TEST REPORT

KCTL KCTL Inc.
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Suwon-si, Gyeonggi-do, 16677, Korea
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KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2021-03-11

2. Use of Report : Certification

3. Name of Product / Model : Mobile phone / SM-A125F/DS

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / ietnam, India

5. FCC ID : A3LSMA125

6. Date of Test : 2021-03-15 to 2021-03-19

7. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: Address of testing location)

8. Test method used : FCC Part 2
FCC Part 22 subpart H
FCC Part 27 subpart C

9. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Taeyoung Kim (Signature)	Technical Manager Name : Seungyong Kim (Signature)

2021-03-23

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2021-03-23	Originally issued	-

General remarks for test reports

Nothing significant to report.

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory	:	SAMSUNG ELECTRONICS VIETNAM CO.,LTD.
Address	:	Yenphong1-I.P Yentrung Commune, Yenphong Dist., Bac Ninh Province, Vietnam
Factory	:	Samsung India Electronics PVT. Ltd
Address	:	B-1, Sector-81, Phase-Ⅱ NOIDA U.P. India
Factory	:	Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address	:	Yen Binh Industrial Zone, Pho Ten Dist., Thai Nguyen Province, Vietnam
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 Industry Canada Registration No. : 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Mobile Phone
Model	:	SM-A125F/DS
Derivative model	:	SM-A125F
Modulation technique	:	Bluetooth(BDR/EDR)_ GFSK, π/4DQPSK, 8DPSK Bluetooth(BLE)_GFSK WIFI(802.11b/g/n)_DSSS, OFDM LTE_QPSK, 16QAM, 64QAM WCDMA_QPSK GSM_GMSK, 8-PSK
Number of channels	:	Bluetooth(BDR/EDR)_79 ch / Bluetooth(BLE)_40 ch 802.11b/g/n_HT20 : 13 ch
Power source	:	DC 3.85 V
Antenna specification	:	LTE/WCDMA_LDS Antenna WIFI/Bluetooth(BDR/EDR/BLE)_LDS Antenna

Antenna gain	:	WIFI/Bluetooth(BDR/EDR/BLE): -4.40 dBi
Frequency range	:	Bluetooth(BDR/EDR/BLE)_2 402 ㎒ ~ 2 480 ㎒
		802.11b/g/n_HT20_2 412 ㎒ ~ 2 472 ㎒
		LTE Band 5_824.7 ㎒ ~ 848.3 ㎒
		LTE Band 41_2 498.5 ㎒ ~ 2 687.5 ㎒
		GSM 850_824.2 ㎒ ~ 848.8 ㎒
		GSM 1900_1 850.2 ㎒ ~ 1 909.8 ㎒
		WCDMA 850_826.4 ㎒ ~ 846.6 ㎒
Software version	:	A125F.001
Hardware version	:	REV1.0
Test device serial No.	:	Conducted(R38N9019J8N)
		Radiated(R38N9019G5T, R38N9012ZVR)
Operation temperature	:	-30 ℃ ~ 50 ℃

Note. The Product equality letter includes detailed information about the differences between basic and derivative model.

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID
Travel Adapter	SOLU-M	EP-TA200	R37M12L1AC1 HM3	Input : 100-240V, 50-60Hz (0.5A) Output : 9.0V, 1.67A or 5.0V, 2.0A	-
Data Cable	RFTECH	EP-DT725BBE	-	-	-

2.2. Frequency/channel operations

This device contains the following capabilities:
WiFi (802.11b/g/n), Bluetooth (BDR/EDR/BLE),
LTE Band 5, LTE Band 41, GSM 850, GSM 1900, WCDMA 850

LTE Band 5

Ch.	Frequency (㎒)
20407	824.7
20525	836.5
20643	848.3

Table 2.2.1. 1.4M BW

Ch.	Frequency (㎒)
20415	825.5
20525	836.5
20635	847.5

Table 2.2.2. 3M BW

Ch.	Frequency (㎒)
20425	826.5
20525	836.5
20625	846.5

Table 2.2.3. 5M BW

Ch.	Frequency (㎒)
20450	829.0
20525	836.5
20600	844.0

Table 2.2.4. 10M BW

LTE Band 41

Ch.	Frequency (㎒)
39675	2 498.5
40620	2 593.0
41565	2 687.5

Table 2.2.5. 5M BW

Ch.	Frequency (㎒)
39700	2 501.0
40620	2 593.0
41540	2 685.0

Table 2.2.6. 10M BW

Ch.	Frequency (㎒)
39725	2 503.5
40620	2 593.0
41515	2 682.5

Table 2.2.7. 15M BW

Ch.	Frequency (㎒)
39750	2 506.0
40620	2 593.0
41490	2 680.0

Table 2.2.7. 20M BW

3. Introduction

This report referenced from the FCC ID : A3LSMA125M PCE WWAN (FCC CFR 47 Part 22, 24, 27). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

3.1 Difference

The FCC ID: A3LSMA125 shares the same enclosure and circuit board as FCC ID: A3LSMA125M. The WIFI/BT/BLE/GSM/WCDMA/LTE antenna and surrounding circuitry and layout are identical between these two units.
As for all bands, they have been verified and the parent model test results under FCC ID : A3LSMA125M shall remain representative of FCC ID : A3LSMA125.

Note. The Product equality letter includes detailed information about the differences between FCC ID: A3LSMA125M and FCC ID: A3LSMA125.

3.2 Spot check verification data (Band-edge & Spurious emission)

Test band	Test item	Test mode	Channel	Measured frequency (㎒)	SM-A125M /DS	SM-A125F /DS	Deviation (dB)	Remark
LTE Bnad 5	ERP	QPSK_10M	20450	829.00	21.92	19.08	2.84	-
	RSE	QPSK_10M	20525	2 496.36	-40.00	-46.92	6.92	3rd Harmonic
LTE Bnad 41	EIRP	QPSK_5M	39675	2 498.50	25.56	21.94	3.62	-
	RSE	QPSK_5M	39675	4 992.85	-29.80	-45.50	15.70	2nd Harmonic

Notes:

1. For FCC ID: A3LSMA125 has been verified the performance as for PCE WWAN identical with the FCC ID: A3LSMA125M.
2. Comparison of two models, upper deviation is within 3 ㏈ range and all test results are under FCC technical limits.
3. The test procedure(s) in this report were performed in accordance as following.
   - KDB 484596 D01 v01

3.3 Reference Detail

Reference application that contains the reused reference data in the individual test reports.

Equipment Class	Reference FCC ID	Application Type	Reference Test report Number	Exhibit Type	Variant Test Report Number	Date Re-used
DTS	A3LSMA125M	Original	KR20-SRF0284-A (802.11b/g/n)	Test report	KR21-SRF0038	All
			KR20-SRF0283-A (Bluetooth LE)	Test report	KR21-SRF0037	All
DSS	A3LSMA125M	Original	KR20-SRF0282-A (Bluetooth)	Test report	KR21-SRF0036	All
PCE	A3LSMA125M	Original	KR20-SRF0285-A (2G, 3G)	Test report	KR21-SRF0040	Partial
			KR20-SRF0286-B (LTE)	Test report	KR21-SRF0039	Partial

For this application the data reuse is summarized below for each equipment class

Equipment Class	Reference FCC ID	Application Type	Test Item	Data Re-used
DTS	A3LSMA125M	Original	WLAN (802.11b/g/n)	All
			Bluetooth LE	All
DSS	A3LSMA125M	Original	Bluetooth	All
PCE	A3LSMA125M	Original	2G, 3G	GSM 850, GSM 1900, WCDMA 850
			LTE	Band 5, Band 41

4. Maximum ERP/EIRP power

LTE Band 5

Mode	Tx frequency (㎒)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
LTE Band 5	824.7 ~ 848.3	1M10G7D	21.14	0.130
		1M10W7D	20.26	0.106
	825.5 ~ 847.5	2M69G7D	21.31	0.135
		2M69W7D	20.63	0.116
	826.5 ~ 846.5	4M51G7D	21.56	0.143
		4M50W7D	20.79	0.120
	829.0 ~ 844.0	8M99G7D	**21.92**	**0.156**
		8M99W7D	21.21	0.132

LTE Band 41

Mode	Tx frequency (㎒)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
LTE Band 41	2 498.5 ~ 2 687.5	4M51G7D	**25.56**	**0.360**
		4M53W7D	23.59	0.229
	2 501.0 ~ 2 685.0	9M02G7D	24.69	0.294
		8M99W7D	24.05	0.254
	2 503.5 ~ 2 682.5	13M5G7D	24.96	0.313
		13M5W7D	24.66	0.292
	2 506.0 ~ 2 680.0	18M0G7D	24.30	0.269
		18M0W7D	23.76	0.238

5. Summary of tests

FCC Part section(s)	Parameter	Test Limit	Test Condition	Test results
2.1046	Conducted Output Power	N/A	Conducted	Pass
2.1049	Occupied Bandwidth & 26 dB Bandwidth	N/A		Pass
2.1051 22.917(a) 27.53(m)	Band Edge Emissions at Antenna Terminal	<43 + 10Log10(P) dB for all out of band emissions, <65 + 10Log10(P) dB, Undesirable emissions must Meet the limits detailed in 27.53(m).		Pass
	Spurious Emissions at Antenna Terminal			Pass
27.50(d)(5)	Peak to Average Power Ratio	< 13 dB		Pass
2.1055 22.355	Frequency stability	< 2.5 ppm		Pass
27.54		Emission must remain in band		
22.913(a)(5)	Effective Radiated Power	< 7 Watts max. ERP	Radiated	Pass
27.50(h)(2)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP		Pass
2.1053 22.917(a) 27.53(m)	Radiated Spurious Emissions	<43 + 10Log10(P) dB for all out of band emissions, Undesirable emissions must Meet the limits detailed in 27.53(m).		Pass

Notes:

1. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.26-2015
   - ANSI/TIA-603-E-2016
   - KDB 971168 D01 v03r01

5.1. Worst case orientation

1. All modes of operation were investigated and the worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations in the test data.
2. Output power measurements were measured on QPSK, 16QAM and 64QAM Modulation. All tests except output power was performed with QPSK and 16QAM modulation.
3. All final radiated testing was performed with the EUT in worst case orientation.
4. For LTE Band 5 and 41 the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Y** orientation was worst-case orientation.
   Therefore, all final radiated testing was performed with the EUT in **Y** orientation.
5. All the radiated tests have been performed several case.
   (Stand-alone, with accessories (TA etc.))
   Worst case : Stand-alone

Test condition	LTE Band	Modulation	Bandwidth (㎒)	RB size	RB offset
Radiated	B5	QPSK	10	1	0, 24, 49
	B41		5	1	0, 13, 24
	B5	QPSK 16QAM	1.4, 3, 5, 10	1	0, 5, 14, 24, 49
				Full	0
	B41		5, 10, 15, 20	1	0, 24, 49, 74, 99
				Full	0

6. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)	
Conducted RF power	1.3 dB	
Conducted spurious emissions	1.3 dB	
Radiated spurious emissions	30 MHz ~ 1 GHz	3.7 dB
	Above 1 GHz	5.7 dB

7. Measurement results explanation example

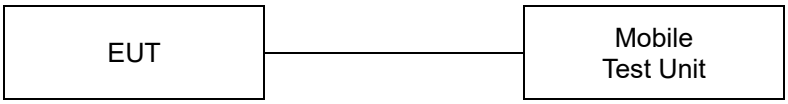
Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	5.55	11 000	7.01
50	6.00	12 000	7.05
100	6.19	13 000	7.40
200	6.23	14 000	7.44
300	6.26	15 000	7.55
400	6.29	16 000	7.27
500	6.31	17 000	7.96
600	6.33	18 000	7.70
700	6.36	19 000	8.47
800	6.38	20 000	8.37
900	6.40	21 000	8.11
1 000	6.40	22 000	8.92
2 000	6.53	23 000	8.40
3 000	6.63	24 000	8.70
4 000	6.79	25 000	8.93
5 000	6.83	26 000	8.64
6 000	6.92	26 500	8.33
7 000	6.87	27 000	9.15
8 000	6.94	28 000	8.66
9 000	7.07	29 000	8.41
10 000	7.47	30 000	7.96

Note.
Offset(㏈) = RF cable loss(㏈) + Divider(㏈)

8. Test results

8.1. Conducted output power

Test setup



Test procedure

971168 D01 v03r01 – Section 5.2
ANSI C63.26-2015 – Section 5.2.4.2
CFR 47, - Section §2.1046

Test settings

When an average power meter is used to perform RF output power measurements, the fundamental condition that measurement be performed only over durations of active transmissions at maximum output power level applies. Thus, an average power meter can always be used to perform the measurement when the EUT can be configured to transmit continuously.

If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98%), then the following options can be implemented to facilitate measurement of the average power with an average power meter:

a) A gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only during active transmission bursts at maximum output power levels.
b) A conventional average power meter with no signal gating capability can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than or equal to ± 2%) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to [10log (1/duty cycle)]. See 5.2.4.3.4 for guidance with respect to measuring the transmitter duty cycle.

See item r) of 4.1 for more information regarding power meter functional requirements and limitations, and consult the instrumentation-specific application literature for proper set-up and use.

Test results

Test Band	Bandwidth (㎒)	Test mode	RB size	RB offset	MPR	Maximum power Frequency (㎒)		
						Low	Middle	High
LTE Band 5	1.4	QPSK	1	0	0	23.53	23.25	23.32
			1	3	0	23.70	23.50	23.50
			1	5	0	23.54	23.27	23.32
			3	0	0	23.60	23.42	23.47
			3	1	0	23.64	23.47	23.52
			3	3	0	23.59	23.50	23.46
			6	0	1	22.50	22.32	22.41
		16QAM	1	0	1	22.66	22.32	22.31
			1	3	1	22.62	22.53	22.54
			1	5	1	22.69	22.40	22.40
			3	0	1	22.64	22.51	22.69
			3	1	1	22.66	22.58	22.75
			3	3	1	22.66	22.60	22.68
			6	0	2	21.61	21.47	21.47
		64QAM	1	0	2	21.60	21.47	21.61
			1	3	2	21.78	21.64	21.74
			1	5	2	21.67	21.51	21.63
			3	0	2	21.62	21.55	21.60
			3	1	2	21.66	21.56	21.63
			3	3	2	21.60	21.52	21.57
			6	0	3	20.54	20.42	20.47
	3	QPSK	1	0	0	23.37	23.65	23.50
			1	8	0	23.43	23.52	23.36
			1	14	0	23.50	23.46	23.33
			8	0	1	22.43	22.35	22.38
			8	4	1	22.51	22.60	22.43
			8	7	1	22.45	22.43	22.38
			15	0	1	22.41	22.31	22.38
		16QAM	1	0	1	22.78	22.49	22.52
			1	8	1	22.74	22.69	22.47
			1	14	1	22.77	22.65	22.39
			8	0	2	21.69	21.64	21.53
			8	4	2	21.77	21.72	21.51
			8	7	2	21.74	21.64	21.48
			15	0	2	21.49	21.74	21.46
		64QAM	1	0	2	21.70	21.53	21.60
			1	8	2	21.63	21.65	21.62
			1	14	2	21.65	21.65	21.60
			8	0	3	20.60	20.50	20.57
			8	4	3	20.62	20.52	20.55
			8	7	3	20.63	20.50	20.58
			15	0	3	20.54	20.43	20.56

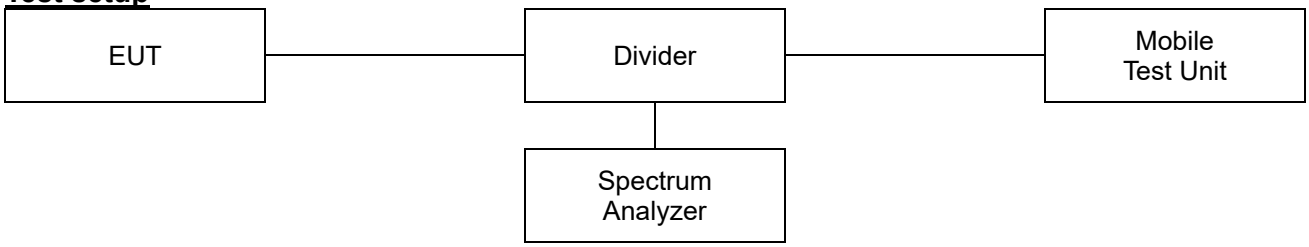
Test Band	Bandwidth (㎒)	Test mode	RB size	RB offset	MPR	Maximum power Frequency (㎒)		
						Low	Middle	High
LTE Band 5	5	QPSK	1	0	0	23.41	23.28	23.30
			1	12	0	23.65	23.72	23.59
			1	24	0	23.40	23.32	23.36
			12	0	1	22.45	22.45	22.46
			12	7	1	22.45	22.66	22.47
			12	13	1	22.48	22.62	22.41
			25	0	1	22.47	22.35	22.39
		16QAM	1	0	1	22.27	22.70	22.31
			1	12	1	22.49	22.87	22.57
			1	24	1	22.27	22.62	22.33
			12	0	2	21.48	21.66	21.40
			12	7	2	21.68	21.80	21.49
			12	13	2	21.71	21.62	21.38
			25	0	2	21.66	21.73	21.48
		64QAM	1	0	2	21.52	21.56	21.59
			1	12	2	21.86	21.84	21.76
			1	24	2	21.62	21.53	21.58
			12	0	3	20.54	20.49	20.45
			12	7	3	20.64	20.53	20.31
			12	13	3	20.52	20.41	20.45
			25	0	3	20.46	20.43	20.40
	10	QPSK	1	0	0	23.41	23.82	23.42
			1	25	0	23.53	23.71	23.39
			1	49	0	23.31	23.52	23.44
			25	0	1	22.52	22.64	22.46
			25	12	1	22.52	22.38	22.49
			25	25	1	22.48	22.48	22.40
			50	0	1	22.45	22.61	22.44
		16QAM	1	0	1	23.01	22.67	22.33
			1	25	1	23.15	22.92	22.47
			1	49	1	23.03	22.48	22.41
			25	0	2	21.61	21.69	21.62
			25	12	2	21.69	21.75	21.62
			25	25	2	21.74	21.73	21.55
			50	0	2	21.85	21.93	21.56
		64QAM	1	0	2	21.69	21.61	21.55
			1	25	2	21.76	21.73	21.58
			1	49	2	21.63	21.56	21.60
			25	0	3	20.57	20.55	20.54
			25	12	3	20.56	20.47	20.43
			25	25	3	20.54	20.43	20.25
			50	0	3	20.50	20.47	20.36

