number of blacklisted frequencies. This value shall be added to the sum calculated in step 3 above. If the number of blacklisted frequencies cannot be determined, the minimum number of hopping frequencies (N) as defined in clause 4.3.1.4.3 shall be assumed
- 2, The calculated value for Duty Cycle (DC) shall be recorded in the test report. This value shall be equal to or less than the maximum value declared by the manufacturer

Step 5

- 1, Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
- 2, Identify any TxOff time that is equal to or greater than the minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3. These are the potential valid gap times to be further considered in this procedure.
- 3, Starting from the second identified gap, calculate the time from the start of this gap to the end of the preceding gap. This time is the Tx-sequence time for this transmission. Repeat this procedure until the last identified gap within the observation period is reached.
- 4, A combination of consecutive Tx-sequence times and Tx-gap times followed by a Tx-gap time, which is at least as long as the duration of this combination, may be considered as a single Tx-sequence time and in which case it shall comply with the limits defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.
- 5, It shall be noted in the test report whether the UUT complies with the limits for the maximum Tx-sequence time and minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.

4.3.4 Test Data

Applicability requirement:

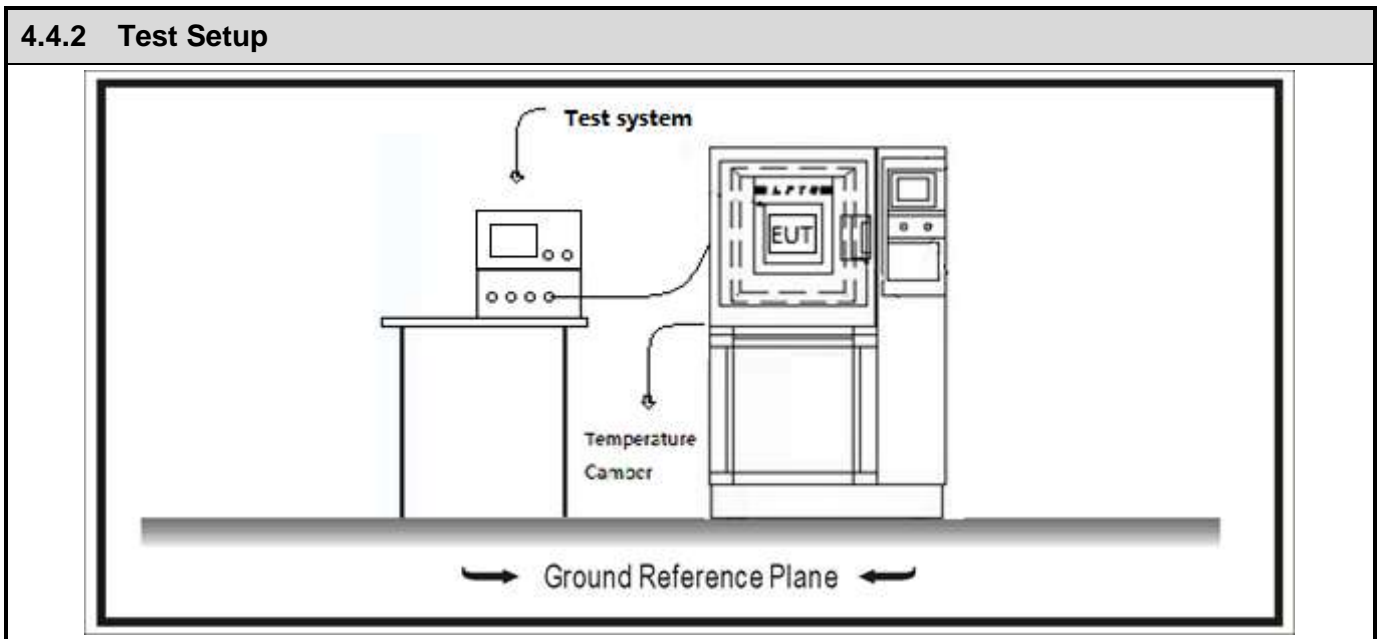
These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

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

Applicability judgment: Not Application

4.4 Medium Utilisation (MU) factor	VERDICT: N/A
---	---------------------

4.4.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS / For non-adaptive equipment using wide band modulations other than FHSS and EIRP lower than 10dBm.
N/A	
<input checked="" type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS and EIRP higher than 10dBm.
the maximum Medium Utilisation factor shall be 10 %.	



4.4.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.2.2.1.4	Medium Utilisation (MU) factor
Step 1		
Use the same stored measurement samples from the procedure described in clause 5.3.2.2.1.2.		
Step 2		
For each burst calculate the product of ($P_{burst} / 100 \text{ mW}$) and the T_{xOn} time. P_{burst} is expressed in mW. T_{xOn} time is expressed in ms.		
Step 3		
Medium Utilization is the sum of all these products divided by the observation period (expressed in ms) which is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. This value, which shall comply with the limit given in clause 4.3.1.6.3 or clause 4.3.2.5.3, shall be recorded in the test report.		
If operation without blacklisted frequencies is not possible, the power of the bursts on blacklisted hopping frequencies (for the calculation of the Medium Utilization) is assumed to be equal to the average value of the RMS power of the bursts on all active hopping frequencies.		

4.4.4 Test Data

Applicability requirement:

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

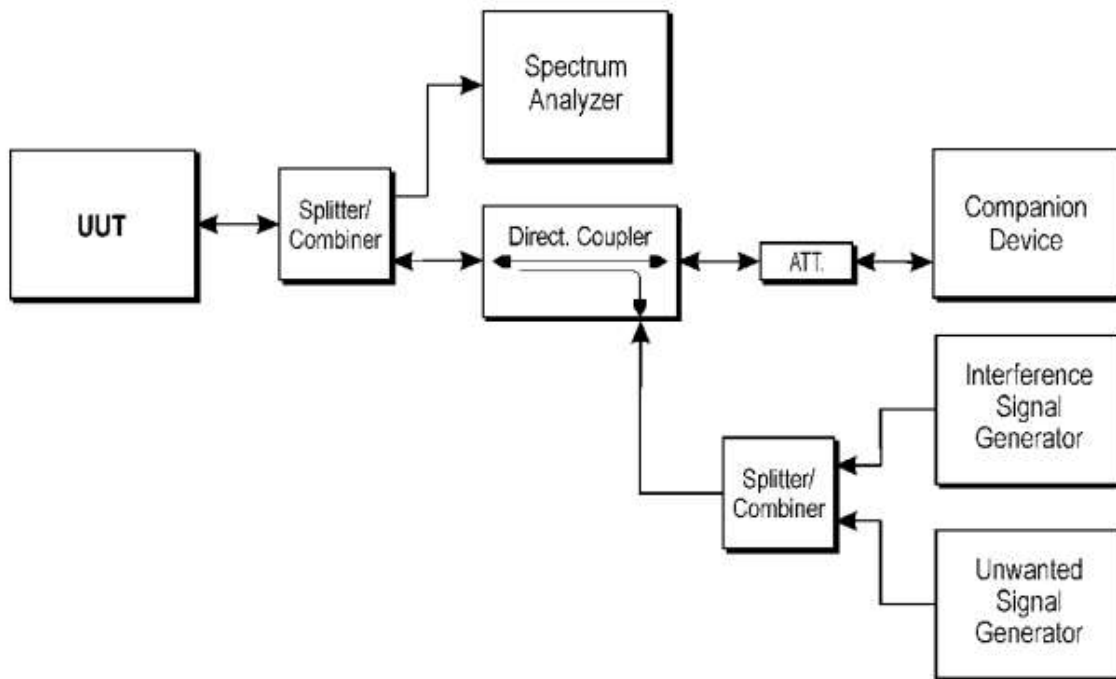
These requirements do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Applicability judgment: Not Application

4.5 Adaptivity	VERDICT: N/A
-----------------------	---------------------

4.5.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS
<input type="checkbox"/>	Non-LBT based Detect and Avoid
	(1) The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel; (2) COT \leq 40 ms; (3) Idle Period shall be minimum 5% of COT with a minimum of 100 μ s; (4) Detection threshold level = -70 dBm/MHz + 10 \times log ₁₀ (100 mW / P _{out}) (P _{out} in mW e.i.r.p.); (5) To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.
<input type="checkbox"/>	LBT based Detect and Avoid(Frame Based Equipment)
	(1) The CCA observation time shall be not less than 18 μ s; (2) The CCA time used by the equipment shall be declared by the supplier; (3) COT = 1-10 ms; (4) Idle Period = 5% of COT; (5) Detection threshold level = -70 dBm/MHz + 10 \times log ₁₀ (100 mW / P _{out}) (P _{out} in mW e.i.r.p.); (6) To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.
<input type="checkbox"/>	LBT based Detect and Avoid(Load Based Equipment)
	(1) The CCA observation time shall be not less than 18 μ s; (2) Extended CCA time shall be between 18 μ s and 160 μ s; (3) COT \leq 13ms; (4) Detection threshold level = -70 dBm/MHz + 10 \times log ₁₀ (100 mW / P _{out}) (P _{out} in mW e.i.r.p.); (5) To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.
<input type="checkbox"/>	Short Control Signalling Transmissions:
	Short Control Signalling Transmissions of adaptive non-FHSS equipment shall have a maximum T _{Xon} / (T _{Xon} + T _{Xoff}) ratio of 10 % within any observation period of 50 ms.
<input type="checkbox"/>	Unwanted Signal
	Single power \geq -35dBm

4.5.2 Test Setup



4.5.3 Test Procedure

References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.6.2.1.3	Adaptivity

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

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

Step 1

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

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

NOTE 1: Testing of Unidirectional equipment does not require a link to be established with a companion device.

3, The analyzer shall be set as follows:

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

(2)VBW: $3 \times$ RBW (if the analyzer does not support this setting, the highest available setting shall be used)

(3)Detector Mode: RMS

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

(5)Span: 0 Hz

(6)Sweep time: $>$ maximum Channel Occupancy Time

(7)Trace Mode: Clear Write

(8)Trigger Mode: Video

Step 2

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

2, For Frame Based Equipment, using the procedure defined in clause 5.4.7.2.1.4, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.3.2.2 step 3). When measuring the Idle Period of the UUT, only transmissions from the UUT shall be considered.

3, For Load Based equipment, using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.3.2.3, step 2 and step 3. When measuring the Idle Period of the UUT, only transmissions from the UUT shall be considered.

NOTE 2: For the purpose of testing Load Based Equipment referred to in the first paragraph of clause 4.3.2.6.3.2.3 (IEEE 802.11™ [i.3] or IEEE 802.15.4™ [i.4] equipment), the limits to be applied for the minimum Idle Period and the maximum Channel Occupancy Time are the same as defined for other types of Load Based

<p>Equipment (see clause 4.3.2.6.3.2.3 step 2) and step 3). The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3 step 1) and step 2).</p>
<p>Step 3: Adding the interference signal</p> <p>An interference signal as defined in clause B.6 is injected on the current operating channel of the UUT. The power spectral density level (at the input of the UUT) of this interference signal shall be equal to the detection threshold defined in clause 4.3.2.6.3.2.2 step 5) (frame based equipment) or clause 4.3.2.6.3.2.3 step 5) (load based equipment).</p>
<p>Step 4: Verification of reaction to the interference signal</p> <p>1, The spectrum analyzer shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyzer sweep to be triggered by the start of the interfering signal.</p> <p>2, Using the procedure defined in clause 5.4.7.2.1.4, it shall be verified that:</p> <p>i) The UUT shall stop transmissions on the current operating channel.</p> <p>NOTE 3: The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time defined in clause 4.3.2.6.3.2.2 (frame based equipment) or clause 4.3.2.6.3.2.3 (load based equipment).</p> <p>ii) Apart from Short Control Signalling Transmissions, there shall be no subsequent transmissions while the interfering signal is present.</p> <p>NOTE 4: To verify that the UUT is not resuming normal transmissions as long as the interference signal is present, the monitoring time may need to be 60 s or more.</p> <p>iii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering signal is present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2. NOTE 5: The verification of the Short Control Signalling transmissions may require the analyzer settings to be changed (e.g. sweep time).</p> <p>iv) Alternatively, the equipment may switch to a non-adaptive mode.</p>
<p>Step 5: Adding the unwanted CW signal</p> <p>1, With the interfering signal present, a 100 % duty cycle CW signal is inserted as the unwanted signal. The frequency and the level are provided in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.</p> <p>2, The spectrum analyzer shall be used to monitor the transmissions of the UUT on the selected operating</p> <p>3, Using the procedure defined in clause 5.4.7.2.1.4, it shall be verified that:</p> <p>i) The UUT shall not resume normal transmissions on the current operating channel as long as both the interference and blocking signals remain present.</p> <p>NOTE 6: To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.</p> <p>ii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering and blocking signals are present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2.</p> <p>NOTE 7: The verification of the Short Control Signalling transmissions may require the analyzer settings to be changed (e.g. sweep time).</p>
<p>Step 6: Removing the interference and unwanted signal</p> <p>On removal of the interference and unwanted signal the UUT is allowed to start transmissions again on this channel however this is not a requirement and therefore does not require testing.</p>
<p>Step 7: Removing the interference and unwanted signal</p> <p>Step 2 to step 6 shall be repeated for each of the frequencies to be tested.</p>

4.5.4 Test Data

Applicability requirement:

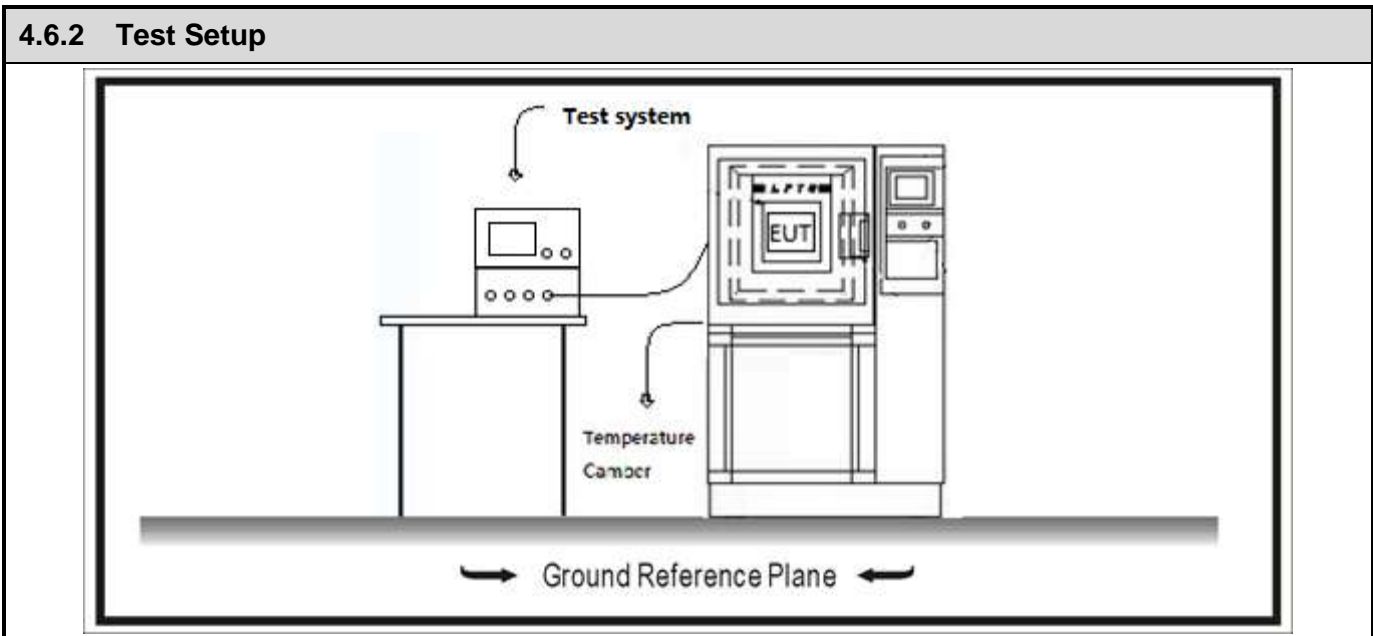
These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

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

Applicability judgment: Not Application

4.6 Occupied Channel Bandwidth	VERDICT: PASS
---------------------------------------	----------------------

4.6.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS
The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.	
<input checked="" type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.	



4.6.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.7.2.1	Occupied Channel Bandwidth
Step 1		
<p>1, Connect the UUT to the spectrum analyzer and use the following settings</p> <p>(1), Centre Frequency: The centre frequency of the channel under test</p> <p>(2), Resolution BW: ~ 1 % of the span without going below 1 %</p> <p>(3), Video BW: 3 x RBW</p> <p>(4), Frequency Span : 2 x Nominal Channel Bandwidth</p> <p>(5), Detector Mode: RMS</p> <p>(6), Trace Mode: Max Hold</p> <p>(7), Sweep time: 1 s</p>		

Step 2

Wait for the trace to stabilize.

Find the peak value of the trace 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 UUT. This value shall be recorded.

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

4.7 Transmitter unwanted emissions in the out-of-band domain	VERDICT: PASS
---	----------------------

4.7.1 Limit

Standard	ETSI EN 300 328 V2.2.2
-----------------	------------------------

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.
 NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement.

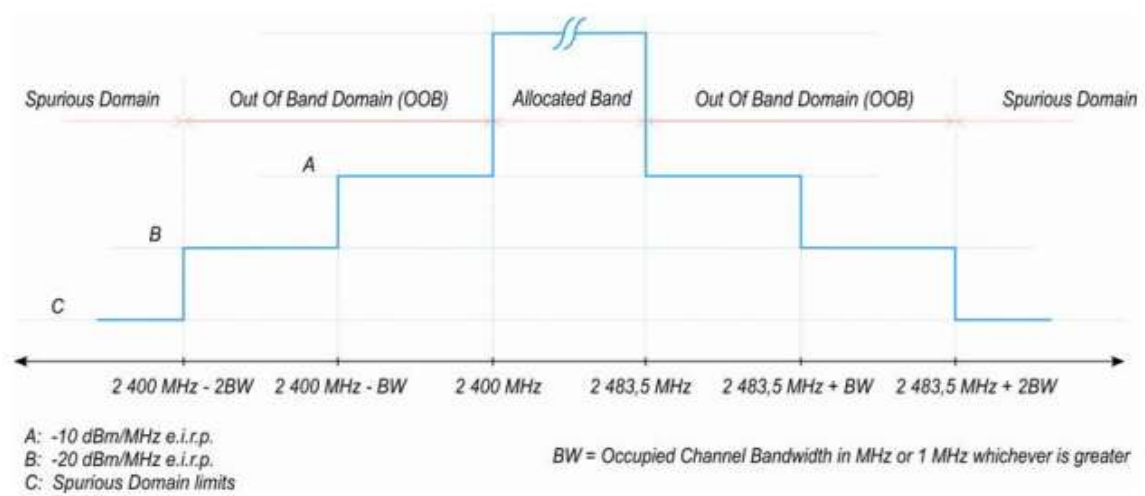
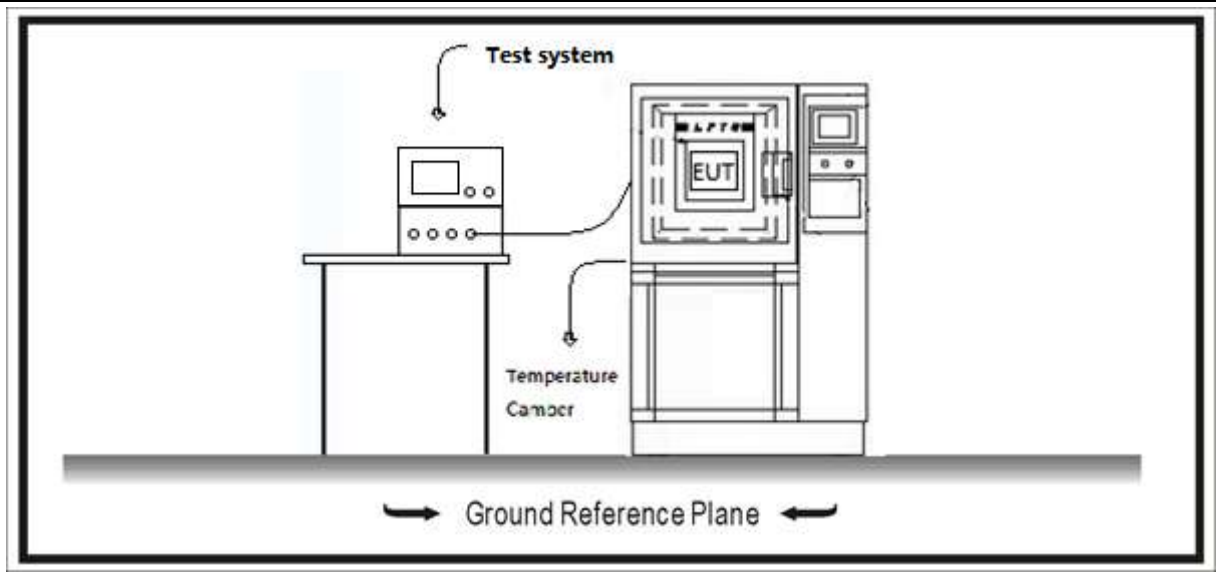


Figure 3: Transmit mask

4.7.2 Test Setup



4.7.3 Test Setup			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.8.2.1	Transmitter unwanted emissions in the out-of-band domain
<p>The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyzer is equipped with the Time Domain Power option.</p>			
Step 1			
<p>1, Connect the UUT to the spectrum analyzer and use the following settings</p> <p>(1), Centre Frequency: 2 484 MHz</p> <p>(2), Span: 0 Hz</p> <p>(3), Resolution BW: 1 MHz</p> <p>(4), Video BW: 3 MHz</p> <p>(5), Detector Mode: RMS</p> <p>(6), Trace Mode: Max Hold</p> <p>(7), Sweep Mode: Single Sweep</p> <p>(8), Sweep Points: Sweep time [μs] / (1 μs) with a maximum of 30 000</p> <p>(9), Trigger Mode: Video trigger</p> <p>(10), Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power</p>			
Step 2(segment 2 483,5 MHz to 2 483,5 MHz + BW):			
<p>1, Adjust the trigger level to select the transmissions with the highest power level.</p> <p>2, For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.</p> <p>3, Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.</p> <p>4, Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.</p> <p>5, Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).</p>			
Step 3(segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW):			
<p>Change the centre frequency of the analyzer to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).</p>			
Step 4 (segment 2 400 MHz - BW to 2 400 MHz):			
<p>Change the centre frequency of the analyzer to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).</p>			

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

Change the centre frequency of the analyzer to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):

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

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

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

(2) Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by $10 \times \log_{10}(Ach)$ and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

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

It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

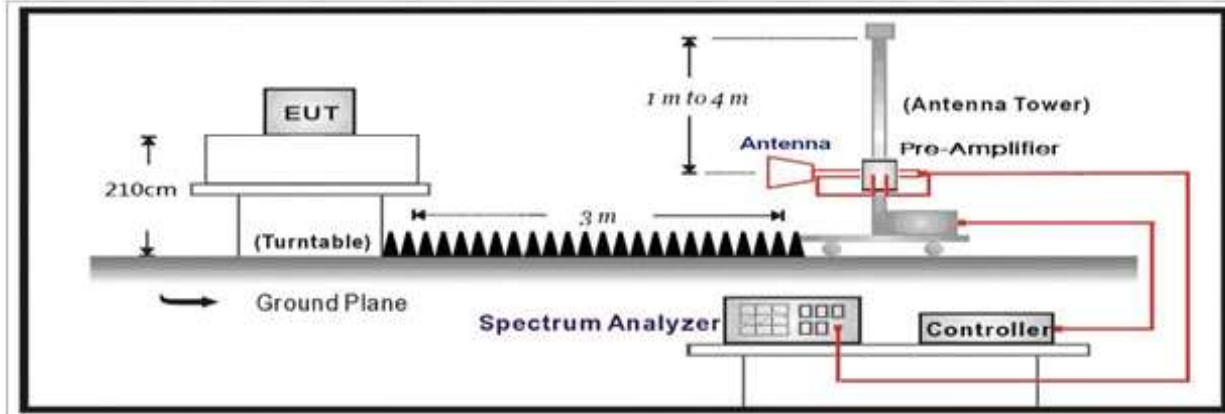
4.7.4 Test Data			
Test Mode	Frequency Range (MHz)	Total Max Measured Values (dBm/MHz)	Limit (dBm/MHz)
Mode 1	2 400-2BW~2 400-BW	-50.03	≤-20
	2 400-BW~2 400	-44.42	≤-10
	2 483.5~2 483.5+BW	-40.72	≤-10
	2 483.5+BW~2 483.5+2BW	-45.32	≤-20
Note 1: The Antenna Gain please refer to clause 1.2			

4.8 Transmitter unwanted emissions in the spurious domain**VERDICT: PASS**

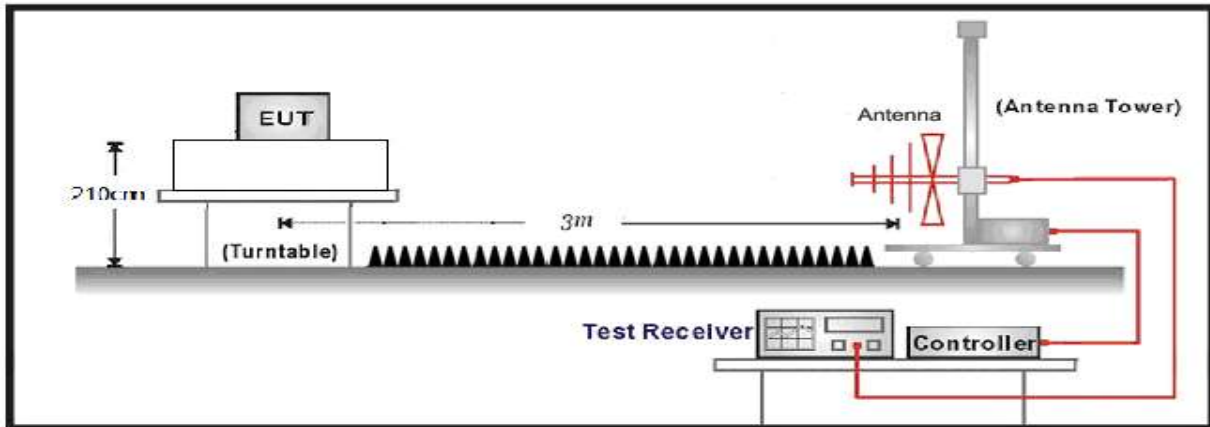
4.8.1 Limit		
Standard	ETSI EN 300 328 V2.2.2	
Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100kHz
47 MHz to 74 MHz	-54 dBm	100kHz
74 MHz to 87,5 MHz	-36 dBm	100kHz
87,5 MHz to 118 MHz	-54 dBm	100kHz
118 MHz to 174 MHz	-36 dBm	100kHz
174 MHz to 230 MHz	-54 dBm	100kHz
230 MHz to 470 MHz	-36 dBm	100kHz
470 MHz to 694 MHz	-54 dBm	100kHz
694 MHz to 1 GHz	-36 dBm	100kHz
1 GHz to 12,75 GHz	-30 dBm	1MHz

4.8.2 Test Setup

Transmitter unwanted emissions in the spurious domain / AC6 (Below 1G)



Transmitter unwanted emissions in the spurious domain / AC6(Above 1G)



