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TEST REPORT

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1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2019-10-25

2. Use of Report : -

3. Name of Product and Model : Mobile phone / SM-A515F/DS

4. Manufacturer and Country of Origin : SAMSUNG ELECTRONICS VIETNAM CO.,LTD. / Vietnam

5. FCC ID : A3LSMA515F

6. Date of Test : 2019-11-11 to 2019-11-27

7. Test Standards : FCC Part 2
FCC Part 22 Subpart H
FCC Part 90 Subpart S

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

Affirmation	Tested by Name : Euijung Kim (Signature)	Technical Manager Name : Jaehyong Lee (Signature)

2019-12-09

KCTL Inc.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

Report revision history

Date	Revision	Page No
2019-11-28	Initial report	-
2019-12-09	Updated	12 ~ 14

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Note. The report No. KR19-SRF0194 is superseded by the report No. KR19-SRF0194-A.

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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 VIETNAM CO.,LTD.
Address	:	Kcn Yen Binh1, huyen pho Yen Tinh Thai Nguyen 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-A515F/DS
Derivative model	:	SM-A515F
Modulation technique	:	Bluetooth(BDR/EDR)_ GFSK, π/4DQPSK, 8DPSK
		Bluetooth(BLE), ANT+_GFSK
		WIFI(802.11b/g/n20/n40/ac20/ac40/ac80)_DSSS, OFDM
		LTE_QPSK, 16QAM
		WCDMA_QPSK
		GSM_GMSK, 8-PSK
Number of channels	:	Bluetooth(BDR/EDR), ANT+_79ch / Bluetooth(BLE)_40ch
		11 ch: 802.11b/g/n_HT20
		UNII-1: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)
		UNII-2A: 4 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)
		UNII-2C: 12 ch (20 MHz), 6 ch (40 MHz), 3 ch (80 MHz)
		UNII-3: 5 ch (20 MHz), 2 ch (40 MHz), 1 ch (80 MHz)
Power source	:	DC 3.85 V
Antenna specification	:	LTE/WCDMA_FPCB Antenna
		WIFI/Bluetooth(BDR/EDR/BLE)_FPCB Antenna
Antenna gain	:	WIFI/Bluetooth(BDR/EDR/BLE) : -4.70 dBi
		UNII-1 -4.10 dBi
		UNII-2A -4.74 dBi
		UNII-2C -3.92 dBi
		UNII-3 -4.40 dBi

Frequency range	:	Bluetooth(BDR/EDR/BLE), ANT+_2 402 ㎒ ~ 2 480 ㎒
		2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20)
		UNII-1: 5 180 ㎒ ~ 5 240 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-1: 5 190 ㎒ ~ 5 230 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-1: 5 210 ㎒ (802.11ac_VHT80)
		UNII-2A: 5 260 ㎒ ~ 5 320 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-2A: 5 270 ㎒ ~ 5 310 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-2A: 5 290 ㎒ (802.11ac_VHT80)
		UNII-2C: 5 500 ㎒ ~ 5 720 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-2C: 5 510 ㎒ ~ 5 710 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-2C: 5 530 ㎒ ~ 5 690 ㎒ (802.11ac_VHT80)
		UNII-3: 5 745 ㎒ ~ 5 825 ㎒ (802.11a/n_HT20/ac_VHT20)
		UNII-3: 5 755 ㎒ ~ 5 795 ㎒ (802.11n_HT40/ac_VHT40)
		UNII-3: 5 775 ㎒ (802.11ac_VHT80)
		LTE Band 2_1 850.7 ㎒ ~ 1 909.3 ㎒
		LTE Band 4_1 710.7 ㎒ ~ 1 754.3 ㎒
		LTE Band 5_824.7 ㎒ ~ 848.3 ㎒
		LTE Band 12_699.7 ㎒ ~ 715.3 ㎒
		LTE Band 13_779.5 ㎒ ~ 784.5 ㎒
		LTE Band 17_706.5 ㎒ ~ 713.5 ㎒
		LTE Band 26_824.7 ㎒ ~ 848.3 ㎒, 814.7 ㎒ ~ 823.3 ㎒
		LTE Band 41_2 498.5 ㎒ ~ 2 687.5 ㎒
		LTE Band 66_1 710.7 ㎒ ~ 1 779.3 ㎒
		GSM 850_824.2 ㎒ ~ 848.8 ㎒
		GSM 1900_1 850.2 ㎒ ~ 1 909.8 ㎒
		WCDMA 850_826.4 ㎒ ~ 846.6 ㎒
		WCDMA 1700_1 712.4 ㎒ ~ 1 752.6 ㎒
		WCDMA 1910_1 852.4 ㎒ ~ 1 907.6 ㎒
Software version	:	A515F.001
Hardware version	:	REV0.1
Test device serial No.	:	Conducted(cecbed2e6a3f7e34)
		Radiated(R38MA05XG0M, R38MA05WHQF)
Operation temperature	:	-30 ℃ ~ 50 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
Earphone	Samsung Electronics Co., Ltd.	EHS61ASFBE	-	-
Travel Adapter	Samsung Electronics Co., Ltd.	EP-TA200	R37M6LAKG31DK3	AC 100-240V 50-60 Hz, 9.0V-1.67A 5.0V-2.0A
Micro USB Data Cable	Samsung Electronics Co., Ltd.	-	-	-

2.2. Information about derivative model

The difference between basic model and derivative models is:

SM-A515F
- It does not support Dual-Sim card, support Single-Sim card and changed from Dual SIM tray to single SIM tray.

2.3. Frequency/channel operations

This device contains the following capabilities:
WIFI(2.4㎓ band 802.11b/g/n(HT20), 5㎓ band 802.11a/n(HT20/HT40)/ac(VHT/20/40/80)), Bluetooth(BDR/EDR/BLE), ANT+
LTE Band 2, LTE Band 4, LTE Band 5, LTE Band 12, LTE Band 13, LTE Band 17, LTE Band 26, LTE Band41, WCDMA 850, WCDMA 1700, WCDMA 1900, GSM 850, GSM 1900

LTE Band 26

Ch.	Frequency (㎒)
26697	814.7
26797	824.7
26783	823.3
26915	836.5
27033	848.3

Table 2.3.1. 1.4M BW

Ch.	Frequency (㎒)
26705	815.5
26775	822.5
26805	825.5
26915	836.5
27025	847.5

Table 2.3.2. 3M BW

Ch.	Frequency (㎒)
26715	816.5
26765	821.5
26815	826.5
26915	836.5
27015	846.5

Table 2.3.3. 5M BW

Ch.	Frequency (㎒)
26740	819.0
26840	829.0
26915	836.5
26990	844.0

Table 2.3.4. 10M BW

Ch.	Frequency (㎒)
26765	821.5
26865	831.5
26965	841.5

Table 2.3.5. 15M BW

3. Maximum ERP/EIRP power

LTE Band 26

Mode	Tx frequency (MHz)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
LTE Band 26 (Part 90S)	814.7 ~ 823.3	1M10G7D	18.69	0.074
		1M10W7D	17.41	0.055
	815.5 ~ 822.5	2M71G7D	18.50	0.071
		2M71W7D	17.60	0.058
	816.5 ~ 821.5	4M52G7D	18.64	0.073
		4M53W7D	17.72	0.059
	819.0	8M99G7D	18.43	0.070
		8M99W7D	17.23	0.053
	821.5	13M5G7D	18.43	0.070
		13M5W7D	17.40	0.055
LTE Band 26 (Part 22H)	824.7 ~ 848.3	1M11G7D	18.75	0.075
		1M10W7D	17.60	0.058
	825.5 ~ 847.5	2M72G7D	18.90	0.078
		2M71W7D	17.68	0.059
	826.5 ~ 846.5	4M55G7D	17.95	0.062
		4M53W7D	16.94	0.049
	829.0 ~ 844.0	9M08G7D	17.72	0.059
		9M04W7D	16.88	0.049
	831.5 ~ 841.5	13M6G7D	17.69	0.059
		13M5W7D	16.62	0.046
Straddle channel	824.0	1M10G7D	19.18	0.083
		1M09W7D	18.09	0.064
		2M71G7D	19.35	0.086
		2M72W7D	18.07	0.064
		4M55G7D	19.21	0.083
		4M56W7D	19.09	0.081
		9M02G7D	19.19	0.083
		9M07W7D	18.08	0.064
		13M5G7D	19.29	0.085
		13M5W7D	18.11	0.065

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4. Summary of tests

FCC Part section(s)	Parameter	Test Limit	Test Condition	Test results
2.1046 90.635	Conducted Output Power	< 100 Watts	Conducted	Pass
2.1049	Occupied Bandwidth & 26 dB Bandwidth	N/A		Pass
2.1051 22.917(a) 90.691(a)	Band Edge Emissions at Antenna Terminal	>43 + 10Log$_{10}$(P) dB for all out-of-band emissions except >50 10Log$_{10}$(P) dB at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge		Pass
	Spurious Emissions at Antenna Terminal			Pass
2.1055 22.355 90.213	Frequency stability	< 2.5 ppm		Pass
22.913(a)(5)	Effective Radiated Power	< 7 Watts max. ERP	Radiated	Pass
2.1053 22.917(a) 90.691(a)	Radiated Spurious Emissions	>43 + 10Log$_{10}$(P) dB for all out-of-band emissions except		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
2. Per evaluation report, all of the data contained herein is re-used from the reference FCC ID : A3LSMA515FN

4.1. 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. All final radiated testing was performed with the EUT in worst case orientation.
3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that Z orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Z orientation

Test condition	LTE Band	Modulation	Bandwidth (㎒)	RB size	RB offset
Radiated	B26 (Part90)	QPSK	1.4	1	0
	B26 (Part22)		3	1	0
Conducted	B26 (Part90)	QPSK, 16QAM	1.4, 3, 5, 10, 15	1	0, 5, 14, 24, 49, 74
				Full	0
	B26 (Part22)		1.4, 3, 5, 10, 15	1	0, 5, 14, 24, 49, 74
				Full	0

