PEAK TO AVERAGE POWER (PAPR) CCDF 5G

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 - Signal Analyzer	Keysight Technologies	N9030B	R275	2020-06-13	2021-06-13
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21

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 13 dB.

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 FCC Part 27.50, 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 only on one port. The AZHL antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown during output power testing) and antenna 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.

PEAK TO AVERAGE POWER (PAPR) CCDF 5G

TbtTx 2019.08.30.0 XMit 2020.12.30.0

EUT:	**AZHL**			**Work Order:**	**NOKI0018**
Serial Number:	**YK203400016**			**Date:**	**19-Feb-21**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**23.6 °C**
Attendees:	**John Rattanavong, Mitchell Hill, David Le**			**Humidity:**	**14.9% RH**
Project:	**None**			**Barometric Pres.:**	**1037 mbar**
Tested by:	**Mark Baytan**	**Power:**	**54 VDC**	**Job Site:**	**TX05**

TEST SPECIFICATIONS	**Test Method**
FCC 27:2021	ANSI C63.26:2015

COMMENTS

External 1 gating was set using a trig delay = 86.2us and a gate length = 3.714ms. Reference level offset adjusted to include (2) coax cables, DC block, and attenuator. The carrier power was set to maximum for testing.

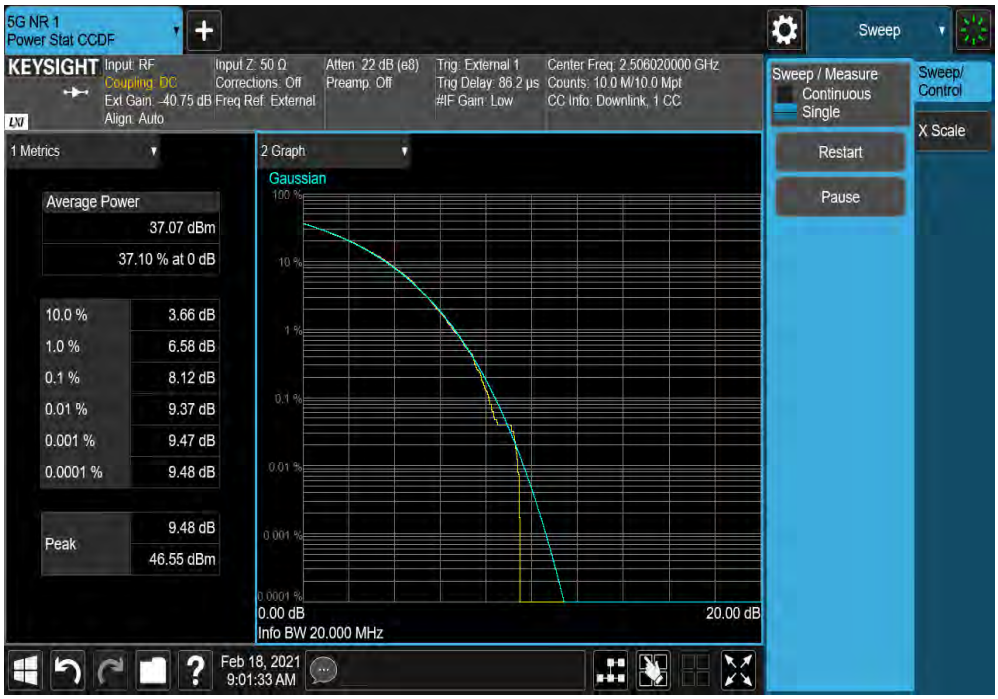
DEVIATIONS FROM TEST STANDARD

None

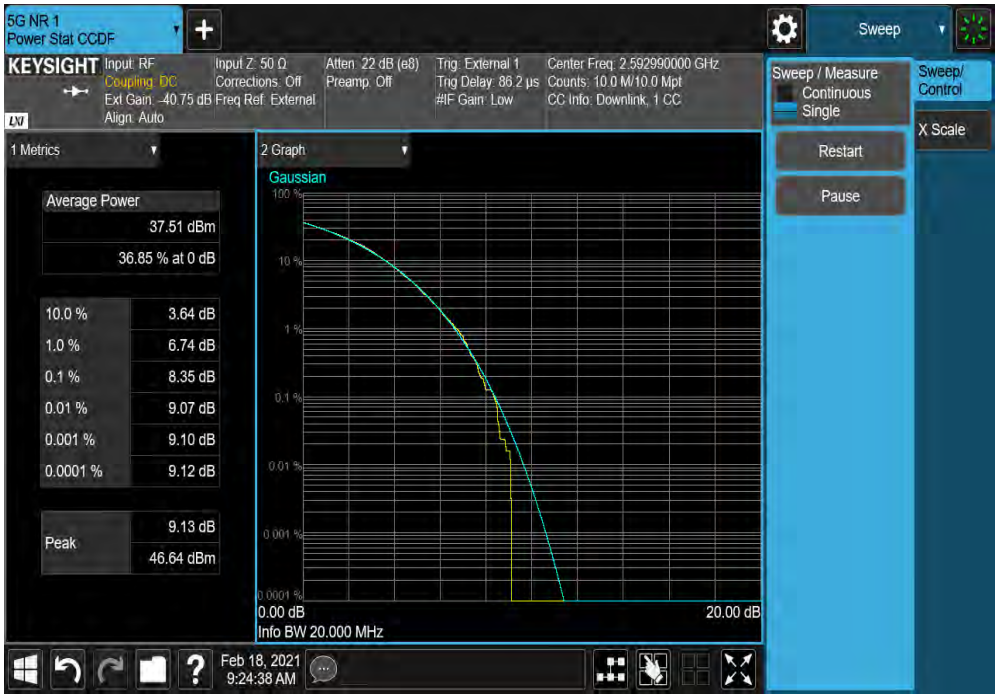
Configuration #	**2**	*Signature*

		0.1% Value (dB)	**Limit (dB)**	**Result**
5G NR, Band n41, 2496 MHz - 2690 MHz				
Port 1				
NR20 (20MHz)				
256QAM				
	Low Channel 2506.02 MHz	8.12	13	Pass
	Mid Channel 2592.99 MHz	8.35	13	Pass
	High Channel 2679.99 MHz	8.25	13	Pass
NR40 (40MHz)				
256QAM				
	Low Channel 2516.01 MHz	8.22	13	Pass
	Mid Channel 2592.99 MHz	8.05	13	Pass
	High Channel 2670 MHz	8.19	13	Pass
NR60 (60MHz)				
256QAM				
	Low Channel 2526 MHz	8.09	13	Pass
	Mid Channel 2592.99 MHz	8.05	13	Pass
	High Channel 2659.98 MHz	8.19	13	Pass
NR80 (80MHz)				
256QAM				
	Low Channel 2536.02 MHz	8.07	13	Pass
	Mid Channel 2592.99 MHz	8.08	13	Pass
	High Channel 2649.99 MHz	8.08	13	Pass
NR100 (100MHz)				
QPSK				
	Mid Channel 2592.99 MHz	7.70	13	Pass
16QAM				
	Mid Channel 2592.99 MHz	7.65	13	Pass
64QAM				
	Mid Channel 2592.99 MHz	7.65	13	Pass
256QAM				
	Low Channel 2546.01 MHz	6.50	13	Pass
	Mid Channel 2592.99 MHz	7.67	13	Pass
	High Channel 2640 MHz	7.97	13	Pass

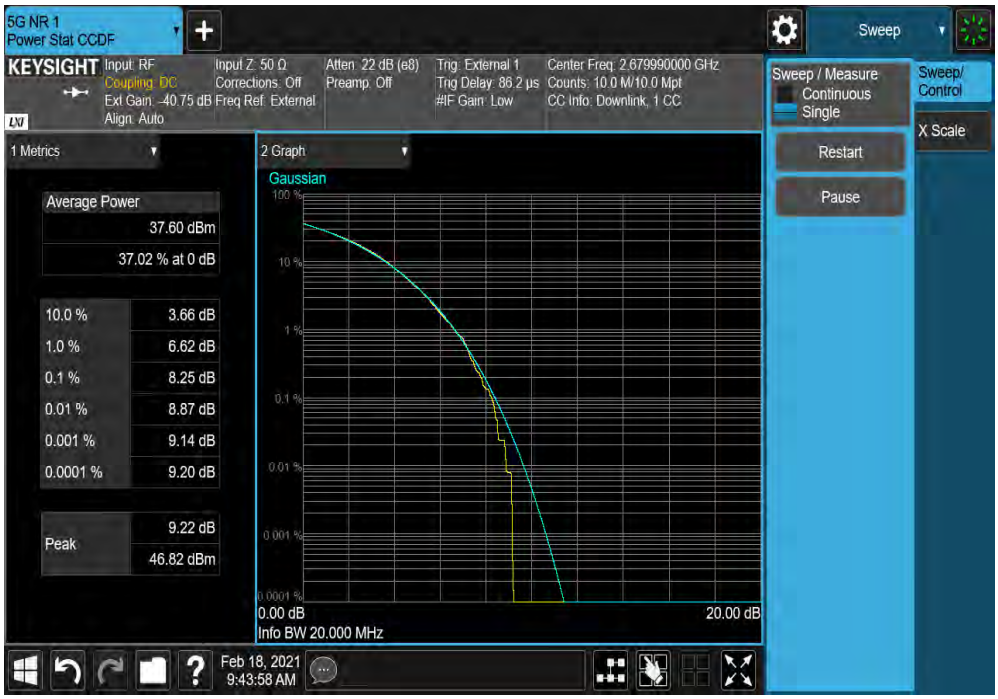
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR20 (20MHz), 256QAM, Low Channel 2506.02 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.12	13	Pass



