



FCC LISTED,
REGISTRATION
NUMBER: 720267
ISED LISTED
REGISTRATION NUMBER
4621A-2

Test report No:

NIE: 52288RRF.001

Test report

REFERENCE STANDARD: USA FCC Part 24 & Part 27 CANADA ISED RSS-133, RSS-139, RSS-130

Identificación del objeto ensayado.....: Identification of item tested	LTE Module CAT M
Marca Trademark	Telit
Modelo y/o referencia tipo Model and /or type reference	ME910C1-NA
Other identification of the product	FCC ID: RI7ME910C1NA IC: 5131A-ME910C1NA
Final HW version	0.0
Final SW version	31.00.102
Características Features	LTE CAT M
Solicitante Applicant	TELIT COMMUNICATIONS Via Stazione di Prosecco 5/B. 34010 Sgonico. Trieste-Italy.
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 27 10-1-16 Edition. CANADA IC RSS-139 Issue 3, Jul. 2015. CANADA IC RSS-130 Issue 1, Oct. 2013. USA FCC Part 24 10-1-16 Edition. CANADA IC RSS-133 Issue 6, Jan. 2013. Measurement Guidance 971168 D01 v02r02 for certification of Licensed Digital Transmitters. ANSI/TIA-603-D (2010).
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) Approved by (name / position & signature)	A. Llamas RF Lab. Manager
Fecha de realización Date of issue	2017-08-02
Formato de informe No.: Report template No	FDT08_20

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Competences and guarantees

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DEKRA Testing and Certification is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

DEKRA Testing and Certification is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: ISED 4621A-2.

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
52288/001	Module	ME910C1-NA	355154089999656	2017-01-25
46047/018	LTE antennas	---	---	2015-05-12
40081/003	Test board	---	113990003417	2013-07-23

1. Sample S/01 has undergone the test(s).
All radiated tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52288/009	Module	ME910C1-NA	355154089995183	2017-05-30
46047/015	Test board	---	113990005110	2013-07-23

1. Sample S/02 has undergone the test(s).
All conducted tests indicated in appendix A.

Test sample description

The test sample consists of a wireless LTE Module CAT M.

Identification of the client

TELIT COMMUNICATIONS

Via Stazione di Prosecco 5/B.

34010 Sgonico. Trieste-Italy.

Testing period

The performed test started on 2017-02-11 and finished on 2017-07-05.

The tests have been performed at DEKRA Testing and Certification.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

In the semianechoic chamber the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Remarks and comments

1: 1; The tests have been performed by the technical personnel: José Carlos Luque.

2: Used instrumentation.

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2015/10	2017/10
2.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
3.	Vector signal analyzer Rohde & Schwarz FSQ8	2016/06	2018/06
4.	Climatic chamber HERAEUS VM 07/100	2016/03	2018/03
5.	DC power supply R&S NGPE 40/40	2014/11	2017/11
6.	Universal Radio communication Tester R&S CMW500	2016/02	2018/02

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2017/04	2020/04
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2016/11	2019/11
5.	Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170	2017/03	2020/03
6.	Horn antenna 0.8-18 GHz Rohde & Schwarz R&S HF907 (Link antenna)	N.A.	N.A.
7.	EMI Test Receiver Rohde & Schwarz ESU 40	2016/03	2018/03
8.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
9.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2016/02	2018/02
10.	RF pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2015/12	2017/12
11.	Universal Radio communication Tester R&S CMW500	2016/02	2018/02

Testing verdicts

Not applicable	N/A
Pass	P
Fail	F
Not measured	N/M

FCC PART 24/IC RSS-133 PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 24.232/RSS-133 Clause 6.4: RF output power		P		
Clause 2.1047/RSS-133 Clause 6.2: Modulation characteristics		P		
Clause 24.235/RSS-133 Clause 6.3: Frequency stability		P		
Clause 2.1049: Occupied Bandwidth		P		
Clause 24.238/RSS-133 Clause 6.5: Spurious emissions at antenna terminals		P		
Clause 24.238/RSS-133 Clause 6.5: Radiated emissions		P		

FCC PART 27/IC RSS-139/IC RSS-130/ PARAGRAPH	VERDICT			
	NA	P	F	NM
Clause 27.50 / RSS-139 Clause 6.5. / RSS-130 Clause 4.4.: RF output power		P		
Clause 2.1047 / RSS-139 Clause 6.2. / RSS-130 Clause 4.1.: Modulation characteristics		P		
Clause 27.54 / RSS-139 Clause 6.4. / RSS-130 Clause 4.3.: Frequency stability		P		
Clause 2.1049: Occupied Bandwidth		P		
Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6.: Spurious emissions at antenna terminals		P		
Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6.: Radiated emissions		P		

Appendix A – Test result for FCC Part 24/IC RSS-133

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TEST CONDITIONS	10
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TEST RESULTS FOR FCC PART 24

TEST CONDITIONS

Power supply (V):

$V_{nom} = 3.8 \text{ Vdc}$

$V_{max} = 4.37 \text{ Vdc}$

$V_{min} = 3.23 \text{ Vdc}$

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from external power supply

Type of antenna = External attachable antenna

Antenna gain = 2.3 dBi

TEST FREQUENCIES:

LTE. QPSK AND 16QAM MODULATION (BAND II)

	Channel (Frequency, MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Lowest	18607 (1850.70)	18615 (1851.50)	18625 (1852.50)	18650 (1855.00)	18675 (1857.50)	18700 (1860.00)
Middle	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)
Highest	19193 (1909.30)	19185 (1908.50)	19175 (1907.50)	19150 (1905.00)	19125 (1902.50)	19100 (1900.00)

RF Output Power

SPECIFICATION

FCC §2.1046 and 24.232
RSS-133. Clause 6.4.

Mobile/portable stations are limited to 2 Watts (33 dBm) Effective Isotropic Radiated Power (E.I.R.P.).

The peak-to-average ratio (PAR) of the transmission shall not exceed 13 dB.

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester R&S CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi).

The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.

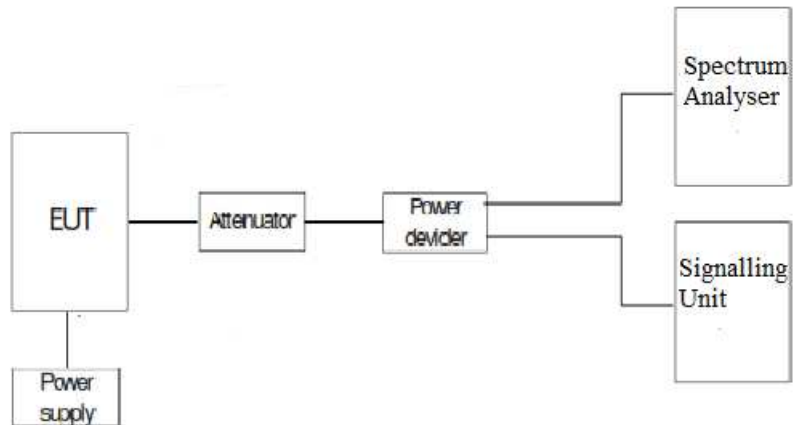
The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP

Conducted average power.



Peak-to-average power ratio (PAPR)



RESULTS

MAXIMUM OUTPUT POWER (CONDUCTED).

LTE. BAND II.

Narrow band = 1

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
1.4	Low 18607	1850.7	QPSK	1	0	23.25	6.23
				1	2	23.39	
				1	5	23.24	
				3	0	22.38	
				3	1	22.5	
				3	2	22.4	
				6	0	21.31	
			16-QAM	1	0	22.32	6.78
				1	2	22.49	
				1	5	22.37	
				3	0	21.01	
				3	1	21.05	
				3	2	21.06	
				5	0	21.29	
	Middle 18900	1880	QPSK	1	0	23.46	5.99
				1	2	23.54	
				1	5	23.41	
				3	0	22.26	
				3	1	22.31	
				3	2	22.31	
				6	0	21.32	
			16-QAM	1	0	22.28	7.14
				1	2	22.46	
				1	5	22.32	
				3	0	20.93	
				3	1	20.92	
				3	2	20.93	
				5	0	21.19	
	High 19193	1909.3	QPSK	1	0	23.33	6.47
				1	2	23.41	
				1	5	23.32	
				3	0	22.08	
				3	1	22.16	
				3	2	22.17	
				6	0	21.17	
			16-QAM	1	0	22,64	7.19
				1	2	22,71	
				1	5	22,71	
				3	0	21,68	
				3	1	21,78	
				3	2	21,82	
				5	0	22,05	

Narrow band = 1 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
3	Low 18615	1851.5	QPSK	1	0	23.48	5.96
				1	2	23.56	
				1	5	23.5	
				3	0	22.27	
				3	1	22.37	
				3	2	22.37	
				6	0	21.29	
			16-QAM	1	0	21.97	6.51
				1	2	22.15	
				1	5	21.98	
				3	0	21.52	
				3	1	21.09	
				3	2	21.09	
				5	0	21.13	
	Middle 18900	1880	QPSK	1	0	23.38	5.77
				1	2	23.37	
				1	5	23.35	
				3	0	22.4	
				3	1	22.36	
				3	2	22.39	
				6	0	21.29	
			16-QAM	1	0	21.95	6.71
				1	2	22.16	
				1	5	22.33	
				3	0	21.48	
				3	1	21.45	
				3	2	21.5	
				5	0	21.48	
	High 19185	1908.5	QPSK	1	0	23.2	6.23
				1	2	23.2	
				1	5	23.22	
				3	0	22.08	
				3	1	22.13	
				3	2	22.13	
				6	0	21.17	
			16-QAM	1	0	21.77	6.95
				1	2	22.01	
				1	5	22.2	
				3	0	21.31	
				3	1	21.32	
				3	2	21.31	
				5	0	21.31	

Narrow band = 2 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
5	Low 18625	1852.5	QPSK	1	0	23.5	5.05
				1	2	23.57	
				1	5	23.49	
				3	0	22.26	
				3	1	22.34	
				3	2	22.35	
				6	0	22.36	
			16-QAM	1	0	23.34	6.06
				1	2	23.45	
				1	5	23.35	
				3	0	22.05	
				3	1	22.01	
				3	2	22.08	
				5	0	21.23	
	Middle 18900	1880	QPSK	1	0	23.39	5.22
				1	2	23.35	
				1	5	23.38	
				3	0	22.31	
				3	1	22.41	
				3	2	22.43	
				6	0	22.34	
			16-QAM	1	0	22.97	6.23
				1	2	23.16	
				1	5	23.16	
				3	0	22.46	
				3	1	22.48	
				3	2	22.46	
				5	0	21.41	
	High 19175	1907.5	QPSK	1	0	23.29	5.43
				1	2	23.31	
				1	5	23.32	
				3	0	22.32	
				3	1	22.31	
				3	2	22.33	
				6	0	22.3	
			16-QAM	1	0	22.88	6.35
				1	2	23.13	
				1	5	22.96	
				3	0	22.34	
				3	1	22.36	
				3	2	22.4	
				5	0	21.39	

Narrow band = 4 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
10	Low 18650	1855	QPSK	1	0	23.38	5.1
				1	2	23.43	
				1	5	23.4	
				3	0	23.31	
				3	1	23.33	
				3	2	23.43	
				6	0	22.32	
			16-QAM	1	0	23.23	
				1	2	23.34	
				1	5	23.28	
				3	0	23.2	
				3	1	23.23	
				3	2	23.2	
				5	0	22.48	
	Middle 18900	1880	QPSK	1	0	23.37	5.22
				1	2	23.52	
				1	5	23.35	
				3	0	23.37	
				3	1	23.36	
				3	2	23.4	
				6	0	22.43	
			16-QAM	1	0	23.46	
				1	2	23.51	
				1	5	23.5	
				3	0	23.13	
				3	1	23.08	
				3	2	23.17	
				5	0	22.15	
	High 19150	1905	QPSK	1	0	23.28	5.38
				1	2	23.43	
				1	5	23.17	
				3	0	23.2	
				3	1	23.16	
				3	2	23.1	
				6	0	22.26	
			16-QAM	1	0	23.22	
				1	2	23.28	
				1	5	23.21	
				3	0	23.29	
				3	1	23.25	
				3	2	23.27	
				5	0	22.29	

Narrow band = 6 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
15	Low 18675	1857.5	QPSK	1	0	23.43	4.83
				1	2	23.38	
				1	5	23.36	
				3	0	23.18	
				3	1	23.31	
				3	2	23.25	
				6	0	23.31	
			16-QAM	1	0	23.01	5.17
				1	2	23.07	
				1	5	23.04	
				3	0	23.41	
				3	1	23.41	
				3	2	23.42	
				5	0	23.32	
	Middle 18900	1880	QPSK	1	0	23.46	4.88
				1	2	23.54	
				1	5	23.42	
				3	0	23.32	
				3	1	23.38	
				3	2	23.38	
				6	0	23.35	
			16-QAM	1	0	23.34	5.22
				1	2	23.53	
				1	5	23.45	
				3	0	23.4	
				3	1	23.32	
				3	2	23.22	
				5	0	23.49	
	High 19125	1902.5	QPSK	1	0	23.29	5.07
				1	2	23.54	
				1	5	23.3	
				3	0	23.18	
				3	1	23.26	
				3	2	23.25	
				6	0	23.23	
			16-QAM	1	0	23.32	5.43
				1	2	23.48	
				1	5	23.36	
				3	0	22.99	
				3	1	22.94	
				3	2	23.06	
				5	0	23.04	

Narrow band = 8 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
20	Low 18700	1860	QPSK	1	0	23.29	4.81
				1	2	23.5	
				1	5	23.36	
				3	0	23.27	
				3	1	23.35	
				3	2	23.23	
				6	0	23.26	
			16-QAM	1	0	22.9	5.26
				1	2	23.02	
				1	5	23.02	
				3	0	23.44	
				3	1	23.47	
				3	2	23.5	
				5	0	23.35	
	Middle 18900	1880	QPSK	1	0	23.39	4.86
				1	2	23.48	
				1	5	23.58	
				3	0	23.48	
				3	1	23.27	
				3	2	23.32	
				6	0	23.28	
			16-QAM	1	0	23.19	5.29
				1	2	23.57	
				1	5	23.16	
				3	0	23.24	
				3	1	23.33	
				3	2	23.2	
				5	0	23.24	
	High 19100	1900	QPSK	1	0	23.13	5.07
				1	2	23.45	
				1	5	23.22	
				3	0	23.24	
				3	1	23.27	
				3	2	23.32	
				6	0	23.14	
			16-QAM	1	0	23.24	5.43
				1	2	23.35	
				1	5	23.24	
				3	0	23.28	
				3	1	23.23	
				3	2	23.32	
				5	0	23.44	

LTE QPSK AND 16QAM MODULATION. Bandwidth = 1.4 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.39	2.3	25.69	6.78
Middle	23.54	2.3	25.84	7.14
Highest	23.41	2.3	25.71	7.19
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. Bandwidth = 3 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.56	2.3	25.86	6.51
Middle	23.38	2.3	25.68	6.71
Highest	23.22	2.3	25.52	6.95
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. Bandwidth = 5 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.57	2.3	25.87	6.06
Middle	23.39	2.3	25.69	6.23
Highest	23.32	2.3	25.62	6.35
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. Bandwidth = 10 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.43	2.3	25.73	5.67
Middle	23.52	2.3	25.82	5.77
Highest	23.43	2.3	25.73	5.94
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. Bandwidth = 15 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.43	2.3	25.73	5.17
Middle	23.54	2.3	25.84	5.22
Highest	23.54	2.3	25.84	5.43
Measurement uncertainty (dB)	<±1.11			

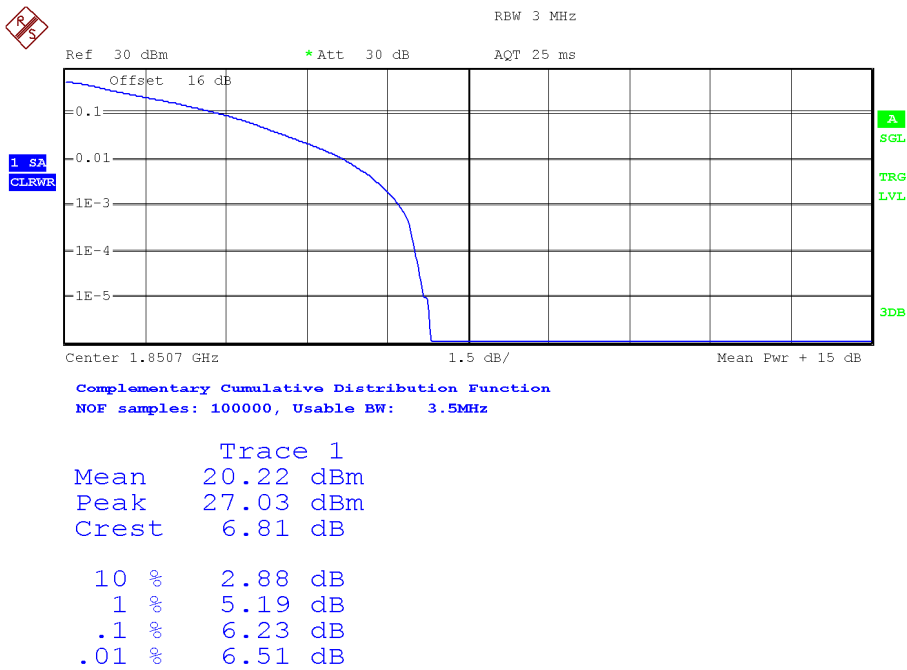
LTE QPSK AND 16QAM MODULATION. Bandwidth = 20 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.5	2.3	25.8	5.26
Middle	23.58	2.3	25.88	5.29
Highest	23.45	2.3	25.75	5.43
Measurement uncertainty (dB)	<±1.11			

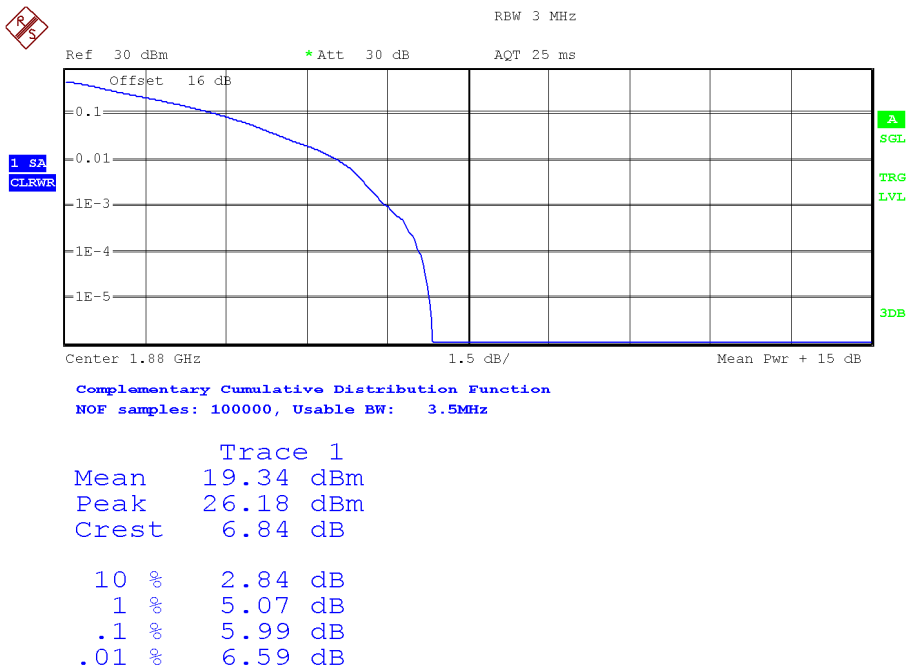
Verdict: PASS

PEAK-TO-AVERAGE POWER RATIO (PAPR).

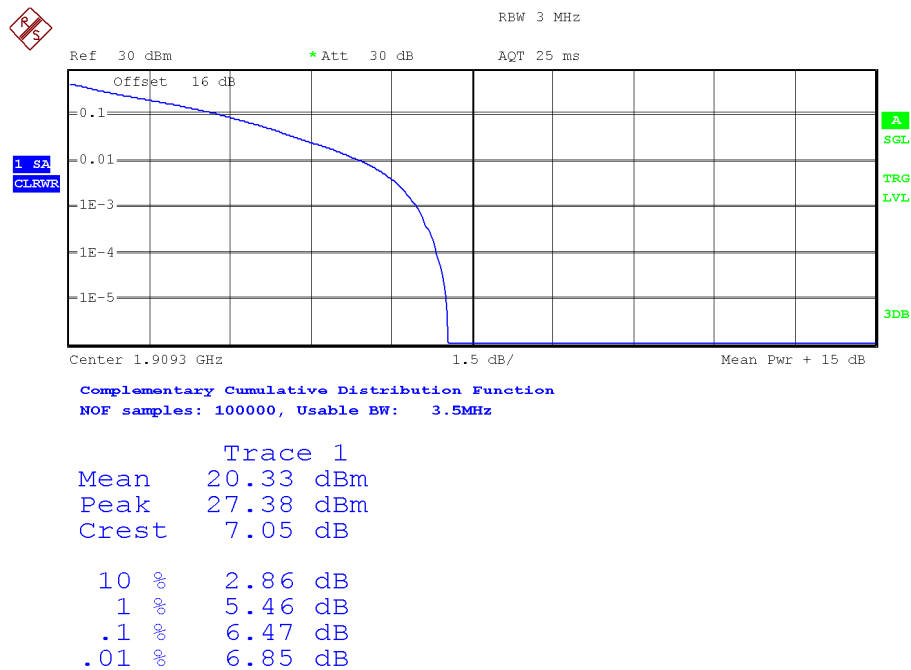
Bandwidth = 1.4 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.
Channel Low:



Channel Middle:

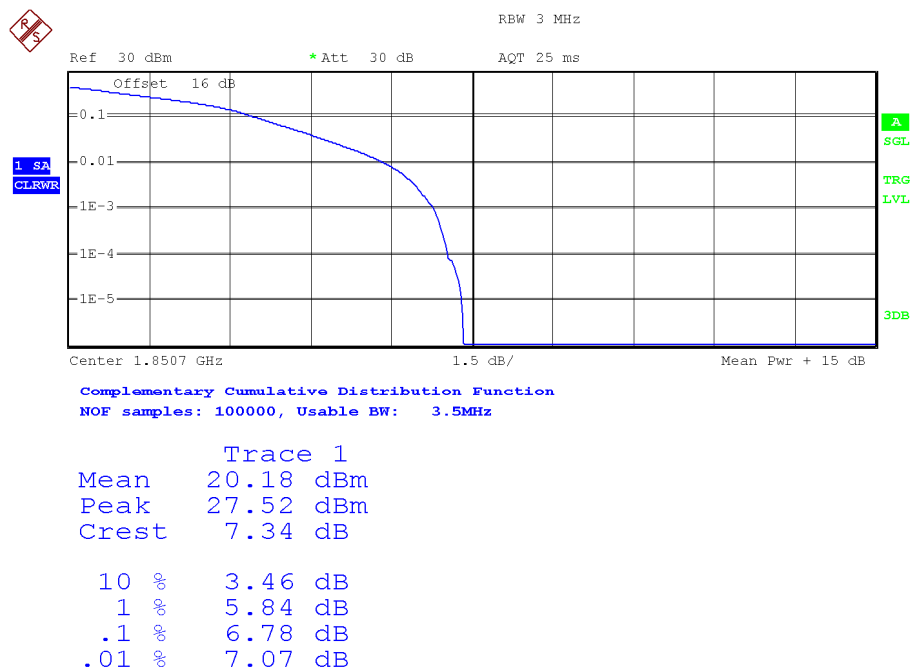


Channel High:

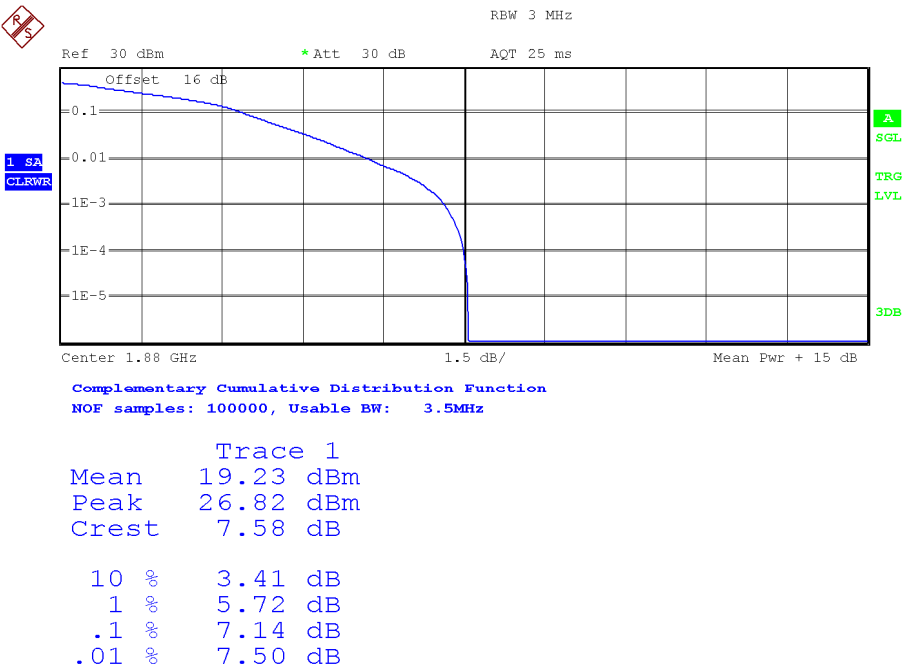


Bandwidth = 1.4 MHz. Modulation 16 QAM. Modulation bandwidth: 1. RB Size: 5. RB Offset: 0.

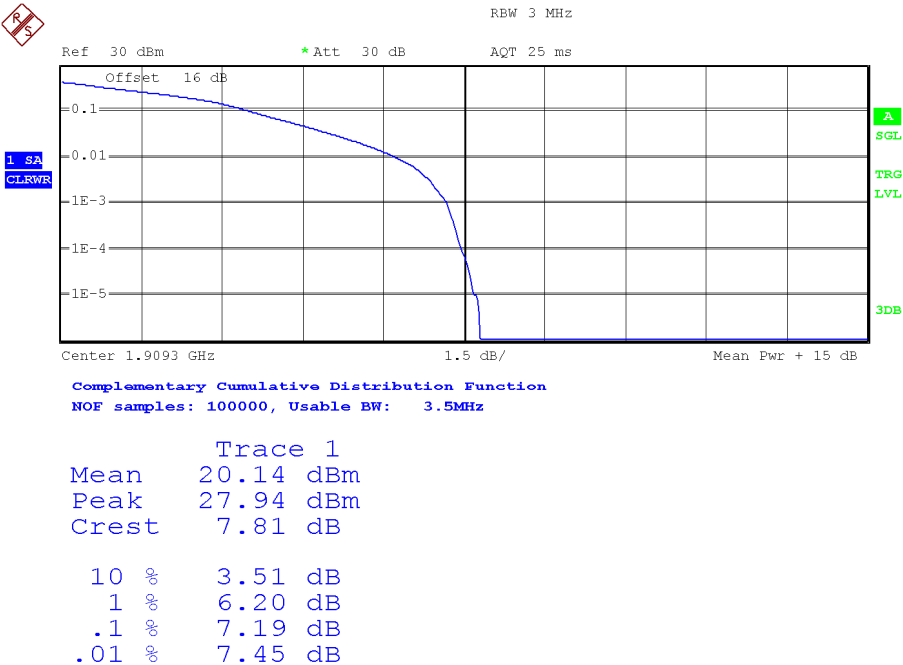
Channel Low:



Channel Middle:

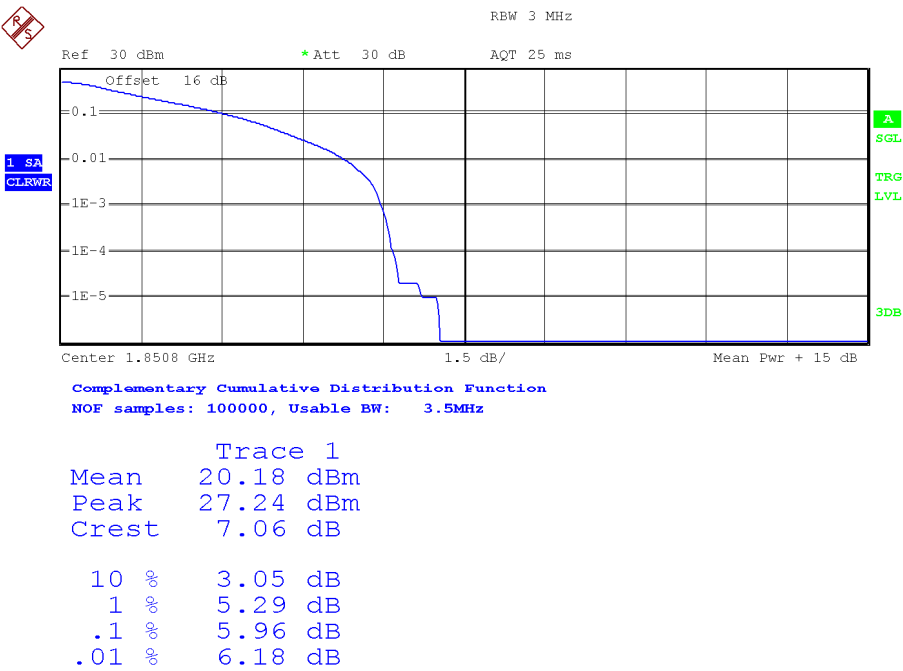


Channel High:

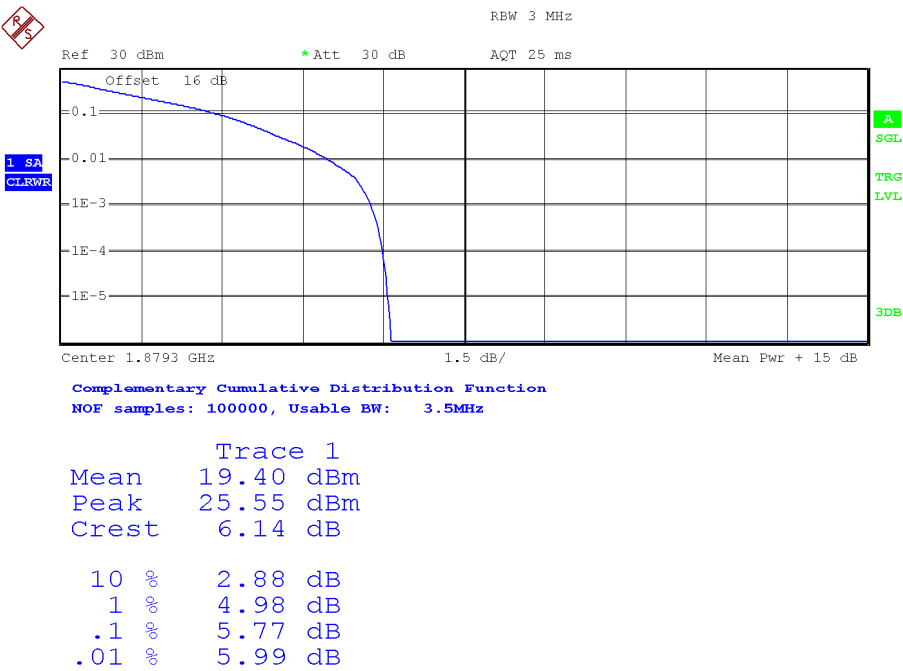


Bandwidth = 3 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.

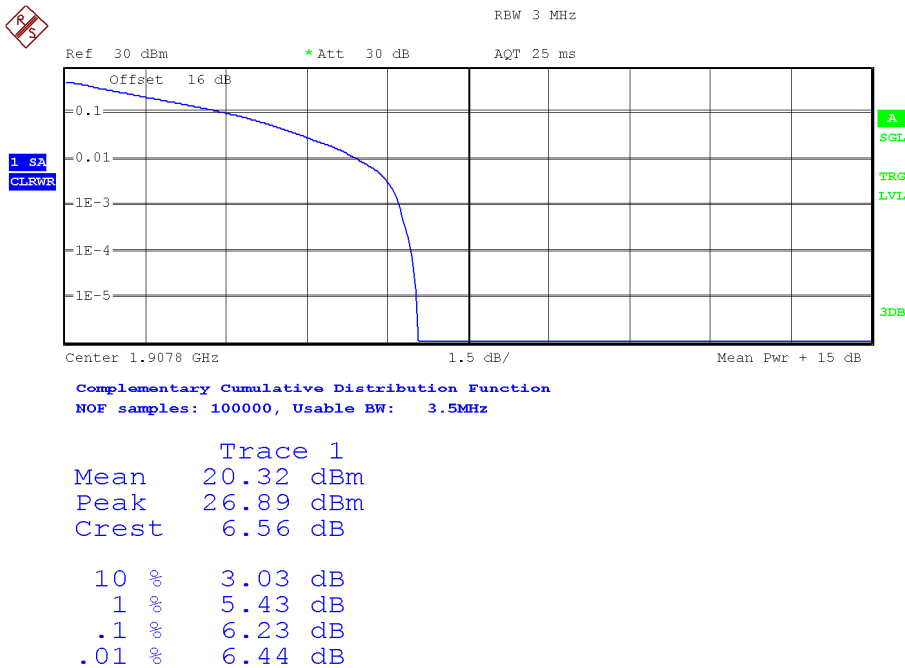
Channel Low:



Channel Middle:

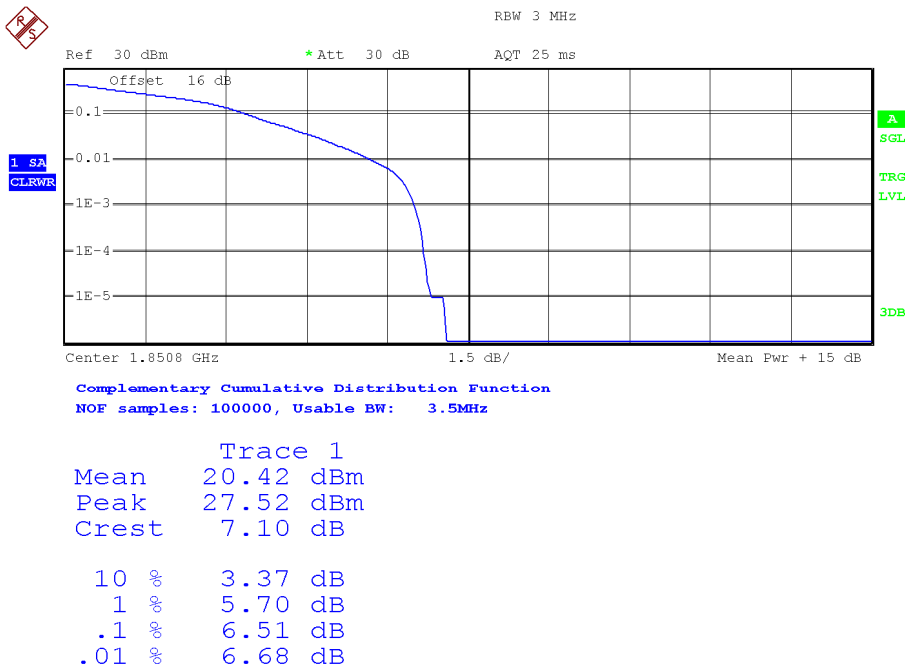


Channel High:

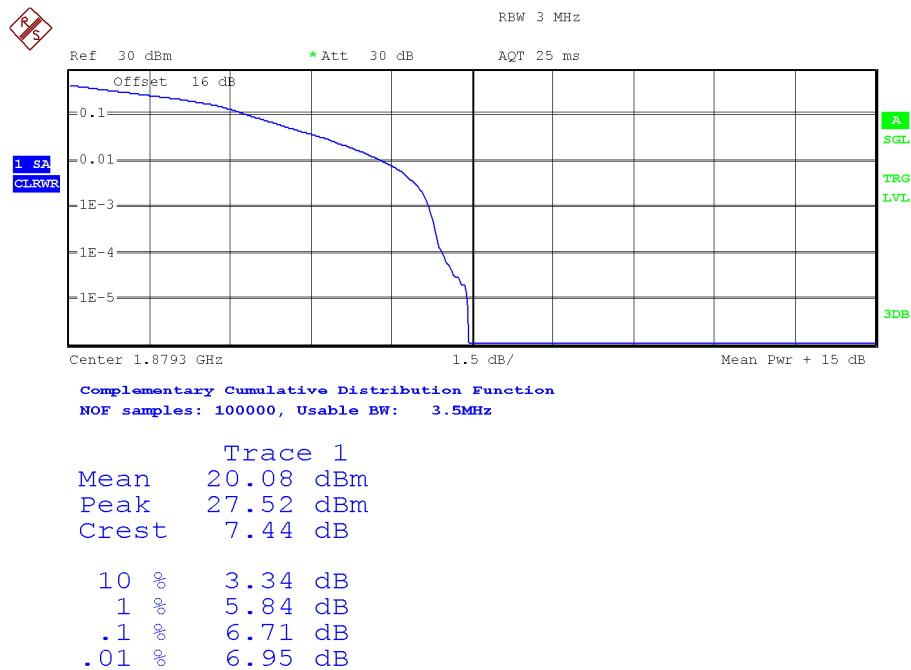


Bandwidth = 3 MHz. Modulation 16 QAM. Modulation bandwidth: 1. RB Size: 5. RB Offset: 0.

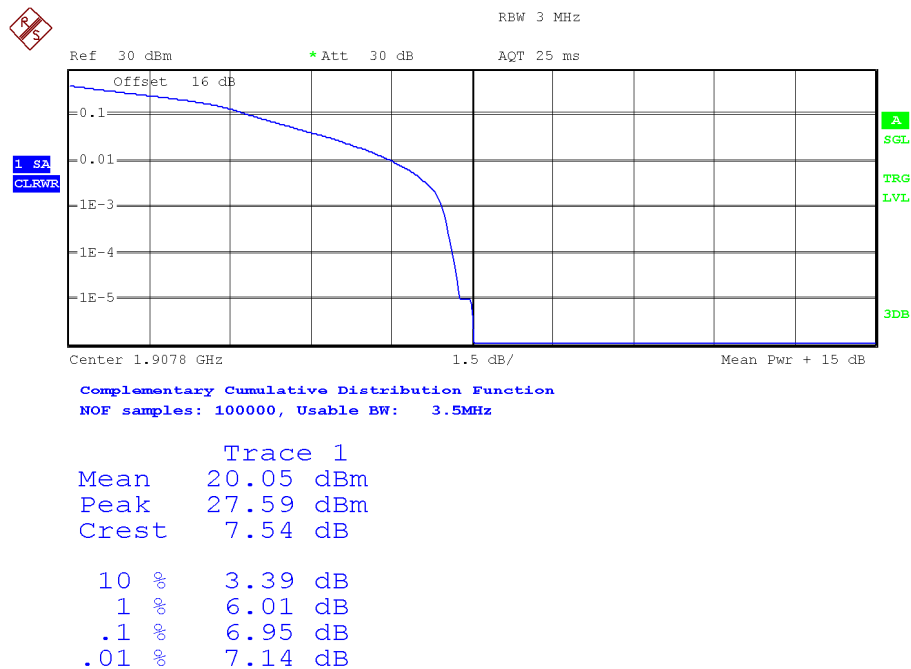
Channel Low:



Channel Middle:

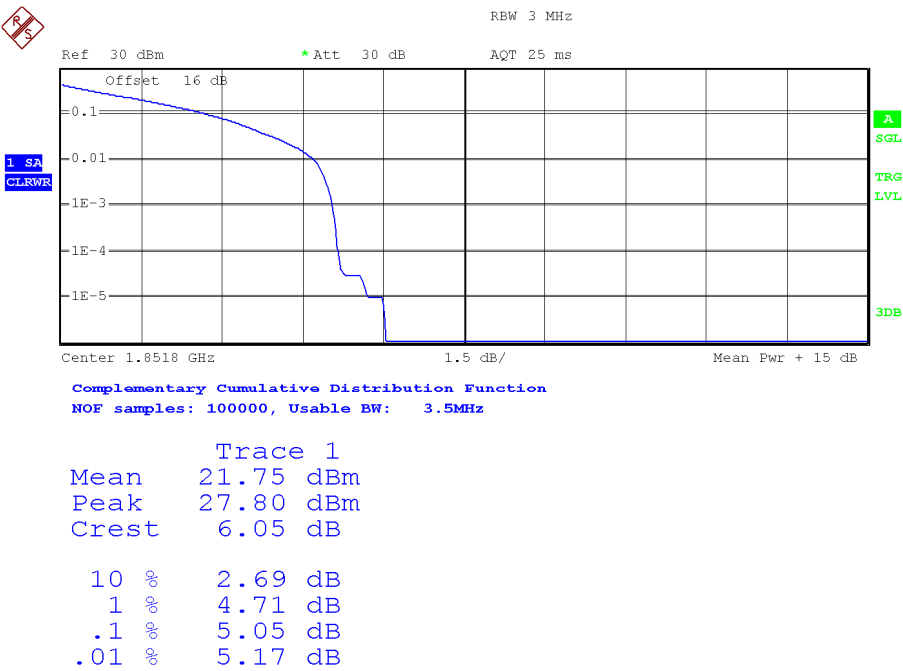


Channel High:

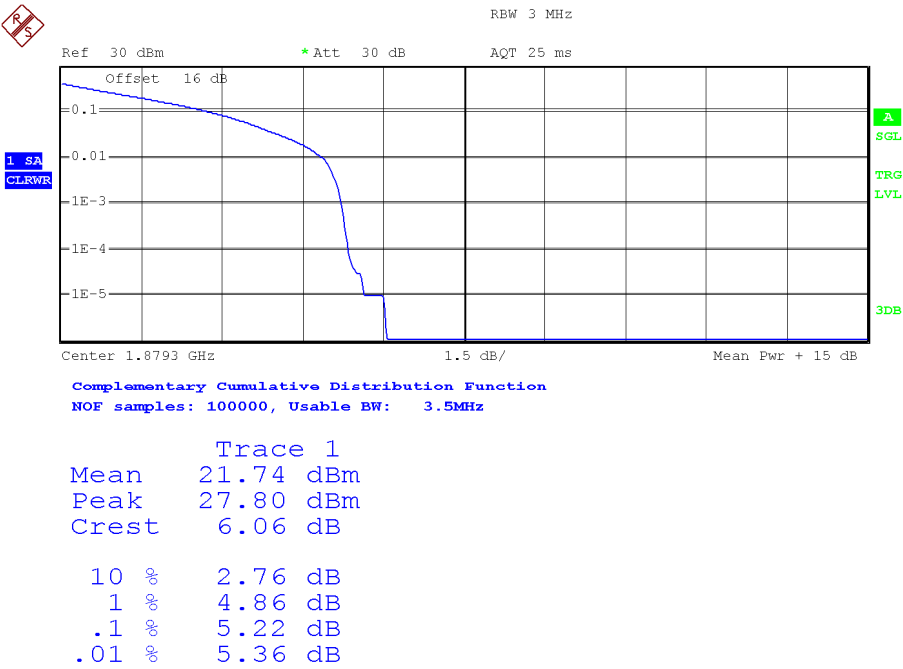


Bandwidth = 5 MHz. Modulation QPSK. Modulation bandwidth: 2. RB Size: 6. RB Offset: 0.

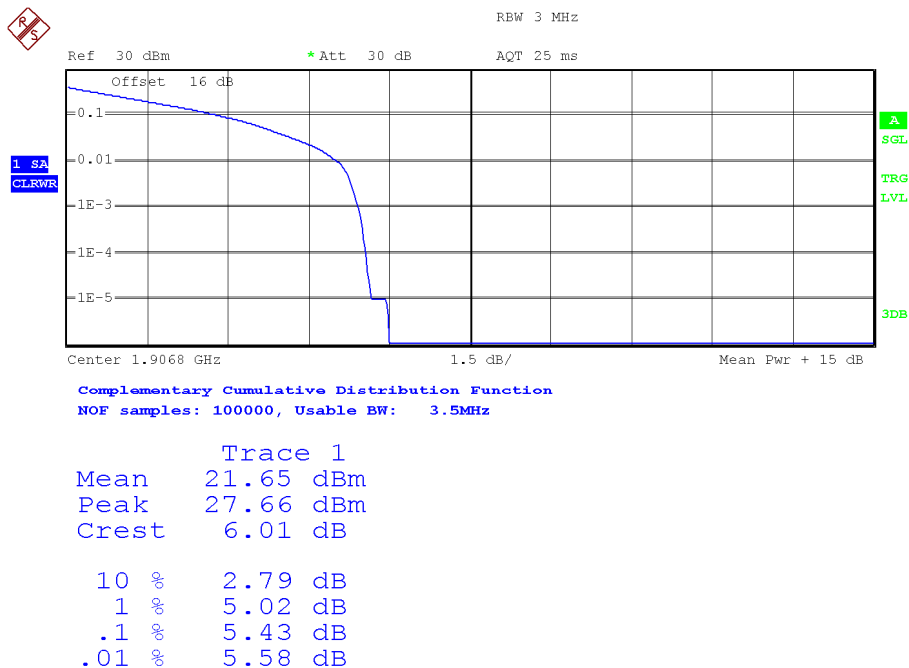
Channel Low:



Channel Middle:

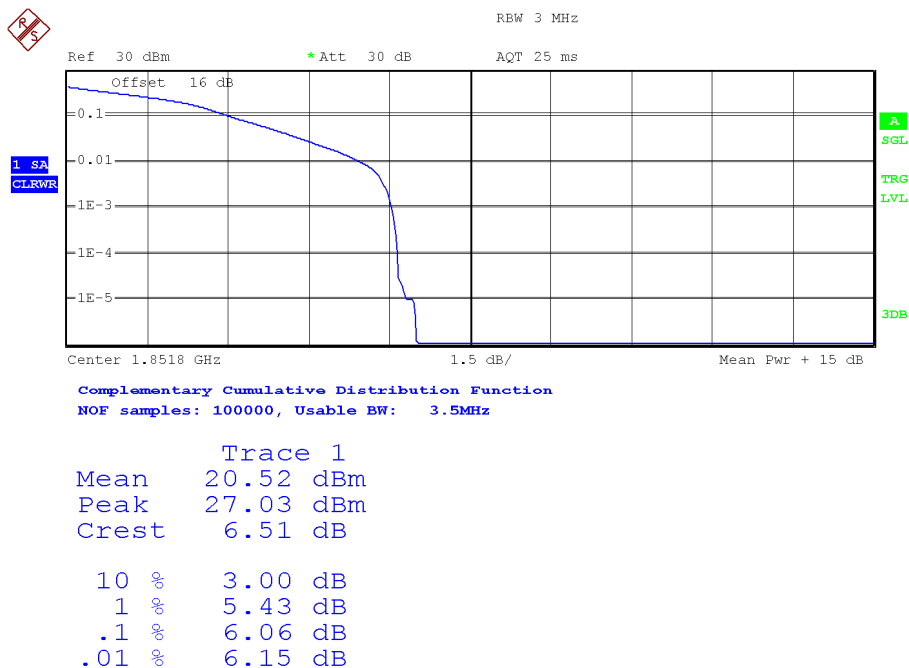


Channel High:

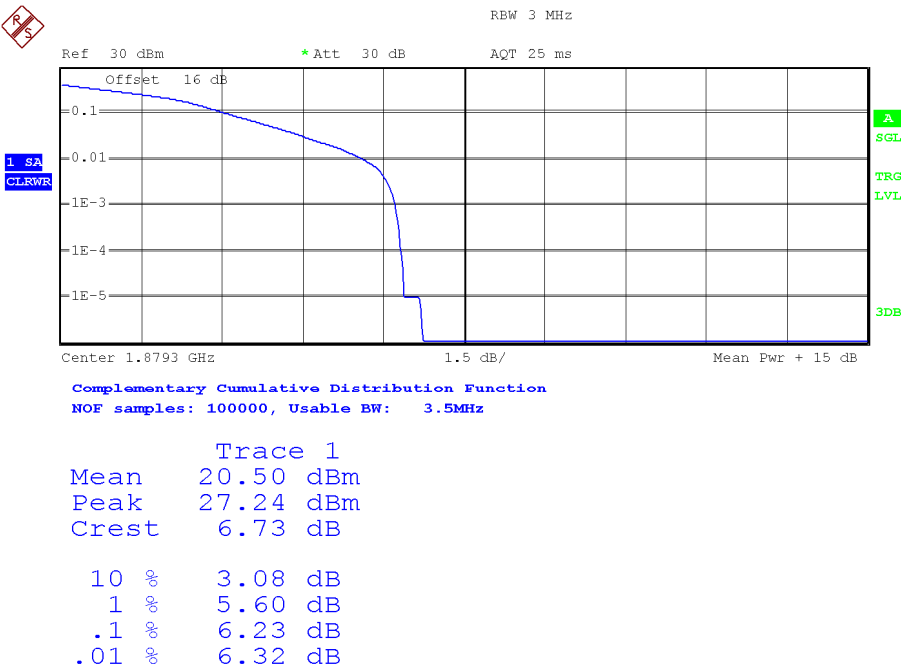


Bandwidth = 5 MHz. Modulation 16 QAM. Modulation bandwidth: 2. RB Size: 5. RB Offset: 0.

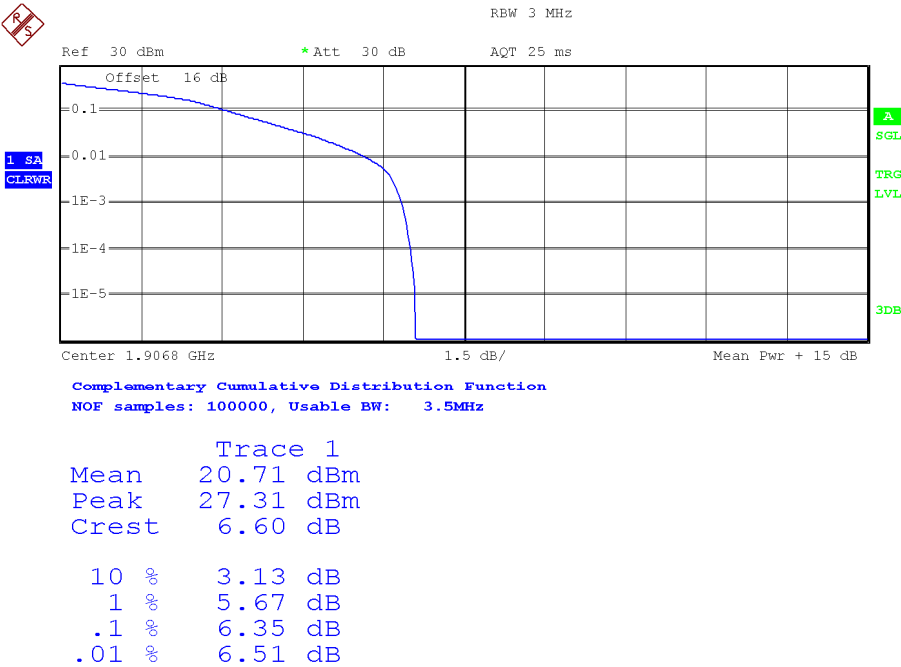
Channel Low:



Channel Middle:

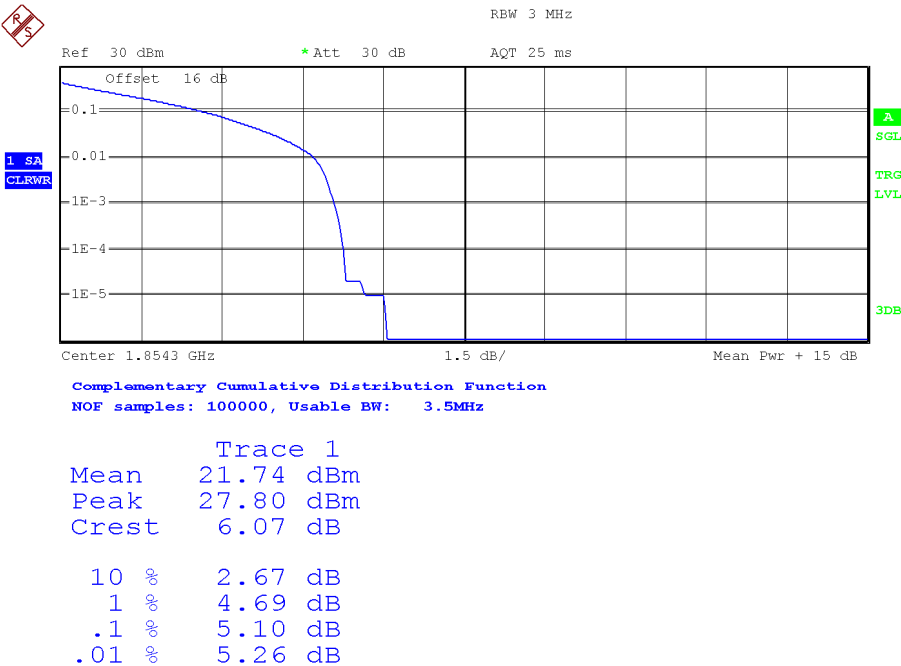


Channel High:

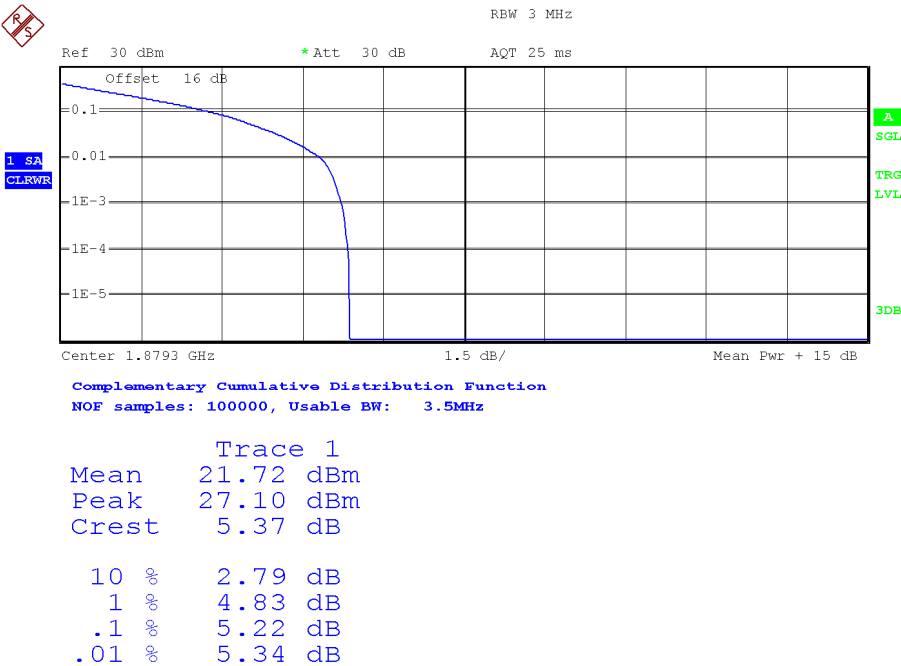


Bandwidth = 10 MHz. Modulation QPSK. Modulation bandwidth: 4. RB Size: 6. RB Offset: 0

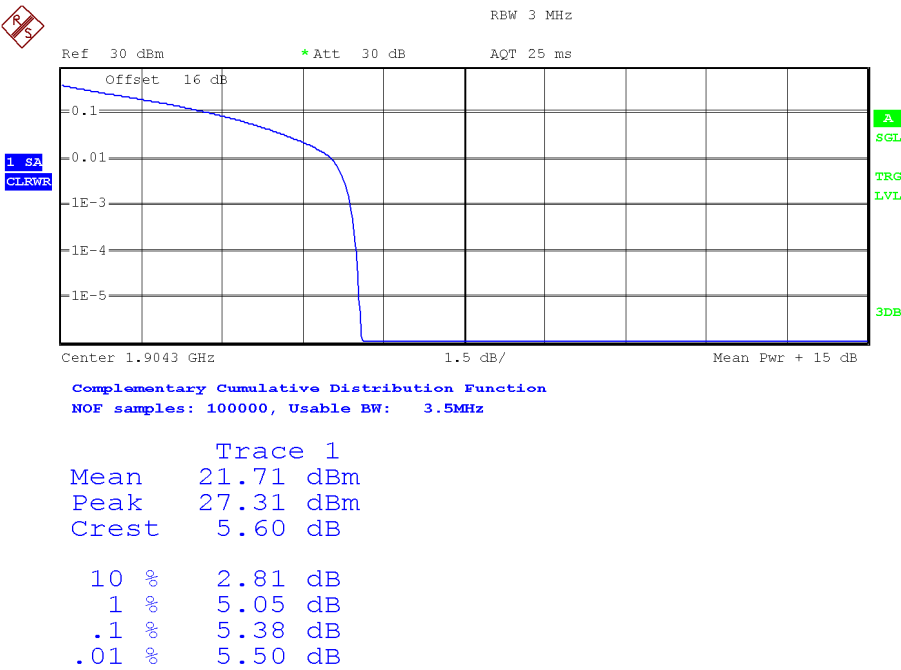
Channel Low:



Channel Middle:

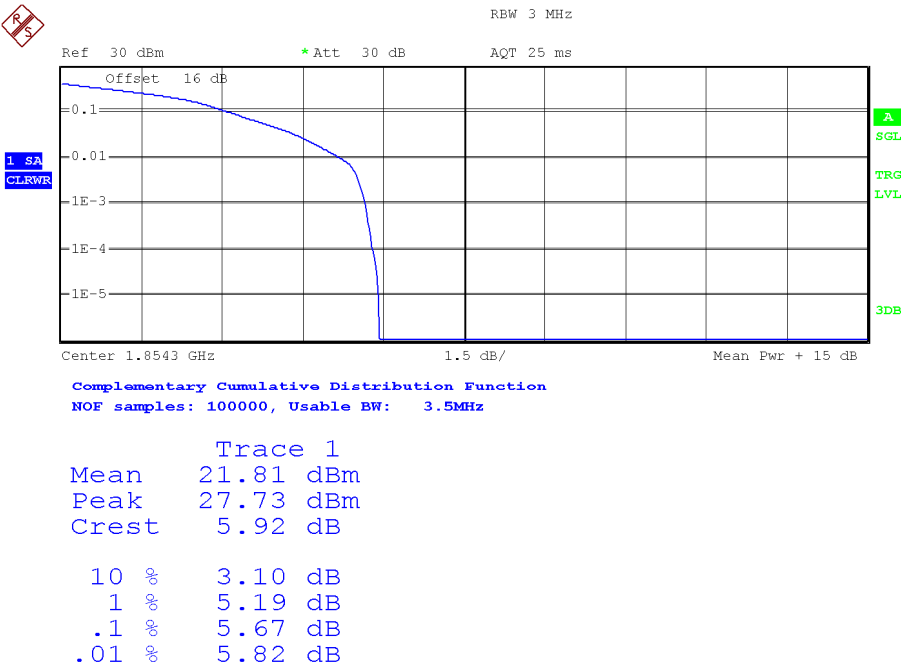


Channel High:

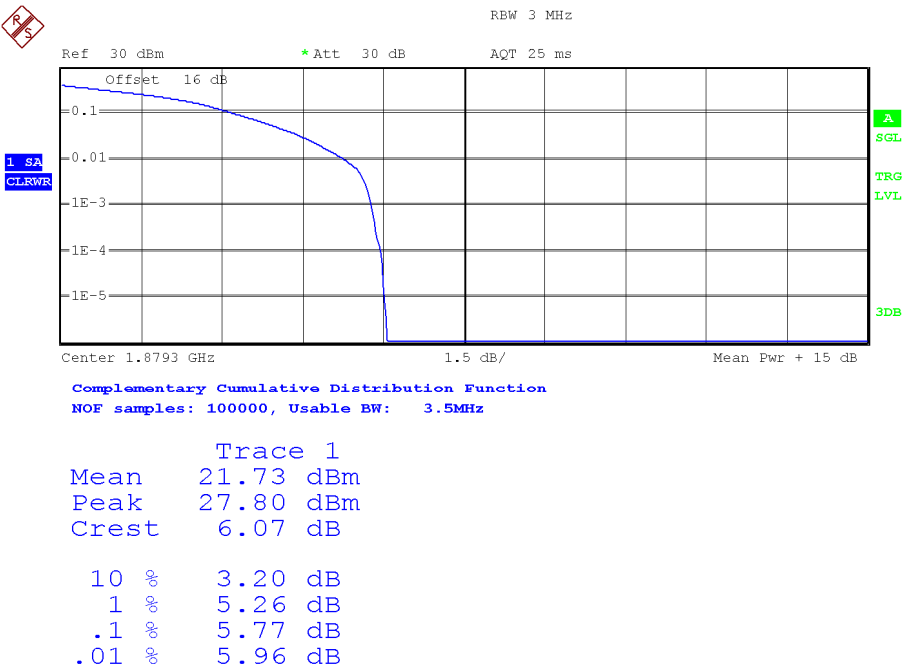


Bandwidth = 10 MHz. Modulation 16 QAM. Modulation bandwidth: 4. RB Size: 5. RB Offset: 0.

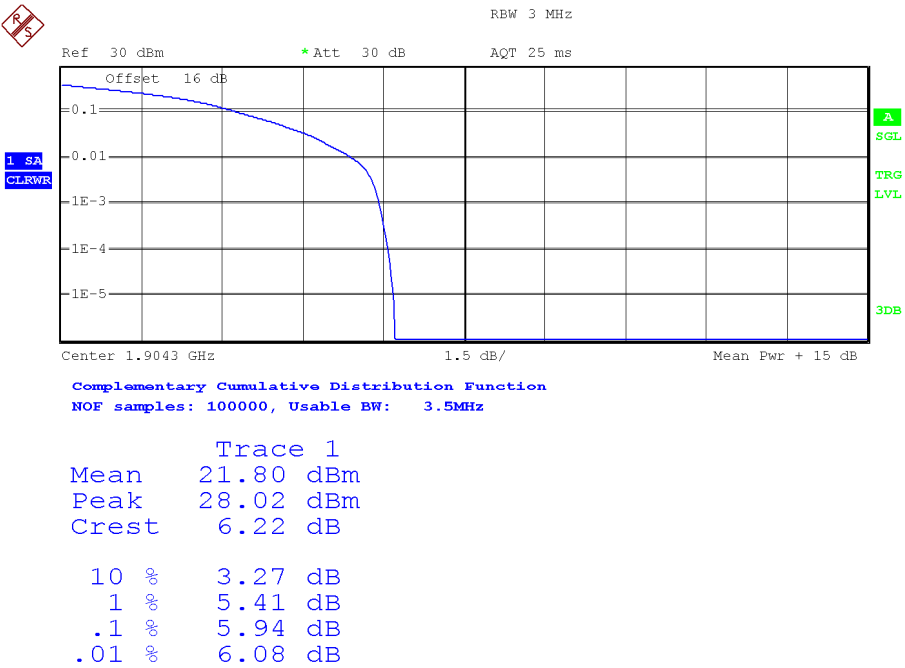
Channel Low:



Channel Middle:

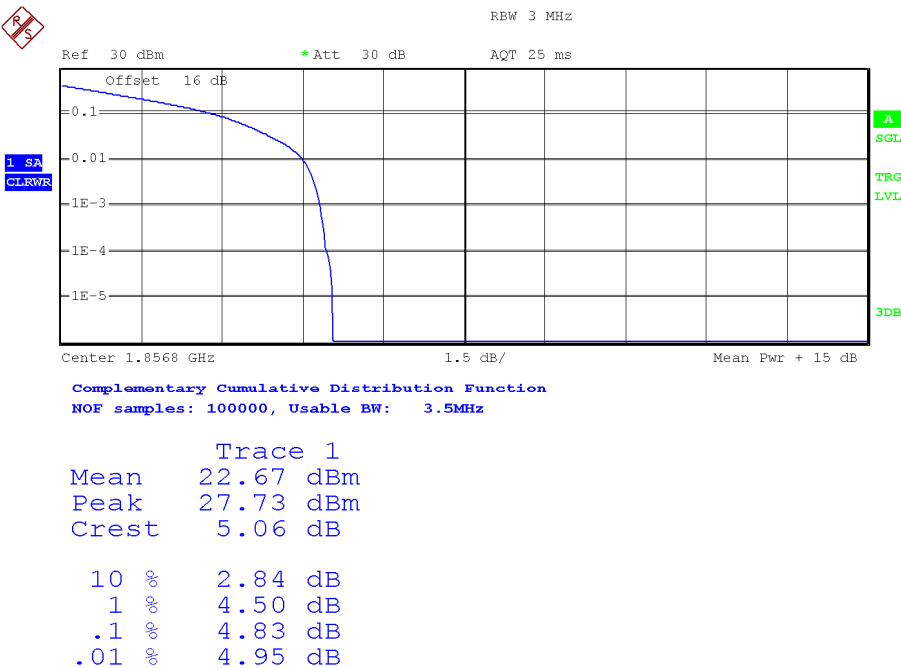


Channel High:

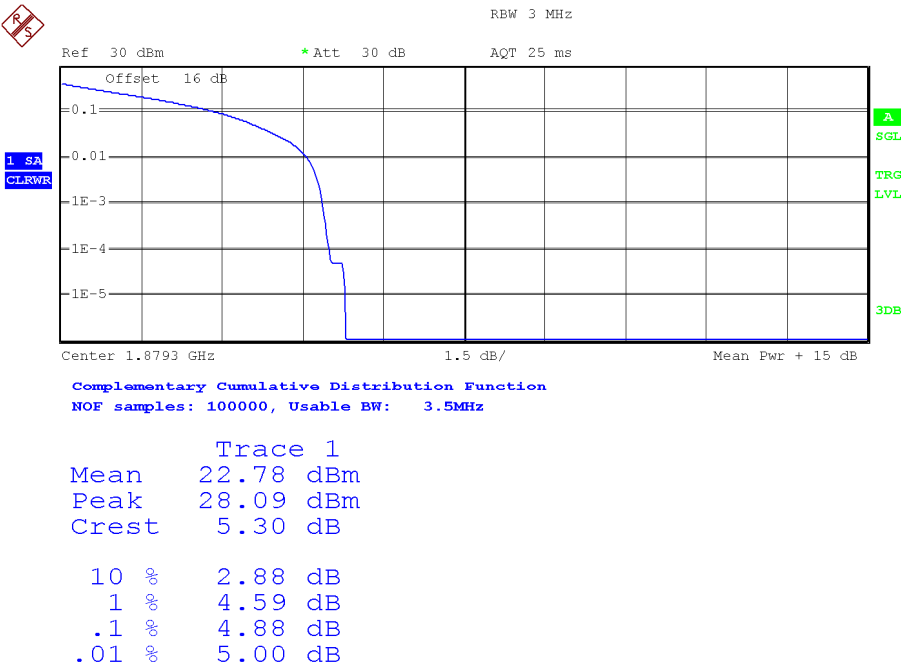


Bandwidth = 15 MHz. Modulation QPSK. Modulation bandwidth: 6. RB Size: 6. RB Offset: 0.

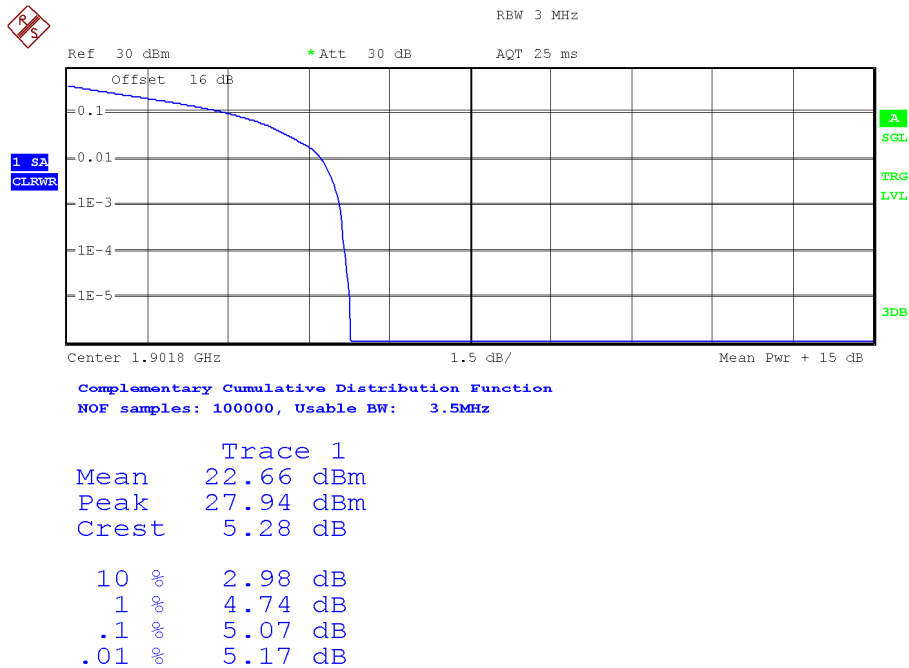
Channel Low:



Channel Middle:

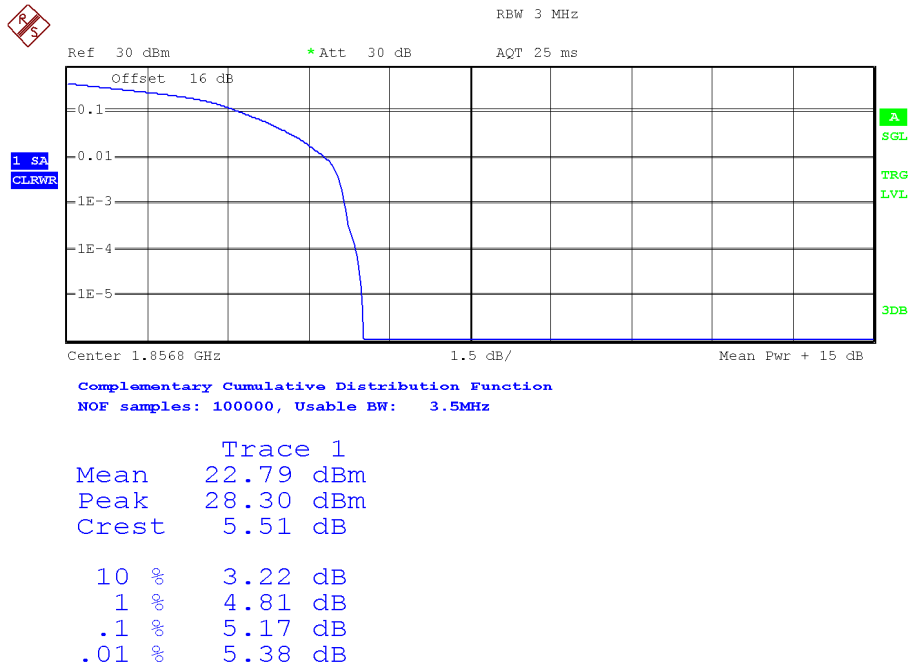


Channel High:

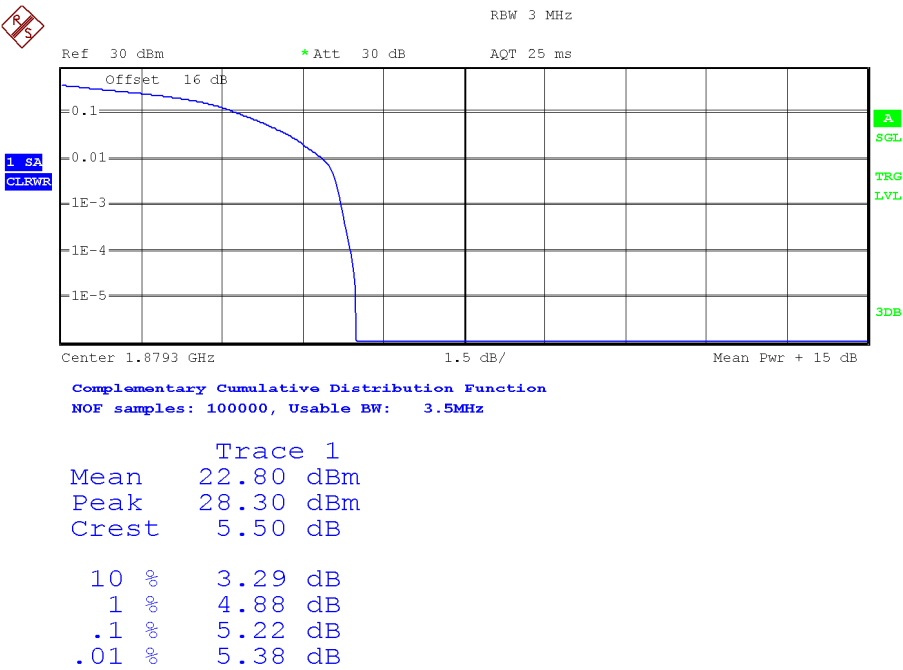


Bandwidth = 15 MHz. Modulation 16 QAM. Modulation bandwidth: 6. RB Size: 5. RB Offset: 0.

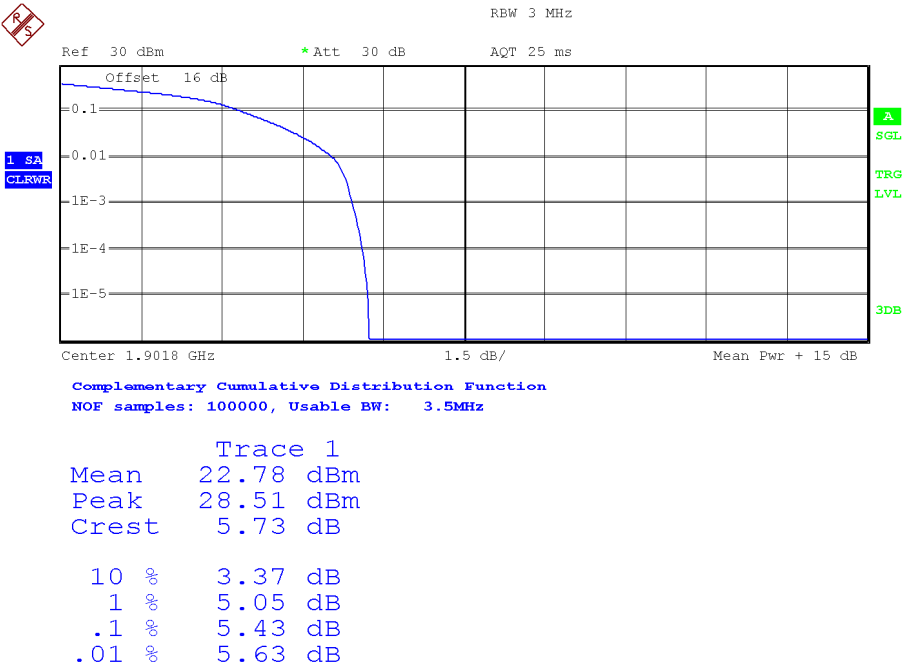
Channel Low:



Channel Middle:

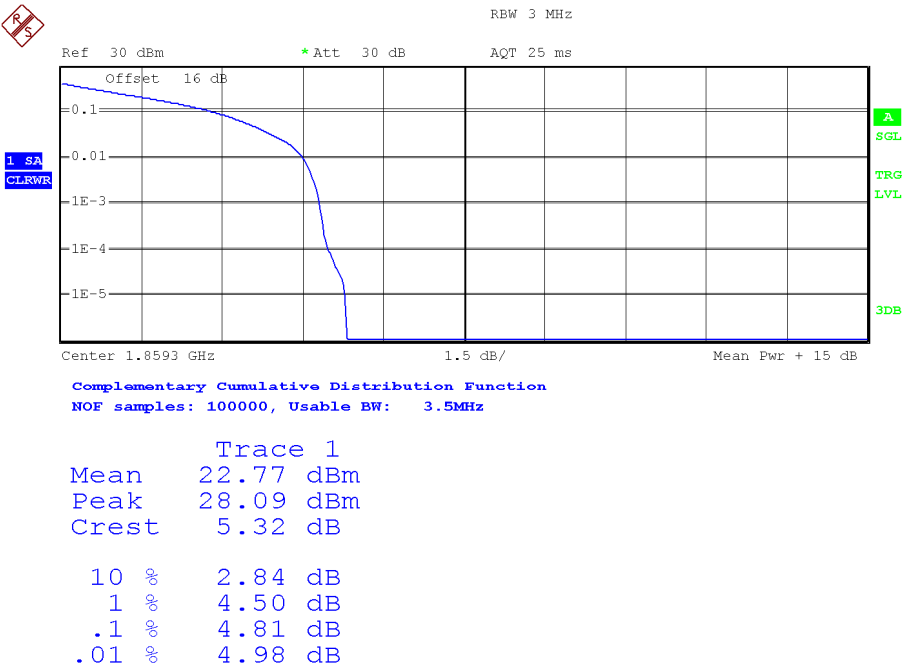


Channel High:

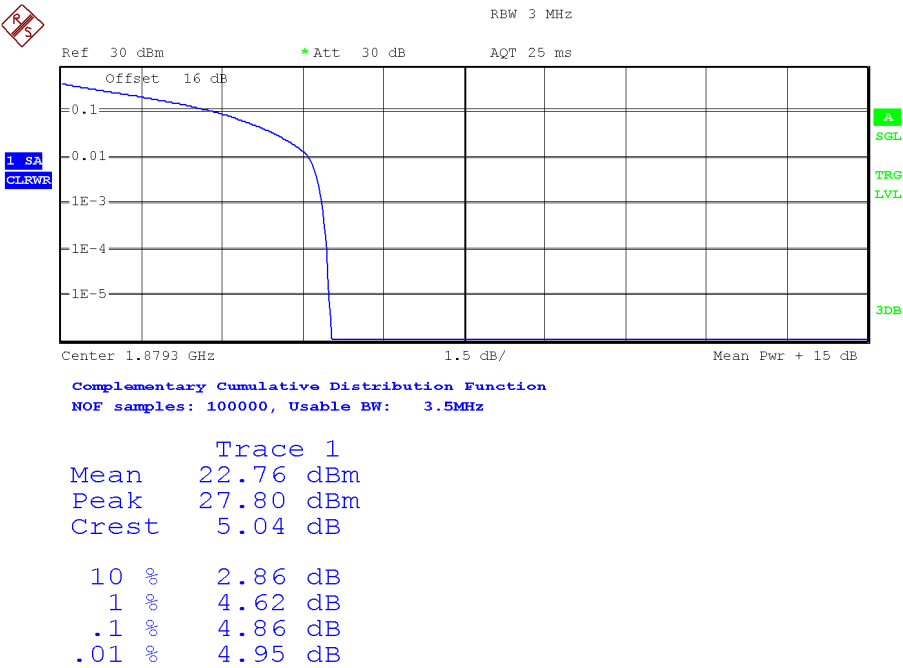


Bandwidth = 20 MHz. Modulation QPSK. Modulation bandwidth: 8. RB Size: 6. RB Offset: 0.

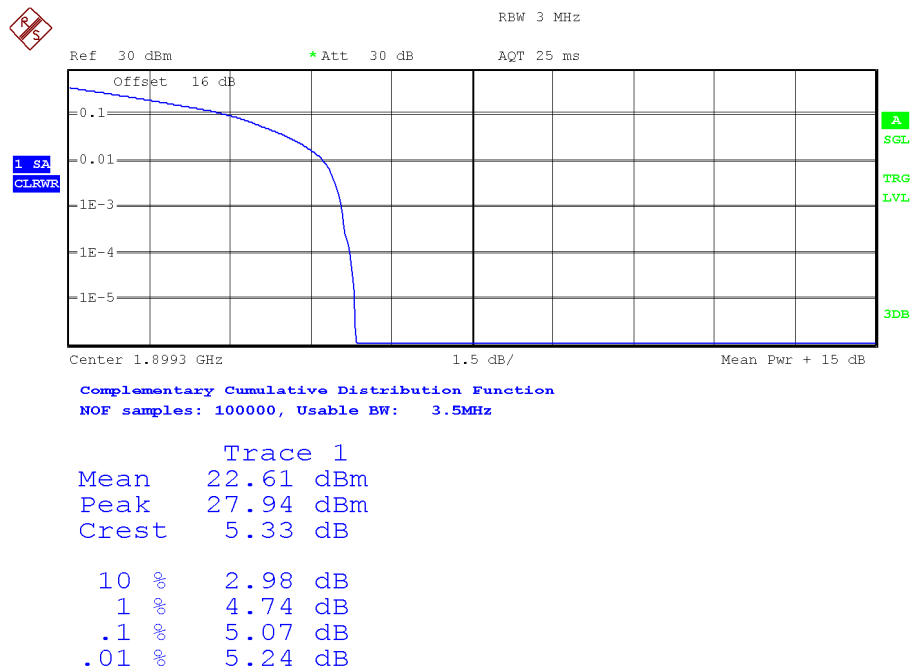
Channel Low:



Channel Middle:

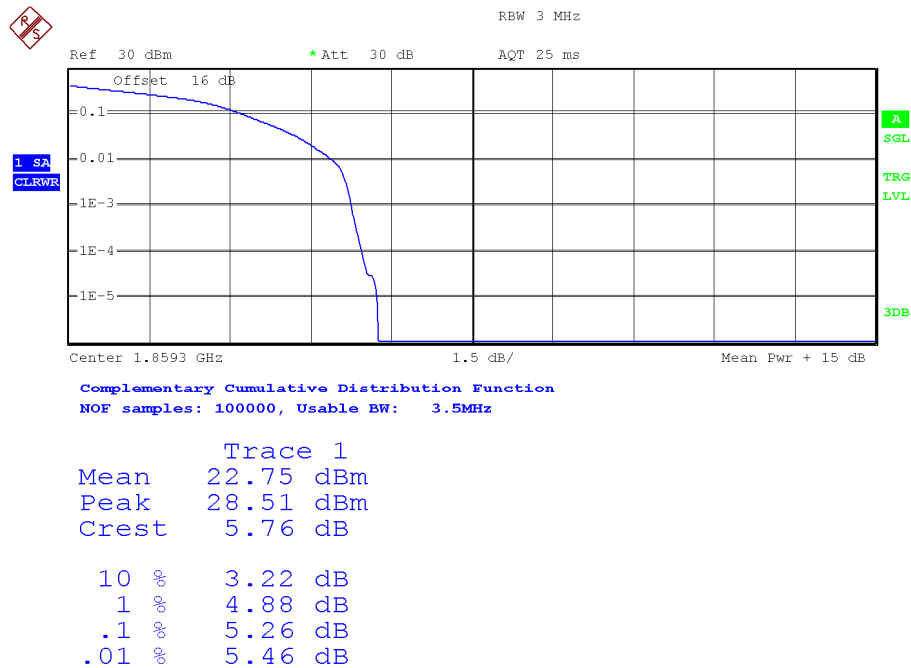


Channel High:

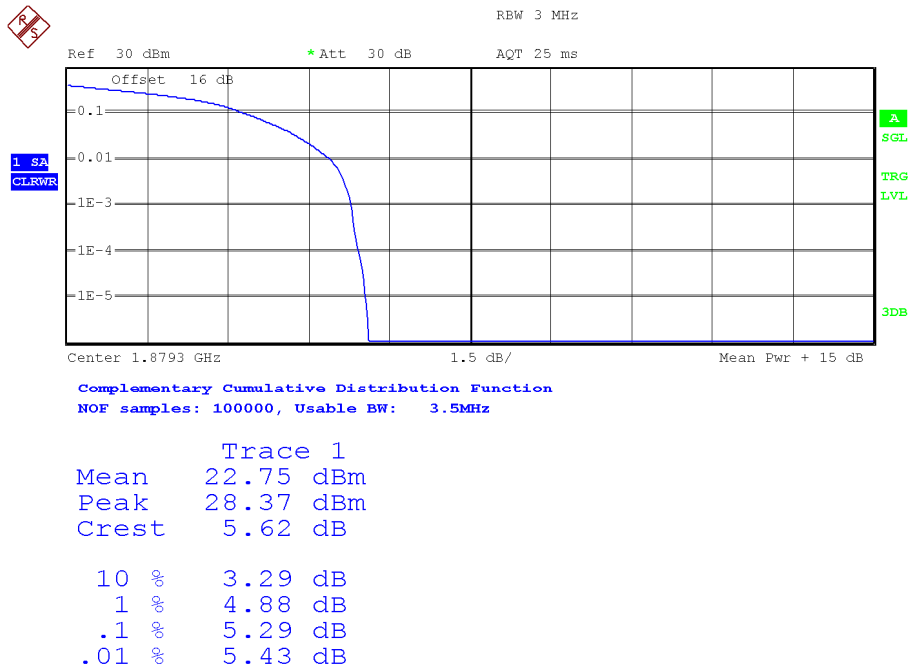


Bandwidth = 20 MHz. Modulation 16 QAM. Modulation bandwidth: 6. RB Size: 5. RB Offset: 0.

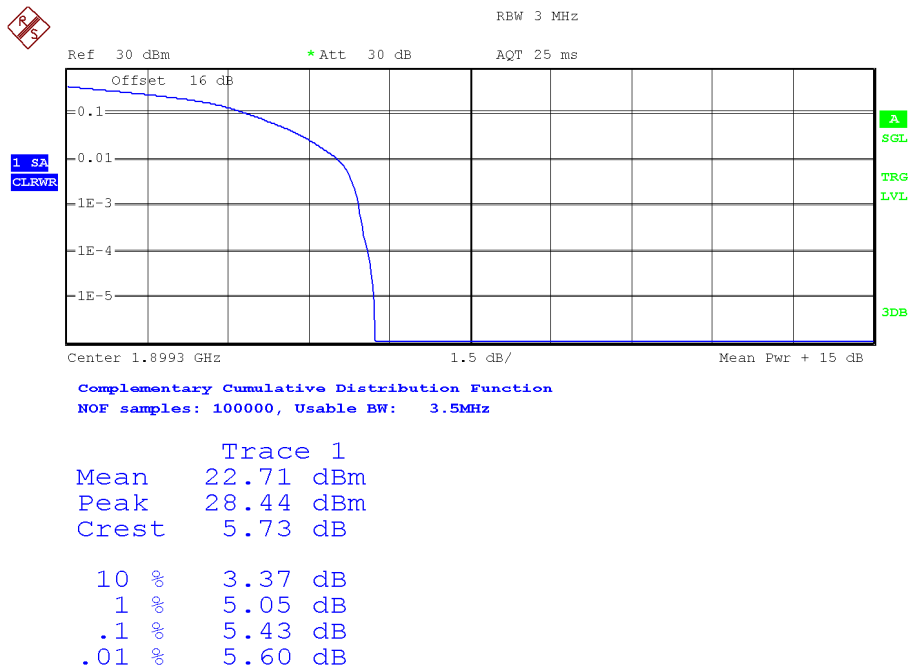
Channel Low:



Channel Middle:



Channel High:



Modulation Characteristics

SPECIFICATION

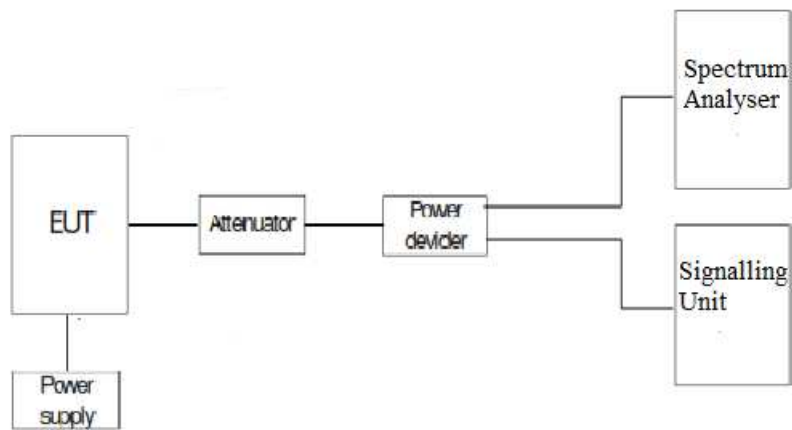
FCC §2.1047

RSS-133. Clause 6.2. The devices shall employ digital modulation techniques.

METHOD

For LTE the EUT operates with QPSK and 16QAM modulation modes in which the information is digitised 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).

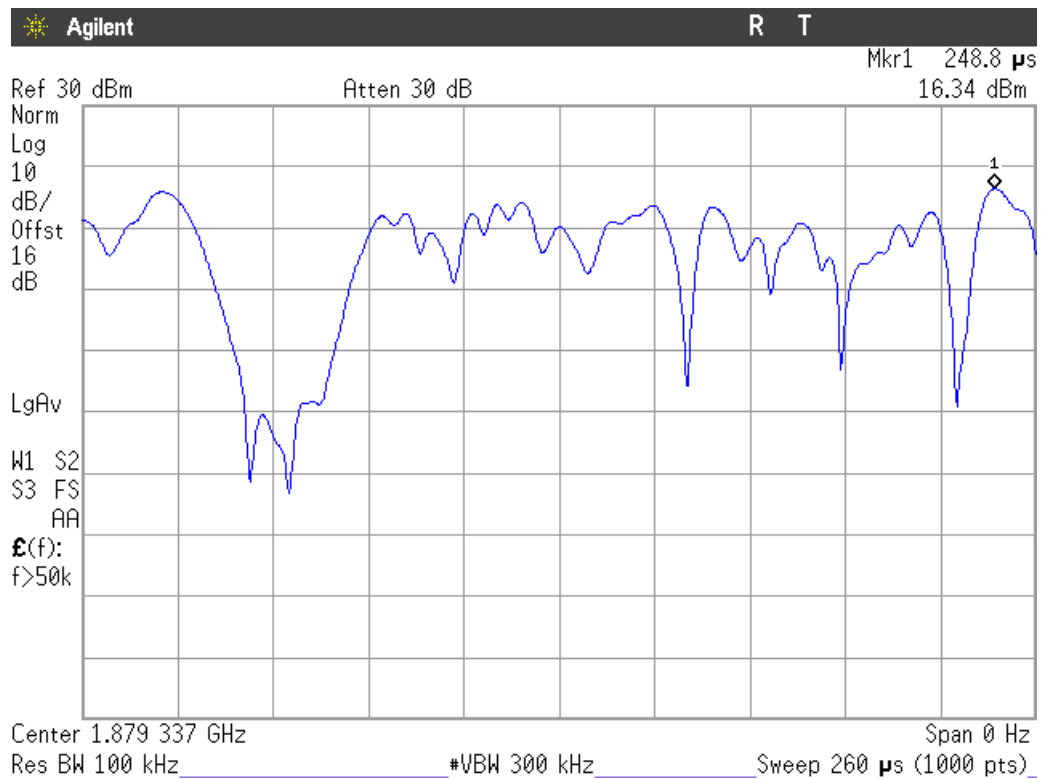
TEST SETUP



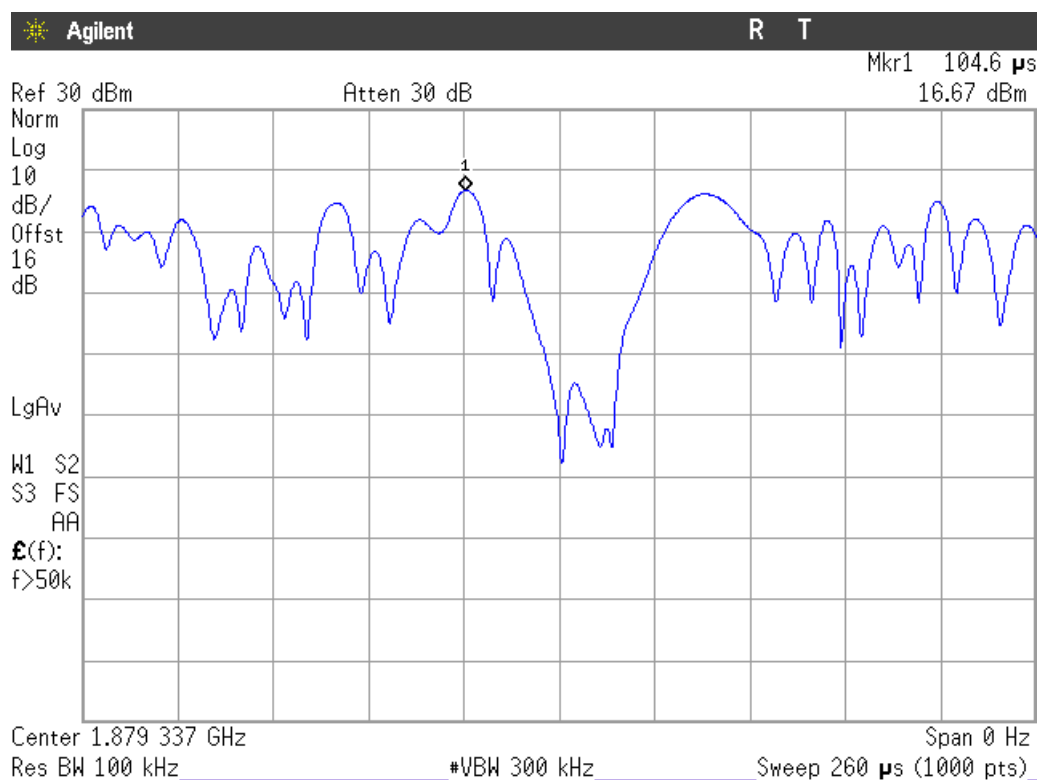
RESULTS

The following plot shows the modulation schemes in the EUT.

LTE MODULATION. QPSK. Band II



LTE MODULATION. 16QAM. Band II



Frequency Stability

SPECIFICATION

FCC §2.1055 and §24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-133. Clause 6.3. The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from -30°C up to $+50^{\circ}\text{C}$.

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

The EUT was set in “Radio Resource Control (RRC)” 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.

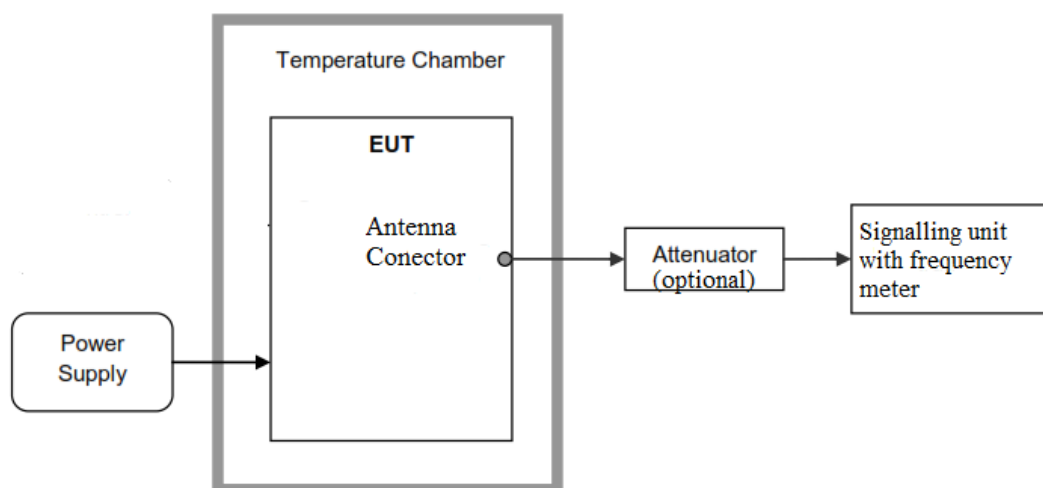
The worst case LTE mode for conducted power was used for the test.

In order to check that the frequency stability is sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point is established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation are identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods is added or subtracted from the values of f_L and f_H to check that the resulting frequencies remain within the band.

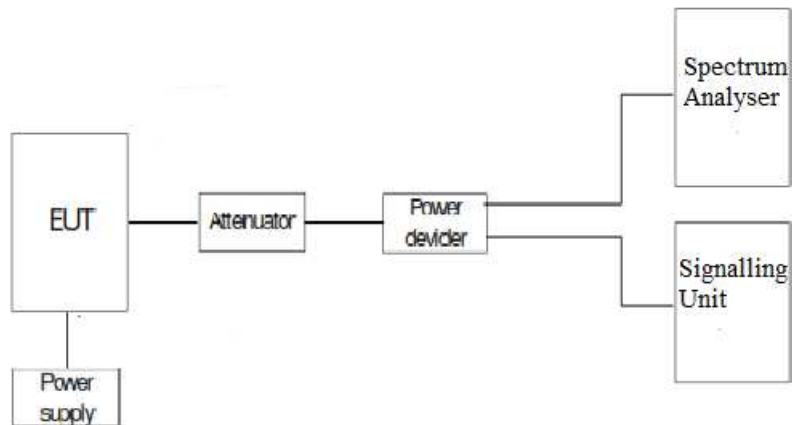
The reference point measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP

Frequency tolerance.



Reference points f_L and f_H .



RESULTS

Frequency stability over temperature variations.

BW = 1.4 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-8.53	-0.004537234
+40	-8.54	-0.004542553
+30	-9.5	-0.005053191
+20	-9.44	-0.005021277
+10	-9.46	-0.005031915
0	-8.96	-0.004765957
-10	-10.01	-0.005324468
-20	-10.14	-0.005393617
-30	-10.19	-0.005420213

BW = 3 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-9.1	-0.004840426
+40	-8.87	-0.004718085
+30	-9.74	-0.005180851
+20	-8.5	-0.004521277
+10	-7.75	-0.00412234
0	-8.31	-0.004420213
-10	-10.47	-0.005569149
-20	-9.74	-0.005180851
-30	-10.97	-0.005835106

BW = 5 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-8.11	-0.00431383
+40	-8	-0.004255319
+30	-9.3	-0.004946809
+20	-8.41	-0.004473404
+10	-9.08	-0.004829787
0	-8.25	-0.004388298
-10	-10.47	-0.005569149
-20	-9.24	-0.004914894
-30	-12.37	-0.006579787

BW = 10 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-7.8	-0.004148936
+40	-7.88	-0.004191489
+30	-10.43	-0.005547872
+20	-7.98	-0.004244681
+10	-8.17	-0.004345745
0	-8.57	-0.004558511
-10	-8.65	-0.004601064
-20	-9.21	-0.004898936
-30	-11.36	-0.006042553

BW = 15 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-8.05	-0.004281915
+40	-8.17	-0.004345745
+30	-9.96	-0.005297872
+20	-8.44	-0.004489362
+10	-10.06	-0.005351064
0	-9.1	-0.004840426
-10	-8.63	-0.004590426
-20	-9.36	-0.004978723
-30	-9.58	-0.005095745

BW = 20 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	9.16	0.00487234
+40	10.77	0.005728723
+30	9.83	0.005228723
+20	9.53	0.005069149
+10	10.13	0.005388298
0	12.53	0.006664894
-10	9.27	0.004930851
-20	11.3	0.006010638
-30	10.26	0.005457447

Frequency stability over voltage variations.

BW = 1.4 MHz

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-9.7	-0.005159574
V _{min}	3.23	-7.41	-0.003941489

BW = 3 MHz

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-10.57	-0.00562234
V _{min}	3.23	-6.35	-0.00337766

BW = 5 MHz

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-9.14	-0.004861702
V _{min}	3.23	-6.35	-0.00337766

BW = 10 MHz

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-9.21	-0.004898936
V _{min}	3.23	-7	-0.003723404

BW = 15 MHz

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-11.59	-0.006164894
V _{min}	3.23	-6.81	-0.00362234

BW = 20 MHz

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	10.66	0.005670213
V _{min}	3.23	11.14	0.005925532

Reference points established at the applicable unwanted emissions limit (worst case):

	BW = 1.4 MHz (Band II)	BW = 3 MHz (Band II)	BW = 5 MHz (Band II)	BW = 10 MHz (Band II)	BW = 15 MHz (Band II)	BW = 20 MHz (Band II)
f_L (MHz)	1850.0871	1850.2272	1850.1612	1850.5776	1850.8218	1851.2330
f_H (MHz)	1909.9089	1909.7648	1909.8448	1909.4404	1909.1842	1908.7610

Reference points f_L and f_H with the worst-case frequency offsets added or subtracted:

	BW = 1.4 MHz (Band II)	BW = 3 MHz (Band II)	BW = 5 MHz (Band II)	BW = 10 MHz (Band II)	BW = 15 MHz (Band II)	BW = 20 MHz (Band II)
f_L (MHz)	1850.0871	1850.2272	1850.1612	1850.5776	1850.8218	1851.2330
f_H (MHz)	1909.9089	1909.7648	1909.8448	1909.4404	1909.1842	1908.7610

The reference frequency points stay within the authorized blocks.

Verdict: PASS

Measurement uncertainty	$<\pm 1 \times 10^{-6}$
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Verdict: PASS

Occupied Bandwidth

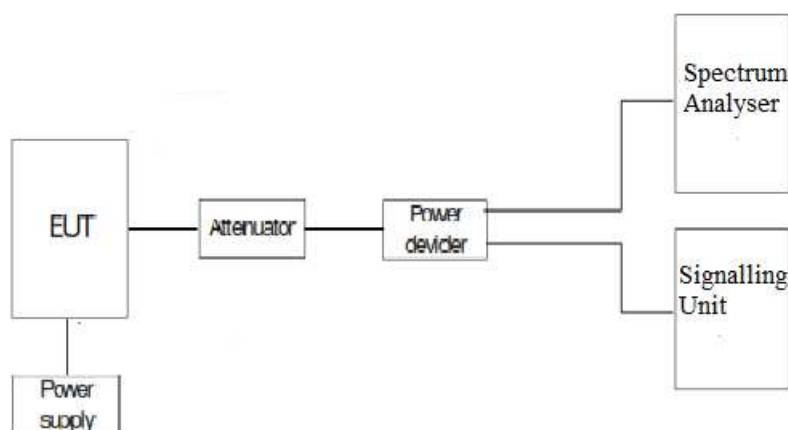
SPECIFICATION

FCC §2.1049

METHOD

The occupied bandwidth measurement was performed at the output terminals of the EUT using an attenuator, power splitter and spectrum analyser. 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 analyser.