5. 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	1.76 dB	
Conducted spurious emissions	4.03 dB	
Radiated spurious emissions	9 kHz ~ 30 MHz:	2.28 dB
	30 MHz ~ 1 GHz	3.68 dB
	Above 1 GHz	5.72 dB

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6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.
With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	16.06	11 000	18.29
50	16.14	12 000	18.60
100	16.17	13 000	18.67
200	16.27	14 000	19.16
300	16.27	15 000	19.25
400	16.30	16 000	19.33
500	16.37	17 000	19.58
600	16.46	18 000	19.65
700	16.46	19 000	20.10
800	16.55	20 000	20.11
900	16.58	21 000	20.28
1 000	16.61	22 000	20.36
2 000	16.93	23 000	20.37
3 000	17.18	24 000	20.51
4 000	17.34	25 000	20.64
5 000	17.59	26 000	20.68
6 000	17.75	26 500	20.72
7 000	17.99	27 000	20.94
8 000	18.18	28 000	21.00
9 000	18.23	29 000	21.68
10 000	18.26	30 000	21.79

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

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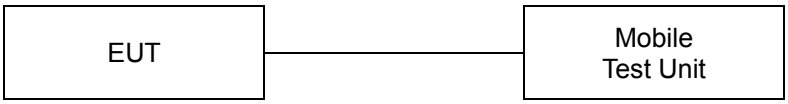
7. Test results

7.1. 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 26 (Part 90S)	1.4	QPSK	1	0	0	24.12	-	24.55
			1	3	0	24.08	-	24.53
			1	5	0	24.12	-	24.50
			3	0	0	24.12	-	24.48
			3	1	0	24.15	-	24.48
			3	3	0	24.16	-	24.44
			6	0	1	23.05	-	23.33
		16QAM	1	0	1	23.03	-	23.48
			1	3	1	22.91	-	23.54
			1	5	1	23.06	-	23.44
			3	0	1	23.09	-	23.49
			3	1	1	23.14	-	23.48
			3	3	1	23.14	-	23.49
			6	0	2	22.03	-	22.48
	3	QPSK	1	0	0	24.23	-	24.48
			1	8	0	24.23	-	24.41
			1	14	0	24.20	-	24.47
			8	0	1	23.12	-	23.37
			8	4	1	23.16	-	23.37
			8	7	1	23.11	-	23.35
			15	0	1	23.12	-	23.38
		16QAM	1	0	1	22.99	-	23.00
			1	8	1	22.91	-	23.49
			1	14	1	22.93	-	23.14
			8	0	2	22.17	-	22.40
			8	4	2	22.15	-	22.40
			8	7	2	22.19	-	22.39
			15	0	2	22.14	-	22.41
	5	QPSK	1	0	0	24.37	-	24.36
			1	12	0	24.38	-	24.40
			1	24	0	24.34	-	24.39
			12	0	1	23.16	-	23.33
			12	7	1	23.15	-	23.34
			12	13	1	23.14	-	23.32
			25	0	1	23.15	-	23.35
		16QAM	1	0	1	22.89	-	23.51
			1	12	1	22.93	-	23.38
			1	24	1	22.92	-	23.37
			12	0	2	22.09	-	22.33
			12	7	2	22.06	-	22.26
			12	13	2	22.02	-	22.30
			25	0	2	22.15	-	22.41
	10	QPSK	1	0	0	-	24.31	-
			1	25	0	-	24.30	-
			1	49	0	-	24.27	-
			25	0	1	-	23.15	-
			25	12	1	-	23.14	-
			25	25	1	-	23.10	-
			50	0	1	-	23.12	-
		16QAM	1	0	1	-	23.14	-
			1	25	1	-	23.10	-
			1	49	1	-	23.09	-
			25	0	2	-	22.12	-
			25	12	2	-	22.08	-
			25	25	2	-	22.12	-
			50	0	2	-	22.21	-
	15	QPSK	1	0	0	-	24.40	-
			1	36	0	-	24.32	-
			1	74	0	-	23.62	-
			36	0	1	-	23.34	-
			36	18	1	-	23.25	-
			36	37	1	-	23.27	-
			75	0	1	-	23.29	-
		16QAM	1	0	1	-	22.90	-
			1	36	1	-	23.02	-
			1	74	1	-	22.77	-
			36	0	2	-	22.23	-
			36	18	2	-	22.21	-
			36	37	2	-	22.21	-
			75	0	2	-	22.29	-

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Test Band	Bandwidth (MHz)	Test mode	RB size	RB offset	MPR	Maximum power Frequency (MHz) Low	Middle	High
LTE Band 26 (Part 22H)	1.4	QPSK	1	0	0	24.45	24.52	23.81
			1	3	0	24.40	24.41	23.78
			1	5	0	24.44	24.47	23.77
			3	0	0	24.48	24.41	23.82
			3	1	0	24.46	24.41	23.87
			3	3	0	24.41	24.40	23.85
			6	0	1	23.35	23.32	22.75
		16QAM	1	0	1	23.49	23.34	22.76
			1	3	1	23.50	23.31	22.73
			1	5	1	23.46	23.21	22.79
			3	0	1	23.50	23.25	22.76
			3	1	1	23.37	23.24	22.80
			3	3	1	23.33	23.18	22.71
			6	0	2	22.42	22.29	21.68
	3	QPSK	1	0	0	24.43	24.55	23.90
			1	8	0	24.44	24.56	23.89
			1	14	0	24.46	24.55	23.86
			8	0	1	23.36	23.32	22.77
			8	4	1	23.39	23.34	22.74
			8	7	1	23.38	23.32	22.76
			15	0	1	23.40	23.34	22.76
		16QAM	1	0	1	23.55	23.03	22.62
			1	8	1	23.50	23.31	22.60
			1	14	1	23.54	23.01	22.60
			8	0	2	22.39	22.22	21.75
			8	4	2	22.41	22.20	21.75
			8	7	2	22.39	22.21	21.75
			15	0	2	22.36	22.22	21.69
	5	QPSK	1	0	0	24.47	24.39	23.91
			1	12	0	24.45	24.41	23.96
			1	24	0	24.45	24.36	23.93
			12	0	1	23.44	23.34	22.79
			12	7	1	23.41	23.36	22.79
			12	13	1	23.40	23.32	22.82
			25	0	1	23.42	23.33	22.77
		16QAM	1	0	1	23.68	23.23	22.70
			1	12	1	23.78	23.44	22.70
			1	24	1	23.35	23.17	22.70
			12	0	2	22.27	22.27	21.72
			12	7	2	22.29	22.25	21.74
			12	13	2	22.27	22.26	21.71
			25	0	2	22.38	22.33	21.77
	10	QPSK	1	0	0	24.56	24.36	24.14
			1	25	0	24.56	24.30	24.06
			1	49	0	24.53	24.33	24.04
			25	0	1	23.47	23.37	23.01
			25	12	1	23.44	23.35	22.93
			25	25	1	23.41	23.31	22.94
			50	0	1	23.41	23.38	22.97
		16QAM	1	0	1	23.37	23.52	22.92
			1	25	1	23.40	23.35	22.88
			1	49	1	23.43	23.48	22.86
			25	0	2	22.41	22.30	22.02
			25	12	2	22.43	22.29	21.94
			25	25	2	22.41	22.27	21.95
			50	0	2	22.44	22.27	21.95
	15	QPSK	1	0	0	24.26	-	24.38
			1	36	0	24.56	-	24.25
			1	74	0	24.29	-	23.67
			36	0	1	23.41	-	23.13
			36	18	1	23.35	-	23.14
			36	37	1	23.34	-	23.09
			75	0	1	23.36	-	23.13
		16QAM	1	0	1	23.54	-	23.16
			1	36	1	23.49	-	23.09
			1	74	1	23.44	-	22.91
			36	0	2	22.43	-	22.09
			36	18	2	22.38	-	22.01
			36	37	2	22.33	-	22.00
			75	0	2	22.29	-	22.05

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Straddle channel

Test Band	Bandwidth (㎒)	Test mode	RB size	RB offset	MPR	Maximum power Frequency (㎒)
LTE Band 26 (Part 90S)	1.4	QPSK	1	0	0	24.26
			1	3	0	24.16
			1	5	0	24.27
			3	0	0	24.17
			3	1	0	24.15
			3	3	0	24.10
			6	0	1	23.15
		16QAM	1	0	1	23.30
			1	3	1	23.27
			1	5	1	23.31
			3	0	1	23.07
			3	1	1	23.06
			3	3	1	23.05
			6	0	2	22.16
	3	QPSK	1	0	0	24.09
			1	8	0	24.14
			1	14	0	24.10
			8	0	1	23.09
			8	4	1	23.04
			8	7	1	23.08
			15	0	1	23.14
		16QAM	1	0	1	22.97
			1	8	1	22.94
			1	14	1	22.95
			8	0	2	22.12
			8	4	2	22.10
			8	7	2	22.09
			15	0	2	22.10
	5	QPSK	1	0	0	24.22
			1	12	0	24.25
			1	24	0	24.27
			12	0	1	23.14
			12	7	1	23.13
			12	13	1	23.13
			25	0	1	23.12
		16QAM	1	0	1	23.10
			1	12	1	23.07
			1	24	1	23.03
			12	0	2	22.05
			12	7	2	22.11
			12	13	2	22.09
			25	0	2	22.10
	10	QPSK	1	0	0	24.56
			1	25	0	24.56
			1	49	0	24.53
			25	0	1	23.47
			25	12	1	23.44
			25	25	1	23.41
			50	0	1	23.41
		16QAM	1	0	1	23.37
			1	25	1	23.40
			1	49	1	23.43
			25	0	2	22.41
			25	12	2	22.43
			25	25	2	22.41
			50	0	2	22.44
	15	QPSK	1	0	0	24.16
			1	36	0	24.06
			1	74	0	23.89
			36	0	1	23.05
			36	18	1	23.05
			36	37	1	23.05
			75	0	1	23.03
		16QAM	1	0	1	22.79
			1	36	1	22.82
			1	74	1	22.79
			36	0	2	22.02
			36	18	2	22.01
			36	37	2	21.97
			75	0	2	22.04

