PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

XMit 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-20	27-Feb-21
Block - DC	Fairview Microwave	SD3379	AMM	21-Sep-20	21-Sep-21
Generator - Signal	Agilent	N5173B	TIW	17-Jul-20	17-Jul-23

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.
The PAPR was measured using the CCDF function of the spectrum analyzer.

Per 27.50(d)(2), and RSS-139 section 6.5 the PAPR limit shall not exceed 13 dB for more than the ANSI described 0.1% of the time.

RF conducted emissions testing was performed on one port. The FRIG antenna ports are essentially electrically identical (the RF power variation between antenna ports is small) and port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.
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PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

EUT:	FRIG (C2PC FCC/ISED Approval for 5G)	Work Order:	NOKI0025
Serial Number:	RY142309120	Date:	4-Dec-20
Customer:	Nokia Solutions and Networks	Temperature:	23.3 °C
Attendees:	Mitchell Hill, John Rattanavong	Humidity:	28.6% RH
Project:	None	Barometric Pres.:	1028 mbar
Tested by:	Brandon Hobbs	Power: 54 VDC	Job Site: TX05

TEST SPECIFICATIONS	Test Method
FCC 27:2020	ANSI C63.26:2015
RSS-139:2015	RSS-139:2015

COMMENTS

All measurement path losses were accounted for in the reference level offest including any attenuators, filters and DC blocks. AWS Band 1 carriers are enabled at maximum power (MIMO 4x4, 30 watts/carrier). The output power was measured for a single carrier over the carrier channel bandwidth on port 1.

DEVIATIONS FROM TEST STANDARD

None

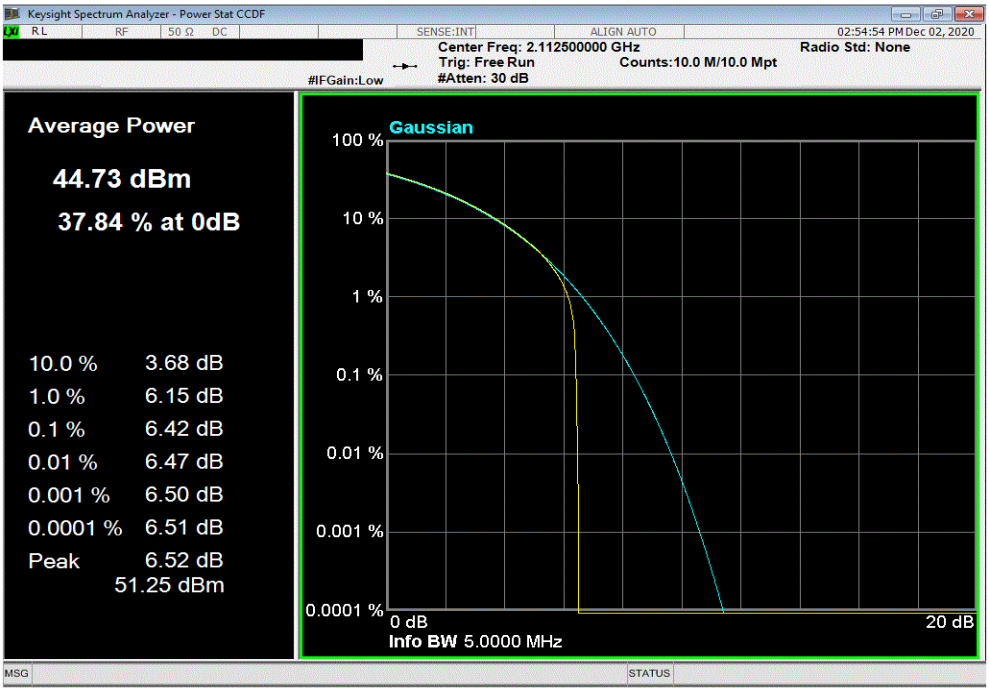
Configuration #	2	Signature

	PAPR Value (dB)	PAPR Limit (dB)	Results
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz			
5 MHz Bandwidth			
QPSK Modulation			
Low Channel 2112.5 MHz	6.42	13	Pass
Mid Channel 2132.5 MHz	6.42	13	Pass
High Channel 2152.5 MHz	6.44	13	Pass
16-QAM Modulation			
Low Channel 2112.5 MHz	6.57	13	Pass
Mid Channel 2132.5 MHz	6.57	13	Pass
High Channel 2152.5 MHz	6.58	13	Pass
64-QAM Modulation			
Low Channel 2112.5 MHz	6.40	13	Pass
Mid Channel 2132.5 MHz	6.40	13	Pass
High Channel 2152.5 MHz	6.40	13	Pass
256-QAM Modulation			
Low Channel 2112.5 MHz	6.48	13	Pass
Mid Channel 2132.5 MHz	6.47	13	Pass
High Channel 2152.5 MHz	6.49	13	Pass
10 MHz Bandwidth			
QPSK Modulation			
Low Channel 2115 MHz	6.45	13	Pass
Mid Channel 2132.5 MHz	6.41	13	Pass
High Channel 2150 MHz	6.45	13	Pass
16-QAM Modulation			
Low Channel 2115 MHz	6.57	13	Pass
Mid Channel 2132.5 MHz	6.55	13	Pass
High Channel 2150 MHz	6.59	13	Pass
64-QAM Modulation			
Low Channel 2115 MHz	6.44	13	Pass
Mid Channel 2132.5 MHz	6.41	13	Pass
High Channel 2150 MHz	6.45	13	Pass
256-QAM Modulation			
Low Channel 2115 MHz	6.52	13	Pass
Mid Channel 2132.5 MHz	6.49	13	Pass
High Channel 2150 MHz	6.53	13	Pass
15 MHz Bandwidth			
QPSK Modulation			
Low Channel 2117.5 MHz	6.48	13	Pass
Mid Channel 2132.5 MHz	6.42	13	Pass
High Channel 2147.5 MHz	6.51	13	Pass
16-QAM Modulation			
Low Channel 2117.5 MHz	6.56	13	Pass
Mid Channel 2132.5 MHz	6.48	13	Pass
High Channel 2147.5 MHz	6.58	13	Pass
64-QAM Modulation			
Low Channel 2117.5 MHz	6.44	13	Pass
Mid Channel 2132.5 MHz	6.40	13	Pass
High Channel 2147.5 MHz	6.48	13	Pass
256-QAM Modulation			
Low Channel 2117.5 MHz	6.46	13	Pass
Mid Channel 2132.5 MHz	6.42	13	Pass
High Channel 2147.5 MHz	6.51	13	Pass
20 MHz Bandwidth			
QPSK Modulation			
Low Channel 2120 MHz	6.43	13	Pass
Mid Channel 2132.5 MHz	6.35	13	Pass
High Channel 2145 MHz	6.50	13	Pass
16-QAM Modulation			
Low Channel 2120 MHz	6.50	13	Pass
Mid Channel 2132.5 MHz	6.42	13	Pass
High Channel 2145 MHz	6.55	13	Pass
64-QAM Modulation			
Low Channel 2120 MHz	6.44	13	Pass
Mid Channel 2132.5 MHz	6.36	13	Pass
High Channel 2145 MHz	6.49	13	Pass
256-QAM Modulation			
Low Channel 2120 MHz	6.43	13	Pass
Mid Channel 2132.5 MHz	6.35	13	Pass
High Channel 2145 MHz	6.49	13	Pass

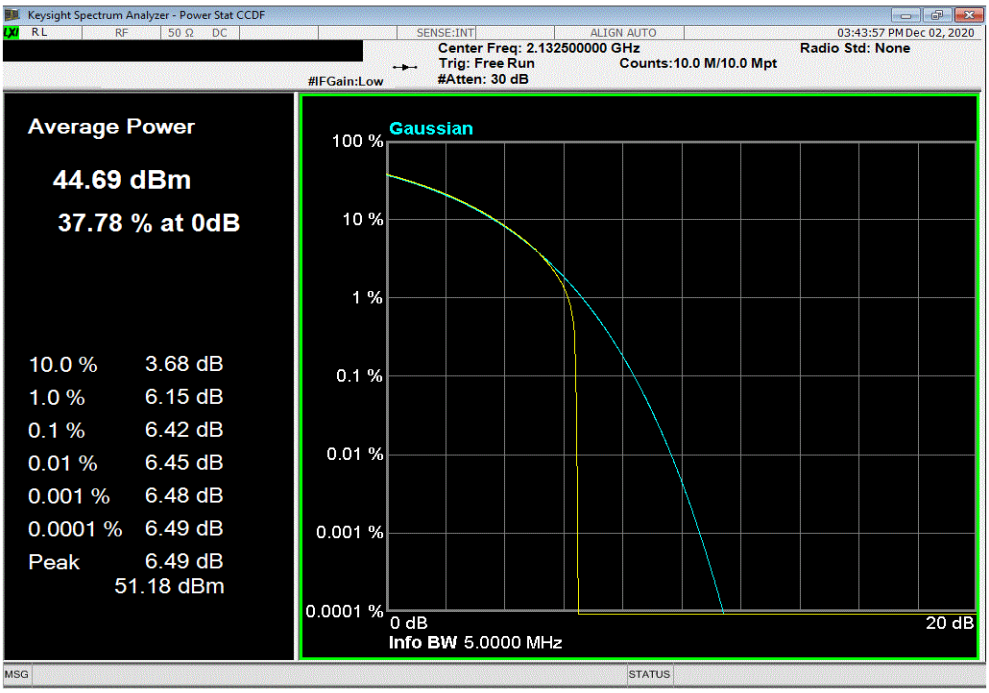
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , QPSK Modulation, Low Channel 2112.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.42	13	Pass



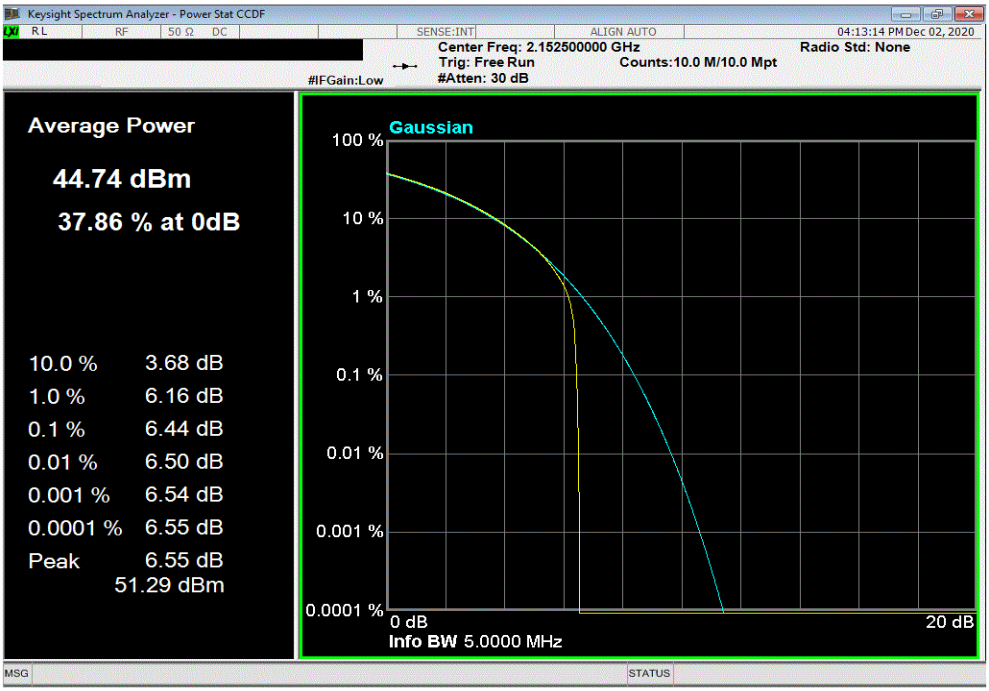
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , QPSK Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.42	13	Pass



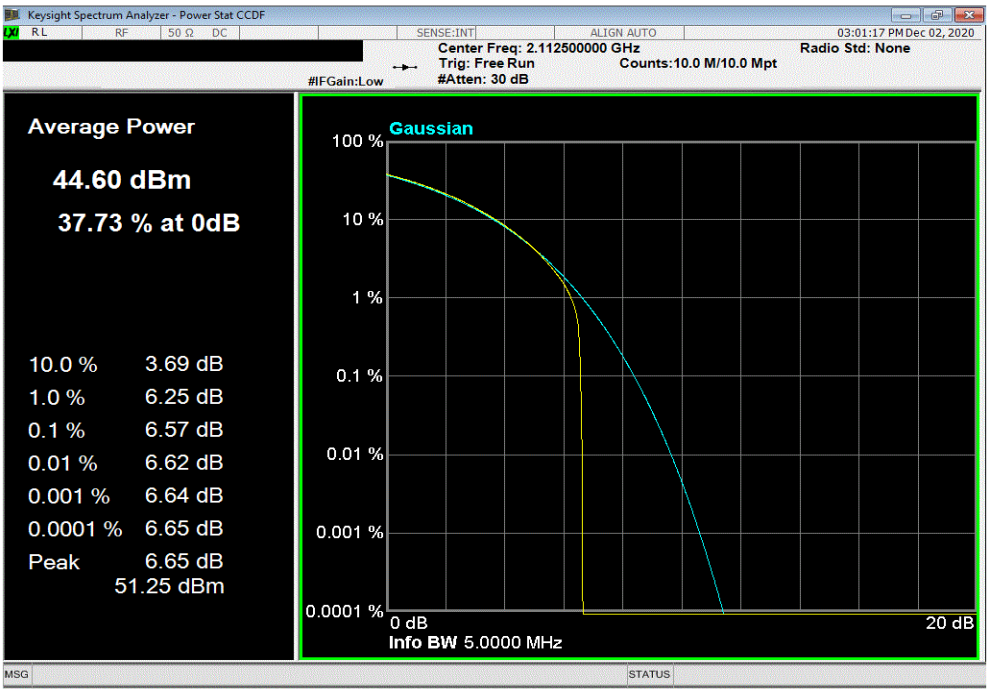
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , QPSK Modulation, High Channel 2152.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.44	13	Pass



