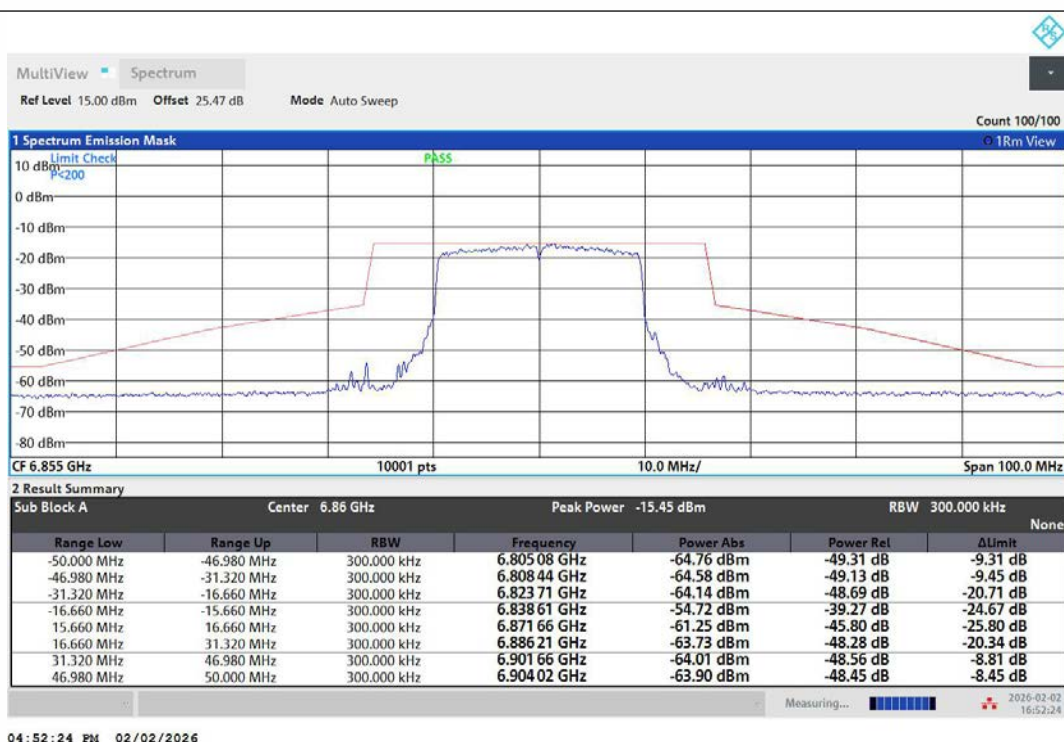
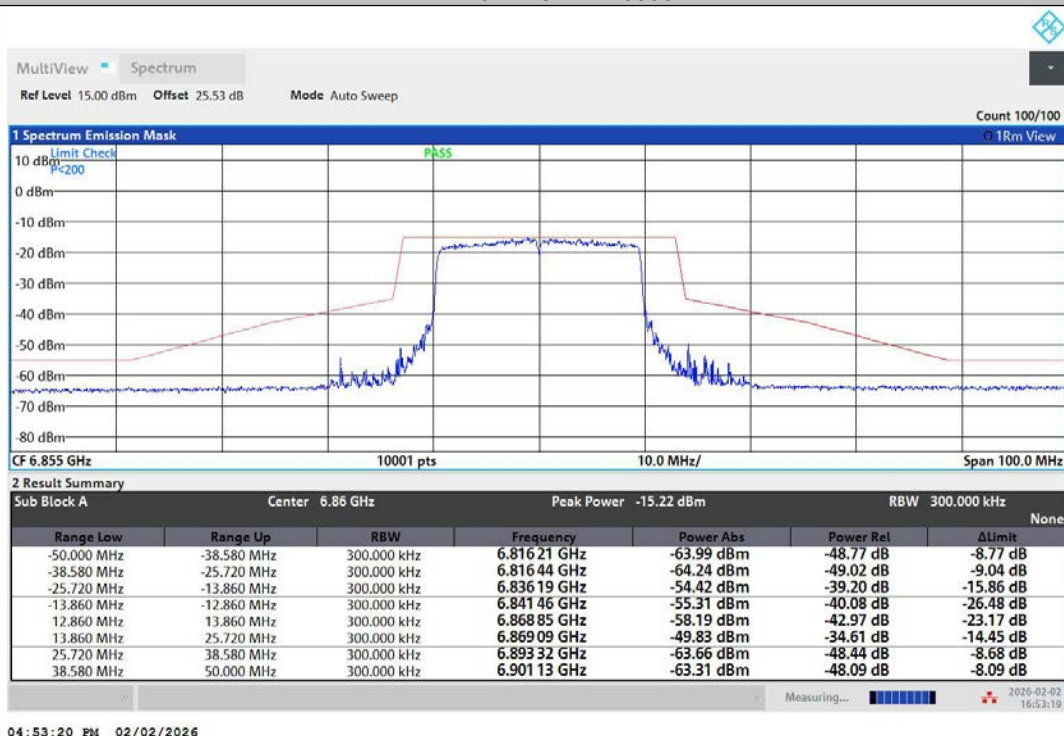
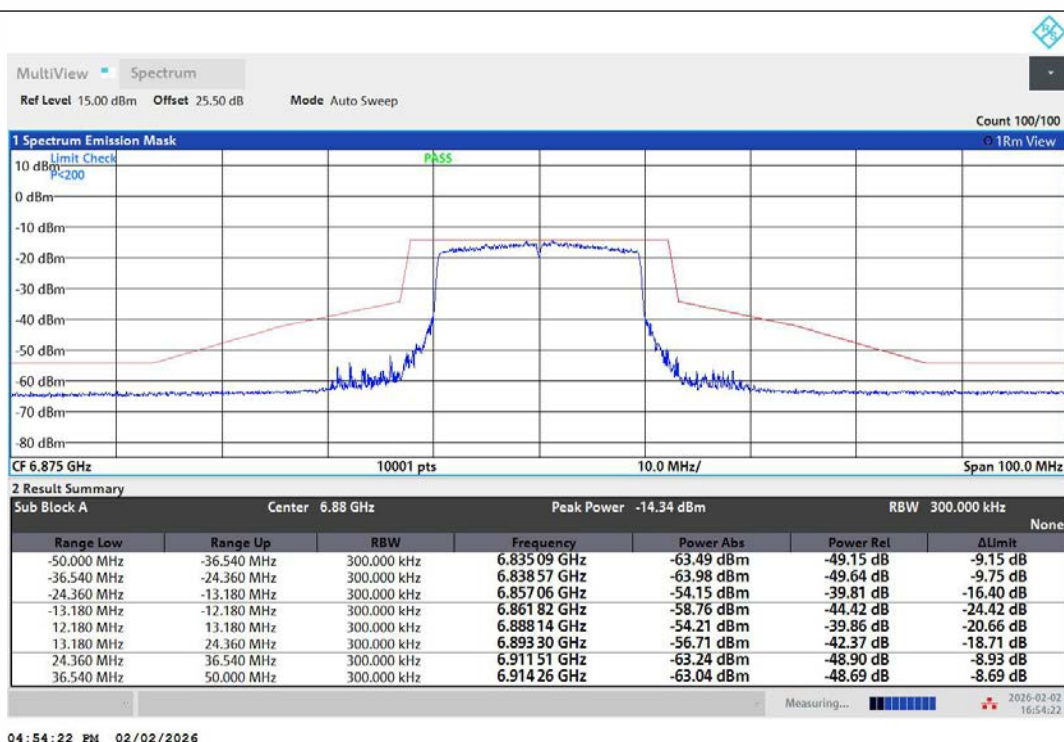