TEST SETUP



RESULTS

LTE QPSK MODULATION. BW = 1.4 MHz. Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.10200	1.09540	1.09300
-26 dBc bandwidth (MHz)	1.28800	1.27500	1.29200
Measurement uncertainty (kHz)	<±4.67		

LTE 16QAM MODULATION. BW = 1.4 MHz. Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.91630	0.91958	0.92631
-26 dBc bandwidth (MHz)	1.10800	1.09100	1.11700
Measurement uncertainty (kHz)	<±4.67		

LTE QPSK MODULATION. BW = 3 MHz. Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.10220	1.20360	1.11110
-26 dBc bandwidth (MHz)	1.46400	2.13600	1.37200
Measurement uncertainty (kHz)	<±10		

LTE 16QAM MODULATION. BW = 3 MHz. Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.95213	1.04860	0.93812
-26 dBc bandwidth (MHz)	1.28400	2.06800	1.21800
Measurement uncertainty (kHz)	<±10		

LTE QPSK MODULATION. BW = 5 MHz. Narrow band: 2.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.15520	1.13540	1.13660
-26 dBc bandwidth (MHz)	1.73300	1.82600	1.67700
Measurement uncertainty (kHz)	<±16.67		

LTE 16QAM MODULATION. BW = 5 MHz. Narrow band: 2.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.98908	0.96384	1.00240
-26 dBc bandwidth (MHz)	1.48600	1.46800	1.60000
Measurement uncertainty (kHz)	<±16.67		

LTE QPSK MODULATION. BW = 10 MHz. Narrow band: 4.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.17560	1.15010	1.15480
-26 dBc bandwidth (MHz)	1.75100	1.73600	1.76400
Measurement uncertainty (kHz)	<±33.33		

LTE 16QAM MODULATION. BW = 10 MHz. Narrow band: 4.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.00630	1.01410	1.06460
-26 dBc bandwidth (MHz)	1.53100	1.68500	1.77900
Measurement uncertainty (kHz)	<±33.33		

LTE QPSK MODULATION. BW = 15 MHz. Narrow band: 6.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.14160	1.16580	1.11370
-26 dBc bandwidth (MHz)	1.72100	1.85900	1.76300
Measurement uncertainty (kHz)	<±50		

LTE 16QAM MODULATION. BW = 15 MHz. Narrow band: 6.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.98303	0.98515	0.98063
-26 dBc bandwidth (MHz)	1.56900	1.58400	1.61100
Measurement uncertainty (kHz)	<±50		

LTE QPSK MODULATION. BW = 20 MHz. Narrow band: 8.

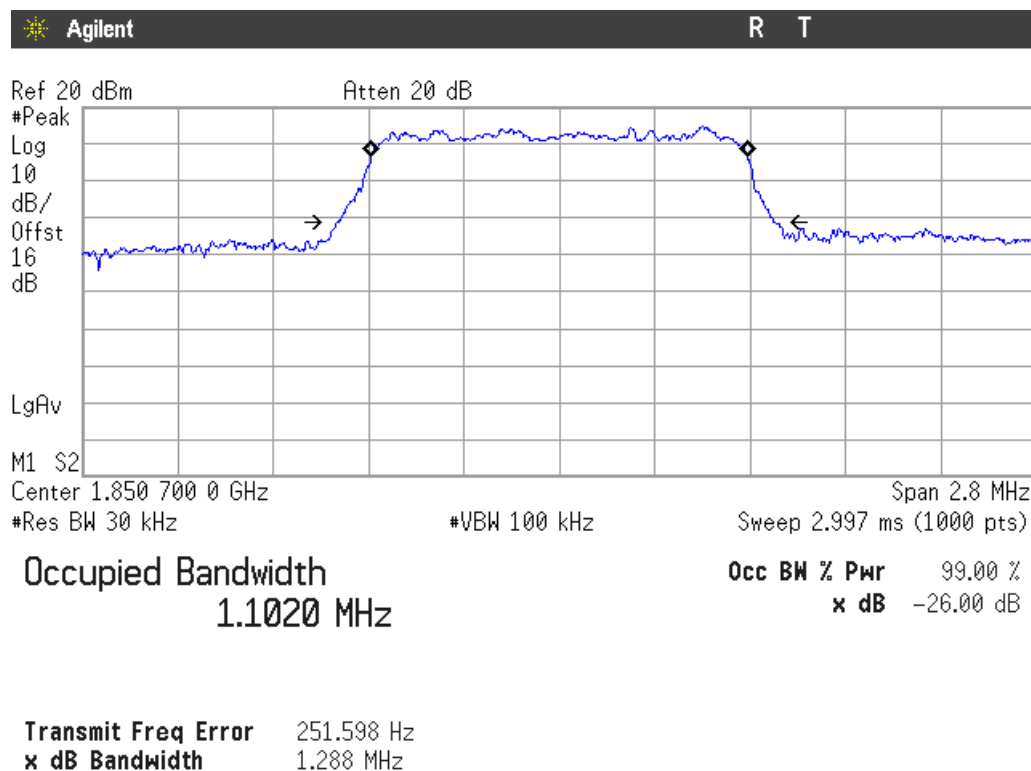
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.14780	1.15940	1.15870
-26 dBc bandwidth (MHz)	1.74800	1.81200	1.77400
Measurement uncertainty (kHz)	<±66.67		

LTE 16QAM MODULATION. BW = 20 MHz. Narrow band: 8.

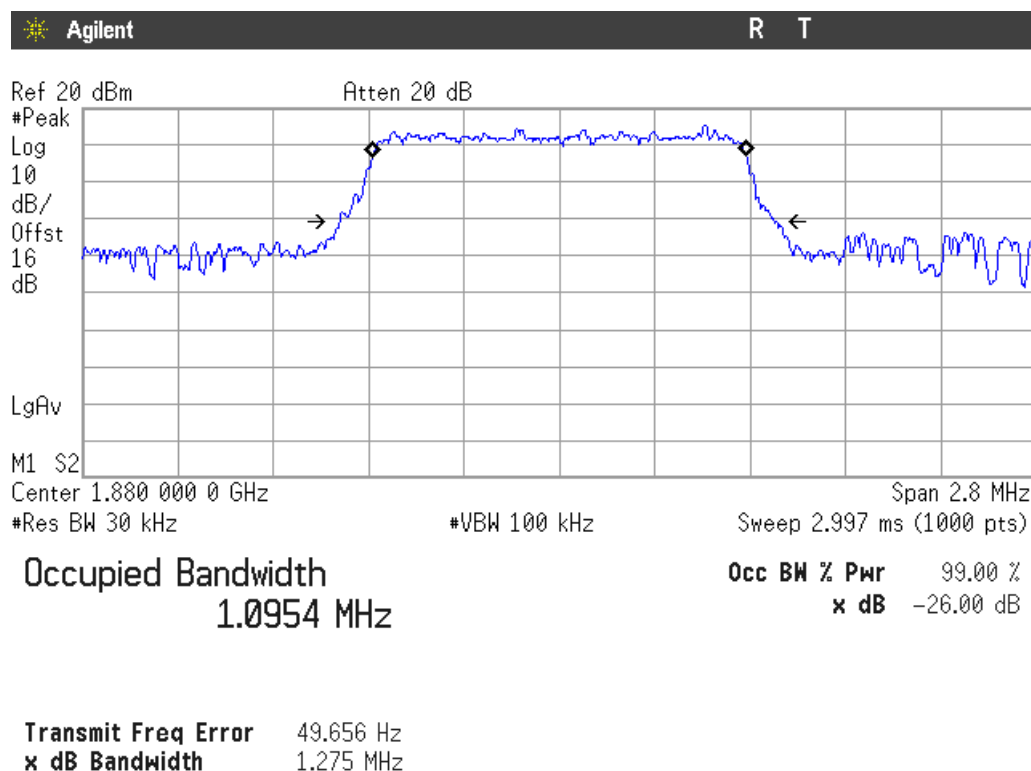
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.99741	1.00440	0.98826
-26 dBc bandwidth (MHz)	1.54000	1.63600	1.54900
Measurement uncertainty (kHz)	<±66.67		

LTE QPSK MODULATION. BW = 1.4 MHz

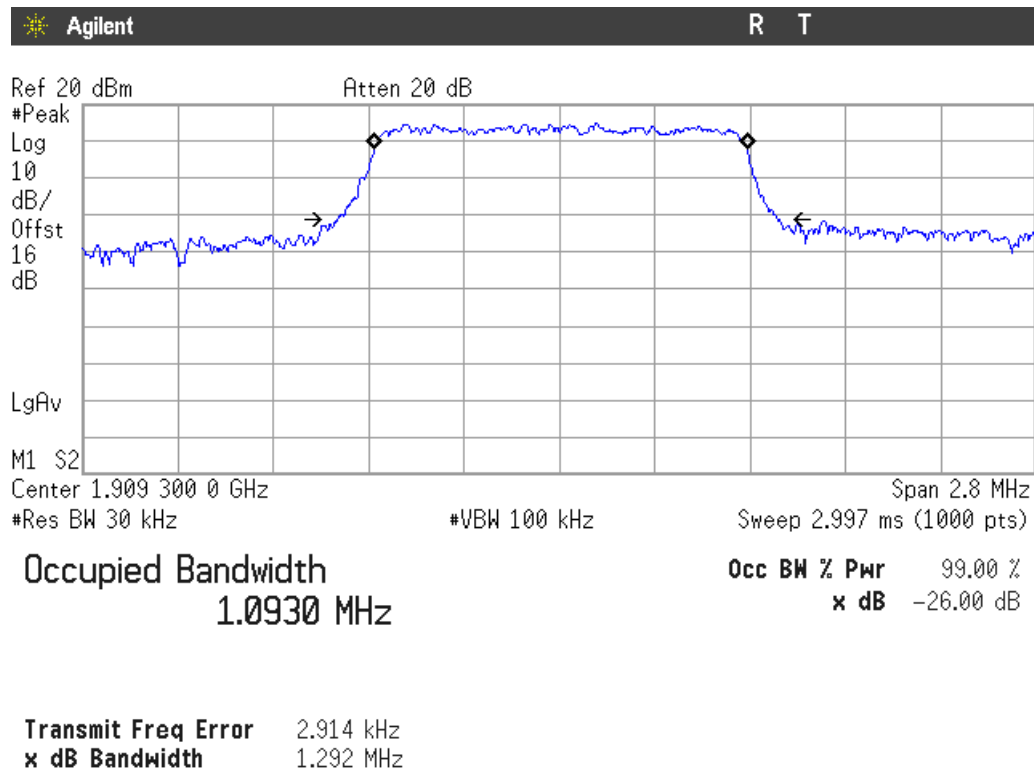
Lowest Channel



Middle Channel

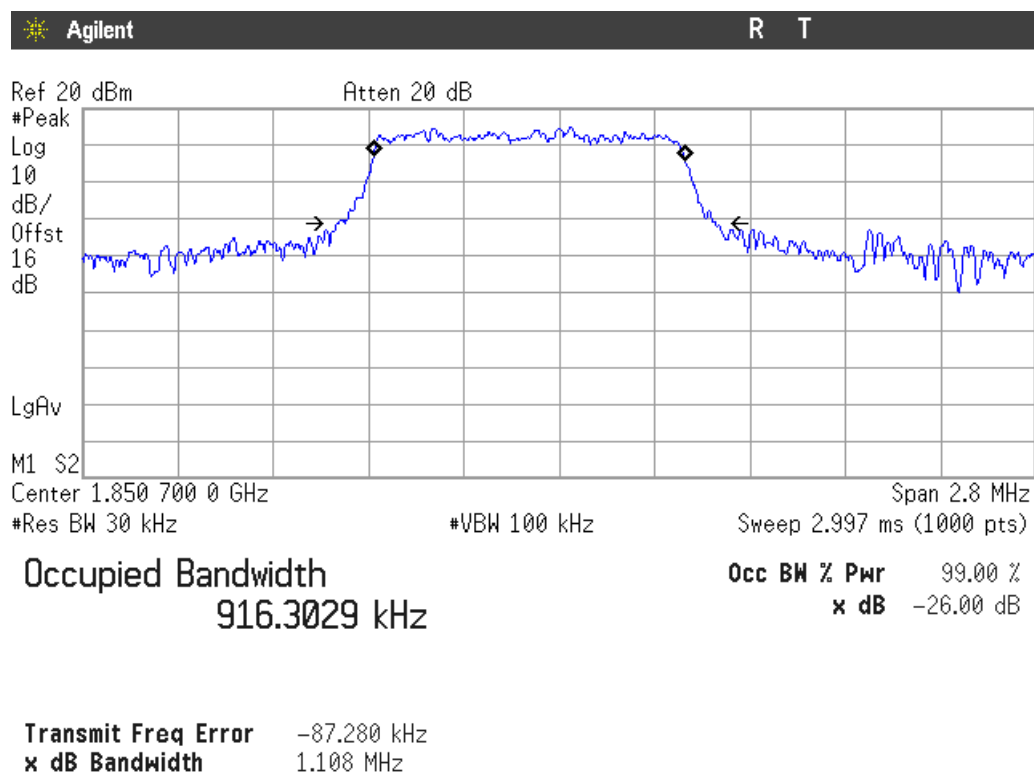


Highest Channel

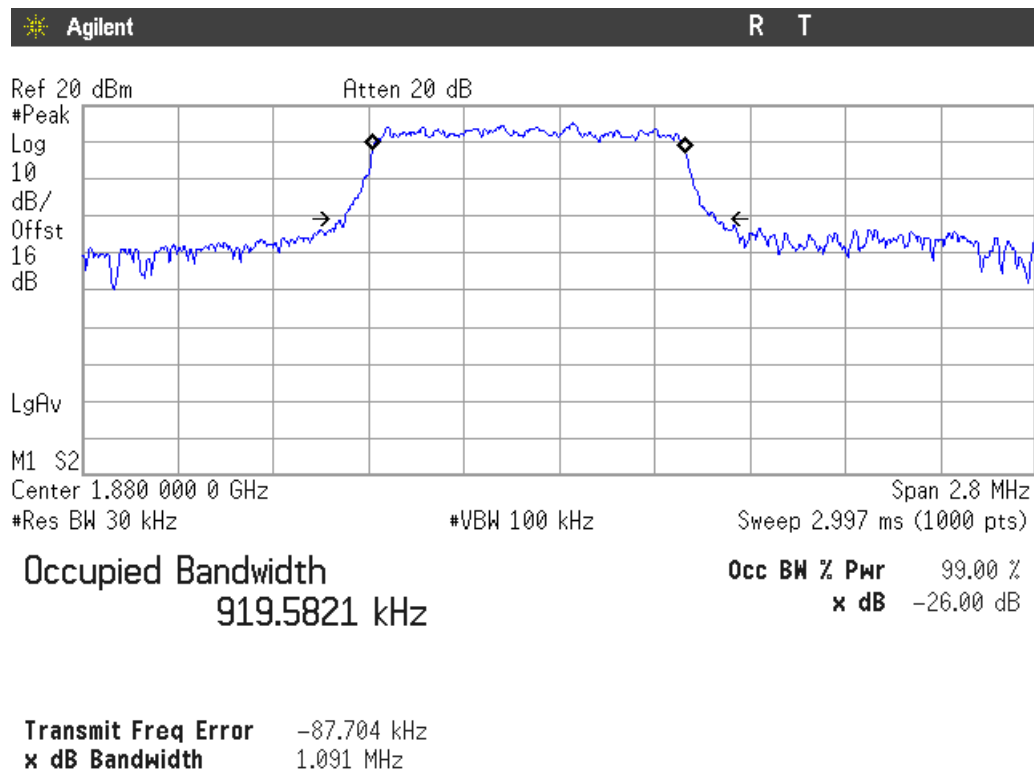


LTE 16QAM MODULATION. BW = 1.4 MHz

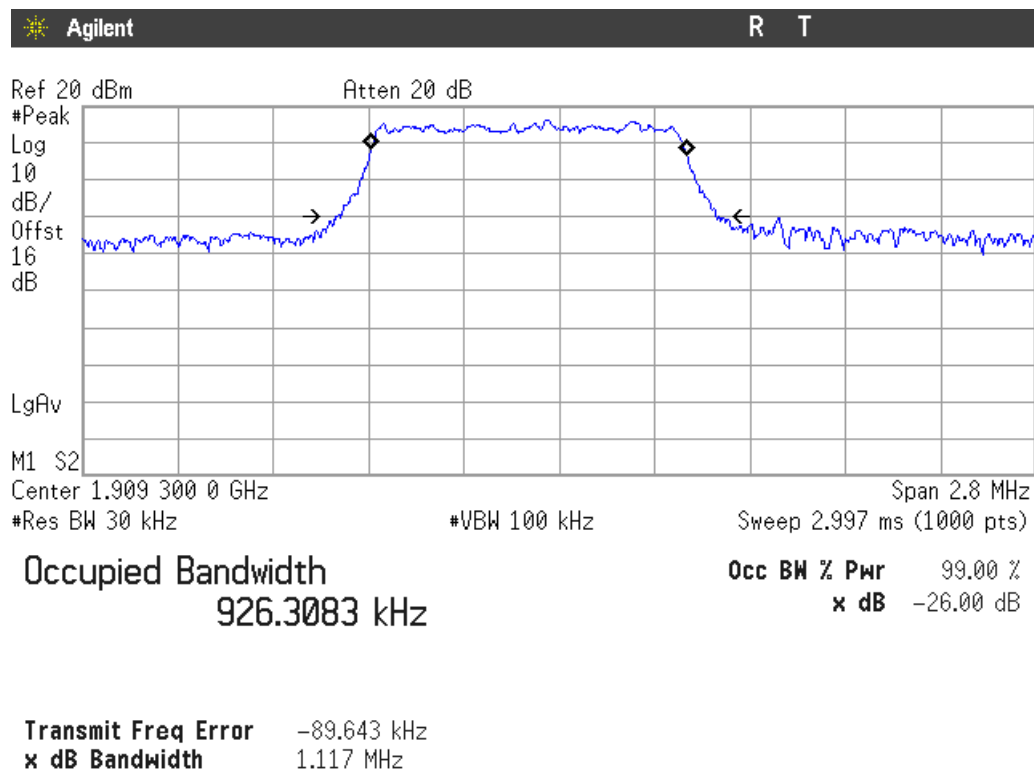
Lowest Channel



Middle Channel

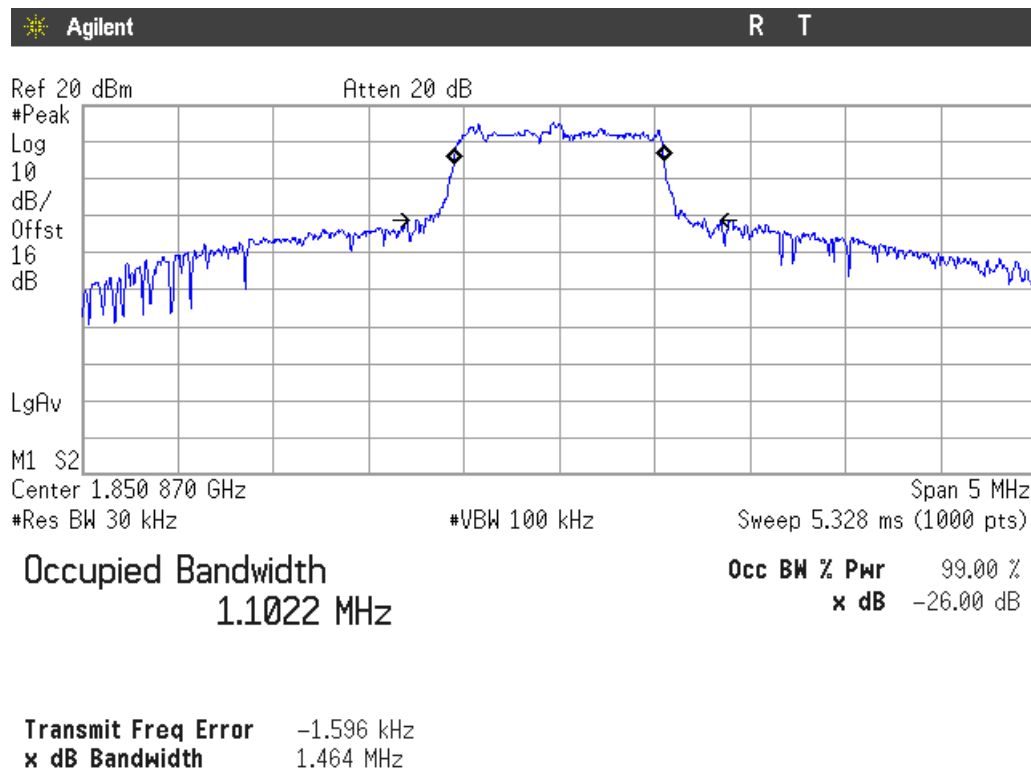


Highest Channel

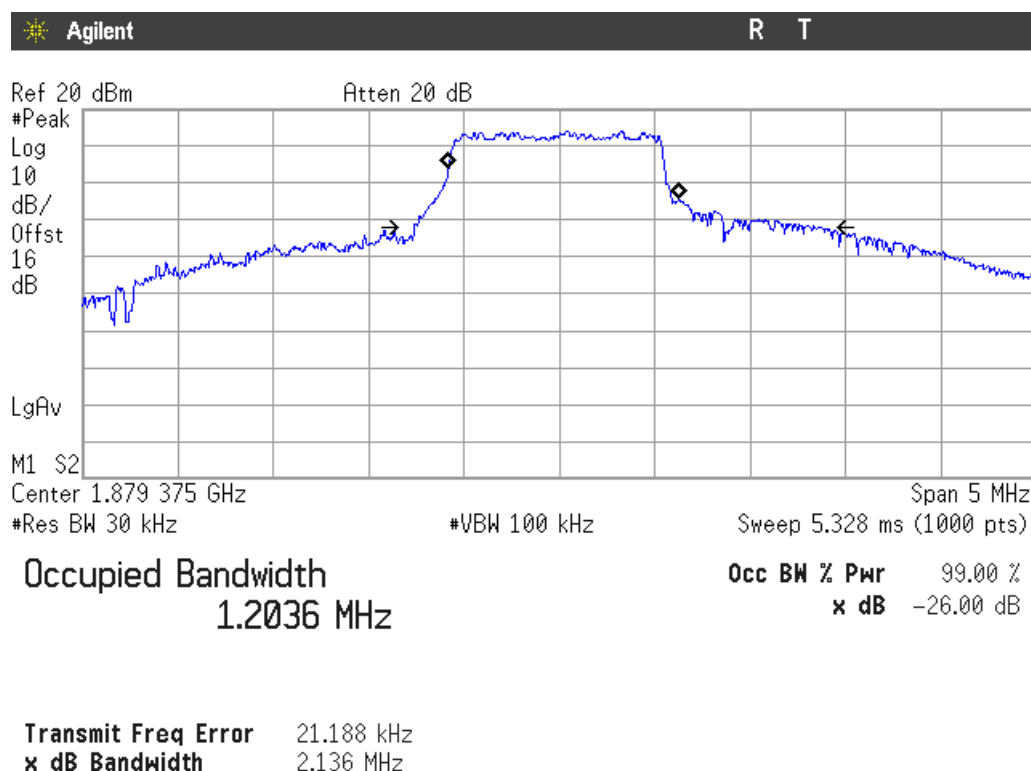


LTE QPSK MODULATION. BW = 3 MHz

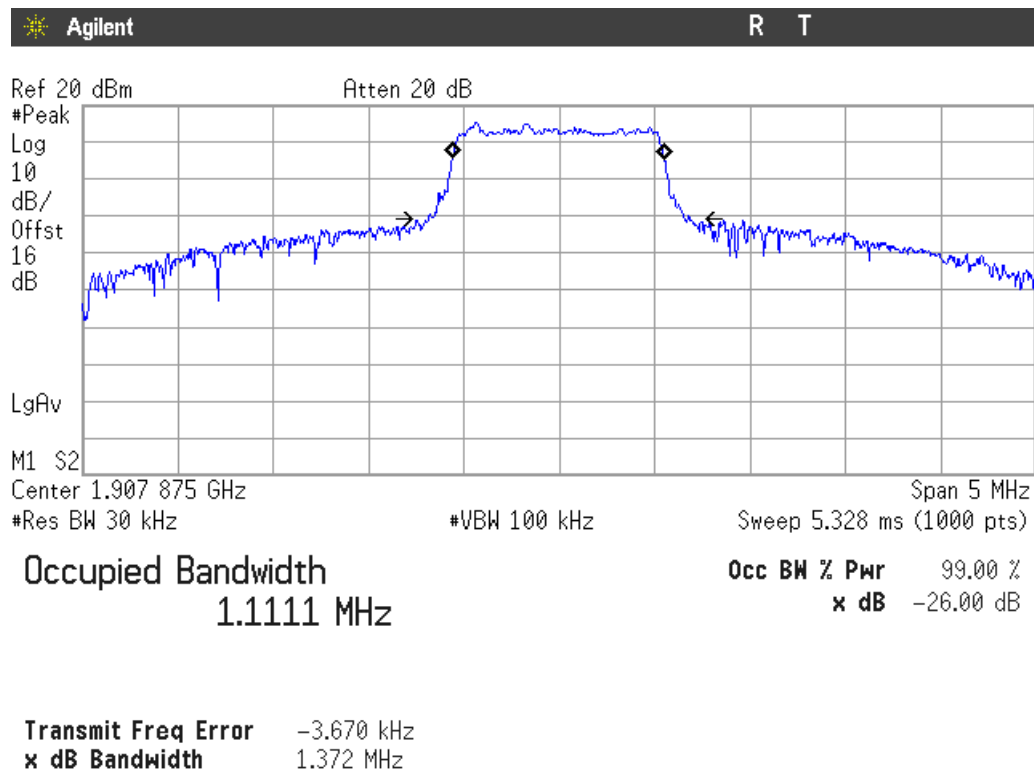
Lowest Channel



Middle Channel

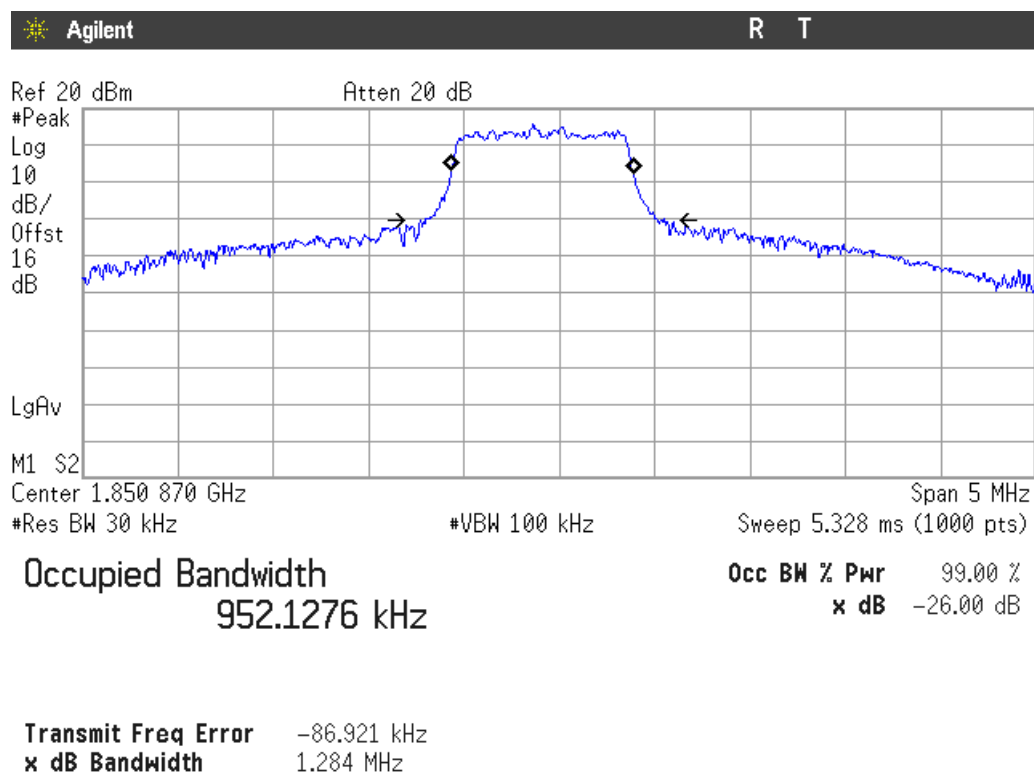


Highest Channel

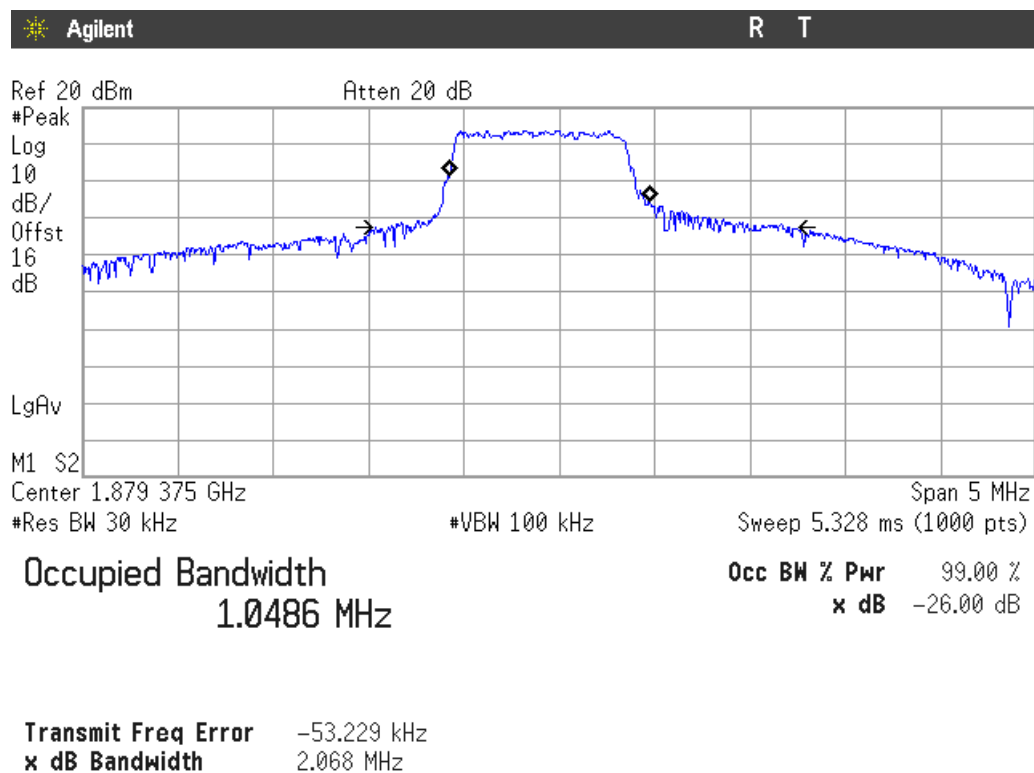


LTE 16QAM MODULATION. BW = 3 MHz

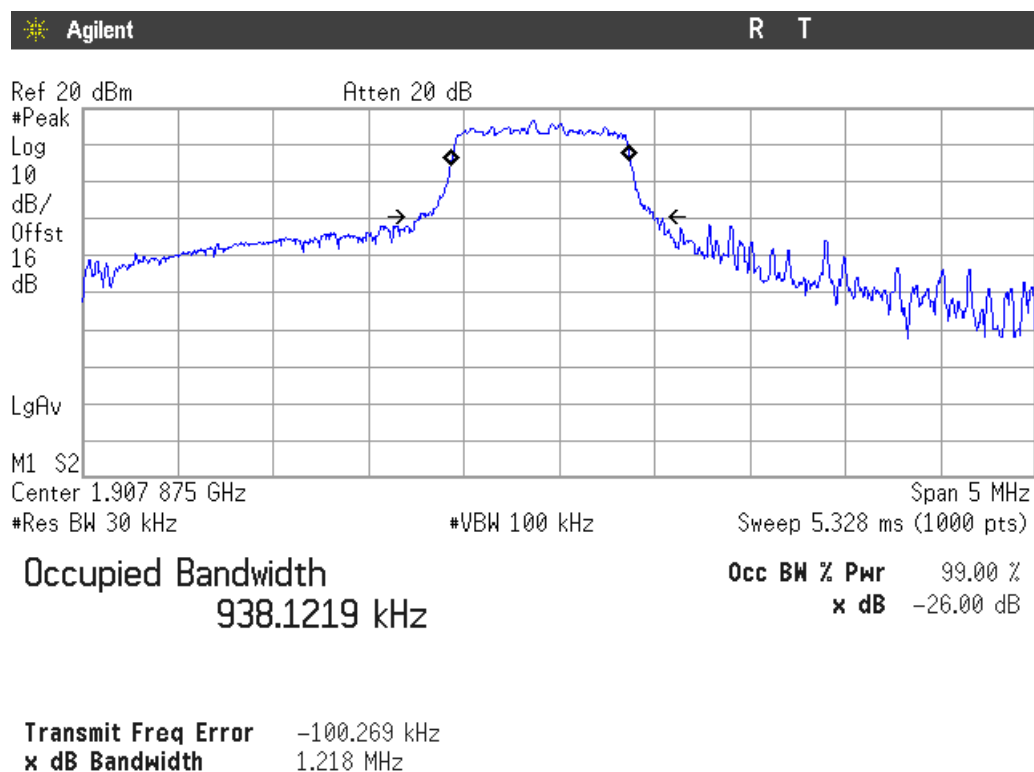
Lowest Channel



Middle Channel

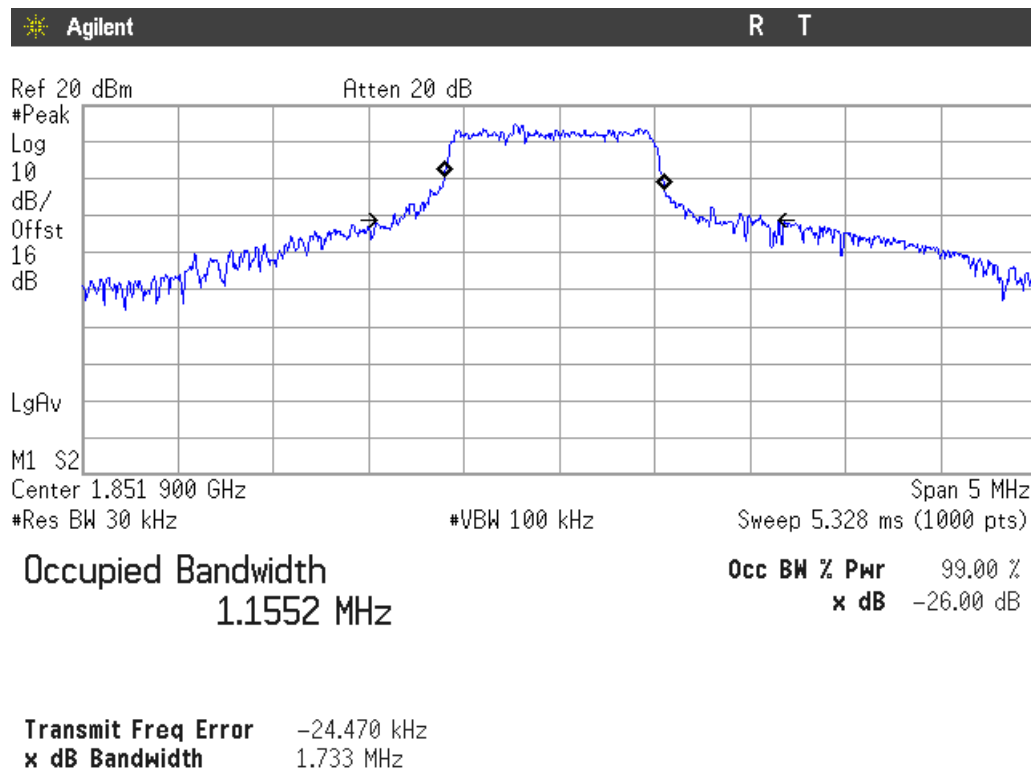


Highest Channel

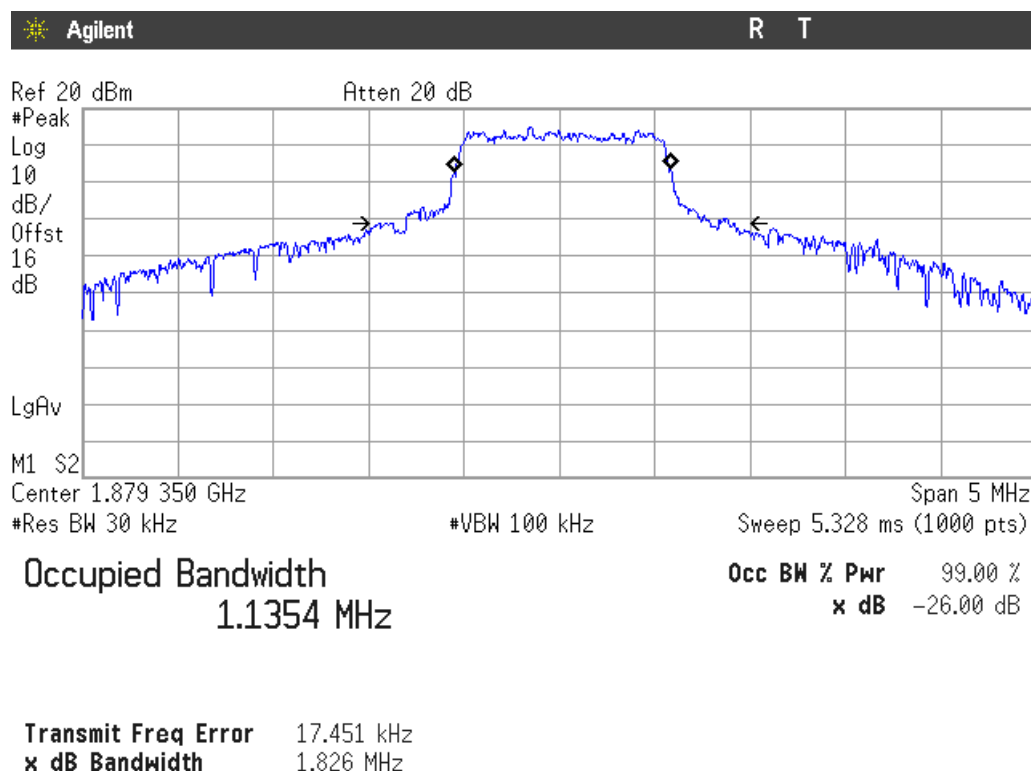


LTE QPSK MODULATION. BW = 5 MHz

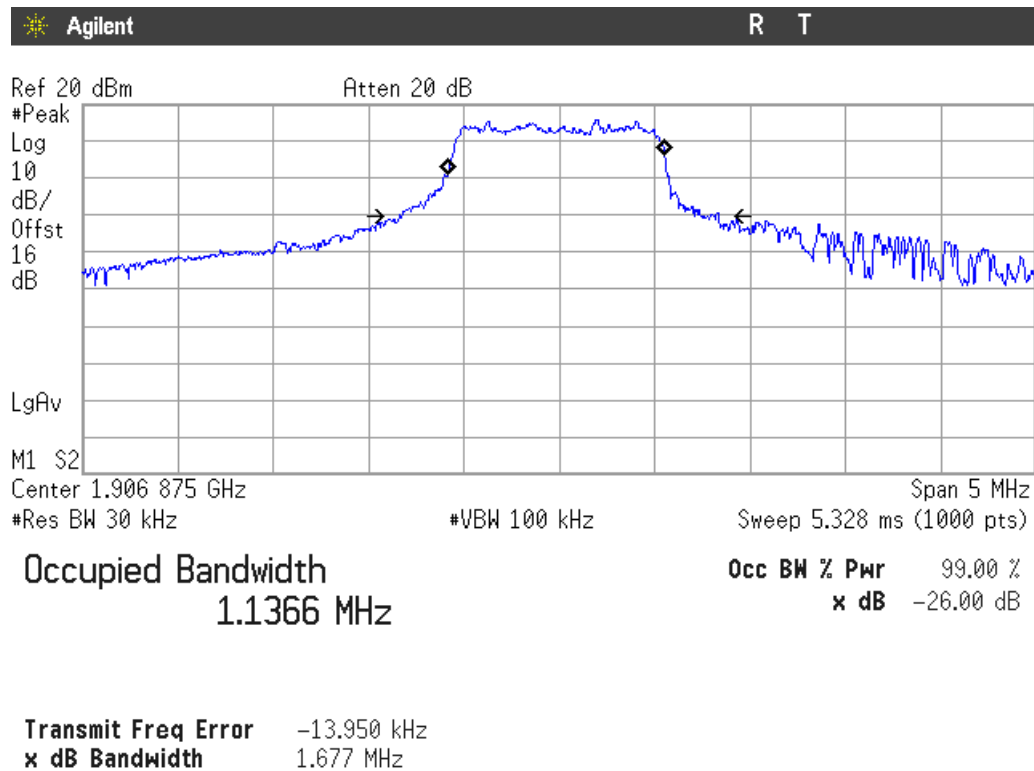
Lowest Channel



Middle Channel

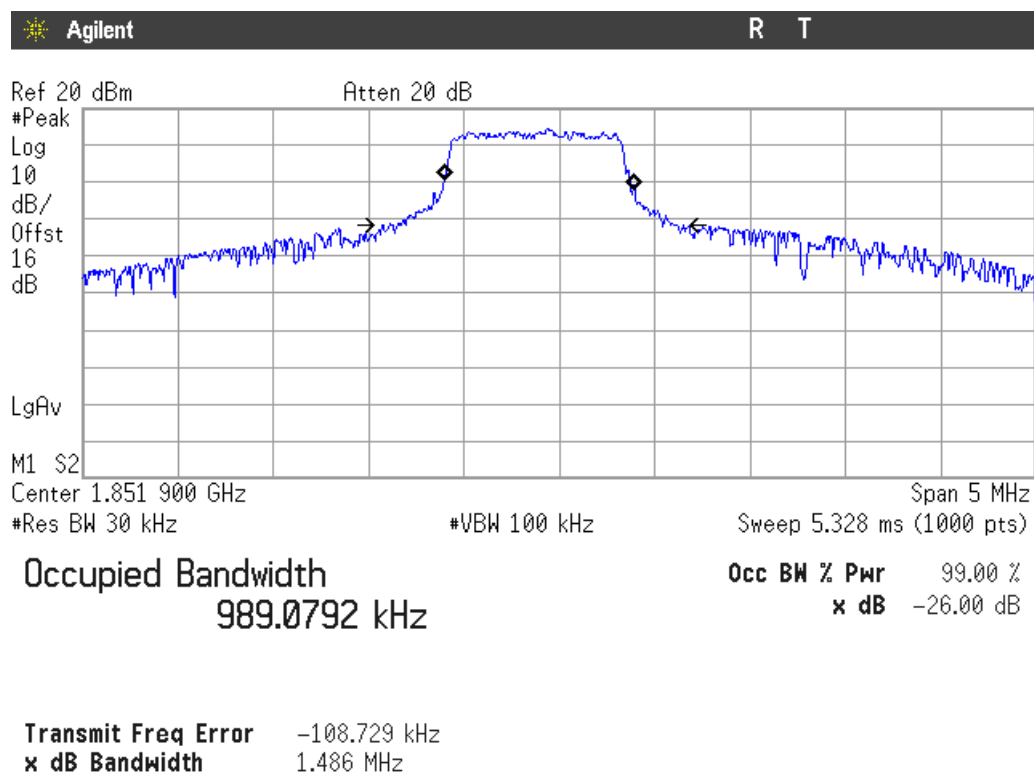


Highest Channel

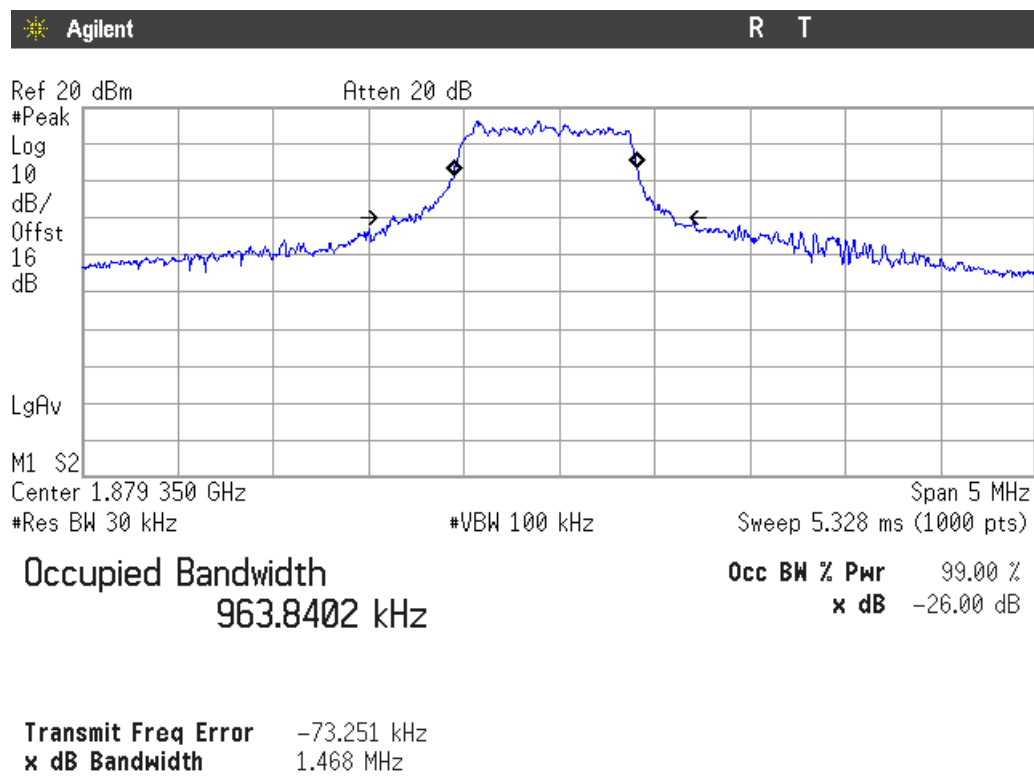


LTE 16QAM MODULATION. BW = 5 MHz

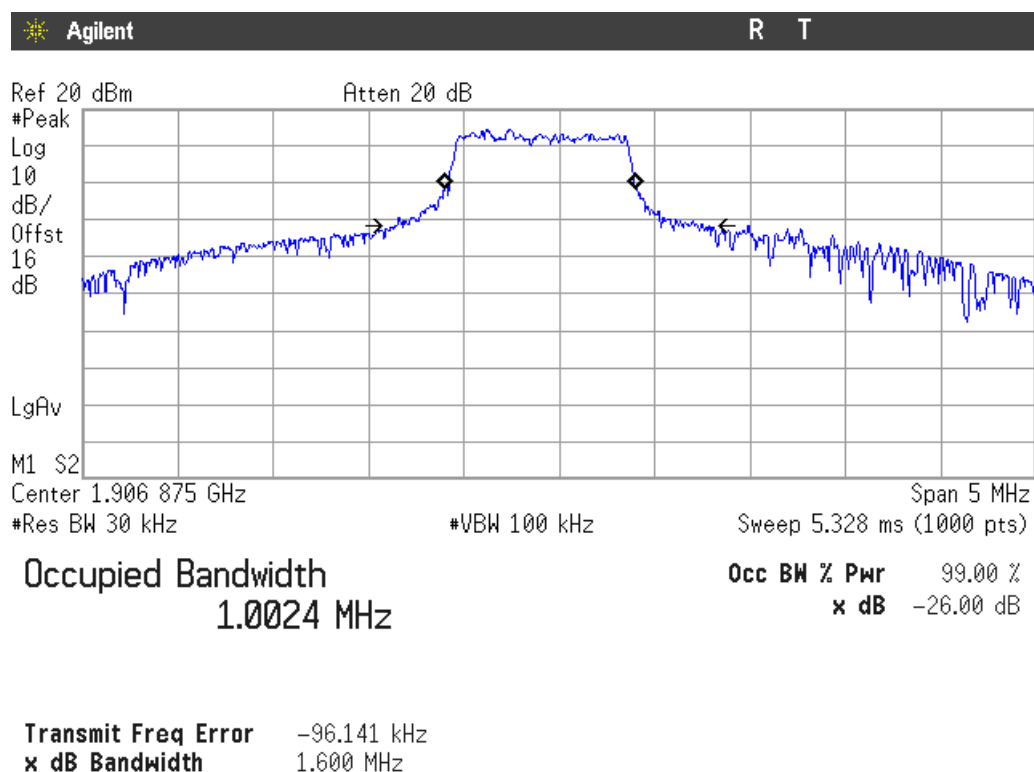
Lowest Channel



Middle Channel

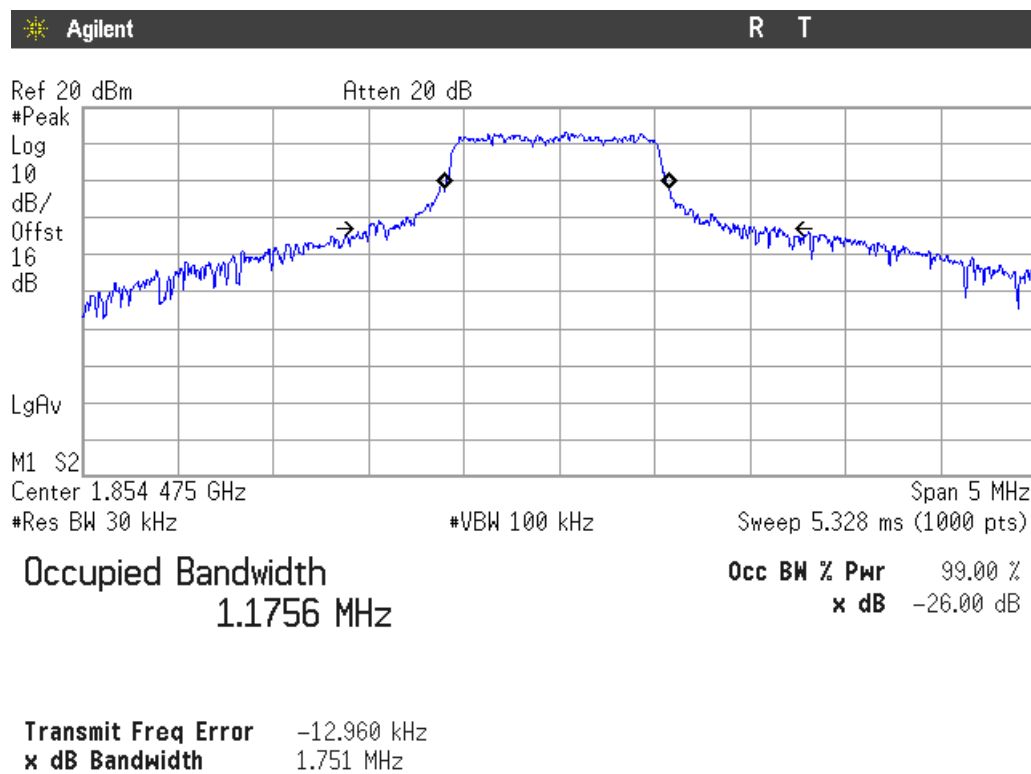


Highest Channel

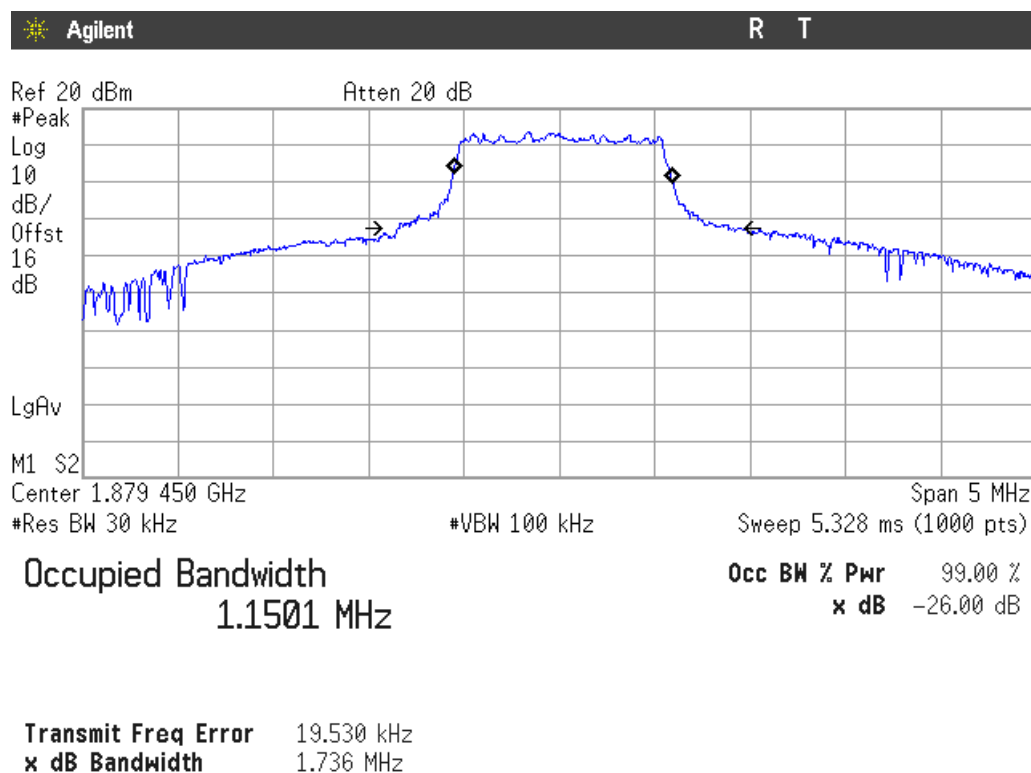


LTE QPSK MODULATION. BW = 10 MHz

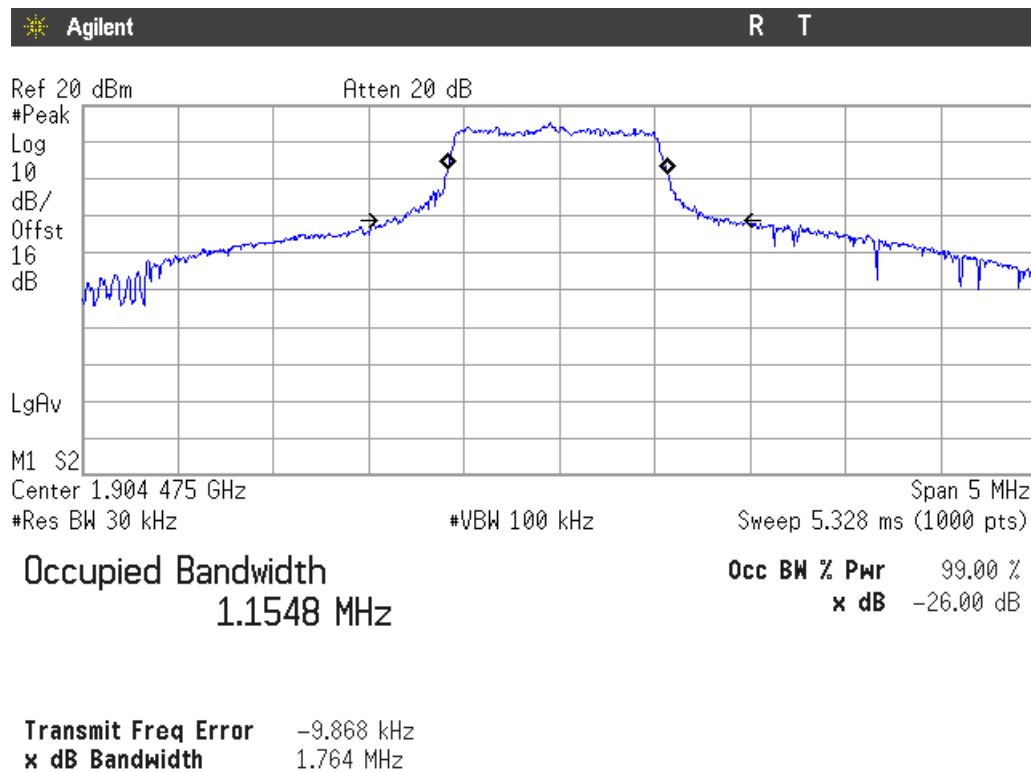
Lowest Channel



Middle Channel

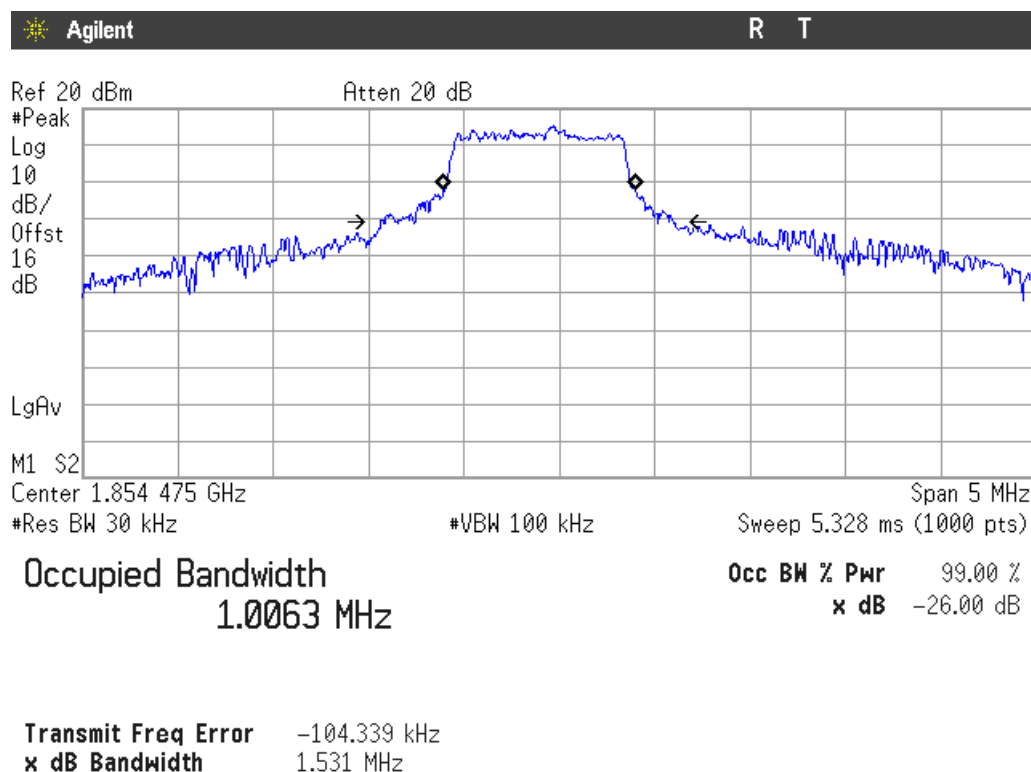


Highest Channel

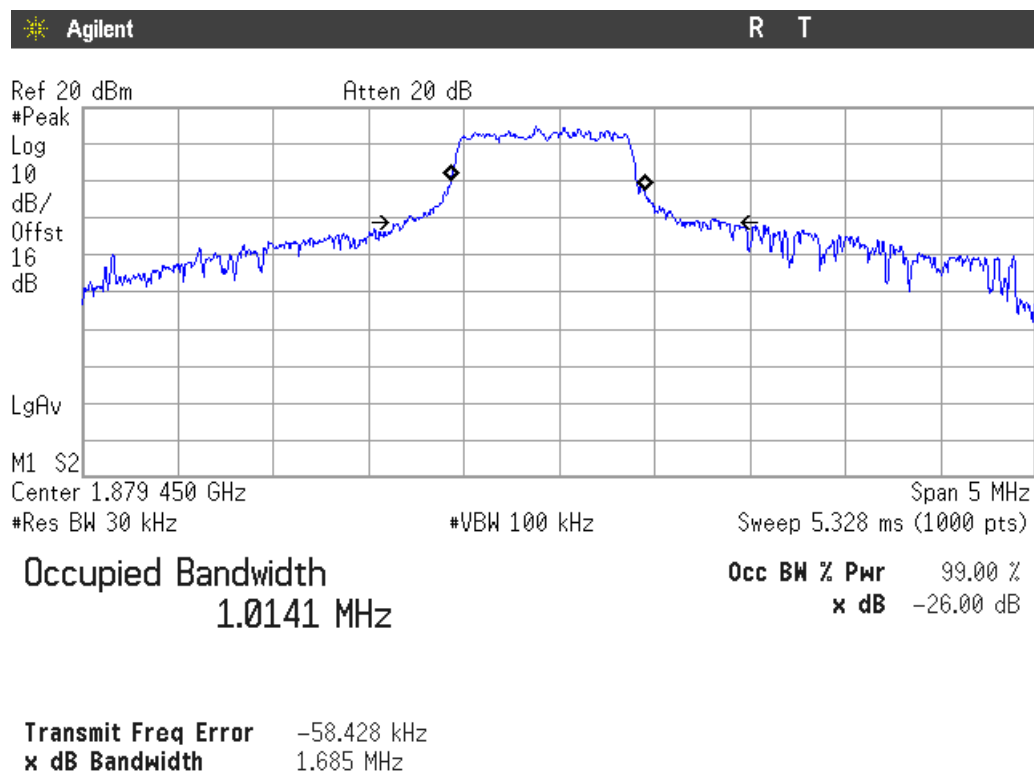


LTE 16QAM MODULATION. BW = 10 MHz

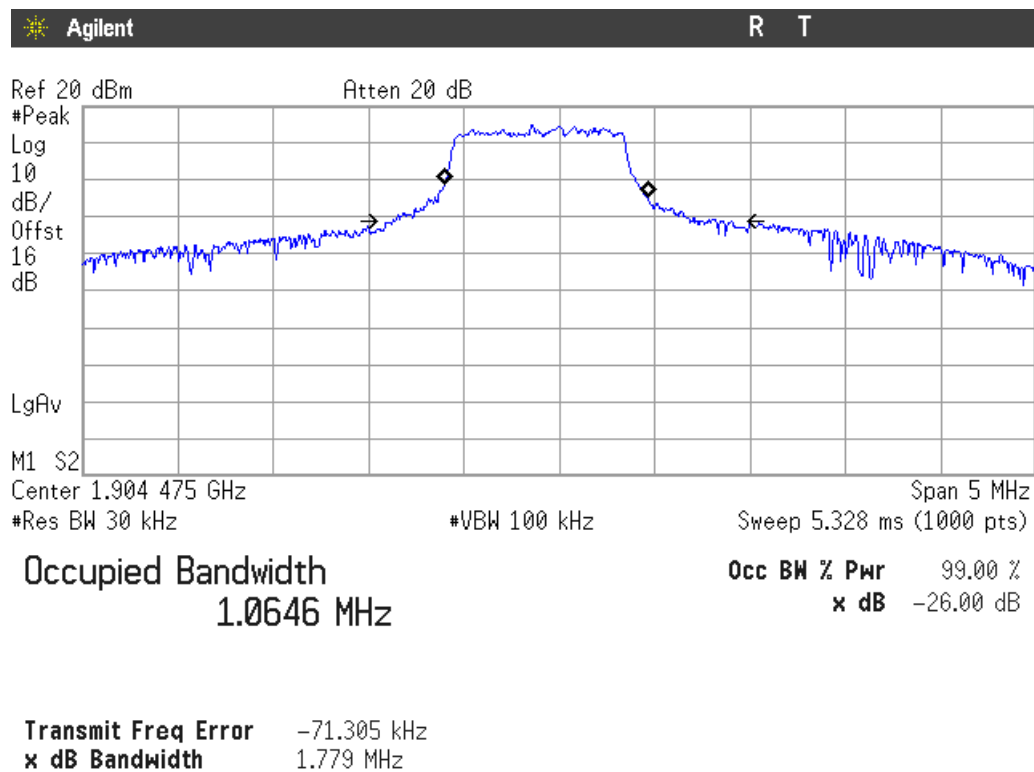
Lowest Channel



Middle Channel

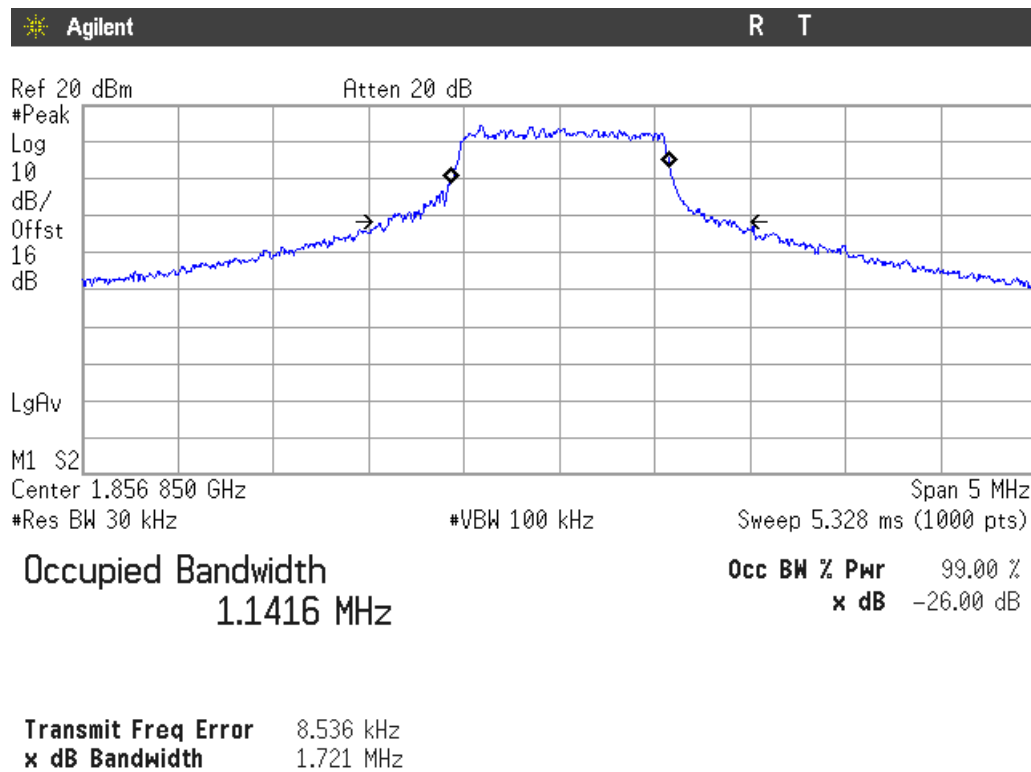


Highest Channel

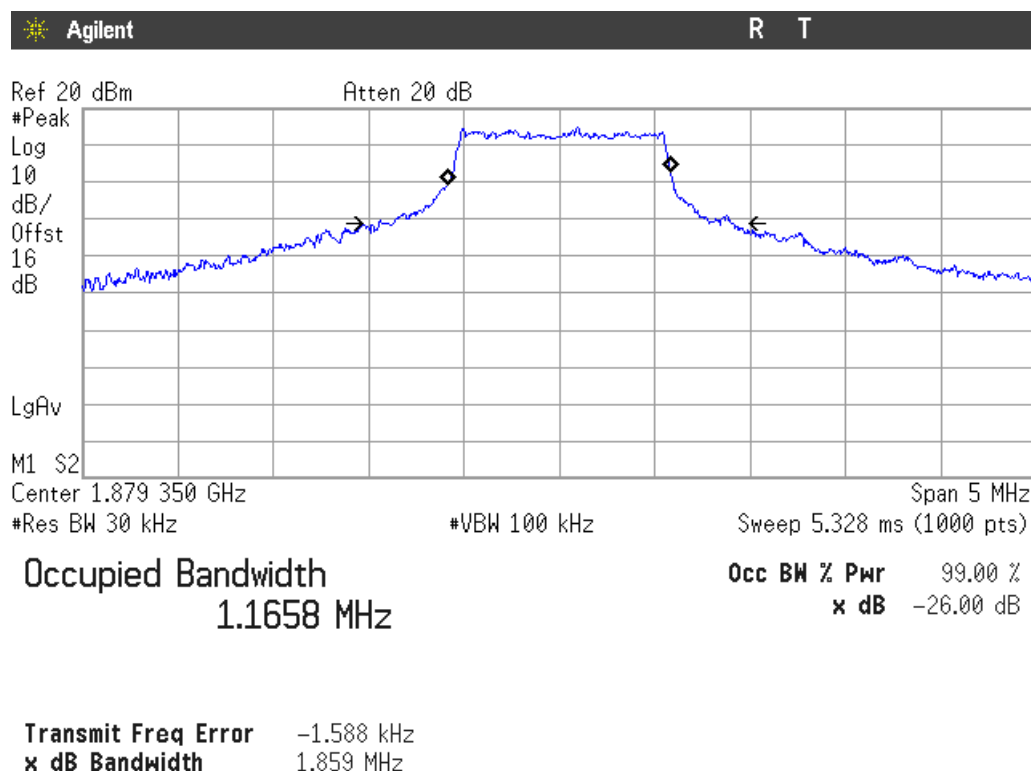


LTE QPSK MODULATION. BW = 15 MHz

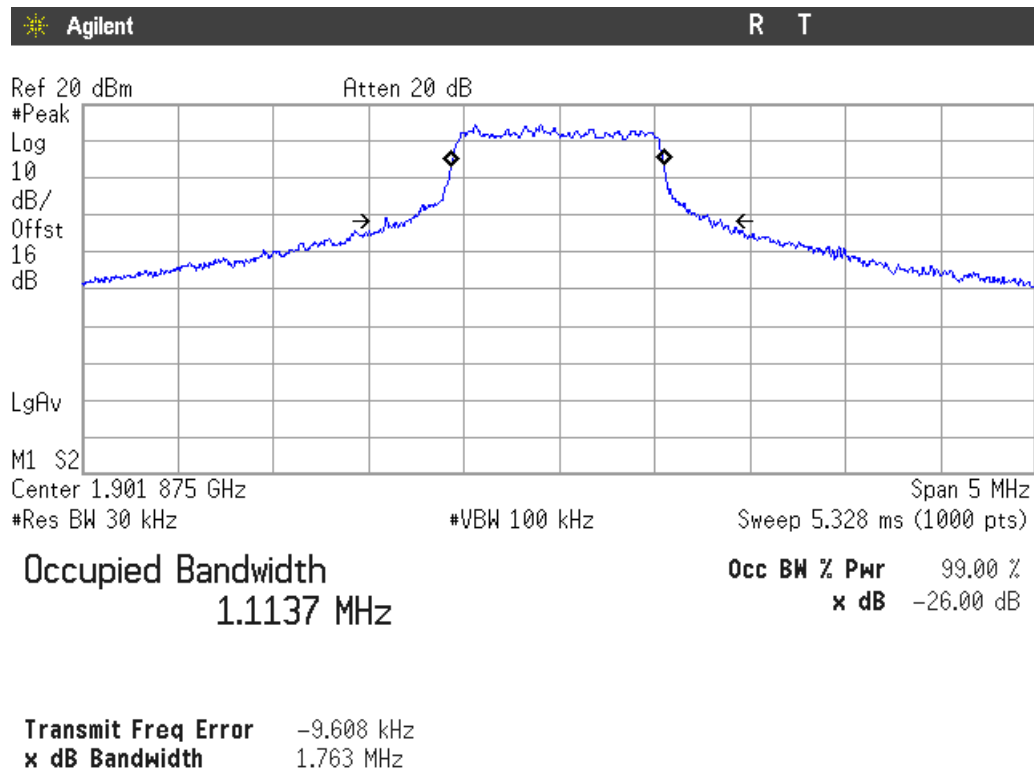
Lowest Channel



Middle Channel

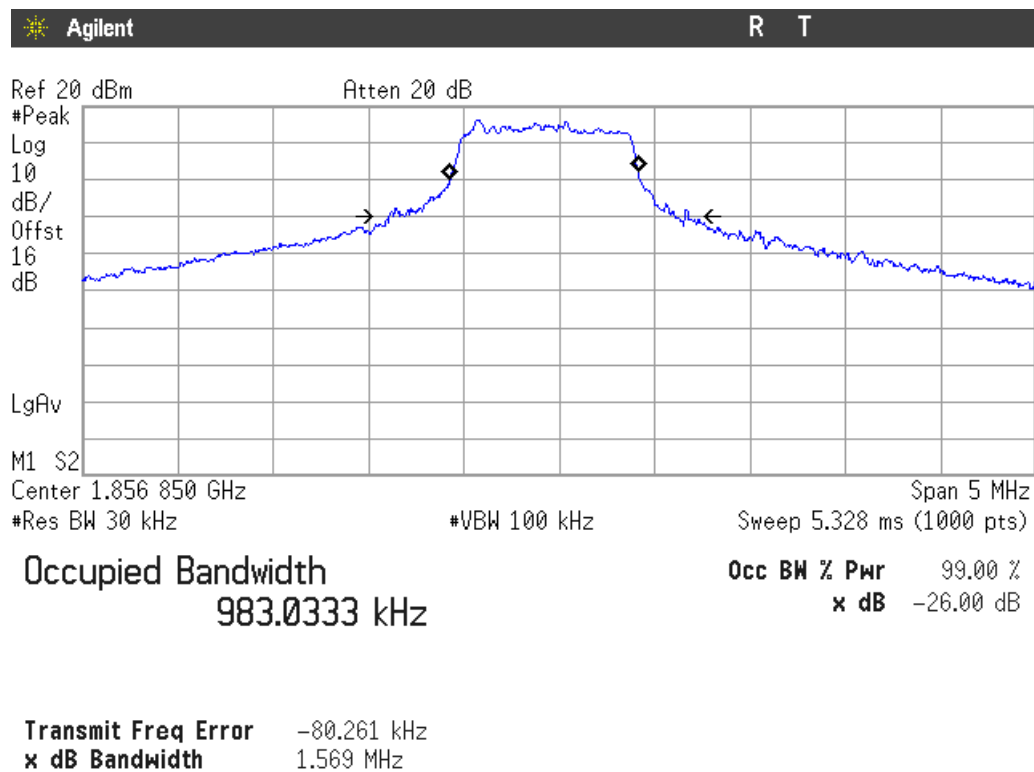


Highest Channel

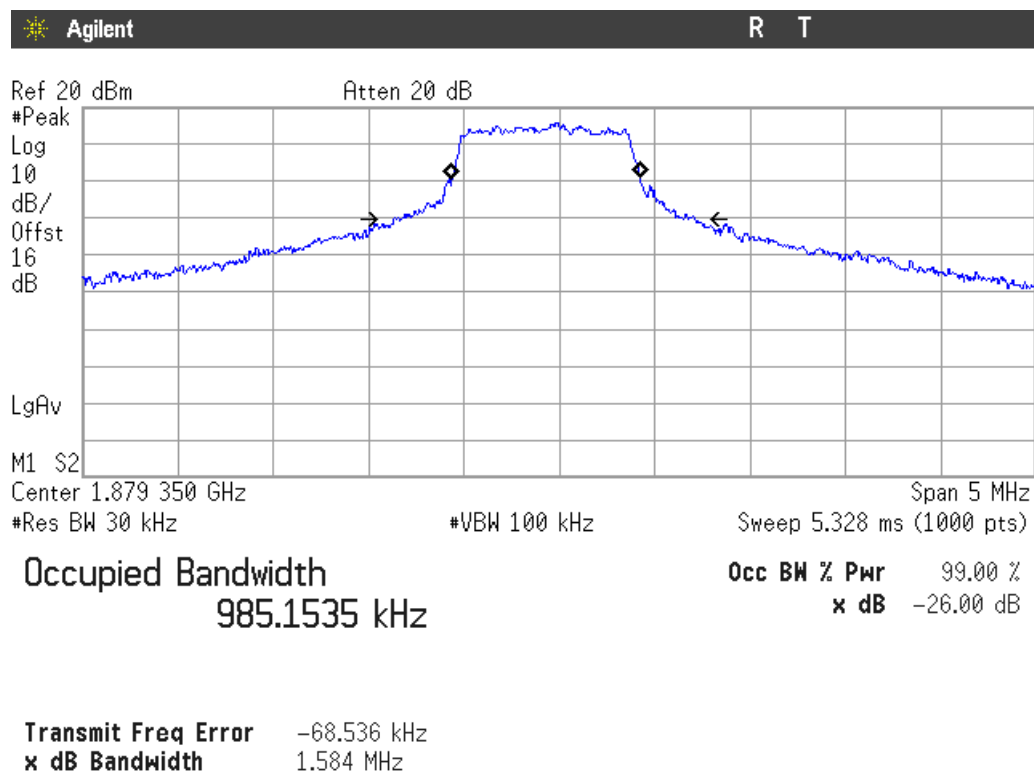


LTE 16QAM MODULATION. BW = 15 MHz

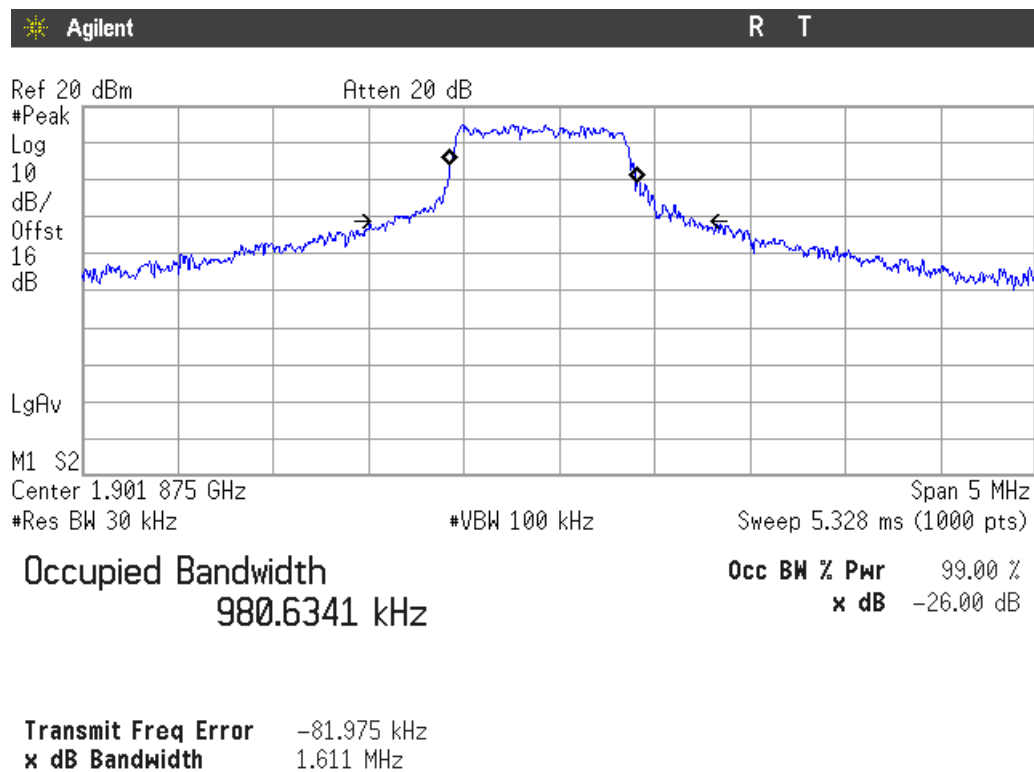
Lowest Channel



Middle Channel

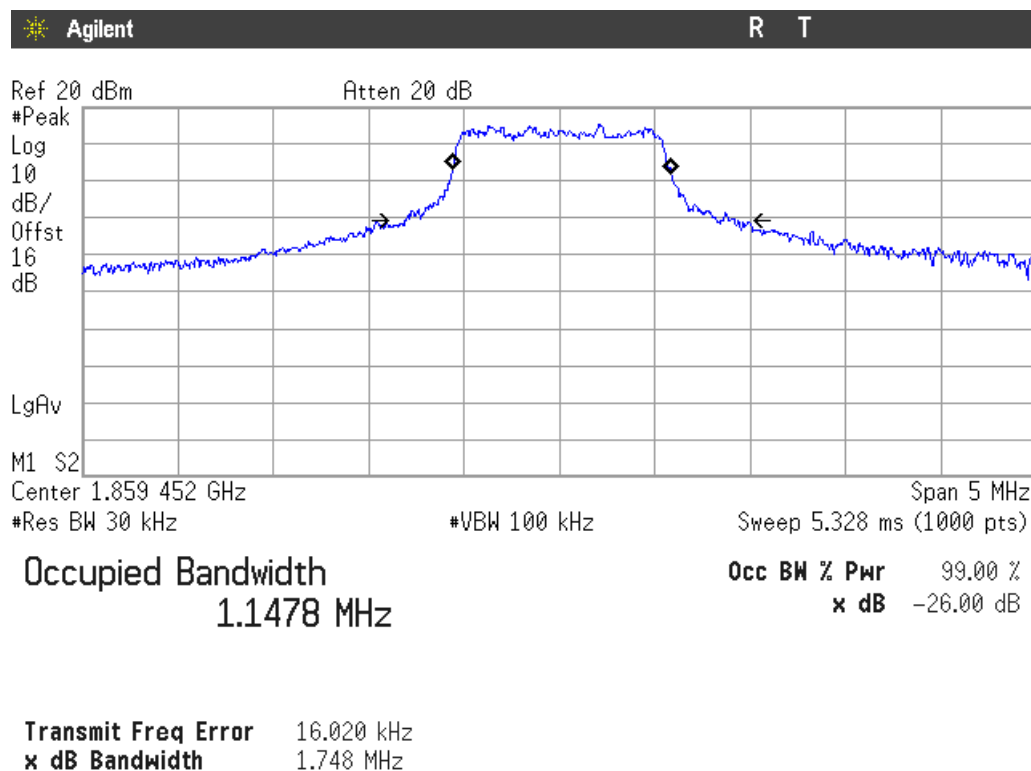


Highest Channel

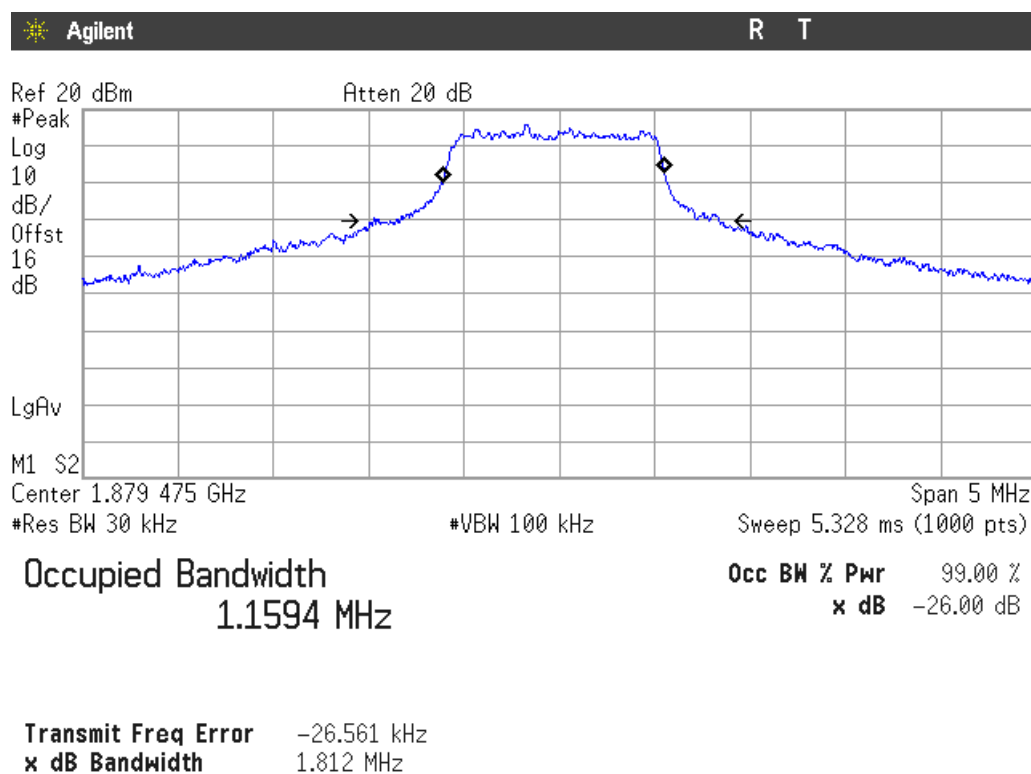


LTE QPSK MODULATION. BW = 20 MHz

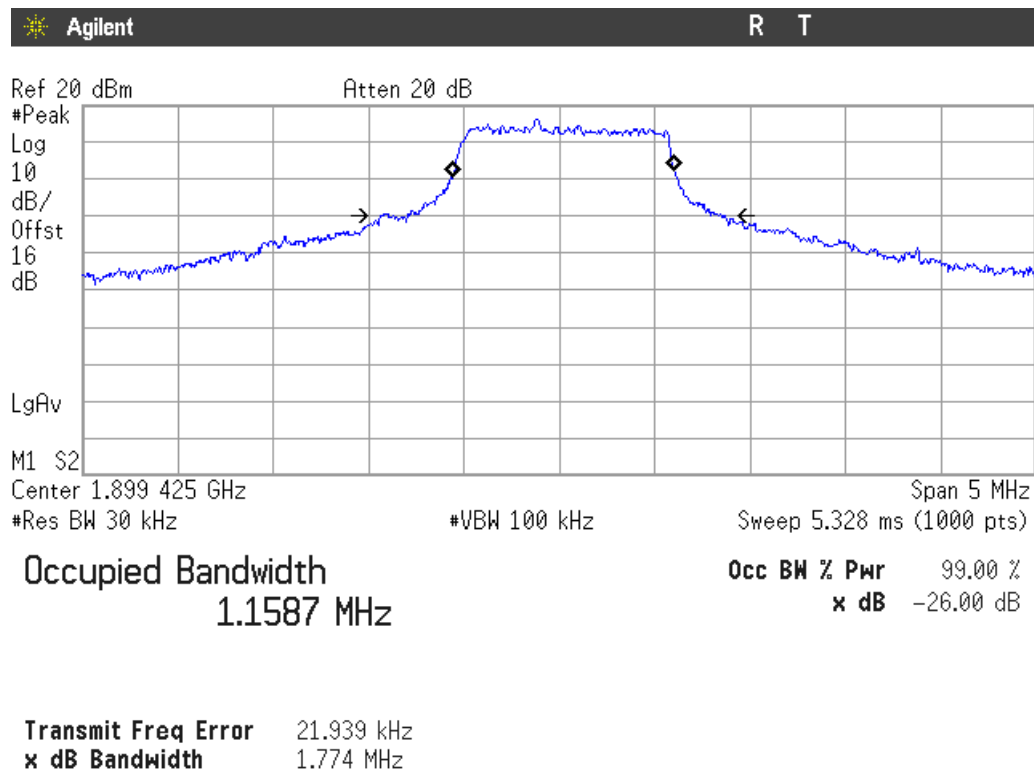
Lowest Channel



Middle Channel

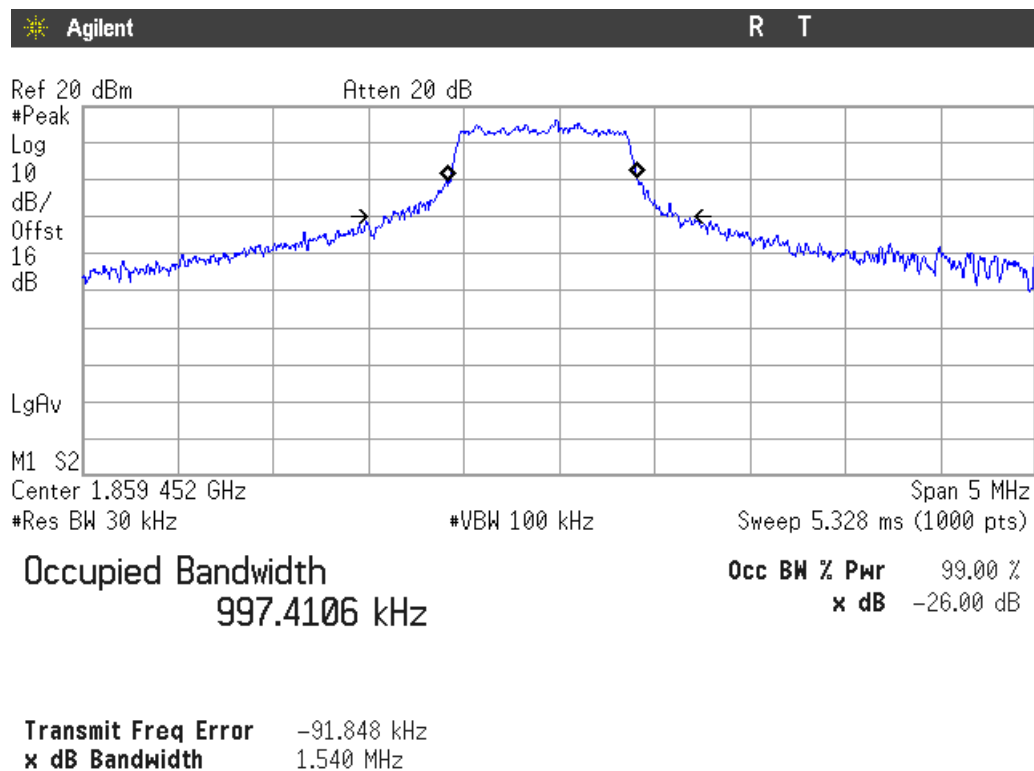


Highest Channel

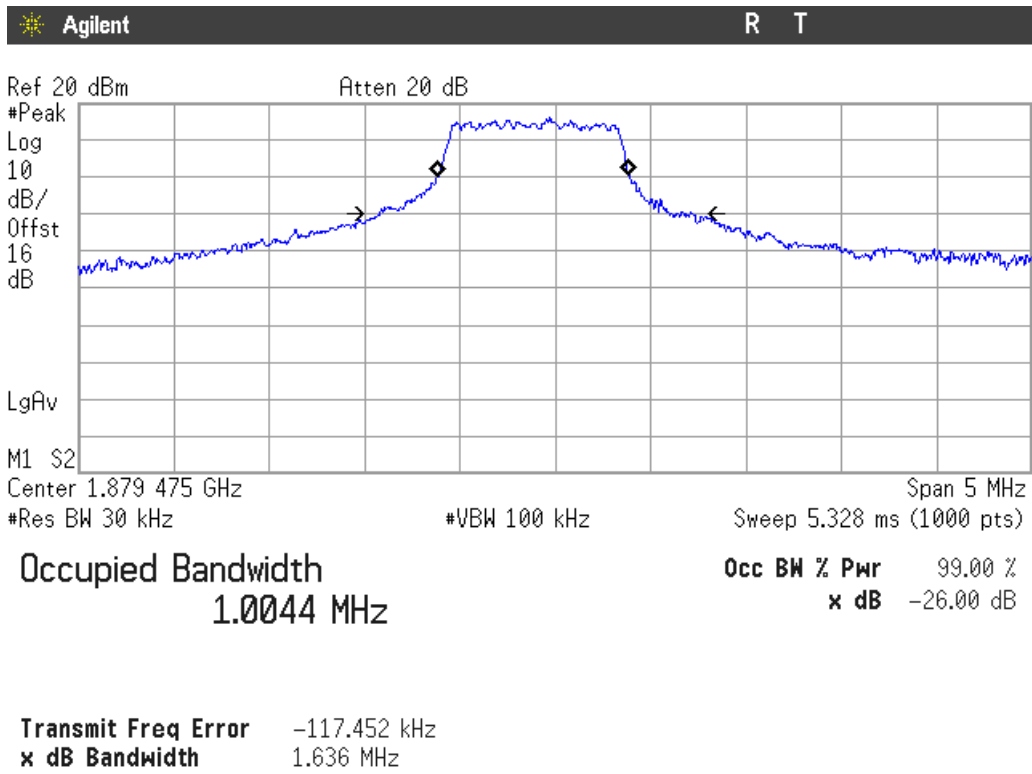


LTE 16QAM MODULATION. BW = 20 MHz

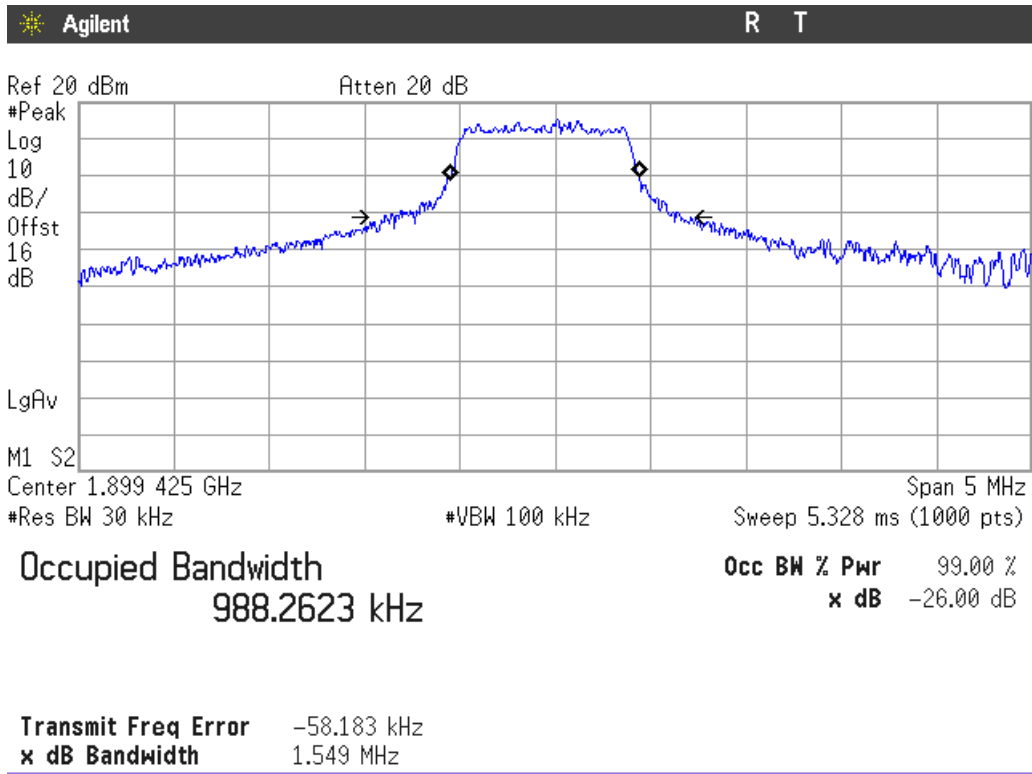
Lowest Channel



Middle Channel



Highest Channel



Spurious emissions at antenna terminals

SPECIFICATION

FCC §2.1051 and §24.238

RSS-133. Clause 6.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

METHOD

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMU200 and CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power splitter.

The spectrum was investigated from 9 kHz to 20 GHz.

For LTE mode the configuration of Narrow band, Resource Blocks and modulation which is the worst case for conducted power was used.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

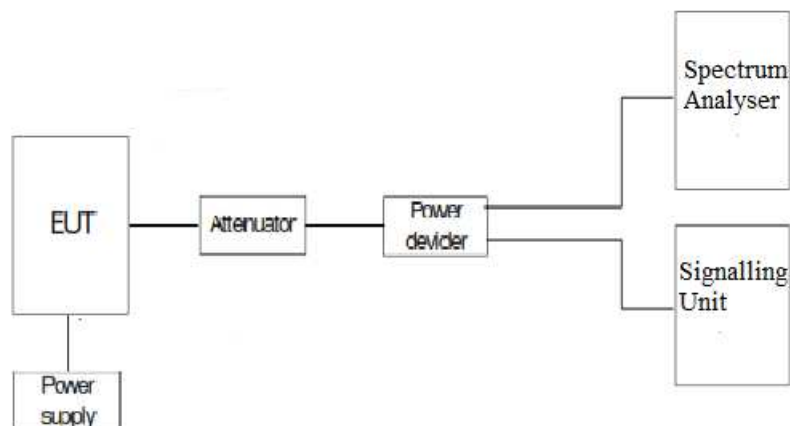
Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

TEST SETUP



RESULTS (see plots in next pages)

LTE BW = 1.4 MHz.

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 3 MHz.

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 5 MHz.

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 10 MHz.

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 15 MHz.

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 20 MHz.

