

6 Peak to Average Power Ratio

6.1 Test Specification

FCC Part 27.50(a)(1)(B)

6.2 Test Procedure

(Temperature (22°C)/ Humidity (40%RH))

The method used is detailed in FCC KDB 971168 D03 v01

Measurements was using CCDF function for each modulation.

6.3 Test Limit

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

6.4 Test Results

JUDGEMENT: Passed

For additional information see Table 11 to Table 14 and Figure 226 to Figure 356.

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit	Margin
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
16QAM	5	15	730.5	8.56	13.0	-4.4
			743.0	8.64		-4.4
			750.5	8.67		-4.3
		30	730.5	8.65		-4.4
			743.0	8.58		-4.4
			750.5	8.55		-4.5
		10	733.0	8.65		-4.4
			742.99	8.64		-4.4
			753.0	8.63		-4.4
			733.0	8.71		-4.3
			743.0	8.65		-4.4
			753.0	8.57		-4.4
			733.0	8.61		-4.4
			743.0	8.55		-4.5
			753.0	8.52		-4.5
	15	15	735.5	8.97		-4.0
			743.0	9.02		-4.0
			750.5	9.02		-4.0
		30	735.5	8.76		-4.2
			743.0	8.65		-4.4
			750.5	8.59		-4.4
		60	735.5	8.59		-4.4
			743.0	8.39		-4.6
			750.5	8.32		-4.7
		20	738.0	8.60		-4.4
			743.0	8.64		-4.4
			748.0	8.62		-4.4
			738.0	8.34		-4.7
			743.0	8.39		-4.6
			748.0	8.41		-4.6
			738.0	8.74		-4.3
			743.0	8.73		-4.3
			748.0	8.59		-4.4

Table 11 Test Results Peak to Average Power Ratio 16 QAM

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit	Margin
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
64QAM	5	15	730.5	9.12	13.0	-3.9
			743.0	9.04		-4.0
			755.5	8.97		-4.0
		30	730.5	8.61		-4.4
			743.0	8.84		-4.2
			755.5	8.91		-4.1
		10	733.0	9.18		-3.8
			743.0	8.94		-4.1
			753.0	9.14		-3.9
		30	733.0	9.03		-4.0
			743.0	8.94		-4.1
			753.0	8.99		-4.0
		60	733.0	8.64		-4.4
			743.0	8.85		-4.2
			753.0	8.95		-4.1
	15	15	735.5	9.00		-4.0
			743.0	8.85		-4.2
			750.5	8.79		-4.2
		30	735.5	8.92		-4.1
			743.0	8.89		-4.1
			750.5	8.95		-4.1
		60	735.5	8.93		-4.1
			743.0	8.90		-4.1
			750.5	8.90		-4.1
	20	15	738.0	8.99		-4.0
			743.0	9.11		-3.9
			748.0	9.02		-4.0
		30	738.0	9.09		-3.9
			743.0	9.07		-3.9
			748.0	8.98		-4.0
		60	738.0	9.06		-3.9
			743.0	8.95		-4.1
			748.0	9.00		-4.0

Table 12 Test Results Peak to Average Power Ratio 64 QAM

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit	Margin
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
256QAM	5	15	730.5	8.53	13.0	-4.5
			743.0	8.57		-4.4
			755.5	8.66		-4.3
		30	730.5	8.74		-4.3
			743.0	8.77		-4.2
			755.5	8.72		-4.3
		10	15	733.0		-4.2
				743.0		-4.2
				753.0		-4.1
			30	733.0		-4.3
				743.0		-4.3
				753.0		-4.4
			60	733.0		-4.4
				743.0		-4.2
				753.0		-4.3
	15	15	735.5	8.87		-4.1
			743.0	8.75		-4.3
			750.5	8.67		-4.3
		30	735.5	8.83		-4.2
			743.0	9.03		-4.0
			750.5	8.99		-4.0
		60	735.5	8.79		-4.2
			743.0	8.90		-4.1
			750.5	9.00		-4.0
	20	15	738.0	9.08		-3.9
			743.0	9.03		-4.0
			748.0	9.04		-4.0
		30	738.0	8.76		-4.2
			743.0	8.78		-4.2
			748.0	8.77		-4.2
		60	738.0	8.84		-4.2
			743.0	8.70		-4.3
			748.0	8.64		-4.4

Table 13 Test Results Peak to Average Power Ratio 256 QAM

Modulation	Bandwidth	Sub Carrier	Operation Frequency	0.1% PAPR	Limit	Margin
	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
QPSK	5	15	733.0	9.36	13.0	-3.6
			743.0	9.76		-3.2
			753.0	9.74		-3.3
		30	733.0	9.73		-3.3
			743.0	9.92		-3.1
			733.0	9.97		-3.0
		10	733.0	9.51		-3.5
			743.0	9.50		-3.5
			753.0	9.48		-3.5
		30	733.0	9.78		-3.2
			743.0	9.90		-3.1
			753.0	9.48		-3.5
		60	733.0	9.81		-3.2
			743.0	9.95		-3.1
			753.0	10.00		-3.0
	15	15	735.5	9.17		-3.8
			743.0	9.16		-3.8
			750.5	9.12		-3.9
		30	735.5	9.46		-3.5
			743.0	9.56		-3.4
			750.5	9.72		-3.3
		60	735.5	9.59		-3.4
			743.0	9.63		-3.4
			750.5	9.65		-3.4
	20	15	738.0	9.05		-4.0
			743.0	9.01		-4.0
			748.0	9.01		-4.0
		30	738.0	9.51		-3.5
			743.0	9.51		-3.5
			748.0	9.49		-3.5
		60	738.0	9.91		-3.1
			743.0	9.92		-3.1
			748.0	10.12		-2.9