4.8.3 Test Procedure

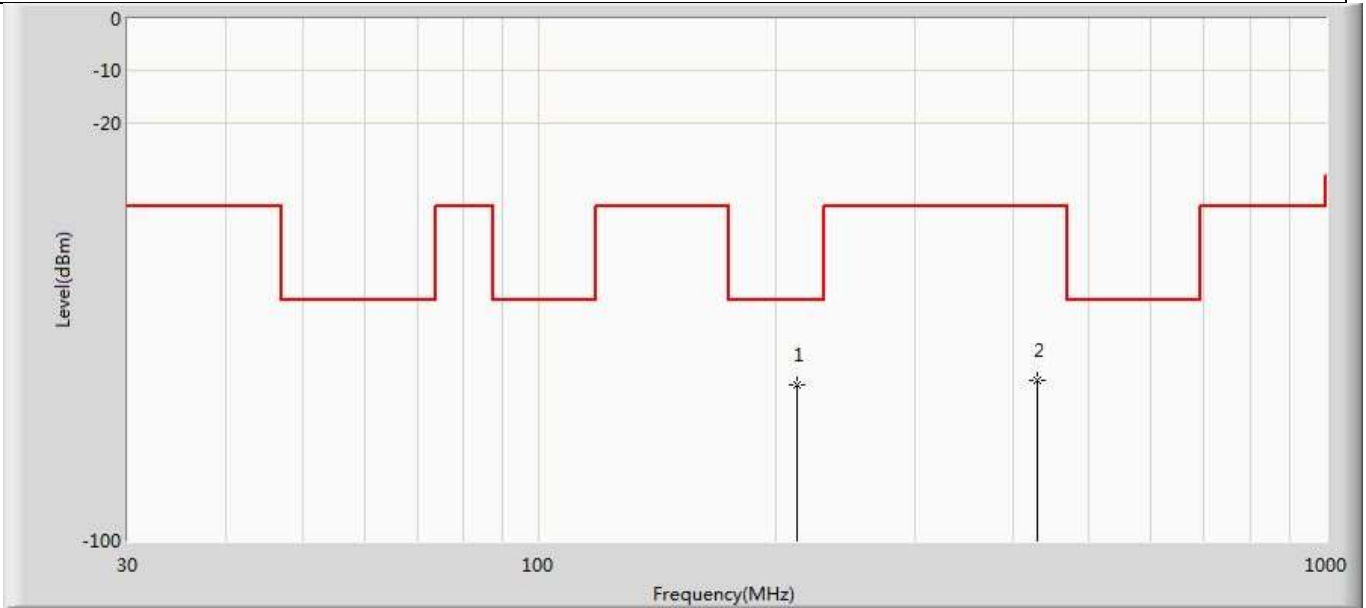
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.9.2.2	Radiated measurement
	Step 1		
	The sensitivity of the measurement set-up should be such that the noise floor is at least 12 dB below the limits given in table 4 or table 12.		
	Step 2		
	The emissions over the range 30 MHz to 1 000 MHz shall be identified.		
	Spectrum analyzer settings:		
	(1),Resolution bandwidth: 100 kHz		
	(2),Video bandwidth: 300 kHz		
	(3),Filter type: 3 dB (Gaussian)		
	(4),Detector mode: Peak		
	(5),Trace Mode: Max Hold		
	(6),Sweep Points: ≥ 19 400		
	NOTE 1: For spectrum analyzers not supporting this high number of sweep points, the frequency band		

	<p>may need to be segmented.</p> <p>(7)Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT, on any channel.</p> <p>For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on any of the hopping frequencies.</p> <p>NOTE 2: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyzer could be used.</p> <p>Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12</p> <p>Step 3</p> <p>The emissions over the range 1 GHz to 12,75 GHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 1 MHz</p> <p>(2),Video bandwidth: 3 MHz</p> <p>(3),Filter type: 3 dB (Gaussian)</p> <p>(4),Detector mode: Peak</p> <p>(5),Trace Mode: Max Hold</p> <p>(6),Sweep Points: ≥ 23 500</p> <p>NOTE 3: For spectrum analyzers not supporting this high number of sweep points, the frequency band may need to be segmented.</p> <p>(7)Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT, on any channel.</p> <p>For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on any of the hopping frequencies.</p> <p>NOTE 4: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyzer could be used.</p> <p>Allow the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12.</p> <p>Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.9.2.1.3.</p> <p>Step 4</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 and step 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identify emissions during this pre-scan need to be reduced with $10 \times \log_{10} (Ach)$ (number of active transmit chains).</p> <p>Measurement of the emissions identified during the pre-scan</p> <p>The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyzer has a Time Domain Power function</p>
--	---

Step 1
<p>The level of the emissions shall be measured using the following spectrum analyzer settings:</p> <p>(1),Measurement Mode: Time Domain Power</p> <p>(2),Centre Frequency: Frequency of the emission identified during the pre-scan</p> <p>(3),Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)</p> <p>(4),Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)</p> <p>(5),Frequency Span: Zero Span</p> <p>(6),Sweep mode: Single Sweep</p> <p>(7),Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power</p> <p>(8),Sweep points: Sweep time [μs] / (1 μs) with a maximum of 30 000</p> <p>(9),Trigger: Video (burst signals) or Manual (continuous signals)</p> <p>(10),Detector: RMS</p>
Step 2
<p>Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window.</p> <p>If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.</p>
Step 3
<p>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 needs to be repeated for each of the active transmit chains (Ach).</p> <p>Sum the measured power (within the observed window) for each of the active transmit chains.</p>
Step 4
<p>The value defined in step 3 shall be compared to the limits defined in tables 4 and 12.</p>

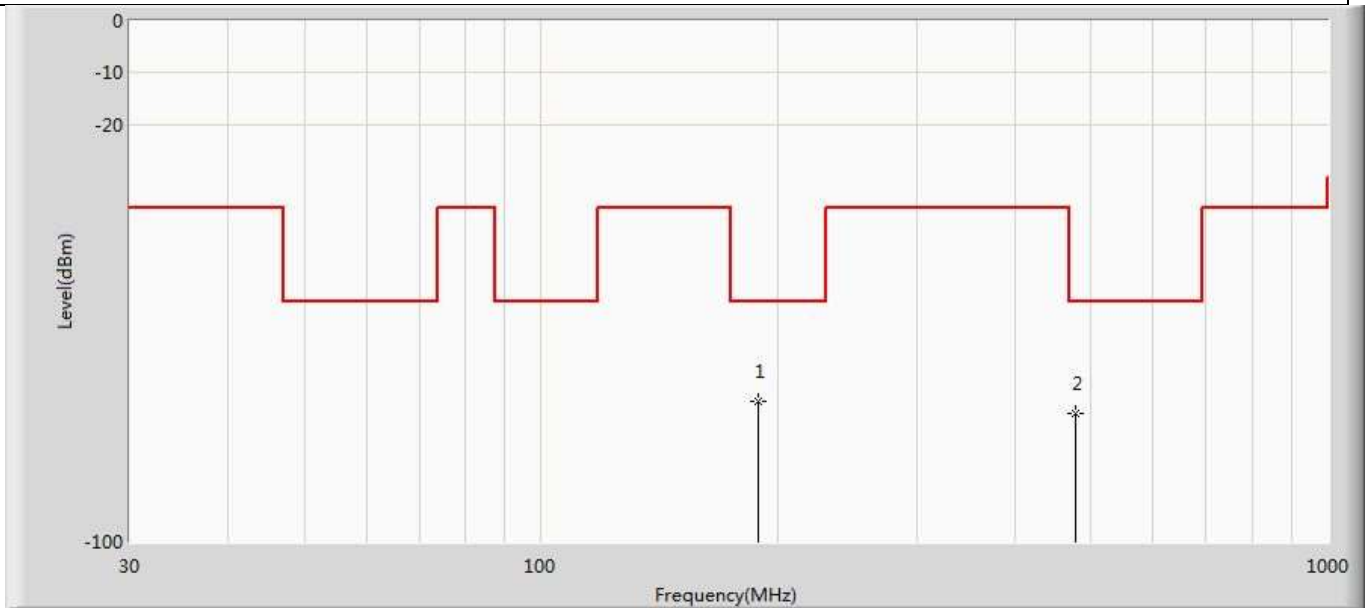
4.8.4 Test Data

Profile: 2110839R	Page No.: 73
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2405MHz by Zigbee	



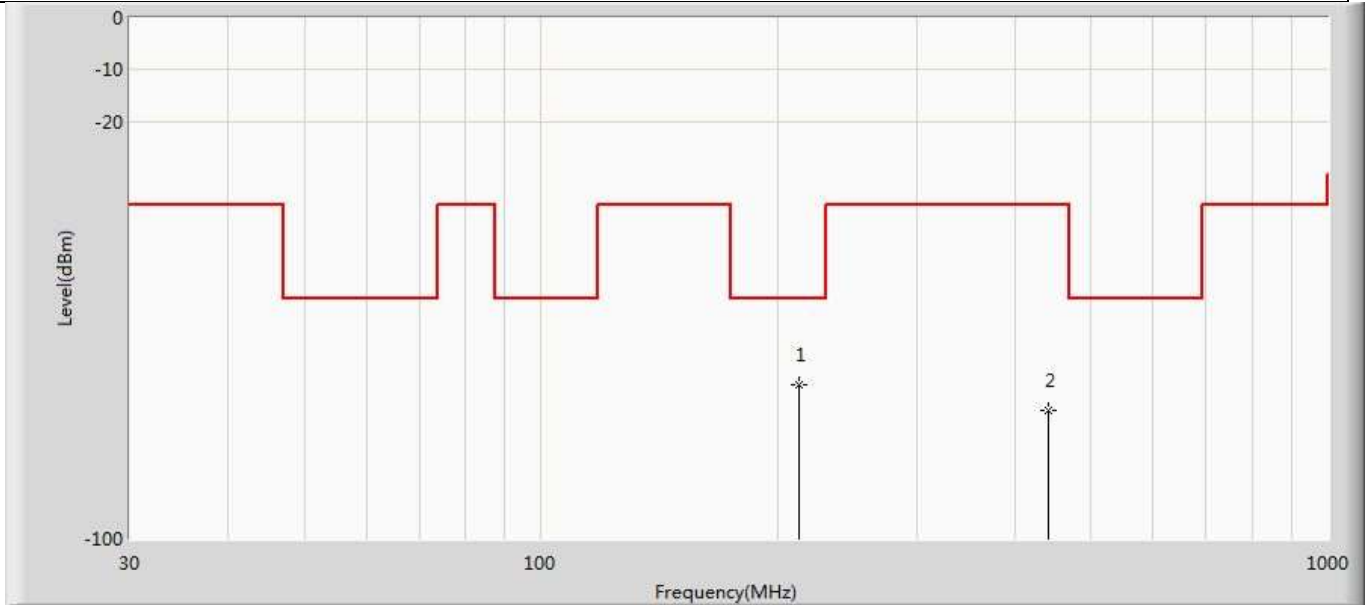
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	212.360	-70.270	-91.403	-16.270	-54.000	21.133	PK
2		429.640	-69.349	-100.775	-33.349	-36.000	31.426	PK

Profile: 2110839R	Page No.: 74
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2405MHz by Zigbee	



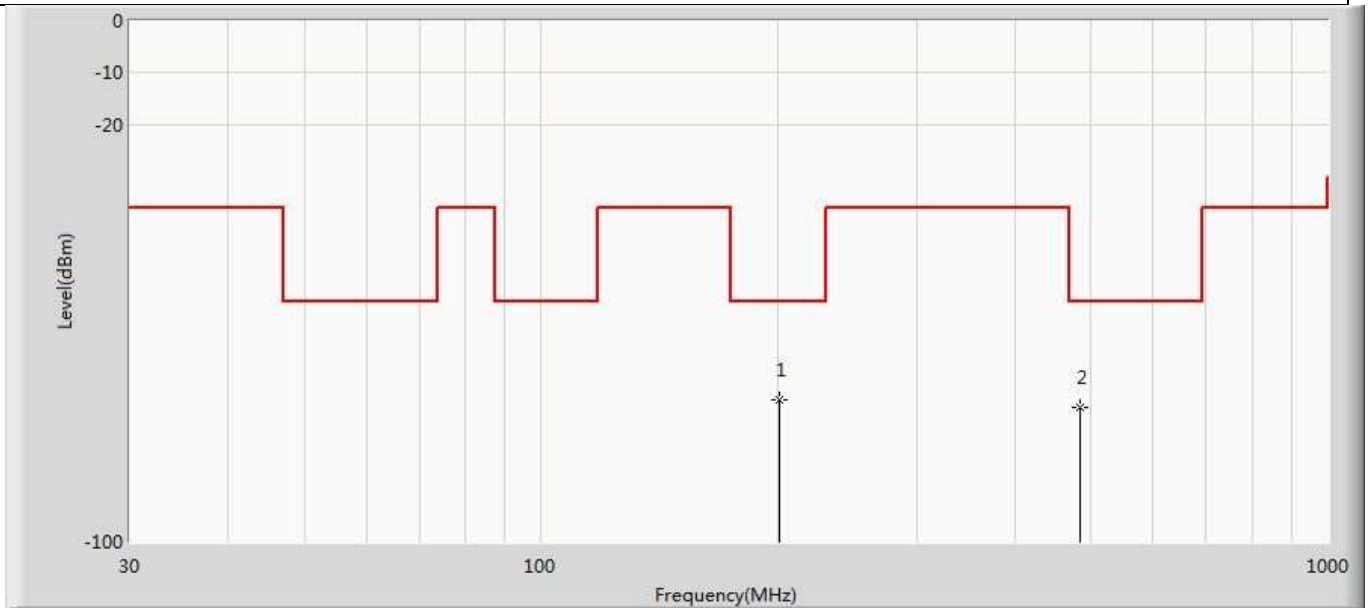
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	189.080	-72.942	-94.905	-18.942	-54.000	21.963	PK
2		478.140	-75.258	-105.713	-21.258	-54.000	30.455	PK

Profile: 2110839R	Page No.: 75
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2480MHz by Zigbee	



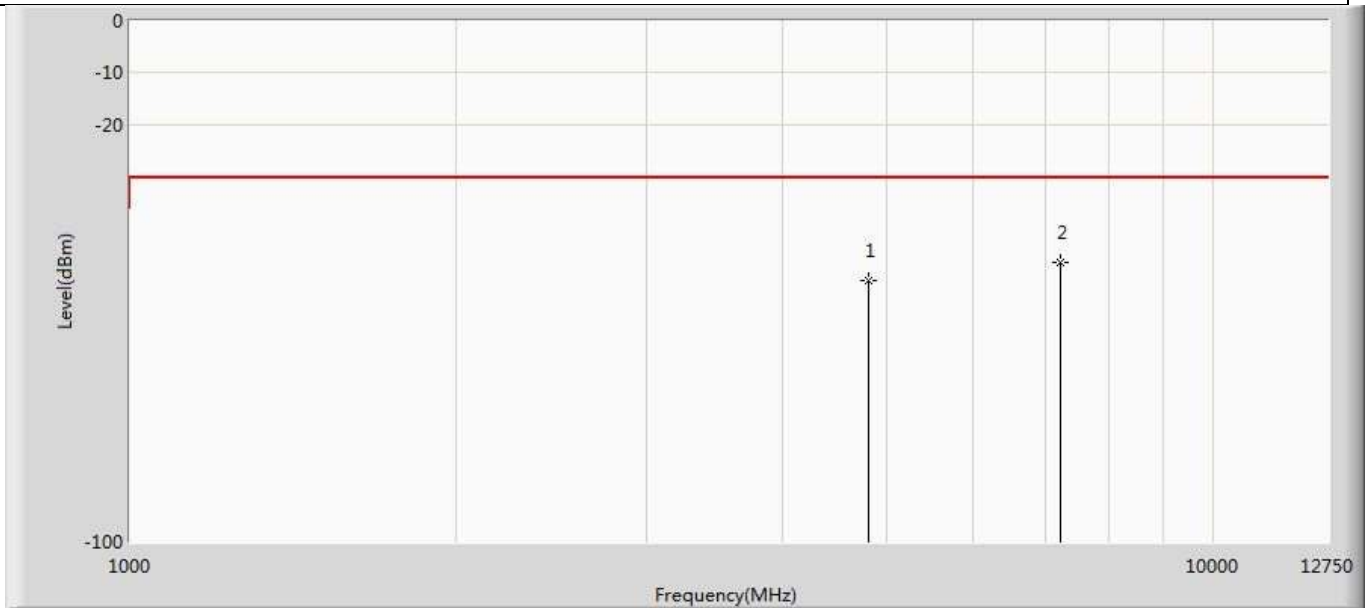
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	212.360	-70.351	-91.484	-16.351	-54.000	21.133	PK
2		441.280	-75.293	-106.152	-39.293	-36.000	30.859	PK

Profile: 2110839R	Page No.: 76
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2480MHz by Zigbee	



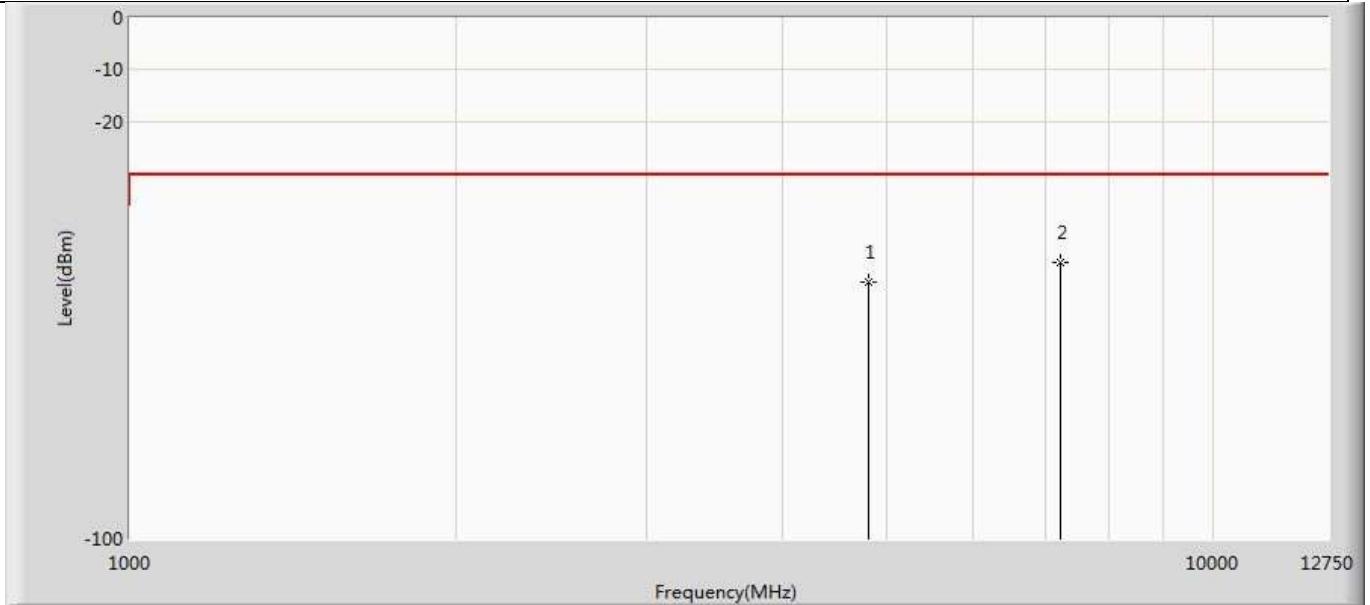
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	200.720	-72.614	-94.937	-18.614	-54.000	22.323	PK
2		483.960	-74.099	-104.617	-20.099	-54.000	30.518	PK

Profile: 2110839R	Page No.: 81
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2405MHz by Zigbee	



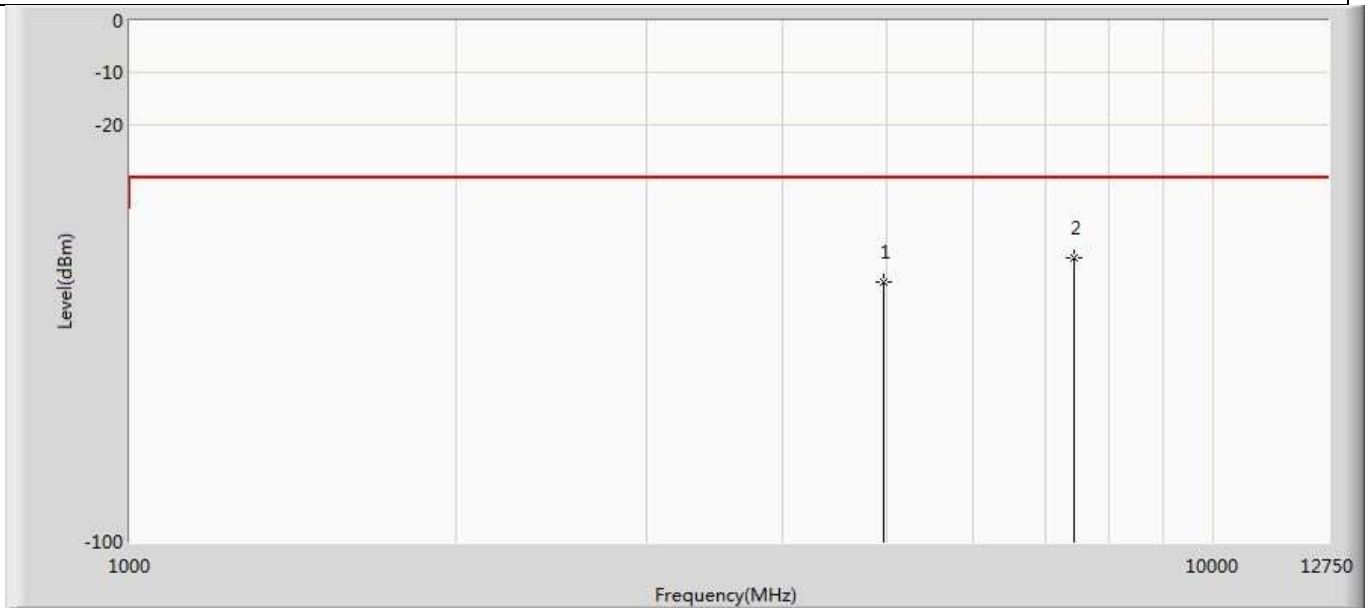
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4811.000	-49.908	-65.526	-19.908	-30.000	15.618	PK
2	*	7216.000	-46.473	-67.438	-16.473	-30.000	20.965	PK

Profile: 2110839R	Page No.: 82
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2405MHz by Zigbee	



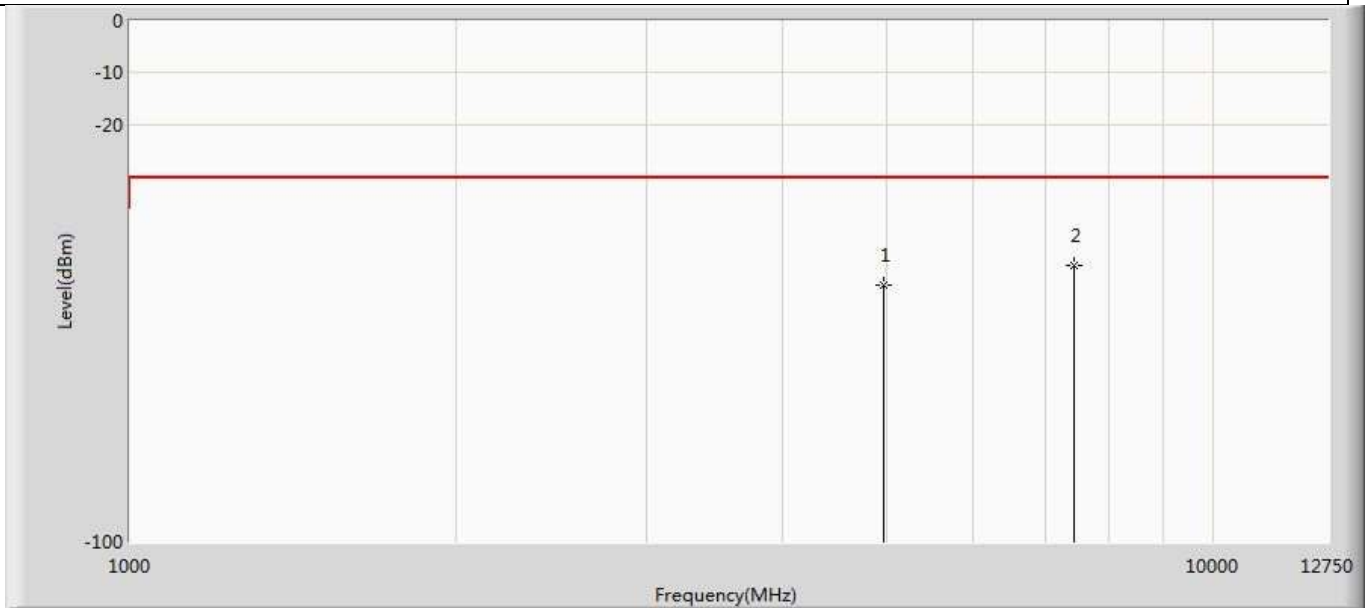
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4809.000	-50.809	-65.343	-20.809	-30.000	14.534	PK
2	*	7215.000	-46.951	-67.650	-16.951	-30.000	20.699	PK

Profile: 2110839R	Page No.: 83
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2480MHz by Zigbee	



No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4960.000	-50.178	-65.693	-20.178	-30.000	15.515	PK
2	*	7438.000	-45.600	-67.687	-15.600	-30.000	22.087	PK

Profile: 2110839R	Page No.: 84
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2480MHz by Zigbee	



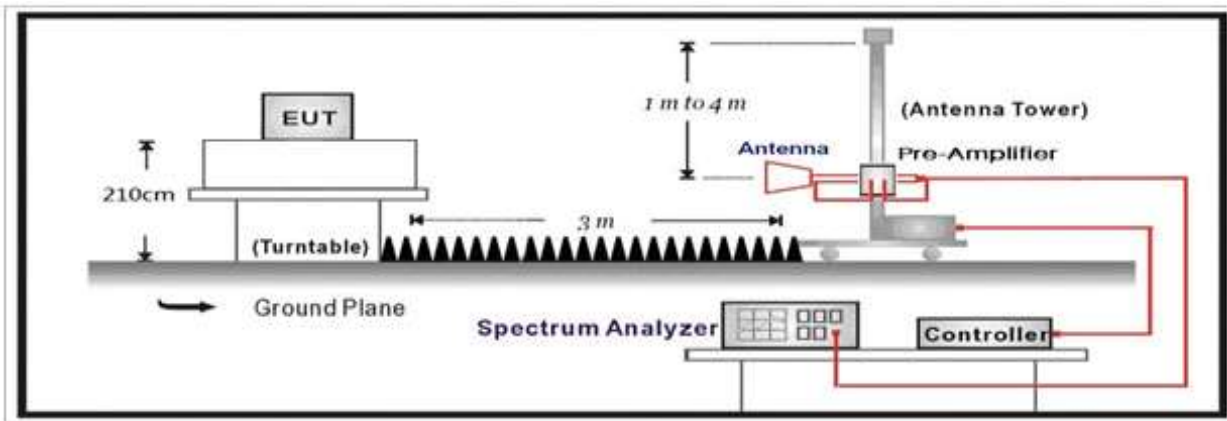
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4963.000	-50.782	-65.204	-20.782	-30.000	14.422	PK
2	*	7440.000	-46.841	-68.527	-16.841	-30.000	21.686	PK

4.9 Receiver Spurious Emissions **VERDICT: PASS**

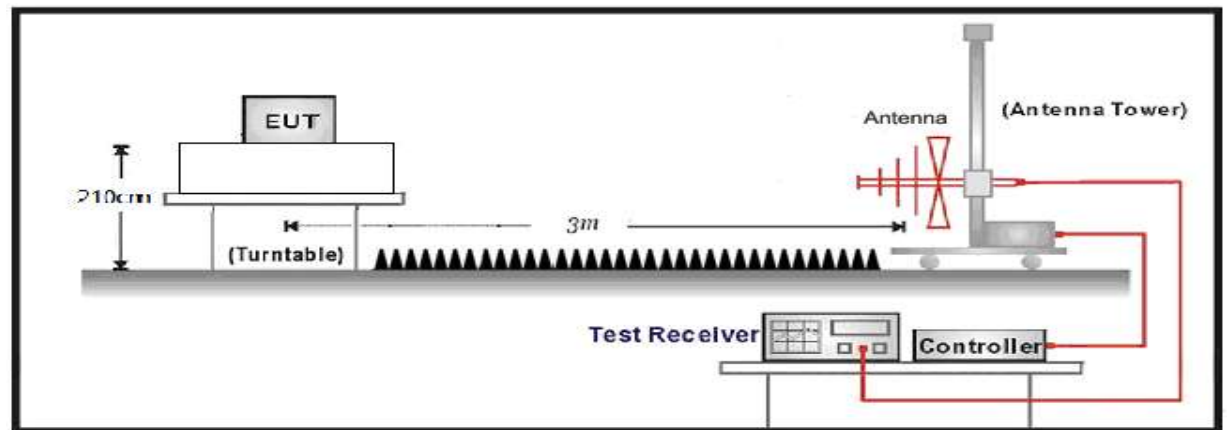
4.9.1 Limit		
Standard	ETSI EN 300 328 V2.2.2	
Frequency range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

4.9.2 Test Setup

Receiver Spurious Emissions / AC6 (Below 1G)



Receiver Spurious Emissions / AC6 (Above 1G)

