

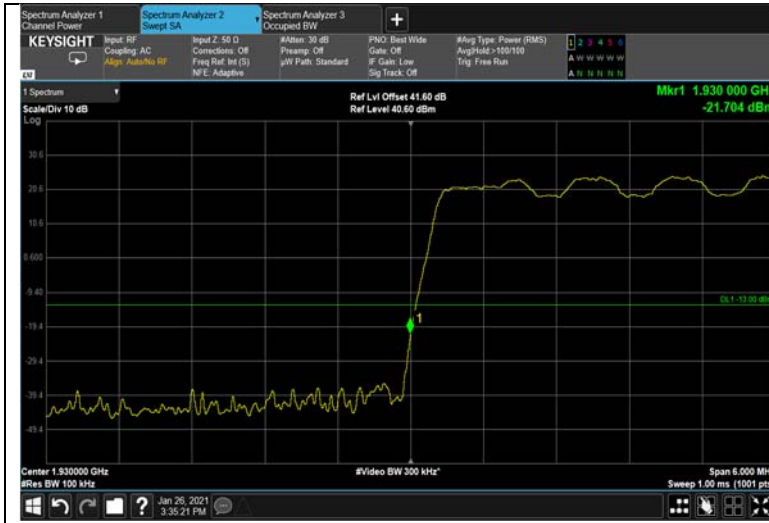


Figure 111: 16QAM 5MHz B.W.; 1932.5MHz, 15kHz
Lower Edge

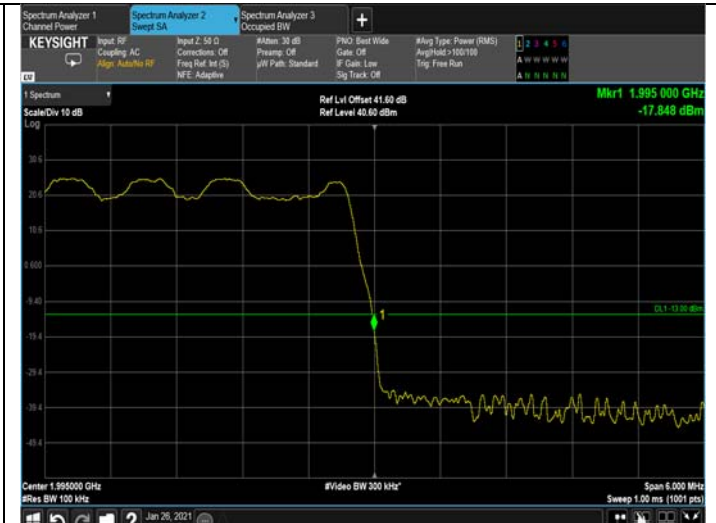


Figure 112: 16QAM 5MHz B.W.; 1992.5MHz, 15kHz
Upper Edge

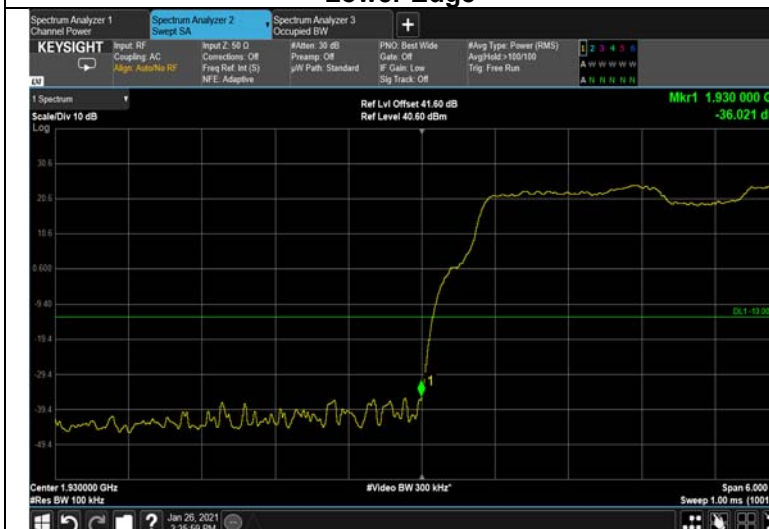


Figure 113: 16QAM 5MHz B.W.; 1932.5MHz, 30kHz
Lower Edge



Figure 114: 16QAM 5MHz B.W.; 1992.5MHz, 30kHz
Upper Edge

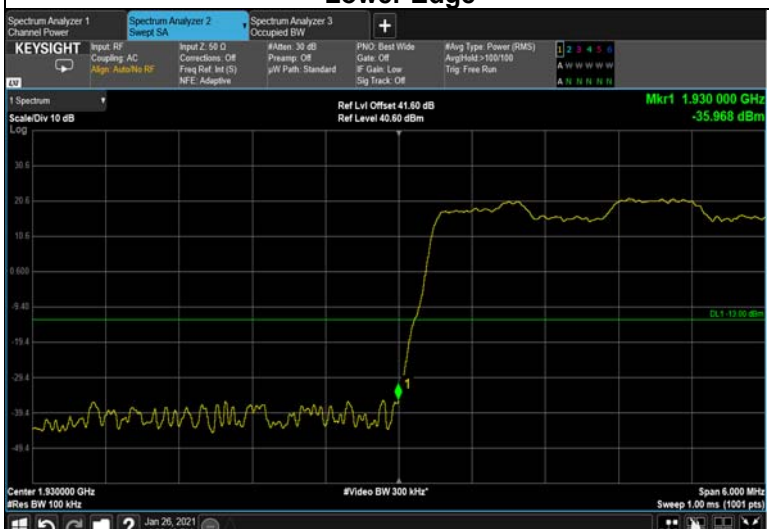


Figure 115: 16QAM 10MHz B.W.; 1935MHz, 15kHz
Lower Edge

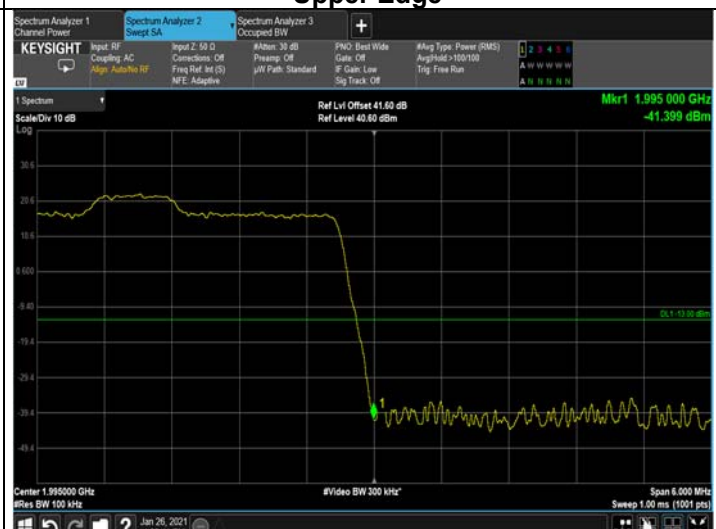


Figure 116: 16QAM 10MHz B.W.; 1990MHz, 15kHz
Upper Edge

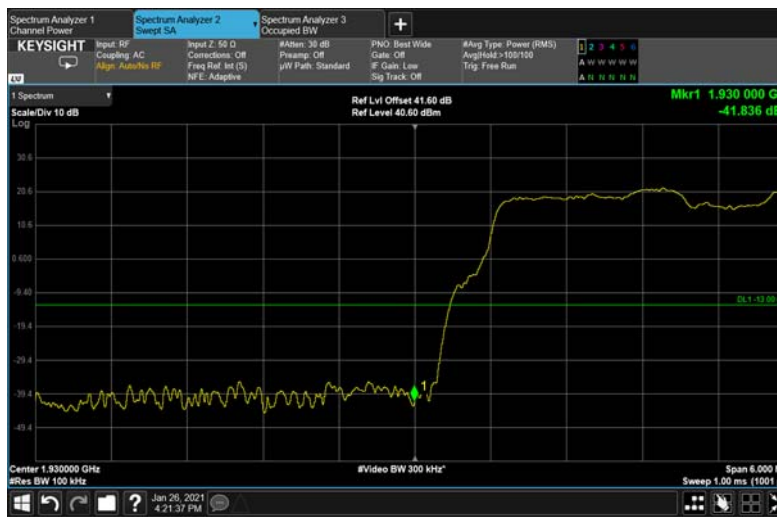
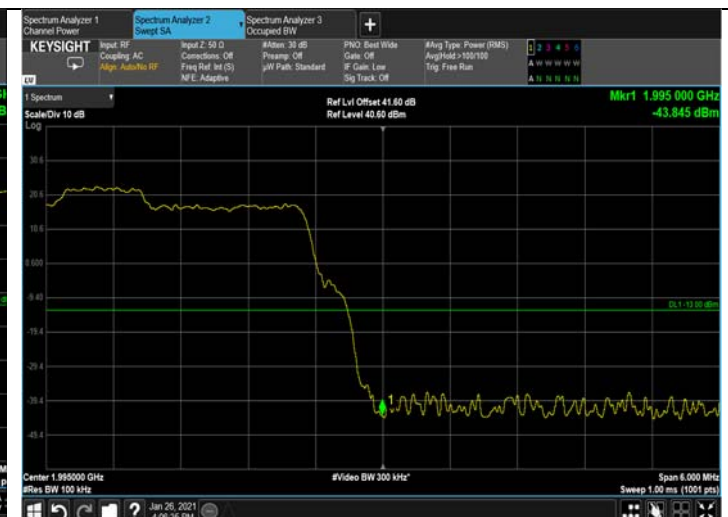


