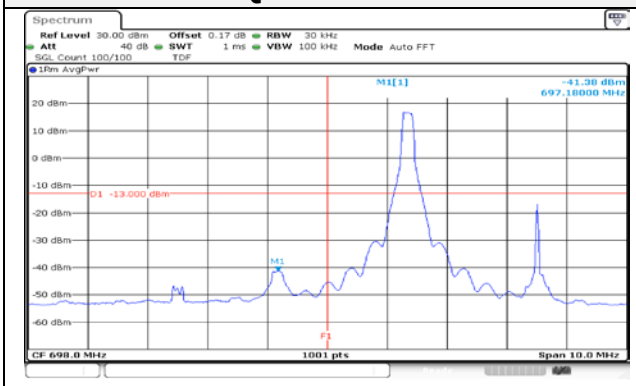
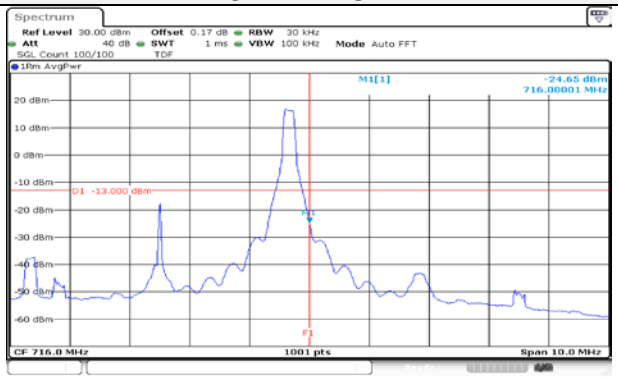
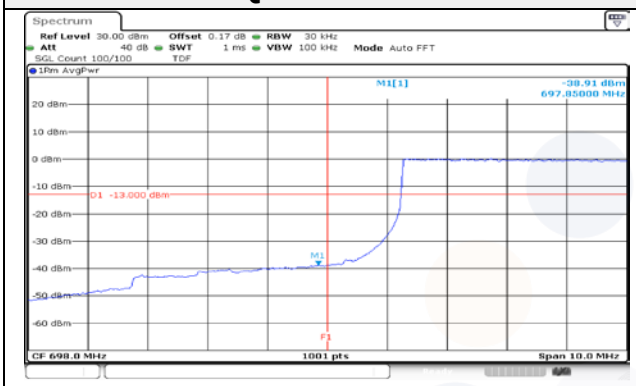
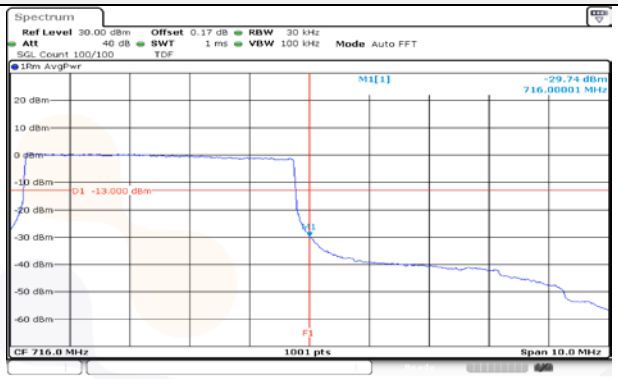
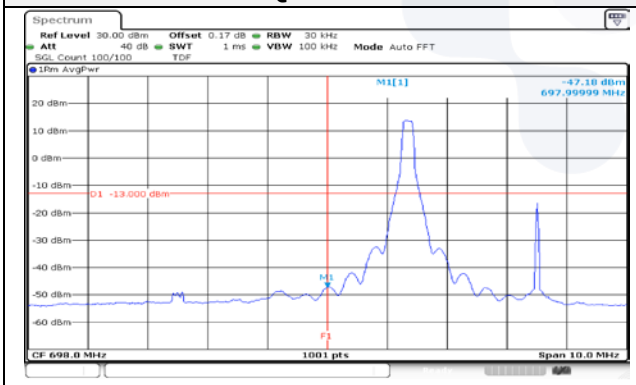
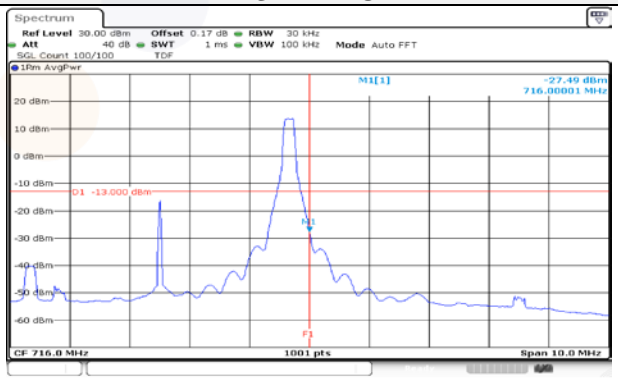
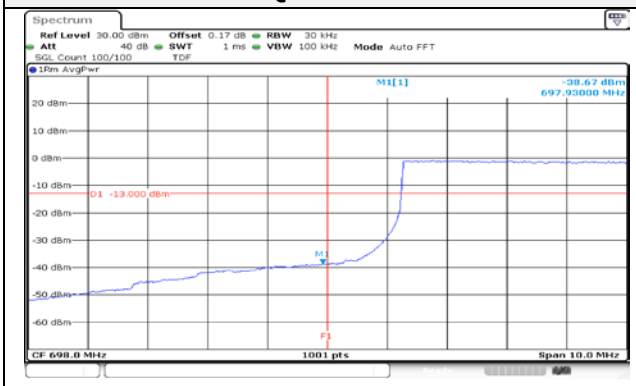
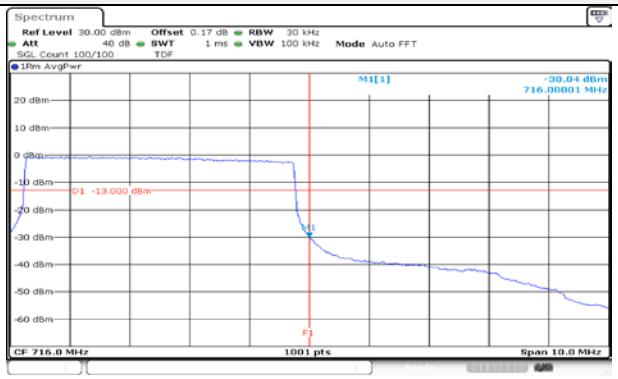
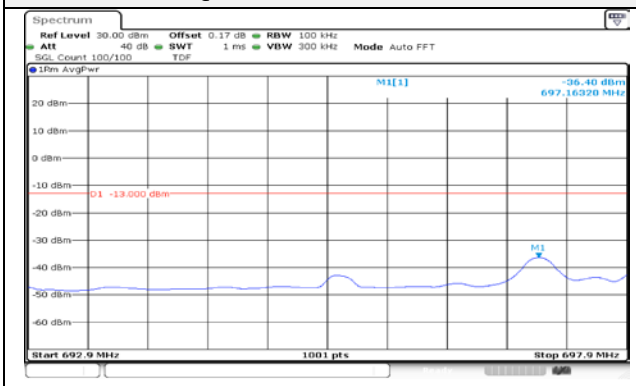
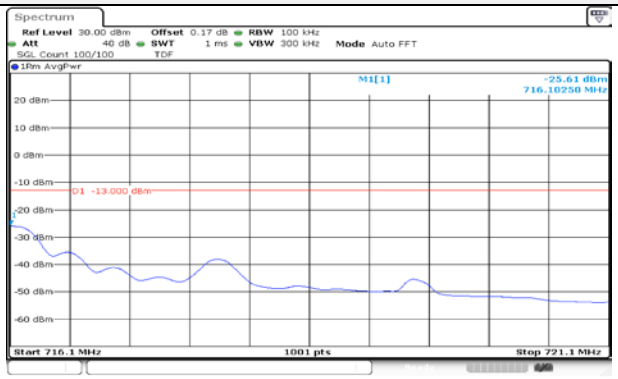
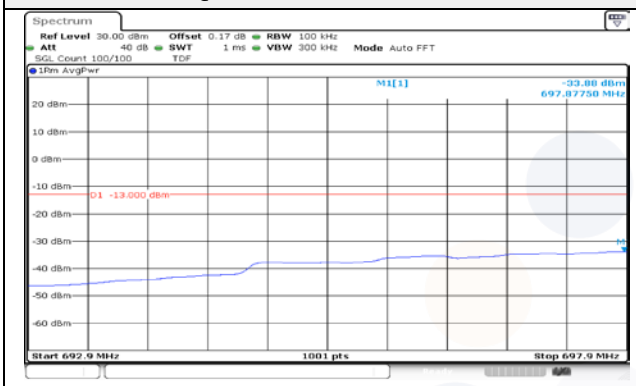
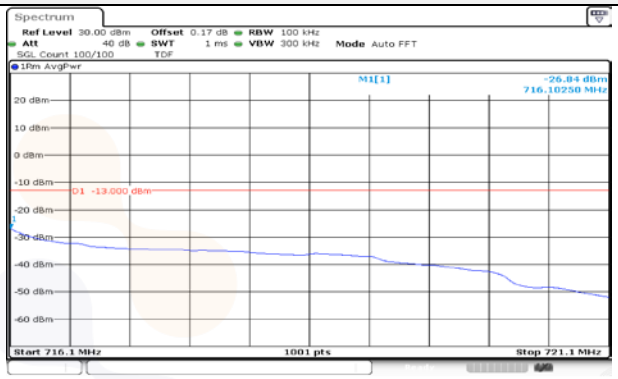
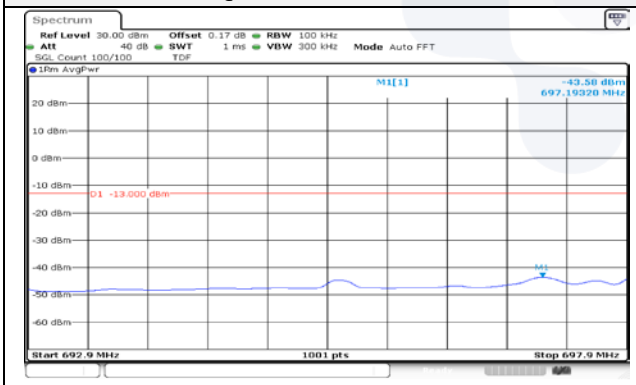
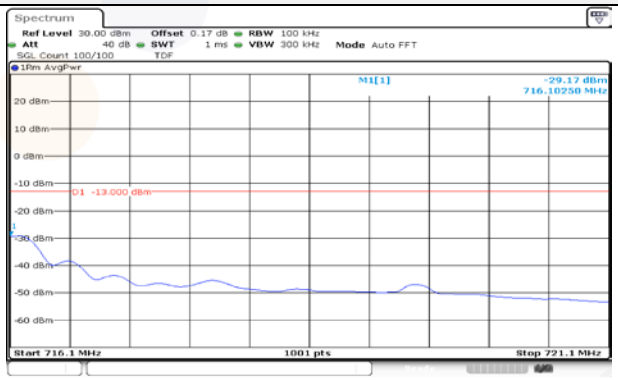
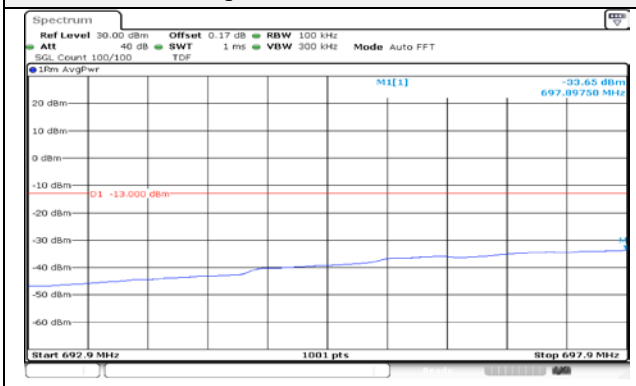
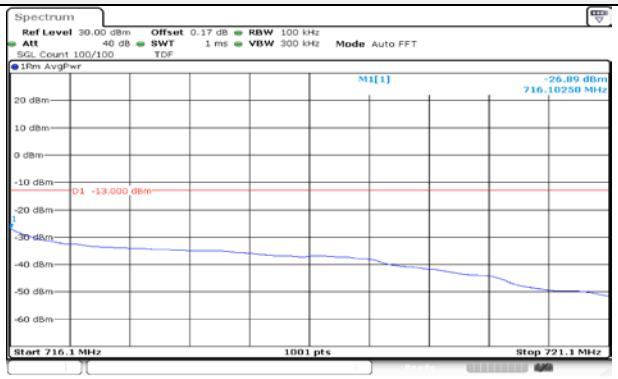
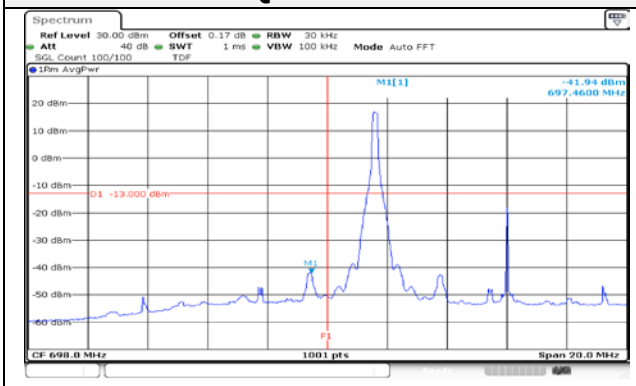
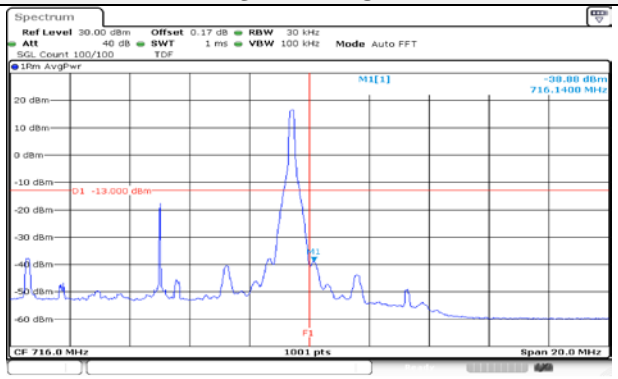
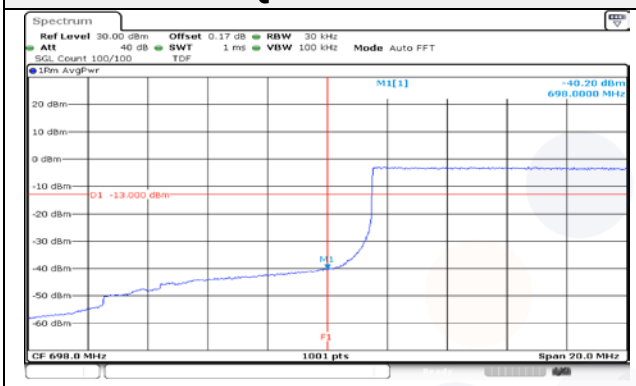
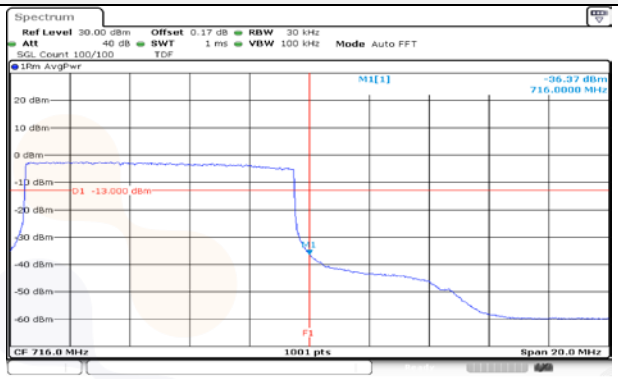
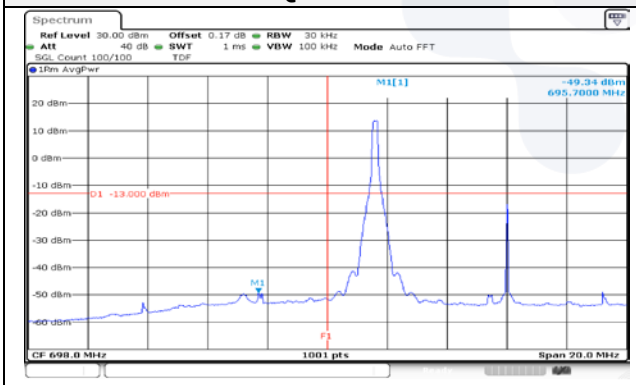
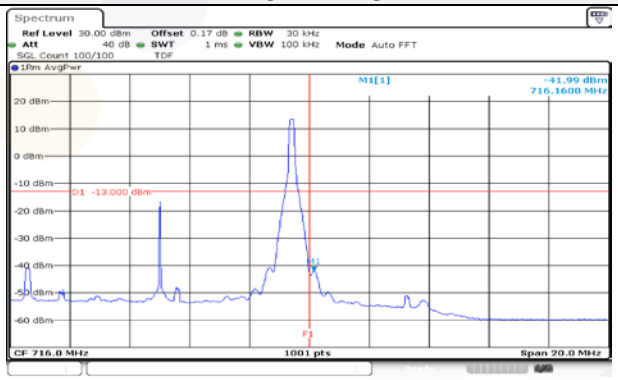
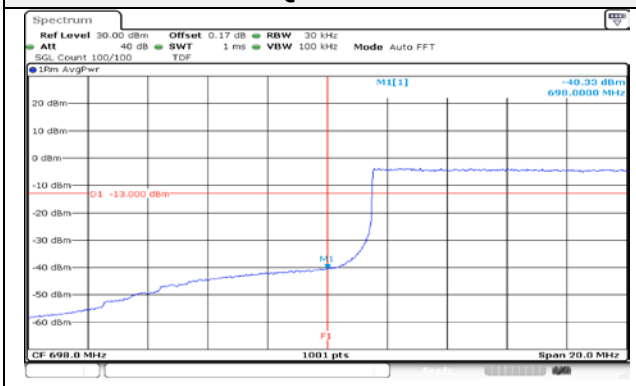
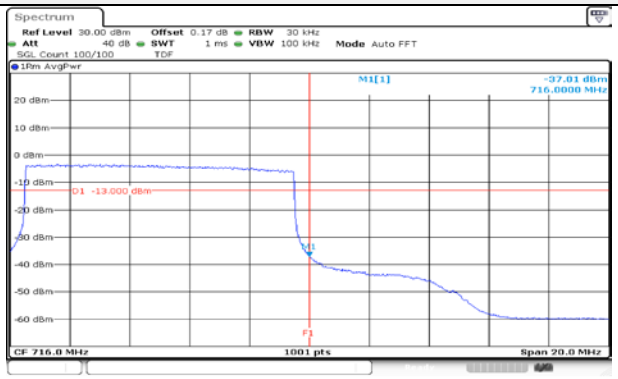
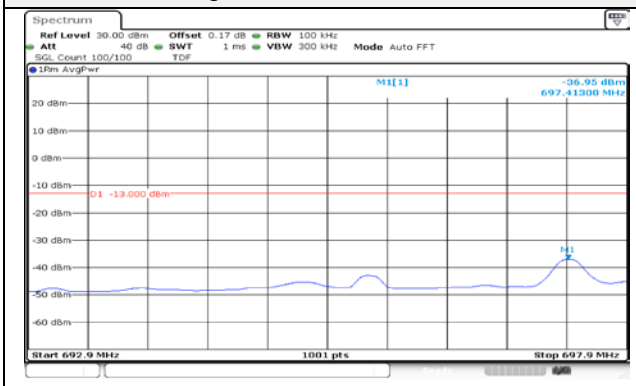
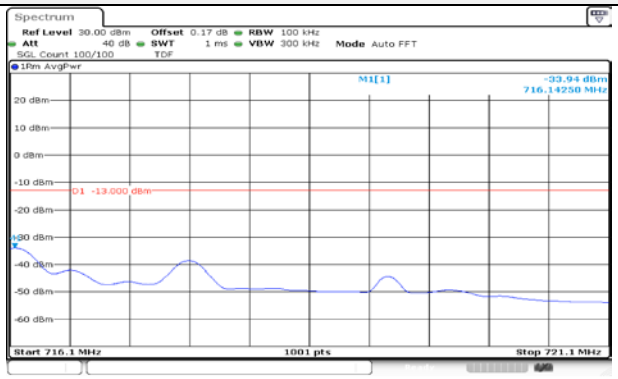
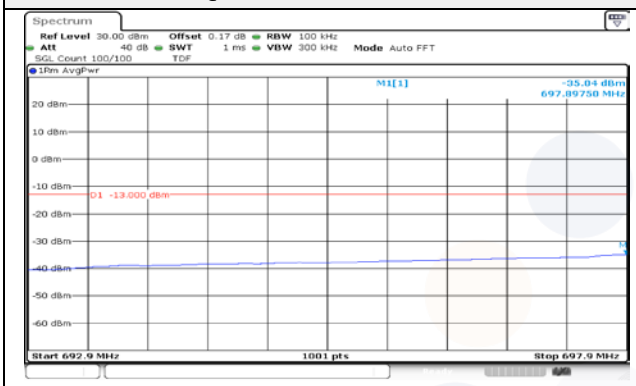
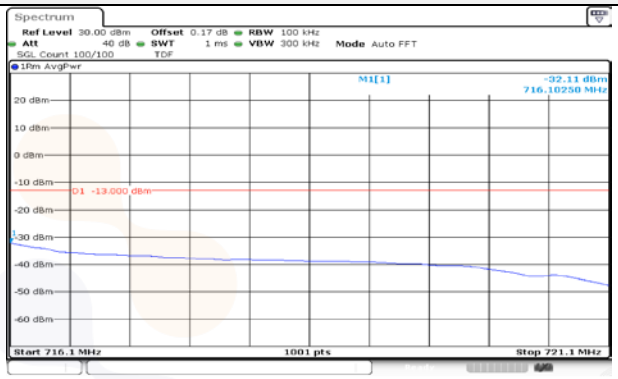
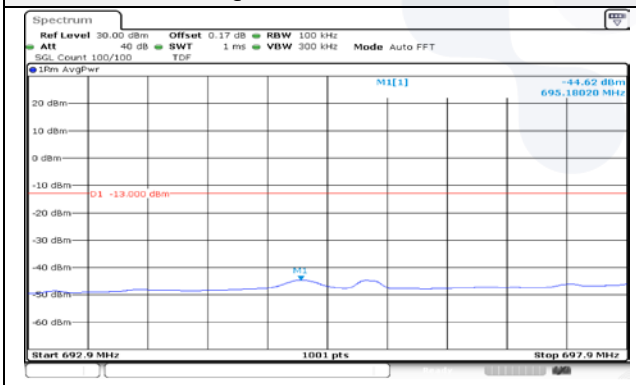
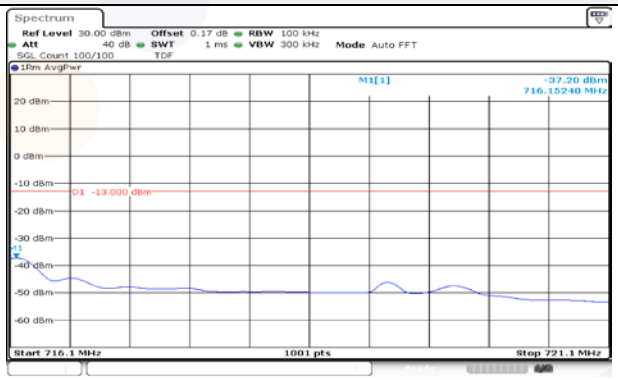
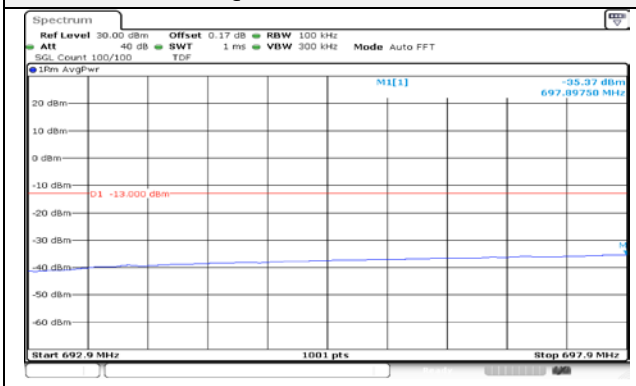
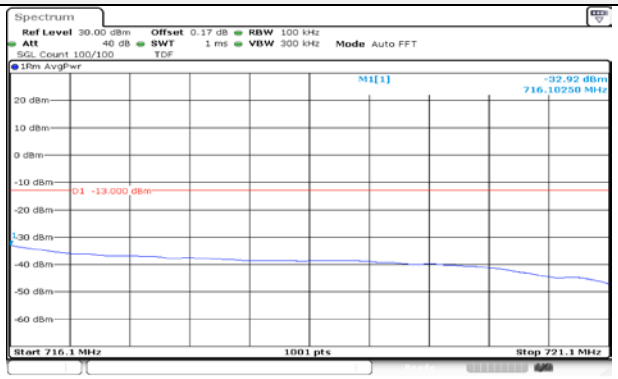
| 5M BW QPSK Low ch. 1RB | 5M BW QPSK High ch. 1RB |
|---|---|
|  |  |
| **5M BW QPSK Low ch. FRB** | **5M BW QPSK High ch. FRB** |
|  |  |
| **5M BW 16QAM Low ch. 1RB** | **5M BW 16QAM High ch. 1RB** |
|  |  |
| **5M BW 16QAM Low ch. FRB** | **5M BW 16QAM High ch. FRB** |
|  |  |