Test Band	Bandwidth (㎒)	Test mode	RB size	RB offset	MPR	Maximum power Frequency (㎒)		
						Low	Middle	High
LTE Band 41	5	QPSK	1	0	0	21.78	21.87	21.79
			1	12	0	22.09	22.18	22.08
			1	24	0	21.85	21.94	21.85
			12	0	1	20.80	20.91	20.85
			12	7	1	20.95	21.07	21.02
			12	13	1	20.85	20.98	20.85
			25	0	1	20.84	20.96	20.87
		16QAM	1	0	1	20.87	20.95	20.86
			1	12	1	21.11	21.19	21.14
			1	24	1	20.88	20.96	20.90
			12	0	2	19.82	19.93	19.81
			12	7	2	19.83	19.93	19.88
			12	13	2	19.79	19.88	19.82
			25	0	2	19.78	19.93	19.80
		64QAM	1	0	2	20.26	19.62	20.68
			1	12	2	20.47	19.81	20.90
			1	24	2	20.24	19.66	20.63
			12	0	3	19.66	19.00	19.69
			12	7	3	19.80	19.08	19.79
			12	13	3	19.58	18.94	19.70
			25	0	3	19.75	19.07	19.87
	10	QPSK	1	0	0	21.77	21.89	21.82
			1	25	0	22.02	22.14	22.00
			1	49	0	21.80	21.87	21.79
			25	0	1	20.78	20.92	20.80
			25	12	1	20.86	20.94	20.82
			25	25	1	20.91	20.99	20.85
			50	0	1	20.77	20.92	20.84
		16QAM	1	0	1	20.56	20.58	20.58
			1	25	1	20.69	20.83	20.75
			1	49	1	20.70	20.83	20.70
			25	0	2	19.85	19.96	19.87
			25	12	2	19.82	19.96	19.83
			25	25	2	19.89	20.00	19.85
			50	0	2	19.80	19.94	19.85
		64QAM	1	0	2	20.52	19.54	20.30
			1	25	2	20.27	19.53	20.28
			1	49	2	20.19	19.75	20.25
			25	0	3	19.81	19.07	19.96
			25	12	3	19.84	19.14	19.90
			25	25	3	19.69	19.23	19.81
			50	0	3	19.82	19.17	19.98

Test Band	Bandwidth (㎒)	Test mode	RB size	RB offset	MPR	Maximum power Frequency (㎒)		
						Low	Middle	High
LTE Band 41	15	QPSK	1	0	0	21.68	21.75	21.61
			1	36	0	21.91	21.98	21.89
			1	74	0	21.81	21.94	21.81
			36	0	1	20.80	20.92	20.79
			36	18	1	20.90	21.05	20.94
			36	37	1	20.91	21.02	20.96
			75	0	1	20.81	20.92	20.83
		16QAM	1	0	1	20.50	20.61	20.58
			1	36	1	20.75	20.82	20.68
			1	74	1	20.59	20.74	20.69
			36	0	2	19.76	19.85	19.77
			36	18	2	19.86	19.96	19.87
			36	37	2	19.84	19.99	19.94
			75	0	2	19.84	19.91	19.76
		64QAM	1	0	2	20.41	19.51	20.14
			1	36	2	20.33	19.73	20.21
			1	74	2	19.95	19.64	20.07
			36	0	3	19.70	18.90	19.82
			36	18	3	19.74	19.08	19.93
			36	37	3	19.59	19.18	19.89
			75	0	3	19.74	19.04	19.83
	20	QPSK	1	0	0	22.50	21.54	22.53
			1	49	0	22.81	22.21	22.99
			1	99	0	22.07	21.89	22.43
			50	0	1	21.70	20.89	21.77
			50	24	1	21.61	20.99	21.78
			50	50	1	21.60	21.03	21.72
			100	0	1	21.61	20.97	21.77
		16QAM	1	0	1	21.28	20.57	21.07
			1	49	1	21.60	21.22	21.55
			1	99	1	20.86	20.91	21.00
			50	0	2	20.62	19.97	20.80
			50	24	2	20.60	19.92	20.79
			50	50	2	20.58	20.02	20.76
			100	0	2	20.60	19.95	20.77
		64QAM	1	0	2	20.29	19.58	20.07
			1	49	2	20.55	20.13	20.48
			1	99	2	19.89	19.96	20.06
			50	0	3	19.80	19.13	19.95
			50	24	3	19.80	19.12	20.00
			50	50	3	19.76	19.22	19.97
			100	0	3	19.86	19.21	20.05

8.2. 99% Occupied Bandwidth & 26 dB Bandwidth

Test setup



Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Test procedure

971168 D01 v03r01 – Section 4.2 and 4.3
ANSI C63.26-2015 – Section 5.4.3 and 5.4.4

Test settings

◆ **26dB Bandwidth**

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.

b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
See guidance provided in 4.2.3.

d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.

e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

f) Determine the reference value by either of the following:
   1) Set the EUT to transmit a modulated signal. Allow the trace to stabilize.
   Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
   2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.

g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

h) If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i).

i) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.

j) The spectral envelope can cross the "−X dB amplitude" at multiple points. The lowest or highest frequency shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the "−X dB amplitude."

k) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

◆ 99% Occupied Bandwidth

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.

d) Set the detection mode to peak, and the trace mode to max-hold.

e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the u pper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

Notes:

1. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, Modulation.

Test results

Test Band	Bandwidth (㎒)	Frequency (㎒)	Test mode	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
LTE Band 5	1.4	824.7	QPSK	1.31	1.10
			16QAM	1.29	1.09
		836.5	QPSK	1.28	1.10
			16QAM	1.28	1.09
		848.3	QPSK	1.29	1.09
			16QAM	1.31	1.10
	3	825.5	QPSK	2.89	2.69
			16QAM	2.91	2.68
		836.5	QPSK	2.90	2.69
			16QAM	2.91	2.69
		847.5	QPSK	2.91	2.69
			16QAM	2.90	2.67
	5	826.5	QPSK	4.95	4.50
			16QAM	4.91	4.48
		836.5	QPSK	4.95	4.51
			16QAM	4.90	4.50
		846.5	QPSK	4.90	4.50
			16QAM	4.96	4.50
	10	829.0	QPSK	9.84	8.99
			16QAM	9.67	8.99
		836.5	QPSK	9.69	8.97
			16QAM	9.77	8.99
		844.0	QPSK	9.77	8.99
			16QAM	9.77	8.99

Test Band	Bandwidth (㎒)	Frequency (㎒)	Test mode	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
LTE Band 41	5	2 498.5	QPSK	5.00	4.50
			16QAM	4.98	4.48
		2 593.0	QPSK	4.95	4.48
			16QAM	5.03	4.48
		2 687.5	QPSK	4.92	4.51
			16QAM	4.95	4.53
	10	2 501.0	QPSK	9.67	8.99
			16QAM	9.69	8.97
		2 593.0	QPSK	9.67	8.97
			16QAM	10.02	8.97
		2 685.0	QPSK	9.67	9.02
			16QAM	9.74	8.99
	15	2 503.5	QPSK	14.39	13.49
			16QAM	14.84	13.45
		2 593.0	QPSK	14.50	13.41
			16QAM	14.31	13.45
		2 682.5	QPSK	14.50	13.45
			16QAM	14.72	13.45
	20	2 506.0	QPSK	19.33	18.03
			16QAM	19.28	17.93
		2 593.0	QPSK	19.53	17.98
			16QAM	19.13	18.03
		2 680.0	QPSK	19.18	17.98
			16QAM	19.58	17.98

26 dB Bandwidth

Test mode: LTE Band 5

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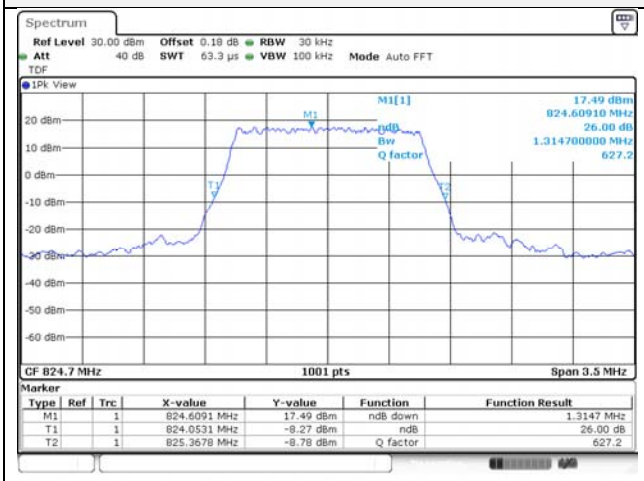	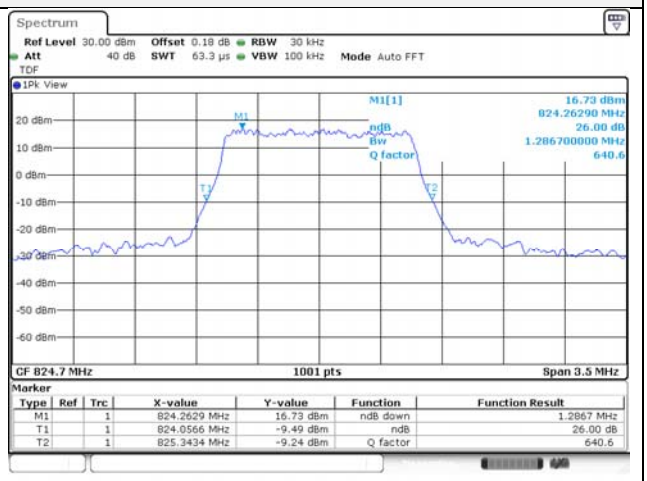
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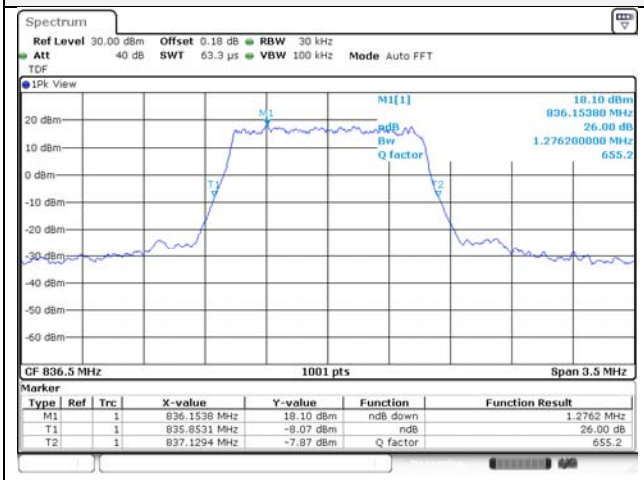
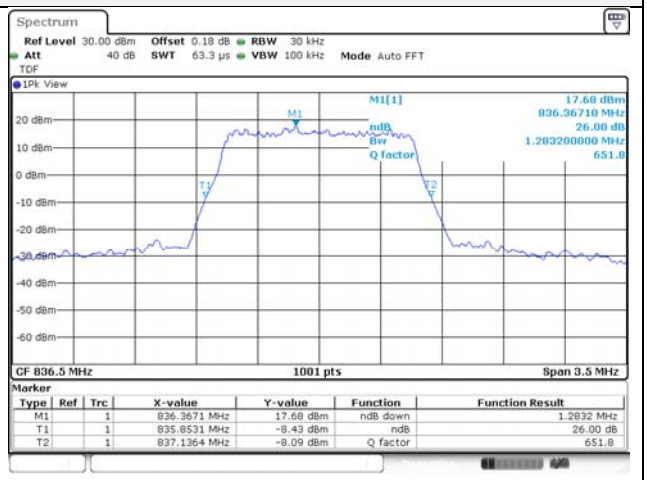
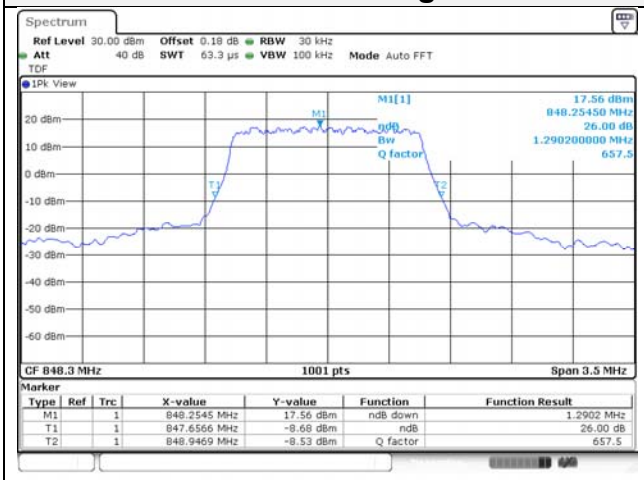
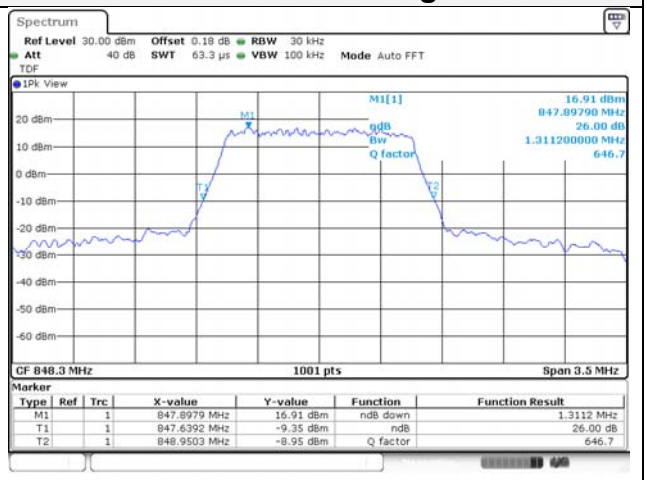
	
1.4M BW QPSK High ch.	1.4M BW 16QAM High ch.
	

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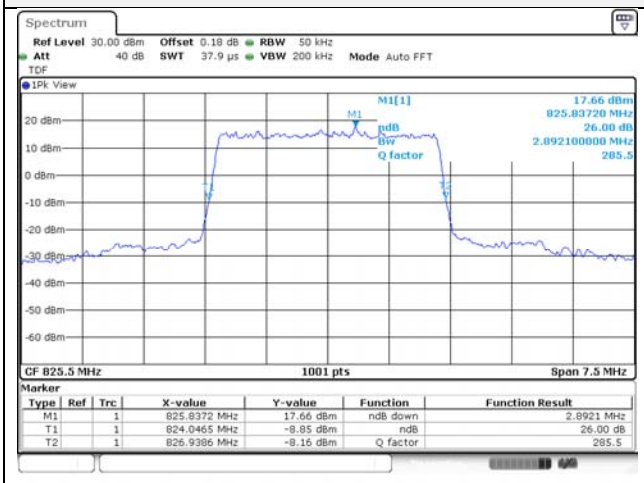
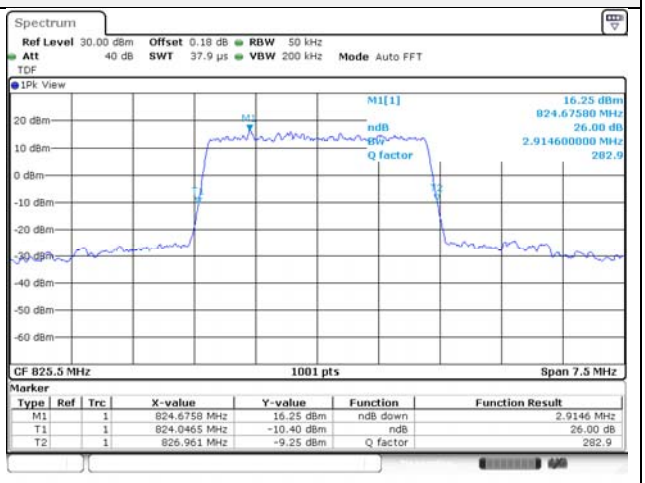
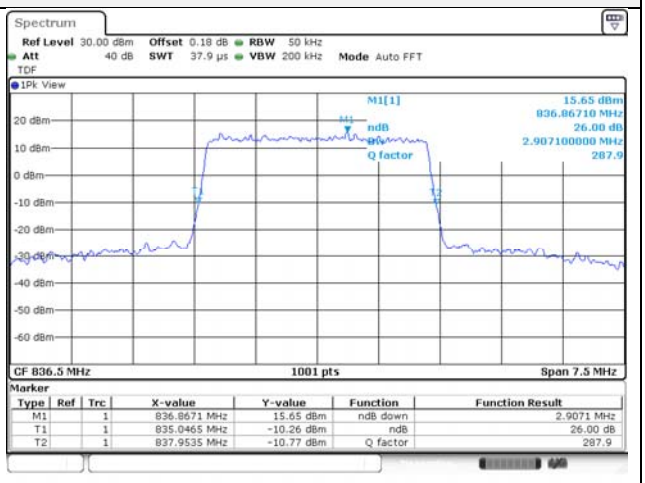


3M BW 16QAM Low ch.



3M BW QPSK Mid ch.

3M BW 16QAM Mid ch.