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

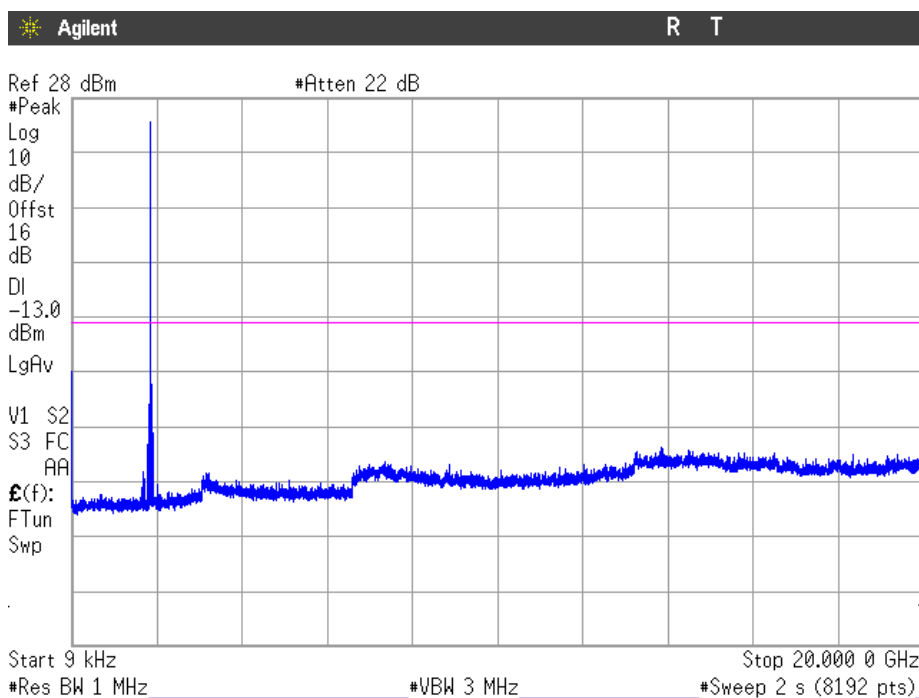
3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

Verdict: PASS

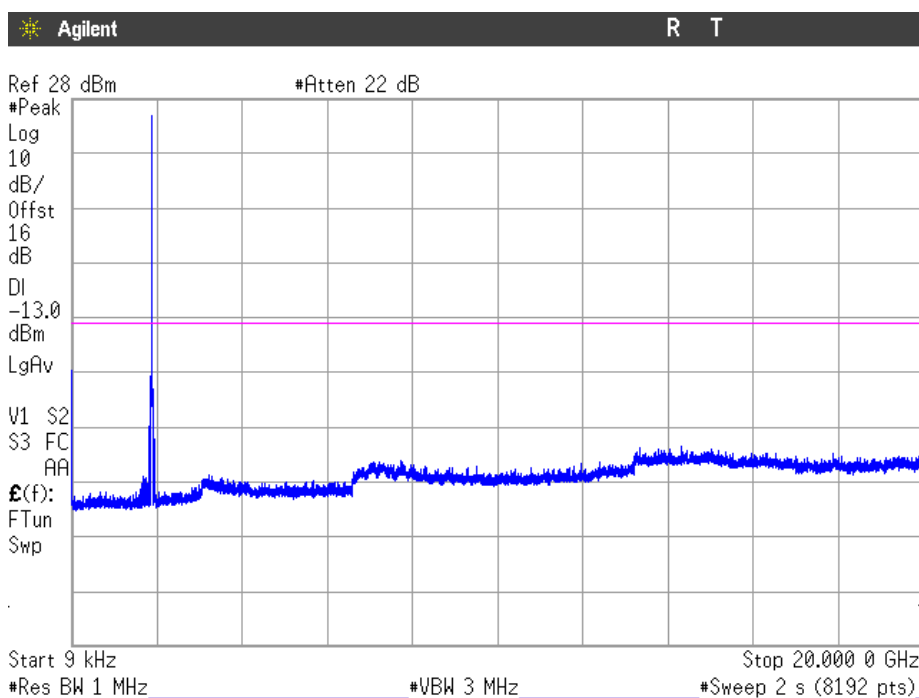
LTE. BW = 1.4 MHz

1. CHANNEL: LOWEST



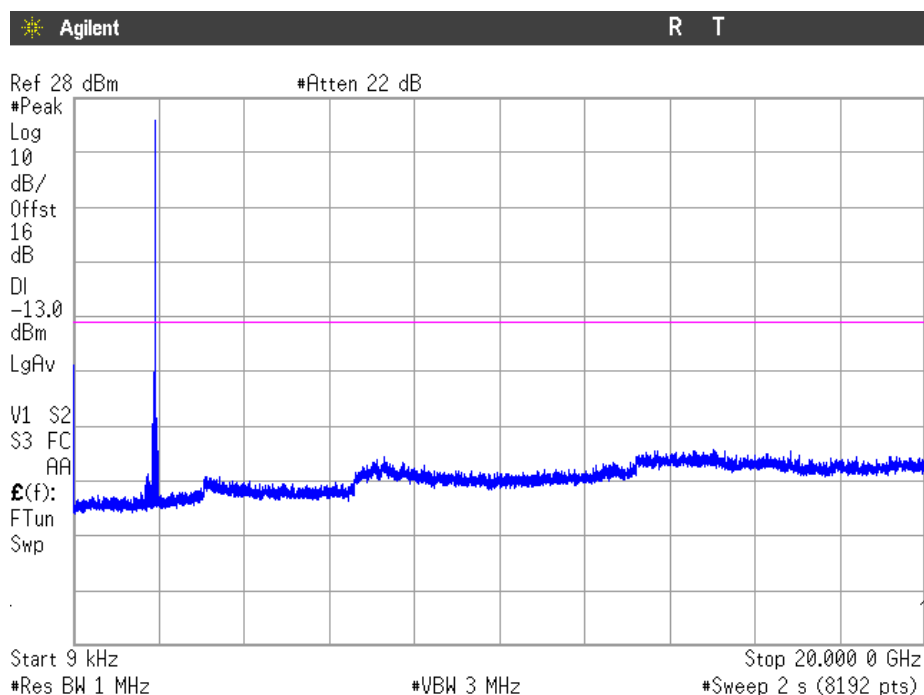
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

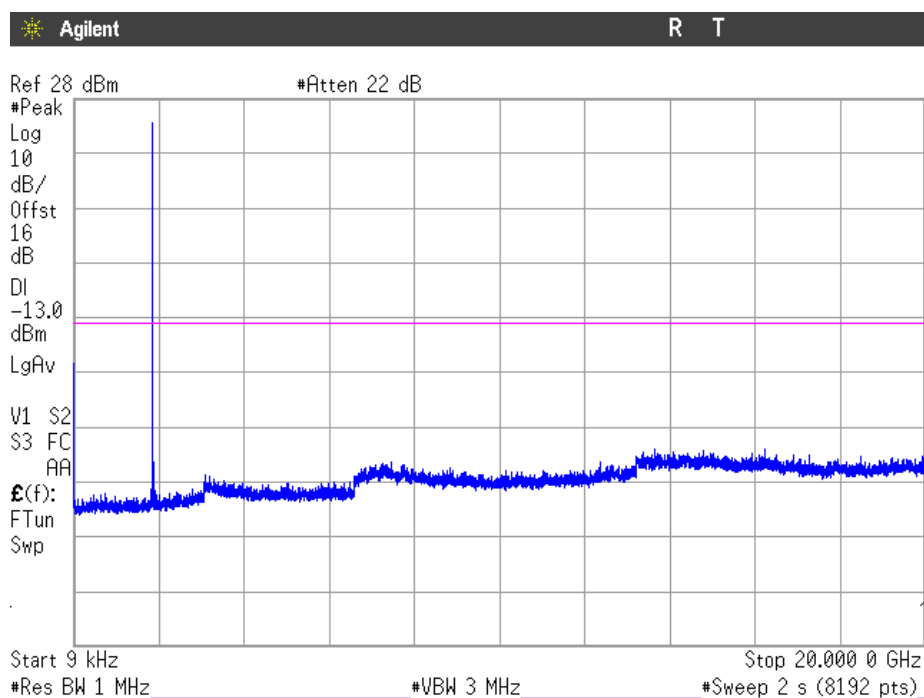
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

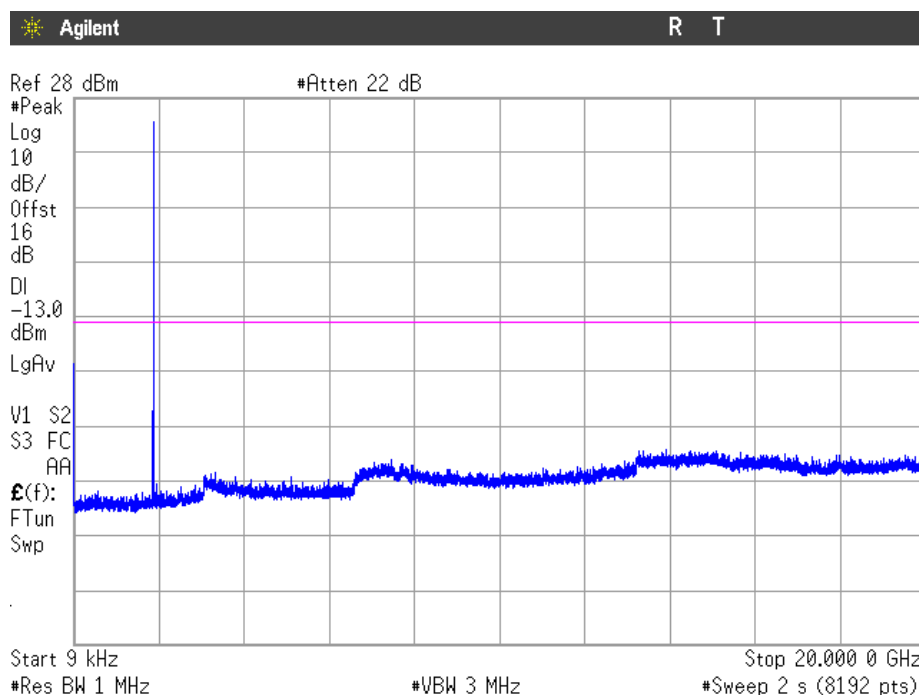
LTE BW = 3 MHz

1. CHANNEL: LOWEST



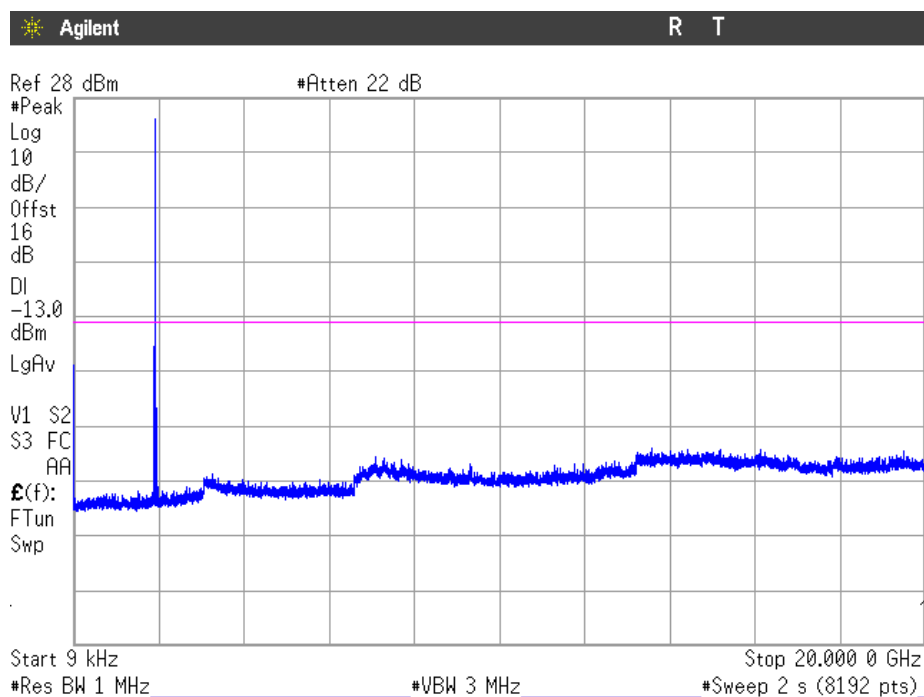
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

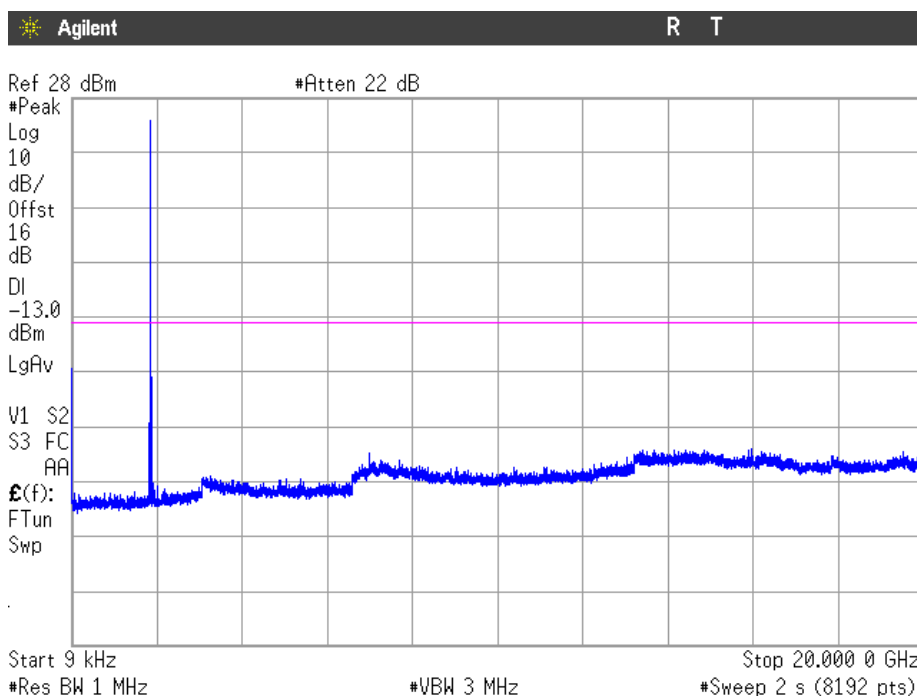
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

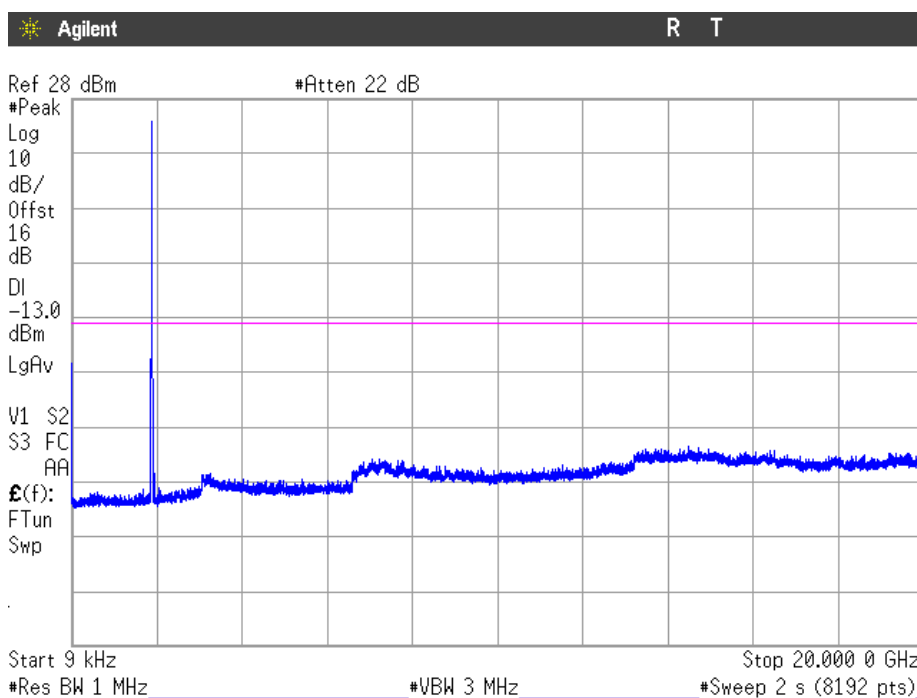
LTE BW = 5 MHz

1. CHANNEL: LOWEST



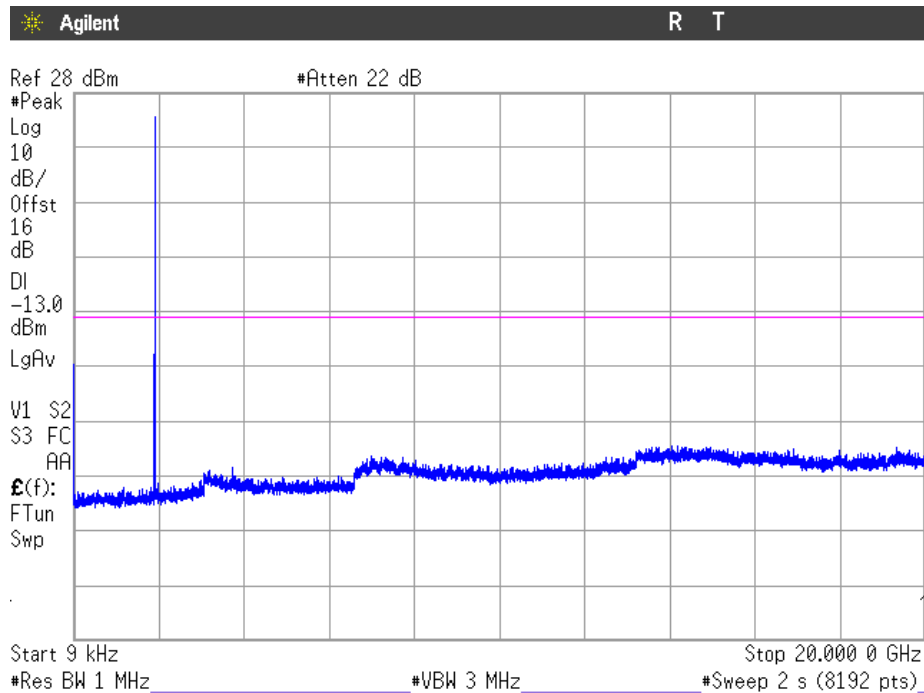
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

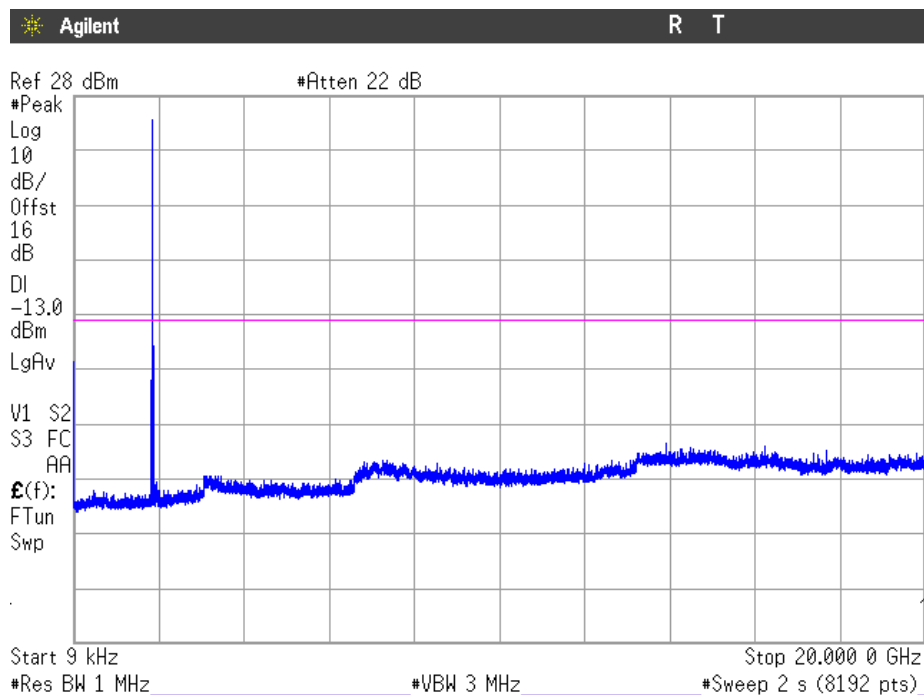
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

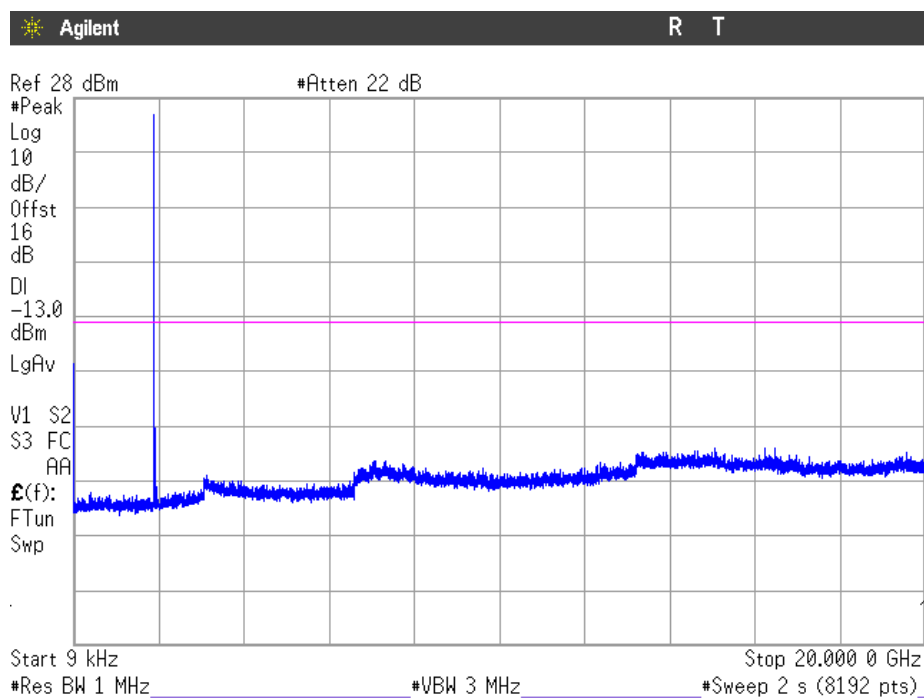
LTE BW = 10 MHz

1. CHANNEL: LOWEST



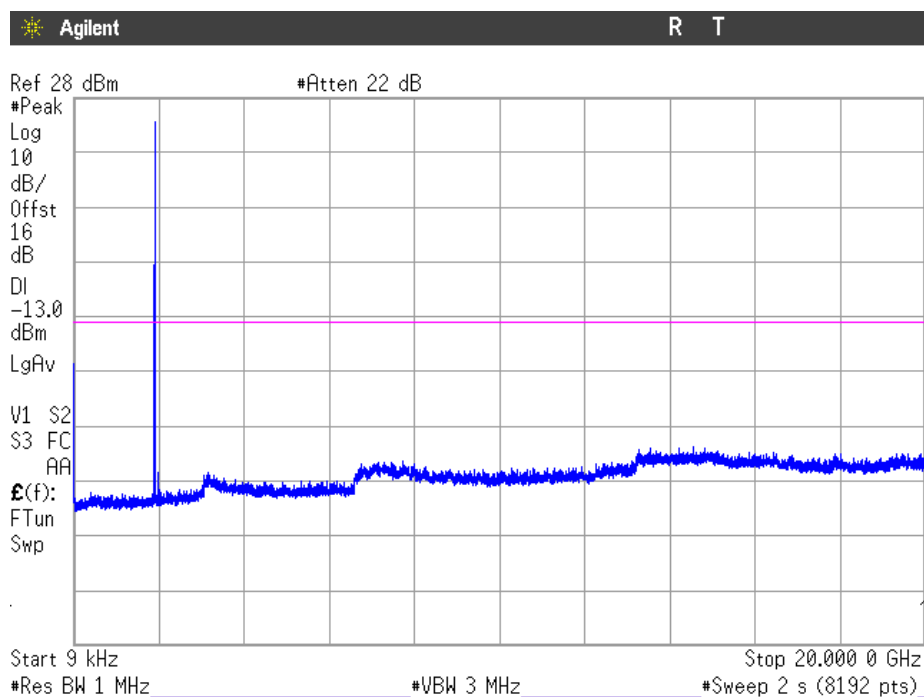
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

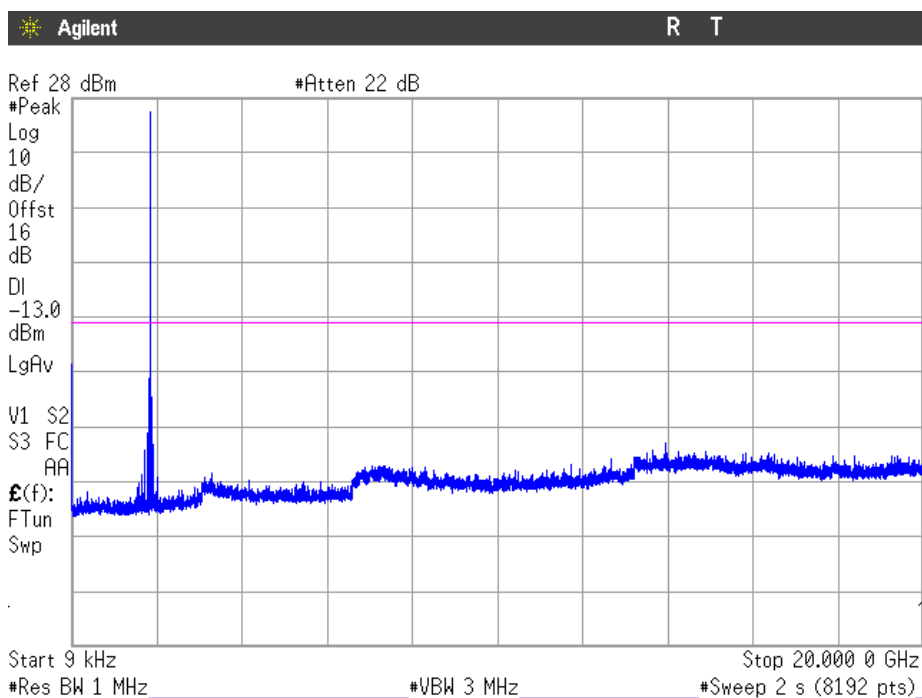
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

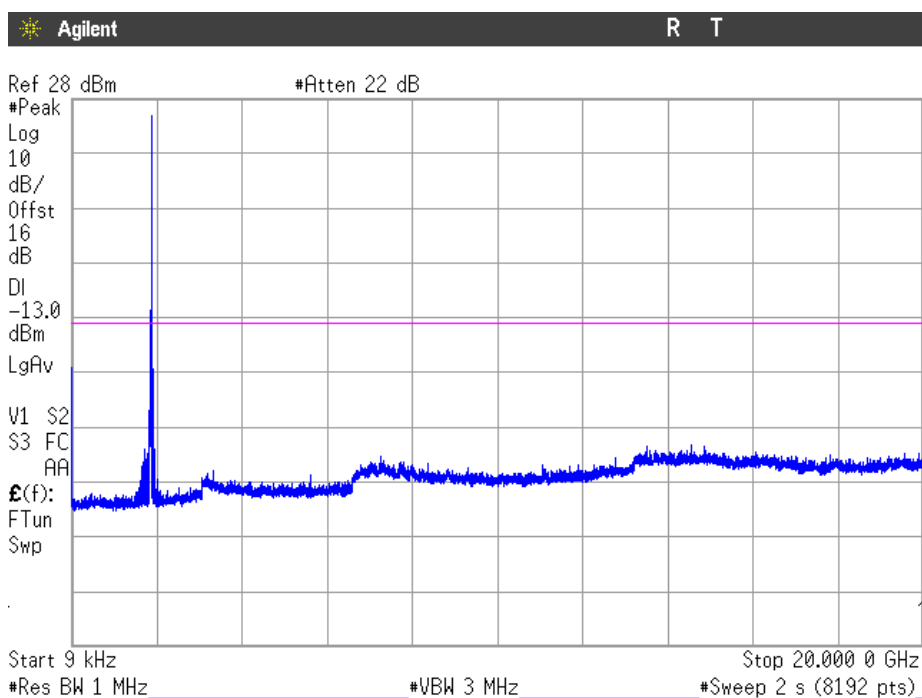
LTE BW = 15 MHz

1. CHANNEL: LOWEST



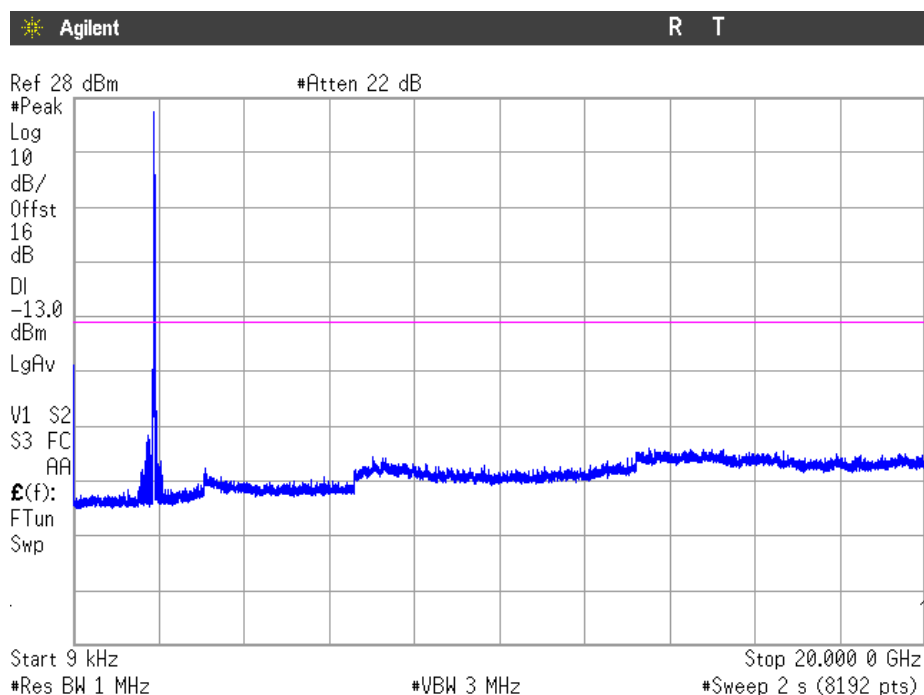
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

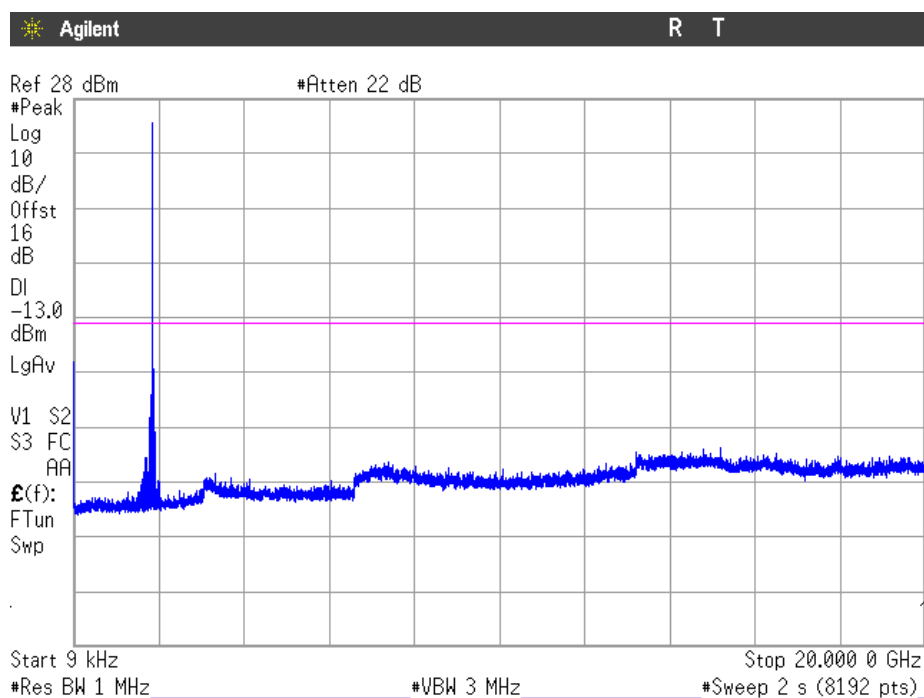
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

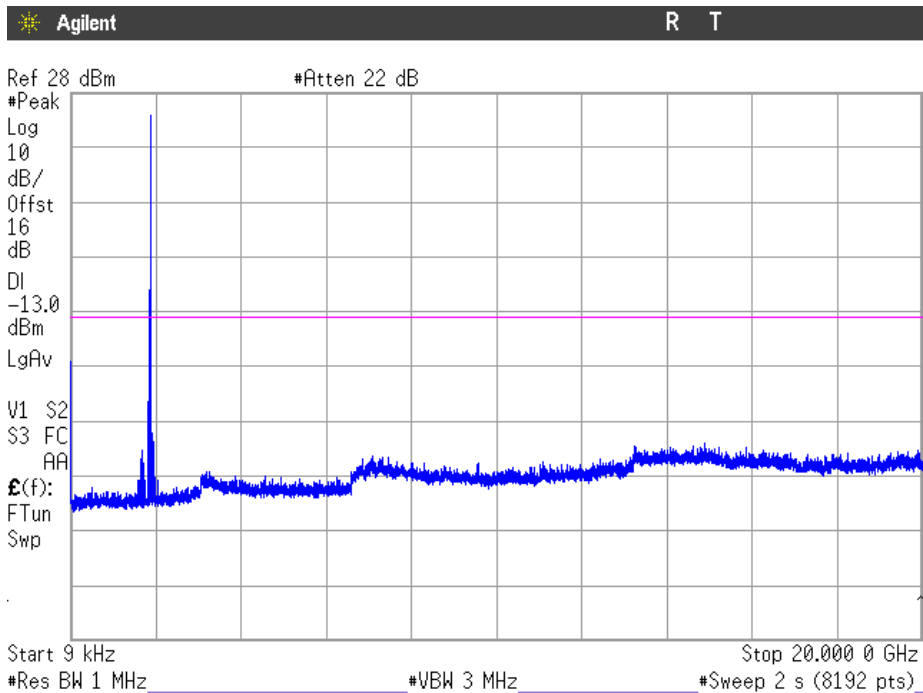
LTE BW = 20 MHz

1. CHANNEL: LOWEST



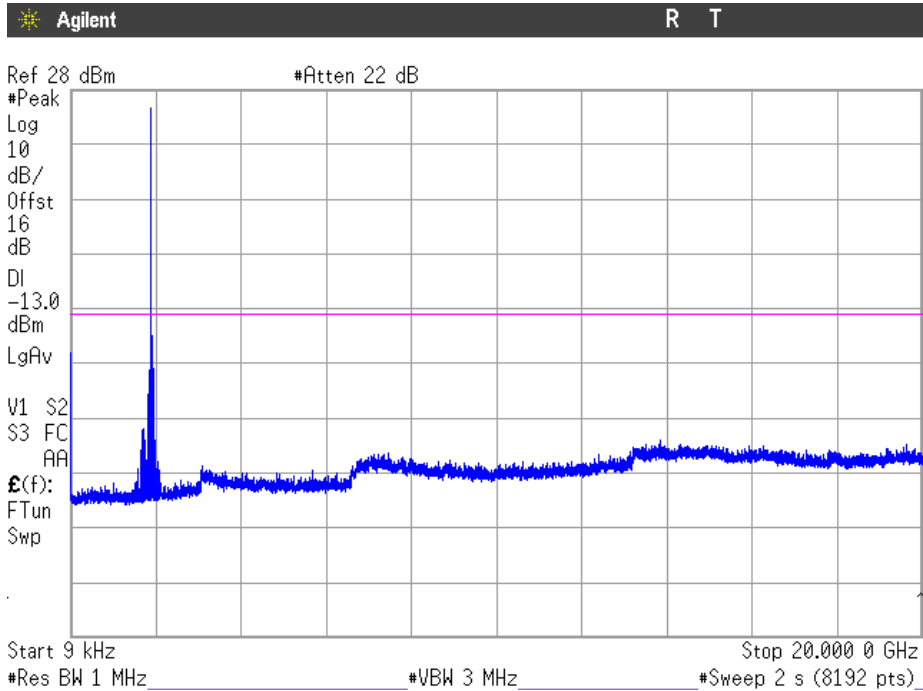
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

Measurement uncertainty (dB)	<±2.03
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Spurious emissions at antenna terminals at Block Edges

SPECIFICATION

FCC §2.1051 and §24.238

RSS-133. Clause 6.5.

METHOD

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power splitter.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For LTE mode the configuration of modulation which is the worst case for conducted power was used.

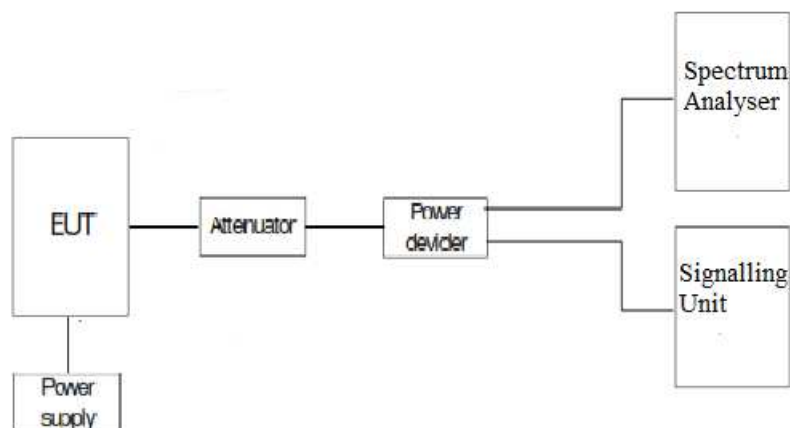
As indicated in FCC part 24/RSS-133. in the 1 MHz bands immediately outside and adjacent to the frequency block or band a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Measurement Limit:

According to specification. the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

At P_o transmitting power. the specified minimum attenuation becomes $43 + 10 \log (P_o)$. and the level in dBm relative P_o becomes:

TEST SETUP



RESULTS (see plots in next pages)

(Channels in Band II):	RB=1. Offset=0. Narrow band = 1 BW=1.4 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 3 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 5 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 10 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 15 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 20 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-24.35	-28.84	-27.69	-35.31	-38.19	-39.84

(Channels in Band II):	RB= All. Offset=0. Narrow band = 1 BW=1.4 MHz	RB= All. Offset =0. Narrow band = 1 BW = 3 MHz	RB= All. Offset =0. Narrow band = 1 BW = 5 MHz	RB= All. Offset =0. Narrow band = 1 BW = 10 MHz	RB= All. Offset =0. Narrow band = 1 BW = 15 MHz	RB= All. Offset =0. Narrow band = 1 BW = 20 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-27.36	-30.85	-29.6	-33.25	-33.75	-39.3

(Channels in Band II):	RB= 1. Offset=Max. Narrow band = 1 BW=1.4 MHz	RB= 1. Offset=Max. Narrow band = 2 BW = 3 MHz	RB= 1. Offset=Max. Narrow band = 4 BW = 5 MHz	RB= 1. Offset=Max. Narrow band = 8 BW = 10 MHz	RB= 1. Offset=Max. Narrow band = 12 BW = 15 MHz	RB= 1. Offset=Max. Narrow band = 16 BW = 20 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-23.51	-27.34	-24.19	-30.2	-34.07	-39.74

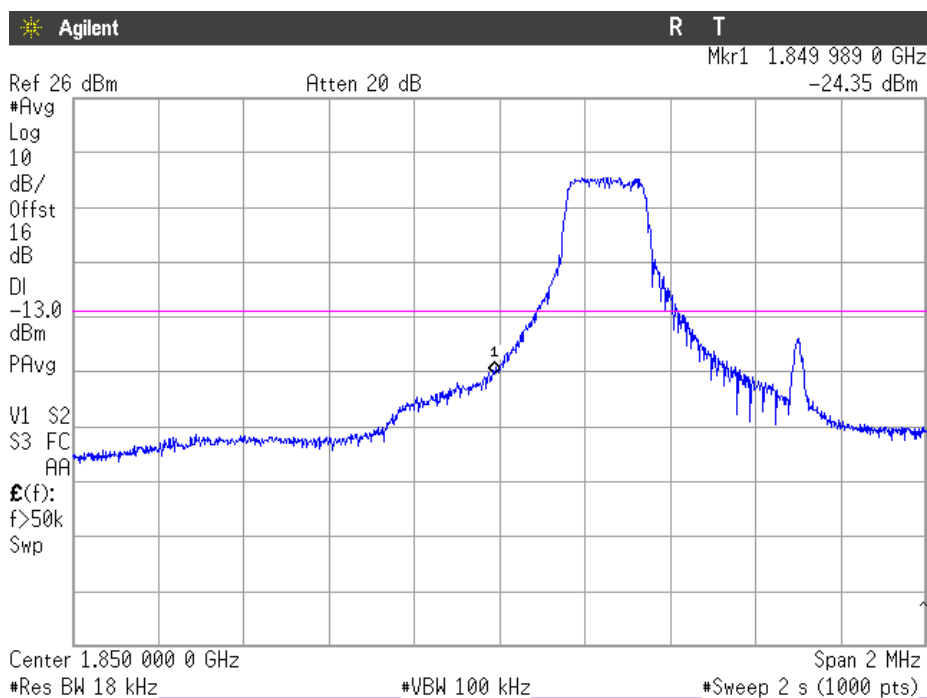
(Channels in Band II):	RB= All. Offset=0. Narrow band = 1 BW=1.4 MHz	RB= All. Offset =0. Narrow band = 2 BW = 3 MHz	RB= All. Offset =0. Narrow band = 4 BW = 5 MHz	RB= All. Offset =0. Narrow band = 8 BW = 10 MHz	RB= All. Offset =0. Narrow band = 12 BW = 15 MHz	RB= All. Offset =0. Narrow band = 16 BW = 20 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-28.08	-30.75	-27.09	-31.45	-35.46	-37.39

Measurement uncertainty = ± 2.03 dB.

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 1.4 MHz (Band II)

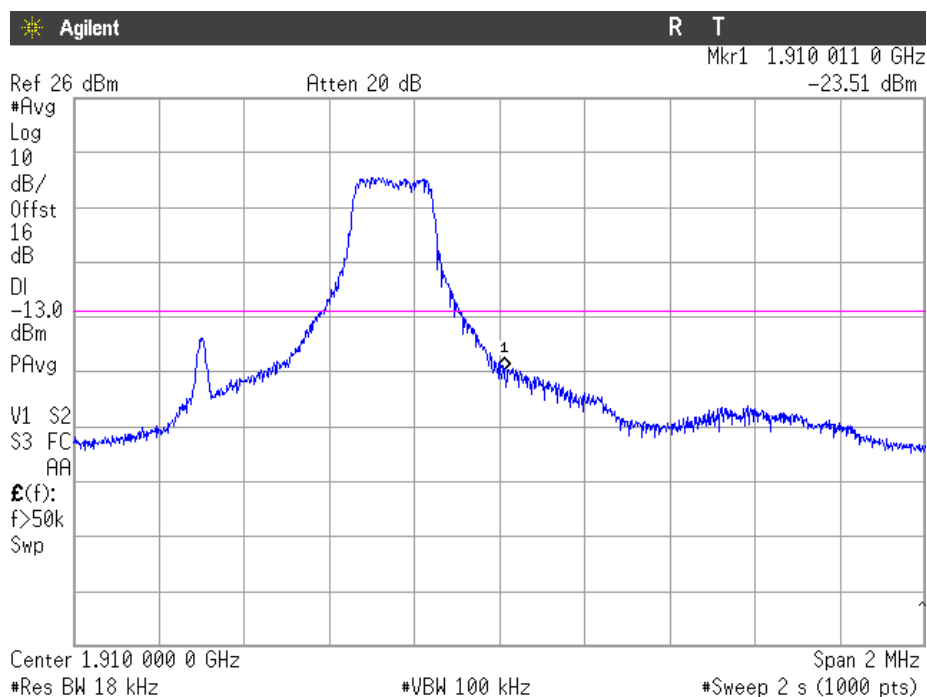
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 1. RB = 1. Offset = Max. BW = 1.4 MHz (Band II)

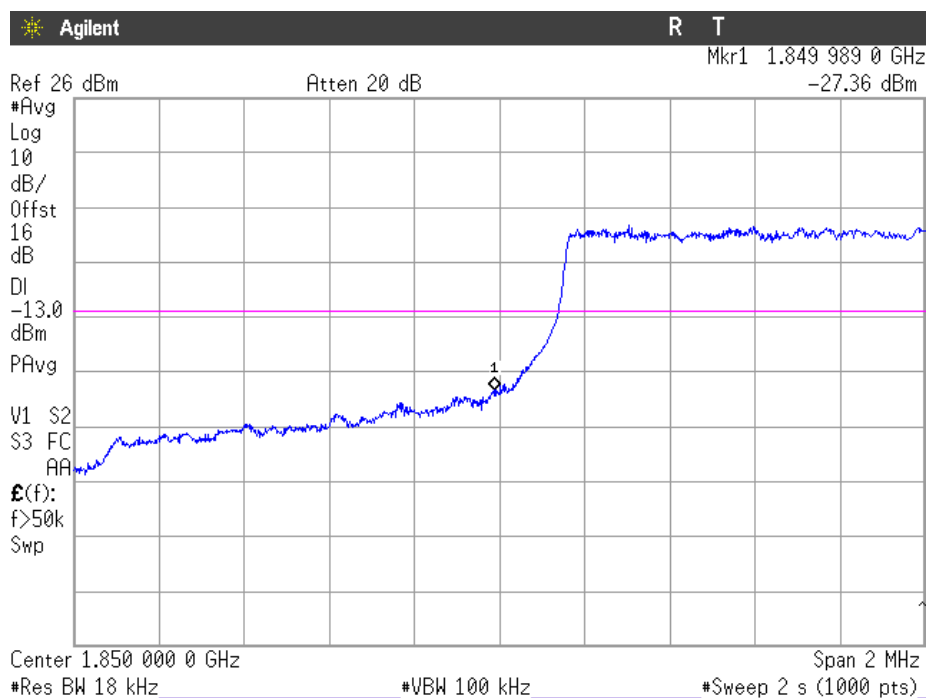
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

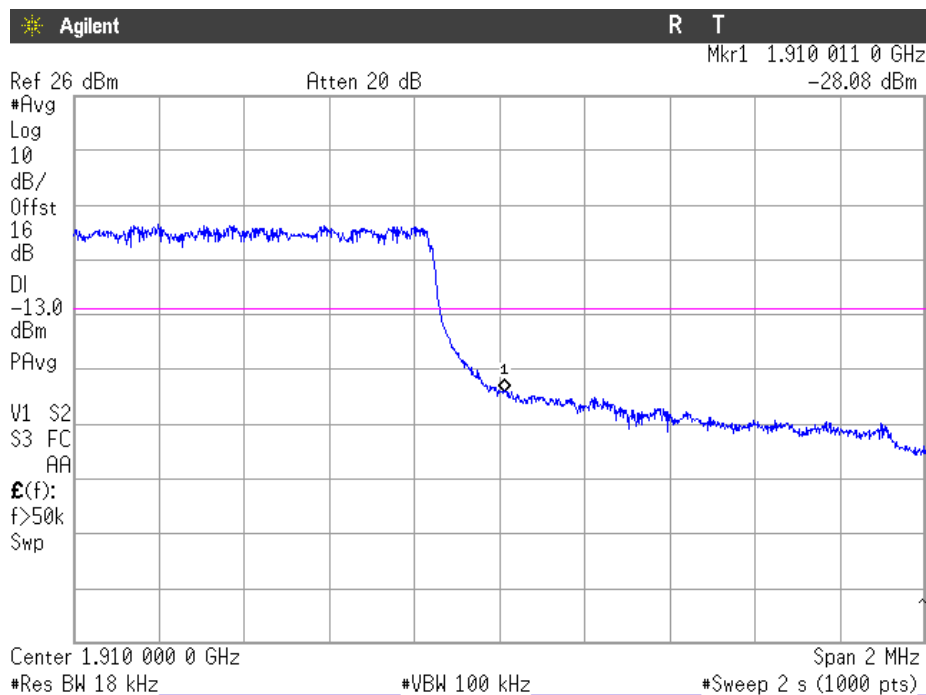
Narrow band = 1. RB = All. Offset = 0. BW = 1.4 MHz (Band II)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

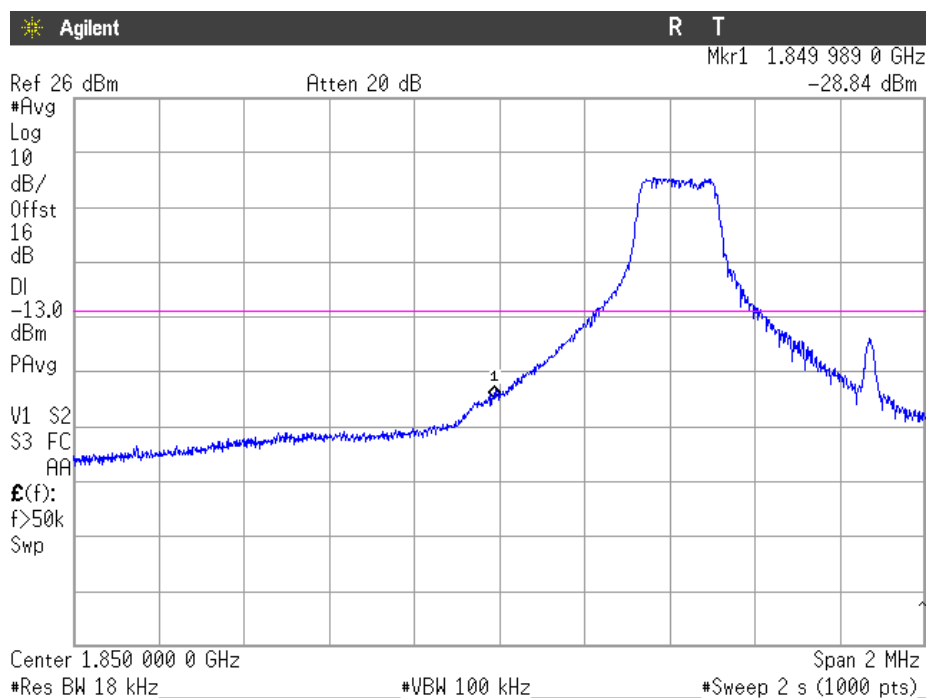


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 3 MHz (Band II)

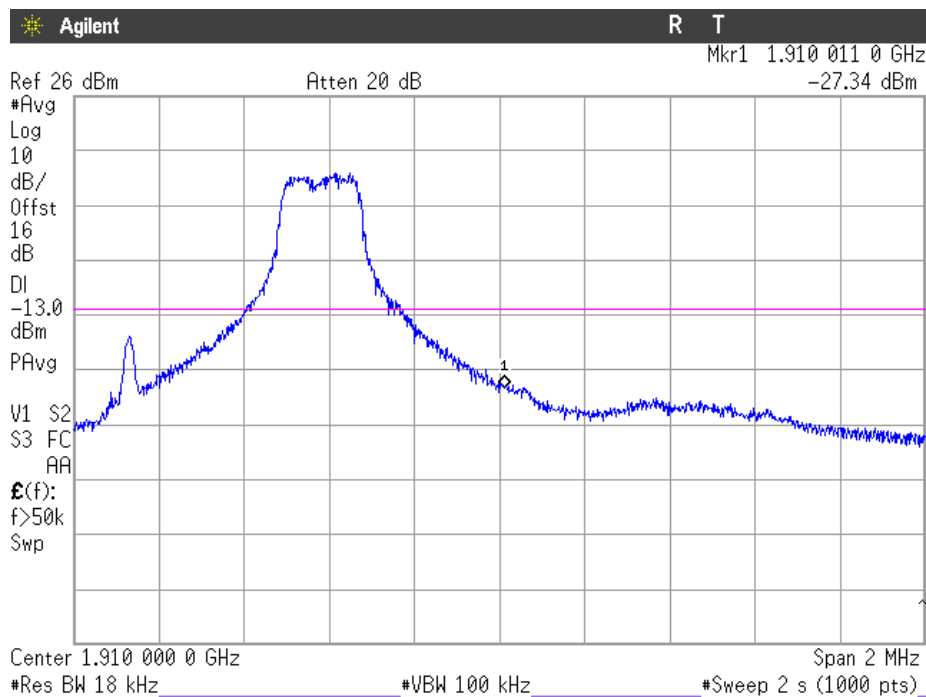
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 2. RB = 1. Offset = Max. BW = 3 MHz (Band II)

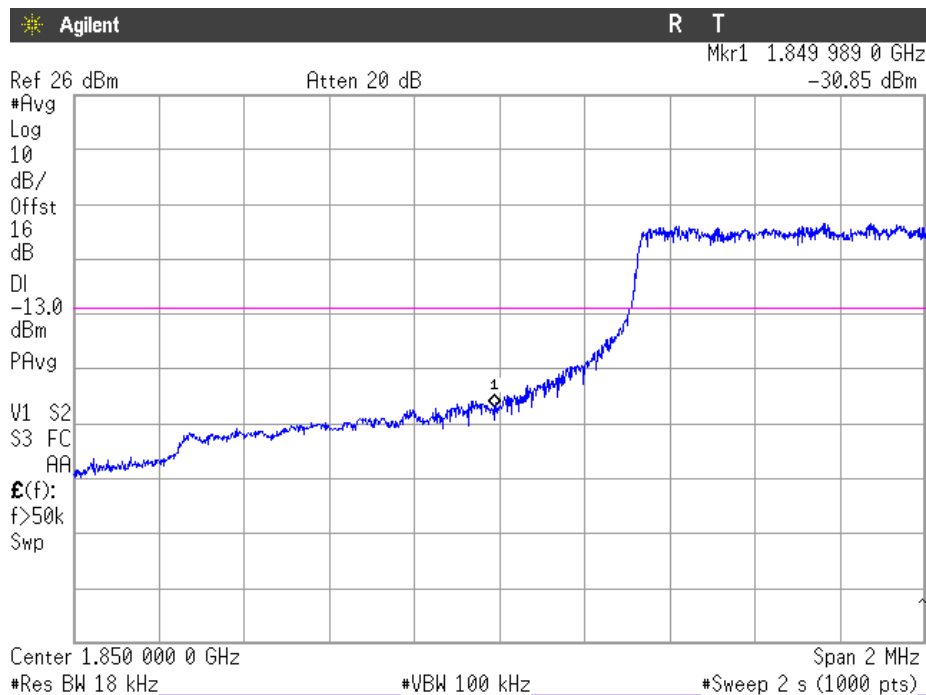
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

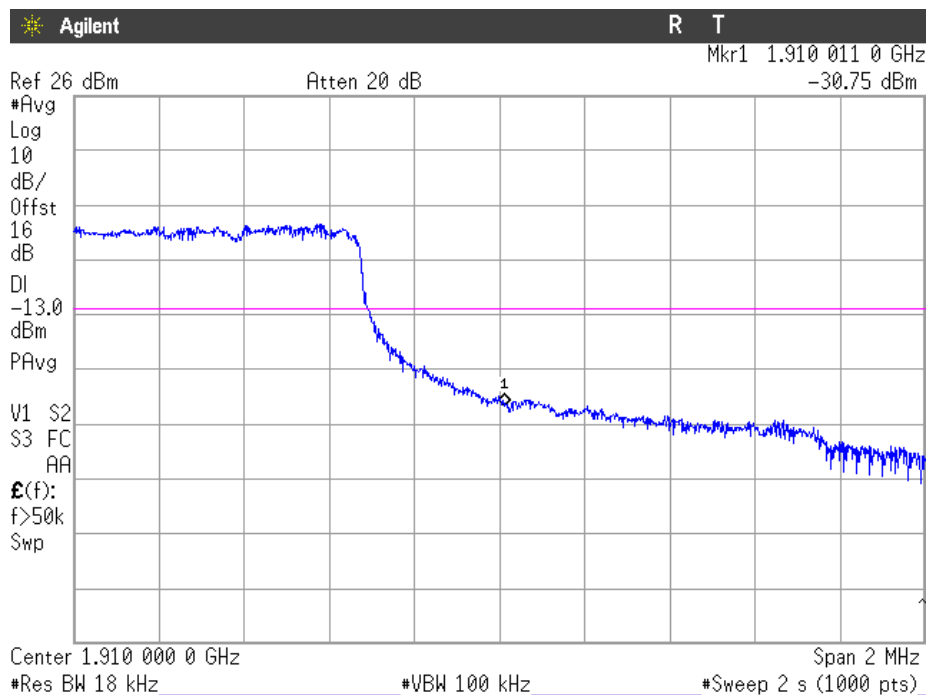
RB = All. Offset = 0. BW = 3 MHz (Band II)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 2.

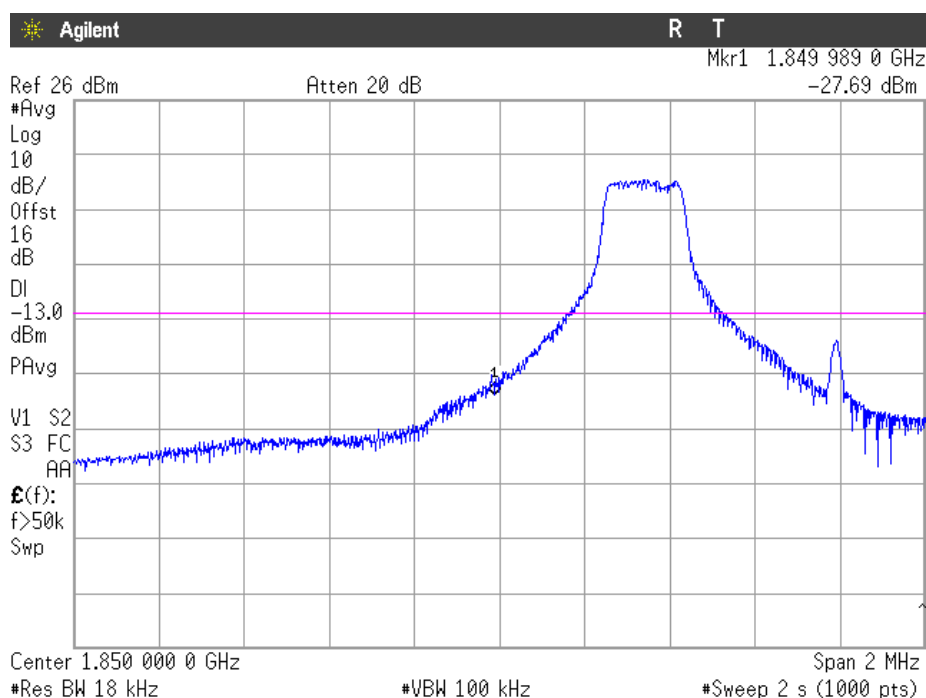


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 5 MHz (Band II)

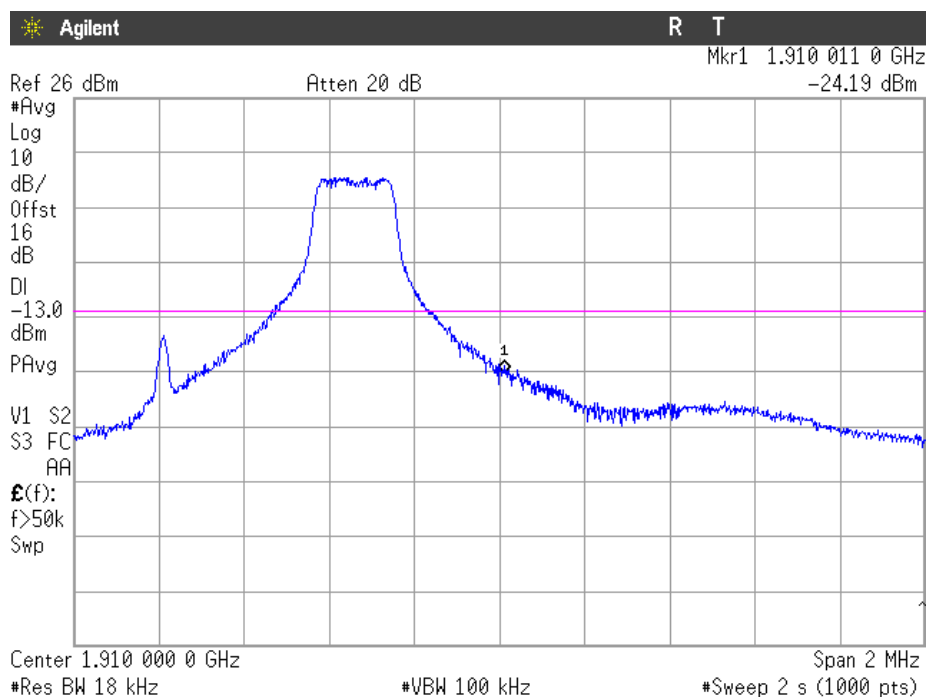
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 4. RB = 1. Offset = Max. BW = 5 MHz (Band II)

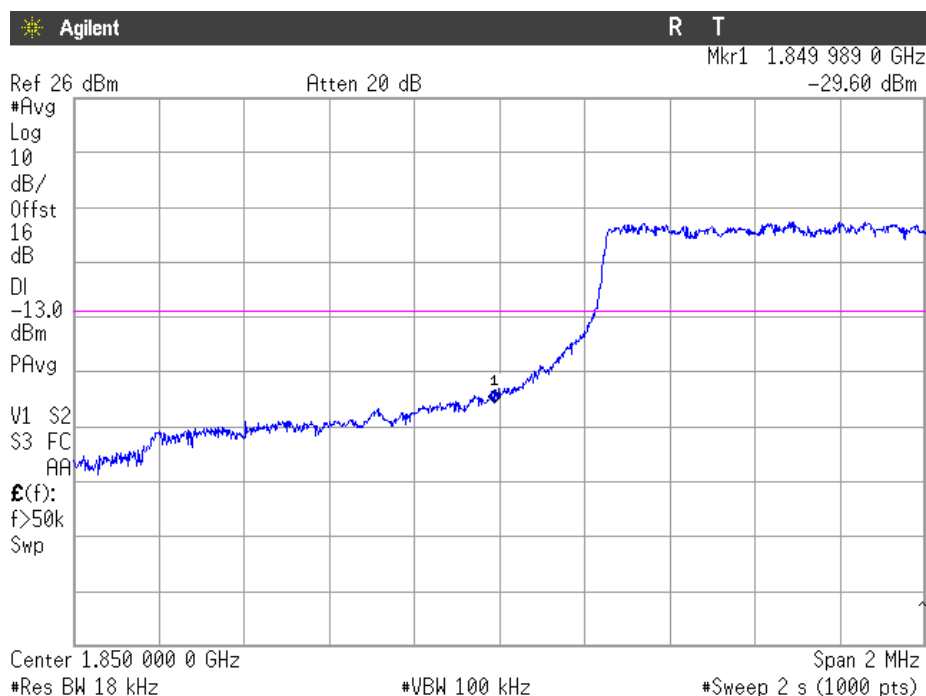
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

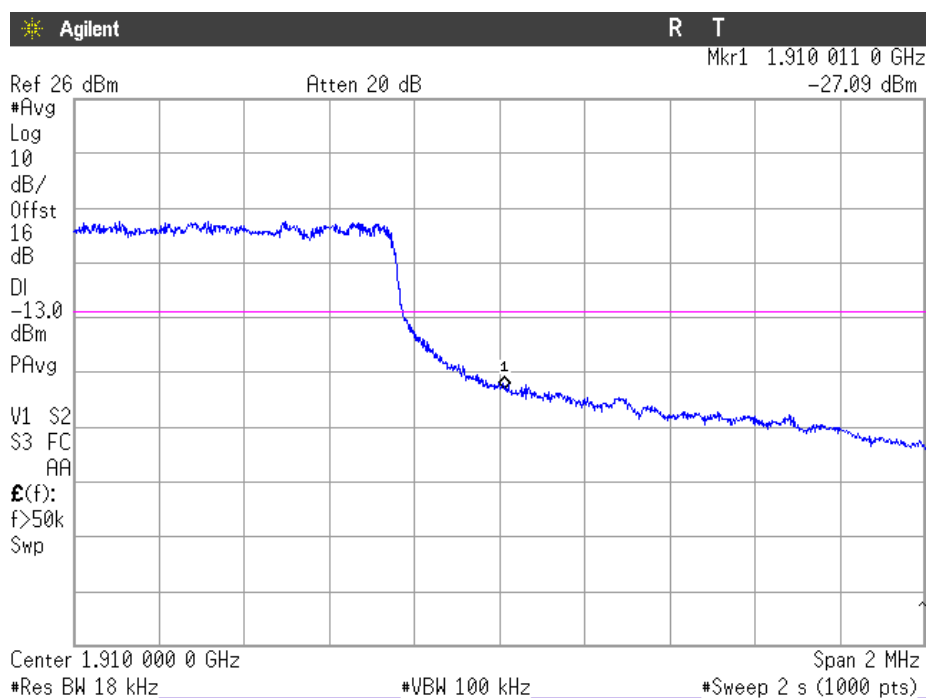
RB = All. Offset = 0. BW = 5 MHz (Band II)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 4.

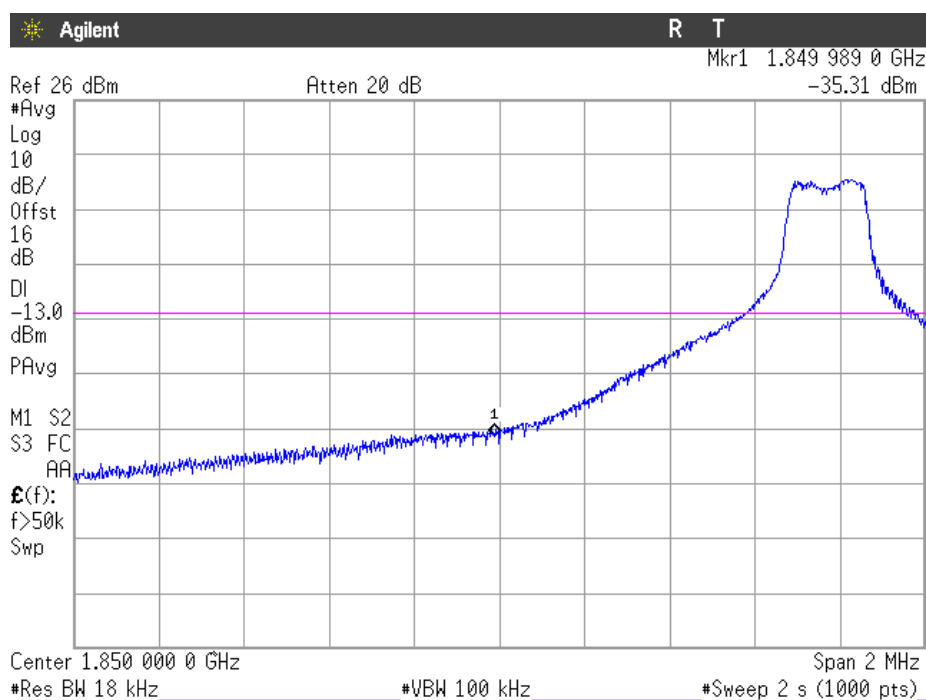


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 10 MHz (Band II)

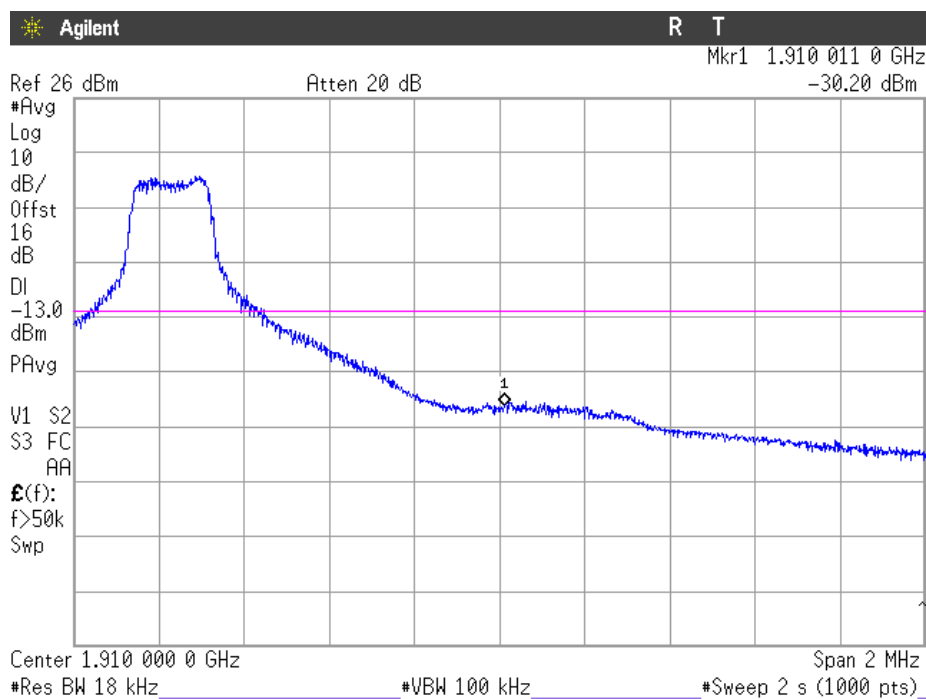
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 8. RB = 1. Offset = Max. BW = 10 MHz (Band II)

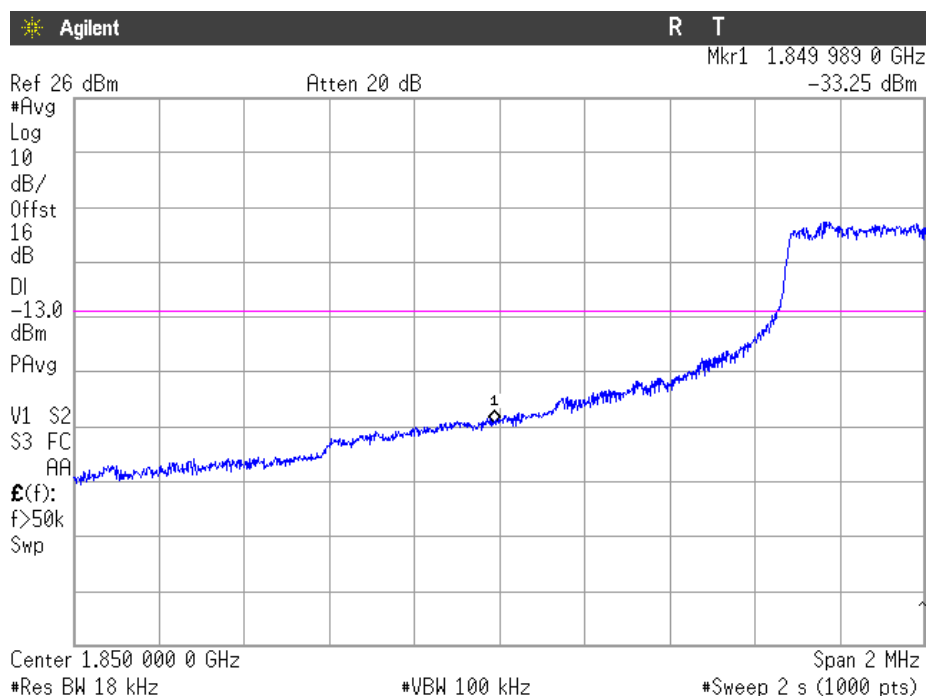
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

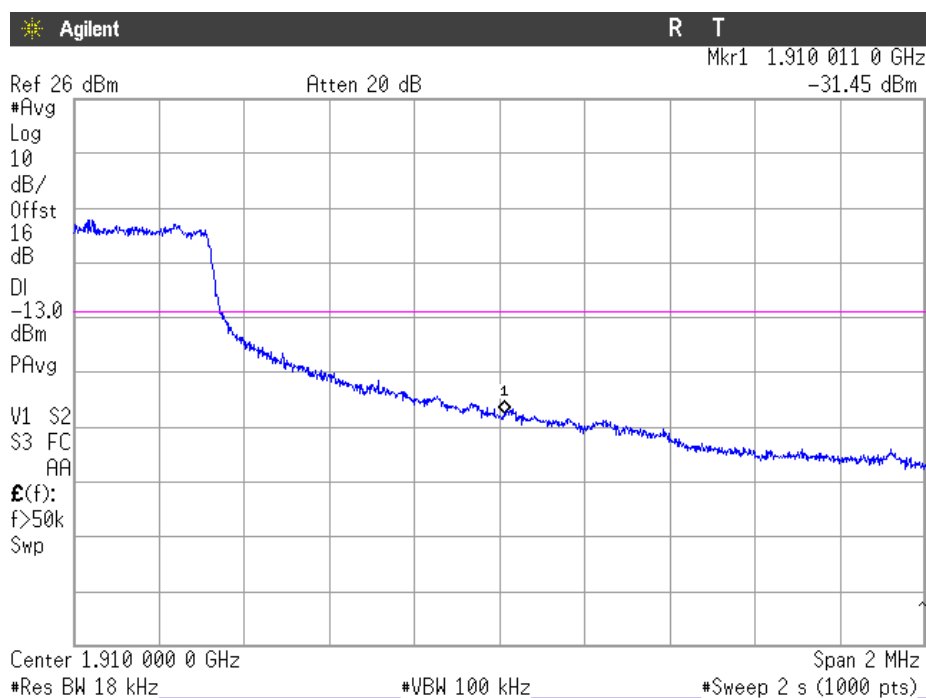
RB = All. Offset = 0. BW = 10 MHz (Band II)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 8.

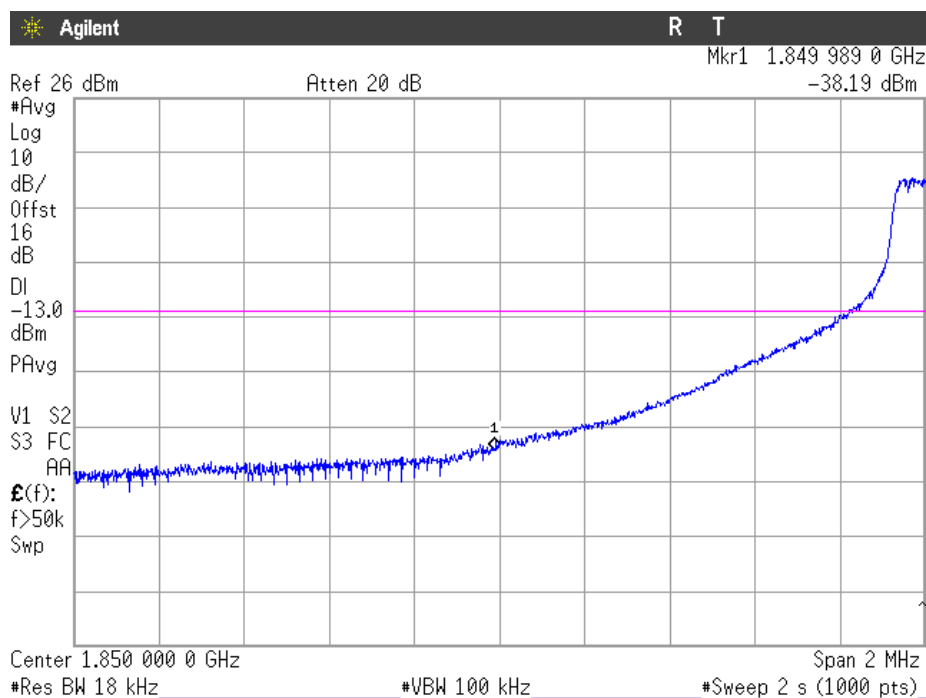


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 15 MHz (Band II)

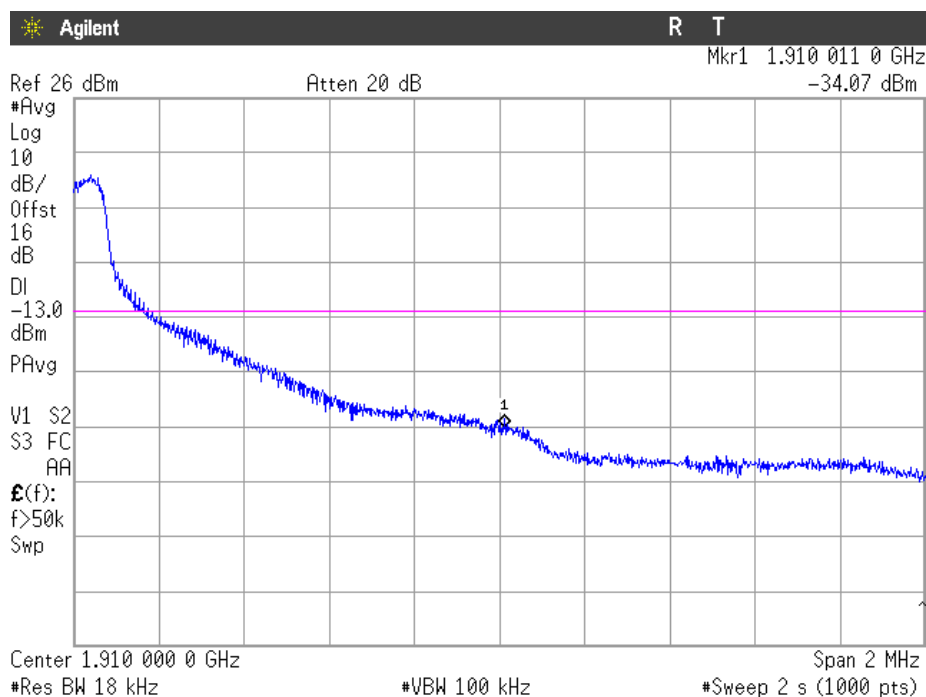
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 12. RB = 1. Offset = Max. BW = 15 MHz (Band II)

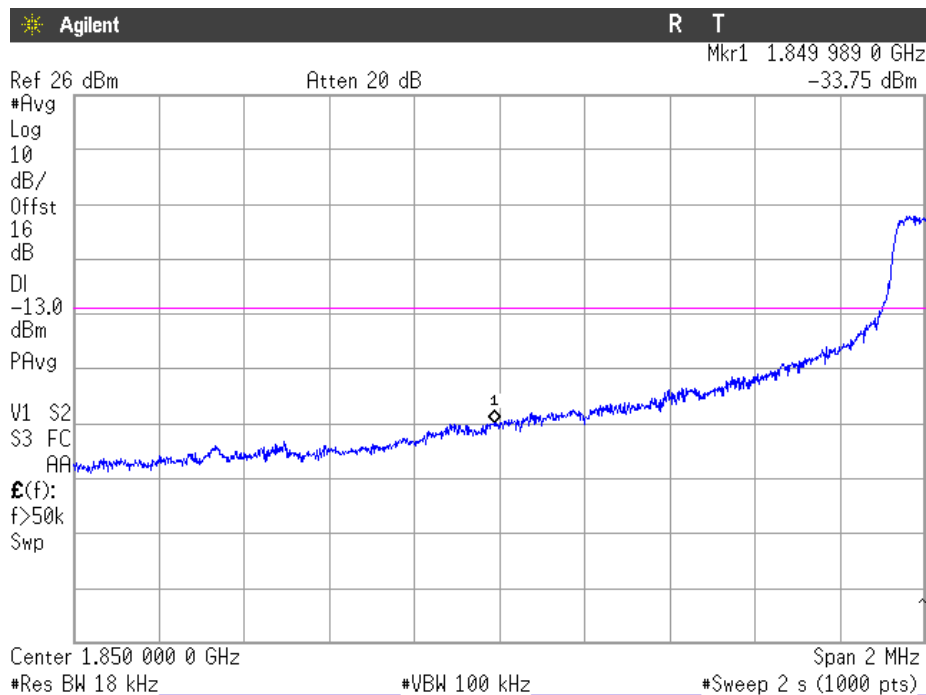
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

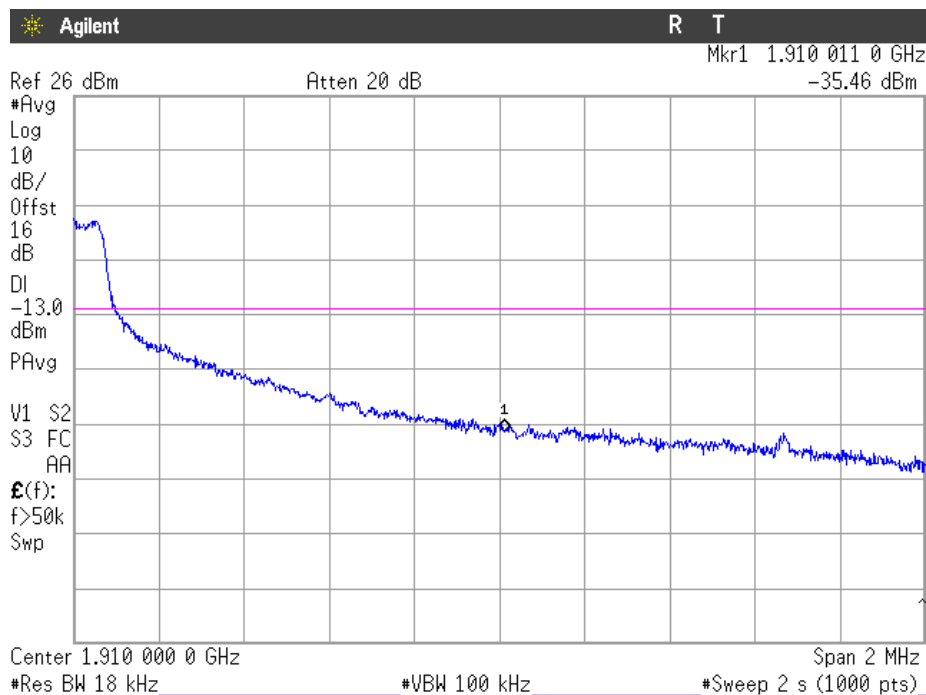
RB = All. Offset = 0. BW = 15 MHz (Band II)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 12.

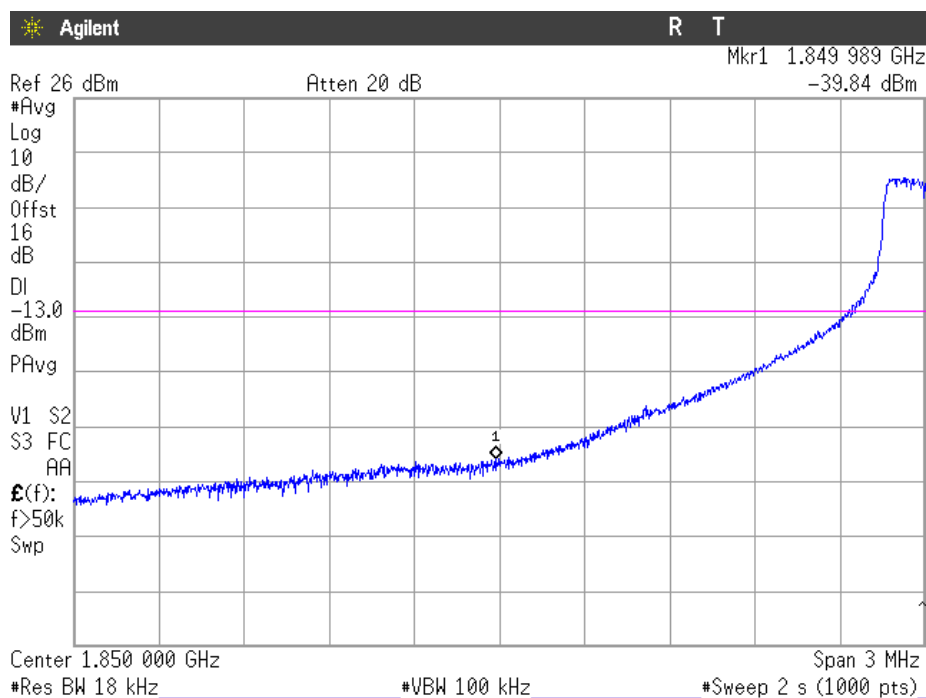


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 20 MHz (Band II)

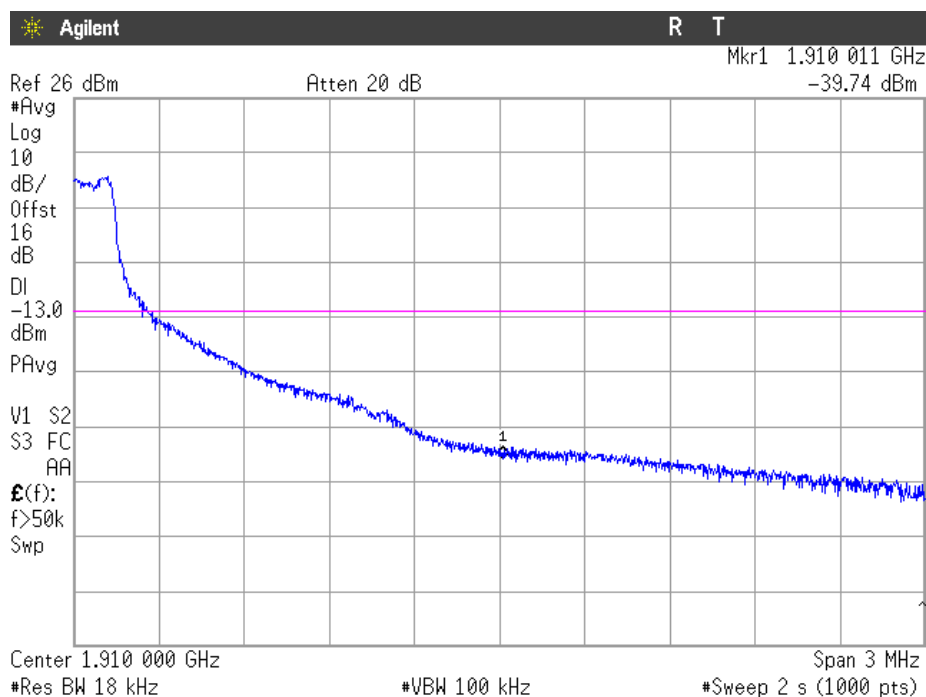
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 16. RB = 1. Offset = Max. BW = 20 MHz (Band II)

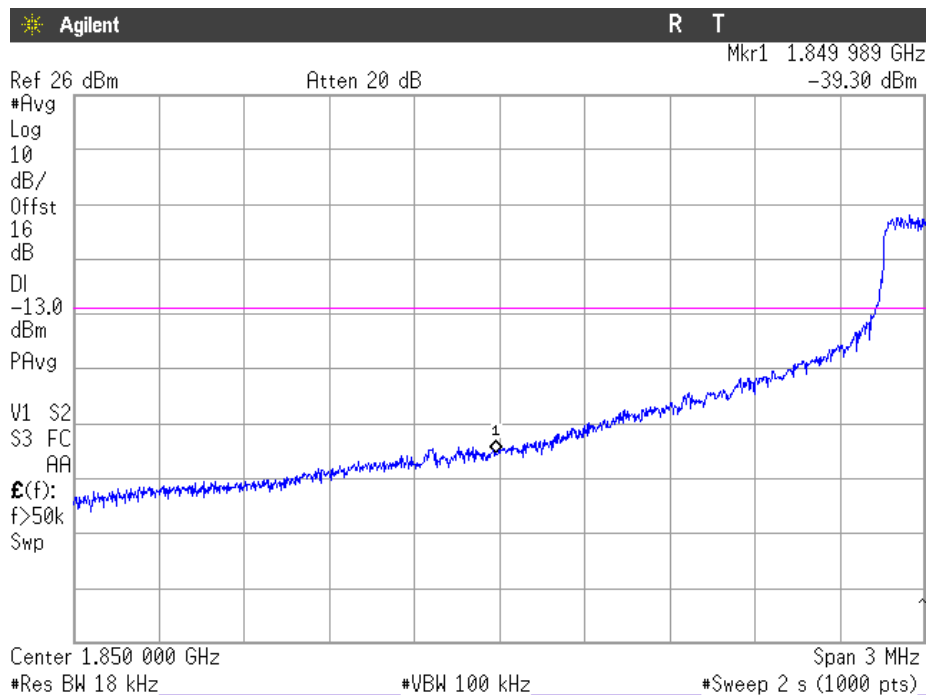
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

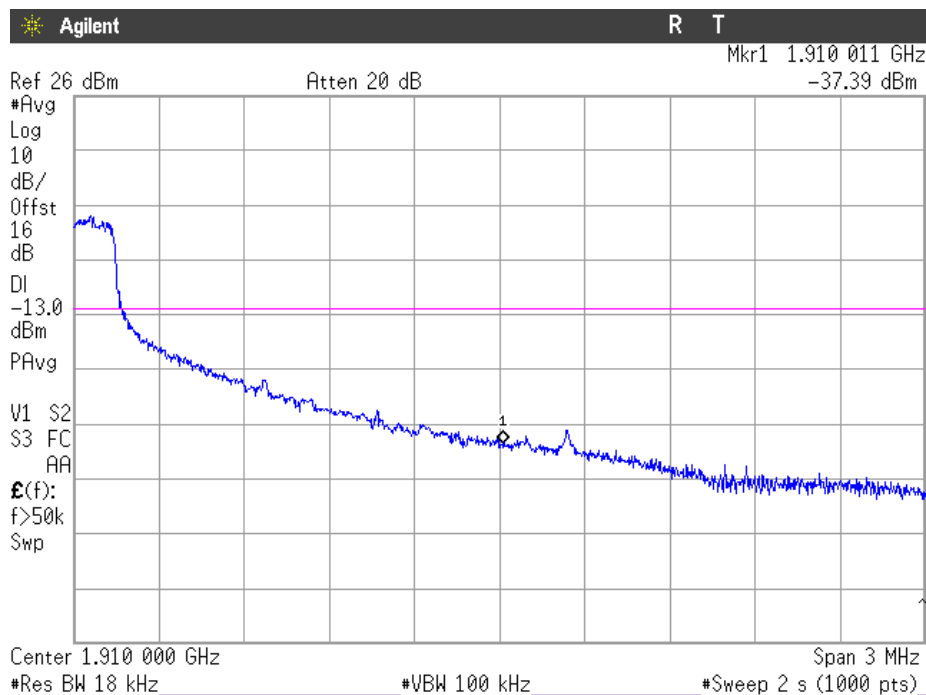
RB = All. Offset = 0. BW = 20 MHz (Band II)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 16.



NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Radiated emissions

SPECIFICATION

FCC §2.1051 and §24.238

RSS-133. Clause 6.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method. in accordance with the ANSI/TIA/EIA-603-D.

Measurement Limit:

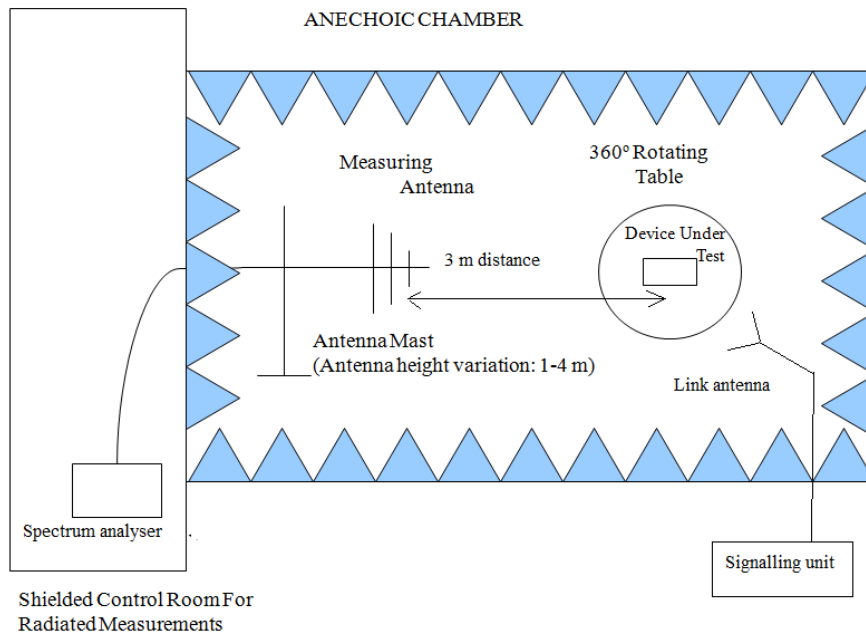
According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log (P_o)$ and the level in dBm relative P_o becomes:

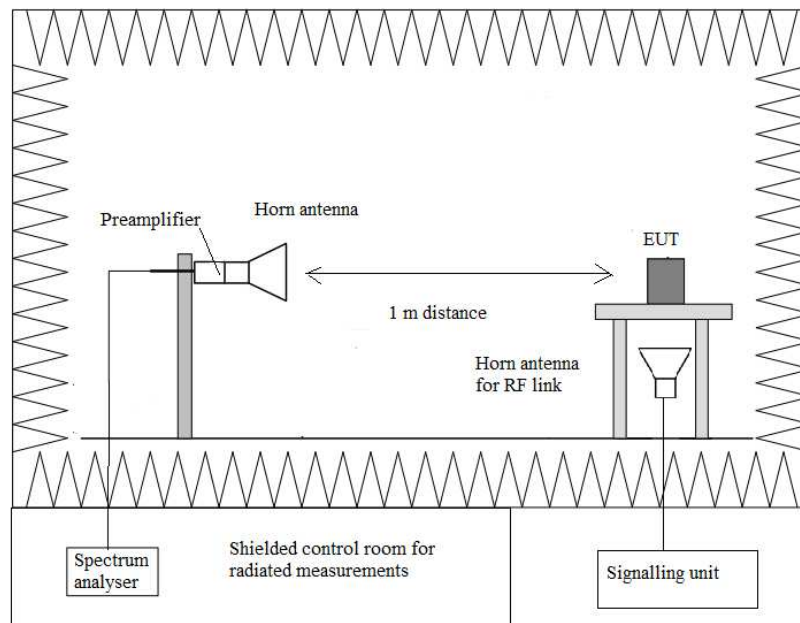
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



RESULTS

A preliminary scan determined the QPSK 5 MHz bandwidth, Narrow band =2, RB = 6, as the worst case.

The following tables and plots show the results for this configuration.

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-18 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-18 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

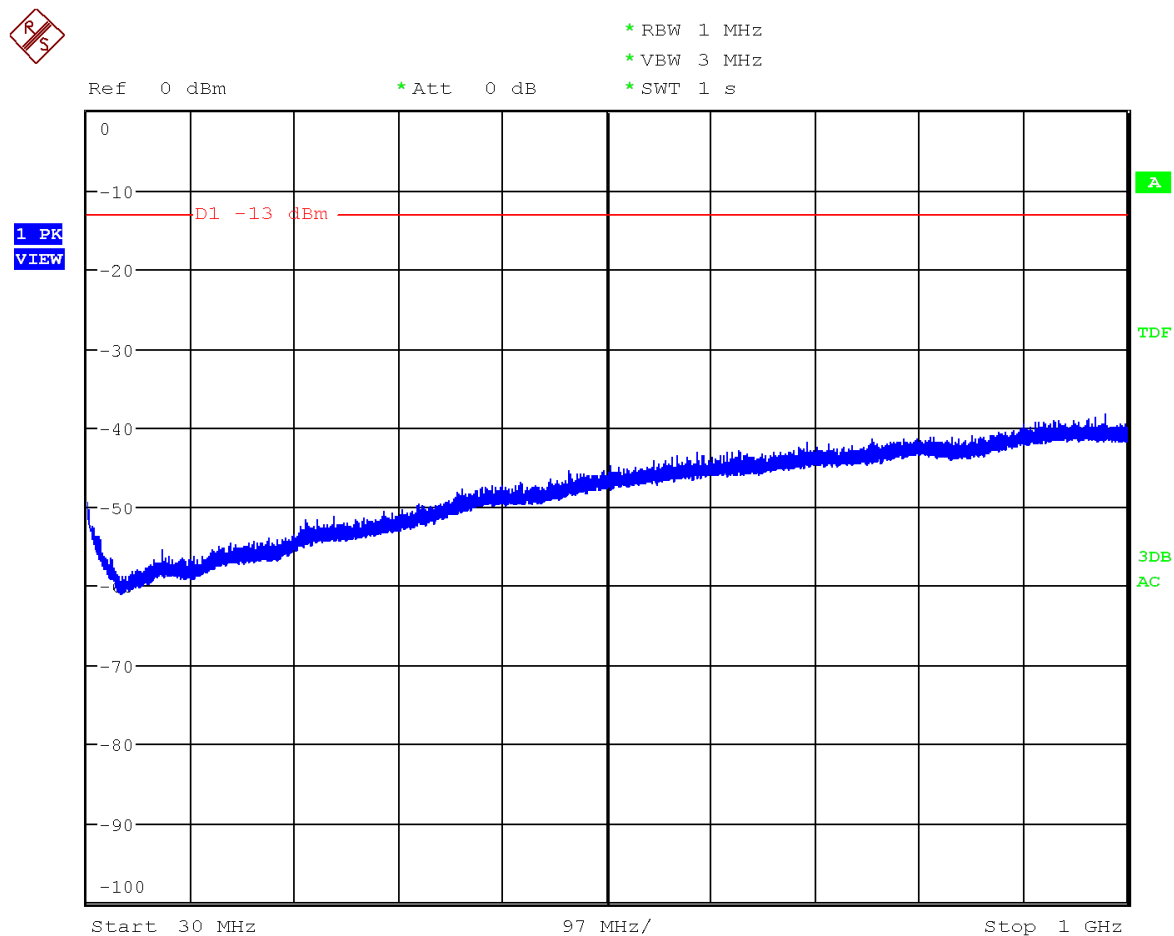
Frequency range 1 GHz-18 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

Measurement uncertainty (dB)	<±3.88 for $f < 1\text{GHz}$ <±4.87 for $f \geq 1\text{ GHz}$ up to 18 GHz
------------------------------	---

Verdict: PASS

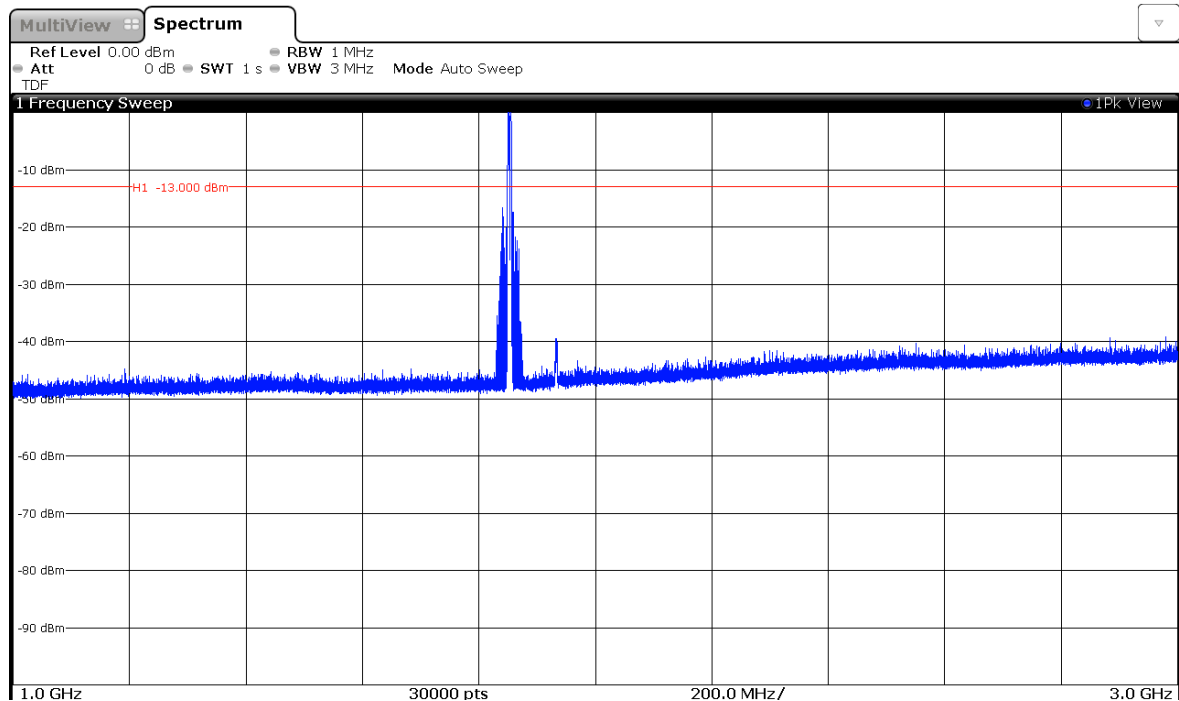
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels)

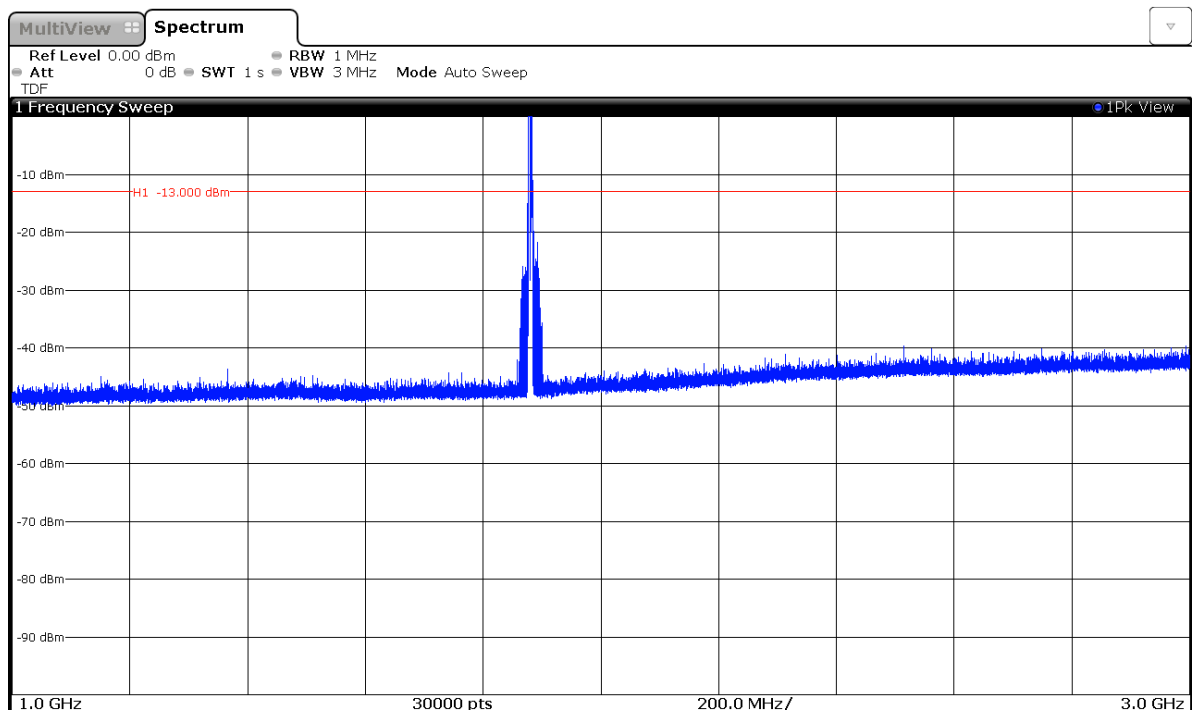
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: LOWEST



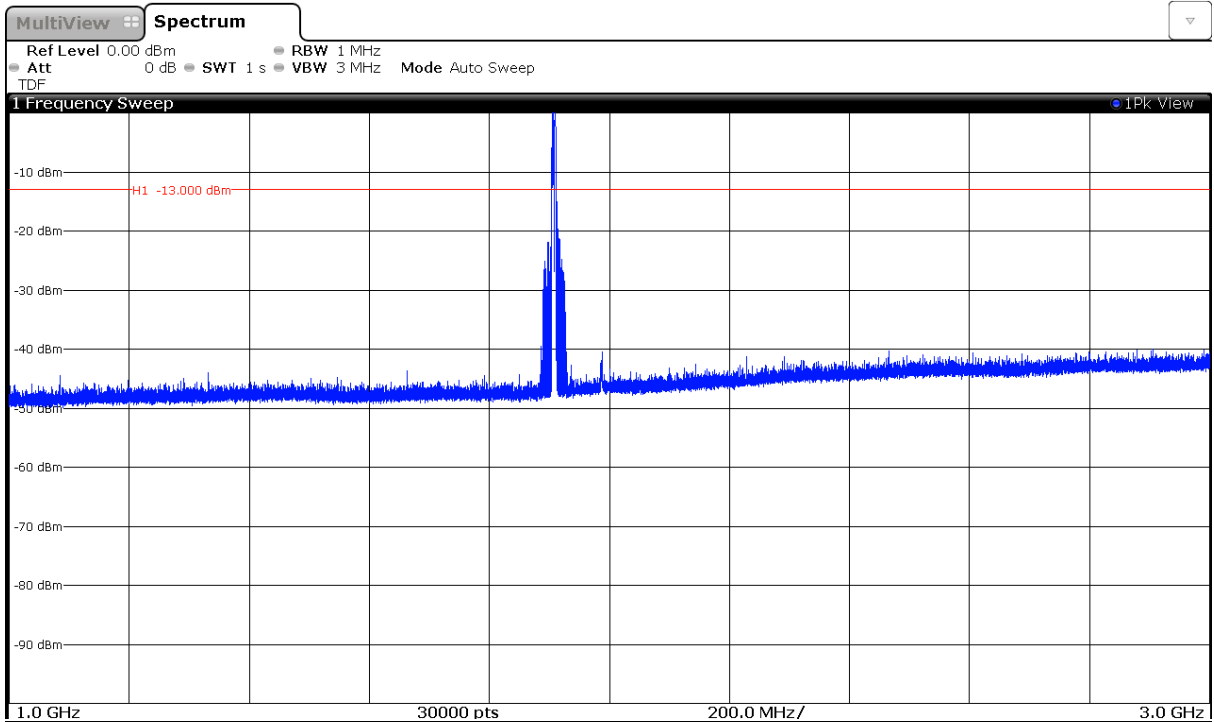
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

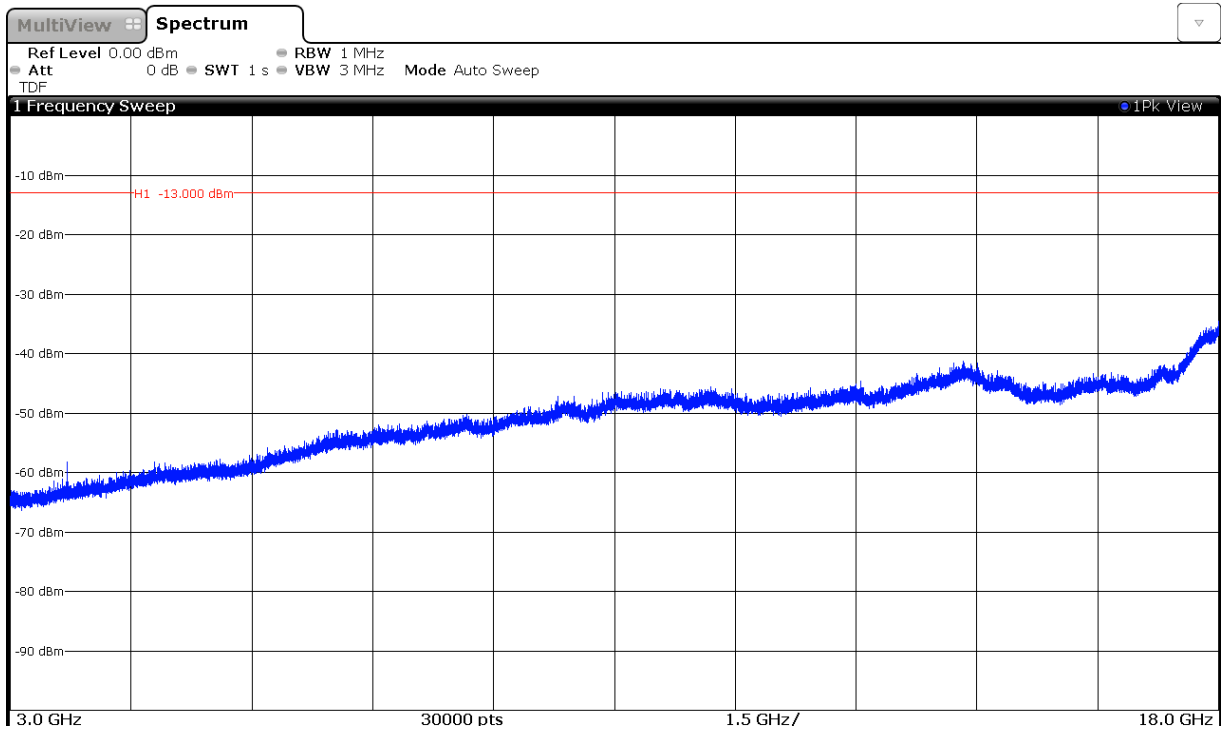
CHANNEL: HIGHEST



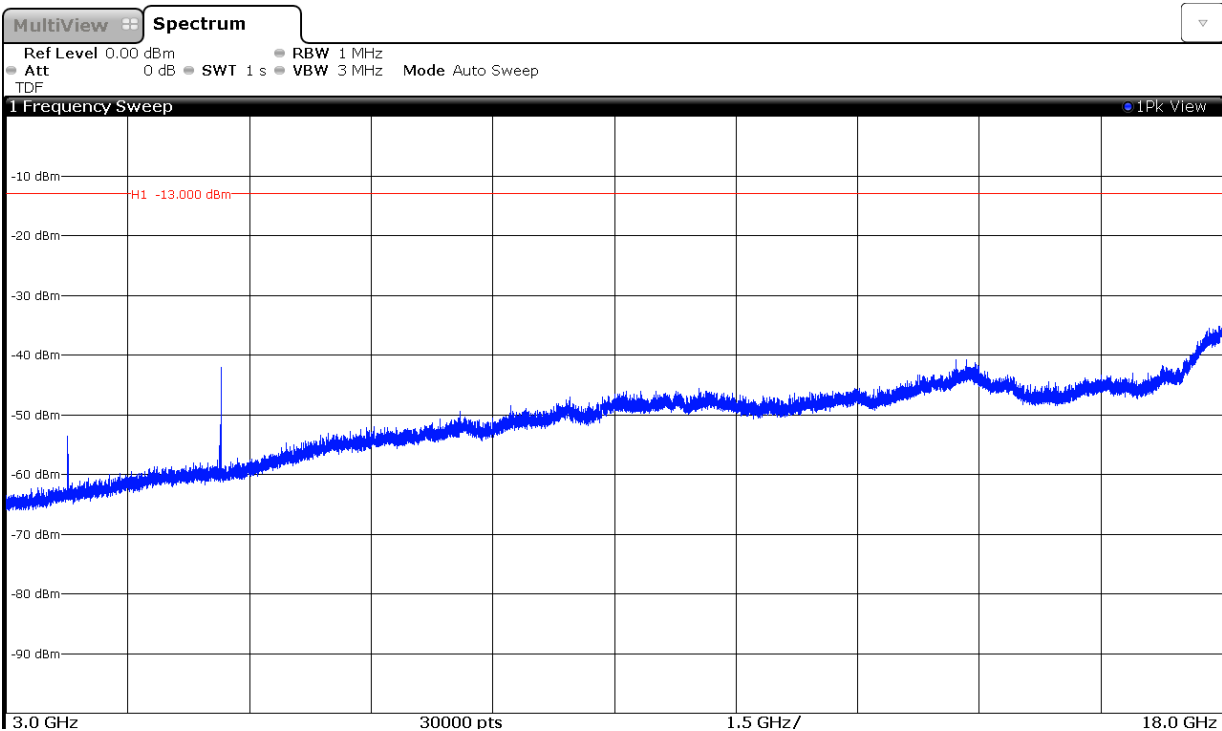
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 18 GHz.

