

Application Report

CE Compliance Test Procedure for TI's Wi-Fi Devices



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ABSTRACT

This application report covers the CE compliance test procedure for TI's Wi-Fi® devices (CC31xx and CC32xx). For CE regulations for SRDs operating in License-Free 2.4 GHz and 5 GHz frequency bands, see the [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#). This application report is used along with [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#).

Note

This application report serves as guidance on CE compliance test procedures for TI's Wi-Fi devices. For detailed requirements and test procedures, see the device-specific ETSI and local official documents.

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Trademarks

Wi-Fi® is a registered trademark of Wi-Fi Alliance.

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1 Introduction

Texas Instruments' Wi-Fi wireless portfolio [2] consists of Wi-Fi MCUs, Wi-Fi Network processors and Certified Wi-Fi modules, which support the operation in both 2.4 GHz and 5 GHz frequency bands. In most cases, they are used inside the unlicensed or license-free frequency bands. Unlicensed means only that the user of these products does not need an individual license from the telecommunication regulatory authorities for the use of the frequency band. Unlicensed does not mean unregulated; the wireless product itself usually needs to meet strict regulations and to be certified by the appropriate regulatory authorities.

International regulations and national laws regulate the use of radio equipment. Although the operation of radio equipment in the 2.4 GHz and 5 GHz bands are license-free, the final product itself has to be type approved. Note that the type approval is not required for the Chips (ICs) by itself but rather the actual application of an end product requires type approval. For CE regulations for SRDs operating in License-Free 2.4 GHz and 5 GHz frequency bands and type approval procedure, see [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1]. Also, for the appropriate ETSI and local documentation related to the product, see [1].

This application note is a summary of the CE Conformity test requirements and test procedures for Wi-Fi devices which operates in both 2.4 GHz and 5 GHz bands. The CE Conformity test requirements for Wi-Fi devices are shown in [Table 2-1](#) and the test procedure for TI's Wi-Fi devices (CC3x20, CC3x35, CC3100 and CC3200) are covered in [Section 2](#) through [Section 7](#). For a complete understanding of CE Regulations and its test procedure, see [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] along with this application report.

2 CE Conformity Test Requirements and Test Procedure for Wi-Fi Devices

The summary of CE conformity test requirements for Wi-Fi devices are shown in [Table 2-1](#). The Wi-Fi equipment must pass in all of the tests listed in [Table 2-1](#) in order to meet the RED compliance.

Table 2-1. CE Conformity Test Requirements for Wi-Fi Devices

Standard	Description of the Test	Clause(s) of the Standard	Reference in Application Report SWRA670 [1]	Applicability
EN 300 328 [3]	RF Output Power (e.i.r.p.)	4.3.2.2	5.3.2.1	Applies to 2.4 GHz band Wi-Fi devices.
	Power Spectral Density	4.3.2.3	5.3.2.2	
	Occupied Channel Bandwidth	4.3.2.7	5.3.2.6	
	Transmitter Unwanted Emissions in OOB domain	4.3.2.8	5.3.2.7	
	Transmitter Unwanted Emissions in Spurious domain	4.3.2.9	5.3.2.8	
	Adaptivity	4.3.2.6	5.3.2.5	
	Receiver Spurious Emissions	4.3.2.10	5.3.2.9	
	Receiver Blocking	4.3.2.11	5.3.2.10	

Table 2-1. CE Conformity Test Requirements for Wi-Fi Devices (continued)

Standard	Description of the Test	Clause(s) of the Standard	Reference in Application Report SWRA670 [1]	Applicability
EN 301 893 [4]	Carrier Frequencies	4.2.1	6.2.1	Applies to 5 GHz band Wi-Fi devices only.
	Channel Bandwidth	4.2.2	6.2.2	
	RF Output Power and TPC	4.2.3	6.2.3	
	Power Density	4.2.3	6.2.3	
	Transmitter Unwanted Emissions - Outside the 5 GHz RLAN Band	4.2.4	6.2.4	
	Transmitter Unwanted Emissions - Within the 5 GHz RLAN Band	4.2.4	6.2.5	
	Receiver Spurious Emissions	4.2.5	6.2.6	
	Dynamic Frequency Selection (DFS)	4.2.6	6.2.7	
	Adaptivity	4.2.7	6.2.8.2 6.2.8.3	
	Receiver Blocking	4.2.8	6.2.9	
User Access Restrictions	4.2.9	6.2.10		
EN 301 489-1 [5]	Radiated Emission	8.2	7.7.1	Applies to both 2.4 GHz and 5 GHz band Wi-Fi devices. (Additional tests may be required based on type of equipment. For more information, see the <i>ETSI/EN 301 489</i> section in [1])
EN 301 489-17 [6]	Conducted Emission	8.3	7.7.2	
	RF electromagnetic field (80 MHz to 6000 MHz)	9.2	7.8.1	
	Electrostatic Discharge	9.3	7.8.2	
IEC 62368-1 [7]	General requirements	4	8.1	Applies to both 2.4 GHz and 5 GHz band Wi-Fi devices.
	Electrically-caused Injury	5	8.1	
	Electrically-caused Fire	6	8.1	
	Injury caused by Hazardous substances	7	8.1	
	Mechanically-caused injury	8	8.1	
	Thermal burn Injury	9	8.1	
	Radiation	10	8.1	
EN 62311 [8]	Human Exposure Restrictions	Annex III Annex II	9.1	Applies to both 2.4 GHz and 5 GHz band Wi-Fi devices.

2.1 Test Setup for Compliance Testing

Figure 2-1 shows the general test setup for testing Wi-Fi devices (CC3xxx). A suitable companion device is used to set up a communication link for performance testing, whenever it requires.

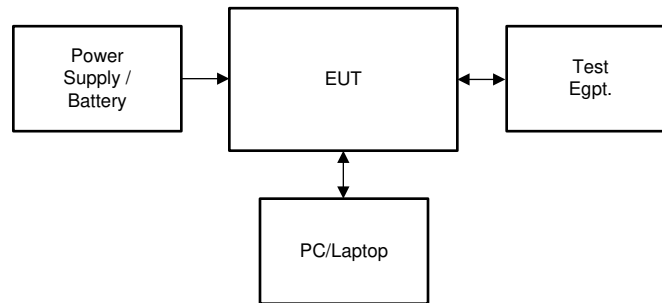


Figure 2-1. Test Setup for Compliance Testing

2.2 Test Conditions

The EUT should be tested under the following general test conditions:

- The tests should be carried out at representative points within the boundary limits of the operational environmental profile and the operating voltage declared by the manufacturer.
- Unless otherwise specified, the measurements are performed using normal operation of the equipment (see item I in Annex-E of EN 300 328 [14]).
- The equipment is operated under its worst case configuration (for example modulation, bandwidth, data rate, power) with regards to the requirement to be tested. This worst case configuration is determined and declared by the manufacturer (see item f in Annex-E of EN 300 328 [14]) and documented in the test report.
- Unless otherwise specified, either conducted or radiated measurements can be used.
- For integral antenna equipment, connectors may be provided to allow conducted measurements to be performed. In the case of integral antenna equipment that has no antenna connector(s), the manufacturer may be required to supply a test fixture, to allow relative measurements to be made.
- A suitable companion device is used to set up a communication link for performance testing, whenever it required.

2.3 Test Configurations of the EUT

The EUT is tested under its worst case configuration (for example modulation, bandwidth, data rate, power). This worst case configuration is determined by carrying out preliminary tests on EUT at different operating frequencies (low, mid and high channel frequencies) in all operating frequency bands at each modulation it operates, at highest Tx power level and at highest data rate.

The worst case configurations for Wi-Fi devices are shown in [Table 2-2](#). [Table 2-2](#) just serves as an example. You are advised to test your equipment to determine the worst case configurations on your equipment.

Table 2-2. Worst Case Test Configurations/Modes for Wi-Fi Devices

Wi-Fi Standard	Modulation	Data Rate	Tx Power Setting	Test Channels / Frequencies	
				Tx Mode	Rx Mode
802.11b	DSSS	1 MBPS	0 (Max Pwr)	CH01 (2412 MHz) CH13 (2472 MHz)	-
802.11g	OFDM	6 MBPS	0 (Max Pwr)	CH01 (2412 MHz) CH13 (2472 MHz)	-
802.11n HT20	OFDM	MCS0	0 (Max Pwr)	CH01 (2412 MHz) CH13 (2472 MHz)	CH01 (2412 MHz) CH13 (2472 MHz)
802.11a	OFDM	6 MBPS	0 (Max Pwr)	CH36 (5180 MHz) CH100 (5500 MHz)	CH36 (5180 MHz) -

2.4 Configuring and Testing the EUT (Wi-Fi Device – CC3xxx)

The EUT (Wi-Fi Devices – CC3x20 and CC3x3x type devices) can be configured to the desired mode by using a [CC3XXX Radio Testing Tool \[9\]](#) from TI. The Radio Testing Tool [9] is a Windows-based software tool for RF validation and testing of SimpleLink Wi-Fi CC3x20 and CC3x35 based designs during development and certification. The tool enables low-level radio testing capabilities by manually setting the radio into transmit or receive modes. Using the tool requires familiarity and knowledge of radio circuit theory and radio test methods. For more information on how to use Radio tool to configure the TI's Wi-Fi chip to the desired mode on both TI and Non-TI EVMs/Custom equipment that uses TI's Wi-Fi Chips, see the [SimpleLink™ Wi-Fi® CC3x20, CC3x3x Radio Tool User Guide \[10\]](#) on. The [CC3XXX Radio Testing Tool \[9\]](#) can be downloaded for free of charge from the TI website [11].

Note that different Radio Testing Tool [12] is required for configuring and testing CC3100 and CC3200 devices. This tool also can be downloaded from TI website [11].

The typical test configurations for CC3235 in different modes by using Radio Testing Tool [9] is shown in Figure 2-2 through Figure 2-5.

