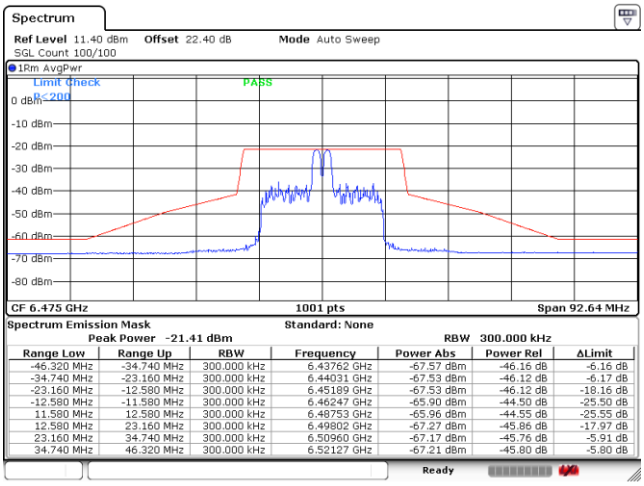
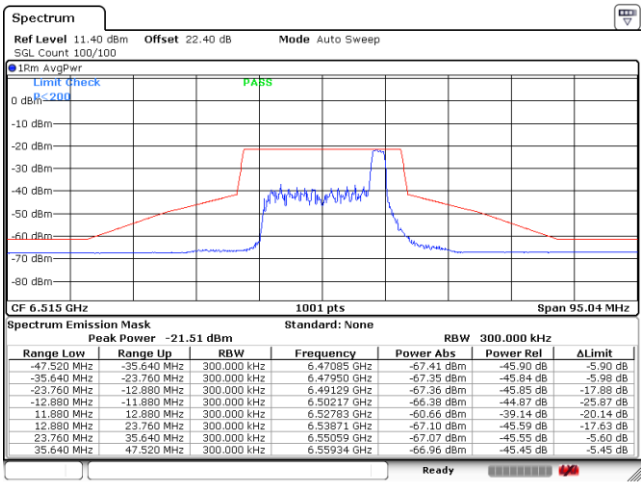
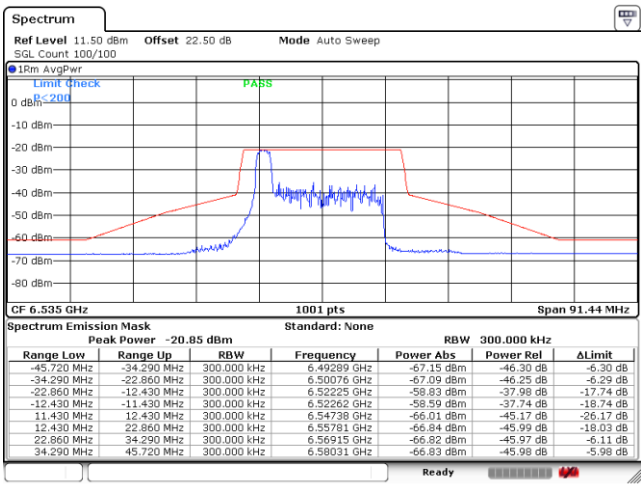
Plot on Channel 6475MHz