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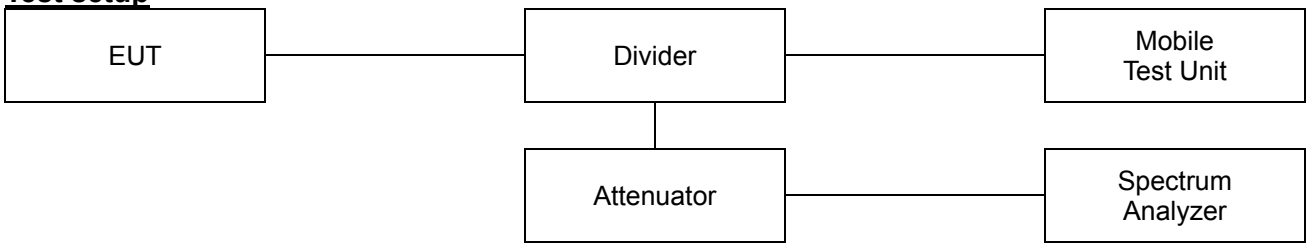
7.2. 99% Occupied Bandwidth & 26 dB Bandwidth

Test setup



Limit

According to §2.1049 ,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**

c) 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.

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

e) 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 upper 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 26 (Part 90S)	1.4	814.7	QPSK	1.35	1.10
			16QAM	1.35	1.10
		823.3	QPSK	1.36	1.10
			16QAM	1.34	1.10
	3	815.5	QPSK	3.16	2.71
			16QAM	3.14	2.71
		822.5	QPSK	3.10	2.71
			16QAM	3.15	2.71
	5	816.5	QPSK	5.46	4.51
			16QAM	5.40	4.53
		821.5	QPSK	5.46	4.52
			16QAM	5.52	4.52
	10	819.0	QPSK	10.69	8.99
			16QAM	10.37	8.99
	15	821.5	QPSK	15.21	13.45
			16QAM	15.25	13.45

Straddle channel

Test Band	Bandwidth (㎒)	Frequency (㎒)	Test mode	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
LTE Band 26 (Part 90S)	1.4	824	QPSK	1.36	1.10
			16QAM	1.33	1.09
	3	824	QPSK	3.07	2.71
			16QAM	3.13	2.72
	5	824	QPSK	5.59	4.55
			16QAM	5.51	4.56
	10	824	QPSK	10.66	9.02
			16QAM	10.34	9.07
	15	824	QPSK	15.36	13.49
			16QAM	15.21	13.49

Test Band	Bandwidth (㎒)	Frequency (㎒)	Test mode	26㏈ bandwidth (㎒)	99 % bandwidth (㎒)
LTE Band 26 (Part 22H)	1.4	824.7	QPSK	1.36	1.11
			16QAM	1.34	1.09
		836.5	QPSK	1.35	1.10
			16QAM	1.34	1.10
		848.3	QPSK	1.34	1.09
			16QAM	1.34	1.10
	3	825.5	QPSK	3.19	2.71
			16QAM	3.12	2.71
		836.5	QPSK	3.11	2.70
			16QAM	3.15	2.70
		847.5	QPSK	3.12	2.72
			16QAM	3.12	2.71
	5	826.5	QPSK	5.45	4.54
			16QAM	5.37	4.54
		836.5	QPSK	5.37	4.53
			16QAM	5.43	4.53
		846.5	QPSK	5.51	4.55
			16QAM	5.38	4.53
	10	829.0	QPSK	10.51	9.08
			16QAM	10.37	9.04
		836.5	QPSK	10.39	8.99
			16QAM	10.34	8.99
		844.0	QPSK	10.49	9.02
			16QAM	10.39	9.04
	15	831.5	QPSK	15.40	13.49
			16QAM	15.17	13.45
		841.5	QPSK	15.32	13.56
			16QAM	15.25	13.52

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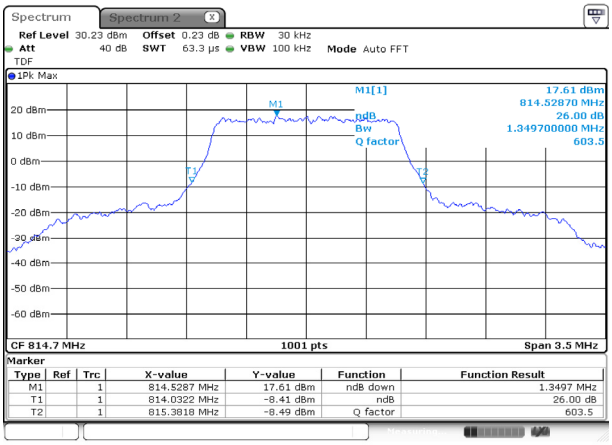
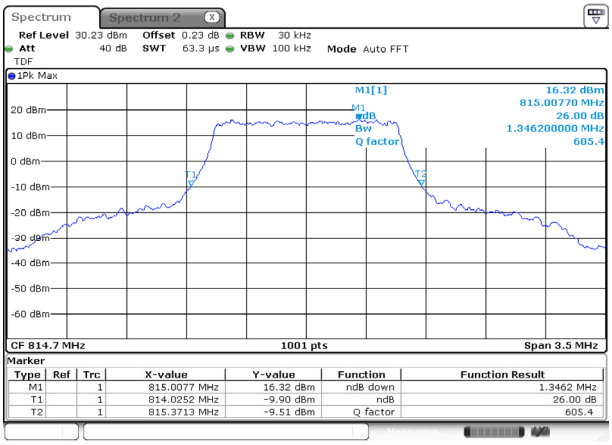
26dB Bandwidth

Test mode: LTE Band 26 (Part 90S)

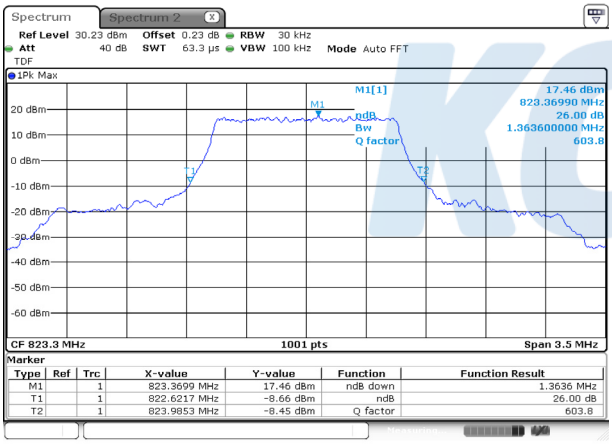
1.4M BW / QPSK / Low ch.



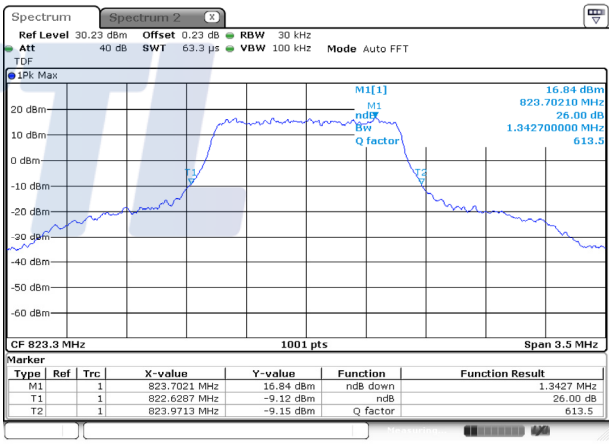
1.4M BW / 16QAM / Low ch.



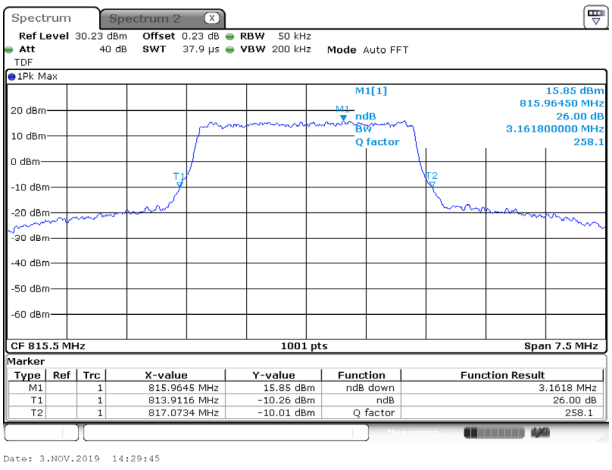
1.4M BW / QPSK / High ch.



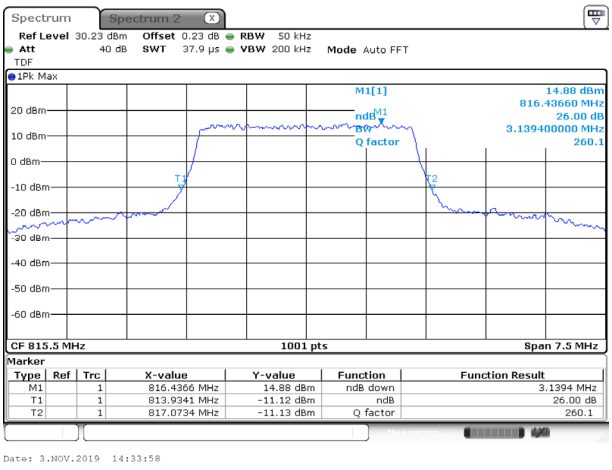
1.4M BW / 16QAM / High ch.



