



FCC LISTED, REGISTRATION
 NUMBER: 2764.01

ISED LISTED REGISTRATION
 NUMBER: 23595-1

Test report No:
 2456ERM.008A1

Test report

REFERENCE STANDARD:
 USA FCC Part 90

Identification of item tested	Wireless Module
Trademark	Cinterion ALAS5-W
Model and /or type reference	ALAS5-W
Other identification of the product	FCC ID: QIPALAS5-W IC: 7830A-ALAS5W
Features	Wireless Module supporting 2G, 3G and 4G Cellular Technologies
Manufacturer	Gemalto M2M GmbH Werinherstr. 81, 81541 Munich, Germany.
Test method requested, standard	USA FCC Part 90 KDB 971168 D01 v03r01 Measurement guidance for certification of licensed digital transmitters. KDB 971168 D02 v02r01 for Miscellaneous and basic review and approval items for transmitting equipment used in licensed radio services. ANSI C63.26 – 2015.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	04-11-2019
Report template No	FDT08_21

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01.

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

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

DEKRA Certification Inc. 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 Certification at the time of performance of the test.

DEKRA Certification Inc. 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.

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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 Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

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

Frequency (MHz)	U(k=2)	Units
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

Wireless Module supporting 2G,3G and 4G Cellular Technologies.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2456.03	Cinterion® ALAS5	ALAS5-W	004401083195152	2/7/2019
2456.04	GPS Antenna	AA62	162CT15170382	2/7/2019
2456.05	Antenna	Panorama_LPBEM-7-27	-	2/7/2019
2456.06	Antenna	Panorama_LPBEM-7-27	-	2/7/2019

1. Sample S/01 has undergone following test(s):

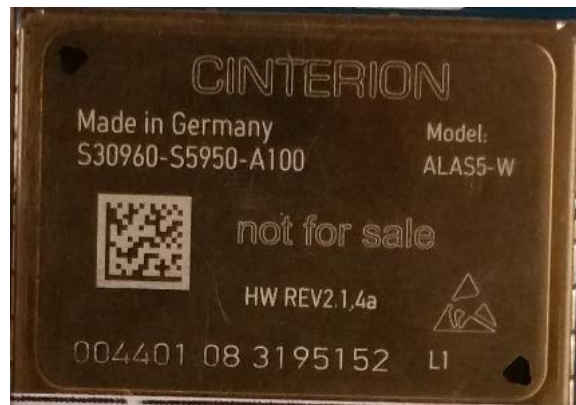
All conducted and radiated tests indicated in appendix A.

Test sample description

Ports..... :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	No Data Provided			<input type="checkbox"/>	<input type="checkbox"/>		
				<input type="checkbox"/>	<input type="checkbox"/>		
				<input type="checkbox"/>	<input type="checkbox"/>		
				<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports..... :	No Data Provided						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC: 230Vac / 50Hz.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	DC:3.3 to 4.2V					
<input checked="" type="checkbox"/>	DC: 3.8V						
Rated Power	No Data Provided						
Clock frequencies	No Data Provided						
Other parameters..... :	No Data Provided						
Software version	Rev. 00.030						
Hardware version..... :	Rev2.14a						
Dimensions in cm (L x W x D)	40mm x 36mm x 3mm						
Mounting position..... :	<input type="checkbox"/>	Table top equipment					
	<input type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input type="checkbox"/>	Other:					
Modules/parts	Module/parts of test item		Type		Manufacturer		
	No Data provided						

Accessories (not part of the test item)	Description	Type	Manufacturer
Documents as provided by the applicant.....	Description	File name	Issue date
	Equipment declaration data	FDT30_15_Declaration_Equipment_Data_Gemalto_ALAS5-W_signed	2019-03-14

Copy of marking plate:



Identification of the client

Gemalto M2M GmbH
 Werinherstr. 81, 81541 Munich, Germany

Testing period and place

Test Location	DEKRA Certification, Inc.
Date (start)	04-05-2019
Date (finish)	04-11-2019

Document history

Report number	Date	Description
2456ERM.008	04-10-2019	First release
2456ERM.008A1	04-11-2019	2nd release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2456ERM.008 related with the same samples, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
Page 32-34 / A.1: RF OUTPUT POWER	TC#02 test result was added	To meet requirement in KDB 971168 D02 v02r01 VIII
Page:62-68/ A.4: OCCUPIED BANDWIDTH	TC#02 test result was added	To meet requirement in KDB 971168 D02 v02r01 VIII
Page:77-80/ A.5: SPURIOUS EMISSIONS AT ANTENNA TERMINALS	TC#02 test result was added	To meet requirement in KDB 971168 D02 v02r01 VIII

This modification test report cancels and replaces the test report 2456ERM.008

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semi anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Sravani Gollamudi, Koji Nishimoto, and Poojita Bhattu.

Testing verdicts

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

Summary

FCC PART 90 / PARAGRAPH				
Report Section	Part 90 Spec Clause	Test Description	Verdict	Remark
A.1	§2.1046 and § 90.635 (b)	RF Output power	P	Note1
A.2	§2.1055 and § 90.213	Frequency stability	P	N/A
A.3	§ 2.1049 and § 90.209(7)	Occupied Bandwidth	P	Note1
A.4	§2.1051 and §90.691	Spurious emissions at antenna terminals	P	Note1
A.5	§90.691	Spurious emissions at antenna terminals at Block edges	P	N/A
A.6	§2.1051 and §90.691	Radiated emissions	P	N/A
<u>Supplementary information and remarks:</u> Note1: According to KDB 971168 D02 v02r01, Band 26 testing is affected by part 22 and 90 crossed rules, the emission testing was performed in extra Frequency with bandwidth centered at the allocation boundary.				

List of equipment used during the test

Conducted Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1039	Spectrum analyzer Rohde & Schwarz FSV40	2018/10	2020/10
1149	Wideband Radio Communication Tester Rohde & Schwarz CMW 500	2018/07	2020/07
1041	EMI Test Receiver Rohde & Schwarz ESR 7	2017/04	2019/03
101	Climatic chamber Espec	2019/10	2020/10

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber Frankonia SAC 3 plus "L"	N/A	N/A
1065	BiconicalLog antenna ETS LINDGREN 3142E	2017/03	2020/03
1058	Double-ridge Waveguide Horn antenna 1-18 GHz	2017/03	2020/03
1059	Double-ridge Waveguide Horn antenna 18-40 GHz	2017/03	2020/03
1039	Spectrum analyzer Rohde & Schwarz FSV40	2018/10	2020/10
0980	RF pre-amplifier 30 MHz-6 GHz Bonn Elektronik BLMA 0360-01N	2017/05	2019/05
0981	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-2A	2018/10	2020/10
1015,1017, 1019, 1020	Rohde & Schwarz EMC32 software	N/A	N/A

Appendix A: Test Results for FCC Part 90

Appendix A Content

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PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	QPSK, QAM
Maximum RF Output Power	23 dBm
Operation mode:	
- Operating Frequency Range	Band 26: 814-824 MHz
- Nominal Channel Bandwidth	Band 26: 1.4 / 3 / 5 / 10 / 15 MHz
Extreme operating conditions	
- Temperature range	T _{nom} = +15 to + 35 T _{min} = -30 T _{max} = +50
Antenna type	External attachable Antenna.
Antenna gain	5 dBi
Nominal Voltage	
- Supply Voltage	3.8 Vdc
- Type of power source	DC voltage from power supply.

DESCRIPTION OF TEST CONDITIONS

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

TEST CONDITIONS	DESCRIPTION										
<p>TC#02 LTE Band 26</p>	<p>Power supply (V): $V_{\text{nominal}} = 3.8 \text{ Vdc}$</p> <p><u>Test Frequencies for Conducted tests:</u></p> <p><u>1.4 MHz Bandwidth:</u></p> <ul style="list-style-type: none"> -Lowest Channel: 26797 (824.7 MHz) -Middle Channel: 26915 (836.5 MHz) -Highest Channel: 27033 (848.3 MHz) <p><u>3 MHz Bandwidth:</u></p> <ul style="list-style-type: none"> -Lowest Channel: 26805 (825.5 MHz) -Middle Channel: 26915 (836.5 MHz) -Highest Channel: 27025 (847.5 MHz) <p><u>5 MHz Bandwidth:</u></p> <ul style="list-style-type: none"> -Lowest Channel: 26815 (826.5 MHz) -Middle Channel: 26915 (836.5 MHz) -Highest Channel: 27015 (846.5 MHz) <p><u>10 MHz Bandwidth:</u></p> <ul style="list-style-type: none"> -Lowest Channel: 26840 (829.0 MHz) -Middle Channel: 26915 (836.5 MHz) -Highest Channel: 26990 (844.0 MHz) <p><u>15 MHz Bandwidth:</u></p> <ul style="list-style-type: none"> -Lowest Channel: 26865 (831.5 MHz) -Middle Channel: 26915 (836.5 MHz) -Highest Channel: 26965 (841.5 MHz) <p><u>Test Frequencies for Radiated tests:</u></p> <table border="1" data-bbox="411 1756 1394 1921"> <thead> <tr> <th>Available Frequencies</th> <th>Tested Frequency</th> <th>Channel Bandwidth</th> <th>Modulation</th> <th>Mode</th> </tr> </thead> <tbody> <tr> <td>824 to 849 MHz</td> <td>825.5, 836.5, 847.5 MHz</td> <td>3 MHz</td> <td>QPSK</td> <td>1 RB</td> </tr> </tbody> </table> <p>Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case found in QPSK modulation.</p>	Available Frequencies	Tested Frequency	Channel Bandwidth	Modulation	Mode	824 to 849 MHz	825.5, 836.5, 847.5 MHz	3 MHz	QPSK	1 RB
Available Frequencies	Tested Frequency	Channel Bandwidth	Modulation	Mode							
824 to 849 MHz	825.5, 836.5, 847.5 MHz	3 MHz	QPSK	1 RB							

TEST CONDITIONS	DESCRIPTION
<p>TC#02 LTE Band 26</p>	<p>Power supply (V): $V_{\text{nominal}} = 3.8 \text{ Vdc}$</p> <p><u>Test Frequencies for Conducted tests:</u></p> <p><u>1.4 MHz Bandwidth:</u> - Channel: 26790 (824.0 MHz)</p> <p><u>3 MHz Bandwidth:</u> - Channel: 26790 (824.0 MHz)</p> <p><u>5 MHz Bandwidth:</u> - Channel: 26790 (824.0 MHz)</p> <p><u>10 MHz Bandwidth:</u> - Channel: 26740 (824.0 MHz)</p> <p><u>15 MHz Bandwidth:</u> - Channel: 26790 (824.0 MHz)</p>

TEST A.1: RF OUTPUT POWER

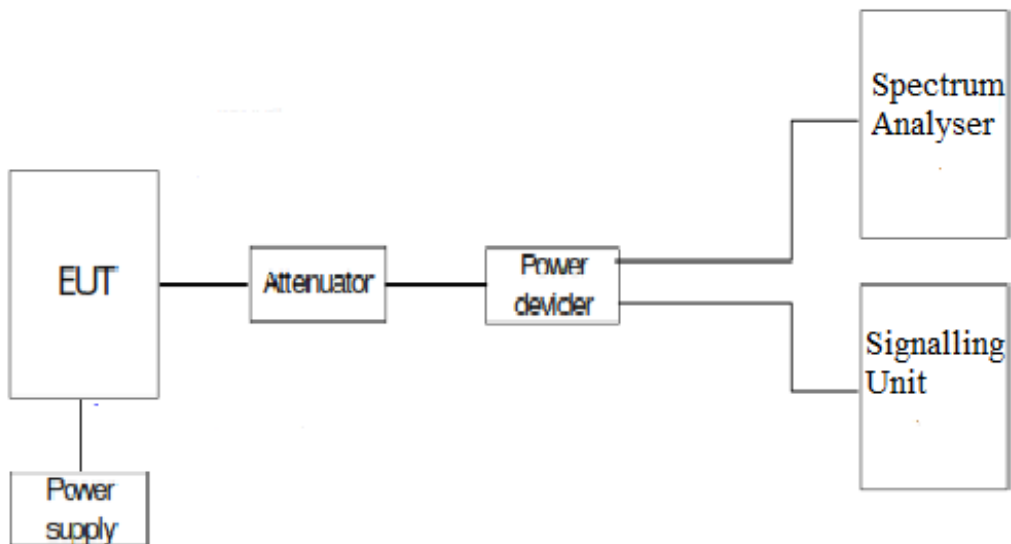
LIMITS:	Product standard:	FCC Part 90
	Test standard:	FCC §2.1046 and §90.635 (b).

LIMITS

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 2 Watts.

