EN 301 893 V2.1.1
AS/NZS 4268:2017 A1

TEST REPORT

For

WiFi Module

MODEL NUMBER: VS19250

REPORT NUMBER: 4790425813-7

ISSUE DATE: June 1, 2022

Prepared for

ViewSonic Corporation
10 Pointe Dr., Suite 200, Brea, CA 92821, USA

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	06/01/2022	Initial Issue	

Note: This is a copy report base on 4790081439-15 which is issued by UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch on January 17, 2022. The customer wants to add a new applicant and change the model name but everything about the EUT remain unchanged, so we update the test report without any test. For other data, please refer to the original report.

Summary of Test Results			
Clause	Test Item	Limit	Results
4.2.1	Nominal Center Frequencies	within the range fc ± 20 ppm	Pass
4.2.2	Nominal Channel Bandwidth and Occupied Channel Bandwidth	at least 5 MHz 80 % and 100 % of the declared Nominal Channel Bandwidth (devices with multiple transmit chains)	Pass
4.2.3	RF output power	Please refer to EN301893 V2.1.1 Table 2 and table 3	Pass
4.2.3	Transmit Power Control (TPC)	Please refer to EN301893 V2.1.1 Table 2 and table 3	Not Support
4.2.3	Power Density	Please refer to EN301893 V2.1.1 Table 2 and table 3	Pass
4.2.4.1	Transmitter unwanted emissions outside the 5 GHz RLAN bands	Please refer to EN301893 V2.1.1 Table 4	Pass
4.2.4.2	Transmitter unwanted emissions within the 5 GHz RLAN bands	Please refer to EN301893 V2.1.1 Figure 1	Pass
4.2.5	Receiver spurious emissions	Please refer to EN301893 V2.1.1 Table 5	Pass
4.2.6	Dynamic Frequency Selection (DFS)	Please refer to EN301893 V2.1.1 Clause 4.2.6.2	Not Applicable (Note 1)
4.2.7	Adaptivity (Channel Access Mechanism)	Please refer to EN301893 V2.1.1 Clause 4.2.7	Pass
4.2.8	Receiver Blocking	Please refer to EN301893 V2.1.1 Clause 4.2.8.4	Pass
4.2.9	User Access Protocol	Please refer to EN301893 V2.1.1 Clause 4.2.9.2	Pass
4.2.10	Geo-location capability	Refer to EN 301893 V2.1.1 Clause 4.2.10.3	Not Support
Note: 1. The EUT only supply Lower sub-band (5 150 MHz to 5 250 MHz). 2.This test report is only published to and used by the applicant, and it is not for evidence purpose in China. 2. The measurement result for the sample received is <Pass> according to < EN 301 893 V2.1.1 and AS/NZS 4268:2017 A1 > when <Accuracy Method> decision rule is applied.			

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	ViewSonic Corporation
Address:	10 Pointe Dr., Suite 200, Brea, CA 92821, USA

Manufacturer Information

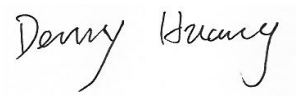
Company Name:	ViewSonic Corporation
Address:	10 Pointe Dr., Suite 200, Brea, CA 92821, USA

EUT Information

EUT Name:	WiFi Module
Model:	VS19250
Sample Received Date:	August 31, 2021
Sample Status:	Normal
Sample ID:	4175726
Date of Tested:	September 1, 2021 ~ December 22, 2021

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
ETSI EN 301 893 V2.1.1 (2017-05)	**PASS**
AS/NZS 4268:2017 A1	**PASS**

Prepared By:



Denny Huang
Project Engineer

Checked By:

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

All tests were performed in accordance with ETSI EN 301 893 V2.1.1 (2017-05) and AS/NZS 4268:2017 A1.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **ISED(Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Description	Limit	Uncertainties
Carrier Frequencies	±1.0E-05	±2.2E-10
Occupied Channel Bandwidth	-	±1.71 %
Power	±1.5 dB	±1.15 dB
Power Density	±1.5 dB	±1.21 dB
Transmitter unwanted emissions outside the 5 GHz RLAN bands		
30 MHz to 1 GHz	±3 dB	±0.80 dB
1 GHz to 26GHz	±3 dB	±2.42 dB
Transmitter unwanted emissions inside the 5 GHz RLAN bands		
5 150 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz	±3 dB	±1.69 dB
Receiver Spurious emission		
30 MHz to 1 GHz	±3 dB	±0.80 dB
1 GHz to 26GHz	±3 dB	±2.42 dB

Test Item	Uncertainty
Uncertainty for Radiation Emission test	4.62dB (30 MHz-1GHz)
	3.50dB (1 GHz-18 GHz)
	4.24dB (18 GHz-26 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	WiFi Module
Model	VS19250
Radio Technology	WLAN (IEEE 802.11a/n HT20/n HT40/ac VHT20/ac VHT 40/ac VHT 80)
Operation frequency	Lower sub-band (5 150 MHz to 5 250 MHz)
Modulation	IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT20: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT40: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT80: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Power Supply	DC 5 V
Wireless Module	MT7663BUN

5.2. MAXIMUM EIRP

Frequency Range (MHz)	Max Number of Transmit chains (NTX)	IEEE Std. 802.11	Max EIRP (dBm)
5150-5250 (Lower Sub-Band)	2	a	16.40
5150-5250 (Lower Sub-Band)	2	n HT20	18.23
5150-5250 (Lower Sub-Band)	2	n HT40	18.39
5150-5250 (Lower Sub-Band)	2	ac VHT20	18.13
5150-5250 (Lower Sub-Band)	2	ac VHT40	18.43
5150-5250 (Lower Sub-Band)	2	ac VHT80	18.90

5.3. CHANNEL LIST

Lower Sub-Band (BW 20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	48	5240	40	5200	/	/

Lower Sub-Band (BW 40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230	/	/	/	/

Lower Sub-Band (BW 80MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	5210	/	/	/	/	/	/

5.4. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter	
Test Software	QATool_Dbg

Mode	Rate	Channel	Soft set value	
			ANT1	ANT2
11a	6M	36	1F	1F
11n HT20	MCS0	36	Cover by 11ac VHT20	Cover by 11ac VHT20
11n HT40	MCS0	38	Cover by 11ac VHT40	Cover by 11ac VHT40
11ac VHT20	MCS0	36	1F	1F
11ac VHT40	MCS0	38	1F	1F
11ac VHT80	MCS0	42	1F	1F

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna No.	Frequency Band	Antenna Type	Max Antenna Gain (dBi)
1	5150 ~ 5250	PCB	4.36
2	5150 ~ 5250	PCB	3.01

IEEE Std. 802.11	Transmit and Receive Mode	Description
a	☒2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
n HT20	☒2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
n HT40	☒2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
ac VHT20	☒2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
ac VHT40	☒2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
ac VHT80	☒2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
Note: Only 802.11n HT20/HT40 and 802.11ac VHT20/VHT40/VHT80 support MIMO mode.		

Note: The value of the antenna gain was declared by customer.

5.6. WORST-CASE CONFIGURATIONS

The EUT was tested in the following configuration(s):

Controlled in test mode using a software application on the EUT supplied by customer. The application was used to enable a continuous transmission and to select the mode, test channels, bandwidth, data rates as required.

For SISO modes, there are two transmission antennas. The antenna used in any given time can be either ANTENNA 1 or ANTENNA 2. All antenna ports have the same power; output power measurement for SISO modes on both antennas are reported.

For 2TX MIMO modes, ANTENNA 1 and ANTENNA 2, used at the same time.

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0
802.11ac VHT20 mode: MCS0
802.11ac VHT40 mode: MCS0
802.11ac VHT80 mode: MCS0

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages and have the same power settings, so for these 4 modes, only 802.11ac VHT20 and 802.11ac VHT40 modes data are recorded in the report .

802.11a support SISO mode, two antennas have the same power setting, so only the worst data for antenna 1 are recorded in the report.

The measured additional path loss was included in any path loss calculations for all RF cable used during tested.

RF output power, power spectral density tests separately on each port with all supported SISO & MIMO port combinations.

Conducted unwanted emissions tests were performed with SISO mode, as this port was found to have the worst case in terms of power settings amongst all supported possible SISO & MIMO port combinations.

Radiated unwanted emissions tests were performed with the MIMO modes. These were found to be the worst modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest conducted output power level, it was deemed to be the worst case.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remarks
1	Laptop	Lenovo	XIAOXIN 5000	/

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	0.3	/

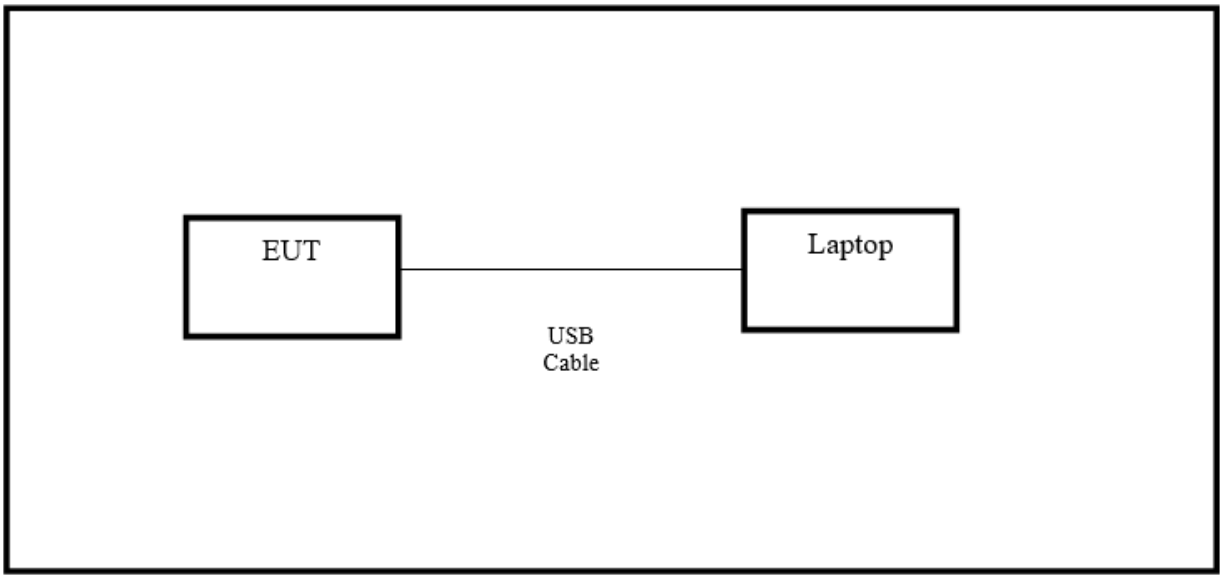
ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
1	/	/	/	/

TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



5.8. MEASURING INSTRUMENT AND SOFTWARE USED

Last time calibration information:

Tonsend RF Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Wideband Radio Communication Tester	R&S	CMW500	155523	Nov.20,2020	Nov.19,2021
PXA Signal Analyzer	Keysight	N9030A	MY55410512	Nov.20,2020	Nov.19,2021
MXG Vector Signal Generator	Keysight	N5182B	MY56200284	Nov.20,2020	Nov.19,2021
MXG Vector Signal Generator	Keysight	N5172B	MY56200301	Nov.20,2020	Nov.19,2021
Software					
Description	Manufacturer	Name		Version	
Tonsend SRD Test System	Tonsend	JS1120-3 RF Test System		2.6.77.0518	

RSE Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Spectrum Analyzer	R&S	FSV40	101117	Nov.20,2020	Nov.19,2021
Trilog broadband antenna	Schwarzbeck	VULB9163	01061	Feb.28,2020	Feb.28,2023
Horn Antenna	ETS-Lindgren	3117	00213191	Feb.28,2020	Feb.28,2023
Preamplifier	TDK	PA-02-001-3000	TRS-305-00067	Nov.12,2020	Nov.11,2021
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Nov.20,2020	Nov.19,2021
High Gain Horn Antenna	Schwarzbeck	BBHA-9170	697	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-2	TRS-307-00002	Nov.12,2020	Nov.11,2021
Preamplifier	TDK	PA-02-3	TRS-308-00002	Nov.12,2020	Nov.11,2021
Band Reject Filter	Wainwright	WRCJV12-5695-5725-5850-5880-40SS	4	Nov.12,2020	Nov.11,2021
Band Reject Filter	Wainwright	WRCJV20-5120-5150-5350-5380-60SS	2	Nov.12,2020	Nov.11,2021
Band Reject Filter	Wainwright	WRCJV20-5440-5470-5725-5755-60SS	1	Nov.12,2020	Nov.11,2021

Highpass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	4	Nov.12,2020	Nov.11,2021

Software			
Description	Manufacturer	Name	Version
For TDK RSE Test System	TDK	TDK Emission lab	V10.81

R&S TS 8997 Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Power sensor, Power Meter	R&S	OSP120	100921	Mar.23,2021	Mar.2,2022
Vector Signal Generator	R&S	SMBV100A	261637	Nov.20,2020	Nov.19,2021
Signal Generator	R&S	SMB100A	178553	Nov.20,2020	Nov.19,2021
Signal Analyzer	R&S	FSV40	101118	Nov.20,2020	Nov.19,2021

Software			
Description	Manufacturer	Name	Version
For R&S TS 8997 Test System	Rohde & Schwarz	EMC 32	10.60.10

This time calibration information:

Tonsend RF Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
PXA Signal Analyzer	Keysight	N9030A	MY55410512	Oct.30, 2021	Oct.29, 2022
MXG Vector Signal Generator	Keysight	N5182B	MY56200284	Oct.30, 2021	Oct.29, 2022
MXG Vector Signal Generator	Keysight	N5172B	MY56200301	Oct.30, 2021	Oct.29, 2022
DC power supply	Keysight	E3642A	MY55159130	Oct.30, 2021	Oct.29, 2022
Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	Nov.20,2020	Nov.19,2022
Software					
Description	Manufacturer	Name		Version	
Tonsend SRD Test System	Tonsend	JS1120-3 RF Test System		2.6.77.0518	

RSE Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Spectrum Analyzer	R&S	FSV40	101117	Oct.31, 2021	Oct.30, 2022
Trilog broadband antenna	Schwarzbeck	VULB9163	01061	Feb.28,2020	Feb.28,2023
Horn Antenna	ETS-Lindgren	3117	00213191	Feb.28,2020	Feb.28,2023
Preamplifier	TDK	PA-02-001-3000	TRS-305-00067	Oct.30, 2021	Oct.29, 2022
Preamplifier	TDK	PA-02-0118	TRS-305-00066	Jun.23,2021	Jun.23,2022
High Gain Horn Antenna	Schwarzbeck	BBHA-9170	697	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-2	TRS-307-00002	Oct.31, 2021	Oct.30, 2022
Preamplifier	TDK	PA-02-3	TRS-308-00002	Oct.31, 2021	Oct.30, 2022
Band Reject Filter	Wainwright	WRCJV12-5695-5725-5850-5880-40SS	4	Oct.31, 2021	Oct.30, 2022
Band Reject Filter	Wainwright	WRCJV20-5120-5150-5350-5380-60SS	2	Oct.31, 2021	Oct.30, 2022
Band Reject Filter	Wainwright	WRCJV20-5440-5470-5725-5755-60SS	1	Oct.31, 2021	Oct.30, 2022

Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Oct.31, 2021	Oct.30, 2022
Notch Filter	Wainwright	WRCT5-901.6-902.3-902.5-903.2-40SS	1	Oct.31, 2021	Oct.30, 2022
Band Reject Filter	Wainwright	WRCD5-1746.4-1747 25-1747.55-1748.4-40SS	1	Oct.31, 2021	Oct.30, 2022
Highpass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	4	Oct.31, 2021	Oct.30, 2022
Highpass Filter	Wainwright	WHKX10-2700-3000-1800-40SS	24	Oct.31, 2021	Oct.30, 2022

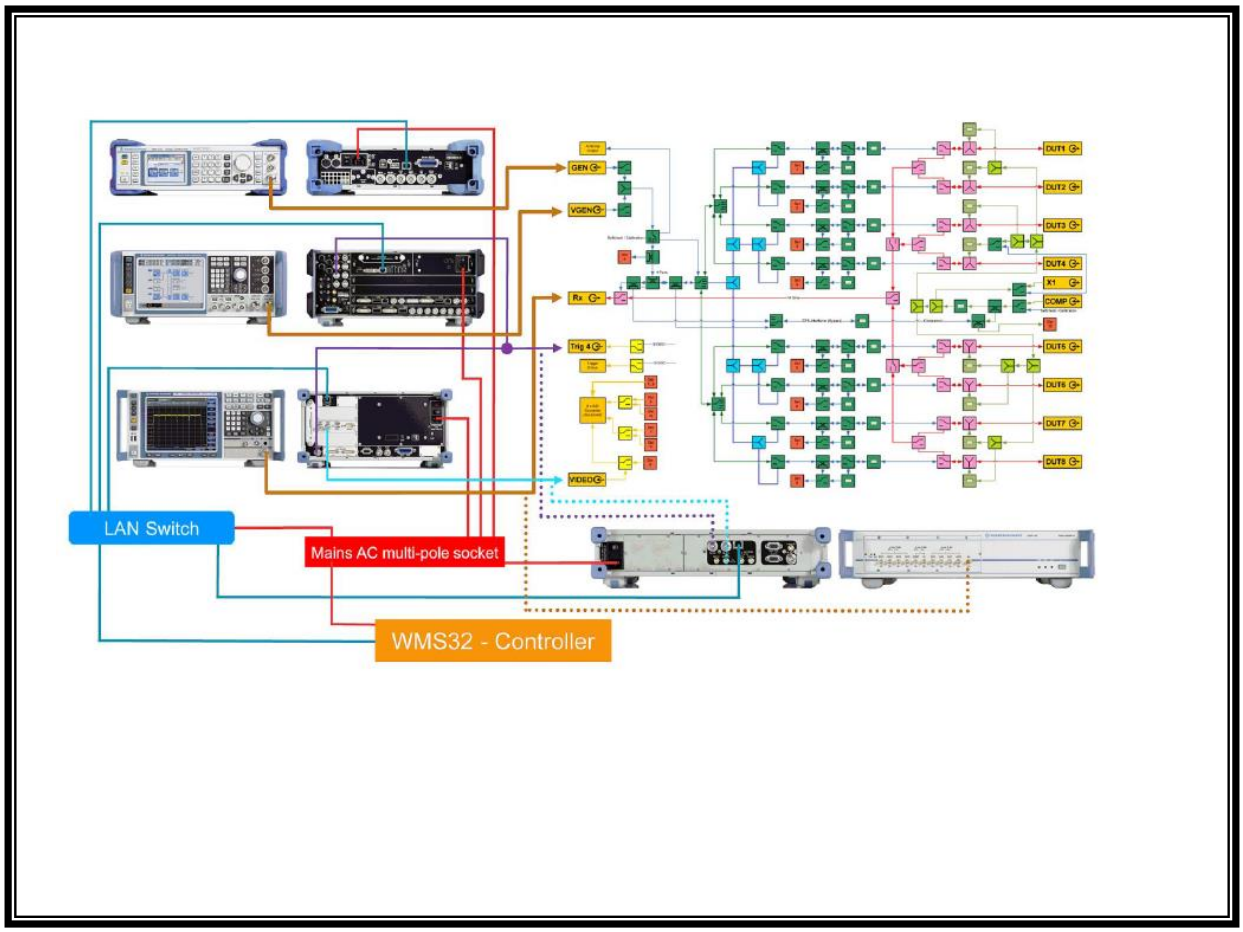
Software			
Description	Manufacturer	Name	Version
For TDK RSE Test System	TDK	TDK Emission lab	V10.81

R&S TS 8997 Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Power sensor, Power Meter	R&S	OSP120	100921	Mar.23,2021	Mar.22,2022
Vector Signal Generator	R&S	SMBV100A	261637	Oct.30, 2021	Oct.29, 2022
Signal Generator	R&S	SMB100A	178553	Oct.30, 2021	Oct.29, 2022
Signal Analyzer	R&S	FSV40	101118	Oct.30, 2021	Oct.29, 2022

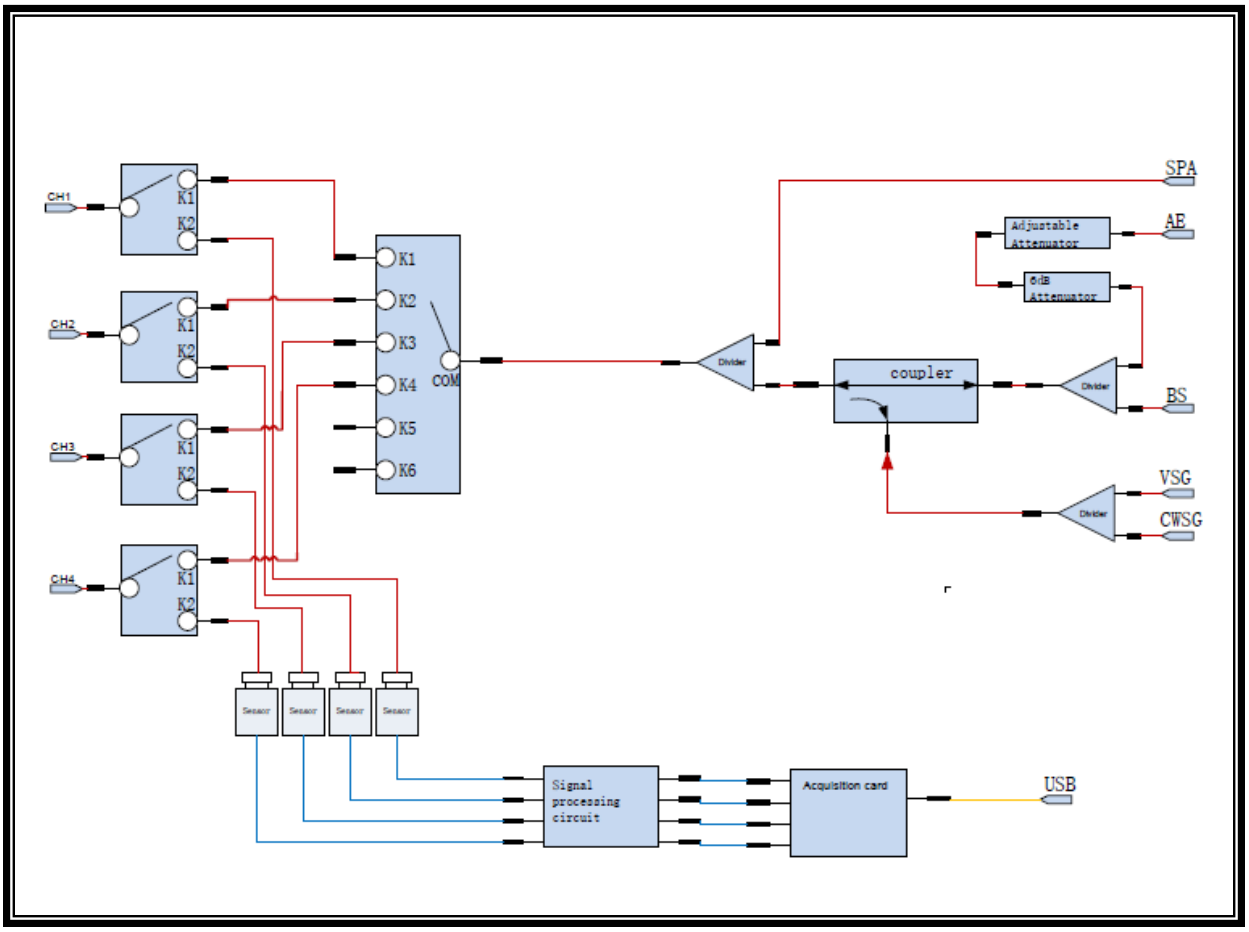
Software			
Description	Manufacturer	Name	Version
For R&S TS 8997 Test System	Rohde & Schwarz	EMC 32	10.60.10

5.9. TEST SYSTEM CONFIGURATION

R&S TS 8997 Test System



Tonsend SRD Test System



5.10. DESCRIPTION OF THE EQUIPMENT UNDER TESTED

(INFORMATION AS REQUIRED BY ETSI EN 301 893 (V2.1.1), clause 5.4.1)

a)	**The Nominal Channel Bandwidth(s)**		
	Nominal Channel Bandwidth 1	☒20MHZ	
	Nominal Channel Bandwidth 2	☒40MHZ	
	Nominal Channel Bandwidth 3	☒80MHZ	
	Nominal Channel Bandwidth 4	☐160MHz	
	The associated center frequencies		
	☒For Nominal Channel Bandwidth 1		
	For the band 5150 MHz to 5350 MHz	CH36 (5180MHz)	CH40 (5200MHz)
	For the band 5470 MHz to 5725 MHz		
	☒For Nominal Channel Bandwidth 2		
	For the band 5150 MHz to 5350 MHz	CH38 (5190MHz)	CH46 (5230MHz)
	For the band 5470 MHz to 5725 MHz		
	☒For Nominal Channel Bandwidth 3		
	For the band 5150 MHz to 5350 MHz	CH42 (5210MHz)	
	For the band 5470 MHz to 5725 MHz		
	☐For Nominal Channel Bandwidth 4		
	For the band 5150 MHz to 5350 MHz	CH50 (5250MHz)	
	For the band 5470 MHz to 5725 MHz		
b)	**If the Load Based Equipment can support multi-channel operation (see clause 4.2.7.3.2.3), the following shall be provided:**		
	Whether the LBE equipment uses Option 1 and/or Option 2 (see clause 4.2.7.3.2.3) for its multi-channel operation	☒ Option 1 ☐ Option 2	
	Whether or not these channels are adjacent or non-adjacent	☐ Yes ☒ No	
	Whether or not these channels are in different sub-bands	☐ Yes ☒ No	
	For equipment implementing option 1 (see clause 4.2.7.3.2.3), the number of channels used for multi-channel operation when performing the test described in clause 5.4.9.3.2.3.1.		
c)	**The different transmit operating modes (see clause 5.3.3.2) (tick all that apply)**		
	☒Operating mode 1: Single Antenna Equipment	☐Equipment with only one antenna	
		☒Equipment with two diversity antennas but at any moment in time only one antenna is used.	
		☐ Smart antenna system with two or more antennas, but operating in a mode where only one antenna is used.	