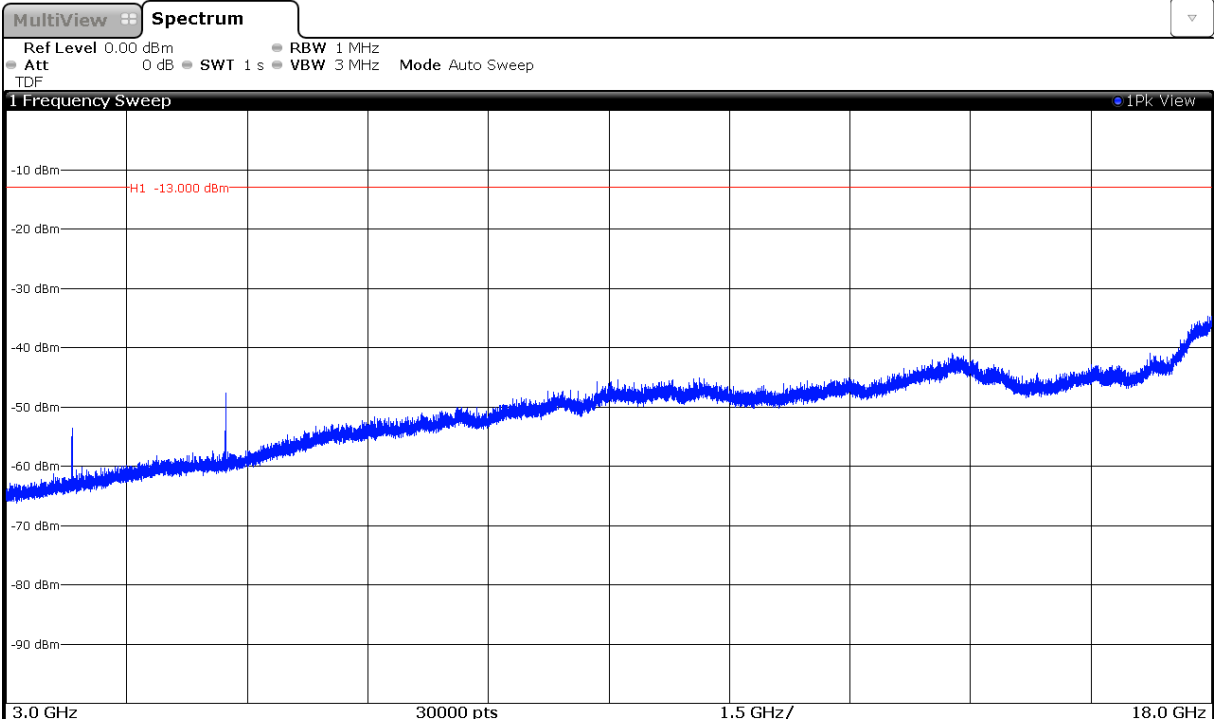
CHANNEL: LOWEST



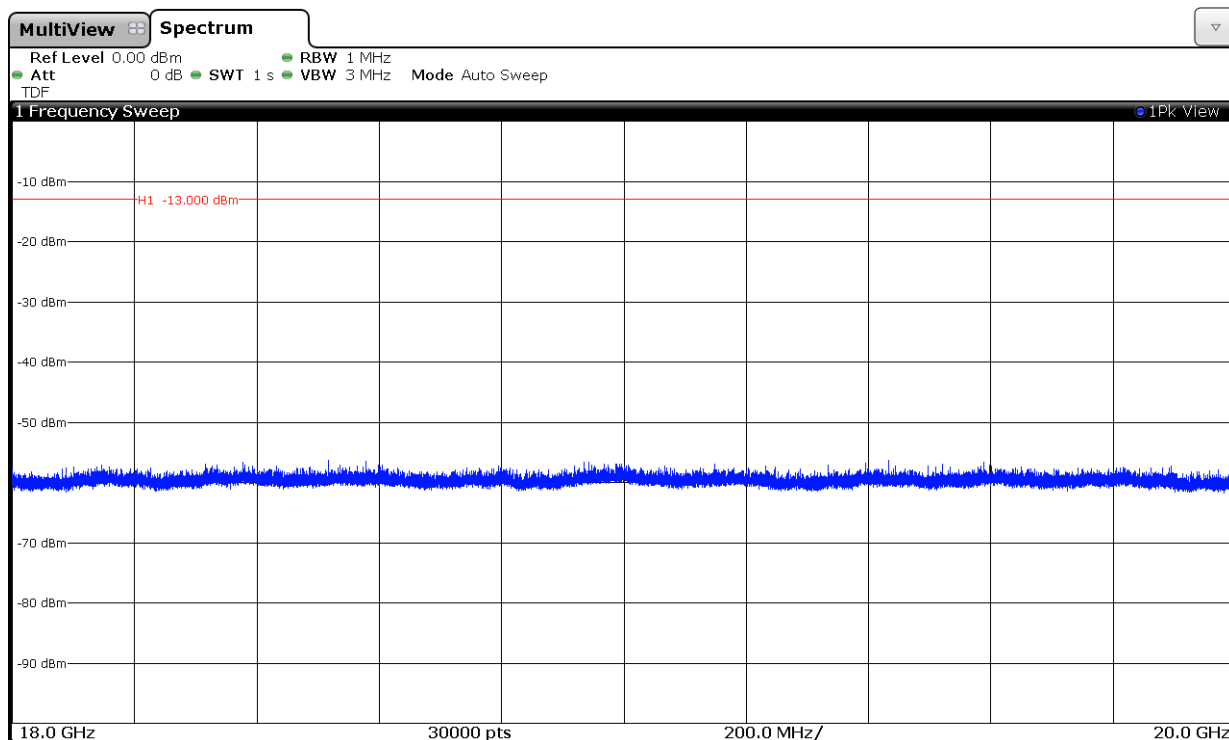
CHANNEL: MIDDLE



CHANNEL: HIGHEST



FREQUENCY RANGE 18 GHz TO 20 GHz.



(This plot is valid for all three channels)

Appendix B – Test result for FCC Part 27/IC RSS-139/IC RSS-130

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TEST RESULTS FOR FCC PART 27 AND IC RSS-139/RSS-130

TEST CONDITIONS

Power supply (V):

$V_{nom} = 3.8 \text{ Vdc}$

$V_{max} = 4.37 \text{ Vdc}$

$V_{min} = 3.23 \text{ Vdc}$

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from external power supply

Type of antenna = External attachable antenna

Antenna gain = 2.3 dBi

TEST FREQUENCIES:

LTE, QPSK AND 16QAM MODULATION (BAND IV)

	Channel (Frequency. MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Lowest	19957 (1710.7)	19965 (1711.5)	19975 (1712.5)	20000 (1715.0)	20025 (1717.5)	20050 (1720.0)
Middle	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)
Highest	20393 (1754.3)	20385 (1753.5)	20375 (1752.5)	20350 (1750.0)	20325 (1747.5)	20300 (1745.0)

LTE. QPSK AND 16QAM MODULATION (BAND XII)

	Channel (Frequency. MHz)			
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz
Lowest	23017 (699.7)	23025 (700.5)	23035 (701.5)	23060 (704.0)
Middle	23095 (707.5)	23095 (707.5)	23095 (707.5)	23095 (707.5)
Highest	23173 (715.3)	23165 (714.5)	23155 (713.5)	23130 (711.0)

RF Output Power

SPECIFICATION

FCC §2.1046 and §27.50. RSS-139 Clause 6.5.

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band are limited to 1 watt EIRP (30 dBm). Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

The peak-to-average ratio (PAR) of the transmission shall not exceed 13 dB.

Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.

Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

RSS-130 Clause 4.4.

The e.i.r.p. shall not exceed 50 watts (46.99 dBm) for mobile equipment or for outdoor fixed subscriber equipment nor shall it exceed 5 watts (36.99 dBm) for portable equipment or for indoor fixed subscriber equipment.

The peak-to-average power ratio (PAPR) of the transmission shall not exceed 13 dB.

METHOD

The conducted RF output power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester R&S CMU200 and CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi).

The maximum effective radiated power e.r.p. is calculated from the maximum equivalent isotropically radiated power (e.i.r.p.) by subtracting 2.15 dB:

$$E.R.P. = E.I.R.P. - 2.15 \text{ dB}$$

The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.

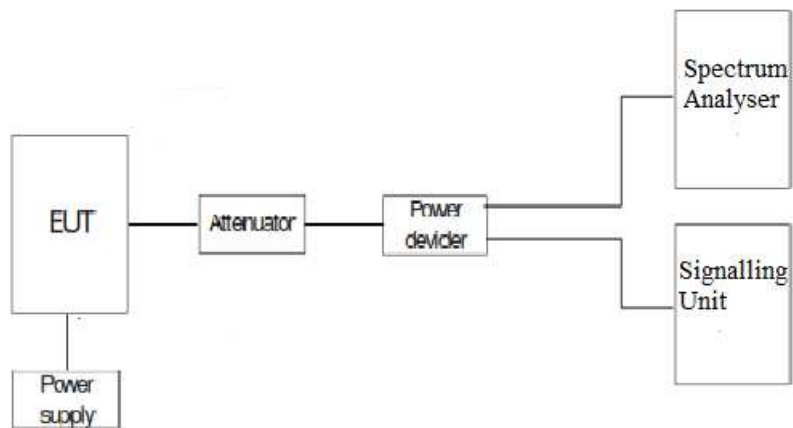
The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP

Conducted average power.



Peak-to-average power ratio (PAPR)



RESULTS

MAXIMUM OUTPUT POWER (CONDUCTED).

LTE. BAND IV.

Narrow band = 1

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
1.4	Low 19957	1710.7	QPSK	1	0	23.12	6.37
				1	2	23.23	
				1	5	23.16	
				3	0	22.02	
				3	1	22.15	
				3	2	22.04	
				6	0	21.06	
			16-QAM	1	0	21.66	6.92
				1	2	21.87	
				1	5	21.62	
				3	0	21.21	
				3	1	21.28	
				3	2	21.15	
				5	0	21.04	
	Middle 20175	1732.5	QPSK	1	0	23.19	6.35
				1	2	23.51	
				1	5	23.29	
				3	0	22.39	
				3	1	22.31	
				3	2	22.34	
				6	0	21.19	
			16-QAM	1	0	22.56	7.02
				1	2	22.64	
				1	5	22.49	
				3	0	21.53	
				3	1	21.55	
				3	2	21.61	
				5	0	21.29	
	High 20393	1754.3	QPSK	1	0	23.18	6.25
				1	2	23.25	
				1	5	23.18	
				3	0	22.19	
				3	1	22.32	
				3	2	22.39	
				6	0	21.28	
			16-QAM	1	0	21.88	6.68
				1	2	22.15	
				1	5	21.85	
				3	0	21.37	
				3	1	21.49	
				3	2	21.36	
				5	0	21.2	

Narrow band = 1 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
3	Low 19965	1711.5	QPSK	1	0	22.99	6.03
				1	2	23.03	
				1	5	22.92	
				3	0	21.99	
				3	1	22.1	
				3	2	22.22	
				6	0	21.09	
			16-QAM	1	0	21.62	6.97
				1	2	21.77	
				1	5	21.62	
				3	0	21.19	
				3	1	21.21	
				3	2	21.1	
				5	0	20.89	
	Middle 20175	1732.5	QPSK	1	0	23.3	5.96
				1	2	23.57	
				1	5	23.31	
				3	0	22.22	
				3	1	22.23	
				3	2	22.29	
				6	0	21.19	
			16-QAM	1	0	21.97	6.63
				1	2	22.07	
				1	5	22.29	
				3	0	21.27	
				3	1	21.27	
				3	2	21.2	
				5	0	21.33	
	High 20385	1753.5	QPSK	1	0	23.26	5.82
				1	2	23.58	
				1	5	23.31	
				3	0	22.22	
				3	1	22.31	
				3	2	22.29	
				6	0	21.16	
			16-QAM	1	0	21.81	6.68
				1	2	22.09	
				1	5	22.25	
				3	0	21.4	
				3	1	21.28	
				3	2	21.41	
				5	0	21.33	

Narrow band = 2 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
5	Low 19975	1712.5	QPSK	1	0	23.16	5.38
				1	2	23.19	
				1	5	23.12	
				3	0	22.13	
				3	1	22.16	
				3	2	22.15	
				6	0	22.11	
			16-QAM	1	0	22.81	6.23
				1	2	22.91	
				1	5	22.8	
				3	0	22.18	
				3	1	22.24	
				3	2	22.21	
				5	0	20.89	
	Middle 20175	1732.5	QPSK	1	0	23.34	5.26
				1	2	23.49	
				1	5	23.36	
				3	0	22.27	
				3	1	22.34	
				3	2	22.37	
				6	0	22.32	
			16-QAM	1	0	23.31	6.18
				1	2	23.42	
				1	5	23.3	
				3	0	22.37	
				3	1	22.23	
				3	2	22.23	
				5	0	21.37	
	High 20375	1752.5	QPSK	1	0	23.24	5.14
				1	2	23.38	
				1	5	23.24	
				3	0	22.31	
				3	1	22.38	
				3	2	22.51	
				6	0	22.42	
			16-QAM	1	0	23.37	6.15
				1	2	23.34	
				1	5	23.33	
				3	0	22.29	
				3	1	22.28	
				3	2	22.3	
				5	0	21.42	

Narrow band = 4 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
10	Low 20000	1715	QPSK	1	0	23.04	5.29
				1	2	23.18	
				1	5	23.08	
				3	0	23.11	
				3	1	23	
				3	2	23.03	
				6	0	22.08	
			16-QAM	1	0	23.22	6.37
				1	2	23.23	
				1	5	23.22	
				3	0	22.82	
				3	1	22.74	
				3	2	22.82	
				5	0	21.99	
	Middle 20175	1732.5	QPSK	1	0	23.36	5.24
				1	2	23.42	
				1	5	23.39	
				3	0	23.35	
				3	1	23.3	
				3	2	23.36	
				6	0	22.32	
			16-QAM	1	0	23.32	6.18
				1	2	23.35	
				1	5	23.32	
				3	0	23.17	
				3	1	23.24	
				3	2	23.21	
				5	0	22.5	
	High 20350	1750	QPSK	1	0	23.35	4.98
				1	2	23.42	
				1	5	23.34	
				3	0	23.3	
				3	1	23.37	
				3	2	23.41	
				6	0	22.27	
			16-QAM	1	0	23.33	6.11
				1	2	23.37	
				1	5	23.31	
				3	0	23.35	
				3	1	23.31	
				3	2	23.36	
				5	0	22.4	

Narrow band = 6 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
15	Low 20025	1717.5	QPSK	1	0	23.17	5.31
				1	2	23.16	
				1	5	23.09	
				3	0	22.97	
				3	1	23.05	
				3	2	23.02	
				6	0	23.11	
			16-QAM	1	0	22.84	6.25
				1	2	22.99	
				1	5	22.97	
				3	0	23.27	
				3	1	23.26	
				3	2	23.31	
				5	0	23.16	
	Middle 20175	1732.5	QPSK	1	0	23.25	5.24
				1	2	23.26	
				1	5	23.33	
				3	0	23.25	
				3	1	23.35	
				3	2	23.31	
				6	0	23.32	
			16-QAM	1	0	23.51	6.2
				1	2	23.39	
				1	5	23.34	
				3	0	23.02	
				3	1	23.05	
				3	2	23	
				5	0	23.11	
	High 20325	1747.5	QPSK	1	0	23.27	5.17
				1	2	23.38	
				1	5	23.32	
				3	0	23.09	
				3	1	23.12	
				3	2	23.24	
				6	0	23.22	
			16-QAM	1	0	23.18	6.13
				1	2	23.3	
				1	5	23.23	
				3	0	23.25	
				3	1	23.24	
				3	2	23.12	
				5	0	23.25	

Narrow band = 8 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
20	Low 20050	1720	QPSK	1	0	23.13	5.31
				1	2	23.38	
				1	5	23.14	
				3	0	23.04	
				3	1	23.12	
				3	2	23	
			16-QAM	6	0	23.08	6.32
				1	0	22.79	
				1	2	22.83	
				1	5	22.84	
				3	0	23.16	
				3	1	23.18	
	Middle 20175	1732.5	QPSK	3	2	23.26	5.24
				5	0	23.08	
				1	0	23.32	
				1	2	23.31	
				1	5	23.37	
				3	0	23.29	
			16-QAM	3	1	23.27	6.18
				3	2	23.28	
				6	0	23.24	
				1	0	23.29	
				1	2	23.46	
				1	5	23.44	
	High 20300	1745	QPSK	3	0	23.09	5.02
				3	1	23.04	
				3	2	23.13	
				5	0	23.54	
			16-QAM	1	0	23.34	6.13
				1	2	23.45	
				1	5	23.23	
				3	0	23.3	
				3	1	23.32	
				3	2	23.28	
				6	0	23.4	
			16-QAM	1	0	23.38	6.13
				1	2	23.36	
				1	5	23.27	
				3	0	23.43	
				3	1	23.41	
				3	2	23.49	
				5	0	23.53	

LTE. BAND XII.

Narrow band = 1

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
1.4	Low 23017	699.7 MHz	QPSK	1	0	23.5	6.13
				1	2	23.57	
				1	5	23.46	
				3	0	22.24	
				3	1	22.33	
				3	2	22.32	
				6	0	21.24	
			16-QAM	1	0	21.93	6.73
				1	2	22.2	
				1	5	21.92	
				3	0	21.43	
				3	1	21.5	
				3	2	21.39	
				5	0	21.33	
	Middle 23095	707.5 MHz	QPSK	1	0	23.39	5.96
				1	2	23.49	
				1	5	23.4	
				3	0	22.22	
				3	1	22.35	
				3	2	22.26	
				6	0	21.25	
			16-QAM	1	0	22.35	6.59
				1	2	22.5	
				1	5	22.36	
				3	0	20.94	
				3	1	20.95	
				3	2	20.96	
				5	0	21.14	
	High 23173	715.3 MHz	QPSK	1	0	23.29	5.99
				1	2	23.4	
				1	5	23.32	
				3	0	22.18	
				3	1	22.29	
				3	2	22.2	
				6	0	21.21	
			16-QAM	1	0	22.24	6.56
				1	2	22.42	
				1	5	22.27	
				3	0	20.89	
				3	1	20.86	
				3	2	20.95	
				5	0	21.12	

Narrow band = 1 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
3	Low 23025	700.5 MHz	QPSK	1	0	23.4	5.6
				1	2	23.44	
				1	5	23.42	
				3	0	22.27	
				3	1	22.31	
				3	2	22.32	
				6	0	21.31	
			16-QAM	1	0	22.33	6.61
				1	2	22.41	
				1	5	22.21	
				3	0	21.31	
				3	1	21.25	
				3	2	24.45	
				5	0	21.33	
	Middle 23095	707.5 MHz	QPSK	1	0	23.29	5.67
				1	2	23.37	
				1	5	23.42	
				3	0	22.3	
				3	1	22.33	
				3	2	22.37	
				6	0	21.27	
			16-QAM	1	0	21.91	6.63
				1	2	22.13	
				1	5	22.34	
				3	0	21.47	
				3	1	21.43	
				3	2	21.44	
				5	0	21.39	
	High 23165	714.5 MHz	QPSK	1	0	23.35	5.58
				1	2	23.37	
				1	5	23.34	
				3	0	22.27	
				3	1	22.26	
				3	2	22.37	
				6	0	21.27	
			16-QAM	1	0	22.06	6.61
				1	2	22.18	
				1	5	22.28	
				3	0	21.51	
				3	1	21.5	
				3	2	21.52	
				5	0	21.41	

Narrow band = 2 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
5	Low 23035	701.5 MHz	QPSK	1	0	23.38	4.98
				1	2	23.5	
				1	5	23.43	
				3	0	22.22	
				3	1	22.32	
				3	2	22.32	
				6	0	22.25	
			16-QAM	1	0	23.03	6.03
				1	2	23.15	
				1	5	22.85	
				3	0	22.45	
				3	1	22.41	
				3	2	22.43	
				5	0	21.41	
	Middle 23095	707.5 MHz	QPSK	1	0	23.32	5
				1	2	23.52	
				1	5	23.44	
				3	0	22.23	
				3	1	22.36	
				3	2	22.25	
				6	0	22.32	
			16-QAM	1	0	22.89	6.01
				1	2	23.04	
				1	5	22.81	
				3	0	22.36	
				3	1	22.35	
				3	2	22.32	
				5	0	21.25	
	High 23155	713.5 MHz	QPSK	1	0	23.27	4.98
				1	2	23.3	
				1	5	23.22	
				3	0	22.22	
				3	1	22.29	
				3	2	22.26	
				6	0	22.2	
			16-QAM	1	0	23.13	5.91
				1	2	23.27	
				1	5	23.1	
				3	0	22.24	
				3	1	22.17	
				3	2	22.25	
				5	0	21.27	

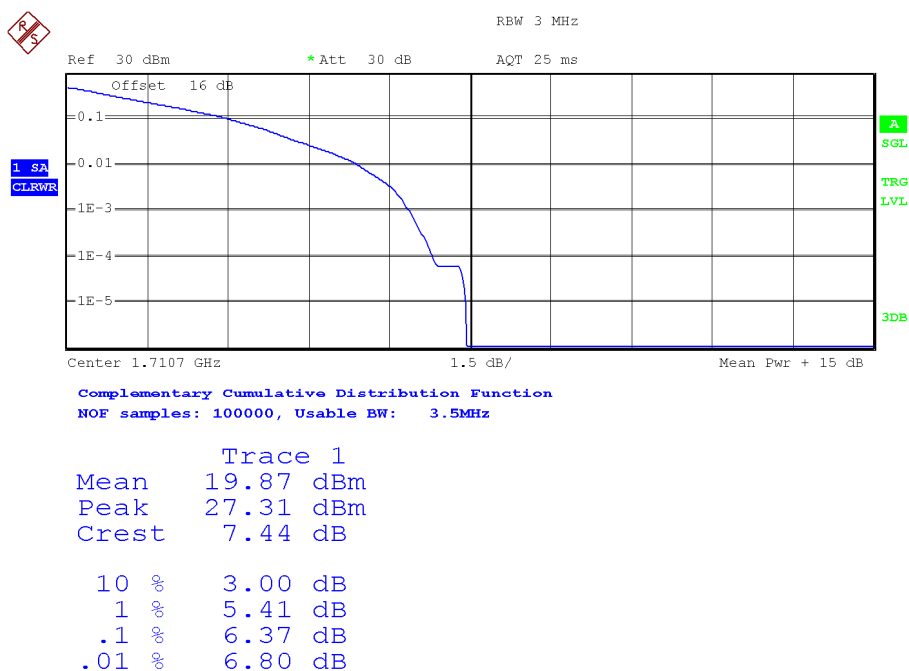
Narrow band = 4 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
10	Low 23060	704 MHz	QPSK	1	0	23.32	4.98
				1	2	23.34	
				1	5	23.34	
				3	0	23.25	
				3	1	23.23	
				3	2	23.31	
				6	0	22.34	
		NB=4	16-QAM	1	0	22.85	6.01
				1	2	22.98	
				1	5	23.24	
				3	0	23.34	
				3	1	23.39	
				3	2	23.32	
				5	0	22.33	
	Middle 23095	707.5 MHz	QPSK	1	0	23.11	4.98
				1	2	23.27	
				1	5	23.32	
				3	0	23.07	
				3	1	23.1	
				3	2	23.25	
				6	0	22.13	
			16-QAM	1	0	22.78	5.99
				1	2	22.88	
				1	5	23.23	
				3	0	23.26	
				3	1	23.22	
				3	2	23.3	
				5	0	22.25	
	High 23130	711 MHz	QPSK	1	0	23.43	4.95
				1	2	23.46	
				1	5	23.43	
				3	0	23.32	
				3	1	23.35	
				3	2	23.35	
				6	0	22.32	
			16-QAM	1	0	23.39	6.01
				1	2	23.47	
				1	5	23.47	
				3	0	23.03	
				3	1	22.98	
				3	2	23.01	
				5	0	22.22	

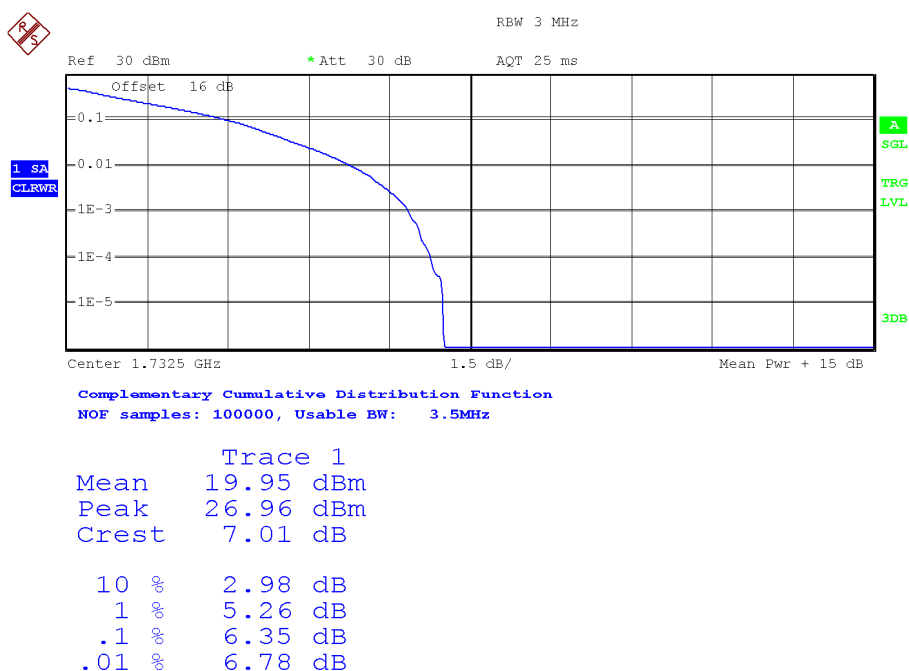
PEAK-TO-AVERAGE POWER RATIO (PAPR).

LTE. BAND IV.

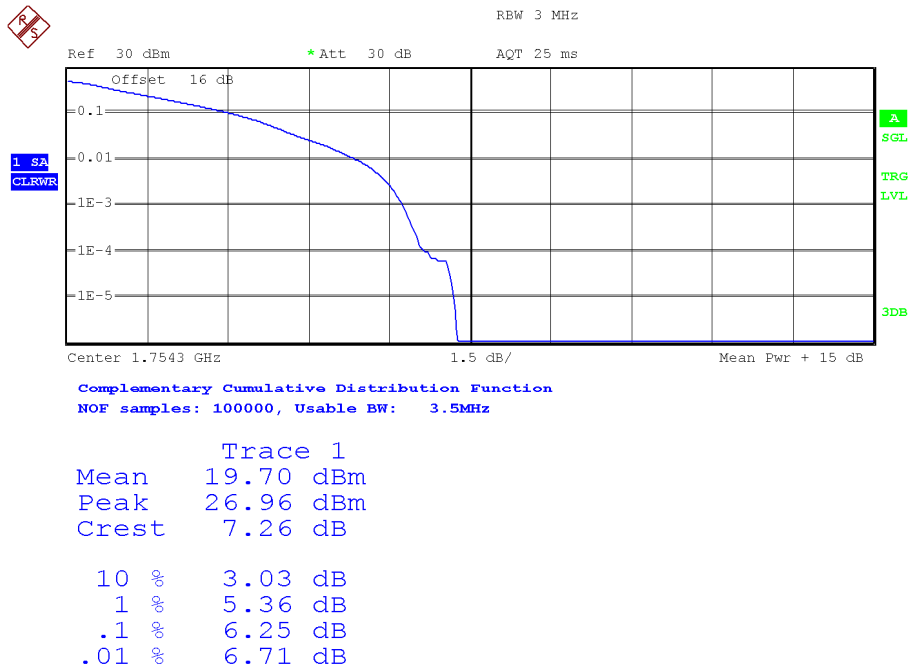
Bandwidth = 1.4 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.
Channel Low:



Channel Middle:

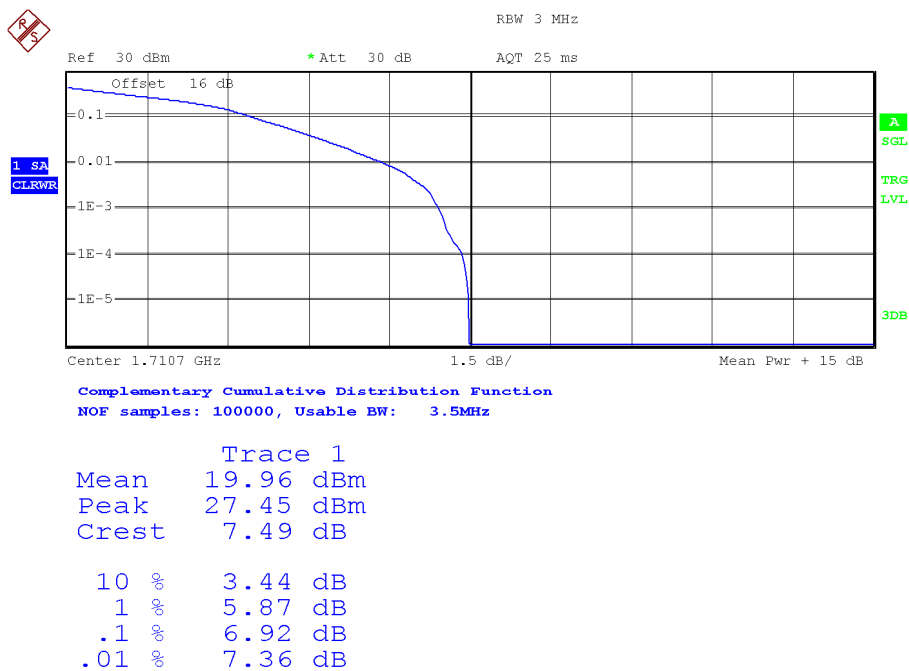


Channel High:

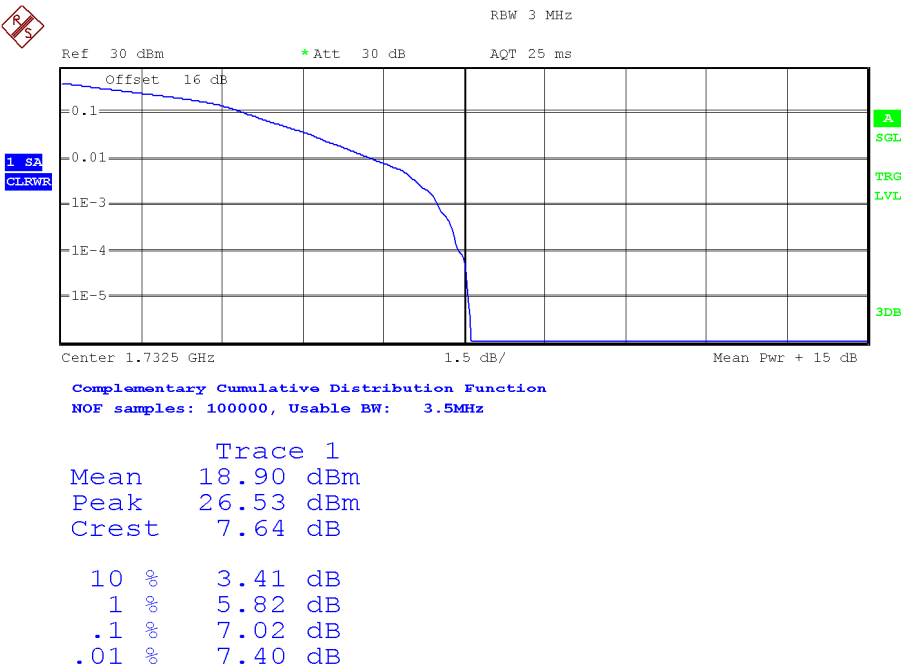


Bandwidth = 1.4 MHz. Modulation 16 QAM. Modulation bandwidth: 1. RB Size: 5. RB Offset: 0.

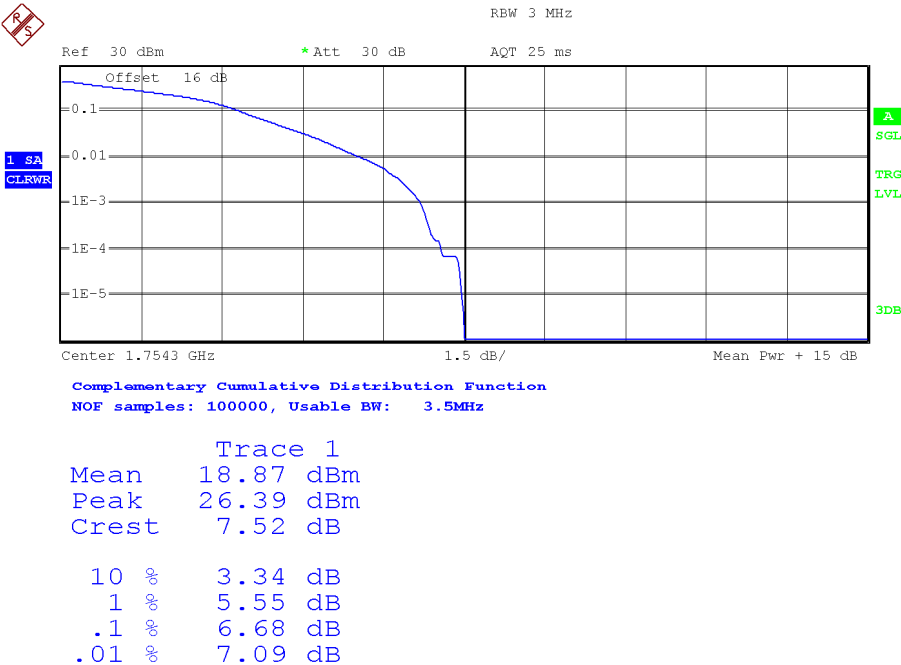
Channel Low:



Channel Middle:

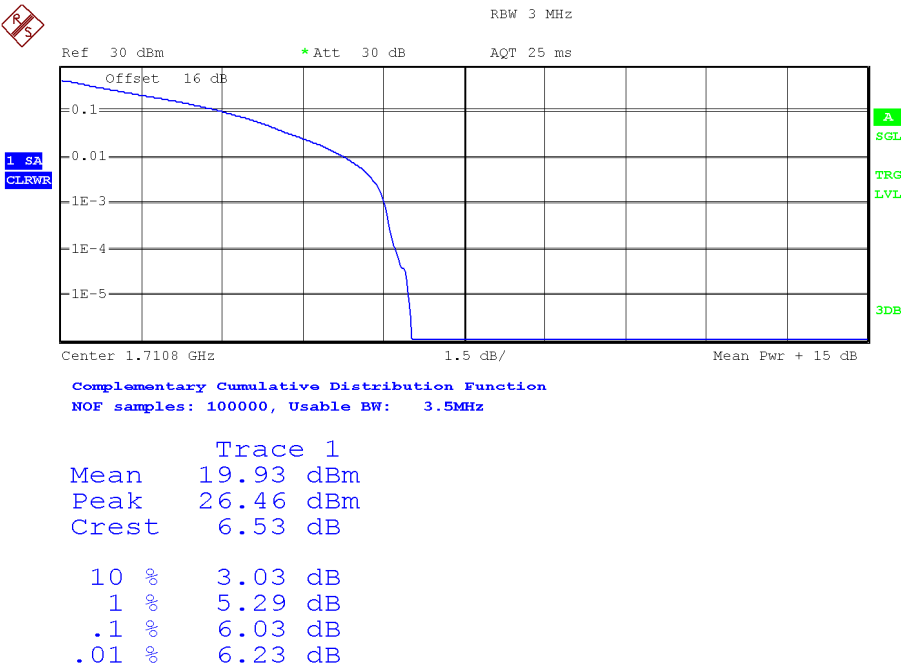


Channel High:

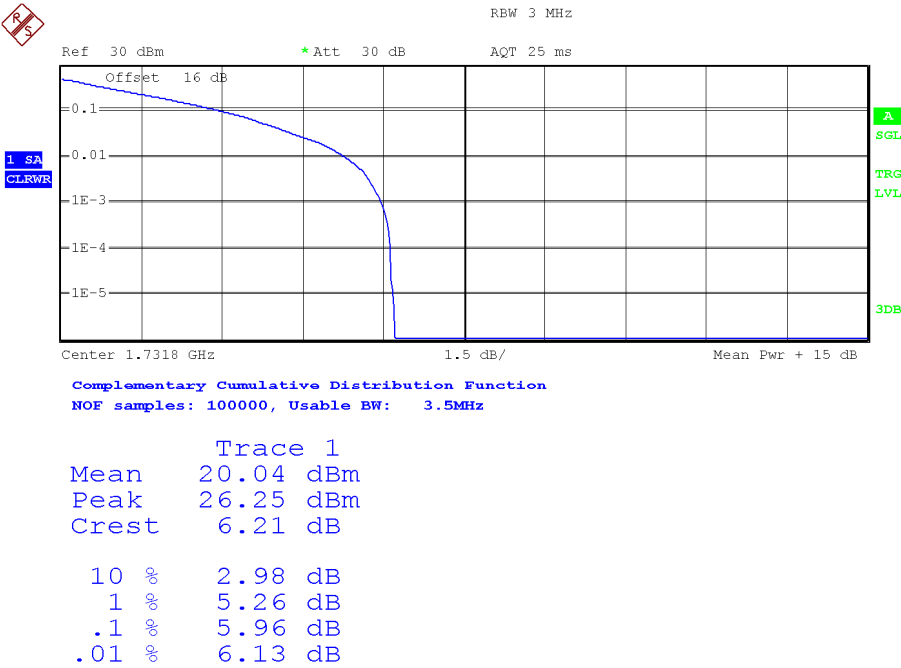


Bandwidth = 3 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.

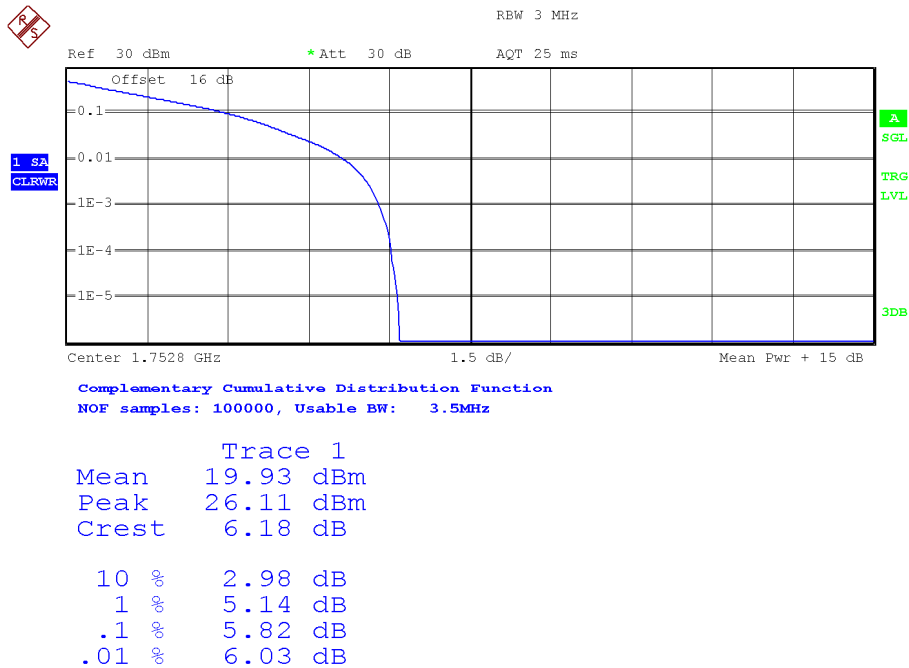
Channel Low:



Channel Middle:

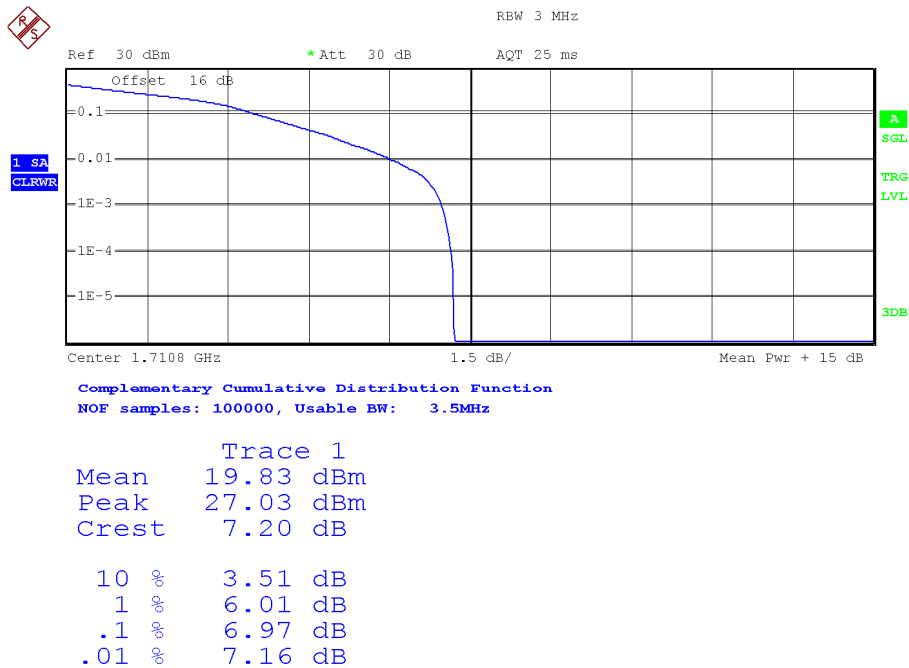


Channel High:

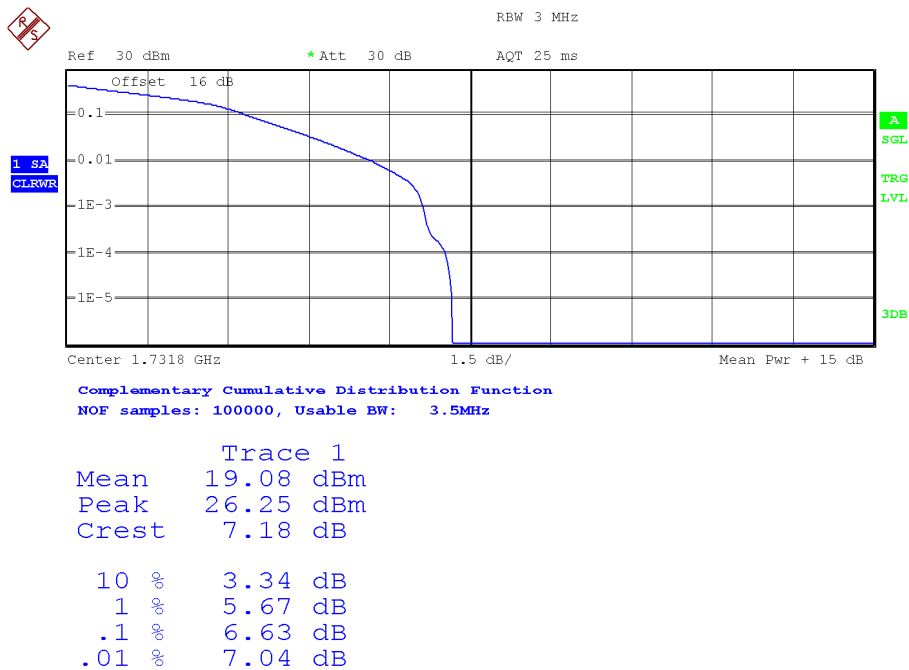


Bandwidth = 3 MHz. Modulation 16 QAM. Modulation bandwidth: 1. RB Size: 5. RB Offset: 0.

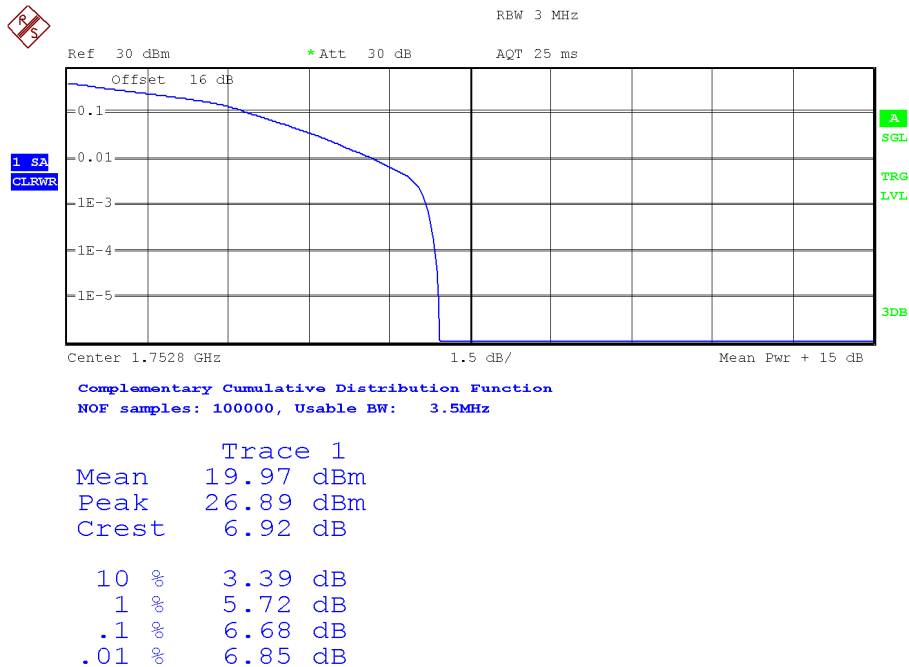
Channel Low:



Channel Middle:

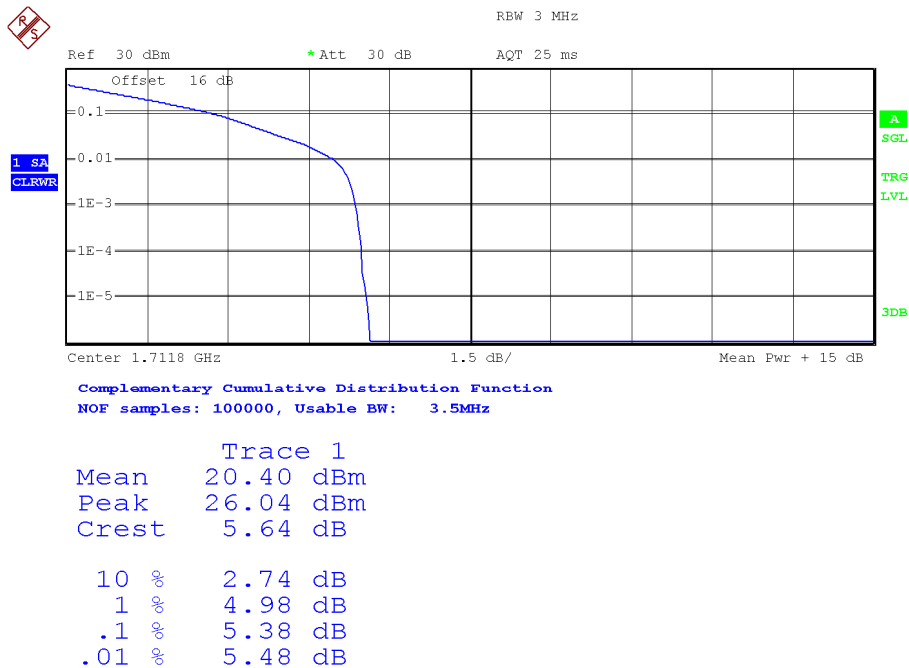


Channel High:

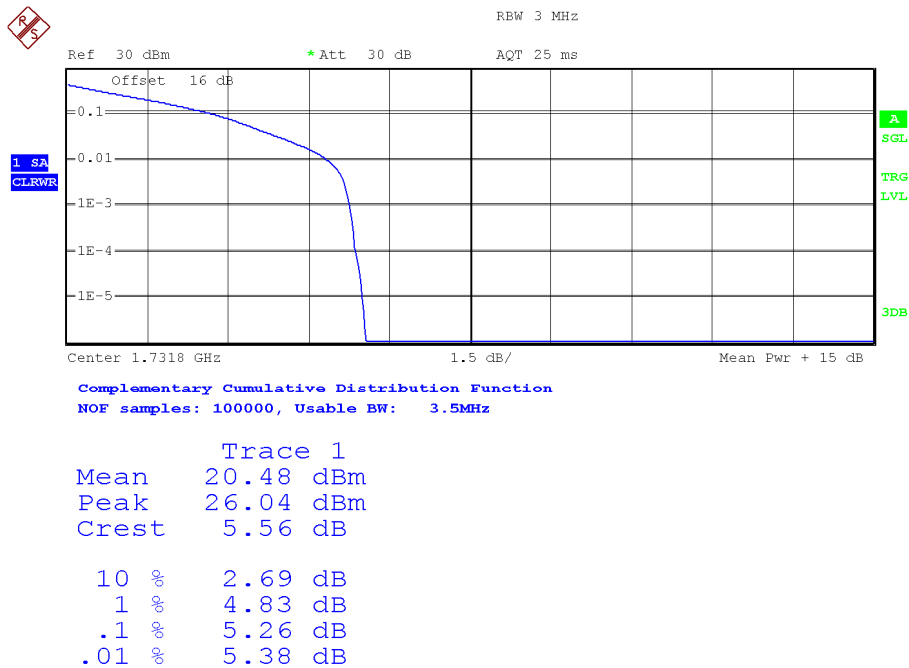


Bandwidth = 5 MHz. Modulation QPSK. Modulation bandwidth: 2. RB Size: 6. RB Offset: 0.

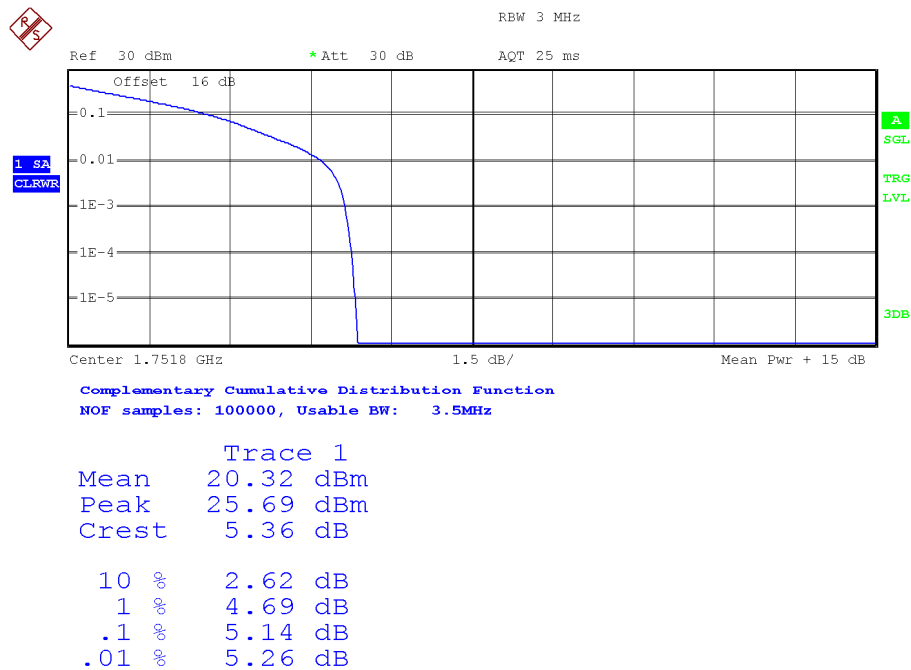
Channel Low:



Channel Middle:

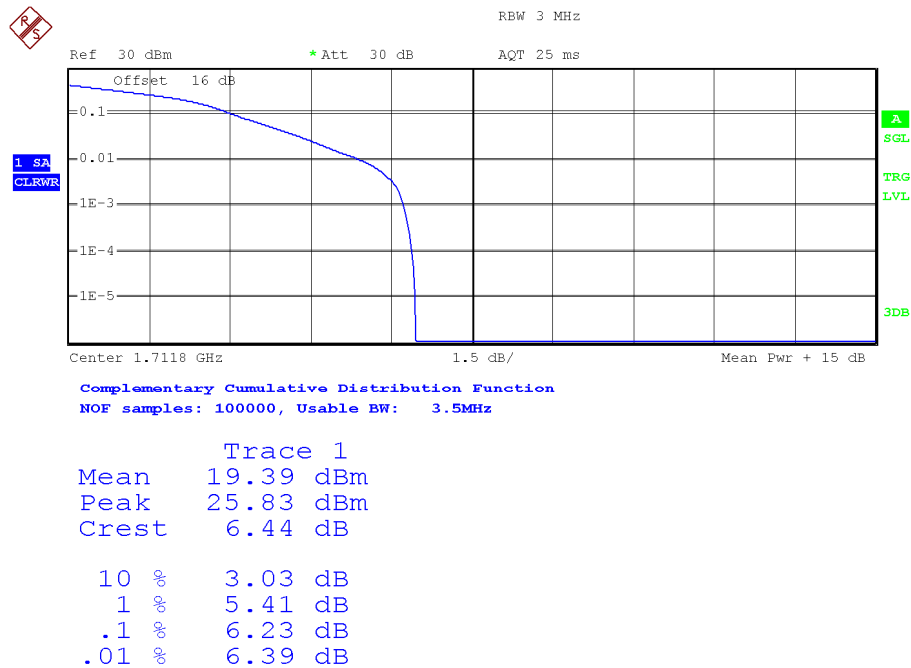


Channel High:

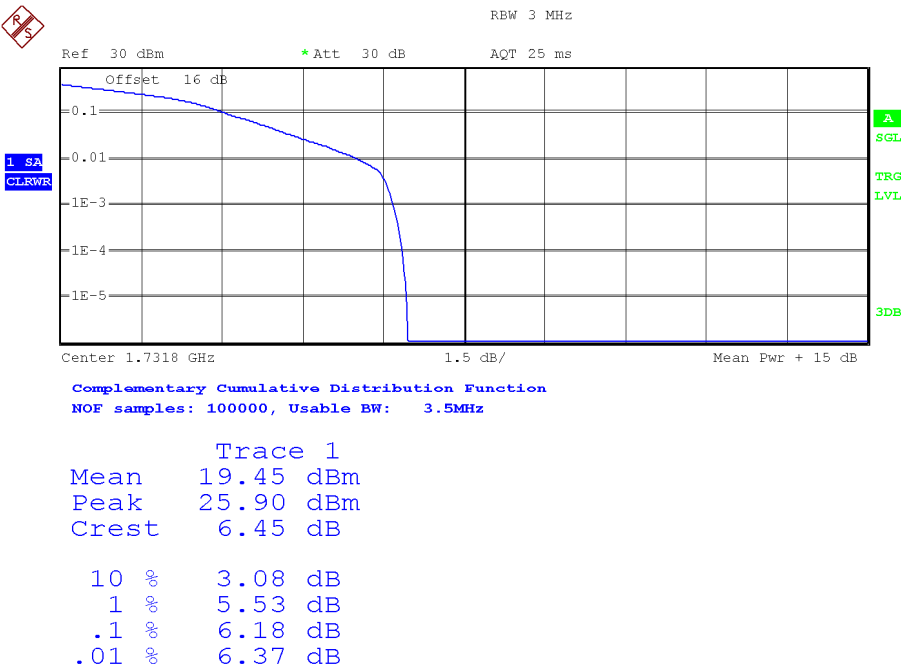


Bandwidth = 5 MHz. Modulation 16 QAM. Modulation bandwidth: 2. RB Size: 5. RB Offset: 0.

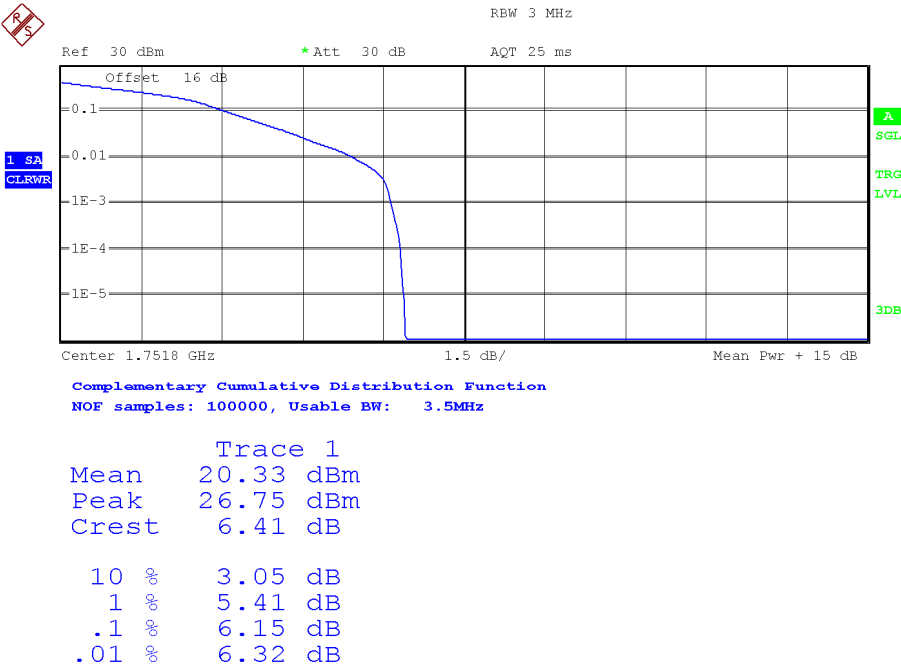
Channel Low:



Channel Middle:

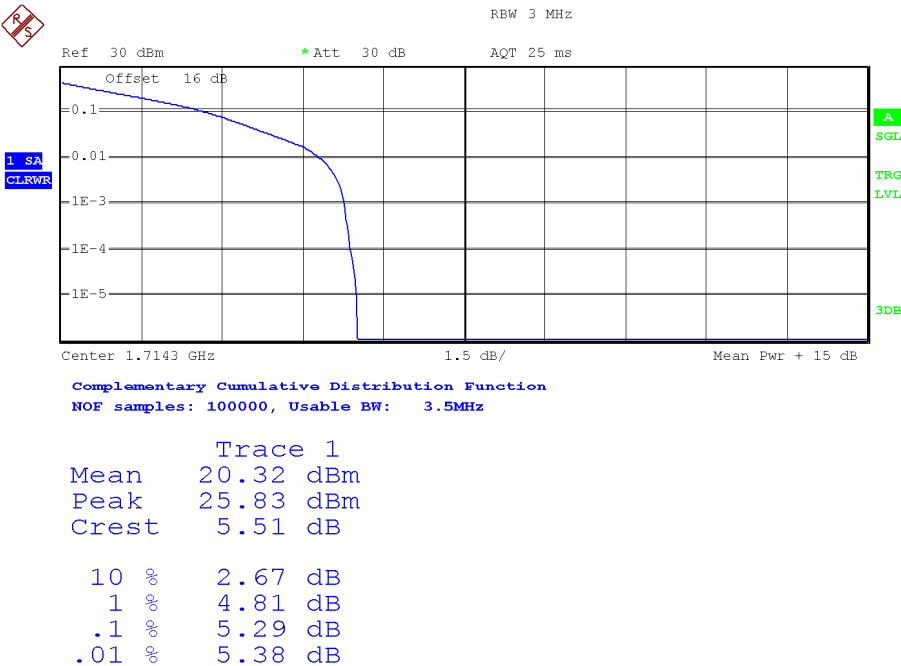


Channel High:

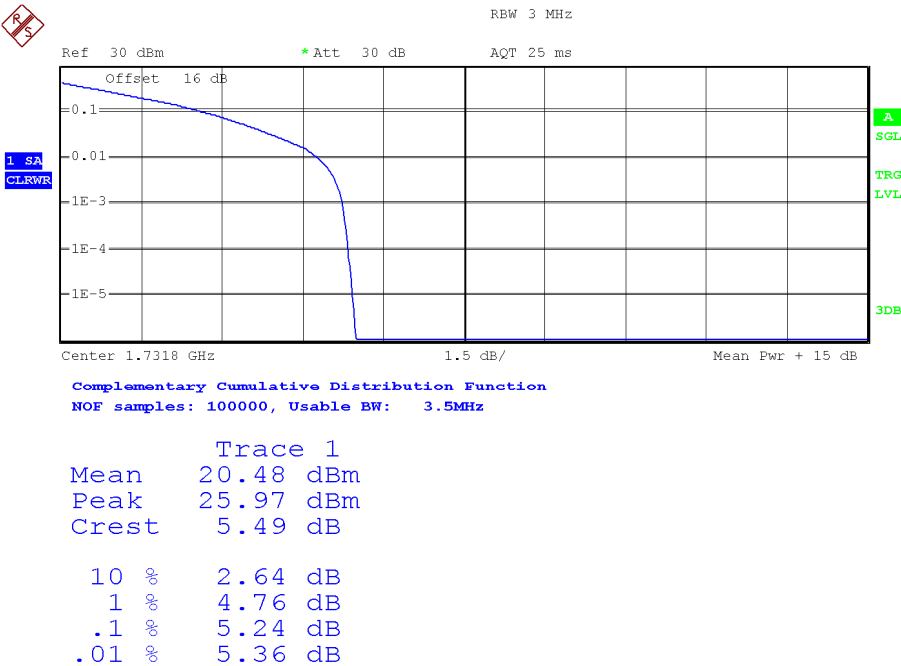


Bandwidth = 10 MHz. Modulation QPSK. Modulation bandwidth: 4. RB Size: 6. RB Offset: 0

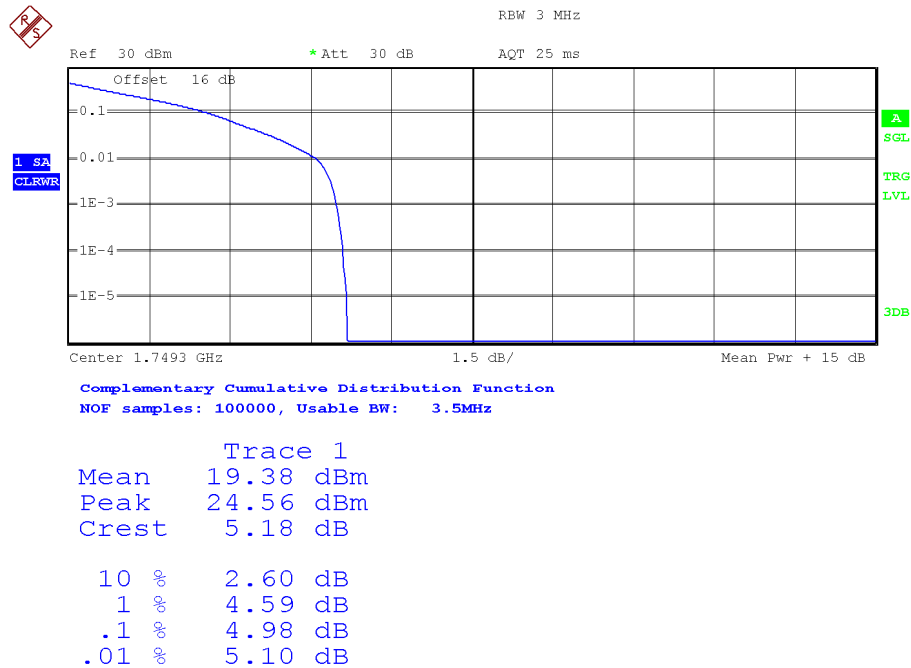
Channel Low:



Channel Middle:

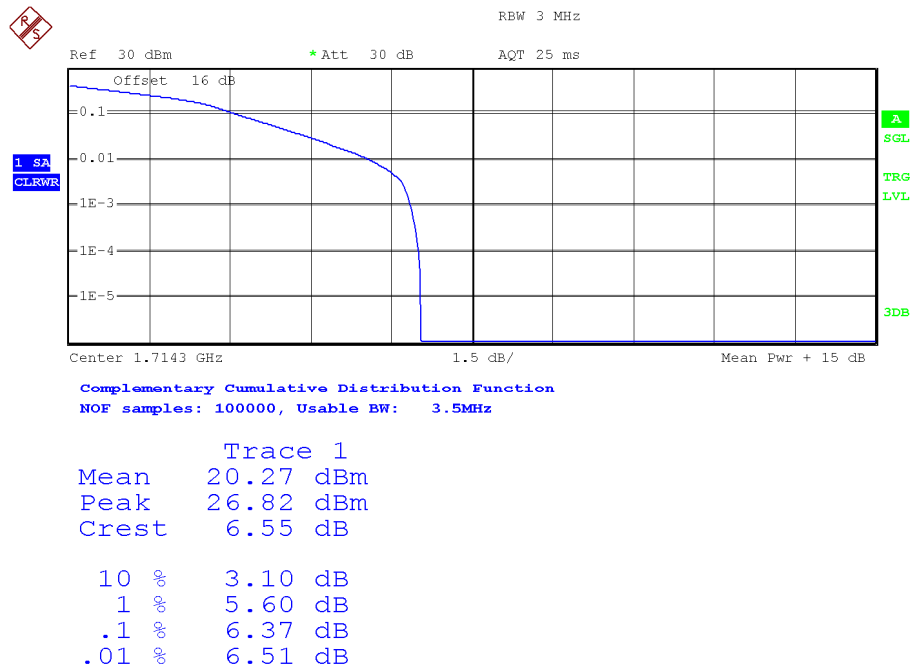


Channel High:

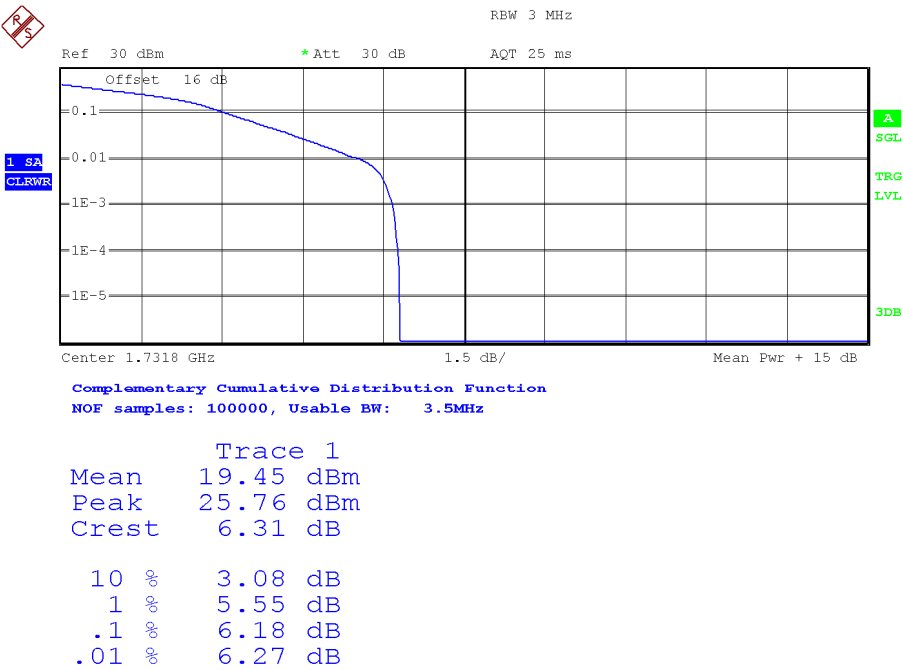


Bandwidth = 10 MHz. Modulation 16 QAM. Modulation bandwidth: 4. RB Size: 5. RB Offset: 0.

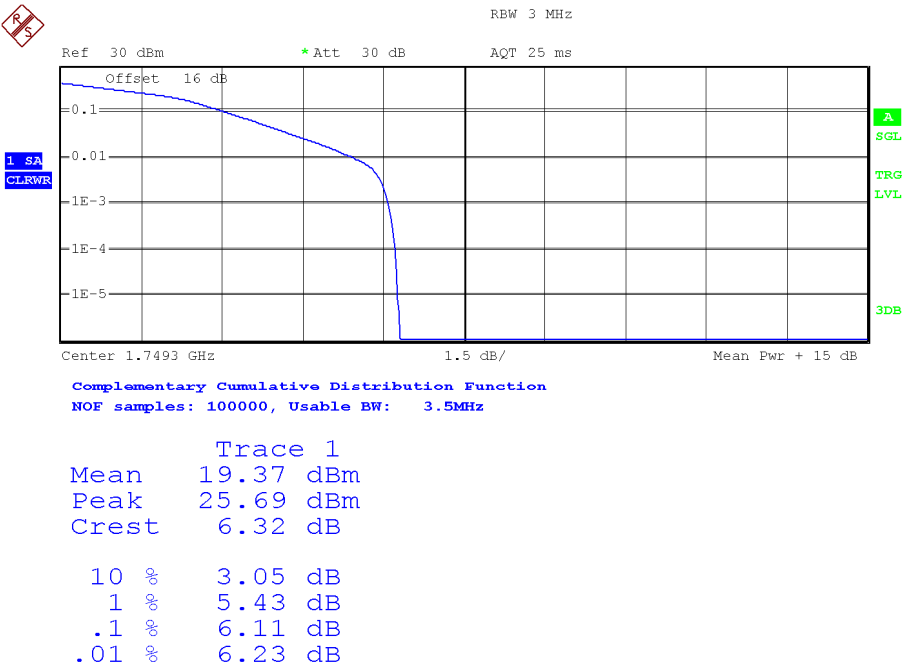
Channel Low:



Channel Middle:

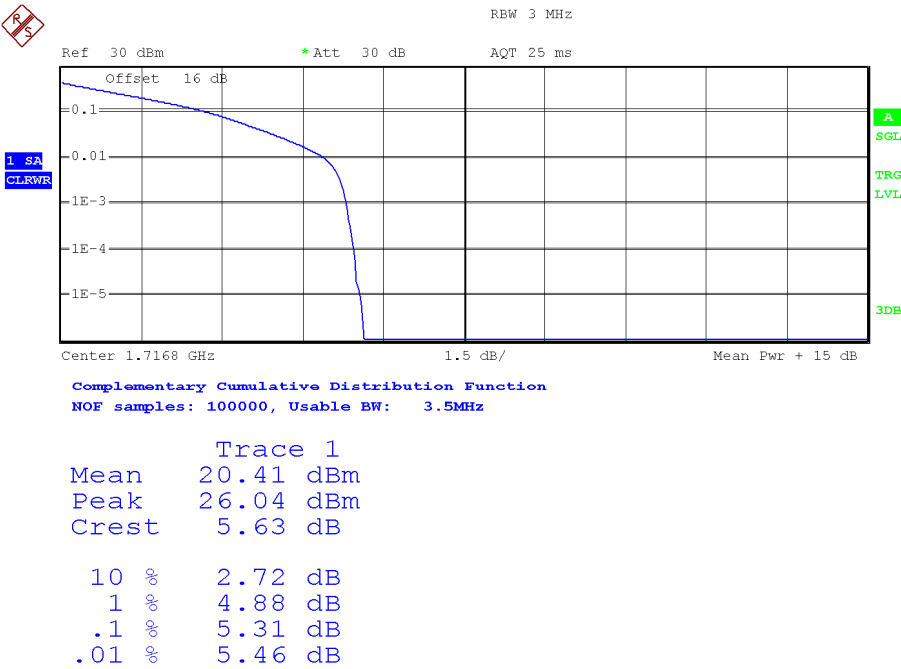


Channel High:

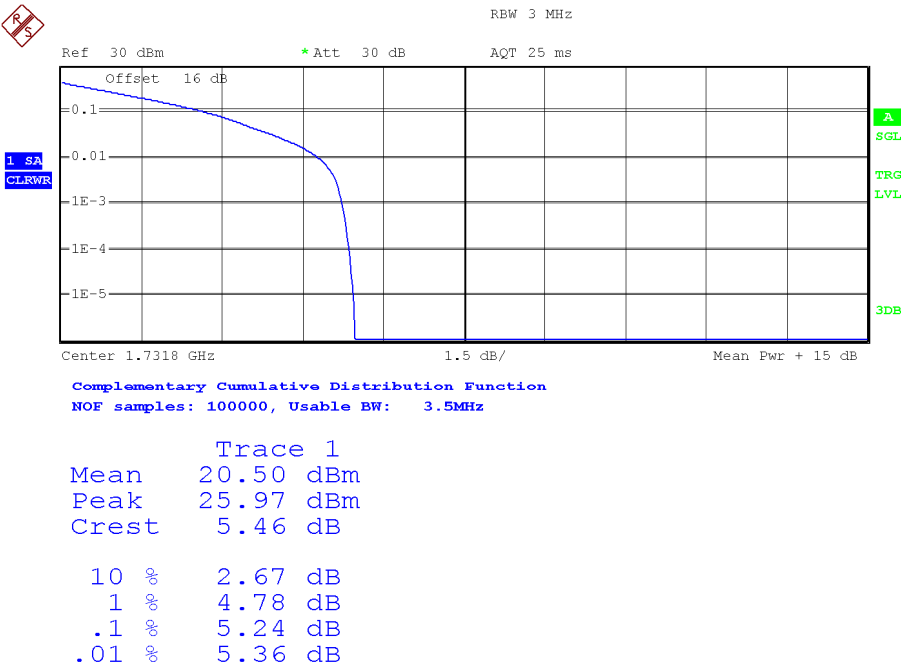


Bandwidth = 15 MHz. Modulation QPSK. Modulation bandwidth: 6. RB Size: 6. RB Offset: 0.

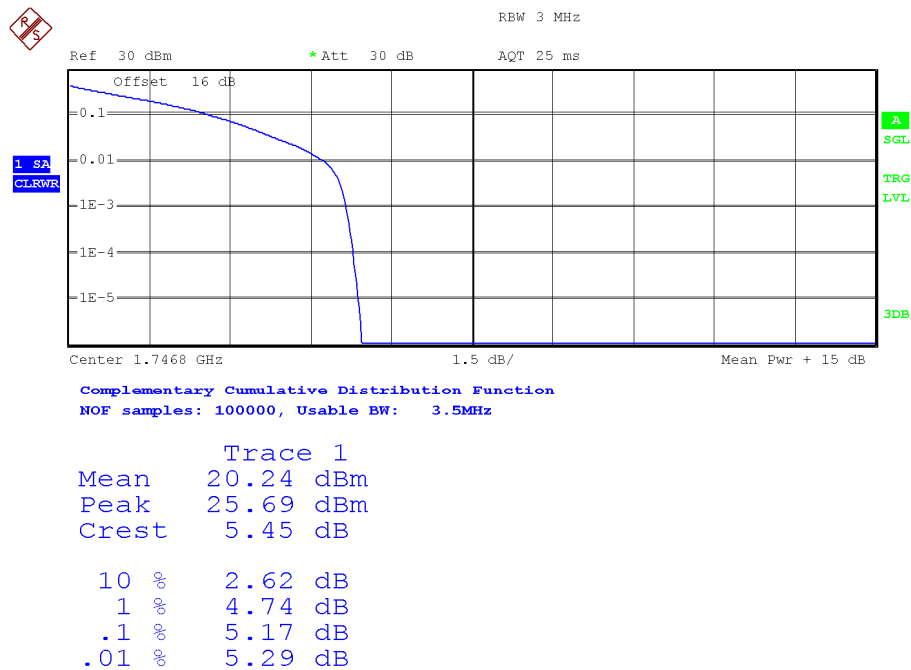
Channel Low:



Channel Middle:

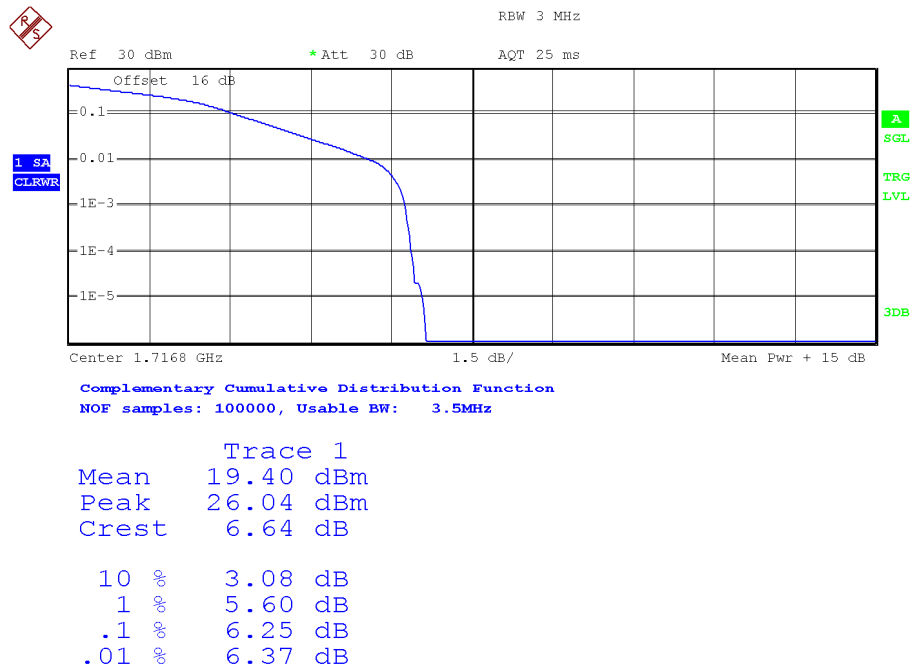


Channel High:

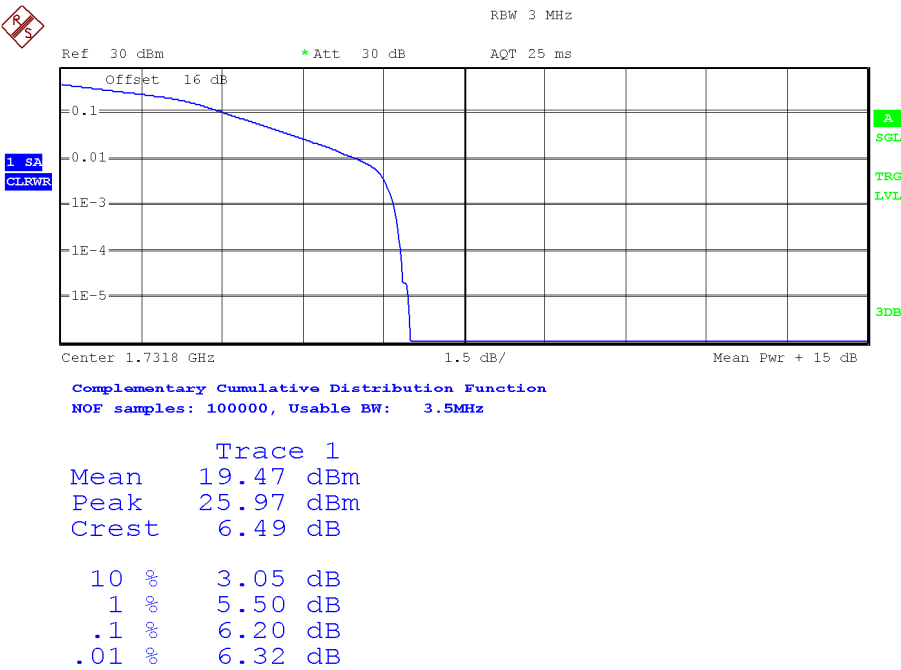


Bandwidth = 15 MHz. Modulation 16 QAM. Modulation bandwidth: 6. RB Size: 5. RB Offset: 0.

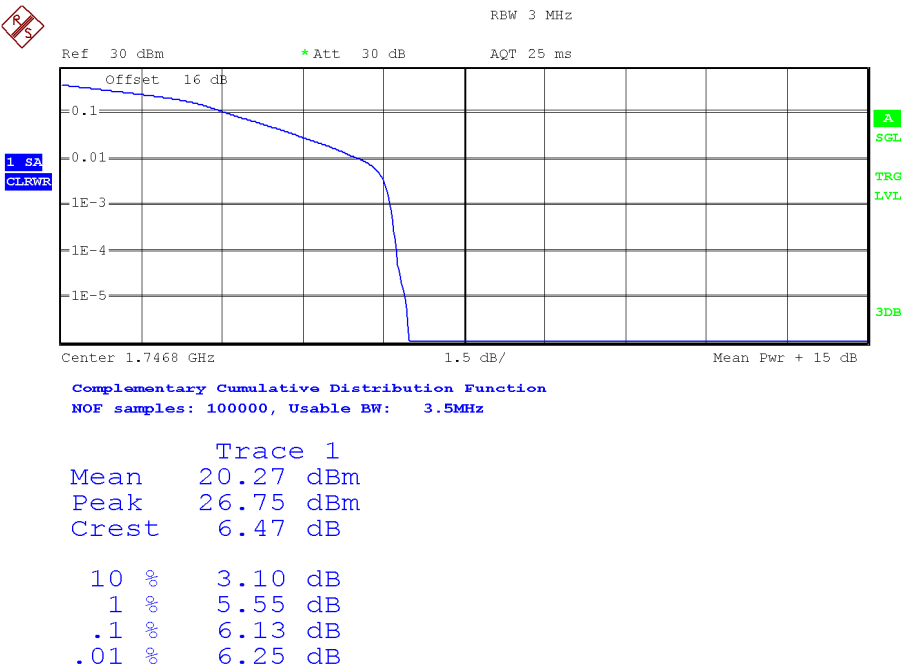
Channel Low:



Channel Middle:

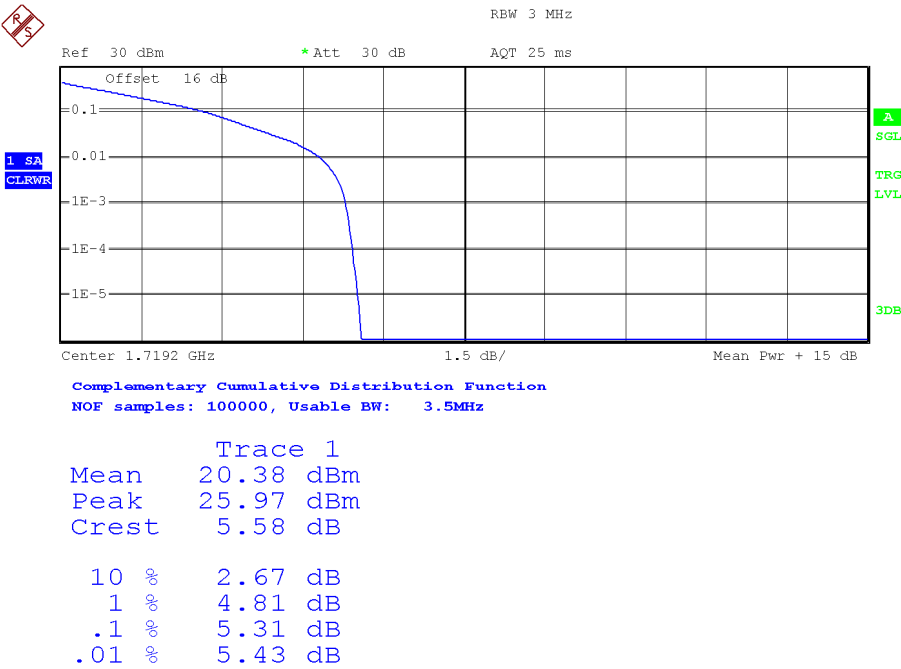


Channel High:

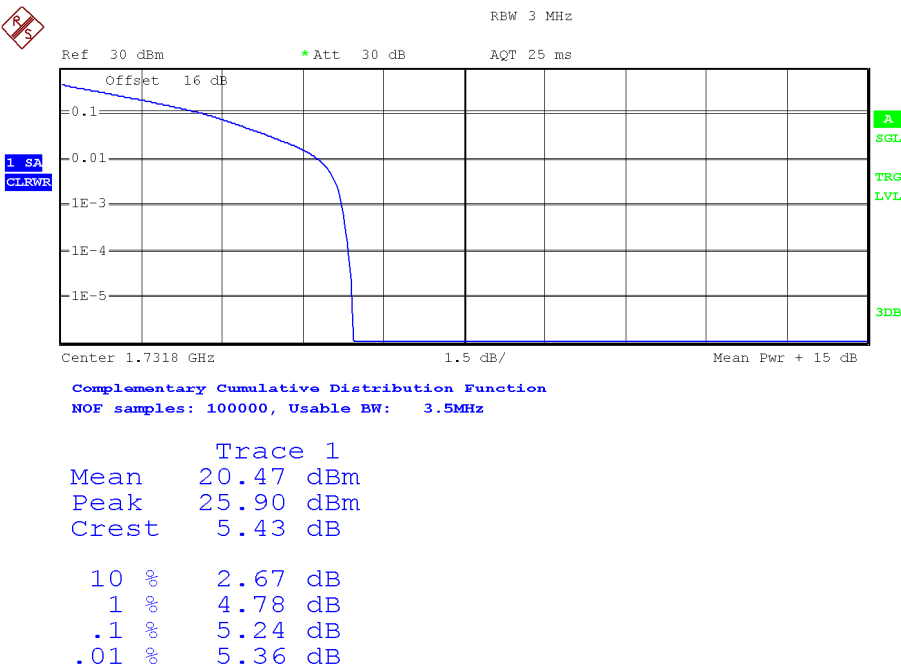


Bandwidth = 20 MHz. Modulation QPSK. Modulation bandwidth: 8. RB Size: 6. RB Offset: 0.

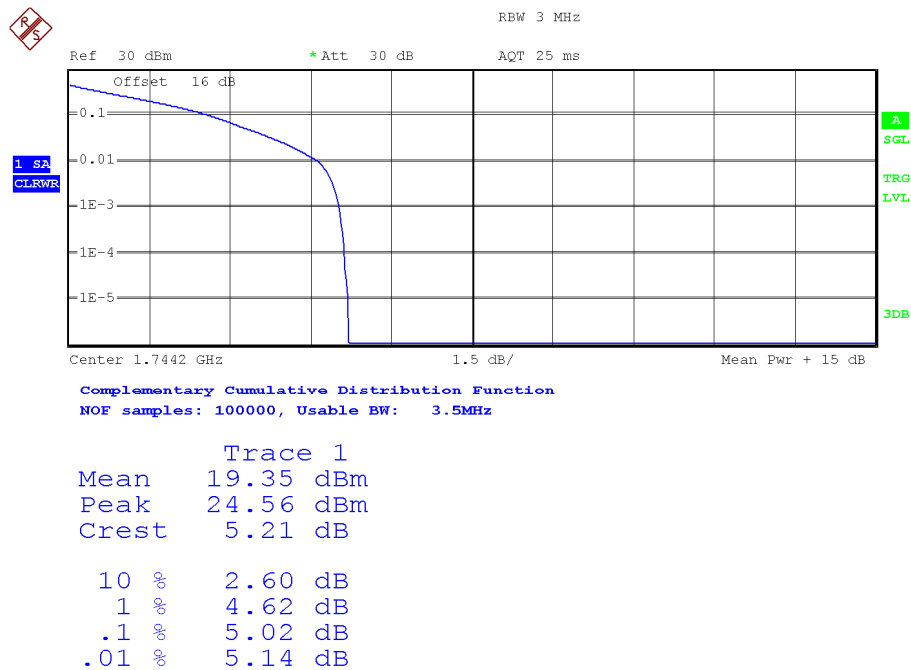
Channel Low:



Channel Middle:

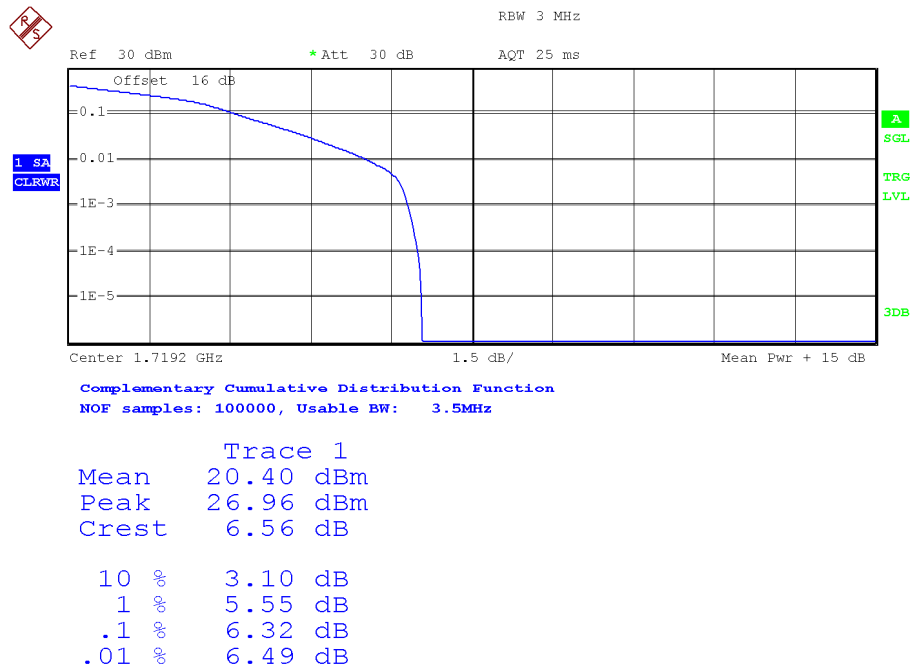


Channel High:

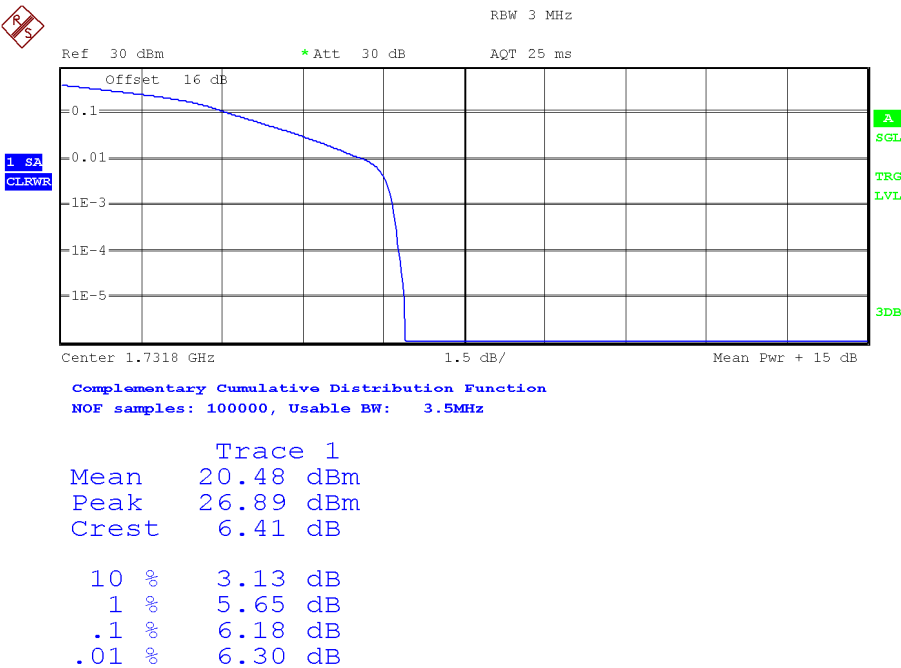


Bandwidth = 20 MHz. Modulation 16 QAM. Modulation bandwidth: 6. RB Size: 5. RB Offset: 0.

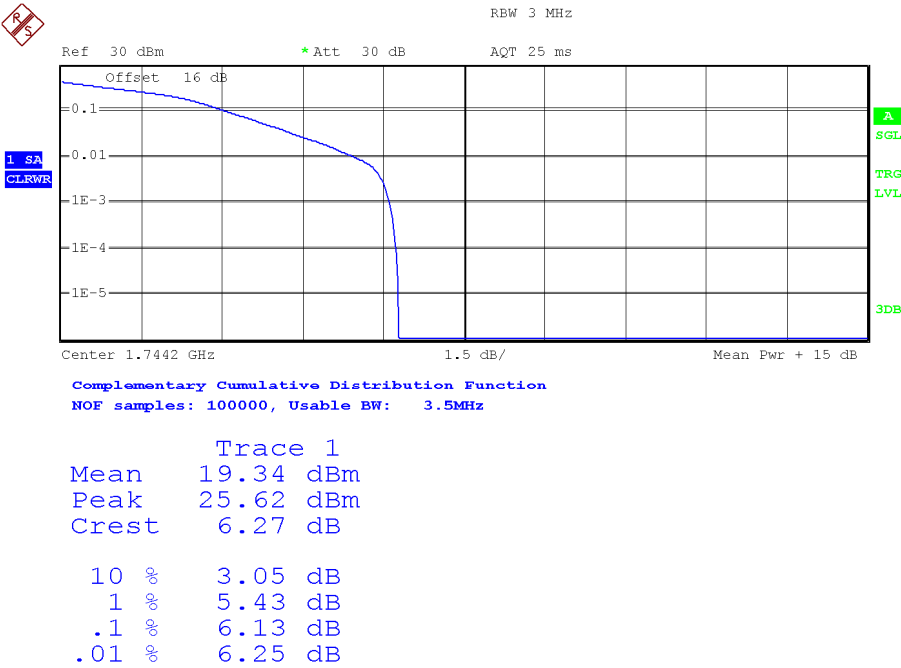
Channel Low:



Channel Middle:

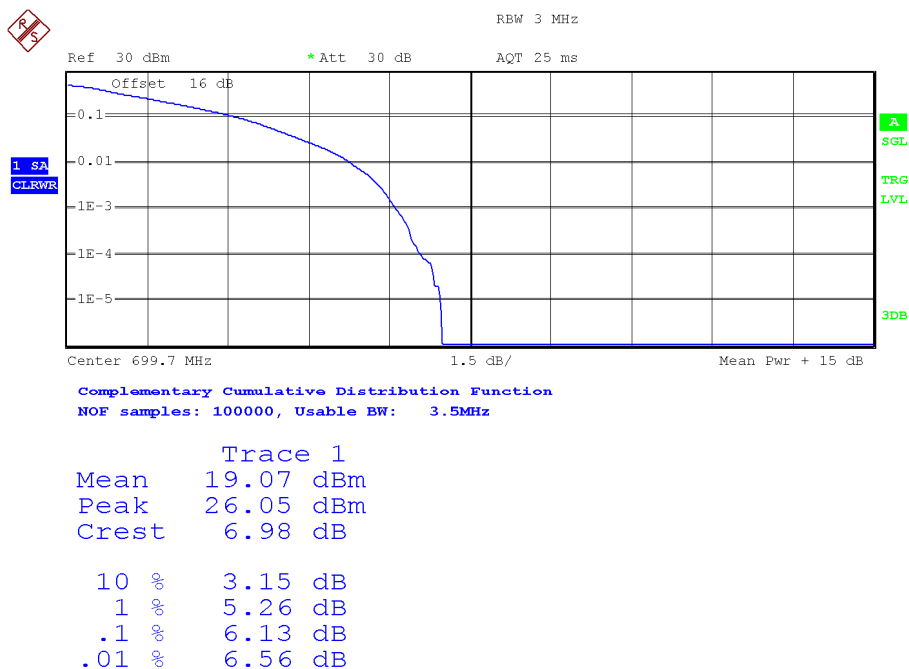


Channel High:

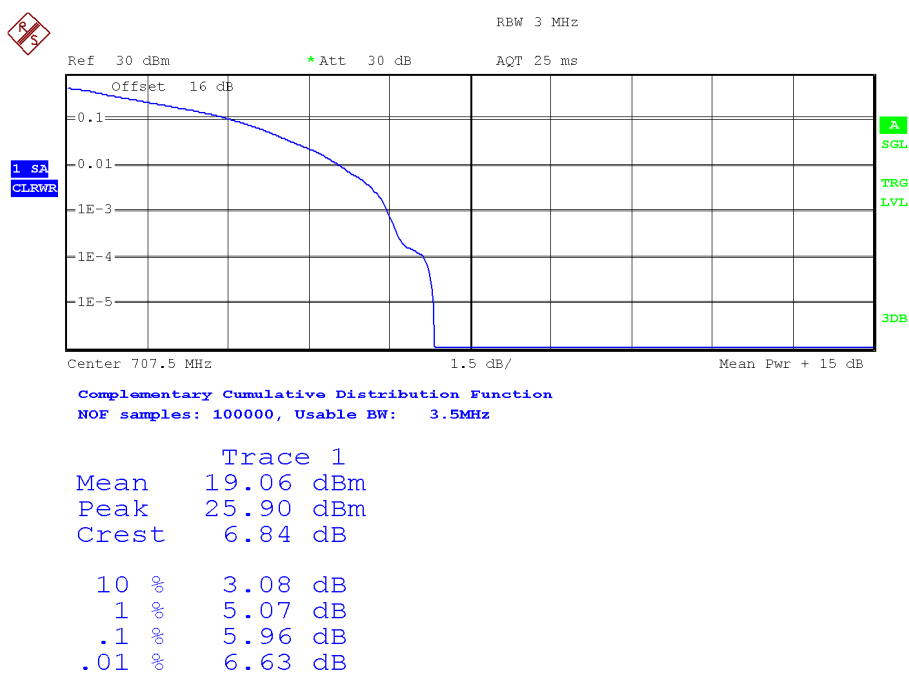


LTE. BAND XII.

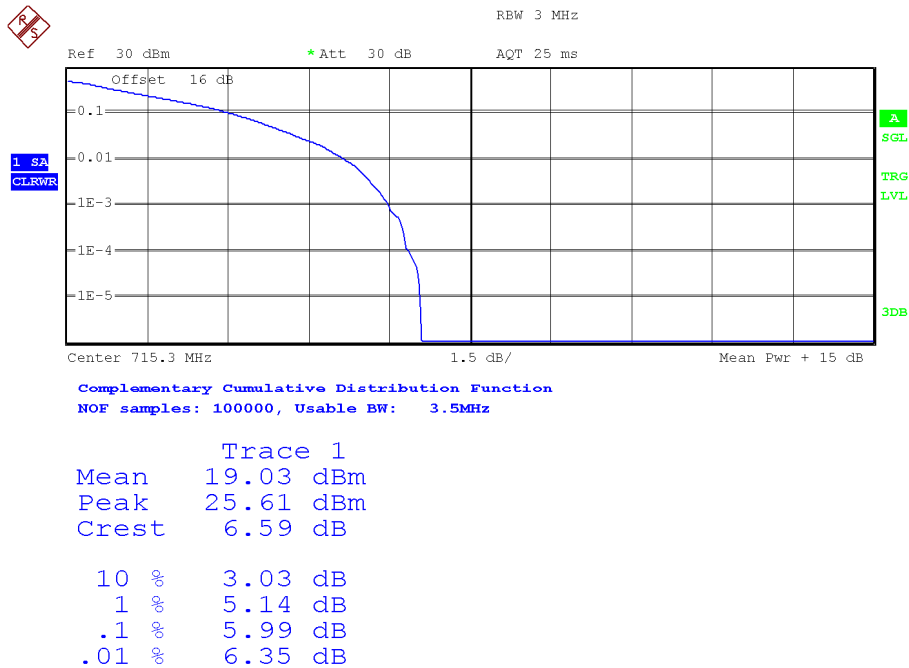
Bandwidth = 1.4 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.
Channel Low:



Channel Middle:

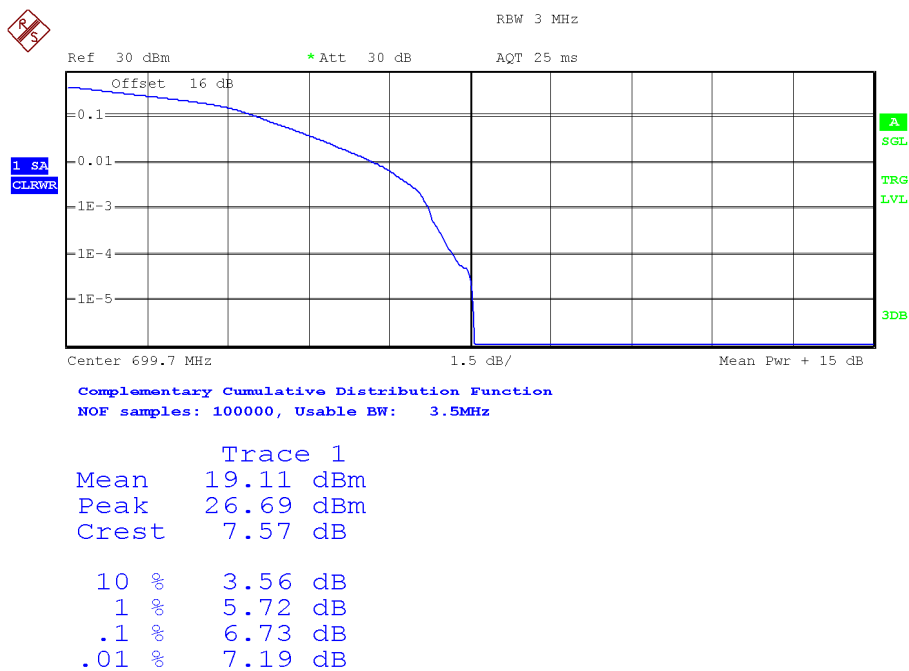


Channel High:

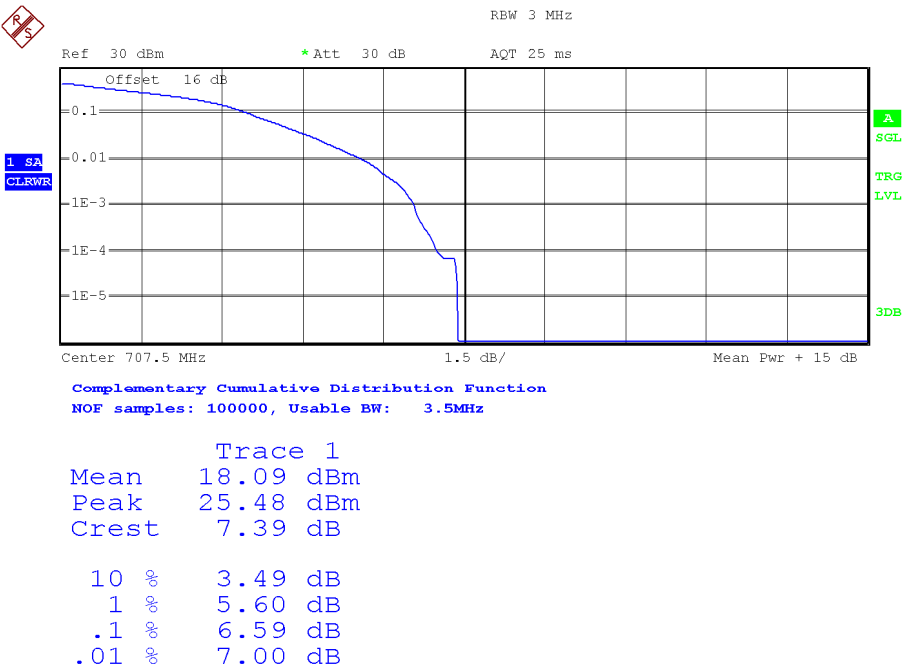


Bandwidth = 1.4 MHz. Modulation 16 QAM. Modulation bandwidth: 1. RB Size: 5. RB Offset: 0.