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

TEST SETUP



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

LTE QPSK AND 16QAM MODULATION. Bandwidth = 1.4 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Lowest	23.04	5.0	28.04	5.97
Middle	23.14	5.0	28.14	5.91
Highest	23.19	5.0	28.19	5.71

LTE QPSK AND 16QAM MODULATION. Bandwidth = 3 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Lowest	23.14	5.0	28.14	5.77
Middle	23.19	5.0	28.19	5.71
Highest	23.19	5.0	28.19	5.45

LTE QPSK AND 16QAM MODULATION. Bandwidth = 5 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Lowest	23.12	5.0	28.12	5.65
Middle	23.14	5.0	28.14	5.71
Highest	23.13	5.0	28.13	5.42

LTE QPSK AND 16QAM MODULATION. Bandwidth = 10 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Single	23.07	5.0	28.07	5.71

LTE QPSK AND 16QAM MODULATION. Bandwidth = 15 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Single	23.13	5.0	28.13	5.71
Measurement uncertainty (dB)			<±0.95	

TEST RESULTS (Cont):						
Bandwidth (MHz)	Channel Location Frequency (MHz) Channel Number	Modulation	Resource Block Size	Resource Block Offset	Average power at antenna port (dBm)	PAPR (dB)
1.4	Lowest (26697 (814.7 MHz))	QPSK	1	0	23.00	5.07
			1	2	23.04	
			1	5	22.98	
			3	0	22.99	
			3	1	23.01	
			3	2	23.03	
		16-QAM	6	0	21.96	5.97
			1	0	22.22	
			1	2	22.27	
			1	5	22.29	
			3	0	22.00	
			3	1	22.12	
	Middle (26740 (819 MHz))	QPSK	3	2	22.10	4.96
			6	0	21.07	
			1	0	23.04	
			1	2	23.09	
			1	5	23.01	
			3	0	23.07	
		16-QAM	3	1	23.11	5.91
			3	2	23.14	
			6	0	22.01	
			1	0	22.28	
			1	2	22.29	
			1	5	22.25	
Highest (26783 (823.3 MHz))	QPSK	3	0	22.02	4.75	
		3	1	22.07		
		3	2	22.08		
		6	0	21.13		
		1	0	22.98		
		1	2	23.06		
	16-QAM	1	5	22.95	5.71	
		3	0	23.04		
		3	1	23.09		
		3	2	23.10		
		6	0	21.97		
		1	0	21.95		
1	2	22.00				
1	5	21.90				
3	0	21.96				
3	1	22.03				
3	2	22.01				
6	0	21.09				

TEST RESULTS (Cont):						
Bandwidth (MHz)	Channel Location Frequency (MHz) Channel Number	Modulation	Resource Block Size	Resource Block Offset	Average power at antenna port (dBm)	PAPR (dB)
3	Lowest (26705 (815.5 MHz))	QPSK	1	0	23.08	4.78
			1	7	23.14	
			1	14	23.02	
			8	0	22.06	
			8	4	22.11	
			8	7	22.09	
		15	0	22.07		
		16-QAM	1	0	22.24	5.77
			1	7	22.35	
			1	14	22.24	
			8	0	21.12	
			8	4	21.32	
	8		7	21.27		
	Middle (26740 (819 MHz))	QPSK	1	0	23.03	4.75
			1	7	23.19	
			1	14	23.08	
			8	0	22.10	
			8	4	22.05	
			8	7	22.15	
		15	0	22.15		
		16-QAM	1	0	22.38	5.71
			1	7	22.46	
			1	14	22.37	
			8	0	21.15	
8			4	21.19		
8	7		21.28			
Highest (26775 (822.5 MHz))	QPSK	1	0	23.13	4.52	
		1	7	23.19		
		1	14	23.06		
		8	0	22.08		
		8	4	22.09		
		8	7	22.10		
	15	0	22.06			
	16-QAM	1	0	22.30	5.45	
		1	7	22.40		
		1	14	22.36		
		8	0	21.11		
		8	4	21.19		
8		7	21.20			
15	0	21.20				

TEST RESULTS (Cont):						
Bandwidth (MHz)	Channel Location Frequency (MHz) Channel Number	Modulation	Resource Block Size	Resource Block Offset	Average power at antenna port (dBm)	PAPR (dB)
5	Lowest (26715 (816.5 MHz))	QPSK	1	0	23.10	4.75
			1	12	23.08	
			1	24	23.12	
			12	0	22.07	
			12	6	22.09	
			12	11	22.05	
			25	0	22.05	
		16-QAM	1	0	22.25	5.65
			1	12	22.15	
			1	24	22.30	
			12	0	21.10	
			12	6	21.11	
			12	11	21.09	
			25	0	21.03	
	Middle (26740 (819 MHz))	QPSK	1	0	23.09	4.75
			1	12	23.14	
			1	24	23.14	
			12	0	22.05	
			12	6	22.12	
			12	11	22.11	
			25	0	22.14	
		16-QAM	1	0	22.15	5.71
			1	12	22.18	
			1	24	22.20	
			12	0	21.15	
			12	6	21.28	
			12	11	21.25	
25			0	21.12		
Highest (26765 (821.5 MHz))	QPSK	1	0	23.12	4.41	
		1	12	23.11		
		1	24	23.08		
		12	0	22.13		
		12	6	22.13		
		12	11	22.13		
		25	0	22.08		
	16-QAM	1	0	22.56	5.42	
		1	12	22.52		
		1	24	22.53		
		12	0	21.02		
		12	6	21.03		
		12	11	20.99		
		25	0	21.12		

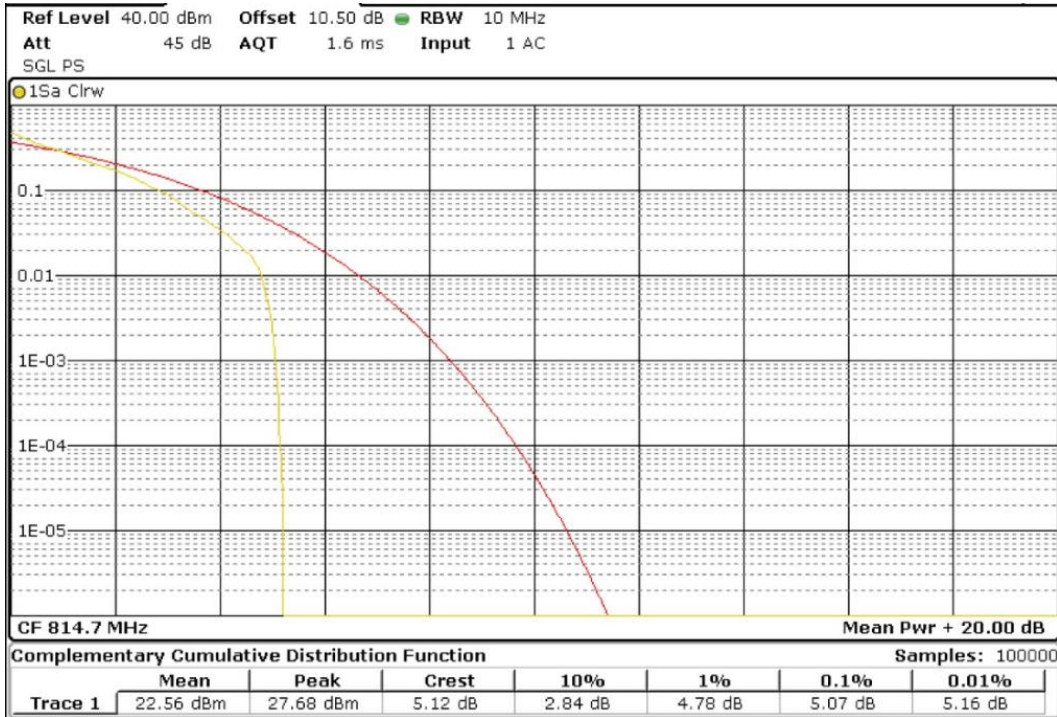
TEST RESULTS (Cont):						
Bandwidth (MHz)	Channel Location Frequency (MHz) Channel Number	Modulation	Resource Block Size	Resource Block Offset	Average power at antenna port (dBm)	PAPR (dB)
10	26740 (819 MHz)	QPSK	1	0	23.06	4.72
			1	24	23.07	
			1	49	23.04	
			25	0	22.09	
			25	12	22.20	
			25	24	22.09	
			50	0	22.12	
		16-QAM	1	0	22.28	5.65
			1	24	22.31	
			1	49	22.21	
			25	0	21.15	
			25	12	21.24	
			25	24	21.19	
			50	0	21.14	
15	26765 (821.5 MHz)	QPSK	1	0	23.06	4.67
			1	37	23.12	
			1	74	23.13	
			36	0	22.12	
			36	18	22.18	
			36	37	22.10	
			75	0	22.12	
		16-QAM	1	0	22.33	5.65
			1	37	22.32	
			1	74	22.35	
			36	0	21.14	
			36	18	21.22	
			36	37	21.19	
			75	0	21.12	

TEST RESULTS (Cont):

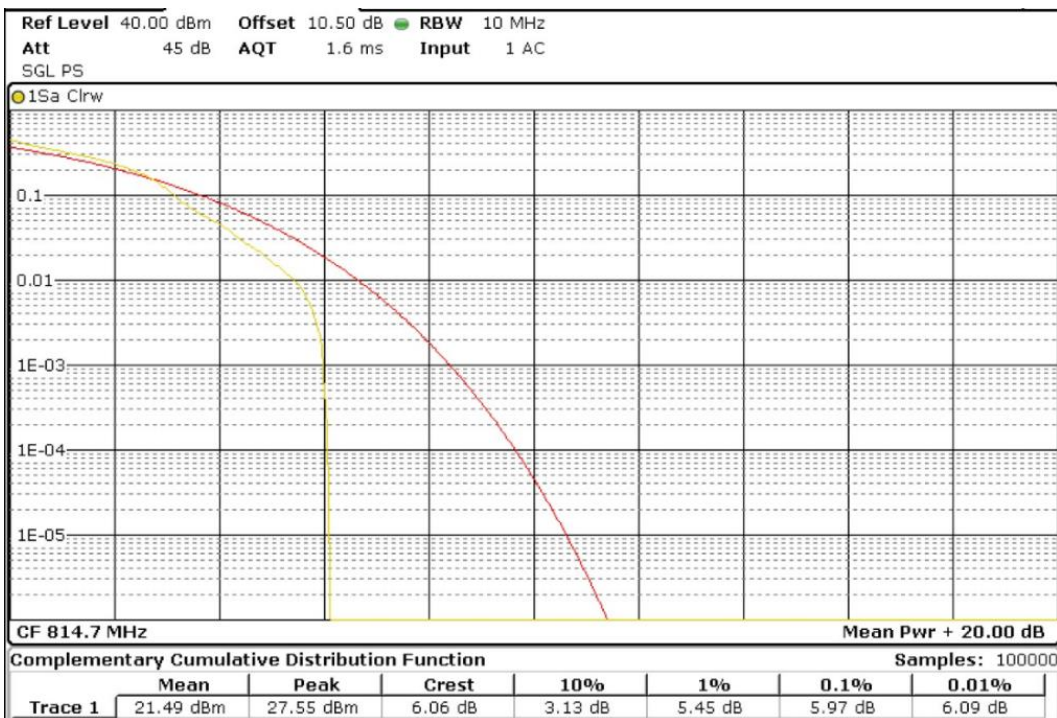
PAPR

Bandwidth = 1.4 MHz. Modulation QPSK. RB Size: 1. RB Offset: 0.

Lowest channel

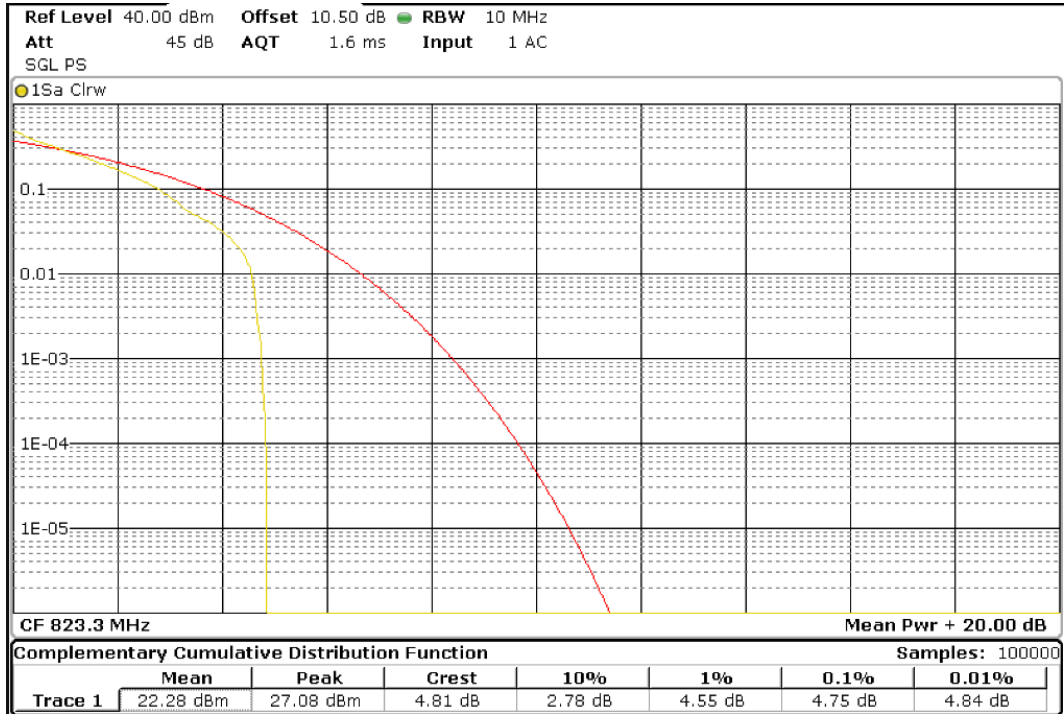


Middle channel



TEST RESULTS (Cont):

