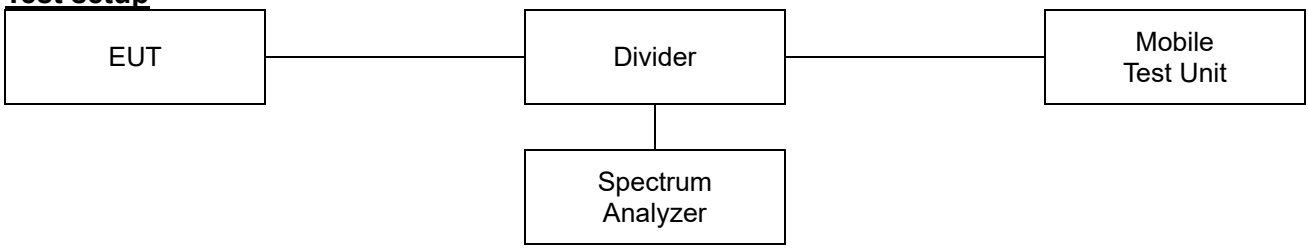
8.4. Band Edge Emissions at Antenna Terminal

Test setup



Limit

According to §22.917(a), §24.238(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 attenuation factor shall be not less than 40 + 10log($P_{[Watts]}$) ㏈ on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10log($P_{[Watts]}$) ㏈ on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10log($P_{[Watts]}$) ㏈ on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10log($P_{[Watts]}$) ㏈ on all frequencies between 2490.5 ㎒ and 2496 ㎒ and 55 + 10log($P_{[Watts]}$) ㏈ at or below 2490.5 ㎒.

Test procedure

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Test settings

1) Start frequency was set to 30 ㎒ and stop frequency was set to at least 10th the fundamental frequency.
2) Span was set large enough so as to capture all out of band emissions near the band edge.
3) Set the RBW > 1% of the emission bandwidth.
4) Set the VBW ≥ 3 x RBW.
5) Set the number of sweep points ≥ 2 x Span/RBW
6) Detector = RMS
7) Trace mode = trace average
8) Sweep time should be auto for peak detection. For RMS detection the sweep time should be set as follows:
    a) If the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) x (symbol period) (e.g., by a factor of 10 x symbol period x number of points) Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
    b) If the device cannot transmit continuously (duty cycle < 98%), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) x (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time
    c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2%).
    d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > ±2%), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold art necessary to ensure that the maximum power is measured.
9) Allow trace to fully stabilize.

Notes:

1. Per 22.917(b), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 ㎒ or greater. however in the 1 ㎒ bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be may be employed. 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.
2. Per 27.53(m)(6), in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 ㎒, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 ㎒).
3. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.

Test results

Test mode: LTE Band 5

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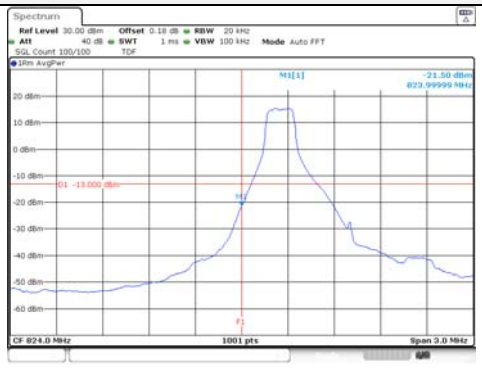	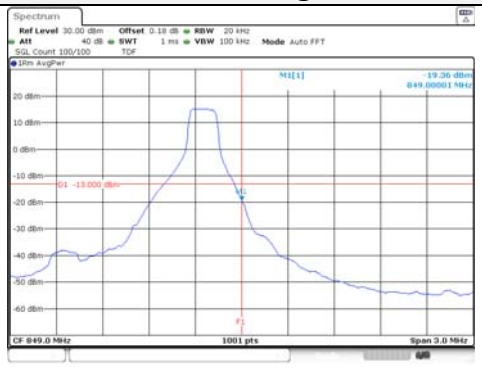
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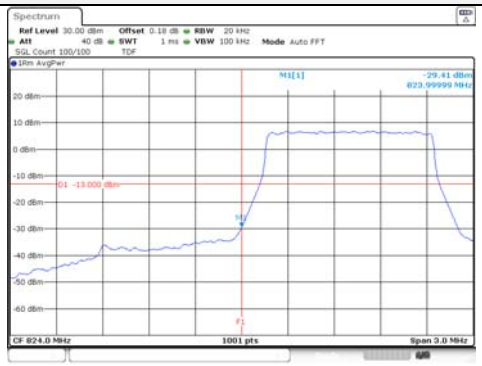	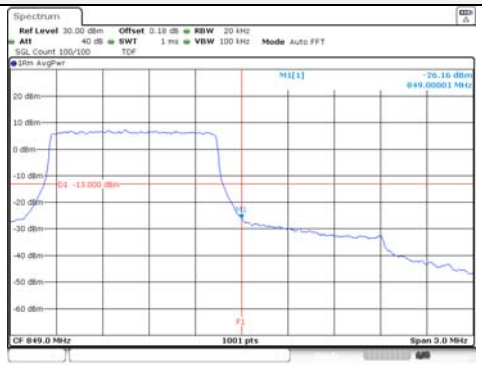
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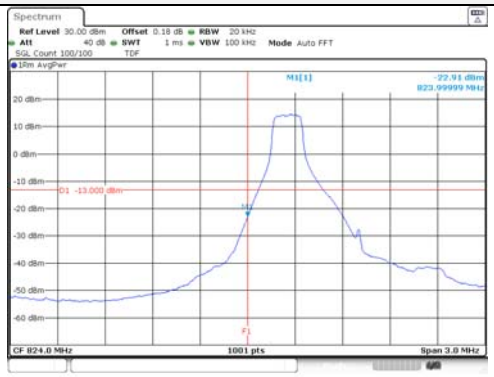	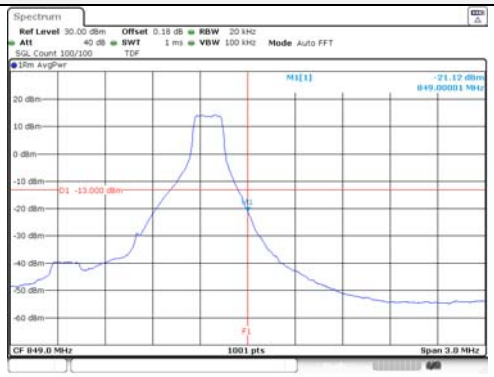
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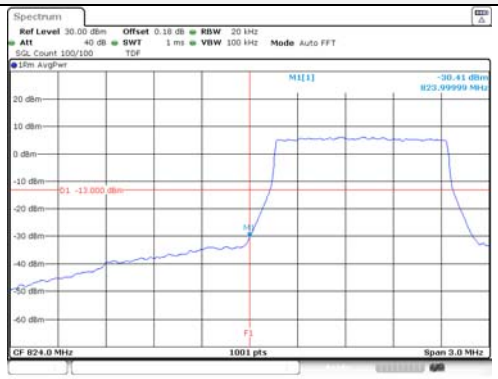	

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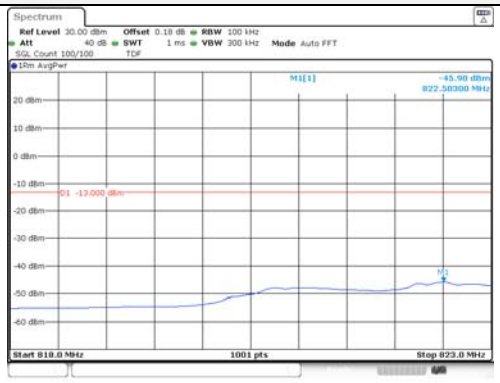	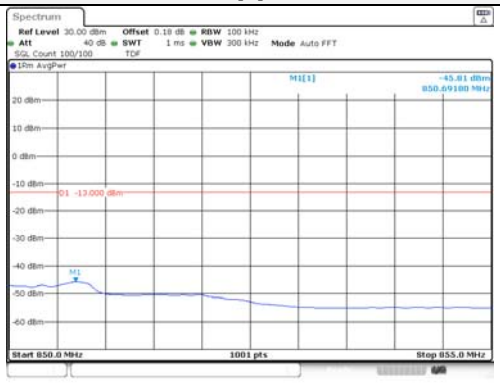
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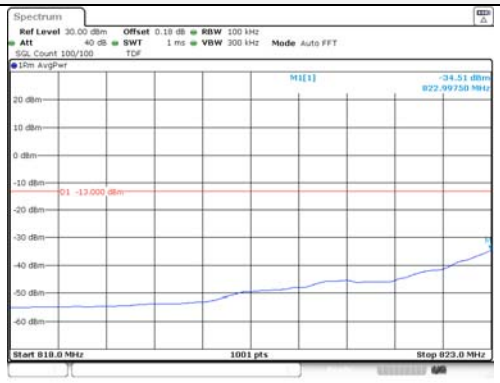	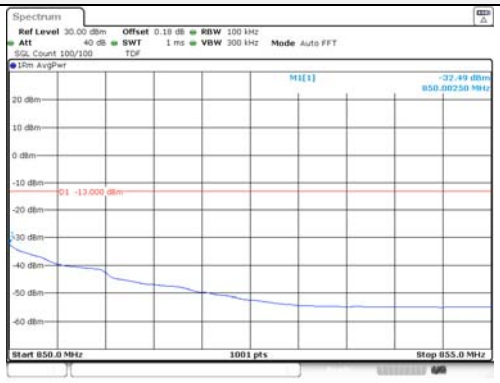
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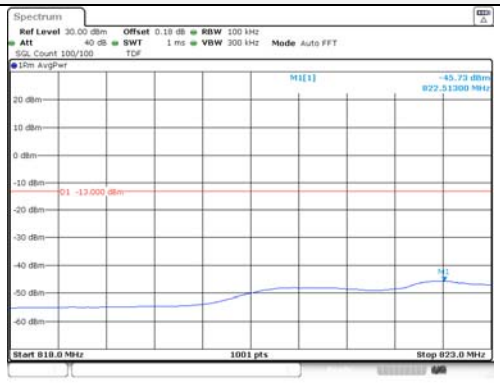	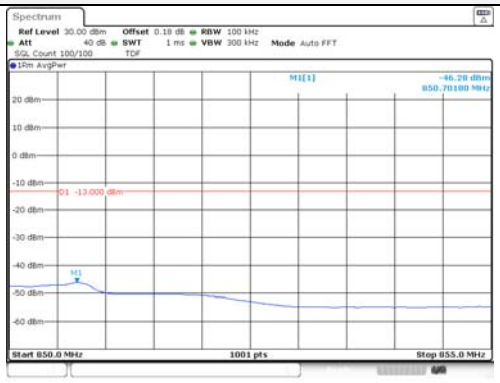
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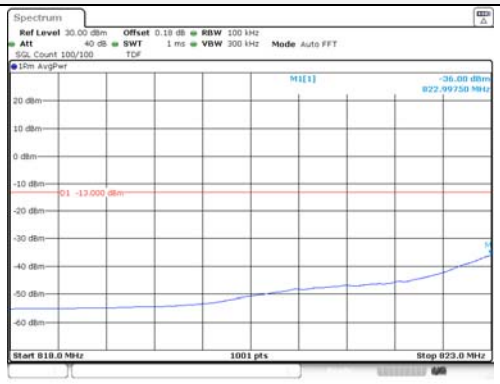	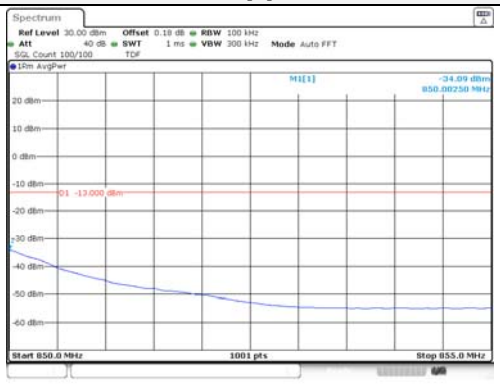