	☒ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beamforming	The equipment that can operate in this mode contains a smart antenna system using two or more transmit chains simultaneously but without beamforming.		
	☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beamforming	The equipment that can operate in this mode contains a smart antenna system using two or more transmit chains simultaneously with beamforming. In addition to the antenna assembly gain G, the beamforming gain Y may have to be taken into account when performing the measurements described in the present document.		
d)	**In case of Smart Antenna Systems or multiple antenna systems**			
	The number of Receive chains		2	
	The number of Transmit chains		2	
	Equal power distribution among the transmit chains		☐Yes	☒No
	In case of beamforming, the maximum (additional) beamforming gain		NA	
e)	**TPC feature available**	☐Yes	☒No	
f)	**For devices with a TPC feature, for each TPC range:**			
	TPC range 1: Applicable Frequency Range	☐5150 MHz to 5350 MHz and 5470 MHz to 5725 MHz (Indoor)	Simultaneous transmissions in both sub-bands	
			☐Yes	☐No
		☐5 470 MHz to 5 725 MHz only (Outdoor only)		
	Power levels are specified for (integrated antenna equipment)		☐Tx out	☐e.i.r.p
	The lowest power level			
	The highest power level			
g)	**For devices operating in a mode without a TPC feature:**			
	TPC range 1: Applicable Frequency Range	☒5150 MHz to 5350 MHz and 5470 MHz to 5725 MHz (Indoor)	Simultaneous transmissions in both sub-bands	
			☐Yes	☒No
		☐5 470 MHz to 5 725 MHz only (Outdoor only)		
	Power levels are specified for (integrated antenna equipment)		☐Tx out	☐e.i.r.p
	The highest power level			
h)	**The DFS related operating mode(s) of the equipment (Not Applicable)**			
	☐Master	☐ Slave with radar detection	☐ Slave without radar detection	
i)	**User access restrictions (please check box below to confirm)**			
	☒The equipment is constructed to comply with the requirements contained in clause 4.2.9 in ETSI EN 301 893 V2.1.1			

j)	**For equipment with Off-Channel CAC functionality**		
	The equipment has an "Off-Channel CAC" function	☐ Yes ☒ No	
		For channels outside the 5 600 MHz to 5 650 MHz range	hours
		If applicable, for channels (partially) within the 5 600 MHz to 5 650 MHz range	hours
k)	The equipment can operate in ad-hoc mode		
	☒ no ad-hoc operation		
	☐ ad-hoc operation in the frequency range 5 150 MHz to 5 250 MHz without DFS		
	☐ ad-hoc operation with DFS		
l)	**Operating Frequency Range(s):**		
	☐ Range 1	5 150 MHz to 5 350 MHz and 5 470 MHz to 5 725 MHz	
	☐ Range 2	5 470 MHz to 5 725 MHz	
	☒ Range 3	5 150 MHz to 5 250 MHz	
	☐ Range 4	other	
m)	**The operational environmental profile (e.g. the normal test conditions and the extreme test conditions) that applies to the equipment.**		
	☐-20 °C to +35 °C (Outdoor & Indoor usage)	☐0 °C to +35 °C (Indoor usage only)	☒Other 0 °C to +40°C
n)	**The test sequence/test software used by the UUT.**		
	The test sequence	/	
	The test software	QATool_Dbg	
o)	**Type of Equipment**		
	☒ Stand-alone		
	☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)		
	☐ Plug-in radio device (Equipment intended for a variety of host systems)		
	☐ Other		
p)	**Adaptivity (Channel Access Mechanism)**		
	☐ Frame Based Equipment		
	☒ Load Based Equipment		
q)	**With regards to Adaptivity for Frame Based Equipment:**		
	☐ The Frame Based Equipment operates as an Initiating Device		
	☐ The Frame Based Equipment operates as an Responding Device		
	☐ The Frame Based Equipment can operate as an Initiating Device and as a Responding Device		
	The Frame Based Equipment has implemented the following Fixed Frame Period(s): ms		
r)	**With regards to Adaptivity for Load Based Equipment**		
	☒ The Load Based Equipment operates as a Supervising Device		
	☐ The Load Based Equipment operates as a Supervised Device		
	☐ The Load Based Equipment can operate as a Supervising and as a Supervised Device		

	☐ The Load Based Equipment makes use of note 1 in table 7 or note 1 in table 8 of ETSI EN 301 893 V2.1.1	
	☐ The Load Based Equipment, when operating as a Supervising Device, makes use of note 2 in table 7 of ETSI EN 301 893 V2.1.1	
	The Priority Classes implemented by the Load Based Equipment	
	When operating as a Supervising Device	Priority Class 3
	When operating as a Supervised Device	NA
	☒ The Load Based Equipment operates as an Initiating Device	
	☐ The Load Based Equipment operates as a Responding Device	
	☐ The Load Based Equipment can operate as an Initiating Device and as a Responding Device	
	With regard to Energy Detection Threshold, the Load Based Equipment has implemented either option 1 of clause 4.2.7.3.2.5 of ETSI EN 301 893 V2.1.1 or option 2 of clause 4.2.7.3.2.5 of ETSI EN 301 893 V2.1.1:	
	☒Option 1	☐Option 2
	Specify which protocol has been implemented	
	☒IEEE 802.11™	☐Other:
s)	**The equipment supports a geo-location capability as defined in clause 4.2.10 of ETSI EN 301 893 V2.1.1**	
	☐YES	☒NO
t)	**The minimum performance criteria (see ETSI EN 301 893 V2.1.1, clause 4.2.8.3) that corresponds to the intended use of the equipment:**	
	A Mode 6 Mbps : PER 10%, Pmin= -92.1dBm	
u)	**The theoretical maximum radio performance of the equipment (e.g. maximum throughput) (see ETSI EN 301 893 V2.1.1, clause 5.4.9.3.1)**	

6. TEST RESULTS

6.1. NORMAL AND EXTREME CONDITIONS

LIMITS

None; for reporting purposes only.

RESULTS

	Normal Test Conditions	Extreme Test Conditions
Relative Humidity	45% ~ 55%	N/A
Atmospheric Pressure	100 kPa ~ 102 kPa	N/A
Temperature	T_{nom} (Normal Temperature): 22 °C ~ 28 °C	LT (Low Temperature): 0 °C
		HT (High Temperature): 40 °C
Supply Voltage	V_{nom} (Normal Voltage): DC 5 V	N/A
		N/A

6.2. NOMINAL CENTRE FREQUENCIES

LIMIT

CARRIER FREQUENCIES AND CHANNELIZATION	
Condition	Limit
Normal Conditions	f_c +/- 20 ppm
Extreme Conditions	f_c +/- 20 ppm

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.2.2

Measurement	
☒Conducted measurement	☐Radiated measurement

1. Equipment operating without modulation

This test method requires that the UUT can be operated in an unmodulated test mode.

The UUT shall be connected to a frequency counter and operated in an unmodulated mode.

The result shallbe recorded.

2. Equipment operating with modulation

This method is an alternative to the above method in case the UUT cannot be operated in an un-modulated mode.

The UUT shall be connected to spectrum analyser.

The settings of the spectrum analyser shall be adjusted to optimize the instruments frequency accuracy.

Max Hold shall be selected and the centre frequency adjusted to that of the UUT.

The peak value of the power envelope shall be measured and noted. The span shall be reduced and the marker moved in a positive frequency increment until the upper, (relative to the centre frequency), -10 dBc point is reached. This value shall be noted as f1.

The marker shall then be moved in a negative frequency increment until the lower, (relative to the centre frequency), -10 dBc point is reached. This value shall be noted as f2.

The centre frequency is calculated as (f1 + f2) / 2.

TEST ENVIRONMENT

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to Appendix A.

6.3. NOMINAL CHANNEL BANDWIDTH AND OCCUPIED BANDWIDTH

LIMIT

NOMINAL CHANNEL BANDWIDTH AND OCCUPIED BANDWIDTH	
Condition	Limit
Nominal Channel Bandwidth	5 MHz
Occupied Bandwidth	80 % and 100 % of the declared Nominal Channel Bandwidth
During an established communication, a device is allowed to operate temporarily in a mode where its Occupied Channel Bandwidth may be reduced to as low as 40 % of its Nominal Channel Bandwidth with a minimum of 4 MHz	

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.3.2

Measurement	
☒Conducted measurement	☐Radiated measurement

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Frequency Span	2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector	RMS
RBW	100K
VBW	300K
Trace	Max hold
Detector Mode	RMS
Sweep time	> 1 s; for larger Nominal Bandwidths, the sweep time may be increased until a value where the sweep time has no impact on the RMS value of the signal

TEST ENVIRONMENT

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to Appendix D.

6.4. RF OUTPUT POWER

LIMITS

RF output power		
Frequency Range	Limit	
	With TPC	Without TPC
5150 to 5350	23	20/23 (See note 1)
5470 to 5725	30 (See note 2)	27 (See note 2)
Note 1	The applicable limit is 20dBm, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 23dBm.	
Note 2	Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350MHz.	

RF output power at the lowest power level of the TPC range	
Frequency Range	Limit
5150 to 5350	17
5470 to 5725	24 (See note 1)
Note	Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350MHz.

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.4.2.1.1 and 5.4.4.2.1.2

Measurement	
☒Conducted measurement	☐Radiated measurement

JS0806-2 module is used for power measurement, and it supports High sampling rate greater than 1 M sample/s and measurement time of up to 32 s at 1 M sample/s. JS1120-3 software is used to control the power detector and the sampling unit.
For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.

For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment)
P_H /P_L (EIRP) = A + G + Y+ 10 × log (1 / x)

For equipment without continuous transmission capability and operating (or with the capability to operate) in only one sub-band

P_H /P_L (EIRP) = A + G + Y

For equipment without continuous transmission capability and having simultaneous transmissions in both sub-bands

1. Measuring the Total Peak Power within the lower sub-band
2. Measuring the Total Peak Power within the upper sub-band
3. Calculate the total peak power by adding the measured value for the band 5 150 MHz to 5350 MHz in step 1 to the value measured for the band 5 470 MHz to 5 725 MHz in step 2
4. Measuring Total Mean Output Power
5. Calculating the Peak to Mean Power Ratio
6. Calculating the RF Output Power (e.i.r.p.) for each sub-band

   PH /PL (EIRP) = A + G + Y

Where,

EIRP is the effective isotropic radiated power in dBm

PH is RF output power at the highest power

PL is RF output power at the lowest power level of the TPC range

A is the highest of all Pburst values as measured by the test system in dBm

G is stated assembly antenna gain of the individual antenna in dBi

Y is any additional beam-forming gain

X is duty cycle of the transmitter (Tx on / (Tx on + Tx off)) shall be noted as x ($0 < x \leq 1$)

TEST ENVIRONMENT

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to Appendix B.

6.5. POWER DENSITY AT THE HIGHEST POWER LEVEL

LIMIT

Power Density at The Highest Power Level		
Frequency Range	Limit	
	With TPC	Without TPC
5150 to 5350	10	7/10 (See note 1)
5470 to 5725	17 (See note 2)	14 (See note 2)
Note 1	The applicable limit is 7dBm/MHz, except for transmissions whose nominal bandwidth falls completely within the band 5 150 MHz to 5 250 MHz, in which case the applicable limit is 10dBm/MHz	
Note 2	Slave devices without a Radar Interference Detection function shall comply with the limits for the band 5 250 MHz to 5 350MHz	

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.4.2.1.3

JS1120-3 software is used to control the spectrum analyzer to use the following settings:

For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment):

Centre Frequency	The centre frequency of the channel under test
Frequency Span	2 × Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector	Peak
Sweep Time	1 minute
RBW	1MHz
VBW	3MHz
Trace Mode	Max Hold

PD = D + G + Y + 10 × log (1 / x)

D is power density at the highest power level in dBm/MHz

G is stated assembly antenna gain of the individual antenna in dBi

Y is any additional beam-forming gain

X is duty cycle of the transmitter (Tx on / (Tx on + Tx off)) shall be noted as x ($0 < x \leq 1$)

For equipment without continuous transmission capability and without the capability to transmit with a constant duty cycle:

Start Frequency	lower band edge of applicable sub-band (e.g. 5150 MHz or 5470 MHz)
Stop Frequency	upper band edge of applicable sub-band (e.g. 5350 MHz or 5725 MHz)
Detector	Peak
Sweep Time	30s
RBW	10KHz
VBW	30KHz
Trace Mode	Max Hold
Sweep Points	> 20 000 (for 5 150 MHz to 5 350 MHz) > 25 500 (for 5 470 MHz to 5 725 MHz)

JS1120-3 software acquires the trace data and calculate the Spectral Density in 1MHz.

Measurement	
☒Conducted measurement	☐Radiated measurement

TEST ENVIRONMENT

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to Appendix C.

6.6. ADAPTIVITY

LIMITS

Measurement	
☐Frame Based Equipment (FBE)	☒Load Based Equipment (LBE)
☒Supervising Devices	☐Supervised Devices

Table 8: Priority Class dependent Channel Access parameters for *Supervised Devices*

Class #	p_0	CW_{min}	CW_{max}	Maximum Channel Occupancy Time (COT)
4	2	3	7	2 ms
3	2	7	15	4 ms
2	3	15	1 023	6 ms (see note 1)
1	7	15	1 023	6 ms (see note 1)
NOTE 1: The maximum *Channel Occupancy Time* (COT) of 6 ms may be increased to 8 ms by inserting one or more pauses. The minimum duration of a pause shall be 100 µs. The maximum duration (Channel Occupancy) before including any such pause shall be 6 ms. Pause duration is not included in the channel occupancy time.				
NOTE 2: The values for p_0, CW_{min}, CW_{max} are minimum values. Greater values are allowed.				

Table 7: Priority Class dependent Channel Access parameters for *Supervising Devices*

Class #	p_0	CW_{min}	CW_{max}	Maximum Channel Occupancy Time (COT)
4	1	3	7	2 ms
3	1	7	15	4 ms
2	3	15	63	6 ms (see note 1 and note 2)
1	7	15	1 023	6 ms (see note 1)
NOTE 1: The maximum *Channel Occupancy Time* (COT) of 6 ms may be increased to 8 ms by inserting one or more pauses. The minimum duration of a pause shall be 100 µs. The maximum duration (Channel Occupancy) before including any such pause shall be 6 ms. Pause duration is not included in the channel occupancy time.				
NOTE 2: The maximum Channel Occupancy Time (COT) of 6 ms may be increased to 10 ms by extending CW to CW × 2 + 1 when selecting the random number q for any backoff(s) that precede the Channel Occupancy that may exceed 6 ms or which follow the Channel Occupancy that exceeded 6 ms. The choice between preceding or following a Channel Occupancy shall remain unchanged during the operation time of the device.				
NOTE 3: The values for p_0, CW_{min}, CW_{max} are minimum values. Greater values are allowed.				

The use of Short Control Signalling Transmissions is constrained as follows:

- within an observation period of 50 ms, the number of *Short Control Signalling Transmissions* by the equipment shall be equal to or less than 50; and
- the total duration of the equipment's *Short Control Signalling Transmissions* shall be less than 2 500 µs within said observation period.

ED Threshold Level (Energy Detection Threshold Level)
Equipment shall consider a channel to be occupied as long as other RLAN transmissions are detected at a level greater than the ED Threshold Level (TL). The ED Threshold Level (TL) is integrated over the total Nominal Channel Bandwidth of all Operating Channels used by the equipment.

The ED Threshold level (TL) depends on the type of equipment:
Option 1: For equipment that for its operation in the 5 GHz bands is conforming to IEEE 802.11™-2016 [9], clause 17, clause 19 or clause 21, or any combination of these clauses, the ED Threshold Level (TL) is independent of the equipment's maximum transmit power (PH).
Assuming a 0 dBi receive antenna the ED Threshold Level (TL) shall be:
TL = -75 dBm/MHz

Option 2: For equipment conforming to one or more of the clauses listed in Option 1, and to at least one other operating mode, and for equipment conforming to none of the clauses listed in Option 1, the ED Threshold Level (TL) shall be proportional to the equipment's maximum transmit power (PH).
Assuming a 0 dBi receive antenna the ED Threshold Level (TL) shall be:

For PH
≤ 13 dBm: TL = -75 dBm/MHz
For 13 dBm < PH < 23 dBm: TL = -85 dBm/MHz + (23 dBm - PH) (3)

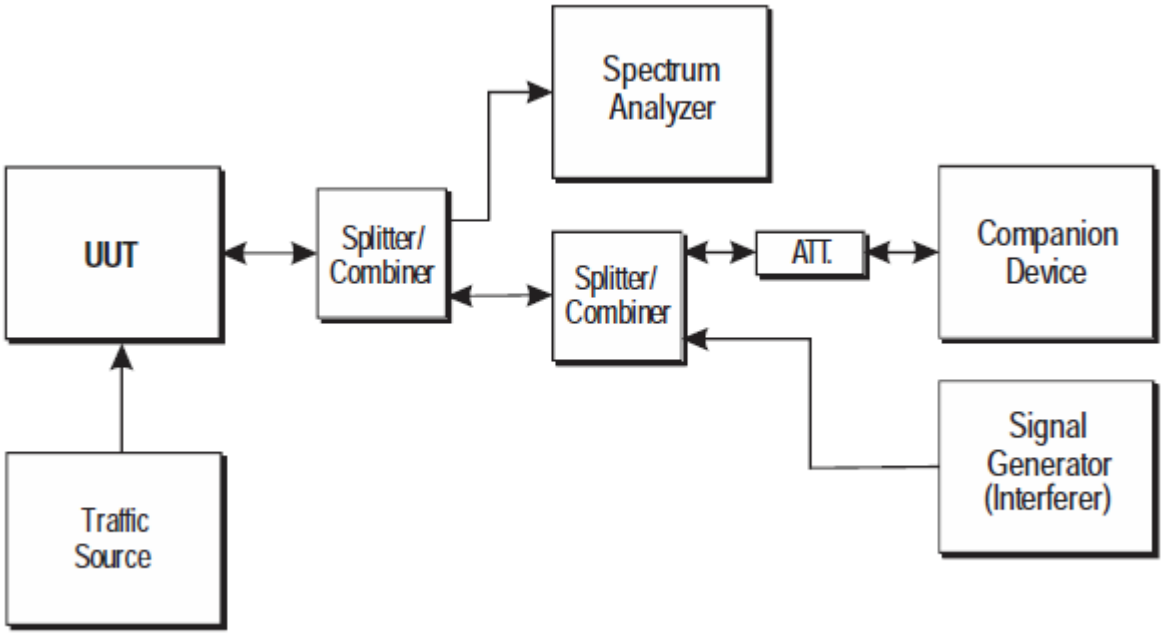
For PH
≥ 23 dBm: TL = -85 dBm/MHz
Equipment shall consider a channel to be occupied as long as other RLAN transmissions are detected at a level greater than the TL.

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.9

Measurement	
☒Conducted measurement	☐Radiated measurement

Test set-up



TEST ENVIRONMENT

Temperature	27.2 °C	Relative Humidity	53.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to Appendix I.

6.7. DYNAMIC FREQUENCY SELECTION (DFS)

APPLICABILITY AND LIMIT

Applicability of DFS requirements			
Requirement	DFS Operational mode		
	☐ Master	☒ Slave without radar detection (See Note 2)	☐ Slave with radar detection (See Note 2)
Channel Availability Check (CAC)	Required	Not required	Required (See Note 3)
Off-Channel CAC (see note 1)	Required	Not required	Required (See Note 3)
In-Service Monitoring	Required	Not required	Required
Channel Shutdown	Required	Required	Required
Non-Occupancy Period	Required	Not required	Required
Uniform Spreading	Required	Not required	Not required
Note 1	Where implemented by the manufacturer.		
Note 2	A slave with radar detection is not required to perform a CAC or Off-Channel CAC at initial use of the channel but only after the slave has detected a radar signal on the Operating Channel by In-Service Monitoring.		

Channel Availability Check

The Channel Availability Check shall be performed during a continuous period in time (Channel Availability Check Time) which shall not be less than the value defined in table D.1.
During the Channel Availability Check, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.
The RLAN device shall comply with the minimum detection probability as defined in table D.5.

In-Service Monitoring

The In-Service Monitoring shall be used to monitor each Operating Channel.
The In-Service-Monitoring shall start immediately after the RLAN device has started transmissions on a channel.
During the In-Service Monitoring, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.
The RLAN device shall comply with the minimum detection probability associated with a given radar test signal as defined in table D.5.

Off-Channel CAC (Off-Channel Channel Availability Check)

Where implemented, the Off-Channel CAC Time shall be declared by the manufacturer. However, the declared Off-Channel CAC Time shall be within the range specified in table D.1. During the Off-Channel CAC, the RLAN device shall be capable of detecting any of the radar test signals that fall within the ranges given by table D.4 with a level above the Radar Detection Threshold Level defined in table D.2.
The RLAN device shall comply with the minimum detection probability as defined in table D.5.

Channel Shutdown

The Channel Move Time shall not exceed the limit defined in table D.1.
The Channel Closing Transmission Time shall not exceed the limit defined in table D.1.

Non-Occupancy Period

The Non-Occupancy Period shall not be less than the value defined in table D.1.

Uniform Spreading

Each of the declared Channel Plans (see clause 3.1) shall make use of at least 60 % of the spectrum available in the
applicable sub-band(s).
The Uniform Spreading is limited to the usable channels being declared as part of the channel plan.
Usable channels do not include channels which are precluded by either:
1) the intended outdoor usage of the RLAN; or
2) previous detection of a radar on the channel (Unavailable Channel or Unusable Channel); or
3) national regulations; or
4) the restriction to only operate in the band 5 150 MHz to 5 250 MHz for RLAN devices without a radar detection capability.
Each of the Usable Channels shall be used with approximately equal probability. RLAN equipment for which the declared channel plan includes channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz may omit these channels from the list of Usable Channels at initial power up or at initial installation. Channels being used by other RLAN equipment may be omitted from the list of Usable Channels.

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check Time	60 s (see note 1)
Minimum Off-Channel CAC Time	6 minutes (see note 2)
Maximum Off-Channel CAC Time	4 hours (see note 2)
Channel Move Time	10 s
Channel Closing Transmission Time	1 s
Non-Occupancy Period	30 minutes
NOTE 1: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the *Channel Availability Check Time* shall be 10 minutes. NOTE 2: For channels whose nominal bandwidth falls completely or partly within the band 5 600 MHz to 5 650 MHz, the *Off-Channel CAC Time* shall be within the range 1 hour to 24 hours.	

Table D.2: Radar Detection Threshold Levels

e.i.r.p. Spectral Density (dBm/MHz)	Value (see note 1 and note 2)
10	-62 dBm

NOTE 1: This is the level at the input of the receiver of an RLAN device with a maximum e.i.r.p. density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different e.i.r.p. spectral density and/or a different receive antenna gain G (dBi) the Radar Detection Threshold Level at the receiver input follows the following relationship:
DFS Detection Threshold (dBm) = -62 + 10 - e.i.r.p. Spectral Density (dBm/MHz) + G (dBi); however the Radar Detection Threshold Level shall not be less than -64 dBm assuming a 0 dBi receive antenna gain.

NOTE 2: Slave devices with a maximum e.i.r.p. of less than 23 dBm do not have to implement radar detection unless these devices are used in fixed outdoor point to point or fixed outdoor point to multipoint applications (see clause 4.2.6.1.3).

Table D.3: Parameters of the reference DFS test signal

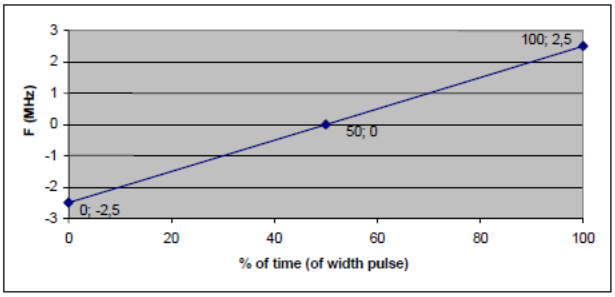
Pulse width W (µs)	Pulse repetition frequency PRF (PPS)	Pulses per burst (PPB)
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (see note 1 to note 3)	Pulse width W (µs)		Pulse repetition frequency PRF (PPS)		Number of different PRFs	Pulses per burst for each PRF (PPB) (see note 5)
	Min	Max	Min	Max		
1	0,5	5	200	1 000	1	10 (see note 6)
2	0,5	15	200	1 600	1	15 (see note 6)
3	0,5	15	2 300	4 000	1	25
4	20	30	2 000	4 000	1	20
5	0,5	2	300	400	2/3	10 (see note 6)
6	0,5	2	400	1 200	2/3	15 (see note 6)

NOTE 1: Radar test signals #1 to #4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2.

NOTE 2: Radar test signal #4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a ±2,5 MHz frequency deviation which is described below.



NOTE 3: Radar test signals #5 and #6 are single pulse based Staggered PRF radar test signals using 2 or 3 different PRF values. For radar test signal #5, the difference between the PRF values chosen shall be between 20 PPS and 50 PPS. For radar test signal #6, the difference between the PRF values chosen shall be between 80 PPS and 400 PPS. See figure D.3.

NOTE 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figure D.1, figure D.3 and figure D.4.
For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figure D.2 and figure D.5. See also clause 4.2.6.2.3, clause 5.4.8.2.1.4.2 and clause 5.4.8.2.1.4.3.

NOTE 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF multiplied by the number of different PRFs used.

NOTE 6: For the CAC and Off-Channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5 600 MHz to 5 650 MHz shall be 18.

Table D.5: Detection probability

Parameter	Detection Probability (P_d)	
	Channels whose nominal bandwidth falls partly or completely within the 5 600 MHz to 5 650 MHz band	Other channels
CAC, Off-Channel CAC	99,99 %	60 %
In-Service Monitoring	60 %	60 %
NOTE: P_d gives the probability of detection per simulated radar burst and represents a minimum level of detection performance under defined conditions. Therefore P_d does not represent the overall detection probability for any particular radar under real life conditions.		

TEST PROCEDURE AND REQUIREMENT

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.8.2

Measurement	
☒Conducted measurement	☐Radiated measurement

Channel Availability Check (CAC)

Tests with a radar burst at the beginning of the Channel Availability Check Time

The steps below define the procedure to verify the radar detection capability on the selected channel Chr when a radar burst occurs at the beginning of the Channel Availability Check Time:
a) The signal generator and UUT are connected using Set-up A as described in clause 5.4.8.1.3.1. The power of the UUT is switched off.
b) The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (Tpower_up) and is ready to start the radar detection. The Channel Availability Check is expected to commence on Chr at instant T1 and is expected to end no sooner than T1 + Tch_avail_check unless the radar test signal is detected sooner. Additional verification may be needed to define T1 in case it is not exactly known or indicated by the UUT.
c) A single radar burst is generated on Chr using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in clause 5.4.8.2.1.1. This single-burst radar test signal shall commence within 2 s after time T1.
d) It shall be recorded if the radar test signal was detected.
e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.

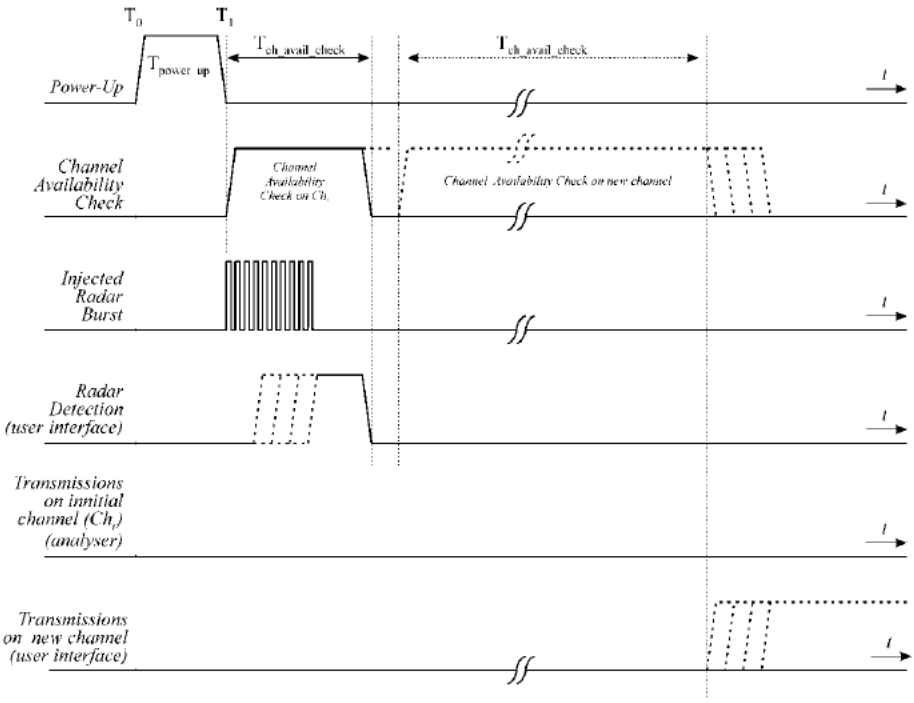


Figure 8: Example of timing for radar testing at the beginning of the Channel Availability Check Time

Tests with radar burst at the end of the Channel Availability Check Time

The steps below define the procedure to verify the radar detection capability on the selected channel Chr when a radar burst occurs at the end of the Channel Availability Check Time (see note). This is illustrated in figure 9.
NOTE: The applicable Channel Availability Check Times are given by table D.1.
a) The signal generator and UUT are connected using Set-up A described in clause 5.4.8.1.3.1. The power of the UUT is switched off.
b) The UUT is powered up at T0. T1 denotes the instant when the UUT has completed its power-up sequence (Tpower_up) and is ready to start the radar detection. The Channel Availability Check is expected to commence
on Chr at instant T1 and is expected to end no sooner than T1 + Tch_avail_check unless the radar test signal is detected sooner.
Additional verification may be needed to define T1 in case it is not exactly known or indicated by the UUT.
c) A single radar burst is generated on Chr using the reference test signal defined in table D.3 at a level of up to 10 dB above the level defined in clause 5.4.8.2.1.1. This single-burst radar test signal shall commence towards
the end of the minimum required Channel Availability Check Time but not before time
T1 + Tch_avail_check - 2 s.
d) It shall be recorded if the radar test signal was detected.
e) A timing trace or description of the observed timing and behaviour of the UUT shall be recorded.