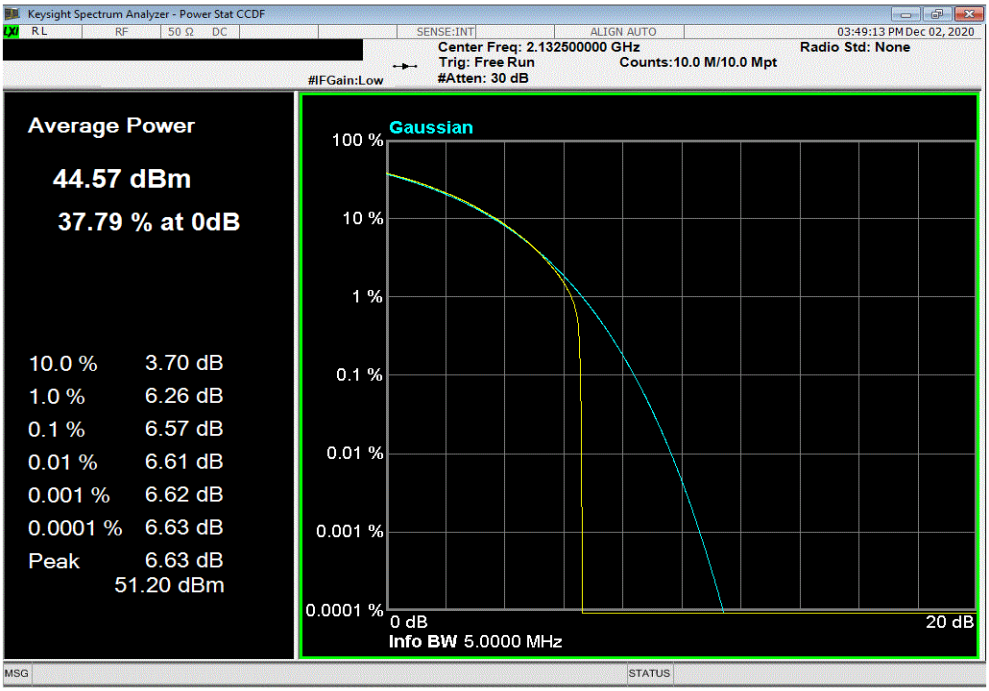
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 16-QAM Modulation, Low Channel 2112.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.57	13	Pass



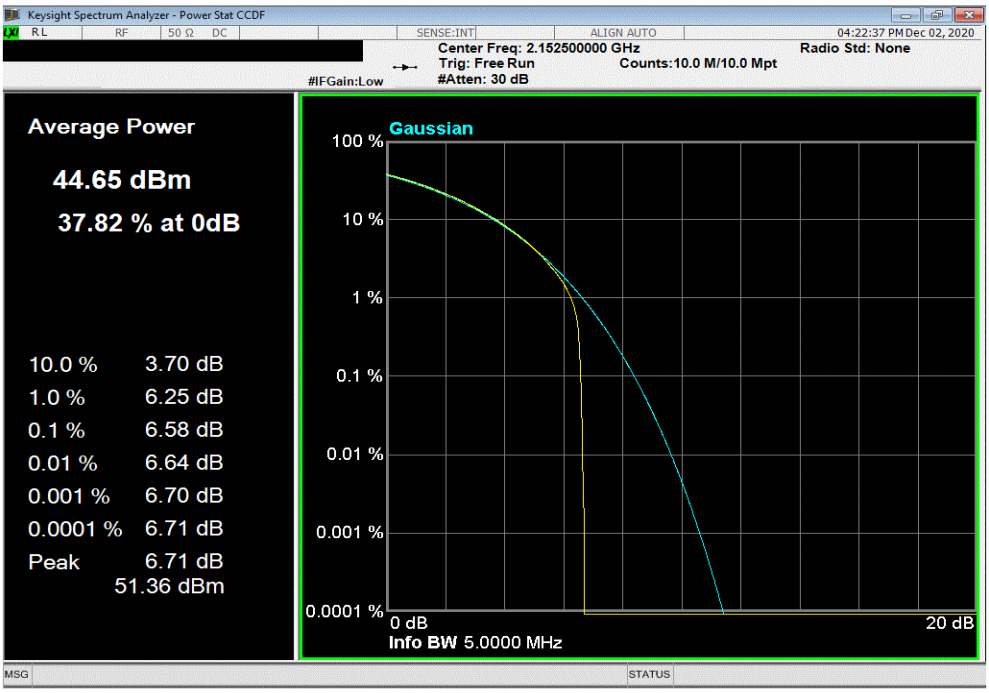
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 16-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.57	13	Pass



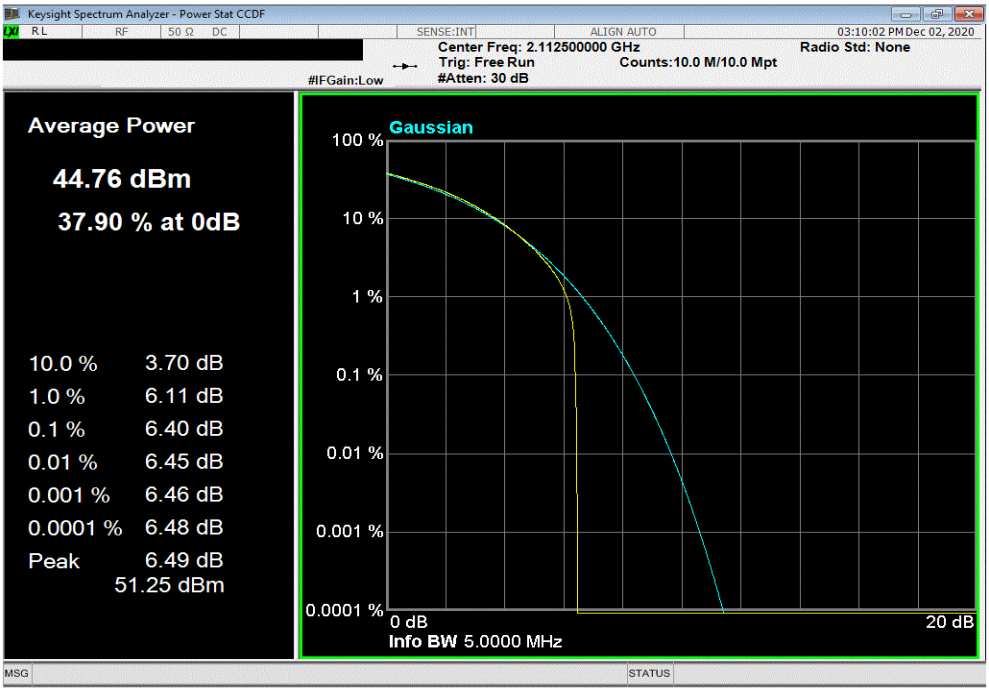
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 16-QAM Modulation, High Channel 2152.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.58	13	Pass



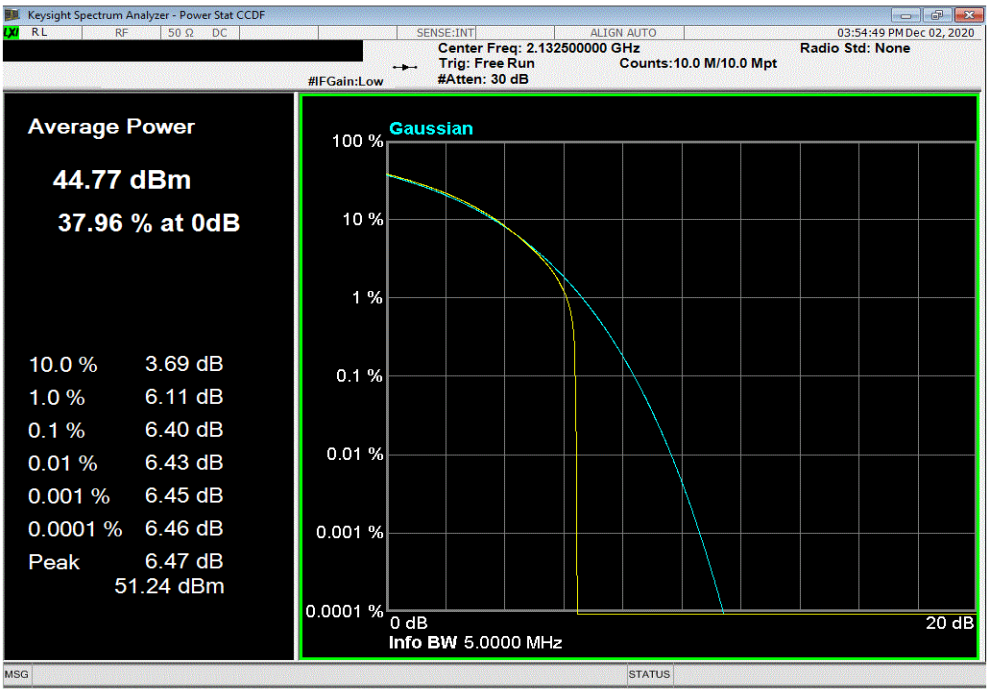
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 64-QAM Modulation, Low Channel 2112.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.4	13	Pass



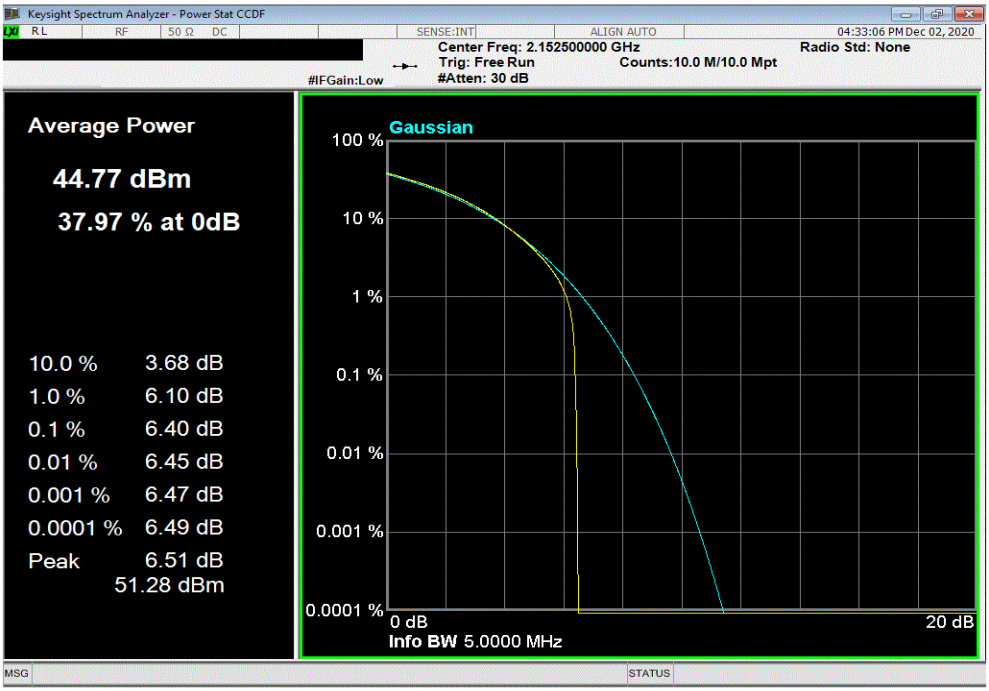
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 64-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.4	13	Pass



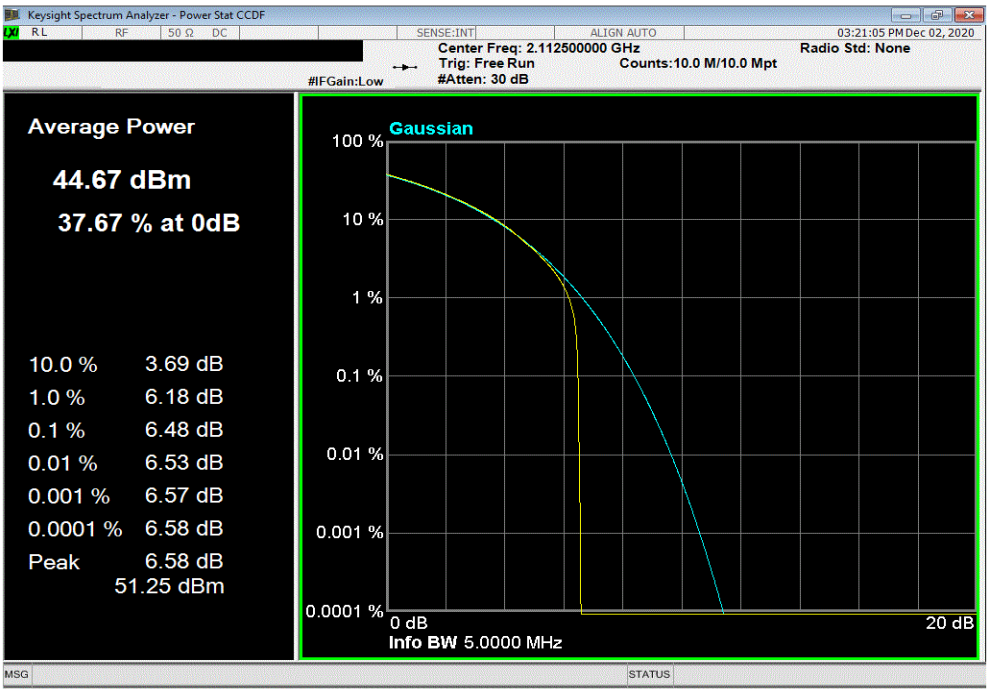
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 64-QAM Modulation, High Channel 2152.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.4	13	Pass