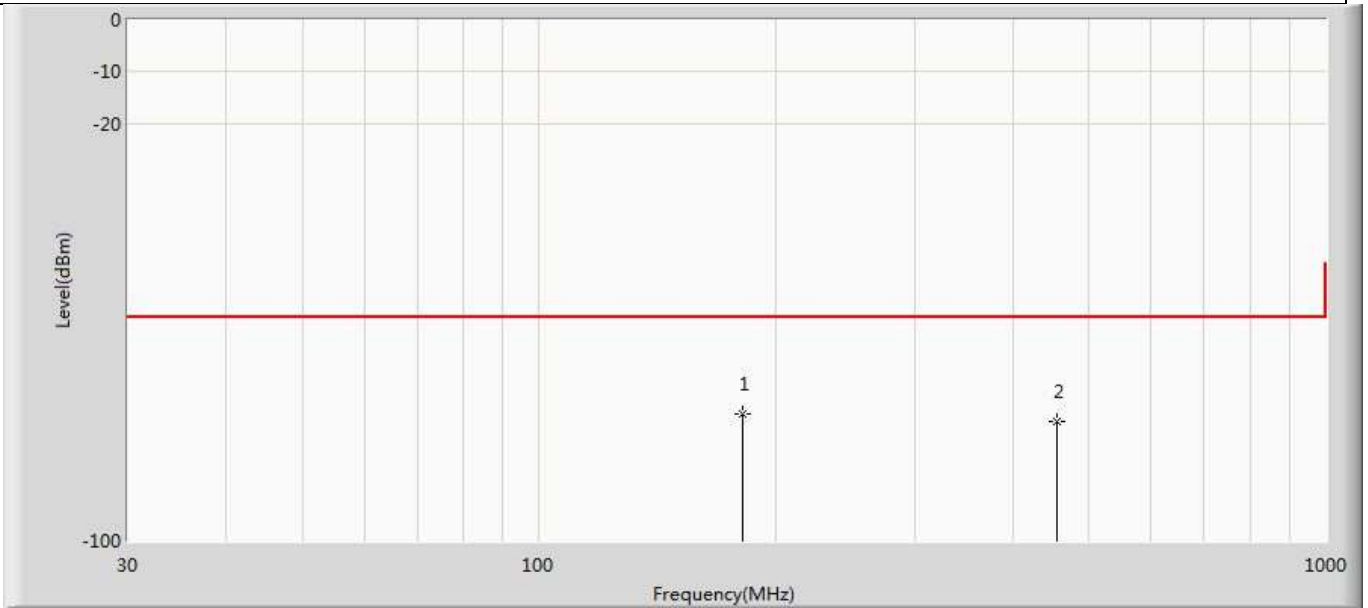


4.9.3 Test Procedure			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.10.2.2	Radiated measurement
	<p>Step 1</p> <p>The sensitivity of the spectrum analyzer should be such that the noise floor is at least 12 dB below the limits given in table 5 or table 13.</p>		
	<p>Step 2</p> <p>The emissions over the range 30 MHz to 1 000 MHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 100 kHz (2),Video bandwidth: 300 kHz (3),Filter type: 3 dB (Gaussian) (4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 19 400 (7)Sweep time:Auto</p> <p>Wait for the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in table 5 or table 13.</p>		
	<p>Step 3</p> <p>The emissions over the range 1 GHz to 12,75 GHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 1 MHz (2),Video bandwidth: 3 MHz (3),Filter type: 3 dB (Gaussian) (4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 23 500;For spectrum analyzers not supporting this high number of sweep points, the frequency band may need to be segmented. (7),Sweep time: Auto</p> <p>Wait for the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in table 5 or table 13.</p> <p>FHSS equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.10.2.1.3.</p>		
	<p>Step 4</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 and step 3 need to be repeated for each of the active receive chains (Ach)The limits used to identify emissions during this pre-scan need to be reduced with $10 \times \log_{10} (Ach)$ (number of active receive chains).</p>		
	<p>Measurement of the emissions identified during the pre-scan</p> <p>The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyzer has a Time</p>		

	<p>Domain Power function</p> <p>Step 1</p> <p>The level of the emissions shall be measured using the following spectrum analyzer settings:</p> <p>(1),Measurement Mode: Time Domain Power (2),Centre Frequency: Frequency of the emission identified during the pre-scan (3),Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz) (4),Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz) (5),Frequency Span: Zero Span (6),Sweep mode: Single Sweep (7),Sweep time: 30 ms (8),Sweep points: ≥ 30 000 (9),Trigger: Video (burst signals) or Manual (continuous signals) (10),Detector: RMS</p> <p>Step 2</p> <p>Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.</p> <p>Step 3</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 needs to be repeated for each of the active receive chains (Ach). Sum the measured power (within the observed window) for each of the active receive chains</p> <p>Step 4</p> <p>The value defined in step 3 shall be compared to the limits defined in tables 5 and 13.</p>
--	---

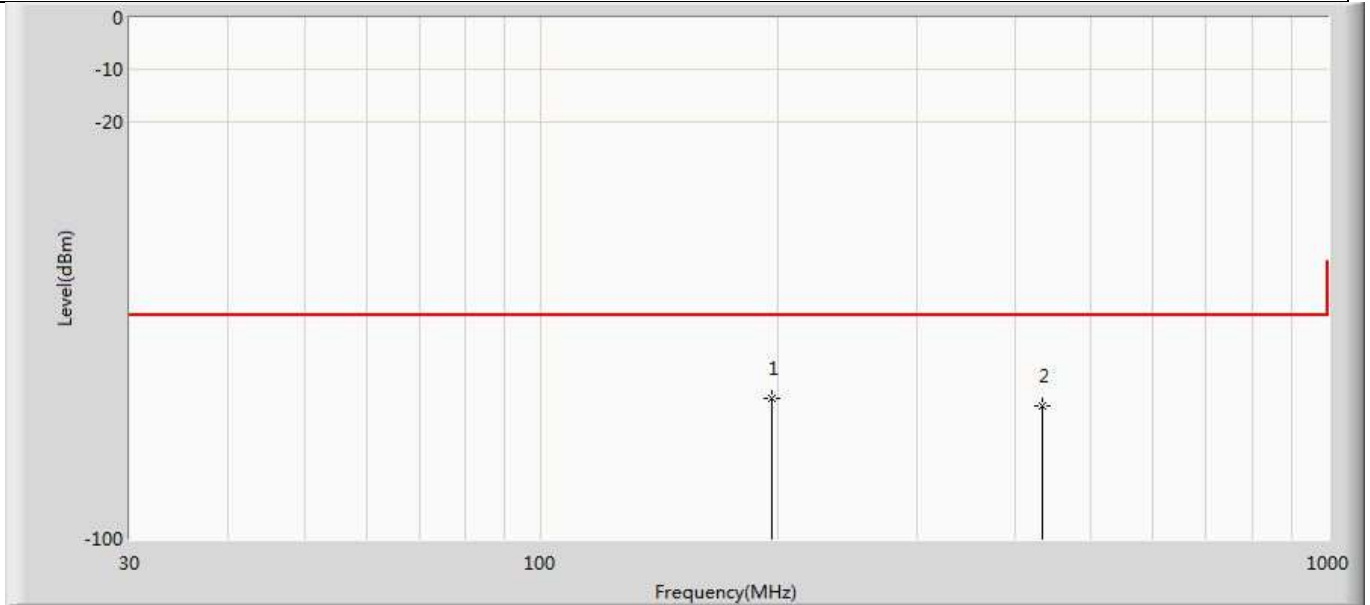
4.9.4 Test Data

Profile: 2110839R	Page No.: 77
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2405MHz by Zigbee	



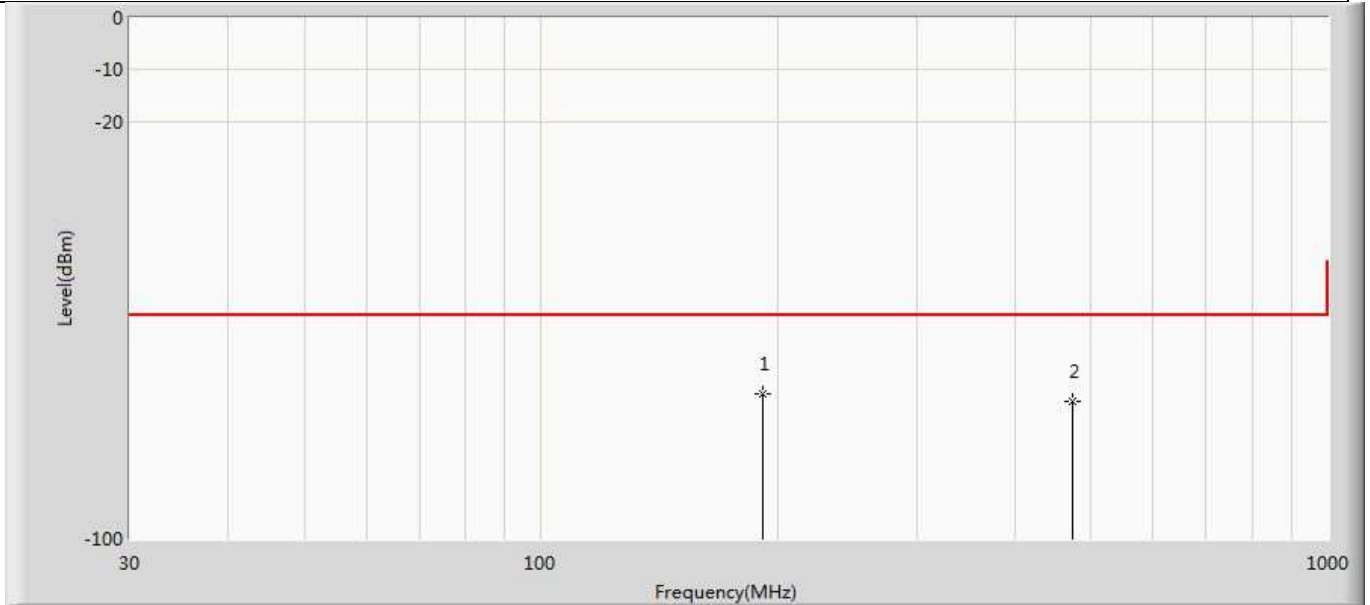
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	181.320	-75.557	-98.083	-18.557	-57.000	22.526	PK
2		454.860	-77.053	-107.465	-20.053	-57.000	30.412	PK

Profile: 2110839R	Page No.: 78
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2405MHz by Zigbee	



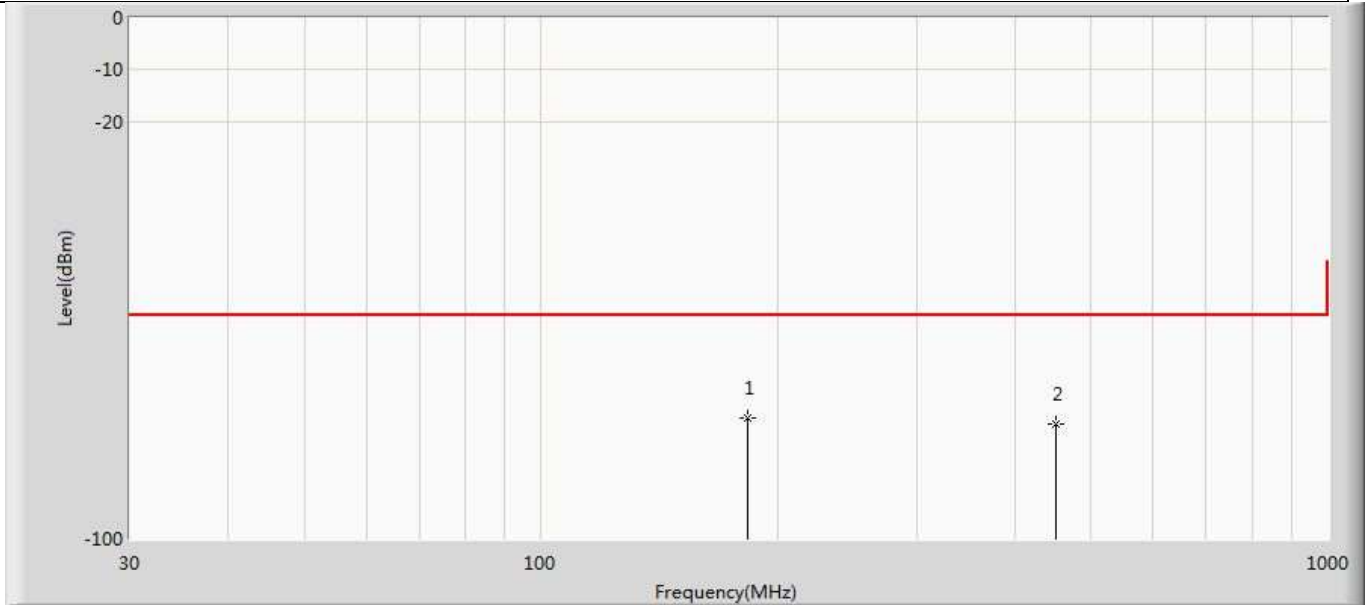
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	196.840	-73.187	-95.654	-16.187	-57.000	22.467	PK
2		433.520	-74.458	-104.808	-17.458	-57.000	30.350	PK

Profile: 2110839R	Page No.: 79
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2480MHz by Zigbee	



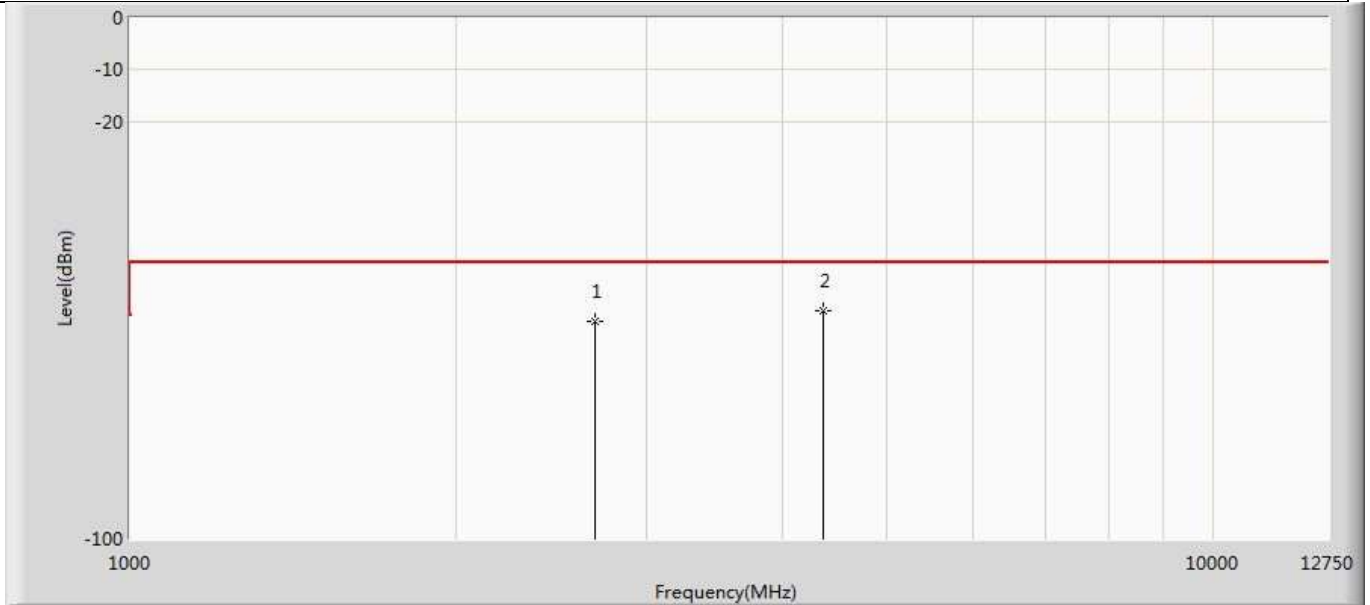
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	191.020	-72.230	-95.311	-15.230	-57.000	23.081	PK
2		474.260	-73.757	-104.420	-16.757	-57.000	30.663	PK

Profile: 2110839R	Page No.: 80
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:59
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2480MHz by Zigbee	



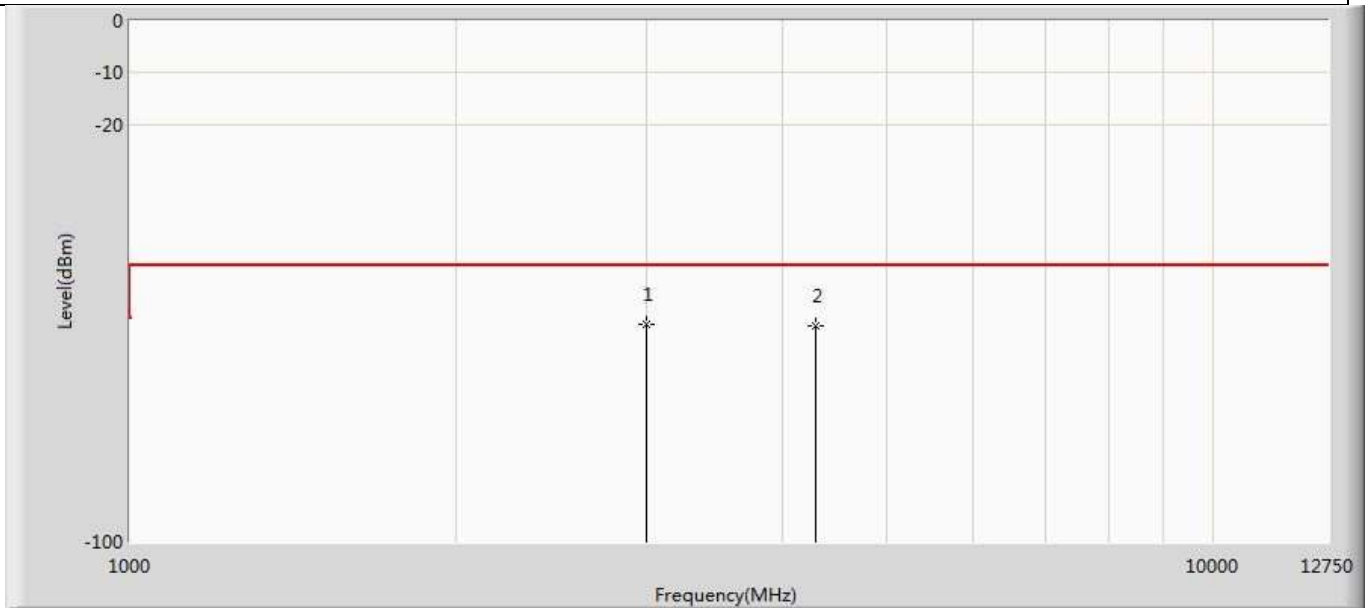
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	183.260	-76.774	-98.030	-19.774	-57.000	21.256	PK
2		450.980	-77.962	-108.329	-20.962	-57.000	30.367	PK

Profile: 2110839R	Page No.: 85
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 15:00
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2405MHz by Zigbee	



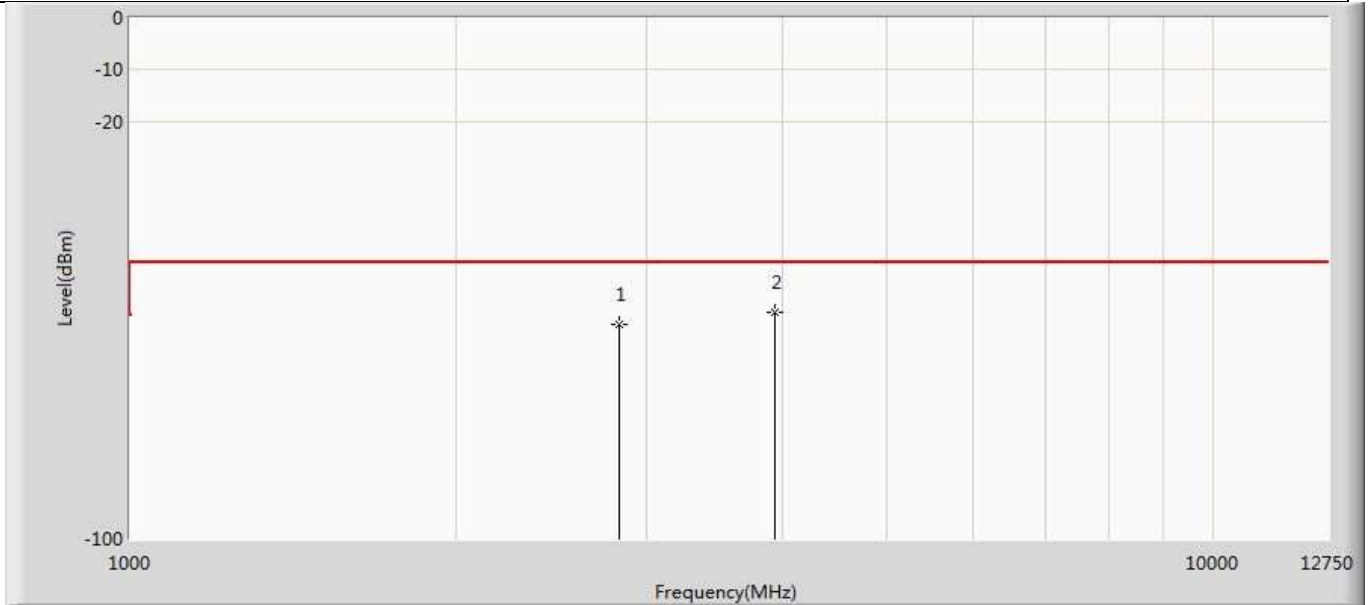
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		2692.000	-58.330	-67.912	-11.330	-47.000	9.582	PK
2	*	4360.500	-56.265	-70.097	-9.265	-47.000	13.832	PK

Profile: 2110839R	Page No.: 86
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 15:00
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2405MHz by Zigbee	



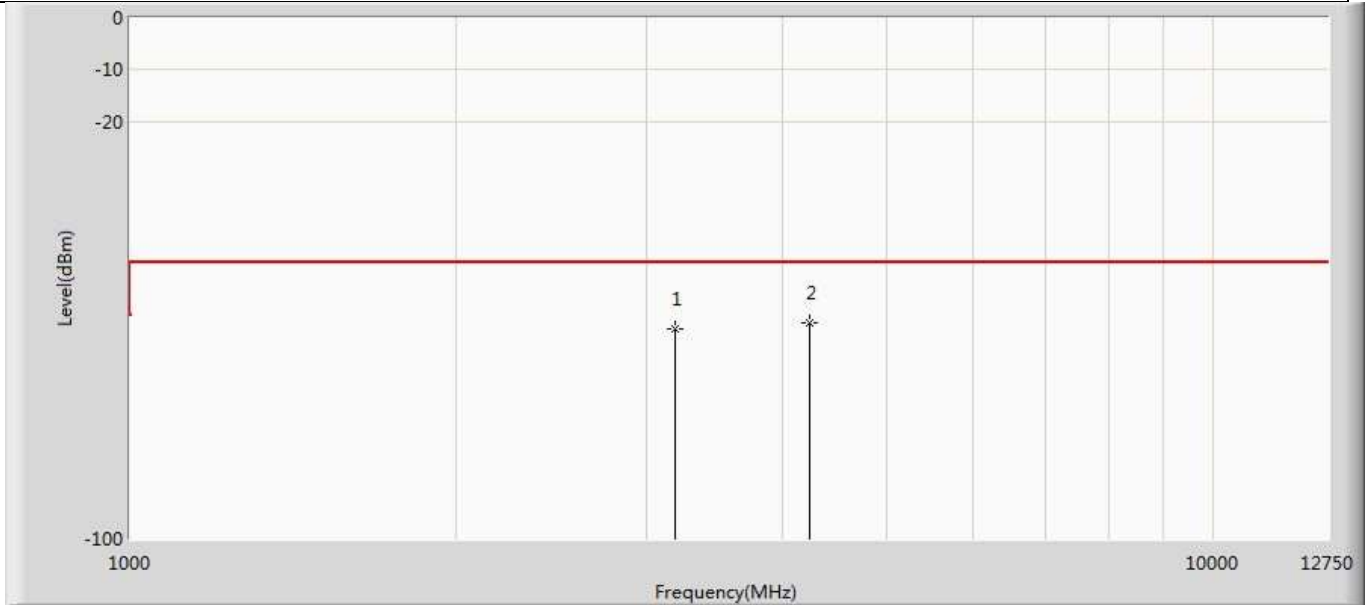
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	2997.500	-58.207	-67.312	-11.207	-47.000	9.105	PK
2		4290.000	-58.558	-70.803	-11.558	-47.000	12.245	PK

Profile: 2110839R	Page No.: 87
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 15:00
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2480MHz by Zigbee	



No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		2833.000	-58.931	-68.559	-11.931	-47.000	9.628	PK
2	*	3937.500	-56.391	-69.120	-9.391	-47.000	12.729	PK

Profile: 2110839R	Page No.: 88
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 15:00
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Rx	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Receive at 2480MHz by Zigbee	



No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		3185.500	-59.738	-69.857	-12.738	-47.000	10.119	PK
2	*	4243.000	-58.629	-70.674	-11.629	-47.000	12.045	PK

4.10 Receiver Blocking	VERDICT: PASS
-------------------------------	----------------------

4.10.1 Limit					
Standard	ETSI EN 300 328 V2.2.2				
<input type="checkbox"/>	Receiver Category 1				
Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal		
(-133 dBm + 10 × log ₁₀ (OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW		
(-139 dBm + 10 × log ₁₀ (OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674				
NOTE 1: OCBW is in Hz.					
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P _{min} + 26 dB where P _{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.					
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P _{min} + 20 dB where P _{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.					
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2					
<input checked="" type="checkbox"/>	Receiver Category 2				
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal		
(-139 dBm + 10 × log ₁₀ (OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW		

NOTE 1: OCBW is in Hz.

