FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E

TEST REPORT

For

Computer

Trade Name: ADVANTECH

Model: TREK-530

Issued to

Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C

Issued by

Compliance Certification Services Inc.
Wugu Laboratory
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
Issued Date: April 24, 2018

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		April 24, 2018		Initial Issue	ALL	Allison Chen
01		August 15, 2018		1. Revised antenna type. 2. Revised description of KDB 971168 no. 3. Revised test procedure in section 8.2. 4. Added note for test results in section 8.4 5. Added note for test results in section 8.5 6. Revised test procedure of antenna gain values of (dBd) to (dBi) in section 8.8. 7. Added note for test results below 1GHz in section 8.8.	P.5, 8, 26, 37-39, 51-58, 162, 163-166	Allison Chen
02		August 21, 2018		1. Removed remark in section 8.2.	P.28, P.30	Allison Chen
03		August 29, 2018		1. Revised test procedure in section 8.8.	P.162	Allison Chen

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APPENDIX I - PHOTOGRAPHS OF EUT

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1. TEST RESULT CERTIFICATION

Applicant: Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.

Manufacturer: Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.

Equipment Under Test: Computer

Trade Name: ADVANTECH

Model: TREK-530

Date of Test: December 1, 2017 ~ April 19, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E	No non-compliance noted

We hereby certify that:

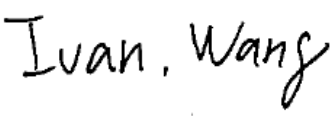
The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA-603-E and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rule FCC PART 22 Subpart H, PART 24 Subpart E.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

Sam Chuang
Manager
Compliance Certification Services Inc.

Tested by:



Ivan Wang
Assistant Engineer
Compliance Certification Services Inc.

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2. EUT DESCRIPTION

Product	Computer	
Trade Name	ADVANTECH	
Model	TREK-530	
Model Discrepancy	N/A	
Received Date	September 8, 2017	
Power Supply	Powered from host device: DC 12V	
Frequency Range	LTE Band 2 Channel Bandwidth: 1.4MHz	1850.7 MHz ~ 1909.2 MHz
	LTE Band 2 Channel Bandwidth: 3MHz	1851.5 MHz ~ 1908.4 MHz
	LTE Band 2 Channel Bandwidth: 5MHz	1852.5 MHz ~ 1907.5 MHz
	LTE Band 2 Channel Bandwidth: 10MHz	1855.0 MHz ~1905.0 MHz
	LTE Band 2 Channel Bandwidth: 15MHz	1857.5 MHz ~ 1902.5 MHz
	LTE Band 2 Channel Bandwidth: 20MHz	1860.0 MHz ~1900.0 MHz
	LTE Band 5 Channel Bandwidth: 1.4MHz	824.7 MHz ~ 848.2MHz
	LTE Band 5 Channel Bandwidth: 3MHz	825.5 MHz ~ 847.4 MHz
	LTE Band 5 Channel Bandwidth: 5MHz	826.5 MHz ~846.5 MHz
	LTE Band 5 Channel Bandwidth: 10MHz	829 MHz ~844 MHz
Modulation Technique	LTE Band 2	QPSK, 16QAM
	LTE Band 5	QPSK, 16QAM
Antenna Specification	Dipole Antenna LTE Band 2: 1.2dBi LTE Band 5: -0.1dBi	

Remark: *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

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Transmit Power (ERP & EIRP Power)	LTE Band 2 Channel Bandwidth: 1.4MHz	QPSK:	28.00	dBm
		16QAM:	26.34	dBm
	LTE Band 2 Channel Bandwidth: 3MHz	QPSK:	27.29	dBm
		16QAM:	24.91	dBm
	LTE Band 2 Channel Bandwidth: 5MHz	QPSK:	22.99	dBm
		16QAM:	23.24	dBm
	LTE Band 2 Channel Bandwidth: 10MHz	QPSK:	23.33	dBm
		16QAM:	22.05	dBm
	LTE Band 2 Channel Bandwidth: 15MHz	QPSK:	24.09	dBm
		16QAM:	25.51	dBm
	LTE Band 2 Channel Bandwidth: 20MHz	QPSK:	23.95	dBm
		16QAM:	25.81	dBm
	LTE Band 5 Channel Bandwidth: 1.4MHz	QPSK:	19.27	dBm
		16QAM:	21.05	dBm
	LTE Band 5 Channel Bandwidth: 3MHz	QPSK:	19.67	dBm
		16QAM:	19.65	dBm
	LTE Band 5 Channel Bandwidth: 5MHz	QPSK:	20.05	dBm
		16QAM:	20.63	dBm
	LTE Band 5 Channel Bandwidth: 10MHz	QPSK:	28.91	dBm
		16QAM:	29.16	dBm

Remark: *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

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3. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
-	2	Antenna Requirement	Pass
2.1046	8.1	Output Power measurement	Pass
22.913(a), 24.232(c)	8.2	ERP and EIRP Measurement	Pass
2.1055, 22.355, 24.235	8.3	Frequency Stability v.s. temperature measurement	Pass
2.1049	8.4	Occupied Bandwidth Measurement	Pass
22.917(a), 24.238(a)	8.5	Conducted Band Edge	Pass
22.913(d), 24.232(d)	8.6	Peak to Average Ratio	Pass
22.917(a), 24.238(a)	8.7	Conducted Spurious Emission	Pass
22.917(a), 24.238(a)	8.8	Spurious Radiation Measurement	Pass

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4. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures document on chapter 13 of TIA-603-E and FCC CFR 47, Part 2 and Part 22 Subpart H & Part 24 Subpart E, KDB 971168 D01 Power Meas License Digital Systems.

4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

4.3 DESCRIPTION OF TEST MODES

The EUT had been tested under operating condition.
Software used to control the EUT for staying in continuous transmitting mode was programmed.

LTE Band 2: 1850 MHz ~ 1915MHz
Three channels had been tested for each channel bandwidth.

Channel Bandwidth	1.4MHz		3MHz		5MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low channel (L)	18607	1850.7	18615	1851.5	18625	1852.5
Middle channel (M)	18900	1880	18900	1880.0	18900	1880
High channel (H)	19192	1909.2	19184	1908.4	19175	1907.5
Channel Bandwidth	**10MHz**		**15MHz**		**20MHz**	
	Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
Low channel (L)	18650	1855	18675	1857.5	18700	1860
Middle channel (M)	18900	1880	18900	1880.0	18900	1880
High channel (H)	19150	1905	19125	1902.5	19100	1900

LTE Band 5: 824 MHz ~ 849 MHz
Three channels had been tested for each channel bandwidth.

Channel Bandwidth	1.4MHz		3MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low channel (L)	20407	824.7	20415	825.5
Middle channel (M)	20525	836.5	20525	836.5
High channel (H)	20642	848.2	20634	847.4
Channel Bandwidth	**5MHz**		**10MHz**	
	Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
Low channel (L)	20425	826.5	20450	829
Middle channel (M)	20525	836.5	20525	836.5
High channel (H)	20625	846.5	20600	844

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For test mode:
The conducted power be measured in 1, 50% and 100% RB allocation, offset to upper edge, centered and lower edge of the channel bandwidth of each required channel.

	QPSK	Worst Mode	16QAM	Worst Mode
Band2	1.4M	1 RB ALLOCATED AT THE UPPER EDGE	1.4M	1 RB ALLOCATED AT THE UPPER EDGE
	5M	1 RB ALLOCATED AT THE UPPER EDGE	5M	1 RB ALLOCATED AT THE UPPER EDGE
	10M	1 RB ALLOCATED AT THE UPPER EDGE	10M	1 RB ALLOCATED AT THE CENTERED
	20M	1 RB ALLOCATED AT THE UPPER EDGE	20M	1 RB ALLOCATED AT THE UPPER EDGE
Band5	1.4M	1 RB ALLOCATED AT THE UPPER EDGE	1.4M	1 RB ALLOCATED AT THE UPPER EDGE
	5M	1 RB ALLOCATED AT THE UPPER EDGE	5M	1 RB ALLOCATED AT THE UPPER EDGE
	10M	1 RB ALLOCATED AT THE UPPER EDGE	10M	1 RB ALLOCATED AT THE CENTERED

4.4 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement	
Test Condition	**Band edge, Emission for Unwanted and Fundamental**
DC Voltage	**12V**
Test Mode	**Mode 1: EUT power by Power Supply.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Position	☐ **P**laced in fixed position. ☒ **P**laced in fixed position at X-Plane (E2-Plane) ☐ **P**laced in fixed position at Y-Plane (E1-Plane) ☐ **P**laced in fixed position at Z-Plane (H-Plane)

Remark:
1. The worst mode was record in this test report.
2. The EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case (X-Plane) were recorded in this report.

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5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Wugu fully Chamber					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Signal Analyzer	Agilent	E4407B	MY44212686	04/07/2017	04/06/2018
Pre-Amplifier	EMEC	EM01M62G	60570	08/01/2017	07/31/2018
Bilog Antenna	Sunol Sciences	JB1	A052609	03/17/2017	03/16/2018
Horn Antenna	SCHWARZBECK	BBHA 9120D	779	03/08/2017	03/07/2018
Pre-Amplifier	Anritsu	MH648A	M89145	06/27/2017	06/26/2018
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Filter	N/A	800-1G	N/A	07/20/2017	07/19/2018
Filter	N/A	1800-2000	N/A	07/20/2017	07/19/2018
WWAN signal cable	HUBER SUHNER	SUCOFLEX 104PEA	33960	07/31/2017	07/30/2018
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	116875	04/25/2017	04/24/2018
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	116875	04/20/2018	04/19/2019

Conducted Emissions Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal Date**	**Cal Due**
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	116875	04/25/2017	04/24/2018
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	116875	04/20/2018	04/19/2019
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Spectrum Analyzer	Keysight	N9010B	MY55460167	06/14/2017	06/13/2018
Thermostatic/Hrgrosatic Chamber	TAICHY	MHG-150LF	930619	10/11/2017	10/10/2018
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Divider	Solvang Technology	2-18GHz 4Way	STI08-0015	07/26/2017	07/25/2018

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5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

***Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

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6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan, R.O.C

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

6.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

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7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

7.2 SUPPORT EQUIPMENT

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable
1	DC Power Source	GWINSTEK	SPS-3610	N/A	N/A	DC Cable 1.5m shielding
2	NB	ASUS	M5200AE	N/A	PD9WM3B2100	RS232 to USB Cable 1.5m

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

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8. FCC PART 22 & 24 REQUIREMENTS

8.1 OUTPUT POWER MEASUREMENT

Test Procedures

CONDUCTED POWER MEASUREMENT:

1. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
2. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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TEST RESULTS

LTE Band 2

Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 2	1.4M	18607	1850.7	QPSK	1	0	0	23.36	0.2168
					1	2	0	23.39	0.2183
					1	5	0	23.11	0.2046
					3	0	1	22.42	0.1746
					3	1	1	22.48	0.1770
					3	2	1	22.24	0.1675
					6	0	1	22.44	0.1754
				16QAM	1	0	1	22.46	0.1762
					1	2	1	22.50	0.1778
					1	5	1	22.16	0.1644
					3	0	2	21.52	0.1419
					3	1	2	21.51	0.1416
					3	2	2	21.21	0.1321
					6	0	2	21.36	0.1368
		18900	1880.0	QPSK	1	0	0	23.42	0.2198
					1	2	0	23.34	0.2158
					1	5	0	22.86	0.1932
					3	0	1	22.54	0.1795
					3	1	1	22.39	0.1734
					3	2	1	21.90	0.1549
					6	0	1	22.54	0.1795
				16QAM	1	0	1	22.54	0.1795
					1	2	1	22.49	0.1774
					1	5	1	21.97	0.1574
					3	0	2	21.57	0.1435
					3	1	2	21.46	0.1400
					3	2	2	20.85	0.1216
					6	0	2	21.88	0.1542
		19192	1909.2	QPSK	1	0	0	23.09	0.2037
					1	2	0	23.23	0.2104
					1	5	0	22.93	0.1963
					3	0	1	22.23	0.1671
					3	1	1	22.30	0.1698
					3	2	1	22.03	0.1596
					6	0	1	22.23	0.1671
				16QAM	1	0	1	22.14	0.1637
					1	2	1	22.28	0.1690
					1	5	1	22.10	0.1622
					3	0	2	21.22	0.1324
					3	1	2	21.30	0.1349
					3	2	2	21.05	0.1274
					6	0	2	21.00	0.1259

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 2	3M	18615	1851.5	QPSK	1	0	0	23.37	0.2173
					1	7	0	23.40	0.2188
					1	14	0	23.12	0.2051
					8	0	1	22.43	0.1750
					8	4	1	22.49	0.1774
					8	7	1	22.25	0.1679
					15	0	1	22.45	0.1758
				16QAM	1	0	1	22.47	0.1766
					1	7	1	22.51	0.1782
					1	14	1	22.17	0.1648
					8	0	2	21.53	0.1422
					8	4	2	21.52	0.1419
					8	7	2	21.22	0.1324
					15	0	2	21.37	0.1371
		18900	1880.0	QPSK	1	0	0	23.43	0.2203
					1	7	0	23.35	0.2163
					1	14	0	22.87	0.1936
					8	0	1	22.55	0.1799
					8	4	1	22.40	0.1738
					8	7	1	21.91	0.1552
					15	0	1	22.55	0.1799
				16QAM	1	0	1	22.55	0.1799
					1	7	1	22.50	0.1778
					1	14	1	21.98	0.1578
					8	0	2	21.58	0.1439
					8	4	2	21.47	0.1403
					8	7	2	20.86	0.1219
					15	0	2	21.89	0.1545
		19184	1908.4	QPSK	1	0	0	23.10	0.2042
					1	7	0	23.24	0.2109
					1	14	0	22.94	0.1968
					8	0	1	22.24	0.1675
					8	4	1	22.31	0.1702
					8	7	1	22.04	0.1600
					15	0	1	22.24	0.1675
				16QAM	1	0	1	22.15	0.1641
					1	7	1	22.29	0.1694
					1	14	1	22.11	0.1626
					8	0	2	21.23	0.1327
					8	4	2	21.31	0.1352
					8	7	2	21.06	0.1276
					15	0	2	21.01	0.1262

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 2	5M	18625	1852.5	QPSK	1	0	0	23.39	0.2183
					1	12	0	23.42	0.2198
					1	24	0	23.14	0.2061
					12	0	1	22.45	0.1758
					12	6	1	22.51	0.1782
					12	11	1	22.27	0.1687
					25	0	1	22.47	0.1766
				16QAM	1	0	1	22.49	0.1774
					1	12	1	22.53	0.1791
					1	24	1	22.19	0.1656
					12	0	2	21.55	0.1429
					12	6	2	21.54	0.1426
					12	11	2	21.24	0.1330
					25	0	2	21.39	0.1377
		18900	1880.0	QPSK	1	0	0	23.44	0.2208
					1	12	0	23.36	0.2168
					1	24	0	22.88	0.1941
					12	0	1	22.56	0.1803
					12	6	1	22.41	0.1742
					12	11	1	21.92	0.1556
					25	0	1	22.56	0.1803
				16QAM	1	0	1	22.56	0.1803
					1	12	1	22.51	0.1782
					1	24	1	21.99	0.1581
					12	0	2	21.59	0.1442
					12	6	2	21.48	0.1406
					12	11	2	20.87	0.1222
					25	0	2	21.90	0.1549
		19175	1907.5	QPSK	1	0	0	23.11	0.2046
					1	12	0	23.25	0.2113
					1	24	0	22.95	0.1972
					12	0	1	22.25	0.1679
					12	6	1	22.32	0.1706
					12	11	1	22.05	0.1603
					25	0	1	22.25	0.1679
				16QAM	1	0	1	22.16	0.1644
					1	12	1	22.30	0.1698
					1	24	1	22.12	0.1629
					12	0	2	21.24	0.1330
					12	6	2	21.32	0.1355
					12	11	2	21.07	0.1279
					25	0	2	21.02	0.1265

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 2	10M	18650	1855.0	QPSK	1	0	0	23.40	0.2188
					1	24	0	23.43	0.2203
					1	49	0	23.15	0.2065
					25	0	1	22.46	0.1762
					25	12	1	22.52	0.1786
					25	24	1	22.28	0.1690
					50	0	1	22.48	0.1770
				16QAM	1	0	1	22.50	0.1778
					1	24	1	22.54	0.1795
					1	49	1	22.20	0.1660
					25	0	2	21.56	0.1432
					25	12	2	21.55	0.1429
					25	24	2	21.25	0.1334
					50	0	2	21.40	0.1380
		18900	1880.0	QPSK	1	0	0	23.46	0.2218
					1	24	0	23.38	0.2178
					1	49	0	22.90	0.1950
					25	0	1	22.58	0.1811
					25	12	1	22.43	0.1750
					25	24	1	21.94	0.1563
					50	0	1	22.58	0.1811
				16QAM	1	0	1	22.58	0.1811
					1	24	1	22.53	0.1791
					1	49	1	22.01	0.1589
					25	0	2	21.61	0.1449
					25	12	2	21.50	0.1413
					25	24	2	20.89	0.1227
					50	0	2	21.92	0.1556
		19150	1905.0	QPSK	1	0	0	23.14	0.2061
					1	24	0	23.28	0.2128
					1	49	0	22.98	0.1986
					25	0	1	22.28	0.1690
					25	12	1	22.35	0.1718
					25	24	1	22.08	0.1614
					50	0	1	22.28	0.1690
				16QAM	1	0	1	22.19	0.1656
					1	24	1	22.33	0.1710
					1	49	1	22.15	0.1641
					25	0	2	21.27	0.1340
					25	12	2	21.35	0.1365
					25	24	2	21.10	0.1288
					50	0	2	21.05	0.1274

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 2	15M	18675	1857.5	QPSK	1	0	0	23.43	0.2203
					1	37	0	23.46	0.2218
					1	74	0	23.18	0.2080
					36	0	1	22.49	0.1774
					36	18	1	22.55	0.1799
					36	35	1	22.31	0.1702
					75	0	1	22.51	0.1782
				16QAM	1	0	1	22.53	0.1791
					1	37	1	22.57	0.1807
					1	74	1	22.23	0.1671
					36	0	2	21.59	0.1442
					36	18	2	21.58	0.1439
					36	35	2	21.28	0.1343
					75	0	2	21.43	0.1390
		18900	1880.0	QPSK	1	0	0	23.48	0.2228
					1	37	0	23.40	0.2188
					1	74	0	22.92	0.1959
					36	0	1	22.60	0.1820
					36	18	1	22.45	0.1758
					36	35	1	21.96	0.1570
					75	0	1	22.60	0.1820
				16QAM	1	0	1	22.60	0.1820
					1	37	1	22.55	0.1799
					1	74	1	22.03	0.1596
					36	0	2	21.63	0.1455
					36	18	2	21.52	0.1419
					36	35	2	20.91	0.1233
					75	0	2	21.94	0.1563
		19125	1902.5	QPSK	1	0	0	23.16	0.2070
					1	37	0	23.30	0.2138
					1	74	0	23.00	0.1995
					36	0	1	22.30	0.1698
					36	18	1	22.37	0.1726
					36	35	1	22.10	0.1622
					75	0	1	22.30	0.1698
				16QAM	1	0	1	22.21	0.1663
					1	37	1	22.35	0.1718
					1	74	1	22.17	0.1648
					36	0	2	21.29	0.1346
					36	18	2	21.37	0.1371
					36	35	2	21.12	0.1294
					75	0	2	21.07	0.1279

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 2	20M	18700	1860.0	QPSK	1	0	0	23.51	0.2244
					1	49	0	23.54	0.2259
					1	99	0	23.26	0.2118
					50	0	1	22.57	0.1807
					50	24	1	22.63	0.1832
					50	49	1	22.39	0.1734
					100	0	1	22.59	0.1816
				16QAM	1	0	1	22.61	0.1824
					1	49	1	22.65	0.1841
					1	99	1	22.31	0.1702
					50	0	2	21.67	0.1469
					50	24	2	21.66	0.1466
					50	49	2	21.36	0.1368
					100	0	2	21.51	0.1416
		18900	1880.0	QPSK	1	0	0	23.54	0.2259
					1	49	0	23.46	0.2218
					1	99	0	22.98	0.1986
					50	0	1	22.66	0.1845
					50	24	1	22.51	0.1782
					50	49	1	22.02	0.1592
					100	0	1	22.66	0.1845
				16QAM	1	0	1	22.66	0.1845
					1	49	1	22.61	0.1824
					1	99	1	22.09	0.1618
					50	0	2	21.69	0.1476
					50	24	2	21.58	0.1439
					50	49	2	20.97	0.1250
					100	0	2	22.00	0.1585
		19100	1900.0	QPSK	1	0	0	23.21	0.2094
					1	49	0	23.35	0.2163
					1	99	0	23.05	0.2018
					50	0	1	22.35	0.1718
					50	24	1	22.42	0.1746
					50	49	1	22.15	0.1641
					100	0	1	22.35	0.1718
				16QAM	1	0	1	22.26	0.1683
					1	49	1	22.40	0.1738
					1	99	1	22.22	0.1667
					50	0	2	21.34	0.1361
					50	24	2	21.42	0.1387
					50	49	2	21.17	0.1309
					100	0	2	21.12	0.1294

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LTE Band 5

Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 5	1.4M	20407	824.7	QPSK	1	0	0	23.30	0.2138
					1	2	0	23.15	0.2065
					1	5	0	23.02	0.2004
					3	0	1	22.49	0.1774
					3	1	1	22.27	0.1687
					3	2	1	22.19	0.1656
					6	0	1	22.46	0.1762
				16QAM	1	0	1	22.39	0.1734
					1	2	1	22.26	0.1683
					1	5	1	22.08	0.1614
					3	0	2	21.43	0.1390
					3	1	2	21.27	0.1340
					3	2	2	21.09	0.1285
					6	0	2	21.15	0.1303
		20525	836.5	QPSK	1	0	0	23.24	0.2109
					1	2	0	23.19	0.2084
					1	5	0	23.09	0.2037
					3	0	1	22.44	0.1754
					3	1	1	22.35	0.1718
					3	2	1	22.21	0.1663
					6	0	1	22.32	0.1706
				16QAM	1	0	1	22.33	0.1710
					1	2	1	22.27	0.1687
					1	5	1	22.15	0.1641
					3	0	2	21.39	0.1377
					3	1	2	21.29	0.1346
					3	2	2	21.17	0.1309
					6	0	2	21.17	0.1309
		20642	848.2	QPSK	1	0	0	23.14	0.2061
					1	2	0	23.25	0.2113
					1	5	0	22.47	0.1766
					3	0	1	22.34	0.1714
					3	1	1	22.35	0.1718
					3	2	1	21.67	0.1469
					6	0	1	22.31	0.1702
				16QAM	1	0	1	22.27	0.1687
					1	2	1	22.42	0.1746
					1	5	1	21.55	0.1429
					3	0	2	21.27	0.1340
					3	1	2	21.35	0.1365
					3	2	2	20.55	0.1135
					6	0	2	20.6	0.1148

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 5	3M	20415	825.5	QPSK	1	0	0	23.32	0.2148
					1	7	0	23.17	0.2075
					1	14	0	23.04	0.2014
					8	0	1	22.51	0.1782
					8	4	1	22.29	0.1694
					8	7	1	22.21	0.1663
					15	0	1	22.48	0.1770
				16QAM	1	0	1	22.41	0.1742
					1	7	1	22.28	0.1690
					1	14	1	22.10	0.1622
					8	0	2	21.45	0.1396
					8	4	2	21.29	0.1346
					8	7	2	21.11	0.1291
					15	0	2	21.17	0.1309
		20525	836.5	QPSK	1	0	0	23.26	0.2118
					1	7	0	23.21	0.2094
					1	14	0	23.11	0.2046
					8	0	1	22.46	0.1762
					8	4	1	22.37	0.1726
					8	7	1	22.23	0.1671
					15	0	1	22.34	0.1714
				16QAM	1	0	1	22.35	0.1718
					1	7	1	22.29	0.1694
					1	14	1	22.17	0.1648
					8	0	2	21.41	0.1384
					8	4	2	21.31	0.1352
					8	7	2	21.19	0.1315
					15	0	2	21.19	0.1315
		20634	847.4	QPSK	1	0	0	23.17	0.2075
					1	7	0	23.28	0.2128
					1	14	0	22.50	0.1778
					8	0	1	22.37	0.1726
					8	4	1	22.38	0.1730
					8	7	1	21.70	0.1479
					15	0	1	22.34	0.1714
				16QAM	1	0	1	22.30	0.1698
					1	7	1	22.45	0.1758
					1	14	1	21.58	0.1439
					8	0	2	21.30	0.1349
					8	4	2	21.38	0.1374
					8	7	2	20.58	0.1143
					15	0	2	20.63	0.1156

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 5	5M	20425	826.5	QPSK	1	0	0	23.33	0.2153
					1	12	0	23.18	0.2080
					1	24	0	23.05	0.2018
					12	0	1	22.52	0.1786
					12	6	1	22.30	0.1698
					12	11	1	22.22	0.1667
					25	0	1	22.49	0.1774
				16QAM	1	0	1	22.42	0.1746
					1	12	1	22.29	0.1694
					1	24	1	22.11	0.1626
					12	0	2	21.46	0.1400
					12	6	2	21.30	0.1349
					12	11	2	21.12	0.1294
					25	0	2	21.18	0.1312
		20525	836.5	QPSK	1	0	0	23.27	0.2123
					1	12	0	23.22	0.2099
					1	24	0	23.12	0.2051
					12	0	1	22.47	0.1766
					12	6	1	22.38	0.1730
					12	11	1	22.24	0.1675
					25	0	1	22.35	0.1718
				16QAM	1	0	1	22.36	0.1722
					1	12	1	22.30	0.1698
					1	24	1	22.18	0.1652
					12	0	2	21.42	0.1387
					12	6	2	21.32	0.1355
					12	11	2	21.20	0.1318
					25	0	2	21.20	0.1318
		20625	846.5	QPSK	1	0	0	23.18	0.2080
					1	12	0	23.29	0.2133
					1	24	0	22.51	0.1782
					12	0	1	22.38	0.1730
					12	6	1	22.39	0.1734
					12	11	1	21.71	0.1483
					25	0	1	22.35	0.1718
				16QAM	1	0	1	22.31	0.1702
					1	12	1	22.46	0.1762
					1	24	1	21.59	0.1442
					12	0	2	21.31	0.1352
					12	6	2	21.39	0.1377
					12	11	2	20.59	0.1146
					25	0	2	20.64	0.1159

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Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
Band 5	10M	20450	829.0	QPSK	1	0	0	23.36	0.2168
					1	24	0	23.21	0.2094
					1	49	0	23.08	0.2032
					25	0	1	22.55	0.1799
					25	12	1	22.33	0.1710
					25	24	1	22.25	0.1679
					50	0	1	22.52	0.1786
				16QAM	1	0	1	22.45	0.1758
					1	24	1	22.32	0.1706
					1	49	1	22.14	0.1637
					25	0	2	21.49	0.1409
					25	12	2	21.33	0.1358
					25	24	2	21.15	0.1303
					50	0	2	21.21	0.1321
		20525	836.5	QPSK	1	0	0	23.33	0.2153
					1	24	0	23.28	0.2128
					1	49	0	23.18	0.2080
					25	0	1	22.53	0.1791
					25	12	1	22.44	0.1754
					25	24	1	22.3	0.1698
					50	0	1	22.41	0.1742
				16QAM	1	0	1	22.42	0.1746
					1	24	1	22.36	0.1722
					1	49	1	22.24	0.1675
					25	0	2	21.48	0.1406
					25	12	2	21.38	0.1374
					25	24	2	21.26	0.1337
					50	0	2	21.26	0.1337
		20600	844.0	QPSK	1	0	0	23.25	0.2113
					1	24	0	23.36	0.2168
					1	49	0	22.58	0.1811
					25	0	1	22.45	0.1758
					25	12	1	22.46	0.1762
					25	24	1	21.78	0.1507
					50	0	1	22.42	0.1746
				16QAM	1	0	1	22.38	0.1730
					1	24	1	22.53	0.1791
					1	49	1	21.66	0.1466
					25	0	2	21.38	0.1374
					25	12	2	21.46	0.1400
					25	24	2	20.66	0.1164
					50	0	2	20.71	0.1178

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8.2 ERP & EIRP MEASUREMENT

LIMIT

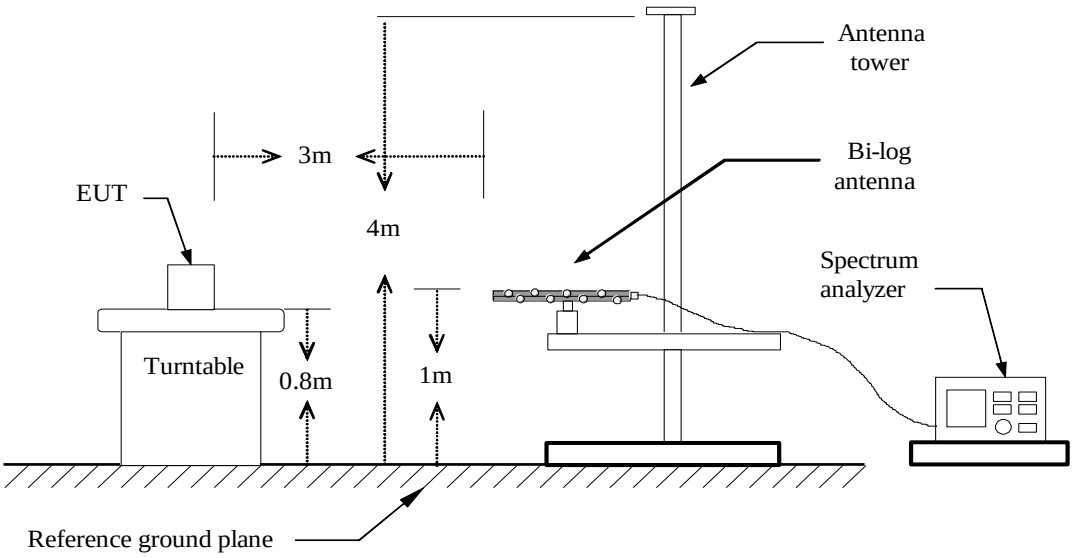
According to FCC §2.1046

FCC 22.913(a): The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.

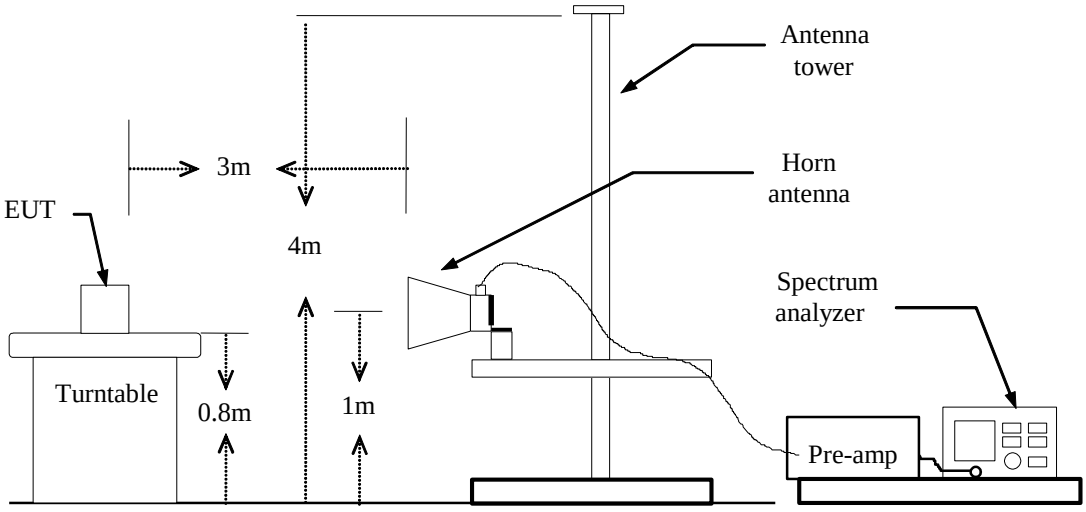
FCC 24.232(c): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

Test Configuration

Below 1 GHz



Above 1 GHz



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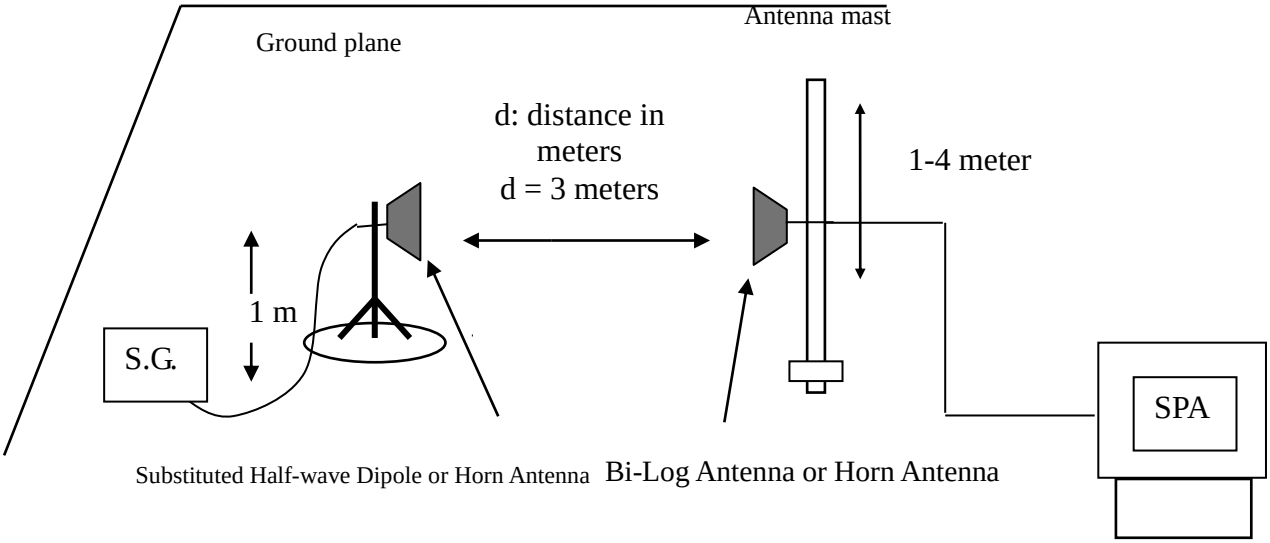
For Substituted Method Test Set-UP



TEST PROCEDURE

1. The EUT was placed on a non-conductive rotating platform (0.8m for below 1G and above 1G) in a semi-chamber. The radiated emission at the fundamental frequency was measured at 3m and SA with RMS detector per section 5, KDB 971168 D01 Power Meas License Digital Systems.

2. During the measurement, the call box parameters were set to get the maximum output power of the EUT. The maximum emission was recorded from spectrum analyzer power level (LVL) from 360 degrees rotation of turntable and the test antenna raised and lowered over a range from 1m to 4m in both horizontally and vertically polarized orientations.

3. EIRP was measured method according to TIA/EIA-603-E. The EUT was replaced by the substitution antenna at same location, and then record the maximum Analyzer reading through raised and lowered the test antenna.

ERP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB) - 2.15

EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

TEST RESULTS

No non-compliance noted.