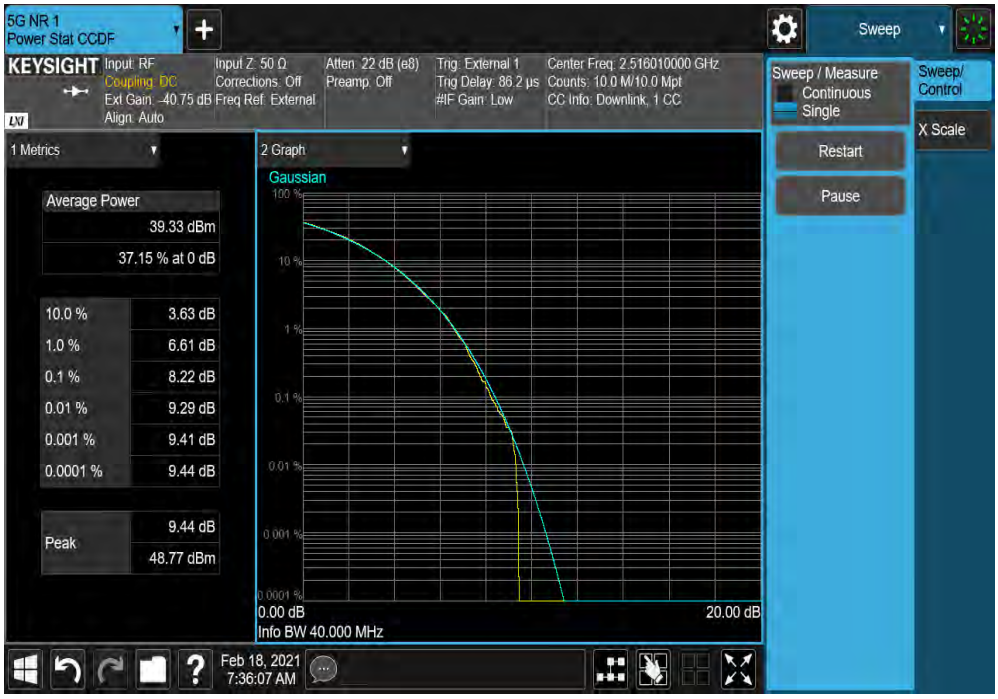
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR20 (20MHz), 256QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.35	13	Pass



5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR20 (20MHz), 256QAM, High Channel 2679.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.25	13	Pass

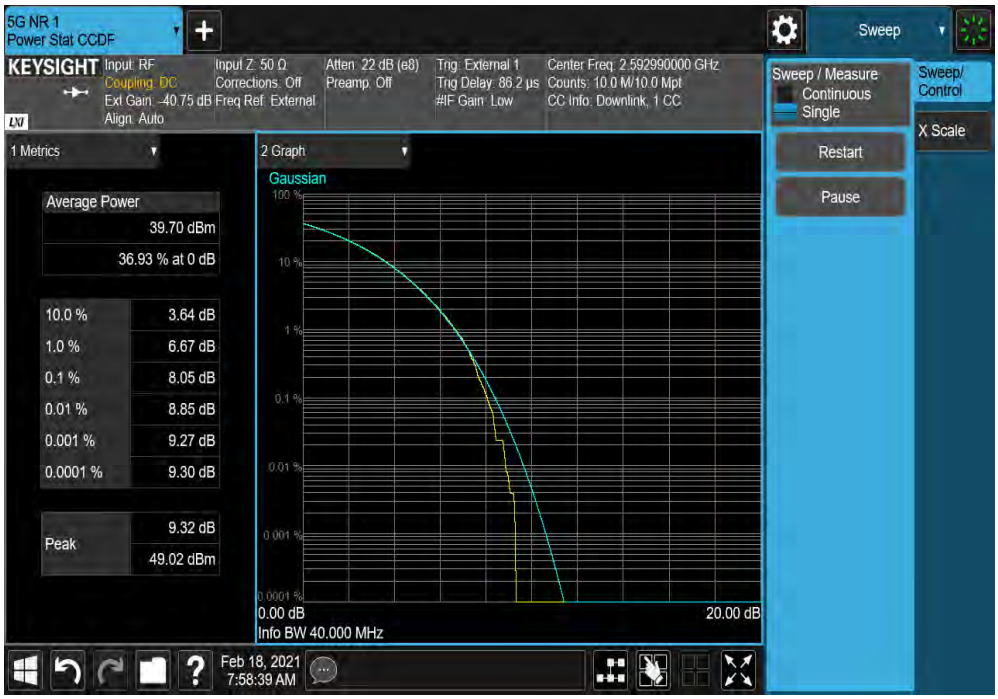


5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR40 (40MHz), 256QAM, Low Channel 2516.01 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.22	13	Pass

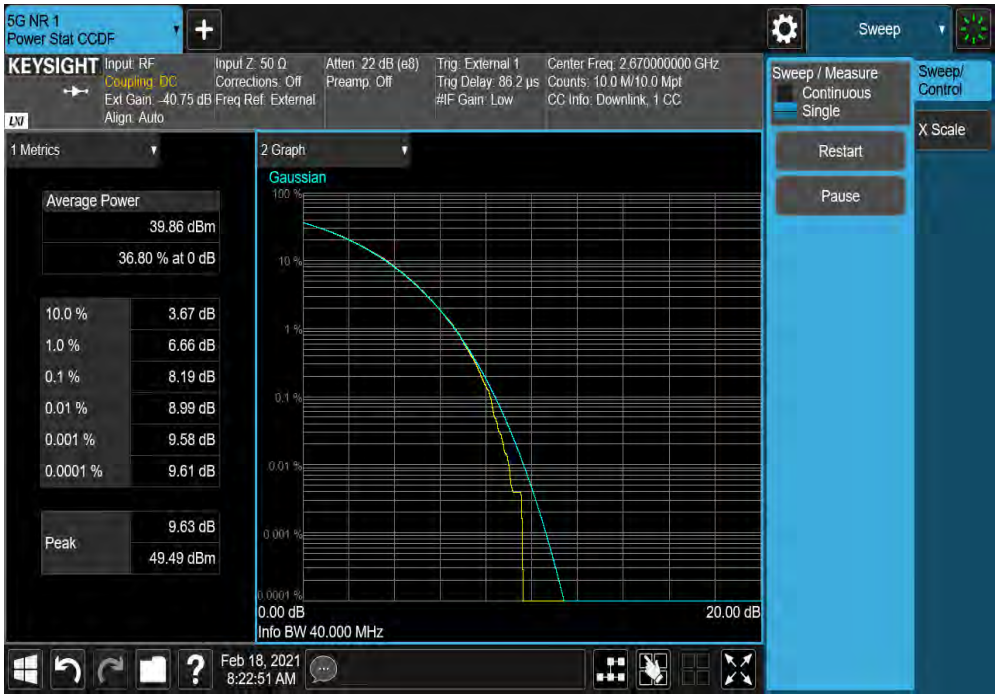


PEAK TO AVERAGE POWER (PAPR) CCDF 5G

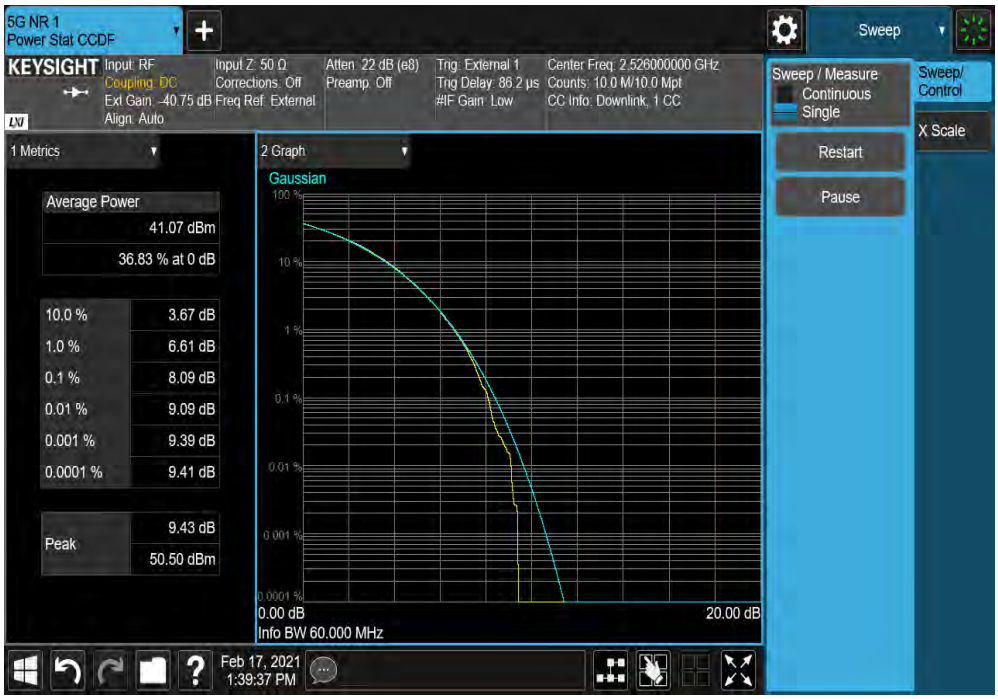
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR40 (40MHz), 256QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.05	13	Pass