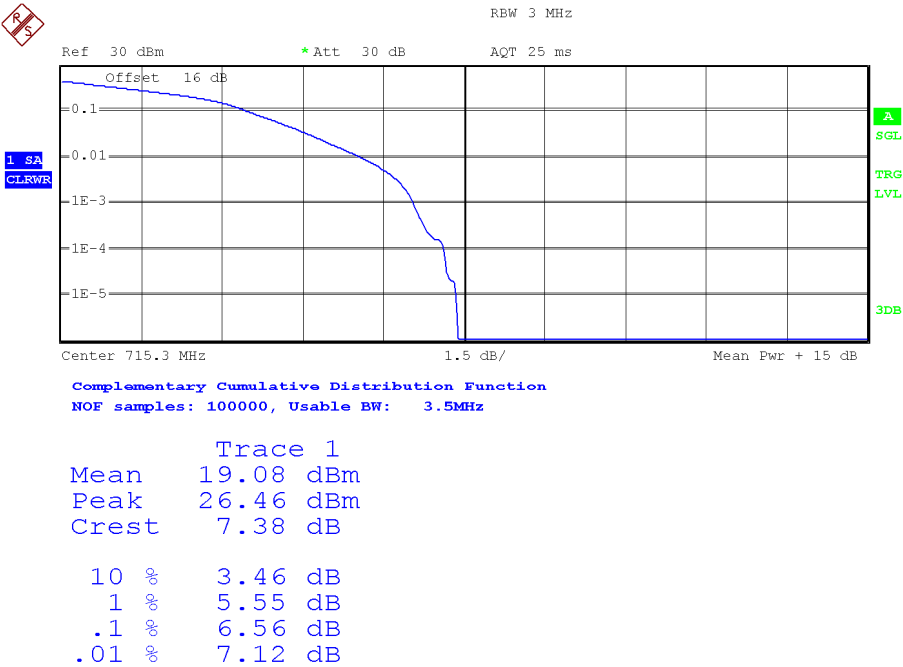
Channel Low:



Channel Middle:

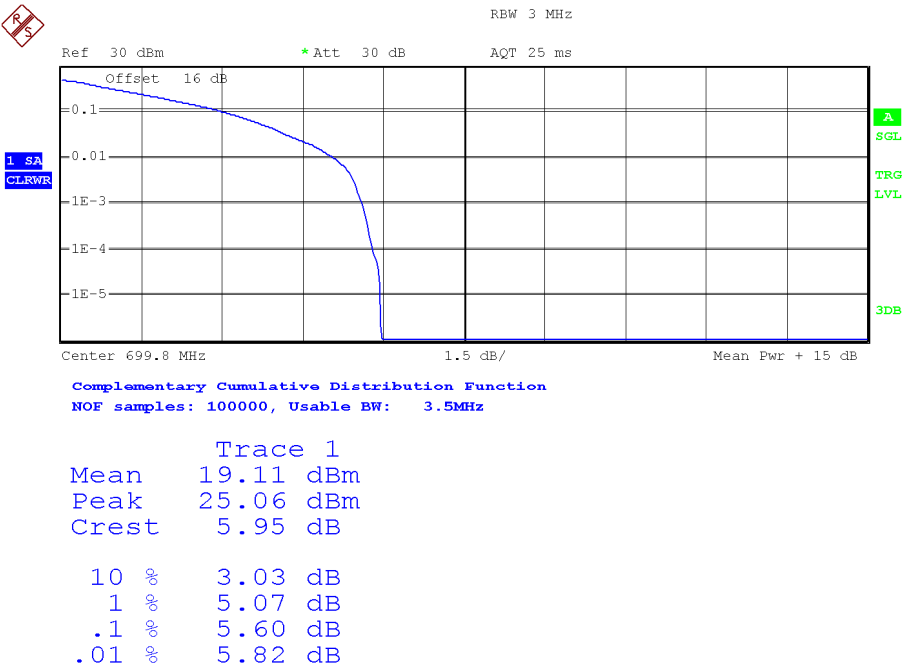


Channel High:

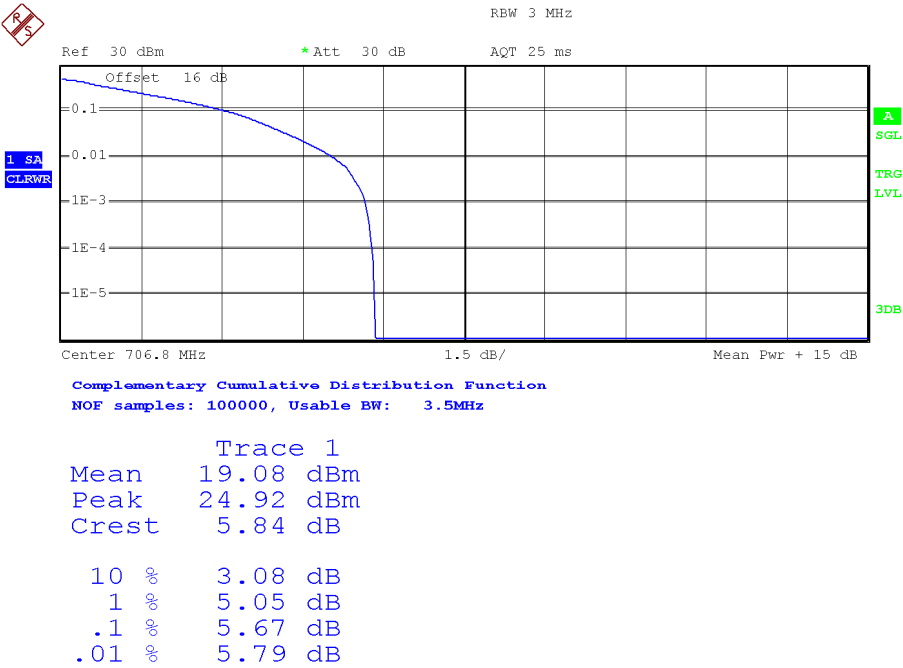


Bandwidth = 3 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.

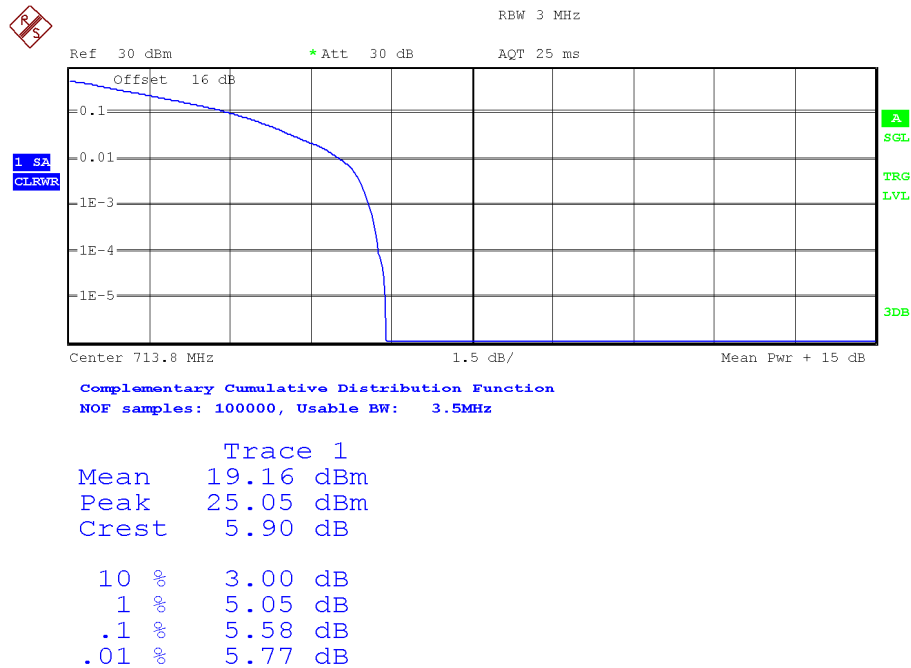
Channel Low:



Channel Middle:

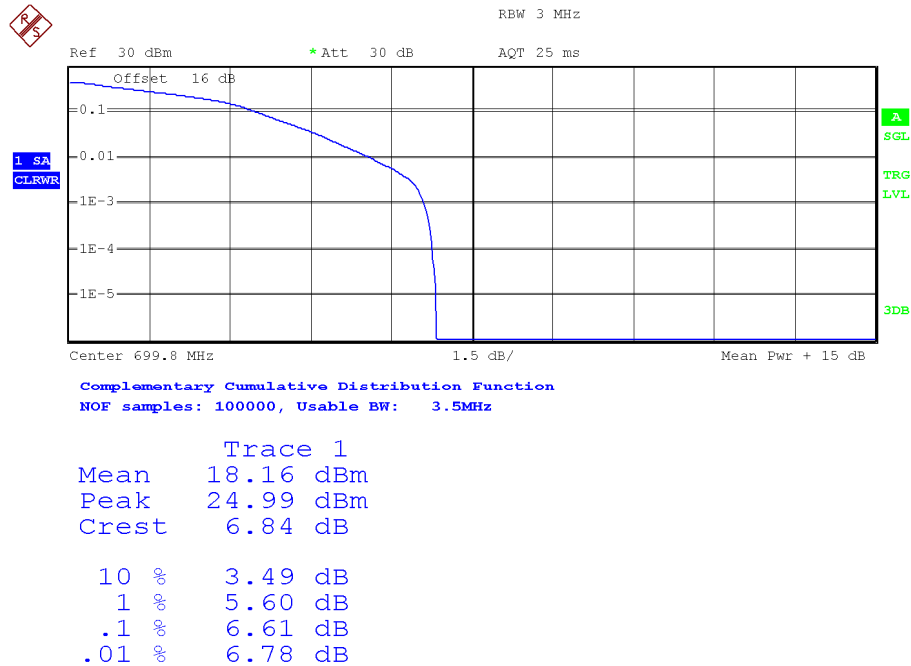


Channel High:

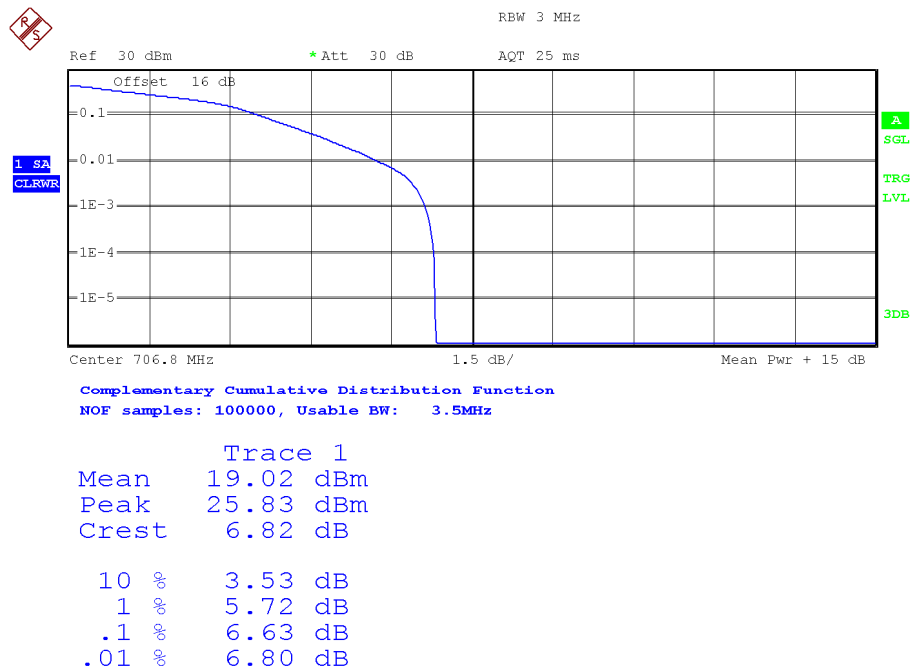


Bandwidth = 3 MHz. Modulation 16 QAM. Modulation bandwidth: 1. RB Size: 5. RB Offset: 0.

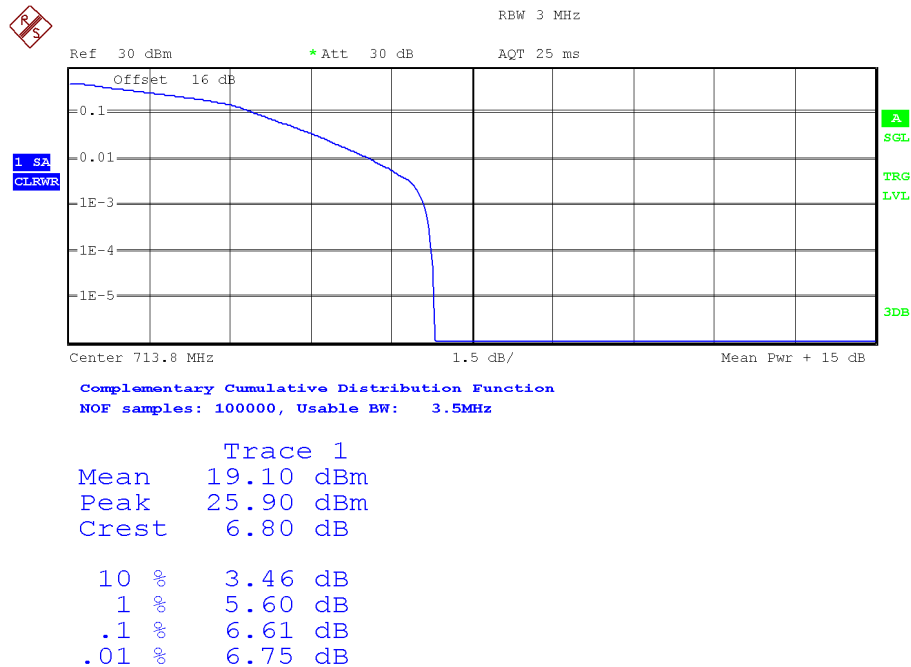
Channel Low:



Channel Middle:

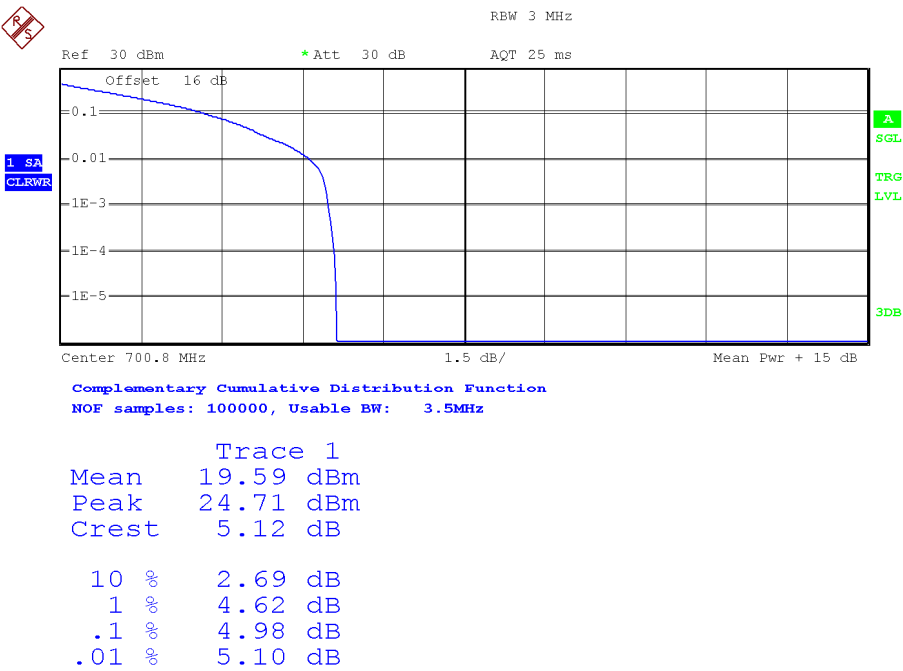


Channel High:

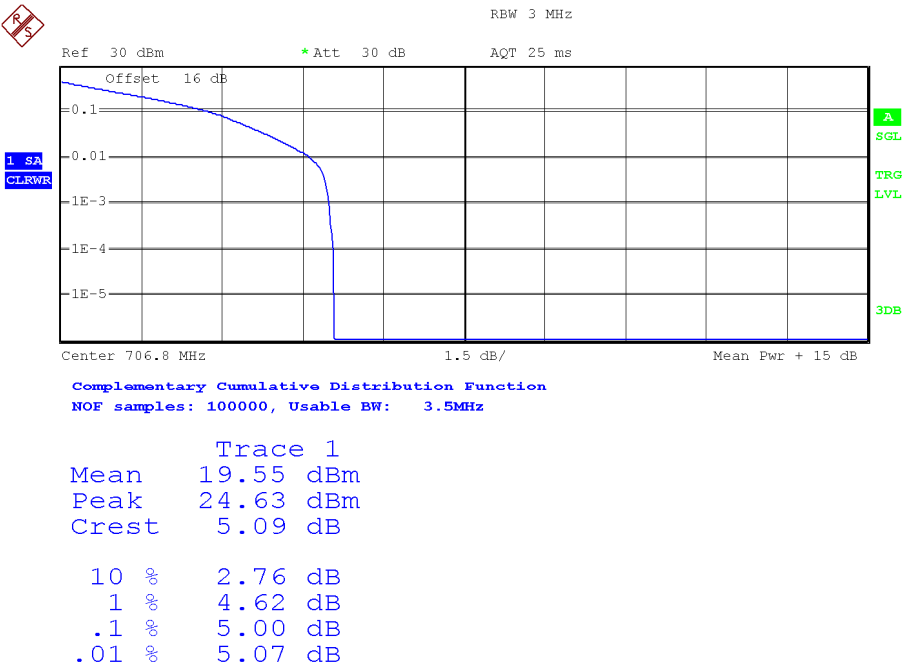


Bandwidth = 5 MHz. Modulation QPSK. Modulation bandwidth: 2. RB Size: 6. RB Offset: 0.

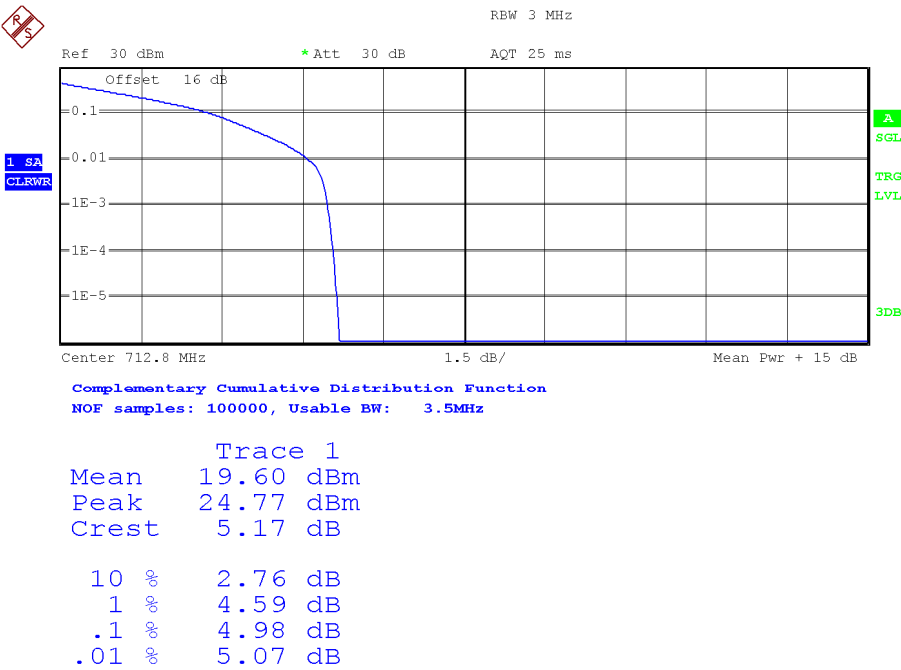
Channel Low:



Channel Middle:

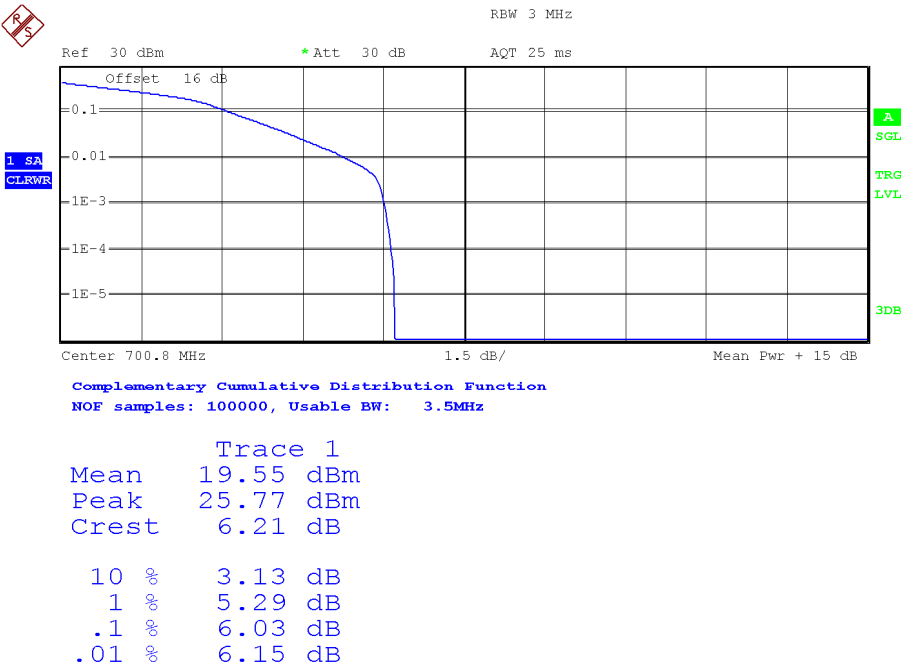


Channel High:

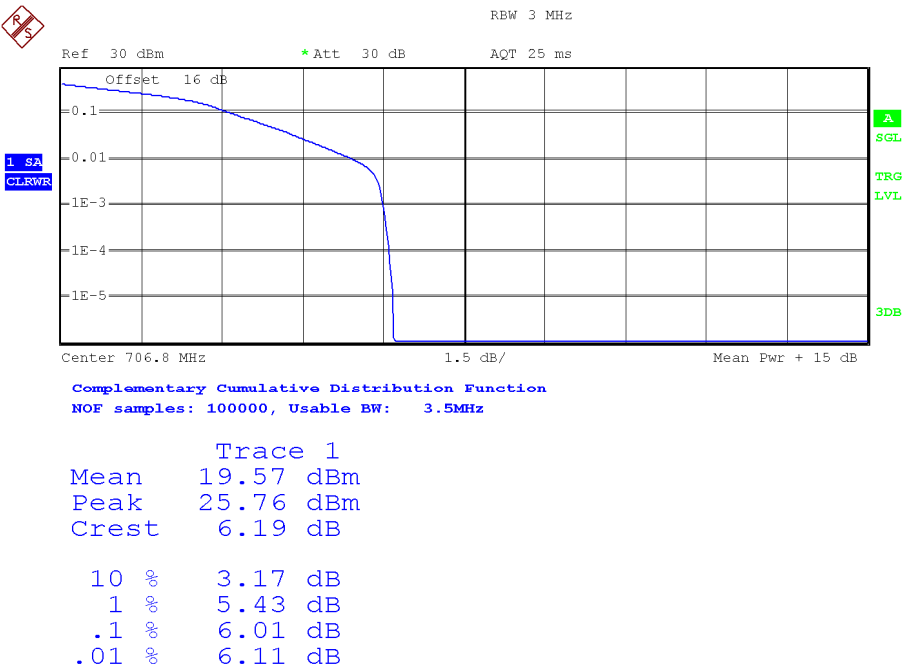


Bandwidth = 5 MHz. Modulation 16 QAM. Modulation bandwidth: 2. RB Size: 5. RB Offset: 0.

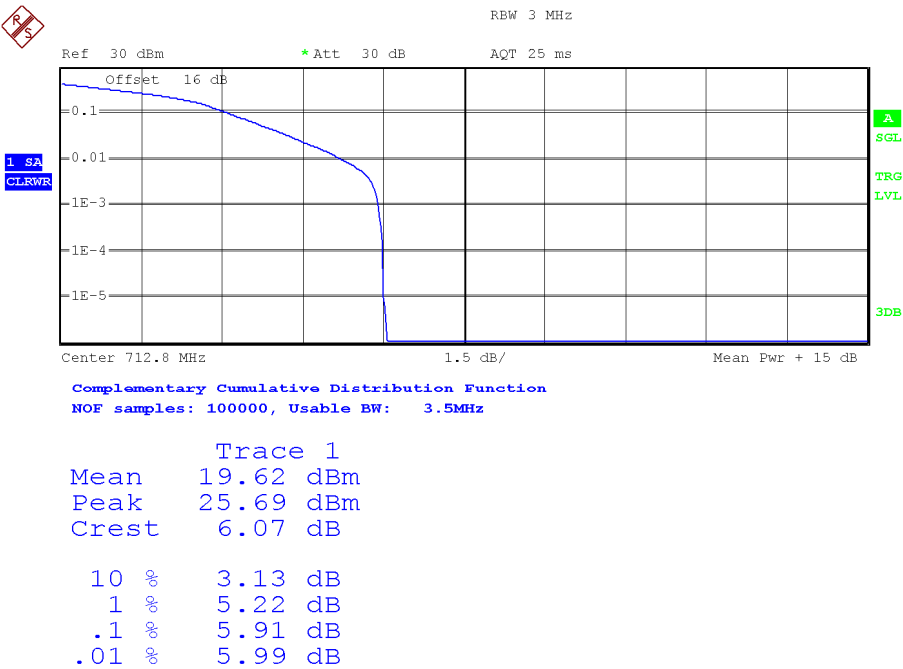
Channel Low:



Channel Middle:

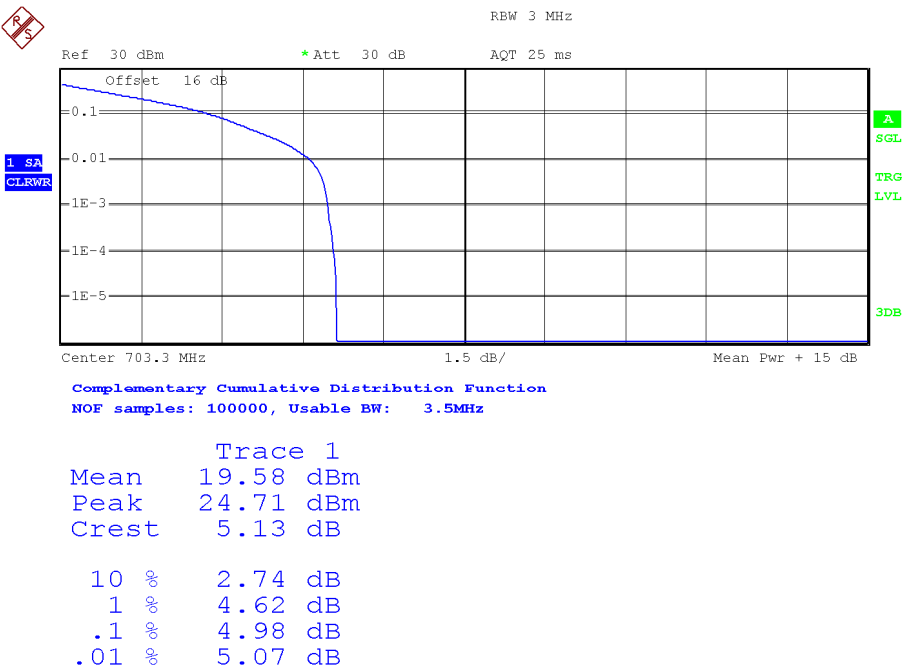


Channel High:

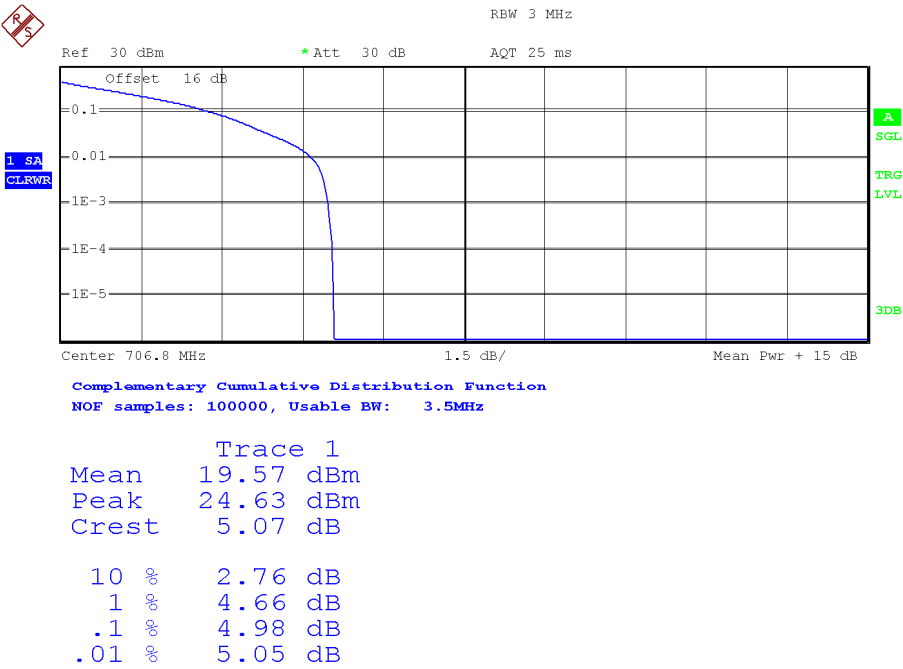


Bandwidth = 10 MHz. Modulation QPSK. Modulation bandwidth: 4. RB Size: 6. RB Offset: 0

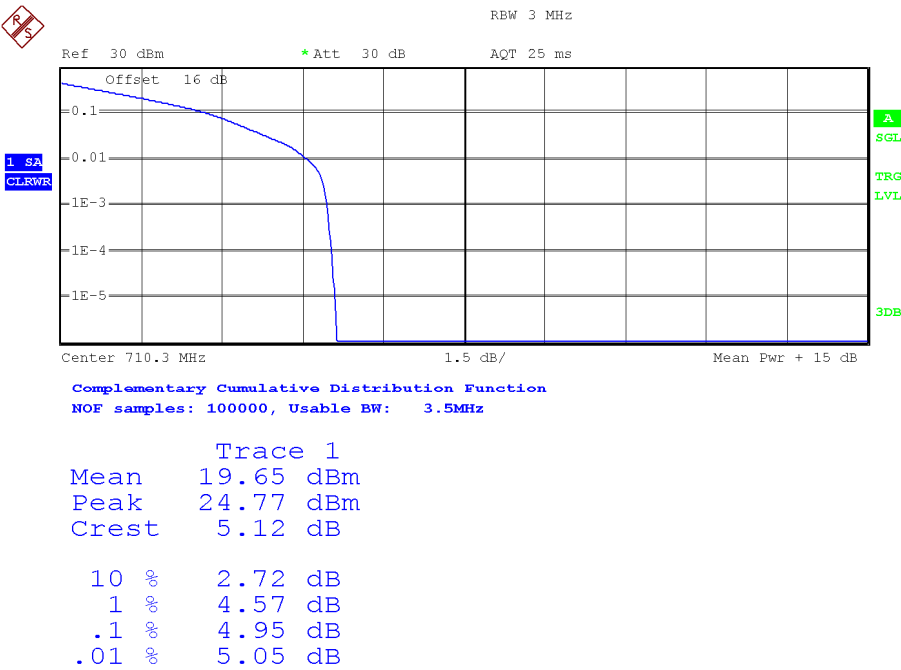
Channel Low:



Channel Middle:

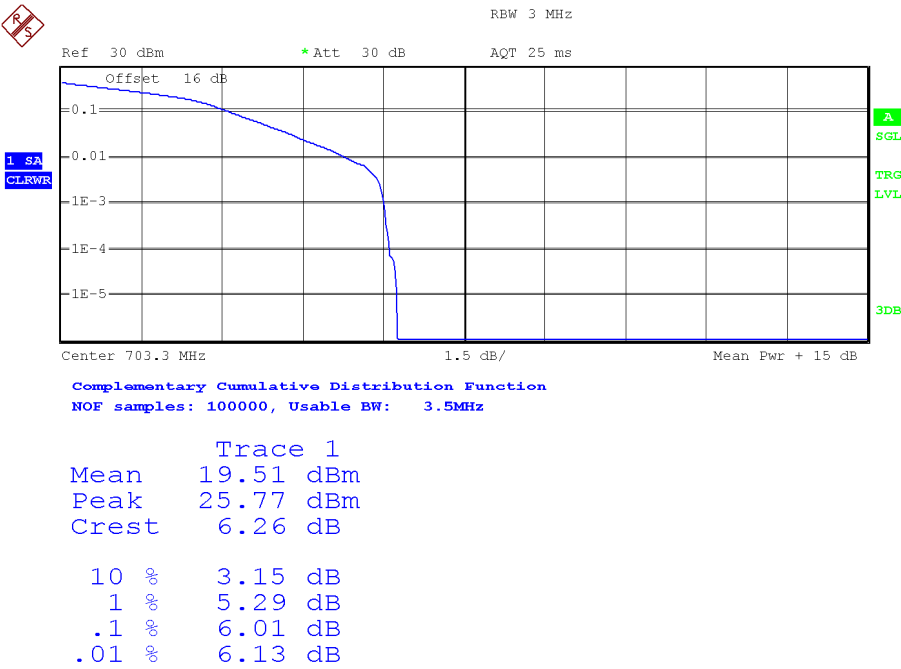


Channel High:

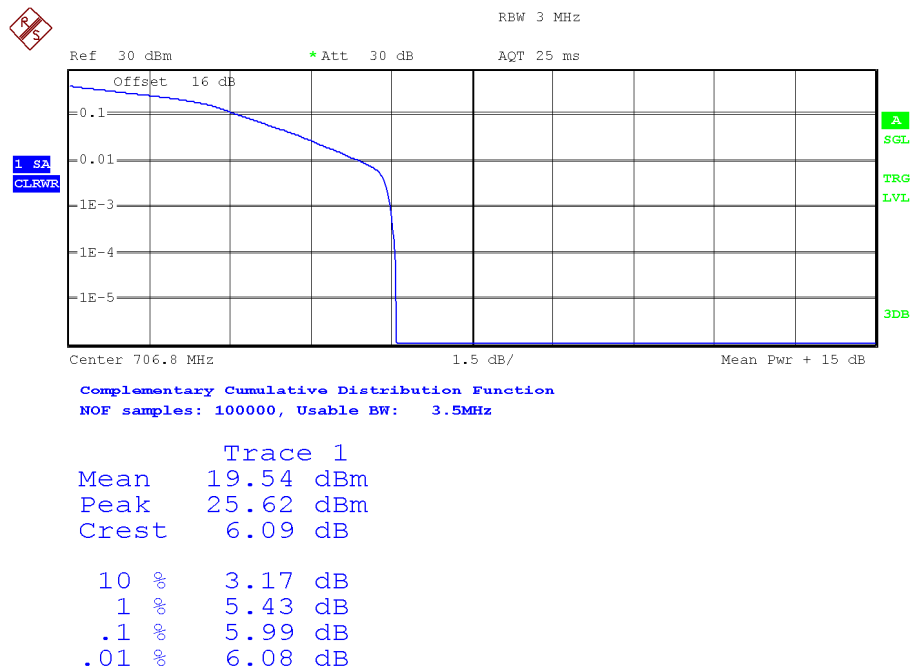


Bandwidth = 10 MHz. Modulation 16 QAM. Modulation bandwidth: 4. RB Size: 5. RB Offset: 0.

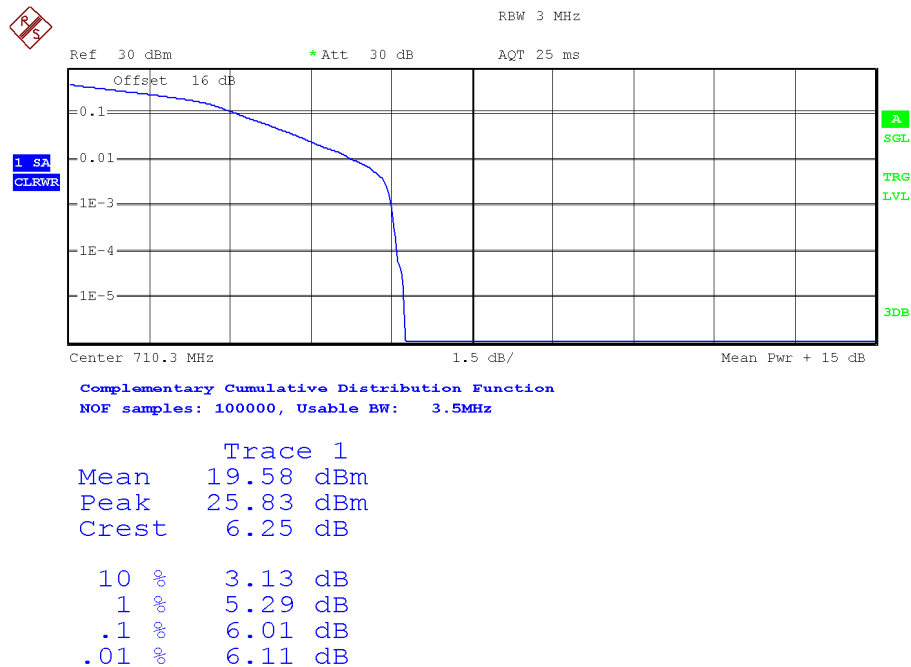
Channel Low:



Channel Middle:



Channel High:



LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 1.4 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.33	2.3	25.63	6.92
Middle	23.51	2.3	25.81	7.02
Highest	23.25	2.3	25.55	6.68
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 3 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.03	2.3	25.33	6.97
Middle	23.57	2.3	25.87	6.63
Highest	23.58	2.3	25.88	6.68
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 5 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.19	2.3	25.49	6.23
Middle	23.49	2.3	25.79	6.18
Highest	23.38	2.3	25.68	6.15
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 10 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.23	2.3	25.53	6.37
Middle	23.42	2.3	25.72	6.18
Highest	23.42	2.3	25.72	6.11
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 15 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.31	2.3	25.61	6.25
Middle	23.51	2.3	25.81	6.2
Highest	23.38	2.3	25.68	6.13
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND IV. Bandwidth = 20 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	PAPR (dB)
Lowest	23.38	2.3	25.68	6.32
Middle	23.54	2.3	25.84	6.18
Highest	23.53	2.3	25.83	6.13
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND XII. Bandwidth = 1.4 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	Maximum effective radiated power E.R.P. (dBm)	PAPR (dB)
Lowest	23.57	2.3	25.87	23.72	6.73
Middle	23.49	2.3	25.79	23.64	6.59
Highest	23.4	2.3	25.7	23.55	6.56
Measurement uncertainty (dB)	<±1.11				

LTE QPSK AND 16QAM MODULATION. BAND XII. Bandwidth = 3 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	Maximum effective radiated power E.R.P. (dBm)	PAPR (dB)
Lowest	24.45	2.3	26.75	24.6	6.61
Middle	23.42	2.3	25.72	23.57	6.63
Highest	23.37	2.3	25.67	23.52	6.61
Measurement uncertainty (dB)	<±1.11				

LTE QPSK AND 16QAM MODULATION. BAND XII. Bandwidth = 5 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	Maximum effective radiated power E.R.P. (dBm)	PAPR (dB)
Lowest	23.5	2.3	25.8	23.65	6.03
Middle	23.52	2.3	25.82	23.67	6.01
Highest	23.3	2.3	25.6	23.45	5.91
Measurement uncertainty (dB)	<±1.11				

LTE QPSK AND 16QAM MODULATION. BAND XII. Bandwidth = 10 MHz

Channel	Measured maximum average power (dBm) at antenna port	Maximum declared antenna gain (dBi)	Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	Maximum effective radiated power E.R.P. (dBm)	PAPR (dB)
Lowest	23.39	2.3	25.69	23.54	6.01
Middle	23.32	2.3	25.62	23.47	5.99
Highest	23.47	2.3	25.77	23.62	6.01
Measurement uncertainty (dB)	<±1.11				

Verdict: PASS

Modulation Characteristics

SPECIFICATION

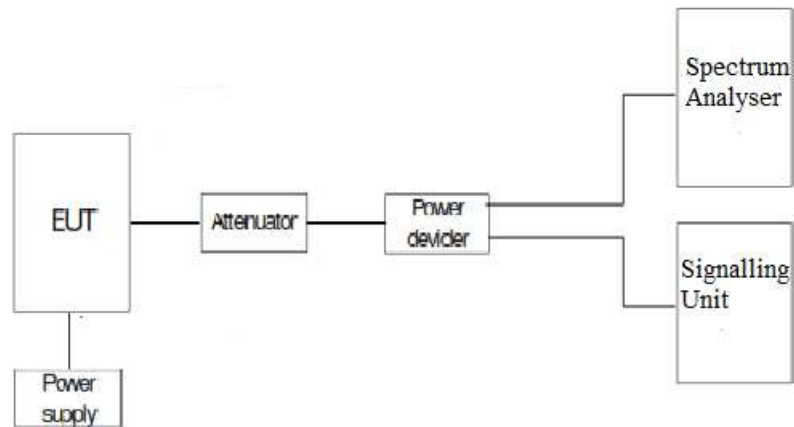
FCC §2.1047.

RSS-139. Clause 6.2. RSS-130. Clause 4.1. The devices shall employ digital modulation techniques.

METHOD

For LTE the EUT operates with QPSK and 16QAM modulation modes in which the information is digitised 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).

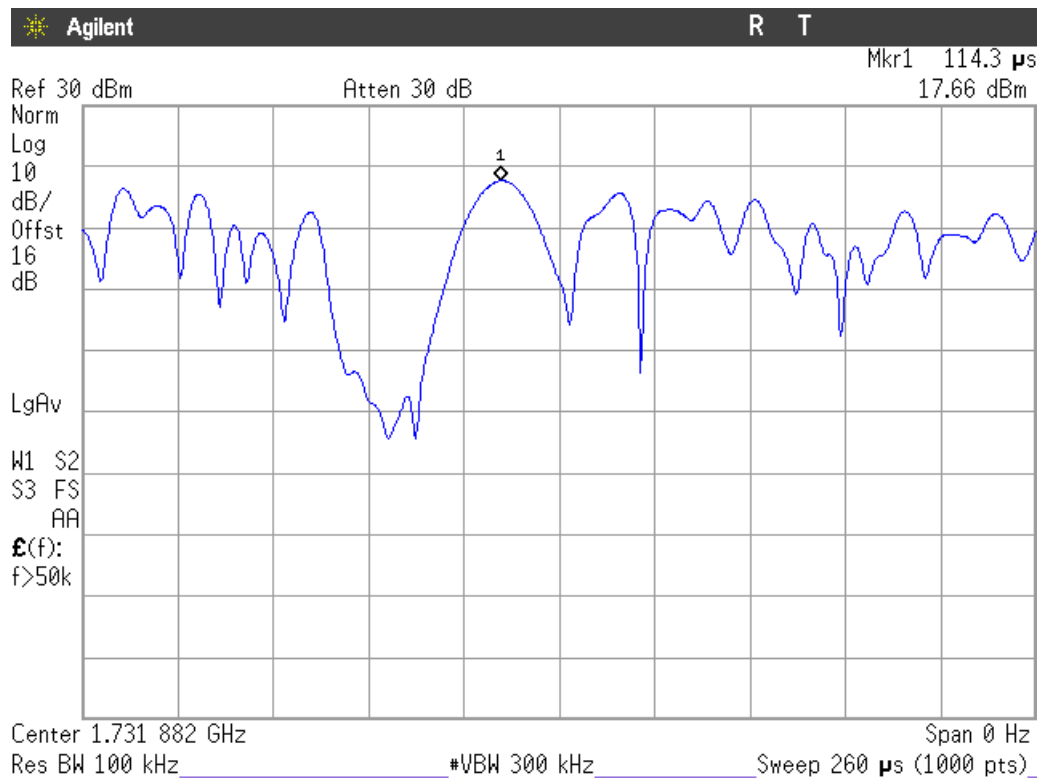
TEST SETUP



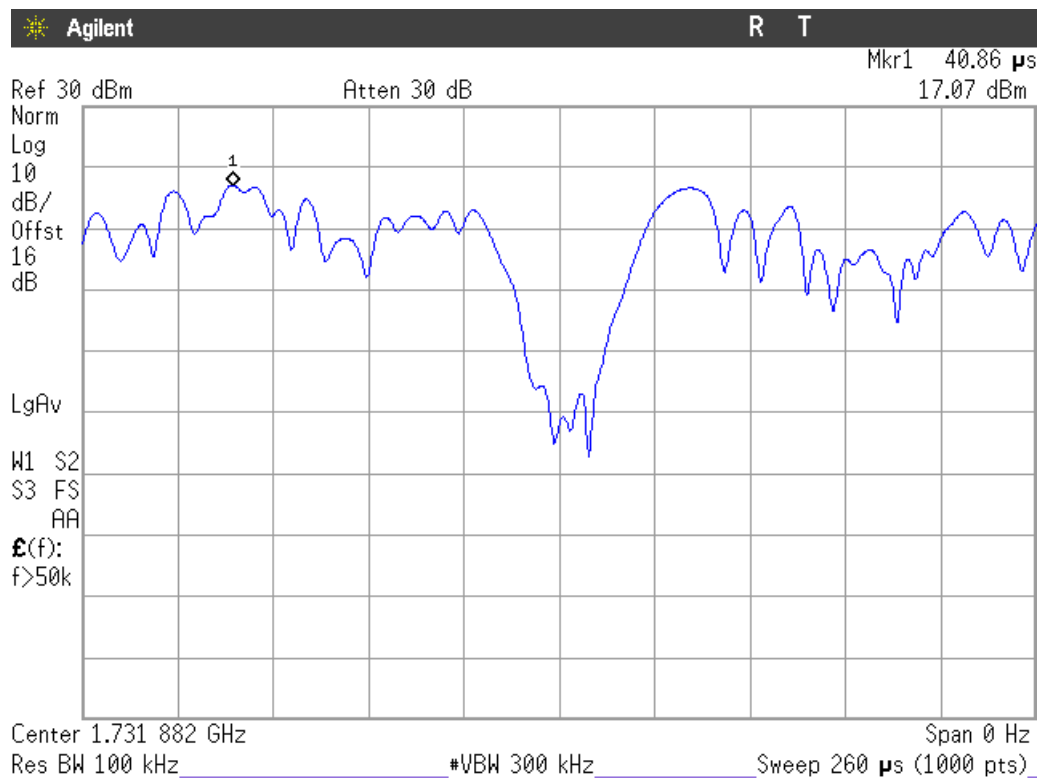
RESULTS

The following plots show the modulation schemes in the EUT.

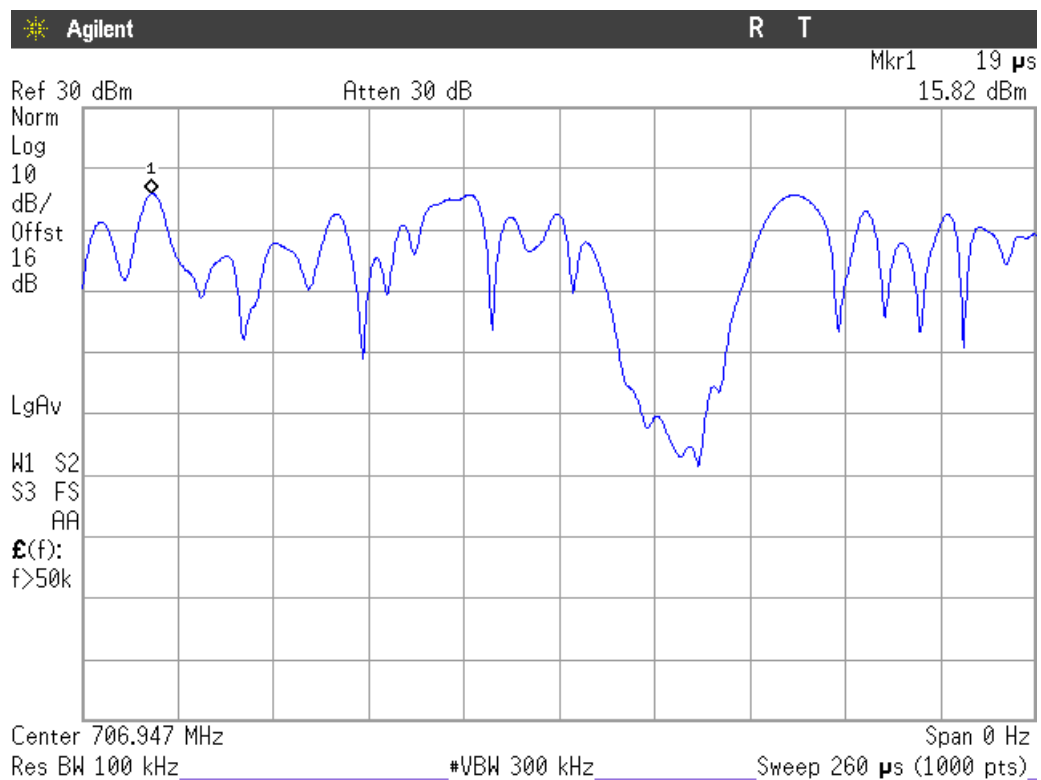
LTE MODULATION. QPSK. Band IV



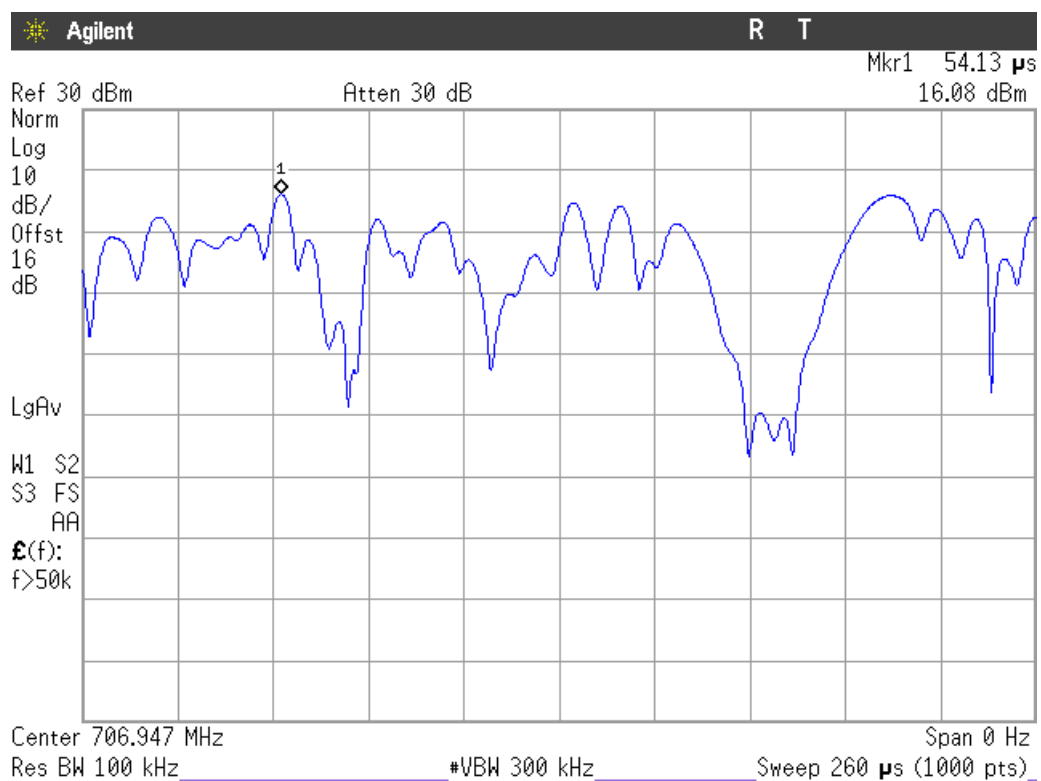
LTE MODULATION. 16QAM. Band IV



LTE MODULATION. QPSK. Band XII



LTE MODULATION. 16QAM. Band XII



Frequency Stability

SPECIFICATION

FCC §2.1055 and §27.54.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-139 Clause 6.4.

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations

RSS-130. Clause 4.3.

The applicant shall ensure frequency stability by showing that f_L minus the frequency offset and f_H plus the frequency offset shall be within the frequency range in which the equipment is designed to operate.

METHOD

The frequency tolerance measurements over temperature variations were made over the temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from -30°C up to $+50^{\circ}\text{C}$.

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

The EUT was set in “Radio Resource Control (RRC)” 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.

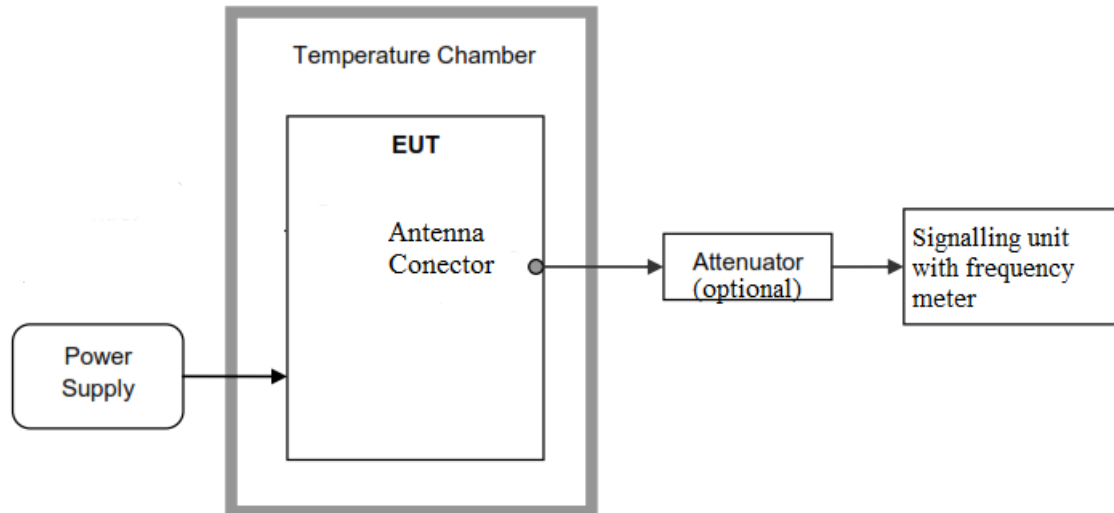
The worst case LTE mode for conducted power was used for the test.

In order to check that the frequency stability is sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point is established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation are identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods is added or subtracted from the values of f_L and f_H to check that the resulting frequencies remain within the band.

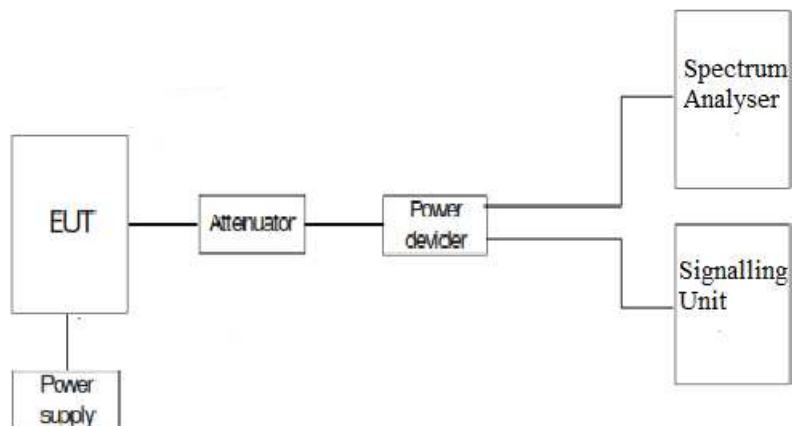
The reference point measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP

Frequency tolerance.



Reference points f_L and f_H .



RESULTS

Frequency stability over temperature variations.

BW = 1.4 MHz. (Band IV)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	6.82	0.003936508
+40	6.52	0.003763348
+30	6.12	0.003532468
+20	8.08	0.004663781
+10	9.41	0.005431457
0	7.75	0.004473304
-10	9.06	0.005229437
-20	8.31	0.004796537
-30	-7.9	-0.004559885

BW = 3 MHz. (Band IV)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	5.94	0.003428571
+40	6.67	0.003849928
+30	6.98	0.00402886
+20	8.61	0.004969697
+10	7.37	0.004253968
0	7.85	0.004531025
-10	8.37	0.004831169
-20	9.9	0.005714286
-30	-8.18	-0.004721501

BW = 5 MHz. (Band IV)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	5.84	0.003370851
+40	8.13	0.004692641
+30	8.21	0.004738817
+20	9.34	0.005391053
+10	8.34	0.004813853
0	8.78	0.005067821
-10	7.82	0.004513709
-20	7.17	0.004138528
-30	-8.07	-0.004658009

BW = 10 MHz. (Band IV)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	8.07	0.004658009
+40	8.33	0.004808081
+30	7.98	0.004606061
+20	9.58	0.005529582
+10	9.18	0.005298701
0	8.51	0.004911977
-10	8.93	0.005154401
-20	7.55	0.004357864
-30	-6.81	-0.003930736

BW = 15 MHz. (Band IV)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	6.59	0.003803752
+40	9.68	0.005587302
+30	7.77	0.004484848
+20	9.63	0.005558442
+10	9.6	0.005541126
0	8.63	0.004981241
-10	9.46	0.005460317
-20	11.04	0.006372294
-30	7.97	0.004600289

BW = 20 MHz. (Band IV)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	8.45	0.004877345
+40	7.07	0.004080808
+30	7.37	0.004253968
+20	8.94	0.005160173
+10	9.17	0.005292929
0	9	0.005194805
-10	9.98	0.005760462
-20	9.61	0.005546898
-30	8.18	0.004721501

BW = 1.4 MHz. (Band XII)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-4.22	-0.005964664
+40	-4.09	-0.005780919
+30	-4.43	-0.006261484
+20	3.66	0.005173145
+10	-4.08	-0.005766784
0	-3.4	-0.004805654
-10	3.91	0.005526502
-20	-4.02	-0.005681979
-30	-5.36	-0.007575972

BW = 3 MHz. (Band XII)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-3.29	-0.004650177
+40	-4.13	-0.005837456
+30	-4.33	-0.006120141
+20	4.55	0.006431095
+10	3.56	0.005031802
0	-3.3	-0.004664311
-10	3.55	0.005017668
-20	-3.56	-0.005031802
-30	-5.68	-0.008028269

BW = 5 MHz. (Band XII)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-3.66	-0.005173145
+40	-4.13	-0.005837456
+30	-3.68	-0.005201413
+20	3.12	0.004409894
+10	-3.2	-0.004522968
0	3.43	0.004848057
-10	-4.56	-0.00644523
-20	-4.41	-0.006233216
-30	-5.75	-0.008127208

BW = 10 MHz. (Band XII)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-3.55	-0.005017668
+40	-4.43	-0.006261484
+30	-4.62	-0.006530035
+20	4.32	0.006106007
+10	4.41	0.006233216
0	-3.26	-0.004607774
-10	-4.13	-0.005837456
-20	-4.26	-0.006021201
-30	-4.88	-0.006897527

Frequency stability over voltage variations.

BW = 1.4 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	7.8	0.004502165
Vmin	3.23	9.38	0.005414141

BW = 3 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	7.67	0.004427128
Vmin	3.23	8.91	0.005142857

BW = 5 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	8.48	0.004894661
Vmin	3.23	10.2	0.005887446

BW = 10 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	8.81	0.005085137
V _{min}	3.23	8.65	0.004992785

BW = 15 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	8.17	0.004715729
V _{min}	3.23	10.66	0.006152958

BW = 20 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	10.54	0.006083694
V _{min}	3.23	10.16	0.005864358

BW = 1.4 MHz (Band XII)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-3.69	-0.005215548
V _{min}	3.23	4.08	0.005766784

BW = 3 MHz (Band XII)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	3.35	0.004734982
V _{min}	3.23	3.66	0.005173145

BW = 5 MHz (Band XII)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-3.72	-0.005257951
V _{min}	3.23	4.08	0.005766784

BW = 10 MHz (Band XII)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
V _{max}	4.37	-4.09	-0.005780919
V _{min}	3.23	4.01	0.005667845

Reference points established at the applicable unwanted emissions limit (worst case):

	BW = 1.4 MHz (Band IV)	BW = 3 MHz (Band IV)	BW = 5 MHz (Band IV)	BW = 10 MHz (Band IV)	BW = 15 MHz (Band IV)	BW = 20 MHz (Band IV)
f_L (MHz)	1710.0871	1710.2212	1710.1491	1710.5576	1710.8098	1711.1820
f_H (MHz)	1754.9109	1754.7788	1754.8529	1754.4484	1754.1822	1753.7730

	BW = 1.4 MHz (Band XII)	BW = 3 MHz (Band XII)	BW = 5 MHz (Band XII)	BW = 10 MHz (Band XII)
f_L (MHz)	699.0800	699.2300	699.1640	699.5680
f_H (MHz)	715.9089	715.7588	715.8448	715.4364

Reference points f_L and f_H with the worst-case frequency offsets added or subtracted:

	BW = 1.4 MHz (Band IV)	BW = 3 MHz (Band IV)	BW = 5 MHz (Band IV)	BW = 10 MHz (Band IV)	BW = 15 MHz (Band IV)	BW = 20 MHz (Band IV)
f_L (MHz)	1710.0871	1710.2212	1710.1491	1710.5576	1710.8098	1711.1820
f_H (MHz)	1754.9109	1754.7788	1754.8529	1754.4484	1754.1822	1753.7730

	BW = 1.4 MHz (Band XII)	BW = 3 MHz (Band XII)	BW = 5 MHz (Band XII)	BW = 10 MHz (Band XII)
f_L (MHz)	699.0800	699.2300	699.1640	699.5680
f_H (MHz)	715.9089	715.7588	715.8448	715.4364

The reference frequency points stay within the authorized blocks.

Verdict: PASS

Occupied Bandwidth

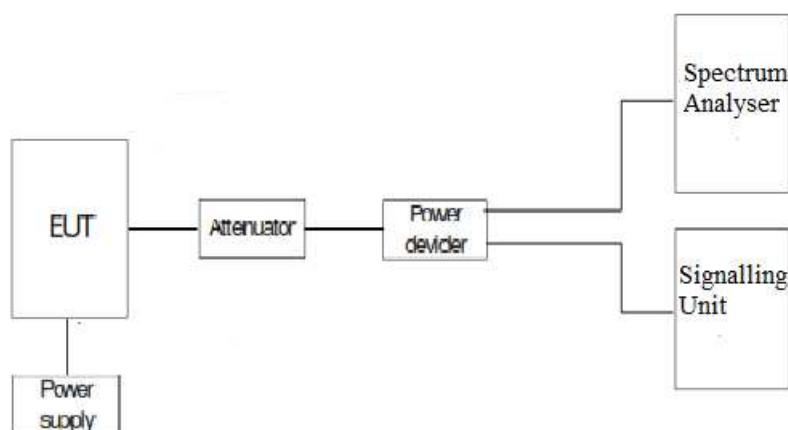
SPECIFICATION

§2.1049

METHOD

The occupied bandwidth measurement was performed at the output terminals of the EUT using an attenuator, power splitter and spectrum analyser. 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 analyser.

TEST SETUP



RESULTS

LTE QPSK MODULATION. BW = 1.4 MHz (Band IV). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.10940	1.10190	1.09590
-26 dBc bandwidth (MHz)	1.37400	1.27400	1.31000
Measurement uncertainty (kHz)	<±4.67		

LTE 16QAM MODULATION. BW = 1.4 MHz (Band IV). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.92472	0.91864	0.91797
-26 dBc bandwidth (MHz)	1.17000	1.17300	1.15800
Measurement uncertainty (kHz)	<±4.67		

LTE QPSK MODULATION. BW = 3 MHz (Band IV). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.28950	1.11120	1.12390
-26 dBc bandwidth (MHz)	1.71000	1.46100	1.51000
Measurement uncertainty (kHz)	<±10.00		

LTE 16QAM MODULATION. BW = 3 MHz (Band IV). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.96371	0.98395	0.94432
-26 dBc bandwidth (MHz)	1.50000	1.67400	1.24900
Measurement uncertainty (kHz)	<±10.00		

LTE QPSK MODULATION. BW = 5 MHz (Band IV). Narrow band: 2.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12240	1.18800	1.12740
-26 dBc bandwidth (MHz)	1.79000	1.92200	1.73500
Measurement uncertainty (kHz)	<±16.67		

LTE 16QAM MODULATION. BW = 5 MHz (Band IV). Narrow band: 2.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.99132	1.02580	0.98457
-26 dBc bandwidth (MHz)	1.56700	1.69600	1.64700
Measurement uncertainty (kHz)	<±16.67		

LTE QPSK MODULATION. BW = 10 MHz (Band IV). Narrow band: 4.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.18950	1.17510	1.15530
-26 dBc bandwidth (MHz)	1.73500	2.12900	1.70700
Measurement uncertainty (kHz)	<±33.33		

LTE 16QAM MODULATION. BW = 10 MHz (Band IV). Narrow band: 4.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.03360	1..0053	0.98568
-26 dBc bandwidth (MHz)	1.72700	1.60900	1.53800
Measurement uncertainty (kHz)	<±33.33		

LTE QPSK MODULATION. BW = 15 MHz (Band IV). Narrow band: 6.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12320	1.15870	1.14170
-26 dBc bandwidth (MHz)	1.79800	1.76900	1.63400
Measurement uncertainty (kHz)	<±50.00		

LTE 16QAM MODULATION. BW = 15 MHz (Band IV). Narrow band: 6.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.96279	0.99406	0.99409
-26 dBc bandwidth (MHz)	1.55200	1.59400	1.59900
Measurement uncertainty (kHz)	<±50.00		

LTE QPSK MODULATION. BW = 20 MHz (Band IV). Narrow band: 8.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.17120	1.16130	1.13980
-26 dBc bandwidth (MHz)	1.71400	1.82600	1.73900
Measurement uncertainty (kHz)	<±66.67		

LTE 16QAM MODULATION. BW = 20 MHz (IV). Narrow band: 8.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.00220	1.01850	1.01190
-26 dBc bandwidth (MHz)	1.62500	1.66900	1.59500
Measurement uncertainty (kHz)	<±66.67		

LTE QPSK MODULATION. BW = 1.4 MHz (Band XII). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.10660	1.09560	1.10140
-26 dBc bandwidth (MHz)	1.28900	1.31800	1.26600
Measurement uncertainty (kHz)	<±4.67		

LTE 16QAM MODULATION. BW = 1.4 MHz (Band XII) Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	0.92859	0.92537	0.91919
-26 dBc bandwidth (MHz)	1.12400	1.14500	1.09300
Measurement uncertainty (kHz)	<±4.67		

LTE QPSK MODULATION. BW = 3 MHz (Band XII). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12670	1.13680	1.14200
-26 dBc bandwidth (MHz)	1.39600	1.85600	1.80800
Measurement uncertainty (kHz)	<±10.00		

LTE 16QAM MODULATION. BW = 3 MHz (Band XII). Narrow band: 1.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.08980	0.97115	0.97027
-26 dBc bandwidth (MHz)	2.05600	1.34200	1.33300
Measurement uncertainty (kHz)	<±10.00		

LTE QPSK MODULATION. BW = 5 MHz (Band XII). Narrow band: 2.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.17290	1.13300	1.16650
-26 dBc bandwidth (MHz)	1.72400	1.92700	1.78700
Measurement uncertainty (kHz)	<±16.67		

LTE 16QAM MODULATION. BW = 5 MHz (Band XII). Narrow band: 2.

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.03770	1.11180	1.04720
-26 dBc bandwidth (MHz)	1.71700	1.48800	1.37000
Measurement uncertainty (kHz)	<±16.67		

LTE QPSK MODULATION. BW = 10 MHz (Band XII) Narrow band: 4.

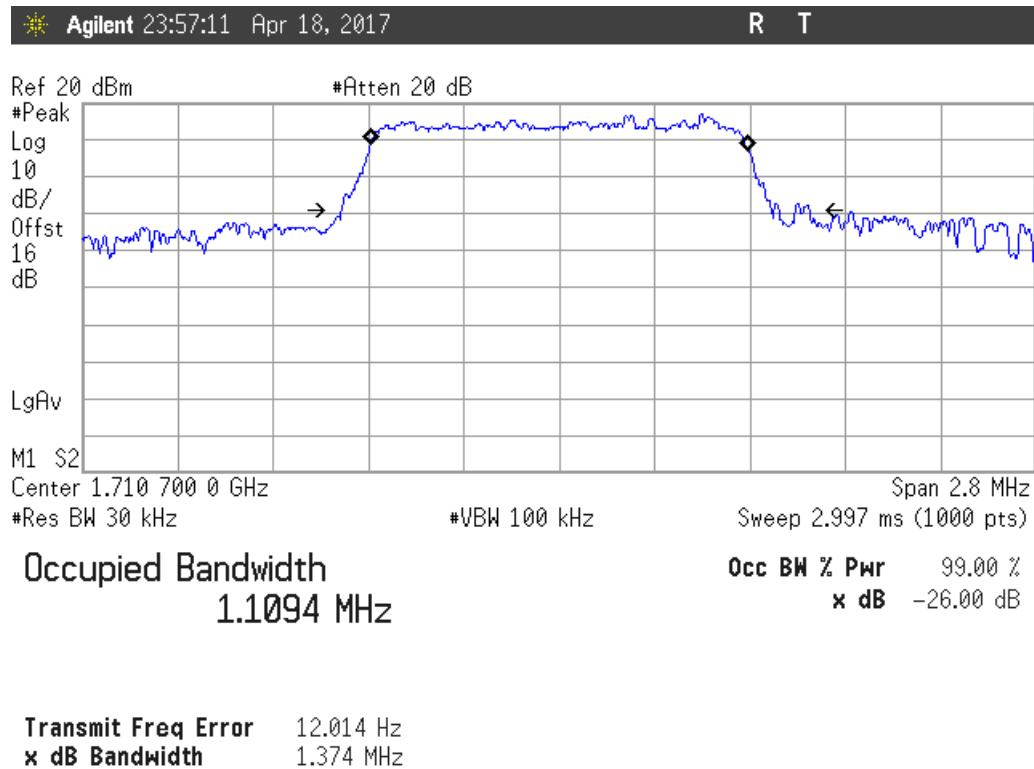
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.16220	1.15360	1.17170
-26 dBc bandwidth (MHz)	1.73300	1.53100	1.78100
Measurement uncertainty (kHz)	<±33.33		

LTE 16QAM MODULATION. BW = 10 MHz (Band XII). Narrow band: 4.

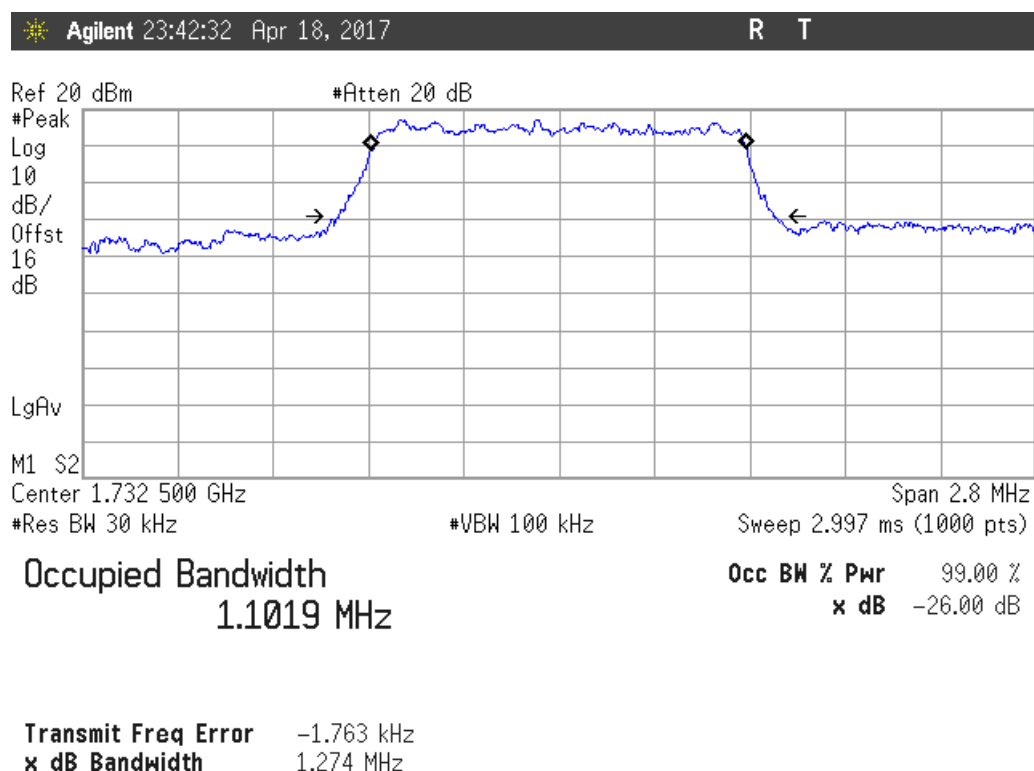
Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.05250	1.13620	1.04560
-26 dBc bandwidth (MHz)	1.69000	1.52000	1.77500
Measurement uncertainty (kHz)	<±33.33		

LTE QPSK MODULATION. BW = 1.4 MHz (Band IV)

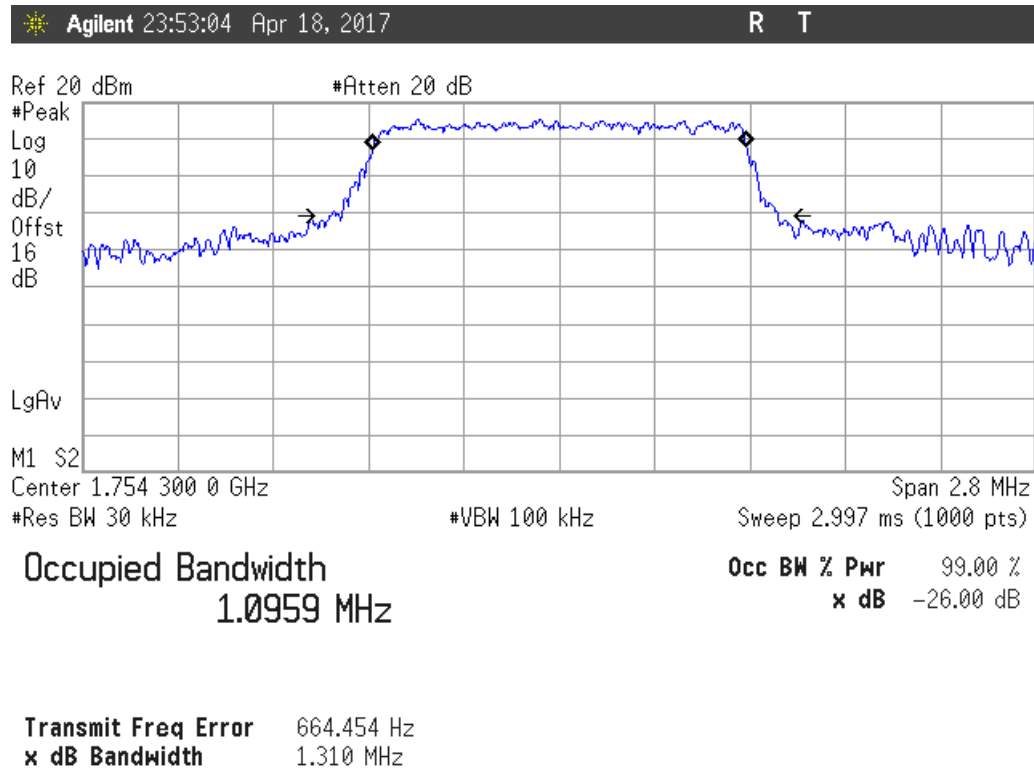
Lowest Channel



Middle Channel

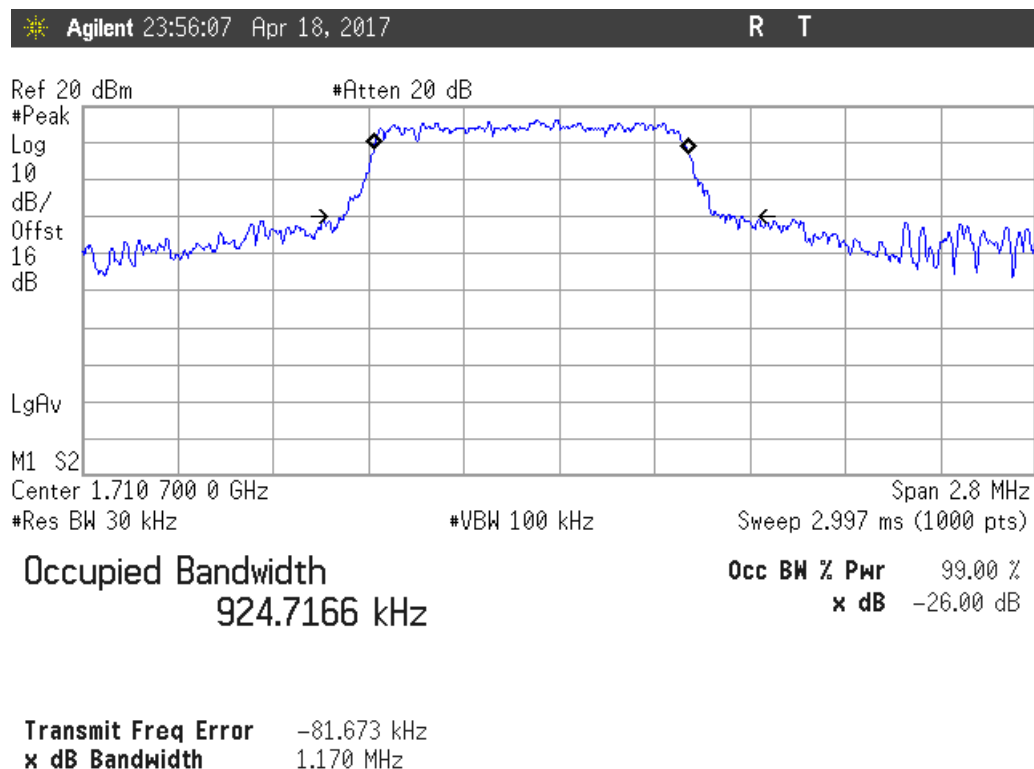


Highest Channel

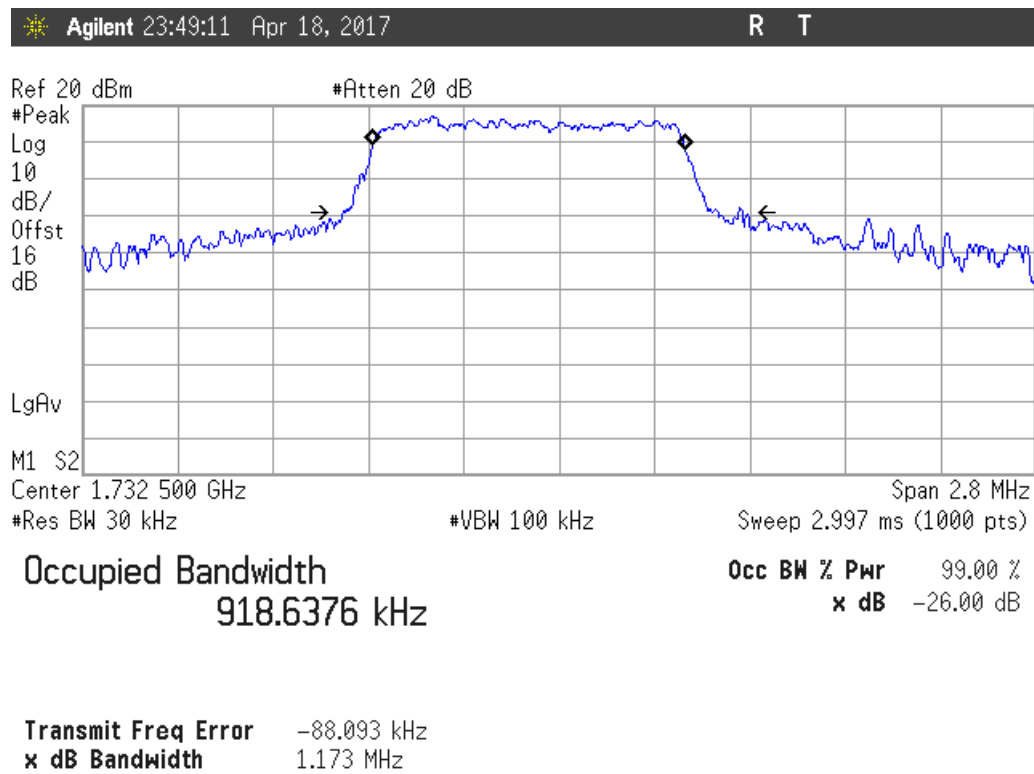


LTE 16QAM MODULATION. BW = 1.4 MHz (Band IV)

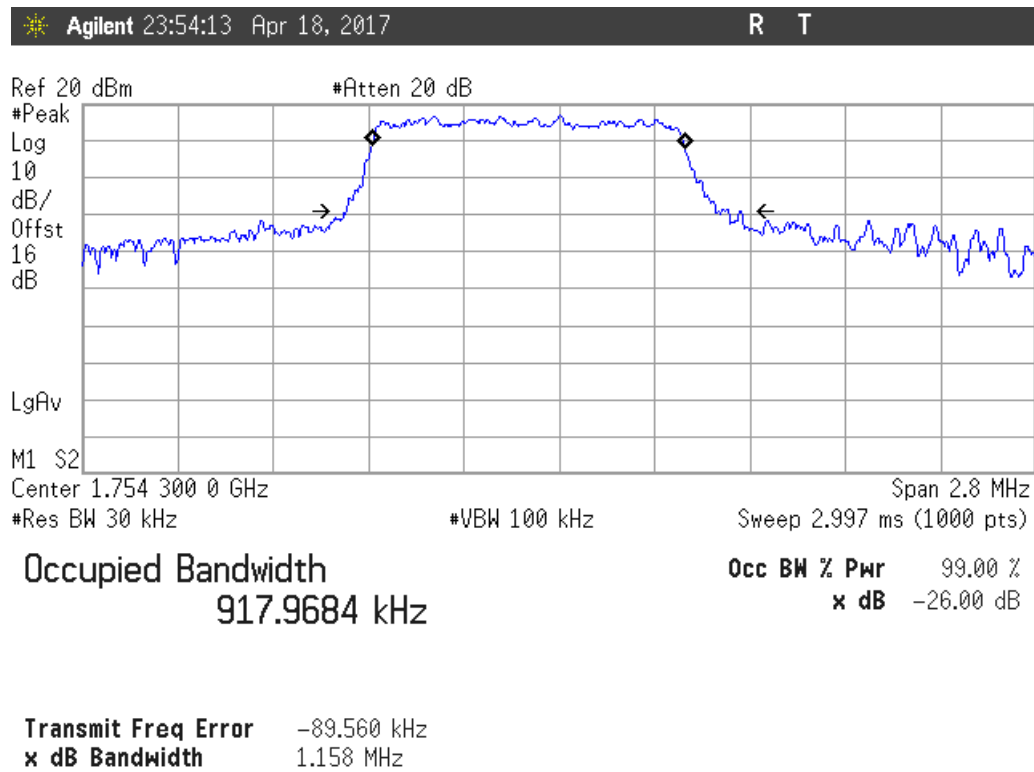
Lowest Channel



Middle Channel

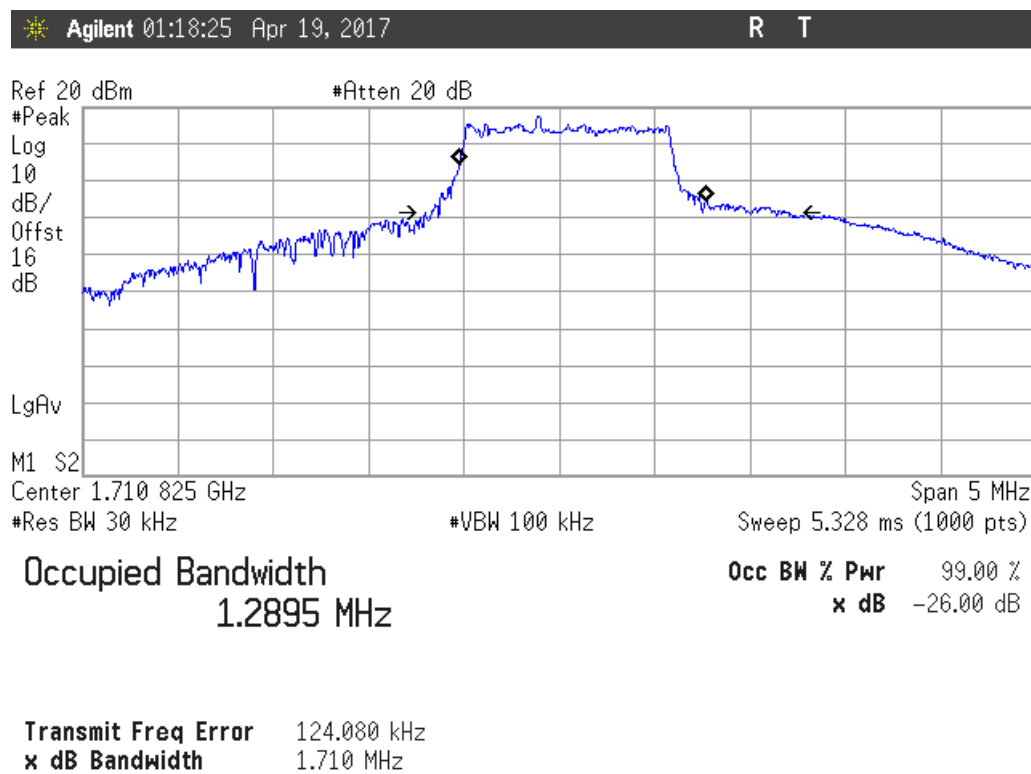


Highest Channel

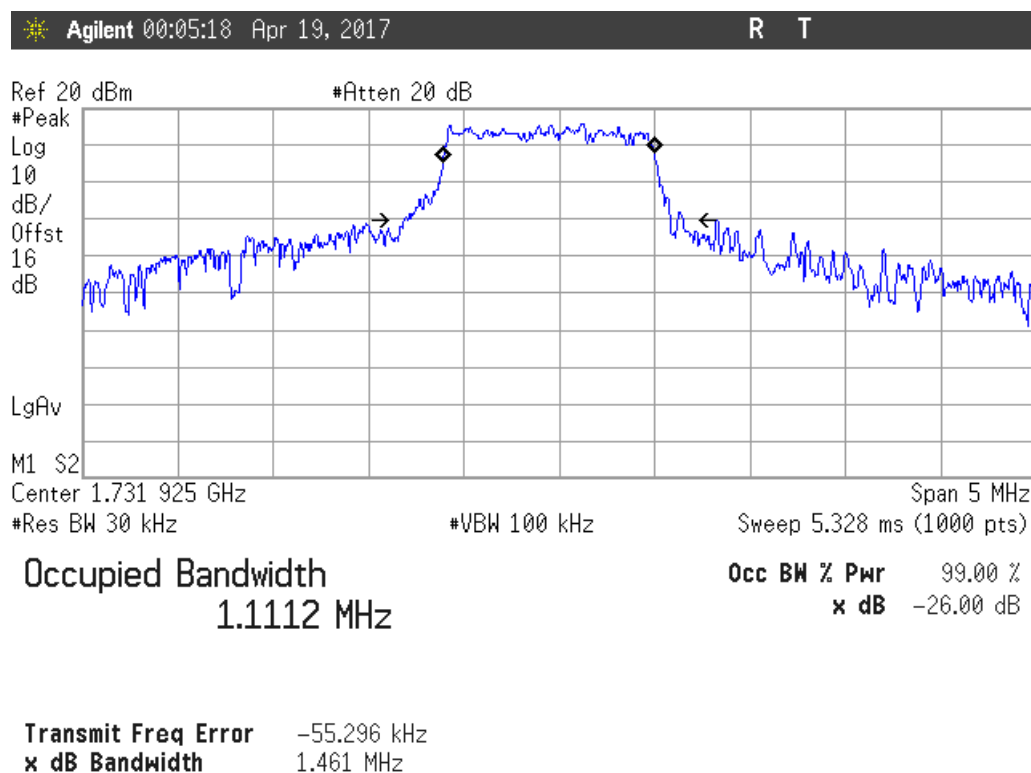


LTE QPSK MODULATION. BW = 3 MHz (Band IV)

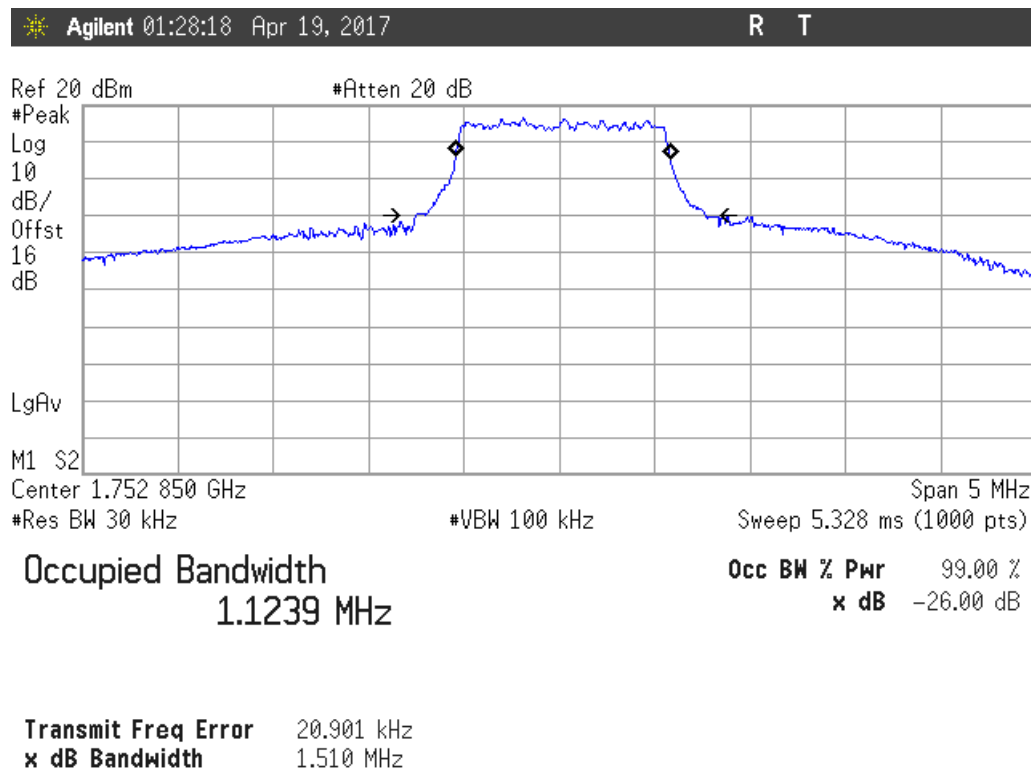
Lowest Channel



Middle Channel

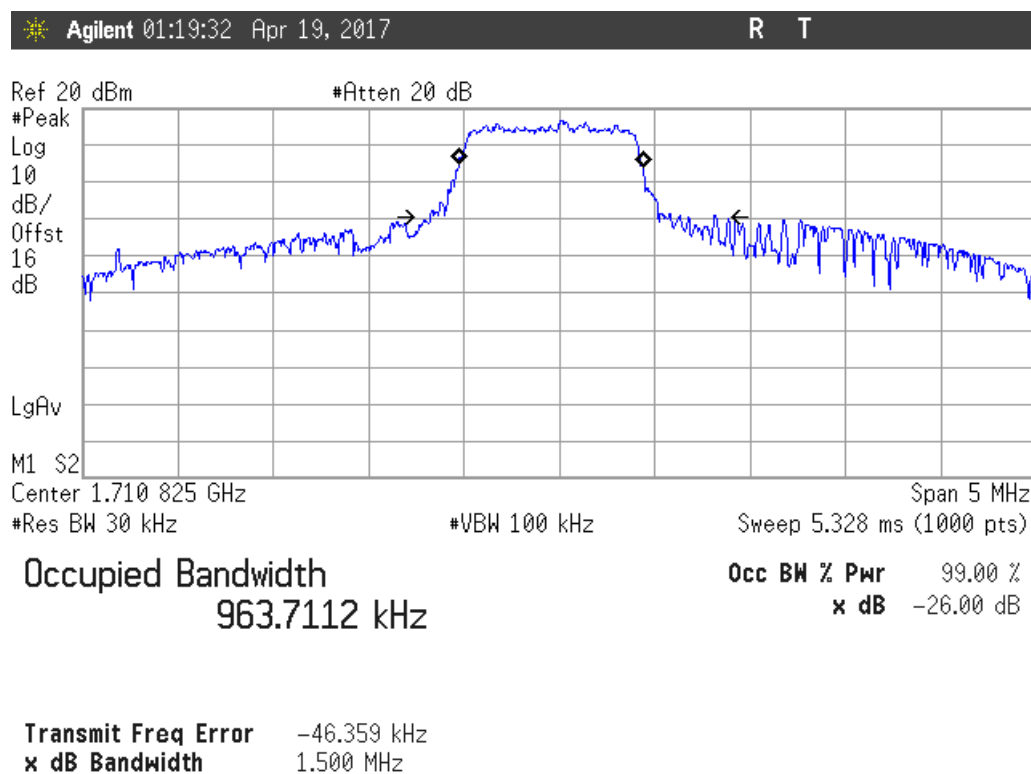


Highest Channel

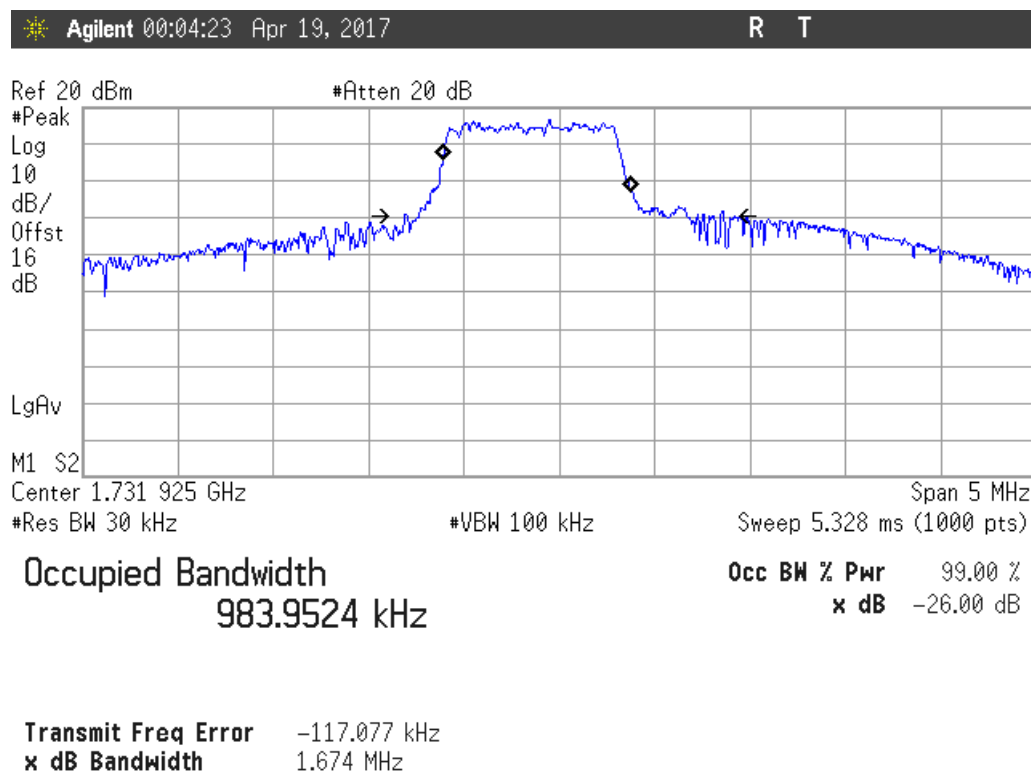


LTE 16QAM MODULATION. BW = 3 MHz (Band IV)

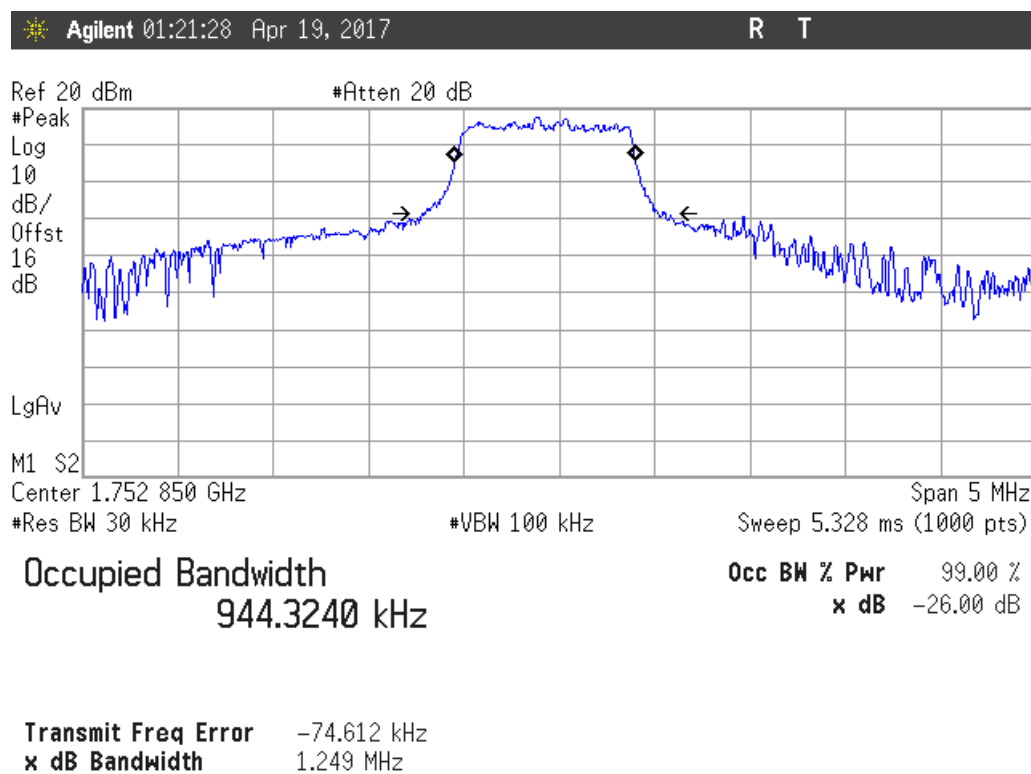
Lowest Channel



Middle Channel

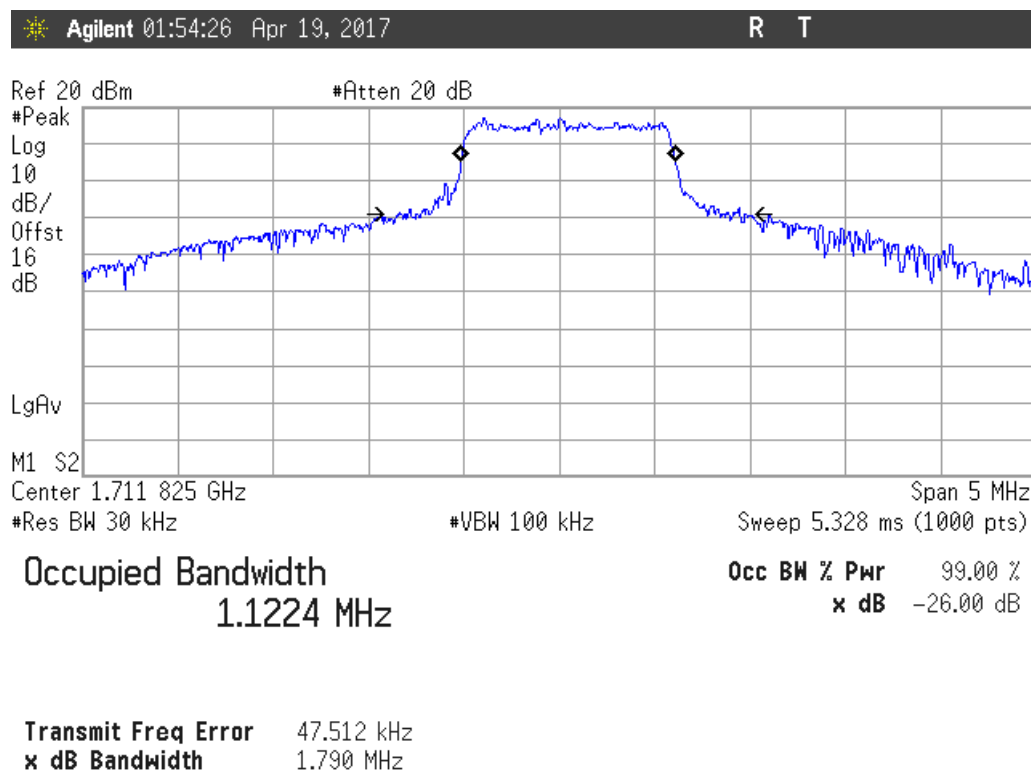


Highest Channel

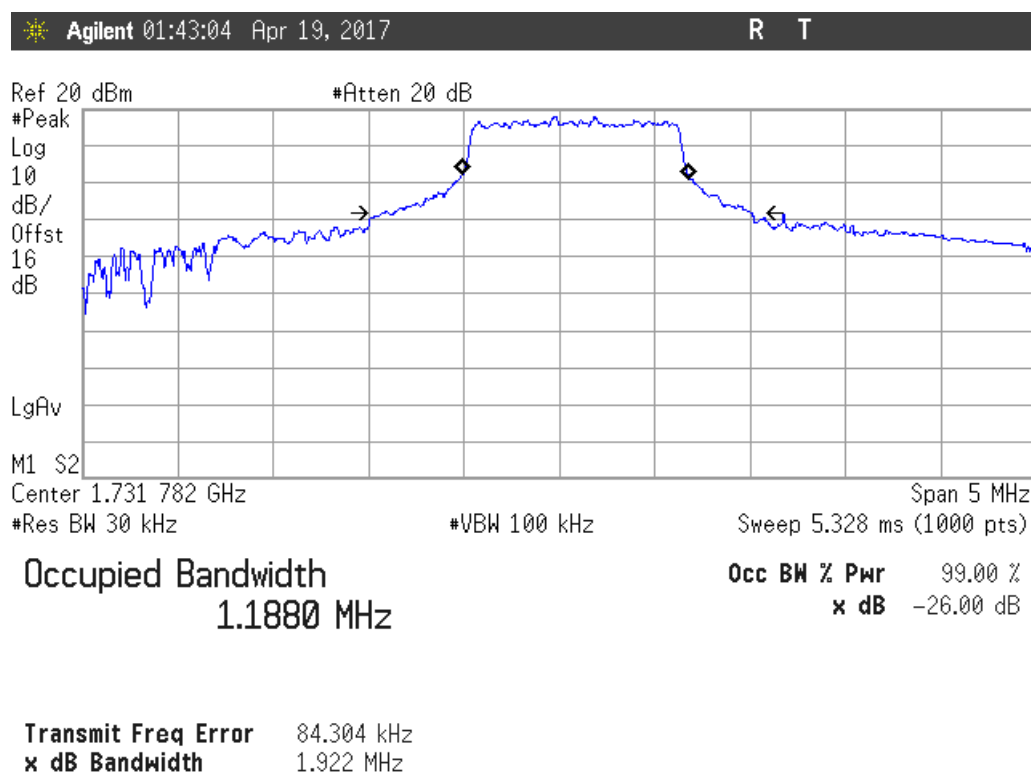


LTE QPSK MODULATION. BW = 5 MHz (Band IV)