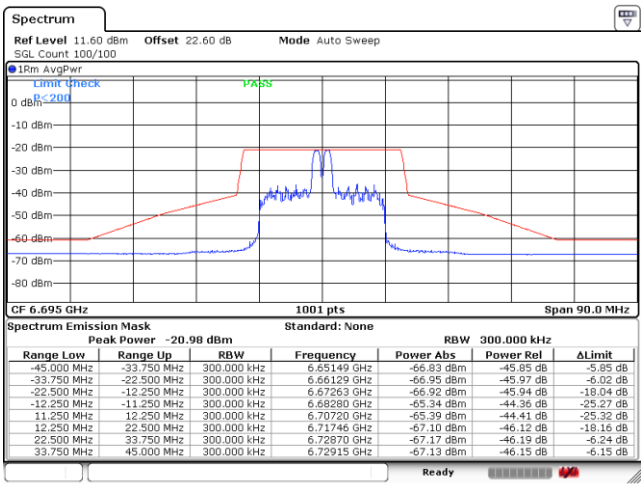
Plot on Channel 6515MHz



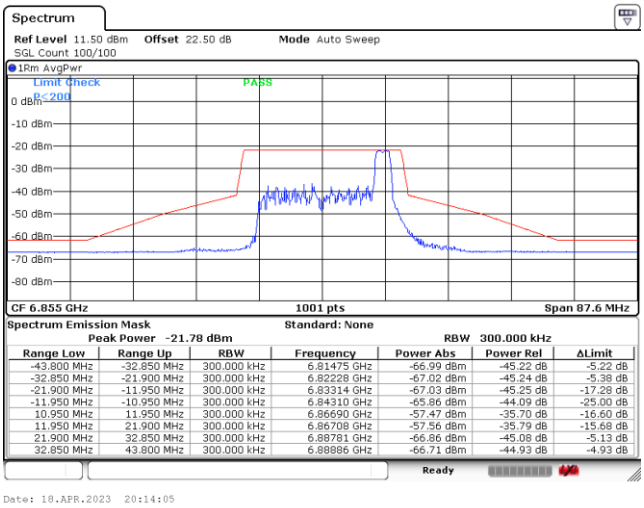
Plot on Channel 6535MHz



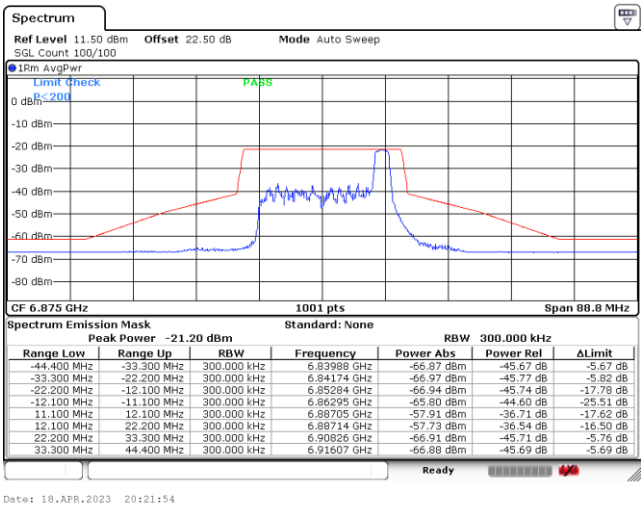
Plot on Channel 6695MHz



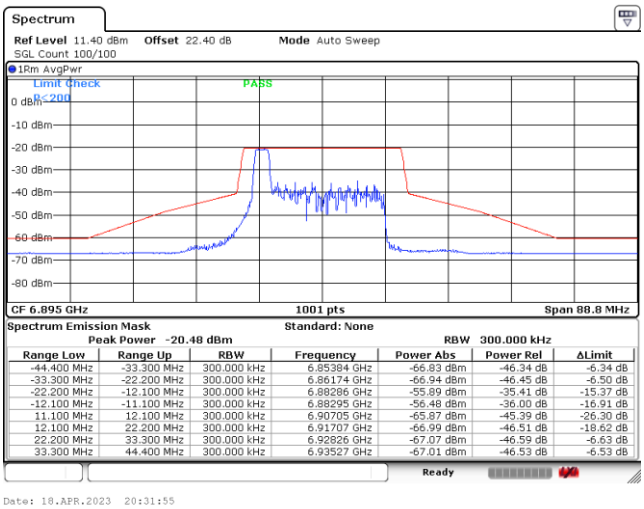
Plot on Channel 6855MHz



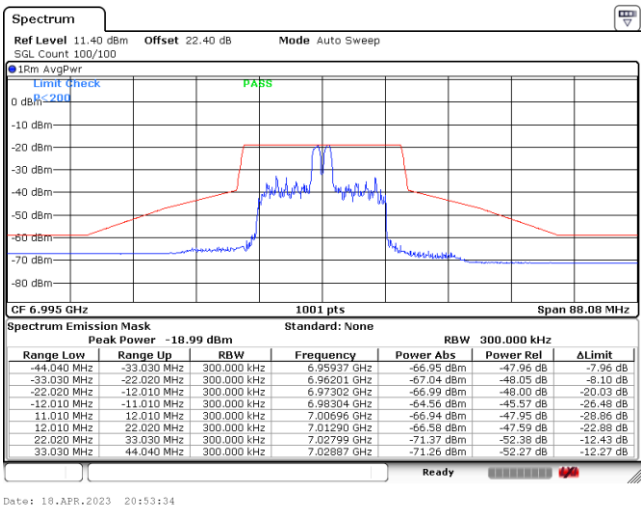
Plot on Channel 6875MHz



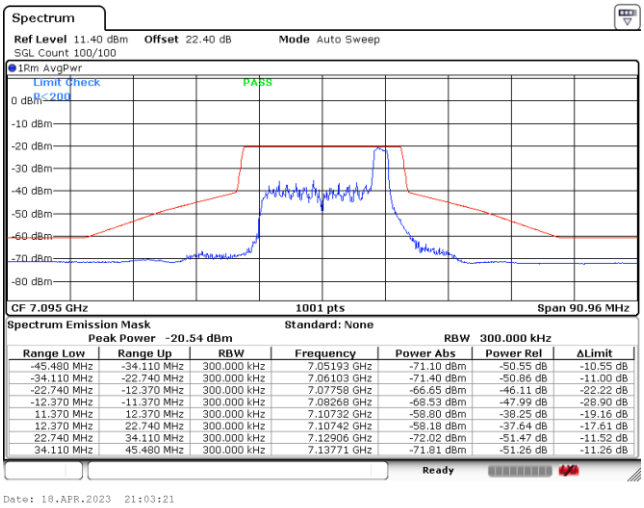
Plot on Channel 6895MHz



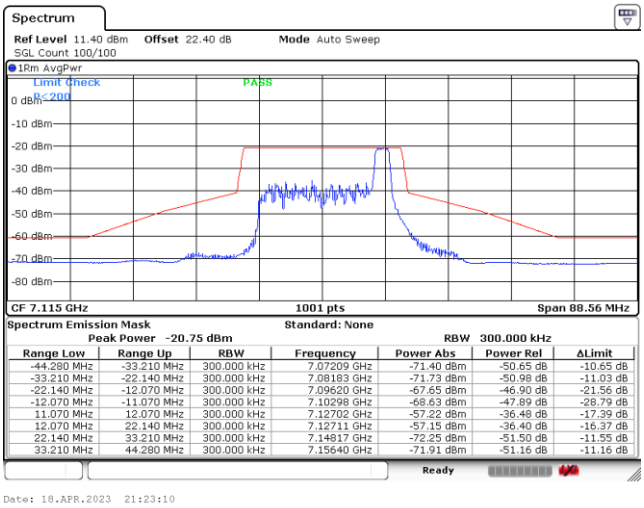
Plot on Channel 6995MHz



Plot on Channel 7095MHz

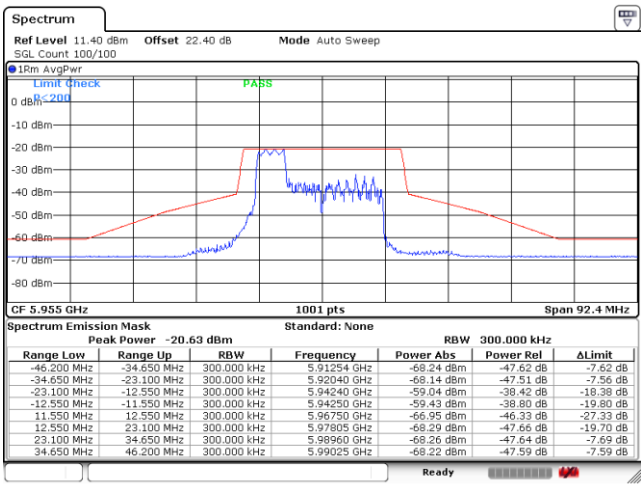


Plot on Channel 7115MHz

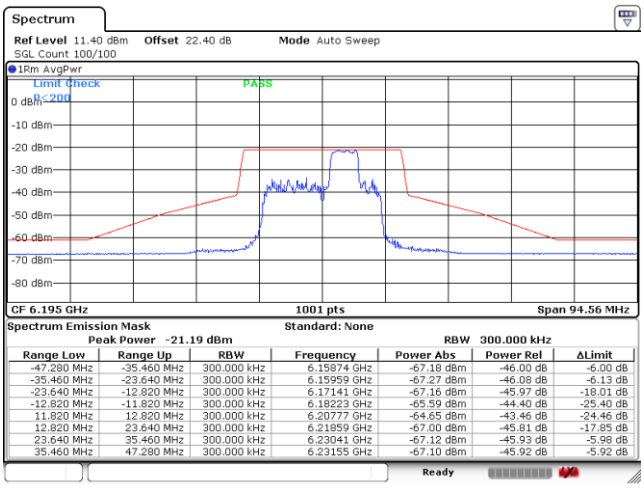


EUT Mode :	802.11ax HE20 52RU

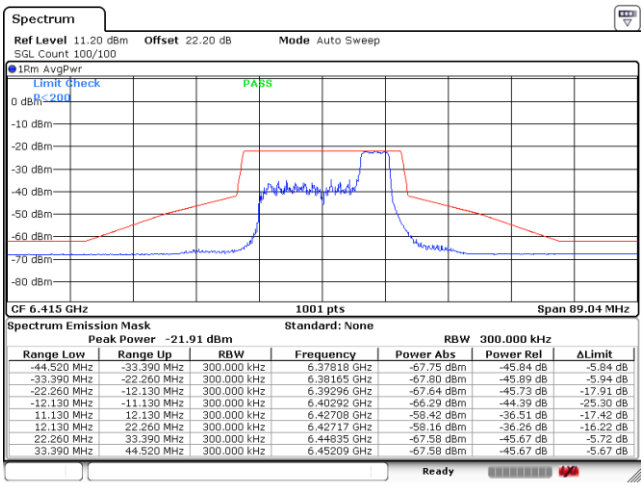
Plot on Channel 5955MHz



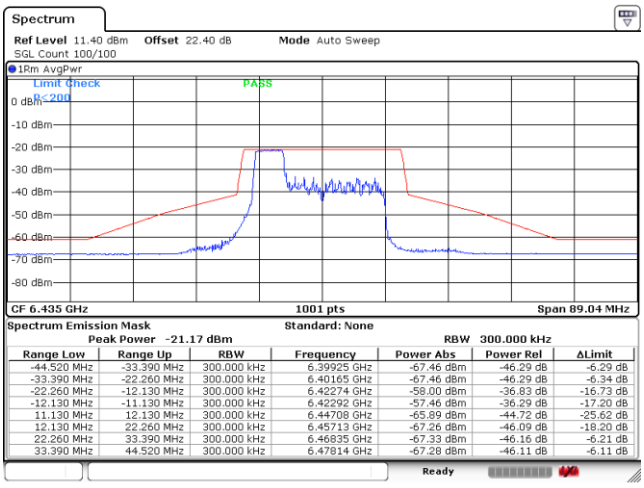
Plot on Channel 6195MHz



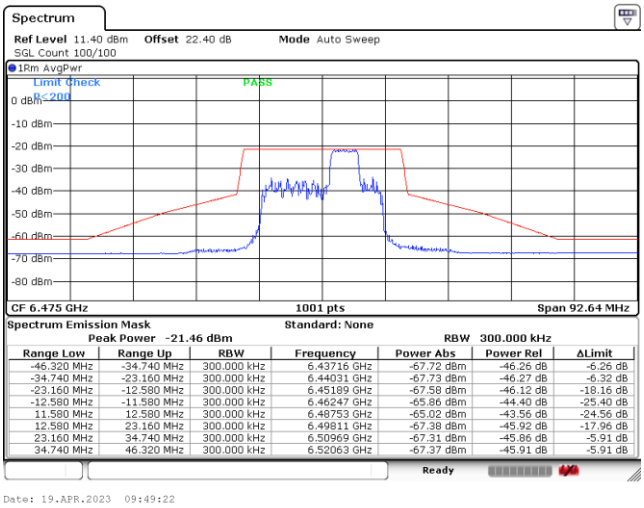
Plot on Channel 6415MHz



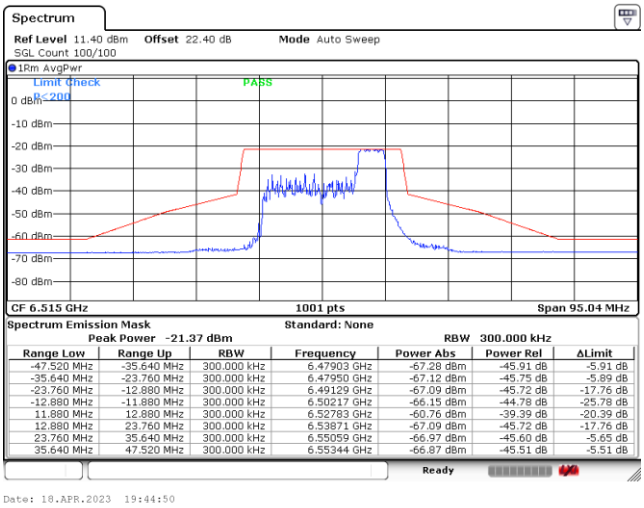
Plot on Channel 6435MHz



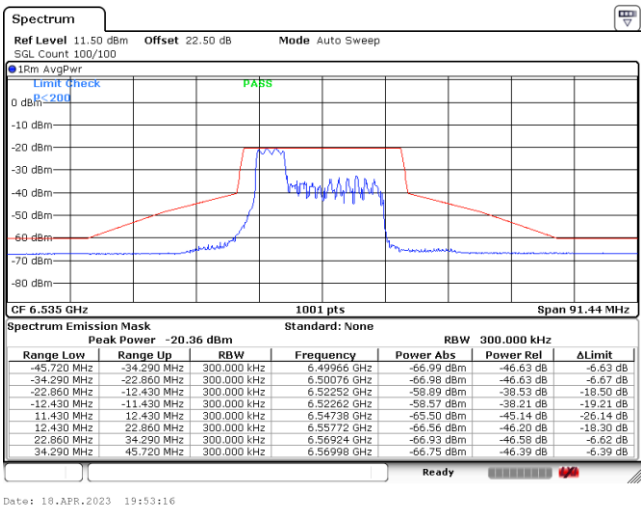
Plot on Channel 6475MHz



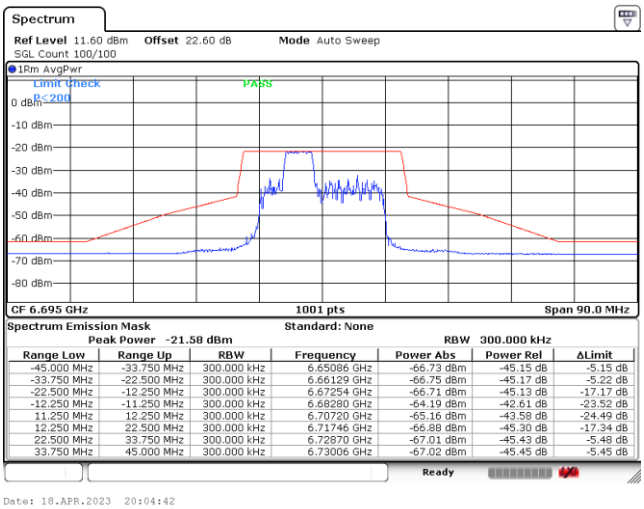
Plot on Channel 6515MHz



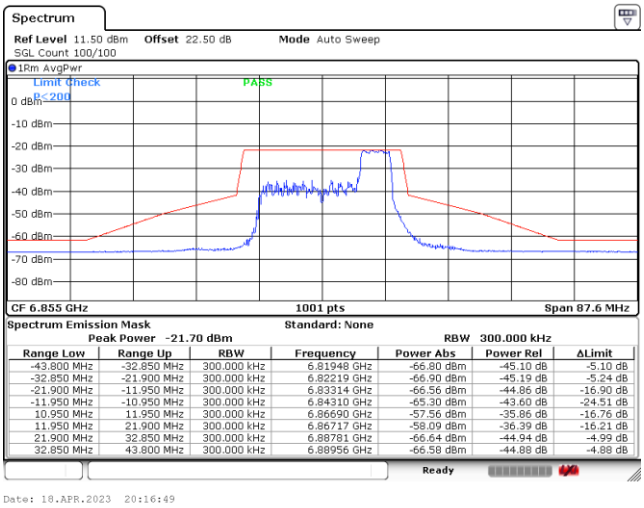
Plot on Channel 6535MHz



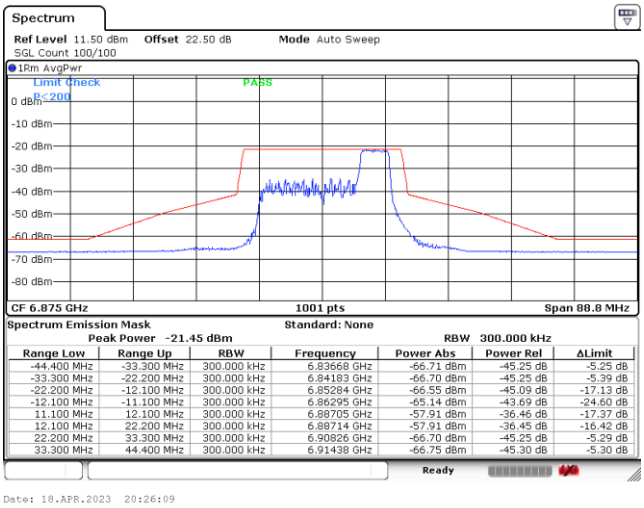
