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

Test report No:

NIE: 52288RRF.002

Test report
REFERENCE STANDARD:
USA FCC Part 27
CANADA ISED 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-NV
Other identification of the product .....:	FCC ID: RI7ME910C1NV IC: 5131A-ME910C1NV
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. 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 ALEJANDRO LLAMAS RODRIGUEZ Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2017.08.02 12:12:45 +02'00'
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

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

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 conjuction 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.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

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 Nº	Description	Model	Serial Nº	Date of reception
52288/007	Module	ME910C1-NV	IMEI: 355155089999687	2017-01-25
46047B/018	Antennas	---	---	2015-05-12
46047B/015	Test board	---	113990003417	2015-05-12

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
52288/007	Module	ME910C1-NV	IMEI: 355155089999687	2017-01-25
46047B/015	Test board	---	113990003417	2015-05-12

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 2017-02-10 and finished on 2017-07-10.

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 ºC Max. = 35 ºC
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 ºC Max. = 35 ºC
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 ºC Max. = 35 ºC
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: Carolina Postigo, Pedro Parada and 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	2014/07	2017/07

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	2014/07	2017/07

Testing verdicts

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

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 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):

Vnom = 3.8 Vdc

Vmax = 4.37 Vdc

Vmin = 3.23 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 XIII)

	Channel (Frequency, MHz)	
	BW = 5 MHz	BW = 10 MHz
Lowest	23205 (779.5)	N/A
Middle	23230 (782.0)	23230 (782.0)
Highest	23255 (784.5)	N/A

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 stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP (44.77 dBm).

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 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).

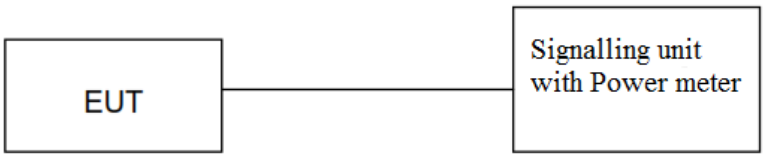
The maximum effective radiated power e.r.p. is calculated from the maximum equivalent isotropically radiated power (e.i.r.p.) by subtracting 2.15 dB:

$$E.R.P. = E.I.R.P. – 2.15\ dB$$

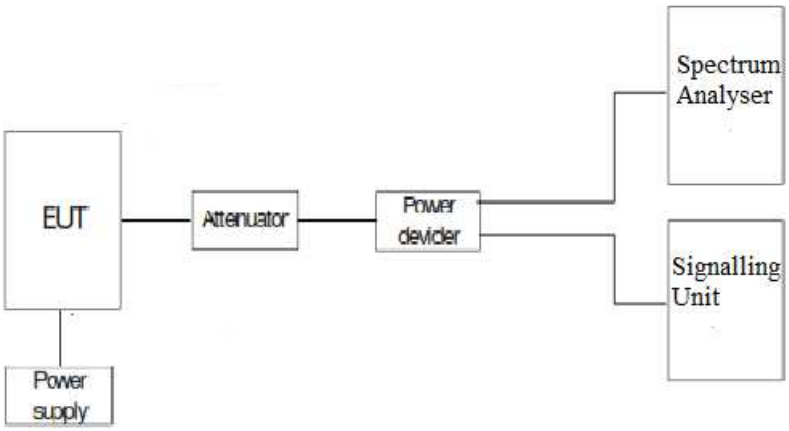
The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.
The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT 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	21.19	
				1	2	21.17	
				1	5	21.09	
				3	0	20.62	
				3	1	20.57	
				3	2	20.64	
				6	0	20.1	5.87
			16-QAM	1	0	20.68	
				1	2	20.79	
				1	5	20.68	
				3	0	20.02	
				3	1	20.09	
				3	2	20.06	
				5	0	20.01	6.8
	Middle 20175	1732,5	QPSK	1	0	21.07	
				1	2	21.1	
				1	5	21.05	
				3	0	20.54	
				3	1	20.56	
				3	2	20.13	
				5	0	20.13	5.82
			16-QAM	1	0	20.65	
				1	2	21.06	
				1	5	20.75	
				3	0	19.94	
				3	1	20.09	
				3	2	20.04	
				5	0	19.99	6.39
	High 20393	1754,3	QPSK	1	0	21.07	
				1	2	21.08	
				1	5	21.06	
				3	0	20.54	
				3	1	20.66	
				3	2	20.58	
				6	0	20.1	5.7
			16-QAM	1	0	20.48	
				1	2	20.55	
				1	5	20.5	
				3	0	20.14	
				3	1	20.3	
				3	2	20.18	
				5	0	20.16	6.32

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	21.02	
				1	2	21.05	
				1	5	21.04	
				3	0	20.64	
				3	1	20.66	
				3	2	20.66	
				6	0	20.21	5.63
			16-QAM	1	0	21.01	
				1	2	20.87	
				1	5	20.73	
				3	0	20.46	
				3	1	20.44	
				3	2	20.68	
				5	0	20.08	6.78
	Middle 20175	1732,5	QPSK	1	0	21.06	
				1	2	21.05	
				1	5	21.08	
				3	0	20.67	
				3	1	20.58	
				3	2	20.58	
				6	0	20.57	5.48
			16-QAM	1	0	20.57	
				1	2	20.67	
				1	5	20.59	
				3	0	20.39	
				3	1	20.49	
				3	2	20.35	
				5	0	20.31	6.44
	High 20385	1753,5	QPSK	1	0	21.02	
				1	2	21.07	
				1	5	21.05	
				3	0	20.68	
				3	1	20.65	
				3	2	20.69	
				6	0	20.48	5.38
			16-QAM	1	0	20.59	
				1	2	20.68	
				1	5	20.57	
				3	0	20.34	
				3	1	20.51	
				3	2	20.34	
				5	0	20.37	6.35

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	21.05	
				1	2	21.08	
				1	5	20.99	
				3	0	20.71	
				3	1	20.81	
				3	2	20.75	
				6	0	20.62	4.95
			16-QAM	1	0	20.95	
				1	2	21.01	
				1	5	20.97	
				3	0	20.78	
				3	1	20.6	
				3	2	20.74	
				5	0	20.45	5.91
	Middle 20175	1732,5	QPSK	1	0	21.1	
				1	2	21.14	
				1	5	21.12	
				3	0	20.64	
				3	1	20.59	
				3	2	20.64	
				6	0	20.46	4.86
			16-QAM	1	0	21.06	
				1	2	21.13	
				1	5	21.05	
				3	0	20.68	
				3	1	20.66	
				3	2	20.68	
				5	0	20.26	5.75
	High 20375	1752,5	QPSK	1	0	21.16	
				1	2	21.16	
				1	5	21.14	
				3	0	20.66	
				3	1	20.71	
				3	2	20.71	
				6	0	20.54	4.76
			16-QAM	1	0	21.07	
				1	2	21.09	
				1	5	21.08	
				3	0	20.7	
				3	1	20.68	
				3	2	20.69	
				5	0	20.54	5.63

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	21.12	
				1	2	21.13	
				1	5	21.12	
				3	0	20.66	
				3	1	20.68	
				3	2	20.65	
				6	0	20.6	4.93
			16-QAM	1	0	21.08	
				1	2	21.1	
				1	5	21.12	
				3	0	20.68	
				3	1	20.66	
				3	2	20.62	
				5	0	20.07	5.75
	Middle 20175	1732,5	QPSK	1	0	21.12	
				1	2	21.14	
				1	5	21.15	
				3	0	20.6	
				3	1	20.74	
				3	2	20.68	
				6	0	20.59	4.83
			16-QAM	1	0	21.11	
				1	2	21.06	
				1	5	21.1	
				3	0	20.72	
				3	1	20.64	
				3	2	20.65	
				5	0	20.08	5.7
	High 20350	1750	QPSK	1	0	21.08	
				1	2	21.13	
				1	5	21.1	
				3	0	20.62	
				3	1	20.65	
				3	2	20.6	
				6	0	20.63	4.71
			16-QAM	1	0	21.06	
				1	2	21.1	
				1	5	21.04	
				3	0	20.59	
				3	1	20.55	
				3	2	20.54	
				5	0	20.41	5.58

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	21.13	
				1	2	21.19	
				1	5	21.15	
				3	0	21.05	
				3	1	21.12	
				3	2	21.11	
				6	0	21.04	4.83
			16-QAM	1	0	20.92	
				1	2	20.93	
				1	5	20.94	
				3	0	21.09	
				3	1	21.09	
				3	2	21.07	
				5	0	21.11	5.48
	Middle 20175	1732,5	QPSK	1	0	21	
				1	2	21.13	
				1	5	21.09	
				3	0	20.94	
				3	1	21.04	
				3	2	21.01	
				6	0	20.91	4.76
			16-QAM	1	0	20.81	
				1	2	20.77	
				1	5	20.69	
				3	0	20.97	
				3	1	20.98	
				3	2	20.97	
				5	0	21.04	5.43
	High 20325	1747,5	QPSK	1	0	21.2	
				1	2	21.22	
				1	5	21.2	
				3	0	21.13	
				3	1	21.16	
				3	2	21.11	
				6	0	21.09	4.64
			16-QAM	1	0	20.85	
				1	2	20.87	
				1	5	20.94	
				3	0	21.09	
				3	1	21.06	
				3	2	21.05	
				5	0	21.04	5.36

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	20.97	
				1	2	20.97	
				1	5	21.06	
				3	0	20.88	
				3	1	20.89	
				3	2	20.86	
				6	0	20.87	4.78
			16-QAM	1	0	21.09	
				1	2	21.1	
				1	5	19.59	
				3	0	20.74	
				3	1	20.69	
				3	2	20.75	
				5	0	20.71	5.43
	Middle 20175	1732,5	QPSK	1	0	20.77	
				1	2	21.16	
				1	5	21.12	
				3	0	20.86	
				3	1	20.98	
				3	2	20.96	
				6	0	20.98	4.76
			16-QAM	1	0	21.06	
				1	2	20.94	
				1	5	20.94	
				3	0	21.04	
				3	1	21.03	
				3	2	21.02	
				5	0	21.04	5.41
	High 20300	1745	QPSK	1	0	21.02	
				1	2	21	
				1	5	20.97	
				3	0	21.14	
				3	1	21.15	
				3	2	21.18	
				6	0	21.05	4.69
			16-QAM	1	0	20.9	
				1	2	21.02	
				1	5	21.11	
				3	0	21.3	
				3	1	21.26	
				3	2	21.17	
				5	0	20.99	5.38

LTE. BAND XIII.

Narrow band = 2 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
5	Low 23205	779,5	QPSK	1	0	22.99	5.29
				1	2	23.01	
				1	5	22.29	
				3	0	22.2	
				3	1	22.09	
				3	2	22.13	
				6	0	22.2	
			16-QAM	1	0	22.85	6.15
				1	2	22.99	
				1	5	22.87	
				3	0	22.09	
				3	1	22.08	
				3	2	22.08	
				5	0	21.35	
	Middle 23230	782	QPSK	1	0	22.98	4.59
				1	2	23	
				1	5	22.99	
				3	0	22.16	
				3	1	22.25	
				3	2	22.25	
				6	0	22.14	
			16-QAM	1	0	23.24	5.53
				1	2	23.35	
				1	5	23.22	
				3	0	21.98	
				3	1	21.97	
				3	2	21.98	
				5	0	21.05	
	High 23255	784,5	QPSK	1	0	22.9	4.86
				1	2	22.93	
				1	5	22.91	
				3	0	22.12	
				3	1	22.2	
				3	2	22.04	
				6	0	22.2	
			16-QAM	1	0	23.31	5.63
				1	2	23.41	
				1	5	23.33	
				3	0	21.92	
				3	1	21.95	
				3	2	22.04	
				5	0	21.07	

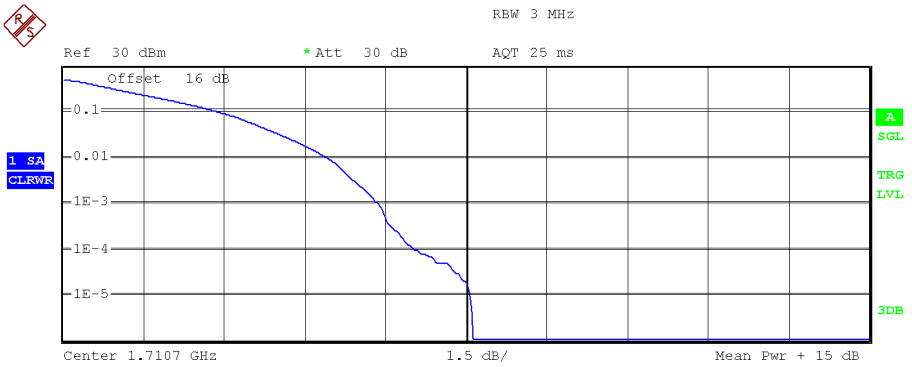
Narrow band = 5 (worst case)

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)	PAPR (dB)
10	Middle 23230	782	QPSK	2	0	22.96	4.57
				2	4	22.97	
				6	0	22.15	
			16-QAM	2	0	23.04	5.53
				2	4	23.15	
				5	0	22.03	

PEAK-TO-AVERAGE POWER RATIO (PAPR).

LTE. BAND IV.

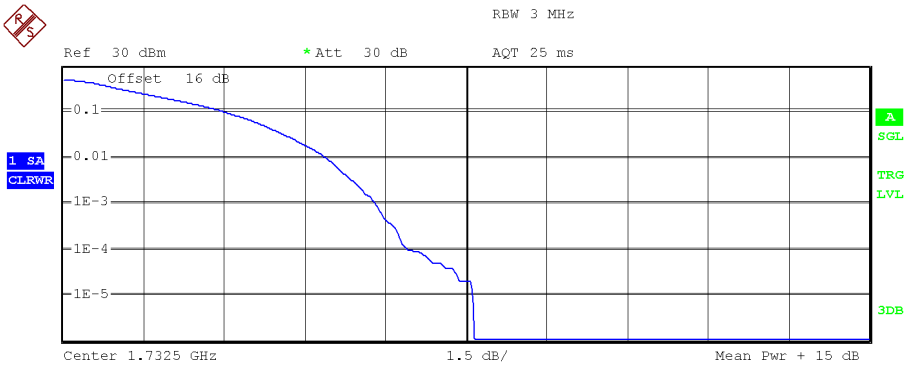
Bandwidth = 1.4 MHz. Modulation QPSK. Modulation bandwidth: 1. RB Size: 6. RB Offset: 0.
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.68 dBm
Peak	26.32 dBm
Crest	7.64 dB
10 %	2.88 dB
1 %	4.90 dB
.1 %	5.87 dB
.01 %	6.59 dB

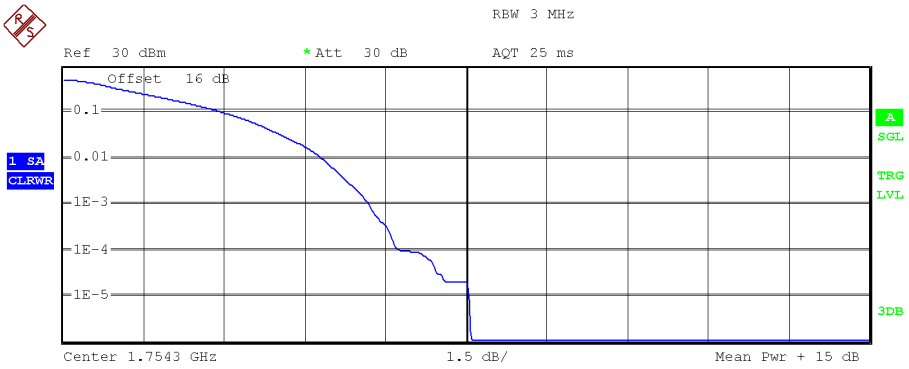
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.38 dBm
Peak	26.04 dBm
Crest	7.66 dB
10 %	3.00 dB
1 %	4.88 dB
.1 %	5.82 dB
.01 %	6.47 dB

Channel High:

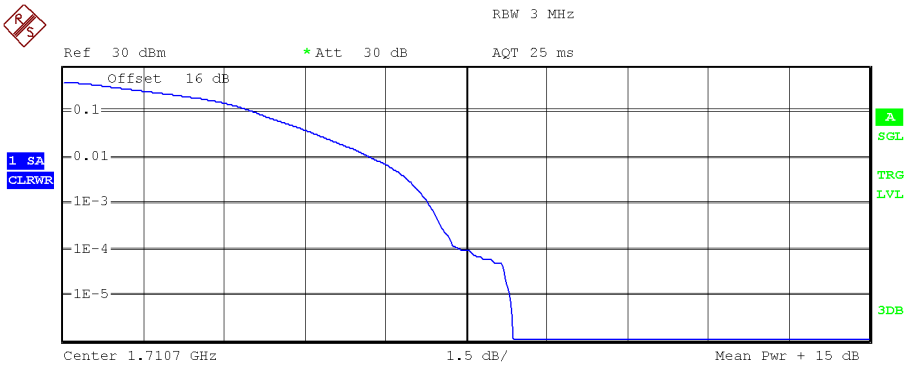


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.38 dBm
Peak	25.97 dBm
Crest	7.59 dB
10 %	2.96 dB
1 %	4.81 dB
.1 %	5.70 dB
.01 %	6.39 dB

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

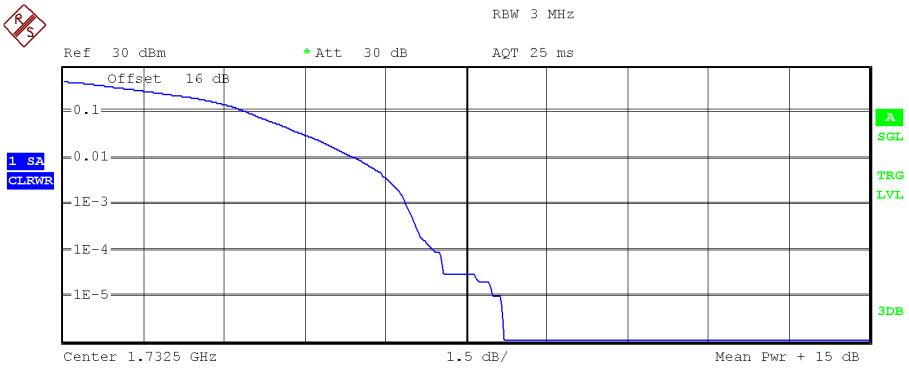
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.51 dBm
Peak	26.89 dBm
Crest	8.38 dB
10 %	3.56 dB
1 %	5.75 dB
.1 %	6.80 dB
.01 %	7.52 dB

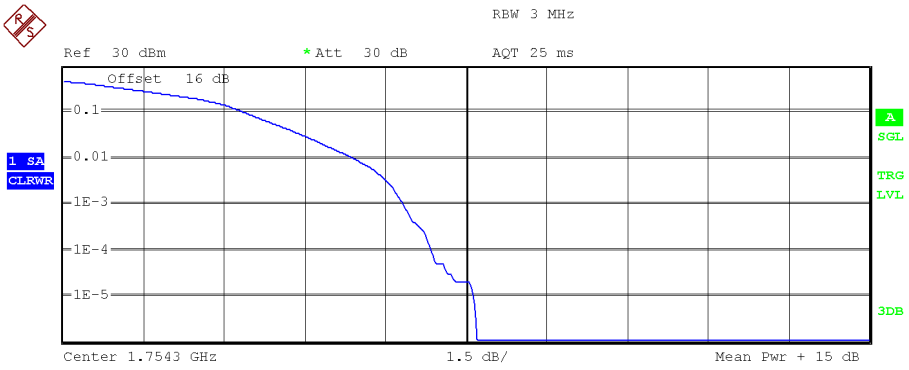
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.47 dBm
Peak	26.67 dBm
Crest	8.21 dB
10 %	3.41 dB
1 %	5.43 dB
.1 %	6.39 dB
.01 %	6.88 dB

Channel High:

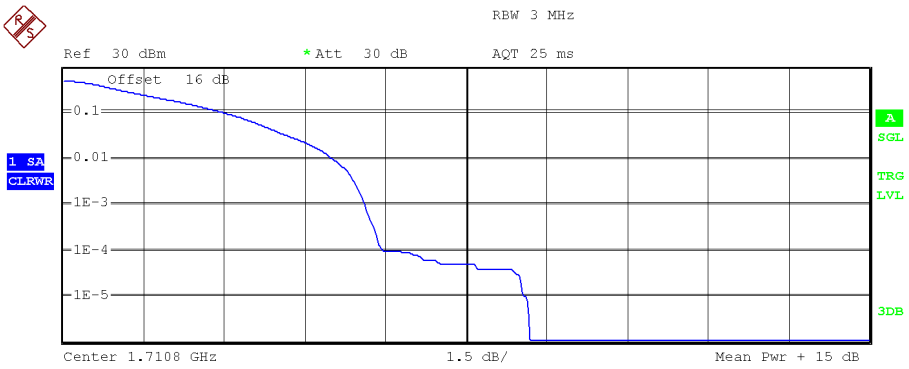


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.41 dBm
Peak	26.11 dBm
Crest	7.70 dB
10 %	3.37 dB
1 %	5.41 dB
.1 %	6.32 dB
.01 %	6.85 dB

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

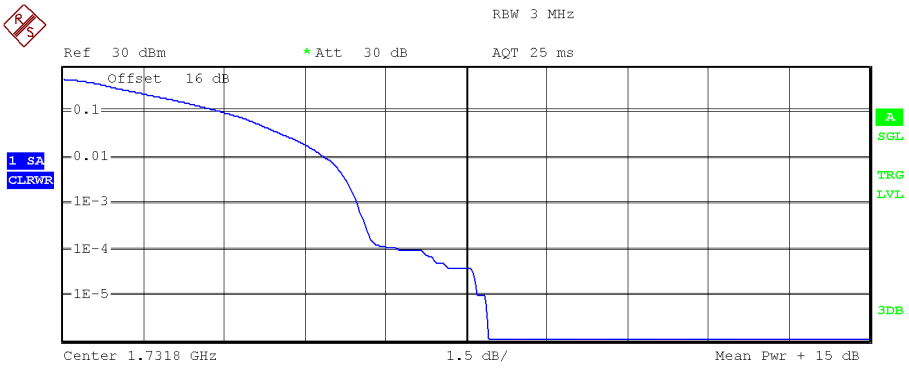
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.55 dBm
Peak	27.24 dBm
Crest	8.69 dB
10 %	3.00 dB
1 %	5.00 dB
.1 %	5.63 dB
.01 %	6.23 dB

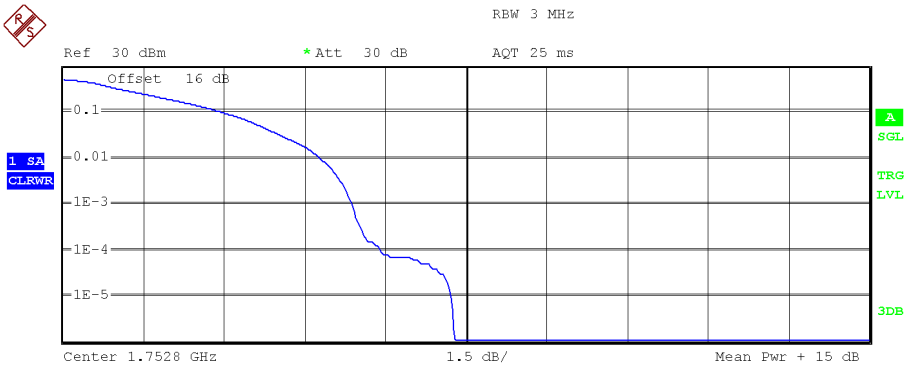
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.48 dBm
Peak	26.39 dBm
Crest	7.92 dB
10 %	2.96 dB
1 %	4.88 dB
.1 %	5.48 dB
.01 %	6.63 dB

Channel High:

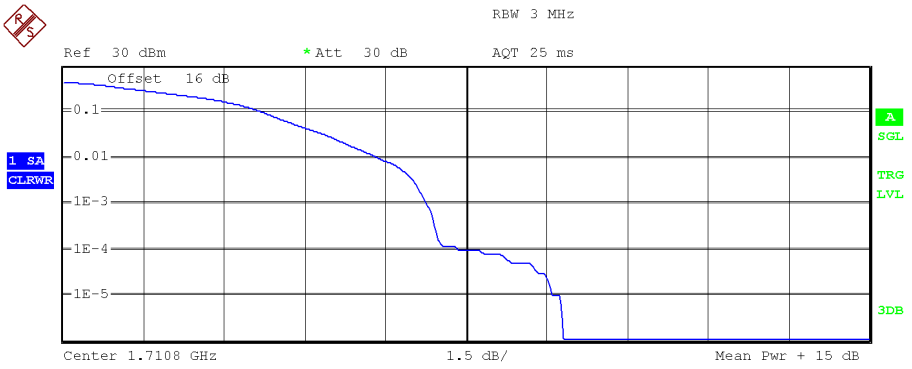


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.40 dBm
Peak	25.69 dBm
Crest	7.28 dB
10 %	2.96 dB
1 %	4.78 dB
.1 %	5.38 dB
.01 %	5.91 dB

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

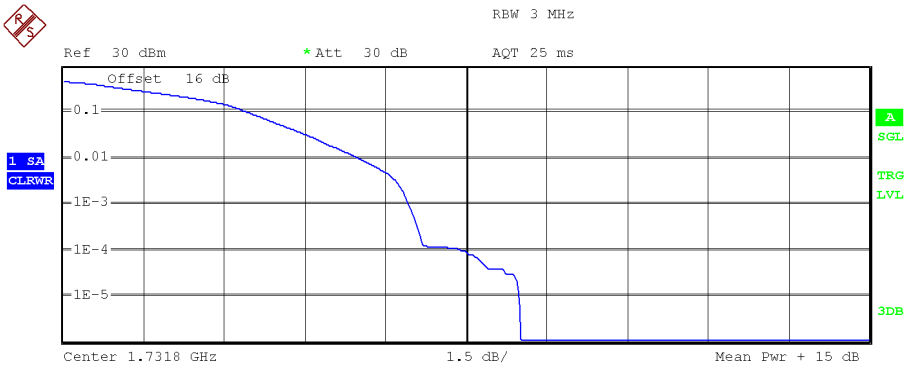
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.28 dBm
Peak	27.59 dBm
Crest	9.31 dB
10 %	3.70 dB
1 %	5.84 dB
.1 %	6.78 dB
.01 %	7.69 dB

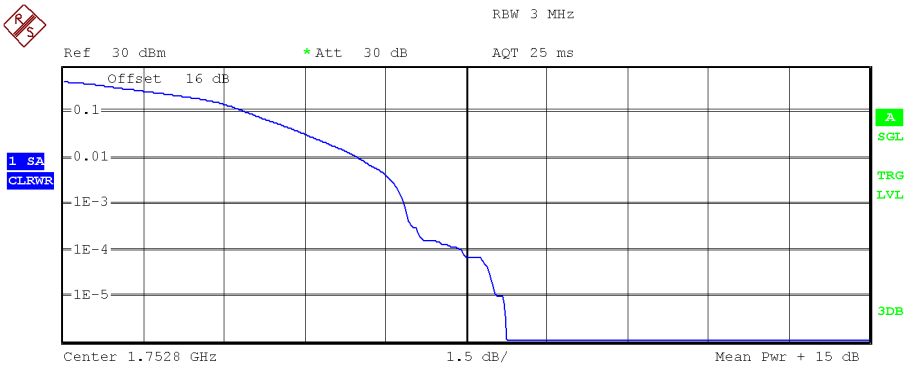
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.51 dBm
Peak	27.03 dBm
Crest	8.52 dB
10 %	3.44 dB
1 %	5.48 dB
.1 %	6.44 dB
.01 %	7.45 dB

Channel High:

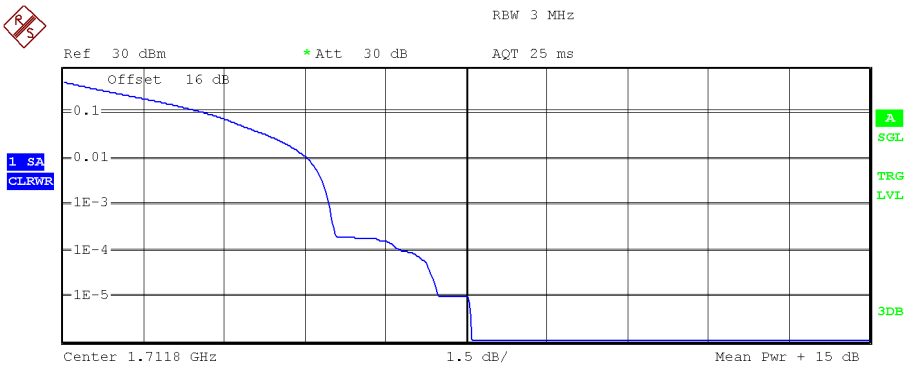


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.28 dBm
Peak	26.53 dBm
Crest	8.26 dB
10 %	3.41 dB
1 %	5.50 dB
.1 %	6.35 dB
.01 %	7.40 dB

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

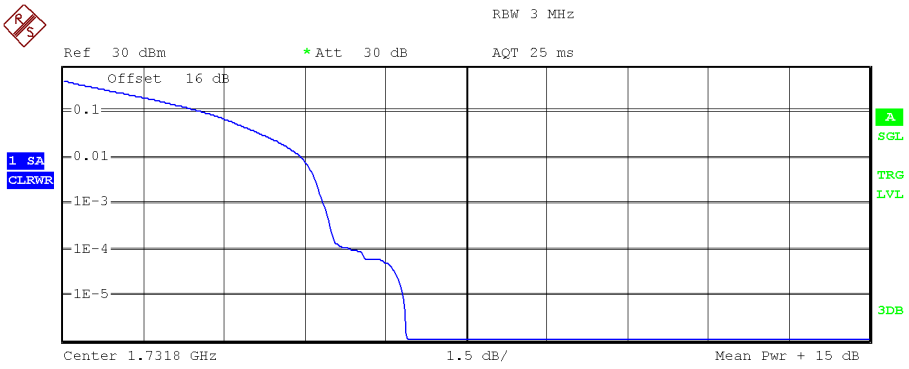
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.19 dBm
Peak	27.80 dBm
Crest	7.61 dB
10 %	2.64 dB
1 %	4.54 dB
.1 %	4.95 dB
.01 %	6.35 dB

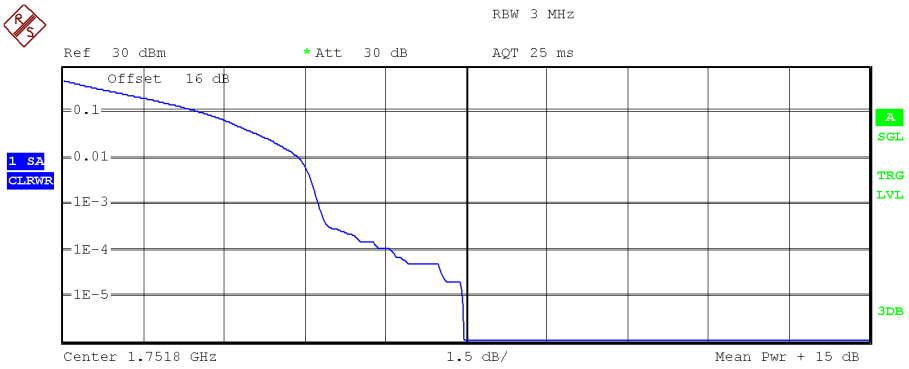
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.00 dBm
Peak	26.39 dBm
Crest	6.39 dB
10 %	2.60 dB
1 %	4.45 dB
.1 %	4.86 dB
.01 %	5.41 dB

Channel High:

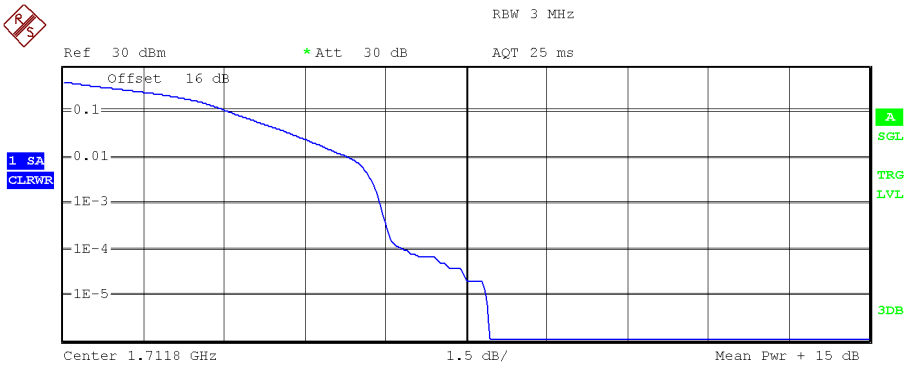


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	19.99 dBm
Peak	27.45 dBm
Crest	7.46 dB
10 %	2.55 dB
1 %	4.40 dB
.1 %	4.76 dB
.01 %	6.11 dB

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

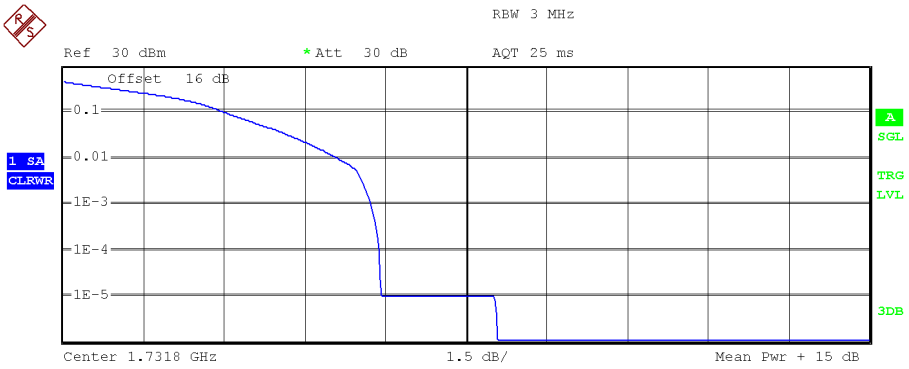
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.88 dBm
Peak	26.82 dBm
Crest	7.94 dB
10 %	3.10 dB
1 %	5.31 dB
.1 %	5.91 dB
.01 %	6.39 dB

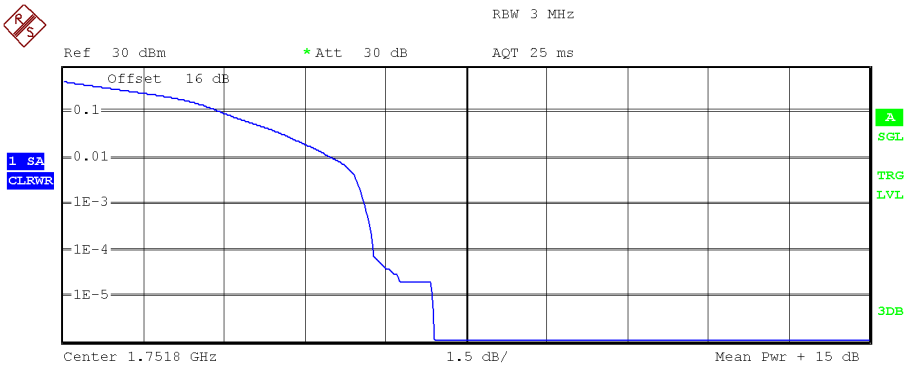
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.93 dBm
Peak	27.03 dBm
Crest	8.09 dB
10 %	3.00 dB
1 %	5.10 dB
.1 %	5.75 dB
.01 %	5.89 dB

Channel High:

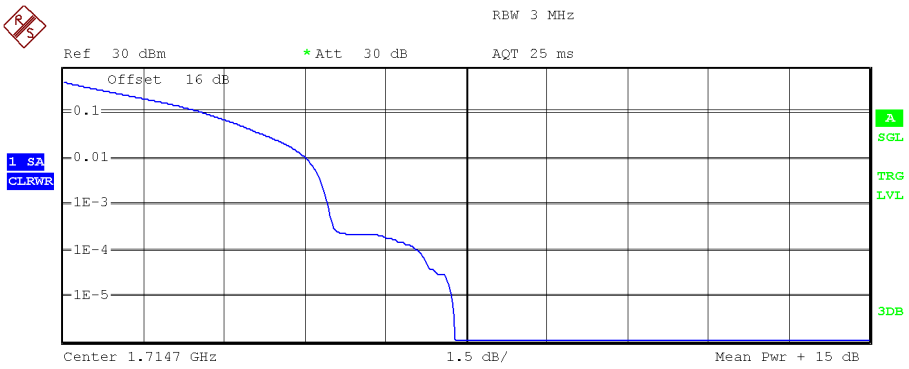


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.85 dBm
Peak	25.76 dBm
Crest	6.91 dB
10 %	2.96 dB
1 %	5.02 dB
.1 %	5.63 dB
.01 %	5.79 dB

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

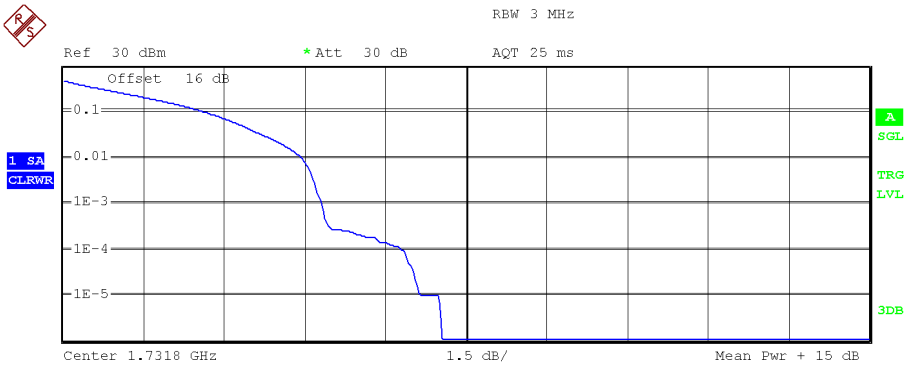
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.01 dBm
Peak	27.31 dBm
Crest	7.30 dB
10 %	2.62 dB
1 %	4.54 dB
.1 %	4.93 dB
.01 %	6.61 dB

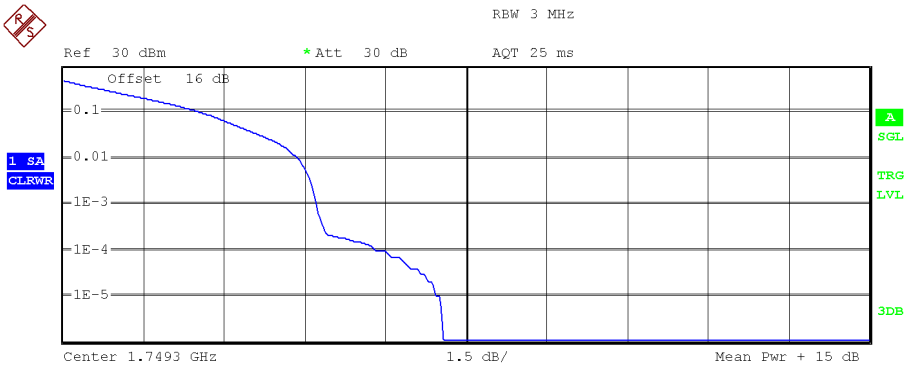
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.11 dBm
Peak	27.17 dBm
Crest	7.05 dB
10 %	2.64 dB
1 %	4.42 dB
.1 %	4.83 dB
.01 %	6.30 dB

Channel High:

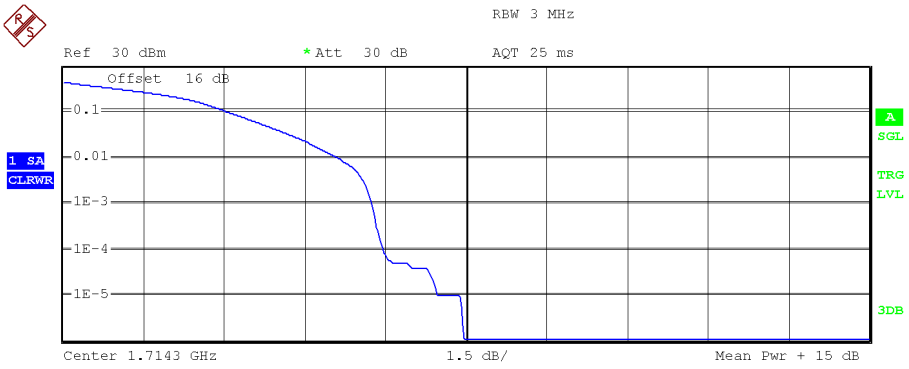


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	19.95 dBm
Peak	27.03 dBm
Crest	7.07 dB
10 %	2.55 dB
1 %	4.35 dB
.1 %	4.71 dB
.01 %	5.94 dB

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

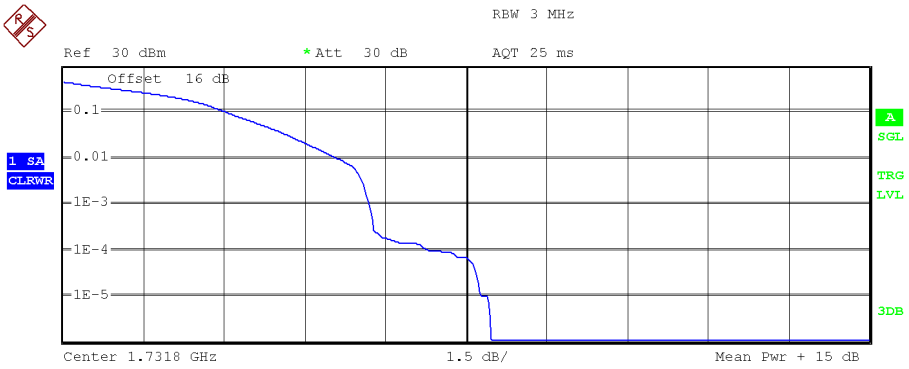
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.00 dBm
Peak	27.45 dBm
Crest	7.45 dB
10 %	3.05 dB
1 %	5.10 dB
.1 %	5.75 dB
.01 %	5.96 dB

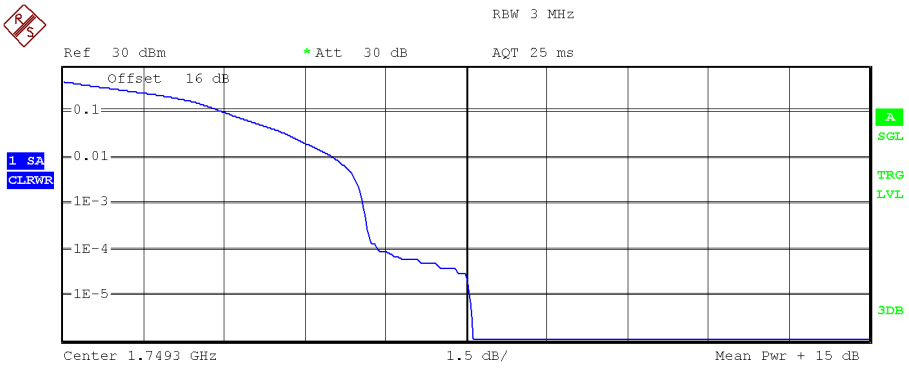
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.04 dBm
Peak	28.02 dBm
Crest	7.97 dB
10 %	3.03 dB
1 %	5.10 dB
.1 %	5.70 dB
.01 %	6.97 dB

Channel High:

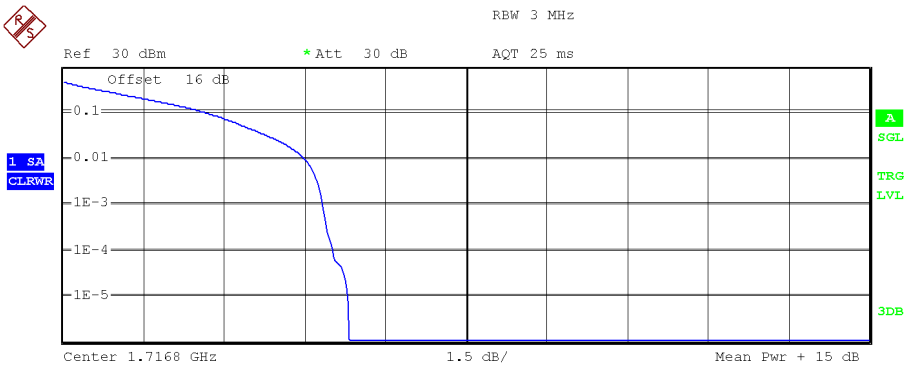


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	19.89 dBm
Peak	27.52 dBm
Crest	7.63 dB
10 %	2.98 dB
1 %	5.02 dB
.1 %	5.58 dB
.01 %	5.87 dB

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

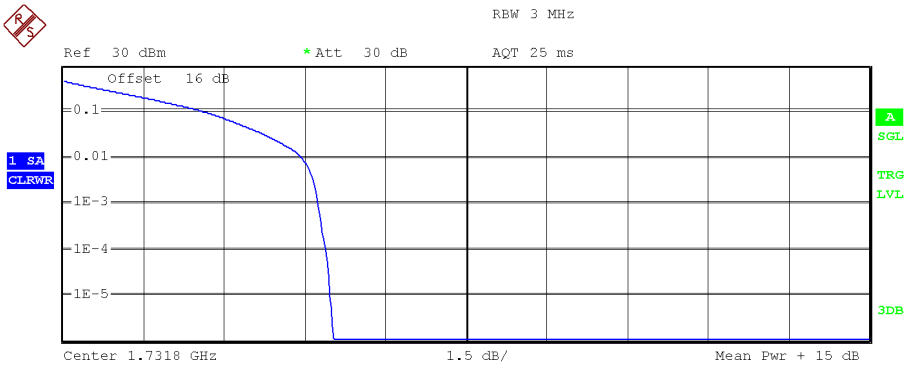
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.06 dBm
Peak	26.39 dBm
Crest	5.33 dB
10 %	2.67 dB
1 %	4.50 dB
.1 %	4.83 dB
.01 %	5.02 dB

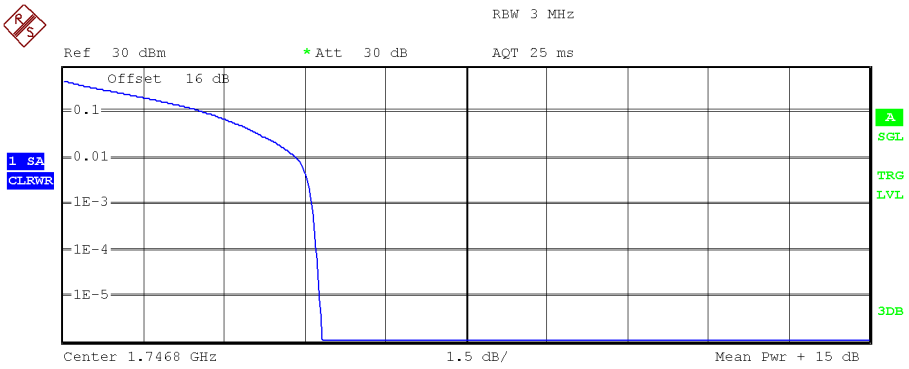
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.01 dBm
Peak	26.04 dBm
Crest	5.03 dB
10 %	2.64 dB
1 %	4.45 dB
.1 %	4.76 dB
.01 %	4.90 dB

Channel High:

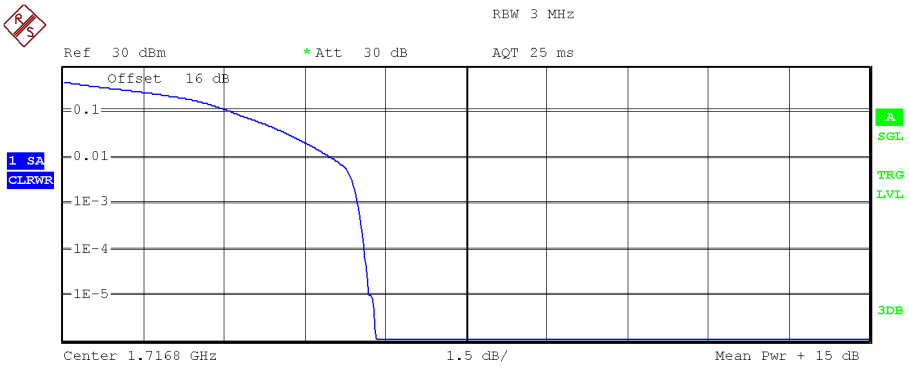


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.07 dBm
Peak	25.90 dBm
Crest	4.83 dB
10 %	2.62 dB
1 %	4.35 dB
.1 %	4.64 dB
.01 %	4.71 dB

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

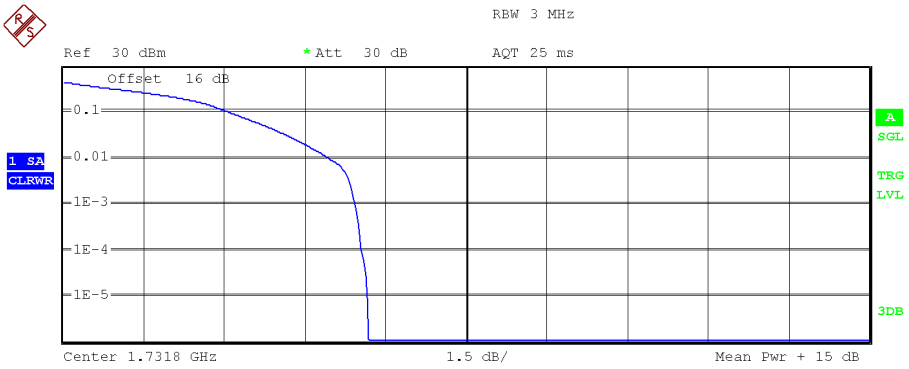
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.21 dBm
Peak	27.03 dBm
Crest	5.82 dB
10 %	3.13 dB
1 %	5.00 dB
.1 %	5.48 dB
.01 %	5.60 dB

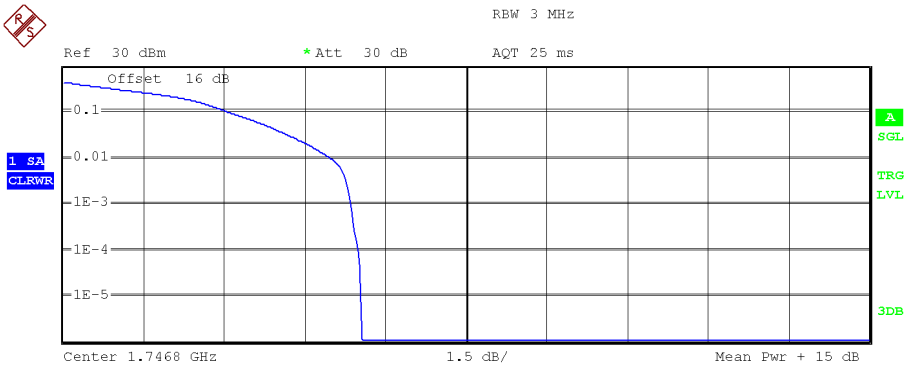
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.07 dBm
Peak	26.75 dBm
Crest	5.68 dB
10 %	3.10 dB
1 %	4.93 dB
.1 %	5.43 dB
.01 %	5.55 dB

