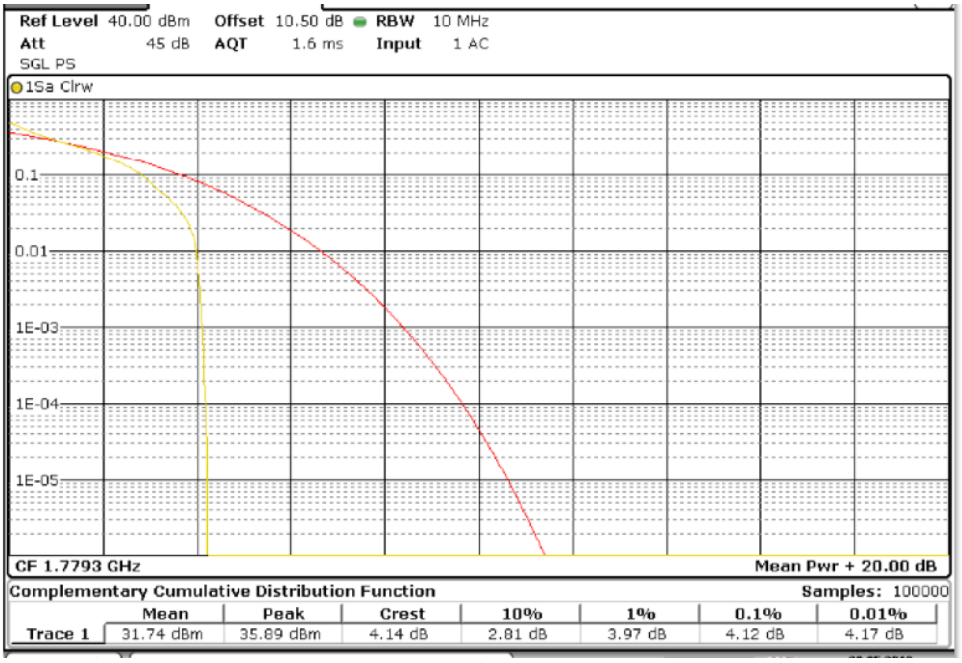
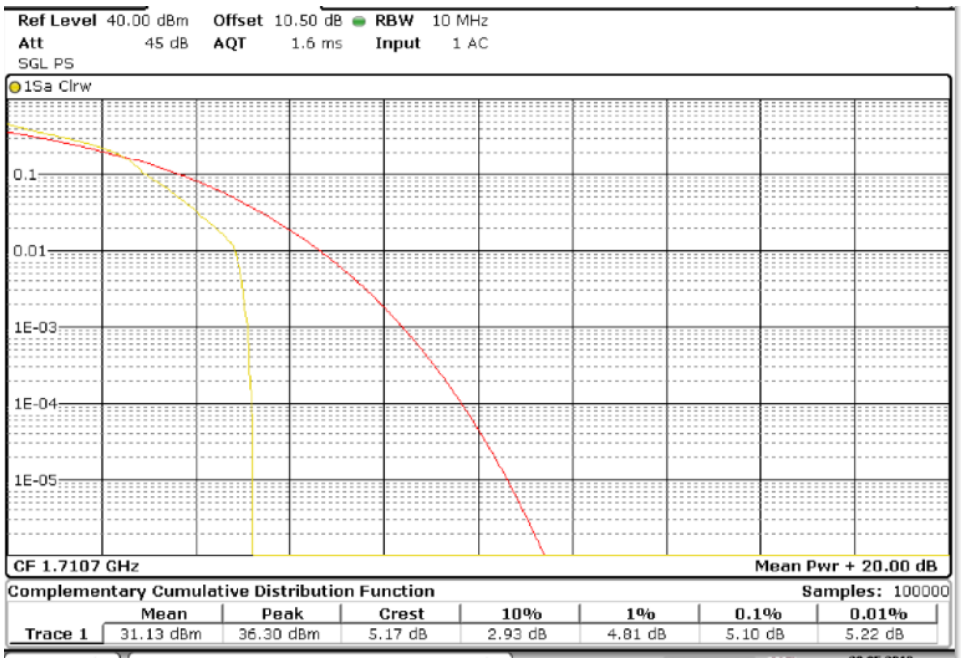
TEST RESULTS (Cont):	

Highest channel

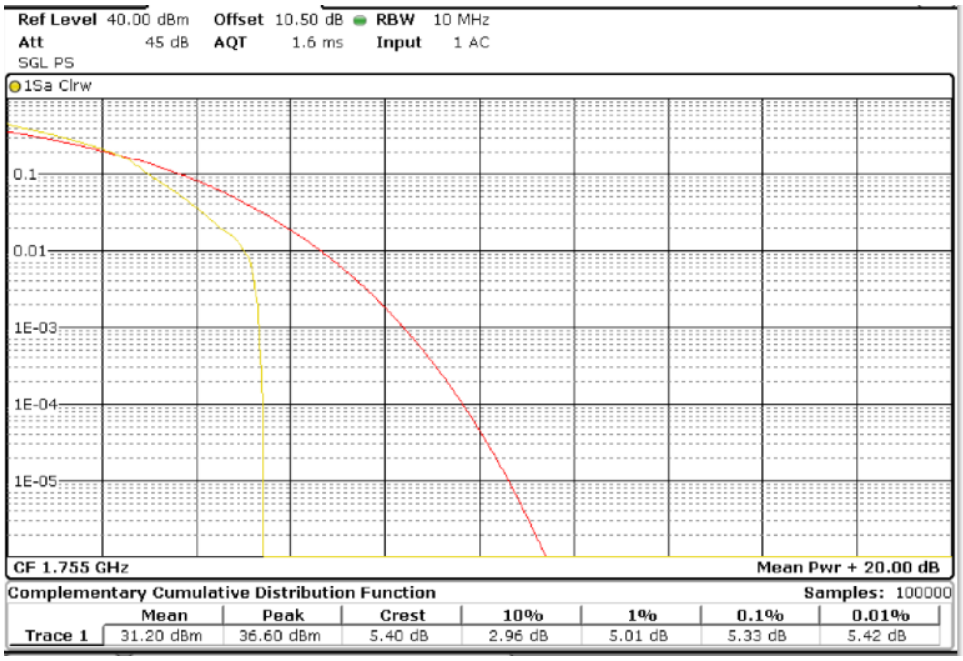


PAPR
Bandwidth = 1.4 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
Lowest channel

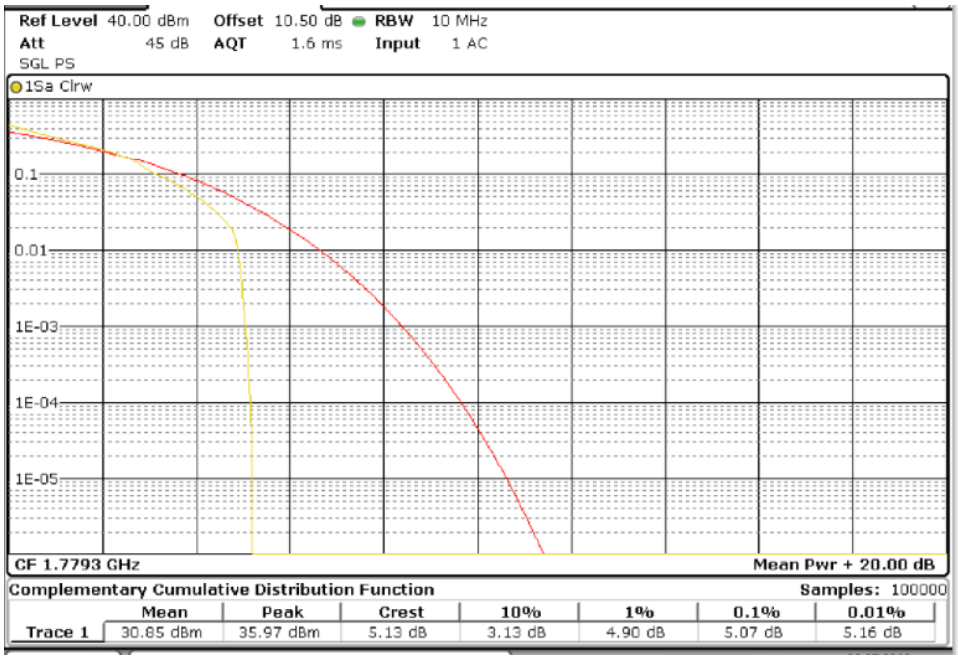


TEST RESULTS (Cont):	

Middle channel

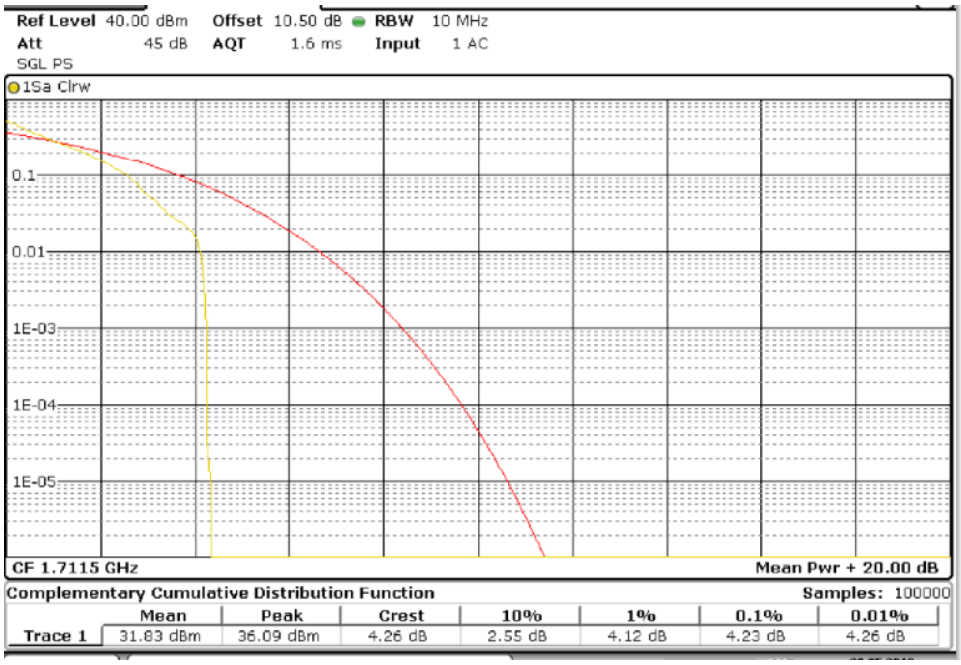


Highest channel

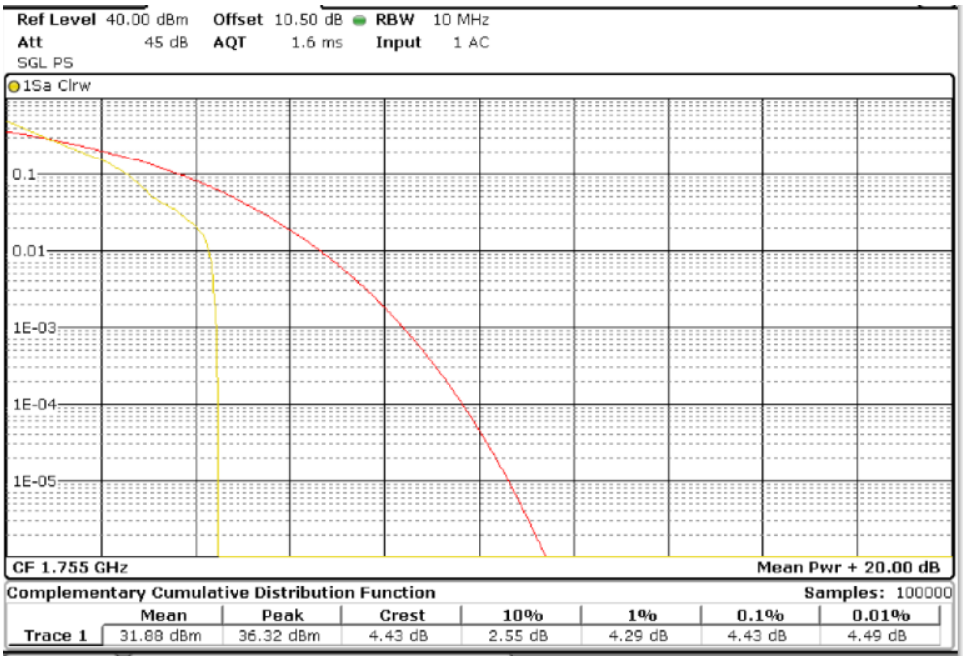


TEST RESULTS (Cont):	

PAPR
Bandwidth = 3 MHz. Modulation QPSK. RB Size: 1. RB Offset: 0.
Lowest channel

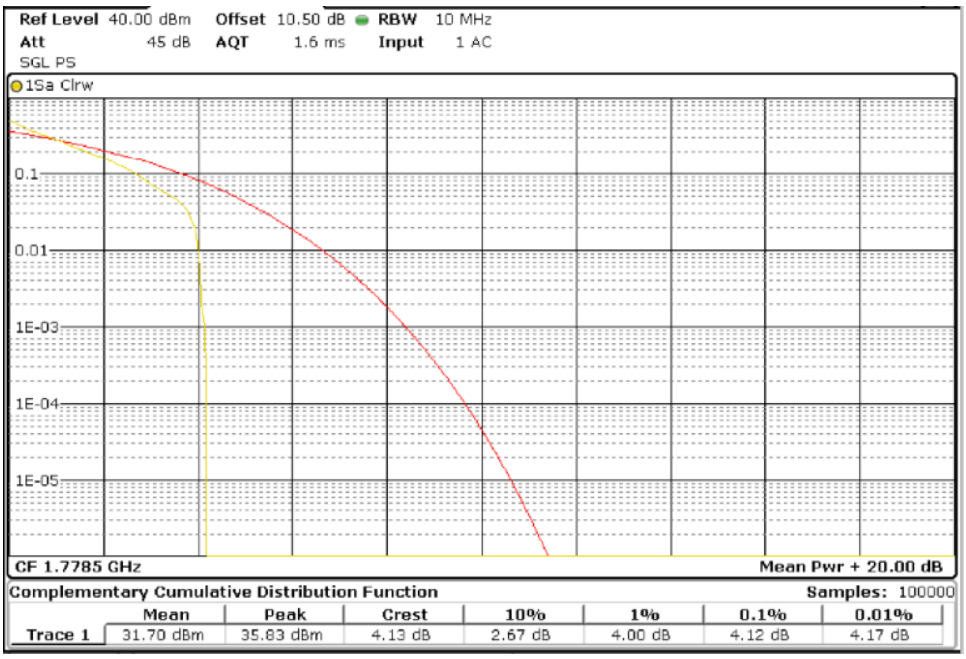


Middle channel

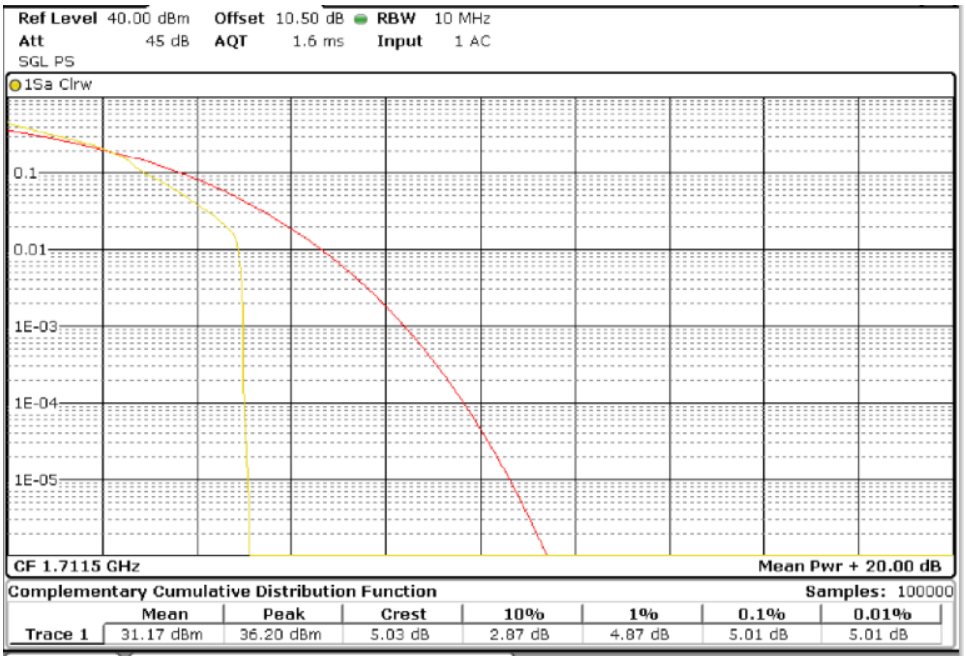


TEST RESULTS (Cont):	

Highest channel

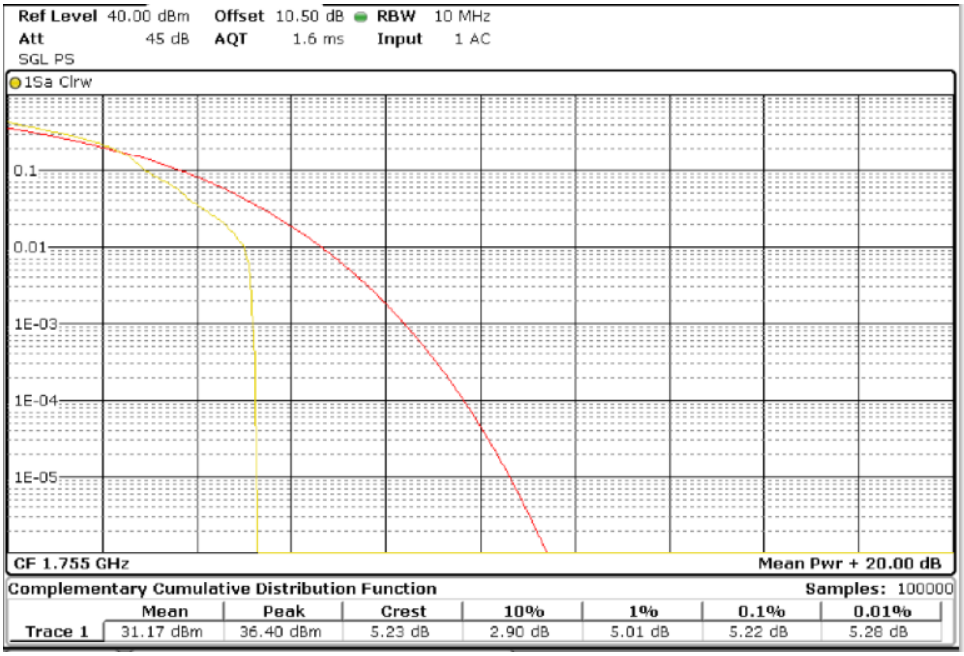


PAPR
Bandwidth = 3 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
Lowest channel

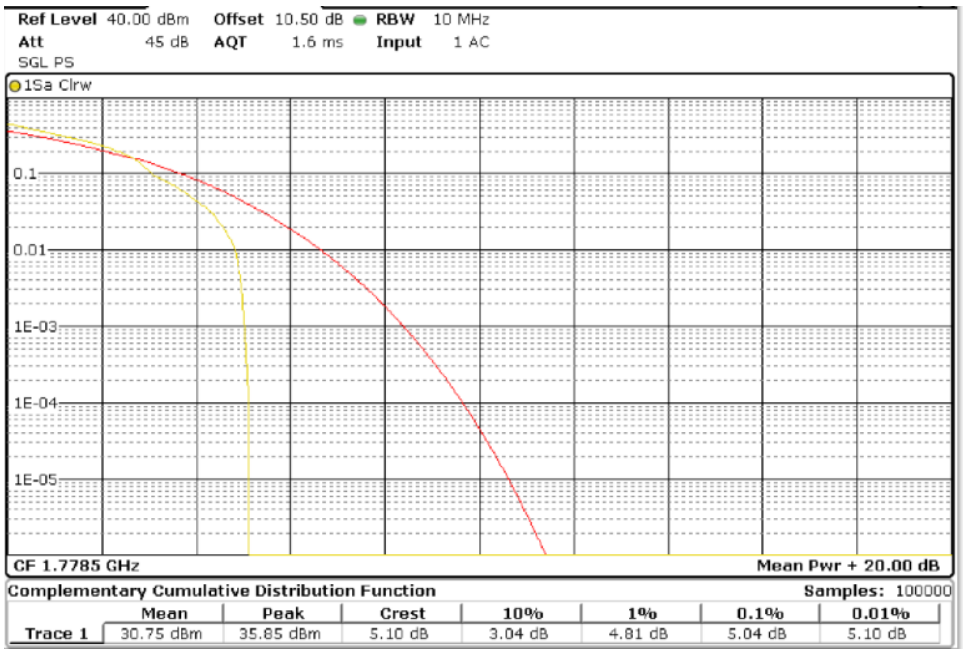


TEST RESULTS (Cont):	