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LTE Band 2

BW: 1.4MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
2	1.4	Lowest	QPSK	1	0	24.36	0.272	27.96	0.625
		Middle		1	0	25.17	0.328	28.00	0.631
		Highest		1	0	25.66	0.368	27.60	0.575
		Lowest	16 QAM	1	0	18.94	0.078	25.52	0.356
		Middle		1	0	17.63	0.057	26.08	0.405
		Highest		1	0	19.09	0.081	26.34	0.430

BW: 3MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
2	3	Lowest	QPSK	1	0	10.11	0.010	22.70	0.186
		Middle		1	0	11.93	0.015	21.73	0.148
		Highest		1	0	25.73	0.374	27.29	0.535
		Lowest	16 QAM	1	0	16.88	0.048	23.90	0.245
		Middle		1	0	16.81	0.048	24.70	0.295
		Highest		1	0	18.02	0.063	24.91	0.309

BW: 5MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
2	5	Lowest	QPSK	1	0	9.93	0.009	22.99	0.199
		Middle		1	0	11.86	0.015	21.91	0.155
		Highest		1	0	12.68	0.018	22.18	0.165
		Lowest	16 QAM	1	0	15.33	0.034	22.47	0.176
		Middle		1	0	14.94	0.031	22.69	0.185
		Highest		1	0	16.79	0.047	23.24	0.210

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BW: 10MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
2	10	Lowest	QPSK	1	0	9.89	0.009	22.43	0.175
		Middle		1	0	8.59	0.007	21.76	0.150
		Highest		1	0	13.36	0.021	23.33	0.215
		Lowest	16 QAM	1	0	13.60	0.022	20.87	0.122
		Middle		1	0	13.52	0.022	21.66	0.146
		Highest		1	0	14.89	0.030	22.05	0.160

BW: 15MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
2	15	Lowest	QPSK	1	0	9.46	0.008	22.39	0.173
		Middle		1	0	10.96	0.012	21.19	0.131
		Highest		1	0	14.67	0.029	24.09	0.256
		Lowest	16 QAM	1	0	14.34	0.027	25.51	0.355
		Middle		1	0	17.00	0.050	24.71	0.295
		Highest		1	0	18.17	0.065	25.39	0.345

BW: 20MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
2	20	Lowest	QPSK	1	0	9.58	0.009	22.40	0.173
		Middle		1	0	10.70	0.011	21.71	0.148
		Highest		1	0	14.19	0.026	23.95	0.248
		Lowest	16 QAM	1	0	16.26	0.042	25.09	0.322
		Middle		1	0	17.11	0.051	25.81	0.381
		Highest		1	0	16.61	0.045	24.77	0.299

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LTE Band 5

BW: 1.4MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	1.4	Lowest	QPSK	1	0	22.04	0.160	17.09	0.051
		Middle		1	0	23.47	0.222	19.27	0.084
		Highest		1	0	23.58	0.228	19.04	0.080
		Lowest	16 QAM	1	0	-0.13	0.001	13.73	0.023
		Middle		1	0	8.05	0.064	20.93	0.123
		Highest		1	0	11.12	0.012	21.05	0.127

BW: 3MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	3	Lowest	QPSK	1	0	3.23	0.002	13.04	0.020
		Middle		1	0	9.85	0.009	19.67	0.092
		Highest		1	0	9.30	0.008	18.23	0.066
		Lowest	16 QAM	1	0	2.96	0.002	12.93	0.019
		Middle		1	0	8.54	0.007	19.65	0.092
		Highest		1	0	8.37	0.006	18.24	0.066

BW: 5MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	5	Lowest	QPSK	1	0	2.54	0.001	13.04	0.020
		Middle		1	0	6.93	0.004	17.10	0.051
		Highest		1	0	9.64	0.009	20.05	0.101
		Lowest	16 QAM	1	0	9.58	0.009	20.36	0.108
		Middle		1	0	9.47	0.008	20.24	0.105
		Highest		1	0	7.71	0.005	20.63	0.115

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BW: 10MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	10	Lowest	QPSK	1	0	27.04	0.505	27.86	0.610
		Middle		1	0	25.94	0.392	27.83	0.606
		Highest		1	0	26.20	0.416	28.91	0.778
		Lowest	16 QAM	1	0	26.89	0.488	28.03	0.635
		Middle		1	0	26.73	0.470	29.16	0.824
		Highest		1	0	26.19	0.415	28.96	0.787

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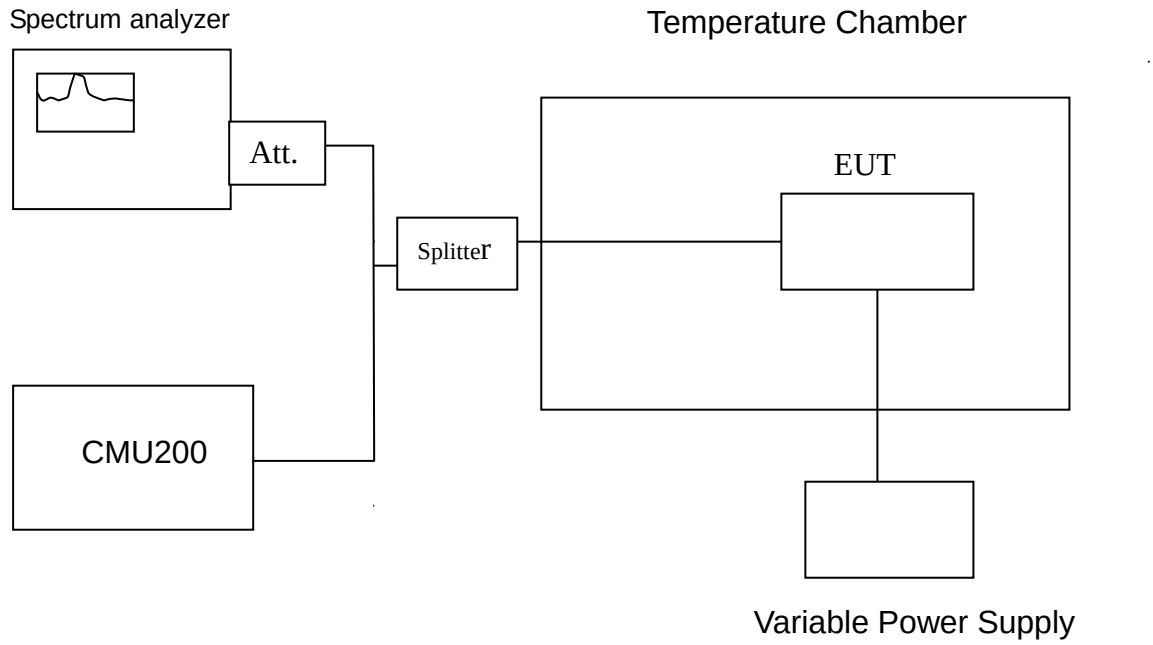
8.3 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

LIMIT

According to FCC §2.1055, FCC §22.355, .FCC §24.235.

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

Test Configuration



Remark: *Measurement setup for testing on Antenna*

TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20ºC operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –30ºC. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10ºC increased per stage until the highest temperature of +50ºC reached.

TEST RESULTS

No non-compliance noted.

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Test Results

FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT: LTE Band 2

Reference Frequency: LTE Band 2 Max Bandwidth QPSK 1880 MHz		
Limit: 1860.0 MHz ~1900.0 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
12	50	0.04
12	40	0.05
12	30	0.02
12	20	0.02
12	10	0.01
12	0	0.03
12	-10	0.01
12	-20	0.00

Reference Frequency: LTE Band 2 Max Bandwidth 16QAM 1882.5 MHz		
Limit: 1860.0 MHz ~1900.0 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
12	50	0.02
12	40	0.04
12	30	0.01
12	20	0.03
12	10	0.01
12	0	0.02
12	-10	0.02
12	-20	0.00

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LTE Band 5

Reference Frequency: LTE Band 5 Max Bandwidth QPSK 836.5 MHz		
Limit: 829 MHz ~844 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
12	50	0.01
12	40	0.05
12	30	0.01
12	20	0.00
12	10	-0.02
12	0	0.01
12	-10	0.02
12	-20	0.04

Reference Frequency: LTE Band 5 Max Bandwidth 16QAM 836.5 MHz		
Limit: 829 MHz ~844 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
12	50	0.05
12	40	-0.04
12	30	-0.01
12	20	0.03
12	10	0.02
12	0	0.02
12	-10	-0.05
12	-20	0.02

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FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT:
LTE Band 2

Reference Frequency: LTE Band 2 Max Bandwidth QPSK 1880 MHz		
Limit: 1860.0 MHz ~1900.0 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
10.2	20	0.02
12	20	0.03
13.8	20	0.01

Reference Frequency: LTE Band 2 Max Bandwidth 16QAM 1882.5 MHz		
Limit: 1860.0 MHz ~1900.0 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
10.2	20	0.02
12	20	0.02
13.8	20	0.01

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LTE Band 5

Reference Frequency: LTE Band 5 Max Bandwidth QPSK 836.5 MHz		
imit: 829 MHz ~844 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
10.2	20	0.01
12	20	0.03
13.8	20	0.01

Reference Frequency: LTE Band 5 Max Bandwidth 16QAM 836.5 MHz		
Limit: 829 MHz ~844 MHz		
Power Supply	Environment	Frequency Error
Vdc	Temperature (°C)	(Hz)
10.2	20	-0.01
12	20	0.01
13.8	20	-0.01

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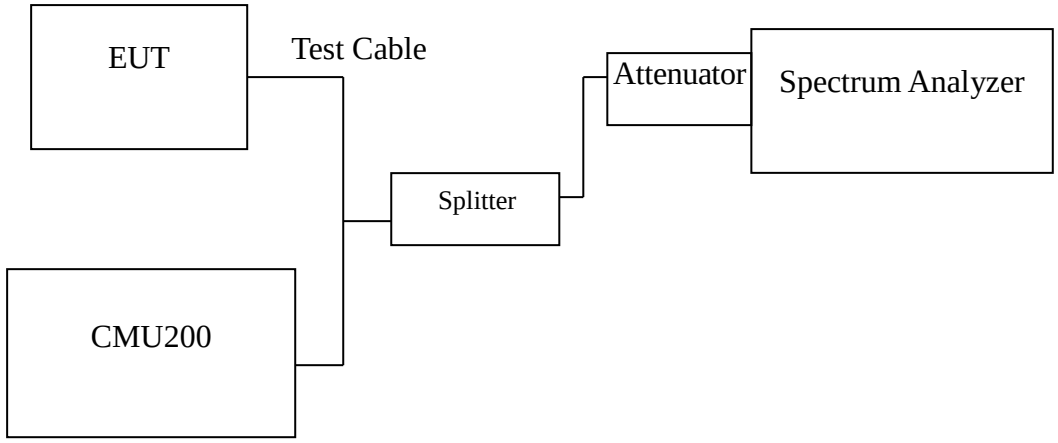
8.4 OCCUPIED BANDWIDTH MEASUREMENT

LIMIT

According to §FCC 2.1049.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW is set to 3 times the RBW, -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

No non-compliance noted

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LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	1.1027

CHANNEL BANDWIDTH: 1.4MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	1.0984

CHANNEL BANDWIDTH: 3MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	2.6743

CHANNEL BANDWIDTH: 3MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	2.6917

CHANNEL BANDWIDTH: 5MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	4.4862

CHANNEL BANDWIDTH: 5MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	4.4717

CHANNEL BANDWIDTH: 10MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	8.9725

CHANNEL BANDWIDTH: 10MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	8.9725

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 15MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	13.5021

CHANNEL BANDWIDTH: 15MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	13.4153

CHANNEL BANDWIDTH: 20MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	18.1186

CHANNEL BANDWIDTH: 20MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
18900	1880.00	18.0607

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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LTE Band 5

CHANNEL BANDWIDTH: 1.4MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	1.0984

CHANNEL BANDWIDTH: 1.4MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	1.0940

CHANNEL BANDWIDTH: 3MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	2.6830

CHANNEL BANDWIDTH: 3MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	2.6830

CHANNEL BANDWIDTH: 5MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	4.4573

CHANNEL BANDWIDTH: 5MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	4.4573

CHANNEL BANDWIDTH: 10MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	8.9435

CHANNEL BANDWIDTH: 10MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
20525	836.50	8.9435

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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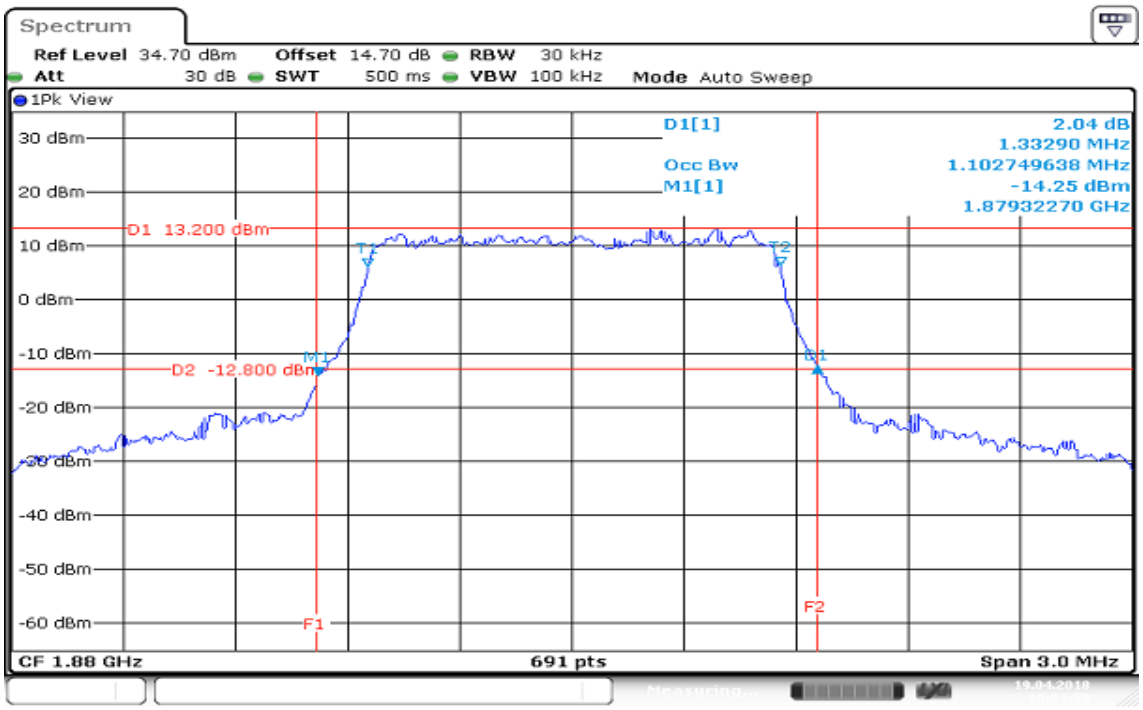
LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK

CH Mid



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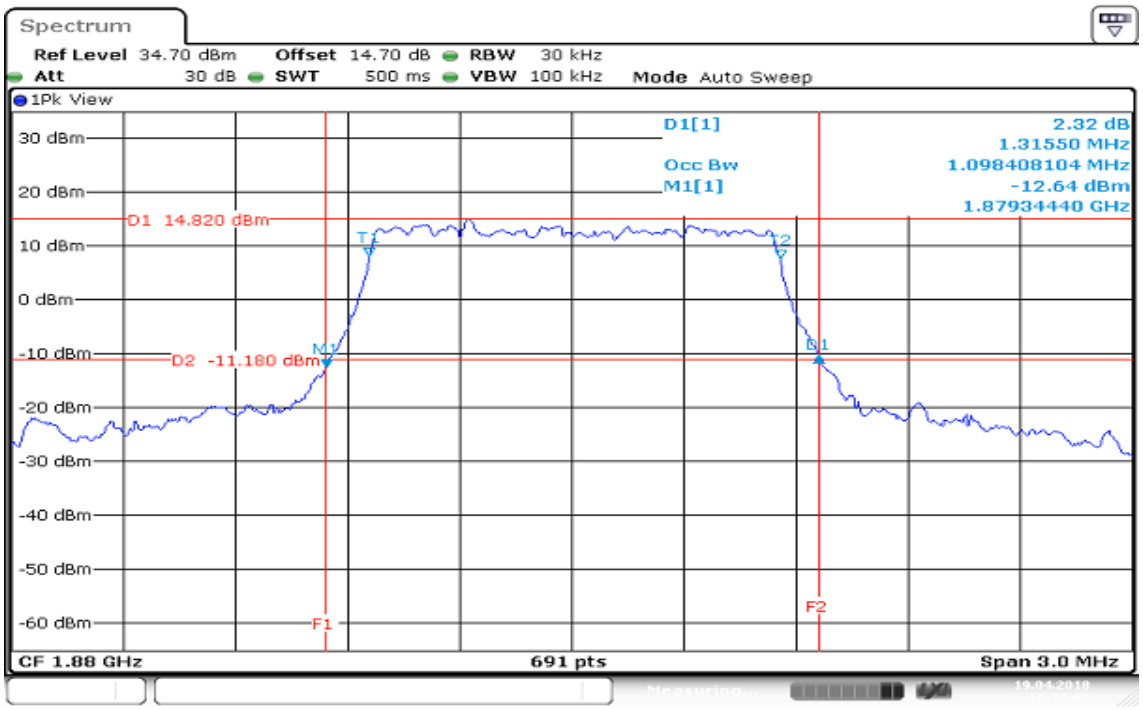
CHANNEL BANDWIDTH: 1.4MHz / 16QAM

CH Mid



Date: 19.APR.2018 10:37:06

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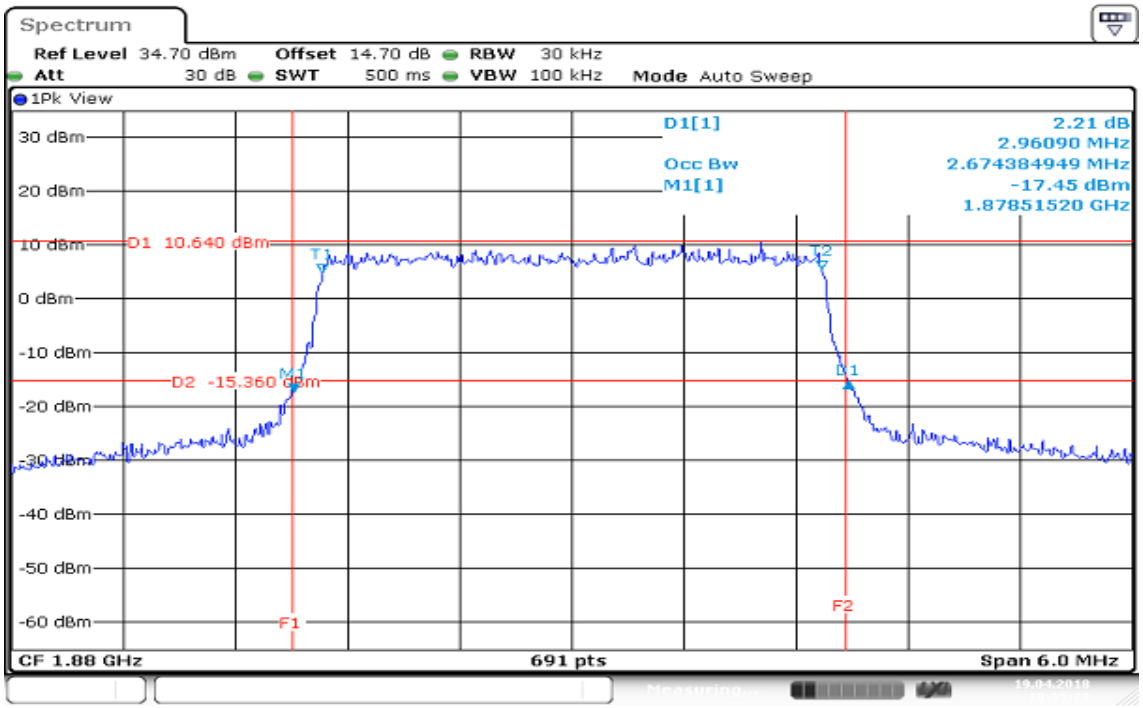
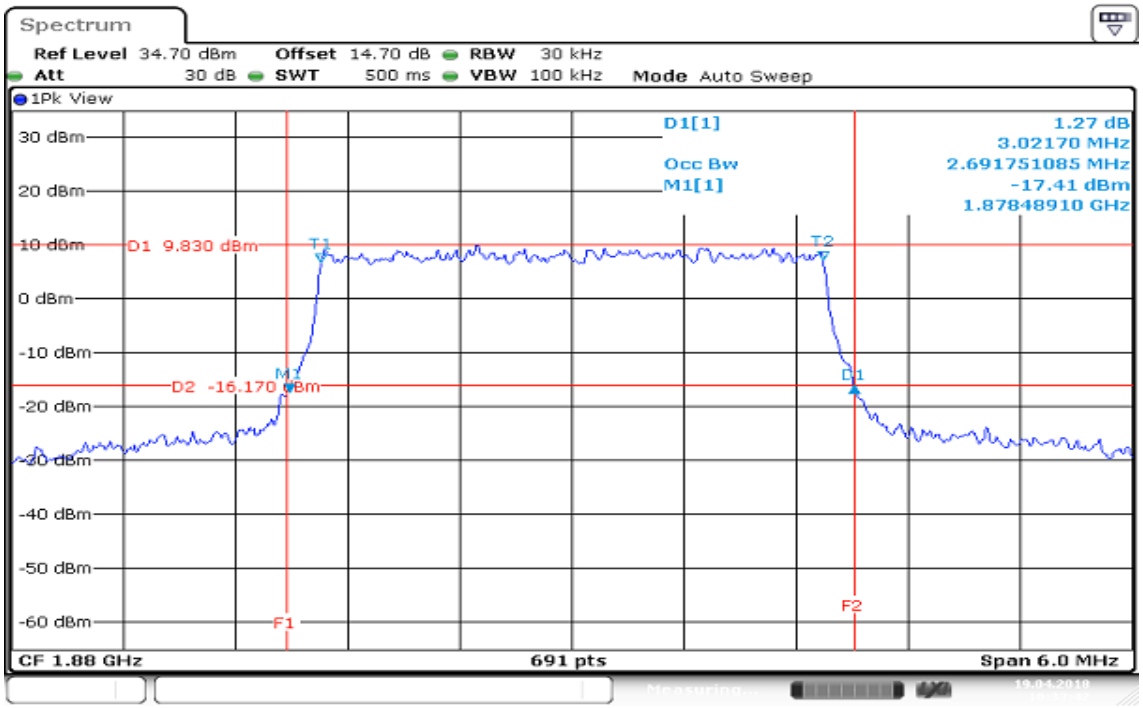
CHANNEL BANDWIDTH:3MHz / QPSK
CH Mid



Date: 19.APR.2018 10:35:29

CHANNEL BANDWIDTH: 3MHz / 16QAM
CH Mid



Date: 19.APR.2018 10:33:42

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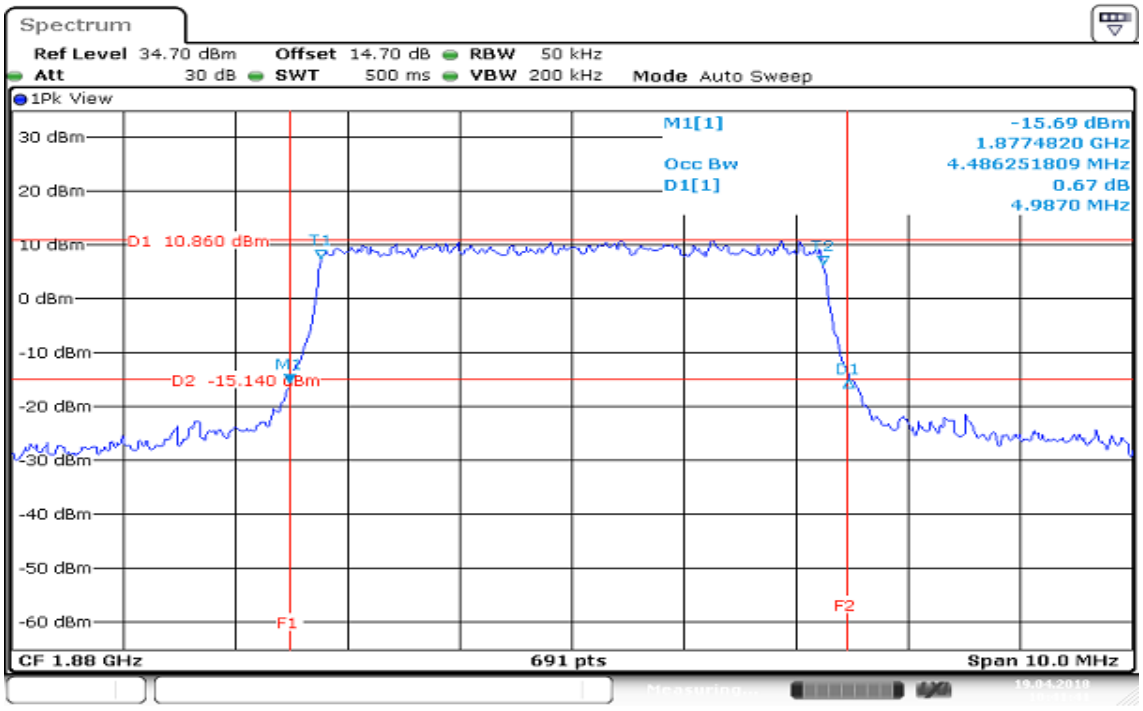
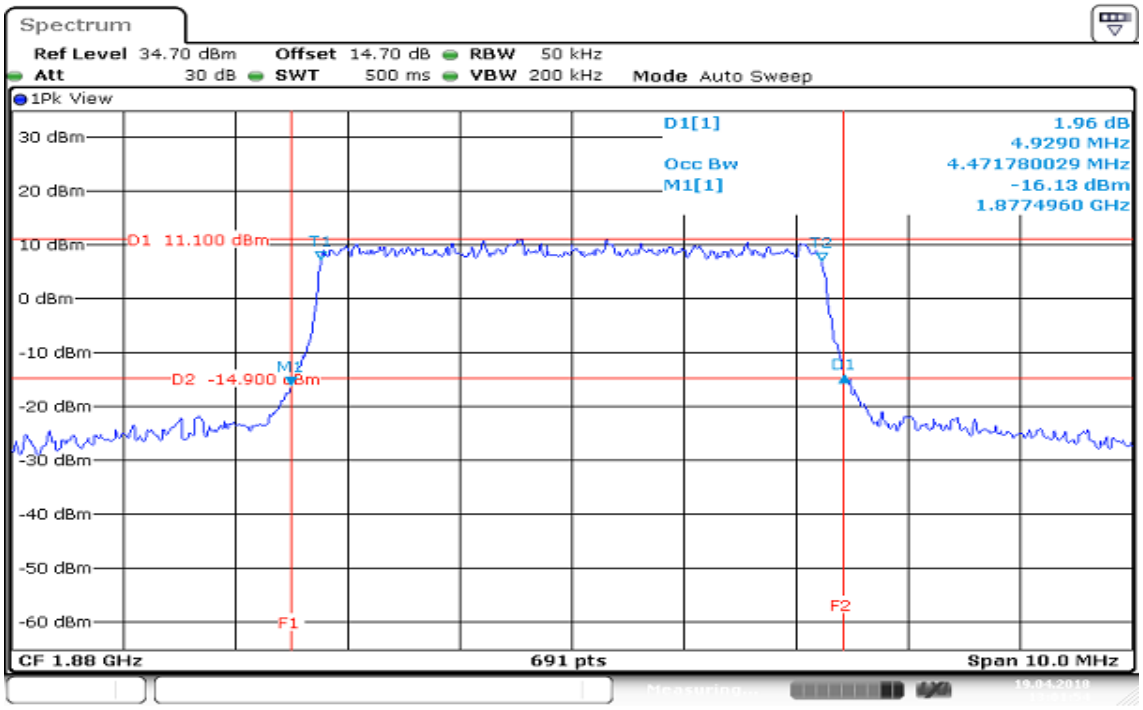
CHANNEL BANDWIDTH: 5MHz / QPSK
CH Mid



Date: 19.APR.2018 10:41:42

CHANNEL BANDWIDTH: 5MHz / 16QAM
CH Mid



Date: 19.APR.2018 13:01:55

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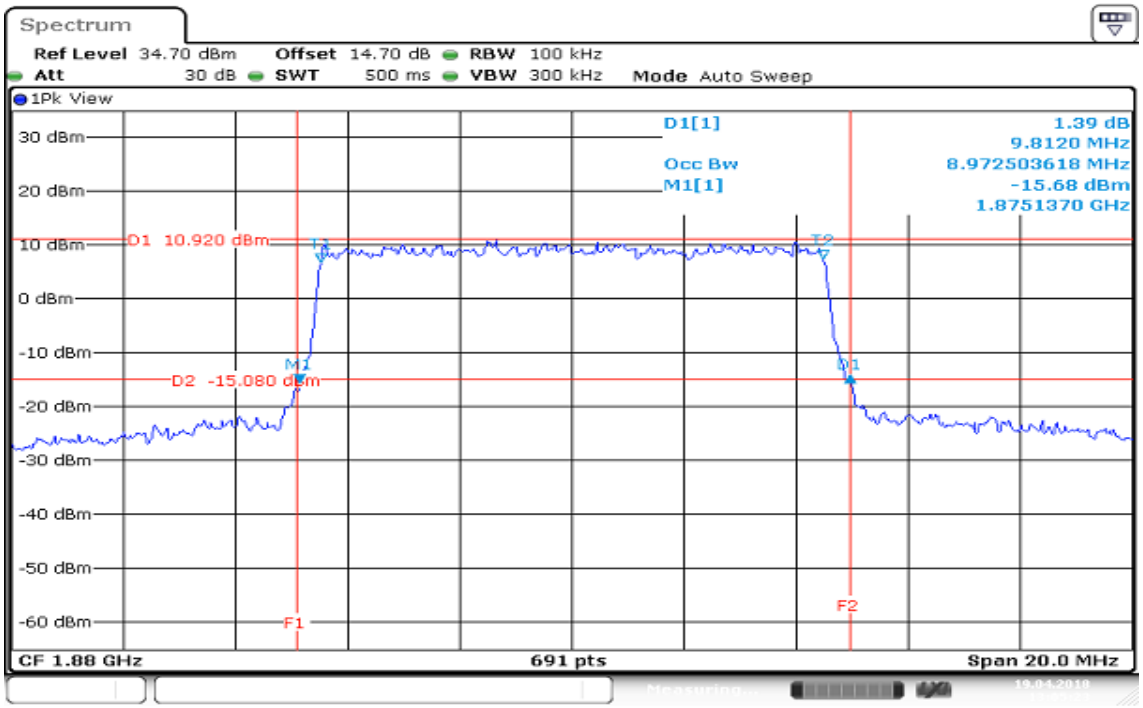
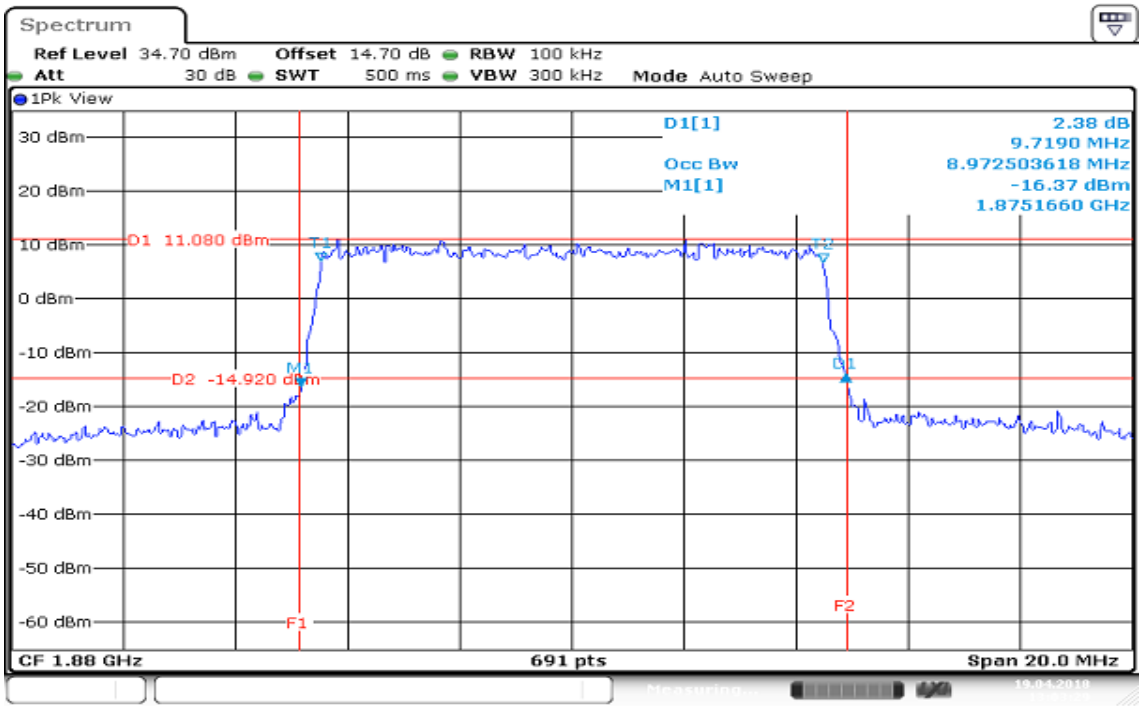
CHANNEL BANDWIDTH: 10MHz / QPSK
CH Mid



Date: 19.APR.2018 13:05:24

CHANNEL BANDWIDTH: 10MHz / 16QAM
CH Mid



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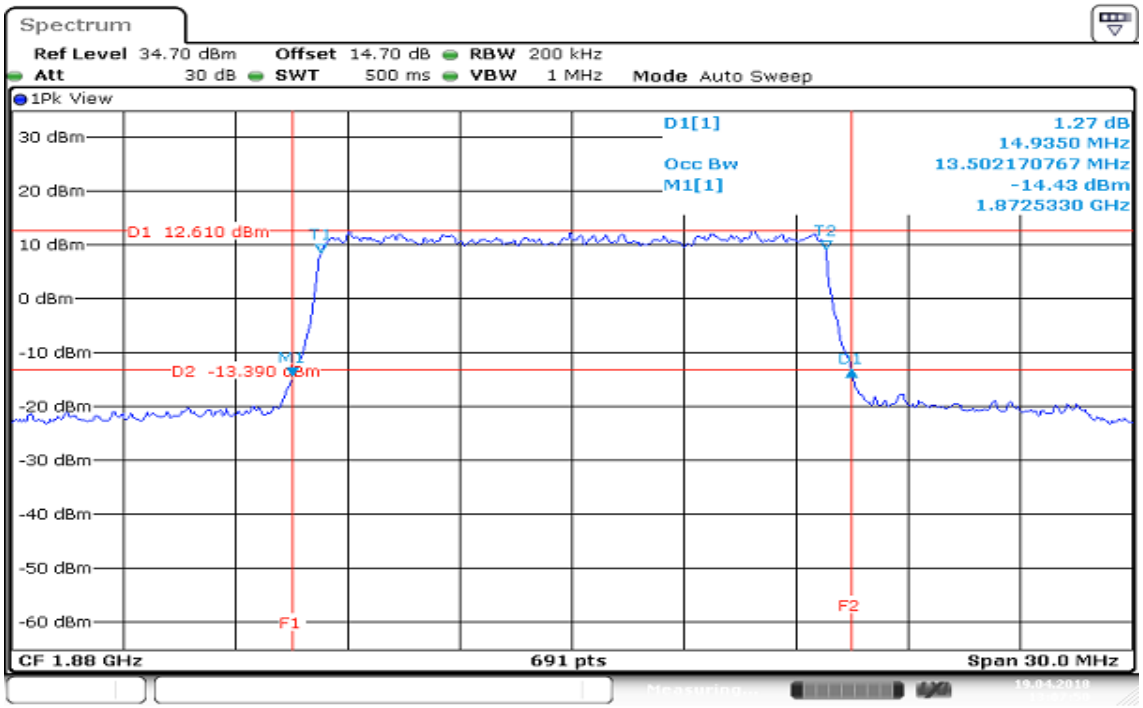
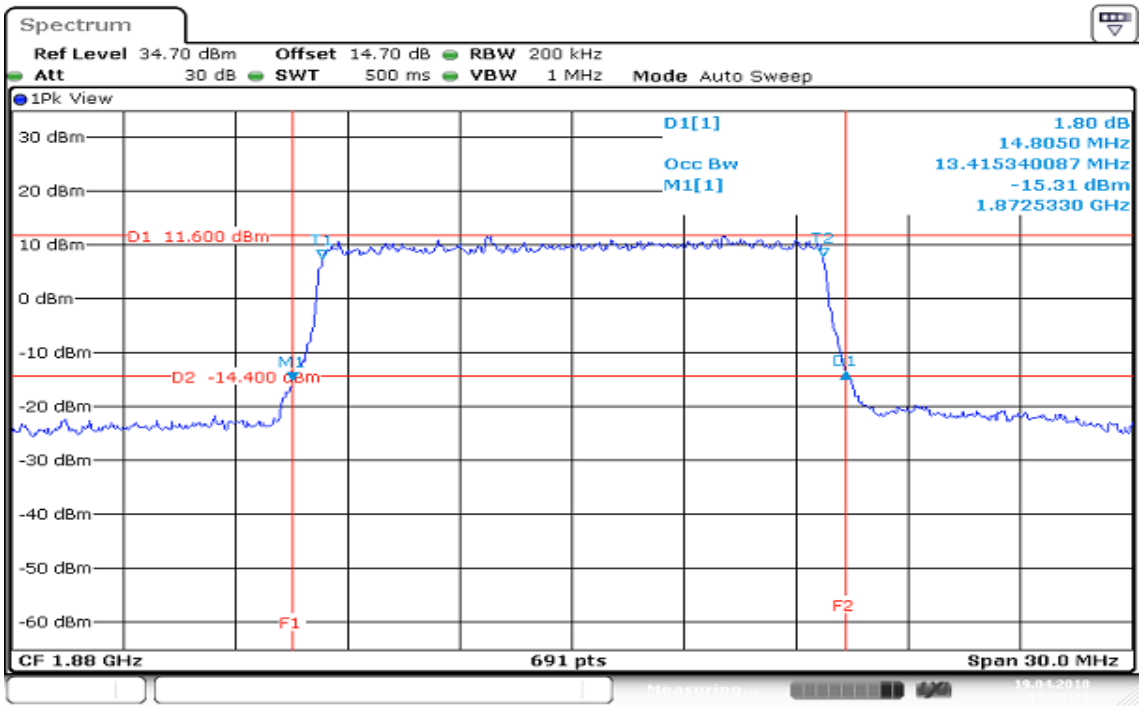
CHANNEL BANDWIDTH: 15MHz / QPSK
CH Mid