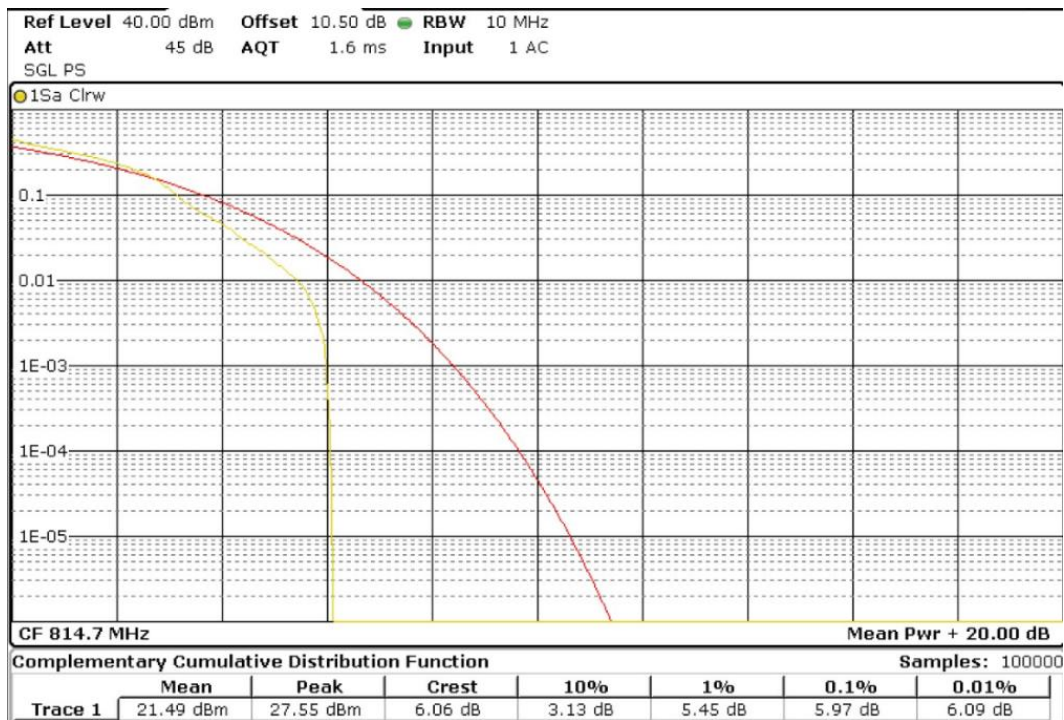
Highest channel



PAPR

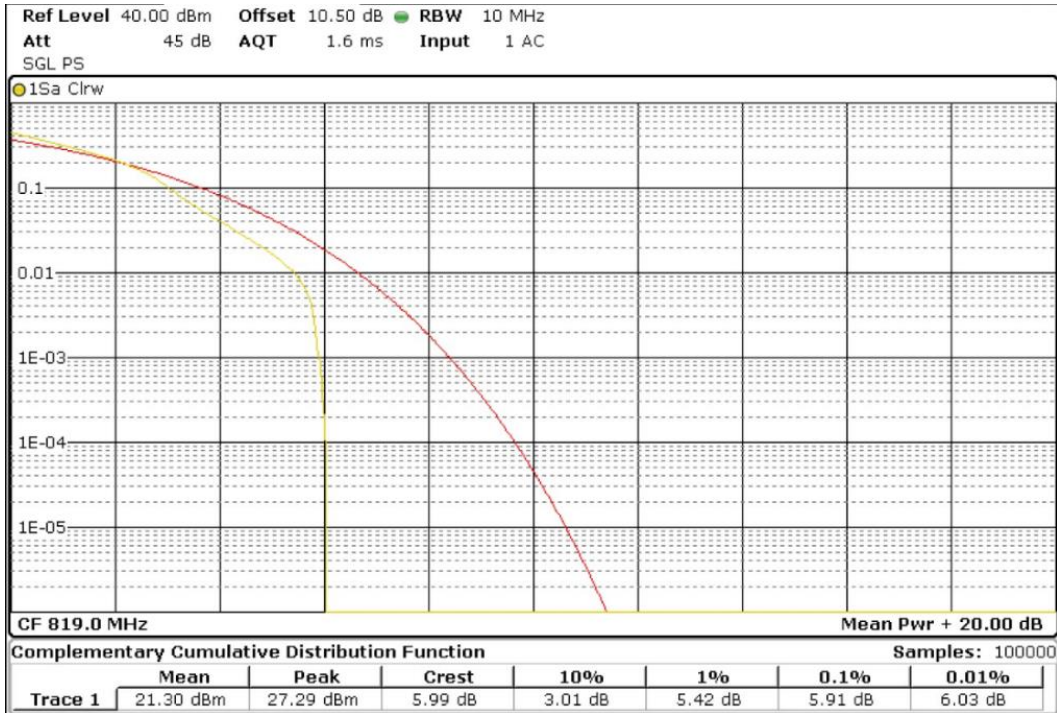
Bandwidth = 1.4 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.

Lowest channel



TEST RESULTS (Cont):

Middle channel



Highest channel

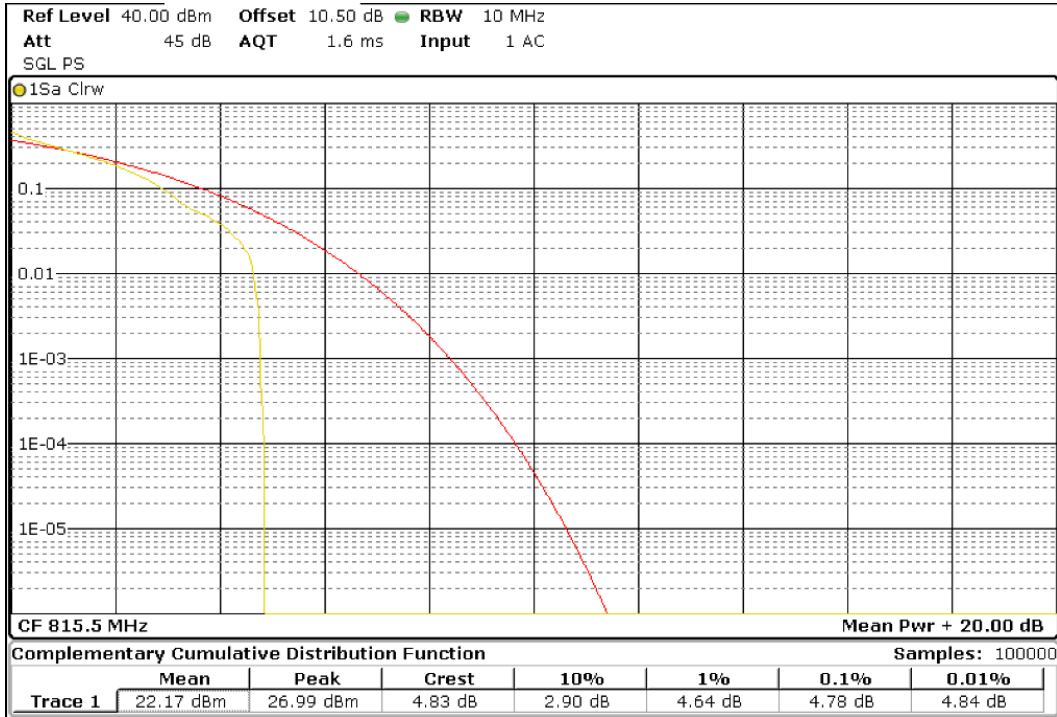


TEST RESULTS (Cont):

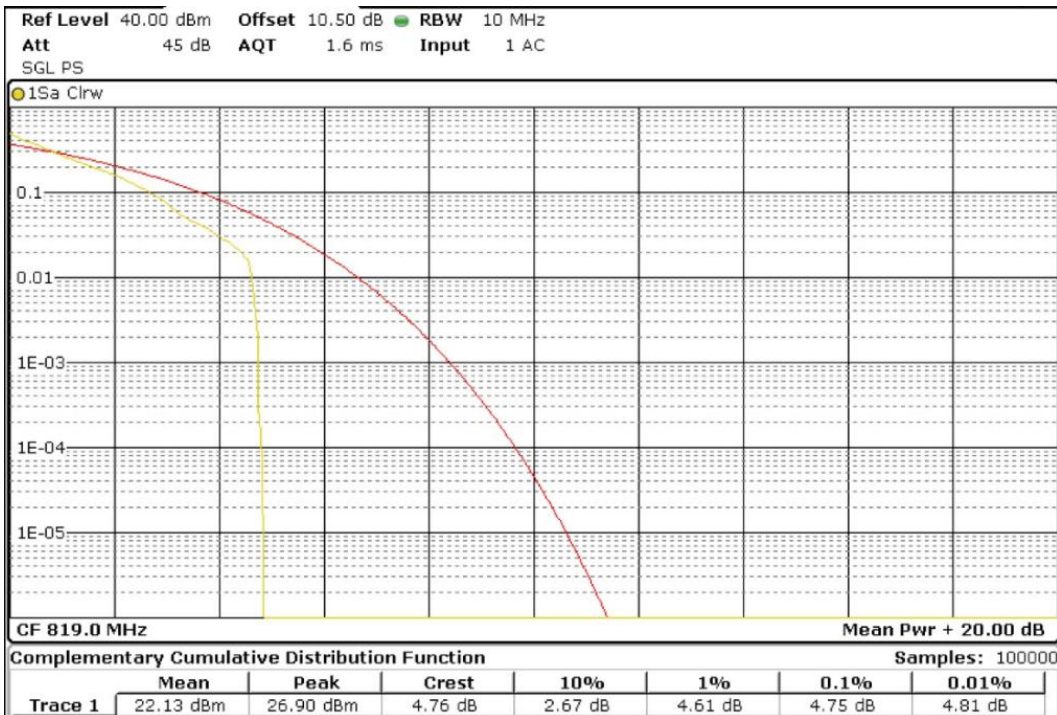
PAPR

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

Lowest channel

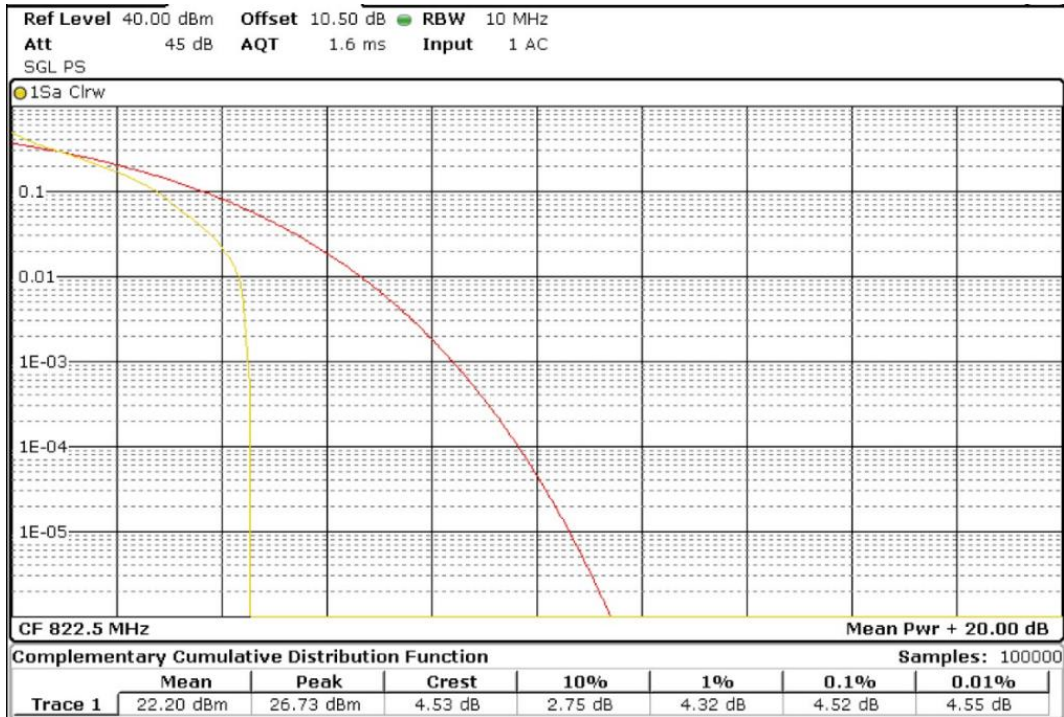


Middle channel



TEST RESULTS (Cont):