Middle channel

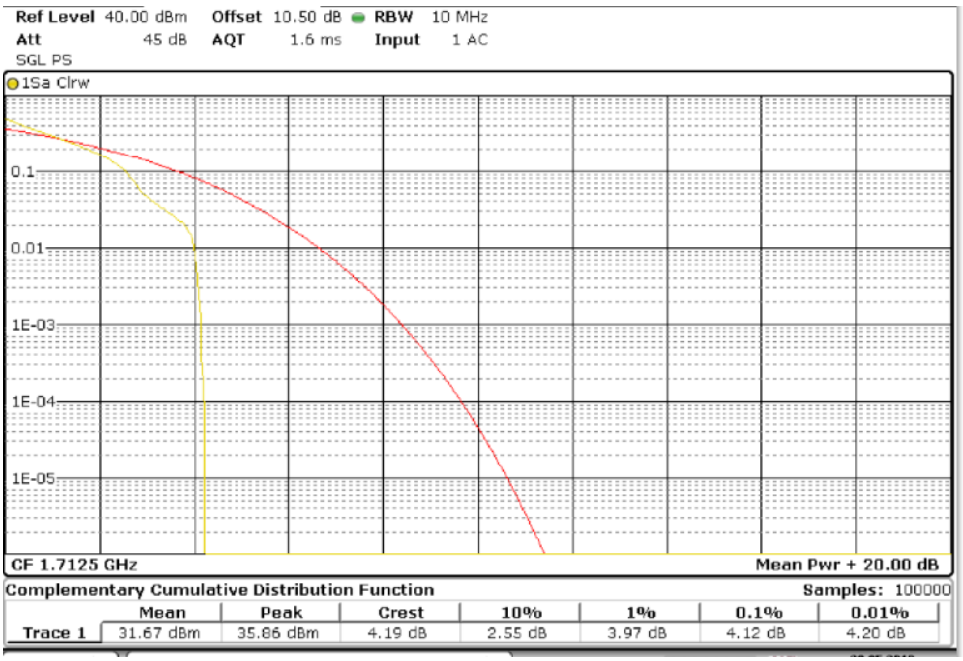


Highest channel

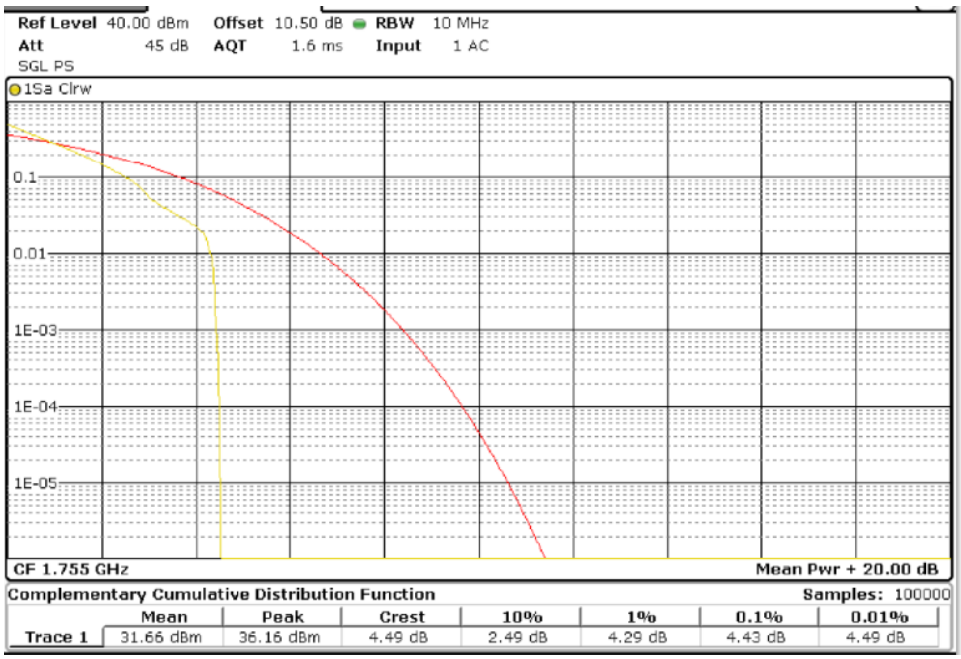


TEST RESULTS (Cont):	

PAPR
Bandwidth = 5 MHz. Modulation QPSK. RB Size: 1. RB Offset: 0.
Lowest channel

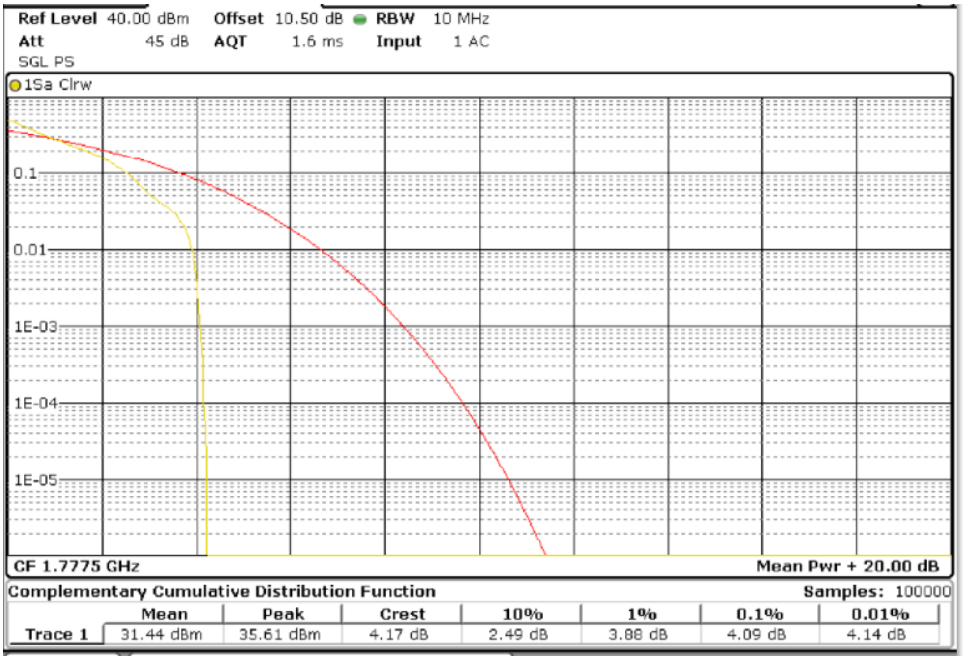


Middle channel

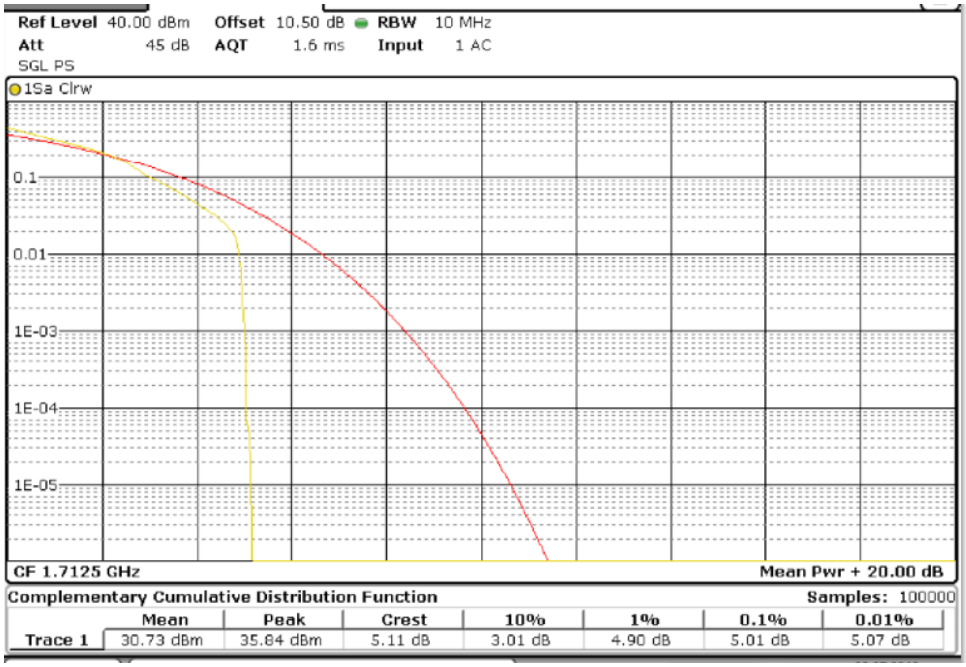


TEST RESULTS (Cont):	

Highest channel

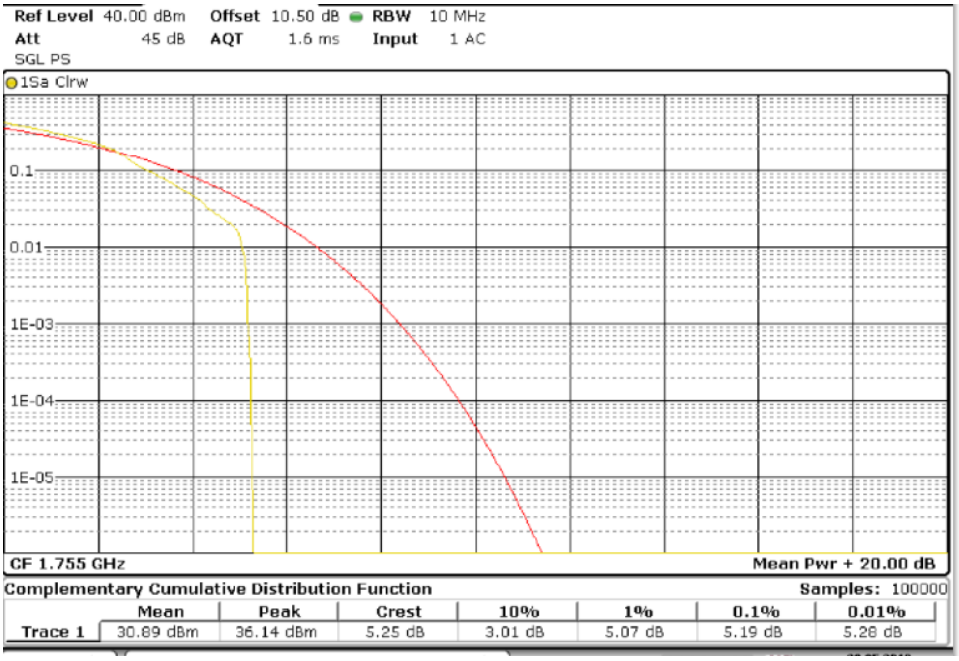


Bandwidth = 5 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
Lowest channel

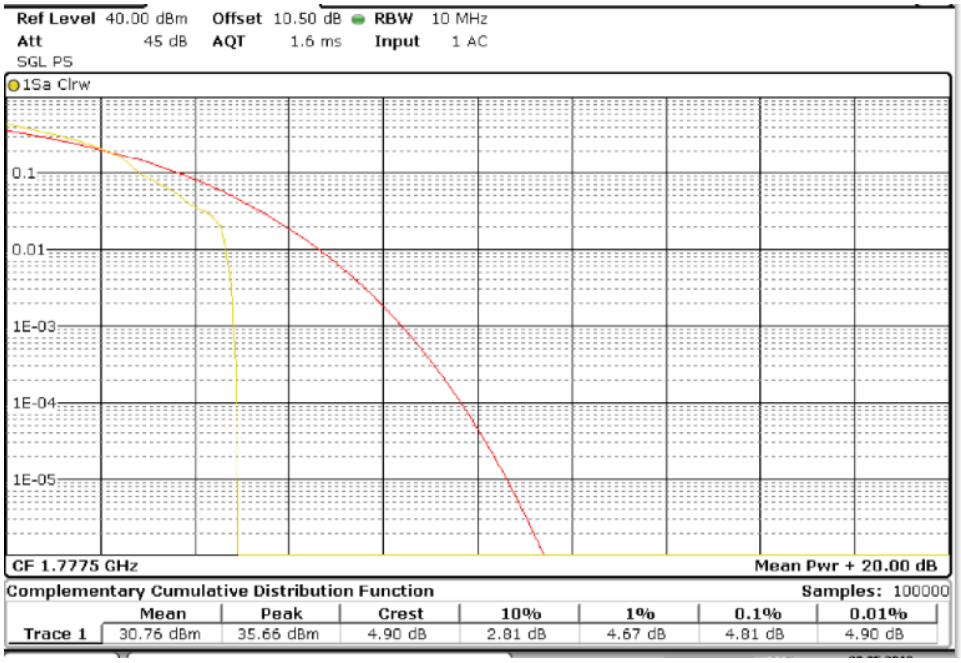


TEST RESULTS (Cont):	

Middle channel

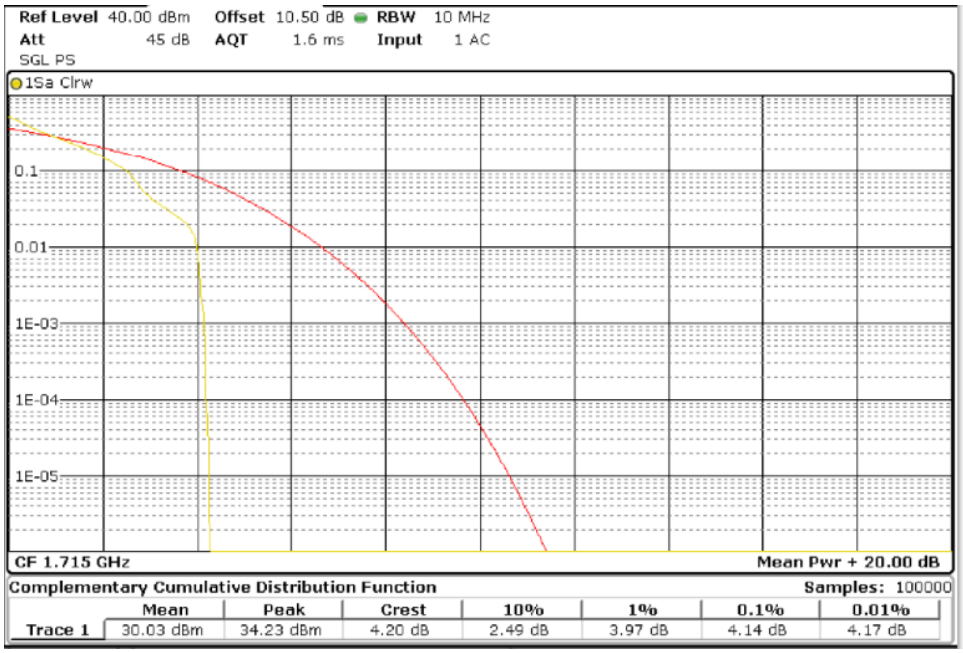


Highest channel

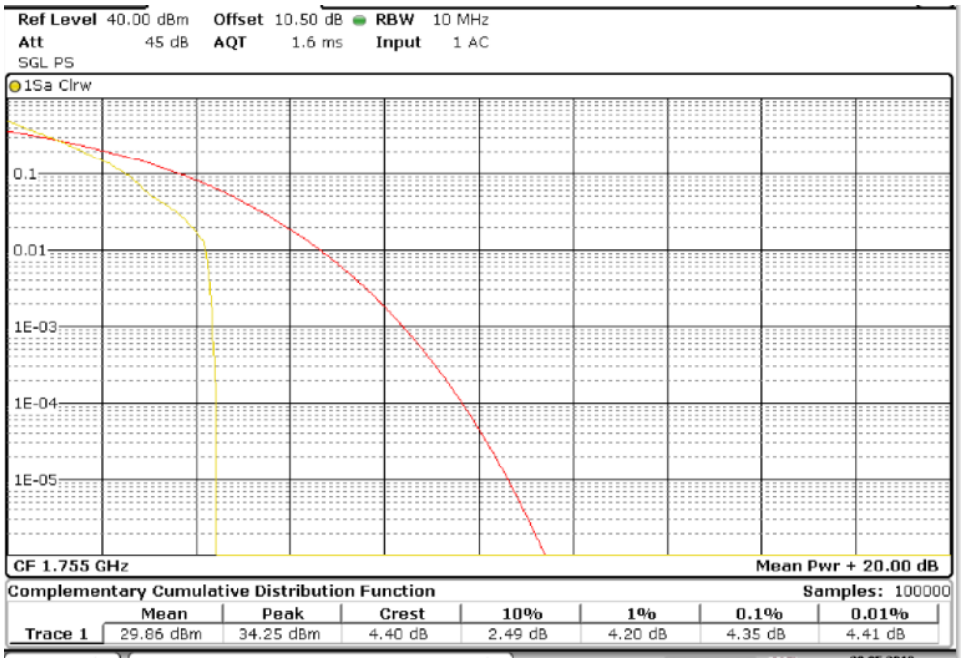


TEST RESULTS (Cont):	

Bandwidth = 10 MHz. Modulation QPSK. RB Size: 1. RB Offset: 0.
Lowest channel

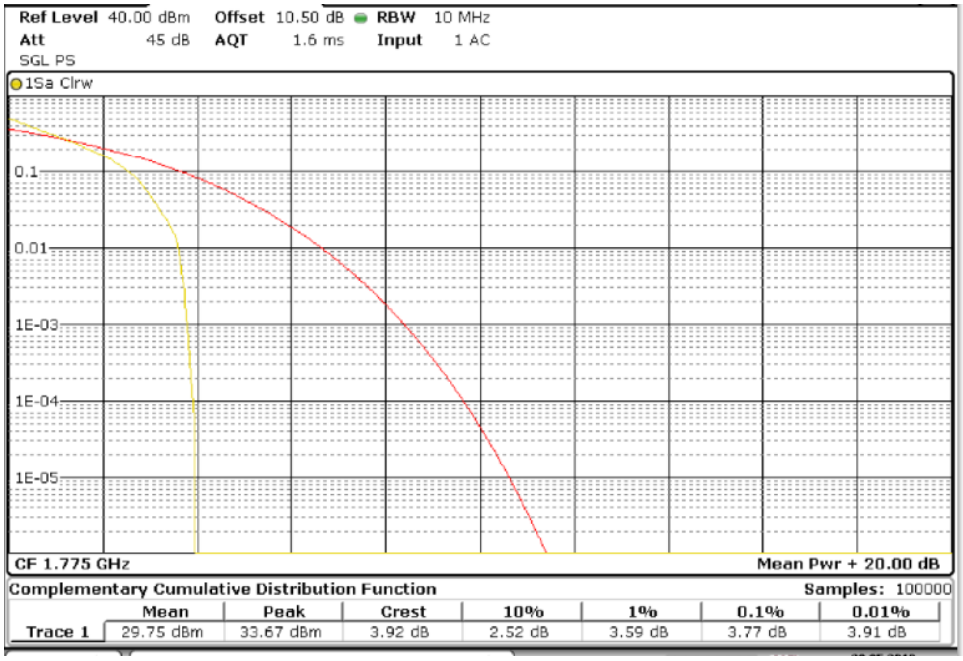


Middle channel

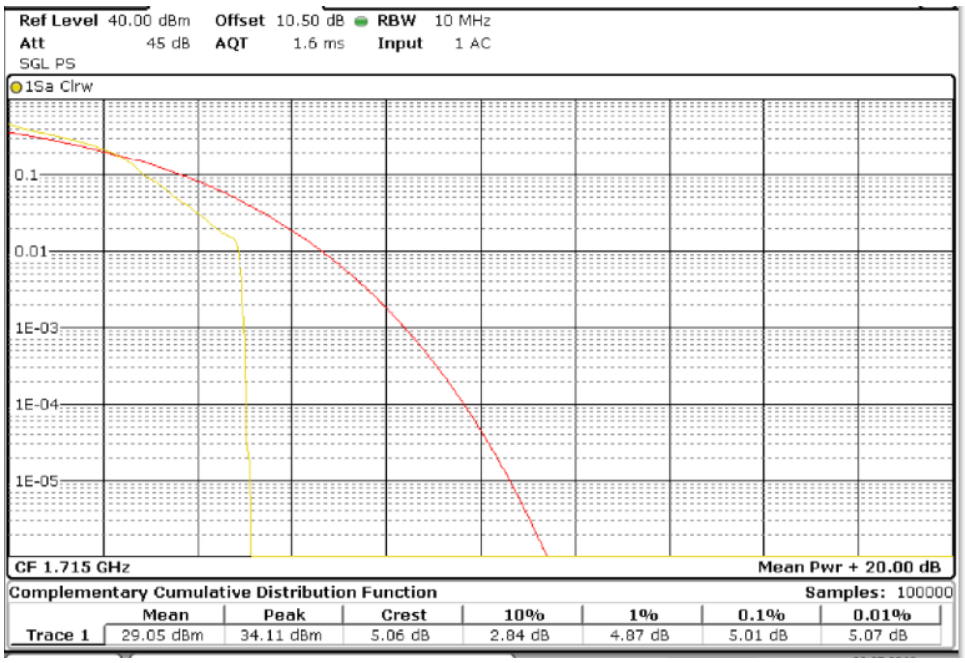


TEST RESULTS (Cont):	