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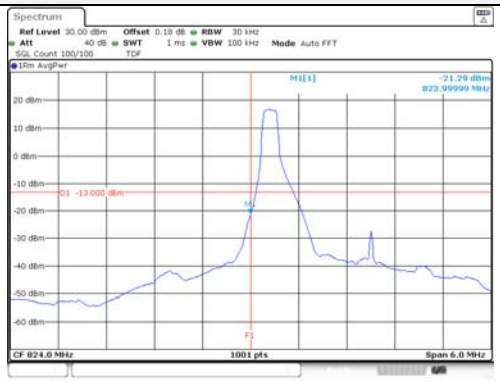	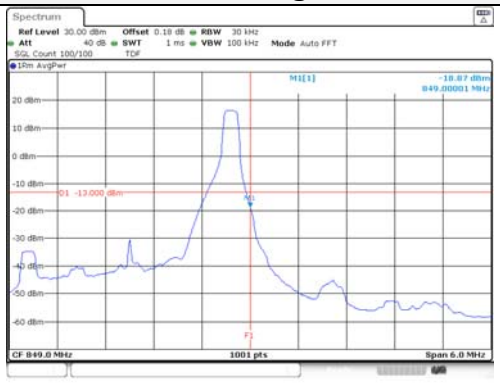
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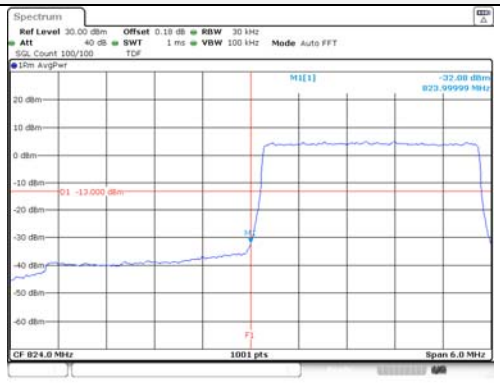	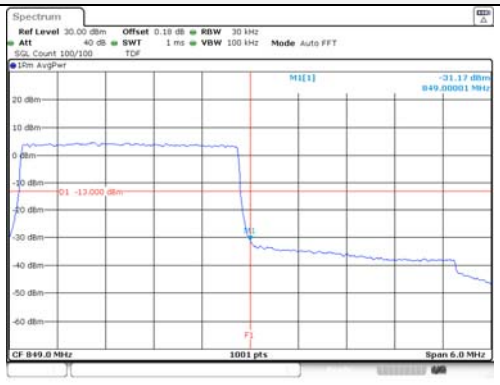
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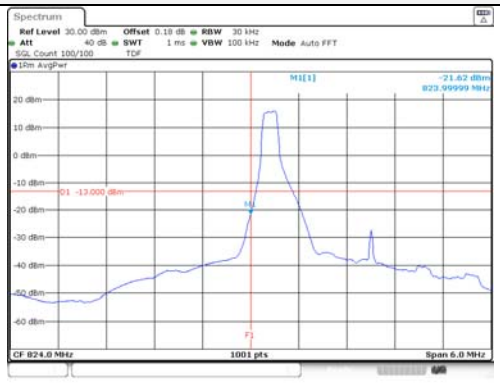	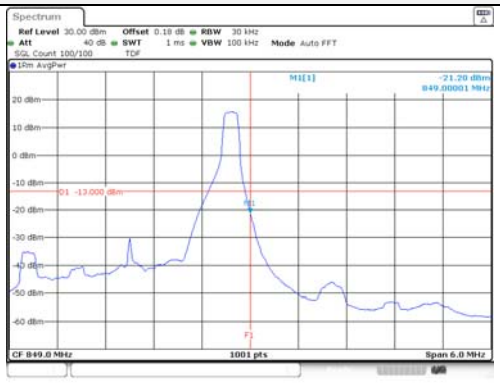
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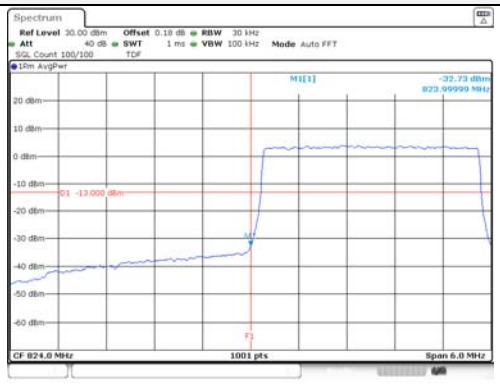	

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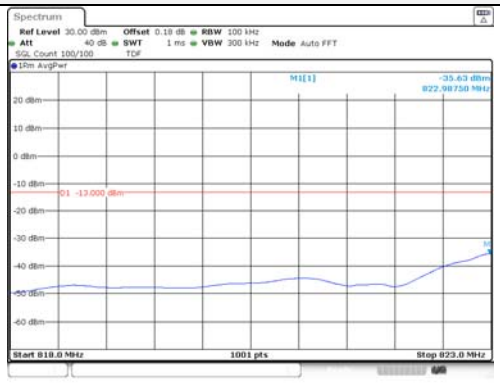	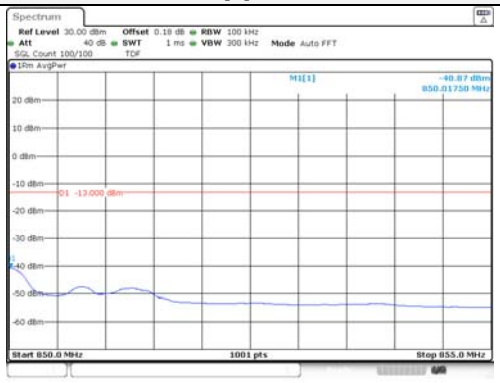
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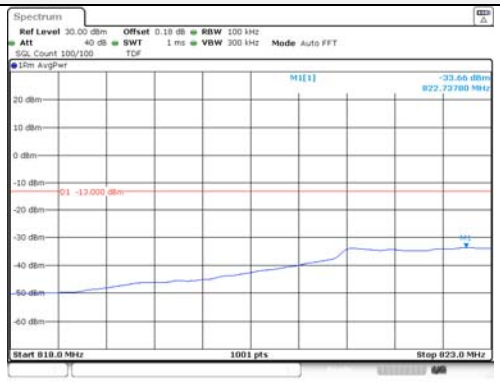	
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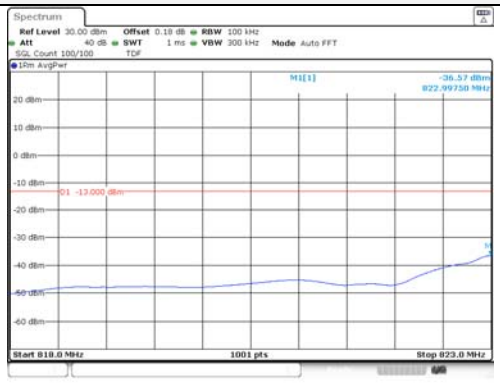	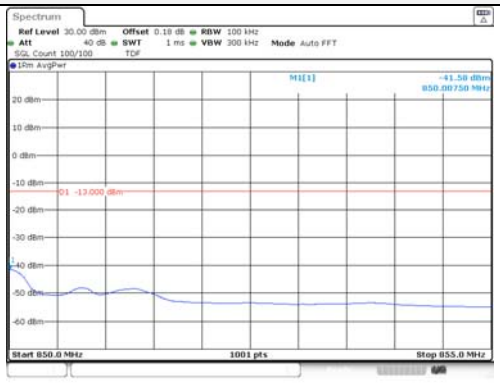
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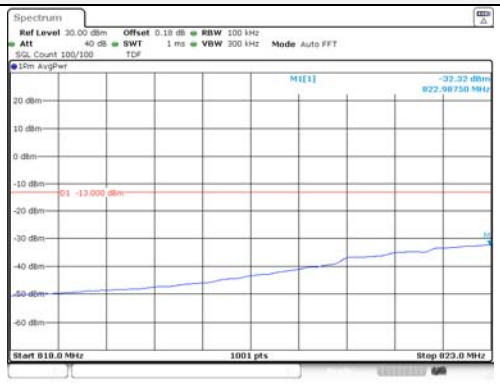	

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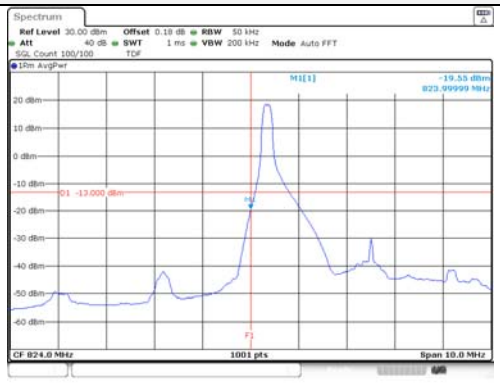	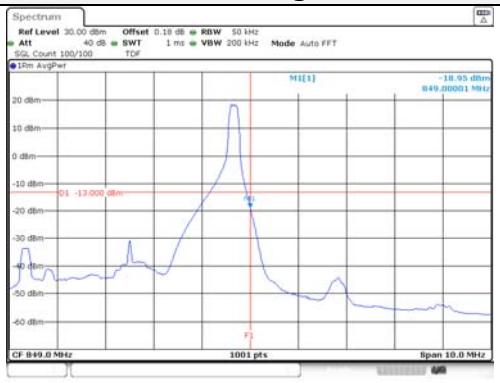
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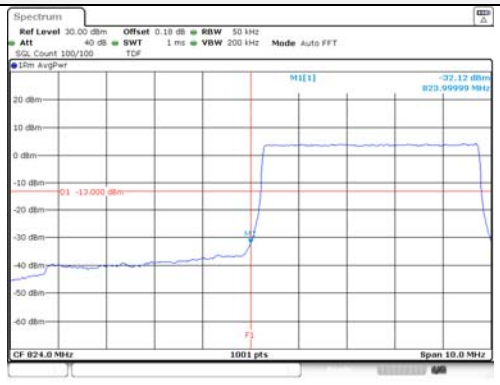	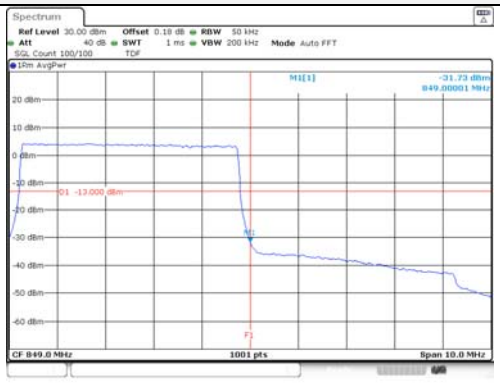
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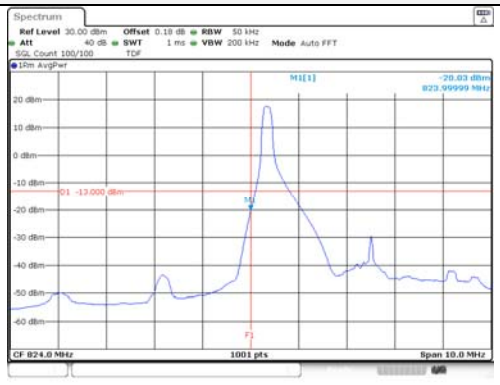	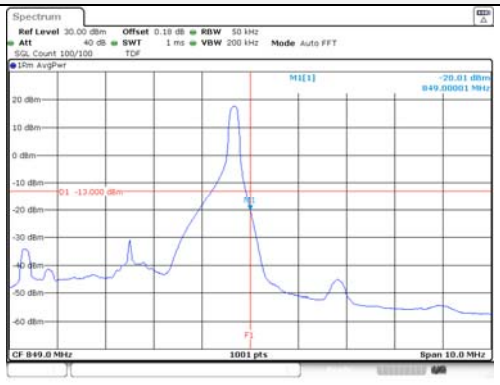
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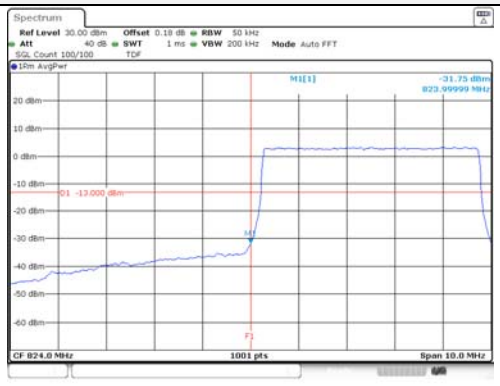	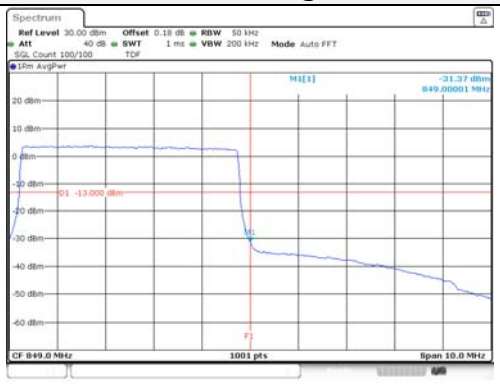

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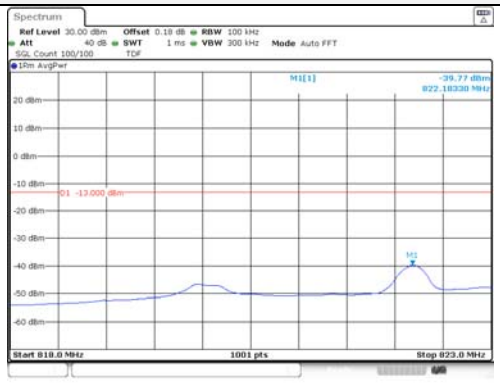	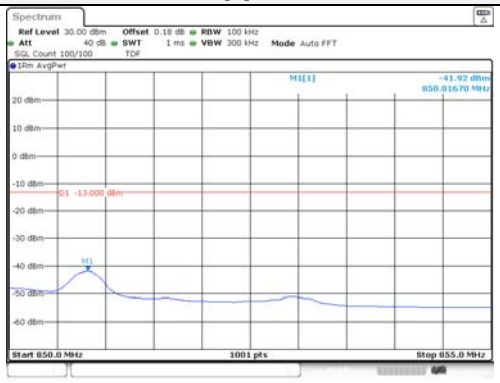
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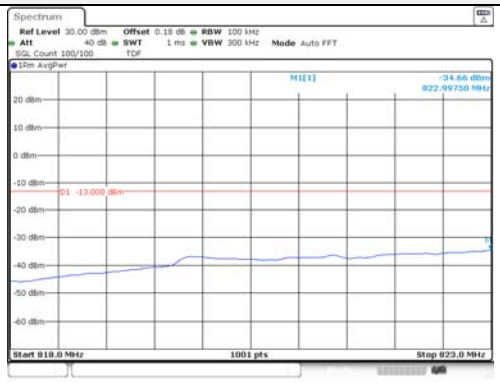	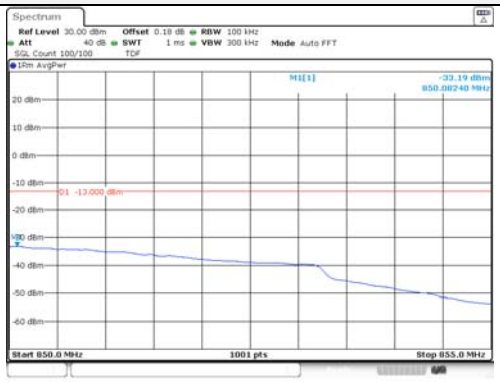
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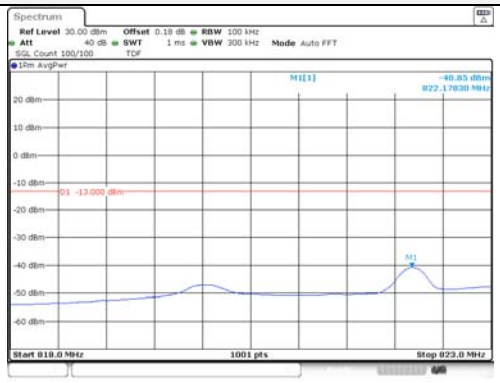	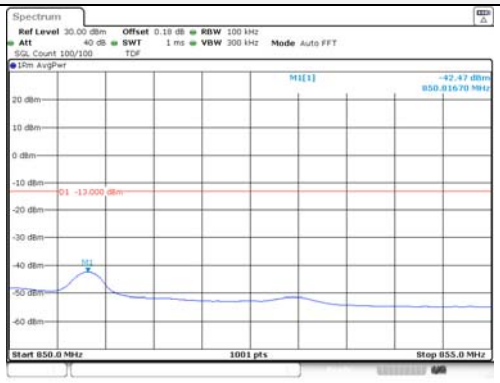
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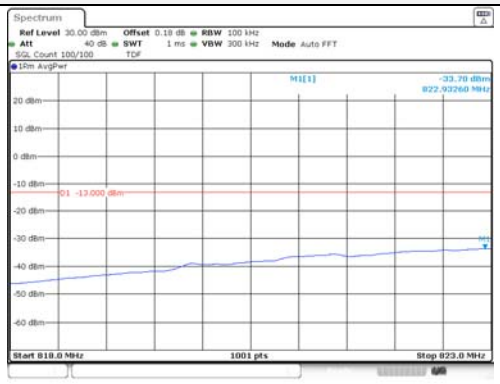	

