ITEMS UNDER TEST REPORT	
Description	Smart plug with BLE module
Model	OSWFR (French version) OSWIT (Italian version) OSWDE (German version)
Applicant	Iotty S.r.l.
Address	Via Del Laghetto 10/20, 33080 Porcia (PN) - Italy
Test carried out by	TÜV Rheinland Italia Srl Via E. Mattei, 3 – 20010 Pogliano Milanese (Italy)
Reference Standards	**ETSI EN 300 328 V2.1.1** **(§ 4.3.2.2; § 4.3.2.9)**
Scope of the tests	To verify the compliance with the following clauses of reference standards, see TESTS SUMMARY section
Test Results	**COMPLIANT**
Number of pages	24
Date of samples receiving	25/08/2020 (storage n° 200666, sampled by applicant)
Date of tests start	01/10/2020
Date of tests end	01/10/2020

Tested by *(name + signature)*	**Approved by** *(name + signature)*
Alessandro Zappa (*Laboratory Technician*)	Giovanni Molteni (*Laboratory Manager*)

ITEM UNDER TEST	
Description	Smart plug with BLE module
Brand	iotty®
Manufacturer	Iotty S.r.l.
Model	OSWFR
Ratings	230V 50/60Hz

DERIVED MODELS
No electronic differences between tested model and derived models OSWFR (French version), tested model. OSWIT (Italian version), derived. OSWDE (German version), derived.

RF MODULE - TECHNICAL DATA	
Manufacturer	ESPRESSIF
Model	ESP32-WROOM-32D
Module type	Wi-Fi+BT+BLE MCU module
Technical data	

Table 2: ESP32-WROOM-32D and ESP32-WROOM-32U Specifications

Categories	Items	Specifications
Certification	RF Certification	FCC/CE-RED/IC/TELEC/KCC/SRRC/NCC
	Wi-Fi Certification	Wi-Fi Alliance
	Bluetooth certification	BQB
	Green Certification	REACH/RoHS
Test	Reliablity	HTOL/HTSL/uHAST/TCT/ESD
Wi-Fi	Protocols	802.11 b/g/n (802.11n up to 150 Mbps)
		A-MPDU and A-MSDU aggregation and 0.4 μs guard interval support
	Frequency range	2.4 GHz ~ 2.5 GHz
Bluetooth	Protocols	Bluetooth v4.2 BR/EDR and BLE specification
	Radio	NZIF receiver with –97 dBm sensitivity
		Class-1, class-2 and class-3 transmitter
		AFH
	Audio	CVSD and SBC
Hardware	Module interfaces	SD card, UART, SPI, SDIO, I^2C, LED PWM, Motor PWM, I^2S, IR, pulse counter, GPIO, capacitive touch sensor, ADC, DAC
	On-chip sensor	Hall sensor
	Integrated crystal	40 MHz crystal
	Integrated SPI flash [1]	4 MB
	Operating voltage/Power supply	3.0 V ~ 3.6 V
	Operating current	Average: 80 mA
	Minimum current delivered by power supply	500 mA
	Recommended operating temperature range [2]	–40 °C ~ +85 °C
	Moisture sensitivity level (MSL)	Level 3

Photo	 ESPRESSIF ESP32-WROOM-32D CCAH18LP0201T7 R-CRM-as5-ESPWROOM32D 211-171102 FCC ID:2AC7Z-ESPWROOM32D IC:21098-ESPWROOM32D CMIIT ID:2018DP2467

GENERAL ANTENNA INFORMATION
PCB antenna on RF module

TEST CONDITIONS, POWER SOURCES AND AMBIENT TEMPERATURES

Normal test conditions

Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature +15 °C to +35 °C;
- relative humidity 20 % to 75 %.

When it is impracticable to carry out tests under these conditions, a note to this effect, stating the ambient temperature and relative humidity during the tests, shall be added to the test report.

Mains voltage

The normal test voltages for equipment to be connected to the mains source shall be the nominal mains voltage. The nominal voltage shall be the declared voltage, or any of the declared voltages, for which the equipment was designed.

Extreme test conditions

Extreme temperatures

For tests at extreme temperatures, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.