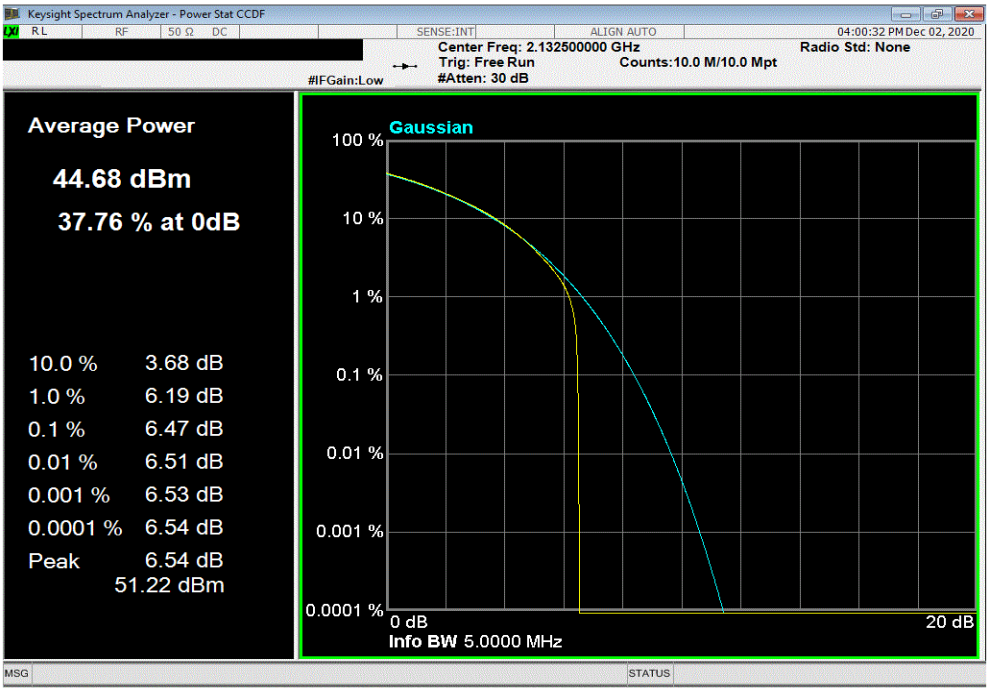
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 256-QAM Modulation, Low Channel 2112.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.48	13	Pass



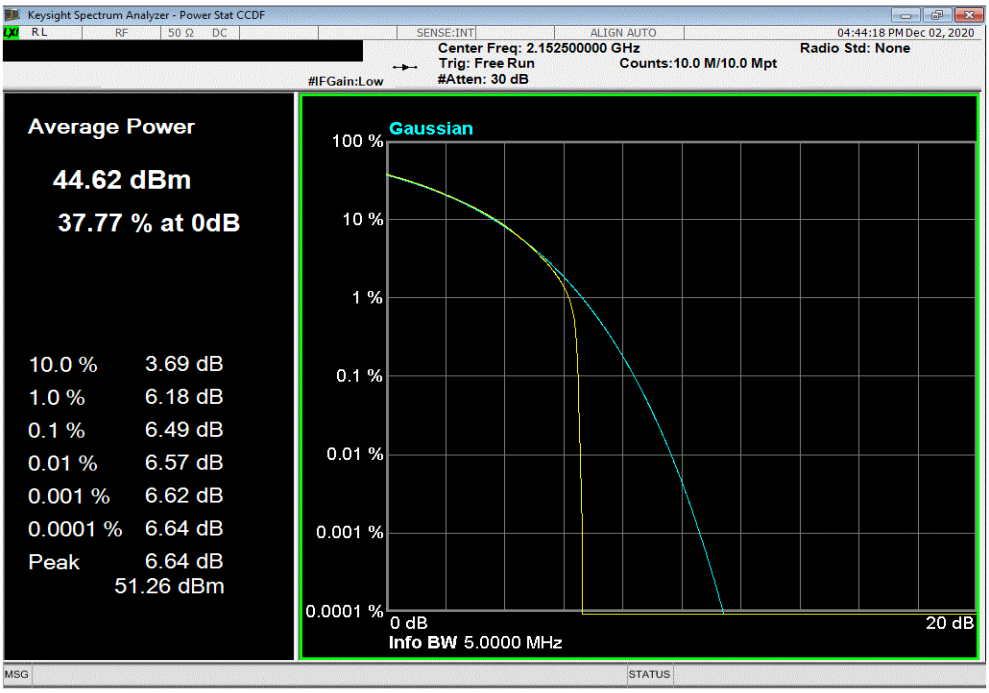
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 256-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.47	13	Pass



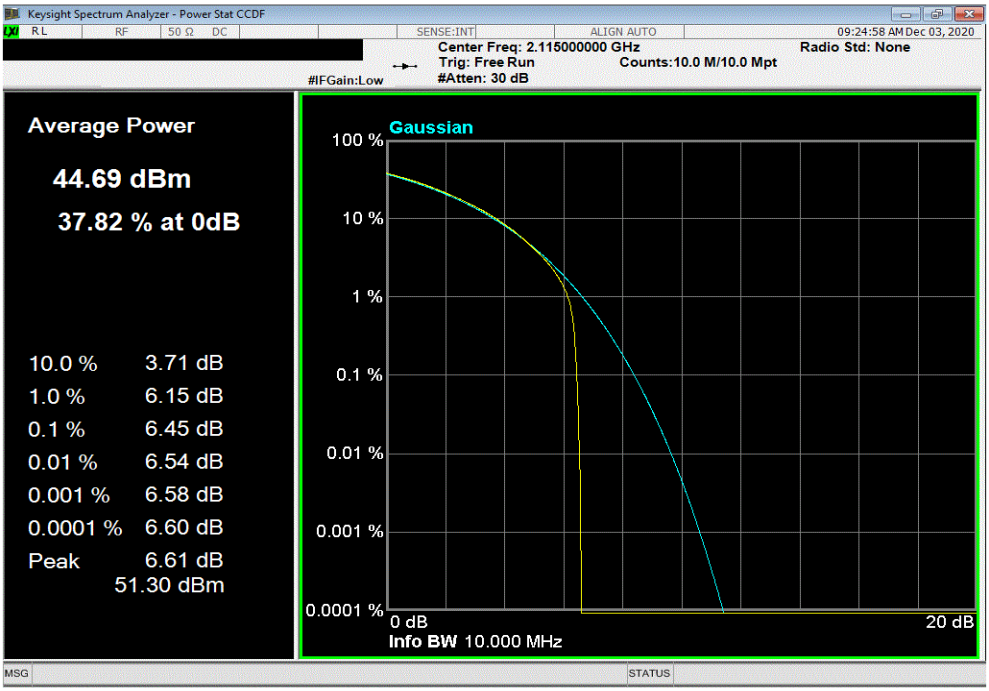
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 5 MHz Bandwidth , 256-QAM Modulation, High Channel 2152.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.49	13	Pass



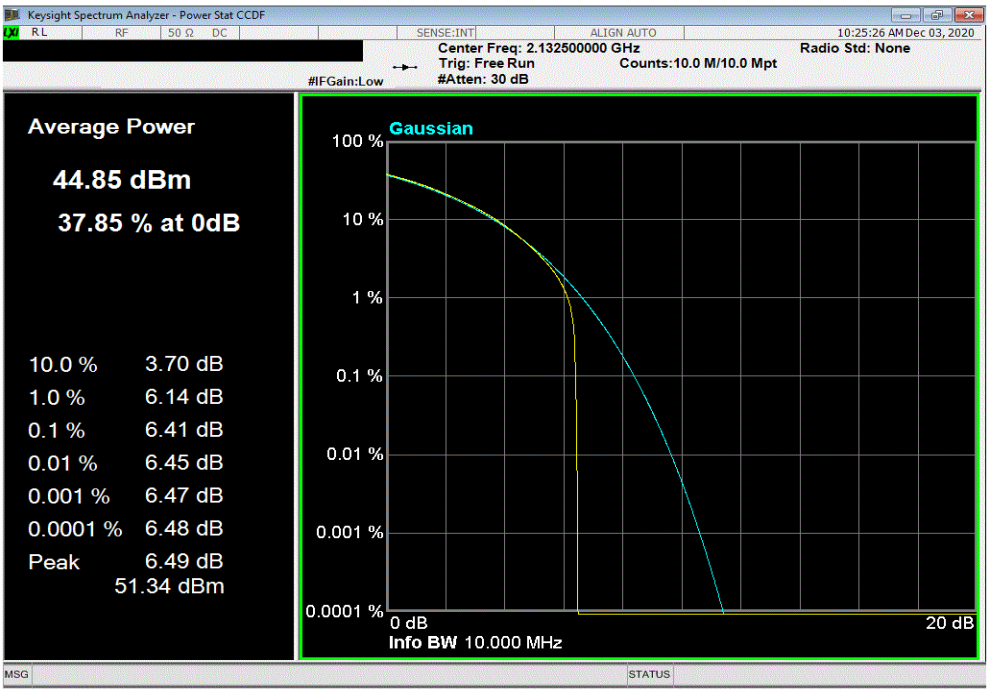
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , QPSK Modulation, Low Channel 2115 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.45	13	Pass



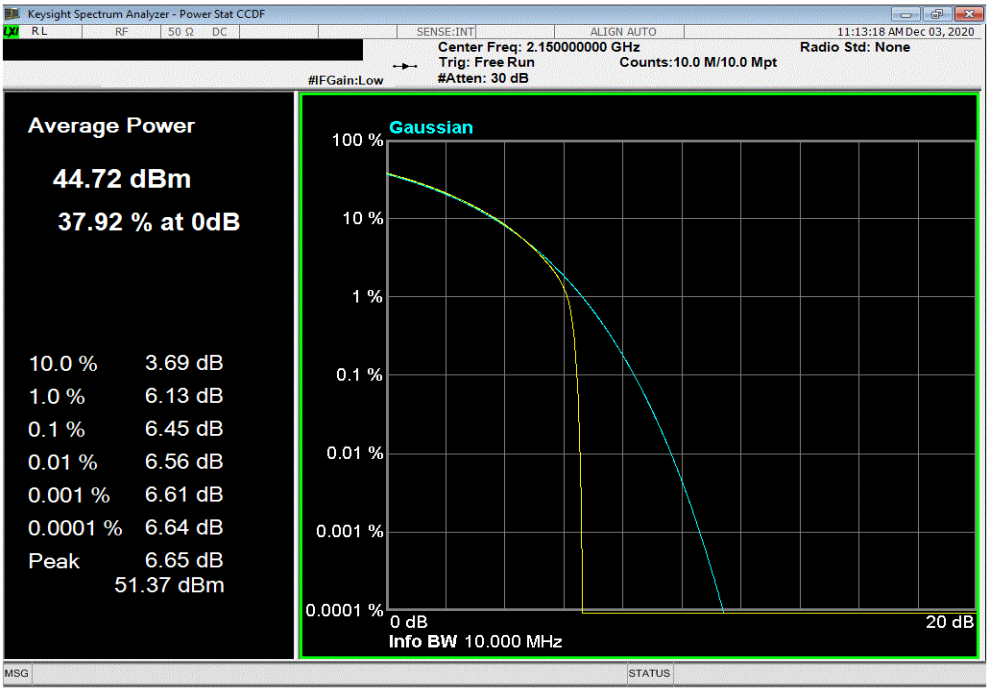
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , QPSK Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.41	13	Pass



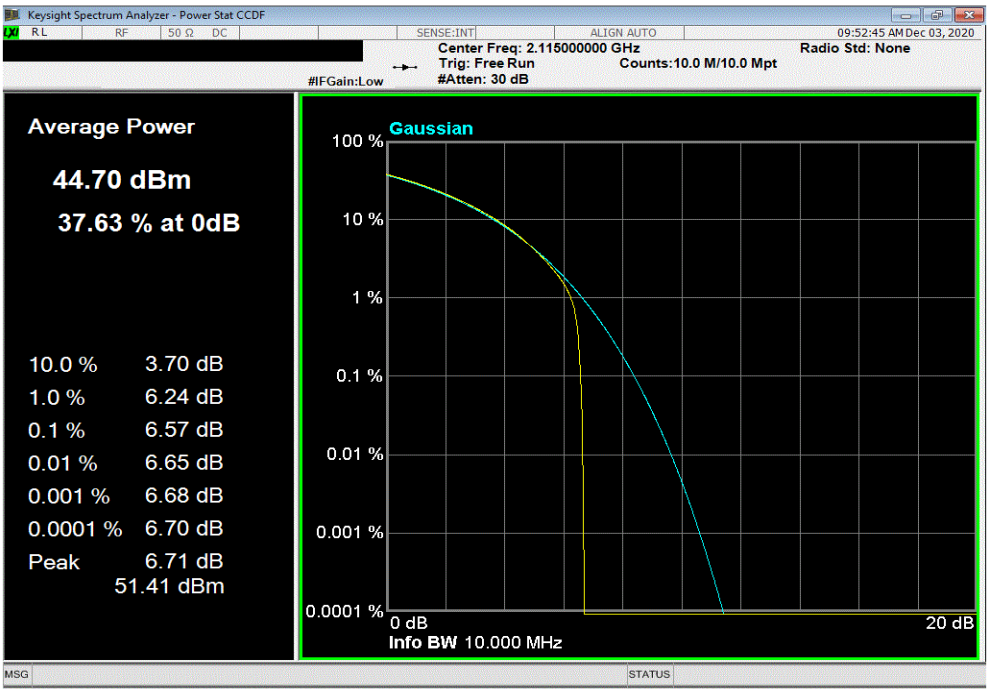
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , QPSK Modulation, High Channel 2150 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.45	13	Pass



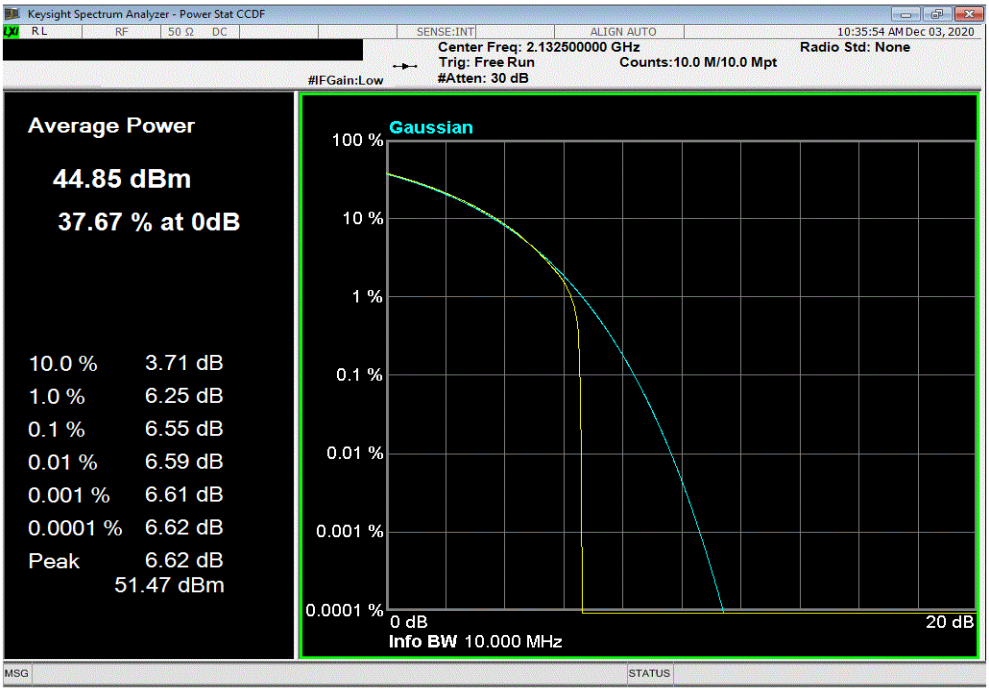
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 16-QAM Modulation, Low Channel 2115 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.57	13	Pass