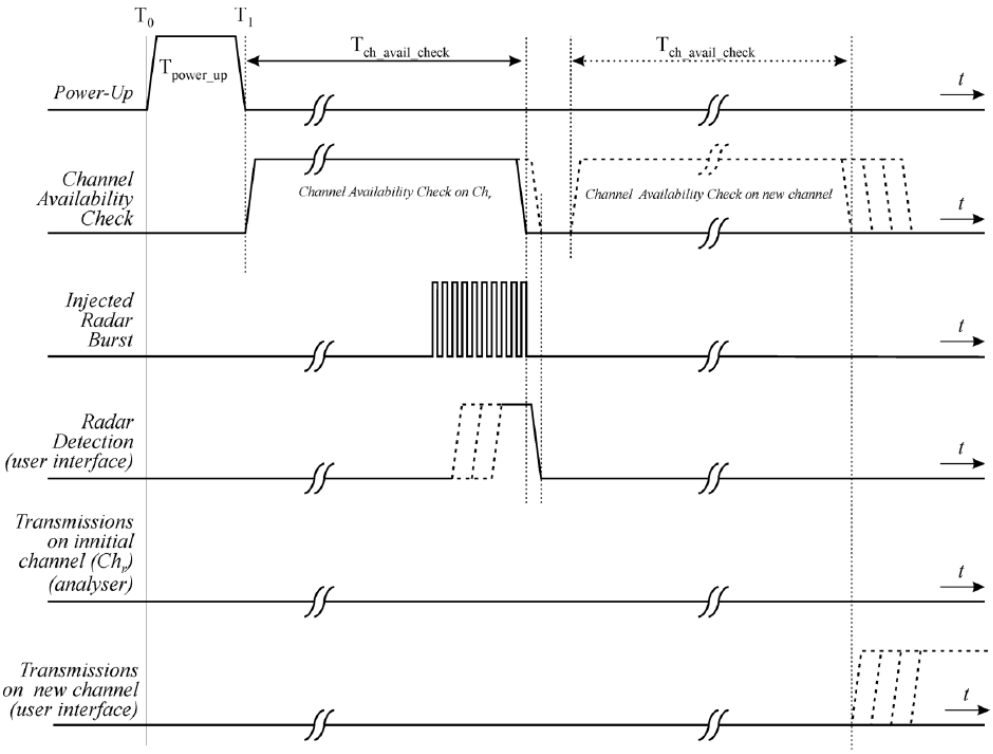


Figure 9: Example of timing for radar testing towards the end of the Channel Availability Check Time

Radar Detection Threshold (during the Channel Availability Check)

a) The signal generator, the UUT (master device) and a slave device associated with the UUT, are connected using Set-up A described in clause 5.4.8.1.3.1.
b) The UUT shall transmit a test transmission sequence in accordance with clause 5.3.1.2 on (all) the Operating Channel(s).
c) A multi burst radar test signal is generated on Chr using any of the radar test signals defined in table D.4 at a level defined in clause 5.4.8.2.1.1. The radar test signal used shall be recorded in the report. This multi burst radar test signal shall commence at T3 and shall continue for the total duration of the Off-Channel CAC Time
(TOff-Channel_CAC) as declared by the manufacturer in accordance with table D.1. For channels within the 5 600 MHz to 5 650 MHz band test signals #3 and #4 shall not be used and the Burst Interval Time (BIT) during the test shall be varied between 8 min and 10 min. For channels outside this band, the Burst Interval Time (BIT) during the test shall be varied between 45 s and 60 s.
d) The UUT shall detect the radar test signal before the end of the Off-Channel CAC Time and this shall be recorded.
For the purpose of reducing test time, the test may be terminated immediately once the UUT has reported detection of the radar test signal.

In-Service Monitoring

The steps below define the procedure to verify the In-Service Monitoring and the Radar Detection Threshold Level during the In-Service Monitoring.
The channel, on which the In-Service Monitoring test will be performed, shall be selected in accordance with clause 5.3.2. This channel, designated as Chr, is an Operating Channel.

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT are connected using Set-up A described in clause 5.4.8.1.3.1. When the UUT is a slave device with a Radar Interference Detection function, the UUT shall associate with a master device. The signal generator and the UUT are connected using Set-up C described in clause 5.4.8.1.3.3.
b) The UUT shall transmit a test transmission sequence in accordance with clause 5.3.1.2 on the selected channel Chr. While the testing is performed on Chr, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent Operating Channels.
c) At a certain time T0, a single burst radar test signal is generated on Chr using radar test signal #1 defined in table D.4 and at a level defined in clause 5.4.8.2.1.1. T1 denotes the end of the radar burst.
d) It shall be recorded if the radar test signal was detected.
e) Step b) to step d) shall be performed 20 times, each time a random value shall be chosen for pulse width and pulse repetition frequency from the corresponding ranges provided in table D.4. For radar test signal #5 and radar test signal #6 provided in table D.4 the number of PRF values shall vary between 2 or 3. The radar test signal shall be detected at least 12 times out of the 20 trials in order to comply with the detection probability specified in table D.5.
f) Step b) to step e) shall be repeated for each of the radar test signals defined in table D.4 and as described in clause 5.4.8.1.2.
Figure 12 provides an example of the timing of a UUT when radar signals are detected during the In-Service Monitoring.

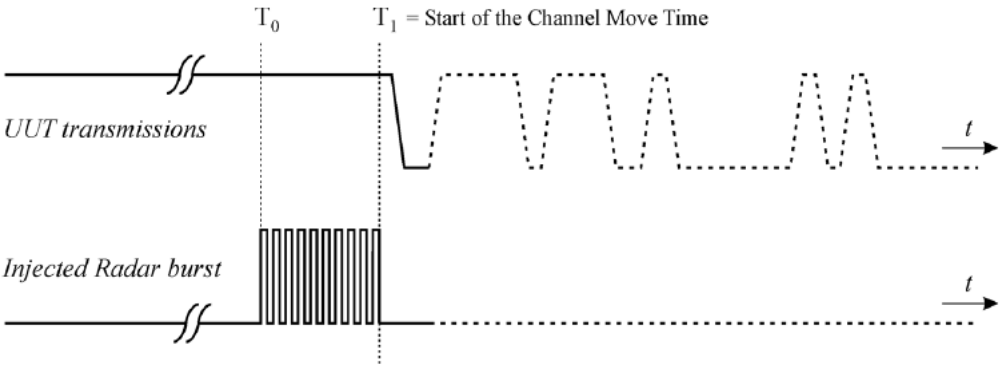


Figure 12: Example of timing for radar testing during In-Service Monitoring

Channel Shutdown and Non-Occupancy Period

The steps below define the procedure to verify the Channel Shutdown process and to determine the Channel Closing Transmission Time, the Channel Move Time and the Non-Occupancy Period. This is illustrated in figure 13.
The channel, on which these tests will be performed, shall be selected in accordance with clause 5.3.2. This channel, designated as Chr, is an Operating Channel.

a) When the UUT is a master device, a slave device will be used that associates with the UUT. The signal generator and the UUT shall be connected using Set-up A described in clause 5.4.8.1.3.1.
When the UUT is a slave device (with or without a Radar Interference Detection function), the UUT shall associate with a master device. The signal generator and the UUT shall be connected using Set-up B described in clause 5.4.8.1.3.2.
In both cases, it is assumed that the channel selection mechanism for the Uniform Spreading requirement is disabled in the master.
b) The UUT shall transmit a test transmission sequence in accordance with clause 5.3.1.2 on the selected channel Chr. While the testing is performed on Chr, the equipment is allowed to have simultaneous transmissions on other adjacent or non-adjacent Operating Channels.
c) At a certain time T0, a single burst test signal is generated on Chr using the reference DFS test signal defined in table D.3 and at a level of up to 10 dB above the level defined in clause 5.4.8.2.1.1 on the selected channel.
T1 denotes the end of the radar burst.
d) The transmissions of the UUT following instant T1 on the selected channel Chr shall be observed for a period greater than or equal to the Channel Move Time defined in table D.1. The aggregate duration (Channel Closing Transmission Time) of all transmissions from the UUT on Chr during the Channel Move Time shall be compared to the limit defined in table D.1. For equipment capable of having simultaneous transmissions on multiple (adjacent or non-adjacent) Operating Channels, the equipment is allowed to continue transmissions on other Operating Channels (different from Chr).
The aggregate duration of all transmissions of the UUT does not include quiet periods in between transmissions of the UUT.
e) T2 denotes the instant when the UUT has ceased all transmissions on the channel Chr. The time difference between T1 and T2 shall be measured. This value (Channel Move Time) shall be noted and compared with the limit defined in table D.1.

f) Following instant T2, the selected channel Chr shall be observed for a period equal to the Non-Occupancy Period (T3-T2) to verify that the UUT does not resume any transmissions on this channel.
g) When the UUT is a slave device with a Radar Interference Detection function step b) to step f) shall be repeated with the generator connected to the UUT using Set-up C as described in clause 5.4.8.1.3.3. See also note 2 in table D.2.

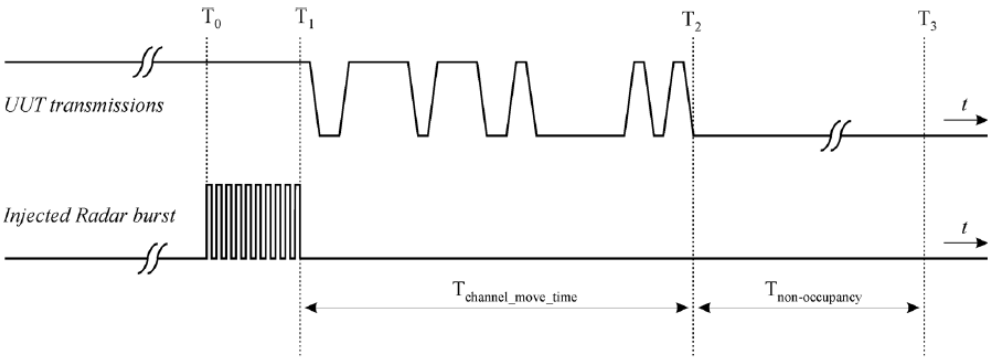


Figure 13: Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period

TEST SETUP

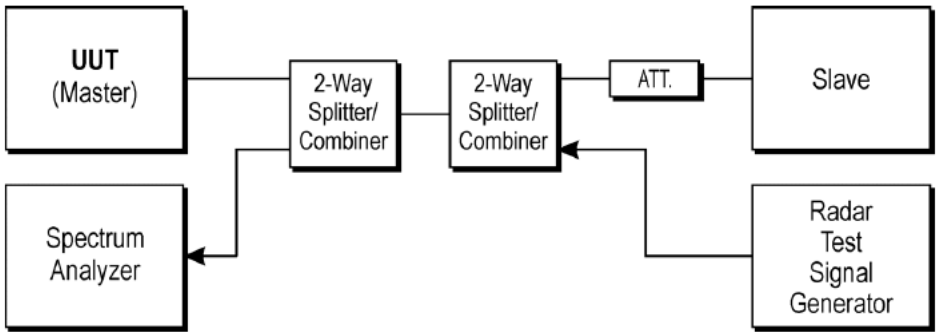


Figure 5: Set-up A

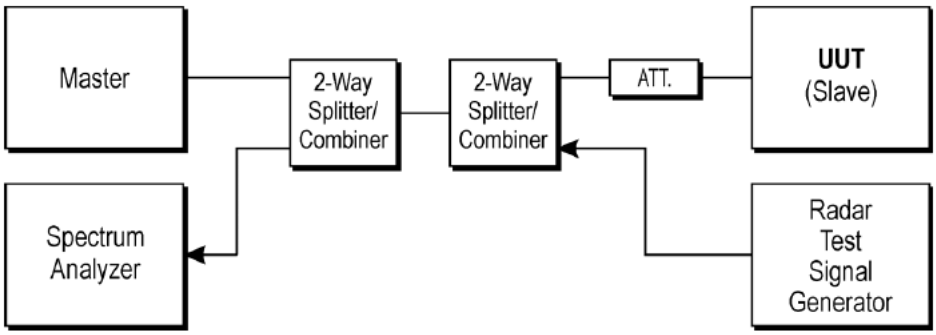


Figure 6: Set-up B

TEST ENVIRONMENT

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Not Applicable.

6.8. TX UNWANTED EMISSIONS OUTSIDE THE 5 GHz RLAN BANDS

LIMIT

Transmitter Unwanted Emissions In The Spurious Domain		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87.5 MHz	-36dBm	100 kHz
87.5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 862 MHz	-54dBm	100 kHz
862 MHz to 1 GHz	-36dBm	100 kHz
1 GHz ~ 5.15 GHz	-30dBm	1 MHz
5.35 GHz ~ 5.47 GHz	-30dBm	1 MHz
5.725 GHz ~ 26 GHz	-30dBm	1 MHz

TEST PROTOCOL

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.5

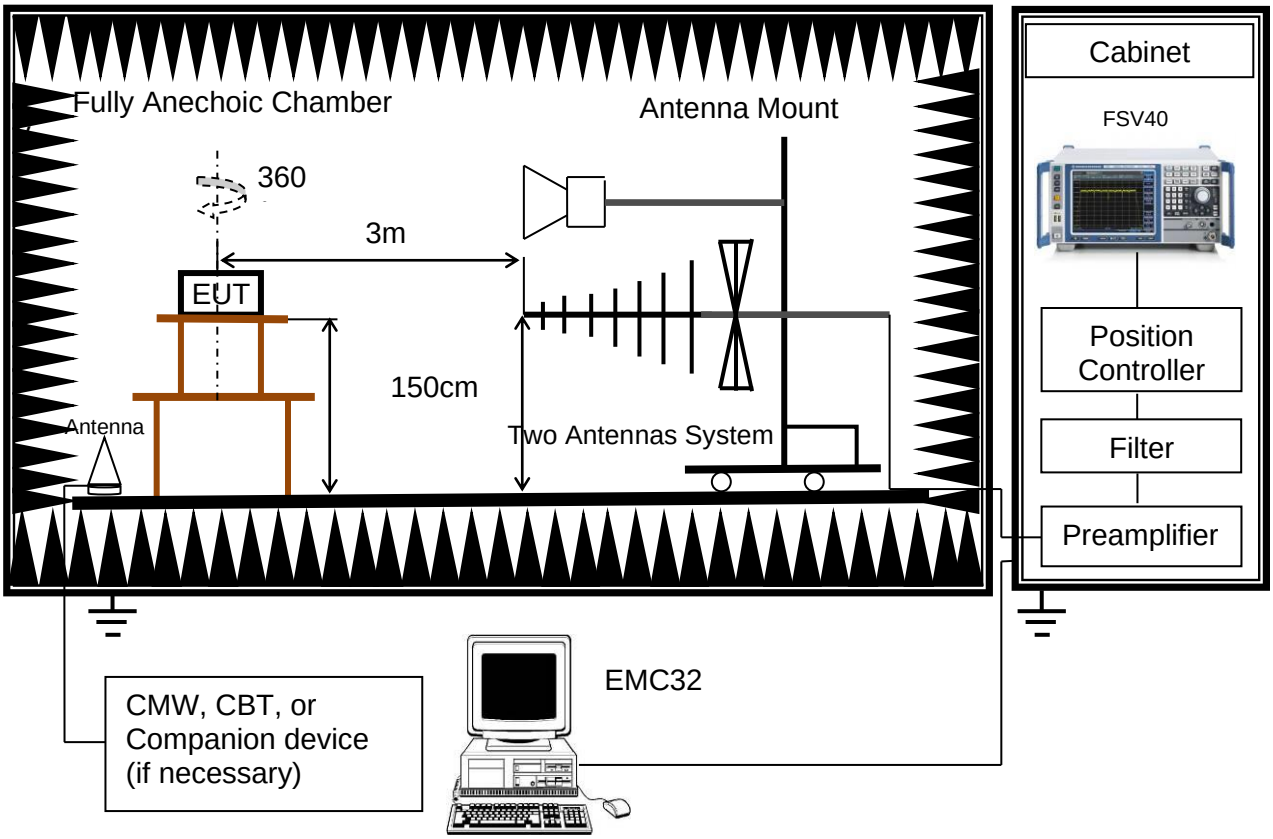
Measurement	
☒Conducted measurement	☒Radiated measurement

The setting of the Receiver

RBW	100kHz(＜1GHz) / 1MHz(＞1GHz)
VBW	300 kHz(＜1GHz) / 3MHz(＞1GHz)

TEST SETUP

Radiated Measurement Test Setup



1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

2. The equipment was configured to operate under its worst case situation with respect to output power.

3. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

Conducted measurement Test Setup

Please refer to Clause 6.10

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.5.2

TEST ENVIRONMENT

For Conducted measurement:

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

For Radiated measurement

Temperature	24.5 °C	Relative Humidity	65 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

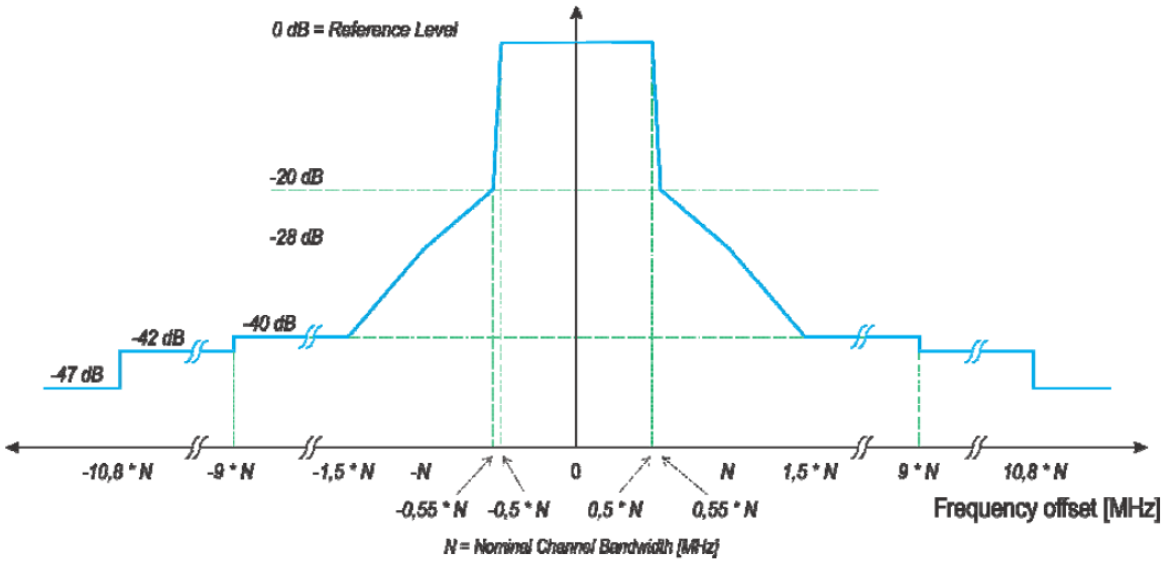
Please refer to Appendix F.

Note: 1. All test mode has been tested, but only the worst case data recorded in the report.
2. The low frequency, which started from 18 GHz to 26GHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

6.9. TX UNWANTED EMISSIONS WITHIN THE 5 GHz RLAN BANDS

LIMIT

ETSI EN 301 893 Clause 4.2.4.2.2, Figure 1



NOTE: dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

Figure 1: Transmit spectral power mask

TEST PROTOCOL

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.6

Measurement	
☒Conducted measurement	☐Radiated measurement

Connect the UUT to the spectrum analyser and use the following settings:

Centre Frequency	Centre frequency of the channel being tested
Span	2 × Nominal Channel Bandwidth
Filter Mode	Channel Filter
Trace Mode	Video Average
Sweep Time	Coupled
Detector	Peak
Sweep Point / Sweep Mode	5000 / Continuous
RBW / VBW	1MHz / 30KHz

TEST PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.6.2

TEST ENVIRONMENT

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to appendix E.

6.10. RECEIVER SPURIOUS EMISSIONS

LIMIT

Receiver Spurious Emissions		
Frequency Range	Maximum Power Limit (E.R.P.(≤1 GHz) E.I.R.P.(> 1 GHz))	Measurement Bandwidth
30 MHz ~ 1 GHz	-57dBm	100KHz
1 GHz ~ 12.75 GHz	-47dBm	1MHz

TEST PROTOCOL

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.7

Measurement	
☒Conducted measurement	☒Radiated measurement

TEST SETUP AND PROCEDURE

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.7.2
Please refer to clause 6.9 TRANSMITTER UNWANTED EMISSIONS OUTSIDE THE 5 GHZ RLAN BANDS TEST SETUP and TEST PROCEDURE

TEST ENVIRONMENT

For Conducted measurement:

Temperature	26.9 °C	Relative Humidity	53.9 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

For Radiated measurement

Temperature	24.5 °C	Relative Humidity	65 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to appendix G.

6.11. RECEIVER BLOCKING

LIMITS

Receiver Blocking Parameters

Table 9: Receiver Blocking parameters

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)		Type of blocking signal
		Master or Slave with radar detection (see table D.2, note 2)	Slave without radar detection (see table D.2, note 2)	
Pmin + 6 dB	5 100	-53	-59	Continuous Wave
Pmin + 6 dB	4 900 5 000 5 975	-47	-53	Continuous Wave
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined clause 4.2.8.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.				

The minimum performance criterion shall be a PER less than or equal to 10 %.

TEST PROTOCOL

Please refer to ETSI EN 301 893 V2.1.1 (2017-05) Clause 5.4.10.2

Measurement	
☒Conducted measurement	☐Radiated measurement

TEST PROCEDURE

Step 1:
• The UUT shall be set to the first operating frequency to be tested (see clause 5.3.2).

Step 2:
• The blocking signal generator is set to the first frequency as defined in table 9.

Step 3:
• With the blocking signal generator switched off a communication link is set up between the UUT and the associated companion device using the test setup shown in figure 18. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.2.8.3 is still met. The resulting level for the wanted signal at the input of the UUT is Pmin.

• This signal level (Pmin) is increased by 6 dB resulting in a new level (Pmin + 6 dB) of the wanted signal at the UUT receiver input.

Step 4:

• The level of the blocking signal at the UUT input is set to the level provided in table 9. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.2.8.3 are met.

• If the performance criteria as specified in clause 4.2.8.3 are met, the level of the blocking signal at the UUT may be further increased (e.g. in steps of 1 dB) until the level whereby the performance criteria as specified in clause 4.2.8.3 are no longer met. The highest level at which the performance criteria are met is recorded in the test report.

Step 5:
• Repeat step 4 for each remaining combination of frequency and level as specified in table 9. Direct. Coupler Splitter/ UUT Combiner Performance Monitoring Device Optional ATT. Spectrum Analyzer Signalling Unit or Companion Device Variable attenuator step size ≤ 1 dB Shielding or Shielded Room Blocking Signal Generator.

Step 6:
• Repeat step 2 to step 5 with the UUT operating at the other operating frequencies at which the blocking test has to be performed. See clause 5.3.2.

TEST SETUP

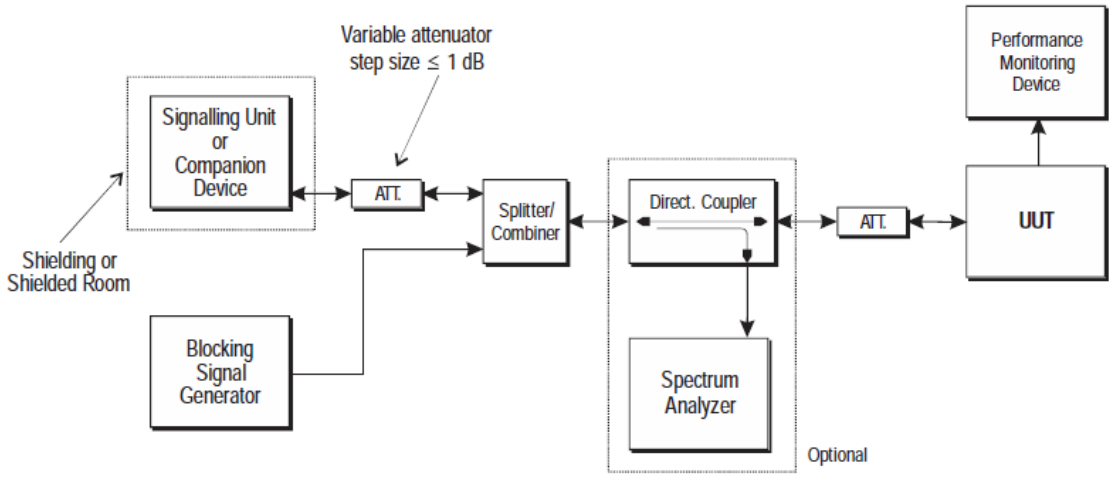


Figure 18: Test Set-up for receiver blocking

TEST ENVIRONMENT

Temperature	27.2 °C	Relative Humidity	53.8 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 5 V

RESULTS

Please refer to Appendix H.

6.12. USER ACCESS RESTRICTIONS

REQUIREMENTS

The equipment shall be so constructed that settings (hardware and/or software) related to DFS shall not be accessible to the user if changing those settings result in the equipment no longer being compliant with the DFS requirements in clause 4.7.

The above requirement includes the prevention of indirect access to any setting that impacts DFS.

CONCLUSION

Conform

6.13. GEO-LOCATION CAPABILITY

REQUIREMENTS

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment.

The geographical location may also be available in equipment already installed and operating at the same geographical location.

GEO-LOCATION CAPABILITY FUNCTION DESCRIBE FOR EUT

Not support.

