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6. Spurious Emission at Antenna Terminal

§ 24.238 Emission limitations for Broadband PCS equipment

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§ 27.53 Emission limits

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

(3) Measurement procedure. (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.



Test Procedures :

The RF Output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 kHz(below 1 GHz), 1 MHz(Above 1 GHz). Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Notes :

1. In 9 kHz - 10 kHz and 150 kHz - 30 MHz bands, RBW was reduced to 1% and 10% of the reference bandwidth for measuring unwanted emission level(typically, 100 kHz if the authorized frequency band is below 1 GHz) and power was integrated.(1% = +20 dB, 10% = +10 dB)
2. Because the test results are similar trend value for each port, attached plots were only the worst test result.

Test port(Worst case)						
Band type	Bandwidth	Positions	Frequency	Power	Output port	Test Port
Band 2	5 MHz	Bottom	1932.5 MHz	40 W	2TX(5, 6)	Port 5
				20 W	4TX(5, 6, 7, 8)	Port 7
		Middle	1960.0 MHz	40 W	2TX(5, 6)	Port 5
				20 W	4TX(5, 6, 7, 8)	Port 7
		Top	1987.5 MHz	40 W	2TX(5, 6)	Port 5
				20 W	4TX(5, 6, 7, 8)	Port 7
	15 MHz	Bottom	1937.5 MHz	60 W	2TX(5, 6)	Port 5
				40 W	4TX(5, 6, 7, 8)	Port 7
		Middle	1960.0 MHz	60 W	2TX(5, 6)	Port 5
				40 W	4TX(5, 6, 7, 8)	Port 7
		Top	1982.5 MHz	60 W	2TX(5, 6)	Port 5
				40 W	4TX(5, 6, 7, 8)	Port 7
Band 66	5 MHz	Bottom	2112.5 MHz	40 W	2TX(1, 2)	Port 1
				20 W	4TX(1, 2, 3, 4)	Port 3
		Middle	2145.0 MHz	40 W	2TX(1, 2)	Port 1
				20 W	4TX(1, 2, 3, 4)	Port 3
		Top	2177.5 MHz	40 W	2TX(1, 2)	Port 1
				20 W	4TX(1, 2, 3, 4)	Port 3
	15 MHz	Bottom	2117.5 MHz	90 W	2TX(1, 2)	Port 1
				60 W	4TX(1, 2, 3, 4)	Port 3
		Middle	2177.5 MHz	90 W	2TX(1, 2)	Port 1
				60 W	4TX(1, 2, 3, 4)	Port 3
		Top	2172.5 MHz	90 W	2TX(1, 2)	Port 1
				60 W	4TX(1, 2, 3, 4)	Port 3



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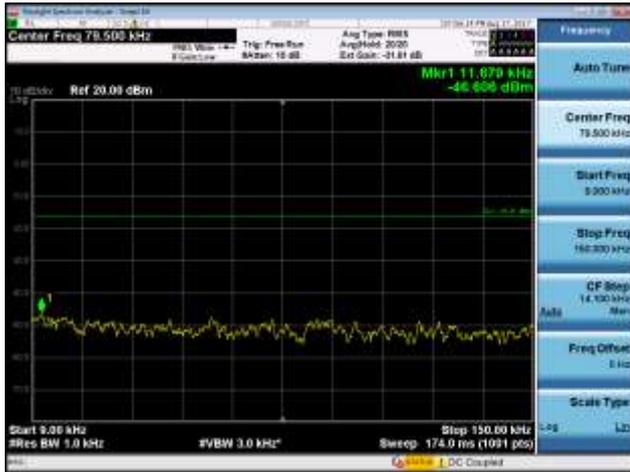
Test port(Worst case)								
Type	Bandwidth positions		1 st FA	2 nd FA	Power Sum	Output port	Test Port	
Band 2	Contiguous	Bottom	Bandwidth	5 MHz	5 MHz			
			Frequency	1932.5 MHz	1937.5 MHz			
			Output Power	30 W	30 W	60 W	2TX(5, 6)	Port 5
				20 W	20 W	40 W	4TX(5, 6, 7, 8)	Port 7
		Top	Bandwidth	5 MHz	5 MHz			
				Frequency	1982.5 MHz	1987.5 MHz		
			Output Power	30 W	30 W	60 W	2TX(5, 6)	Port 5
				20 W	20 W	40 W	4TX(5, 6, 7, 8)	Port 7
	Bottom	Bandwidth	5 MHz	15 MHz				
			Frequency	1932.5 MHz	1942.5 MHz			
		Output Power	15 W	45 W	60 W	2TX(5, 6)	Port 5	
			10 W	30 W	40 W	4TX(5, 6, 7, 8)	Port 7	
	Top	Bandwidth	5 MHz	15 MHz				
			Frequency	1972.5 MHz	1982.5 MHz			
		Output Power	15 W	45 W	60 W	2TX(5, 6)	Port 5	
			10 W	30 W	40 W	4TX(5, 6, 7, 8)	Port 7	
Non-Contiguous	Bottom + Top	Bandwidth	5 MHz	5 MHz				
			Frequency	1932.5 MHz	1987.5 MHz			
		Output Power	30 W	30 W	60 W	2TX(5, 6)	Port 5	
			20 W	20 W	40 W	4TX(5, 6, 7, 8)	Port 7	
	Bottom + Top	Bandwidth	15 MHz	5 MHz				
			Frequency	1937.5 MHz	1987.5 MHz			
		Output Power	45 W	15 W	60 W	2TX(5, 6)	Port 5	
			30 W	10 W	40 W	4TX(5, 6, 7, 8)	Port 7	

Test port(Worst case)								
Type	Bandwidth positions		1 st FA	2 nd FA	Power Sum	Output port	Test Port	
Band 66	Contiguous	Bottom	Bandwidth	5 MHz	5 MHz			
			Frequency	2112.5 MHz	2117.5 MHz			
			Output Power	30 W	30 W	60 W	2TX(1, 2)	Port 1
				20 W	20 W	40 W	4TX(1, 2, 3, 4)	Port 3
		Top	Bandwidth	5 MHz	5 MHz			
				Frequency	2172.5 MHz	2177.5 MHz		
			Output Power	30 W	30 W	60 W	2TX(1, 2)	Port 1
				20 W	20 W	40 W	4TX(1, 2, 3, 4)	Port 3
	Bottom	Bandwidth	5 MHz	15 MHz				
			Frequency	2112.5 MHz	2122.5 MHz			
		Output Power	22 W	66 W	88 W	2TX(1, 2)	Port 1	
			15 W	45 W	60 W	4TX(1, 2, 3, 4)	Port 3	
	Top	Bandwidth	5 MHz	15 MHz				
			Frequency	2162.5 MHz	2172.5 MHz			
		Output Power	22 W	66 W	88 W	2TX(1, 2)	Port 1	
			15 W	45 W	60 W	4TX(1, 2, 3, 4)	Port 3	
Non-Contiguous	Bottom + Top	Bandwidth	5 MHz	5 MHz				
			Frequency	2112.5 MHz	2177.5 MHz			
		Output Power	30 W	30 W	60 W	2TX(1, 2)	Port 1	
			20 W	20 W	40 W	4TX(1, 2, 3, 4)	Port 3	
	Bottom + Top	Bandwidth	15 MHz	5 MHz				
			Frequency	2117.5 MHz	2177.5 MHz			
		Output Power	66 W	22 W	88 W	2TX(1, 2)	Port 1	
			45 W	15 W	60 W	4TX(1, 2, 3, 4)	Port 3	

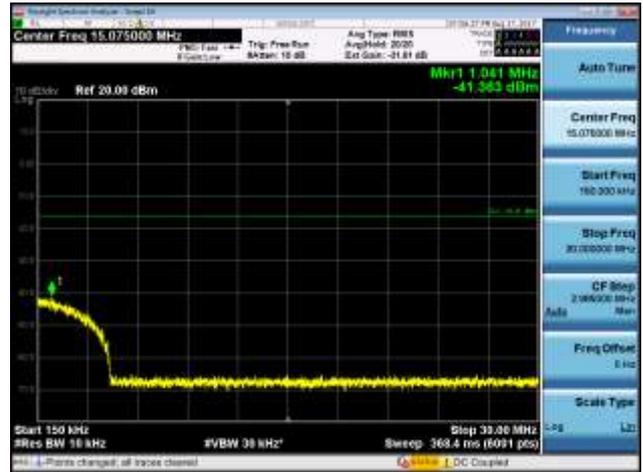
Test Plot at Spurious Emissions

Band 2, BW 5MHz, Single carrier, 2TX, Bottom
 [QPSK]

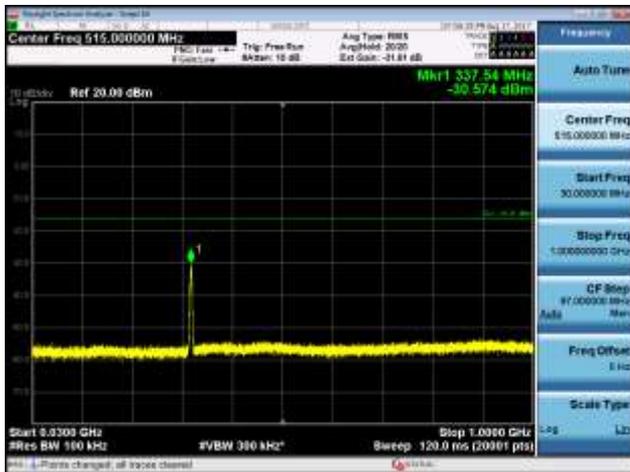
9 kHz - 150 kHz



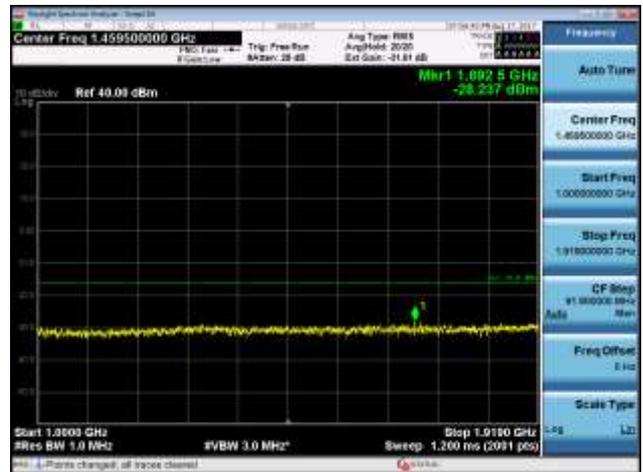
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





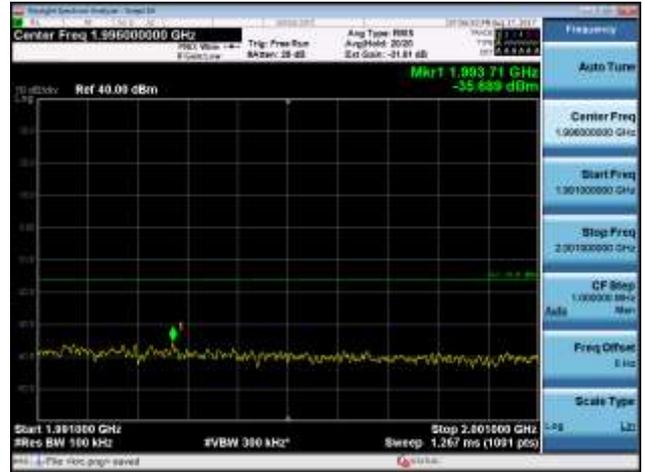
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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



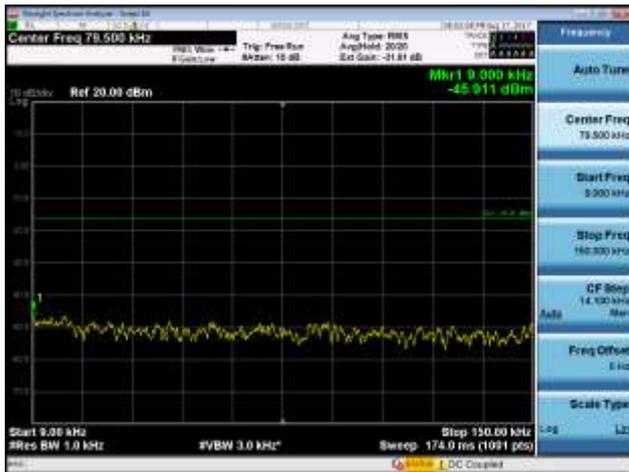


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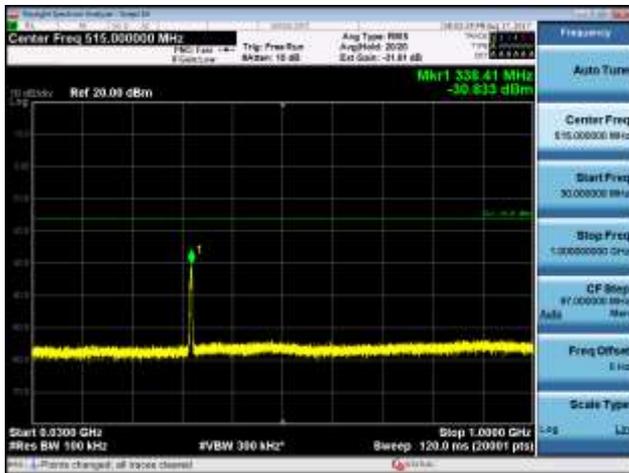
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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[64QAM]

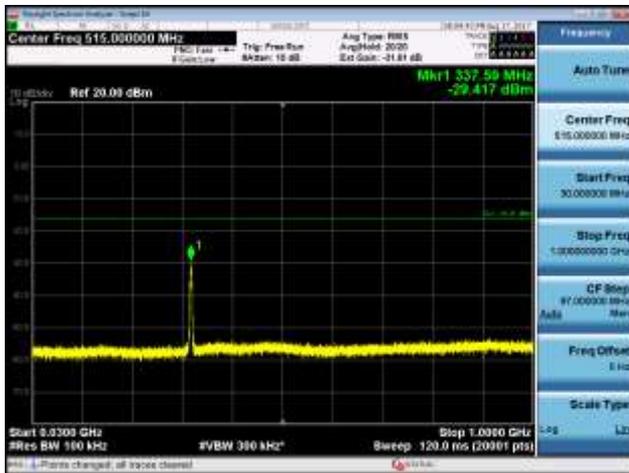
9 kHz - 150 kHz



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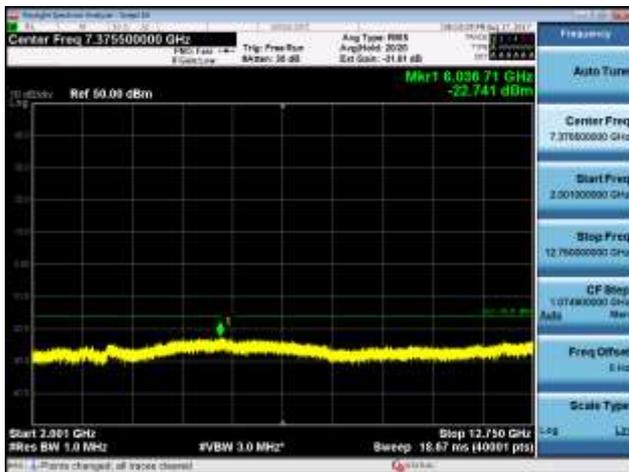
1919 MHz - 1929 MHz



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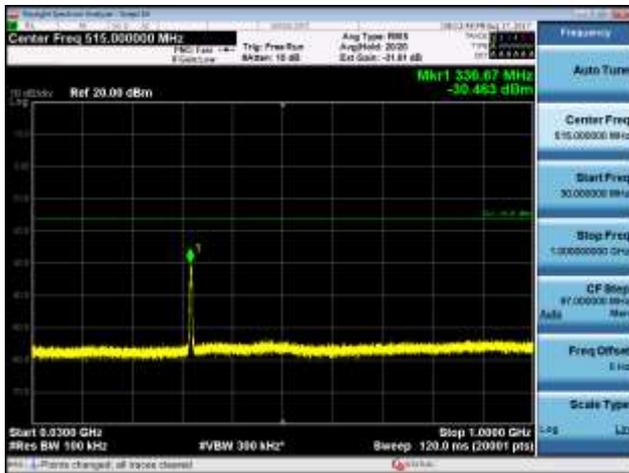
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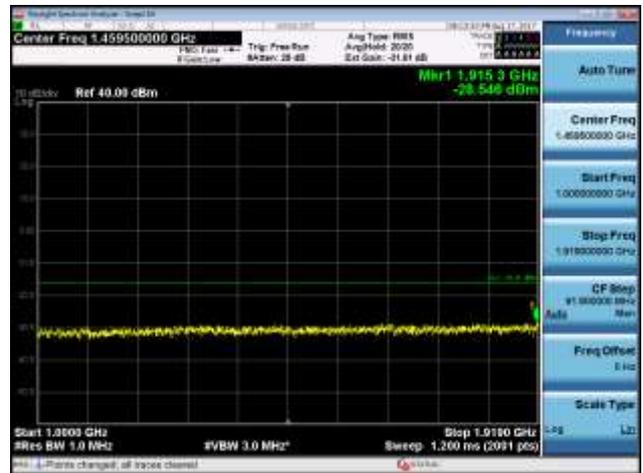
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





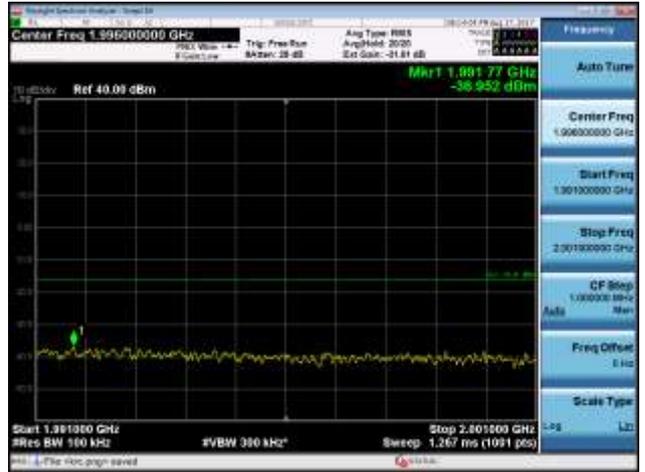
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1919 MHz - 1929 MHz



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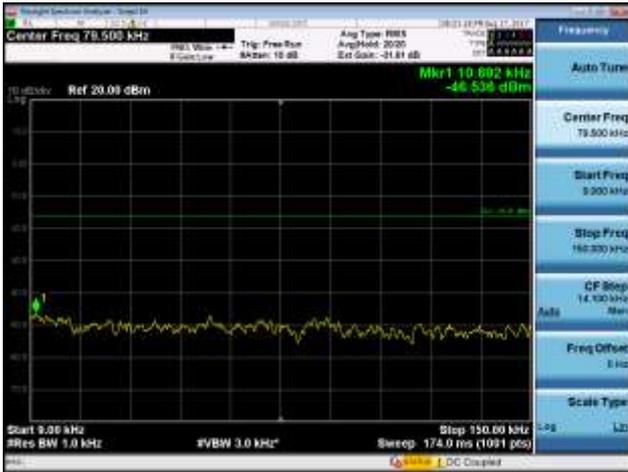


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Band 2, BW 5MHz, Single carrier, 2TX, Middle
 [QPSK]

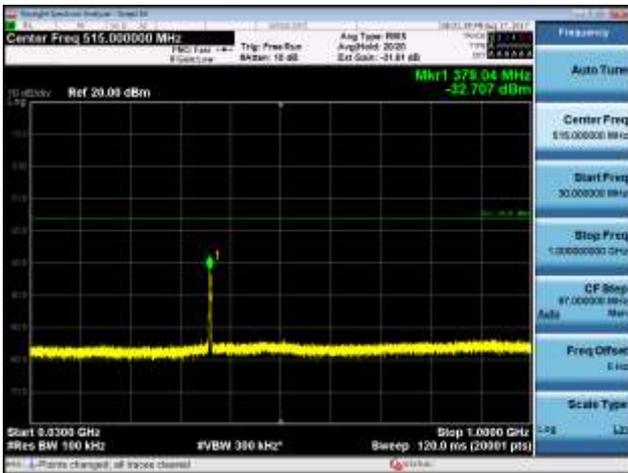
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