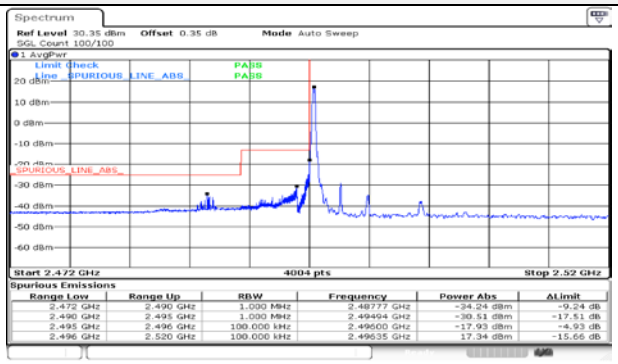
| 5M BW QPSK Lower extended 1RB | 5M BW QPSK Upper extended 1RB |
|---|---|
|  |  |
| **5M BW QPSK Lower extended FRB** | **5M BW QPSK Upper extended FRB** |
|  |  |
| **5M BW 16QAM Lower extended 1RB** | **5M BW 16QAM Upper extended 1RB** |
|  |  |
| **5M BW 16QAM Lower extended FRB** | **5M BW 16QAM Upper extended 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** |
|  |  |

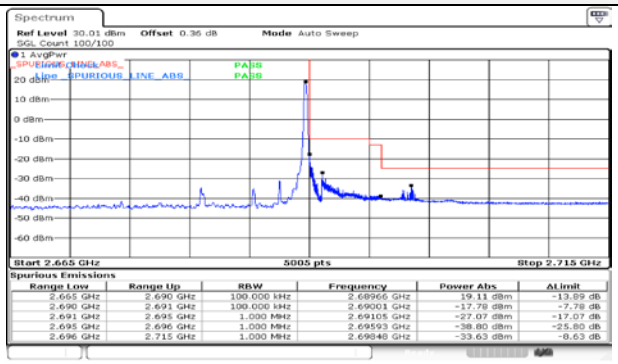
| 10M BW QPSK Lower extended 1RB | 10M BW QPSK Upper extended 1RB |
|---|---|
|  |  |
| **10M BW QPSK Lower extended FRB** | **10M BW QPSK Upper extended FRB** |
|  |  |
| **10M BW 16QAM Lower extended 1RB** | **10M BW 16QAM Upper extended 1RB** |
|  |  |
| **10M BW 16QAM Lower extended FRB** | **10M BW 16QAM Upper extended FRB** |
|  |  |

## Test mode: LTE Band 41

### 5M BW QPSK Low ch. 1RB




### 5M BW QPSK High ch. 1RB

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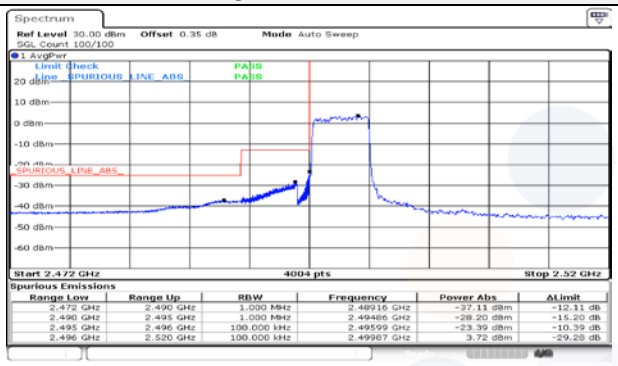
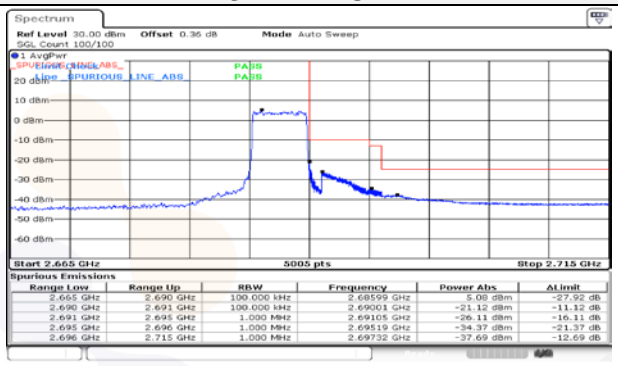
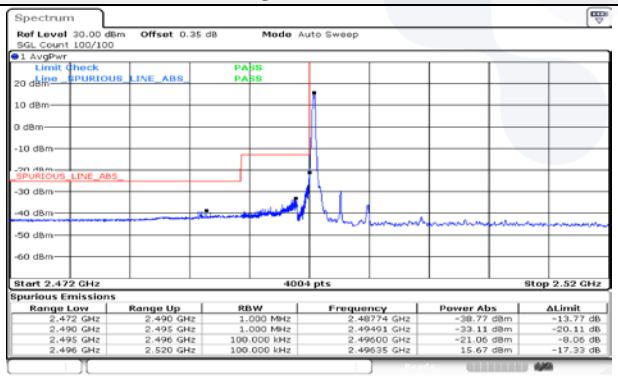



### 5M BW QPSK High ch. FRB




### 5M BW 16QAM Low ch. 1RB

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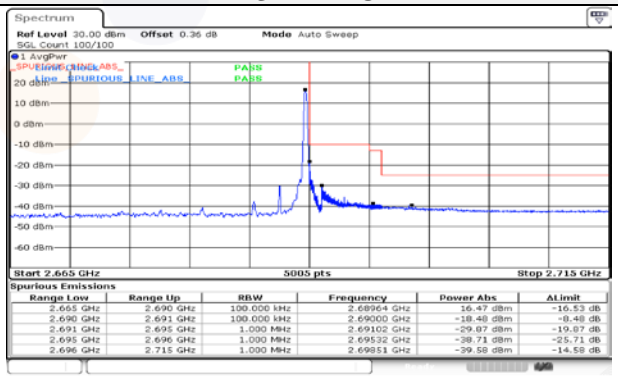