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

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

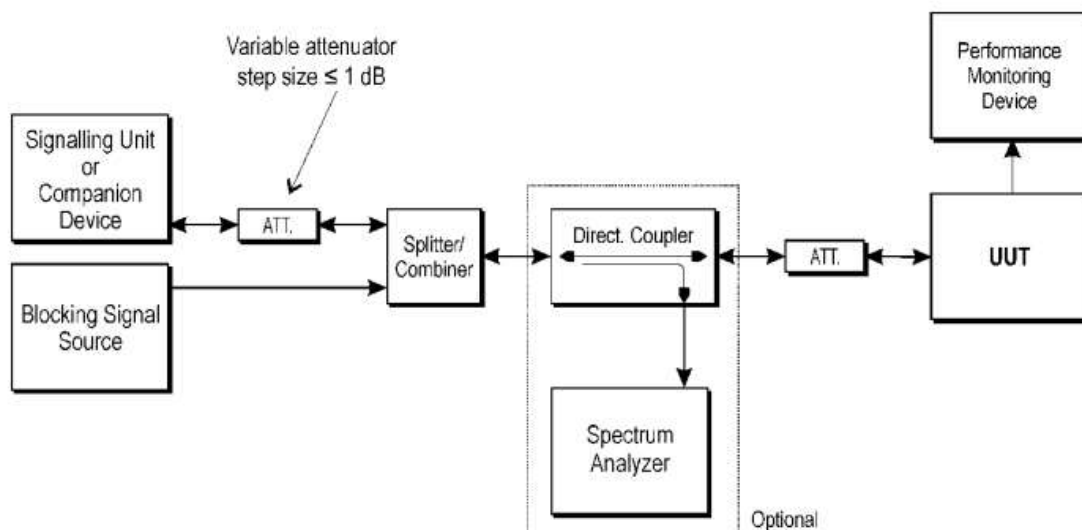
<input type="checkbox"/> Receiver Category 3			
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + $10 \times \log_{10}(\text{OCBW}) + 10$ dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380	-34	CW
	2 504		
	2 300		
	2 584		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{min} + 30$ dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

4.10.2 Test Setup



4.10.3 Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.11.2.1	Receiver Blocking
<p>For systems using multiple receive chains only one chain (antenna port) need to be tested. All other receiver inputs shall be terminated.</p> <p>The procedure in step 1 to step 6 below shall be used to verify the receiver blocking requirement as described in clause 4.3.1.12 or clause 4.3.2.11. The performance monitoring device is capable of verifying the performance criteria as defined in clause 4.3.1.12.3 or clause 4.3.2.11.3.</p>		
Step 1		
<p>For non-FHSS equipment, the UUT shall be set to the lowest operating channel on which the blocking test has to be performed (see clause 5.4.11.1).</p>		
Step 2		
<p>The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.</p>		
Step 3		
<p>1, With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6.</p> <p>2, Unless the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the level of the wanted signal shall be set to the value provided in the table corresponding to the receiver category and type of equipment. The test procedure defined in clause 5.4.2, and more in particular clause 5.4.2.2.1.2, can be used to measure the (conducted) level of the wanted signal however no correction shall be made for antenna gain of the companion device (step 6 in clause 5.4.2.2.1.2 shall be ignored). This level may be measured directly at the output of the companion device and a correction is made for the coupling loss into the UUT. The actual level for the wanted signal shall be recorded in the test report</p> <p>3, When the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is P_{min}. This signal level (P_{min}) is increased by the value provided in note 2 of the applicable table corresponding to the receiver category and type of equipment.</p>		
Step 4		
<p>The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment.</p> <p>If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 are met then proceed to step 6</p>		
Step 5		
<p>1, If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been increased with a value equal to the Occupied Channel Bandwidth except:</p> <p>Note 1: For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.</p> <p>Note 2: For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.</p> <p>2, If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been decreased with a value equal to the Occupied Channel Bandwidth except:</p>		

<p>Note 3: For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.</p> <p>Note 4: For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.</p> <p>If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, the UUT fails to comply with the Receiver Blocking requirement and step 6 and step 7 are no longer required.</p> <p>It shall be recorded in the test report whether the shift of blocking frequencies as described in the present step was used</p>
<p>Step 6</p>
<p>Repeat step 4 and step 5 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.</p>
<p>Step 7</p>
<p>For non-FHSS equipment, repeat step 2 to step 6 with the UUT operating at the highest operating channel on which the blocking test has to be performed (see clause 5.4.11.1)</p>
<p>Step 8</p>
<p>It shall be assessed and recorded in the test report whether the UUT complies with the Receiver Blocking requirement.</p>

4.10.4 Test Data

Test Mode	Frequency (MHz)	Wanted signal power (dBm) (see note 1)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	PER Measure Value (%)	PER Limit (%)
Mode 3	2 405	-65.47	2 380	-34	0.00	≤10
			2 504	-34	0.00	≤10
			2 300	-34	0.00	≤10
			2 584	-34	0.01	≤10
	2 480	-65.46	2 380	-34	0.0	≤10
			2 504	-34	0.0	≤10
			2 300	-34	0.0	≤10
			2 584	-34	0.0	≤10

Note 1: Wanted signal power is $(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB})$ or $(-74 \text{ dBm} + 10 \text{ dB})$ whichever is less

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

5 SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

_____ The End _____

Test report No:
2110839R-RF-CE-P17V01

CE Test Report

Product Name	LED Lamp
Trademark	PHILIPS
Model and /or type reference	9290024688,9290024689
Applicant's name / address	Signify (China) Investment Co., Ltd. Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233, China
Test method requested, standard	ETSI EN 300 328 V2.2.2 (2019-07)
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao/Project Engineer 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2021-02-09
Report Version	V1.0
Report template No	Template_EN 300 328-RF-V1.0

INDEX

	page
Competences and Guarantees.....	5
General conditions.....	5
Environmental conditions.....	5
Possible test case verdicts	6
Abbreviations	6
Document History	7
Remarks and Comments	7
Used Equipment	8
Uncertainty.....	10
1 General Information.....	11
1.1 General Description of the Item(s)	11
1.2 Antenna Information.....	12
1.3 Channel List	13
2 Description of Test Setup	14
2.1 Operating mode(s) used for tests.....	14
2.2 Accessories Information.....	14
2.3 Support / Auxiliary equipment / unit / software for the EUT	14
2.4 Test Configuration / Block diagram used for tests	15
2.5 Testing process	16
3 Verdict summary section	17
3.1 Standards	17
3.2 Deviation(s) from the Standard(s) / Test Specification(s)	17
3.3 Overview of results.....	18
4.1 RF Output Power	19
4.1.1 Limit.....	19
4.1.2 Test Setup.....	19
4.1.3 Test Procedure	20
4.1.4 Test Data	21
4.2 Power Spectral Density.....	23
4.2.1 Limit.....	23
4.2.2 Test Setup.....	23
4.2.3 Test Procedure	23
4.2.4 Test Data	25

4.3	Duty Cycle, Tx-sequence, Tx-gap.....	26
4.3.1	Limit.....	26
4.3.2	Test Setup.....	26
4.3.3	Test Procedure	26
4.3.4	Test Data	27
4.4	Medium Utilisation (MU) factor.....	28
4.4.1	Limit.....	28
4.4.2	Test Setup.....	28
4.4.3	Test Procedure	28
4.4.4	Test Data	29
4.5	Adaptivity.....	30
4.5.1	Limit.....	30
4.5.2	Test Setup.....	31
4.5.3	Test Procedure	32
4.5.4	Test Data	34
4.6	Occupied Channel Bandwidth.....	35
4.6.1	Limit.....	35
4.6.2	Test Setup.....	35
4.6.3	Test Procedure	36
4.6.4	Test Data	37
4.7	Transmitter unwanted emissions in the out-of-band domain.....	38
4.7.1	Limit.....	38
4.7.2	Test Setup.....	38
4.7.3	Test Setup.....	39
4.7.4	Test Data	41
4.8	Transmitter unwanted emissions in the spurious domain.....	42
4.8.1	Limit.....	42
4.8.2	Test Setup.....	43
4.8.3	Test Procedure	44
4.8.4	Test Data	46
4.9	Receiver Spurious Emissions	64
4.9.1	Limit.....	64
4.9.2	Test Setup.....	64
4.9.3	Test Procedure	65
4.9.4	Test Data	67
4.10	Receiver Blocking	68

4.10.1 Limit.....	68
4.10.2 Test Setup.....	70
4.10.3 Procedure	71
4.10.4 Test Data	73
5 Setup photo and EUT photo.....	74

COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Jan.25, 2021
Date (start test)	Jan.27, 2021
Date (finish test)	Feb.09, 2021

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2110839R-RF-CE-P17V01	V1.0	Initial issue of report.	2021-02-09

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with with ETSI EN 300 328 V2.2.2.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;
 - Chapter 1.3 Channel List.

USED EQUIPMENT

Keysight ETSI EN 300 328 / 301893 Test System / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
4TX MIMO Power Sensor	Keysight	U2063X	MY58000119	2020.02.11	2021.02.10
4TX MIMO Power Sensor	Keysight	U2063X	MY58000120	2020.02.11	2021.02.10
4TX MIMO Power Sensor	Keysight	U2063X	MY58000121	2020.02.12	2021.02.11
4TX MIMO Power Sensor	Keysight	U2063X	MY58000122	2020.02.12	2021.02.11
Adaptivity Test Unit	Agilent	N/A	11607310008	N/A	N/A
Rx PER Monitoring Unit	Agilent	N/A	11706190075	N/A	N/A

RF Output Power/ Power Spectral Density/ Occupied Channel Bandwidth/ Transmitter unwanted emissions in the out-of-band domain / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Keysight ETSI EN 300 328 / 301893 Test System	Agilent	N/A	N/A	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.08.15	2021.08.14
MAX Signal Analyzer	Keysight	N9020B	MY59050482	2020.11.25	2021.11.24
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2020.08.13	2021.08.12

Transmitter unwanted emissions in the spurious domain/ Receiver Spurious Emissions/ AC6

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.08.15	2021.08.14
PSG Analog S.G.	Agilent	E8257D	MY44321116	2020.08.15	2021.08.14
Preamplifier	Agilent	8449B	3008A02597	2020.06.09	2021.06.08
Bilog Antenna	Schaffner	CBL6112B	2932	2020.11.27	2021.11.26
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2020.02.19	2023.02.18
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	737	2020.01.18	2021.01.17
Filter Banks	DEKRA	QTK-FB	AC6-FB	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	RF06	2020.08.13	2021.08.12
EMI Test Software	Dekra	-	-	-	-

Blocking / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Keysight ETSI EN 300 328 / 301893 Test System	Agilent	N/A	N/A	N/A	N/A
Splitter/Combiner (Qty: 2)	Mini-Circuits	ZAPD-50W 4.2-6.0 GHz	NN256400424	N/A	N/A
10dB Directional Coupler	Agilent	87300C	MY44300299	N/A	N/A
Adaptivity Test Unit	Agilent	N/A	11607310008	N/A	N/A
Rx PER Monitoring Unit	Agilent	N/A	11706190075	N/A	N/A
Wideband Radio Communication Tester	R & S	CMW500	1201.0002K50- 158243-jb	2020.08.15	2021.08.14
PSG Analog Signal Generator	Agilent	E8257D	MY44321116	2020.08.15	2021.08.14
ESG Vector Signal Generator	Agilent	E4438C	MY49070163	2020.08.25	2021.08.24
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2020.08.13	2021.08.12

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The Uncertainties is complice with standard required as below.

Test item	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1,5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^\circ\text{C}$
Supply voltages	$\pm 3 \%$
Time	$\pm 5 \%$

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name	LED lamp
Model No.....	9290024688,9290024689
Trademark.....	PHILIPS
Manufacturer.....	Signify (China) Investment Co., Ltd.
Manufacturer Address	Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233, China
Model difference(s).....	Two models are total same except for the lamp cap.

Wireless specification	Bluetooth 5.0
Operating frequency range(s)	2 402 ~ 2 480 MHz
Type of Modulation	GFSK
PHYs.....	<input checked="" type="checkbox"/> LE 1M <input checked="" type="checkbox"/> LE 2M <input checked="" type="checkbox"/> LE Coded S=2/8
Data Rate.....	<input checked="" type="checkbox"/> 1Mbit/s <input checked="" type="checkbox"/> 2Mbit/s <input checked="" type="checkbox"/> 500/125 Kbit/s
Number of channel	40
Tempature Range.....	-20 ~ 45 °C

Rated power supply	Voltage and Frequency	
	<input checked="" type="checkbox"/>	AC: 220 – 240 V, 50 / 60 Hz,
	<input type="checkbox"/>	AC: 100 – 240 V, 50 / 60 Hz
	<input type="checkbox"/>	DC: 3.3 V
	<input type="checkbox"/>	Battery:
	<input type="checkbox"/>	PoE: 48V
Mounting position.....	<input type="checkbox"/>	Table top equipment
	<input checked="" type="checkbox"/>	Wall/Ceiling mounted equipment
	<input type="checkbox"/>	Floor standing equipment
	<input type="checkbox"/>	Hand-held equipment
	<input type="checkbox"/>	Other:.....

1.2 Antenna Information

Antenna model / type number.....:	N/A		
Antenna serial number.....:	N/A		
Antenna Delivery	<input checked="" type="checkbox"/>	1TX + 1RX	
	<input type="checkbox"/>	2TX + 2RX	
	<input type="checkbox"/>	Others:.....	
Antenna technology	<input checked="" type="checkbox"/>	SISO	
	<input type="checkbox"/>	MIMO	<input type="checkbox"/> CDD
			<input type="checkbox"/> Beam-forming
Antenna Type	<input type="checkbox"/>	External	<input type="checkbox"/> Dipole
			<input type="checkbox"/> Sectorized
	<input checked="" type="checkbox"/>	Internal	<input type="checkbox"/> PIFA
			<input checked="" type="checkbox"/> PCB
			<input type="checkbox"/> Ceramic chip
			<input type="checkbox"/> Others.....
Antenna Gain	-0.7 dBi		

1.3 Channel List

Bluetooth Working Frequency of Each Channel: (For v5.0)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz	03	2408 MHz
04	2410 MHz	05	2412 MHz	06	2414 MHz	07	2416 MHz
08	2418 MHz	09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz	15	2432 MHz
16	2434 MHz	17	2436 MHz	18	2438 MHz	19	2440 MHz
20	2442 MHz	21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz	27	2456 MHz
28	2458 MHz	29	2460 MHz	30	2462 MHz	31	2464 MHz
32	2466 MHz	33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz	39	2480 MHz

Note: The General Description of the Item , antenna information and Channel List for the EUT in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

Test Mode	Mode1: Transmit by LE_1Mbps
	Mode2: Transmit by LE_2Mbps
	Mode3: Transmit by LE_Coded S=8
	Mode4: Transmit by LE_Coded S=2
	Mode5: Receive by LE_1Mbps
	Mode6: Receive by LE_2Mbps
	Mode7: Receive by LE_Coded S=8
	Mode8: Receive by LE_Coded S=2
	Mode9: Normal operation

2.2 Accessories Information

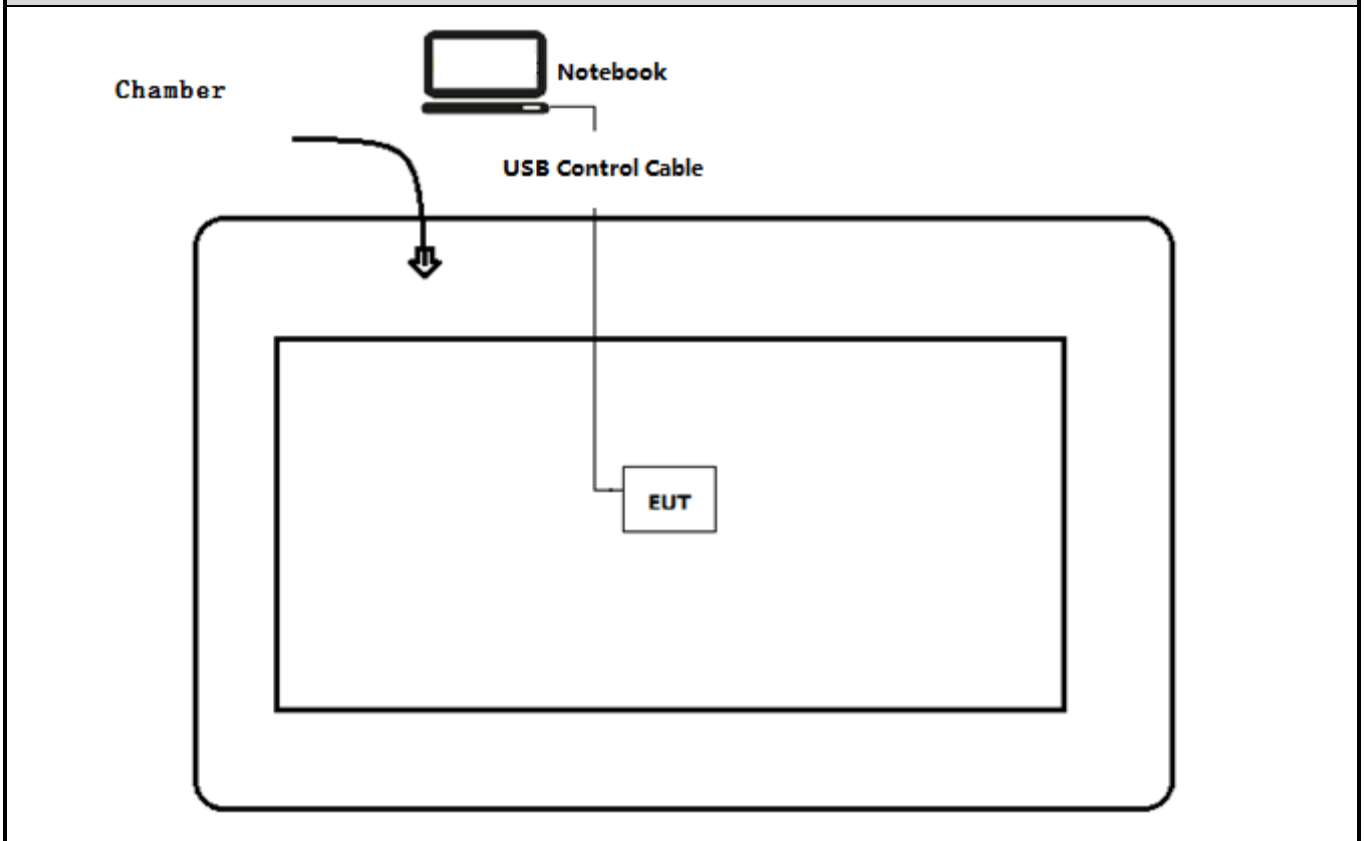
Accessories Information	Brand/model name	Cable		
		Length used during test [m]	Attached during test	Shielded
USB – serial port	N/A	10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

2.3 Support / Auxiliary equipment / unit / software for the EUT

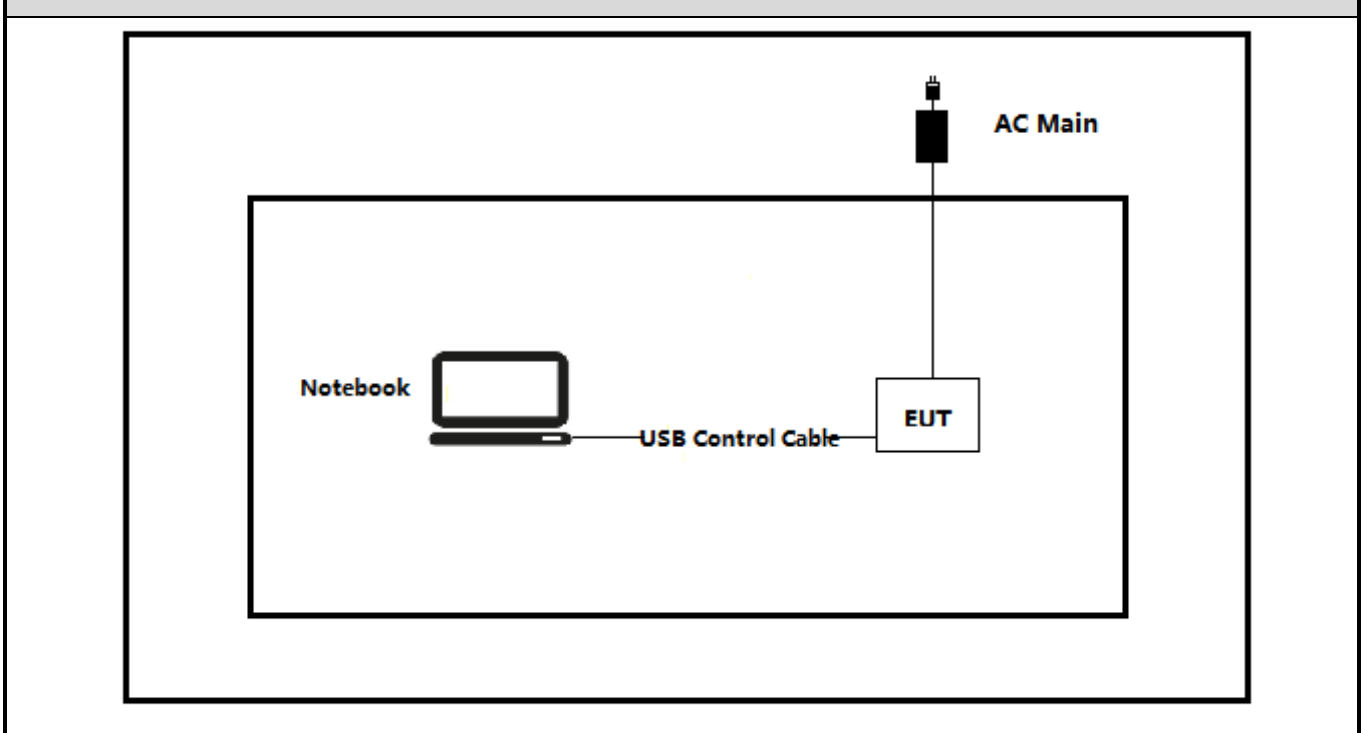
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	E470	Lenovo	Adapter
software	Type / Version	Manufacturer	Supplied by
HueApprobationTool	V1.1.5.0	N/A	N/A

2.4 Test Configuration / Block diagram used for tests

Test setup Diagram- Radiated Emission Test



Test setup Diagram- Conducted test



2.5 Testing process

1	Setup the EUT as shown in Section 2.4
2	Execute the software HueApprobationTool on the notebook.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
ETSI EN 300 328 V2.2.2	2019	Wideband transmission systems;Data transmission equipment operating in the 2,4 GHz band;Harmonised Standard for access to radio spectrum
--	--	--
--	--	--
--	--	--

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

No deviation

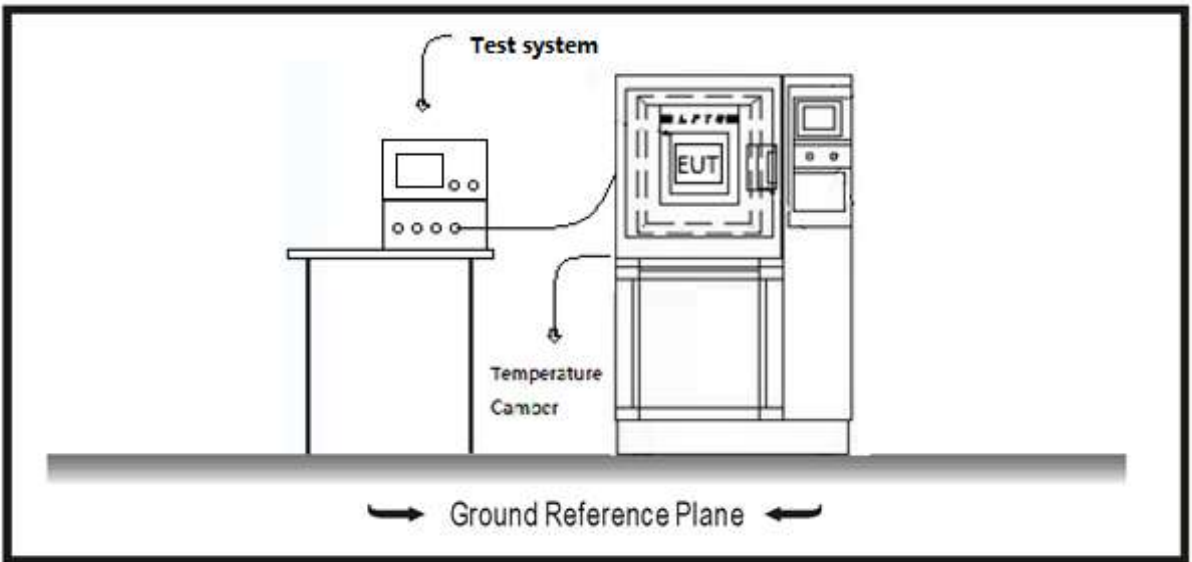
3.3 Overview of results

Test Item – ETSI EN 300 328 V2.2.2						
Performed Test Item	Test Procedure	Adaptive		Non-Adaptive		Verdict
		(≥10dBm)	(<10dBm)	(≥10dBm)	(<10dBm)	
RF Output Power	Clause 5.4.2	Yes	Yes	Yes	Yes	PASS
Power Spectral Density	Clause 5.4.3	Yes	Yes	Yes	Yes	PASS
Duty cycle, Tx-Sequence, Tx-gap	Clause 5.4.2	N/A	N/A	Yes	N/A	N/A
Medium Utilisation (MU) factor	Clause 5.4.2	N/A	N/A	Yes	N/A	N/A
Adaptivity	Clause 5.4.6	Yes	N/A	N/A	N/A	N/A
Occupied Channel Bandwidth	Clause 5.4.7	Yes	Yes	Yes	Yes	PASS
Transmitter unwanted emissions in the out-of-band domain	Clause 5.4.8	Yes	Yes	Yes	Yes	PASS
Transmitter unwanted emissions in the spurious domain	Clause 5.4.9	Yes	Yes	Yes	Yes	PASS
Receiver Spurious Emissions	Clause 5.4.10	Yes	Yes	Yes	Yes	PASS
Receiver Blocking	Clause 5.4.11	Yes	Yes	N/A	N/A	PASS
Geo-location capability	N/A	N/A	N/A	N/A	N/A	N/A
<u>Supplementary information:</u>						
1) Geo-location capability should be implemented by manufacturer.						

4 TEST RESULTS

4.1 RF Output Power	VERDICT: PASS
----------------------------	----------------------

4.1.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS
The maximum RF output power shall be 20 dBm.	
<input checked="" type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS
The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.4.1. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.	

4.1.2 Test Setup
 <p>The diagram illustrates the test setup. On the left, a 'Test system' is placed on a stand. It is connected via cables to an 'EUT' (Equipment Under Test) located inside a test chamber. A 'Temperature Camera' is positioned to monitor the EUT. Below the chamber, a 'Ground Reference Plane' is indicated with arrows pointing outwards.</p>

4.1.3 Test Procedure

References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.2.2.1.2	RF Output Power
Step 1		
<p>1, Use a fast power sensor with a minimum sensitivity of -40 dBm and capable of minimum 1 MS/s</p> <p>2, Use the following settings:</p> <p>(1) Sample speed 1 MS/s or faster</p> <p>(2) The samples shall represent the RMS power of the signal.</p> <p>(3) Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.</p> <p>Note 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.</p>		
Step 2		
<p>1, For conducted measurements on devices with one transmit chain:</p> <p>(1), Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.</p> <p>2, For conducted measurements on devices with multiple transmit chains:</p> <p>(1) Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.</p> <p>(2) Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500 ns.</p> <p>(3) For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples as the new stored data set.</p>		
Step 3		
<p>Find the start and stop times of each burst in the stored measurement samples.</p> <p>The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.</p> <p>NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.</p>		
Step 4		
<p>Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. The start and stop points shall be included. Save these Pburst values, as well as the start and stop times for each burst.</p> $P_{burst} = \frac{1}{k} \sum_{n=1}^k P_{sample}(n)$ <p>with 'k' being the total number of samples and 'n' the actual sample number</p>		
Step 5		
<p>The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculation</p>		
Step 6		
<p>1, Add the (stated) antenna assembly gain "G" in dBi of the individual antenna</p> <p>2, In case of smart antenna systems operating in mode with beamforming (see clause 5.3.2.2.4), add the additional beamforming gain Y in dB.</p> <p>If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.</p> <p>The RF Output Power (P) shall be calculated using the formula: P = A + G + Y</p>		

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

4.1.4 Test Data					
Test Mode	Test Conditions	Frequency (MHz)	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)
Mode1	Tnom (25°C)	2402	9.59	8.89	≤20
		2440	9.06	8.36	≤20
		2480	9.62	8.92	≤20
	Tmax (45°C)	2402	9.22	8.52	≤20
		2440	8.69	7.99	≤20
		2480	9.30	8.60	≤20
	Tmin (-20°C)	2402	9.95	9.25	≤20
		2440	9.41	8.71	≤20
		2480	9.98	9.28	≤20
Mode2	Tnom (25°C)	2402	9.60	8.90	≤20
		2440	9.07	8.37	≤20
		2480	9.59	8.89	≤20
	Tmax (45°C)	2402	9.29	8.59	≤20
		2440	8.73	8.03	≤20
		2480	9.28	8.58	≤20
	Tmin (-20°C)	2402	9.92	9.22	≤20
		2440	9.42	8.72	≤20
		2480	9.89	9.19	≤20

Note 1: EIRP=Measured power+Antenna gain
Note 2: The antenna gain please refer to clause 1.2

Test Mode	Test Conditions	Frequency (MHz)	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)
Mode3	Tnom (25°C)	2402	9.59	8.89	≤20
		2440	9.08	8.38	≤20
		2480	9.58	8.88	≤20
	Tmax (45°C)	2402	9.23	8.53	≤20
		2440	8.73	8.03	≤20
		2480	9.23	8.53	≤20
	Tmin (-20°C)	2402	9.95	9.25	≤20
		2440	9.38	8.68	≤20
		2480	9.94	9.24	≤20
Mode4	Tnom (25°C)	2402	9.57	8.87	≤20
		2440	9.09	8.39	≤20
		2480	9.61	8.91	≤20
	Tmax (45°C)	2402	9.22	8.52	≤20
		2440	8.71	8.01	≤20
		2480	9.23	8.53	≤20
	Tmin (-20°C)	2402	9.94	9.24	≤20
		2440	9.42	8.72	≤20
		2480	9.98	9.28	≤20
Note 1: EIRP=Measured power+Antenna gain					
Note 2: The antenna gain please refer to clause 1.2					

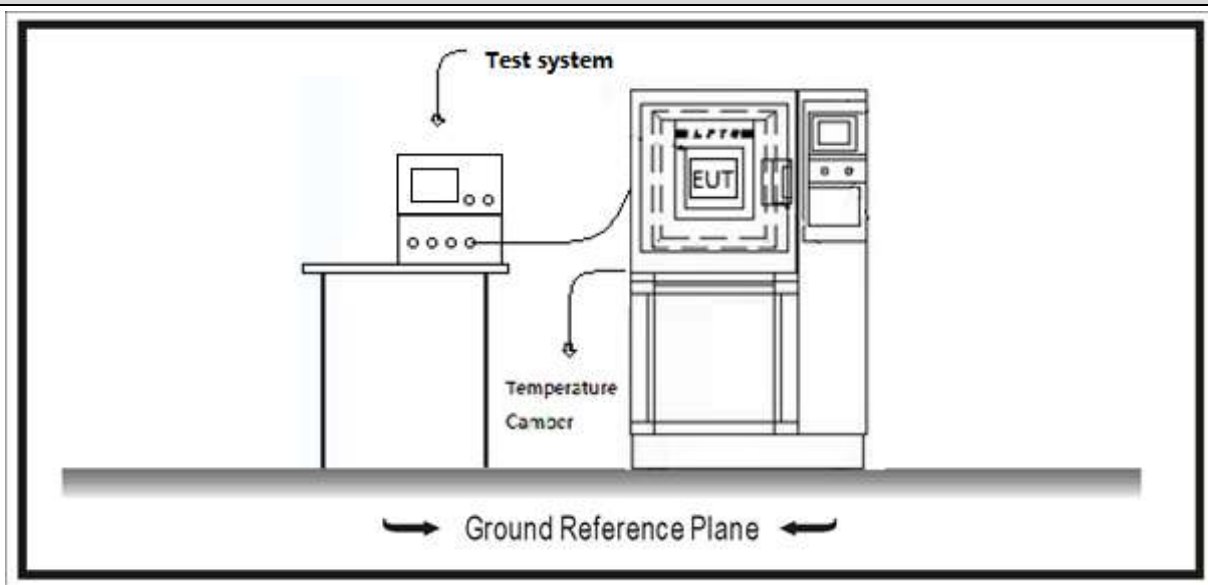
4.2 Power Spectral Density	VERDICT: PASS
-----------------------------------	----------------------

4.2.1 Limit

Standard	ETSI EN 300 328 V2.2.2
-----------------	------------------------

The maximum Power Spectral Density is limited to 10dBm per MHz.