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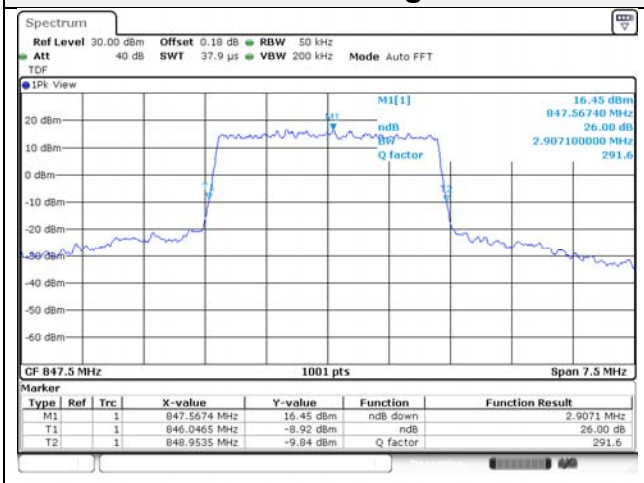

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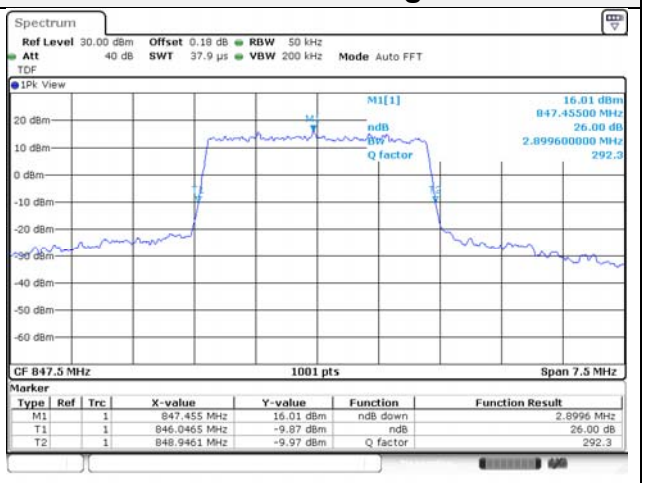

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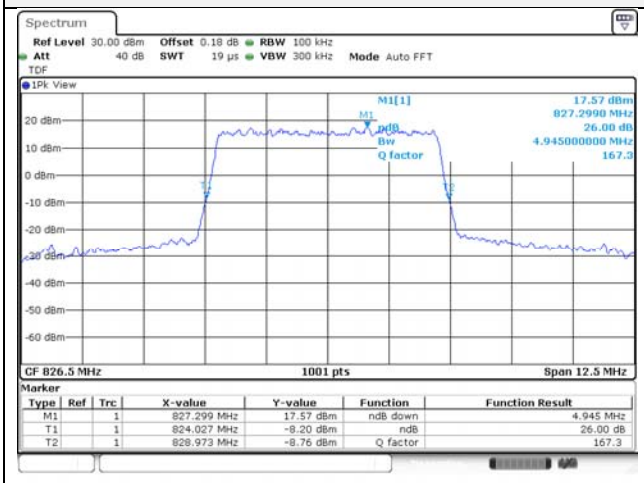

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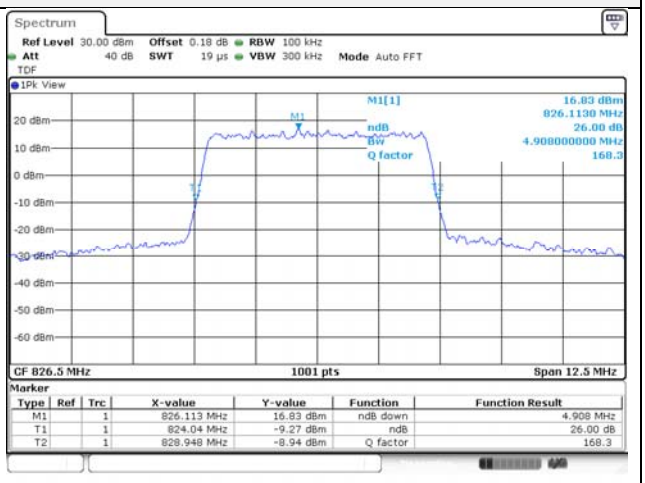

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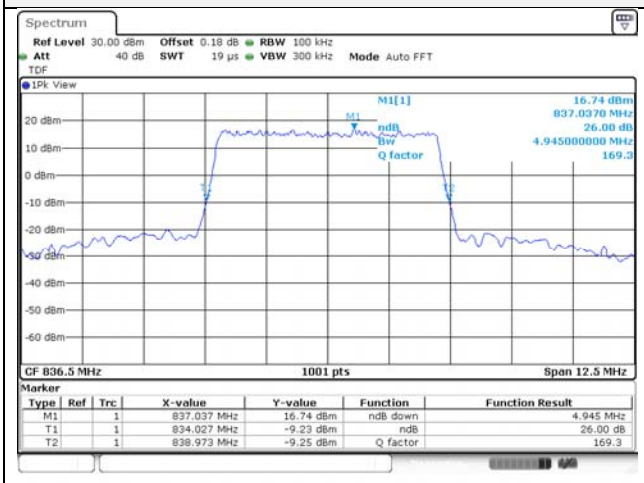

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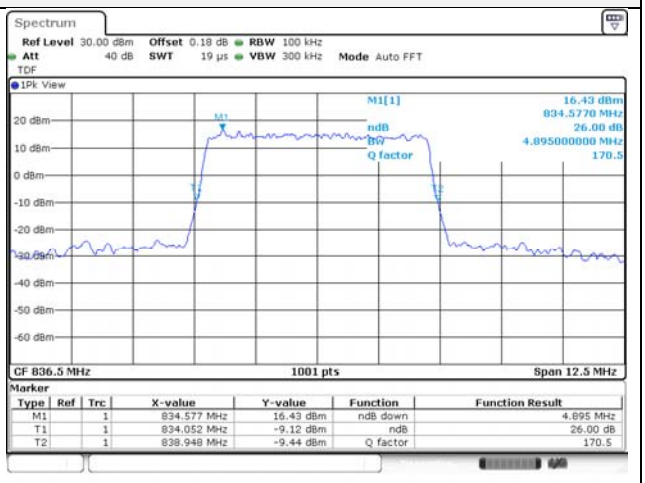

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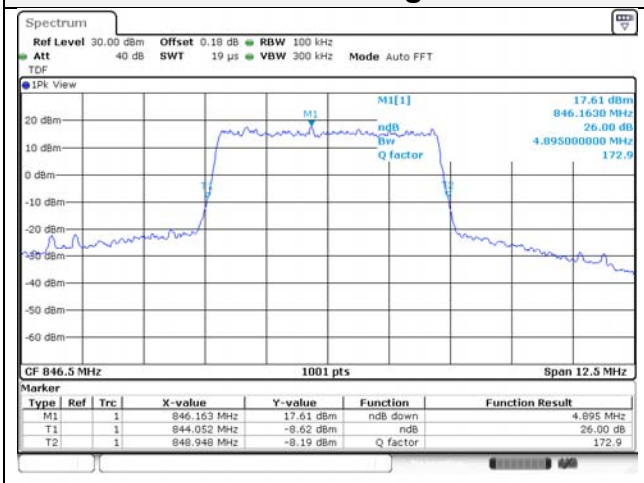

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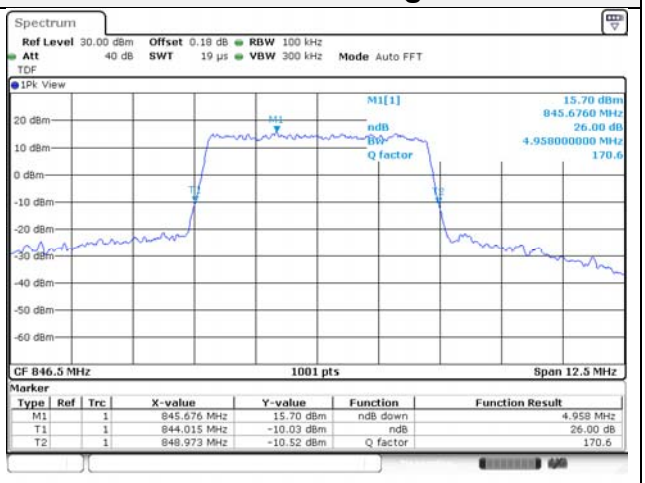

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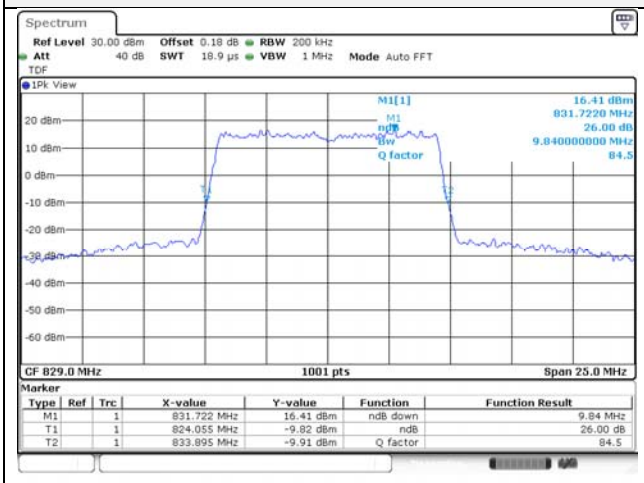

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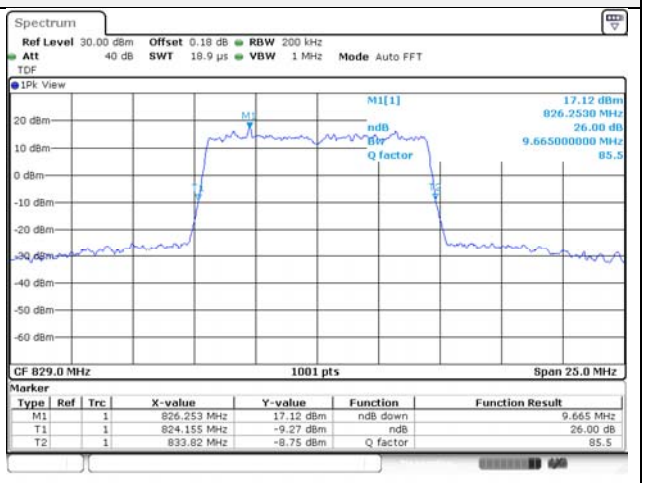

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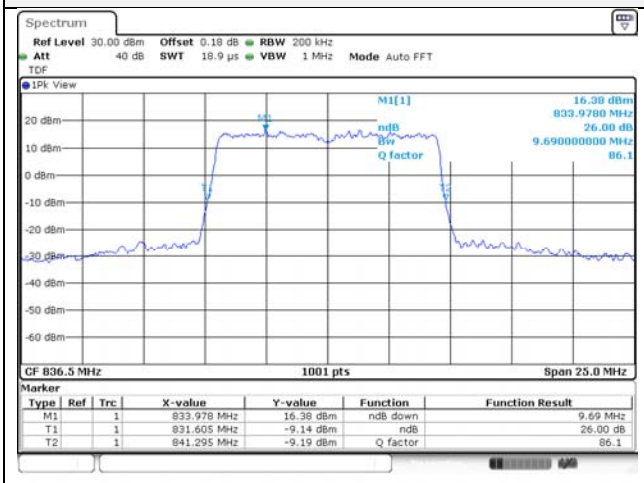

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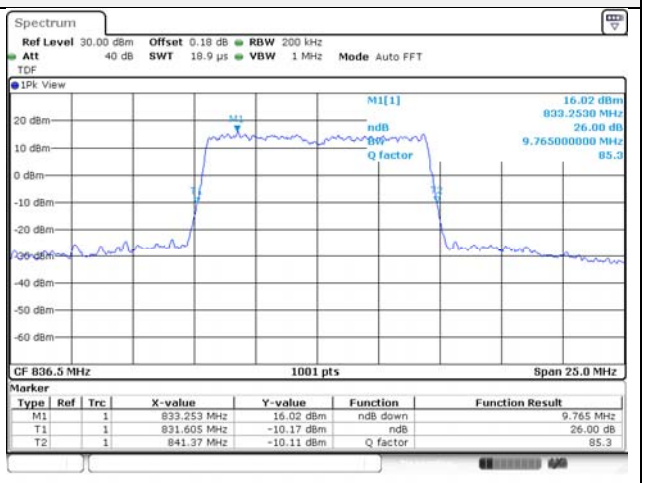

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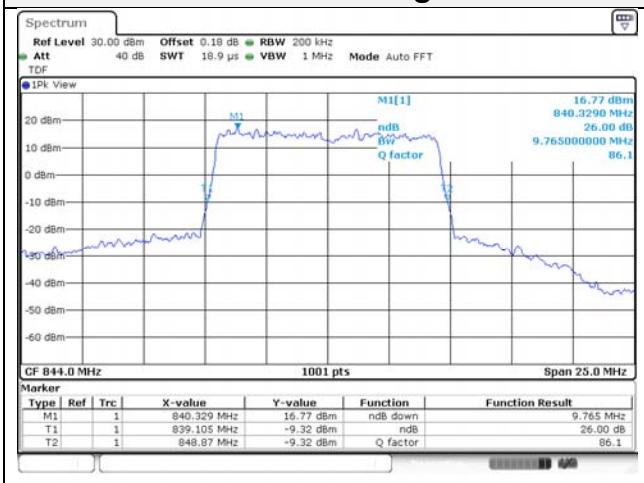

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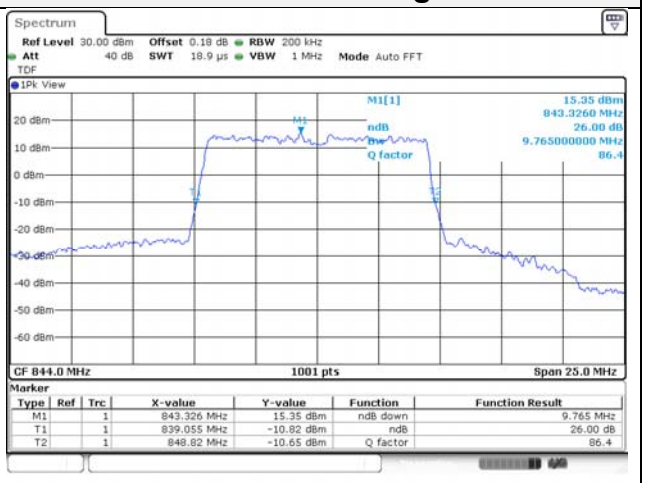

Test mode: LTE Band 41

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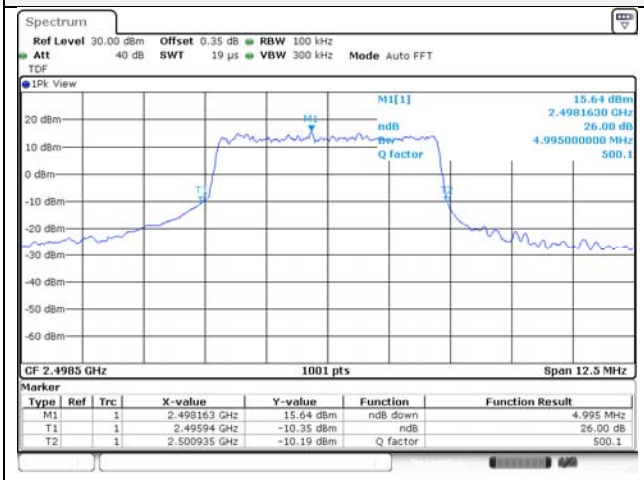

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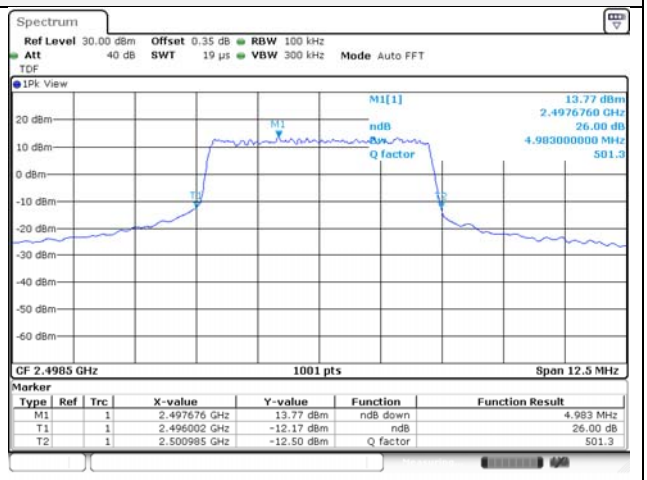
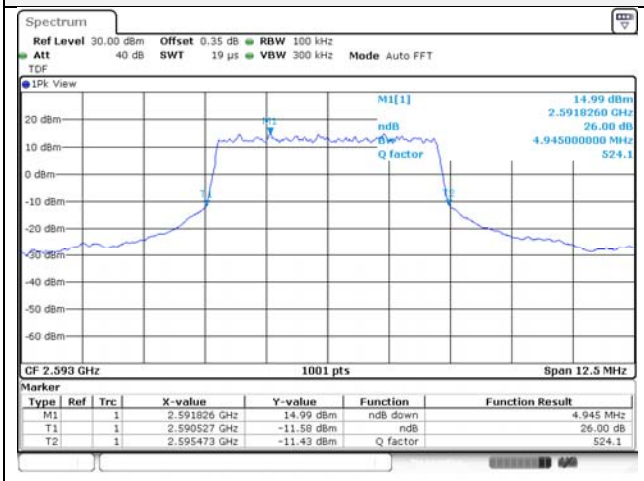


5M BW QPSK Mid ch.