Highest channel

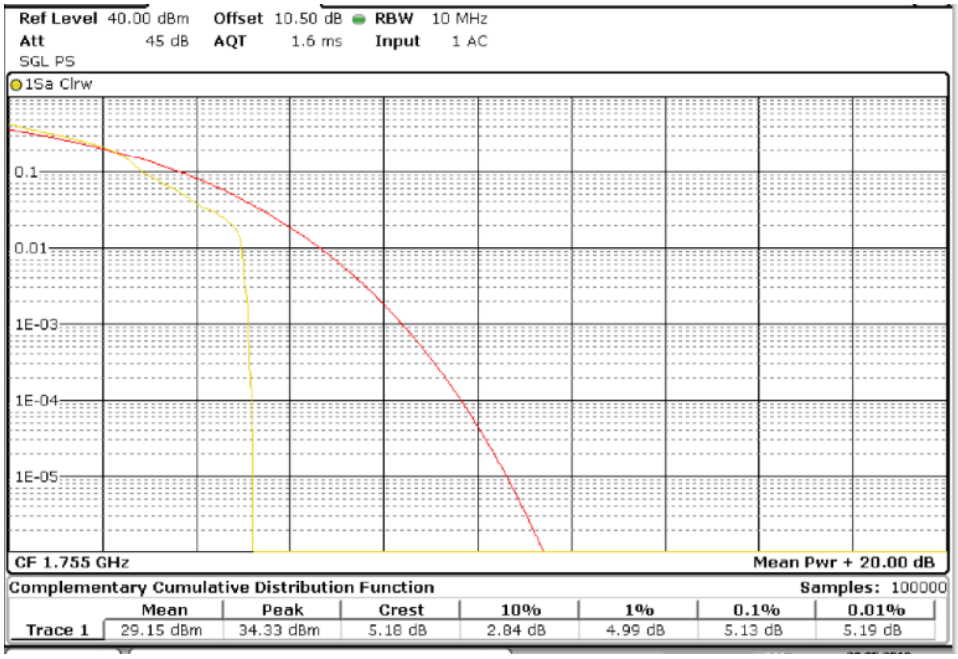


Bandwidth = 10 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
Lowest channel

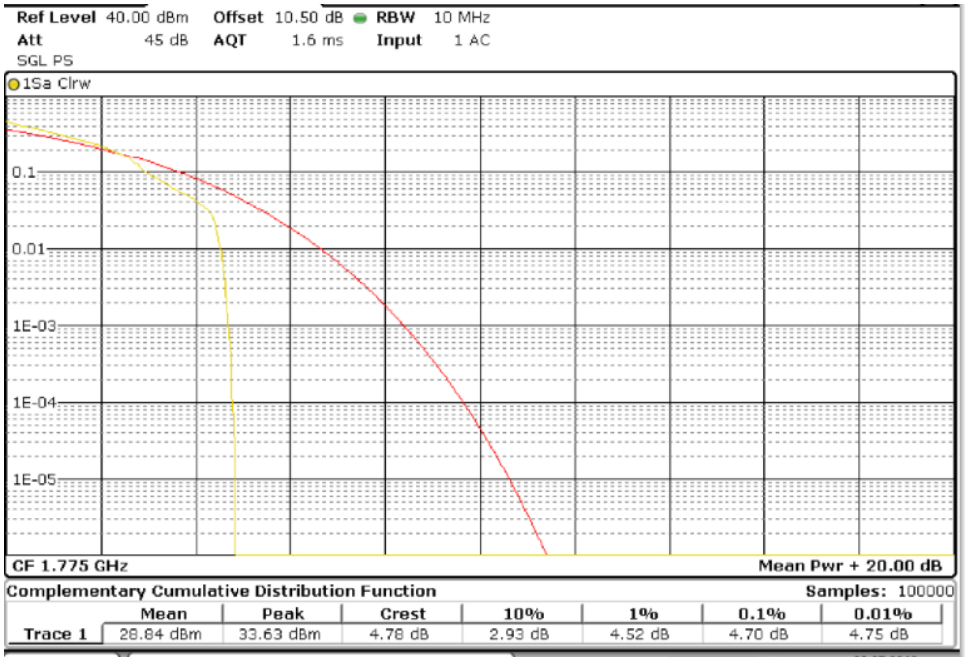


TEST RESULTS (Cont):	

Middle channel

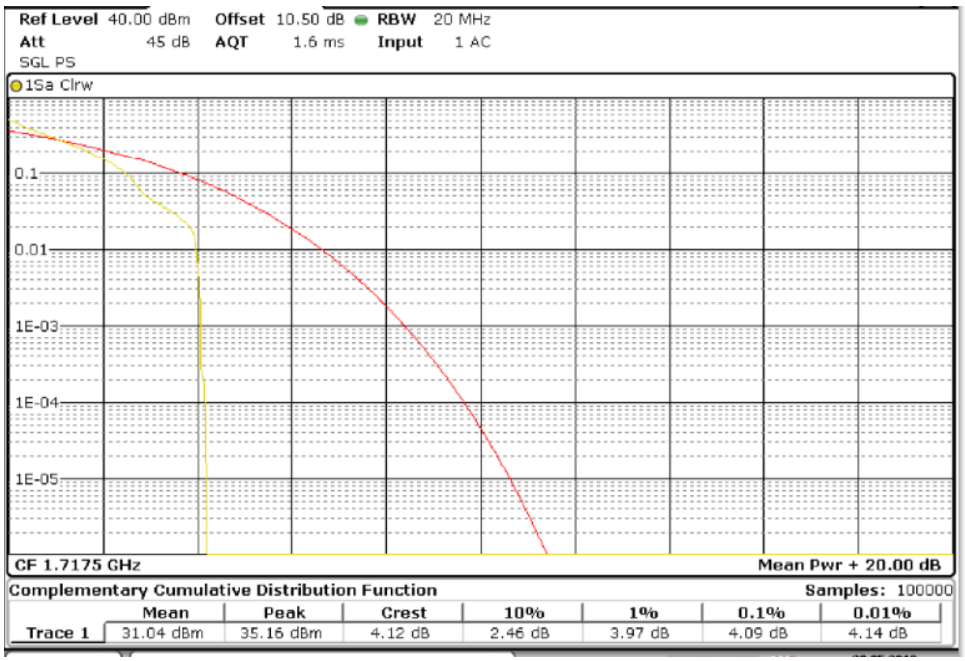


Highest channel

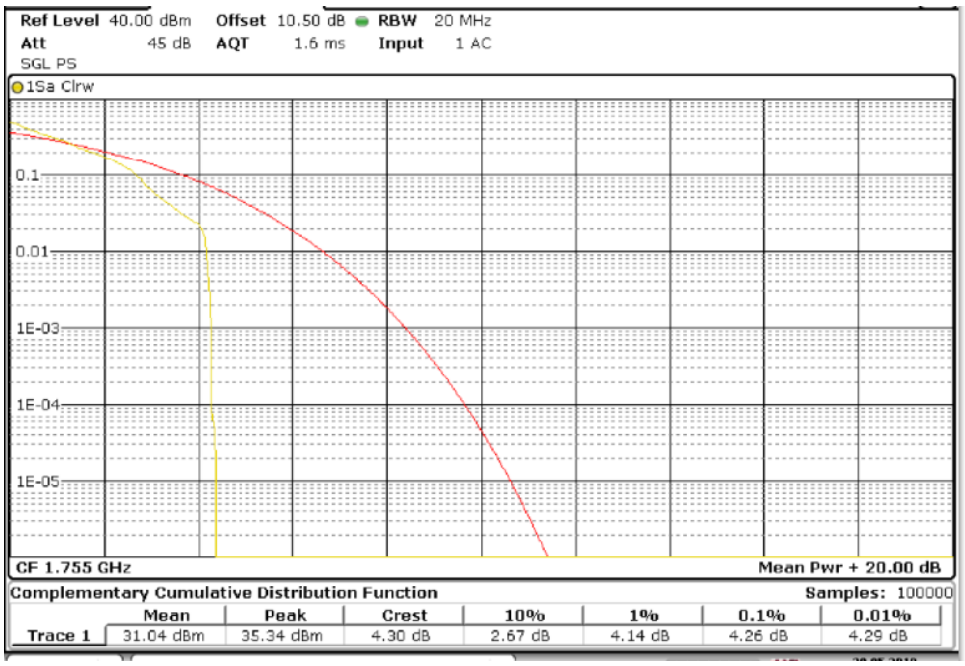


TEST RESULTS (Cont):	

PAPR
Bandwidth = 15 MHz. Modulation QPSK. RB Size: 1. RB Offset: 0.
Lowest channel

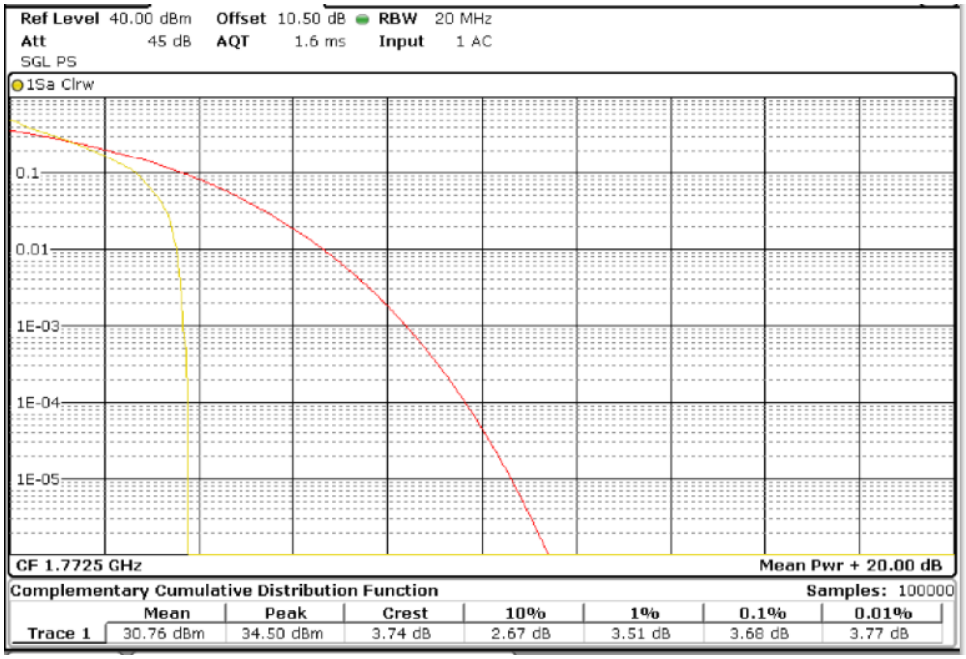


Middle channel

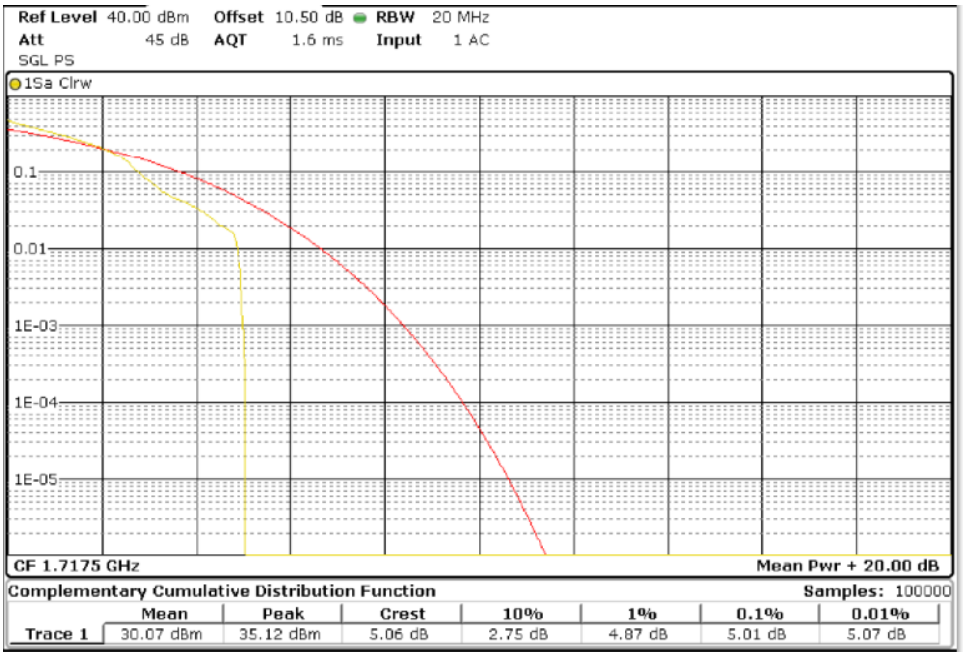


TEST RESULTS (Cont):	

Highest channel

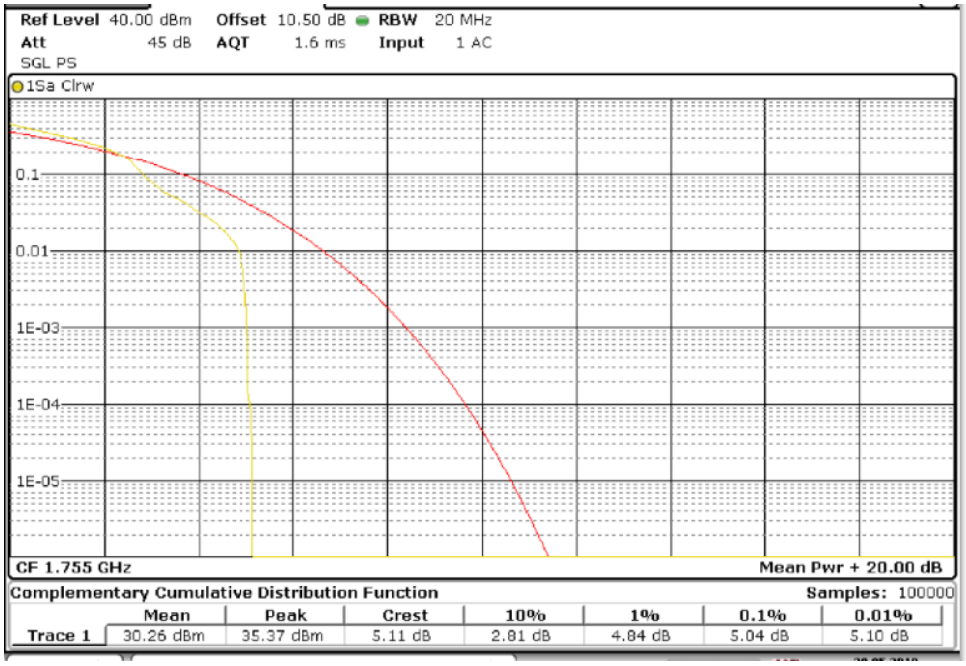


Bandwidth = 15 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
Lowest channel

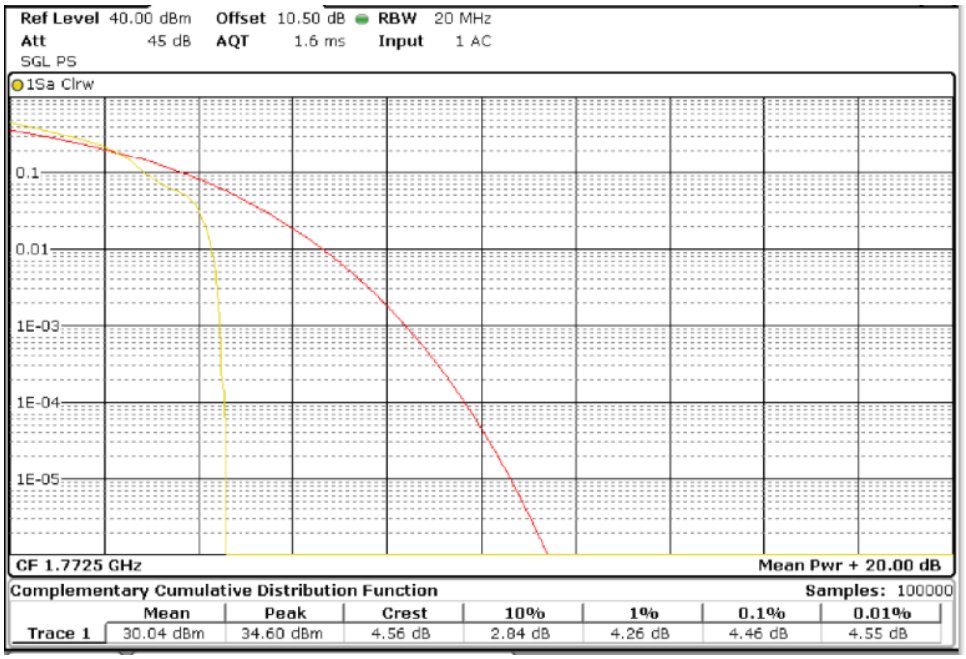


TEST RESULTS (Cont):	