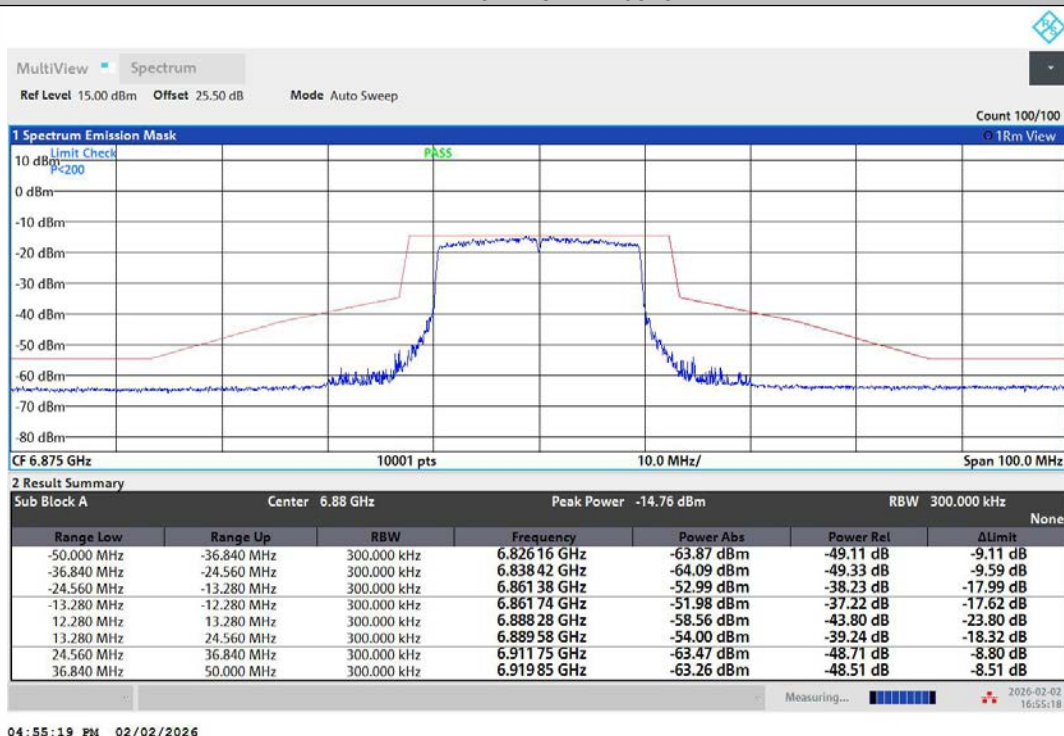
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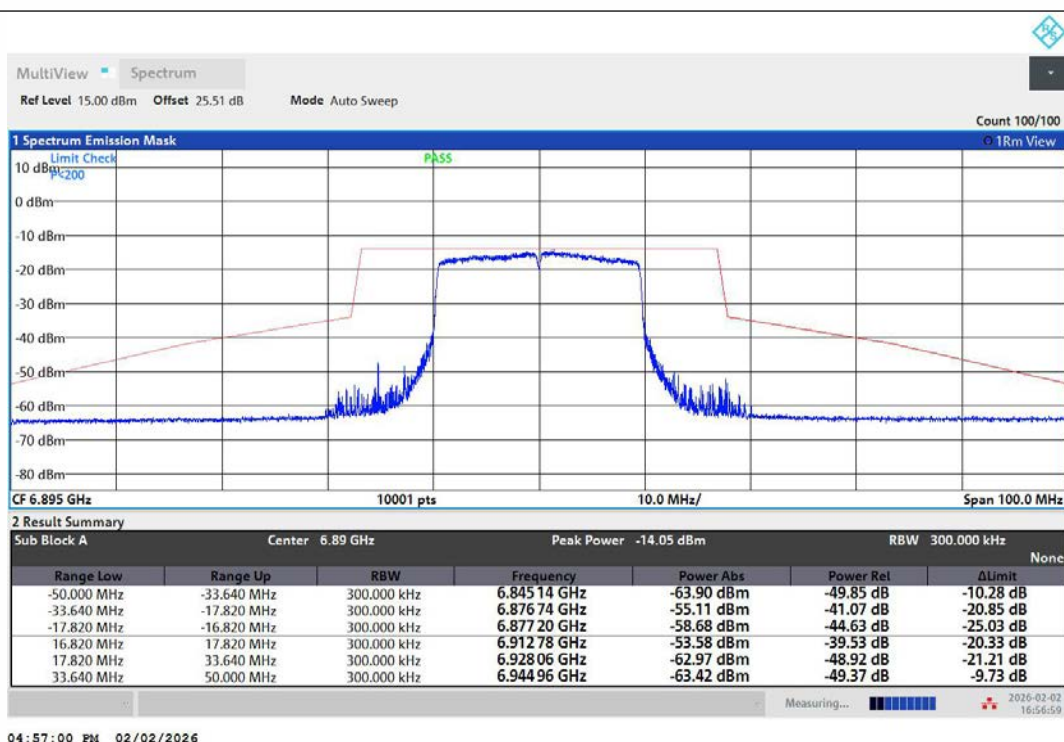
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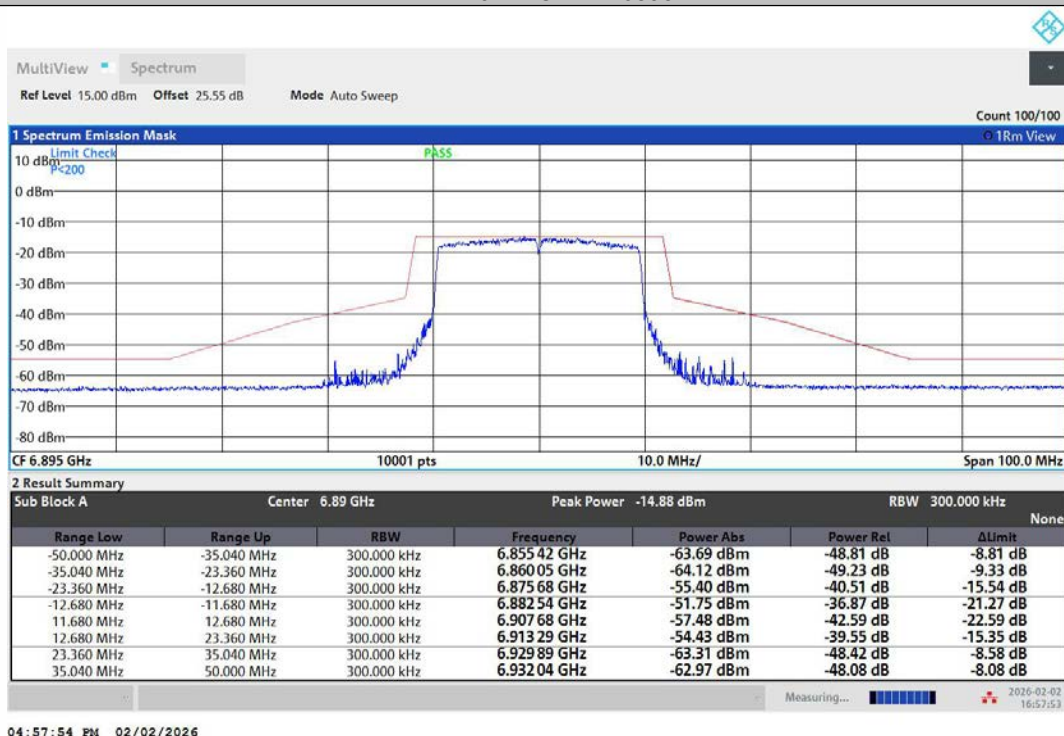
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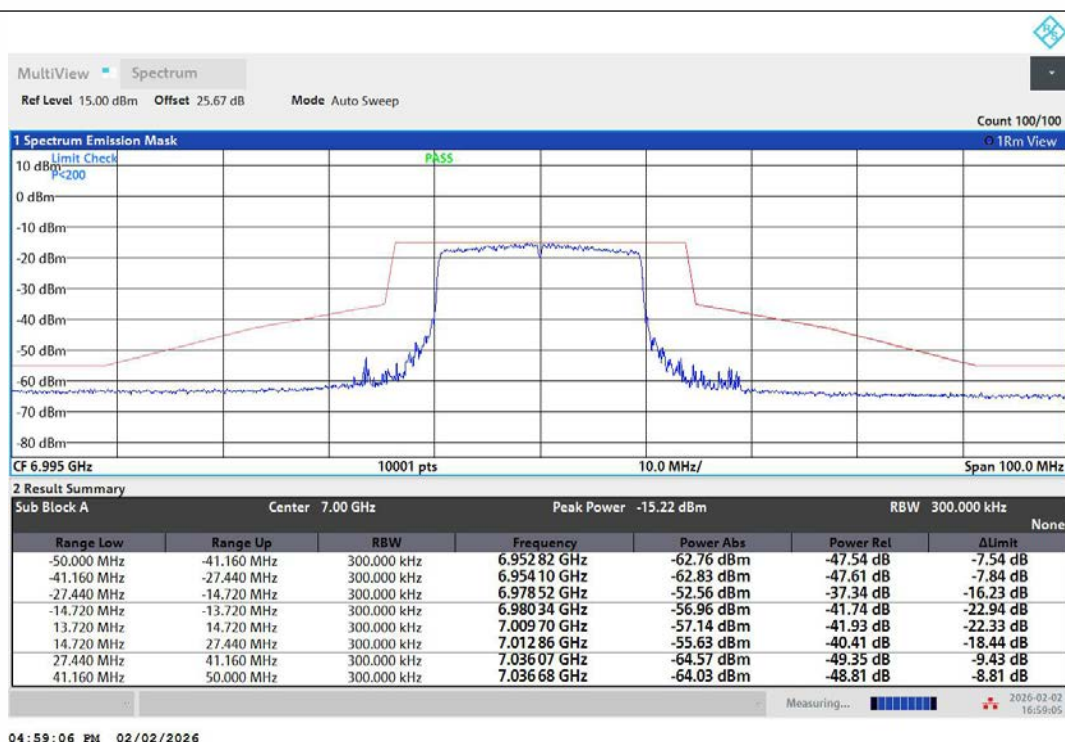
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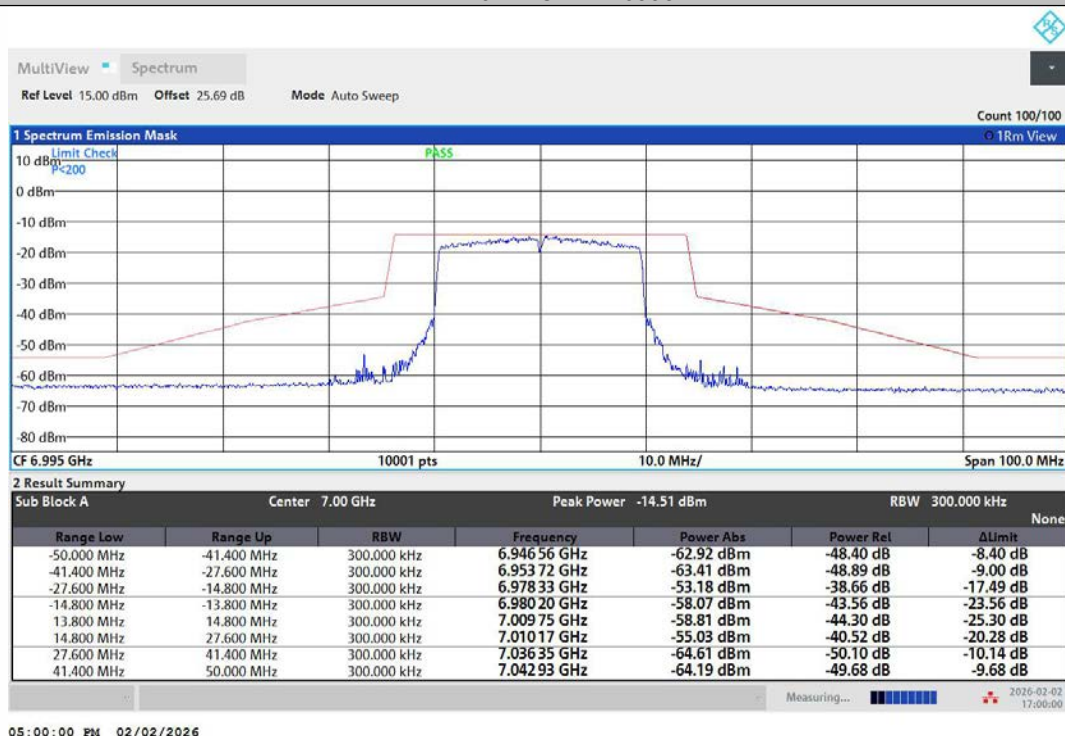
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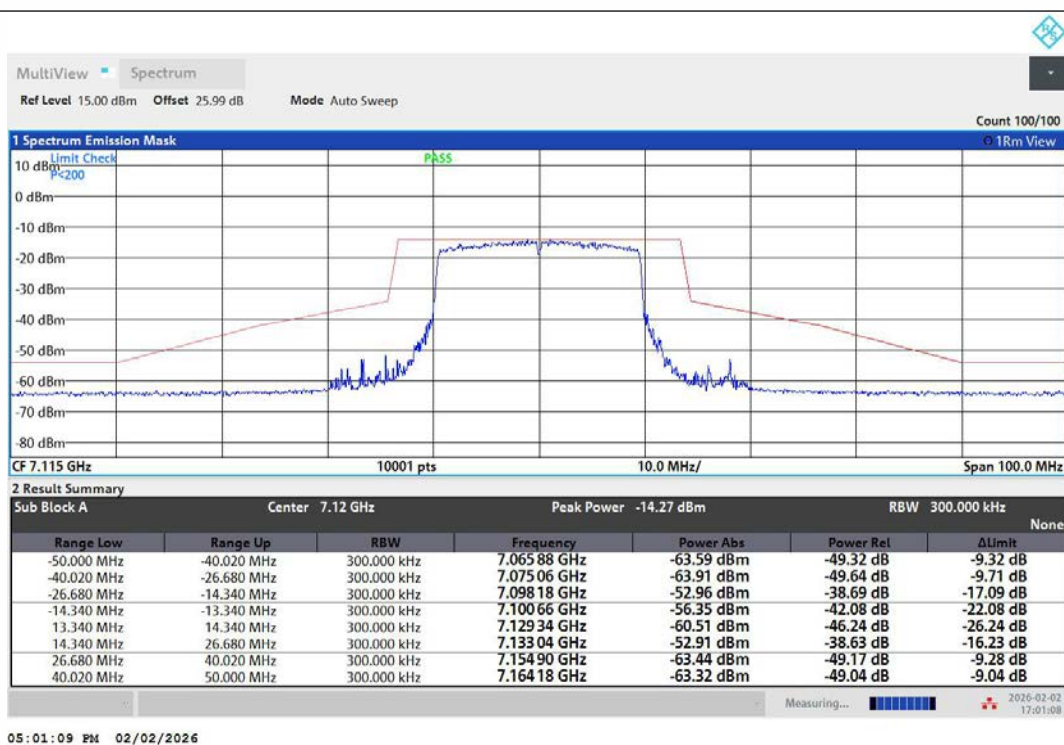
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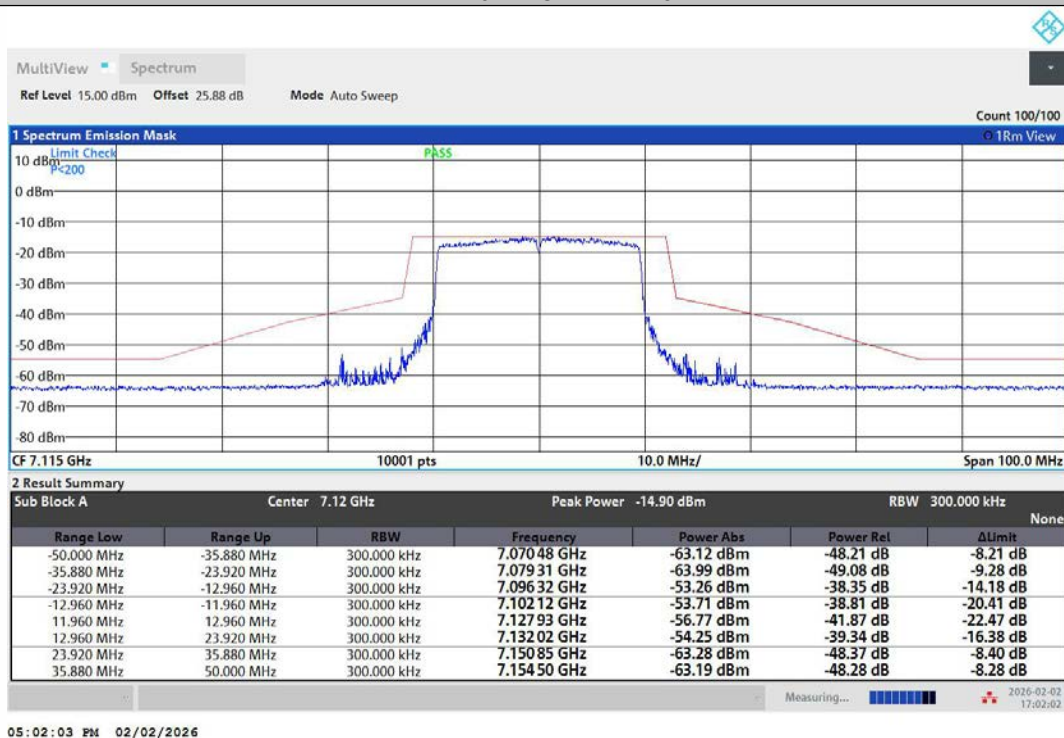
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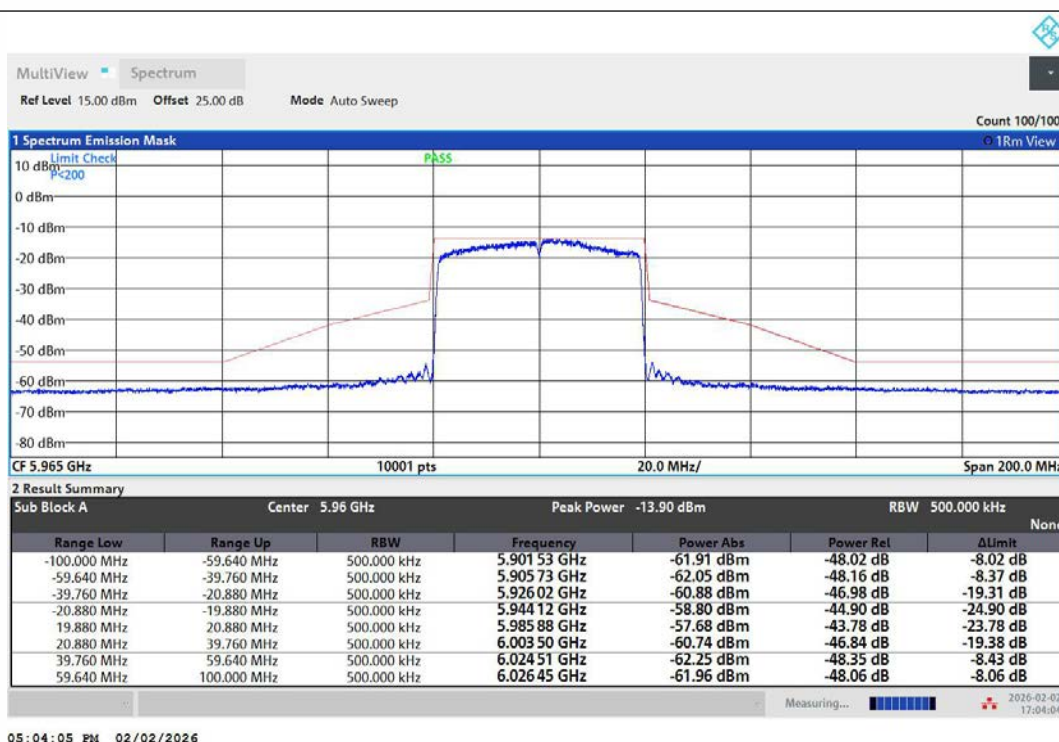