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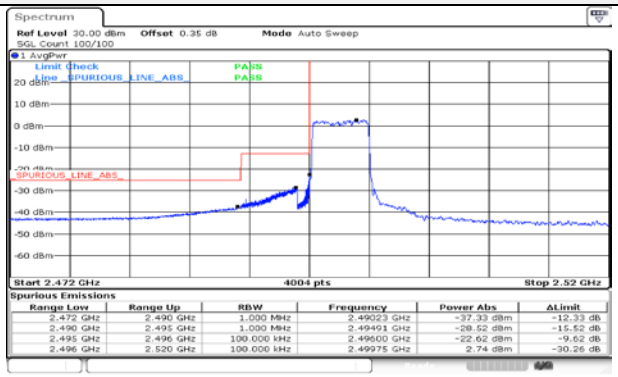
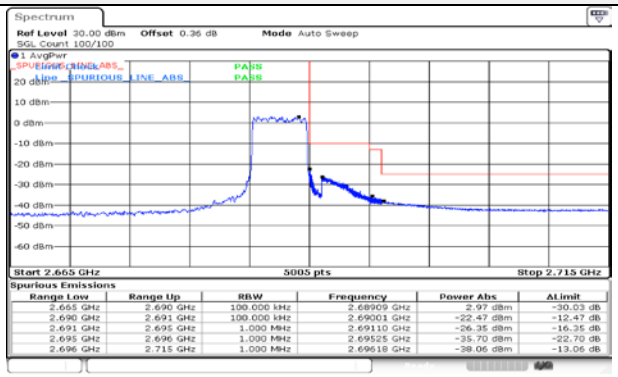
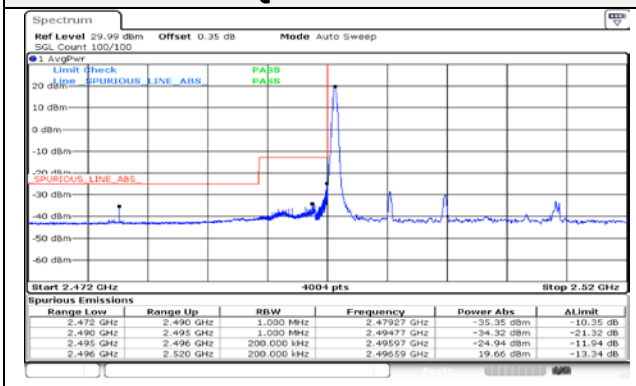