Figure 117: 16QAM 10MHz B.W.; 1935MHz, 30kHz Lower Edge



**Figure 118: 16QAM 10MHz B.W.; 1990MHz, 30kHz
Upper Edge**

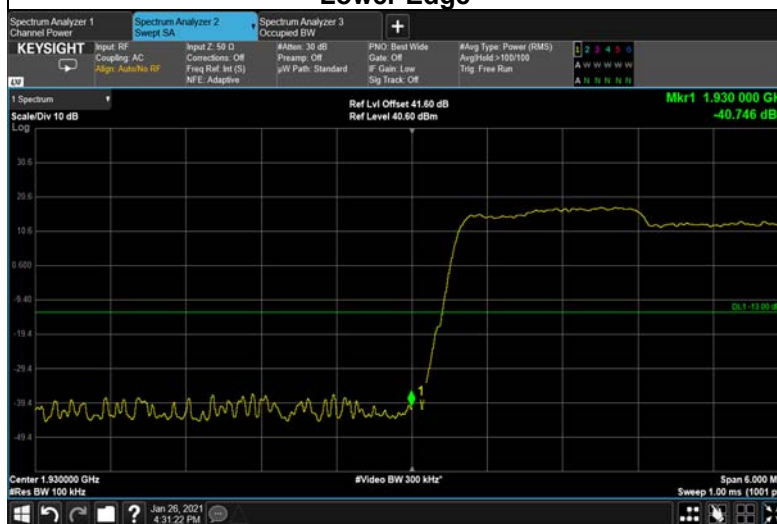


Figure 119: 16QAM 15MHz B.W.; 1937.5MHz, 15kHz Lower Edge

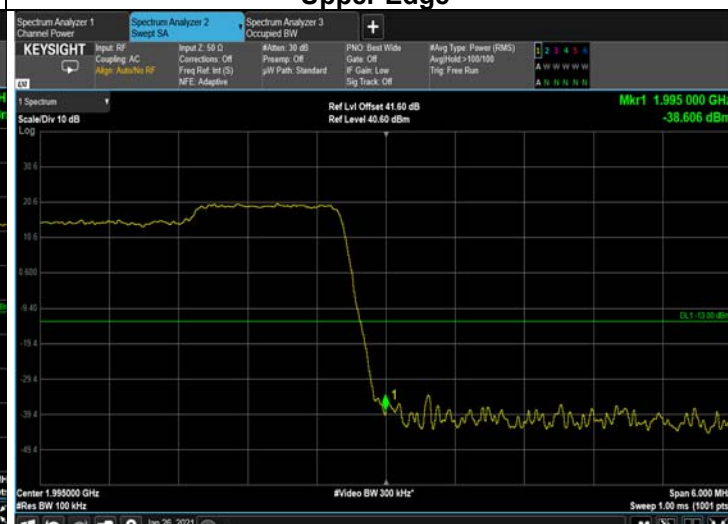


Figure 120: 16QAM 15MHz B.W.; 1987.5MHz, 15kHz Upper Edge



Figure 121: 16QAM 15MHz B.W.; 1987.5MHz, 30kHz Lower Edge

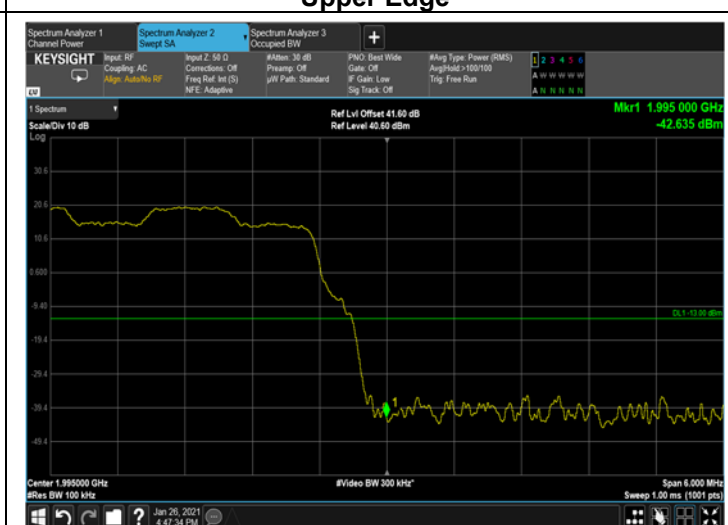


Figure 122: 16QAM 15MHz B.W.; 1987.5MHz, 30kHz Upper Edge

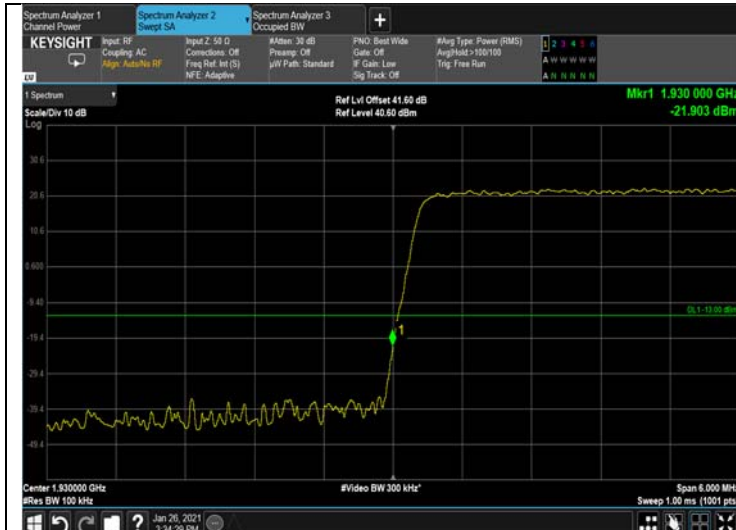


Figure 123: 64QAM 5MHz B.W.; 1932.5MHz, 15kHz
Lower Edge



Figure 124: 64QAM 5MHz B.W.; 1992.5MHz, 15kHz Upper
Edge



Figure 125: 64QAM 5MHz B.W.; 1932.5MHz, 30kHz
Lower Edge



Figure 126: 64QAM 5MHz B.W.; 1992.5MHz, 30kHz
Upper Edge

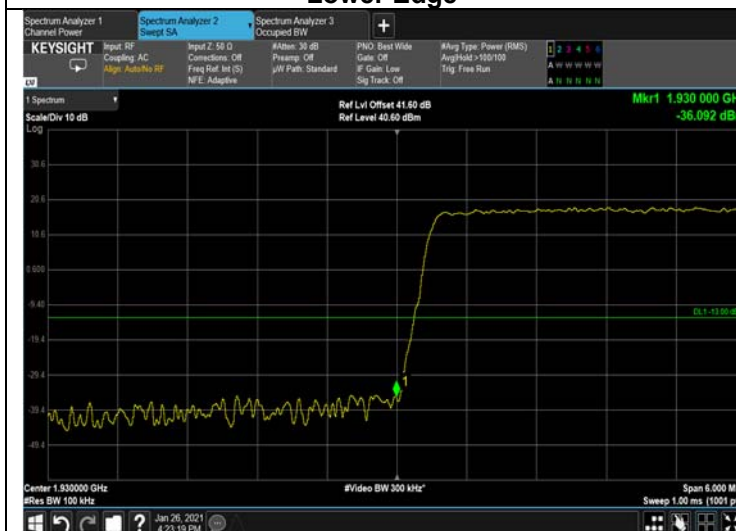


Figure 127: 64QAM 10MHz B.W.; 1935MHz, 15kHz
Lower Edge

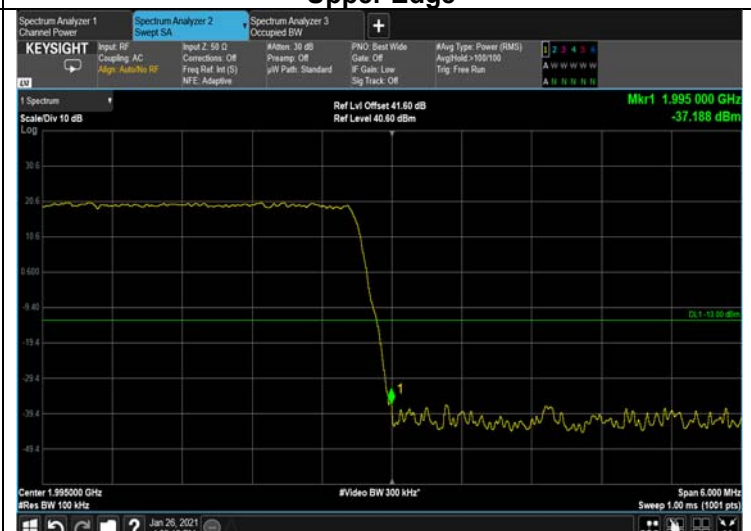


Figure 128: 64QAM 10MHz B.W.; 1990MHz, 15kHz
Upper Edge

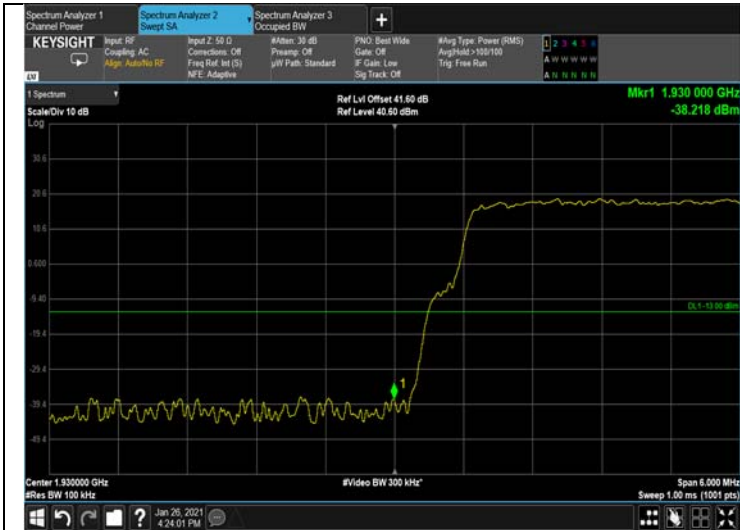


Figure 129: 64QAM 10MHz B.W.; 1935MHz, 30kHz
Lower Edge

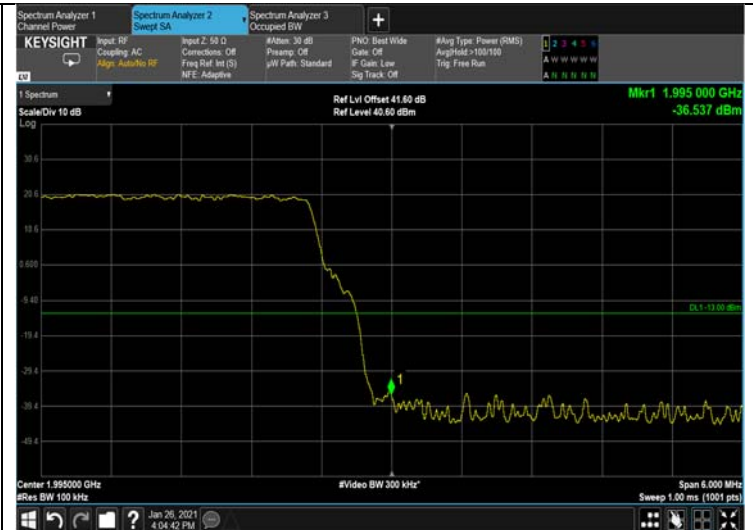


Figure 130: 64QAM 10MHz B.W.; 1990MHz, 30kHz
Upper Edge

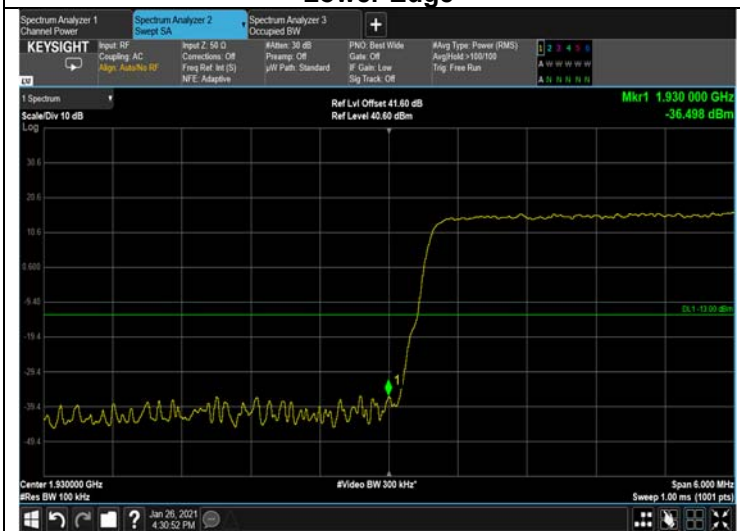


Figure 131: 64QAM 15MHz B.W.; 1937.5MHz, 15kHz
Lower Edge

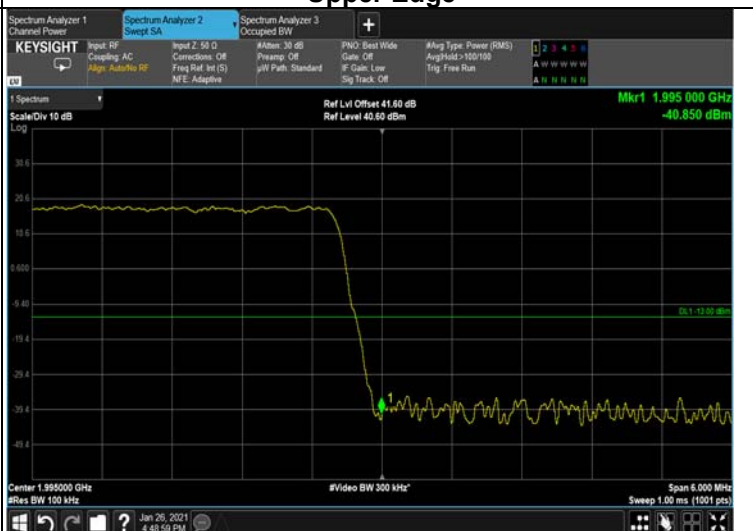


Figure 132: 64QAM 15MHz B.W.; 1987.5MHz, 15kHz
Upper Edge

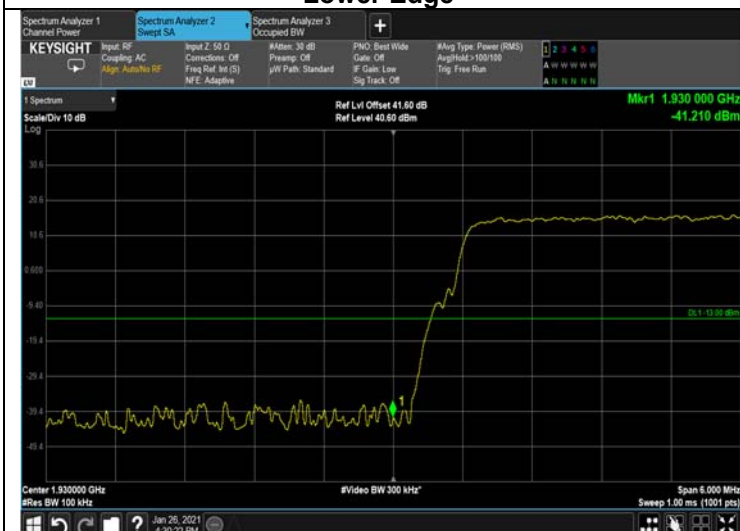


Figure 133: 64QAM 15MHz B.W.; 1937.5MHz, 30kHz
Lower Edge

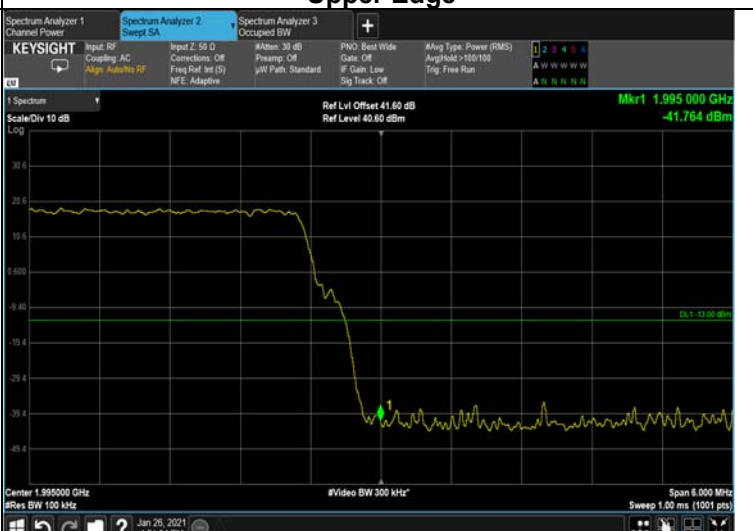


Figure 134: 64QAM 15MHz B.W.; 1987.5MHz, 30kHz
Upper Edge

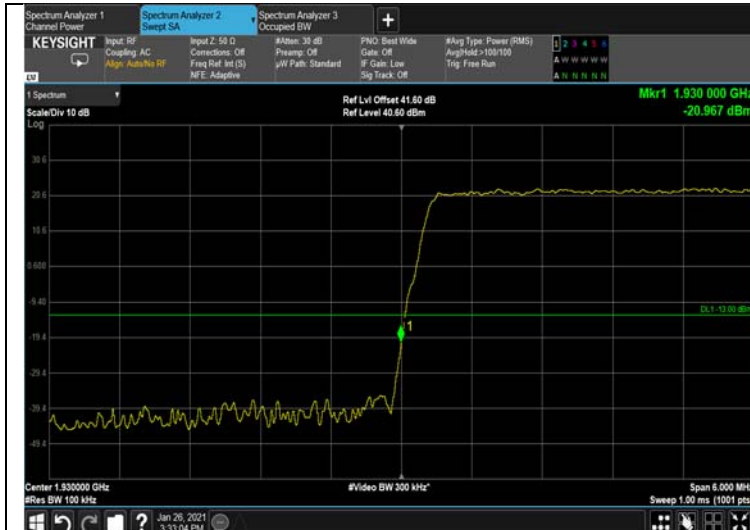


Figure 135: 256QAM 5MHz B.W.; 1932.5MHz, 15kHz
Lower Edge

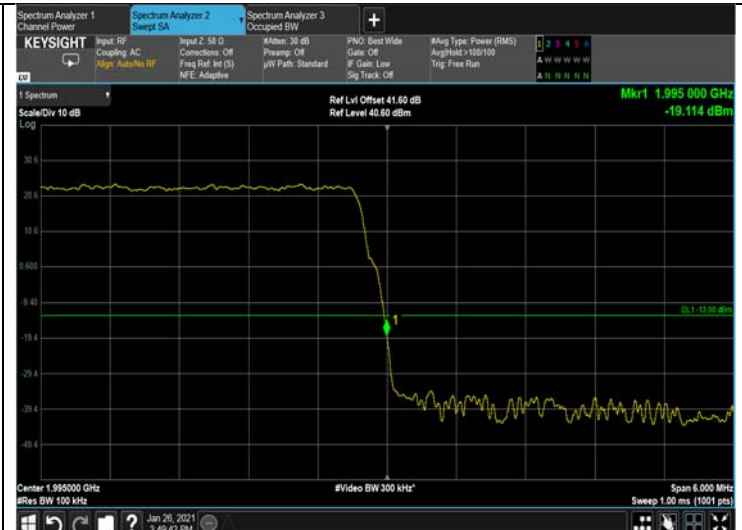


Figure 136: 256QAM 5MHz B.W.; 1987.5MHz, 15kHz
Upper Edge



Figure 137: 256QAM 5MHz B.W.; 1932.5MHz, 30kHz