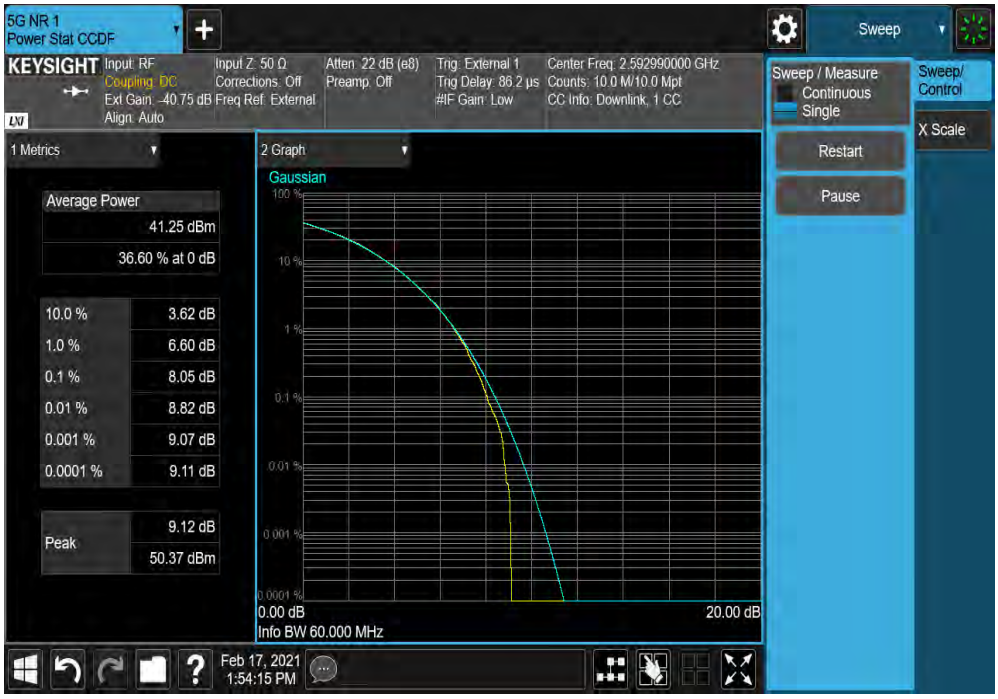
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR40 (40MHz), 256QAM, High Channel 2670 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.19	13	Pass



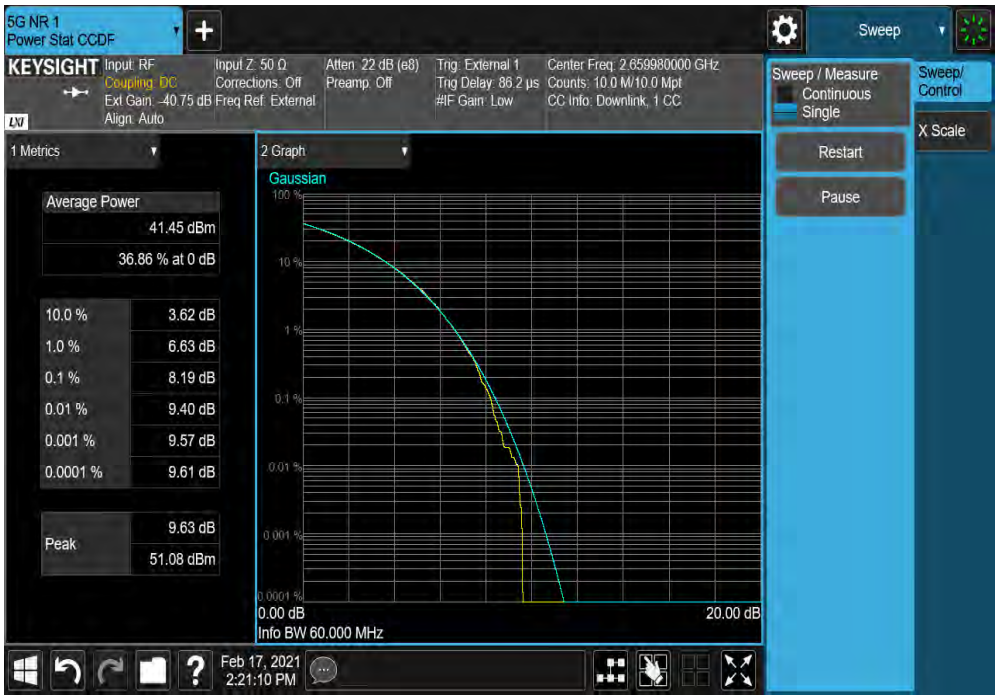
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR60 (60MHz), 256QAM, Low Channel 2526 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.09	13	Pass



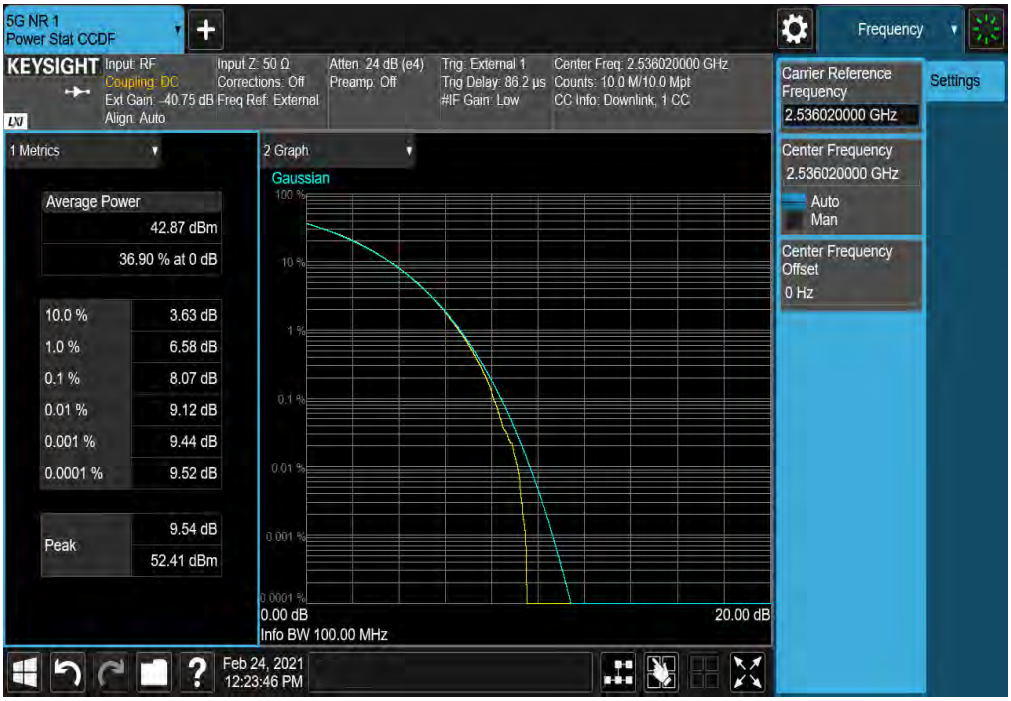
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR60 (60MHz), 256QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.05	13	Pass



5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR60 (60MHz), 256QAM, High Channel 2659.98 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.19	13	Pass