Table 14 Test Results Peak to Average Power Ratio QPSK

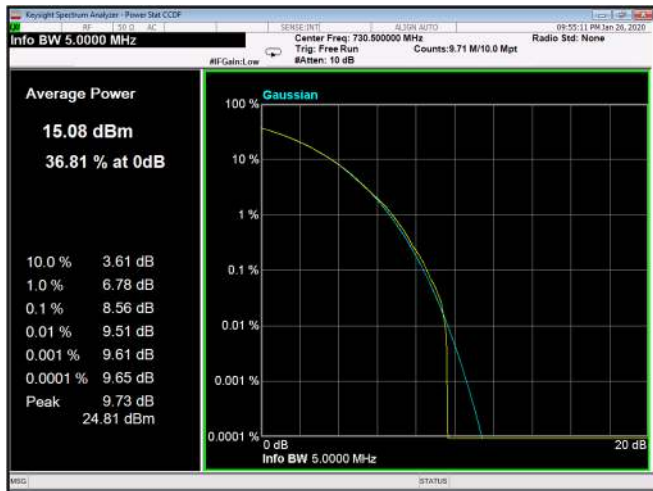


Figure 226: 16QAM 5MHz B.W.; 730.5MHz, 15kHz

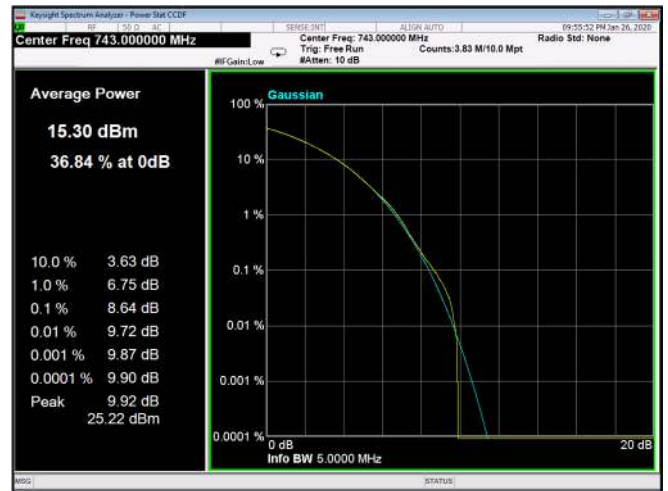


Figure 227: 16QAM 5MHz B.W.; 743.0MHz, 15kHz

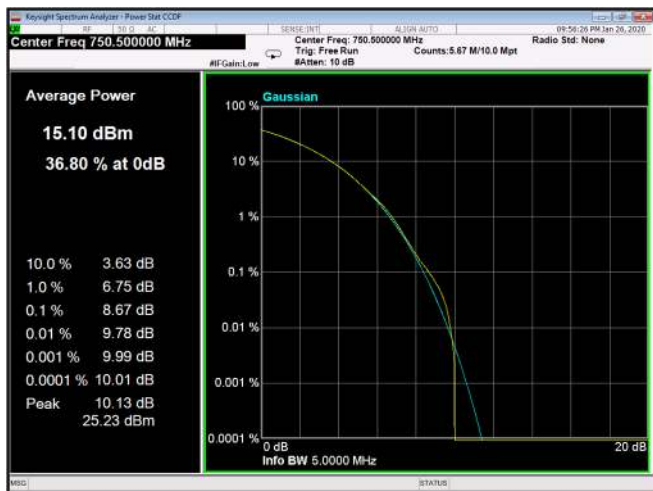


Figure 228: 16QAM 5MHz B.W.; 750.5MHz, 15kHz

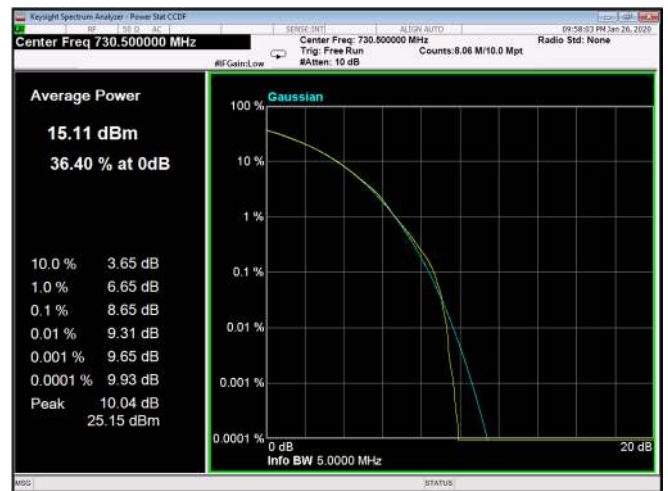


Figure 229: 16QAM 5MHz B.W.; 730.5MHz, 30kHz

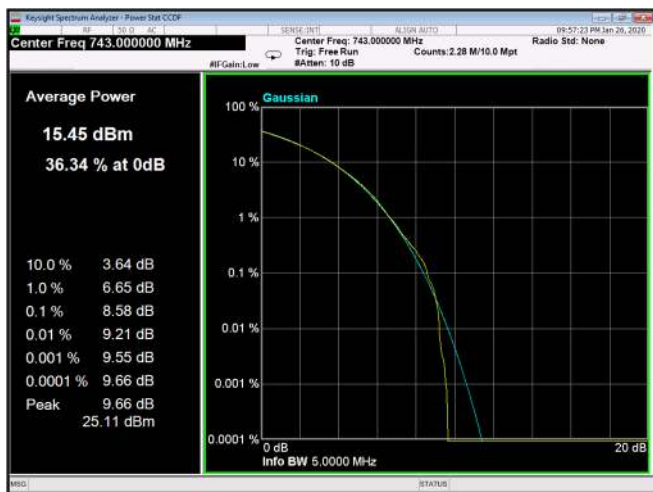


Figure 230: 16QAM 5MHz B.W.; 743.0MHz, 30kHz

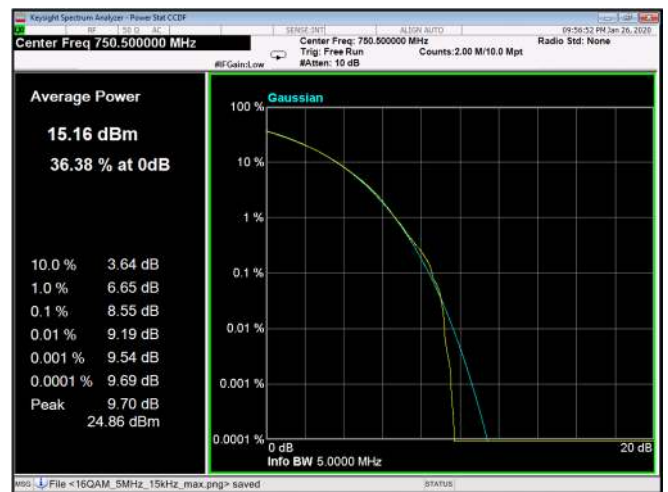


Figure 231: 16QAM 5MHz B.W.; 750.5MHz, 30kHz



Figure 232: 16QAM 10MHz B.W.; 733.0MHz, 15kHz

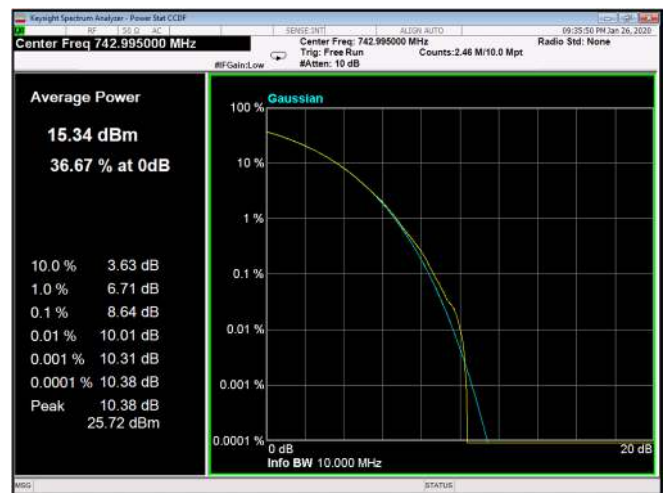


Figure 233: 16QAM 10MHz B.W.; 742.99 (743.0)MHz, 15kHz



Figure 234: 16QAM 10MHz B.W.; 753.0MHz, 15kHz

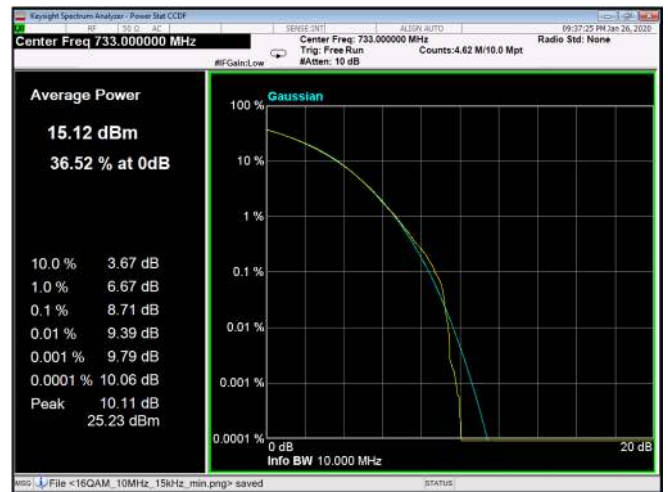


Figure 235: 16QAM 10MHz B.W.; 733.0MHz, 30kHz



Figure 236: 16QAM 10MHz B.W.; 743.0MHz, 30kHz



Figure 237: 16QAM 10MHz B.W.; 753.0MHz, 30kHz



Figure 238: 16QAM 10MHz B.W.; 735.5MHz, 60kHz

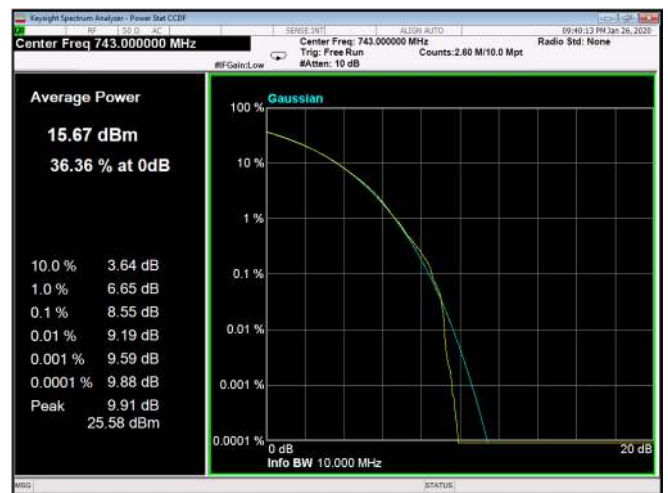


Figure 239: 16QAM 10MHz B.W.; 743.0MHz, 60kHz



Figure 240: 16QAM 10MHz B.W.; 753.5MHz, 60kHz

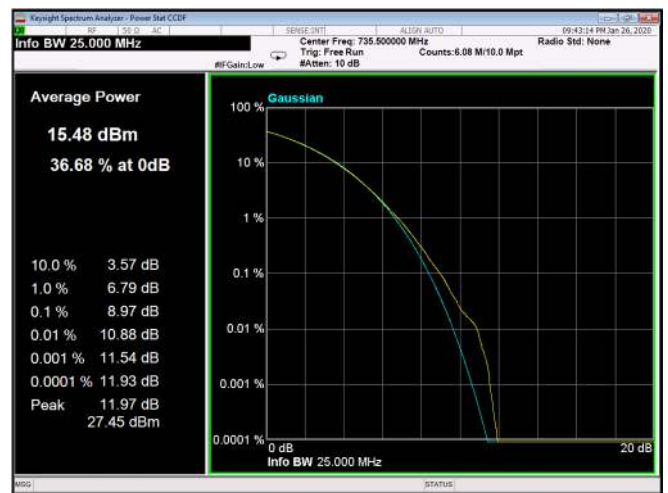


Figure 241: 16QAM 15MHz B.W.; 735.5MHz, 15kHz

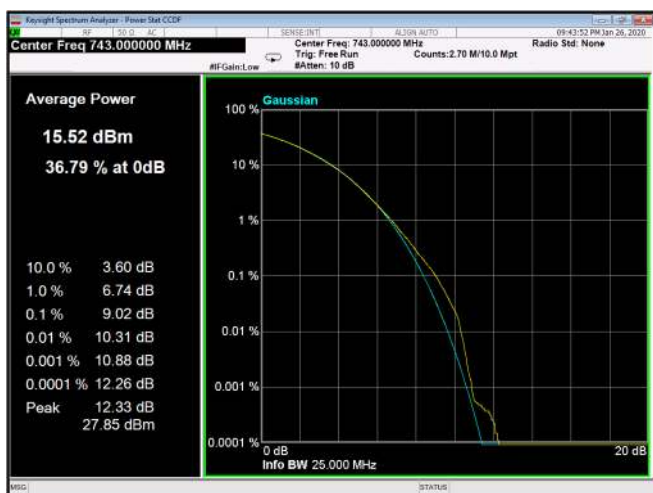


Figure 242: 16QAM 15MHz B.W.; 743.0MHz, 15kHz

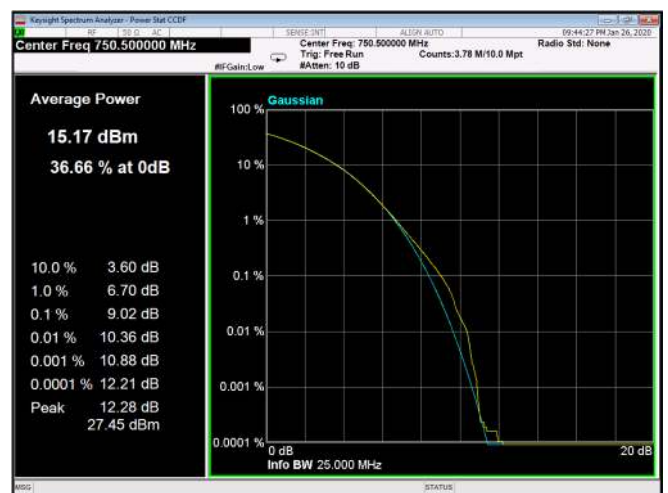


Figure 243: 16QAM 15MHz B.W.; 750.5MHz, 15kHz



Figure 244: 16QAM 15MHz B.W.; 735.5MHz, 30kHz