Date: 19.APR.2018 13:07:51

CHANNEL BANDWIDTH: 15MHz / 16QAM
CH Mid



Date: 19.APR.2018 13:36:40

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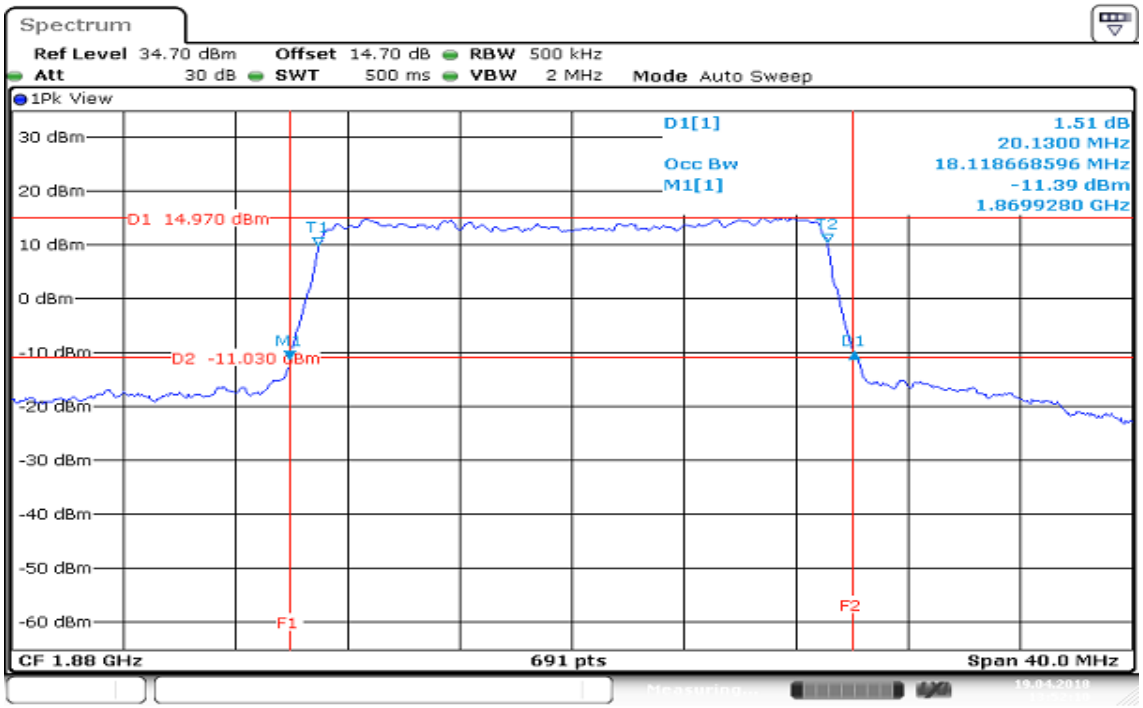
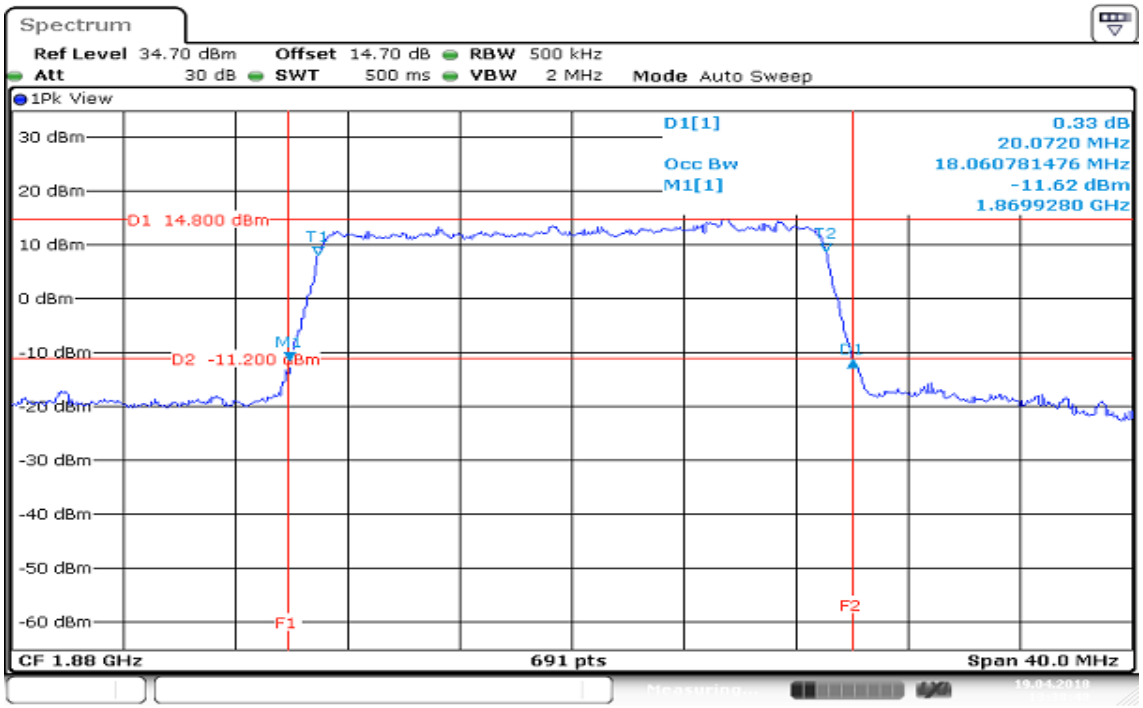
CHANNEL BANDWIDTH: 20MHz / QPSK
CH Mid



Date: 19.APR.2018 13:52:10

CHANNEL BANDWIDTH: 20MHz / 16QAM
CH Mid



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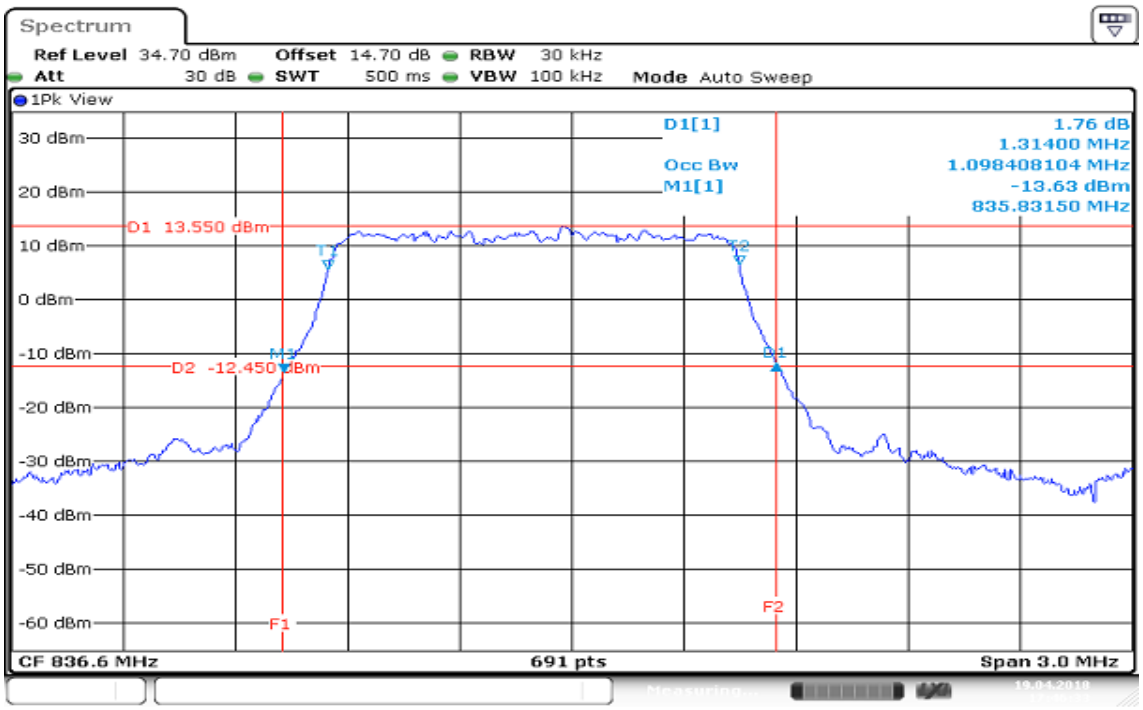
LTE Band 5

CHANNEL BANDWIDTH: 1.4MHz / QPSK

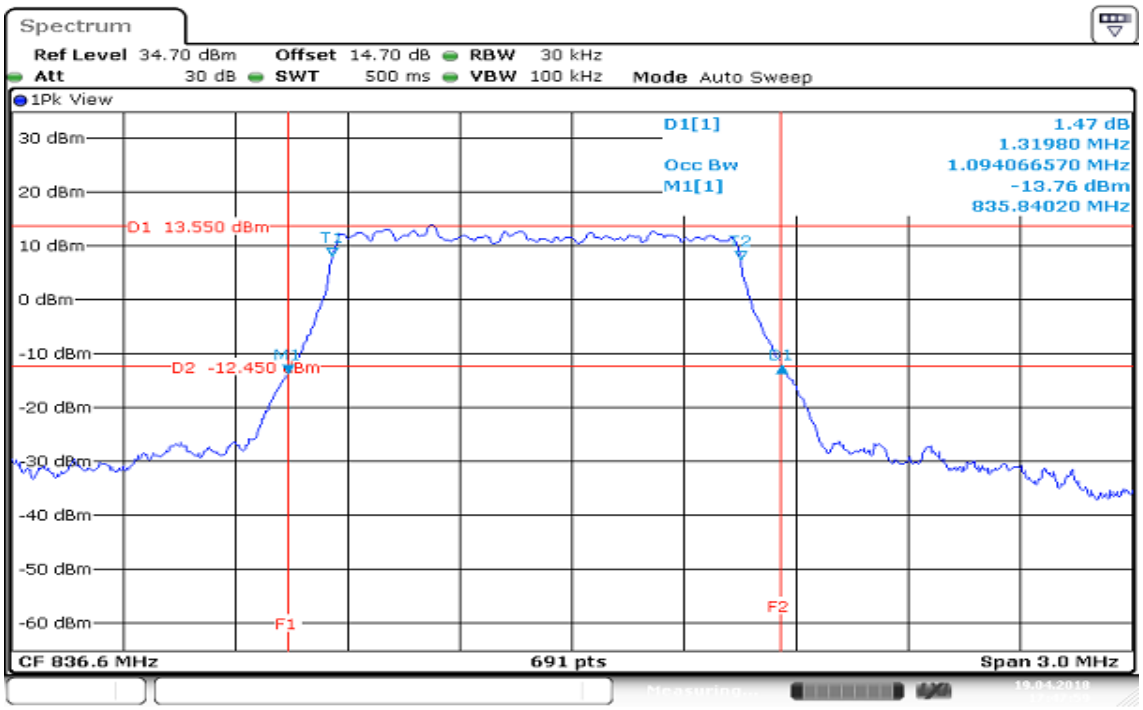
CH Mid



Date: 19.APR.2018 17:46:34

CHANNEL BANDWIDTH: 1.4MHz / 16QAM

CH Mid



Date: 19.APR.2018 17:47:59

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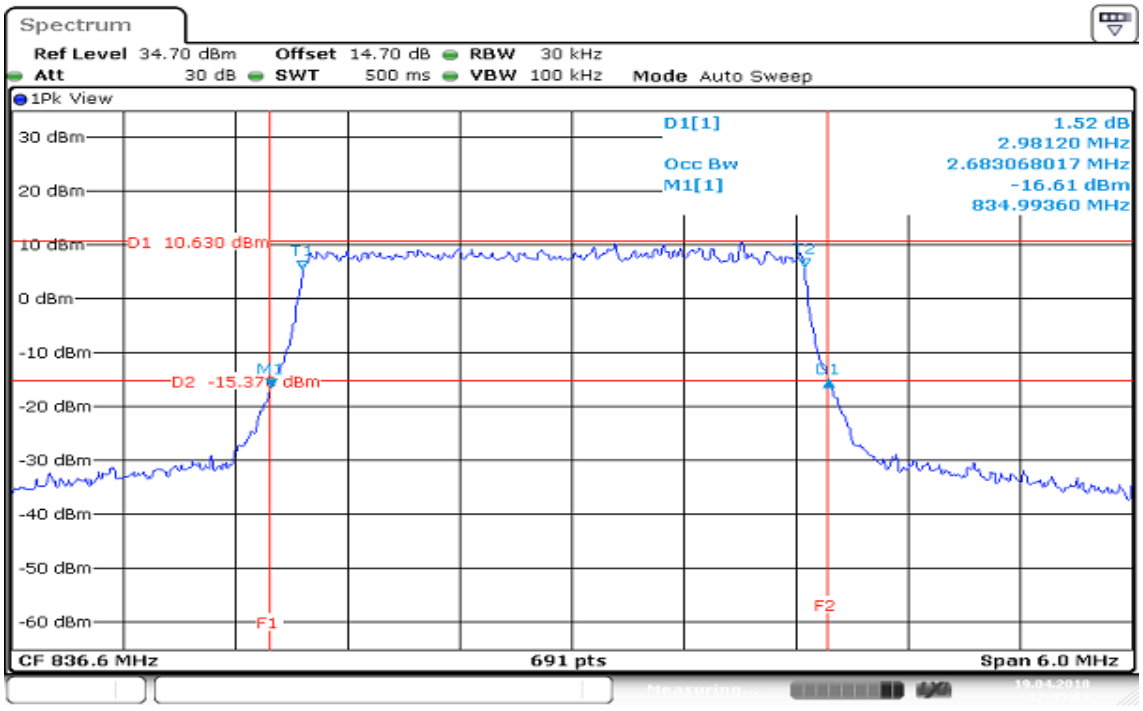
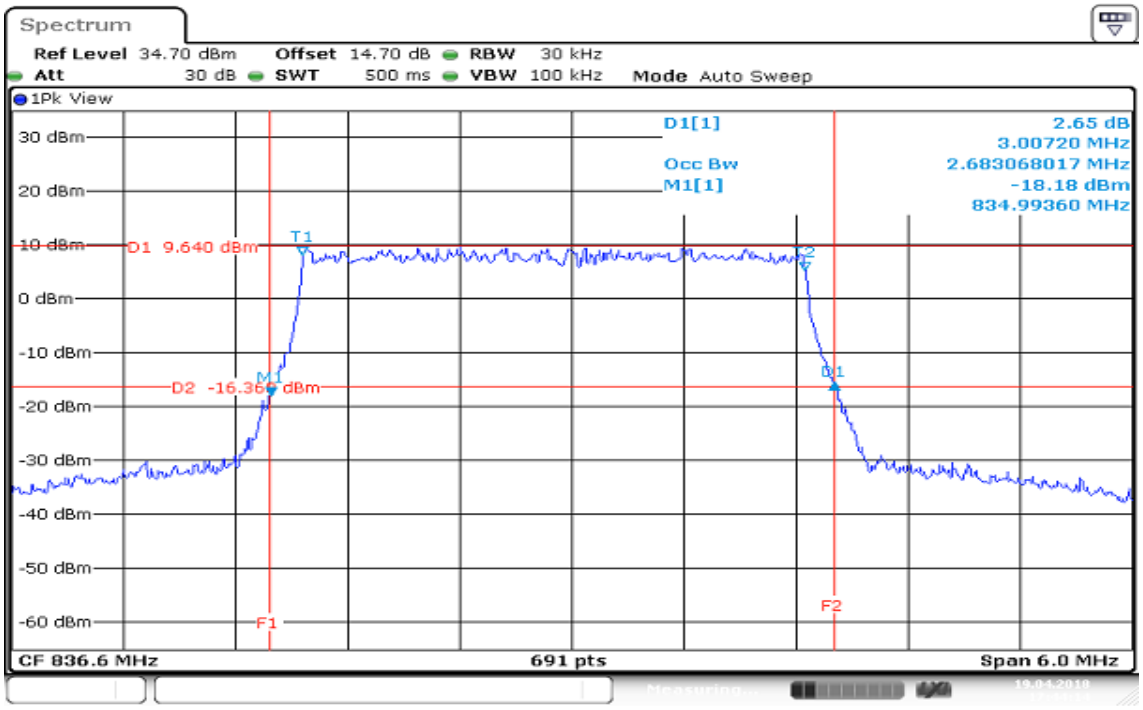
CHANNEL BANDWIDTH:3MHz / QPSK
CH Mid



Date: 19.APR.2018 17:45:09

CHANNEL BANDWIDTH: 3MHz / 16QAM
CH Mid



Date: 19.APR.2018 17:44:15

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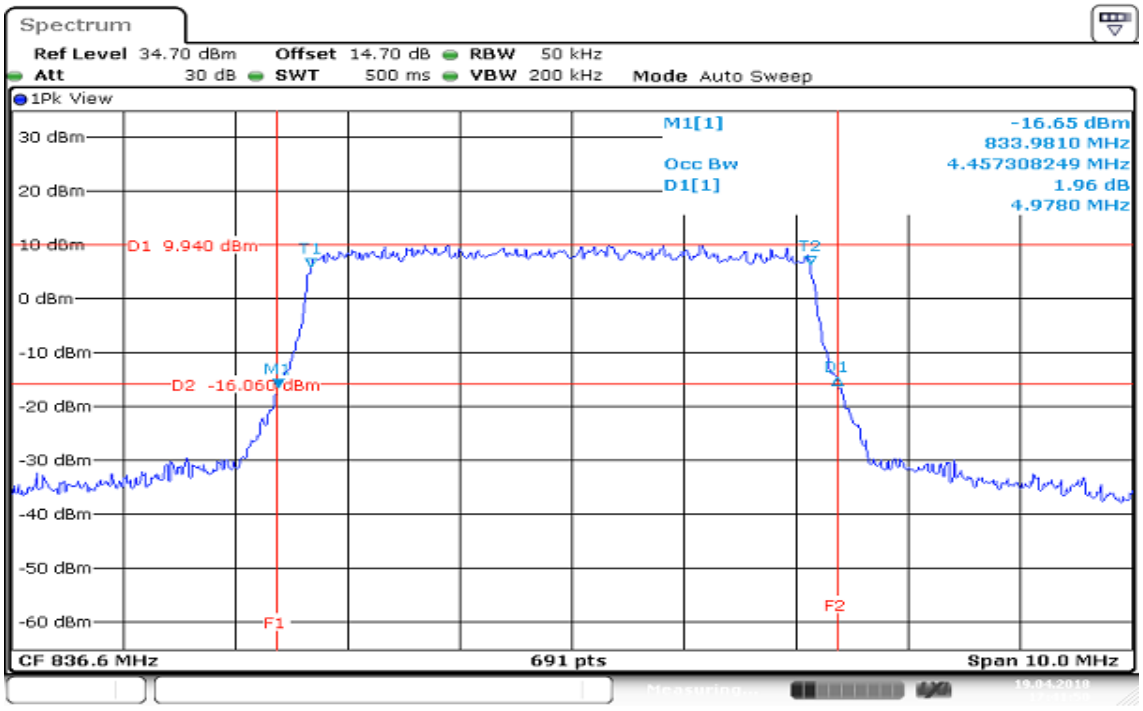
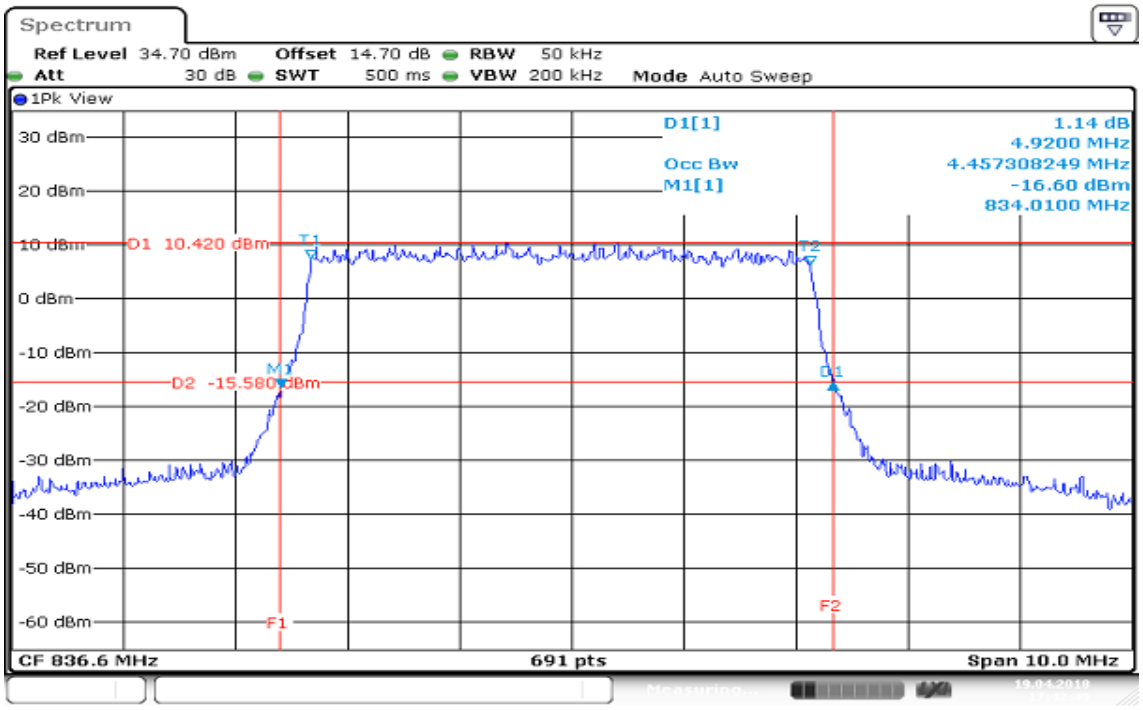
CHANNEL BANDWIDTH: 5MHz / QPSK
CH Mid



Date: 19.APR.2018 17:41:50

CHANNEL BANDWIDTH: 5MHz / 16QAM
CH Mid



Date: 19.APR.2018 17:42:50

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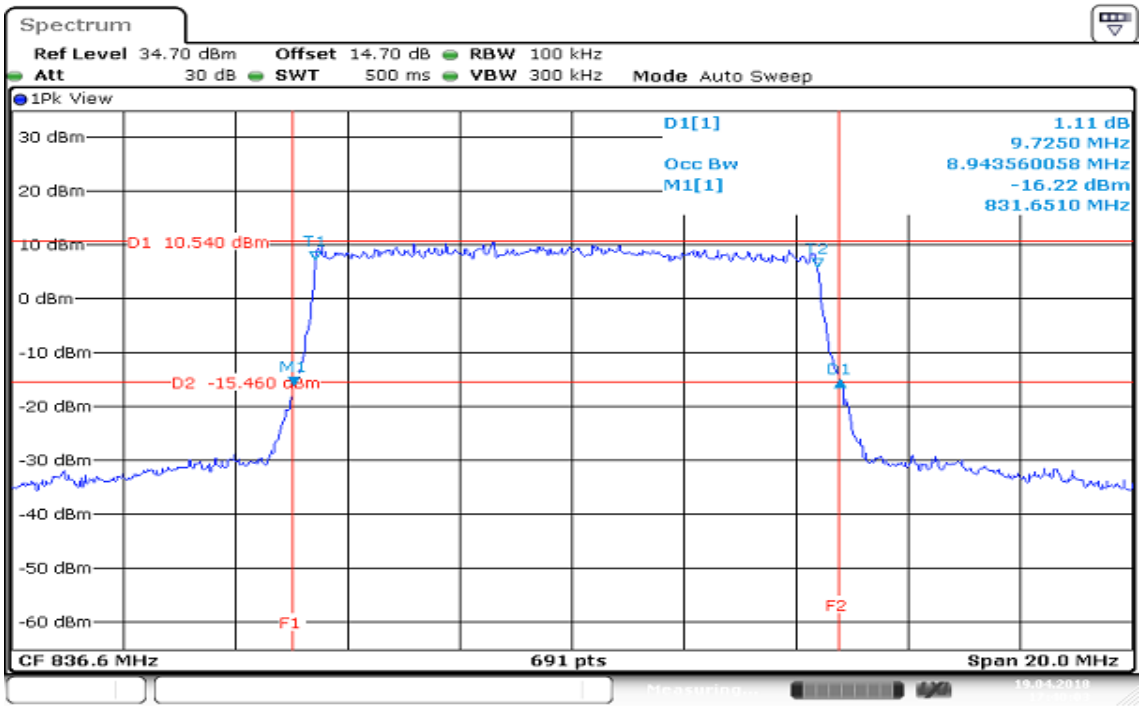
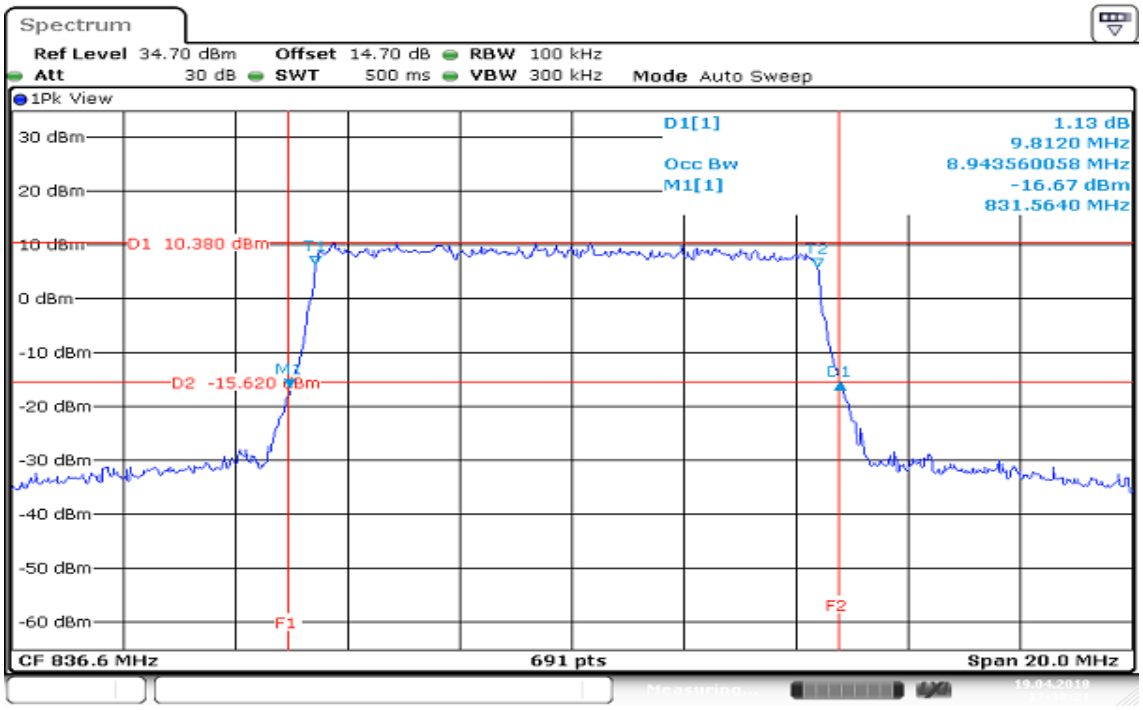
CHANNEL BANDWIDTH: 10MHz / QPSK
CH Mid



Date: 19.APR.2018 17:40:03

CHANNEL BANDWIDTH: 10MHz / 16QAM
CH Mid



Date: 19.APR.2018 17:38:21

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8.5 PEAK TO AVERAGE RATIO

Limit

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test Procedures

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve.
3. Record the maximum PAPR level associated with a probability of 0.1%.

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Test Results

LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.77

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.20

CHANNEL BANDWIDTH: 3MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.91

CHANNEL BANDWIDTH: 3MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.93

CHANNEL BANDWIDTH: 5MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.77

CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.23

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 10MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.45

CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.03

CHANNEL BANDWIDTH: 15MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.62

CHANNEL BANDWIDTH: 15MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.14

CHANNEL BANDWIDTH: 20MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.19

CHANNEL BANDWIDTH: 20MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.94

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 1.4MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.17

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.55

CHANNEL BANDWIDTH: 3MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.06

CHANNEL BANDWIDTH: 3MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.46

CHANNEL BANDWIDTH: 5MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.65

CHANNEL BANDWIDTH: 5MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.26

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 10MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.80

CHANNEL BANDWIDTH: 10MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.38

CHANNEL BANDWIDTH: 15MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.06

CHANNEL BANDWIDTH: 15MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.64

CHANNEL BANDWIDTH: 20MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	5.91

CHANNEL BANDWIDTH: 20MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
18900	1880.00	6.58

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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LTE Band 5

CHANNEL BANDWIDTH: 1.4MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.06

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.52

CHANNEL BANDWIDTH: 3MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	5.54

CHANNEL BANDWIDTH: 3MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.61

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 5MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.06

CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.72

CHANNEL BANDWIDTH: 10MHz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.17

CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.75

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 1.4MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.26

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.70

CHANNEL BANDWIDTH: 3MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	5.97

CHANNEL BANDWIDTH: 3MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.41

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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CHANNEL BANDWIDTH: 5MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	5.74

CHANNEL BANDWIDTH: 5MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.46

CHANNEL BANDWIDTH: 10MHz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	5.71

CHANNEL BANDWIDTH: 10MHz / 16QAM / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
20525	836.5	6.38

Note: We selected worst case to performed test in middle channel, the results can be meet other channel.

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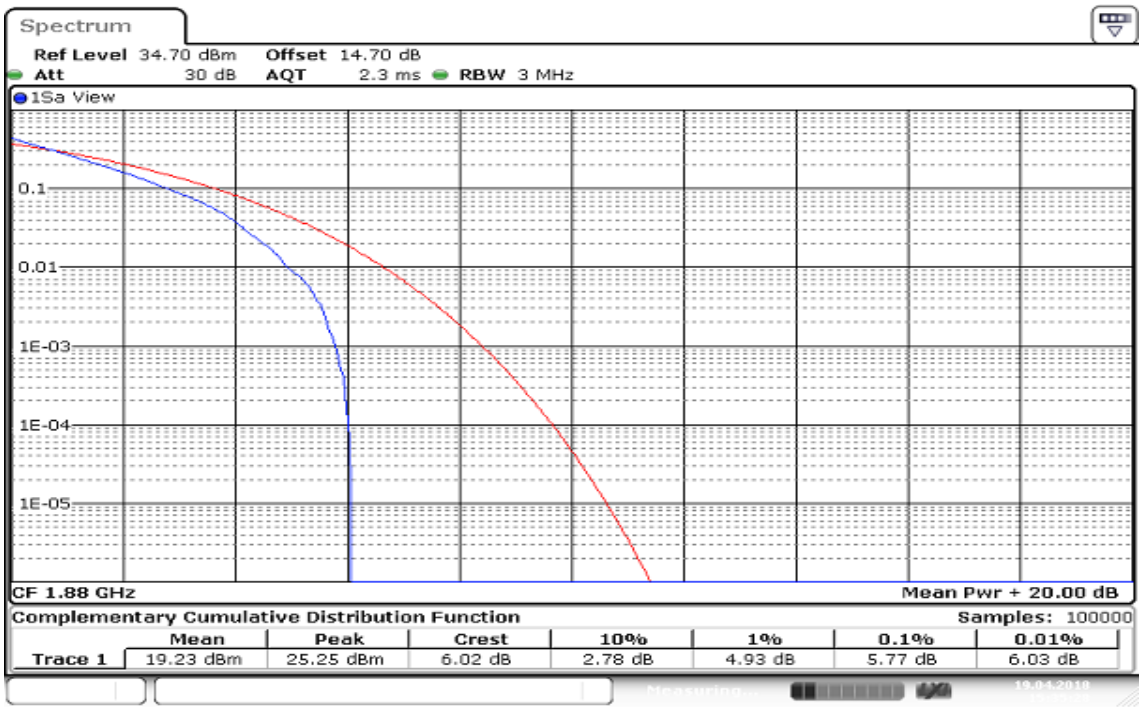
LTE Band 2

CHANNEL BANDWIDTH: 1.4MHz / QPSK / 1RB

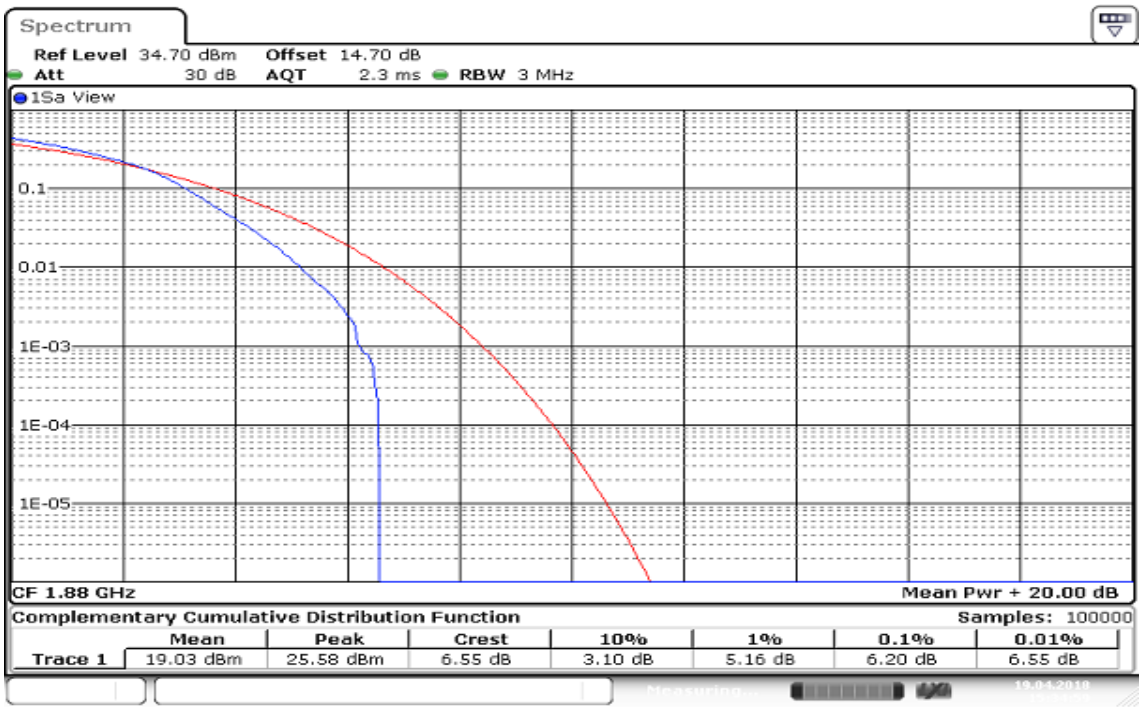
CH Mid



Date: 19.APR.2018 15:35:28

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 1RB

CH Mid



Date: 19.APR.2018 15:35:00

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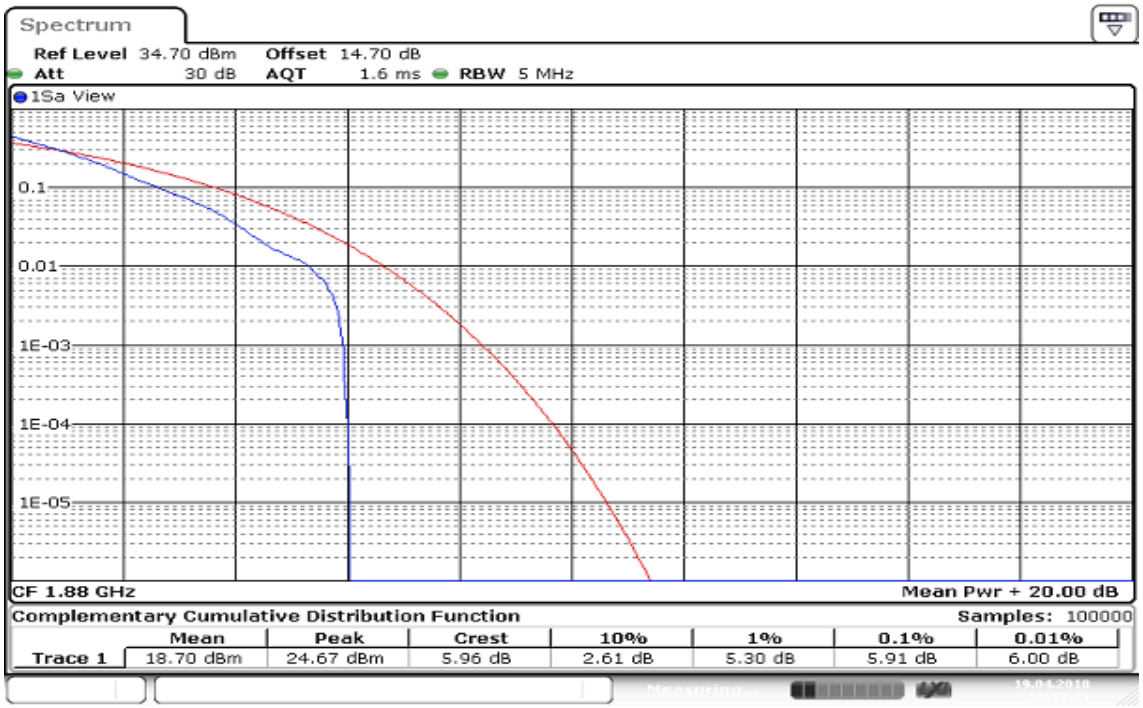
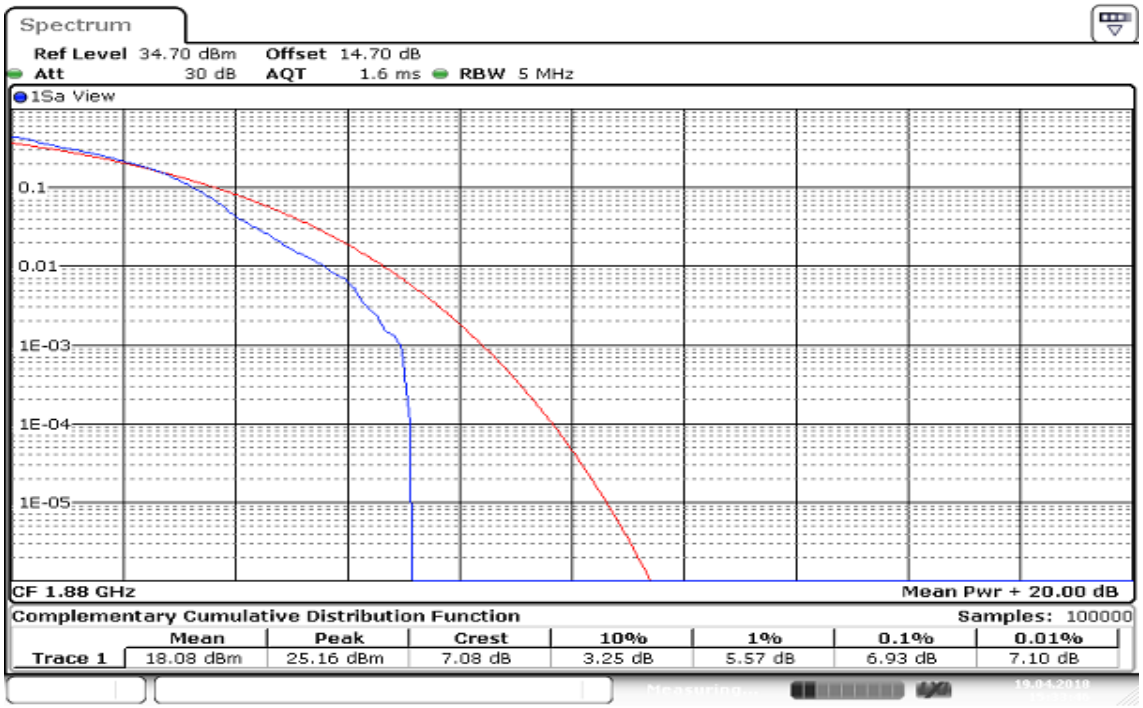
CHANNEL BANDWIDTH: 3MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 15:33:33