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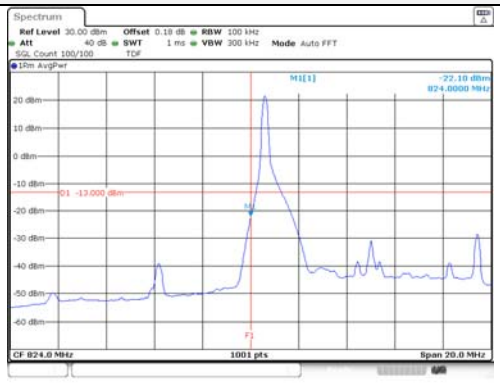	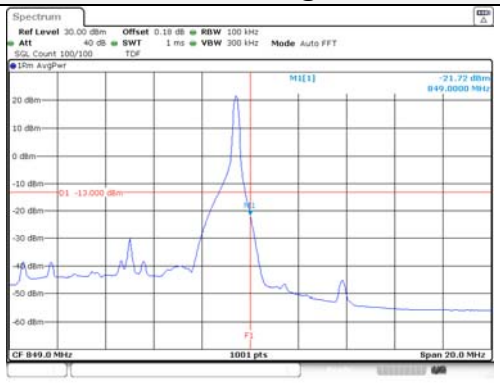
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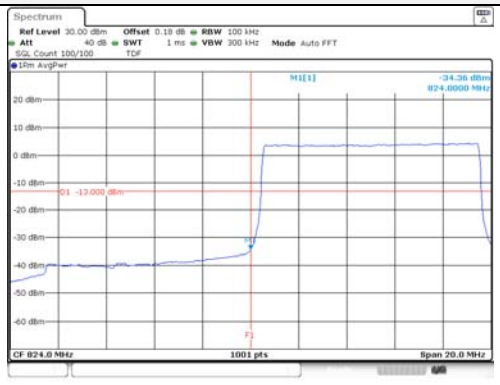
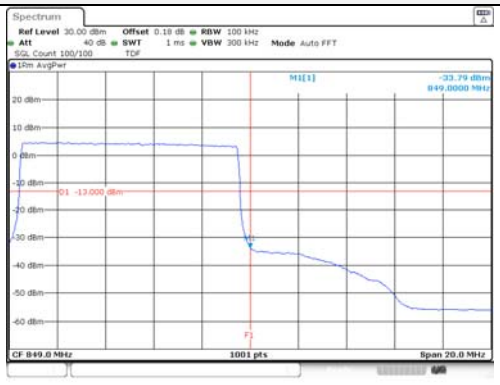
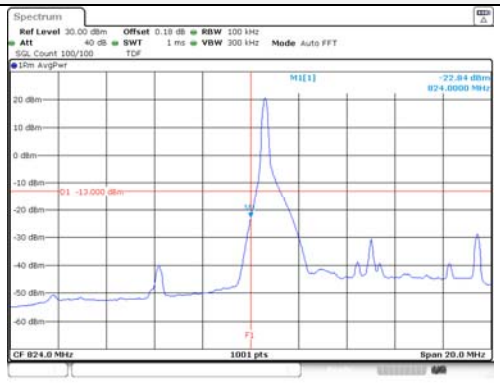
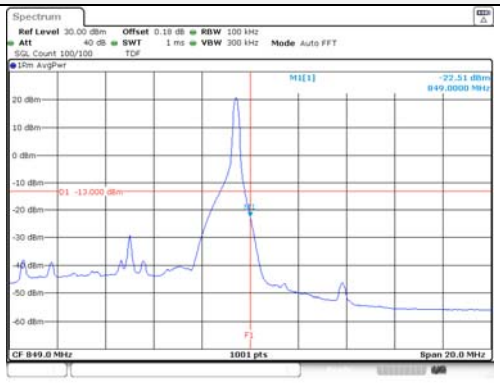
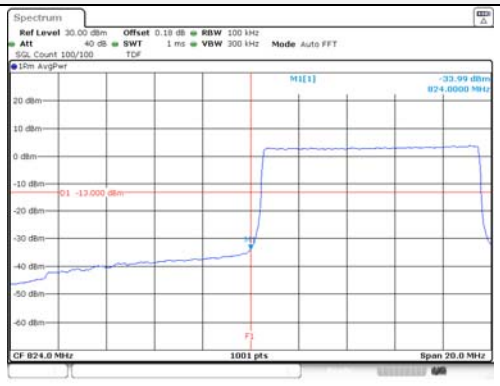
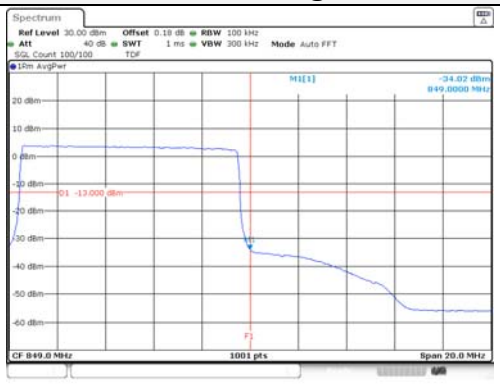
	
10M BW 16QAM Low ch. 1RB	**10M BW 16QAM High ch. 1RB**
	
10M BW 16QAM Low ch. FRB	**10M BW 16QAM High ch. FRB**
	

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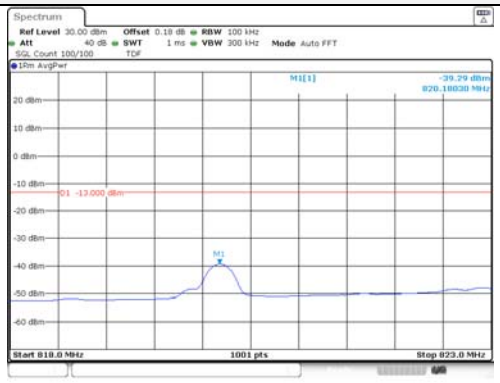	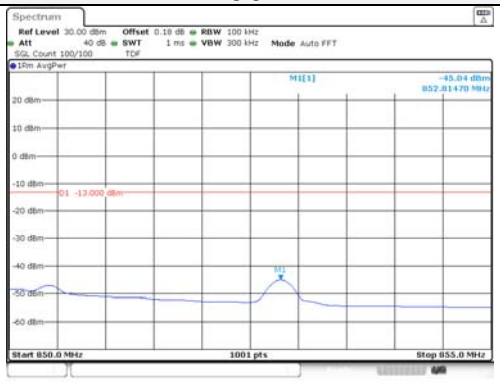
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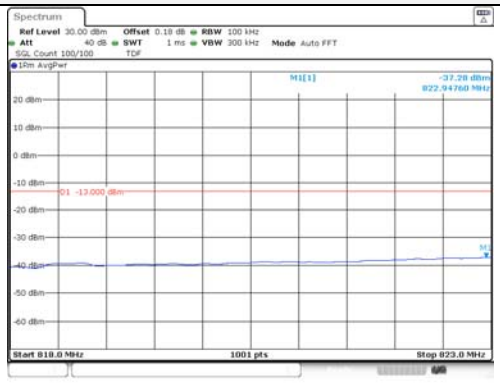	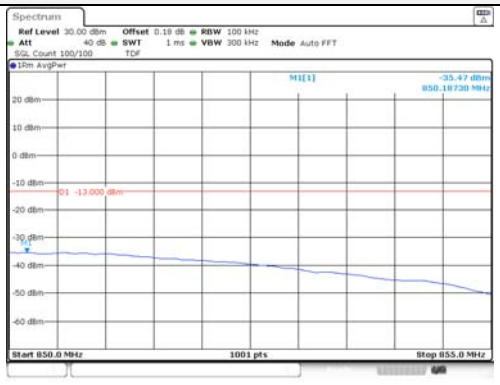
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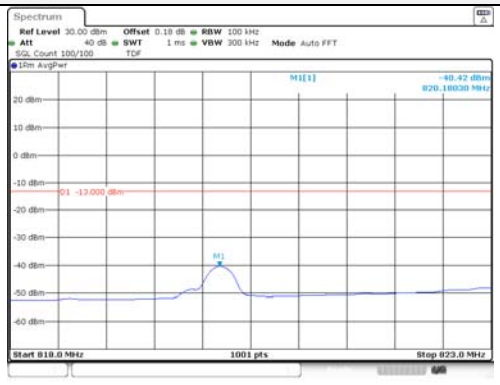	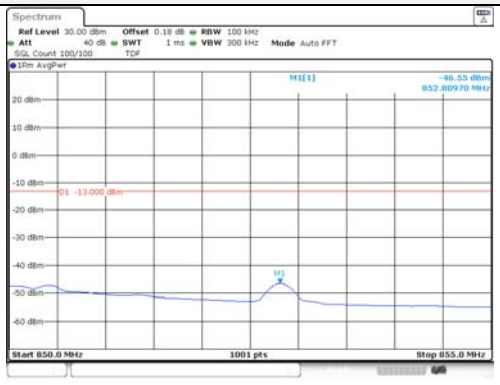
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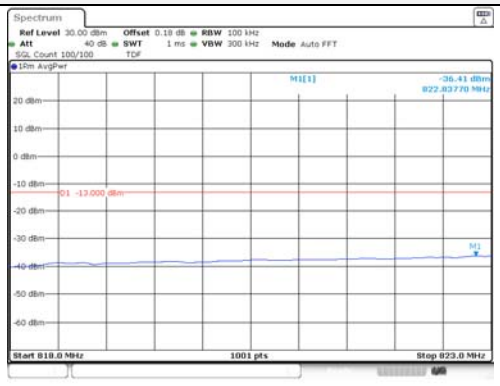
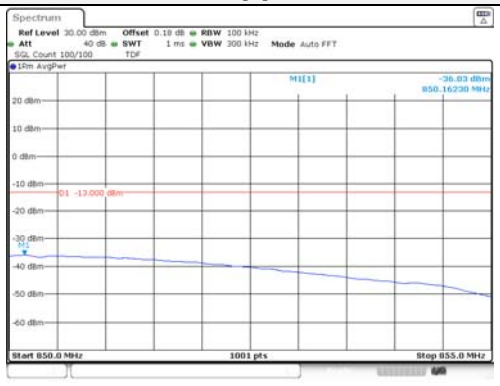
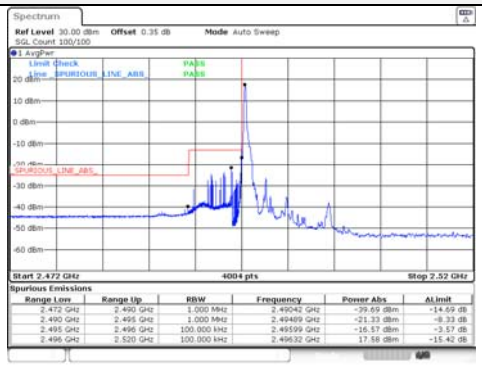
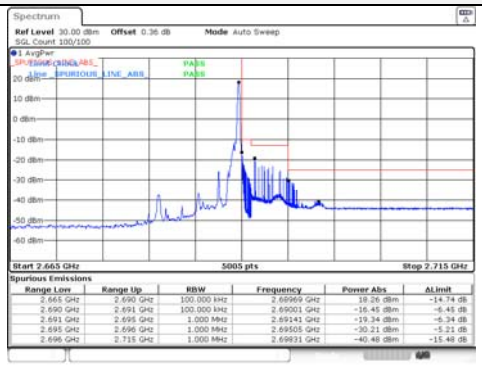
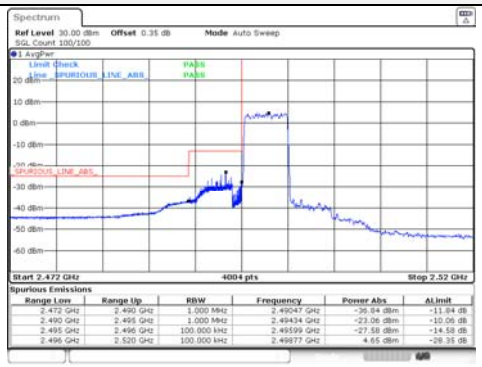
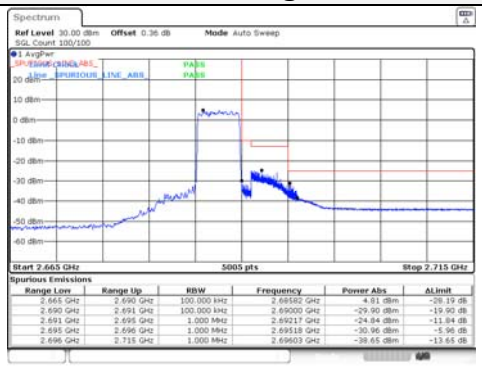
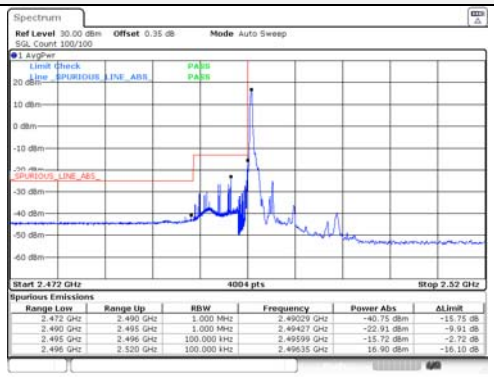
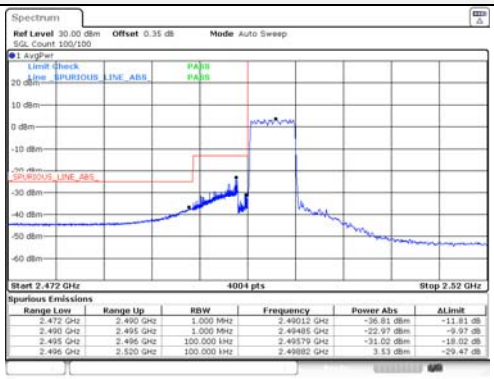
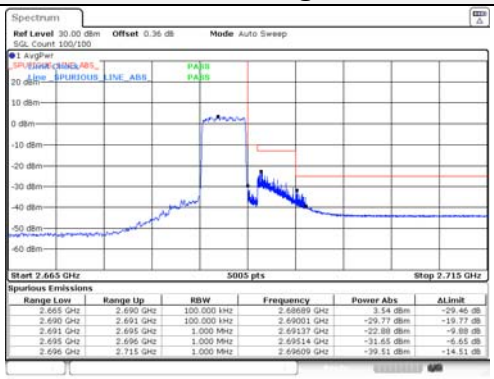
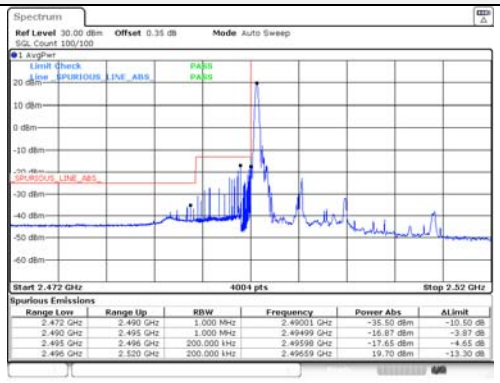
	