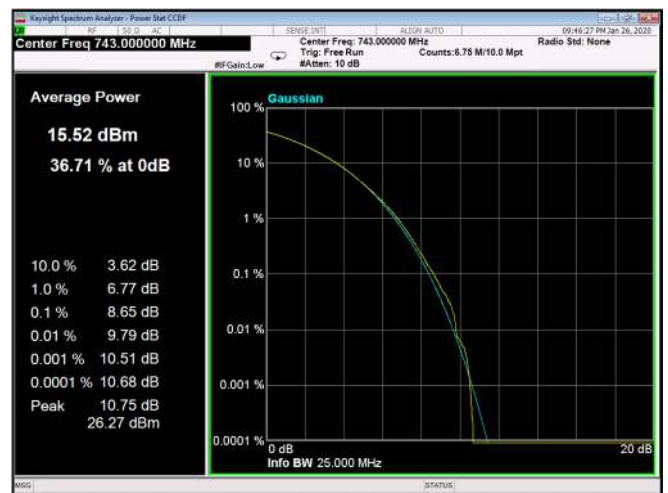


Figure 245: 16QAM 5MHz B.W.; 743.0MHz, 15kHz



Figure 246: 16QAM 15MHz B.W.; 750.0MHz, 30kHz

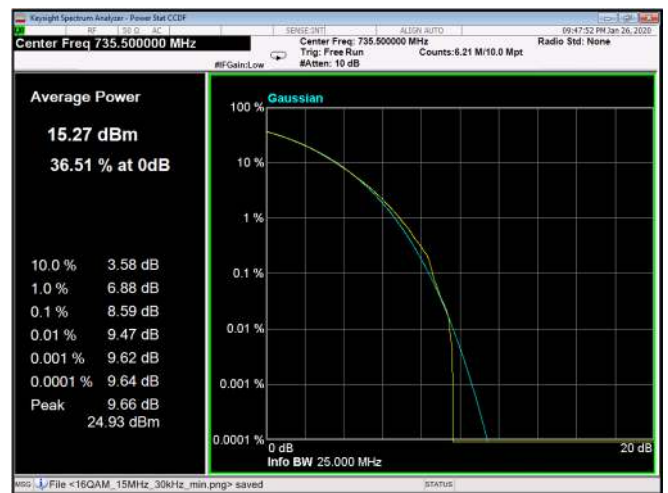


Figure 247: 16QAM 15MHz B.W.; 735.5MHz, 60kHz

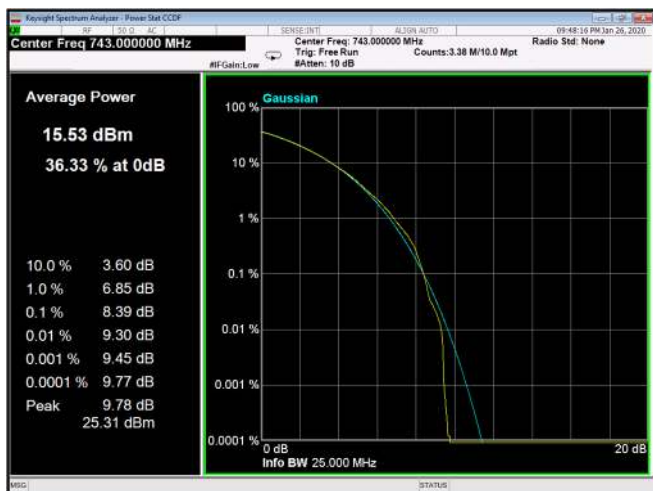


Figure 248: 16QAM 15MHz B.W.; 743.0MHz, 60kHz

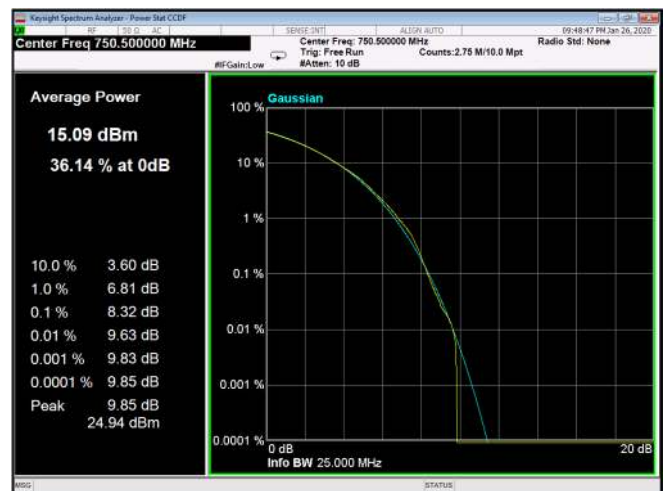


Figure 249: 16QAM 15MHz B.W.; 750.5MHz, 60kHz



Figure 250: 16QAM 20MHz B.W.; 738.0MHz, 15kHz

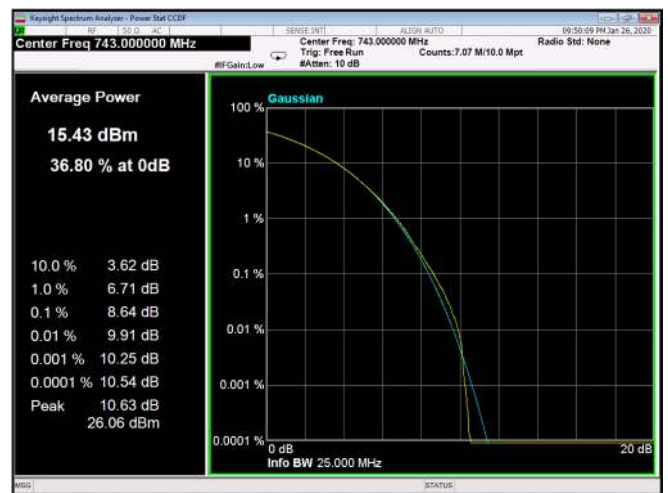


Figure 251: 16QAM 20MHz B.W.; 743.0MHz, 15kHz



Figure 252: 16QAM 20MHz B.W.; 748.0MHz, 15kHz

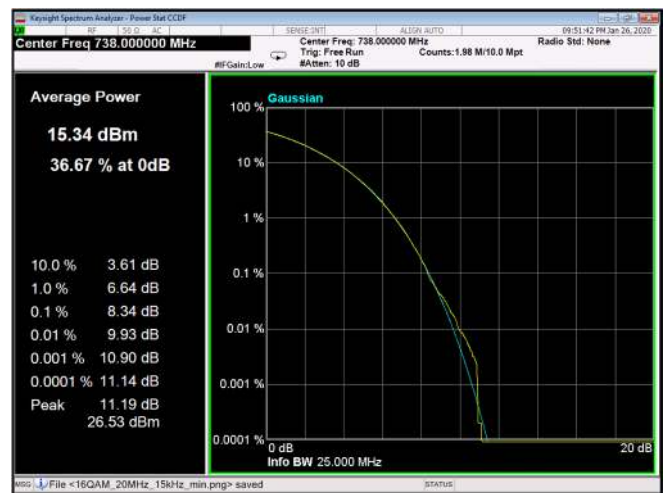


Figure 253: 16QAM 20MHz B.W.; 738.0MHz, 30kHz

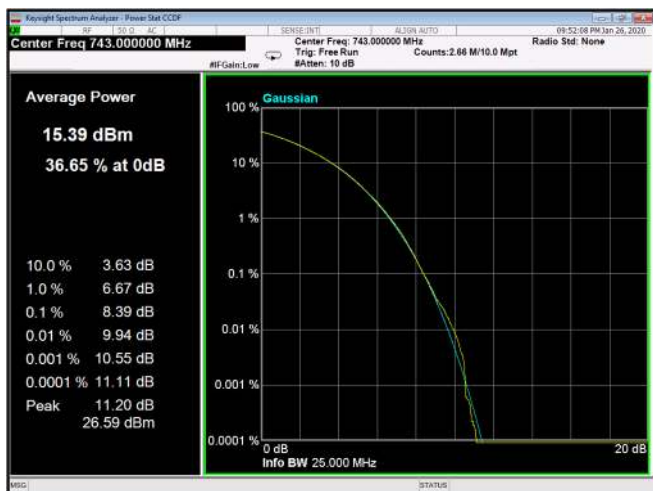


Figure 254: 16QAM 10MHz B.W.; 743.0MHz, 30kHz

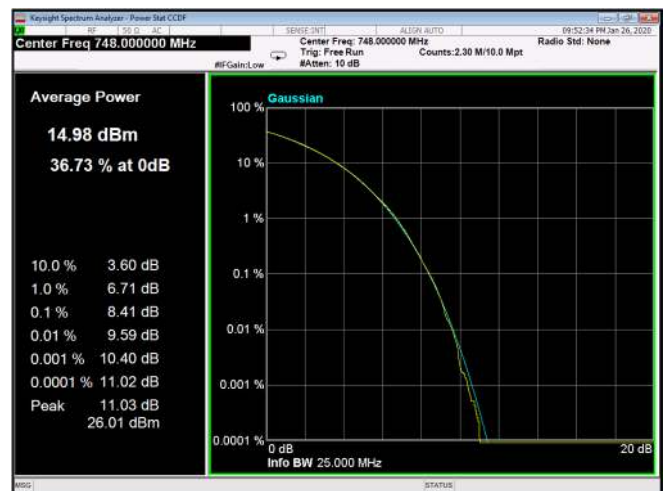


Figure 255: 16QAM 20MHz B.W.; 743.0MHz, 30kHz

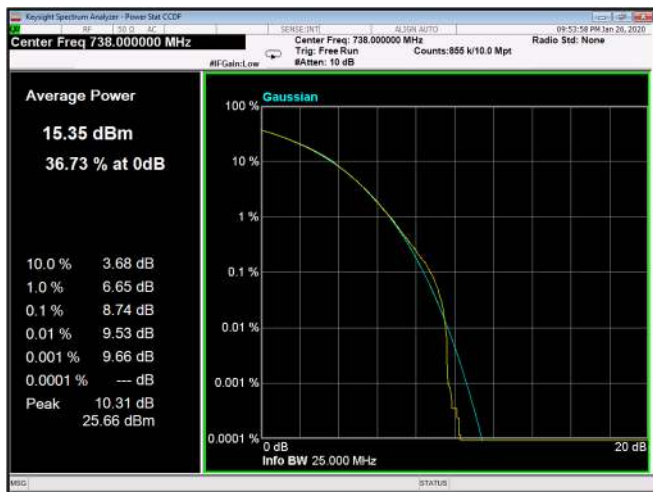


Figure 256: 16QAM 20MHz B.W.; 738.0MHz, 60kHz

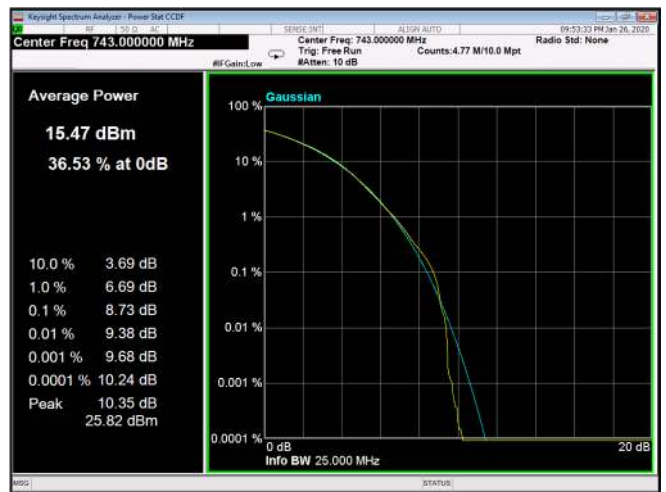


Figure 257: 16QAM 20MHz B.W.; 733.0MHz, 60kHz



Figure 258: 64QAM 5MHz B.W.; 730.5MHz, 15kHz

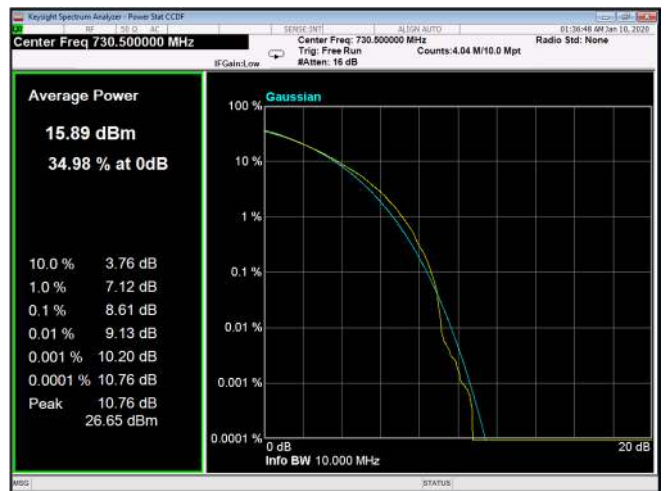


Figure 259: 64QAM 5MHz B.W.; 730.5MHz, 30kHz

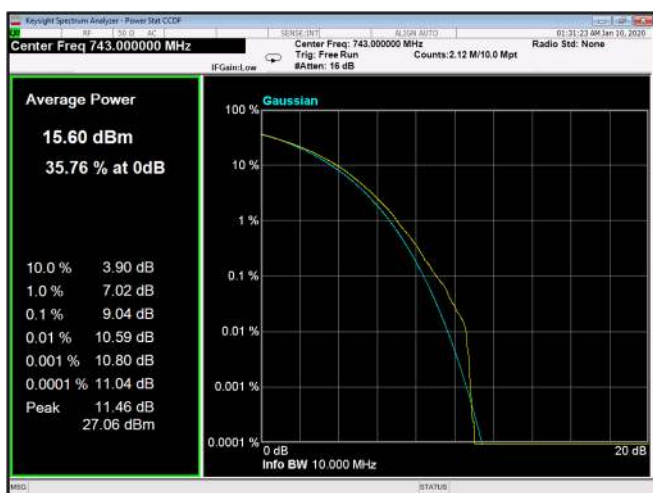


Figure 260: 64QAM 5MHz B.W.; 743.0MHz, 15kHz

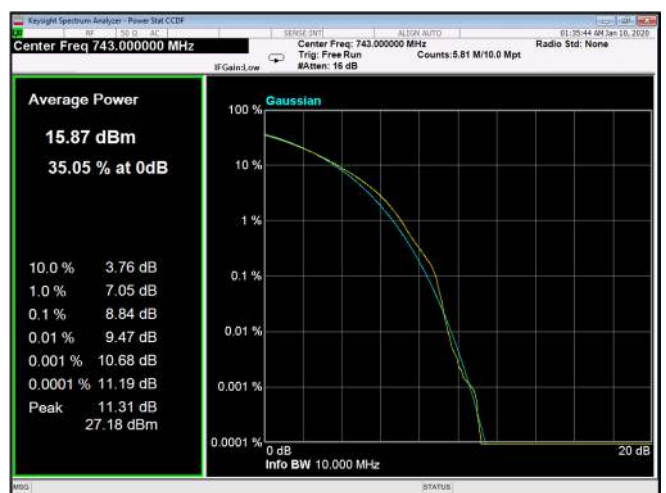


Figure 261: 64QAM 5MHz B.W.; 743.0MHz, 30kHz



Figure 262: 64QAM 5MHz B.W.; 755.5MHz, 15kHz

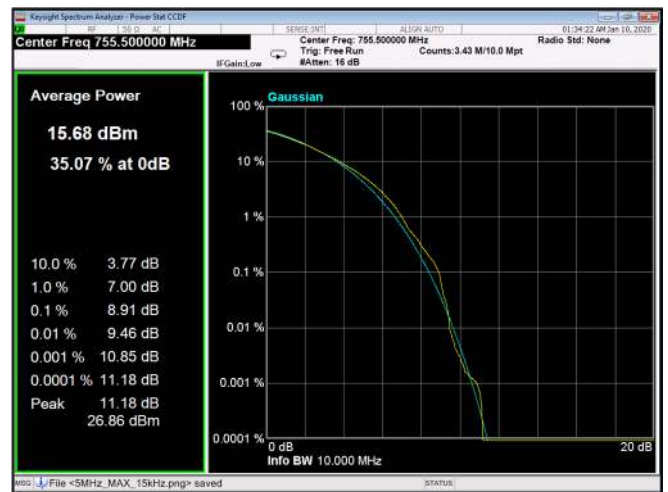


