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TEST REQUIREMENTS FOR EQUIPMENT INTEGRATED WITH BROADBAND DIGITAL MODULATION SYSTEMS V20.2

1. Scope

Equipment that has at least one interface that uses wideband digital modulation must meet the requirements indicated in the following test protocol

2. Definiciones

Module (transmitter / transceiver): Device composed of a radio frequency transmitter / transceiver, an adaptation circuit for antenna connection and a power supply stabilization circuit, whose operation can be evaluated in autonomous mode (stand-alone) under the required conditions under this test protocol, designed primarily to be incorporated into other equipment.

Broadband Digital Modulation Systems (SMDBA): Systems that use modulation techniques that use digital codes to broaden the spectrum of the signals to be transmitted. Examples are direct sequence spread spectrum (DSSS) or mutually orthogonal multiple carrier (OFDM) techniques. Frequency hopping systems are expressly excluded from this category.

Frequency Hopping Systems (SSF): Systems that use the spectrum spreading technique in which the equipment uses a certain number of carrier frequencies within the operating band, selected in a pseudo-random way, each one for a certain period of time, referred to as residence time.

Hybrid Systems: Systems that use a combination of modulation techniques that use digital codes to expand the spectrum of the signals to be transmitted, and the technique of spreading the spectrum by frequency hopping, at the same time and on the same carrier.

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3. Allocated Bands

The allocated bands are the following:

Band	Regulatory Framework
902 – 915 MHz	Resolution SC 302/1998 Resolution SC 226/2008
915 – 928 MHz	Resolution ENACOM 4653/2019
2.400 – 2.483,5 MHz	Resolution ENACOM 4653/2019
5.150 – 5.250 MHz	Resolution ENACOM 4653/2019
5.250 – 5.350 MHz	Resolution ENACOM 4653/2019
5.470 – 5.600 MHz	Resolution ENACOM 4653/2019
5.650 – 5.725 MHz	Resolution ENACOM 4653/2019
5.725 – 5.850 MHz	Resolution ENACOM 4653/2019

Table 1 – Frequency bands

4. Document identification

In "identification of the normative body" (point 7 of the test report) it should be indicated: ***"Protocolo de ensayos para Sistemas de Modulación Digital de Banda Ancha V20.1"***.

5. General considerations

The type of approved equipment must comply with the specifications of this regulation for all operating conditions in which it is expected to be marketed. However, to simplify the measurements, the following will be taken into account:

5.1 A complete and independent test report will be presented for each operating band of the equipment.

5.2 Tests will be carried out with the EUT transmitting at the maximum operating power specified by the manufacturer for the production model.

5.3 In each test, the applicant will adjust the modulation, transmission speed and / or any other variable parameter by software, selecting the operating scheme that he considers representative for the measurement.

5.4 For equipment that has the possibility of configuring different transmission bandwidths, the specifications for the minimum and maximum configurable bandwidths will be checked.

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5.5 The laboratory will report the adjustments in the description of the corresponding test.

5.6 In the case of equipment that has two or more transmission chains (for example, those that use Spatial Multiplexing "MIMO" Multiple Input - Multiple Output, Systems of Intelligent Antennas SAS - Smart Antenna System, etc.), that transmit in the form simultaneously, radiating the same sector with the same frequency, the following considerations will be taken into account -for Power and Power Density tests:

- The total Power and / or Power Density value over which compliance with the limits set forth in this document will be verified, will be the result of the linear sum of the maximum values measured at the output of each transmitter.

- If the EUT has two or more transmission chains whose technical specifications are the same, the laboratory can perform the measurement on one of the outputs (measured value). The level to be compared against the established limits will then be obtained by multiplying the measured value (in Watts) by the number of transmission chains.

5.7 Emissions will be allowed in two or more non-contiguous spectrum segments (eg 80 + 80 MHz mode of IEEE 802.11ac); and emissions that cross the boundary between two adjacent allocated bands (IEEE 802.11ac channel 144, to name one case). In these situations, the limits and conditions of each band must be met.

5.8 In all cases, and especially in homologated modules, it must be ensured that after their installation, the emissions emitted comply with the limits indicated in this test protocol.