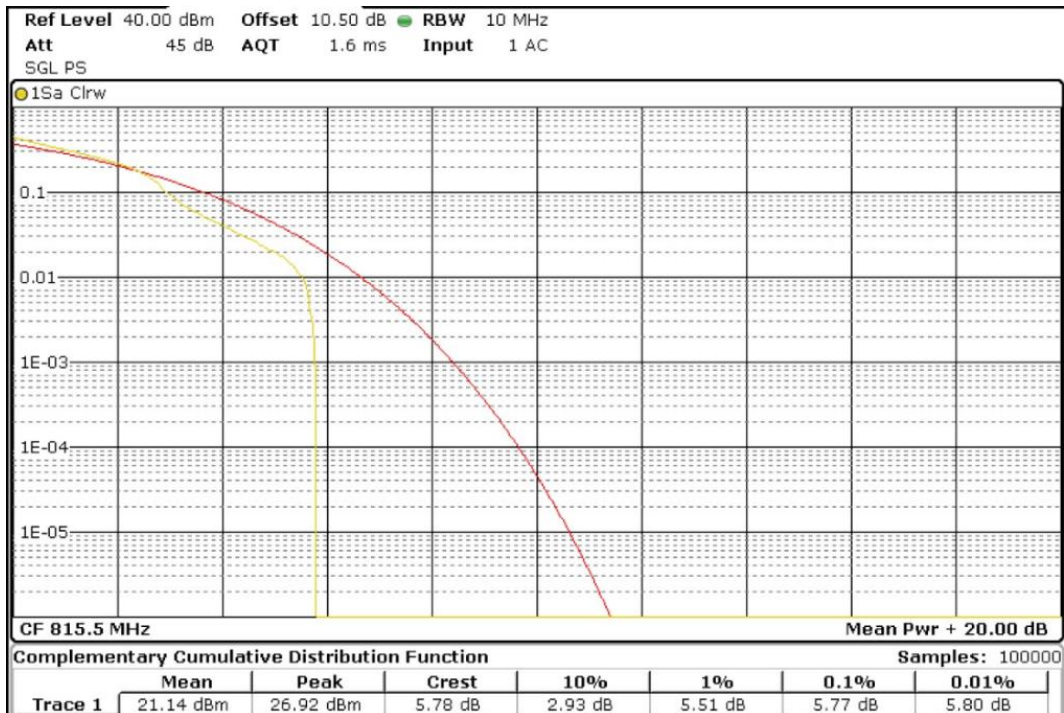
Highest channel



PAPR

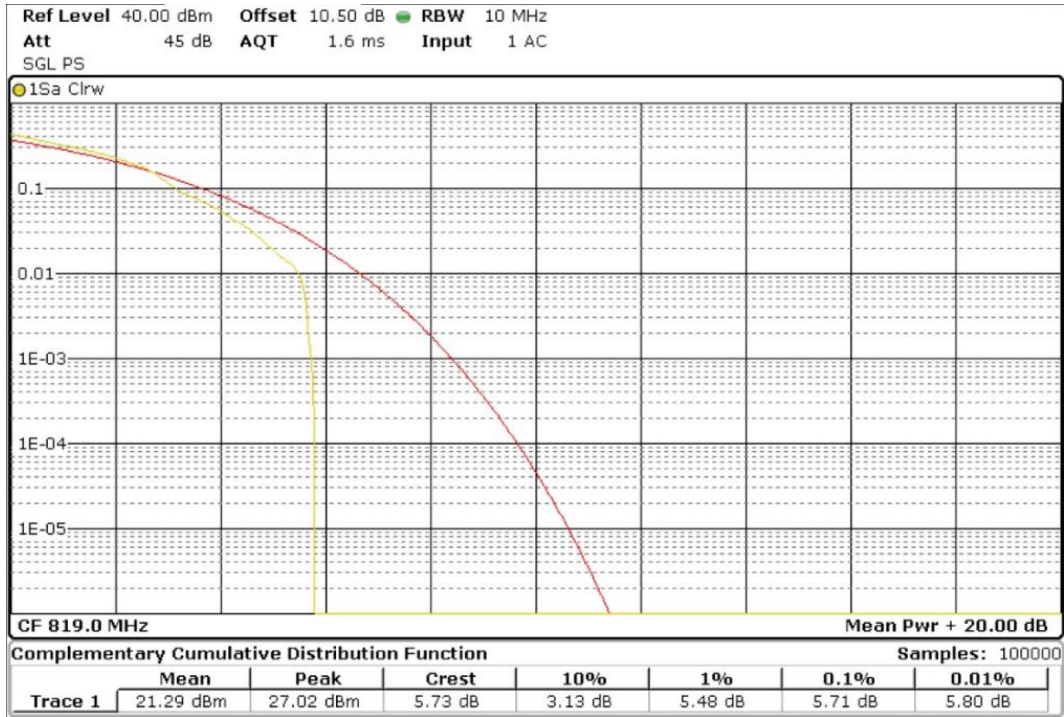
Bandwidth = 3 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.

Lowest channel

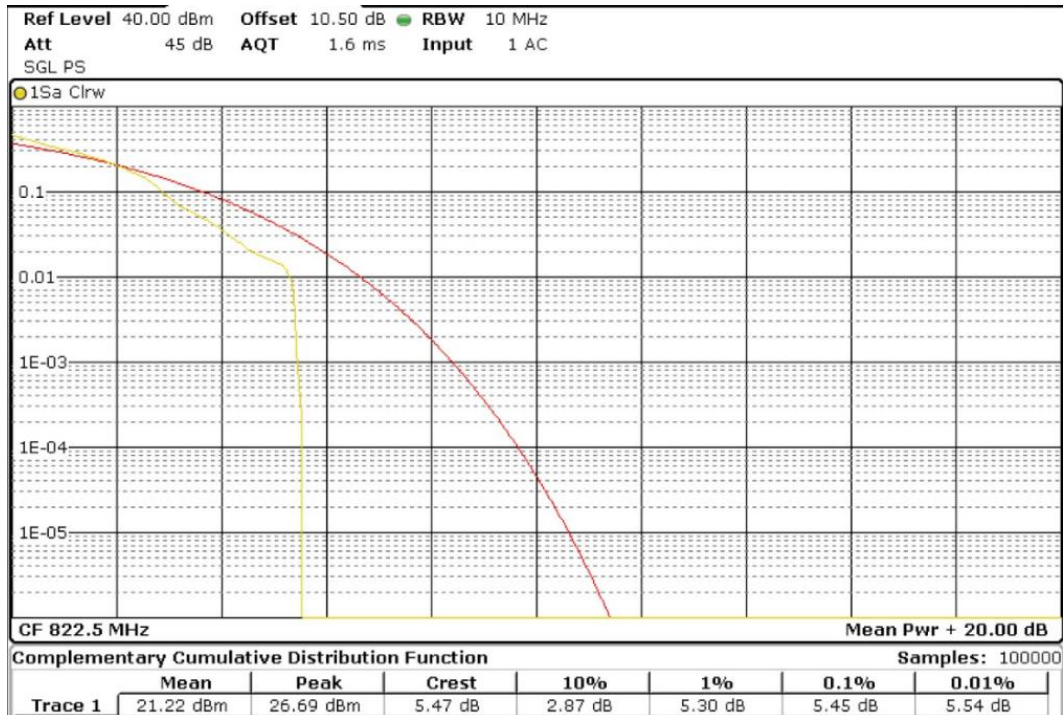


TEST RESULTS (Cont):

Middle channel



Highest channel

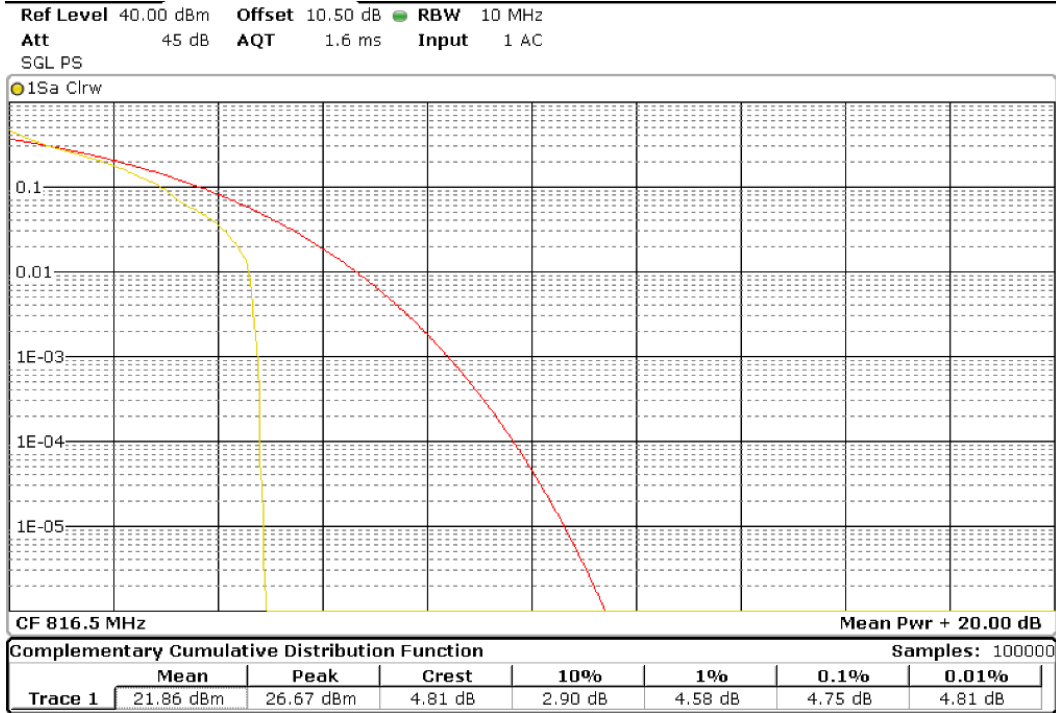


TEST RESULTS (Cont):

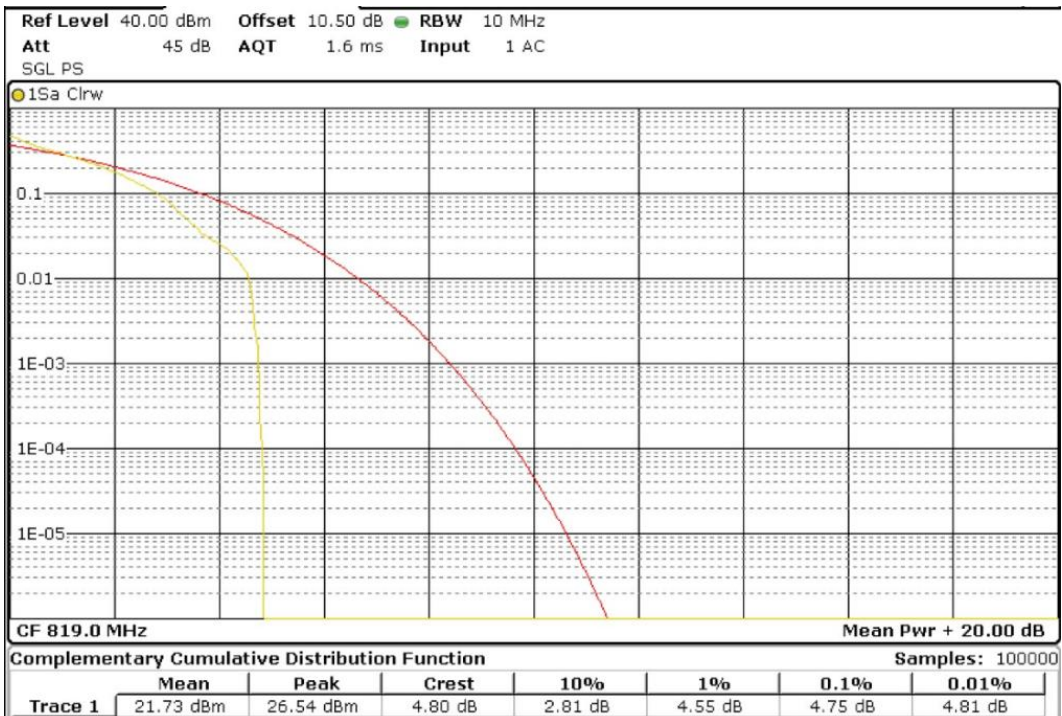
PAPR

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

Lowest channel

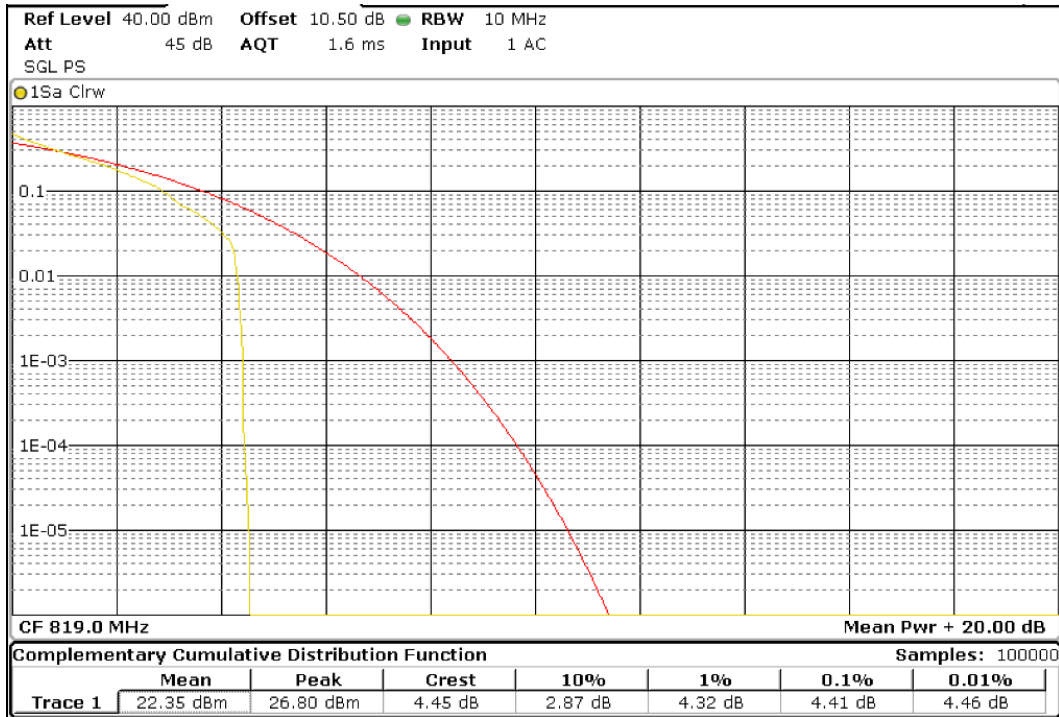


Middle channel



TEST RESULTS (Cont):