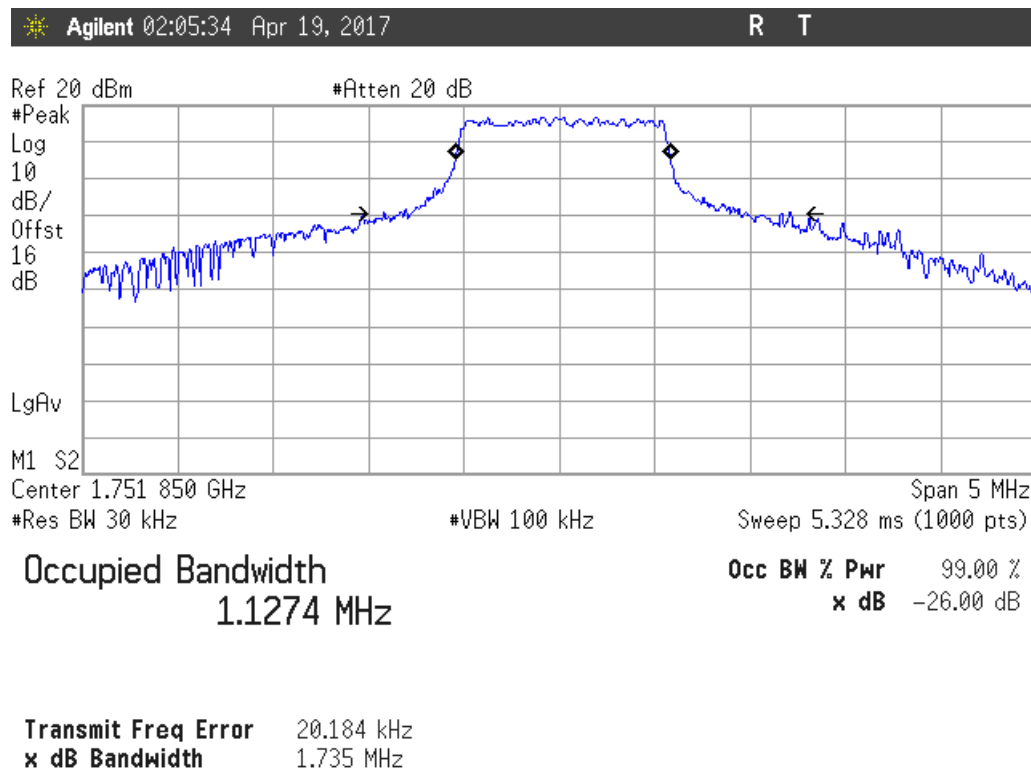
Lowest Channel



Middle Channel

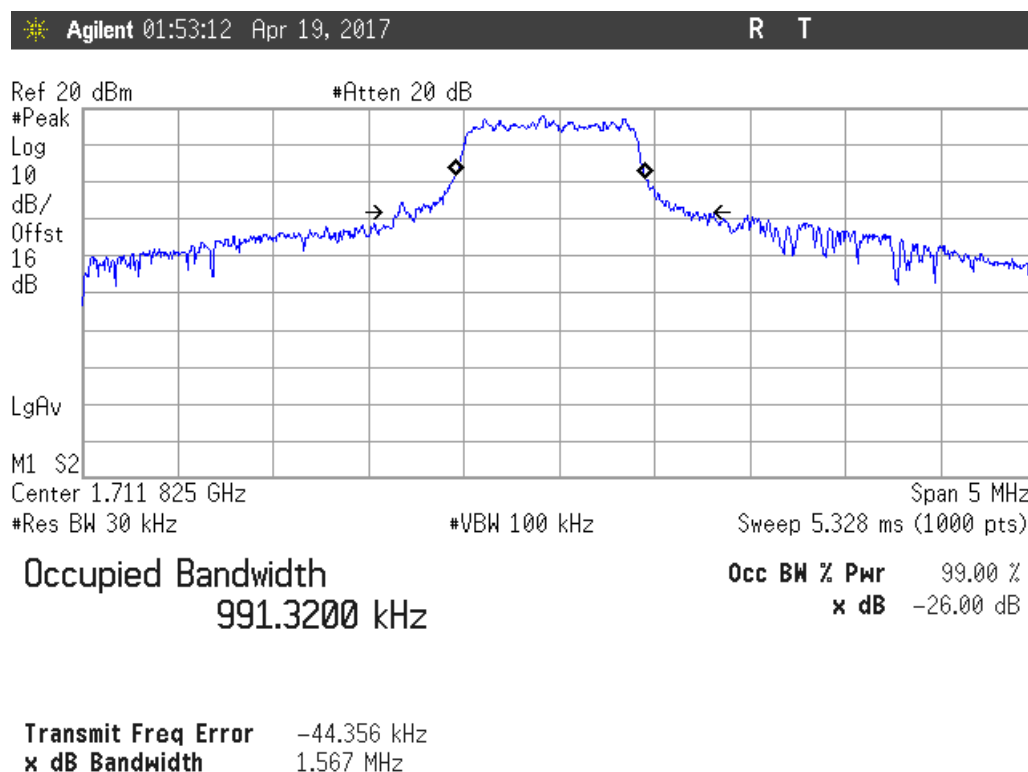


Highest Channel

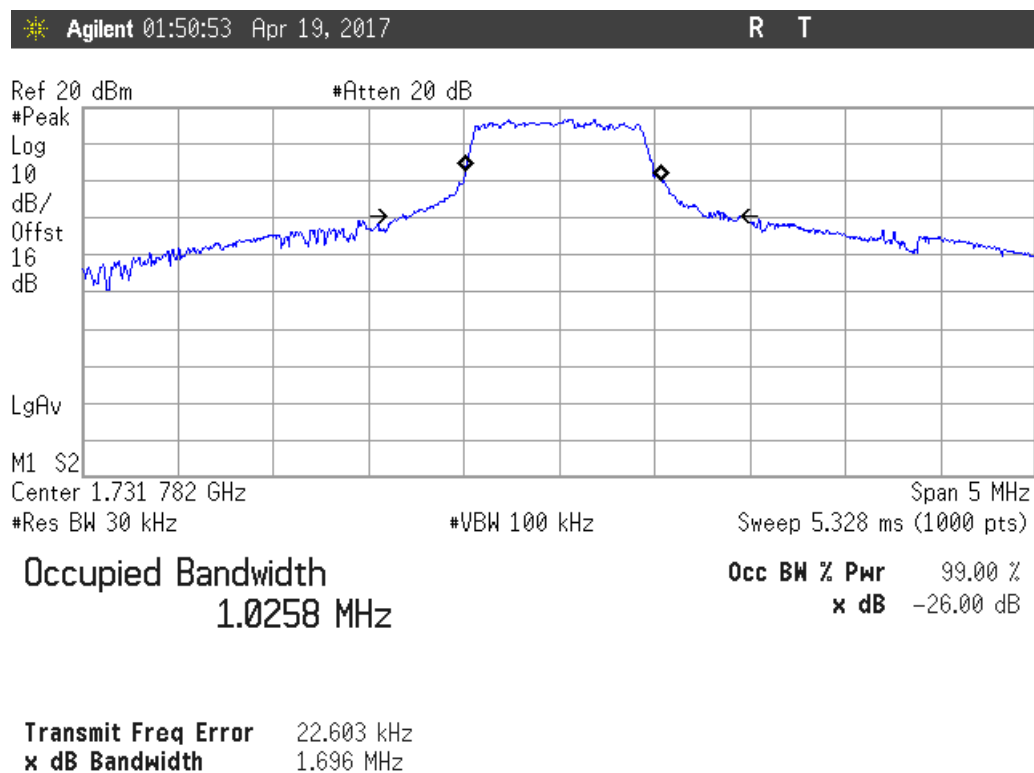


LTE 16QAM MODULATION. BW = 5 MHz (Band IV)

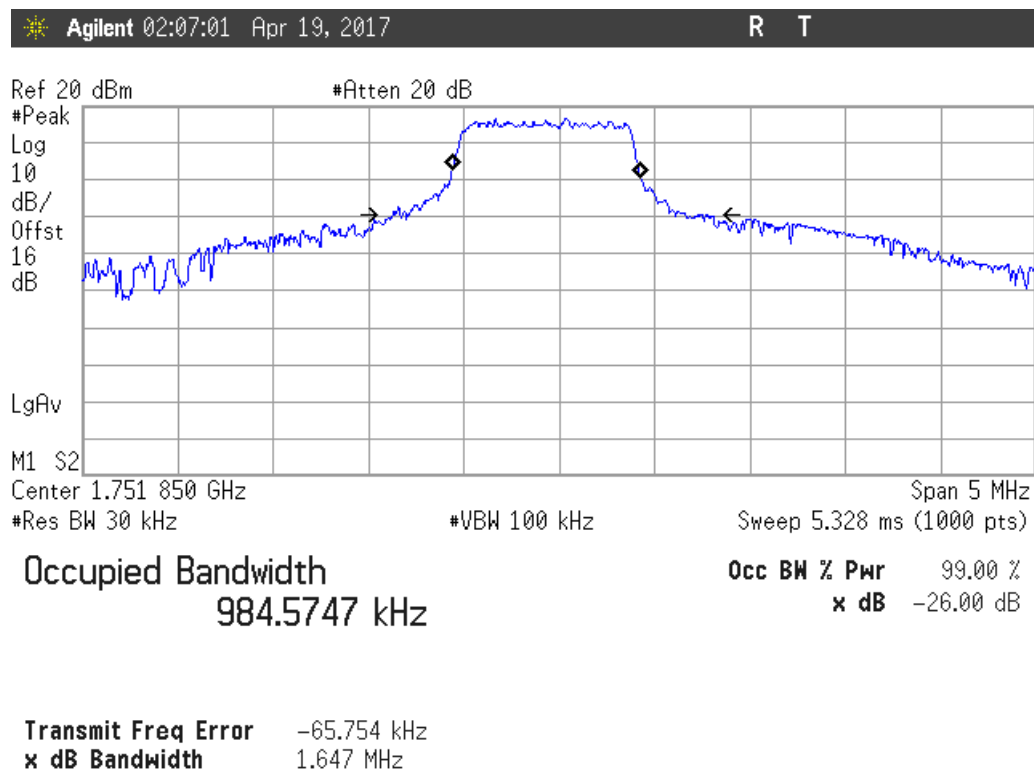
Lowest Channel



Middle Channel

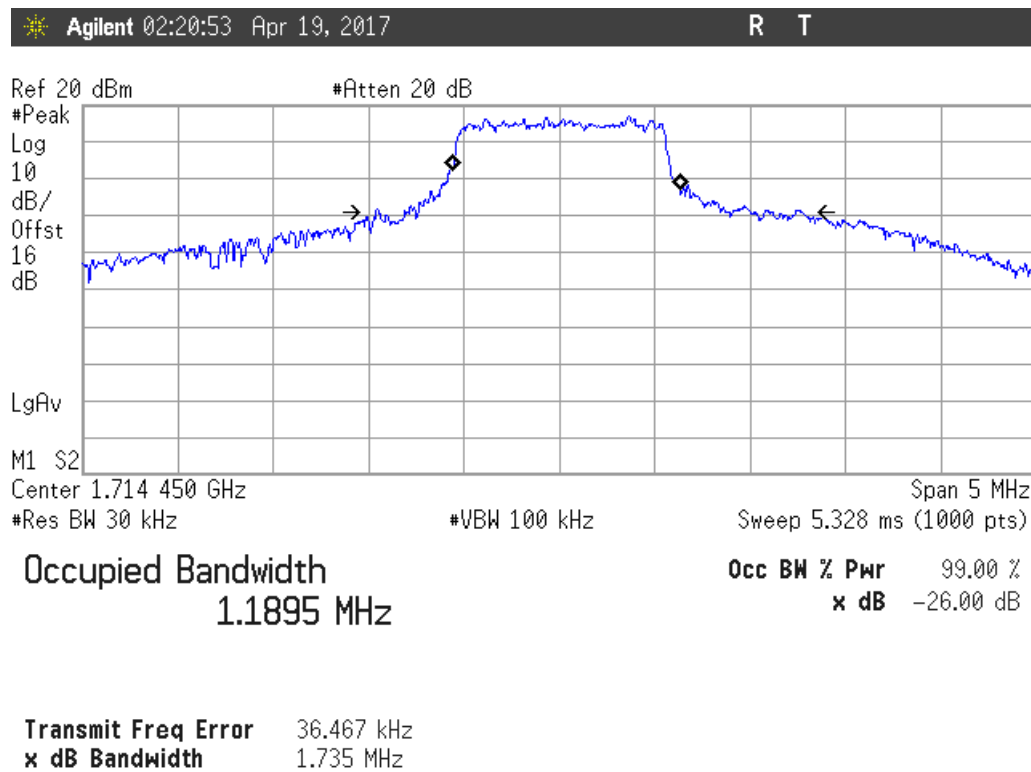


Highest Channel

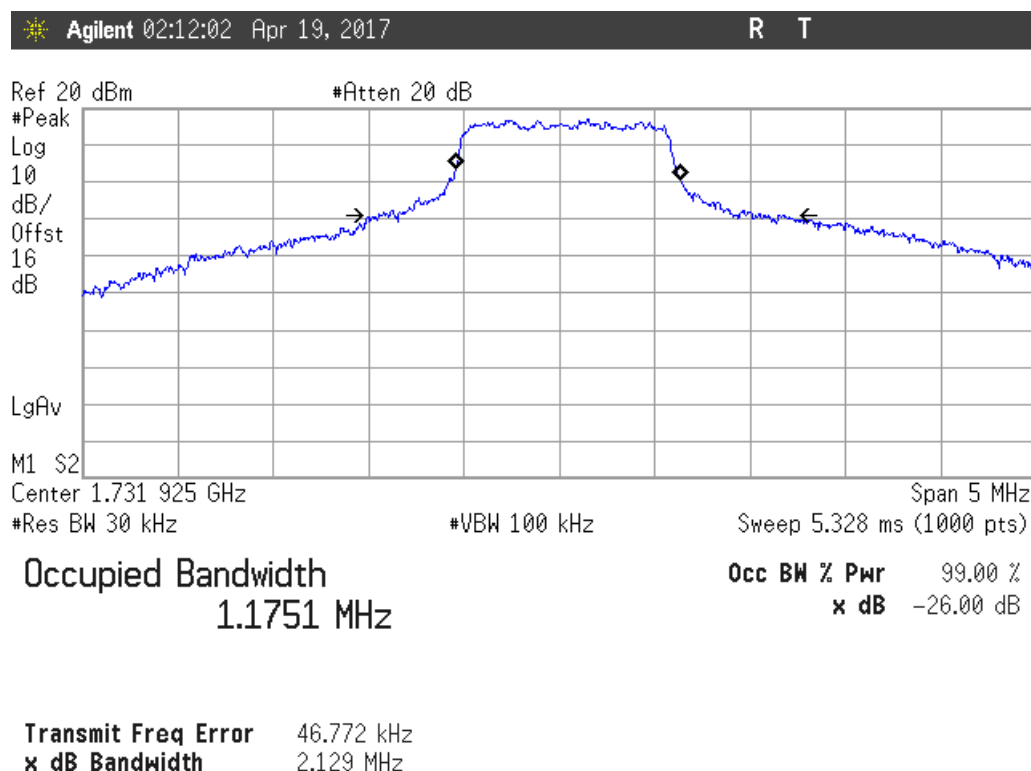


LTE QPSK MODULATION. BW = 10 MHz (Band IV)

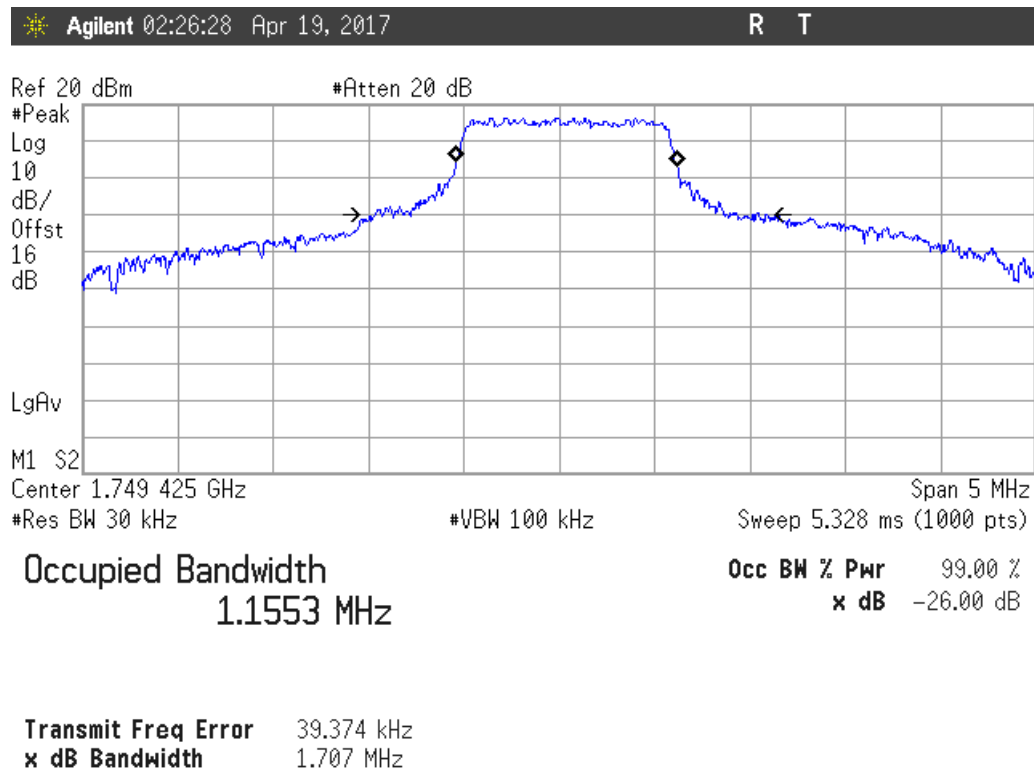
Lowest Channel



Middle Channel

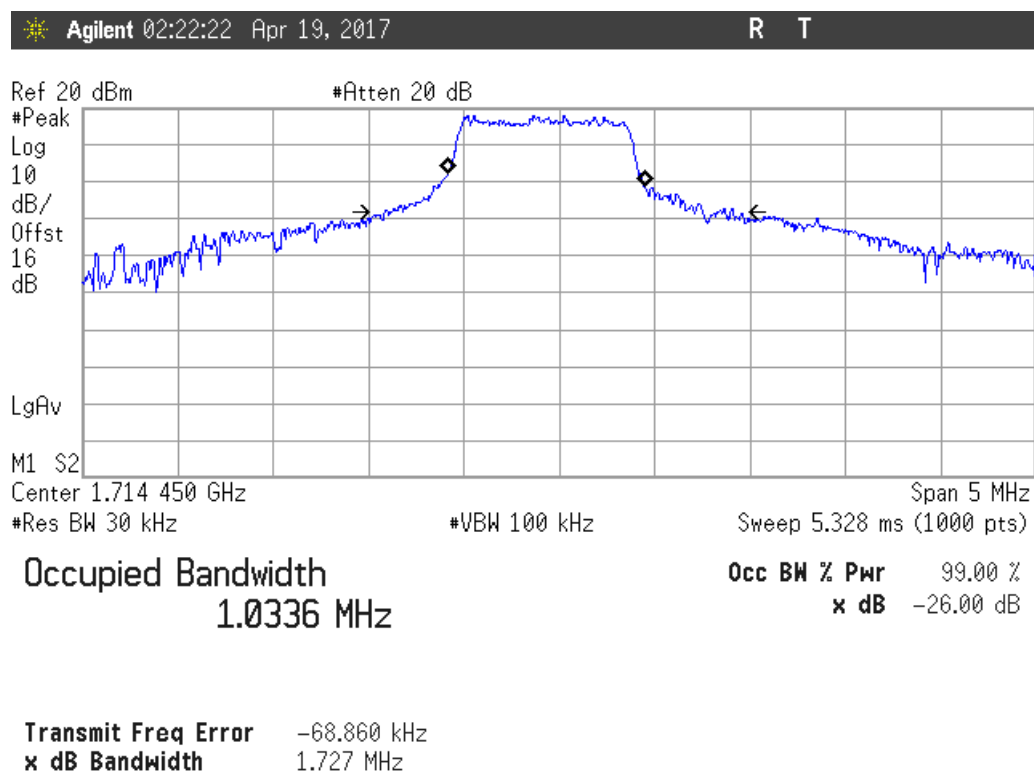


Highest Channel

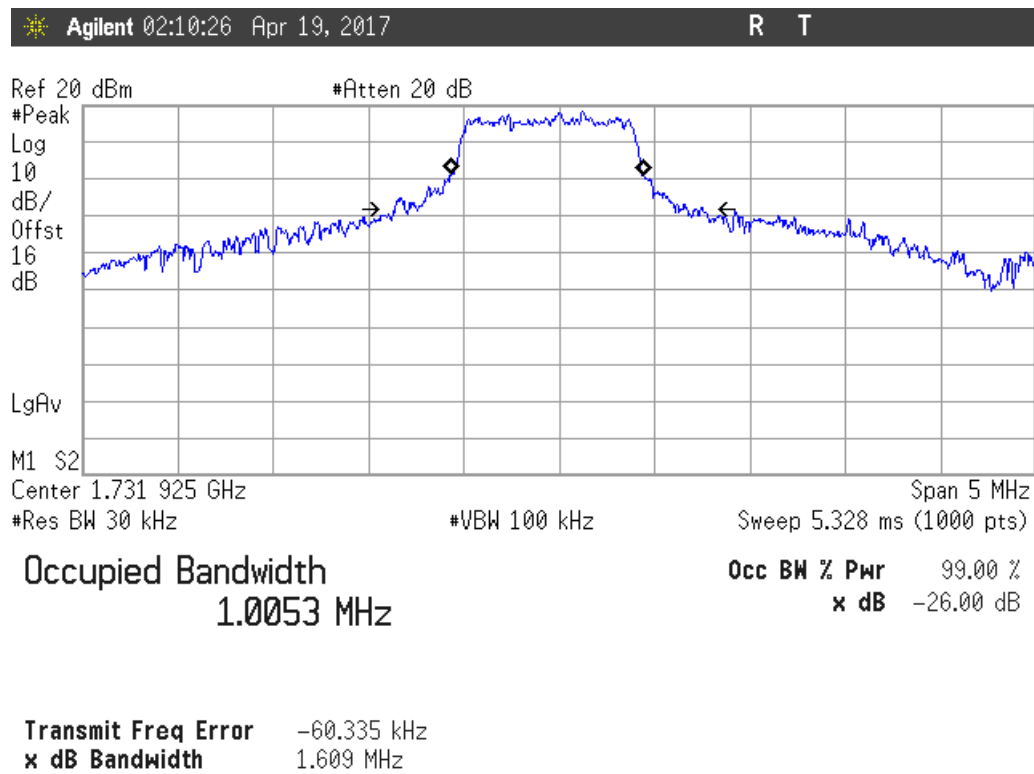


LTE 16QAM MODULATION. BW = 10 MHz (Band IV)

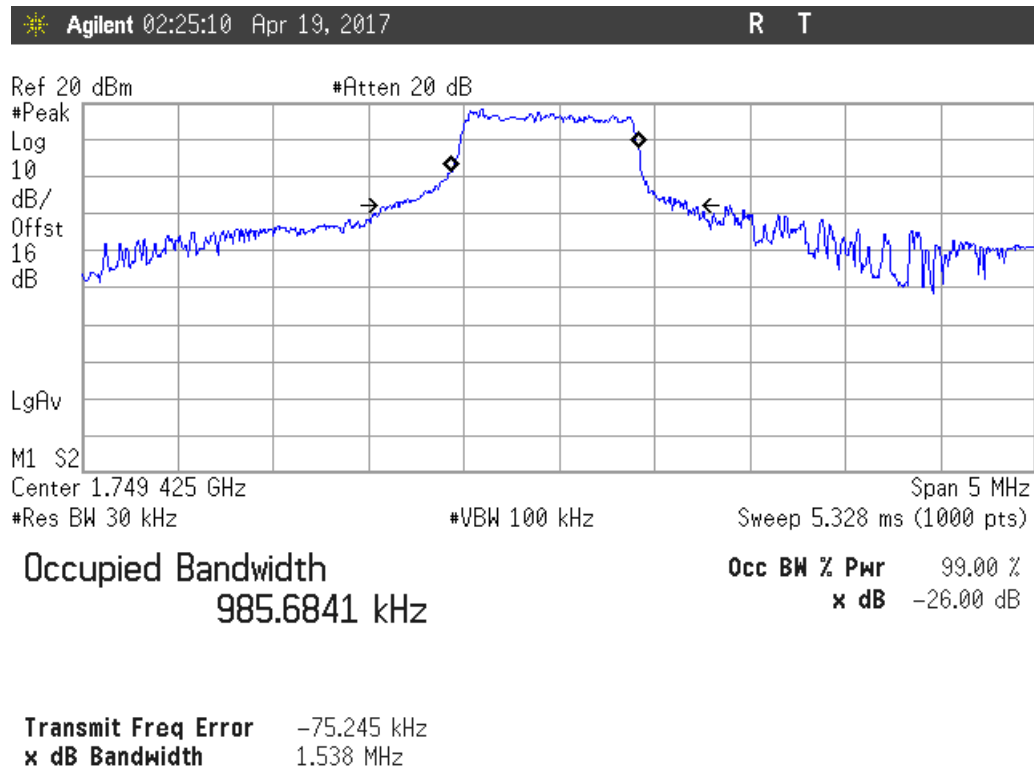
Lowest Channel



Middle Channel

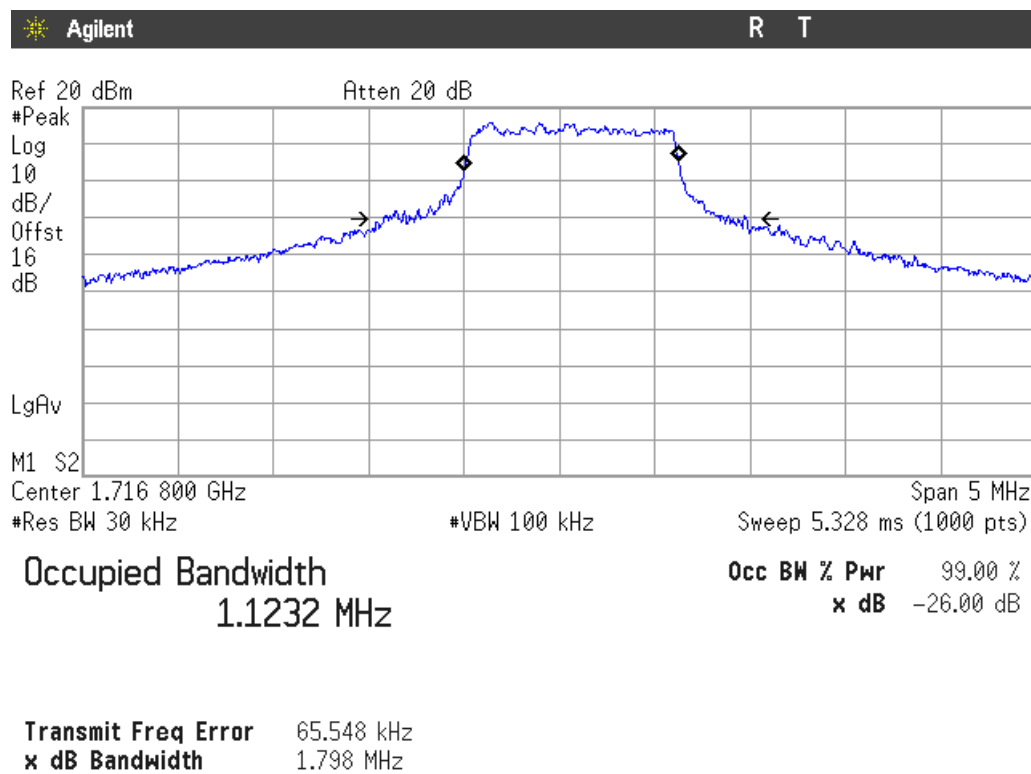


Highest Channel

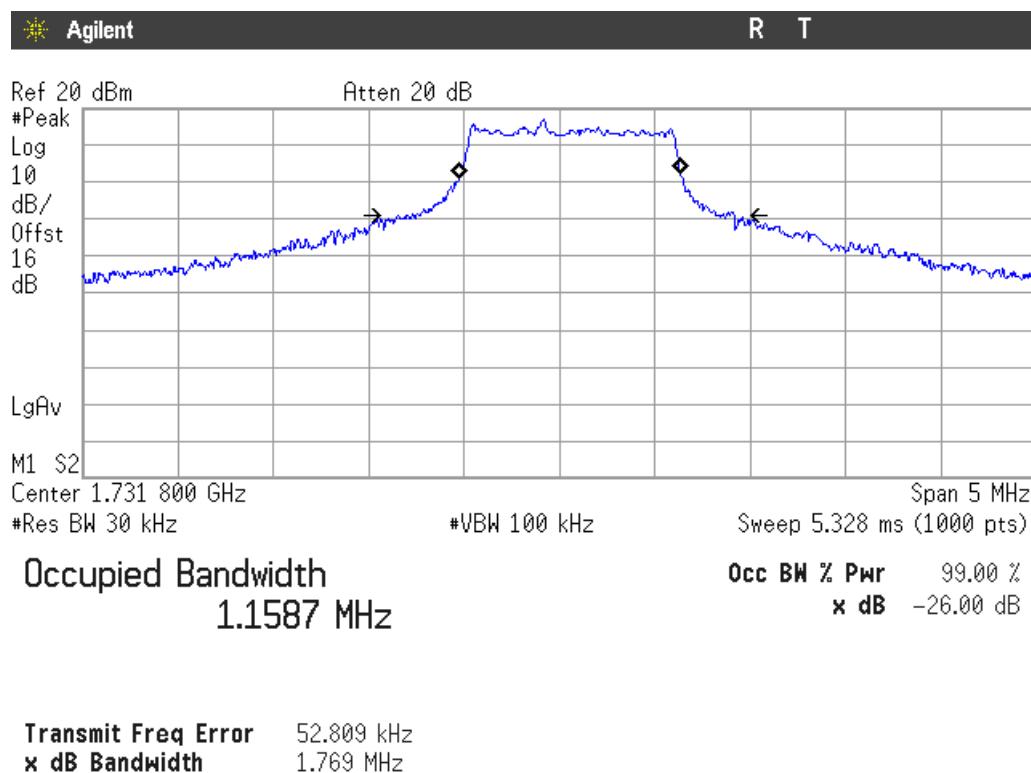


LTE QPSK MODULATION. BW = 15 MHz (Band IV)

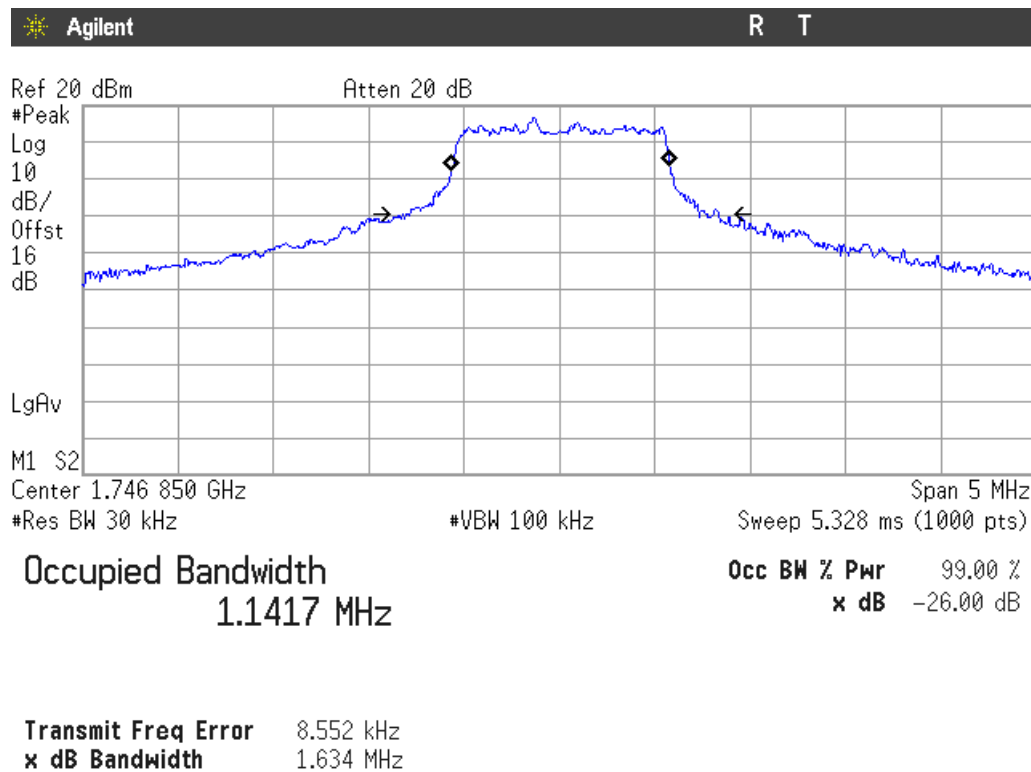
Lowest Channel



Middle Channel

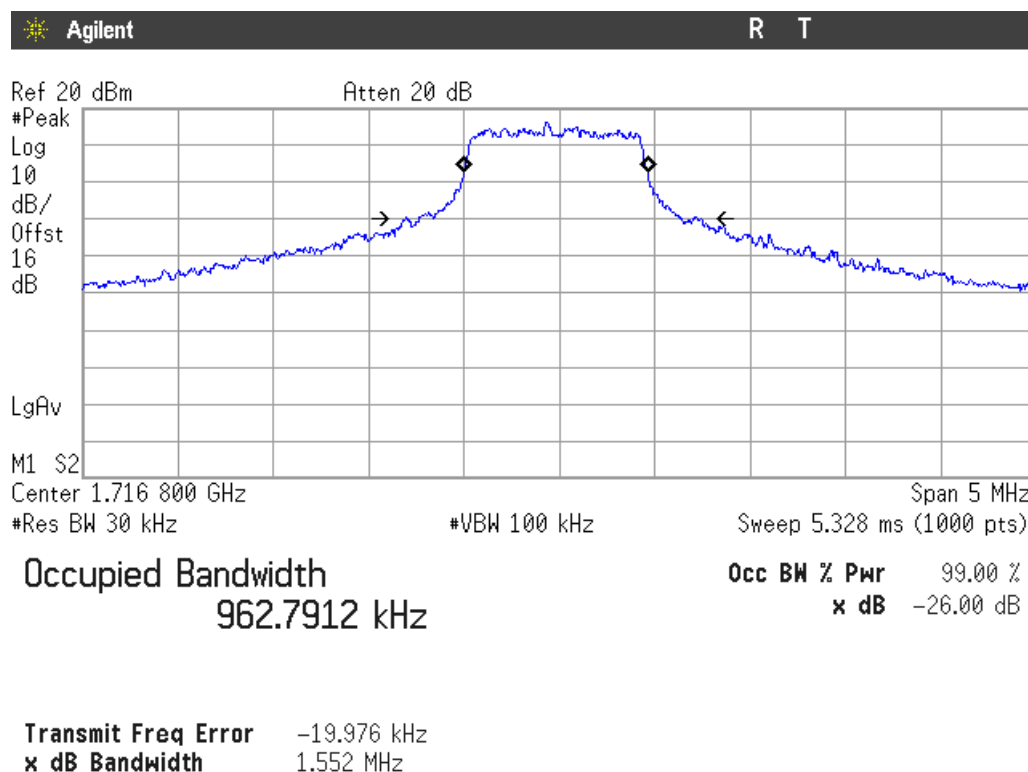


Highest Channel

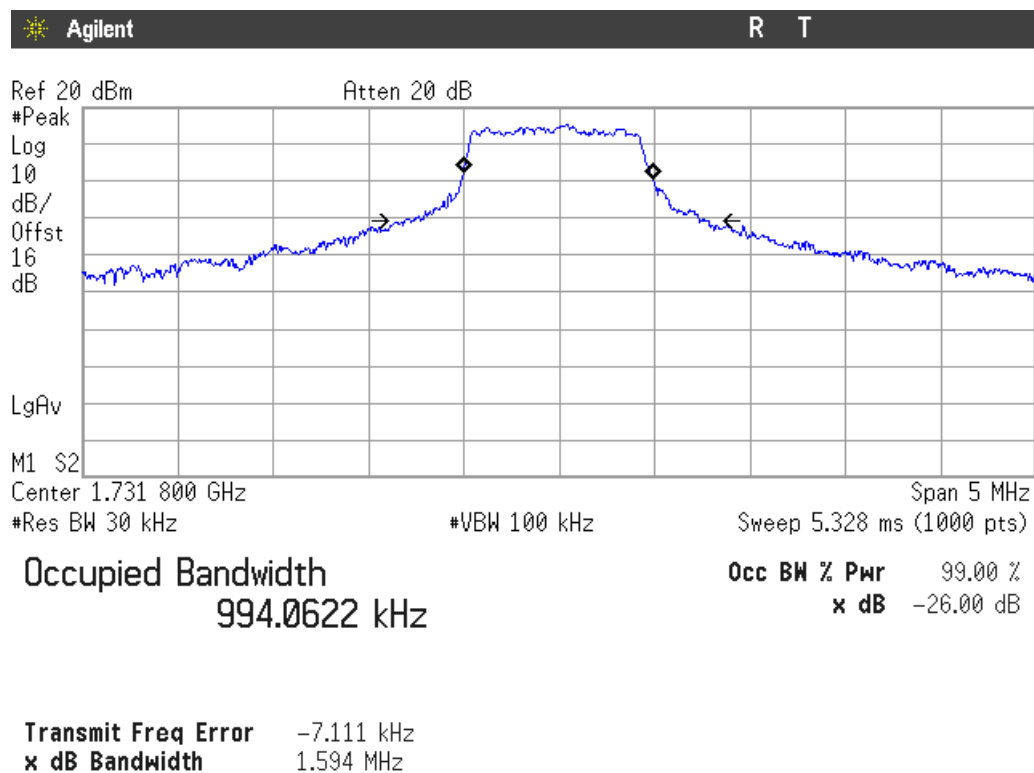


LTE 16QAM MODULATION. BW = 15 MHz (Band IV)

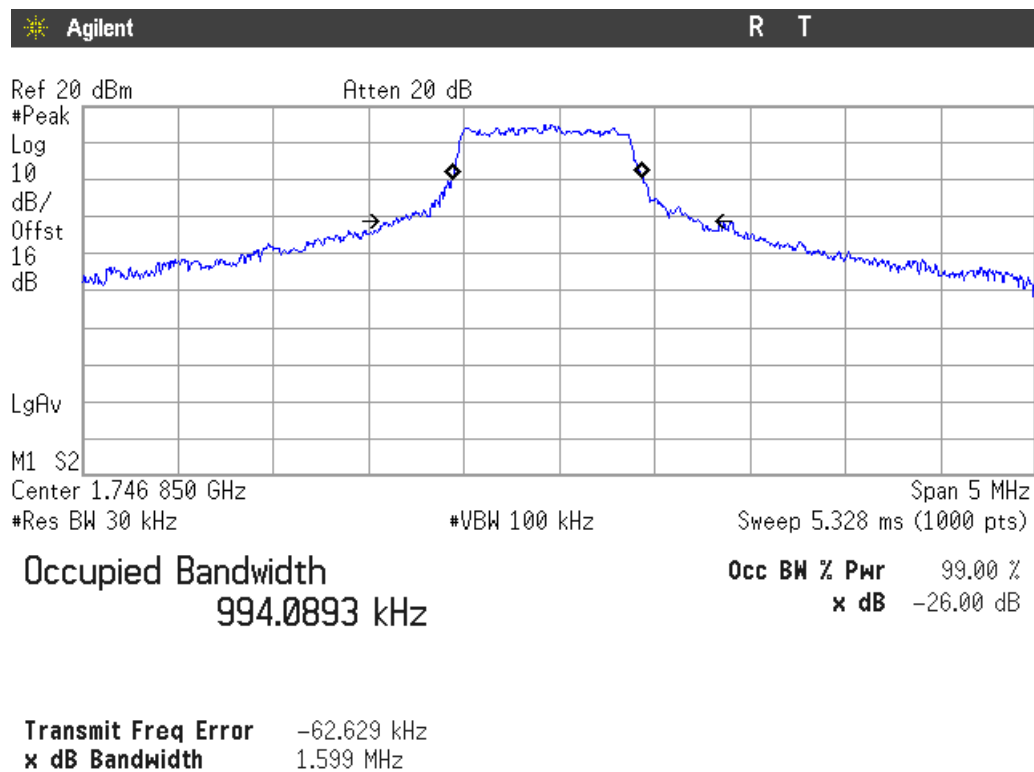
Lowest Channel



Middle Channel

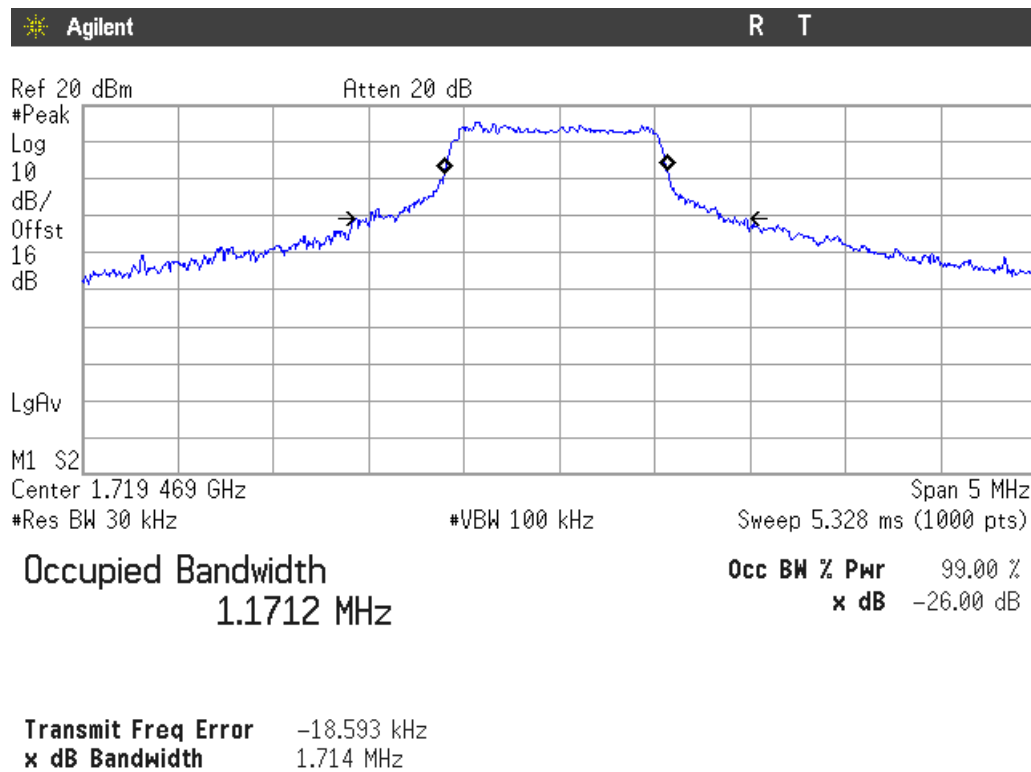


Highest Channel

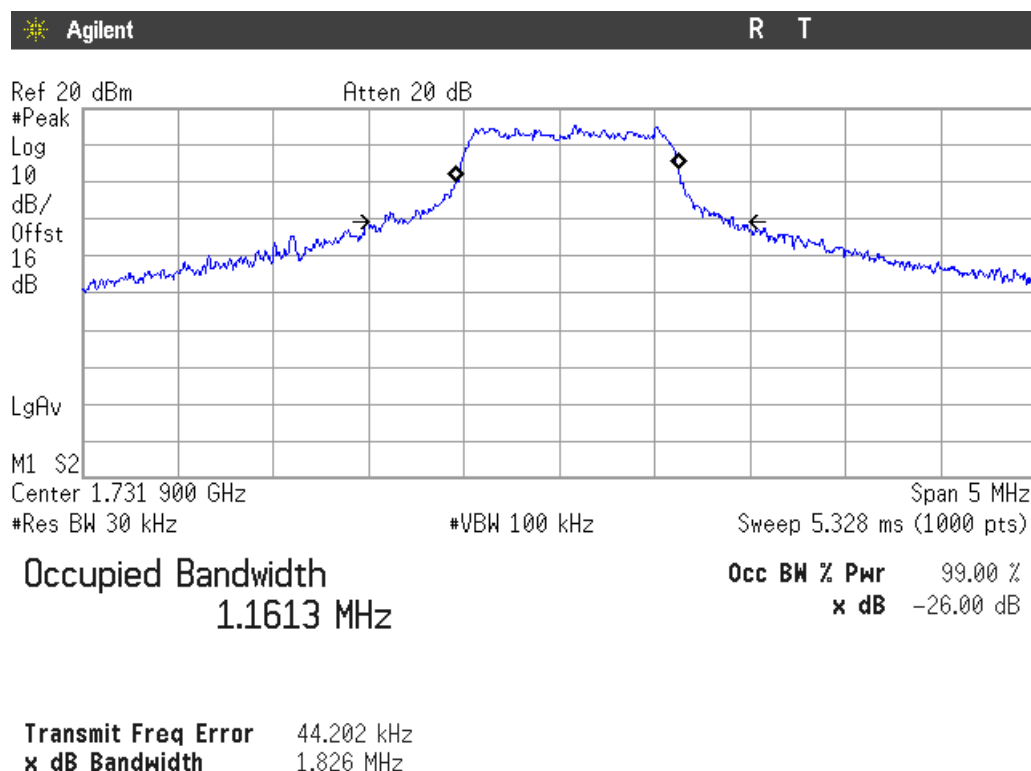


LTE QPSK MODULATION. BW = 20 MHz (Band IV)

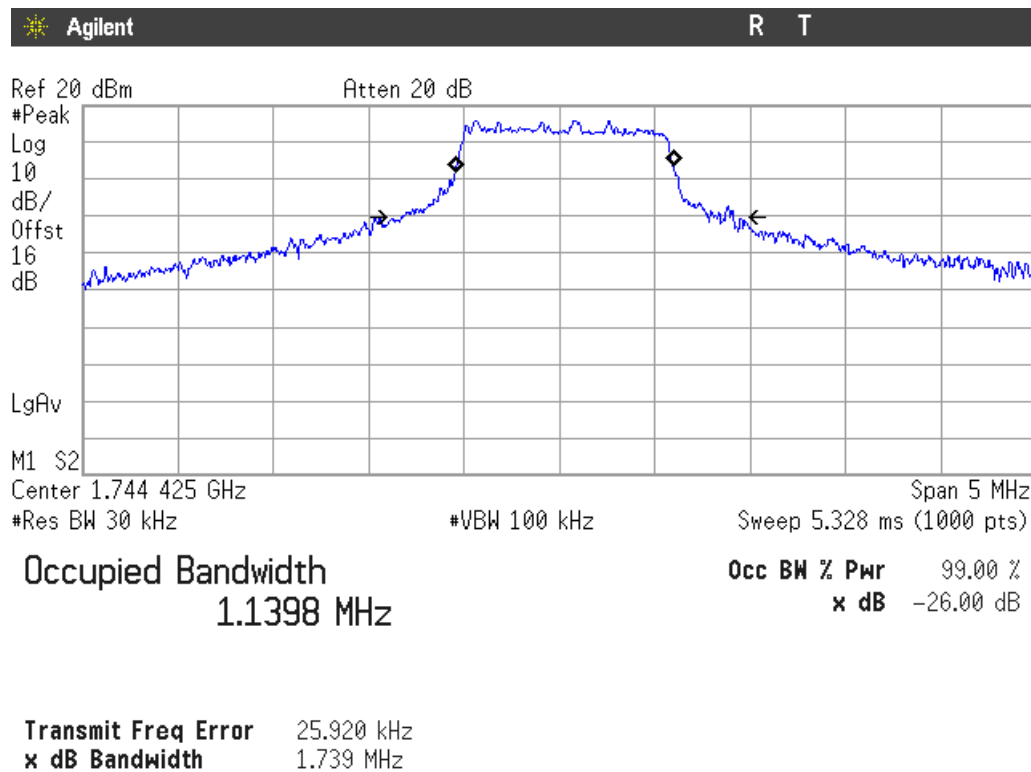
Lowest Channel



Middle Channel

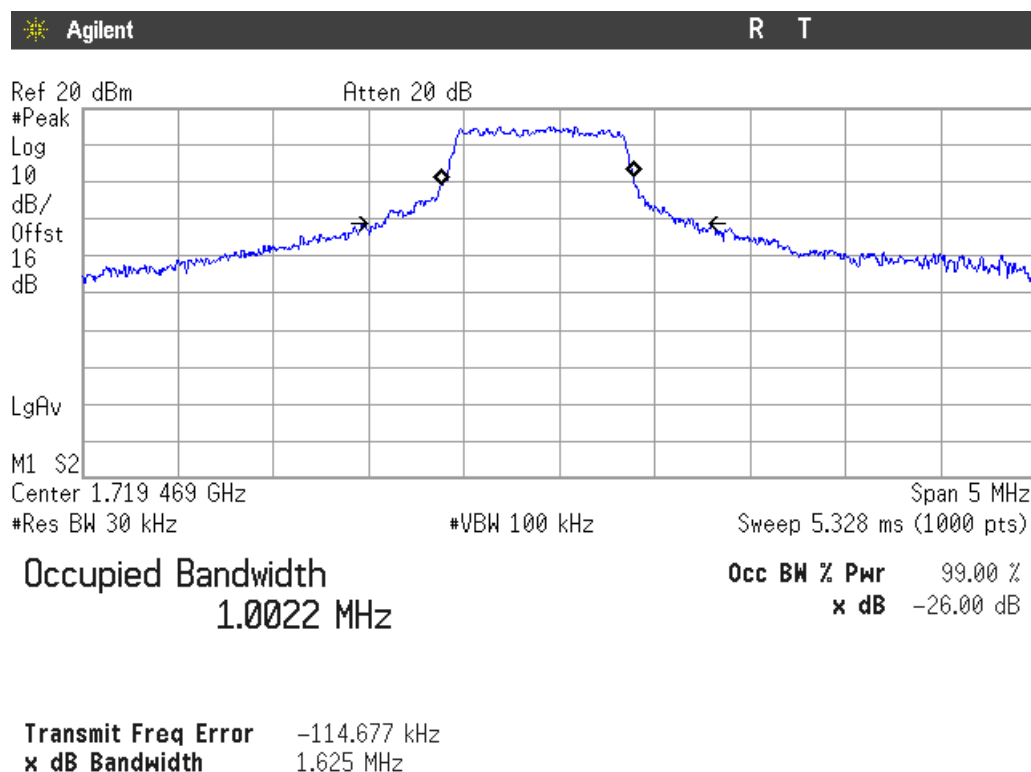


Highest Channel

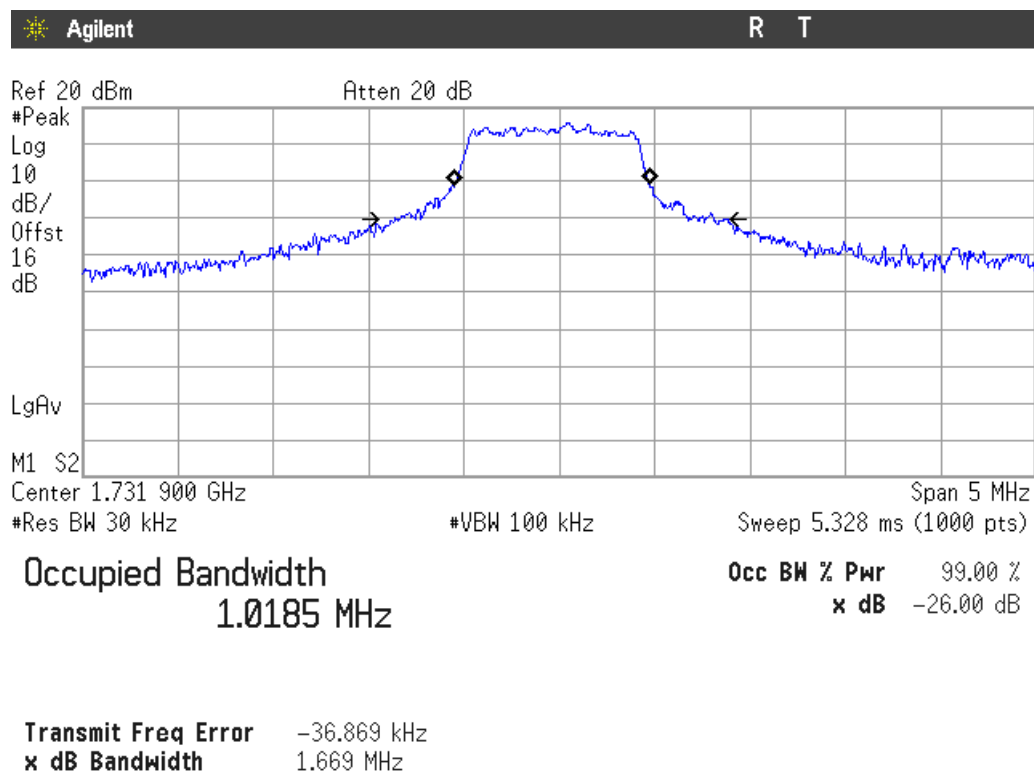


LTE 16QAM MODULATION. BW = 20 MHz (Band IV)

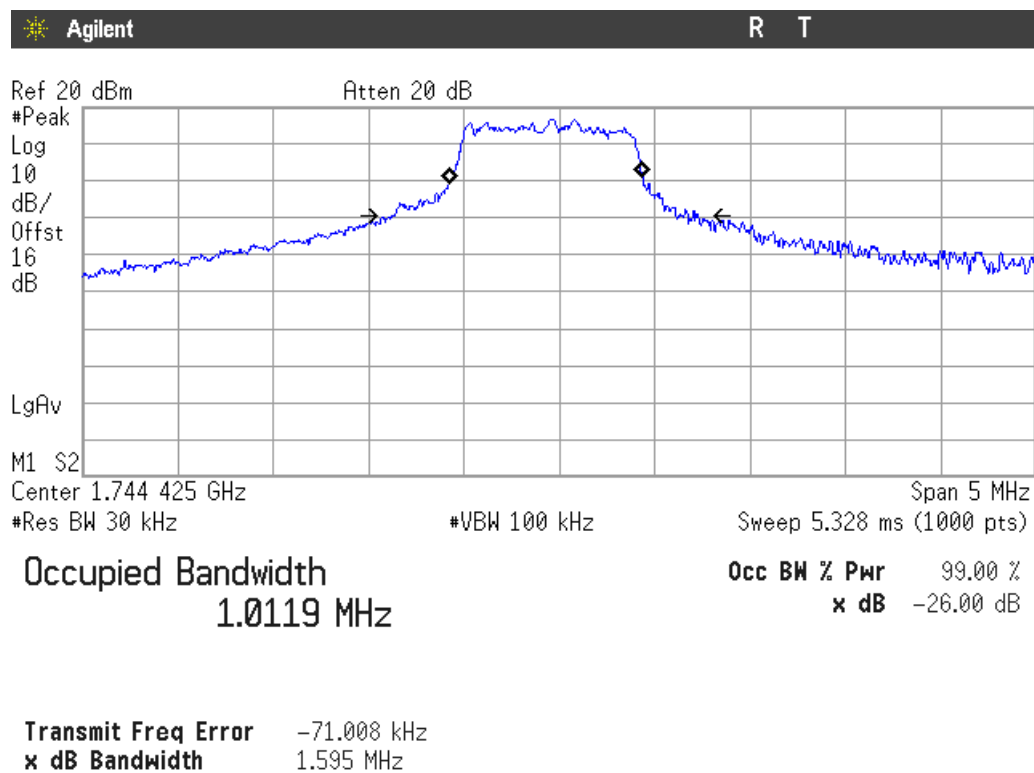
Lowest Channel



Middle Channel

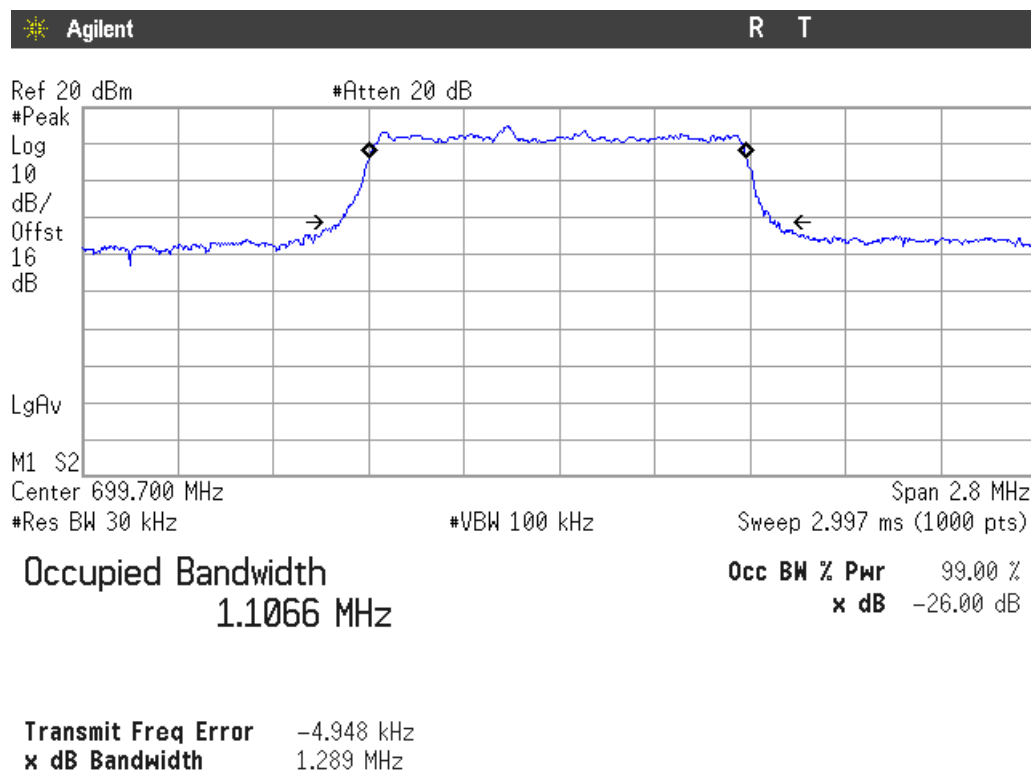


Highest Channel

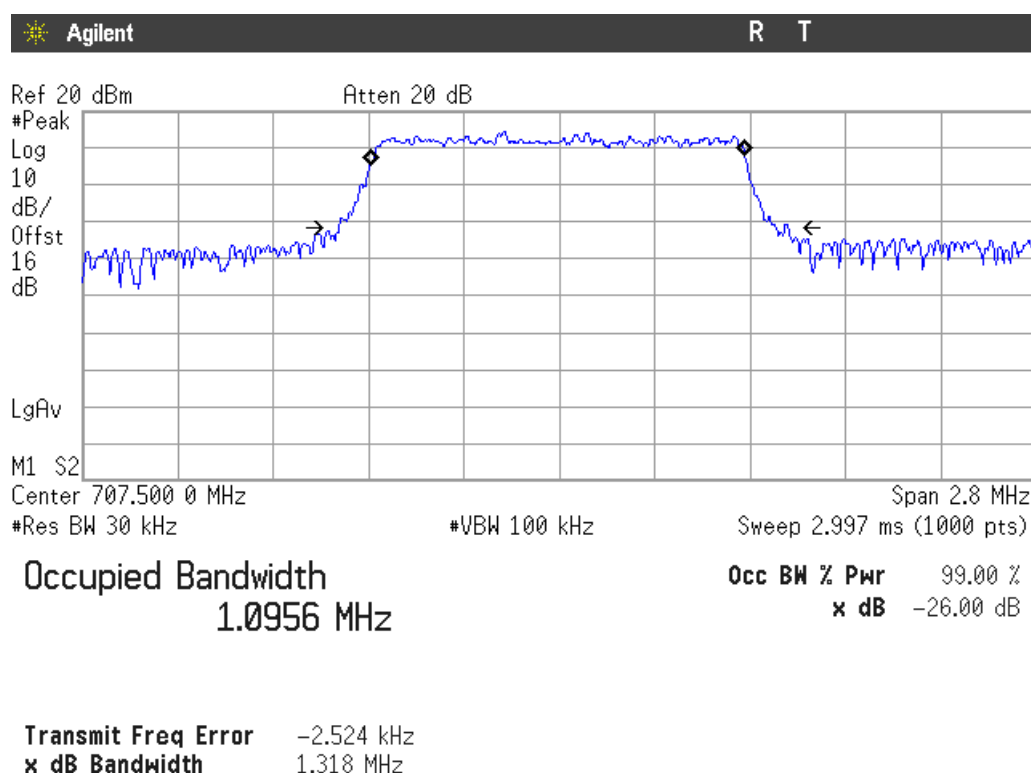


LTE QPSK MODULATION. BW = 1.4 MHz (Band XII)

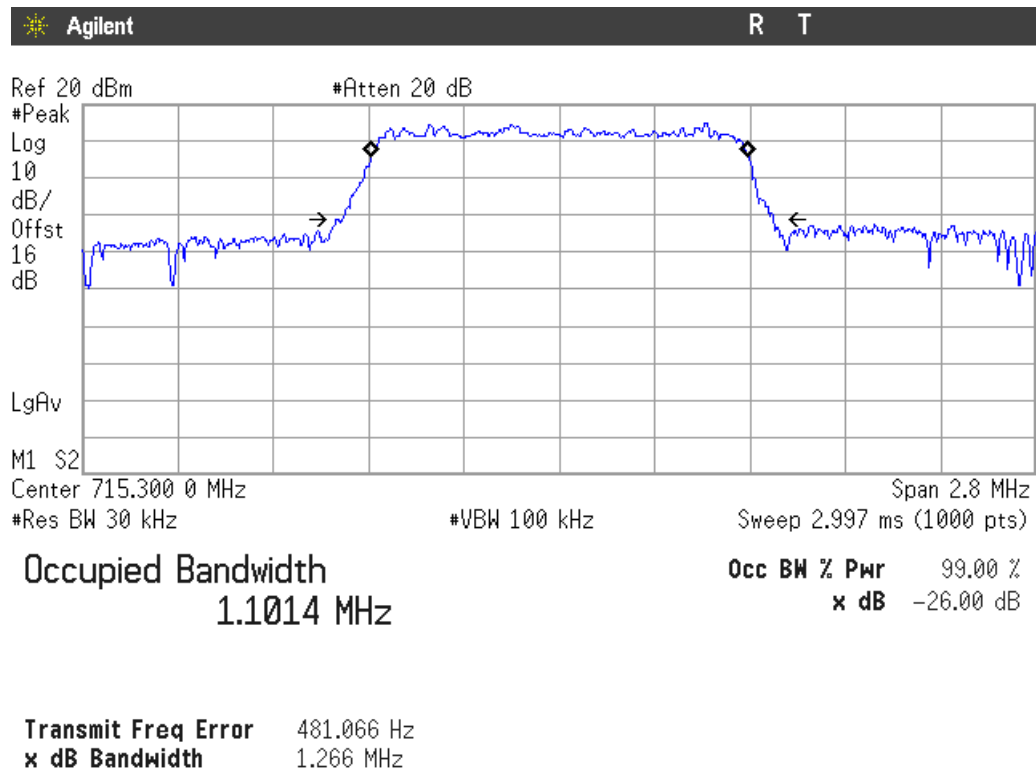
Lowest Channel



Middle Channel

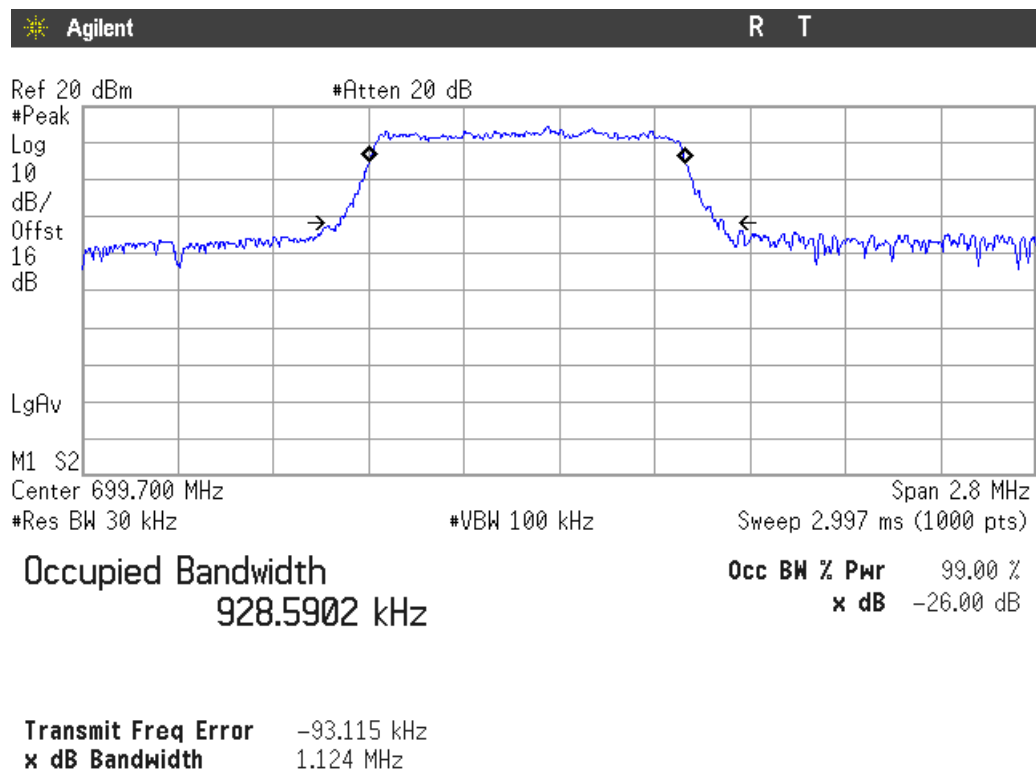


Highest Channel

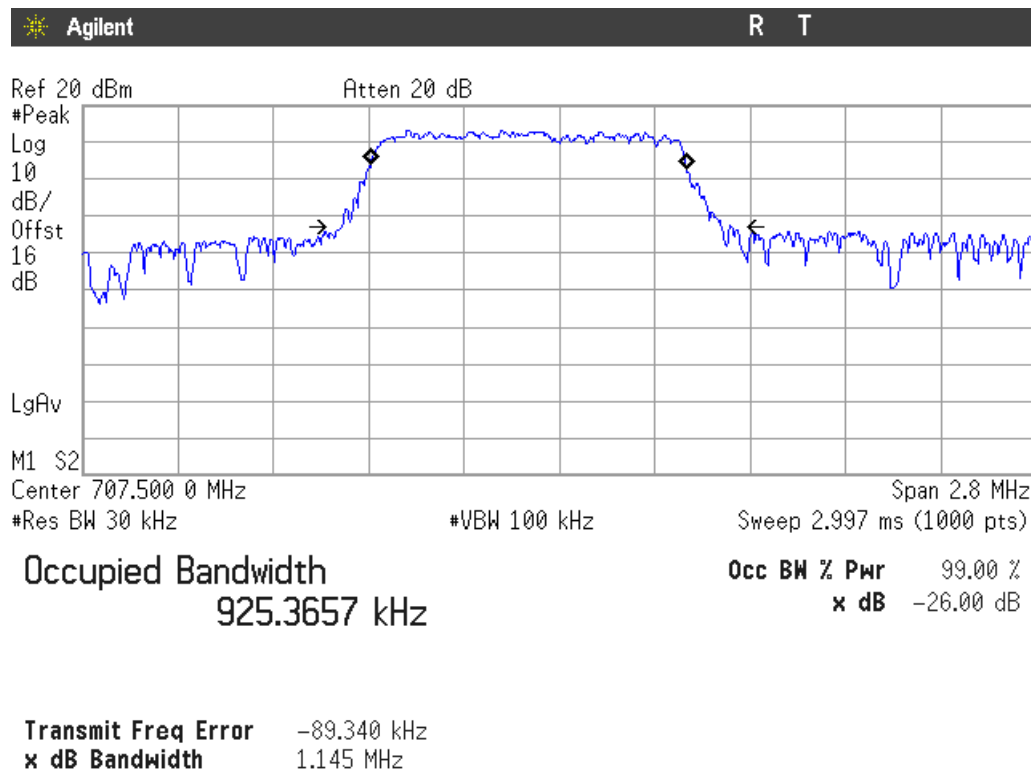


LTE 16QAM MODULATION. BW = 1.4 MHz (Band XII)

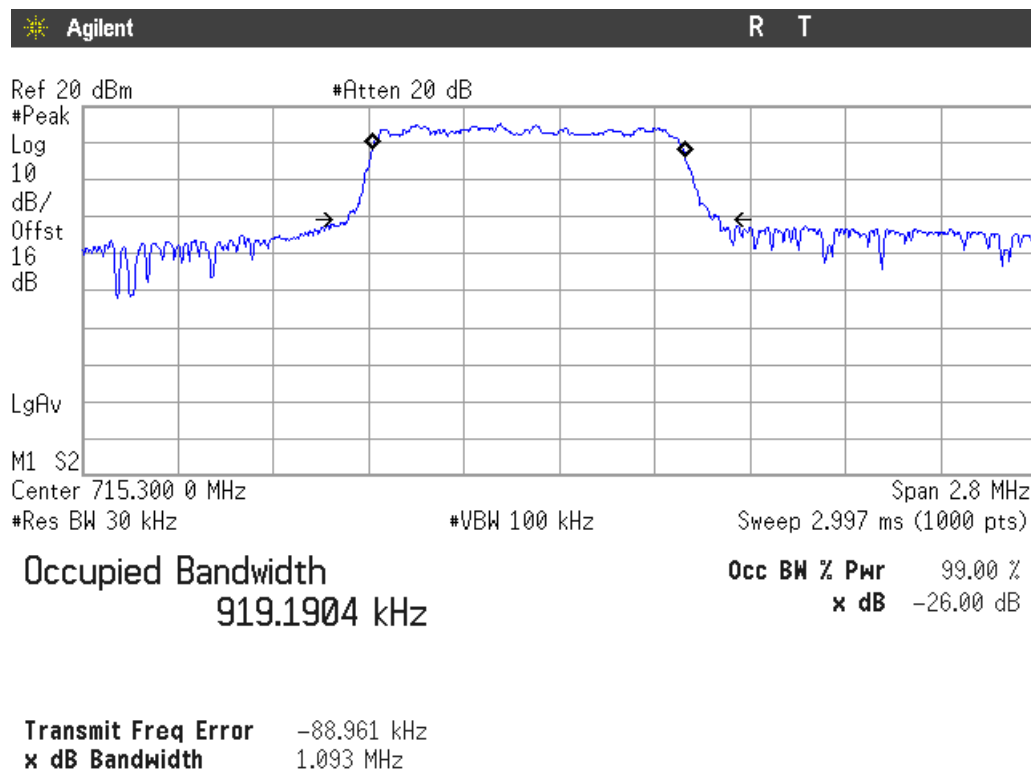
Lowest Channel



Middle Channel

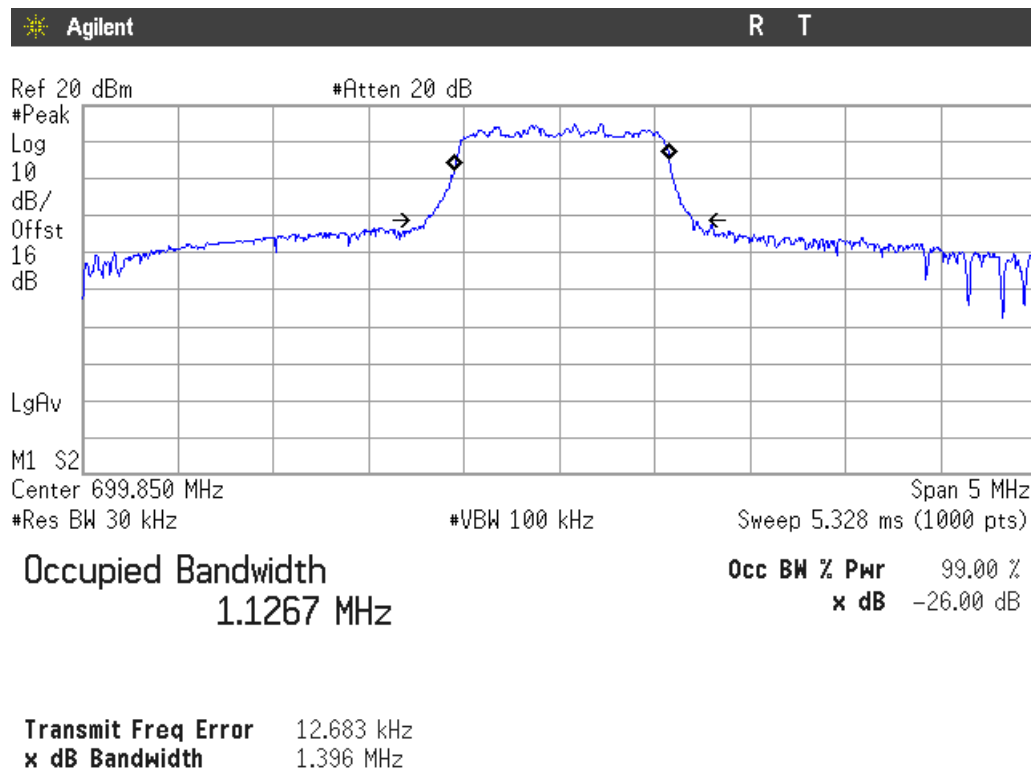


Highest Channel

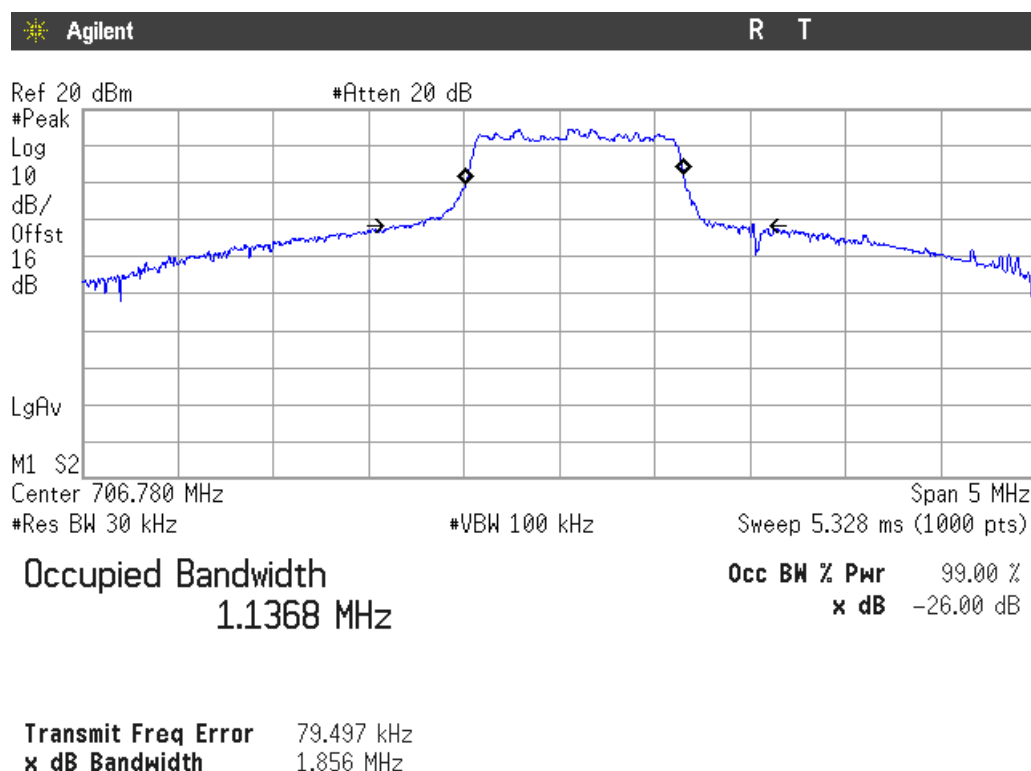


LTE QPSK MODULATION. BW = 3 MHz (Band XII)

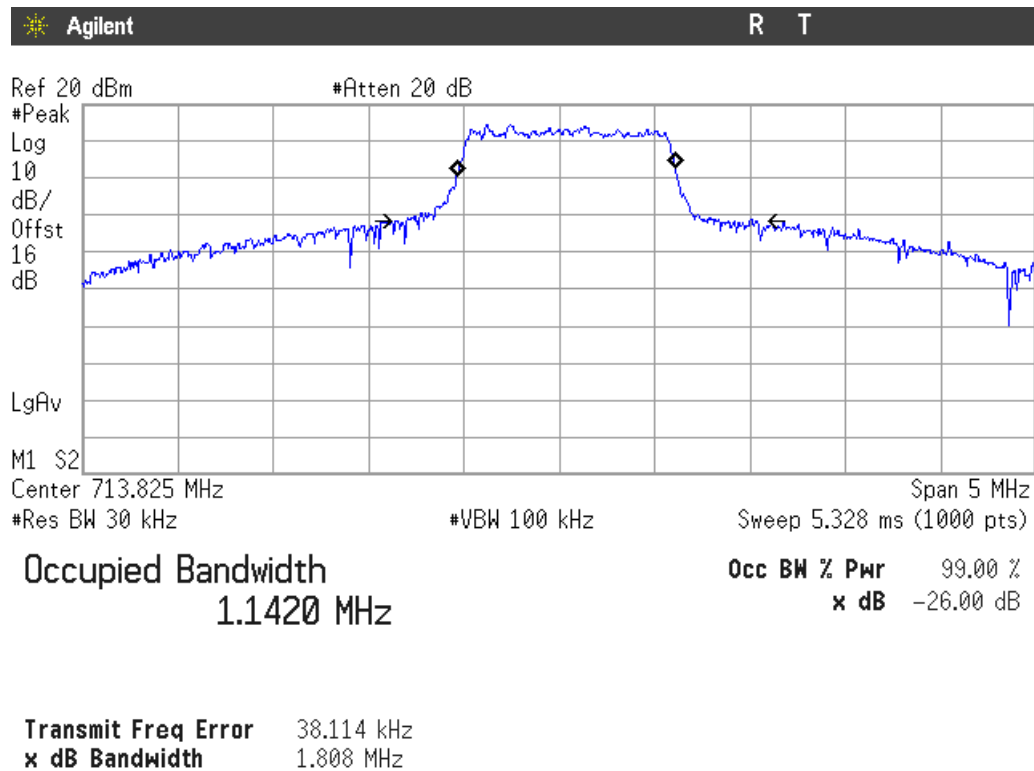
Lowest Channel



Middle Channel

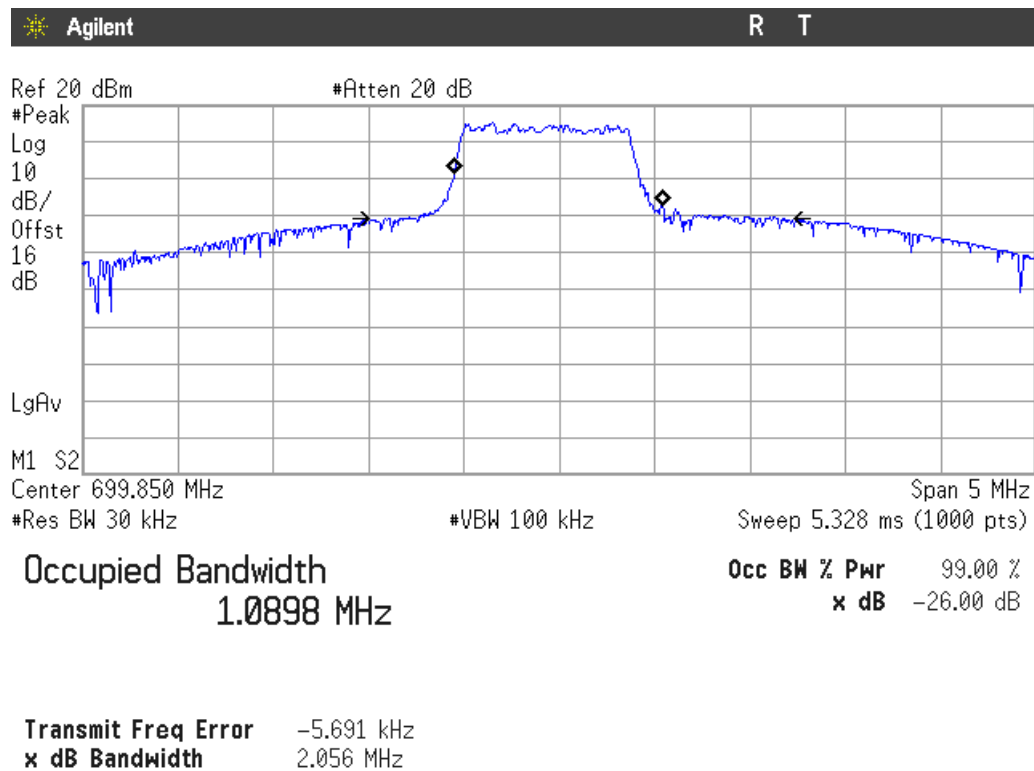


Highest Channel

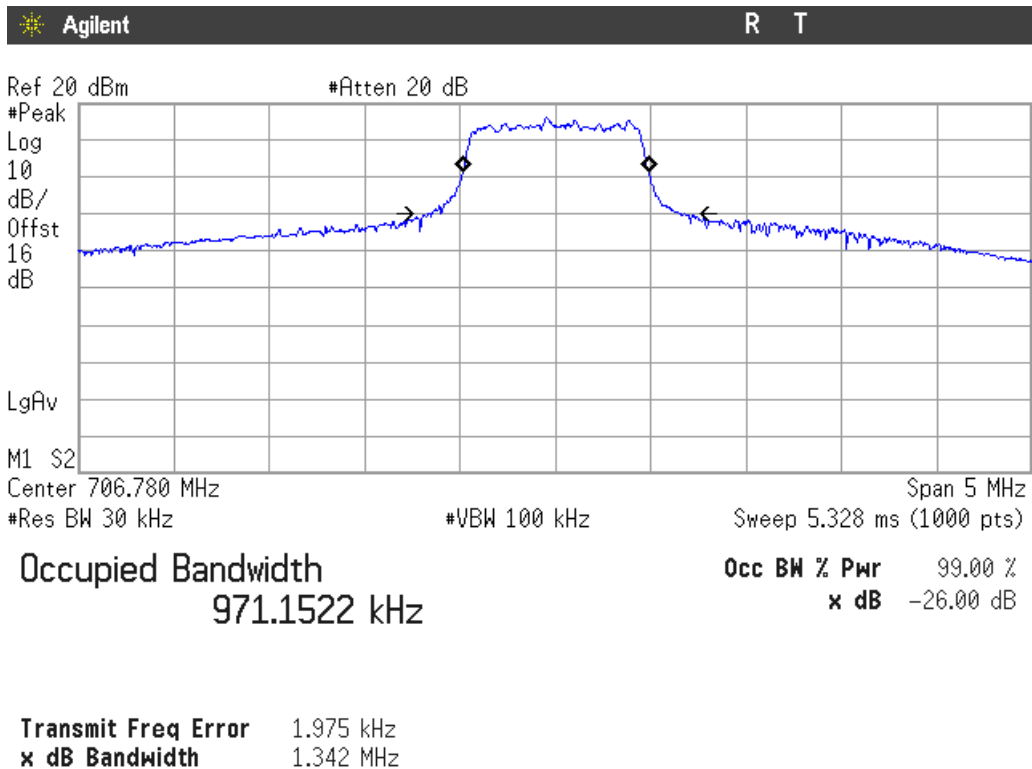


LTE 16QAM MODULATION. BW = 3 MHz (Band XII)

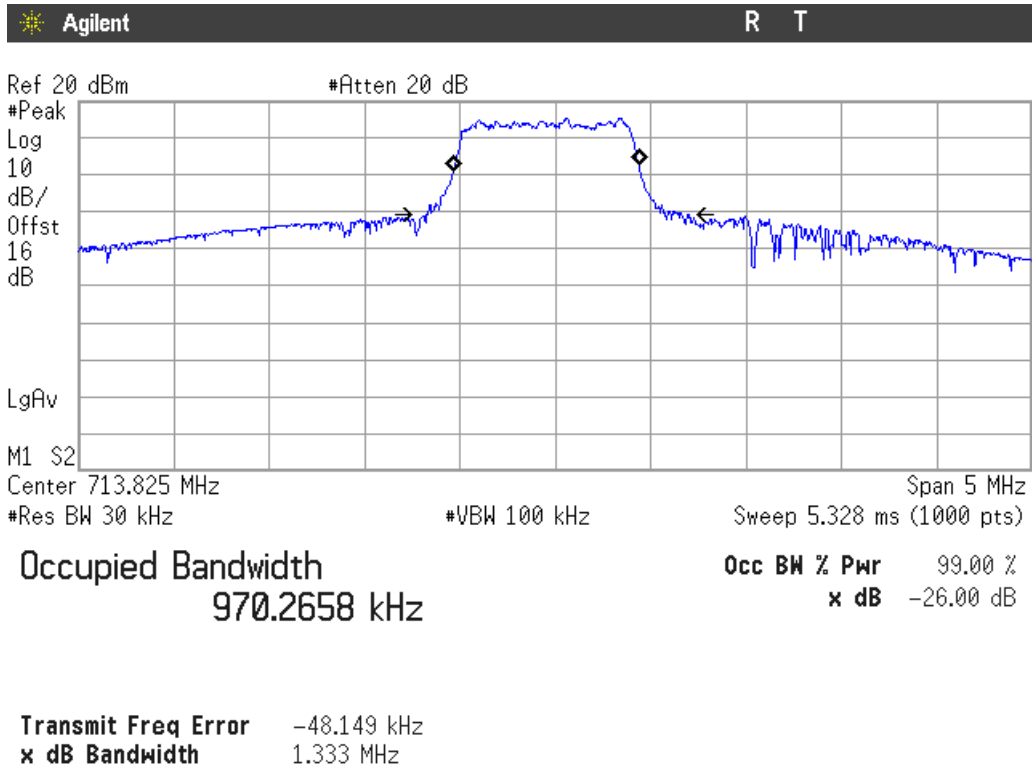
Lowest Channel



Middle Channel

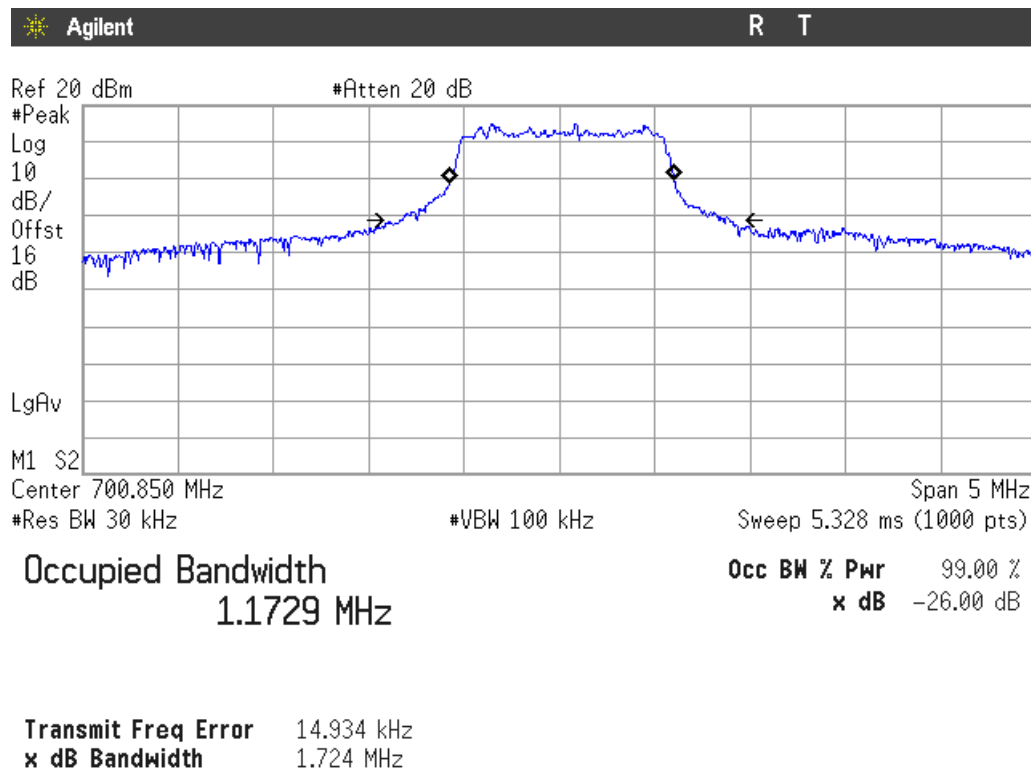


Highest Channel

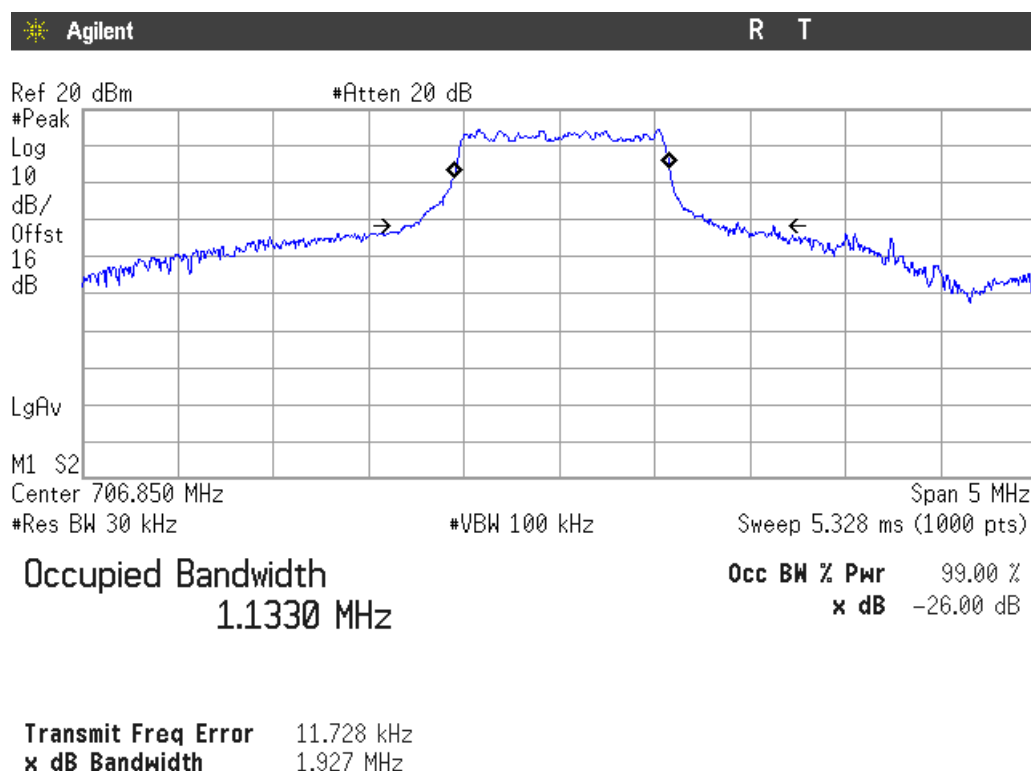


LTE QPSK MODULATION. BW = 5 MHz (Band XII)

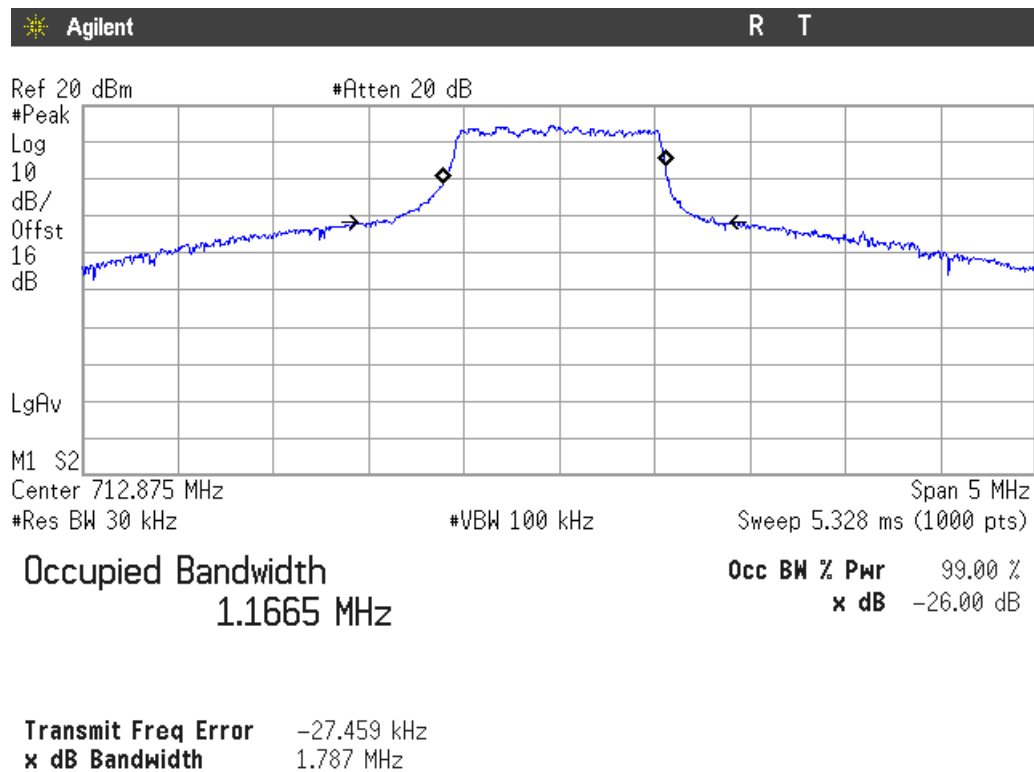
Lowest Channel



Middle Channel

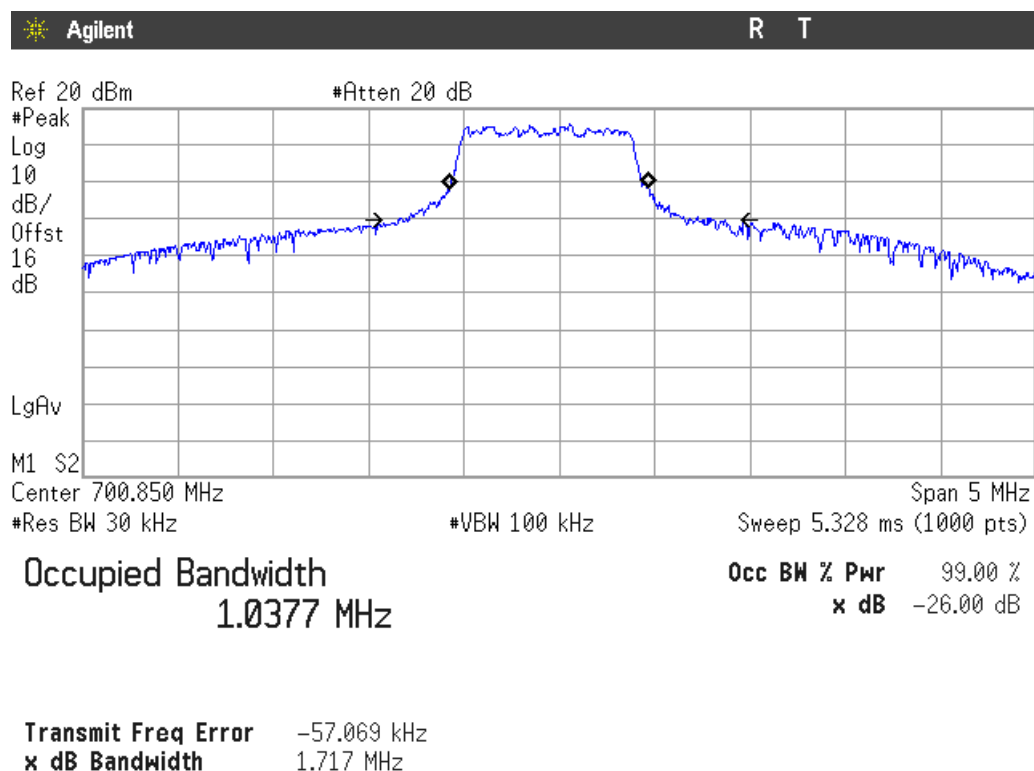


Highest Channel

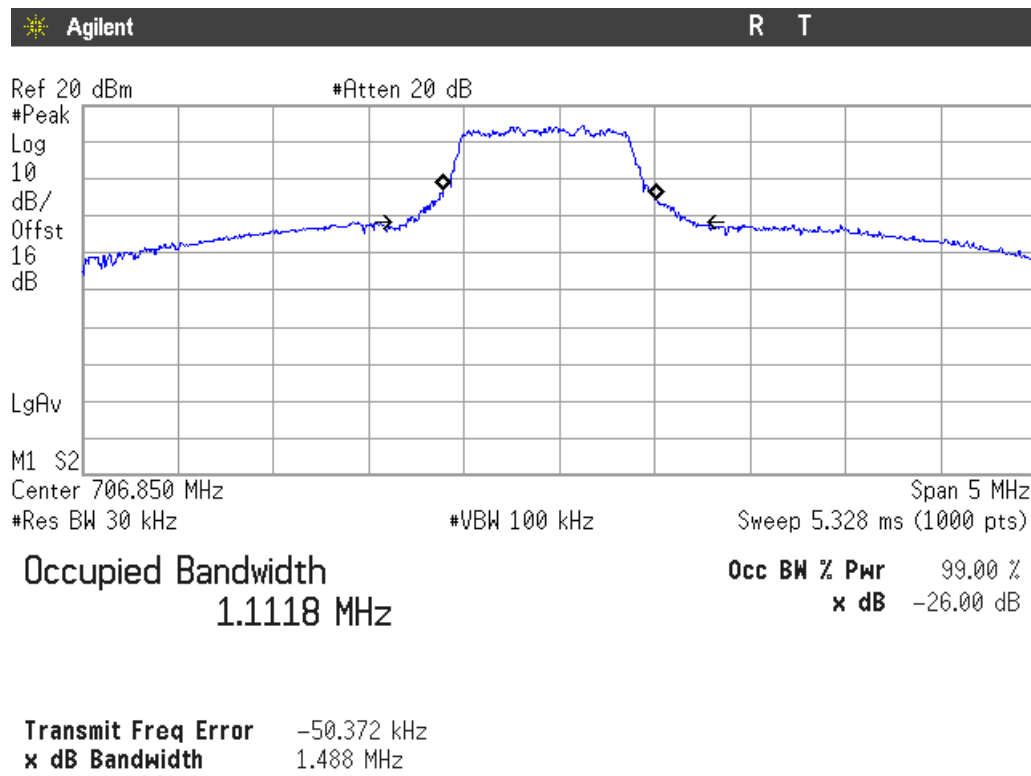


LTE 16QAM MODULATION. BW = 5 MHz (Band XII)