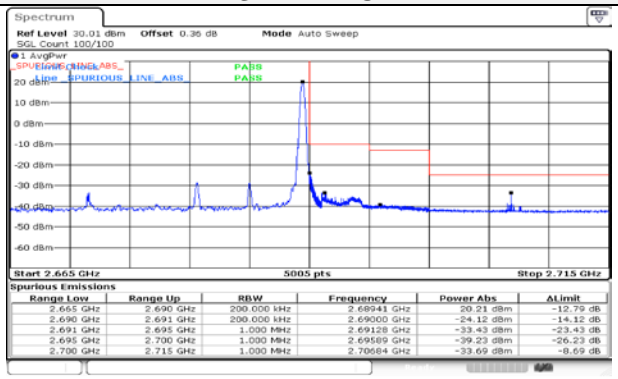

### 5M BW 16QAM High ch. FRB



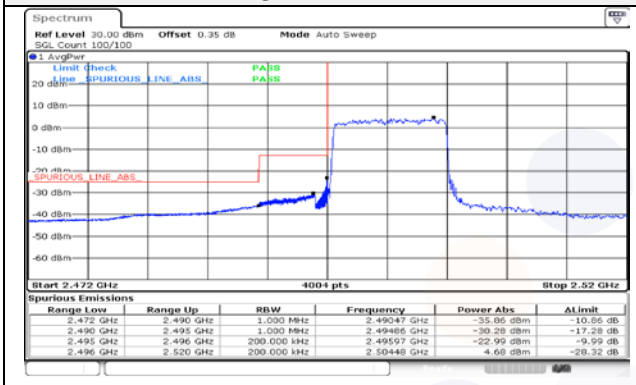
## 10M BW QPSK Low ch. 1RB



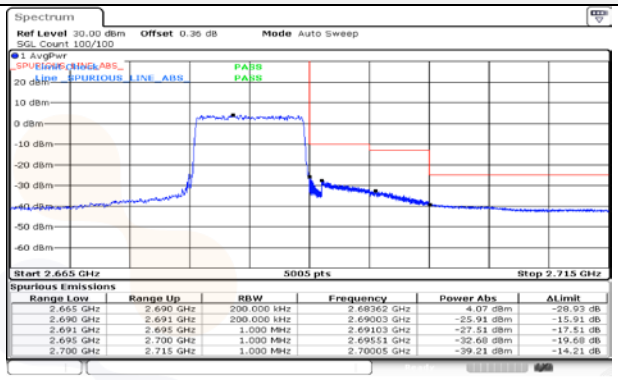

## 10M BW QPSK High ch. 1RB



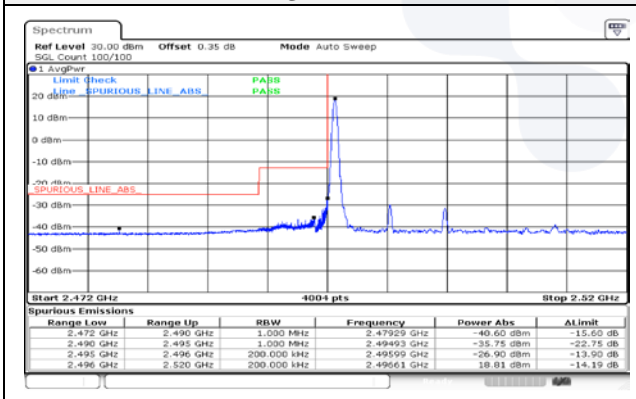

## 10M BW QPSK Low ch. FRB



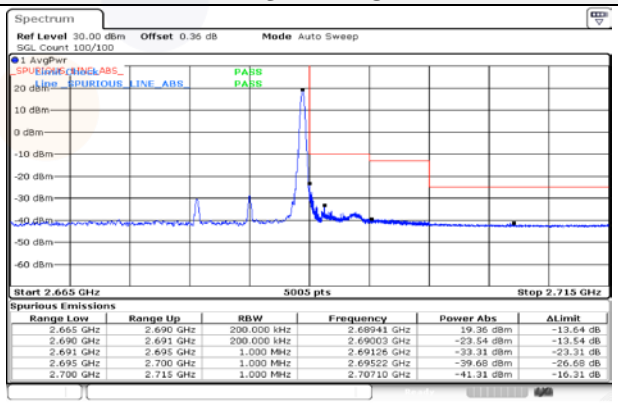

## 10M BW QPSK High ch. FRB



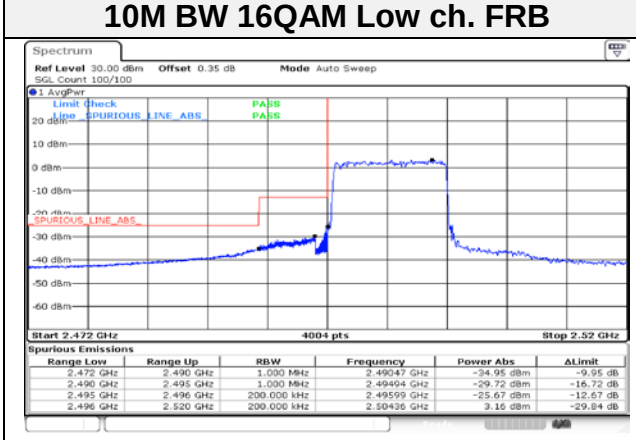

## 10M BW 16QAM Low ch. 1RB



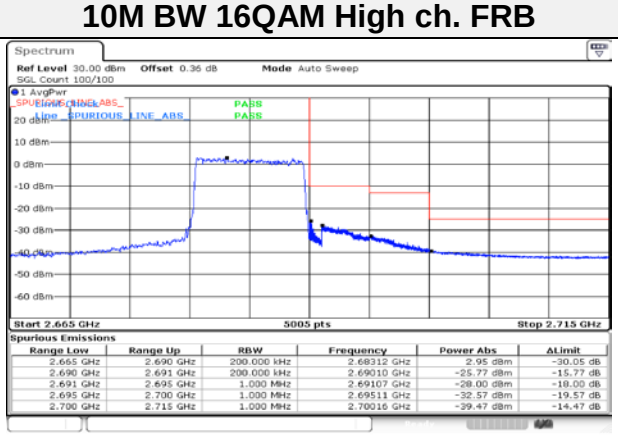

## 10M BW 16QAM High ch. 1RB



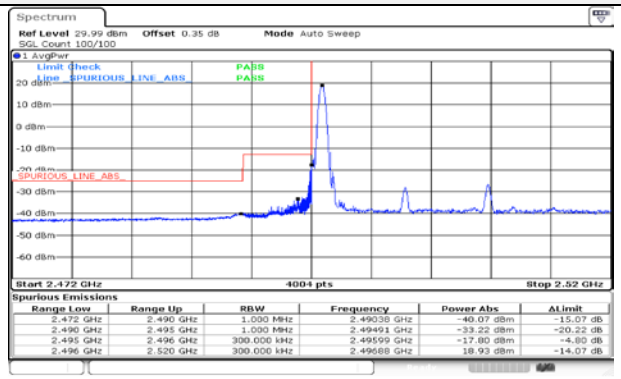

## 10M BW 16QAM Low ch. FRB



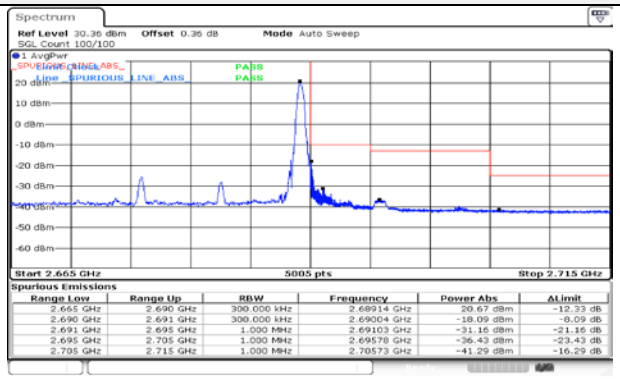

## 10M BW 16QAM High ch. FRB



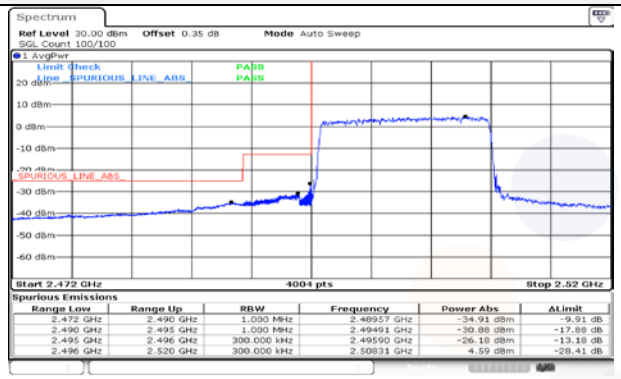
## 15M BW QPSK Low ch. 1RB



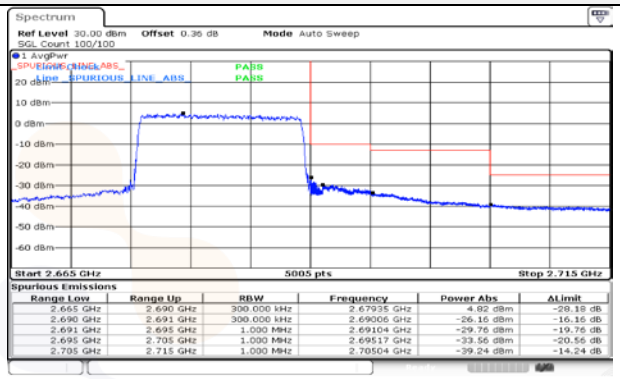

## 15M BW QPSK High ch. 1RB



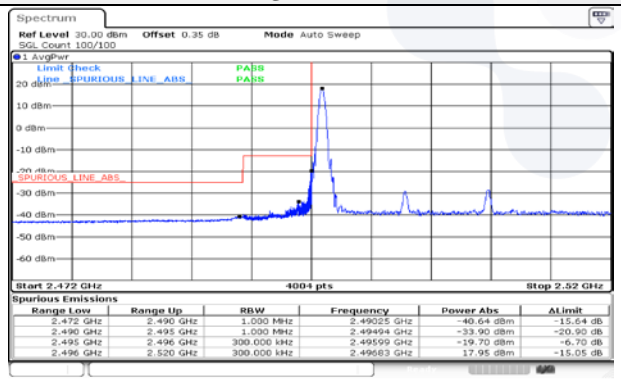

## 15M BW / QPSK / Low ch. / FRB



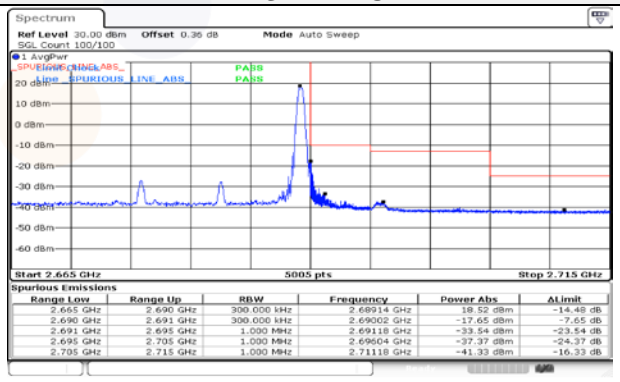

## 15M BW / QPSK / High ch. / FRB



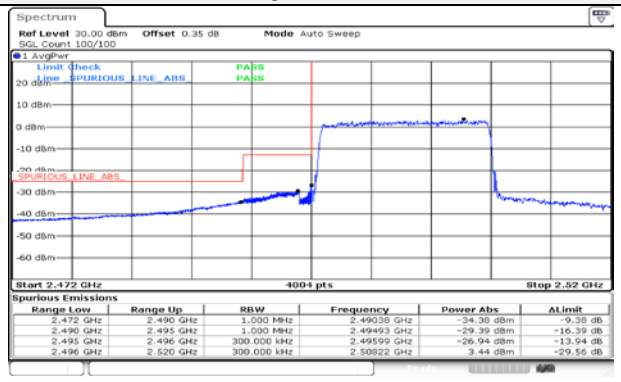

## 15M BW 16QAM Low ch. 1RB



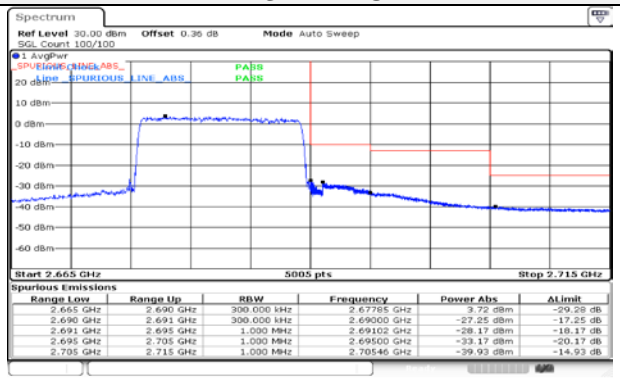

## 15M BW 16QAM High ch. 1RB



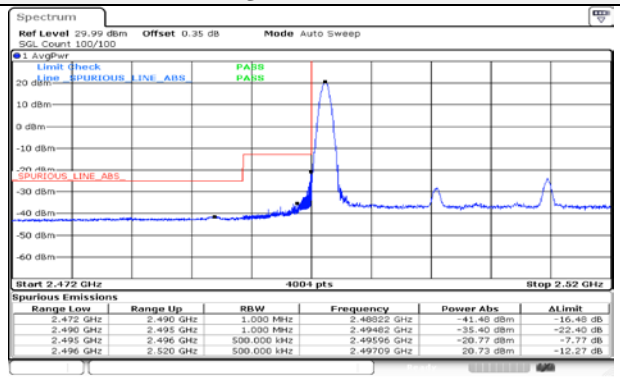

## 15M BW 16QAM Low ch. FRB



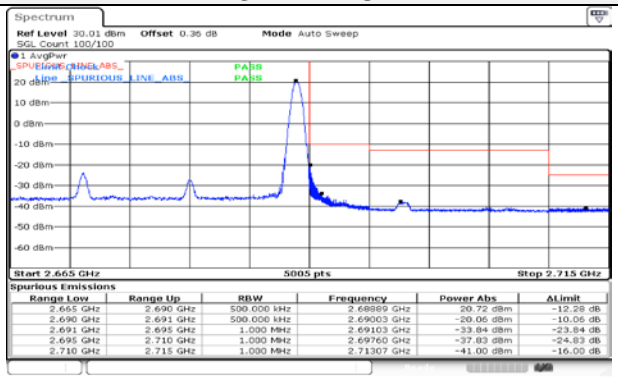

## 15M BW 16QAM High ch. FRB



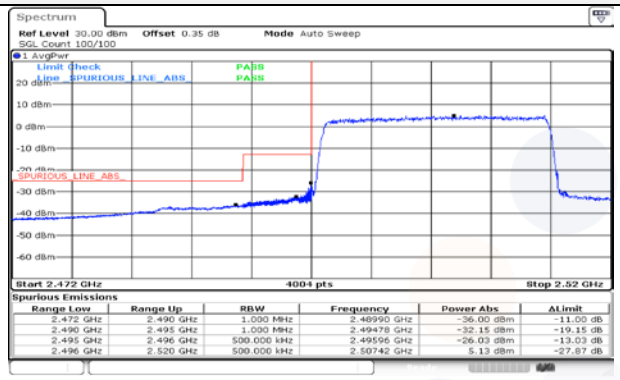
## 20M BW QPSK Low ch. 1RB



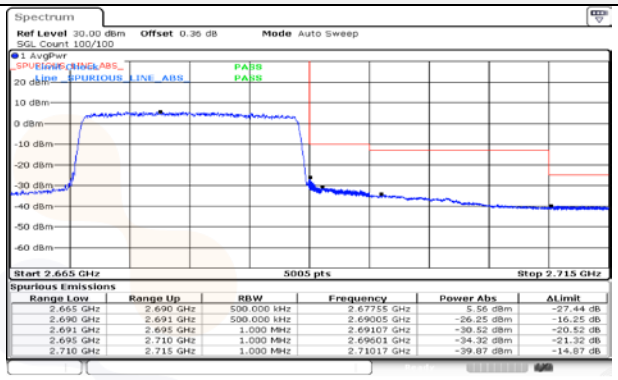

## 20M BW QPSK High ch. 1RB



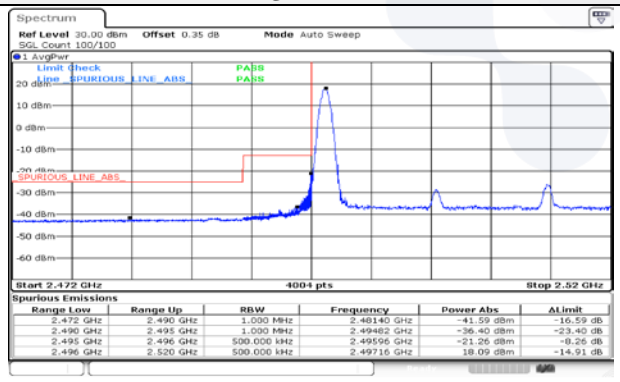

## 20M BW QPSK Low ch. FRB



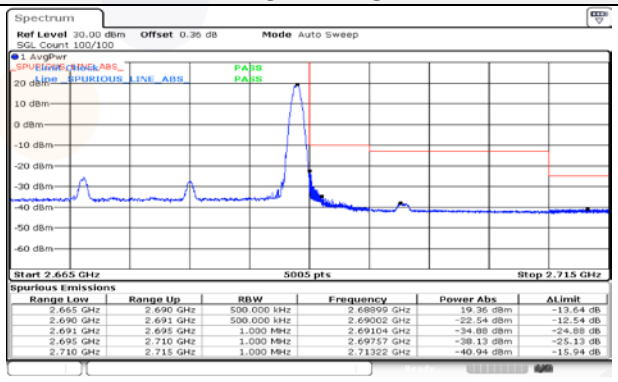

## 20M BW QPSK High ch. FRB



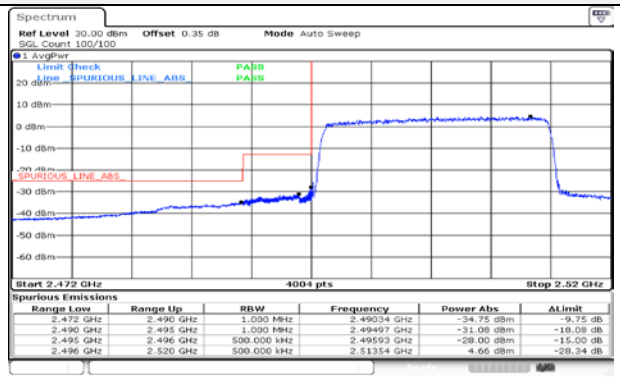

## 20M BW 16QAM Low ch. 1RB



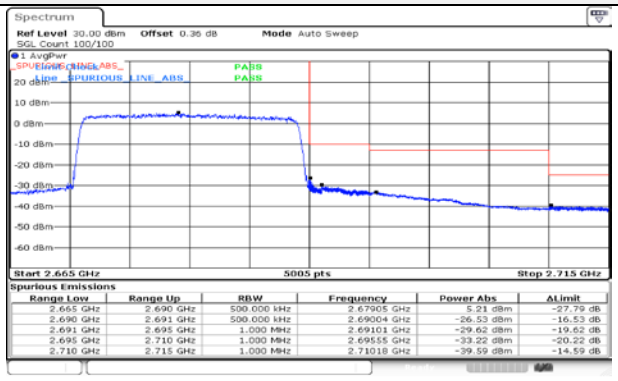

## 20M BW 16QAM High ch. 1RB




## 20M BW 16QAM Low ch. FRB

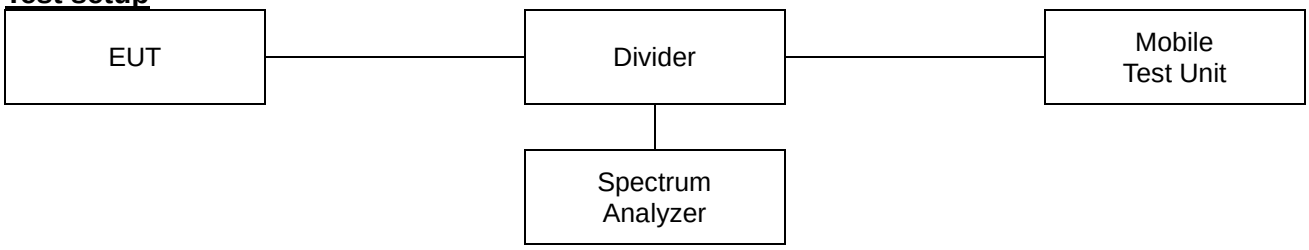



## 20M BW 16QAM High ch. FRB



## 7.5. 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
971168 D02 v02r01 – Section 7.(b)
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%

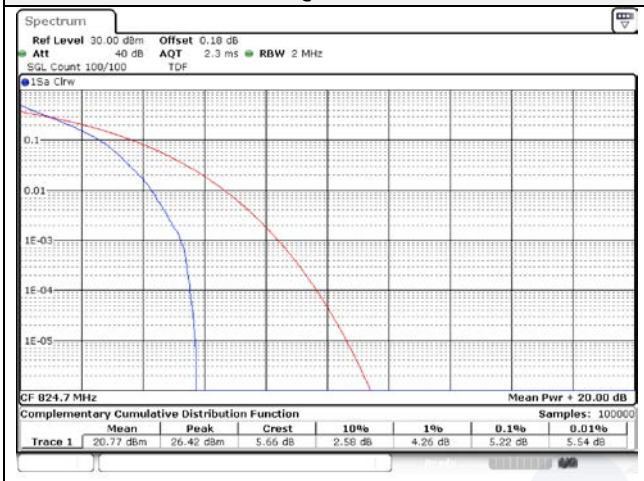
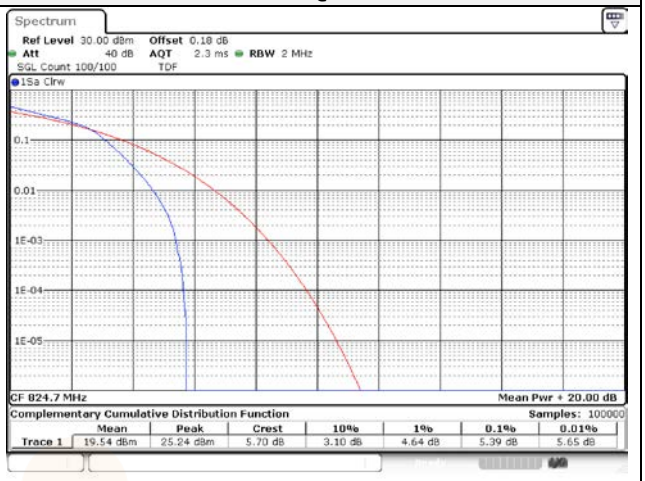
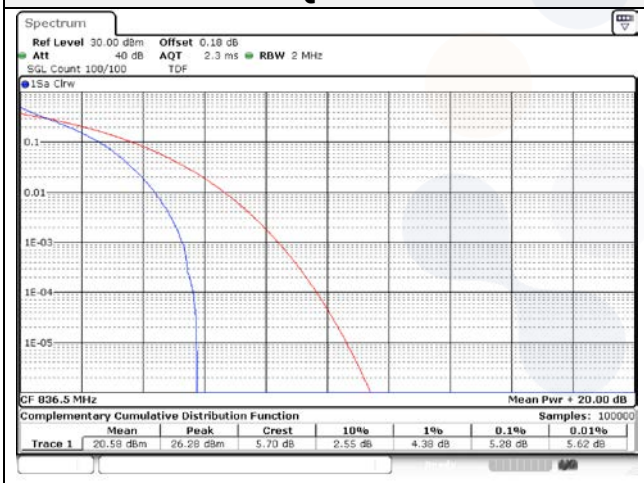
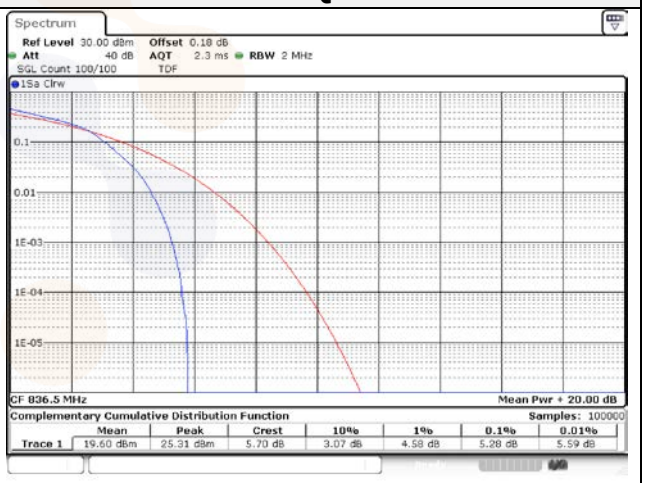
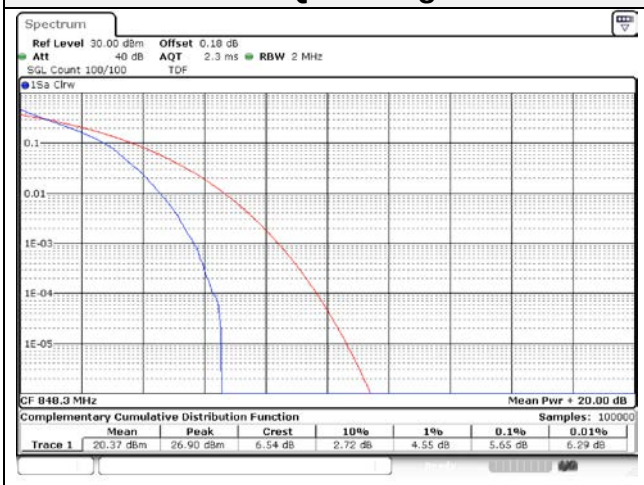
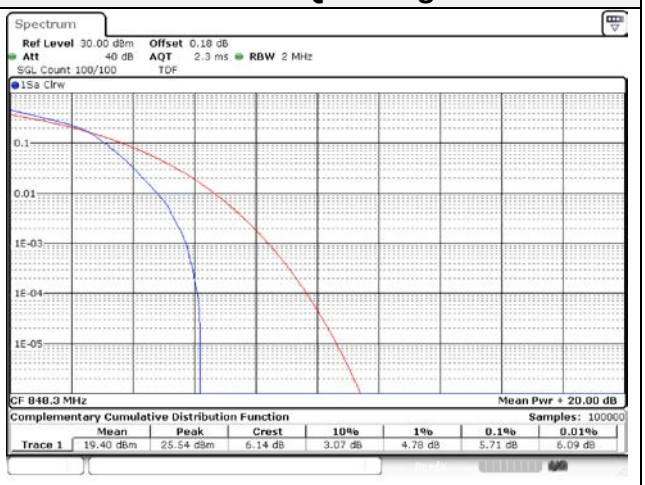
**5.2.6 Peak-to-average power ratio**

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:

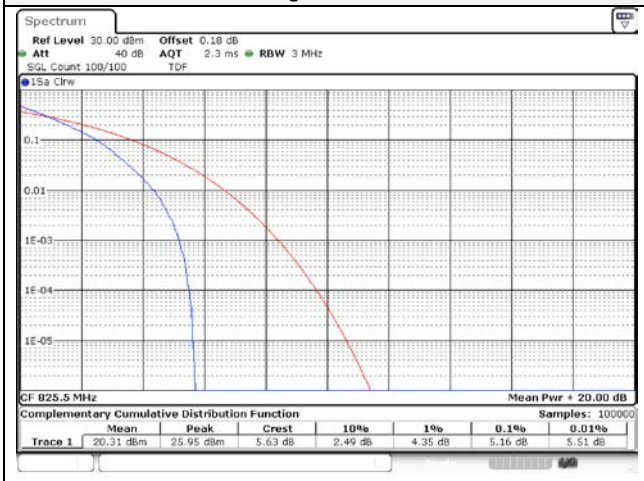
$PAPR(dB) = P_{PK}(dBm \text{ or } dBW) - P_{AG}(dBm \text{ or } dBW)$

## Test results

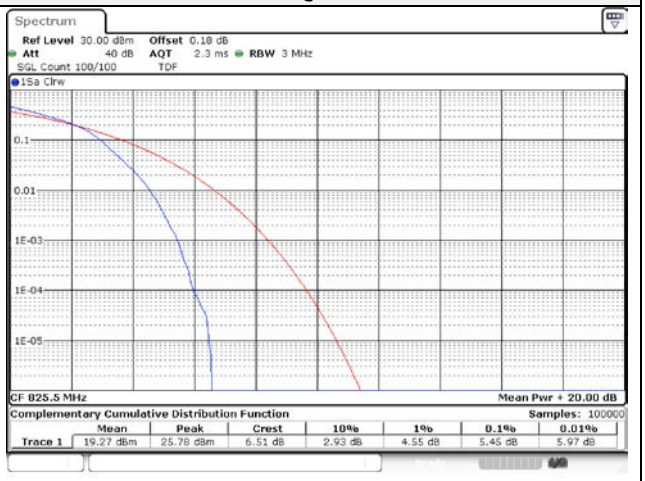
### Test mode: LTE Band 5

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

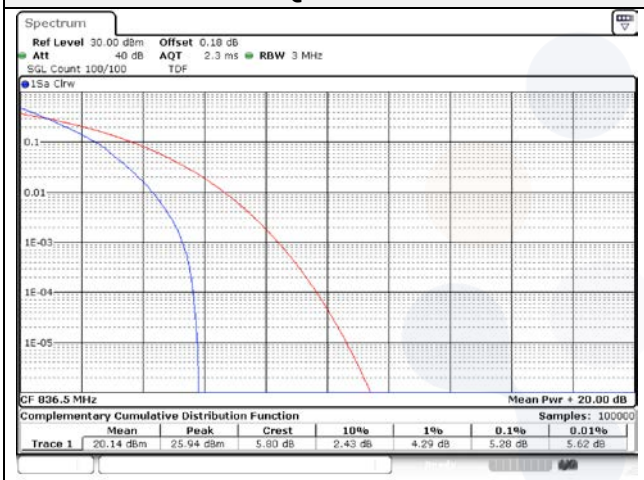
### 3M BW QPSK Low ch.