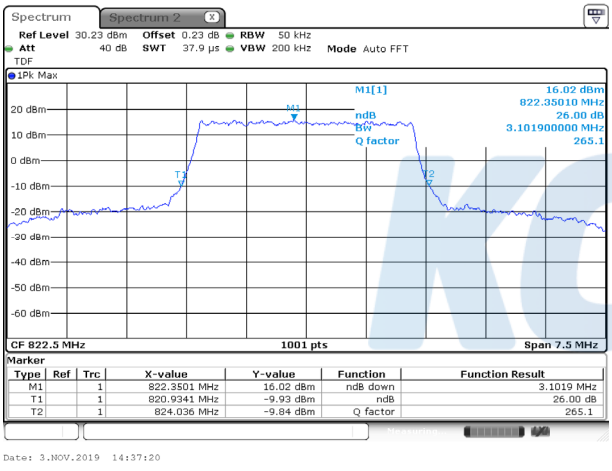
3M BW / QPSK / Low ch.



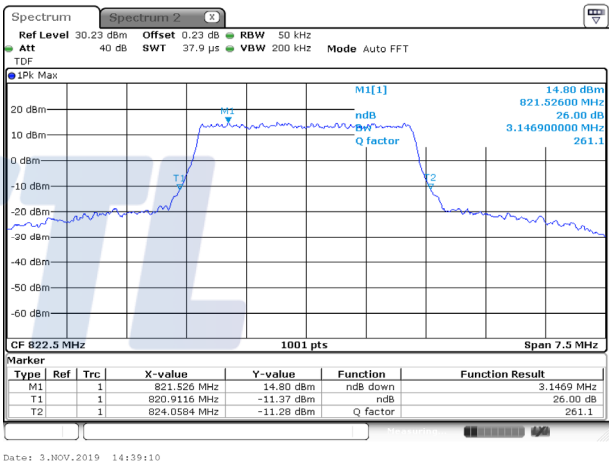
3M BW / 16QAM / Low ch.



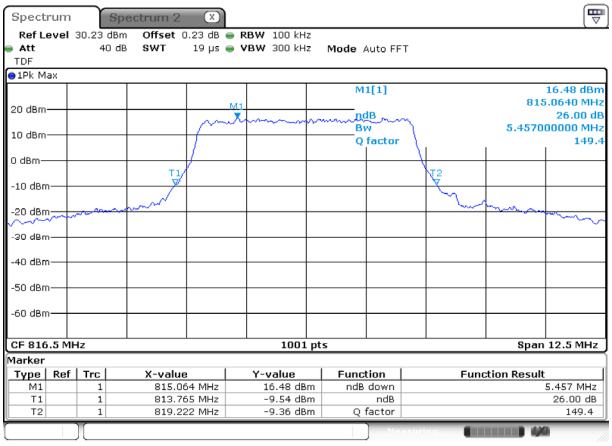
3M BW / QPSK / High ch.



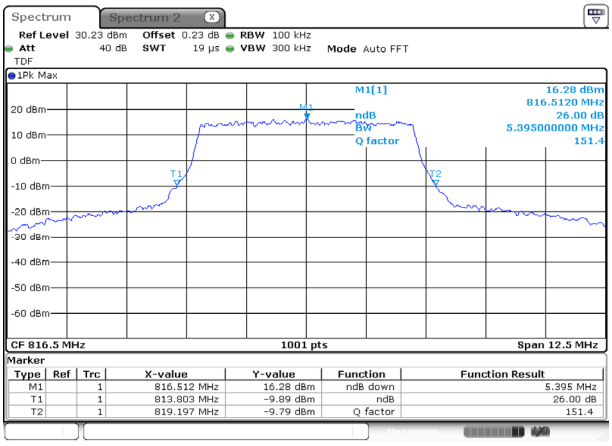
3M BW / 16QAM / High ch.



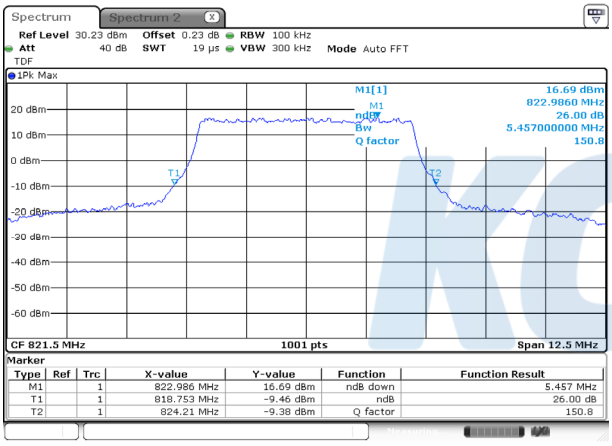
5M BW / QPSK / Low ch.



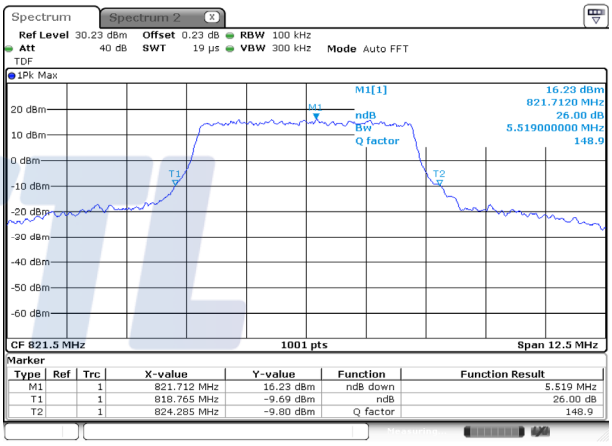
5M BW / 16QAM / Low ch.



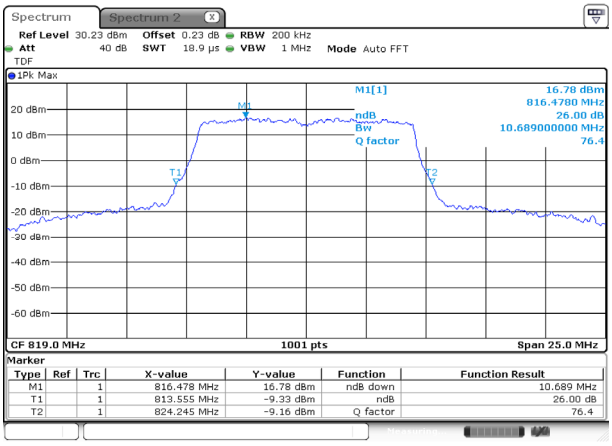
5M BW / QPSK / High ch.



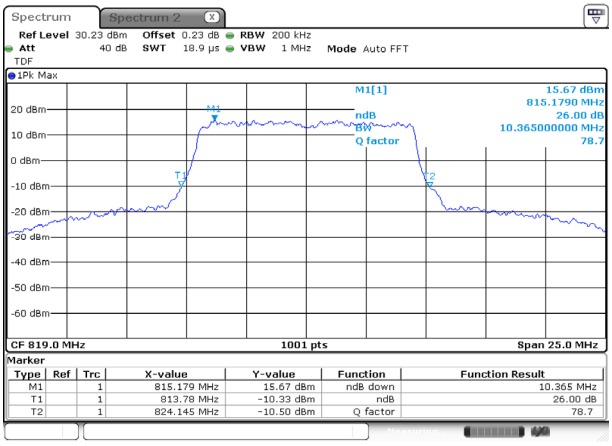
5M BW / 16QAM / High ch.



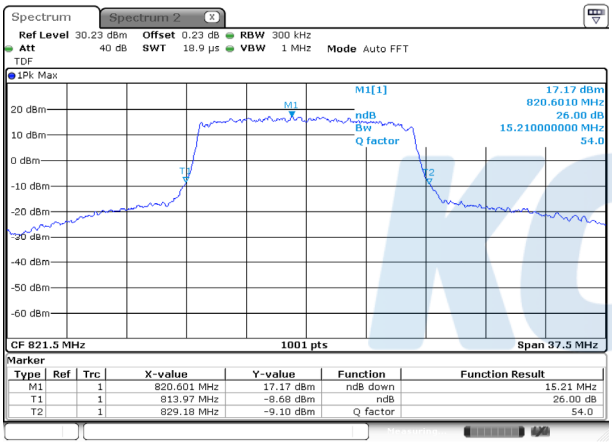
10M BW / QPSK / Mid ch.



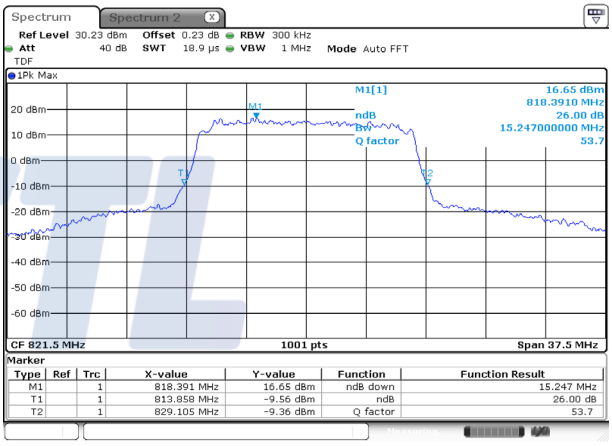
10M BW / 16QAM / Mid ch.



15M BW / QPSK / Mid ch.