Lower Edge

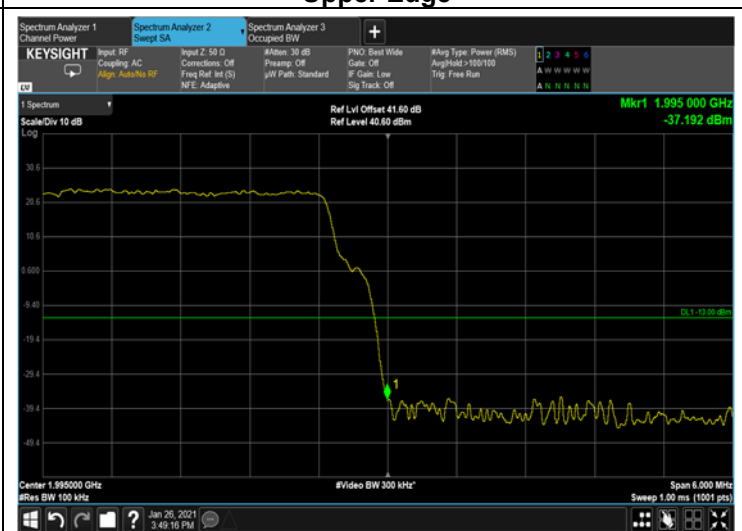


Figure 138: 256QAM 5MHz B.W.; 1987.5MHz, 30kHz
Upper Edge

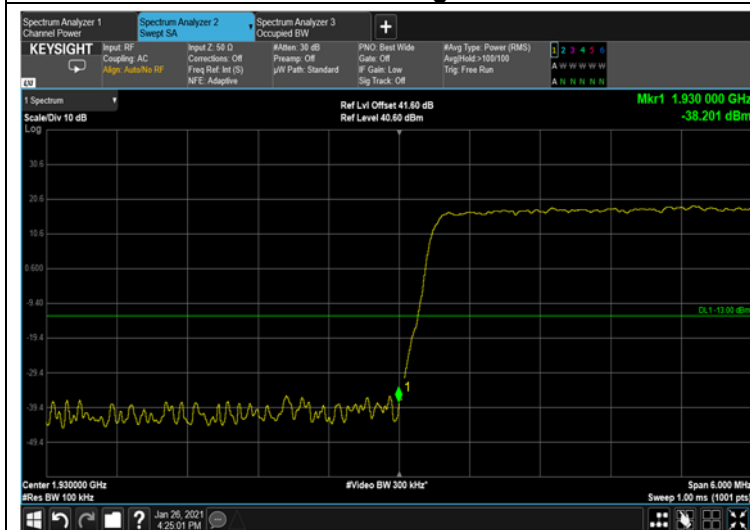


Figure 139: 256QAM 10MHz B.W.; 1935MHz, 15kHz
Lower Edge

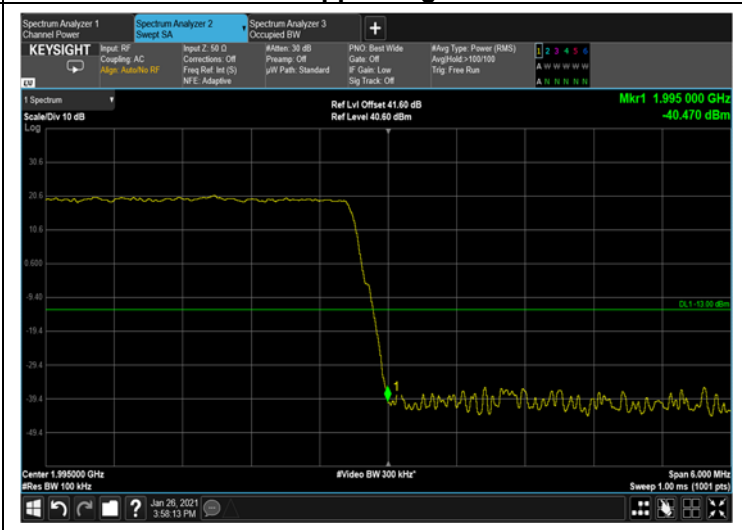


Figure 140: 256QAM 10MHz B.W.; 1990MHz, 15kHz
Upper Edge

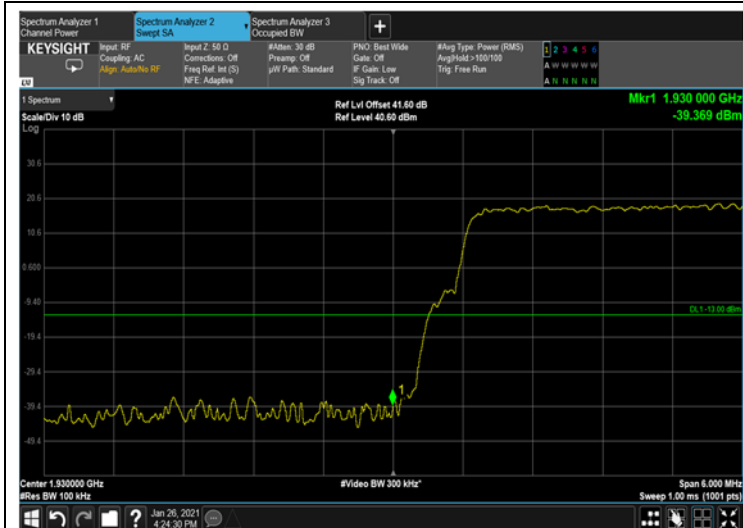


Figure 141: 256QAM 10MHz B.W.; 1935MHz, 30kHz
Lower Edge

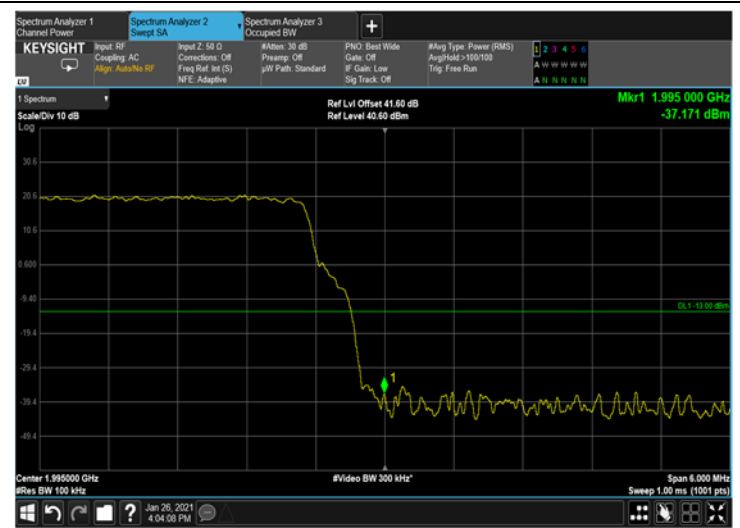


Figure 142: 256QAM 10MHz B.W.; 1990MHz, 30kHz
Upper Edge

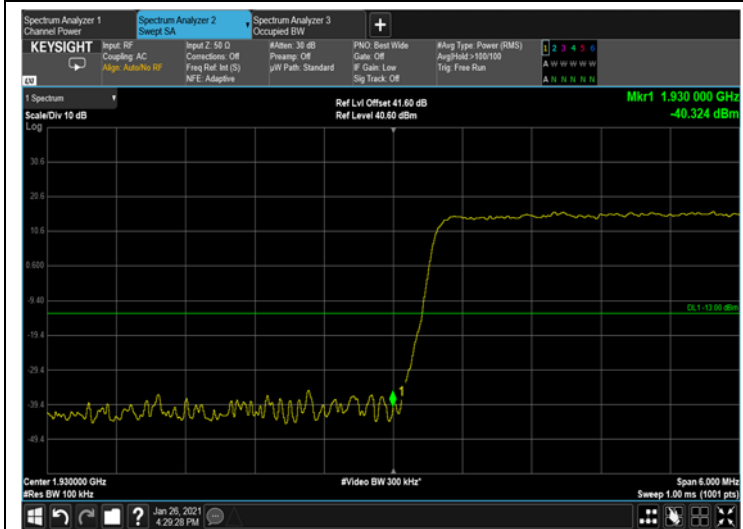


Figure 143: 256QAM 15MHz B.W.; 1937.5Hz, 15kHz
Lower Edge

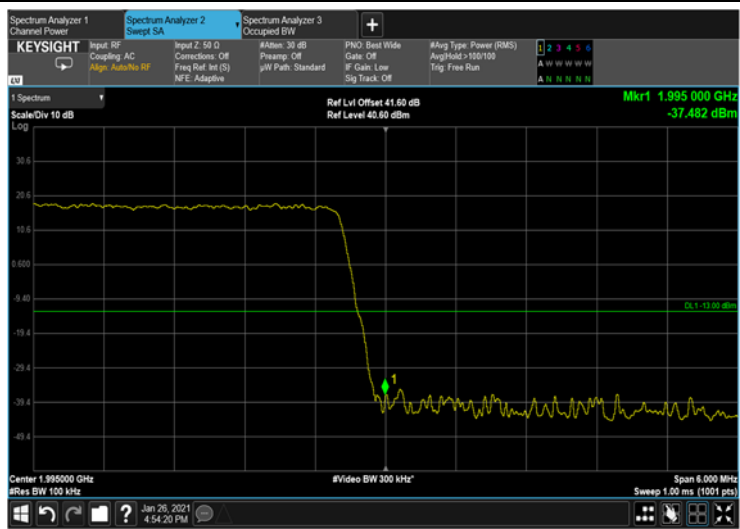


Figure 144: 256QAM 15MHz B.W.; 1987.5MHz, 15kHz
Upper Edge

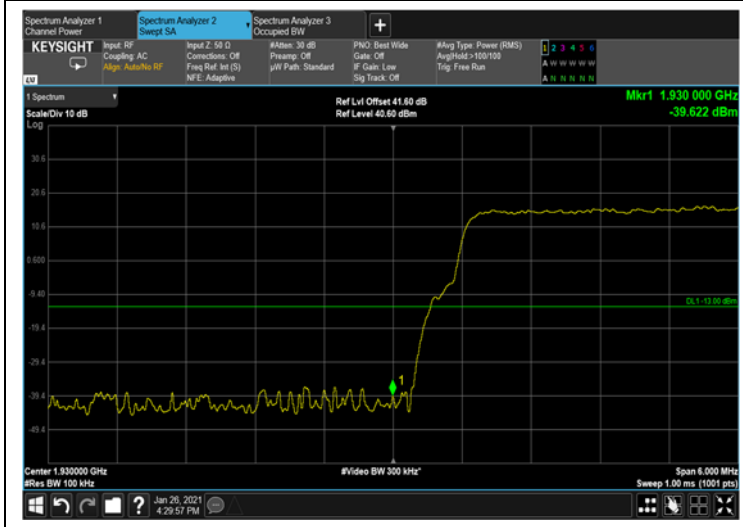


Figure 145: 256QAM 15MHz B.W.; 1937.5MHz, 30kHz
Lower Edge

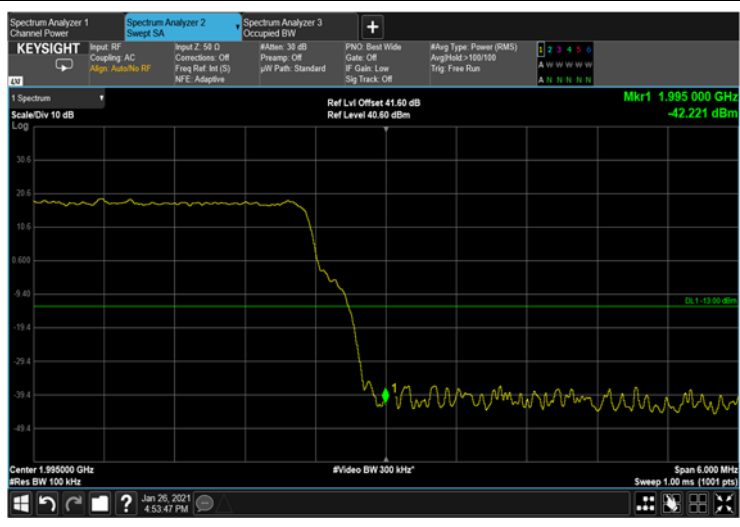


Figure 146: 256QAM 15MHz B.W.; 1987.5MHz, 30kHz
Upper Edge

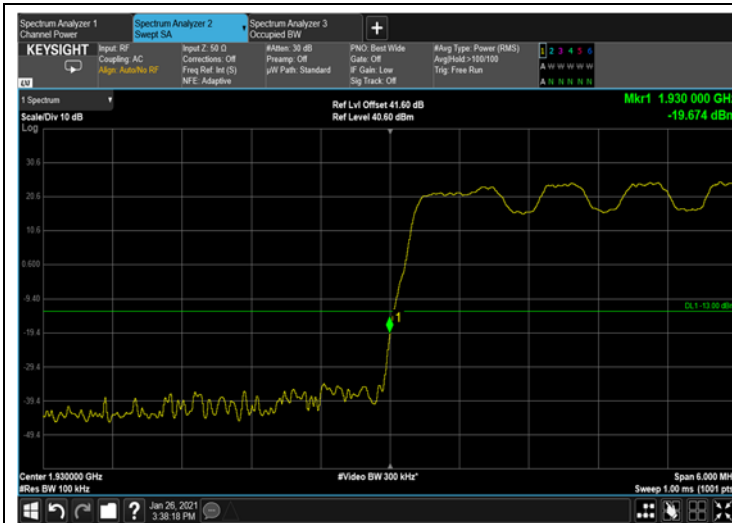


Figure 147: QPSK 5MHz B.W.; 1932.5MHz, 15kHz
Lower Edge

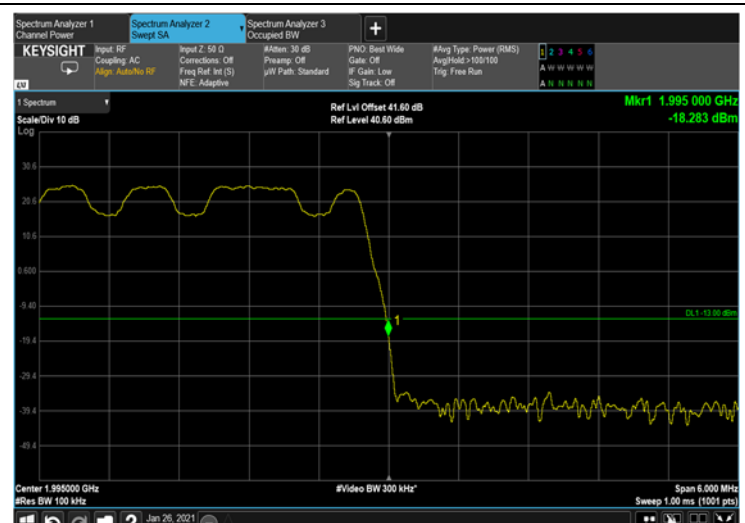


Figure 148: QPSK 5MHz B.W.; 1992.5MHz, 15kHz
Upper Edge

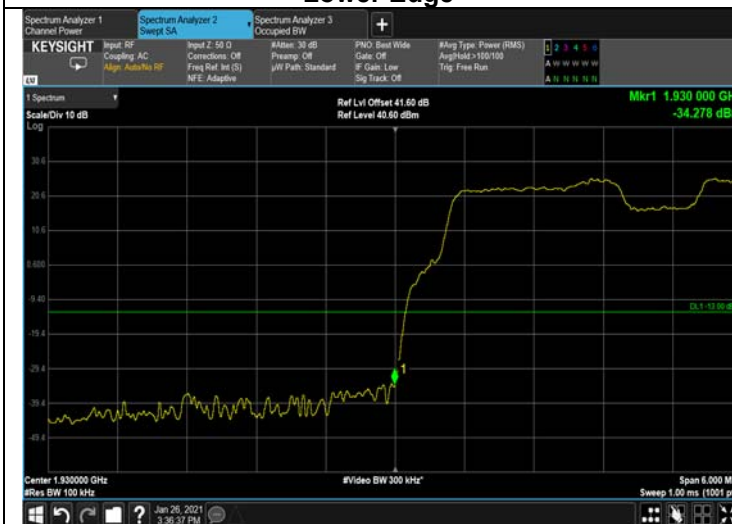


Figure 149: QPSK 5MHz B.W.; 1932.5MHz, 30kHz
Lower Edge



Figure 150: QPSK 5MHz B.W.; 1992.5MHz, 30kHz
Upper Edge



Figure 151: QPSK 10MHz B.W.; 1935MHz, 15kHz
Lower Edge

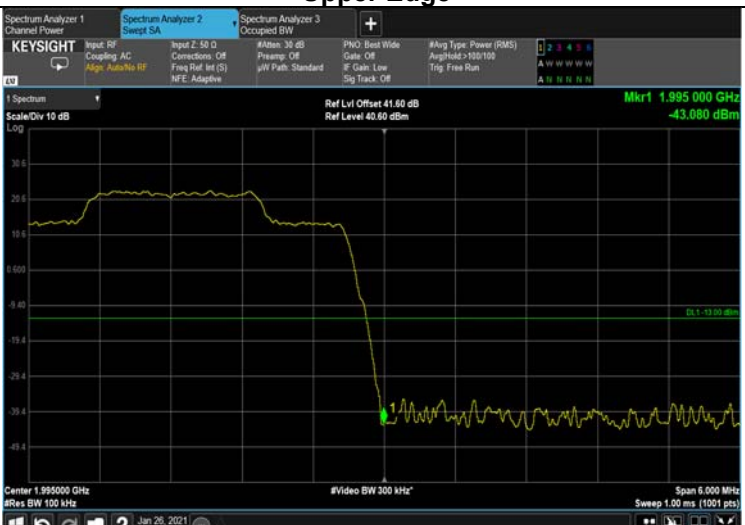


Figure 152: QPSK 10MHz B.W.; 1990MHz, 15kHz
Upper Edge

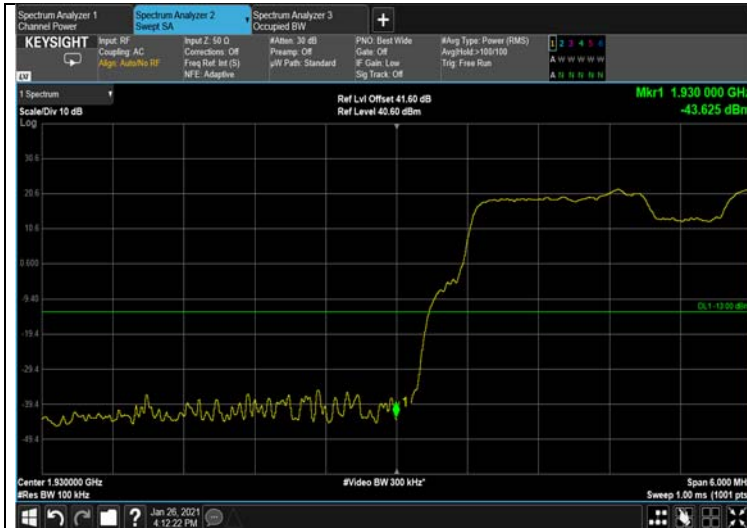


Figure 153: QPSK 10MHz B.W.; 1935MHz, 30kHz
Lower Edge

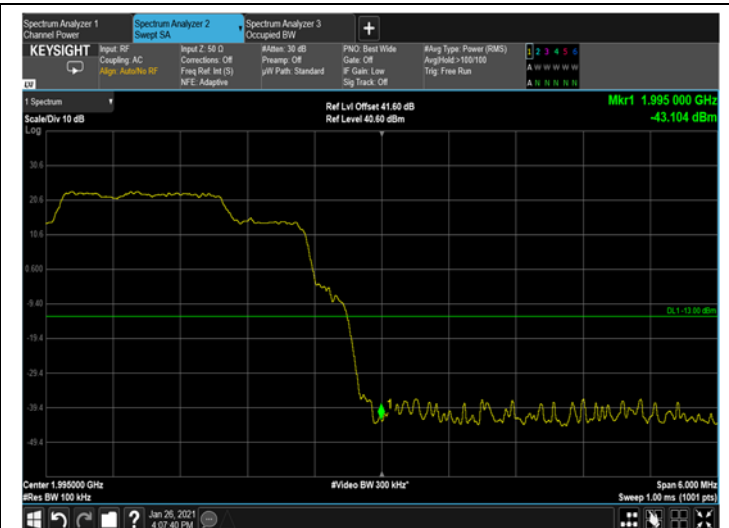


Figure 154: QPSK 10MHz B.W.; 1990MHz, 30kHz
Upper Edge

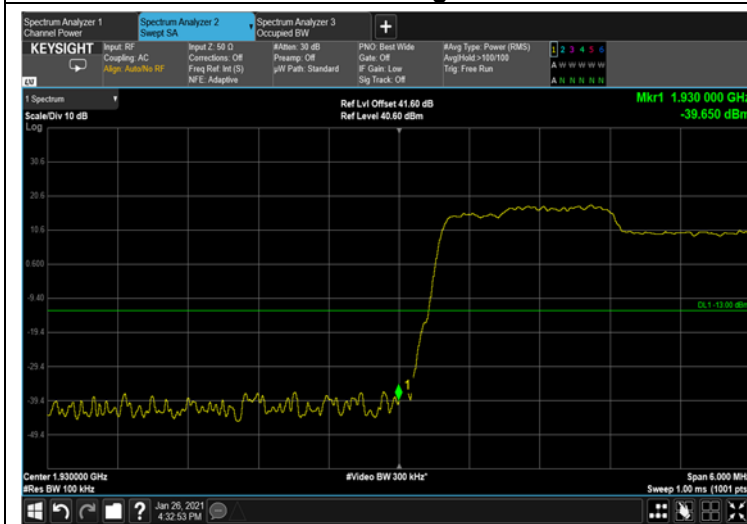


Figure 155: QPSK 15MHz B.W.; 1937.5MHz, 15kHz
Lower Edge

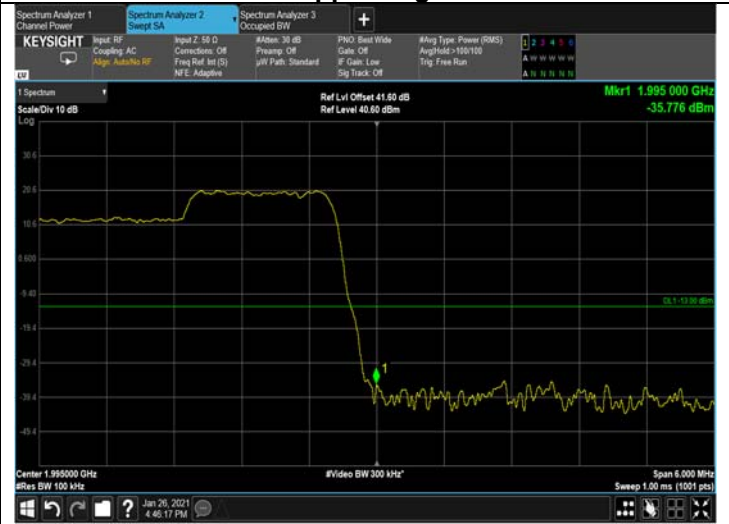


Figure 156: QPSK 15MHz B.W.; 1987.5MHz, 15kHz