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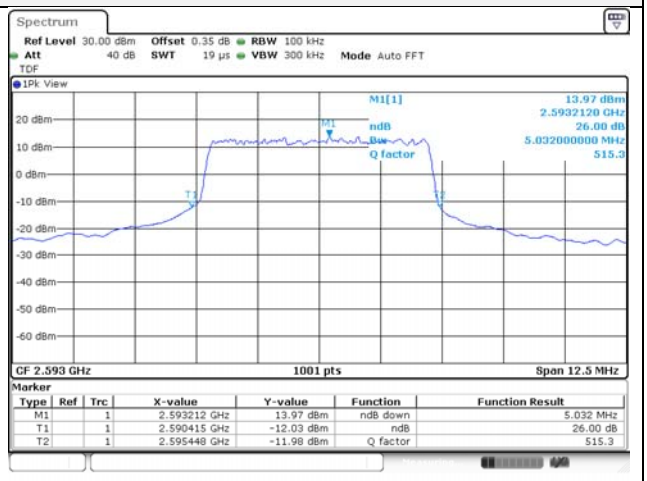

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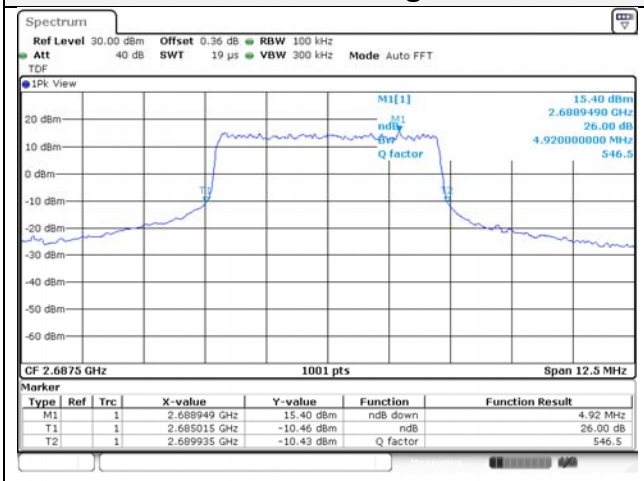
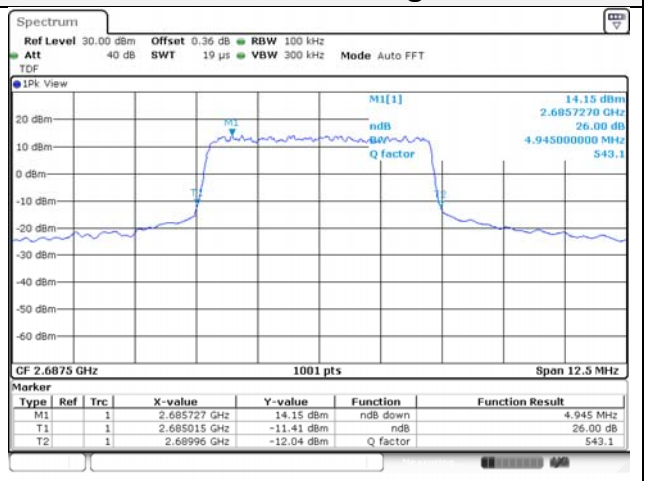


5M BW 16QAM High ch.



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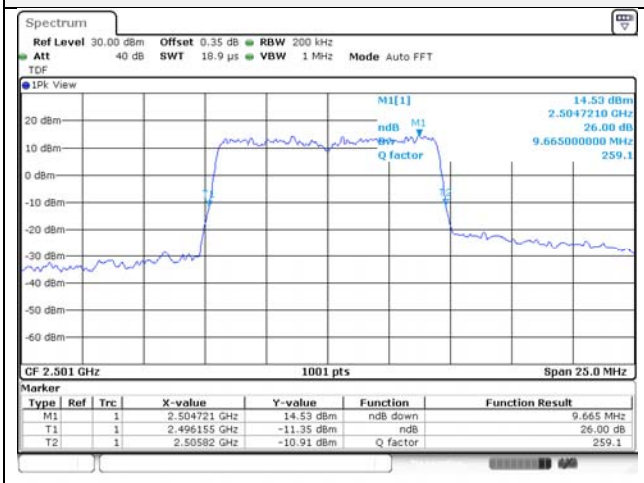

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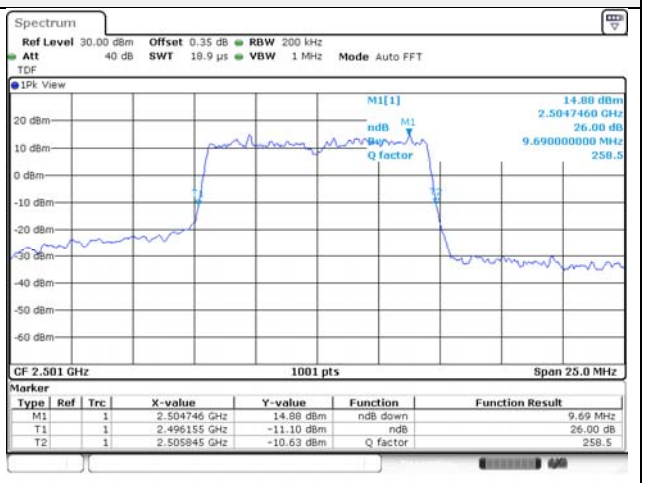

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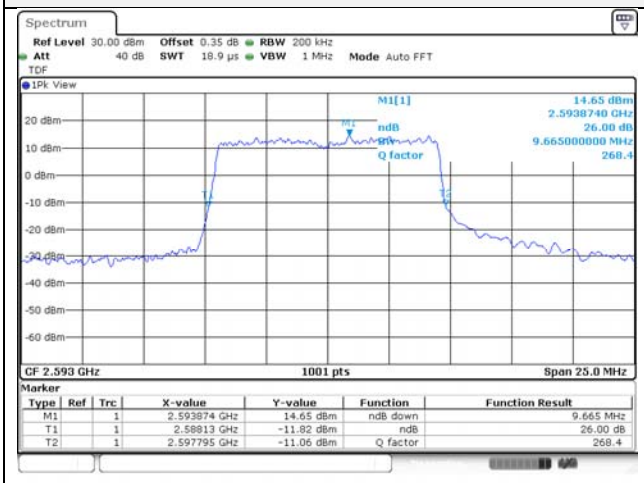
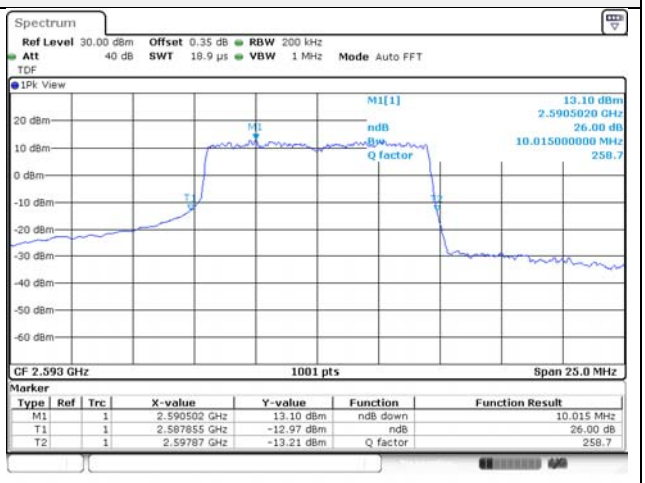
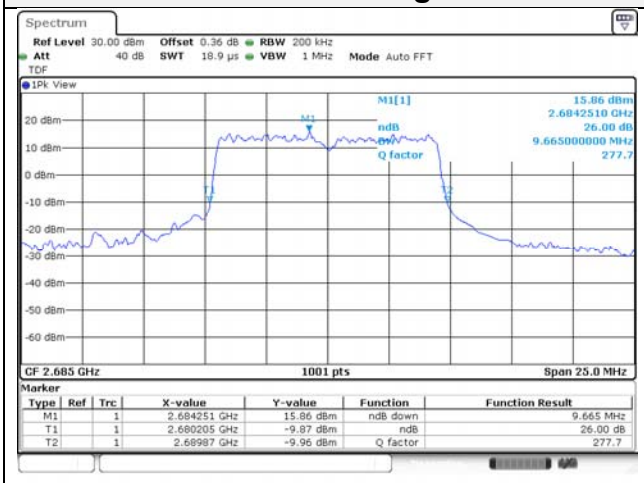


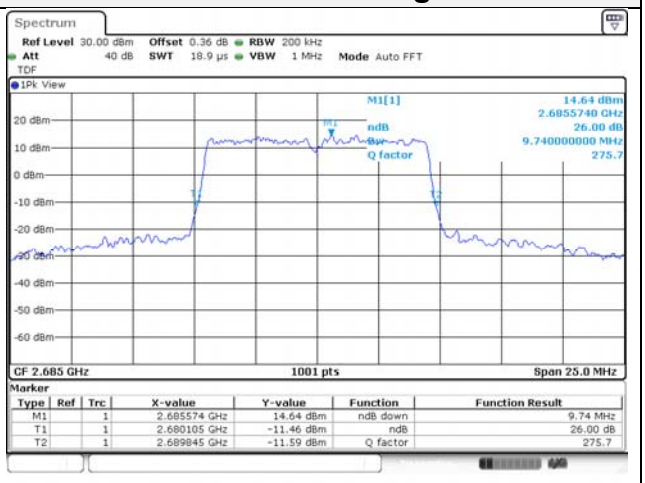
10M BW 16QAM Mid ch.



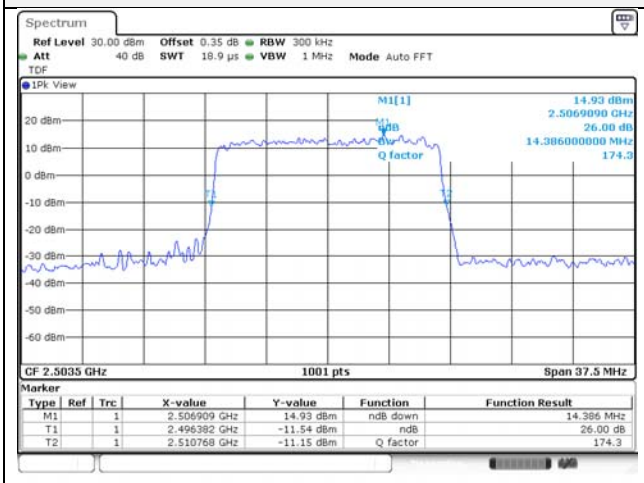
10M BW QPSK High ch.



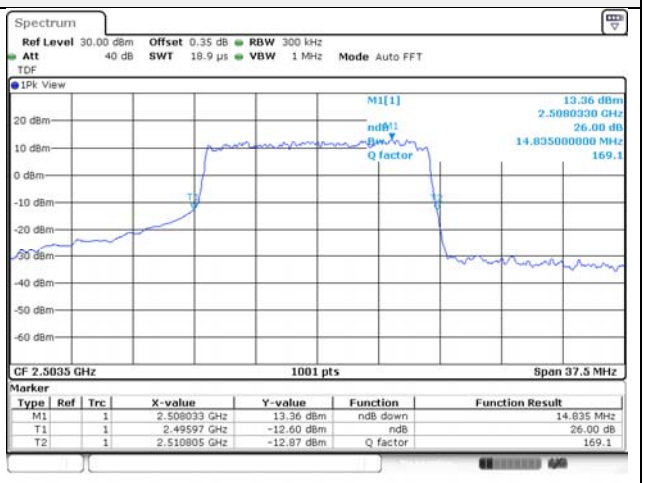
10M BW 16QAM High ch.



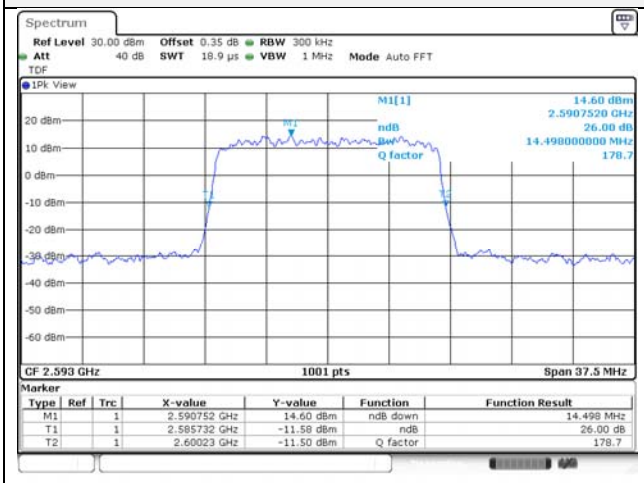
15M BW QPSK Low ch.



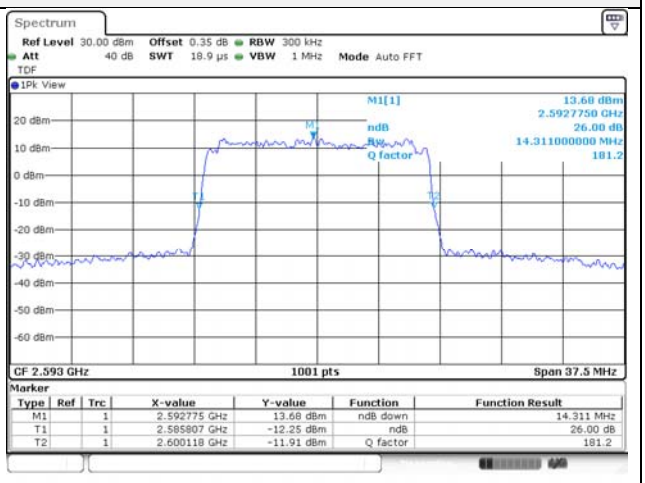
15M BW 16QAM Low ch.



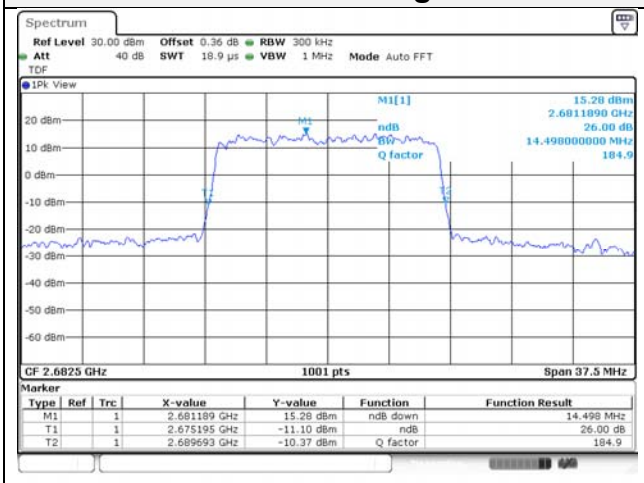
15M BW QPSK Mid ch.



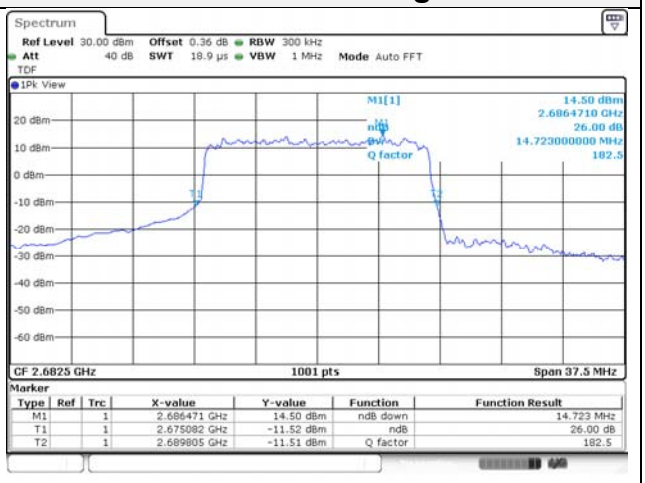
15M BW 16QAM Mid ch.



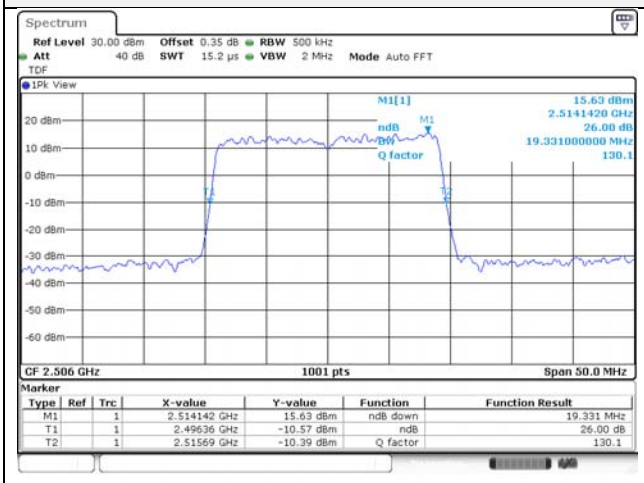
15M BW QPSK High ch.



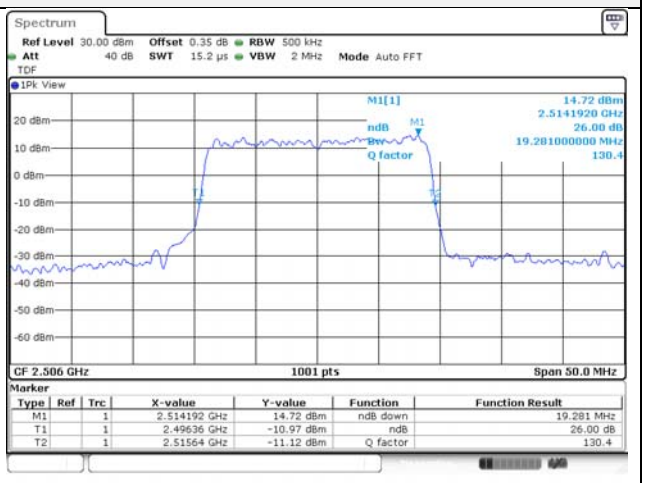
15M BW 16QAM High ch.



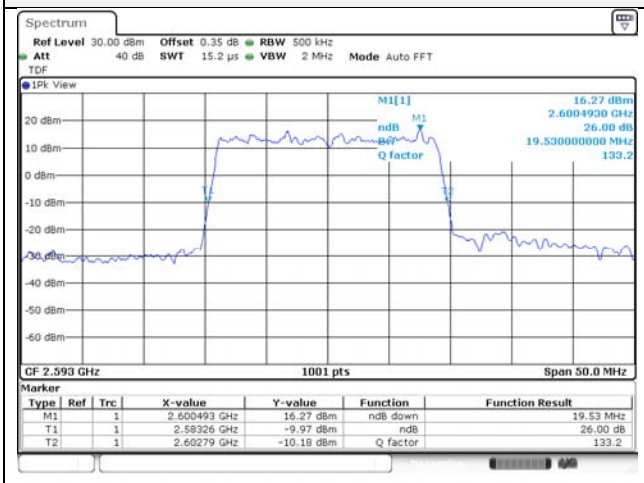
20M BW QPSK Low ch.