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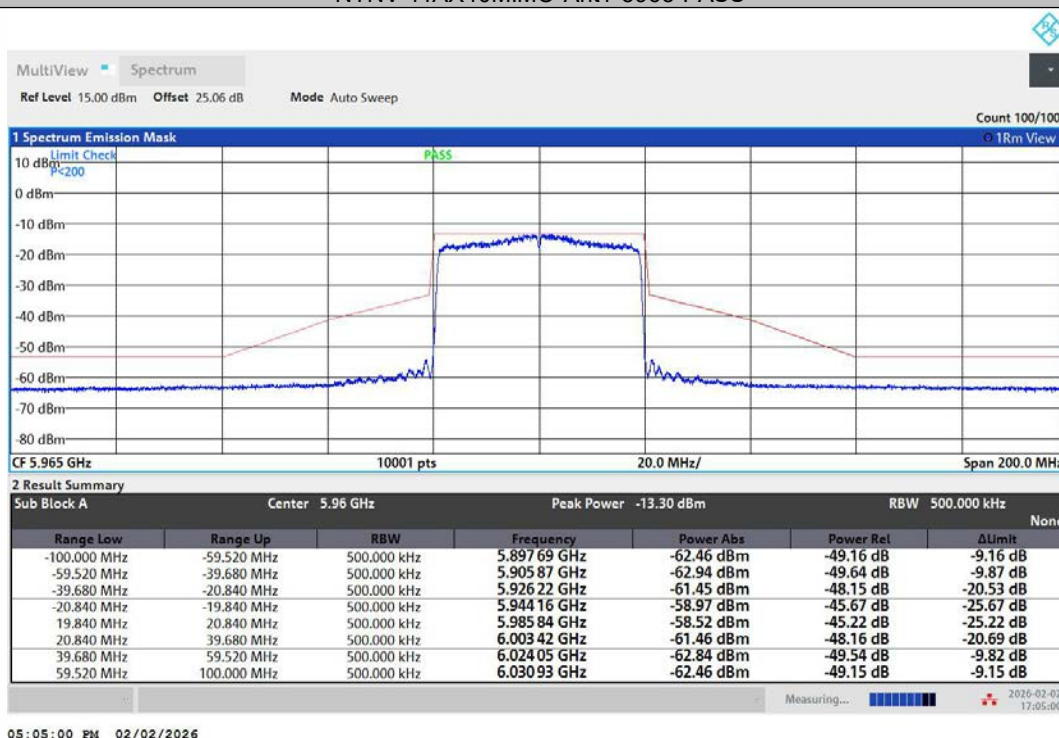
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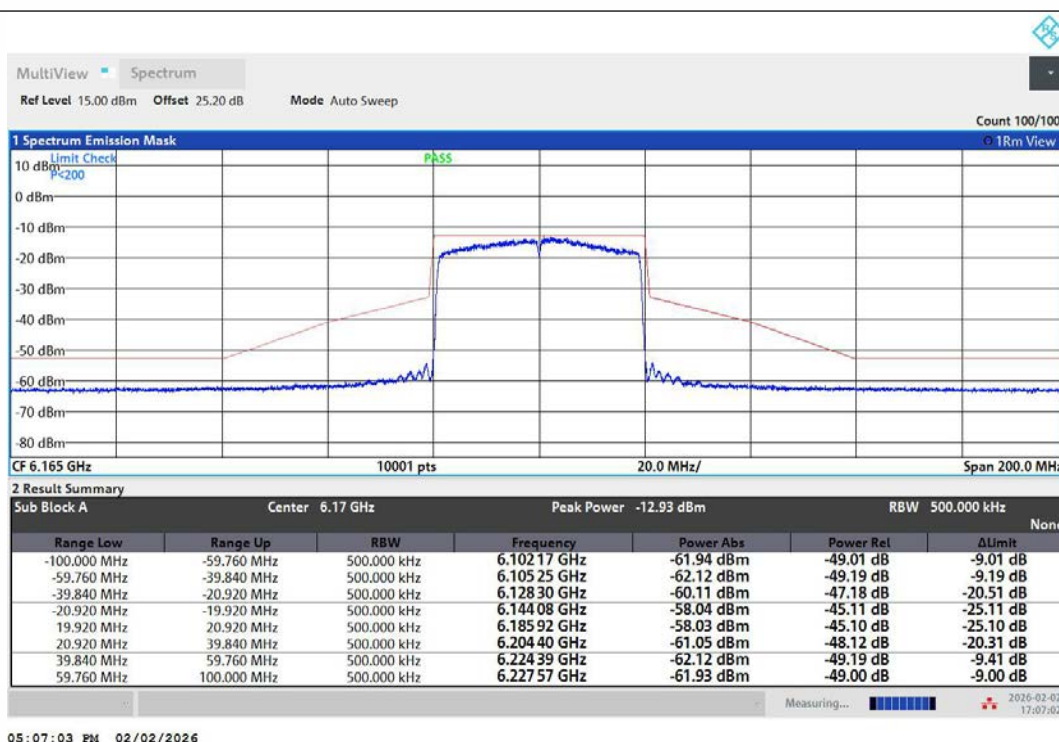
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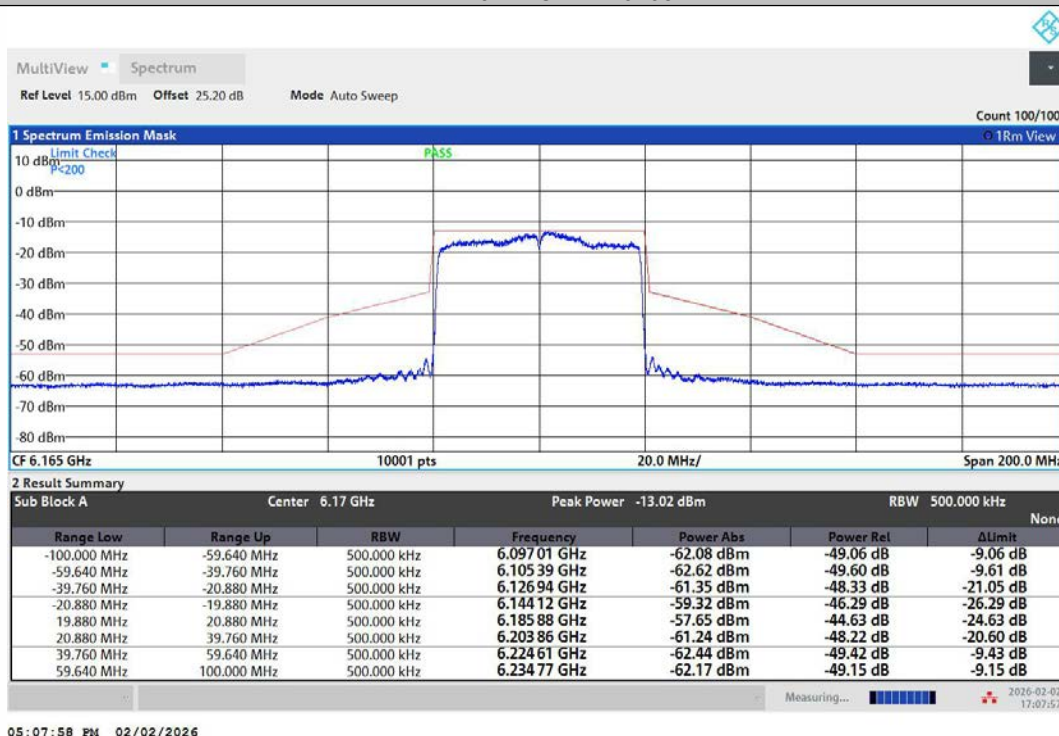
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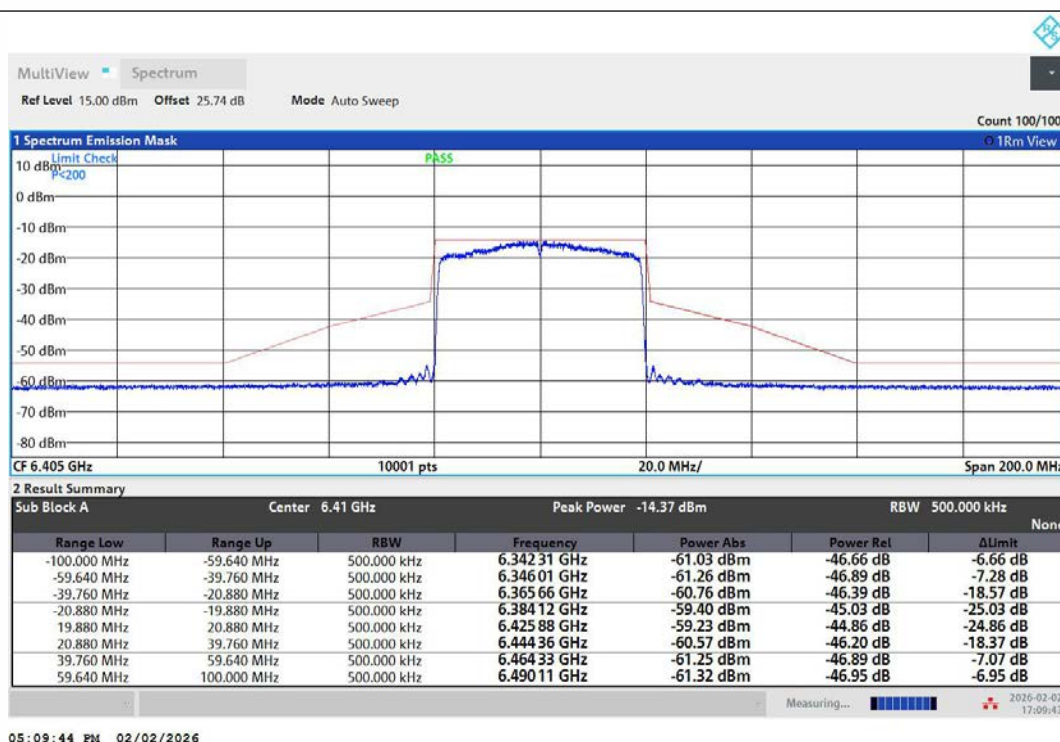
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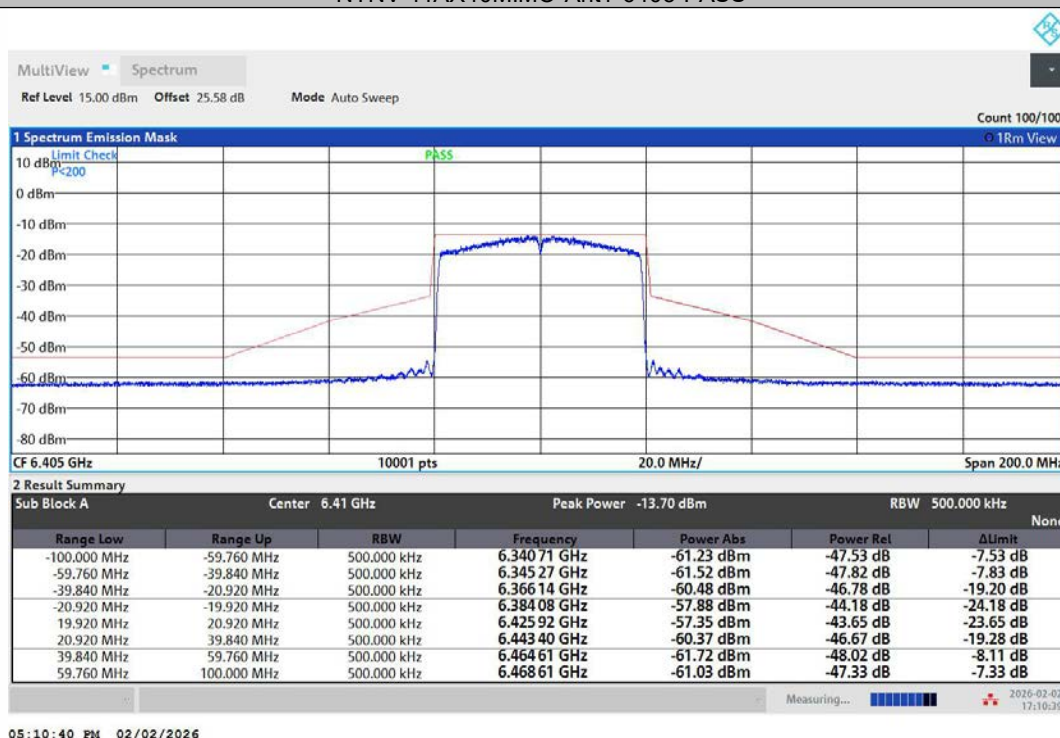
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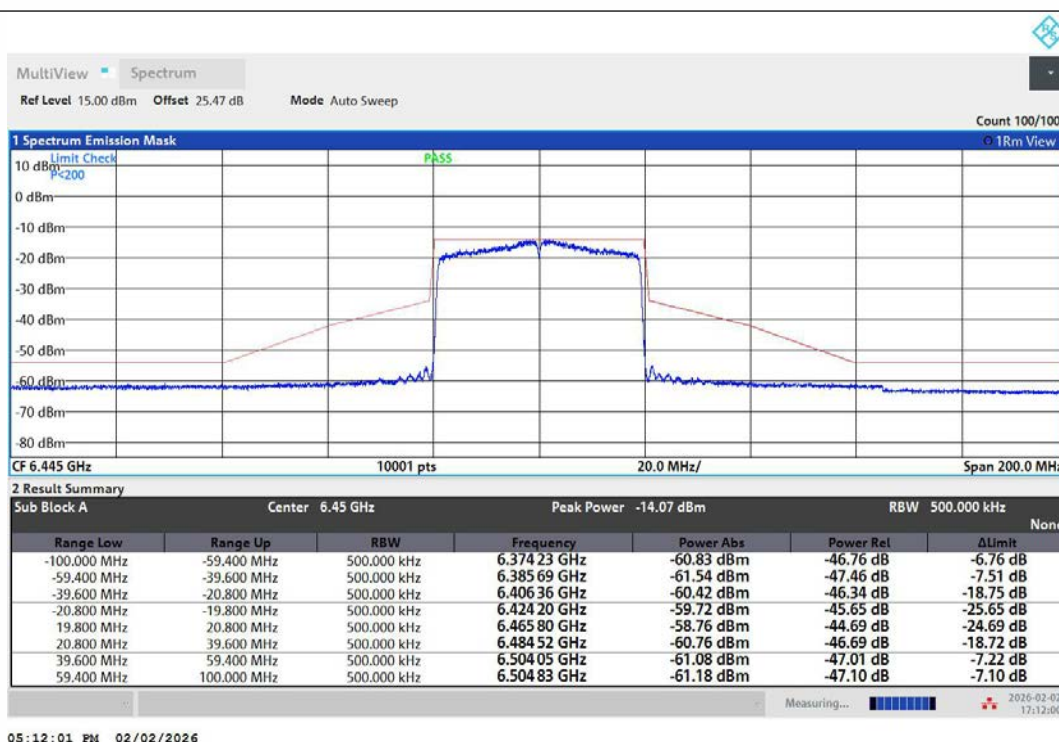
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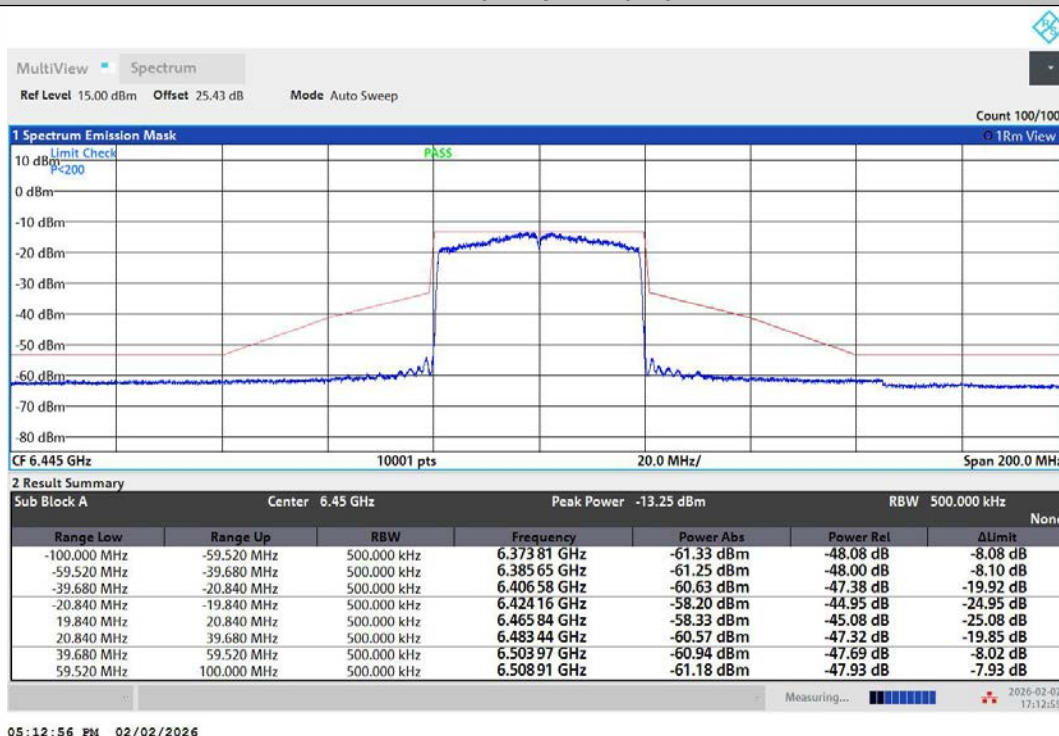
NTNV-11AX40MIMO-Ant1-6405-PASS