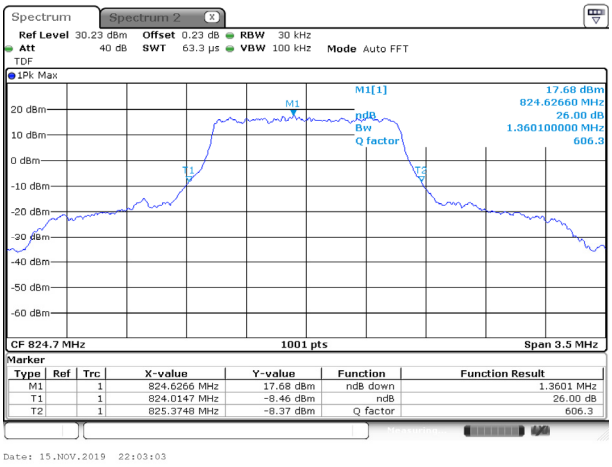


15M BW / 16QAM / Mid ch.

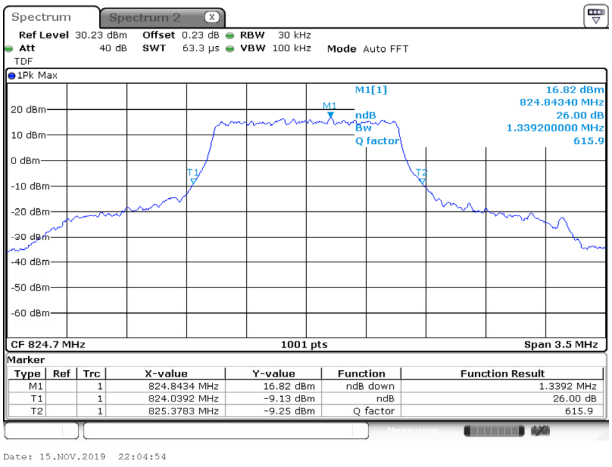


Test mode: LTE Band 26 (Part 22H)

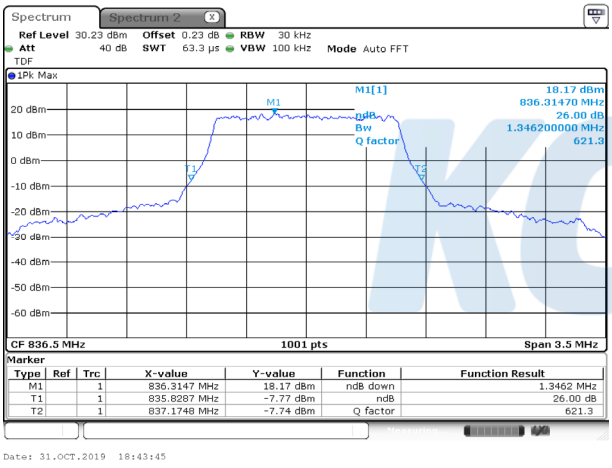
1.4M BW / QPSK / Low ch.



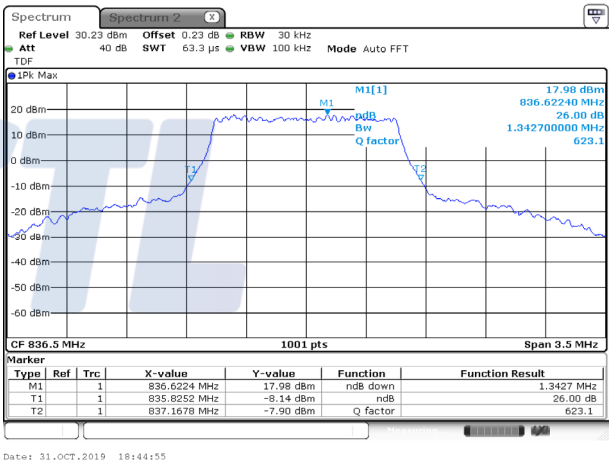
1.4M BW / 16QAM / Low ch.



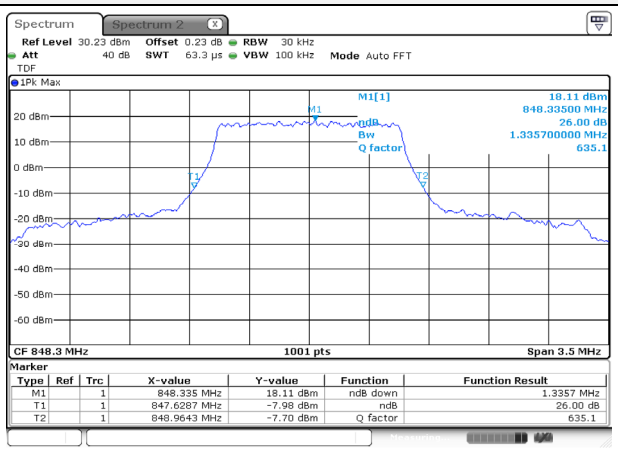
1.4M BW / QPSK / Mid ch.



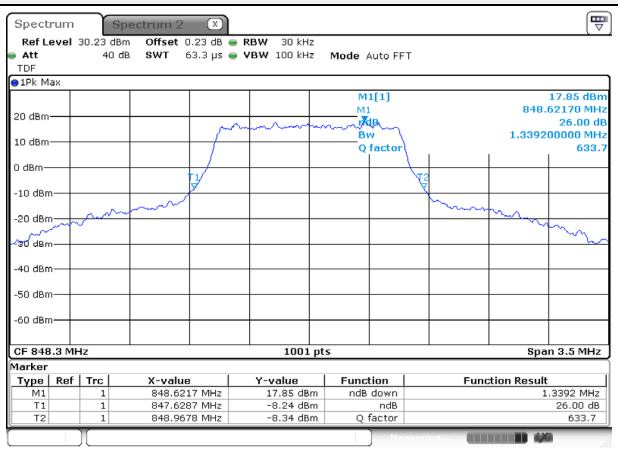
1.4M BW / 16QAM / Mid ch.



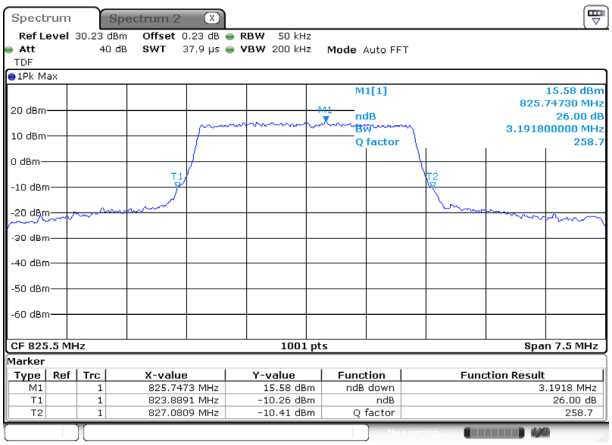
1.4M BW / QPSK / High ch.



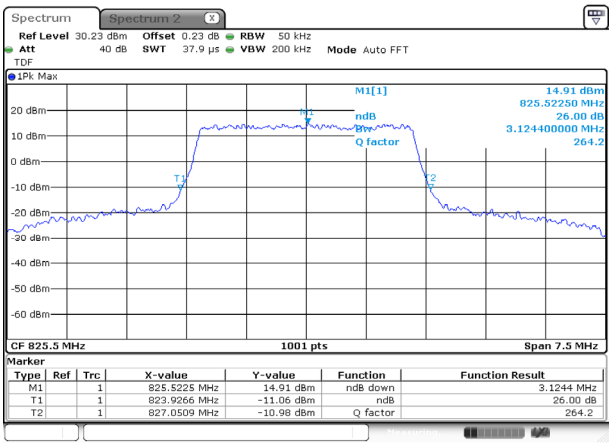
1.4M BW / 16QAM / High ch.



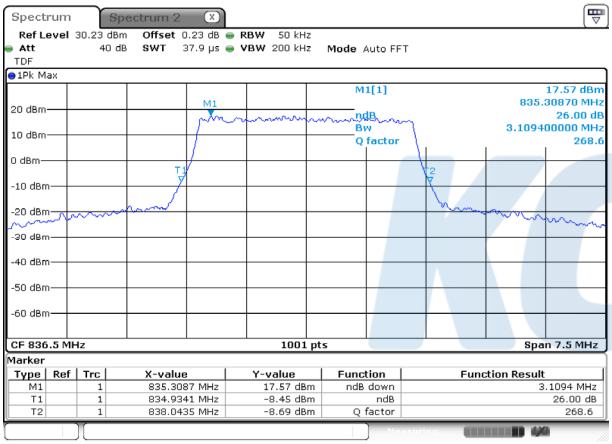
3M BW / QPSK / Low ch.



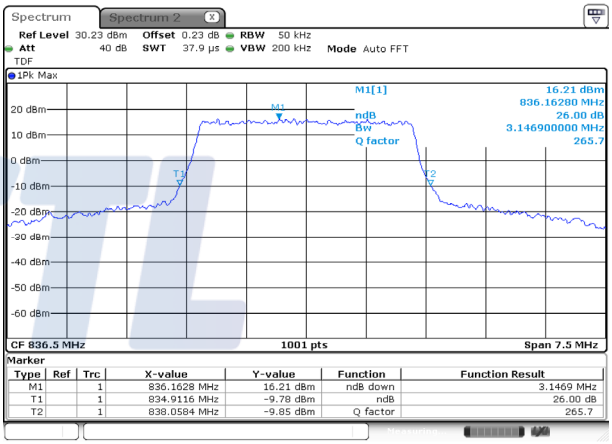
3M BW / 16QAM / Low ch.