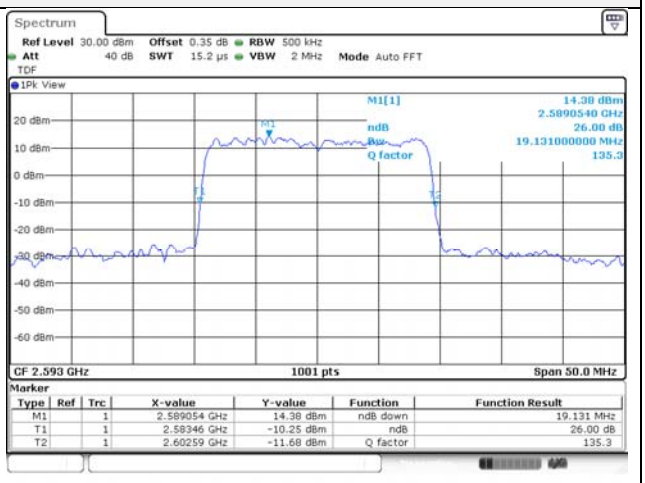
20M BW 16QAM Low ch.



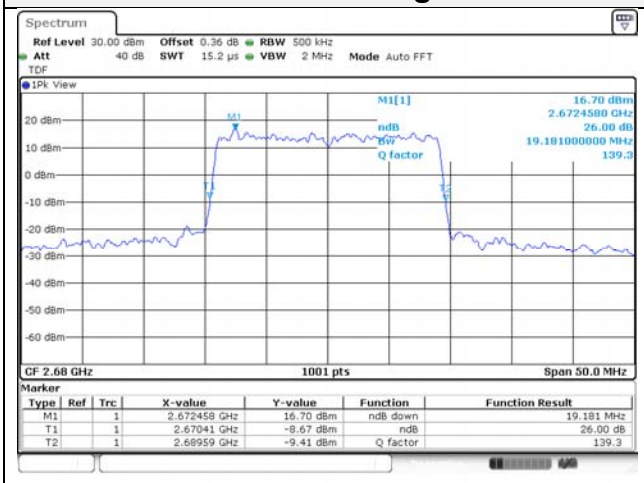
20M BW QPSK Mid ch.



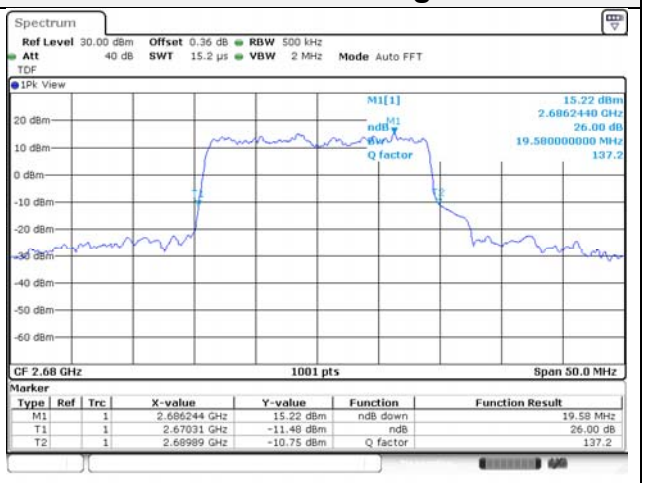
20M BW 16QAM Mid ch.



20M BW QPSK High ch.

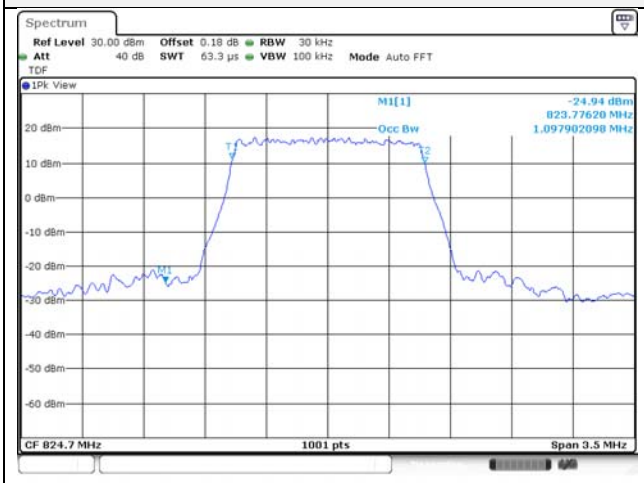
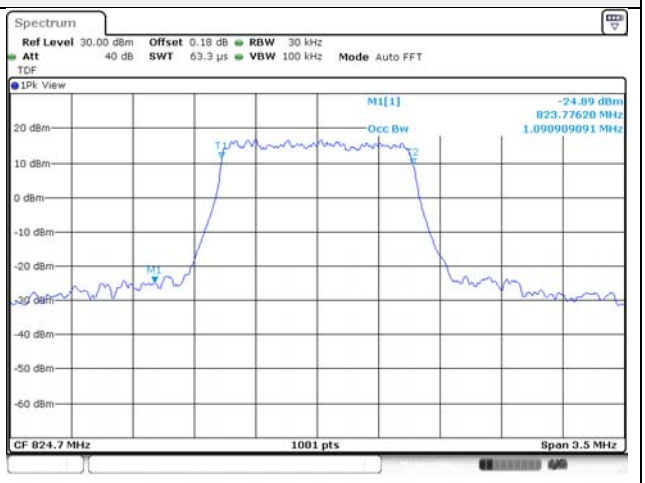
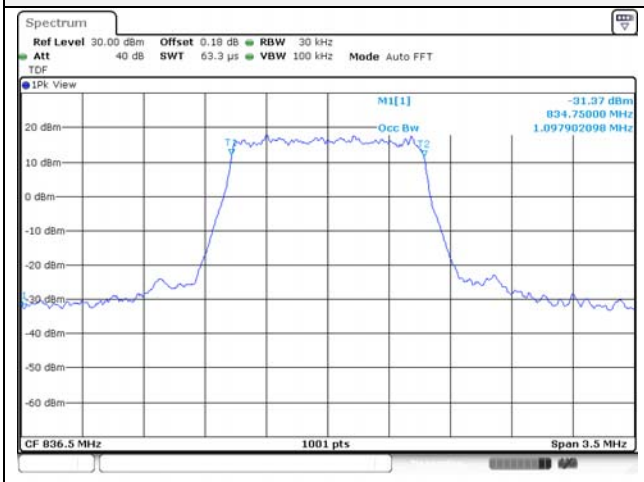
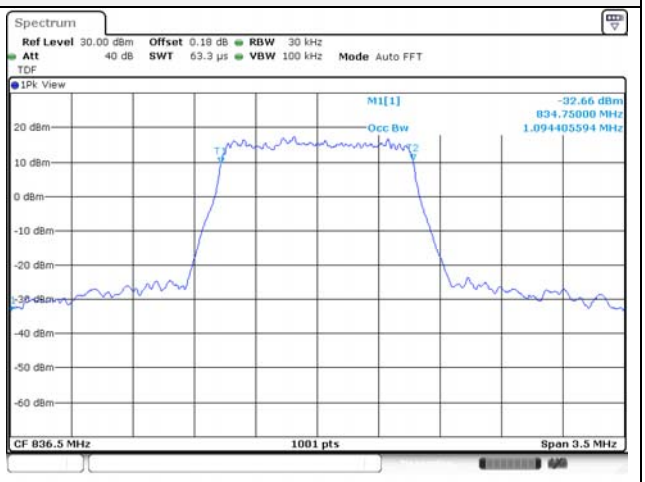
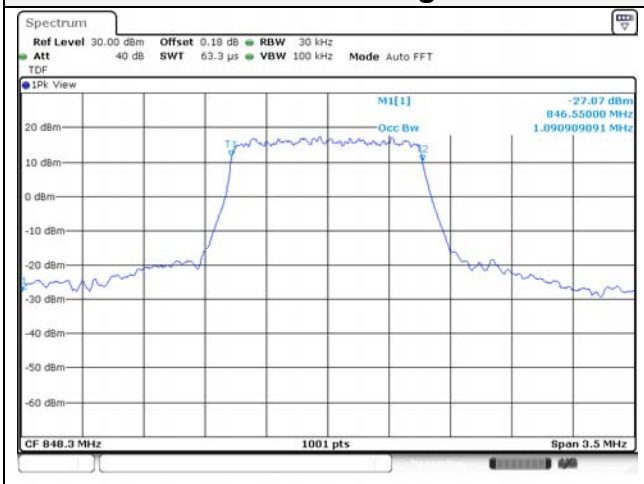
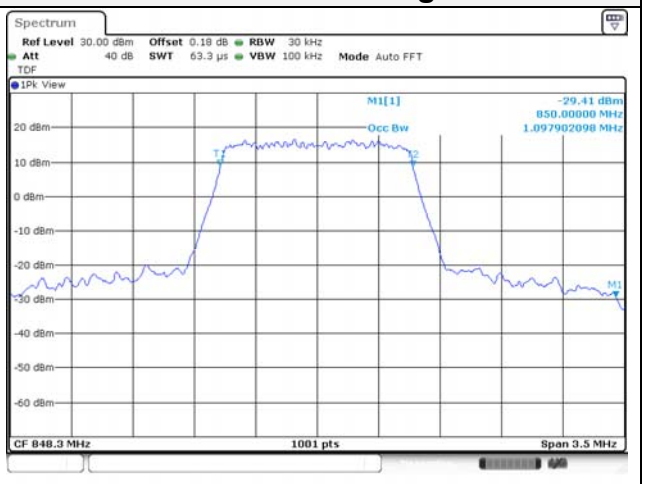


20M BW 16QAM High ch.

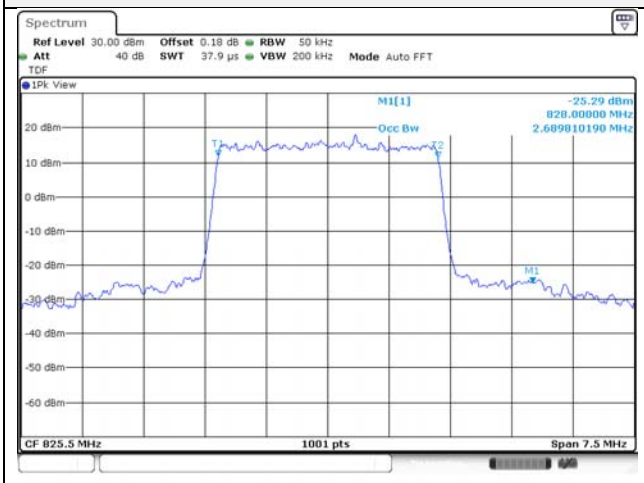


99% Occupied Bandwidth

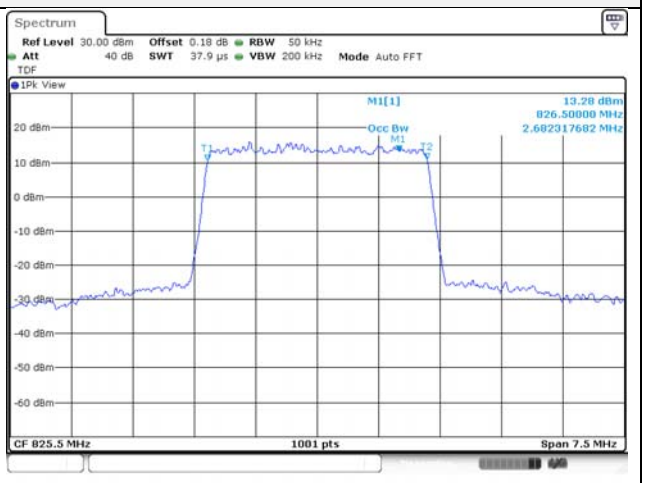
Test mode: LTE Band 5

1.4M BW QPSK Low ch.	1.4M BW 16QAM Low ch.
	
1.4M BW QPSK Mid ch.	**1.4M BW 16QAM Mid ch.**
	
1.4M BW QPSK High ch.	**1.4M BW 16QAM High ch.**
	

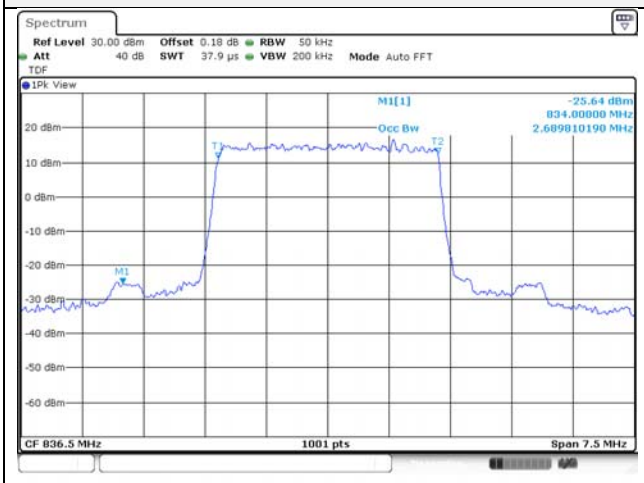
3M BW QPSK Low ch.



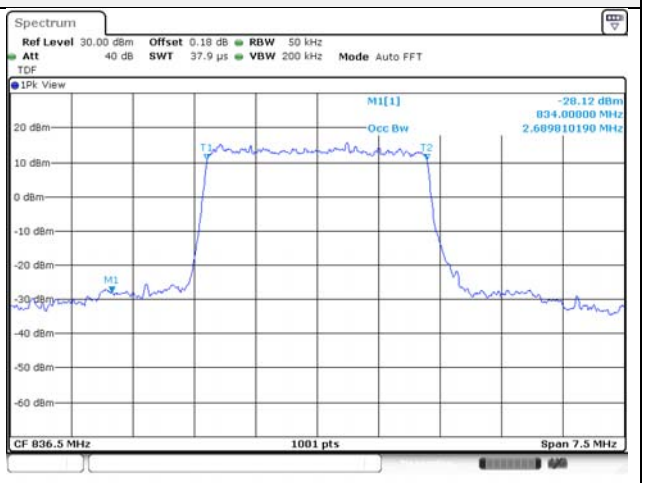
3M BW 16QAM Low ch.



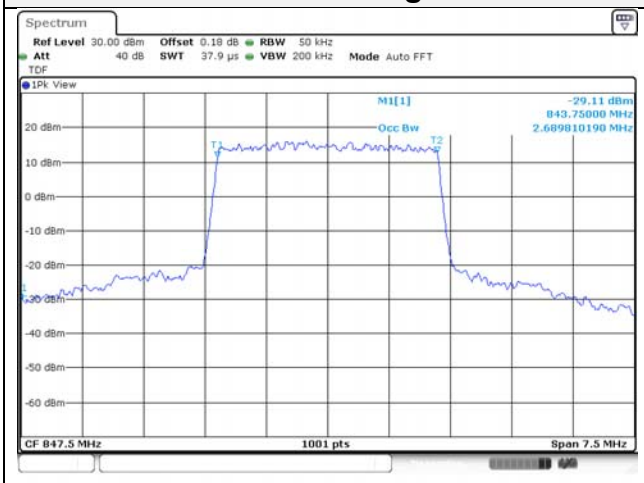
3M BW QPSK Mid ch.



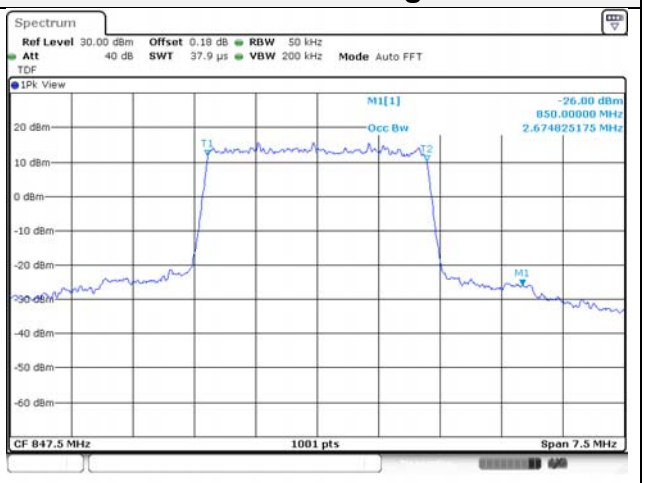
3M BW 16QAM Mid ch.