CHANNEL BANDWIDTH: 3MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 15:33:47

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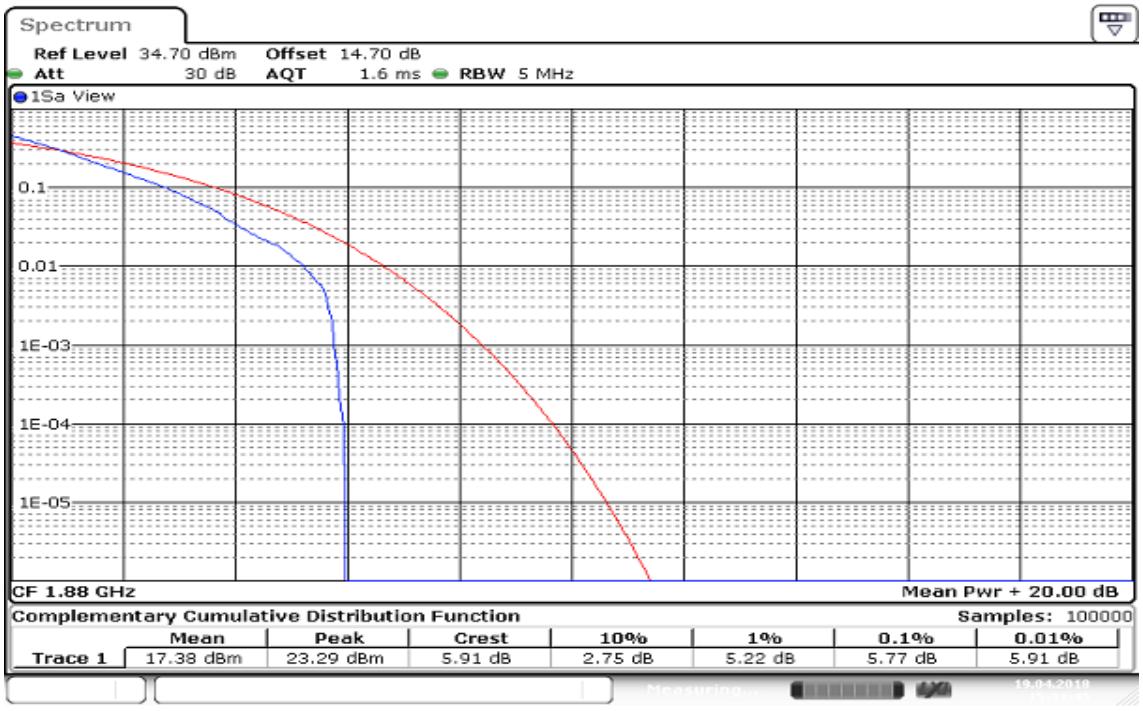
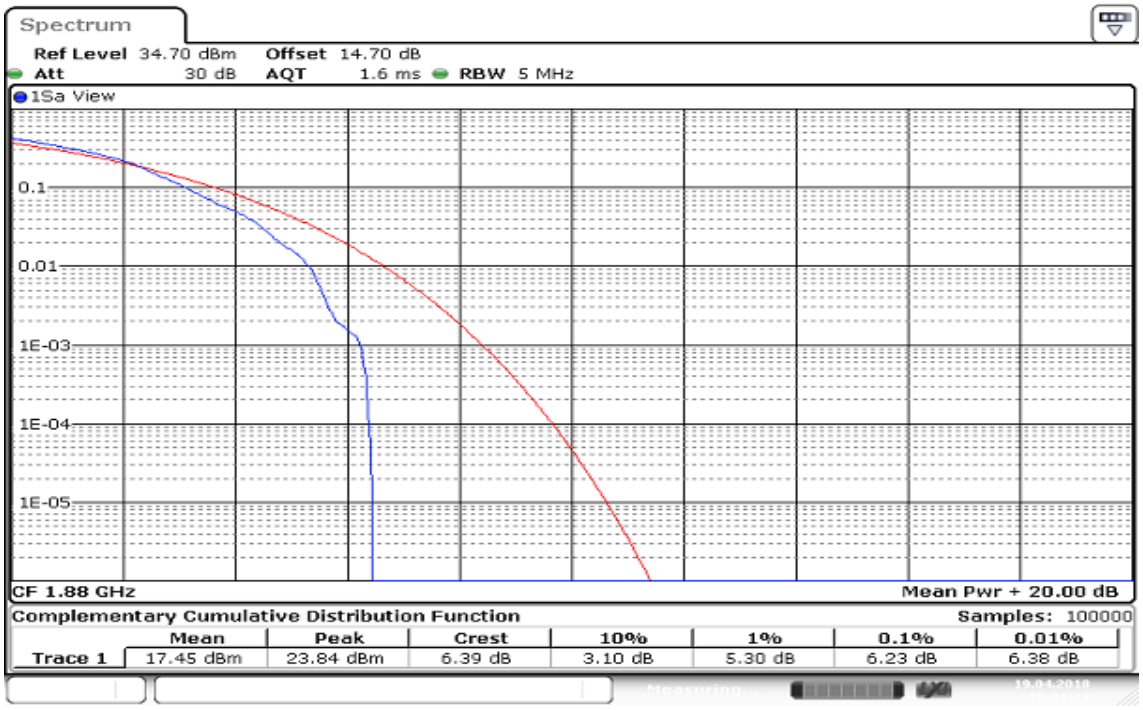
CHANNEL BANDWIDTH: 5MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 15:31:45

CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 15:31:24

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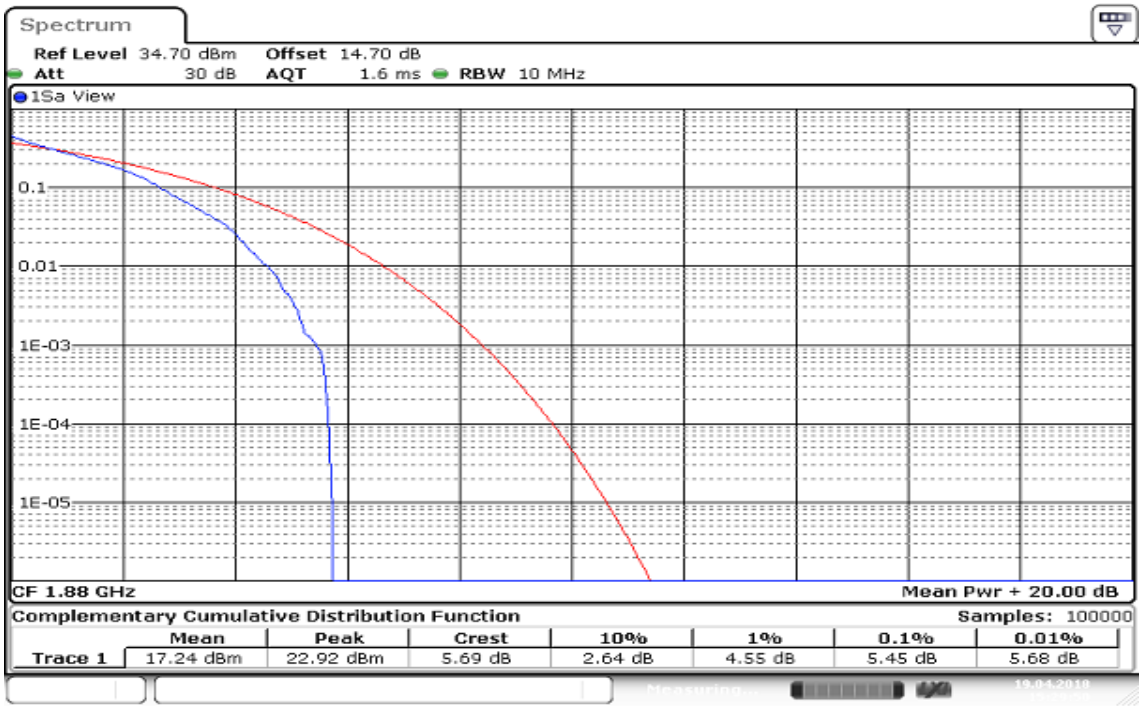
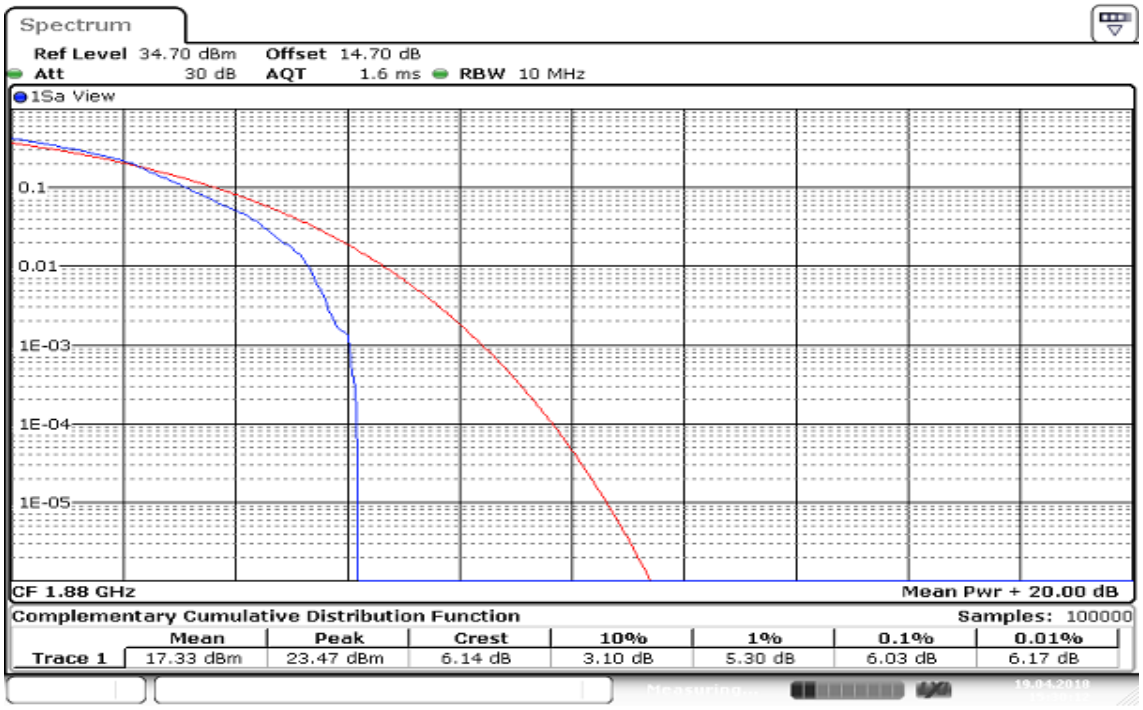
CHANNEL BANDWIDTH: 10MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 15:29:51

CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 15:30:13

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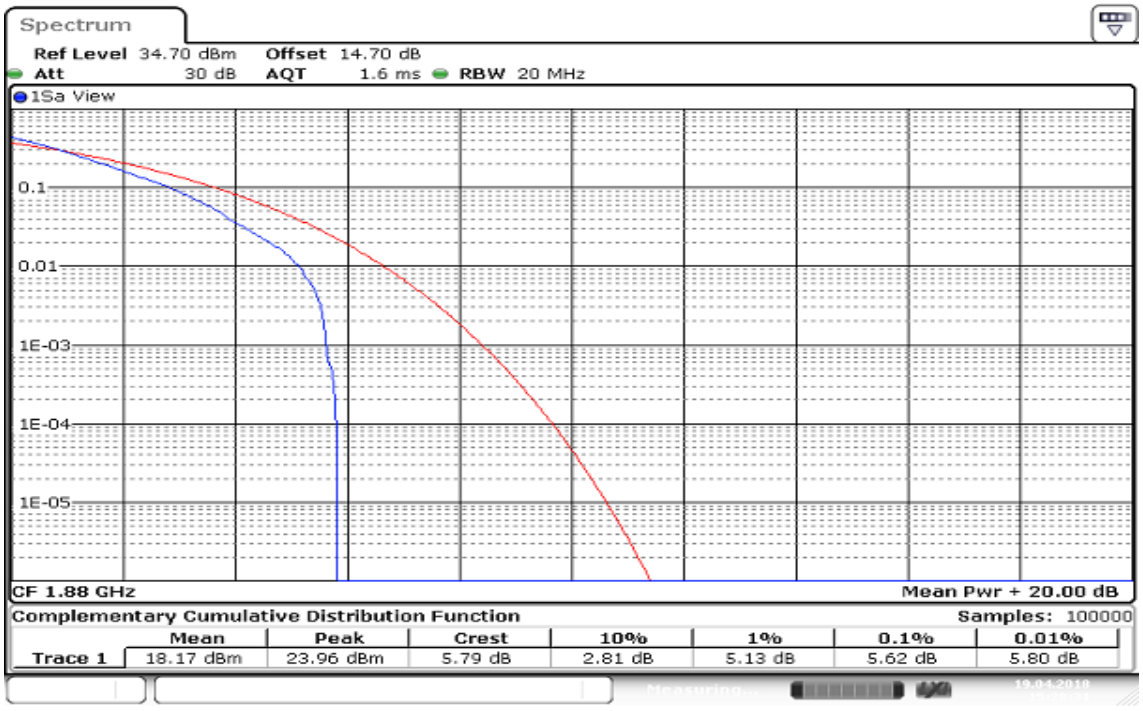
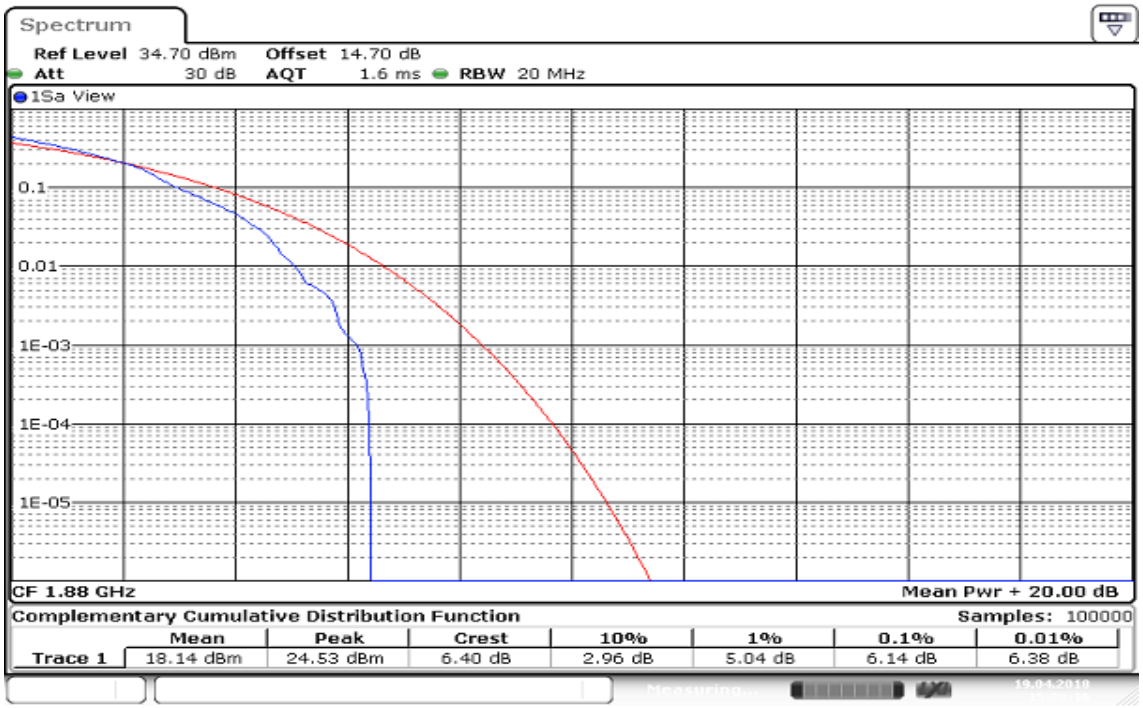
CHANNEL BANDWIDTH: 15MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 15:28:31

CHANNEL BANDWIDTH: 15MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 15:28:16

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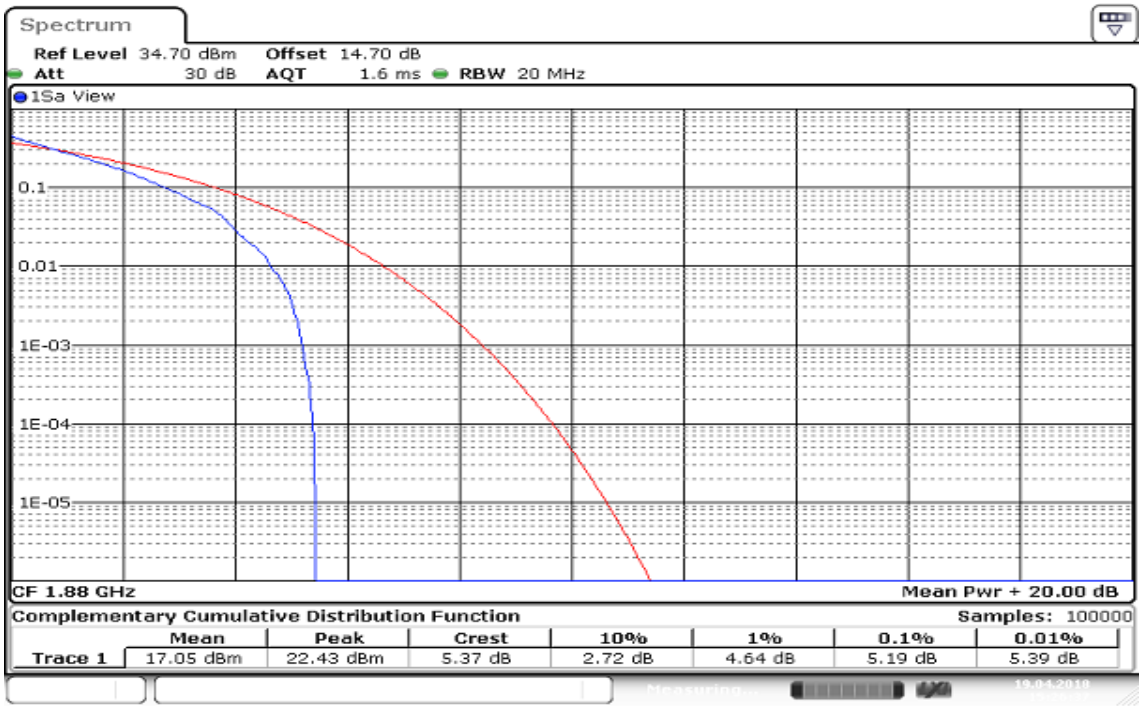
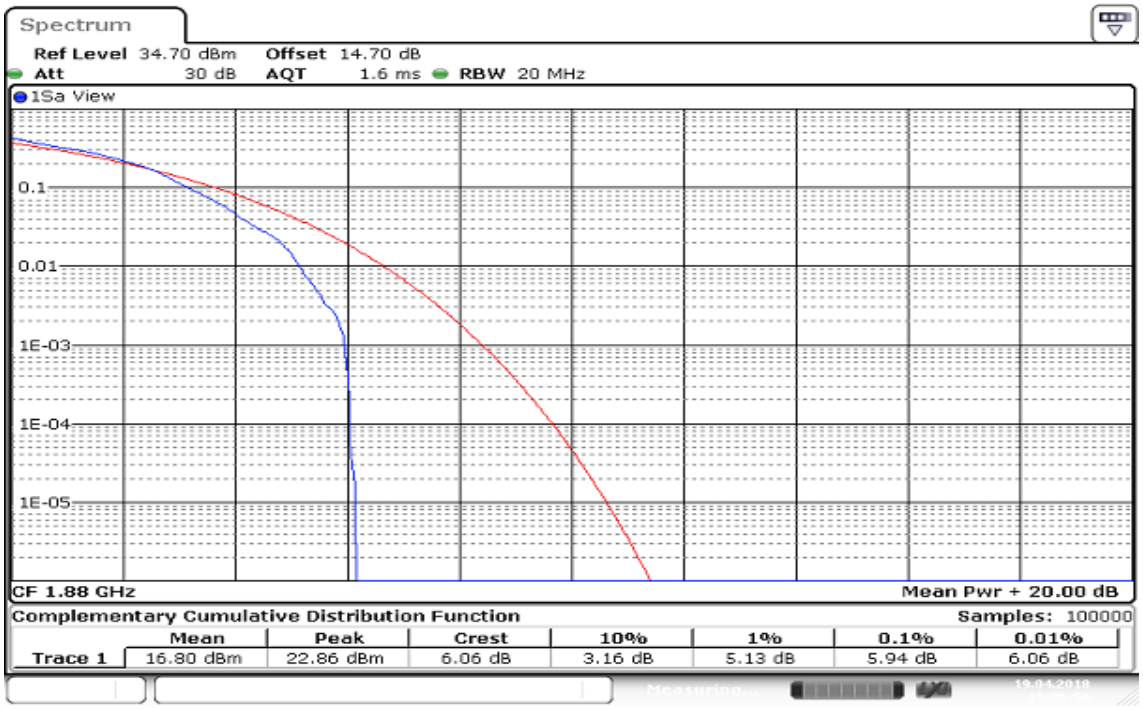
CHANNEL BANDWIDTH: 20MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 15:26:38

CHANNEL BANDWIDTH: 20MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 15:26:56

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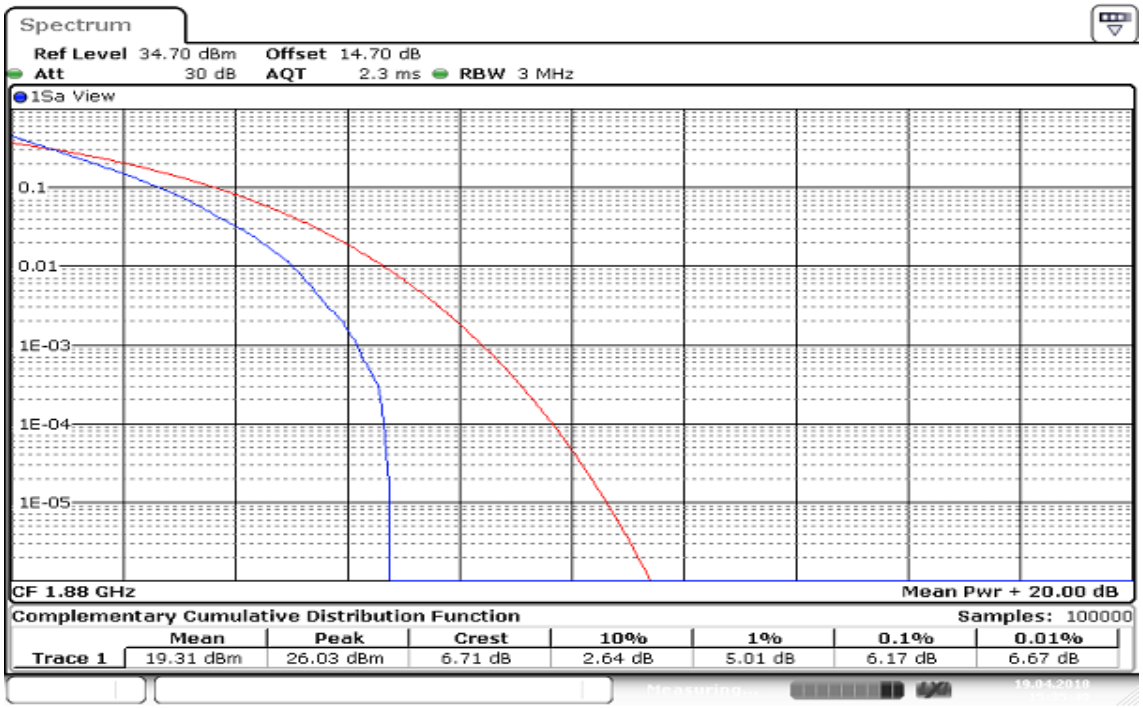
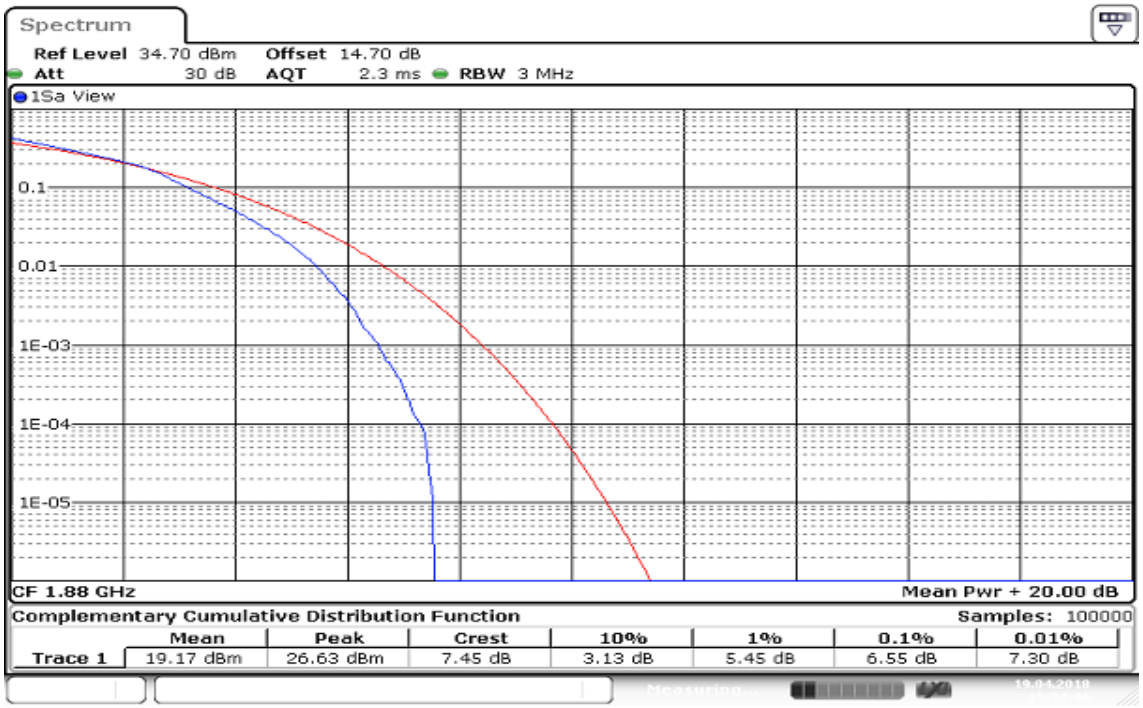
CHANNEL BANDWIDTH: 1.4MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 15:35:50

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 15:34:47

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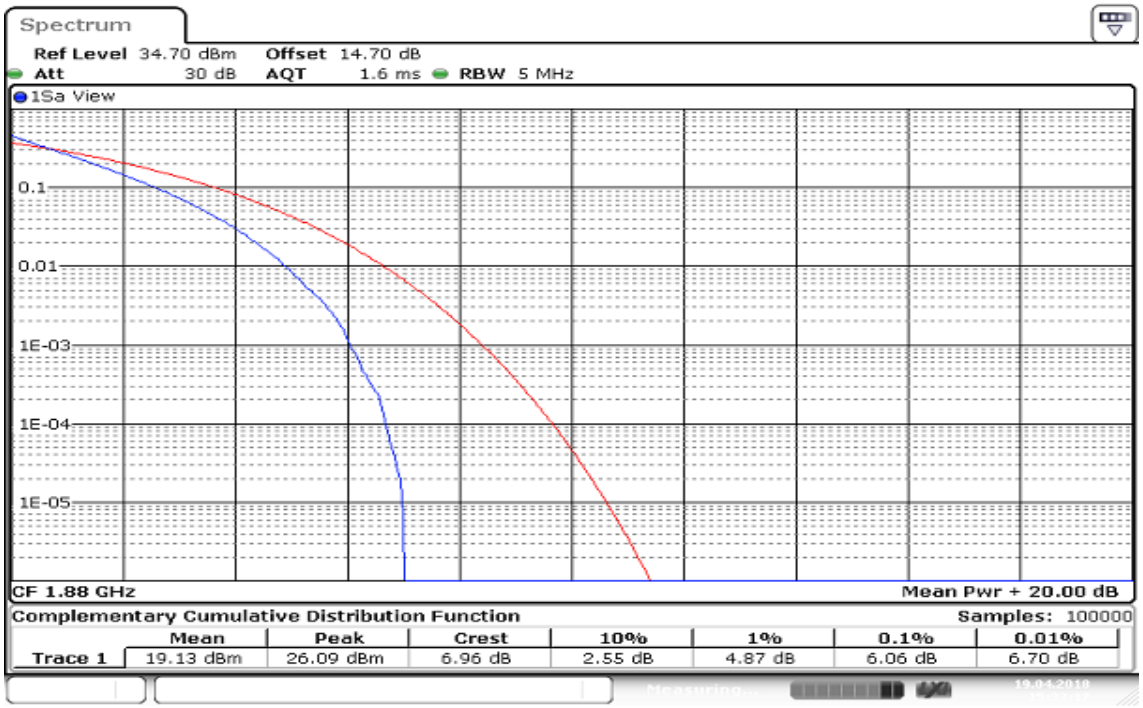
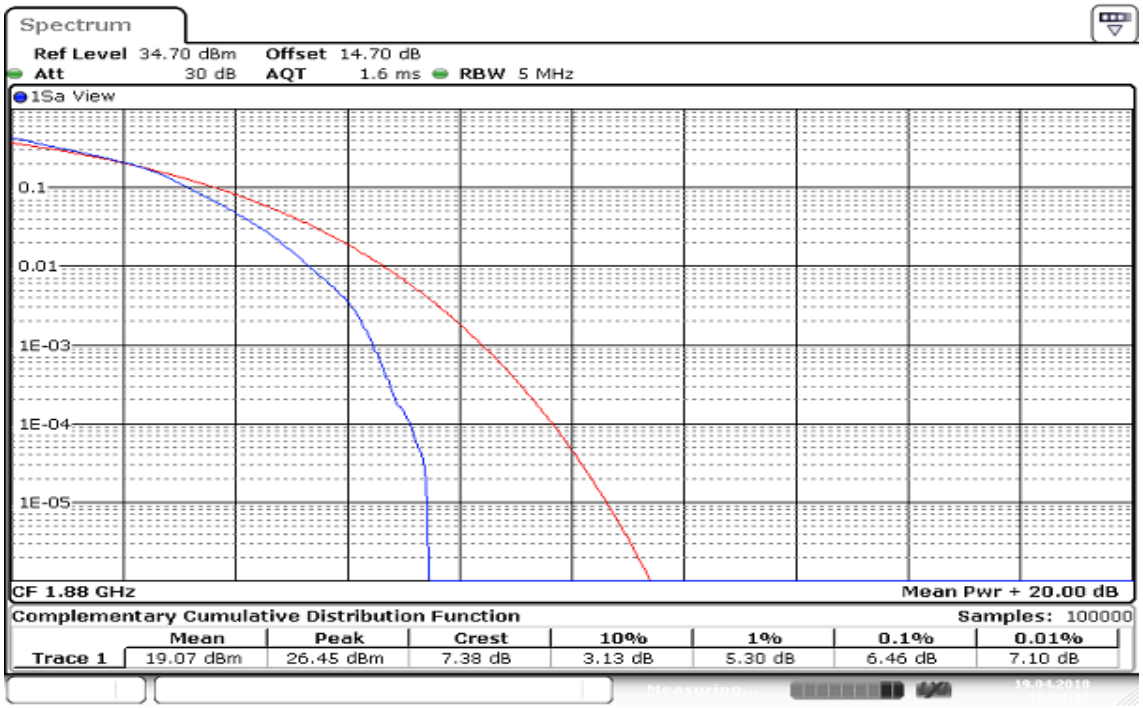
CHANNEL BANDWIDTH: 3MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 15:33:17

CHANNEL BANDWIDTH: 3MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 15:34:12