Channel High:

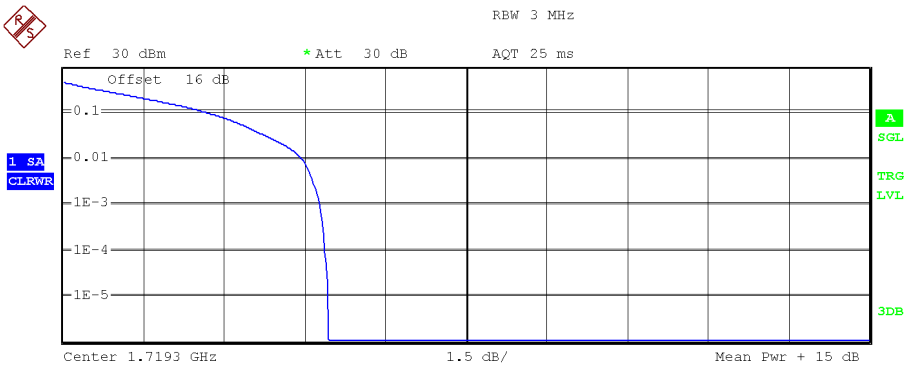


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.99 dBm
Peak	26.53 dBm
Crest	5.55 dB
10 %	3.08 dB
1 %	4.98 dB
.1 %	5.36 dB
.01 %	5.50 dB

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

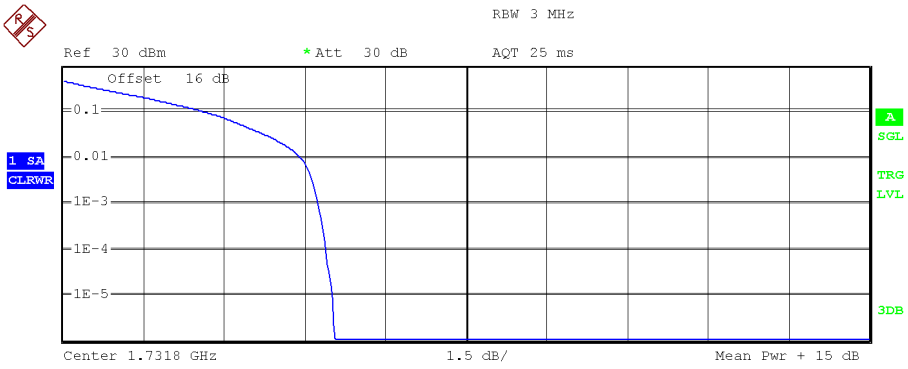
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.10 dBm
Peak	26.04 dBm
Crest	4.94 dB
10 %	2.69 dB
1 %	4.45 dB
.1 %	4.78 dB
.01 %	4.88 dB

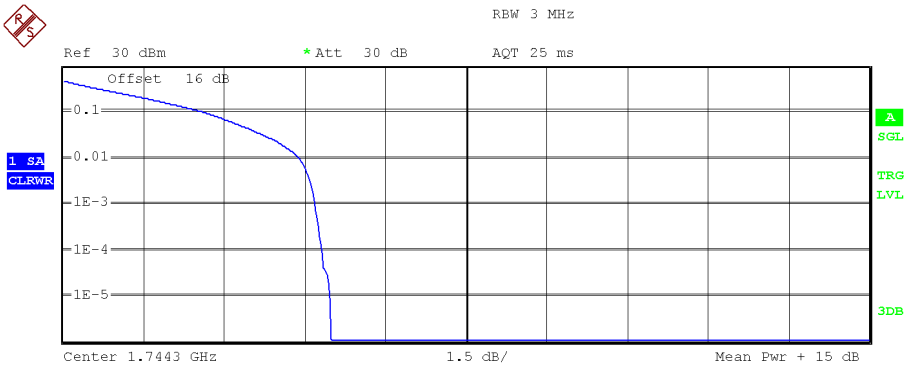
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.06 dBm
Peak	26.11 dBm
Crest	5.05 dB
10 %	2.64 dB
1 %	4.42 dB
.1 %	4.76 dB
.01 %	4.90 dB

Channel High:

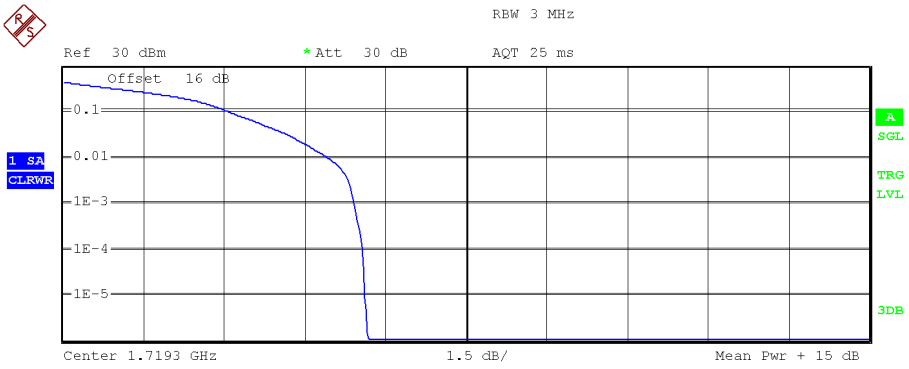


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.05 dBm
Peak	26.04 dBm
Crest	4.99 dB
10 %	2.62 dB
1 %	4.40 dB
.1 %	4.69 dB
.01 %	4.83 dB

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

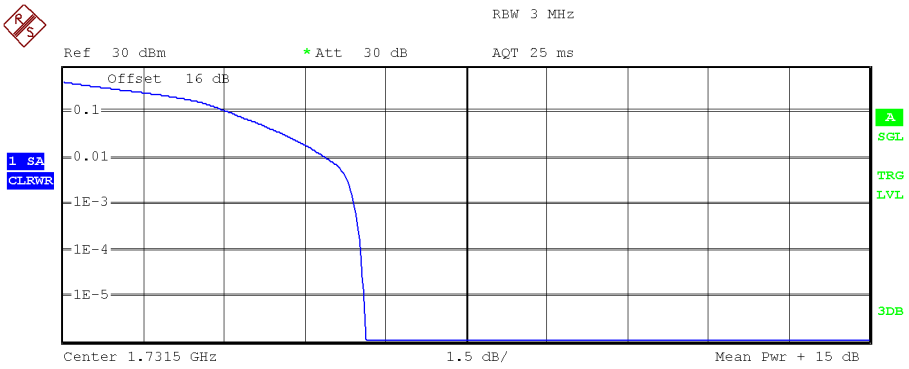
Channel Low:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.07 dBm
Peak	26.75 dBm
Crest	5.67 dB
10 %	3.10 dB
1 %	4.93 dB
.1 %	5.43 dB
.01 %	5.58 dB

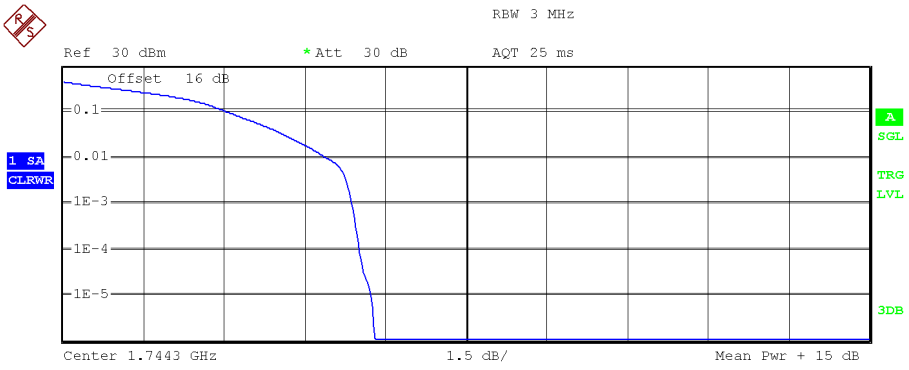
Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.12 dBm
Peak	26.75 dBm
Crest	5.63 dB
10 %	3.10 dB
1 %	4.90 dB
.1 %	5.41 dB
.01 %	5.55 dB

Channel High:



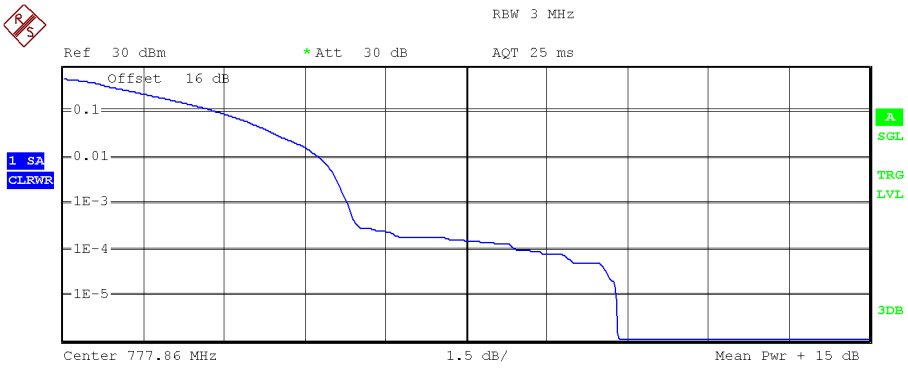
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	21.02 dBm
Peak	26.82 dBm
Crest	5.80 dB
10 %	3.05 dB
1 %	4.90 dB
.1 %	5.38 dB
.01 %	5.53 dB

LTE. BAND XIII.

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

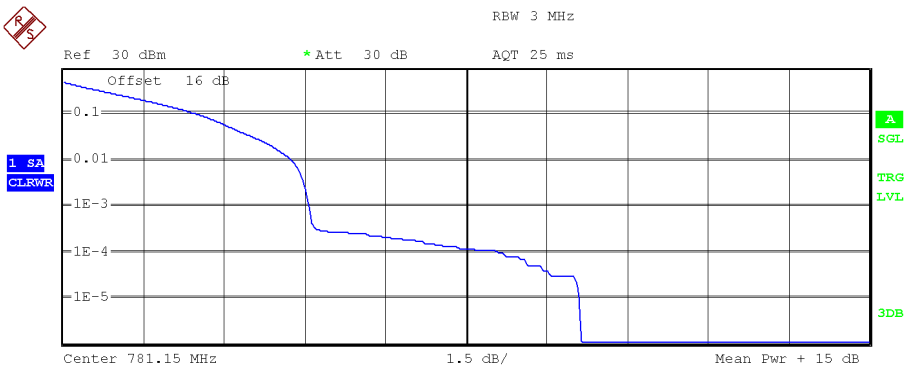
Channel Low. Modulation bandwidth: 1:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	19.82 dBm
Peak	30.15 dBm
Crest	10.33 dB
10 %	2.88 dB
1 %	4.76 dB
.1 %	5.29 dB
.01 %	8.63 dB

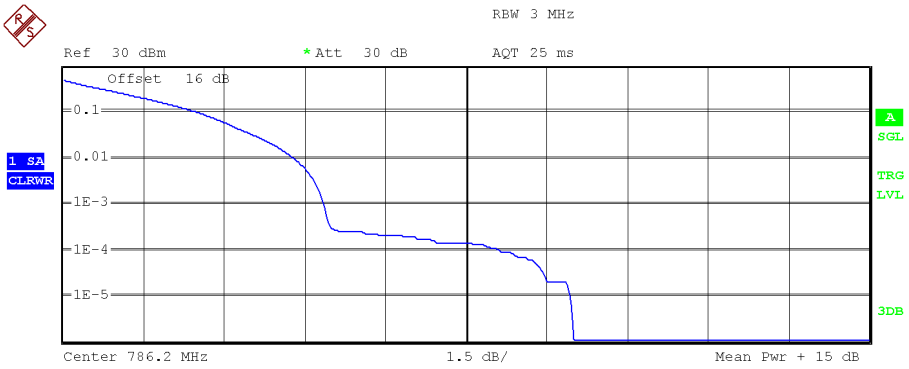
Channel Middle. Modulation bandwidth: 2:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.30 dBm
Peak	29.94 dBm
Crest	9.63 dB
10 %	2.50 dB
1 %	4.23 dB
.1 %	4.59 dB
.01 %	8.15 dB

Channel High. Modulation bandwidth: 4:

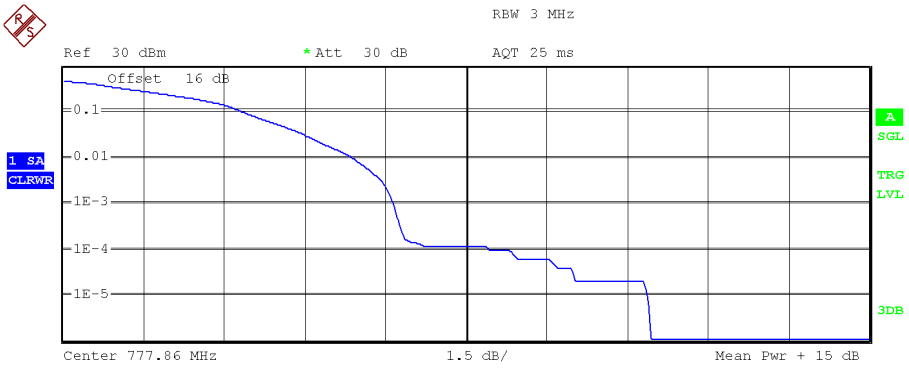


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.30 dBm
Peak	29.80 dBm
Crest	9.50 dB
10 %	2.50 dB
1 %	4.28 dB
.1 %	4.86 dB
.01 %	8.10 dB

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

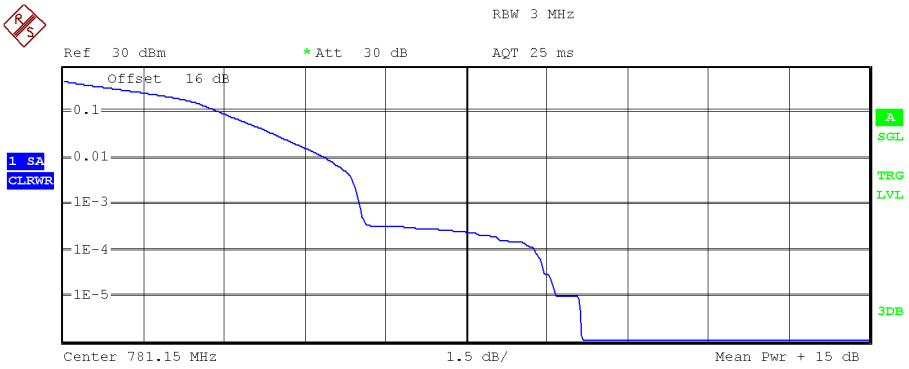
Channel Low. Modulation bandwidth: 1:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	18.79 dBm
Peak	29.73 dBm
Crest	10.94 dB
10 %	3.34 dB
1 %	5.38 dB
.1 %	6.15 dB
.01 %	8.27 dB

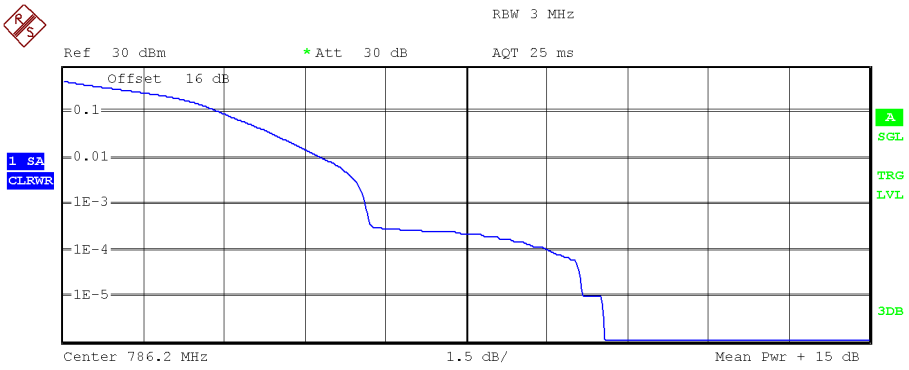
Channel Middle. Modulation bandwidth: 2:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	19.36 dBm
Peak	29.02 dBm
Crest	9.66 dB
10 %	2.91 dB
1 %	4.88 dB
.1 %	5.53 dB
.01 %	8.77 dB

Channel High. Modulation bandwidth: 4:

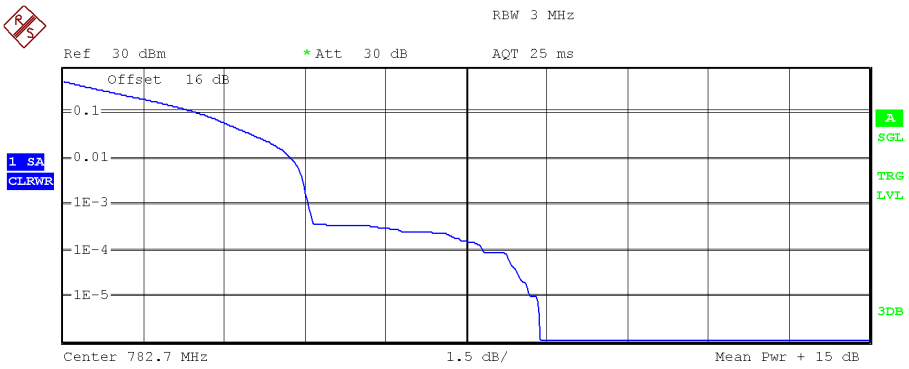


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	19.43 dBm
Peak	29.52 dBm
Crest	10.08 dB
10 %	2.93 dB
1 %	4.83 dB
.1 %	5.63 dB
.01 %	9.04 dB

Bandwidth = 10 MHz. Modulation QPSK. Modulation bandwidth: 5. RB Size: 6. RB Offset: 0

Channel Middle:

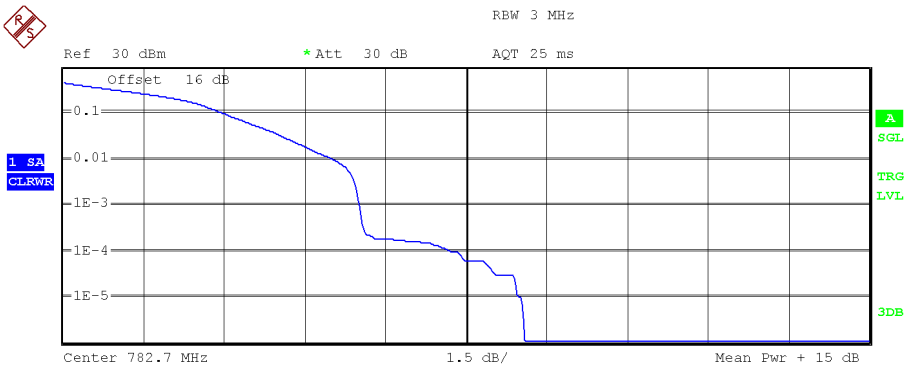


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.28 dBm
Peak	29.16 dBm
Crest	8.89 dB
10 %	2.50 dB
1 %	4.25 dB
.1 %	4.57 dB
.01 %	7.81 dB

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

Channel Middle:



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 3.5MHz

	Trace 1
Mean	20.22 dBm
Peak	28.81 dBm
Crest	8.59 dB
10 %	2.98 dB
1 %	5.02 dB
.1 %	5.53 dB
.01 %	7.33 dB

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	21.19	2.3	23.49	6.8
Middle	21.1	2.3	23.4	6.39
Highest	21.08	2.3	23.38	6.32
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	21.05	2.3	23.35	6.78
Middle	21.08	2.3	23.38	6.44
Highest	21.07	2.3	23.37	6.35
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	21.08	2.3	23.38	5.91
Middle	21.14	2.3	23.44	5.75
Highest	21.16	2.3	23.46	5.63
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	21.13	2.3	23.43	5.75
Middle	21.15	2.3	23.45	5.7
Highest	21.13	2.3	23.43	5.58
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	21.19	2.3	23.49	5.48
Middle	21.13	2.3	23.43	5.43
Highest	21.22	2.3	23.52	5.36
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	21.1	2.3	23.4	5.43
Middle	21.16	2.3	23.46	5.41
Highest	21.3	2.3	23.6	5.38
Measurement uncertainty (dB)	<±1.11			

LTE QPSK AND 16QAM MODULATION. BAND XIII. 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	23.01	2.3	25.31	23.16	6.15
Middle	23.35	2.3	25.65	23.5	5.53
Highest	23.41	2.3	25.71	23.56	5.63
Measurement uncertainty (dB)	<±1.11				

LTE QPSK AND 16QAM MODULATION. BAND XIII. 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)
Middle	23.15	2.3	25.35	23.3	5.53
Measurement uncertainty (dB)	<±1.11				

Verdict: PASS

Modulation Characteristics

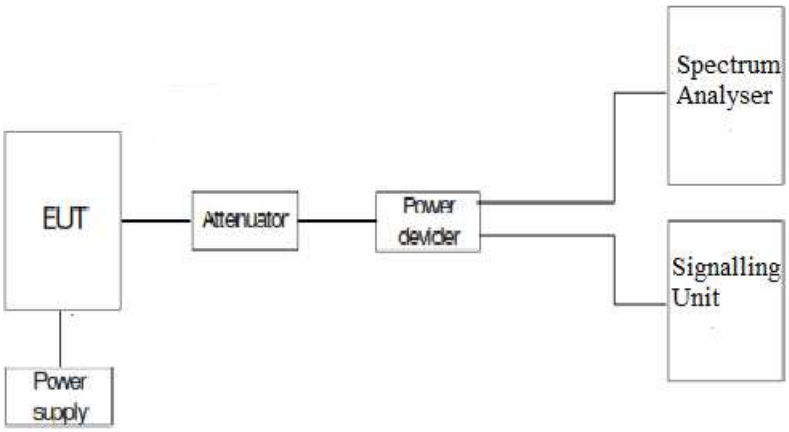
SPECIFICATION

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).

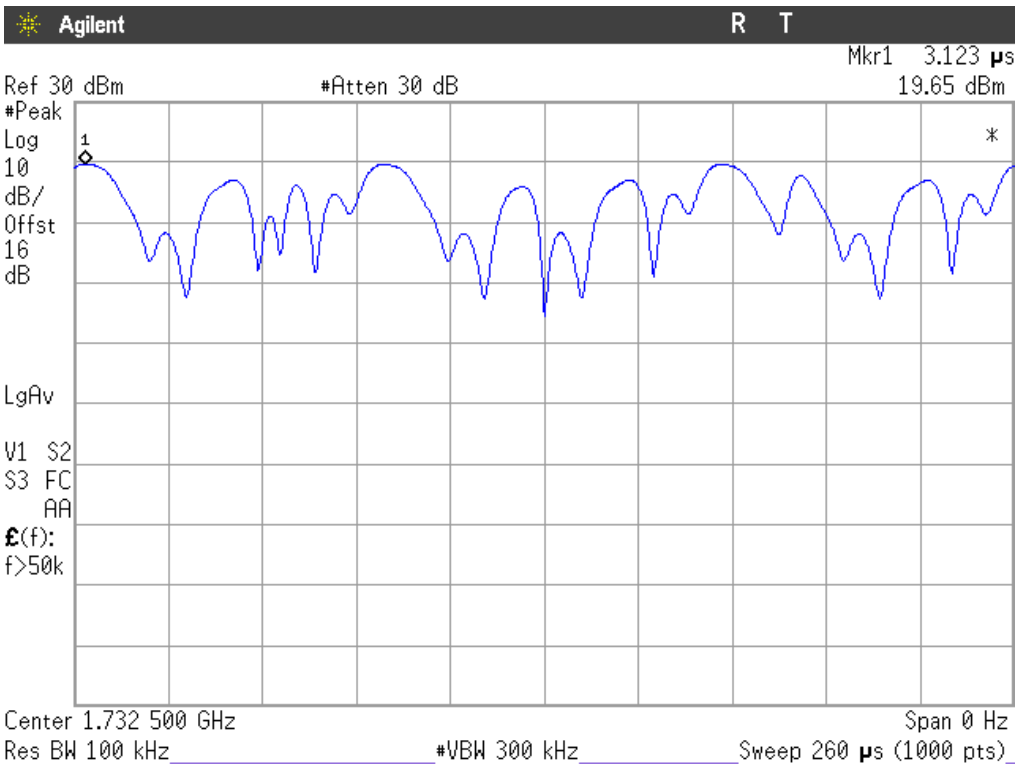
TEST SETUP



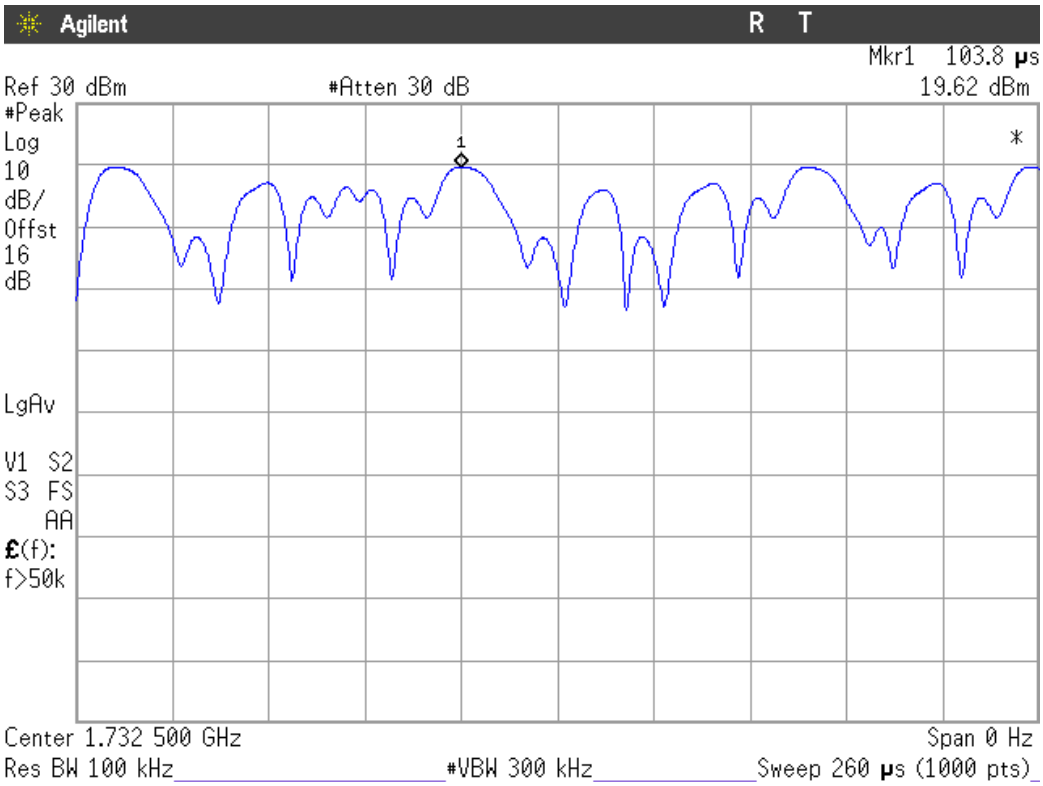
RESULTS

The following plots show the modulation schemes in the EUT.

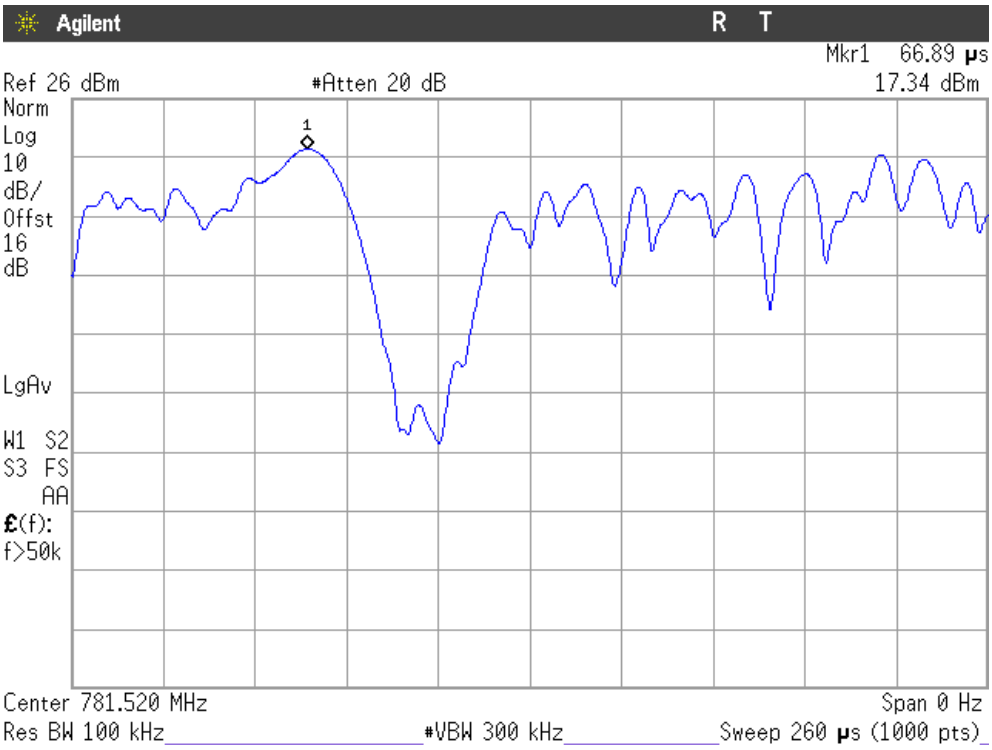
LTE MODULATION. QPSK. Band IV



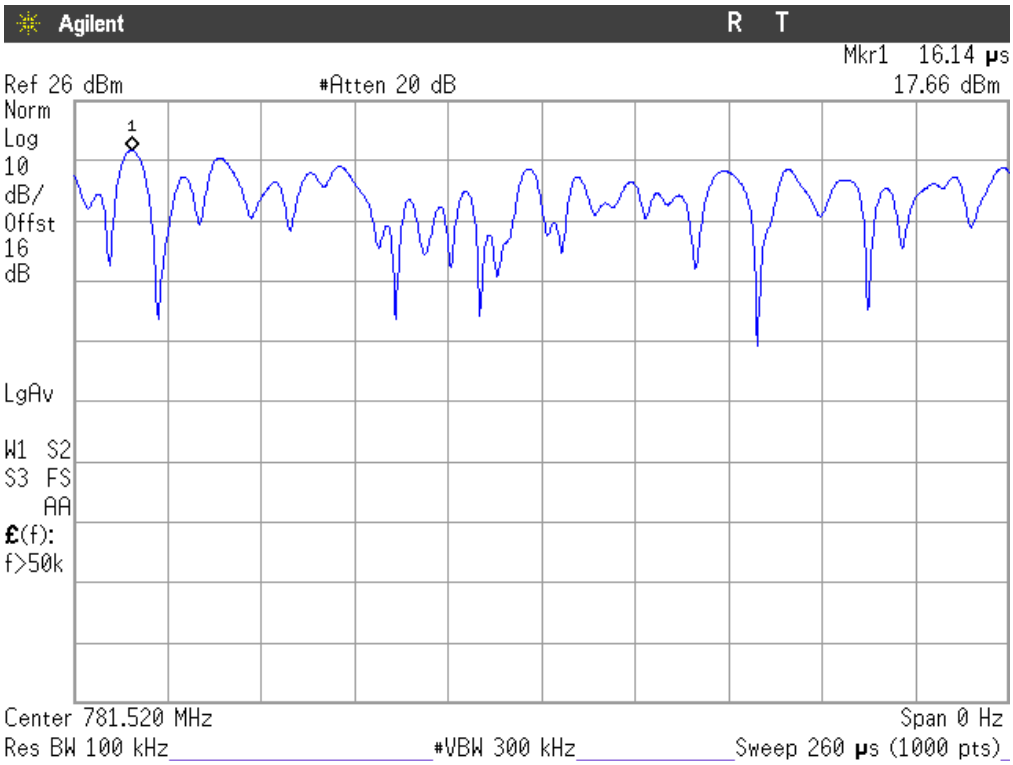
LTE MODULATION. 16QAM. Band IV



LTE MODULATION. QPSK. Band XIII



LTE MODULATION. 16QAM. Band XIII



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

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

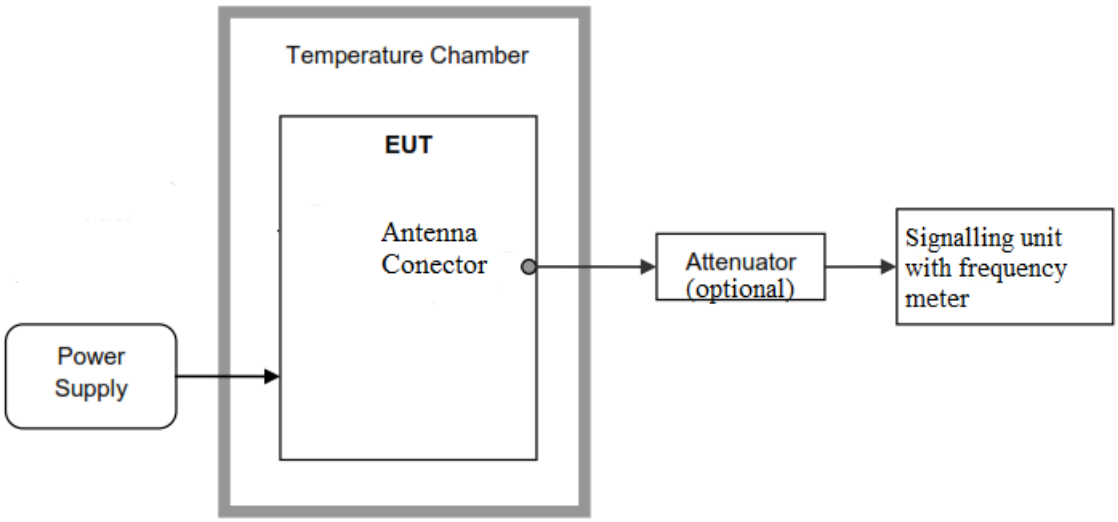
The EUT was set in “Radio Resource Control (RRC) mode” in the middle channel using the Universal Radio Communication tester R&S CMW500 and the maximum frequency error was measured using the built-in calibrated frequency meter.

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

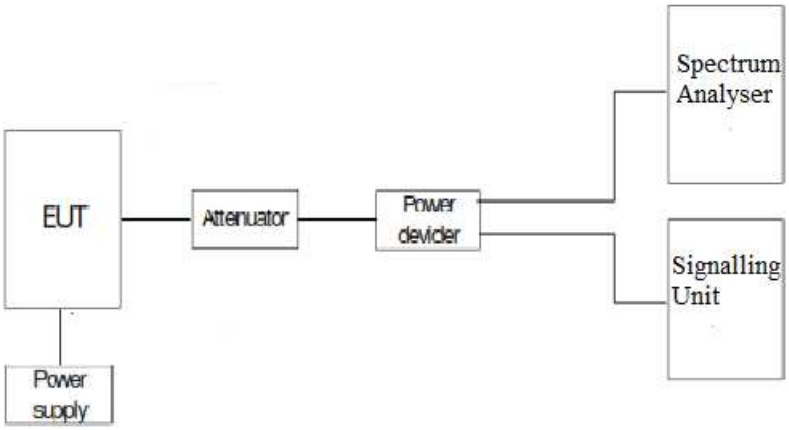
In order to check that the frequency stability is sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point is established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of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



RESULTS

Frequency stability over temperature variations.

BW = 1.4 MHz. (Band IV)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	7.45	0.004300144
+40	6.91	0.003988456
+30	8.45	0.004877345
+20	6.39	0.003688312
+10	7.9	0.004559885
0	6.01	0.003468975
-10	-6.51	-0.003757576
-20	-6.95	-0.004011544
-30	-6.78	-0.00391342

BW = 3 MHz. (Band IV)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-7.75	-0.004473304
+40	-7.91	-0.004565657
+30	-8.43	-0.004865801
+20	8.71	0.005027417
+10	7.75	0.004473304
0	-7.64	-0.004409812
-10	6.84	0.003948052
-20	6.34	0.003659452
-30	-6.82	-0.003936508

BW = 5 MHz. (Band IV)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-7.44	-0.004294372
+40	-7.02	-0.004051948
+30	-6.94	-0.004005772
+20	8	0.004617605
+10	8.74	0.005044733
0	-8.61	-0.004969697
-10	8.61	0.004969697
-20	8.77	0.005062049
-30	-7.44	-0.004294372

BW = 10 MHz. (Band IV)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-7.05	-0.004069264
+40	-8.47	-0.004888889
+30	-8.03	-0.004634921
+20	6.52	0.003763348
+10	8.58	0.004952381
0	6.44	0.003717172
-10	7.68	0.0044329
-20	-8.97	-0.005177489
-30	-8	-0.004617605

BW = 15 MHz. (Band IV)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-17.35	-0.01001443
+40	-13.93	-0.008040404
+30	-8.55	-0.004935065
+20	8.31	0.004796537
+10	12.43	0.007174603
0	12.85	0.007417027
-10	12.32	0.007111111
-20	9.28	0.005356421
-30	-16.21	-0.009356421

BW = 20 MHz. (Band IV)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-24.58	-0.01418759
+40	-18.32	-0.010574315
+30	-9.77	-0.00563925
+20	11.32	0.006533911
+10	16.68	0.009627706
0	21.79	0.012577201
-10	18.91	0.010914863
-20	9.44	0.005448773
-30	22.03	0.012715729

BW = 5 MHz. (Band XIII)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-5.35	-0.006841432
+40	-9.08	-0.011611253
+30	-7.31	-0.009347826
+20	3.99	0.005102302
+10	4.79	0.00612532
0	-6.39	-0.008171355
-10	-7.55	-0.009654731
-20	-5.02	-0.006419437
-30	-9.7	-0.012404092

BW = 10 MHz. (Band XIII)

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-7.3	-0.009335038
+40	-7.2	-0.009207161
+30	-5.88	-0.007519182
+20	5.29	0.006764706
+10	5.35	0.006841432
0	-6.27	-0.008017903
-10	-6.81	-0.00870844
-20	5.16	0.006598465
-30	-8.13	-0.010396419

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	7.74	0.004467532
Vmin	3.23	7.77	0.004484848

BW = 3 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	-9.97	-0.00575469
Vmin	3.23	-6.47	-0.003734488

BW = 5 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	8.47	0.004888889
Vmin	3.23	7.98	0.004606061

BW = 10 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	7.11	0.004103896
Vmin	3.23	8.38	0.004836941

BW = 15 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	7.84	0.004525253
Vmin	3.23	7.74	0.004467532

BW = 20 MHz (Band IV)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	10.77	0.00621645
Vmin	3.23	13.33	0.007694084

BW = 5 MHz (Band XIII)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	-4.92	-0.00629156
Vmin	3.23	-9.53	-0.012186701

BW = 10 MHz (Band XIII)

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	-6.95	-0.008887468
Vmin	3.23	4.76	0.006086957

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)	1710.0911	1710.2533	1710.1692	1710.5976	1710.8298	1711.2750
fH (MHz)	1754.9029	1754.7327	1754.7768	1754.3944	1754.1622	1753.6620

	BW = 5 MHz (Band XIII)	BW = 10 MHz (Band XIII)
*f*L (MHz)	777.1752	777.5796
fH (MHz)	786.8308	786.4224

Reference points *f*L and *fH* 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)	1710.0911	1710.2533	1710.1692	1710.5976	1710.8298	1711.2750
fH (MHz)	1754.9029	1754.7327	1754.7768	1754.3944	1754.1622	1753.6620

	BW = 5 MHz (Band XIII)	BW = 10 MHz (Band XIII)
*f*L (MHz)	777.1752	777.5796
fH (MHz)	786.8308	786.4224

The reference frequency points stay within the authorized blocks.

Verdict: PASS

Occupied Bandwidth

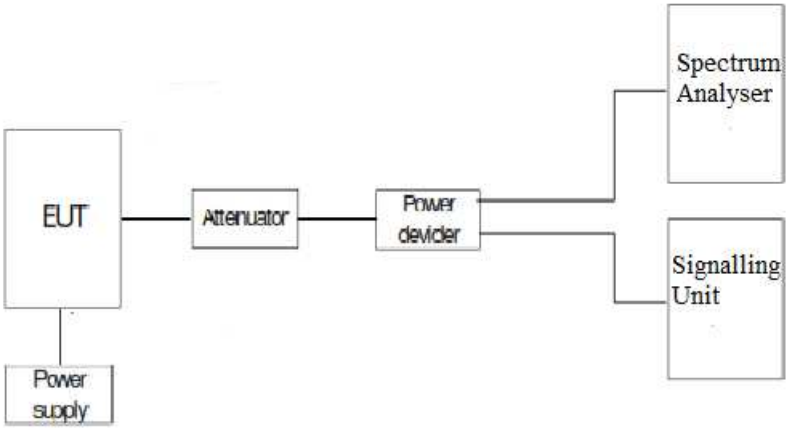
SPECIFICATION

§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)	1.10300	1.10070	1.10010
-26 dBc bandwidth (MHz)	1.69800	1.68300	1.60700
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)	0.94450	0.95924	0.94539
-26 dBc bandwidth (MHz)	1.67800	1.76200	1.80000
Measurement uncertainty (kHz)	<±4.67		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.11190	1.18200	1.13560
-26 dBc bandwidth (MHz)	1.75500	1.93300	1.67600
Measurement uncertainty (kHz)	<±10.00		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.04570	1.02780	0.99080
-26 dBc bandwidth (MHz)	1.75000	1.75100	1.50900
Measurement uncertainty (kHz)	<±10.00		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.16760	1.17560	1.15050
-26 dBc bandwidth (MHz)	1.70000	1.84500	1.74700
Measurement uncertainty (kHz)	<±16.67		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.01890	1.10430	1.02420
-26 dBc bandwidth (MHz)	1.71100	1.84700	1.79800
Measurement uncertainty (kHz)	<±16.67		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.17170	1.18890	1.14570
-26 dBc bandwidth (MHz)	1.74400	2.15400	1.77000
Measurement uncertainty (kHz)	<±33.33		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.08110	1.02090	1.05860
-26 dBc bandwidth (MHz)	1.76000	1.65300	1.77200
Measurement uncertainty (kHz)	<±33.33		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12350	1.15020	1.13900
-26 dBc bandwidth (MHz)	1.72600	1.87800	1.67700
Measurement uncertainty (kHz)	<±50.00		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.00010	0.99667	1.00040
-26 dBc bandwidth (MHz)	1.79500	1.81800	1.70700
Measurement uncertainty (kHz)	<±50.00		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.11930	1.15450	1.16600
-26 dBc bandwidth (MHz)	1.75000	1.81500	1.75800
Measurement uncertainty (kHz)	<±66.67		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.01760	1.01390	1.02620
-26 dBc bandwidth (MHz)	1.62500	1.72700	1.64800
Measurement uncertainty (kHz)	<±66.67		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.22410	1.30840	1.22910
-26 dBc bandwidth (MHz)	2.45400	2.78900	2.64700
Measurement uncertainty (kHz)	<±16.67		

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

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.39610	1.38490	1.44110
-26 dBc bandwidth (MHz)	2.44800	2.81400	2.30200
Measurement uncertainty (kHz)	<±16.67		

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

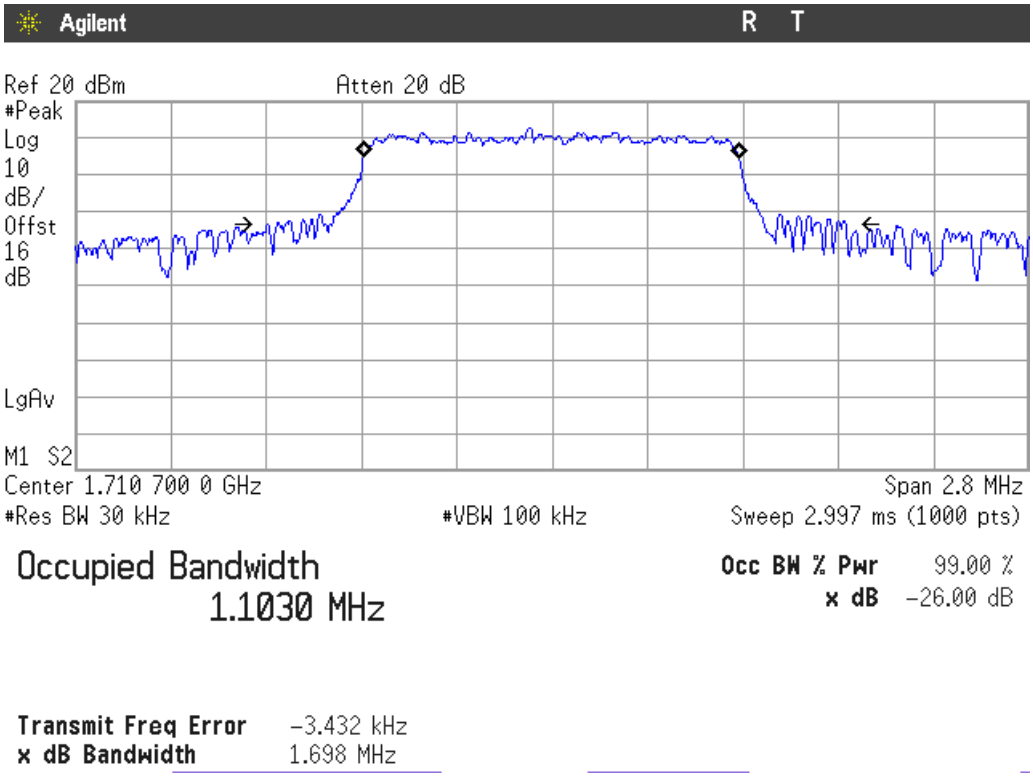
Channel	Middle
99% Occupied bandwidth (MHz)	1.34270
-26 dBc bandwidth (MHz)	2.66900
Measurement uncertainty (kHz)	<±33.33

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

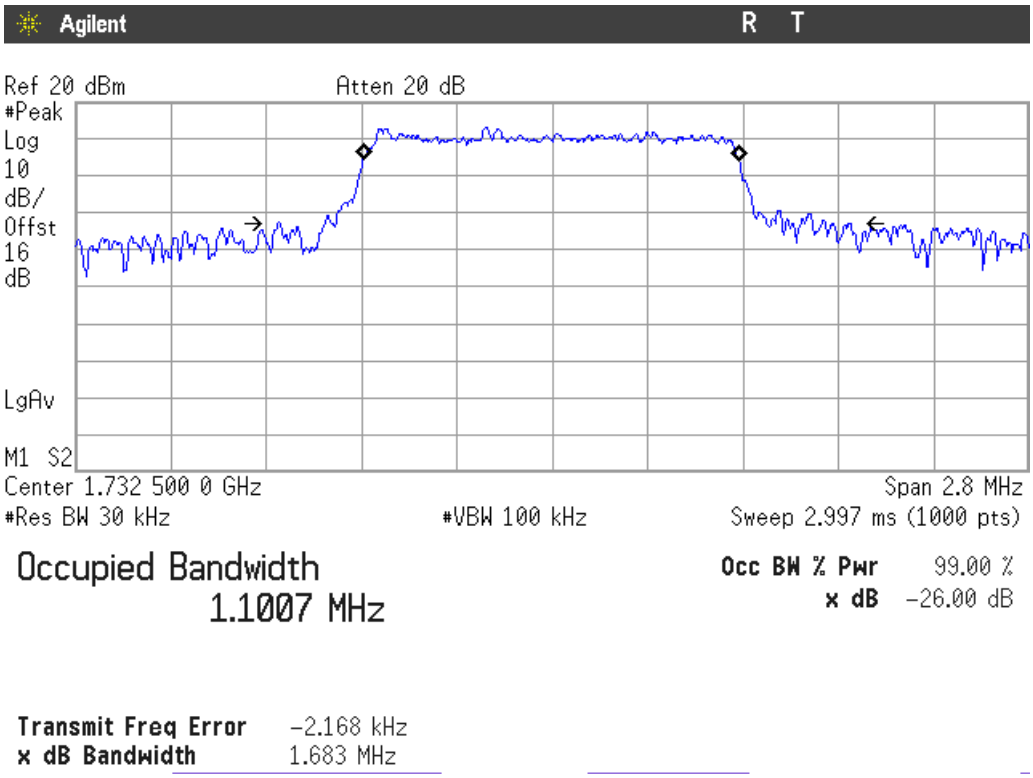
Channel	Middle
99% Occupied bandwidth (MHz)	1.20850
-26 dBc bandwidth (MHz)	2.32400
Measurement uncertainty (kHz)	<±33.33