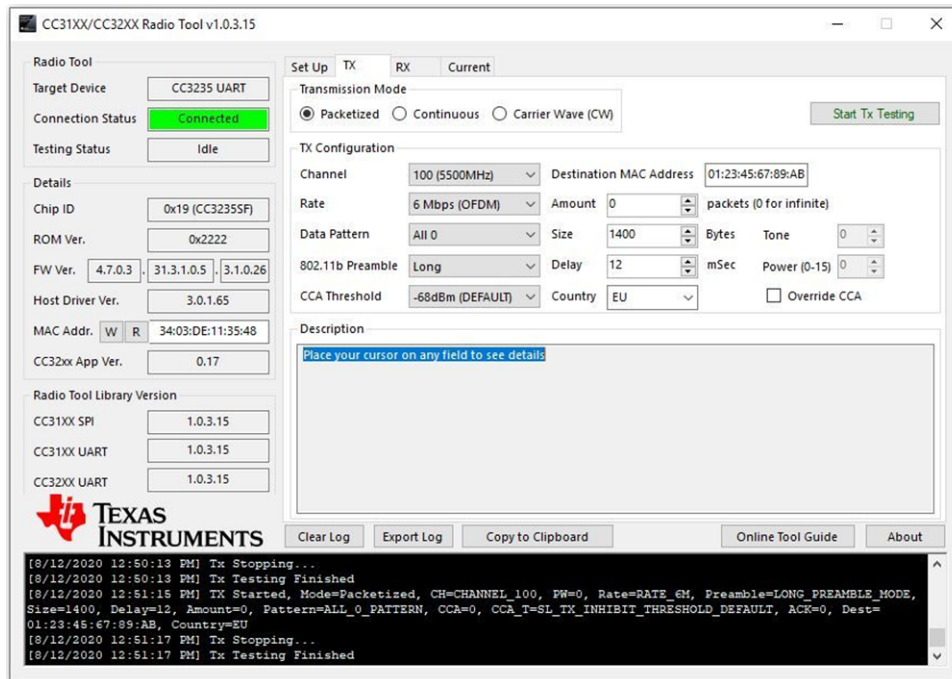


Figure 2-2. CC3235 – Configuration for 802.11a Mode

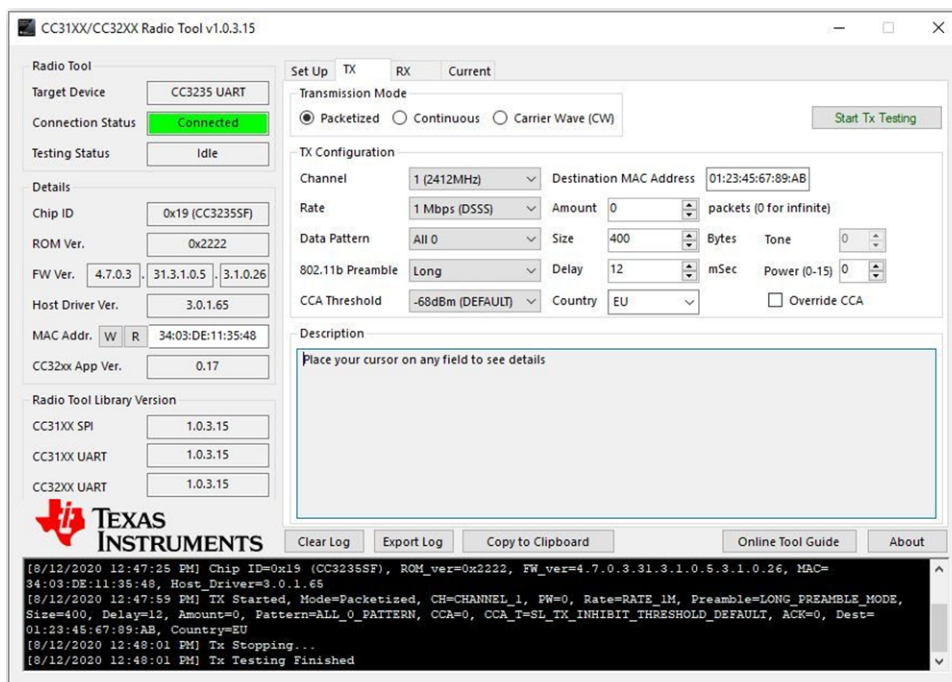


Figure 2-3. CC3235 – Configuration for 802.11b Mode

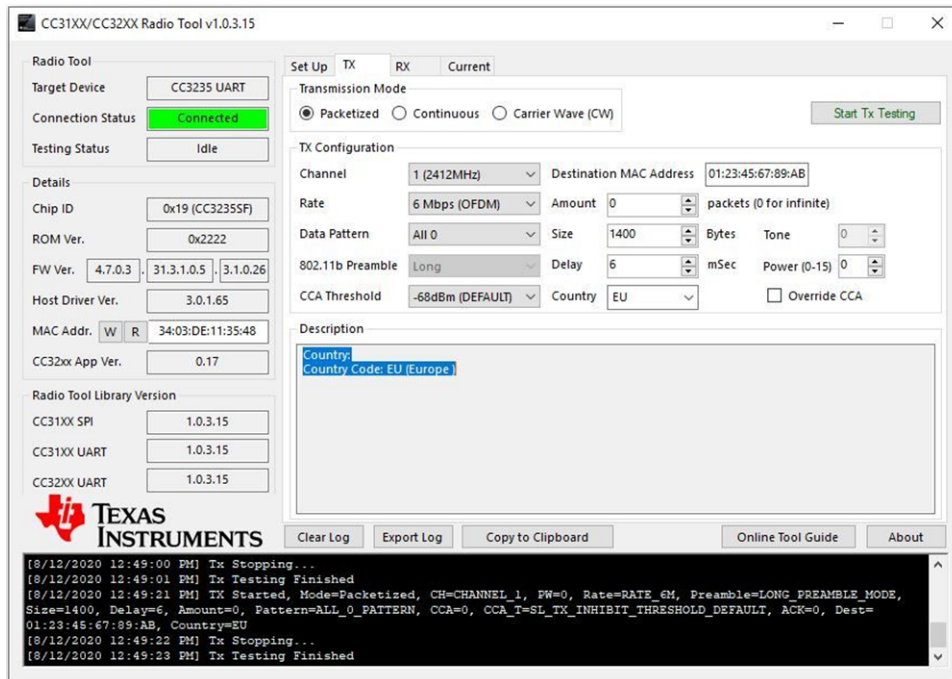


Figure 2-4. CC3235 – Configuration for 802.11g Mode

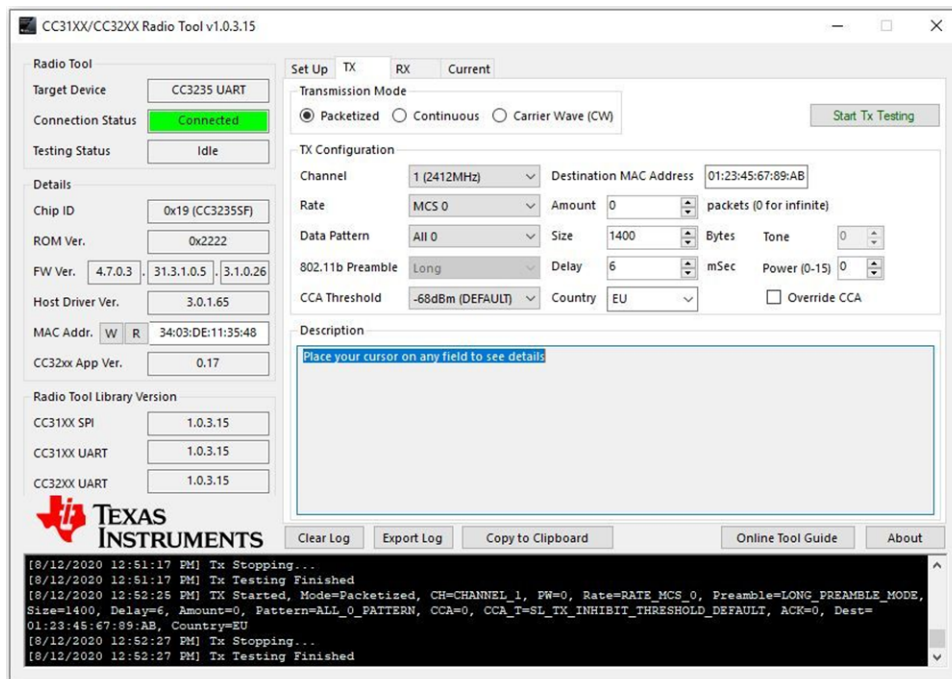


Figure 2-5. CC3235 – Configuration for 802.11n HT-20 Mode

2.4.1 Setting-Up the Country Code

The Country code on CC3x20 and CC3x3x devices can be configured to the desired Country by using a [CC3XXX Radio Testing Tool](#) [9] from TI. For more information on how to use the Radio tool to configure the TI's Wi-Fi chip to the desired mode on both TI and Non-TI EVMs/Custom equipment that uses TI's Wi-Fi Chips, see the [SimpleLink™ Wi-Fi® CC3x20, CC3x3x Radio Tool User Guide](#) [10]. The [CC3XXX Radio Testing Tool](#) [9] can be downloaded for free of charge from the TI website [11]. To see the country code setting, see [Figure 2-2](#) through [Figure 2-5](#).

Note that the Radio Testing Tool [12] cannot be used on setting the Country code on the CC3100 and CC3200 devices. The [Uniflash Tool](#) [13] is used in setting-up a Country code on the CC3100 and CC3200 devices. Uniflash tool can be downloaded from TI website [11]. Country code is under AP parameters. Choose AP and set to the desired Country code. The user must reflash the service pack after setting the Country code. The Screen shot of Uniflash tool is shown in [Figure 2-6](#).

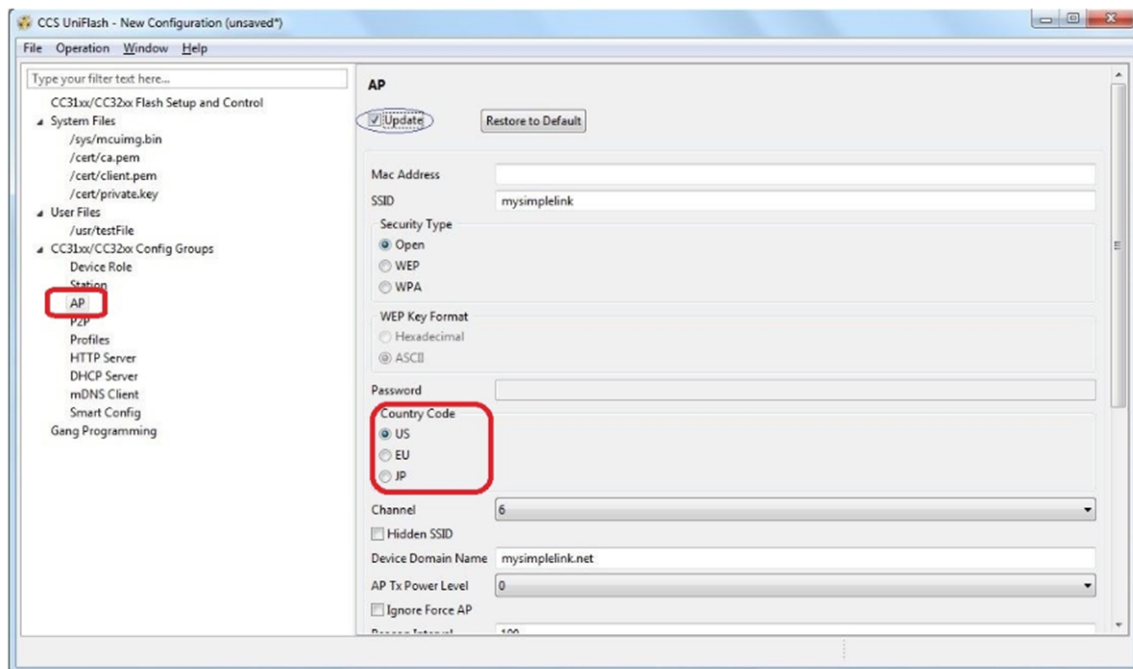


Figure 2-6. Uniflash Tool – Country Code Setup

2.4.2 Duty Cycle for Measurement of Tx Parameters

Duty cycle is to be set at 30% maximum in order measure the Tx Power and other Tx parameters accurately. Otherwise, the device may heat up and degrade the Tx power, which gives a false reading of Tx Power. Measure the Tx power at 30% duty cycle and extrapolate the result to 100% duty cycle. 30% Duty cycle can be used for all the tests related to Transmitter. Note that the 30% Duty Cycle setting is not the requirement in the regulatory spec, but for measuring Tx Power and other Tx parameters accurately.