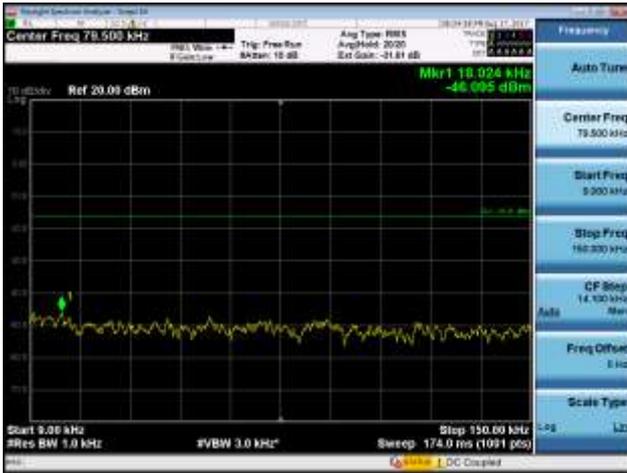


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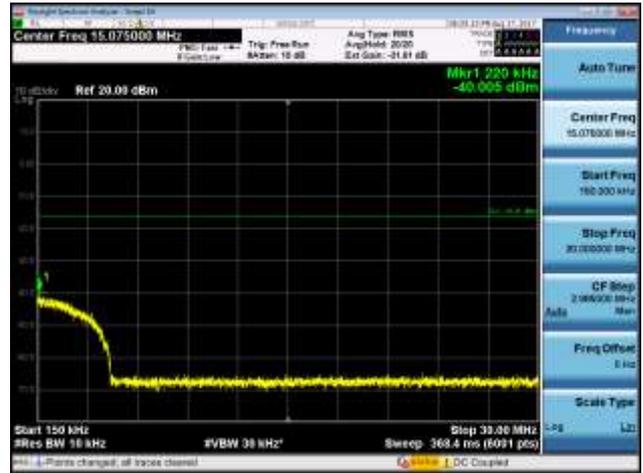
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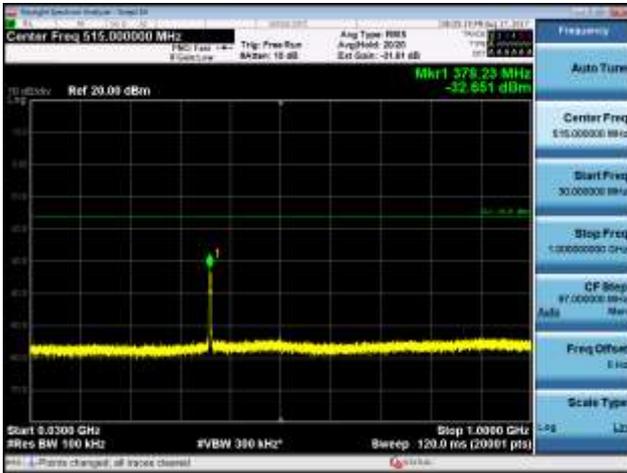
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

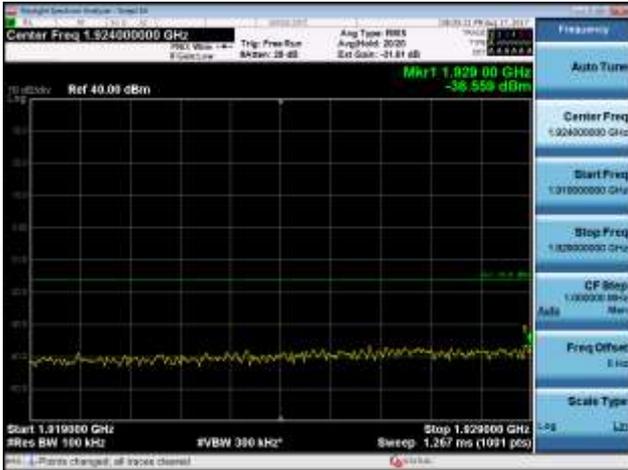




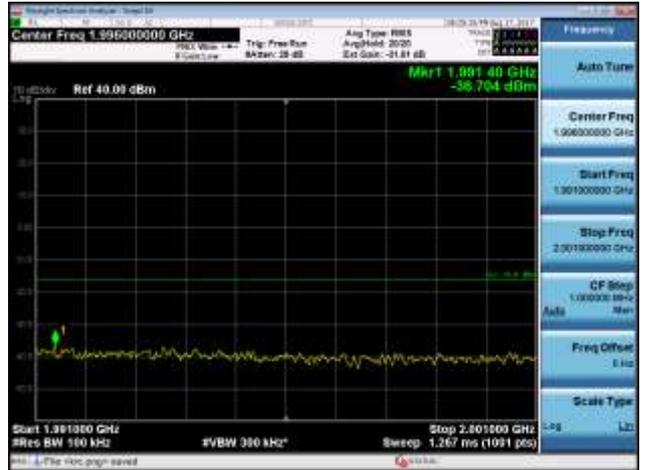
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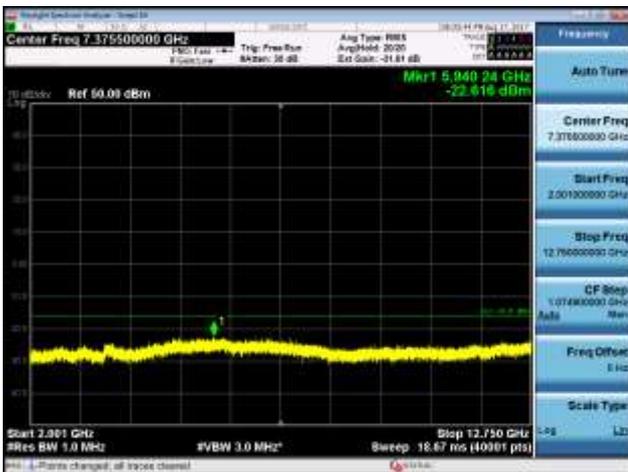
1919 MHz - 1929 MHz



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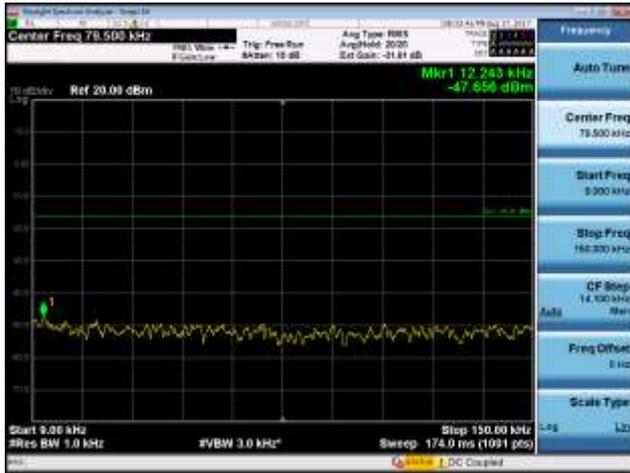


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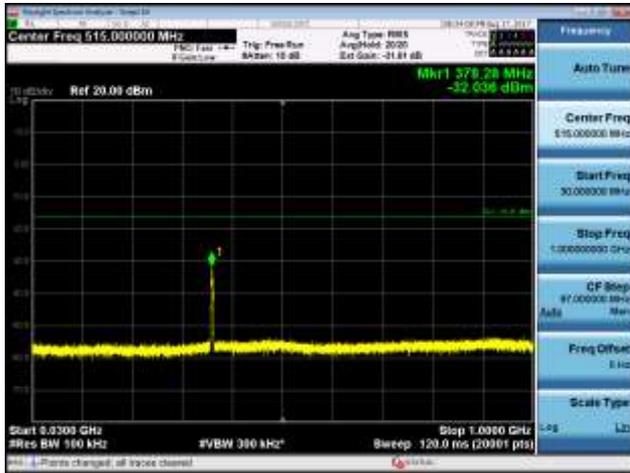
9 kHz - 150 kHz



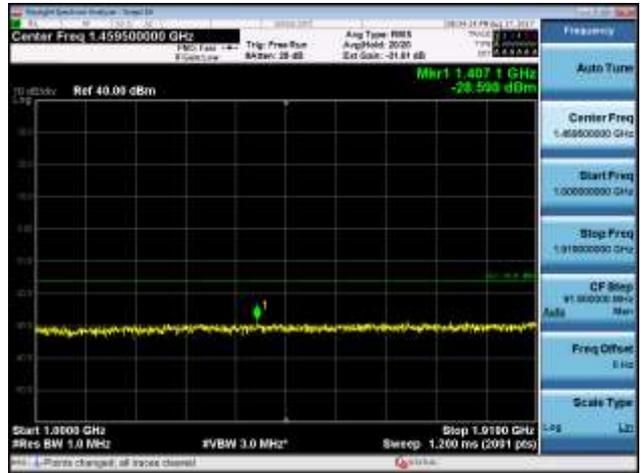
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

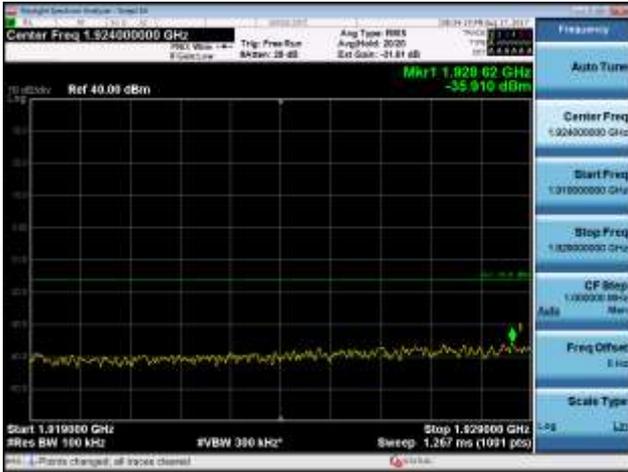




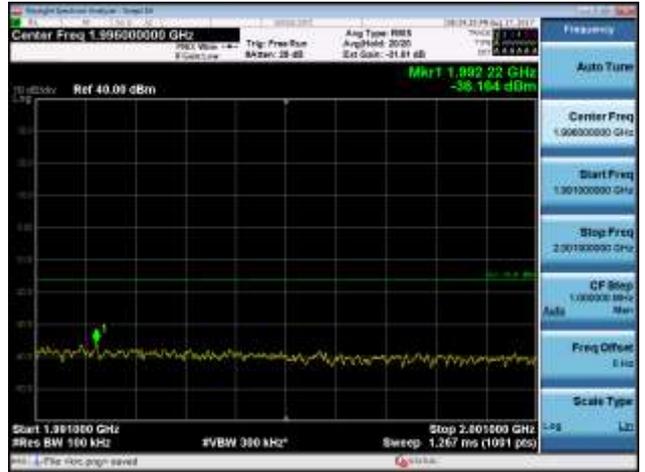
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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



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12.75 GHz - 26.5 GHz



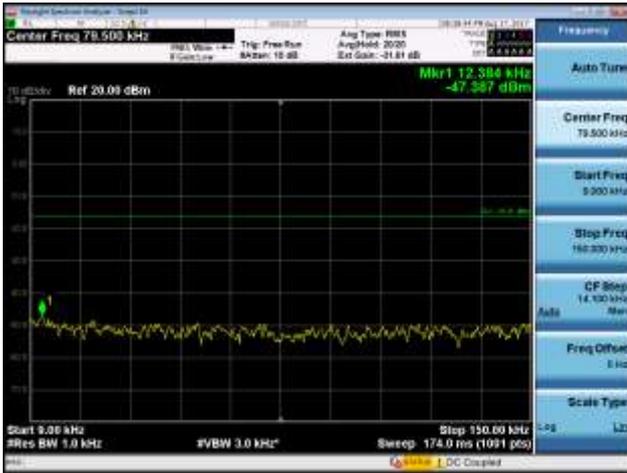


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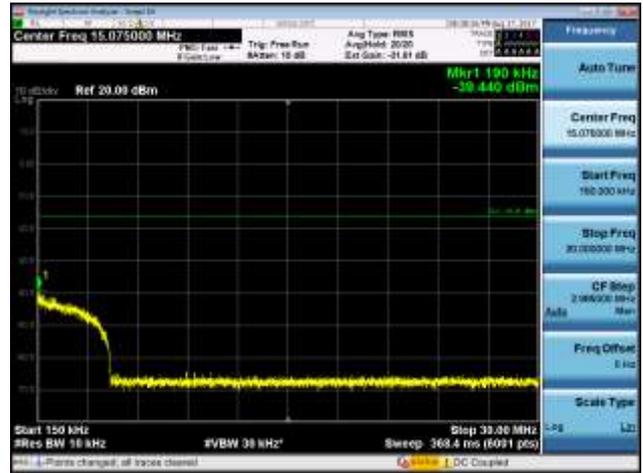
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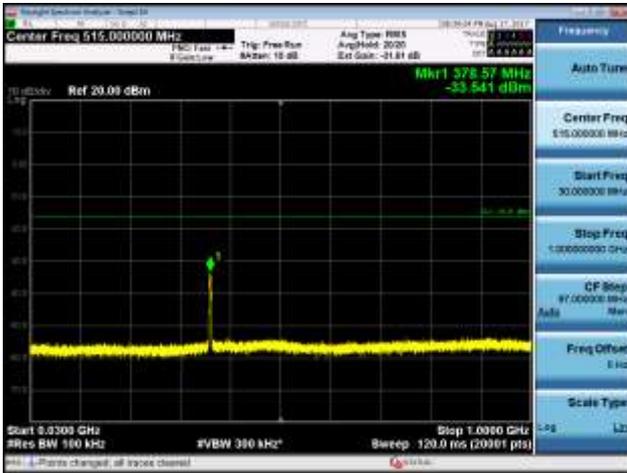
9 kHz - 150 kHz



150 kHz - 30 MHz



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1000 MHz - 1919 MHz





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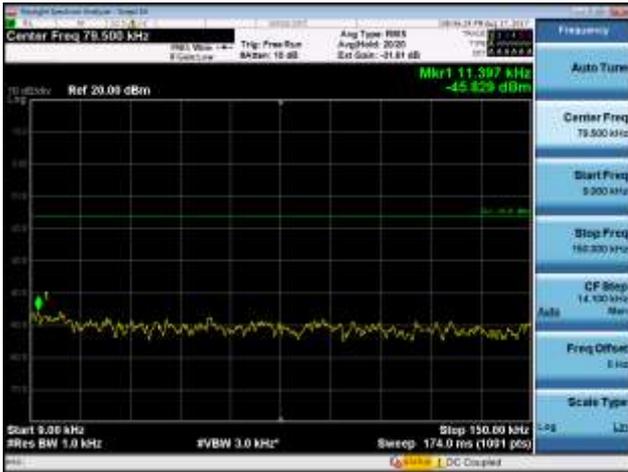


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Band 2, BW 5MHz, Single carrier, 2TX, Top
 [QPSK]

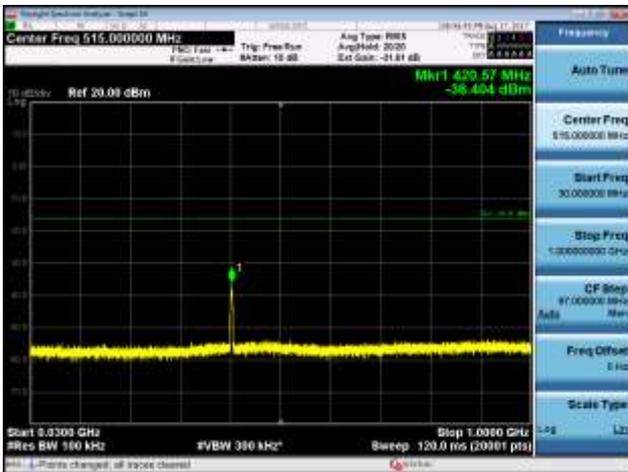
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

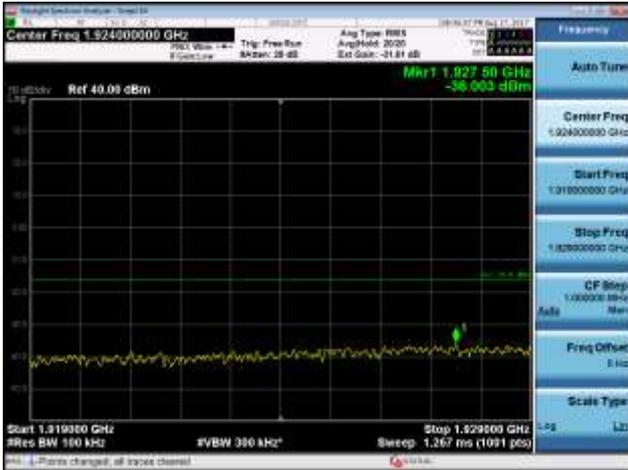




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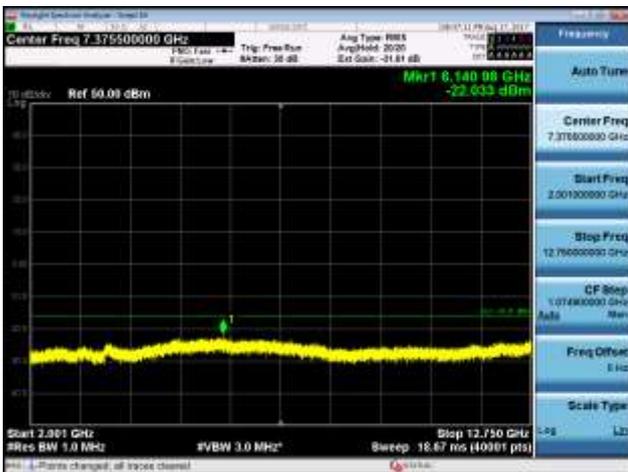
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



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12.75 GHz - 26.5 GHz



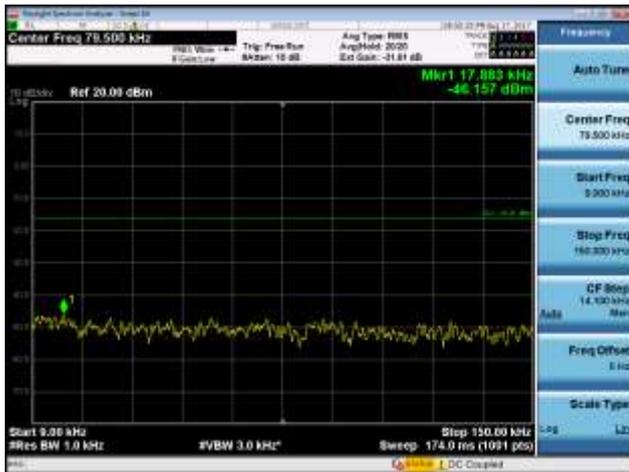


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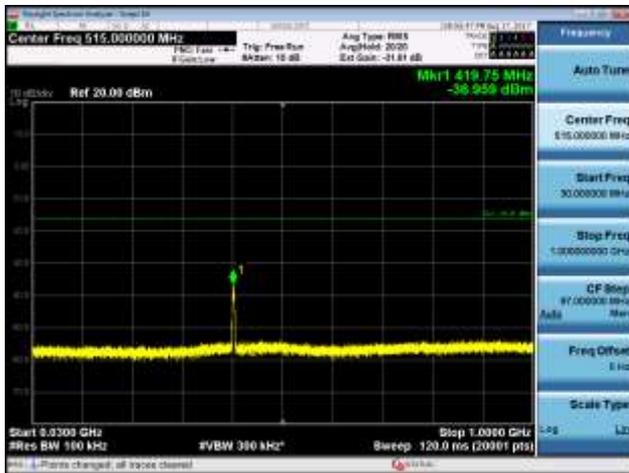
9 kHz - 150 kHz



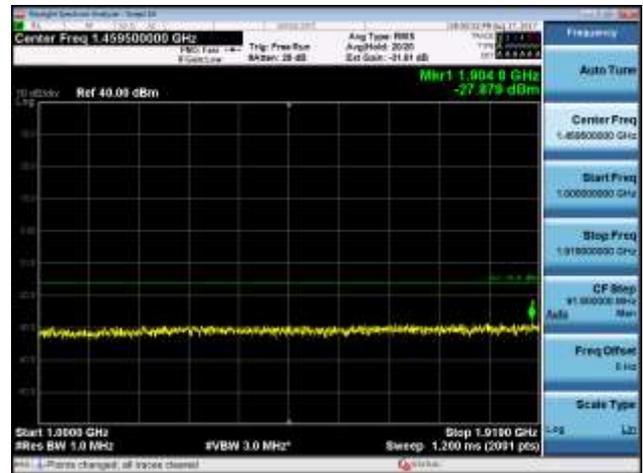
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

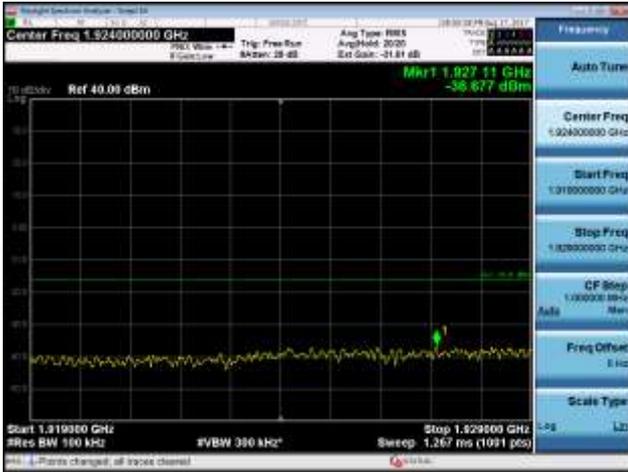




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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