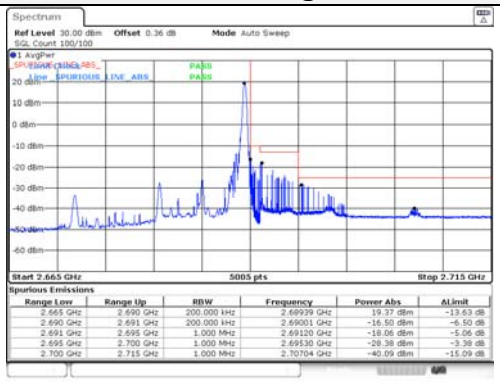
Test mode: LTE Band 41

5M BW QPSK Low ch. 1RB	5M BW QPSK High ch. 1RB
	
5M BW QPSK Low ch. FRB	**5M BW QPSK High ch. FRB**
	
5M BW 16QAM Low ch. 1RB	**5M BW 16QAM High ch. 1RB**
	
5M BW 16QAM Low ch. FRB	**5M BW 16QAM High ch. FRB**
	

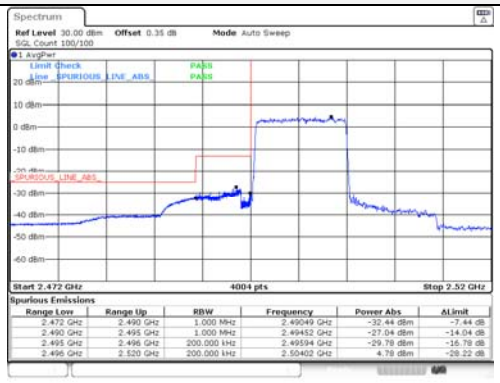
10M BW QPSK Low ch. 1RB



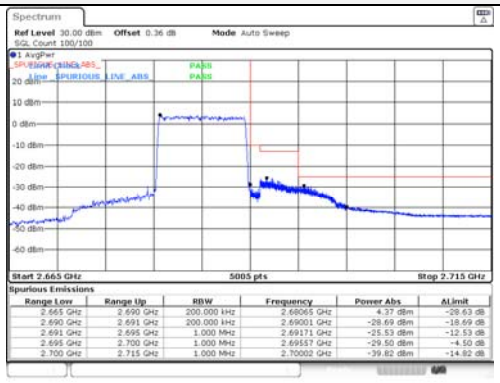
10M BW QPSK High ch. 1RB



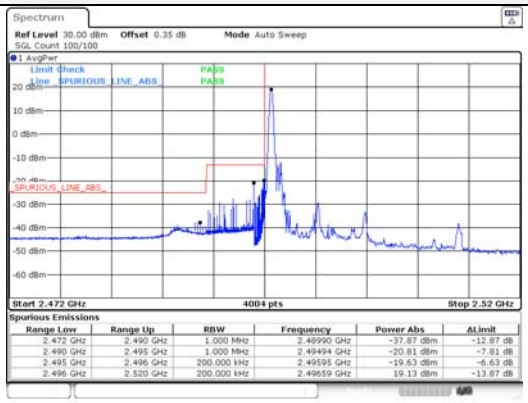
10M BW QPSK Low ch. FRB



10M BW QPSK High ch. FRB

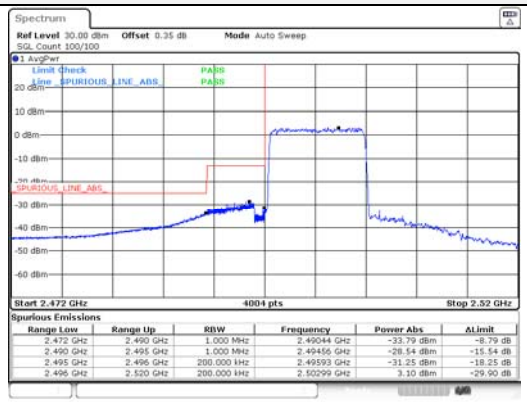


10M BW 16QAM Low ch. 1RB

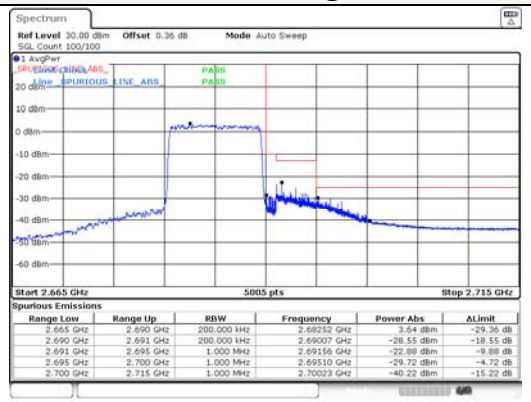


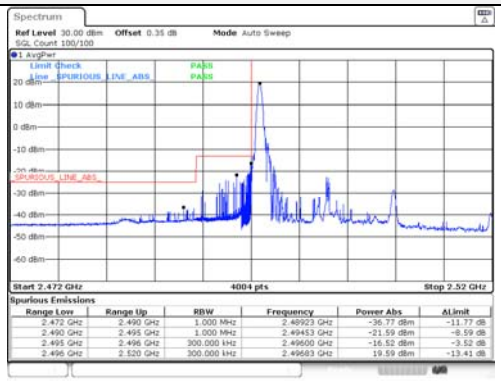
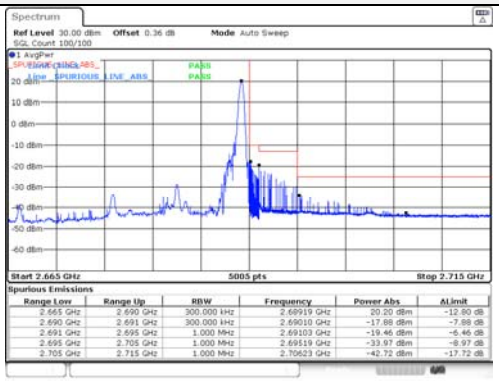
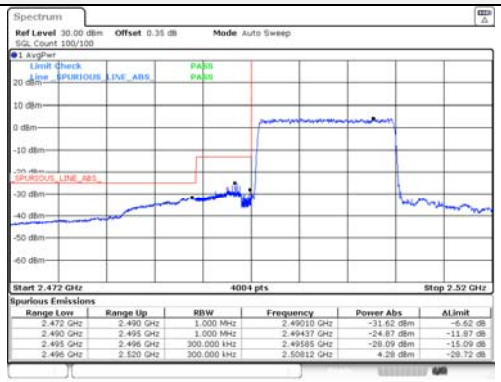
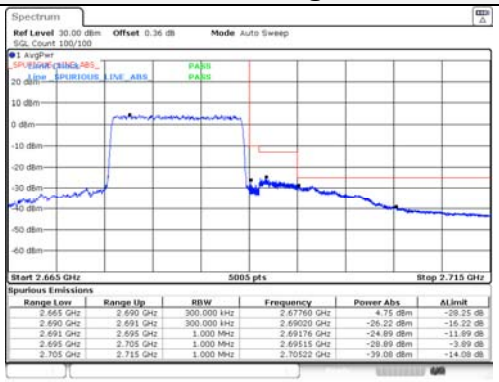
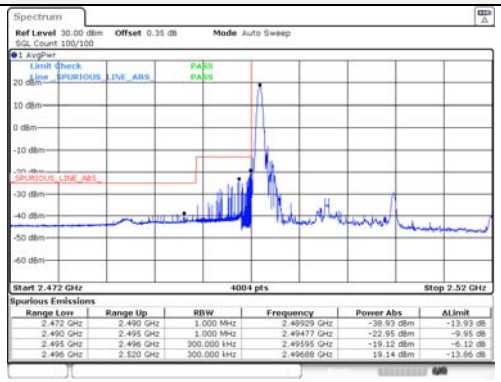
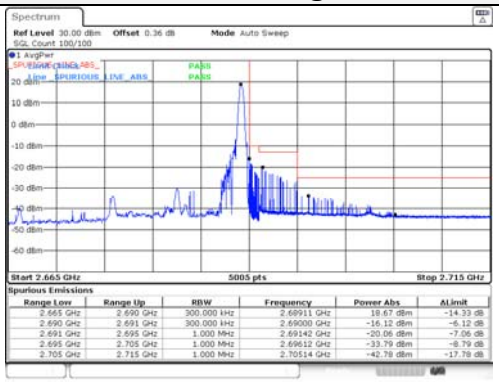
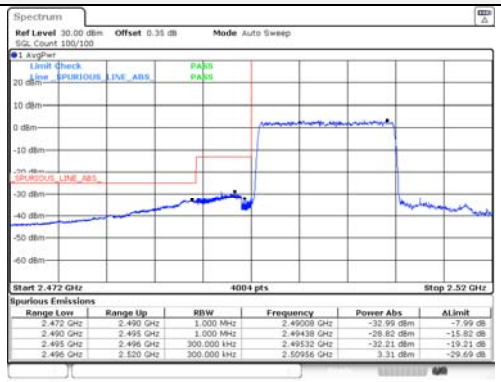
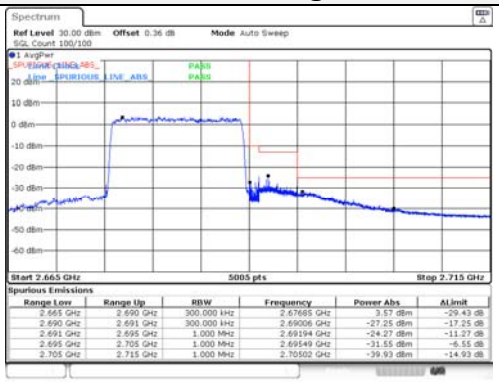
10M BW 16QAM High ch. 1RB

10M BW 16QAM Low ch. FRB

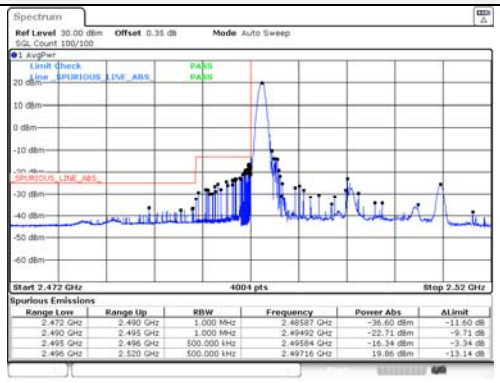


10M BW 16QAM High ch. FRB

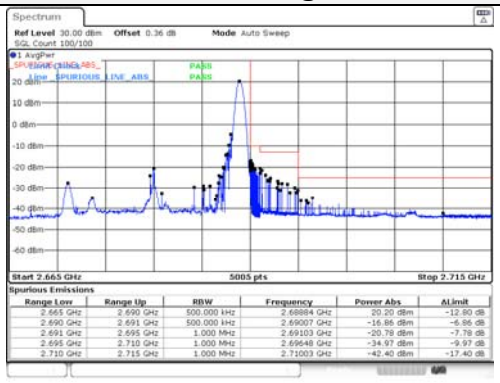


15M BW QPSK Low ch. 1RB	15M BW QPSK High ch. 1RB
	
15M BW / QPSK / Low ch. / FRB	**15M BW / QPSK / High ch. / FRB**
	
15M BW 16QAM Low ch. 1RB	**15M BW 16QAM High ch. 1RB**
	
15M BW 16QAM Low ch. FRB	**15M BW 16QAM High ch. FRB**
	

20M BW QPSK Low ch. 1RB



20M BW QPSK High ch. 1RB



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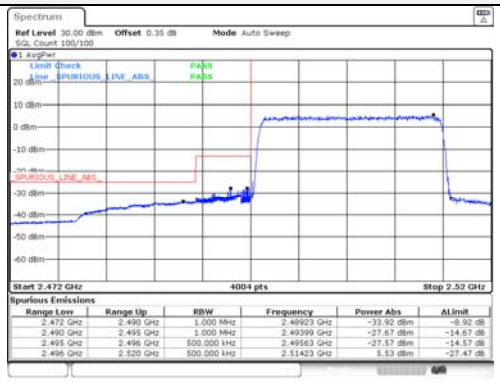
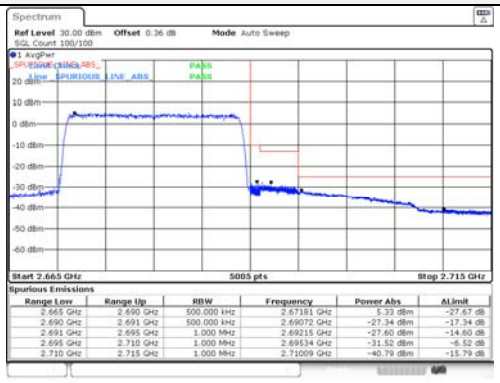
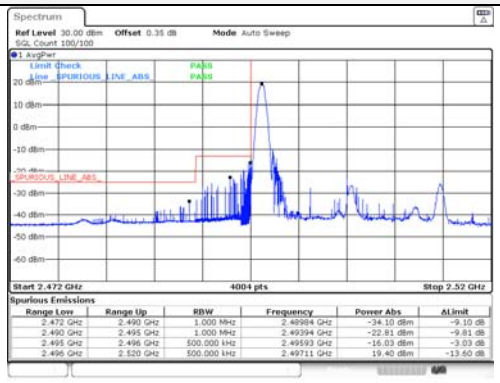