NTNV-11AX40MIMO-Ant2-6405-PASS



NTNV-11AX40MIMO-Ant1-6445-PASS



NTNV-11AX40MIMO-Ant2-6445-PASS



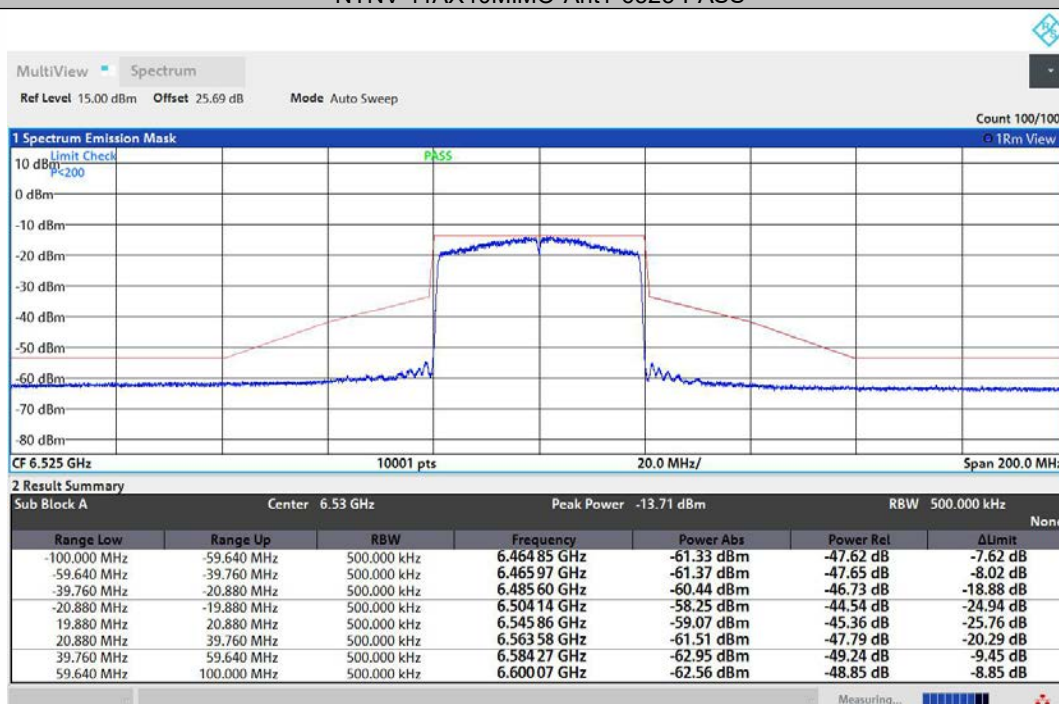
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NTNV-11AX40MIMO-Ant2-6485-PASS



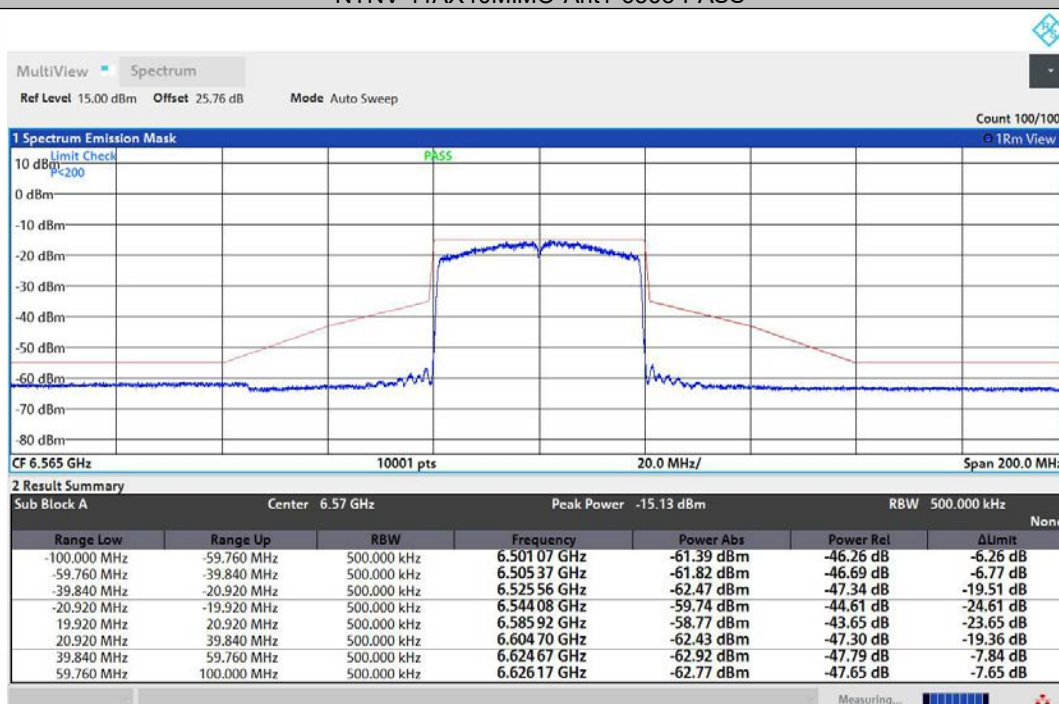
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NTNV-11AX40MIMO-Ant2-6525-PASS



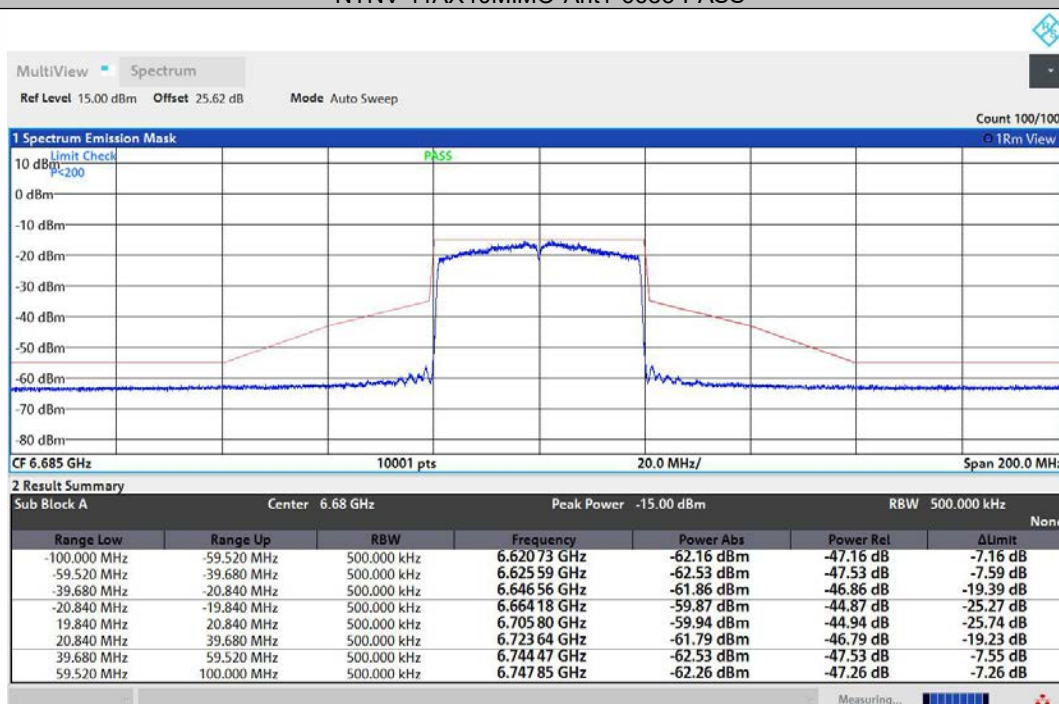
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NTNV-11AX40MIMO-Ant2-6565-PASS



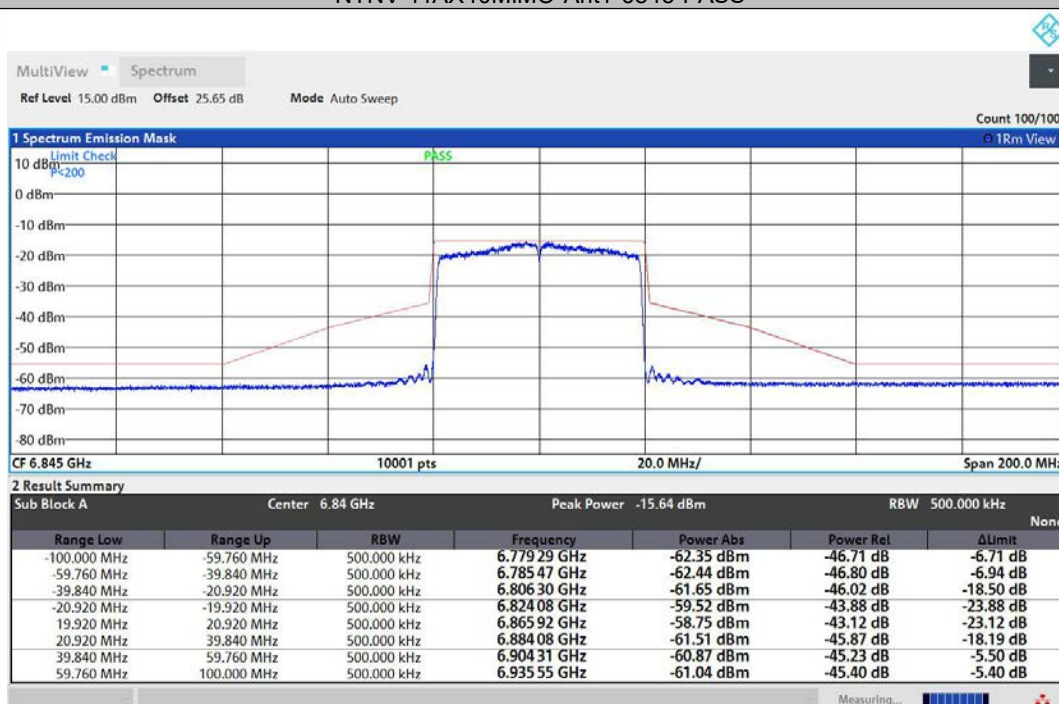
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NTNV-11AX40MIMO-Ant2-6685-PASS