Upper Edge

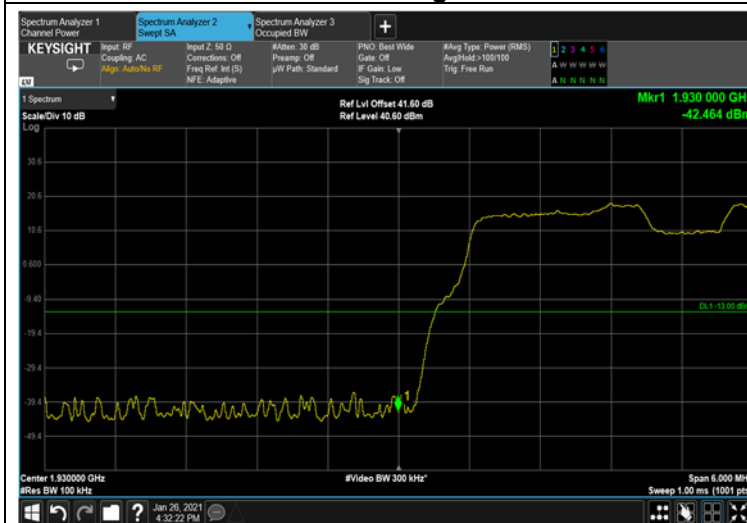


Figure 157: QPSK 15MHz B.W.; 1937.5MHz, 30kHz
Lower Edge

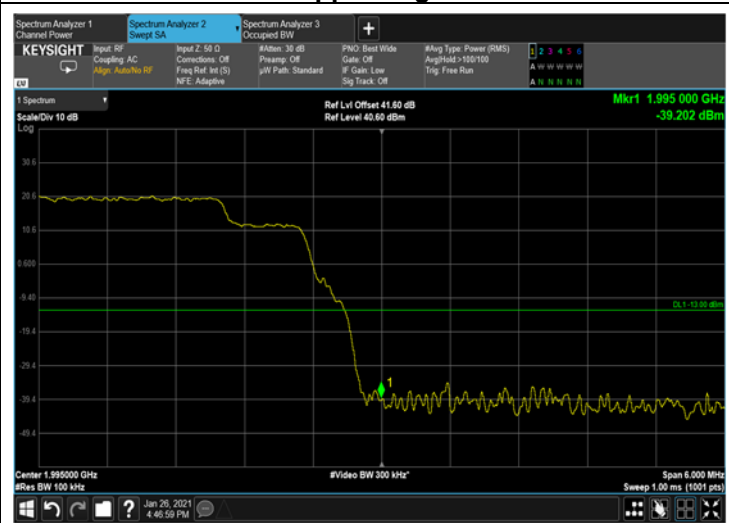


Figure 158: QPSK 15MHz B.W.; 1987.5MHz, 30kHz
Upper Edge



6.5 Test Equipment Used; Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 15 Test Equipment Used

7 Band Edge Spectrum – 3G and 4G

7.1 Test Specification

FCC Part 24, Subpart E (24.238(a))

7.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41.1 dB). resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter was employed

7.3 Test Limit

The power of any emission outside of the authorized operating frequency ranges (1930- 1995 MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + \log (P)$ dB, yielding -13dBm .

7.4 Test Results

JUDGEMENT: Passed

See additional information in Table 16 to Table 19 and Figure 159 to Figure 178.

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
WCDMA	(MHz)	(MHz)	(dBm)	(dBm)
	5	1932.5	-31.994	-13.0
		1992.5	-26.523	-13.0

Table 16 Band Edge Spectrum Results WCDMA – 3G

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
16QAM	(MHz)	(MHz)	(dBm)	(dBm)
	5	1932.5	-35.409	-13.0
		1992.5	-27.110	-13.0
	10	1935.0	-37.931	-13.0
		1990.0	-37.621	-13.0
	15	1937.5	-35.819	-13.0
		1987.5	-34.082	-13.0

Table 17 Band Edge Spectrum Results 16QAM – 4G

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
64QAM	(MHz)	(MHz)	(dBm)	(dBm)
	5	1932.5	-34.572	-13.0
		1992.5	-32.190	-13.0
	10	1935.0	-37.312	-13.0
		1990.0	-37.368	-13.0
	15	1937.5	-35.794	-13.0
		1987.5	-34.175	-13.0

Table 18 Band Edge Spectrum Results 64QAM – 4G

Modulation	Bandwidth	Band Edge Frequency	Reading	Limit
QPSK	(MHz)	(MHz)	(dBm)	(dBm)
	5	1932.5	-31.534	-13.0
		1992.5	-31.970	-13.0
	10	1935.0	-36.999	-13.0
		1990.0	-37.317	-13.0
	15	1937.5	-36.580	-13.0
		1987.5	-35.938	-13.0