4.2.2 Test Setup



4.2.3 Test Procedure

	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.3.2.1	Power Spectral Density
<input checked="" type="checkbox"/>	Option 1:		For equipment with continuous and non-continuous transmissions
<input type="checkbox"/>	Option 2:		For equipment with continuous transmission capability or for equipment operating with a constant duty cycle

Step 1

1, Connect the UUT to the spectrum analyzer 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 analyzers not supporting this number of sweep points, the frequency band may be segmented.
 Detector: RMS Trace Mode: Max Hold
 Sweep time: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal
 For non-continuous signals, wait for the trace to stabilize.
 Save the data (trace data) set to a file.

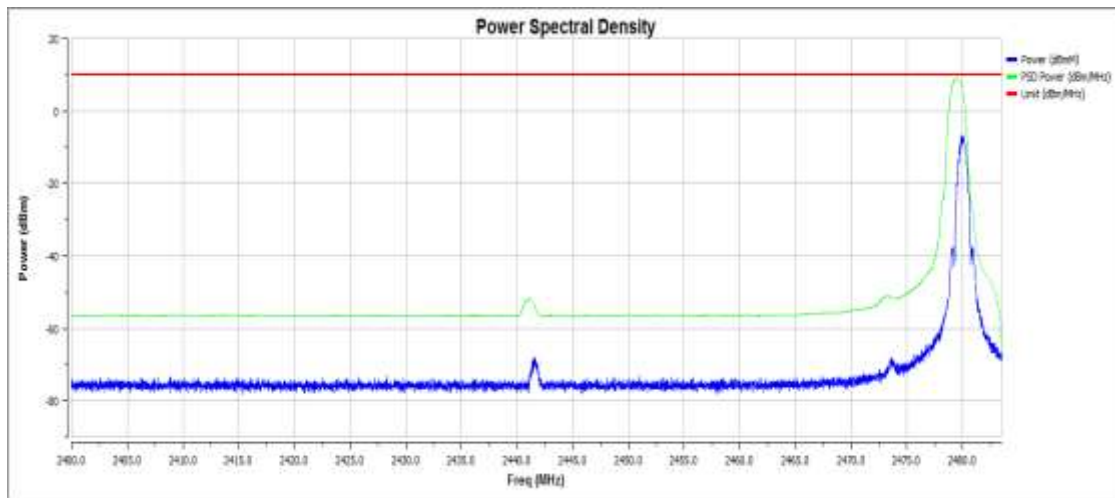
Step 2
For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each sampling point, add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.
Step 3
Add up the values for power for all the samples in the file using the formula below. $P_{Sum} = \sum_{n=1}^k P_{sample}(n)$ with 'k' being the total number of samples and 'n' the actual sample number
Step 4
Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.4.2 and save the corrected data. The following formulas can be used: $C_{corr} = P_{sum} - P_{e.i.r.p.} \quad P_{samplecorr}(n) = P_{sample}(n) - C_{corr}$ with 'n' being the actual sample number
Step 5
Starting from the first sample $P_{samplecorr}(n)$ (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6
Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).
Step 7
Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments. From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

4.2.4 Test Data

Test Mode	Test Conditions	Frequency (MHz)	Power Spectral Density (dBm/MHz)	Limit (dBm)
Mode1	Tnom (25°C)	2402	8.83	≦ 10
		2440	8.30	≦ 10
		2480	8.86	≦ 10
Mode2	Tnom (25°C)	2402	7.72	≦ 10
		2440	7.19	≦ 10
		2480	7.71	≦ 10
Mode3	Tnom (25°C)	2402	8.77	≦ 10
		2440	8.27	≦ 10
		2480	8.77	≦ 10
Mode4	Tnom (25°C)	2402	8.77	≦ 10
		2440	8.29	≦ 10
		2480	8.81	≦ 10

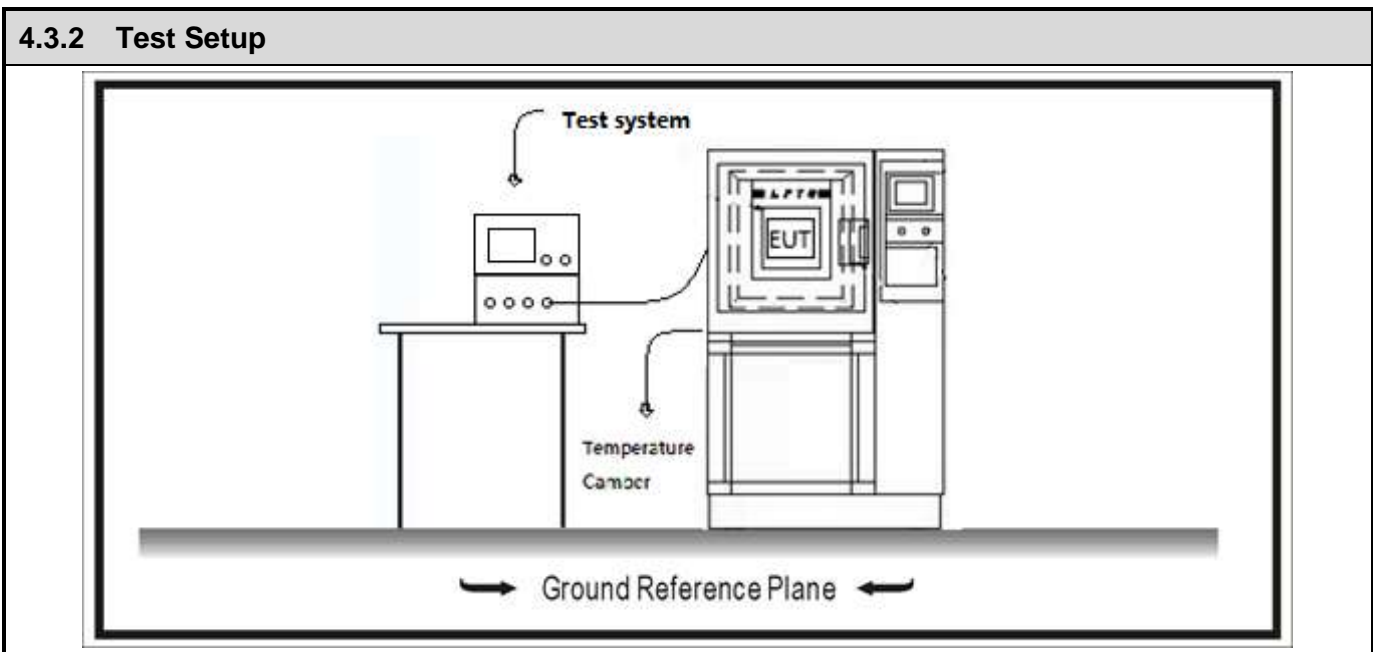
Note 1: The worst data plot as below:

Mode1/CH39/2480MHz



4.3 Duty Cycle, Tx-sequence, Tx-gap	VERDICT: N/A
--	---------------------

4.3.1 Limit	
Standard	ETSI EN 300328 V2.2.2
<input checked="" type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS / For non-adaptive equipment using wide band modulations other than FHSS and EIRP lower than 10dBm.
N/A	
<input type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS and EIRP higher than 10dBm.
<p>1, The Duty Cycle shall be equal to or less than the maximum value declared by the supplier.</p> <p>2, The maximum Tx-sequence Time and the minimum Tx-gap Time shall be according to the formula below:</p> <p>3, Maximum Tx-Sequence Time = Minimum Tx-gap Time = M</p> <p>where M is in the range of 3,5 ms to 10 ms.</p>	



4.3.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.2.2.1.3	Duty Cycle, Tx-sequence, Tx-gap
Step 1		
<p>1, Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.</p> <p>2, The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples. In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.</p>		
Step 2		
Between the saved start and stop times of each individual burst, calculate the TxOn time. Save these TxOn values.		

Step 3

Duty Cycle is the sum of all TxOn times between the end of the first gap (which is the start of the first burst within the observation period) and the start of the last burst (within this observation period) divided by the observation period. The observation period is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2.

Step 4

- 1, For FHSS equipment using blacklisting, the TxOn time measured for a single (and active) hopping frequency shall be multiplied by the number of blacklisted frequencies. This value shall be added to the sum calculated in step 3 above. If the number of blacklisted frequencies cannot be determined, the minimum number of hopping frequencies (N) as defined in clause 4.3.1.4.3 shall be assumed
- 2, The calculated value for Duty Cycle (DC) shall be recorded in the test report. This value shall be equal to or less than the maximum value declared by the manufacturer

Step 5

- 1, Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
- 2, Identify any TxOff time that is equal to or greater than the minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3. These are the potential valid gap times to be further considered in this procedure.
- 3, Starting from the second identified gap, calculate the time from the start of this gap to the end of the preceding gap. This time is the Tx-sequence time for this transmission. Repeat this procedure until the last identified gap within the observation period is reached.
- 4, A combination of consecutive Tx-sequence times and Tx-gap times followed by a Tx-gap time, which is at least as long as the duration of this combination, may be considered as a single Tx-sequence time and in which case it shall comply with the limits defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.
- 5, It shall be noted in the test report whether the UUT complies with the limits for the maximum Tx-sequence time and minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.

4.3.4 Test Data

Applicability requirement:

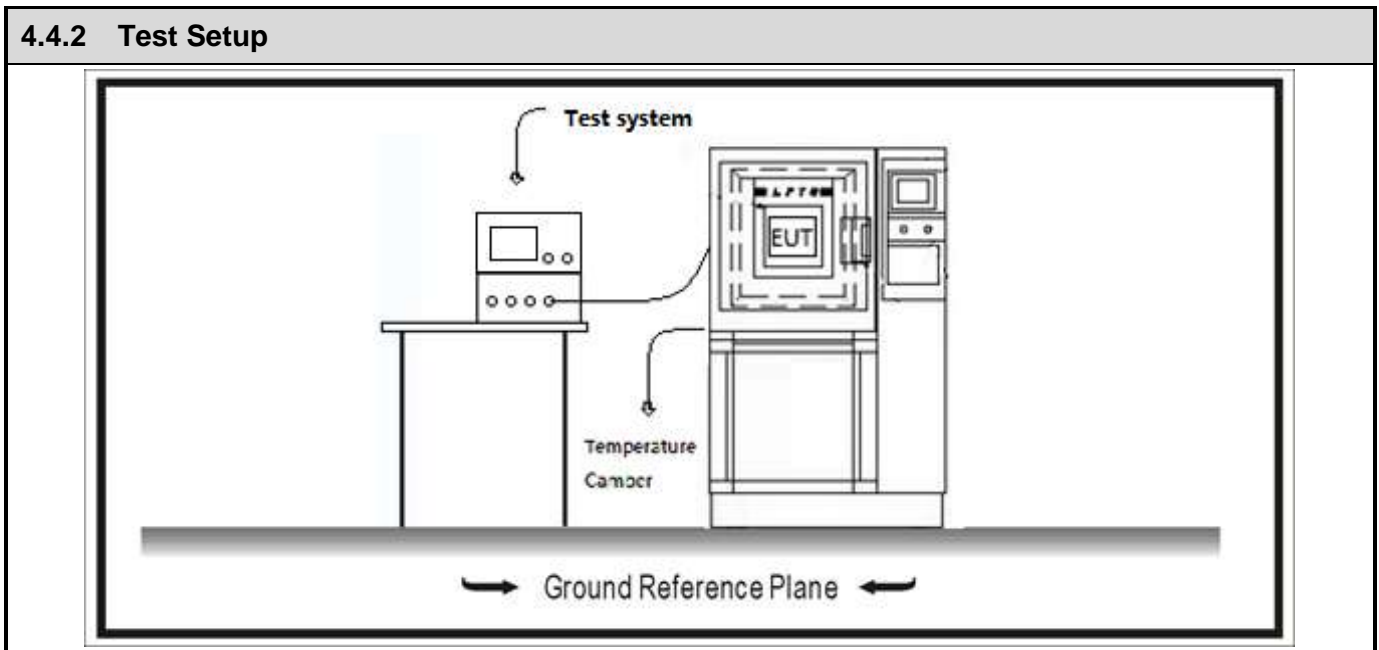
These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

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

Applicability judgment: Not Application

4.4 Medium Utilisation (MU) factor	VERDICT: N/A
---	---------------------

4.4.1 Limit	
Standard	ETSI EN 300328 V2.2.2
<input checked="" type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS / For non-adaptive equipment using wide band modulations other than FHSS and EIRP lower than 10dBm.
N/A	
<input type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS and EIRP higher than 10dBm.
the maximum Medium Utilisation factor shall be 10 %.	



4.4.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.2.2.1.4	Medium Utilisation (MU) factor
Step 1		
Use the same stored measurement samples from the procedure described in clause 5.3.2.2.1.2.		
Step 2		
For each burst calculate the product of ($P_{burst} / 100 \text{ mW}$) and the TxOn time. P_{burst} is expressed in mW. TxOn time is expressed in ms.		
Step 3		
Medium Utilization is the sum of all these products divided by the observation period (expressed in ms) which is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. This value, which shall comply with the limit given in clause 4.3.1.6.3 or clause 4.3.2.5.3, shall be recorded in the test report.		
If, in case of FHSS equipment, operation without blacklisted frequencies is not possible, the power of the bursts on		

blacklisted hopping frequencies (for the calculation of the Medium Utilization) is assumed to be equal to the average value of the RMS power of the bursts on all active hopping frequencies.

4.4.4 Test Data

Applicability requirement:

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

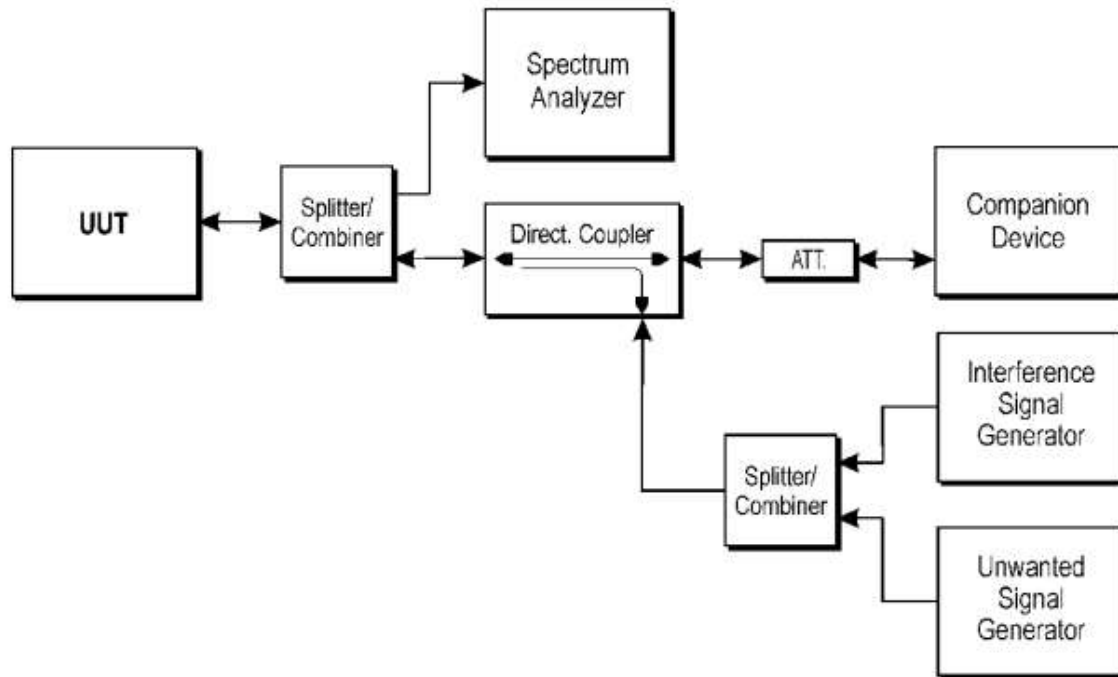
These requirements do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Applicability judgment: Not Application

4.5 Adaptivity	VERDICT: N/A
-----------------------	---------------------

4.5.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input checked="" type="checkbox"/> For adaptive equipment using wide band modulations other than FHSS	
<input type="checkbox"/> Non-LBT based Detect and Avoid	
	(1) The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel; (2) COT \leq 40 ms; (3) Idle Period shall be minimum 5% of COT with a minimum of 100 μ s; (4) Detection threshold level = -70 dBm/MHz + 10 \times log ₁₀ (100 mW / P _{out}) (P _{out} in mW e.i.r.p.); (5) To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.
<input type="checkbox"/> LBT based Detect and Avoid(Frame Based Equipment)	
	(1) The CCA observation time shall be not less than 18 μ s; (2) The CCA time used by the equipment shall be declared by the supplier; (3) COT = 1-10 ms; (4) Idle Period = 5% of COT; (5) Detection threshold level = -70 dBm/MHz + 10 \times log ₁₀ (100 mW / P _{out}) (P _{out} in mW e.i.r.p.); (6) To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.
<input type="checkbox"/> LBT based Detect and Avoid(Load Based Equipment)	
	(1) The CCA observation time shall be not less than 18 μ s; (2) Extended CCA time shall be between 18 μ s and 160 μ s; (3) COT \leq 13ms; (4) Detection threshold level = -70 dBm/MHz + 10 \times log ₁₀ (100 mW / P _{out}) (P _{out} in mW e.i.r.p.); (5) To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.
<input type="checkbox"/> Short Control Signalling Transmissions:	
	Short Control Signalling Transmissions of adaptive non-FHSS equipment shall have a maximum Tx _{On} / (Tx _{On} + Tx _{Off}) ratio of 10 % within any observation period of 50 ms.
<input type="checkbox"/> Unwanted Signal	
	Single power \geq -35dBm

4.5.2 Test Setup



4.5.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.6.2.1.3	Adaptivity
<p>The different steps below define the procedure to verify the efficiency of the LBT based adaptive mechanism of equipment using wide band modulations other than FHSS. This method can be applied on Load Based Equipment and Frame Based Equipment.</p> <p>For systems using multiple receive chains only one chain (antenna port) need to be tested. All other receiver inputs shall be terminated.</p>		
Step 1		
<p>1, The UUT shall connect to a companion device during the test. The interference signal generator, the unwanted signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5 although the interference and unwanted signal generator do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of both the UUT and the companion device and it should be possible to distinguish between either transmission. In addition, the spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the unwanted signals.</p> <p>2, Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.</p> <p>NOTE 1: Testing of Unidirectional equipment does not require a link to be established with a companion device.</p> <p>3, The analyzer shall be set as follows:</p> <p>(1)RBW: \geq Occupied Channel Bandwidth (if the analyzer does not support this setting, the highest available setting shall be used)</p> <p>(2)VBW: $3 \times$ RBW (if the analyzer does not support this setting, the highest available setting shall be used)</p> <p>(3)Detector Mode: RMS</p> <p>(4)Centre Frequency: Equal to the centre frequency of the operating channel</p> <p>(5)Span: 0 Hz</p> <p>(6)Sweep time: $>$ maximum Channel Occupancy Time</p> <p>(7)Trace Mode: Clear Write</p> <p>(8)Trigger Mode: Video</p>		
Step 2		
<p>1, Configure the UUT for normal transmissions with a sufficiently high payload resulting in a minimum transmitter activity ratio (TxOn / (TxOn + TxOff)) of 0,3. Where this is not possible, the UUT shall be configured to the maximum payload possible.</p> <p>2, For Frame Based Equipment, using the procedure defined in clause 5.4.7.2.1.4, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.3.2.2 step 3). When measuring the Idle Period of the UUT, only transmissions from the UUT shall be considered.</p> <p>3, For Load Based equipment, using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.3.2.3, step 2 and step 3. When measuring the Idle Period of the UUT, only transmissions from the UUT shall be considered.</p> <p>NOTE 2: For the purpose of testing Load Based Equipment referred to in the first paragraph of clause 4.3.2.6.3.2.3 (IEEE 802.11™ [i.3] or IEEE 802.15.4™ [i.4] equipment), the limits to be applied for the minimum Idle Period and the maximum Channel Occupancy Time are the same as defined for other types of Load Based Equipment (see</p>		

clause 4.3.2.6.3.2.3 step 2) and step 3). The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3 step 1) and step 2).

Step 3: Adding the interference signal

An interference signal as defined in clause B.6 is injected on the current operating channel of the UUT. The power spectral density level (at the input of the UUT) of this interference signal shall be equal to the detection threshold defined in clause 4.3.2.6.3.2.2 step 5) (frame based equipment) or clause 4.3.2.6.3.2.3 step 5) (load based equipment).

Step 4: Verification of reaction to the interference signal

1, The spectrum analyzer shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyzer sweep to be triggered by the start of the interfering signal.

2, Using the procedure defined in clause 5.4.7.2.1.4, it shall be verified that:

i) The UUT shall stop transmissions on the current operating channel.

NOTE 3: The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time defined in clause 4.3.2.6.3.2.2 (frame based equipment) or clause 4.3.2.6.3.2.3 (load based equipment).

ii) Apart from Short Control Signalling Transmissions, there shall be no subsequent transmissions while the interfering signal is present.

NOTE 4: To verify that the UUT is not resuming normal transmissions as long as the interference signal is present, the monitoring time may need to be 60 s or more.

iii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering signal is present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2. NOTE 5: The verification of the Short Control Signalling transmissions may require the analyzer settings to be changed (e.g. sweep time).

iv) Alternatively, the equipment may switch to a non-adaptive mode.

Step 5: Adding the unwanted CW signal

1, With the interfering signal present, a 100 % duty cycle CW signal is inserted as the unwanted signal. The frequency and the level are provided in table 10 (clause 4.3.2.6.3.2.2) for Frame Based Equipment or in table 11 (clause 4.3.2.6.3.2.3) for Load Based Equipment.

2, The spectrum analyzer shall be used to monitor the transmissions of the UUT on the selected operating

3, Using the procedure defined in clause 5.4.7.2.1.4, it shall be verified that:

i) The UUT shall not resume normal transmissions on the current operating channel as long as both the interference and blocking signals remain present.

NOTE 6: To verify that the UUT is not resuming normal transmissions as long as the interference and blocking signals are present, the monitoring time may need to be 60 s or more.

ii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering and blocking signals are present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2.

NOTE 7: The verification of the Short Control Signalling transmissions may require the analyzer settings to be changed (e.g. sweep time).

Step 6: Removing the interference and unwanted signal

On removal of the interference and unwanted signal the UUT is allowed to start transmissions again on this channel however this is not a requirement and therefore does not require testing.

Step 7: Removing the interference and unwanted signal

Step 2 to step 6 shall be repeated for each of the frequencies to be tested.

4.5.4 Test Data

Applicability requirement:

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is using wide band modulations other than FHSS.

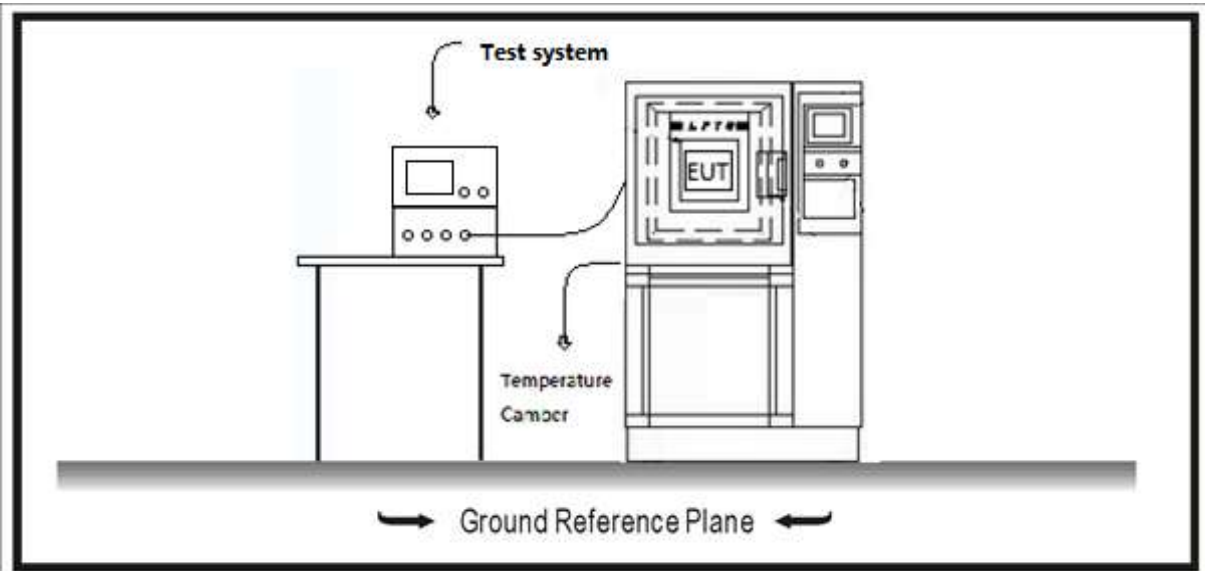
These requirements do not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Applicability judgment: Not Application

4.6 Occupied Channel Bandwidth	VERDICT: PASS
---------------------------------------	----------------------

4.6.1 Limit	
Standard	ETSI EN 300 328 V2.2.2
<input checked="" type="checkbox"/>	For adaptive equipment using wide band modulations other than FHSS
The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.	
<input type="checkbox"/>	For non-adaptive equipment using wide band modulations other than FHSS
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.	

4.6.2 Test Setup



4.6.3 Test Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.7.2.1	Occupied Channel Bandwidth
Step 1		
<p>1, Connect the UUT to the spectrum analyzer and use the following settings</p> <p>(1),Centre Frequency: The centre frequency of the channel under test</p> <p>(2),Resolution BW: ~ 1 % of the span without going below 1 %</p> <p>(3),Video BW: 3 x RBW</p> <p>(4),Frequency Span : 2 x Nominal Channel Bandwidth</p> <p>(5), Detector Mode: RMS</p> <p>(6), Trace Mode: Max Hold</p> <p>(7), Sweep time: 1 s</p>		
Step 2		
<p>Wait for the trace to stabilize.</p> <p>Find the peak value of the trace and place the analyzer marker on this peak.</p>		
Step 3		
<p>Use the 99 % bandwidth function of the spectrum analyzer to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.</p> <p>NOTE: Make sure that the power envelope is sufficiently above the noise floor of the analyzer to avoid the noise signals left and right from the power envelope being taken into account by this measurement.</p>		

4.6.4 Test Data

Test Mode	Frequency (MHz)	99% Bandwidth (MHz)	Frequency near the operating band (MHz)	Limit (MHz)
Mode1	2402	1.036	2401.477	Within 2400-2483.5MHz
	2480	1.036	2480.513	Within 2400-2483.5MHz
Mode2	2402	2.099	2400.946	Within 2400-2483.5MHz
	2480	2.111	2481.052	Within 2400-2483.5MHz
Mode3	2402	1.110	2401.437	Within 2400-2483.5MHz
	2480	1.107	2480.546	Within 2400-2483.5MHz
Mode4	2402	1.093	2401.447	Within 2400-2483.5MHz
	2480	1.092	2480.540	Within 2400-2483.5MHz

Note 1: The worst data plot as below:

Mode2/CH00/2402MHz



4.7 Transmitter unwanted emissions in the out-of-band domain	VERDICT: PASS
---	----------------------

4.7.1 Limit

Standard	ETSI EN 300 328 V2.2.2
-----------------	------------------------

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.