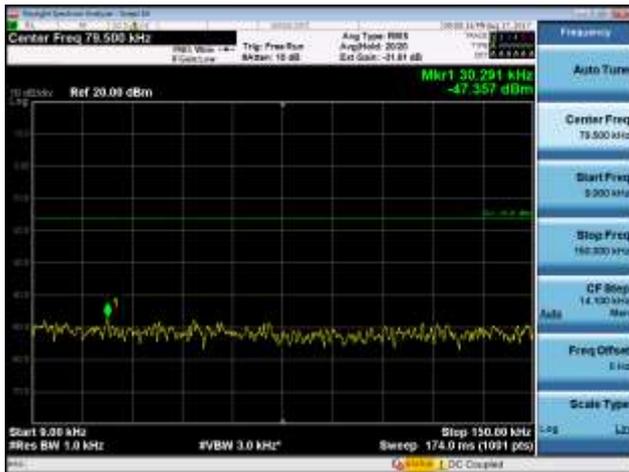


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[64QAM]

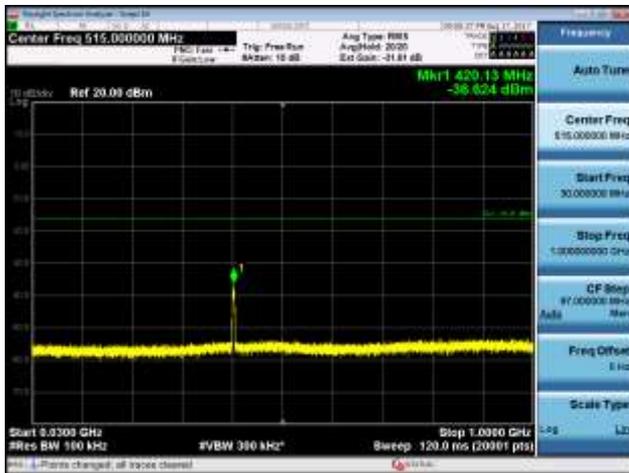
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

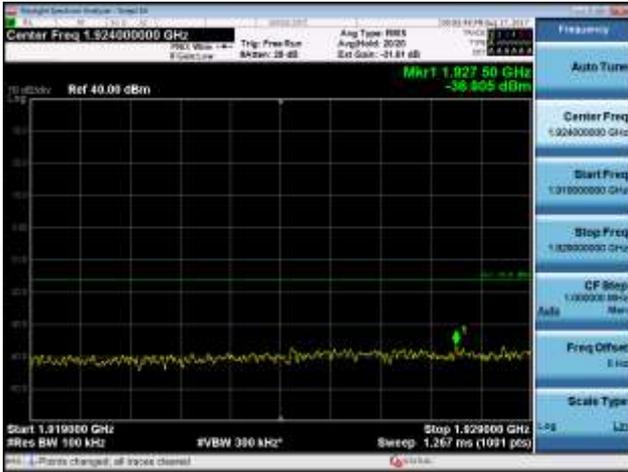




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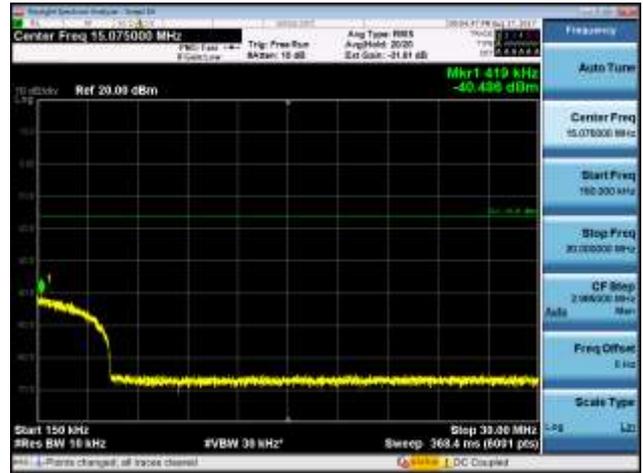
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[256QAM]

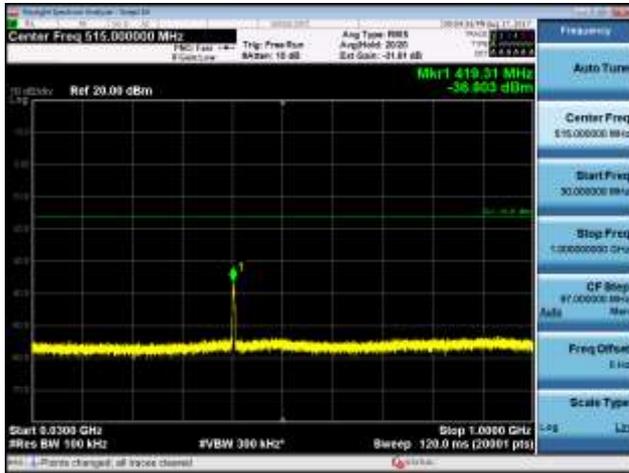
9 kHz - 150 kHz



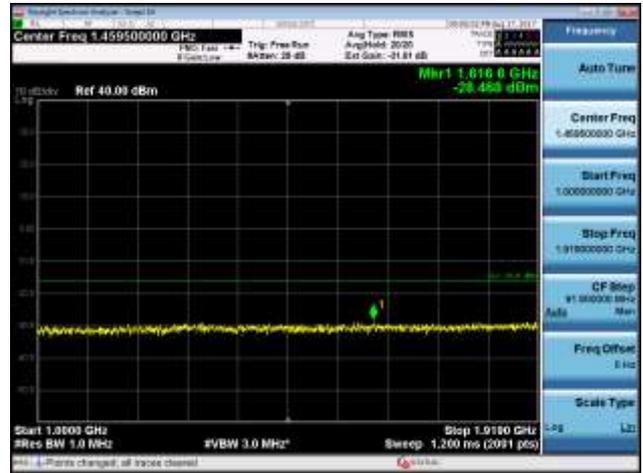
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

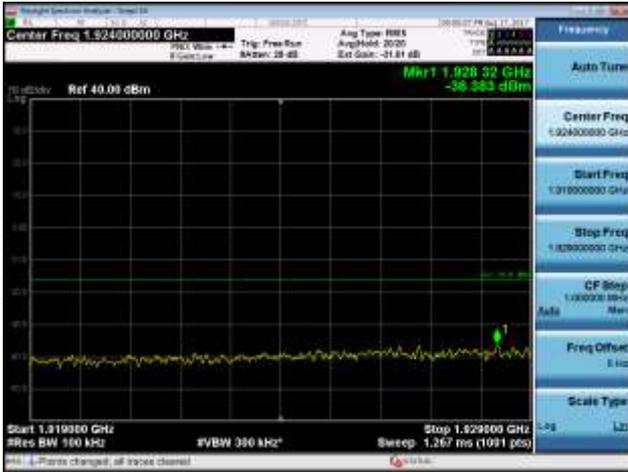




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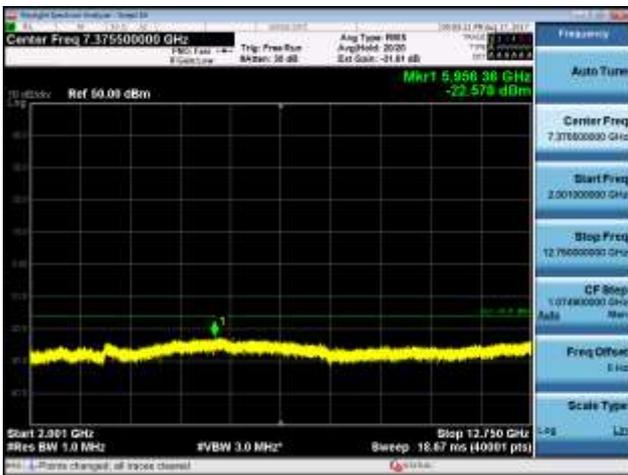
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



Band 2, BW 15MHz, Single carrier, 2TX, Bottom
 [QPSK]

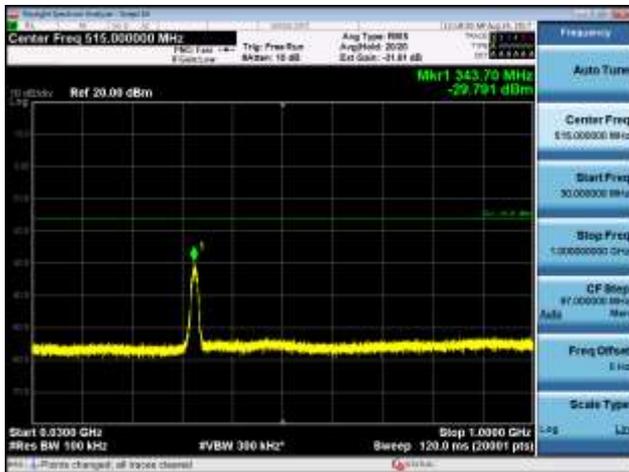
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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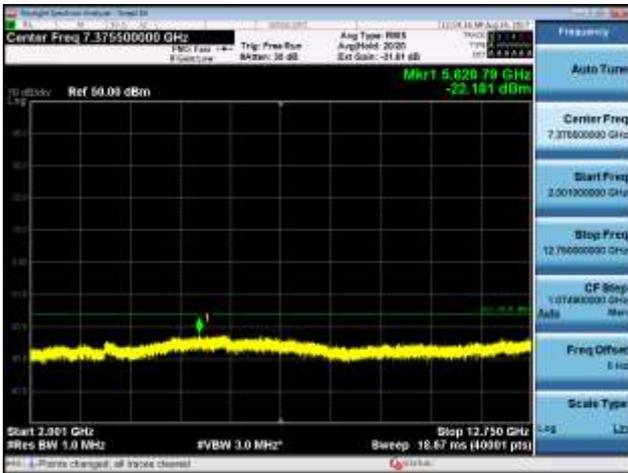
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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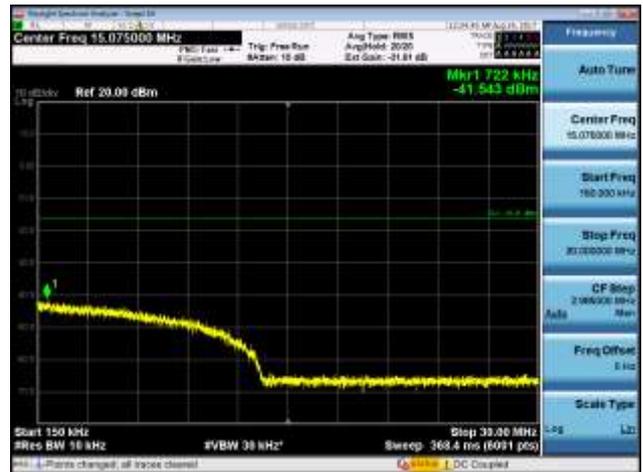
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[16QAM]

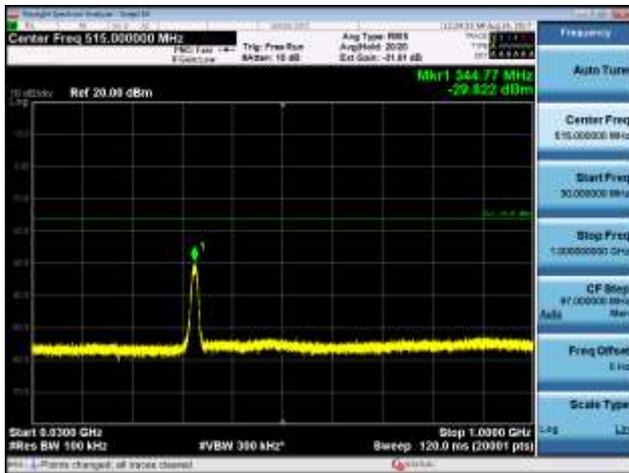
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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1919 MHz - 1929 MHz



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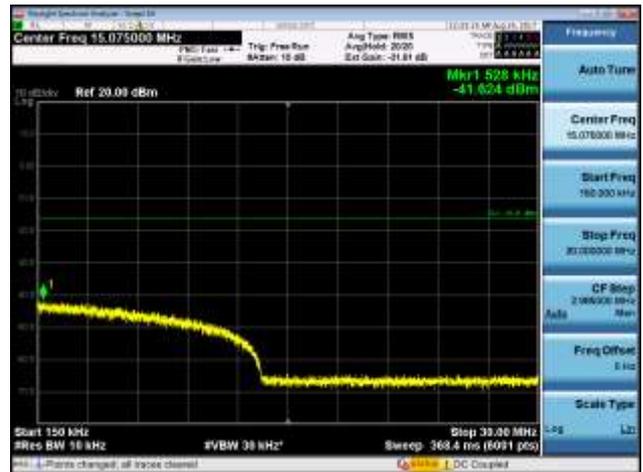
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[64QAM]

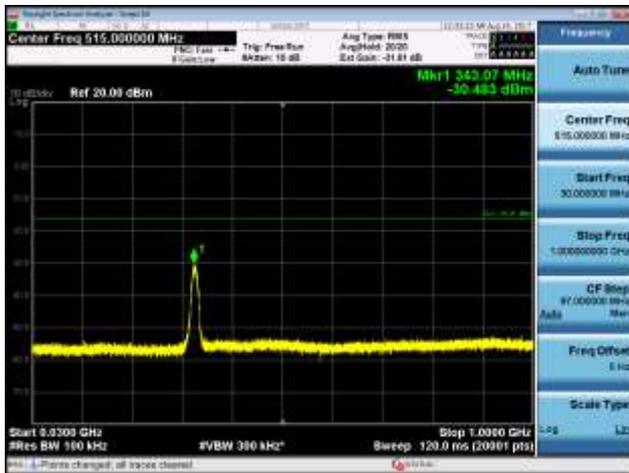
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





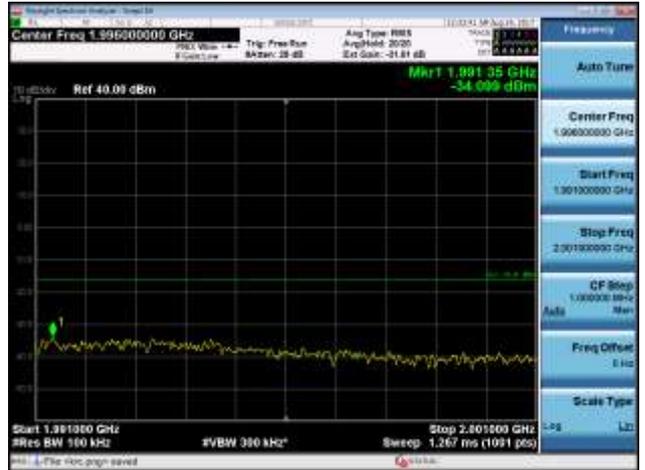
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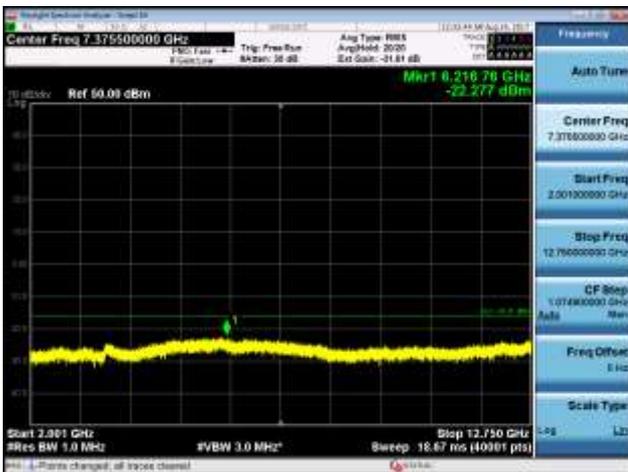
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



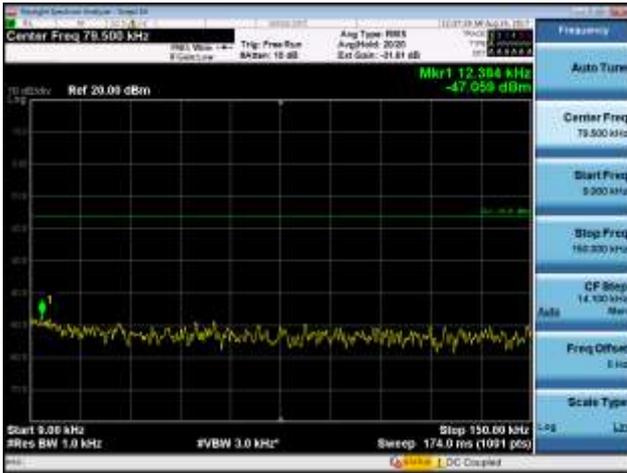


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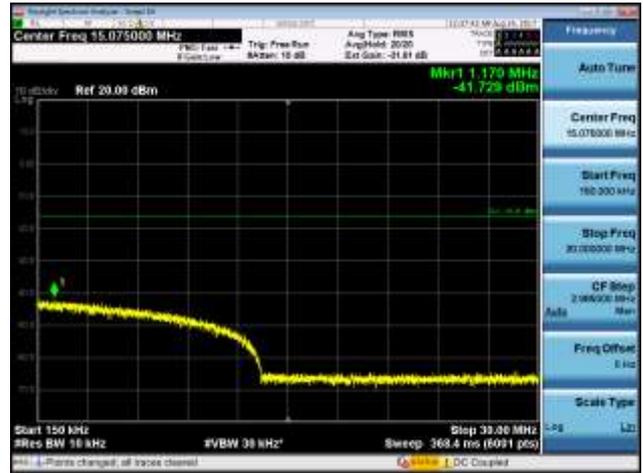
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[256QAM]

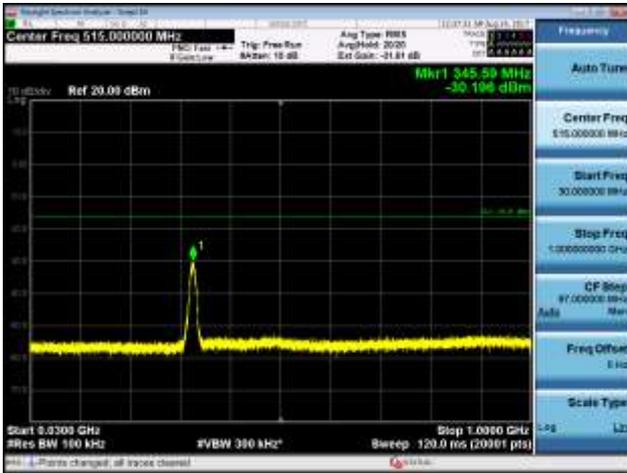
9 kHz - 150 kHz



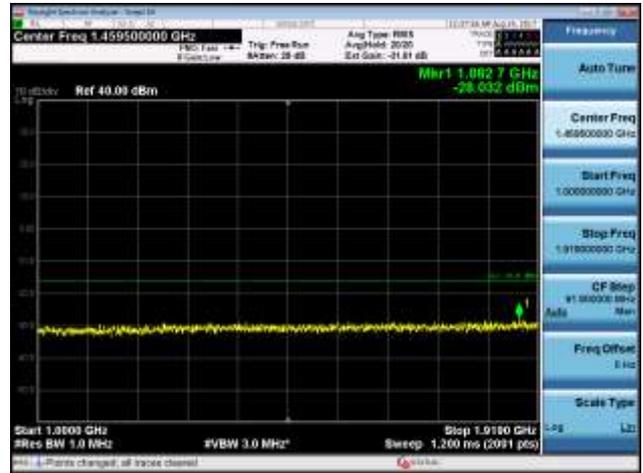
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





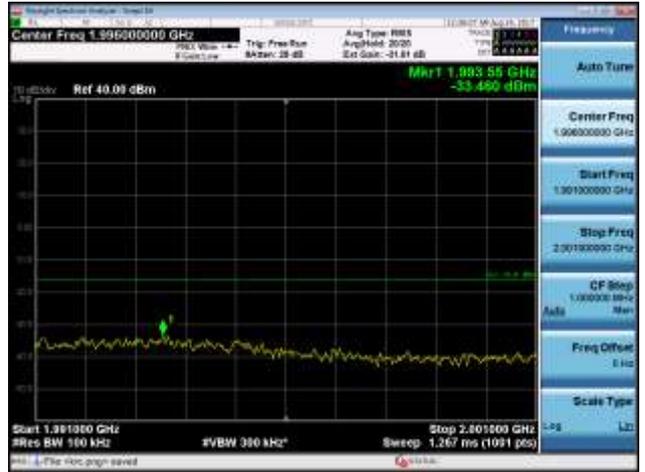
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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



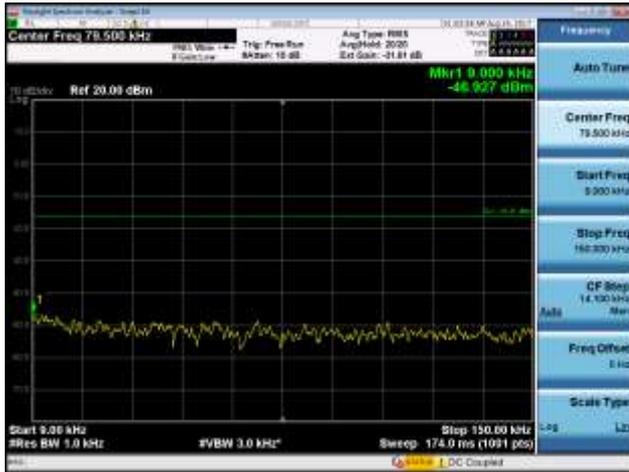


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Band 2, BW 15MHz, Single carrier, 2TX, Middle
[QPSK]