Highest channel

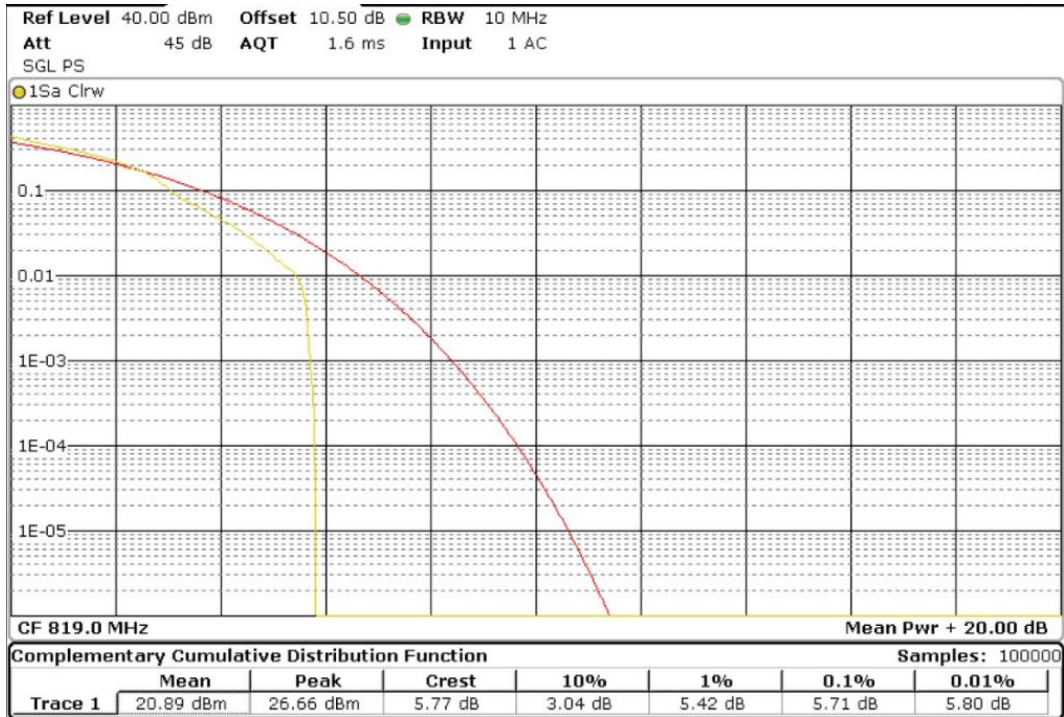


Bandwidth = 5 MHz. Modulation 16QAM. RB Size: 1. RB Offset: 0.
 Lowest channel

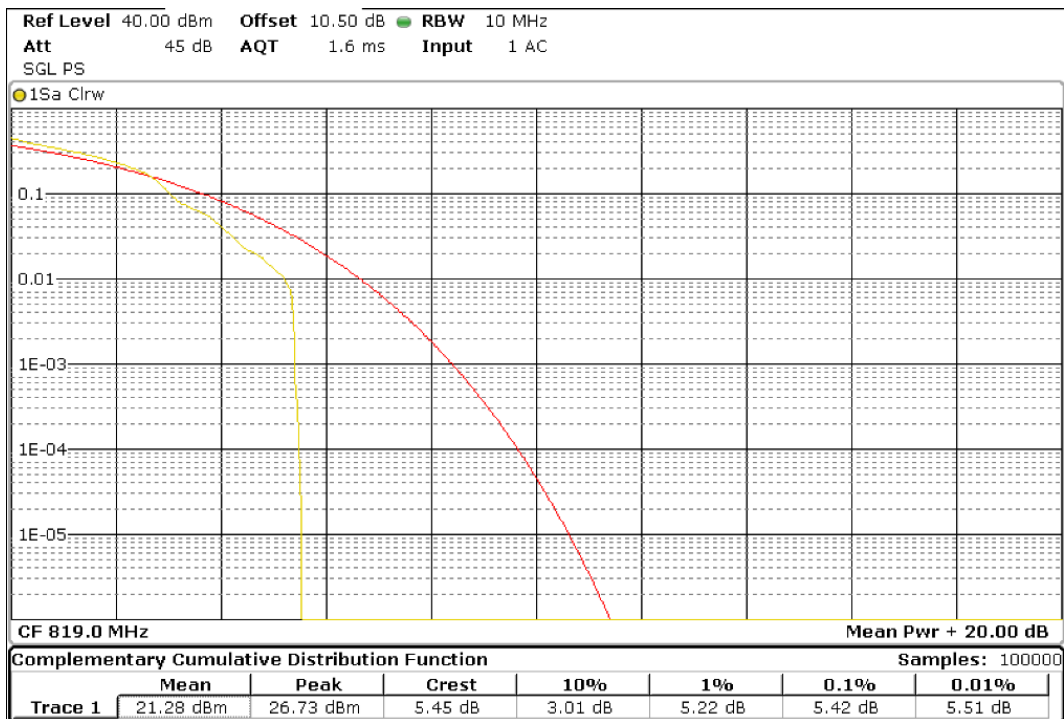


TEST RESULTS (Cont):

Middle channel

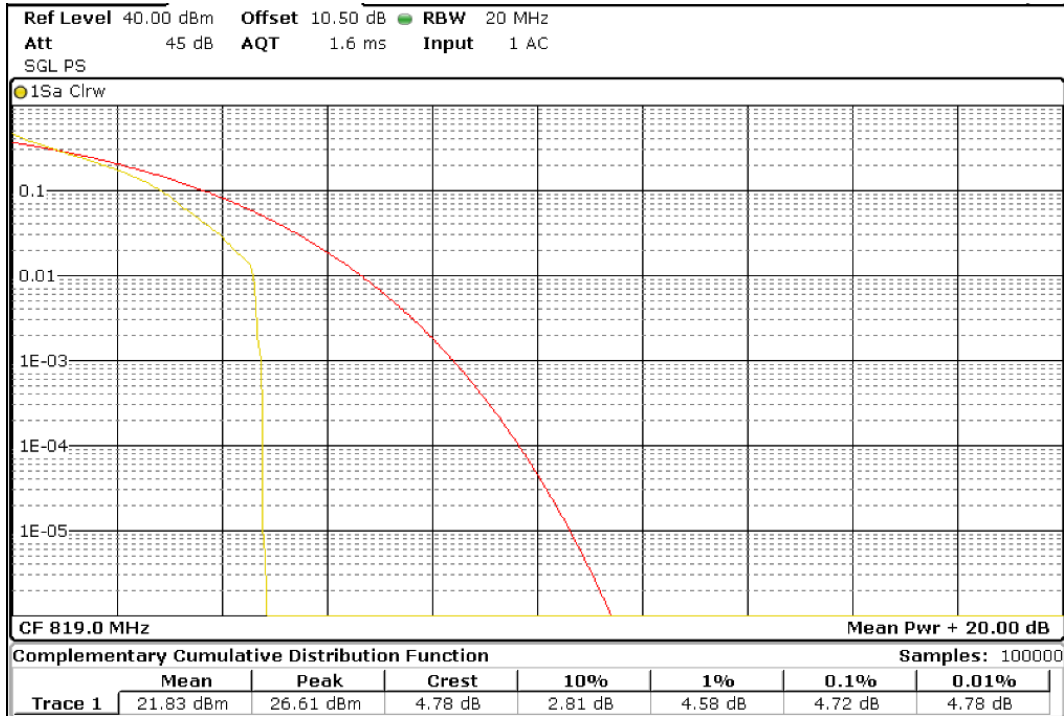


Highest channel



TEST RESULTS (Cont):

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

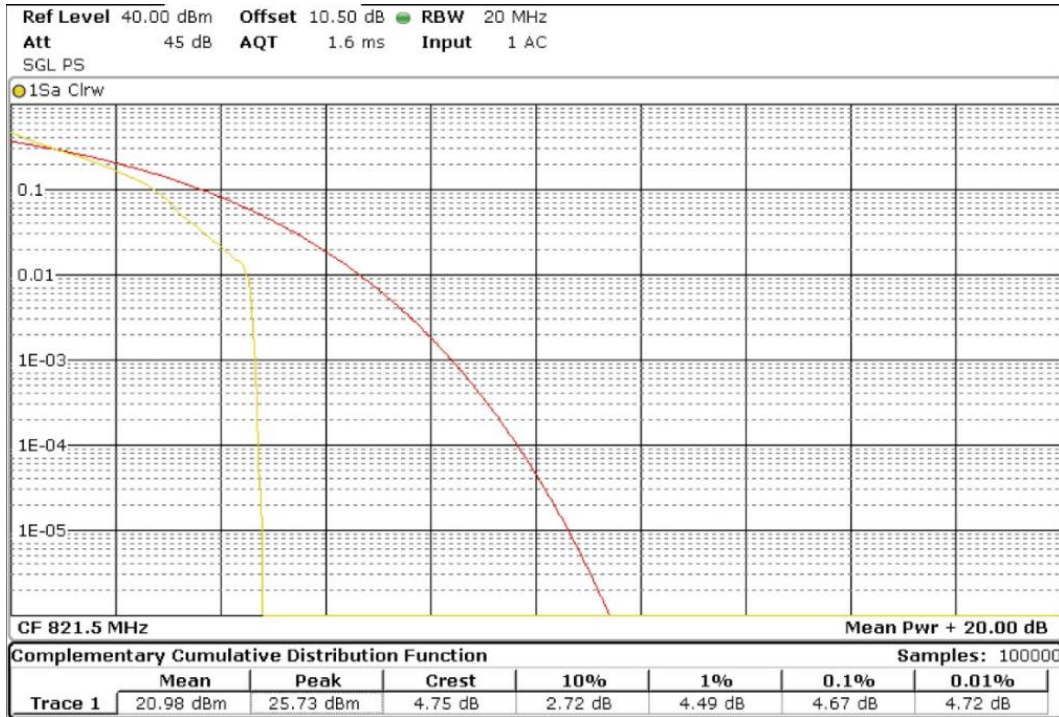


Bandwidth = 10 MHz. Modulation 16 QAM. RB Size: 1. RB Offset: 0.

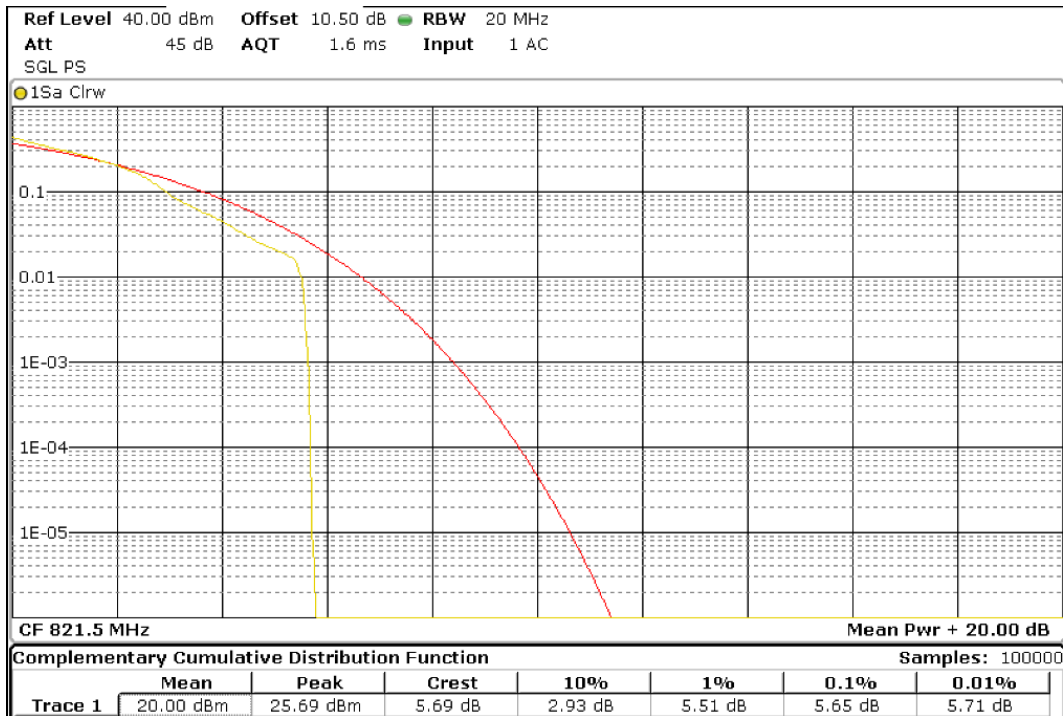


TEST RESULTS (Cont):

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



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



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

LTE QPSK AND 16QAM MODULATION. Bandwidth = 1.4 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)
26790	23.03	5.0	28.03
Measurement uncertainty (dB)			<±0.95

LTE QPSK AND 16QAM MODULATION. Bandwidth = 3 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)
26790	23.08	5.0	28.08
Measurement uncertainty (dB)			<±0.95

LTE QPSK AND 16QAM MODULATION. Bandwidth = 5 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)
26790	23.05	5.0	28.05
Measurement uncertainty (dB)			<±0.95

LTE QPSK AND 16QAM MODULATION. Bandwidth = 10 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)
26790	23.09	5.0	28.09
Measurement uncertainty (dB)			<±0.95

LTE QPSK AND 16QAM MODULATION. Bandwidth = 15 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)
26790	23.04	5.0	28.04
Measurement uncertainty (dB)			<±0.95