CONCLUSION

N/A

7. Appendix

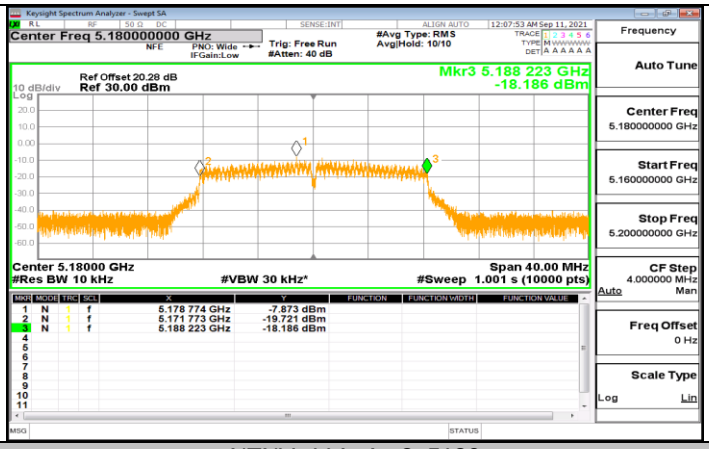
7.1. Appendix A: Carrier Frequencies

7.1.1. Test Result

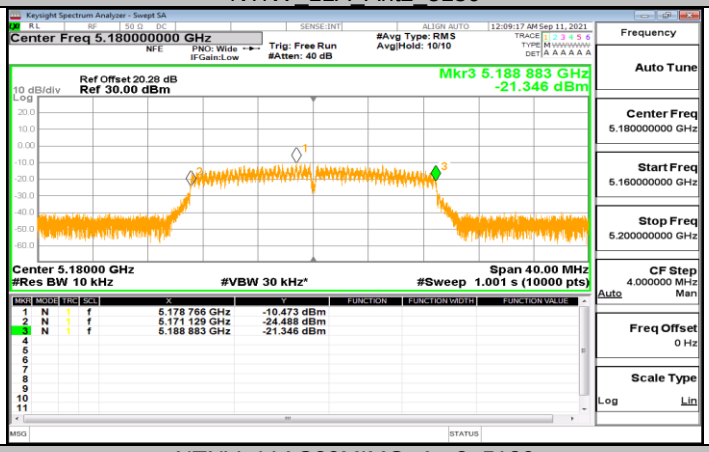
Test Condition	Test Mode	Antenna	Channel	Result[ppm]	Limit[ppm]	Verdict
NTNV	11A	Ant2	5180	-0.38614	±20	PASS
	11AC20MIMO	Ant2	5180	1.15842	±20	PASS
	11AC40MIMO	Ant2	5190	1.54158	±20	PASS
	11AC80MIMO	Ant2	5210	6.14265	±20	PASS
LTNV	11A	Ant2	5180	8.49506	±20	PASS
	11AC20MIMO	Ant2	5180	5.40595	±20	PASS
	11AC40MIMO	Ant2	5190	0.77079	±20	PASS
	11AC80MIMO	Ant2	5210	9.21397	±20	PASS
HTNV	11A	Ant2	5180	3.86139	±20	PASS
	11AC20MIMO	Ant2	5180	-2.70297	±20	PASS
	11AC40MIMO	Ant2	5190	3.85395	±20	PASS
	11AC80MIMO	Ant2	5210	10.74964	±20	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

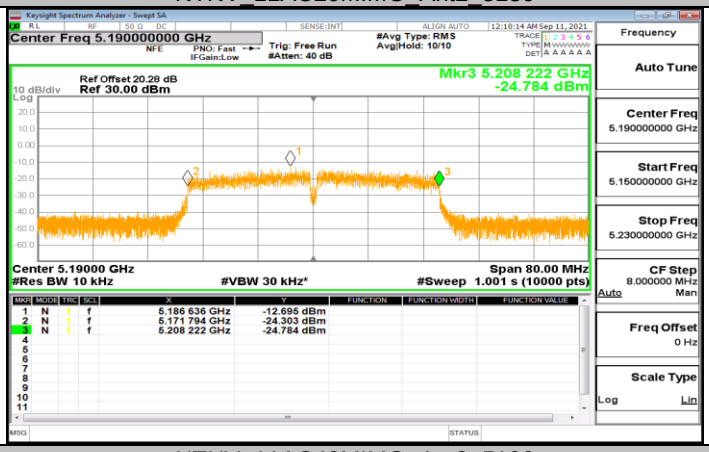
7.1.2. Test Graphs



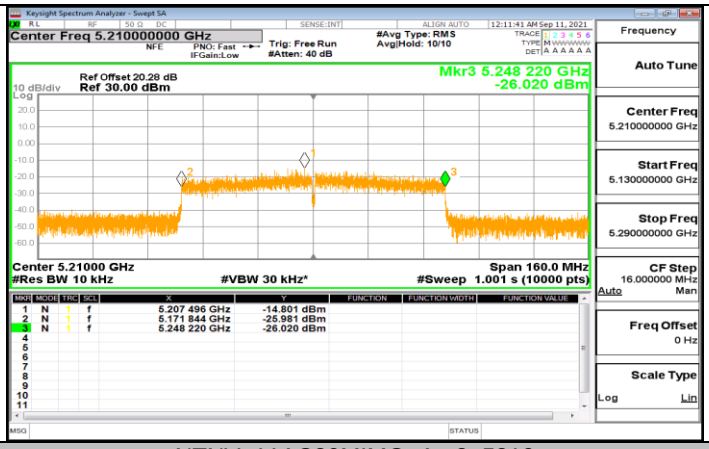
NTNV_11A_Ant2_5180



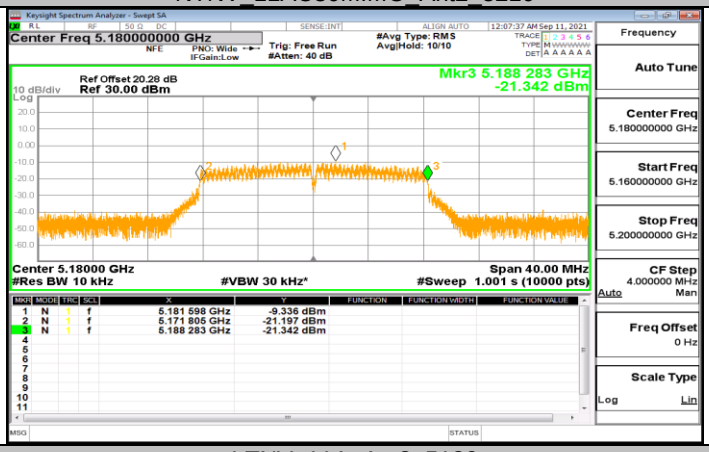
NTNV_11AC20MIMO_Ant2_5180



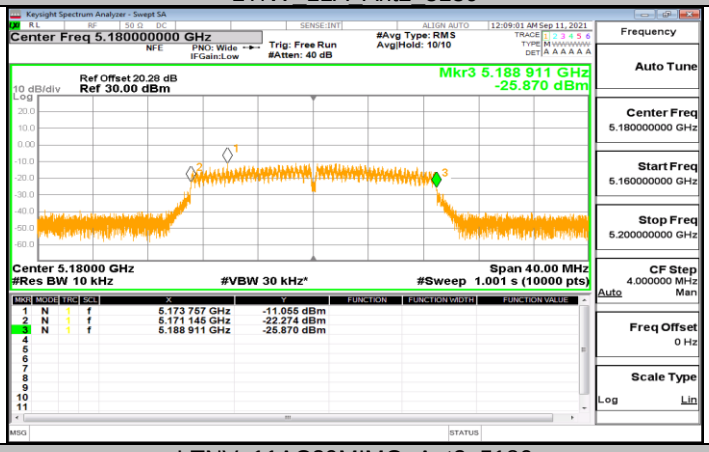
NTNV_11AC40MIMO_Ant2_5190



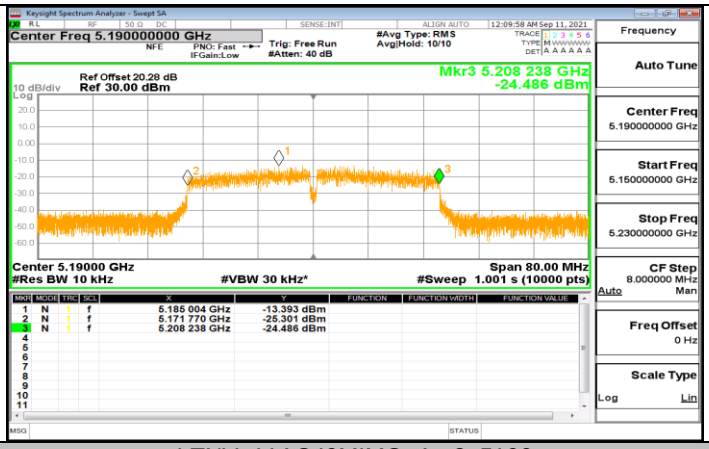
NTNV_11AC80MIMO_Ant2_5210



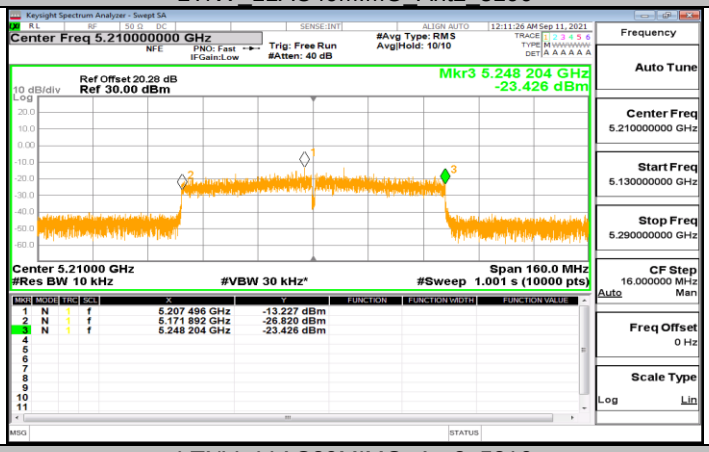
LTNV_11A_Ant2_5180



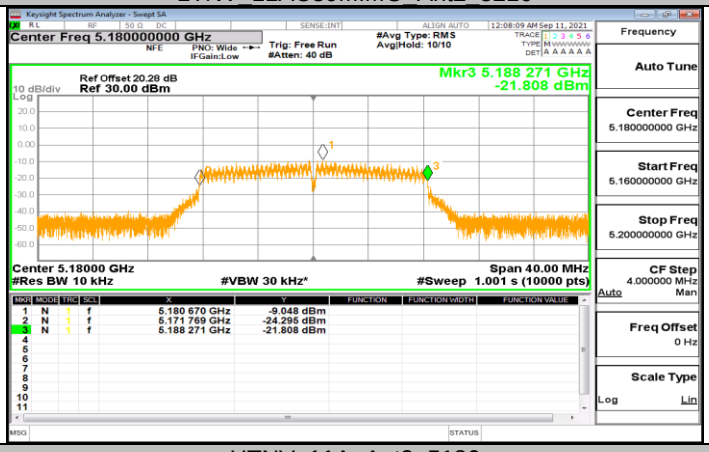
LTNV_11AC20MIMO_Ant2_5180



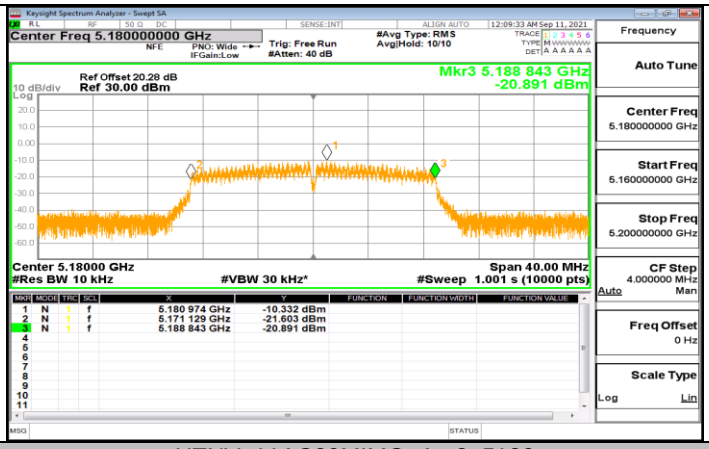
LTNV_11AC40MIMO_Ant2_5190



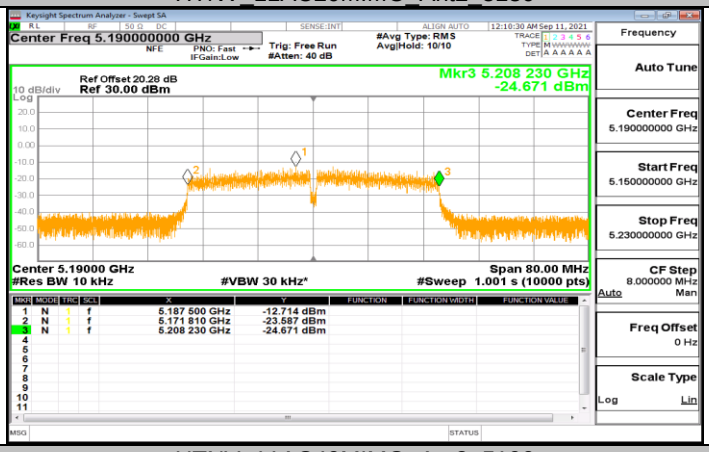
LTNV_11AC80MIMO_Ant2_5210



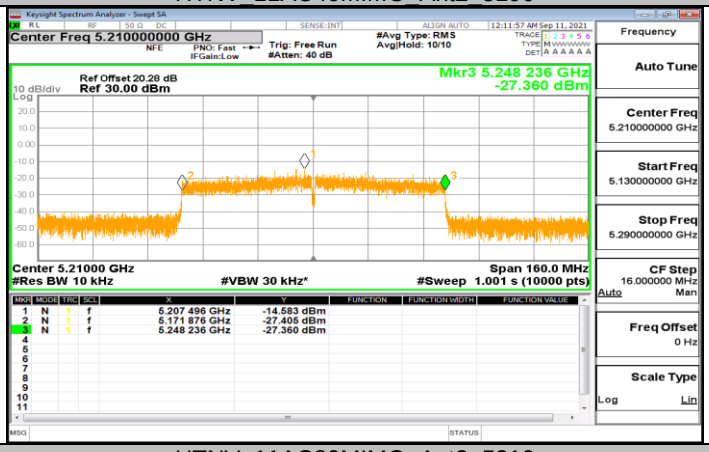
HTNV_11A_Ant2_5180



HTNV_11AC20MIMO_Ant2_5180



HTNV_11AC40MIMO_Ant2_5190



HTNV_11AC80MIMO_Ant2_5210

Note: All the modes had been tested, but only the worst data was recorded in the report.

7.2. Appendix B: RF Output Power

7.2.1. Test Result

Test Condition	Test Mode	TPC	Antenna	Channel	EIRP[dBm]	Limit[dBm]	Verdict
NTNV	11A	NA	Ant1	5180	16.40	23	PASS
		NA	Ant2	5180	15.93	23	PASS
	11N20MIMO	NA	total	5180	18.23	23	PASS
	11N40MIMO	NA	total	5190	18.39	23	PASS
	11AC20MIMO	NA	total	5180	18.13	23	PASS
	11AC40MIMO	NA	total	5190	18.43	23	PASS
	11AC80MIMO	NA	total	5210	18.90	23	PASS

Test Condition	Test Mode	TPC	Antenna	Channel	EIRP[dBm]	Limit[dBm]	Verdict
LTNV	11A	NA	Ant1	5180	16.09	23	PASS
		NA	Ant2	5180	15.57	23	PASS
	11N20MIMO	NA	total	5180	17.91	23	PASS
	11N40MIMO	NA	total	5190	18.06	23	PASS
	11AC20MIMO	NA	total	5180	17.75	23	PASS
	11AC40MIMO	NA	total	5190	18.02	23	PASS
	11AC80MIMO	NA	total	5210	18.53	23	PASS

Test Condition	Test Mode	TPC	Antenna	Channel	EIRP[dBm]	Limit[dBm]	Verdict
HTNV	11A	NA	Ant1	5180	16.02	23	PASS
		NA	Ant2	5180	15.61	23	PASS
	11N20MIMO	NA	total	5180	17.85	23	PASS
	11N40MIMO	NA	total	5190	18.02	23	PASS
	11AC20MIMO	NA	total	5180	17.82	23	PASS
	11AC40MIMO	NA	total	5190	18.11	23	PASS
	11AC80MIMO	NA	total	5210	18.59	23	PASS

Note 1: For EIRP, the maximum antenna 4.36 dBi was added to the total MIMO conducted power.
Note 2: The duty cycle correction factor had already added to the final test result.

Note: All the modes had been tested, but only the worst data was recorded in the report.

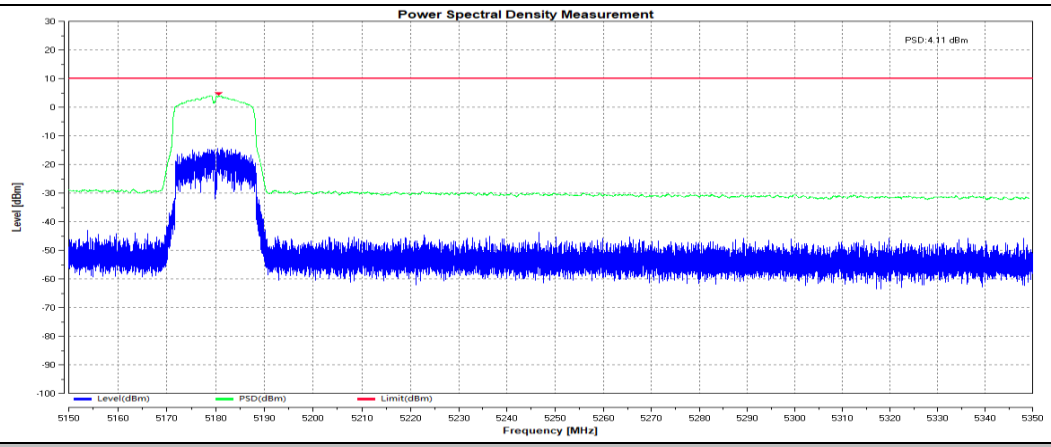
7.3. Appendix C: Power Spectral Density

7.3.1. Test Result

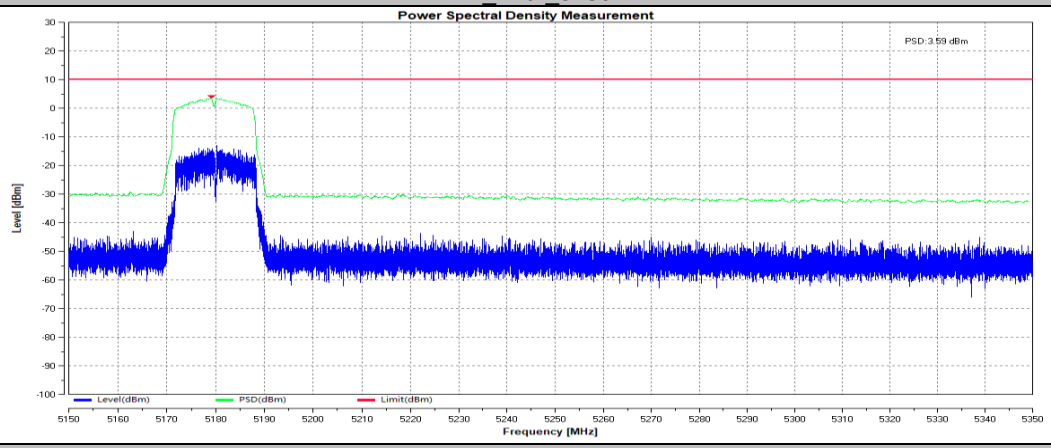
Test Mode	Antenna	Channel	PSD[dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	4.11	10	PASS
	Ant2	5180	3.59	10	PASS
11N20MIMO	Ant1	5180	3.08	10	PASS
	Ant2	5180	2.51	10	PASS
	total	5180	5.81	10	PASS
11N40MIMO	Ant1	5190	0.24	10	PASS
	Ant2	5190	-0.45	10	PASS
	total	5190	2.78	10	PASS
11AC20MIMO	Ant1	5180	3.14	10	PASS
	Ant2	5180	2.53	10	PASS
	total	5180	5.77	10	PASS
11AC40MIMO	Ant1	5190	0.47	10	PASS
	Ant2	5190	-0.40	10	PASS
	total	5190	2.99	10	PASS
11AC80MIMO	Ant1	5210	-2.01	10	PASS
	Ant2	5210	-2.22	10	PASS
	total	5210	0.86	10	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