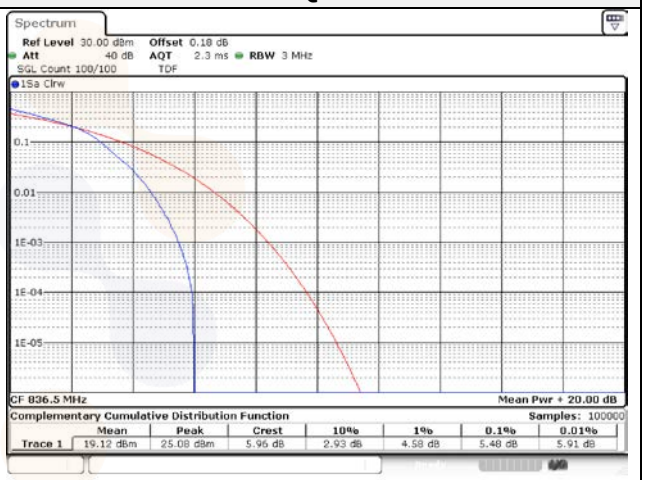

### 3M BW 16QAM Low ch.



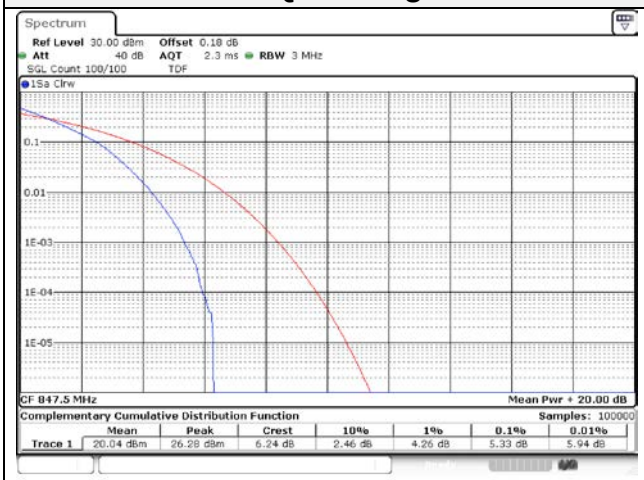

### 3M BW QPSK Mid ch.



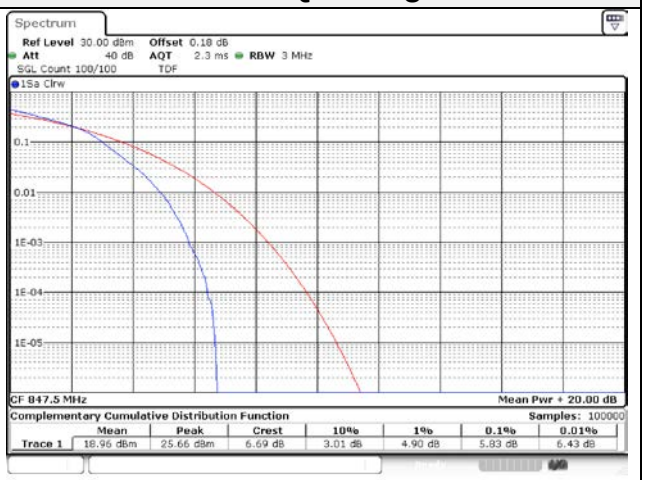

### 3M BW 16QAM Mid ch.

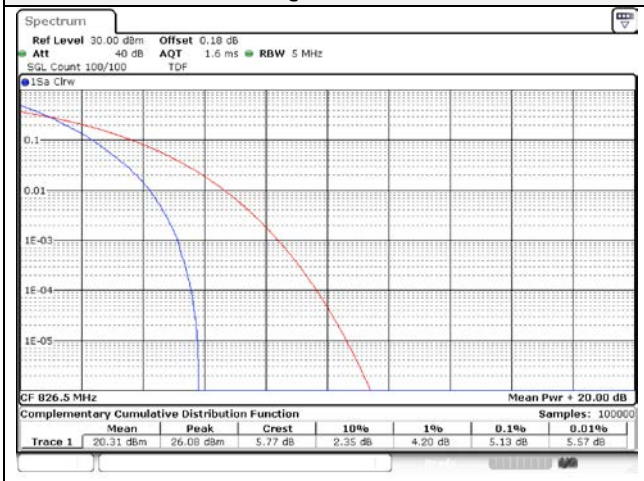
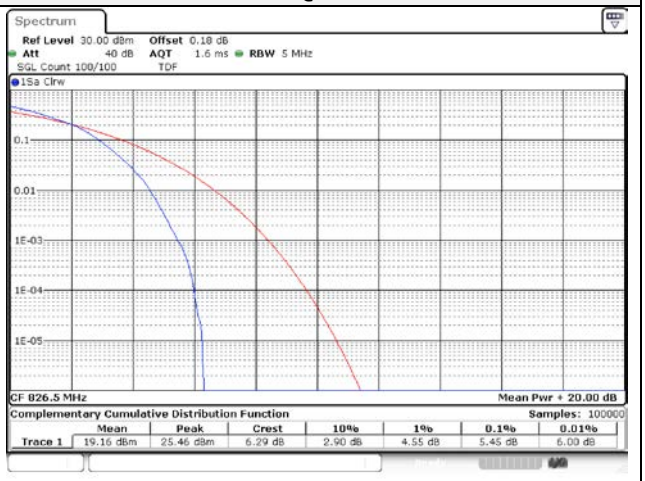
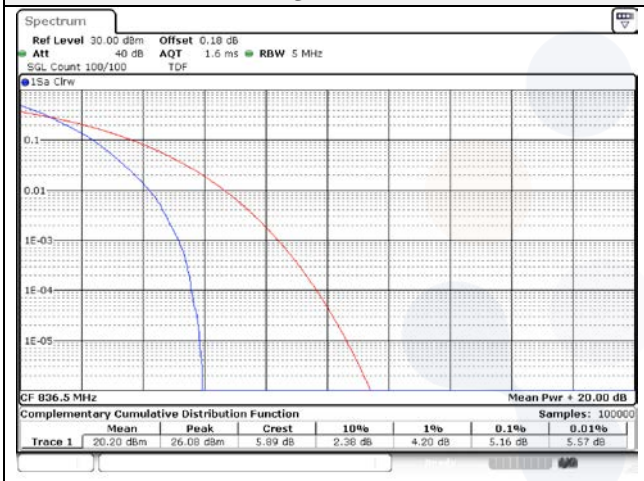
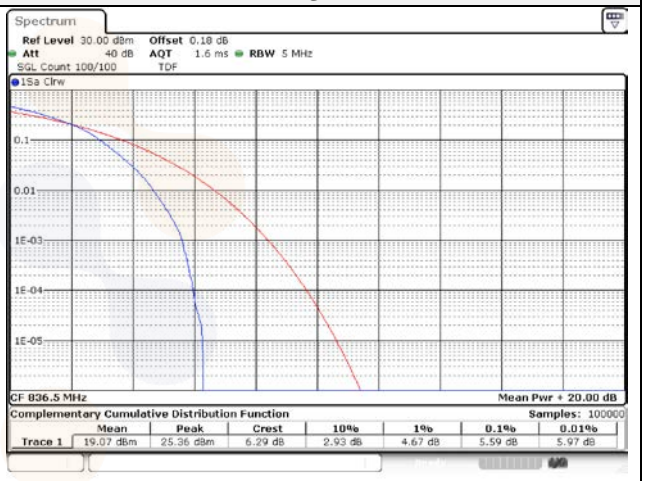
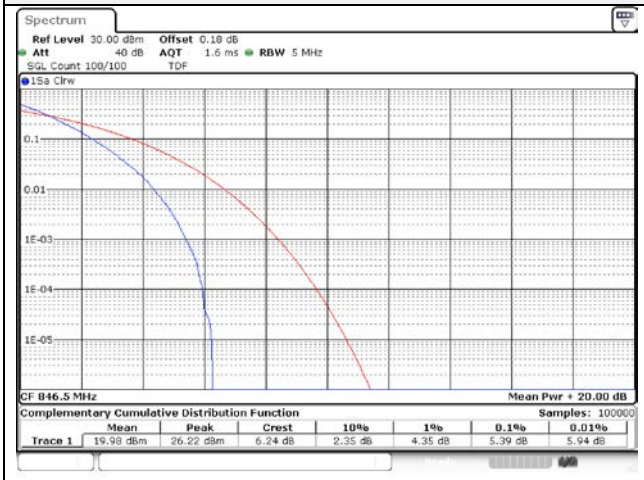
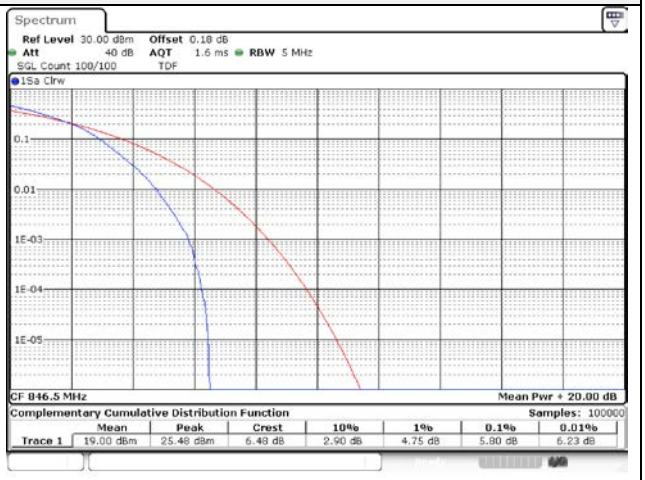


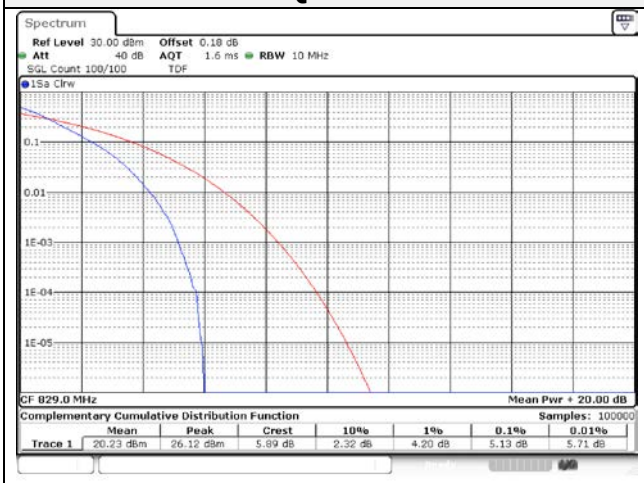
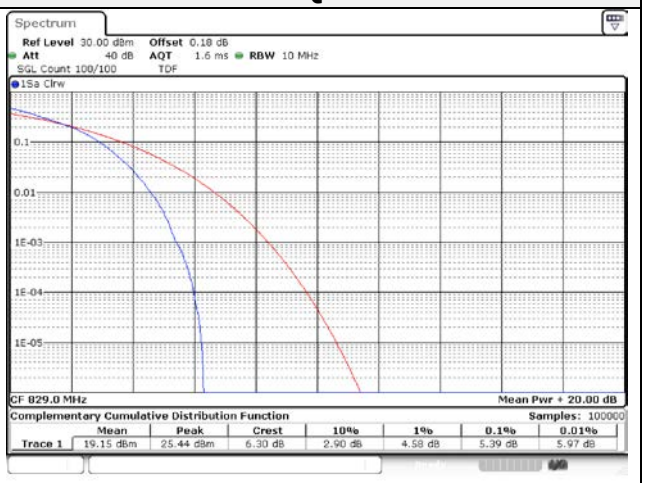
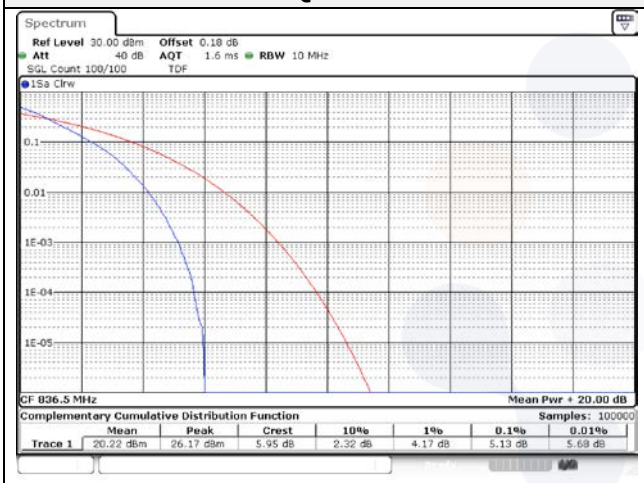
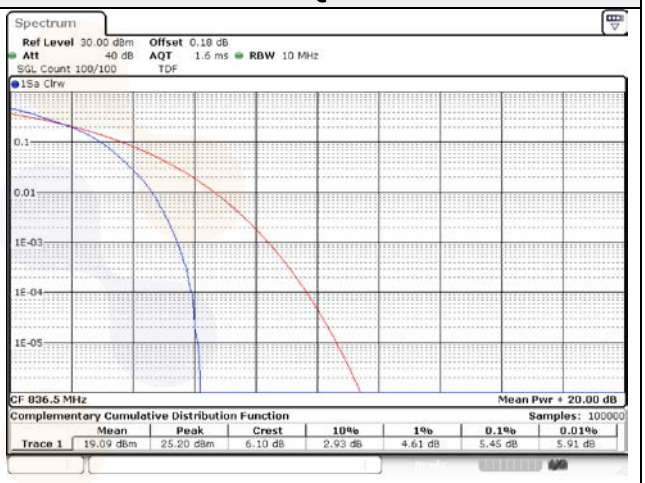

### 3M BW QPSK High ch.




### 3M BW 16QAM High ch.



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

| 10M BW QPSK Low ch. | 10M BW 16QAM Low ch. |
|---|---|
|  |  |
| **10M BW QPSK Mid ch.** | **10M BW 16QAM Mid ch.** |
|  |  |
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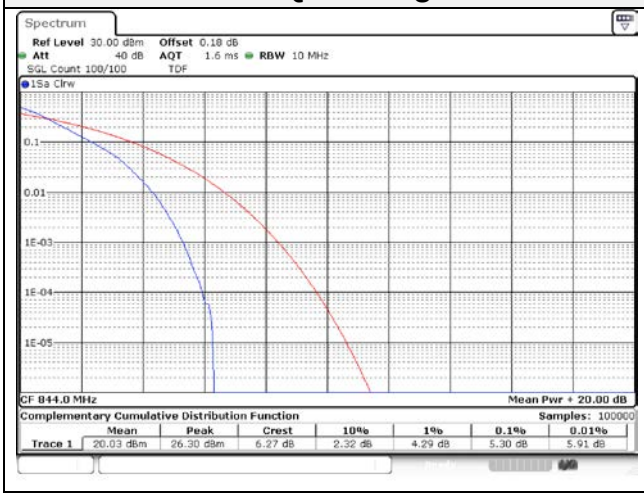
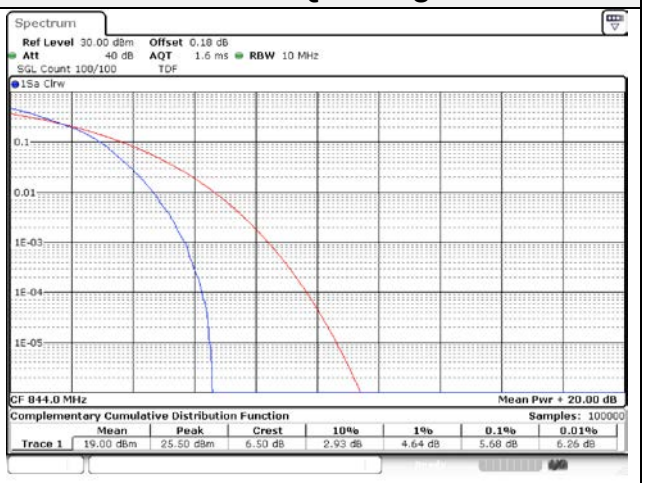
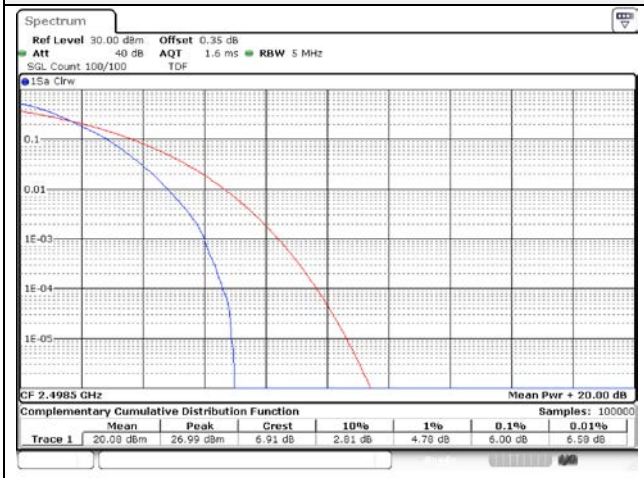
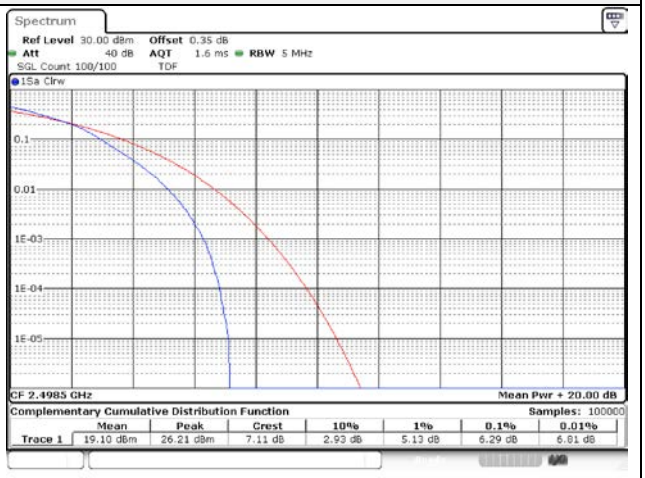
|  |  |

## Test mode: LTE Band 41

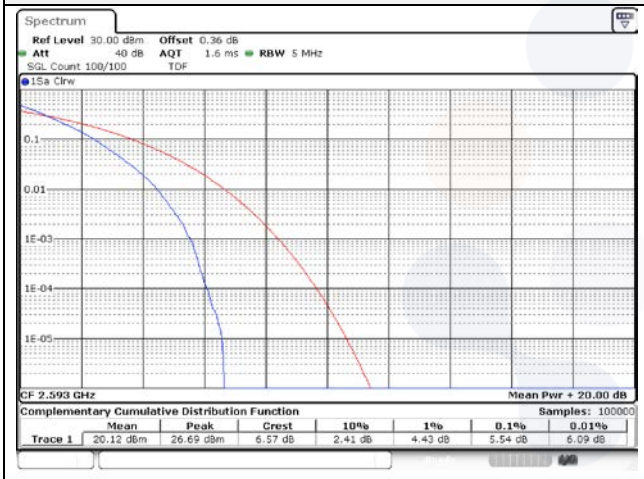
### 5M BW QPSK Low ch.