Figure 263: 64QAM 5MHz B.W.; 755.50MHz, 30kHz

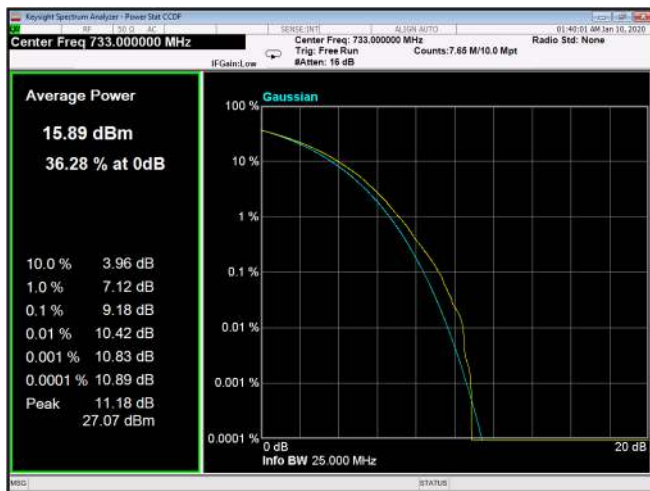


Figure 264: 64QAM 10MHz B.W.; 733.0MHz, 15kHz

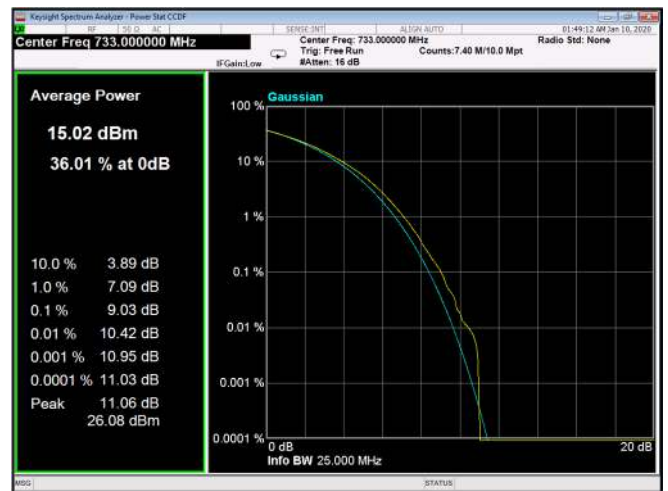


Figure 265: 64QAM 10MHz B.W.; 733.0MHz, 30kHz

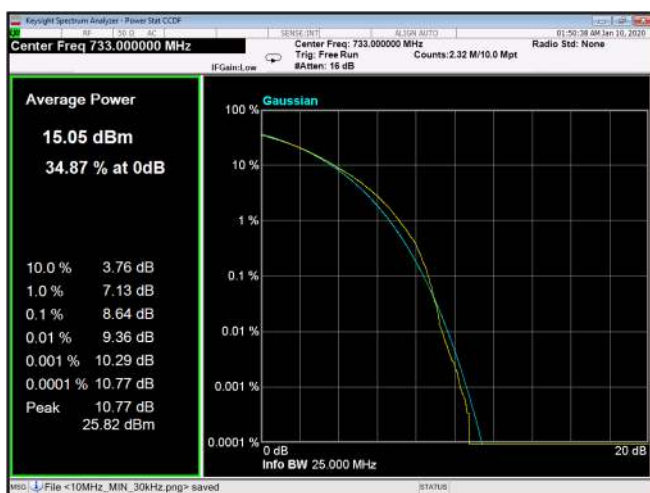


Figure 266: 64QAM 10MHz B.W.; 733.0MHz, 60kHz

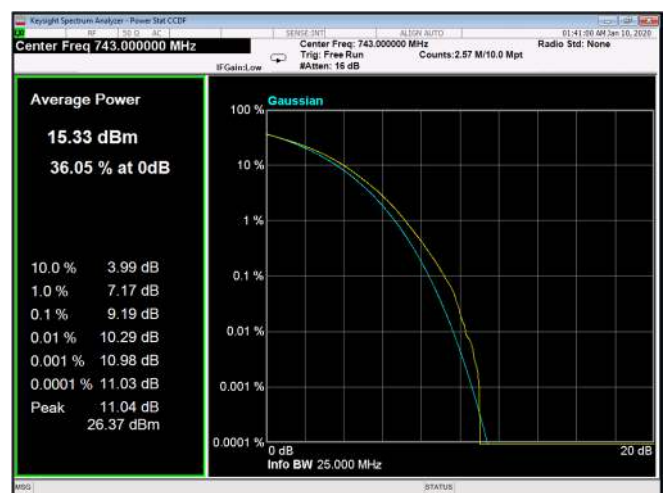


Figure 267: 64QAM 10MHz B.W.; 743.0MHz, 15kHz

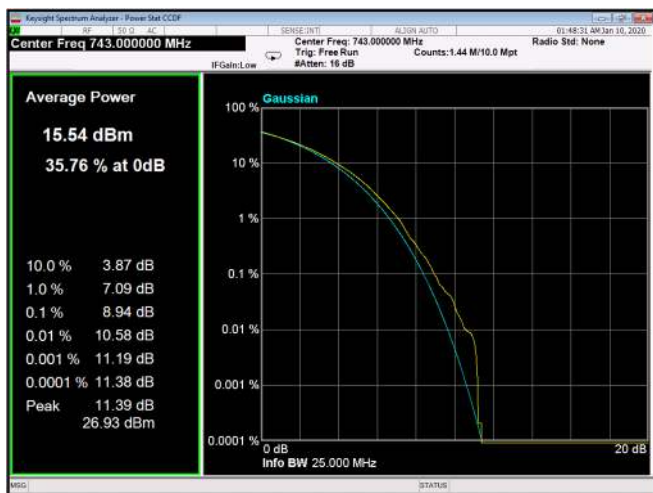


Figure 268: 64QAM 10MHz B.W.; 743.0MHz, 30kHz

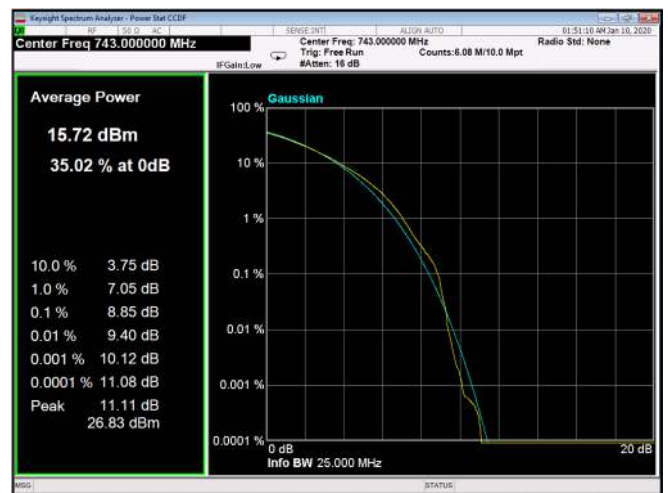


Figure 269: 64QAM 10MHz B.W.; 743.0MHz, 60kHz



Figure 270: 64QAM 10MHz B.W.; 753.0MHz, 15kHz



Figure 271: 64QAM 10MHz B.W.; 753.0MHz, 30kHz



Figure 272: 64QAM 10MHz B.W.; 753.0MHz, 60kHz

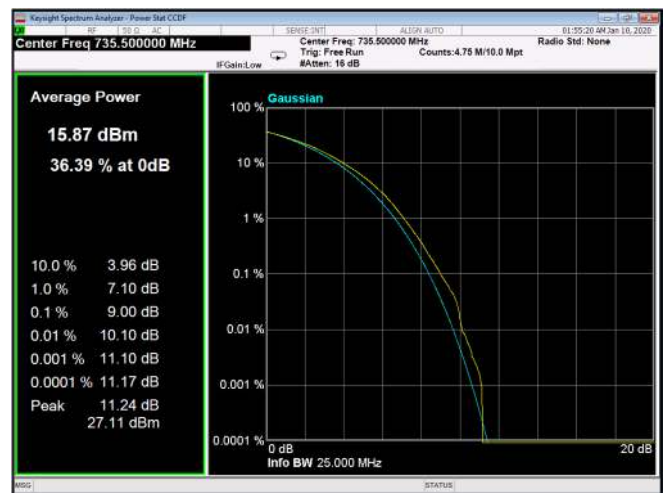


Figure 273: 64QAM 15MHz B.W.; 735.5MHz, 15kHz

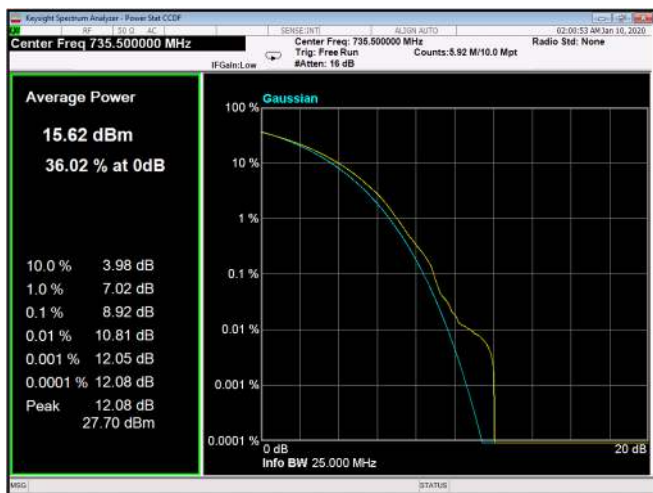


Figure 274: 64QAM 15MHz B.W.; 735.5MHz, 30kHz

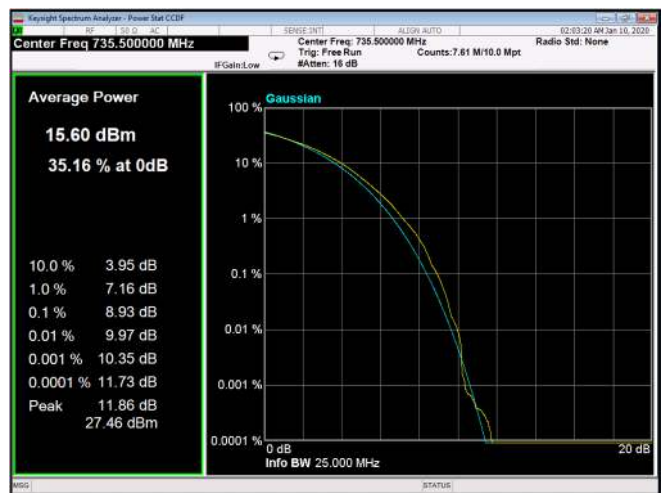


Figure 275: 64QAM 15MHz B.W.; 735.5MHz, 60kHz



Figure 276: 64QAM 15MHz B.W.; 743.0MHz, 15kHz

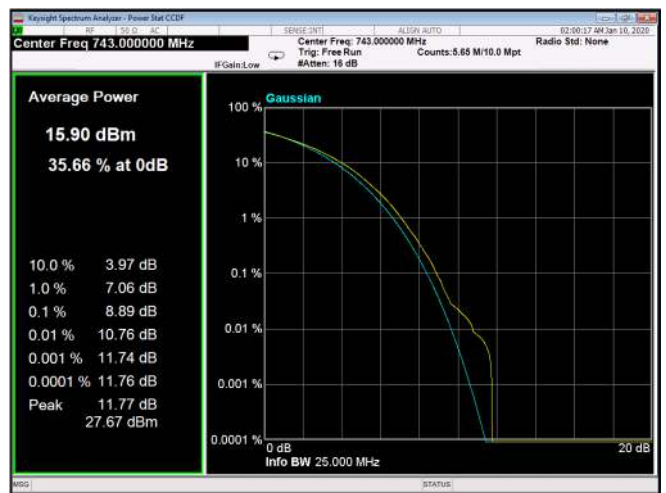


Figure 277: 64QAM 15MHz B.W.; 743.0MHz, 30kHz

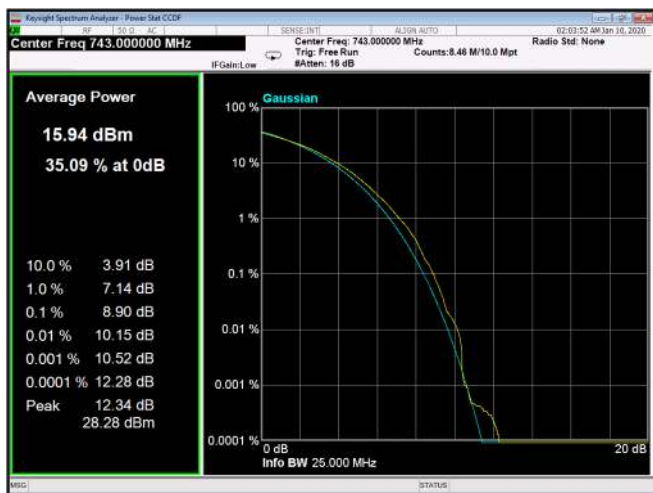


Figure 278: 64QAM 15MHz B.W.; 743.0MHz, 60kHz

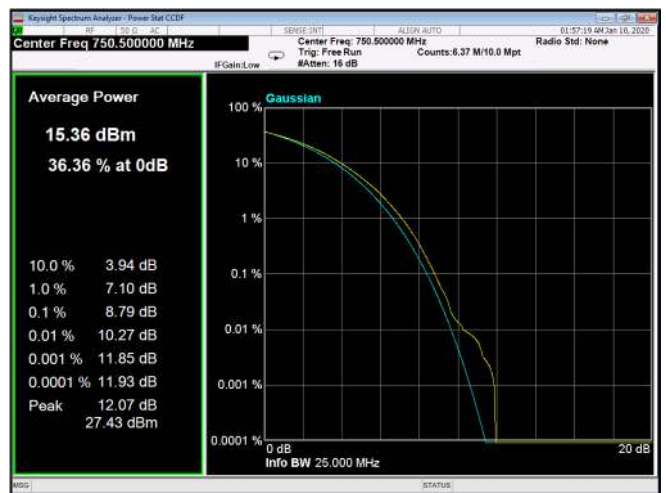


Figure 279: 64QAM 15MHz B.W.; 750.5MHz, 15kHz

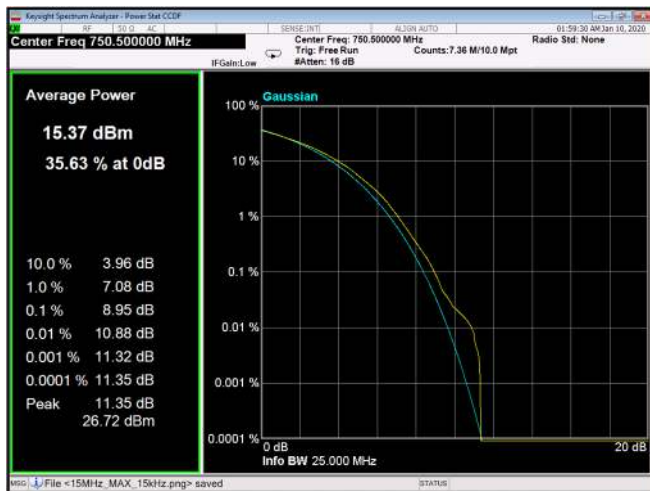


Figure 280: 64QAM 15MHz B.W.; 750.5MHz, 30kHz

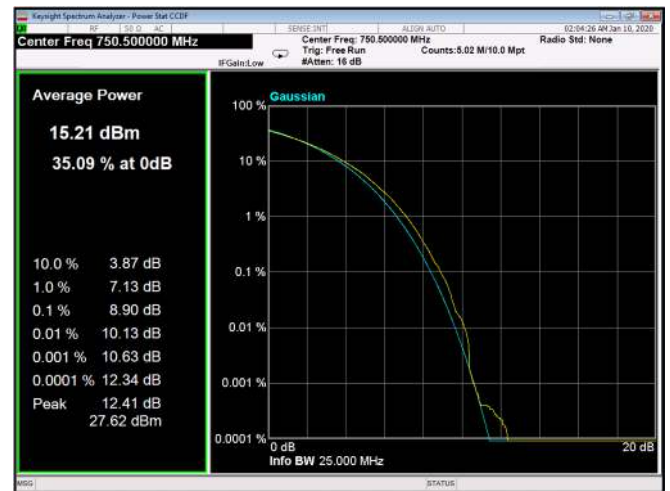


Figure 281: 64QAM 15MHz B.W.; 750.5MHz, 60kHz