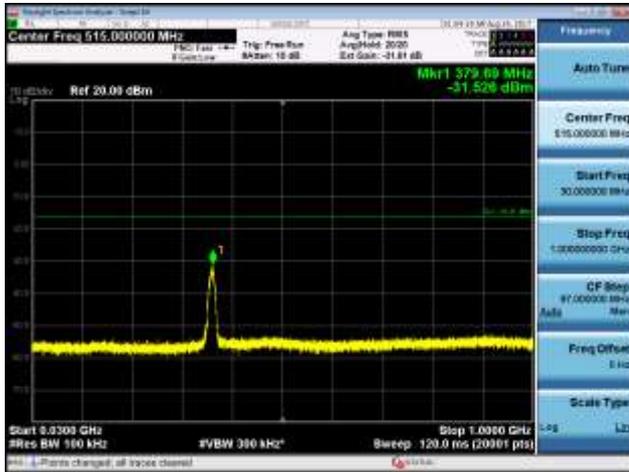
9 kHz - 150 kHz



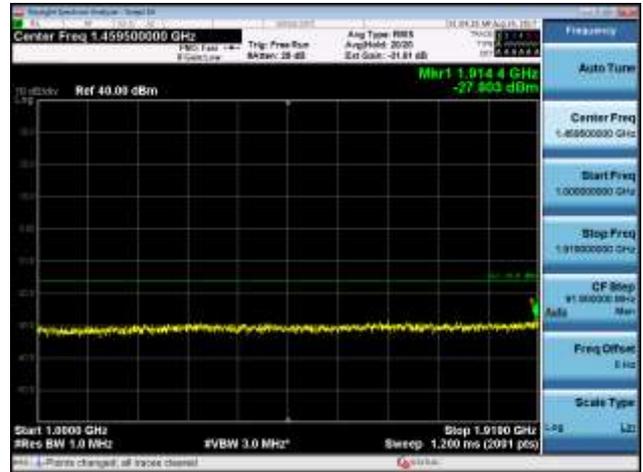
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





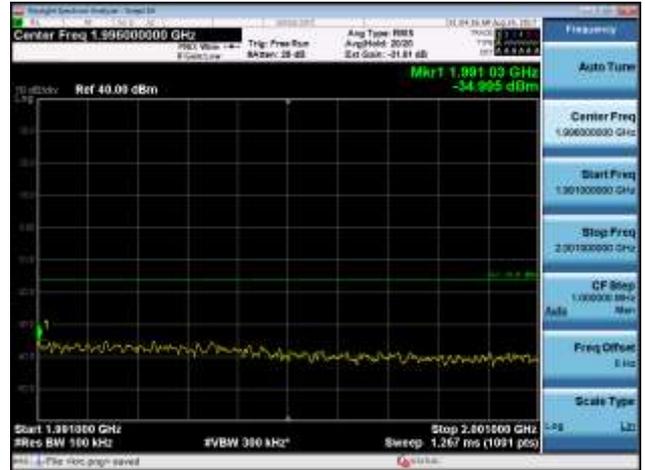
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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



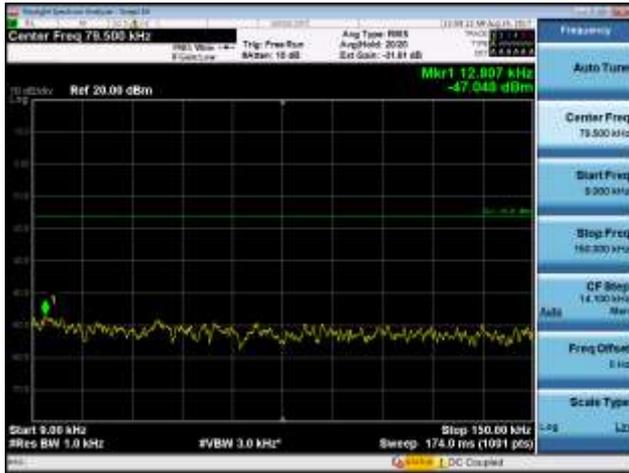


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[16QAM]

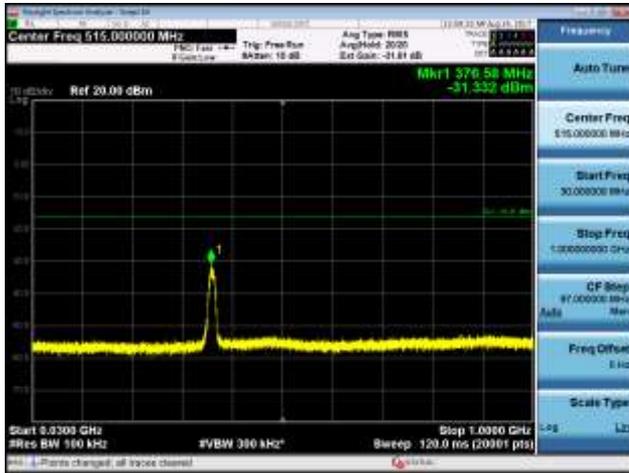
9 kHz - 150 kHz



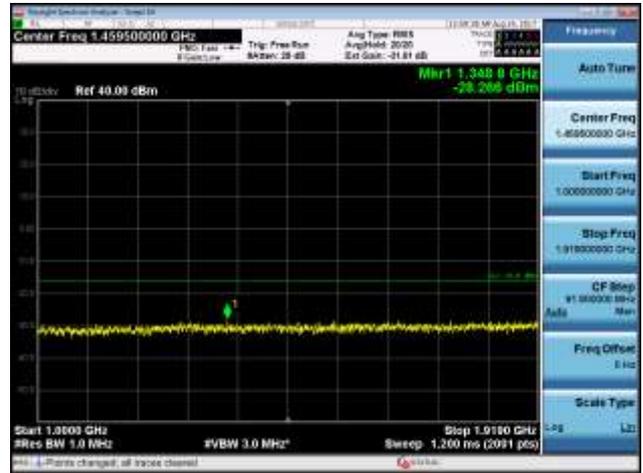
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

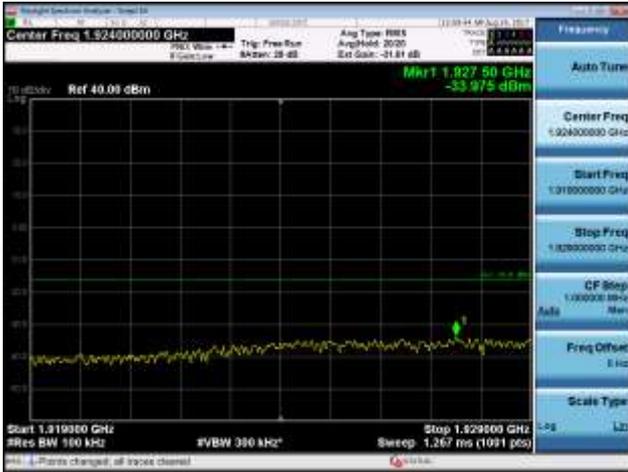




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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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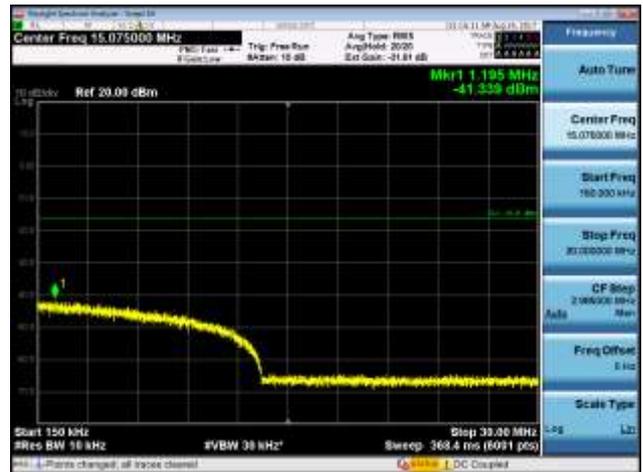
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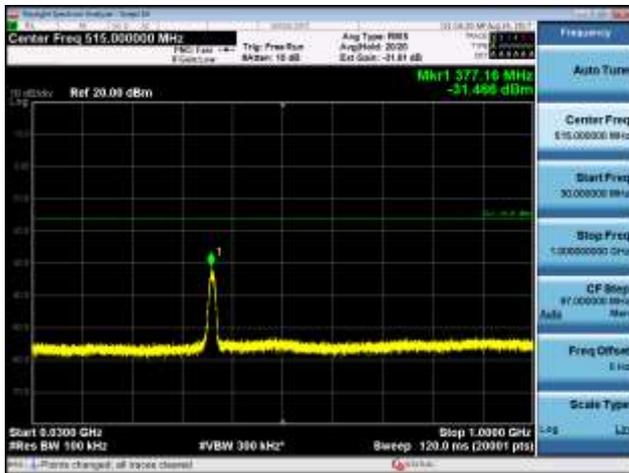
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

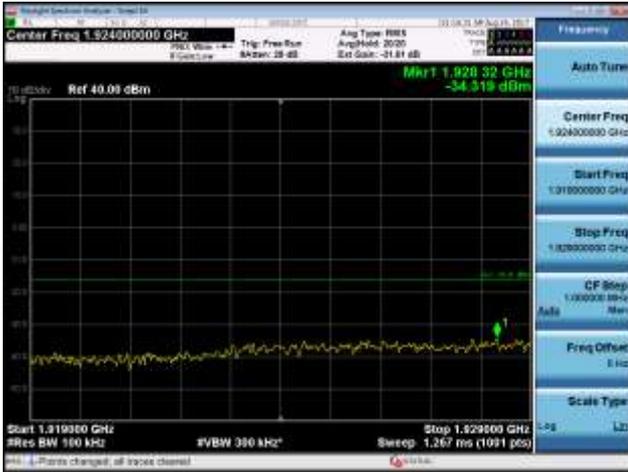




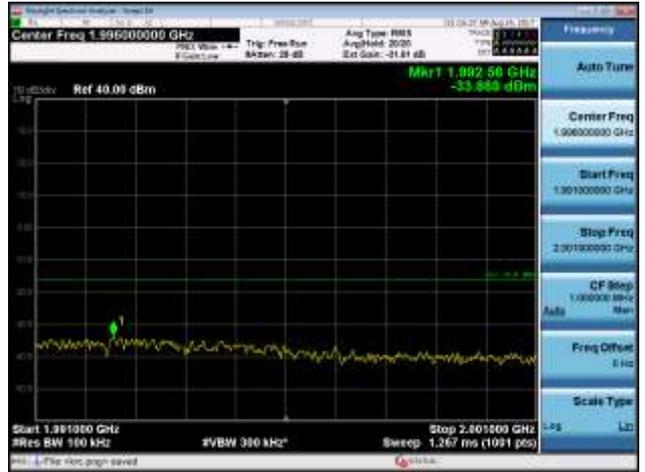
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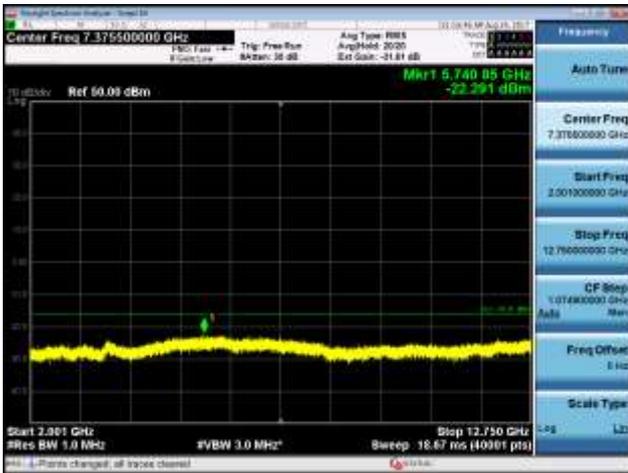
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



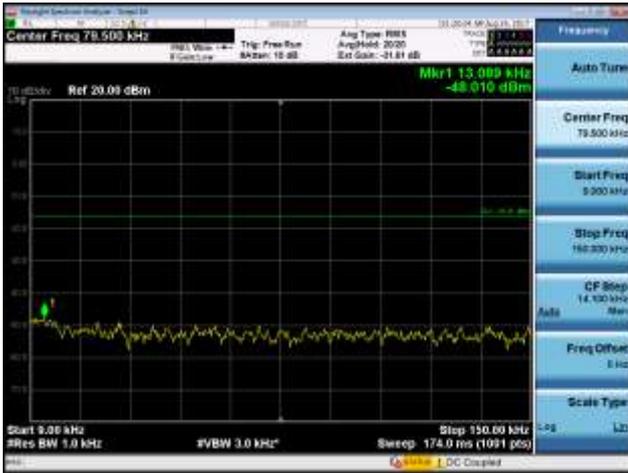


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[256QAM]

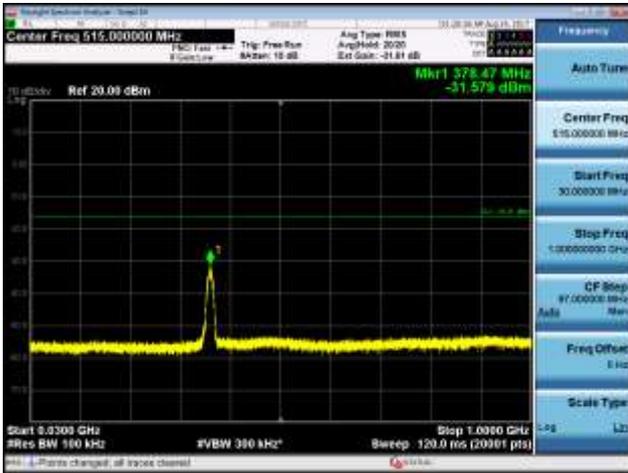
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

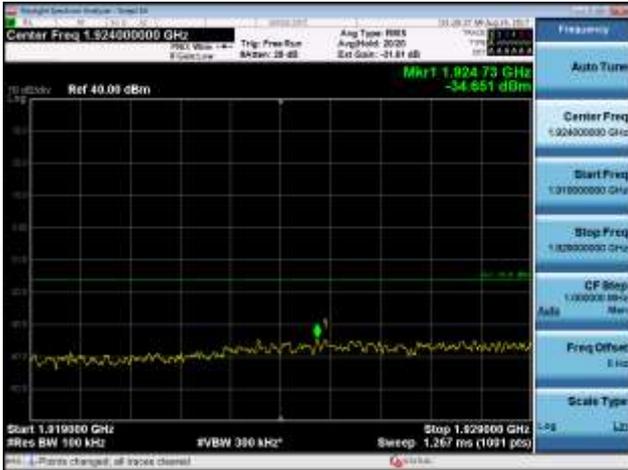




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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



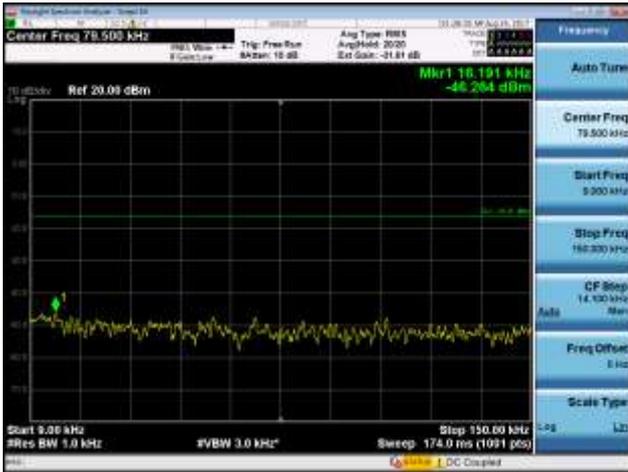


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Band 2, BW 15MHz, Single carrier, 2TX, Top
 [QPSK]

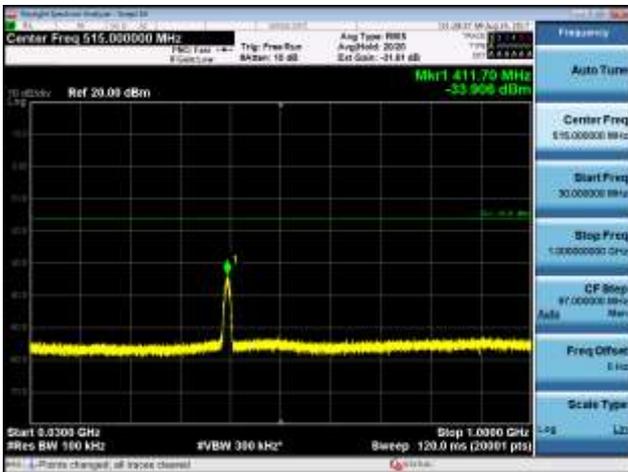
9 kHz - 150 kHz



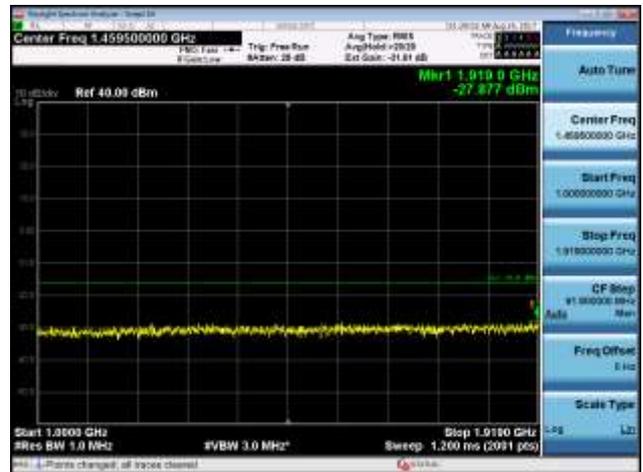
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

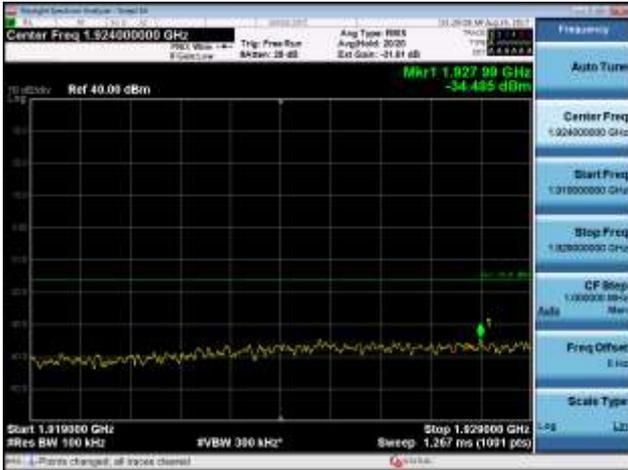




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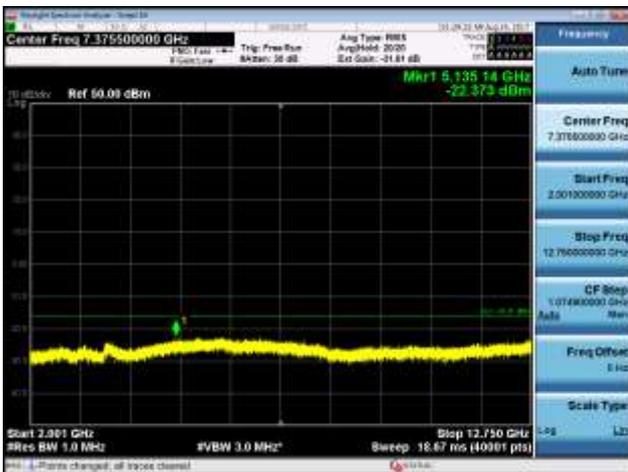
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



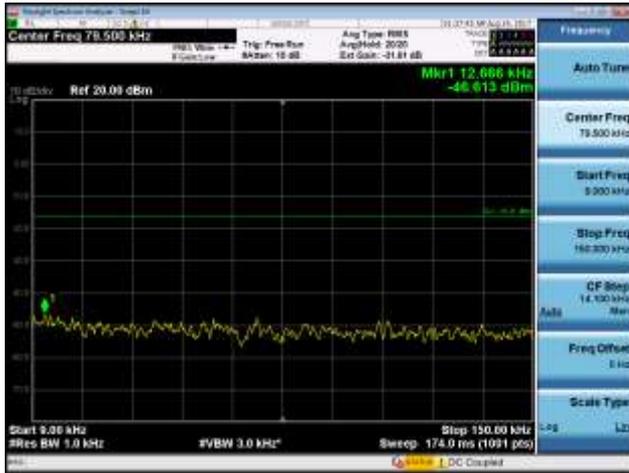


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[16QAM]