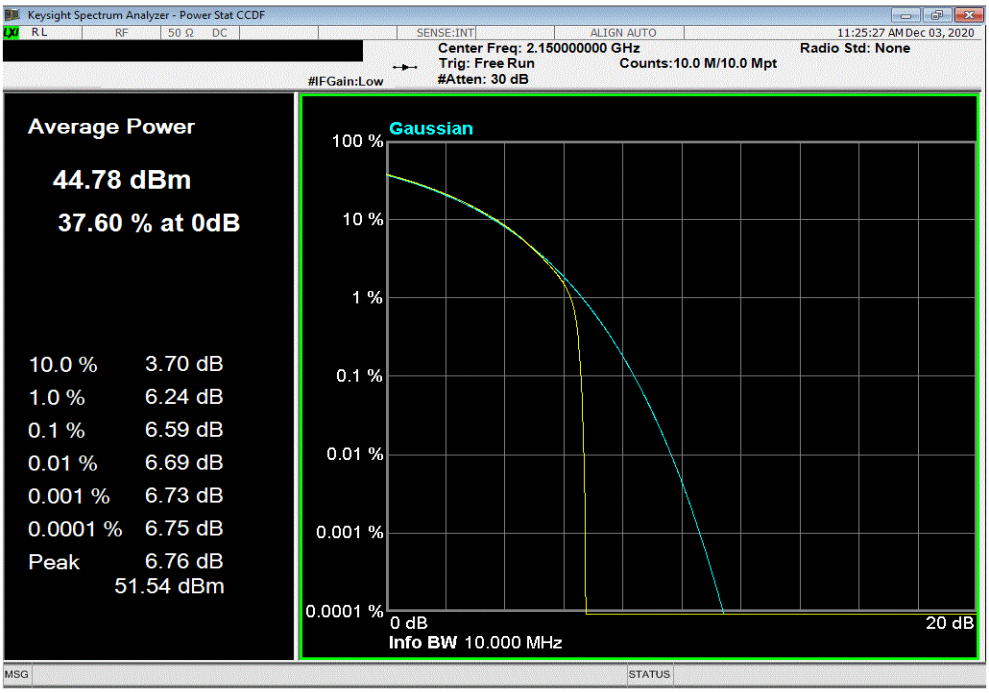
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 16-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.55	13	Pass



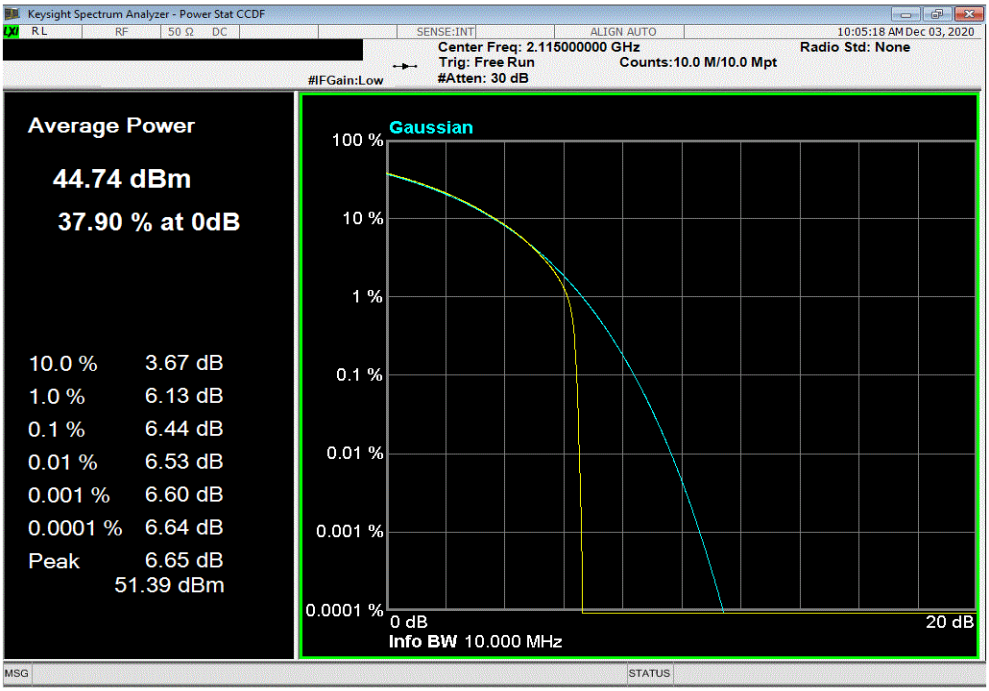
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 16-QAM Modulation, High Channel 2150 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.59	13	Pass



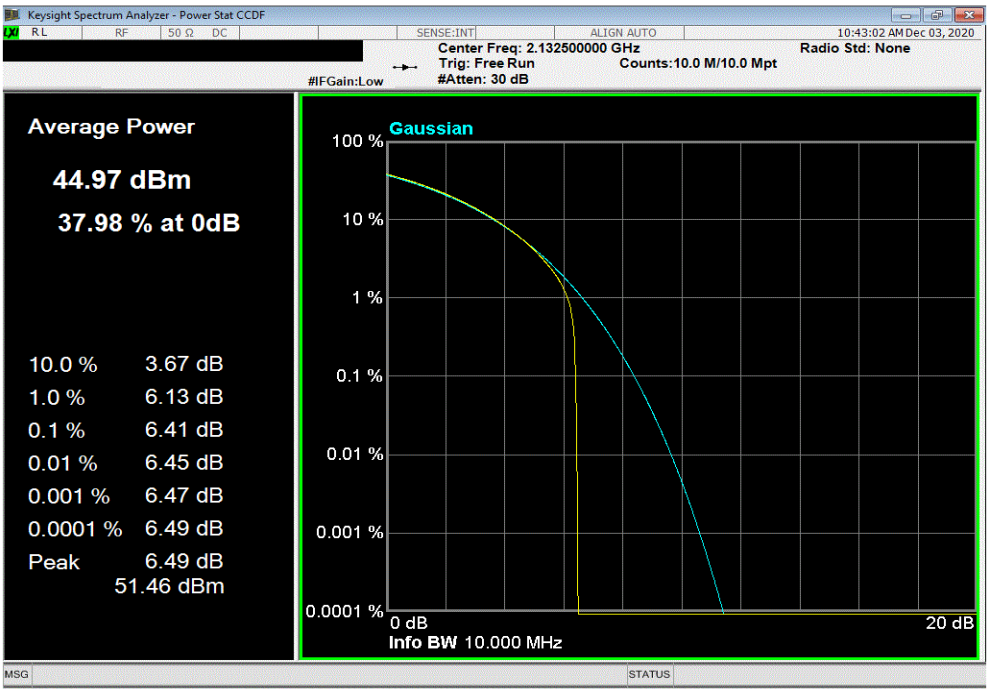
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 64-QAM Modulation, Low Channel 2115 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.44	13	Pass



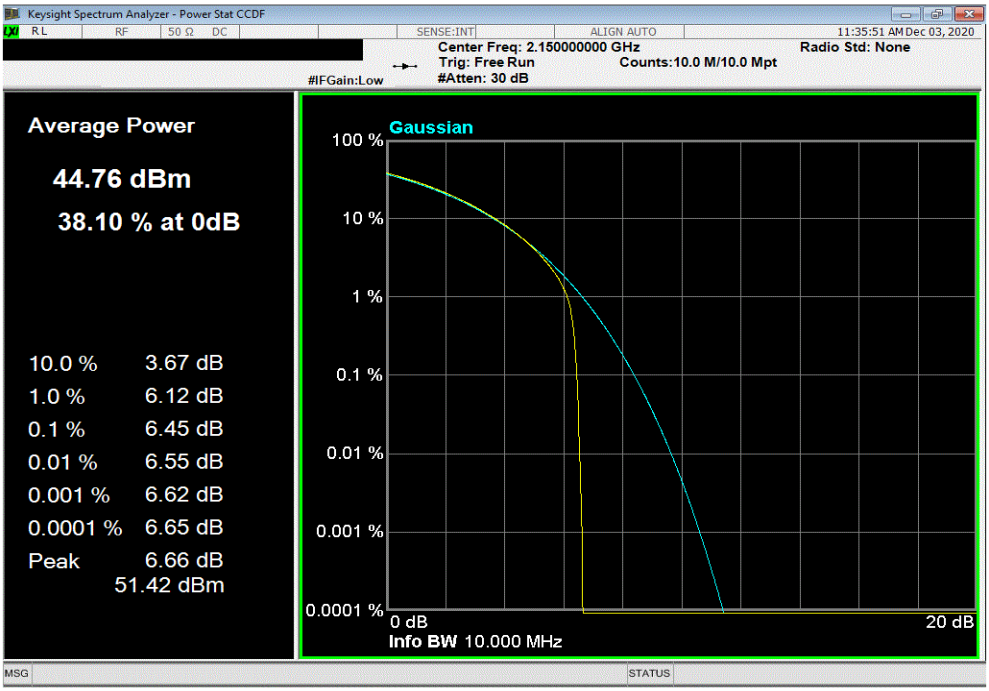
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 64-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.41	13	Pass



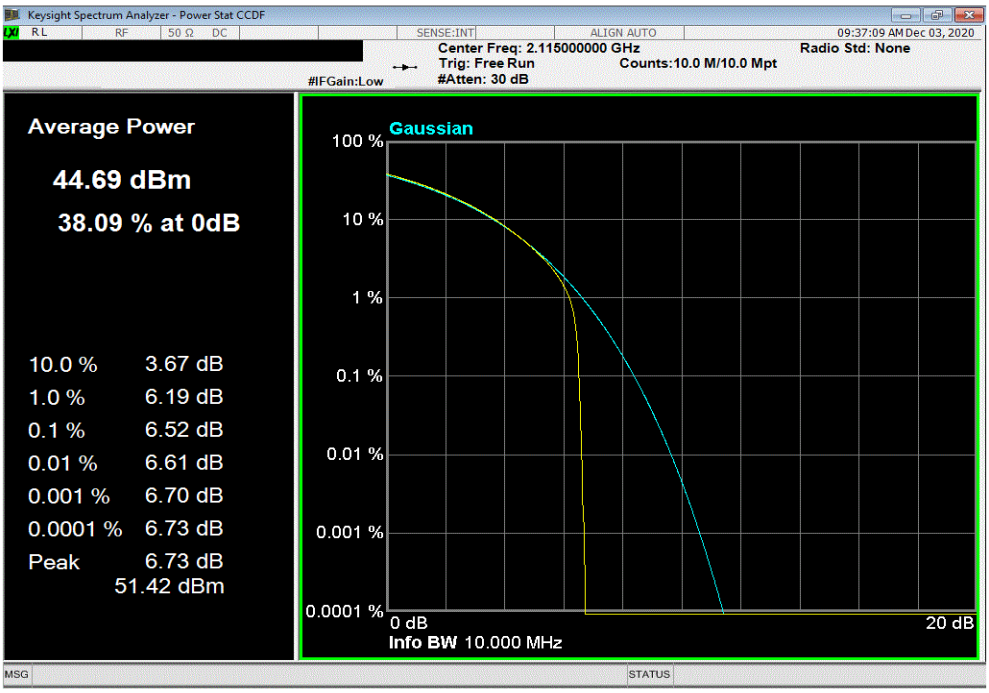
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 64-QAM Modulation, High Channel 2150 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.45	13	Pass



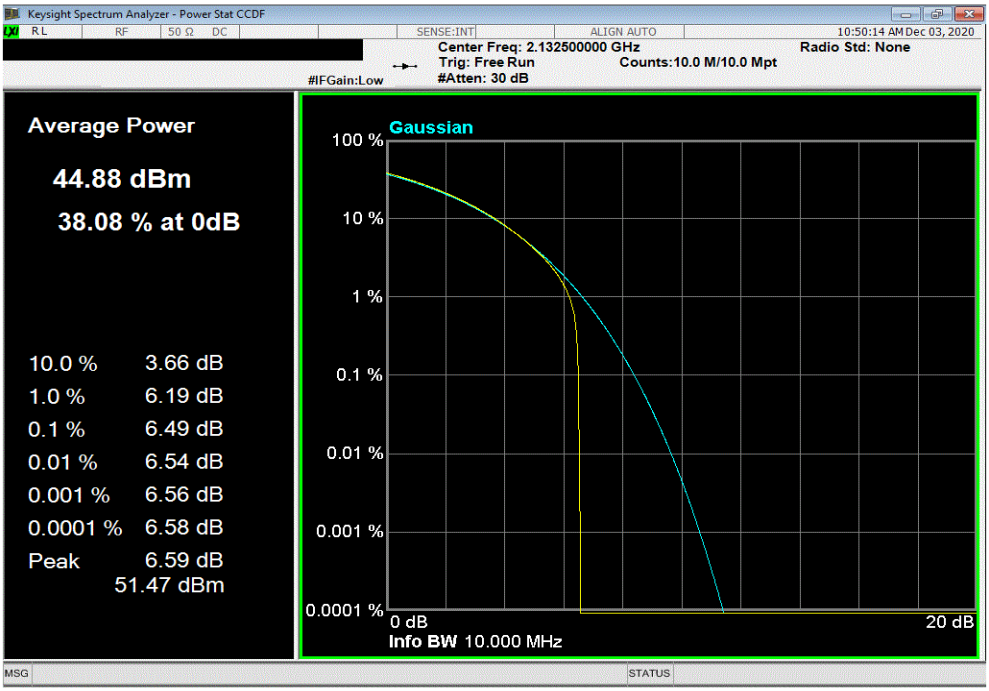
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 256-QAM Modulation, Low Channel 2115 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.52	13	Pass