Table 19 Band Edge Spectrum Results QPSK – 4G

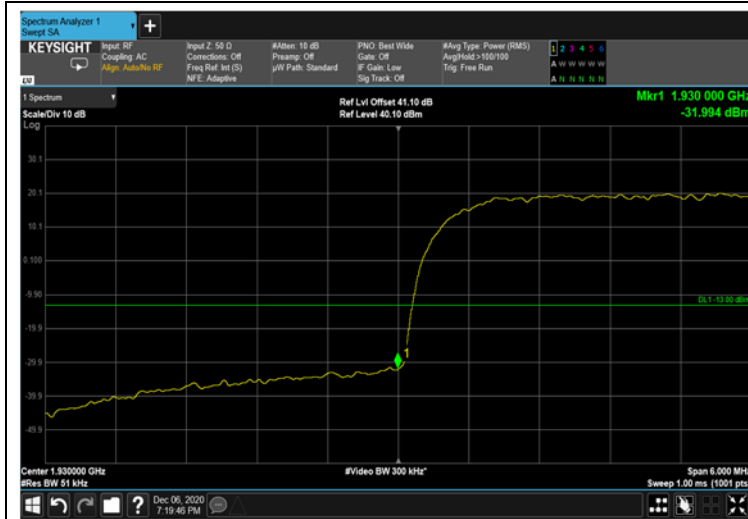


Figure 159: WCDMA 5MHz B.W.; 1932.5MHz
Lower Edge – 3G

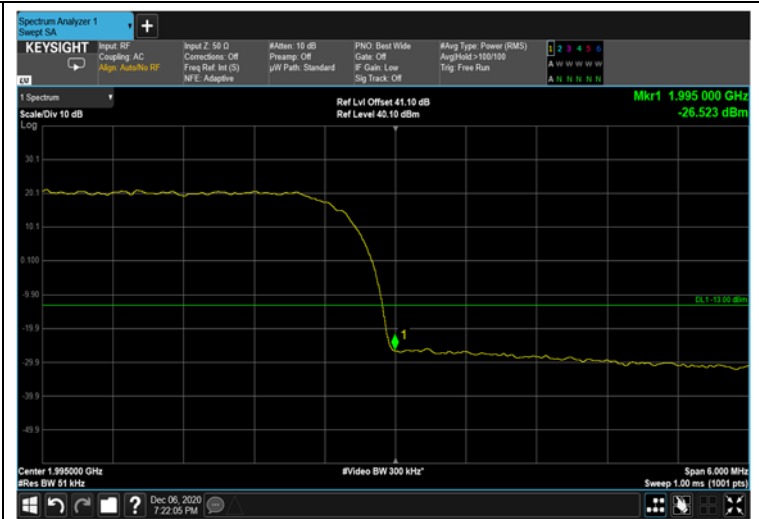


Figure 160: WCDMA 5MHz B.W.; 1992.5MHz
Upper Edge- 3G

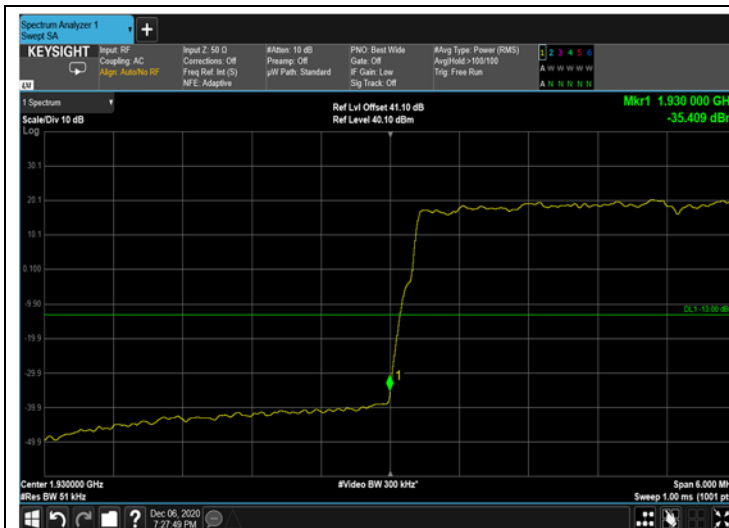


Figure 161: 16QAM 5MHz B.W.; 1932.5MHz
Lower Edge – 4G

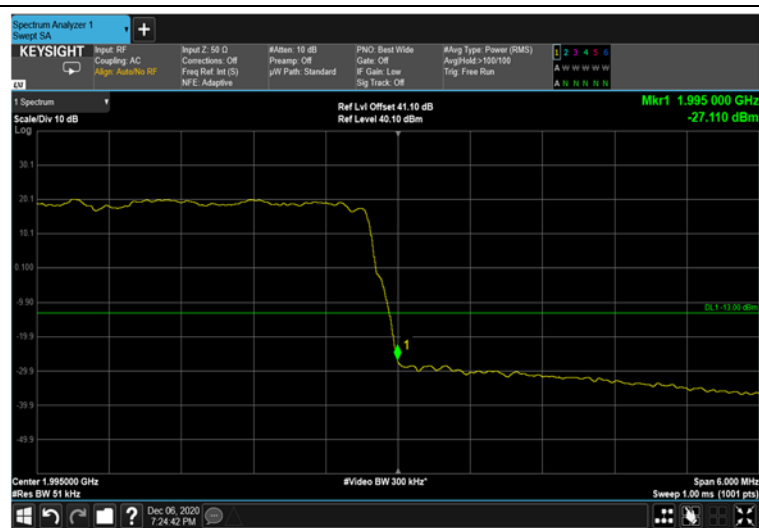


Figure 162: 16QAM 5MHz B.W.; 1987.5MHz
Upper Edge – 4G

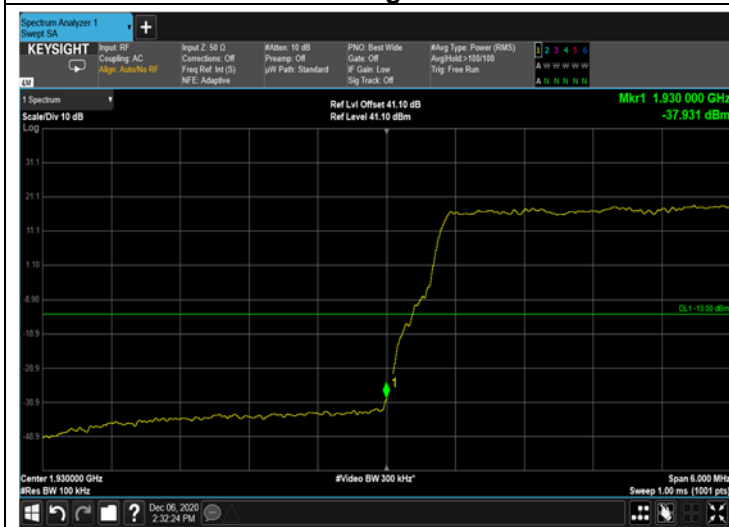


Figure 163: 16QAM 10MHz B.W.; 1935MHz
Lower Edge – 4G

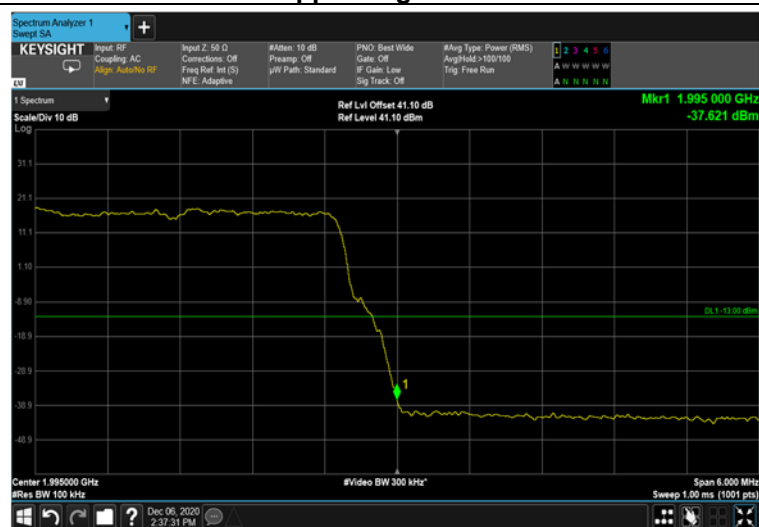


Figure 164: 16QAM 10MHz B.W.; 1990MHz
Upper Edge – 4G

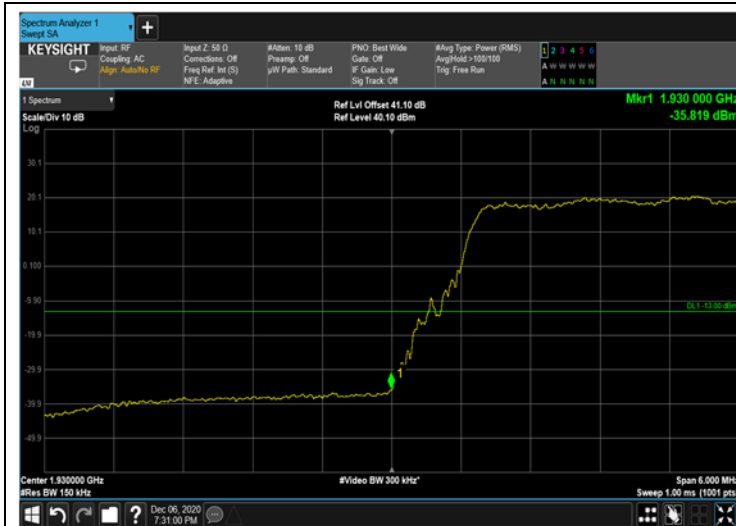


Figure 165: 16QAM 15MHz B.W.; 1937.5MHz
Lower Edge – 4G

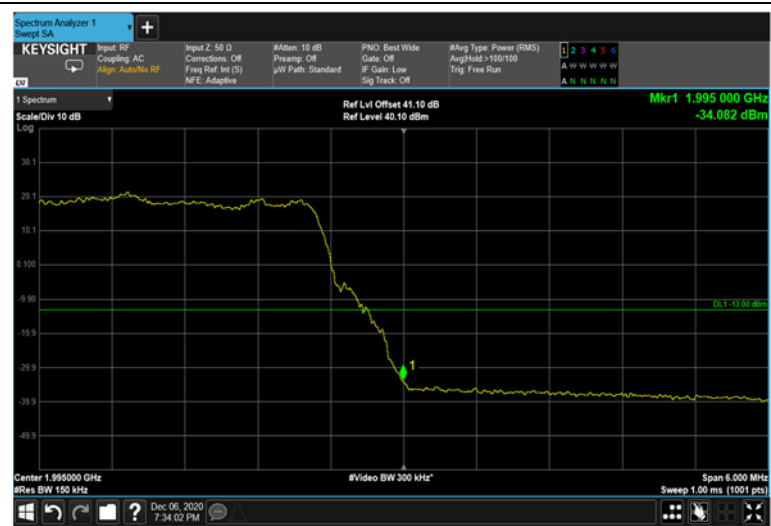


Figure 166: 16QAM 15MHz B.W.; 1987.5MHz
Upper Edge – 4G

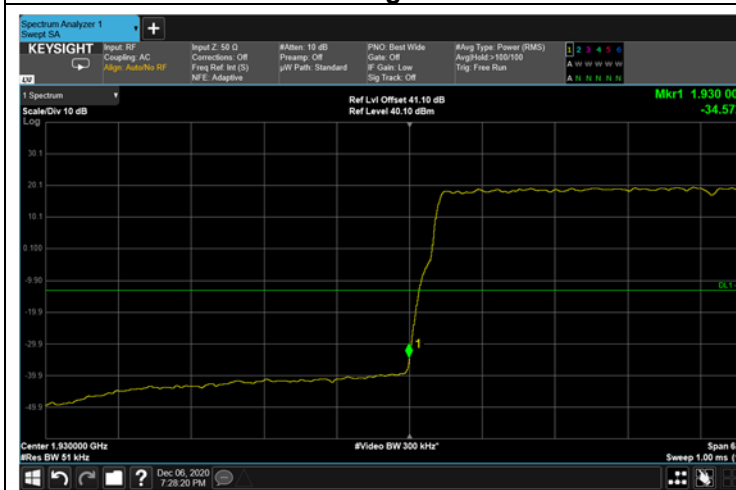


Figure 167: 64QAM 5MHz B.W.; 1932.5MHz
Lower Edge – 4G

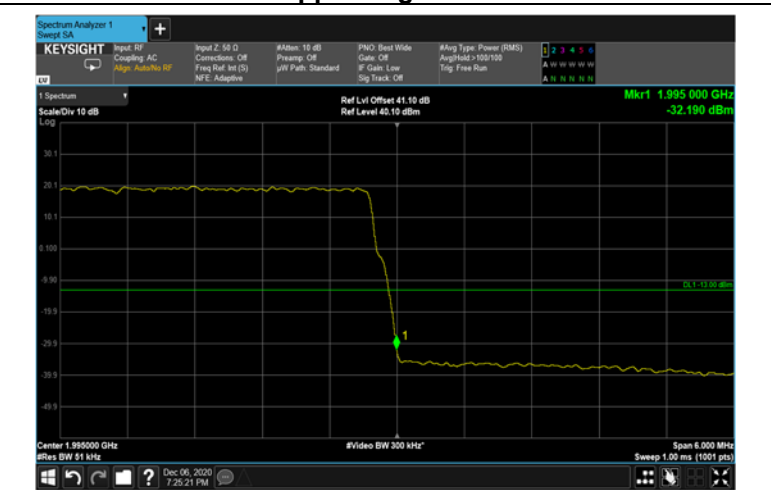


Figure 168: 64QAM 5MHz B.W.; 1987.5MHz
Upper Edge – 4G

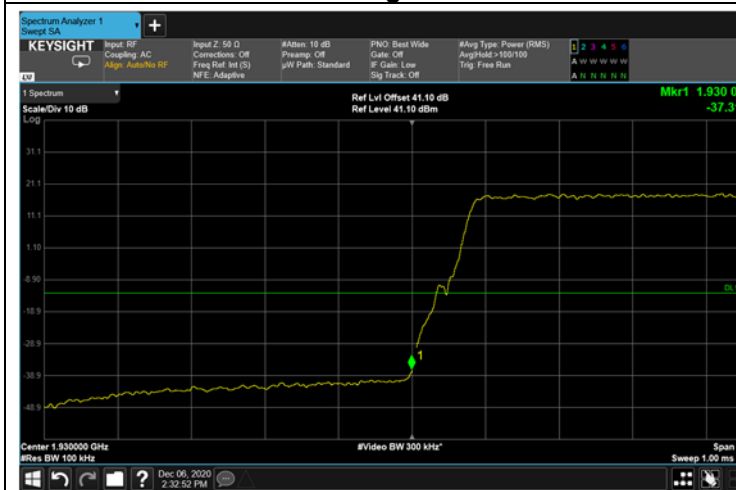


Figure 169: 64QAM 10MHz B.W.; 1935MHz
Lower Edge – 4G

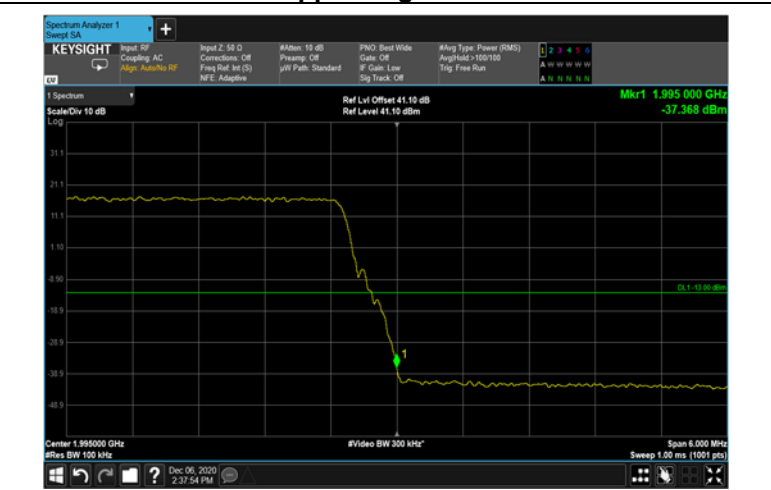


Figure 170: 64QAM 10MHz B.W.; 1990MHz
Upper Edge – 4G

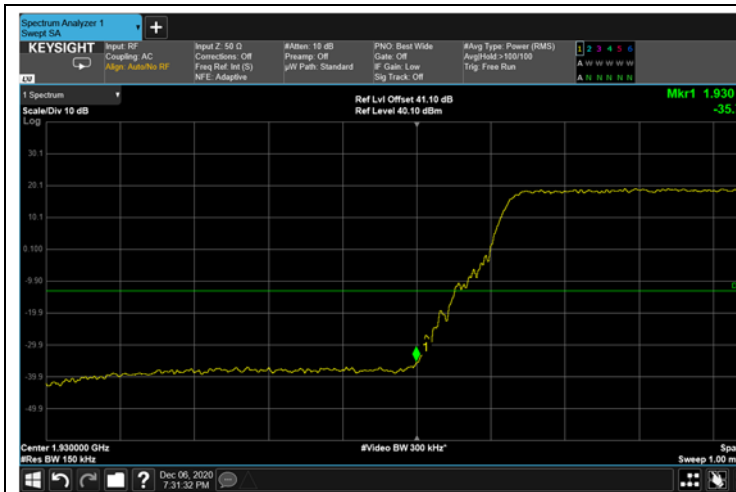


Figure 171: 64QAM 15MHz B.W.; 1937.5MHz
Lower Edge – 4G

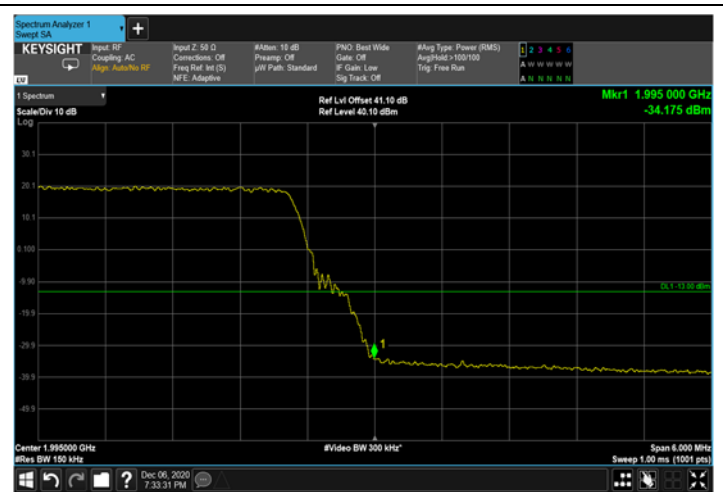


Figure 172: 64QAM 15MHz B.W.; 1987.5MHz
Upper Edge – 4G

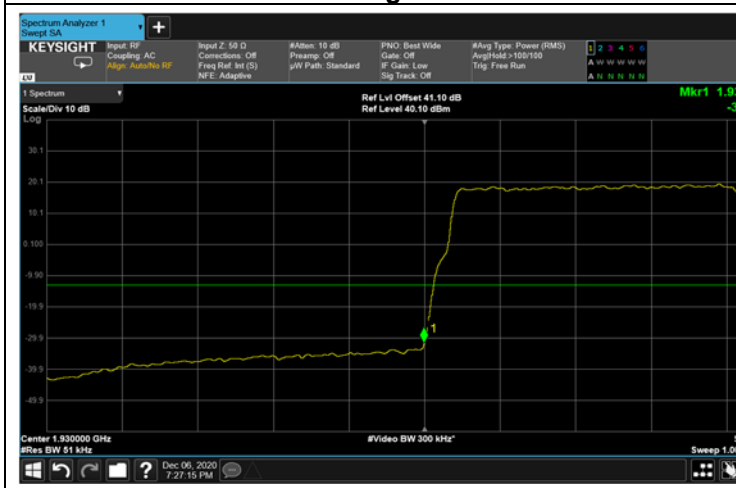


Figure 173: QPSK 5MHz B.W.; 1932.5MHz
Lower Edge – 4G

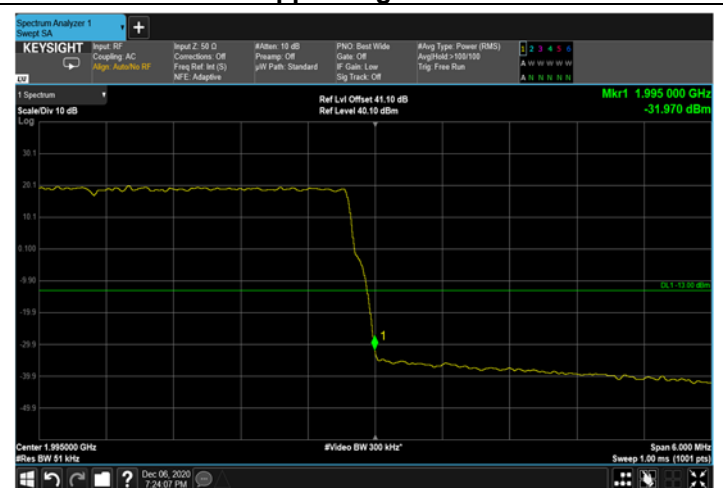


Figure 174: QPSK 5MHz B.W.; 1987.5MHz
Upper Edge – 4G

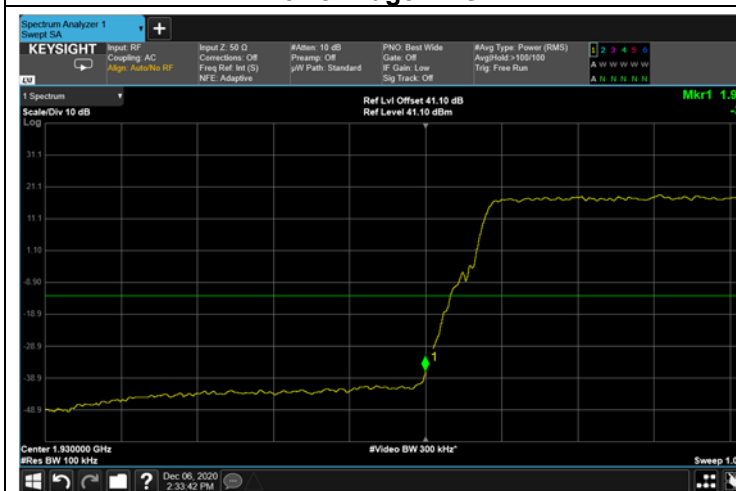


Figure 175: QPSK 10MHz B.W.; 1935MHz
Lower Edge – 4G

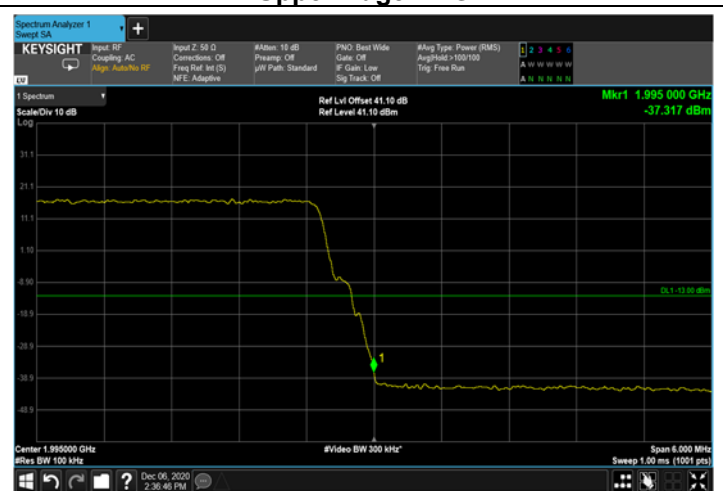
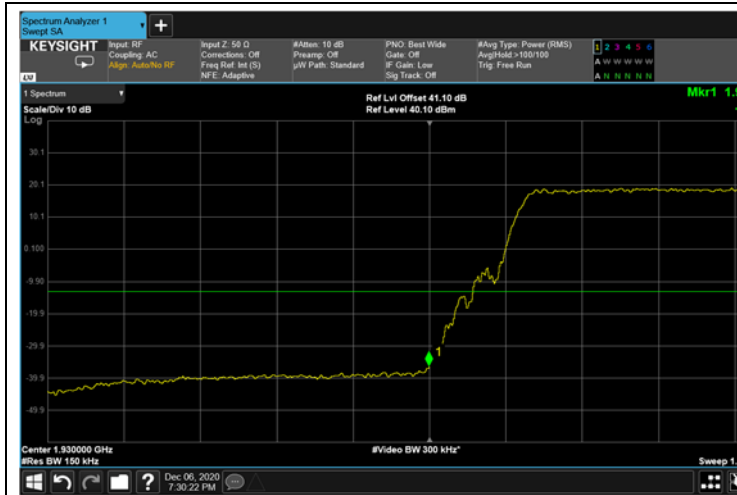
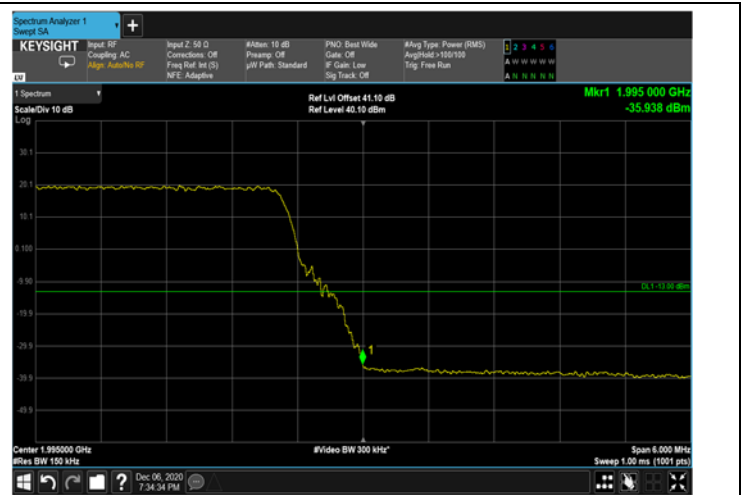


Figure 176: QPSK 10MHz B.W.; 1990MHz
Upper Edge – 4G



**Figure 177: QPSK 15MHz B.W.; 1937.5MHz
Lower Edge – 4G**



**Figure 178: QPSK 15MHz B.W.; 1987.5MHz
Upper Edge – 4G**

7.5 Test Equipment Used; Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 20 Test Equipment Used



8 Occupied Bandwidth - 5G

8.1 Test Specification

FCC Part 2, Section 1049

8.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss=41.1 dB). The spectrum analyzer was set to proper RBW

OBW function (99%) was employed for this evaluation.

Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

8.3 Test Limit

N/A

8.4 Test Results

JUDGEMENT: Passed

See additional information in Table 21 to Table 28 and Figure 179 to Figure 322.

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
16QAM	5	15	1932.5	4.5300
		30		4.0624
		15	1962.5	4.5309
		30		4.0618
		15	1992.5	4.5184
		30		4.0650
	10	15	1935.0	9.2490
		30		8.6004
		15	1962.5	9.2516
		30		8.6075
		15	1990.0	9.2529
		30		8.6003
	15	15	1937.5	14.174
		30		13.551
		15	1962.5	14.178
		30		13.553
		15	1987.5	14.177
		30		13.551

Table 21 Occupied Bandwidth 16 QAM Input

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