Plot on Channel 6695MHz



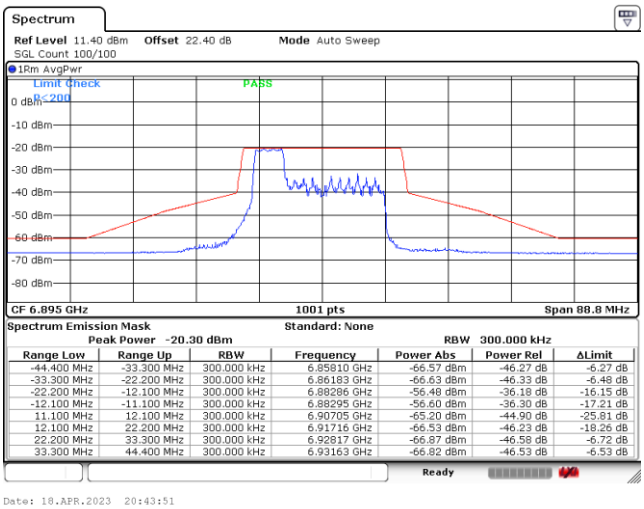
Plot on Channel 6855MHz



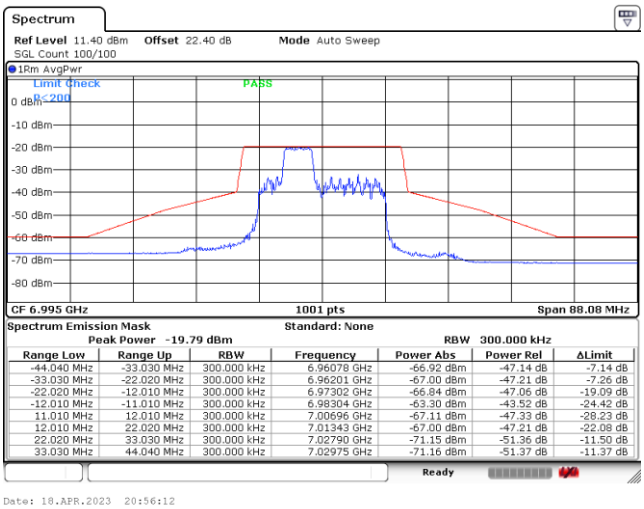
Plot on Channel 6875MHz



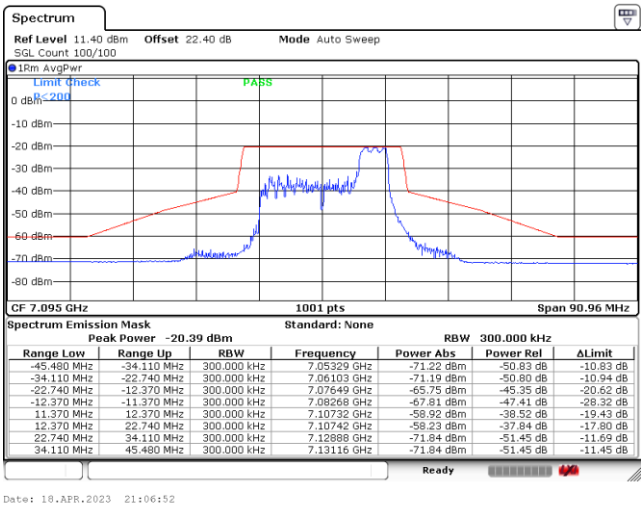
Plot on Channel 6895MHz



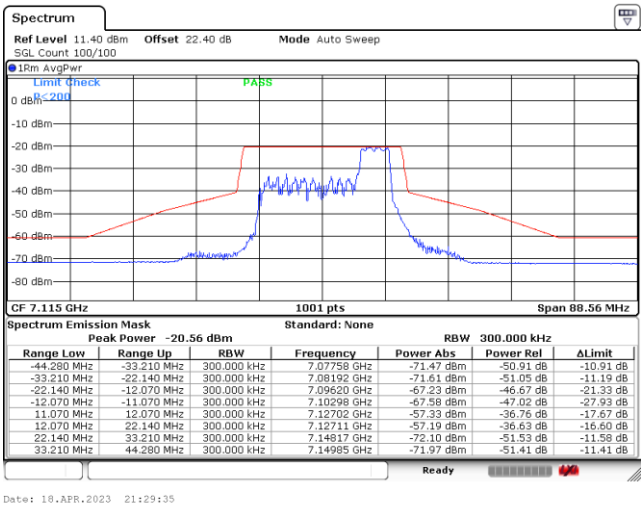
Plot on Channel 6995MHz



Plot on Channel 7095MHz

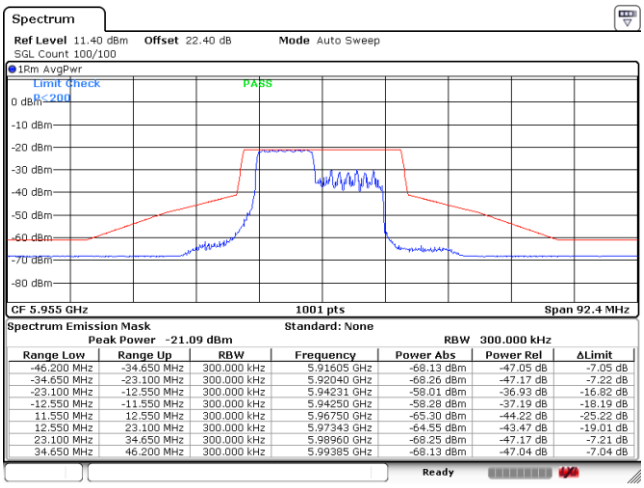


Plot on Channel 7115MHz

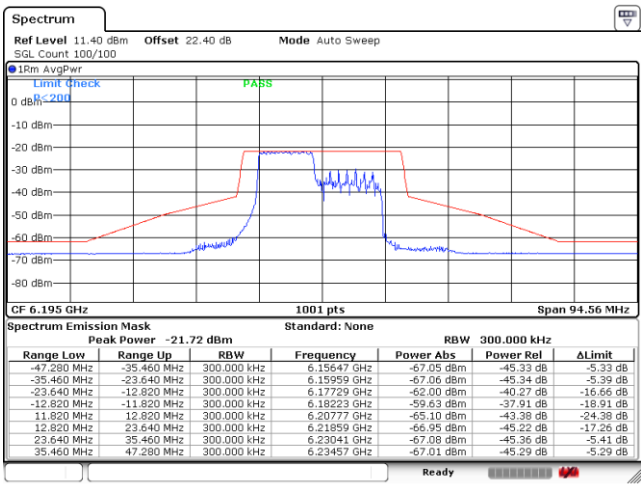


EUT Mode :	802.11ax HE20 106RU

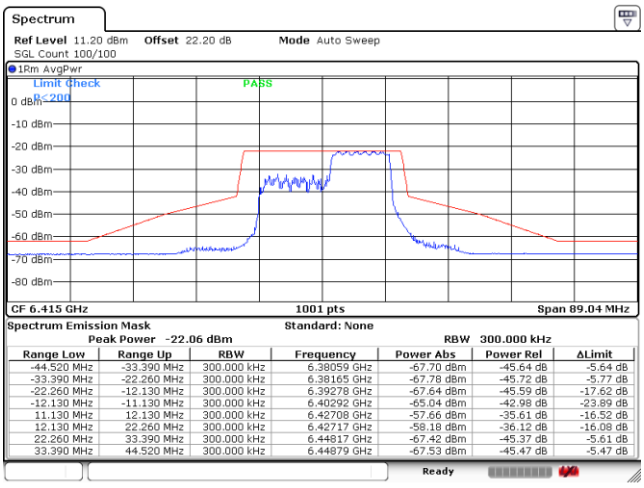
Plot on Channel 5955MHz



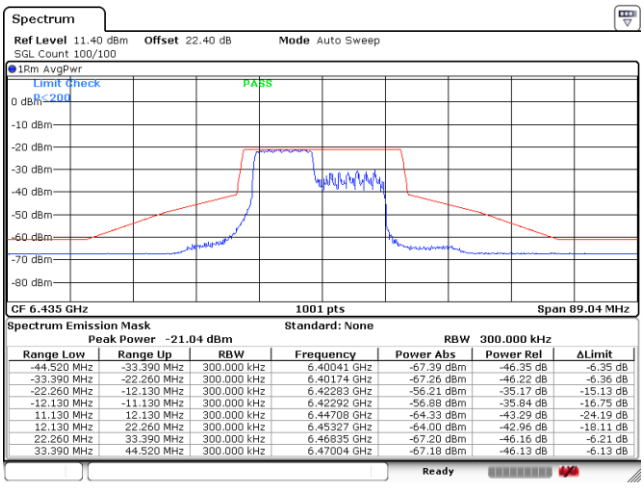
Plot on Channel 6195MHz



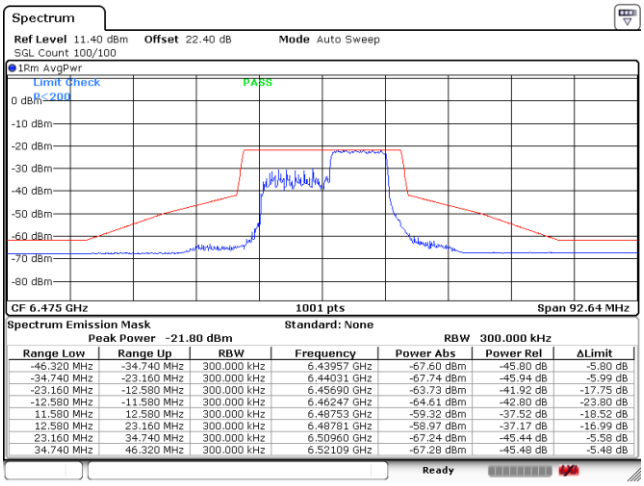
Plot on Channel 6415MHz



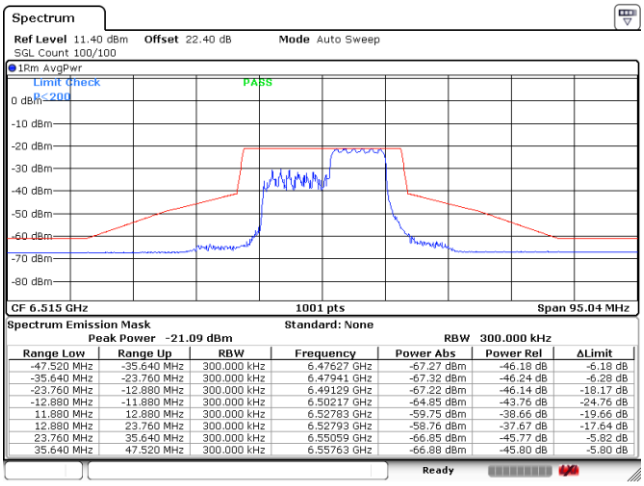
Plot on Channel 6435MHz



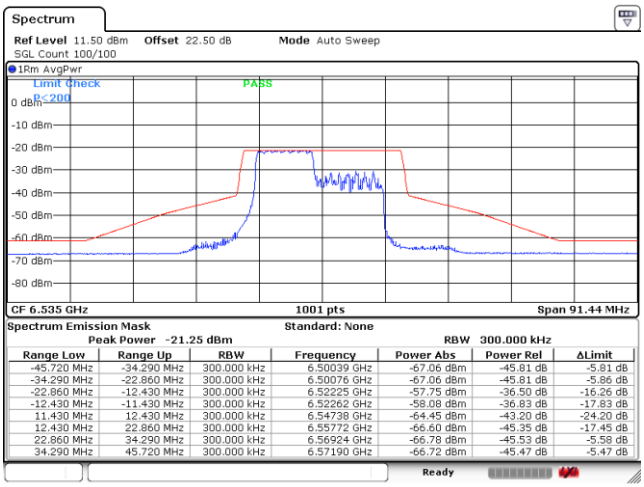
Plot on Channel 6475MHz



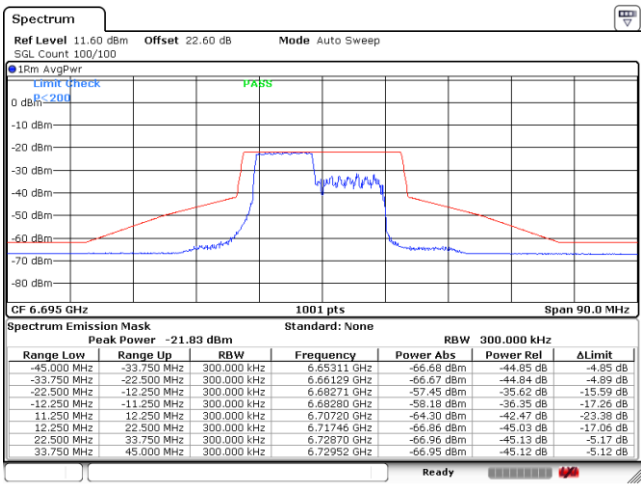
Plot on Channel 6515MHz



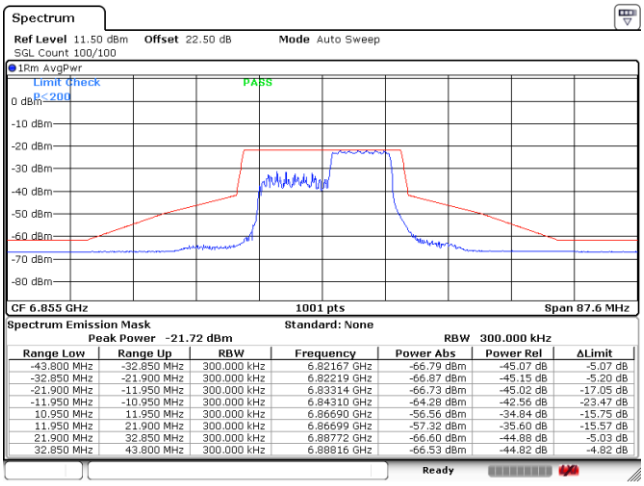
Plot on Channel 6535MHz



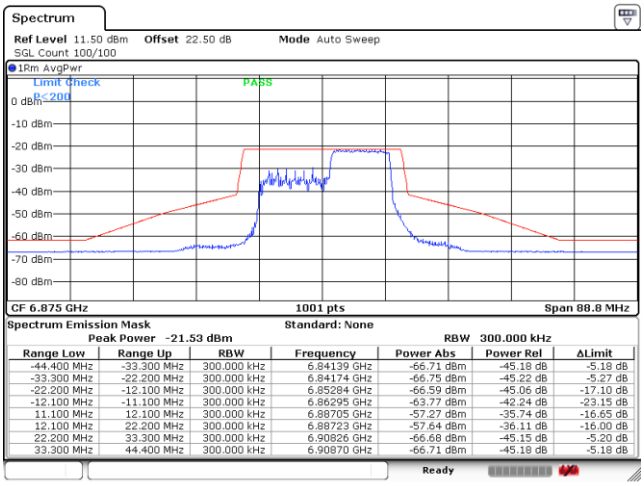
Plot on Channel 6695MHz



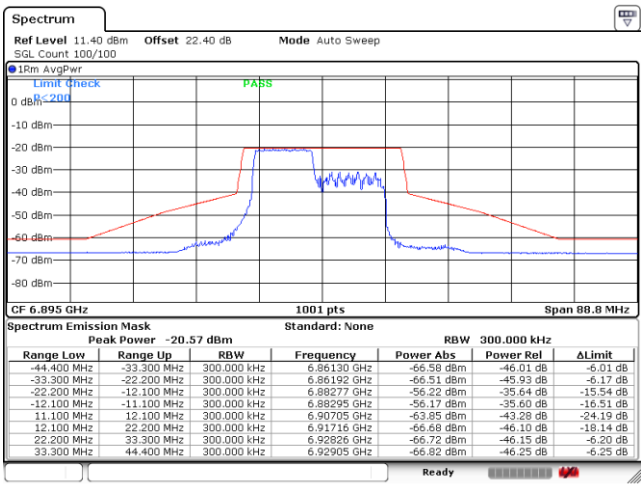
Plot on Channel 6855MHz



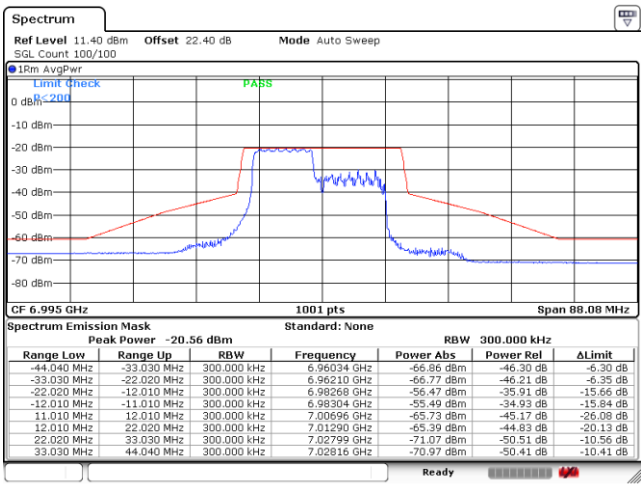