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

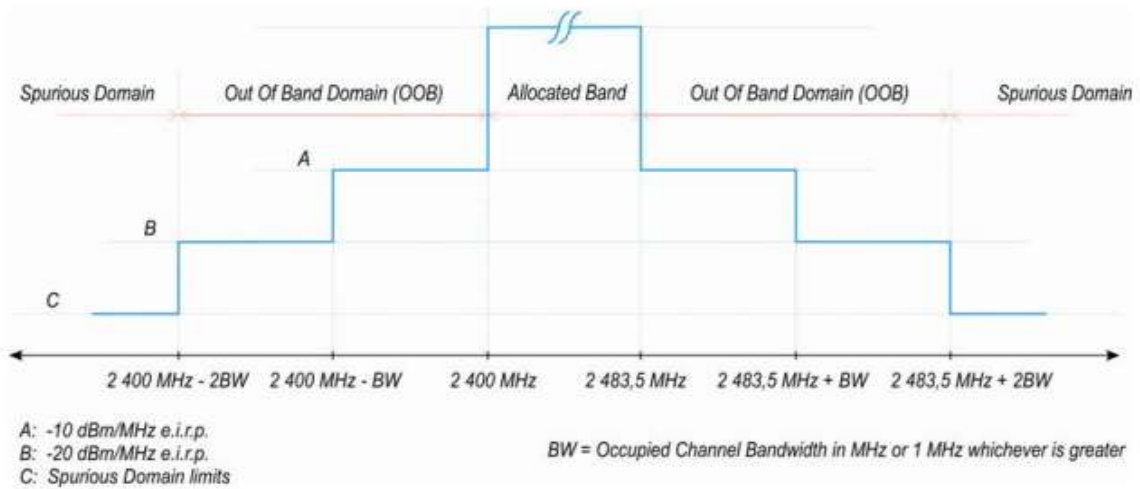
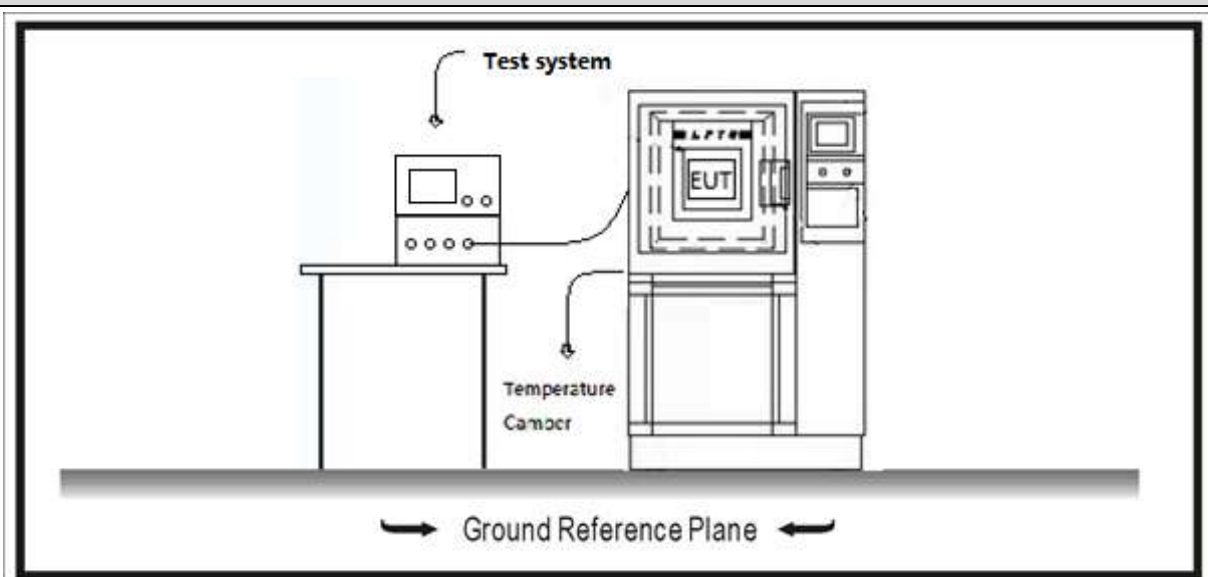


Figure 3: Transmit mask

4.7.2 Test Setup



4.7.3 Test Setup

	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.8.2.1	Transmitter unwanted emissions in the out-of-band domain
<p>The applicable mask is defined by the measurement results from the tests performed under clause 5.4.7 (Occupied Channel Bandwidth).</p> <p>The Out-of-band emissions within the different horizontal segments of the mask provided in figure 1 and figure 3 shall be measured using the procedure in step 1 to step 6 below. This method assumes the spectrum analyser is equipped with the Time Domain Power option</p>			
Step 1			
<p>1, Connect the UUT to the spectrum analyzer and use the following settings</p> <p>(1), Centre Frequency: 2 484 MHz</p> <p>(2), Span: 0 Hz</p> <p>(3), Resolution BW: 1 MHz</p> <p>(4), Video BW: 3 MHz</p> <p>(5), Detector Mode: RMS</p> <p>(6), Trace Mode: Max Hold</p> <p>(7), Sweep Mode: Single Sweep</p> <p>(8), Sweep Points: Sweep time [µs] / (1 µs) with a maximum of 30 000</p> <p>(9), Trigger Mode: Video trigger</p> <p>(10), Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power</p>			
Step 2(segment 2 483,5 MHz to 2 483,5 MHz + BW):			
<p>1, Adjust the trigger level to select the transmissions with the highest power level.</p> <p>2, For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.</p> <p>3, Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.</p> <p>4, Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.</p> <p>5, Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).</p>			
Step 3(segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW):			
<p>Change the centre frequency of the analyzer to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).</p>			
Step 4 (segment 2 400 MHz - BW to 2 400 MHz):			
<p>Change the centre frequency of the analyzer to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).</p>			

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

Change the centre frequency of the analyzer to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):

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

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

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

(2) Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by

$10 \times \log_{10}(A_{ch})$ and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE 2: A_{ch} refers to the number of active transmit chains.

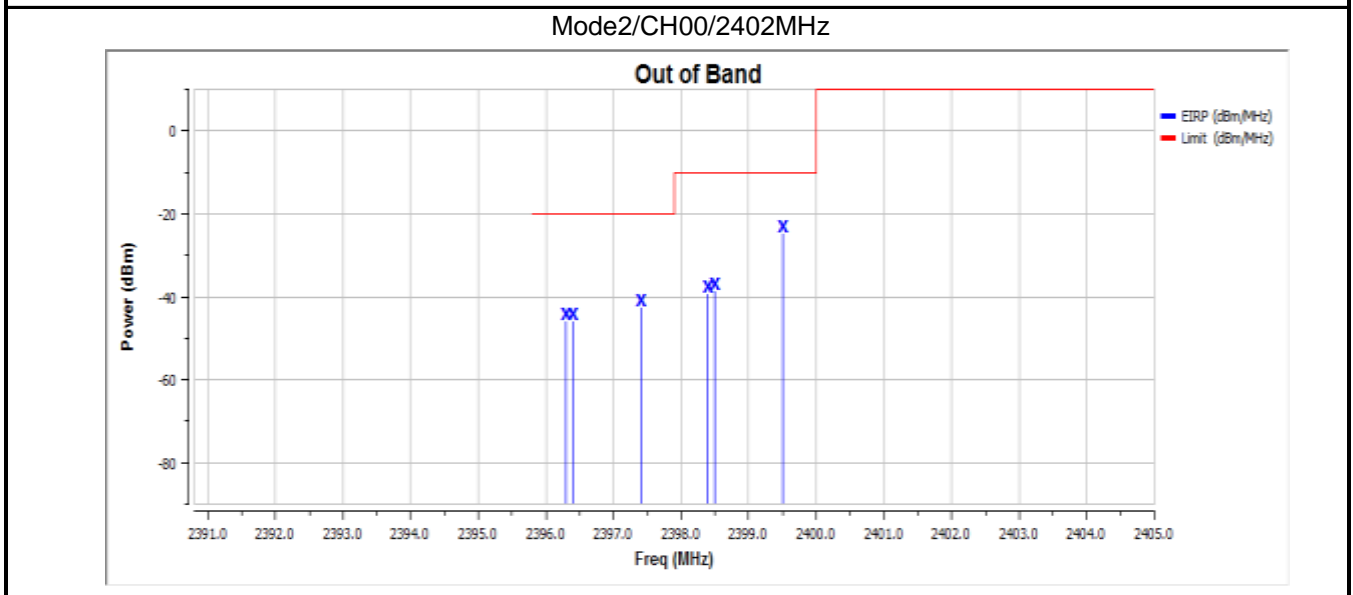
It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

4.7.4 Test Data

Test Mode	Frequency Range (MHz)	Total Max Measured Values (dBm/MHz)	Limit (dBm/MHz)
Mode1	2400-2BW~2400-BW	-42.85	≤-20
	2400-BW~2400	-39.17	≤-10
	2483.5~2483.5+BW	-44.97	≤-10
	2483.5+BW~2483.5+2BW	-47.45	≤-20
Mode2	2400-2BW~2400-BW	-42.70	≤-20
	2400-BW~2400	-24.87	≤-10
	2483.5~2483.5+BW	-41.15	≤-10
	2483.5+BW~2483.5+2BW	-46.48	≤-20
Mode3	2400-2BW~2400-BW	-43.13	≤-20
	2400-BW~2400	-39.94	≤-10
	2483.5~2483.5+BW	-45.01	≤-10
	2483.5+BW~2483.5+2BW	-47.23	≤-20
Mode4	2400-2BW~2400-BW	-43.11	≤-20
	2400-BW~2400	-39.98	≤-10
	2483.5~2483.5+BW	-44.98	≤-10
	2483.5+BW~2483.5+2BW	-47.29	≤-20

Note 1: The Antenna Gain please refer to clause 1.2

Note 2: The worst data plot as below:

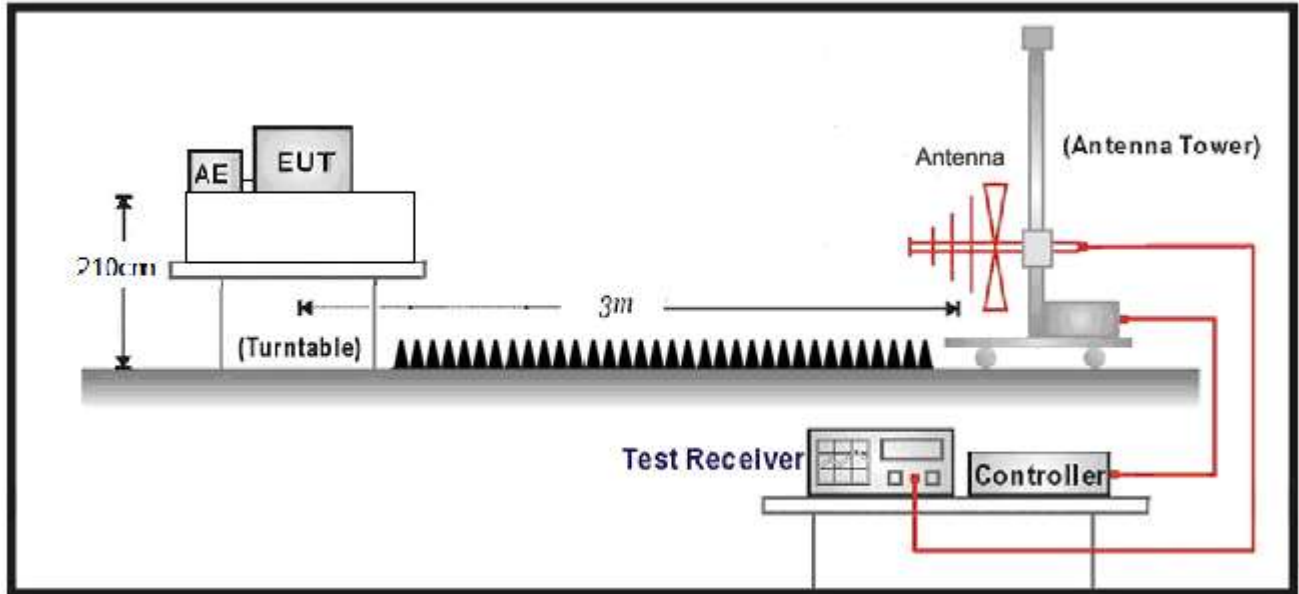


4.8 Transmitter unwanted emissions in the spurious domain**VERDICT: PASS****4.8.1 Limit**

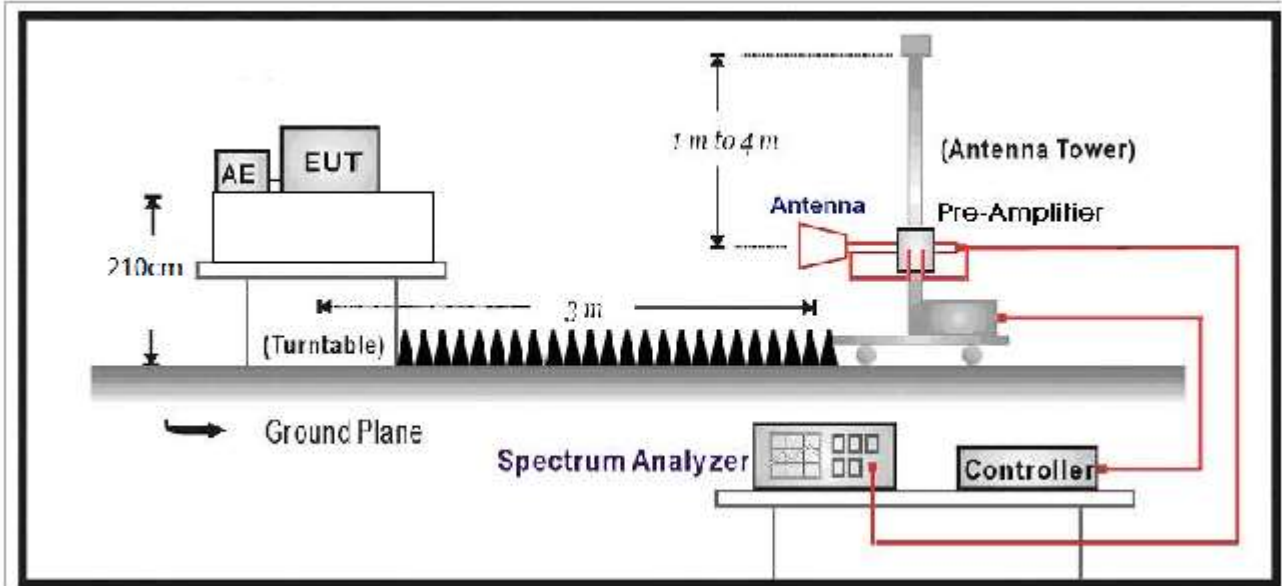
Standard	ETSI EN 300 328 V2.2.2		
Frequency range	Maximum power	Bandwidth	
30 MHz to 47 MHz	-36 dBm	100kHz	
47 MHz to 74 MHz	-54 dBm	100kHz	
74 MHz to 87,5 MHz	-36 dBm	100kHz	
87,5 MHz to 118 MHz	-54 dBm	100kHz	
118 MHz to 174 MHz	-36 dBm	100kHz	
174 MHz to 230 MHz	-54 dBm	100kHz	
230 MHz to 470 MHz	-36 dBm	100kHz	
470 MHz to 694 MHz	-54 dBm	100kHz	
694 MHz to 1 GHz	-36 dBm	100kHz	
1 GHz to 12,75 GHz	-30 dBm	1MHz	

4.8.2 Test Setup

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



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

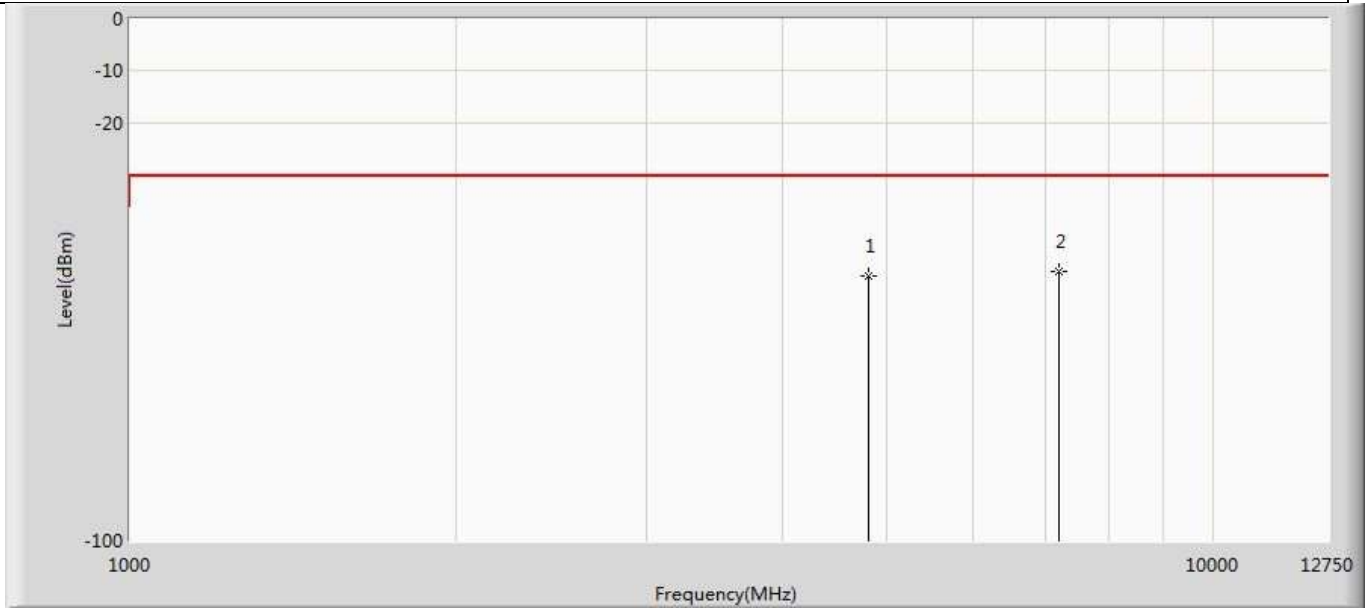


4.8.3 Test Procedure			
☒	References Rule	Chapter	Description
	ETSI EN 300 328 V2.2.2	5.4.9.2.2	Radiated measurement
	<p>Step 1</p> <p>The sensitivity of the measurement set-up should be such that the noise floor is at least 12 dB below the limits given in table 4 or table 12.</p>		
	<p>Step 2</p> <p>The emissions over the range 30 MHz to 1 000 MHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 100 kHz (2),Video bandwidth: 300 kHz (3),Filter type: 3 dB (Gaussian) (4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 19 400</p> <p>NOTE 1: For spectrum analyzers not supporting this high number of sweep points, the frequency band may need to be segmented.</p> <p>(7)Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT, on any channel.</p> <p>For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on any of the hopping frequencies.</p> <p>NOTE 2: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyzer could be used. Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12.</p>		
	<p>Step 3</p> <p>The emissions over the range 1 GHz to 12,75 GHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 1 MHz (2),Video bandwidth: 3 MHz (3),Filter type: 3 dB (Gaussian) (4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 23 500</p> <p>NOTE 3: For spectrum analyzers not supporting this high number of sweep points, the frequency band may need to be segmented.</p> <p>(7)Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT, on any channel.</p> <p>For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on any of the</p>		

	<p>hopping frequencies.</p> <p>NOTE 4: The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyzer could be used. Allow the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12. FHSS equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.9.2.1.3.</p> <p>Step 4</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 and step 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identify emissions during this pre-scan need to be reduced with $10 \times \log_{10} (Ach)$ (number of active transmit chains).</p> <p>Measurement of the emissions identified during the pre-scan</p> <p>The procedure in step 1 to step 4 below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyser has a Time Domain Power function.</p> <p>Step 1</p> <p>The level of the emissions shall be measured using the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> (1),Measurement Mode: Time Domain Power (2),Centre Frequency: Frequency of the emission identified during the pre-scan (3),Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz) (4),Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz) (5),Frequency Span: Zero Span (6),Sweep mode: Single Sweep (7),Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power (8),Sweep points: Sweep time [μs] / (1 μs) with a maximum of 30 000 (9),Trigger: Video (burst signals) or Manual (continuous signals) (10),Detector: RMS <p>Step 2</p> <p>Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.</p> <p>Step 3</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 needs to be repeated for each of the active transmit chains (Ach). Sum the measured power (within the observed window) for each of the active transmit chains.</p> <p>Step 4</p> <p>The value defined in step 3 shall be compared to the limits defined in tables 4 and 12.</p>
--	---

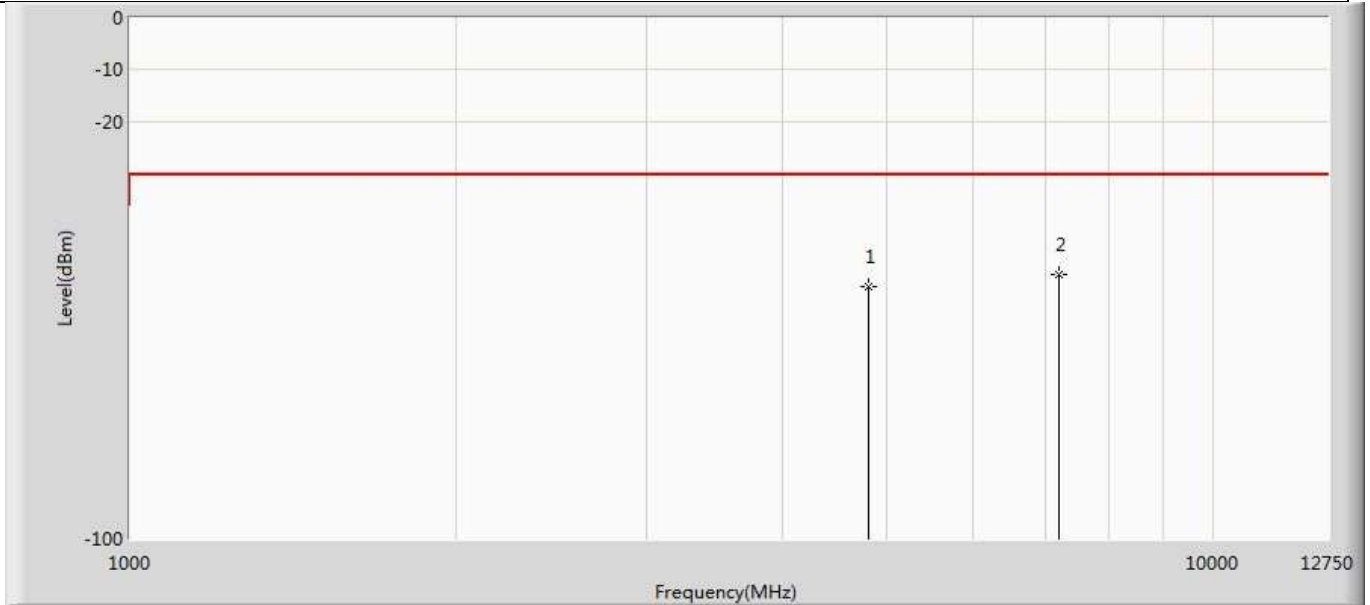
4.8.4 Test Data

Profile: 2110839R	Page No.: 53
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:57
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2402MHz by LE_1Mbps	



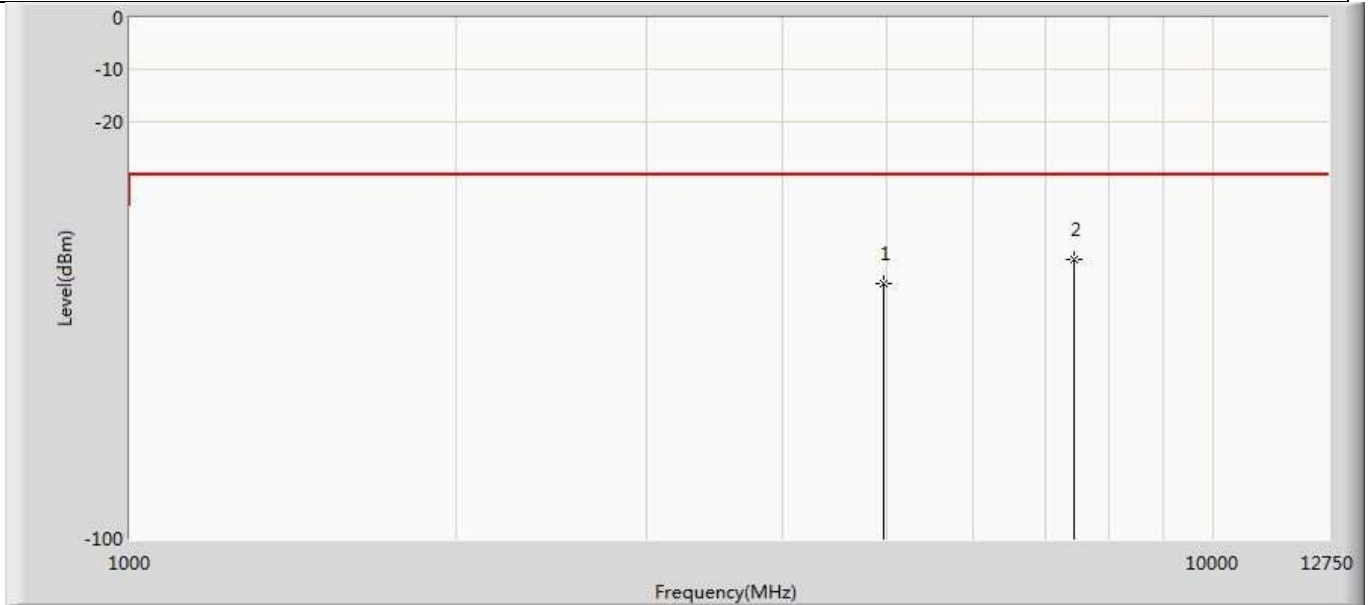
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4807.000	-49.401	-65.131	-19.401	-30.000	15.730	PK
2	*	7206.000	-48.300	-69.024	-18.300	-30.000	20.724	PK

Profile: 2110839R	Page No.: 54
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:57
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2402MHz by LE_1Mbps	