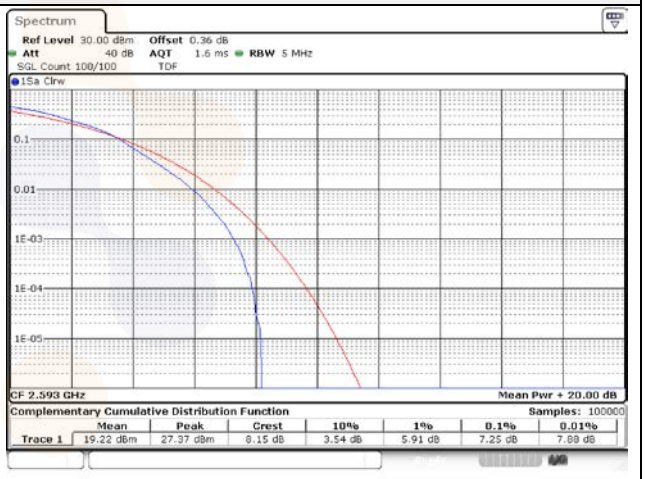

### 5M BW 16QAM Low ch.



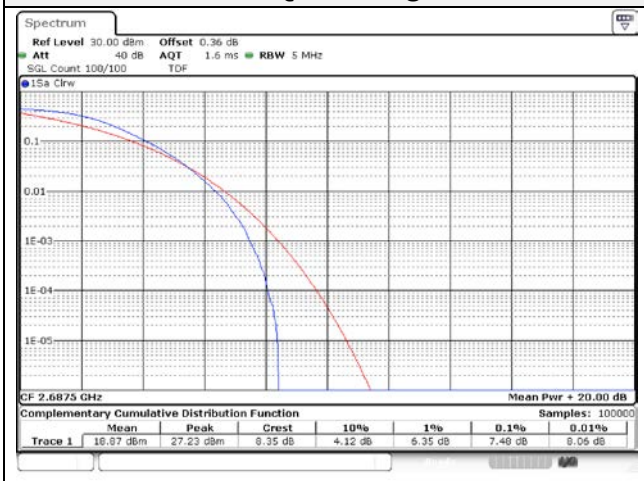

### 5M BW QPSK Mid ch.



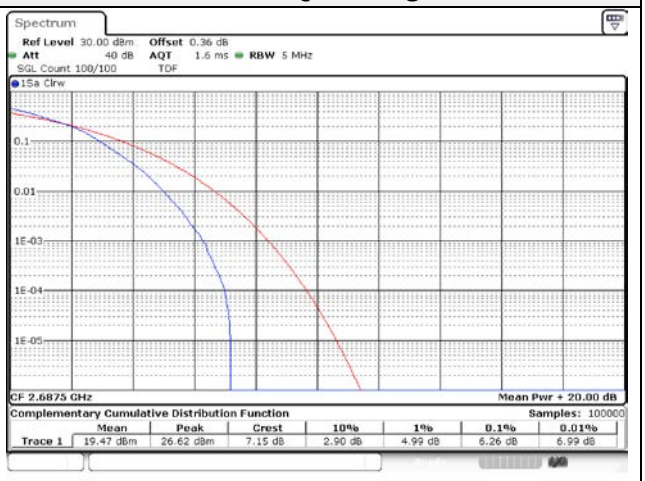

### 5M BW 16QAM Mid ch.

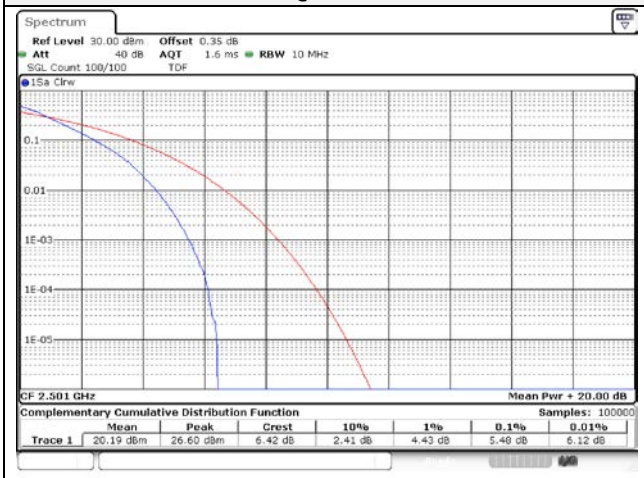
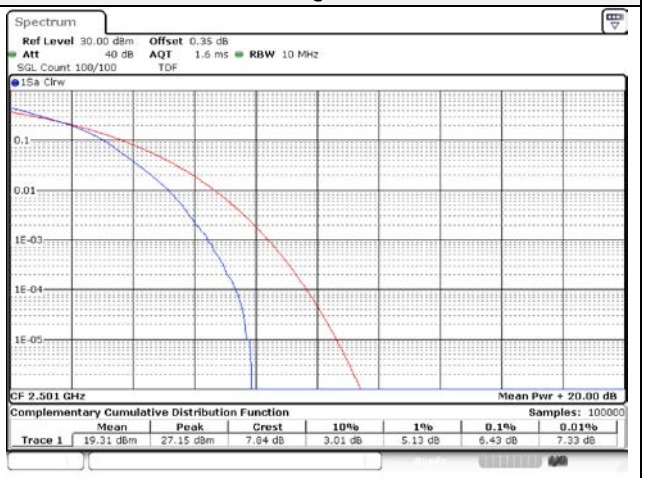
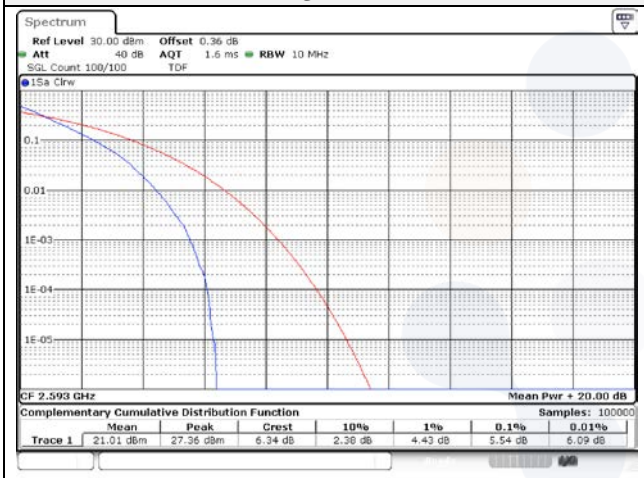
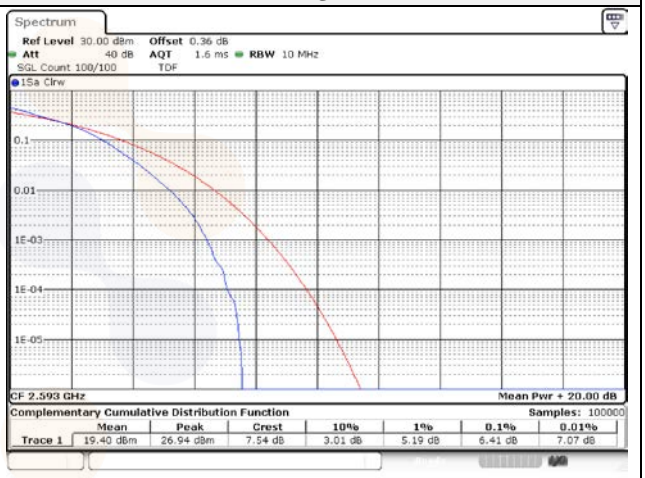
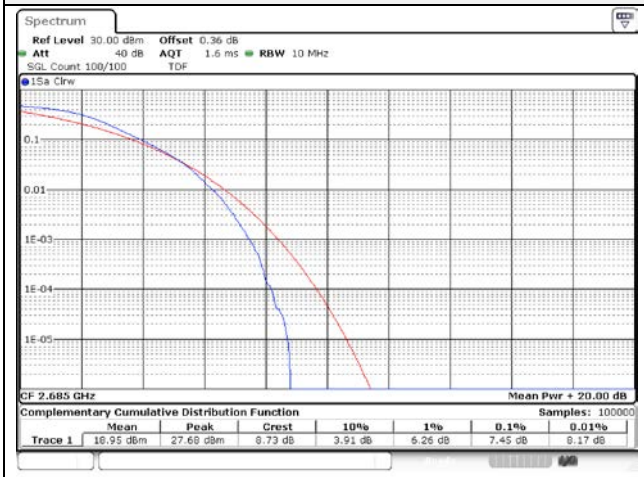
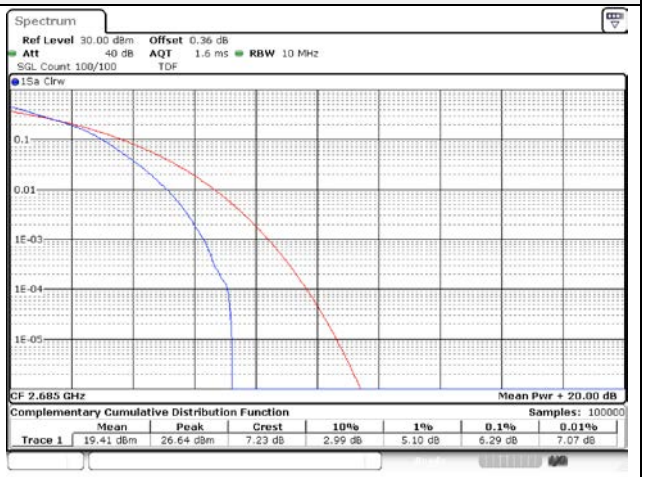


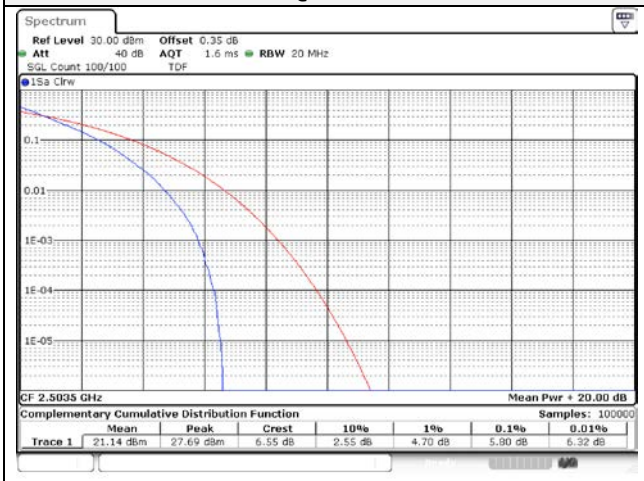
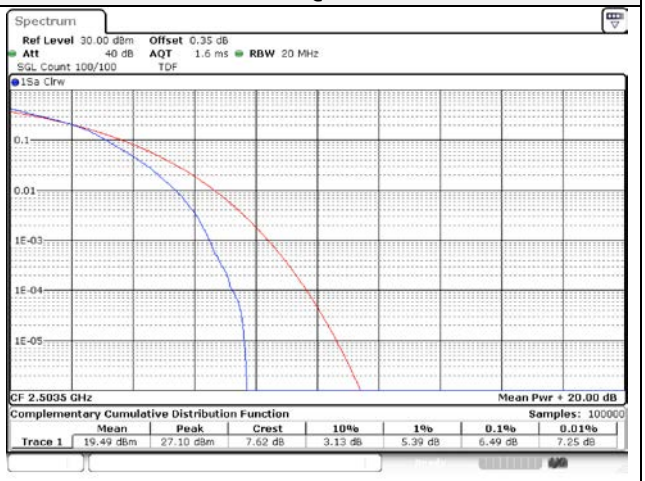
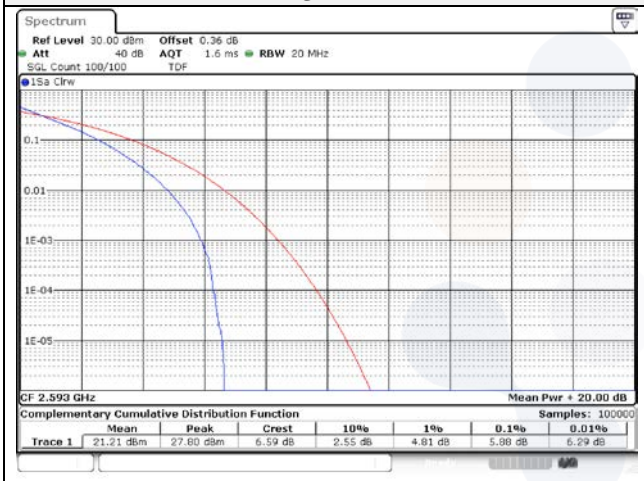
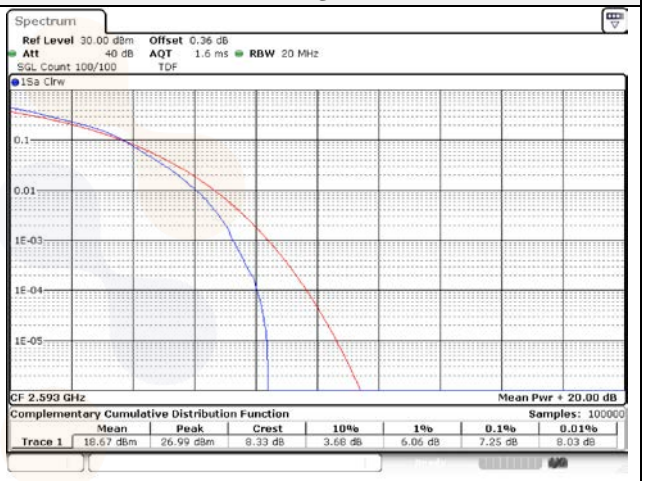
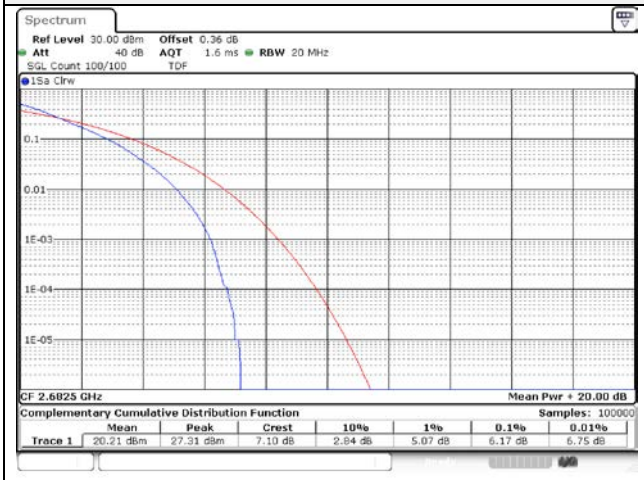
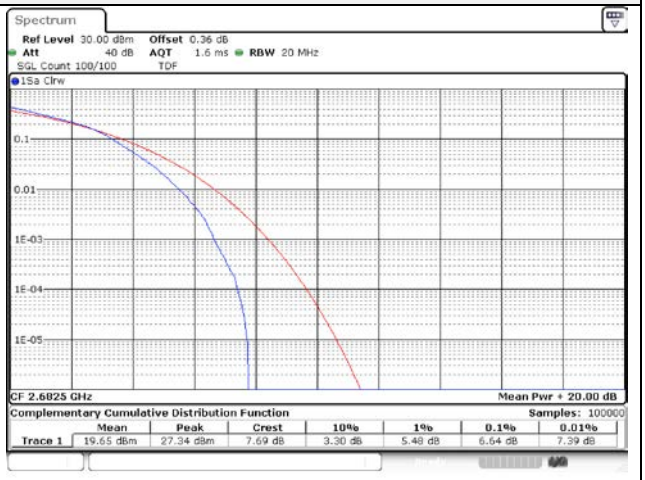