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

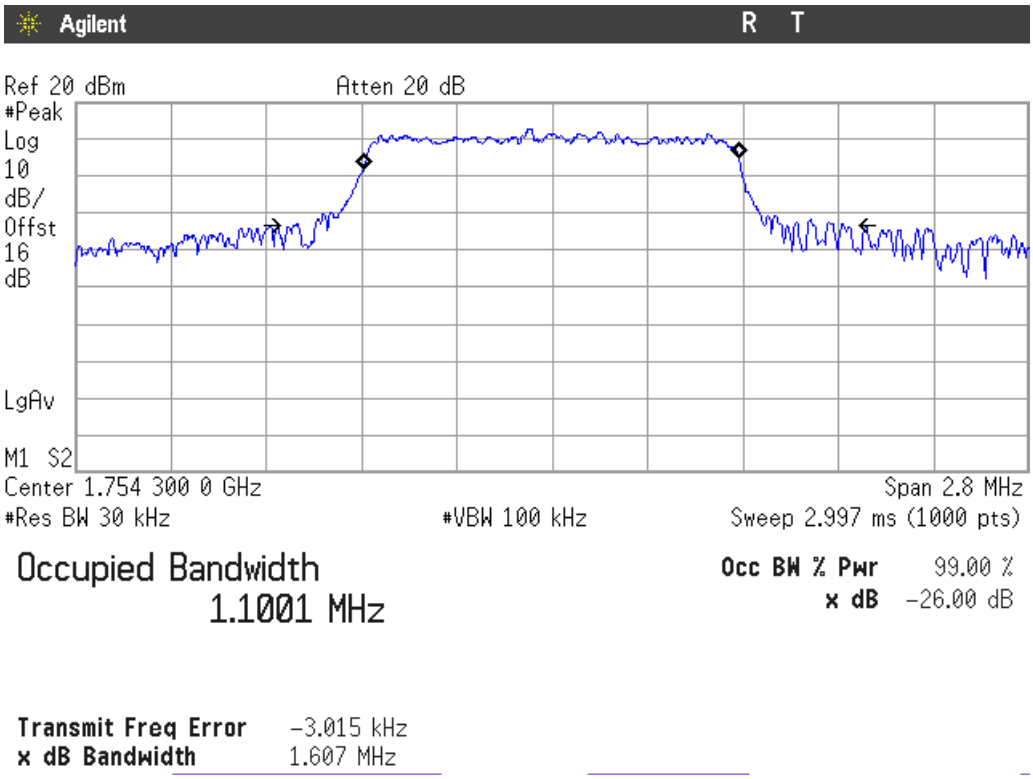
Lowest Channel



Middle Channel

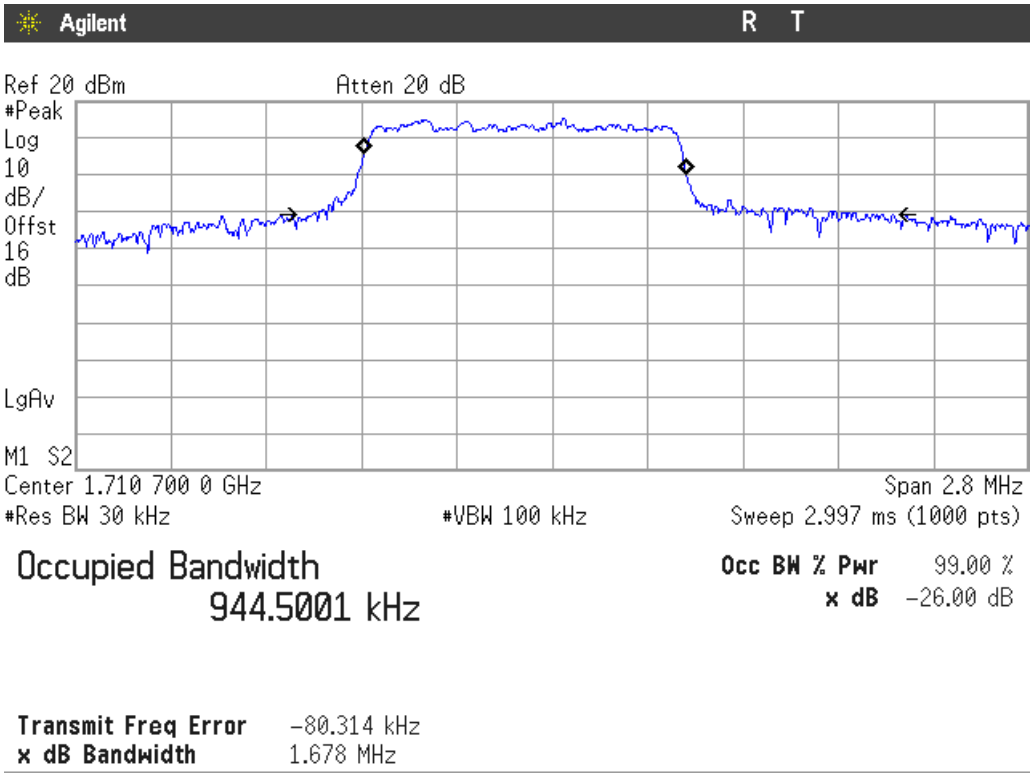


Highest Channel

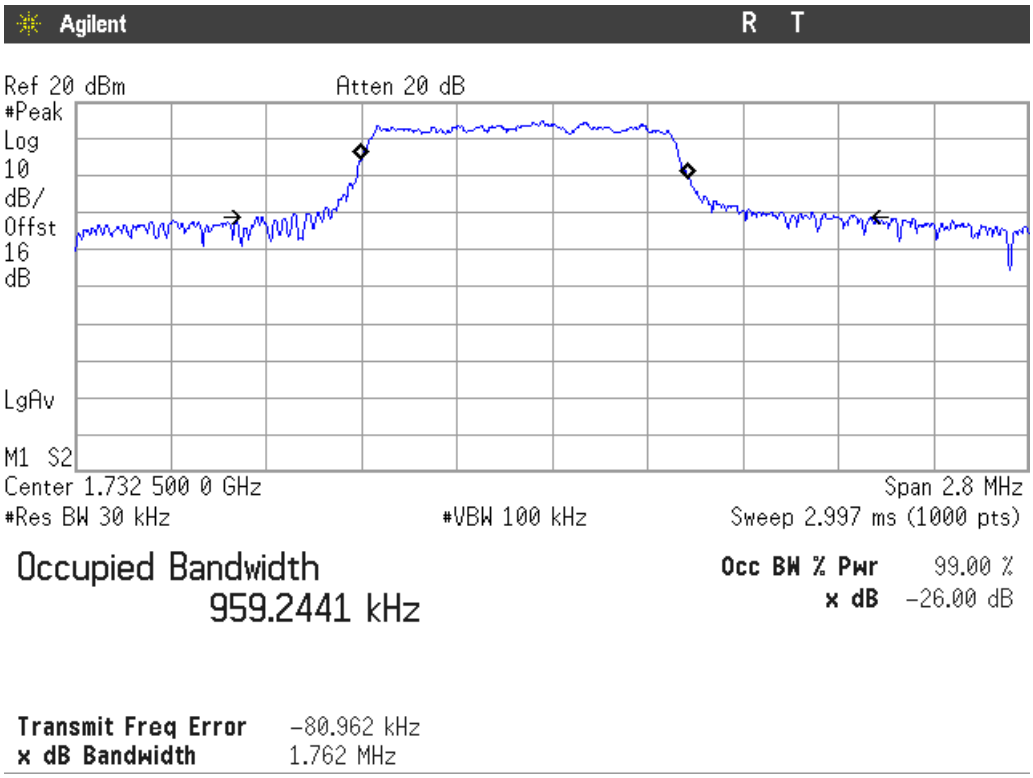


LTE 16QAM MODULATION. BW = 1.4 MHz (Band IV)

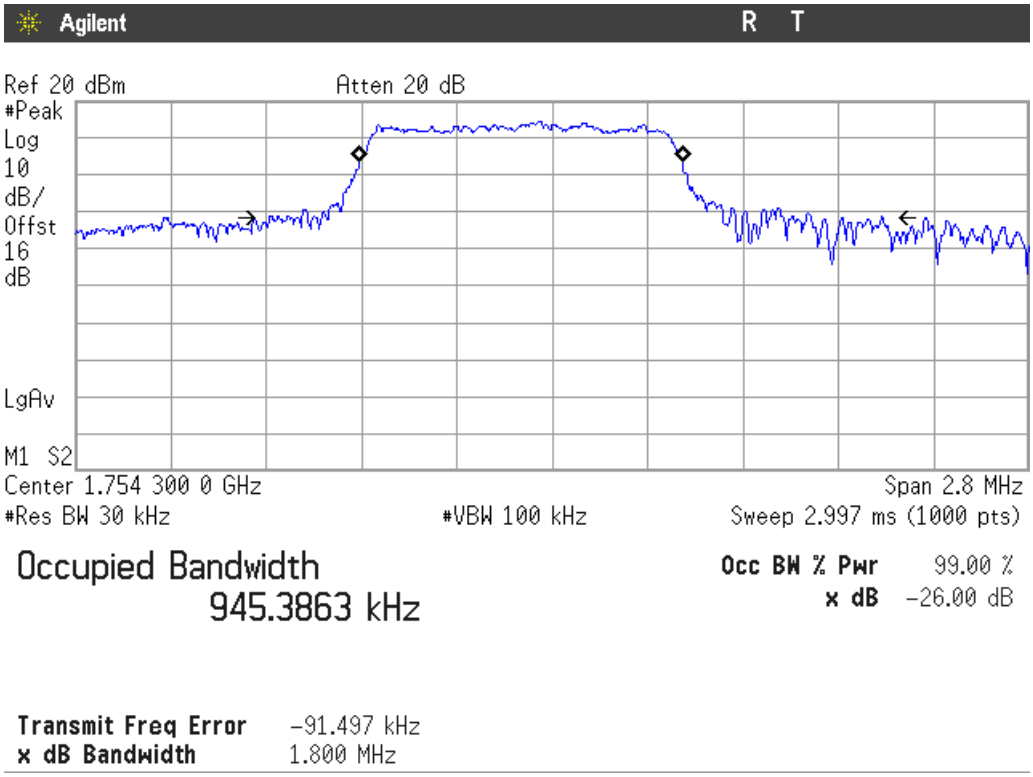
Lowest Channel



Middle Channel

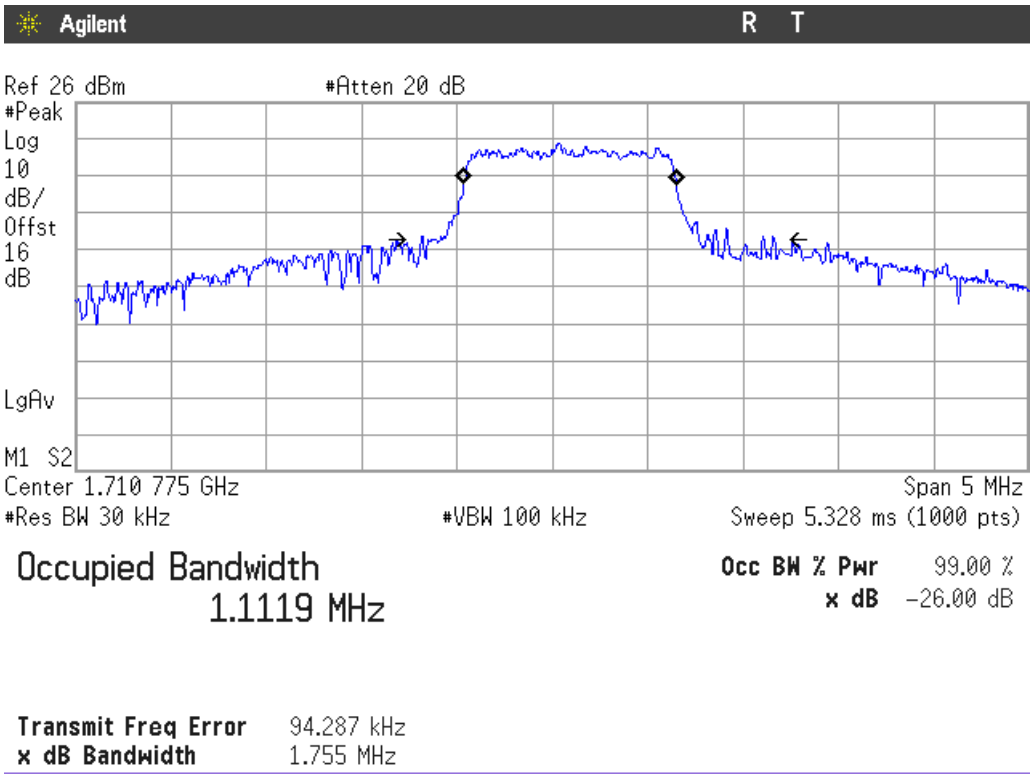


Highest Channel

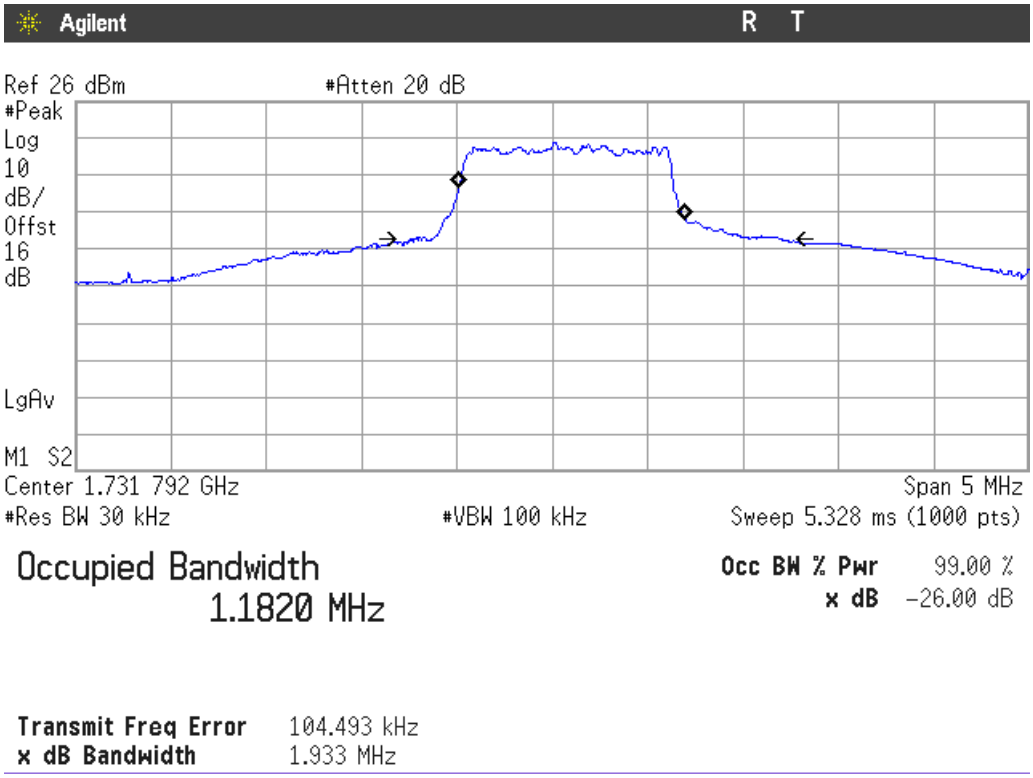


LTE QPSK MODULATION. BW = 3 MHz (Band IV)

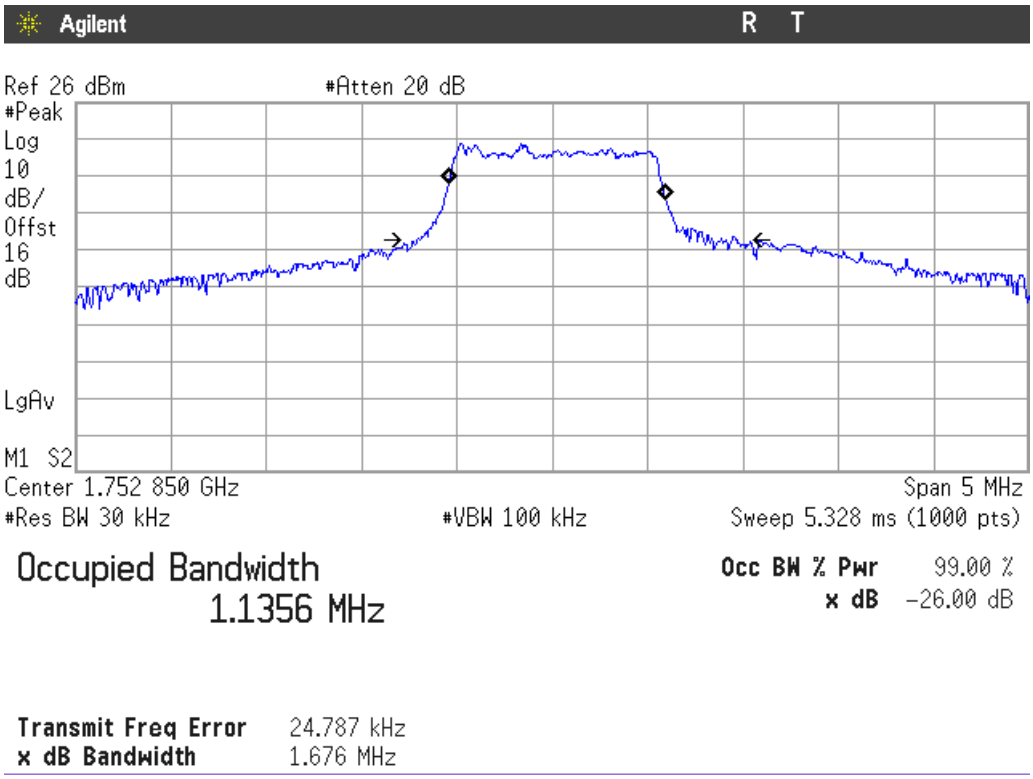
Lowest Channel



Middle Channel

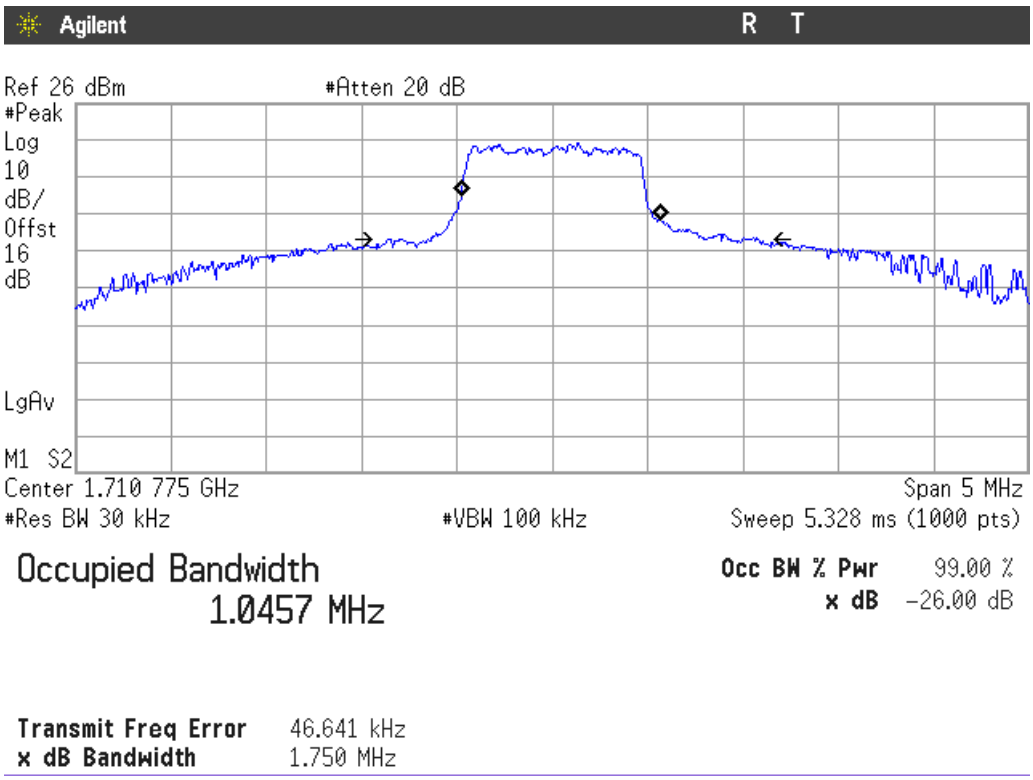


Highest Channel

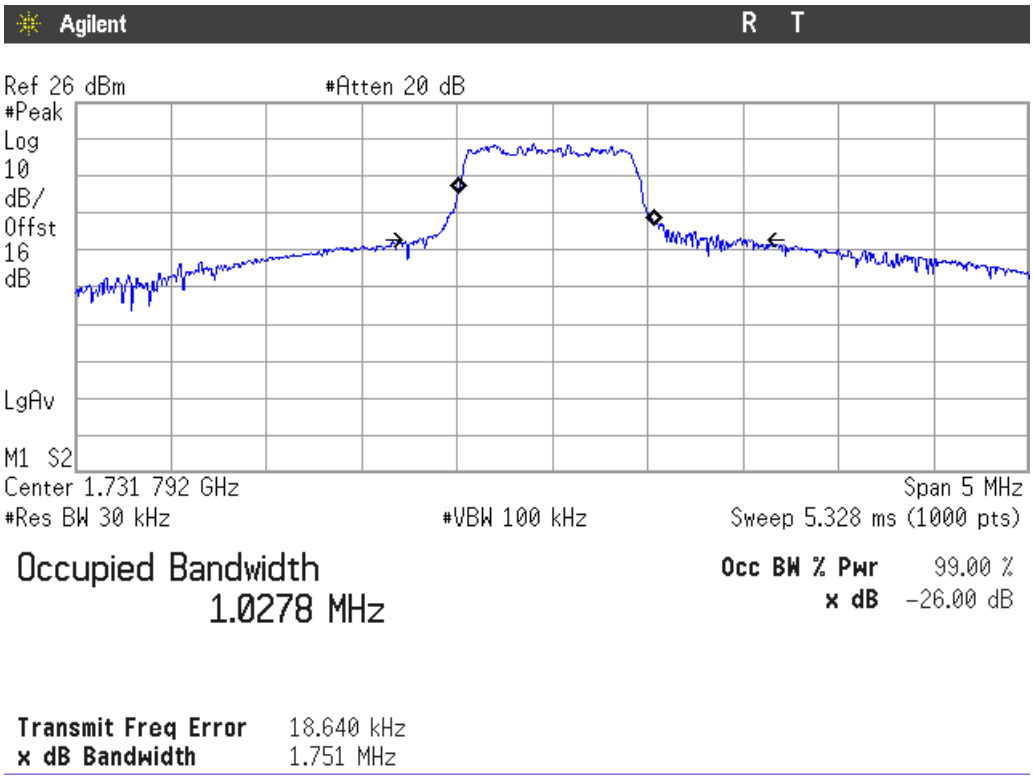


LTE 16QAM MODULATION. BW = 3 MHz (Band IV)

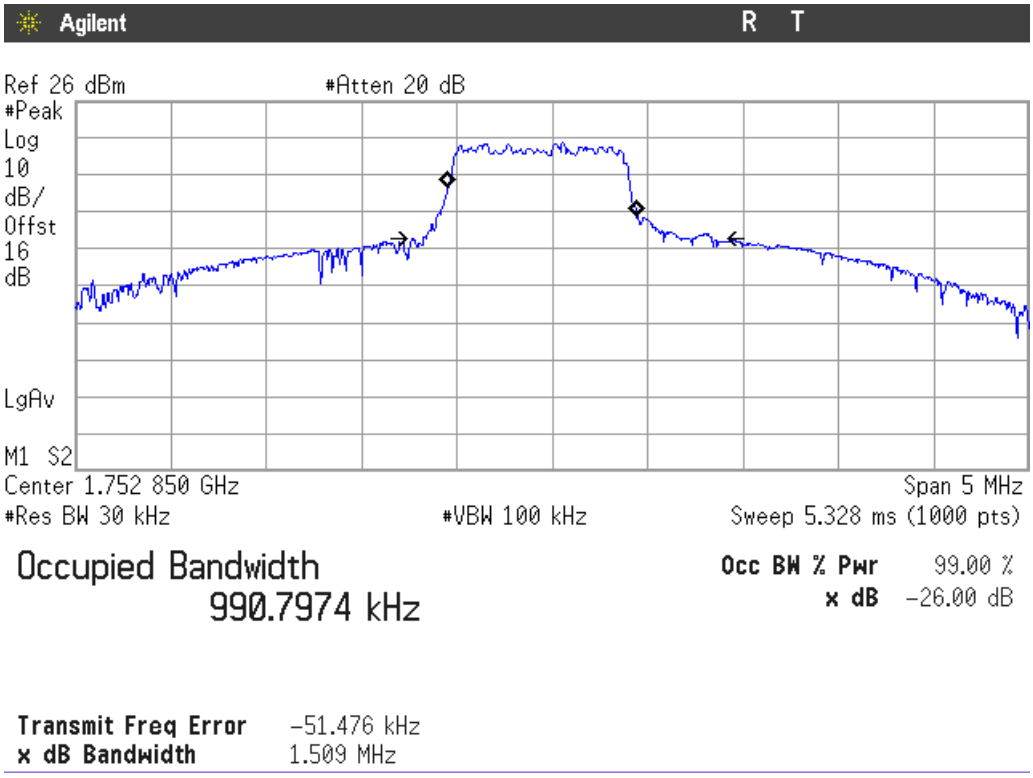
Lowest Channel



Middle Channel

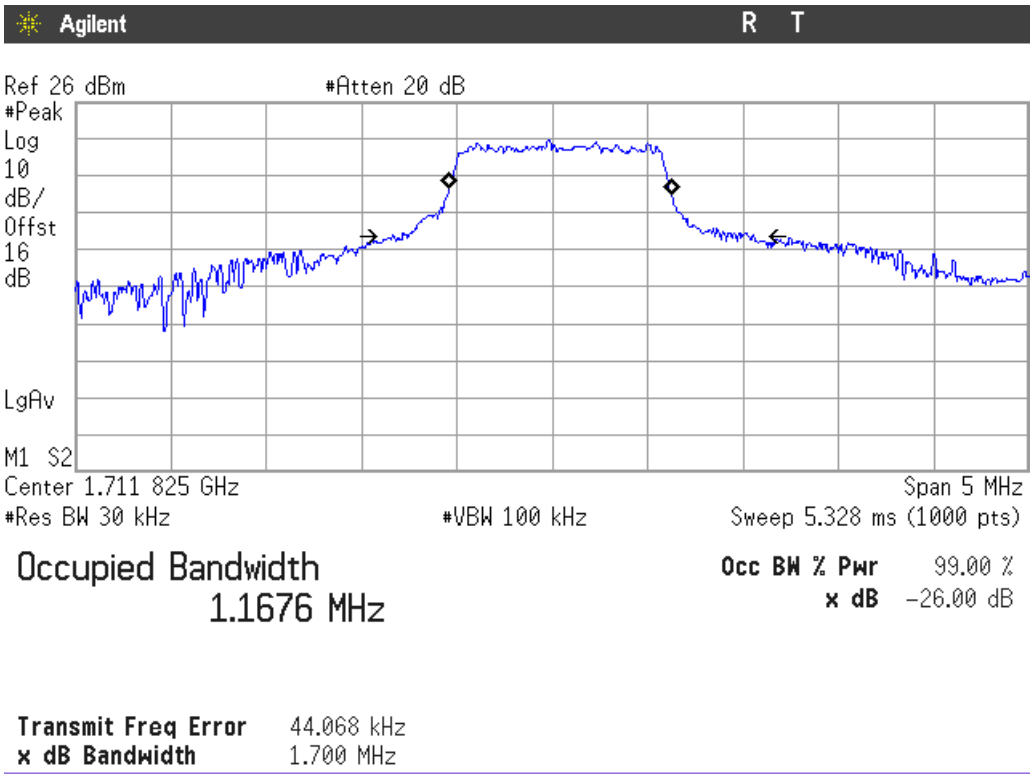


Highest Channel

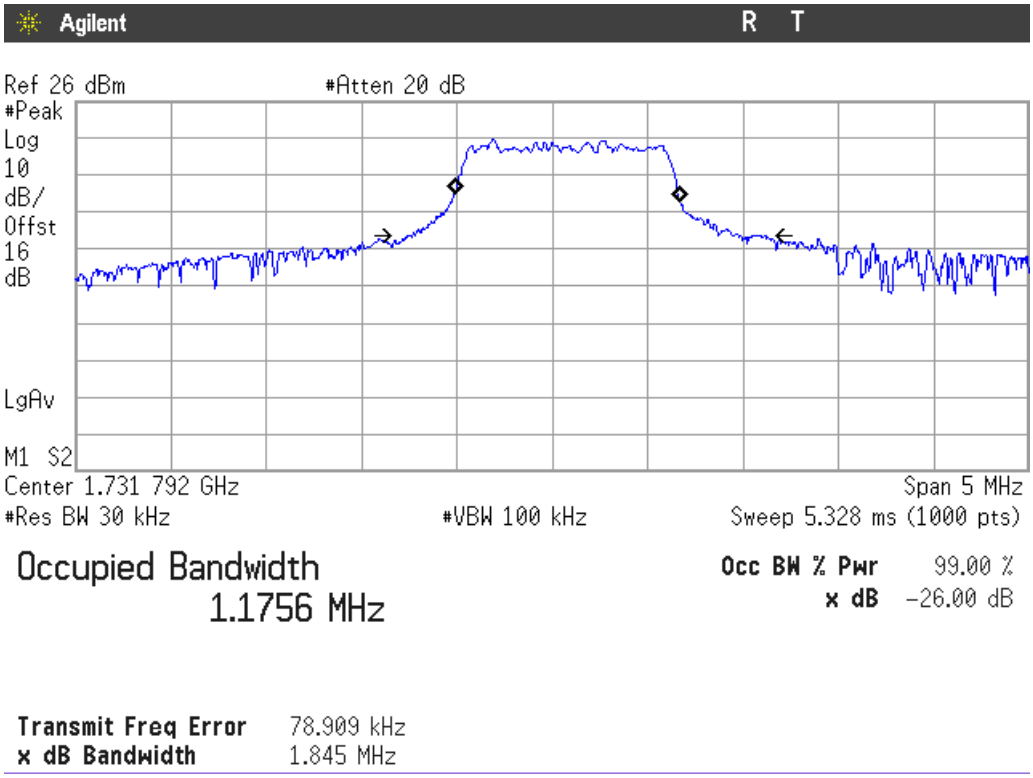


LTE QPSK MODULATION. BW = 5 MHz (Band IV)

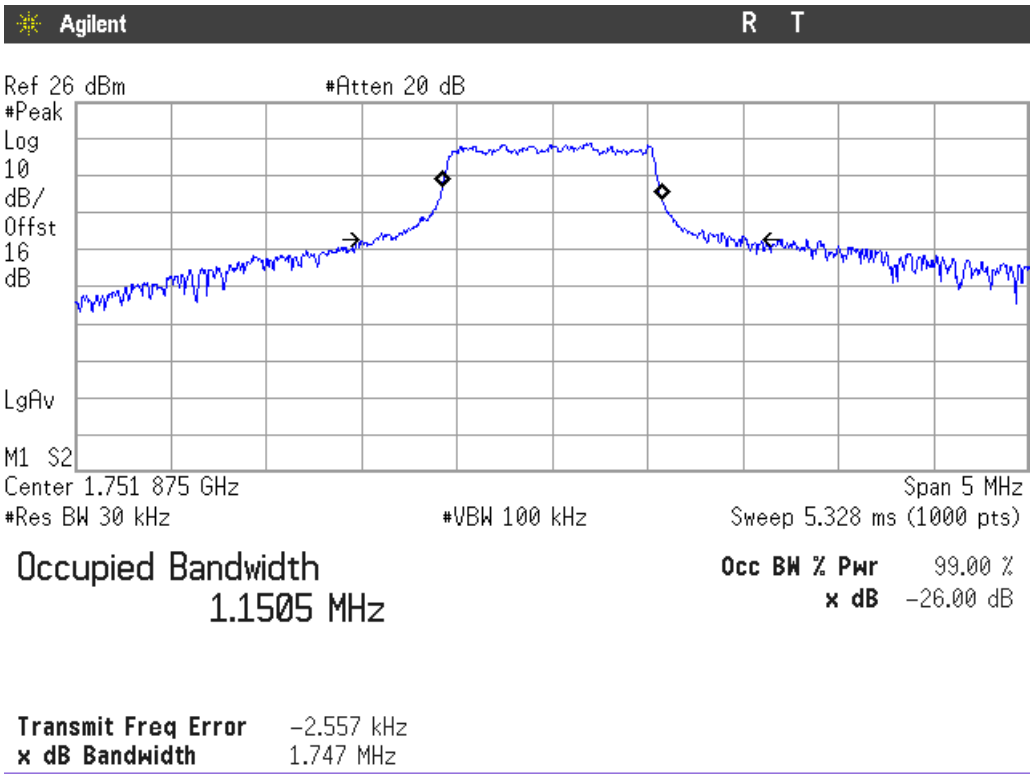
Lowest Channel



Middle Channel

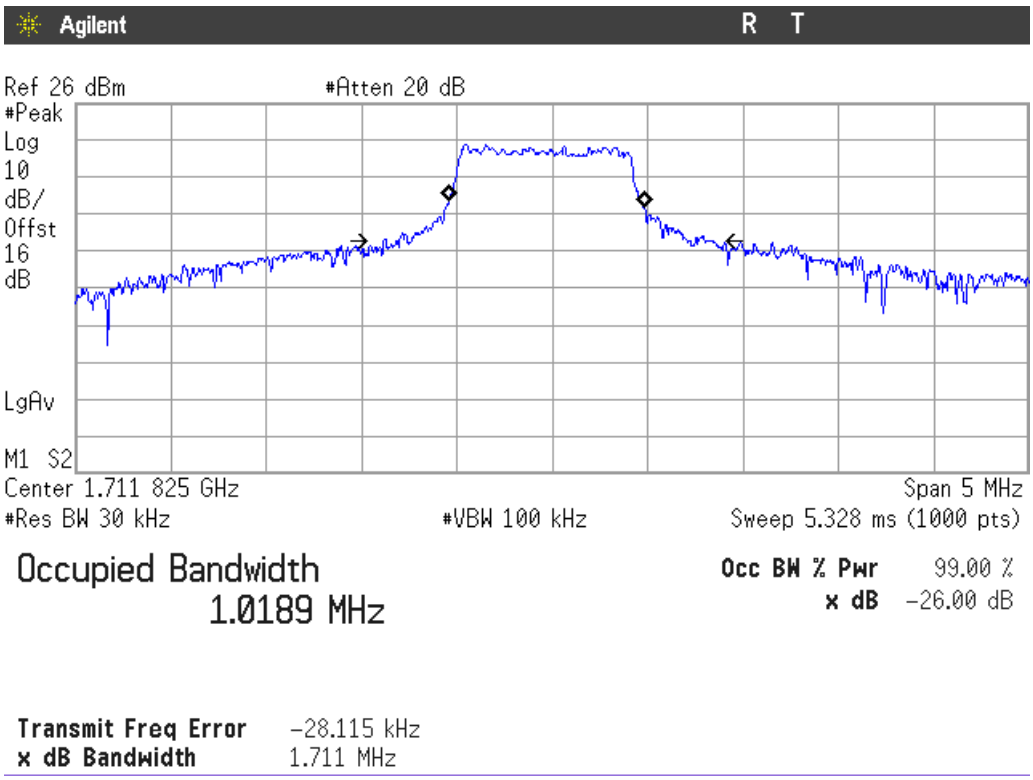


Highest Channel

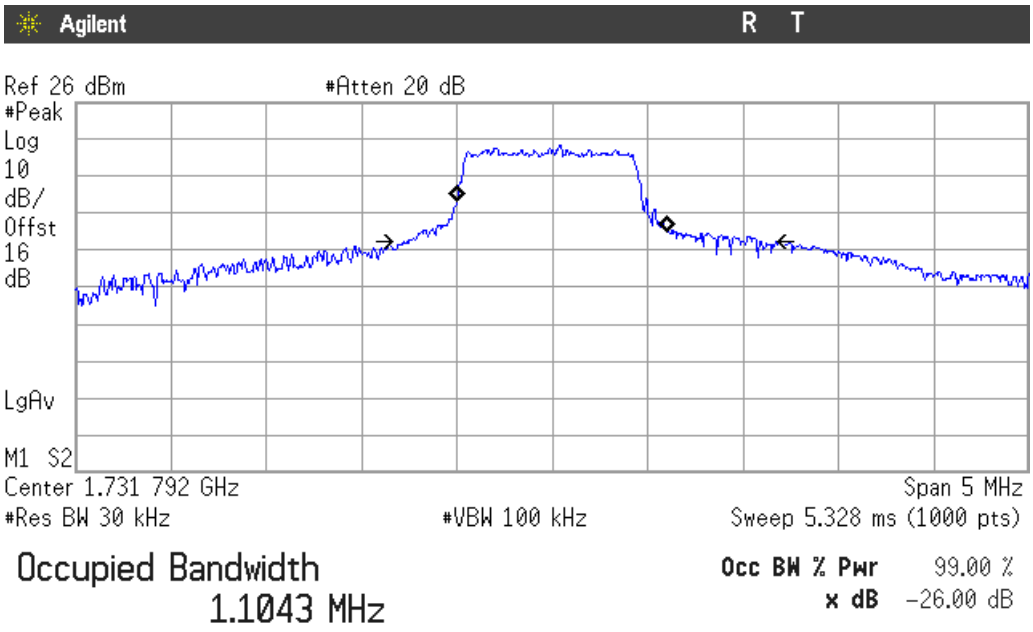


LTE 16QAM MODULATION. BW = 5 MHz (Band IV)

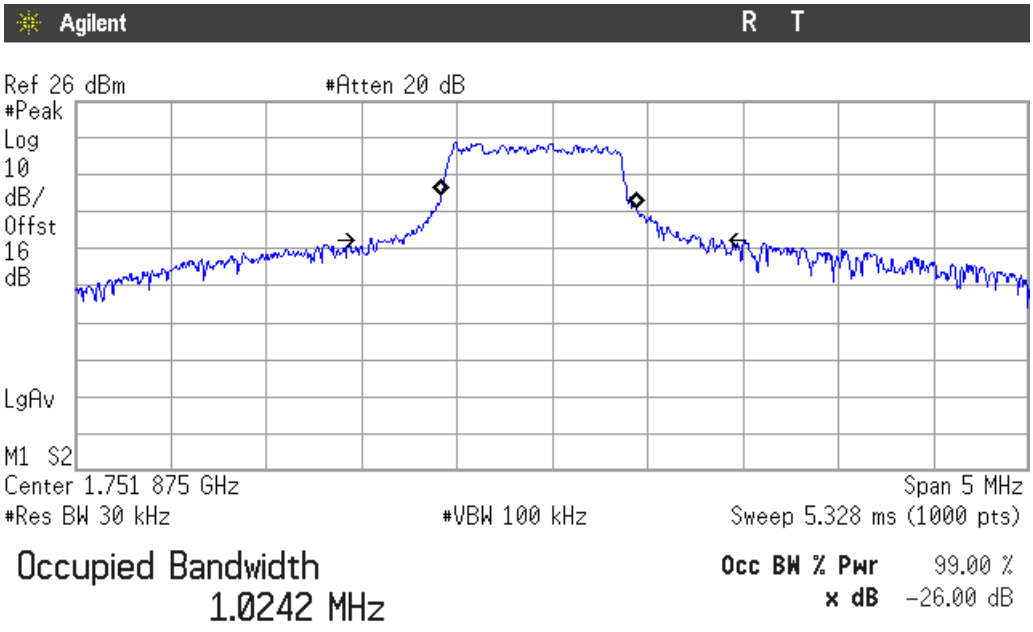
Lowest Channel



Middle Channel

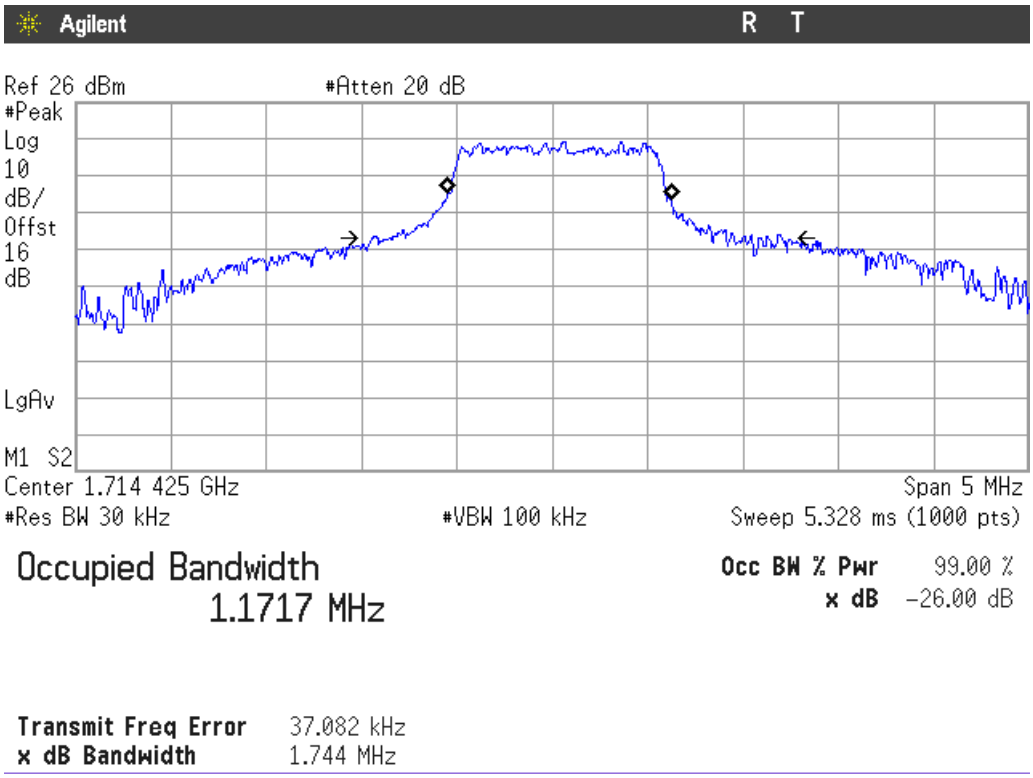


Highest Channel

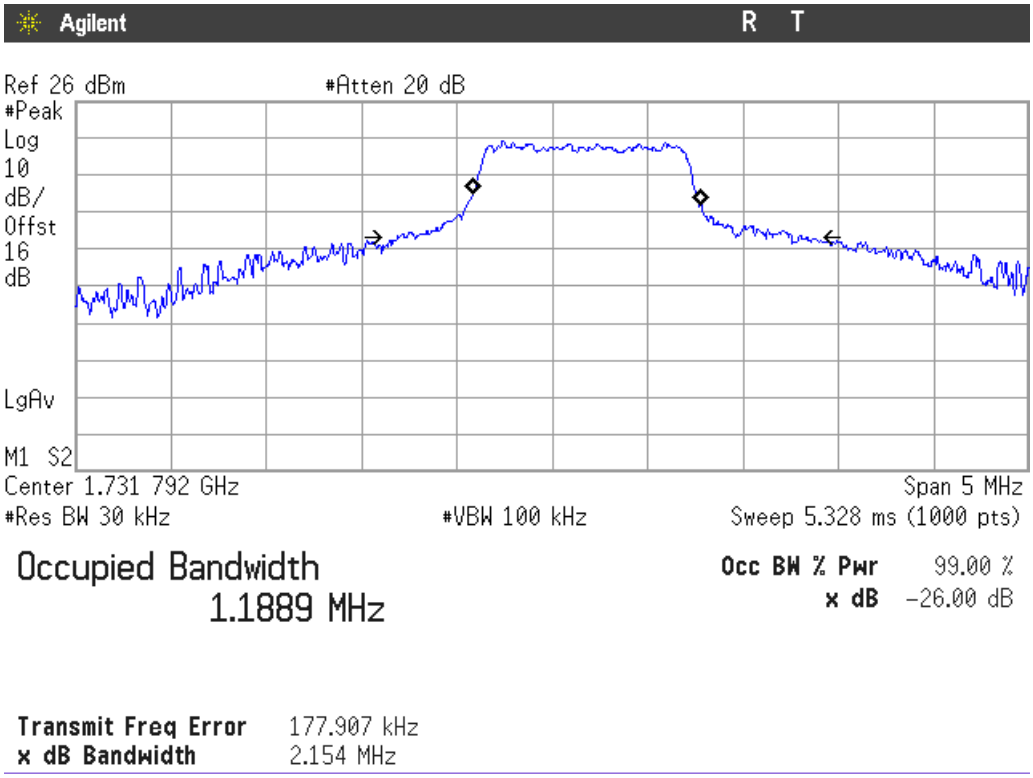


LTE QPSK MODULATION. BW = 10 MHz (Band IV)

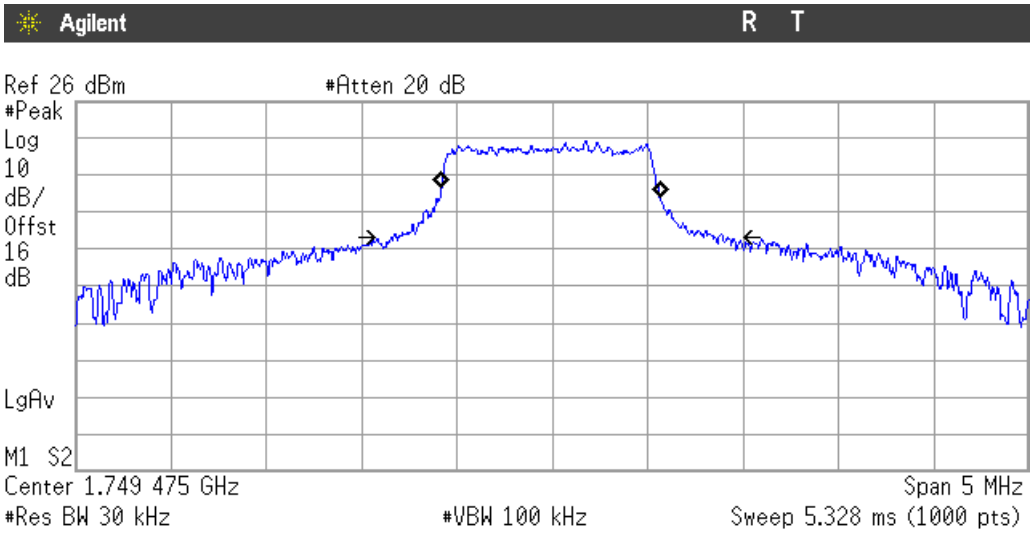
Lowest Channel



Middle Channel

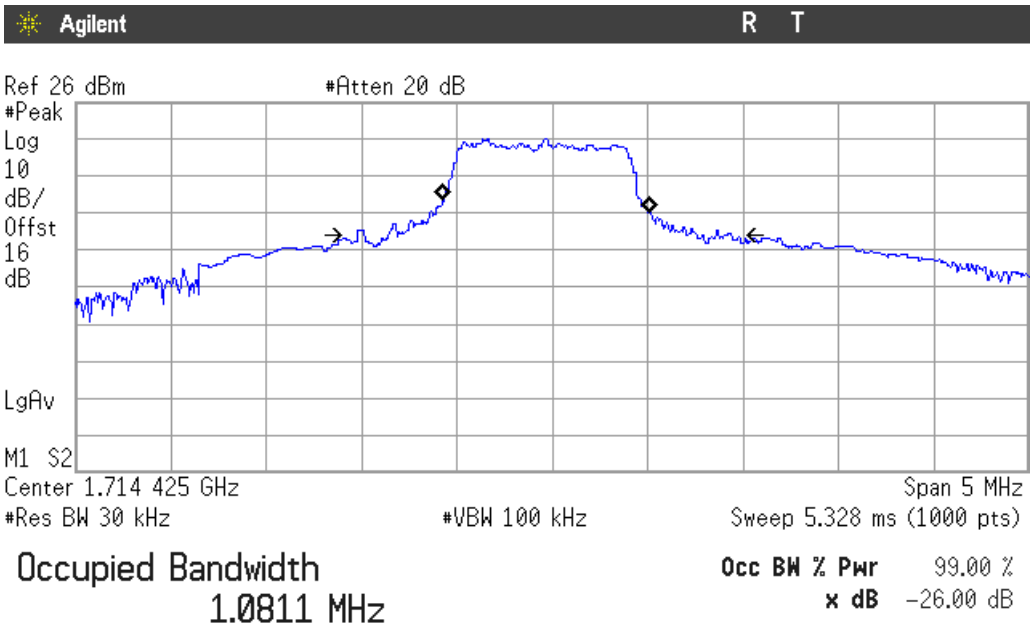


Highest Channel

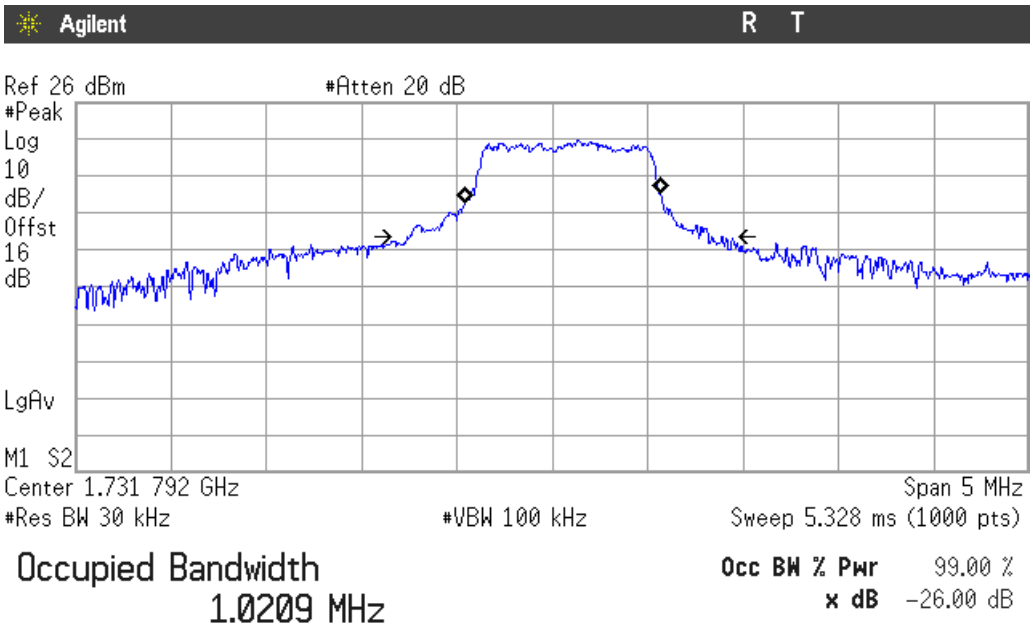


LTE 16QAM MODULATION. BW = 10 MHz (Band IV)