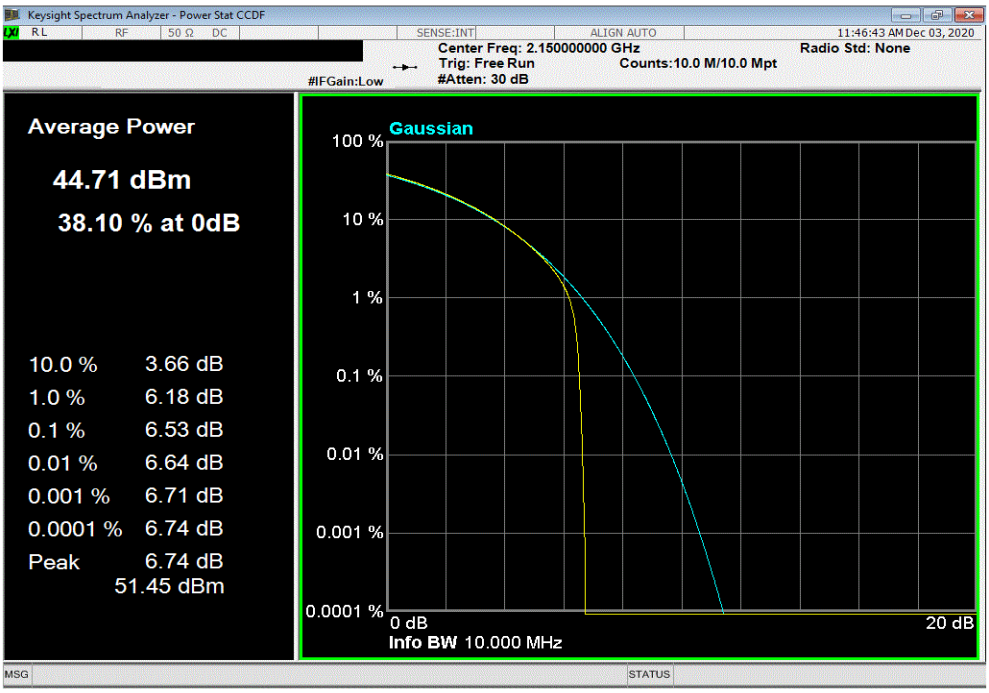
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 256-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.49	13	Pass



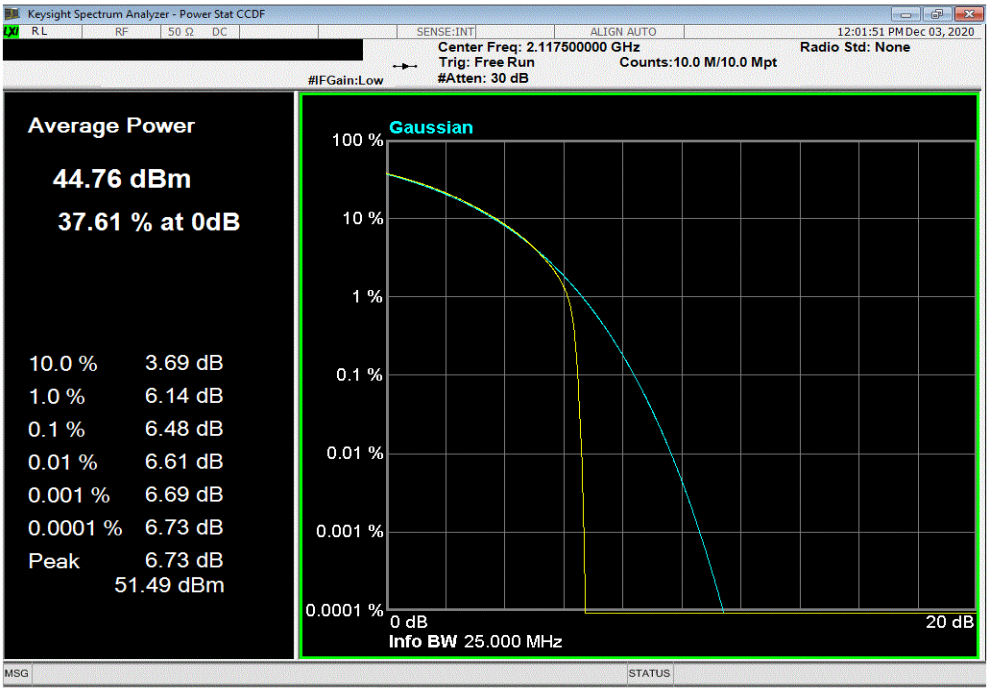
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 10 MHz Bandwidth , 256-QAM Modulation, High Channel 2150 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.53	13	Pass



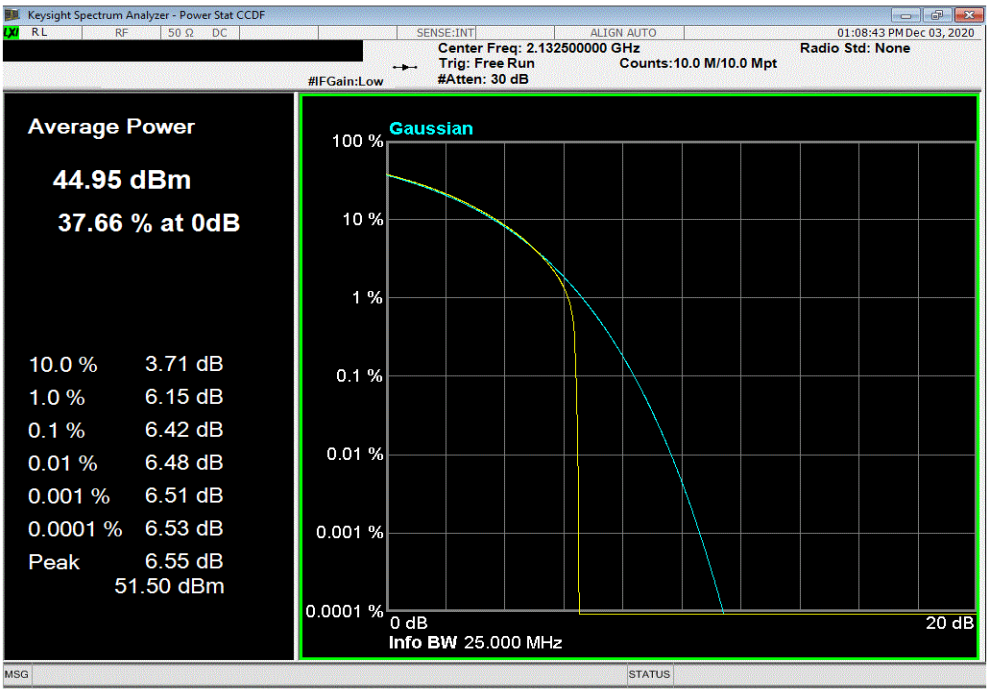
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , QPSK Modulation, Low Channel 2117.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.48	13	Pass



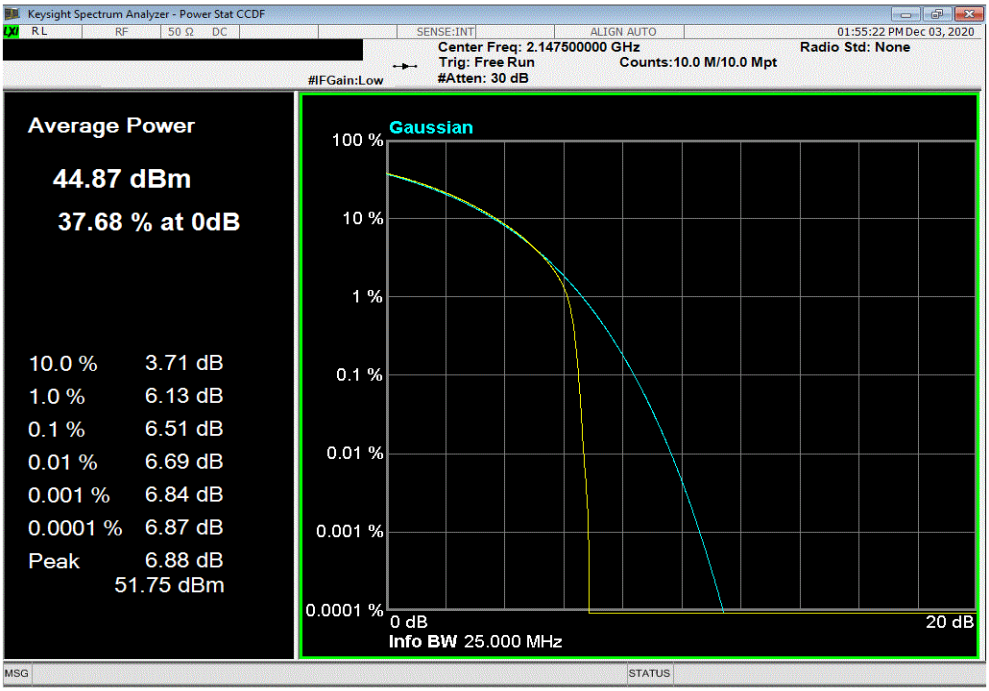
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , QPSK Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.42	13	Pass



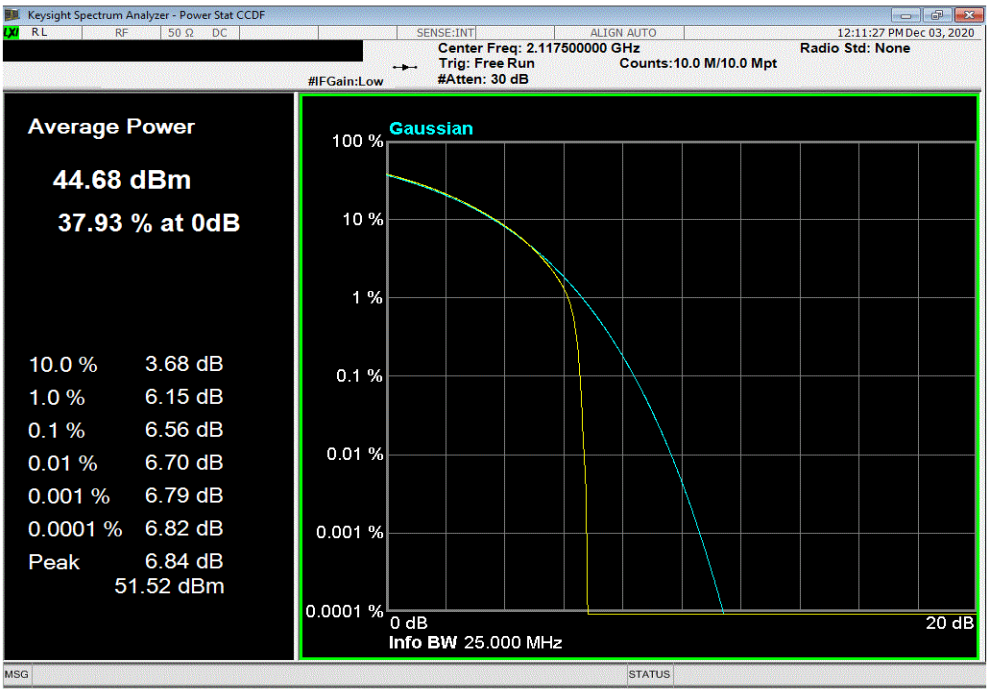
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , QPSK Modulation, High Channel 2147.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.51	13	Pass



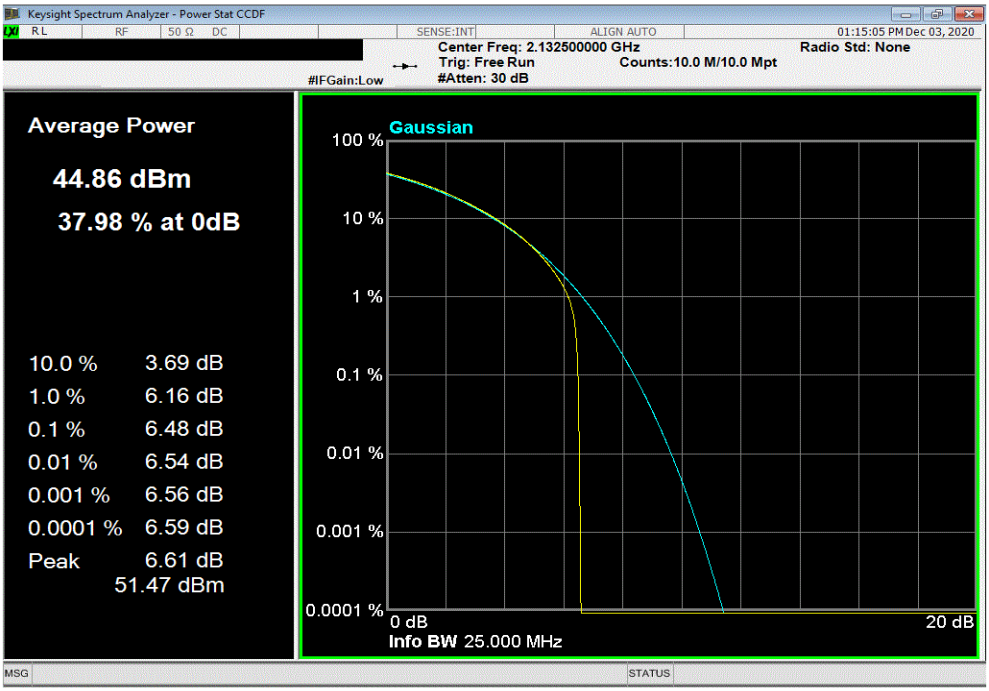
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 16-QAM Modulation, Low Channel 2117.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.56	13	Pass