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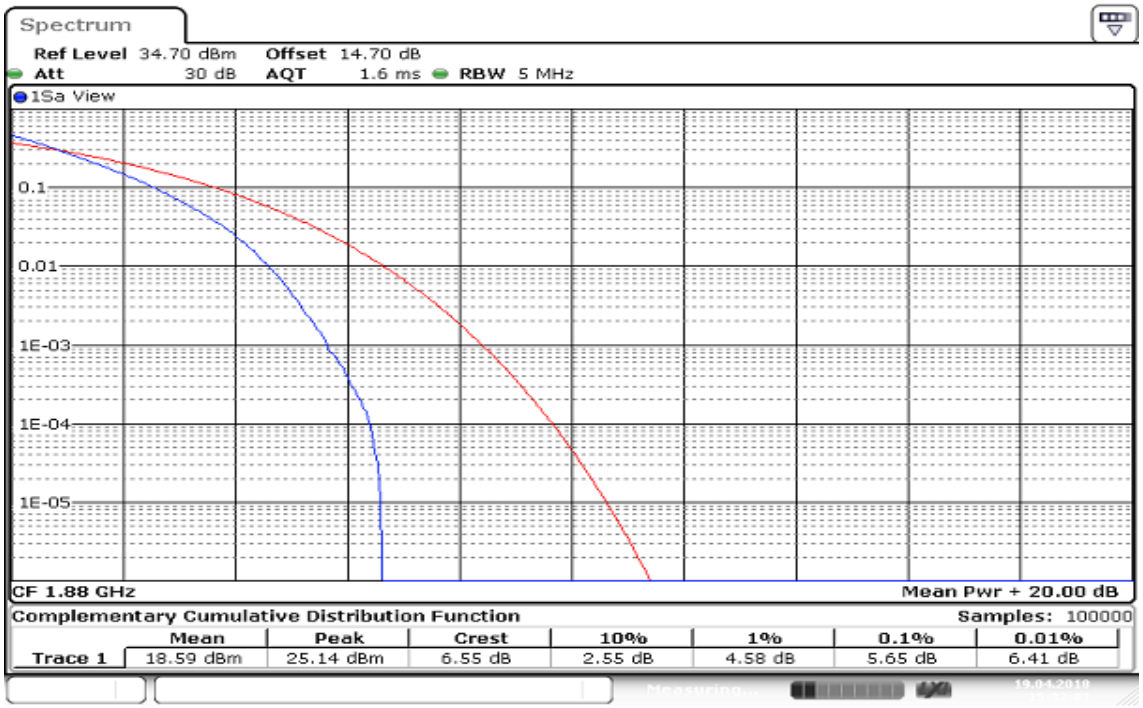
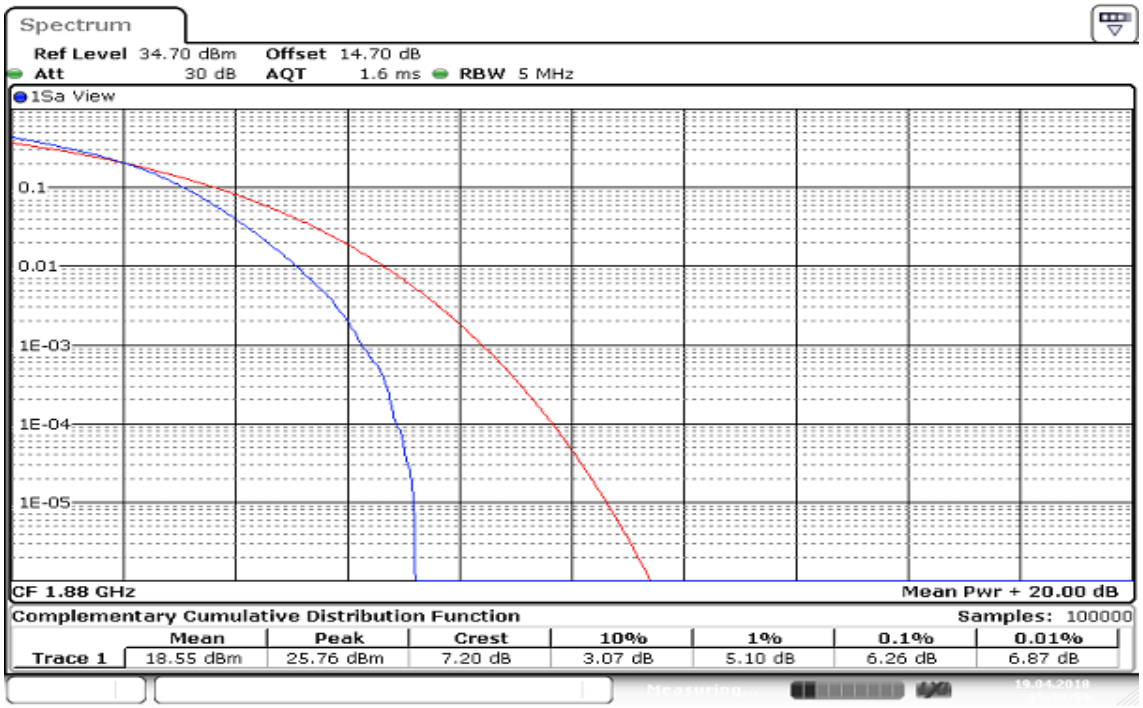
CHANNEL BANDWIDTH: 5MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 15:32:03

CHANNEL BANDWIDTH: 5MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 15:31:00

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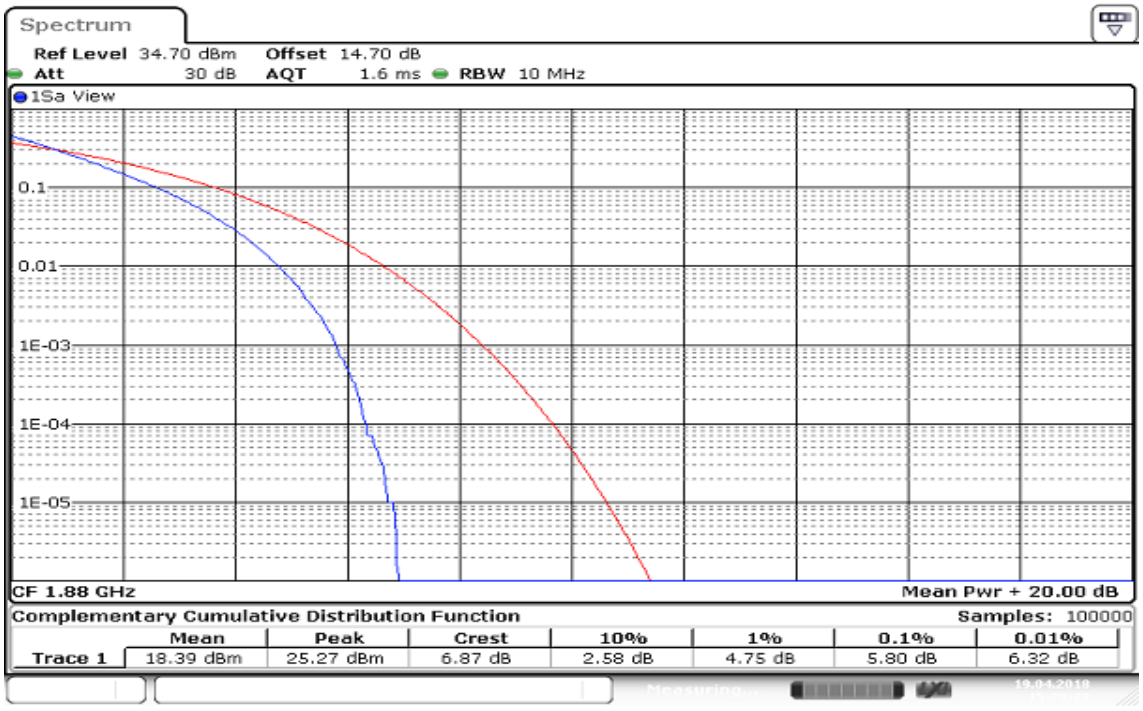
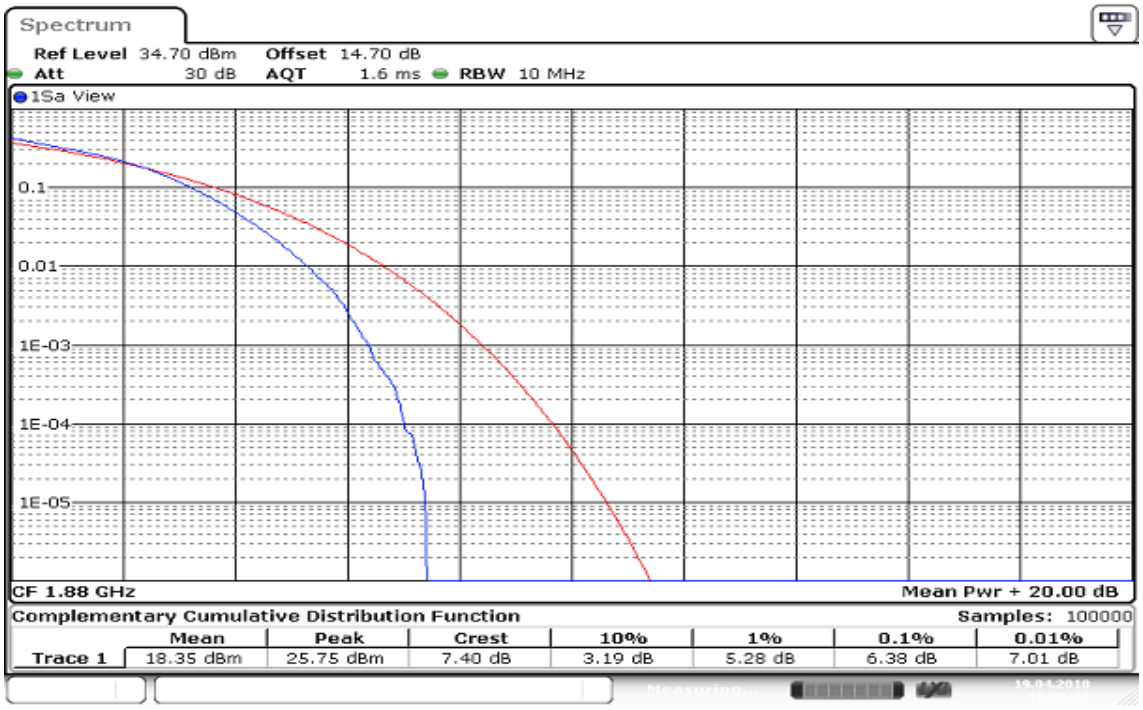
CHANNEL BANDWIDTH: 10MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 15:29:28

CHANNEL BANDWIDTH: 10MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 15:30:34

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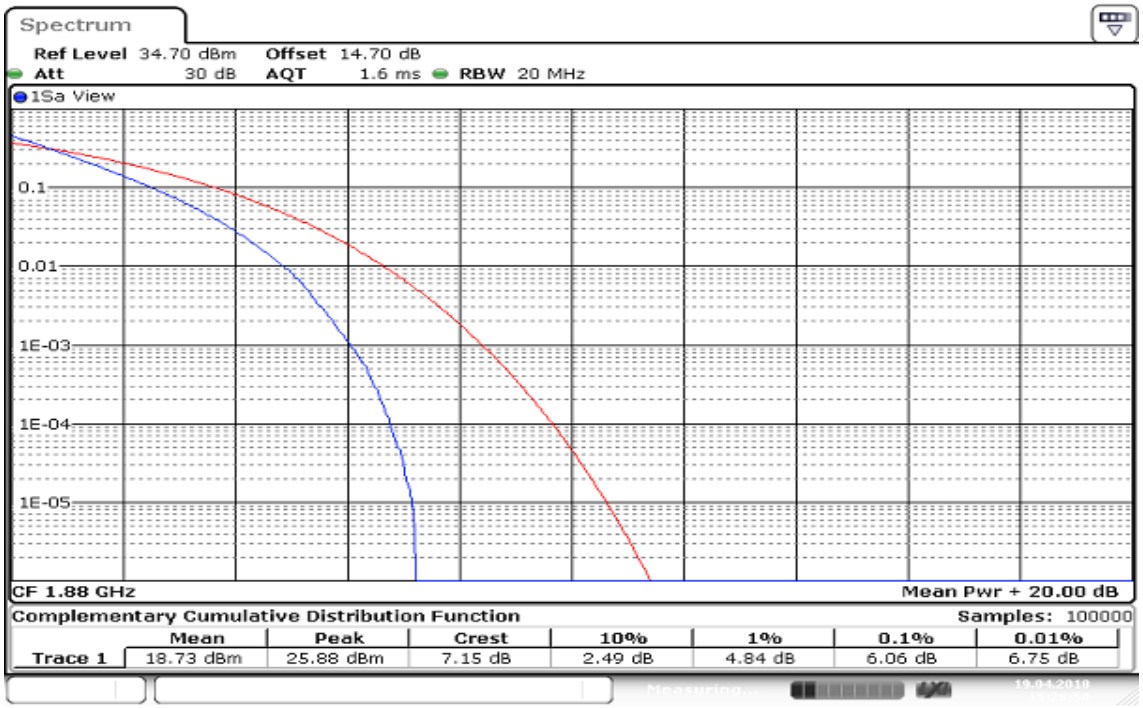
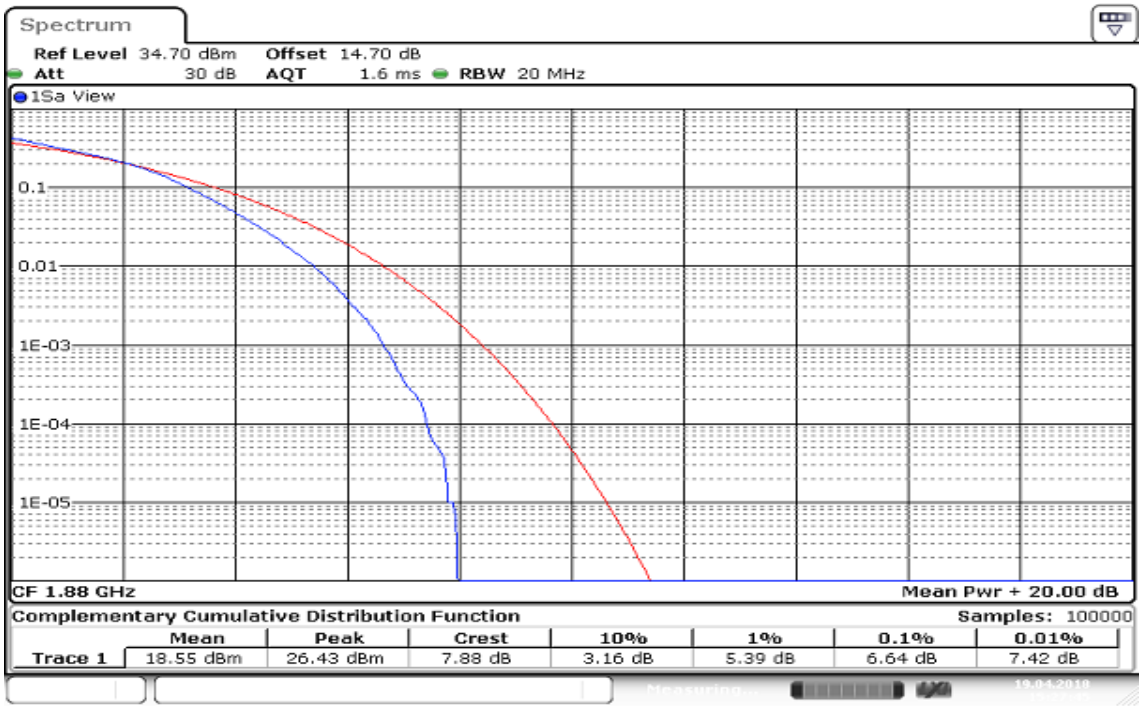
CHANNEL BANDWIDTH: 15MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 15:28:50

CHANNEL BANDWIDTH: 15MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 15:27:46

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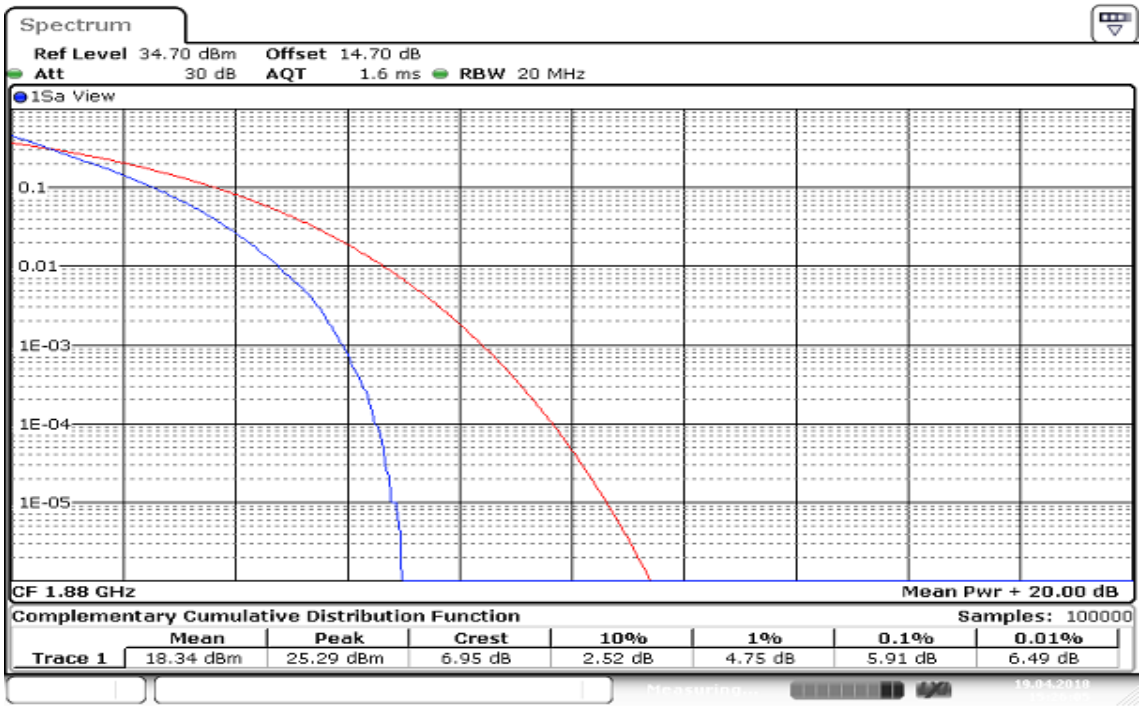
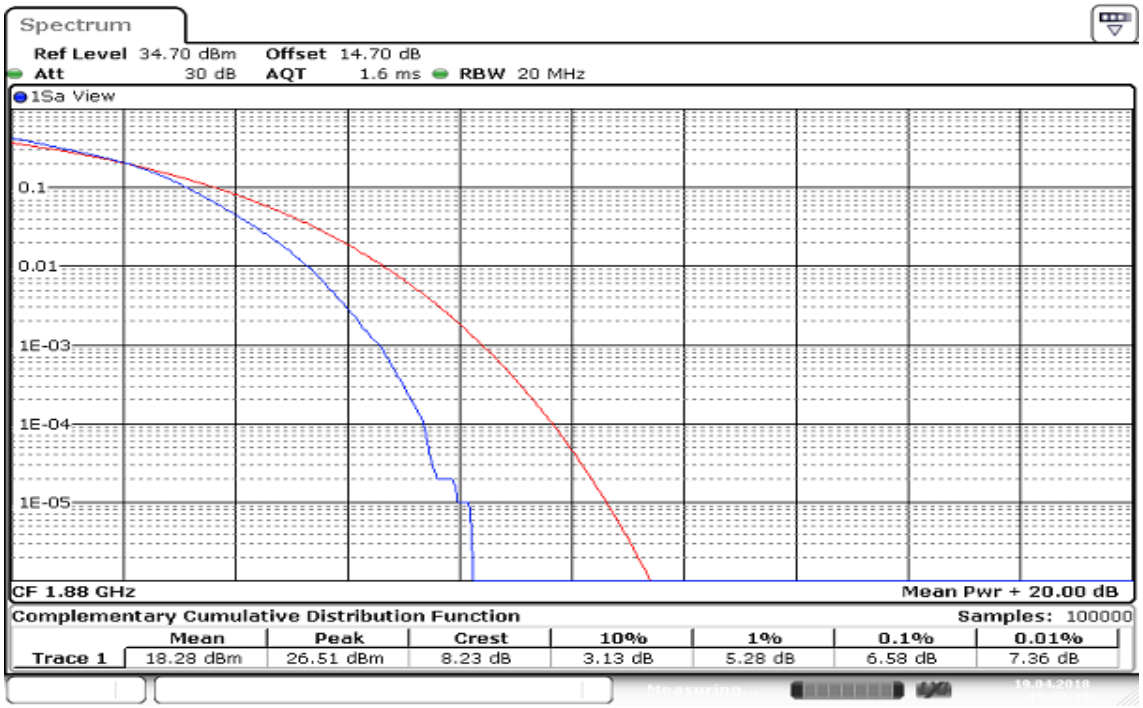
CHANNEL BANDWIDTH: 20MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 15:26:05

CHANNEL BANDWIDTH: 20MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 15:27:18

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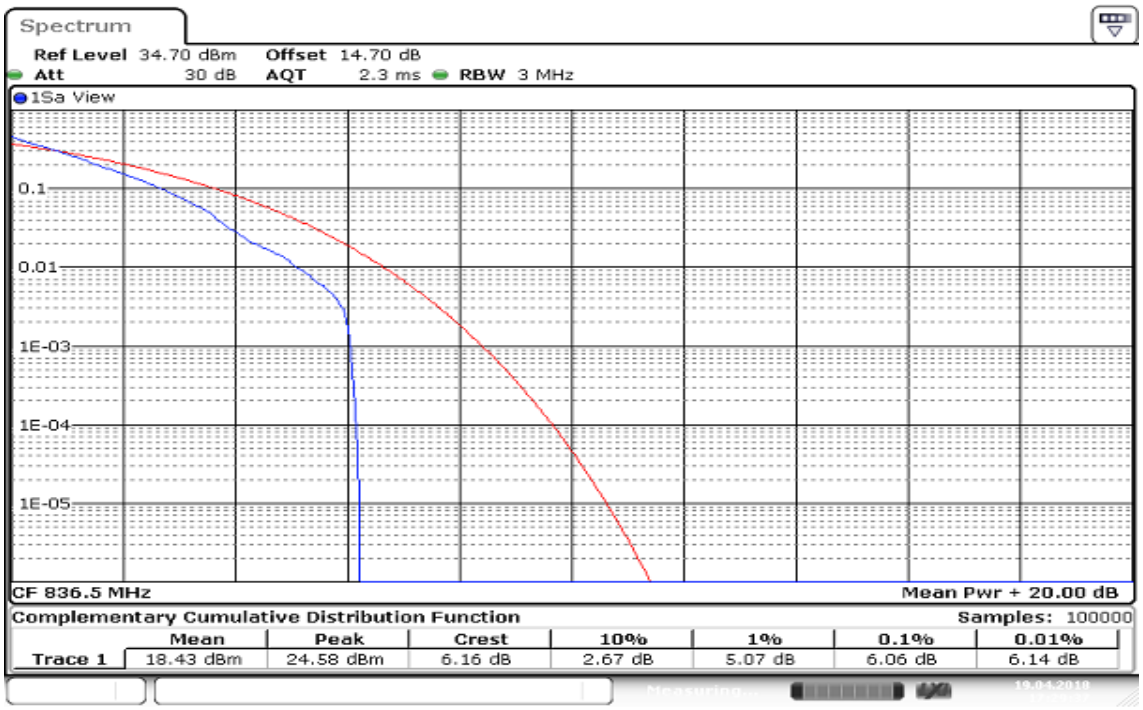
LTE Band 5

CHANNEL BANDWIDTH: 1.4MHz / QPSK / 1RB

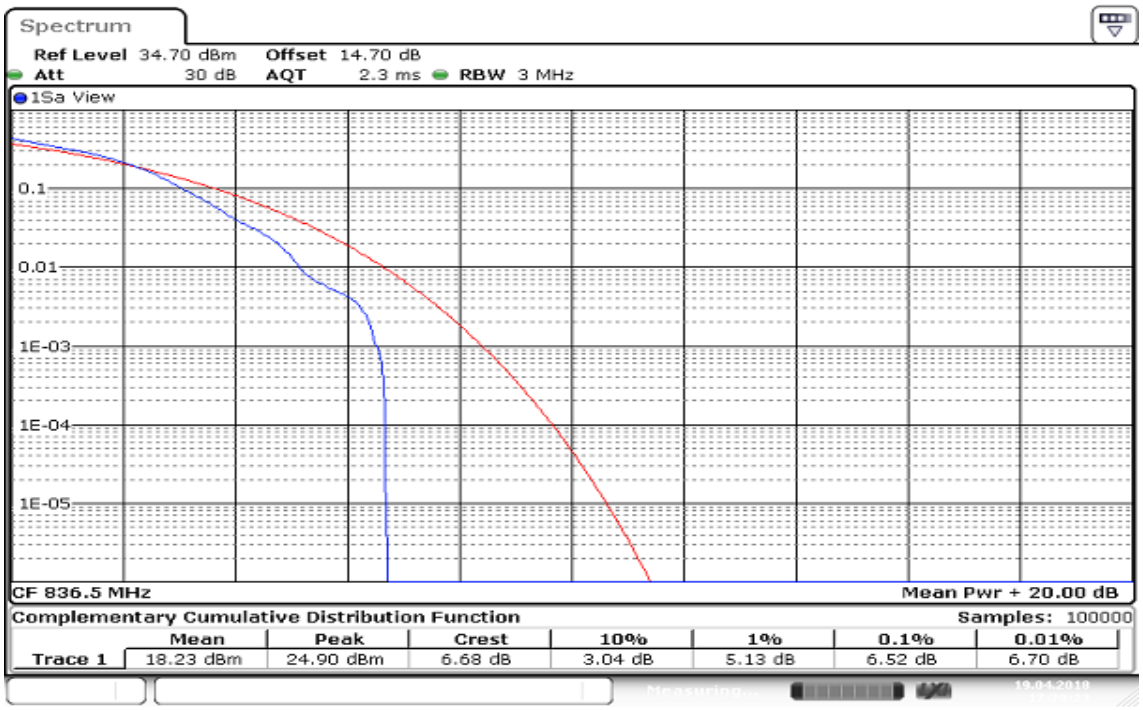
CH Mid



Date: 19.APR.2018 17:29:38

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 1RB

CH Mid



Date: 19.APR.2018 17:29:24

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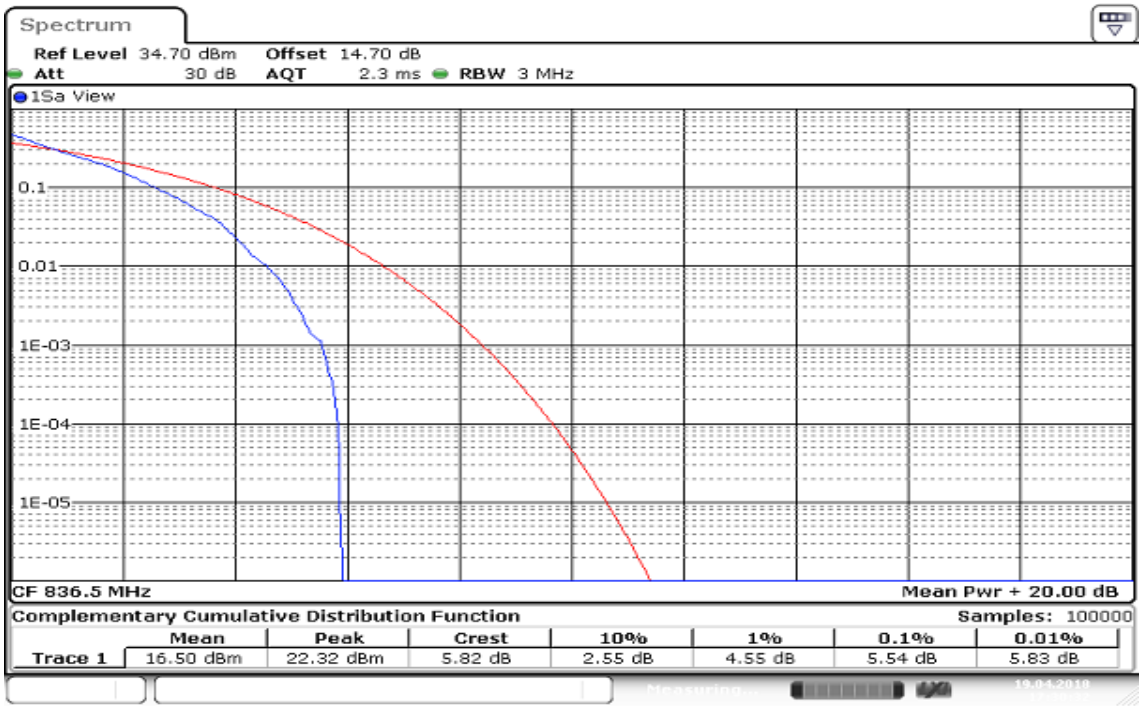
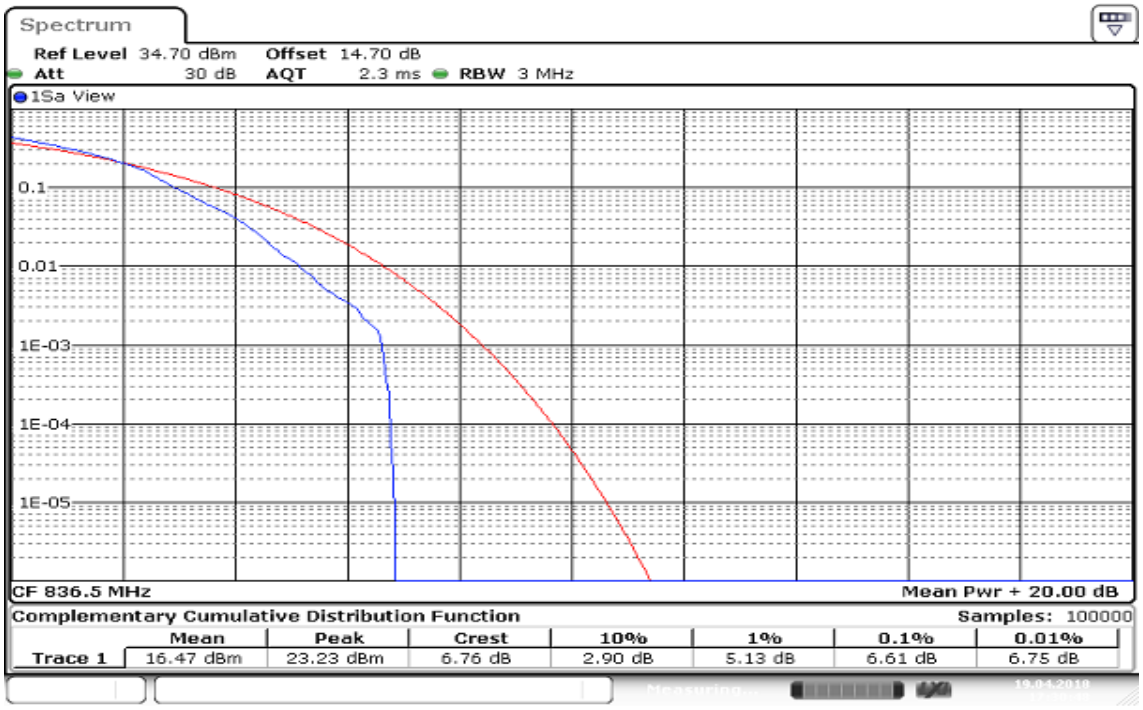
CHANNEL BANDWIDTH: 3MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 17:30:33

CHANNEL BANDWIDTH: 3MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 17:30:48

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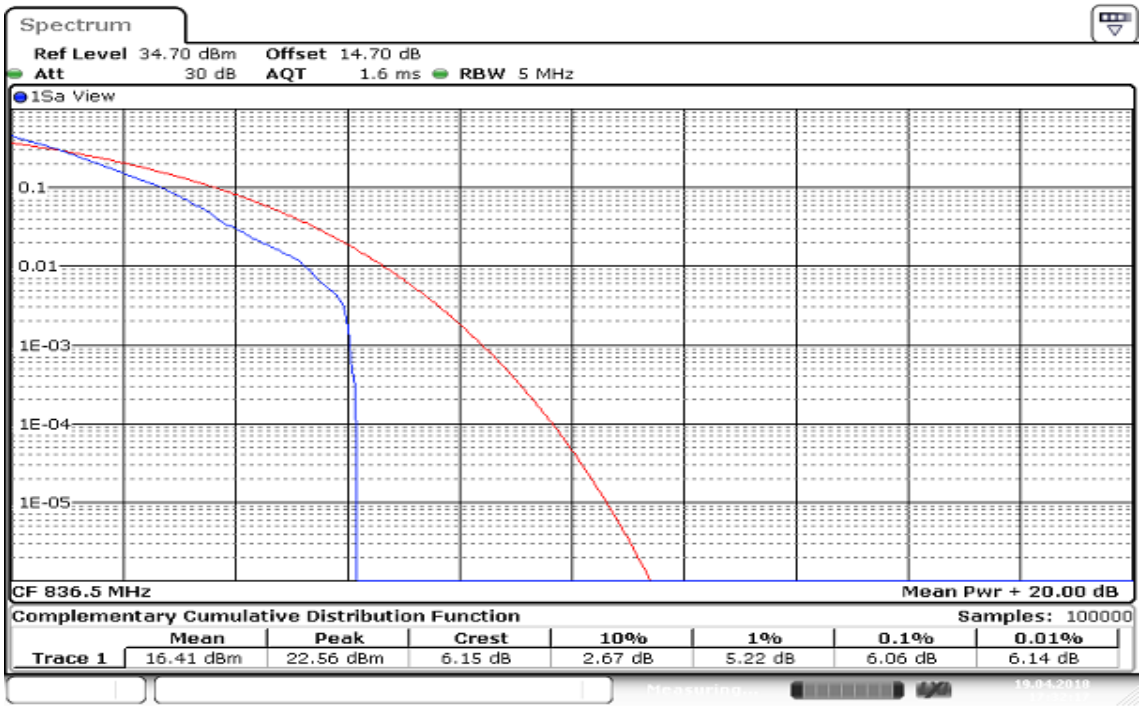
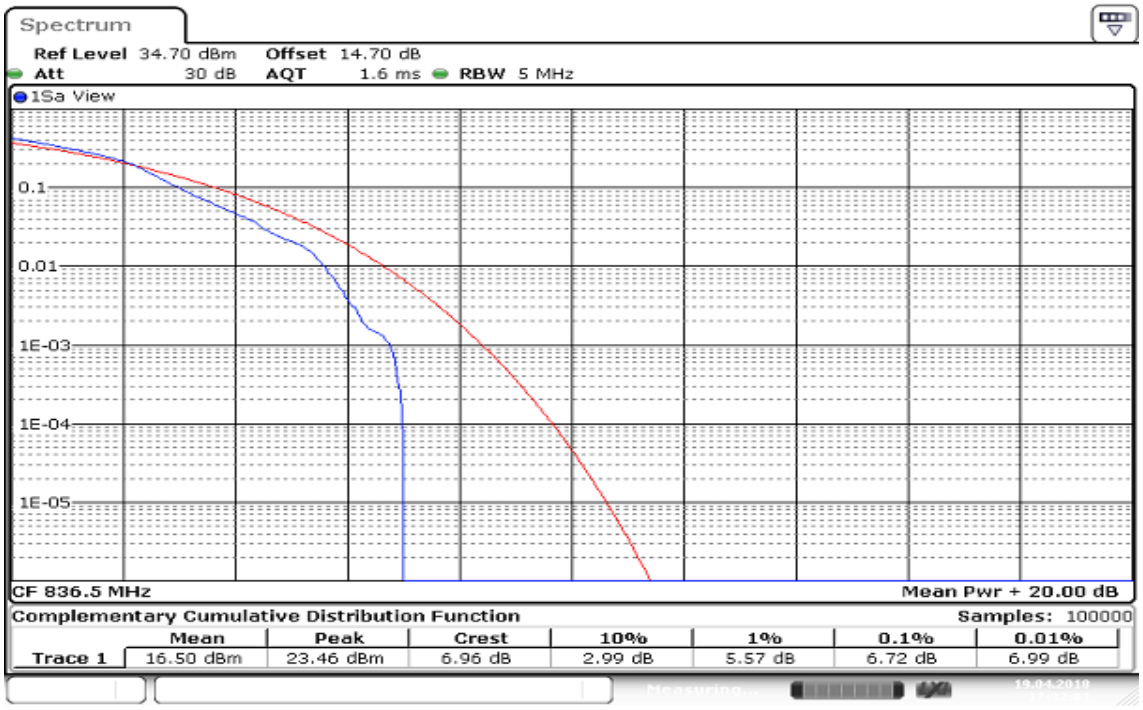
CHANNEL BANDWIDTH: 5MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 17:32:17

CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 17:32:03

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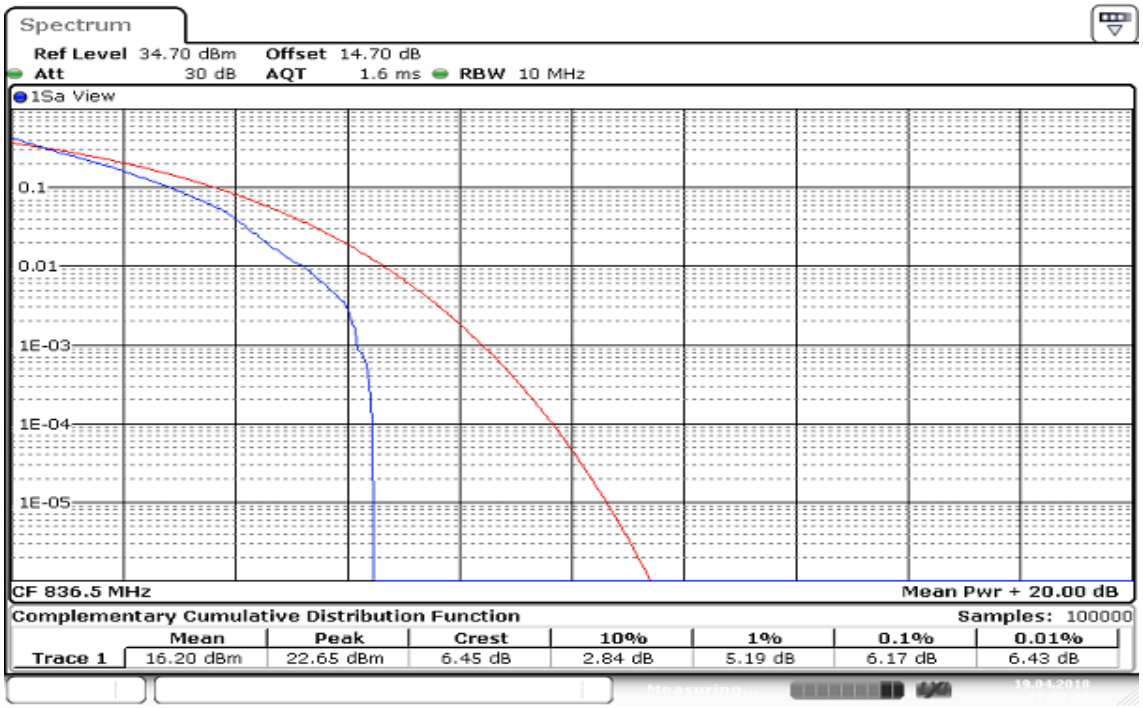
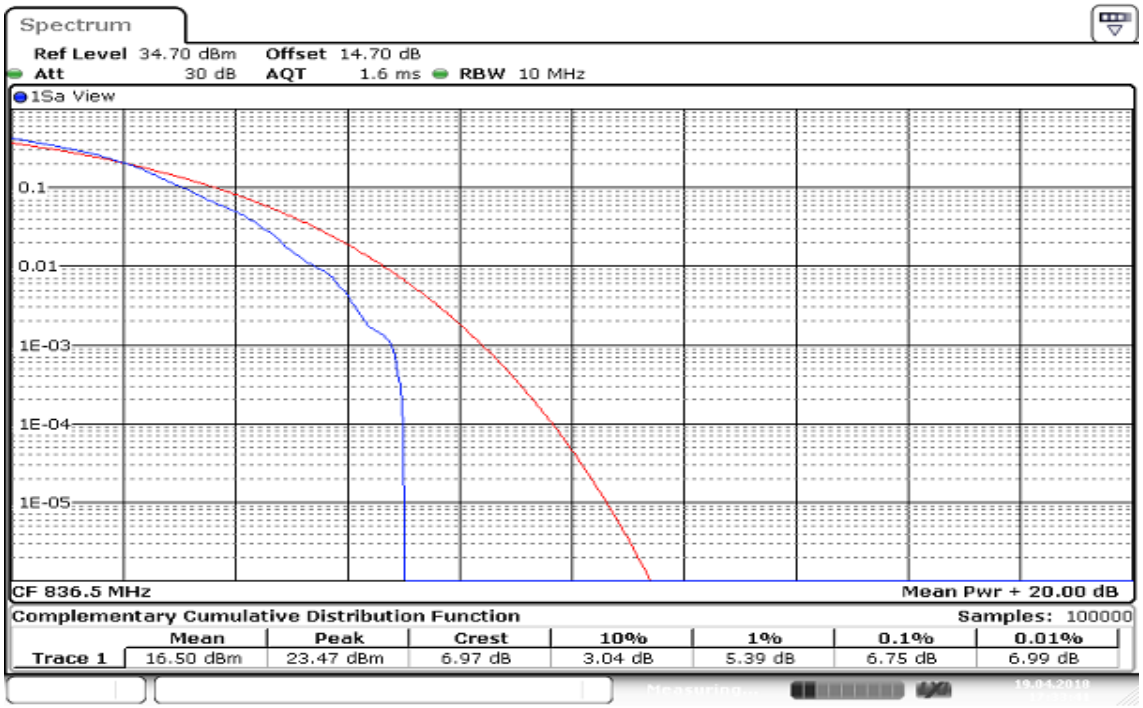
CHANNEL BANDWIDTH: 10MHz / QPSK / 1RB
CH Mid



Date: 19.APR.2018 17:33:23

CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB
CH Mid



Date: 19.APR.2018 17:33:42

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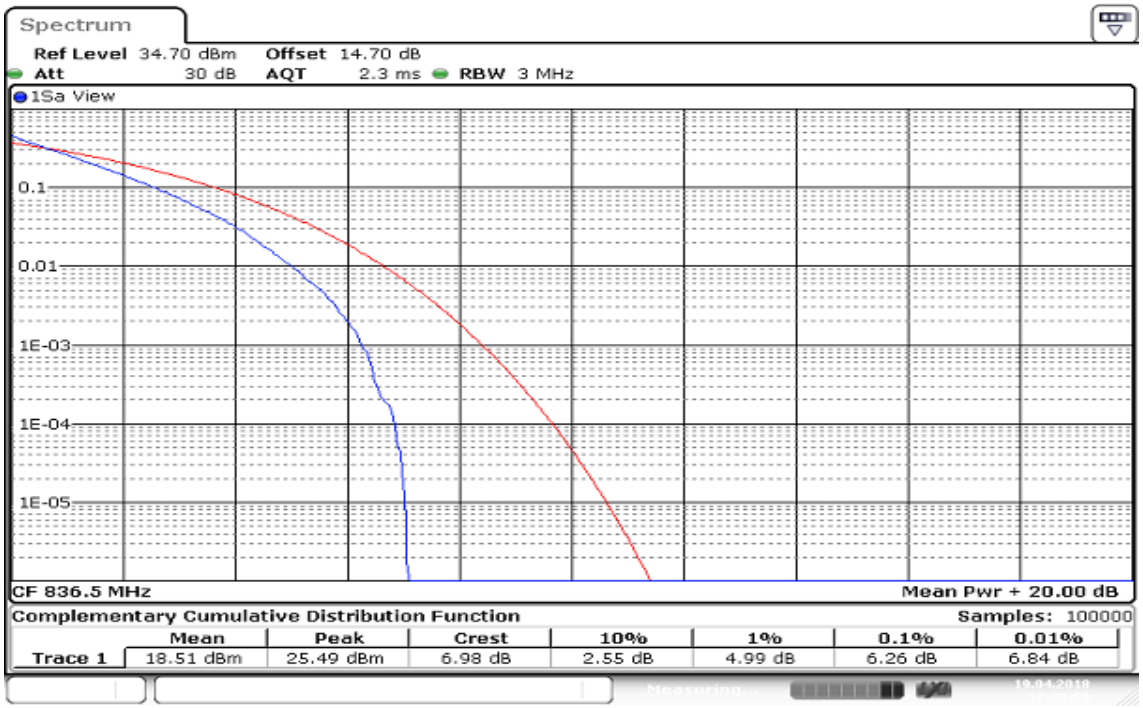
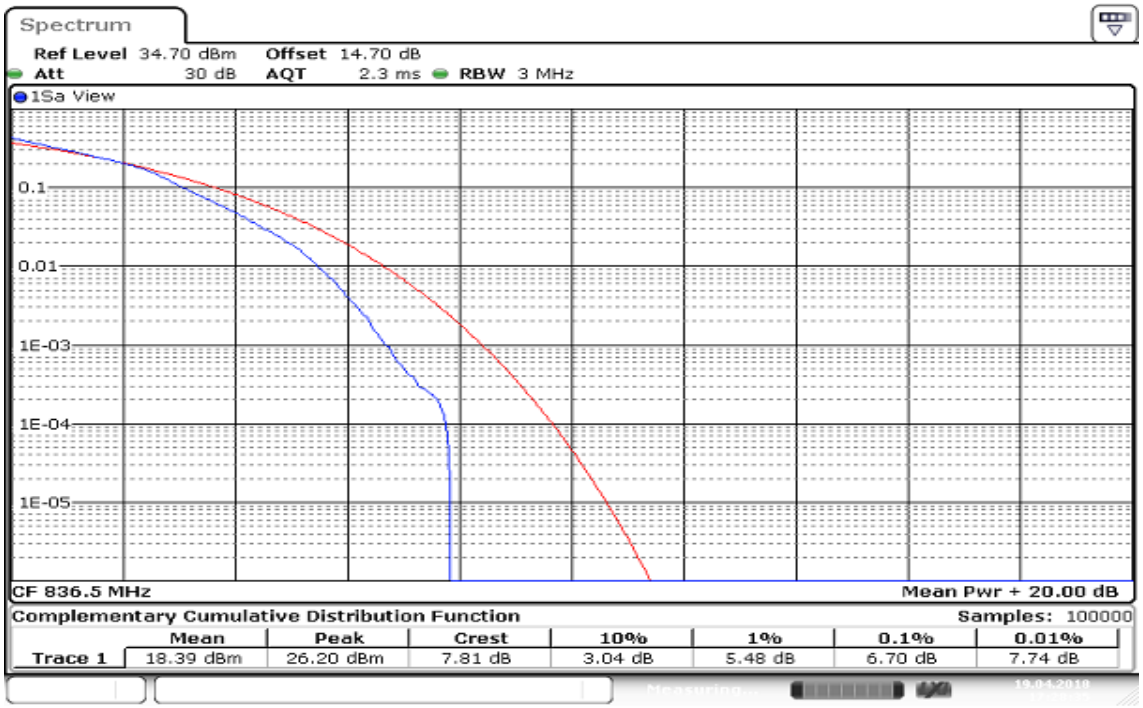
CHANNEL BANDWIDTH: 1.4MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 17:29:59

CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 17:28:36

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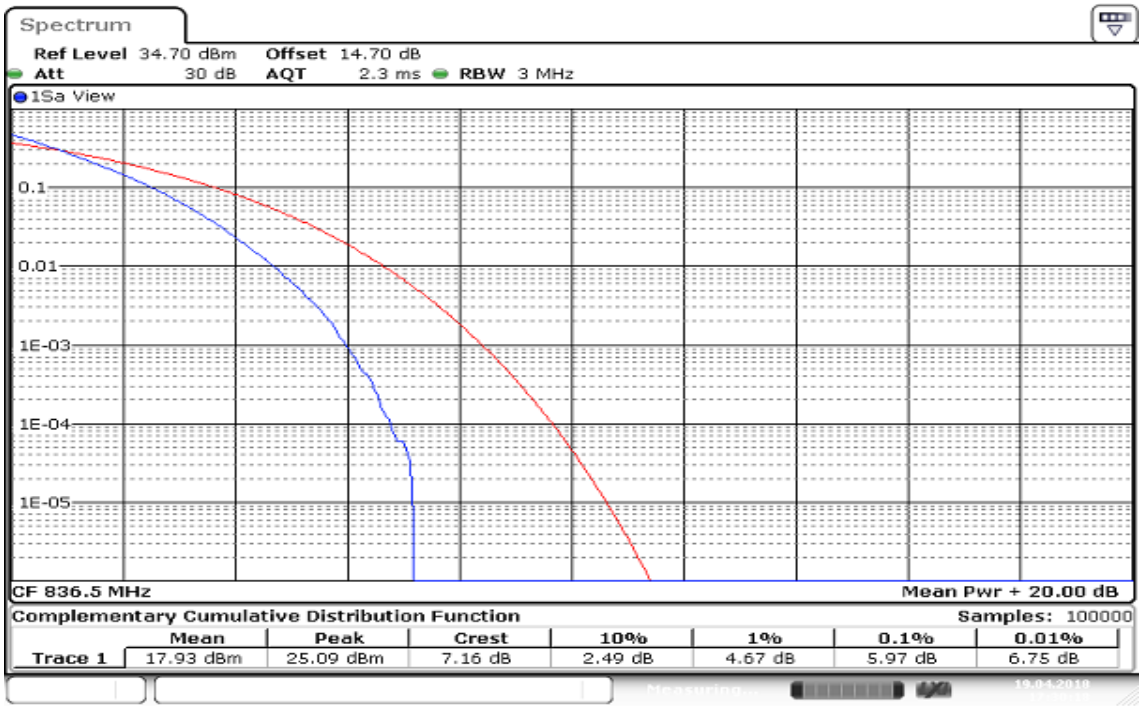
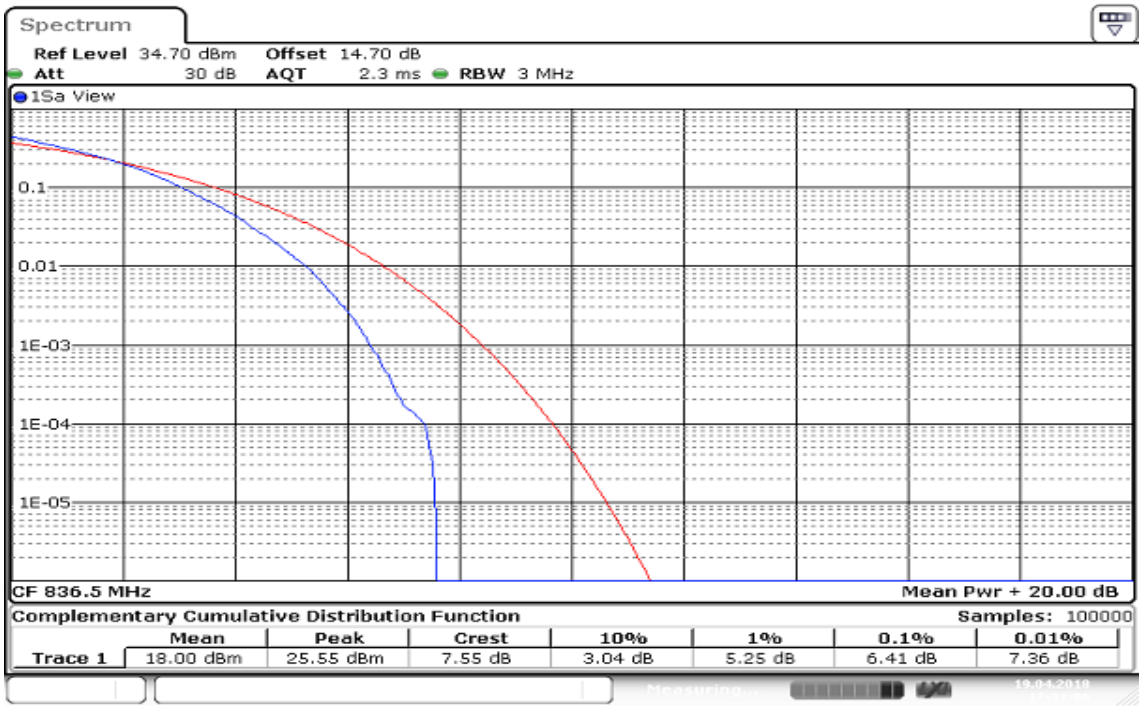
CHANNEL BANDWIDTH: 3MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 17:30:18

CHANNEL BANDWIDTH: 3MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 17:31:06

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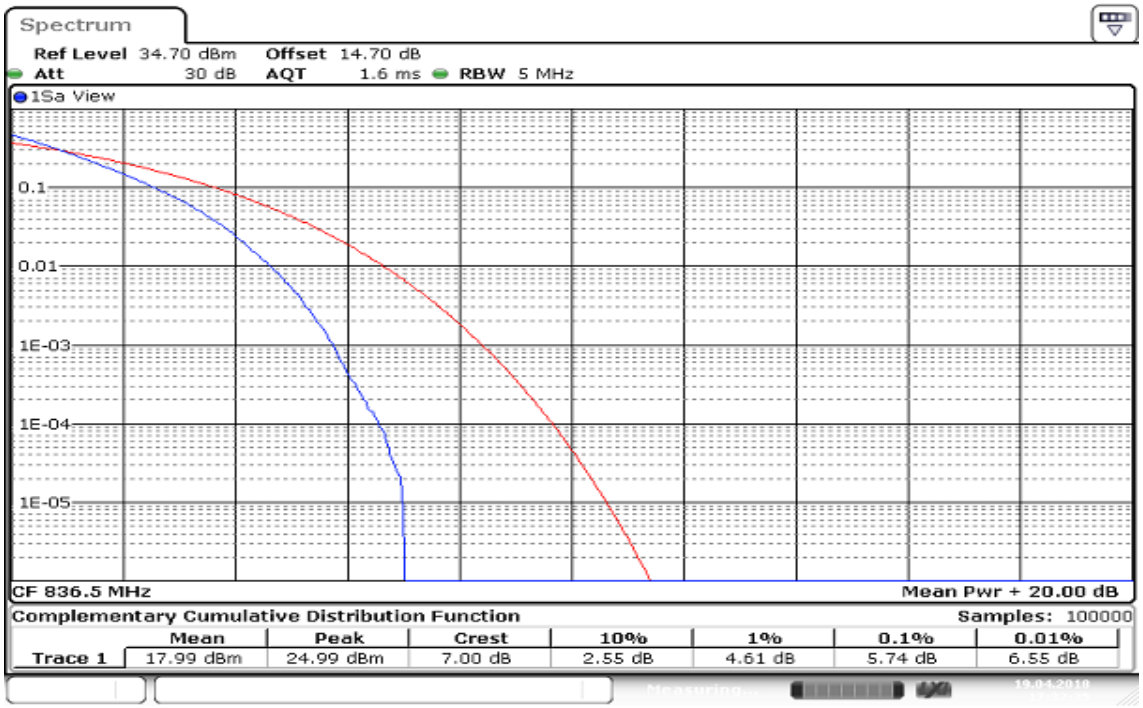
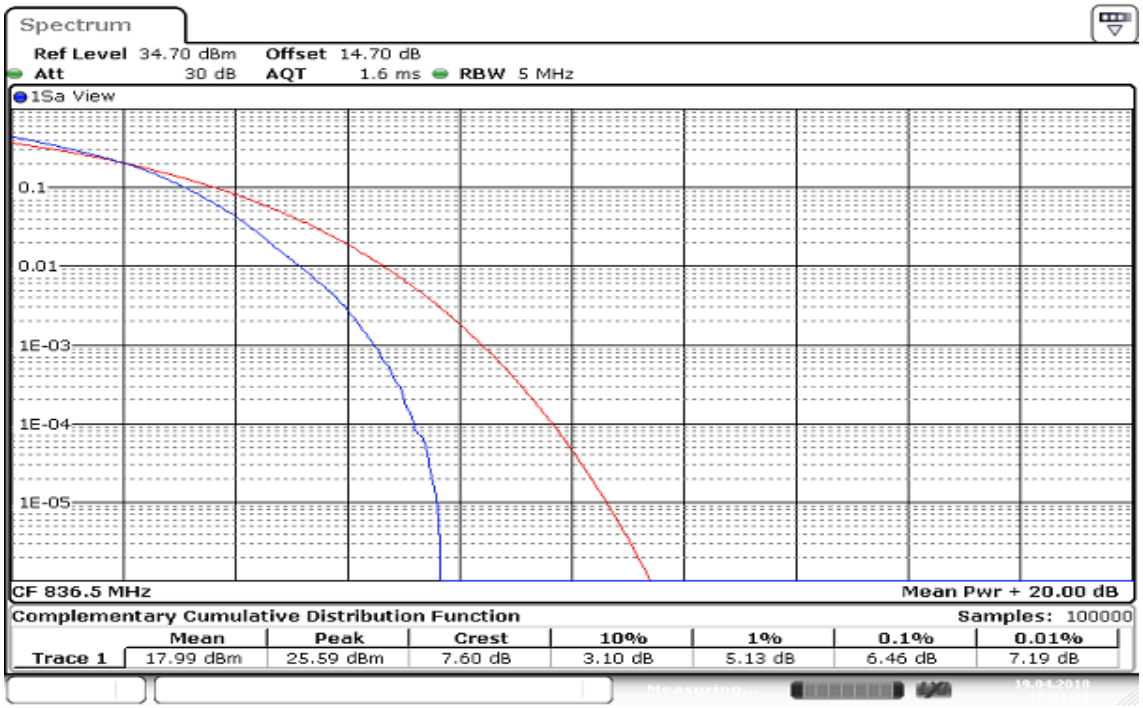
CHANNEL BANDWIDTH: 5MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 17:32:35

CHANNEL BANDWIDTH: 5MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 17:31:41

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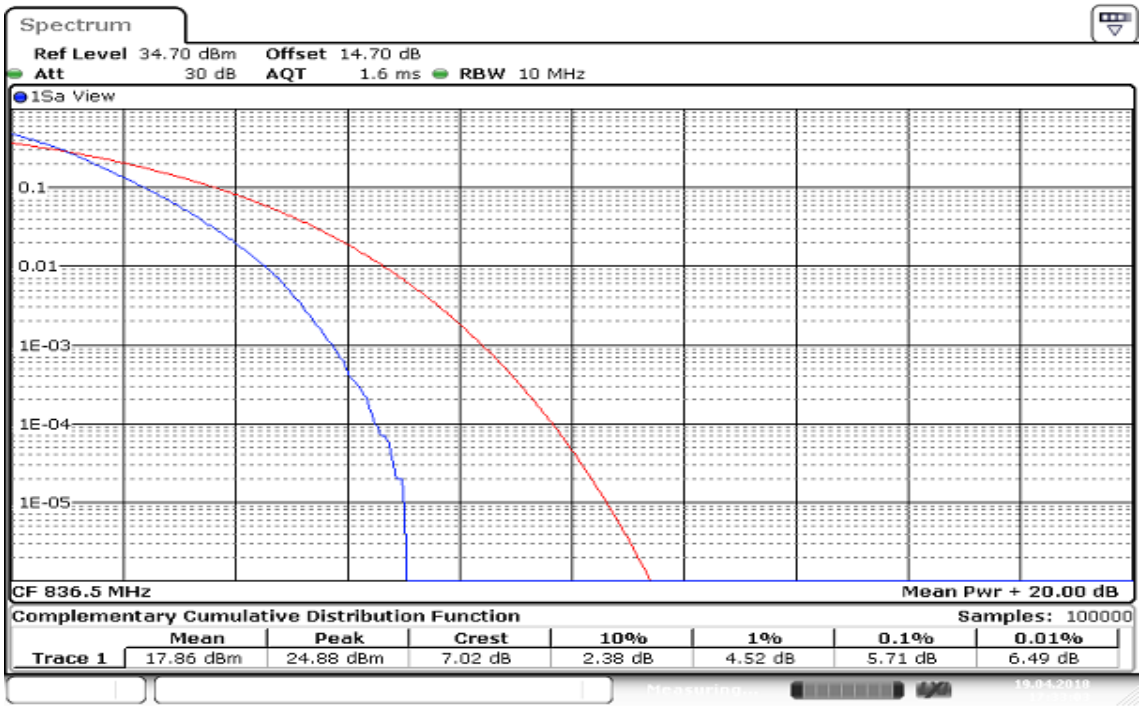
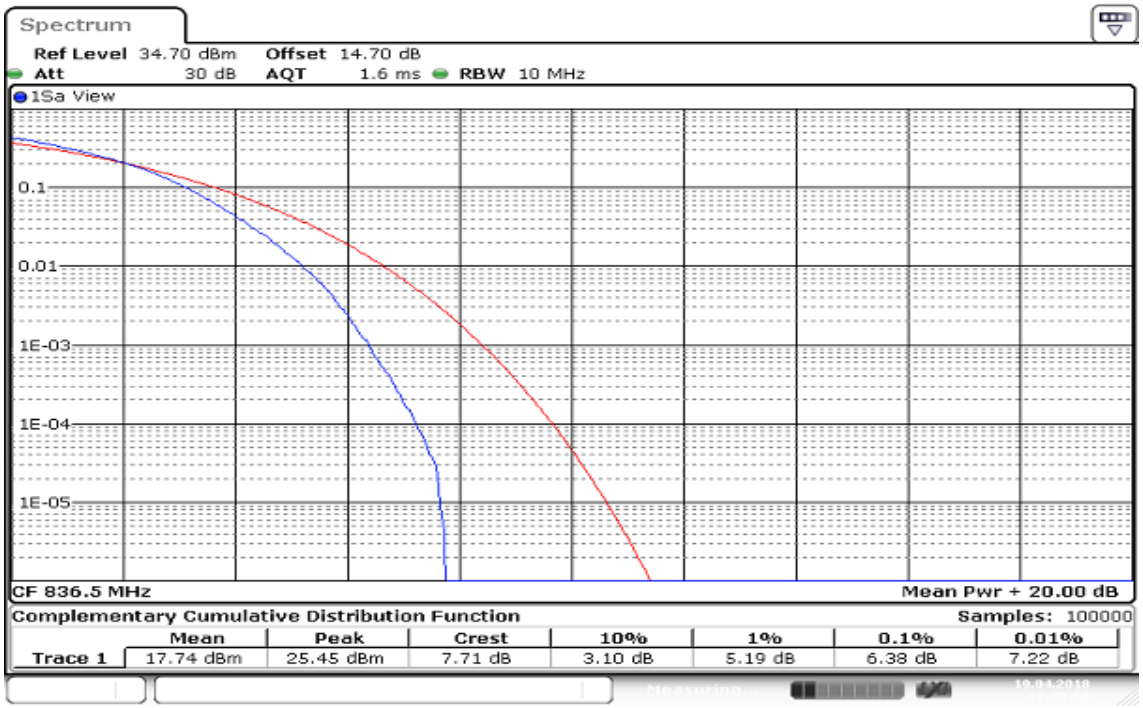
CHANNEL BANDWIDTH: 10MHz / QPSK / 100%RB
CH Mid



Date: 19.APR.2018 17:33:04

CHANNEL BANDWIDTH: 10MHz / 16QAM / 100%RB
CH Mid



Date: 19.APR.2018 17:33:58

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8.6 BAND EDGE MEASUREMENT

Limit

For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed. For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any

emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission equal to –13dBm.In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Test Procedures

1. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
2. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter loss and cable loss are the worst loss 7.2 dB in the transmitted path track.
3. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 50kHz and VB of the spectrum is 200kHz.
4. Record the max trace plot into the test report.

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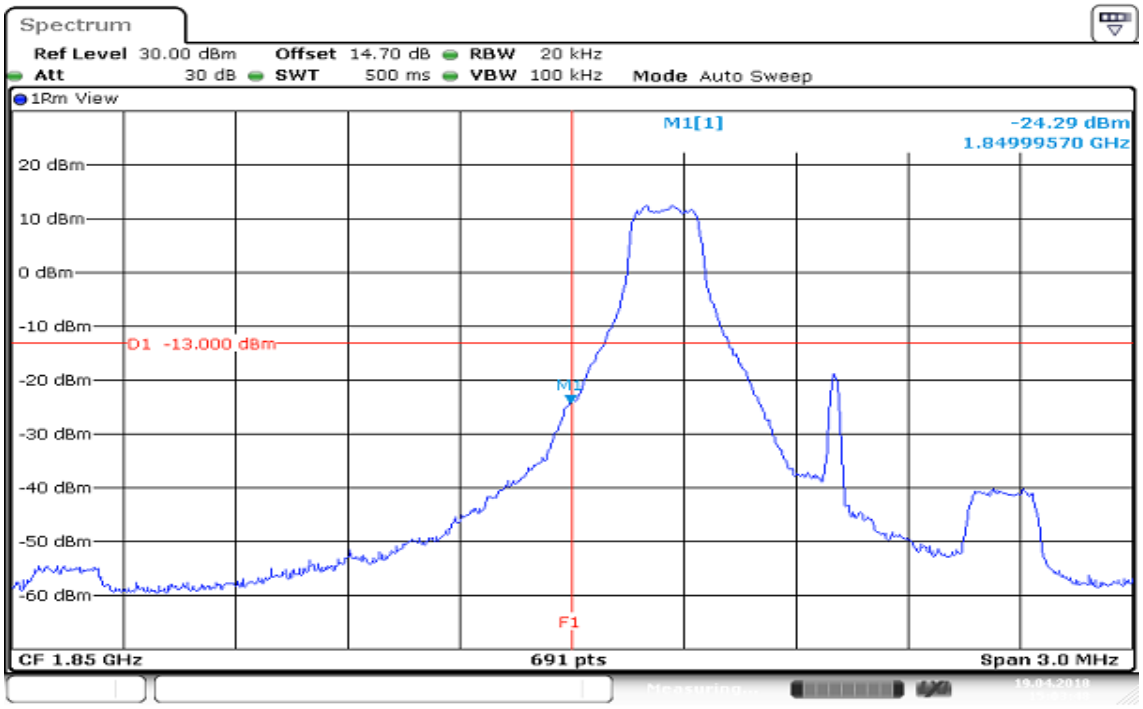
Test Results:

LTE Band 2

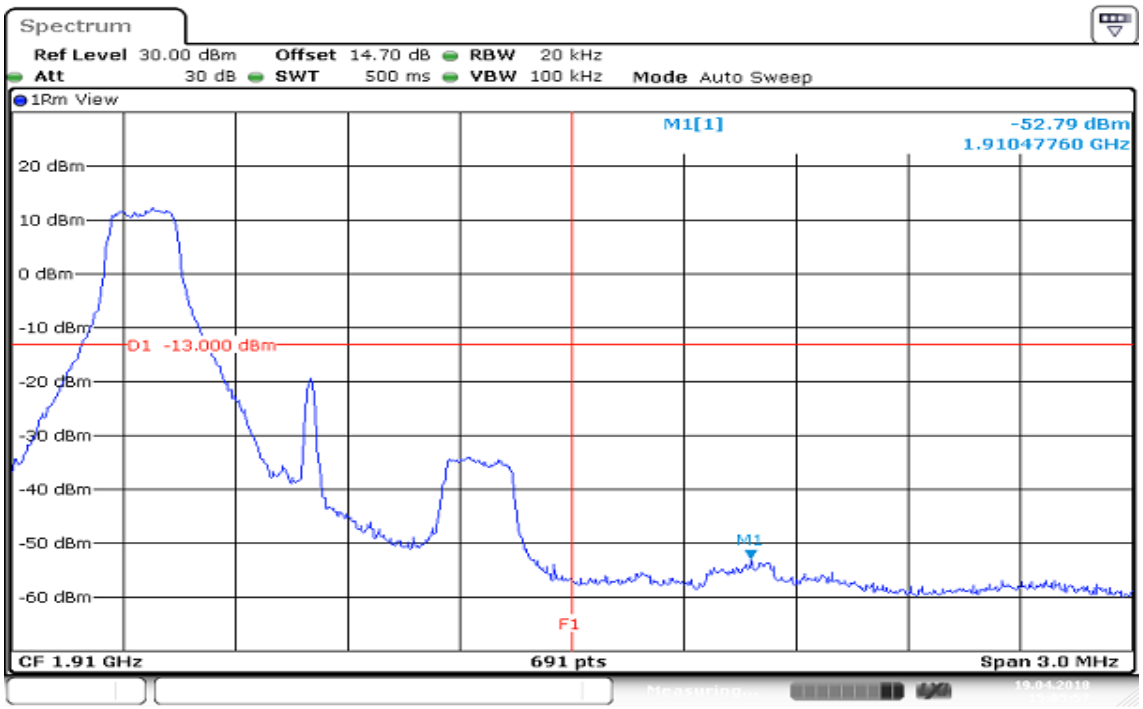
CHANNEL BANDWIDTH: 1.4MHz / QPSK / 1 RB ALLOCATED

LOWER BAND EDGE



Date: 19.APR.2018 15:03:49

HIGHER BAND EDGE



Date: 19.APR.2018 15:05:57

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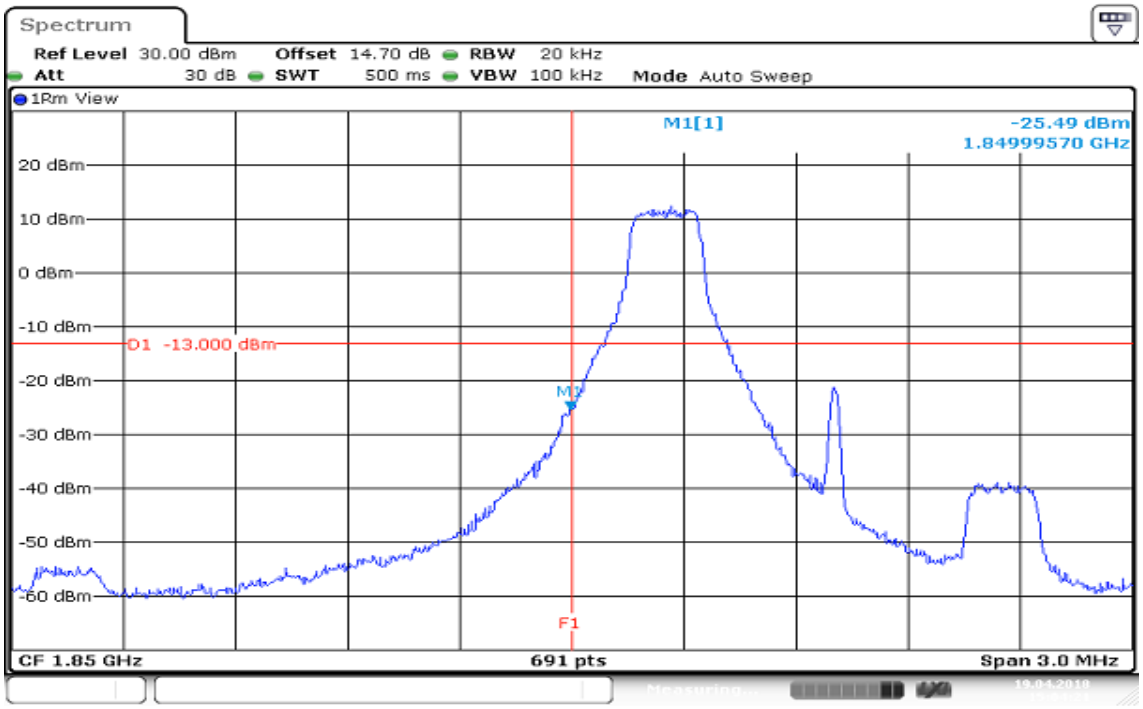
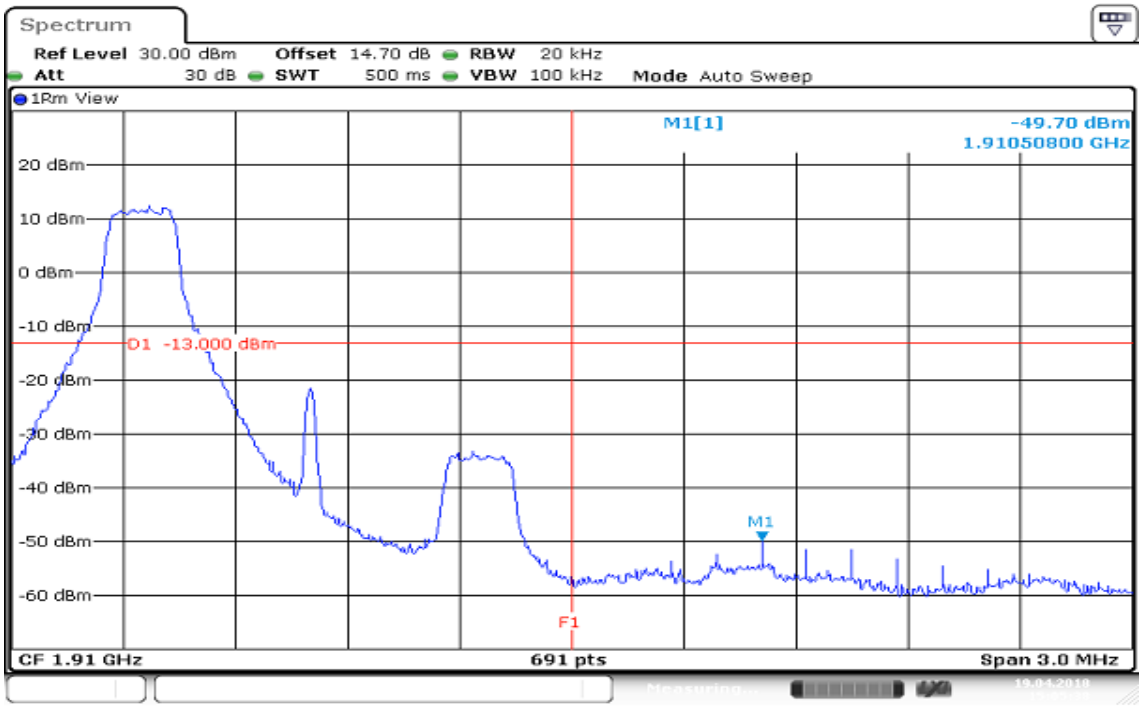
CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:04:21