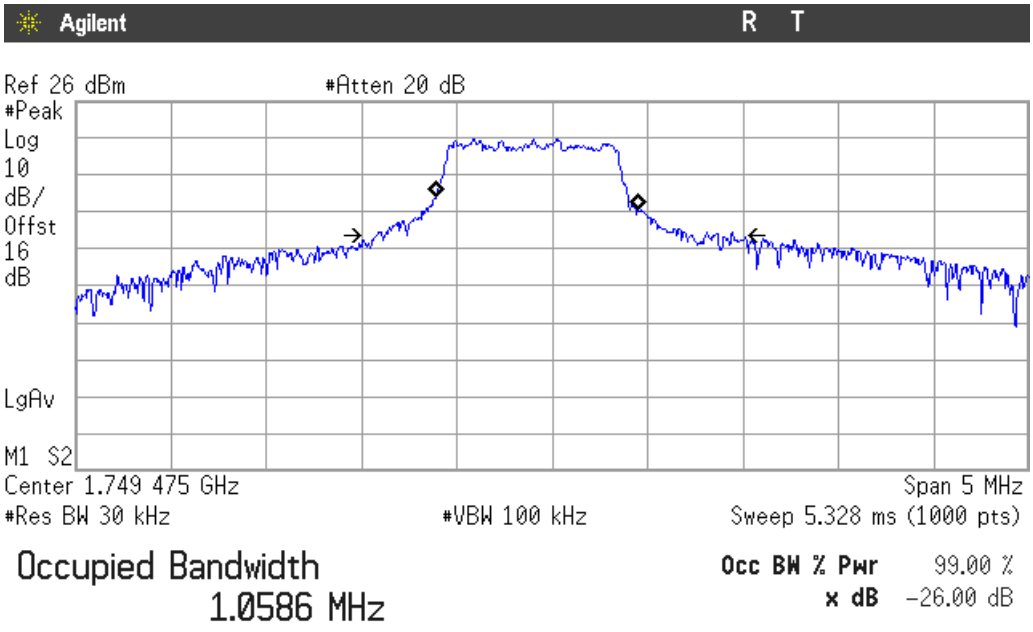
Lowest Channel



Middle Channel

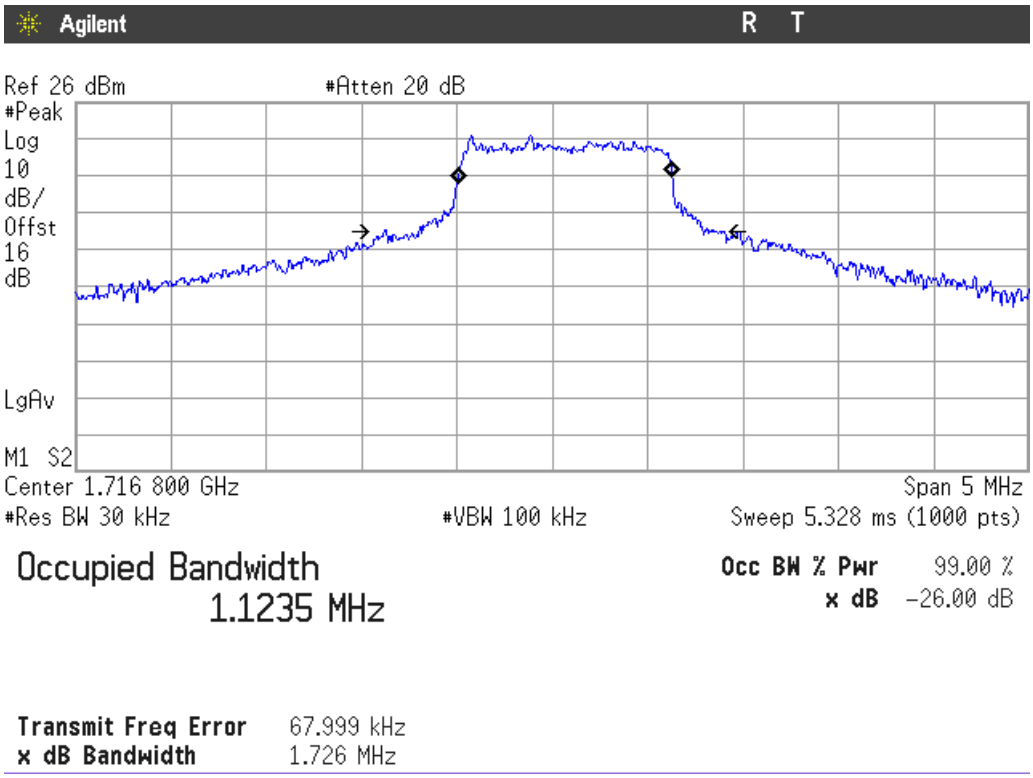


Highest Channel

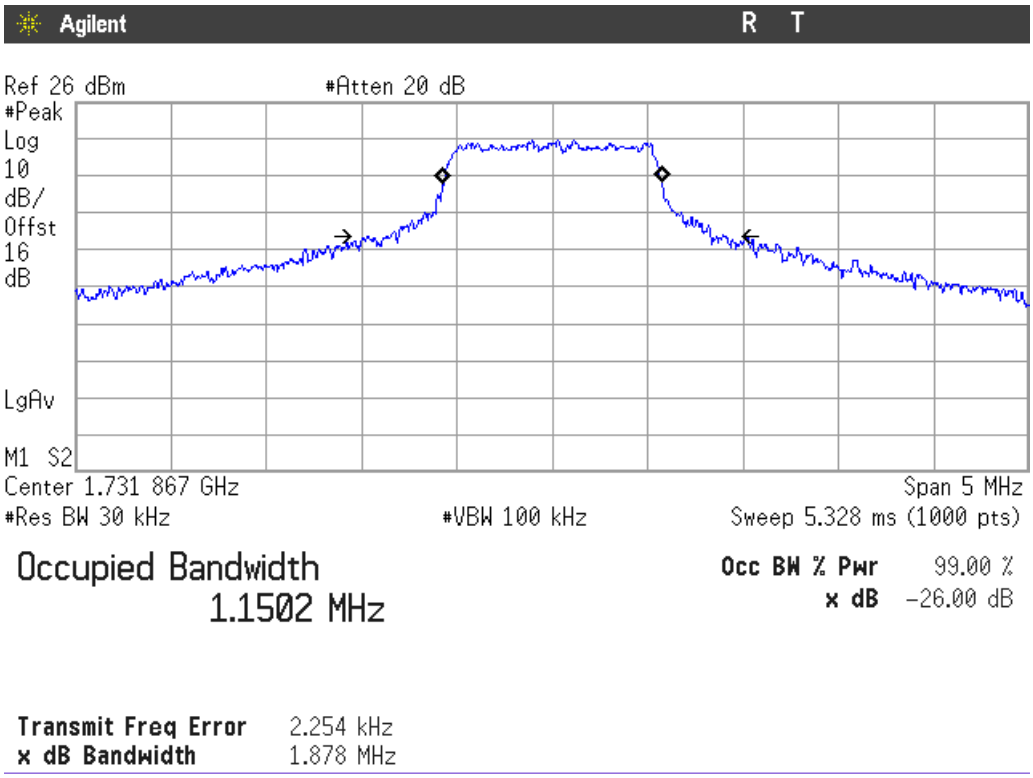


LTE QPSK MODULATION. BW = 15 MHz (Band IV)

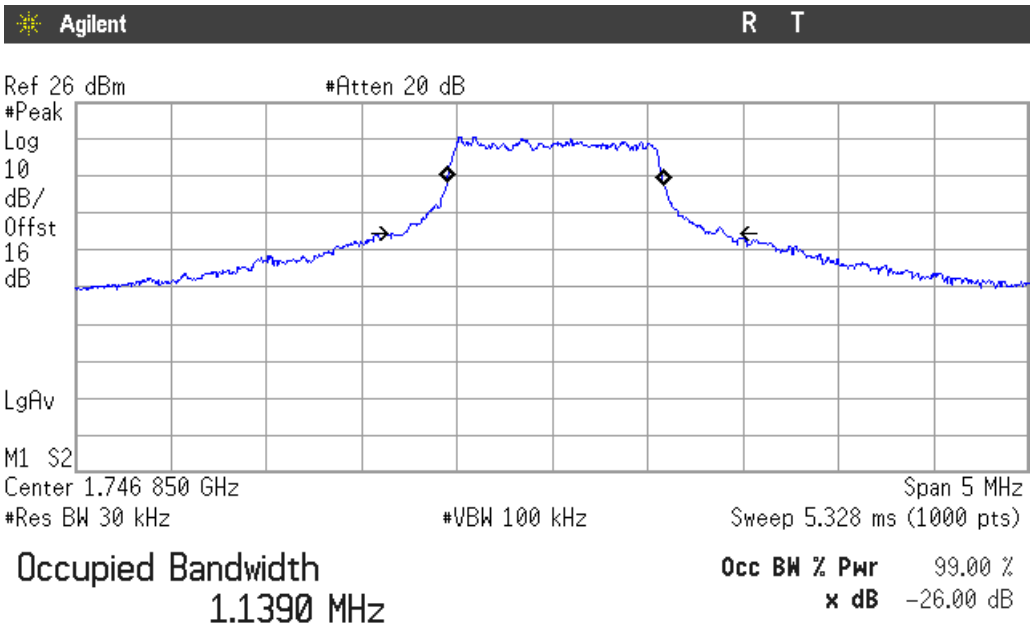
Lowest Channel



Middle Channel

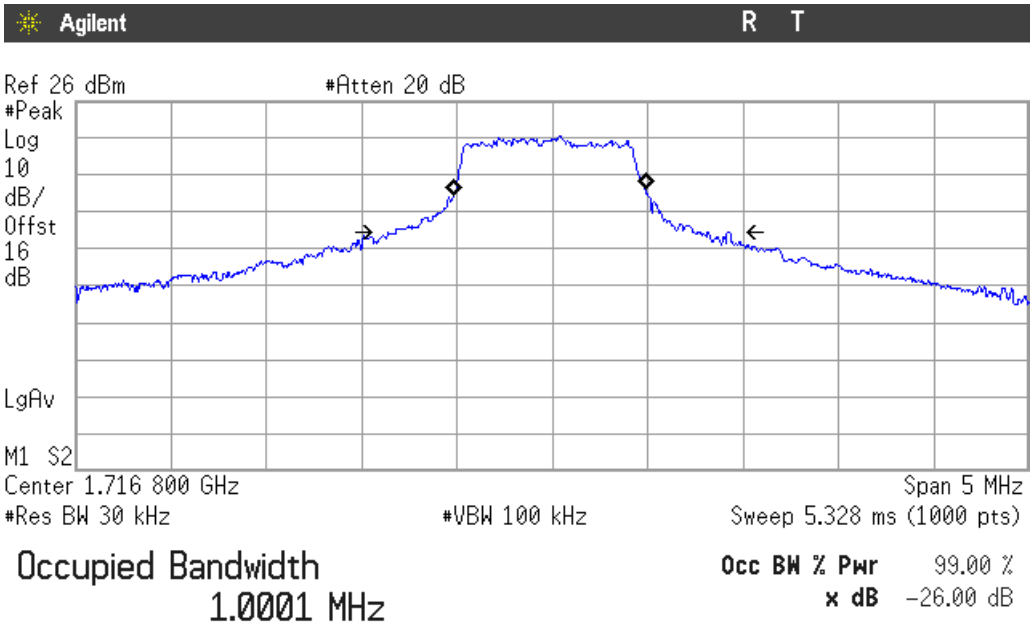


Highest Channel

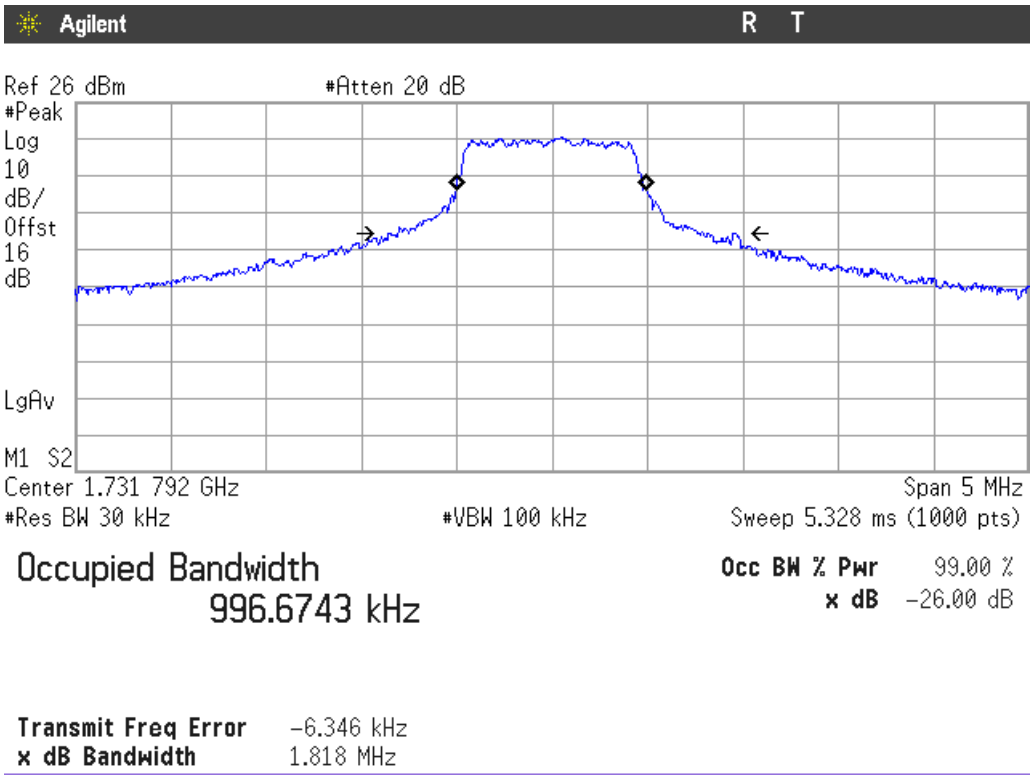


LTE 16QAM MODULATION. BW = 15 MHz (Band IV)

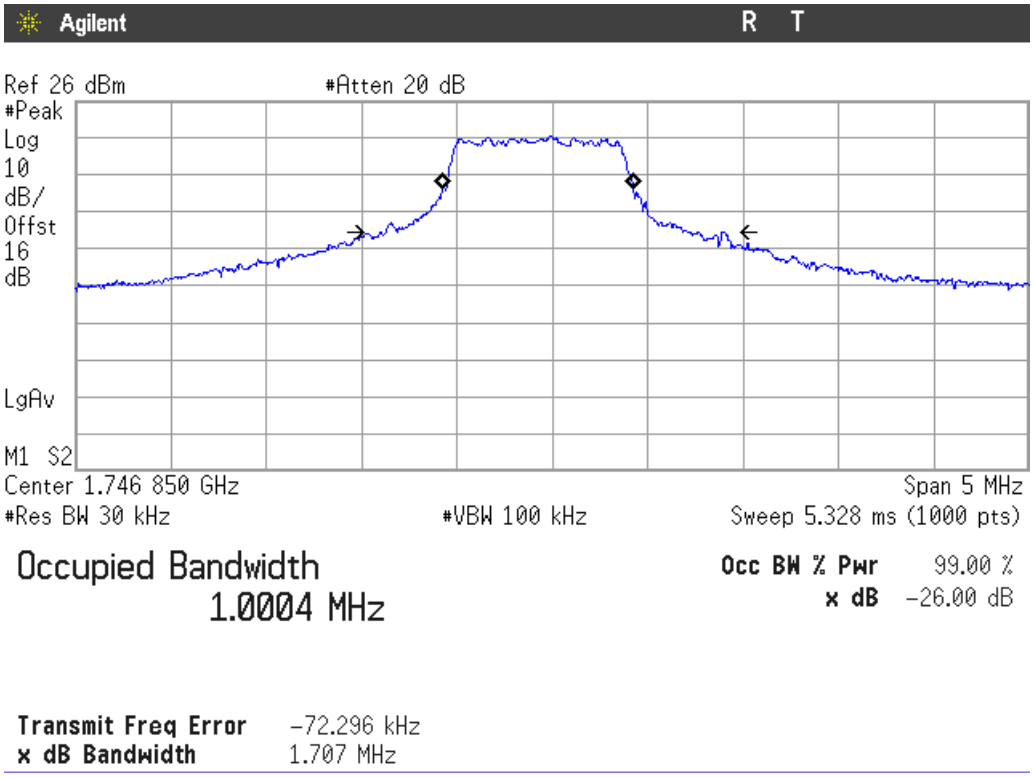
Lowest Channel



Middle Channel

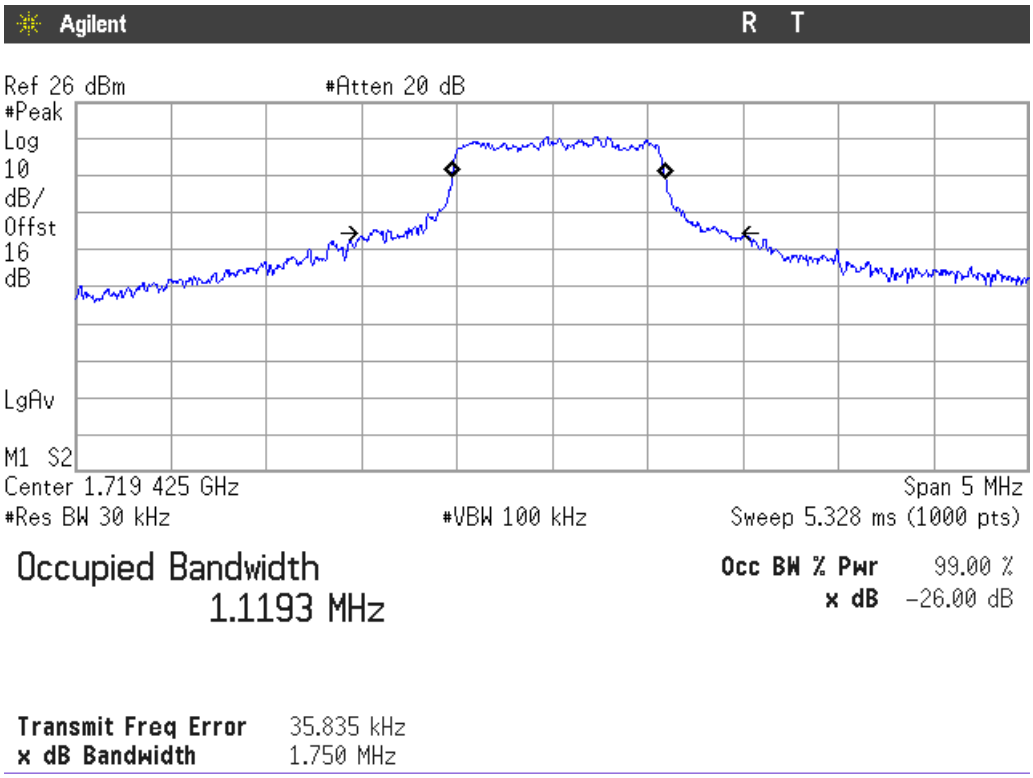


Highest Channel

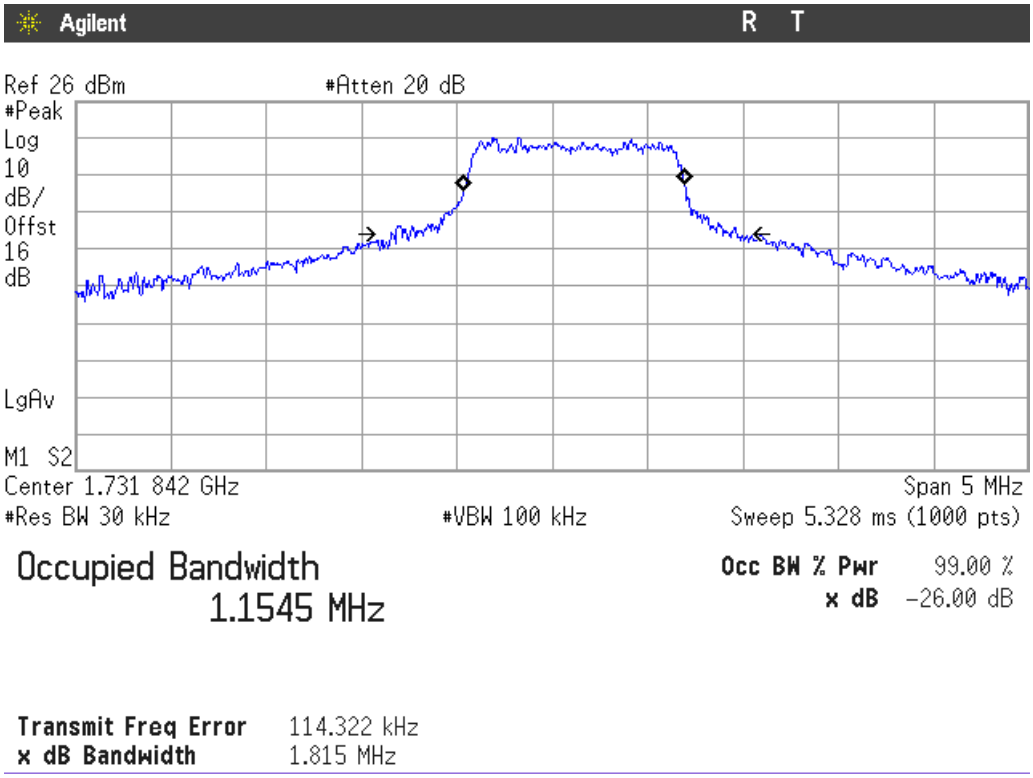


LTE QPSK MODULATION. BW = 20 MHz (Band IV)

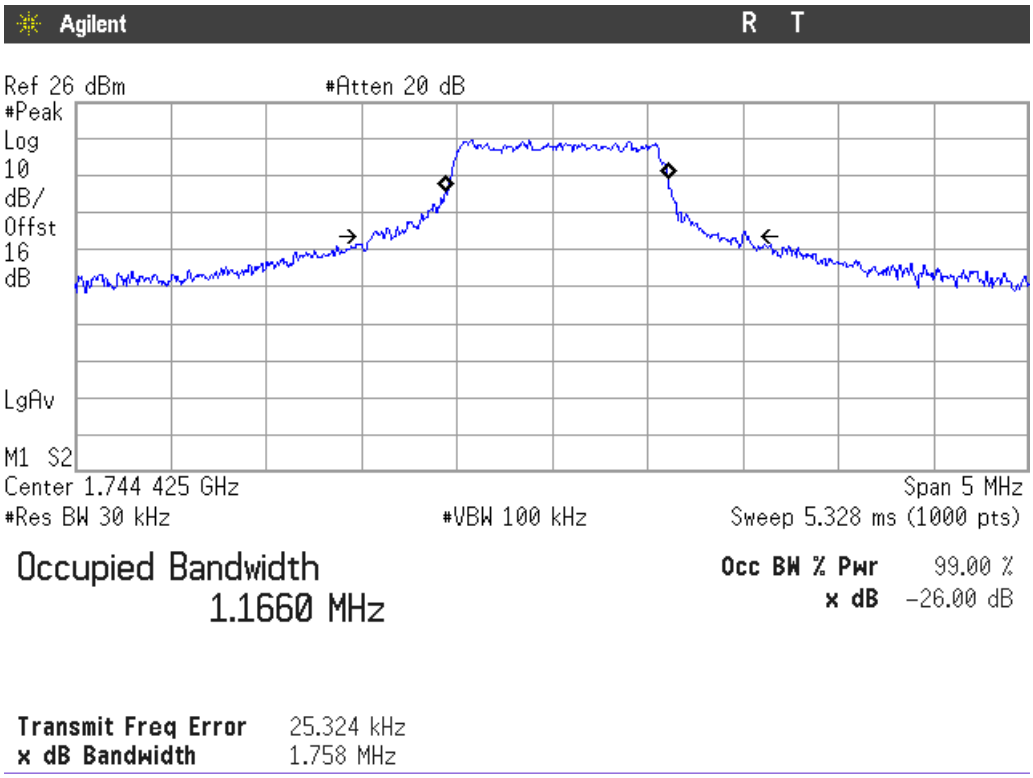
Lowest Channel



Middle Channel

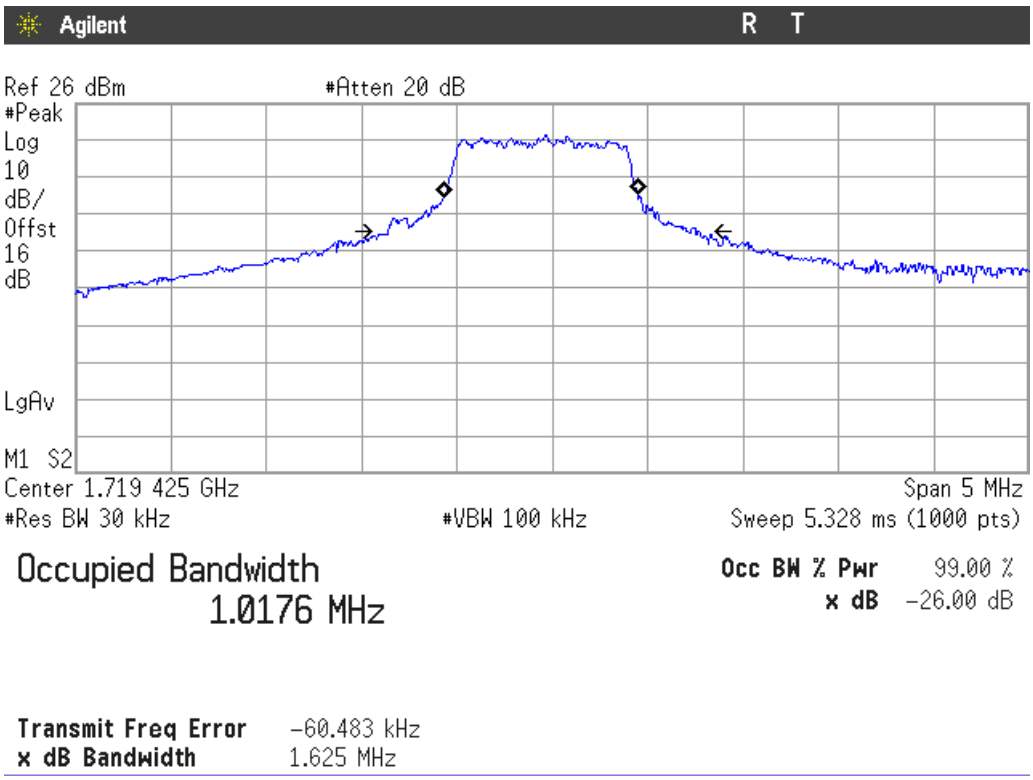


Highest Channel

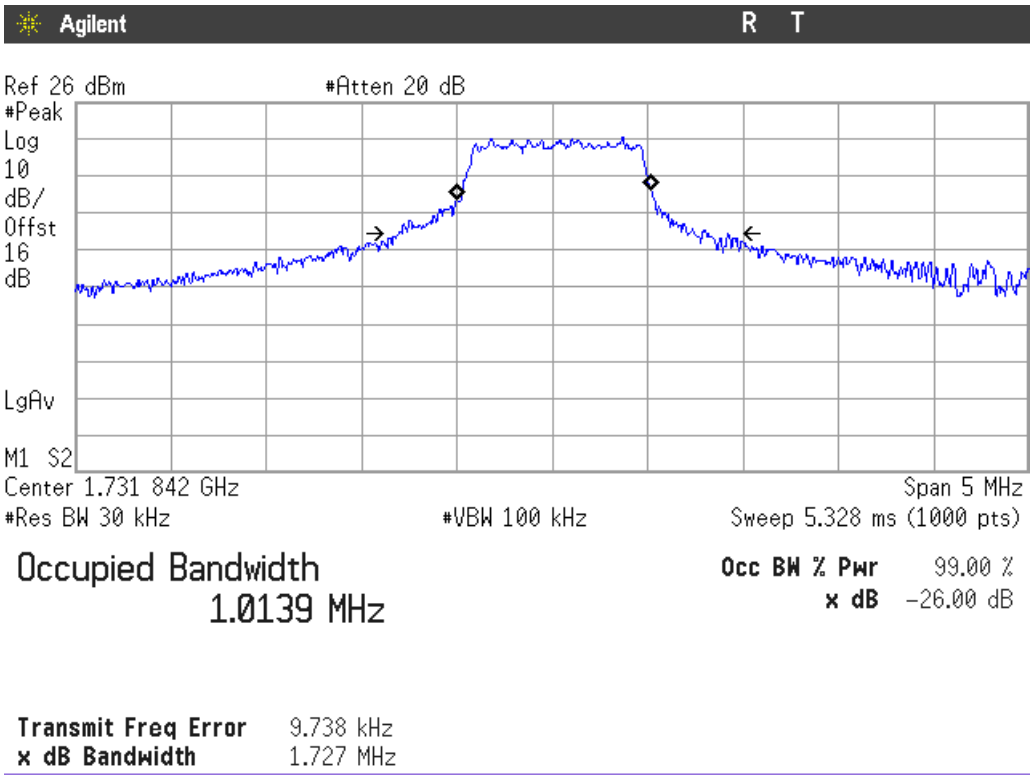


LTE 16QAM MODULATION. BW = 20 MHz (Band IV)

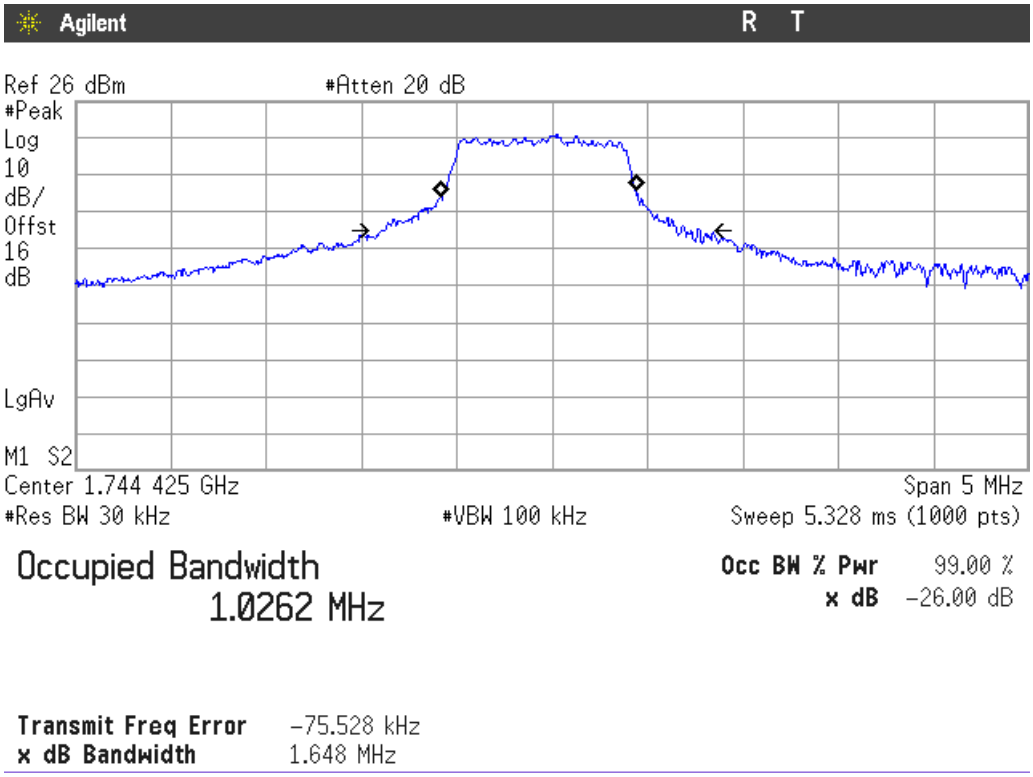
Lowest Channel



Middle Channel

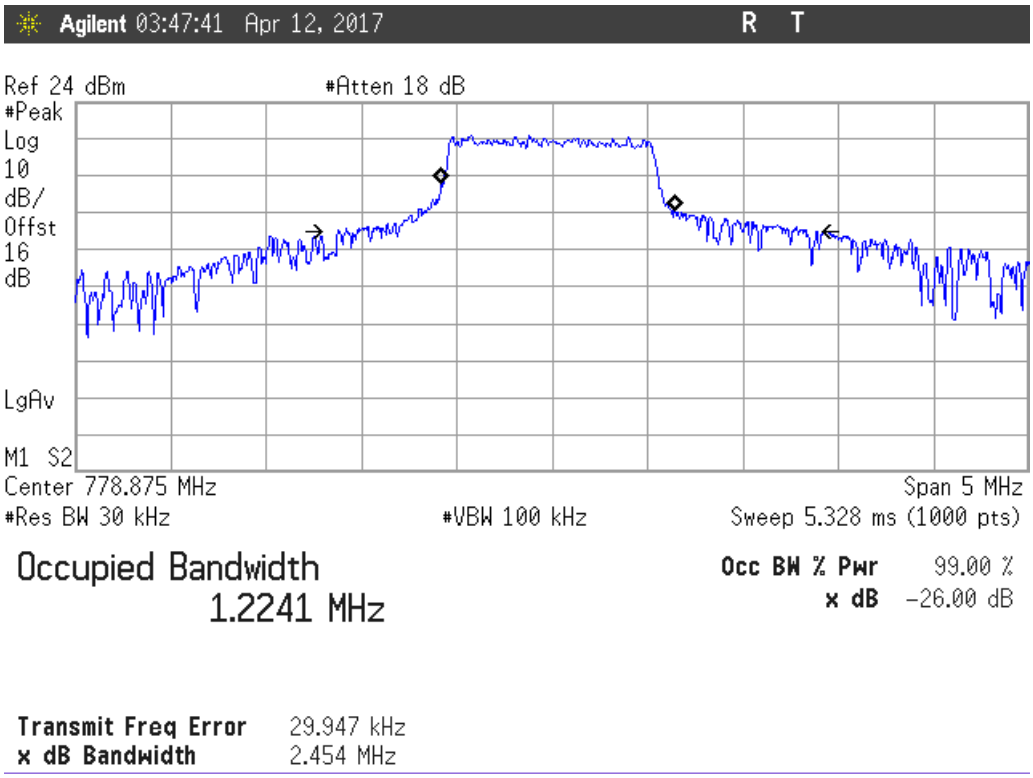


Highest Channel

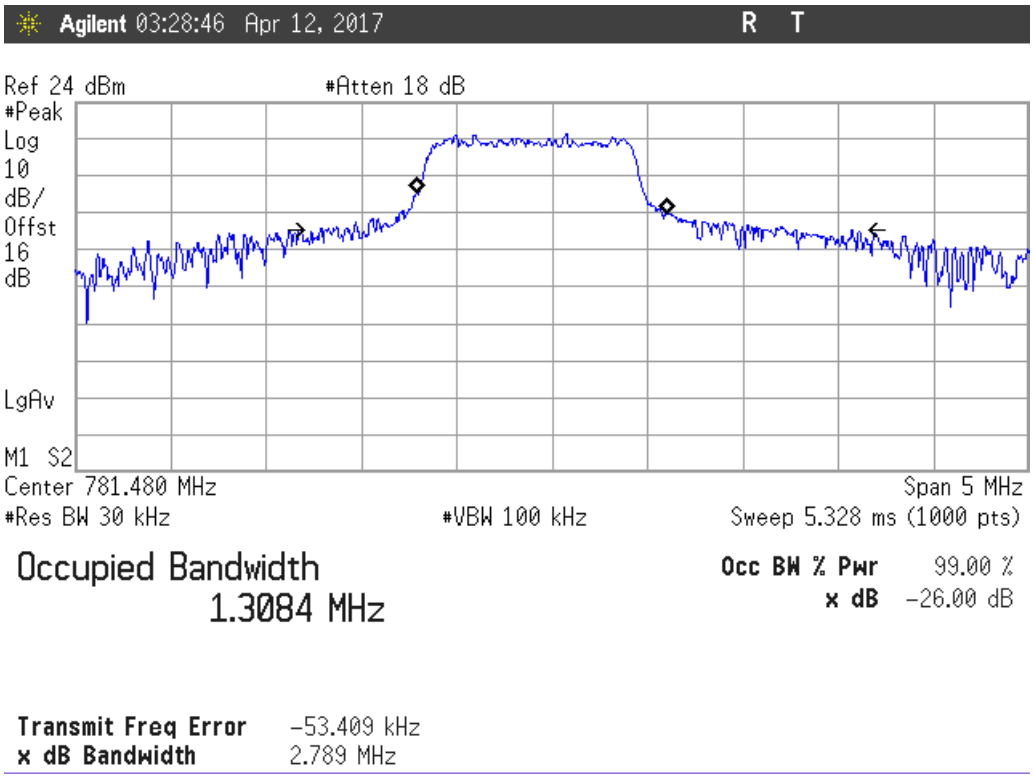


LTE QPSK MODULATION. BW = 5 MHz (Band XIII)

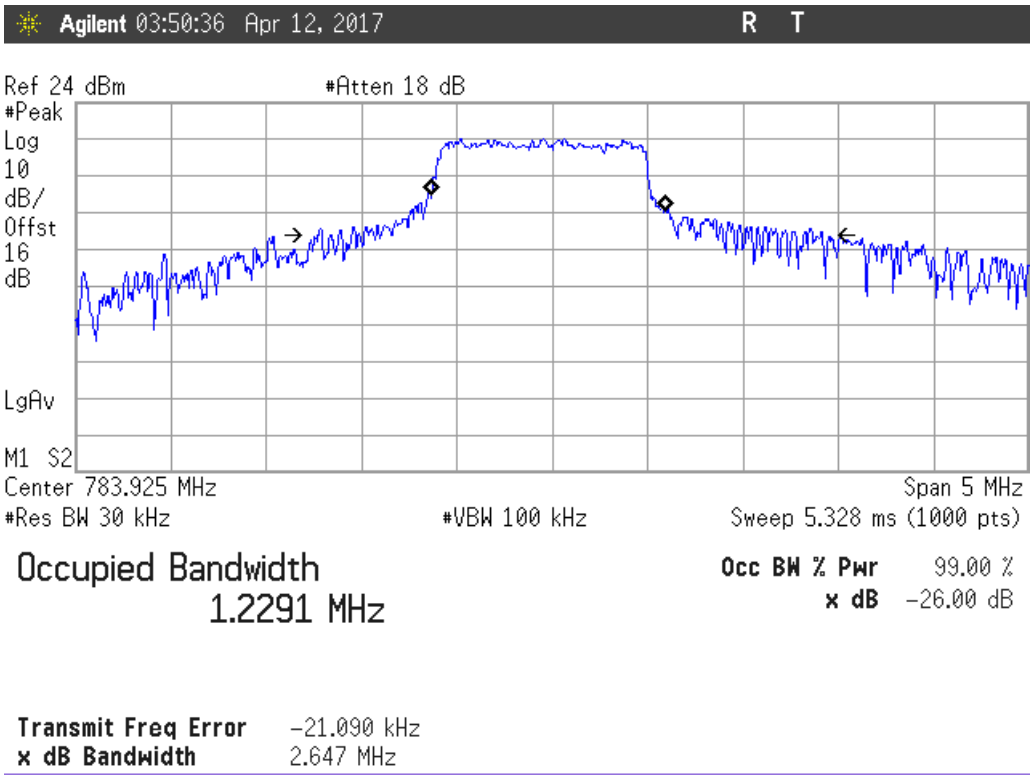
Lowest Channel



Middle Channel

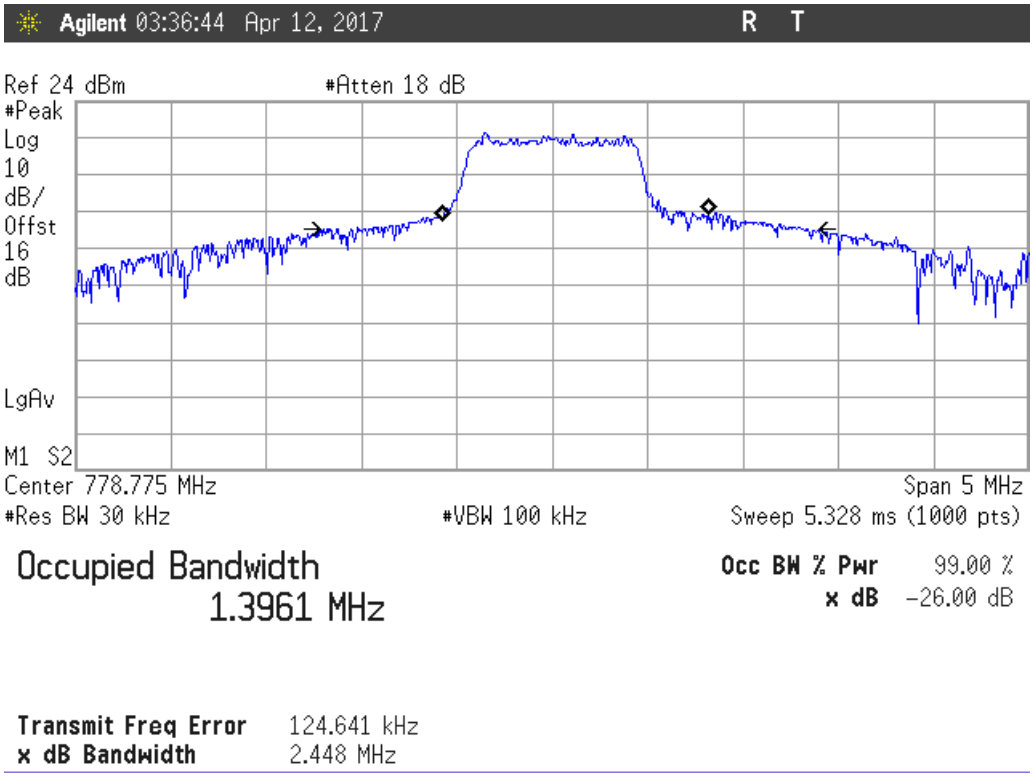


Highest Channel

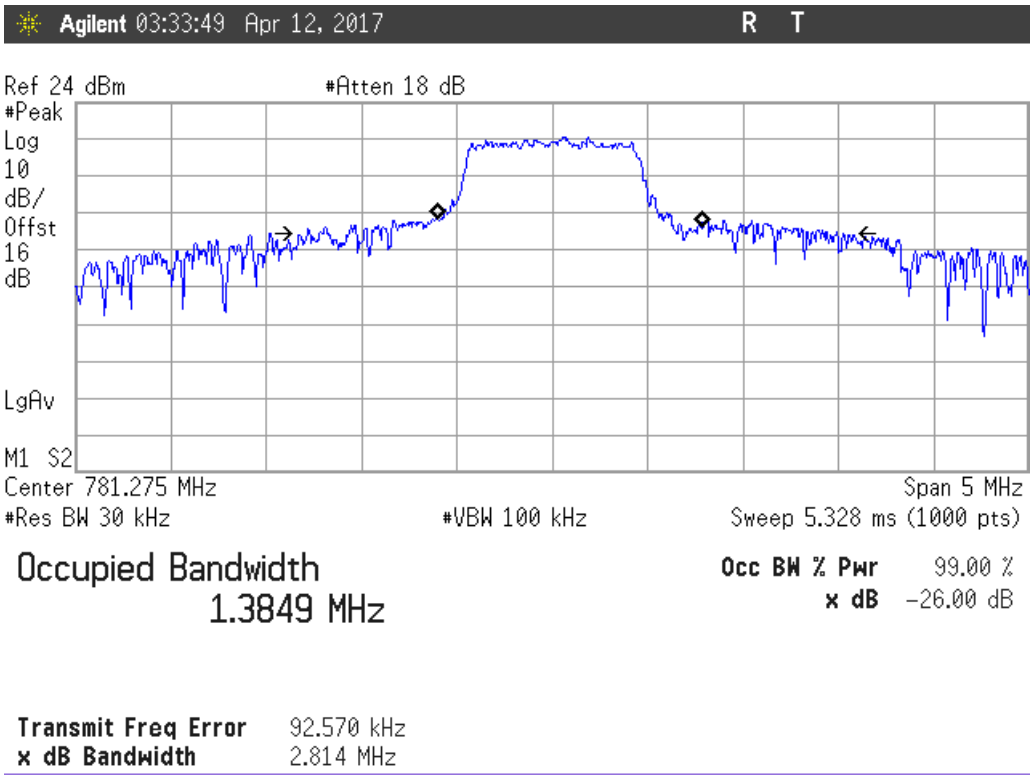


LTE 16QAM MODULATION. BW = 5 MHz (Band XIII)

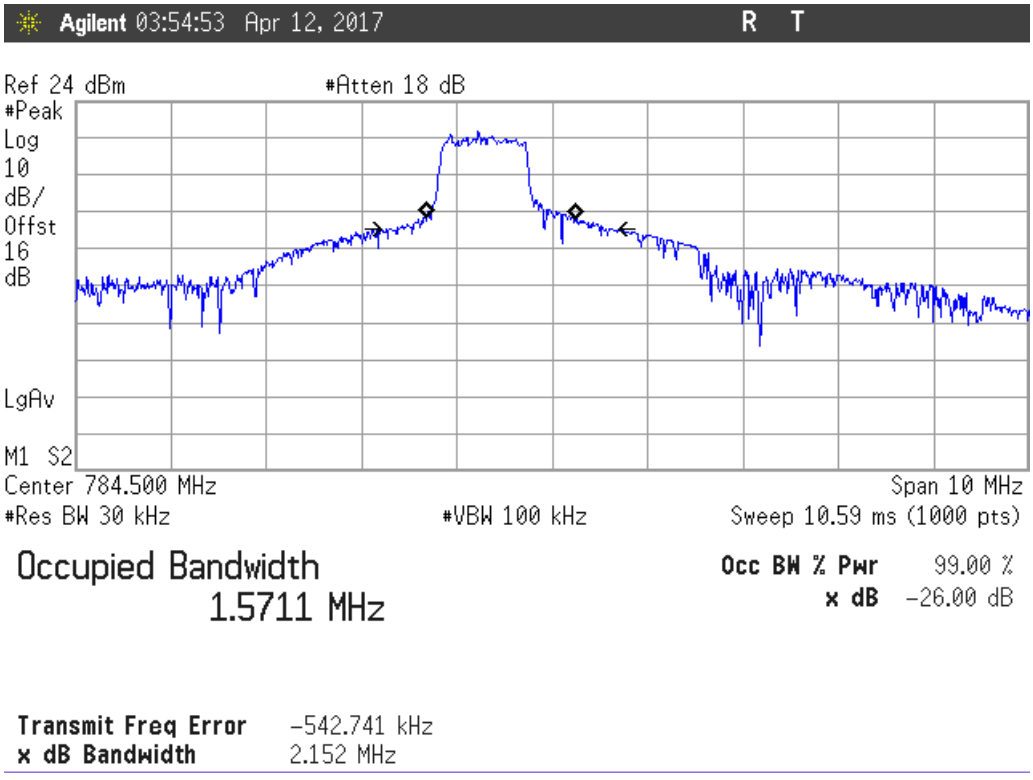
Lowest Channel



Middle Channel

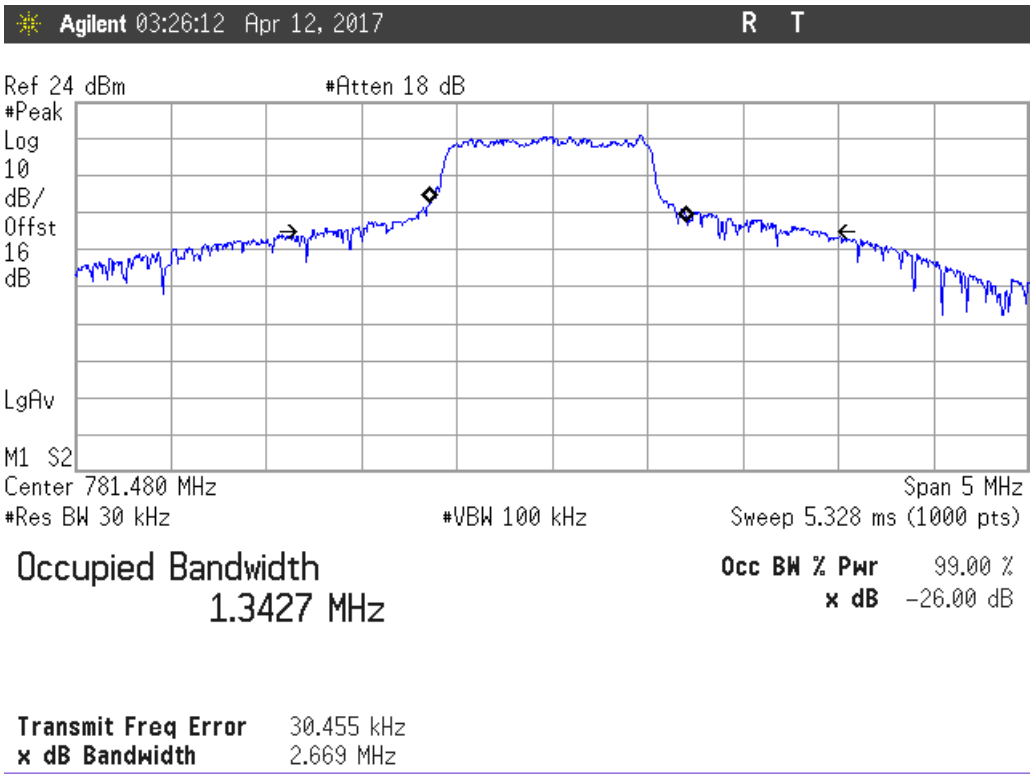


Highest Channel



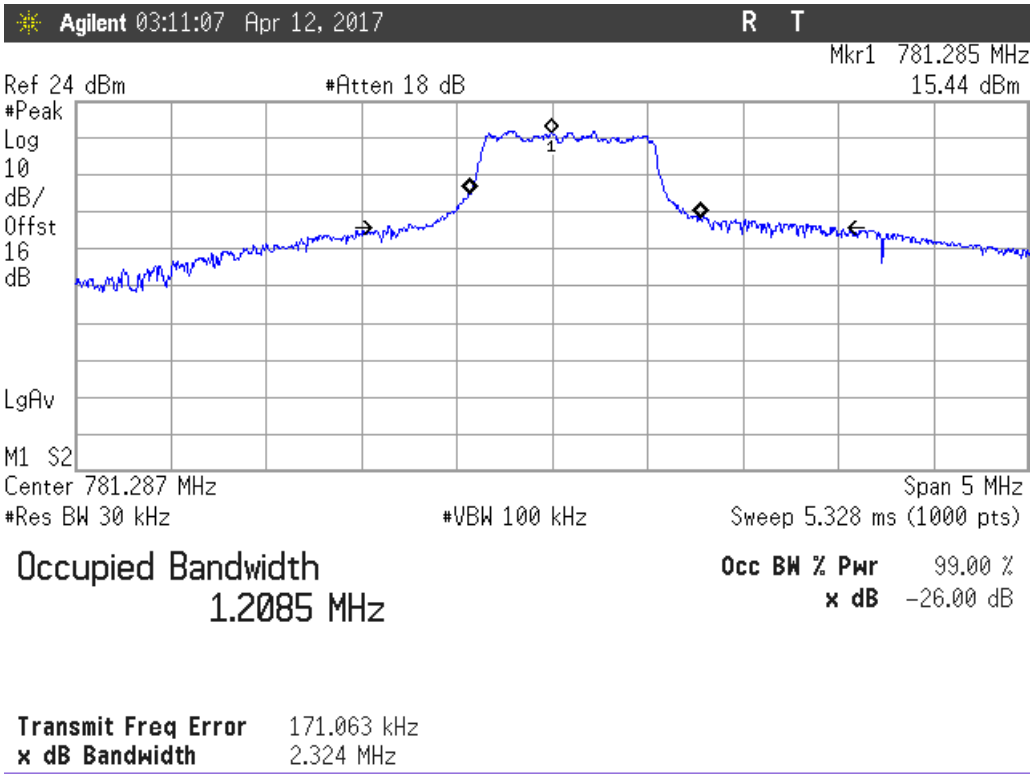
LTE QPSK MODULATION. BW = 10 MHz (Band XIII)

Middle Channel



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

Middle 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 XIII. FCC §2.1051 and §27.53 (c). RSS-130 Clause 4.6.

On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

On all frequencies between 763-775 MHz and 793-806 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

At Po transmitting power, the specified minimum attenuation becomes 43+10 log (Po), and the level in dBm relative Po becomes:
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = -13 dBm.

At Po transmitting power, the specified minimum attenuation becomes 65+10 log (Po), and the level in dBm relative Po becomes:
Po (dBm) – [65 + 10 log (Po in mwatts) - 30] = -35 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.

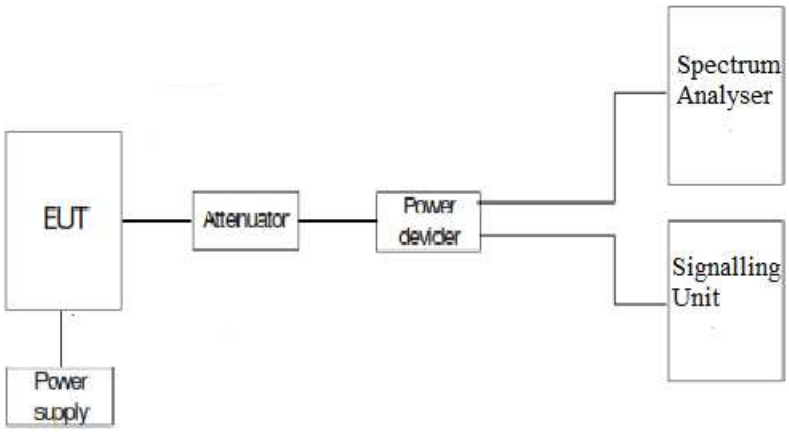
The spectrum was investigated from 9 kHz to 18 GHz for LTE Band IV.