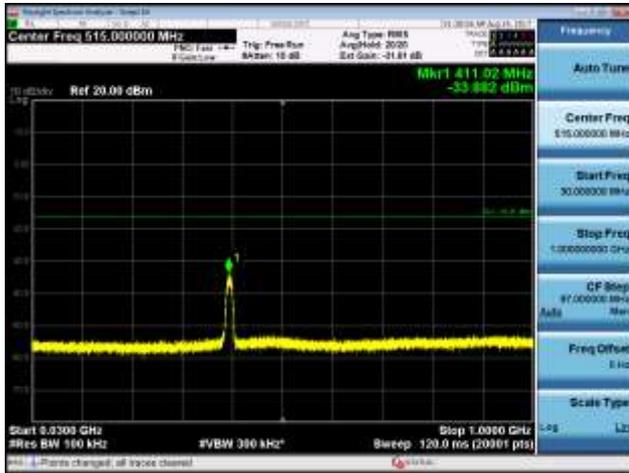
9 kHz - 150 kHz



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1919 MHz - 1929 MHz

Z



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



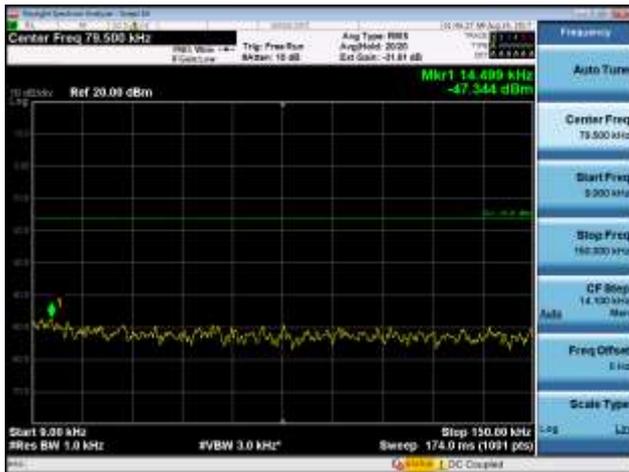


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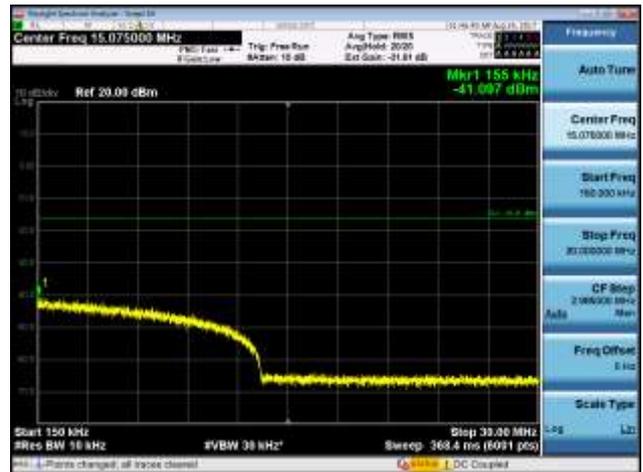
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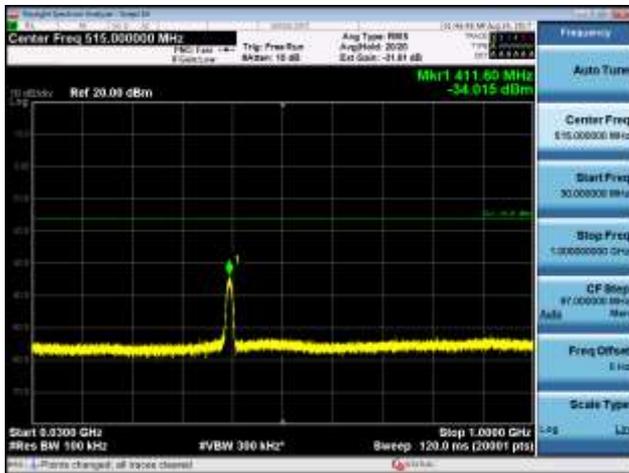
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

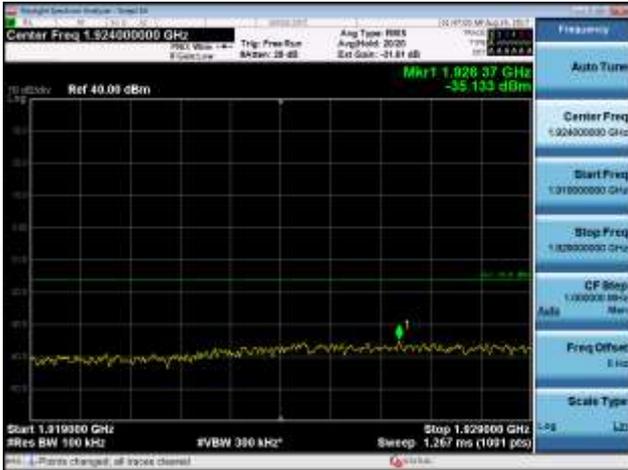




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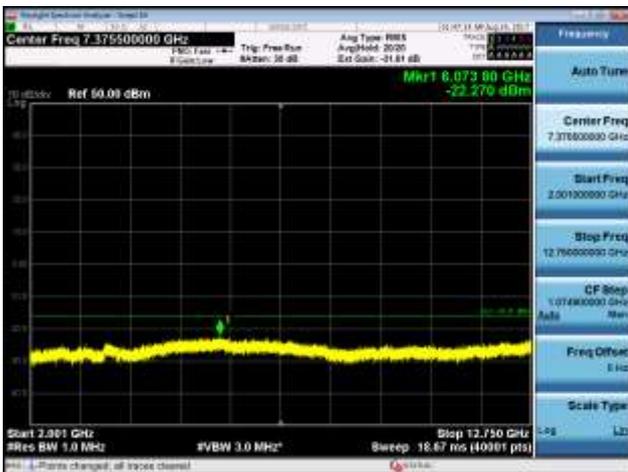
1919 MHz - 1929 MHz



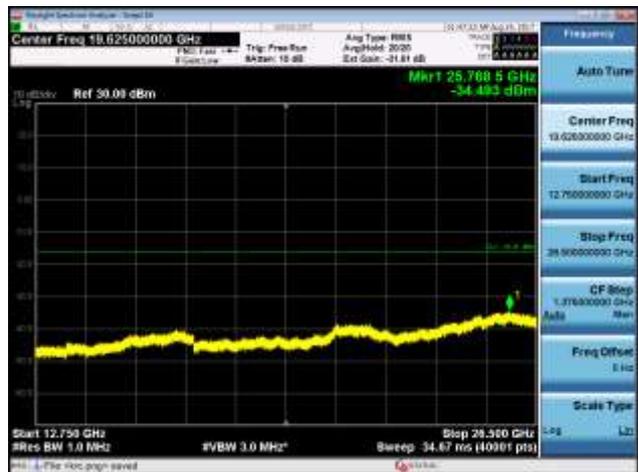
1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



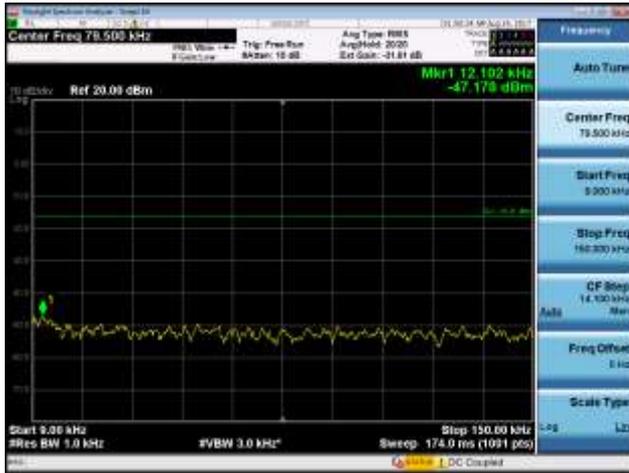


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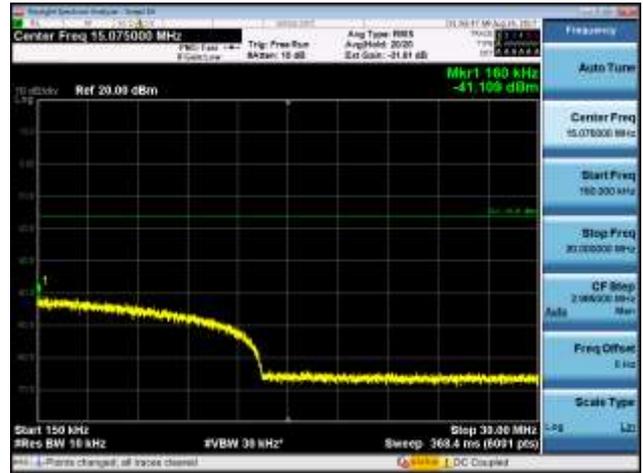
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[256QAM]

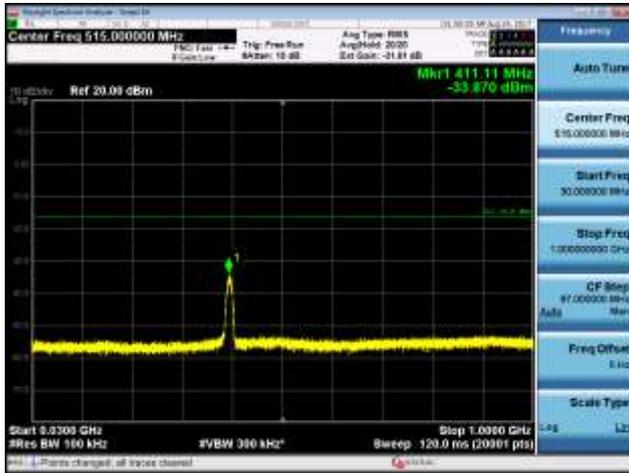
9 kHz - 150 kHz



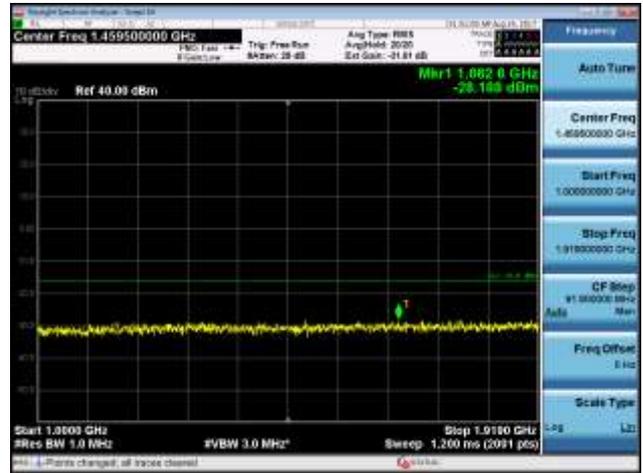
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

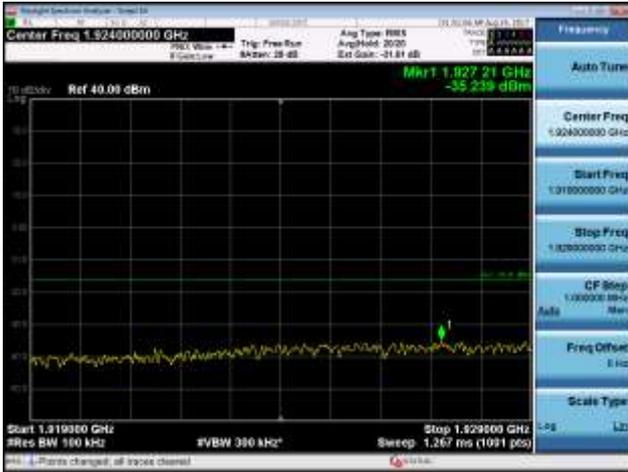




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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



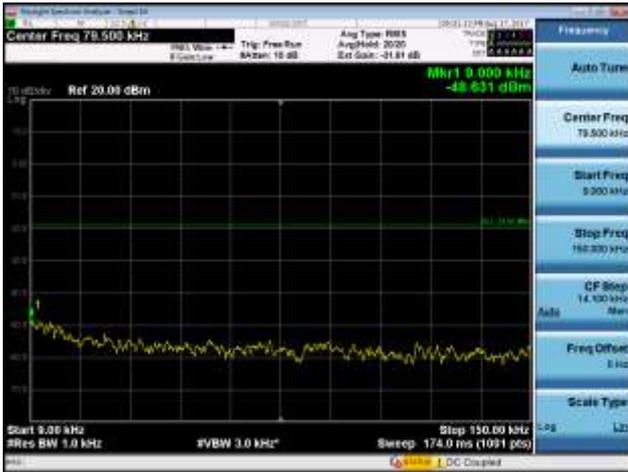


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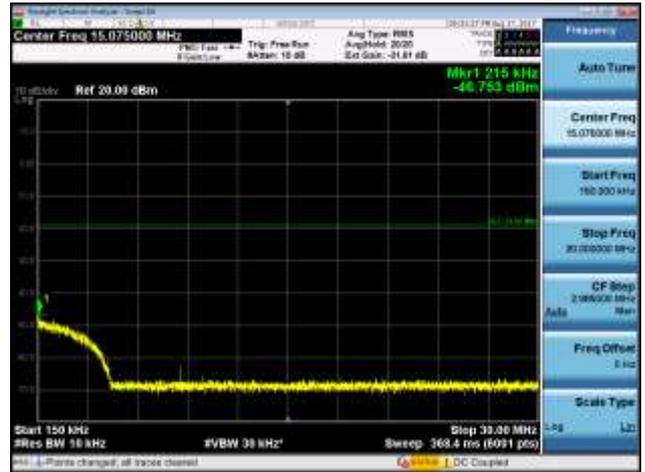
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Band 2, BW 5MHz, Single carrier, 4TX, Bottom
 [QPSK]

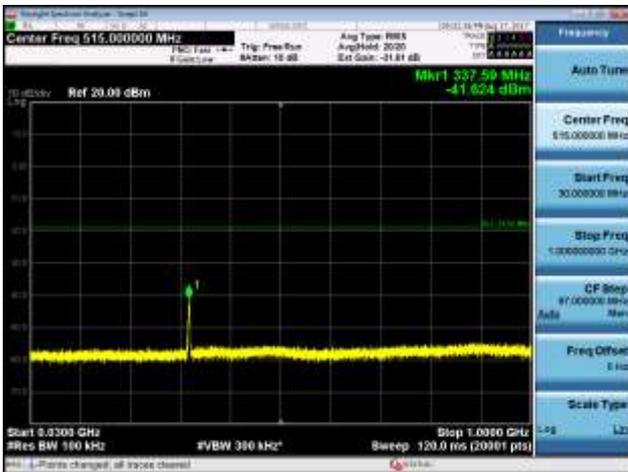
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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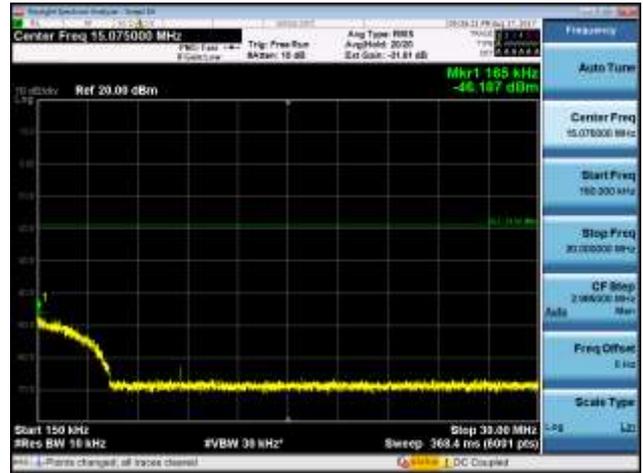
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[16QAM]

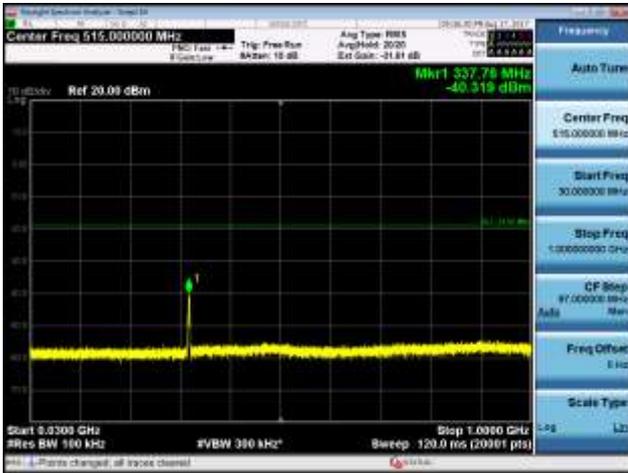
9 kHz - 150 kHz



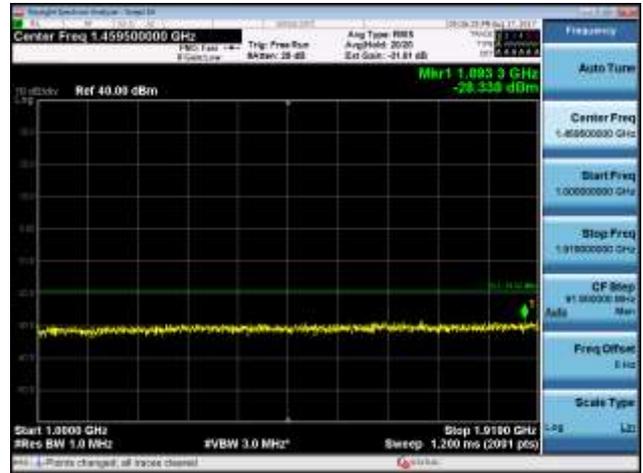
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





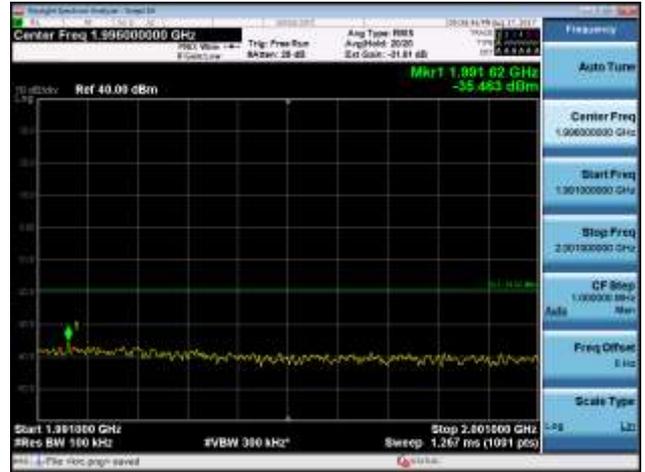
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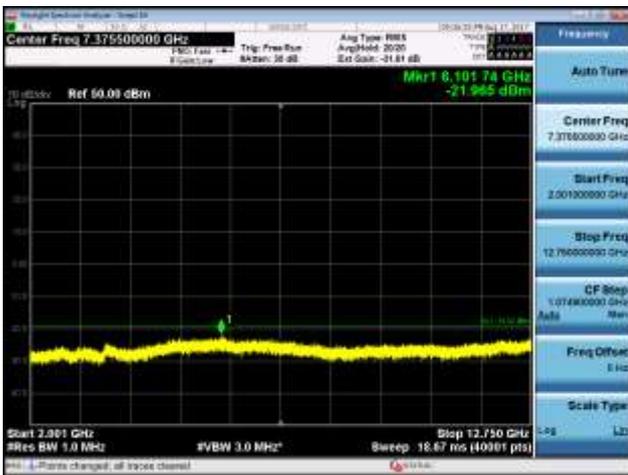
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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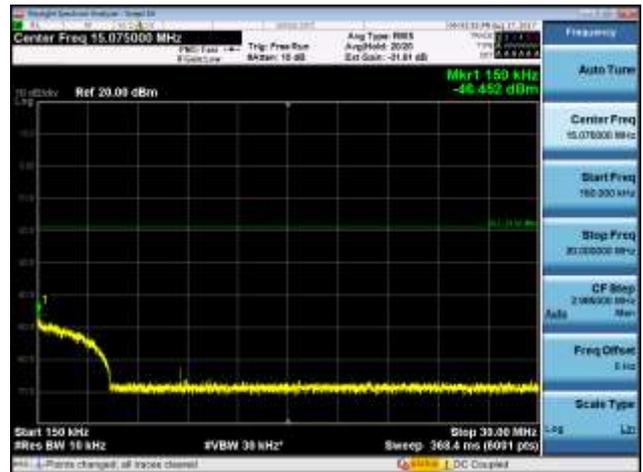
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[64QAM]

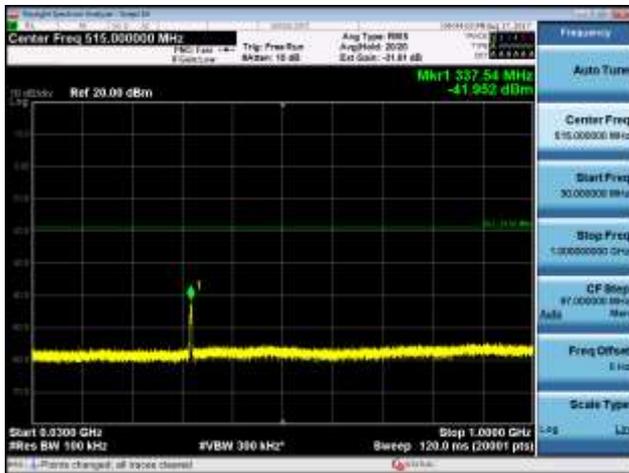
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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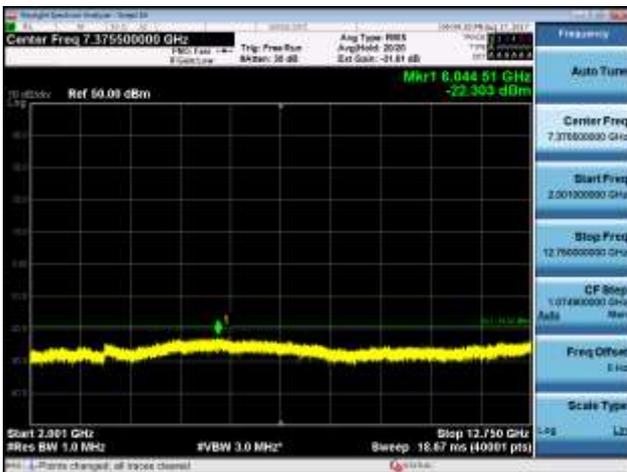
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