64QAM	5	15	1932.5	4.4927
		30		4.0006
		15	1962.5	4.4934
		30		3.9989
		15	1992.5	4.4946
		30		3.9965
	10	15	1935.0	9.3336
		30		8.6410
		15	1962.5	9.3372
		30		8.6376
		15	1990.0.	9.3361
		30		8.6393
	15	15	1937.5	14.147
		30		13.657
		15	1962.5	14.136
		30		13.651
		15	1987.5	14.150
		30		13.657

Table 22 Occupied Bandwidth 64QAM Input

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
256QAM	5	15	1932.5	4.4894
		30		4.0225
		15	1962.5	4.4911
		30		4.0218
		15	1992.5	4.4900
		30		4.0175
	10	15	1935.0	9.3140
		30		8.6270
		15	1962.5	9.3141
		30		8.6412
		15	1990.0	9.3193
		30		8.6506
	15	15	1937.5	14.133
		30		13.589
		15	1962.5	14.150
		30		13.605
		15	1987.5	14.141
		30		13.600

Table 23 Occupied Bandwidth 256QAM Input

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
QPSK	5	15	1932.5	4.5222
		30		4.1149
		15	1962.5	4.5166
		30		4.1120
		15	1992.5	4.5215
		30		4.1145
	10	15	1935.0	9.1672
		30		8.5245
		15	1962.5	9.1621
		30		8.5273
		15	1990.0	9.1635
		30		8.5157
	15	15	1937.5	14.188
		30		13.383
		15	1962.5	14.186
		30		13.400
		15	1987.5	14.187
		30		13.392

Table 24 Occupied Bandwidth QPSK Input

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
16QAM	5	15	1932.5	4.5180
		30		4.0528
		15	1962.5	4.5271
		30		4.0532
		15	1992.5	4.5219
		30		4.0617
	10	15	1935.0	9.2188
		30		8.5905
		15	1962.5	9.2395
		30		8.6007
		15	1990.0	9.2263
		30		8.5946
	15	15	1937.5	14.147
		30		13.513
		15	1962.5	14.173
		30		13.537
		15	1987.5	14.164
		30		13.531

Table 25 Occupied Bandwidth 16QAM Output

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
64QAM	5	15	1932.5	4.4887
		30		3.9929
		15	1962.5	4.4901
		30		4.0001
		15	1992.5	4.4895
		30		3.9998
	10	15	1935.0.	9.3164
		30		8.6179
		15	1962.5	9.3328
		30		8.6358
		15	1990.0	9.3278
		30		8.6382
	15	15	1937.5	14.090
		30		13.603
		15	1962.5	14.139
		30		13.640
		15	1987.5	14.136
		30		13.645

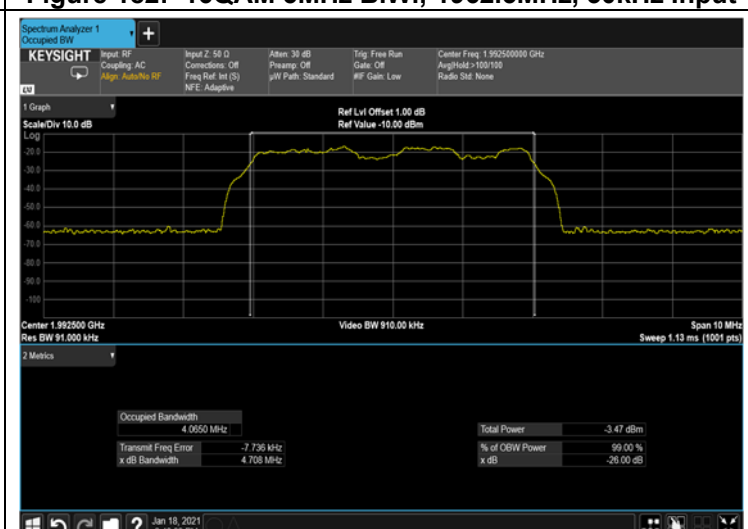
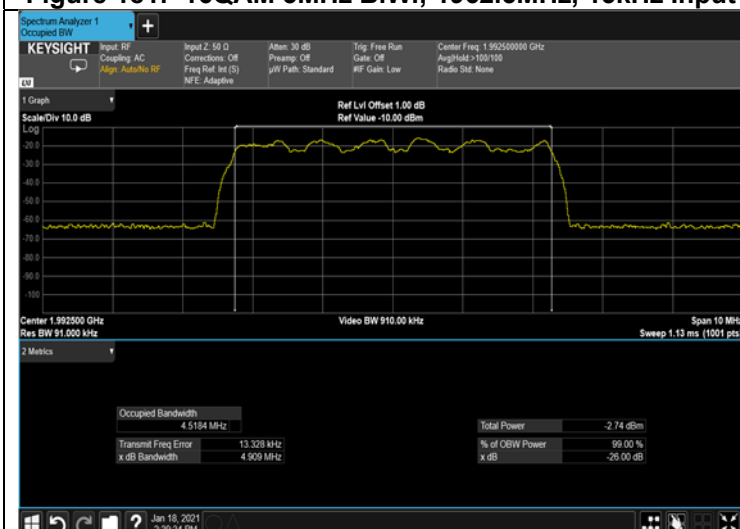
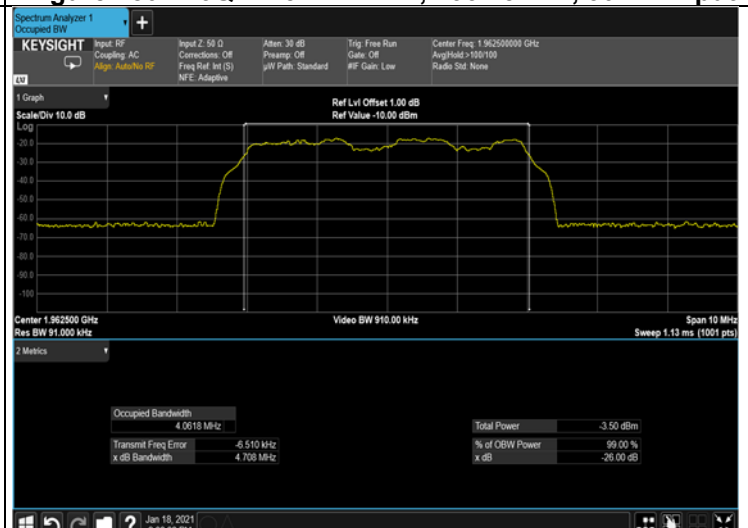
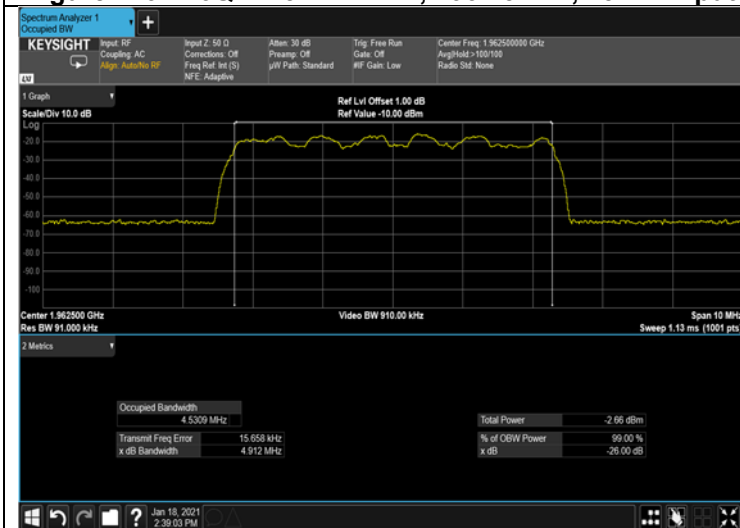
Table 26 Occupied Bandwidth 64QAM Output

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
256QAM	5	15	1932.5	4.4871
		30		4.0102
		15	1962.5	4.4900
		30		4.0226
		15	1992.5	4.4872
		30		4.0231
	10	15	1935.0	9.2842
		30		8.6112
		15	1962.5	9.3117
		30		8.6455
		15	1990.0	9.2963
		30		8.6380
	15	15	1937.5	14.105
		30		13.555
		15	1962.5	14.105
		30		13.583
		15	1987.5	14.114
		30		13.576

Table 27 Occupied Bandwidth 256QAM Output

Modulation	Bandwidth	Sub Carrier	Operation Frequency	Reading
	(MHz)	(kHz)	(MHz)	(MHz)
QPSK	5	15	1932.5	4.5120
		30		4.1075
		15	1962.5	4.5139
		30		4.1204
		15	1992.5	4.5161
		30		4.1133
	10	15	1935.0	9.1565
		30		8.5236
		15	1962.5	9.1490
		30		8.5214
		15	1990.0	9.1484
		30		8.5078
	15	15	1937.5	14.139
		30		13.374
		15	1962.5	14.183
		30		13.362
		15	1987.5	14.179
		30		13.352

Table 28 Occupied Bandwidth QPSK Output



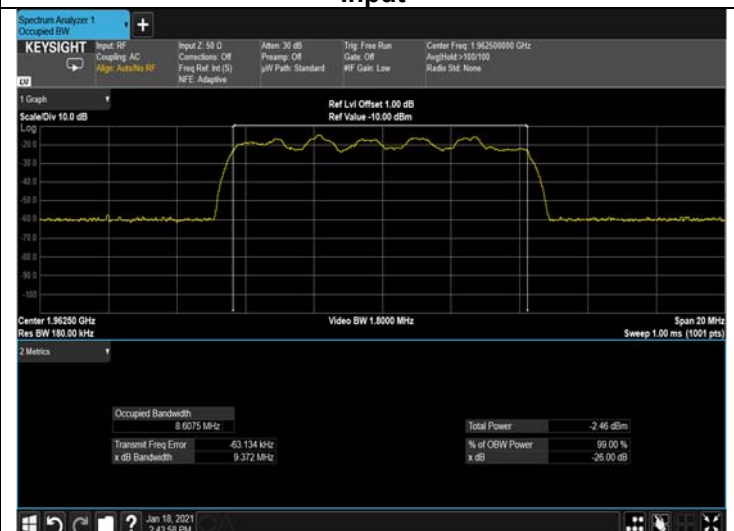
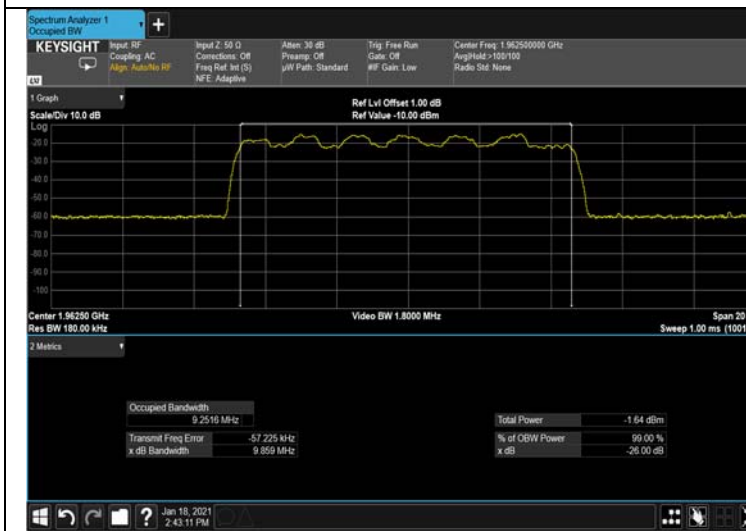