6. Technical requirements

Equipment that integrates *Broadband Digital Modulation Systems* must meet the specifications established in the following sections.

6.1. Operation bands

Operating bands of the equipment covered by this regulation, defined by the range of frequencies that are intentionally emitted by the transmitter, must be contained within at least one of the bands indicated in Table 1.

6.2. Transmitter Average Conducted Power

The average conducted power level of the transmitter must comply with the limits indicated in Table 2.

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Band	Limit	
902 – 928 MHz	1 W	30 dBm
2.400 – 2.483,5 MHz	1 W	30 dBm
5.150 – 5.250 MHz	0,050 W	17 dBm
5.250 – 5.350 MHz	0,250 W	24 dBm
5.470 – 5.600 MHz	0,250 W	24 dBm
5.650 – 5.725 MHz	0,250 W	24 dBm
5.725 – 5.850 MHz	1 W	30 dBm

Table 2 - Transmitter Average Conducted Power Specifications

6.3. Occupied bandwidth

- ***Equipment operating in 902 - 928 MHz band***

Bandwidth of the emission spectrum measured with spectral resolution of 100 kHz between extreme points corresponding to a drop of 6 dB, with respect to the point of highest level, shall be at least 500 kHz.

- ***Equipment operating in 2.400 – 2.483,5 MHz band***

Bandwidth of the emission spectrum measured with spectral resolution of 100 kHz between extreme points corresponding to a drop of 6 dB, with respect to the point of highest level, shall be at least 500 kHz.

- ***Equipment operating in 5.150 – 5.250; 5.250 – 5.350; 5.470 – 5.600 and 5.650 – 5.725 MHz bands***

The graph of the bandwidth of the emission spectrum measured between the extreme points corresponding to a 26 dB drop will be presented, with respect to the point of highest level. The spectral resolution used shall be set to approximately 1% of the occupied bandwidth[1] (BW).

- ***Equipment operating in 5.725 – 5.850 MHz band***

Bandwidth of the emission spectrum measured with spectral resolution of 100 kHz between extreme points corresponding to a drop of 6 dB, with respect to the point of highest level, shall be at least 500 kHz.

[1] Occupied bandwidth: width of the frequency band such that, below its lower limit frequency and above its upper limit frequency, average powers are emitted, each equal to 0.5% of the total average power of an emission given.

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Band	Limit	Condition	Resolution Bandwidth
902 – 928 MHz	≥ 500 kHz	6 dB compared to the highest level	100 kHz
2.400 – 2.483,5 MHz	≥ 500 kHz	6 dB compared to the highest level	100 kHz
5.150 – 5.250 MHz	- - -	26 dB compared to the highest level	1 % of BW
5.250 – 5.350 MHz	- - -	26 dB compared to the highest level	1 % of BW
5.470 – 5.600 MHz	- - -	26 dB compared to the highest level	1 % of BW
5.650 – 5.725 MHz	- - -	26 dB compared to the highest level	1 % of BW
5.725 – 5.850 MHz	≥ 500 kHz	6 dB compared to the highest level	100 kHz

Table 3 - Occupied bandwidth specifications

6.4. Conducted spectral power density

Conducted spectral power density of the transmitter shall comply with the limits specified in Table 4:

Band	Limit	Resolution Bandwidth
902 – 928 MHz	8 dBm	3 kHz
2.400 – 2.483,5 MHz	8 dBm	3 kHz
5.150 – 5.250 MHz	4 dBm	1 MHz
5.250 – 5.350 MHz	11 dBm	1 MHz
5.470 – 5.600 MHz	11 dBm	1 MHz
5.650 – 5.725 MHz	11 dBm	1 MHz
5.725 – 5.850 MHz	8 dBm	3 kHz

Table 4 - Conducted spectral power density specifications

6.5. Non-desired emissions

The power of the spurious emissions must be attenuated by at least 30 dB with respect to the emission with the highest level within the operating band, both measured with a resolution bandwidth of 100 kHz. Spurious emissions will be evaluated up to at least the 2nd harmonic of the transmission channel used during the test.
For the determination of the limit of the spurious domain, the criteria indicated in Recommendation ITU-R SM.1539 shall be applied.