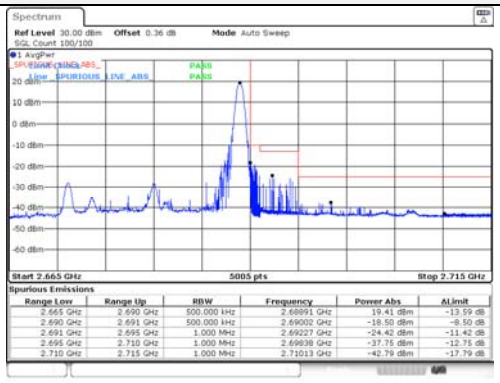
20M BW QPSK High ch. FRB



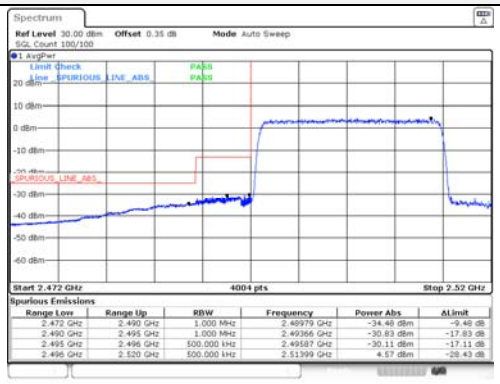
20M BW 16QAM Low ch. 1RB



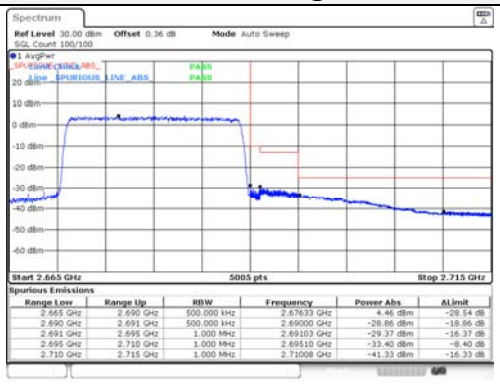
20M BW 16QAM High ch. 1RB



20M BW 16QAM Low ch. FRB

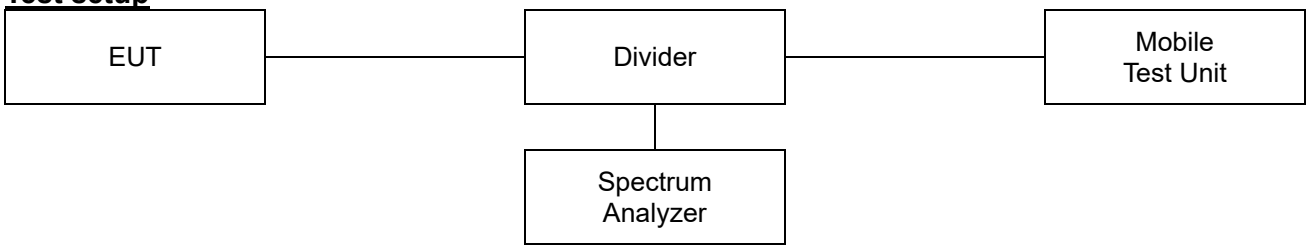


20M BW 16QAM High ch. FRB



8.5. Peak to Average Power Ratio (PAPR)

Test setup



Limit

According to §27.50(d)(5), the peak-to-average ratio(PAR) of the transmission must not exceed 13 dB.

Test procedure

971168 D01 v03r01 - Section 5.7.2
ANSI 63.26-2015 – Section 5.2.3.4

Test settings

5.2.3.4 Measurement of peak power in a broadband noise-like signal using CCDF

1) Set resolution/measurement bandwidth ≥ OBW or specified reference bandwidth
2) Set the number of counts to a value that stabilizes the measured CCDF curve.
3) Set the measurement interval as follows:
   a) For continuous transmissions, set to the greater of [10 x (number of points in sweep) x (transmission symbol period)] or 1 ms.
   b) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement internal to a time that is less than or equal to the burst duration.
   c) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
4) Record the maximum PAPR level associated with a probability of 0.1%

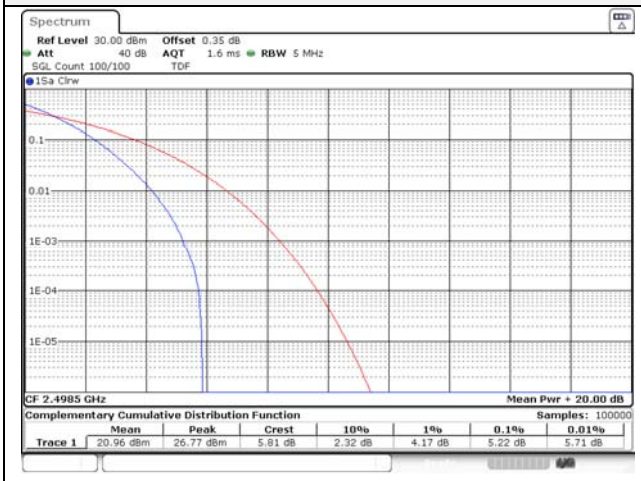
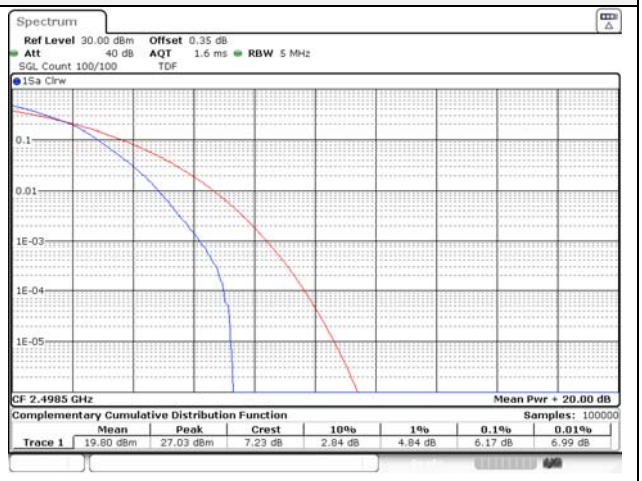
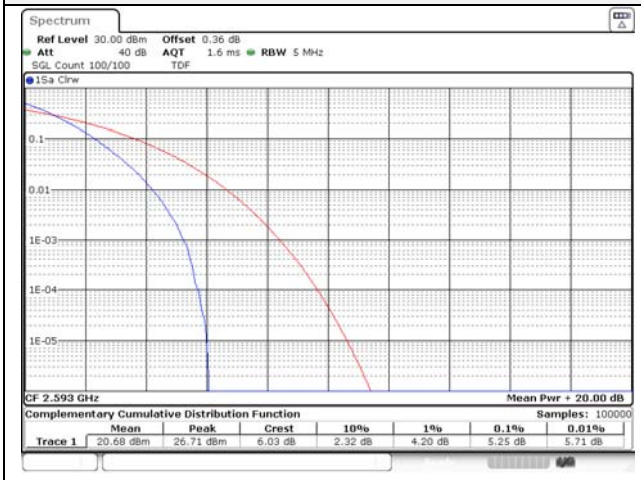
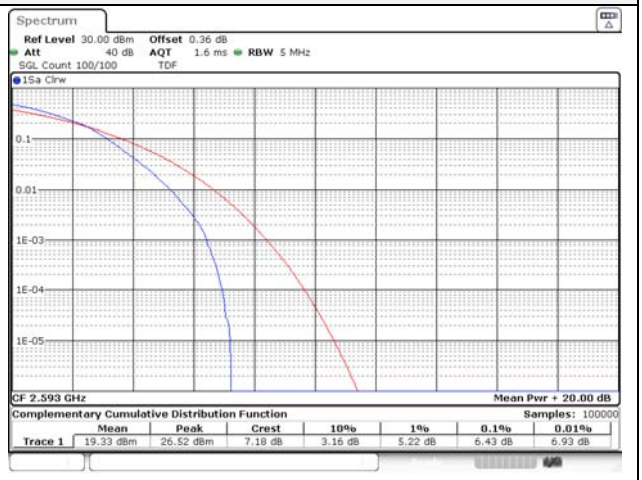
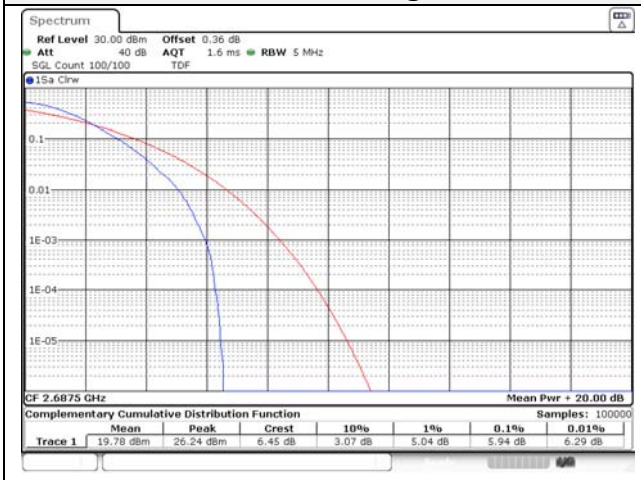
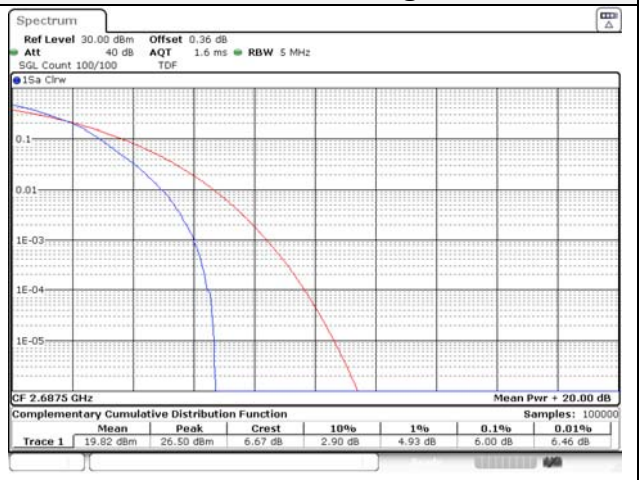
5.2.6 Peak-to-average power ratio

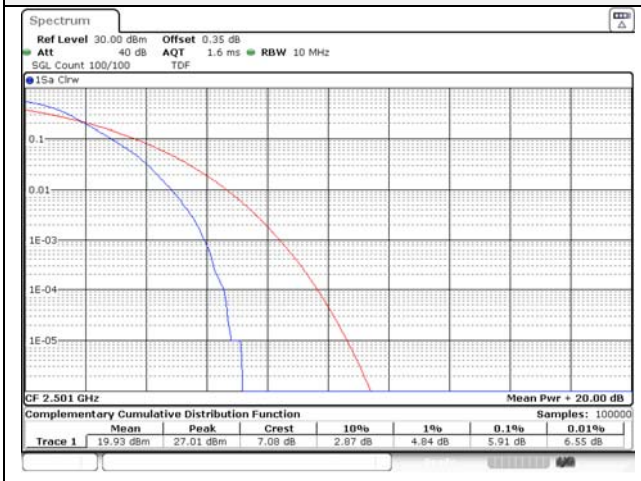
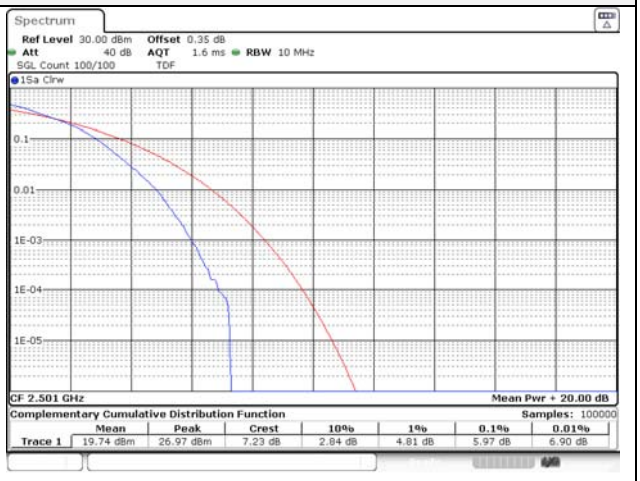
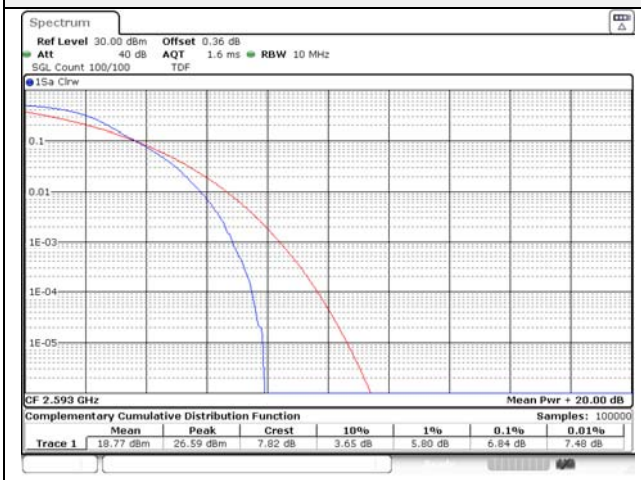
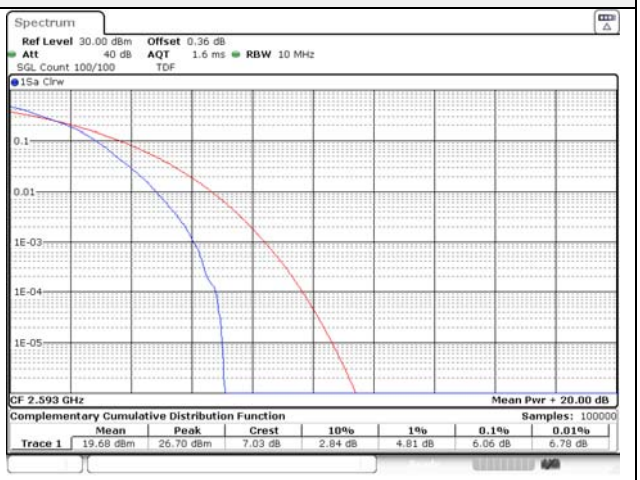
Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as P_{PK}.
Use one of the applicable procedure presented 5.2(ANSI C63.26-2015) to measure the total average power and record as P_{AG}. Determine the P.A.P.R from:

PAPR(dB) = P_{PK} (dBm or dBW) - P_{AG}(dBm or dBW)

Test results

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.**
	
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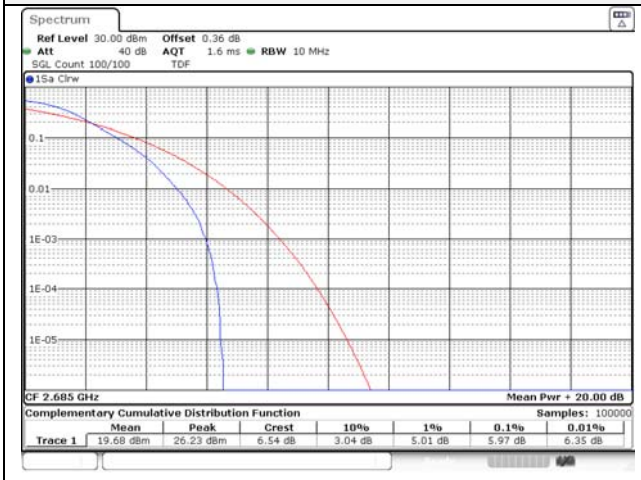
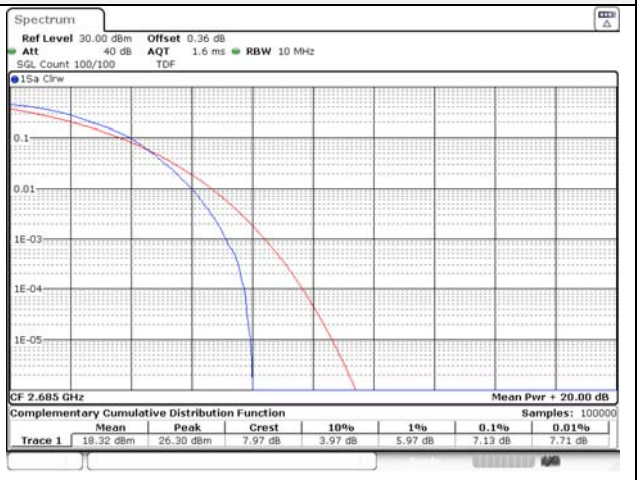
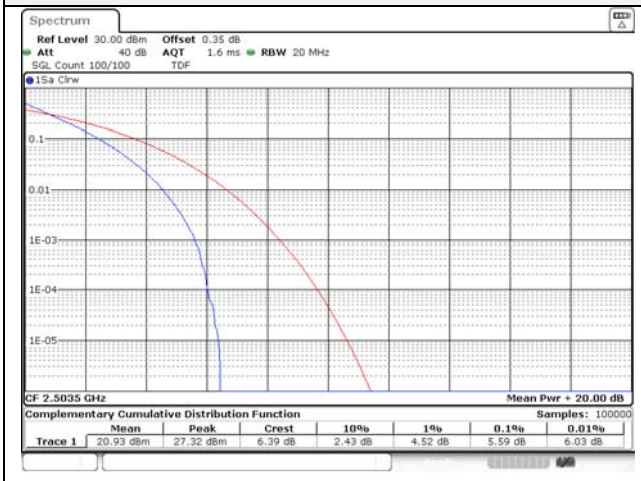
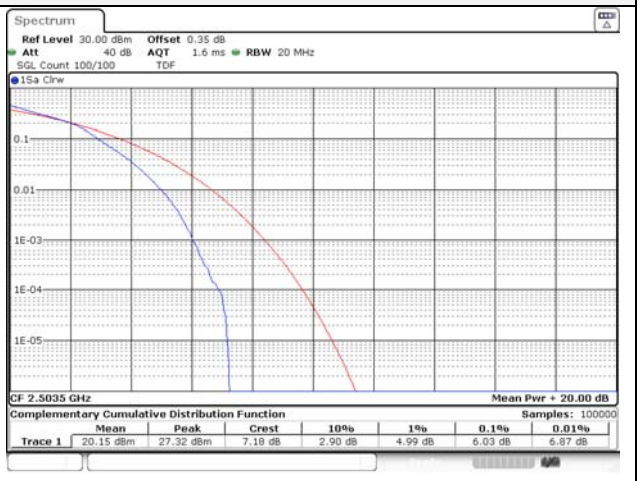
	

15M BW QPSK Low ch.	15M BW 16QAM Low ch.
	
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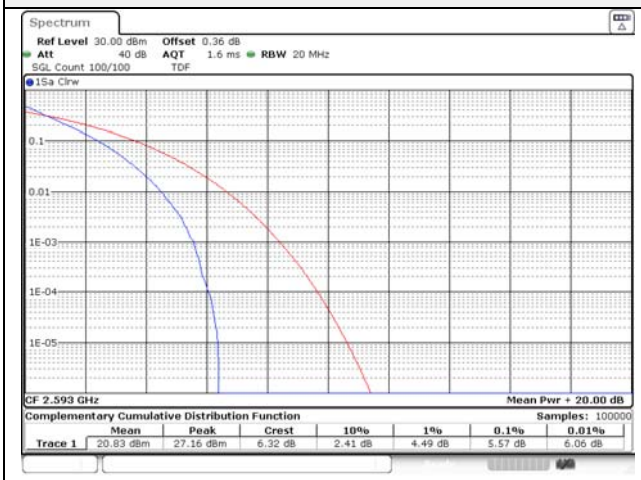
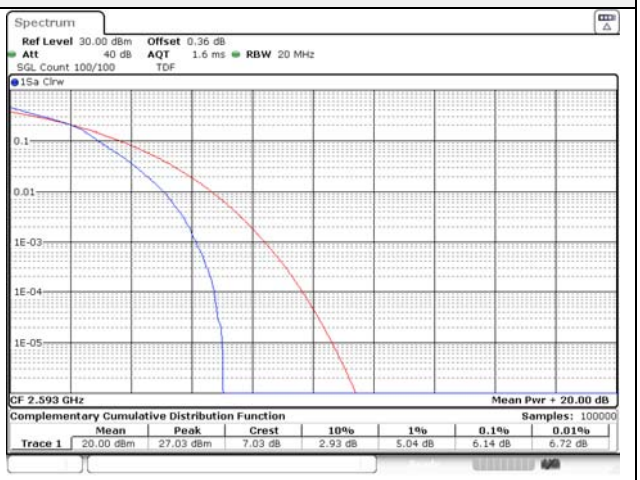
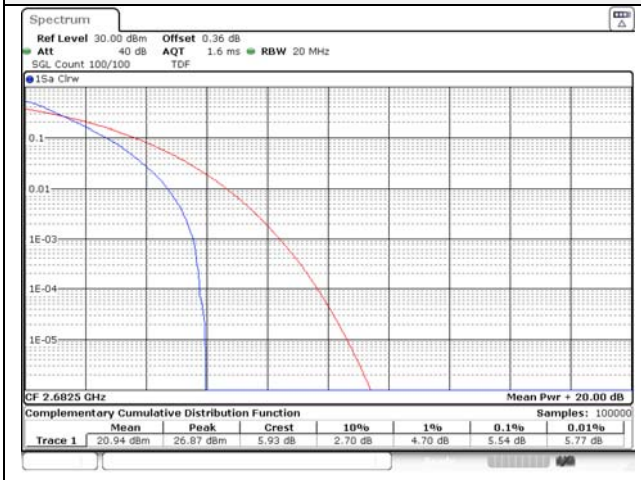
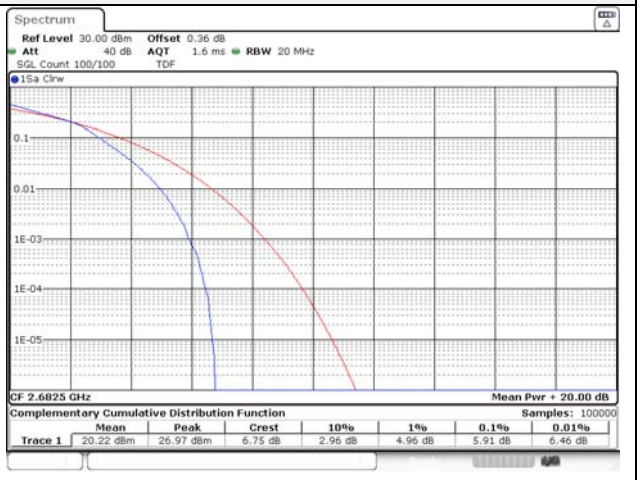
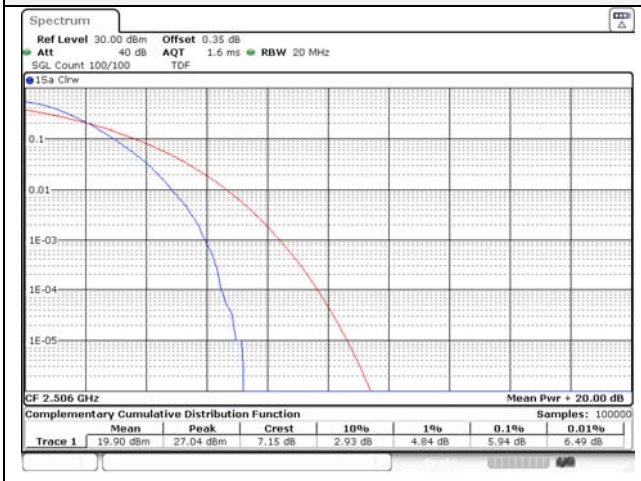
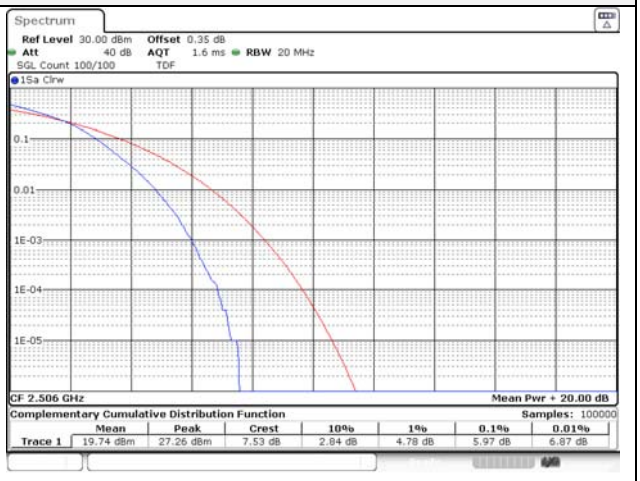
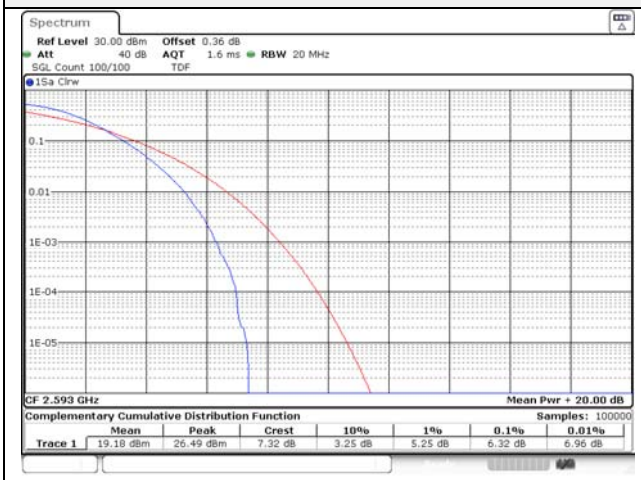
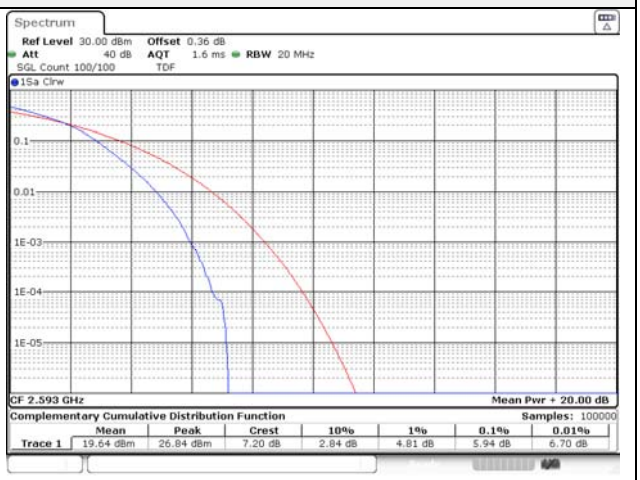
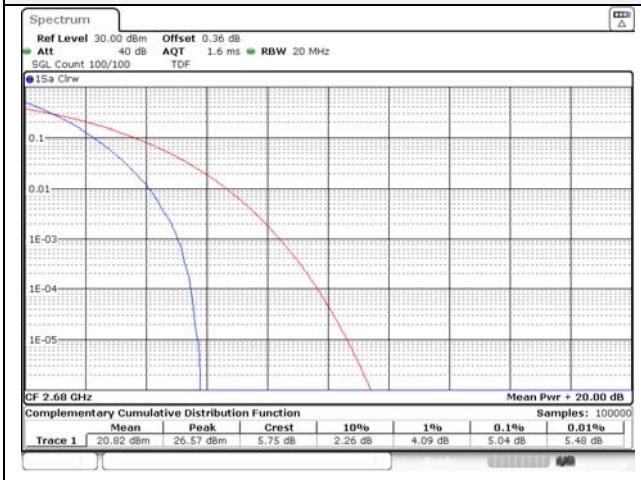
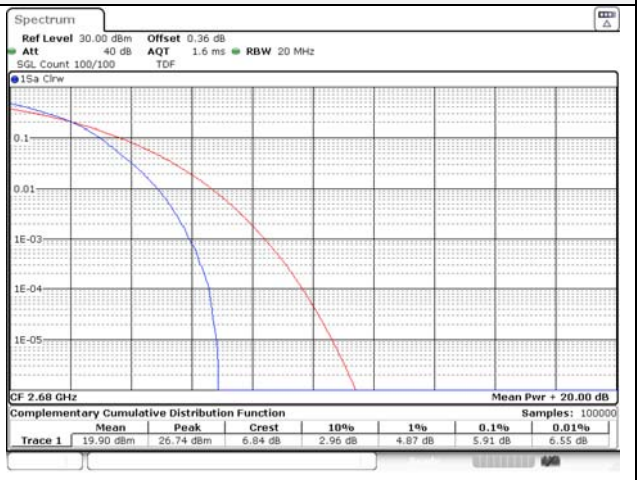
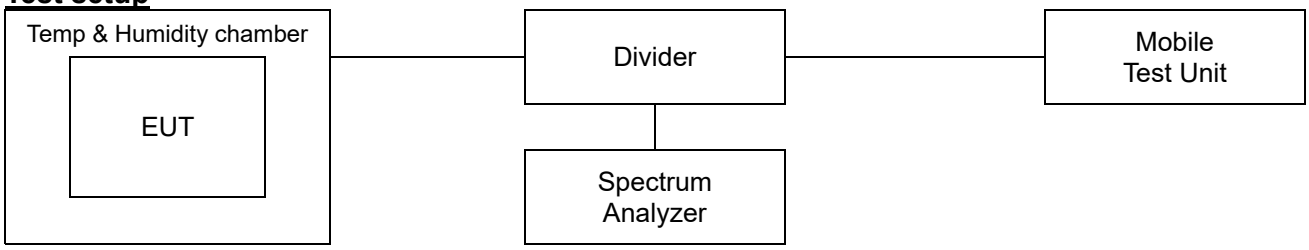
	