Extreme power source voltages

For tests at extreme voltages, measurements shall be made over the extremes of the power source voltage range as declared by the manufacturer. When the equipment under test is designed for operation as part of and powered by another system or piece of equipment, than the limit values of the host equipment or combined equipment as stated by the manufacturer shall apply to the combination to be tested.

ANTENNAS AND TRANSMIT OPERATING MODES

Integrated and dedicated antennas

The equipment can have either integral antennas or dedicated antennas. Dedicated antennas are antennas that are physically external to the equipment and that are assessed in combination with the equipment against the requirements in the present document.

NOTE: It should be noted that assessment does not necessarily lead to testing.

An antenna assembly referred to in the present document is understood as the combination of the antenna (integral or dedicated), its feeder (e.g. coaxial cable) and if applicable, its antenna connector and associated switching components.

The gain of an antenna assembly (G) in dBi, does not include the additional gain that may result out of beamforming.

Smart antenna systems may use beamforming techniques which may result in additional (antenna) gain. This beamforming gain (Y) is specified in dB. The individual antennas used by smart antenna systems are considered to have identical gain referred to as antenna assembly gain (G). Beamforming gain does not include the gain of the antenna assembly (G).

Although the measurement methods in the present document allow conducted measurements to be performed, it should be noted that the equipment together with all its intended antenna assemblies shall comply with the applicable technical requirements defined in the present document.

Smart antenna systems and related operating modes

Smart antenna systems can operate in various operating modes by which the numbers of active antennas vary depending on the mode.

Operating mode 1 (single antenna)

The equipment uses only 1 antenna when operating in this mode.

The following types of equipment and/or operating modes are examples covered by this category:

Equipment with only one antenna.

Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time

Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used.

Operating mode 2 (multiple antennas, no beamforming)

The equipment that can operate in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.

Operating mode 3 (multiple antennas, with beamforming)

The equipment that can operate in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.

In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements described in the present document.

Output power setting

Unless otherwise stated, where multiple combinations of radio equipment and antennas are intended, the configuration to be used for testing shall be chosen as follows:

a) for each combination, determine the highest user selectable power level and the antenna assembly with the highest gain;
b) from the resulting combinations, choose the one with the highest e.i.r.p.

OPERATING MODES	
#1	BLE is in continuous modulated transmission mode at selected channel. WIFI not operating

EQUIPMENT USED DURING TESTS

Use*	Product Type	Manufacturer	Model	Comments
EUT	Smart plug	Iotty	OSWFR	---
AE	PC	Dell	---	Used to set EUT operation channel

Note:

* Use :

EUT - Equipment Under Test,
AE - Auxiliary/Associated Equipment, or
SIM - Simulator (Not Subjected to Test)

No other Auxiliary/Associated Equipment was connected/installed on the EUT

Reference Document	Title of Document
ETSI EN 300 328 V2.1.1	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Compliance with performed tests and recorded in this technical report does not give presumption of compliance to all requirements of the reference standard

TESTS SUMMARY

TESTS SUMMARY

Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU

Harmonised Standard ETSI EN 300 328				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	RF Output Power	4.3.1.2 or 4.3.2.2	U	
2	Power Spectral Density	4.3.2.3	C	Only for equipment using wide band modulations other than FHSS
3	Duty cycle, Tx-Sequence, Tx-gap	4.3.1.3 or 4.3.2.4	C	Only for non-Adaptive equipment
4	Accumulated Transmit time, Frequency Occupation & Hopping Sequence	4.3.1.4	C	Only for FHSS equipment
5	Hopping Frequency Separation	4.3.1.5	C	Only for FHSS equipment
6	Medium Utilization	4.3.1.6 or 4.3.2.5	C	Only for non-Adaptive equipment
7	Adaptivity	4.3.1.7 or 4.3.2.6	C	Only for Adaptive equipment
8	Occupied Channel Bandwidth	4.3.1.8 or 4.3.2.7	U	
9	Transmitter unwanted emissions in the OOB domain	4.3.1.9 or 4.3.2.8	U	
10	Transmitter unwanted emissions in the spurious domain	4.3.1.10 or 4.3.2.9	U	
11	Receiver spurious emissions	4.3.1.11 or 4.3.2.10	U	
12	Receiver Blocking	4.3.1.12 or 4.3.2.11	U	
13	Geo-location capability	4.3.1.13 or 4.3.2.12	C	Only for equipment with geo-location capability