Plot on Channel 6875MHz



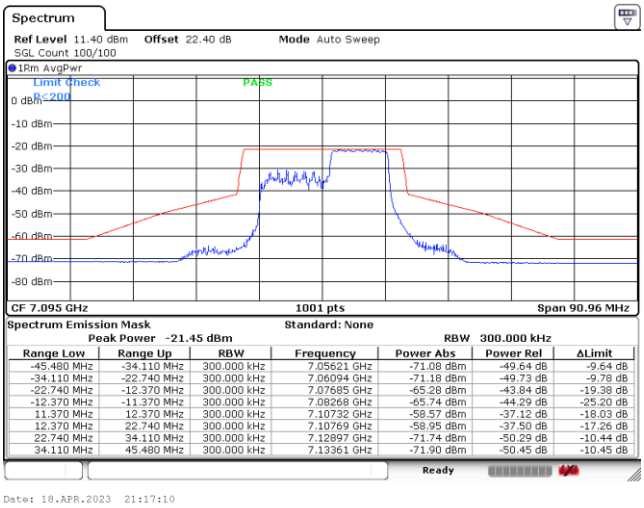
Plot on Channel 6895MHz



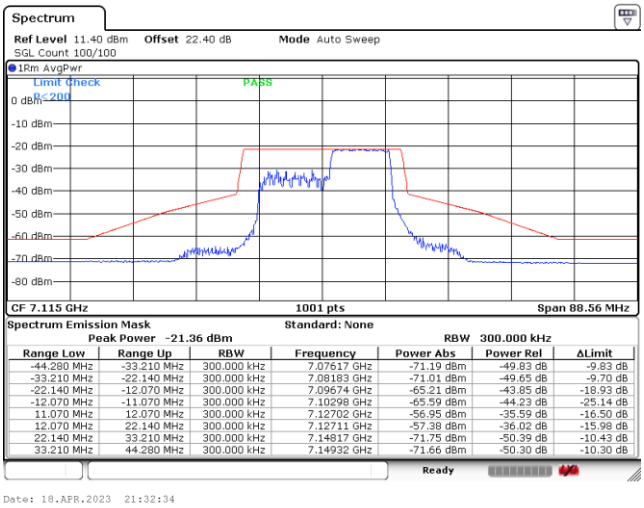
Plot on Channel 6995MHz



Plot on Channel 7095MHz

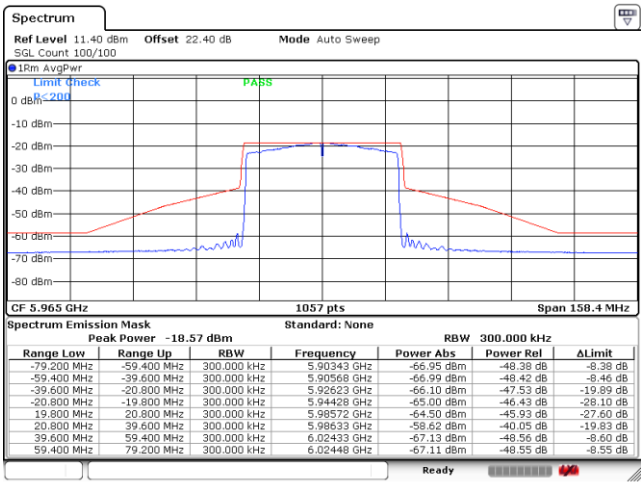


Plot on Channel 7115MHz

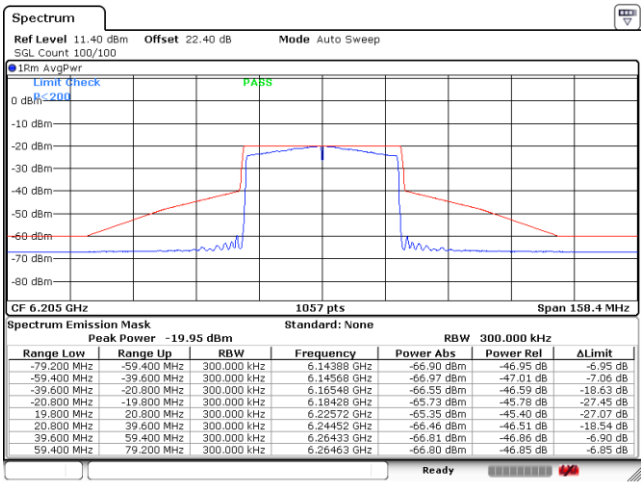


EUT Mode :	802.11ax HE40

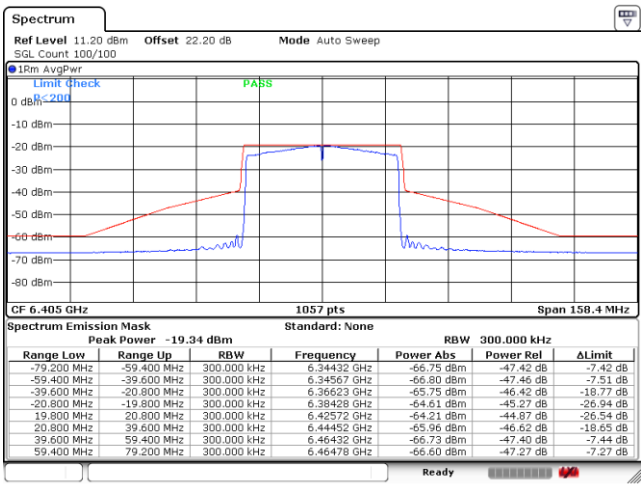
Plot on Channel 5965MHz



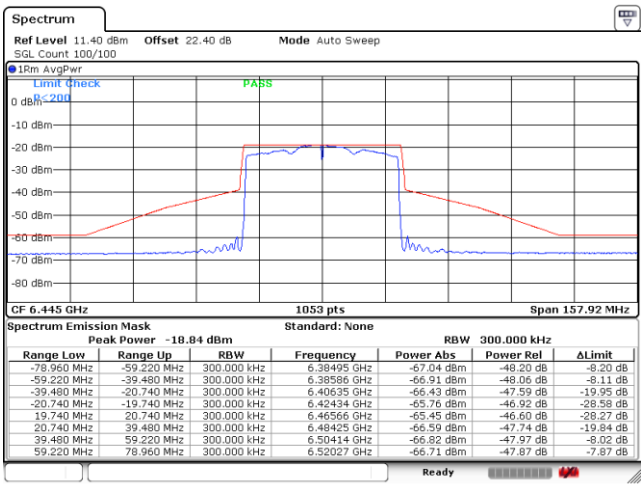
Plot on Channel 6205MHz



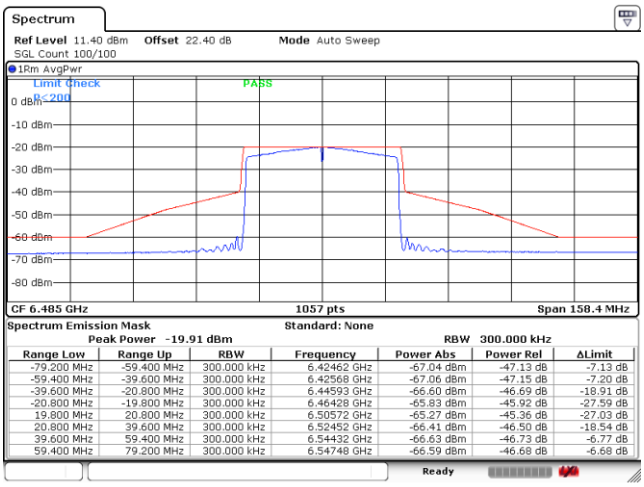
Plot on Channel 6405MHz



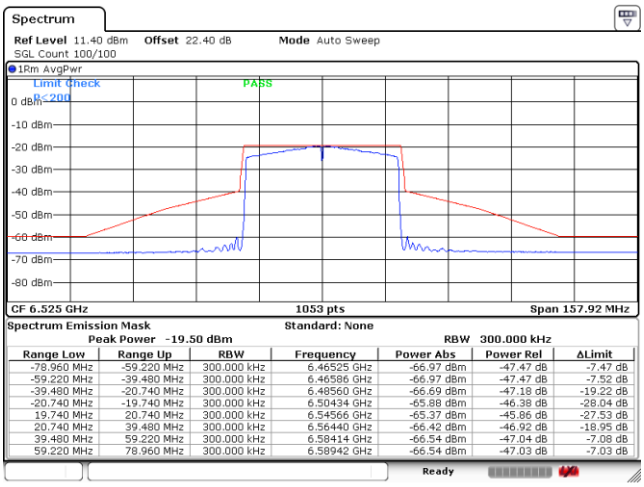
Plot on Channel 6445MHz



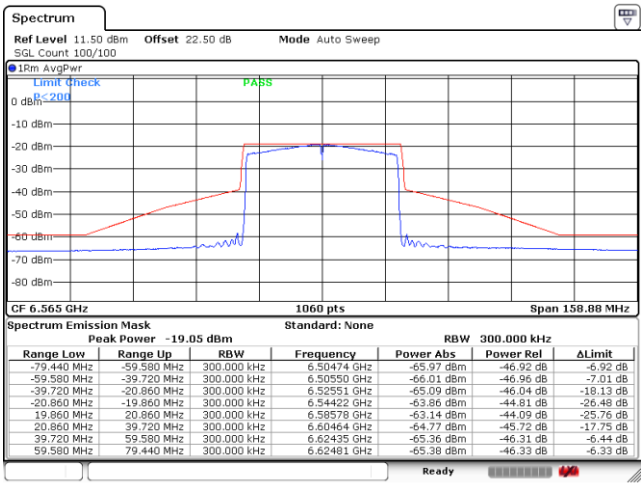
Plot on Channel 6485MHz



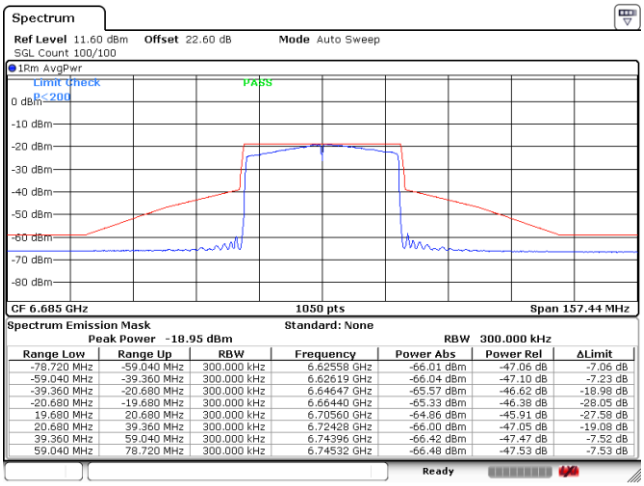
Plot on Channel 6525MHz



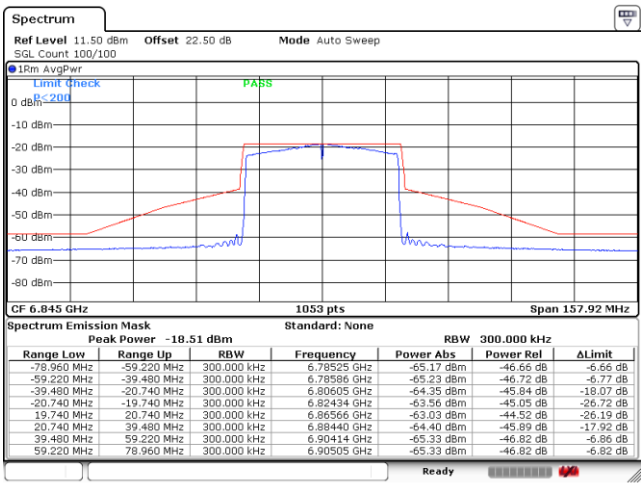
Plot on Channel 6565MHz



Plot on Channel 6685MHz

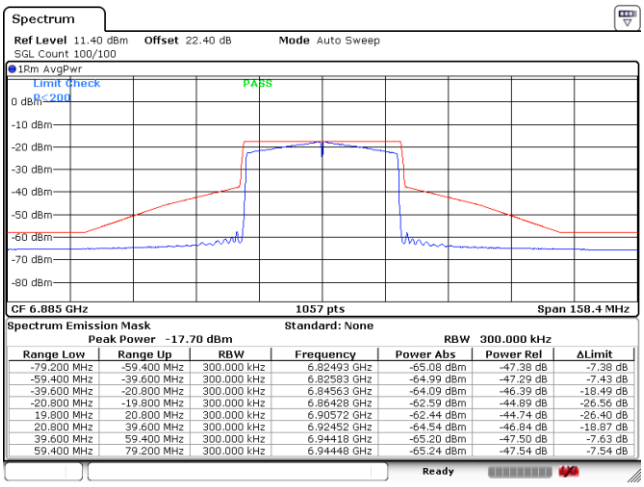


Plot on Channel 6845MHz



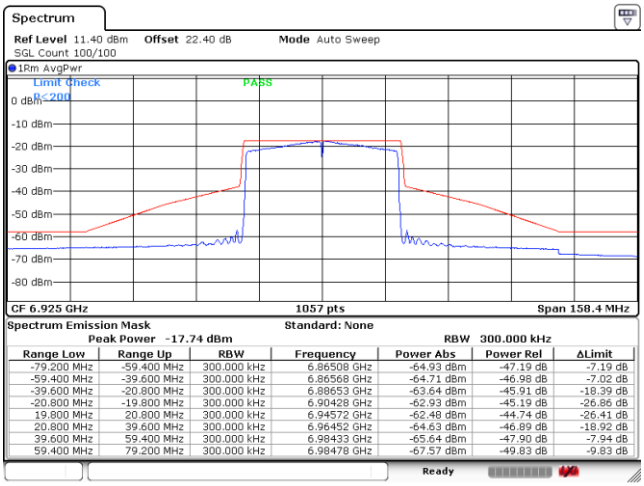
Date: 18.APR.2023 10:13:27

Plot on Channel 6885MHz



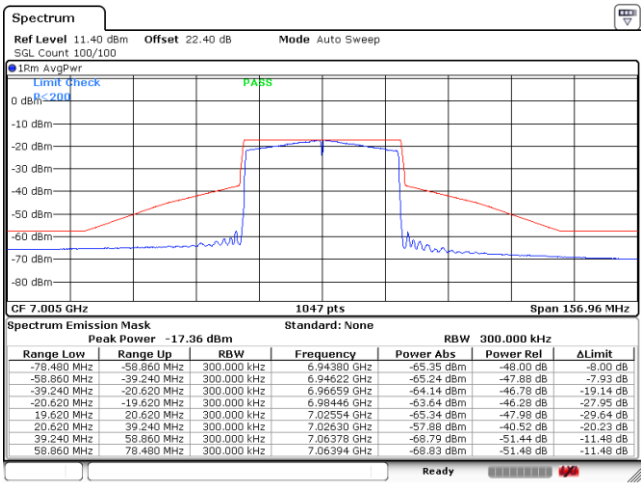
Date: 18.APR.2023 10:40:48

Plot on Channel 6925MHz



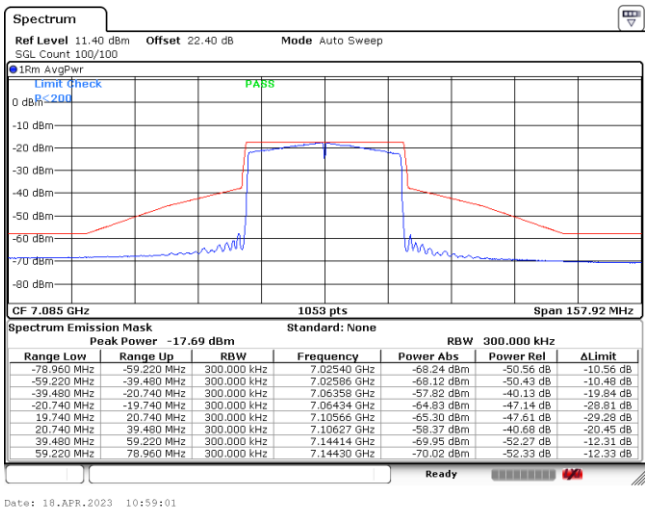
Date: 18.APR.2023 10:51:20