15M BW QPSK High ch.	**15M BW 16QAM High ch.**
	

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.**
	

8.6. Frequency stability

Test setup



Limit

According to §2.1055(a),

The frequency stability shall be measured with variation of ambient temperature as follows:

1) From -30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
2) From -20° to + 50° centigrade for equipment to be licensed for use in the maritime services under part 80 of this chapter, except for class A, B, and S emergency position indicating radiobeacons (EPIRBS), and equipment to be licensed for use above 952 ㎒ at operational fixed stations in all services, stations in the local television transmission service and point-to-point microwave radio service under part 21 of this chapter, equipment licensed for use aboard aircraft in the aviation services under part 87 of this chapter, and equipment authorized for use in the family radio service under part 95 of this chapter.
3) From 0° to + 50° centigrade for equipment to be licensed for use in the radio broadcast Services under part 73 of this chapter.

According to §2.1055(d),

The frequency stability shall be measured with variation of primary supply Voltage as follows:

1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating and point which shall be specified by the manufacturer.
3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

According to §22.355,

The carrier frequency of each transmitter in the public mobile services must be maintained within the tolerances given in Table of this section.

For mobile devices operating in the 824 to 849 ㎒ band at a power level than or equal to 3 Watts, the limit specified in Table C-1 is ±2.5 ppm.

According to §27.54,
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block (bands of operation).

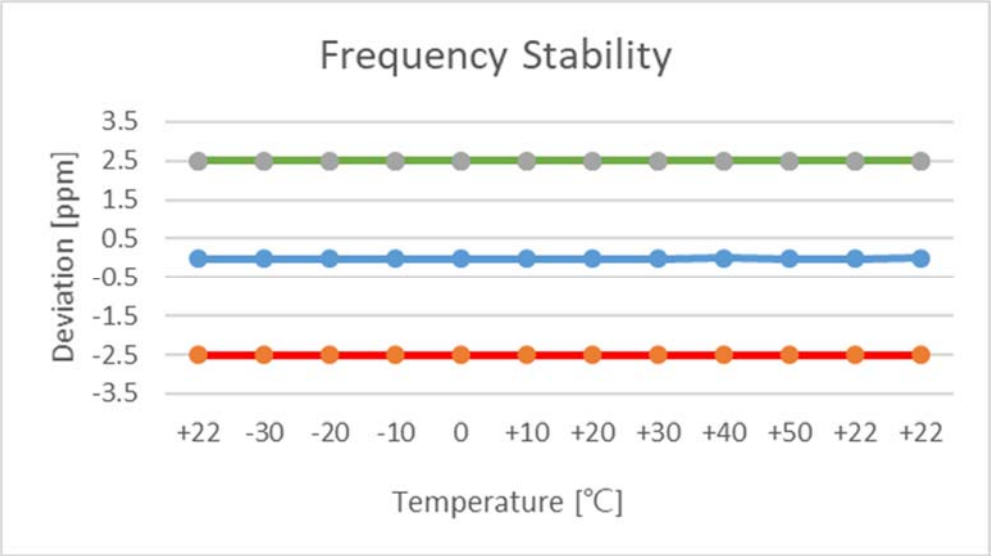
Test procedure
ANSI 63.26-2015 – Section 5.6

Test settings
1) The carrier frequency of the transmitter is measured at room temperature. (20°C to provide a reference)
2) The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3) Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each Temperature level.

Test results

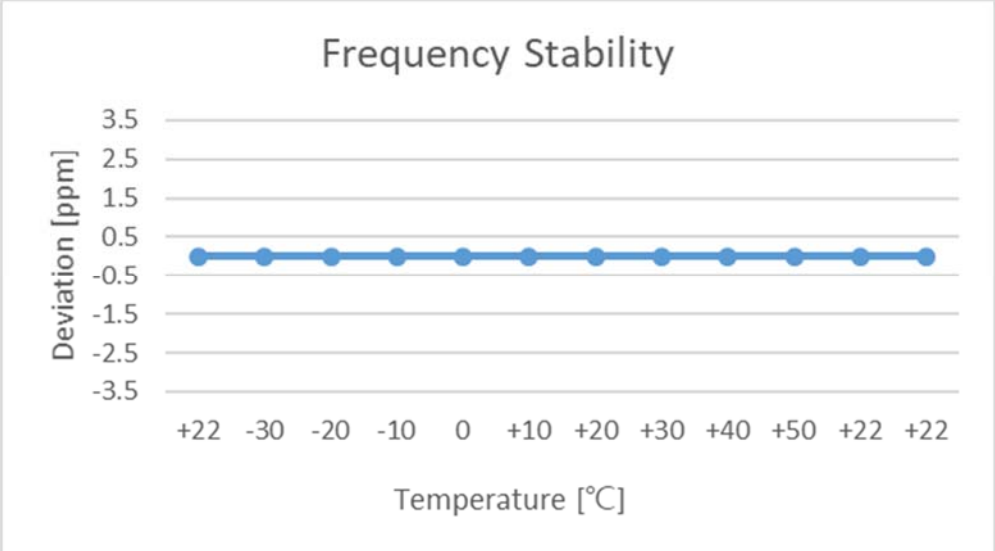
Test mode : LTE Band 5
Frequency (㎐) : 836 500 000
Channel : 20525
Deviation limit : ±0.00025% or 2.5ppm

Voltage (%)	Power (V)	Temp. (°C)	Frequency (㎐)	Frequency error (㎐)	Deviation	
					(ppm)	(%)
100%	3.86	+22(Ref)	836,499,991	-9.34	0.0	-0.000001
		-30	836,499,992	-8.23	0.0	-0.000001
		-20	836,499,991	-9.08	0.0	-0.000001
		-10	836,499,991	-9.30	0.0	-0.000001
		0	836,499,991	-9.08	0.0	-0.000001
		+10	836,499,991	-8.97	0.0	-0.000001
		+20	836,499,991	-8.99	0.0	-0.000001
		+30	836,499,993	-7.33	0.0	-0.000001
		+40	836,499,992	-7.94	0.0	-0.000001
		+50	836,499,991	-9.28	0.0	-0.000001
115%	4.44	+22(Ref)	836,499,989	-10.99	0.0	-0.000001
End point	3.45	+22(Ref)	836,499,993	-7.20	0.0	-0.000001



Test mode : LTE Band 41
Frequency (㎐) : 2 593 000 000
Channel : 40620
Deviation limit(FCC&IC) : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized bands of operation.

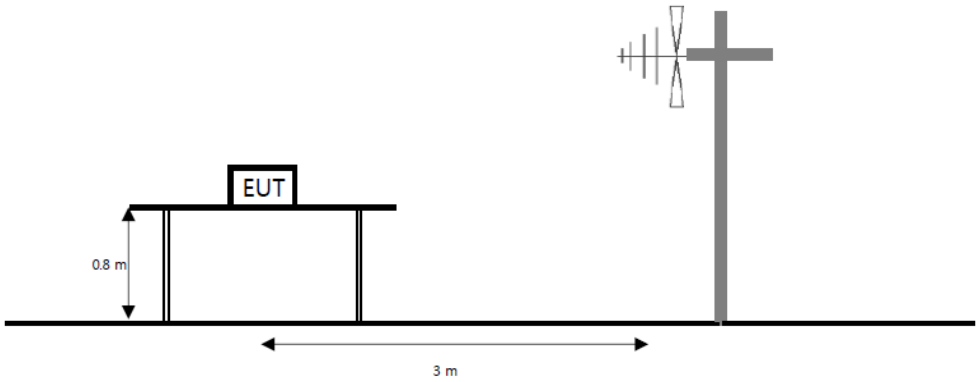
Voltage (%)	Power (V)	Temp. (°C)	Frequency (㎐)	Frequency error (㎐)	Deviation	
					(ppm)	(%)
100%	3.86	+22(Ref)	2,592,999,988	-12.16	0.0	0.000000
		-30	2,592,999,988	-11.89	0.0	0.000000
		-20	2,592,999,988	-11.92	0.0	0.000000
		-10	2,592,999,988	-12.16	0.0	0.000000
		0	2,592,999,987	-13.17	0.0	-0.000001
		+10	2,592,999,987	-12.84	0.0	0.000000
		+20	2,592,999,988	-11.57	0.0	0.000000
		+30	2,592,999,988	-12.42	0.0	0.000000
		+40	2,592,999,986	-13.64	0.0	-0.000001
		+50	2,592,999,987	-13.42	0.0	-0.000001
115%	4.44	+22	2,592,999,986	-14.05	0.0	-0.000001
End point	3.45	+22	2,592,999,988	-11.59	0.0	0.000000



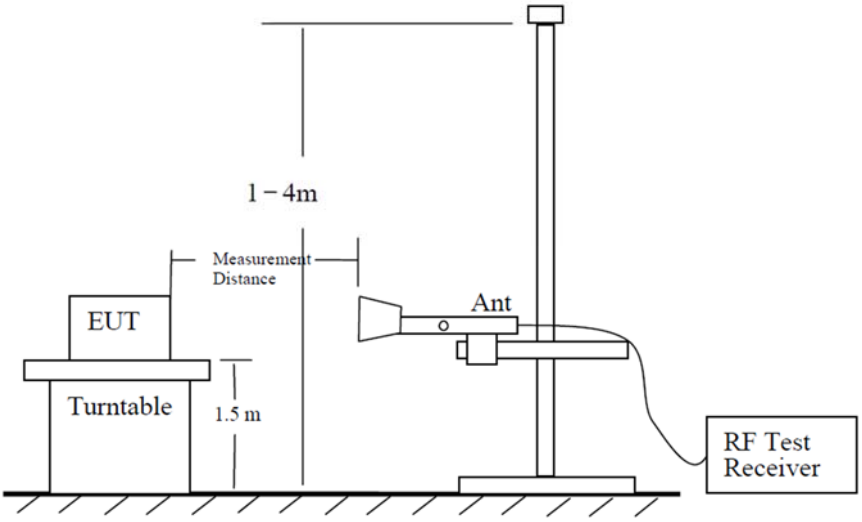
8.7. Radiated Power (ERP/EIRP)

Test setup

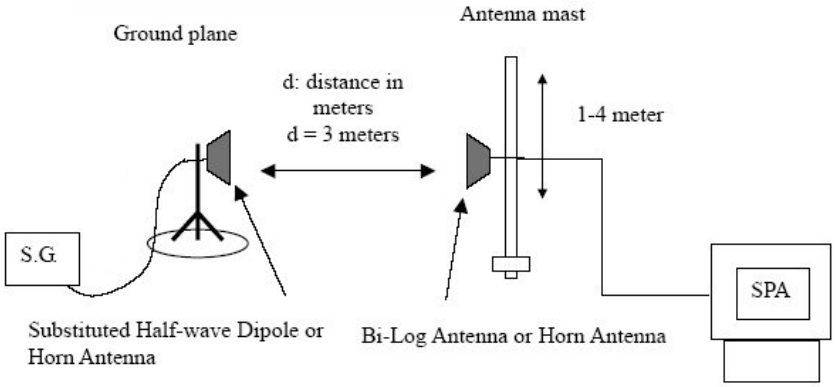
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



Limit

According to §22.913(a)(5), the ERP of transmitters in the cellular radiotelephone service must not exceed the limits in this section. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to §27.50(h)(2), Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test procedure

971168 D01 v03r01 - Section 5.2 and 5.8, 412172 D01 v01r01
ANSI 63.26-2015 – Section 5.2
ANSI/TIA-603-E-2016 - Section 2.2.17

Test settings

1) RBW = 1 % to 5 % of the OBW.
2) VBW ≥ 3 × RBW.
3) SPAN = 2 × to 3 × the OBW.
4) Number of measurement points in sweep ≥ 2 × span / RBW.
5) Sweep time :
   1) Auto couple, or
   2) ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
6) Detector = RMS
7) If the EUT can be configured to transmit continuously, then set the trigger to free run.
8) If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full -power transmissions).
9) Trace mode = trace averaging (RMS) over 100 sweeps.
10) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
11) Allow trace to fully stabilize.