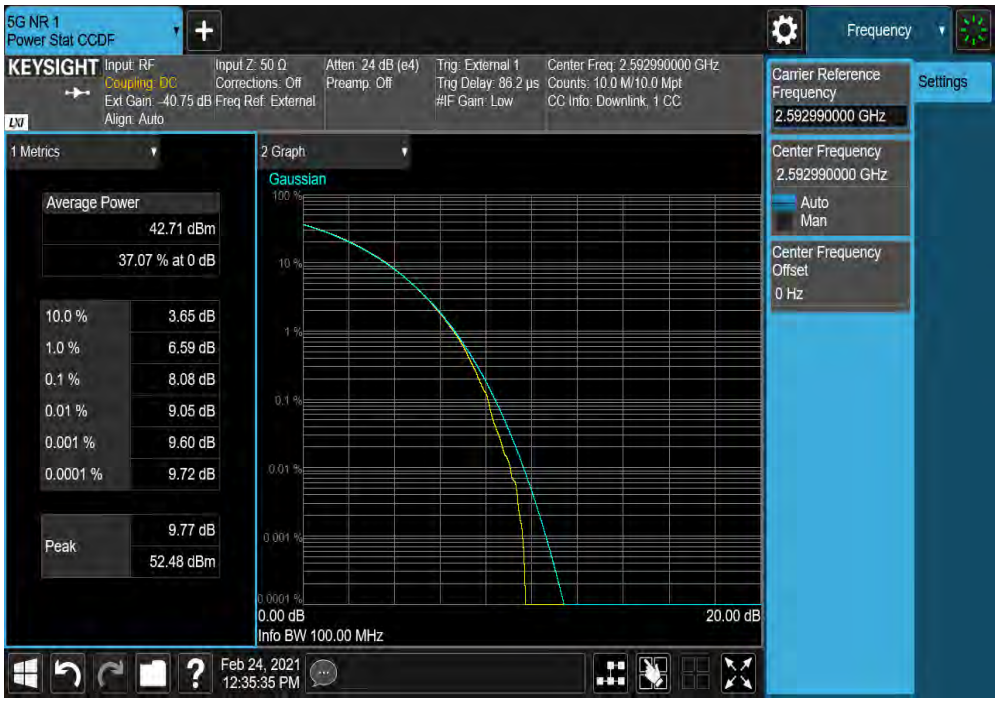


5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR80 (80MHz), 256QAM, Low Channel 2536.02 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.07	13	Pass

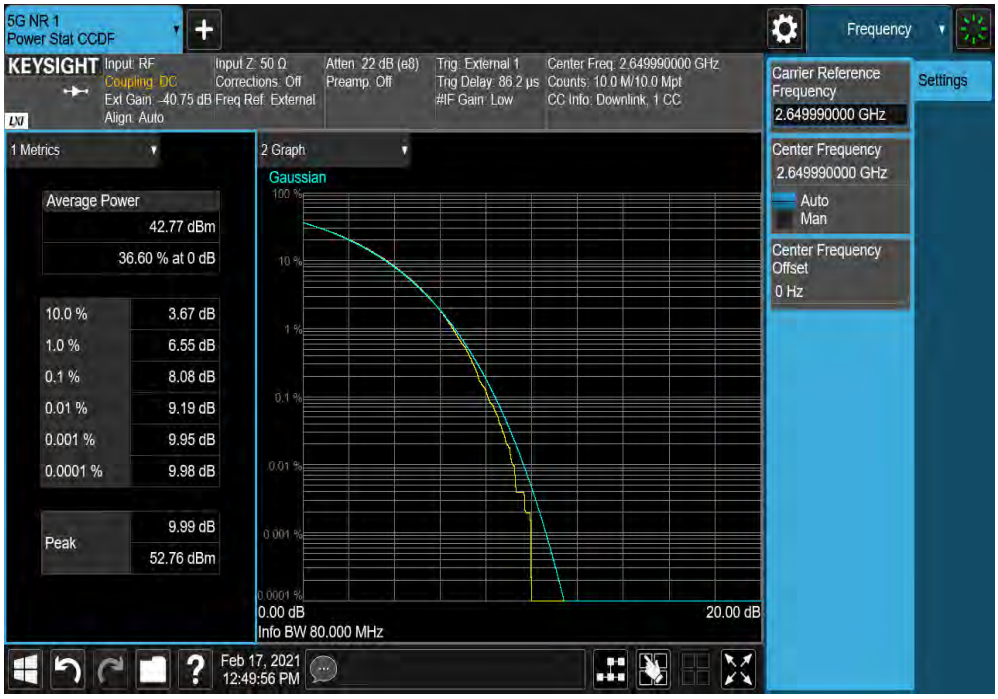


PEAK TO AVERAGE POWER (PAPR) CCDF 5G

5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR80 (80MHz), 256QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.08	13	Pass

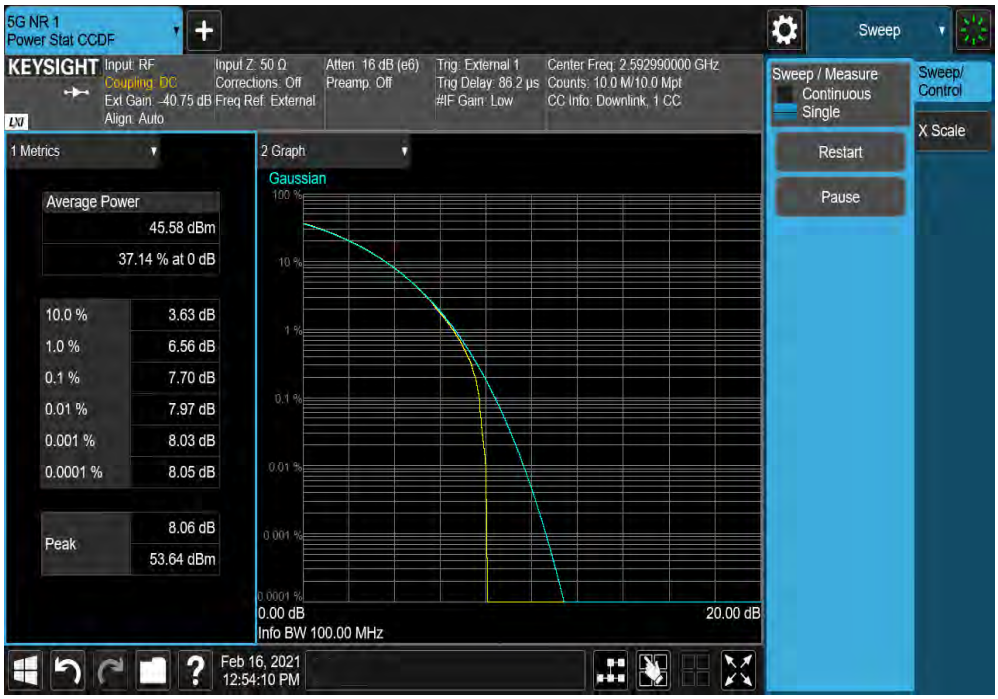


5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR80 (80MHz), 256QAM, High Channel 2649.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				8.08	13	Pass

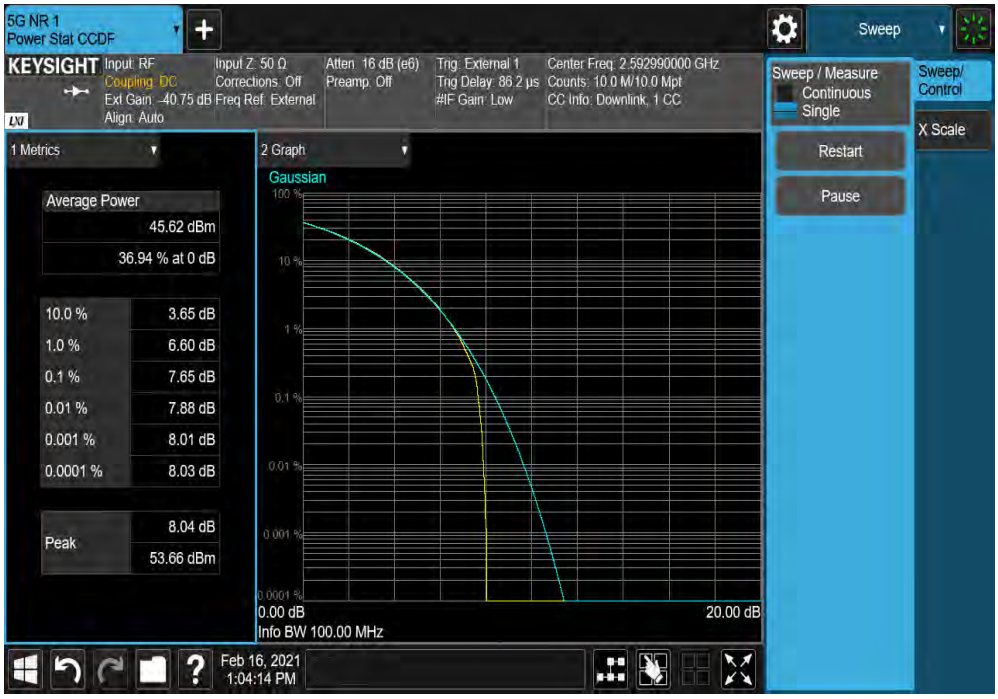


PEAK TO AVERAGE POWER (PAPR) CCDF 5G

5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR100 (100MHz), QPSK, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				7.70	13	Pass