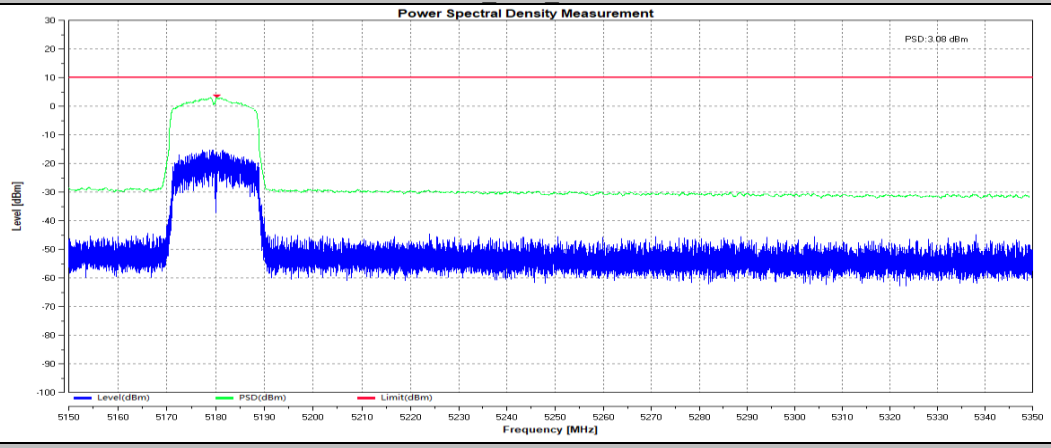
7.3.2. Test Graphs



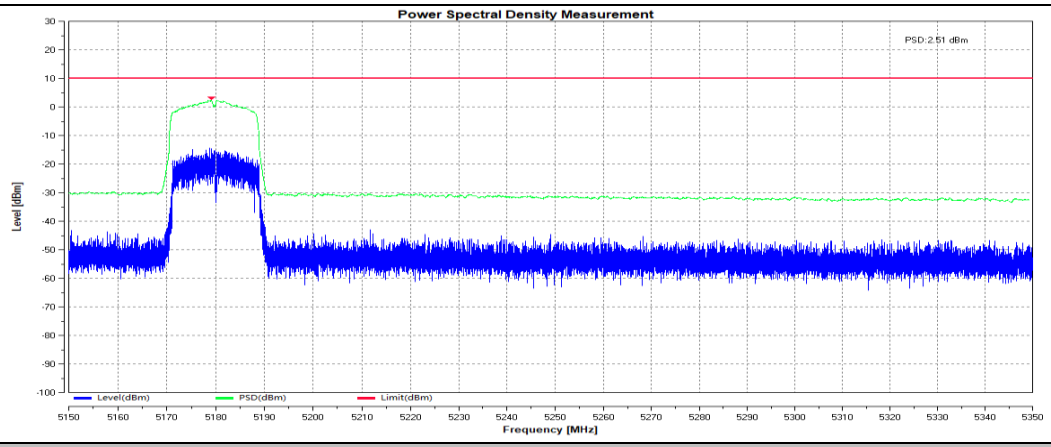
11A_Ant1_5180



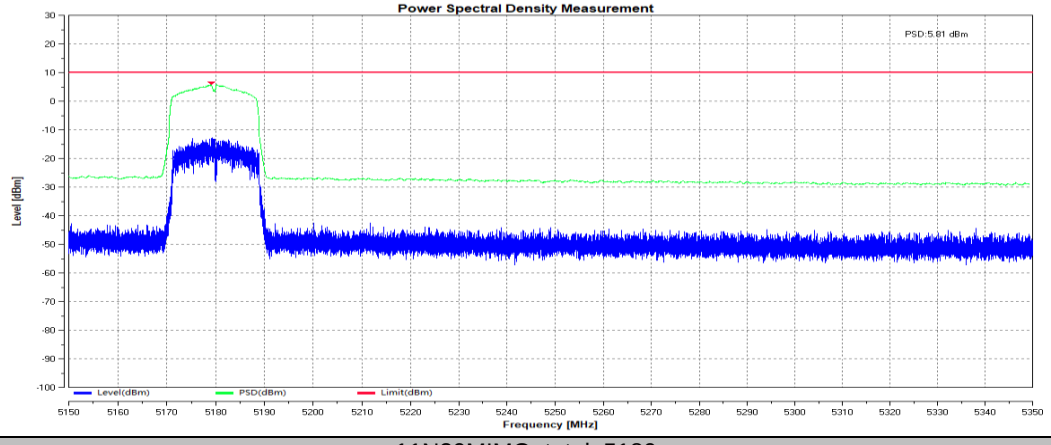
11A_Ant2_5180



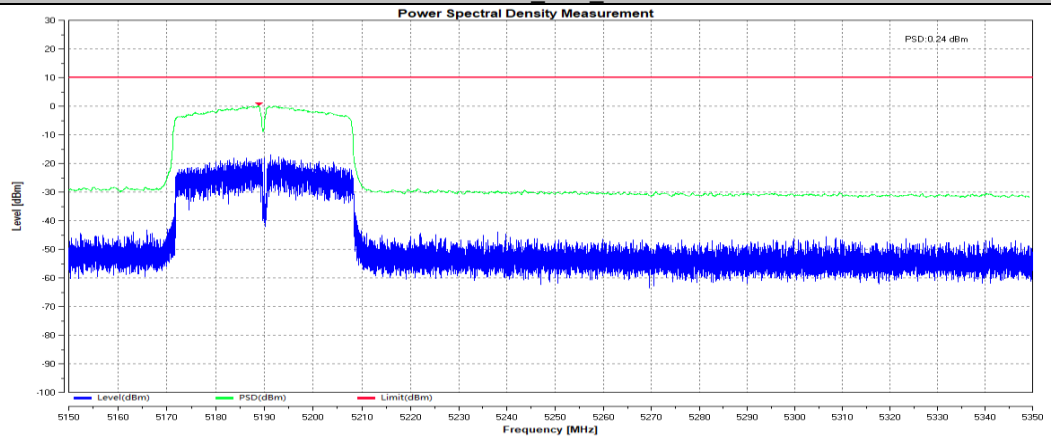
11N20MIMO_Ant1_5180



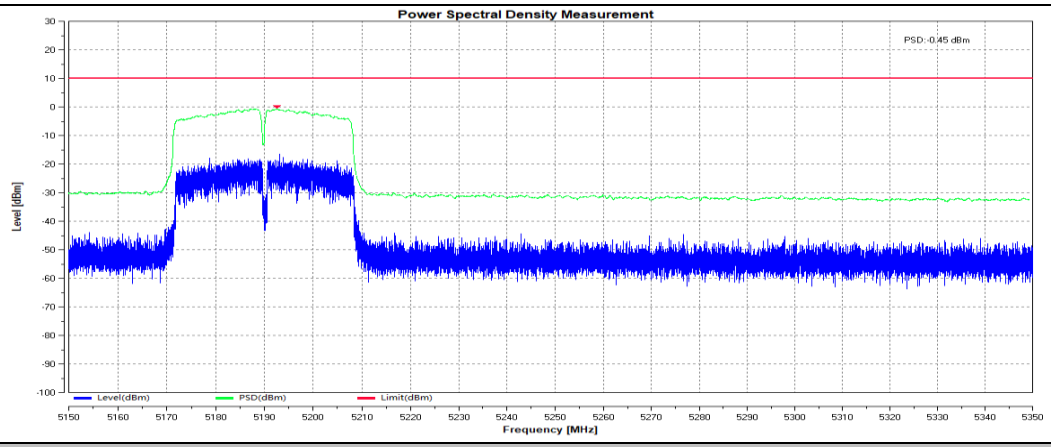
11N20MIMO_Ant2_5180



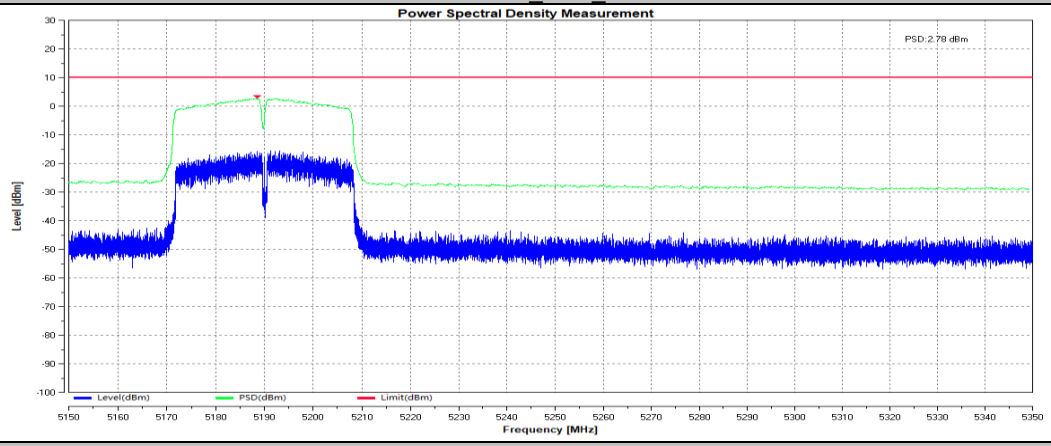
11N20MIMO_total_5180



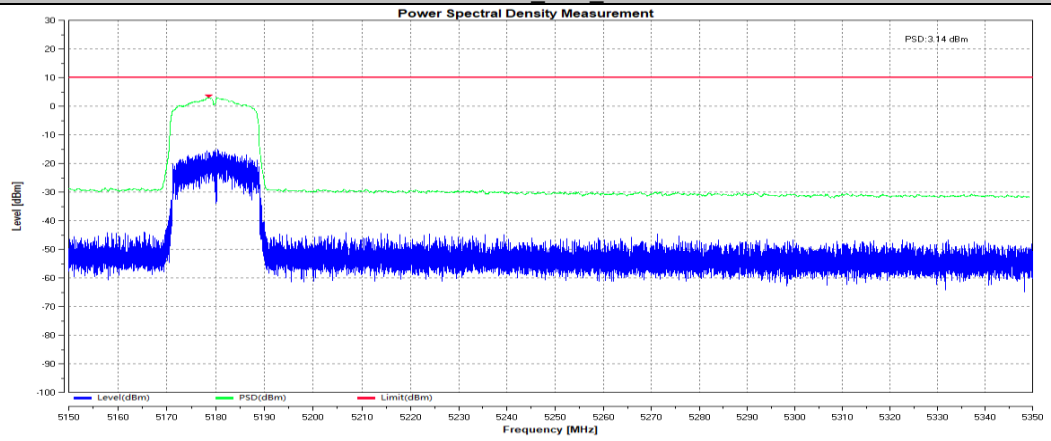
11N40MIMO_Ant1_5190



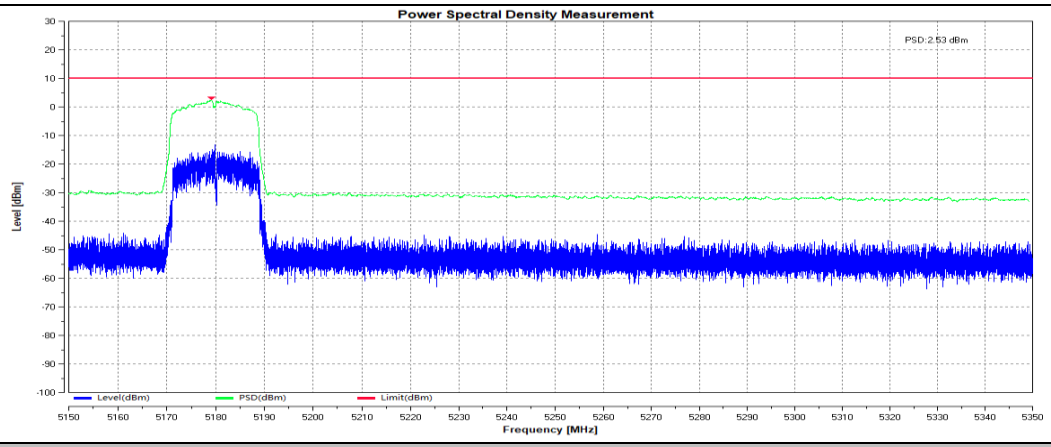
11N40MIMO_Ant2_5190



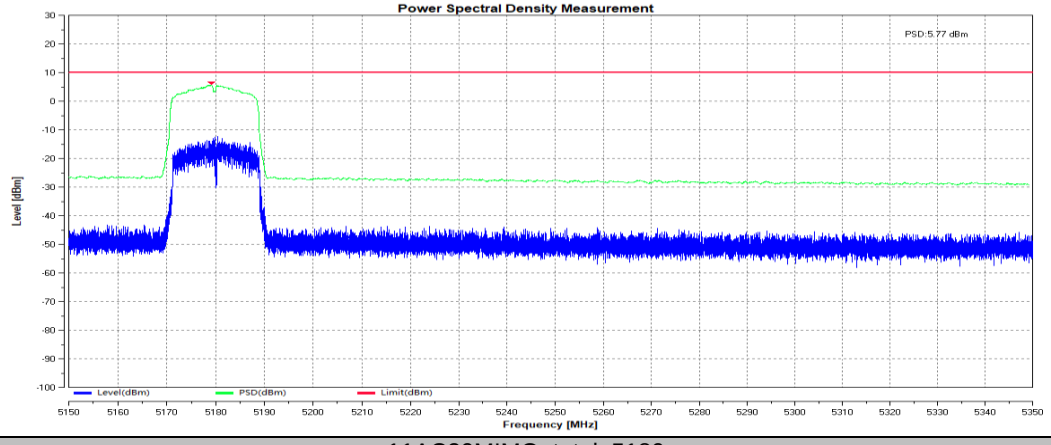
11N40MIMO_total_5190



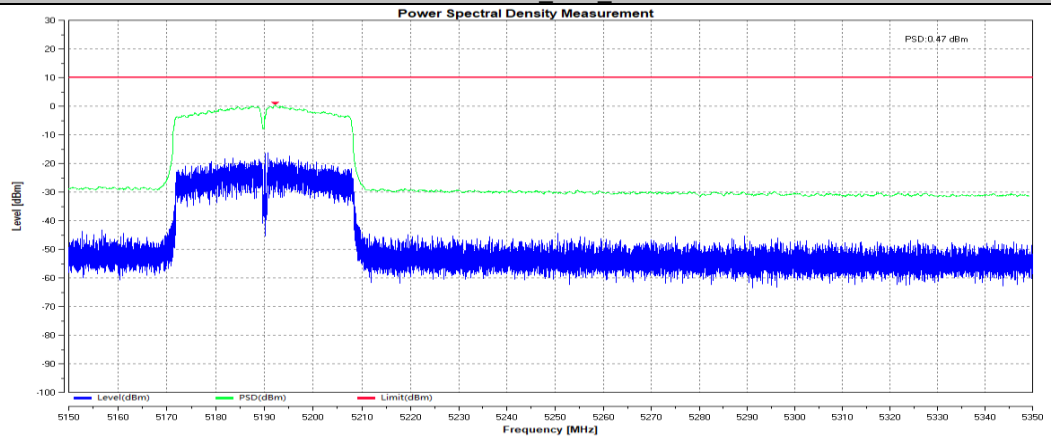
11AC20MIMO_Ant1_5180



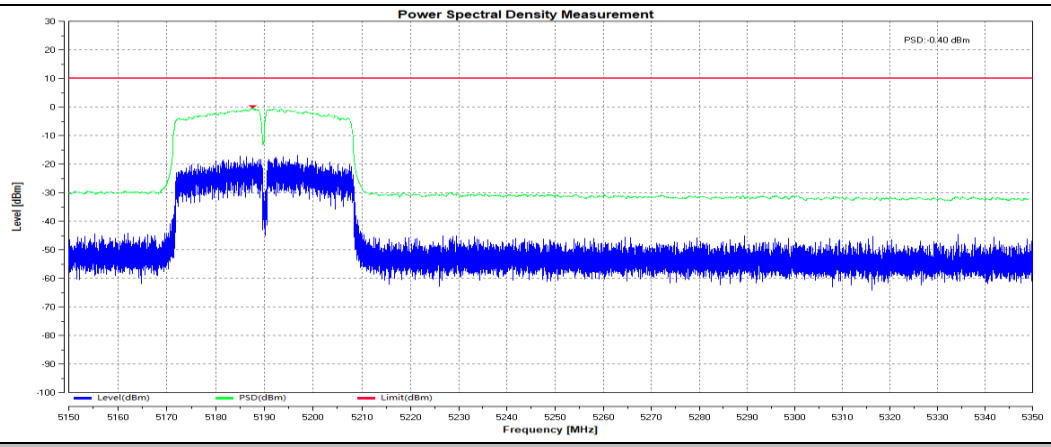
11AC20MIMO_Ant2_5180



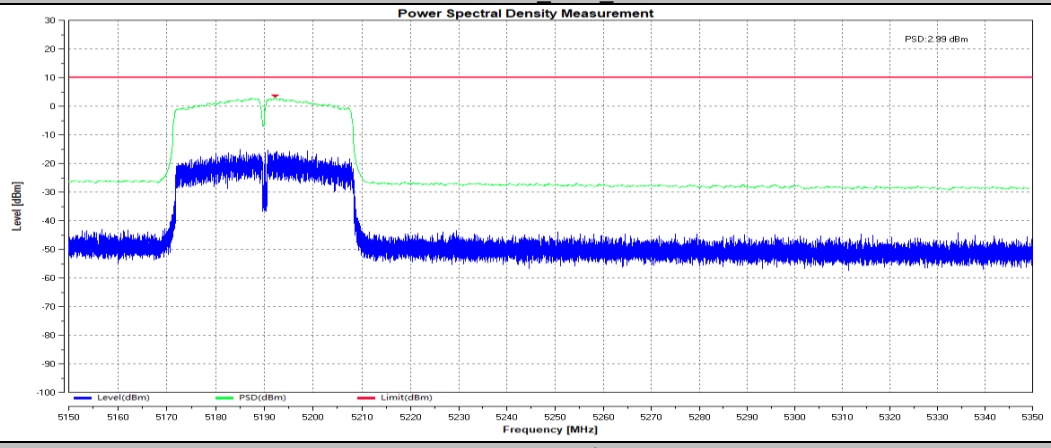
11AC20MIMO_total_5180



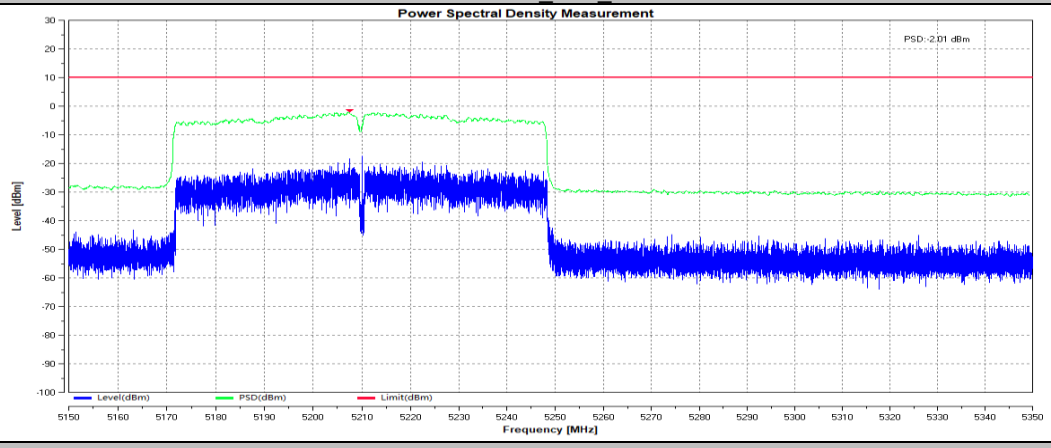
11AC40MIMO_Ant1_5190



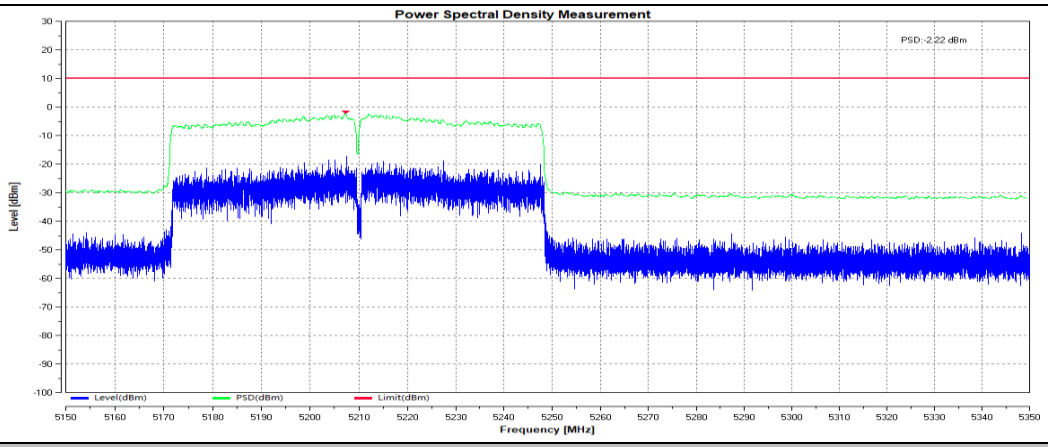
11AC40MIMO_Ant2_5190



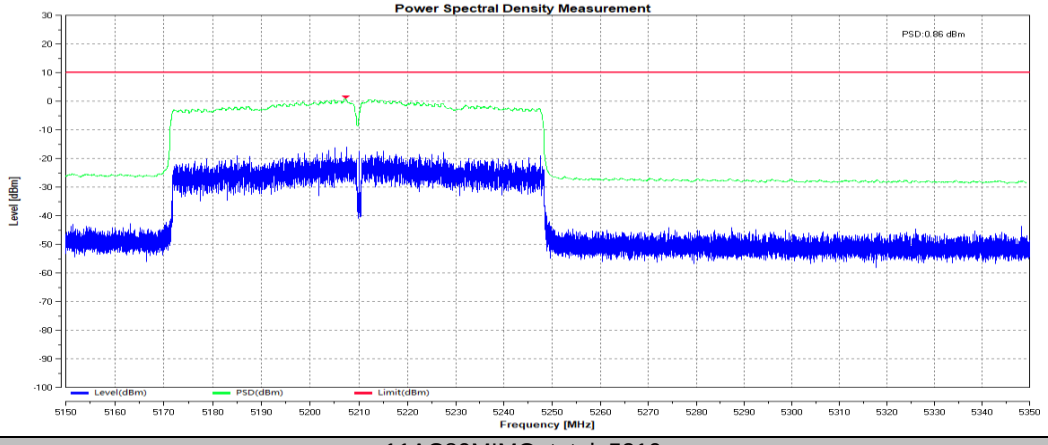
11AC40MIMO_total_5190



11AC80MIMO_Ant1_5210



11AC80MIMO_Ant2_5210



11AC80MIMO_total_5210

Note: All the modes had been tested, but only the worst data was recorded in the report.

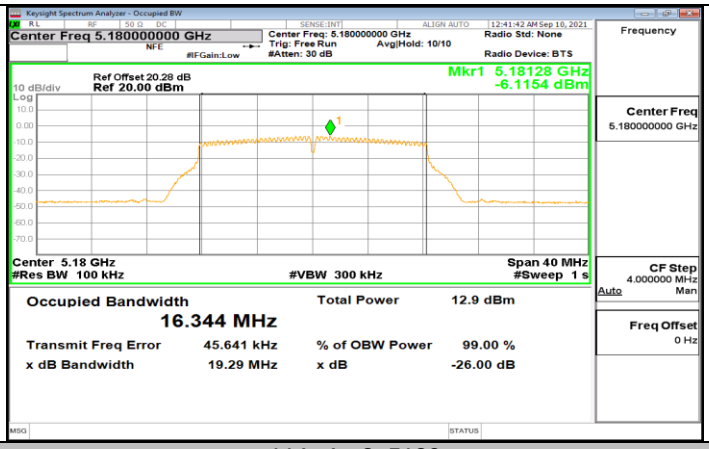
7.4. Appendix D: Occupied Channel Bandwidth

7.4.1. Test Result

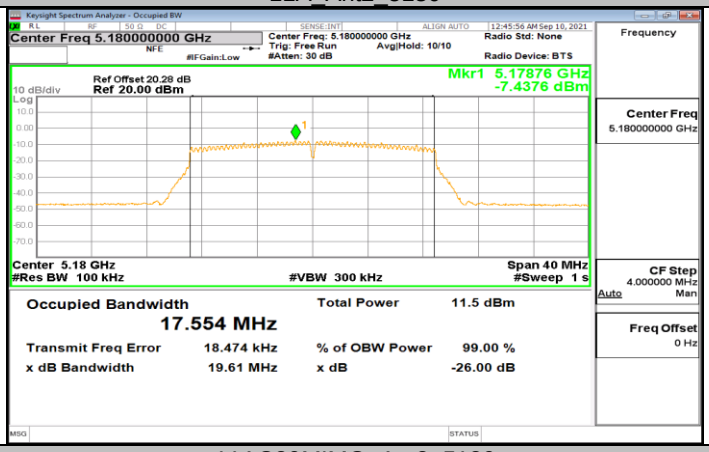
Test Mode	Antenna	Channel	OCB[MHz]	Limit[MHz]	Verdict
11A	Ant2	5180	16.344	16 to 20	PASS
11AC20MIMO	Ant2	5180	17.554	16 to 20	PASS
11AC40MIMO	Ant2	5190	36.010	32 to 40	PASS
11AC80MIMO	Ant2	5210	75.515	64 to 80	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

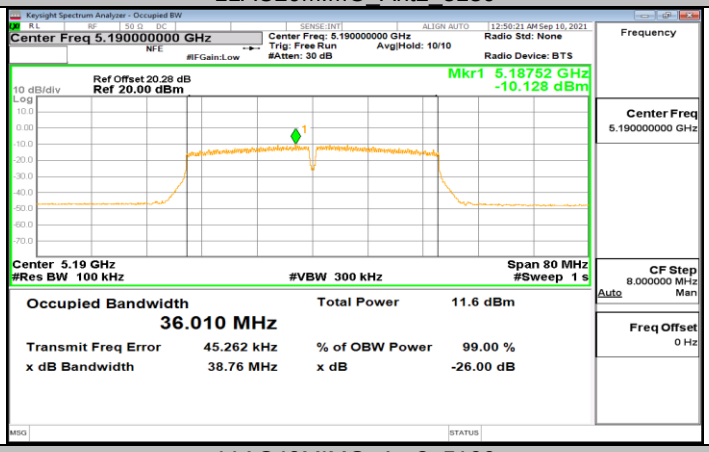
7.4.2. Test Graphs



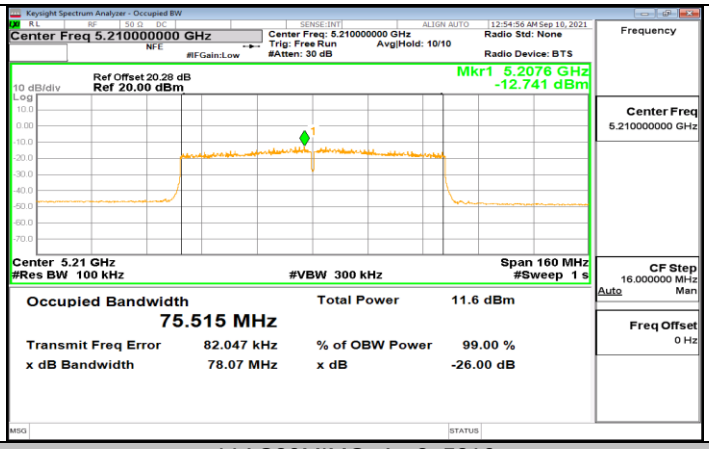
11A_Ant2_5180



11AC20MIMO_Ant2_5180



11AC40MIMO_Ant2_5190



11AC80MIMO_Ant2_5210

Note: All the modes had been tested, but only the worst data was recorded in the report.

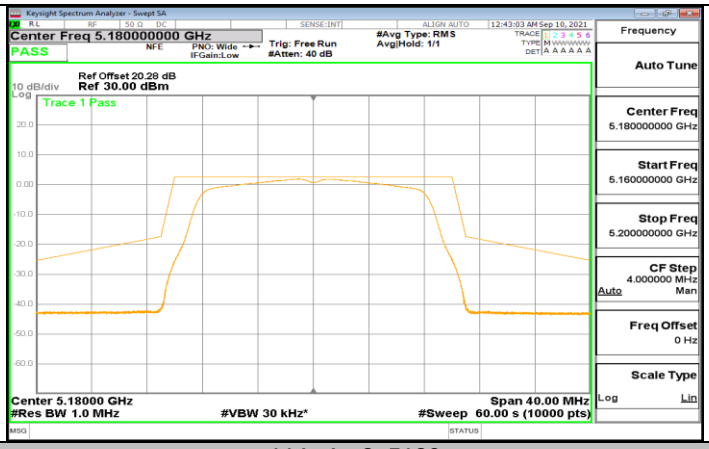
7.5. Appendix E: Transmitter Unwanted Emissions Within The 5 GHz RLAN Bands

7.5.1. Test Result

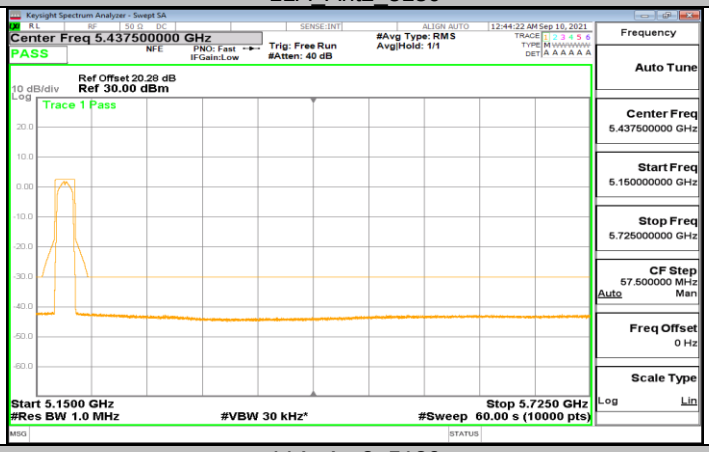
Test Mode	Antenna	Channel	Result [dBm]	Limit[dBm]	Verdict
11A	Ant2	5180	See test graph	See test graph	PASS
11AC20MIMO	Ant2	5180	See test graph	See test graph	PASS
11AC40MIMO	Ant2	5190	See test graph	See test graph	PASS
11AC80MIMO	Ant2	5210	See test graph	See test graph	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

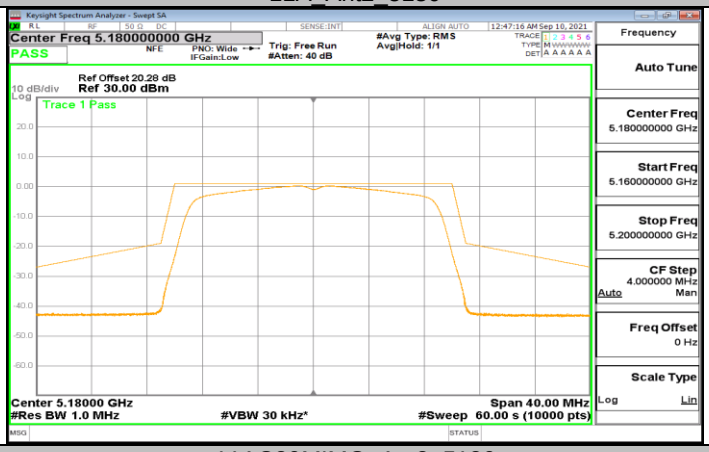
7.5.2. Test Graphs



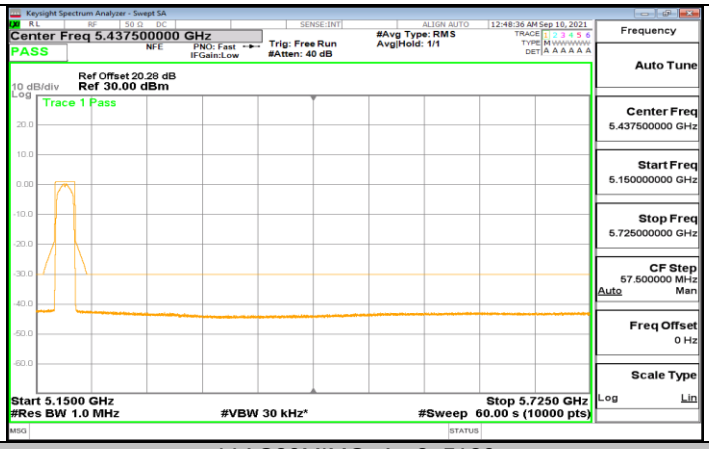
11A_Ant2_5180



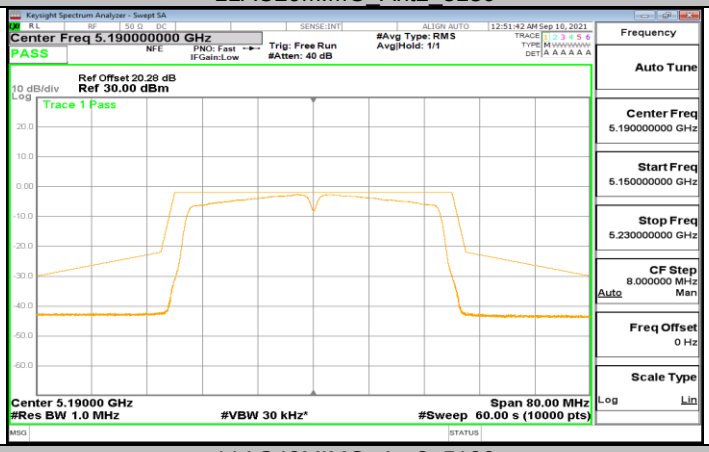
11A_Ant2_5180



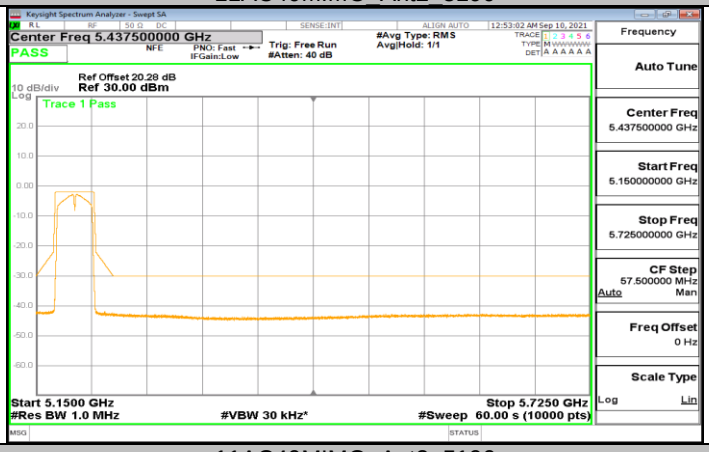
11AC20MIMO_Ant2_5180



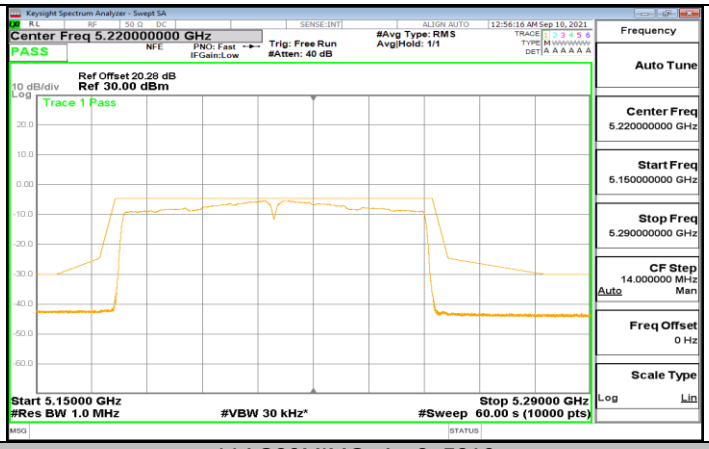
11AC20MIMO_Ant2_5180



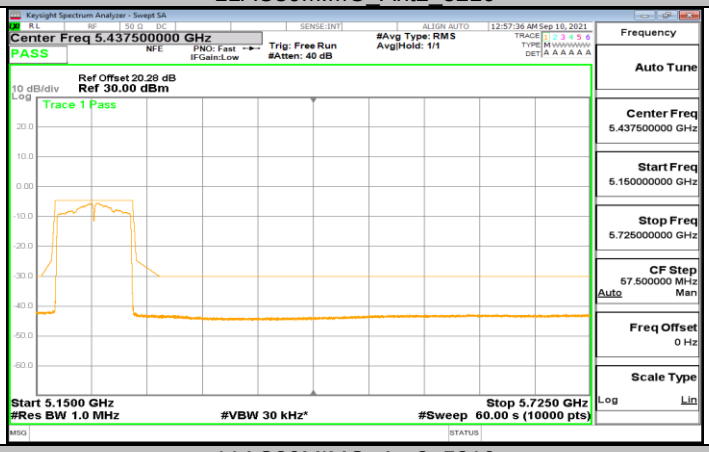
11AC40MIMO_Ant2_5190



11AC40MIMO_Ant2_5190



11AC80MIMO_Ant2_5210



11AC80MIMO_Ant2_5210

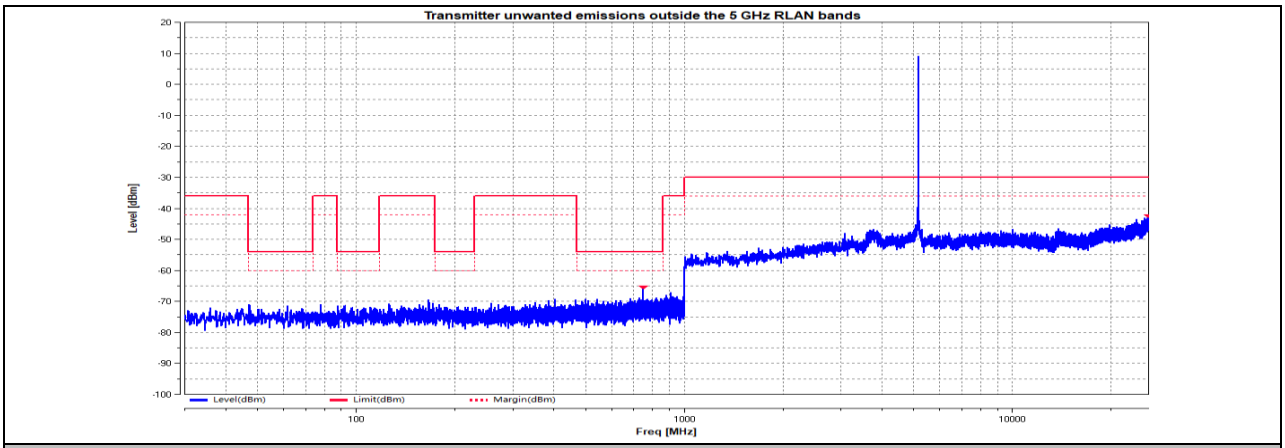
7.6. Appendix F: Transmitter Unwanted Emissions Outside The 5 GHz RLAN Bands