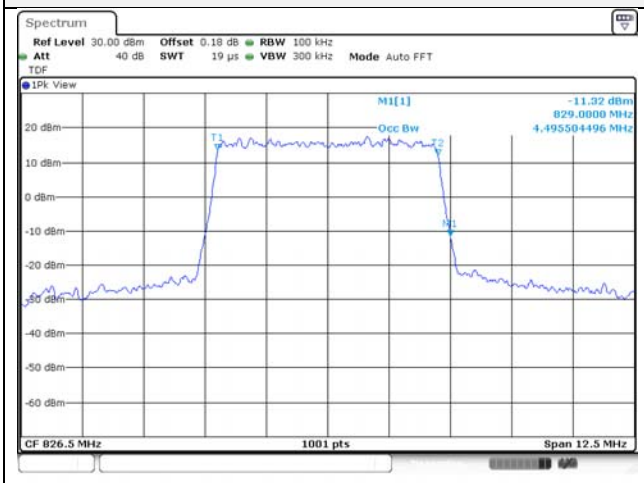
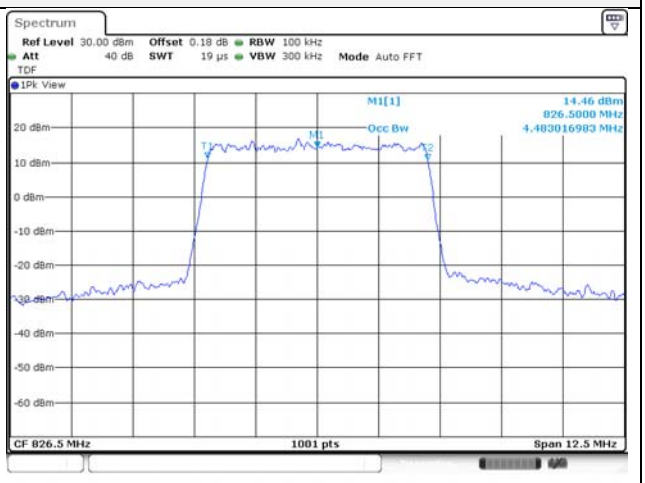
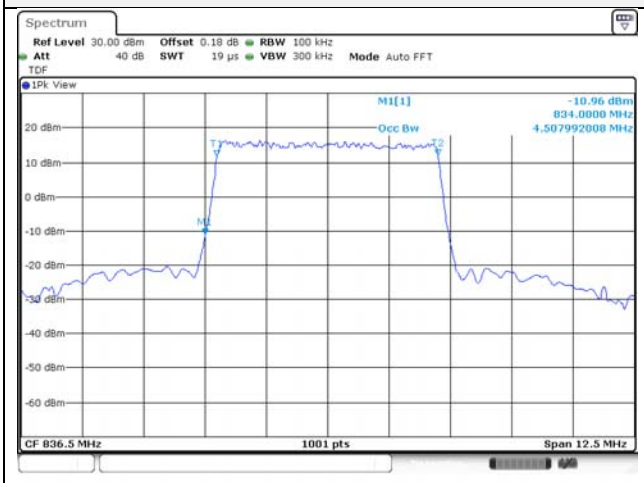
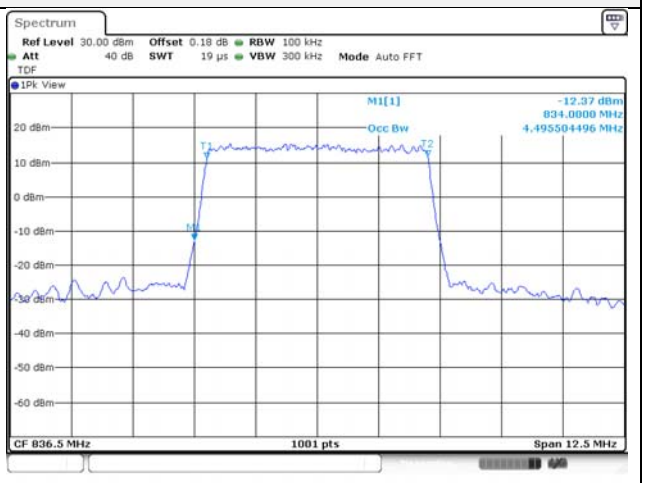
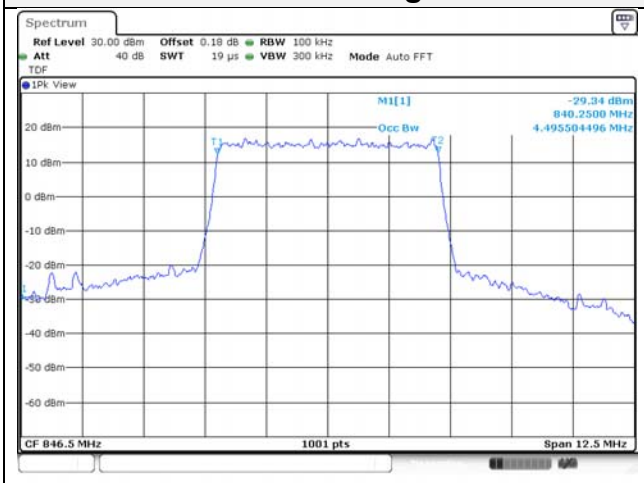
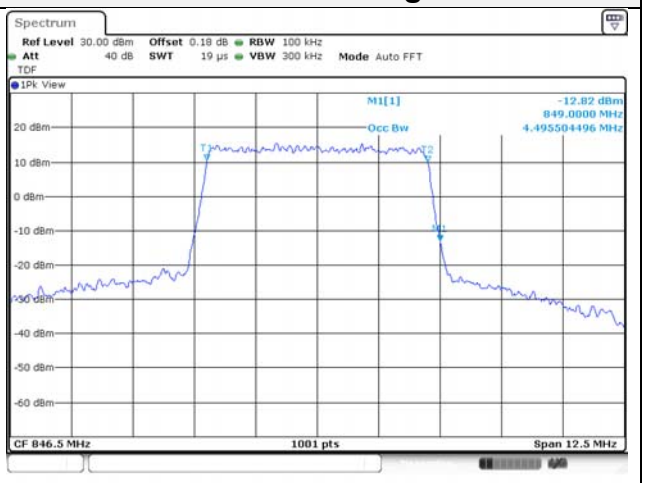


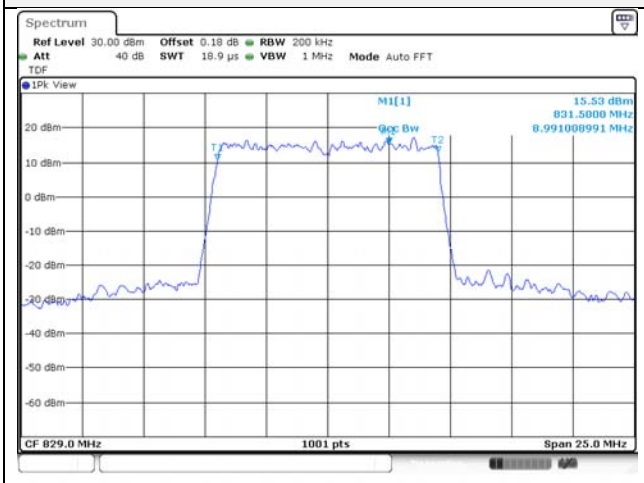
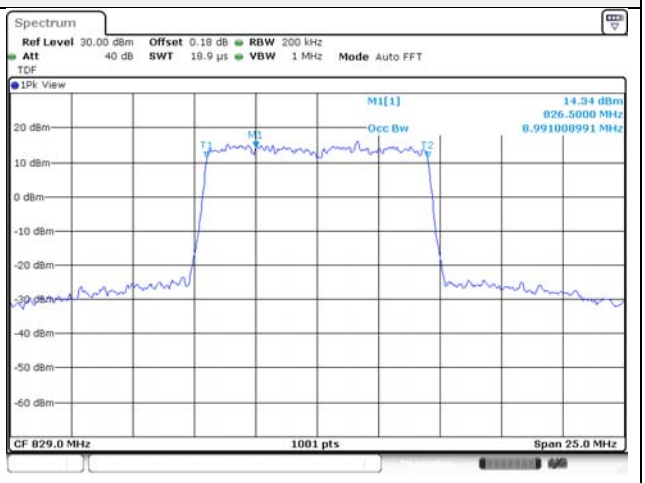
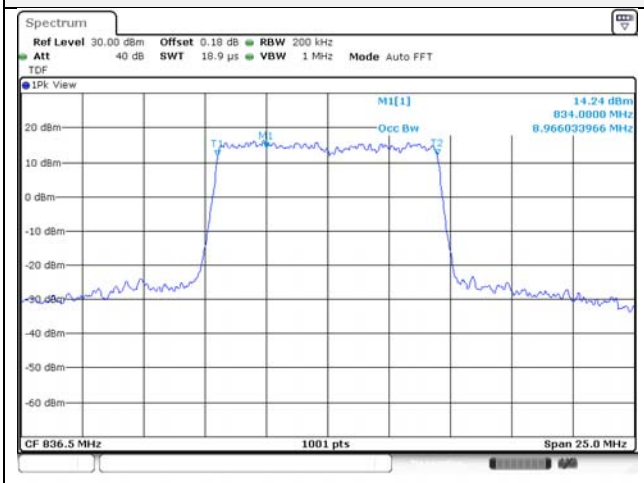
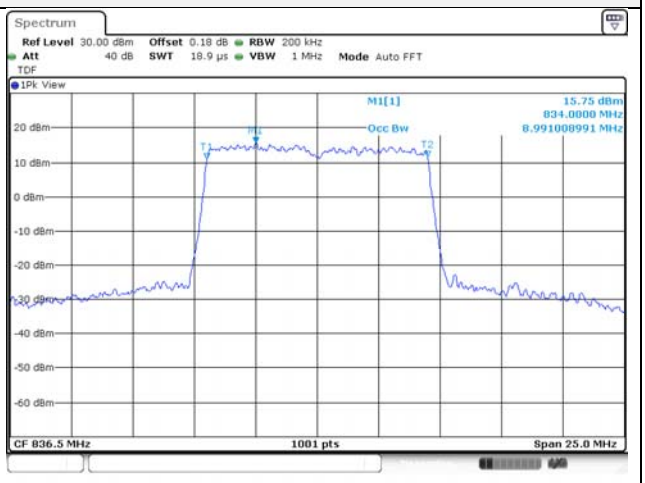
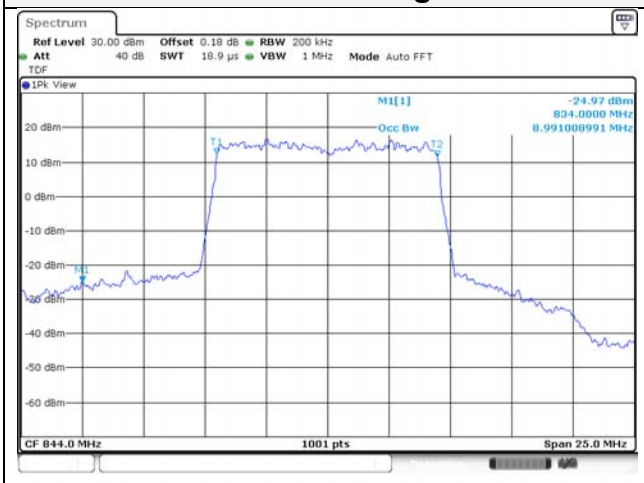
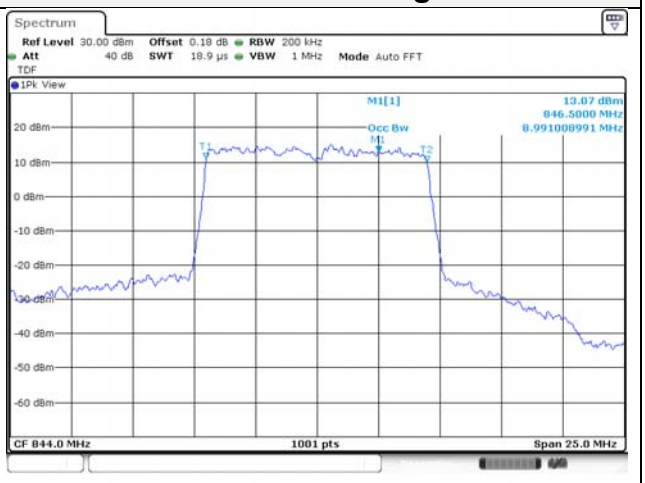
3M BW QPSK High ch.



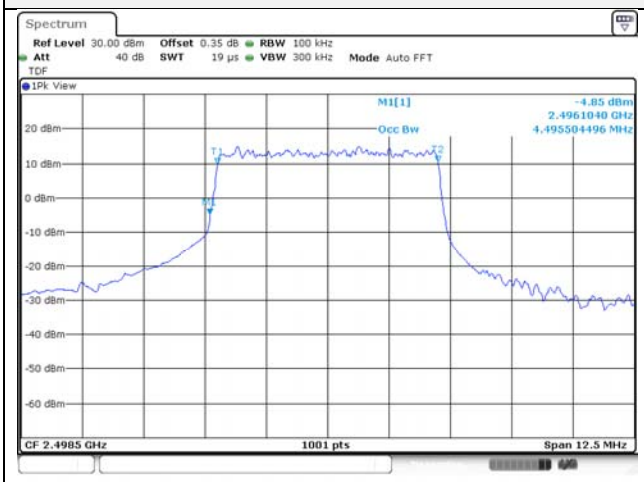
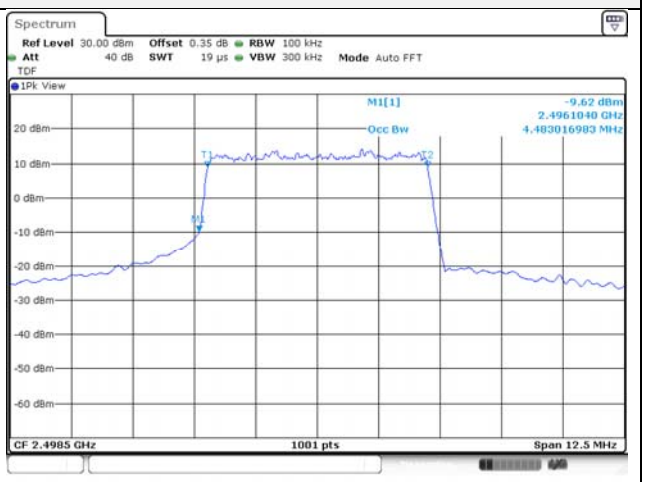
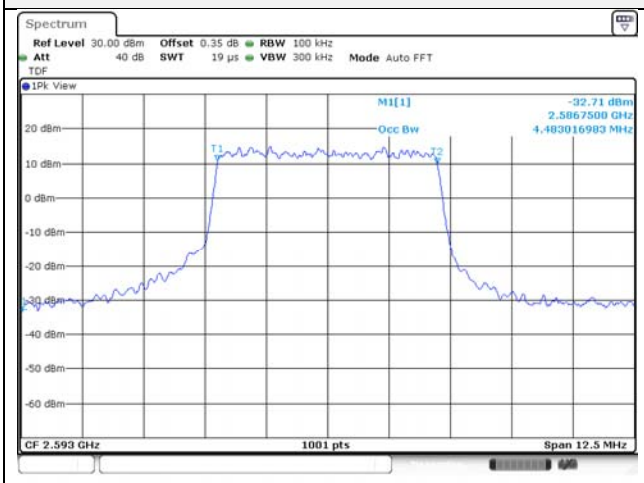
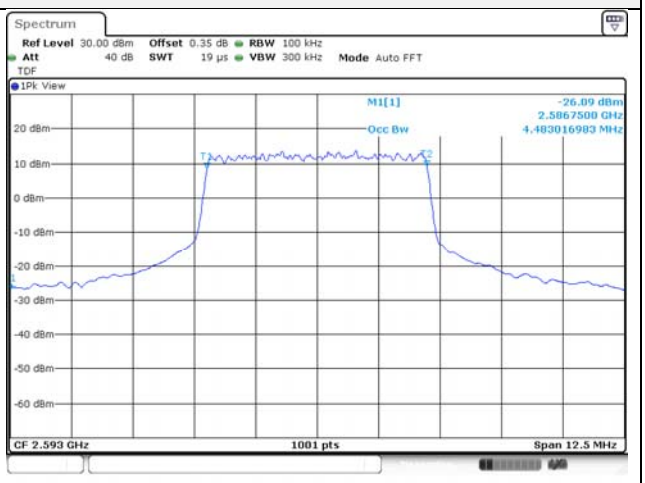
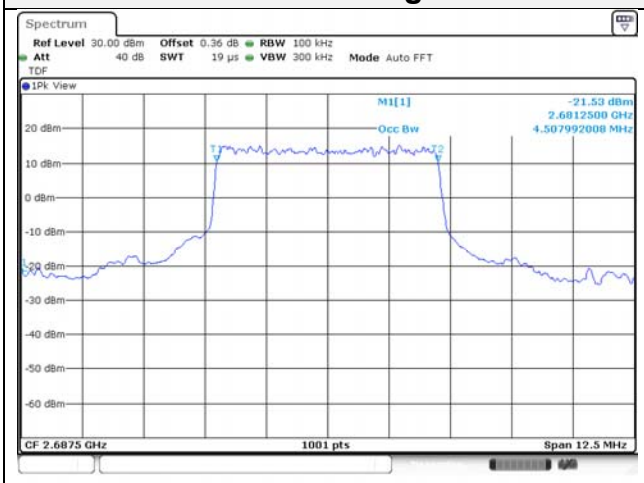
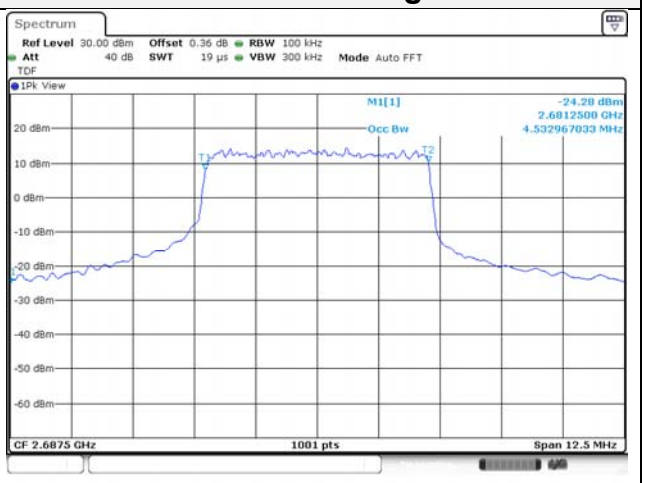
3M BW 16QAM High ch.