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

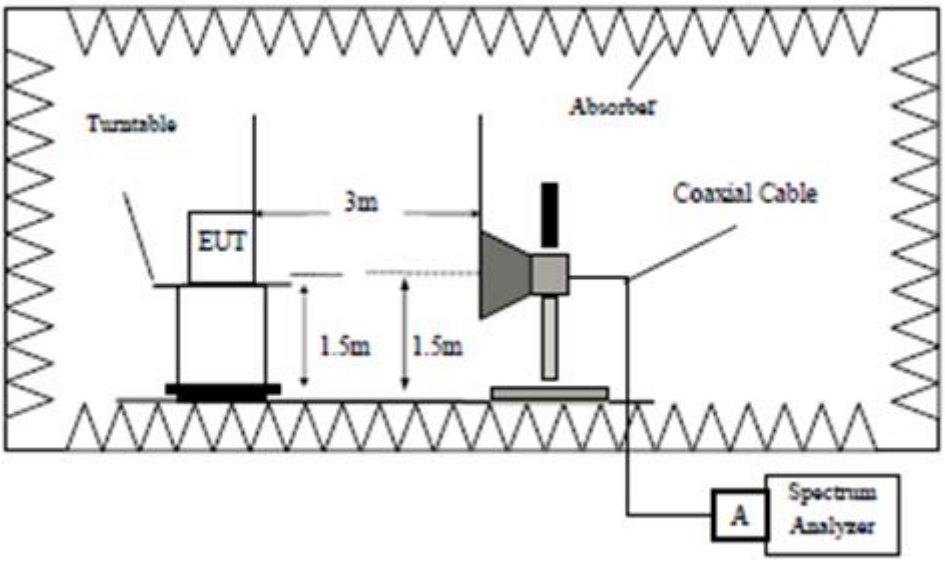
Condition Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

TESTS RESULT			
No.	**Description**	**Result**	**Notes**
1	RF output power	PASS	Radiated test
2	Transmitter unwanted emissions in the spurious domain	PASS	Radiated test

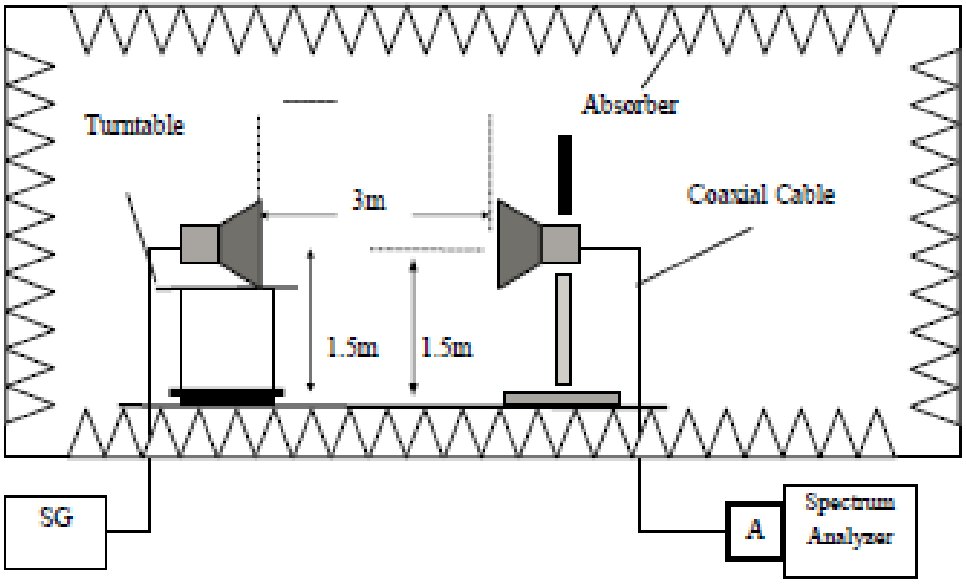
Legend:
PASS = Result within the limits
N/A = Not Applicable
N/R = Not requested by the Client