Figure 191: 16QAM 15MHz B.W.; 1937.5MHz, 15kHz Input



Figure 192: 16QAM 15MHz B.W.; 1937.5MHz, 30kHz Input

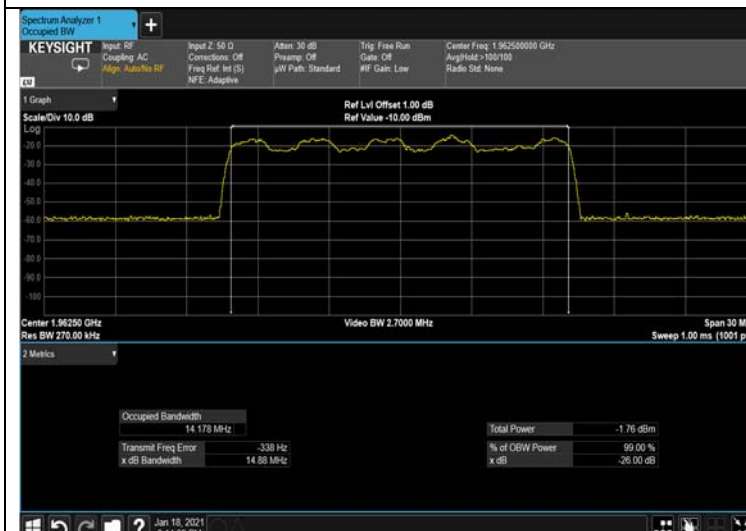


Figure 193: 16QAM 15MHz B.W.; 1962.5MHz, 15kHz Input



Figure 194: 16QAM 15MHz B.W.; 1962.5MHz, 30kHz Input

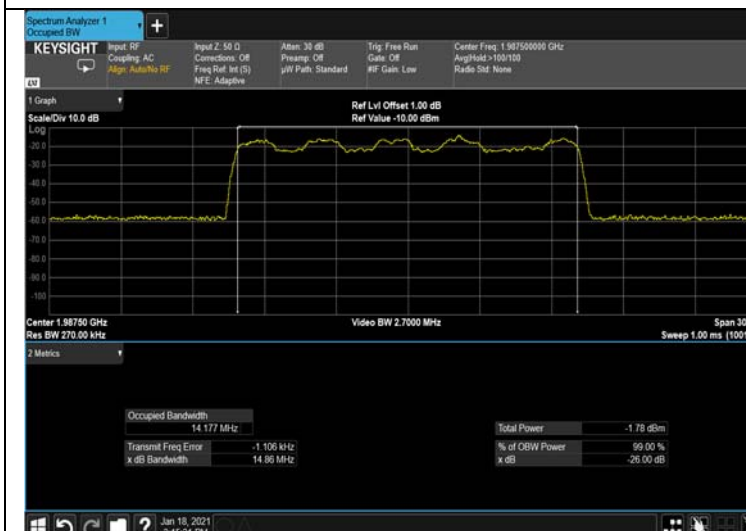
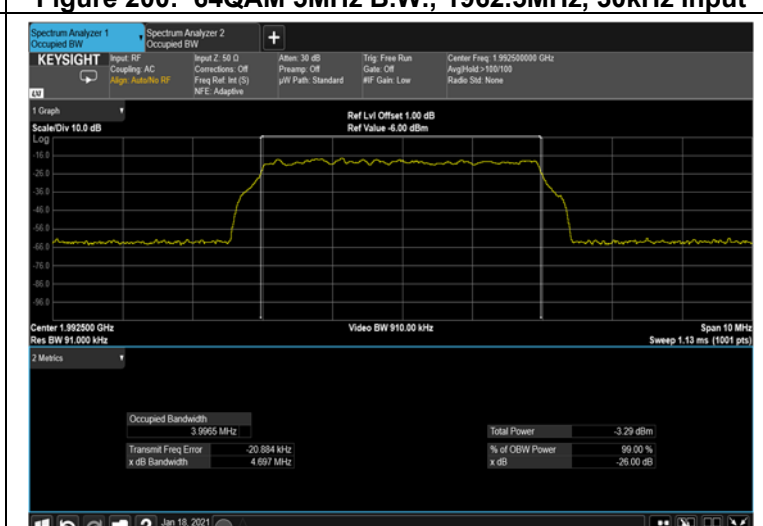
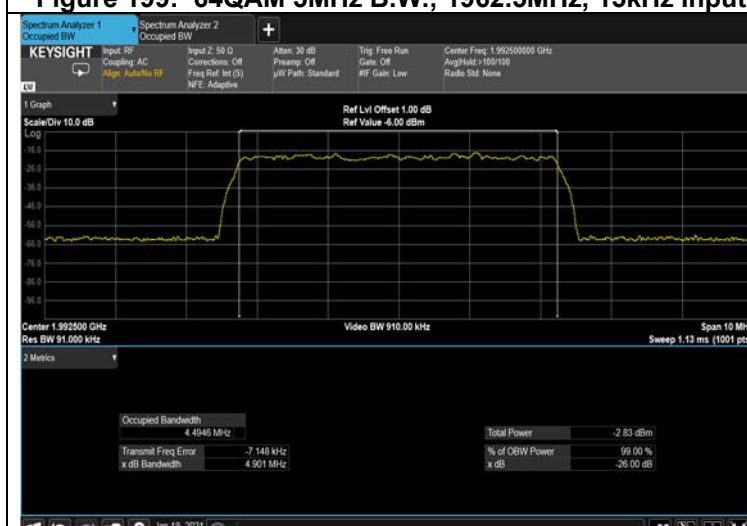
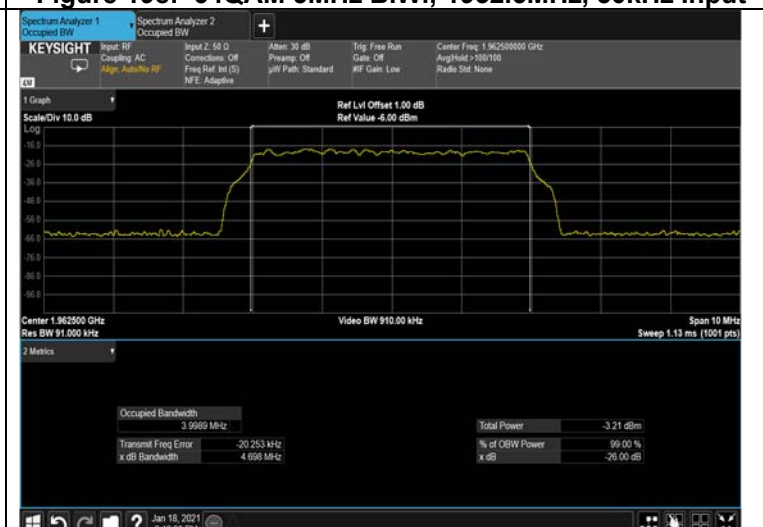
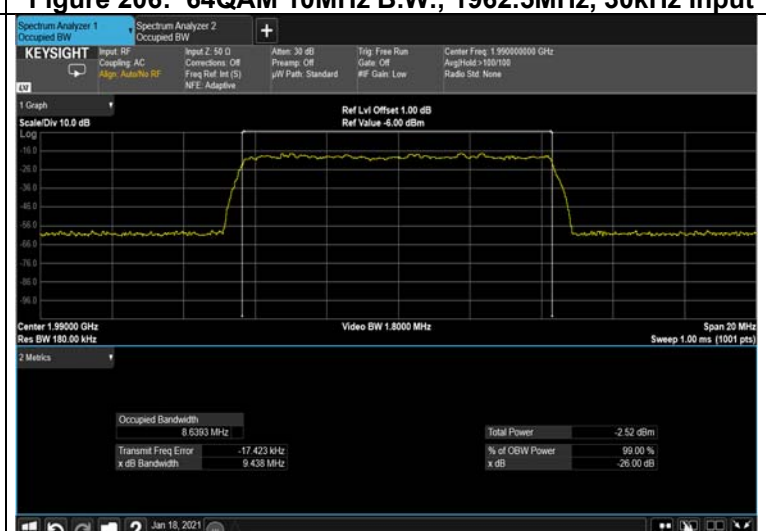
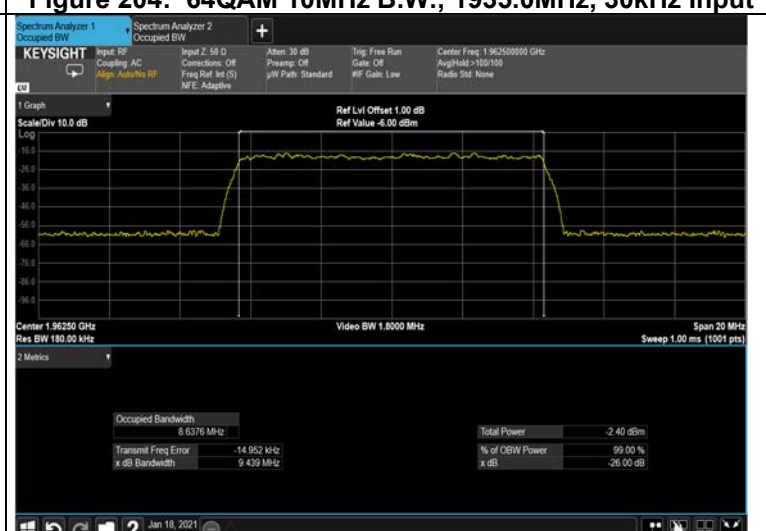
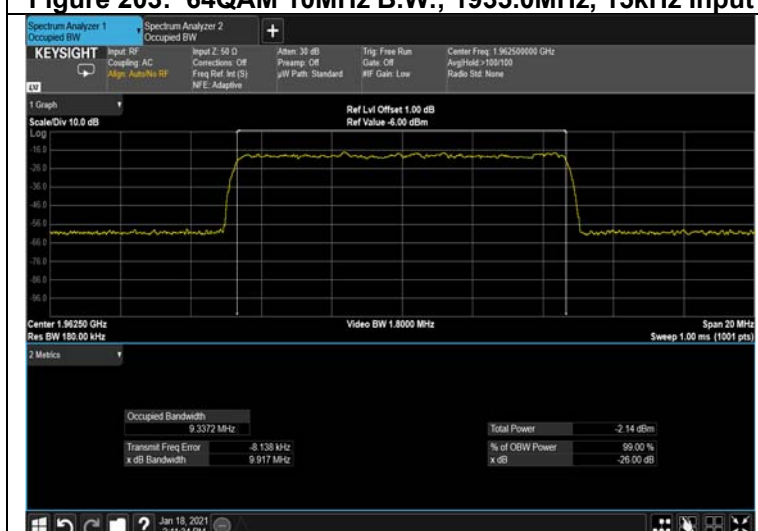
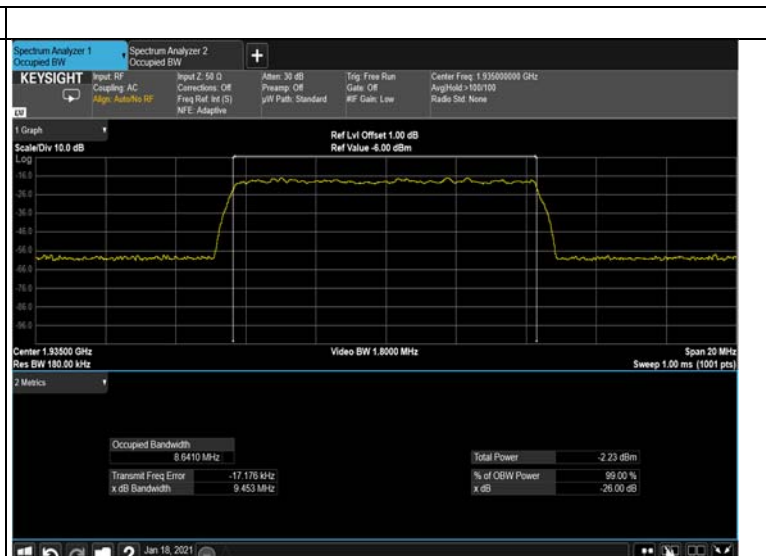
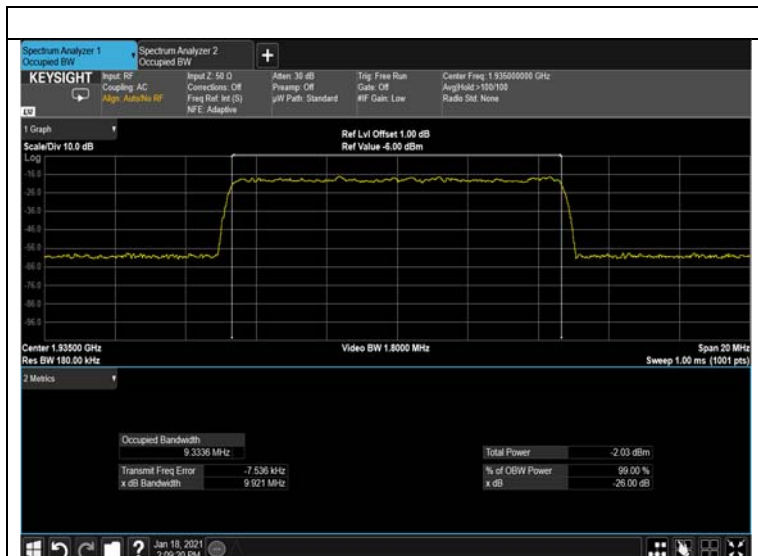


Figure 195: 16QAM 15MHz B.W.; 1987.5MHz, 15kHz Input



Figure 196: 16QAM 15MHz B.W.; 1987.5MHz, 30kHz Input





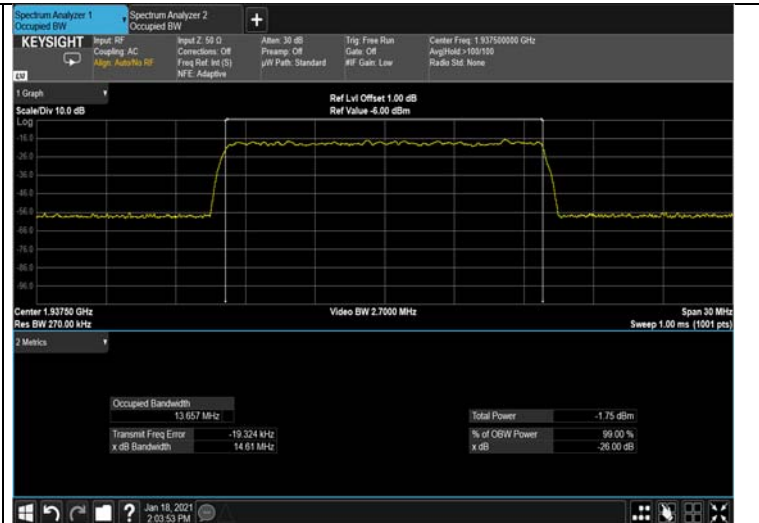
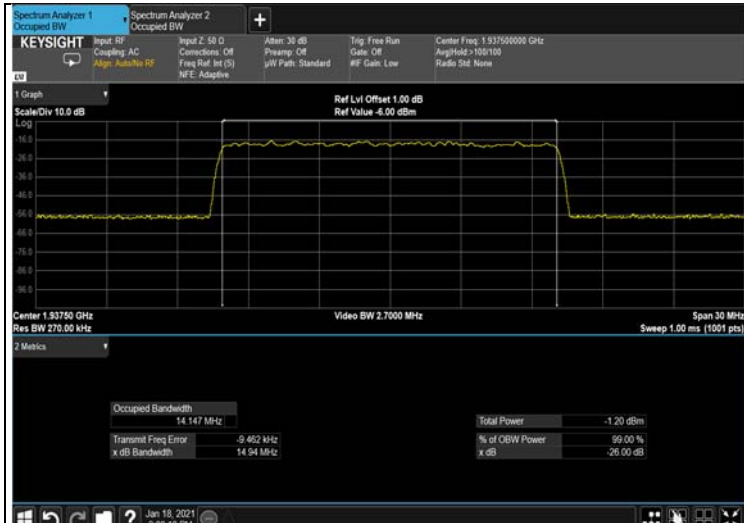