TEST RESULTS (Cont):					
CHANNEL FREQUENCY (MHz)	BANDWIDTH (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
26790 824.0	1.4	QPSK	1	0	22.93
			1	2	22.96
			1	5	22.90
			3	0	22.95
			3	1	23.02
			3	2	23.03
		6	0	21.90	
		16-QAM	1	0	21.84
			1	2	21.87
			1	5	21.85
			3	0	21.87
			3	1	21.91
	3		2	21.93	
	3	QPSK	6	0	21.00
			1	0	22.99
			1	7	23.08
			1	14	22.95
			8	0	22.01
			8	4	22.01
		8	7	22.00	
		15	0	21.98	
		16-QAM	1	0	22.19
			1	7	22.28
			1	14	22.17
			8	0	21.20
	8		4	21.23	
	8		7	21.17	
	5		15	0	21.01
			1	0	23.05
			1	12	23.02
			1	24	23.05
			12	0	22.01
			12	6	22.03
		12	11	22.00	
		25	0	22.02	
			1	0	22.20
1			12	22.14	
1			24	22.22	
12			0	21.05	
12	6		21.07		
12	11		21.06		
25	0	20.97			

TEST RESULTS (Cont):

CHANNEL FREQUENCY (MHz)	BANDWIDTH (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
26790 824.0	10	QPSK	1	0	23.05
			1	24	23.00
			1	49	23.09
			25	0	22.04
			25	12	22.04
			25	24	21.99
		50	0	22.02	
		16-QAM	1	0	22.29
		16-QAM	1	24	22.12
		16-QAM	1	49	22.21
		16-QAM	25	0	21.11
		16-QAM	25	12	21.08
	16-QAM	25	24	21.05	
	16-QAM	50	0	21.00	
	15	QPSK	1	0	22.99
			1	37	23.02
			1	74	23.04
			36	0	22.06
			36	18	22.08
			36	37	22.11
		75	0	22.03	
		16-QAM	1	0	22.21
		16-QAM	1	37	22.21
		16-QAM	1	74	22.20
16-QAM		36	0	21.10	
16-QAM		36	18	21.16	
16-QAM	36	37	21.17		
16-QAM	75	0	21.05		

Test A.2: Frequency stability

LIMITS:	Product standard:	FCC Part 90
	Test standard:	FCC §2.1055 and § 90.213

LIMITS

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

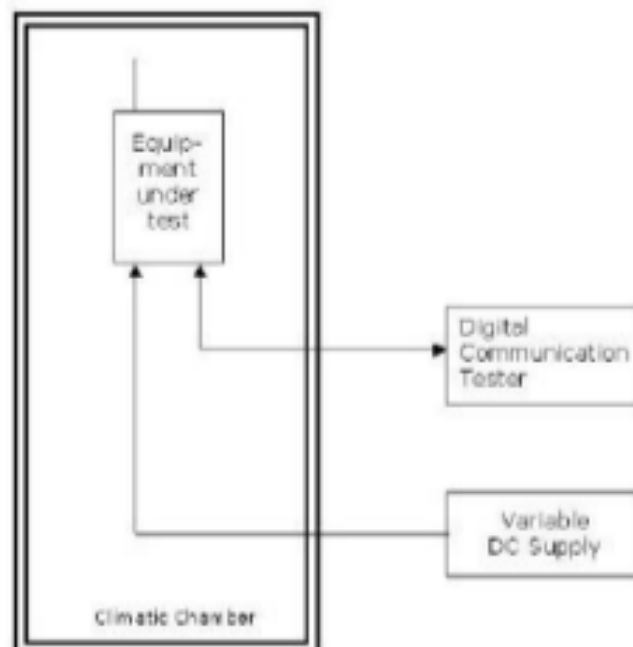
TEST SETUP

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

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

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

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



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

LTE QPSK MODULATION. BW = 5 MHz

Frequency stability over temperature variations

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	-1.79	0.0009	0.00000009
40	0.3	0.0005	0.00000005
30	-14.71	-0.0007	-0.00000007
20	22.1	0.0028	0.00000028
10	-6.07	-0.0021	-0.00000021
0	1.53	-0.0005	-0.00000005
-10	-1.02	-0.0004	-0.00000004
-20	2.35	0.0004	0.00000004
-30	5.35	-0.0021	-0.00000021

Frequency stability over voltage variations

Battery Supply Voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.4	1.73	0.0008	0.00000008
Vmin	3.3	8.6	-0.0028	-0.00000028

TEST A.3: OCCUPIED BANDWIDTH

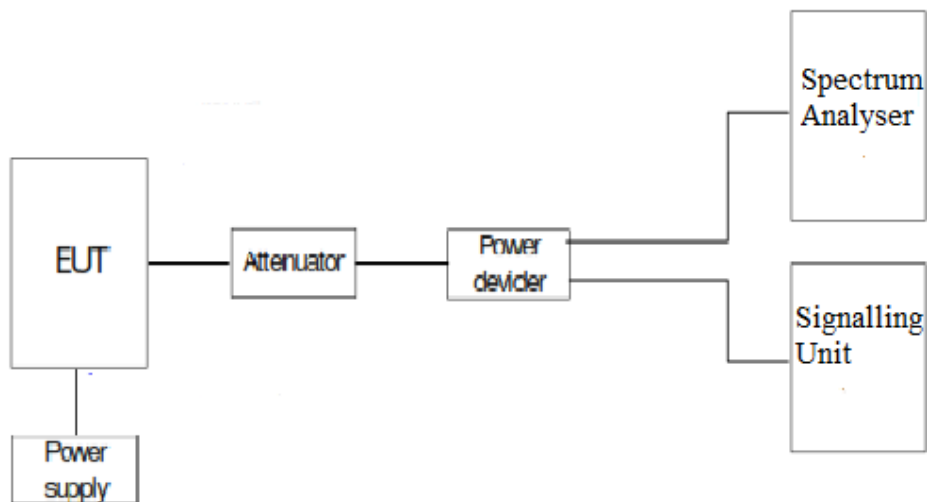
LIMITS:	Product standard:	FCC Part 90.
	Test standard:	FCC § 2.1049 and §90.209(7)

LIMITS

Reference only.

TEST SETUP

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



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

LTE QPSK MODULATION. BW = 1.4 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12	1.11	1.12
-26 dBc bandwidth (MHz)	1.28	1.33	1.28

LTE 16QAM MODULATION. BW = 1.4 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.11	1.11	1.10
-26 dBc bandwidth (MHz)	1.29	1.34	1.27

LTE QPSK MODULATION. BW = 3 MHz

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

LTE 16QAM MODULATION. BW = 3 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	2.76	2.72	2.73
-26 dBc bandwidth (MHz)	3.09	3.09	3.09

LTE QPSK MODULATION. BW = 5 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	4.58	4.55	4.56
-26 dBc bandwidth (MHz)	5.17	5.17	5.16

TEST RESULTS (Cont):

LTE 16QAM MODULATION. BW = 5 MHz

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

LTE QPSK MODULATION. BW = 10 MHz

Channel	Single
99% Occupied bandwidth (MHz)	9.16
-26 dBc bandwidth (MHz)	9.85

LTE 16QAM MODULATION. BW = 10 MHz

Channel	Single
99% Occupied bandwidth (MHz)	9.16
-26 dBc bandwidth (MHz)	9.82

LTE QPSK MODULATION. BW = 15 MHz

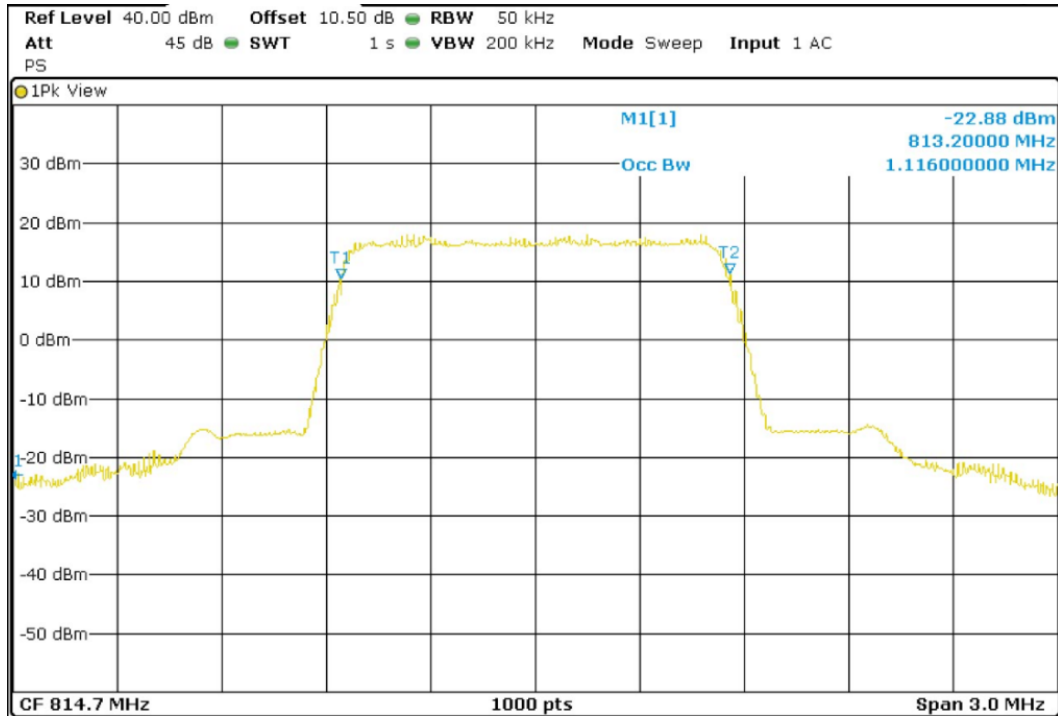
Channel	Single
99% Occupied bandwidth (MHz)	13.53
-26 dBc bandwidth (MHz)	15.20

LTE 16QAM MODULATION. BW = 15 MHz

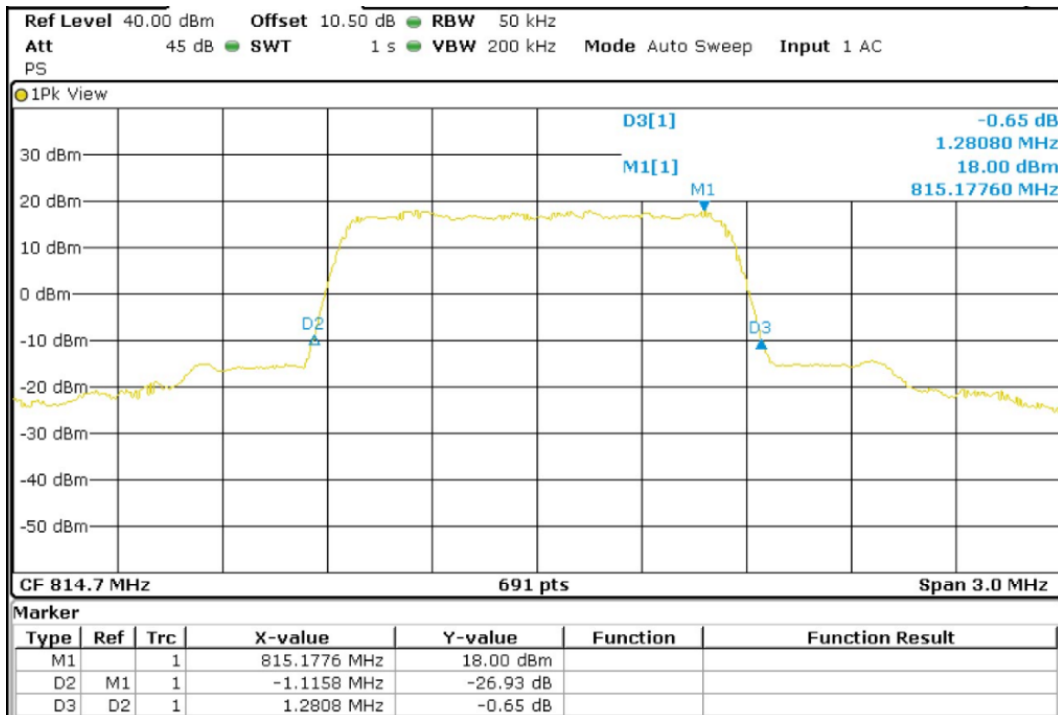
Channel	Single
99% Occupied bandwidth (MHz)	13.56
-26 dBc bandwidth (MHz)	15.02

TEST RESULTS (Cont):