Duty cycle is defined as $\text{Tx-OnTime} / (\text{Tx-OnTime} + \text{Tx-OffTime})$. Duty cycle can be set to the desired value by configuring the length of Preamble (No of Bytes), Packet size (No of Bytes) and Delay (Tx-OffTime) based on the data rate.

The configuration of Preamble length, Packet size and Delay at different data rates for different modes to achieve 30% Duty Cycle is shown in [Table 2-3](#) through [Table 2-5](#).

Table 2-3. Configuration of Duty Cycle at Different Rates for DSSS and CCK Modes

Rate Name	Data Rate	Preamble	Packet length	Data Ratio	Duty cycle	Packet size	Delay
1DSSS	1Mbps	196 μ s	402 μ s	51%	30%	26 Bytes	938 μ s
2DSSS	2Mbps	196 μ s	300 μ s	35%	30%	26 Bytes	700 μ s
5.5CCK	6Mbps	196 μ s	300 μ s	35%	30%	72 Bytes	700 μ s
11CCK	11Mbps	196 μ s	300 μ s	35%	30%	143 Bytes	700 μ s

Table 2-4. Configuration of Duty Cycle at Different Rates for OFDM Modes

Rate Name	Data Rate	Symbol length	Preamble	Packet length	Data Ratio	Duty cycle	Packet size	Delay
6OFDM	6 Mbps	4 μ s	24 μ s	300 μ s	92%	30%	207 Bytes	700 μ s
9OFDM	9 Mbps	4 μ s	24 μ s	300 μ s	92%	30%	311 Bytes	700 μ s
12OFDM	12 Mbps	4 μ s	24 μ s	300 μ s	92%	30%	414 Bytes	700 μ s
18OFDM	18 Mbps	4 μ s	24 μ s	300 μ s	92%	30%	621 Bytes	700 μ s
24OFDM	24 Mbps	4 μ s	24 μ s	300 μ s	92%	30%	828 Bytes	700 μ s
36OFDM	36 Mbps	4 μ s	24 μ s	300 μ s	92%	30%	1242 Bytes	700 μ s
48OFDM	48 Mbps	4 μ s	24 μ s	280 μ s	91%	30%	1536 Bytes	653 μ s
54OFDM	54 Mbps	4 μ s	24 μ s	250 μ s	90%	30%	1539 Bytes	583 μ s

Table 2-5. Configuration of Duty Cycle at Different Rates for MCS Modes

Rate Name	Data Rate	Symbol length	Preamble	Packet length	Data Ratio	Duty cycle	Packet size	Delay
MCS0_MM	7 Mbps	4 μ s	36 μ s	300 μ s	88%	30%	215 Bytes	700 μ s
MCS1_MM	13 Mbps	4 μ s	36 μ s	300 μ s	88%	30%	429 Bytes	700 μ s
MCS2_MM	20 Mbps	4 μ s	36 μ s	300 μ s	88%	30%	644 Bytes	700 μ s
MCS3_MM	26 Mbps	4 μ s	36 μ s	300 μ s	88%	30%	858 Bytes	700 μ s
MCS4_MM	39 Mbps	4 μ s	36 μ s	300 μ s	88%	30%	1287 Bytes	700 μ s
MCS5_MM	52 Mbps	4 μ s	36 μ s	250 μ s	86%	30%	1404 Bytes	583 μ s
MCS6_MM	59 Mbps	4 μ s	36 μ s	240 μ s	85%	30%	1492 Bytes	560 μ s
MCS7_MM	65 Mbps	4 μ s	36 μ s	200 μ s	82%	30%	1333 Bytes	467 μ s
MCS7_MM_SGI	72 Mbps	3.6 μ s	32.4 μ s	200 μ s	84%	30%	1528 Bytes	467 μ s

3 Test Procedure for Compliance Testing - EN 300 328

The test procedure for configuring the Wi-Fi devices (CC3x20 and CC3x3x) by using the [CC3XXX Radio Testing Tool \[9\]](#) and for compliance testing against EN 300 328 [3] standard is described in the following subsections. The same test procedure applies to the CC3100 and CC3200 devices, but needs to use the [CC3100-CC3200-Radio Testing Tool \[12\]](#) to configure and test the devices.

3.1 Product Information as per Annex-E of EN 300 328

The product information is provided by the manufacturer in order to carry out the compliance tests by the test/certification lab. The application form in Annex-E of the EN 300 328 [3] can be used to provide the product information to the certification lab for 2.4 GHz band equipment. The application form duly filled out by the manufacturer is an integral part of the test report.

For product information related to a specific Wi-Fi device from TI as per the [ETSI EN 300 328 V2.2.2 \(2019-07\) \[3\]](#), see [Product Information for CC3xxx Devices as Per Annex-E of EN 300 328 \[14\]](#).

3.2 RF Output Power - EN 300 328

The measurements for RF output power is performed at both normal environmental conditions and at the extremes of the operating temperature range declared by the manufacturer. The test results comply with the limits shown in the *Limits on RF Output Power - Non-FHSS Equipment* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) and are recorded in the test report. The test procedure for RF Output power measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Spectrum Analyzer or Power meter can be used as test equipment.
3. For a detailed test procedure, see the *Conducted measurements* clause of EN 300 328 [3].
4. Switch ON the EUT and other test equipment.
5. Setup the test equipment to the desired settings. If Spectrum Analyzer is used for this test then set the Spectrum Analyzer to Burst power measurement and set the other parameters (Center Freq, Span, Reference Level, Threshold Level, and so forth.).
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the [SimpleLink™ Wi-Fi® CC3x20, CC3x3x Radio Tool User Guide \[10\]](#).
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using Setup tab.
8. Open the Tx tab and set the transmission mode to "Packtized".
9. Configure the EUT to the desired parameters such as Channel / Frequency, Data Rate, Data Pattern, Power Level, and so forth.). For Duty Cycle configuration, set the Duty Cycle to 30% maximum for accurate measurement. For more information, see [Table 2-3](#) through [Table 2-5](#).
10. Click on " Start Tx Testing"
11. Observe the Tx signal on the test equipment, measure the tx power and record the value (A in dBm).
12. Add the antenna gain (G in dBi) and an additional beamforming gain (Y in dB, if applicable).
13. The resultant RF Output Power in e.i.r.p. equal to (A+G+Y) from the above steps. Record this value.
14. Repeat the above for other desired channels and also repeat the test at extreme temperature conditions.
15. The RF Output Power in e.i.r.p. comply with the limits shown in the *Limits on RF Output Power - Non-FHSS Equipment* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) for all the above test cases.

3.3 Power Spectral Density - EN 300 328

The measurements for Power Spectral Density is performed at normal environmental conditions only. The test results comply with the limits shown in the *Power Spectral Density* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and is recorded in the test report. The test procedure for Power Spectral Density measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedure, see clause 5.4.3.2.1 of EN 300 328 [3].
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the following settings:
 - a. Center Frequency: The center frequency of the channel under test
 - b. Reference Level: 30 dBm
 - c. RBW: 1 MHz
 - d. VBW: 3 MHz
 - e. Frequency Span: $> 2 \times \text{OCBW}$
 - f. Sweep Time: Auto
 - g. Detector: Peak
 - h. Trace Mode: Max Hold
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel / Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing".
11. Observe the Tx signal on the spectrum analyzer. When the trace is complete, find the peak power by using peak marker function. Record the frequency of the peak marker.
12. Modify the settings of the Spectrum Analyzer to the following settings:
 - a. Center Frequency: Equal to the center frequency of the marker (from the above step)
 - b. Frequency Span: 3 MHz
 - c. Reference Level: 30dBm
 - d. RBW: 1 MHz
 - e. VBW: 3 MHz
 - f. Sweep Time: 1 Minute
 - g. Detector: RMS
 - h. Trace Mode: Max Hold
13. Observe the Tx signal on the spectrum analyzer. When the trace is complete, find the peak power by using peak marker function. Record the highest power value (D in dBm / MHz).
14. Add the antenna gain (G in dBi) and an additional beamforming gain (Y in dB, if applicable).
15. The resultant Power Spectral Density (PSD) in e.i.r.p. equal to (D+G+Y) from the above steps. Record this value.
16. Repeat the above for other data rates / modulations and also other desired channels.
17. The Power Spectral Density (PSD) in e.i.r.p. complies with the limits shown in the *Power Spectral Density* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the above test cases.

3.4 Occupied Channel Bandwidth (OCBW) - EN 300 328

The measurements for Occupied Channel Bandwidth is performed at normal environmental conditions only. The test results comply with the limits shown in the *Limits on Occupied Channel Bandwidth - Non-FHSS Equipment* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) and are recorded in the test report. The test procedure for Occupied Channel Bandwidth measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Spectrum Analyzer as test equipment.
3. For a detailed test procedure, see clause 5.4.7.2.1 of EN 300 328 [3].
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the following settings:
 - a. Center Frequency: The center frequency of the channel under test
 - b. Reference Level: 30dBm
 - c. Frequency Span: > 2*Nominal Channel Bandwidth
 - d. RBW: ~ 1% of the Frequency Span
 - e. VBW: 3 * RBW
 - f. Sweep Time: 1 Sec
 - g. Detector: RMS
 - h. Trace Mode: Max Hold
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing"
11. Observe the Tx signal on the spectrum analyzer. When the trace is complete, find the peak power by using peak marker function.
12. Measure OCBW by using the 99% bandwidth function of the spectrum analyzer and record it.
13. Repeat the above for other data rates/modulations and also other desired channels.
14. The Occupied Channel Bandwidth (OCBW) complies with the limits shown in the *Limits on Occupied Channel Bandwidth - Non-FHSS Equipment* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) for all the above test cases.