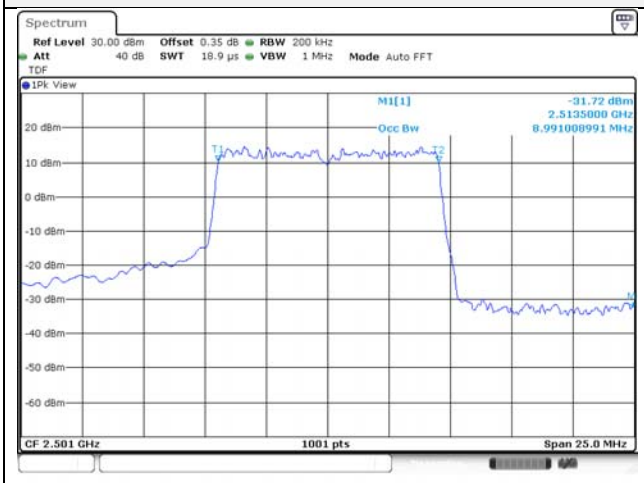
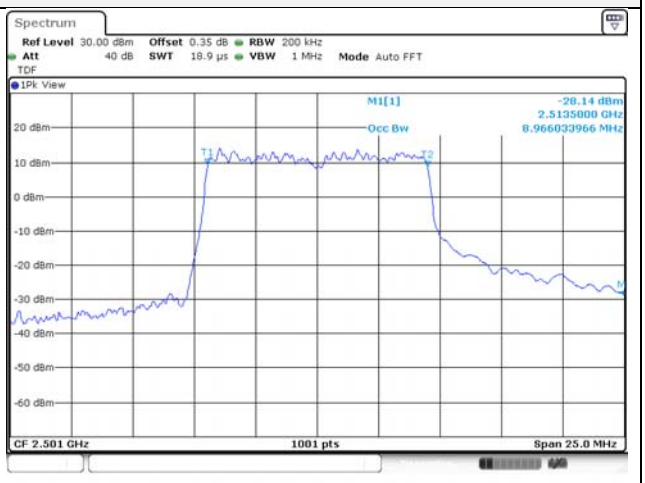
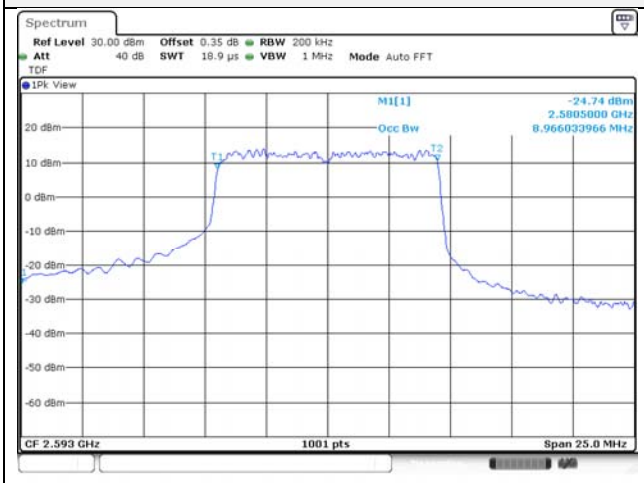
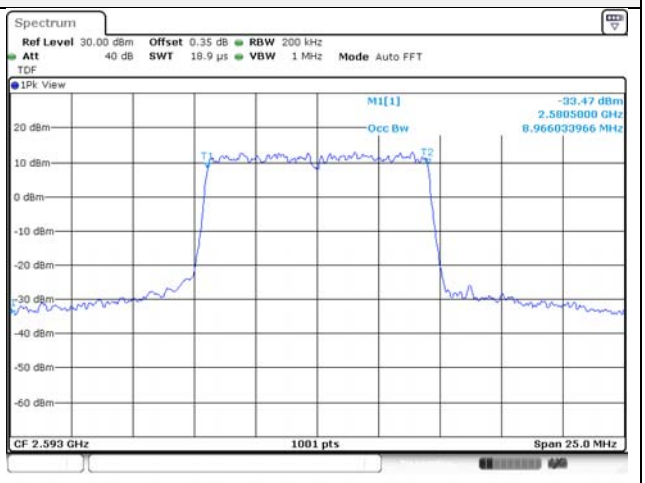
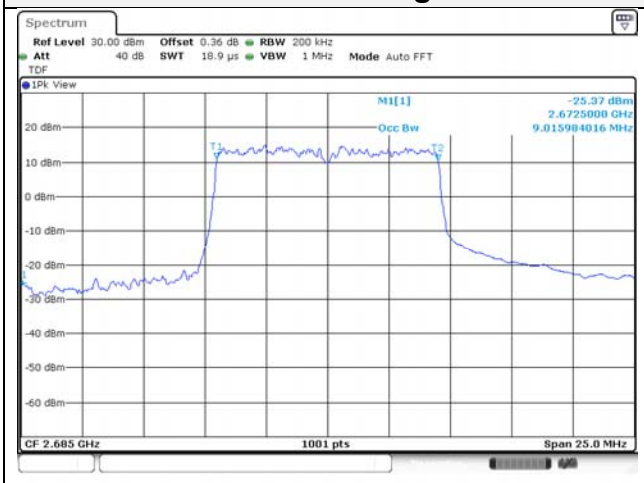
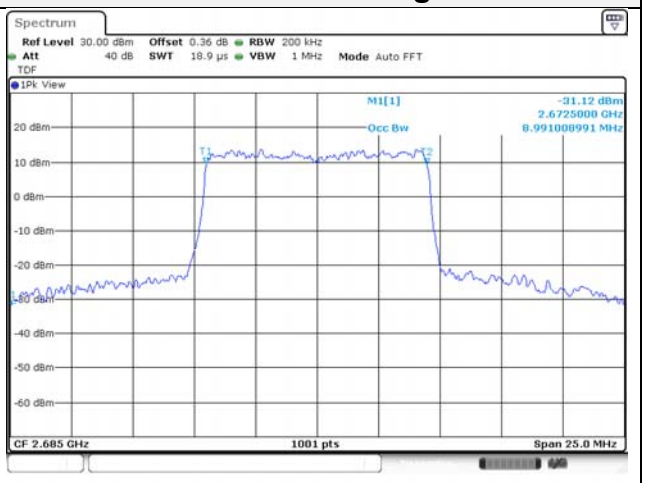


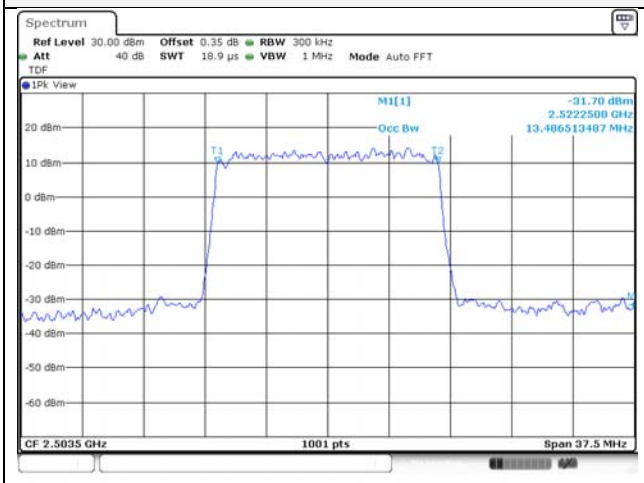
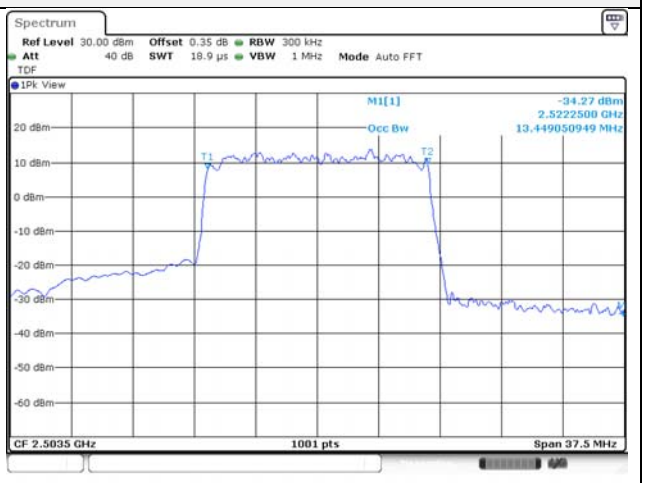
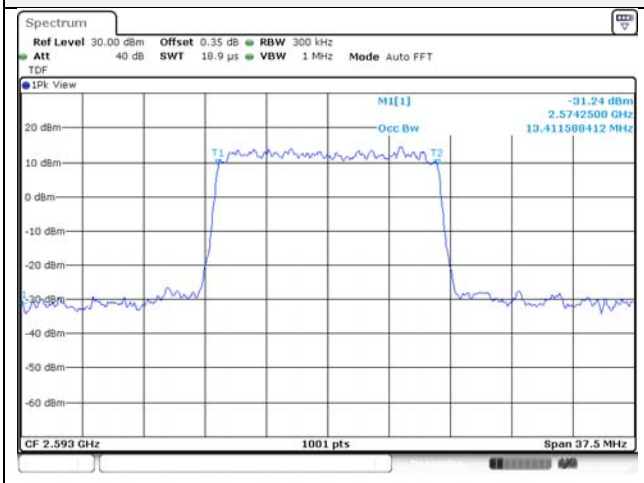
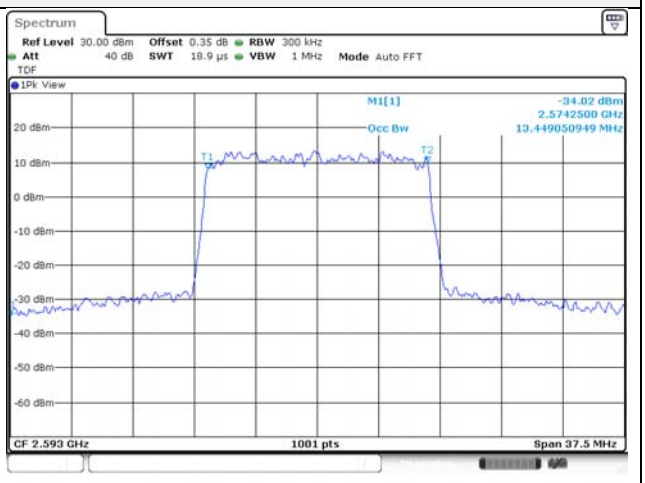
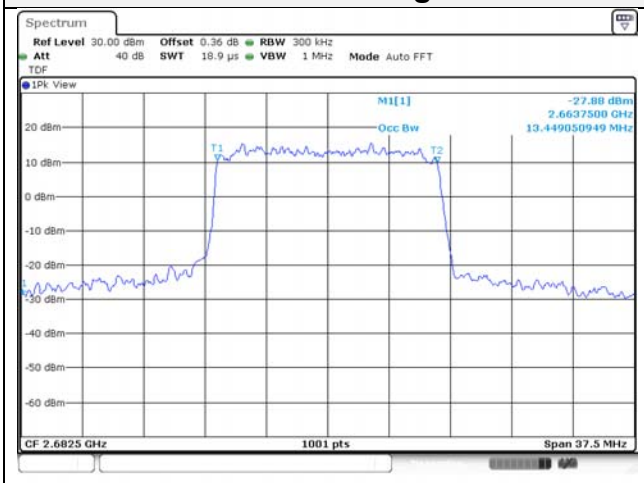
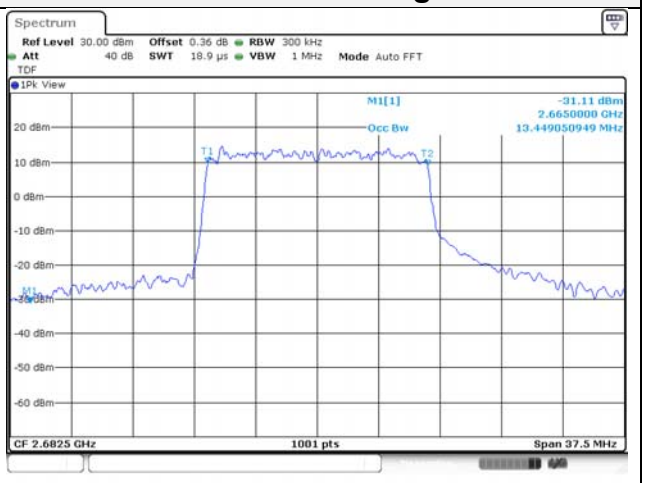
5M BW QPSK Low ch.	5M BW 16QAM Low ch.
	
5M BW QPSK Mid ch.	**5M BW 16QAM Mid ch.**
	
5M BW QPSK High ch.	**5M BW 16QAM High ch.**
	

10M BW QPSK Low ch.	10M BW 16QAM Low ch.
	
10M BW QPSK Mid ch.	**10M BW 16QAM Mid ch.**
	
10M BW QPSK High ch.	**10M BW 16QAM High ch.**
	

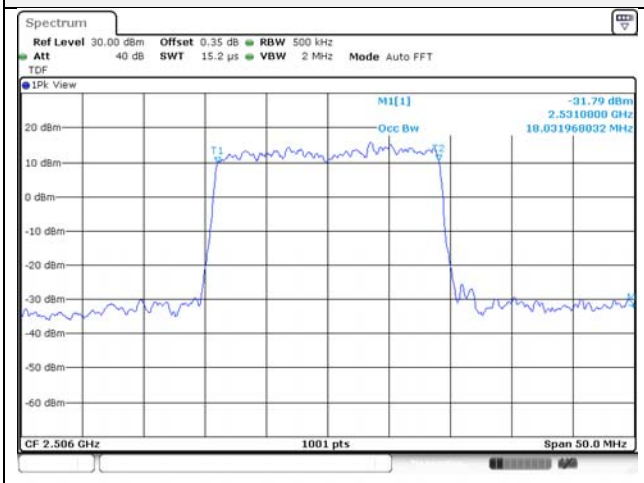
Test mode: LTE Band 41

5M BW QPSK Low ch.	5M BW 16QAM Low ch.
	
5M BW QPSK Mid ch.	**5M BW 16QAM Mid ch.**
	
5M BW QPSK High ch.	**5M BW 16QAM High ch.**
	

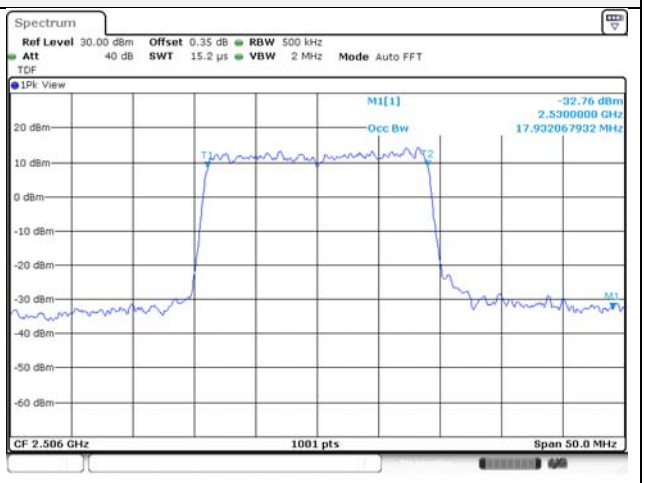
10M BW QPSK Low ch.	10M BW 16QAM Low ch.
	
10M BW QPSK Mid ch.	**10M BW 16QAM Mid ch.**
	
10M BW QPSK High ch.	**10M BW 16QAM High ch.**
	

15M BW QPSK Low ch.	15M BW 16QAM Low ch.
	
15M BW QPSK Mid ch.	**15M BW 16QAM Mid ch.**
	
15M BW QPSK High ch.	**15M BW 16QAM High ch.**
	

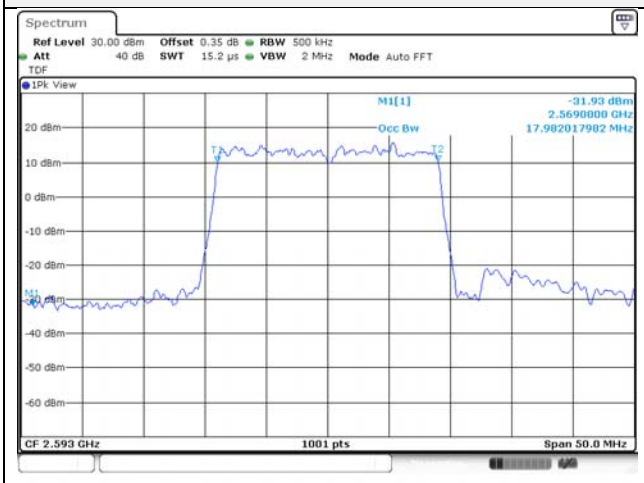
20M BW QPSK Low ch.



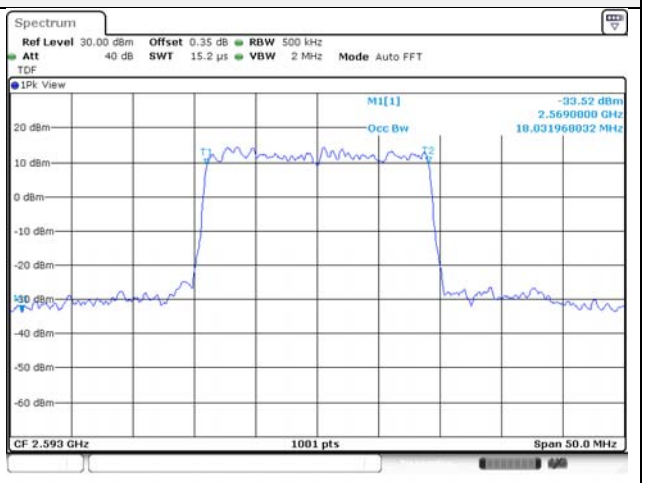
20M BW 16QAM Low ch.



20M BW QPSK Mid ch.

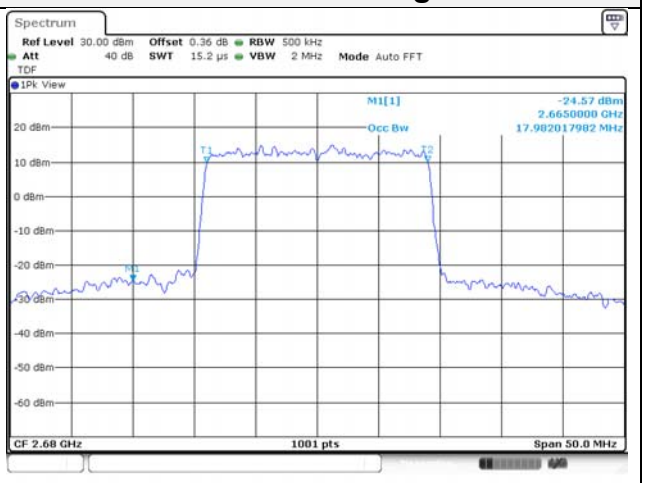


20M BW 16QAM Mid ch.



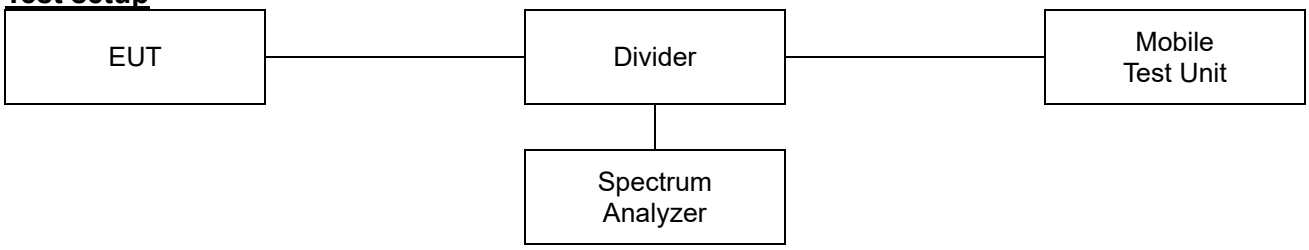
20M BW QPSK High ch.