LTE QPSK MODULATION. BW = 1.4 MHz
 Lowest Channel 99% Occupied Bandwidth

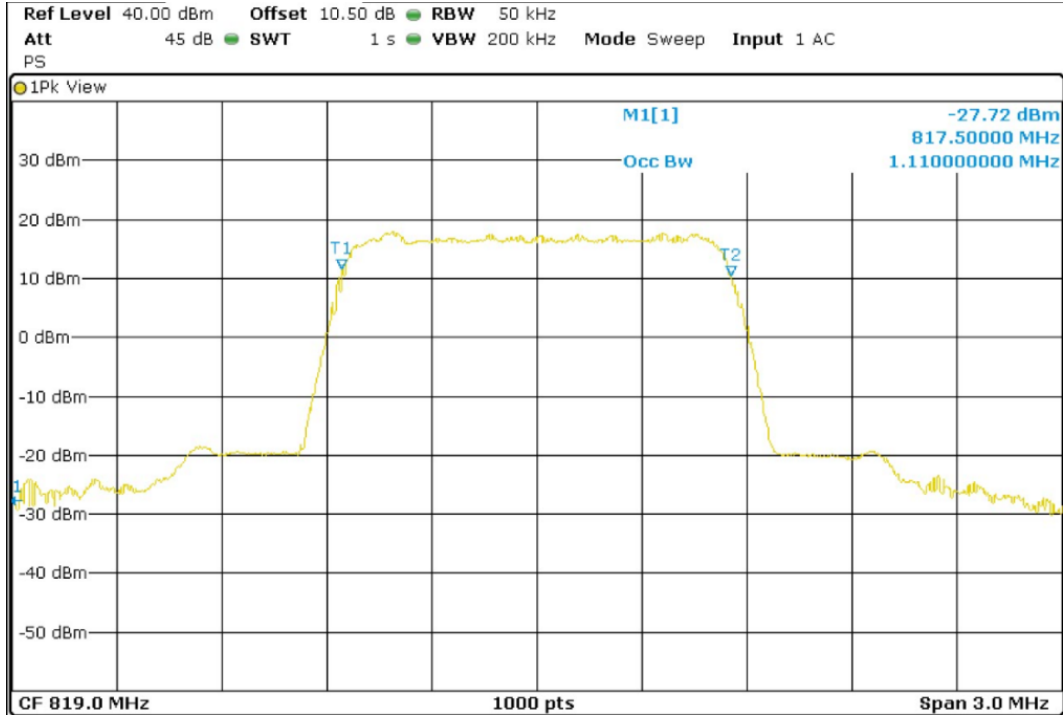


Lowest Channel -26dBc Bandwidth kHz

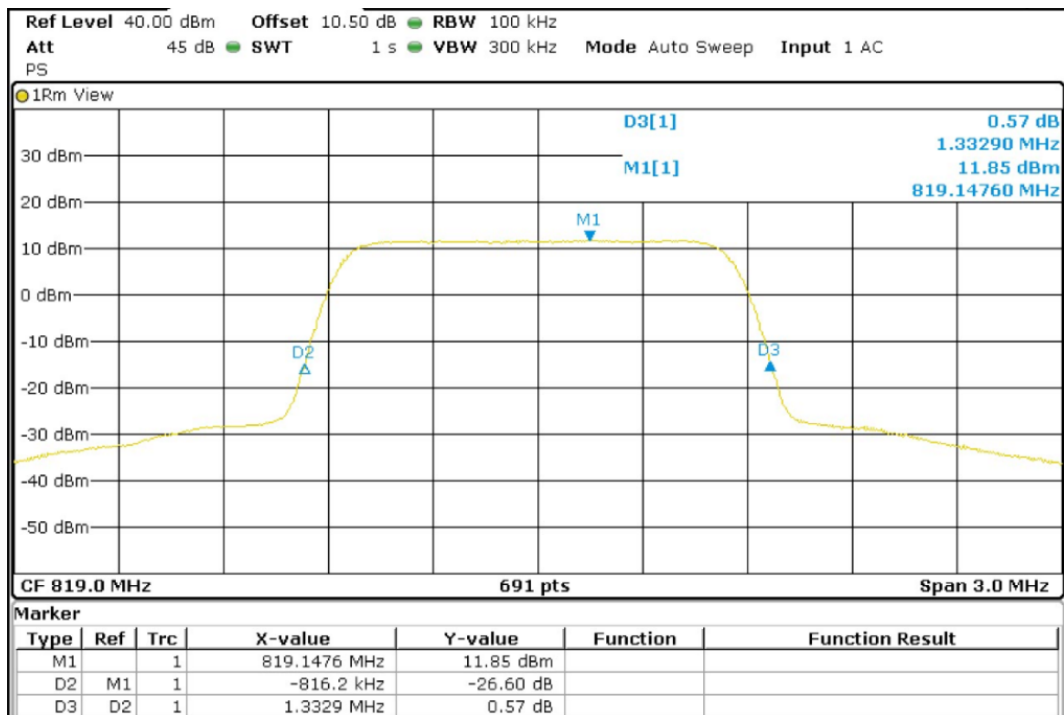


TEST RESULTS (Cont):

Middle Channel 99% Occupied Bandwidth

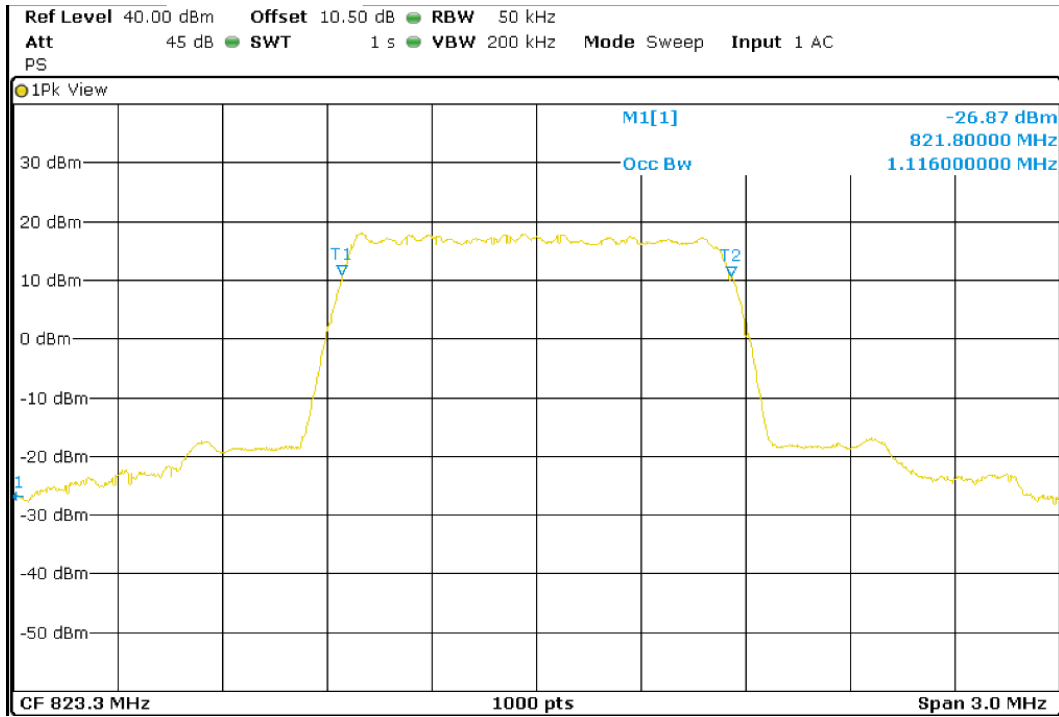


Middle Channel 26dBc Bandwidth kHz

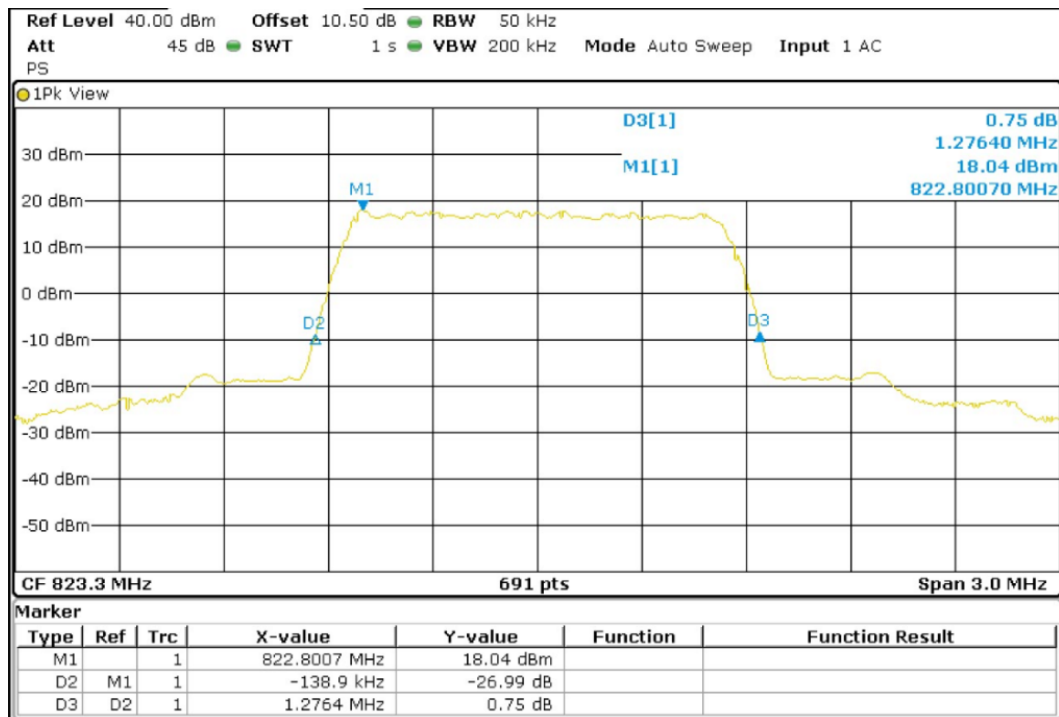


TEST RESULTS (Cont):

Highest Channel 99% Occupied Bandwidth

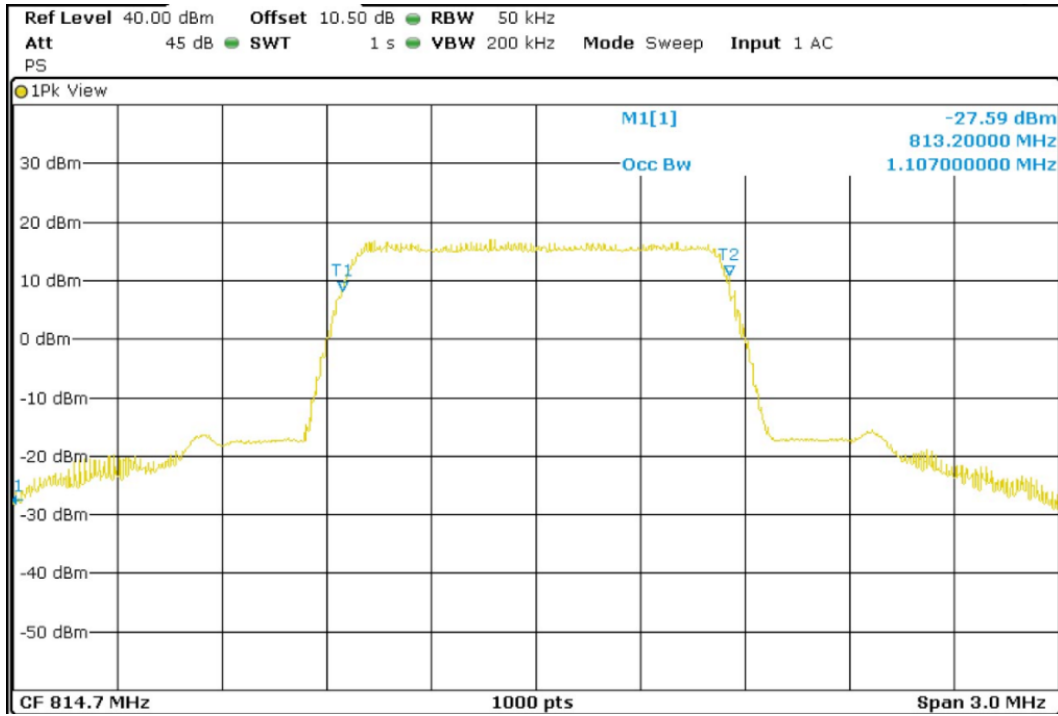


Highest Channel 26dBc Bandwidth kHz

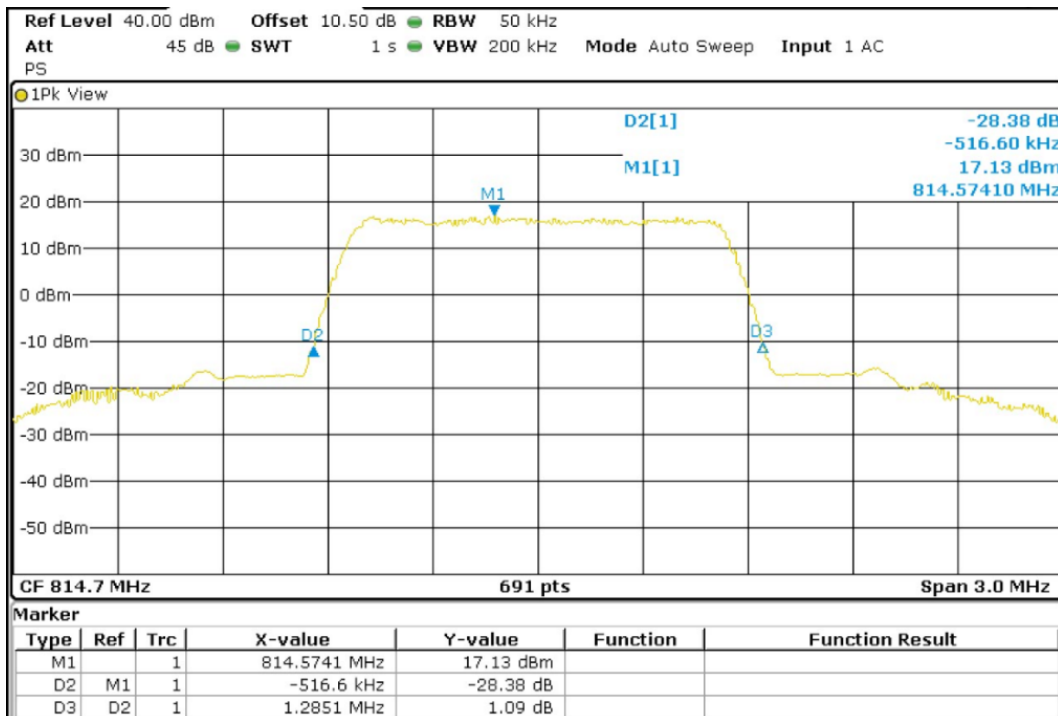


TEST RESULTS (Cont):