Figure 282: 64QAM 20MHz B.W.; 738.0MHz, 15kHz

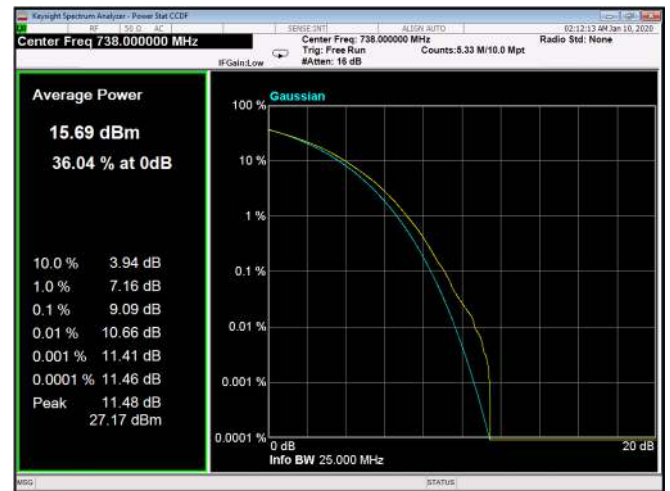


Figure 283: 64QAM 20MHz B.W.; 738.0MHz, 30kHz

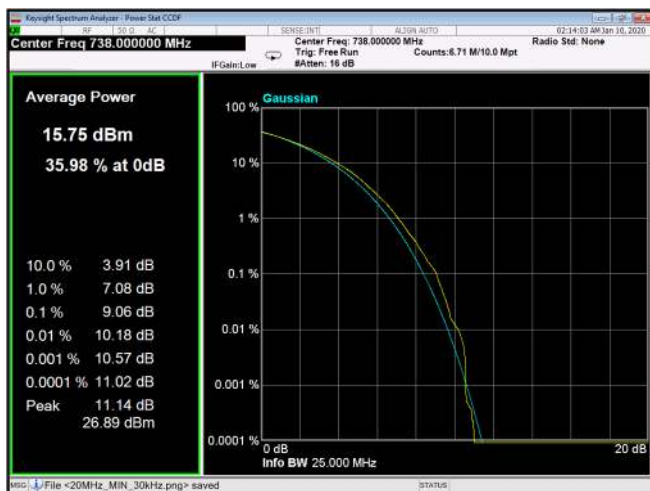


Figure 284: 64QAM 20MHz B.W.; 738.0MHz, 60kHz

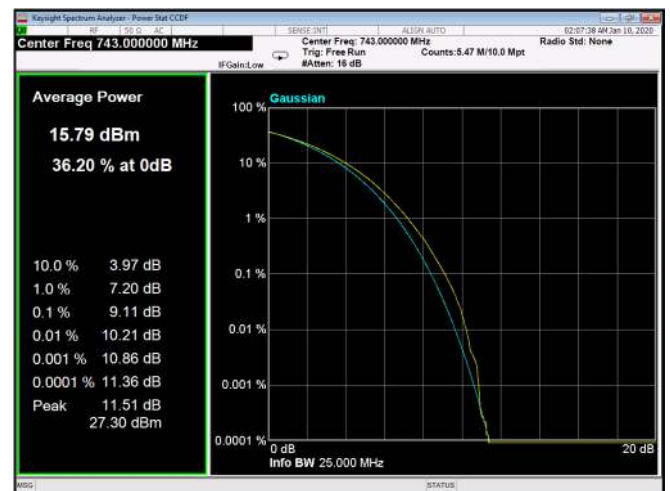


Figure 285: 64QAM 20MHz B.W.; 743.0MHz, 15kHz

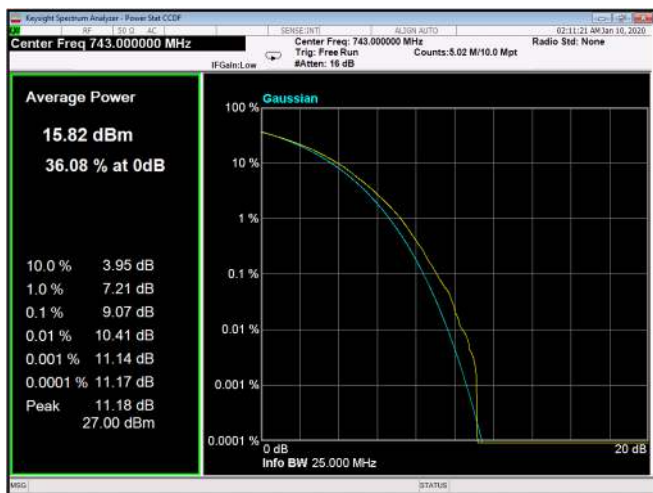


Figure 286: 64QAM 20MHz B.W.; 743.0MHz, 30kHz

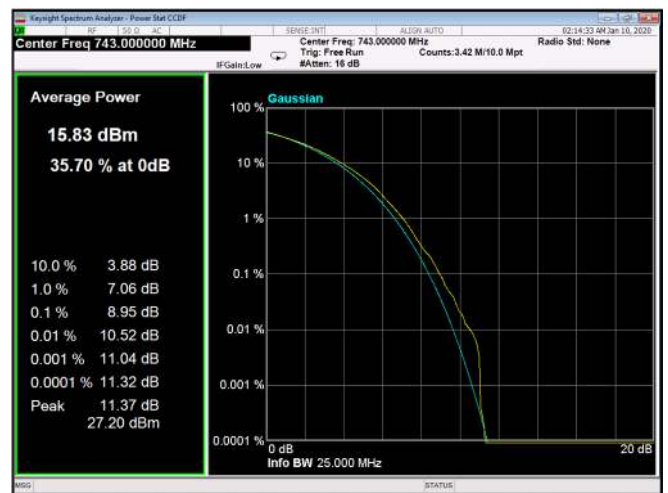


Figure 287: 64QAM 20MHz B.W.; 743.0MHz, 60kHz



Figure 288: 64QAM 20MHz B.W.; 748.0MHz, 15kHz

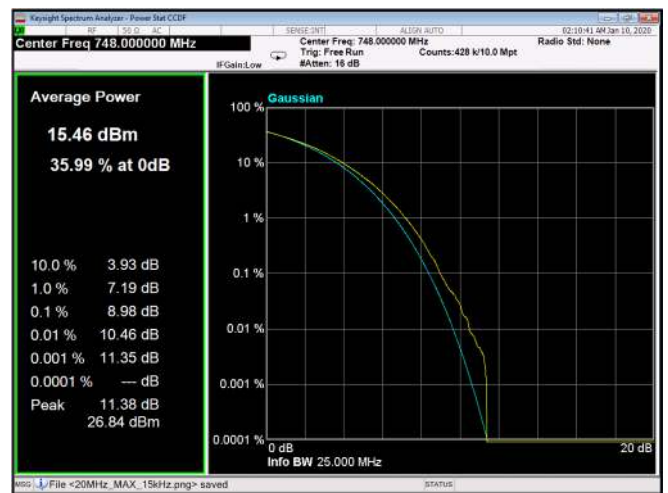


Figure 289: 64QAM 20MHz B.W.; 748.0MHz, 30kHz



Figure 290: 64QAM 20MHz B.W.; 748.0MHz, 60kHz

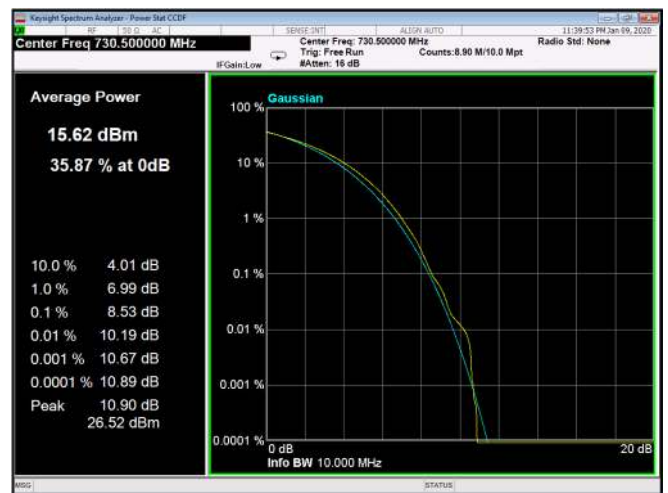


Figure 291: 256QAM 5MHz B.W.; 730.5MHz, 15kHz

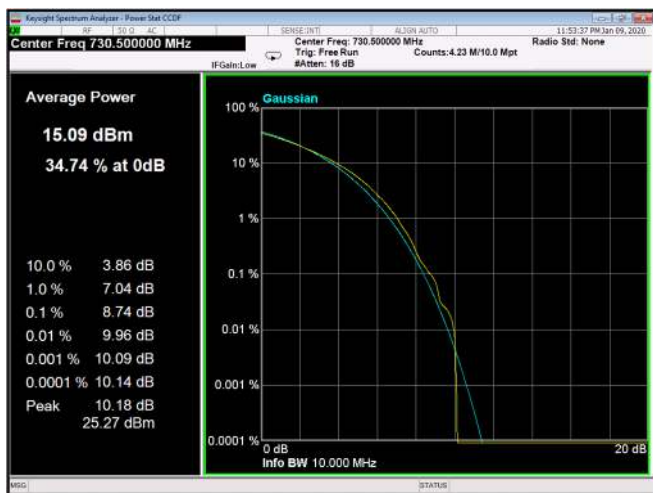


Figure 292: 256QAM 5MHz B.W.; 730.5MHz, 30kHz

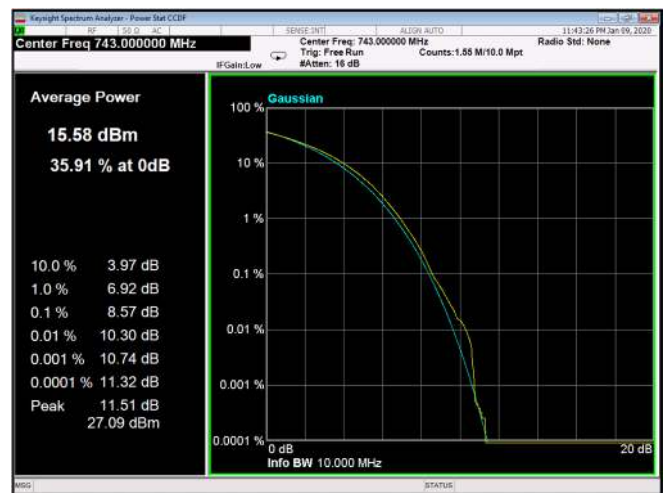


Figure 293: 256QAM 5MHz B.W.; 743.0MHz, 15kHz



Figure 294: 256QAM 5MHz B.W.; 743.0MHz, 30kHz

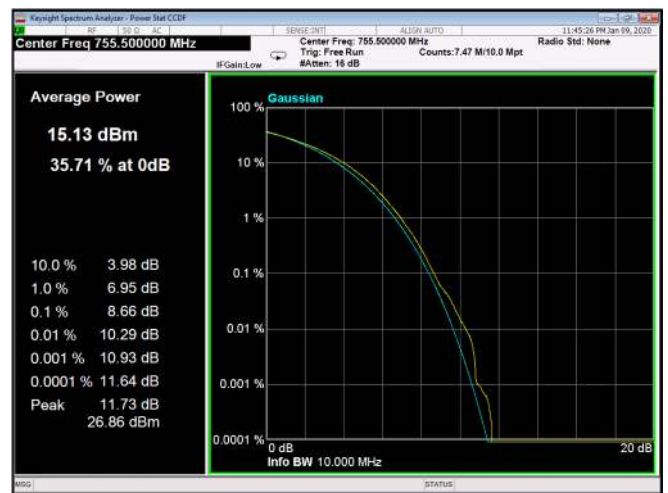


Figure 295: 256QAM 5MHz B.W.; 755.5MHz, 15kHz



Figure 296: 256QAM 5MHz B.W.; 755.5MHz, 30kHz

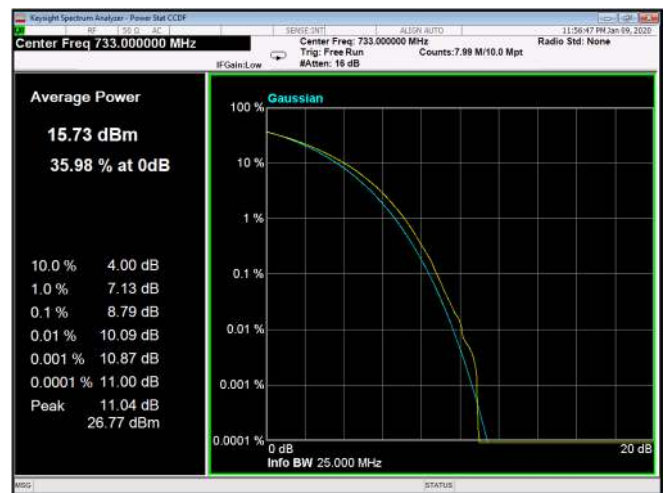


Figure 297: 256QAM 10MHz B.W.; 733.0MHz, 15kHz

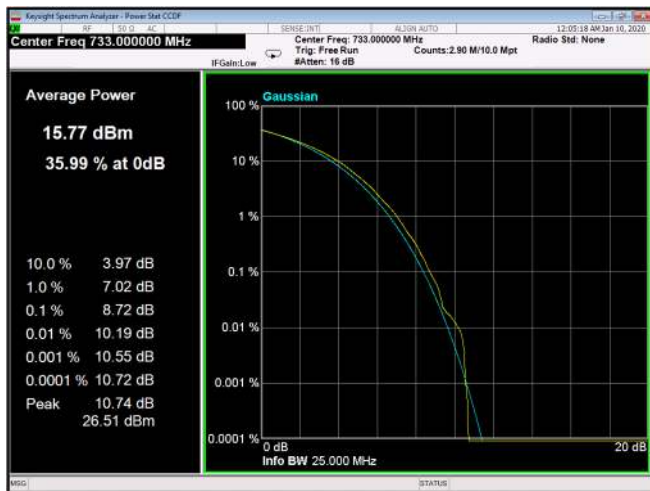


Figure 298: 256QAM 10MHz B.W.; 733.0MHz, 30kHz

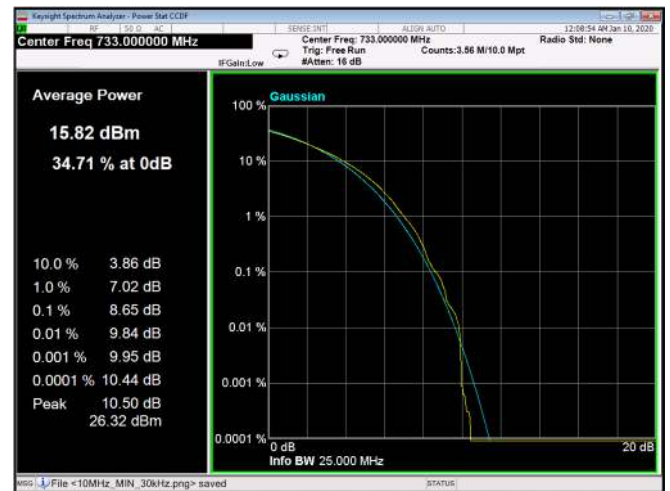


Figure 299: 256QAM 10MHz B.W.; 733.0MHz, 60kHz

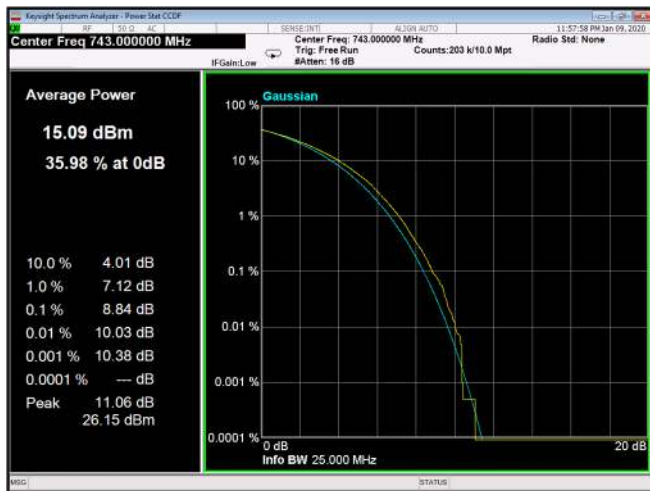