Middle channel

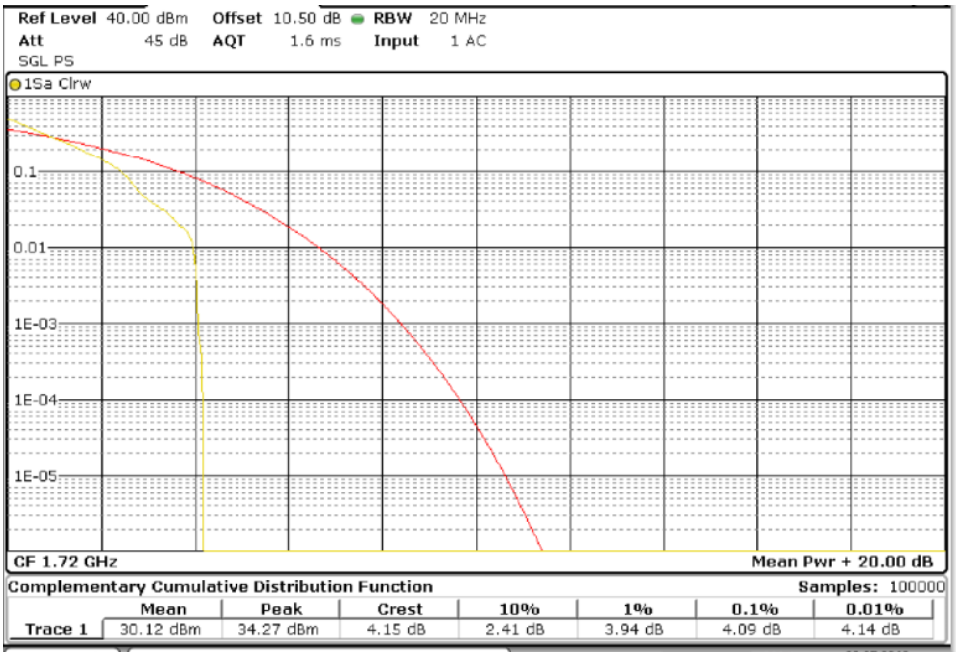


Highest channel

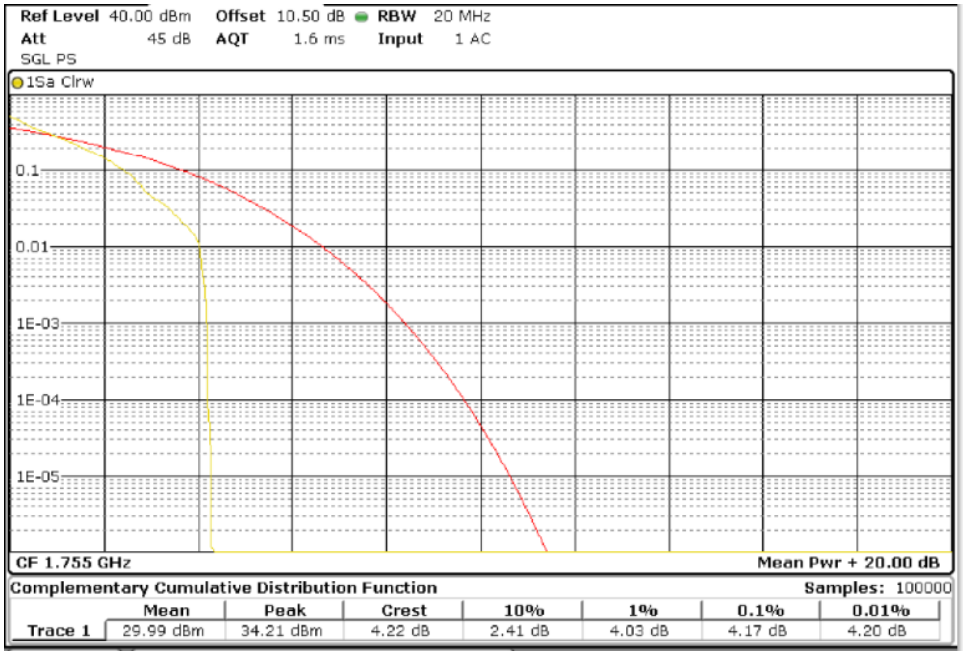


TEST RESULTS (Cont):	

Bandwidth = 20 MHz. Modulation QPSK. RB Size: 1. RB Offset: 0.
Lowest channel

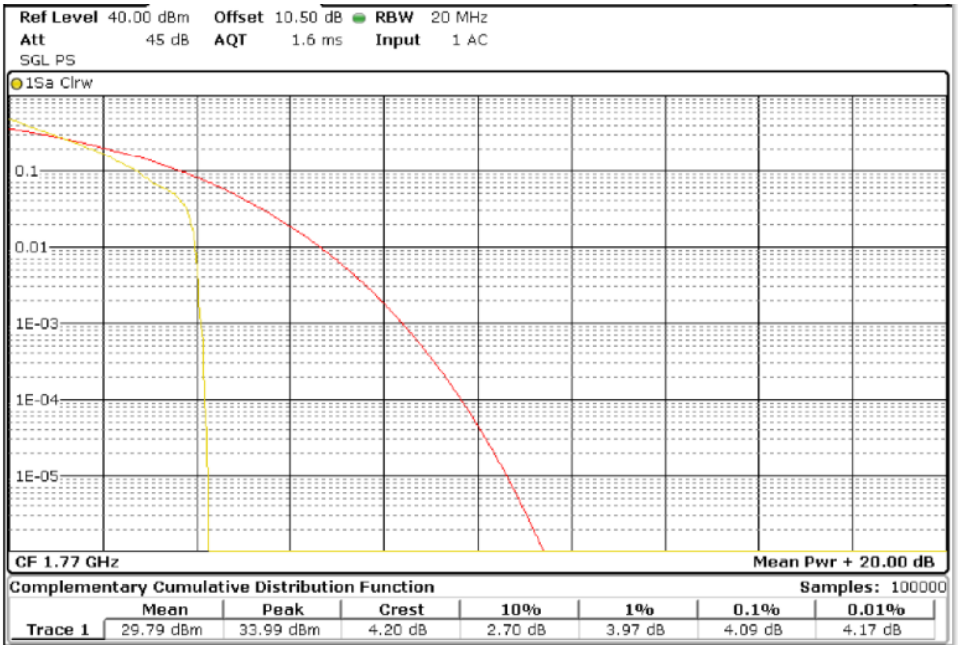


Middle channel

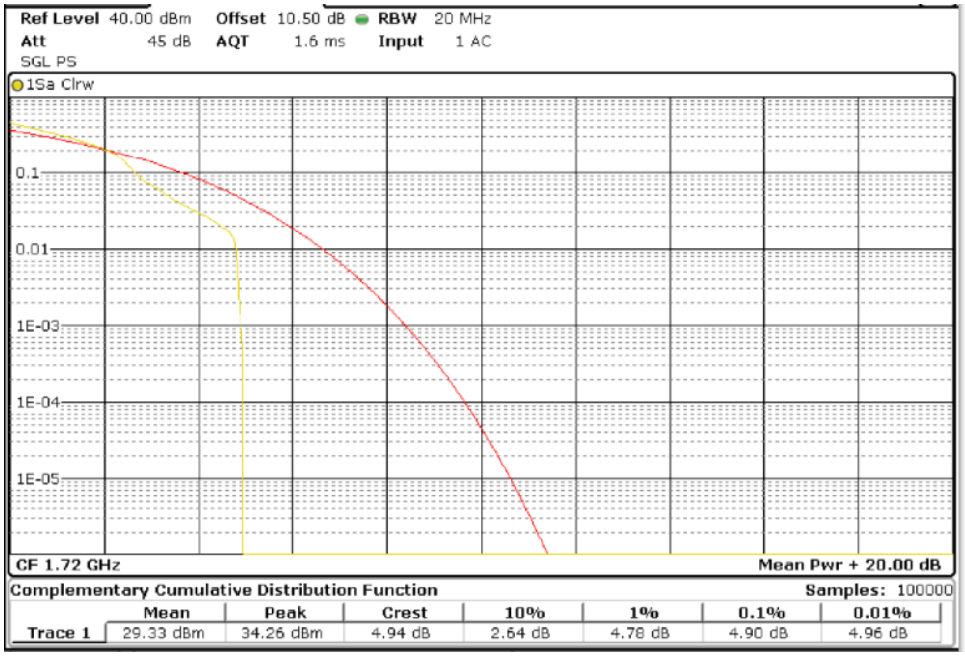


TEST RESULTS (Cont):	

Highest channel

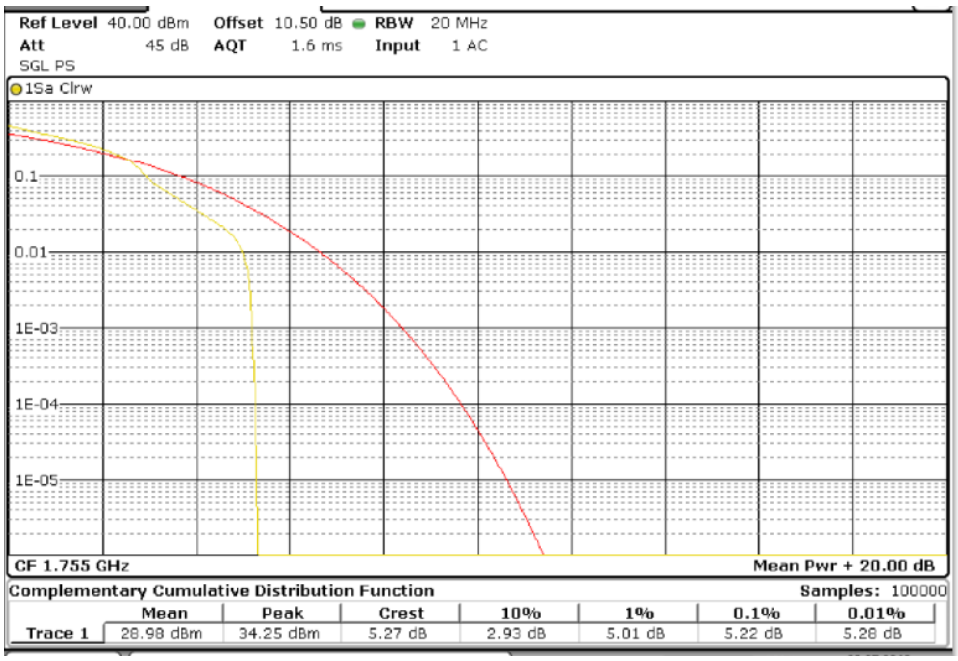


Bandwidth = 20 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
Lowest channel

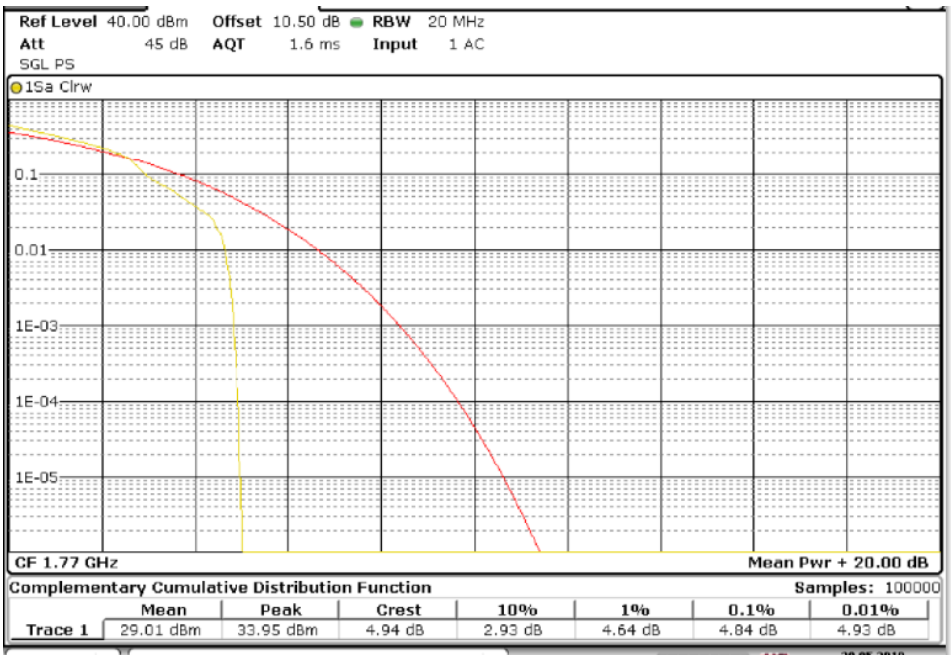


TEST RESULTS (Cont):	

Middle channel



Highest channel



TEST A.2: MODULATION CHARACTERISTICS

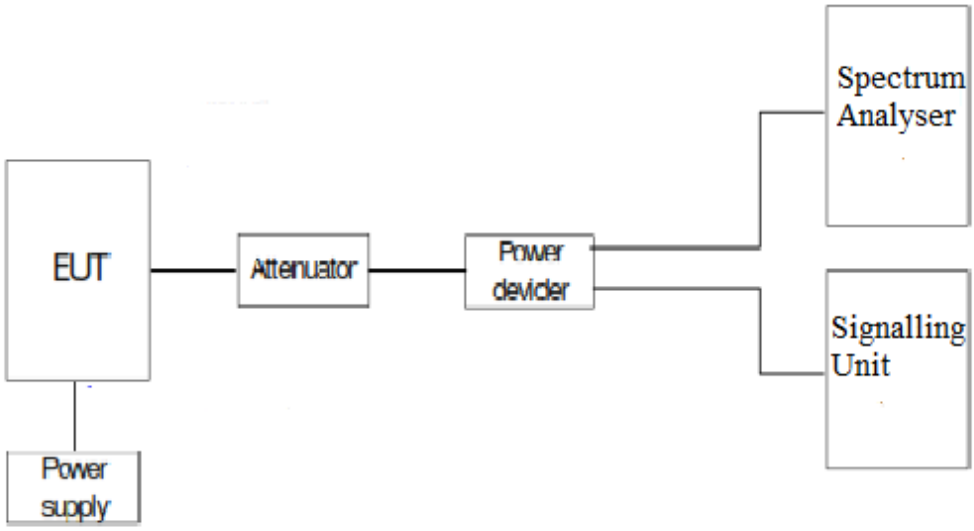
LIMITS:	Product standard:	FCC Part 27 / IC RSS-199
	Test standard:	FCC §2.1047 and §27.50 / RSS-199 Clause 4.1

LIMITS

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

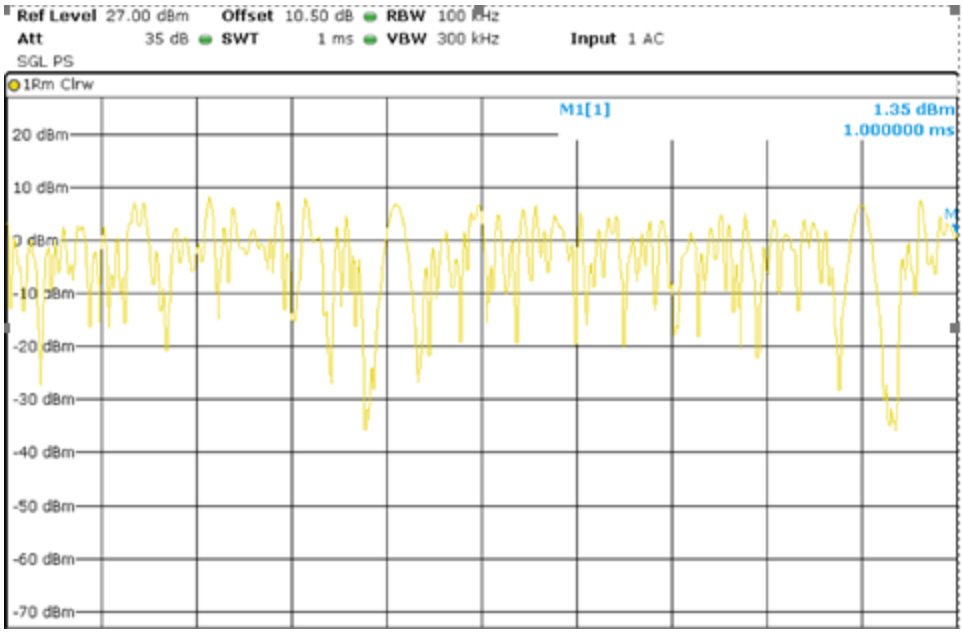
TEST SETUP

For LTE the EUT operates with QPSK and 16QAM modulation modes in which the information is digitized and coded into a bit stream. The RF transmission is multiplexed using Orthogonal Frequency Division Multiplexing (OFDM) using different possible arrangement of subcarriers (Resource Blocks RB).

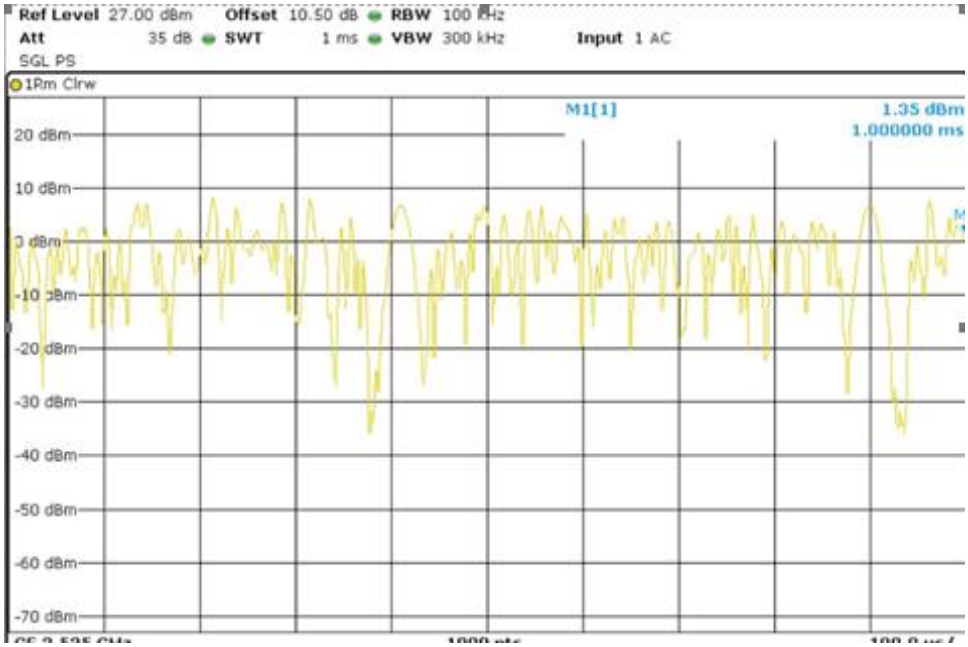


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

QPSK Modulation



16QAM Modulation



TEST A.3: FREQUENCY STABILITY

LIMITS:	Product standard:	FCC Part 27 / IC RSS-199
	Test standard:	FCC §2.1055 and § 27.54 / RSS-199 Clause 4.3

LIMITS

The frequency stability shall be enough to ensure that the fundamental emissions stay within the authorized bands of operation.

TEST SETUP

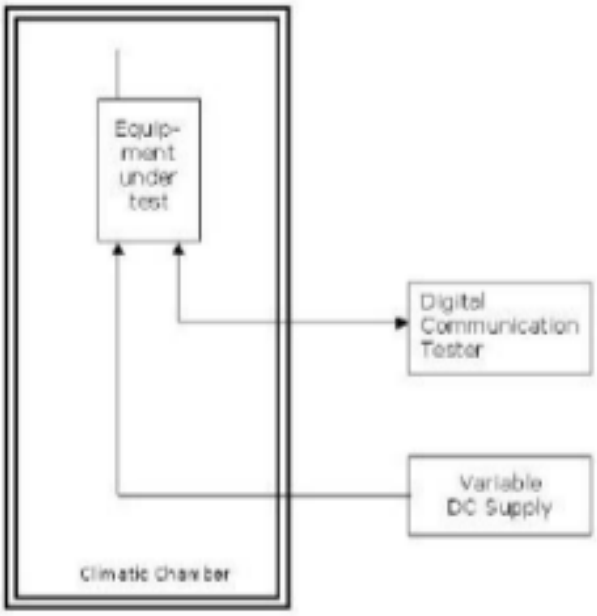
The frequency tolerance measurements over temperature variations were made over the temperature range of

–30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.

The supply voltage was varied between 85% and 115% of nominal voltage.

The EUT was set in “call mode” in the middle channel using the Universal Radio Communication tester R&S CMW500 and the maximum frequency error was measured using the built-in calibrated frequency meter.