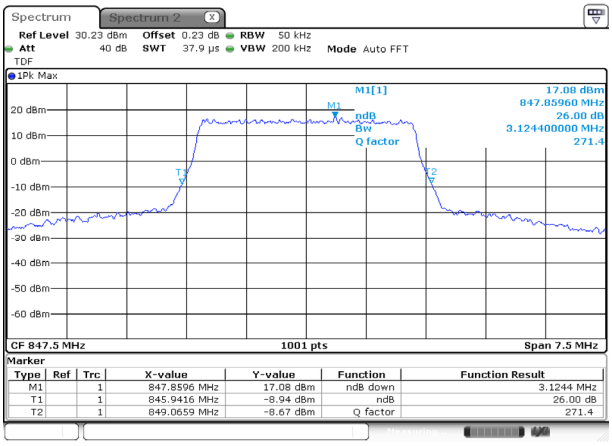
3M BW / QPSK / Mid ch.



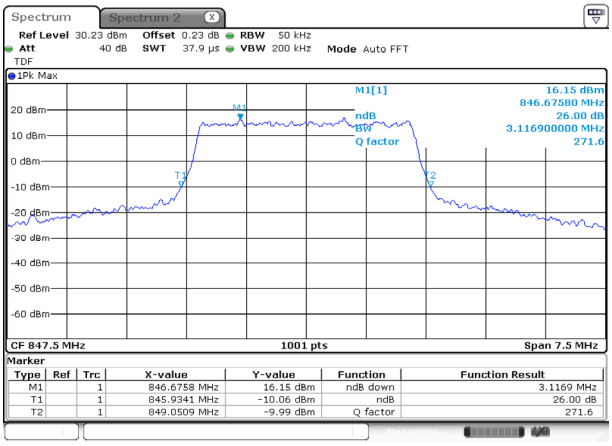
3M BW / 16QAM / Mid ch.



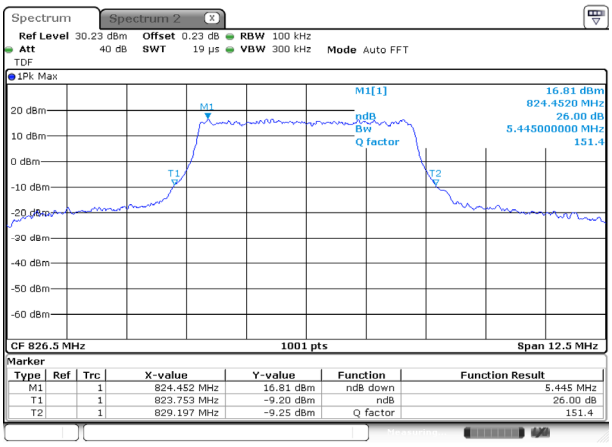
3M BW / QPSK / High ch.



3M BW / 16QAM / High ch.



5M BW / QPSK / Low ch.



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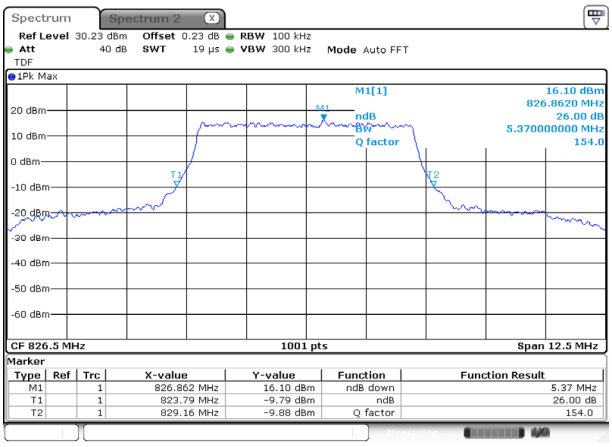
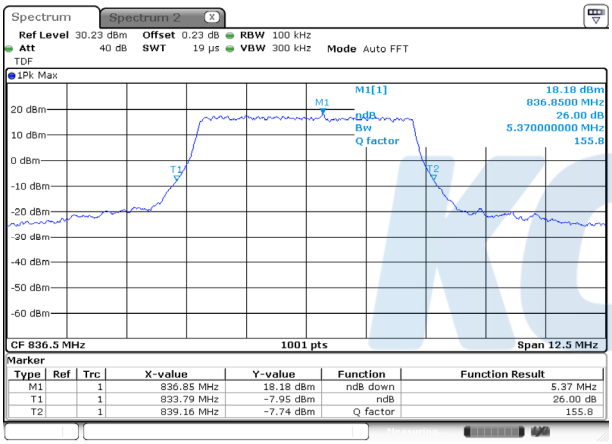
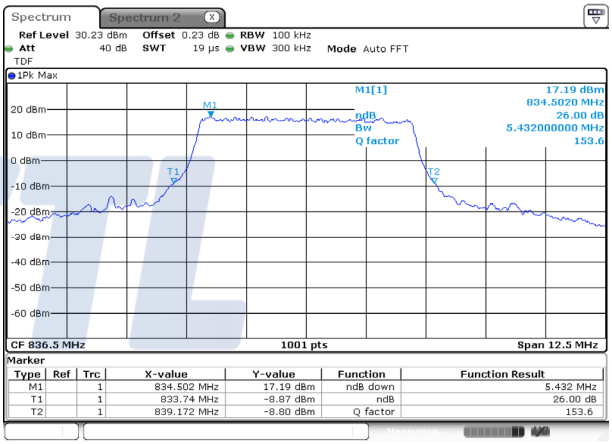


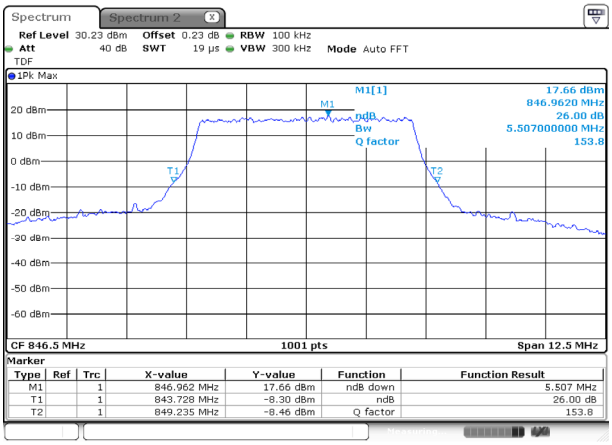
5M BW / QPSK / Mid ch.



5M BW / 16QAM / Mid ch.



5M BW / QPSK / High ch.



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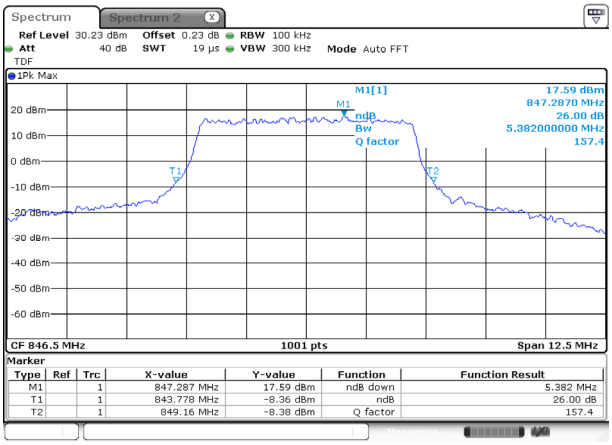
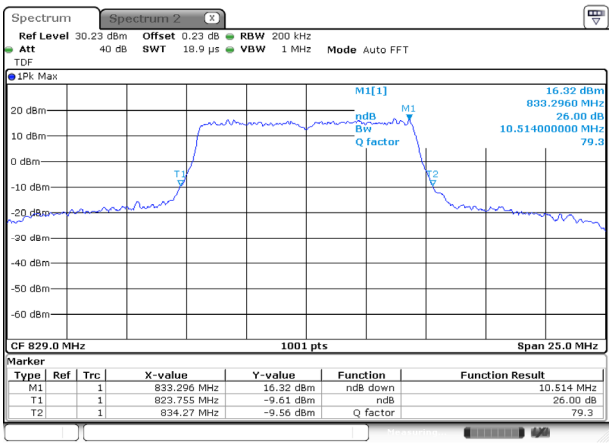
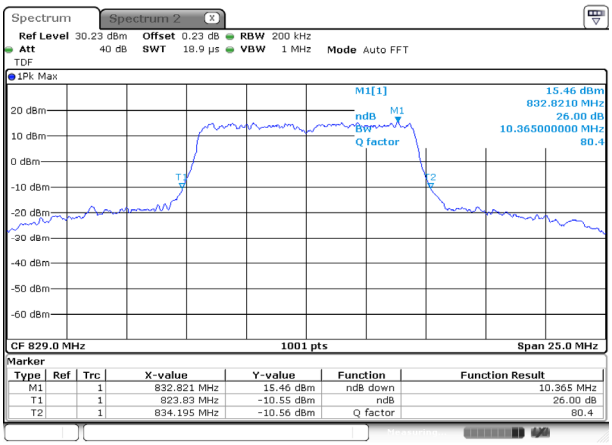


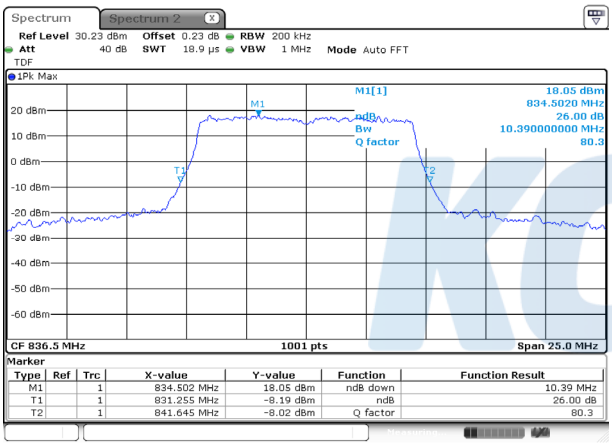
10M BW / QPSK / Low ch.



10M BW / 16QAM / Low ch.



10M BW / QPSK / Mid ch.