### 5M BW QPSK High ch.



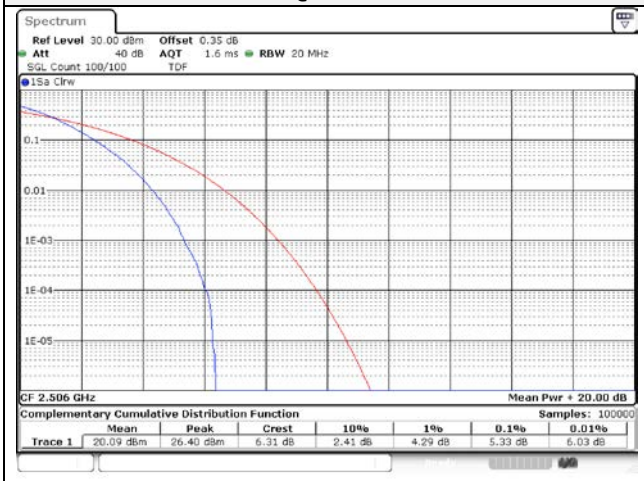

### 5M BW 16QAM High ch.



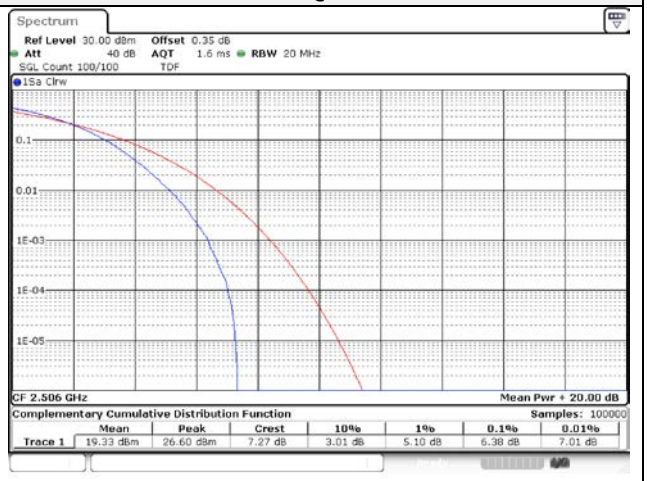
| 10M BW QPSK Low ch. | 10M BW 16QAM Low ch. |
|---|---|
|  |  |
| **10M BW QPSK Mid ch.** | **10M BW 16QAM Mid ch.** |
|  |  |
| **10M BW QPSK High ch.** | **10M BW 16QAM High ch.** |
|  |  |

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

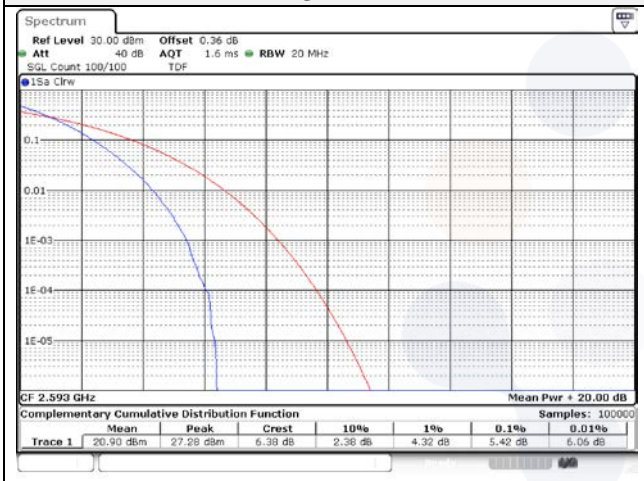
## 20M BW QPSK Low ch.



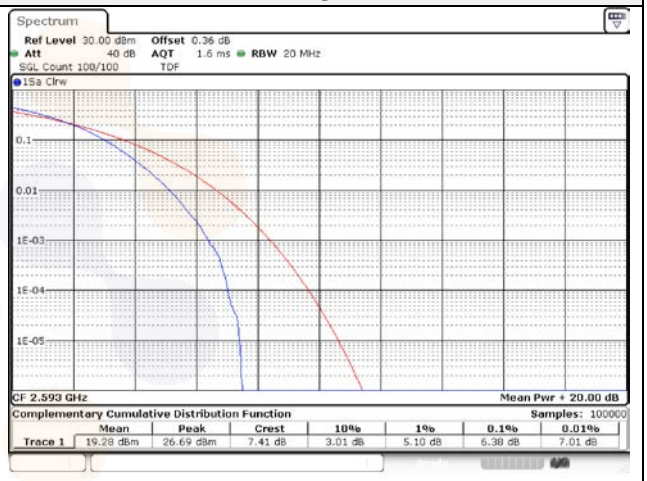

## 20M BW 16QAM Low ch.



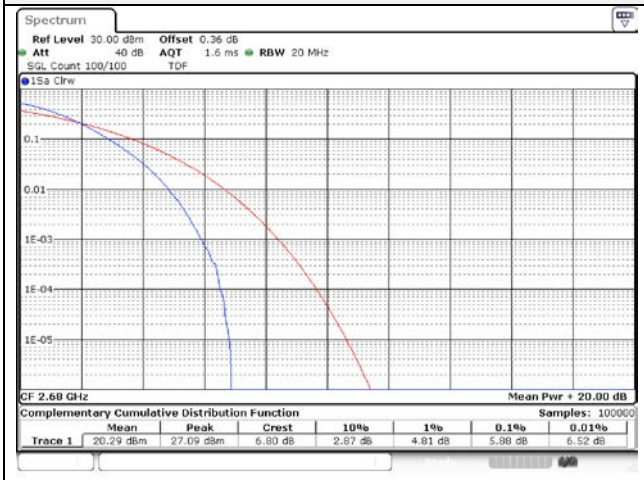

## 20M BW QPSK Mid ch.



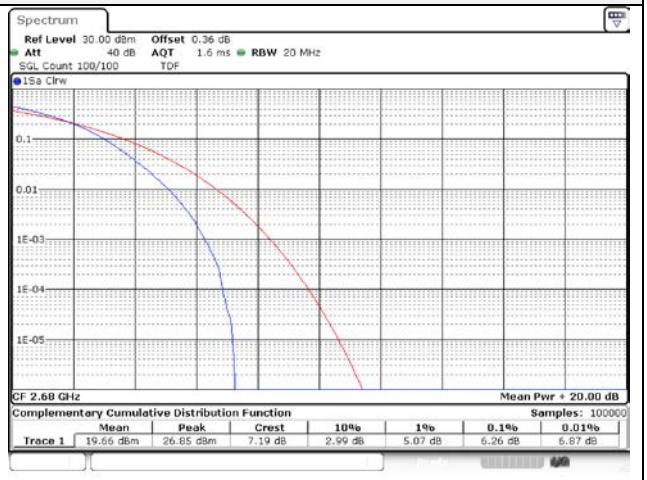

## 20M BW 16QAM Mid ch.




## 20M BW QPSK High ch.

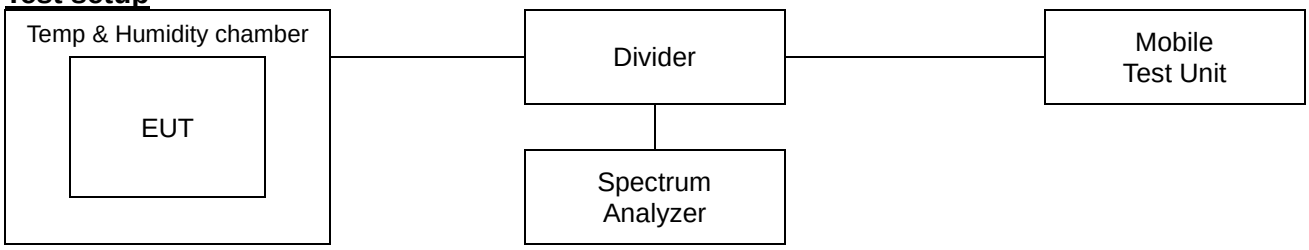



## 20M BW 16QAM High ch.



## 7.6. 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 bands of operation.

**Test procedure**

ANSI 63.26-2015 – Section 5.6

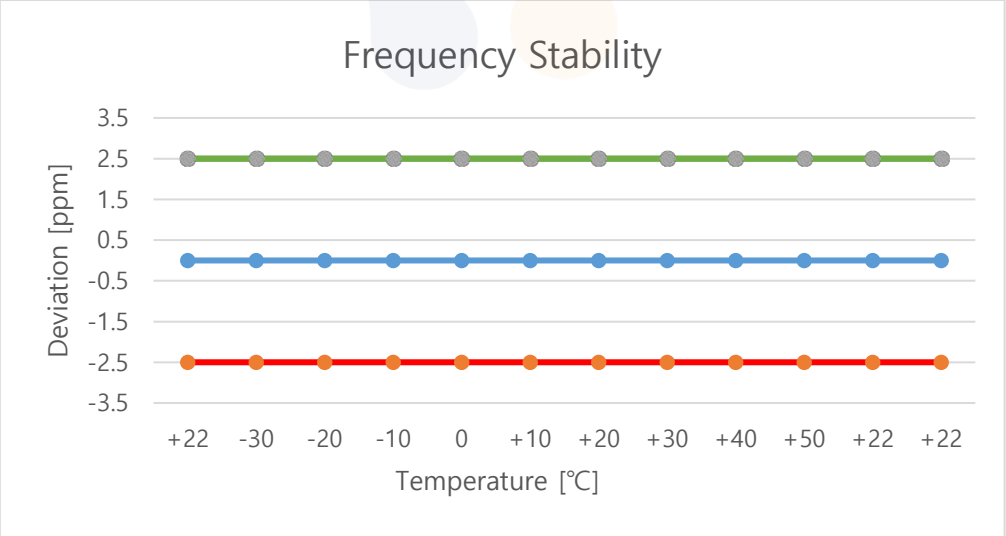
**Test settings**

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**

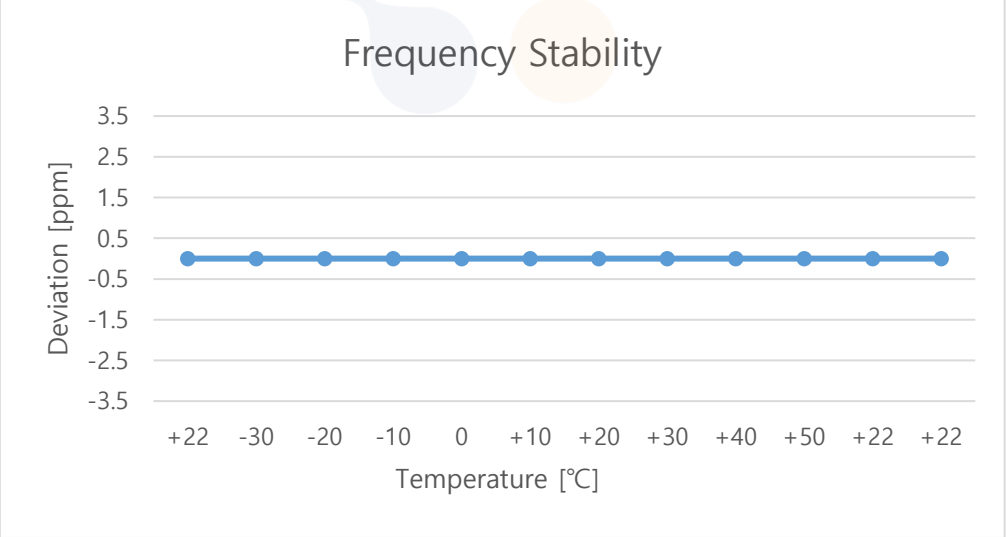
Test mode : LTE Band 5
Frequency (㎐) : 836 500 000
Channel : 20525
Deviation limit : ±0.00025% or 2.5ppm

| Voltage (%) | Power (V) | Temp. (°C) | Frequency (㎐) | Frequency error (㎐) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.88 | +22(Ref) | 836,499,997 | -2.59 | 0.0 | 0.000000 |
| | | -30 | 836,500,002 | 2.30 | 0.0 | 0.000000 |
| | | -20 | 836,500,002 | 1.76 | 0.0 | 0.000000 |
| | | -10 | 836,500,001 | 0.54 | 0.0 | 0.000000 |
| | | 0 | 836,500,001 | 0.86 | 0.0 | 0.000000 |
| | | +10 | 836,499,999 | -1.47 | 0.0 | 0.000000 |
| | | +20 | 836,499,998 | -1.99 | 0.0 | 0.000000 |
| | | +30 | 836,499,998 | -2.05 | 0.0 | 0.000000 |
| | | +40 | 836,499,996 | -3.98 | 0.0 | 0.000000 |
| | | +50 | 836,499,997 | -2.63 | 0.0 | 0.000000 |
| 115% | 4.46 | +22(Ref) | 836,499,997 | -3.03 | 0.0 | 0.000000 |
| End point | 3.40 | +22(Ref) | 836,499,999 | -1.42 | 0.0 | 0.000000 |



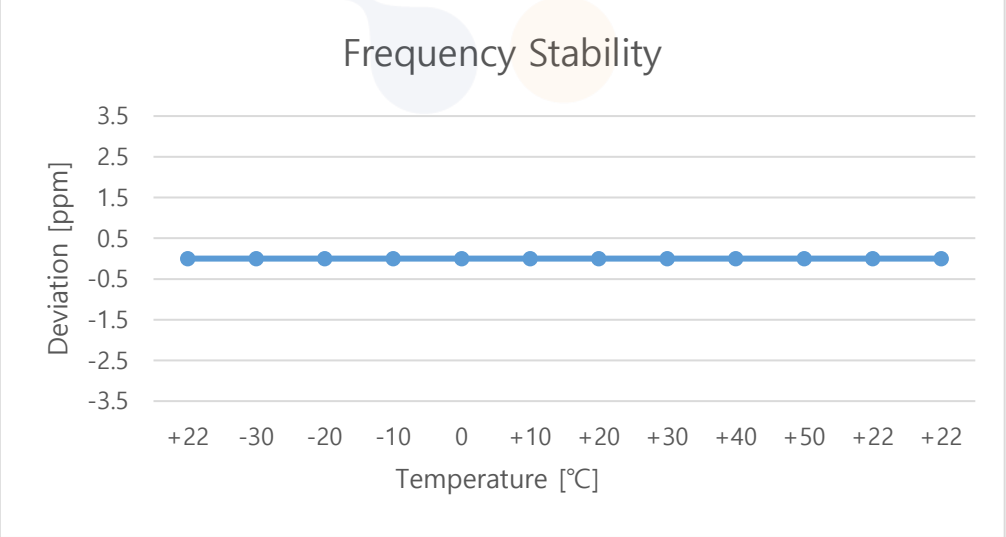
Test mode : LTE Band 12
Frequency (㎐) : 707 500 000
Channel : 23095
Deviation limit : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized bands of operation

| Voltage (%) | Power (V) | Temp. (°C) | Frequency (㎐) | Frequency error (㎐) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.88 | +22(Ref) | 707,500,002 | 1.79 | 0.0 | 0.000000 |
| | | -30 | 707,499,998 | -2.43 | 0.0 | 0.000000 |
| | | -20 | 707,499,999 | -1.00 | 0.0 | 0.000000 |
| | | -10 | 707,499,999 | -0.60 | 0.0 | 0.000000 |
| | | 0 | 707,500,002 | 1.50 | 0.0 | 0.000000 |
| | | +10 | 707,500,000 | 0.33 | 0.0 | 0.000000 |
| | | +20 | 707,500,000 | 0.06 | 0.0 | 0.000000 |
| | | +30 | 707,500,000 | -0.33 | 0.0 | 0.000000 |
| | | +40 | 707,499,998 | -1.72 | 0.0 | 0.000000 |
| | | +50 | 707,499,998 | -1.62 | 0.0 | 0.000000 |
| 115% | 4.46 | +22(Ref) | 707,500,001 | 0.60 | 0.0 | 0.000000 |
| End point | 3.40 | +22(Ref) | 707,500,002 | 2.05 | 0.0 | 0.000000 |