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

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 = 5 MHz. Band XIII

1. CHANNEL: LOWEST

Spurious signals found closest to the limit:

Frequency (MHz)	Level (dBm)	Limit (dBm)
777.9502	-37.17	-35.00
800.4102	-45.25	-35.00

2. CHANNEL: MIDDLE

Spurious signals found closest to the limit:

Frequency (MHz)	Level (dBm)	Limit (dBm)
774.77.15	-49.08	-35.00
802.9099	-45.95	-35.00

3. CHANNEL: HIGHEST

Spurious signals found closest to the limit:

Frequency (MHz)	Level (dBm)	Limit (dBm)
763.5919	-46.58	-35.00
805.4096	-45.33	-35.00

LTE BW = 10 MHz. Band XIII

1. CHANNEL: MIDDLE

Spurious signals found closest to the limit:

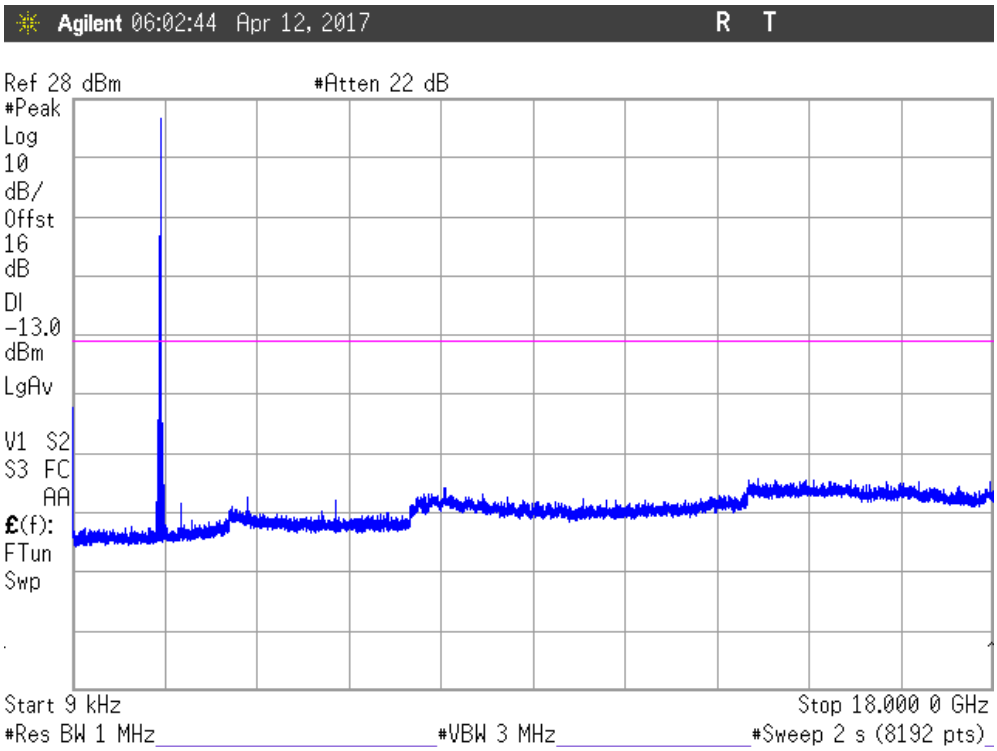
Frequency (MHz)	Level (dBm)	Limit (dBm)
774.6030	-41.70	-35.00
797.4217	-47.15	-35.00

Measurement uncertainty = <±2.01 dB.

Verdict: PASS

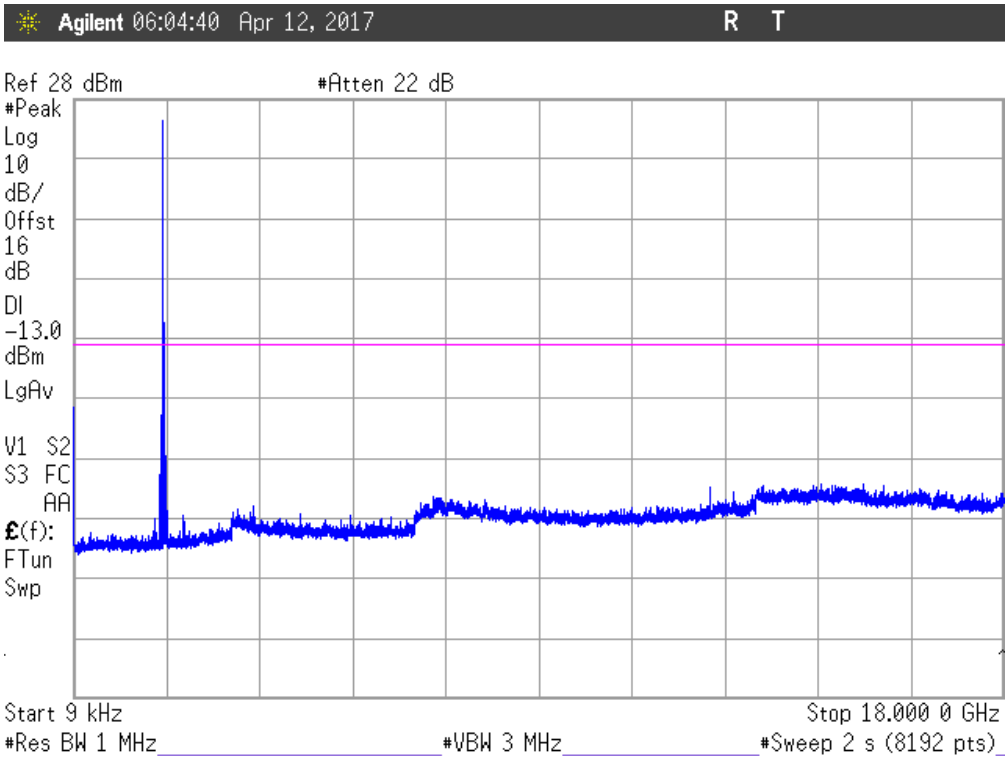
LTE BW = 1.4 MHz (Band IV)

1. CHANNEL: LOWEST



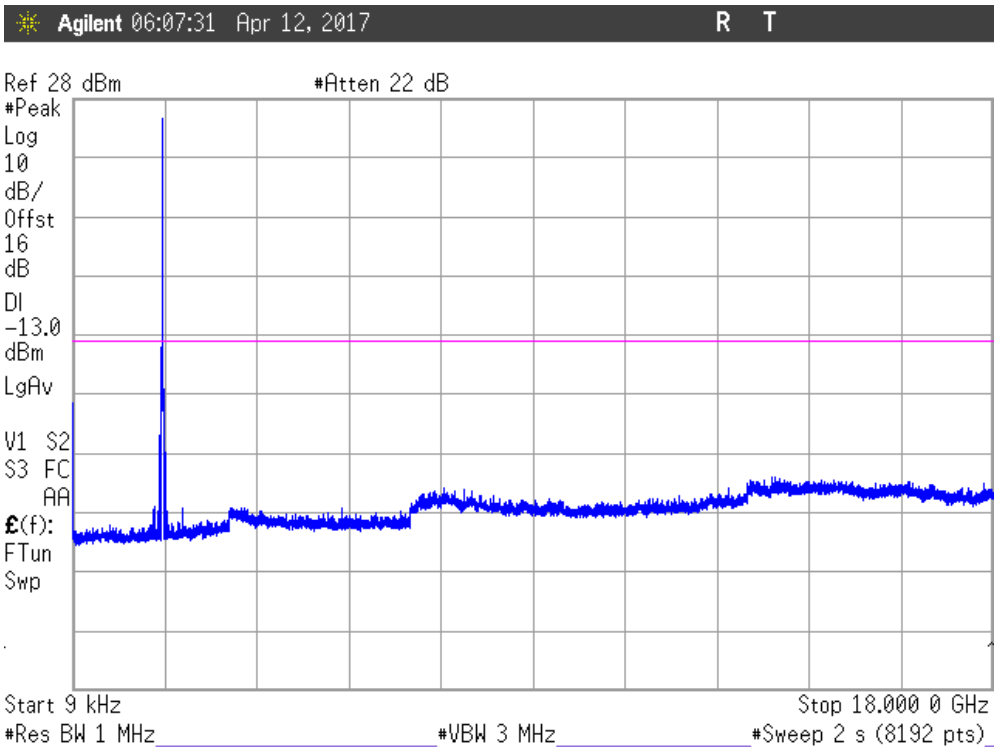
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

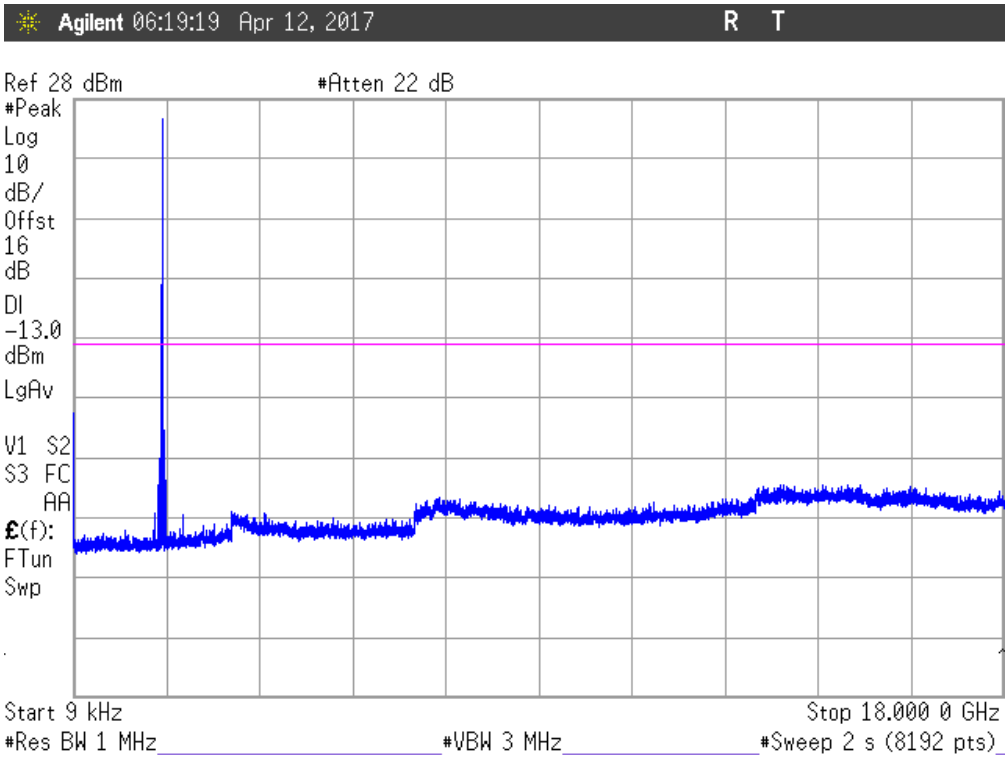
3. CHANNEL: HIGHEST



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

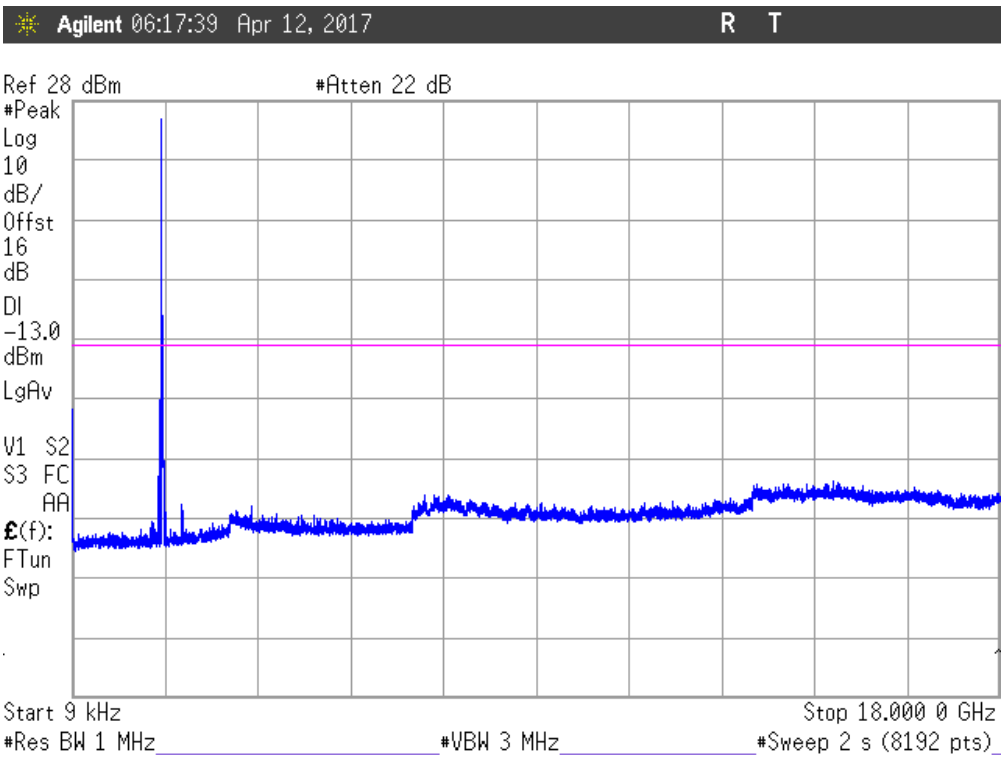
LTE BW = 3 MHz (Band IV)

1. CHANNEL: LOWEST



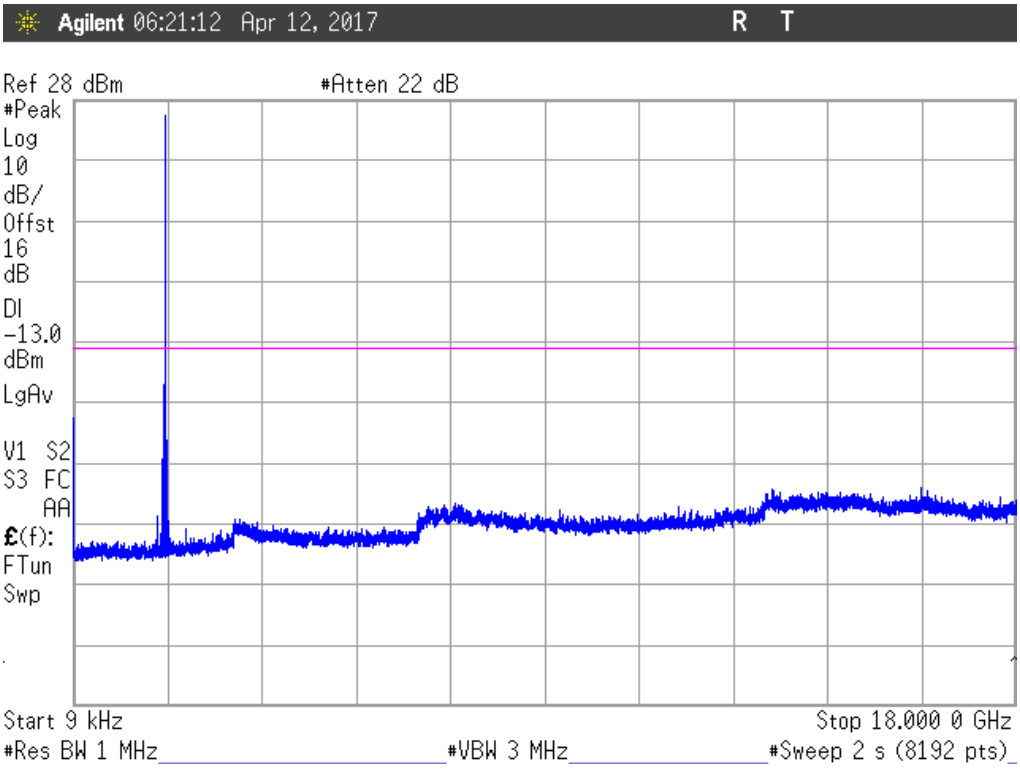
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

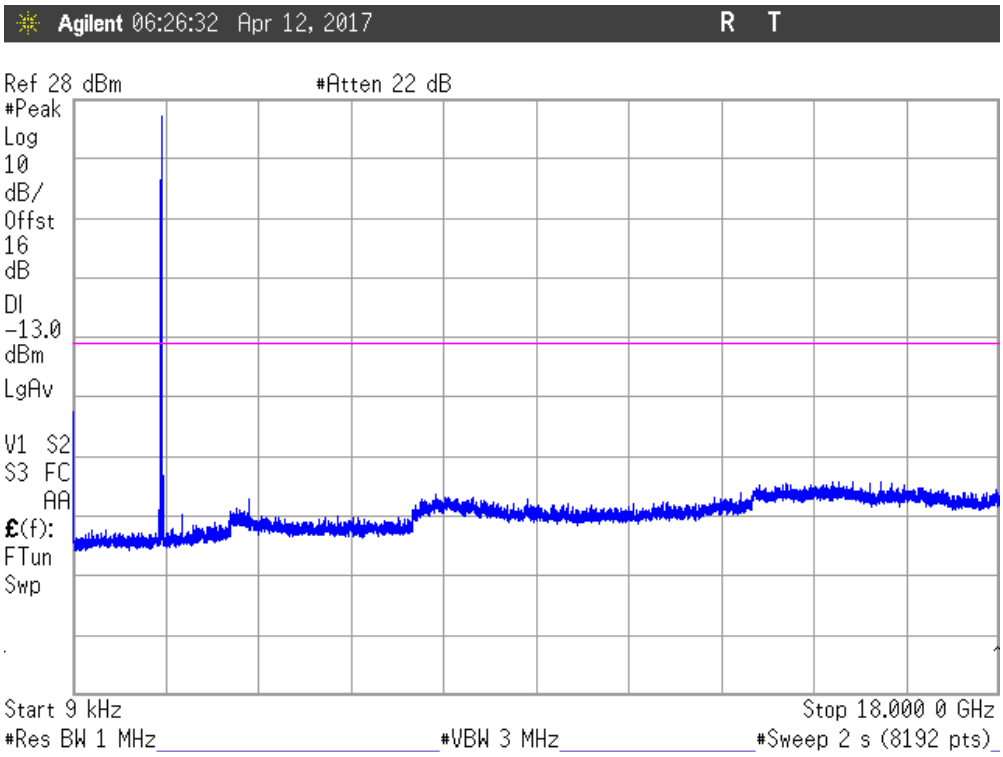
3. CHANNEL: HIGHEST



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

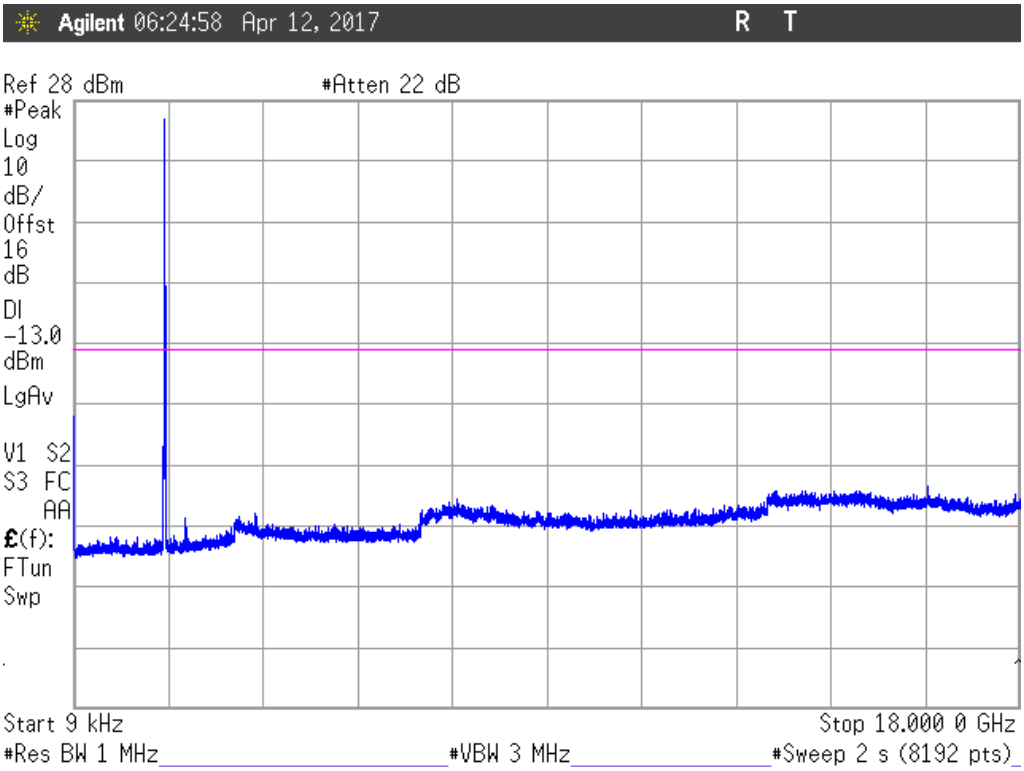
LTE BW = 5 MHz (Band IV)

1. CHANNEL: LOWEST



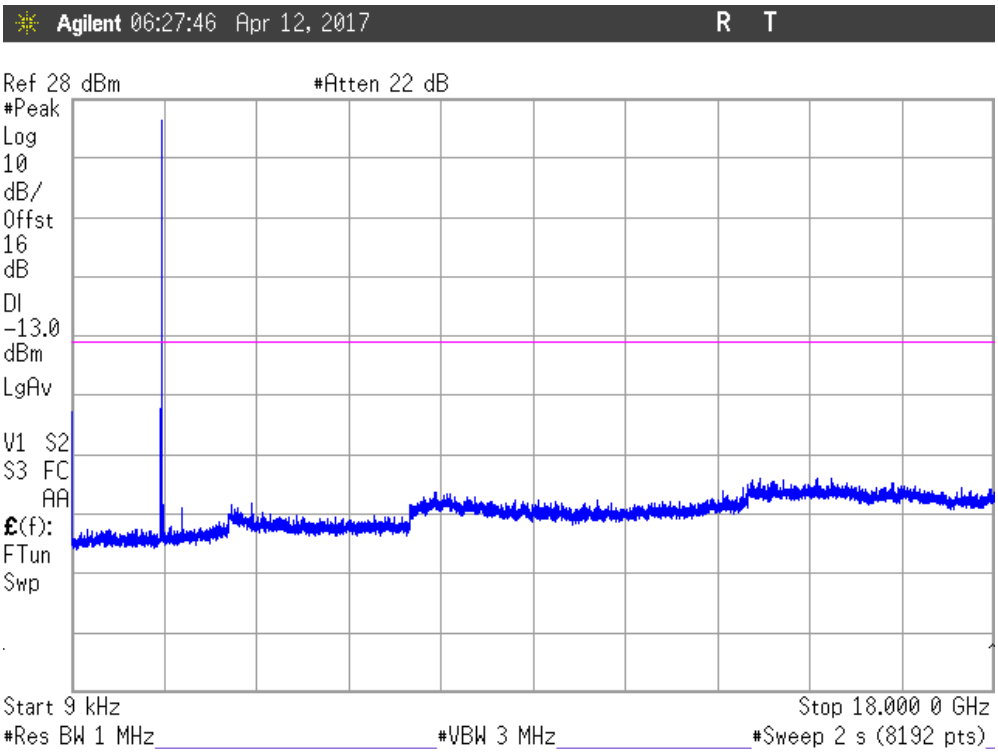
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

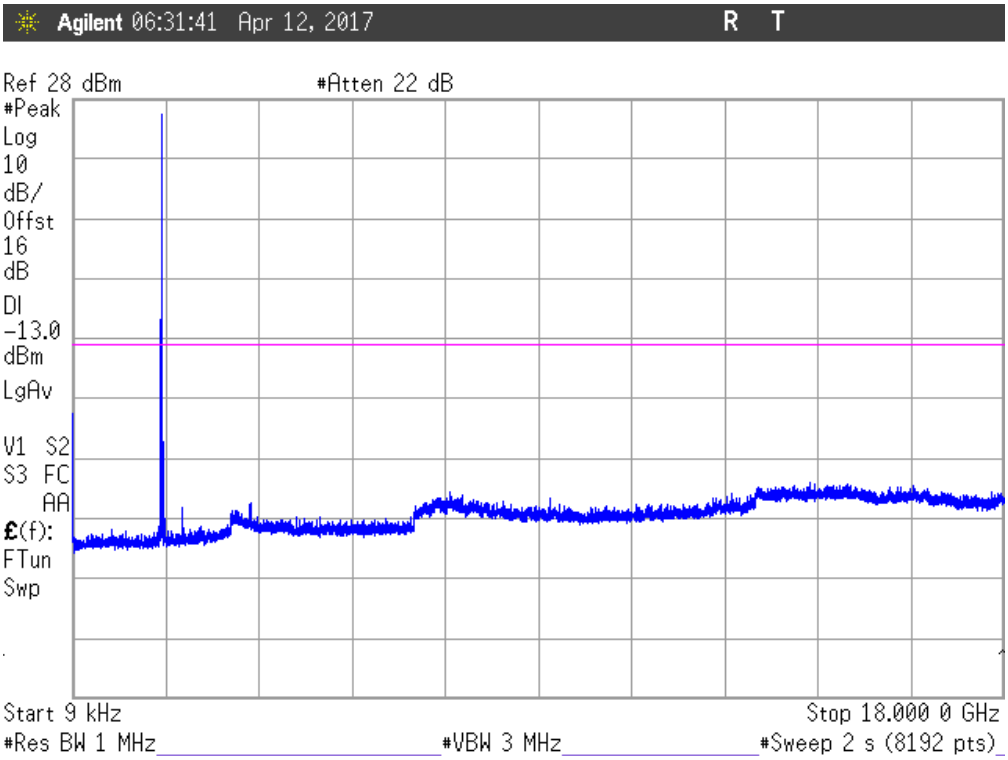
3. CHANNEL: HIGHEST



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

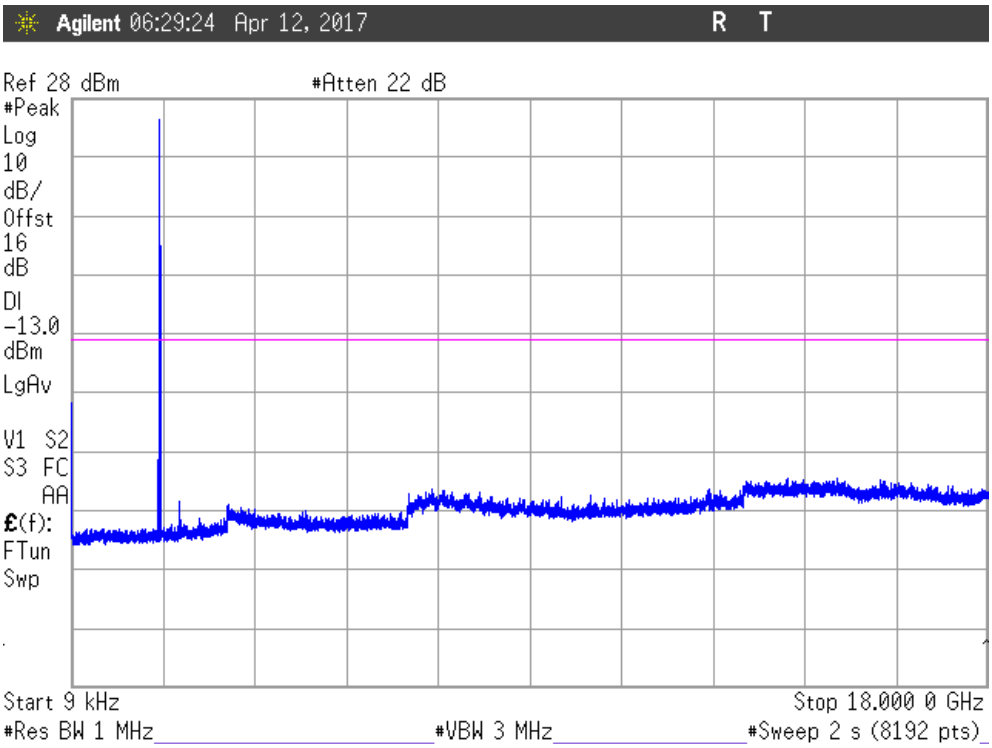
LTE BW = 10 MHz (Band IV)

1. CHANNEL: LOWEST



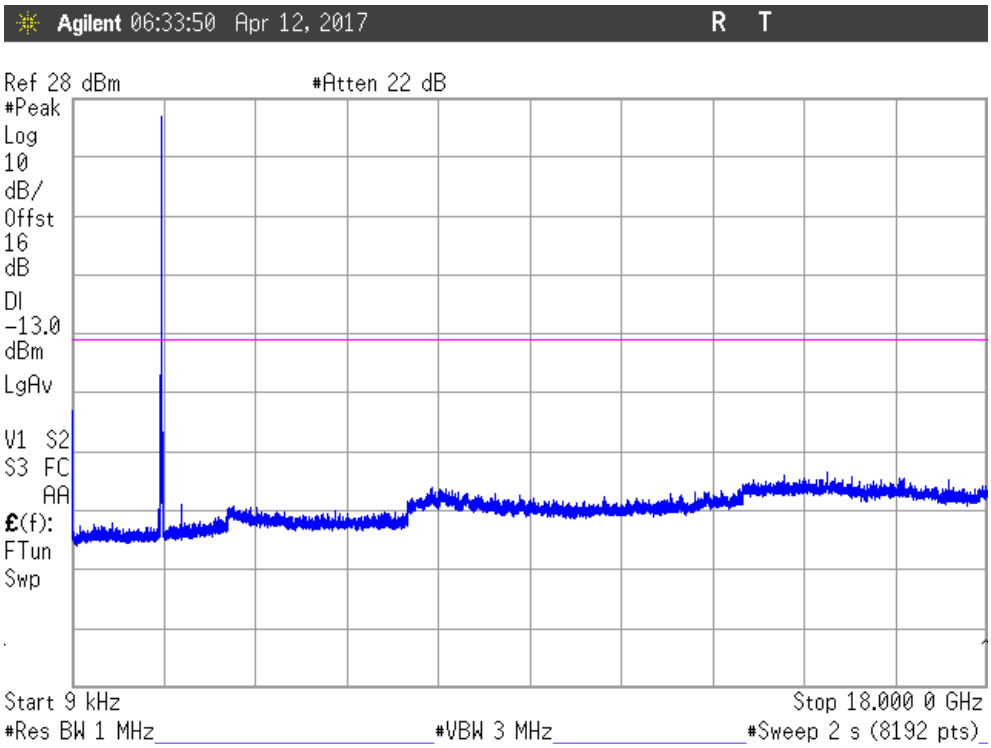
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

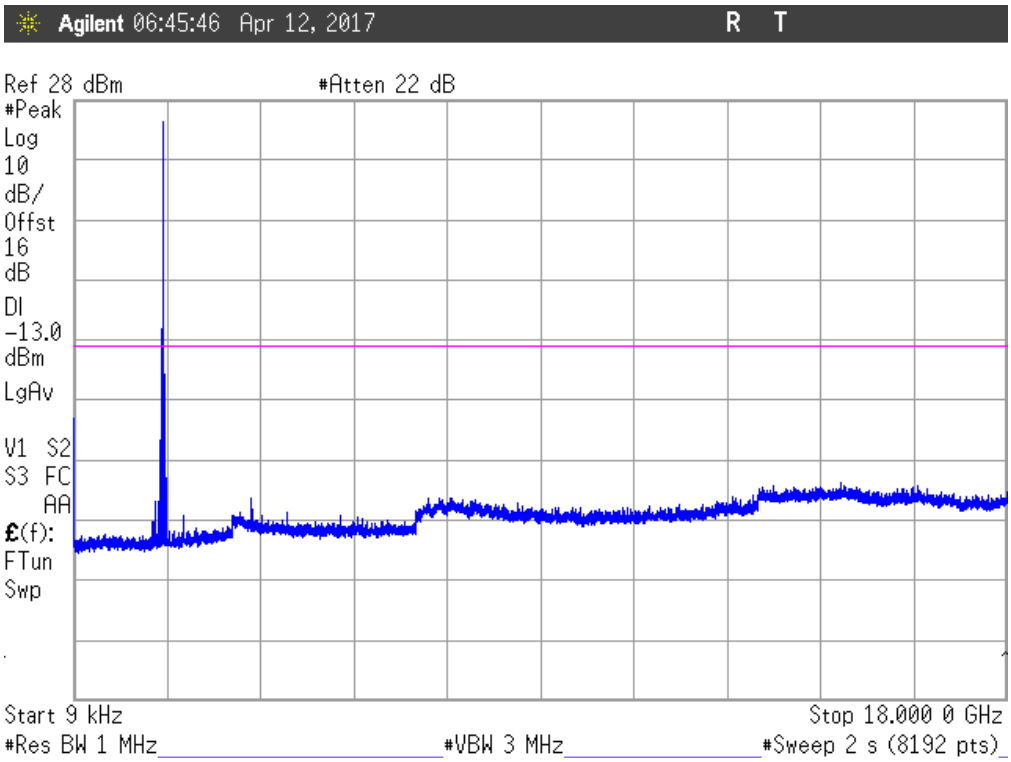
3. CHANNEL: HIGHEST



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

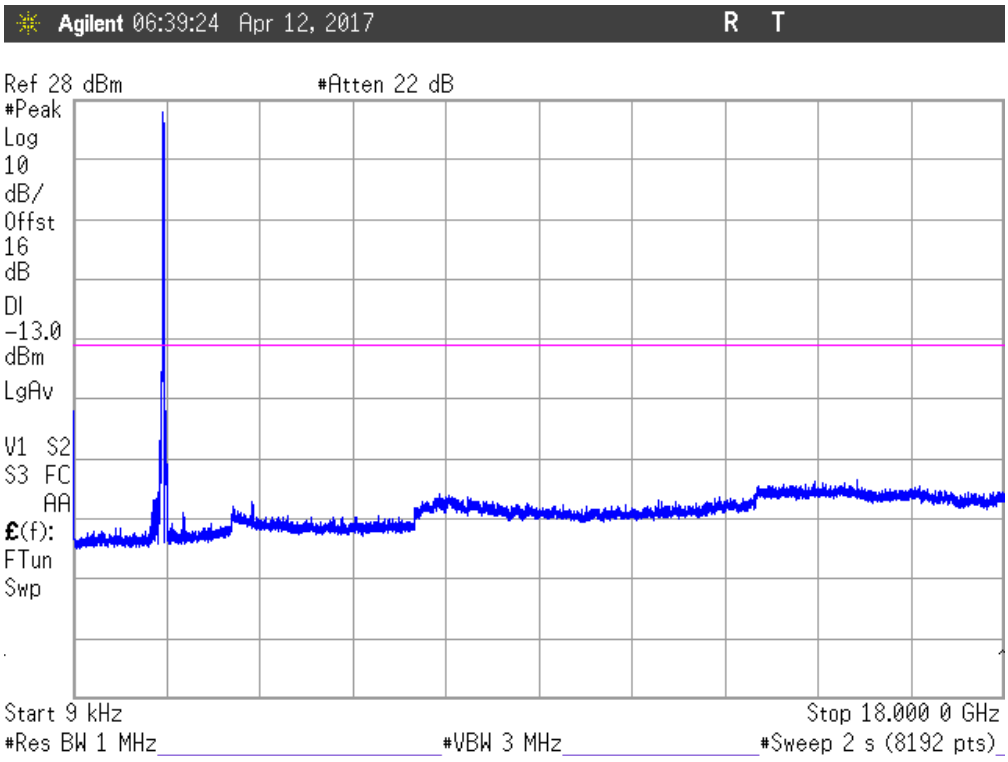
LTE BW = 15 MHz (Band IV)

1. CHANNEL: LOWEST



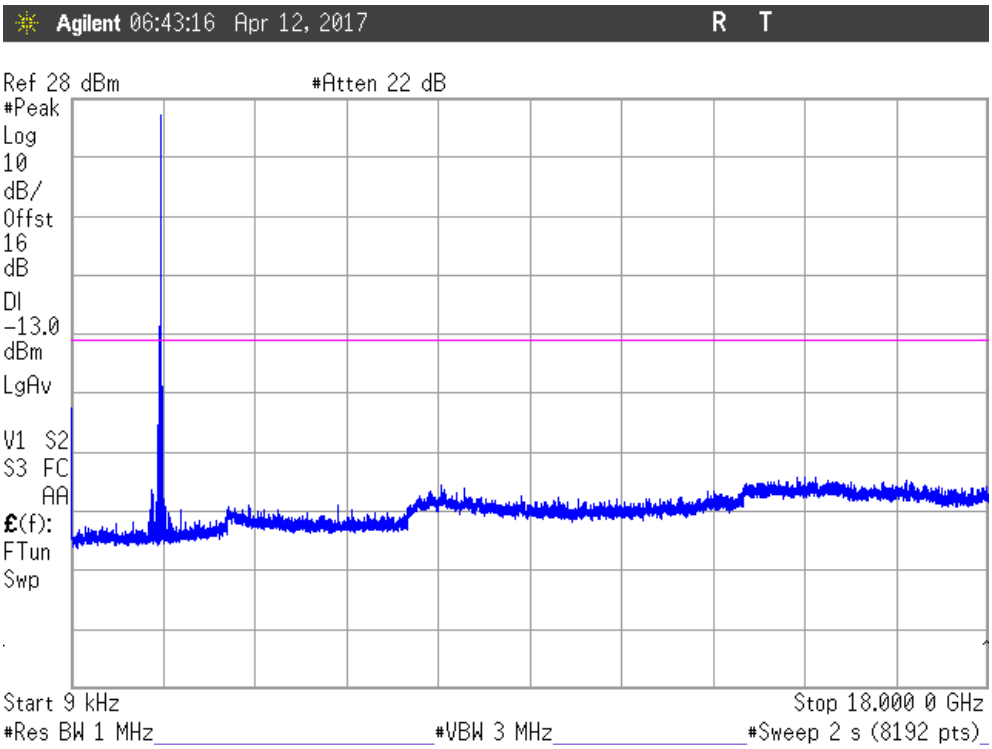
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

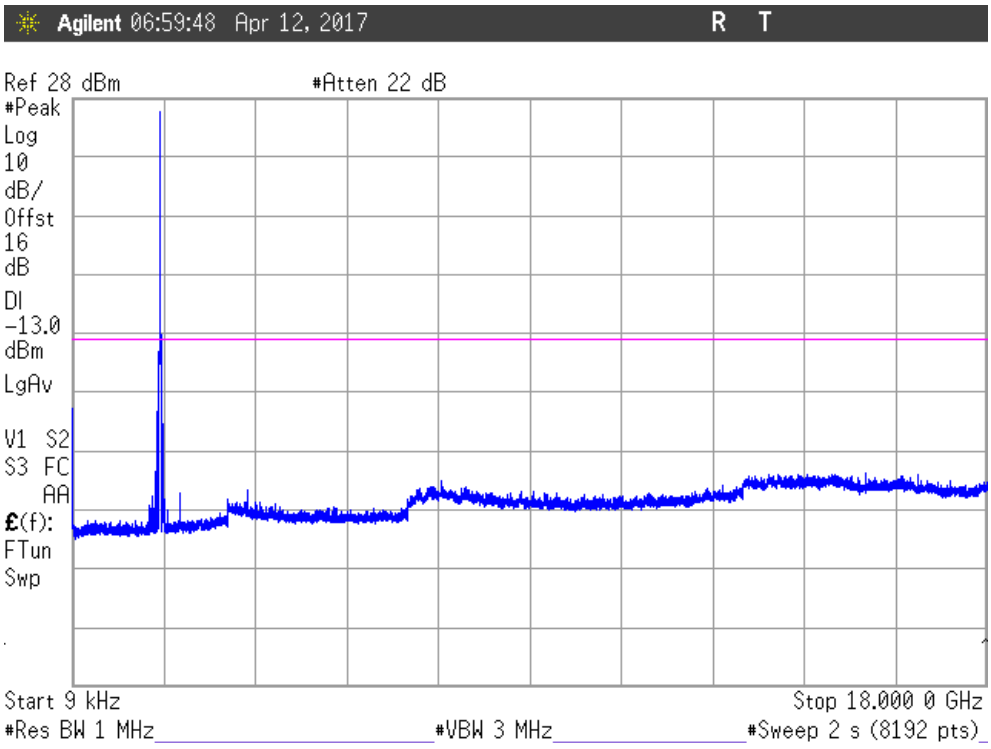
3. CHANNEL: HIGHEST



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

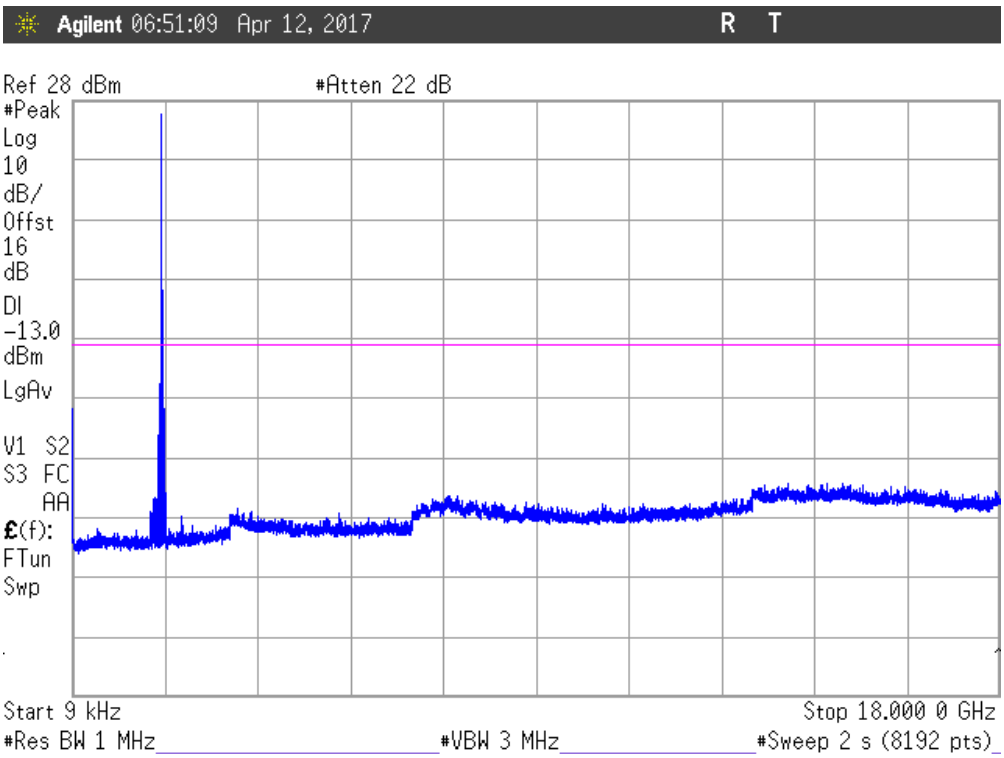
LTE BW = 20 MHz (Band IV)

1. CHANNEL: LOWEST



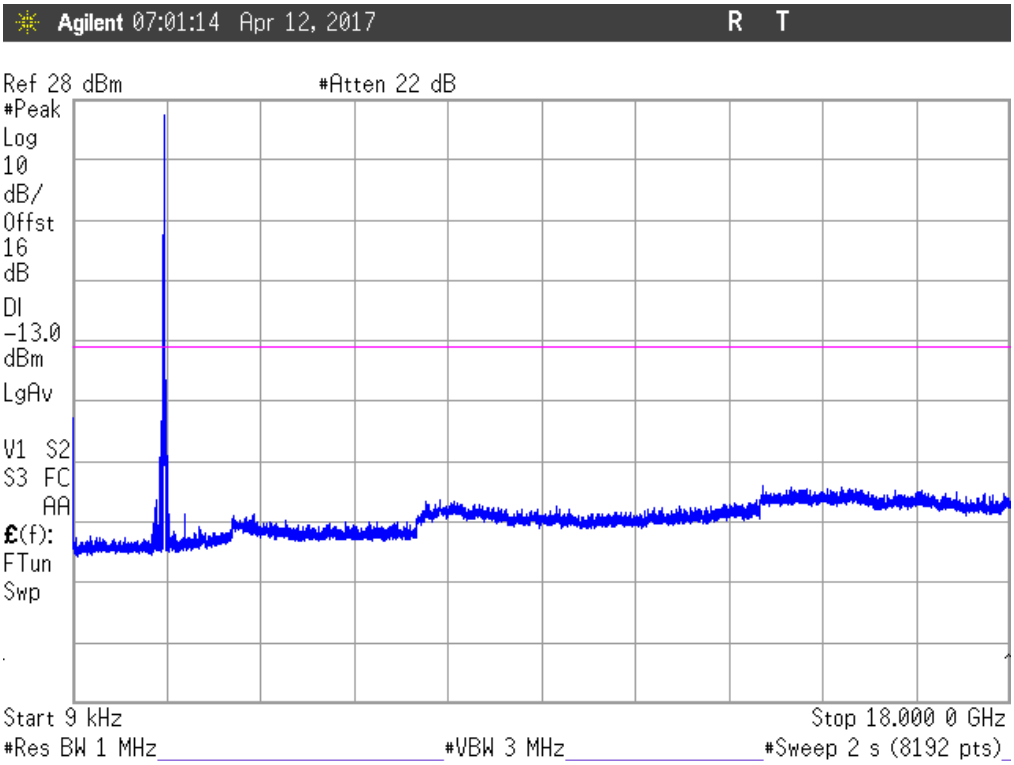
Note: The peak above the limit is the carrier frequency.

2. CHANNEL: MIDDLE



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

3. CHANNEL: HIGHEST

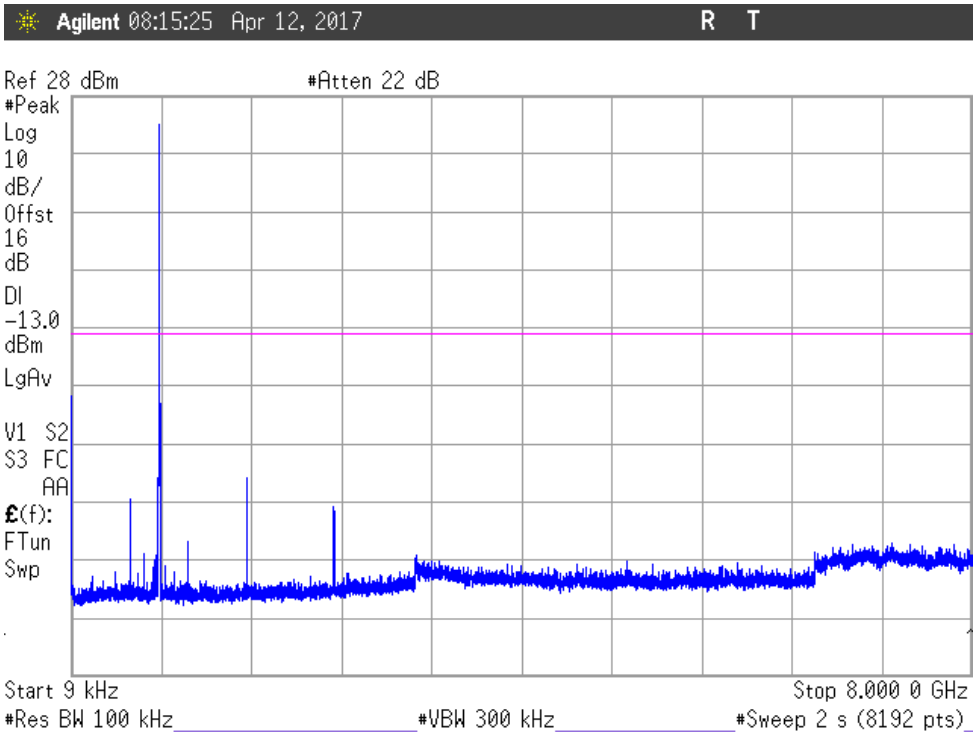


Note: The peak above the limit is the carrier frequency.

LTE BW = 5 MHz (Band XIII)

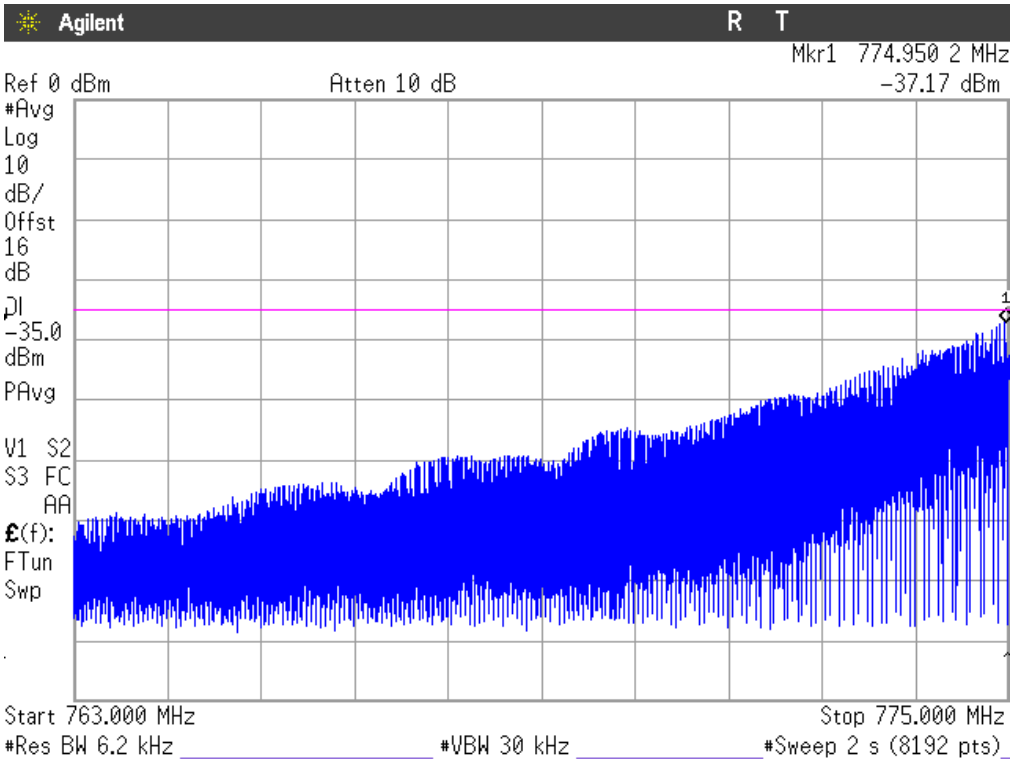
1. CHANNEL: LOWEST

Range 9 kHz – 8 GHz

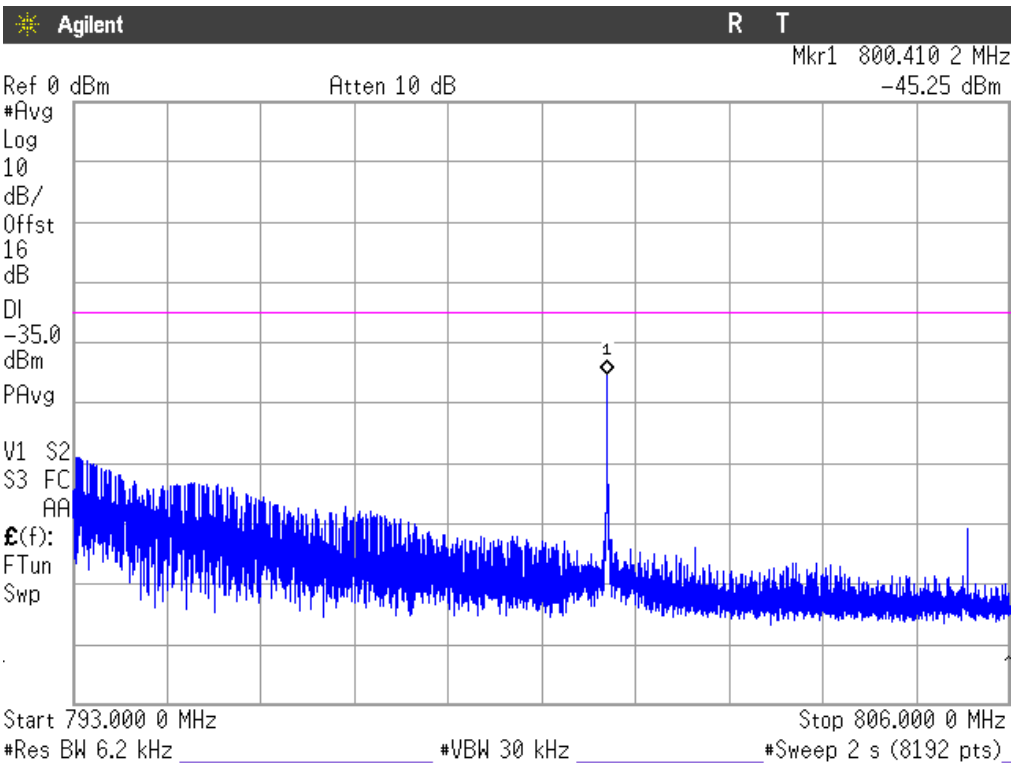


Note: The peak above the limit is the carrier frequency.