3.5 Transmitter Unwanted Emissions in the OOB Domain - EN 300 328

The measurements for the Transmitter unwanted emission in the out-of-band are performed at normal environmental conditions only. The measurement is performed at the lowest and the highest channel on which the equipment can operate. The test results comply with the limits shown in the *Limits on Transmitter Unwanted Emissions in Out-of-Band (OOB) Domain - Non-FHSS* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Transmitter unwanted emission in out-of-band measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedure, see clause 5.4.8.2.1 of EN 300 328 [3].
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the following settings:
 - a. Measurement Mode: Time Domain
 - b. Center Frequency: 2484 MHz
 - c. Frequency Span: Zero Span
 - d. Reference Level: 30dBm
 - e. RBW: 1 MHz
 - f. VBW: 3 MHz
 - g. Filter Mode: Channel Filter
 - h. Detector: RMS
 - i. Sweep Mode: Single Sweep
 - j. Sweep Points: Sweep Time [μs] / (1 μs) with a maximum of 30000
 - k. Trigger Mode: Video
 - l. Sweep Time: >120% of the duration of the longest burst
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing".
11. Measure the unwanted emission levels as per the procedure described in the clause 5.4.8.2.1 of EN 300 328 [3].
12. Repeat the above for other data rates/modulations and also other desired channels.
13. The Unwanted Emission levels in the OOB domain comply with the limits shown in the *Limits on Transmitter Unwanted Emissions in Out-of-Band (OOB) Domain - Non-FHSS* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

3.6 Transmitter Unwanted Emissions in the Spurious Domain - EN 300 328

The measurements for the Transmitter unwanted emission in the spurious domain are performed at normal environmental conditions only. The level of spurious emissions are measured as, either:

- 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
- Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no antenna connectors.

The measurement is performed at the lowest and the highest channel on which the equipment can operate. The test results comply with the limits shown in the *Limits on Transmitter Unwanted Emissions in Spurious Domain - Non-FHSS* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The measurements for this test are radiated and are carried out in an anechoic chamber. The test procedure for radiated measurements of Transmitter unwanted emission in the spurious domain is described in the following steps:

1. For test setup, see Annex-B of EN 300 328 [3].
2. Use Spectrum Analyzer as measuring equipment.
3. Switch ON the EUT and other test equipment.
4. For detailed test procedure, see clause 5.4.9.2.1 of EN 300 328 [3].
5. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
6. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
7. Open the Tx tab and set the transmission mode to "Continuous".
8. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
9. Click on " Start Tx Testing".
10. Carry out the tests as per Annex-C of EN 300 328 [3] measurement procedure.
11. Repeat the above for other data rates/modulations and also other desired channels.
12. The Unwanted Emission levels in the spurious domain comply with the limits shown in the *Limits on Transmitter Unwanted Emissions in Spurious Domain - Non-FHSS* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

3.7 Adaptivity (Channel Access Mechanism) - EN 300 328

The measurements for Adaptivity are performed at normal environmental conditions only. The measurement is performed on two operating frequencies randomly selected from the operating frequencies used by the EUT. The first (lower) frequency is randomly selected within the range 2400 MHz to 2442 MHz while the second (higher) frequency is randomly selected within the range 2442 MHz to 2483.5 MHz. The equipment is in a normal operating mode. The equipment is configured in a mode that results in the longest Channel Occupancy Time. The test setup for Adaptivity is shown in Figure 3-1. The test results comply with the requirements and limits shown in the *Adaptive Non-FHSS Using DAA* and *Adaptive Non-FHSS - Short Control Signaling Transmissions* sections in *CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands* [1] and are recorded in the test report. The test procedure for Adaptivity measurements is described in the following steps:

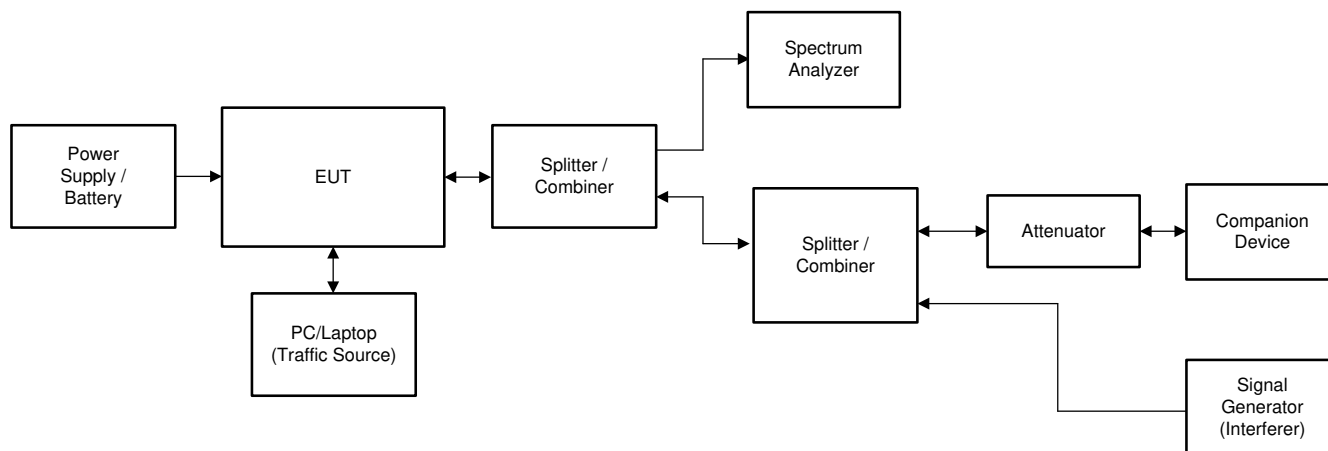


Figure 3-1. Test Setup for Adaptivity Testing – EN 300 328

1. Make the test setup as shown in Figure 3-1.
2. Switch ON the EUT and other test equipment.
3. For detailed test procedure, see clause 5.4.6.2.1.3 of EN 300 328 [3].
4. Configure AP to the desired mode and channel using AP configuration tool.
5. Use the CPERF Testing Tool from TI [16] to setup and configure the EUT. For setting and up configuring the EUT, see the CPERF Testing Tool instructions [16].
6. Carry out the tests as per clause 5.4.6.2.1.3 of EN 300 328 [3] test procedure.
7. Repeat the above for other data rates/modulations and also other desired channels.
8. The Adaptivity test results comply with the requirements and limits shown in the *Adaptivity (Non-FHSS)* section in *CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands* [1] for all the test cases.

3.8 Receiver Spurious Emissions - EN 300 328

The measurements for the Receiver Spurious Emissions are performed at normal environmental conditions only. The level of spurious emissions are measured as, either:

- 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
- Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no temporary antenna connectors.

Testing is performed when the EUT is in receive-only mode. The measurement is performed at the lowest and the highest channel on which the equipment can operate. The measurements for this test are radiated and carried out in an anechoic chamber. The test results comply with the limits shown in the *Limits on Receiver Spurious Emissions - Non-FHSS Equipment* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for radiated measurements of the Transmitter unwanted emission in the spurious domain is described in the following steps:

1. For test setup for radiated testing, see Annex-B of EN 300 328 [3].
2. Use Spectrum Analyzer as measuring equipment.
3. Switch ON the EUT and other test equipment.
4. For detailed test procedure, see clause 5.4.10.2.1 of EN 300 328 [3] .
5. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
6. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
7. Open the Rx tab and set the duration to "infinite (0)".
8. Configure the EUT to the desired parameters such as Channel / Frequency, Data Rate, Data Pattern, and so forth.).
9. Click on " Start Rx Testing".
10. Carry out the tests as per Annex-C of EN 300 328 [3] measurement procedure.
11. Repeat the above for other data rates/modulations and also other desired channels.
12. The Receiver Spurious Emission levels comply with the limits shown in the *Limits on Receiver Spurious Emissions - Non-FHSS Equipment* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

3.9 Receiver Blocking - EN 300 328

The measurements for Receiver Blocking are performed at normal environmental conditions only. For non-FHSS equipment, having more than one operating channel, the operating channels on which the testing has to be performed are selected as follows:

- For testing blocking frequencies less than 2400 MHz, the equipment operates on the lowest operating channel.
- For testing blocking frequencies greater than 2500 MHz, the equipment operates on the highest operating channel.

Figure 3-2 shows the test setup for Receiver Blocking. The test results comply with the Receiver Category-1 limits shown in the *Limits on Receiver Blocking (All Categories) - Non-FHSS Equipment* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Receiver Blocking measurements is described in the following steps:

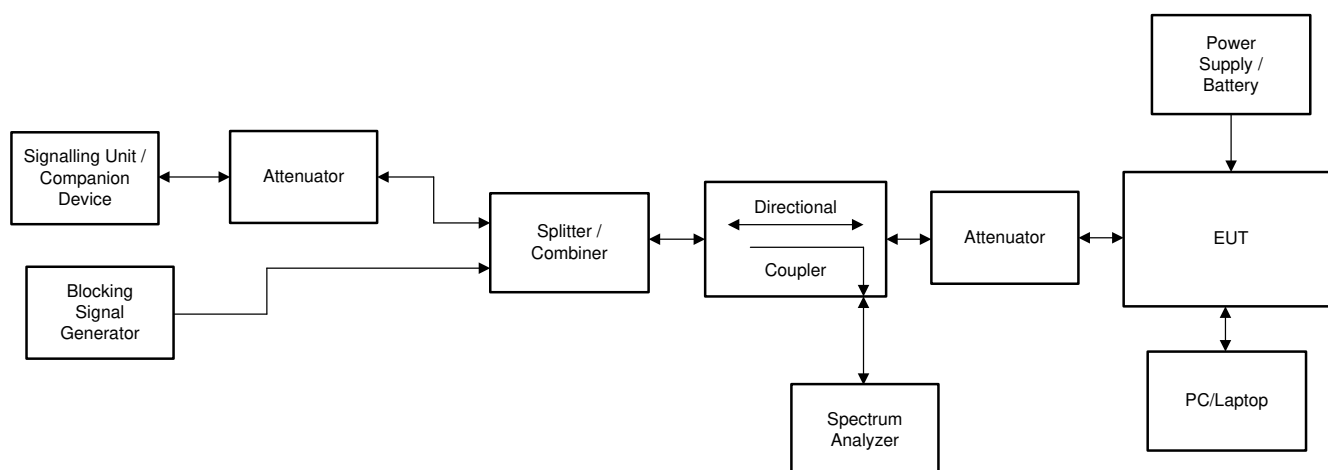


Figure 3-2. Test Setup for Receiver Blocking – EN 300 328

1. Make the test setup as shown in Test Setup for Receiver Blocking – EN 300 328.
2. Switch ON the EUT and other test equipment.
3. For test procedures, see clause 5.4.11.2.1 of EN 300 328 [3].
4. Turn-Off the RF on the Blocking Signal Generator.
5. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
6. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
7. Open the Rx tab and select the desired parameters such as Channel / Frequency, Data Rate, Data Pattern, and so forth.).
8. Click on "Start Rx Testing".
9. Open the Radio Testing Tool [9] and setup the link with the Companion device by using Setup tab or use AP configuration tool to configure AP to the desired parameters (if AP is used as companion device).
10. Open the Tx tab, select the transmission mode to "packetized".
11. Configure the Companion Device to the same parameters such as Channel/Frequency, Data Rate, Data Pattern, Power, and so forth) used for EUT.
12. Click on "Start Tx Testing".
13. Adjust the Attenuator setting and or Tx power of the Companion device to obtain a desired signal level (-68 dBm) at the EUT port.
14. Observe the Rx statistics on the Rx tab of the EUT. Make sure that the PER/FER is at 0% (no errors before adding the interferer).