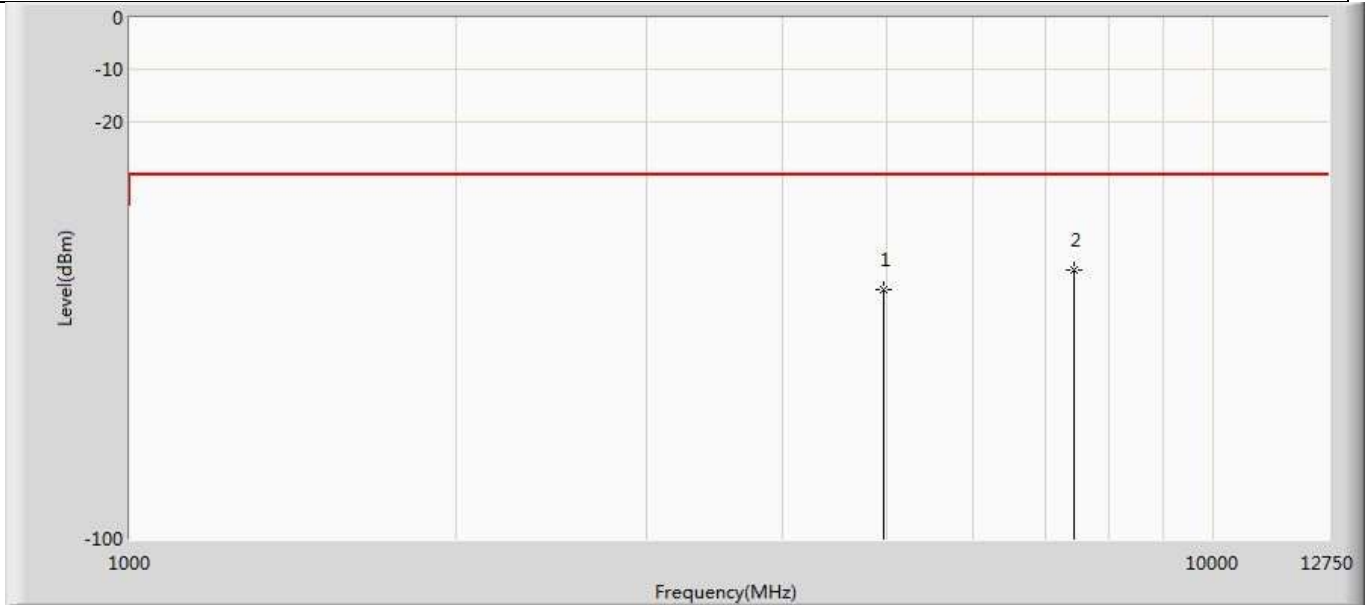
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4804.000	-51.457	-66.055	-21.457	-30.000	14.598	PK
2	*	7205.000	-49.206	-69.746	-19.206	-30.000	20.540	PK

Profile: 2110839R	Page No.: 55
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:57
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2480MHz by LE_1Mbps	



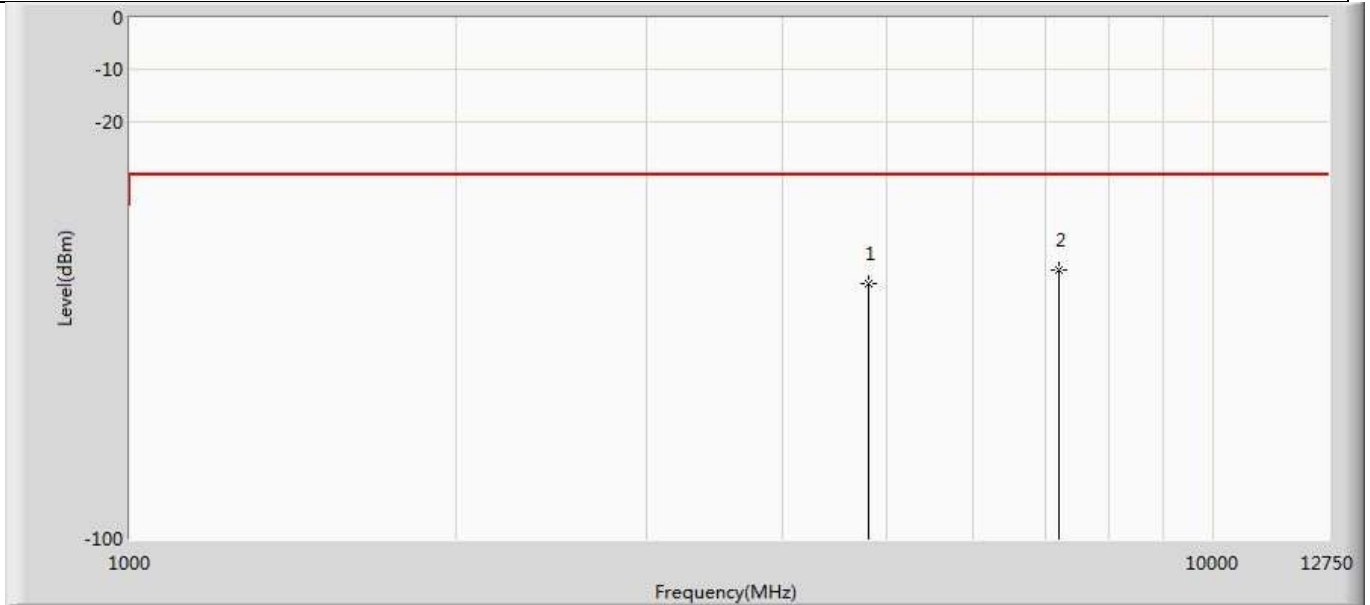
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4960.000	-51.118	-66.633	-21.118	-30.000	15.515	PK
2	*	7440.000	-46.458	-68.606	-16.458	-30.000	22.148	PK

Profile: 2110839R	Page No.: 56
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:57
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2480MHz by LE_1Mbps	



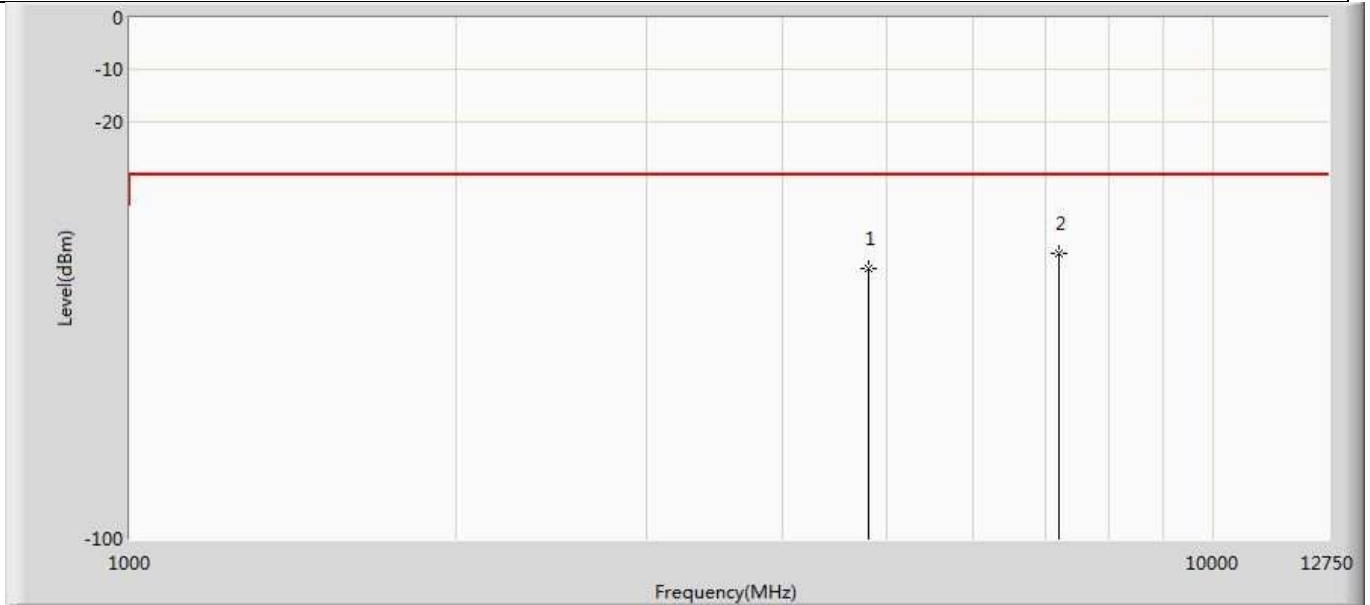
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4961.000	-52.267	-66.697	-22.267	-30.000	14.430	PK
2	*	7438.000	-48.345	-69.981	-18.345	-30.000	21.636	PK

Profile: 2110839R	Page No.: 57
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:57
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Transmit at 2402MHz by LE_2Mbps	



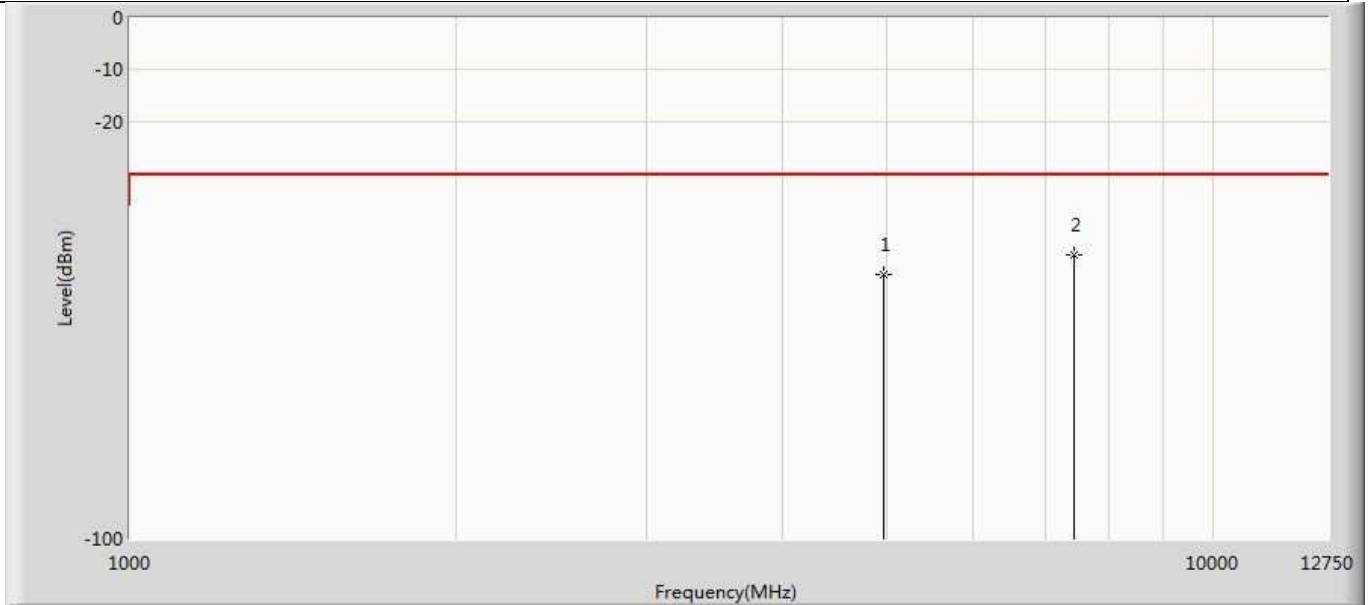
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4804.000	-50.934	-66.604	-20.934	-30.000	15.670	PK
2	*	7207.000	-48.413	-69.161	-18.413	-30.000	20.748	PK

Profile: 2110839R	Page No.: 58
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:57
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Transmit at 2402MHz by LE_2Mbps	



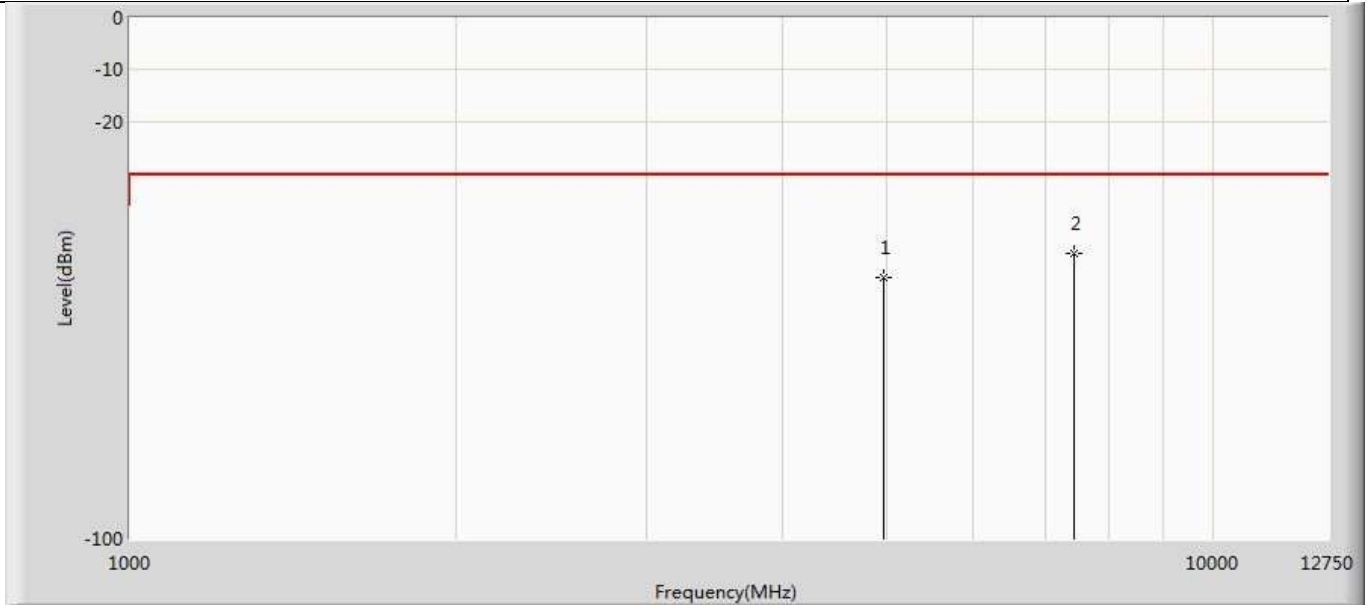
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4804.000	-48.162	-62.760	-18.162	-30.000	14.598	PK
2	*	7206.000	-45.251	-65.807	-15.251	-30.000	20.556	PK

Profile: 2110839R	Page No.: 59
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Transmit at 2480MHz by LE_2Mbps	



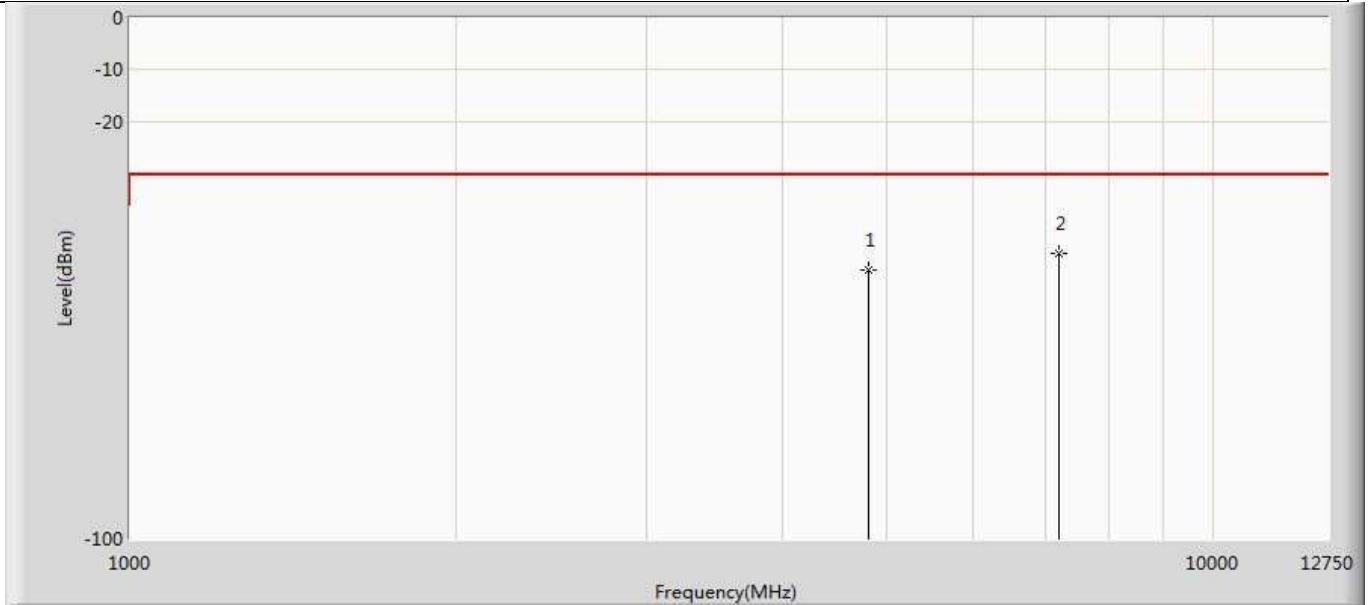
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4961.000	-49.217	-64.727	-19.217	-30.000	15.510	PK
2	*	7440.000	-45.627	-67.775	-15.627	-30.000	22.148	PK

Profile: 2110839R	Page No.: 60
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 2:Transmit at 2480MHz by LE_2Mbps	



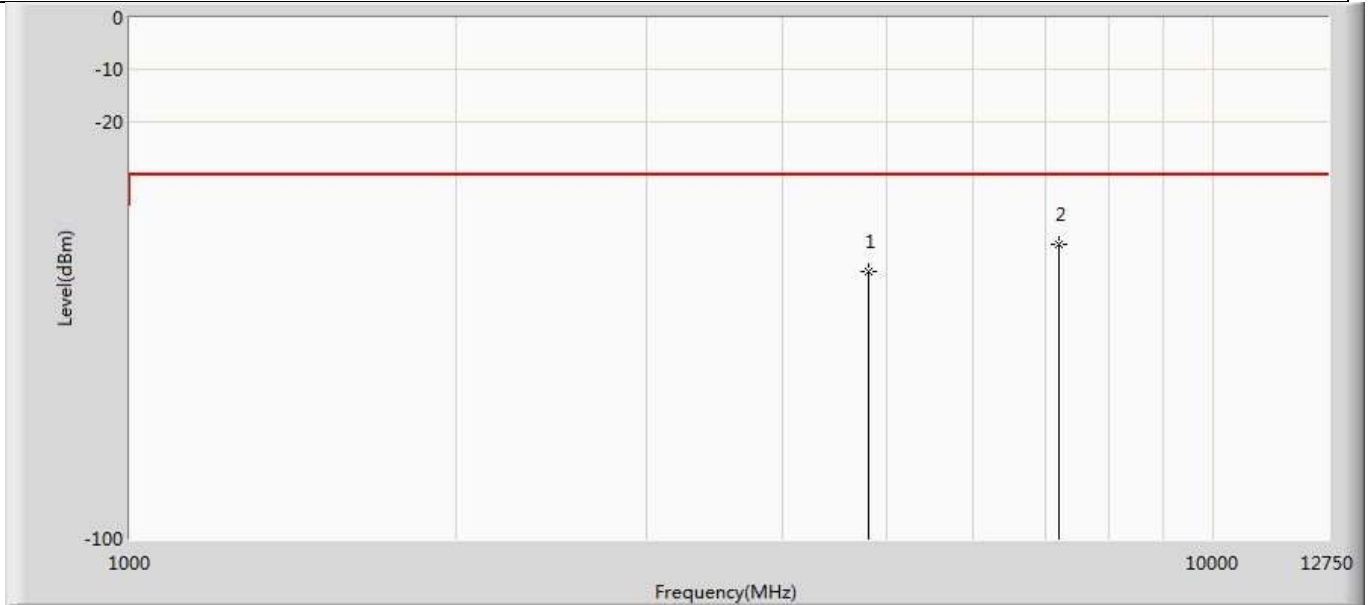
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4961.000	-49.853	-64.283	-19.853	-30.000	14.430	PK
2	*	7438.000	-45.292	-66.928	-15.292	-30.000	21.636	PK

Profile: 2110839R	Page No.: 61
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 3:Transmit at 2402MHz by LE_Coded S=8	



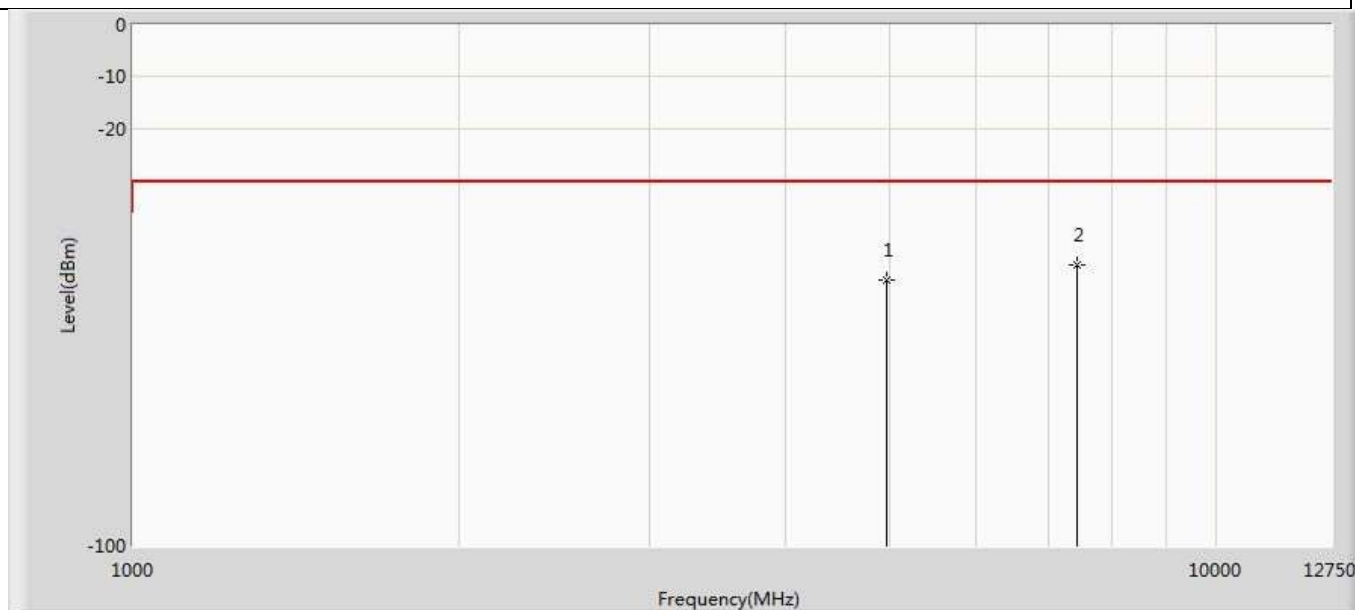
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4804.000	-48.467	-64.137	-18.467	-30.000	15.670	PK
2	*	7206.000	-45.299	-66.023	-15.299	-30.000	20.724	PK

Profile: 2110839R	Page No.: 62
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 3:Transmit at 2402MHz by LE_Coded S=8	



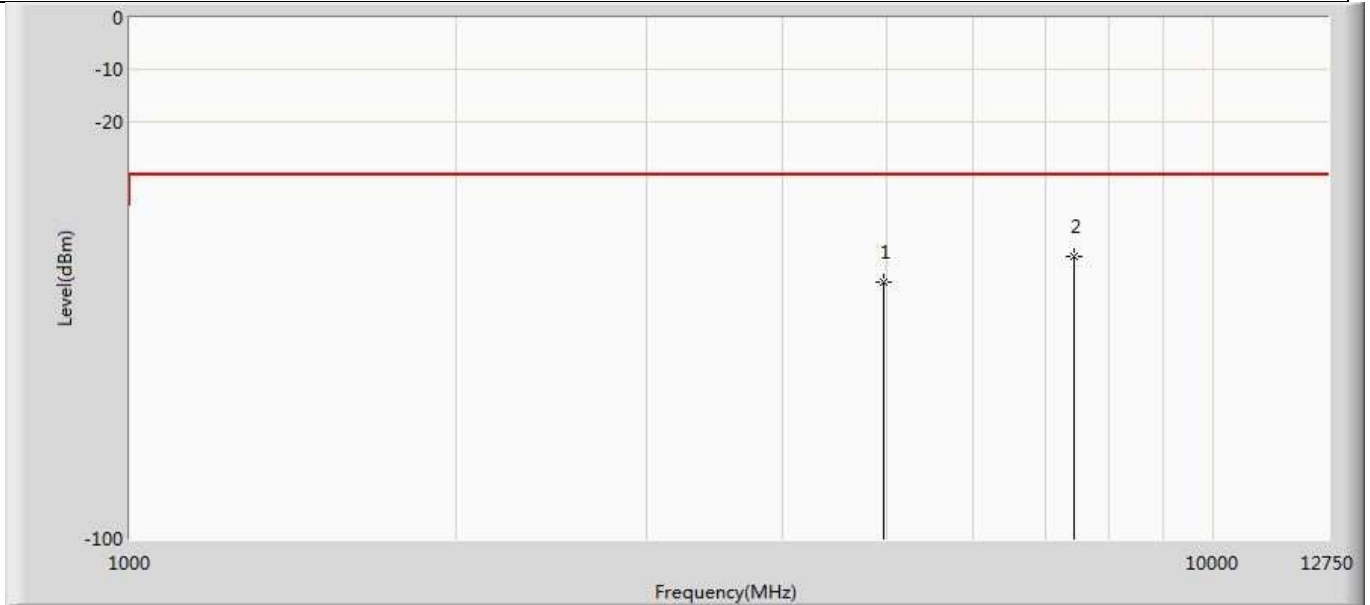
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4805.000	-48.592	-63.180	-18.592	-30.000	14.588	PK
2	*	7206.000	-43.460	-64.016	-13.460	-30.000	20.556	PK

Profile: 2110839R	Page No.: 63
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 3:Transmit at 2480MHz by LE_Coded S=8	



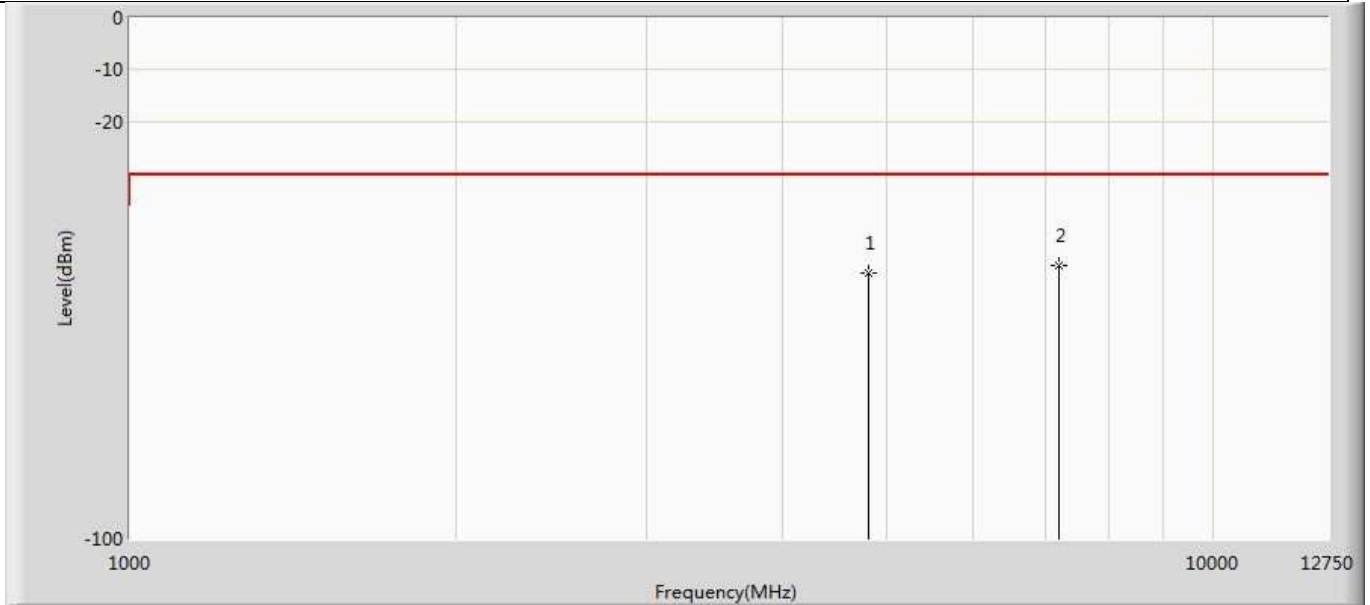
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4960.000	-48.985	-64.500	-18.985	-30.000	15.515	PK
2	*	7440.000	-46.167	-68.315	-16.167	-30.000	22.148	PK

Profile: 2110839R	Page No.: 64
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 3:Transmit at 2480MHz by LE_Coded S=8	