Figure 300: 256QAM 10MHz B.W.; 743.0MHz, 15kHz



Figure 301: 256QAM 10MHz B.W.; 743.0MHz, 30kHz

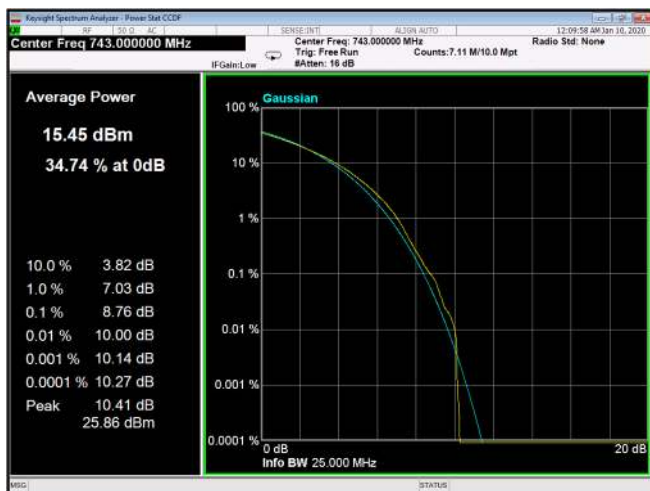


Figure 302: 256QAM 10MHz B.W.; 743.0MHz, 60kHz



Figure 303: 256QAM 10MHz B.W.; 753.0MHz, 15kHz



Figure 304: 256QAM 10MHz B.W.; 753.0MHz, 30kHz

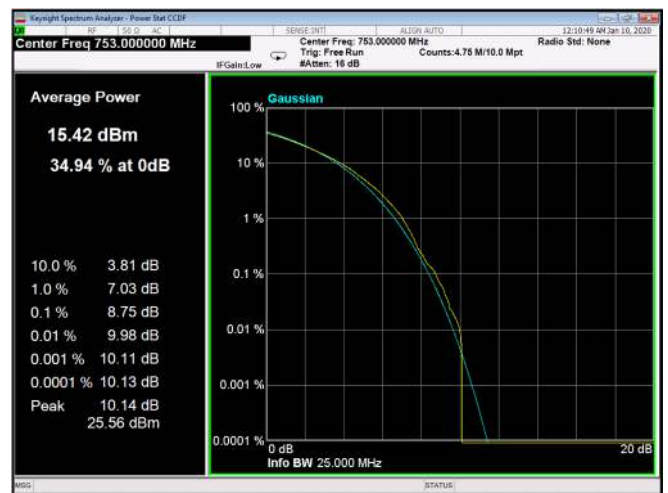


Figure 305: 256QAM 5MHz B.W.; 753.0MHz, 60kHz



Figure 306: 256QAM 15MHz B.W.; 735.5MHz, 15kHz

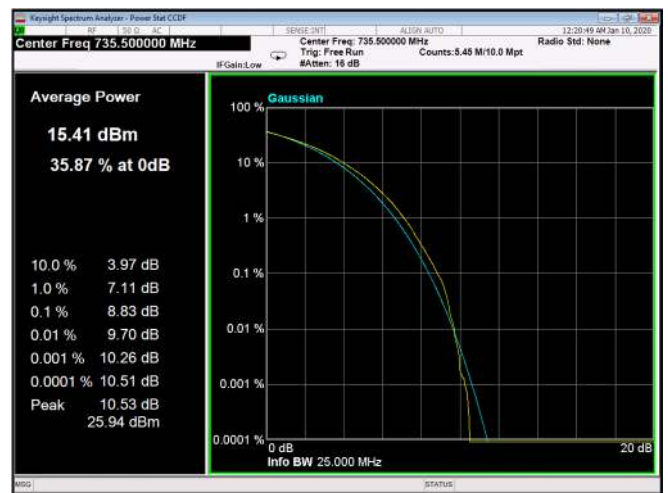


Figure 307: 256QAM 10MHz B.W.; 735.5MHz, 30kHz



Figure 308: 256QAM 15MHz B.W.; 735.5MHz, 60kHz

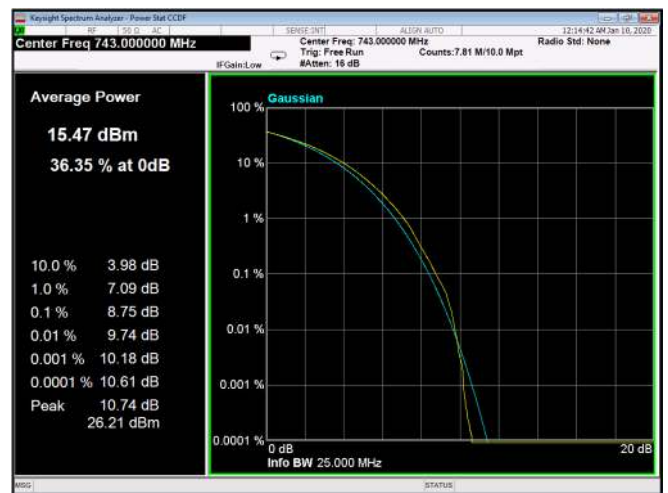


Figure 309: 256QAM 15MHz B.W.; 743.0MHz, 15kHz

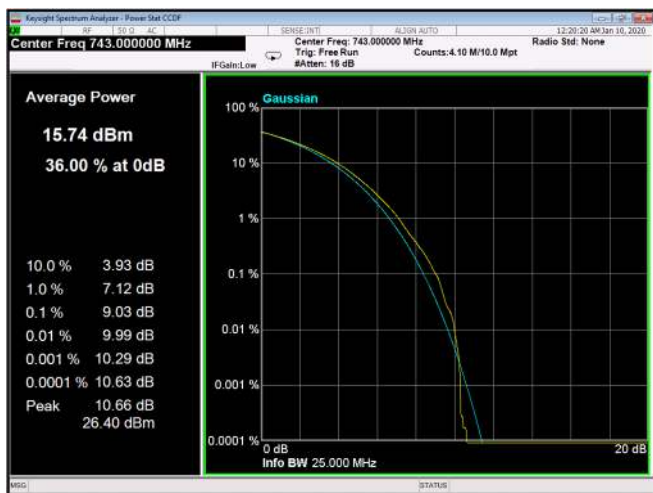


Figure 310: 256QAM 15MHz B.W.; 743.0MHz, 30kHz

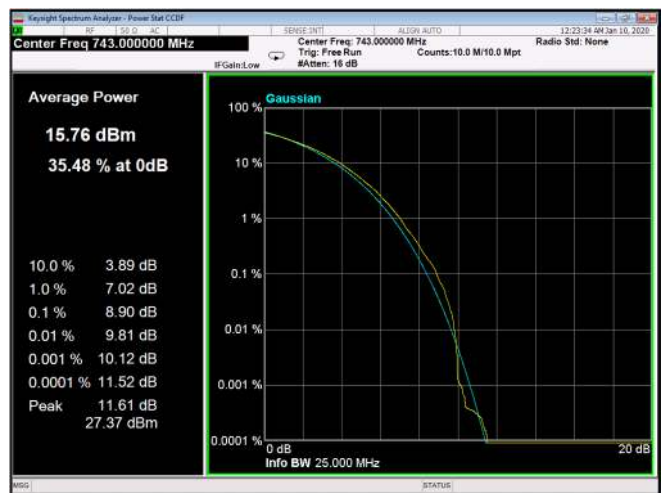


Figure 311: 256QAM 15MHz B.W.; 743.0MHz, 60kHz



Figure 312: 256QAM 15MHz B.W.; 750.5MHz, 15kHz

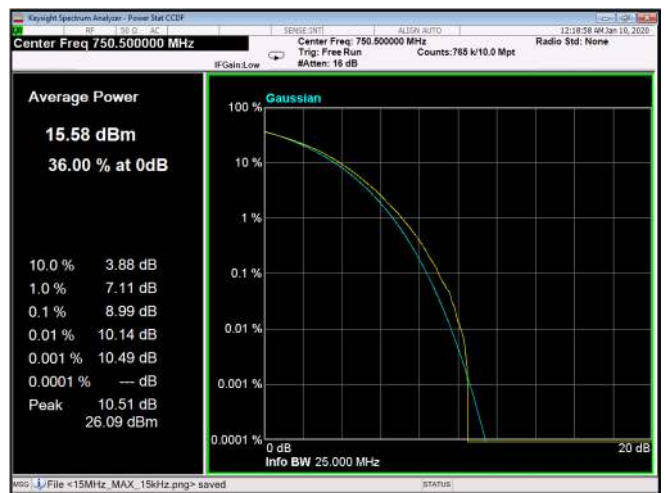


Figure 313: 256QAM 15MHz B.W.; 750.5MHz, 30kHz



Figure 314: 256QAM 15MHz B.W.; 750.5MHz, 60kHz

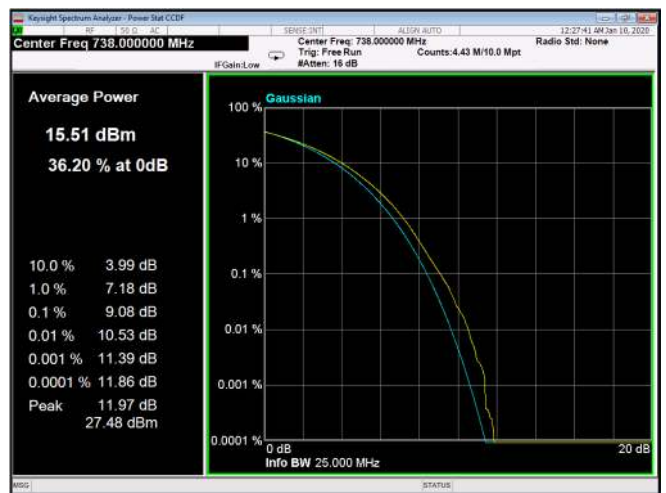


Figure 315: 256QAM 20MHz B.W.; 738.0MHz, 15kHz



Figure 316: 256QAM 20MHz B.W.; 738.0MHz, 30kHz

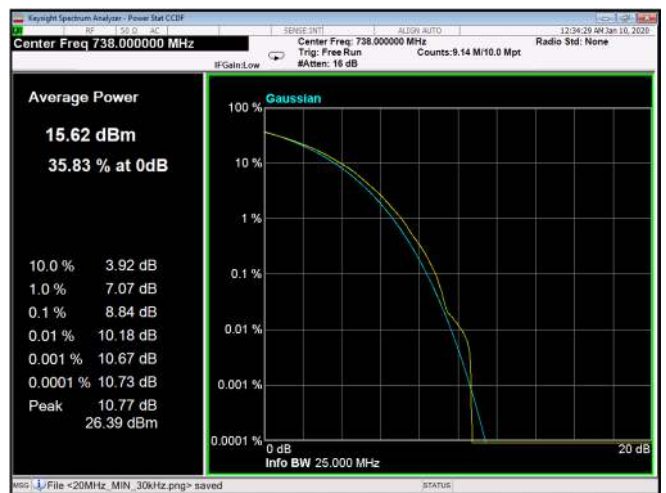


Figure 317: 256QAM 20MHz B.W.; 738.0MHz, 60kHz

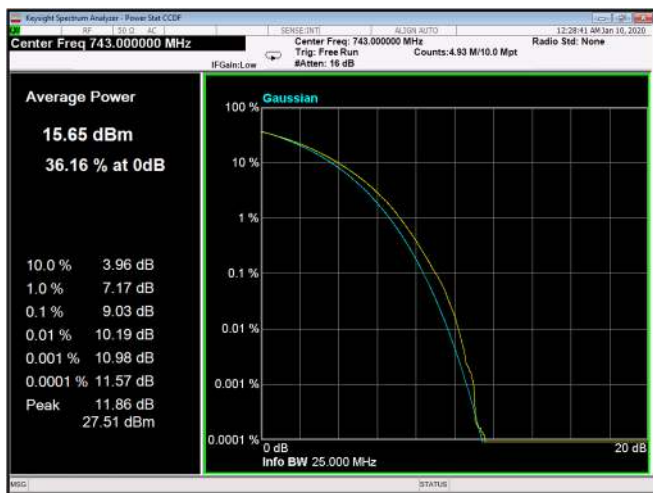


Figure 318: 256QAM 20MHz B.W.; 743.0MHz, 15kHz

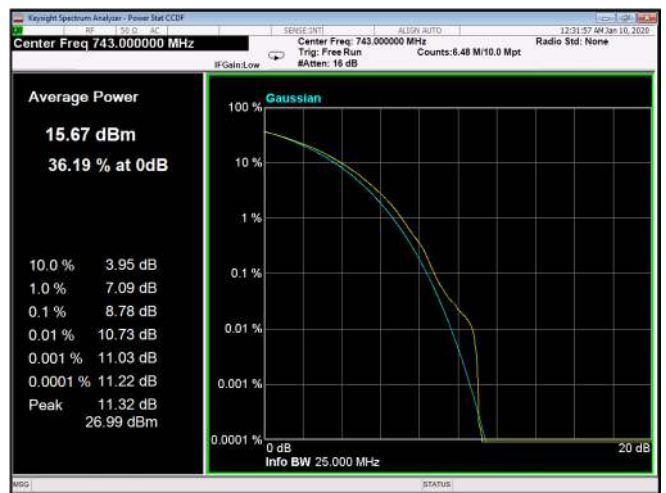


Figure 319: 256QAM 20MHz B.W.; 743.0MHz, 30kHz