Notes:

1. On a test site, the EUT shall be placed at 80 cm height on a turn table, and in the position close To normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to Correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the Level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
   The power is calculated by the following formula;
   Pd(㏈m) = Pg(㏈m) – Cable loss (㏈) + Antenna gain (㏈)
   Note. Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that The maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level Detected by the measuring corrected for the change of input attenuator setting of the measuring Receiver.
9. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for Any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna Orientated for horizontal polarization.

Test results

Test mode: LTE Band 5

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	824.7	H	-0.30	5.28	24.50	18.92	0.078
		836.5	H	-0.80	5.29	24.86	18.77	0.075
		848.3	H	-0.60	5.29	23.61	17.72	0.059
	16QAM	824.7	H	-0.30	5.28	23.30	17.72	0.059
		836.5	H	-0.80	5.29	23.91	17.82	0.061
		848.3	H	-0.60	5.29	22.36	16.47	0.044
3 M	QPSK	825.5	H	0.70	5.26	23.88	19.32	0.086
		836.5	H	-0.80	5.29	25.00	18.91	0.078
		847.5	H	-0.60	5.28	23.04	17.16	0.052
	16QAM	825.5	H	0.70	5.26	22.77	18.21	0.066
		836.5	H	-0.80	5.29	24.05	17.96	0.063
		847.5	H	-0.60	5.28	21.80	15.92	0.039
5 M	QPSK	826.5	H	0.70	5.26	23.71	19.15	0.082
		836.5	H	-0.80	5.29	25.01	18.92	0.078
		846.5	H	-0.60	5.28	23.34	17.46	0.056
	16QAM	826.5	H	0.70	5.26	22.95	18.39	0.069
		836.5	H	-0.80	5.30	23.79	17.69	0.059
		846.5	H	-0.60	5.28	22.26	16.38	0.043
10 M	QPSK	829.0	H	0.70	5.28	24.25	19.67	0.093
		836.5	H	-0.80	5.29	25.16	19.07	0.081
		844.0	H	-0.80	5.33	23.26	17.13	0.052
	16QAM	829.0	H	0.70	5.28	23.01	18.43	0.070
		836.5	H	-0.80	5.29	24.00	17.91	0.062
		844.0	H	-0.80	5.33	22.06	15.93	0.039

Note.
1. ERP & EIRP(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

Test mode: LTE Band 41

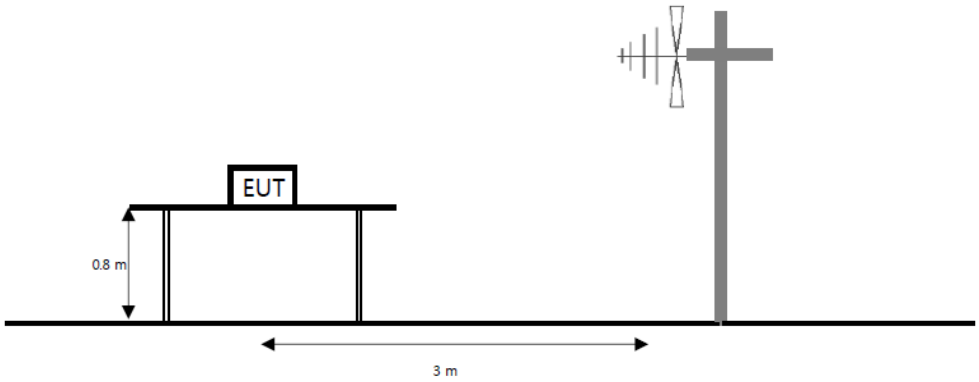
Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[W]
5 M	QPSK	2 498.5	V	6.20	9.07	25.45	22.58	0.181
		2 593.0	V	6.33	9.22	24.19	21.30	0.135
		2 687.5	V	6.46	9.47	20.45	17.44	0.055
	16QAM	2 498.5	V	6.20	9.07	24.65	21.78	0.151
		2 693.0	V	6.33	9.22	22.98	20.09	0.102
		2 687.5	V	6.46	9.47	19.58	16.57	0.045
10 M	QPSK	2 501.0	V	6.20	9.08	24.90	22.02	0.159
		2 593.0	V	6.33	9.22	24.77	21.88	0.154
		2 685.0	V	6.46	9.45	20.33	17.34	0.054
	16QAM	2 501.0	V	6.20	9.08	23.15	20.27	0.106
		2 593.0	V	6.33	9.22	24.07	21.18	0.131
		2 685.0	V	6.46	9.45	19.69	16.70	0.047
15 M	QPSK	2 503.5	V	6.20	9.08	25.50	22.62	0.183
		2 593.0	V	6.33	9.22	24.48	21.59	0.144
		2 682.5	V	6.46	9.46	20.90	17.90	0.062
	16QAM	2 503.5	V	6.20	9.08	24.61	21.73	0.149
		2 593.0	V	6.33	9.22	22.89	20.00	0.100
		2 682.5	V	6.46	9.46	19.92	16.92	0.049
20 M	QPSK	2 506.0	V	6.21	9.10	24.80	21.91	0.155
		2 593.0	V	6.33	9.22	24.20	21.31	0.135
		2 680.0	V	6.45	9.47	20.55	17.53	0.057
	16QAM	2 506.0	V	6.21	9.10	23.57	20.68	0.117
		2 593.0	V	6.33	9.22	23.76	20.87	0.122
		2 680.0	V	6.45	9.47	19.70	16.68	0.047

Note.
1. ERP & EIRP(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

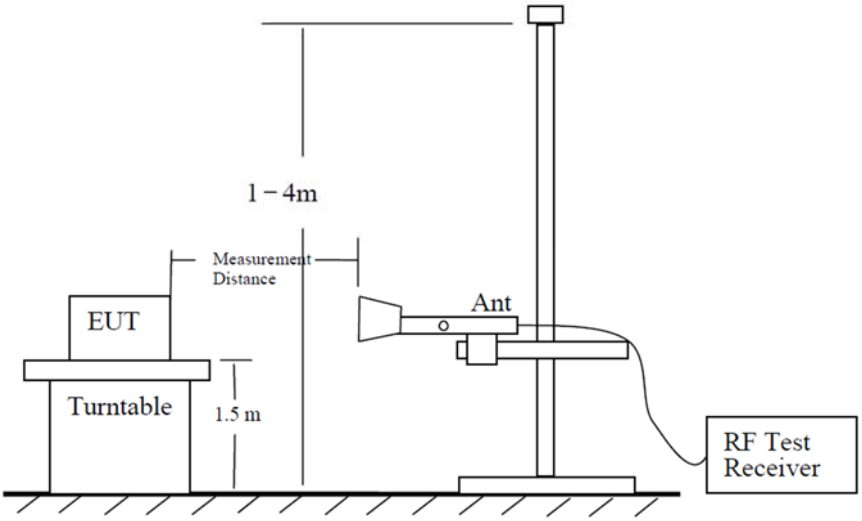
8.8. Radiated Spurious Emissions

Test setup

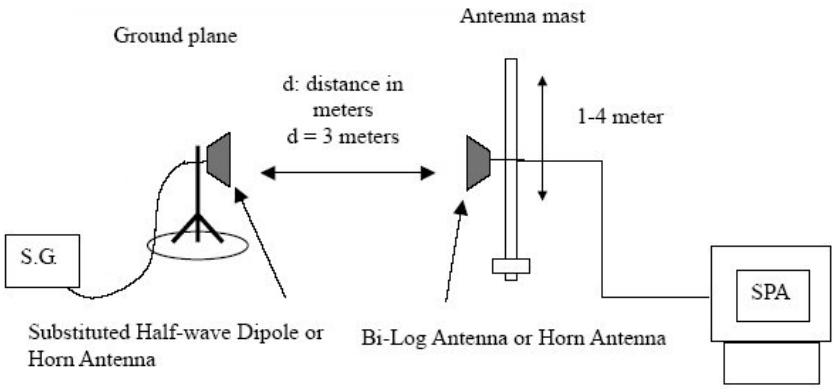
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



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 53 + 10log($P_{[Watts]}$) ㏈.

Test procedure

971168 D01 v03r01 - Section 6.2
ANSI 63.26-2015 – Section 5.5
ANSI/TIA-603-E-2016 - Section 2.2.12

Test settings

1) RBW = 100 ㎑ for below 1 ㎓ and 1 ㎒ for above 1 ㎓.
2) VBW ≥ 3 × RBW.
3) Detector = RMS
4) Trace mode = Max hold
5) Sweep time = Auto couple
6) Number of sweep points ≥ 2 × span / RBW
7) Allow trace to fully stabilize.

For the narrowband spurious settings:

1) RBW = 1 ㎑
2) VBW = 3 ㎑
3) Detector = RMS
4) Trace mode = Max hold
5) Sweep speed slow enough to maintain measurement calibration.

Notes:

1. On a test site, the EUT shall be placed at 80 ㎝ height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring corrected for the change of input attenuator setting of the measuring receiver.
9. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Test results (Above 1 000 ㎒)

Test mode : LTE Band 5
Frequency(㎒) : 829.0
Channel : 20450
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 298.37	H	7.74	10.53	-46.71	-49.50	-13.00	36.50
	4 947.69	V	9.94	13.16	-35.68	-38.90	-13.00	25.90
	5 772.35	V	10.55	14.15	-36.40	-40.00	-13.00	27.00
	6 597.01	V	10.92	15.20	-38.52	-42.80	-13.00	29.80

Test mode : LTE Band 5
Frequency(㎒) : 836.5
Channel : 20525
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	3 327.91	H	7.82	10.58	-46.54	-49.30	-13.00	36.30
	4 992.41	V	10.08	12.61	-32.47	-35.00	-13.00	22.00
	5 824.86	V	10.56	14.56	-32.60	-36.60	-13.00	23.60
	6 656.91	V	10.99	15.14	-34.05	-38.20	-13.00	25.20

Test mode : LTE Band 5
Frequency(㎒) : 844.0
Channel : 20600
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	4 241.60	V	8.76	11.97	-46.99	-50.20	-13.00	37.20
	5 090.47	V	10.17	13.43	-31.24	-34.50	-13.00	21.50
	5 938.92	V	10.59	14.27	-27.92	-31.60	-13.00	18.60
	6 787.37	V	11.14	15.46	-37.68	-42.00	-13.00	29.00

Note.
1. ERP & EIRP(㏈m)= Substitute Level(㏈) + Antenna gain(㏈i) – Cable Loss(㏈)

Test mode : LTE Band 41
Frequency(㎒) : 2 503.5
Channel : 39725
Bandwidth(㎒) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	7 490.62	V	12.09	16.27	-43.02	-47.20	-25.00	22.20
	9 987.11	H	13.10	18.90	-32.40	-38.20	-25.00	13.20
	12 474.02	V	13.20	21.05	-38.55	-46.40	-25.00	21.40
	14 980.72	V	14.10	23.09	-28.81	-37.80	-25.00	12.80

Test mode : LTE Band 41
Frequency(㎒) : 2 593.0
Channel : 40620
Bandwidth(㎒) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	5 170.31	H	10.24	14.12	-47.42	-51.30	-25.00	26.30
	7 759.35	H	12.31	16.40	-44.61	-48.70	-25.00	23.70
	10 342.65	H	13.10	19.19	-38.31	-44.40	-25.00	19.40
	12 977.02	V	13.49	21.51	-39.38	-47.40	-25.00	22.40

Test mode : LTE Band 41
Frequency(㎒) : 2 682.5
Channel : 41515
Bandwidth(㎒) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	8 024.26	V	12.52	16.64	-43.48	-47.60	-25.00	22.60
	10 703.31	H	13.14	19.50	-32.04	-38.40	-25.00	13.40
	13 375.97	V	13.95	21.58	-37.07	-44.70	-25.00	19.70
	16 055.02	H	13.68	24.15	-28.03	-38.50	-25.00	13.50

Note.
1. ERP & EIRP(㏈m)= Substitute Level(㏈) + Antenna gain(㏈i) – Cable Loss(㏈)

9. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Biconical VHF-UHF Broadband Antenna	SCHWARZBECK	VUBA9117	275	22.04.09
Bilog Antenna	ETS.LINDGREN	3143B	00228420	21.09.30
Horn Antenna	ETS.lindgren	3117	161225	21.05.12
Horn Antenna	ETS.LINDGREN	3117	00227509	21.09.23
Horn Antenna	ETS.lindgren	3116	00086632	22.01.29
Horn Antenna	ETS.lindgren	3116	00086635	21.05.12
High pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40SS	32	21.08.20
High pass Filter	Wainwright Instruments GmbH	WHKX10-900-1000-15000-40SS	11	21.08.20
Broadband Amplifier	SONOMA INSTRUMENT	310N	186280	22.04.01
Amplifier	L-3 Narda-MITEQ	AFS5-00101800-25-S-5	2054571	21.08.28
Amplifier	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	22.01.21
Spectrum Analyzer	KEYSIGHT	N9040B	US55230151	21.07.29
Widebnad Radio Communication Tester	R&S	CMW500	141780	22.04.01
Spectrum Analyzer	R&S	FSV40	100988	21.12.23
Spectrum Analyzer	R&S	FSV30	100807	21.07.29
Power Divider	Aeroflex/ Weinschel,Inc	1580-1	PE430	21.07.29
Vector Signal Generator	R&S	SMBV100A	257566	21.07.13
Signal Generator	R&S	SMB100A	176206	22.01.20
Wideband Radio Communication Tester	R&S	CMW500	132120	21.05.11
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	N/A	N/A
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	N/A	N/A
Turn Device	innco systems GmbH	DE3700-RH	N/A	N/A

End of test report