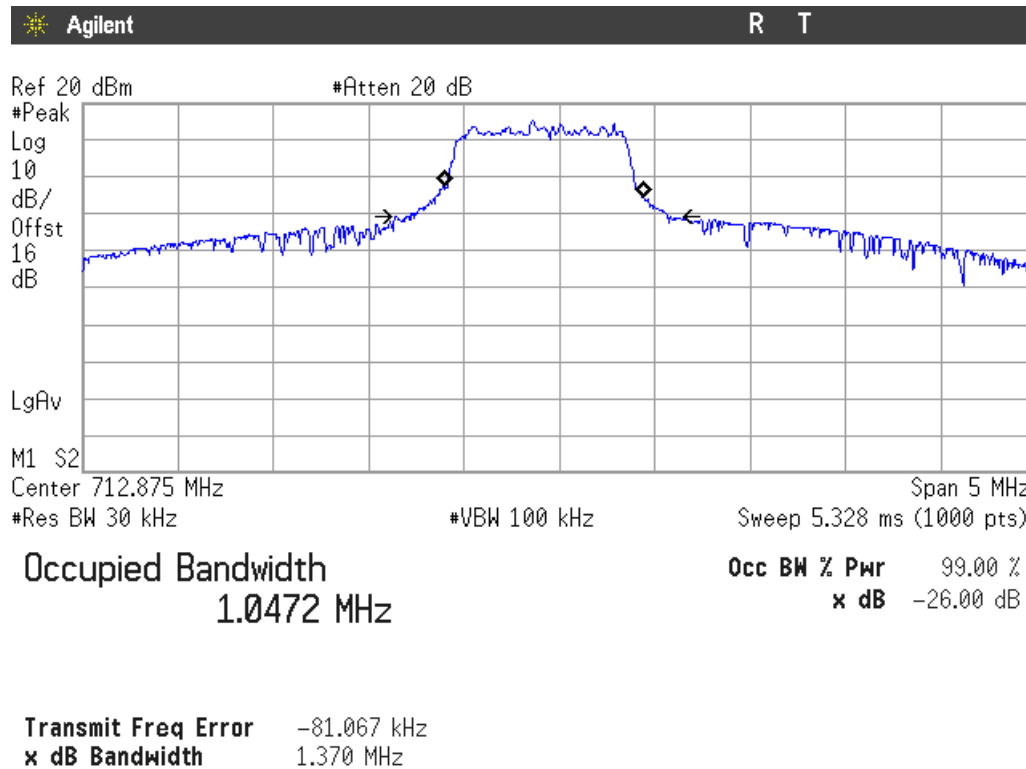
Lowest Channel



Middle Channel

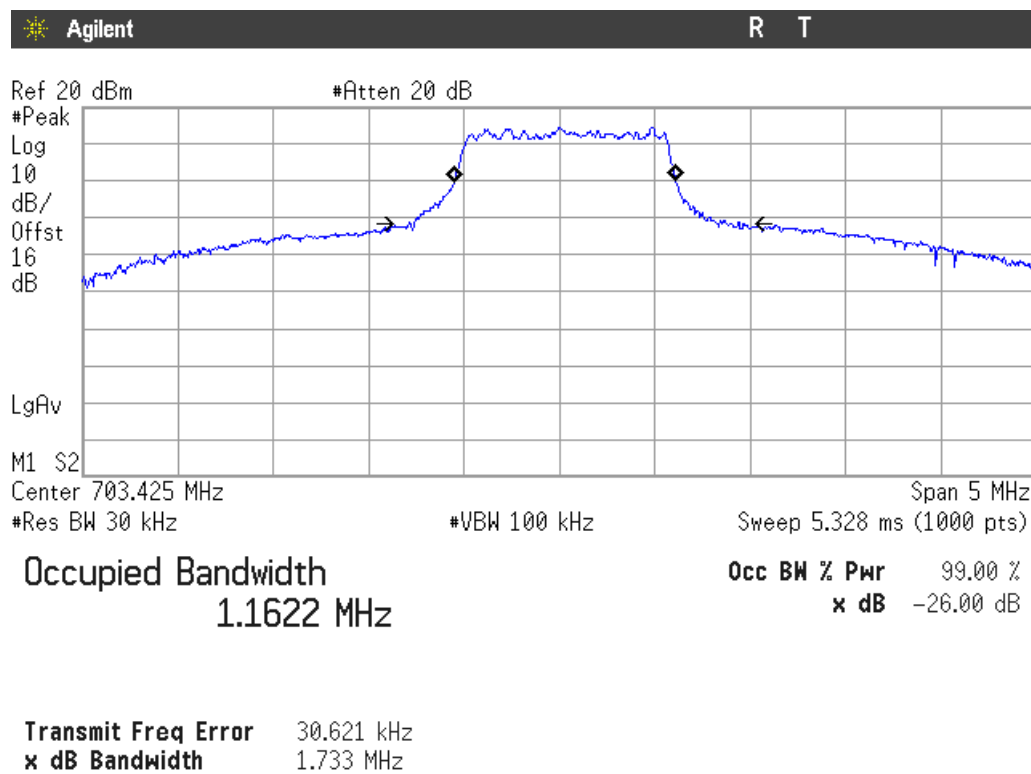


Highest Channel

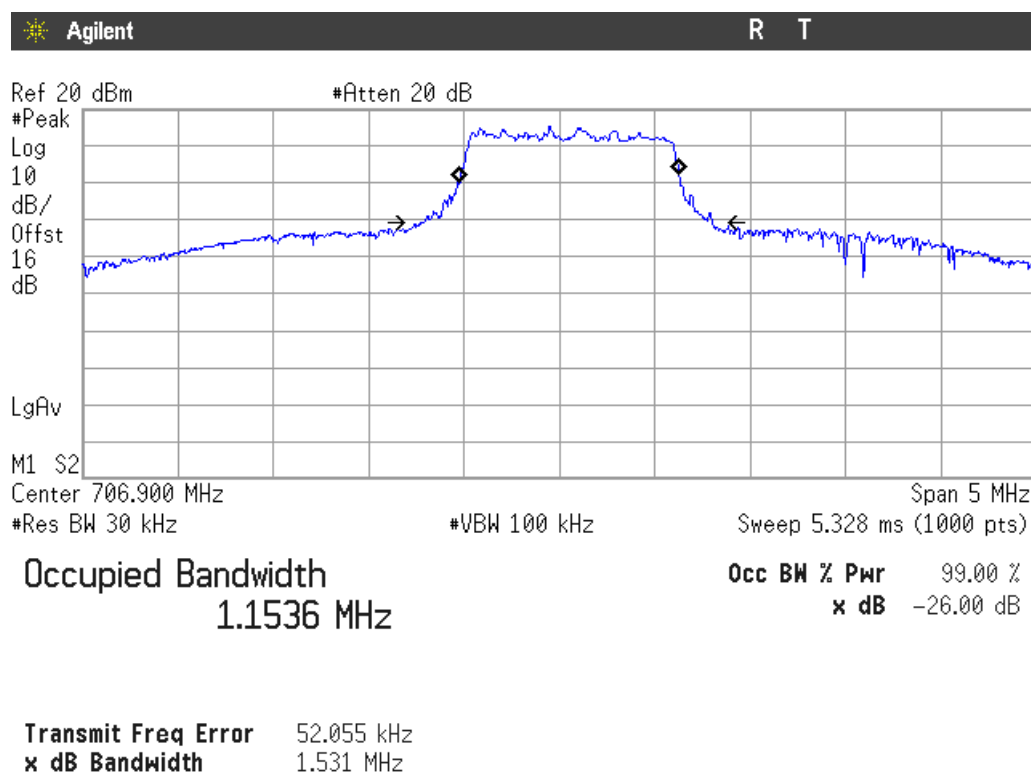


LTE QPSK MODULATION. BW = 10 MHz (Band XII)

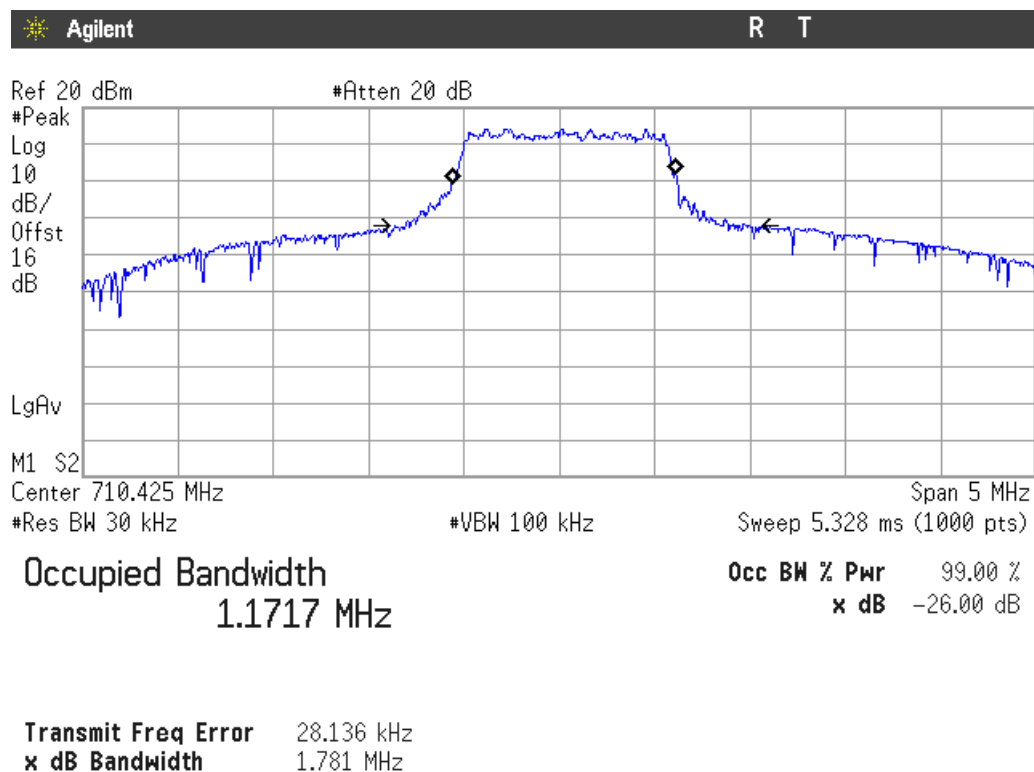
Lowest Channel



Middle Channel

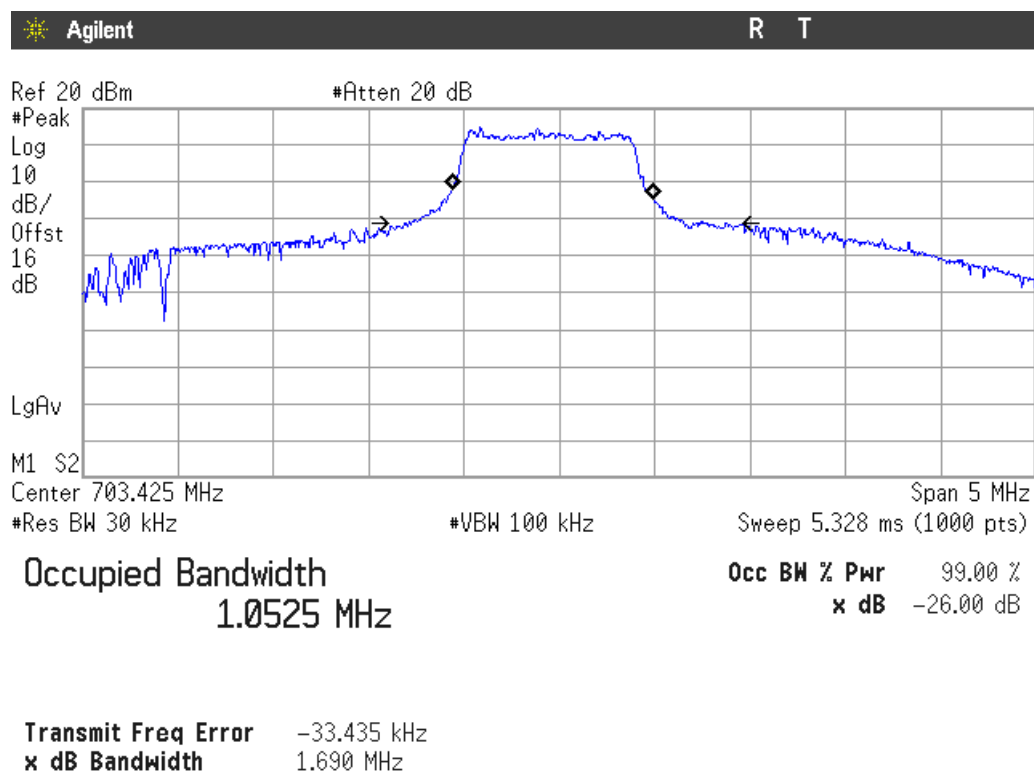


Highest Channel

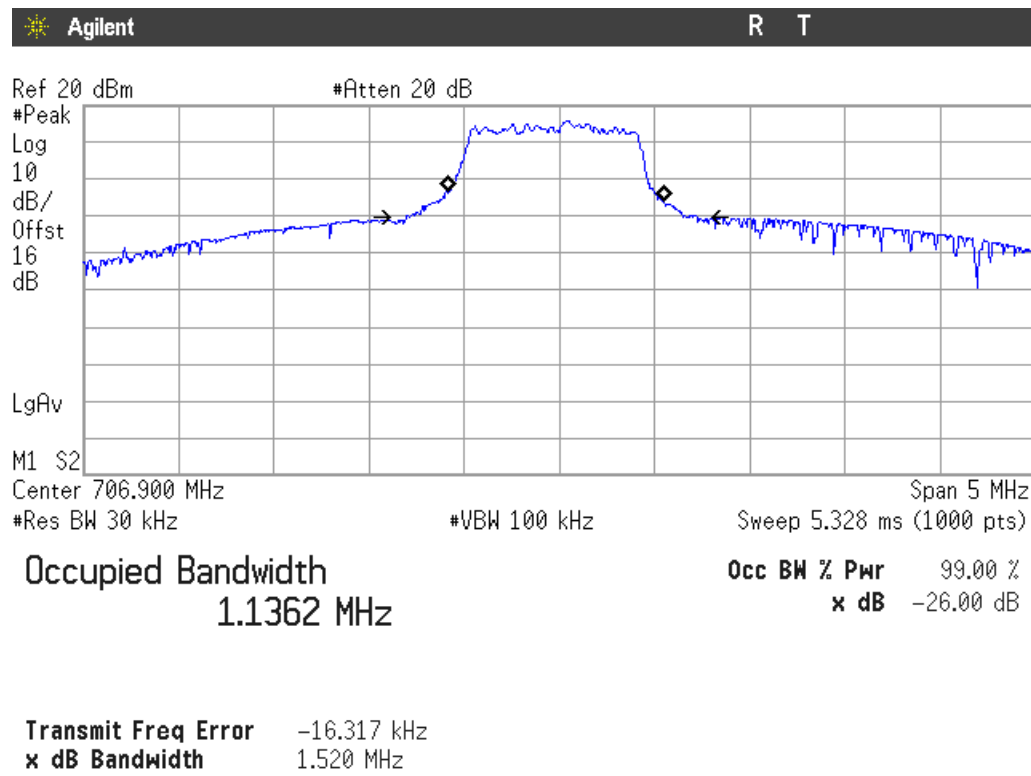


LTE 16QAM MODULATION. BW = 10 MHz (Band XII)

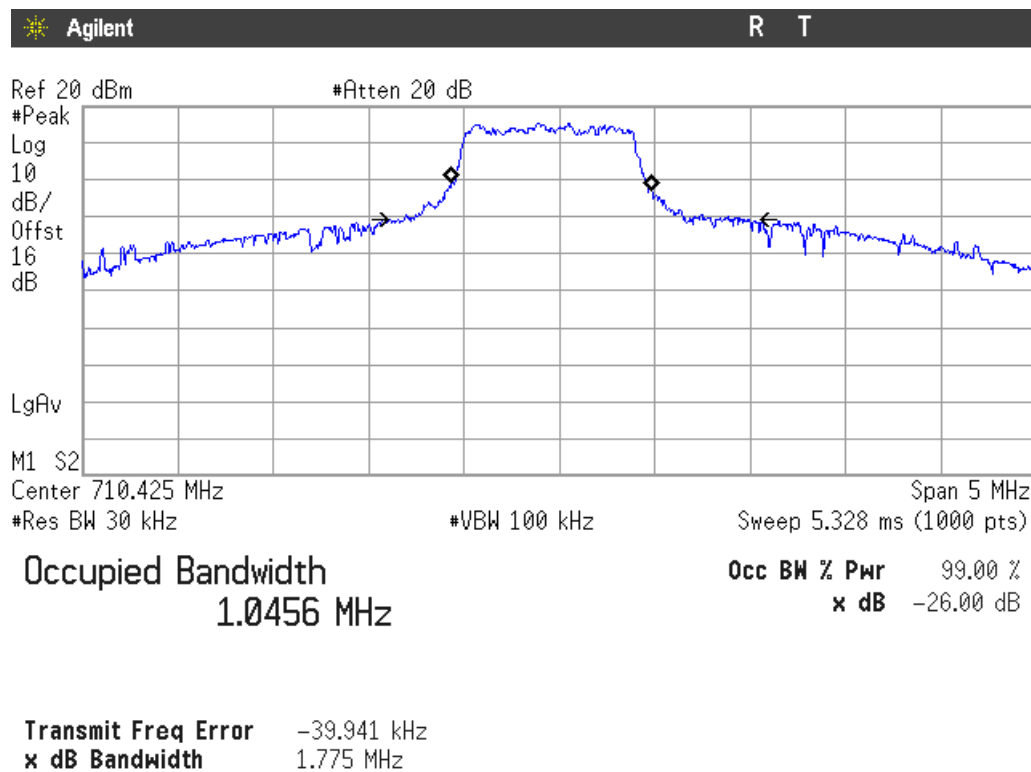
Lowest Channel



Middle Channel



Highest Channel



Spurious emissions at antenna terminals

SPECIFICATION

LTE BAND IV. FCC §2.1051 and §27.53 (h). RSS-139 Clause 6.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

LTE BAND XII. FCC §2.1051 and §27.53 (g). RSS-130 Clause 4.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log (P_o)$, and the level in dBm relative P_o becomes:

$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$.

METHOD

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power splitter.

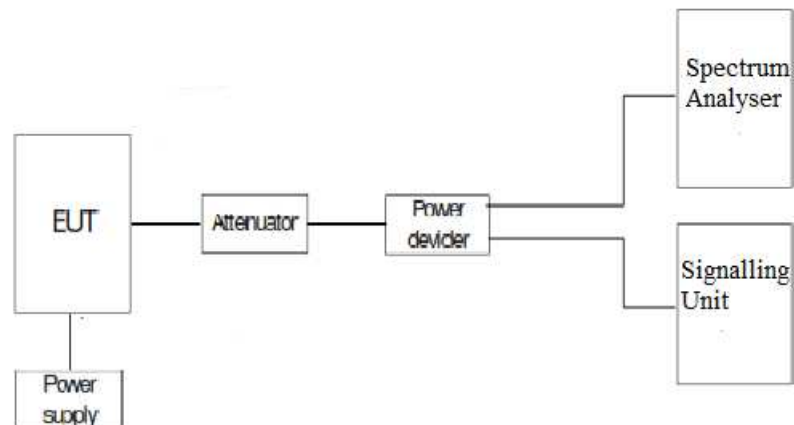
The spectrum was investigated from 9 kHz to 18 GHz for LTE Band IV.

The spectrum was investigated from 9 kHz to 8 GHz for LTE Band XII.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For LTE mode the configuration of Narrow band, Resource Blocks and modulation which is the worst case for conducted power was used.

TEST SETUP



RESULTS (see plots in next pages)

LTE BW = 1.4 MHz. Band IV

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 3 MHz. Band IV

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 5 MHz. Band IV

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 10 MHz. Band IV

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 15 MHz. Band IV

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 20 MHz. Band IV

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 1.4 MHz. Band XII

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 3 MHz. Band XII

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 5 MHz. Band XII

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE BW = 10 MHz. Band XII

1. CHANNEL: LOWEST

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

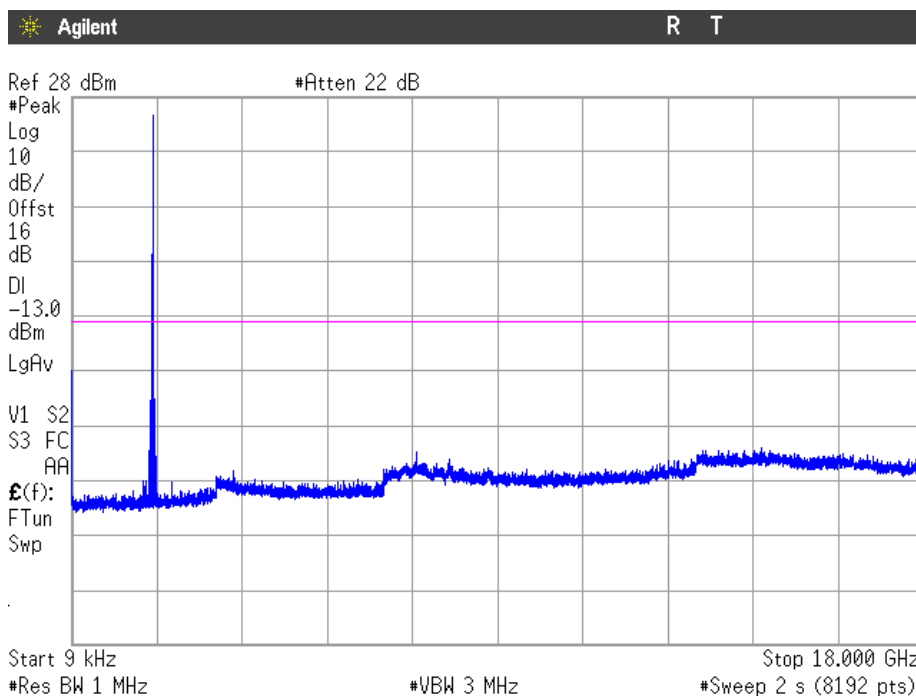
No spurious signals were found at less than 20dB respect to the limit in all the range.

Measurement uncertainty = ± 1.20 dB.

Verdict: PASS

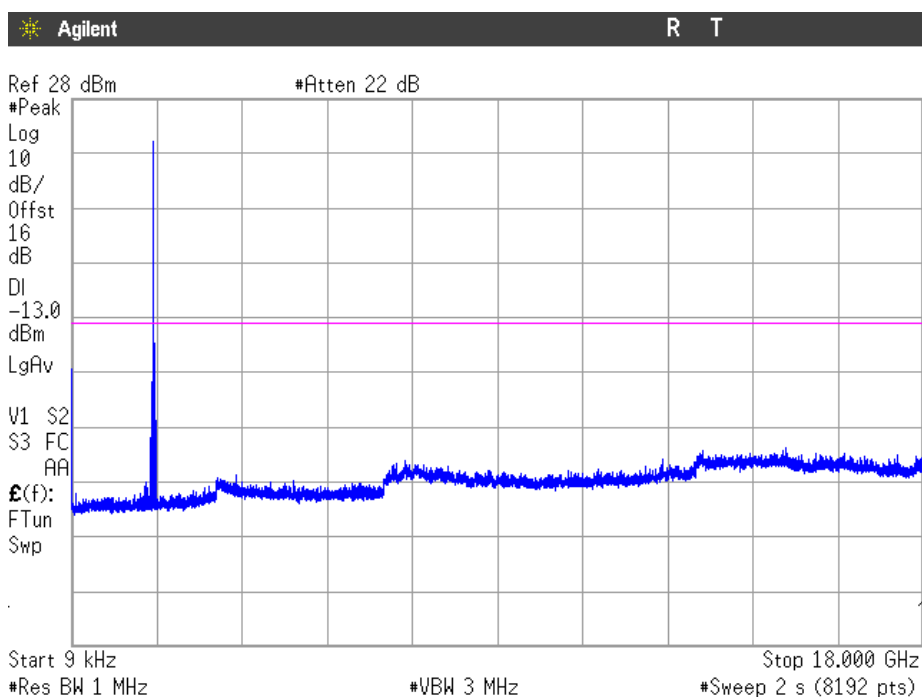
LTE BW = 1.4 MHz (Band IV)

1. CHANNEL: LOWEST



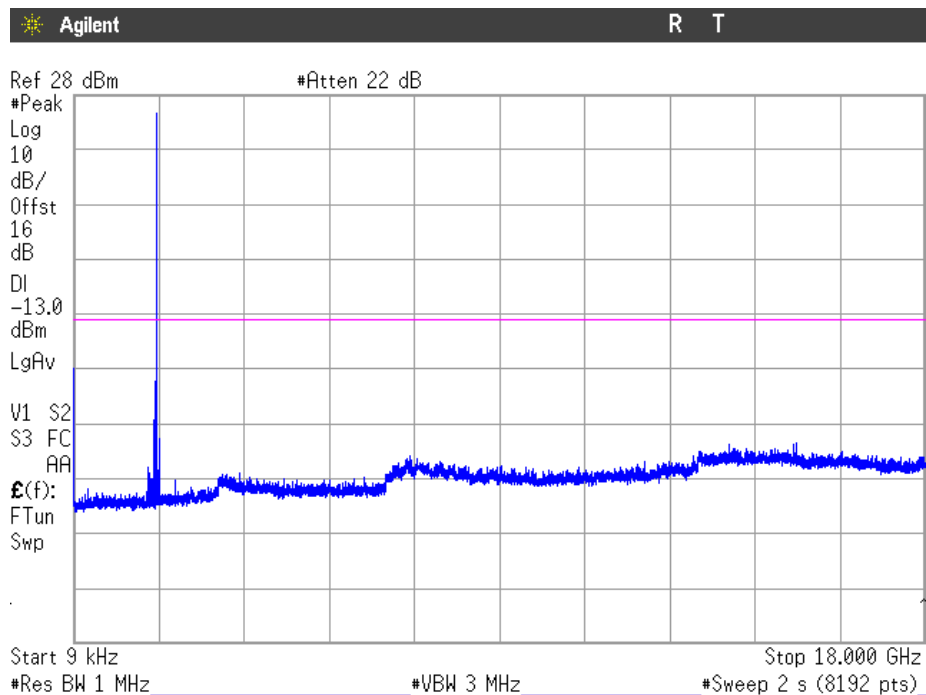
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

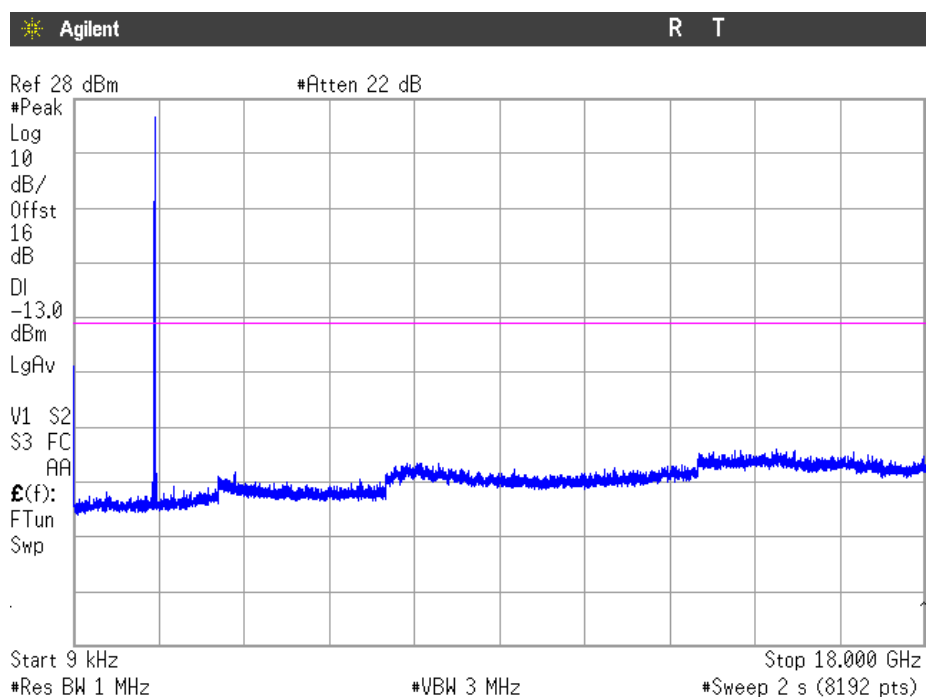
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

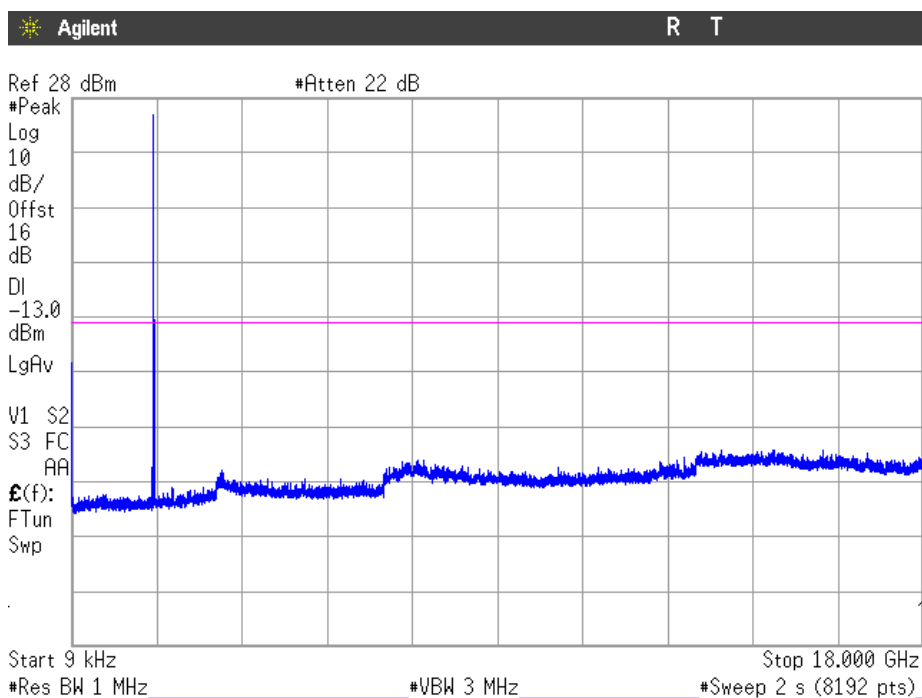
LTE BW = 3 MHz (Band IV)

1. CHANNEL: LOWEST



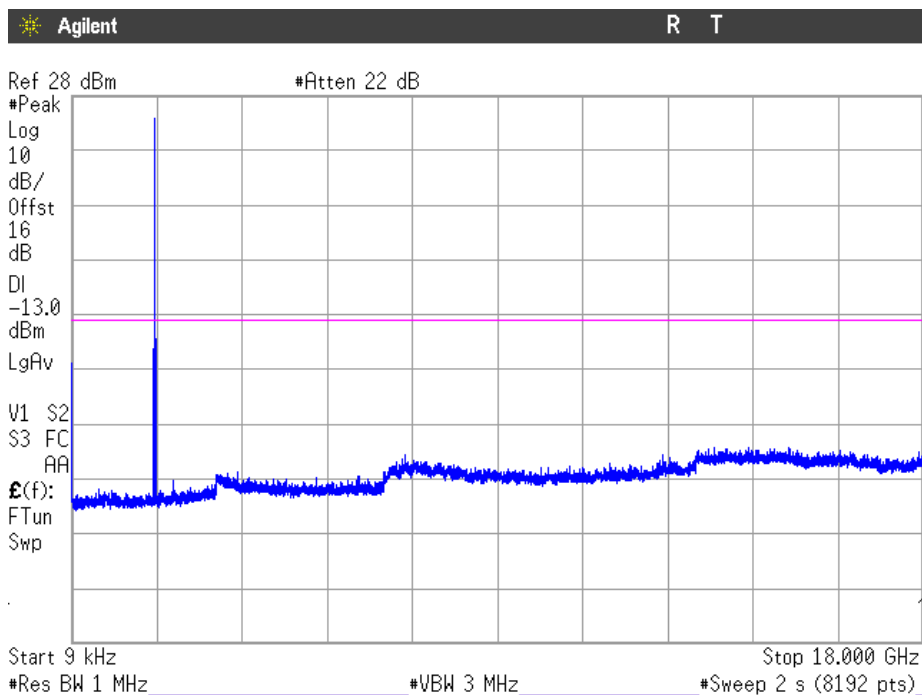
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

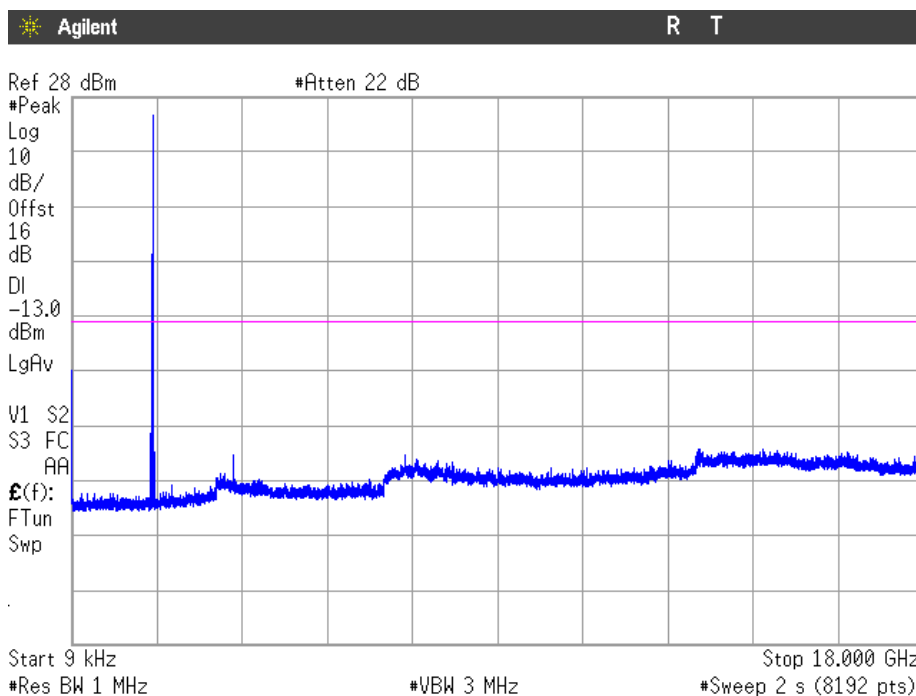
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

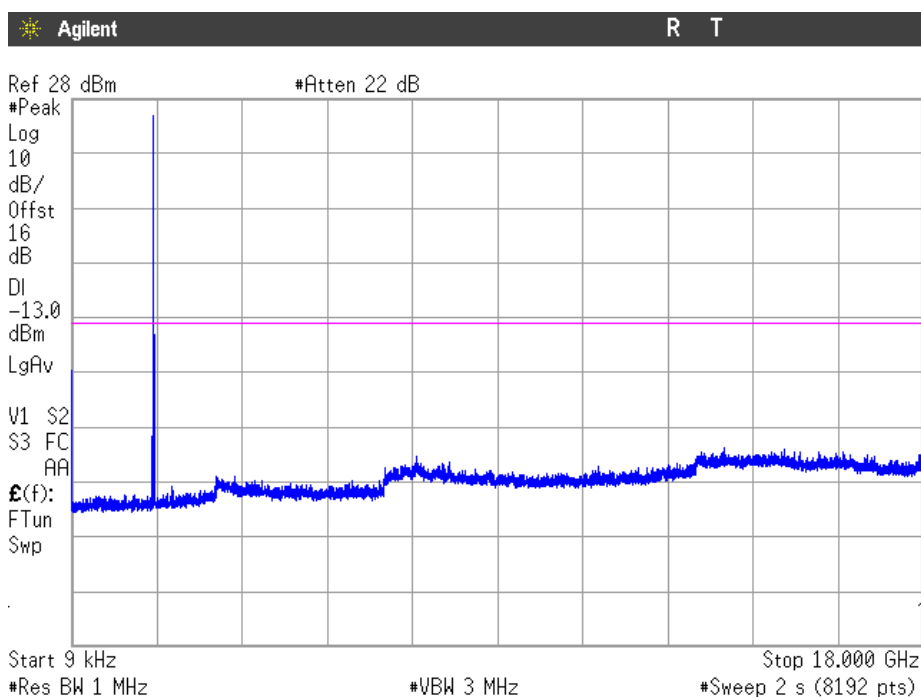
LTE BW = 5 MHz (Band IV)

1. CHANNEL: LOWEST



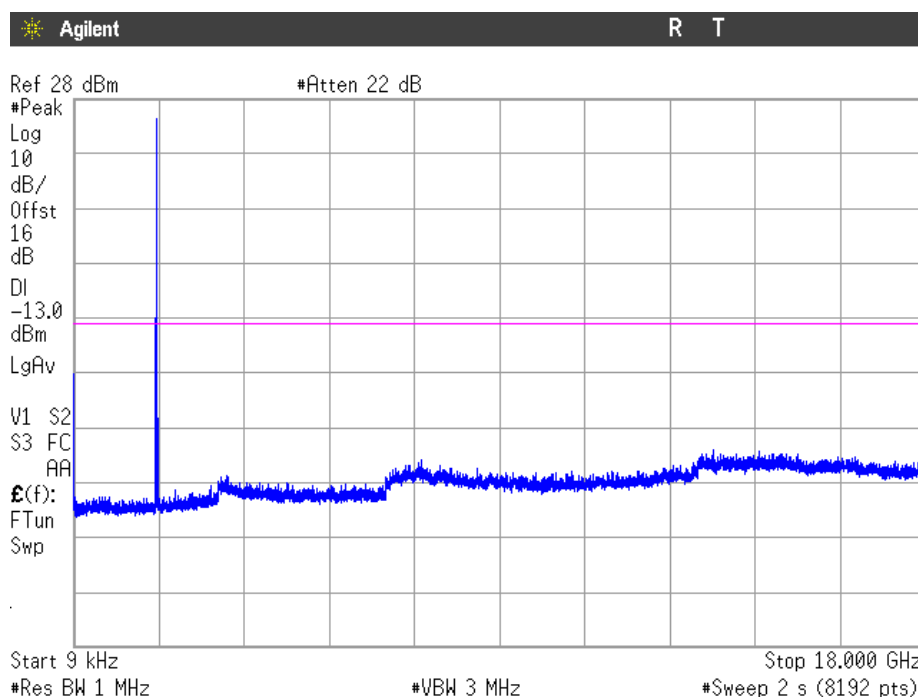
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

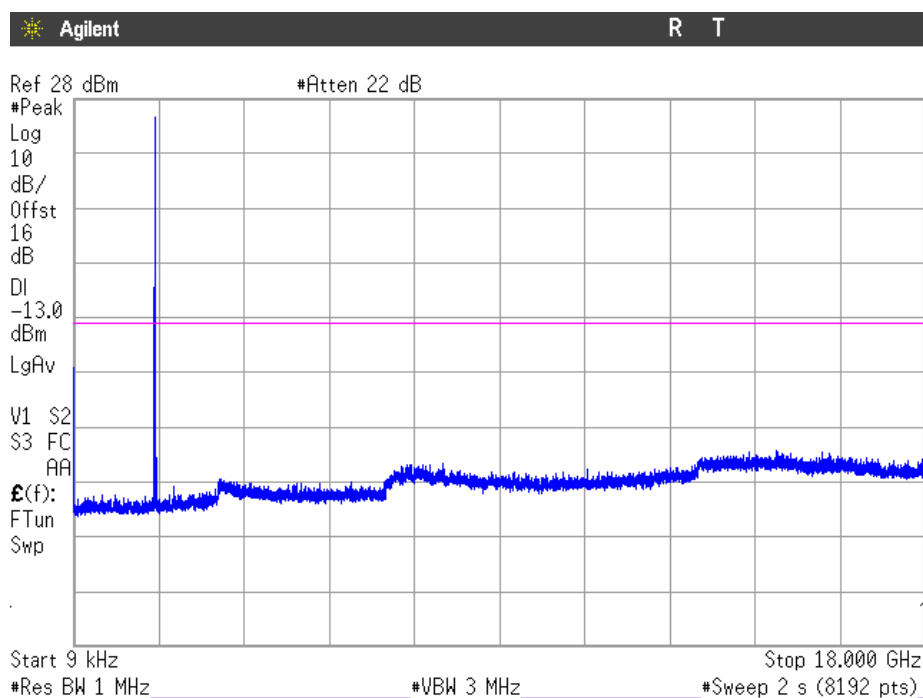
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

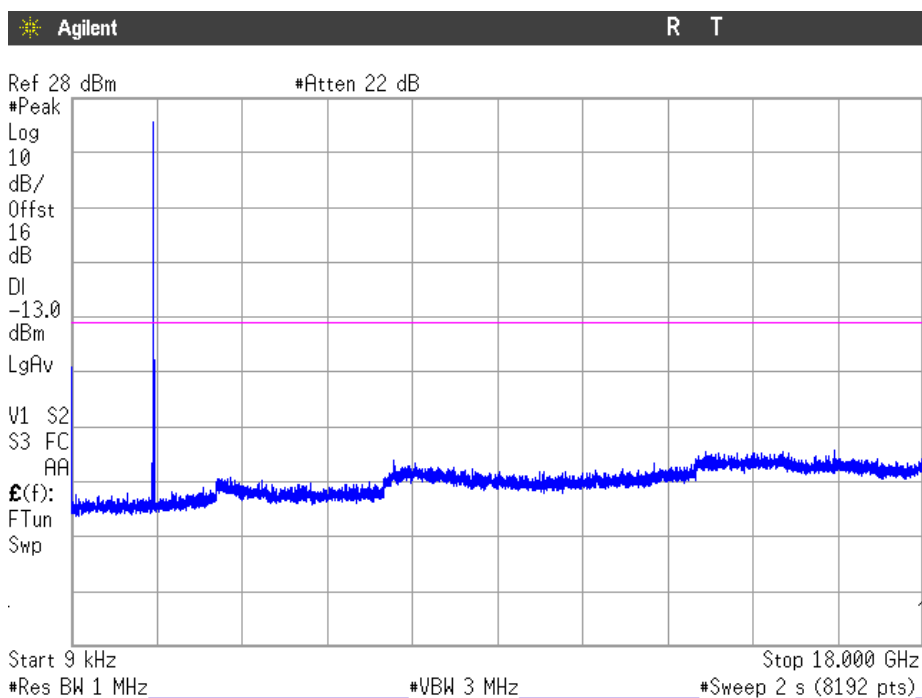
LTE BW = 10 MHz (Band IV)

1. CHANNEL: LOWEST



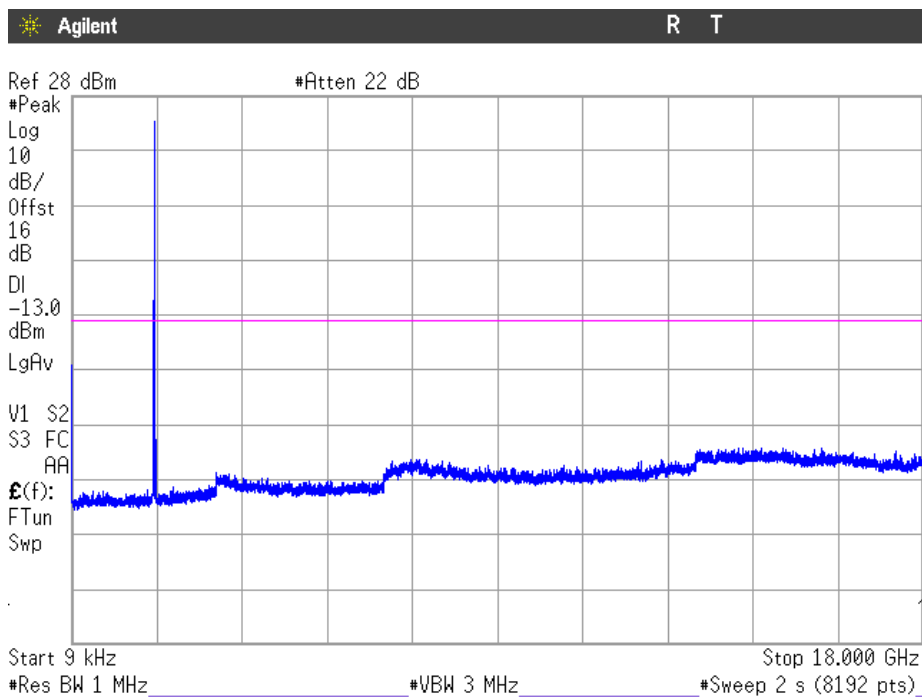
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

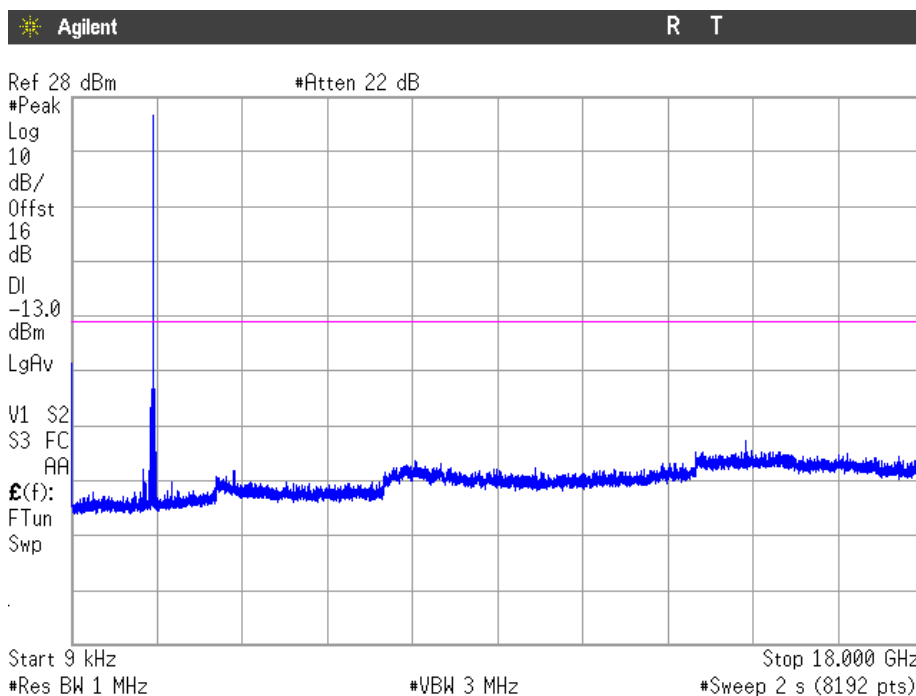
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

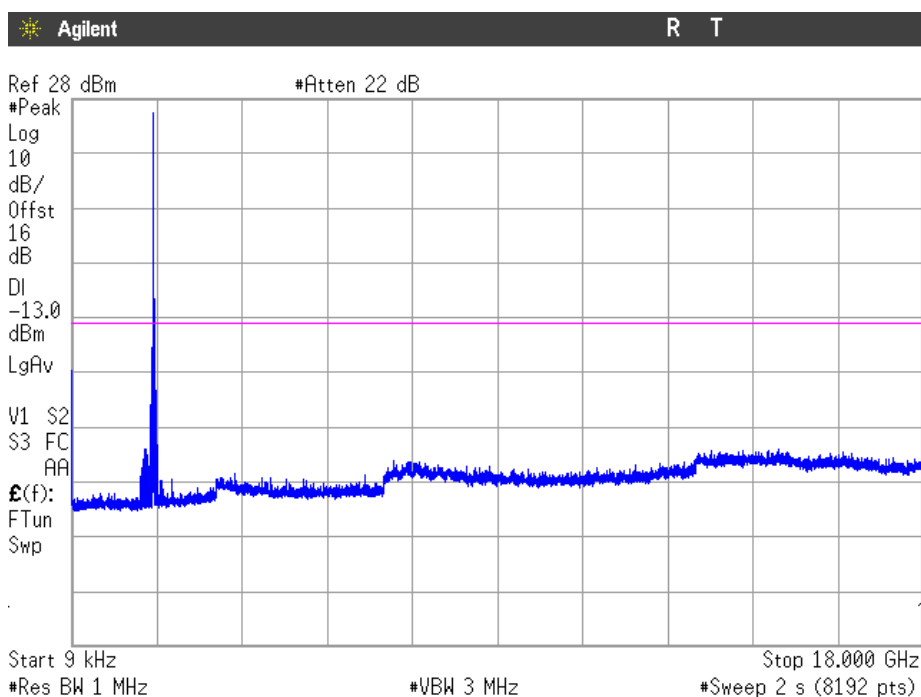
LTE BW = 15 MHz (Band IV)

1. CHANNEL: LOWEST



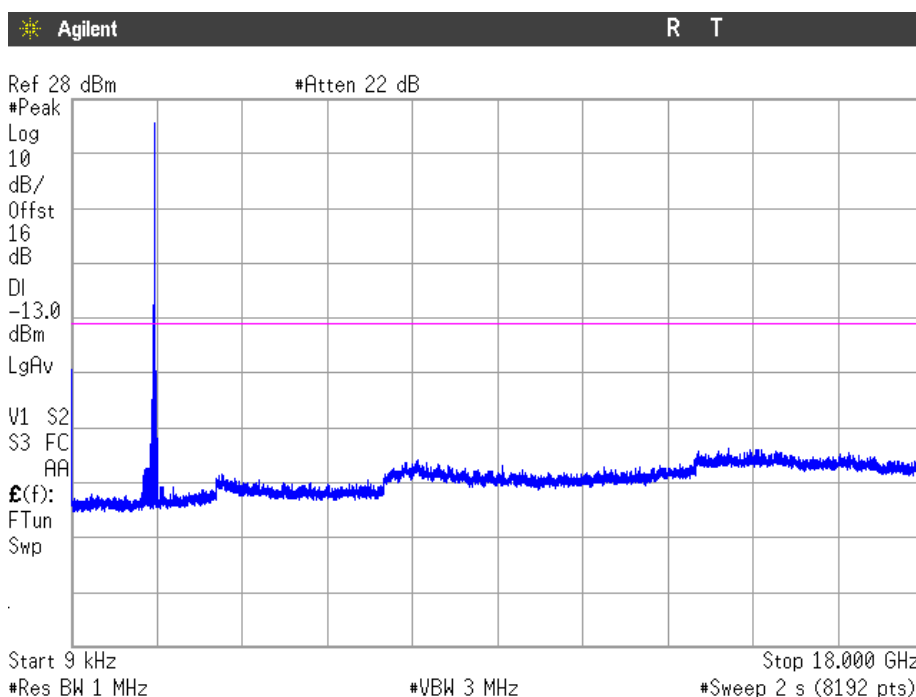
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

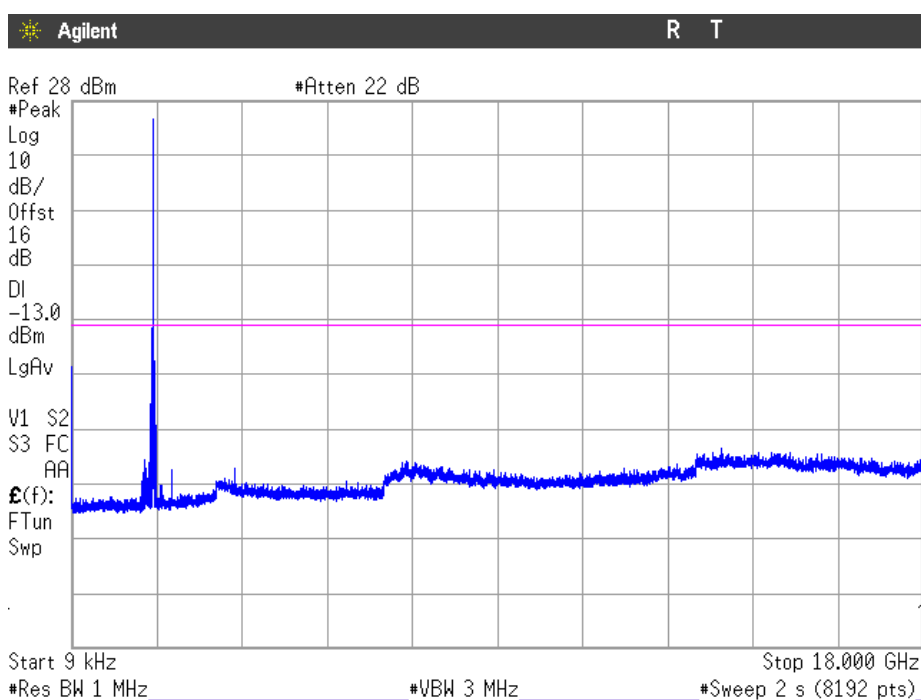
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

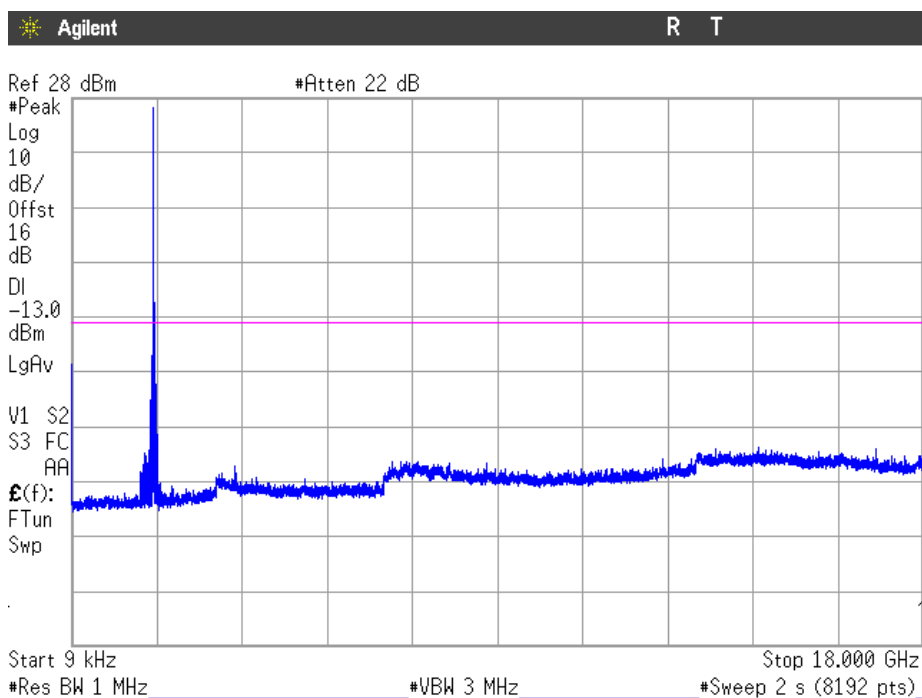
LTE BW = 20 MHz (Band IV)

1. CHANNEL: LOWEST



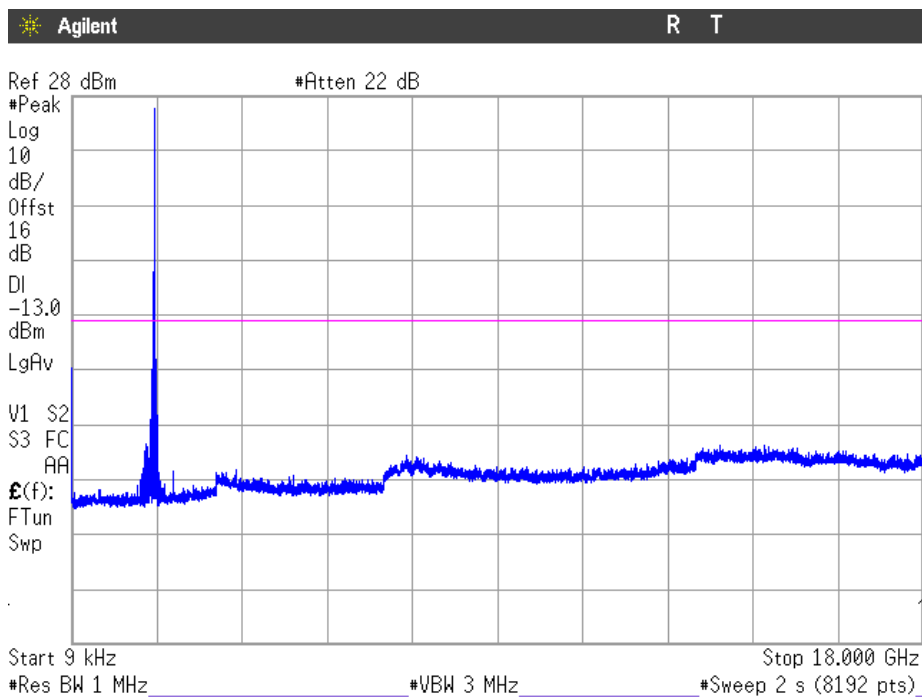
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

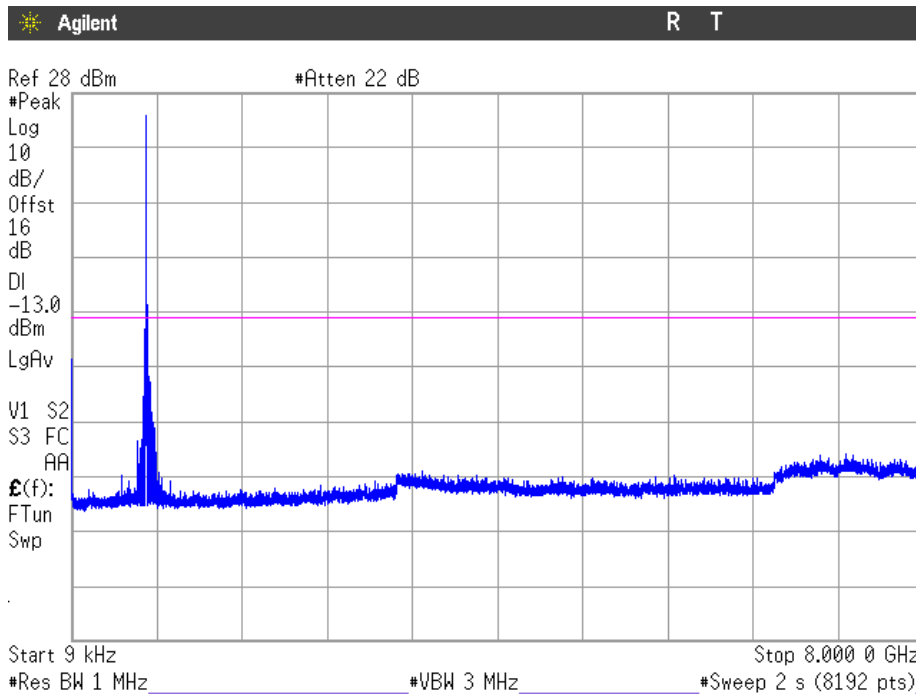
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

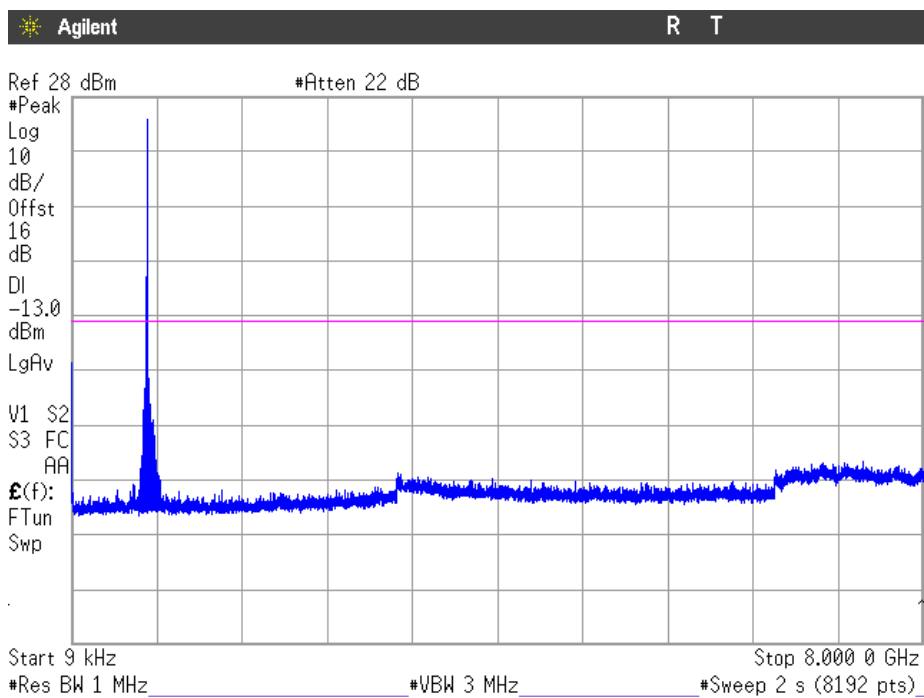
LTE BW = 1.4 MHz (Band XII)

1. CHANNEL: LOWEST



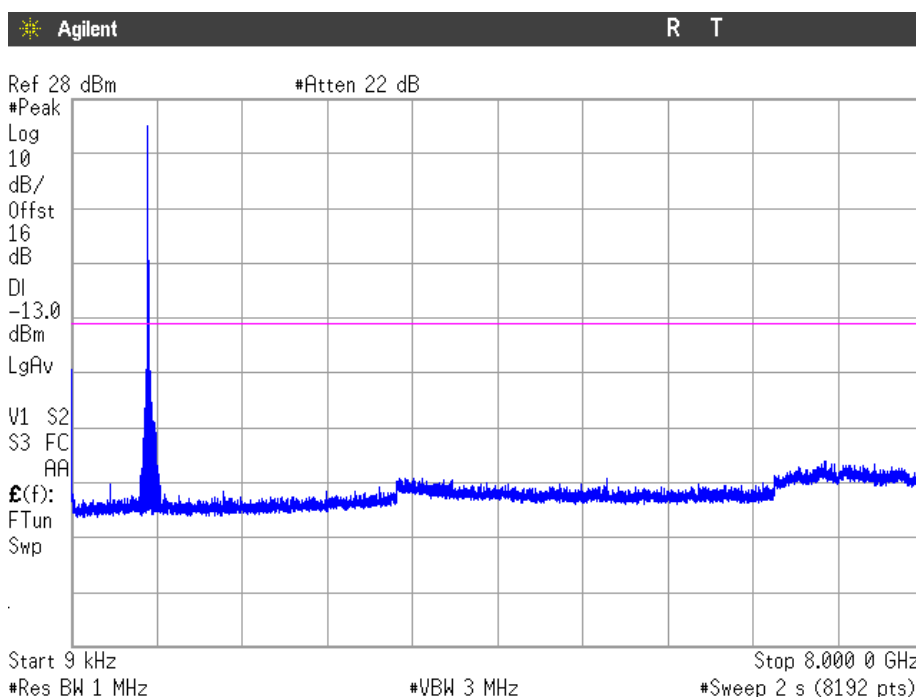
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

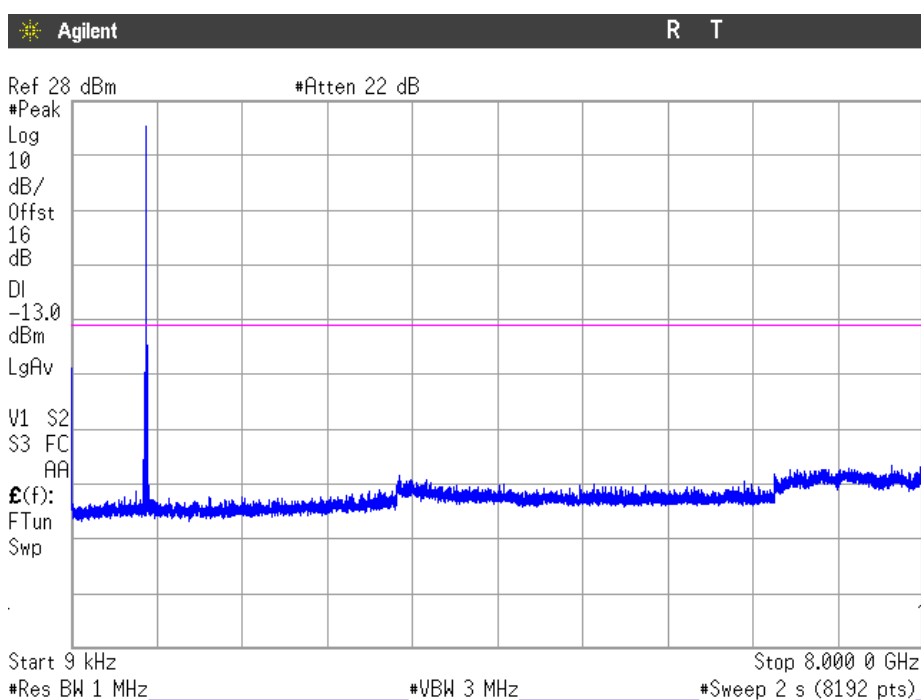
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

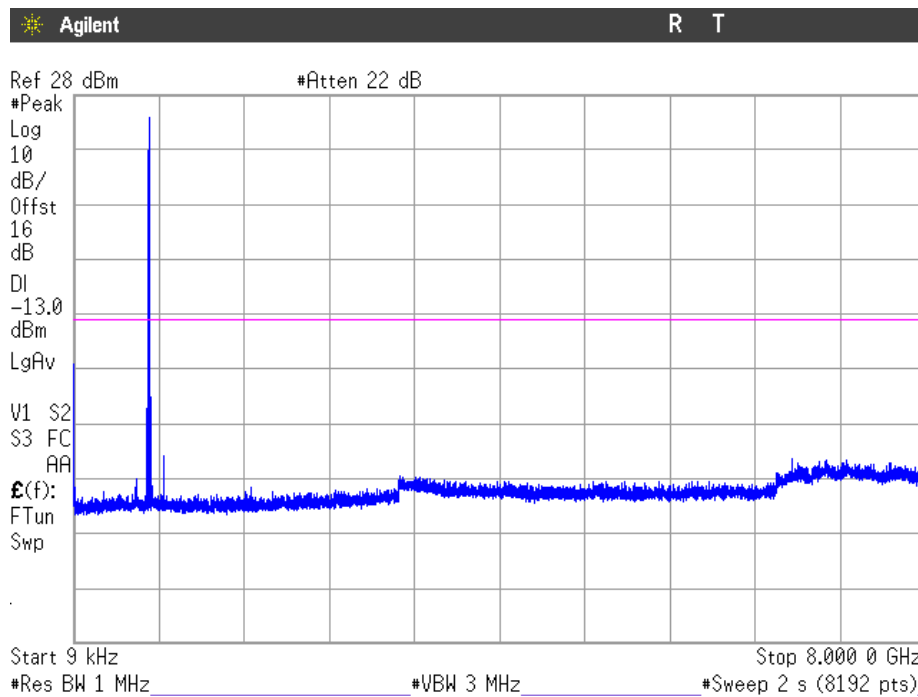
LTE BW = 3 MHz (Band XII)

1. CHANNEL: LOWEST



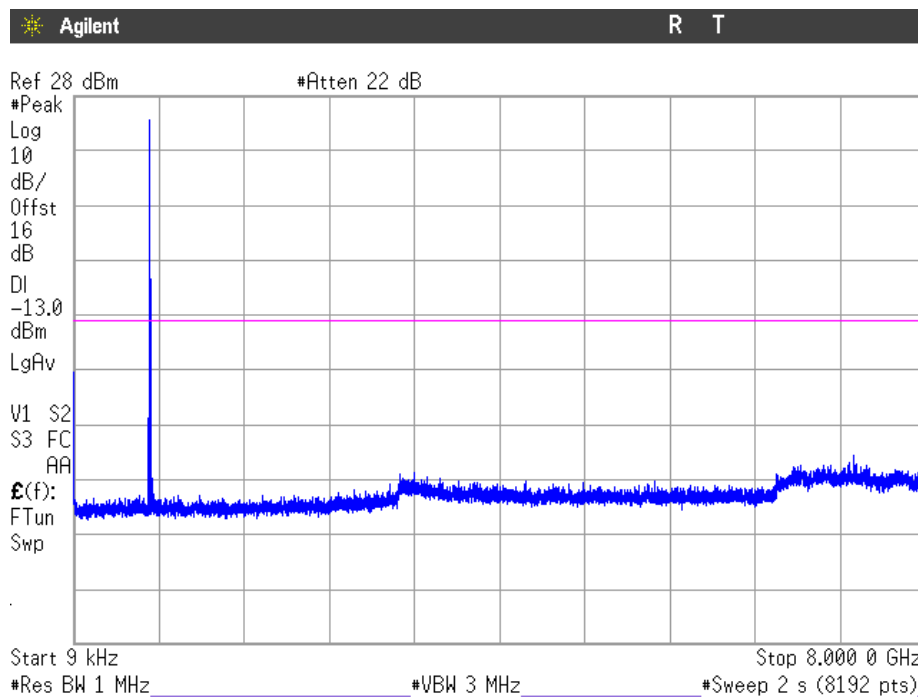
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

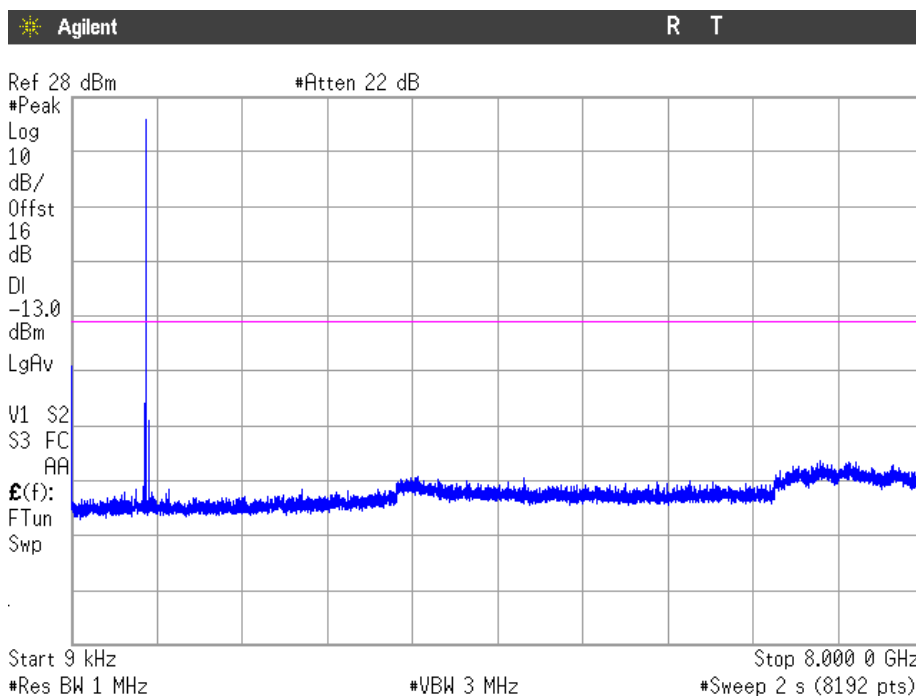
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

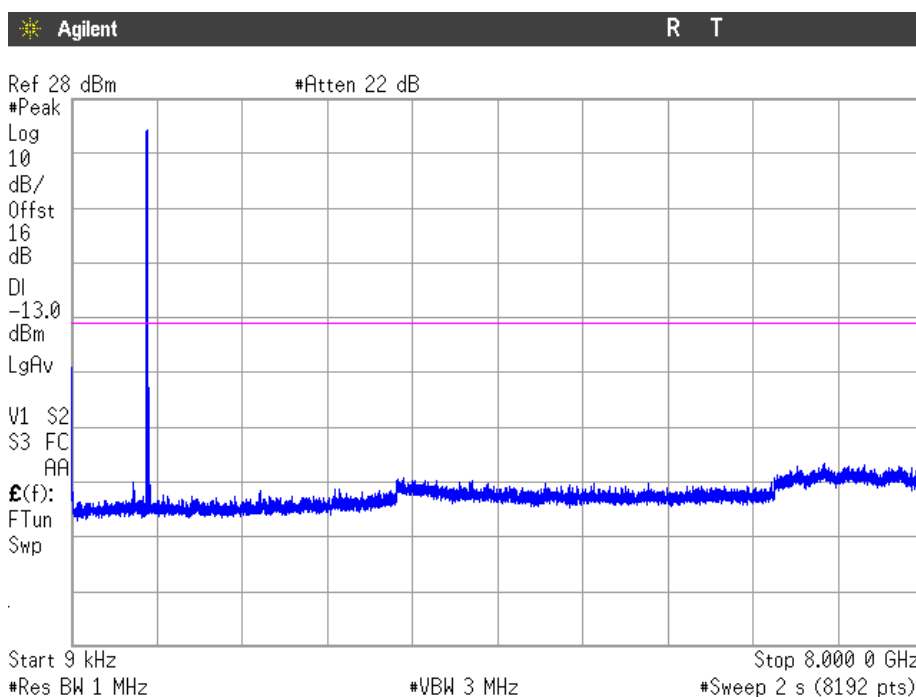
LTE BW = 5 MHz (Band XII)

1. CHANNEL: LOWEST



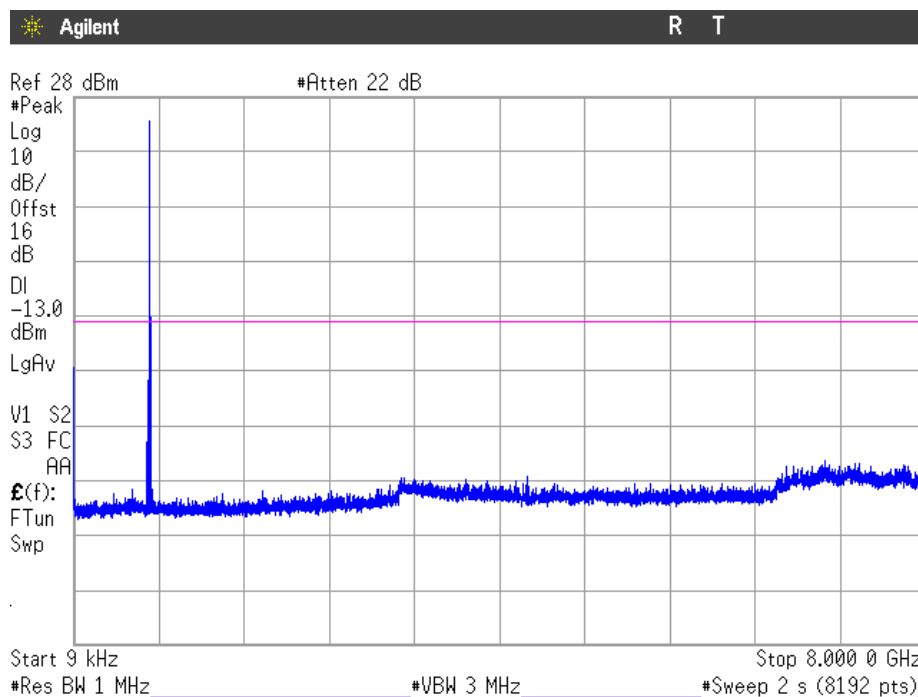
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

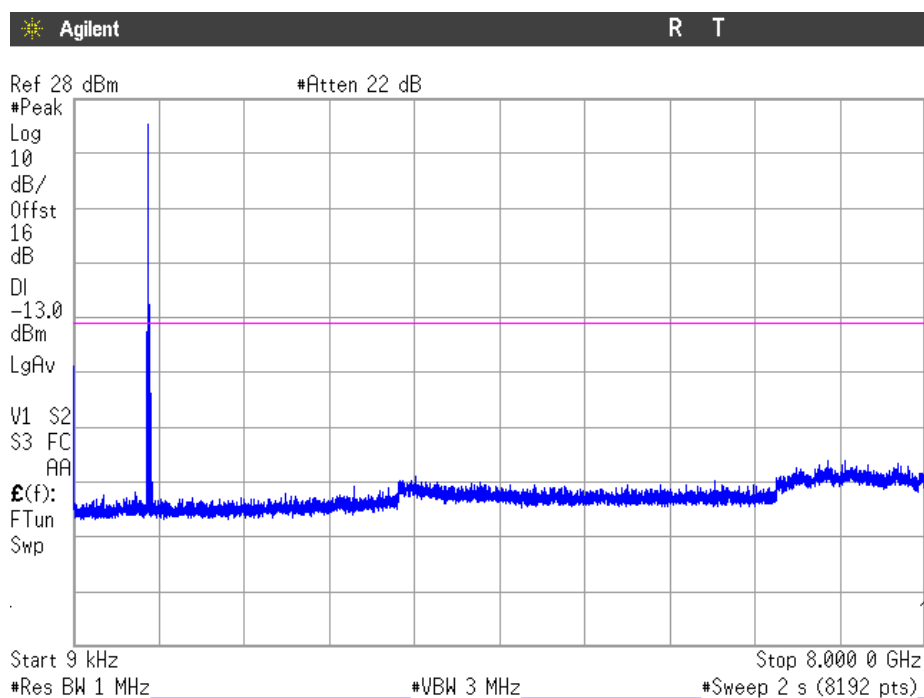
3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

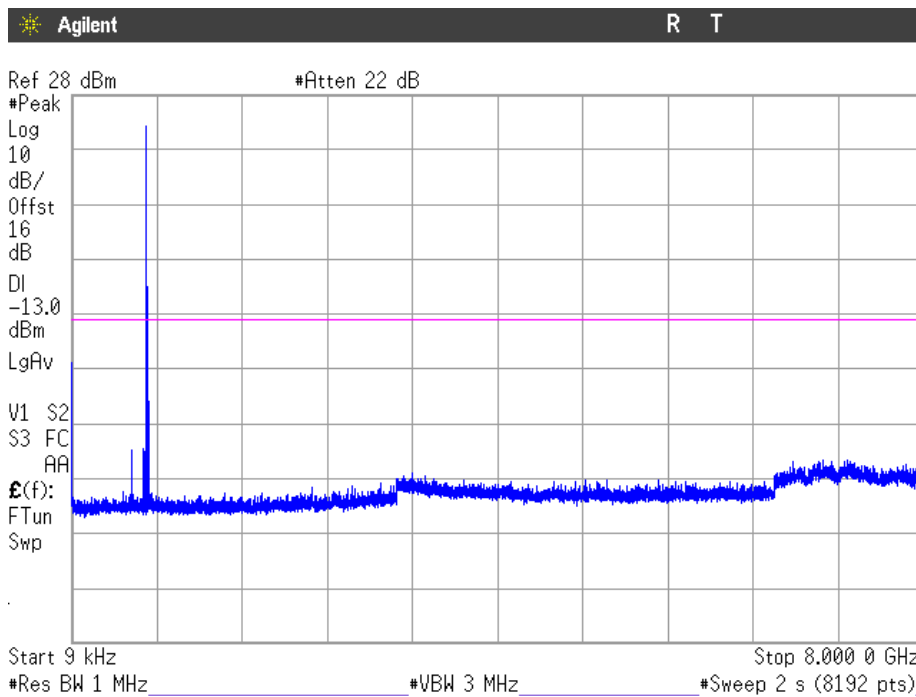
LTE BW = 10 MHz (Band XII)

1. CHANNEL: LOWEST



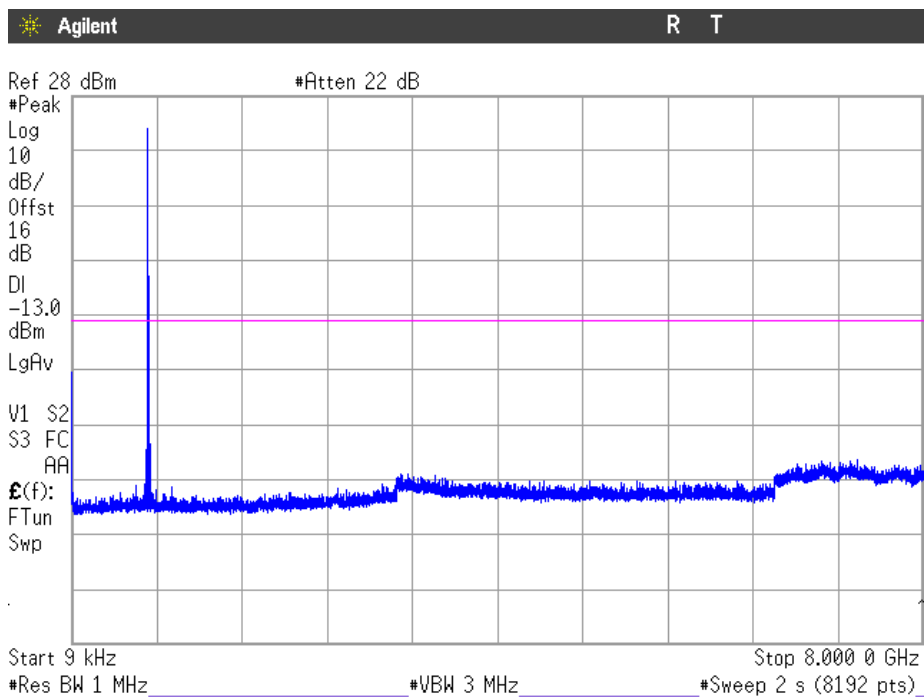
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

3. CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency.

Spurious emissions at antenna terminals at Block Edges

SPECIFICATION

FCC §2.1051 and §27.53(g) (h). RSS-139 Clause 6.6. RSS-130 Clause 4.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43+10\log (P_o)$, and the level in dBm relative P_o becomes:

$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$

METHOD

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50 ohm attenuator and a power splitter.

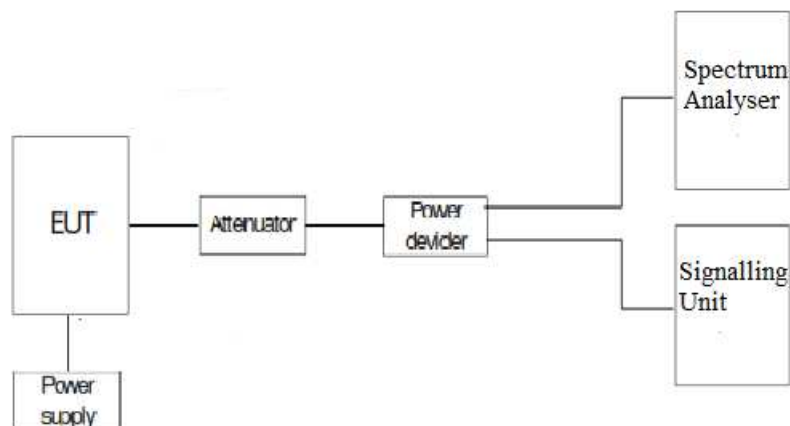
The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

For LTE mode the configuration of modulation which is the worst case for conducted power was used.

For LTE Band IV, as indicated in FCC part 27.53 (h) (3)/RSS-139 Clause 6.6., in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

For LTE Band XII, as indicated in FCC part 27.53 (g) /RSS-130 Clause 4.6., in the 100 kHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of 30 kHz may be employed.

TEST SETUP



RESULTS (see plots in next pages)

(Channels in Band IV):	RB=1. Offset=0. Narrow band = 1 BW=1.4 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 3 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 5 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 10 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 15 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 20 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-22.93	-29.03	-25.64	-33.63	-36.93	-39.22

(Channels in Band IV):	RB= All. Offset=0. Narrow band = 1 BW=1.4 MHz	RB= All. Offset =0. Narrow band = 1 BW = 3 MHz	RB= All. Offset =0. Narrow band = 1 BW = 5 MHz	RB= All. Offset =0. Narrow band = 1 BW = 10 MHz	RB= All. Offset =0. Narrow band = 1 BW = 15 MHz	RB= All. Offset =0. Narrow band = 1 BW = 20 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-25.62	-26.76	-25.73	-29.63	-31.92	-36.17

(Channels in Band IV):	RB= 1. Offset=Max. Narrow band = 1 BW=1.4 MHz	RB= 1. Offset=Max. Narrow band = 2 BW = 3 MHz	RB= 1. Offset=Max. Narrow band = 4 BW = 5 MHz	RB= 1. Offset=Max. Narrow band = 8 BW = 10 MHz	RB= 1. Offset=Max. Narrow band = 12 BW = 15 MHz	RB= 1. Offset=Max. Narrow band = 16 BW = 20 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-22.26	-28.28	-23.91	-30.97	-35.54	-37.41

(Channels in Band IV):	RB= All. Offset=0. Narrow band = 1 BW=1.4 MHz	RB= All. Offset =0. Narrow band = 2 BW = 3 MHz	RB= All. Offset =0. Narrow band = 4 BW = 5 MHz	RB= All. Offset =0. Narrow band = 8 BW = 10 MHz	RB= All. Offset =0. Narrow band = 12 BW = 15 MHz	RB= All. Offset =0. Narrow band = 16 BW = 20 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-26.66	-27.77	-27.58	-30.89	-32.63	-38.31

(Channels in Band XII):	RB=1. Offset=0. Narrow band = 1 BW=1.4 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 3 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 5 MHz	RB=1 . Offset =0. Narrow band = 1 BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-29.43	-31.02	-29.04	-31.46

(Channels in Band XII):	RB= All. Offset=0. Narrow band = 1 BW=1.4 MHz	RB= All. Offset =0. Narrow band = 1 BW = 3 MHz	RB= All. Offset =0. Narrow band = 1 BW = 5 MHz	RB= All. Offset =0. Narrow band = 1 BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-34.17	-32	-29.67	-36.20

(Channels in Band XII):	RB= 1. Offset=Max. Narrow band = 1 BW=1.4 MHz	RB= 1. Offset=Max. Narrow band = 2 BW = 3 MHz	RB= 1. Offset=Max. Narrow band = 4 BW = 5 MHz	RB= 1. Offset=Max. Narrow band = 8 BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-20.95	-23.63	-21.95	-25.49

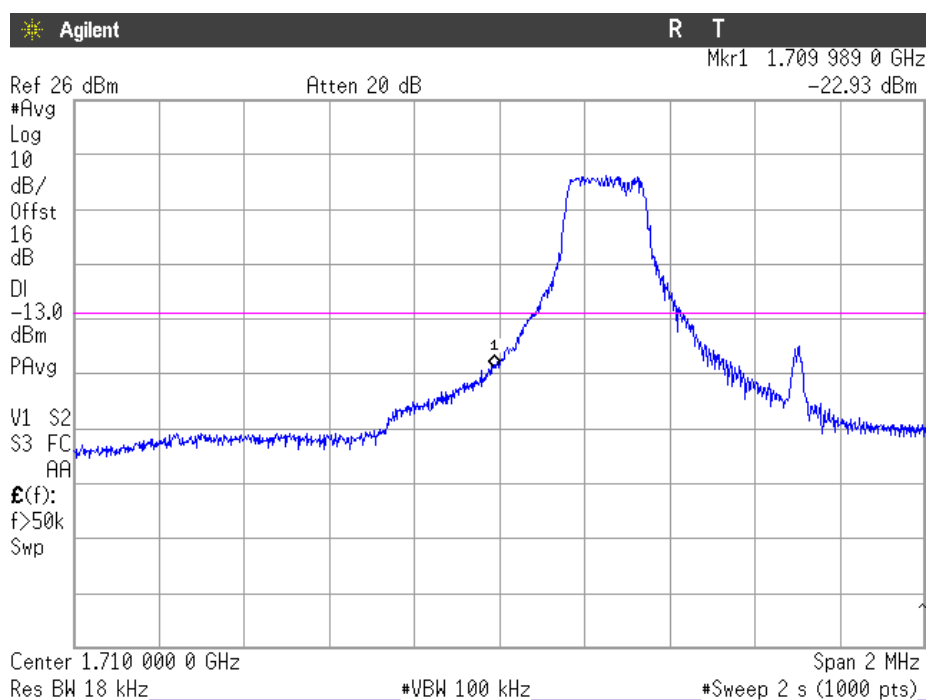
(Channels in Band XII):	RB= All. Offset=0. Narrow band = 1 BW=1.4 MHz	RB= All. Offset =0. Narrow band = 2 BW = 3 MHz	RB= All. Offset =0. Narrow band = 4 BW = 5 MHz	RB= All. Offset =0. Narrow band = 8 BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-25.27	-23.73	-23.34	-27.62

Measurement uncertainty = ± 2.03 dB.

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 1.4 MHz (Band IV)

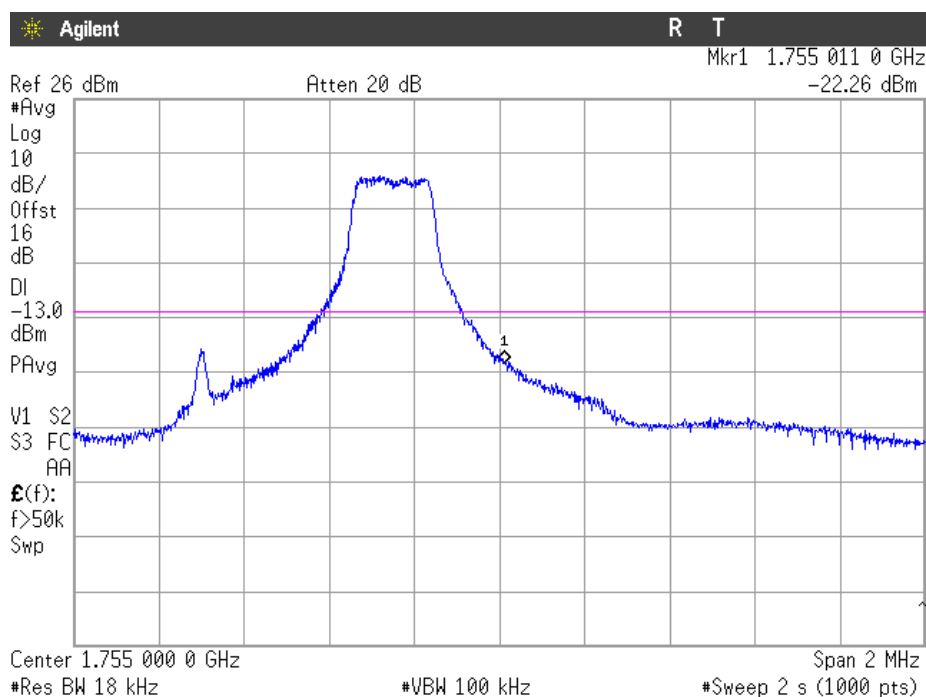
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 1. RB = 1. Offset = Max. BW = 1.4 MHz (Band IV)

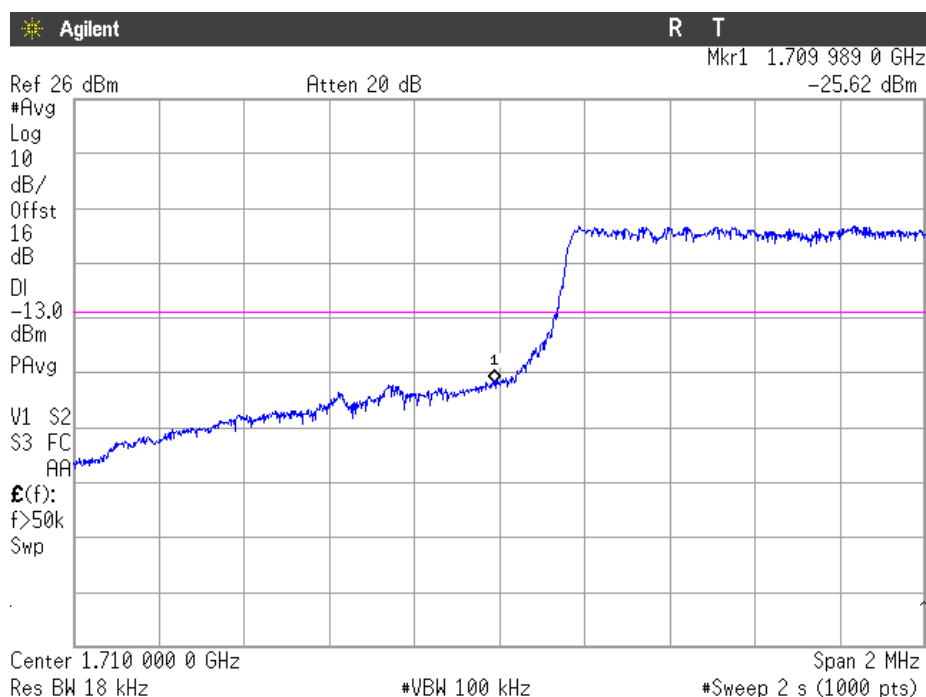
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

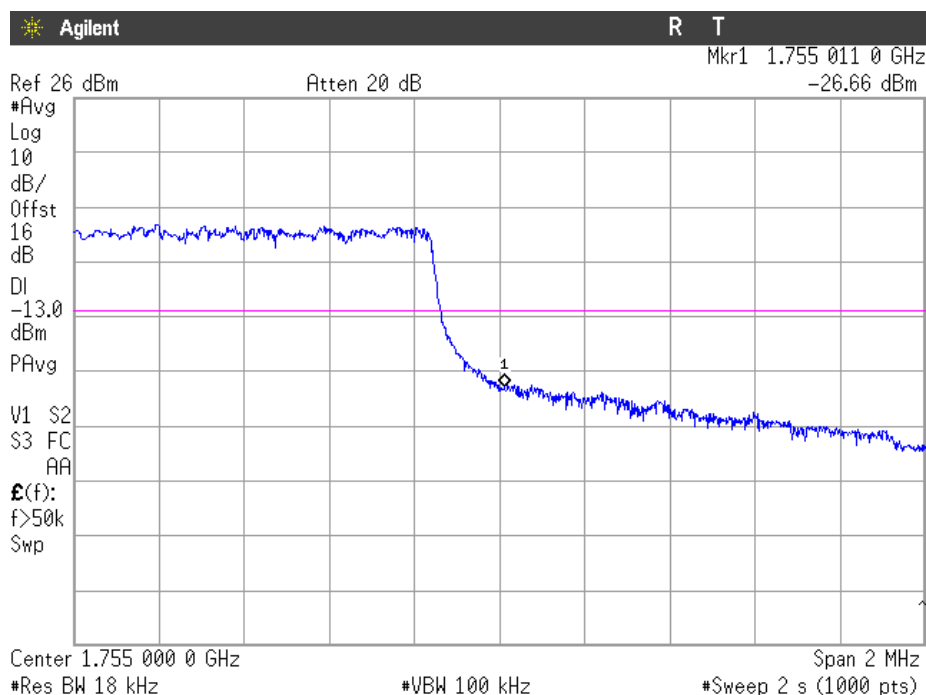
Narrow band = 1. RB = All. Offset = 0. BW = 1.4 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

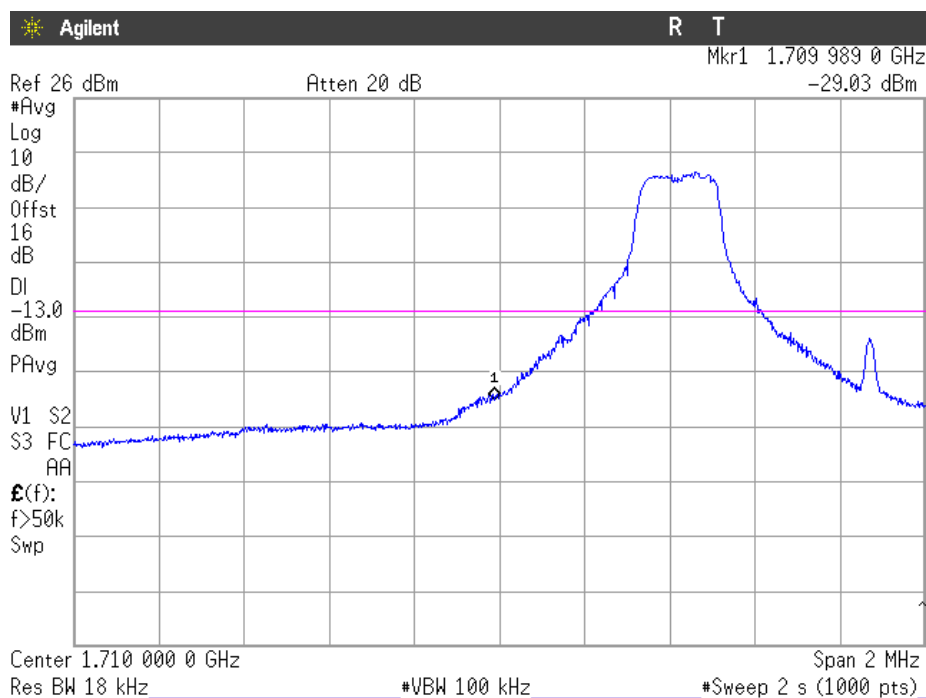


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 3 MHz (Band IV)

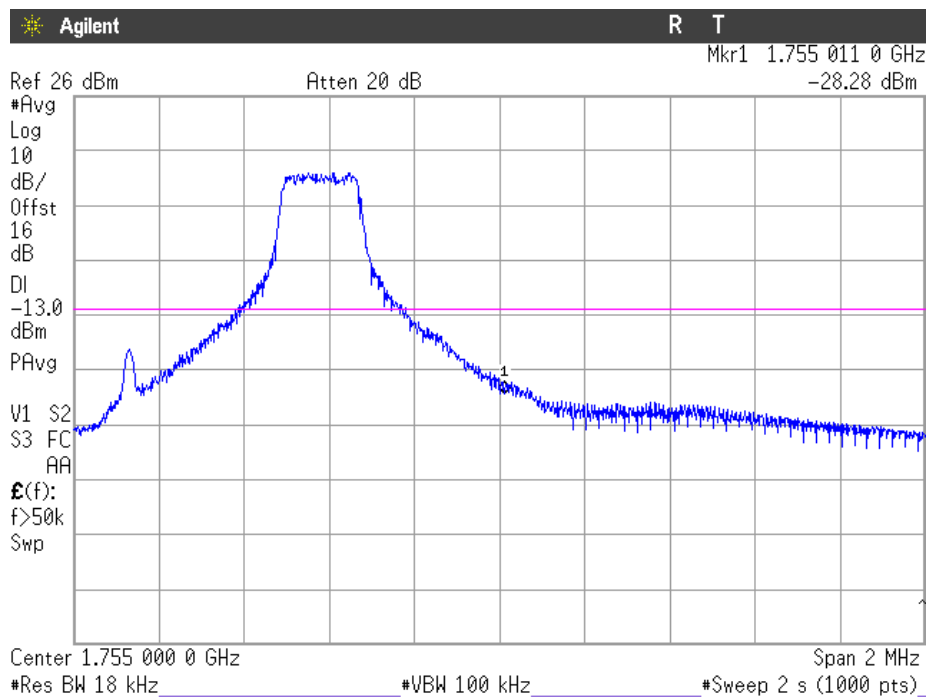
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 2. RB = 1. Offset = Max. BW = 3 MHz (Band IV)

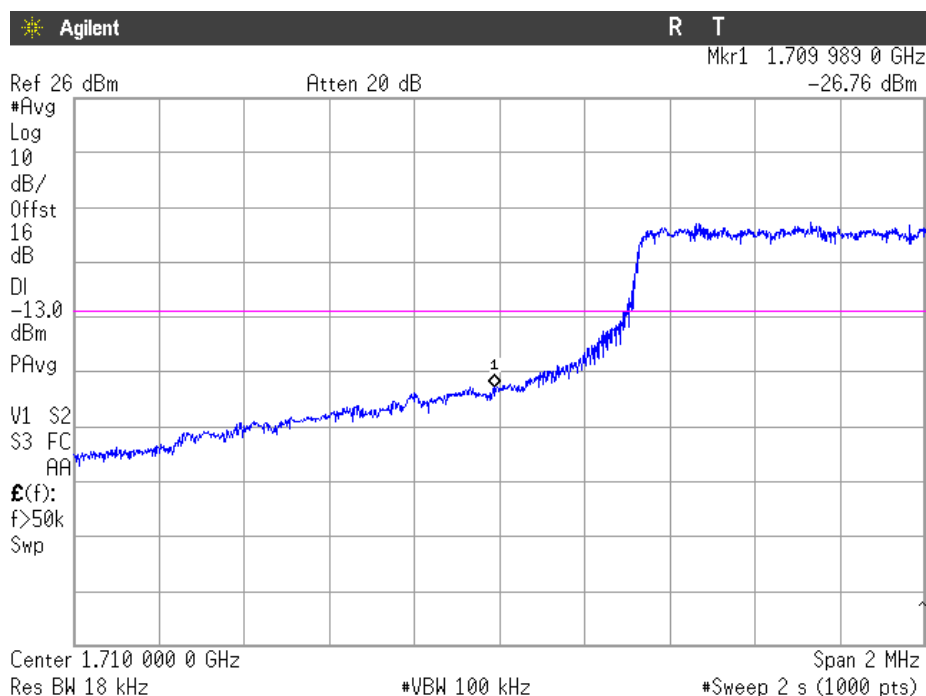
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

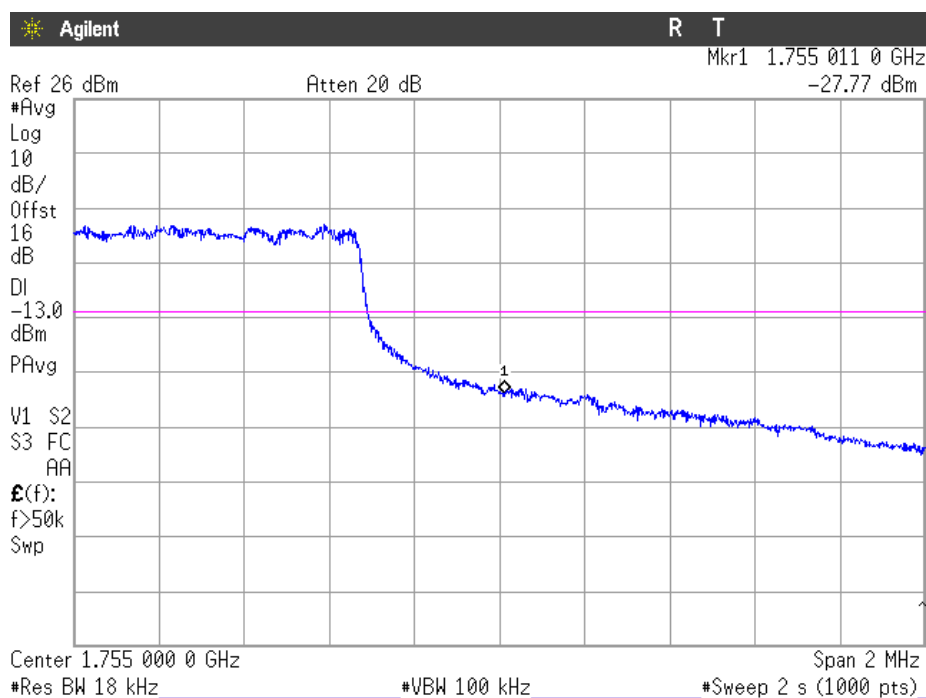
RB = All. Offset = 0. BW = 3 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 2.