Figure 320: 256QAM 20MHz B.W.; 743.0MHz, 60kHz

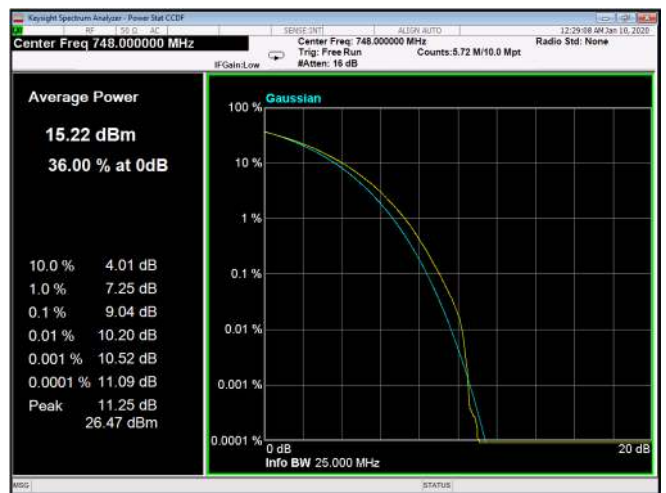


Figure 321: 256QAM 20MHz B.W.; 748.0MHz, 15kHz

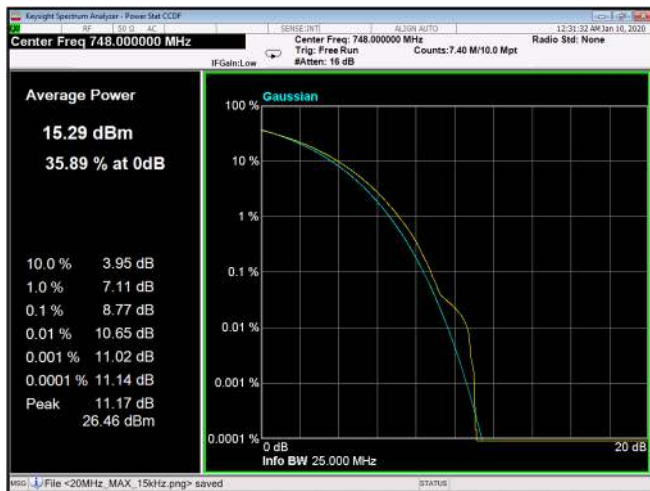


Figure 322: 256QAM 20MHz B.W.; 748.0MHz, 30kHz

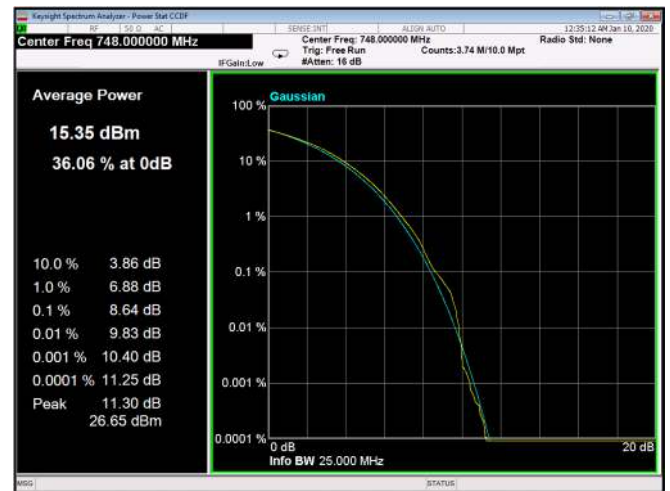


Figure 323: 256QAM 20MHz B.W.; 748.0MHz, 60kHz



Figure 324: QPSK 5MHz B.W.; 733.0MHz, 15kHz

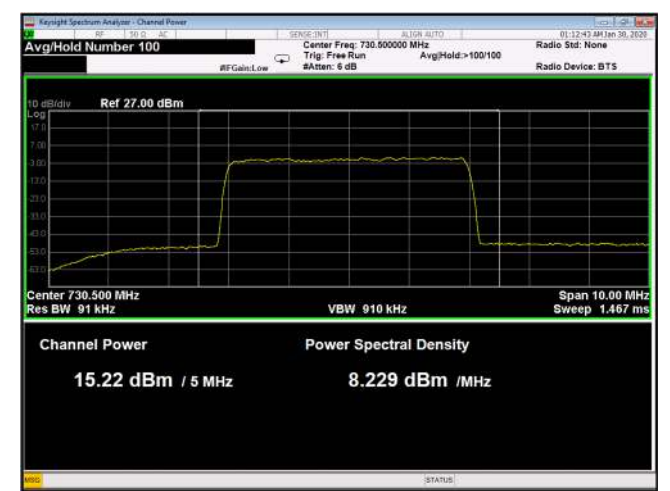


Figure 325: QPSK 5MHz B.W.; 733.0MHz, 30kHz

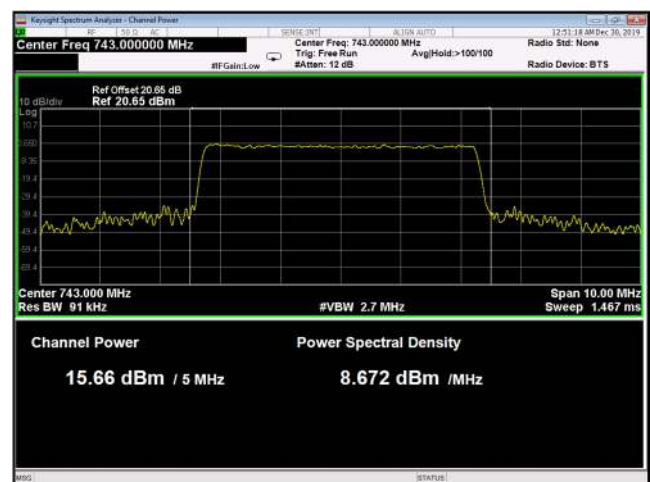


Figure 326: QPSK 5MHz B.W.; 743.0MHz, 15kHz



Figure 327: QPSK 5MHz B.W.; 743.0MHz, 30kHz

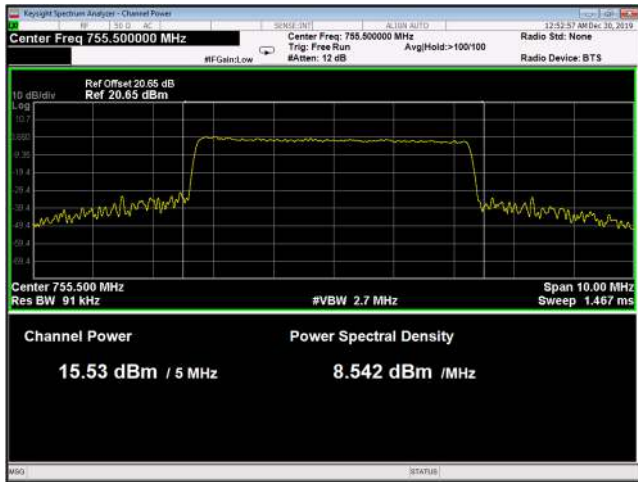


Figure 328: QPSK 5MHz B.W.; 748.0MHz, 15kHz

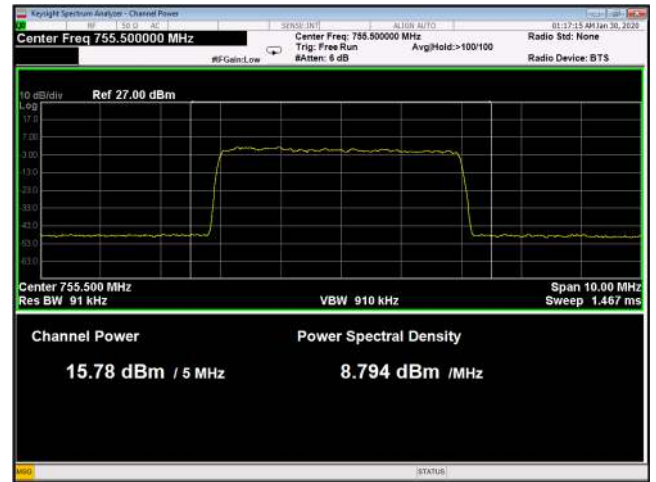


Figure 329: QPSK 5MHz B.W.; 748.0MHz, 30kHz

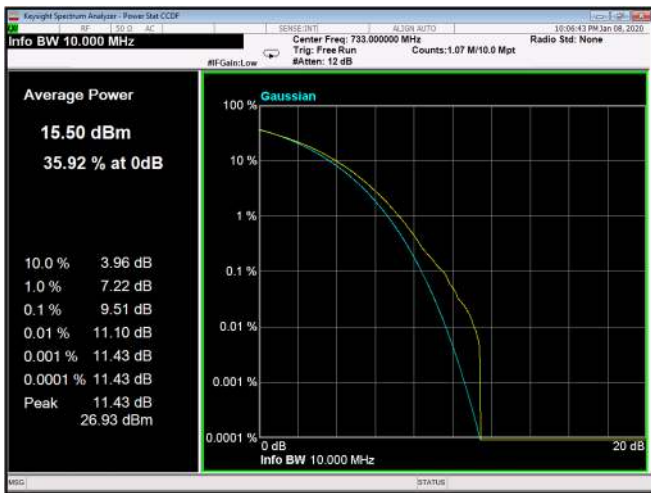


Figure 330: QPSK 10MHz B.W.; 733.0MHz, 15kHz

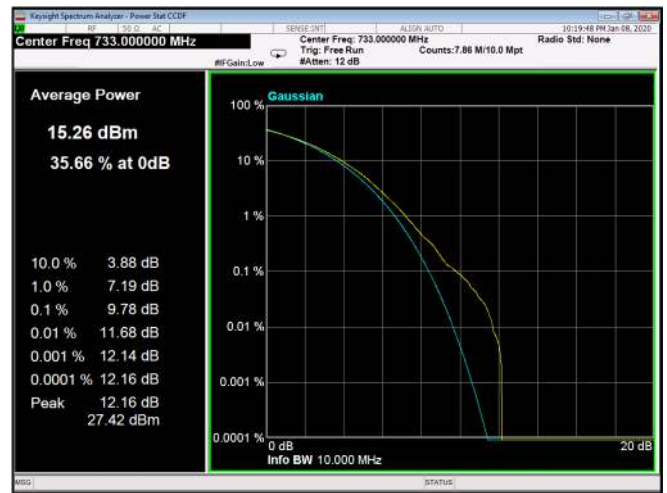


Figure 331: QPSK 10MHz B.W.; 733.0MHz, 30kHz



Figure 332: QPSK 10MHz B.W.; 733.0MHz, 60kHz

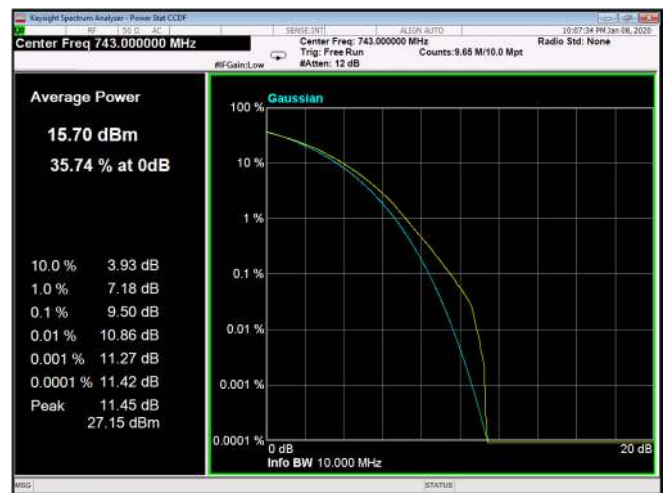


Figure 333: QPSK 10MHz B.W.; 743.0MHz, 15kHz



Figure 334: QPSK 10MHz B.W.; 743.0MHz, 30kHz



Figure 335: QPSK 10MHz B.W.; 743.0MHz, 60kHz



Figure 336: QPSK 10MHz B.W.; 753.0MHz, 15kHz



Figure 337: QPSK 10MHz B.W.; 753.0MHz, 30kHz



Figure 338: QPSK 10MHz B.W.; 753.0MHz, 60kHz

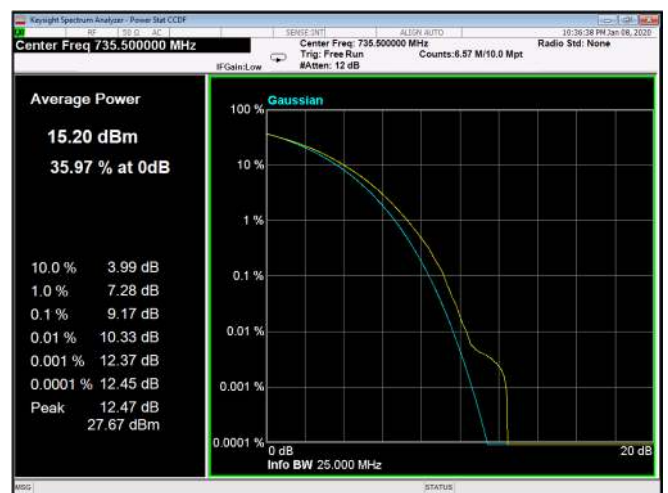


Figure 339: QPSK 15MHz B.W.; 735.5MHz, 15kHz



Figure 340: QPSK 15MHz B.W.; 735.5MHz, 30kHz

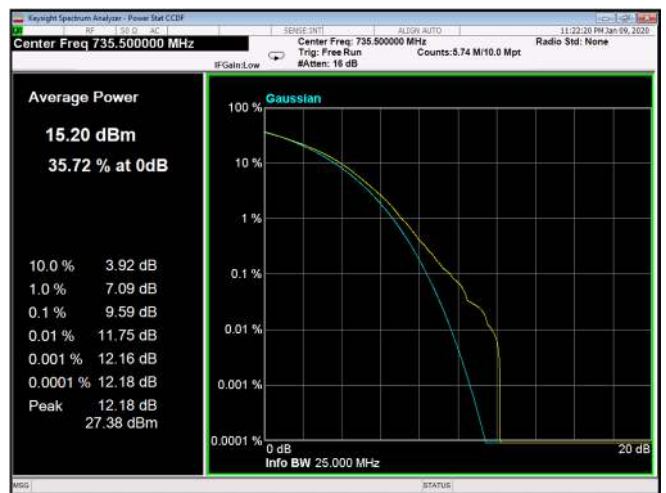