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12.75 GHz - 26.5 GHz



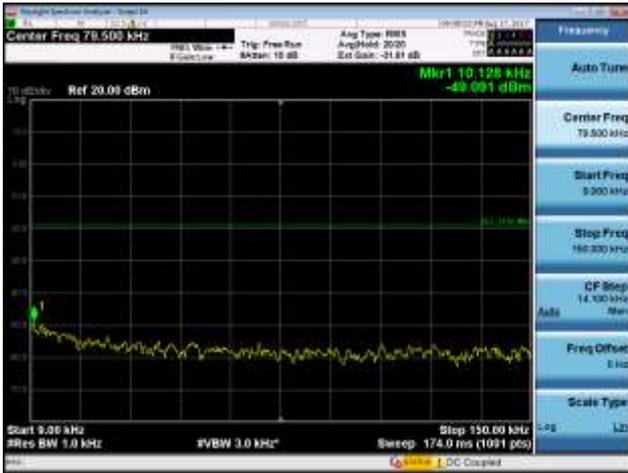


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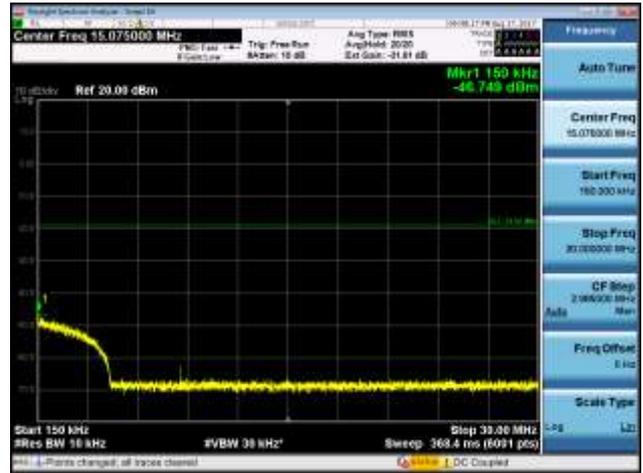
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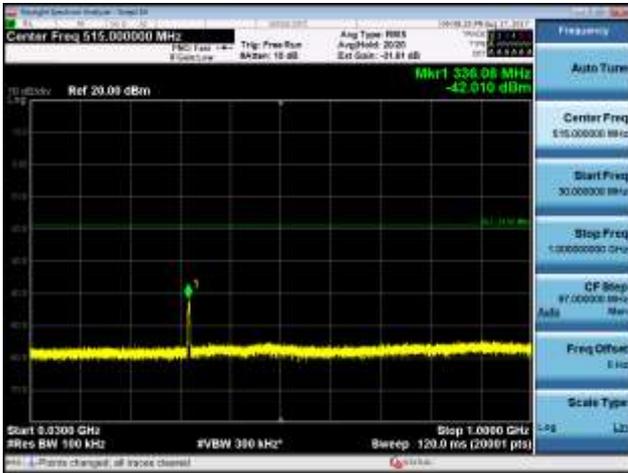
9 kHz - 150 kHz



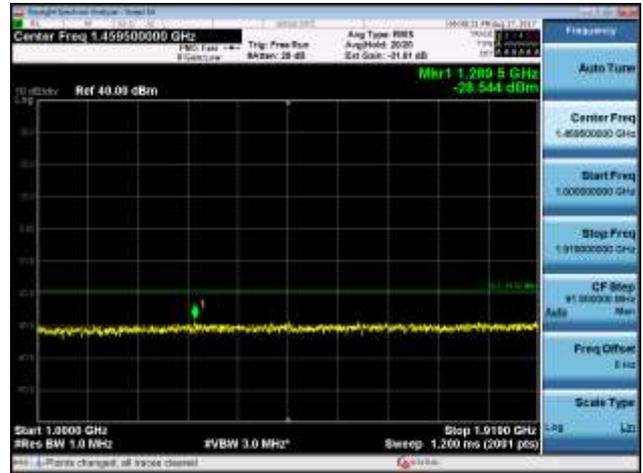
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz

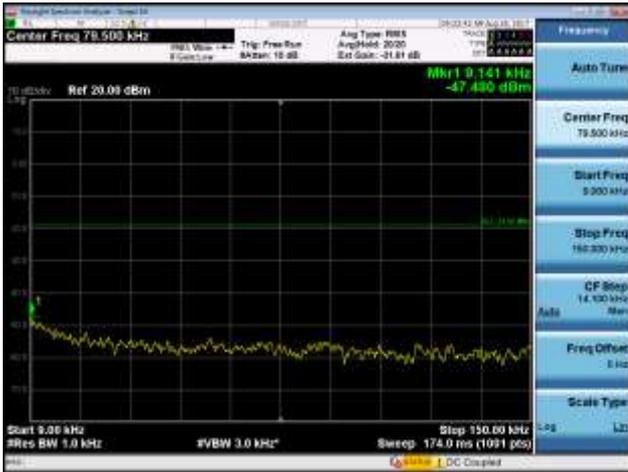


12.75 GHz - 26.5 GHz

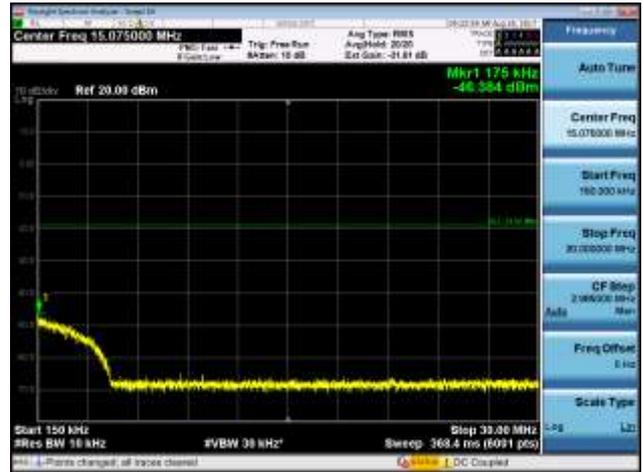


Band 2, BW 5MHz, Single carrier, 4TX, Middle
 [QPSK]

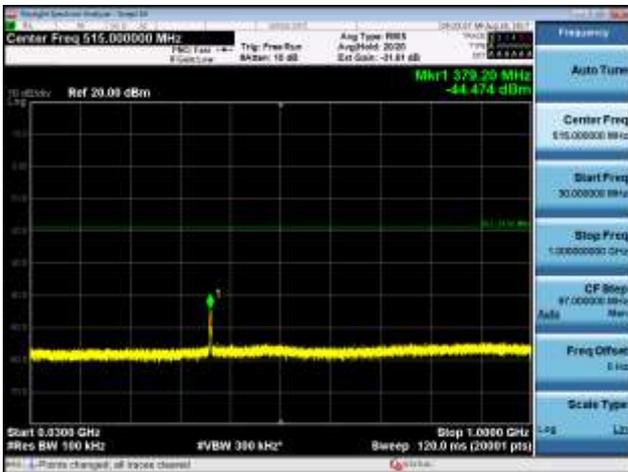
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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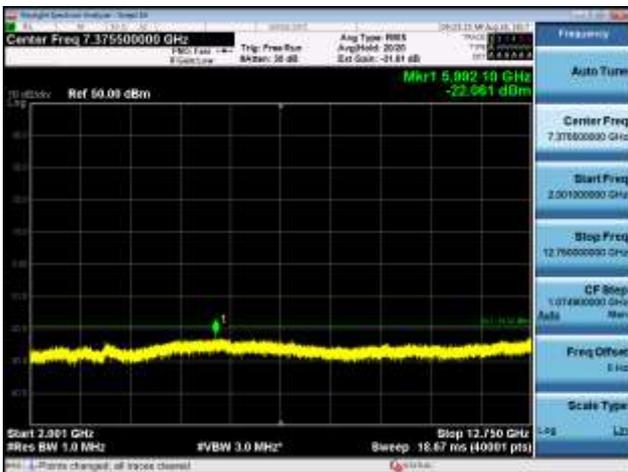
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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[16QAM]

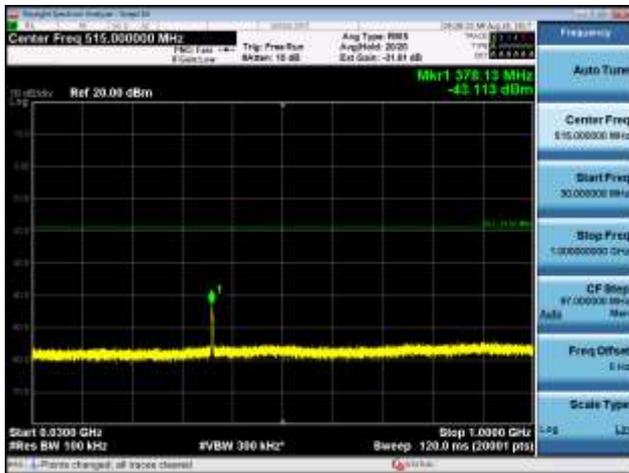
9 kHz - 150 kHz



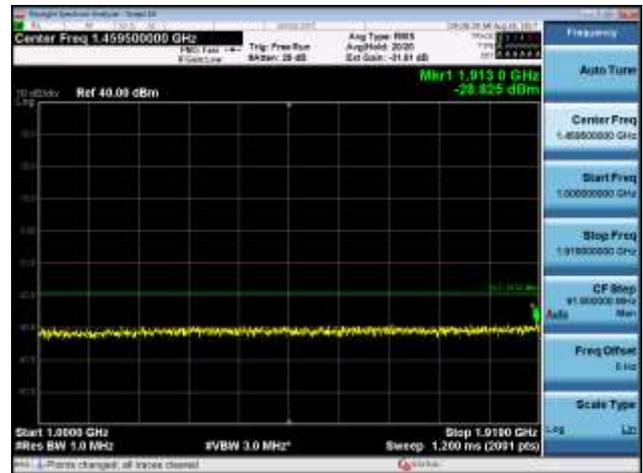
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

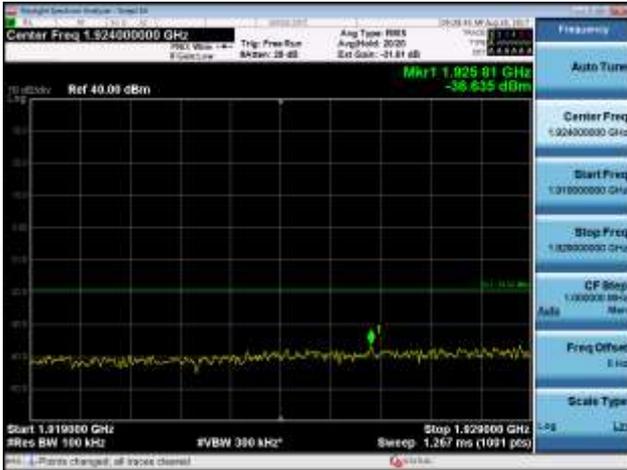




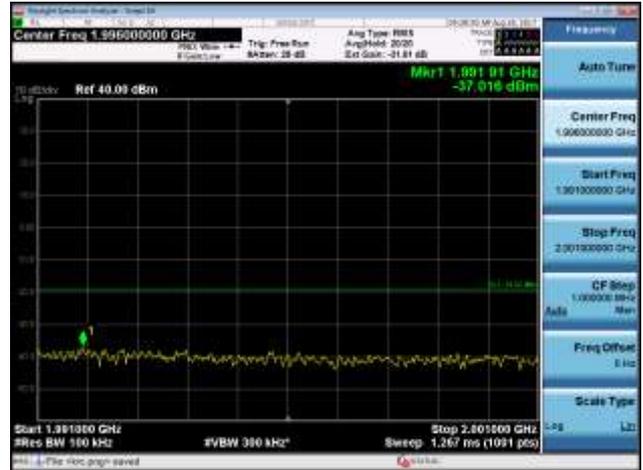
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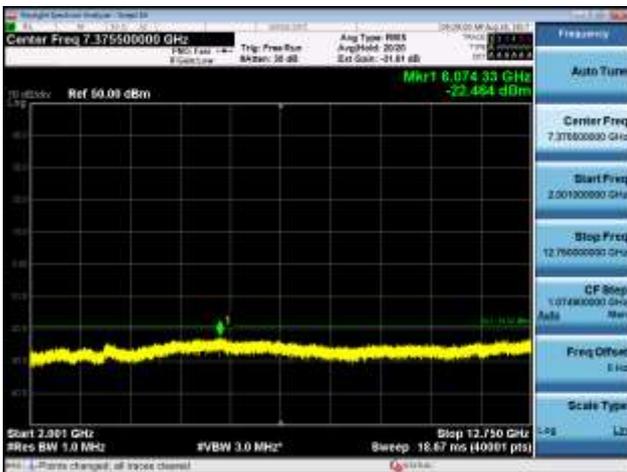
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz



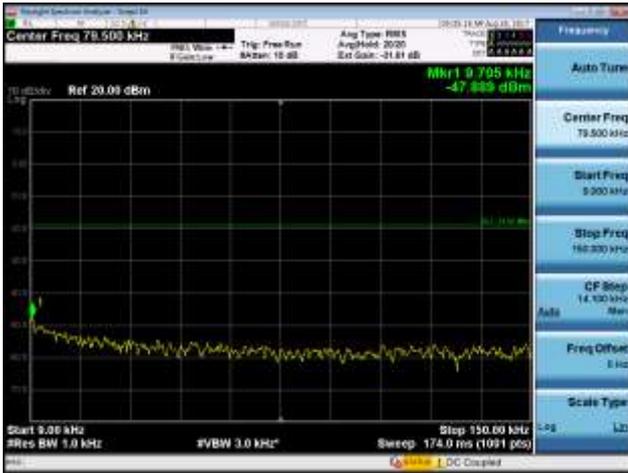


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[64QAM]

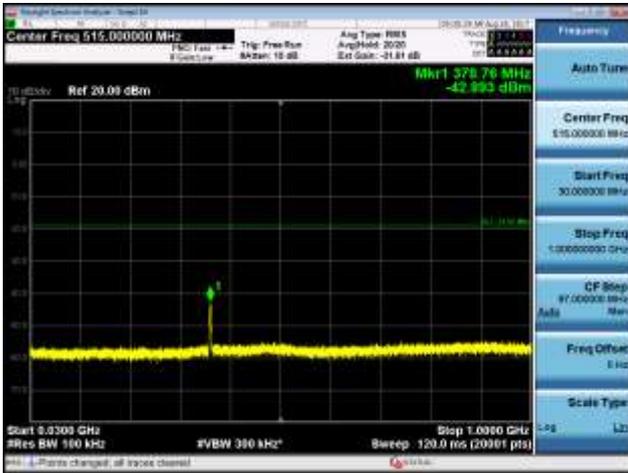
9 kHz - 150 kHz



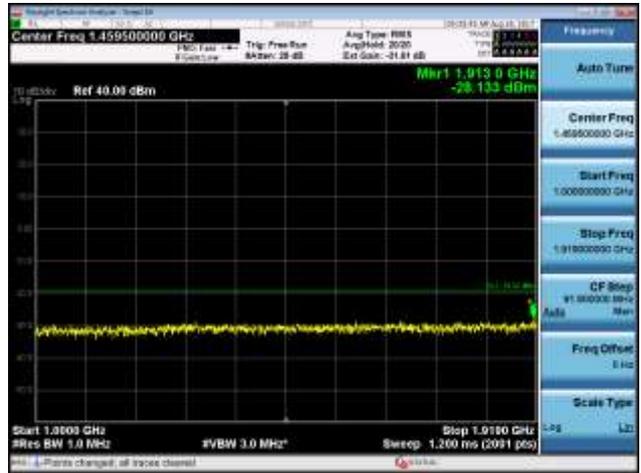
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





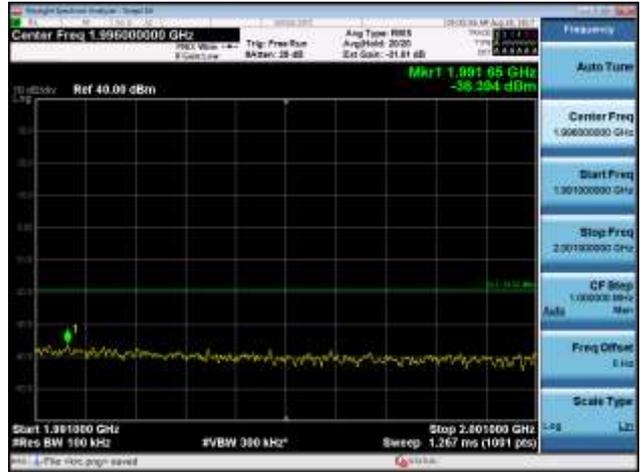
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1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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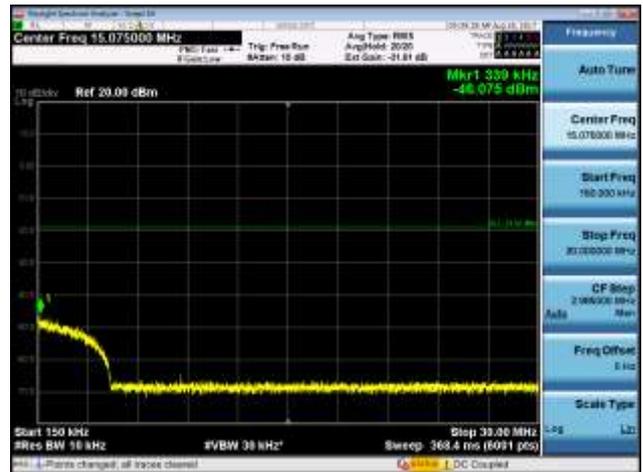
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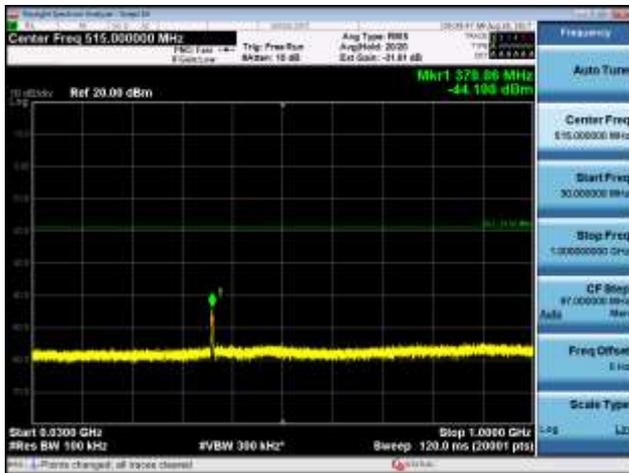
9 kHz - 150 kHz



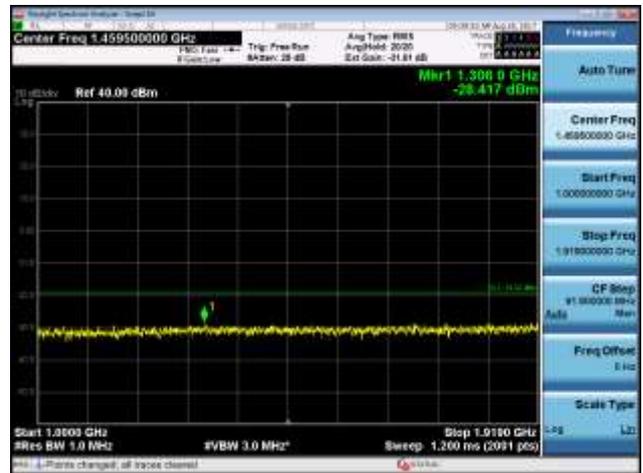
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





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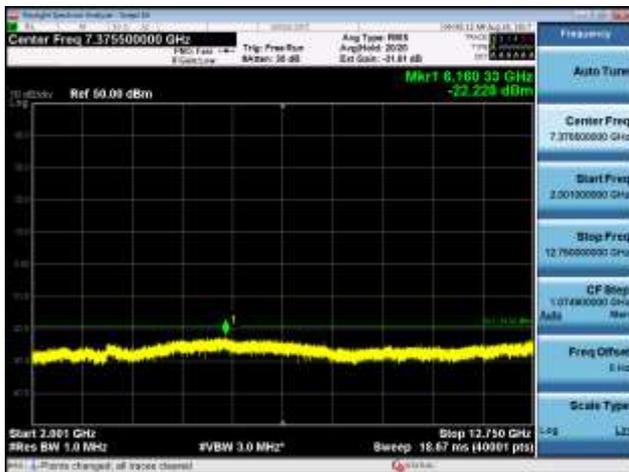
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz

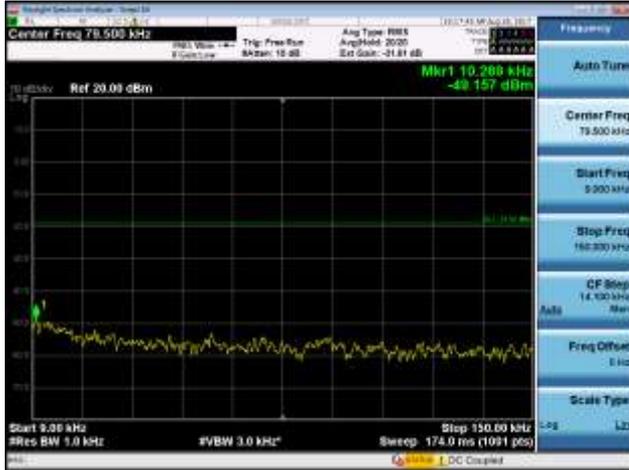


12.75 GHz - 26.5 GHz

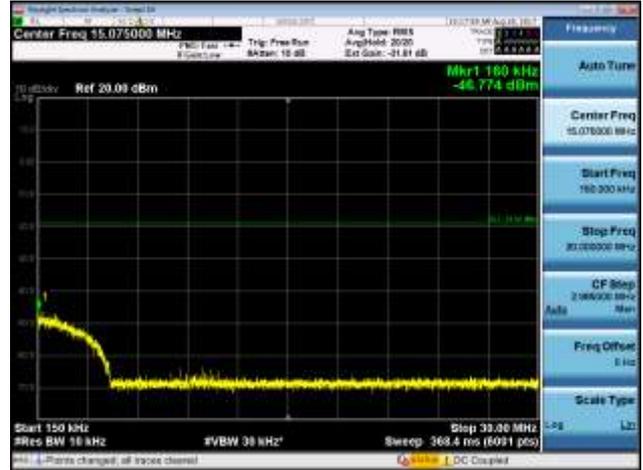


Band 2, BW 5MHz, Single carrier, 4TX, Top
 [QPSK]

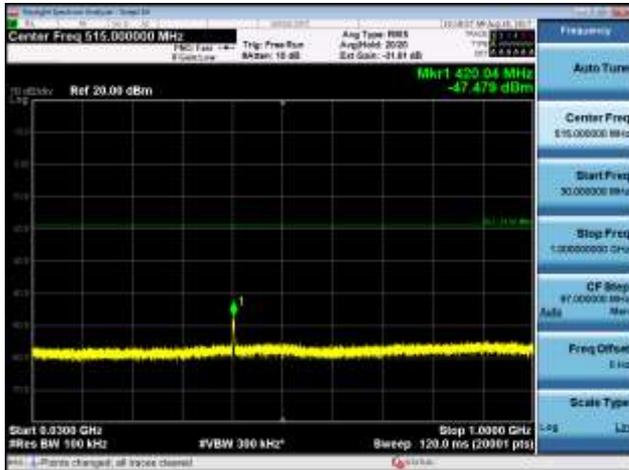
9 kHz - 150 kHz



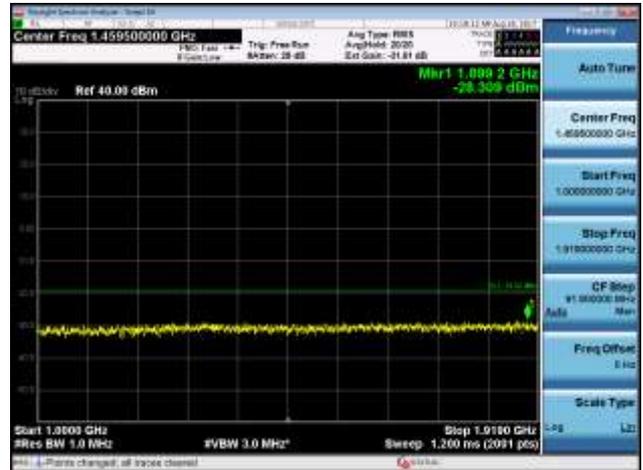
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

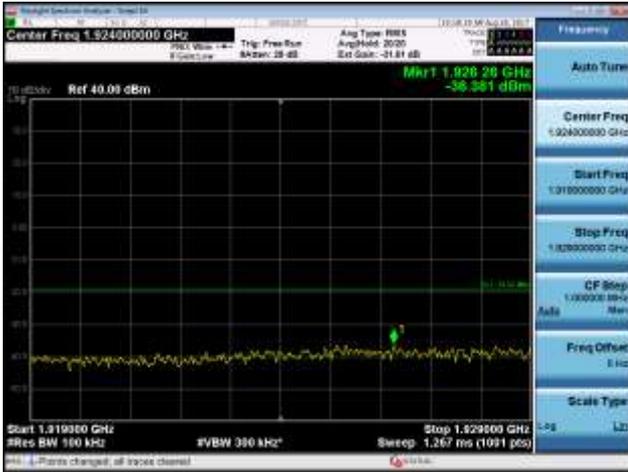




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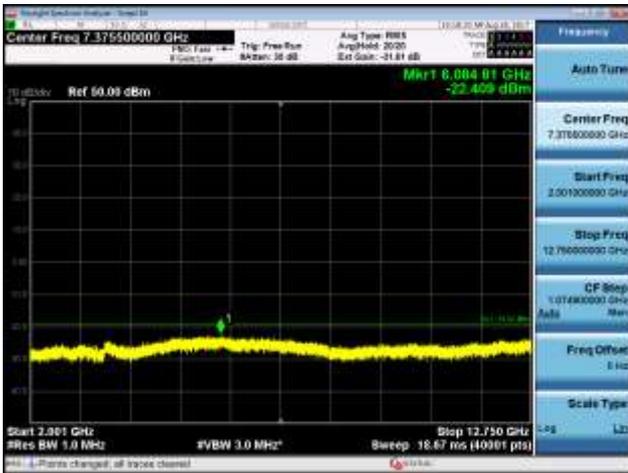
1919 MHz - 1929 MHz



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12.75 GHz - 26.5 GHz



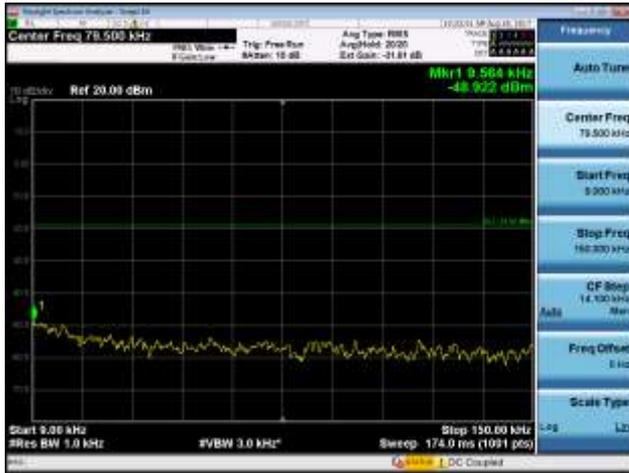


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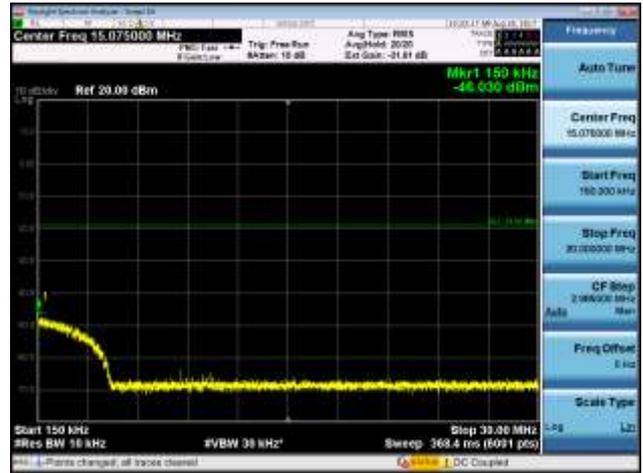
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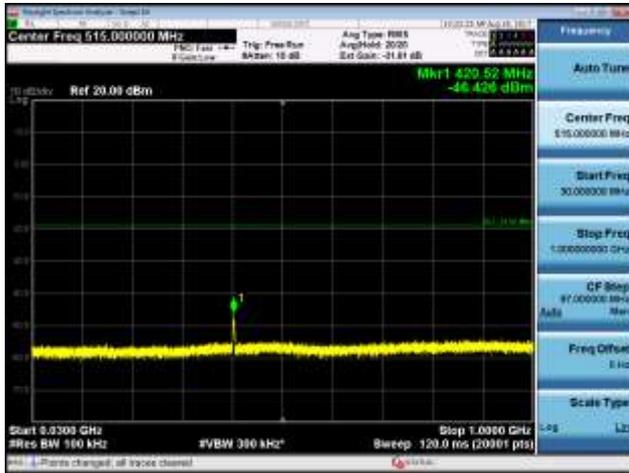
9 kHz - 150 kHz



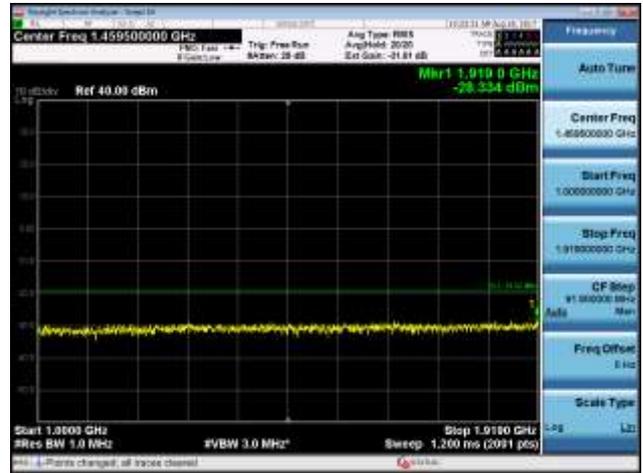
150 kHz - 30 MHz



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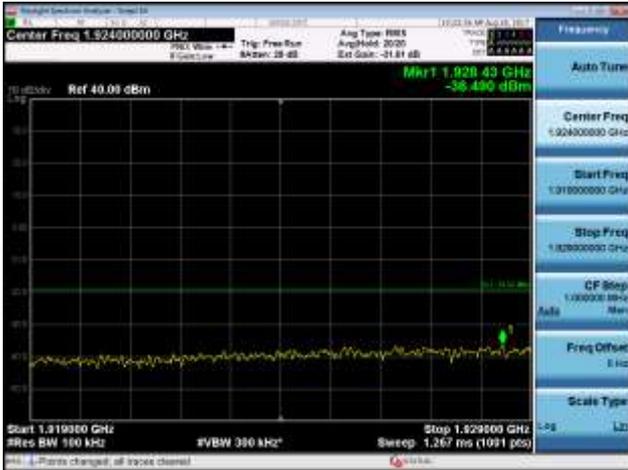




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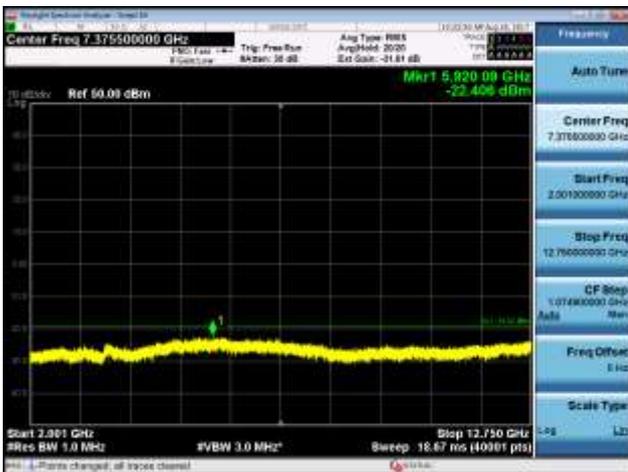
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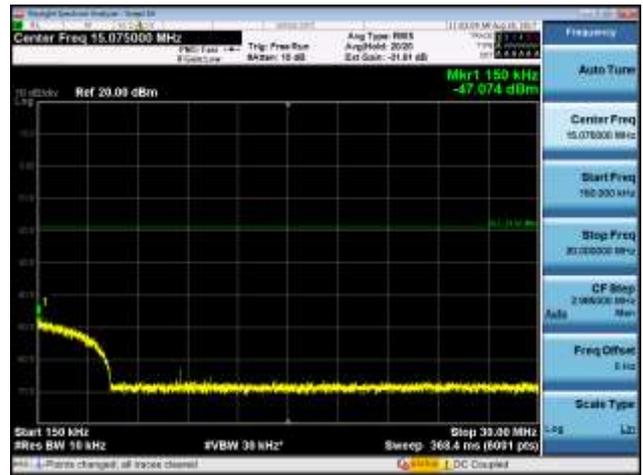
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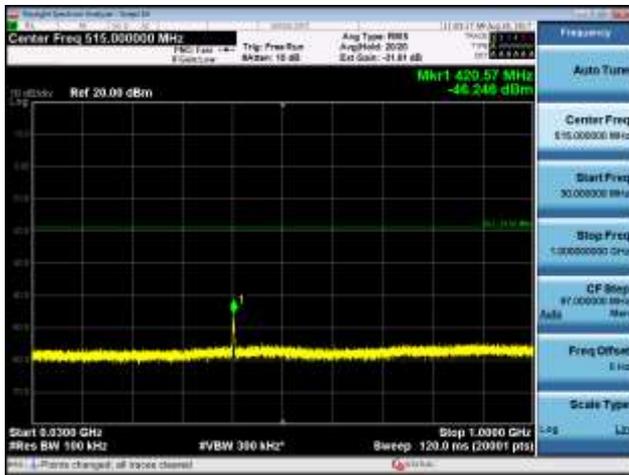
9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz

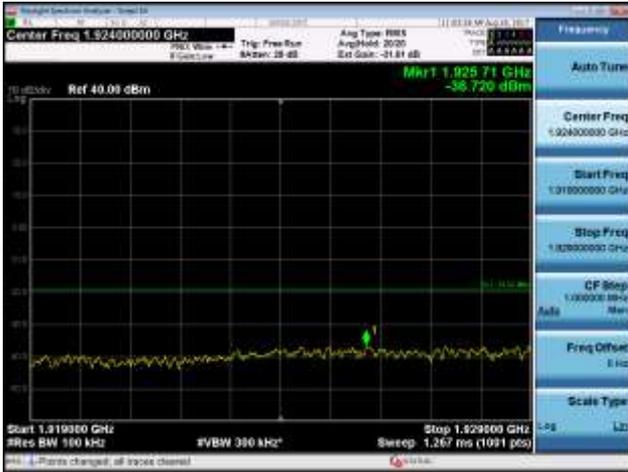




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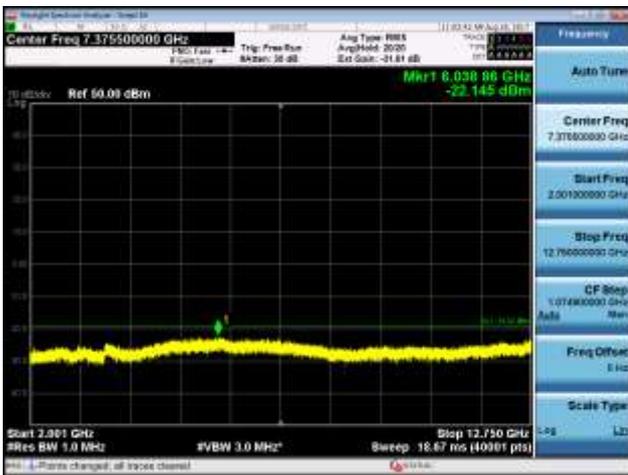
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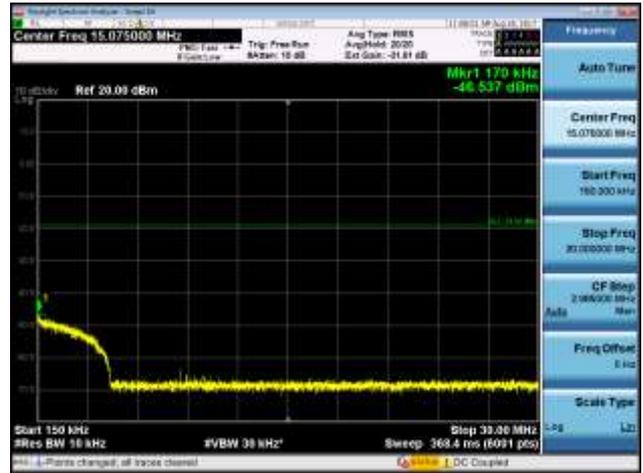
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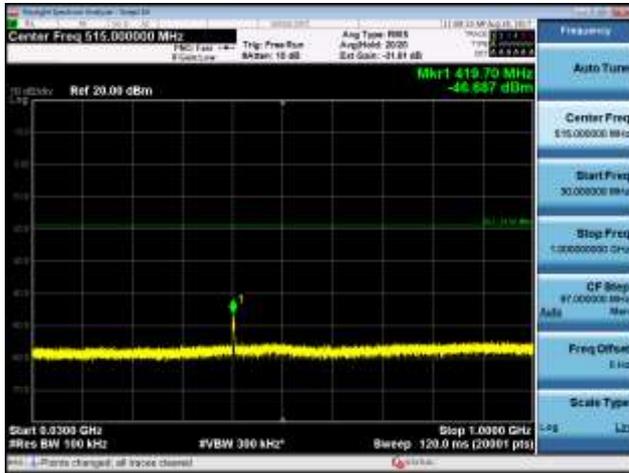
9 kHz - 150 kHz



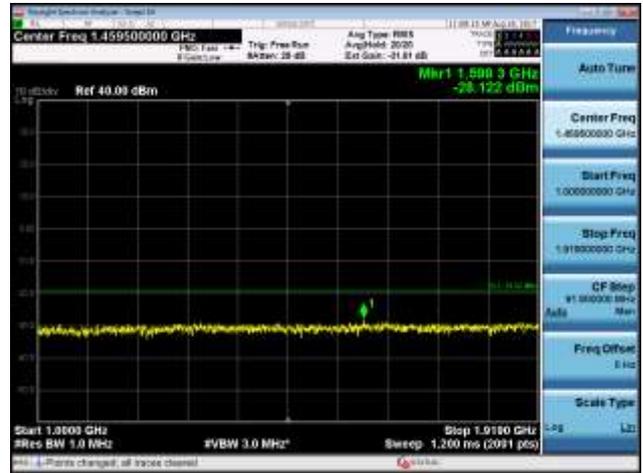
150 kHz - 30 MHz



30 MHz - 1000 MHz



1000 MHz - 1919 MHz





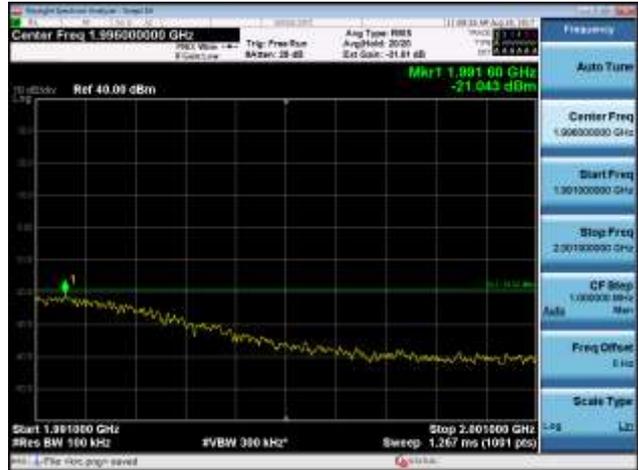
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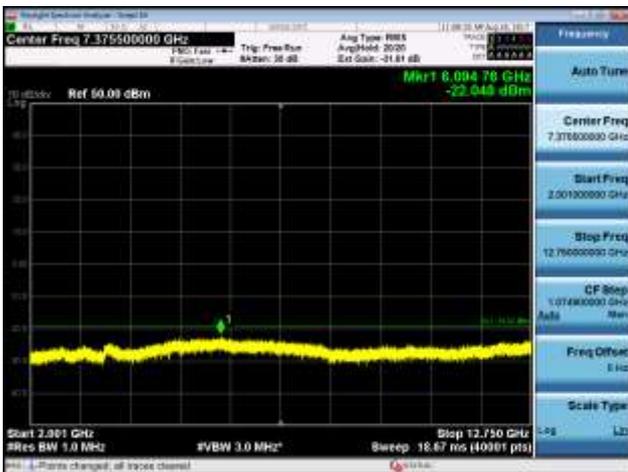
1919 MHz - 1929 MHz



1991 MHz - 2001 MHz



2001 MHz - 12.75 GHz



12.75 GHz - 26.5 GHz





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Band 2, BW 15MHz, Single carrier, 4TX, Bottom
 [QPSK]