HIGHER BAND EDGE



Date: 19.APR.2018 15:05:38

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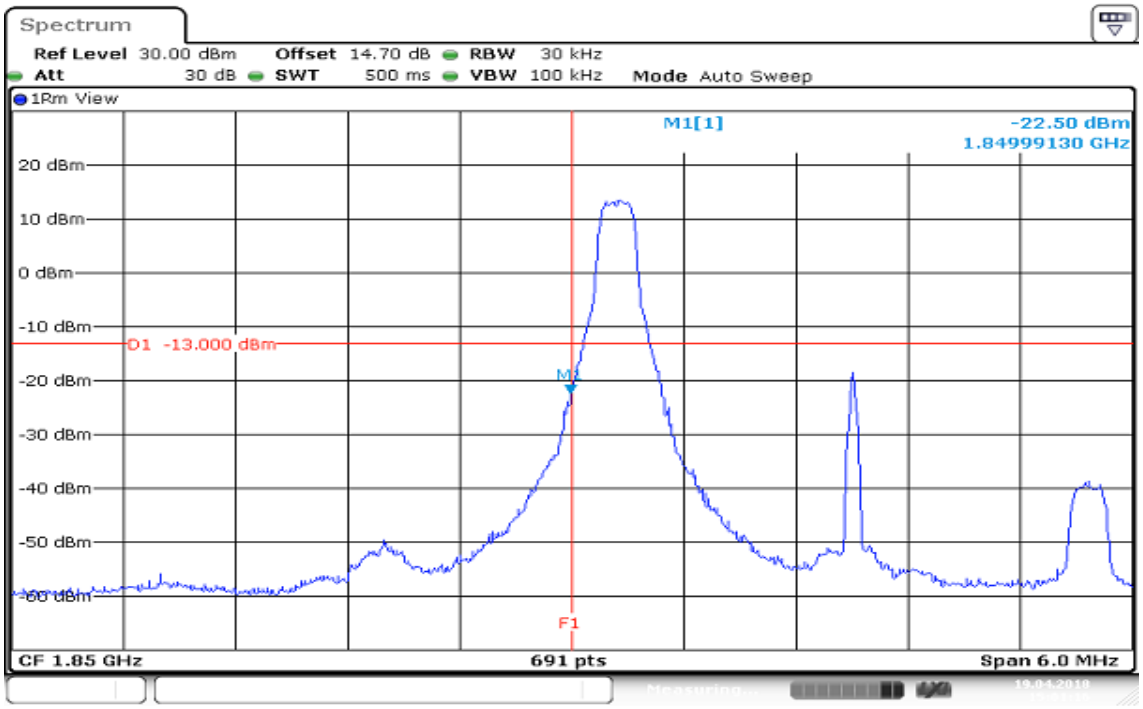
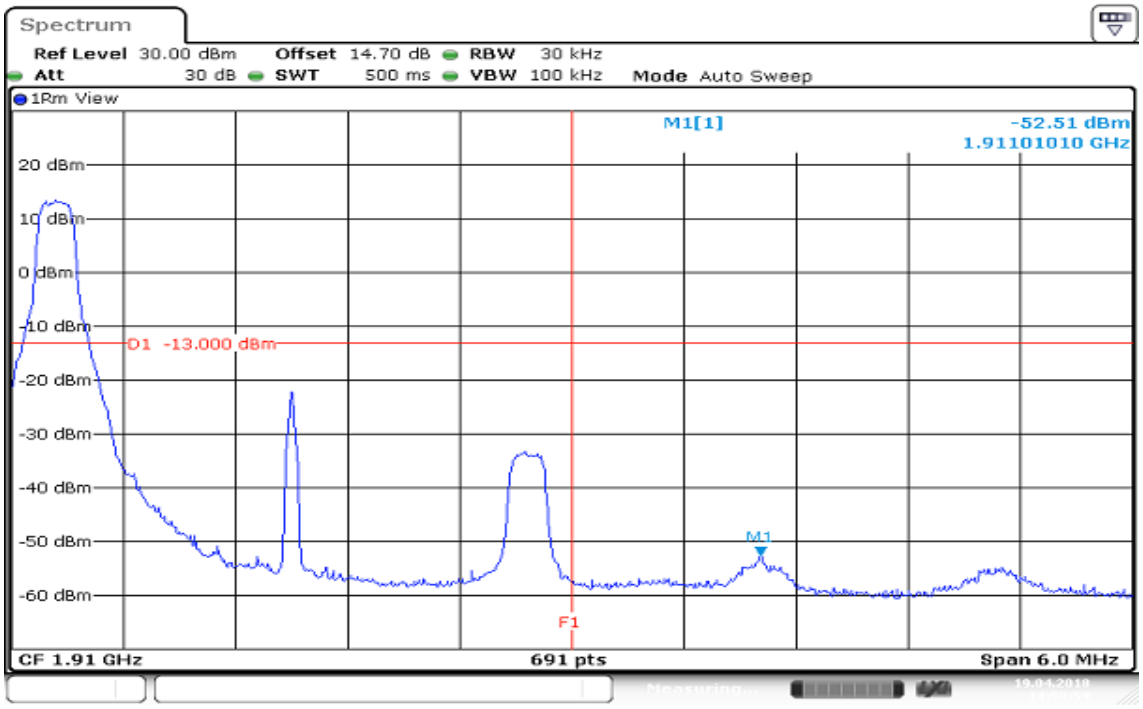
CHANNEL BANDWIDTH: 3MHz / QPSK / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:01:17

HIGHER BAND EDGE



Date: 19.APR.2018 14:59:00

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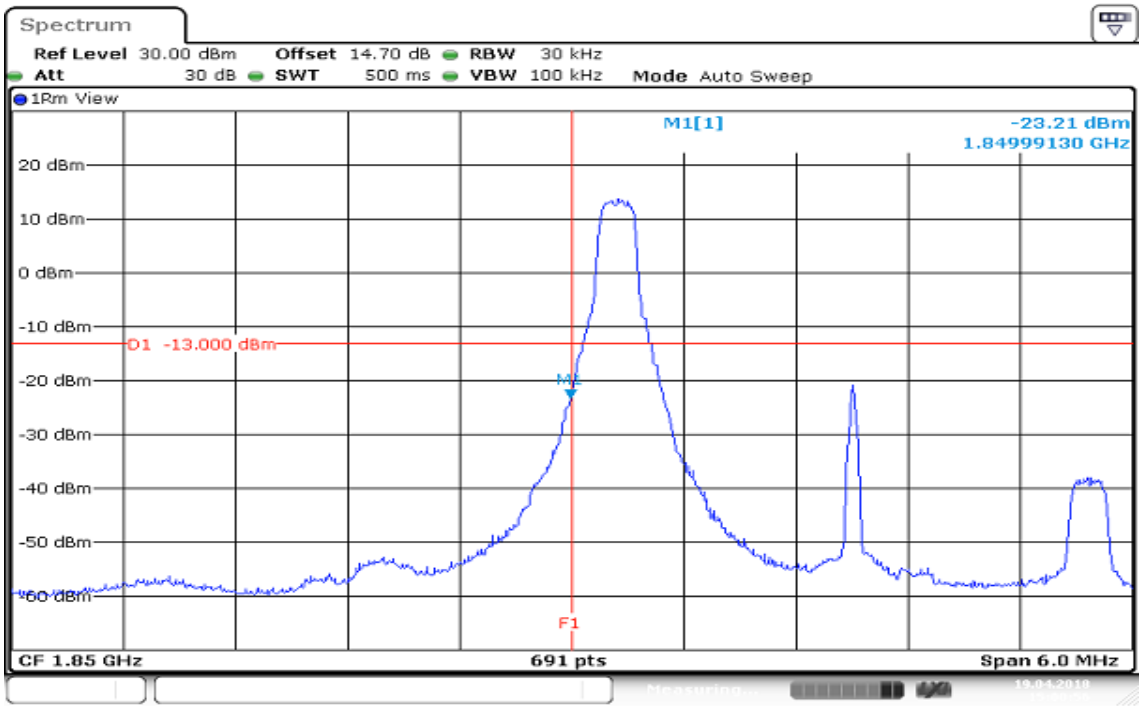
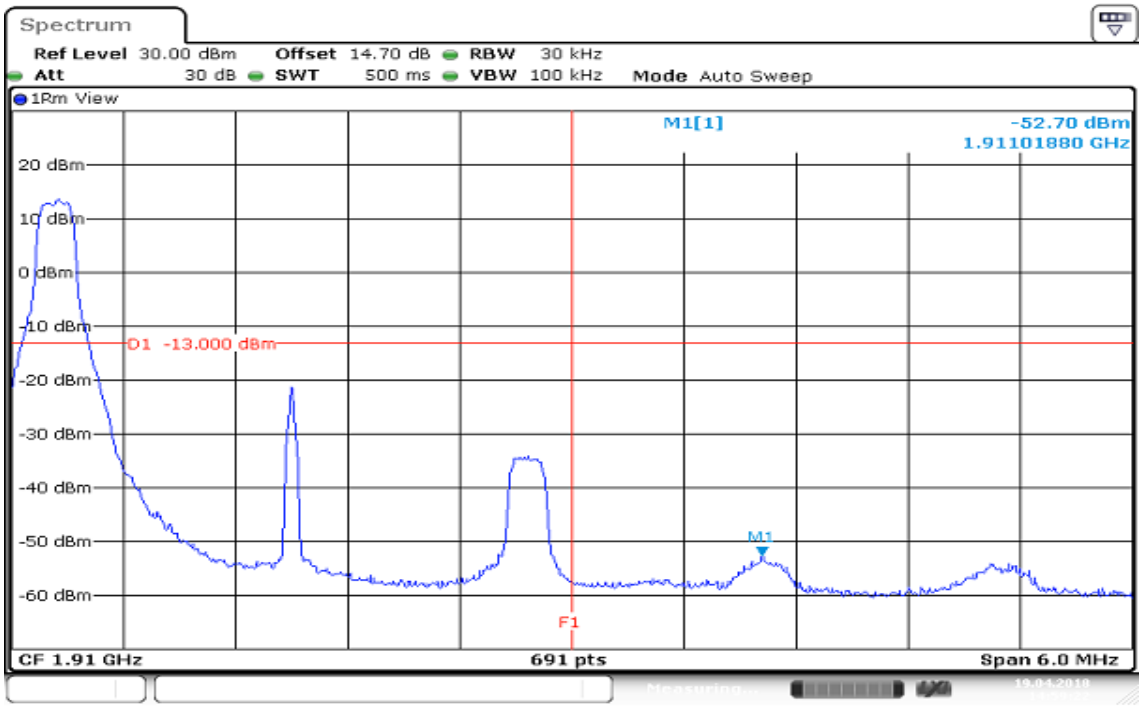
CHANNEL BANDWIDTH: 3MHz / 16QAM / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:00:57

HIGHER BAND EDGE



Date: 19.APR.2018 14:59:22

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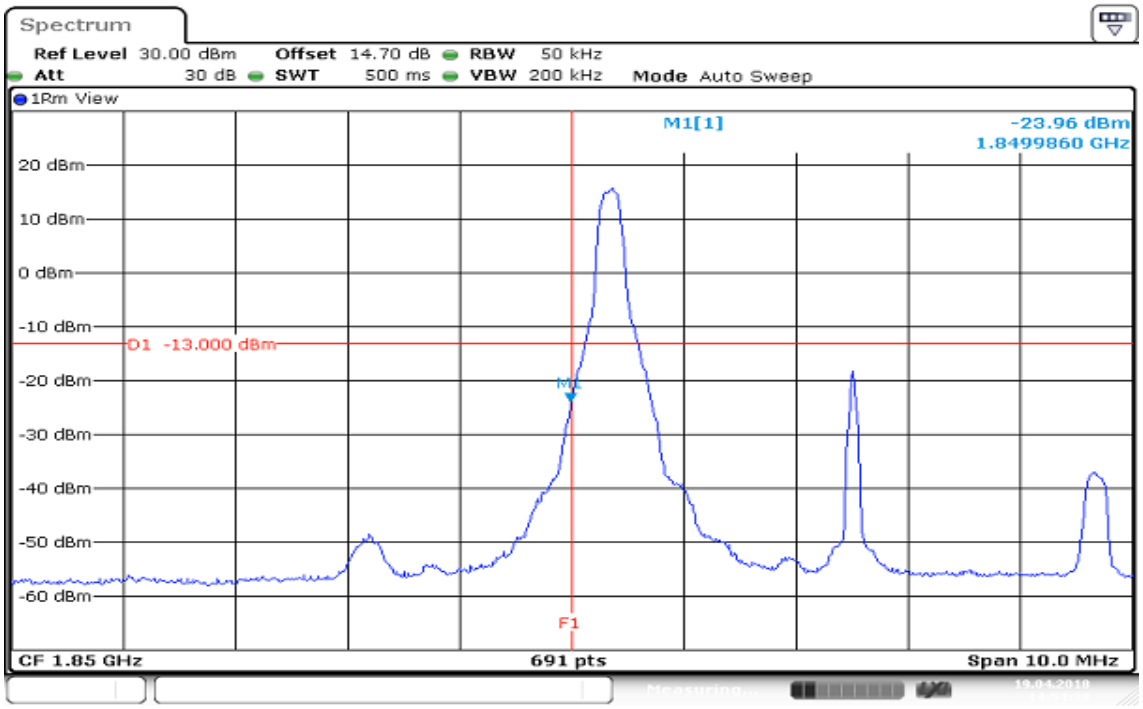
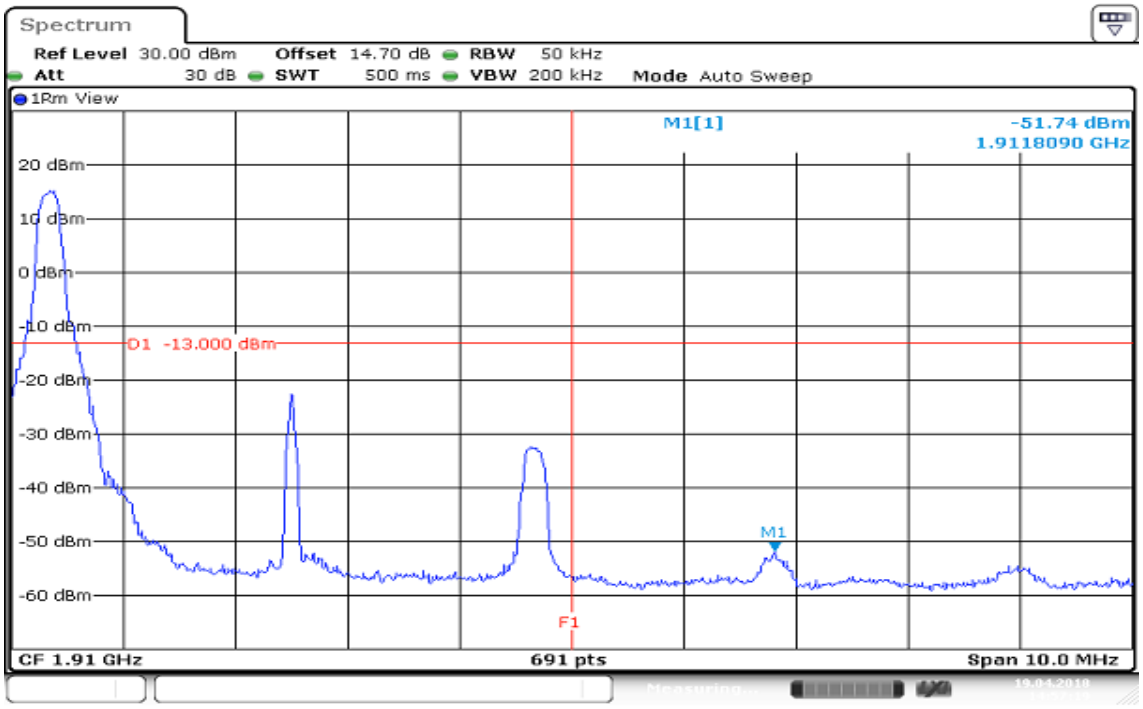
CHANNEL BANDWIDTH: 5MHz / QPSK / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:54:38

HIGHER BAND EDGE



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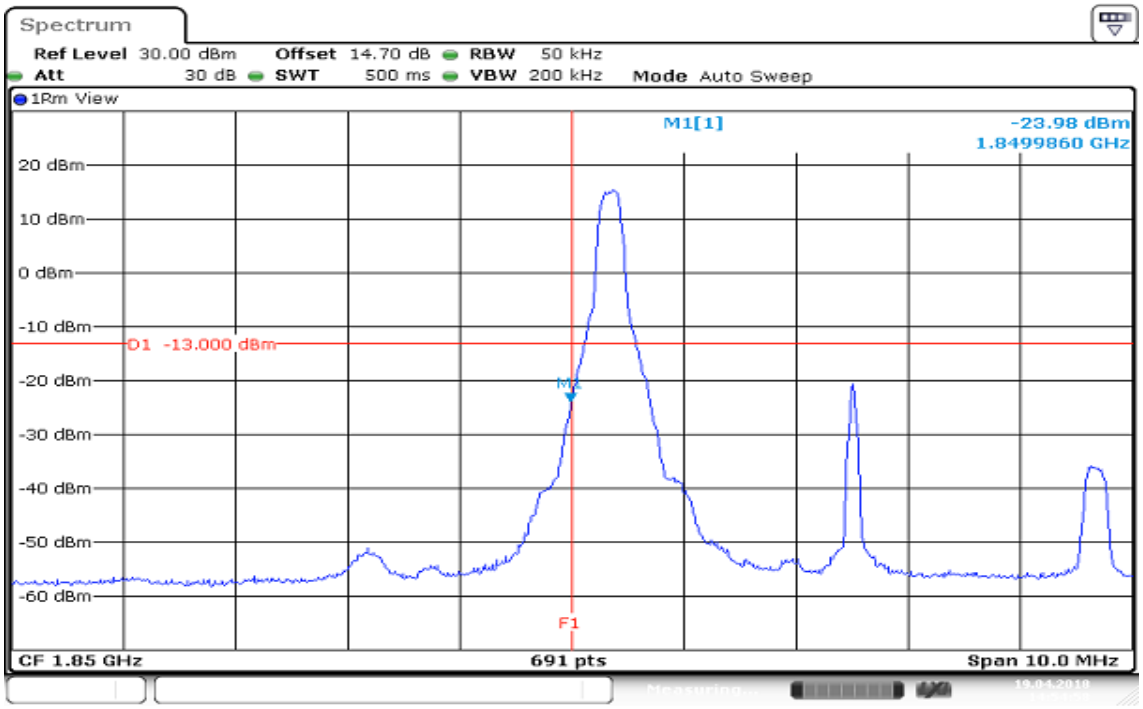
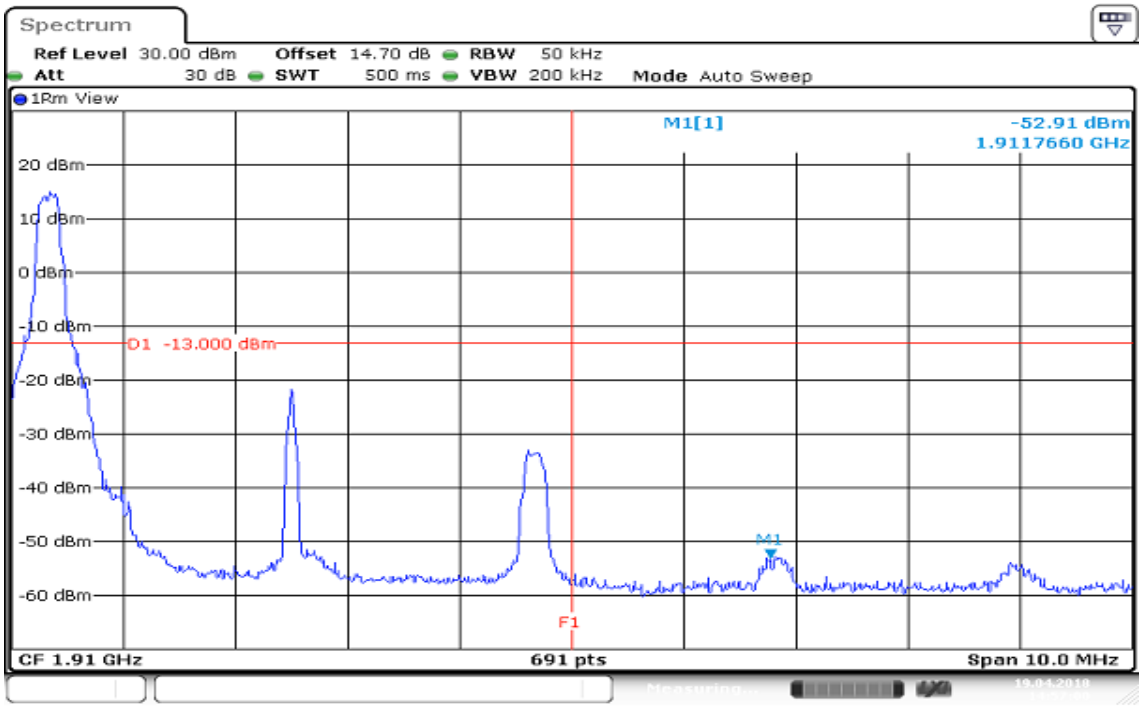
CHANNEL BANDWIDTH: 5MHz / 16QAM / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:54:59

HIGHER BAND EDGE



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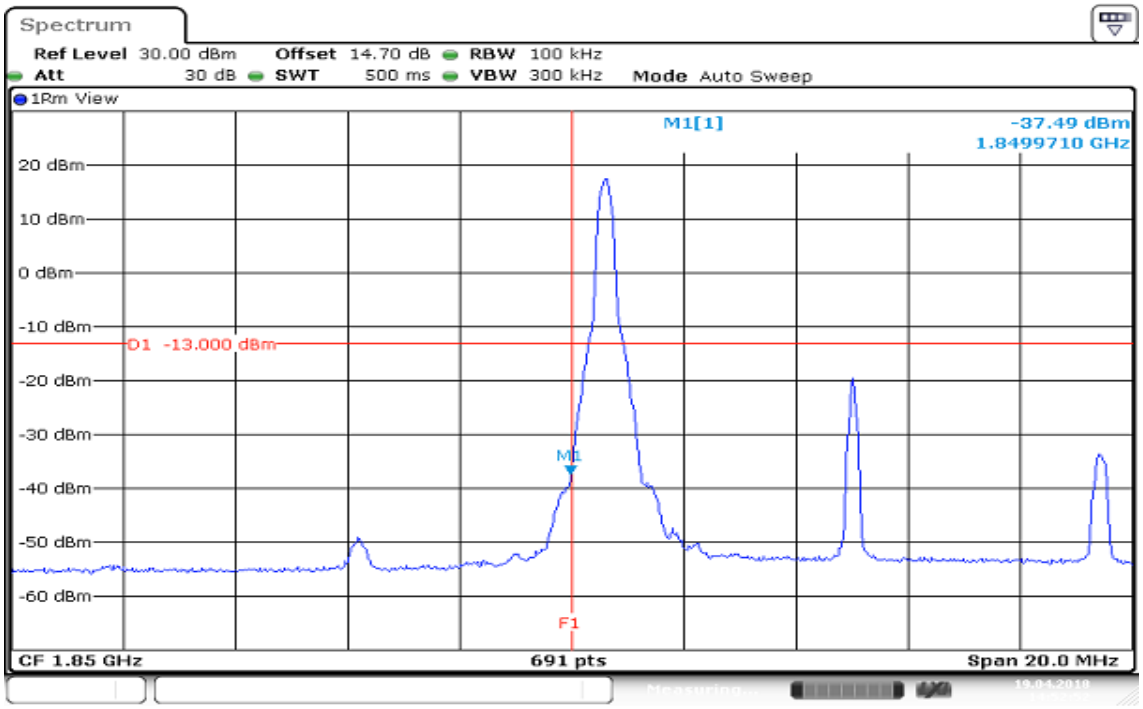
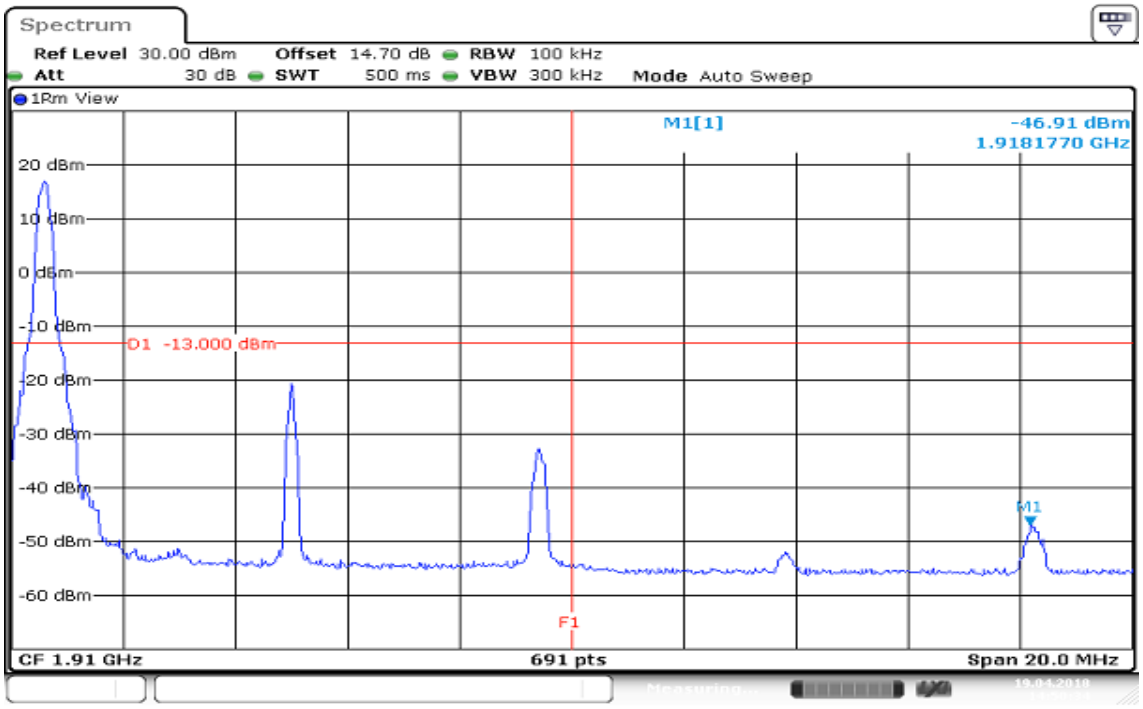
CHANNEL BANDWIDTH: 10MHz / QPSK / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:52:53

HIGHER BAND EDGE



Date: 19.APR.2018 14:50:35

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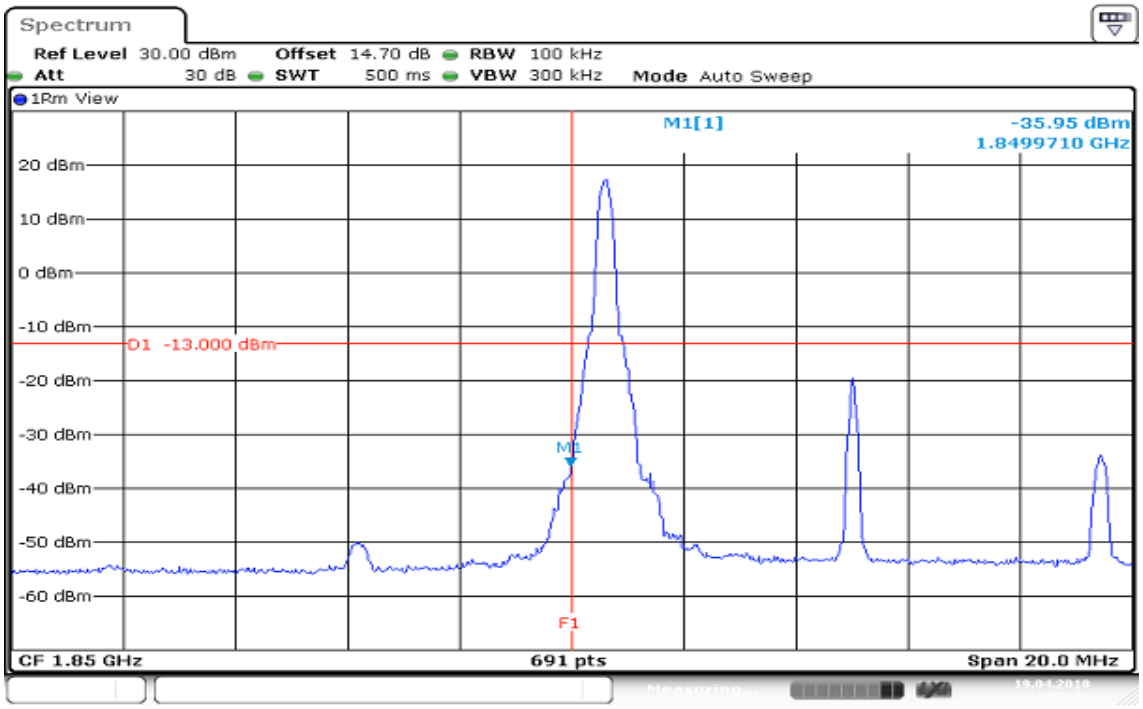
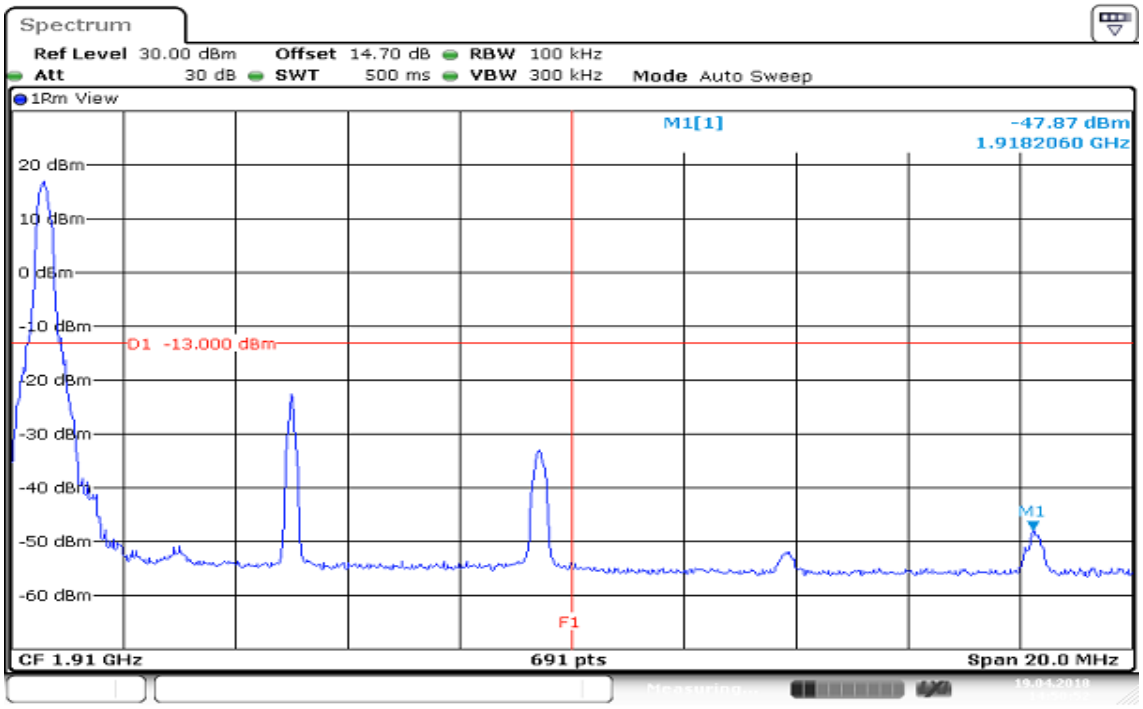
CHANNEL BANDWIDTH: 10MHz / 16QAM / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:52:34

HIGHER BAND EDGE



Date: 19.APR.2018 14:50:52

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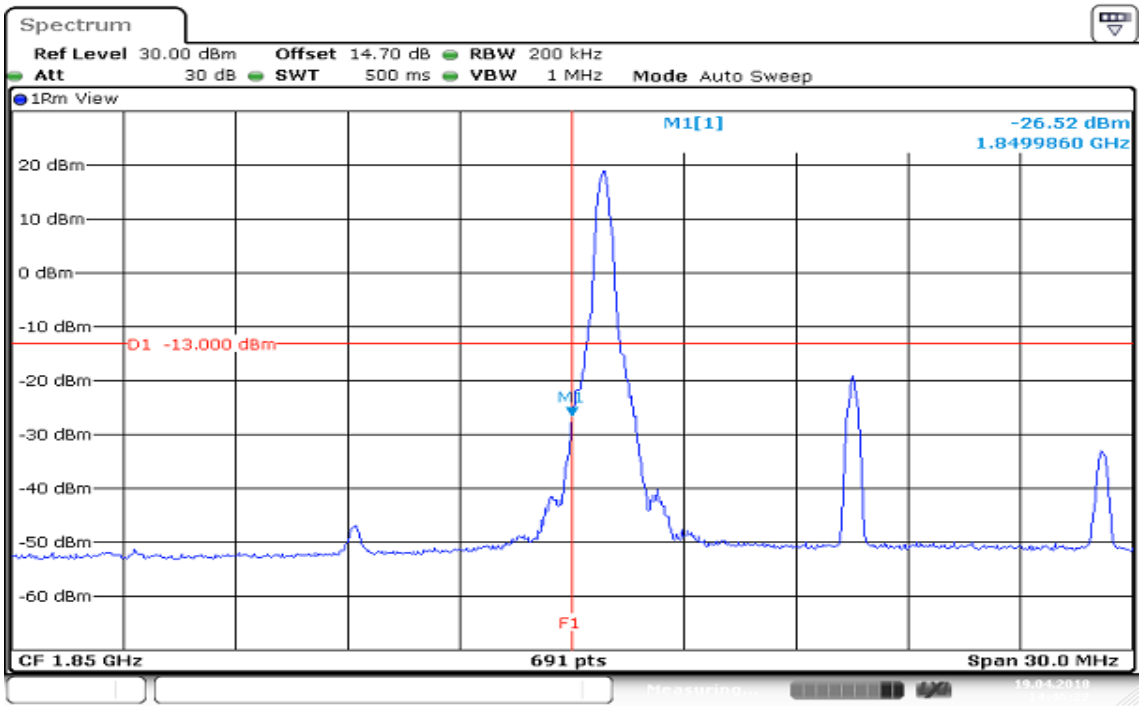
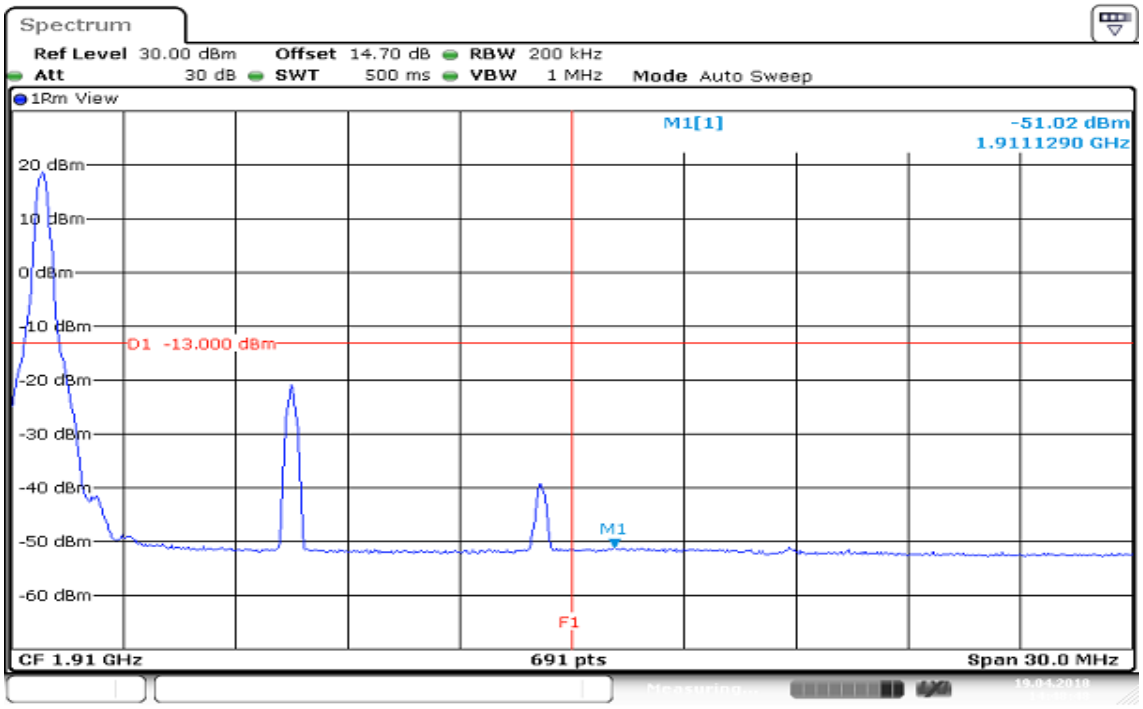
CHANNEL BANDWIDTH: 15MHz / QPSK / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:46:23