Plot on Channel 7005MHz



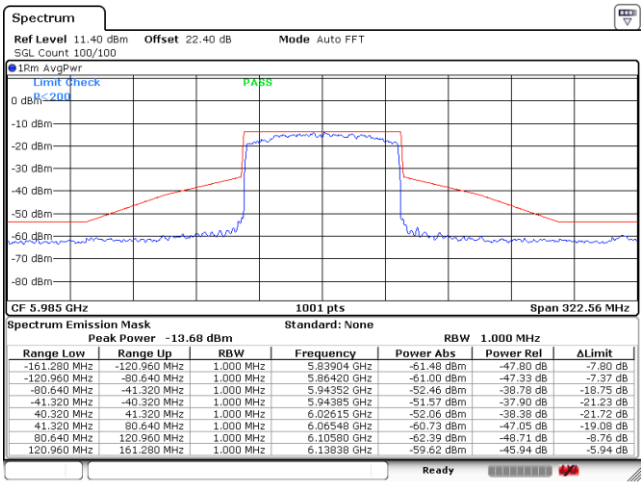
Date: 18.APR.2023 10:55:37

Plot on Channel 7085MHz

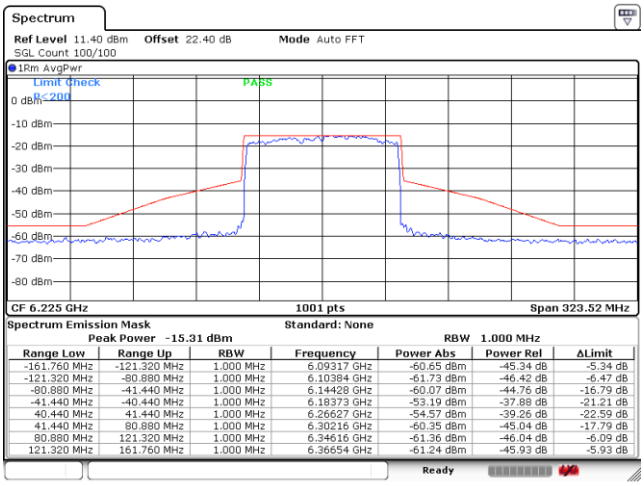


EUT Mode :	802.11ax HE80

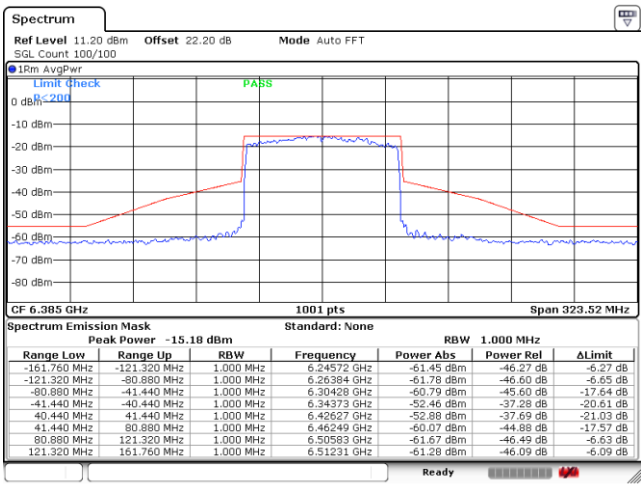
Plot on Channel 5985MHz



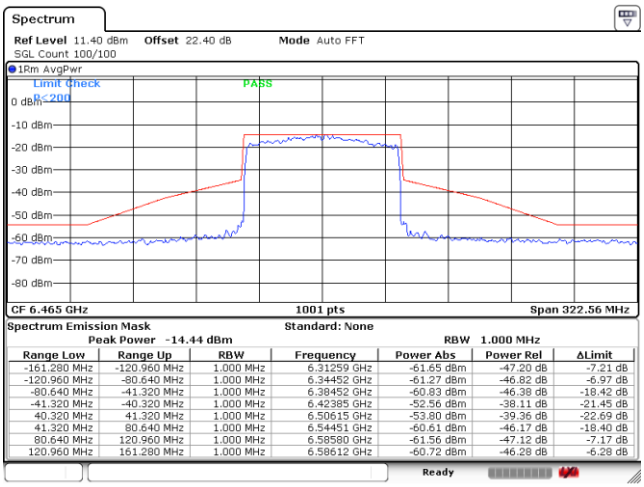
Plot on Channel 6225MHz



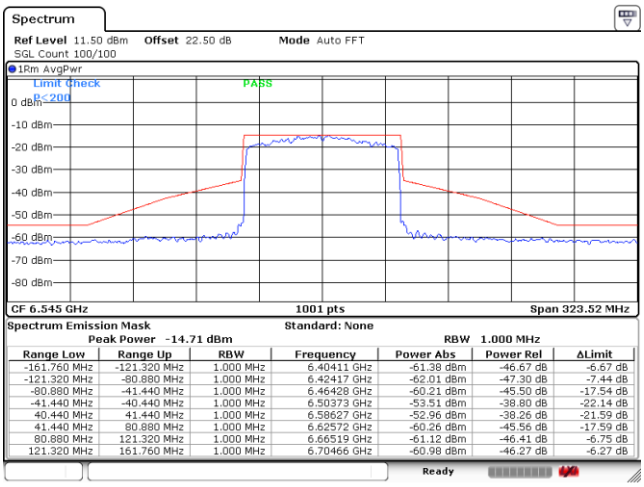
Plot on Channel 6385MHz



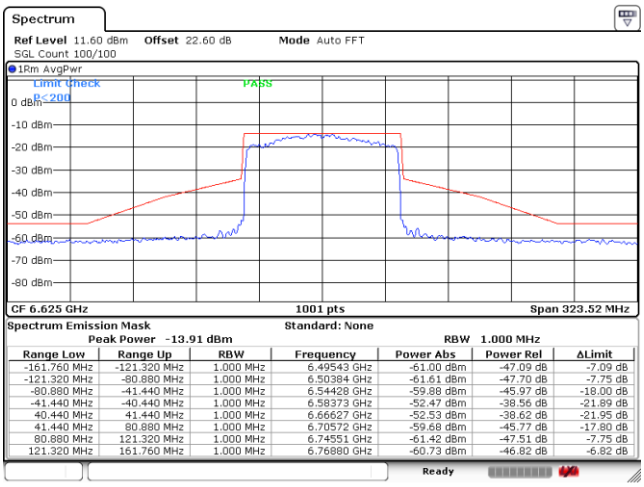
Plot on Channel 6465MHz



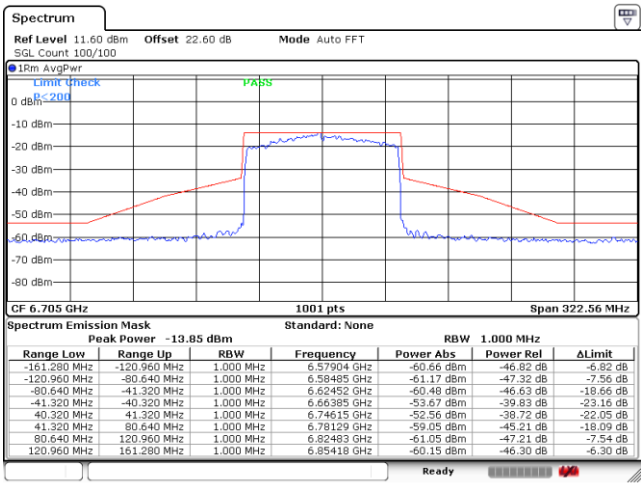
Plot on Channel 6545MHz



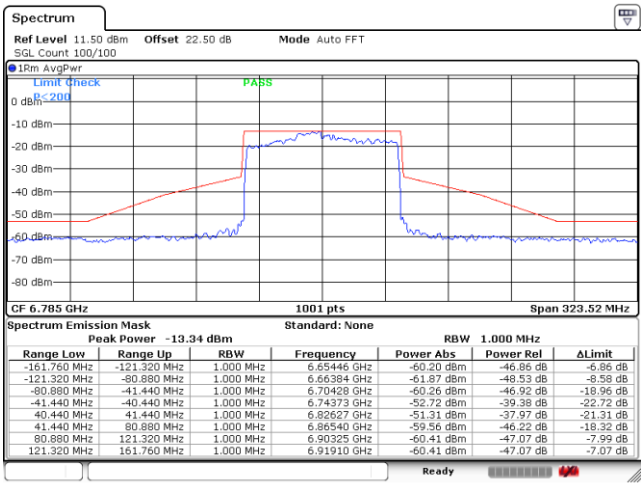
Plot on Channel 6625MHz



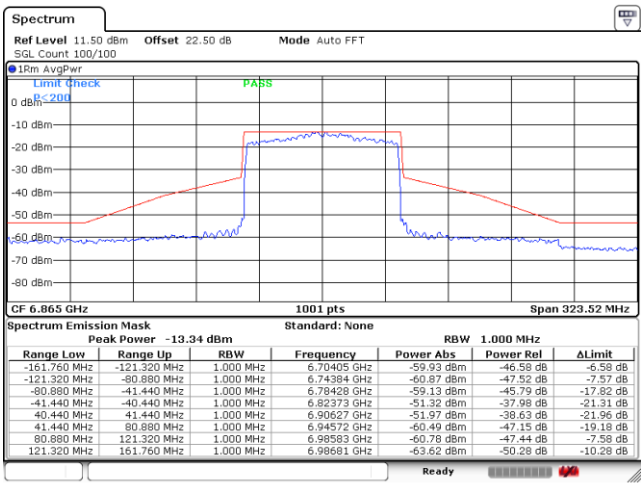
Plot on Channel 6705MHz



Plot on Channel 6785MHz

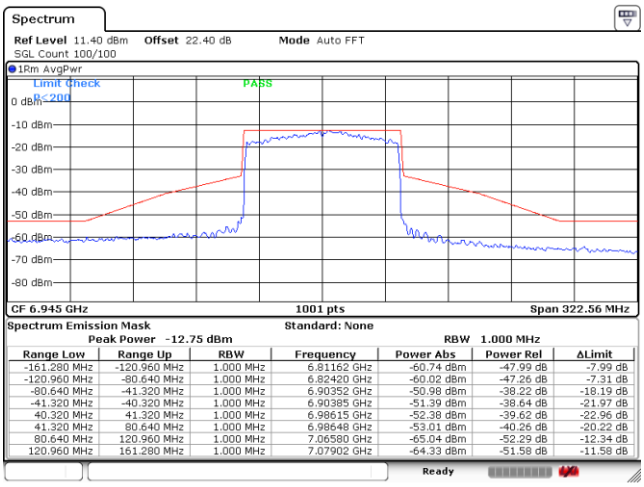


Plot on Channel 6865MHz



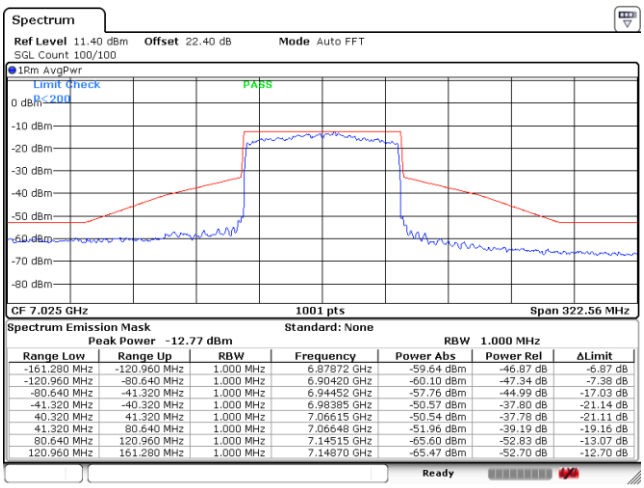
Date: 18.APR.2023 12:04:57

Plot on Channel 6945MHz



Date: 18.APR.2023 12:09:49

Plot on Channel 7025MHz



Date: 18.APR.2023 14:59:10

3.5 Contention Based Protocol

3.5.1 Limit of Contention Based Protocol

<FCC 14-30 CFR 15.407>

(d)(6) Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band must employ a contention-based protocol.

FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain. To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

Table 1. Criteria to determine number of times detection threshold test may be performed

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leq BW_{Inc}$	Once	Tune incumbent and EUT transmissions ($f_{c1} = f_{c2}$)
$BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is located as closely as possible to the lower edge and upper edge, respectively, of the EUT channel
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel

where:

$BWEUT$: Transmission bandwidth of EUT signal

$BWInc$: Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)

$fc1$: Center frequency of EUT transmission

$fc2$: Center frequency of simulated incumbent signal

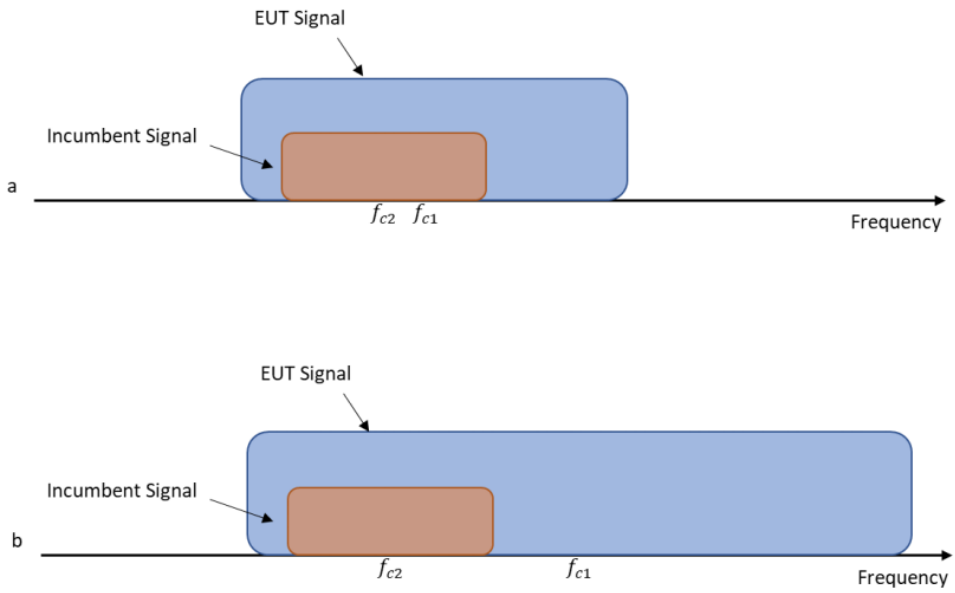


Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it

3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

The testing follows FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01.
Section I) Contention Based Protocol
Conducted method Step-by-Step Procedure, Conducted Setup

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT.
4. Connect the output port of the EUT to the signal analyzer 2, as shown in test setup Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
5. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
6. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
7. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in test setup Figure 2.
8. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.

9. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
10. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
11. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.
12. For the contention-based protocol test where only one channel in each supported sub-band needs to be tested. The narrowest and widest bandwidth in each channel shall be measured EUT was driven in MIMO mode, the interferer level was injected to both chains to monitor the performance, while the interferer level is determined according the lowest antenna gain among both antennas (i.e, lower interferer level).

3.5.4 Test Setup

Conducted Setup

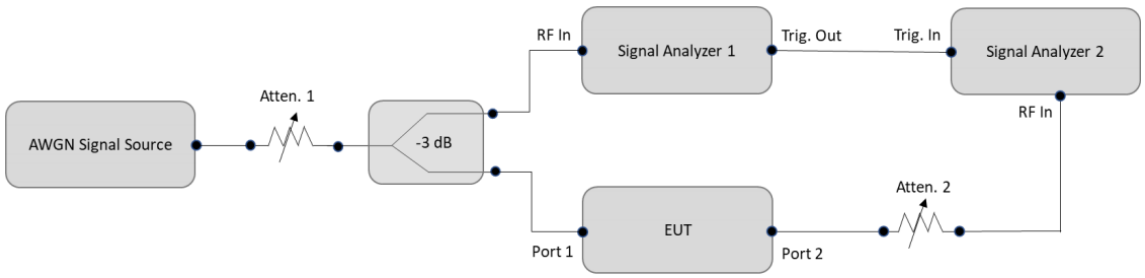


Figure 2. Contention-based protocol test setup, conducted method Step-by-Step Procedure, Conducted Setup

3.5.5 Support Unit used in test configuration and system

Instrument	Brand Name	Model No.	Characteristics
WLAN AP	ASUS	GT-AXE11000	Dual Band AP
Notebook	Acer	N15C1	LAN

3.5.6 Minimum Antenna gain for Contention Based Protocol Test

CBP Antenna Gain	<UNII-5>: [5.0] dBi <UNII-6>: [5.0] dBi <UNII-7>: [5.0] dBi <UNII-8>: [4.0] dBi

Note: The CBP antenna gain is considering the minimum gain from closed mode as worse case.

3.5.7 Test Summary of Contention Based Protocol Test

Test Engineer :	Rebecca Li	Temperature :	21.6~24.1℃
		Relative Humidity :	50.4~54.9%

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 5	6135	20	6135	-65.91	100	-62	-70.91	8.91
					Result: Stop Transmission			
				-72.91	< 90	-62	-77.91	15.91
					Result: Minimal Operation			
				-73.91	0	-62	-78.91	16.91
					Result: Normal Operation			
	6145	80	6110	-61.3	100	-62	-66.30	4.3
					Result: Stop Transmission			
				-73.30	< 90	-62	-78.30	16.30
					Result: Minimal Operation			
				-74.30	0	-62	-79.30	17.30
					Result: Normal Operation			
			6145	-61.27	100	-62	-66.27	4.27
					Result: Stop Transmission			
				-64.27	< 90	-62	-69.27	7.27
					Result: Minimal Operation			
				-65.27	0	-62	-70.27	8.27
					Result: Normal Operation			
			6180	-70.26	100	-62	-75.26	13.26
					Result: Stop Transmission			
				-73.26	< 90	-62	-78.26	16.26
					Result: Minimal Operation			
				-74.26	0	-62	-79.26	17.26
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (5 dBi).

Note 2: The antenna gain has included the path loss between RF connector and antenna.

Note 3: Margin = Regulated Threshold level - Adjusted Power.

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 6	6455	20	6455	-65.34	100	-62	-70.34	8.34
					Result: Stop Transmission			
				-72.34	< 90	-62	-77.34	15.34
					Result: Minimal Operation			
				-73.34	0	-62	-78.34	16.34
					Result: Normal Operation			
	6465	80	6430	-61.4	100	-62	-66.40	4.4
					Result: Stop Transmission			
				-72.40	< 90	-62	-77.40	15.40
					Result: Minimal Operation			
				-73.40	0	-62	-78.40	16.40
					Result: Normal Operation			
			6465	-60.3	100	-62	-65.30	3.3
					Result: Stop Transmission			
				-63.30	< 90	-62	-68.30	6.30
					Result: Minimal Operation			
				-64.30	0	-62	-69.30	7.30
					Result: Normal Operation			
			6500	-69.07	100	-62	-74.07	12.07
					Result: Stop Transmission			
				-72.07	< 90	-62	-77.07	15.07
					Result: Minimal Operation			
				-73.07	0	-62	-78.07	16.07
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (5 dBi).

Note 2: The antenna gain has included the path loss between RF connector and antenna.

Note 3: Margin = Regulated Threshold level - Adjusted Power.

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 7	6695	20	6695	-64.26	100	-62	-69.26	7.26
					Result: Stop Transmission			
				-71.26	< 90	-62	-76.26	14.26
					Result: Minimal Operation			
				-72.26	0	-62	-77.26	15.26
					Result: Normal Operation			
	6705	80	6670	-62.22	100	-62	-67.22	5.22
					Result: Stop Transmission			
				-72.22	< 90	-62	-77.22	15.22
					Result: Minimal Operation			
				-73.22	0	-62	-78.22	16.22
					Result: Normal Operation			
			6705	-59.61	100	-62	-64.61	2.61
					Result: Stop Transmission			
				-62.61	< 90	-62	-67.61	5.61
					Result: Minimal Operation			
				-63.61	0	-62	-68.61	6.61
					Result: Normal Operation			
			6740	-68.52	100	-62	-73.52	11.52
					Result: Stop Transmission			
				-71.52	< 90	-62	-76.52	14.52
					Result: Minimal Operation			
				-72.52	0	-62	-77.52	15.52
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (5 dBi).

Note 2: The antenna gain has included the path loss between RF connector and antenna.

Note 3: Margin = Regulated Threshold level - Adjusted Power.

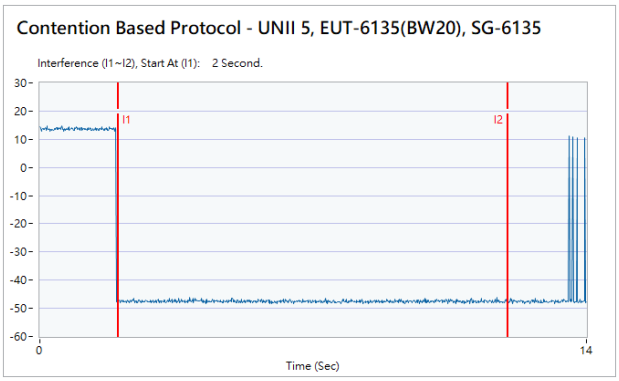
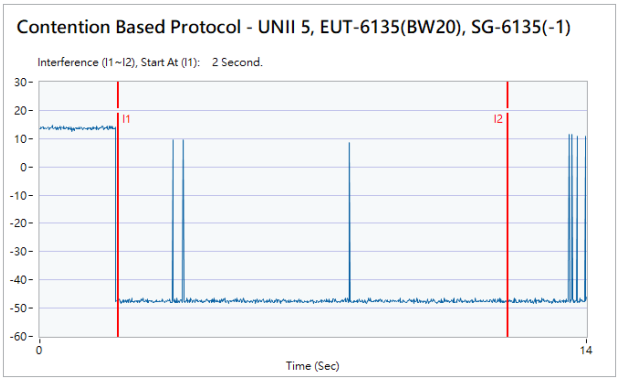
Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 8	7015	20	7015	-64.43	100	-62	-68.43	6.43
					Result: Stop Transmission			
				-72.43	< 90	-62	-76.43	14.43
					Result: Minimal Operation			
				-73.43	0	-62	-77.43	15.43
					Result: Normal Operation			
	7025	80	6990	-65.32	100	-62	-69.32	7.32
					Result: Stop Transmission			
				-73.32	< 90	-62	-77.32	15.32
					Result: Minimal Operation			
				-74.32	0	-62	-78.32	16.32
					Result: Normal Operation			
			7025	-59.53	100	-62	-63.53	1.53
					Result: Stop Transmission			
				-63.53	< 90	-62	-67.53	5.53
					Result: Minimal Operation			
				-64.53	0	-62	-68.53	6.53
					Result: Normal Operation			
			7060	-68.68	100	-62	-72.68	10.68
					Result: Stop Transmission			
				-72.68	< 90	-62	-76.68	14.68
					Result: Minimal Operation			
				-73.68	0	-62	-77.68	15.68
					Result: Normal Operation			

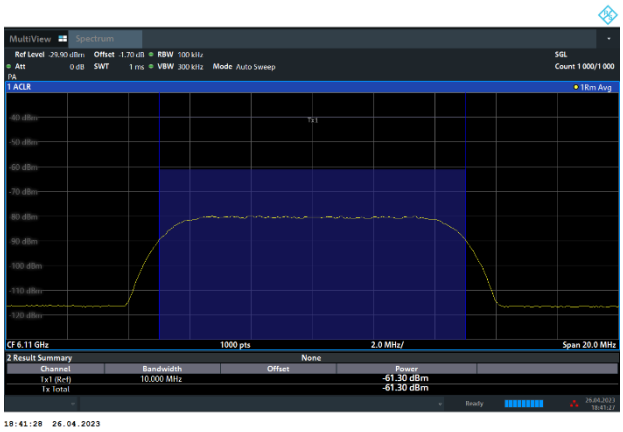
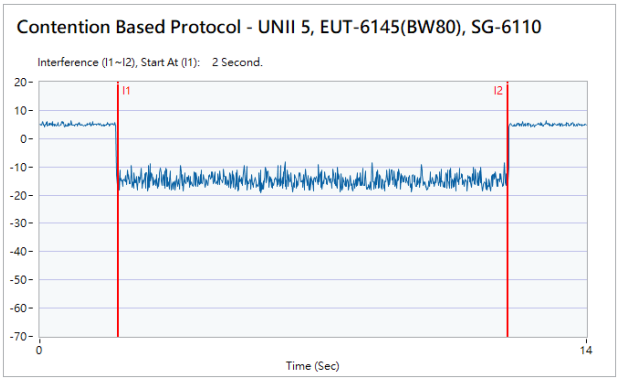
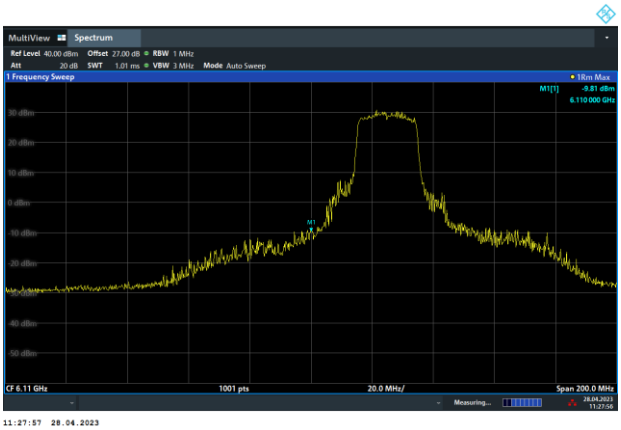
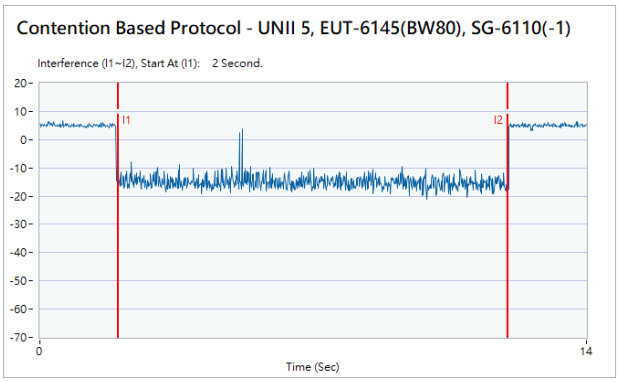
Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (4 dBi).