For LTE mode the QPSK modulation was used for the test as it is the worst case for conducted power.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 4)
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 15 MHz

Frequency stability over temperature variations

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	3.19	0.0018	0.00000018
40	9.56	0.0055	0.00000055
30	9.37	0.0054	0.00000054
20	6.52	0.0038	0.00000038
10	7.95	0.0046	0.00000046
0	5.22	0.0030	0.00000030
-10	0.47	0.0003	0.00000003
-20	5.69	0.0033	0.00000033
-30	6.09	0.0035	0.00000035

Frequency stability over voltage variations

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	13.8	8.8	0.0051	0.00000051
Vmin	10.2	5.98	0.0035	0.00000035

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (Band 7)
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 20 MHz

Frequency stability over temperature variations

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	-0.93	-0.0004	-0.00000004
40	2.88	0.0011	0.00000011
30	-2.82	-0.0011	-0.00000011
20	-4.72	-0.0019	-0.00000019
10	-0.41	-0.0002	-0.00000002
0	-2.62	-0.0010	-0.00000010
-10	3.4	0.0013	0.00000013
-20	3.32	0.0013	0.00000013
-30	1.56	0.0006	0.00000006

Frequency stability over voltage variations

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	13.8	-3.12	-0.0012	-0.00000012
Vmin	10.2	5.29	0.0021	0.00000021

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (Band 12)
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 5 MHz

Frequency stability over temperature variations

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	-5.91	-0.0084	-0.00000084
40	1.49	0.0021	0.00000021
30	-7.45	-0.0105	-0.00000105
20	3.4	0.0048	0.00000048
10	-9.06	-0.0128	-0.00000128
0	-3.05	-0.0043	-0.00000043
-10	-2.09	-0.0030	-0.00000030
-20	-5.51	-0.0078	-0.00000078
-30	-0.9	-0.0013	-0.00000013

Frequency stability over voltage variations

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	13.8	-1.82	-0.0026	-0.00000026
Vmin	10.2	-4.28	-0.0060	-0.00000060

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#04 (Band 13)
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 5 MHz

Frequency stability over temperature variations

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	0.44	0.0006	0.00000006
40	-1.77	-0.0023	-0.00000023
30	-0.69	-0.0009	-0.00000009
20	-1.23	-0.0016	-0.00000016
10	0.5	0.0006	0.00000006
0	-3.95	-0.0051	-0.00000051
-10	1.69	0.0022	0.00000022
-20	-5.49	-0.0070	-0.00000070
-30	-5.05	-0.0065	-0.00000065

Frequency stability over voltage variations

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	13.8	-2.09	-0.0027	-0.00000027
Vmin	10.2	-3.15	-0.0040	-0.00000040

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#05 (Band 66)
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 15 MHz

Frequency stability over temperature variations

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	7.95	0.0045	0.00000045
40	0.44	0.0003	0.00000003
30	2.7	0.0015	0.00000015
20	7.98	0.0045	0.00000045
10	7.2	0.0041	0.00000041
0	10.13	0.0058	0.00000058
-10	11.2	0.0064	0.00000064
-20	10.51	0.0060	0.00000060
-30	5.36	0.0031	0.00000031

Frequency stability over voltage variations

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	13.8	11.72	0.0067	0.00000067
Vmin	10.2	3.16	0.0018	0.00000018

TEST A.4: OCCUPIED BANDWIDTH

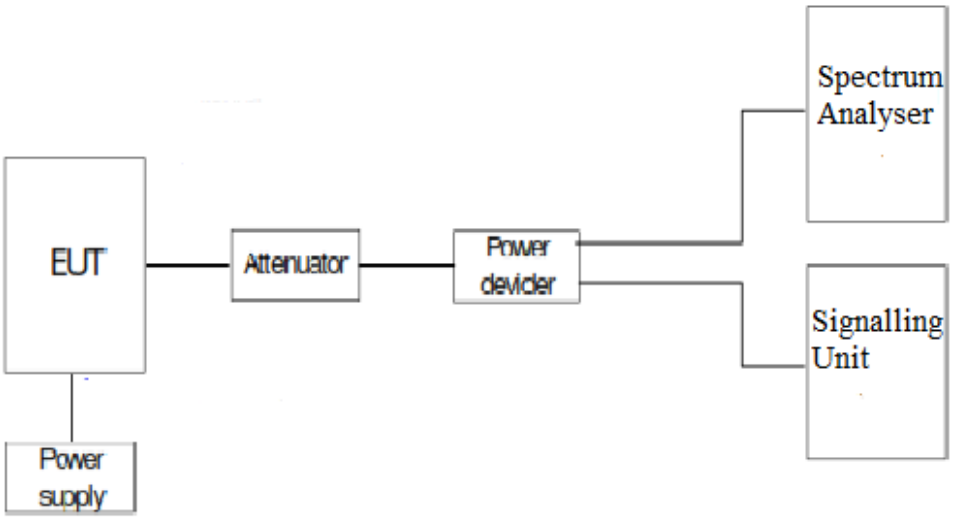
LIMITS:	Product standard:	FCC Part 27 / IC RSS-199
	Test standard:	FCC § 2.1049 / RSS-199 Clause 4.2

LIMITS

Reference only.

TEST SETUP	

The occupied bandwidth measurement was performed at the output terminals of the EUT using an attenuator, power splitter and spectrum analyzer. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyzer.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 4)
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 1.4 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.11	1.11	1.11
-26 dBc bandwidth (MHz)	1.28	1.28	1.27

LTE 16QAM MODULATION. BW = 1.4 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12	1.12	1.11
-26 dBc bandwidth (MHz)	1.28	1.29	1.28

LTE QPSK MODULATION. BW = 3 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	2.74	2.75	2.74
-26 dBc bandwidth (MHz)	3.08	3.09	3.07

LTE 16QAM MODULATION. BW = 3 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	2.74	2.75	2.74
-26 dBc bandwidth (MHz)	3.08	3.11	3.08

LTE QPSK MODULATION. BW = 5 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	4.58	4.57	4.57
-26 dBc bandwidth (MHz)	5.17	5.17	5.14

LTE 16QAM MODULATION. BW = 5 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	4.56	4.57	4.57
-26 dBc bandwidth (MHz)	5.17	5.15	5.14

TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 10 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	8.98	8.98	8.98
-26 dBc bandwidth (MHz)	9.93	9.87	9.93

LTE 16QAM MODULATION. BW = 10 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	8.98	8.98	8.98
-26 dBc bandwidth (MHz)	9.93	9.87	9.90

LTE QPSK MODULATION. BW = 15 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	13.41	13.44	13.41
-26 dBc bandwidth (MHz)	14.63	14.61	14.59

LTE 16QAM MODULATION. BW = 15 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	13.41	13.44	13.41
-26 dBc bandwidth (MHz)	14.63	14.61	14.67

LTE QPSK MODULATION. BW = 20 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	17.84	17.88	17.88
-26 dBc bandwidth (MHz)	19.39	19.40	19.52

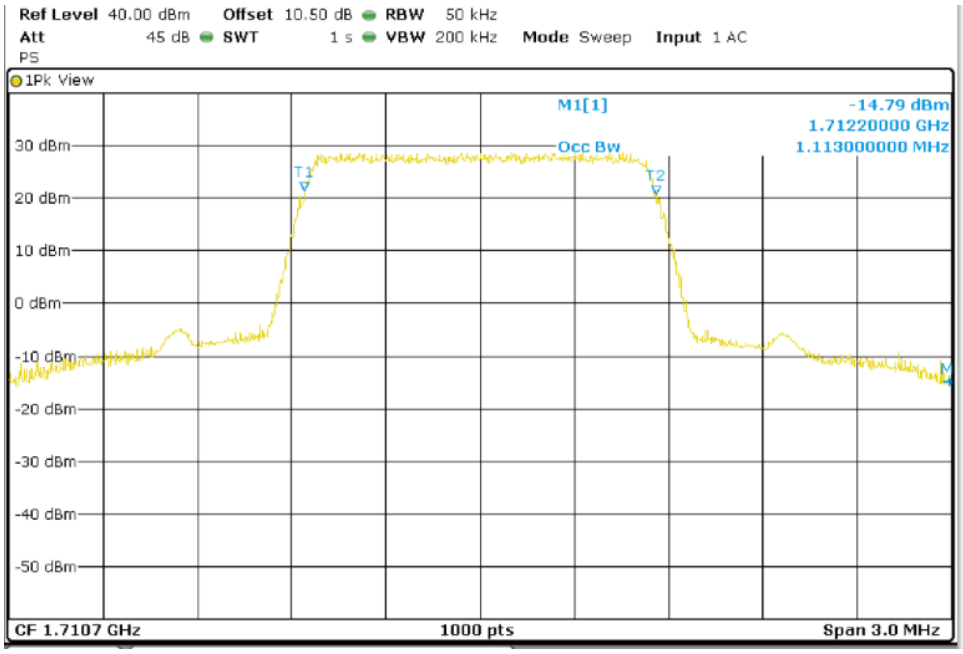
LTE 16QAM MODULATION. BW = 20 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	17.88	17.88	17.88
-26 dBc bandwidth (MHz)	19.57	19.45	19.57

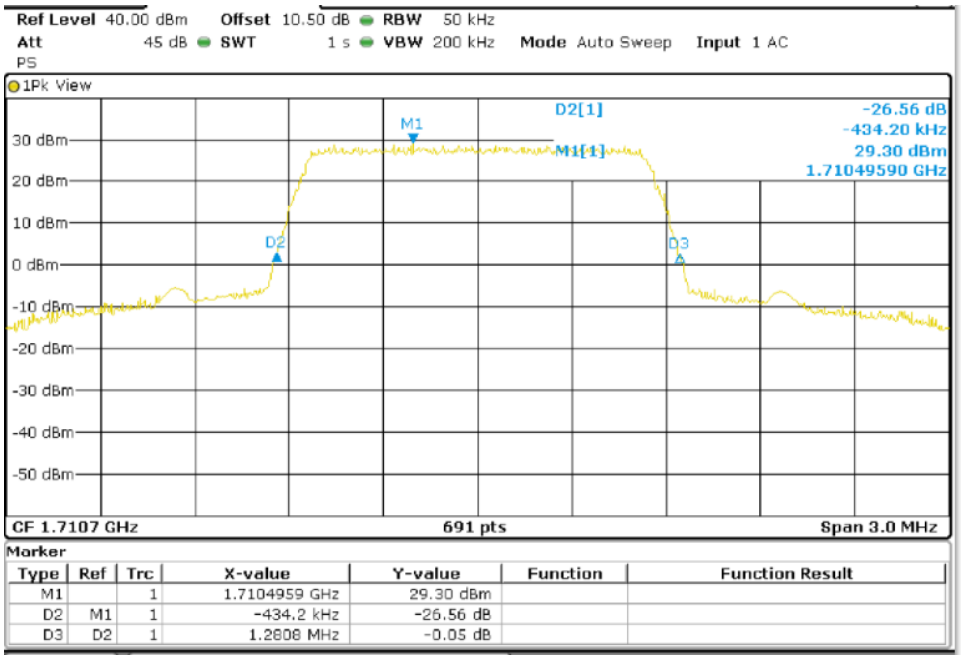
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 1.4 MHz

Lowest Channel 99% Occupied Bandwidth

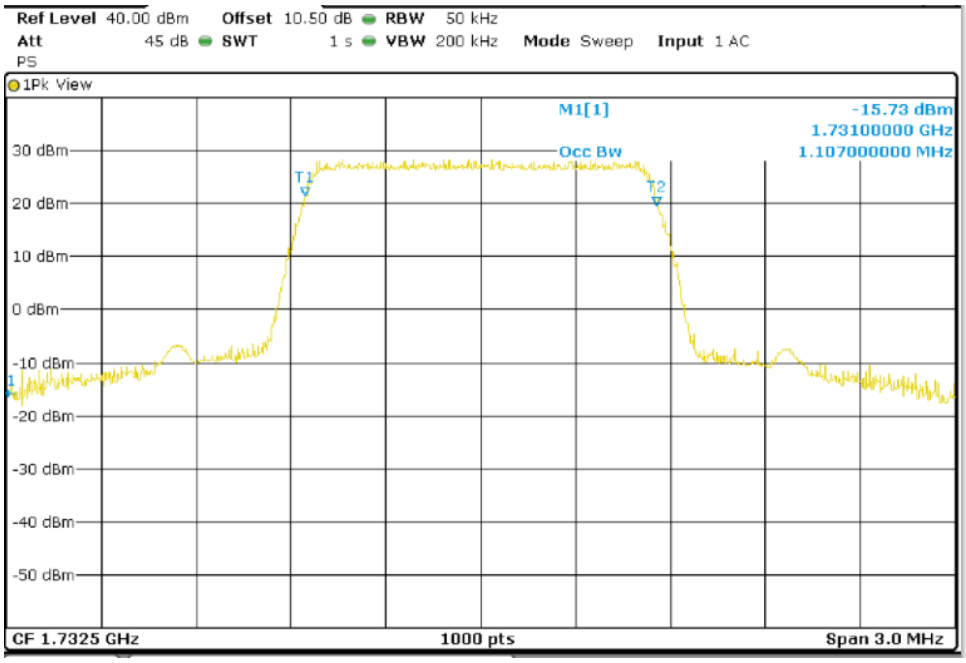


Lowest Channel -26dBc Bandwidth kHz

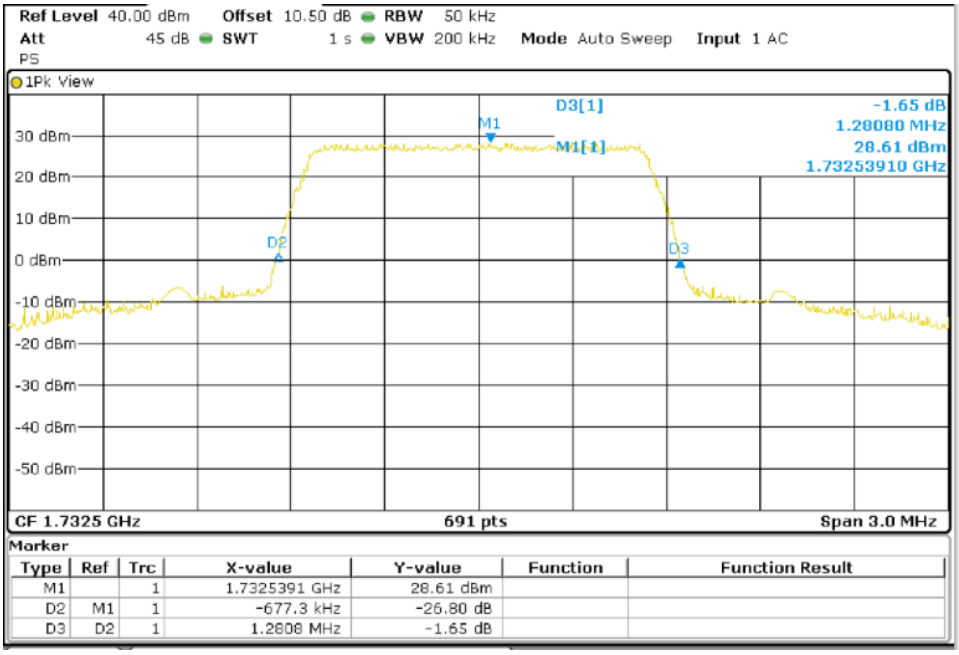


TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel -26dBc Bandwidth kHz

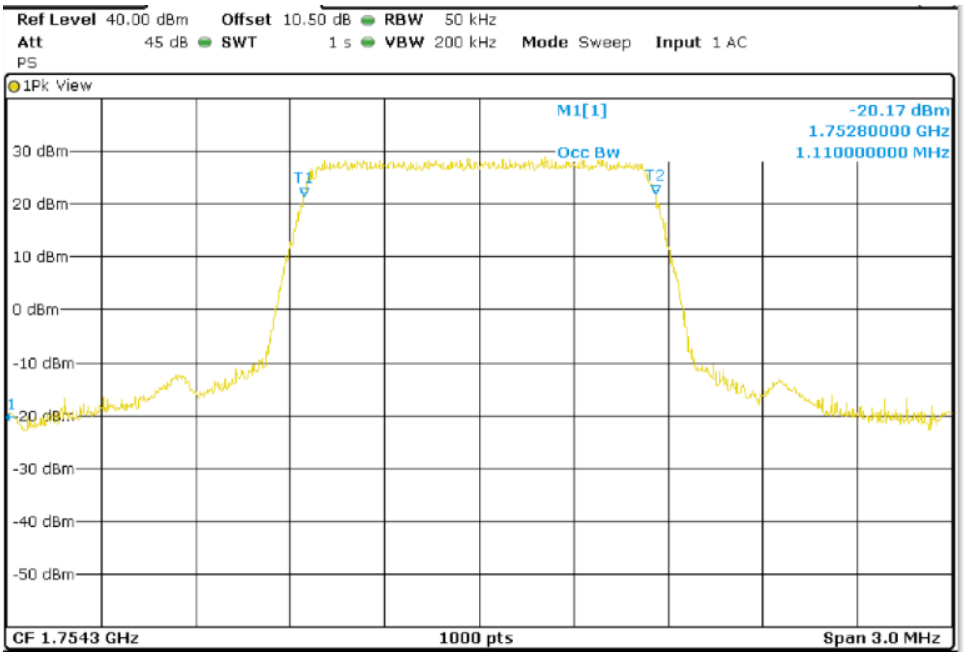


Marker

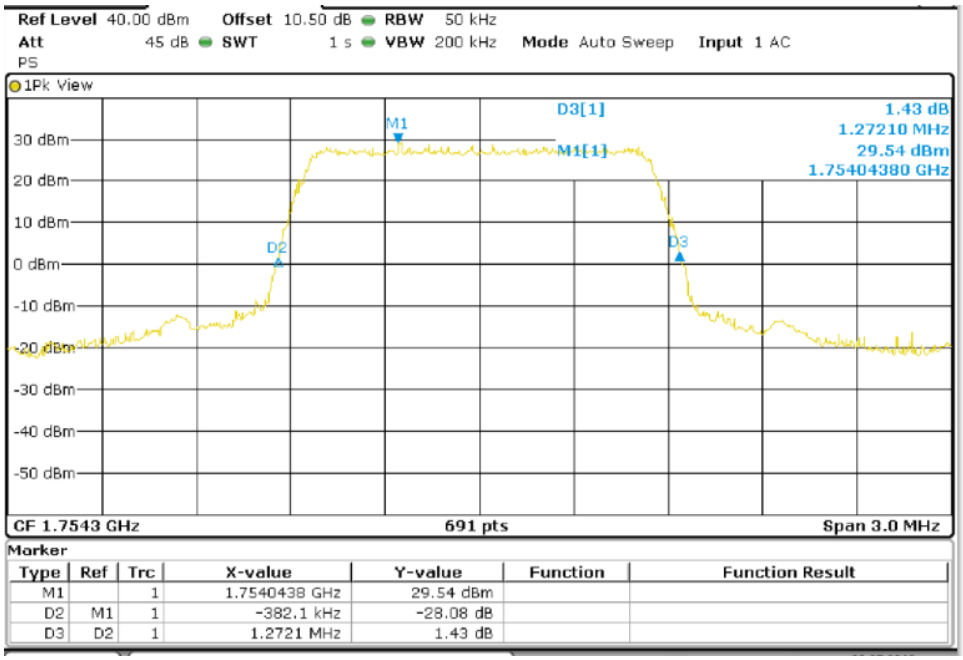
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.7325391 GHz	28.61 dBm		
D2	M1	1	-677.3 kHz	-26.80 dB		
D3	D2	1	1.2808 MHz	-1.65 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



Highest Channel -26dBc Bandwidth kHz



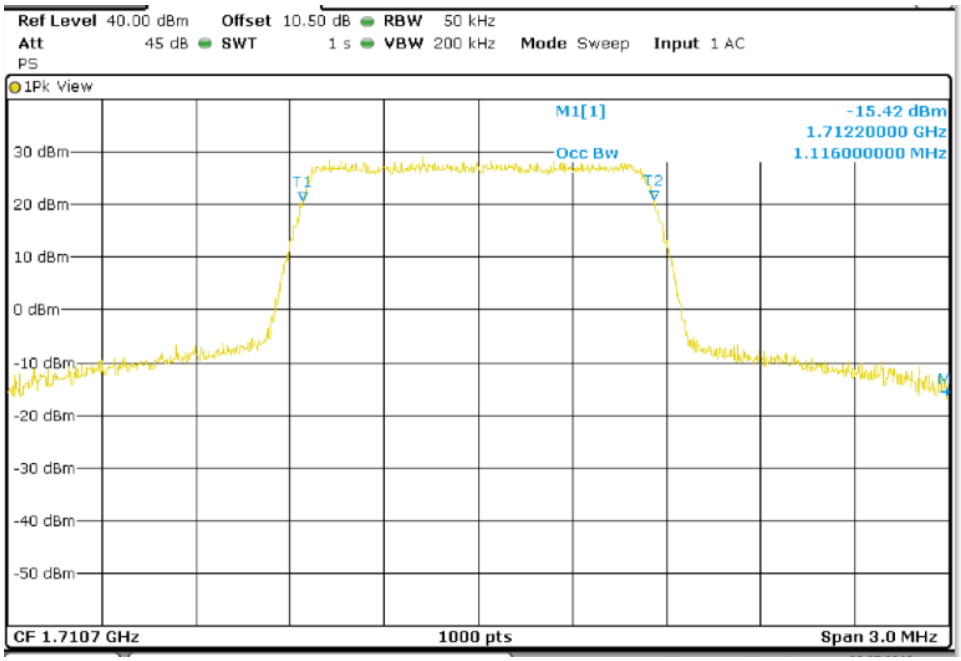
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.7540438 GHz	29.54 dBm		
D2	M1	1	-382.1 kHz	-28.08 dB		
D3	D2	1	1.2721 MHz	1.43 dB		