LTE 16 QAM MODULATION BW = 1.4 MHz
 Lowest Channel 99% Occupied Bandwidth

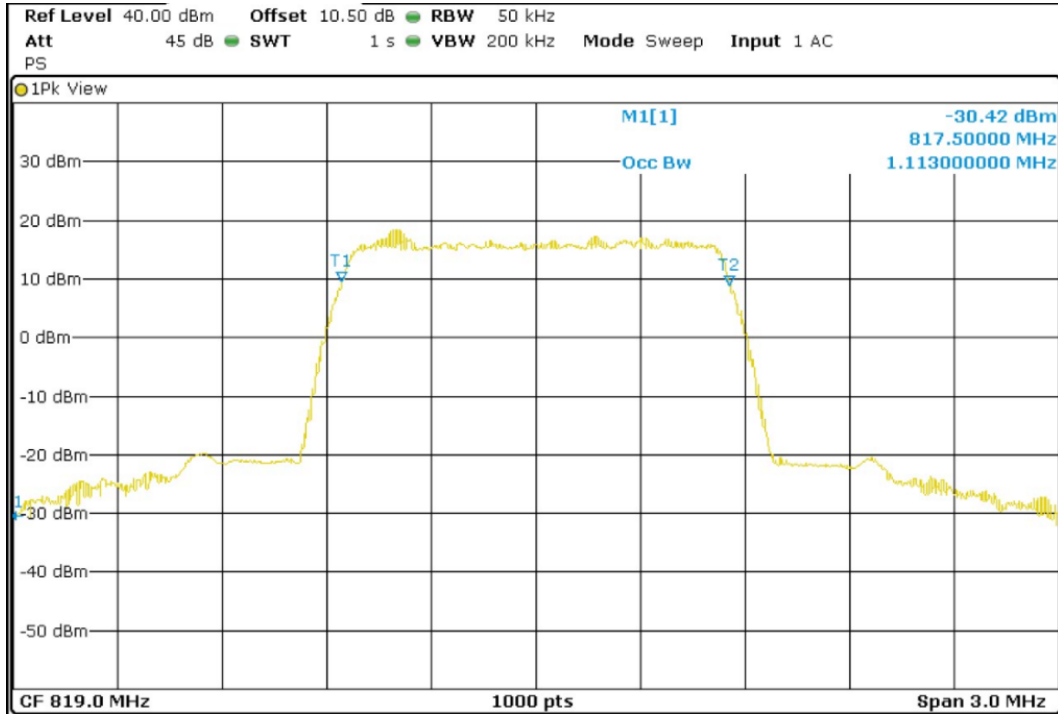


Lowest Channel -26dBc Bandwidth kHz

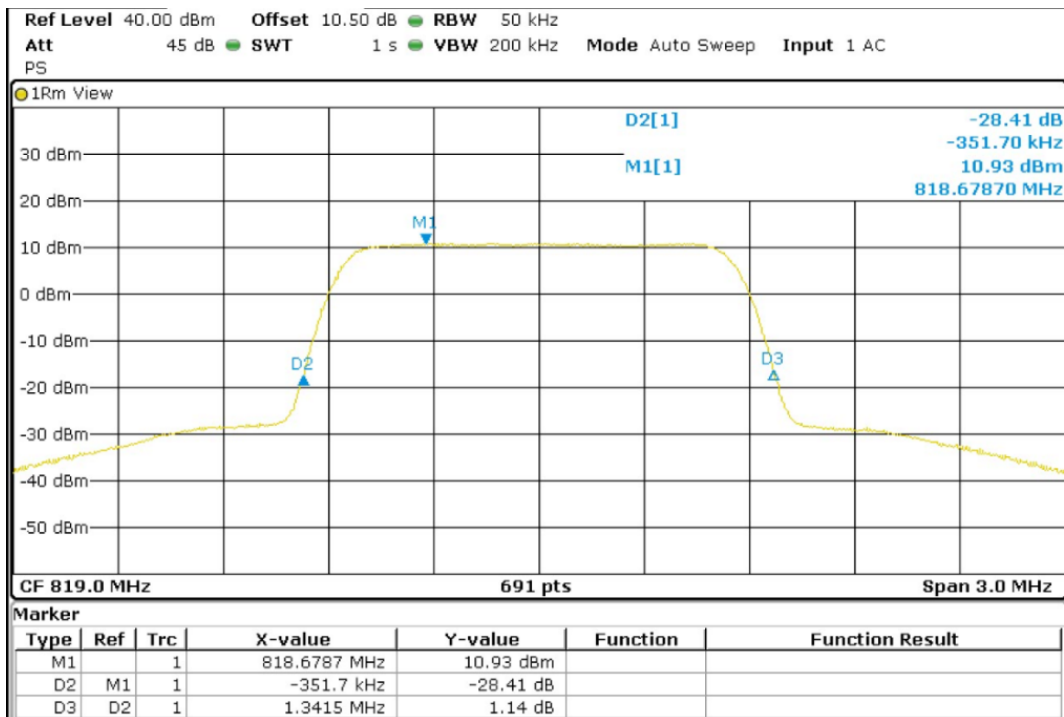


TEST RESULTS (Cont):

Middle Channel 99% Occupied Bandwidth

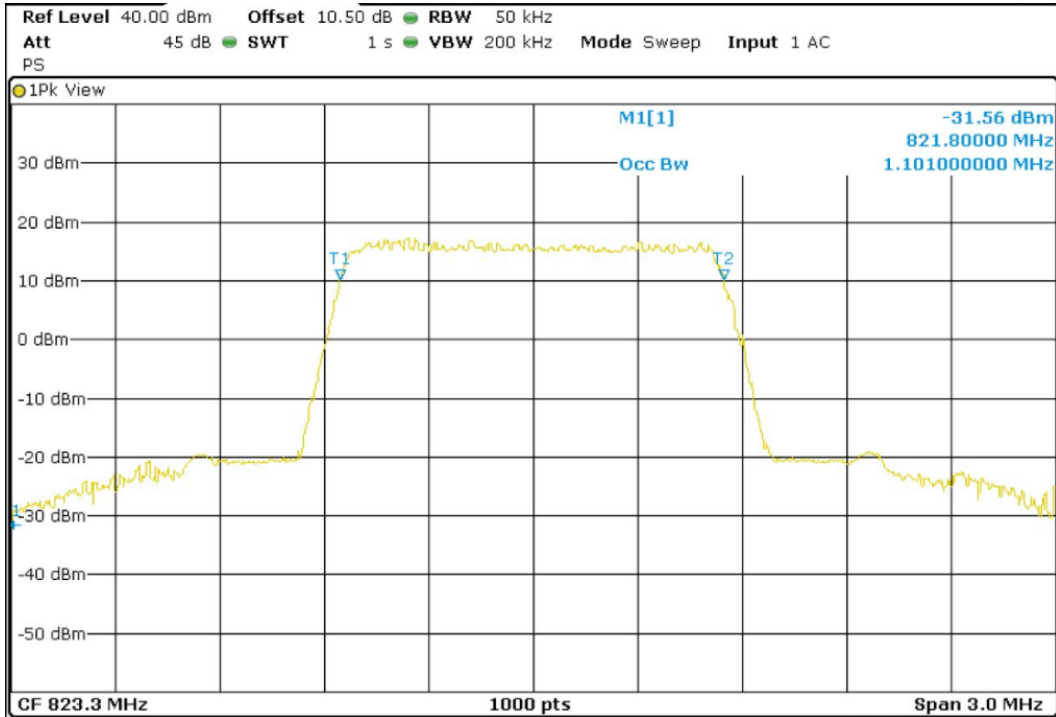


Middle Channel 26dBc Bandwidth kHz

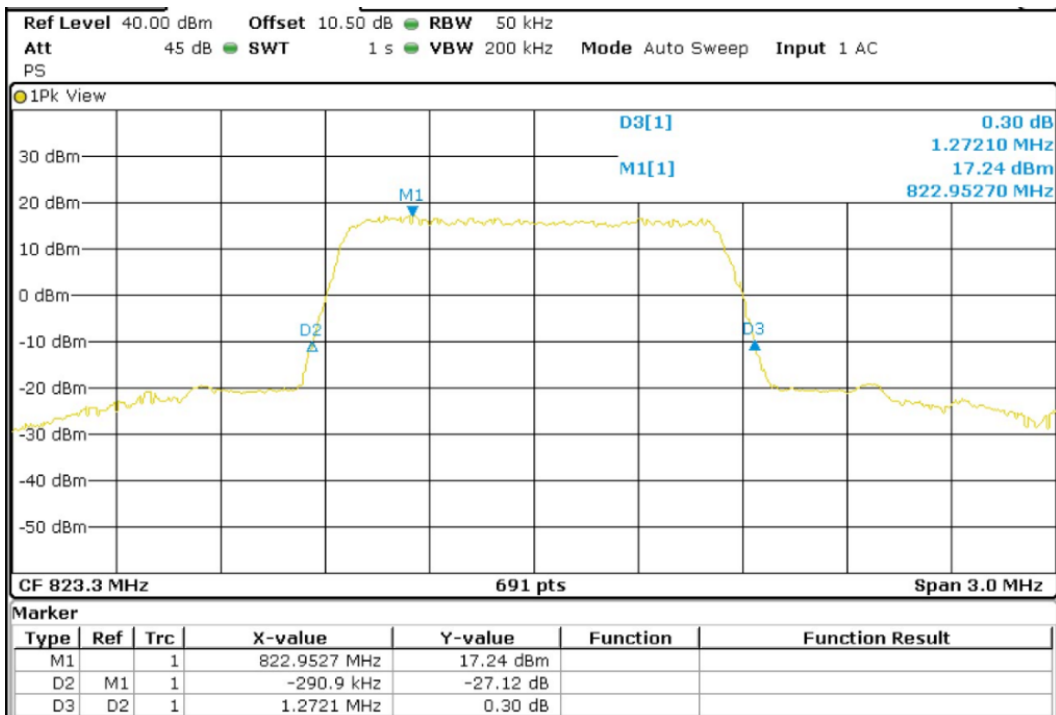


TEST RESULTS (Cont):

Highest Channel 99% Occupied Bandwidth



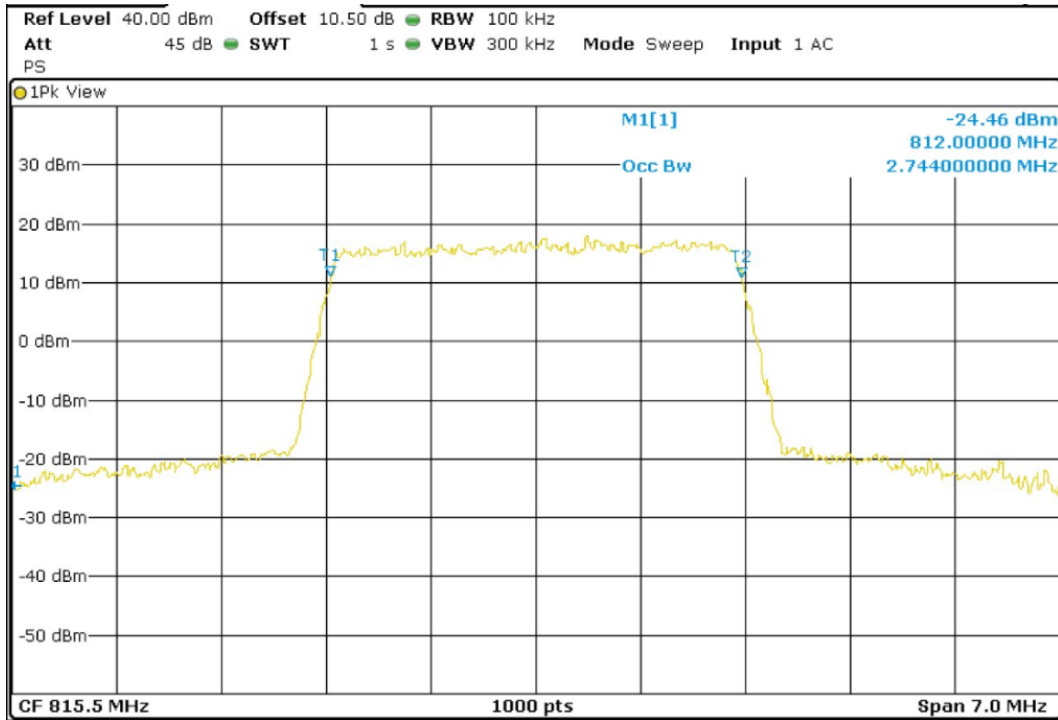
Highest Channel 26dBc Bandwidth kHz



TEST RESULTS (Cont):

LTE QPSK MODULATION. BW = 3 MHz

Lowest Channel 99% Occupied Bandwidth



Lowest Channel -26dBc Bandwidth kHz