15. Turn ON the RF signal on the Blocking Signal Generator, set the mode to CW, set the Frequency as per the *Limits on Receiver Blocking (All Categories) - Non-FHSS Equipment* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and adjust the level to ≥ -34 dBm at the EUT port.
16. Observe the Rx statistics on the Rx of the EUT. Measure the PER/FER and record it.
17. If the PER/FER is $\leq 10\%$, then it passed the test at that blocking frequency.
18. Repeat the above steps for other Blocking frequencies as per the *Limits on Receiver Blocking (All Categories) - Non-FHSS Equipment* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] .
19. The Receiver Blocking test results comply with the Receiver Category-1 limits shown in the *Limits on Receiver Blocking (All Categories) - Non-FHSS Equipment* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

4 Test Procedure for Compliance Testing for Wi-Fi Devices - EN 301 893

The test procedure for configuring the 5 GHz band Wi-Fi devices (CC3x35) by using the Radio Testing Tool [9] and for compliance testing against EN 301 893 [4] standard is described in the following sub sections.

4.1 Product Information as per Annex-G of EN 301 893

The product information is provided by the manufacturer in order to carry out the compliance tests by the test/certification lab. The application form in Annex-G of the EN 301 893 [4] can be used to provide the product information to the certification lab for 5 GHz band equipment. The application forms duly filled by the manufacturer are an integral part of the test report.

For product information related to a specific Wi-Fi device from TI as per Annex-G of the EN 301 893, see [4] and [15].

4.2 Test Channels - EN 301 893

Unless otherwise stated in the test procedure for individual tests in the following sub-sections, the channels are used for testing is shown in [Table 4-1](#).

Table 4-1. Test Channels – EN 301 893 [4]

Test	Clause of EN301 893 ()	Test Channels		
		Lower Sub-Band (5150 MHz to 5350 MHz)		Higher Sub-Band 5470 MHz to 5725 MHz
		5150 MHz to 5250 MHz	5250 MHz to 5350 MHz	
Centre frequencies	5.4.2	C7 (see note 1)		C8 (see note 1)
Occupied Channel Bandwidth	5.4.3	C7		C8
Power, Power Density	5.4.4	C1	C2	C3, C4
Transmitter unwanted emissions outside the 5 GHz RLAN bands	5.4.5	C7 (see note 1)		C8 (see note 1)
Transmitter unwanted emissions within the 5 GHz RLAN bands	5.4.6	C1	C2	C3, C4
Receiver spurious emissions	5.4.7	C7 (see note 1)		C8 (see note 1)
Transmit Power Control (TPC)	5.4.4	NA (see note 2)	C2 (see note 1)	C3, C4 (see note 1)
Dynamic Frequency Selection (DFS)	5.4.8	NA (see note 2)	C5	C6 (see note 3)
Adaptivity	5.4.9	C9		
Receiver Blocking	5.4.10	C7		C8

C1, C3: The lowest declared channel for every declared Nominal Channel Bandwidth within this band. For the Power Density testing, it is sufficient to only perform this test using the lowest Nominal Channel Bandwidth.

C2, C4: The highest declared channel for every declared Nominal Channel Bandwidth within this band. For the Power Density testing, it is sufficient to only perform this test using the lowest Nominal Channel Bandwidth.

C5, C6: One channel out of the declared channels for this frequency range. If more than one Nominal Channel Bandwidth has been declared for this sub-band, testing is performed using the lowest and highest Nominal Channel Bandwidth.

C7, C8: One channel out of the declared channels for this sub-band. For Occupied Channel Bandwidth, testing is repeated for every declared Nominal Channel Bandwidth within this sub-band.

C9: One channel (in case of single-channel testing) or a group of channels (in case of multi-channel testing) out of the declared channels.

1. In case of more than one channel plan has been declared, testing of these specific requirements need only be performed using one of the declared channel plans.
2. Testing is not required for Nominal Channel Bandwidths that fall completely within the frequency range 5150 MHz to 5250 MHz.
3. Where the declared channel plan includes channels whose Nominal Channel Bandwidth falls completely or partly within the 5 600 MHz to 5 650 MHz band, the tests for the Channel Availability Check (and where implemented, for the Off-Channel CAC) are performed on one of these channels in addition to a channel within the band 5 470 MHz to 5 600 MHz or within the band 5650 MHz to 5725 MHz.

4.3 Nominal Center Frequencies - EN 301 893

The measurements for Nominal Center Frequencies are performed at both normal environmental conditions and at the extremes of the operating temperature range declared by the manufacturer. The test results comply with the limits shown in the *Limits on Center Frequency* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Nominal Center Frequencies measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Spectrum Analyzer or Frequency Counter can be used as test equipment.
3. For detailed test procedure, see clause 5.4.2.2.1.1 of EN 301 893 [4].
4. Switch ON the EUT and other test equipment.
5. Setup the test equipment to the desired settings. If the Spectrum Analyzer is used for this test, then set the Spectrum Analyzer to the following settings:
 - a. Center Frequency: The center frequency of the channel under test
 - b. Reference Level: 30 dBm
 - c. Frequency Span: 10 KHz
 - d. Other parameters: Auto
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Carrier Wave (CW)".
9. Configure the EUT to the desired Channel/Frequency, Tx power and Tone to 0 setting.
10. Click on " Start Tx Testing".
11. Observe the Tx signal on the Spectrum Analyzer, measure the Tx signal (Carrier) frequency by using Marker Peak function and record the value.
12. Repeat the above for other desired channels and also repeat the test at extreme temperature conditions.
13. The measured Nominal Center Frequencies comply with the limits shown in the *Limits on Center Frequency* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the above test cases.

4.4 Occupied Channel Bandwidth (OCBW) - EN 301 893

The measurements for Occupied Channel Bandwidth are performed at normal environmental conditions and on those channels and channel bandwidths specified in the *Limits on Nominal and Occupied Channel Bandwidth* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#). The test results comply with the limits shown in the *Limits on Nominal and Occupied Channel Bandwidth* in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) and are recorded in the test report. The test procedure for Occupied Channel Bandwidth measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedure, see clause 5.4.3.2.1 of EN 301 893 [\[4\]](#).
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the following settings:
 - a. Center Frequency: The center frequency of the channel under test
 - b. Reference Level: 30dBm
 - c. Frequency Span: > 2*Nominal Channel Bandwidth (for example, 40 MHz for a 20 MHz channel)
 - d. RBW: 100 KHz
 - e. VBW: 300 KHz
 - f. Sweep Time: > 1 Sec
 - g. Detector: RMS
 - h. Trace Mode: Max Hold
6. Use the Radio Testing Tool [\[9\]](#) to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [\[10\]](#).
7. Open the Radio Testing Tool [\[9\]](#) and setup the link with the EUT by using Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on "Start Tx Testing".
11. Observe the Tx signal on the spectrum analyzer. When the trace is complete, find the peak power by using peak marker function.
12. Measure OCBW by using the 99% bandwidth function of the spectrum analyzer and record it.
13. Repeat the above for other data rates/modulations and also other desired channels.
14. The Occupied Channel Bandwidth (OCBW) comply with the limits shown in the *Limits on Nominal and Occupied Channel Bandwidth* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) for all the above test cases.

4.5 RF Output Power - EN 301 893

The measurements for RF output power are performed at both normal environmental conditions and at the extremes of the operating temperature range declared by the manufacturer. The EUT is configured to the highest sated transmit output power level and is tested on those channels and channel bandwidths specified in the *Limits on Nominal and Occupied Channel Bandwidth* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1]. The test results comply with the limits shown in *Limits on RF Output Power and Power Density at the Highest Power Level (P_H)* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for RF Output power measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Spectrum Analyzer or Power meter can be used as test equipment.
3. fFr detailed test procedure for detailed test procedure, see clause 5.4.4.2.1 of EN 301 893 [4].
4. Switch ON the EUT and other test equipment.
5. Setup the test equipment to the desired settings. If the Spectrum Analyzer is used for this test then set the Spectrum Analyzer to Burst power measurement and set the other parameters (Center Freq, Span, Reference Level, Threshold Level, and so forth).
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth). Set the Duty Cycle to 30% maximum for accurate measurement. For the Duty Cycle configuration, see [Table 2-3](#).
10. Click on "Start Tx Testing"
11. Observe the Tx signal on the test equipment, measure the tx power and record the value (A in dBm).
12. Add the antenna gain (G in dBi) and an additional beamforming gain (Y in dB, if applicable).
13. The resultant RF Output Power in e.i.r.p. equal to (A+G+Y) from the above steps. Record this value.
14. Repeat the above for other desired channels and also repeat the test at extreme temperature conditions.
15. The RF Output Power in e.i.r.p. complies with the limits shown in the *Limits on RF Output Power and Power Density at the Highest Power Level (P_H)* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the above test cases.