HIGHER BAND EDGE



Date: 19.APR.2018 14:48:48

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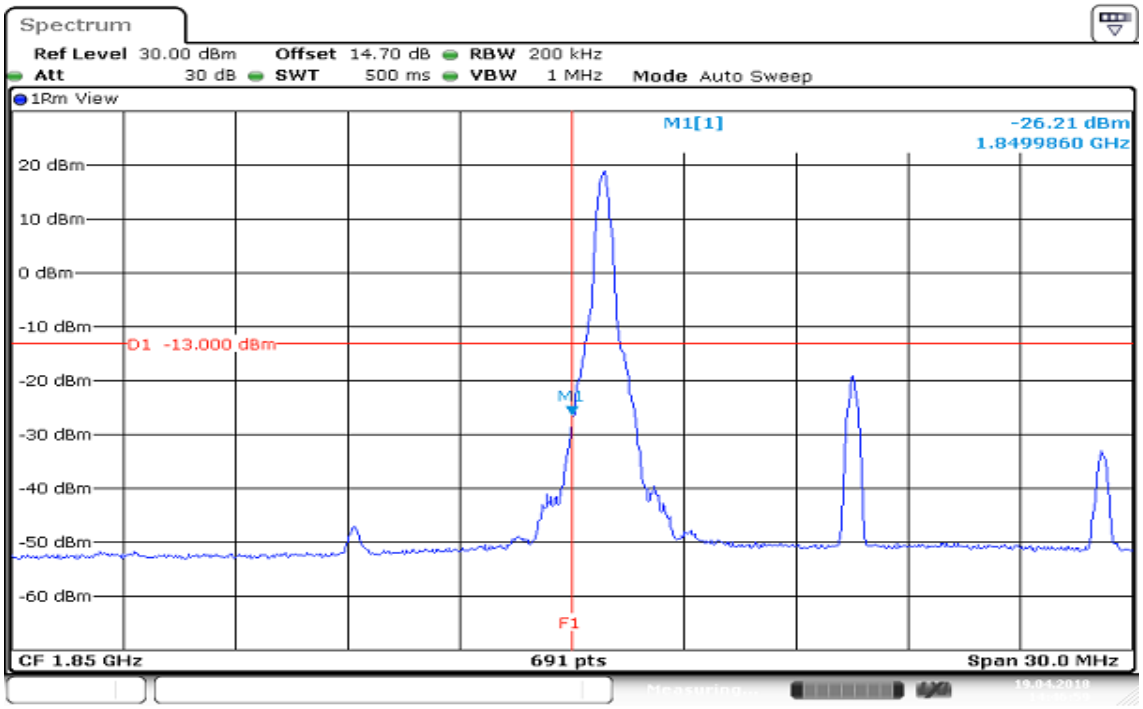
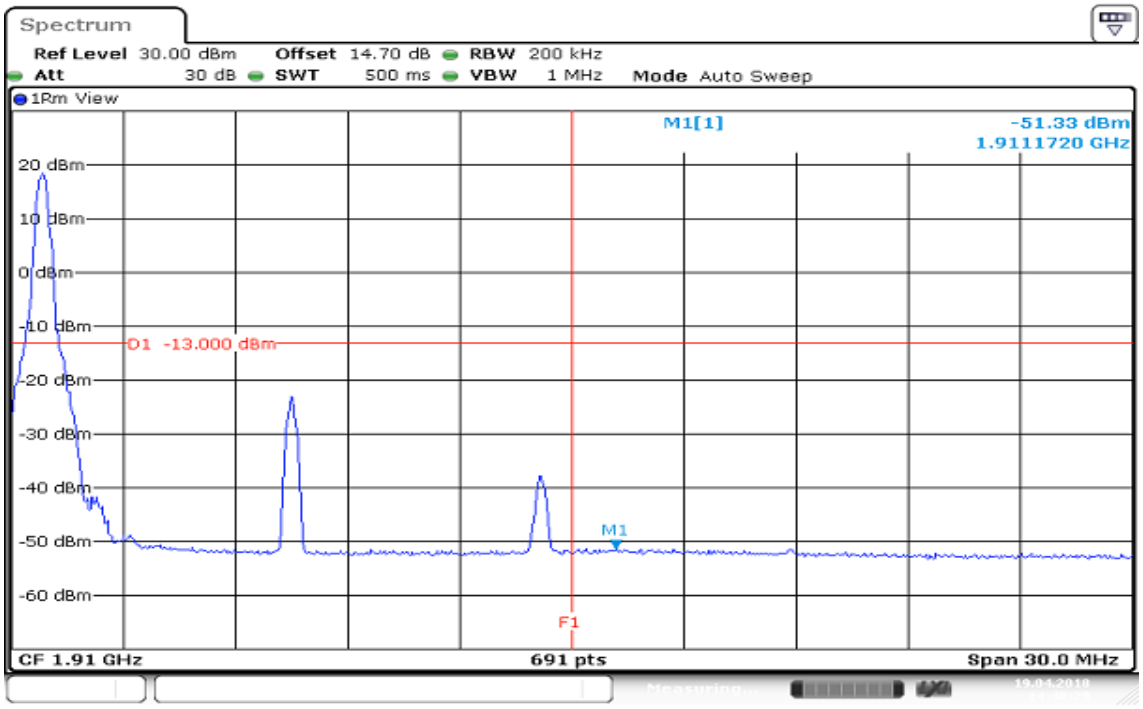
CHANNEL BANDWIDTH: 15MHz / 16QAM / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:46:58

HIGHER BAND EDGE



Date: 19.APR.2018 14:48:20

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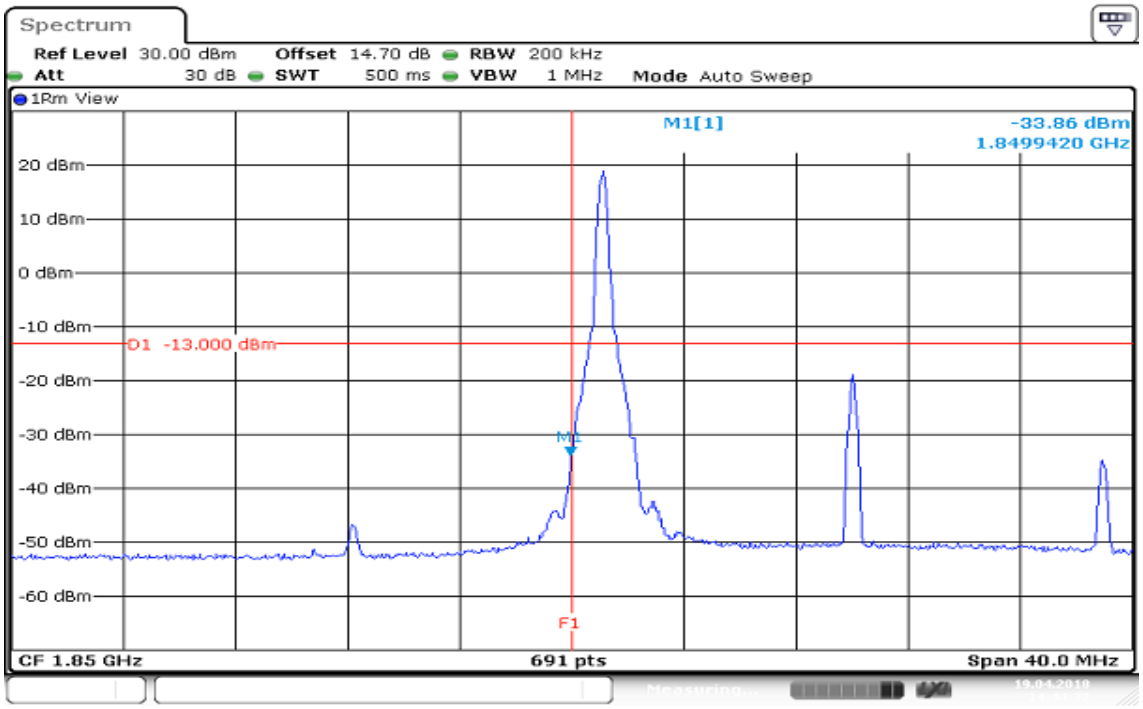
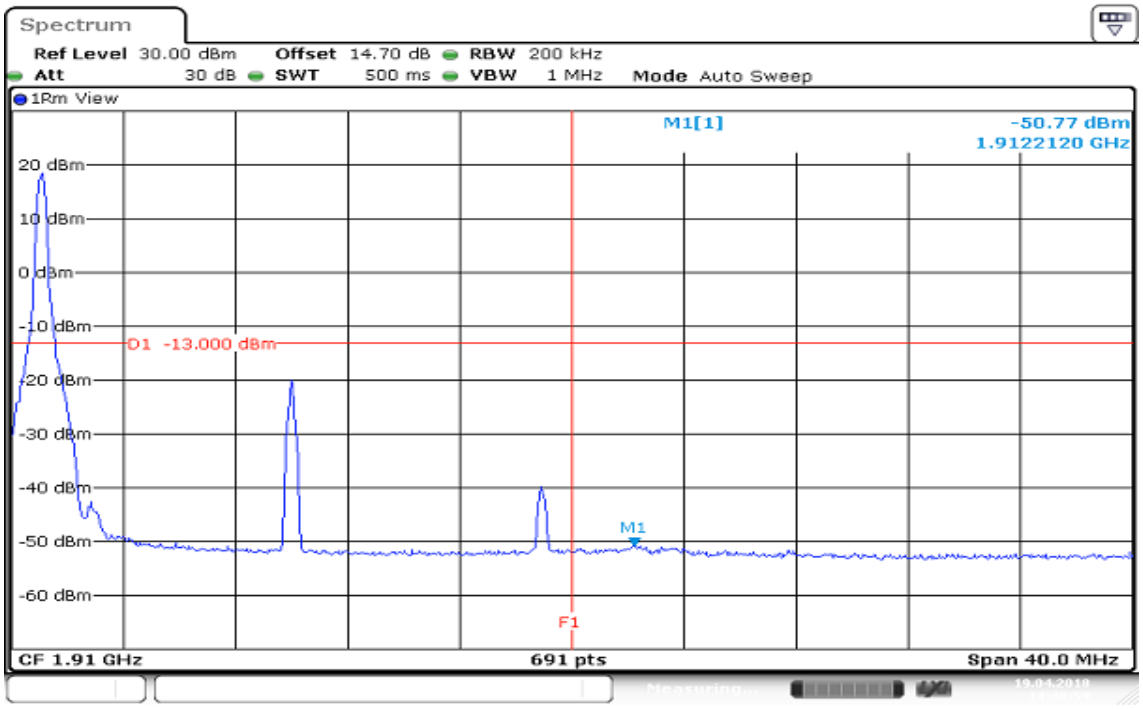
CHANNEL BANDWIDTH: 20MHz / QPSK / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:44:33

HIGHER BAND EDGE



Date: 19.APR.2018 14:40:58

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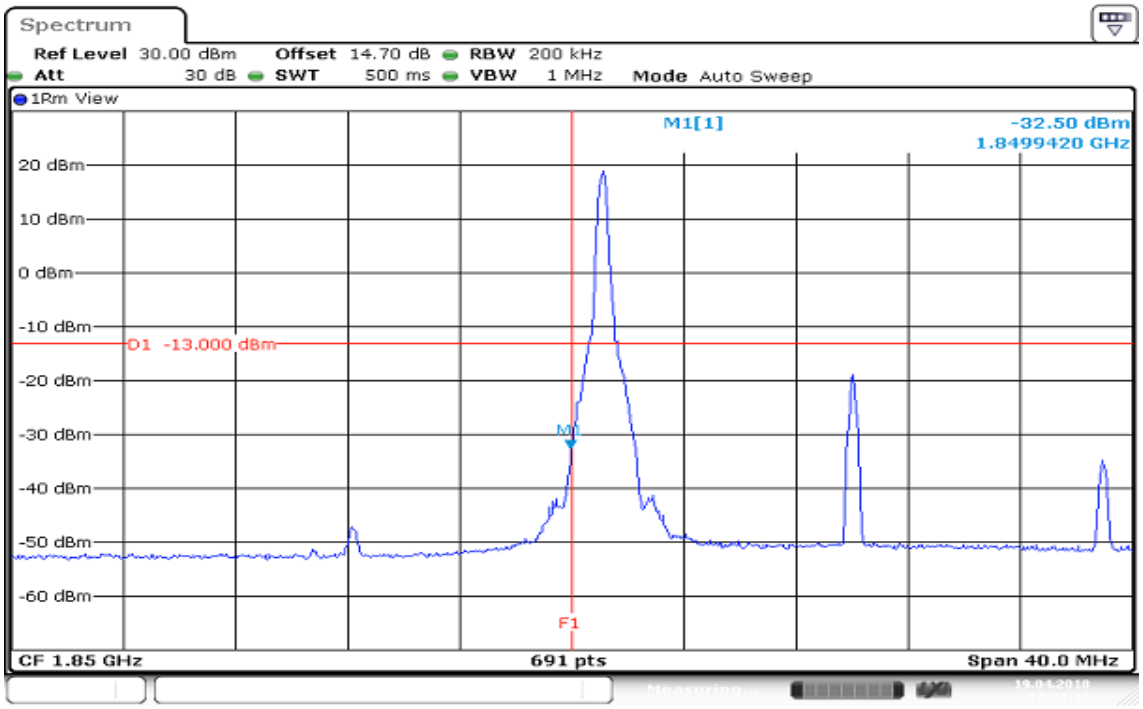
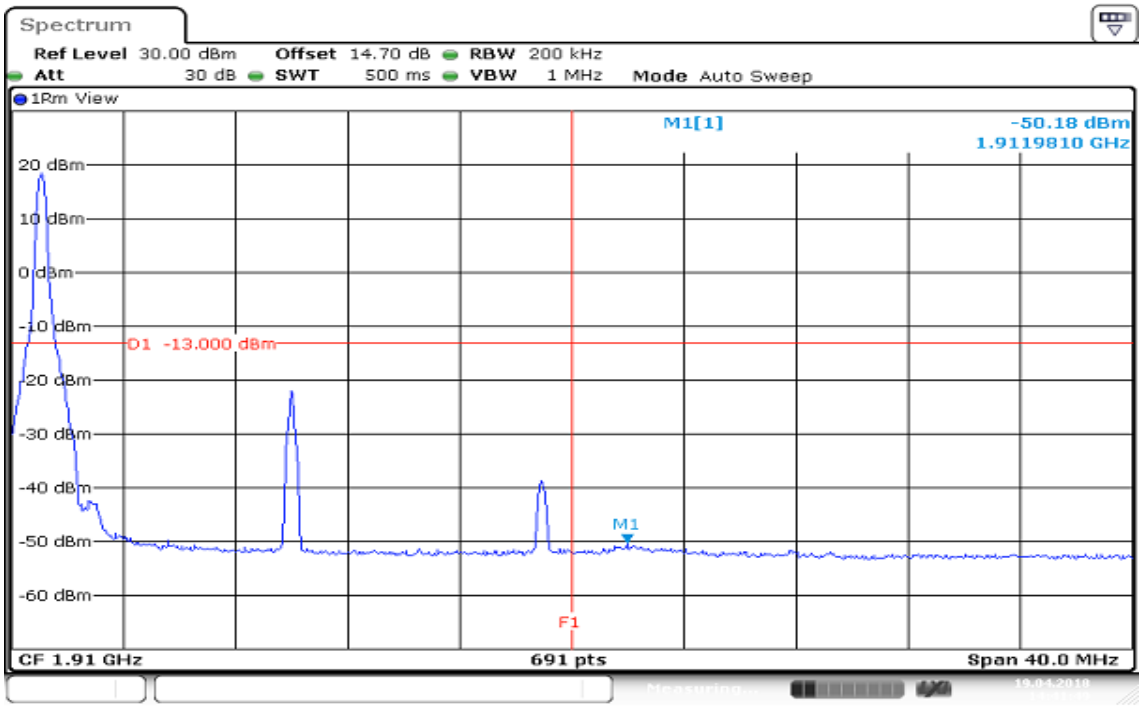
CHANNEL BANDWIDTH: 20MHz / 16QAM / 1 RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 14:44:11

HIGHER BAND EDGE



Date: 19.APR.2018 14:41:50

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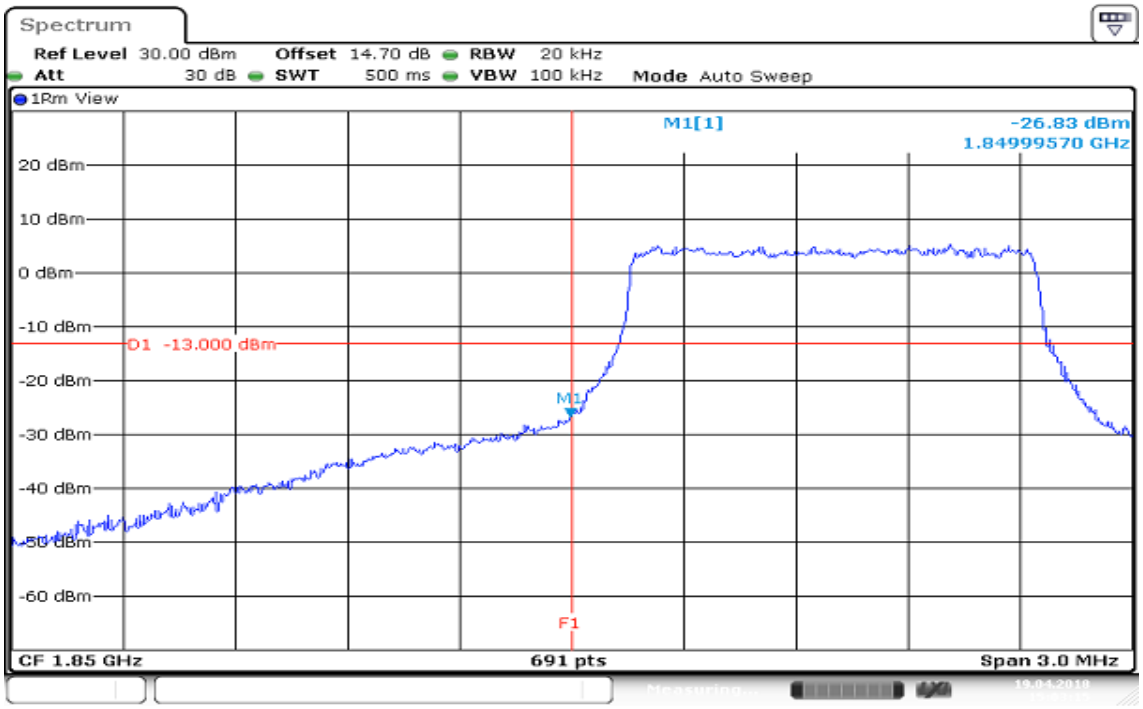
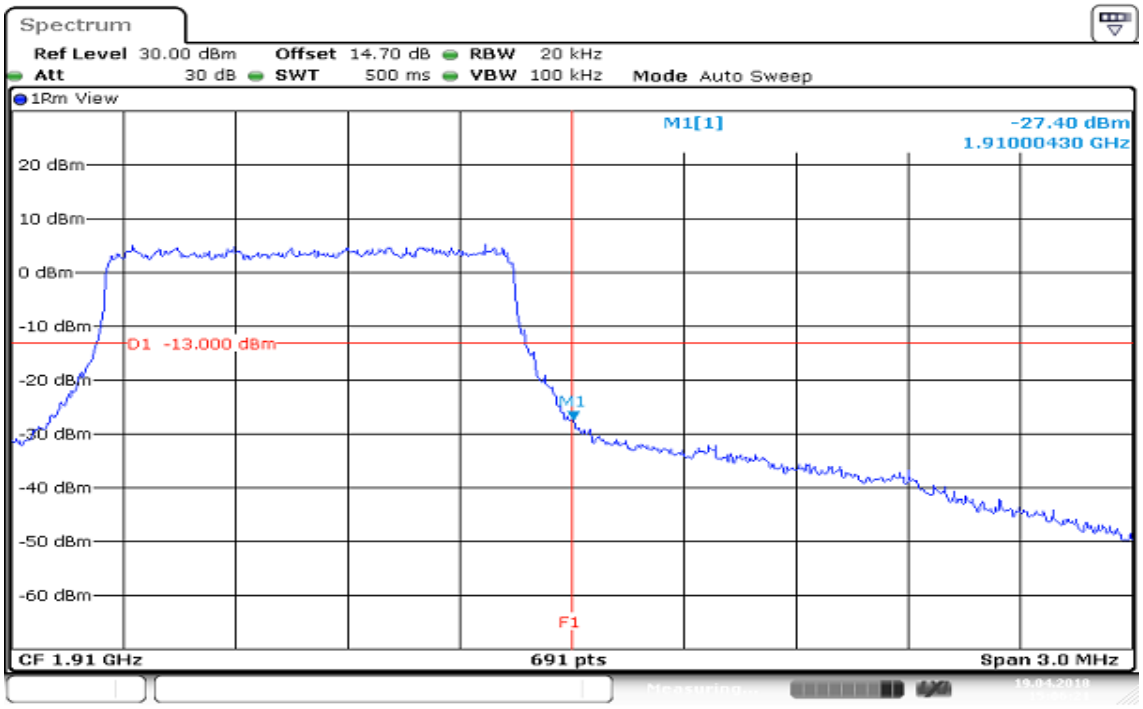
CHANNEL BANDWIDTH: 1.4MHz / QPSK / 100% RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:03:16

HIGHER BAND EDGE



Date: 19.APR.2018 15:06:21

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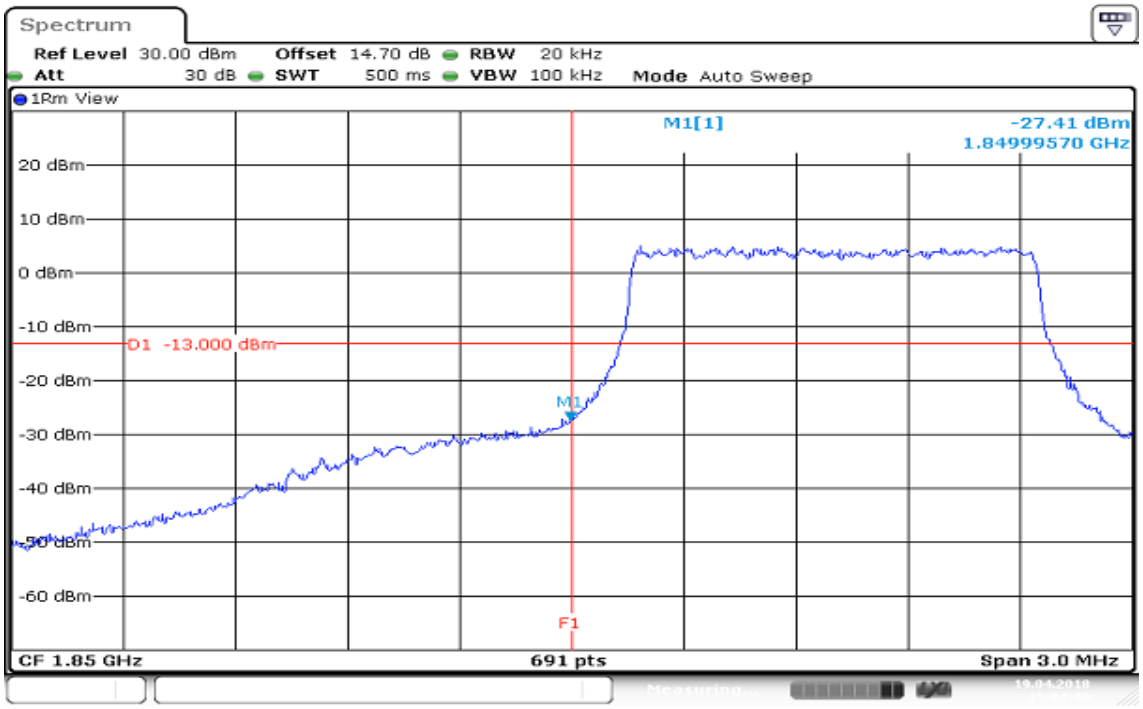
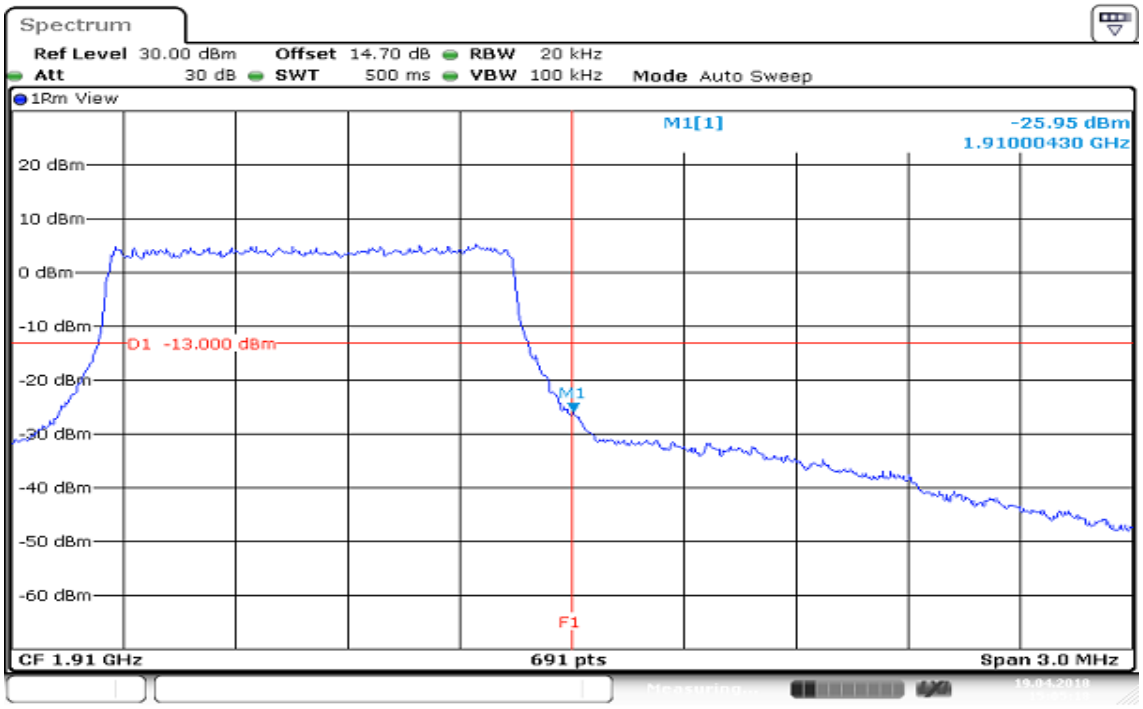
CHANNEL BANDWIDTH: 1.4MHz / 16QAM / 100% RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:04:41

HIGHER BAND EDGE



Date: 19.APR.2018 15:05:18

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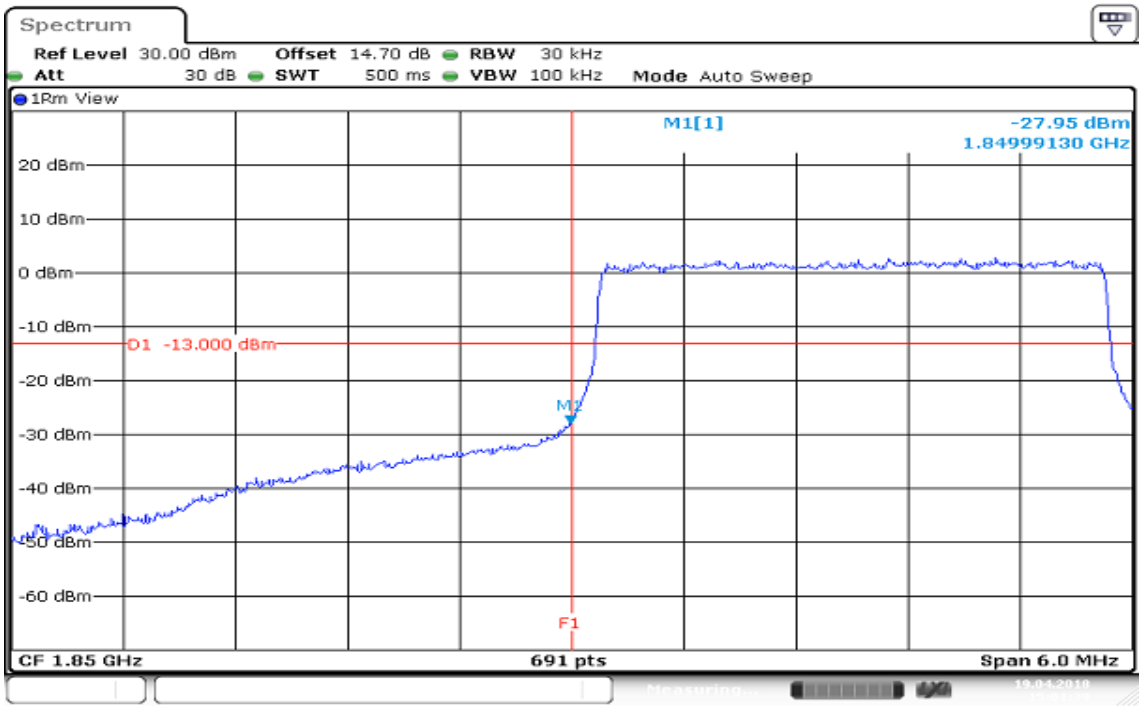
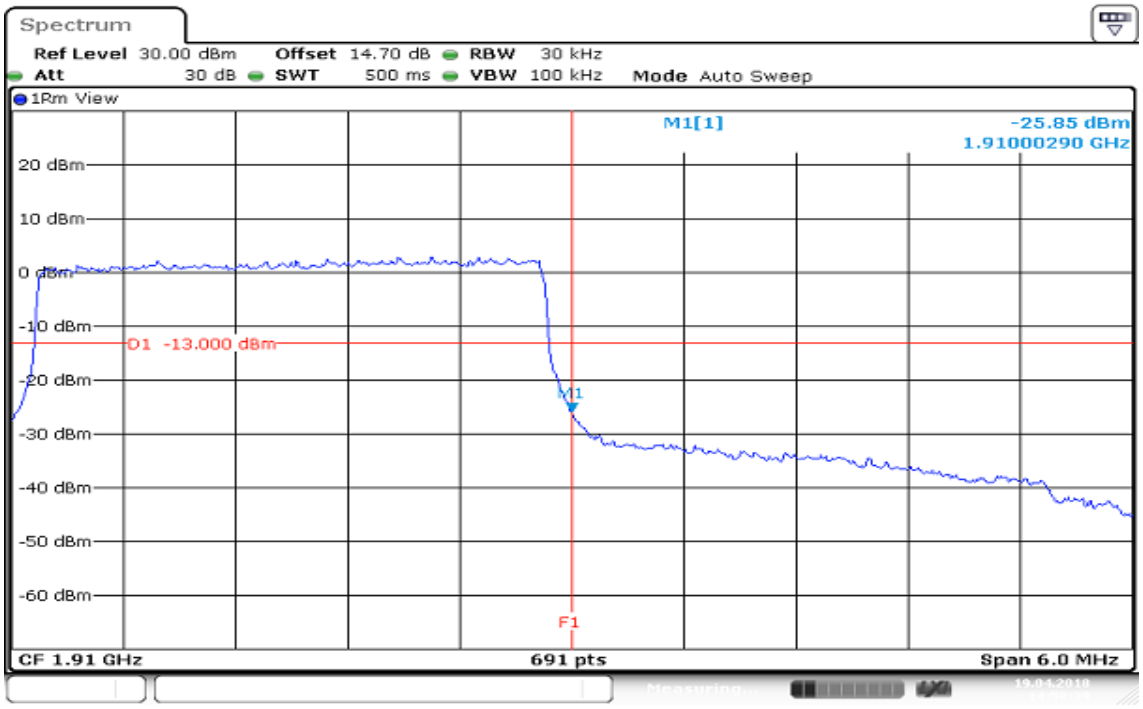
CHANNEL BANDWIDTH: 3MHz / QPSK / 100% RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:01:39

HIGHER BAND EDGE



Date: 19.APR.2018 14:58:40

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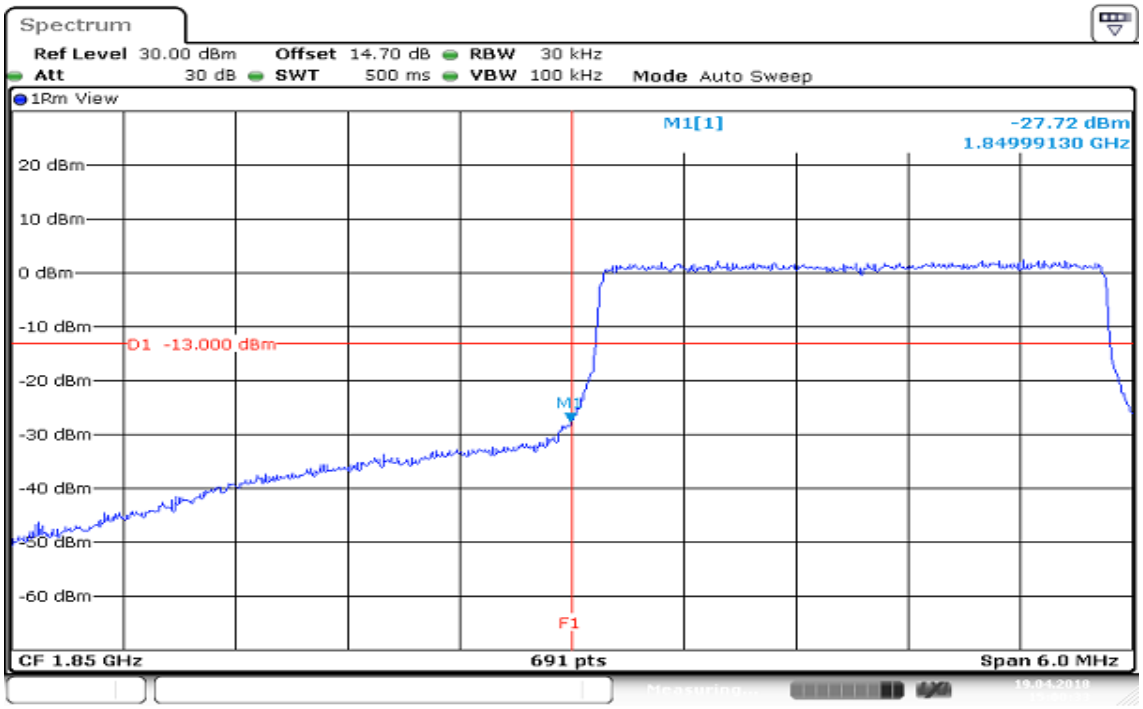
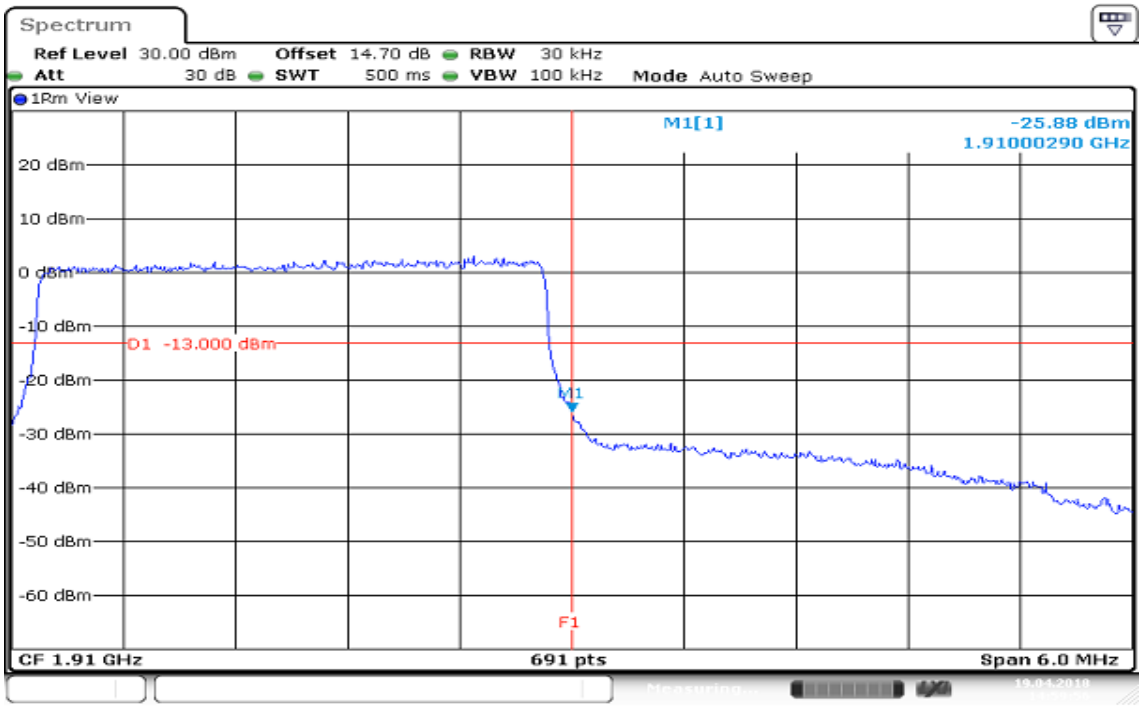
CHANNEL BANDWIDTH: 3MHz / 16QAM / 100% RB ALLOCATED
LOWER BAND EDGE



Date: 19.APR.2018 15:00:33

HIGHER BAND EDGE



Date: 19.APR.2018 14:59:56

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