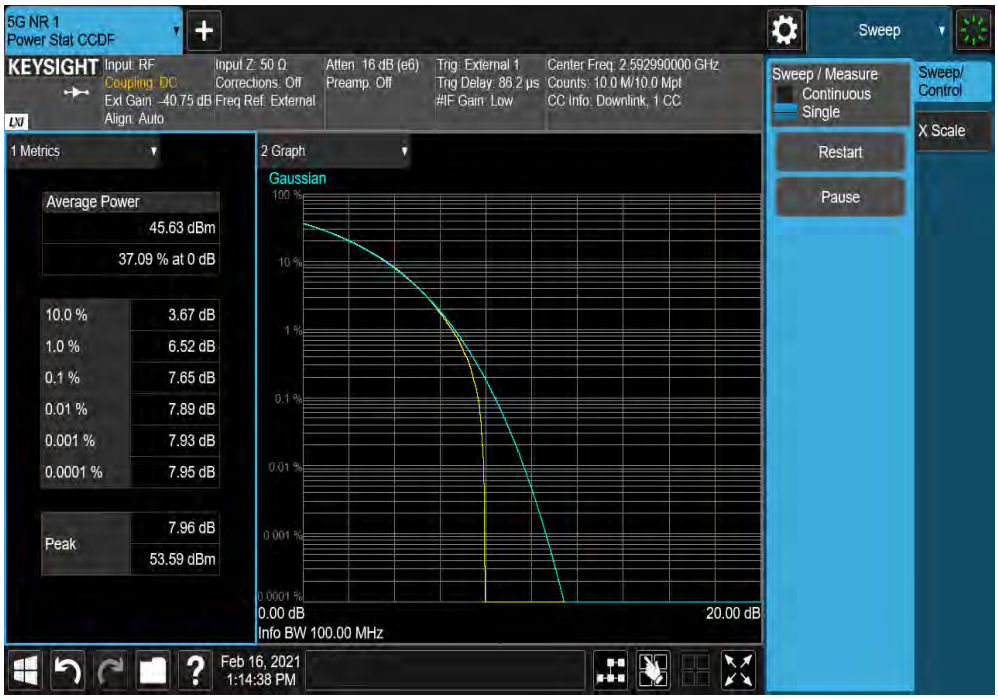


5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR100 (100MHz), 16QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				7.65	13	Pass

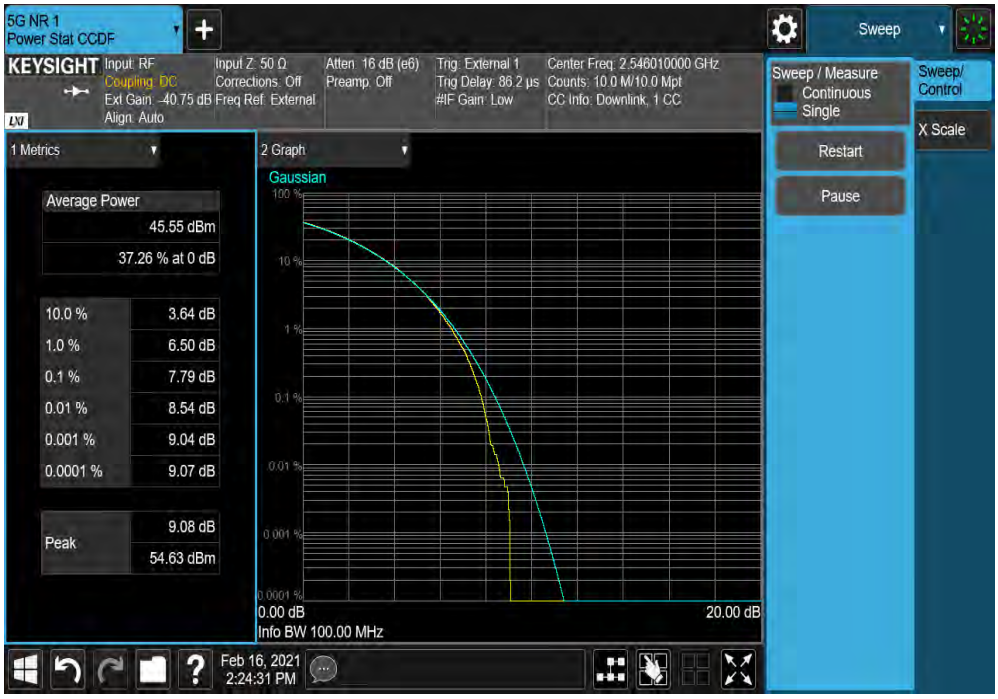


PEAK TO AVERAGE POWER (PAPR) CCDF 5G

5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR100 (100MHz), 64QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				7.65	13	Pass



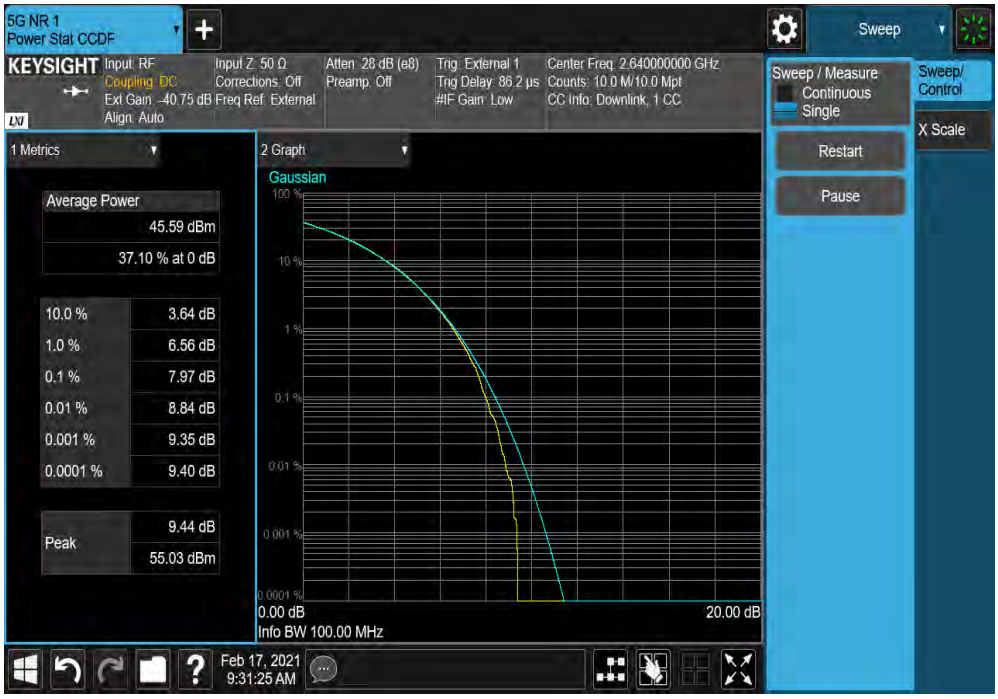
5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR100 (100MHz), 256QAM, Low Channel 2546.01 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				6.50	13	Pass



PEAK TO AVERAGE POWER (PAPR) CCDF 5G

5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR100 (100MHz), 256QAM, Mid Channel 2592.99 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				7.67	13	Pass

5G NR, Band n41, 2496 MHz - 2690 MHz, Port 1, NR100 (100MHz), 256QAM, High Channel 2640 MHz						
				0.1% Value (dB)	Limit (dB)	Result
				7.97	13	Pass



PEAK TO AVERAGE POWER (PAPR) CCDF LTE

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
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21

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 13 dB.

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 FCC 27.50, 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 only on one port. The AZHL antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown during output power testing) and antenna 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.

PEAK TO AVERAGE POWER (PAPR) CCDF LTE

element

TbtTx 2019.08.30.0 XMit 2020.12.30.0

EUT:	**AZHL**			**Work Order:**	**NOKI0018**
Serial Number:	**YK203400016**			**Date:**	**22-Feb-21**
Customer:	**Nokia Solutions and Networks**			**Temperature:**	**23.6 °C**
Attendees:	**John Rattanavong, Mitchell Hill, David Le**			**Humidity:**	**14.9% RH**
Project:	**None**			**Barometric Pres.:**	**1037 mbar**
Tested by:	**Mark Baytan**	**Power:**	**54 VDC**	**Job Site:**	**TX05**

TEST SPECIFICATIONS	**Test Method**
FCC 27:2021	ANSI C63.26:2015

COMMENTS

External 1 gating was set using a trig delay = 5.0us and a gate length = 6.786ms. Reference level offset adjusted to include (2) coax cables, DC block, and attenuator. The carrier power was set to maximum for all testing.