Range 763 MHz - 775 MHz

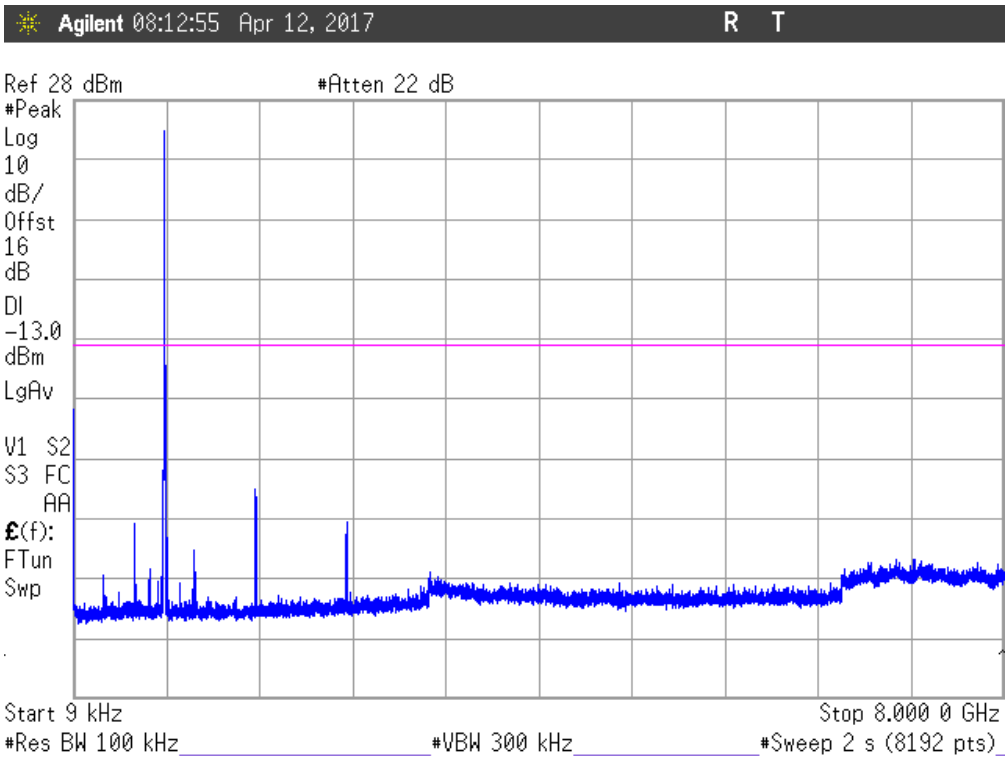


Range 793 MHz - 806 MHz



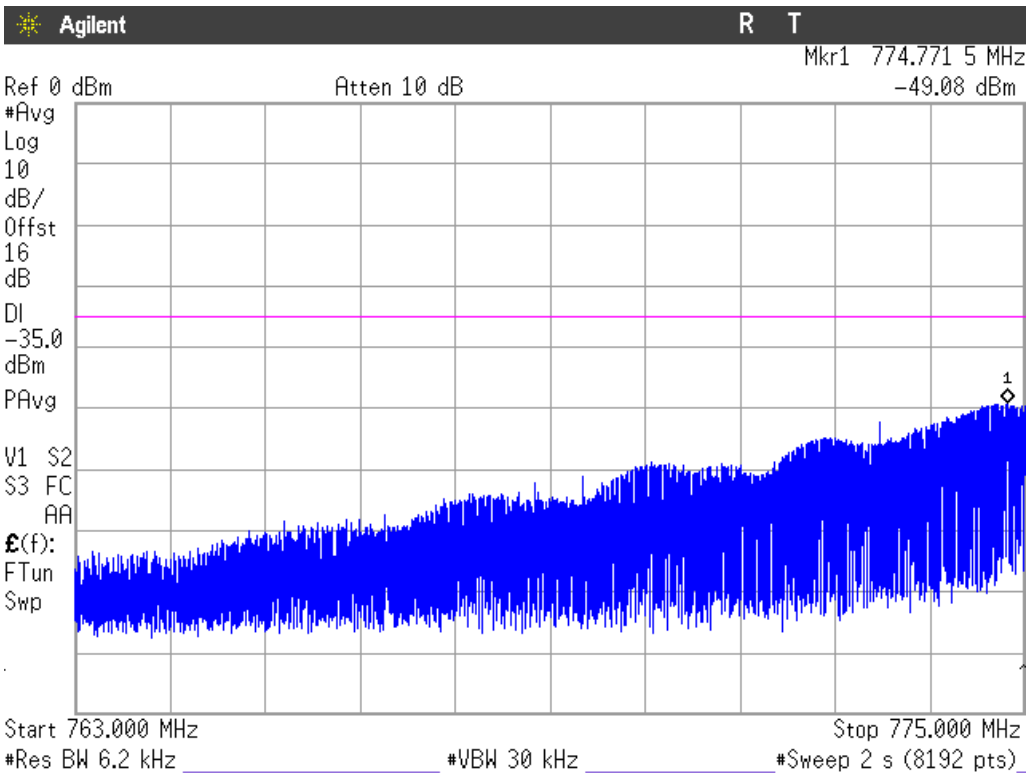
2. CHANNEL: MIDDLE

Range 9 kHz – 8 GHz

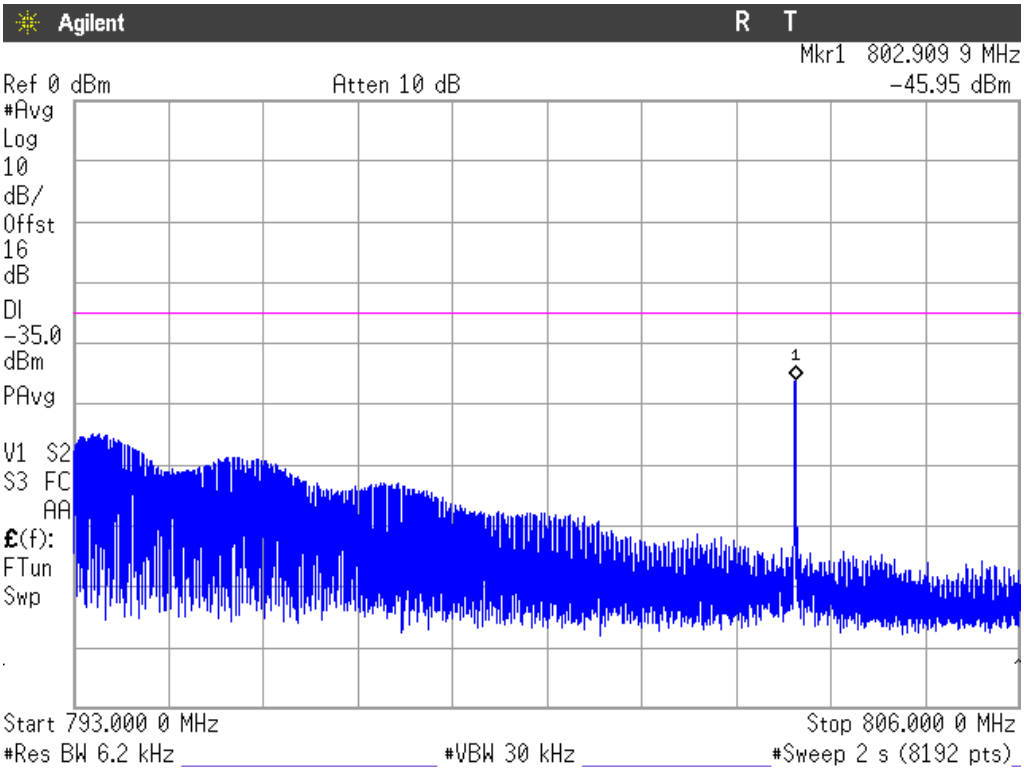


Note: The peak above the limit is the carrier frequency.

Range 763 MHz - 775 MHz

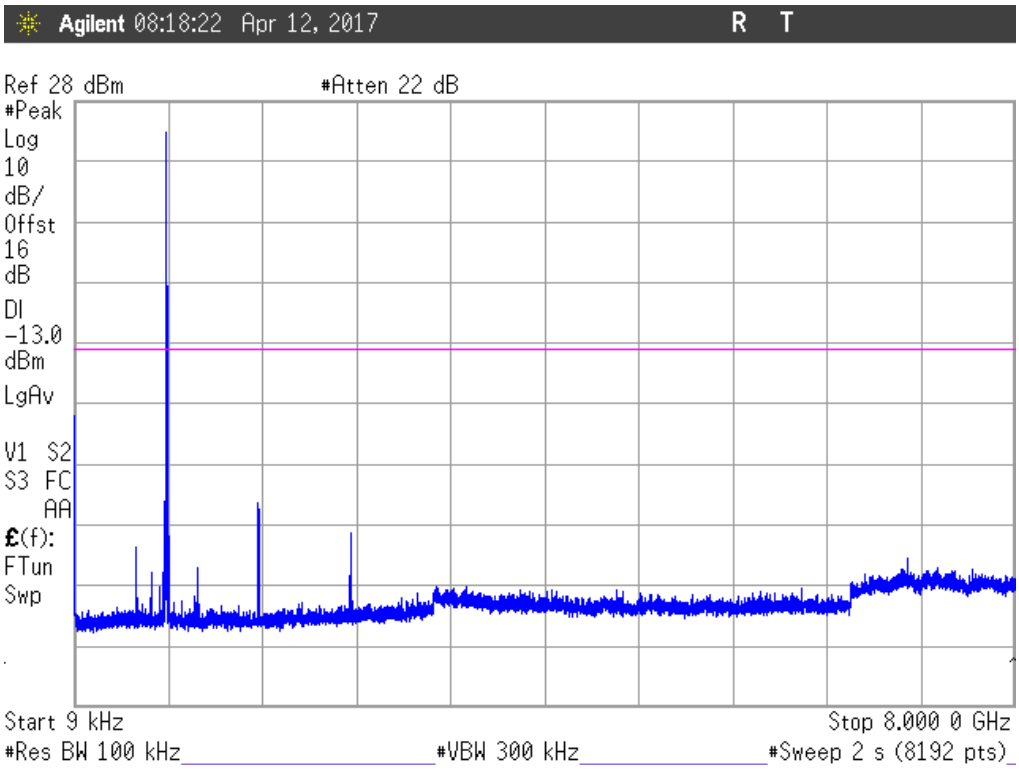


Range 793 MHz - 806 MHz



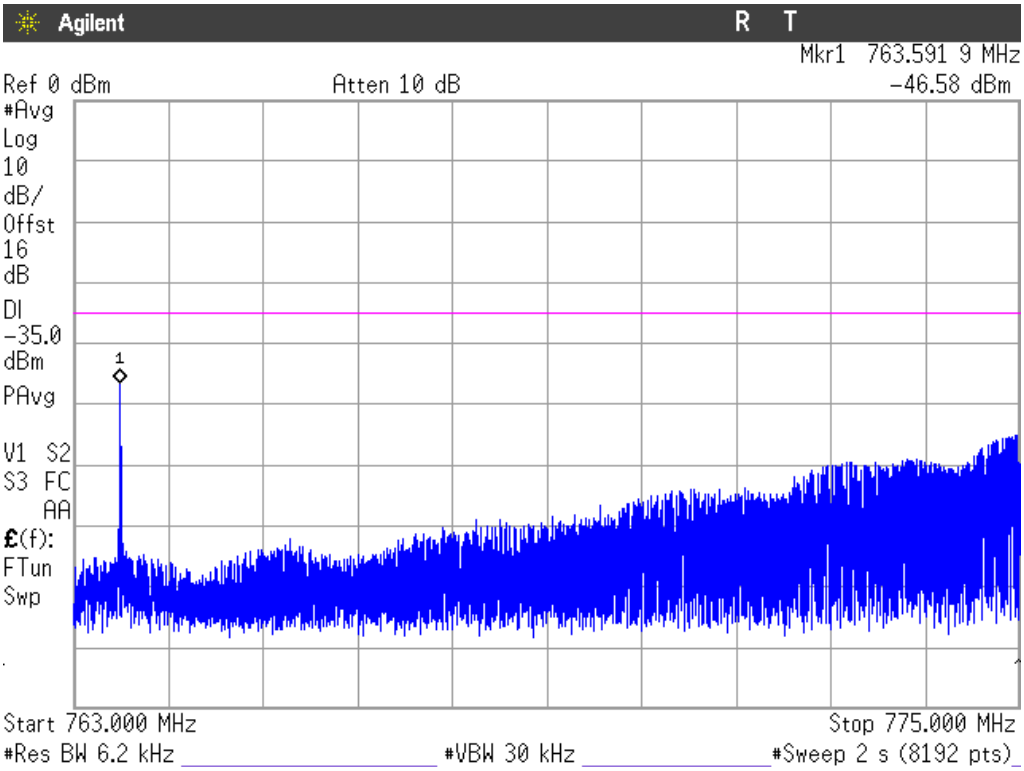
3. CHANNEL: HIGHEST

Range 9 kHz – 8 GHz

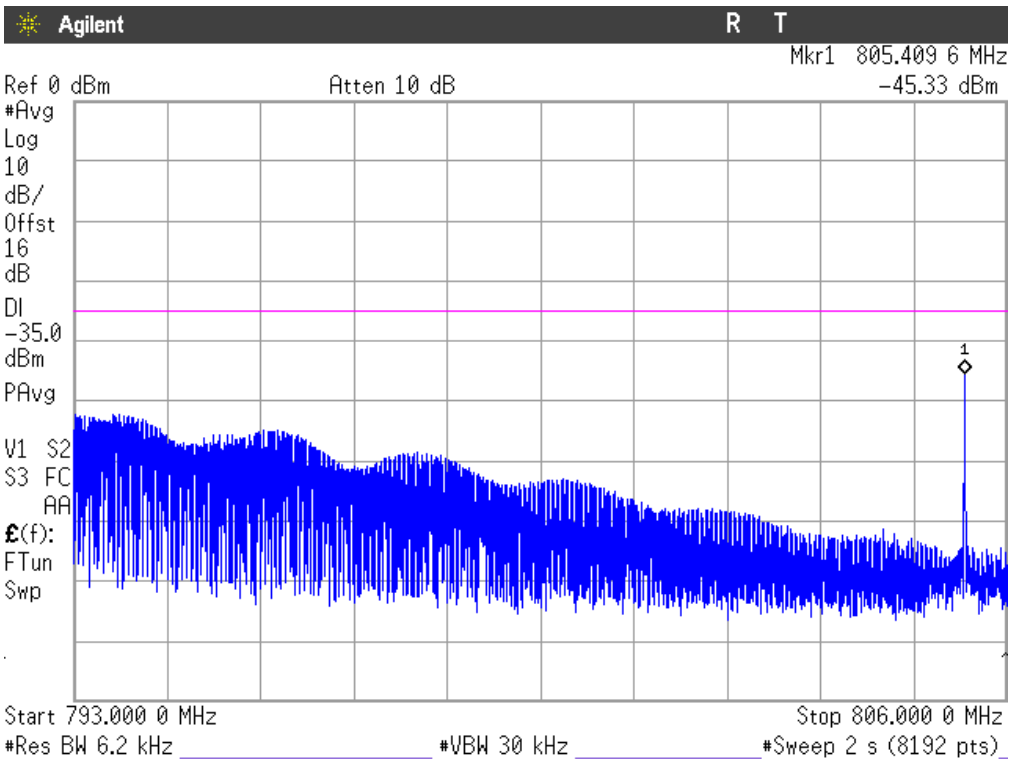


Note: The peak above the limit is the carrier frequency.

Range 763 MHz - 775 MHz



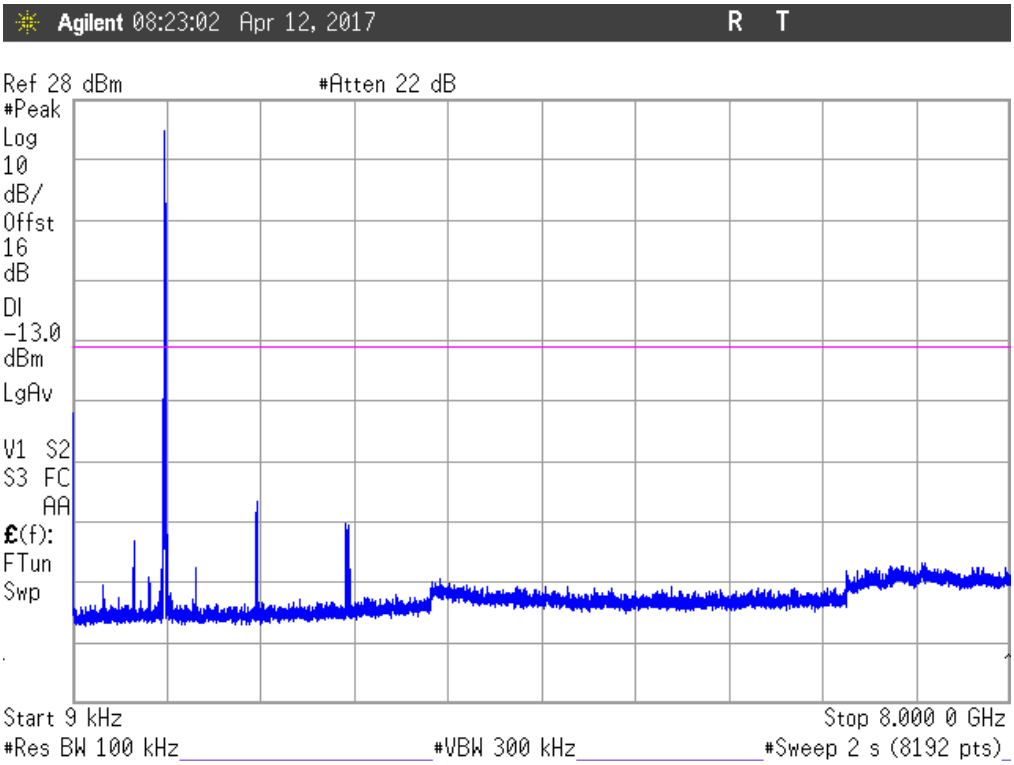
Range 793 MHz - 806 MHz



LTE BW = 10 MHz (Band XIII)

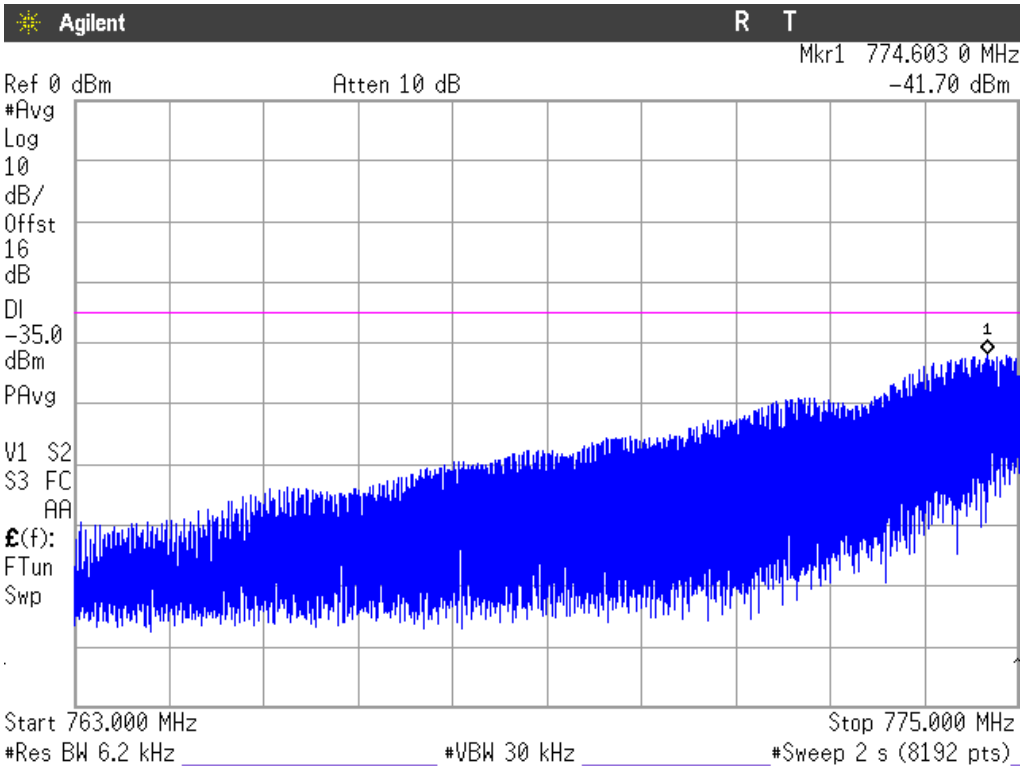
1. CHANNEL: MIDDLE

Range 9 kHz – 8 GHz

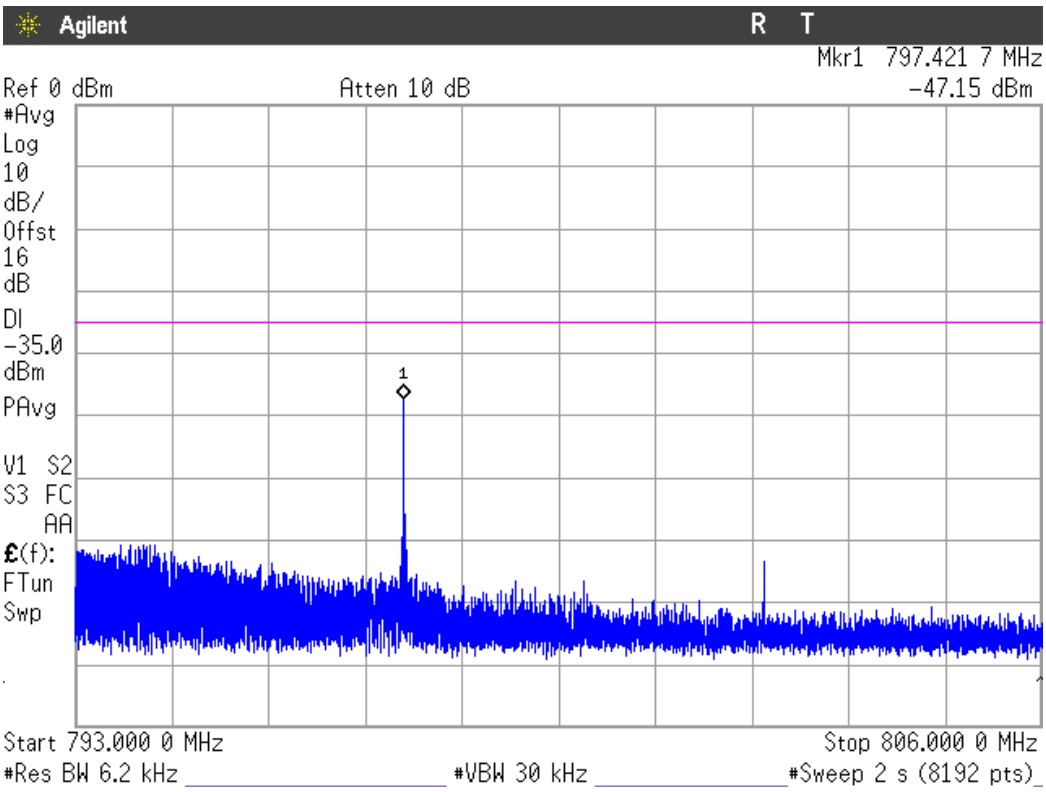


Note: The peak above the limit is the carrier frequency.

Range 763 MHz - 775 MHz



Range 793 MHz - 806 MHz



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 Po transmitting power. the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative Po becomes:
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = -13 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.

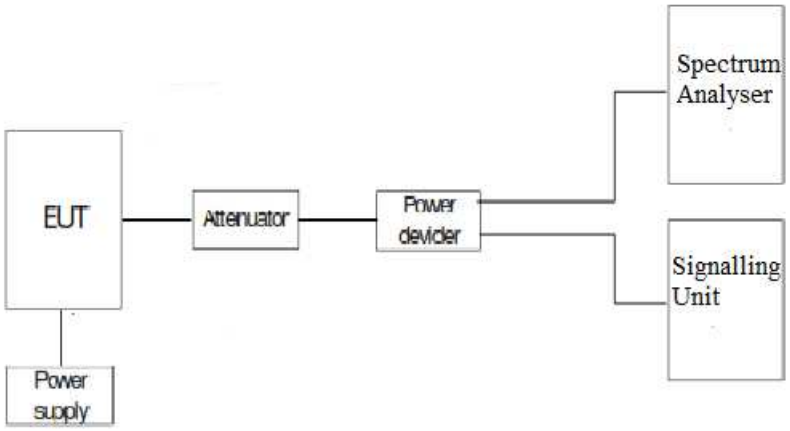
The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

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 XIII, as indicated in FCC part 27.53 (c) (5) /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)	-26.47	-32.35	-29.13	-35.08	-39.7	-41.19

(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)	-27.94	-31.12	-28.32	-33.96	-36.91	-40.01

(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)	-24.28	-31.22	-29.33	-33.15	-39.56	-39.34

(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)	-28.88	-31.03	-28.1	-32.65	-35.48	-41.03

(Channels in Band XIII):	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)	-21.03	-26.30

(Channels in Band XIII):	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)	-24.31	-26.25

(Channels in Band XIII):	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)	-20.66	-24.73

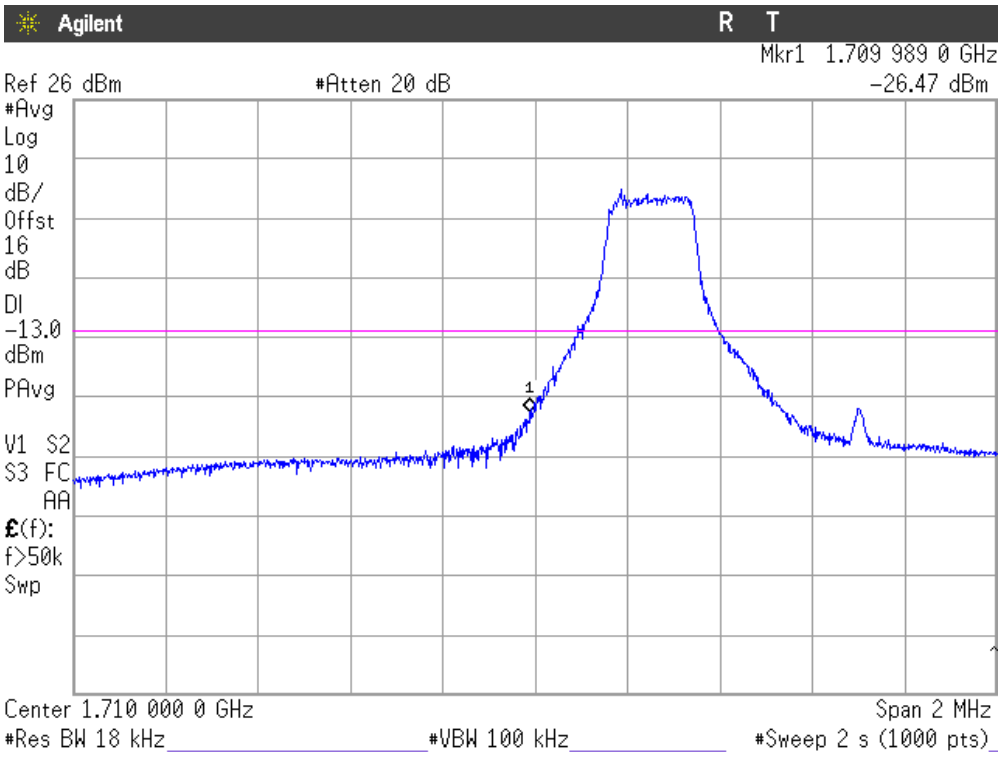
(Channels in Band XIII):	RB= All, Offset =0, Narrow band = 4 BW = 5 MHz	RB= All, Offset =0, Narrow band = 8 BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-22.62	-25.16

Measurement uncertainty = <±2.03 dB.

Verdict: PASS

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

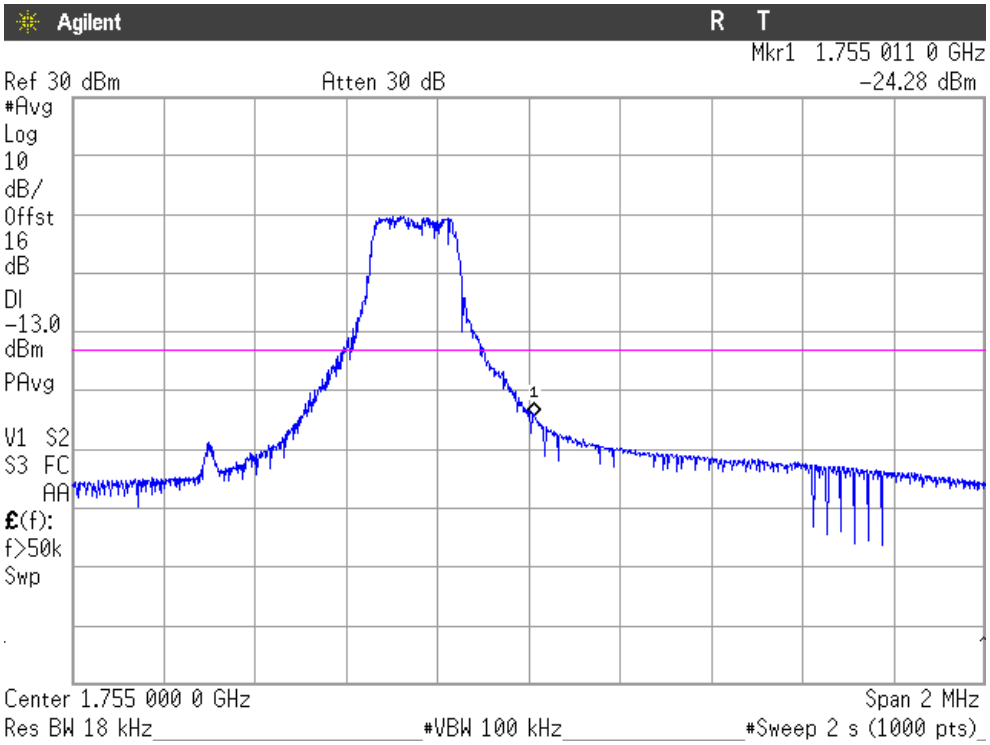
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

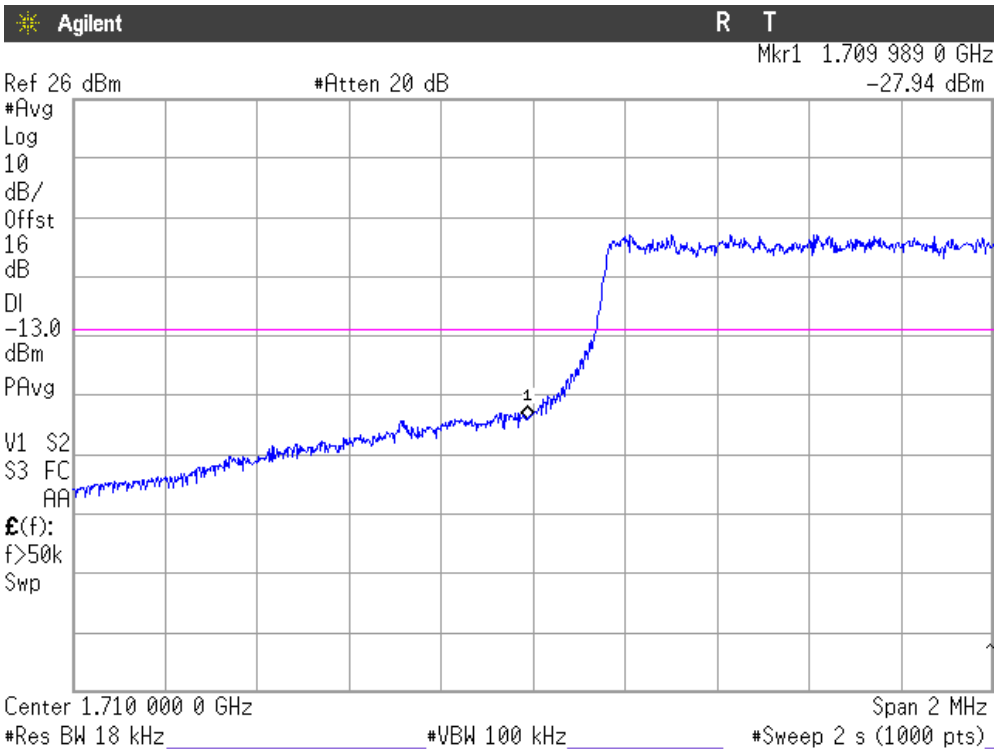
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

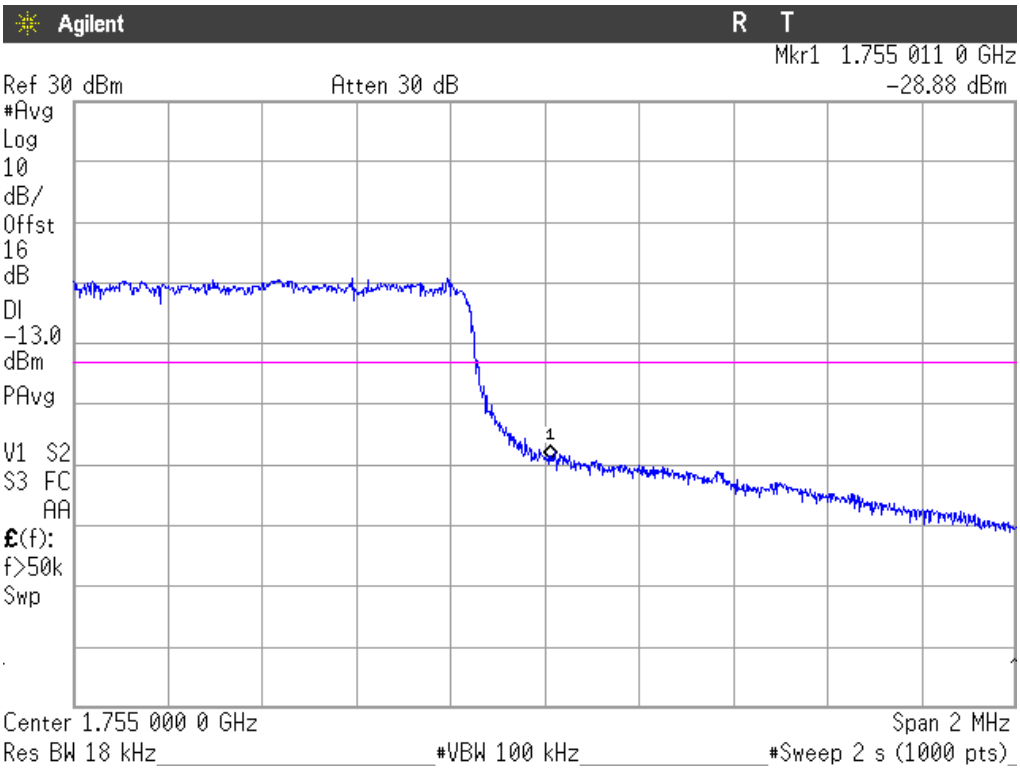
Narrow band = 1. RB = All. Offset = 0. BW = 1.4 MHz (Band IV)

CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST

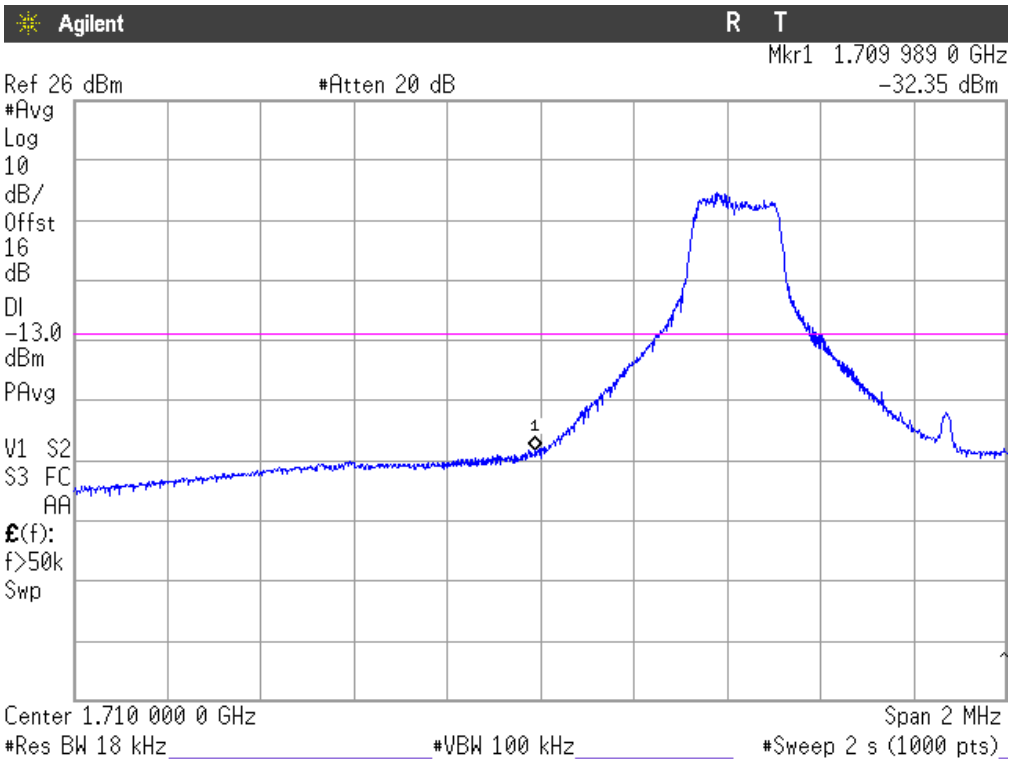


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

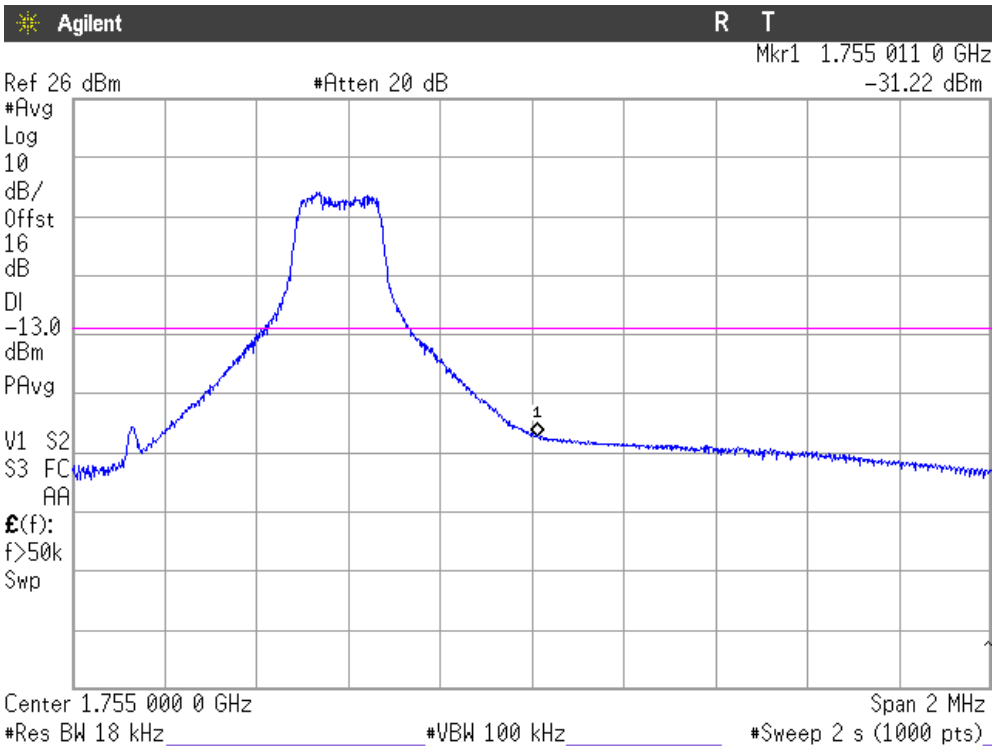
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

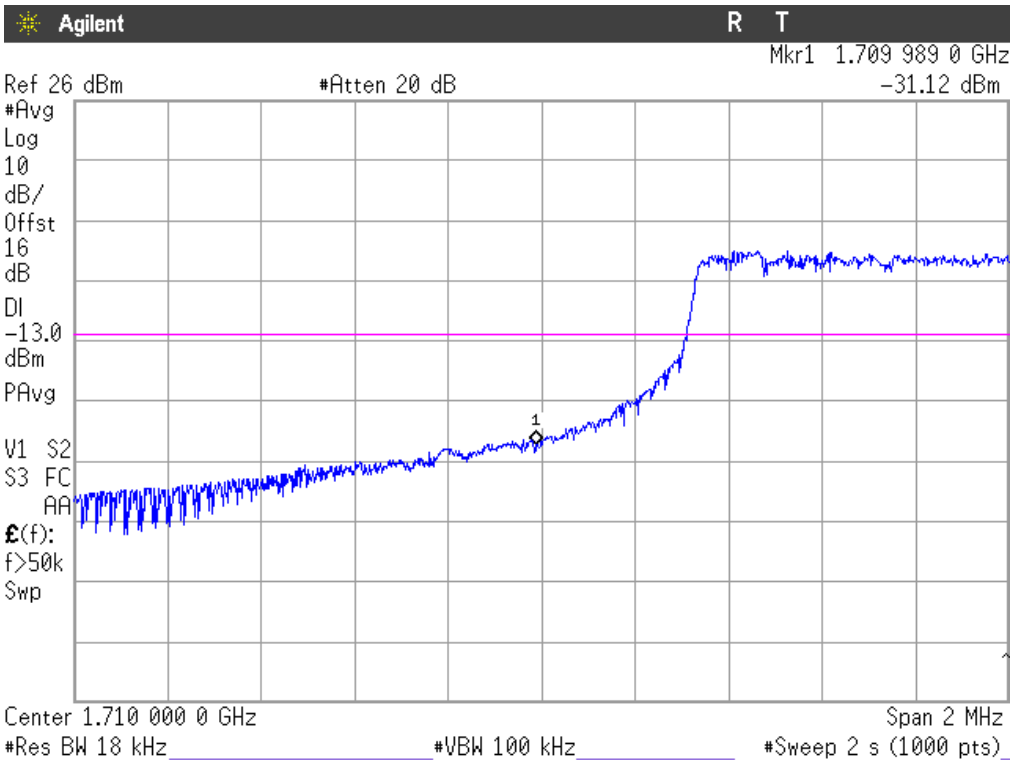
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

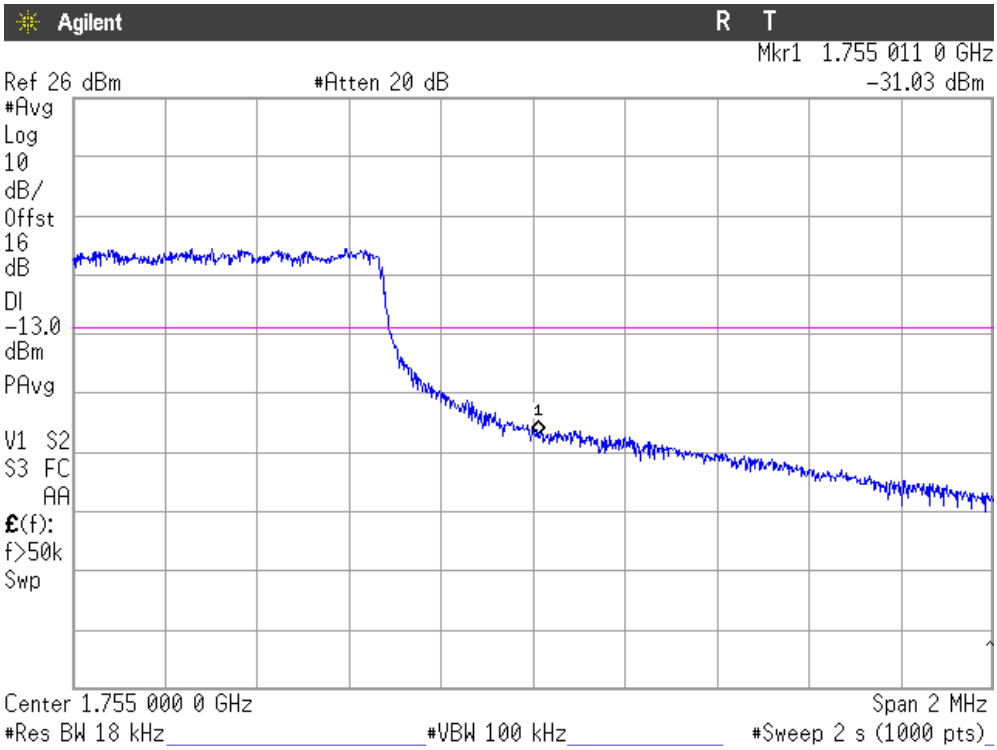
RB = All. Offset = 0. BW = 3 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 2.