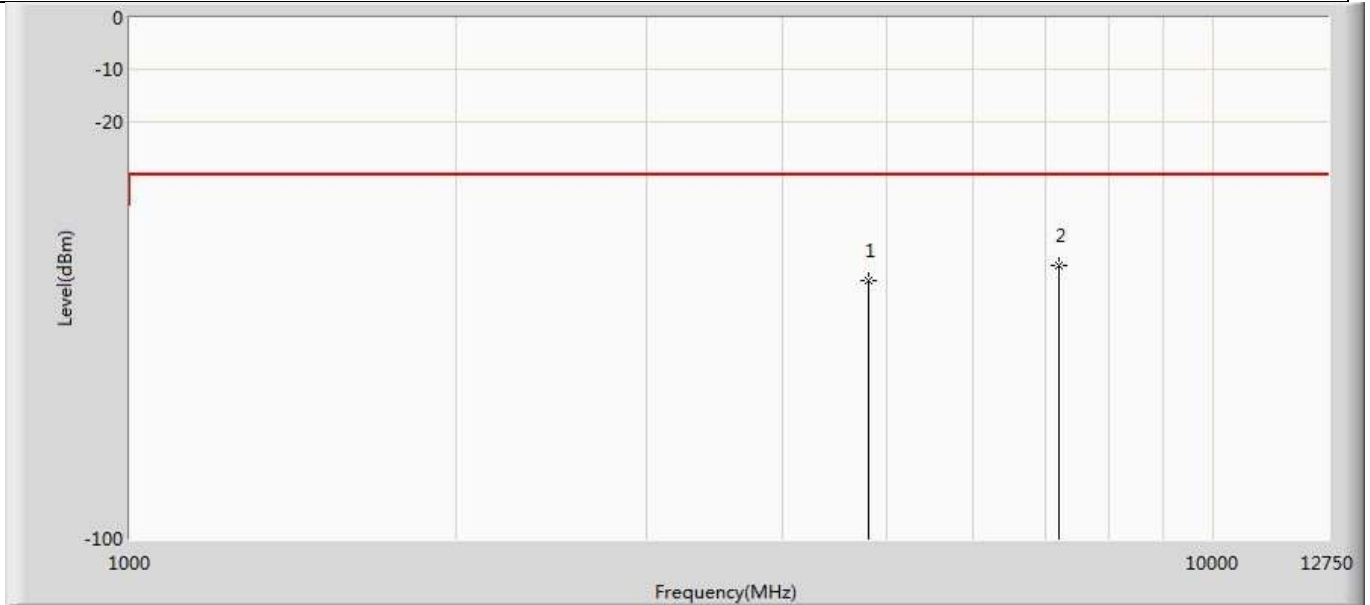
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4960.000	-50.712	-65.141	-20.712	-30.000	14.429	PK
2	*	7439.000	-45.904	-67.565	-15.904	-30.000	21.661	PK

Profile: 2110839R	Page No.: 65
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 4:Transmit at 2402MHz by LE_Coded S=2	



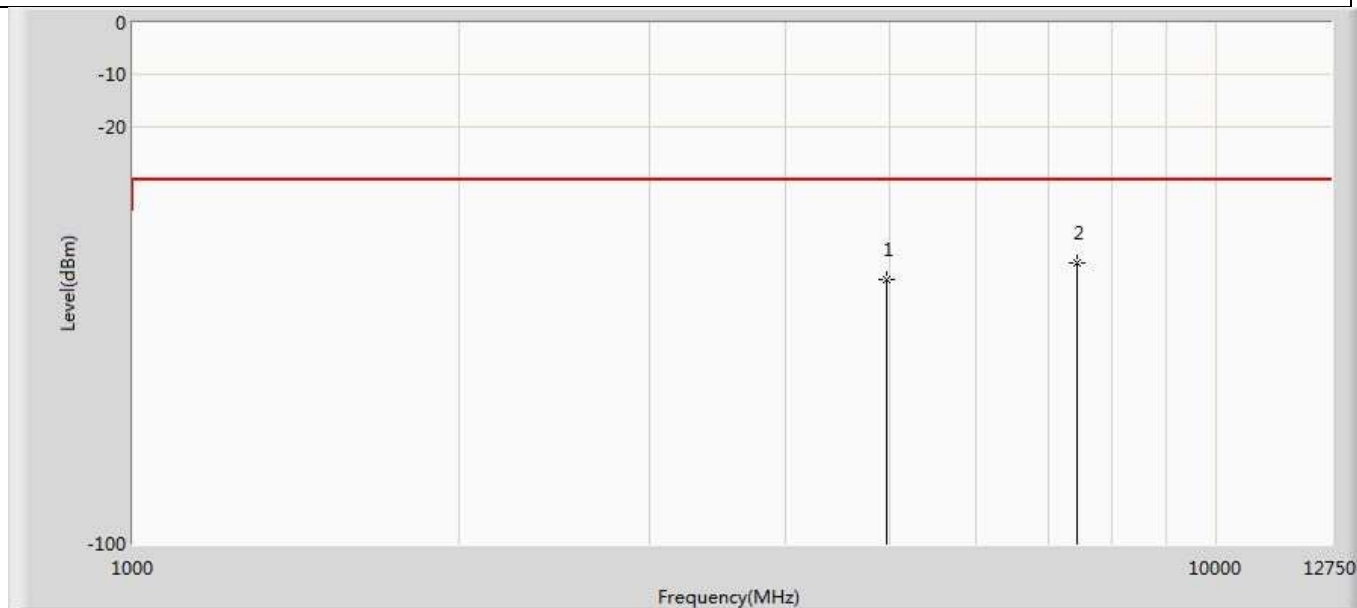
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4804.000	-48.966	-64.636	-18.966	-30.000	15.670	PK
2	*	7206.000	-47.536	-68.260	-17.536	-30.000	20.724	PK

Profile: 2110839R	Page No.: 66
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 4:Transmit at 2402MHz by LE_Coded S=2	



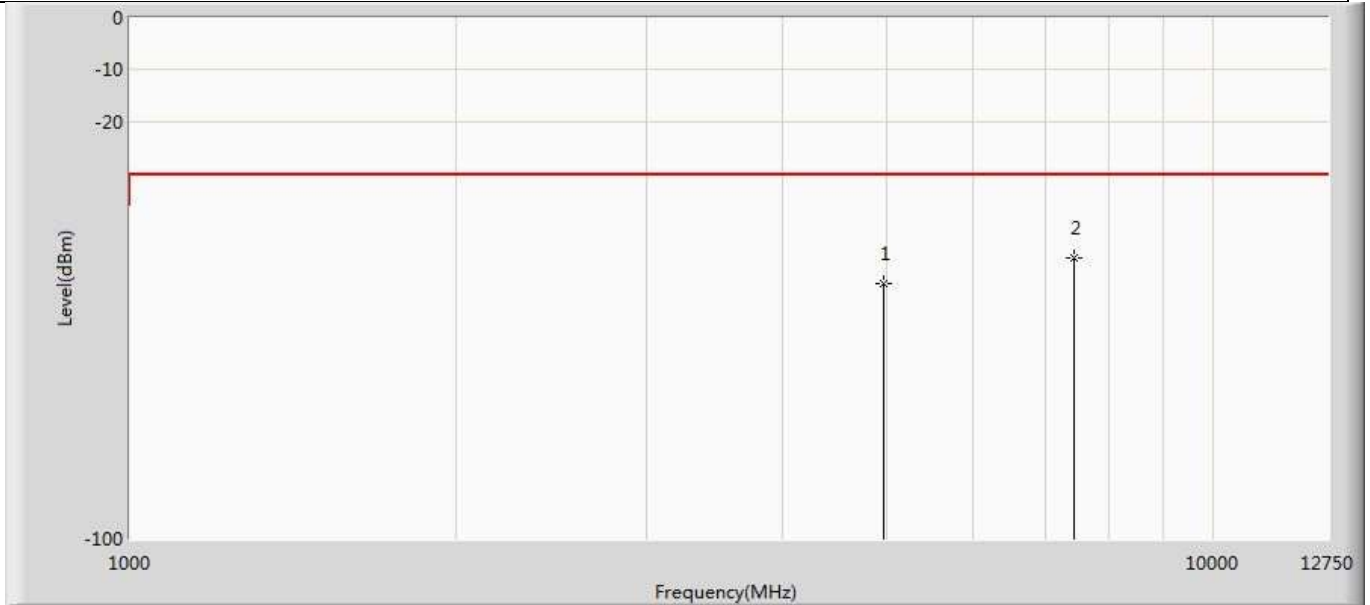
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4804.000	-50.293	-64.891	-20.293	-30.000	14.598	PK
2	*	7209.000	-47.447	-68.051	-17.447	-30.000	20.604	PK

Profile: 2110839R	Page No.: 67
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-H	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 4:Transmit at 2480MHz by LE_Coded S=2	



No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4961.000	-49.375	-64.885	-19.375	-30.000	15.510	PK
2	*	7440.000	-46.112	-68.260	-16.112	-30.000	22.148	PK

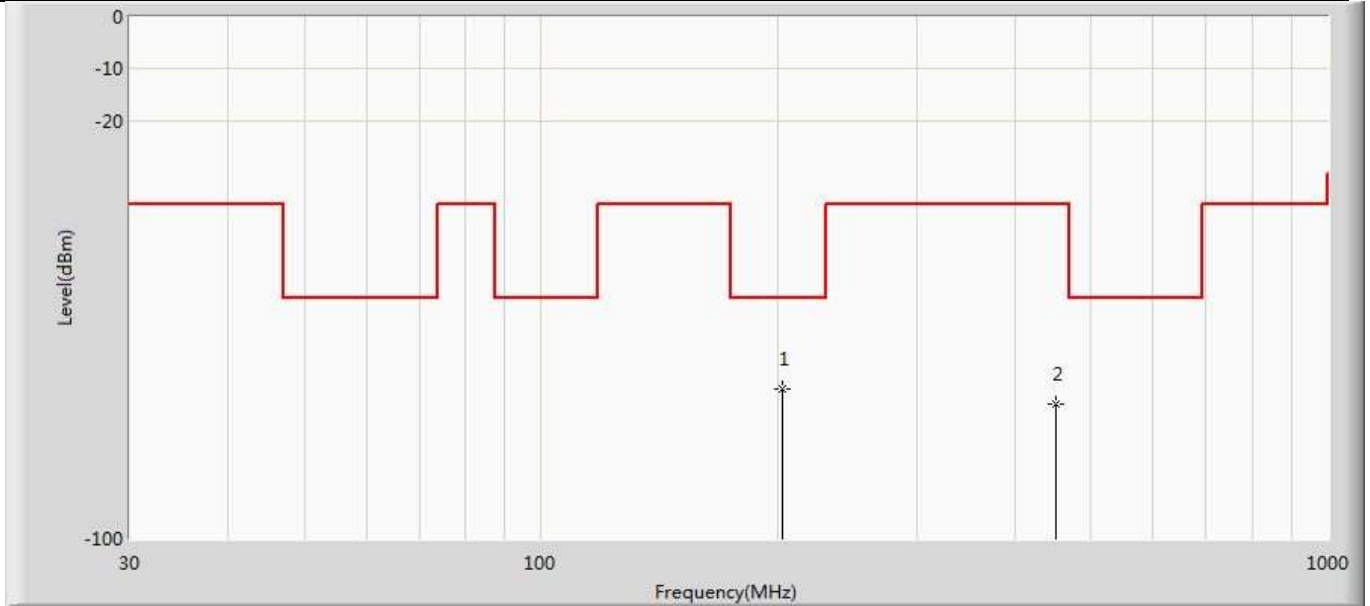
Profile: 2110839R	Page No.: 68
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:58
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: 1-18G AMP-V	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 4:Transmit at 2480MHz by LE_Coded S=2	



No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		4960.000	-51.040	-65.469	-21.040	-30.000	14.429	PK
2	*	7441.000	-46.168	-67.879	-16.168	-30.000	21.711	PK

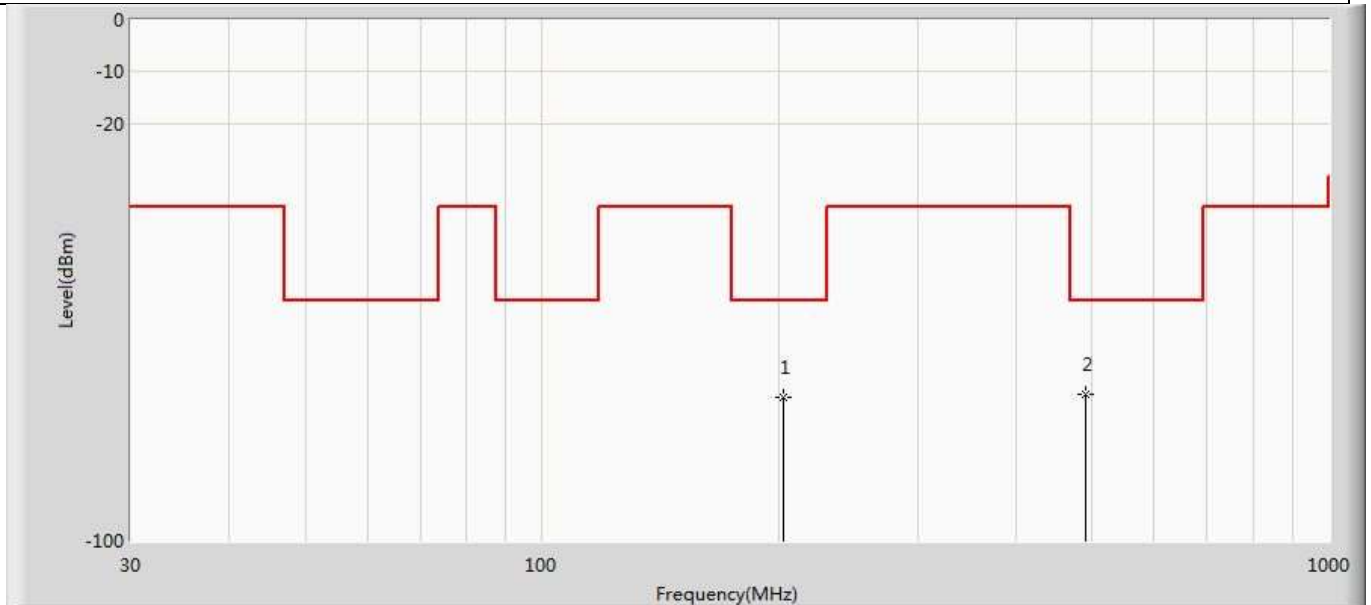
The worst data of below 1GHz:

Profile: 2110839R	Page No.: 45
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:56
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Horizontal
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2402MHz by LE_1Mbps	



No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1	*	202.660	-71.403	-94.118	-17.403	-54.000	22.715	PK
2		450.980	-74.264	-104.773	-38.264	-36.000	30.509	PK

Profile: 2110839R	Page No.: 46
Engineer: Neil	
Site: AC6	Time: 2021/02/09 - 14:56
Limit: ETSI_EN300328_V2.2.2_RSE(3m)_Tx(Operating)	Margin: 0
Probe: RF_Substitution_(DC 30-1000MHz)	Polarity: Vertical
EUT: LED LAMP	Power: AC 230V/50Hz
Note: Mode 1:Transmit at 2402MHz by LE_1Mbps	



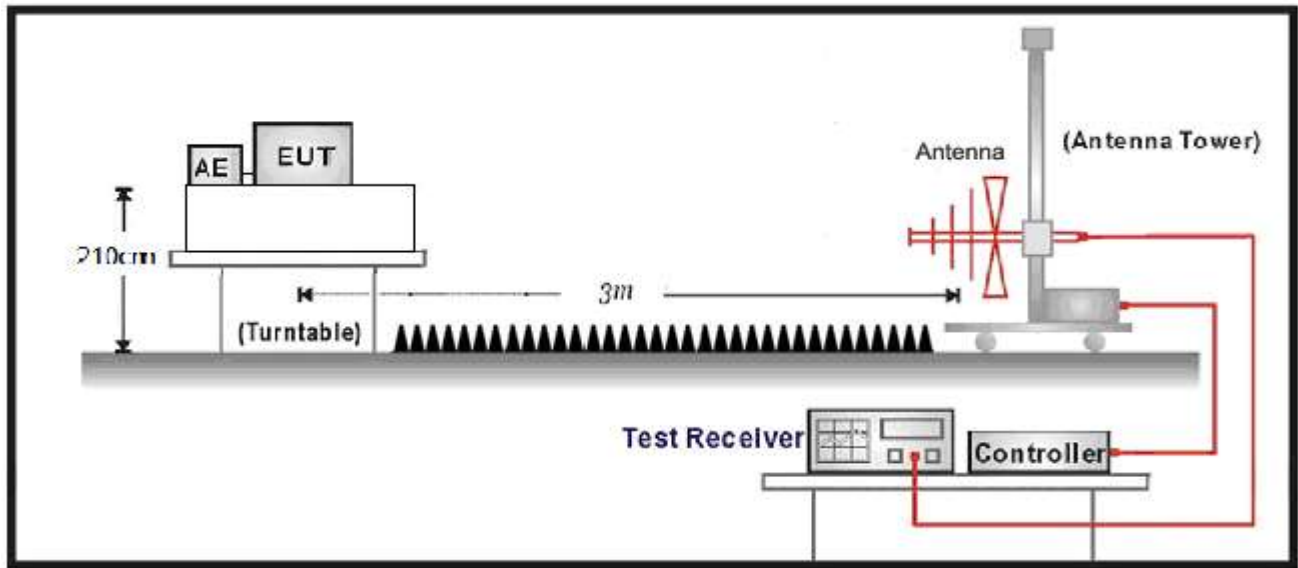
No	Mark	Frequency (MHz)	Measure Level (dBm)	Reading Level (dBm)	Over Limit (dB)	Limit (dBm)	Factor (dB)	Type
1		202.660	-72.457	-94.834	-18.457	-54.000	22.377	PK
2	*	491.720	-71.911	-102.564	-17.911	-54.000	30.653	PK

4.9 Receiver Spurious Emissions **VERDICT: PASS**

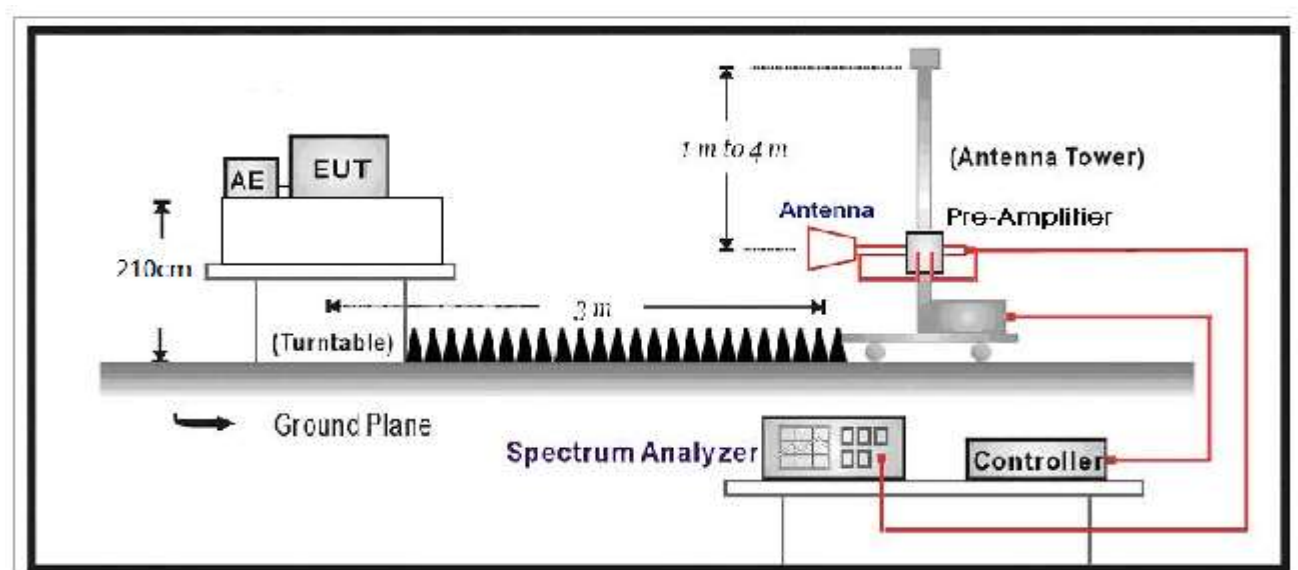
4.9.1 Limit		
Standard	ETSI EN 300 328 V2.2.2	
Frequency range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

4.9.2 Test Setup

Receiver Spurious Emissions / AC-6 (Below 1G)



Receiver Spurious Emissions / AC-6 (Above 1G)



4.9.3 Test Procedure			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ETSI EN 300 328 V2.2.2	5.4.10.2.2	Radiated measurement
	<p>Step 1</p> <p>The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in table 5 or table 13.</p>		
	<p>Step 2</p> <p>The emissions over the range 30 MHz to 1 000 MHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 100 kHz (2),Video bandwidth: 300 kHz (3),Filter type: 3 dB (Gaussian) (4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 19 400 (7)Sweep time: Auto</p> <p>Wait for the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in table 5 or table 13.</p>		
	<p>Step 3</p> <p>The emissions over the range 1 GHz to 12,75 GHz shall be identified.</p> <p>Spectrum analyzer settings:</p> <p>(1),Resolution bandwidth: 1 MHz (2),Video bandwidth: 3 MHz (3),Filter type: 3 dB (Gaussian) (4),Detector mode: Peak (5),Trace Mode: Max Hold (6),Sweep Points: ≥ 23 500</p> <p>NOTE 3: For spectrum analyzers not supporting this high number of sweep points, the frequency band may need to be segmented.</p> <p>(7),Sweep time: Auto</p> <p>Wait for the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in table 5 or table 13.</p> <p>FHSS equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.10.2.1.3.</p>		
	<p>Step 4</p> <p>In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 and step 3 need to be repeated for each of the active receive chains (Ach)The limits used to identify emissions during this pre-scan need to be reduced with $10 \times \log_{10}(\text{Ach})$ (number of active receive chains).</p>		
	<p>Measurement of the emissions identified during the pre-scan</p> <p>The steps below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyzer has a Time Domain Power function</p>		

Step 1
<p>The level of the emissions shall be measured using the following spectrum analyzer settings:</p> <p>(1),Measurement Mode: Time Domain Power</p> <p>(2),Centre Frequency: Frequency of the emission identified during the pre-scan</p> <p>(3),Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)</p> <p>(4),Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)</p> <p>(5),Frequency Span: Zero Span</p> <p>(6),Sweep mode: Single Sweep</p> <p>(7),Sweep time: 30 ms</p> <p>(8),Sweep points: ≥ 30 000</p> <p>(9),Trigger: Video (burst signals) or Manual (continuous signals)</p> <p>(10),Detector: RMS</p>
Step 2
<p>Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.</p>
Step 3
<p>In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 needs to be repeated for each of the active receive chains (Ach).</p> <p>Sum the measured power (within the observed window) for each of the active receive chains</p>
Step 4
<p>The value defined in step 3 shall be compared to the limits defined in tables 5 and 13.</p>

4.9.4 Test Data

The data of receive spurious is the noise base, so no receive data was showed.

4.10 Receiver Blocking	VERDICT: PASS
-------------------------------	----------------------

4.10.1 Limit			
Standard		ETSI EN 300 328 V2.2.2	
<input type="checkbox"/> Receiver Category 1			
Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × log ₁₀ (OCBW)) or -68 dBm whichever is less (see note 2)	2 380	-34	CW
	2 504		
(-139 dBm + 10 × log ₁₀ (OCBW)) or -74 dBm whichever is less (see note 3)	2 300		
	2 330		
	2 360		
	2 524		
	2 584		
2 674			
NOTE 1: OCBW is in Hz.			
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P _{min} + 26 dB where P _{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.			
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P _{min} + 20 dB where P _{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.			
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2			
<input checked="" type="checkbox"/> Receiver Category 2			
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log ₁₀ (OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380	-34	CW
	2 504		
	2 300		
	2 584		

NOTE 1: OCBW is in Hz.

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

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

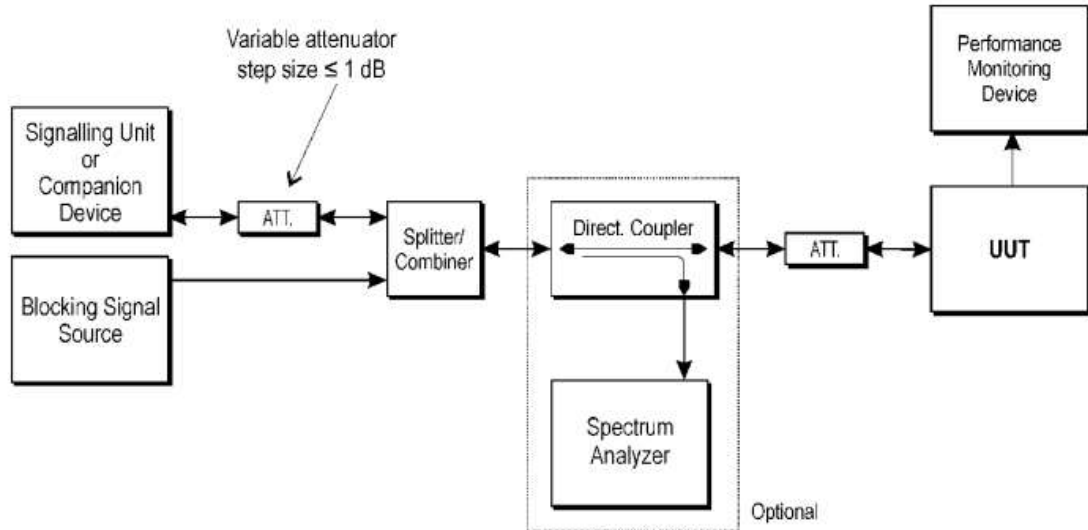
<input type="checkbox"/> Receiver Category 3			
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log ₁₀ (OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380	-34	CW
	2 504		
	2 300		
	2 584		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{min} + 30$ dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

4.10.2 Test Setup



4.10.3 Procedure		
References Rule	Chapter	Description
<input checked="" type="checkbox"/> ETSI EN 300 328 V2.2.2	5.4.11.2.1	Receiver Blocking
<p>For systems using multiple receive chains only one chain (antenna port) need to be tested. All other receiver inputs shall be terminated.</p> <p>The procedure in step 1 to step 6 below shall be used to verify the receiver blocking requirement as described in clause 4.3.1.12 or clause 4.3.2.11. The performance monitoring device is capable of verifying the performance criteria as defined in clause 4.3.1.12.3 or clause 4.3.2.11.3.</p>		
Step 1		
<p>For non-FHSS equipment, the UUT shall be set to the lowest operating channel on which the blocking test has to be performed (see clause 5.4.11.1).</p>		
Step 2		
<p>The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.</p>		
Step 3		
<p>1, With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6.</p> <p>2, Unless the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the level of the wanted signal shall be set to the value provided in the table corresponding to the receiver category and type of equipment. The test procedure defined in clause 5.4.2, and more in particular clause 5.4.2.2.1.2, can be used to measure the (conducted) level of the wanted signal however no correction shall be made for antenna gain of the companion device (step 6 in clause 5.4.2.2.1.2 shall be ignored). This level may be measured directly at the output of the companion device and a correction is made for the coupling loss into the UUT. The actual level for the wanted signal shall be recorded in the test report</p> <p>3, When the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is P_{min}. This signal level (P_{min}) is increased by the value provided in note 2 of the applicable table corresponding to the receiver category and type of equipment.</p>		
Step 4		
<p>The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment.</p> <p>If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 are met then proceed to step 6</p>		
Step 5		
<p>1, If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been increased with a value equal to the Occupied Channel Bandwidth except:</p> <p>Note 1: For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.</p> <p>Note 2: For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.</p> <p>2, If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been decreased with a value</p>		

equal to the Occupied Channel Bandwidth except:

Note 3: For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.

Note 4: For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.

If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, the UUT fails to comply with the Receiver Blocking requirement and step 6 and step 7 are no longer required.

It shall be recorded in the test report whether the shift of blocking frequencies as described in the present step was used

Step 6

Repeat step 4 and step 5 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

Step 7

For non-FHSS equipment, repeat step 2 to step 6 with the UUT operating at the highest operating channel on which the blocking test has to be performed (see clause 5.4.11.1)

Step 8

It shall be assessed and recorded in the test report whether the UUT complies with the Receiver Blocking requirement.

4.10.4 Test Data						
Test Mode	Frequency (MHz)	Wanted signal power (dBm) (see note 1)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	PER Measure Value (%)	PER Limit (%)
Mode 9	2 402	-68.85	2 380	-34	0.10	≤10
			2 504	-34	0.03	≤10
			2 300	-34	0.02	≤10
			2 584	-34	0.02	≤10
	2 480	-68.85	2 380	-34	0.02	≤10
			2 504	-34	0.01	≤10
			2 300	-34	0.02	≤10
			2 584	-34	0.00	≤10

Note 1: Wanted signal power is $(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB})$ or $(-74 \text{ dBm} + 10 \text{ dB})$ whichever is less

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

5 SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

_____ The End _____