Figure 209: 64QAM 15MHz B.W.; 1937.5MHz, 15kHz Input

Figure 210: 64QAM 15MHz B.W.; 1937.5MHz, 30kHz Input



Figure 211: 64QAM 15MHz B.W.; 1962.5MHz, 15kHz Input

Figure 212: 64QAM 15MHz B.W.; 1962.5MHz, 30kHz Input



Figure 213: 64QAM 15MHz B.W.; 1987.5MHz, 30kHz Input

Figure 214: 64QAM 15MHz B.W.; 1987.5MHz, 60kHz Input



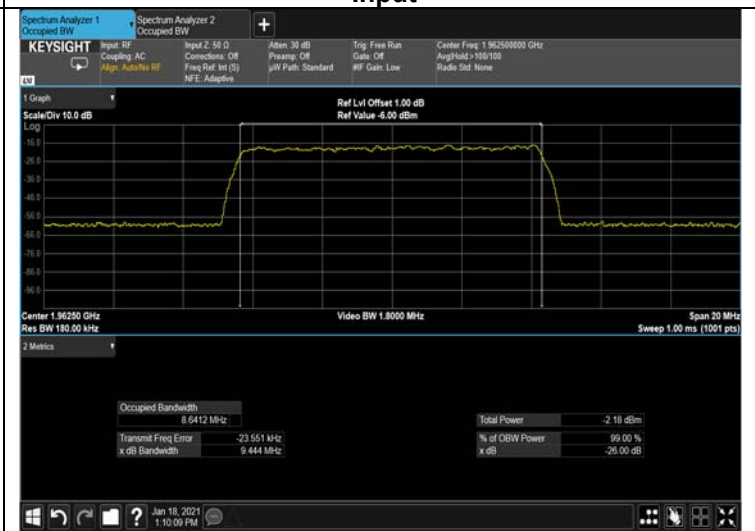
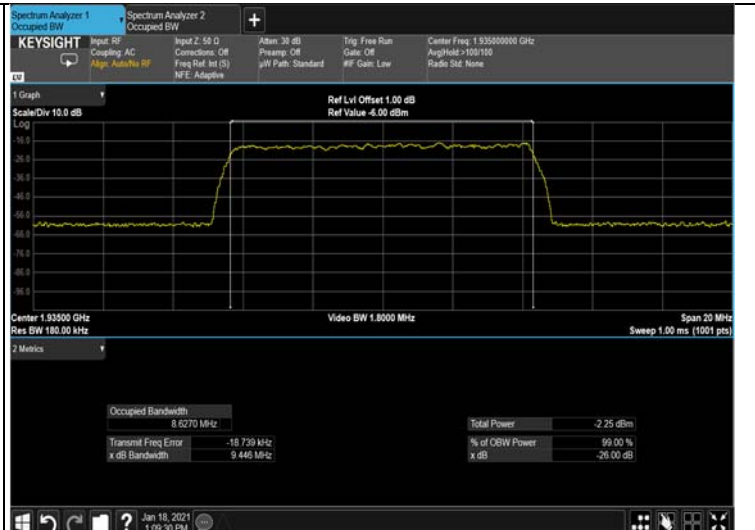




Figure 227: 256QAM 15MHz B.W.; 1937.5MHz, 15kHz Input



Figure 228: 256QAM 15MHz B.W.; 1937.5MHz, 30kHz Input



Figure 229: 256QAM 15MHz B.W.; 1962.5MHz, 15kHz Input



Figure 230: 256QAM 15MHz B.W.; 1962.5MHz, 30kHz Input



Figure 231: 256QAM 15MHz B.W.; 1987.5MHz, 15kHz Input

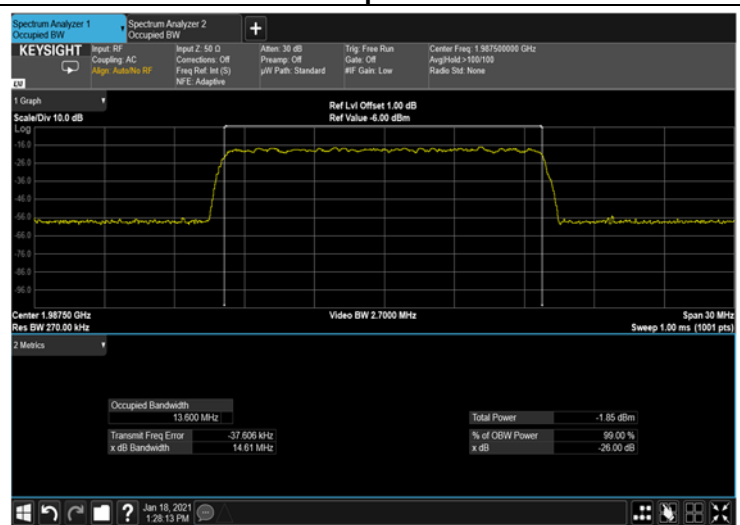


Figure 232: 256QAM 15MHz B.W.; 1987.5MHz, 30kHz Input

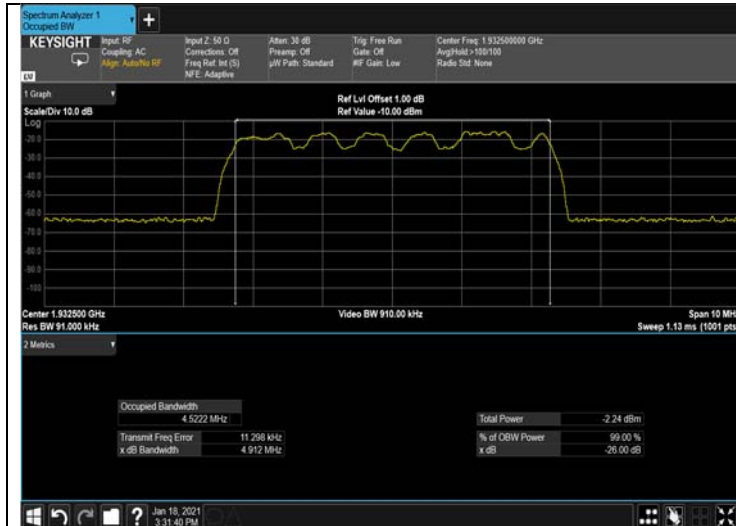


Figure 233: QPSK 5MHz B.W.; 1932.5MHz, 15kHz Input

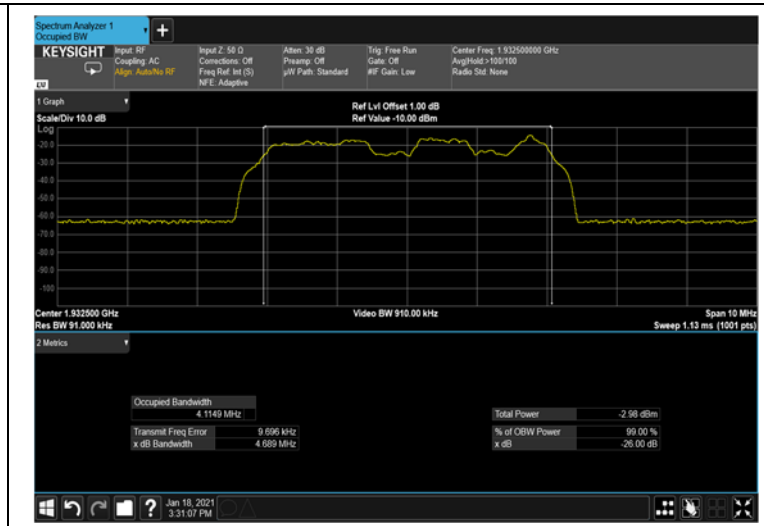


Figure 234: QPSK 5MHz B.W.; 1932.5MHz, 30kHz Input

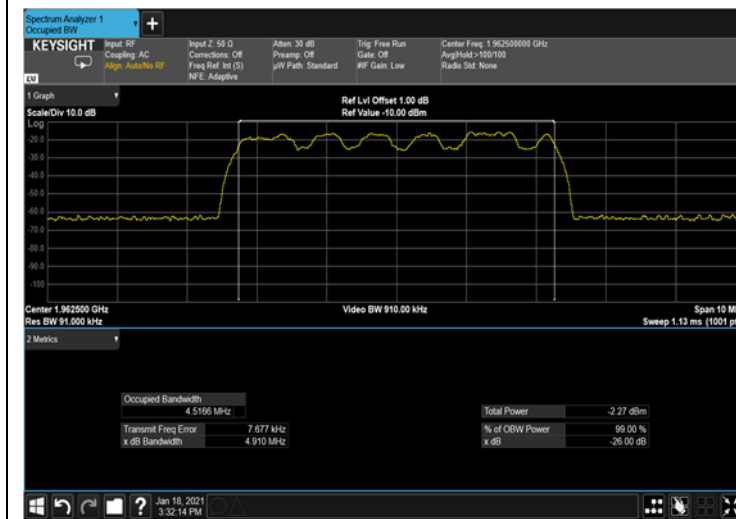


Figure 235: QPSK 5MHz B.W.; 1962.5MHz, 15kHz Input



Figure 236: QPSK 5MHz B.W.; 1962.5MHz, 30kHz Input



Figure 237: QPSK 5MHz B.W.; 1992.5MHz, 15kHz Input



Figure 238: QPSK 5MHz B.W.; 1992.5MHz, 30kHz Input

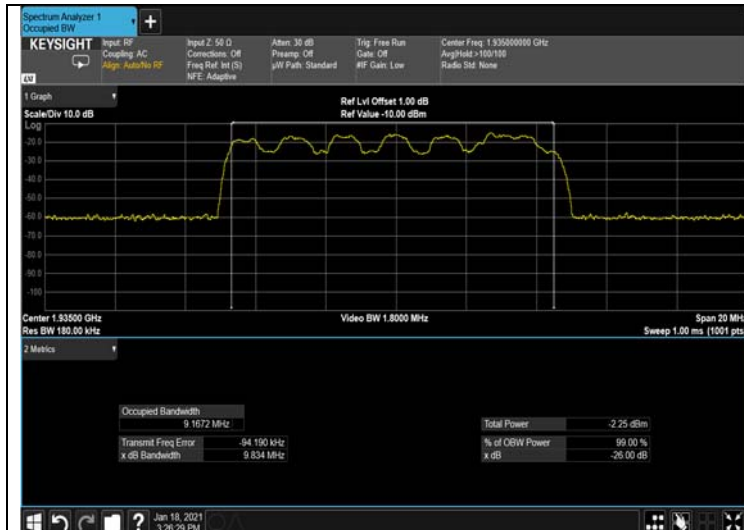


Figure 239: QPSK 10MHz B.W.; 1937.5MHz, 15kHz Input



Figure 240: QPSK 10MHz B.W.; 1937.5MHz, 30kHz Input

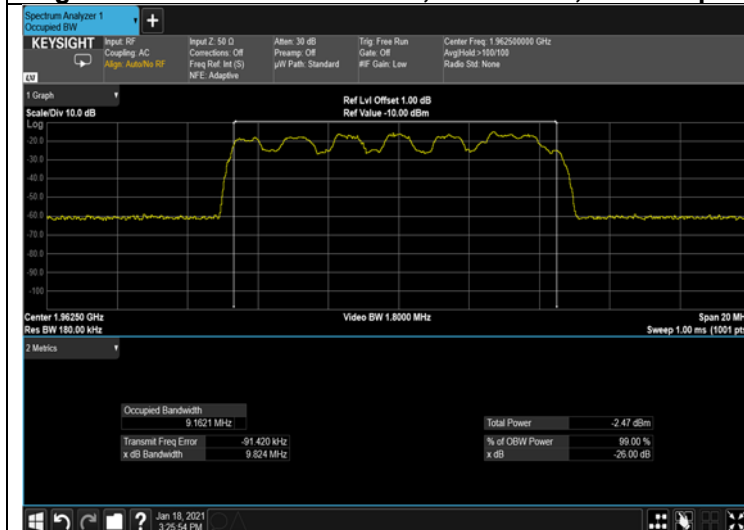


Figure 241: QPSK 10MHz B.W.; 1962.5MHz, 15kHz Input

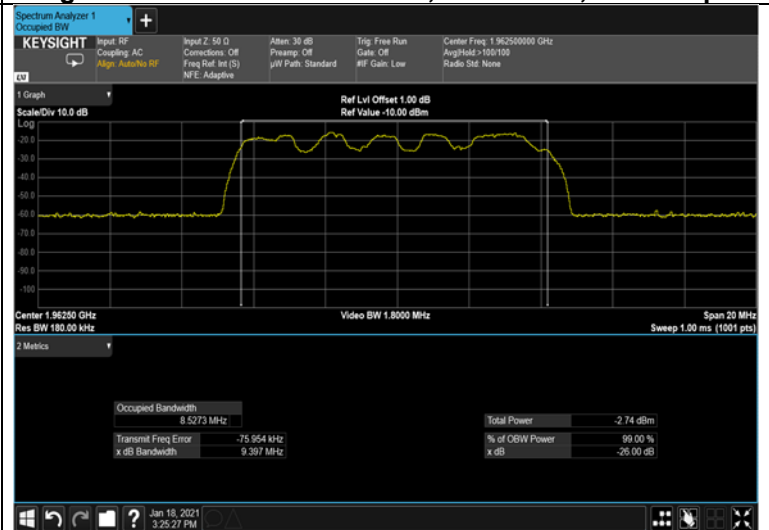


Figure 242: QPSK 10MHz B.W.; 1962.5MHz, 30kHz Input

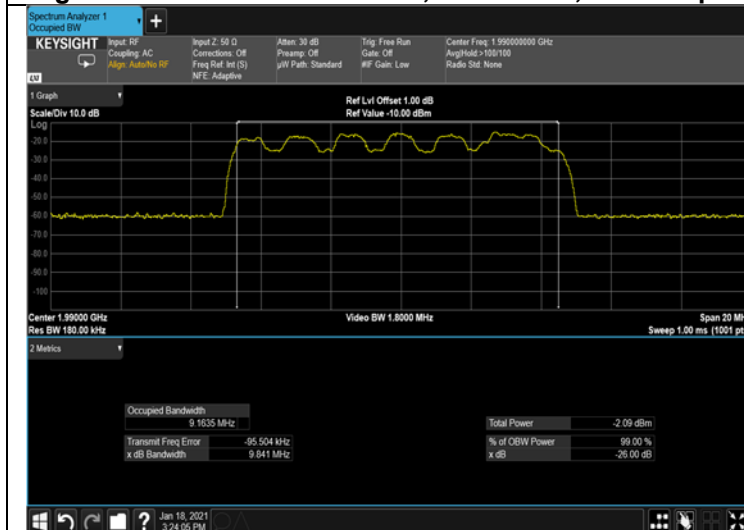


Figure 243: QPSK 10MHz B.W.; 1990.0MHz, 15kHz Input

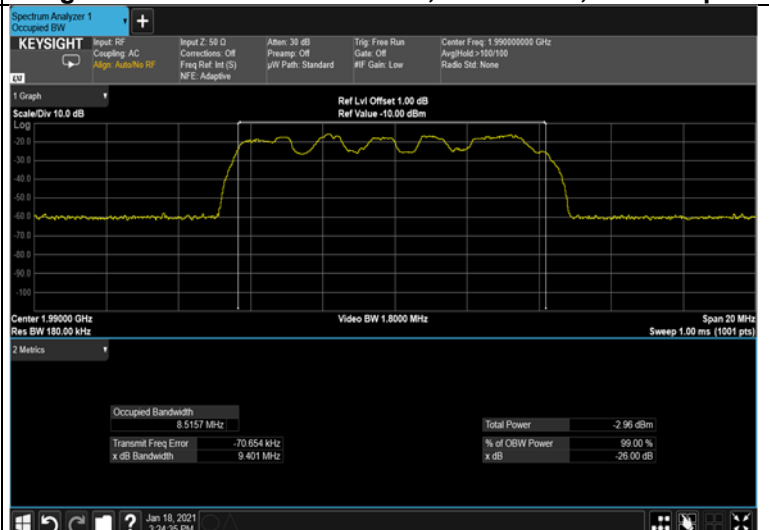


Figure 244: QPSK 10MHz B.W.; 1990.0MHz, 30kHz Input