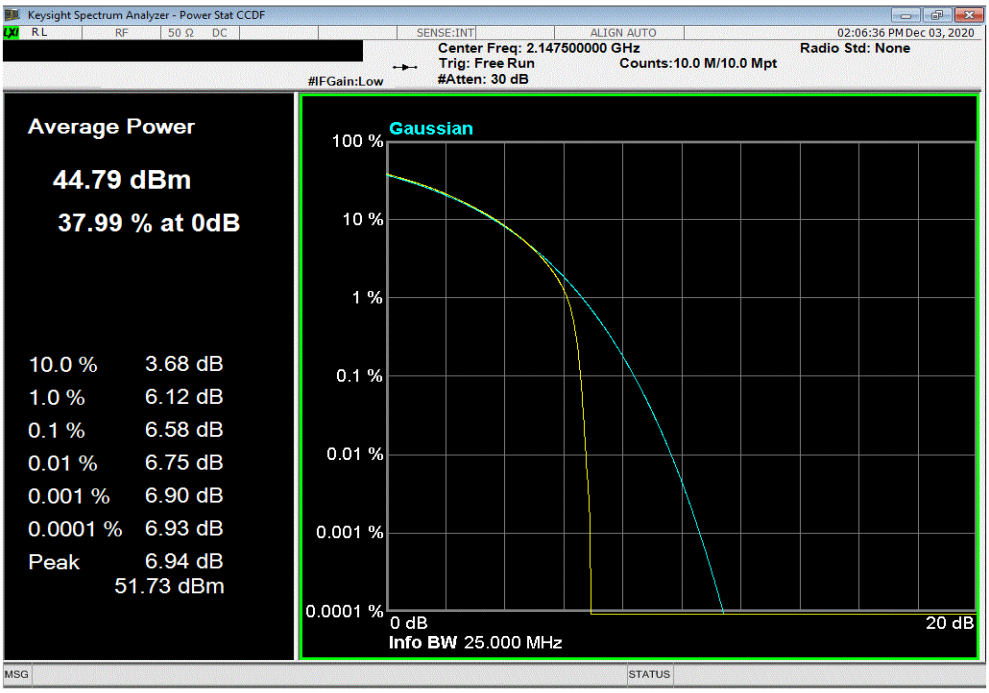
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 16-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.48	13	Pass



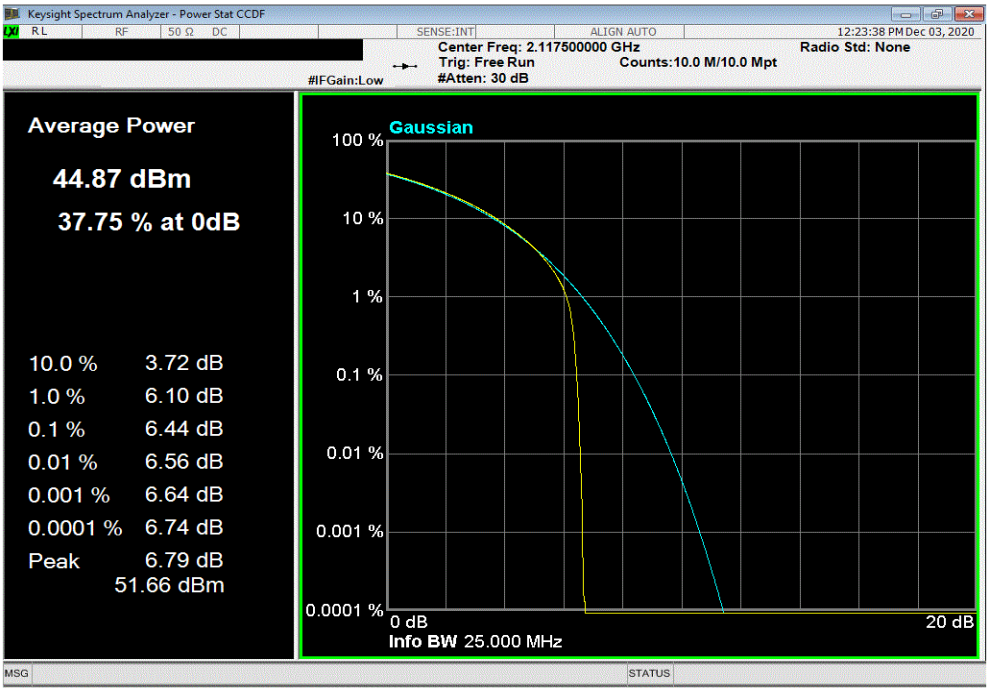
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 16-QAM Modulation, High Channel 2147.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.58	13	Pass



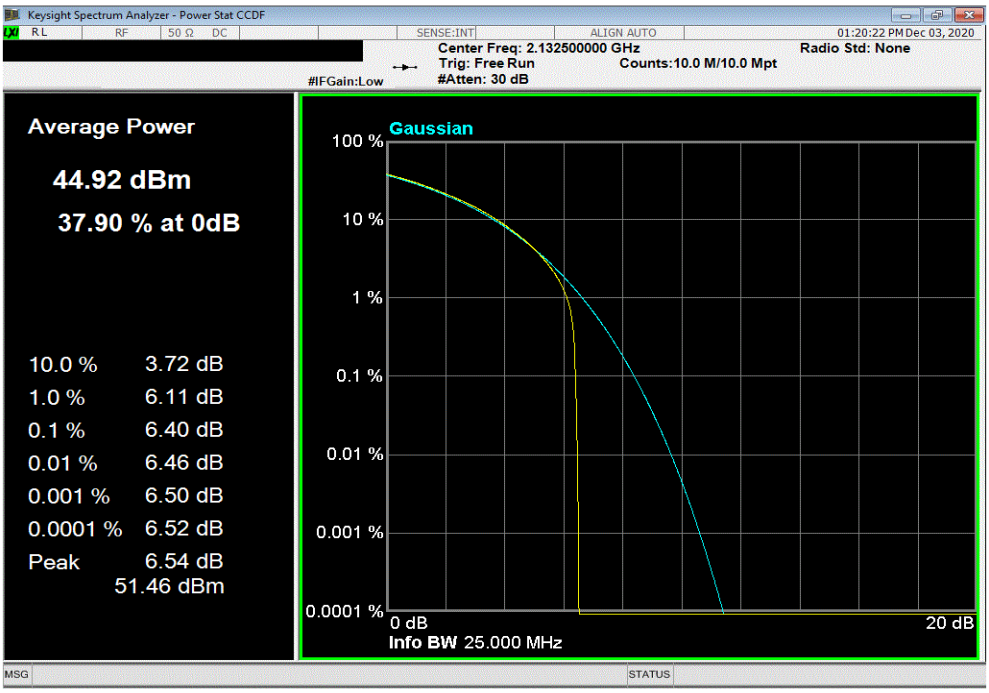
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 64-QAM Modulation, Low Channel 2117.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.44	13	Pass



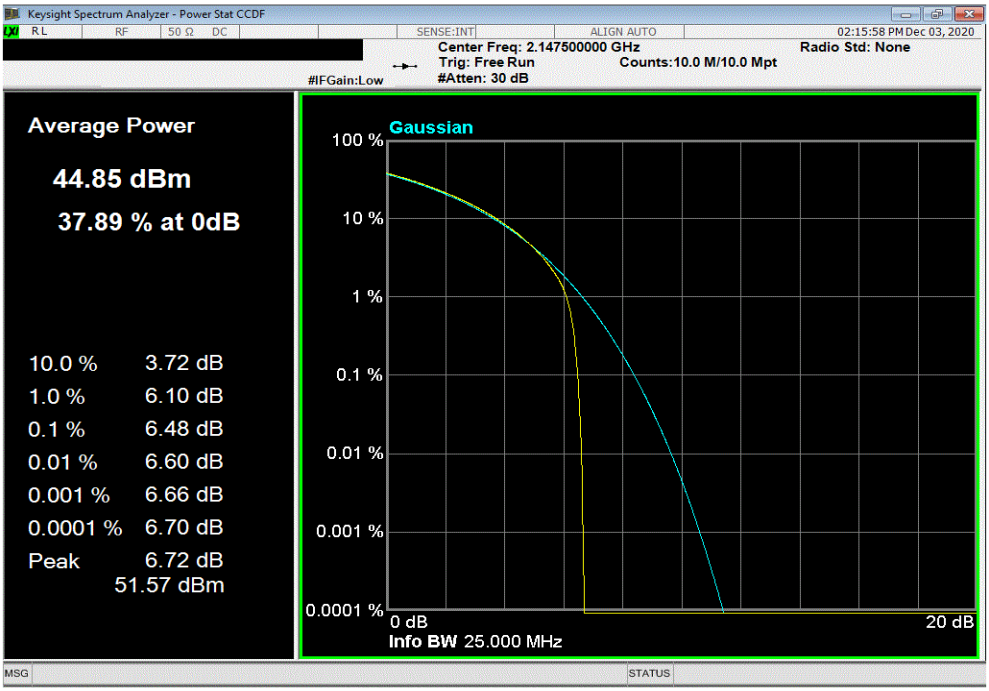
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 64-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.4	13	Pass



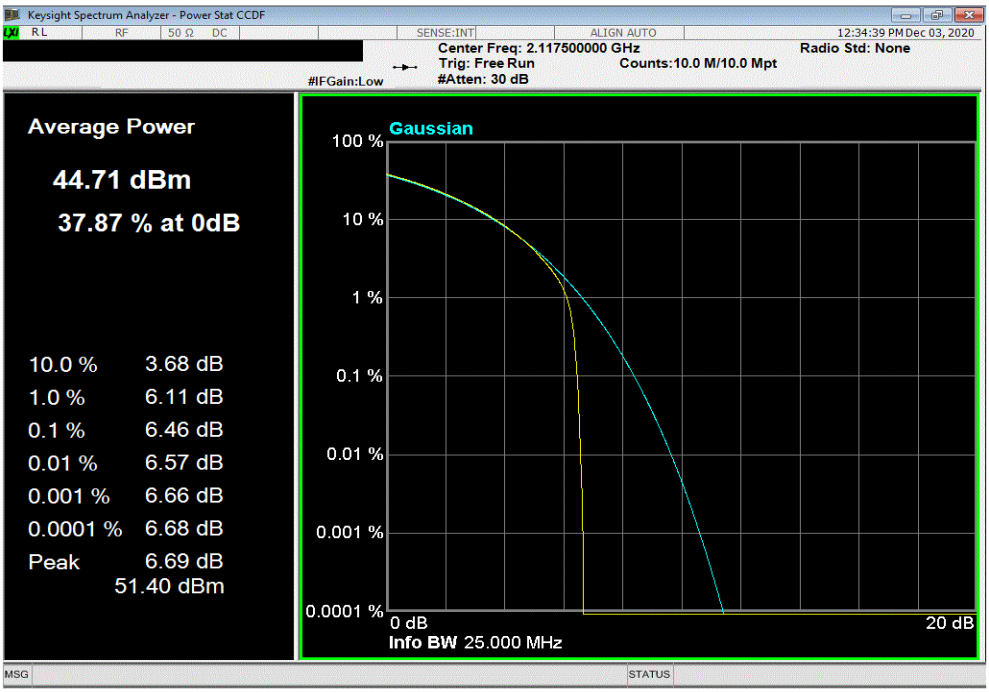
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 64-QAM Modulation, High Channel 2147.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.48	13	Pass



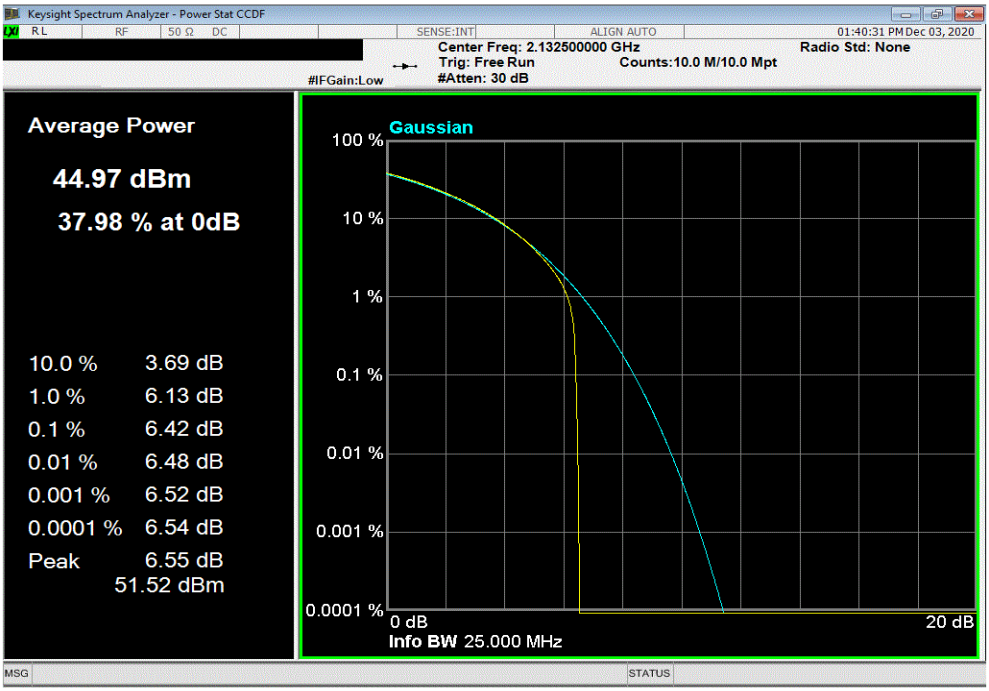
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 256-QAM Modulation, Low Channel 2117.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.46	13	Pass



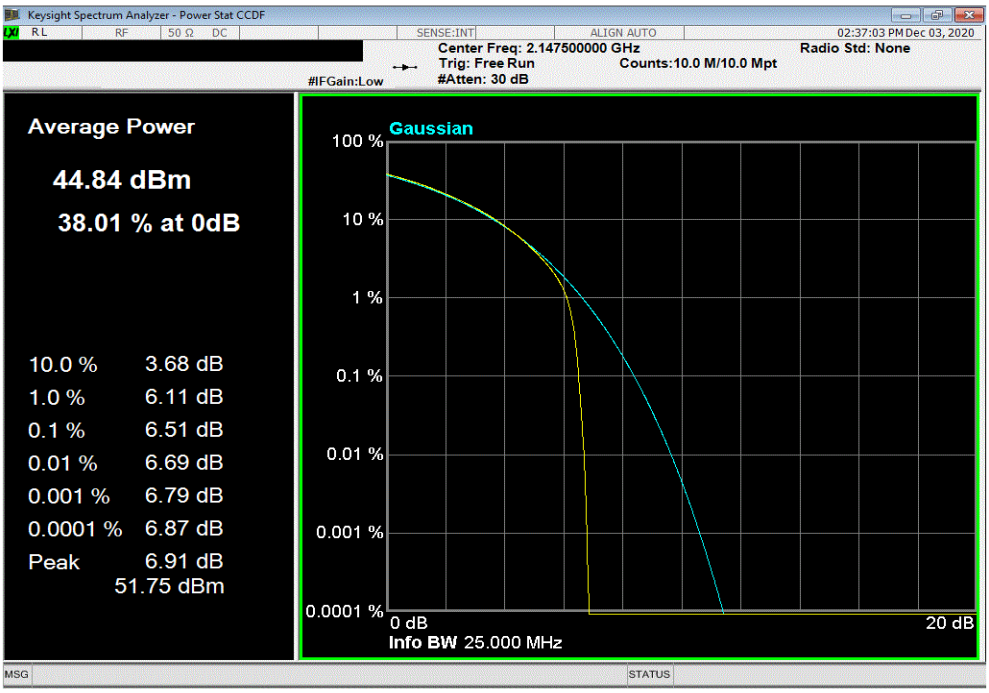
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 256-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.42	13	Pass