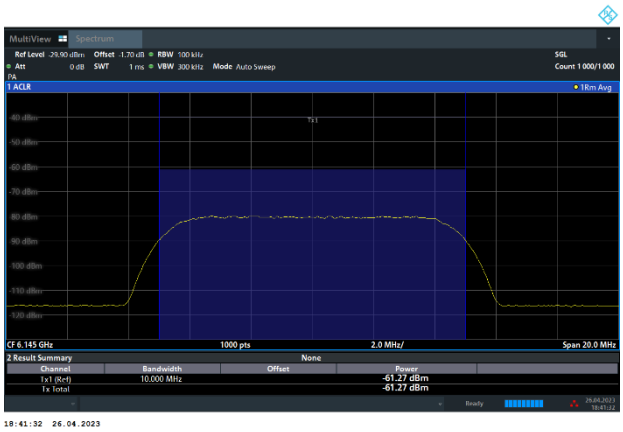
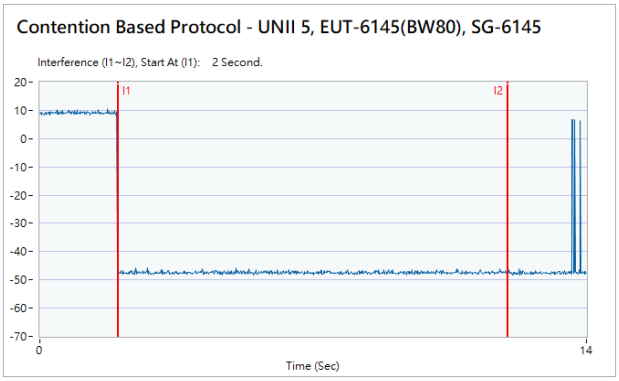
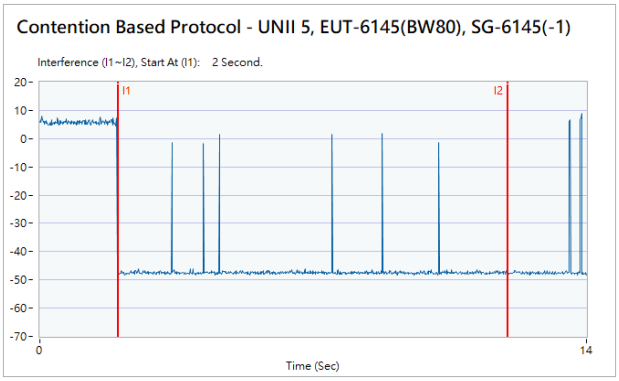
Note 2: The antenna gain has included the path loss between RF connector and antenna.

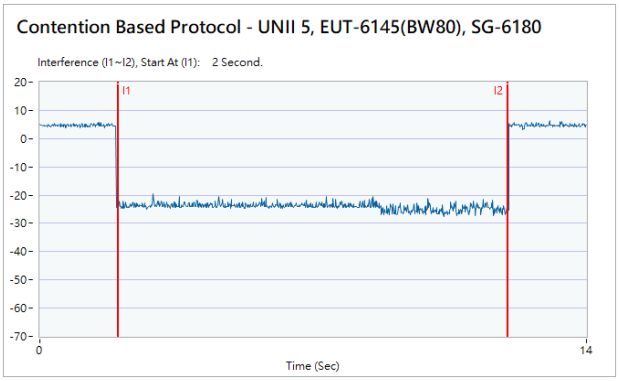
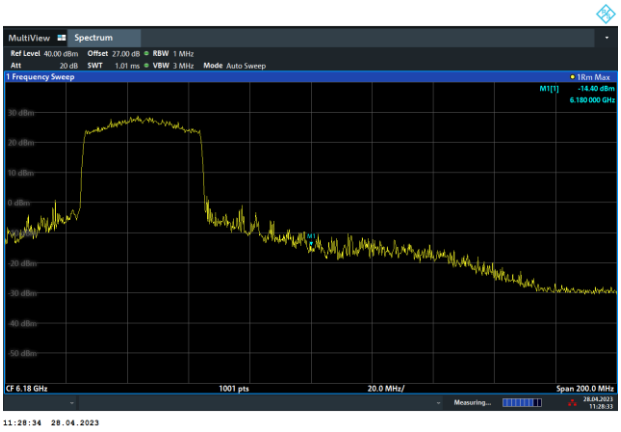
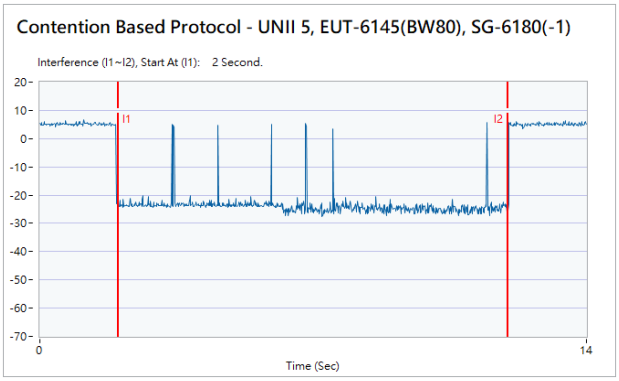
Note 3: Margin = Regulated Threshold level - Adjusted Power.

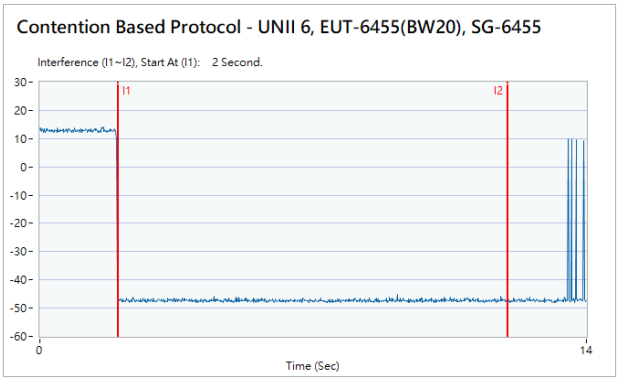
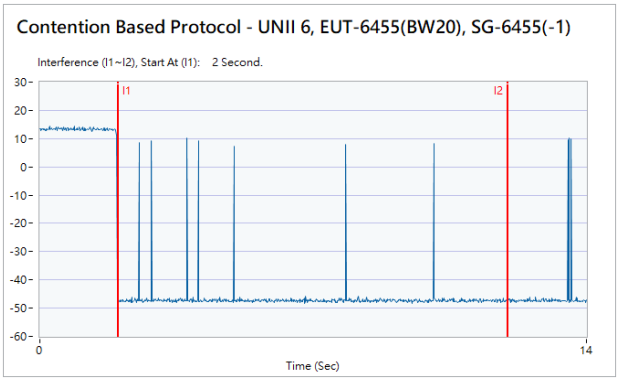
3.5.8 Test Plots of Contention Based Protocol Test

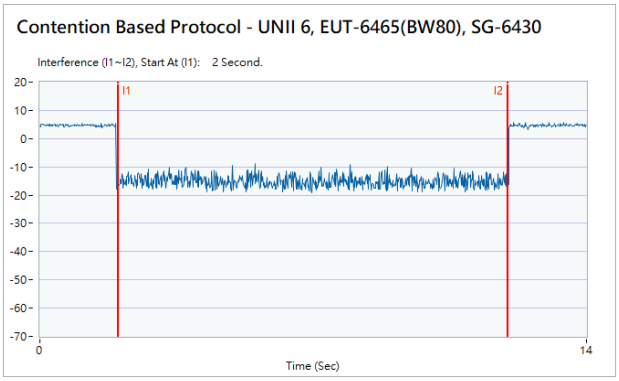
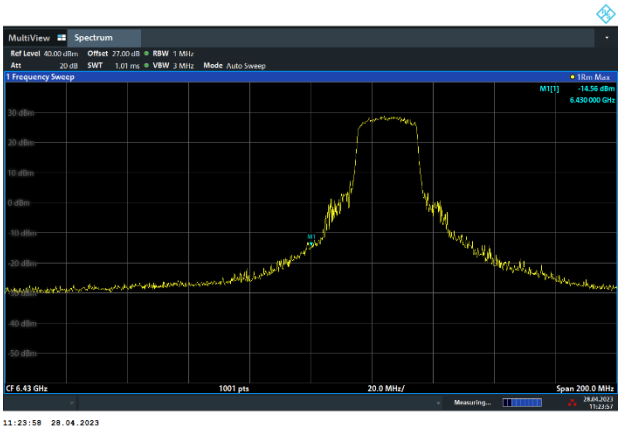
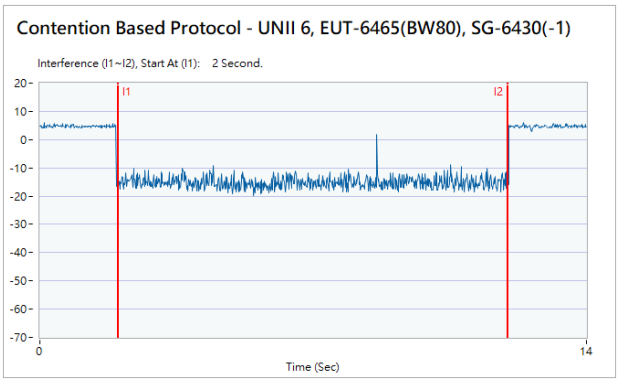
Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference)	
802.11ax (HE20) / 6135MHz Threshold Level (TL) = -65.91dBm	802.11ax (HE20) / CH37 Test result is pass due to no transmission occur.
	
802.11ax (HE20) / 6135MHz Threshold Level (TL) = -66.91dBm	802.11ax (HE20) / CH37 Transmit when the interferer is 1dB lower.
	

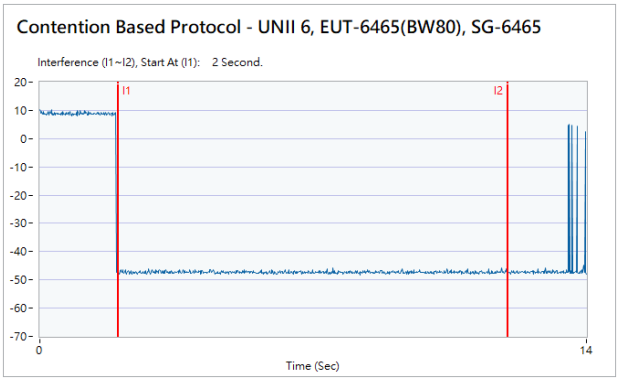
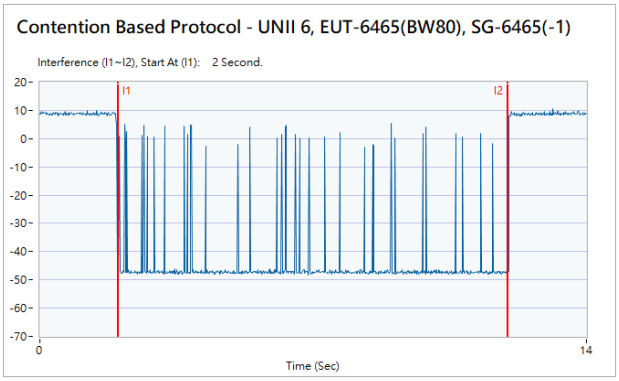
Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference)	
802.11ax (HE80) / 6110MHz (Lower edge) Threshold Level (TL) = -61.3dBm	802.11ax (HE80) / CH39 (Lower edge) Test result is pass due to no transmission occur.
	