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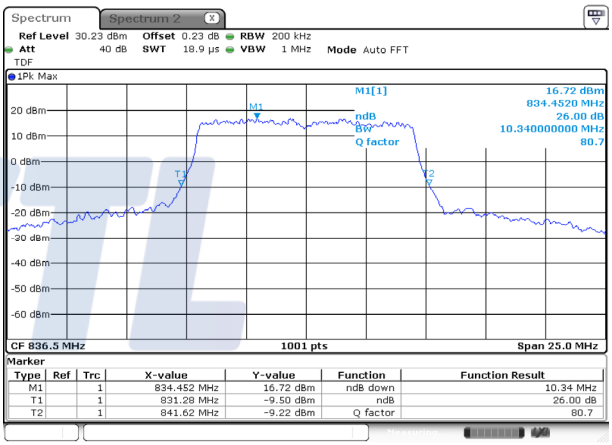
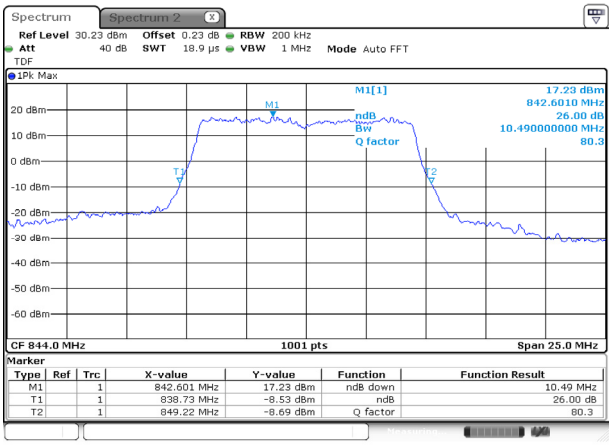


10M BW / QPSK / High ch.



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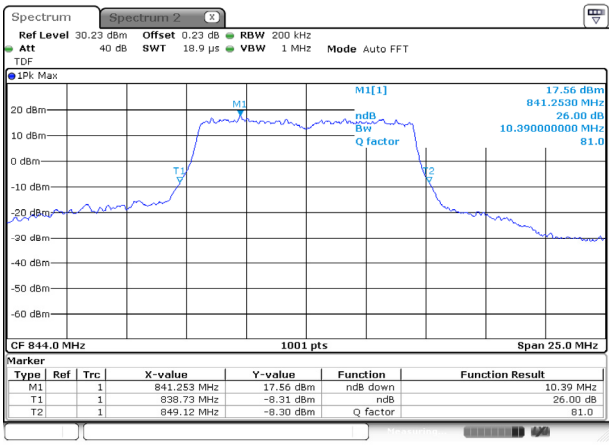
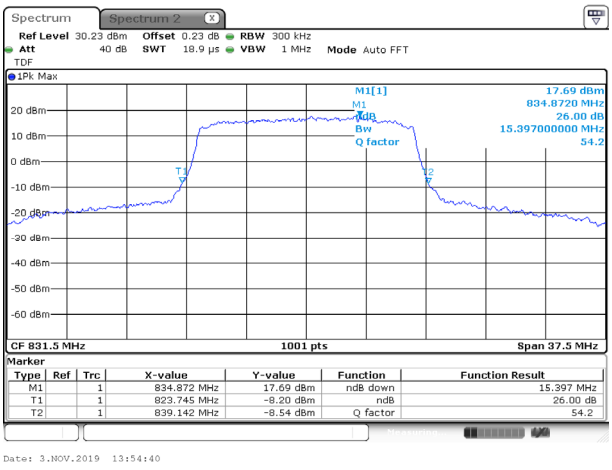
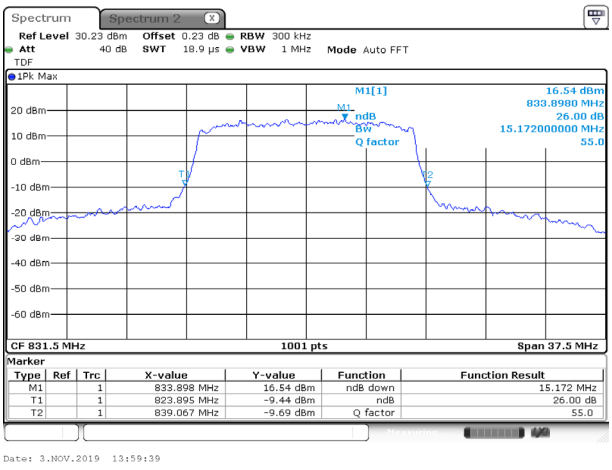


15M BW / QPSK / Low ch.



15M BW / 16QAM / Low ch.



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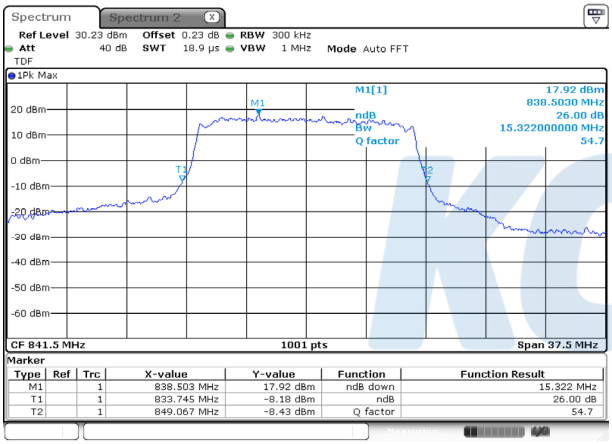

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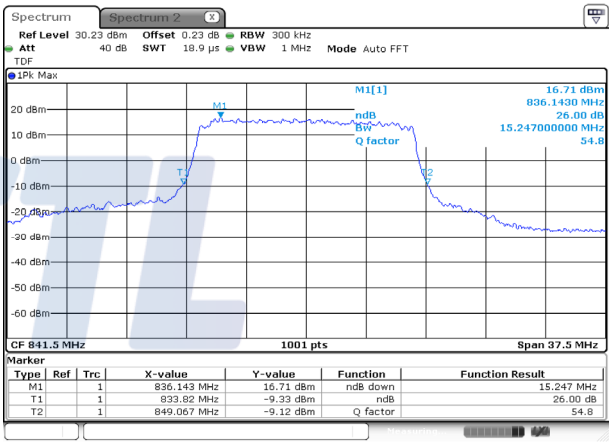
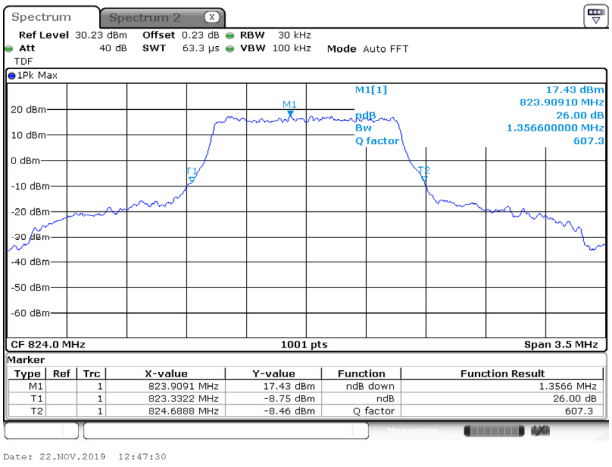
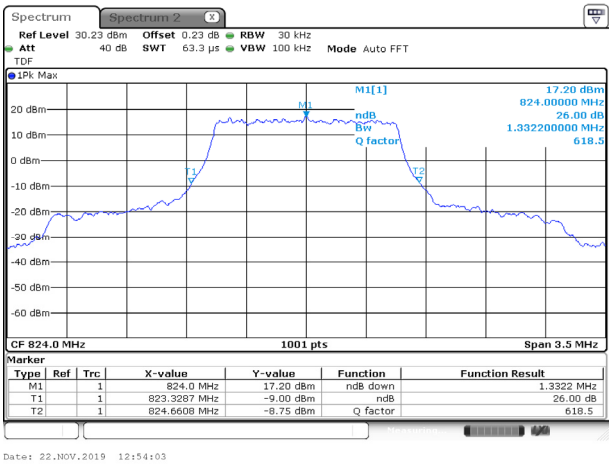