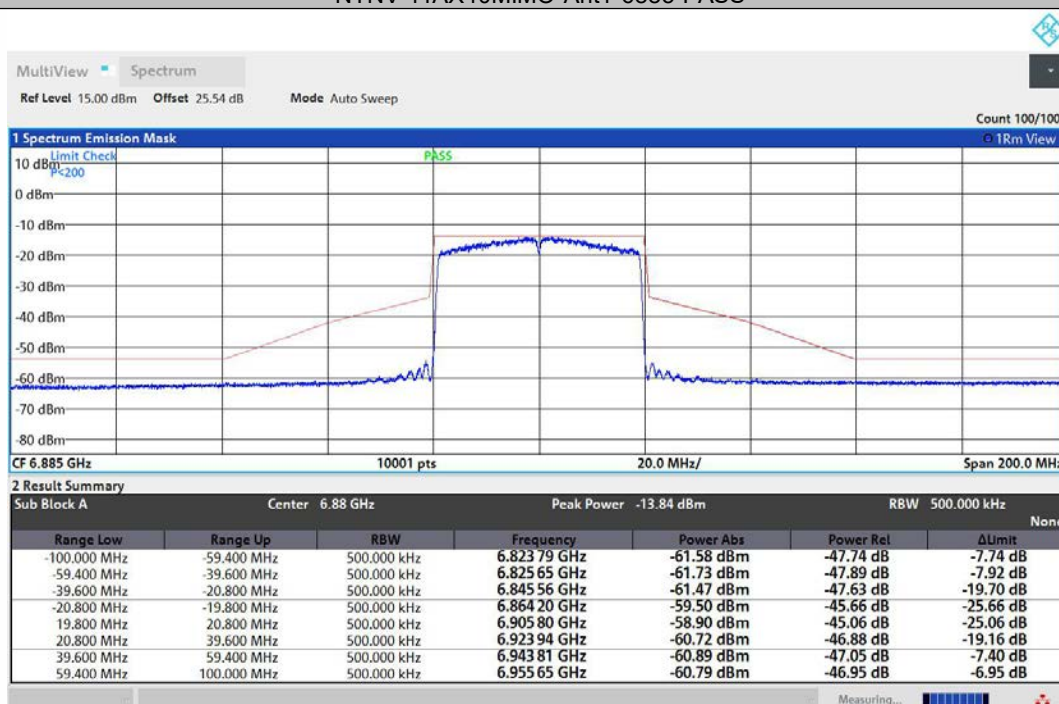
NTNV-11AX40MIMO-Ant1-6845-PASS



NTNV-11AX40MIMO-Ant2-6845-PASS



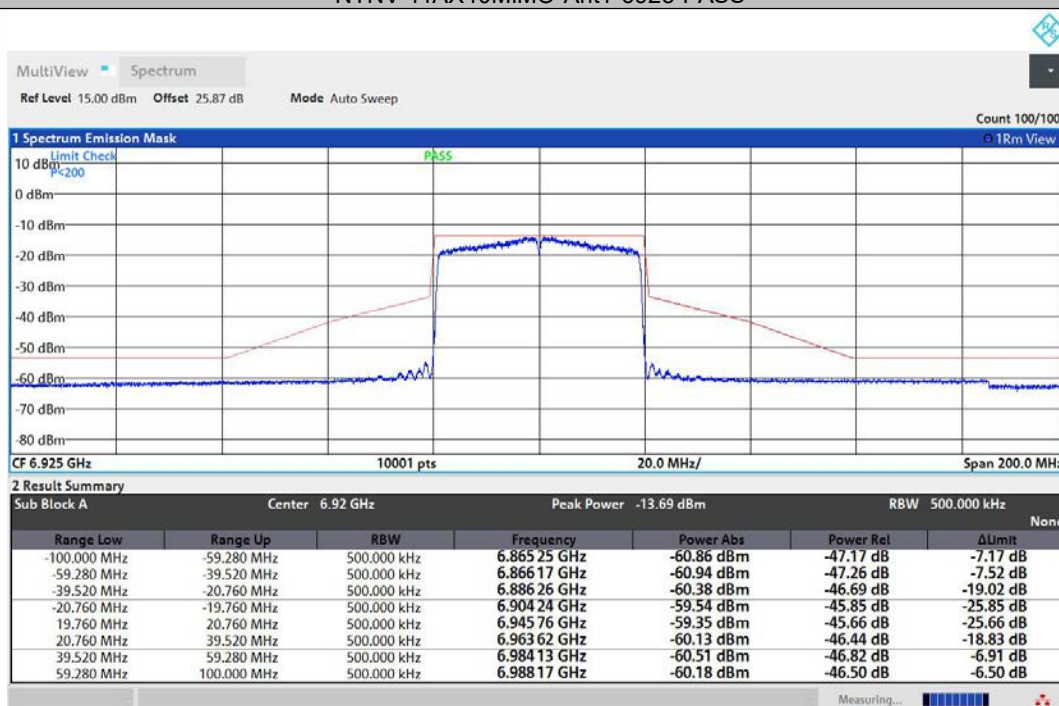
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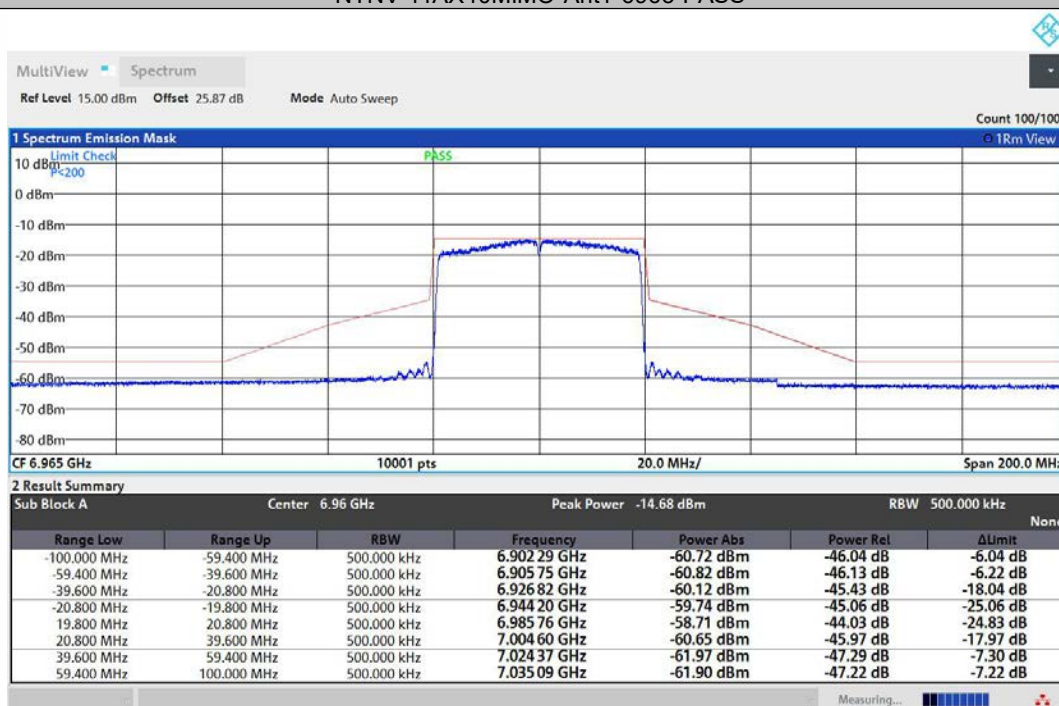
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NTNV-11AX40MIMO-Ant2-6925-PASS



NTNV-11AX40MIMO-Ant1-6965-PASS



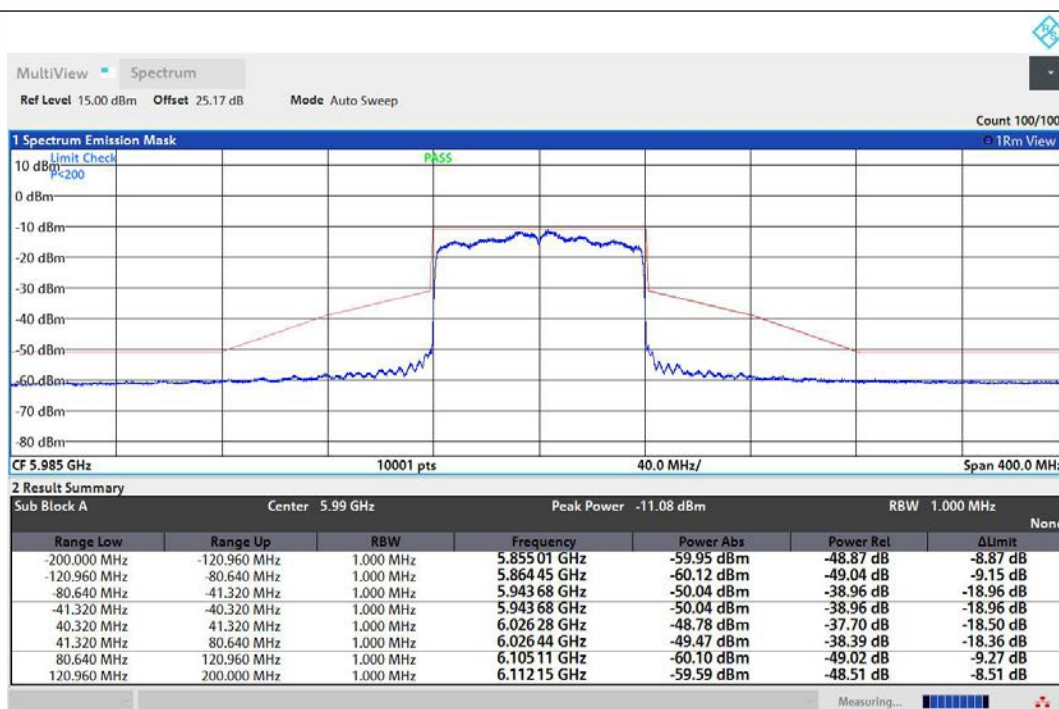
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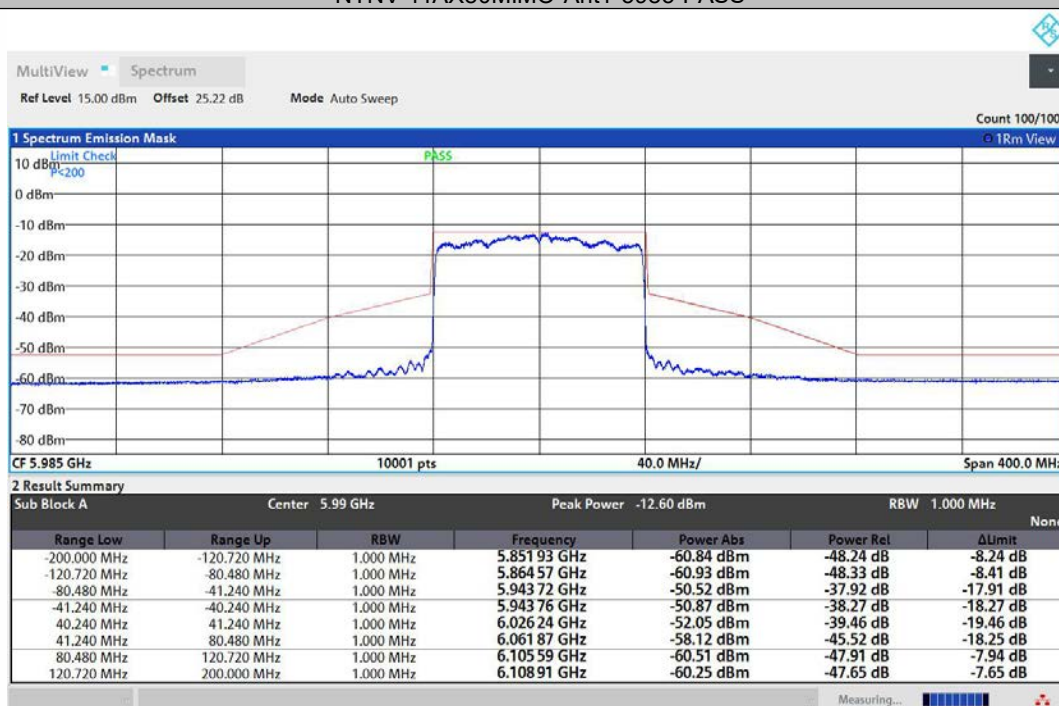
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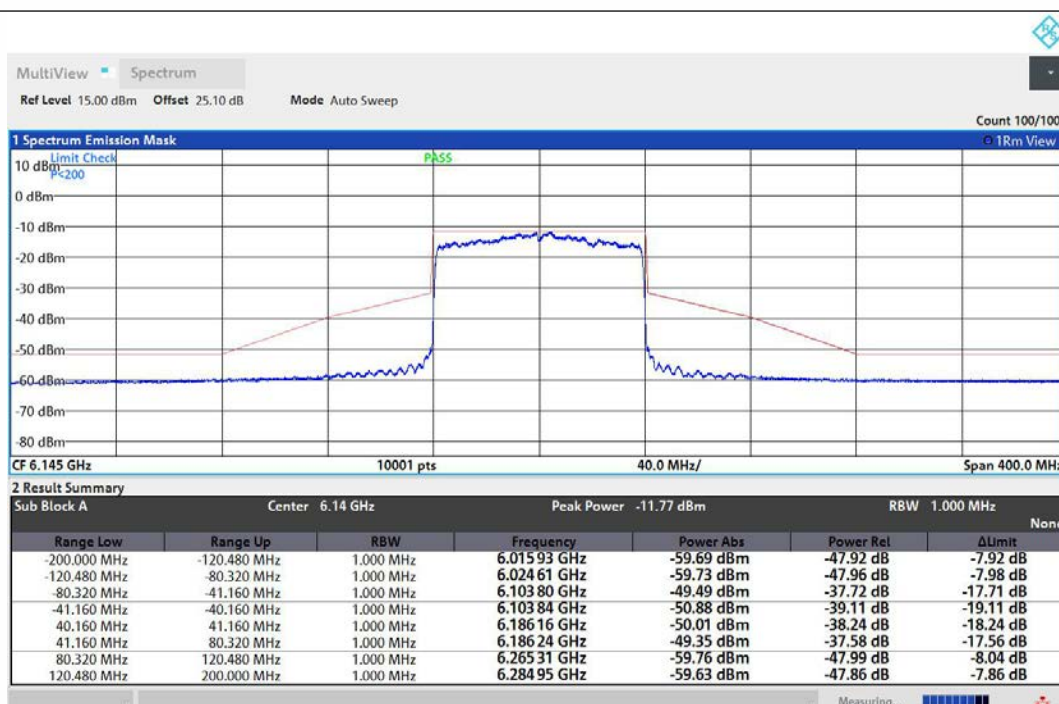
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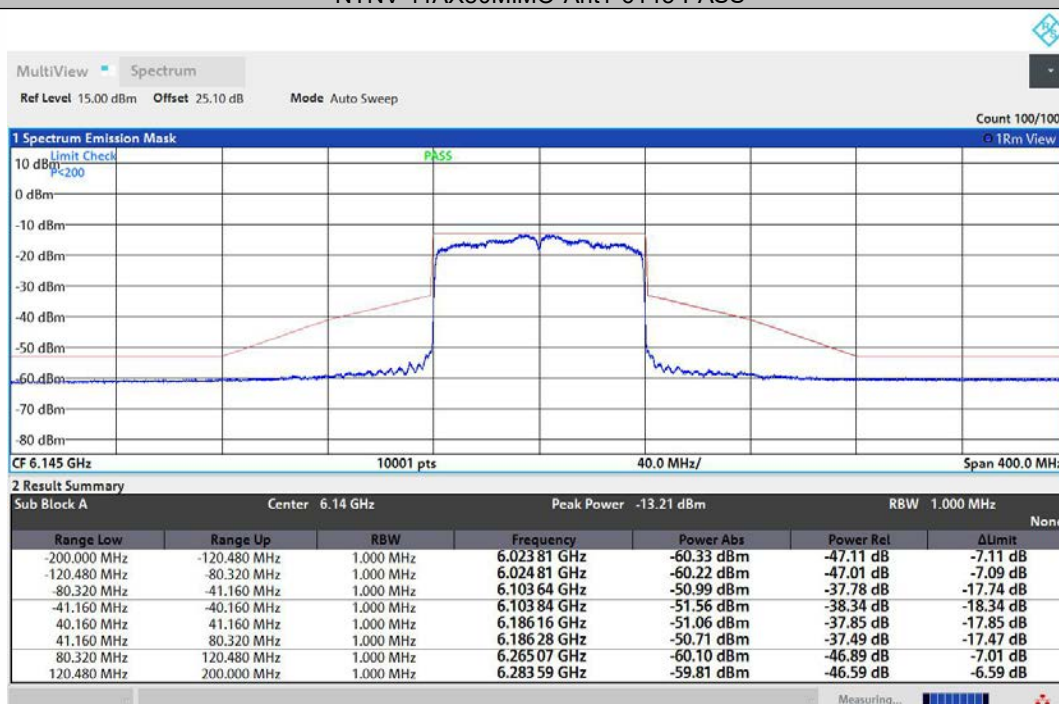
NTNV-11AX80MIMO-Ant1-5985-PASS