The EUT changes to a new 20MHz random channel immediately when the incumbent is detected. The emitted signal after that is generated from side lobe leakage of the new 20MHz channels. The marker 1 is the center frequency of incumbent signal applied to original 80MHz channel.	
802.11ax (HE80) / 6110MHz (Lower edge) Threshold Level (TL) = -62.30dBm	802.11ax (HE80) / CH39 (Lower edge) Transmit when the interferer is 1dB lower.
	

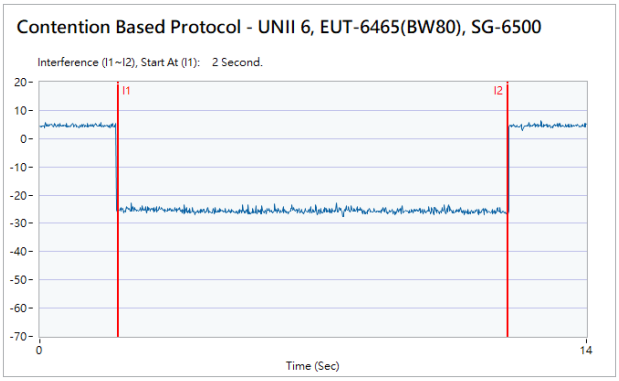
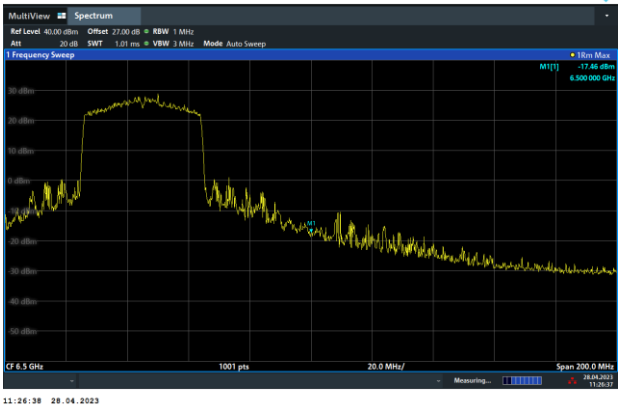
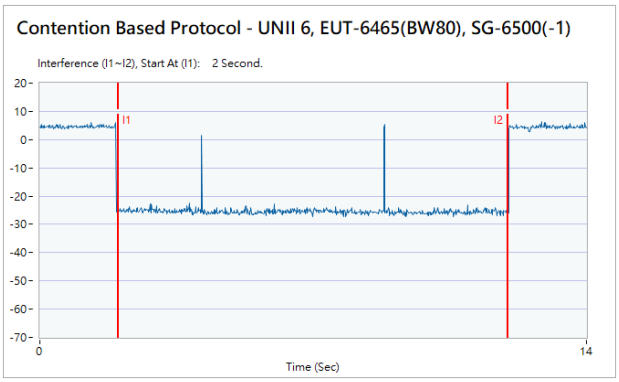
Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference)	
802.11ax (HE80) / 6145MHz (Middle) Threshold Level (TL) = -61.27dBm	802.11ax (HE80) / CH39 (Middle) Test result is pass due to no transmission occur.
	
802.11ax (HE80) / 6145MHz (Middle) Threshold Level (TL) = -62.27dBm	802.11ax (HE80) / CH39 (Middle) Transmit when the interferer is 1dB lower.
	

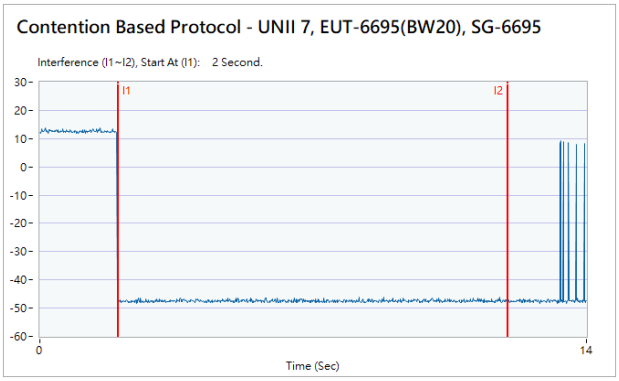
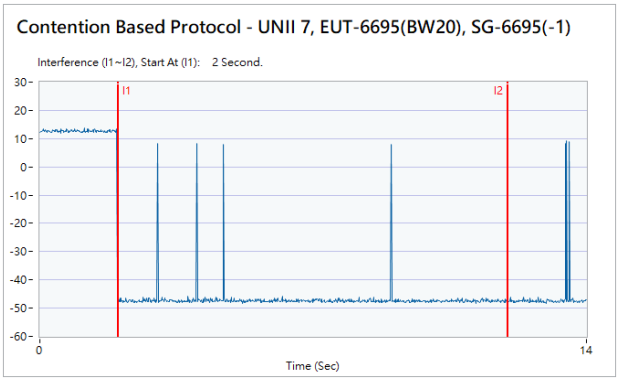
Contention Based Protocol Result Plots on U-NII 5 (AWGN Interference)	
802.11ax (HE80) / 6180MHz (Upper edge) Threshold Level (TL) = -70.26dBm	802.11ax (HE80) / CH39 (Upper edge) Test result is pass due to no transmission occur.
	
The EUT changes to a new 40MHz random channel immediately when the incumbent is detected. The emitted signal after that is generated from side lobe leakage of the new 40MHz channels. The marker 1 is the center frequency of incumbent signal applied to original 80MHz channel.	
802.11ax (HE80) / 6180MHz (Upper edge) Threshold Level (TL) = -71.26dBm	802.11ax (HE80) / CH39 (Upper edge) Transmit when the interferer is 1dB lower.
	

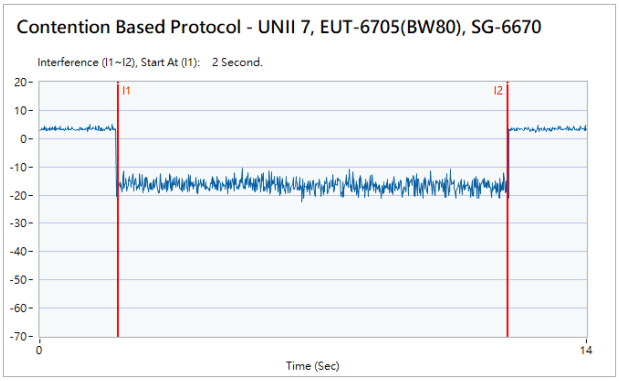
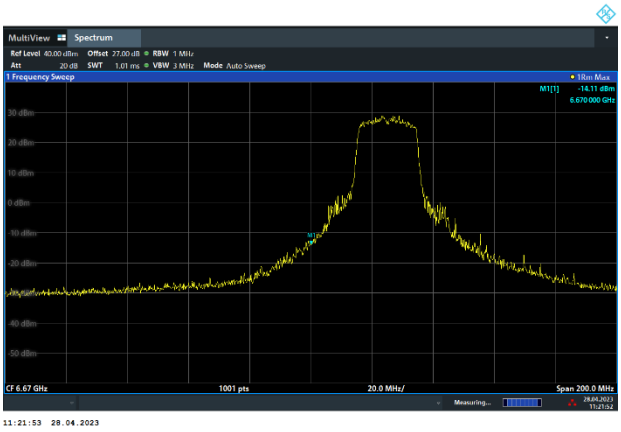
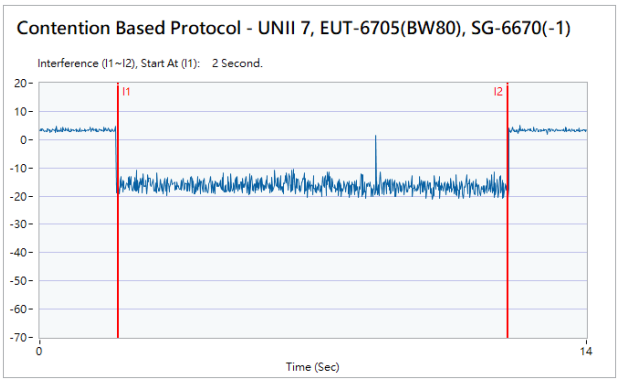
Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference)	
802.11ax (HE20) / 6455MHz Threshold Level (TL) = -65.34dBm	802.11ax (HE20) / CH101 Test result is pass due to no transmission occur.
	
802.11ax (HE20) / 6455MHz Threshold Level (TL) = -66.34dBm	802.11ax (HE20) / CH101 Transmit when the interferer is 1dB lower.
	

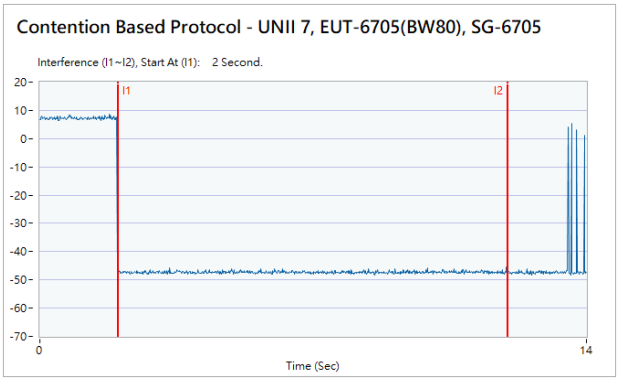
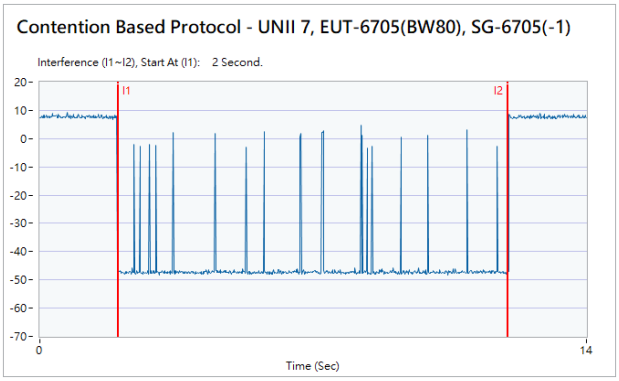
Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference)	
802.11ax (HE80) / 6430MHz (Lower edge) Threshold Level (TL) = -61.4dBm	802.11ax (HE80) / CH103 (Lower edge) Test result is pass due to no transmission occur.
	
The EUT changes to a new 20MHz random channel immediately when the incumbent is detected. The emitted signal after that is generated from side lobe leakage of the new 20MHz channels. The marker 1 is the center frequency of incumbent signal applied to original 80MHz channel.	
802.11ax (HE80) / 6430MHz (Lower edge) Threshold Level (TL) = -62.40dBm	802.11ax (HE80) / CH103 (Lower edge) Transmit when the interferer is 1dB lower.
	

Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference)	
802.11ax (HE80) / 6465MHz (Middle) Threshold Level (TL) = -60.3dBm	802.11ax (HE80) / CH103 (Middle) Test result is pass due to no transmission occur.
	
802.11ax (HE80) / 6465MHz (Middle) Threshold Level (TL) = -61.30dBm	802.11ax (HE80) / CH103 (Middle) Transmit when the interferer is 1dB lower.
	

Contention Based Protocol Result Plots on U-NII 6 (AWGN Interference)	
802.11ax (HE80) / 6500MHz (Upper edge) Threshold Level (TL) = -69.07dBm	802.11ax (HE80) / CH103 (Upper edge) Test result is pass due to no transmission occur.
	
The EUT changes to a new 40MHz random channel immediately when the incumbent is detected. The emitted signal after that is generated from side lobe leakage of the new 40MHz channels. The marker 1 is the center frequency of incumbent signal applied to original 80MHz channel.	
802.11ax (HE80) / 6580MHz (Upper edge) Threshold Level (TL) = -70.07dBm	802.11ax (HE80) / CH103 (Upper edge) Transmit when the interferer is 1dB lower.
	

Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference)	
802.11ax (HE20) / 6695MHz Threshold Level (TL) = -64.26dBm	802.11ax (HE20) / CH149 Test result is pass due to no transmission occur.
	
802.11ax (HE20) / 6695MHz Threshold Level (TL) = -65.26dBm	802.11ax (HE20) / CH149 Transmit when the interferer is 1dB lower.
	

Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference)	
802.11ax (HE80) / 6670MHz (Lower edge) Threshold Level (TL) = -62.22dBm	802.11ax (HE80) / CH151 (Lower edge) Test result is pass due to no transmission occur.
	
The EUT changes to a new 20MHz random channel immediately when the incumbent is detected. The emitted signal after that is generated from side lobe leakage of the new 20MHz channels. The marker 1 is the center frequency of incumbent signal applied to original 80MHz channel.	
802.11ax (HE80) / 6670MHz (Lower edge) Threshold Level (TL) = -63.22dBm	802.11ax (HE80) / CH151 (Lower edge) Transmit when the interferer is 1dB lower.
	

Contention Based Protocol Result Plots on U-NII 7 (AWGN Interference)	
802.11ax (HE80) / 6705MHz (Middle) Threshold Level (TL) = -59.61dBm	802.11ax (HE80) / CH143 (Middle) Test result is pass due to no transmission occur.
	
802.11ax (HE80) / 6705MHz (Middle) Threshold Level (TL) = -60.61dBm	802.11ax (HE80) / CH143 (Middle) Transmit when the interferer is 1dB lower.