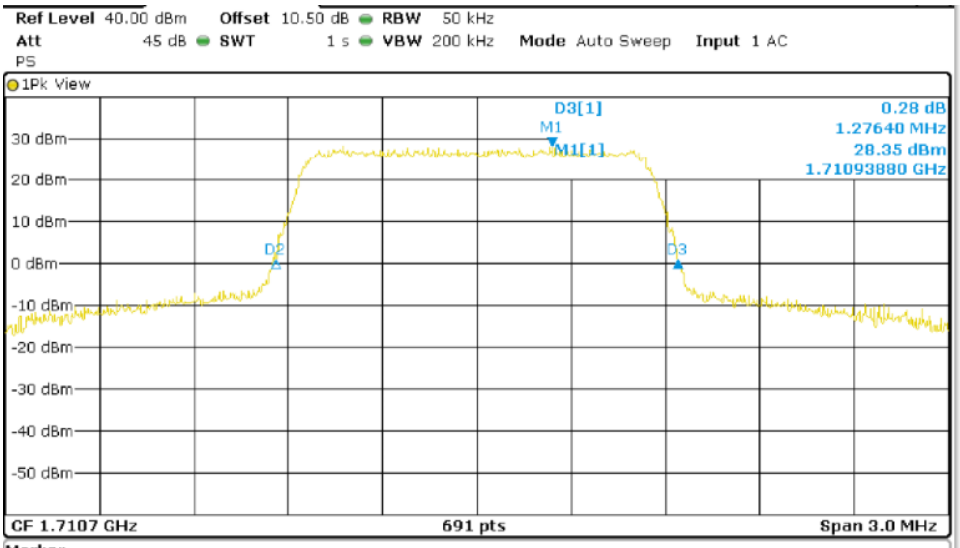
TEST RESULTS (Cont):	

LTE 16QAM MODULATION. BW = 1.4 MHz

Lowest Channel 99% Occupied Bandwidth



Lowest Channel -26dBc Bandwidth kHz

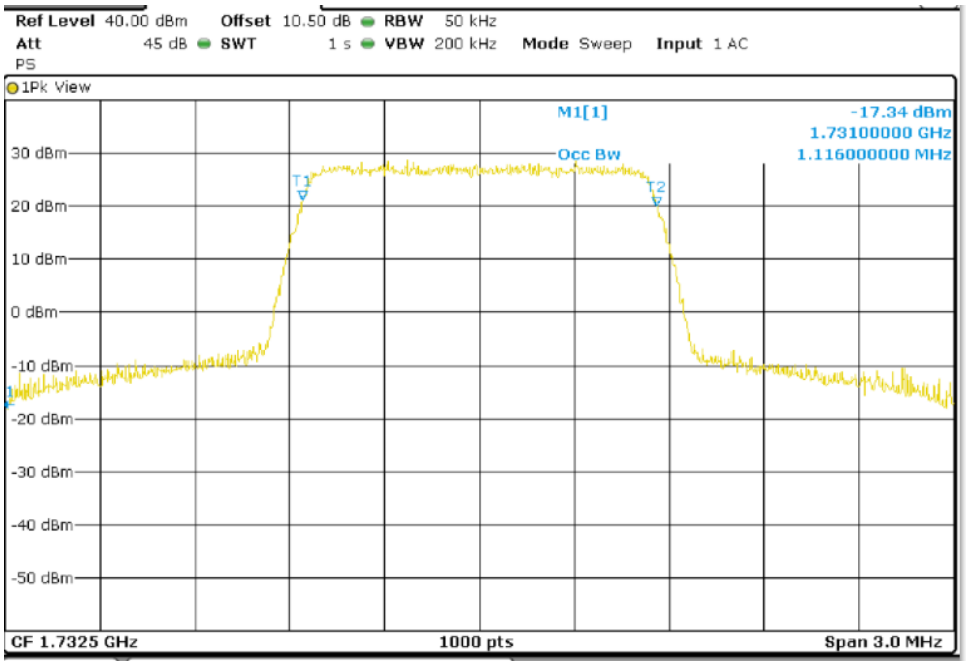


Marker

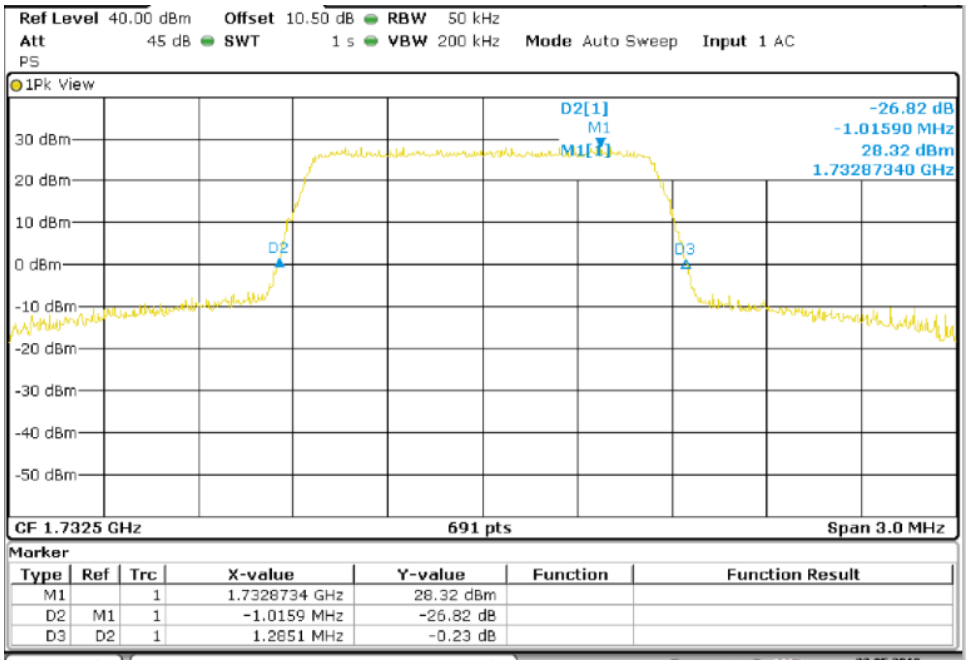
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.7109388 GHz	28.35 dBm		
D2	M1	1	-877.0 kHz	-27.64 dB		
D3	D2	1	1.2764 MHz	0.28 dB		

TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth

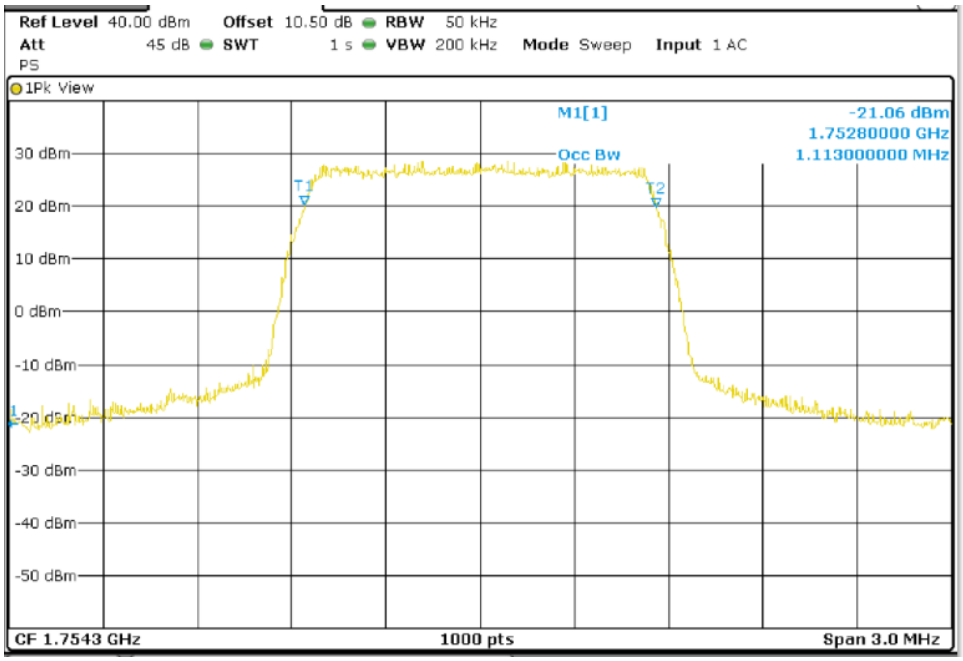


Middle Channel -26dBc Bandwidth kHz

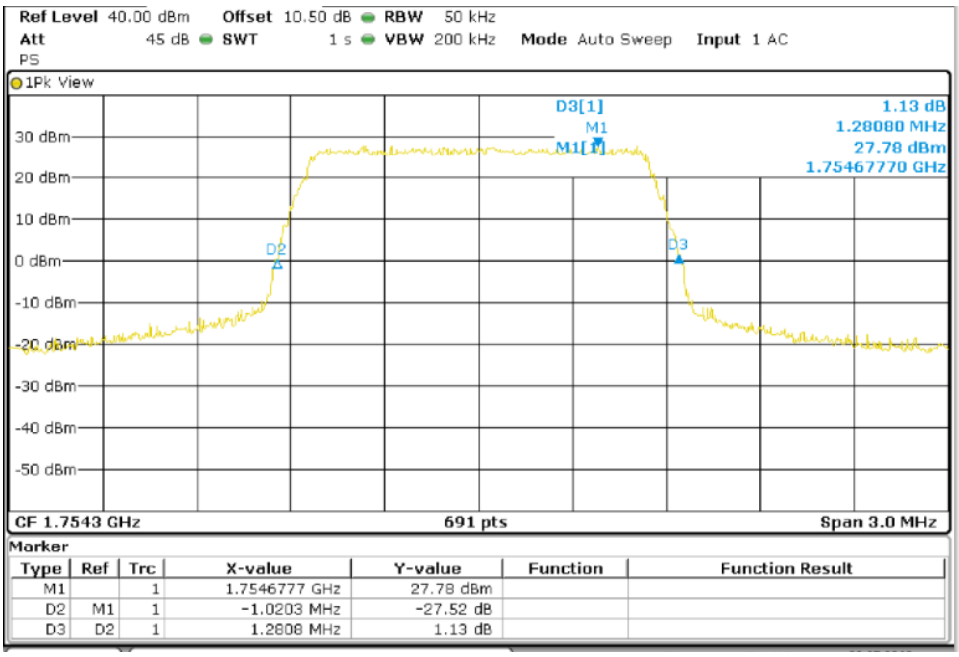


TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



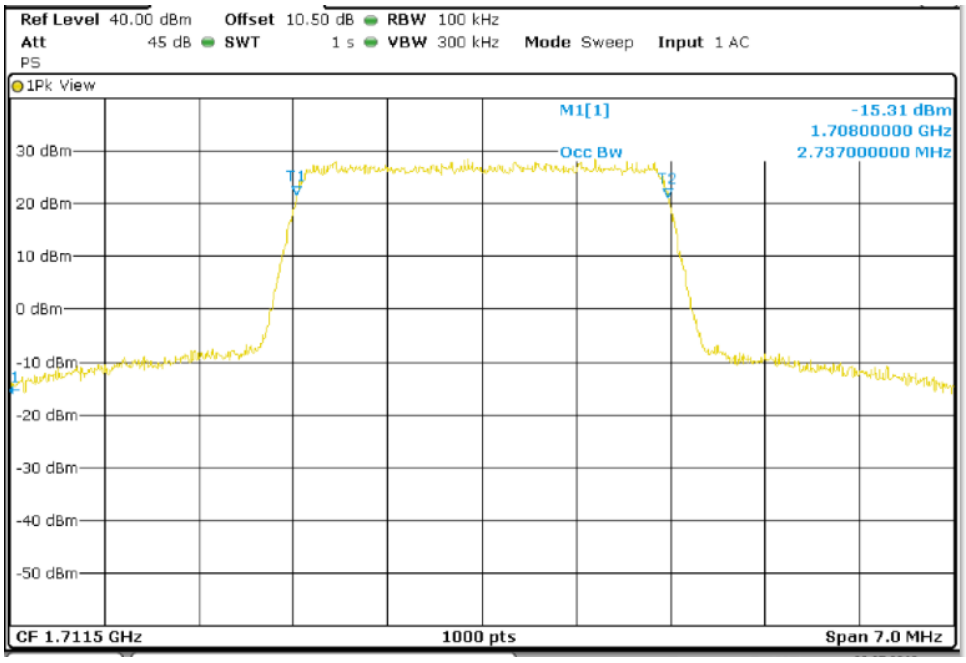
Highest Channel -26dBc Bandwidth kHz



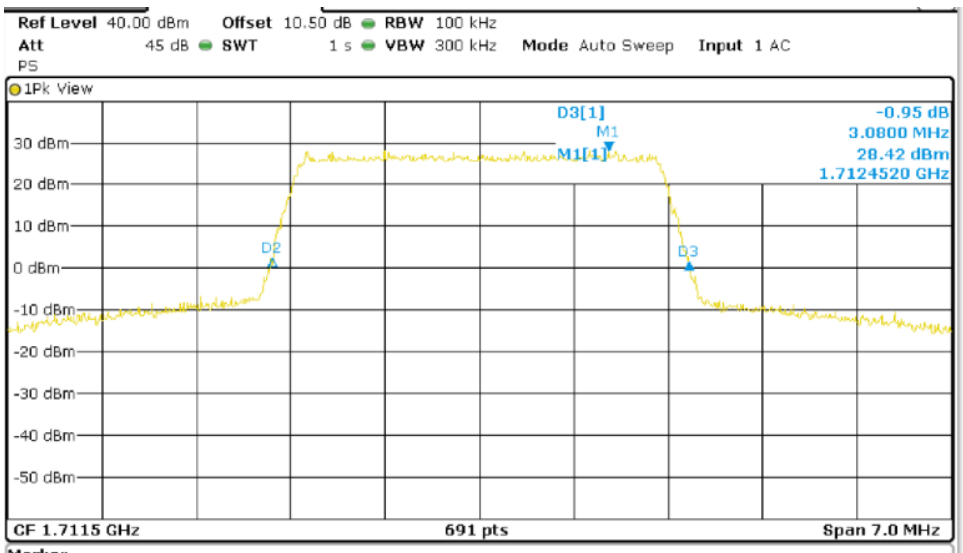
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 3 MHz

Lowest Channel 99% Occupied Bandwidth



Lowest Channel -26dBc Bandwidth kHz

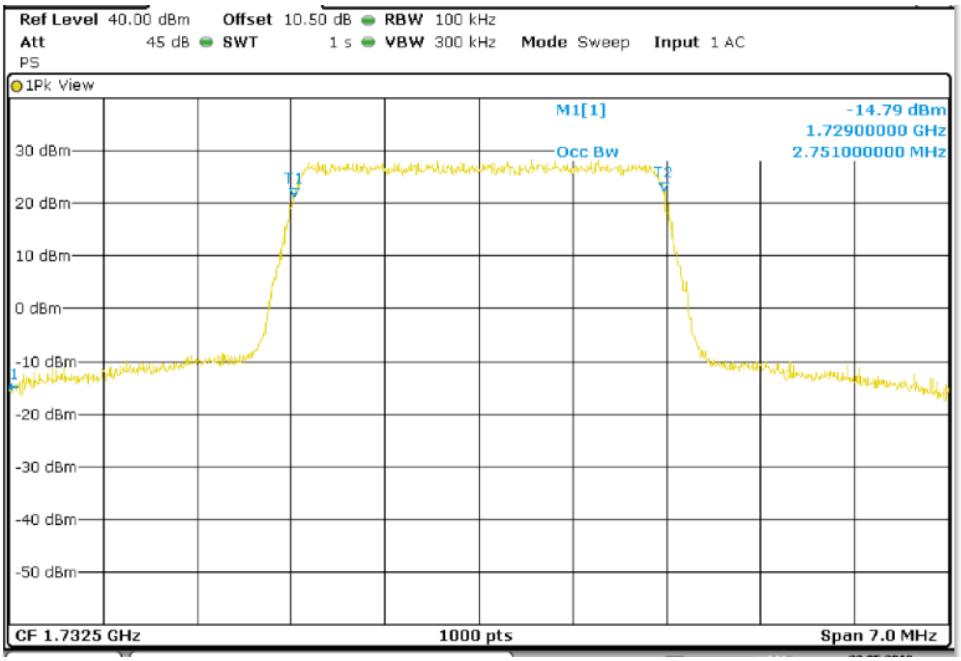


Marker

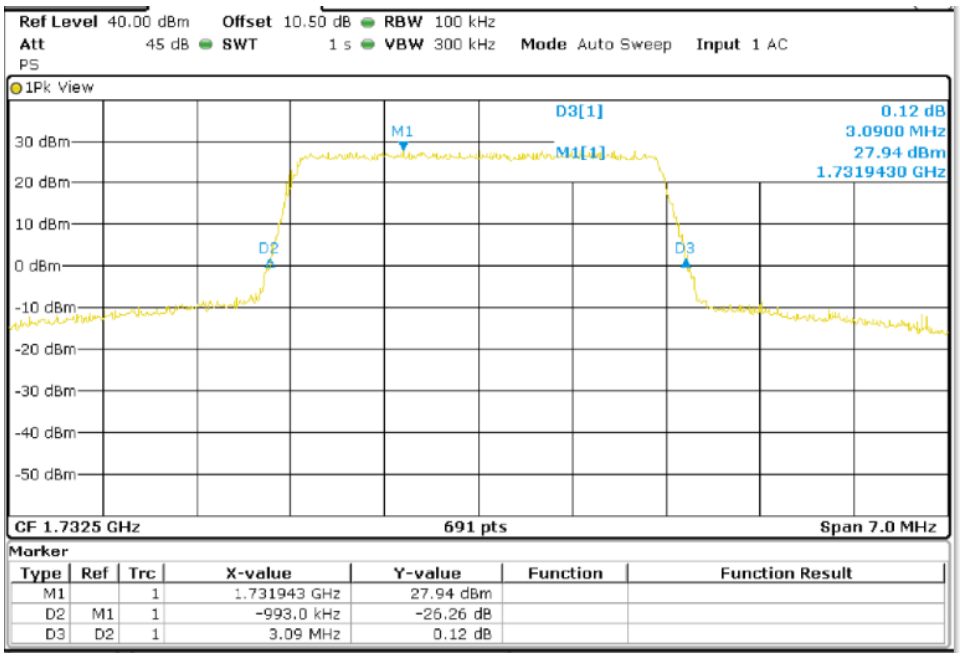
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.712452 GHz	28.42 dBm		
D2	M1	1	-2.482 MHz	-26.10 dB		
D3	D2	1	3.08 MHz	-0.95 dB		

TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel -26dBc Bandwidth kHz

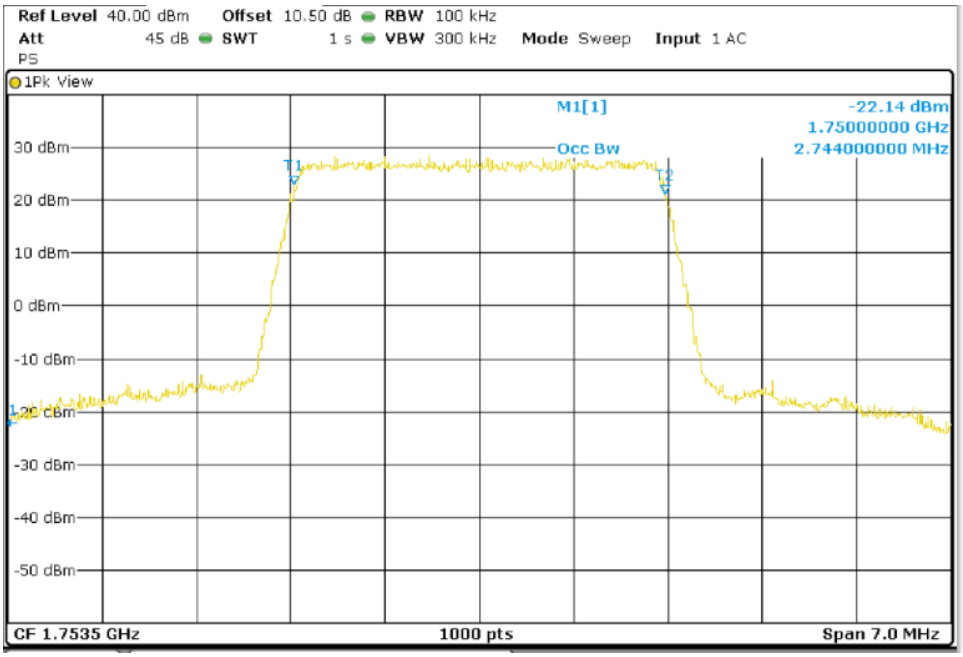


Marker

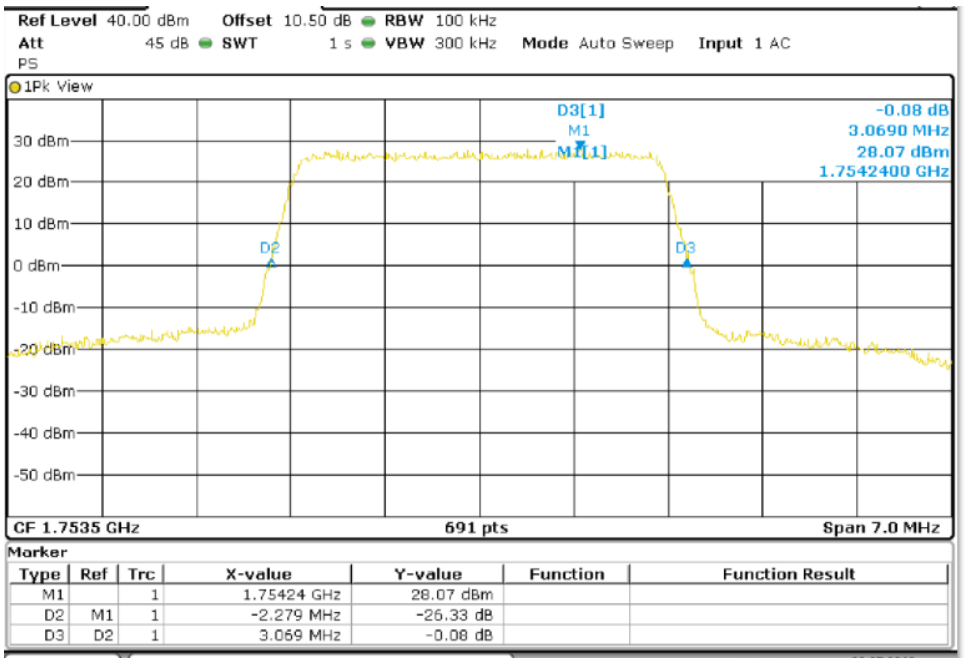
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.731943 GHz	27.94 dBm		
D2	M1	1	-993.0 kHz	-26.26 dB		
D3	D2	1	3.09 MHz	0.12 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



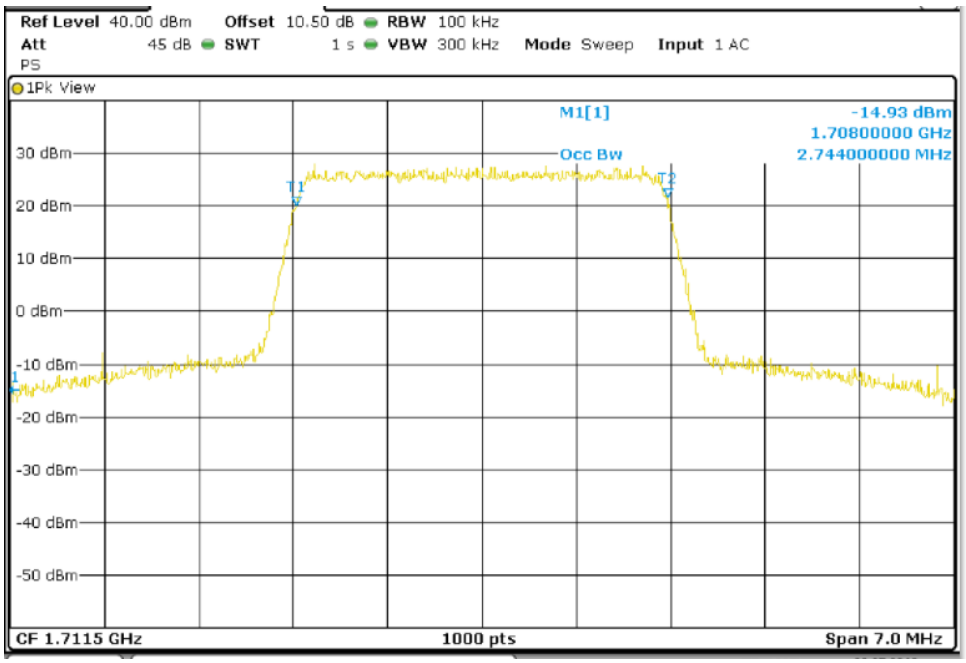
Highest Channel -26dBc Bandwidth kHz



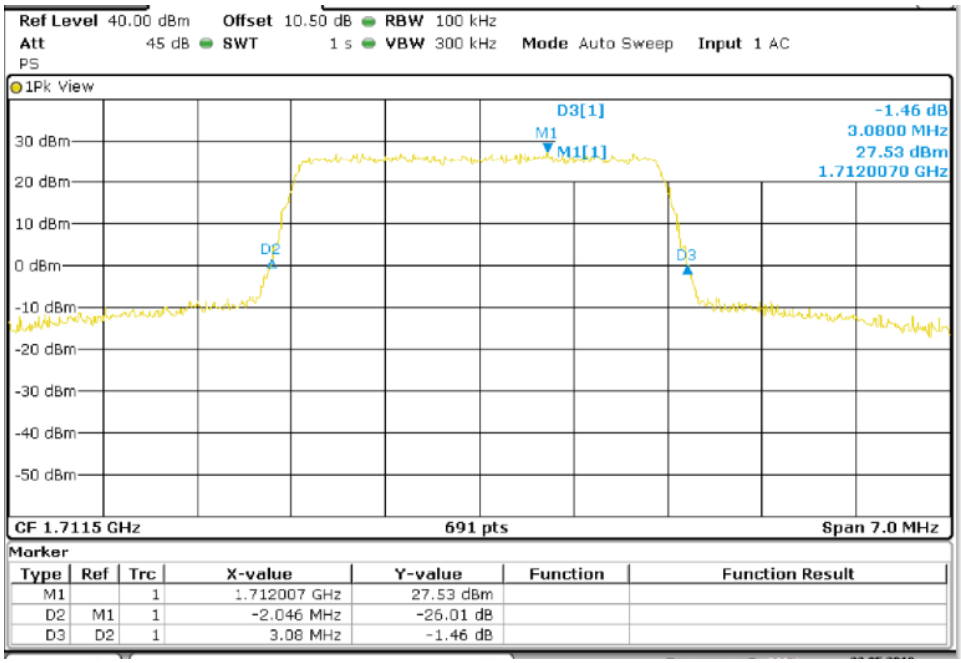
TEST RESULTS (Cont):	

LTE 16QAM MODULATION. BW = 3 MHz

Lowest Channel 99% Occupied Bandwidth



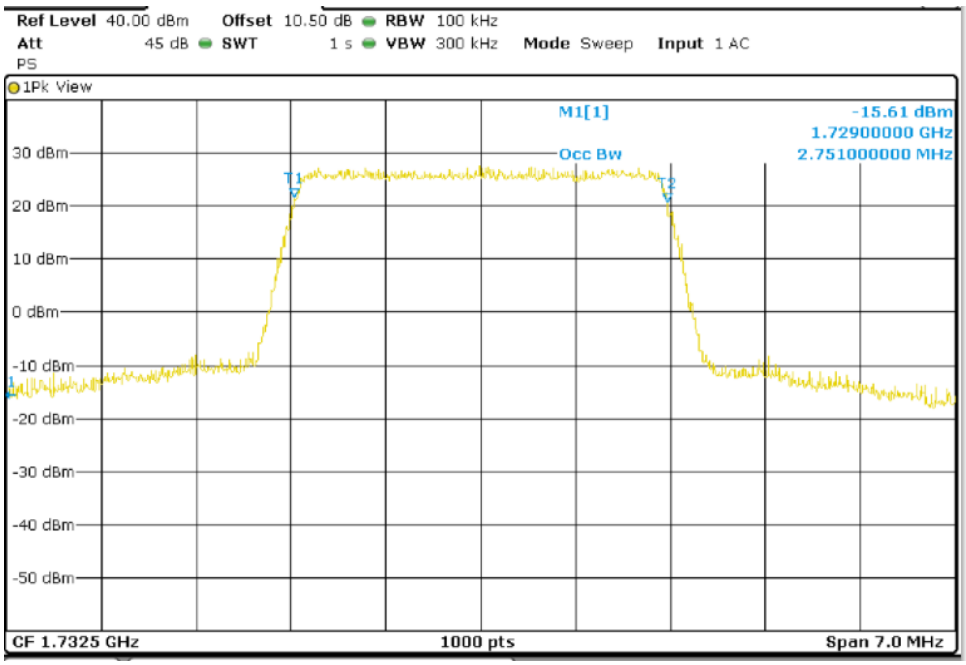
Lowest Channel -26dBc Bandwidth kHz



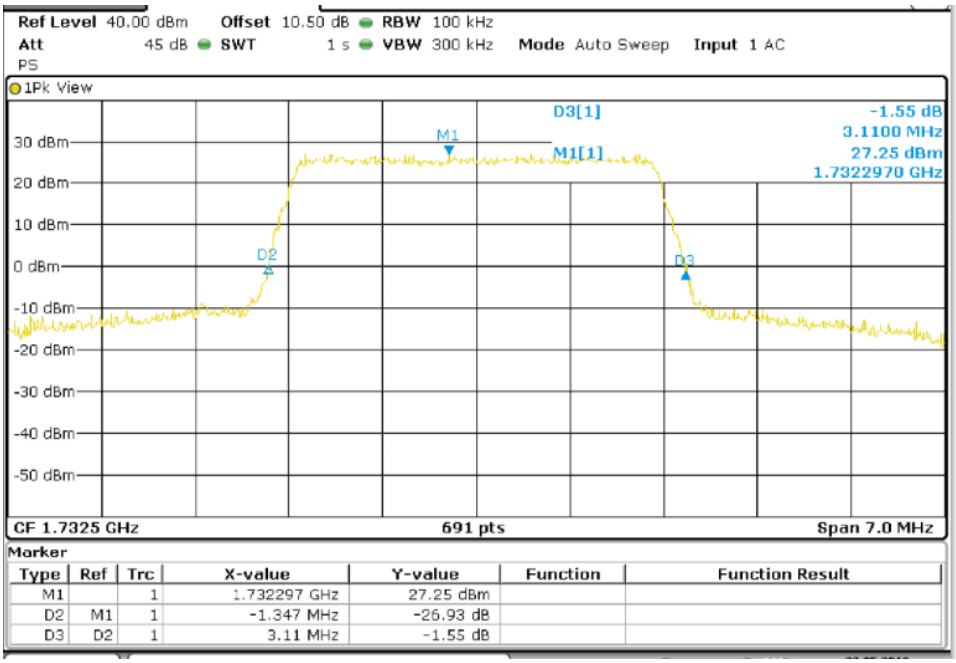
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.712007 GHz	27.53 dBm		
D2	M1	1	-2.046 MHz	-26.01 dB		
D3	D2	1	3.08 MHz	-1.46 dB		

TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel -26dBc Bandwidth kHz

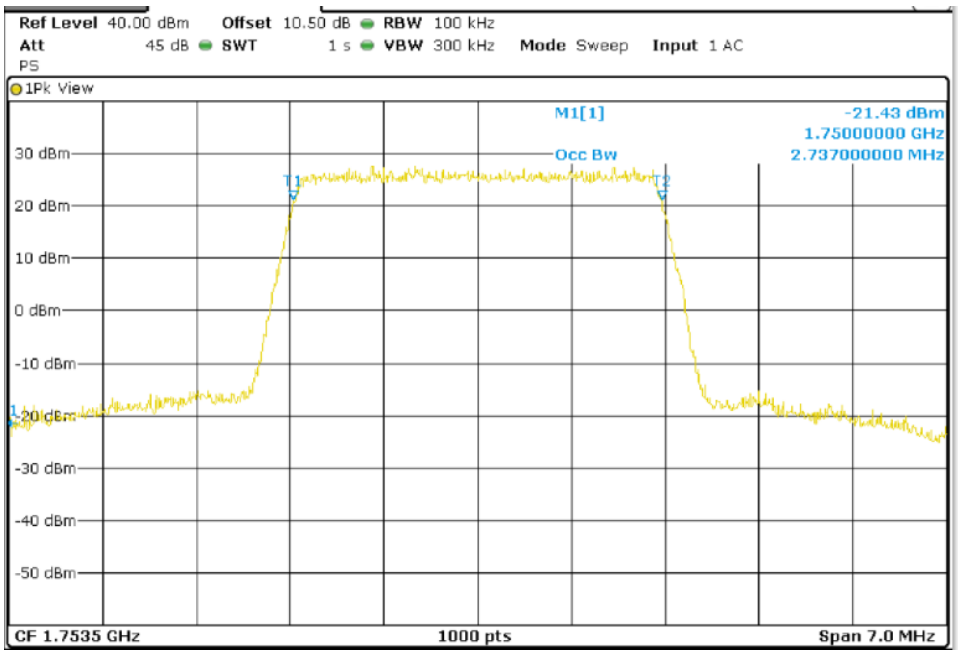


Marker

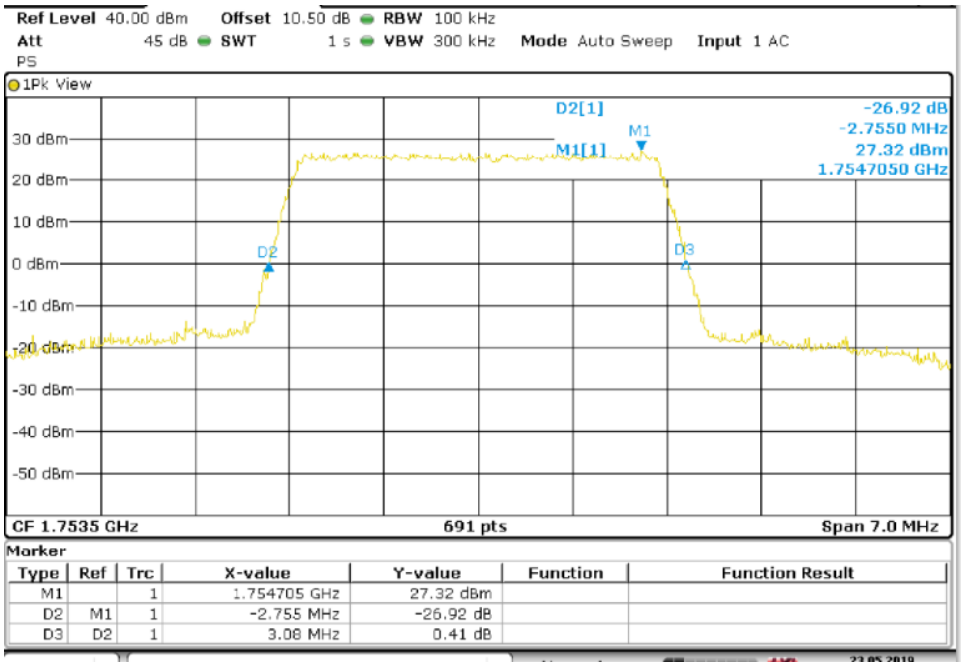
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.732297 GHz	27.25 dBm		
D2	M1	1	-1.347 MHz	-26.93 dB		
D3	D2	1	3.11 MHz	-1.55 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



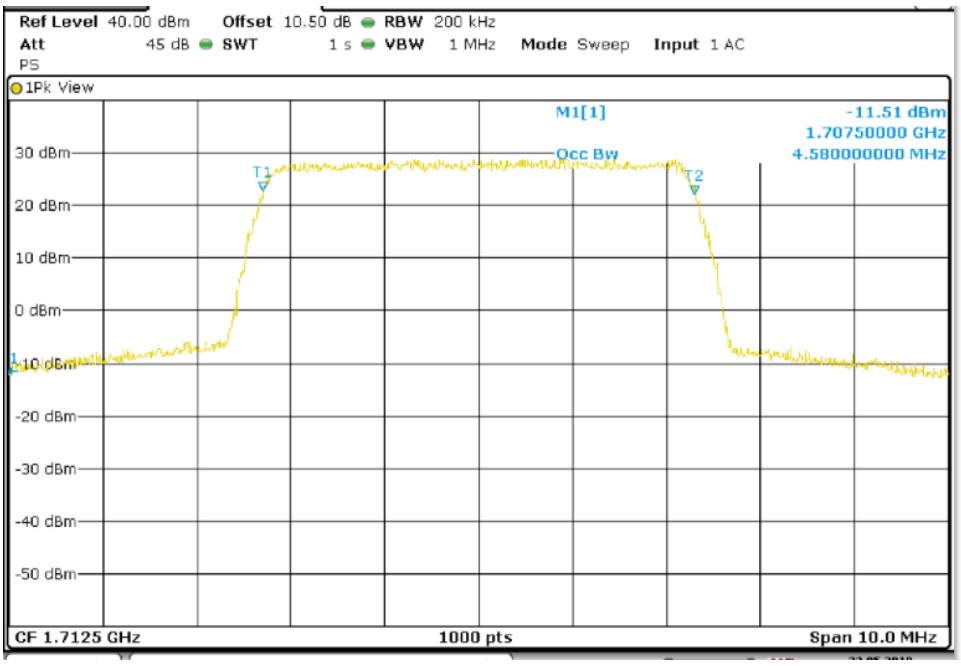
Highest Channel -26dBc Bandwidth kHz



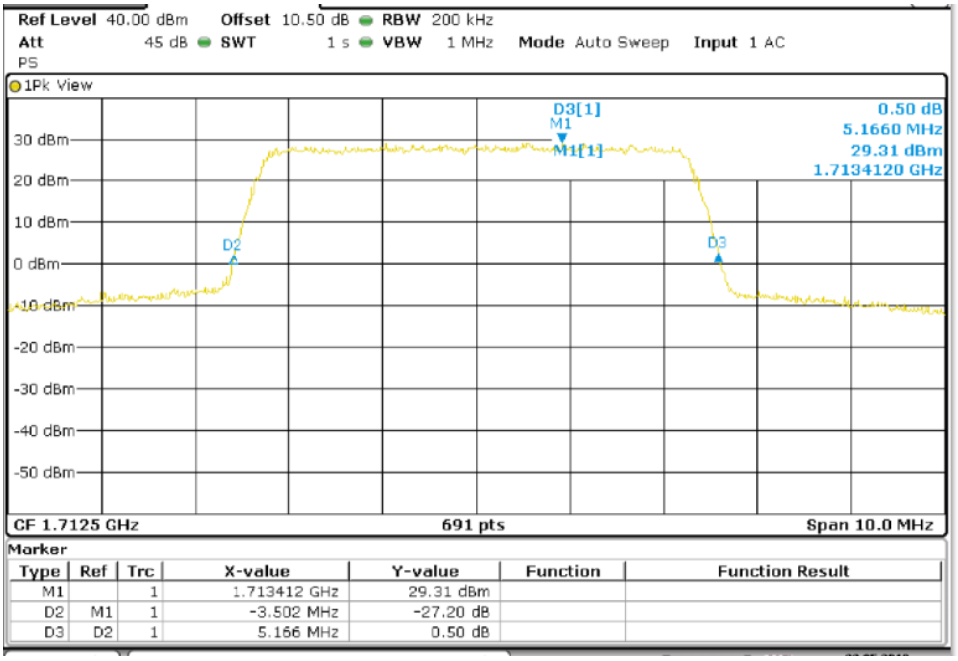
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel 99% Occupied Bandwidth