TEST SETUP

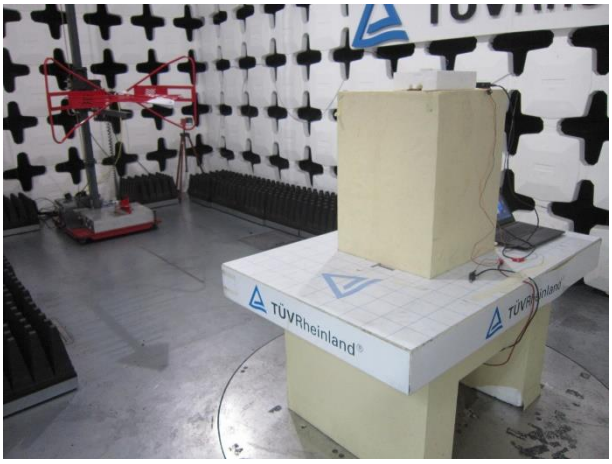
Step 1 Field Strength Measurement



Step 2 Substitution Method



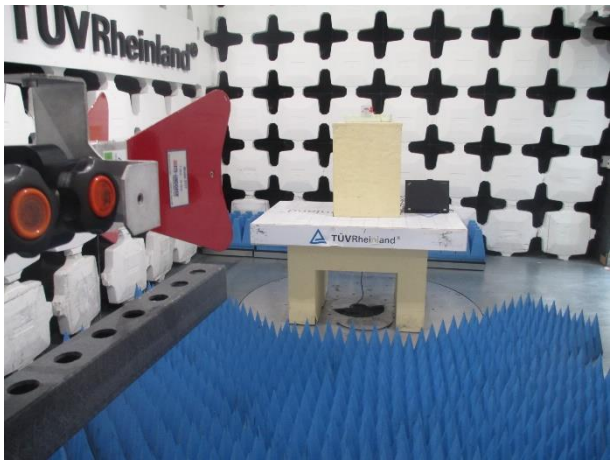
PHOTOGRAPHIC DOCUMENTATION



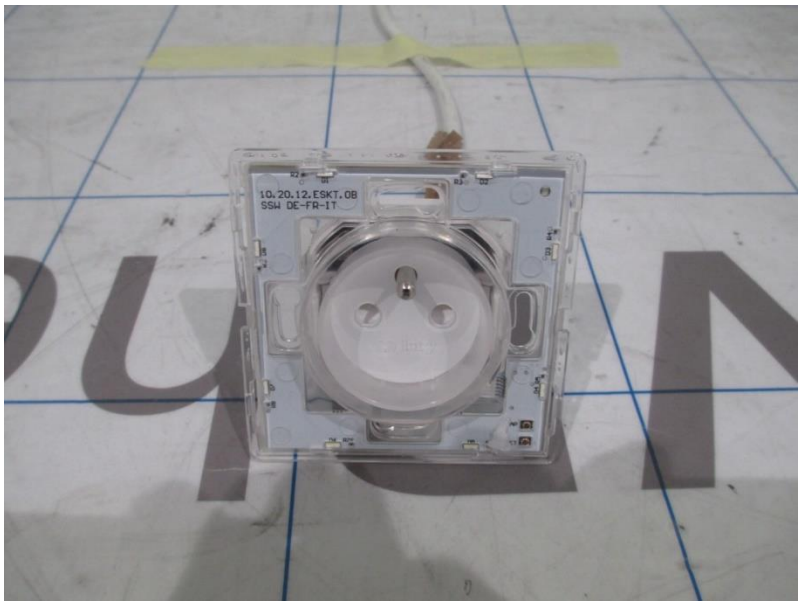
Test setup

Test setup

Test setup above 1GHz



Test setup above 1GHz



EUT view

Test N.1	**RF OUTPUT POWER**

Reference standard	ETSI EN 300 328-1 V2.2.1
List of reference equipment	➢ Semi-Anechoic Chamber ETS-Lindgren mod.FACT3 (Inv. 8020484) ➢ Antenna Horn with preamplifier ETS-Lindgren mod. 3117-PA (Inv. 87020458) ➢ Antenna Horn ETS-Lindgren mod. 3115 (Inv. 87020461) ➢ Fast Power Sensor R&S mod. NRP-Z81 (Inv. 87020796) ➢ Spectrum analyzer R&S mod. ESW44 (Inv. 87020967)
Measurement Uncertainty	Expanded uncertainty: 9kHz – 1 GHz: 2,7 dB Expanded uncertainty: (1 – 8) GHz: 3,3 dB Coverage probability: 95 % Coverage factor: 2,3