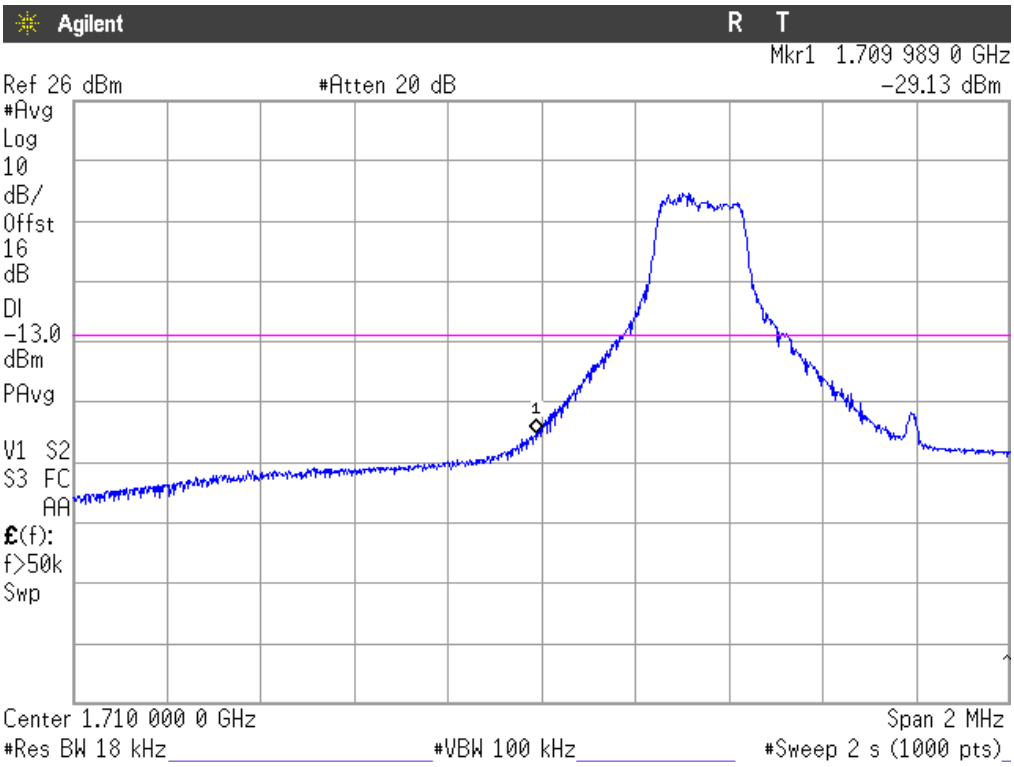


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

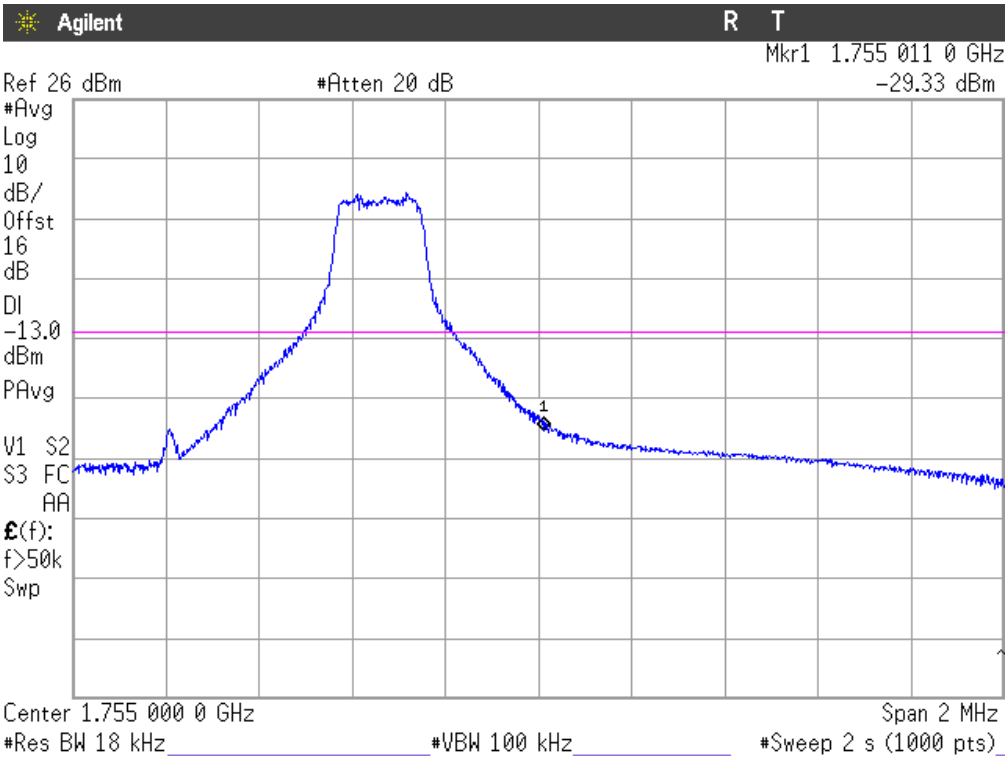
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

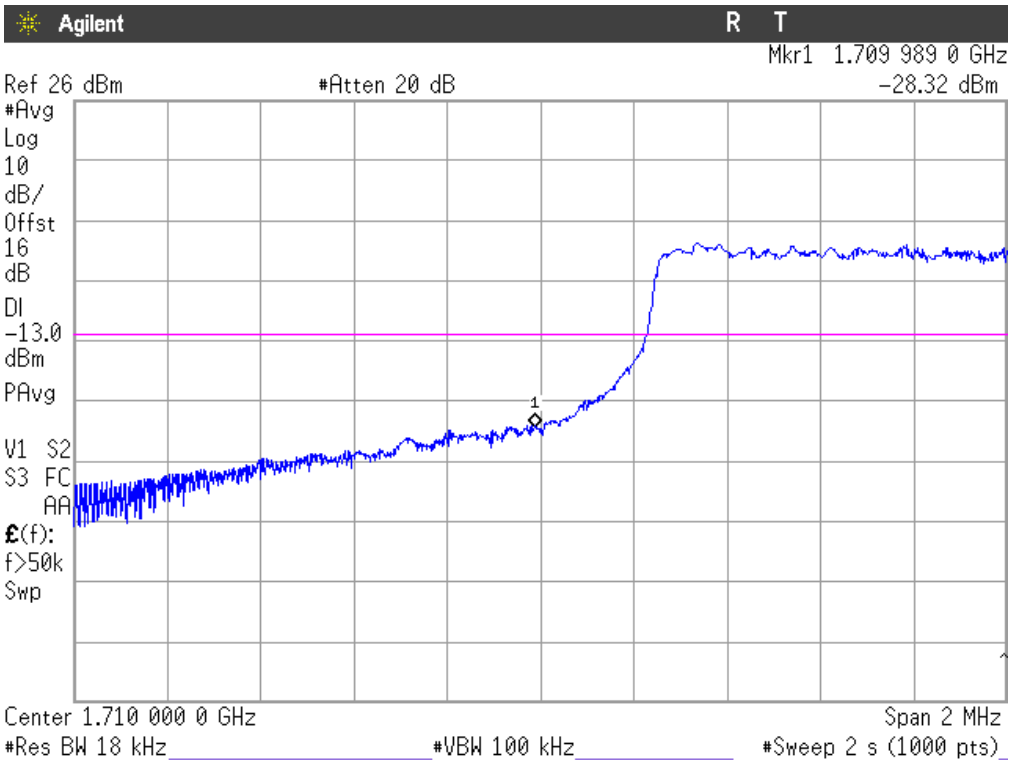
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

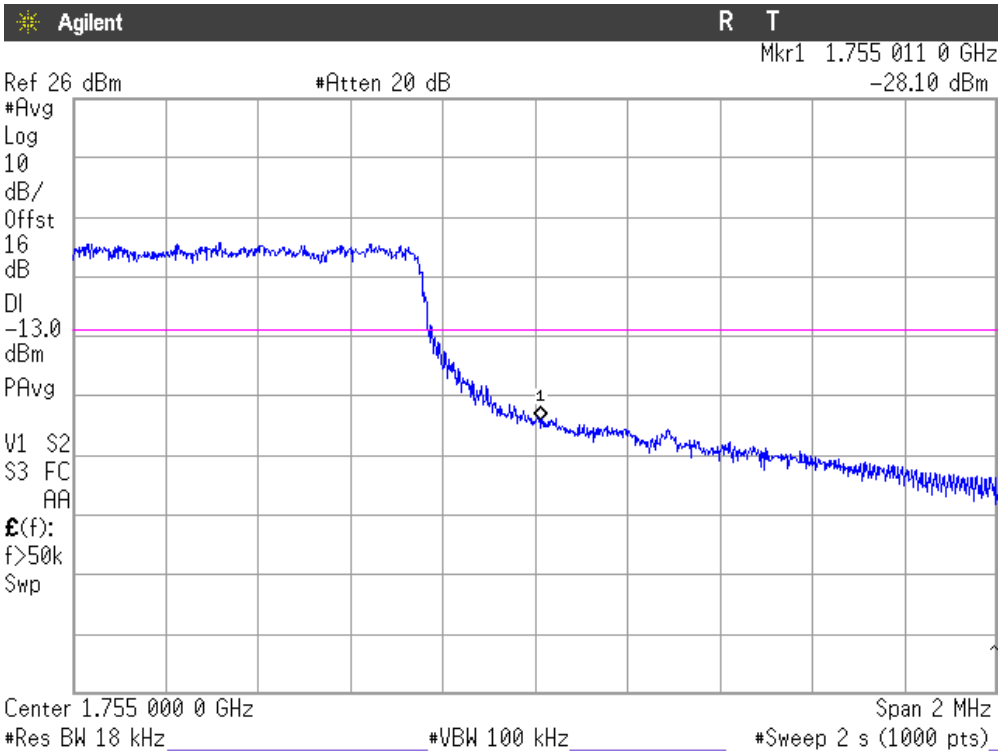
RB = All. Offset = 0. BW = 5 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 4.

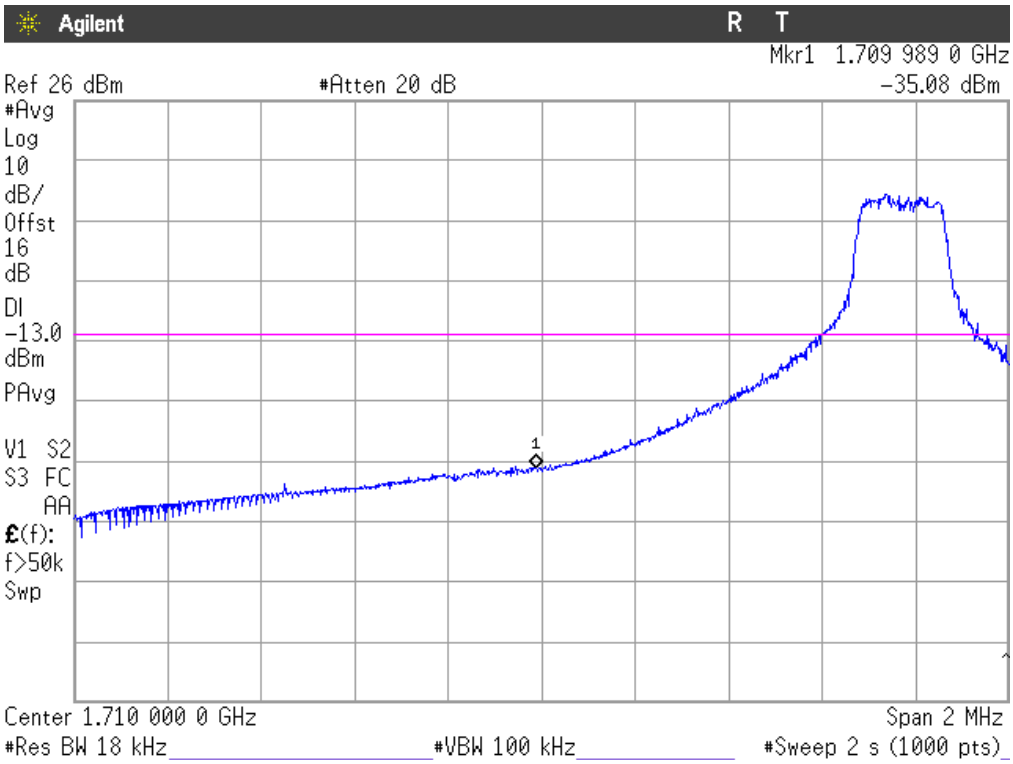


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

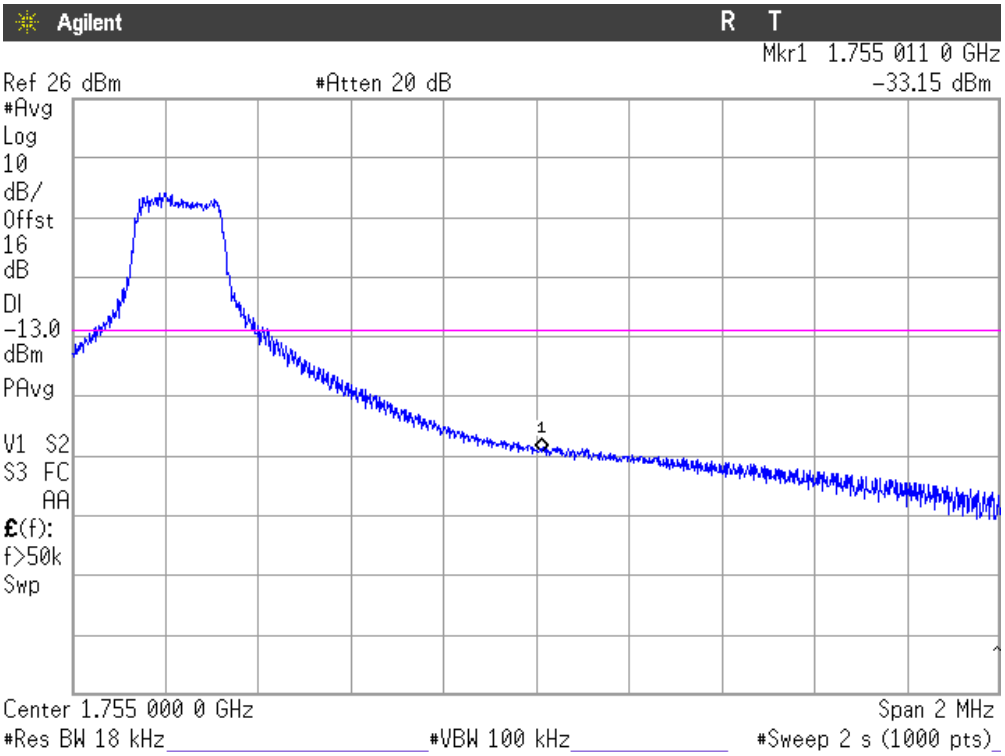
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

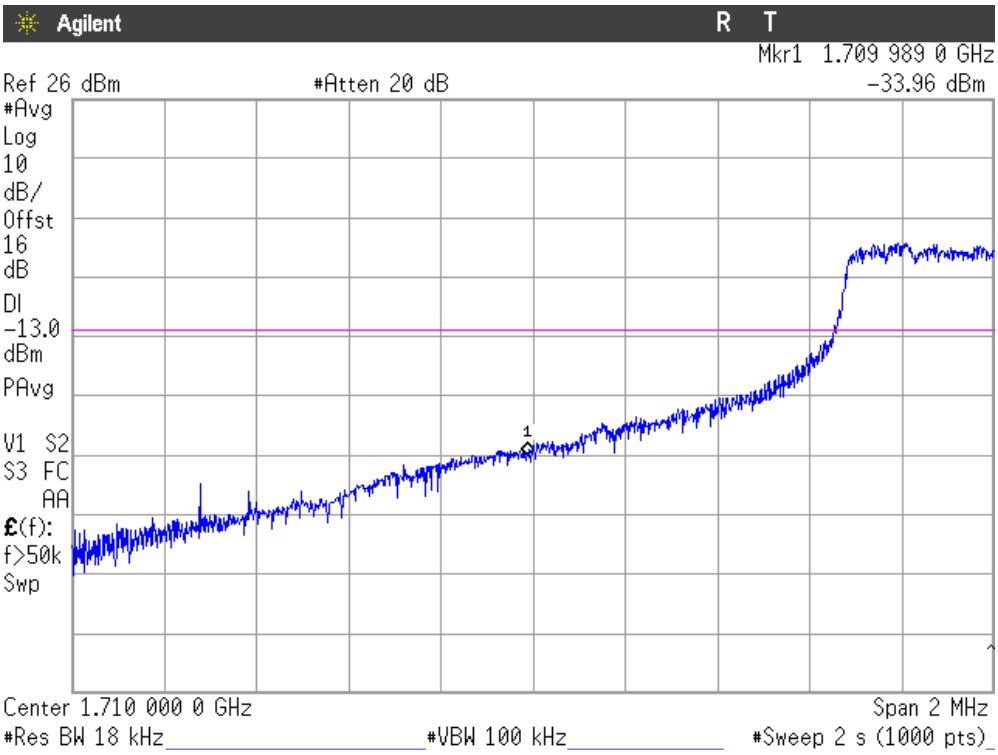
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

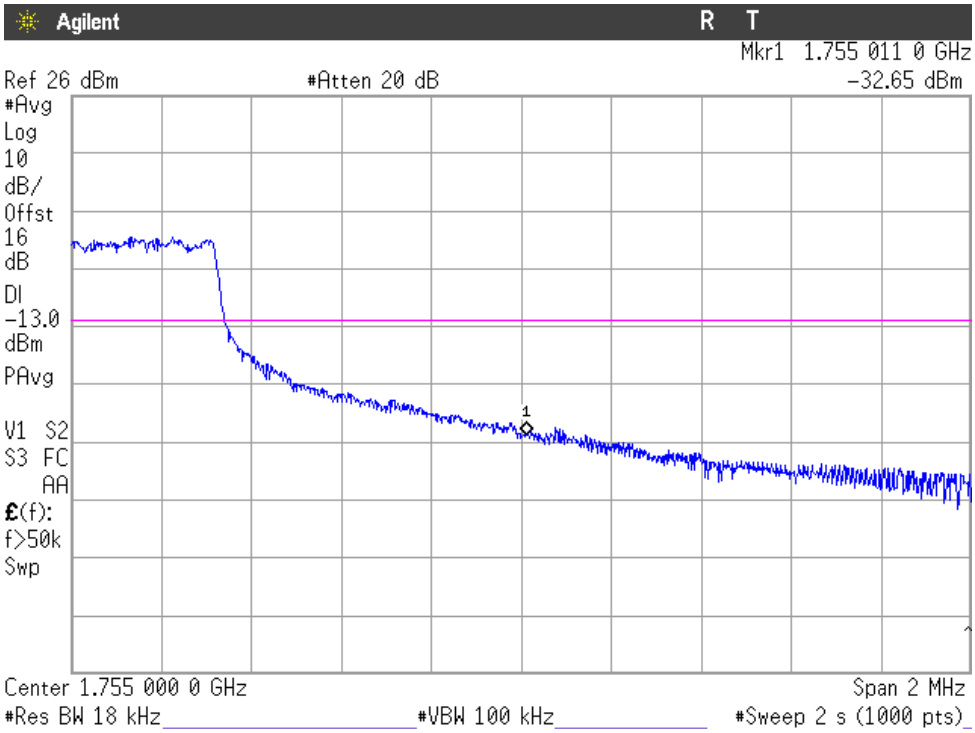
RB = All. Offset = 0. BW = 10 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 8.

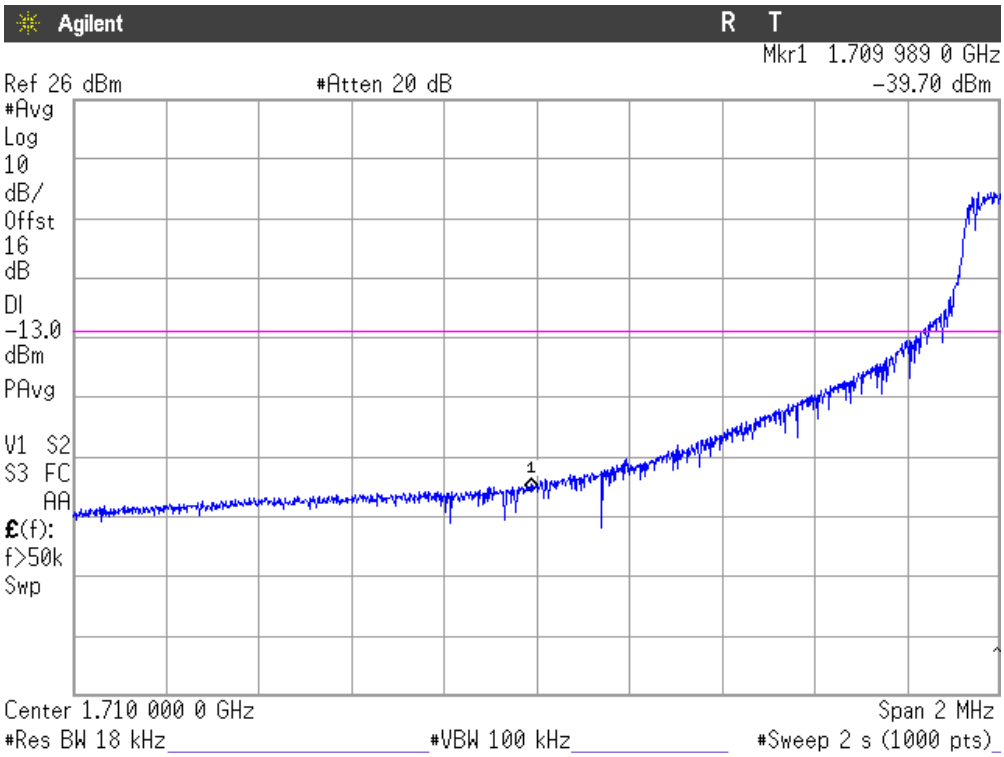


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

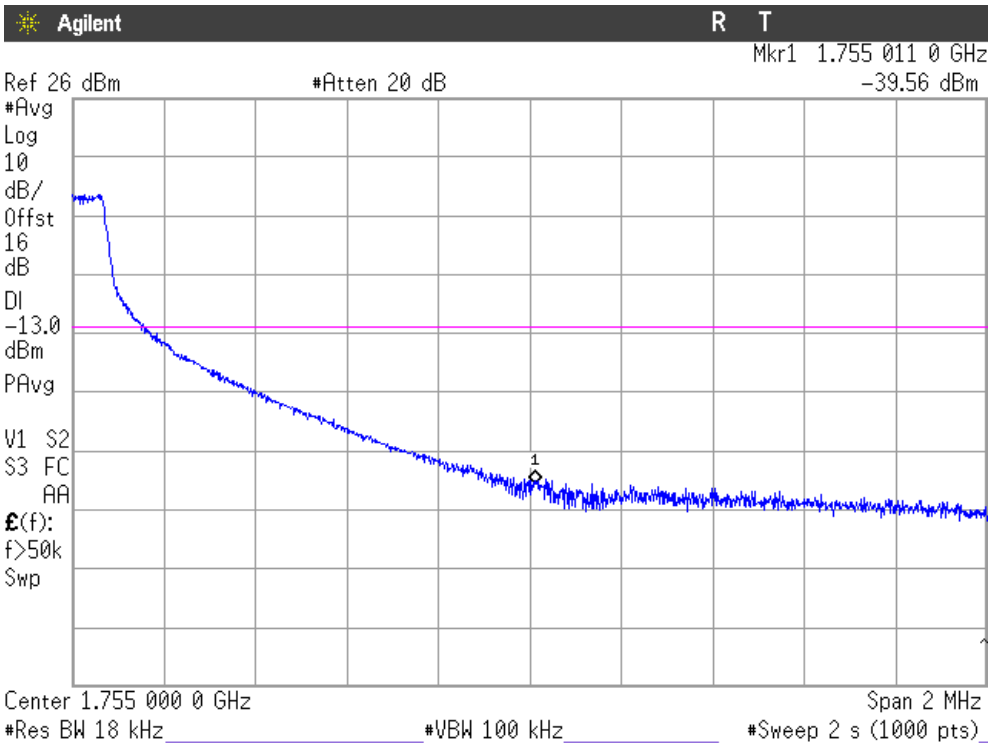
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

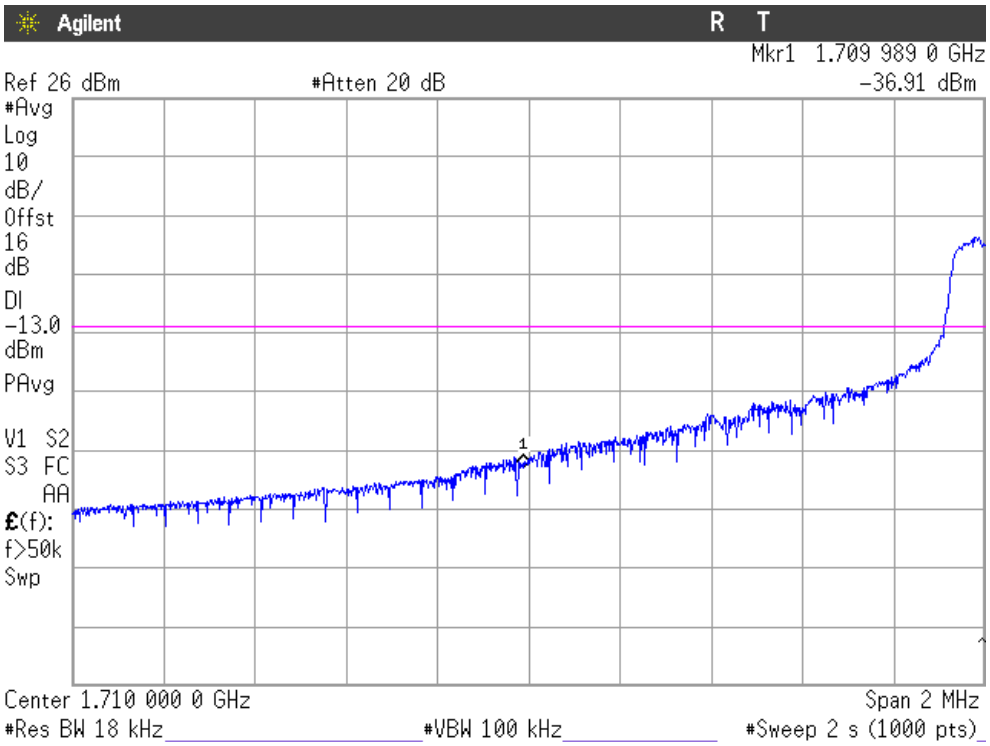
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

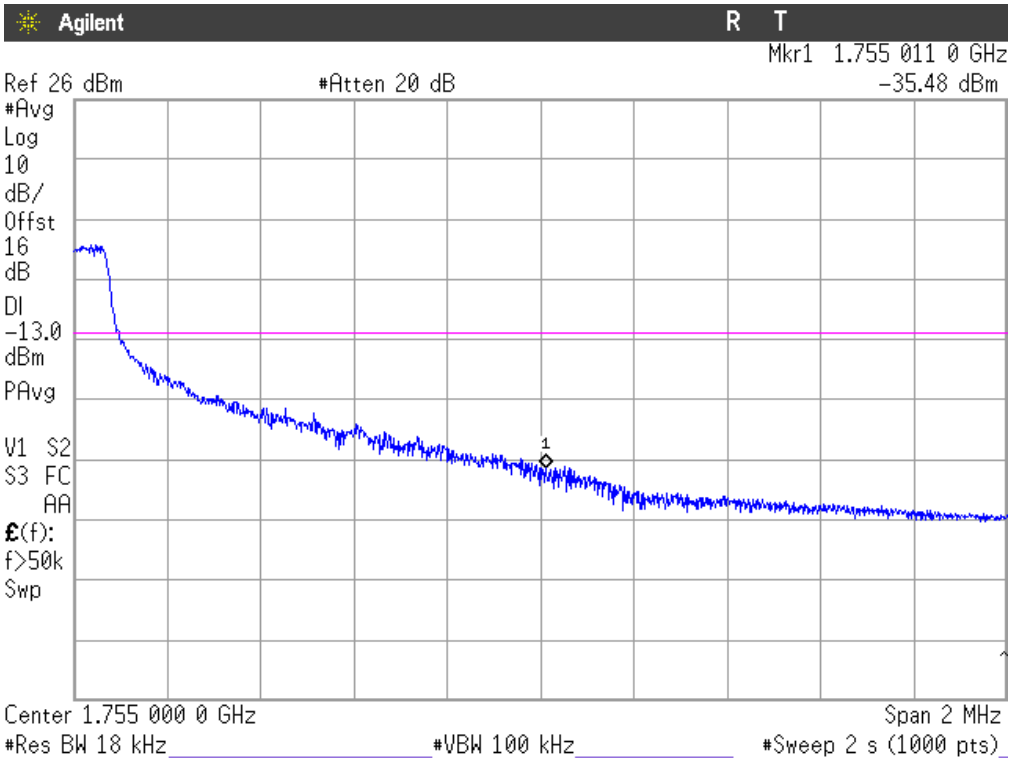
RB = All. Offset = 0. BW = 15 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 12.

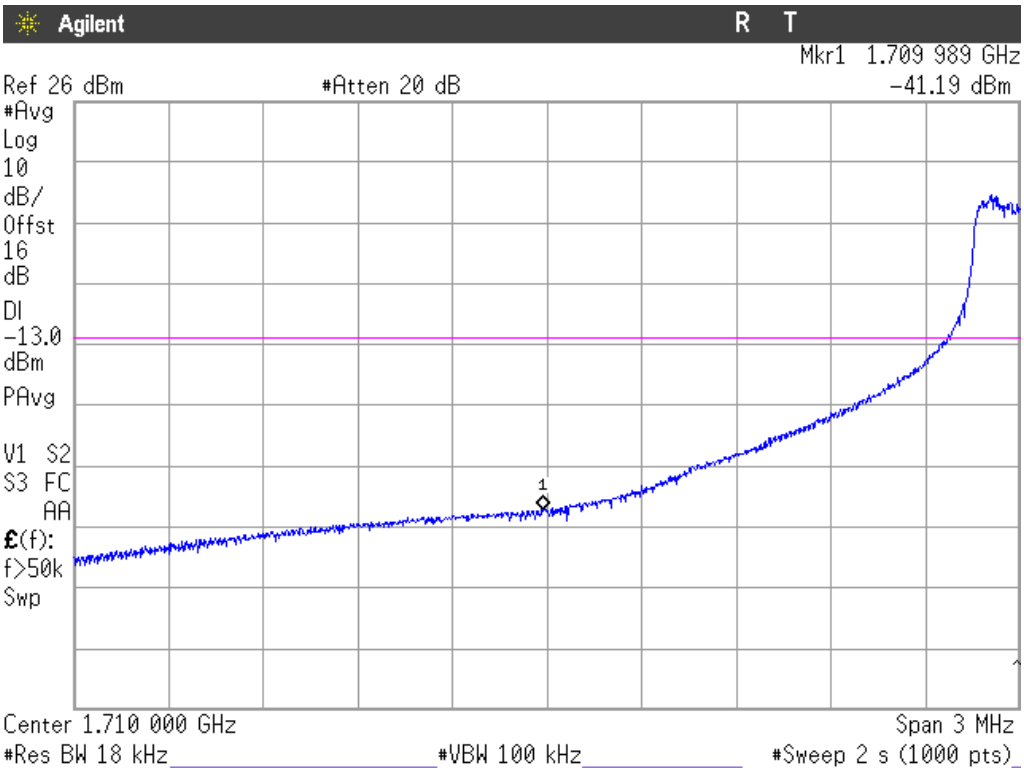


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

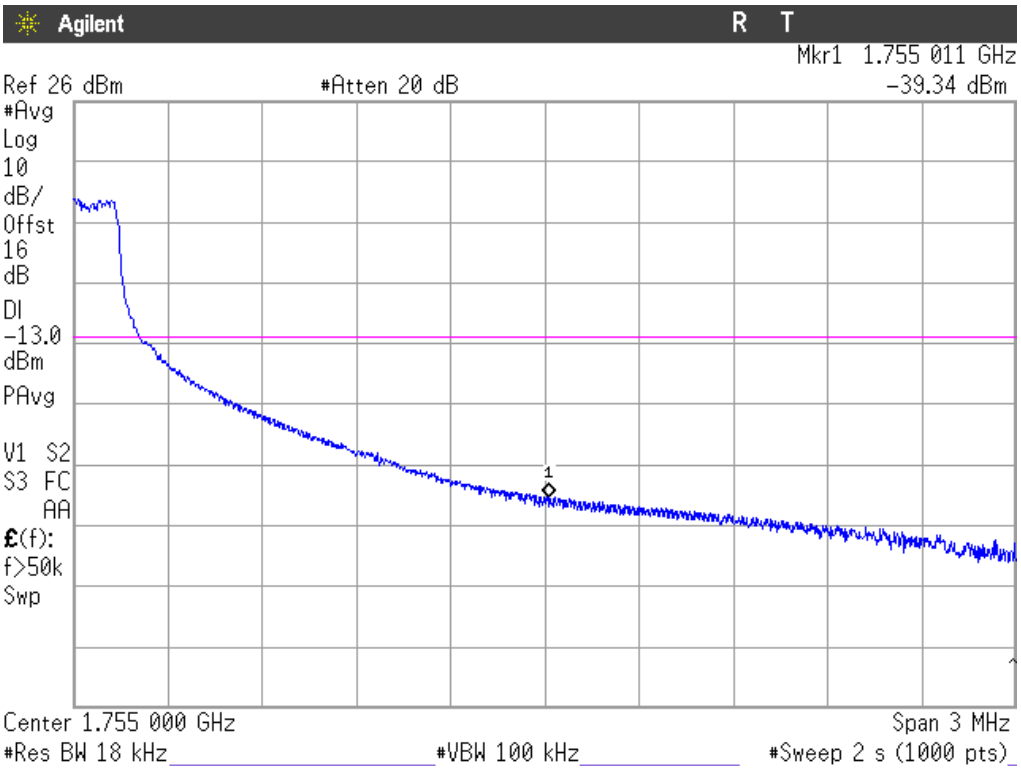
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

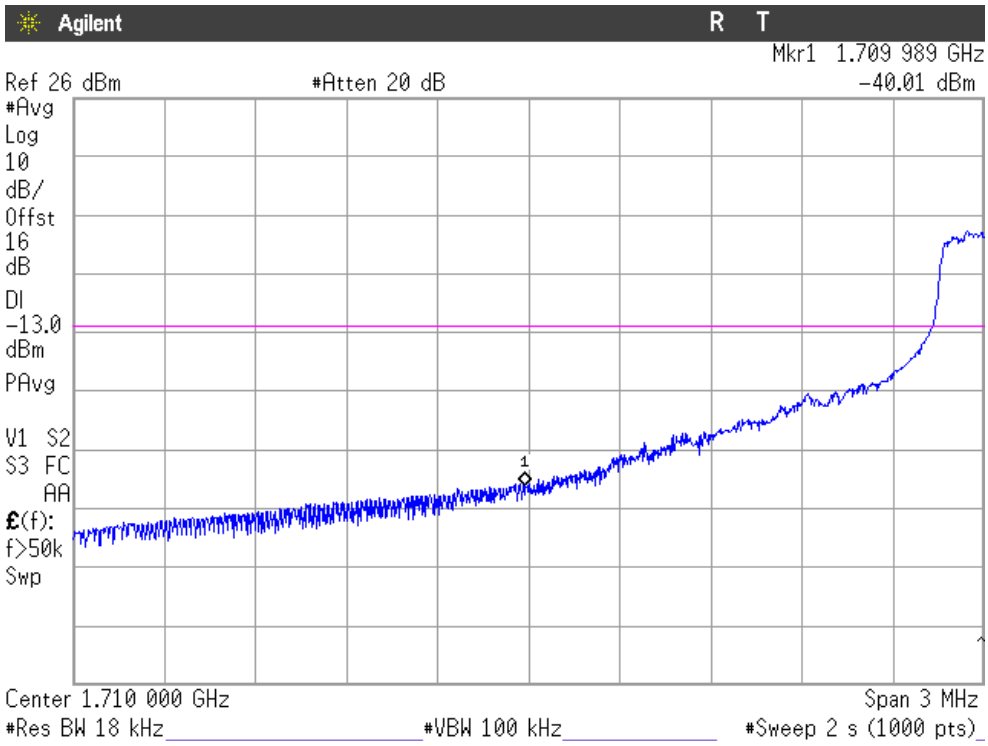
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

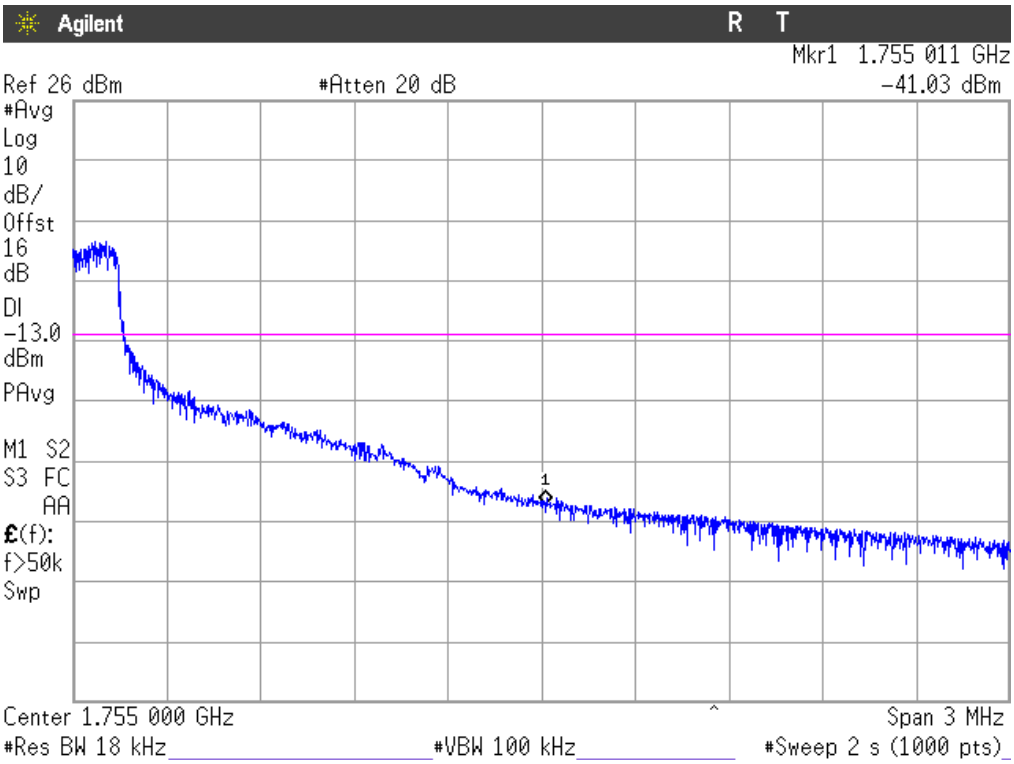
RB = All. Offset = 0. BW = 20 MHz (Band IV)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 16.

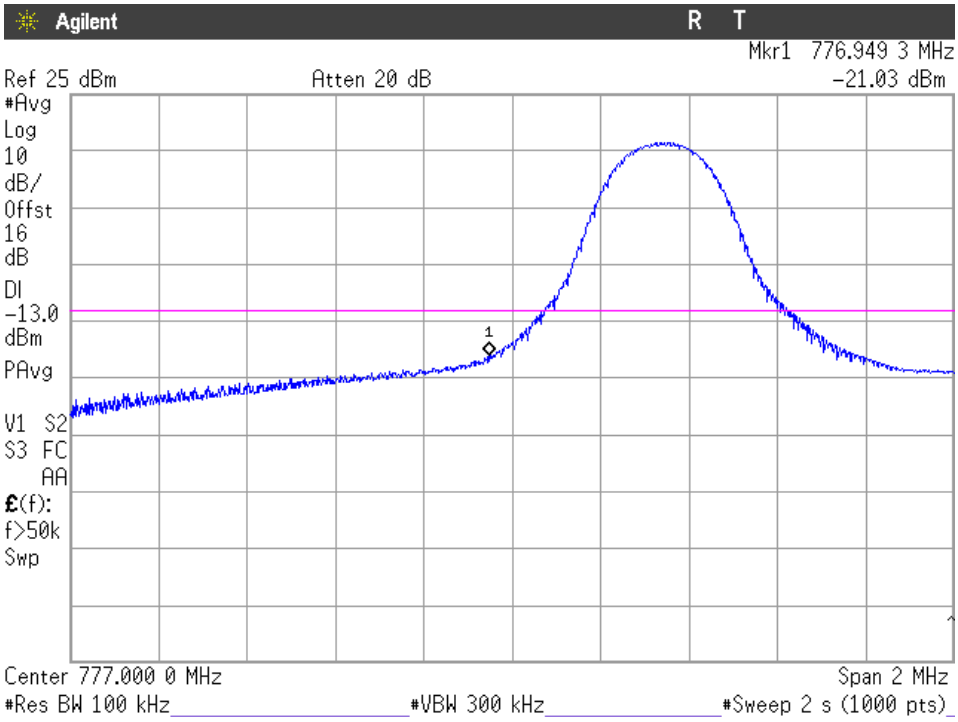


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

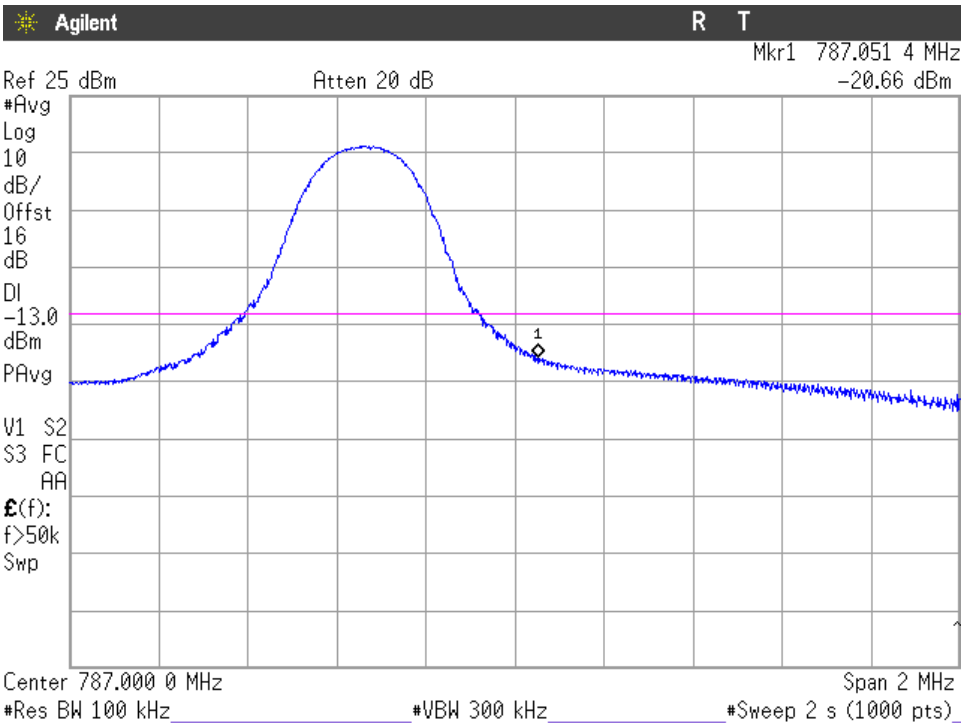
CHANNEL LOWEST



NOTE: The equipment transmits at the maximum output power

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

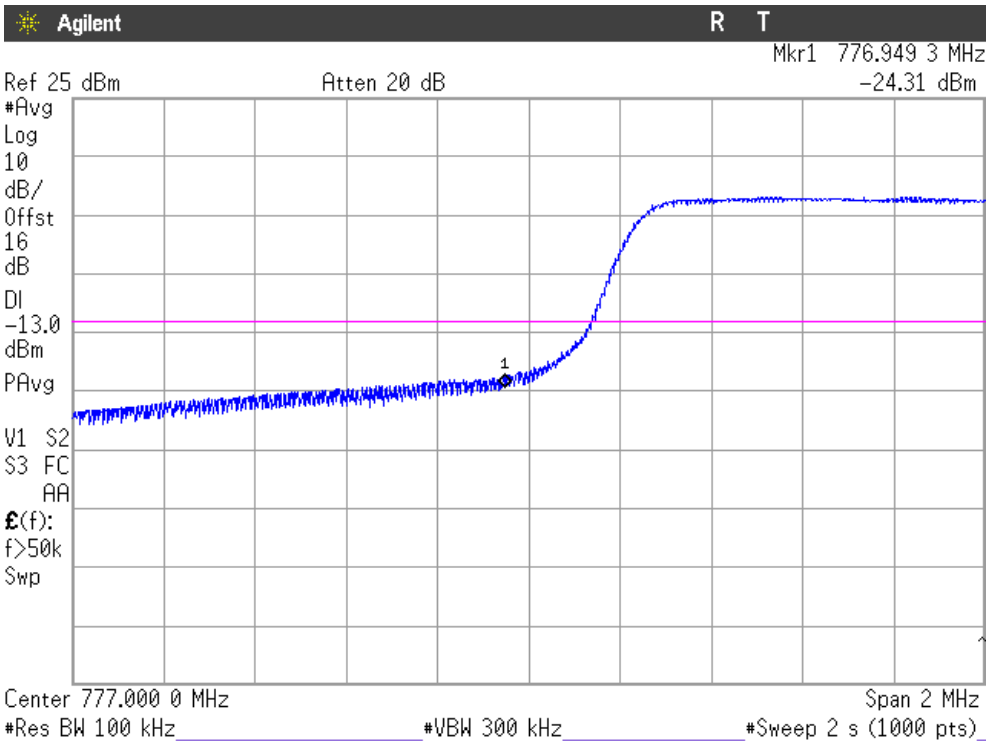
CHANNEL HIGHEST



NOTE: The equipment transmits at the maximum output power

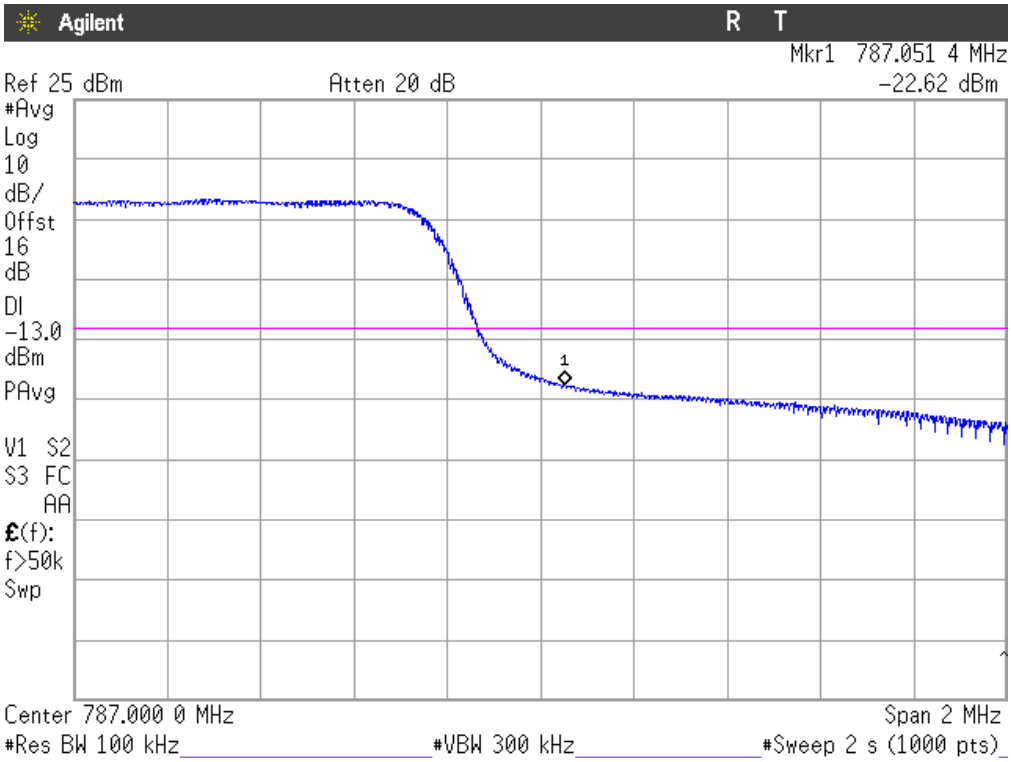
RB = All. Offset = 0. BW = 5 MHz (Band XIII)

CHANNEL LOWEST. Narrow band = 1.



NOTE: The equipment transmits at the maximum output power

CHANNEL HIGHEST. Narrow band = 4.

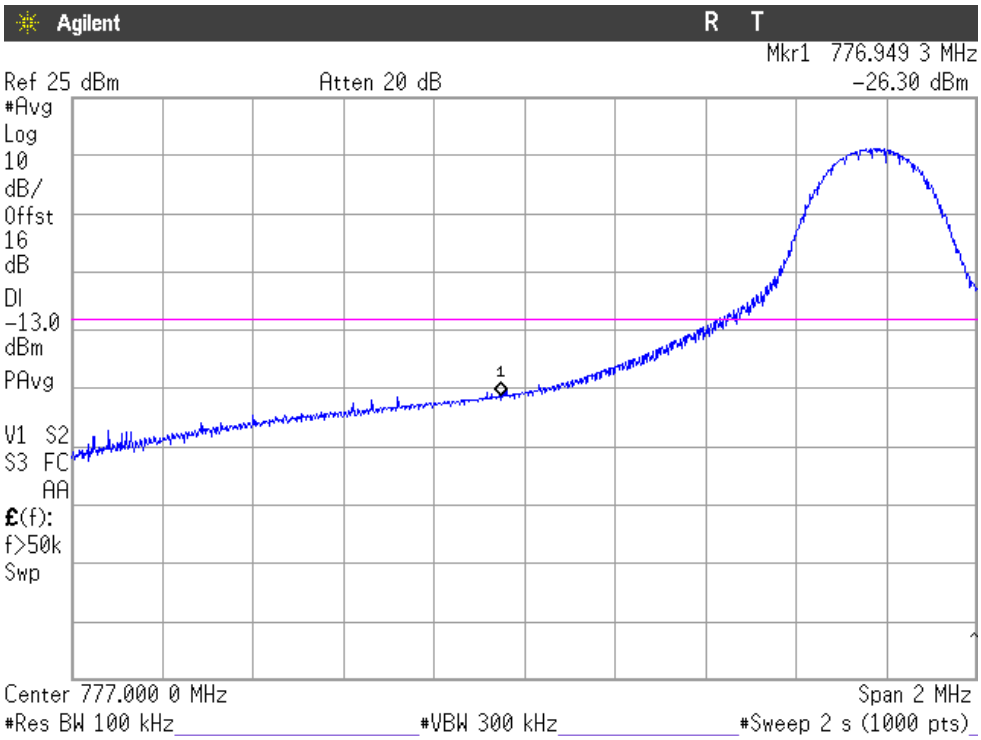


NOTE: The equipment transmits at the maximum output power

Verdict: PASS

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

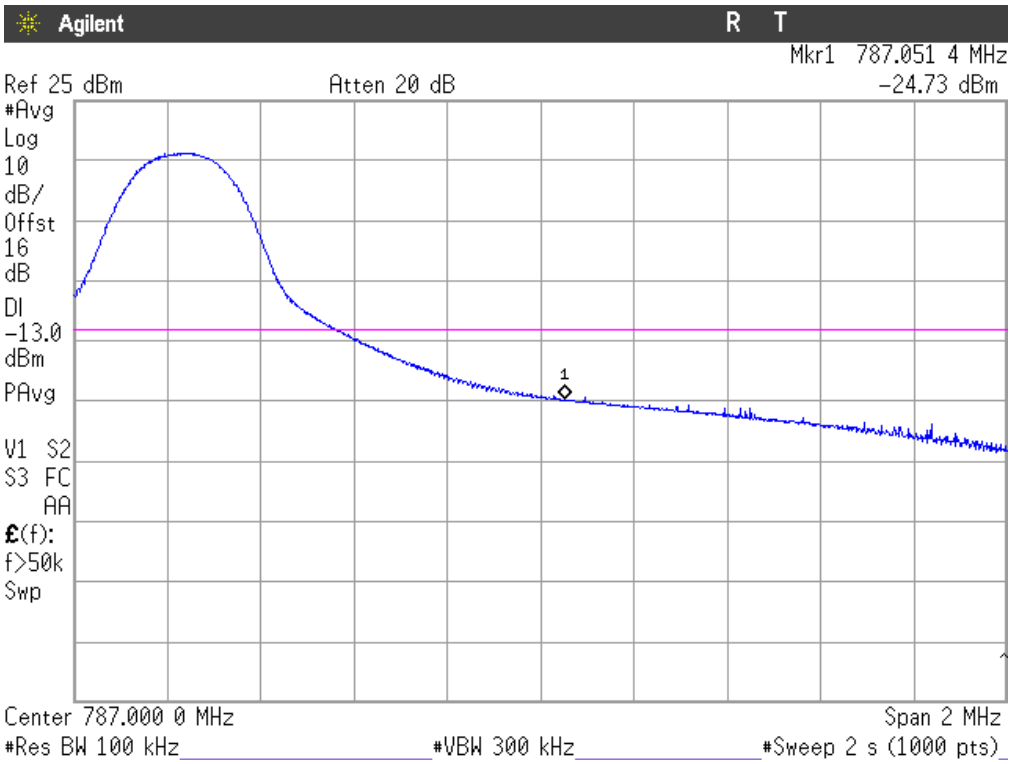
LOW FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

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

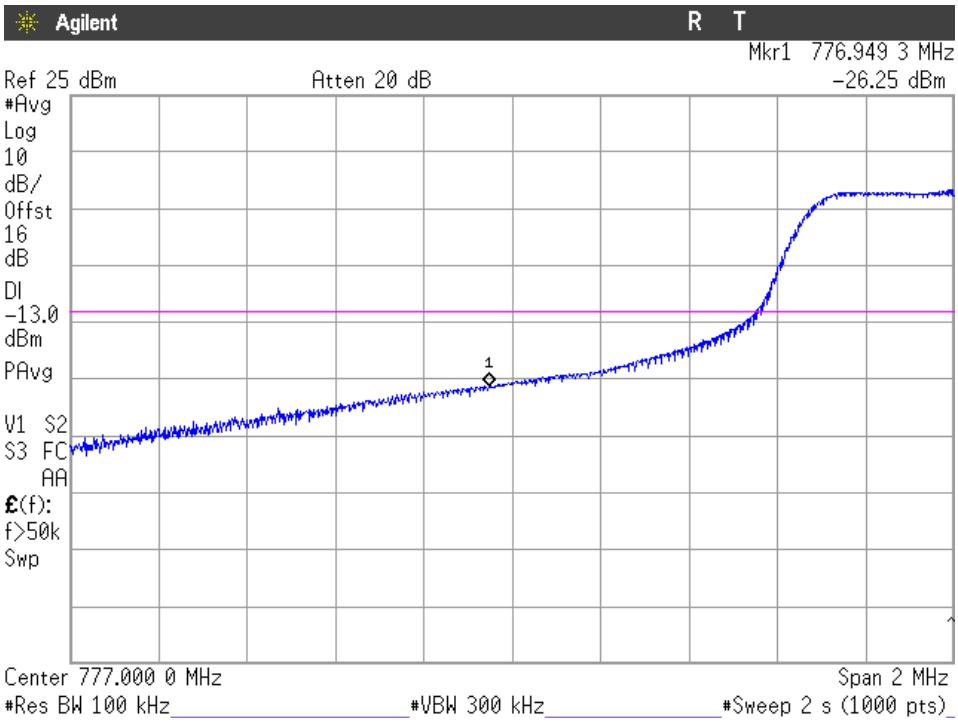
HIGH FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

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

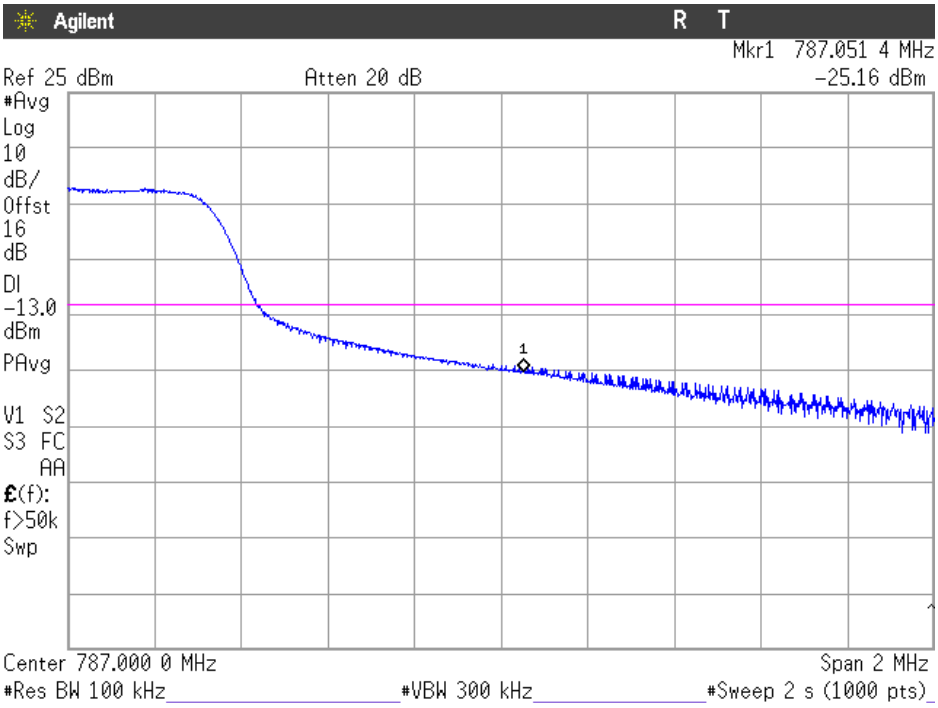
LOW FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

Narrow band = 8. RB = All. Offset = 0. BW = 10 MHz (Band XIII)

HIGH FREQUENCY SECTION



NOTE: The equipment transmits at the maximum output power

Verdict: PASS

Radiated emissions

SPECIFICATION

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

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 XIII. FCC §2.1051 and §27.53 (c) (f). RSS-130 Clause 4.6.