DEVIATIONS FROM TEST STANDARD

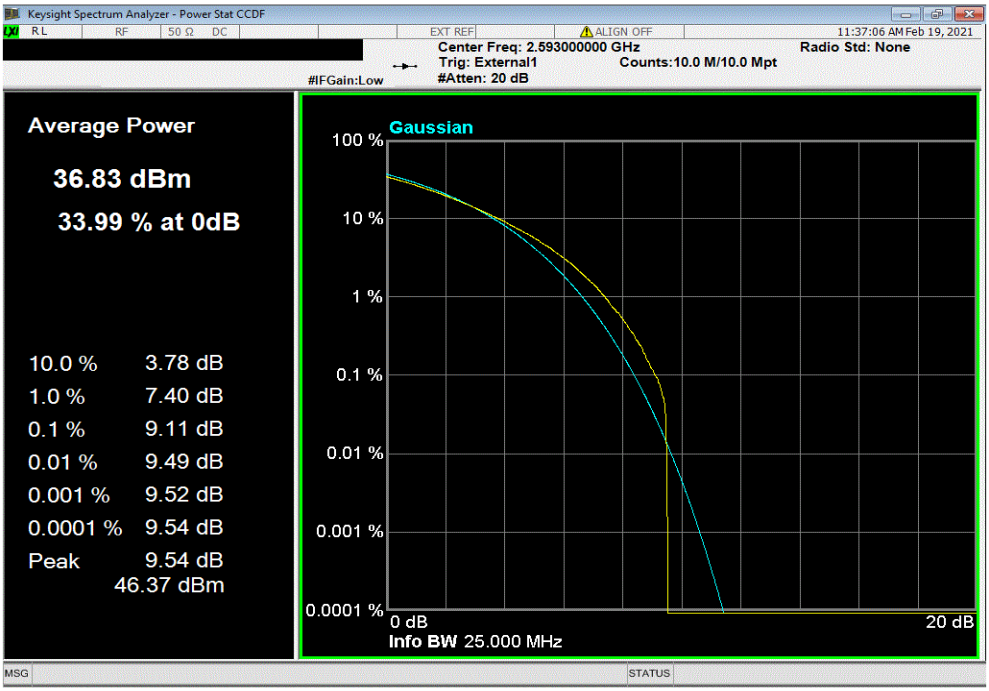
None

Configuration #	**2**	*Signature*

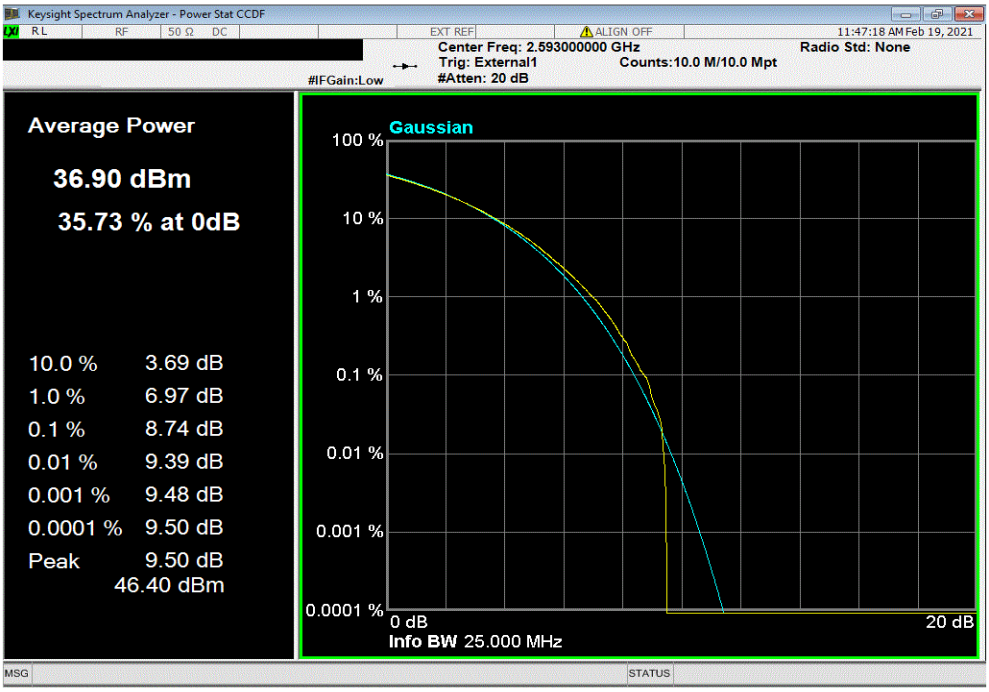
		0.1% Value (dB)	**Limit (dB)**	**Results**
4G LTE, Band 41, 2496 MHz - 2690 MHz				
Port 1				
LTE10 (10MHz)				
QPSK				
	Mid Channel 2593 MHz	9.11	13	Pass
16QAM				
	Mid Channel 2593 MHz	8.74	13	Pass
64QAM				
	Mid Channel 2593 MHz	8.70	13	Pass
256QAM				
	Low Channel 2501 MHz	8.22	13	Pass
	Mid Channel 2593 MHz	9.10	13	Pass
	High Channel 2685 MHz	8.26	13	Pass
LTE15 (15MHz)				
256QAM				
	Low Channel 2503.5 MHz	8.00	13	Pass
	Mid Channel 2593 MHz	7.99	13	Pass
	High Channel 2682.5 MHz	8.09	13	Pass
LTE20 (20MHz)				
256QAM				
	Low Channel 2506 MHz	8.22	13	Pass
	Mid Channel 2593 MHz	8.27	13	Pass
	High Channel 2680 MHz	8.32	13	Pass

PEAK TO AVERAGE POWER (PAPR) CCDF LTE

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE10 (10MHz), QPSK, Mid Channel 2593 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				9.11	13	Pass

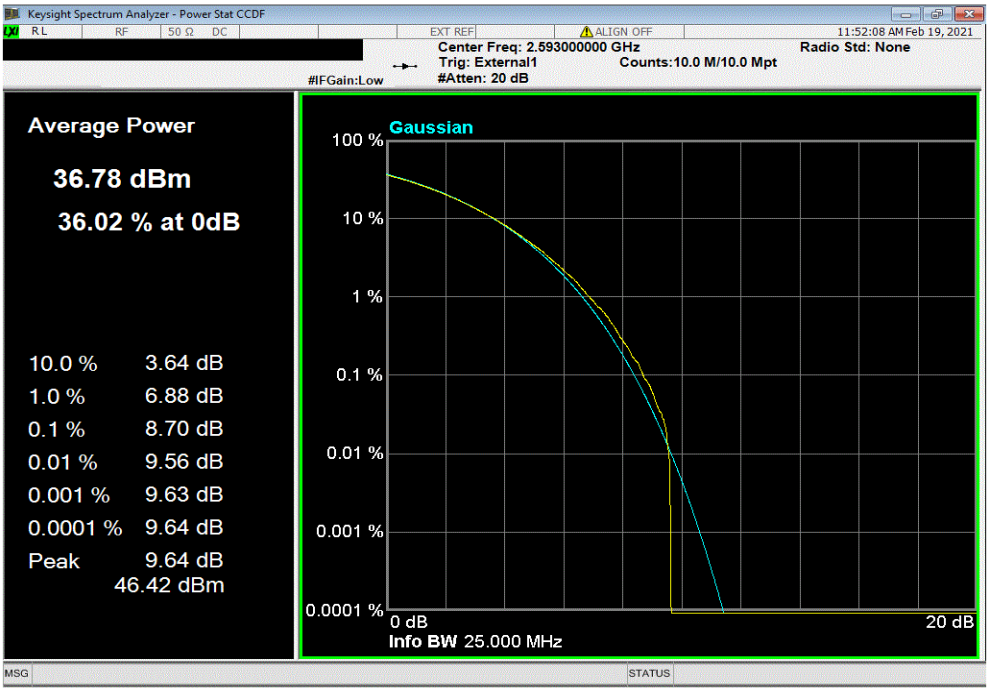


4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE10 (10MHz), 16QAM, Mid Channel 2593 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.74	13	Pass