4.6 Power Spectral Density - EN 301 893

The measurements for Power Spectral Density are performed at normal environmental conditions only. The EUT is configured to the highest sated transmit output power level and tested on those channels and channel bandwidths specified in the *Limits on Nominal and Occupied Channel Bandwidth* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#). The test results comply with the limits shown in the *Limits on RF Output Power and Power Density at the Highest Power Level (P_H)* in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) and are recorded in the test report. The test procedure for Power Spectral Density measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedure for detailed test procedure, see clause 5.4.4.2.1.3 of EN 301 893 [4].
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the following settings:
 - a. Center Frequency: The center frequency of the channel under test
 - b. Reference Level: 30dBm
 - c. RBW: 1 MHz
 - d. VBW: 3 MHz
 - e. Frequency Span: > 2*Nominal Bandwidth (for example, 40 MHz for a 20 MHz channel)
 - f. Sweep Time: Auto
 - g. Detector: Peak
 - h. Trace Mode: Max Hold
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing".
11. Observe the Tx signal on the spectrum analyzer. When the trace is complete, find the peak power by using peak marker function. Record the frequency of the peak marker.
12. Modify the settings of the Spectrum Analyzer to the following settings:
 - a. Center Frequency: Equal to the center frequency of the marker (from the above step)
 - b. Frequency Span: 3 MHz
 - c. Reference Level: 30dBm
 - d. RBW: 1 MHz
 - e. VBW: 3 MHz
 - f. Sweep Time: 1 Minute
 - g. Detector: RMS
 - h. Trace Mode: Max Hold
13. Observe the Tx signal on the spectrum analyzer. When the trace is complete, find the peak power by using peak marker function. Record the highest power value (D in dBm / MHz).
14. Add the antenna gain (G in dBi) and an additional beamforming gain (Y in dB, if applicable).
15. The resultant Power Spectral Density (PSD) in e.i.r.p. equal to (D+G+Y) from the above steps. Record this value.
16. Repeat the above for other data rates/modulations and also other desired channels.
17. The Power Spectral Density (PSD) in e.i.r.p. complies with the limits shown in the limits shown in the *Limits on RF Output Power and Power Density at the Highest Power Level (P_H)* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) for all the above test cases.

4.7 Tx Unwanted Emissions Outside the 5 GHz RLAN Band - EN 301 893

The measurements for Transmitter unwanted emission outside the 5 GHz RLAN bands are performed at normal environmental conditions only. The level of spurious emissions are measured as, either:

- 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
- Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no antenna connectors.

The EUT is configured to operate under its worst case situation with respect to unwanted emissions outside the 5 GHz RLAN bands and is tested on those channels and channel bandwidths specified in **table 6**. The test results comply with the limits shown in the *Limits on Transmitter Unwanted Emissions - Outside the 5 GHz RLAN Bands* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Transmitter unwanted emissions outside the 5 GHz RLAN bands measurement is described in the following steps:

1. For test setup for radiated testing, see Annex-B of of EN 301 893 [4].
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedures, see clause 5.4.5.2.1 of EN 301 893 [4].
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the settings specified in clause 5.4.5.2.1 of EN 301 893 [4].
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing".
11. Measure the unwanted emission levels as per the procedure described in the clause 5.4.5.2.1 of EN 301 893 [4].
12. Repeat the above for other data rates/modulations and also other desired channels.
13. The Unwanted Emission levels outside the 5 GHz RLAN bands domain comply with the limits shown in the *Limits on Transmitter Unwanted Emissions - Outside the 5 GHz RLAN Bands* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

4.8 Tx Unwanted Emissions Within the 5 GHz RLAN Bands - EN 301 893

The measurements for Transmitter unwanted emission within the 5 GHz RLAN bands are performed at normal environmental conditions only. The EUT is configured to operate under its worst case situation with respect to unwanted emissions within the 5 GHz RLAN bands and is tested on those channels and channel bandwidths specified in the *Limits on Nominal and Occupied Channel Bandwidth* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1]. The test results comply with the limits shown in the *Limits on Transmitter Unwanted Emissions - Within the 5 GHz RLAN Bands* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Transmitter unwanted emissions within the 5 GHz RLAN bands measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Spectrum Analyzer as measuring equipment.
3. For detailed test procedure, see clause 5.4.6.2.1.1 of EN 301 893 [4].
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the settings specified in clause 5.4.6.2 of EN 301 893 [4].
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on "Start Tx Testing".
11. Measure the unwanted emission levels as per the procedure described in the clause 5.4.6.2.1 of EN 301 893 [4].
12. Repeat the above for other data rates/modulations and also other desired channels.
13. The Unwanted Emission levels within the 5 GHz RLAN bands domain comply with the limits shown in the *Limits on Transmitter Unwanted Emissions - Within the 5 GHz RLAN Bands* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

4.9 Receiver Spurious Emissions - EN 301 893

The measurements for Receiver Spurious emissions is performed at normal environmental conditions only. The level of spurious emissions are measured as, either:

- 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
- Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no antenna connectors.

The EUT are configured to operate into a continuous receive mode and is tested on those channels and channel bandwidths specified in the *Limits on Nominal and Occupied Channel Bandwidth* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#). The measurements for this test are radiated and carried out in an anechoic chamber. The test results comply with the limits shown in the *Limits on Receiver Spurious Emissions* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) and are recorded in the test report. The test procedure for radiated measurements of Receiver spurious emissions is described in the following steps:

1. For test setup for radiated testing, see Annex-B of of EN 301 893 [4].
2. Use Spectrum Analyzer as measuring equipment.
3. Switch ON the EUT and other test equipment.
4. For detailed test procedure, see clause 5.4.7.2.1 of EN 301 893 [4].
5. Use the Radio Testing Tool [9] to setup and configure the EUT. Ffor setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
6. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
7. Open the Rx tab and set the duration to "infinite (0)".
8. Configure the EUT to the desired parameters such as Channel / Frequency, Data Rate, Data Pattern, and so forth).
9. Click on " Start Rx Testing".
10. Carry out the tests as per Annex-C of EN 301 893 [4] measurement procedure.
11. Repeat the above for other data rates/modulations and also other desired channels.
12. The Receiver Spurious Emission levels comply with the limits shown in the *Limits on Receiver Spurious Emissions* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands \[1\]](#) for all the test cases.

4.10 Receiver Blocking - EN 301 893

The measurements for Receiver Blocking are performed at normal environmental conditions only. The EUT is configured to operate in a normal operational mode and are tested on those channels and channel bandwidths specified in the *Limits on Nominal and Occupied Channel Bandwidth* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

Figure 4-1 shows the test setup for the Receiver Blocking. The test results comply with the *Limits on Receiver Blocking* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Receiver Blocking measurements is described in the following steps:

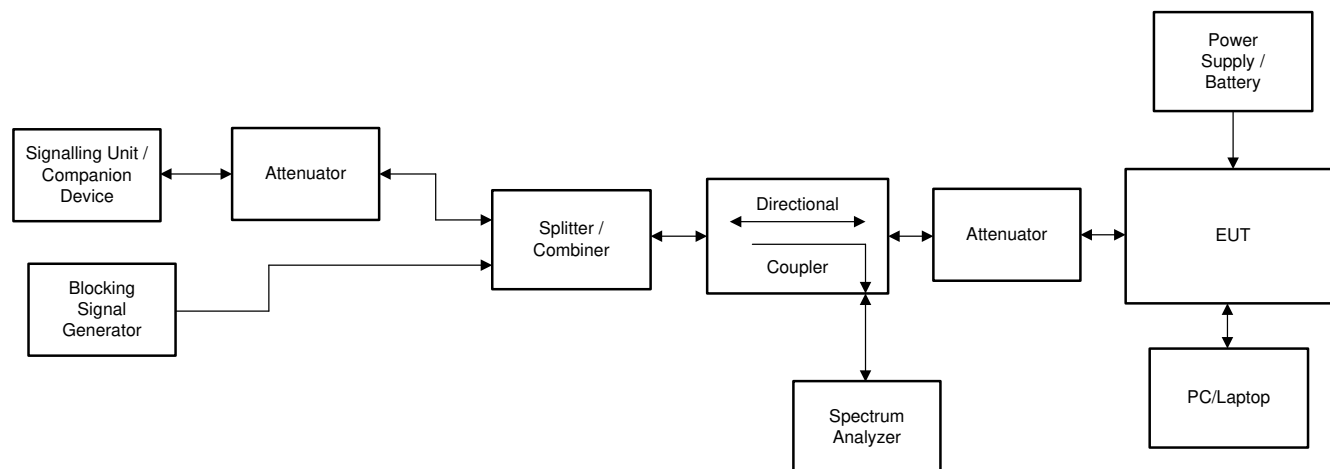


Figure 4-1. Test Setup for Receiver Blocking – EN 301 893

1. Make the test setup as shown in [Figure 4-1](#).
2. Switch ON the EUT and other test equipment.
3. For test procedure, see clause 5.4.10.2.1 of EN 301 893 [4].
4. Turn-Off the RF on the Blocking Signal Generator.
5. Use the Radio Testing Tool [9] to setup and configure the EUT and the Companion device. For setting and up and configuring the EUT, see the Radio Testing Tool User's Guide [10].
6. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
7. Open the Rx tab and select the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, and so forth).
8. Click on "Start Rx Testing".
9. Open the Radio Testing Tool [9] and setup the link with the Companion device by using the Setup tab or use the AP configuration tool to configure AP to the desired parameters (if AP is used as companion device).
- 10..Open the Tx tab, select the transmission mode to "packetized".
11. Configure the Companion Device to the same parameters such as Channel/Frequency, Data Rate, Data Pattern, Power and so forth) used for EUT.
12. Click on "Start Tx Testing".
13. Adjust the Attenuator setting and or Tx power of the Companion device to obtain a desired signal level at the EUT port.
14. Observe the Rx statistics on the Rx tab of the EUT. Make sure that the PER/FER is at 0% (no errors before adding the interferer).
15. Observe the PER on the Rx statistics on the Rx tab of the EUT and adjust the desired signal level to a minimum by using an Attenuator and or Tx power of the Companion device to get the PER <=10% (minimum performance criteria).
16. Note down the desired signal level as Pmin and increase the level of the desired signal to Pmin+6dB by using an Attenuator and or Tx power of the Companion device .