NTNV-11AX80MIMO-Ant2-5985-PASS



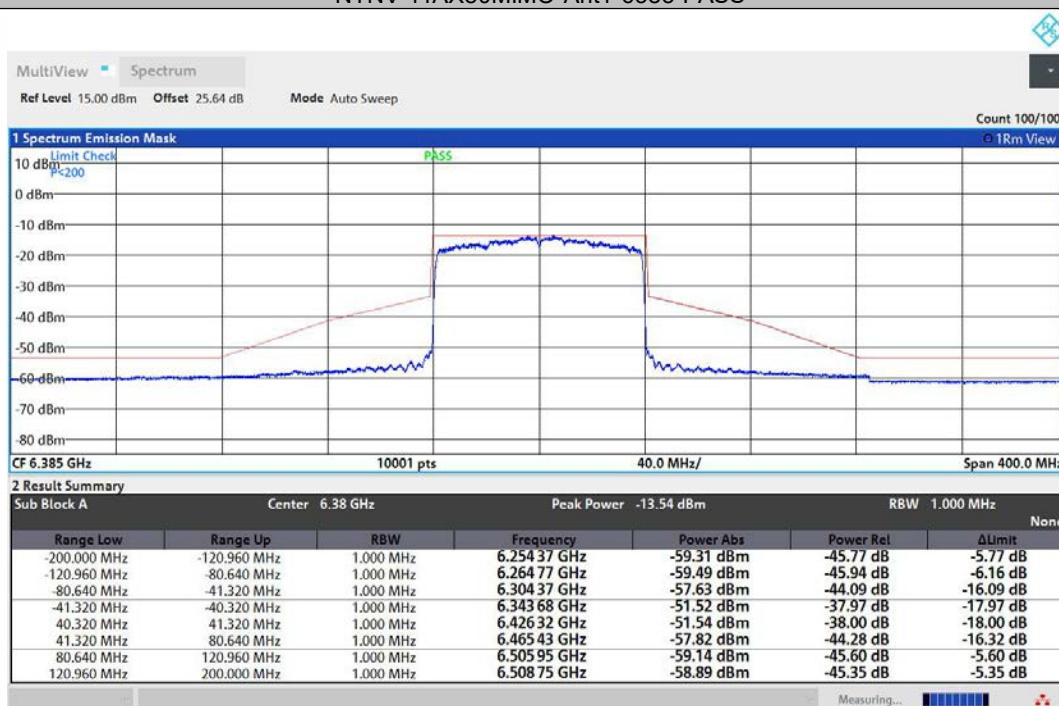
NTNV-11AX80MIMO-Ant1-6145-PASS



NTNV-11AX80MIMO-Ant2-6145-PASS



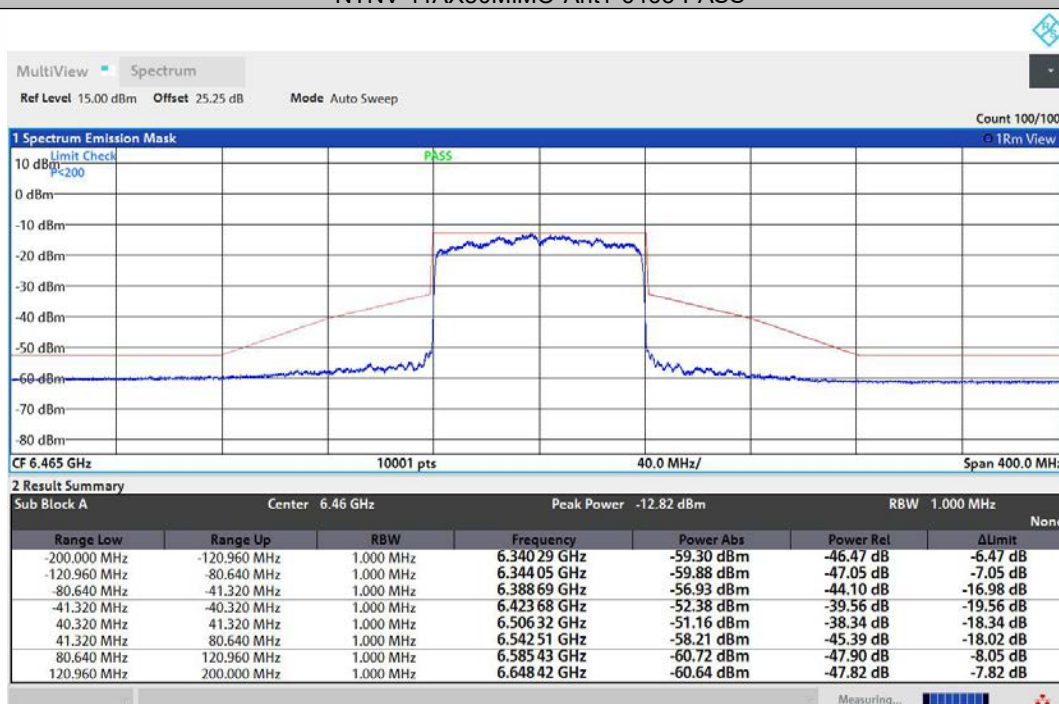
NTNV-11AX80MIMO-Ant1-6385-PASS



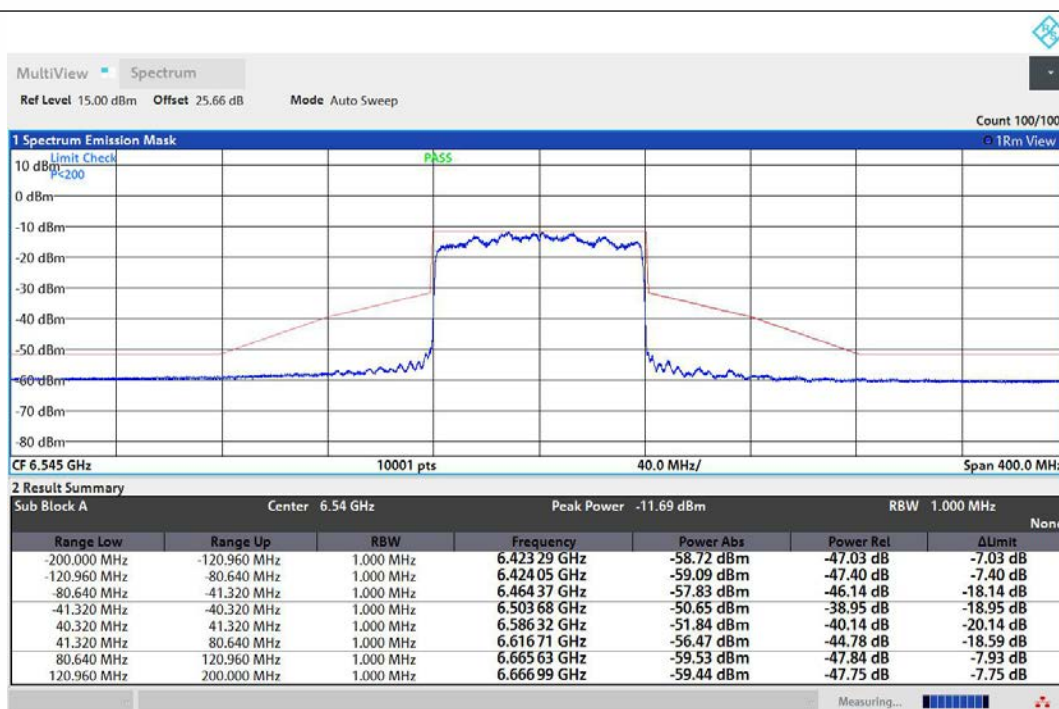
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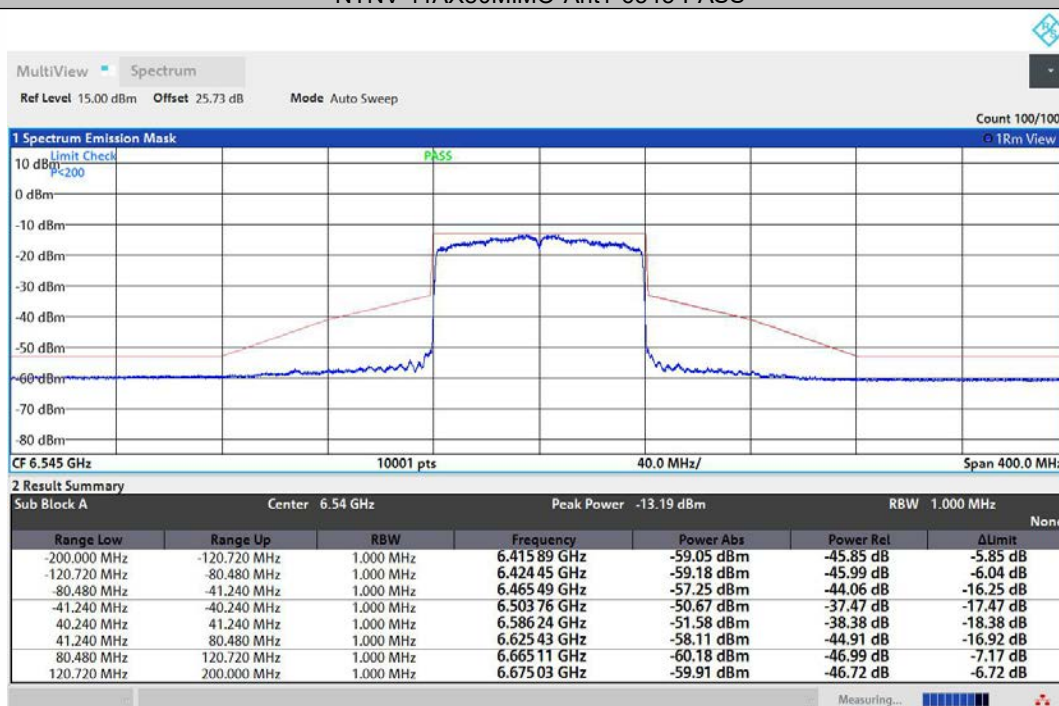
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NTNV-11AX80MIMO-Ant2-6465-PASS



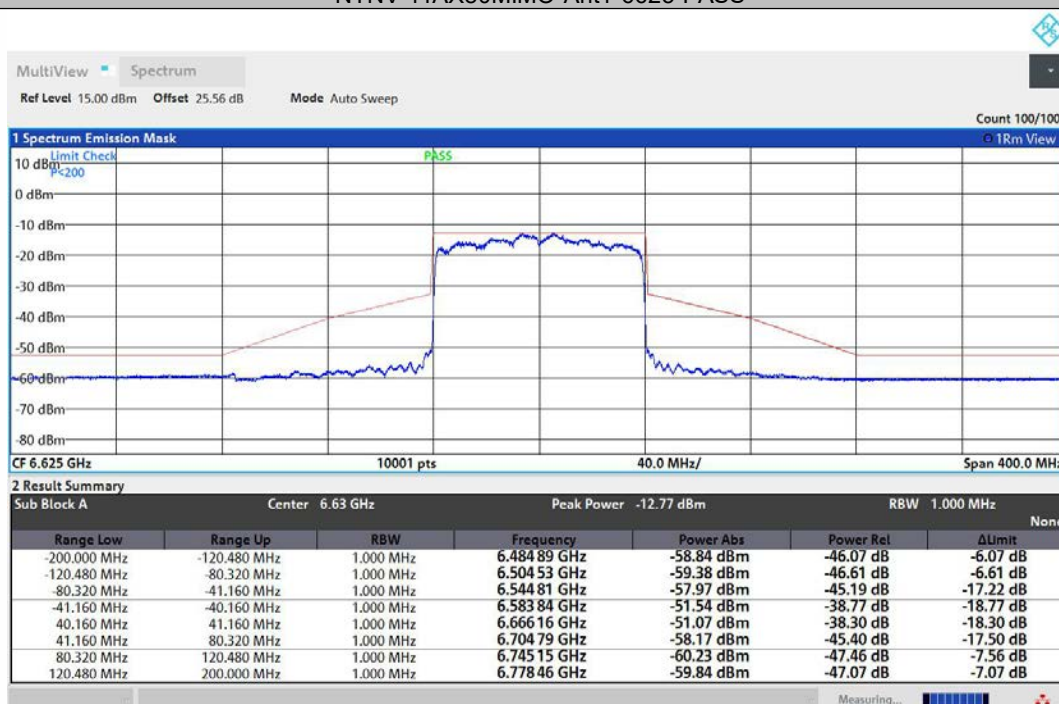
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NTNV-11AX80MIMO-Ant2-6545-PASS



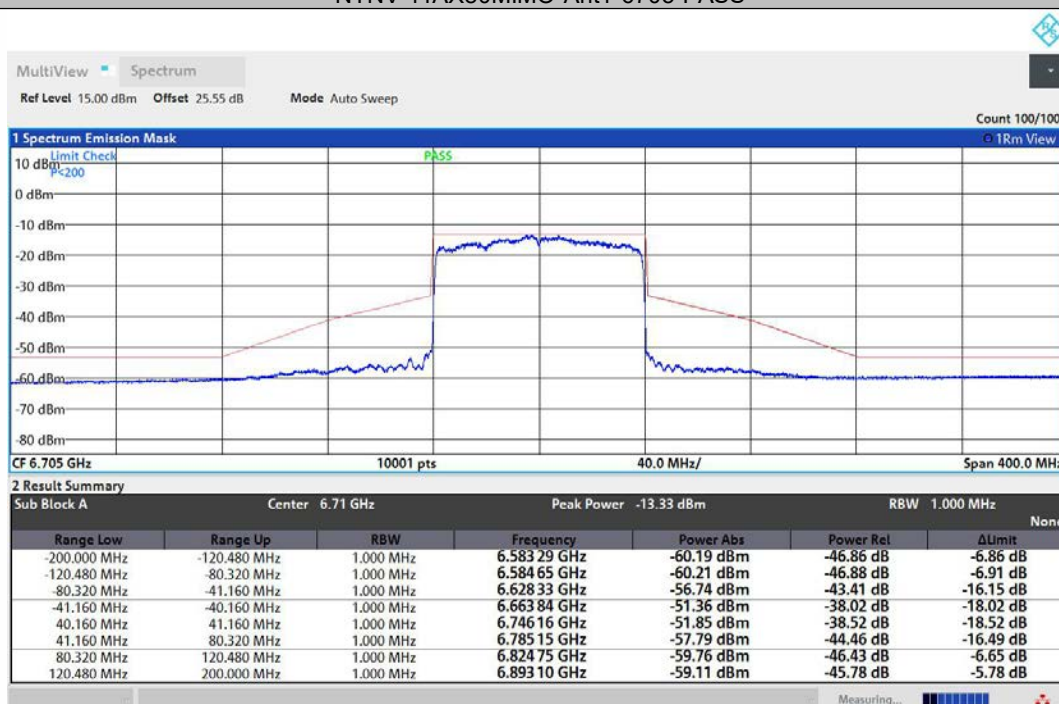
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NTNV-11AX80MIMO-Ant2-6625-PASS