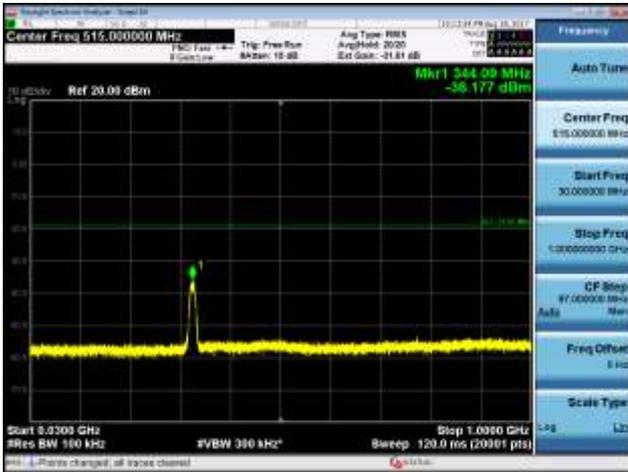
9 kHz - 150 kHz



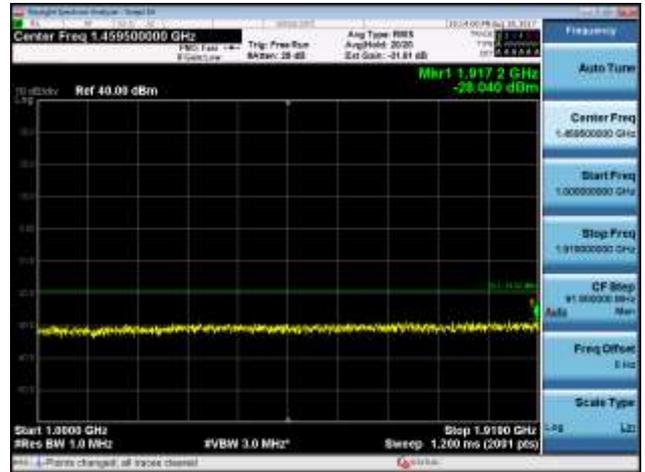
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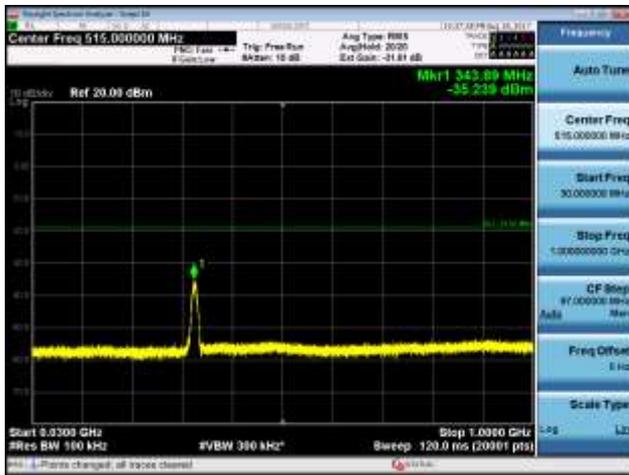
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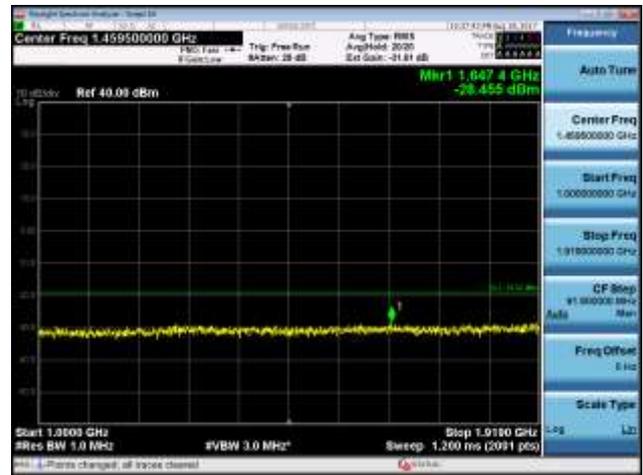
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30 MHz - 1000 MHz



1000 MHz - 1919 MHz





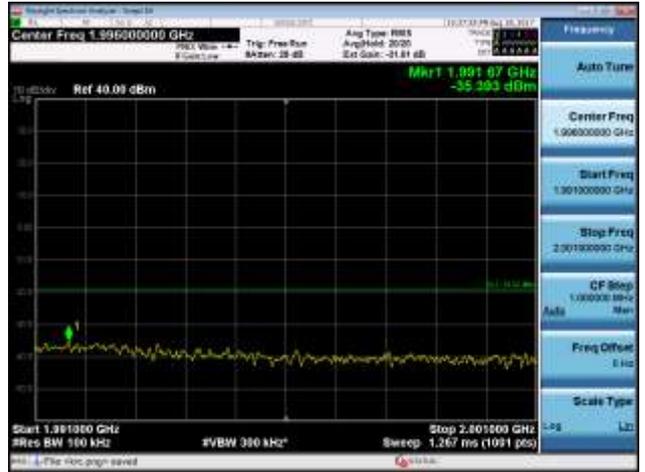
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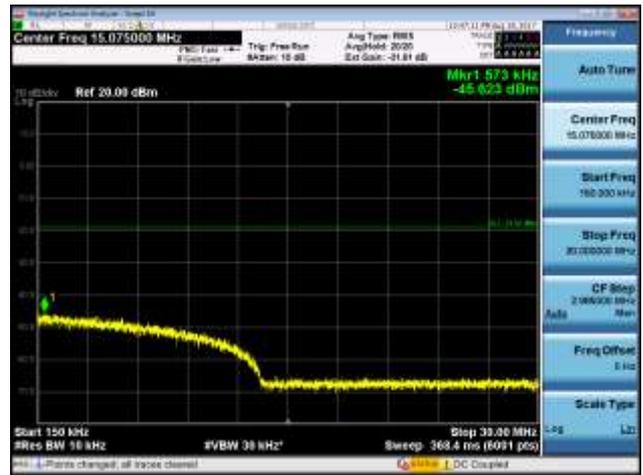
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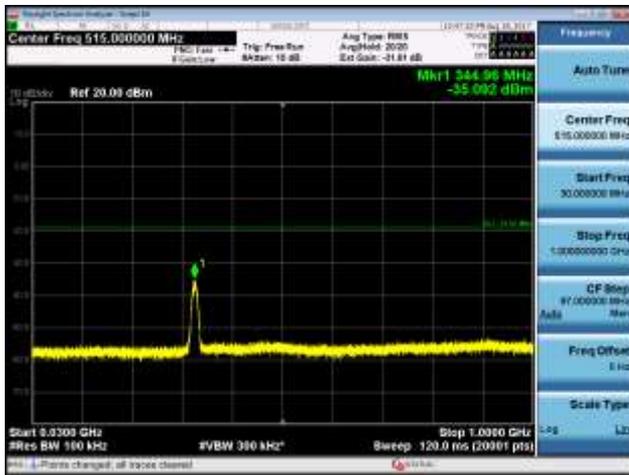
9 kHz - 150 kHz



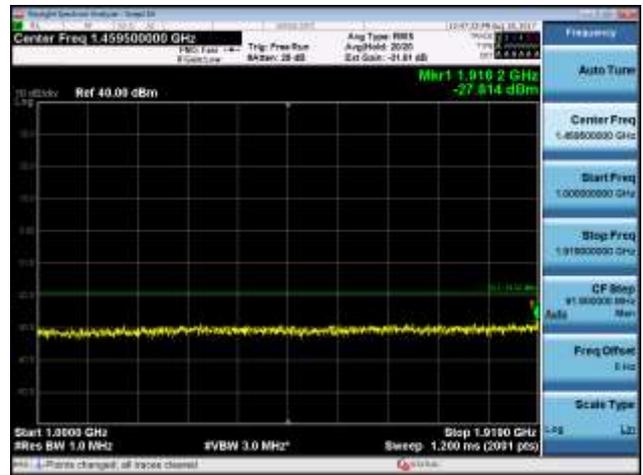
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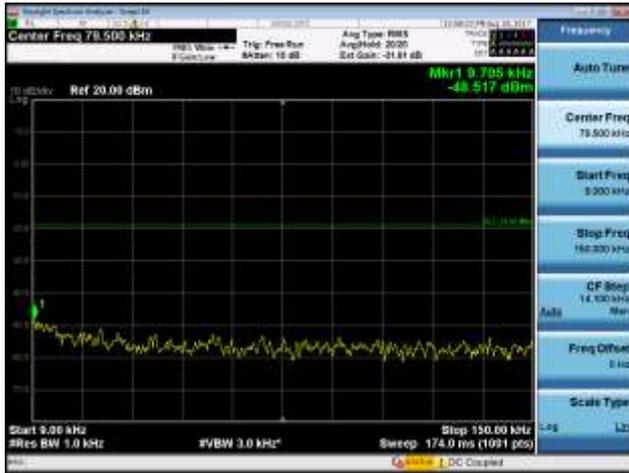


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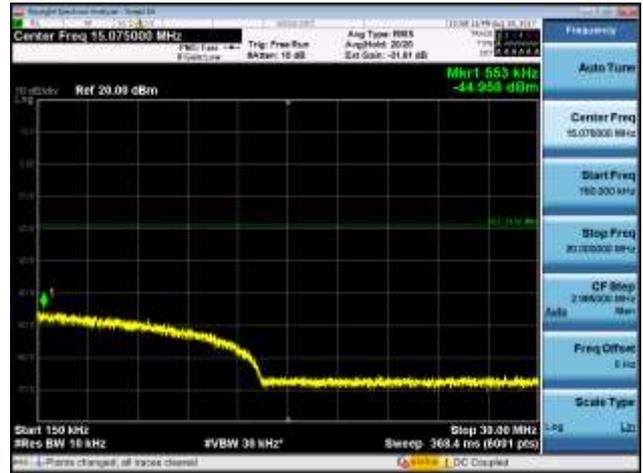
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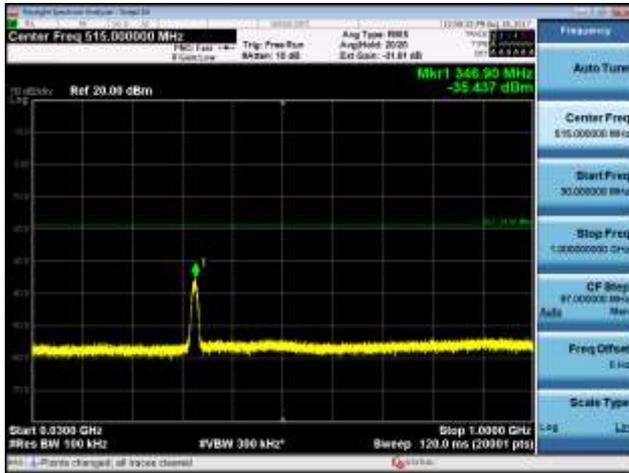
9 kHz - 150 kHz



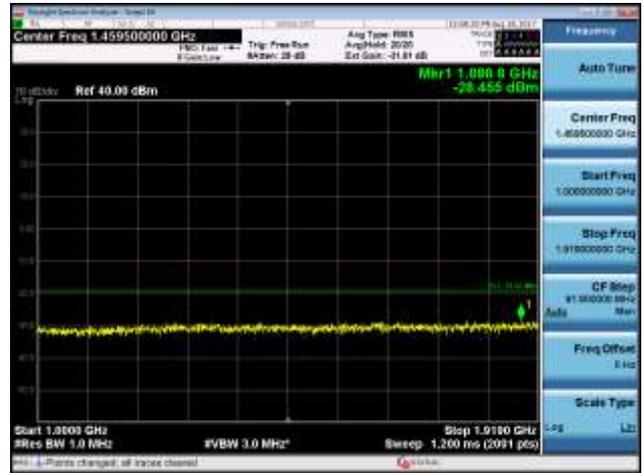
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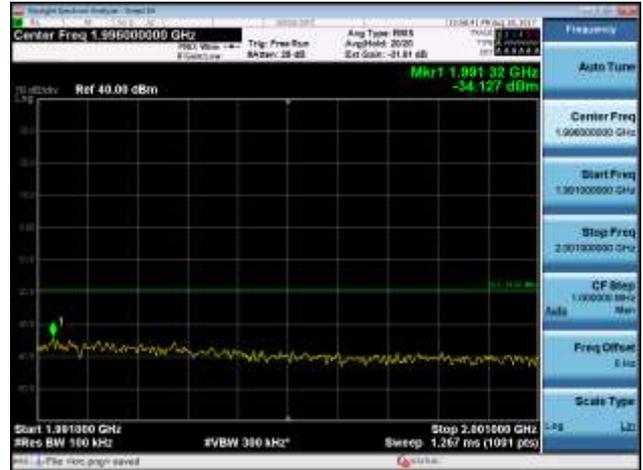
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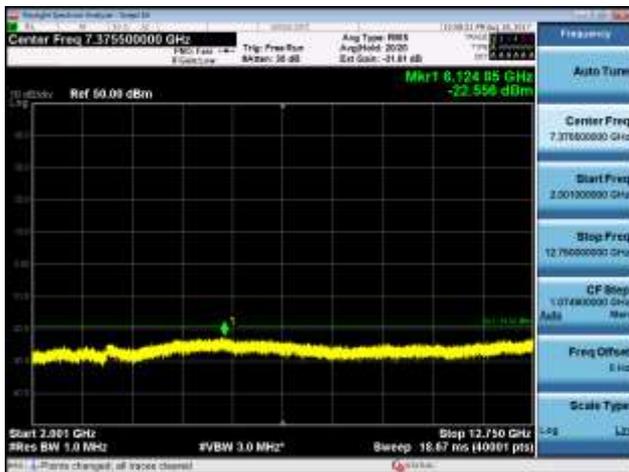
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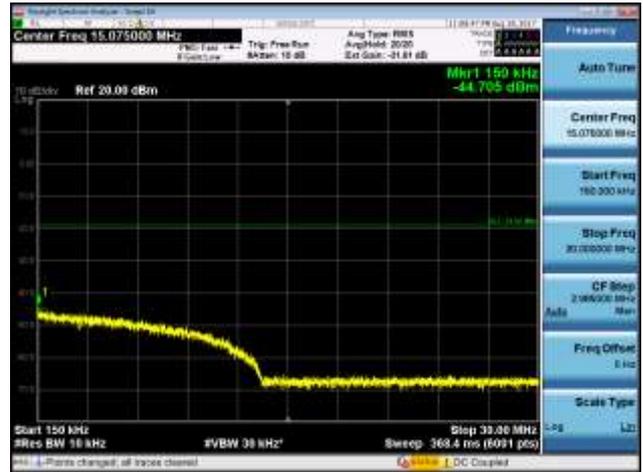
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Band 2, BW 15MHz, Single carrier, 4TX, Middle
[QPSK]

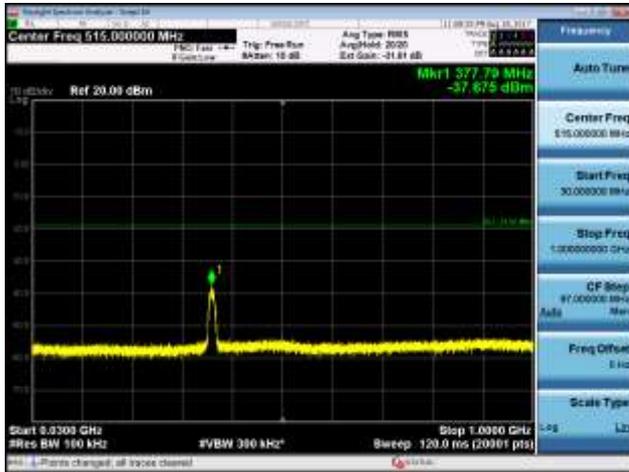
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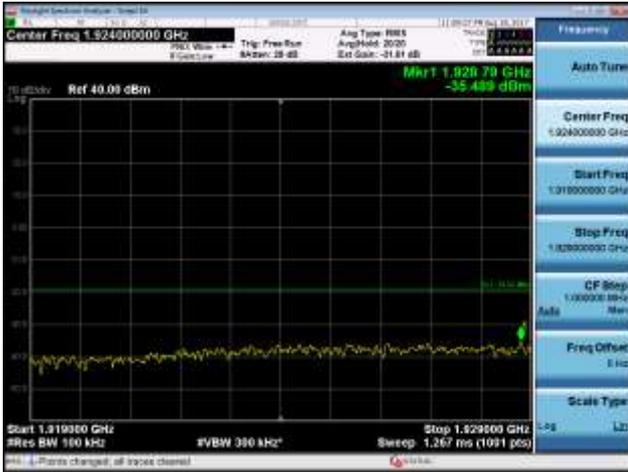




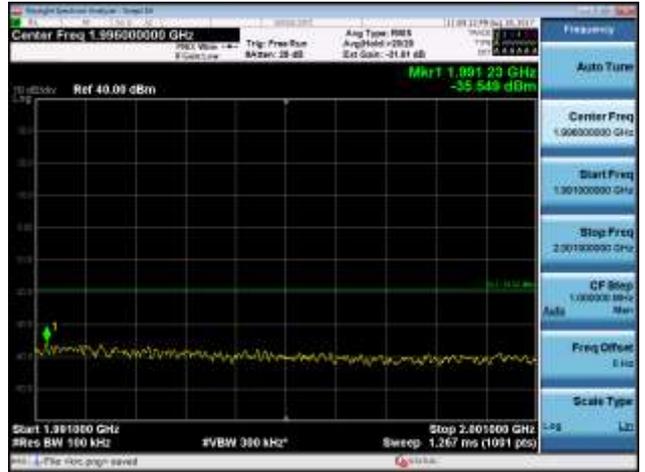
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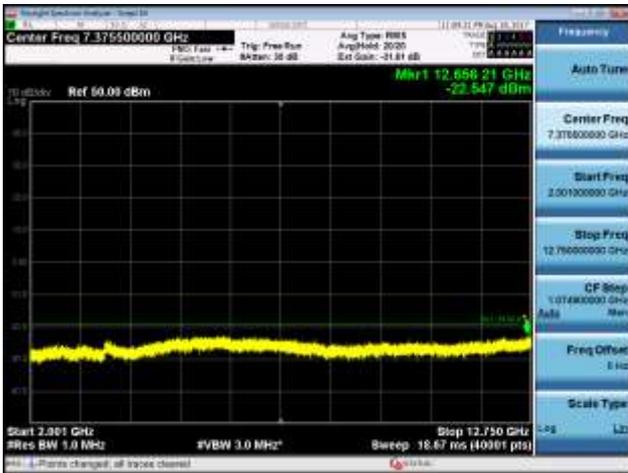
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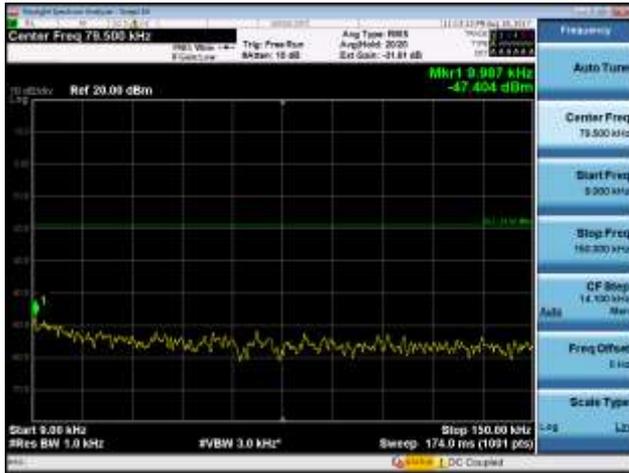


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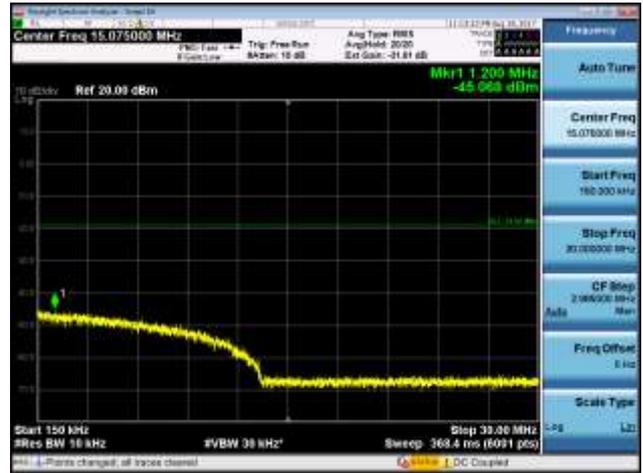
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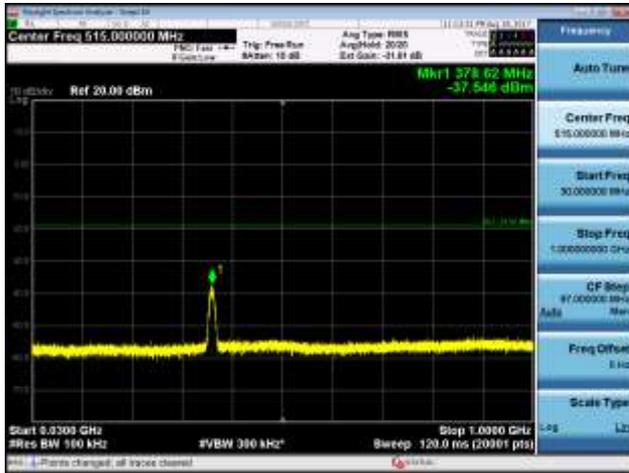
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