7.6.1. Conducted Test Result-Pre-scan

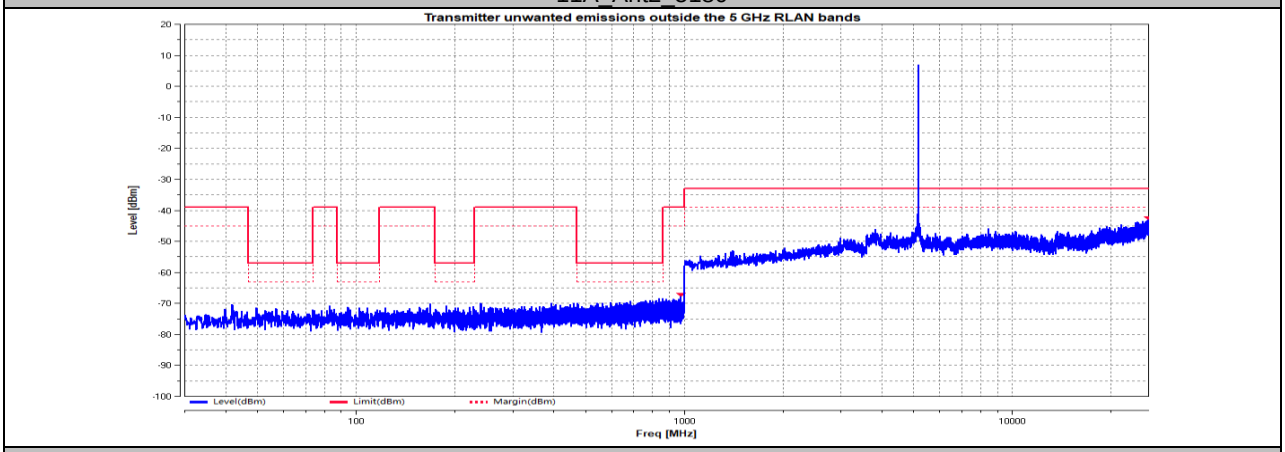
Test Mode	Antenna	Channel	Freq. [MHz]	Level[dBm]	Limit[dBm]	Verdict
11A	Ant2	5180	751.32	-66.18	-54	PASS
			25965.63	-43.09	-30	PASS
11AC20MIMO	Ant2	5180	978.9	-67.88	-39.01	PASS
			25934.38	-43.13	-33.01	PASS
11AC40MIMO	Ant2	5190	874.63	-67.19	-39.01	PASS
			25490.63	-42.85	-33.01	PASS
11AC80MIMO	Ant2	5210	60.07	-63.51	-57.01	PASS
			5146.88	-42.29	-33.01	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

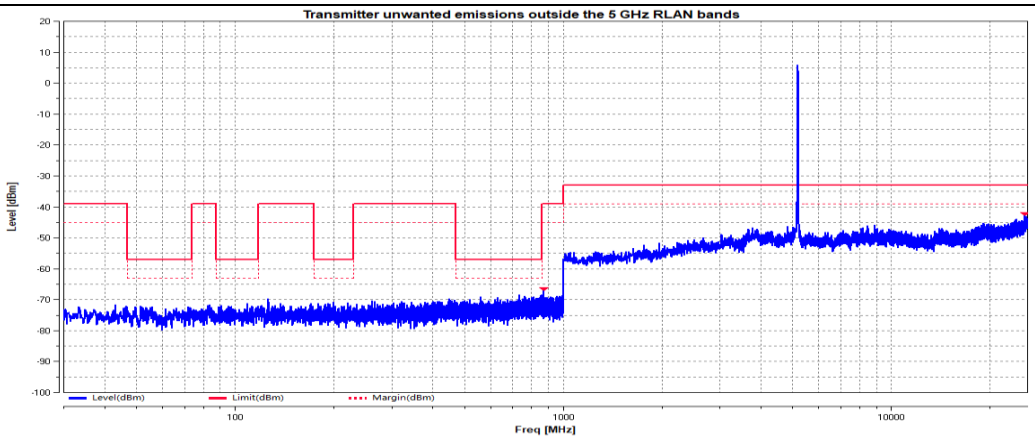
7.6.2. Conducted Test Graphs-Pre-scan



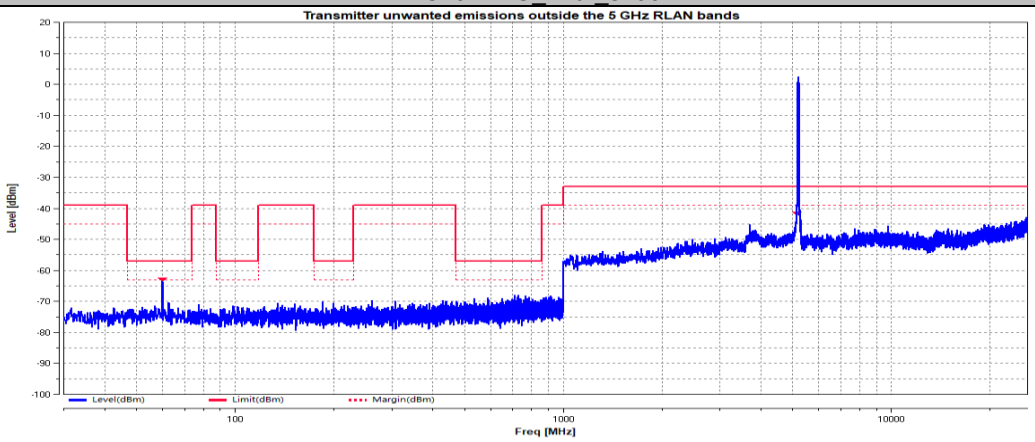
11A_Ant2_5180



11AC20MIMO_Ant2_5180



11AC40MIMO_Ant2_5190

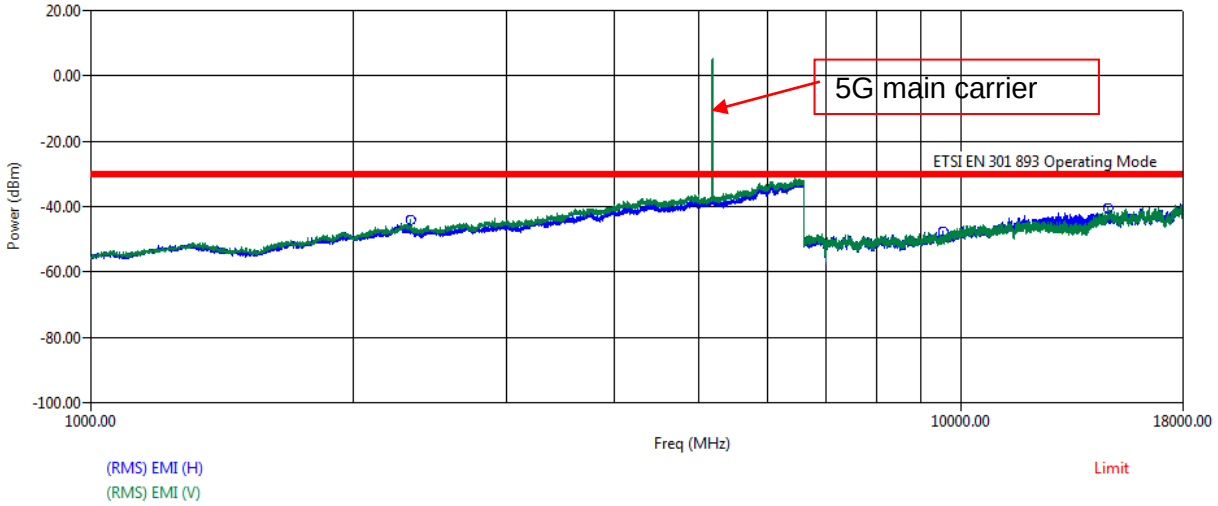


11AC80MIMO_Ant2_5210

Note: All the modes had been tested, but only the worst data was recorded in the report.

7.6.1. Radiated Test Result

Transmitter unwanted emissions outside the 5 GHz RLAN bands above 1 GHz			
Measurement Method	Radiated	Polar:	Horizontal/Vertical
Test Mode:	802.11a	Channel	5180 MHz



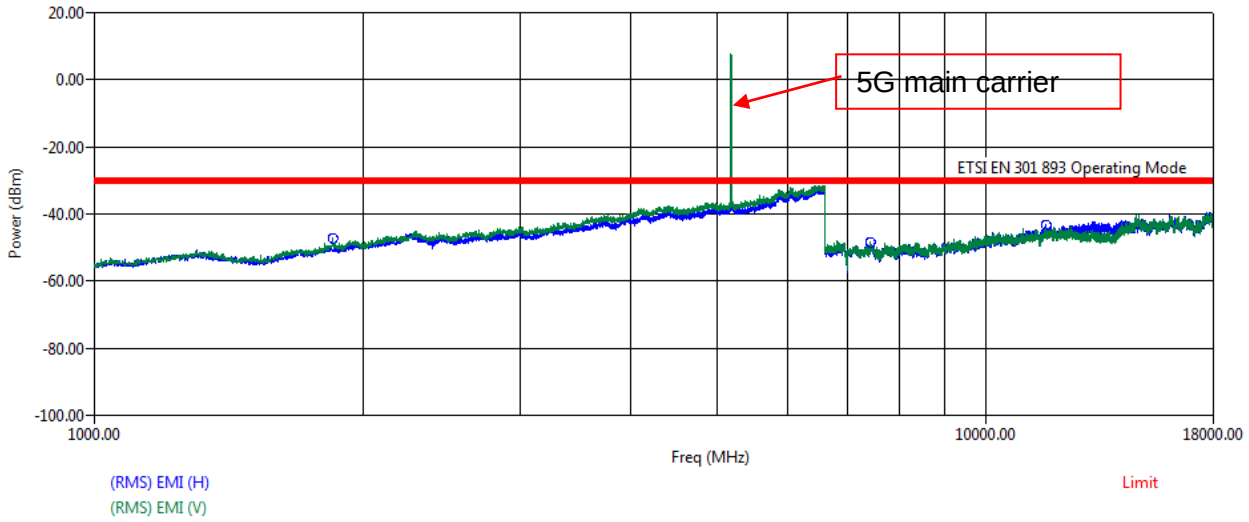
Freq (MHz)	(RMS) Trace (H) (dBuV)	ERP Factor (H) (dB)	Transducer (H) (dB)	Preamp (H) (dB)	Cable (H) (dB)	(RMS) EMI (H) (dBm)	Limit (dBm)	(RMS) Margin (H) (dB)
2326.00	8.62	-62.81	0.00	0.00	6.56	-47.63	-30.00	-17.63
9534.50	41.22	-61.20	0.00	42.11	14.65	-47.45	-30.00	-17.45
14732.50	37.02	-58.34	0.00	41.44	18.99	-43.76	-30.00	-13.76

Freq (MHz)	(RMS) Trace (V) (dBuV)	ERP Factor (V) (dB)	Transducer (V) (dB)	Preamp (V) (dB)	Cable (V) (dB)	(RMS) EMI (V) (dBm)	Limit (dBm)	(RMS) Margin (V) (dB)
2326.00	10.95	-61.65	0.00	0.00	6.56	-44.14	-30.00	-14.14
9534.50	37.36	-61.08	0.00	42.11	14.65	-51.18	-30.00	-21.18
14732.50	39.45	-57.53	0.00	41.44	18.99	-40.52	-30.00	-10.52

Note: EMI=Trace + Cable(Loss) + ERP Factor + Transducer
Margin=EMI – Limit

Note: 5G main carrier has been recorded in the plot.

Transmitter unwanted emissions outside the 5 GHz RLAN bands above 1 GHz			
Measurement Method	Radiated	Polar:	Horizontal/Vertical
Test Mode:	802.11ac VHT20	Channel	5180 MHz



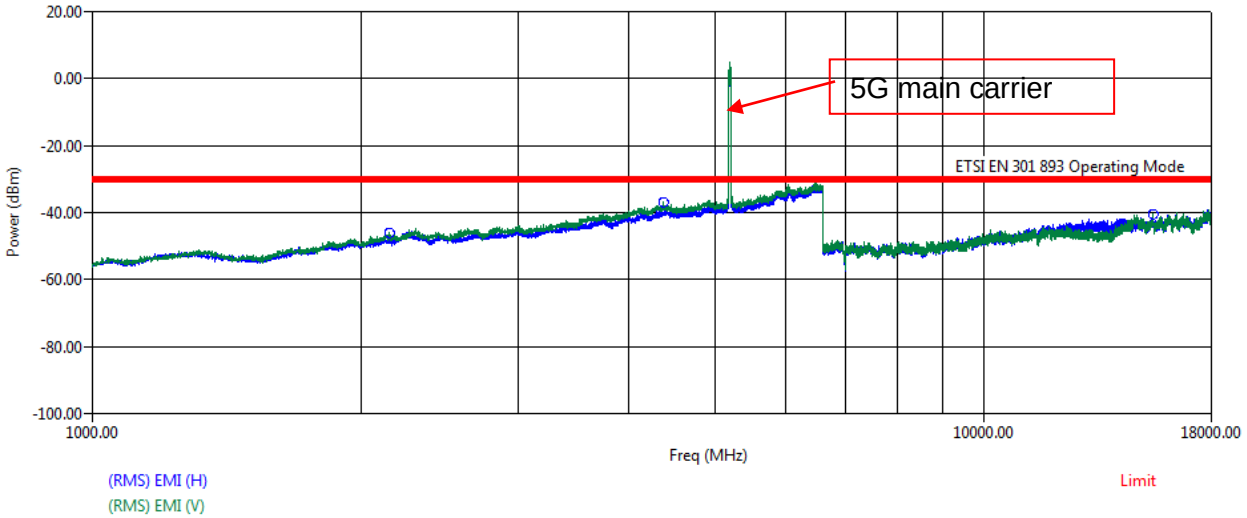
Freq (MHz)	(RMS) Trace (H) (dBuV)	ERP Factor (H) (dB)	Transducer (H) (dB)	Preamp (H) (dB)	Cable (H) (dB)	(RMS) EMI (H) (dBm)	Limit (dBm)	(RMS) Margin (H) (dB)
1850.00	8.12	-64.45	0.00	0.00	5.75	-50.58	-30.00	-20.58
7427.50	40.75	-62.44	0.00	42.04	13.53	-50.20	-30.00	-20.20
11661.50	41.22	-58.82	0.00	42.20	16.62	-43.18	-30.00	-13.18

Freq (MHz)	(RMS) Trace (V) (dBuV)	ERP Factor (V) (dB)	Transducer (V) (dB)	Preamp (V) (dB)	Cable (V) (dB)	(RMS) EMI (V) (dBm)	Limit (dBm)	(RMS) Margin (V) (dB)
1850.00	10.23	-63.32	0.00	0.00	5.75	-47.34	-30.00	-17.34
7427.50	42.52	-62.30	0.00	42.04	13.53	-48.29	-30.00	-18.29
11661.50	39.80	-59.79	0.00	42.20	16.62	-45.57	-30.00	-15.57

Note: EMI=Trace + Cable(Loss) + ERP Factor + Transducer
Margin=EMI – Limit

Note: 5G main carrier has been recorded in the plot.

Transmitter unwanted emissions outside the 5 GHz RLAN bands above 1 GHz			
Measurement Method	Radiated	Polar:	Horizontal/Vertical
Test Mode:	802.11ac VHT40	Channel	5190 MHz



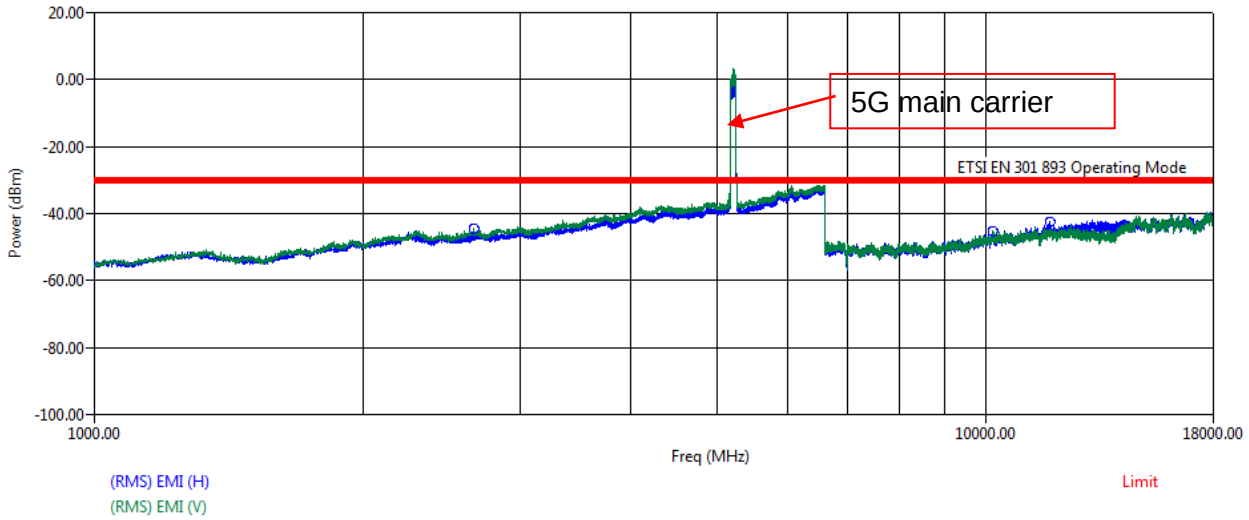
Freq (MHz)	(RMS) Trace (H) (dBuV)	ERP Factor (H) (dB)	Transducer (H) (dB)	Preamp (H) (dB)	Cable (H) (dB)	(RMS) EMI (H) (dBm)	Limit (dBm)	(RMS) Margin (H) (dB)
2148.50	7.93	-63.29	0.00	0.00	6.17	-49.19	-30.00	-19.19
4370.00	11.02	-60.76	0.00	0.00	9.38	-40.37	-30.00	-10.37
15467.50	36.67	-59.93	0.00	41.47	20.32	-44.41	-30.00	-14.41

Freq (MHz)	(RMS) Trace (V) (dBuV)	ERP Factor (V) (dB)	Transducer (V) (dB)	Preamp (V) (dB)	Cable (V) (dB)	(RMS) EMI (V) (dBm)	Limit (dBm)	(RMS) Margin (V) (dB)
2148.50	10.11	-62.13	0.00	0.00	6.17	-45.84	-30.00	-15.84
4370.00	13.22	-59.28	0.00	0.00	9.38	-36.69	-30.00	-6.69
15467.50	40.49	-59.56	0.00	41.47	20.32	-40.22	-30.00	-10.22

Note: EMI=Trace + Cable(Loss) + ERP Factor + Transducer
Margin=EMI – Limit

Note: 5G main carrier has been recorded in the plot.

Transmitter unwanted emissions outside the 5 GHz RLAN bands above 1 GHz			
Measurement Method	Radiated	Polar:	Horizontal/Vertical
Test Mode:	802.11ac VHT80	Channel	5210 MHz



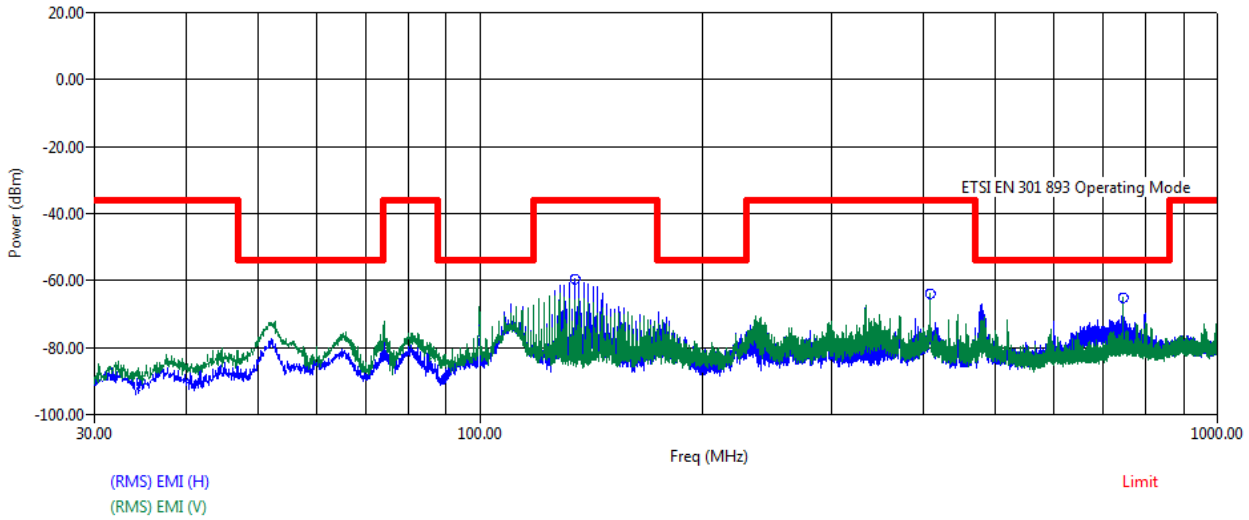
Freq (MHz)	(RMS) Trace (H) (dBuV)	ERP Factor (H) (dB)	Transducer (H) (dB)	Preamp (H) (dB)	Cable (H) (dB)	(RMS) EMI (H) (dBm)	Limit (dBm)	(RMS) Margin (H) (dB)
2660.50	8.34	-63.26	0.00	0.00	7.01	-47.92	-30.00	-17.92
10176.50	39.38	-60.69	0.00	42.20	15.52	-47.99	-30.00	-17.99
11787.00	40.71	-58.06	0.00	42.20	17.13	-42.41	-30.00	-12.41

Freq (MHz)	(RMS) Trace (V) (dBuV)	ERP Factor (V) (dB)	Transducer (V) (dB)	Preamp (V) (dB)	Cable (V) (dB)	(RMS) EMI (V) (dBm)	Limit (dBm)	(RMS) Margin (V) (dB)
2660.50	10.30	-61.80	0.00	0.00	7.01	-44.49	-30.00	-14.49
10176.50	41.93	-60.38	0.00	42.20	15.52	-45.13	-30.00	-15.13
11787.00	36.83	-58.93	0.00	42.20	17.13	-47.16	-30.00	-17.16

Note: EMI=Trace + Cable(Loss) + ERP Factor + Transducer
Margin=EMI – Limit

Note: 5G main carrier has been recorded in the plot.

Transmitter unwanted emissions outside the 5 GHz RLAN bands below 1 GHz worst case			
Measurement Method	Radiated	Polar:	Horizontal/Vertical
Test Mode:	802.11a	Channel	5180 MHz



Freq (MHz)	(RMS) Trace (H) (dBuV)	ERP Factor (H) (dB)	Transducer (H) (dB)	Preamp (H) (dB)	Cable (H) (dB)	(RMS) EMI (H) (dBm)	Limit (dBm)	(RMS) Margin (H) (dB)
134.30	70.59	-88.82	0.00	42.67	1.53	-59.37	-36.00	-23.37
408.00	52.86	-82.48	0.00	42.73	2.70	-69.65	-36.00	-33.65
746.00	40.90	-78.21	0.00	42.54	3.72	-76.13	-54.00	-22.13

Freq (MHz)	(RMS) Trace (V) (dBuV)	ERP Factor (V) (dB)	Transducer (V) (dB)	Preamp (V) (dB)	Cable (V) (dB)	(RMS) EMI (V) (dBm)	Limit (dBm)	(RMS) Margin (V) (dB)
134.30	65.09	-89.80	0.00	42.67	1.53	-65.85	-36.00	-29.85
408.00	58.16	-81.81	0.00	42.73	2.70	-63.68	-36.00	-27.68
746.00	51.57	-77.94	0.00	42.54	3.72	-65.19	-54.00	-11.19

Note: EMI=Trace + Cable(Loss) + ERP Factor + Transducer
Margin=EMI – Limit

Note All the modes had been tested, but only the worst data was recorded in the report.