Figure 341: QPSK 15MHz B.W.; 735.5MHz, 60kHz



Figure 342: QPSK 15MHz B.W.; 743.0MHz, 15kHz

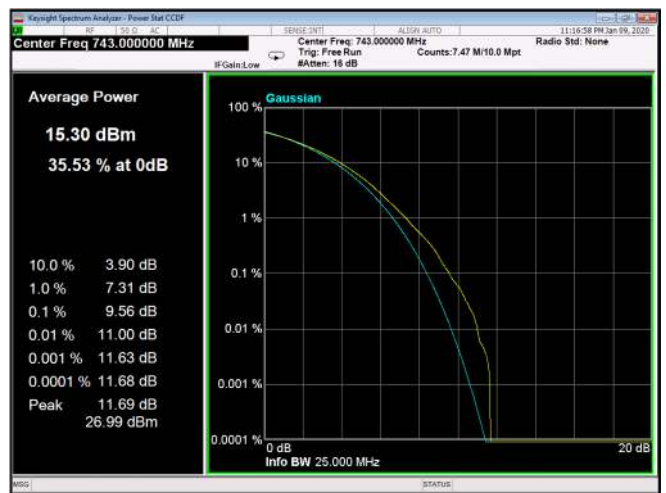


Figure 343: QPSK 15MHz B.W.; 743.0MHz, 30kHz

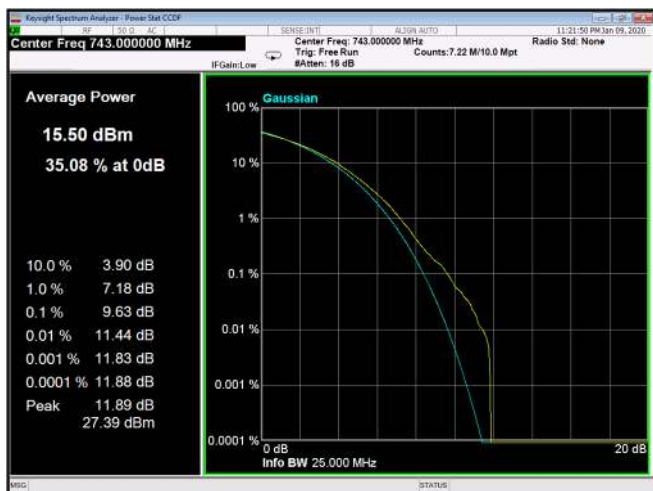


Figure 344: QPSK 15MHz B.W.; 743.0MHz, 60kHz

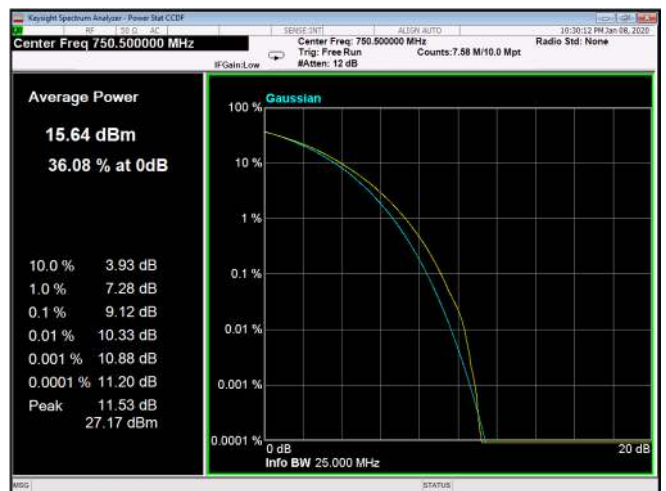


Figure 345: QPSK 15MHz B.W.; 750.5MHz, 15kHz



Figure 346: QPSK 15MHz B.W.; 750.5MHz, 30kHz



Figure 347: QPSK 15MHz B.W.; 750.5MHz, 60kHz



Figure 348: QPSK 20MHz B.W.; 738.0MHz, 15kHz

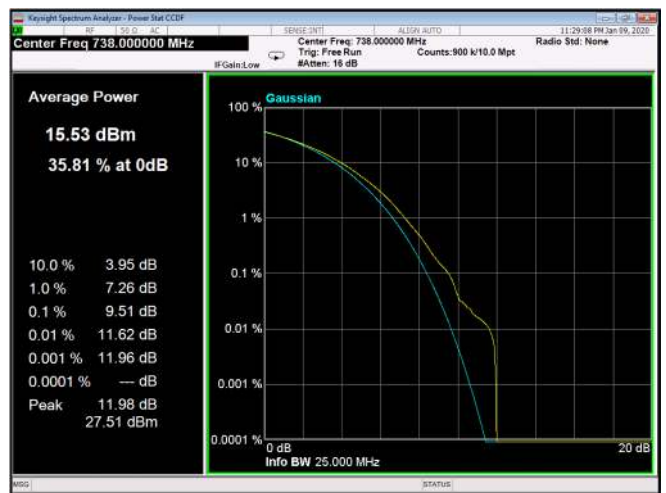


Figure 349: QPSK 20MHz B.W.; 738.0MHz, 30kHz



Figure 350: QPSK 20MHz B.W.; 738.0MHz, 60kHz

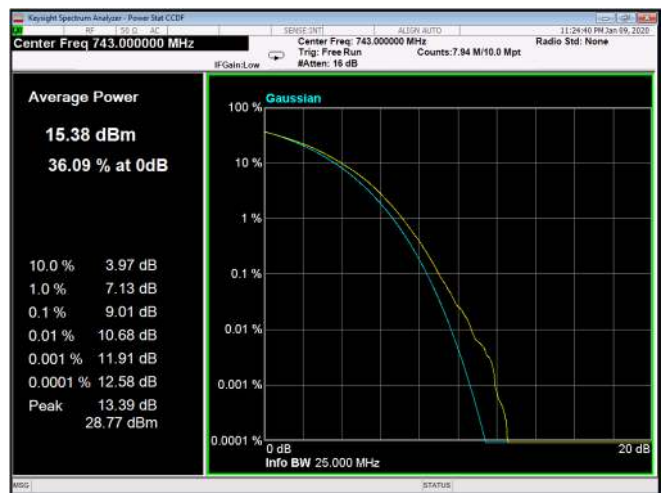


Figure 351: QPSK 20MHz B.W.; 743.0MHz, 15kHz



Figure 352: QPSK 20MHz B.W.; 743.0MHz, 30kHz

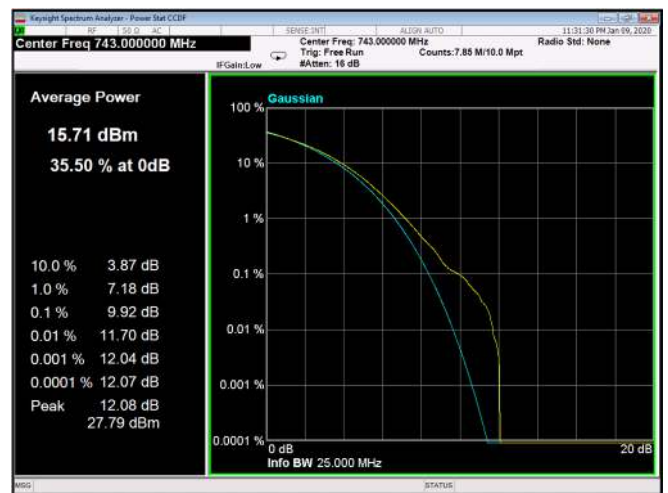


Figure 353: QPSK 20MHz B.W.; 743.0MHz, 60kHz



Figure 354: QPSK 20MHz B.W.; 748.0MHz, 15kHz

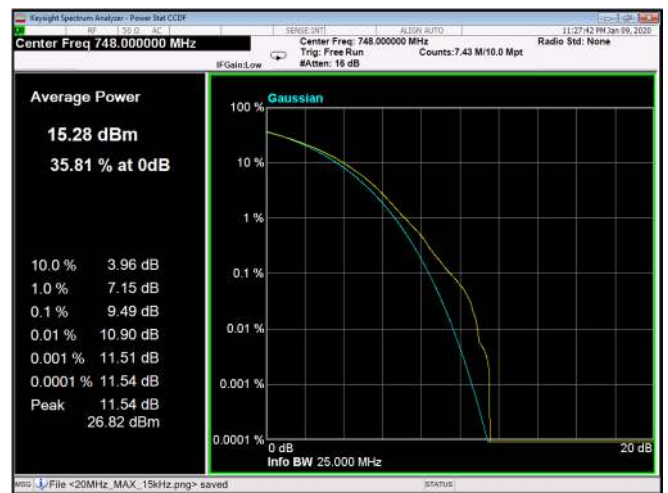


Figure 355: QPSK 20MHz B.W.; 748.0MHz, 30kHz

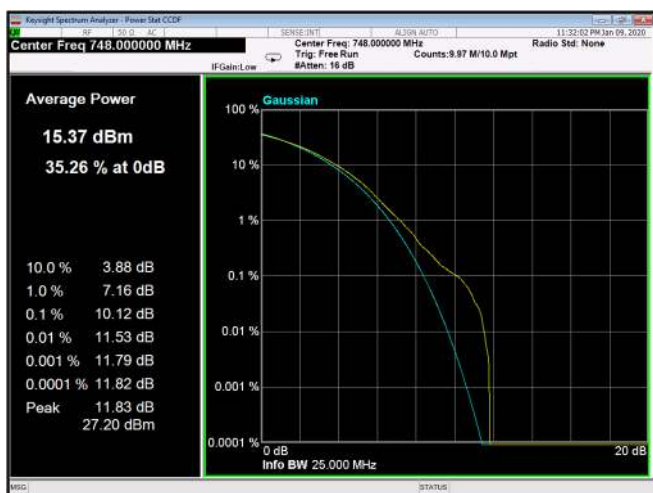


Figure 356: QPSK 20MHz B.W.; 748.0MHz, 60kHz

6.5 Test Equipment Used; 0.1% PAPR

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Agilent Technologies	N9010A	MY52220686	28 November 2018	28 November 2020
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY51350437	03 December 2018	03 December 2020
20 dB Attenuator	Bird	8304-N20DB	-	24 December 2019	24 December 2020

Table 15 Test Equipment Used