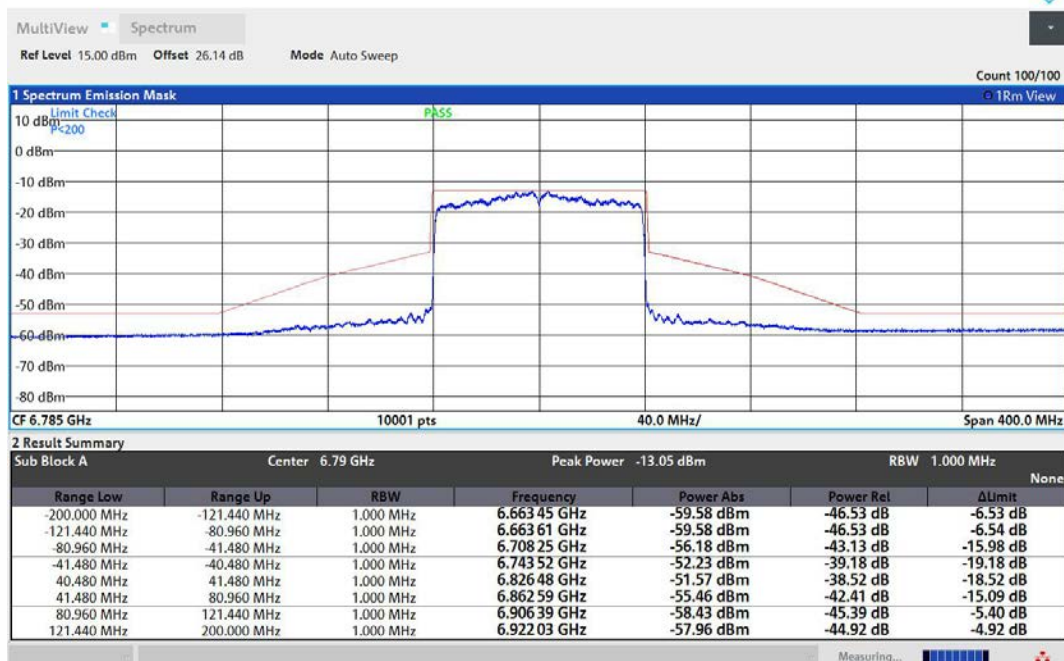
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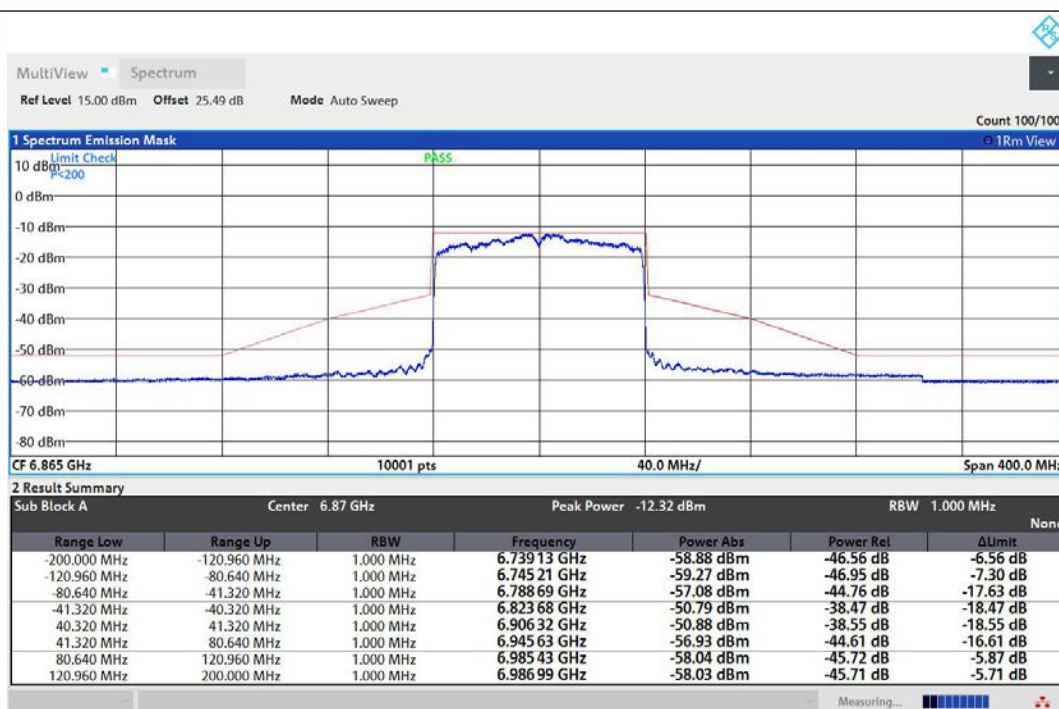
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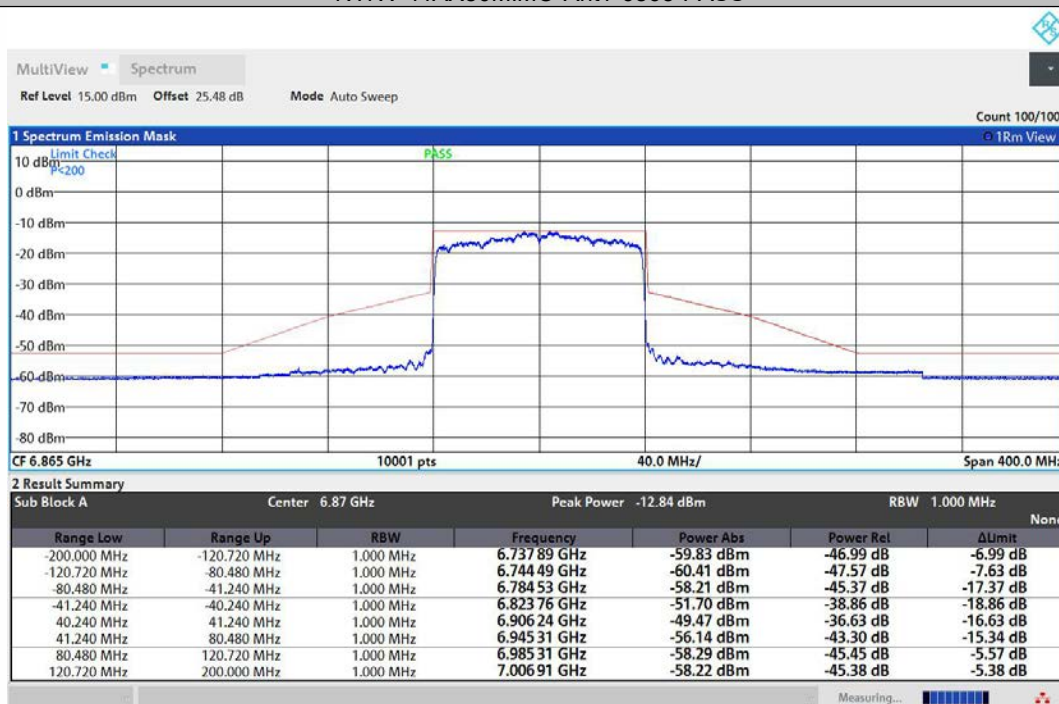
NTNV-11AX80MIMO-Ant1-6785-PASS



NTNV-11AX80MIMO-Ant2-6785-PASS



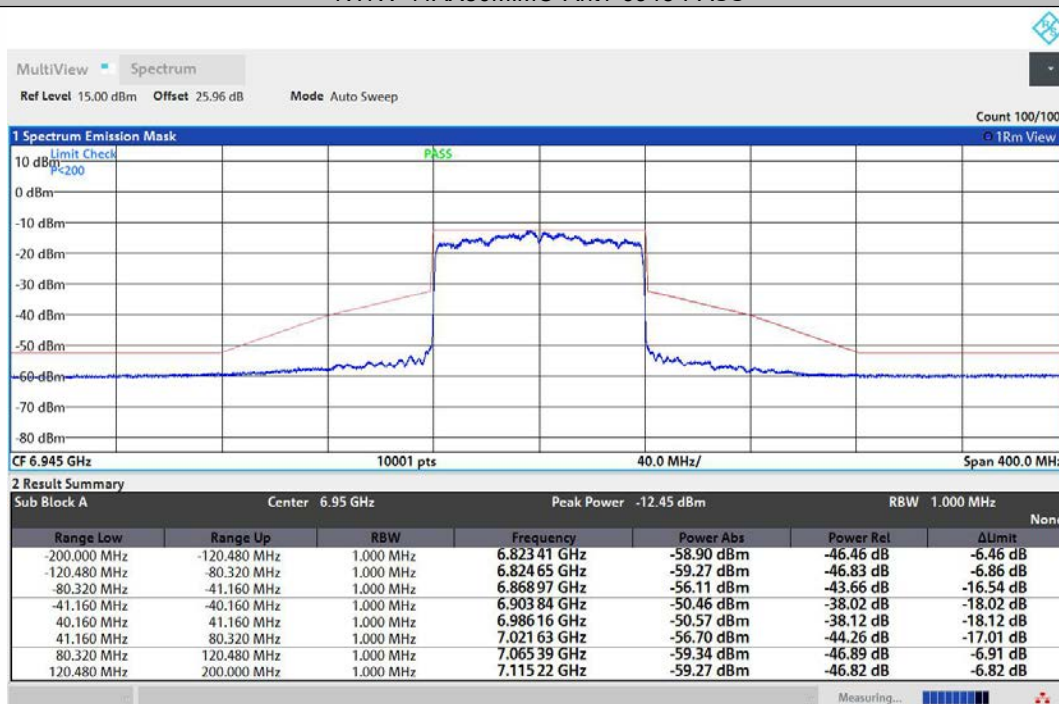
NTNV-11AX80MIMO-Ant1-6865-PASS



NTNV-11AX80MIMO-Ant2-6865-PASS



NTNV-11AX80MIMO-Ant1-6945-PASS



NTNV-11AX80MIMO-Ant2-6945-PASS



NTNV-11AX80MIMO-Ant1-7025-PASS



NTNV-11AX80MIMO-Ant2-7025-PASS

8.5 CONTENTION BASED PROTOCOL

8.5.1 Applicable Standard

According to FCC Part 15.407(d)

According to 987594 D02 Section II.I

According to RSS-248 4.8

8.5.2 Conformance Limit

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) are required to use technologies that include a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are detected in a technology-agnostic manner, unlicensed devices are required to detect co-channel radio frequency energy (energy detect) and avoid simultaneous transmission.

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 (in which incumbent signal is transmitted) and stay off the incumbent 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.

8.5.3 Test Configuration

a) Simulating Incumbent Signal

The incumbent signal is assumed to be noise-like. One example of such transmission could be Digital Video Broadcasting (DVB) systems that use Orthogonal Frequency Division Multiplexing (OFDM). Incumbent systems may also use different bandwidths for their transmissions. A 10 MHz-wide additive white Gaussian noise (AWGN) signal is selected to simulate and represent incumbent transmission.

b) Required number of tests

Incumbent and EUT (access point, subordinate or client) signals may occupy different portions of the channel. Depending on the EUT transmission bandwidth and incumbent signal center frequency

(simulated by a 10 MHz-wide AWGN signal), the center frequency of the EUT signal f_{c1} may fall within

the incumbent's occupied bandwidth, or outside of it.

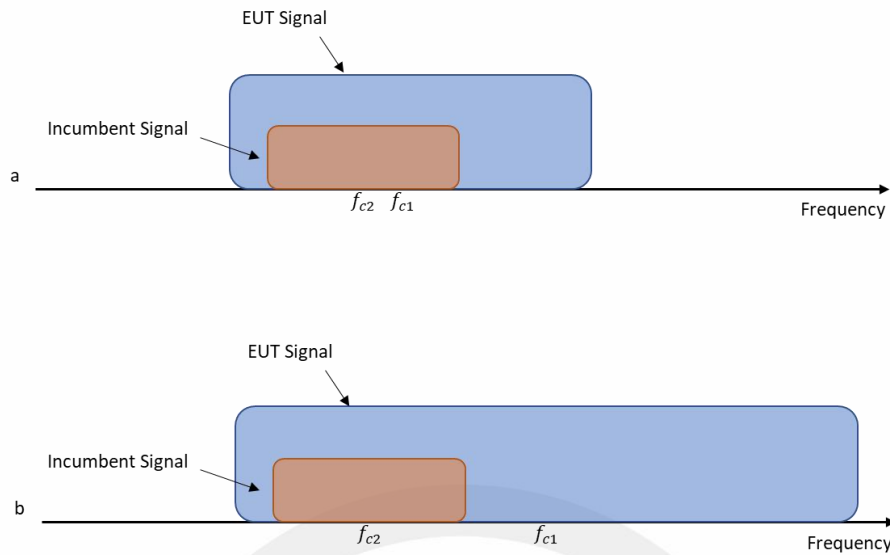


Figure. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it

To ensure EUT reliably detects an incumbent signal in both scenarios shown in Figure, the detection threshold test may be repeated more than once with the incumbent signal (having center frequency f_{c2})

tuned to different center frequencies within the UT transmission bandwidth. The criteria specified in Table determines how many times the detection threshold test must be performed;

Table. 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 ($f_{c1} = f_{c2}$)
$BW_{Inc} \leq BW_{EUT} \leq 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} \leq BW_{EUT} \leq 4BW_{Inc}$	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:

BW_{EUT} : Transmission bandwidth of EUT signal

BW_{Inc} : Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)

f_{c1} : Center frequency of EUT transmission

f_{c2} Center frequency of simulated incumbent signal

8.5.4 Test Procedure

To ensure the EUT is capable of detecting co-channel energy, the first step is to configure the EUT to transmit with a constant duty cycle. To simulate an incumbent signal, a signal generator (or similar source) that is capable of generating band-limited additive white Gaussian noise (AWGN) is required. Depending on the EUT antenna configuration, the AWGN signal can be provided to the EUT receiver via a conducted method (Figure). Figure shows the conducted test setup where a band-limited AWGN signal is generated at a very low power level and injected into the EUT's antenna port. The AWGN signal power level is then incrementally increased while the EUT transmission is monitored on a signal analyzer 2 to verify if the EUT can sense the AWGN signal and can subsequently cease its transmission. A triggered measurement, as shown in Figure, is optional, and assists with determining the time it takes the EUT to cease transmission (or vacate the channel) upon detecting RF energy. If the EUT has only one antenna port, then an AWGN signal source can be connected to the same antenna port.

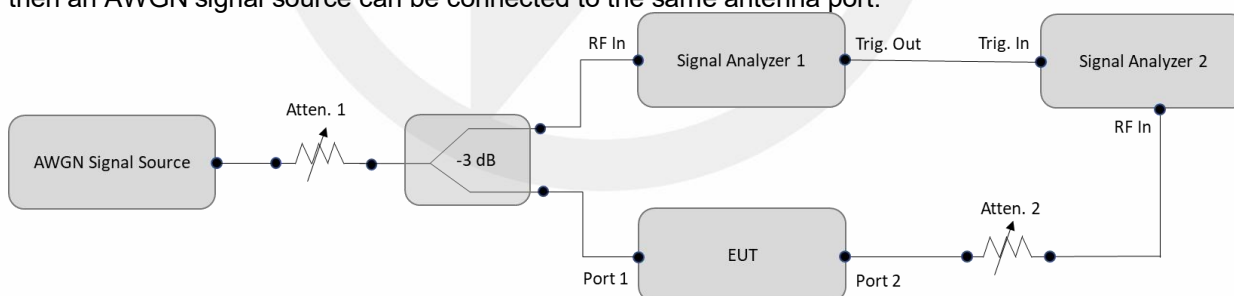


Figure. Contention-based protocol test setup, conducted method Step-by-Step Procedure, Conducted Setup

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. Connect the output port of the EUT to the signal analyzer 2, as shown in Figure. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
4. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
5. 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.
6. 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 Figure.

7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.

8. 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.

9. (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.