17. Turn ON the RF signal on the Blocking Signal Generator, set the mode to CW, set the Frequency as per the *Limits on Receiver Blocking* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and adjust the level to the levels mentioned under the column “Slave without Radar Detection” in the *Limits on Receiver Blocking* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].
18. Observe the Rx statistics on the Rx of the EUT. Measure the PER/FER and record it.
19. If the PER /FER is $\leq 10\%$, then it passed the test at that blocking frequency.
20. Repeat the above steps for other Blocking frequencies as per the *Limits on Receiver Blocking* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].
21. Repeat the above for other data rates/modulations and also other desired channels.
22. The Receiver Blocking test results comply with the limits shown in shown in the *Limits on Receiver Blocking* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

4.11 Adaptivity (Channel Access Mechanism) - EN 301 893

The measurements for Adaptivity is performed at normal environmental conditions only. The EUT are configured to the highest stated transmit output power level and tested on those channels and channel bandwidths specified in [Table 4-1](#). [Figure 4-2](#) shows the test setup for Adaptivity. The test results comply with the requirements and limits shown in the *Load Based Equipment (LBE)* and *Short Control Signalling Transmissions (FBE and LBE)* sections in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Adaptivity measurements is described in the following steps:

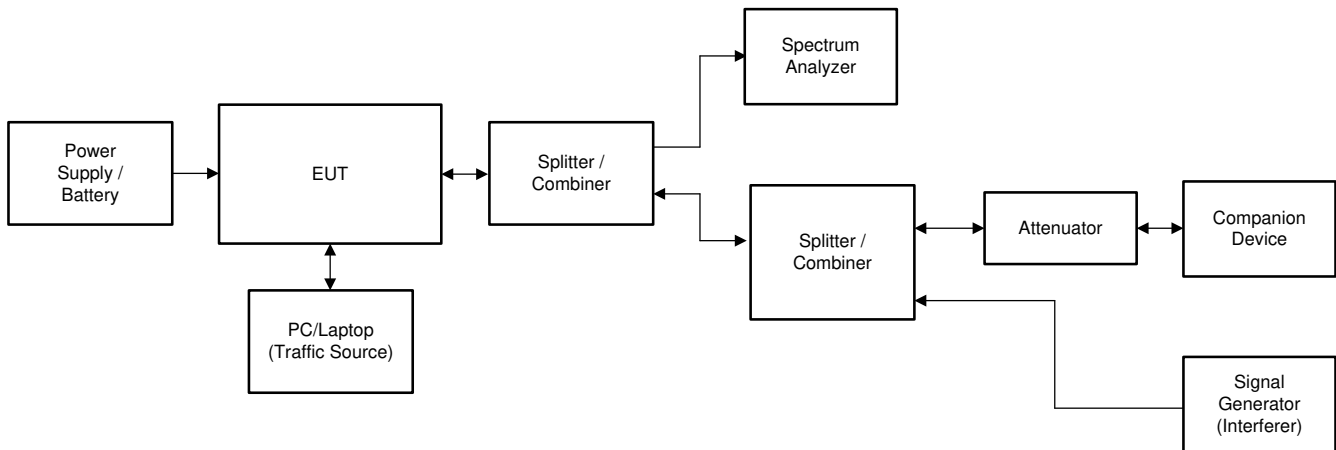


Figure 4-2. Test Setup for Adaptivity – EN 301 893

1. Make the test setup as shown in [Figure 4-2](#).
2. Switch ON the EUT and other test equipment.
3. For detailed test procedure, see clause 5.4.9.3 of EN 301 893 [4].
4. Configure AP to the desired mode and channel using AP configuration tool.
5. Use the CPERF Testing Tool from TI [16] to setup and configure the EUT. For setting and up configuring the EUT, see the CPERF Testing Tool instructions [16].
6. Carry out the tests as per clause 5.4.9.3 of EN 301 893 [4] measurement procedure.
7. Repeat the above for other data rates/modulations and also other desired channels.
8. The Adaptivity test results comply with the requirements and limits shown in the *Load Based Equipment (LBE)* and *Short Control Signalling Transmissions (FBE and LBE)* sections in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] for all the test cases.

4.12 Dynamic Frequency Selection (DFS) - EN 301 893

The measurements for Dynamic Frequency Selection (DFS) are performed at normal operating conditions only. The EUT is configured to the highest rated transmit output power level and is tested on those channels and channel bandwidths specified in table 6. Figure 4-3 shows the test setup for DFS. The test results comply with the requirements and limits shown in the *DFS Requirements and their Applicability and Limits on DFS Requirements* tables in *CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands* [1] and are recorded in the test report. The test procedure for DFS measurements is described in the following steps:

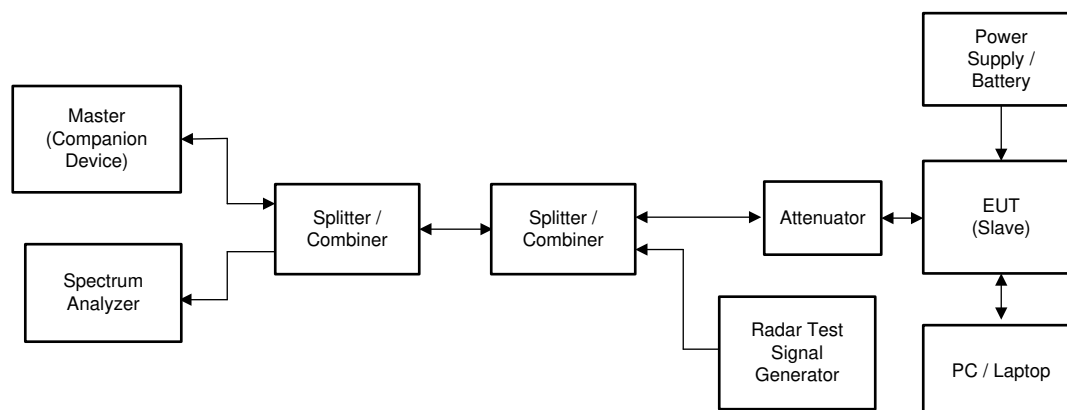


Figure 4-3. Test Setup for DFS – EN 301 893

1. Make the test setup as shown in Figure 4-3.
2. Switch ON the EUT and other test equipment.
3. For detailed test procedure, see clause 5.4.8.2 of EN 301 893 [4].
4. Use the Radio Testing Tool [9] to setup and configure the EUT and the Companion device. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
5. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
6. Open the Tx tab and select the transmission mode to “packetized”.
7. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power, and so forth).
8. Click on “Start Tx Testing”.
9. Open the Radio Testing Tool [9] and setup the link with the Companion device by using the Setup tab.
10. Open the Rx tab and configure the Companion Device to the same parameters such as Channel/Frequency, Data Rate, Data Pattern, and so forth) used for EUT
11. Click on “Start Rx Testing”.
12. Observe the Rx statistics on the Rx tab of the Companion device. Make sure that the PER/FER is at 0%. If it requires adjust the Attenuator value in the test setup.
13. Carry out the tests (Channel Shutdown) as per clause 5.4.8.2.1.6 of EN 301 893 [4] measurement procedure.
14. Repeat the above for other data rates/modulations and also other desired channels.
15. The DFS test results comply with the limits shown in the *Limits on DFS Requirements* table in *CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands* [1] for all the test cases.

4.13 User Access Restrictions - EN 301 893

User Access Restrictions are constraints implemented in the RLAN device to restrict access of the user to any hardware or software settings of the equipment, including software replacement(s), which may impact (directly or indirectly) the compliance of the equipment with the requirements mentioned in *ETSI EN 301 893* section in *CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands* [1]. The EUT complies with the requirements shown in the User Access Restrictions section in *CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands* [1].

5 Test Procedure for Compliance Testing for Wi-Fi Devices - EN 301 489

The test procedure for configuring the Wi-Fi devices (CC3x20 and CC3x35) by using the Radio Testing Tool [9] and for compliance testing against EN 301 489 [5] standard is described in the following sub sections. The same test procedure applies to CC3100 and CC3200 devices, but need to use the CC3100-CC3200 Radio Testing Tool [12] to configure and test the devices. The EMC Emission requirements for the relevant ports of radio and ancillary equipment and their applicability are shown in the *Emission Requirements* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and the immunity requirements for the relevant ports of radio and ancillary equipment and their applicability are shown in the *Immunity Requirements* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

5.1 Radiated Emissions – Enclosure Port - EN 301 489

This test is only applicable to ancillary equipment not incorporated in the radio equipment and assessed separately from its associated radio equipment. Radiated emission testing on the antenna port and/or the enclosure port is not required for radio equipment as it is covered by the appropriate standard under the Directive 2014/53/EU [17].

The EUT is configured to its intended operational mode, which produces the largest emission in the frequency band being investigated. The configuration and mode of operation used in the measurement is noted in the test report. The test method is in accordance with CENELEC EN 55032 [18] annex A.2 and the test results comply with the class B limits described in the *Radiated Emissions - Enclosure Port* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for radiated emissions measurement is described in the following steps:

1. For test setup for radiated testing, see CENELEC EN 55032 [18] annex A.2.
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedure, see CENELEC EN 55032 [18] annex A.2.
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the settings specified in CENELEC EN 55032 [18] annex A.2.
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [10] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to “Continuous”.
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on “ Start Tx Testing”.
11. If it requires use Companion device for link performance testing.
12. Measure the unwanted emission levels as per the procedure described in CENELEC EN 55032 [18] annex A.2.
13. Repeat the above for other data rates/modulations and also other desired channels.
14. The Radiated Emission levels comply with the class B limits described in the *Radiated Emissions - Enclosure Port* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

5.2 Conducted Emissions – DC Power Input/Output Port - EN 301 489

This test is intended to assess the level of internally generated electrical noise present on the DC power input/output ports. This test is performed on a representative configuration of the radio equipment. For applicability requirements see the *Conducted Emissions - DC Power Input/Output Ports* section of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

The EUT is configured to its intended operational mode, which produces the largest emission in the frequency band being investigated. The configuration and mode of operation used in the measurement is noted in the test report. The test method for AC mains power port specified CENELEC EN 55032 [18] annex A.3 is used. The test results comply with limits shown in the *Limits for Conducted Emissions - DC Power Input/Output Port* table in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for DC Power Input/Output port measurement is described in the following steps:

1. For test setup, see CENELEC EN 55032 [18] annex A.3.
2. Use Spectrum Analyzer as test equipment.
3. For detailed test procedure, see CENELEC EN 55032 [18] annex A.3.
4. Switch ON the EUT and other test equipment.
5. Set the Spectrum Analyzer to the settings specified in CENELEC EN 55032 [18] annex A.2.
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing".
11. If it requires use Companion device for link performance testing.
12. Measure the emission levels as per the procedure described in CENELEC EN 55032 [18] annex A.3.
13. Repeat the above for other data rates/modulations and also other desired channels.
14. The DC Power Input/Output port level results comply with limits shown in the for setting and up configuring the EUT table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

5.3 RF Electromagnetic Field (80 MHz to 6000 MHz) - EN 301 489

This test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic field disturbance. This test is applicable for radio equipment and associated ancillary equipment. This test is performed on a representative configuration of the radio equipment. For test requirements, see the *RF Electromagnetic Field (80 MHz to 6000 MHz) - Enclosure Port* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

The EUT is configured to its intended operational mode in the frequency band being investigated. The configuration and mode of operation used in the measurement are noted in the test report. The test method is in accordance with CENELEC EN 61000-4-3 [19], clauses 6, 7 and 8. The test results comply with the performance criteria for continuous phenomena shown in the *Performance Criteria* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and is recorded in the test report. The test procedure for RF Electromagnetic field measurement is described in the following steps:

1. For test setup, see CENELEC EN 61000-4-3 [19], clauses 6, 7 and 8.
2. For detailed test procedures, see CENELEC EN 61000-4-3 [19], clauses 6, 7 and 8.
3. Switch ON the EUT and other test equipment.
4. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
5. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
6. Open the Tx tab and set the transmission mode to "Continuous".
7. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
8. Click on " Start Tx Testing".
9. If it requires use of the Companion device for link performance testing.
10. Carry out the test as per the test method in CENELEC EN 61000-4-3 [19], clauses 6, 7 and 8.
11. Repeat the above for other data rates/modulations and also other desired channels.
12. The test results comply with the performance criteria for continuous phenomena shown in the *Performance Criteria* section in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

5.4 Electrostatic Discharge - EN 301 489

This test assesses the ability of the EUT to operate as intended in the event of electrostatic discharge. This test is applicable for radio equipment and associated ancillary equipment. This test is performed on a representative configuration of the radio equipment. For test levels and requirements, see the *ESD Levels - Enclosure* table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

The EUT is configured to its intended operational mode in the frequency band being investigated. The configuration and mode of operation used in the measurement is noted in the test report. The test method is in accordance with CENELEC EN 61000-4-2 [19], clauses 6, 7 and 8. The test results comply with the performance criteria for transient phenomena (Criteria B) shown in the *Performance Criteria* section of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1] and are recorded in the test report. The test procedure for Electrostatic discharge measurement is described in the following steps:

1. For test setup, see CENELEC EN 61000-4-2 [19], clauses 6, 7 and 8.
2. For a detailed test procedure, see CENELEC EN 61000-4-2 [19], clauses 6, 7 and 8.
3. Switch ON the EUT and other test equipment.
4. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
5. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
6. Open the Tx tab and set the transmission mode to "Continuous".
7. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
8. Click on " Start Tx Testing".
9. If it requires use Companion device for link performance testing.
10. Carry out the test as per the test method in CENELEC EN 61000-4-2 [19], clauses 6, 7 and 8.
11. Repeat the above for other data rates/modulations and also other desired channels.
12. The test results comply with the performance criteria for transient phenomena (Criteria B) shown in the *Performance Criteria* section of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1].

6 Test Procedure for Compliance Testing for Wi-Fi Devices – IEC 62368-1

The safety requirements are very elaborate. Some of the main category requirements are shown in the Safety Requirements - Main Categories table of [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1]. There are many sub-requirements under each category. For a detailed requirements and compliance criteria, see the IEC 62638-1 [20] standard. The test procedure for configuring the Wi-Fi devices (CC3x20 and CC3x35) by using the Radio Testing Tool [9] and for compliance testing against IEC 62638-1 [20] standard is described in the following sub sections. The same test procedure applies to CC3100 and CC3200 devices, but need to use the CC3100-CC3200 Radio Testing Tool [12] to configure and test the devices.

6.1 General Requirements – IEC 62368-1

This test examines EUT design and construction, markings and instructions, use of components and critical components and subassemblies, and so forth. For detailed list of general requirements and test methods, see clause 4 of IEC 62638-1 [20].

6.2 Electrically Caused Injury – IEC 62368-1

This test examines EUT's Electrical energy source classification, ES1, ES2 and ES3 limits and accessibility electrical energy sources and safeguards, and so forth. Testing the EUT is required to measure steady state voltage, current and maximum temperature on the EUT in this test. The measurements for temperature on the EUT is performed at both normal environmental conditions and at the extremes of the operating temperature range declared by the manufacturer. The EUT is configured to its intended operational mode in the frequency band being investigated. The configuration and mode of operation used in the measurement is noted in the test report. For detailed list of electrically caused injury requirements and test methods, see 5 of IEC 62638-1 [20]. The test procedure for steady state voltage, current and maximum temperature on the EUT measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Connect Ammeter in between the Power Supply and EUT.
3. Use Temperature Scope to measure the temperature on the EUT.
4. If it requires use Companion device for link performance testing.
5. Switch ON the EUT and other test equipment.
6. Set the Power supply to the desired voltage level.
7. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see Radio Testing Tool User Guide [10].
8. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
9. Open the Tx tab and set the transmission mode to "Continuous".
10. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
11. Click on " Start Tx Testing".
12. Carry out the test as per clause 5 of IEC 62638-1 [20].
13. Measure the applied voltage on the Power supply, current drawn by the EUT and the maximum temperature on the EUT.
14. Record the levels in the test report.
15. Repeat the above for other data rates/modulations and also other desired channels to determine worst case condition.
16. Repeat the tests for temperature on the EUT at the maximum operating temperature of the EUT.

6.3 Electrically Caused Fire – IEC 62368-1

This test examines EUT's power source circuit classifications, potential ignition sources, safeguards against fire under normal operating and abnormal operation conditions, safeguards against fire under single fault conditions and internal and external wiring, and so forth. Testing the EUT is required to measure input power to the EUT to determine the power classification and potential ignition sources. The EUT is configured to its intended operational mode in the frequency band being investigated. The configuration and mode of operation used in the measurement is noted in the test report. For detailed list of electrically caused fire requirements and test methods, see 6 of IEC 62638-1 [20]. The test procedure for input power to the EUT measurement is described in the following steps.

- Connect the EUT as shown in [Figure 2-1](#).
- Connect Ammeter in between the Power Supply and EUT.
- If it requires use Companion device for link performance testing.
- Switch ON the EUT and other test equipment.
- Set the Power supply to the desired voltage level.
- Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
- Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
- Open the Tx tab and set the transmission mode to "Continuous".
- Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
- Click on " Start Tx Testing".
- Carry out the test as per clause 6 of IEC 62638-1 [20].
- Measure the applied voltage on the Power supply, current drawn by the EUT.
- Calculate Power (Watts) from the above test results and record the levels in the test report.
- Repeat the above for other data rates/modulations and also other desired channels to determine worst case condition.

6.4 Injury Caused by Hazardous Substances – IEC 62368-1

This test examines whether EUT consists any hazardous substances that would cause an injury. For detailed list of mechanically caused injury requirements and test methods, see 7 of IEC 62638-1 [20].

6.5 Mechanically Caused injury – IEC 62368-1

This test examines whether EUT consists of mechanical parts that would cause an injury and also safeguards and safety interlocks to prevent the injury. For detailed list of mechanically caused injury requirements and test methods, see 8 of IEC 62638-1 [20].

6.6 Thermal Burn Injury – IEC 62368-1

This test examines EUT's thermal energy source classifications and safeguards against thermal energy sources, and so forth. Testing the EUT is required to measure the temperature on the EUT to determine the thermal energy source classification. The EUT is configured to its intended operational mode in the frequency band being investigated. The configuration and mode of operation used in the measurement is noted in the test report. For detailed list of thermal burn injury requirements and test methods, see clause 9 of IEC 62638-1 [20]. The test procedure for temperature on the EUT measurement is described in the following steps:

1. Connect the EUT as shown in [Figure 2-1](#).
2. Use Thermal scope to measure the temperature on the EUT.
3. If it requires, use Companion device for link performance testing.
4. Switch ON the EUT and other test equipment.
5. Set the Power supply to the desired voltage level.
6. Use the Radio Testing Tool [9] to setup and configure the EUT. For setting and up configuring the EUT, see the Radio Testing Tool User's Guide [10].
7. Open the Radio Testing Tool [9] and setup the link with the EUT by using the Setup tab.
8. Open the Tx tab and set the transmission mode to "Continuous".
9. Configure the EUT to the desired parameters such as Channel/Frequency, Data Rate, Data Pattern, Power Level, and so forth).
10. Click on " Start Tx Testing".
11. Carry out the test as per clause 9 of IEC 62638-1 [20].
12. Measure the temperature on the EUT with the thermal scope and record the levels.
13. Repeat the above for other data rates/modulations and also other desired channels to determine worst case condition.

6.7 Radiation – IEC 62368-1

This test examines whether EUT consists of any radiation sources such as Lasers, infrared and UV devices, X-radiation energy and acoustic devices, and so forth. It also examines the effective protection measures against radiation sources. Testing the EUT may be required to determine the radiation source classification. For a detailed list of radiation requirements test methods, see clause 10 of IEC 62638-1 [20].

7 Test Assessment for Human Exposure Restrictions – EN 62311

The purpose of this test is to assesses and evaluate the EUT against limits on exposure of people related to electric, magnetic and electromagnetic fields. The EUT meets the RF Exposure limits shown in the Reference levels for *Electric, Magnetic and Electromagnetic Fields* and *Basic Restrictions Limits for Electric, Magnetic, and Electromagnetic Fields* tables in [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#) [1]. For a detailed requirements and compliance criteria, see clause EN 62311 [8] standard. The maximum RF Output power measured in the tests 3.2 RF Output Power – EN 300 328 in the 2.4 GHz frequency band and 4.5 RF Output Power - EN 301 893 in the 5 GHz frequency band are used to calculate the Maximum Permissible Exposure (MPE) level.

MPE is calculated at 20 cm distance as per the following formula:

$$SEQ \text{ (mW/cm}^2\text{)} = (P \times AG) / (4 \times \pi \times D^2)$$

Where,

S_{EQ} = Power density

P = Power at Antenna port in mW

AG = Antenna Gain in Numeric form

D = Distance in cm (20 cms)

Use the following formula to convert of Power density S_{EQ} from mW/cm² to W/m²

$$S_{EQ} \text{ (W/m}^2\text{)} = SEQ \text{ (mW/cm}^2\text{)} \times (10000 / 1000) = S_{EQ} \text{ (mW/cm}^2\text{)} \times 10$$

8 References

1. Texas Instruments: [CE Regulations for SRDs Operating in License-Free 2.4 GHz/5 GHz Bands](#)
2. [SimpleLink Wi-Fi portfolio from TI](#)
3. [ETSI EN 300 328 V2.2.2 \(2019-07\)](#)
4. [ETSI EN 301 893 V2.1.1 \(2017-05\)](#)
5. [ETSI EN301 489-1 V2.2.1 \(2019-03\)](#)
6. [ETSI EN 301 489-17 V3.2.2 \(2019-12\)](#)
7. [IEC 62368-1](#)
8. [EN 62311](#)
9. [CC3XXX Radio Testing Tool](#)
10. Texas Instruments: [SimpleLink™ Wi-Fi® CC3x20, CC3x3x Radio Tool User Guide](#)
11. [SimpleLink Wi-Fi portfolio from TI](#)
12. [CC3100-CC3200-Radio Testing Tool](#)
13. [Uniflash Tool](#)
14. [Product Information for CC3xxx Devices as Per Annex-E of EN 300 328](#)
15. [Product Information for CC3xxx Devices as Per Annex-G of EN 301 893](#)
16. [CPERF Tool, Instructions and Python Scripts](#)
17. [RED \(Radio Equipment Directive\)](#)
18. [CENELEC EN 55032](#)
19. [CENELEC EN 61000-4](#)
20. [IEC 62368-1](#)

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