20M BW 16QAM High ch.



8.3. Spurious Emissions at Antenna Terminal

Test setup



Limit

According to §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log($P_{[Watts]}$) ㏈.

According to §27.53(m)(4), the minimum permissible attenuation level of any spurious emission is 55 + 10log($P_{[Watts]}$) ㏈.

Test procedure

971168 D01 v03r01 - Section 6
ANSI 63.26-2015 – Section 5.7

Test settings

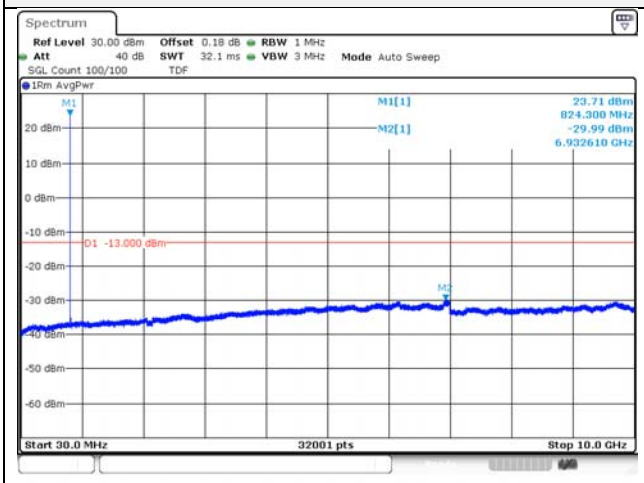
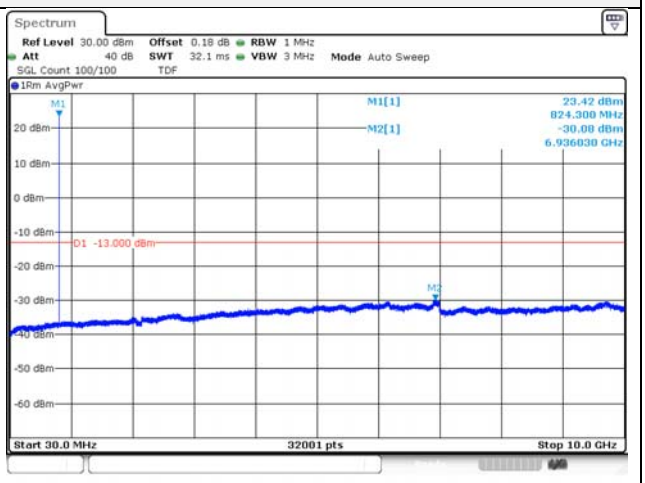
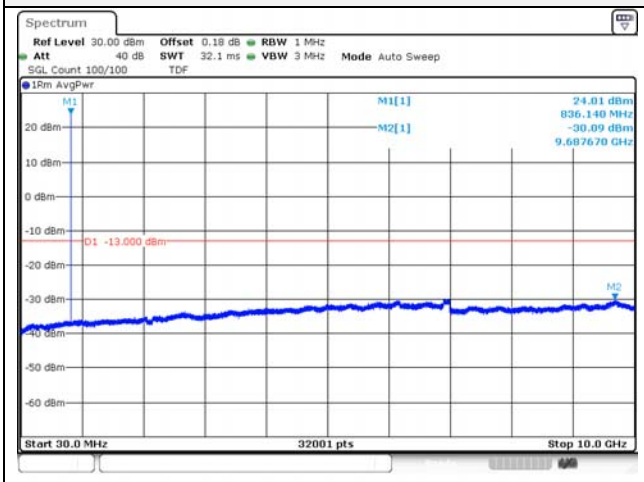
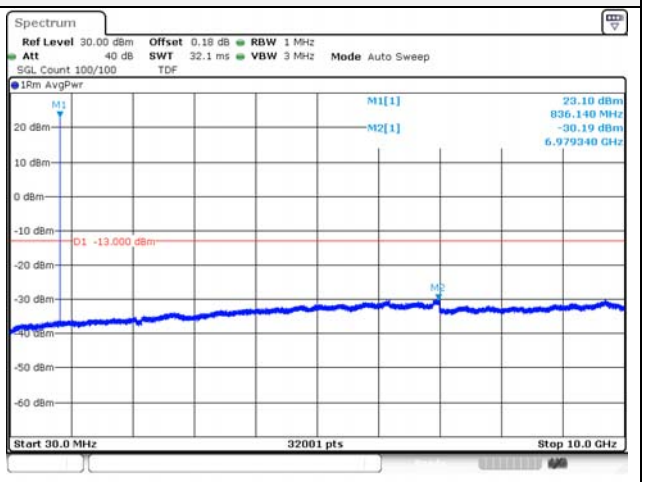
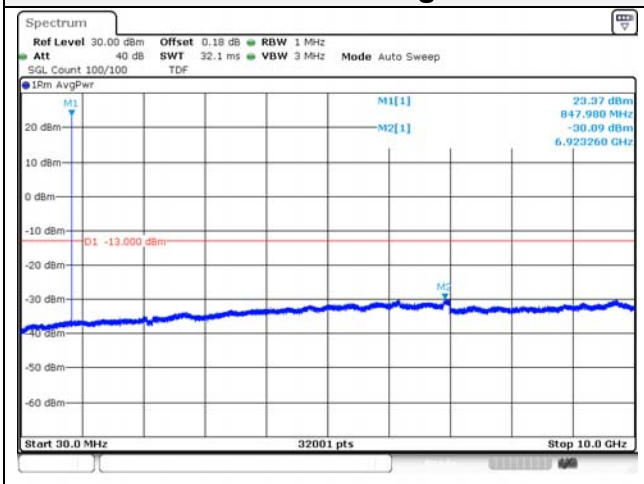
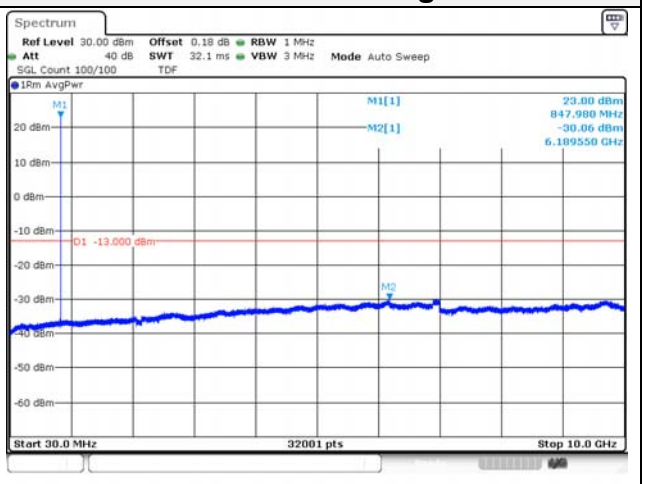
1) Start frequency was set to 30 ㎒ and stop frequency was set to at least 10th the fundamental frequency.
2) Detector = RMS
3) Sweep time = auto couple.
4) Trace mode = trace average
5) Allow trace to fully stabilize.
6) Please see test notes below RBW and VBW settings.

Notes:

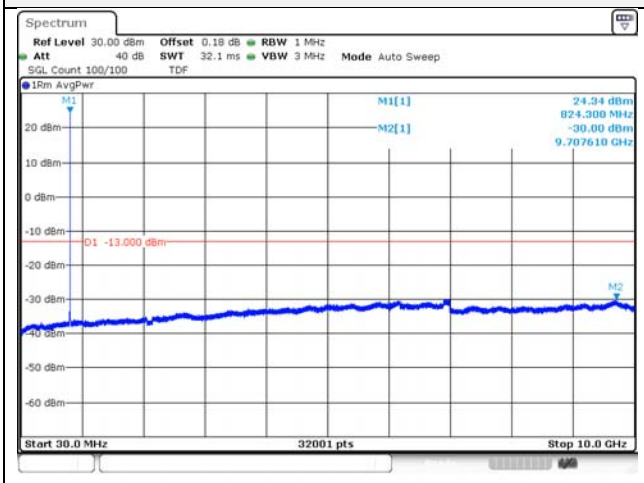
1. Per 22.917(b) and 27.53(m)(6), compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater for frequencies less than 1 ㎓ and 1 ㎒ or greater for frequencies greater than 1 ㎓. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 ㏈ below the transmitter power.

Test results

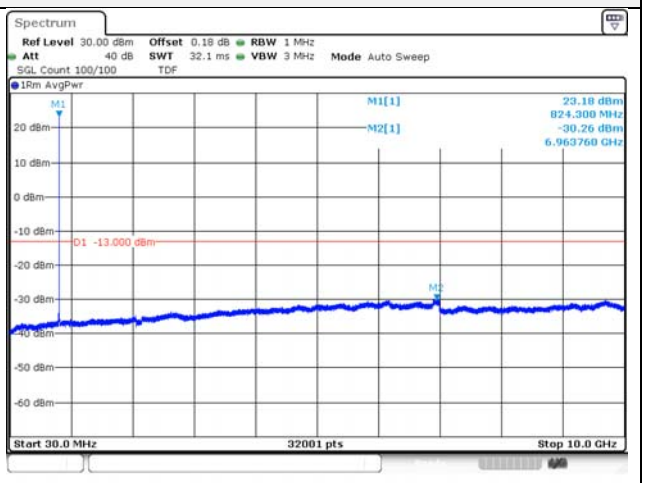
Test mode: LTE Band 5

1.4M BW QPSK Low ch.	1.4M BW 16QAM Low ch.
	
1.4M BW QPSK Mid ch.	**1.4M BW 16QAM Mid ch.**
	
1.4M BW QPSK High ch.	**1.4M BW 16QAM High ch.**
	

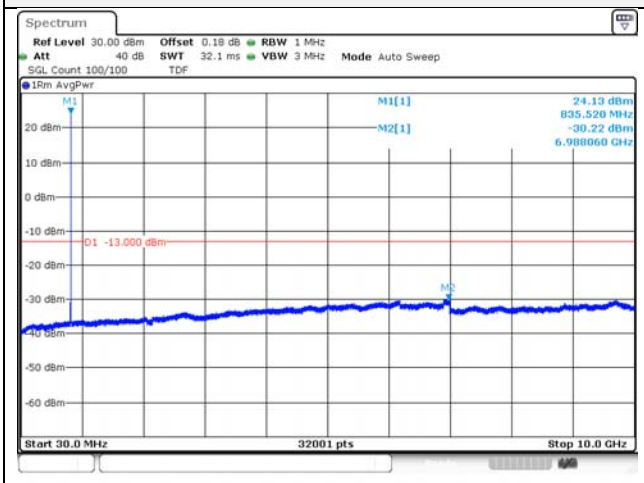
3M BW QPSK Low ch.



3M BW 16QAM Low ch.



3M BW QPSK Mid ch.



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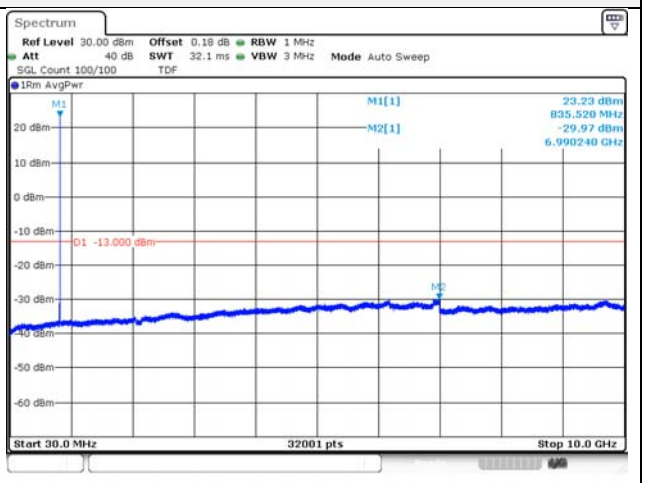
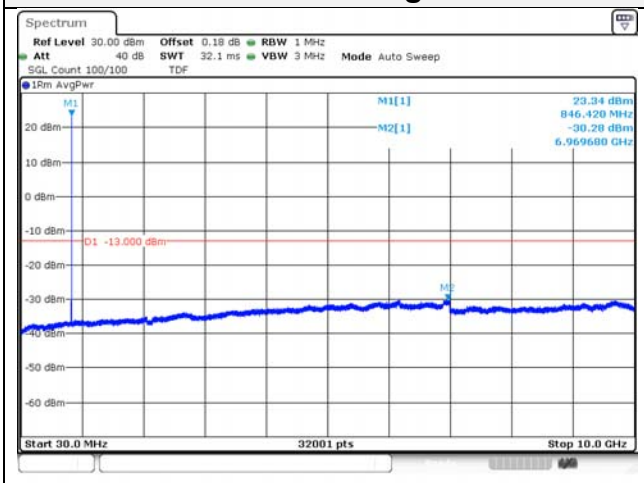


3M BW QPSK High ch.



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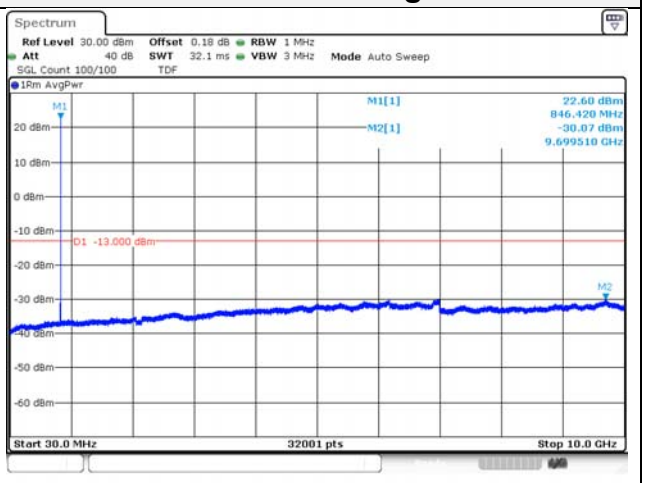
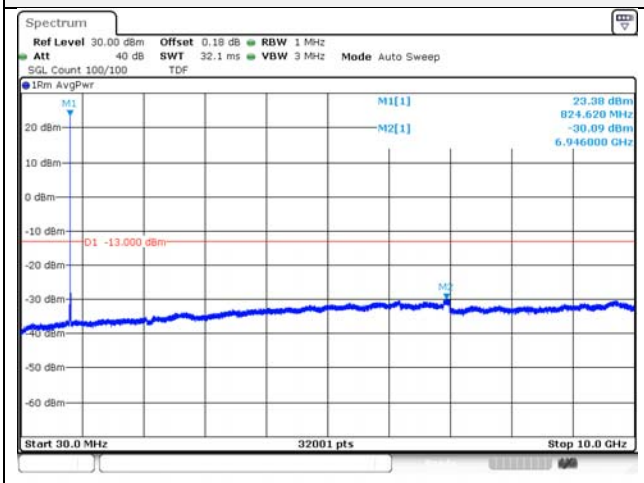
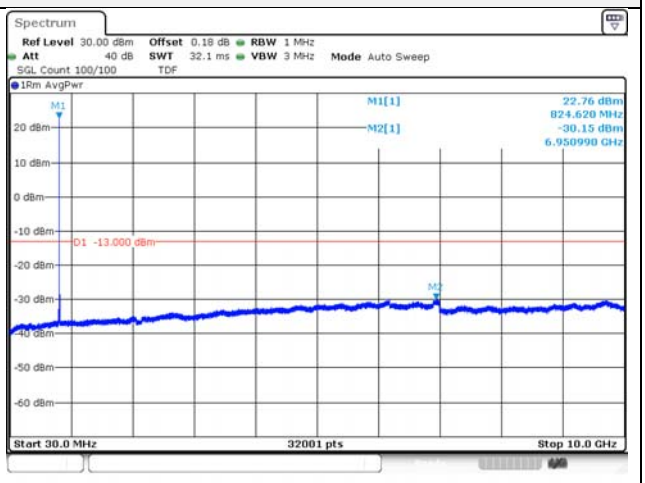
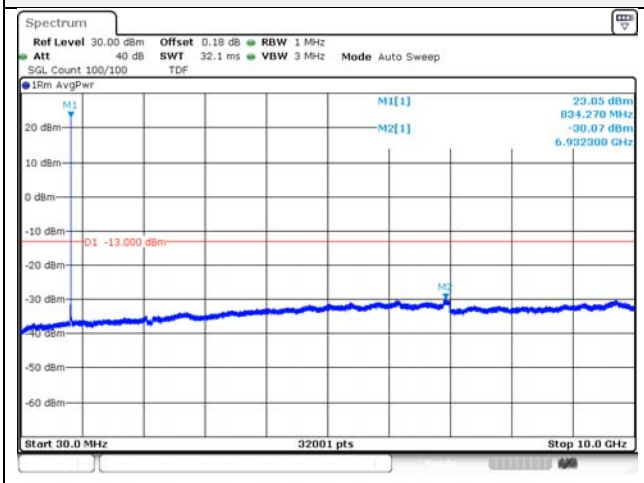
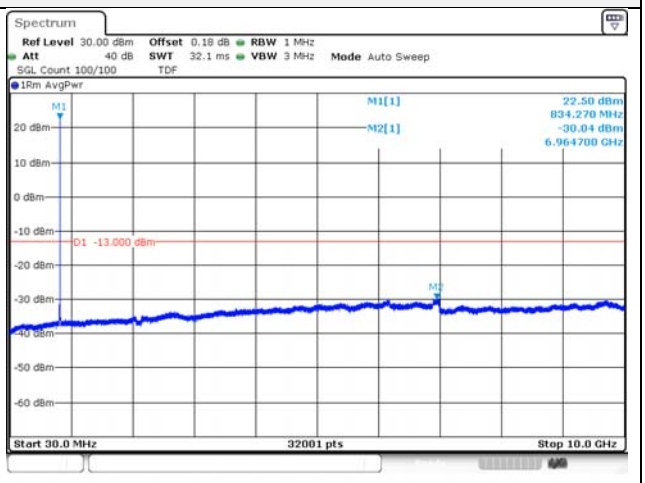


5M BW QPSK Low ch.	5M BW 16QAM Low ch.
	
5M BW QPSK Mid ch.	**5M BW 16QAM Mid ch.**
	
5M BW QPSK High ch.	**5M BW 16QAM High ch.**