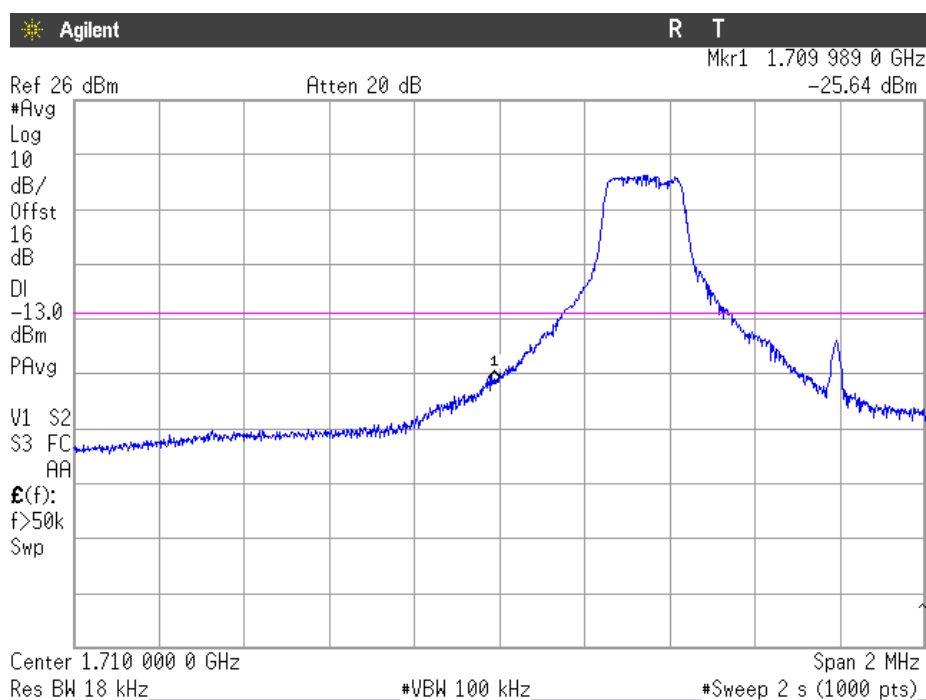


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 5 MHz (Band IV)

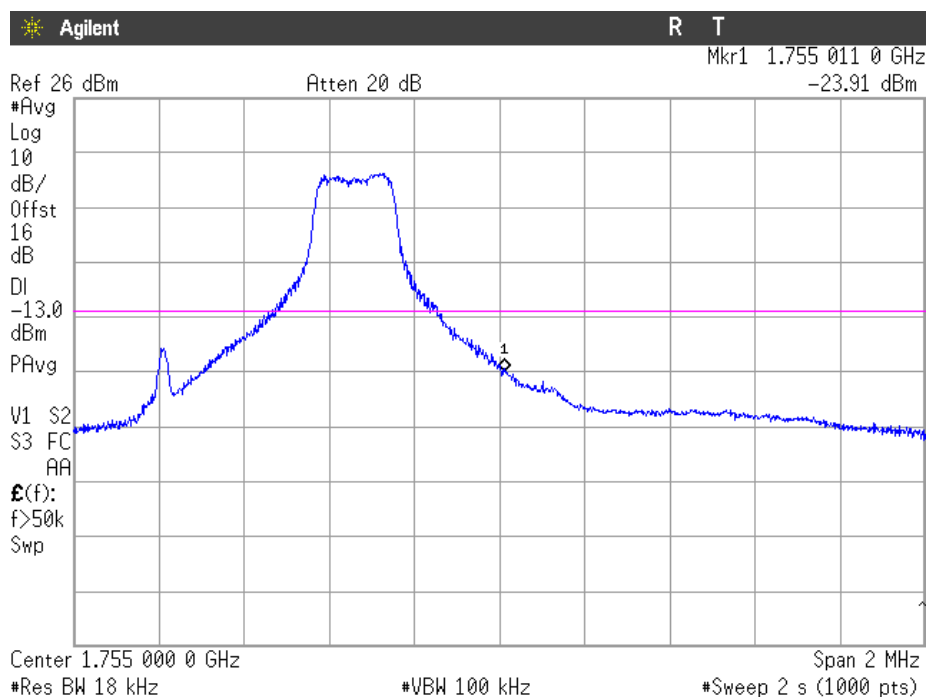
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 4. RB = 1. Offset = Max. BW = 5 MHz (Band IV)

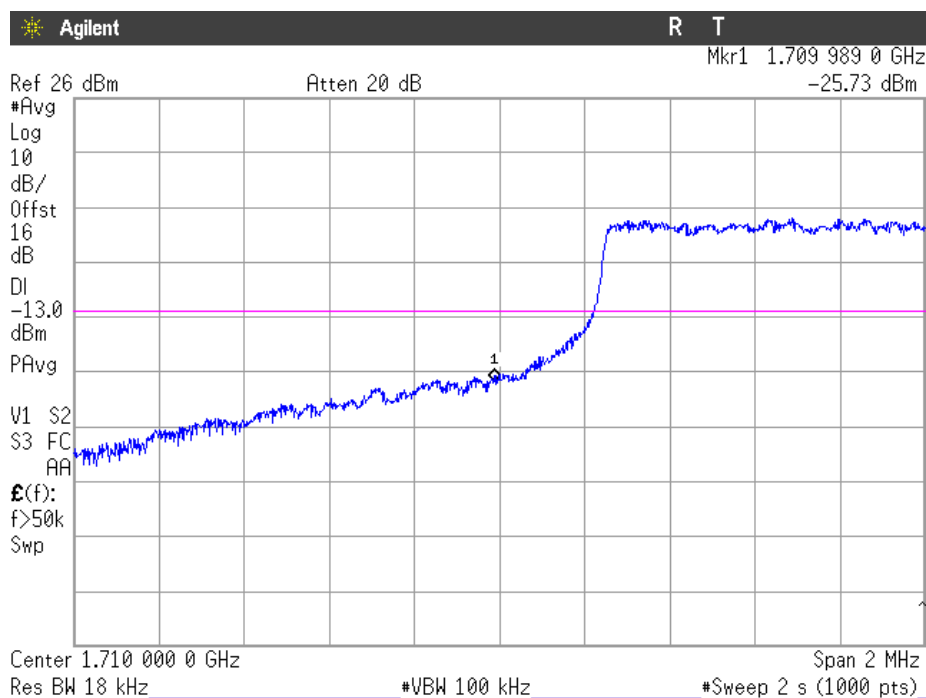
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

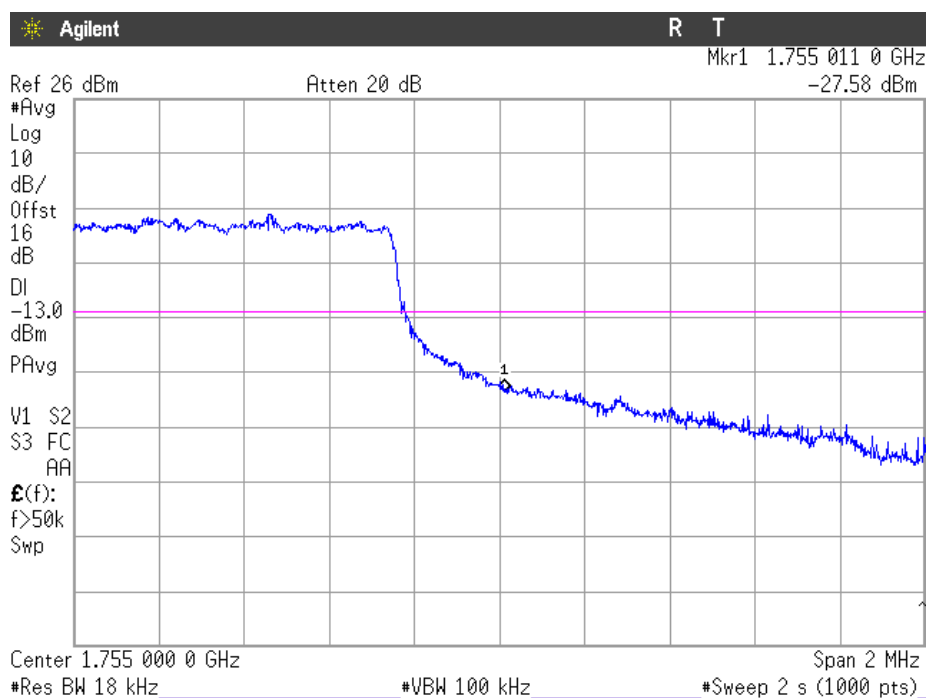
RB = All. Offset = 0. BW = 5 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 4.

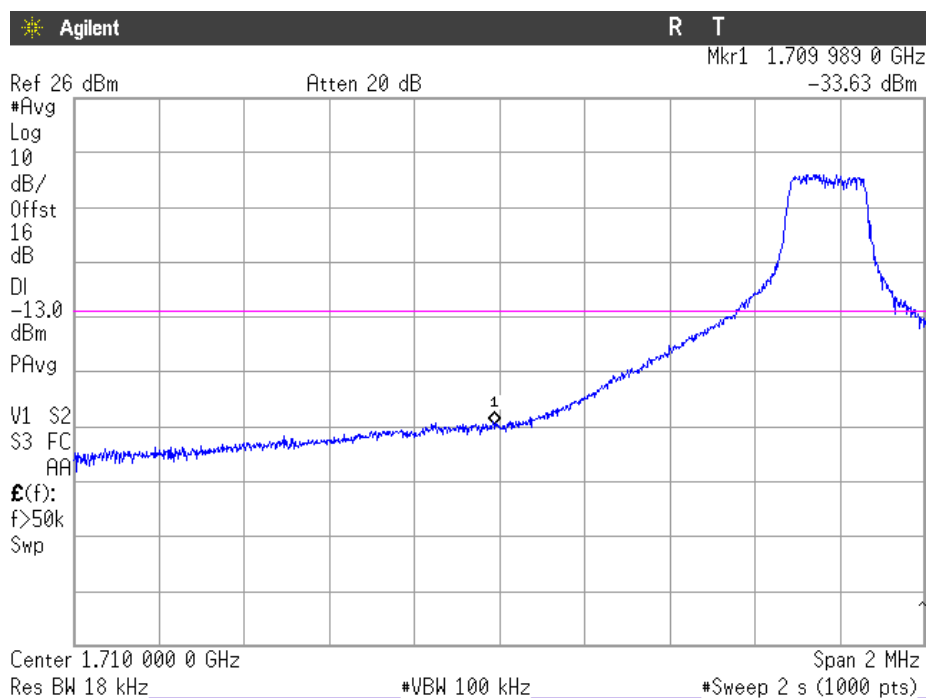


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 10 MHz (Band IV)

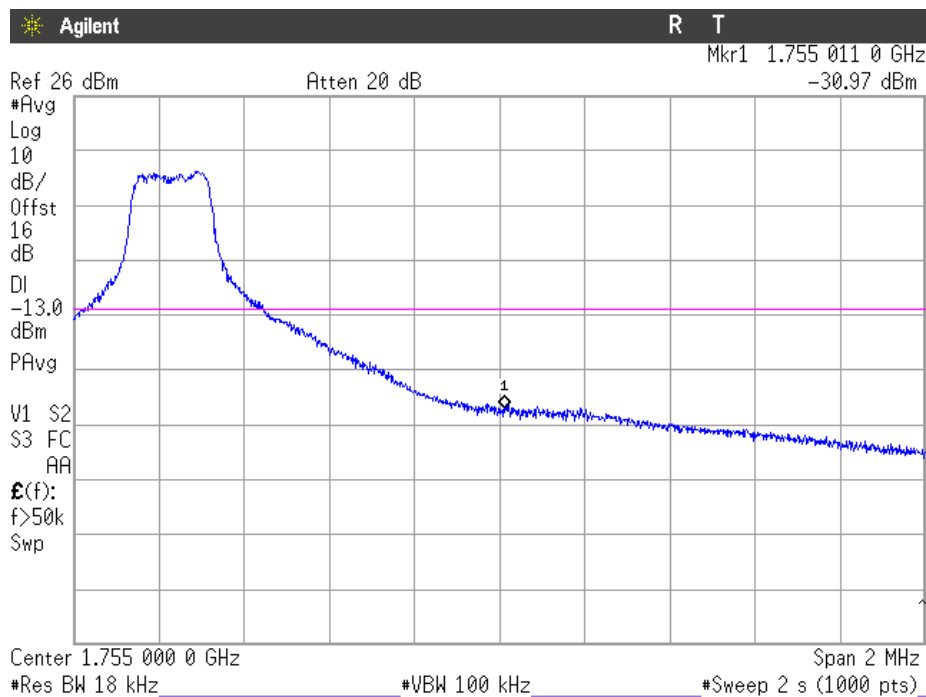
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 8. RB = 1. Offset = Max. BW = 10 MHz (Band IV)

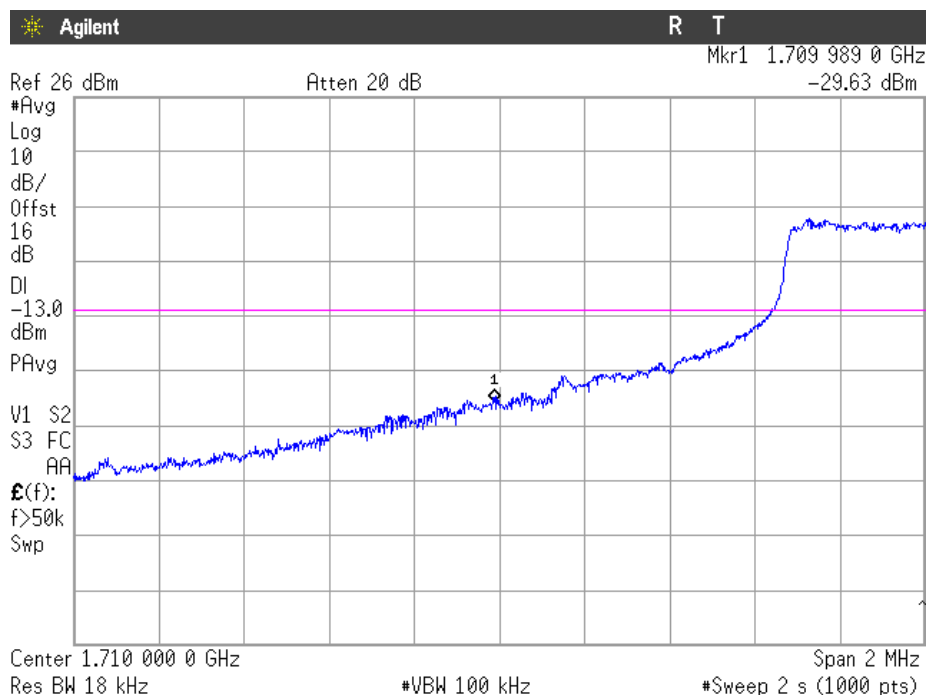
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

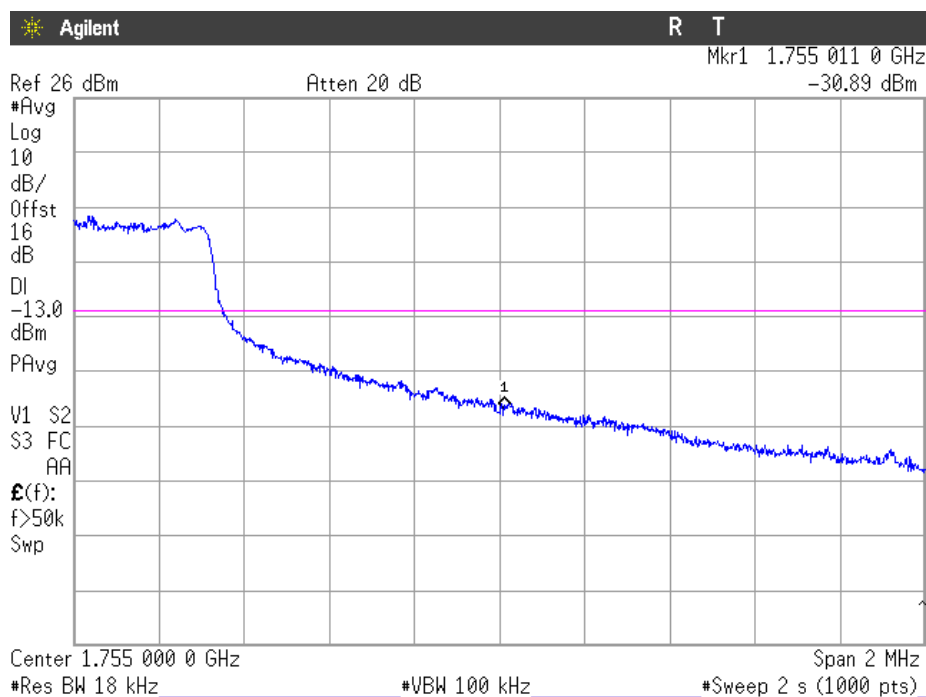
RB = All. Offset = 0. BW = 10 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 8.

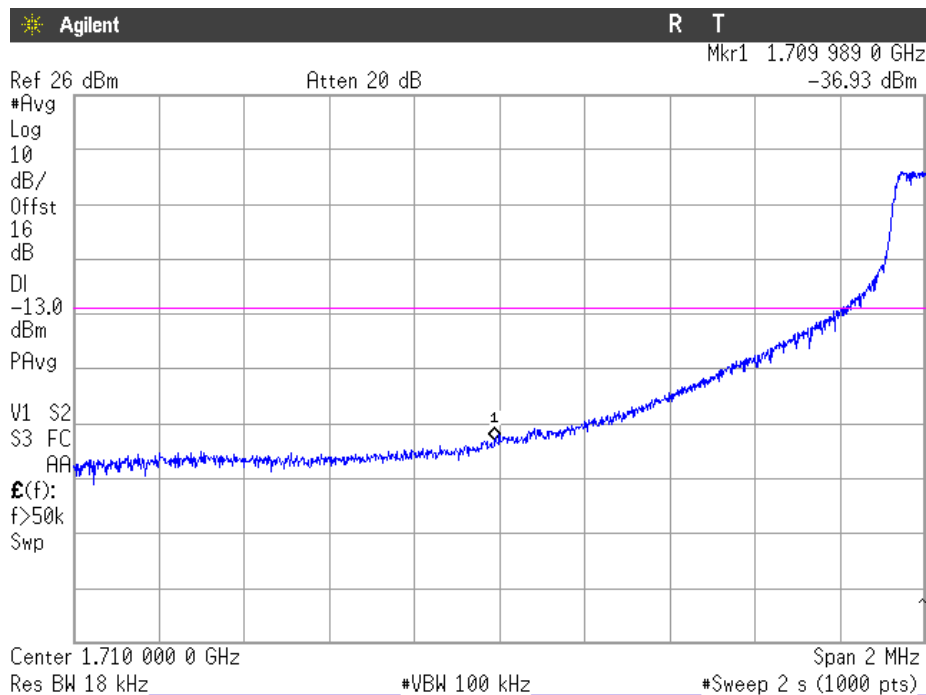


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 15 MHz (Band IV)

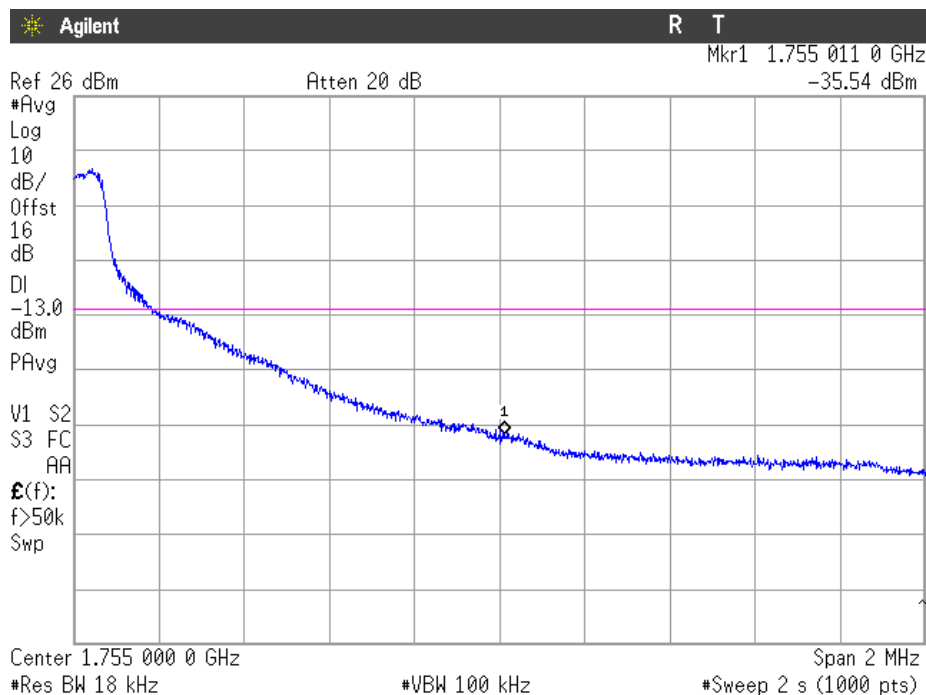
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 12. RB = 1. Offset = Max. BW = 15 MHz (Band IV)

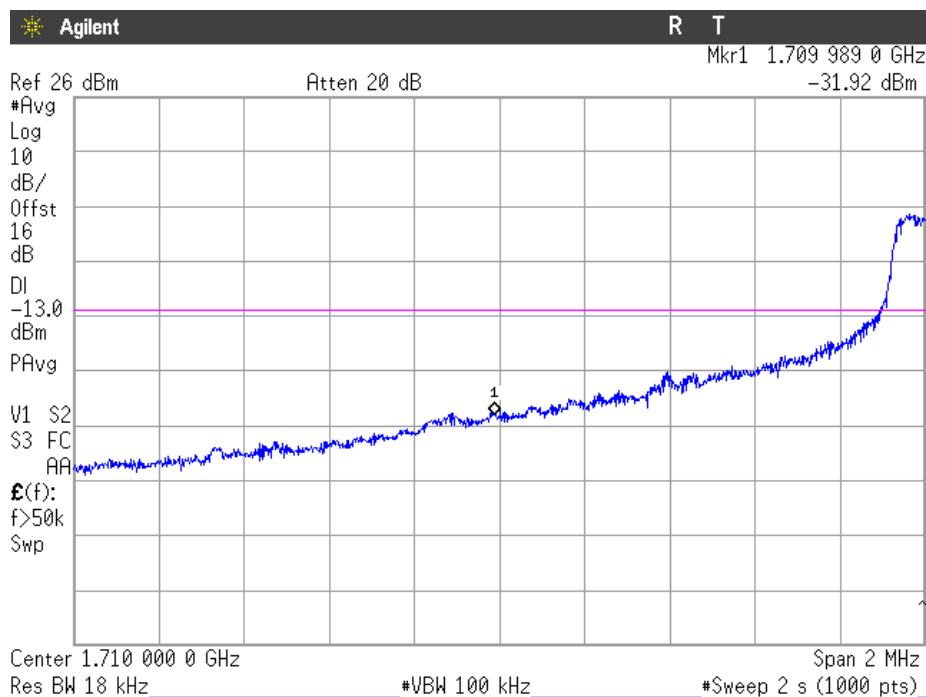
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

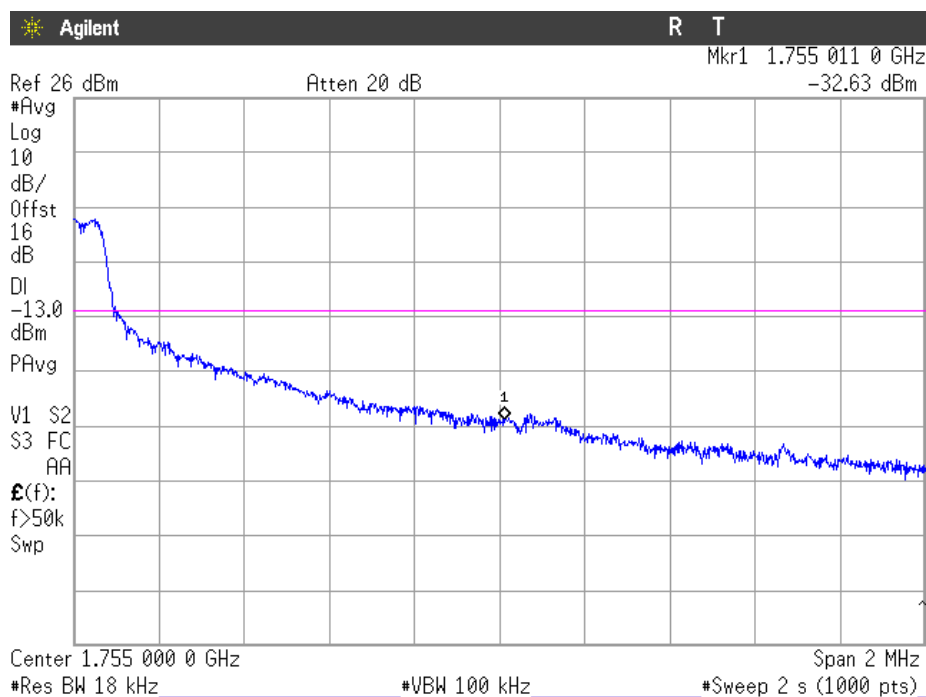
RB = All. Offset = 0. BW = 15 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 12.

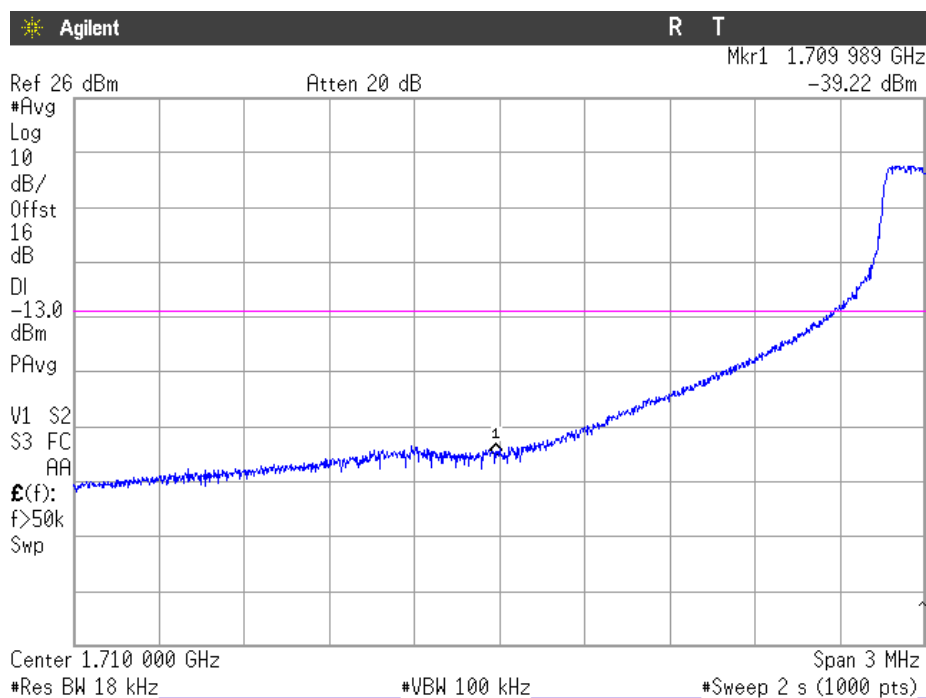


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 20 MHz (Band IV)

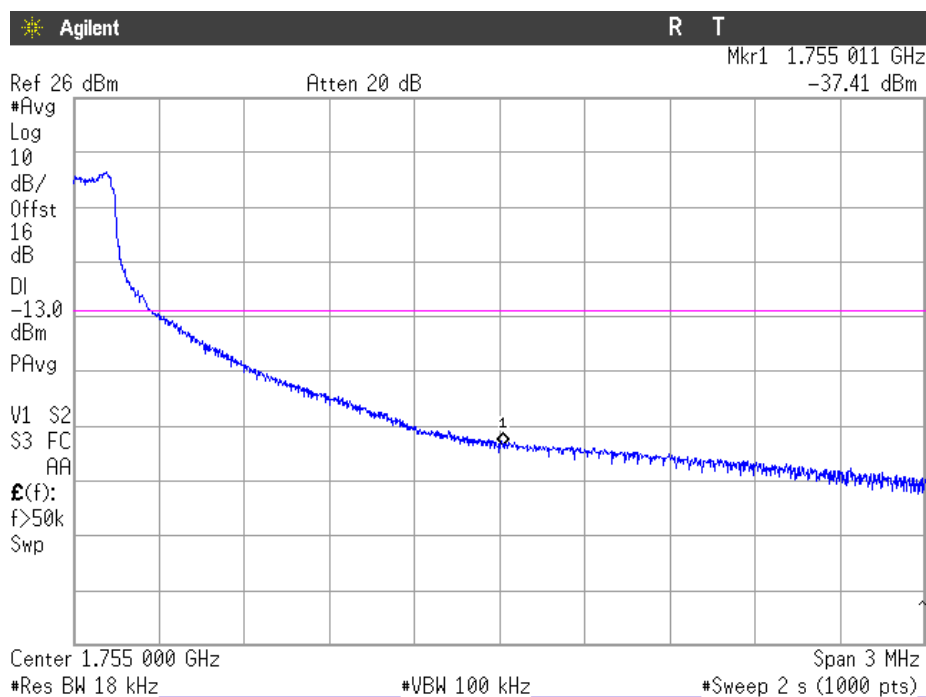
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 16. RB = 1. Offset = Max. BW = 20 MHz (Band IV)

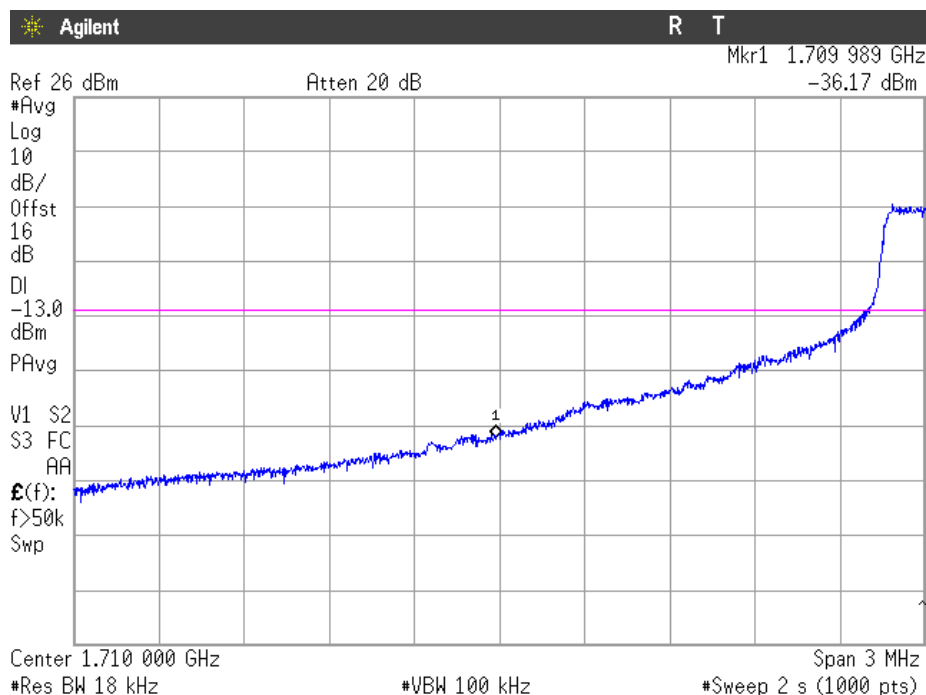
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

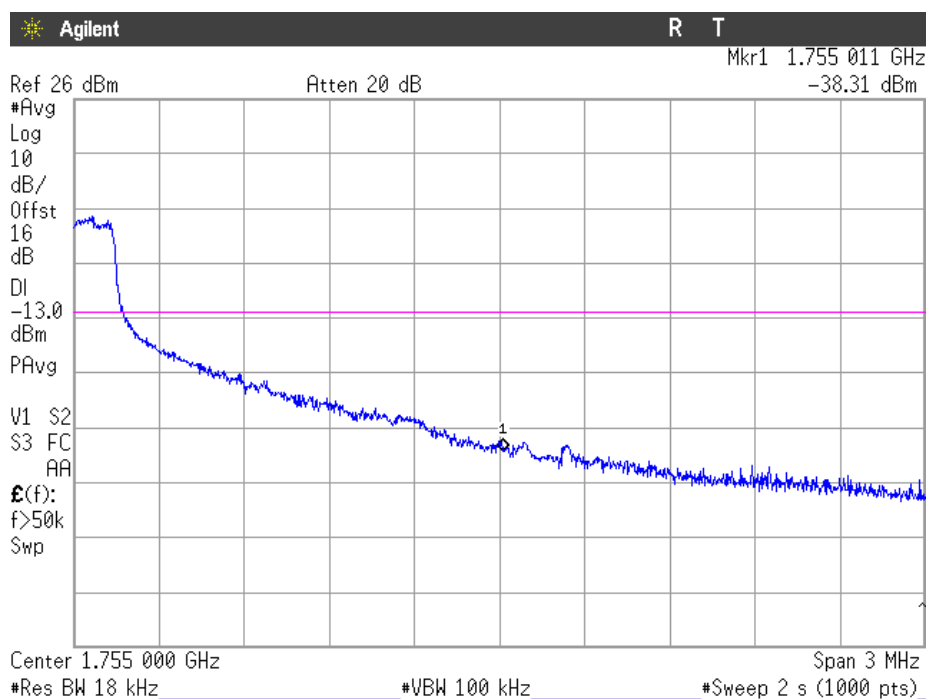
RB = All. Offset = 0. BW = 20 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 16.

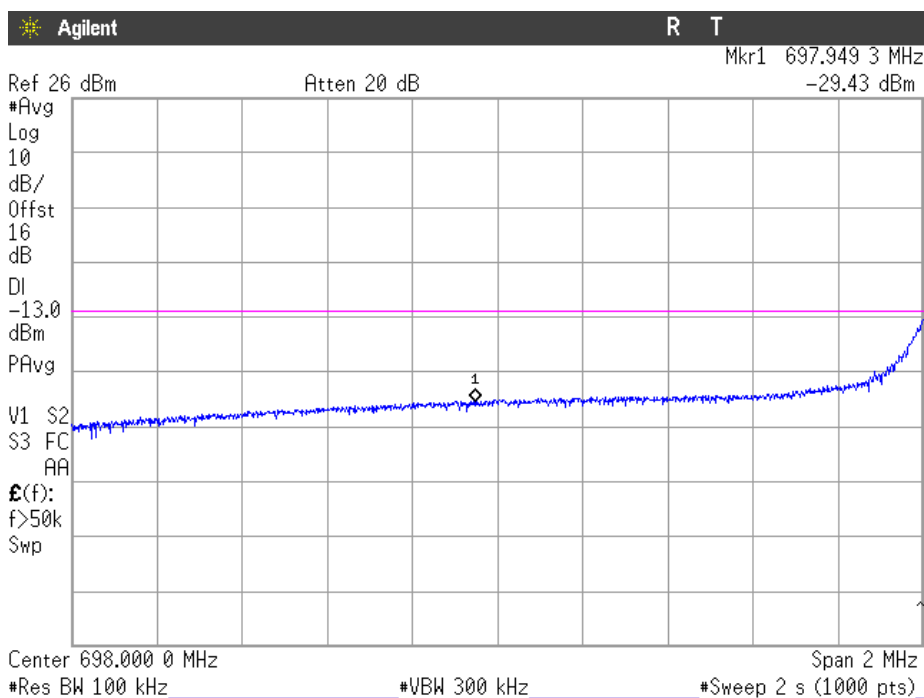


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 1.4 MHz (Band XII)

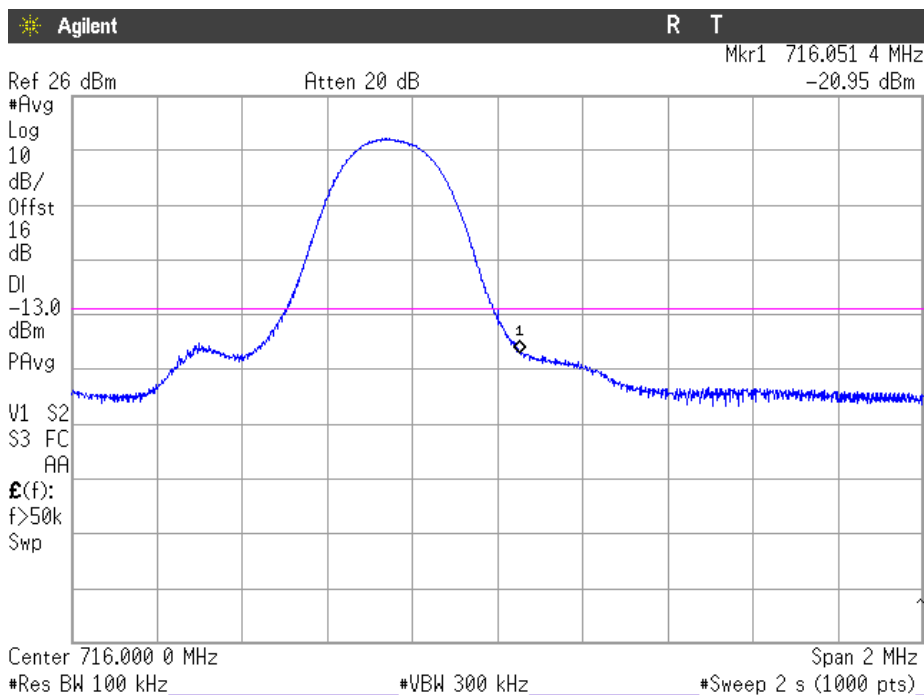
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 1. RB = 1. Offset = Max. BW = 1.4 MHz (Band XII)

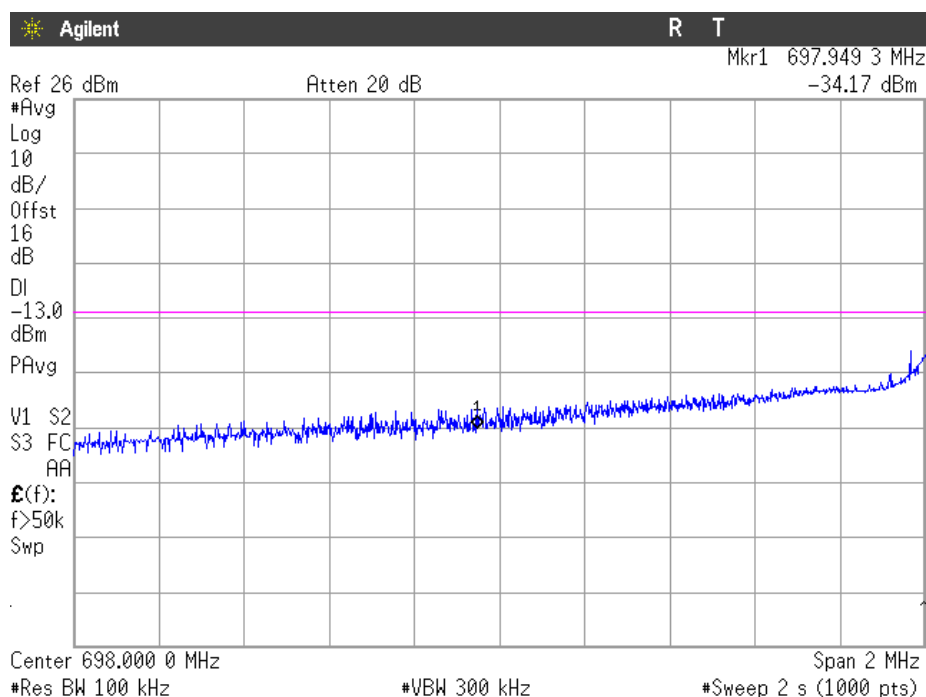
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

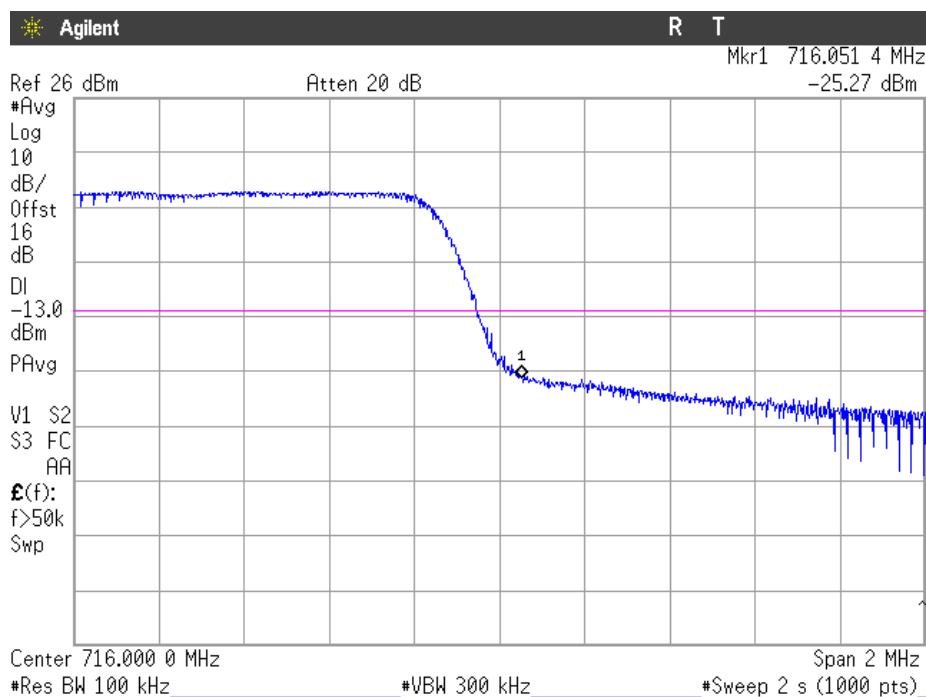
Narrow band = 1. RB = All. Offset = 0. BW = 1.4 MHz (Band XII)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

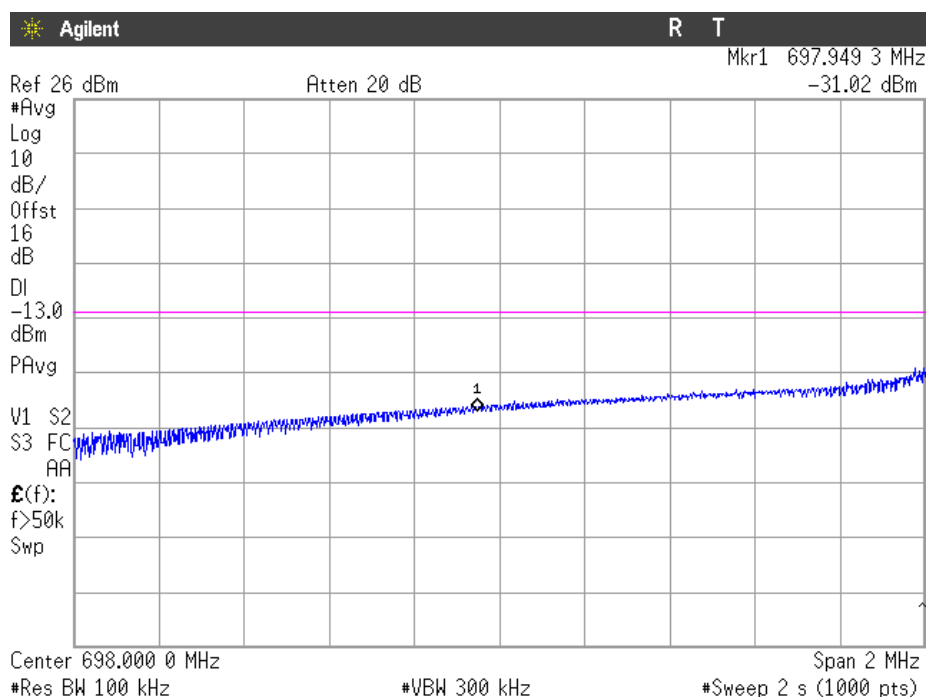


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 3 MHz (Band XII)

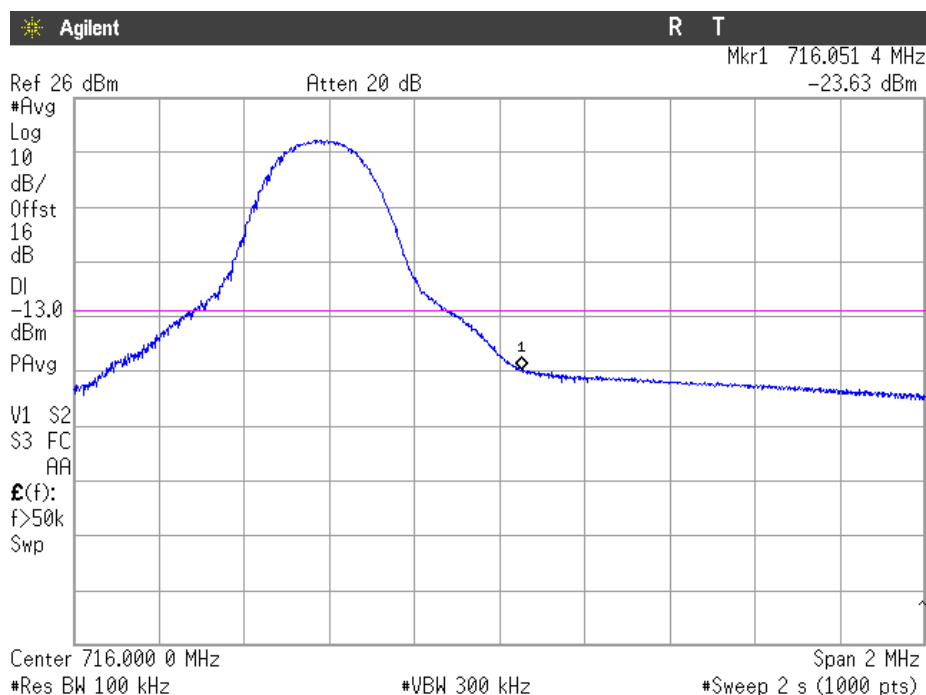
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 2. RB = 1. Offset = Max. BW = 3 MHz (Band XII)

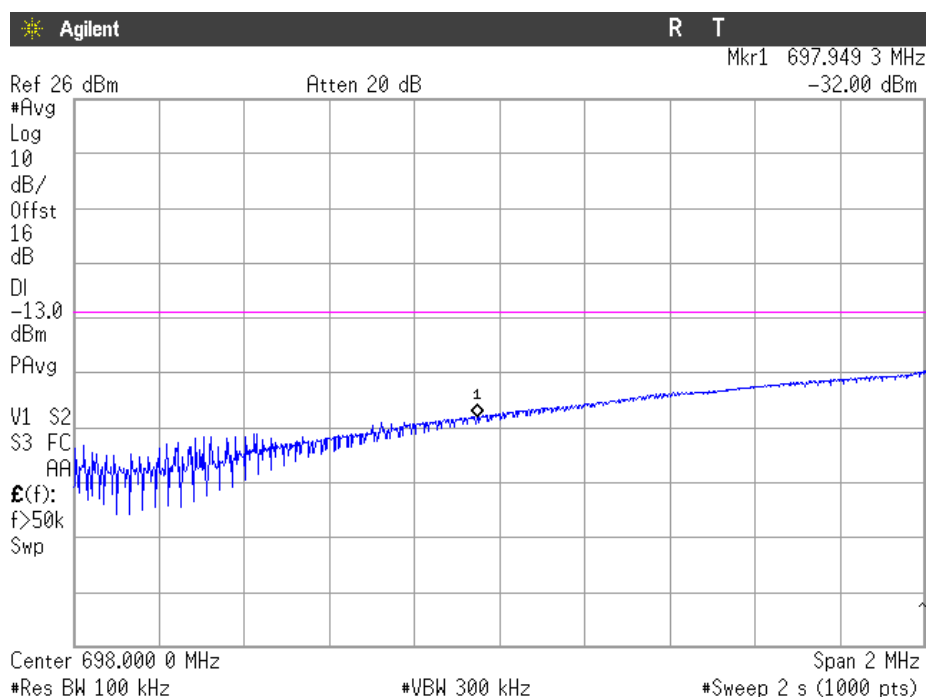
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

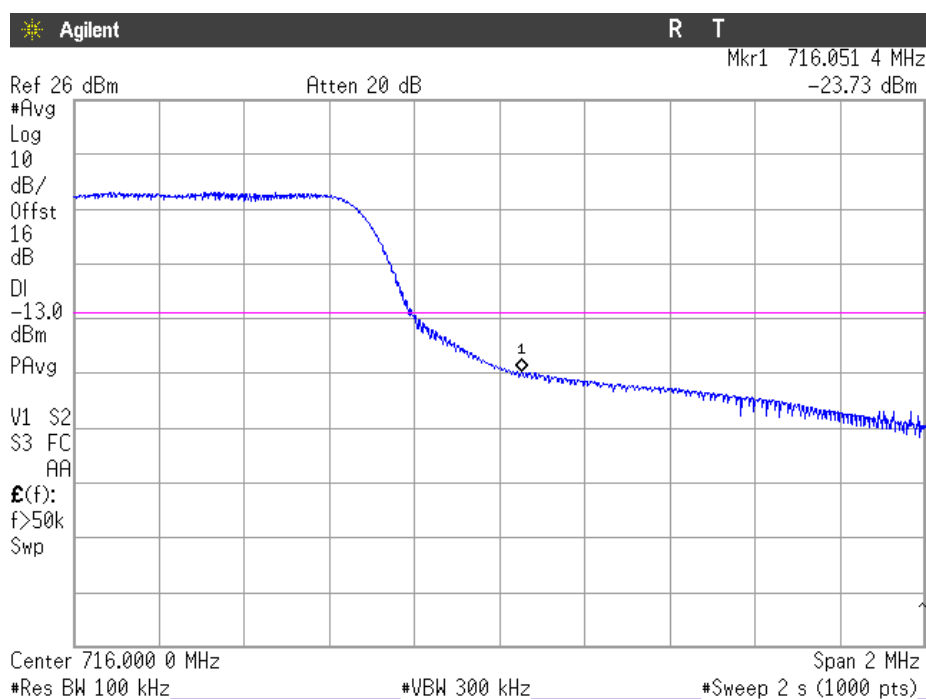
RB = All. Offset = 0. BW = 3 MHz (Band XII)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 2.

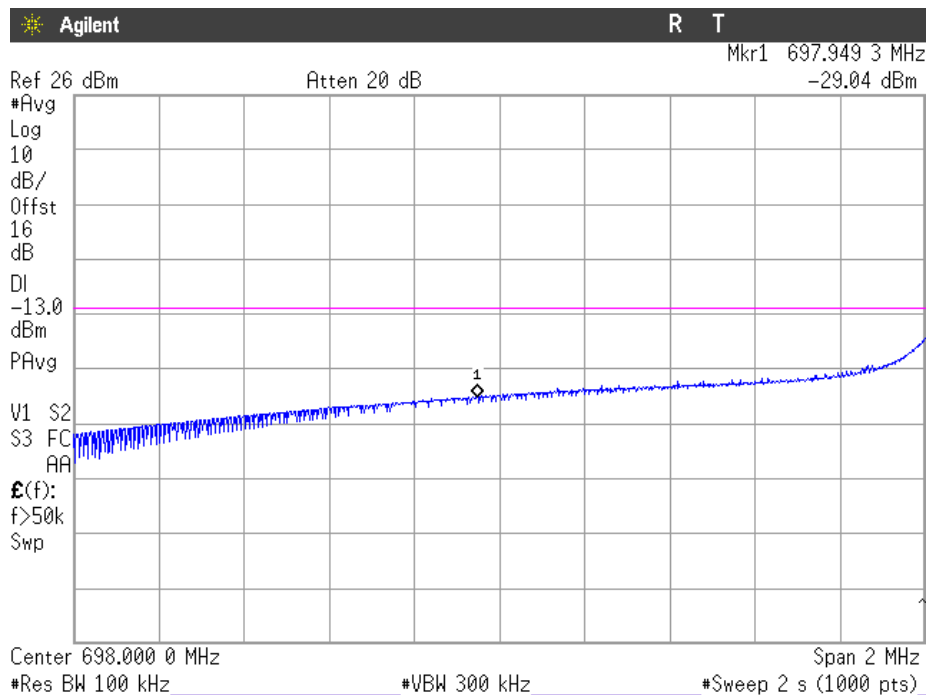


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 5 MHz (Band XII)

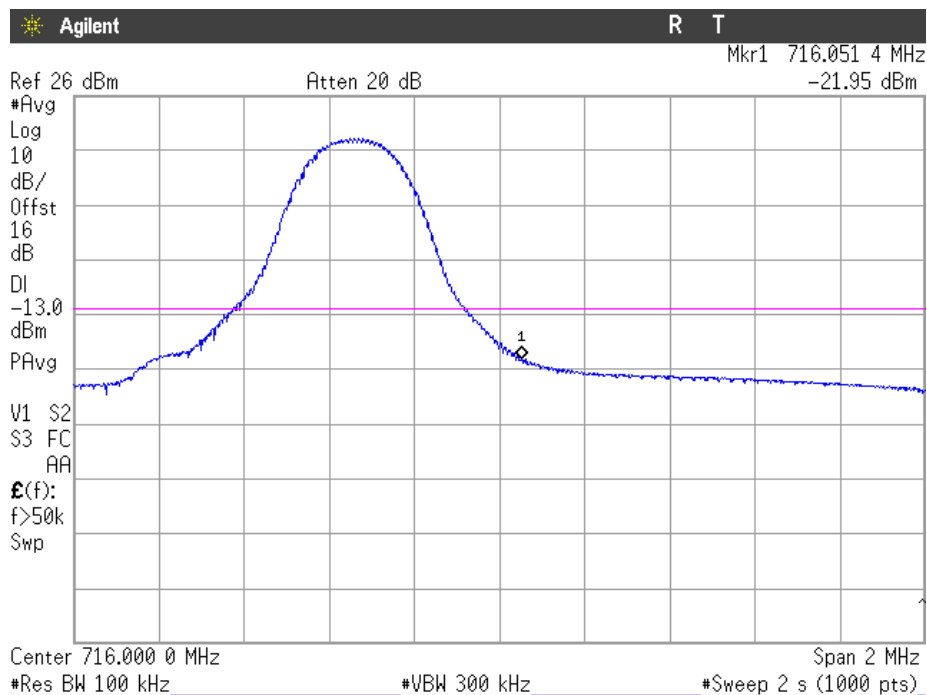
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 4. RB = 1. Offset = Max. BW = 5 MHz (Band XII)

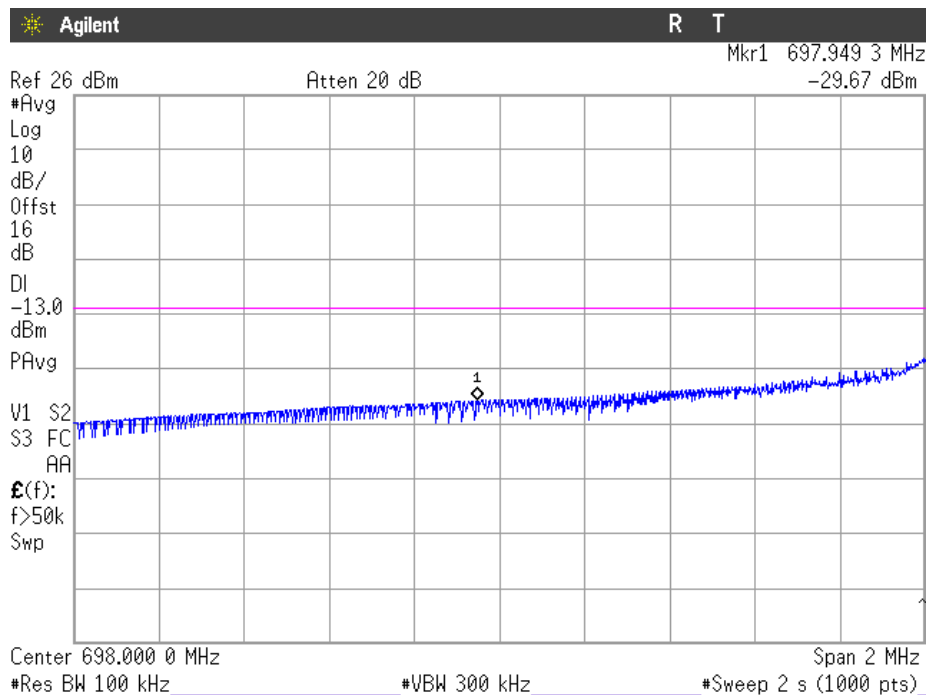
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

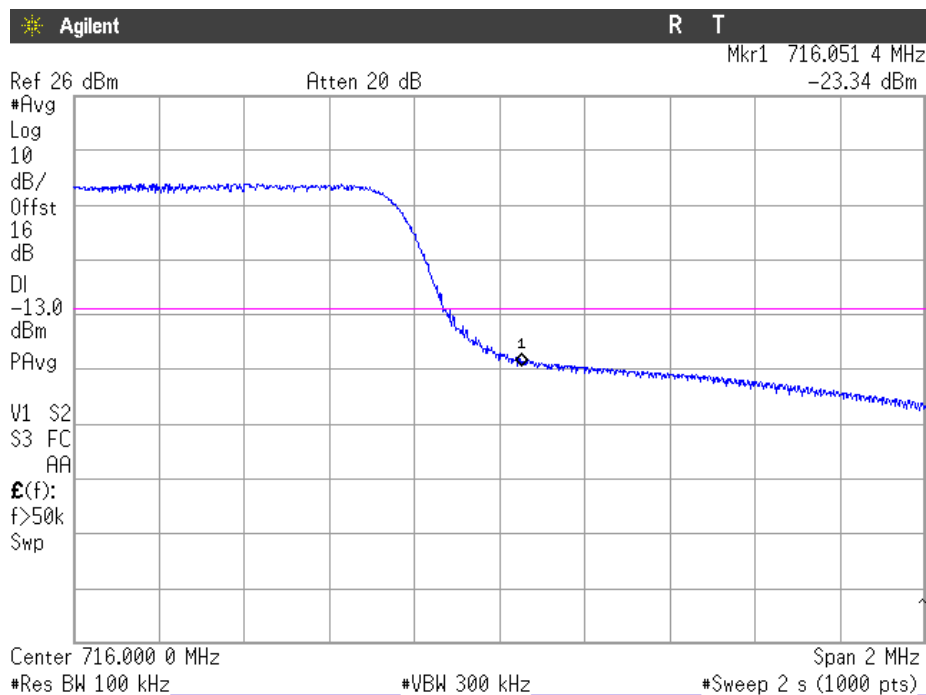
RB = All. Offset = 0. BW = 5 MHz (Band XII)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 4.

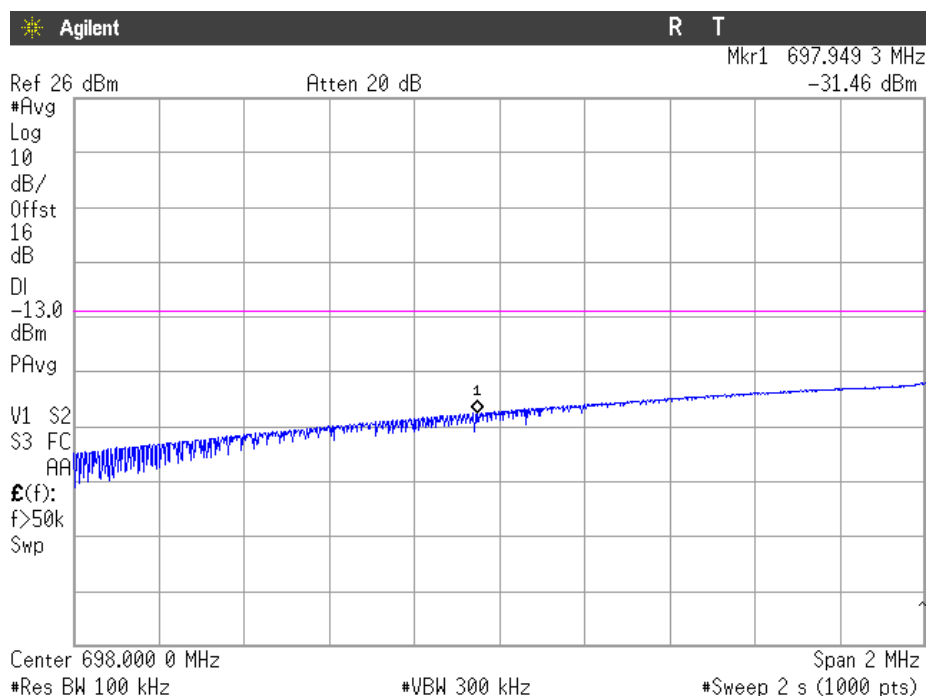


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Narrow band = 1. RB = 1. Offset = 0. BW = 10 MHz (Band XII)

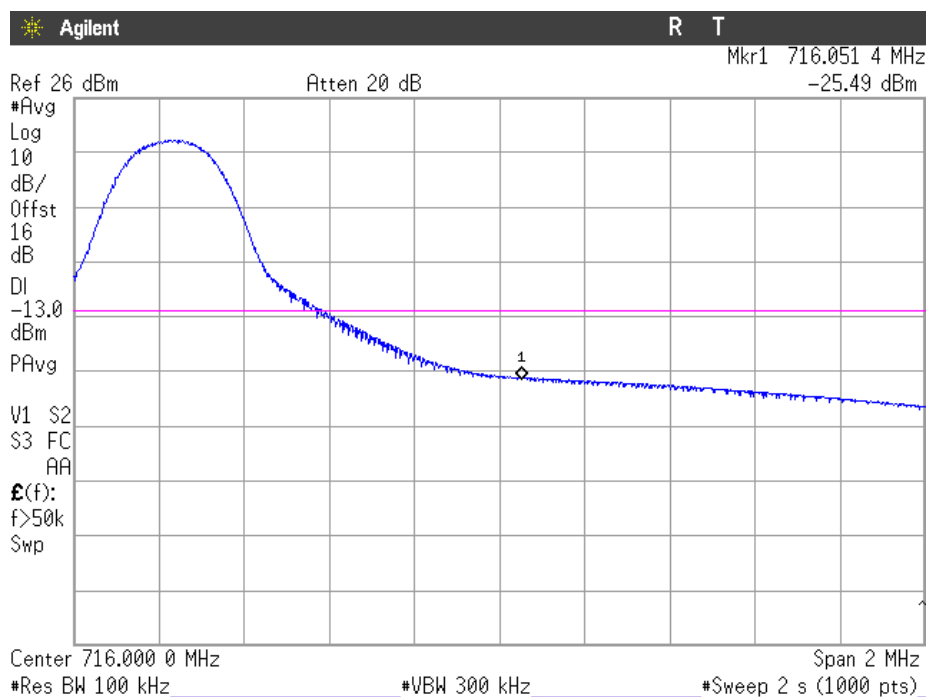
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

Narrow band = 8. RB = 1. Offset = Max. BW = 10 MHz (Band XII)

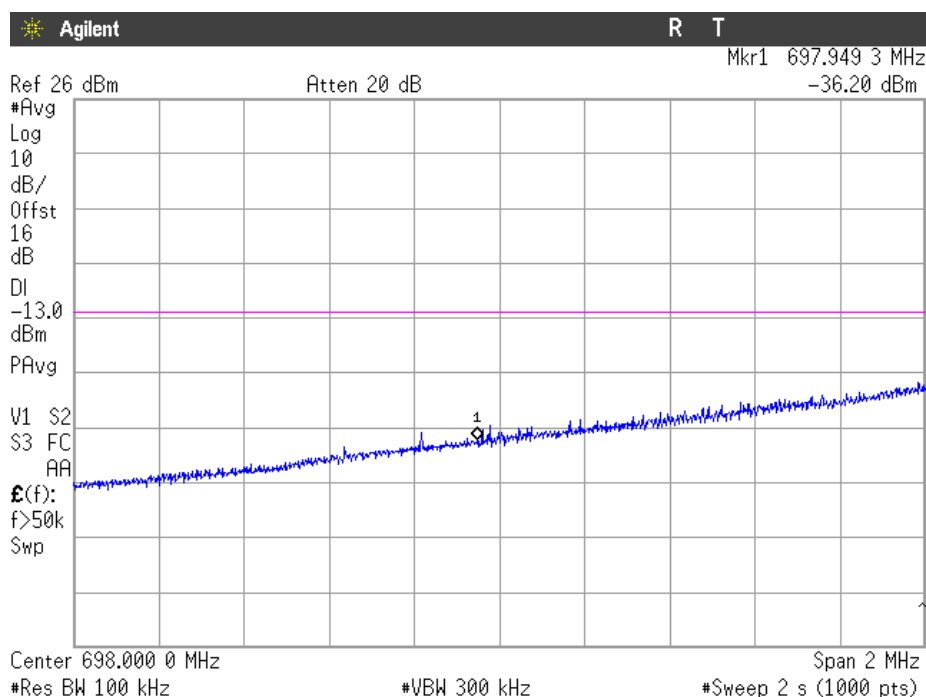
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

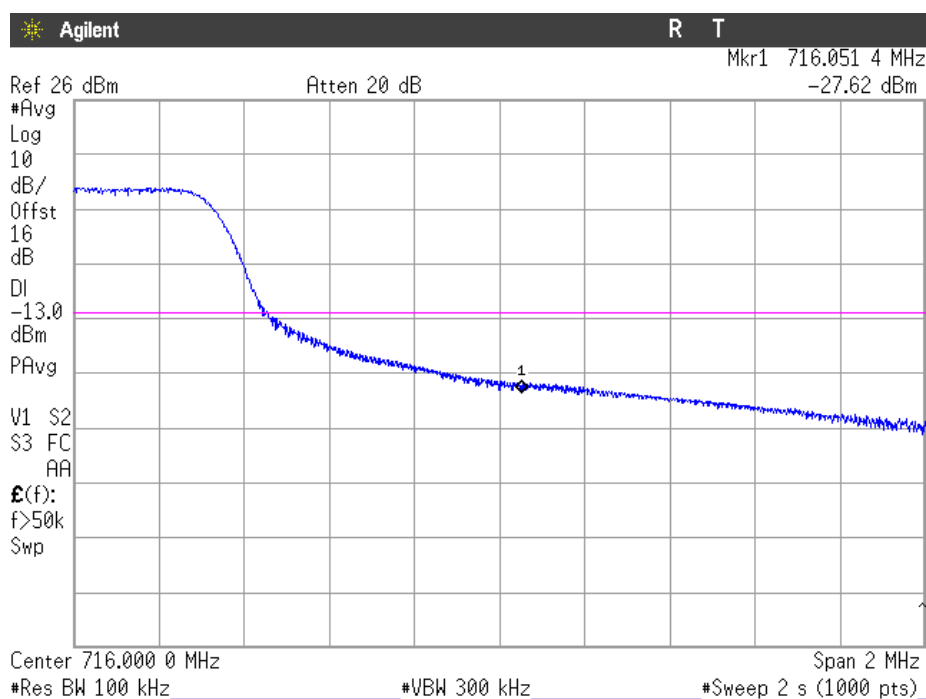
RB = All. Offset = 0. BW = 10 MHz (Band XII)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 8.



NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Radiated emissions

SPECIFICATION

FCC §2.1051 and §27.53(g) (h). RSS-139 Clause 6.6. RSS-130 Clause 4.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

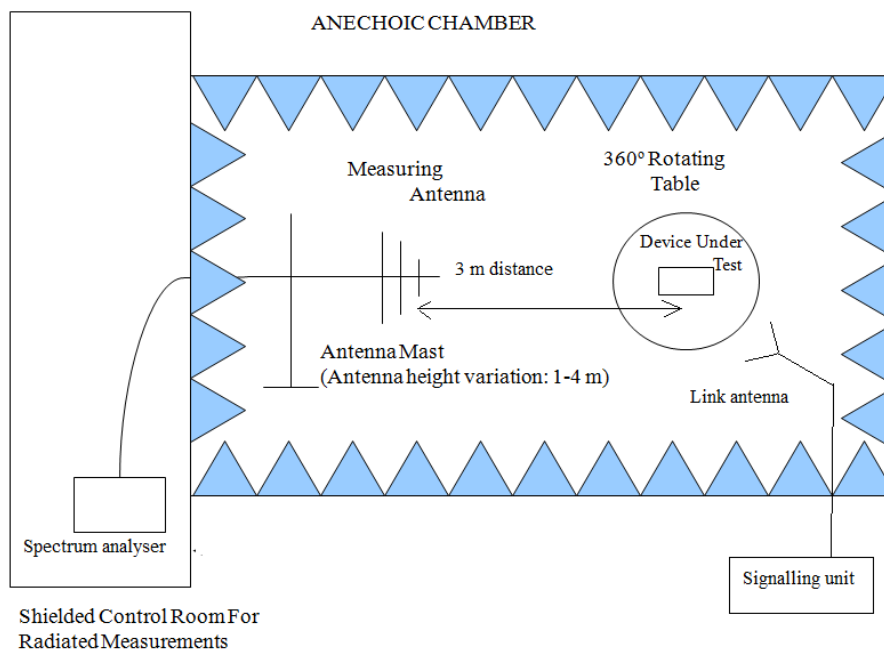
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

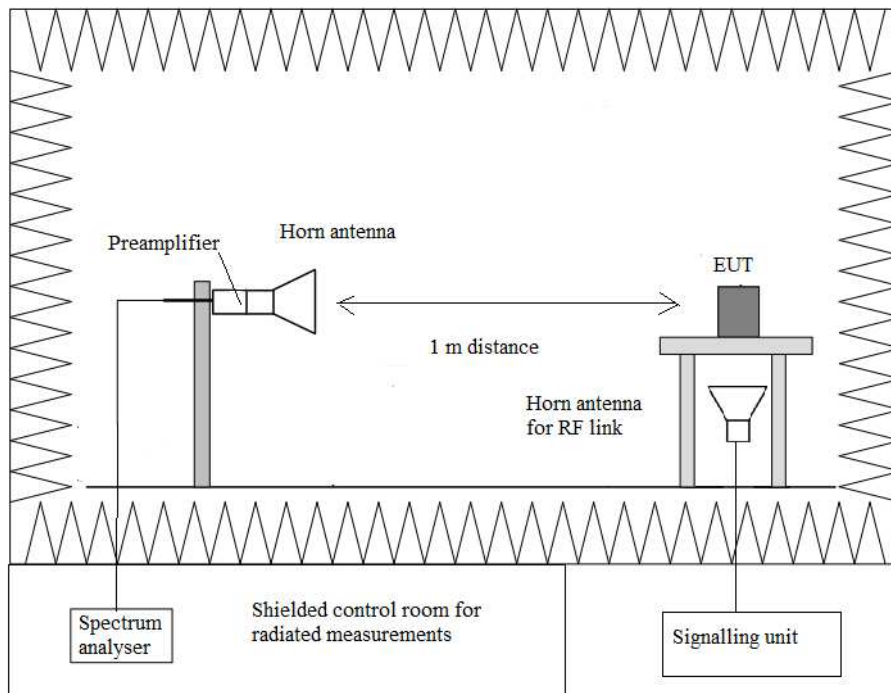
Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method, in accordance with the ANSI/TIA-603-D: 2010.

TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



RESULTS

LTE QPSK AND 16QAM MODULATION. Band IV. BW = 1.4 MHz. 3 MHz. 5 MHz. 10 MHz. 15 MHz and 20 MHz.

A preliminary scan determined the 16QAM 5 MHz bandwidth, Narrow band =2, RB = 5, as the worst case.

The following tables and plots show the results for this configuration.

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-18 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-18 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-18 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

LTE QPSK AND 16QAM MODULATION. Band XII. BW = 1.4 MHz. 3 MHz. 5 MHz and 10 MHz.

A preliminary scan determined the 16QAM 5 MHz bandwidth, Narrow band =2, RB = 5, as the worst case.

The following tables and plots show the results for this configuration.

1. CHANNEL: LOWEST

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-8 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

Frequency range 1 GHz-8 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.

No radiated spurious signals were detected.

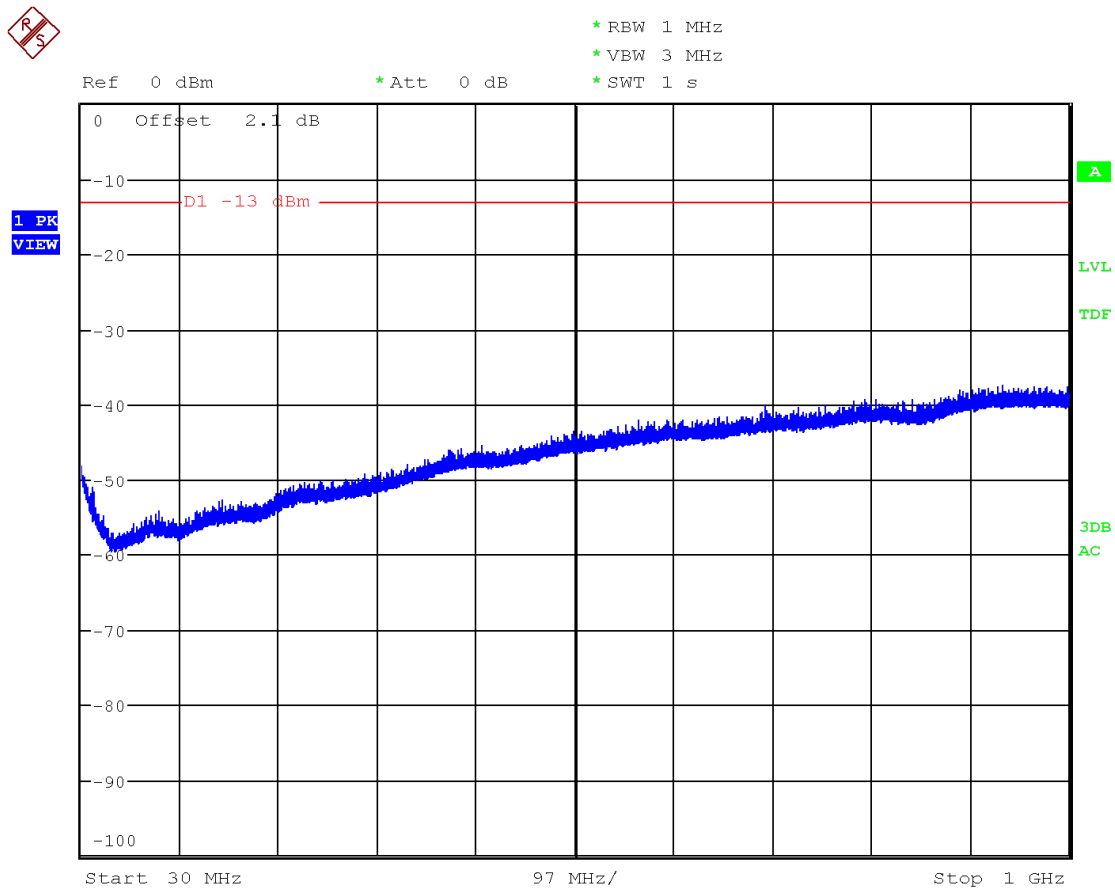
Frequency range 1 GHz-8 GHz.

No spurious signals were found at less than 20dB respect to the limit in all the range.

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

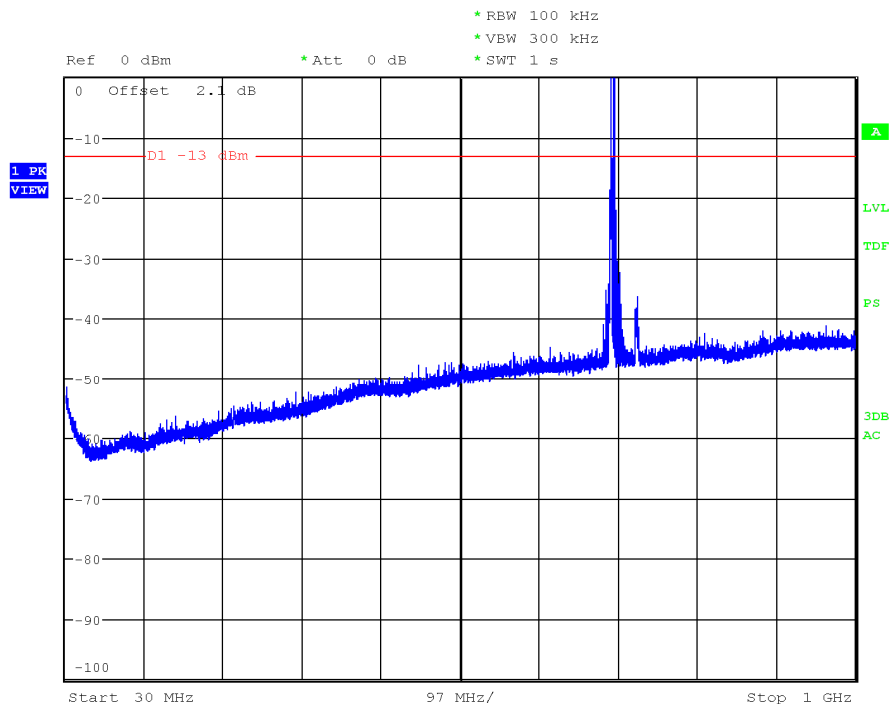
Band IV



(This plot is valid for all three channels)

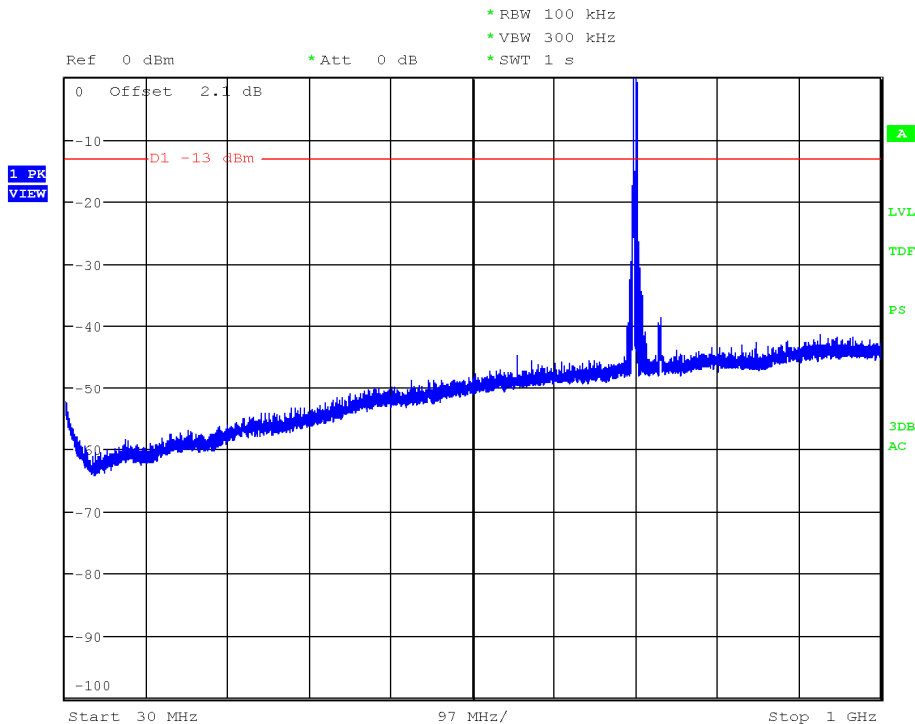
Band XII

CHANNEL: LOWEST



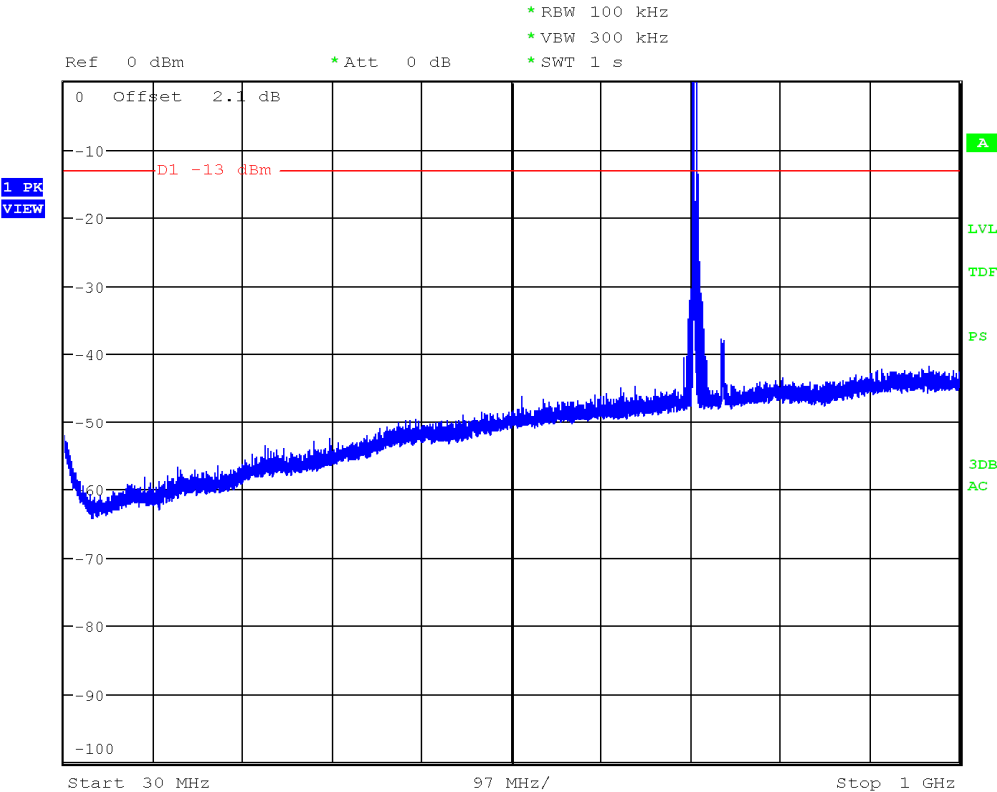
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

CHANNEL: HIGHEST

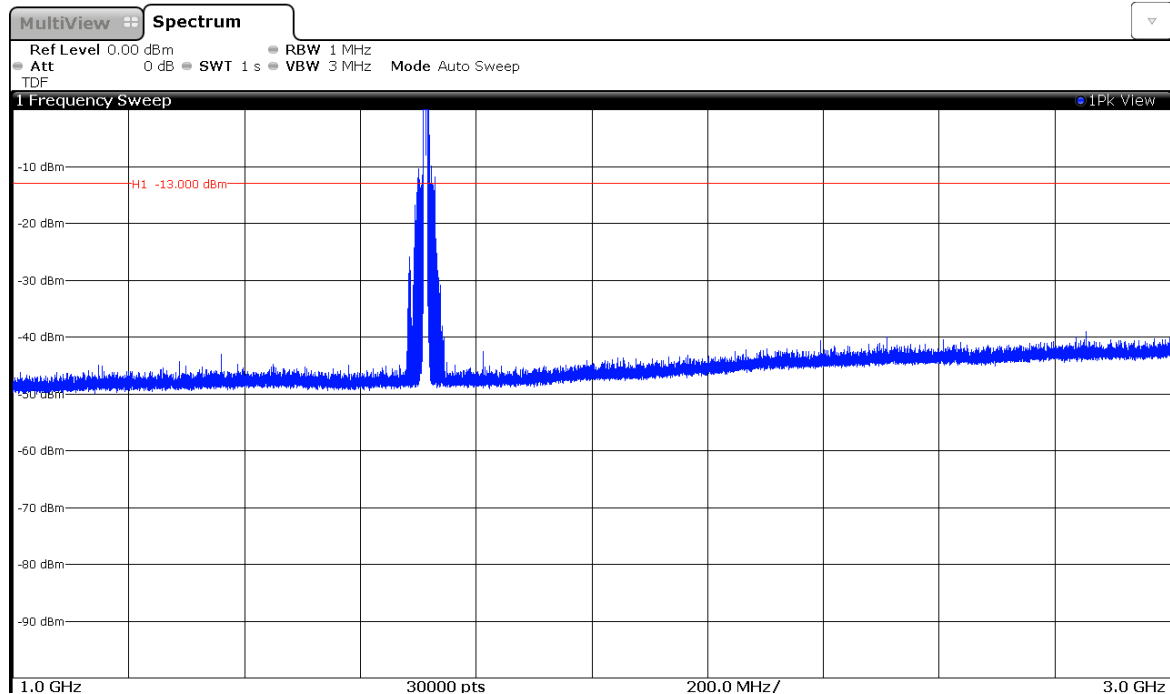


Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 GHz to 3 GHz.

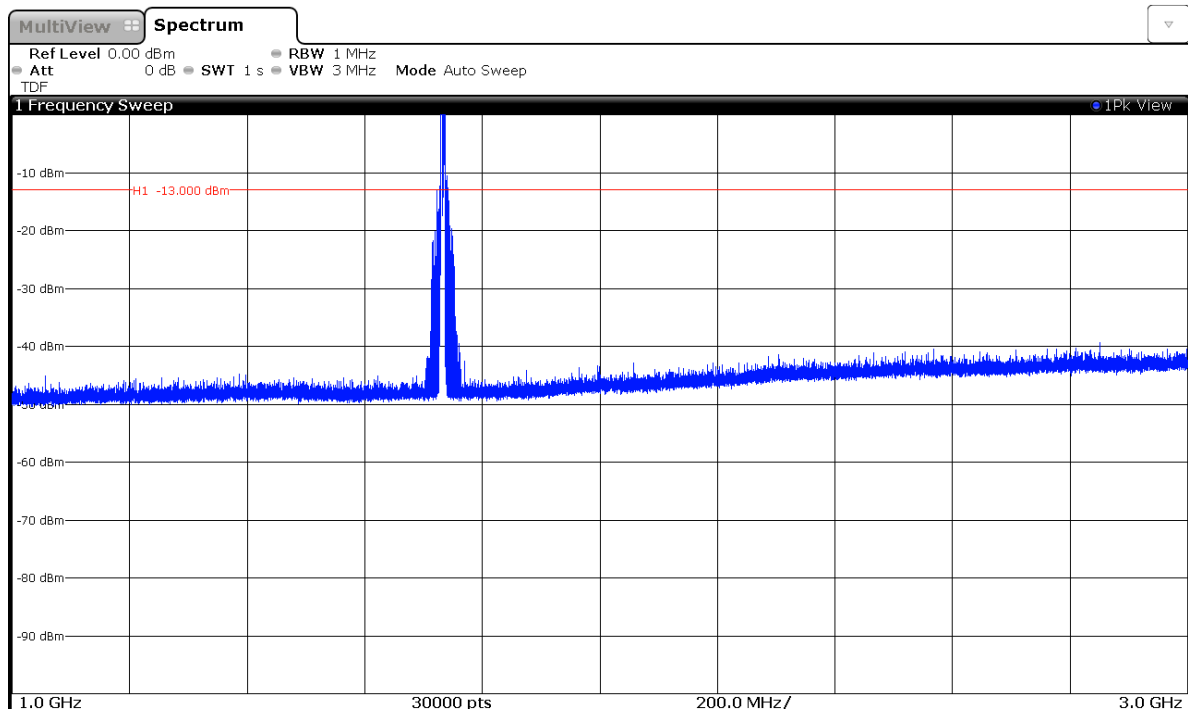
Band IV

CHANNEL: LOWEST



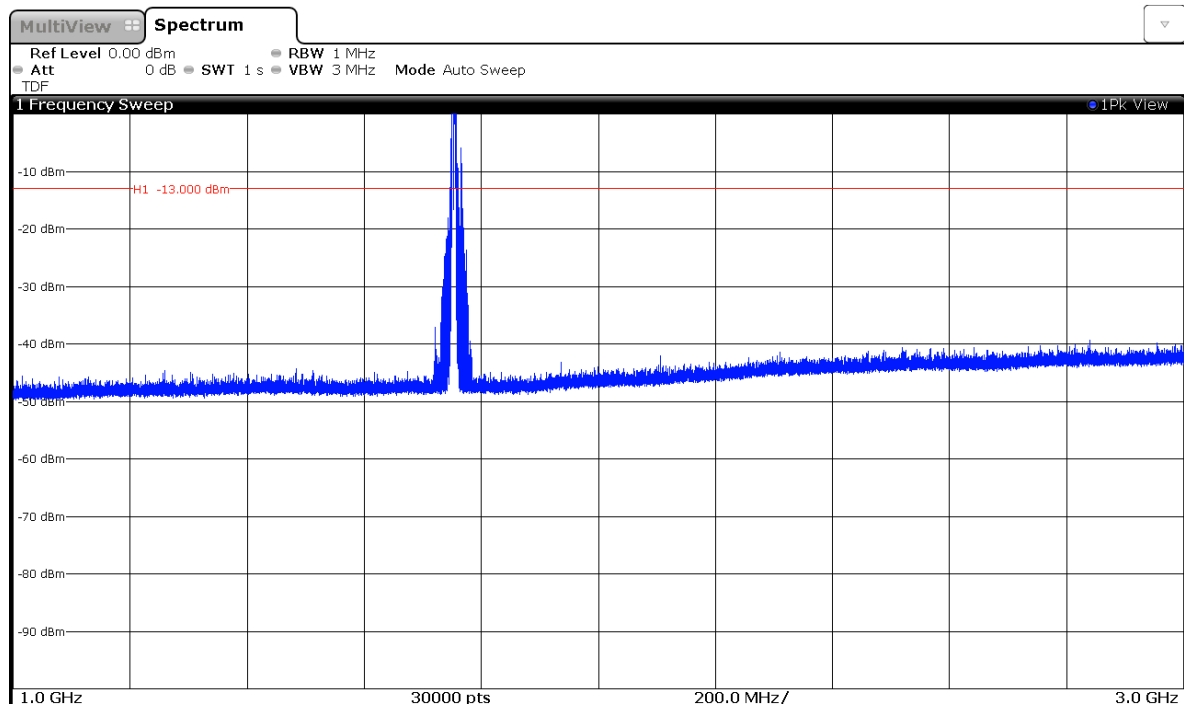
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

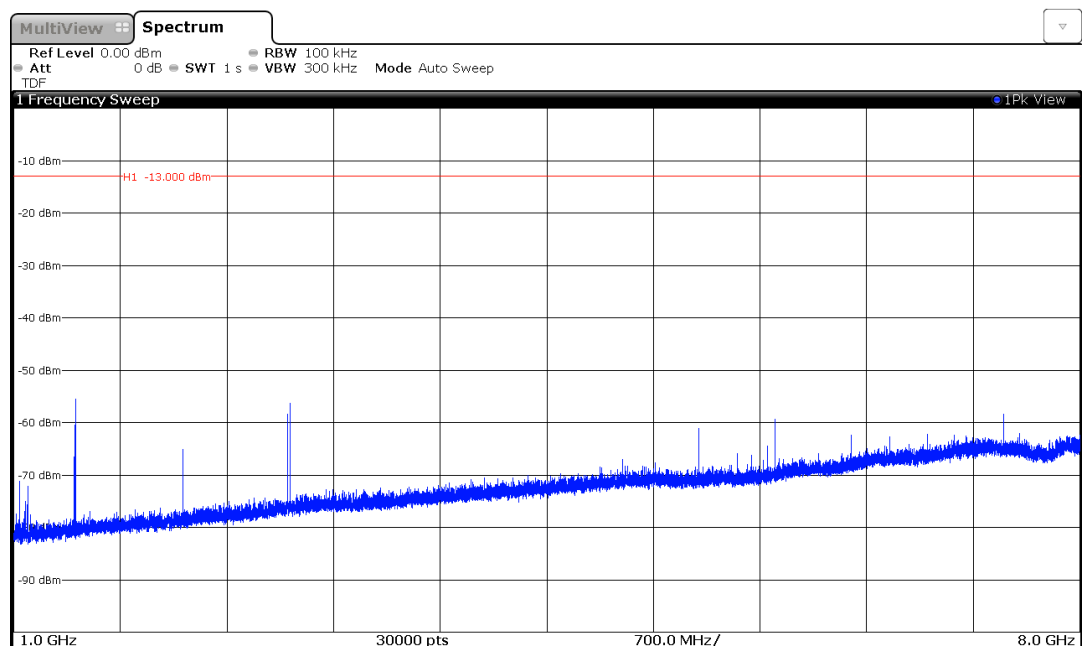
CHANNEL: HIGHEST



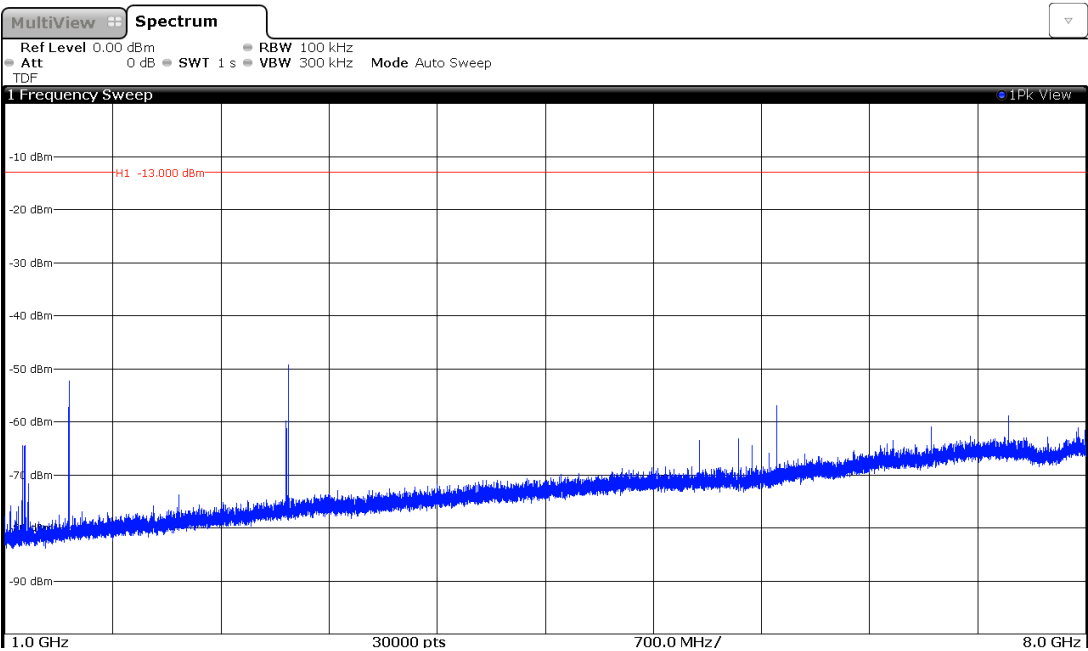
Note: The peak above the limit is the carrier frequency.

Band XII. Range 1 GHz to 8 GHz.

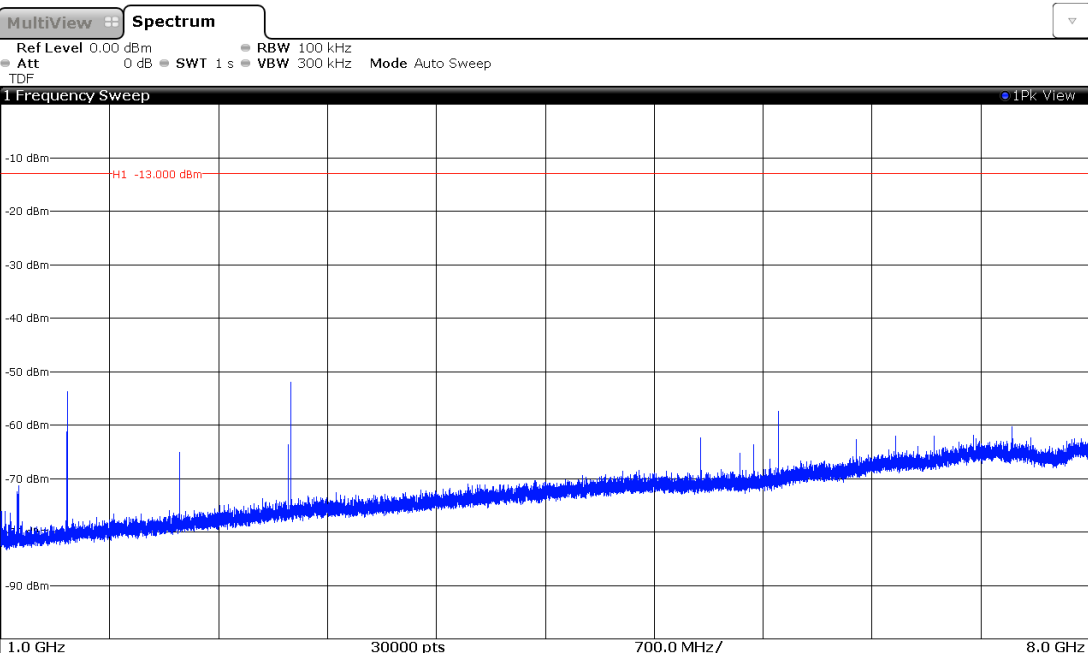
CHANNEL: LOWEST



CHANNEL: MIDDLE



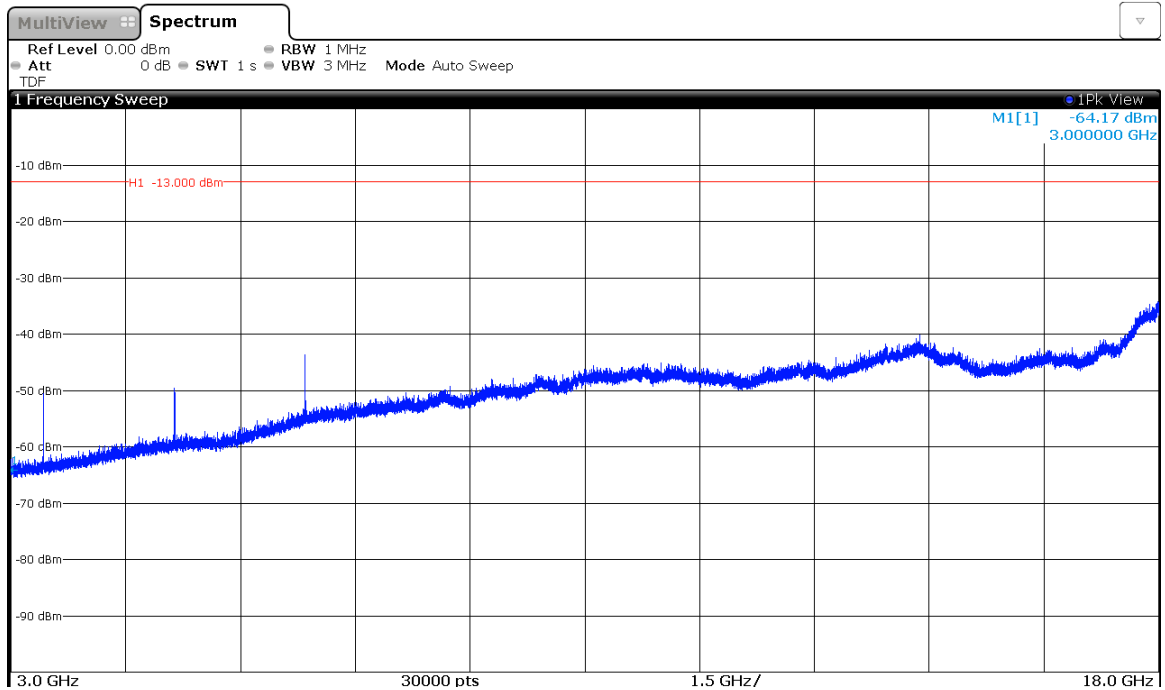
CHANNEL: HIGHEST



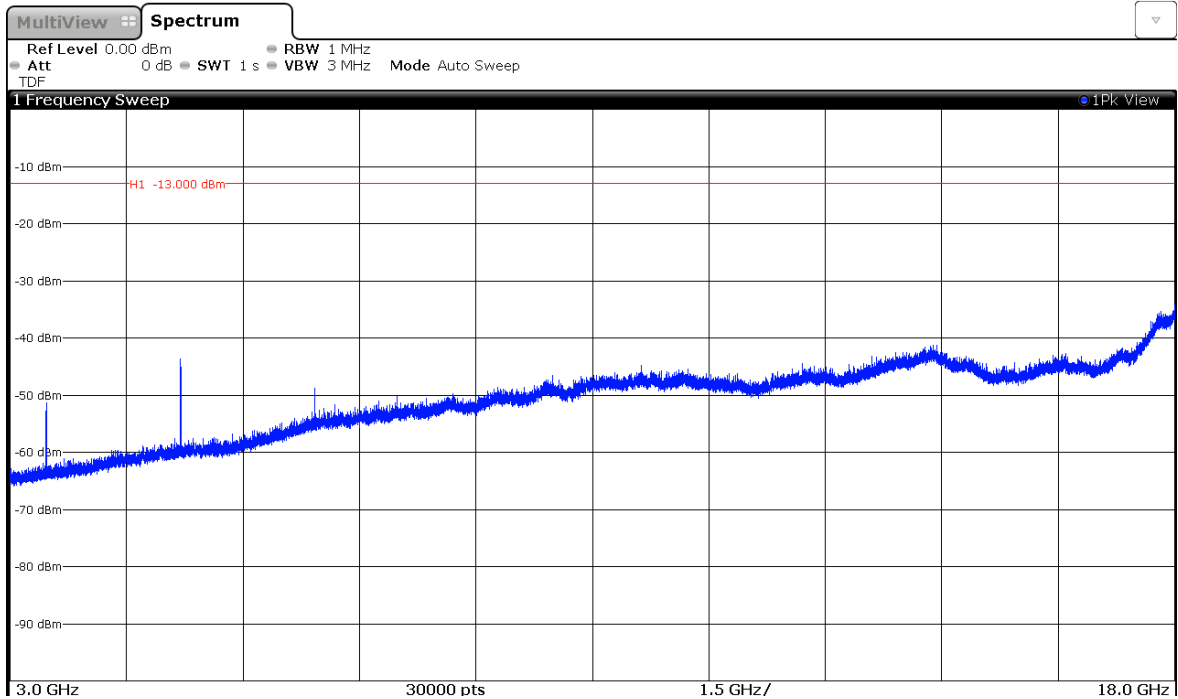
1

Band IV_Frequency range 3 GHz to 18 GHz

CHANNEL: LOWEST



CHANNEL: MIDDLE



CHANNEL: HIGHEST