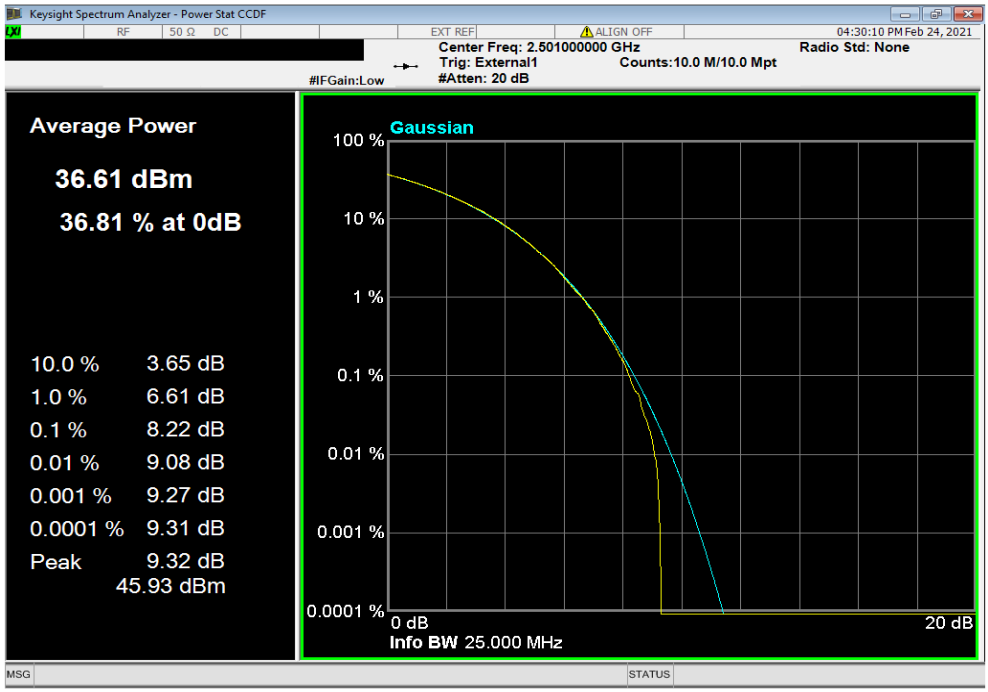


PEAK TO AVERAGE POWER (PAPR) CCDF LTE

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE10 (10MHz), 64QAM, Mid Channel 2593 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.70	13	Pass

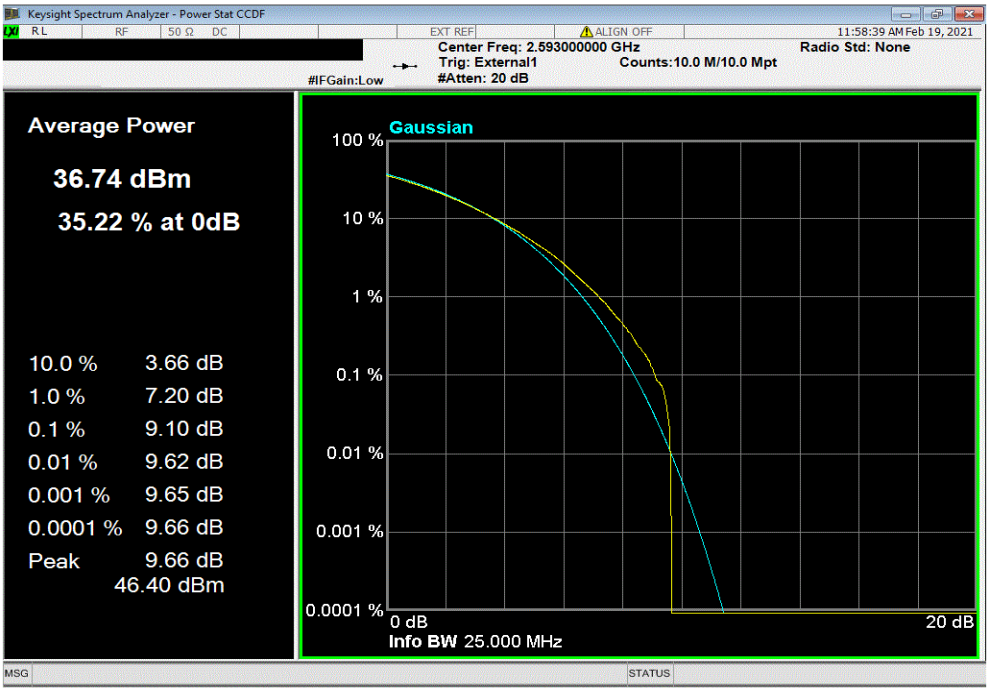


4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE10 (10MHz), 256QAM, Low Channel 2501 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.22	13	Pass

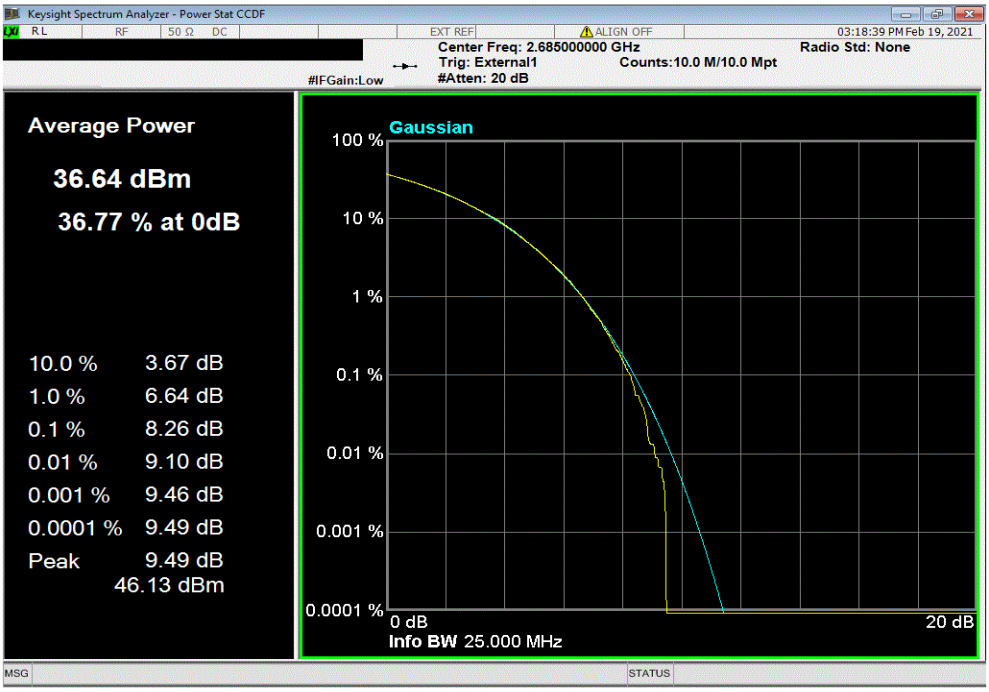


PEAK TO AVERAGE POWER (PAPR) CCDF LTE

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE10 (10MHz), 256QAM, Mid Channel 2593 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				9.10	13	Pass

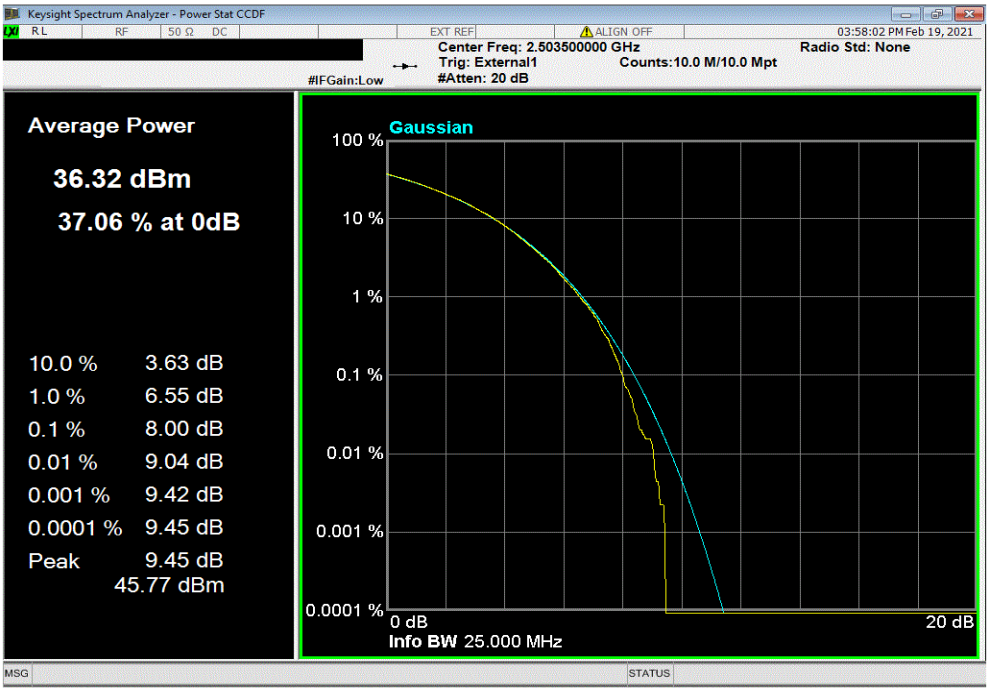


4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE10 (10MHz), 256QAM, High Channel 2685 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.26	13	Pass