Number of samples under test	1

Test Conditions	**Temperature**	**Relative Humidity**
Normal Temperature	25 °C	20% to 75%

Test Conditions	**Parameter**	**Measured**
Test source voltages	Main Power Supply	230V ac

Test conditions ETSI EN 300 328 V.2.1.1

Apart from the RF output power, these measurements need only to be performed at normal environmental conditions. The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range. In the case of equipment intended for use with an integral antenna and where no antenna connectors are provided, a test fixture as described in clause B.4 may be used to perform relative measurements at the extremes of the operating temperature range. The equipment shall be operated under its worst case configuration (for example modulation, bandwidth, data rate. power) with regards to the requirement being tested. Measurement of multiple data sets may be required. For equipment using FHSS modulation, the measurements shall be performed during normal operation (hopping) and the equipment is assumed to have no blacklisted frequencies (operating on all hopping positions). For equipment using wide band modulations other than FHSS, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.

Test Procedure ETSI EN 300 328 V.2.1.1

The test procedure shall be as follows:

Step 1:

• Use a fast power sensor suitable for 2,4 GHz and capable of minimum 1 MS/s.
• Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples shall represent the RMS power of the signal.
- 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) is captured.

For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:

• For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
• For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500 ns.
- 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.

Step 3:

• Find the start and stop times of each burst in the stored measurement samples.

The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.

In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4:

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

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

with k being the total number of samples and n the actual sample number.

Step 5:

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

Step 6:

• Add the (stated) antenna assembly gain G in dBi of the individual antenna.
• If applicable, add the additional beamforming gain Y in dB.
• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
• The RF Output Power (P) shall be calculated using the formula below:

P = A + G + Y

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

EUT Operating Mode(s)	#1
Acceptance Criteria	ETSI EN 300 328 V2.1.1

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm.
The maximum RF output power for non-adaptive Frequency Hopping equipment shall be declared by the manufacturer. See clause 5.4.1 m). The maximum RF output power for this equipment shall be equal to or less than the value declared by the manufacturer. This declared value shall be equal to or less than 20 dBm. This limit shall apply for any combination of power level and intended antenna assembly.

Test Results – Radiated measurement

Horizontal Polarization - Integral Antenna

Test conditions		Measured power (dBm)			Limits (dBm)
		Channel low 2402 MHz	Channel mid 2440 MHz	Channel high 2480 MHz	
Tnom +25°C	Vnom	+2,02	+3,39	+2,47	+20

Vertical Polarization - Integral Antenna

Test conditions		Measured power (dBm)			Limits (dBm)
		Channel low 2402 MHz	Channel mid 2440 MHz	Channel high 2480 MHz	
Tnom +25°C	Vnom	+1,96	+4,23	+6,71	+20

Test N.2	**UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN**

Reference Standard	ETSI EN 300 328 V2.1.1
List of reference equipment	➢ Spectrum analyzer R&S mod. ESW44 (Inv. 87020967) ➢ Semianechoic Chamber ETS-Lindgren mod.FACT3 (Inv. 8020484) ➢ Antenna Horn with preamplifier ETS-Lindgren mod. 3117-PA (Inv. 87020458) ➢ Biconilog Antenna ETS Lindgren mod. 3142 (Inv. 87020457) ➢ Highpass Filter Wainwright instruments mod.whkx 10-2520 (Inv.87020799)
Measurement Uncertainty	Expanded uncertainty: 9kHz – 1 GHz: 2,7 dB Expanded uncertainty: (1 – 8) GHz: 3,3 dB Coverage probability: 95 % Coverage factor: 2,3