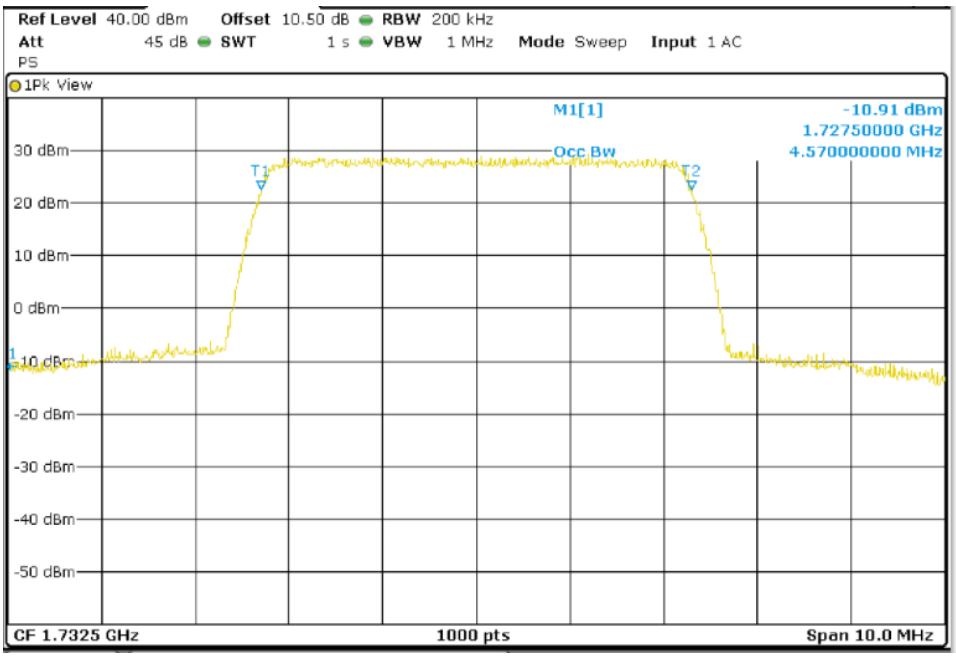


Lowest Channel -26dBc Bandwidth kHz

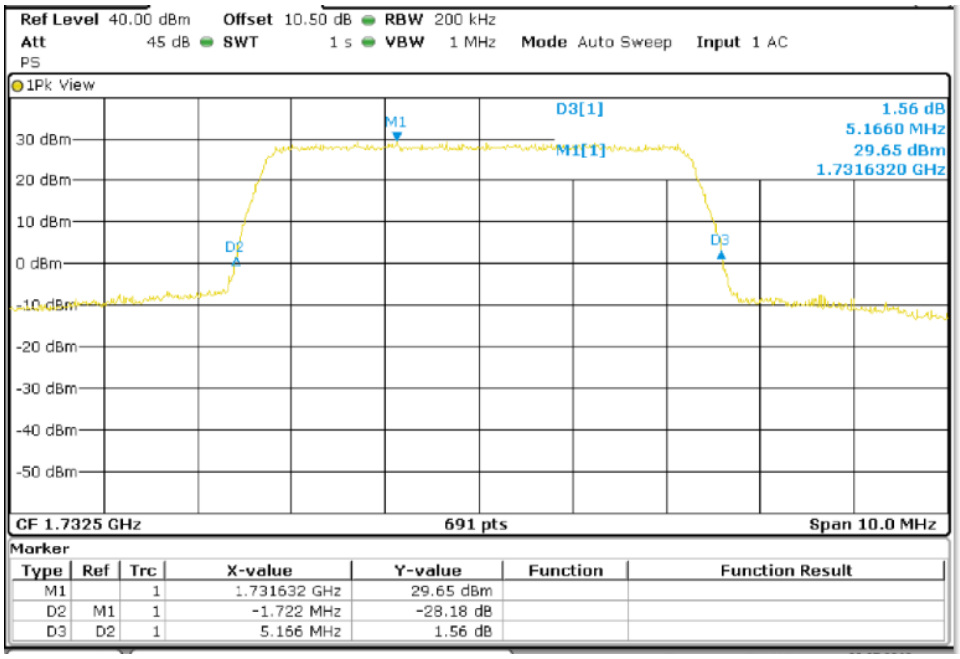


TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth

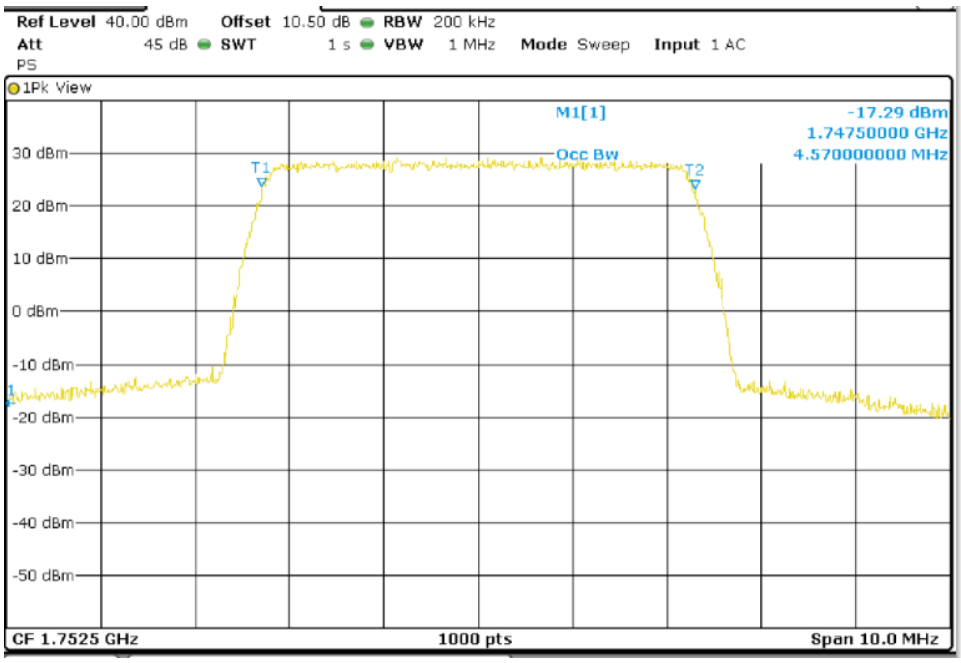


Middle Channel -26dBc Bandwidth kHz

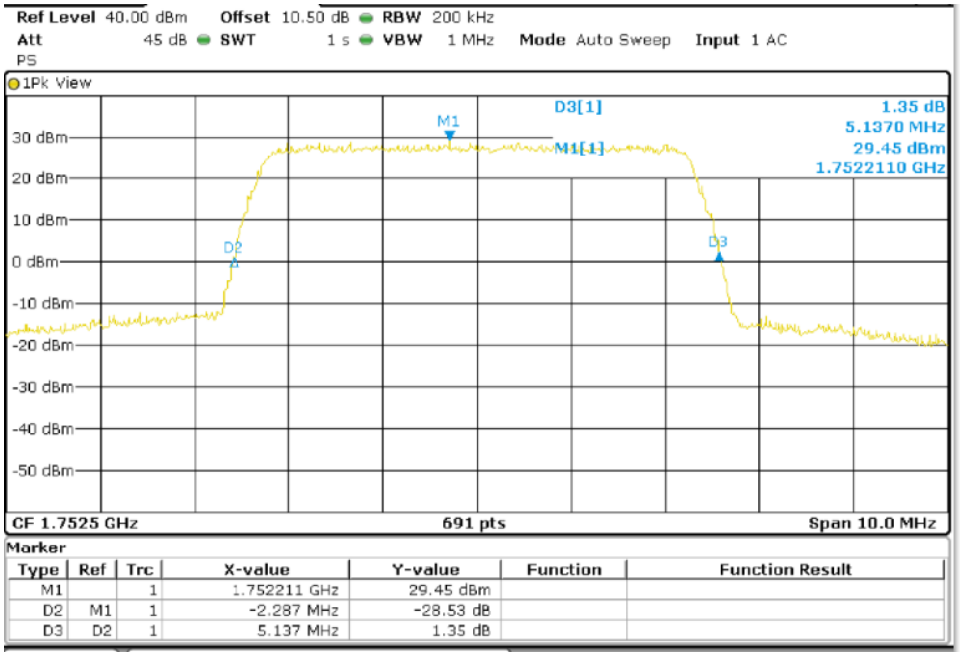


TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



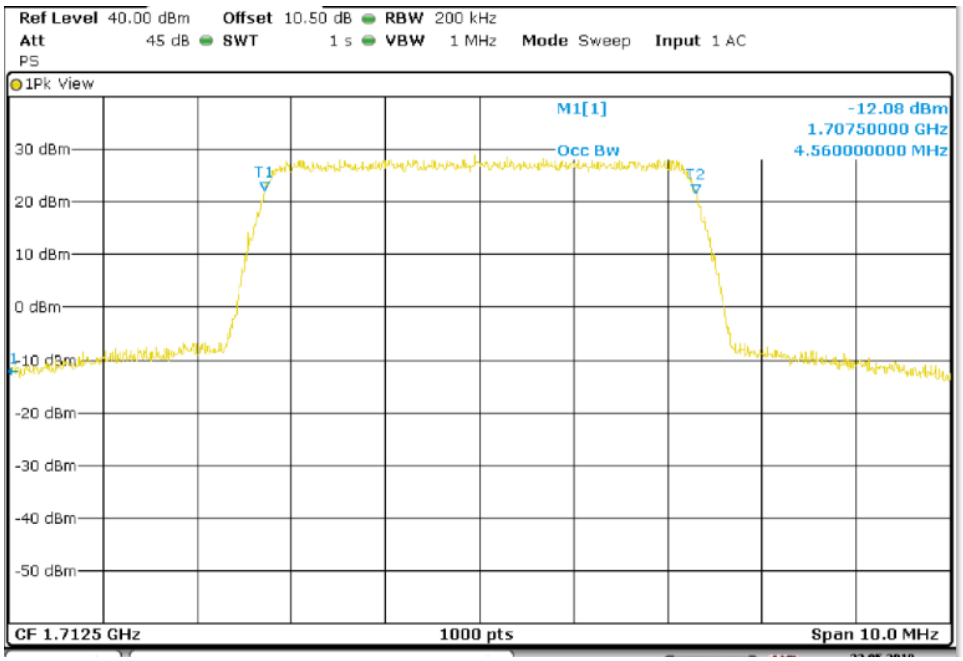
Highest Channel -26dBc Bandwidth kHz



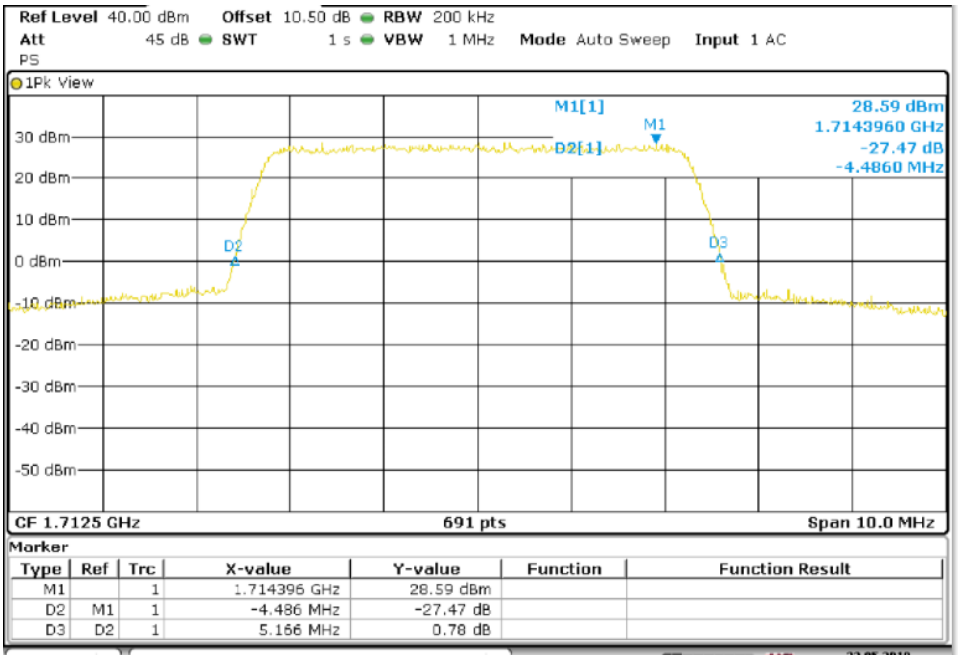
TEST RESULTS (Cont):	

LTE 16QAM MODULATION. BW = 5 MHz

Lowest Channel 99% Occupied Bandwidth

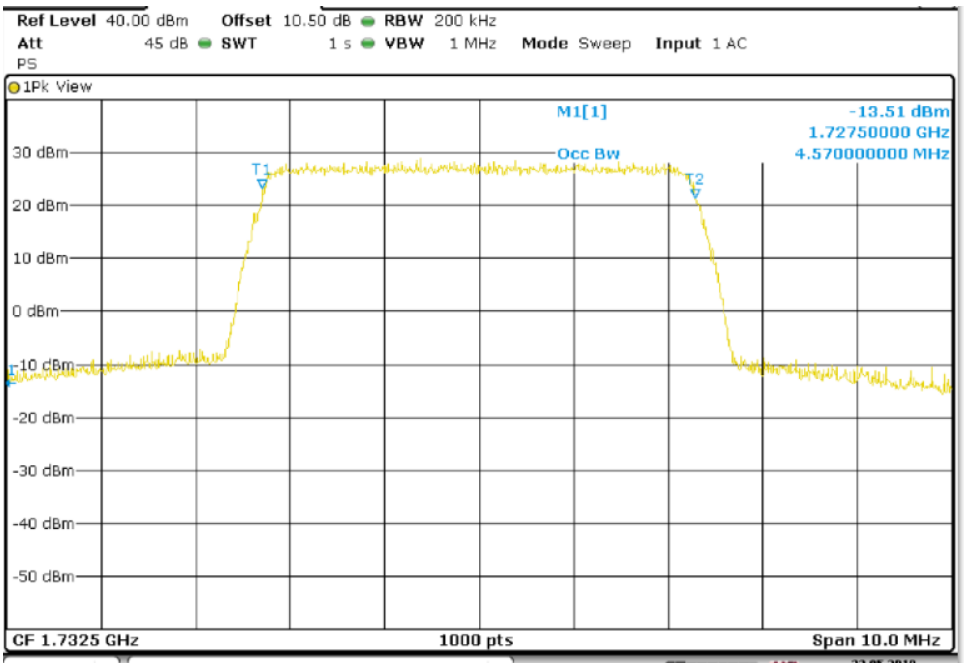


Lowest Channel -26dBc Bandwidth kHz

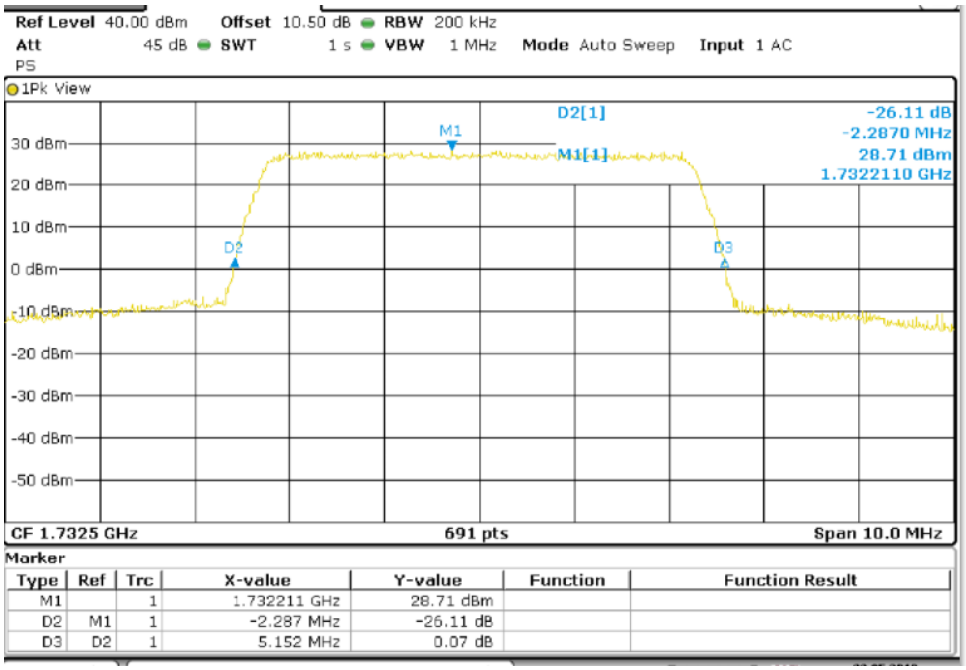


TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



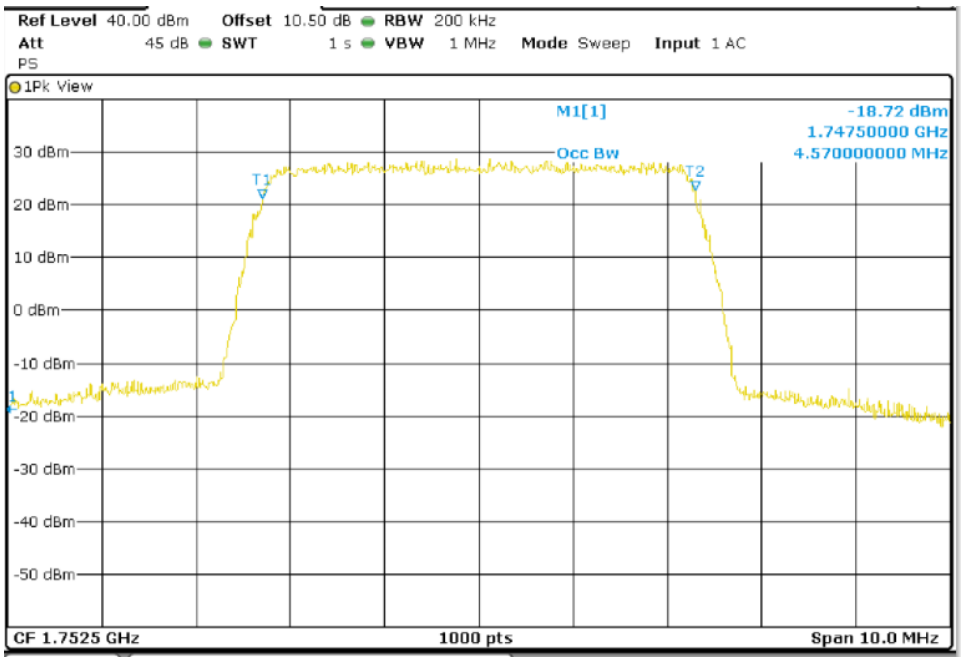
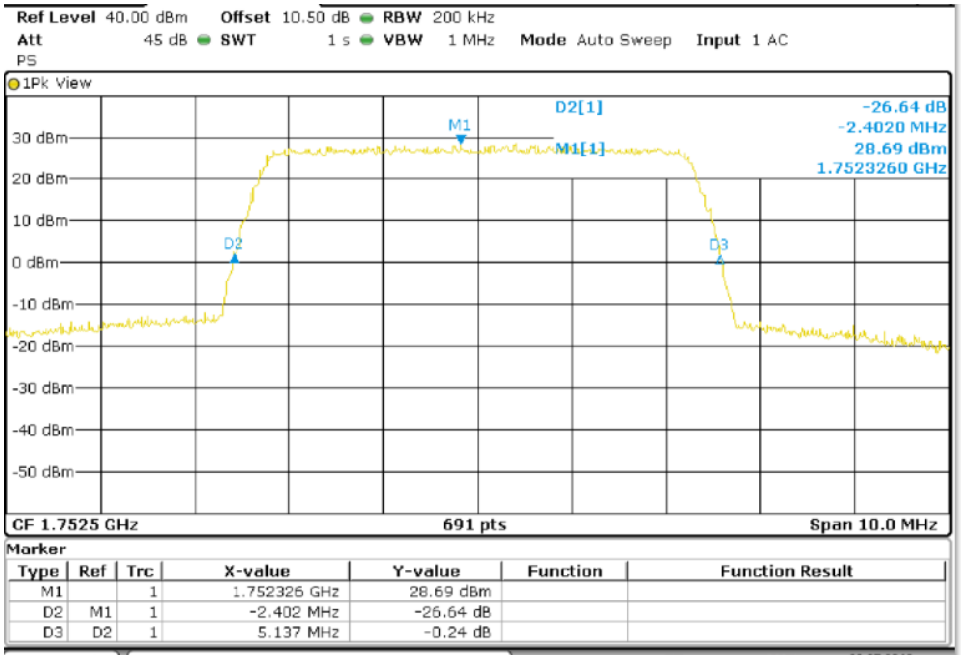
Middle Channel -26dBc Bandwidth kHz



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.732211 GHz	28.71 dBm		
D2	M1	1	-2.287 MHz	-26.11 dB		
D3	D2	1	5.152 MHz	0.07 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



Highest Channel -26dBc Bandwidth kHz