On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

On all frequencies between 763-775 MHz and 793-806 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW (-40 dBm)/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth.

At Po transmitting power, the specified minimum attenuation becomes 43+10 log (Po), and the level in dBm relative Po becomes:
Po (dBm) – [43 + 10 log (Po in mwatts) - 30] = -13 dBm.

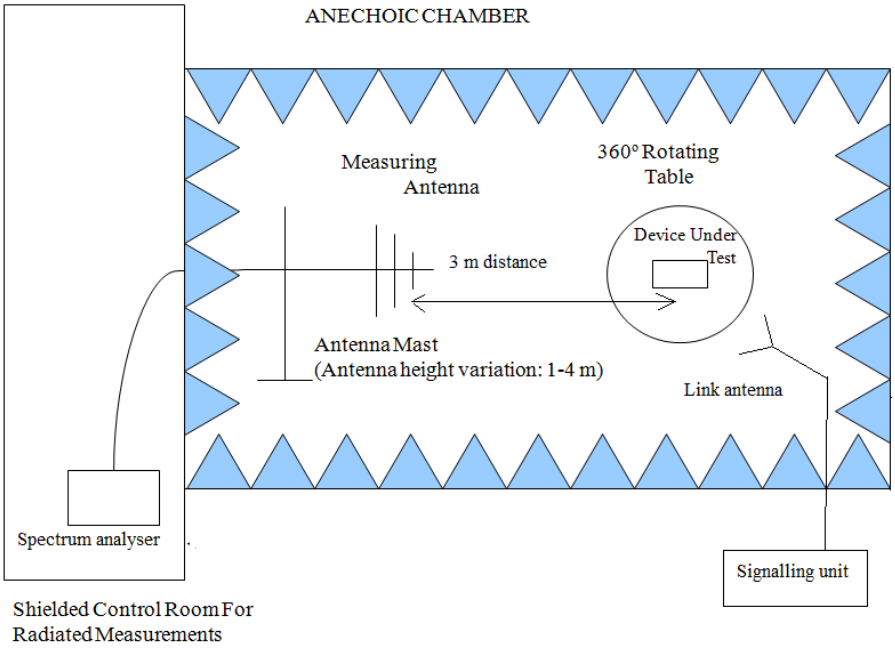
At Po transmitting power, the specified minimum attenuation becomes 65+10 log (Po), and the level in dBm relative Po becomes:
Po (dBm) – [65 + 10 log (Po in mwatts) - 30] = -35 dBm.

METHOD

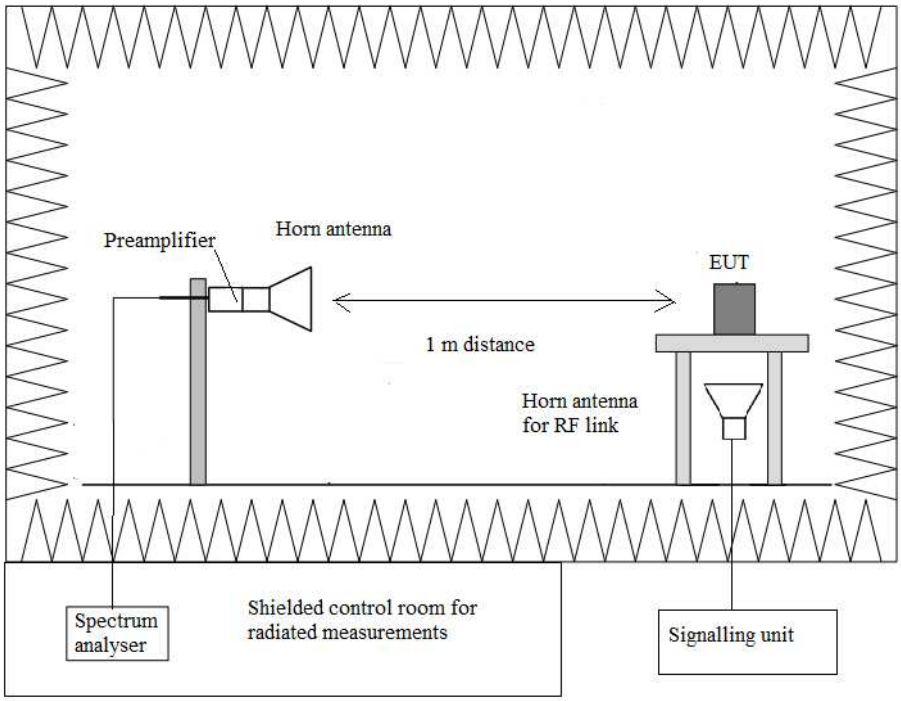
The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements 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 = 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 at less than 20 dB respect to the limit.

Frequency range 1 GHz-18 GHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Frequency range 1 GHz-18 GHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Frequency range 1 GHz-18 GHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

LTE QPSK AND 16QAM MODULATION. Band XIII. BW = 5 MHz and 10 MHz.

A preliminary scan determined the 16QAM 5 MHz bandwidth, Narrow band =2, RB = 1, 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 at less than 20 dB respect to the limit.

Frequency range 1 GHz-8 GHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Frequency range 1559 MHz-1610 MHz.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
1563.2475	-33.42	H	-52.63	0.79	8.33	-45.09

No discrete signals were detected. Only wideband signals were detected.

2. CHANNEL: MIDDLE

Frequency range 30 MHz-1000 MHz.
No radiated spurious signals were detected.

Frequency range 1 GHz-8 GHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Frequency range 1559 MHz-1610 MHz.

Substitution method data

Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
1559.5840	-33.42	H	-48.52	0.79	8.31	-41.00
1568.0636	-34.99	H	-54.20	0.79	8.35	-46.64

No discrete signals were detected. Only wideband signals were detected.

3. CHANNEL: HIGHEST

Frequency range 30 MHz-1000 MHz.
No radiated spurious signals were detected.

Frequency range 1 GHz-8 GHz.
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Frequency range 1559 MHz-1610 MHz. RBW = 1 MHz

Substitution method data

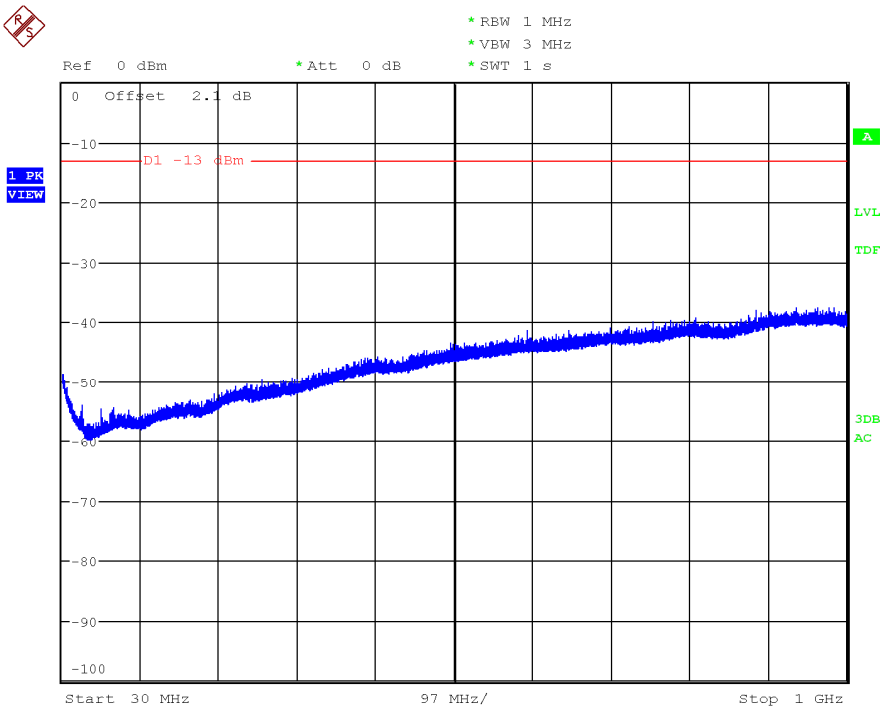
Frequency (MHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
1564.7248	-29.38	H	-48.59	0.79	8.33	-41.05
1573.2877	-34.99	H	-56.28	0.82	8.95	-48.15

No discrete signals were detected. Only wideband signals were detected.

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

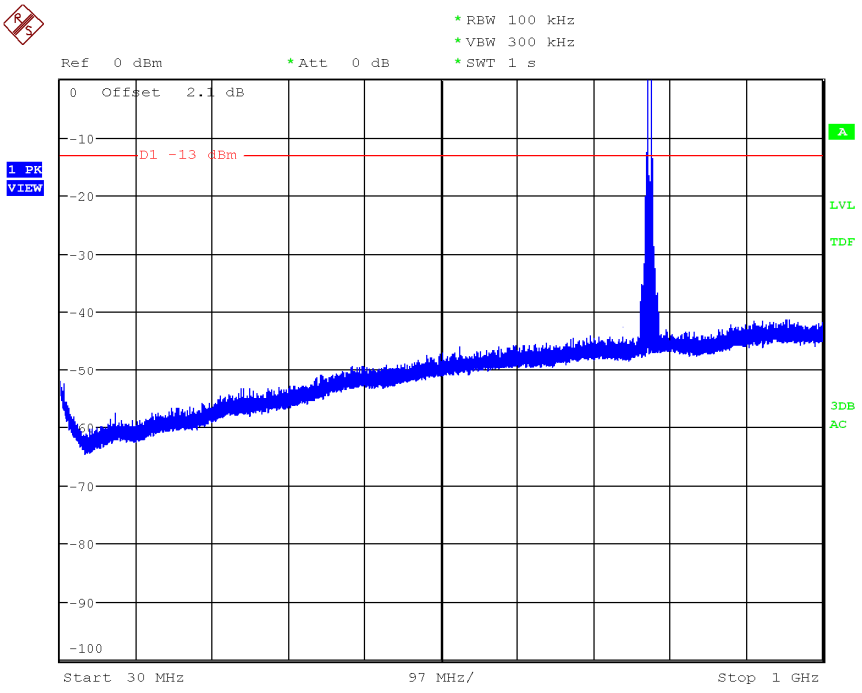
Band IV



(This plot is valid for all three channels)

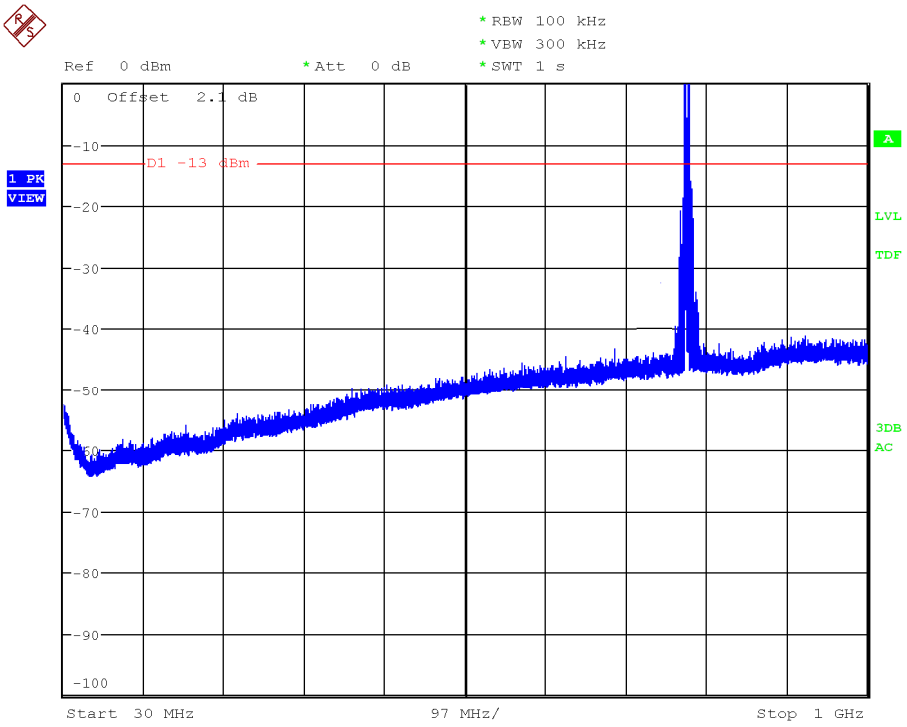
Band XIII

CHANNEL: LOWEST



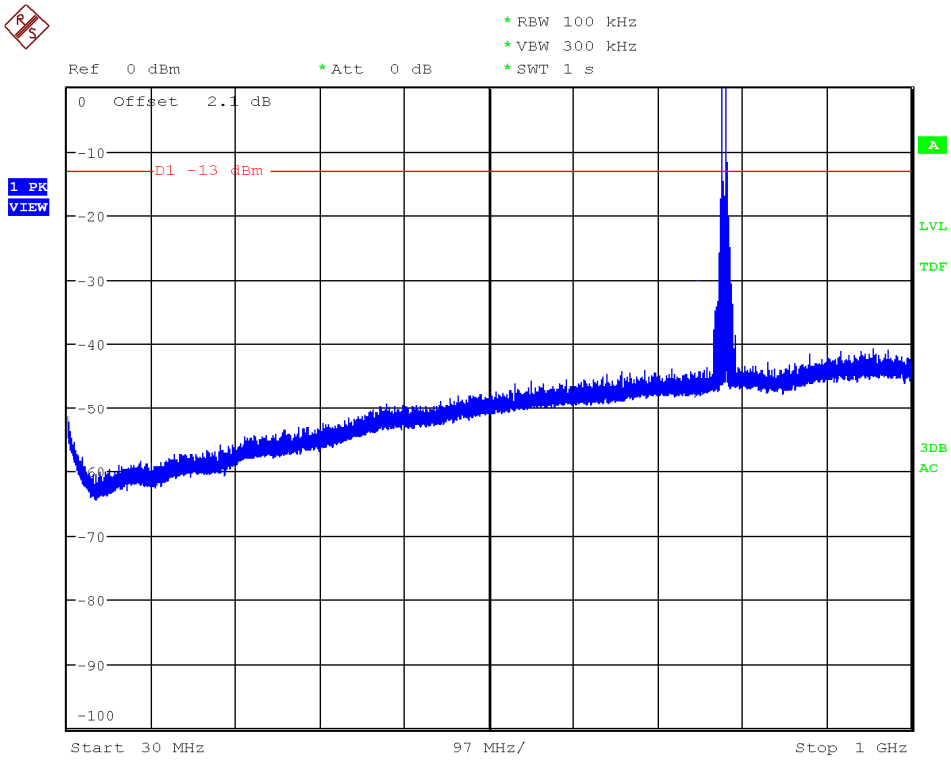
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



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

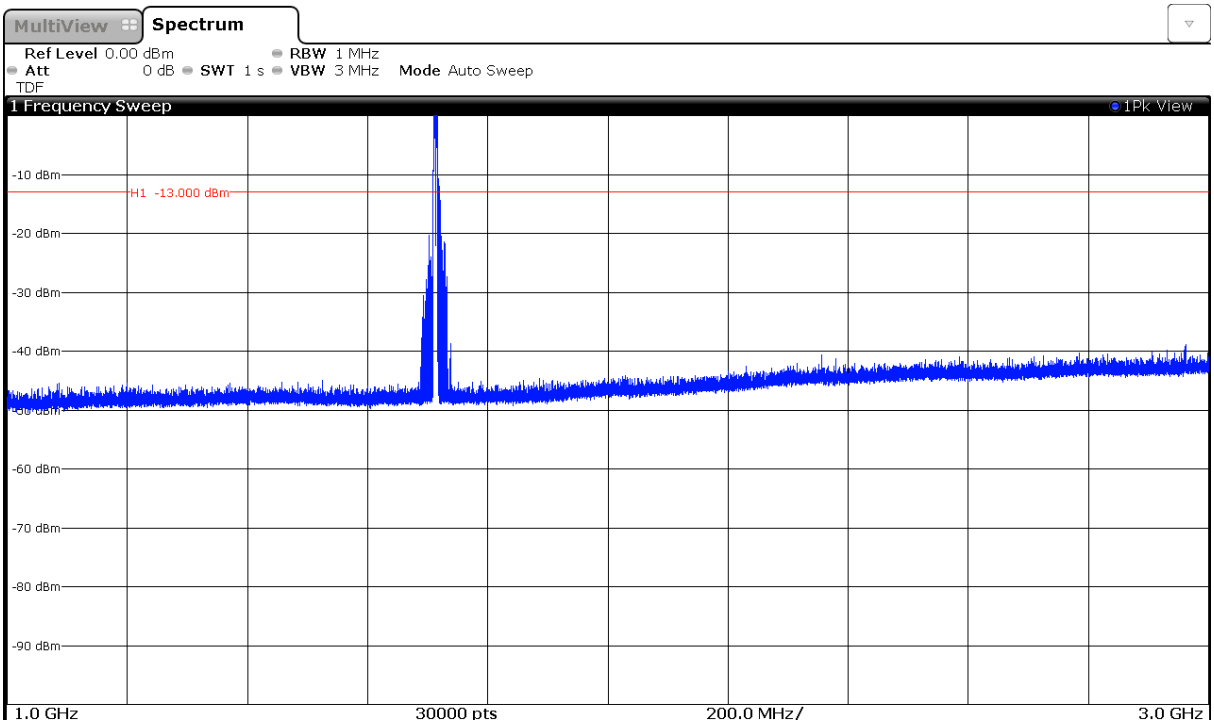
CHANNEL: HIGHEST



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

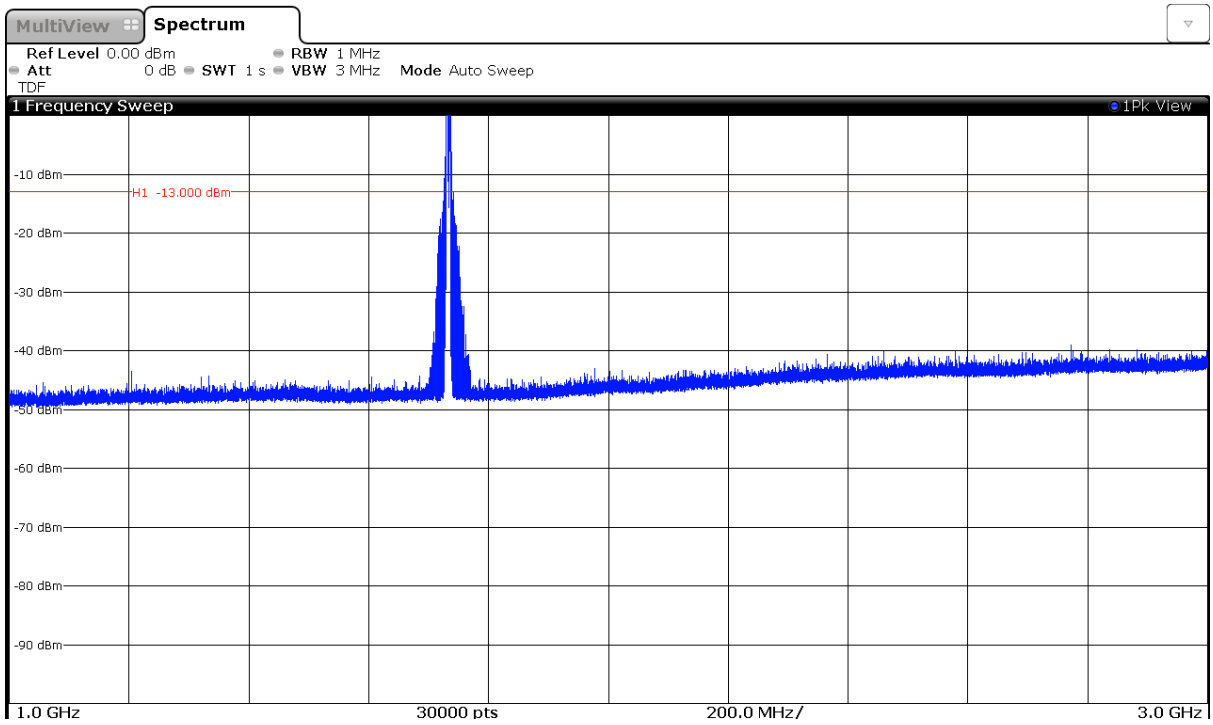
Band IV. Frequency range 1 GHz to 3 GHz

CHANNEL: LOWEST



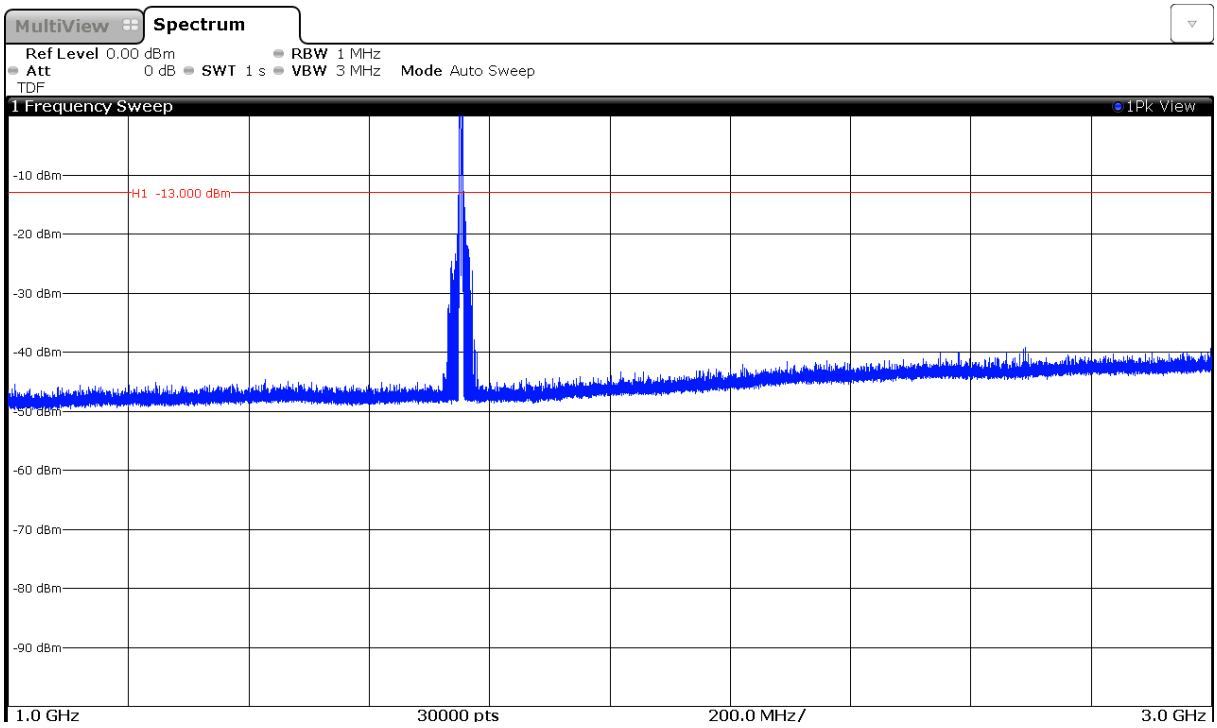
Note: The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE



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

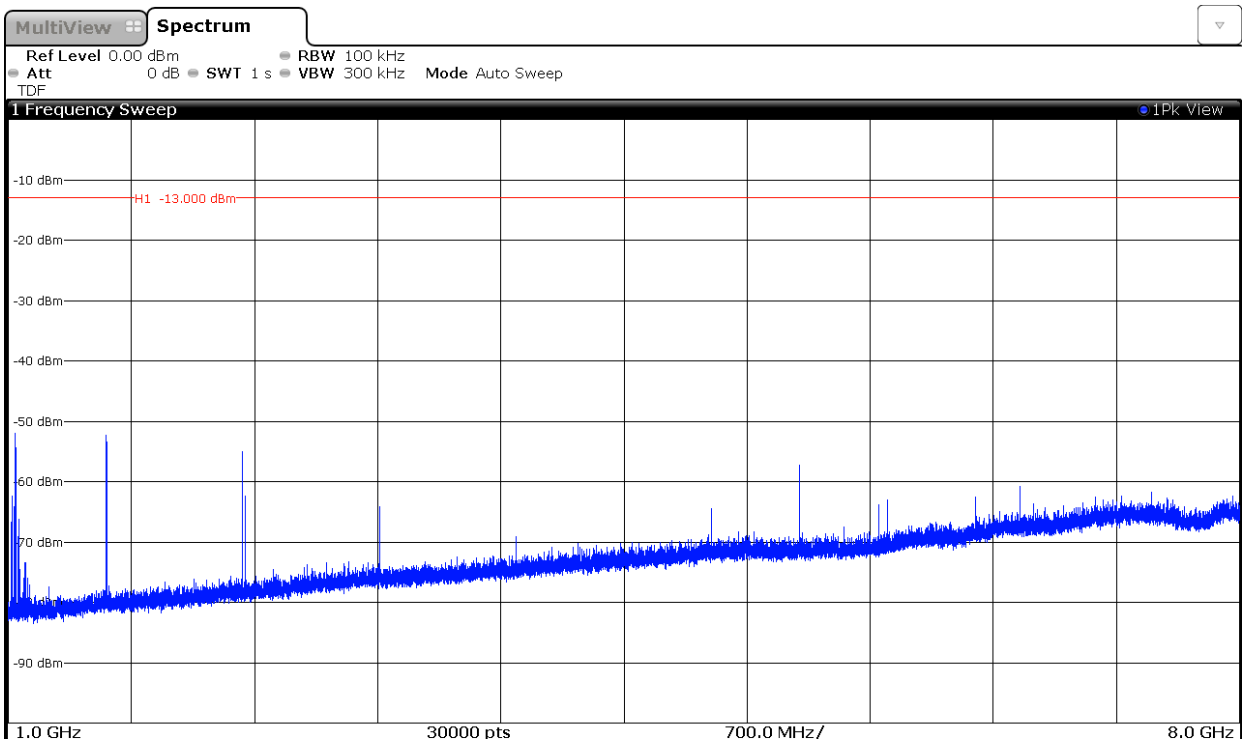
CHANNEL: HIGHEST



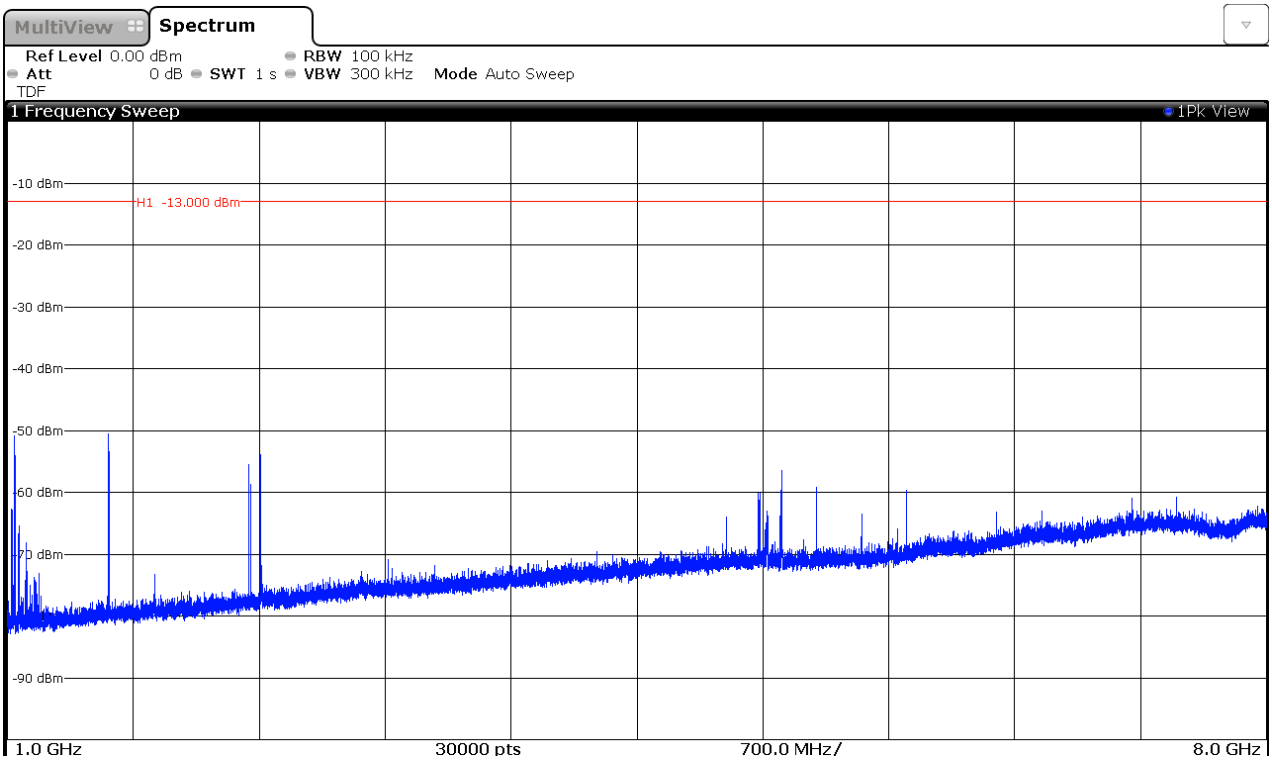
Note: The peak above the limit is the carrier frequency.

Band XIII. Range 1 GHz to 8 GHz.

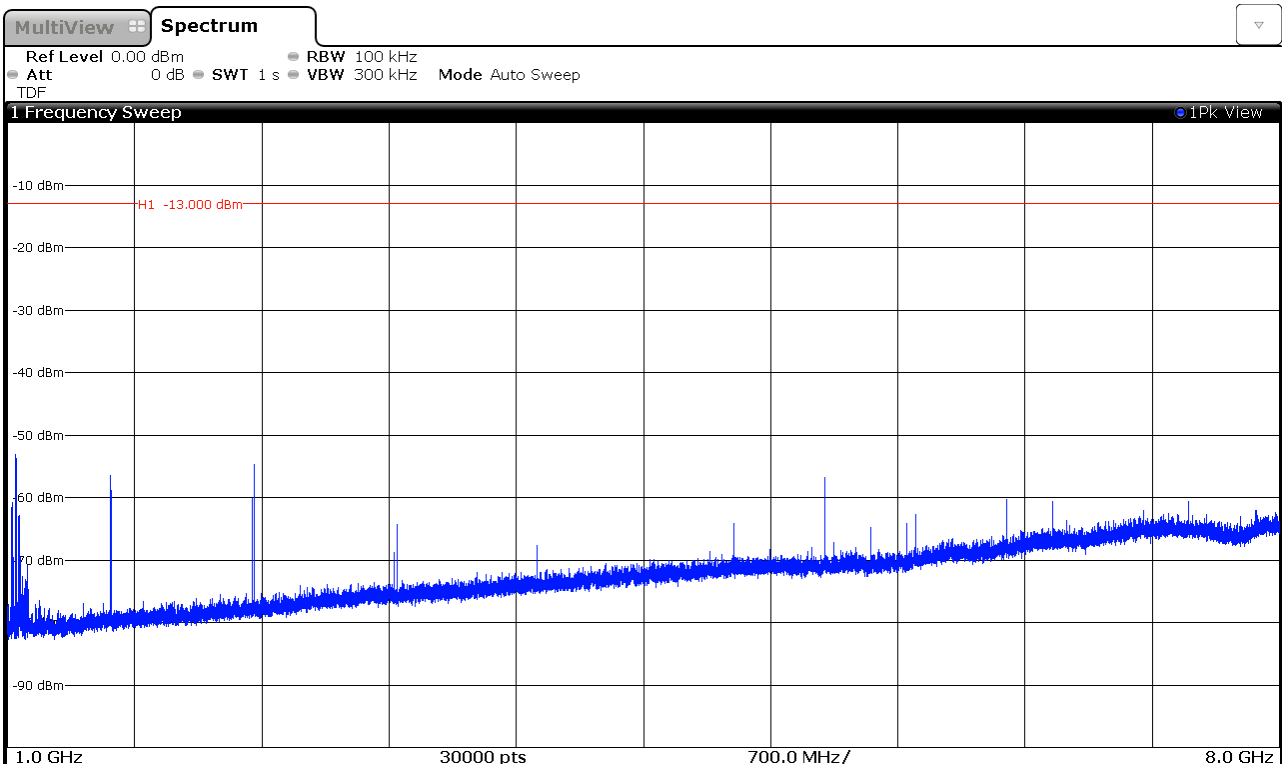
CHANNEL: LOWEST



CHANNEL: MIDDLE

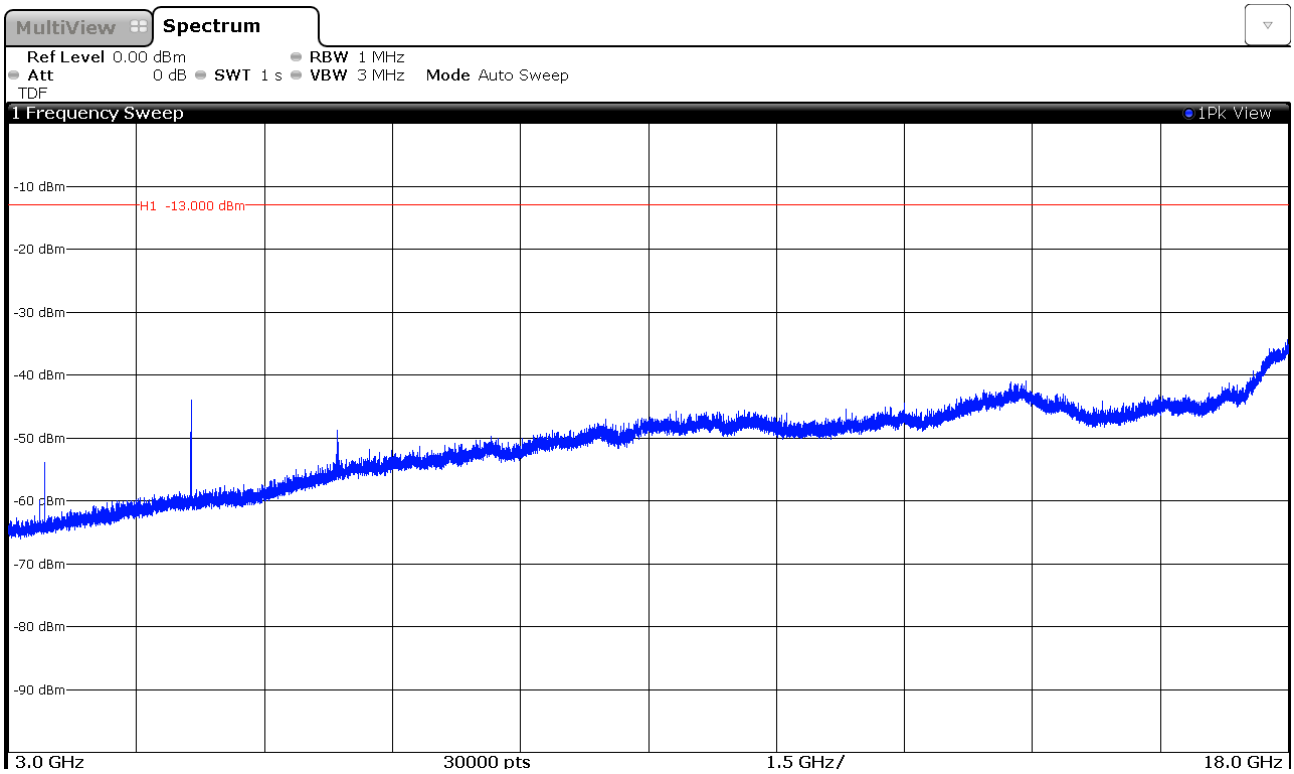


CHANNEL: HIGHEST

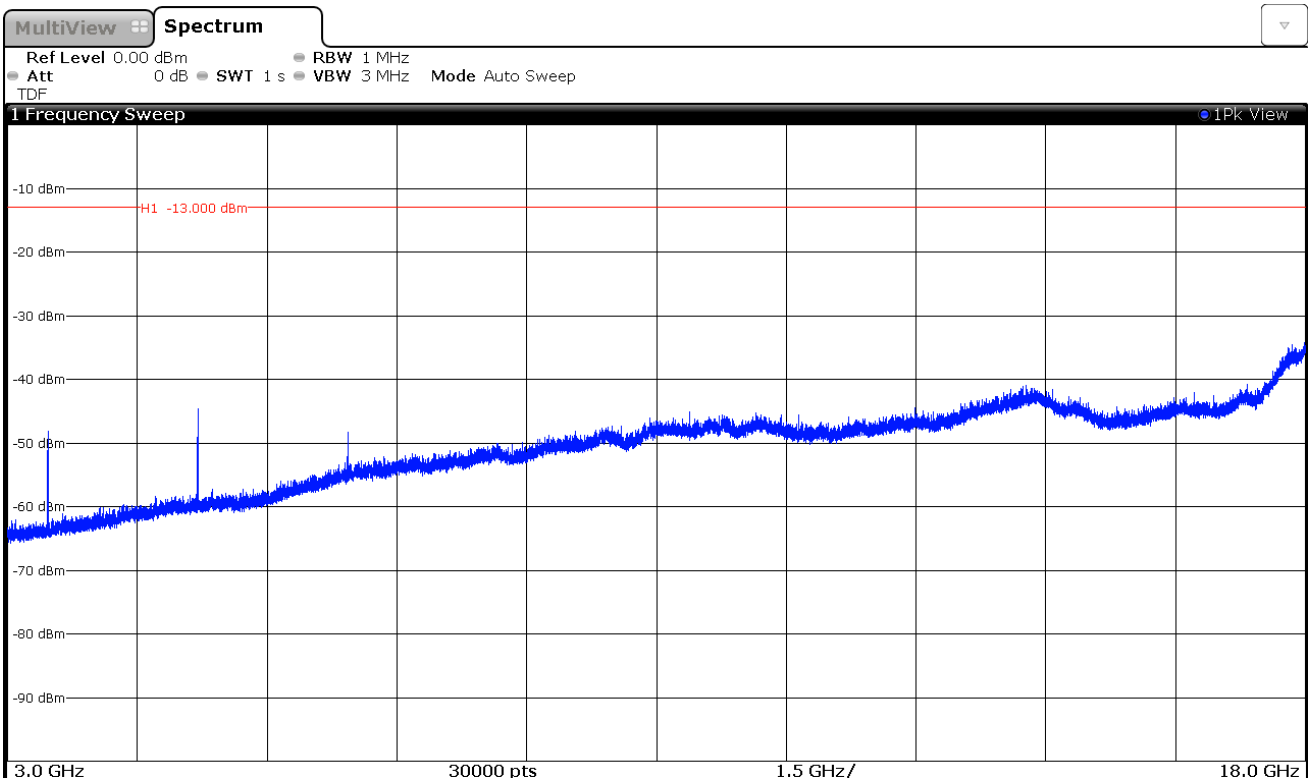


Band IV. Frequency range 3 GHz to 18 GHz

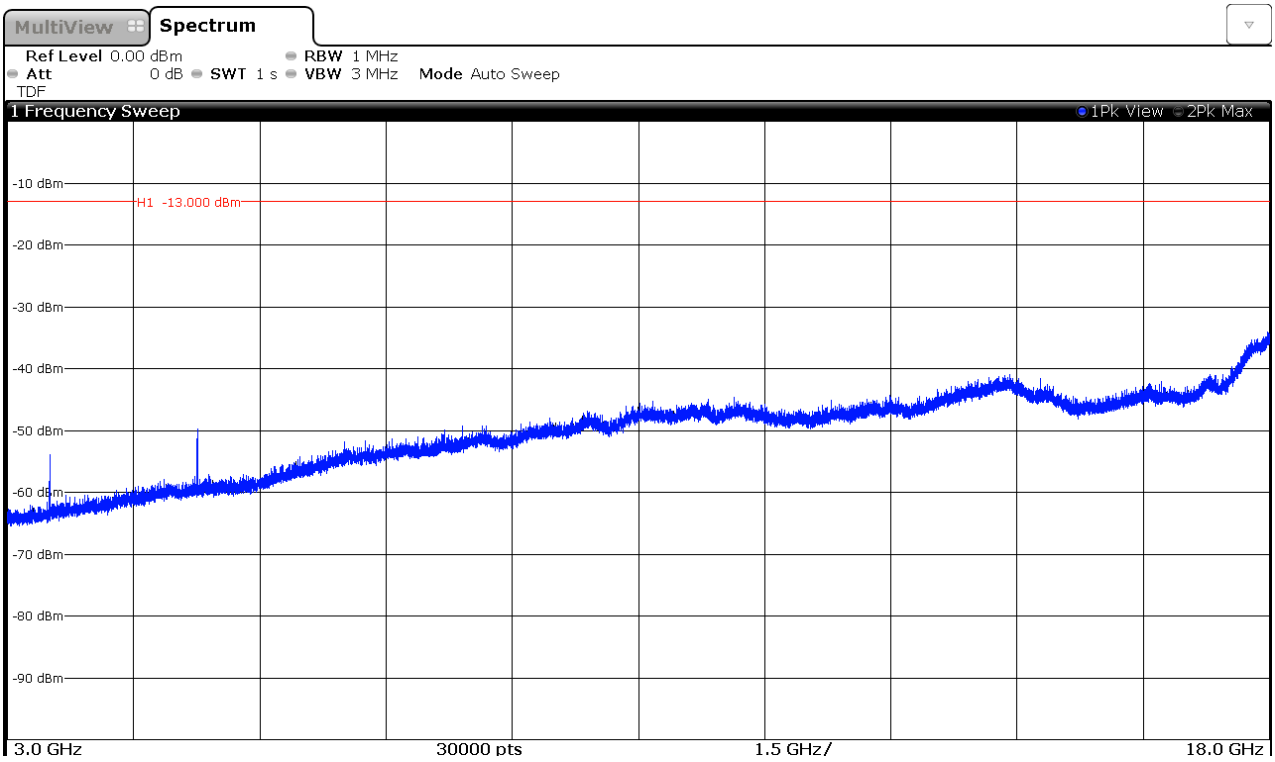
CHANNEL: LOWEST



CHANNEL: MIDDLE

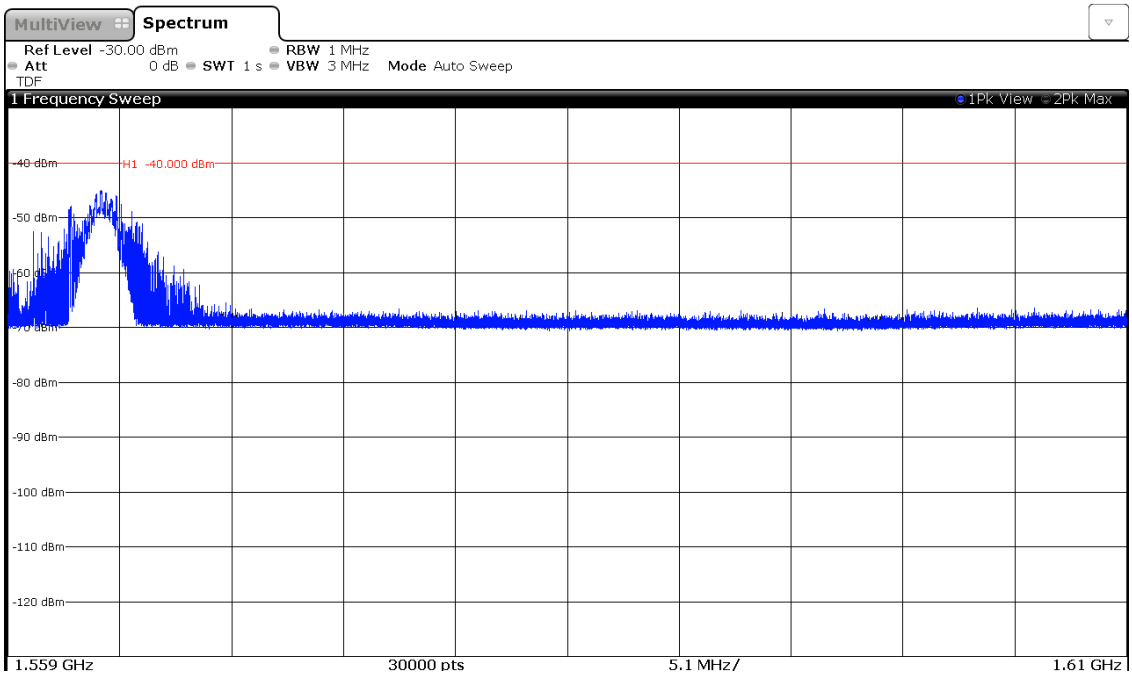


CHANNEL: HIGHEST

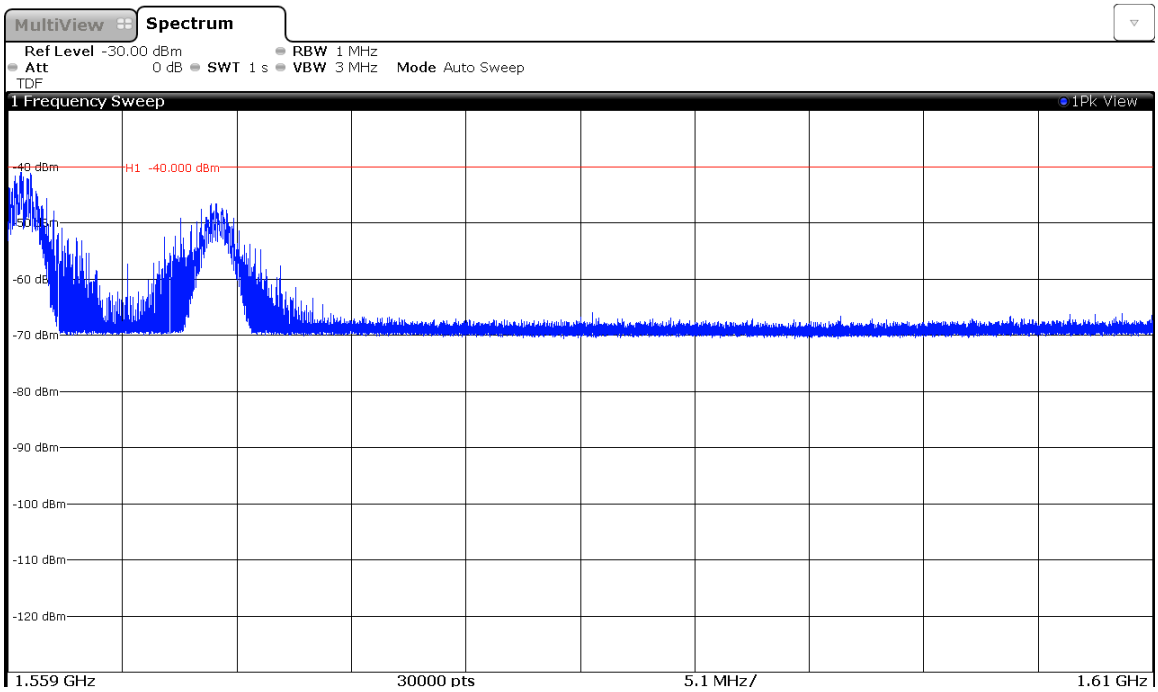


Band XIII. Frequency range 1559 MHz to 1610 MHz.

CHANNEL: LOWEST



CHANNEL: MIDDLE



CHANNEL: HIGHEST