Number of samples under test	1

Test Conditions	**Temperature**	**Relative Humidity**
Normal Temperature	25 °C	20% to 75%
Test Conditions	**Parameter**	**Measured**
Test source voltages	Main Power Supply	230V ac

Test conditions ETSI EN 300 328 V.2.1.1

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions.
The level of spurious emissions shall be measured as, either:
a) their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
b) their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no antenna connectors.
For equipment using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. When this is not possible, the measurement shall be performed during normal operation (hopping). For equipment using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These operating channels shall be recorded. The equipment shall be configured to operate under its worst case situation with respect to output power. If the equipment can operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz), then the equipment shall be configured to operate under its worst case situation with respect to spurious emissions.

Test Procedure ETSI EN 300 328 V.2.1.1

Introduction
The spectrum in the spurious domain (see figure 1 or figure 3) shall be searched for emissions that exceed the limit values given in table 4 or table 12 or that come to within 6 dB below these limits. Each occurrence shall be recorded. The measurement procedure contains 2 parts.

Pre-scan
The procedure in step 1 to step 4 below shall be used to identify potential unwanted emissions of the UUT.

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 analyser settings:
• Resolution bandwidth: 100 kHz
• Video bandwidth: 300 kHz
• Filter type: 3 dB (Gaussian)
• Detector mode: Peak
• Trace Mode: Max Hold
• Sweep Points: ≥ 19 400; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented
• Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT, on any channel For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on any of the hopping frequencies The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser may 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.

Step 3:
The emissions over the range 1 GHz to 12,75 GHz shall be identified.
Spectrum analyser settings:
• Resolution bandwidth: 1 MHz
• Video bandwidth: 3 MHz
• Filter type: 3 dB (Gaussian)
• Detector mode: Peak
• Trace Mode: Max Hold
• Sweep Points: ≥ 23 500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented
• Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT, on any channel For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on any of the hopping frequencies. The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser may 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. Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.9.2.1.3.

Step 4:
• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 and step 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identify emissions during this pre-scan need to be reduced by 10 × log10 (Ach).

Measurement of the emissions identified during the pre-scan

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.

Step 1:

The level of the emissions shall be measured using the following spectrum analyser settings:

- Measurement Mode: Time Domain Power
- Centre Frequency: Frequency of the emission identified during the pre-scan
- Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
- Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
- Frequency Span: Zero Span
- Sweep mode: Single Sweep
- Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power
- Sweep points: Sweep time [µs] / (1 µs) with a maximum of 30 000
- Trigger: Video (burst signals) or Manual (continuous signals)
- Detector: RMS

Step 2:

Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to match the start and stop times of the sweep.

Step 3:

In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 needs to be repeated for each of the active transmit chains (Ach). Sum the measured power (within the observed window) for each of the active transmit chains.

Step 4:

The value defined in step 3 shall be compared to the limits defined in table 4 or table 12.

Radiated measurement

The test site as described in annex B and applicable measurement procedures as described in annex C shall be used. The test procedure is further as described under clause 5.4.9.2.1.

EUT Operating Mode(s) #1

Acceptance Criteria ETSI EN 300 328 V.2.1.1

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 12. In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

Table 12: Transmitter limits for spurious emissions

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

Test Results – Radiated measurement

CH low
Horizontal polarization

Frequency (MHz)	Measured Value	Limit	Results
3201	-43,39 dBm	-30 dBm (1 µW)	PASS

CH low
Vertical polarization

Frequency (MHz)	Measured Value	Limit	Results
30-12750	No spurious detected above noise floor	See Table 12	PASS

Test Results – Radiated measurement

CH high
Horizontal polarization

Frequency (MHz)	Measured Value	Limit	Results
3307	-42,37 dBm	-30 dBm (1 µW)	PASS
4962	-44,01 dBm	-30 dBm (1 µW)	PASS

CH high
Vertical polarization

Frequency (MHz)	Measured Value	Limit	Results
3307	-45,83 dBm	-30 dBm (1 µW)	PASS
4962	-42,55 dBm	-30 dBm (1 µW)	PASS

END OF TEST REPORT