10. Refer to Table 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.

8.5.5 Test Results

PASS

Temperature :	25°C	ATM Pressure:	1011 mbar
Humidity :	45 %	Test Engineer:	LHJ

Test Mode	Antenna	Channel	Interference Frequency [MHz]		Status	Awgn Power [dBm]	Gain [dB]	Path Loss [dB]	Adjusted Power [dBm]	Limit [dBm]	Detection Rate		Verdict
											Result [%]	Limit [%]	
11AX20SISO	Ant2	5975	Center	5975	OFF	-61.03	2.62	0	-63.65	-62	100	90	PASS
11AX20SISO	Ant2	5975	Center	5975	Minimal	-61.96	2.62	0	-64.58	-62	66.67	---	---
11AX20SISO	Ant2	5975	Center	5975	ON	-67	2.62	0	-69.62	-62	---	---	---
11AX20SISO	Ant2	6455	Center	6455	OFF	-60.03	2.62	0	-62.65	-62	100	90	PASS
11AX20SISO	Ant2	6455	Center	6455	Minimal	-61.01	2.62	0	-63.63	-62	66.67	---	---
11AX20SISO	Ant2	6455	Center	6455	ON	-66	2.62	0	-68.62	-62	---	---	---
11AX20SISO	Ant2	6535	Center	6535	OFF	-62.9	2.62	0	-65.52	-62	100	90	PASS
11AX20SISO	Ant2	6535	Center	6535	Minimal	-63.85	2.62	0	-66.47	-62	0	---	---
11AX20SISO	Ant2	6535	Center	6535	ON	-66	2.62	0	-68.62	-62	---	---	---
11AX20SISO	Ant2	6935	Center	6935	OFF	-60.06	2.62	0	-62.68	-62	100	90	PASS
11AX20SISO	Ant2	6935	Center	6935	Minimal	-60.97	2.62	0	-63.59	-62	0	---	---
11AX20SISO	Ant2	6935	Center	6935	ON	-62	2.62	0	-64.62	-62	---	---	---
11AX80MIMO	Ant2	5985	Low	5951.5 236	OFF	-67.61	2.62	0	-70.23	-62	100	90	PASS
11AX80MIMO	Ant2	5985	Low	5951.5 236	Minimal	-68.51	2.62	0	-71.13	-62	0	---	---
11AX80MIMO	Ant2	5985	Low	5951.5 236	ON	-84.38	2.62	0	-87.00	-62	---	---	---
11AX80MIMO	Ant2	6465	Low	6431.6 188	OFF	-66.52	2.62	0	-69.14	-62	100	90	PASS
11AX80MIMO	Ant2	6465	Low	6431.6 188	Minimal	-67.38	2.62	0	-70.00	-62	0	---	---
11AX80MIMO	Ant2	6465	Low	6431.6 188	ON	-84.38	2.62	0	-87.00	-62	---	---	---
11AX80MIMO	Ant2	6625	Low	6591.5 088	OFF	-68.3	2.62	0	-70.92	-62	100	90	PASS
11AX80MIMO	Ant2	6625	Low	6591.5 088	Minimal	-69.17	2.62	0	-71.79	-62	---	---	---
11AX80MIMO	Ant2	6625	Low	6591.5 088	ON	-84.38	2.62	0	-87.00	-62	---	---	---
11AX80MIMO	Ant2	6865	Low	6831.5 703	OFF	-71.37	2.62	0	-73.99	-62	100	90	PASS
11AX80MIMO	Ant2	6865	Low	6831.5 703	Minimal	-72.07	2.62	0	-74.69	-62	0	---	---
11AX80MIMO	Ant2	6865	Low	6831.5 703	ON	-84.38	2.62	0	-87.00	-62	---	---	---

Note 1: Margin = Detection Limit - Adjusted Power

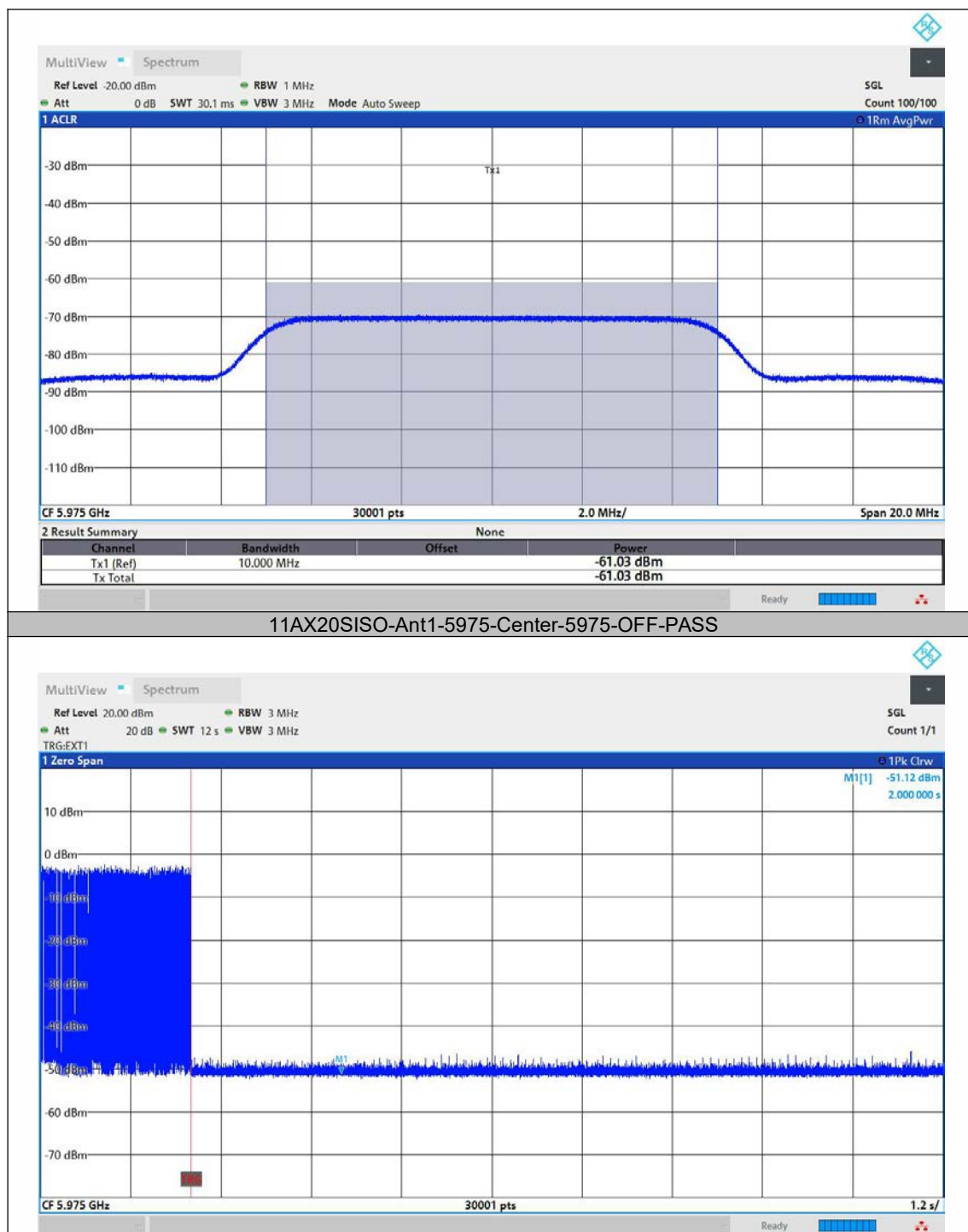
Note 2: Adjusted Power= Injected AWGN Power - Antenna Gain + Path Loss

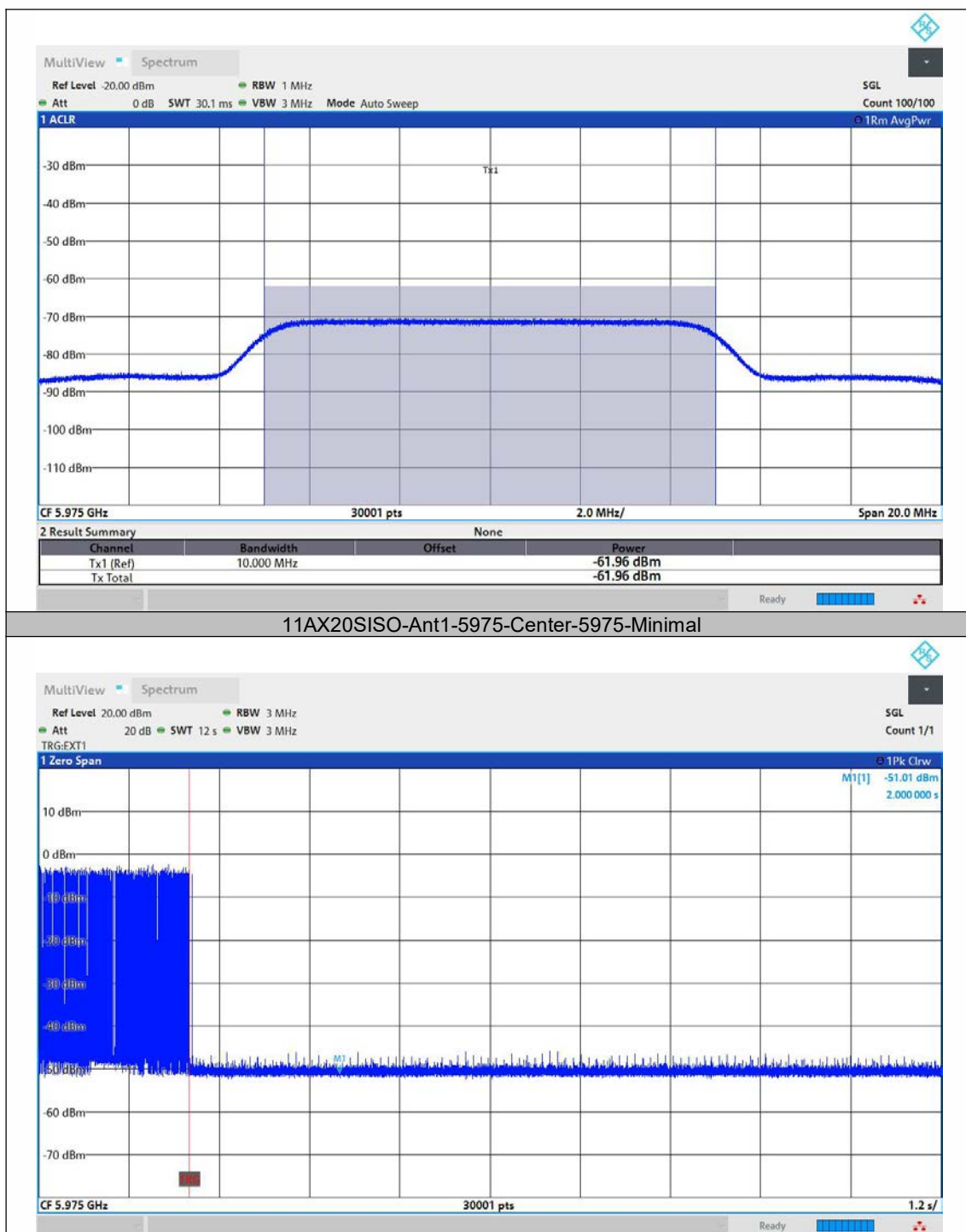
Note 3: The device does not use channel puncturing and bandwidth reduction for the purpose of incumbent avoidance.

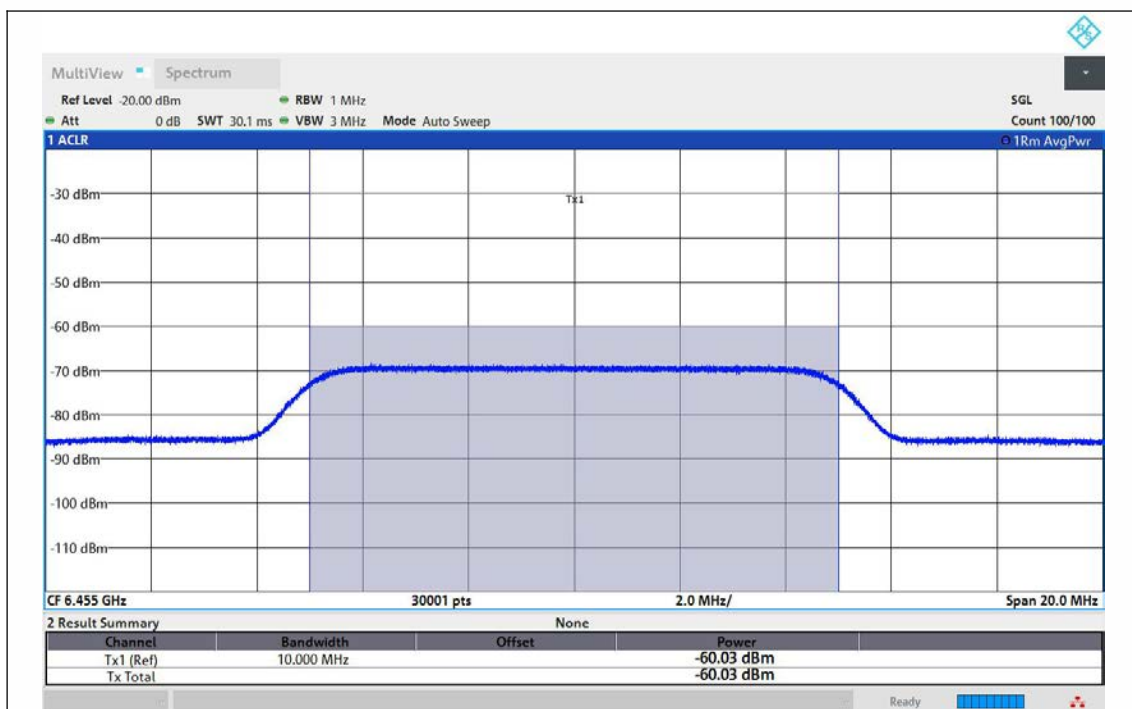
Test Mode	Antenna	Channel	Interference Frequency [MHz]		Status	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Rate [%]	Limit [%]	Verdict
11AX20SISO	Ant2	5975	Center	5975	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX20SISO	Ant2	5975	Center	5975	Minimal	-	---	-	---	-	-	-	-	-	---	66.67	---	---
11AX20SISO	Ant2	5975	Center	5975	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX20SISO	Ant2	6455	Center	6455	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX20SISO	Ant2	6455	Center	6455	Minimal	-	---	-	---	-	-	-	-	-	---	66.67	---	---
11AX20SISO	Ant2	6455	Center	6455	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX20SISO	Ant2	6535	Center	6535	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX20SISO	Ant2	6535	Center	6535	Minimal	-	---	-	---	-	-	-	-	-	---	0	---	---
11AX20SISO	Ant2	6535	Center	6535	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX20SISO	Ant2	6935	Center	6935	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX20SISO	Ant2	6935	Center	6935	Minimal	-	---	-	---	-	-	-	-	-	---	0	---	---
11AX20SISO	Ant2	6935	Center	6935	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX80MIMO	Ant2	5985	Low	5951.5236	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX80MIMO	Ant2	5985	Low	5951.5236	Minimal	-	---	-	---	-	-	-	-	-	---	0	---	---
11AX80MIMO	Ant2	5985	Low	5951.5236	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX80MIMO	Ant2	6465	Low	6431.6188	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX80MIMO	Ant2	6465	Low	6431.6188	Minimal	-	---	-	---	-	-	-	-	-	---	0	---	---
11AX80MIMO	Ant2	6465	Low	6431.6188	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX80MIMO	Ant2	6625	Low	6591.5088	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX80MIMO	Ant2	6625	Low	6591.5088	Minimal	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX80MIMO	Ant2	6625	Low	6591.5088	ON	-	---	-	---	-	-	-	-	-	---	---	---	---
11AX80MIMO	Ant2	6865	Low	6831.5703	OFF	1	1	1	---	-	-	-	-	-	---	100	90	PASS
11AX80MIMO	Ant2	6865	Low	6831.5703	Minimal	-	---	-	---	-	-	-	-	-	---	0	---	---
11AX80MIMO	Ant2	6865	Low	6831.5703	ON	-	---	-	---	-	-	-	-	-	---	---	---	---

Note 1: CBP Detection Trials (1=Detection, 0=No Detection).

Note 2: The device does not use channel puncturing and bandwidth reduction for the purpose of incumbent avoidance.







11AX20SISO-Ant1-6455-Center-6455-OFF-PASS