Straddle channel

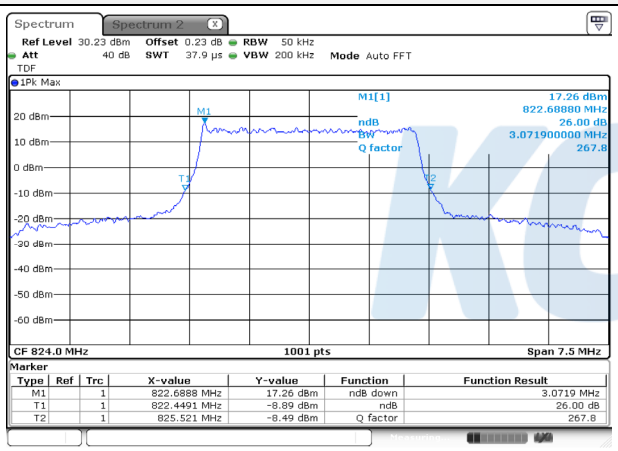
1.4M BW / QPSK



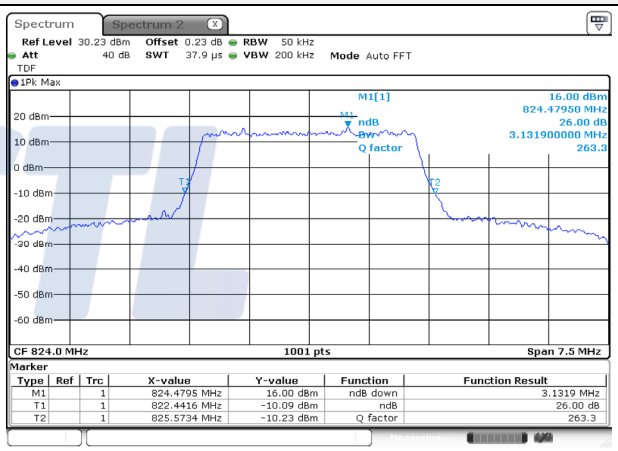
1.4M BW / 16QAM



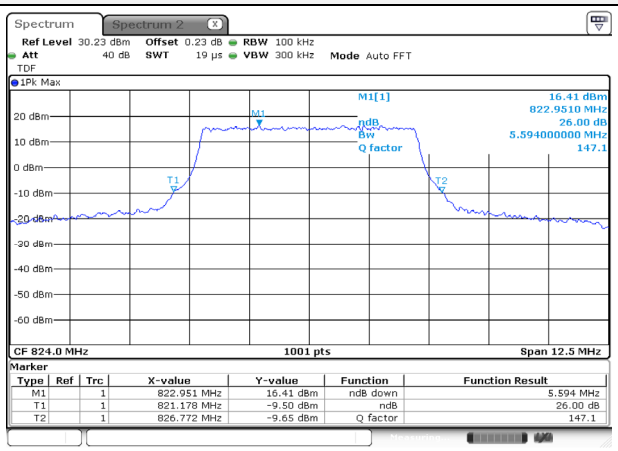
3M BW / QPSK



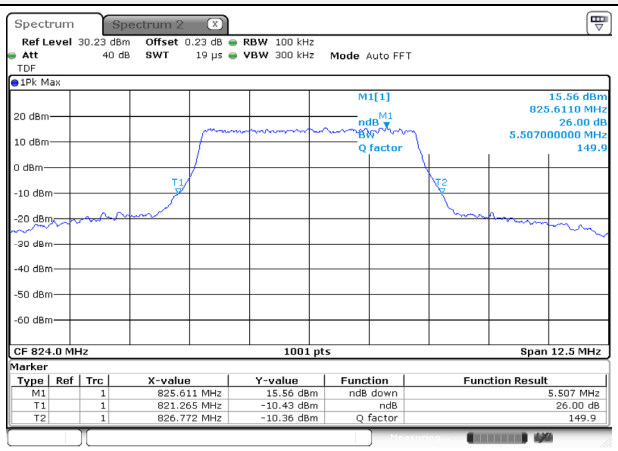
3M BW / 16QAM



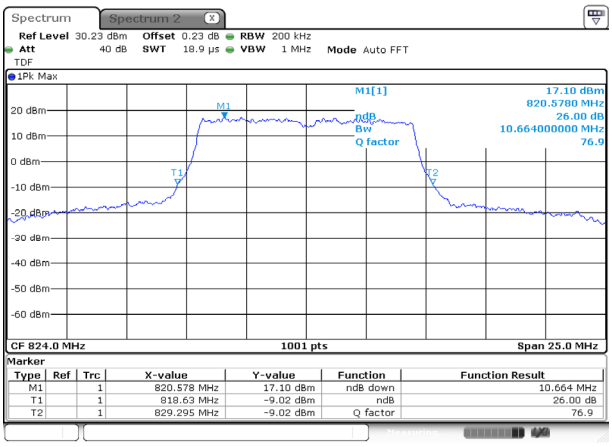
5M BW / QPSK



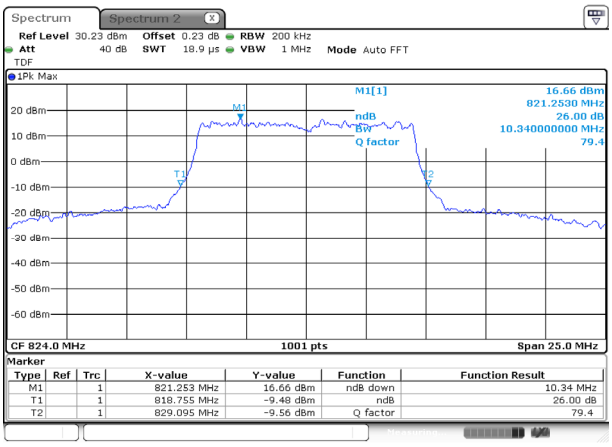
5M BW / 16QAM



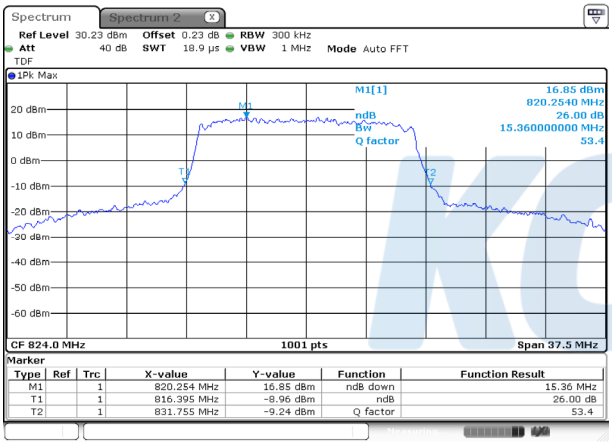
10M BW / QPSK



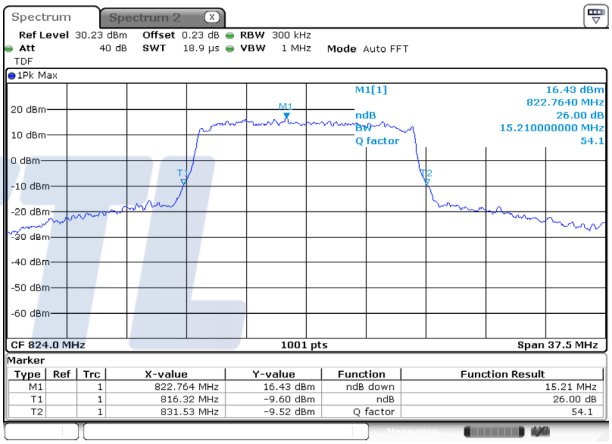
10M BW / 16QAM



15M BW / QPSK



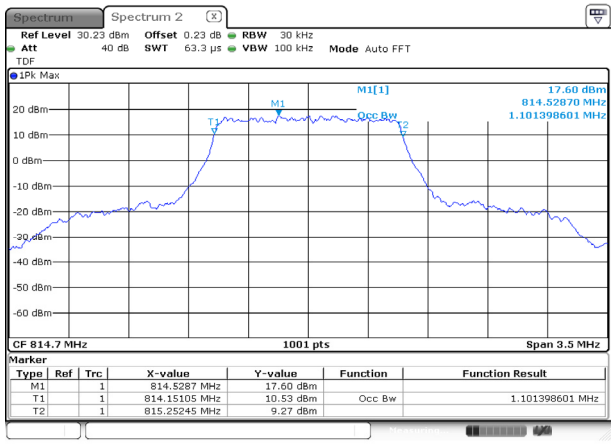
15M BW / 16QAM



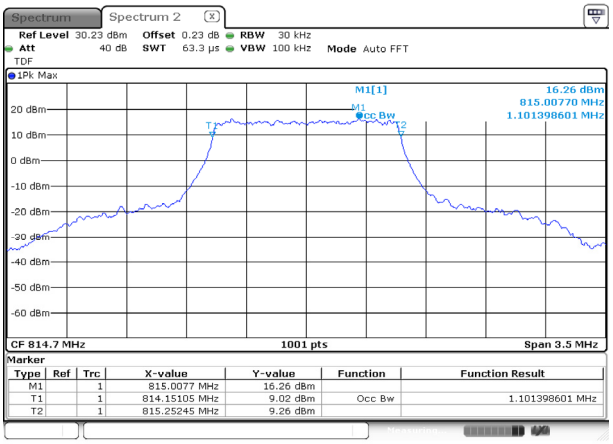
99% Occupied Bandwidth

Test mode: LTE Band 26 (Part 90S)

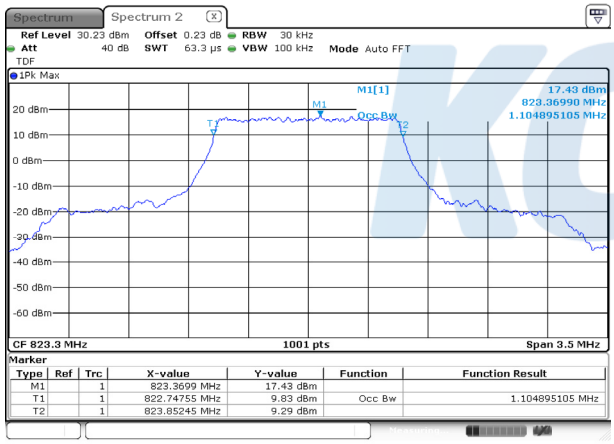
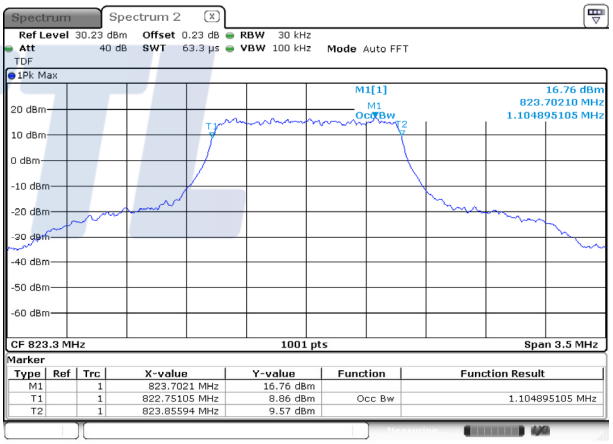
1.4M BW / QPSK / Low ch.



1.4M BW / 16QAM / Low ch.



1.4M BW / QPSK / High ch.



1.4M BW / 16QAM / High ch.