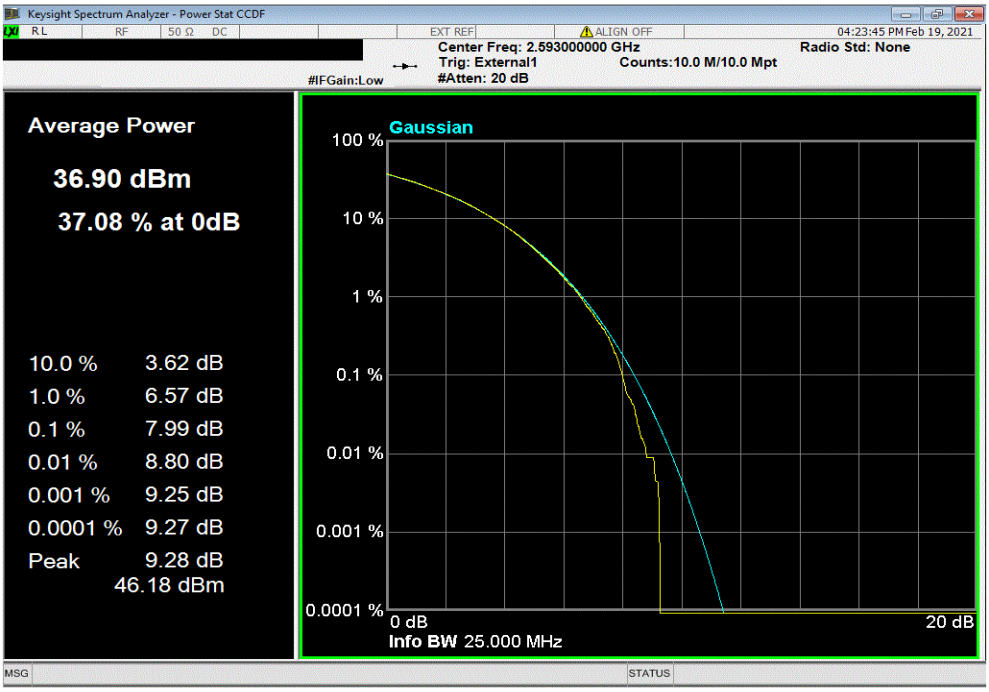


PEAK TO AVERAGE POWER (PAPR) CCDF LTE

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Low Channel 2503.5 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.00	13	Pass

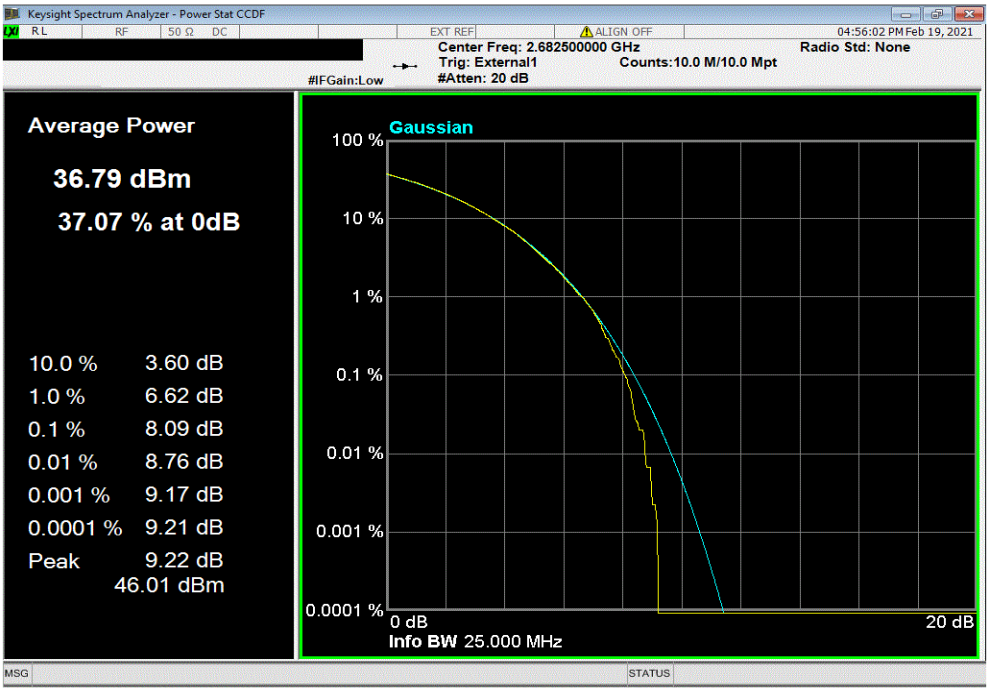


4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				7.99	13	Pass

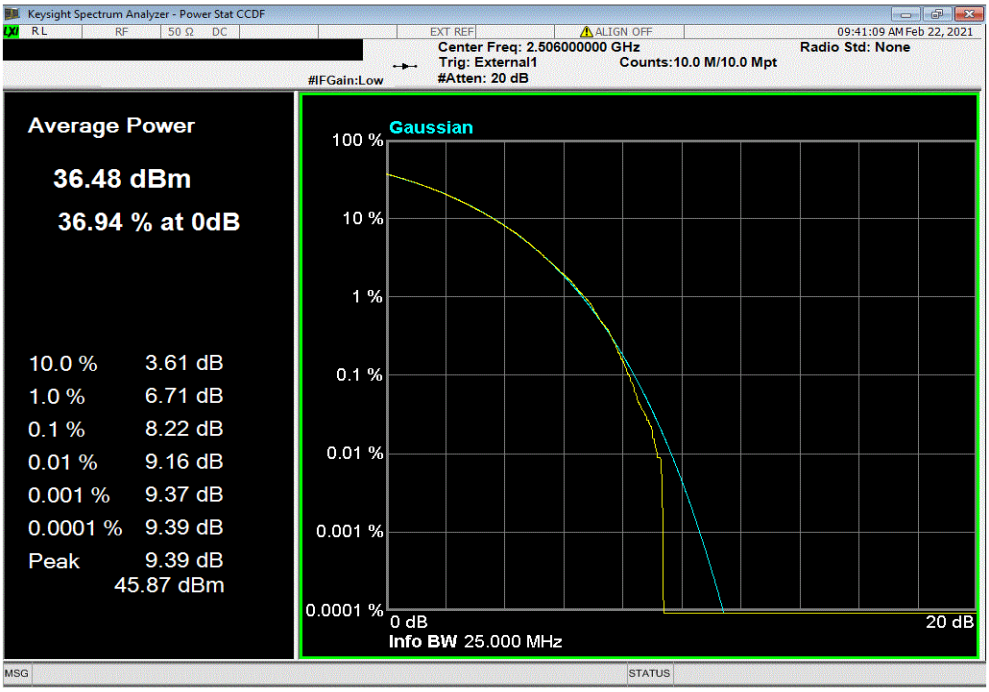


PEAK TO AVERAGE POWER (PAPR) CCDF LTE

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, High Channel 2682.5 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.09	13	Pass

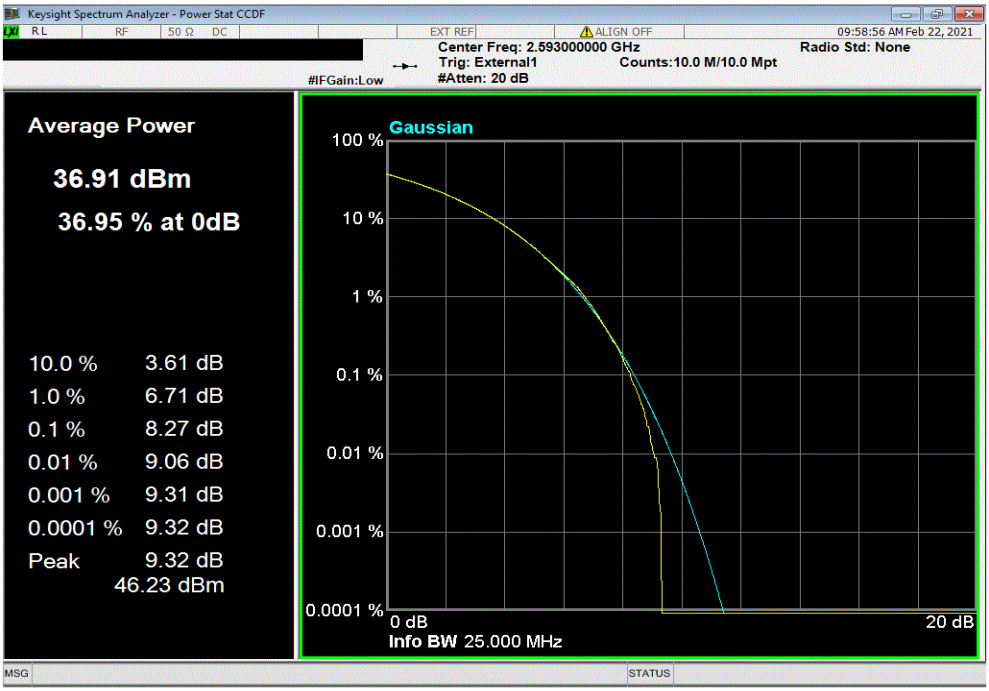


4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Low Channel 2506 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.22	13	Pass



PEAK TO AVERAGE POWER (PAPR) CCDF LTE

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.27	13	Pass



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, High Channel 2680 MHz						
				0.1% Value (dB)	Limit (dB)	Results
				8.32	13	Pass