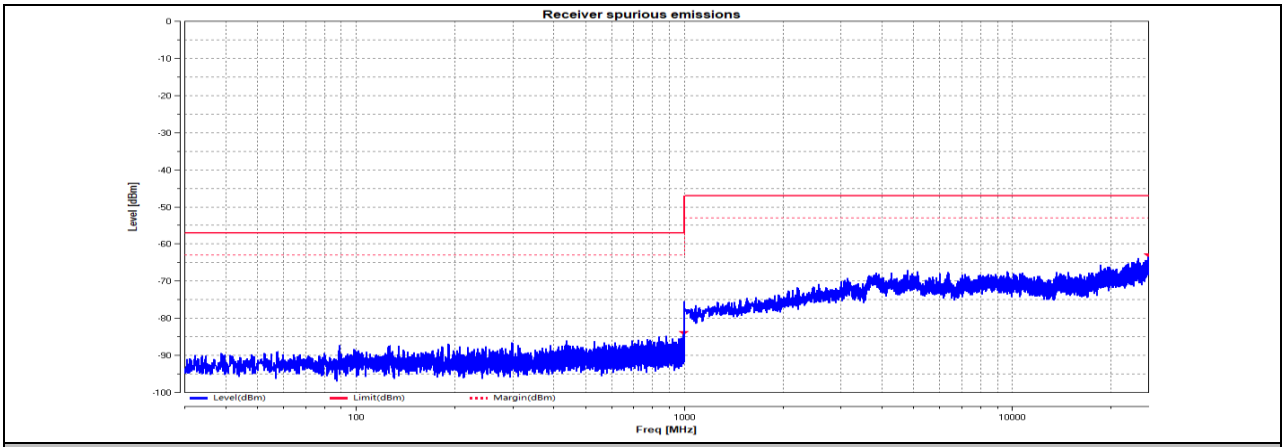
7.7. Appendix G: Receiver Spurious Emissions

7.7.1. Conducted Test Result-Pre-scan

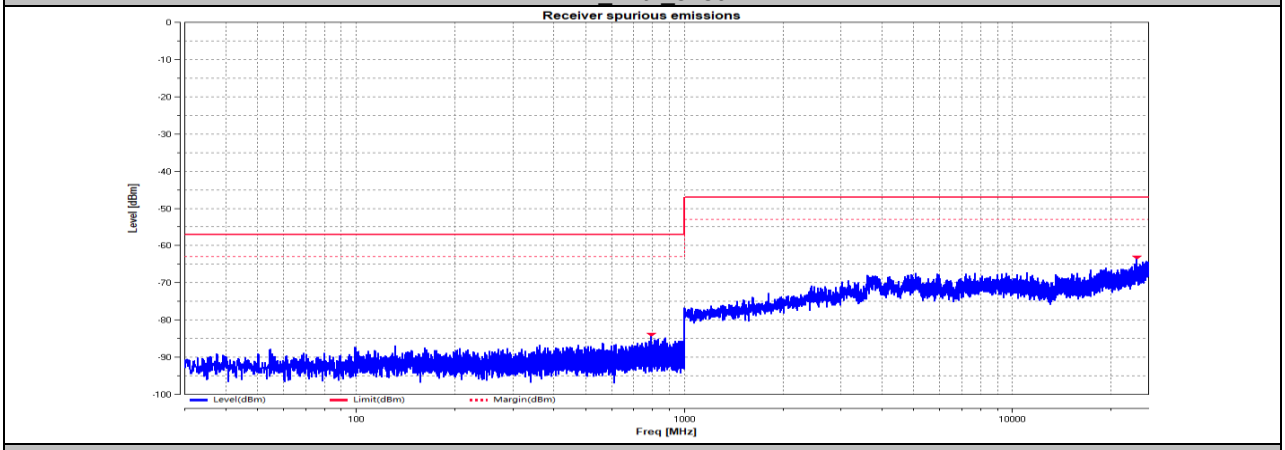
Test Mode	Antenna	Channel	Freq. [MHz]	Level[dBm]	Limit[dBm]	Verdict
11A	Ant2	5180	995.88	-84.45	-57.00	PASS
			25918.75	-63.57	-47.00	PASS
11AC20MIMO	Ant2	5180	795.21	-84.43	-57.00	PASS
			23884.38	-63.77	-47.00	PASS
11AC40MIMO	Ant2	5190	996.36	-84.77	-57.00	PASS
			25856.25	-62.51	-47.00	PASS
11AC80MIMO	Ant2	5210	930.89	-84.85	-57.00	PASS
			25796.88	-62.49	-47.00	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

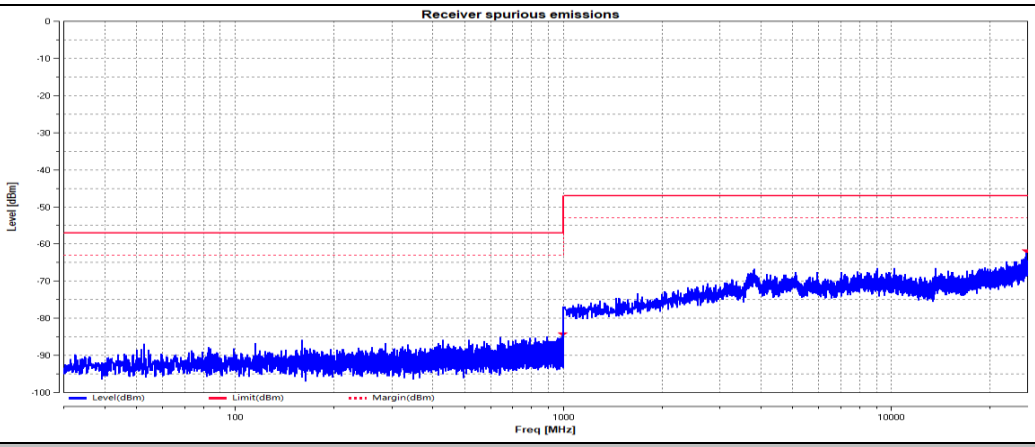
7.7.2. Conducted Test Graphs-Pre-scan



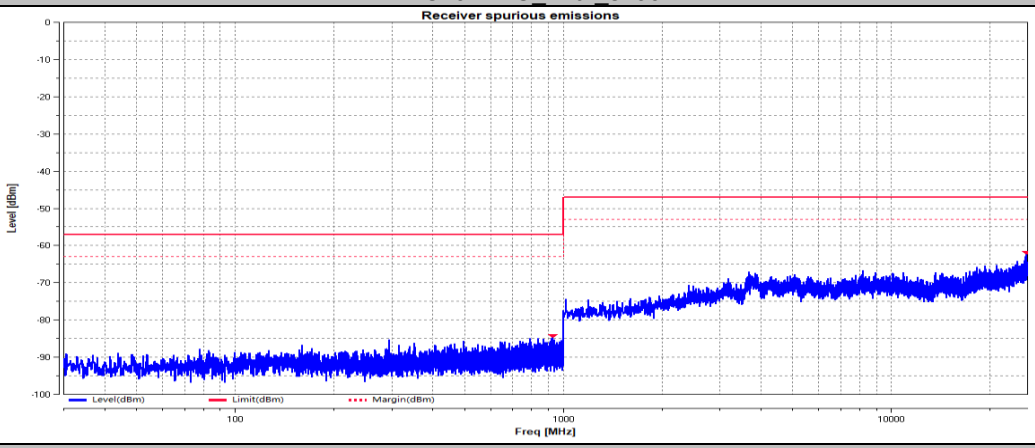
11A_Ant2_5180



11AC20MIMO_Ant2_5180



11AC40MIMO_Ant2_5190

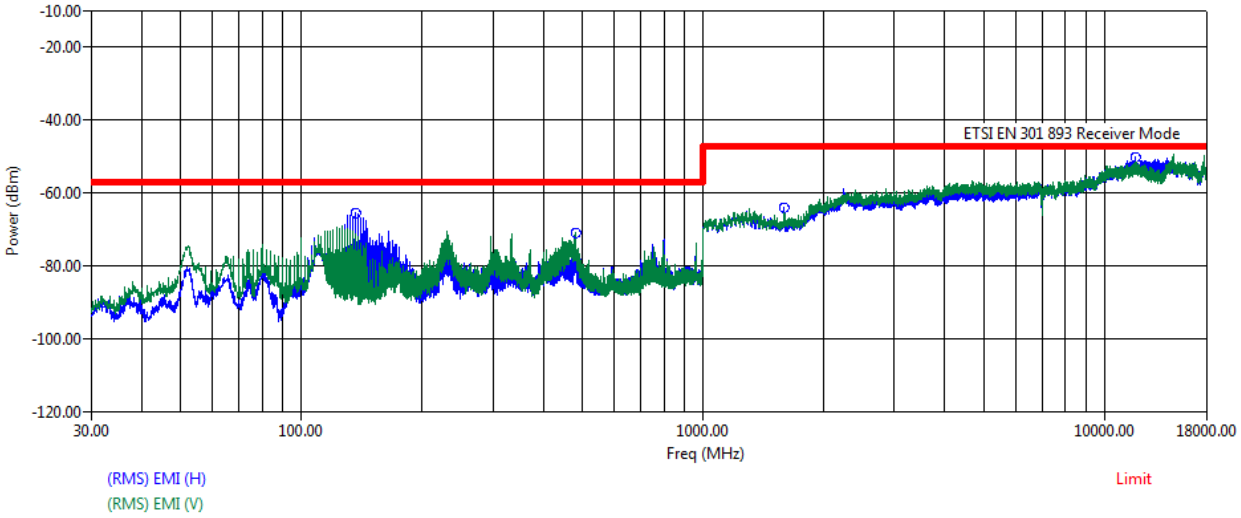


11AC80MIMO_Ant2_5210

Note: All the modes had been tested, but only the worst data was recorded in the report.

7.7.3. Radiated Test Result

Receiver spurious emissions above 1 GHz worst case			
Pressure:	101kPa	Measurement Method	Radiated
Test Mode:	802.11a	Channel	5180MHz



Freq (MHz)	(RMS) Trace (H) (dBuV)	ERP Factor (H) (dB)	Transducer (H) (dB)	Cable (H) (dB)	Preamp (H) (dB)	(RMS) EMI (H) (dBm)	Limit (dBm)	(RMS) Margin (H) (dB)
136.30	64.55	-88.95	0.00	1.56	42.67	-65.52	-57.00	-8.52
480.00	48.18	-81.93	0.00	2.90	42.79	-73.63	-57.00	-16.63
1594.00	45.79	-66.72	0.00	5.77	48.62	-63.79	-47.00	-16.79
11947.00	39.43	-58.37	0.00	16.11	47.20	-50.03	-47.00	-3.03
Freq (MHz)	**(RMS) Trace (V) (dBuV)**	**ERP Factor (V) (dB)**	**Transducer (V) (dB)**	**Cable (V) (dB)**	**Preamp (V) (dB)**	**(RMS) EMI (V) (dBm)**	**Limit (dBm)**	**(RMS) Margin (V) (dB)**
136.30	59.51	-89.61	0.00	1.56	42.67	-71.21	-57.00	-14.21
480.00	50.76	-81.67	0.00	2.90	42.79	-70.79	-57.00	-13.79
1594.00	41.95	-66.09	0.00	5.77	48.62	-66.99	-47.00	-19.99
11947.00	36.74	-59.09	0.00	16.11	47.20	-53.44	-47.00	-6.44

Note: EMI=Trace + Cable(Loss) + ERP Factor + Transducer
Margin=EMI – Limit

Note All the modes had been tested, but only the worst data was recorded in the report.

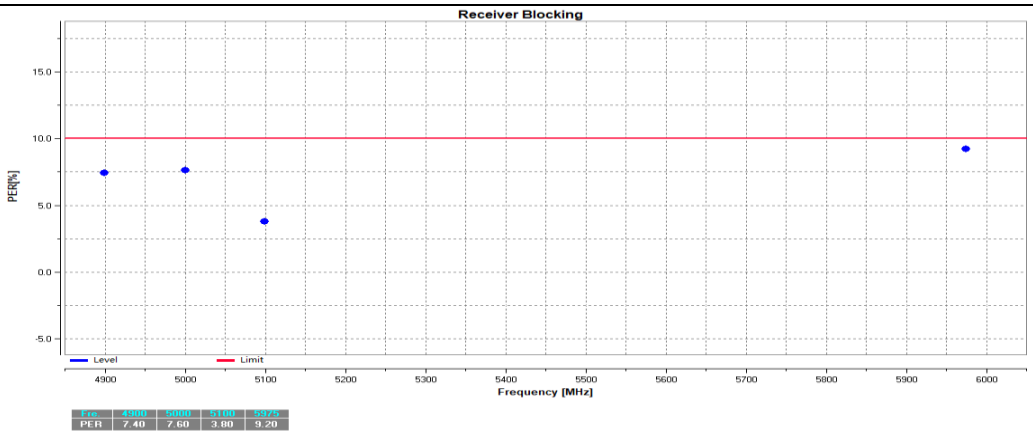
7.8. Appendix H: Receiver Blocking

7.8.1. Test Result

Test Mode	Antenna	Channel	Pmin [dBm]	Wanted signal [dBm]	Freq. [MHz]	CW [dBm]	PER [%]	Limit [%]	Verdict
11A	Ant2	5180	-92.1	-86.1	4900	-42.64	7.40	<=10	PASS
			-92.1	-86.1	5000	-42.64	7.60	<=10	PASS
			-92.1	-86.1	5100	-48.64	3.80	<=10	PASS
			-92.1	-86.1	5975	-42.64	9.20	<= 10	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

7.8.2. Test Graphs



11A_Ant2_5180

Note: All the modes had been tested, but only the worst data was recorded in the report.

7.9. Appendix I: Adaptivity

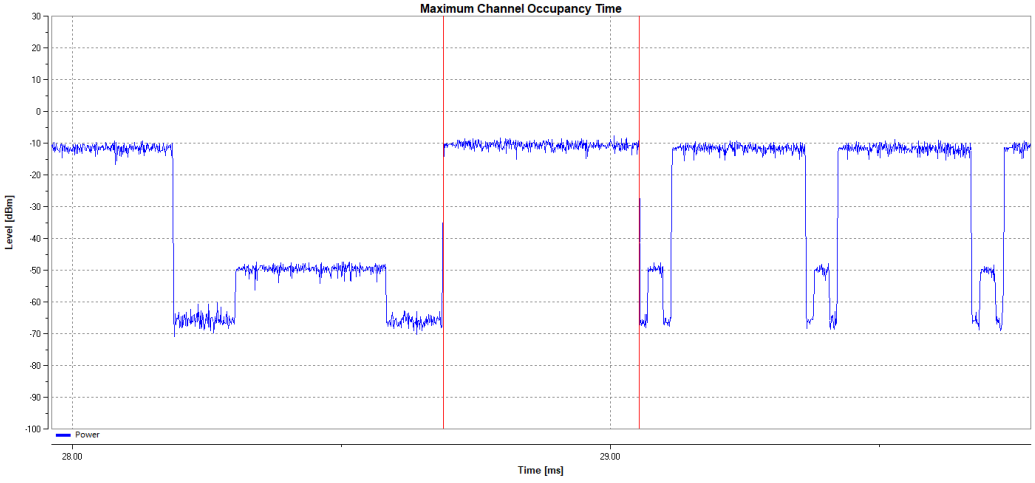
7.9.1. Test Result

Test Mode	Antenna	Channel	Priority Class	COT Num [n]	Max. COT [ms]	Limit [ms]	Min.Idle Time[ms]	Limit [ms]	Idle Period probability	Verdict
11AC20MIMO	Ant2	5180	2	0	0.346	6.000	0.06	0.027	See the graph	PASS
11AC40MIMO	Ant2	5190	2	0	0.249	6.000	0.061	0.027	See the graph	PASS

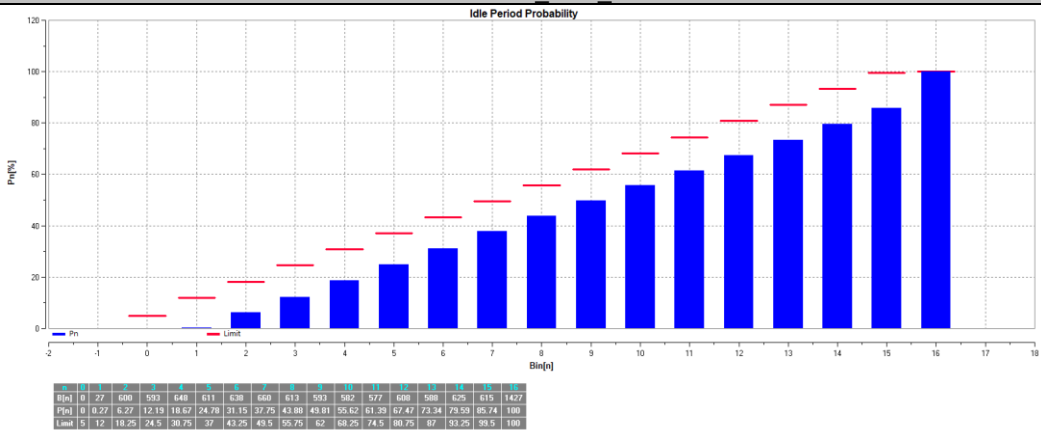
Test Mode	Antenna	Channel	Interference Type	Add interference Time [ms]	Interference Level [dBm/MHz]	Max. Short Control number [n]	Limit [n]	Max. Short Control Time [ms]	Limit [ms]	Verdict
11AC20MIMO	Ant2	5180	AWGN	2014	-71.99	0	50	0.80	2.5	PASS
			LTE	2014	-71.99	0	50	2.40	2.5	PASS
			OFDM	2014	-71.99	0	50	0.00	2.5	PASS
11AC40MIMO	Ant2	5180	AWGN	2014	-71.99	0	50	0.20	2.5	PASS
		5190	AWGN	2014	-71.99	0	50	0.60	2.5	PASS

Note: All the modes had been tested, but only the worst data was recorded in the report.

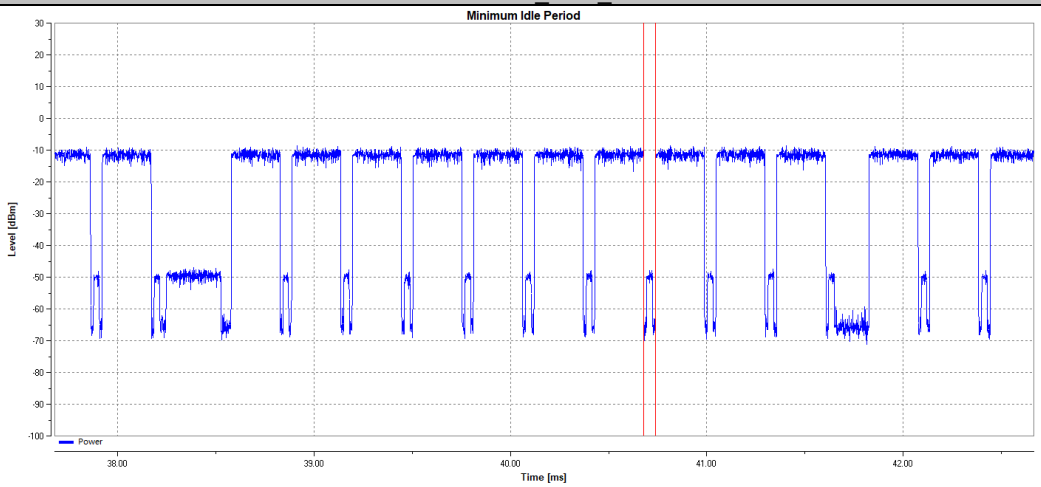
7.9.2. Test Graphs



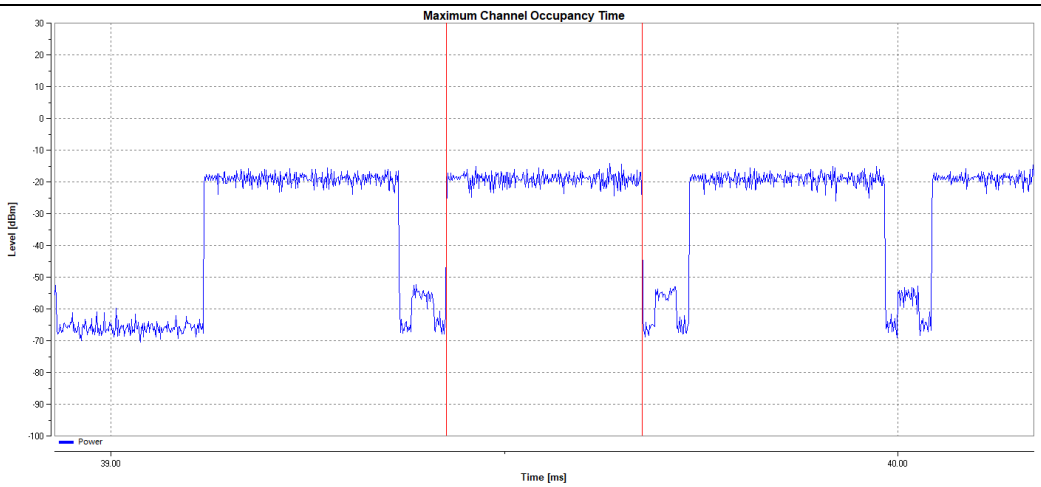
11AC20MIMO_Ant2_5180



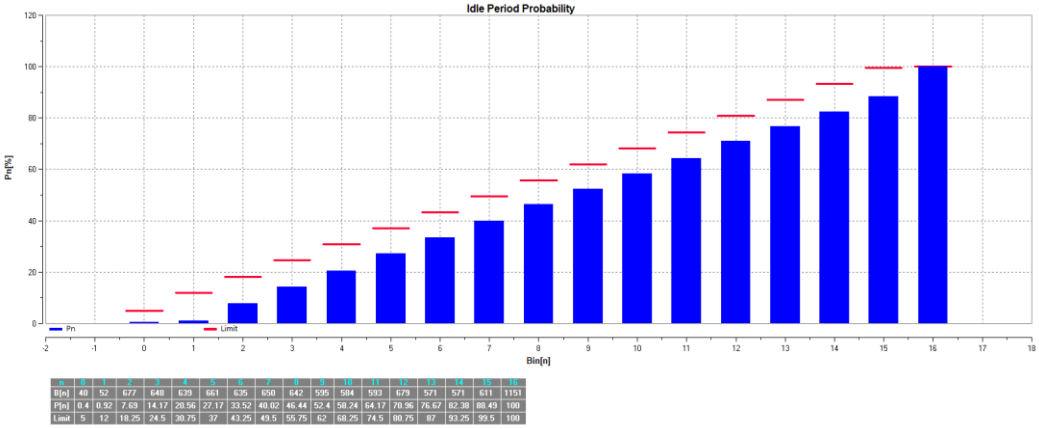
11AC20MIMO_Ant2_5180



11AC20MIMO_Ant2_5180

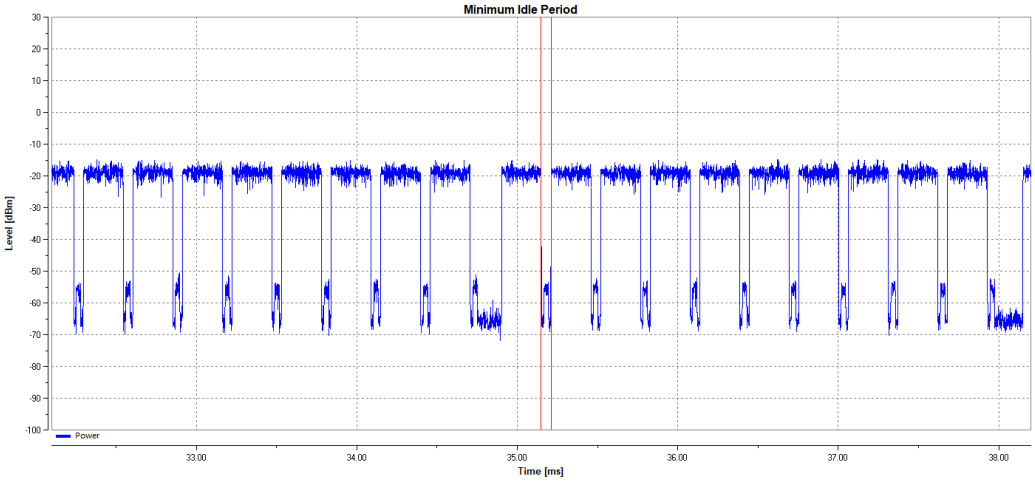


11AC40MIMO_Ant2_5190

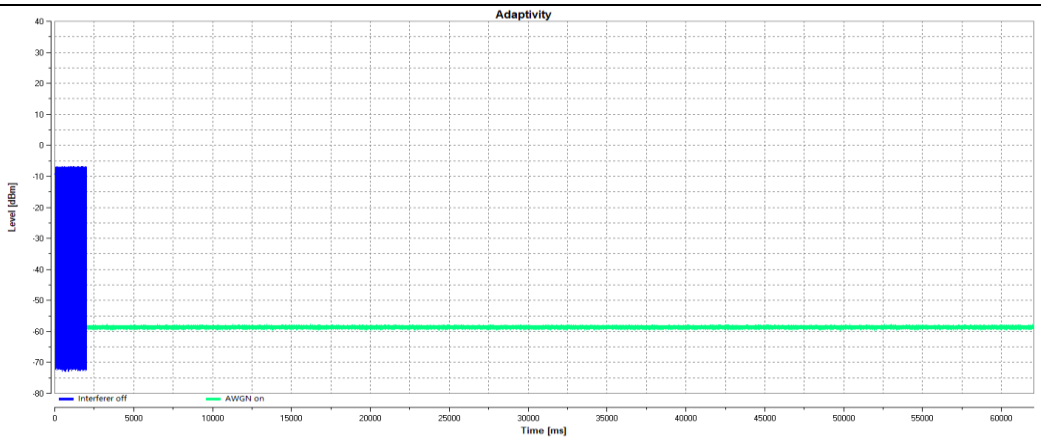


n	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B[n]	40	52	677	648	639	661	635	650	642	595	584	593	679	571	571	611	1151
P[n]	0.4	0.92	7.69	14.17	20.56	27.17	33.52	40.02	46.44	52.4	58.24	64.17	70.96	76.67	82.38	88.49	100
Limit	5	12	18.25	24.5	30.75	37	43.25	49.5	55.75	62	68.25	74.5	80.75	87	93.25	99.5	100

11AC40MIMO_Ant2_5190



11AC40MIMO_Ant2_5190



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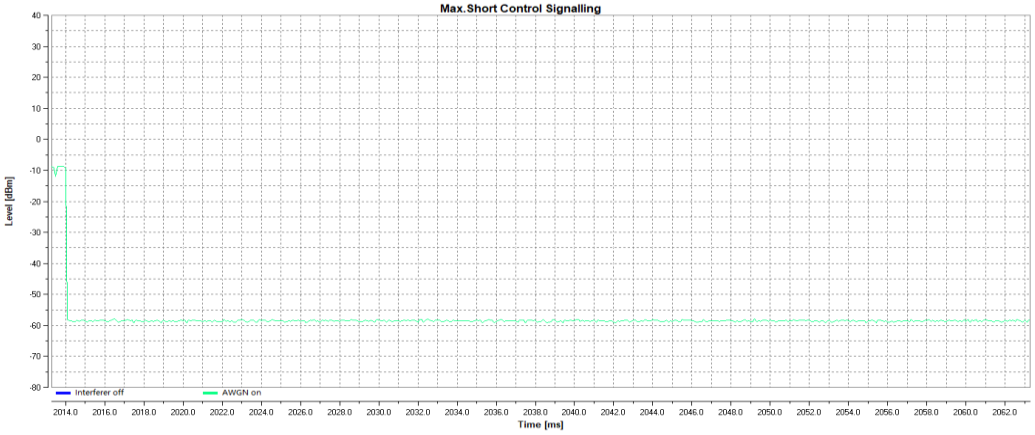

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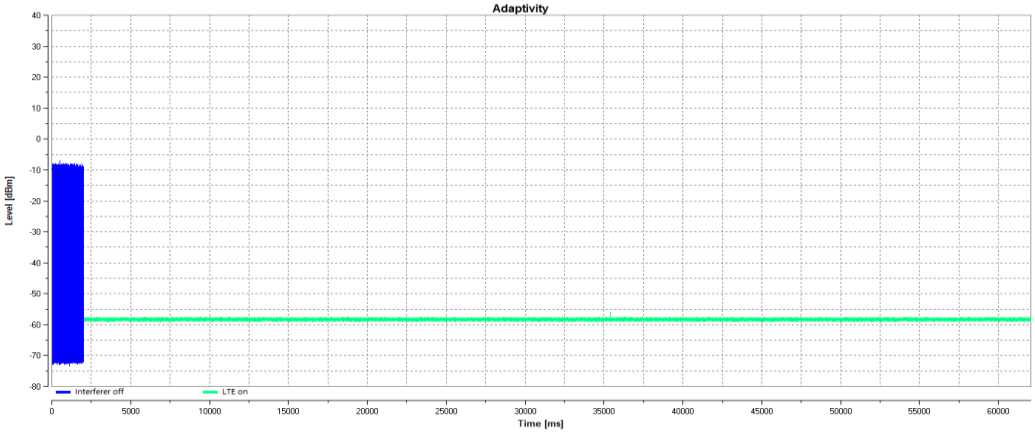
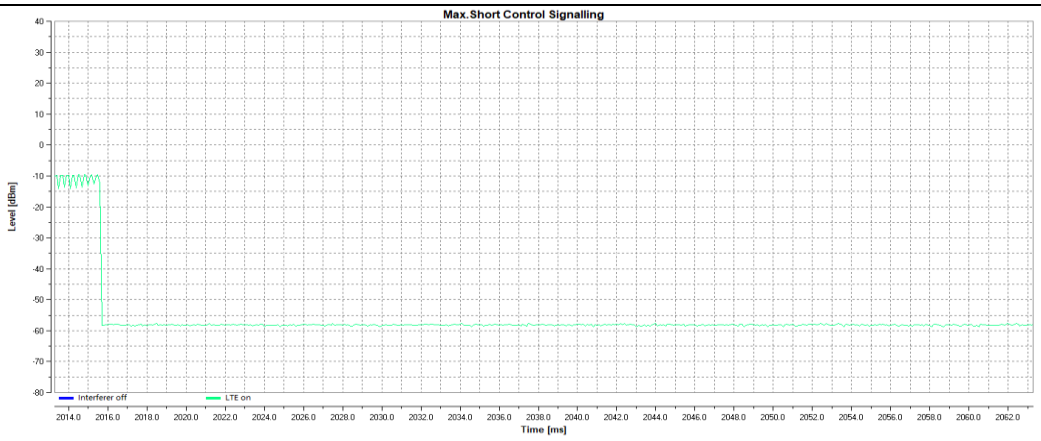