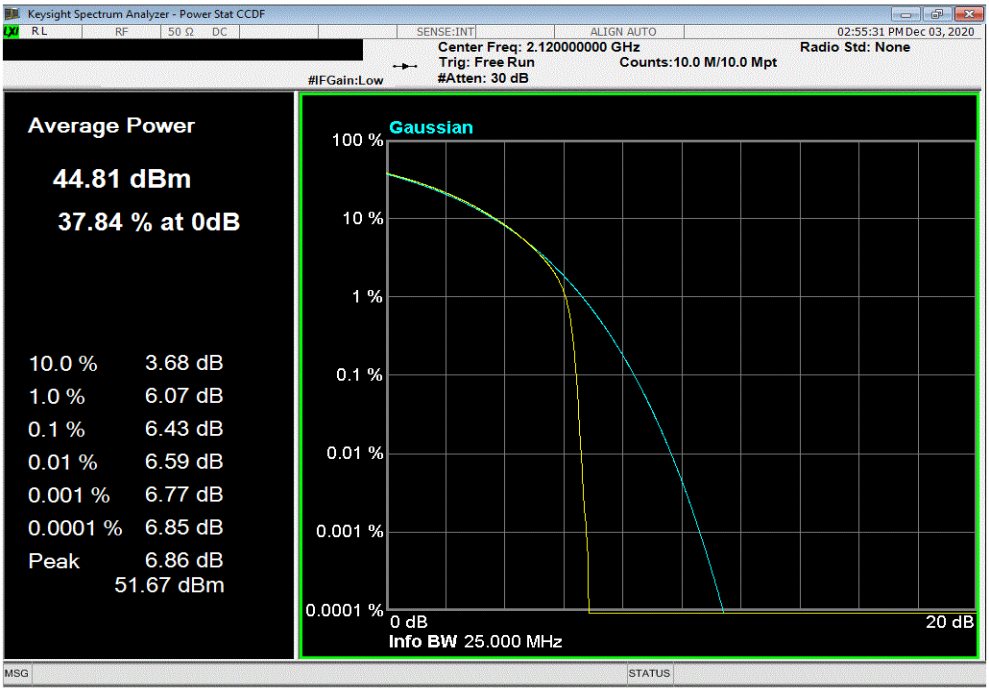
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 15 MHz Bandwidth , 256-QAM Modulation, High Channel 2147.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.51	13	Pass



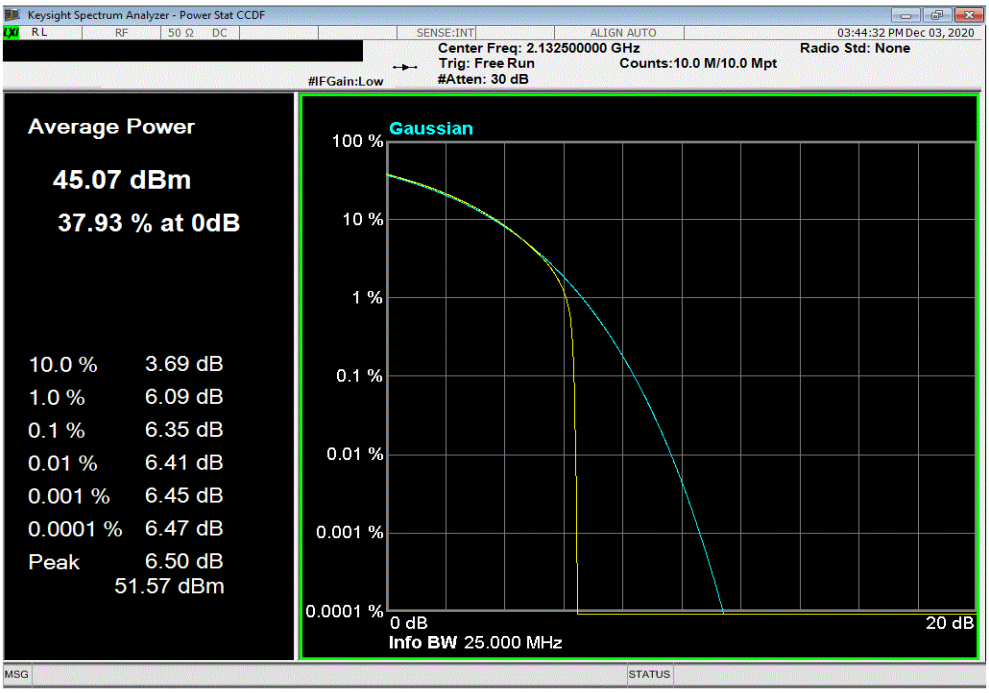
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, QPSK Modulation, Low Channel 2120 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.43	13	Pass



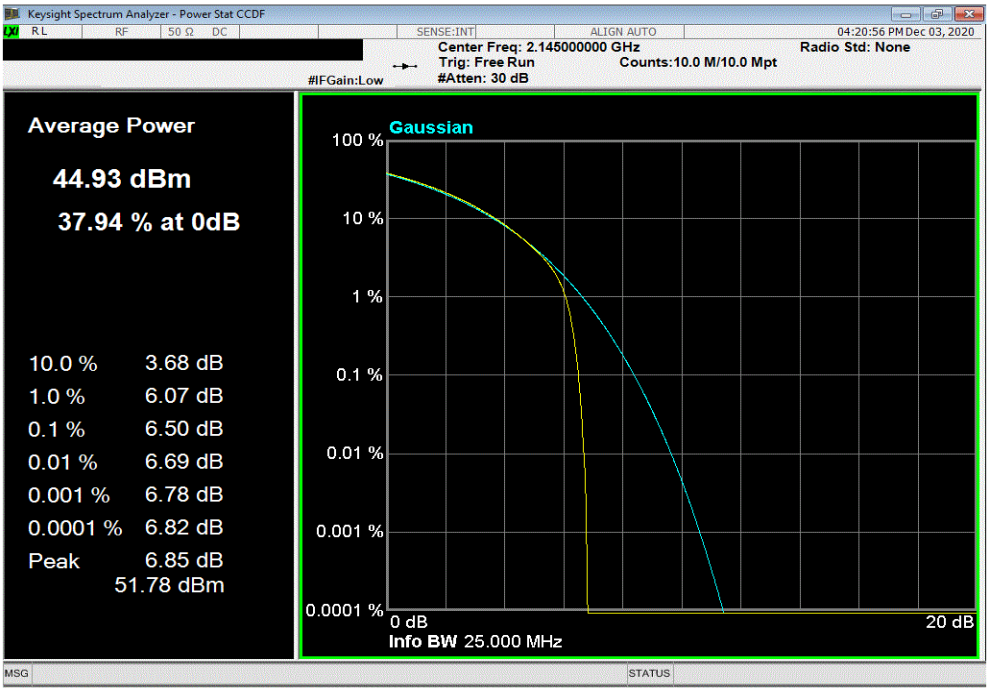
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, QPSK Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.35	13	Pass



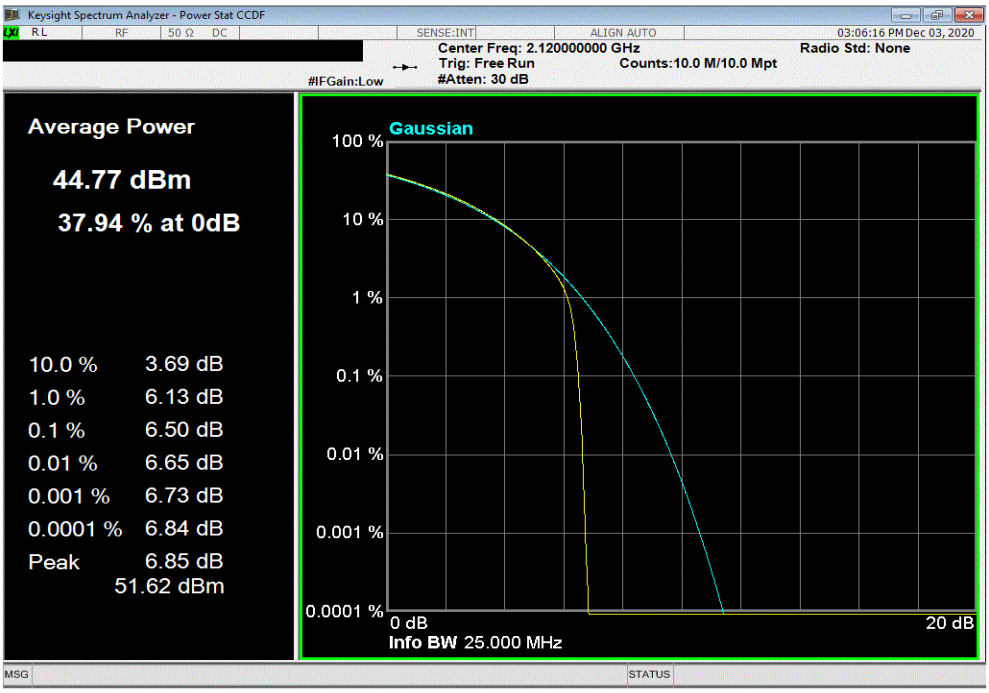
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, QPSK Modulation, High Channel 2145 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.5	13	Pass



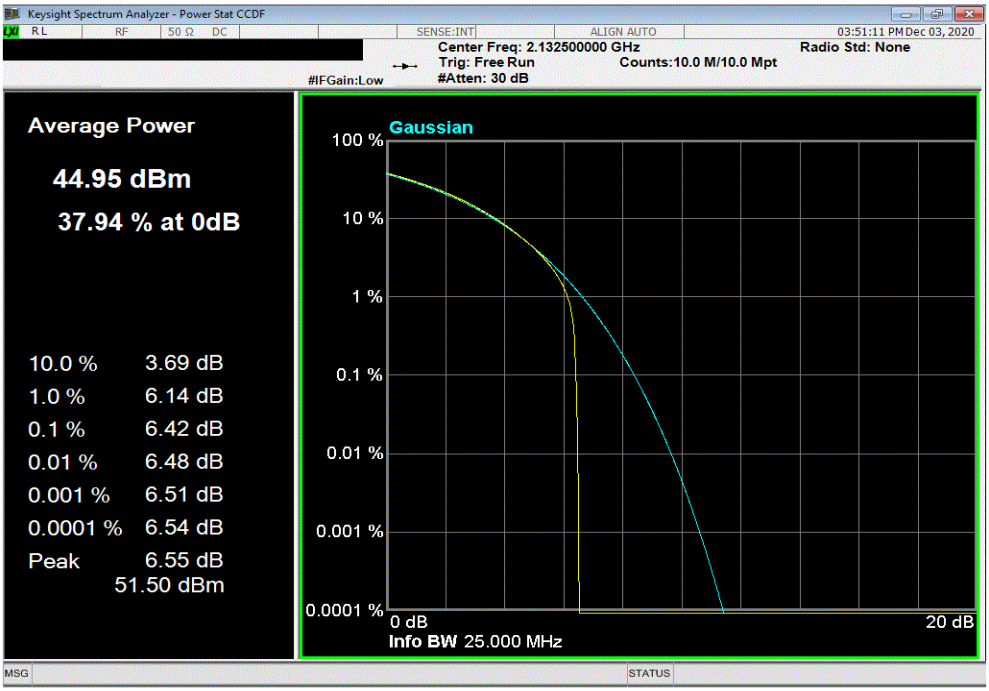
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 16-QAM Modulation, Low Channel 2120 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.5	13	Pass



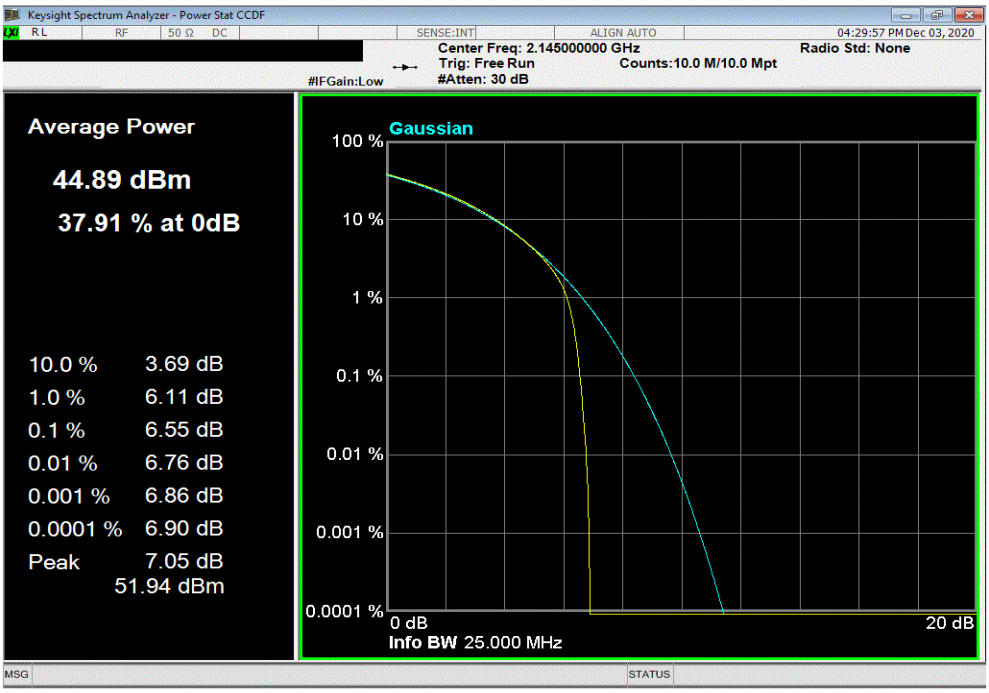
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 16-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.42	13	Pass



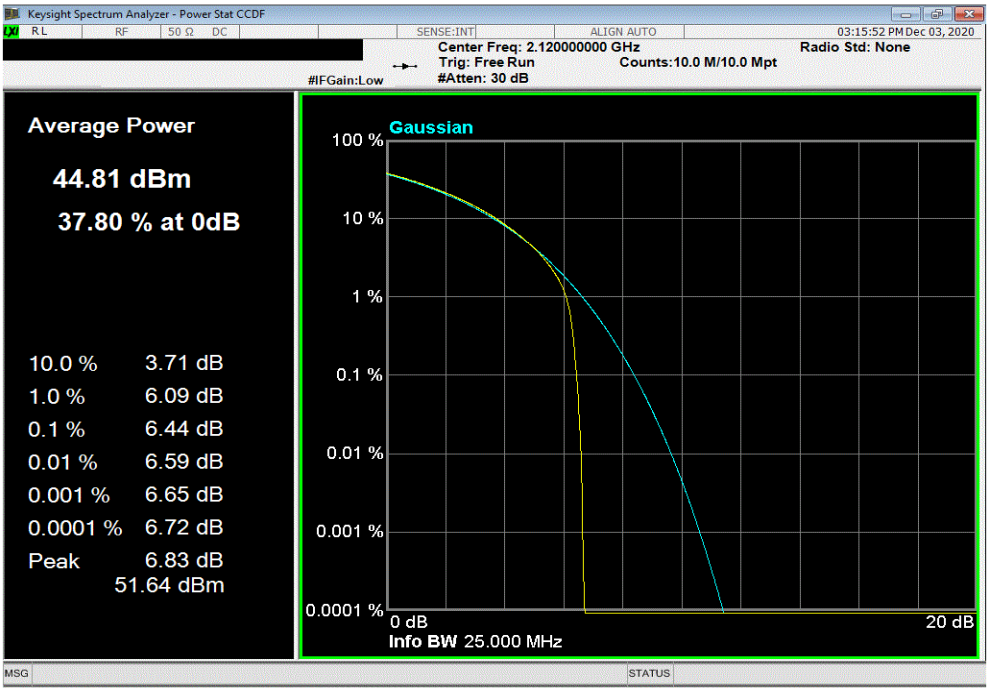
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 16-QAM Modulation, High Channel 2145 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.55	13	Pass



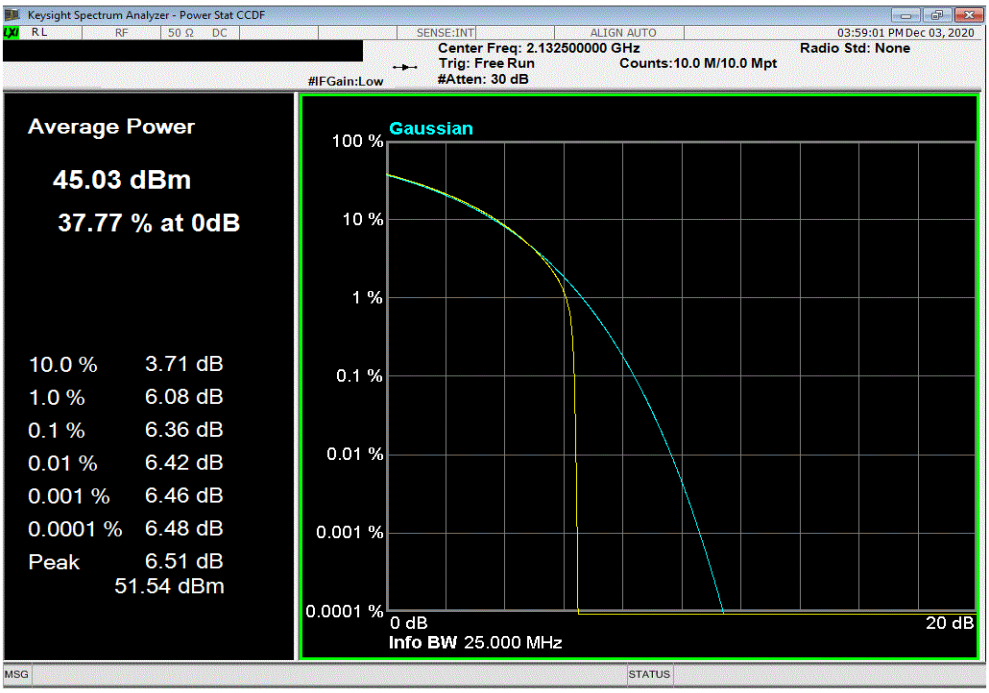
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 64-QAM Modulation, Low Channel 2120 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.44	13	Pass



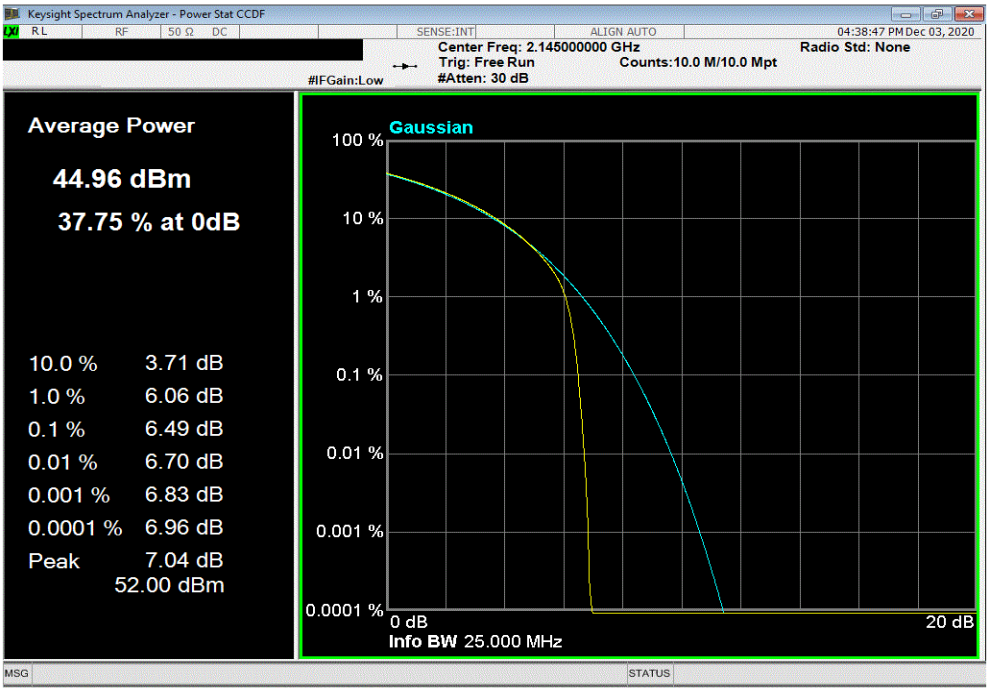
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 64-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.36	13	Pass



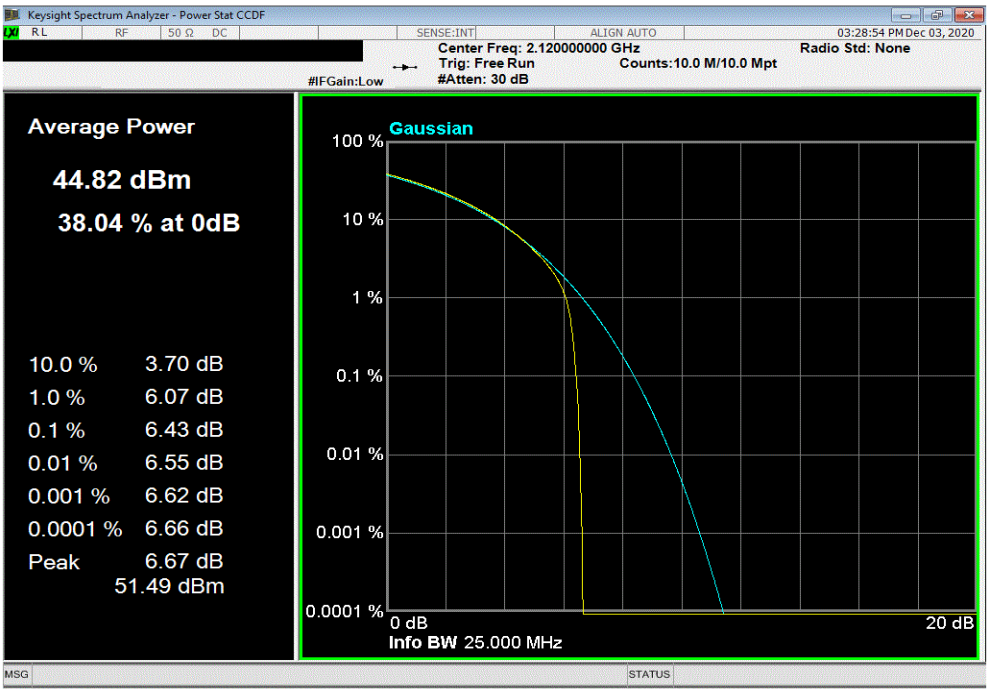
PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 64-QAM Modulation, High Channel 2145 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.49	13	Pass



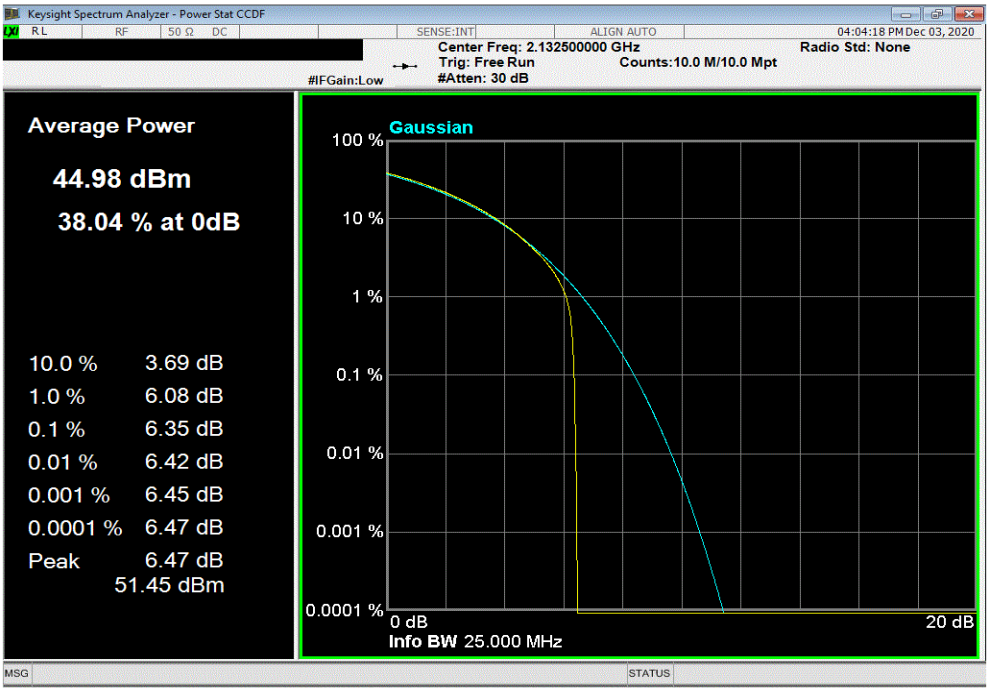
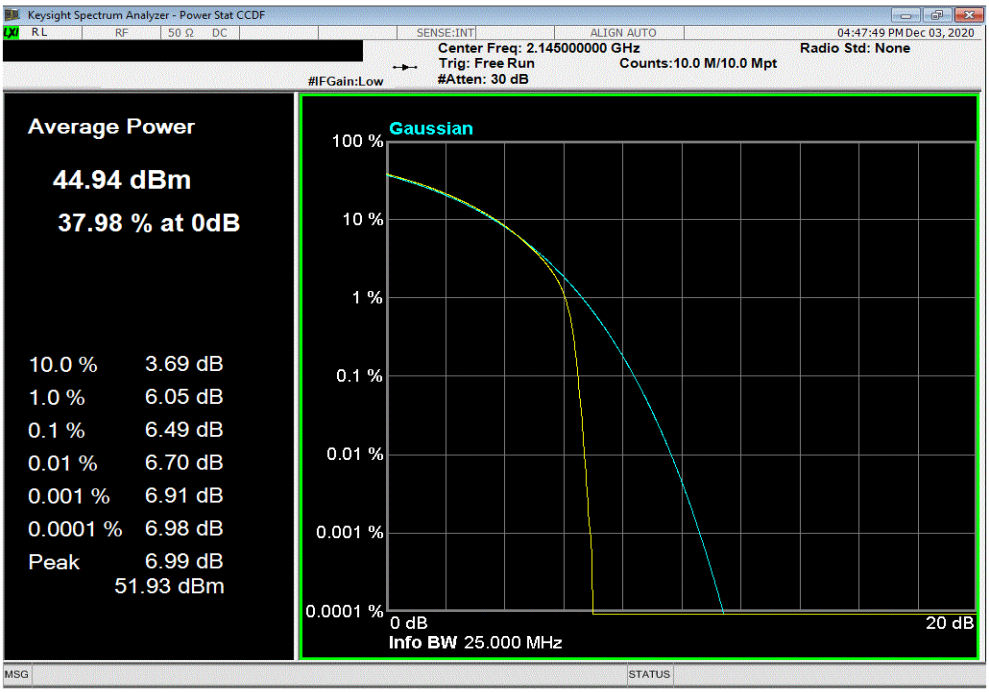
30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Low Channel 2120 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.43	13	Pass



PEAK TO AVERAGE (PAPR) CCDF - 4 PORT MODE

TbtTx 2020.10.20.0 BETA XMit 2020.03.25.0

30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 256-QAM Modulation, Mid Channel 2132.5 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.35	13	Pass



30 Watt Port 1, Band 1, 2110 MHz - 2155 MHz, 20 MHz Bandwidth, 256-QAM Modulation, High Channel 2145 MHz						
				PAPR Value (dB)	PAPR Limit (dB)	Results
				6.49	13	Pass