11AC20MIMO_Ant2_5180



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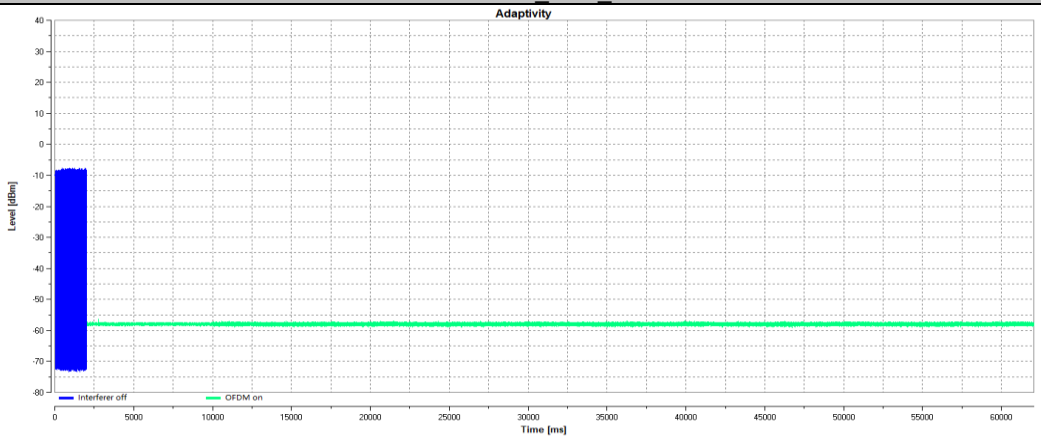

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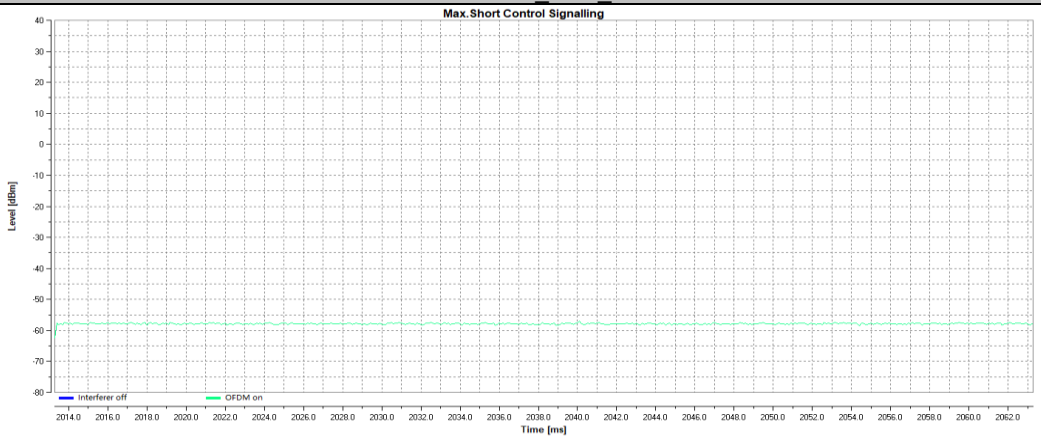

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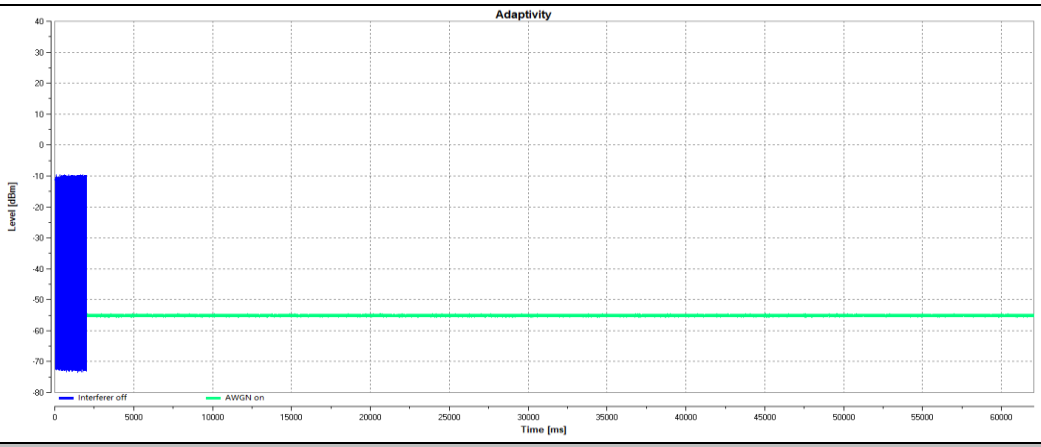

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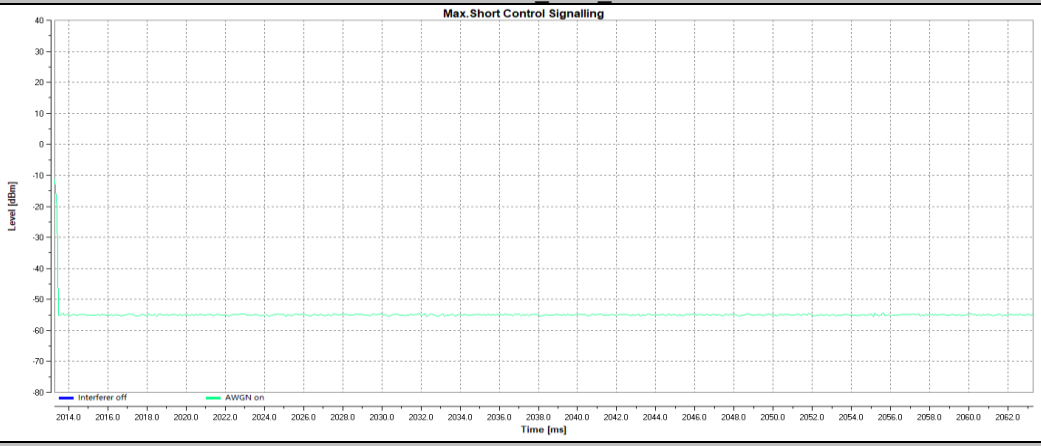

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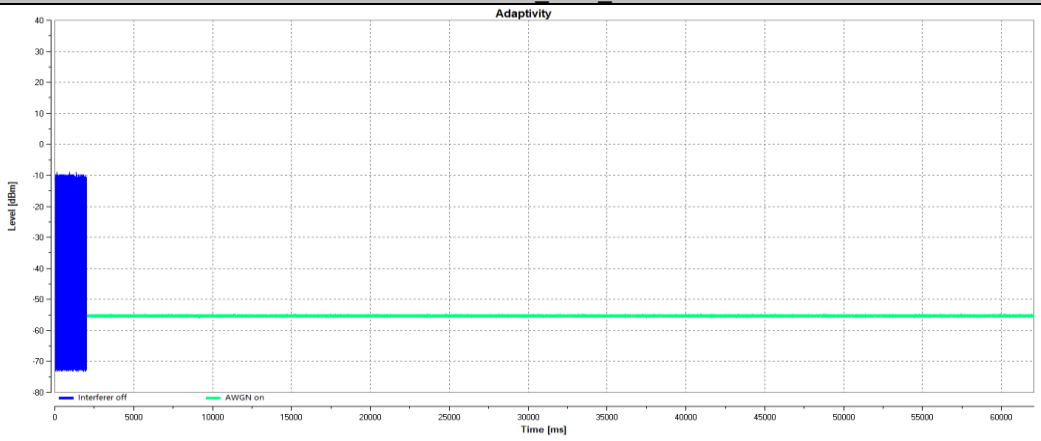

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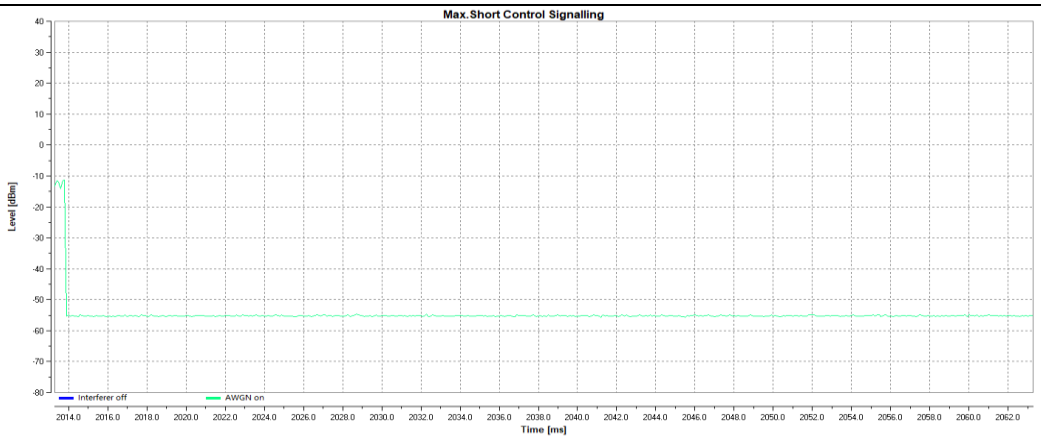

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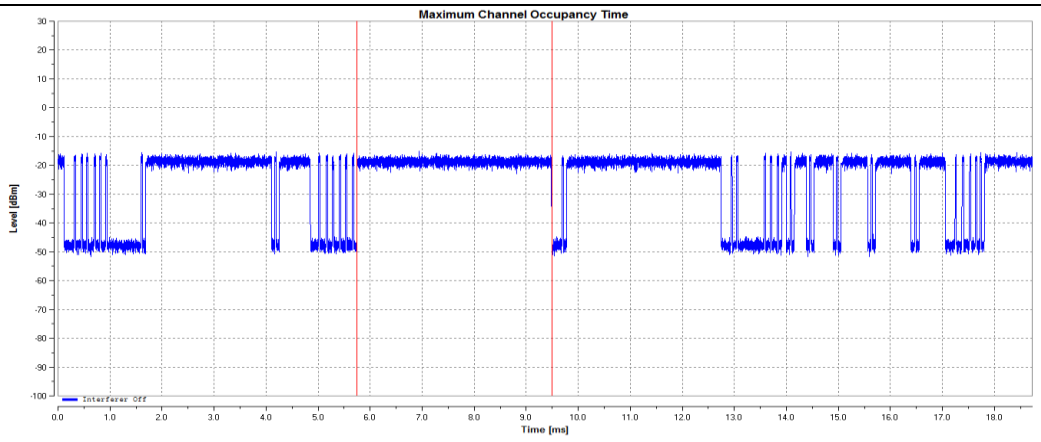

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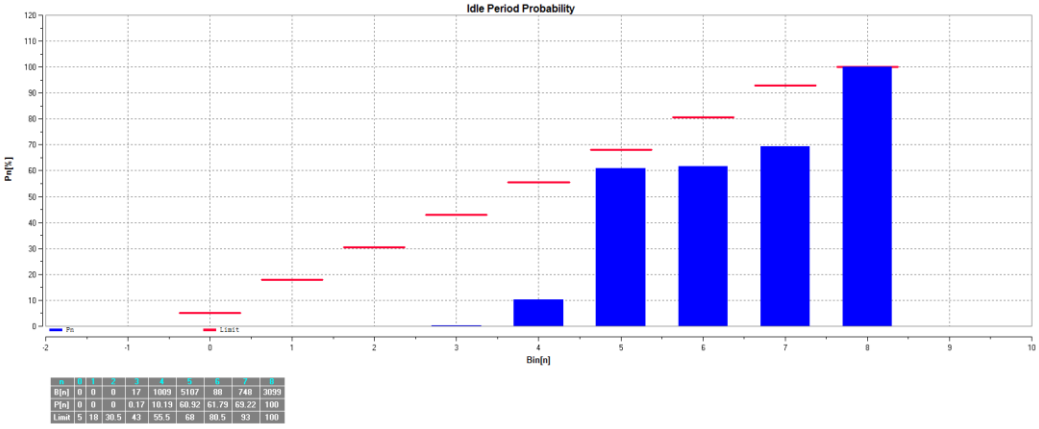
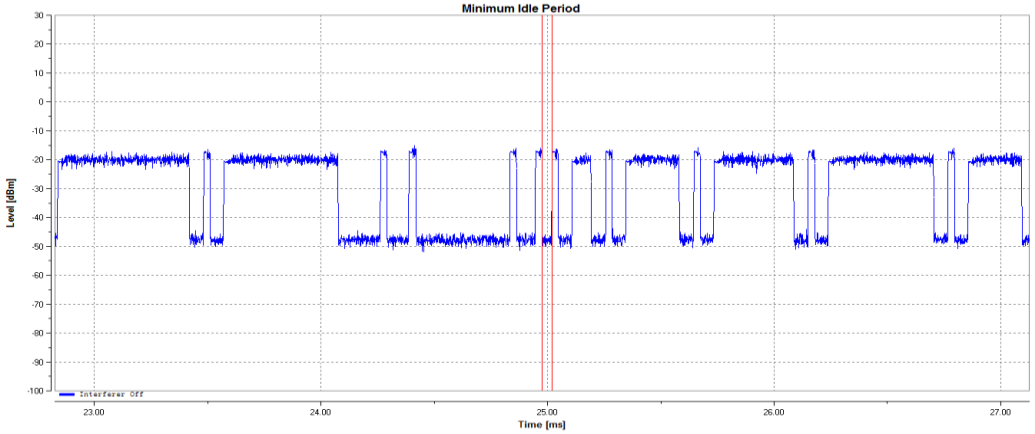
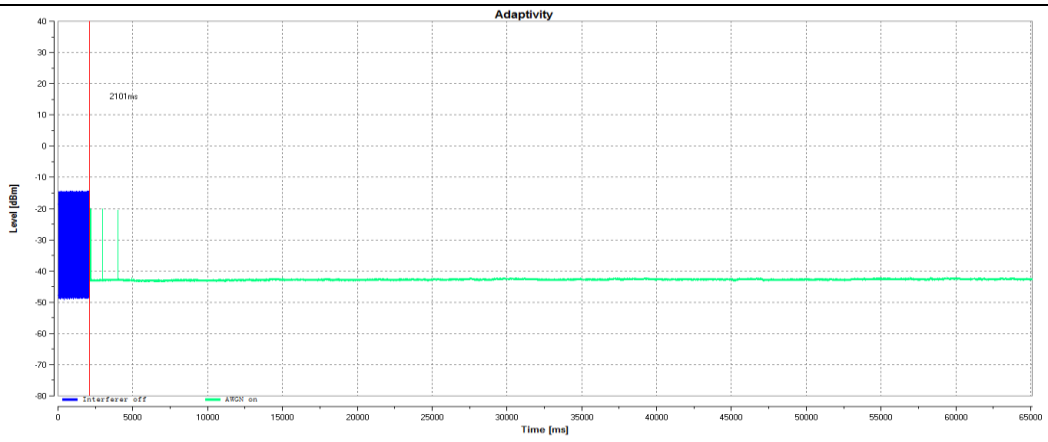


n	0	1	2	3	4	5	6	7	8
B[n]	0	0	0	17	1009	5107	88	748	3099
P[n]	0	0	0	0.17	10.19	68.92	61.79	69.22	100
Limit	5	18	30.5	43	55.5	68	80.5	93	100

11AC40SISO_Ant1_5190





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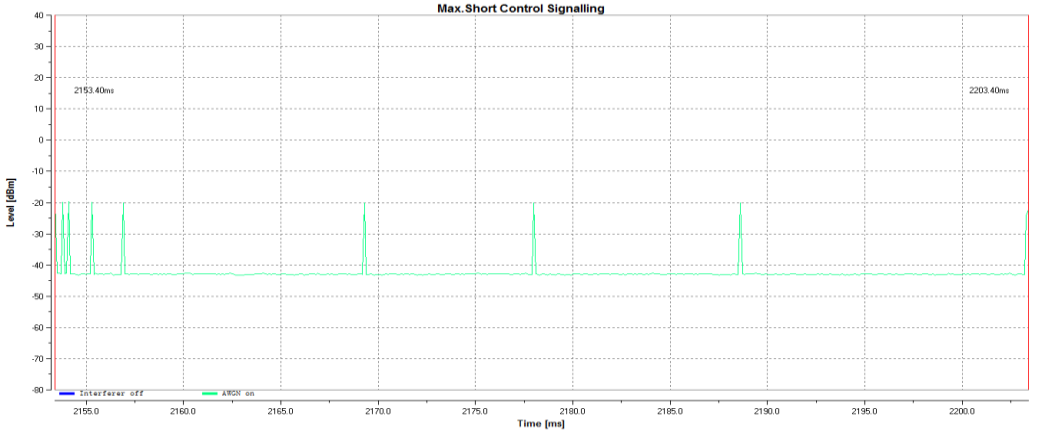

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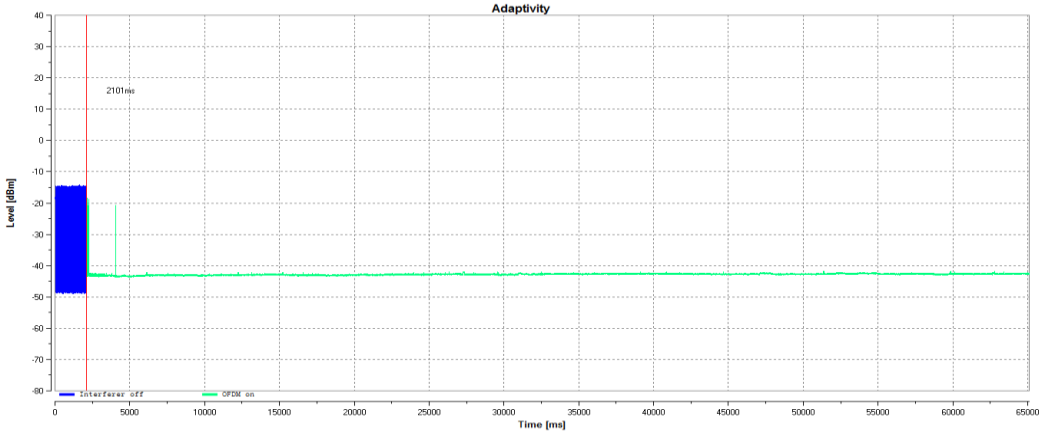

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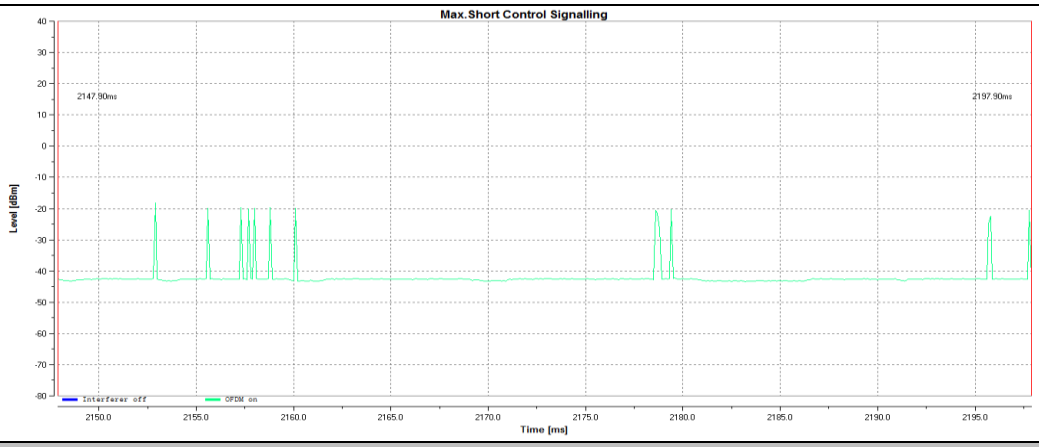

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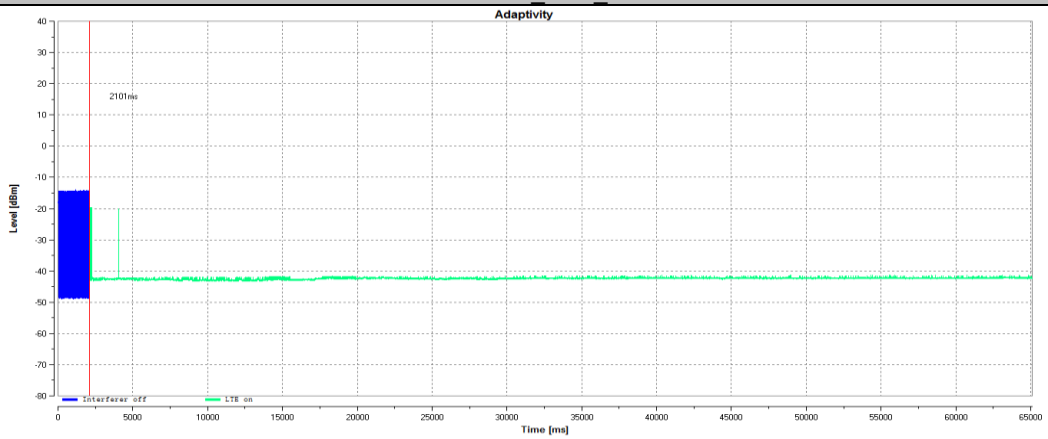

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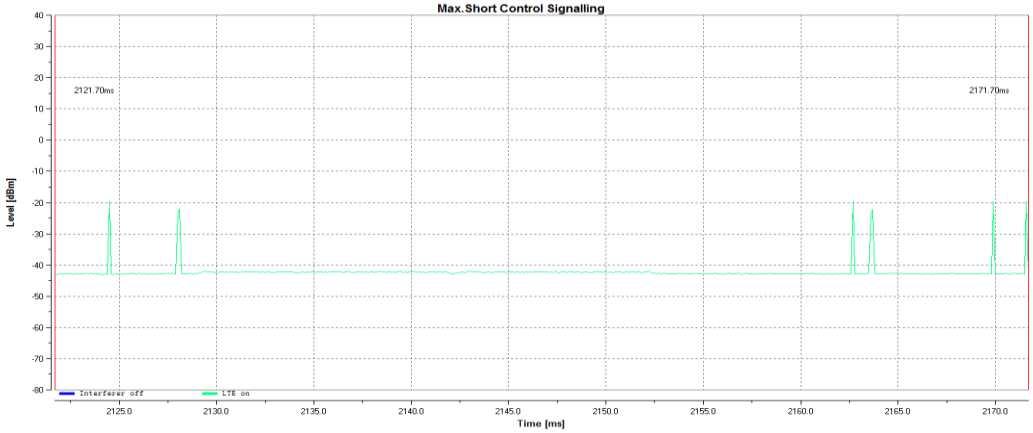

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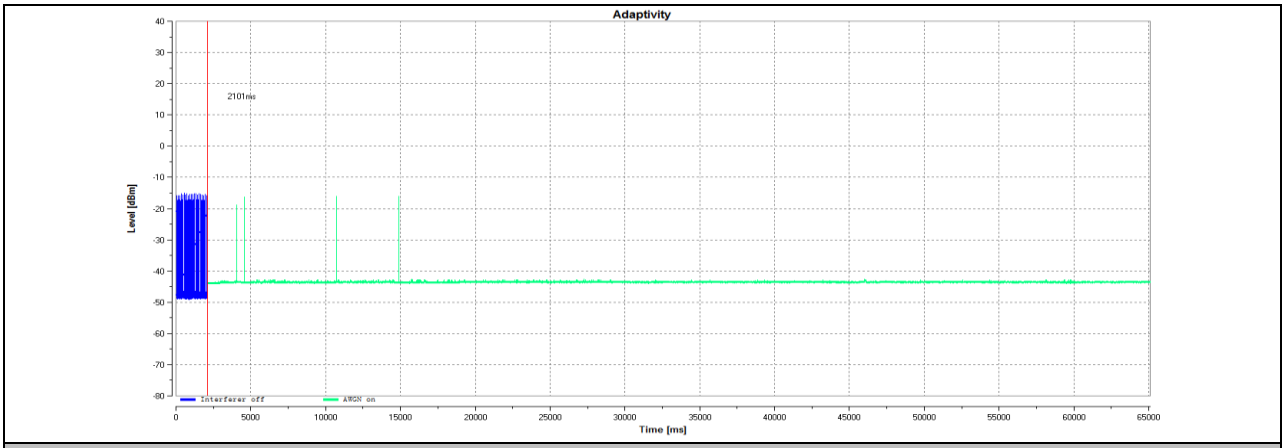
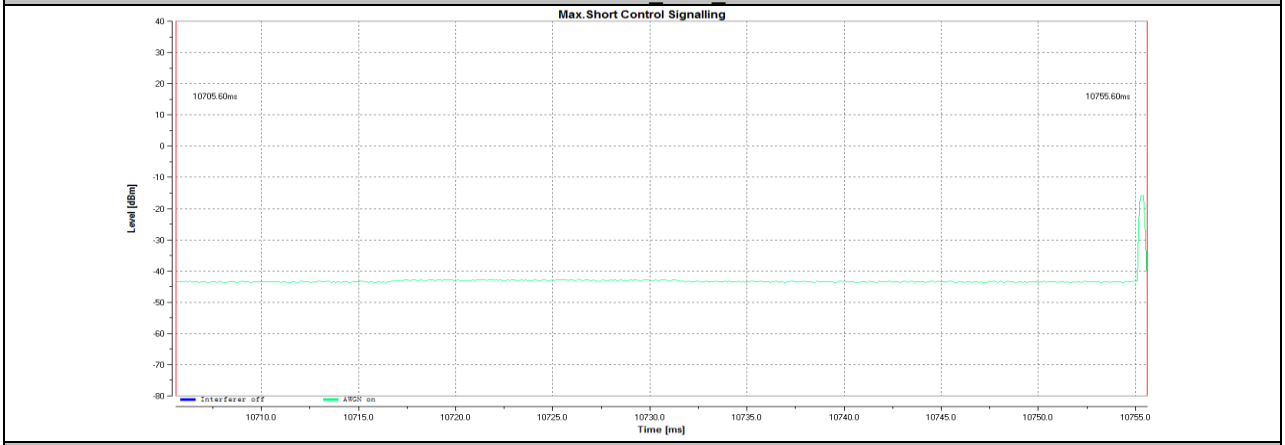


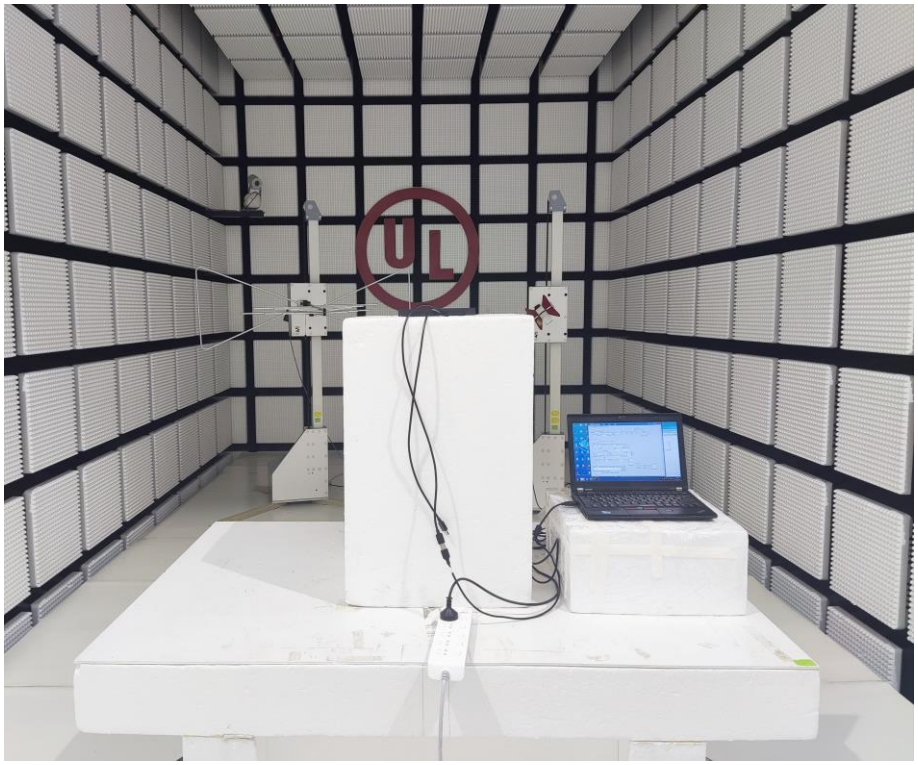
11AC40SISO_Ant1_5190



11AC40SISO_Ant1_5190

Note: All the modes had been tested, but only the worst data was recorded in the report.

RADIATED SPURIOUS EMISSIONS TEST PHOTOS



END OF REPORT