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

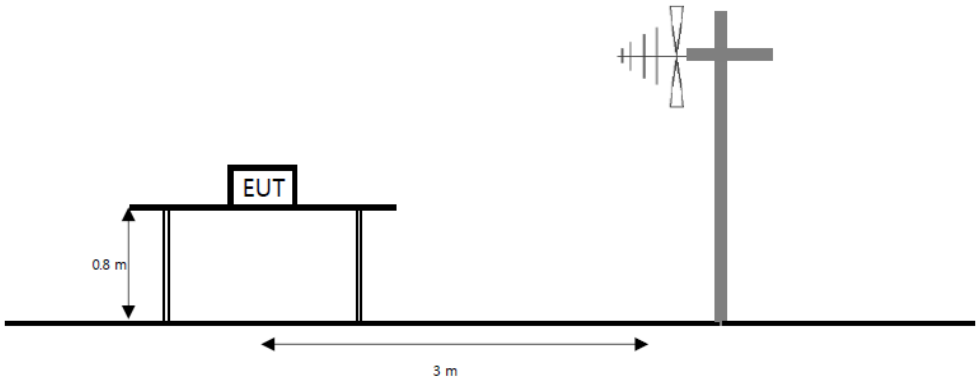
| Voltage (%) | Power (V) | Temp. (°C) | Frequency (㎐) | Frequency error (㎐) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.88 | +22(Ref) | 2,593,000,008 | 7.50 | 0.0 | 0.000000 |
| | | -30 | 2,592,999,992 | -8.30 | 0.0 | 0.000000 |
| | | -20 | 2,592,999,996 | -4.31 | 0.0 | 0.000000 |
| | | -10 | 2,592,999,998 | -2.26 | 0.0 | 0.000000 |
| | | 0 | 2,592,999,999 | -1.22 | 0.0 | 0.000000 |
| | | +10 | 2,592,999,996 | -3.83 | 0.0 | 0.000000 |
| | | +20 | 2,593,000,004 | 4.39 | 0.0 | 0.000000 |
| | | +30 | 2,593,000,003 | 3.09 | 0.0 | 0.000000 |
| | | +40 | 2,593,000,008 | 8.47 | 0.0 | 0.000000 |
| | | +50 | 2,593,000,007 | 7.25 | 0.0 | 0.000000 |
| 115% | 4.46 | +22 | 2,593,000,007 | 6.57 | 0.0 | 0.000000 |
| End point | 3.40 | +22 | 2,593,000,007 | 7.17 | 0.0 | 0.000000 |



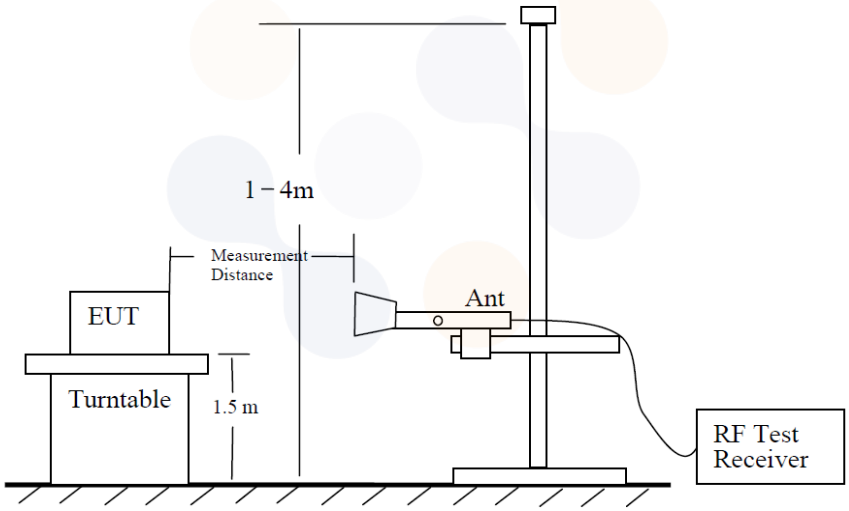
## 7.7. Radiated Power (ERP/EIRP)

**Test setup**

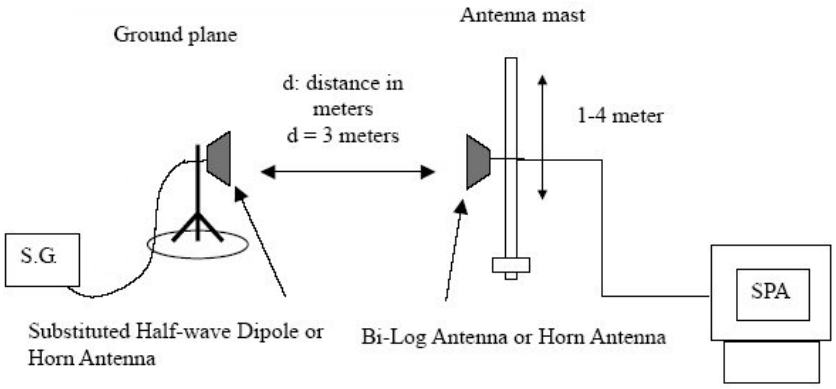
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




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 mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to §27.50(c)(10), Portable stations (hand-held devices) in the 600 ㎒ uplink band and the 698-746 ㎒ band, and fixed and mobile stations in the 600 ㎒ uplink band are limited to 3 watts ERP.

According to §27.50(h)(2), the 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 or 1.5 m 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] | [dBd] | [dB] | [dBm] | [dBm] | [W] |
| 1.4 M | QPSK | 824.7 | H | -1.98 | 5.03 | 25.80 | 18.79 | 0.076 |
| | | 836.5 | H | -2.43 | 5.13 | 26.92 | 19.36 | 0.086 |
| | | 848.3 | H | -2.78 | 5.18 | 26.81 | 18.85 | 0.077 |
| | 16QAM | 824.7 | H | -1.98 | 5.03 | 22.83 | 15.82 | 0.038 |
| | | 836.5 | H | -2.43 | 5.13 | 23.81 | 16.25 | 0.042 |
| | | 848.3 | H | -2.78 | 5.18 | 23.96 | 16.00 | 0.040 |
| 3 M | QPSK | 825.5 | H | -1.90 | 5.04 | 26.25 | 19.31 | 0.085 |
| | | 836.5 | H | -2.43 | 5.13 | 27.21 | 19.65 | 0.092 |
| | | 847.5 | H | -2.80 | 5.18 | 26.86 | 18.88 | 0.077 |
| | 16QAM | 825.5 | H | -1.90 | 5.04 | 23.39 | 16.45 | 0.044 |
| | | 836.5 | H | -2.43 | 5.13 | 24.17 | 16.61 | 0.046 |
| | | 847.5 | H | -2.80 | 5.18 | 23.93 | 15.95 | 0.039 |
| 5 M | QPSK | 826.5 | H | -1.80 | 5.05 | 26.28 | 19.43 | 0.088 |
| | | 836.5 | H | -2.43 | 5.13 | 27.05 | 19.49 | 0.089 |
| | | 846.5 | H | -2.82 | 5.17 | 26.56 | 18.57 | 0.072 |
| | 16QAM | 826.5 | H | -1.80 | 5.05 | 23.41 | 16.56 | 0.045 |
| | | 836.5 | H | -2.43 | 5.13 | 24.13 | 16.57 | 0.045 |
| | | 846.5 | H | -2.82 | 5.17 | 23.68 | 15.69 | 0.037 |
| 10 M | QPSK | 829.0 | H | -1.55 | 5.07 | 26.51 | 19.89 | 0.097 |
| | | 836.5 | H | -2.43 | 5.13 | 27.00 | 19.44 | 0.088 |
| | | 844.0 | H | -2.87 | 5.16 | 26.06 | 18.03 | 0.064 |
| | 16QAM | 829.0 | H | -1.55 | 5.07 | 23.60 | 16.98 | 0.050 |
| | | 836.5 | H | -1.98 | 5.13 | 23.63 | 16.52 | 0.045 |
| | | 844.0 | H | -2.43 | 5.16 | 23.01 | 15.42 | 0.035 |

Note.
1. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi&dBd) - C.L(Cable loss) (dB)

**Test mode: LTE Band 12**

| Bandwidth | Modulation | Frequency | Pol. | Antenna Gain | C.L | Substitute Level | ERP | |
|---|---|---|---|---|---|---|---|---|
| | | [㎒] | [V/H] | [dBd] | [dB] | [dBm] | [dBm] | [W] |
| 1.4 M | QPSK | 699.7 | H | -2.85 | 4.56 | 25.67 | 18.26 | 0.067 |
| | | 707.5 | H | -2.55 | 4.60 | 25.75 | 18.60 | 0.072 |
| | | 715.3 | H | -2.66 | 4.63 | 25.40 | 18.11 | 0.065 |
| | 16QAM | 699.7 | H | -2.85 | 4.56 | 22.68 | 15.27 | 0.034 |
| | | 707.5 | H | -2.55 | 4.60 | 22.55 | 15.40 | 0.035 |
| | | 715.3 | H | -2.66 | 4.63 | 22.28 | 14.99 | 0.032 |
| 3 M | QPSK | 700.5 | H | -2.83 | 4.56 | 25.61 | 18.22 | 0.066 |
| | | 707.5 | H | -2.55 | 4.60 | 25.68 | 18.53 | 0.071 |
| | | 714.5 | H | -2.63 | 4.62 | 25.72 | 18.47 | 0.070 |
| | 16QAM | 700.5 | H | -2.83 | 4.56 | 22.68 | 15.29 | 0.034 |
| | | 707.5 | H | -2.55 | 4.60 | 22.92 | 15.77 | 0.038 |
| | | 714.5 | H | -2.63 | 4.62 | 22.77 | 15.52 | 0.036 |
| 5 M | QPSK | 701.5 | H | -2.79 | 4.57 | 25.70 | 18.34 | 0.068 |
| | | 707.5 | H | -2.55 | 4.60 | 25.77 | 18.62 | 0.073 |
| | | 713.5 | H | -2.59 | 4.62 | 25.67 | 18.46 | 0.070 |
| | 16QAM | 701.5 | H | -2.79 | 4.57 | 22.99 | 15.63 | 0.037 |
| | | 707.5 | H | -2.55 | 4.60 | 22.88 | 15.73 | 0.037 |
| | | 713.5 | H | -2.59 | 4.62 | 22.70 | 15.49 | 0.035 |
| 10 M | QPSK | 704.0 | H | -2.69 | 4.59 | 25.73 | 18.45 | 0.070 |
| | | 707.5 | H | -2.55 | 4.60 | 25.76 | 18.61 | 0.073 |
| | | 711.0 | H | -2.49 | 4.62 | 25.44 | 18.33 | 0.068 |
| | 16QAM | 704.0 | H | -2.69 | 4.59 | 22.82 | 15.54 | 0.036 |
| | | 707.5 | H | -2.85 | 4.60 | 22.98 | 15.53 | 0.036 |
| | | 711.0 | H | -2.55 | 4.62 | 22.83 | 15.66 | 0.037 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

**Test mode: LTE Band 41**

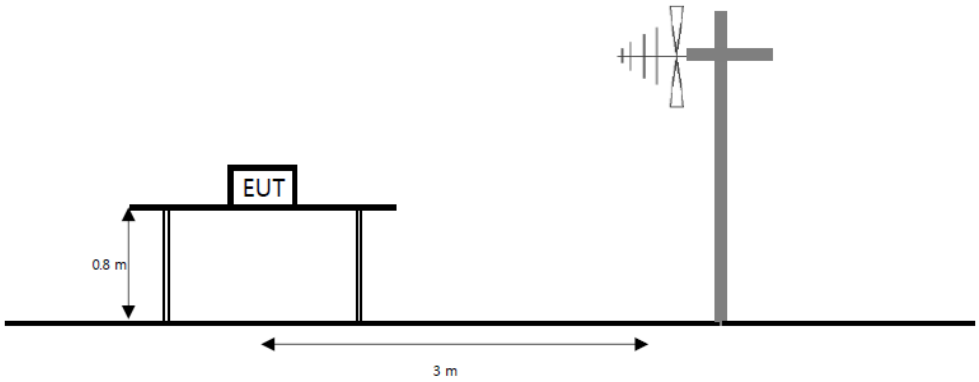
| Bandwidth | Modulation | Frequency | Pol. | Antenna Gain | C.L | Substitute Level | EIRP | |
|---|---|---|---|---|---|---|---|---|
| | | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [W] |
| 5 M | QPSK | 2 498.5 | V | 6.20 | 8.92 | 21.63 | 18.91 | 0.078 |
| | | 2 593.0 | V | 6.33 | 9.09 | 22.04 | 19.28 | 0.085 |
| | | 2 687.5 | V | 6.46 | 9.32 | 21.97 | 19.11 | 0.081 |
| | 16QAM | 2 498.5 | V | 6.20 | 8.92 | 18.53 | 15.81 | 0.038 |
| | | 2 593.0 | V | 6.33 | 9.09 | 19.54 | 16.78 | 0.048 |
| | | 2 687.5 | V | 6.46 | 9.32 | 19.56 | 16.70 | 0.047 |
| 10 M | QPSK | 2 501.0 | V | 6.20 | 8.91 | 21.43 | 18.72 | 0.074 |
| | | 2 593.0 | V | 6.33 | 9.09 | 21.92 | 19.16 | 0.082 |
| | | 2 685.0 | V | 6.46 | 9.32 | 21.29 | 18.43 | 0.070 |
| | 16QAM | 2 501.0 | V | 6.20 | 8.91 | 19.19 | 16.48 | 0.044 |
| | | 2 593.0 | V | 6.33 | 9.09 | 20.06 | 17.30 | 0.054 |
| | | 2 685.0 | V | 6.46 | 9.32 | 19.13 | 16.27 | 0.042 |
| 15 M | QPSK | 2 503.5 | V | 6.20 | 8.93 | 21.97 | 19.24 | 0.084 |
| | | 2 593.0 | V | 6.33 | 9.09 | 22.78 | 20.02 | 0.100 |
| | | 2 682.5 | V | 6.46 | 9.31 | 22.16 | 19.31 | 0.085 |
| | 16QAM | 2 503.5 | V | 6.20 | 8.93 | 19.68 | 16.95 | 0.050 |
| | | 2 593.0 | V | 6.33 | 9.09 | 21.08 | 18.32 | 0.068 |
| | | 2 682.5 | V | 6.46 | 9.31 | 20.06 | 17.21 | 0.053 |
| 20 M | QPSK | 2 506.0 | V | 6.21 | 8.92 | 20.89 | 18.18 | 0.066 |
| | | 2 593.0 | V | 6.33 | 9.09 | 22.92 | 20.16 | 0.104 |
| | | 2 680.0 | V | 6.45 | 9.31 | 21.35 | 18.49 | 0.071 |
| | 16QAM | 2 506.0 | V | 6.21 | 8.92 | 20.18 | 17.47 | 0.056 |
| | | 2 593.0 | V | 6.33 | 9.09 | 21.17 | 18.41 | 0.069 |
| | | 2 680.0 | V | 6.45 | 9.31 | 19.64 | 16.78 | 0.048 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

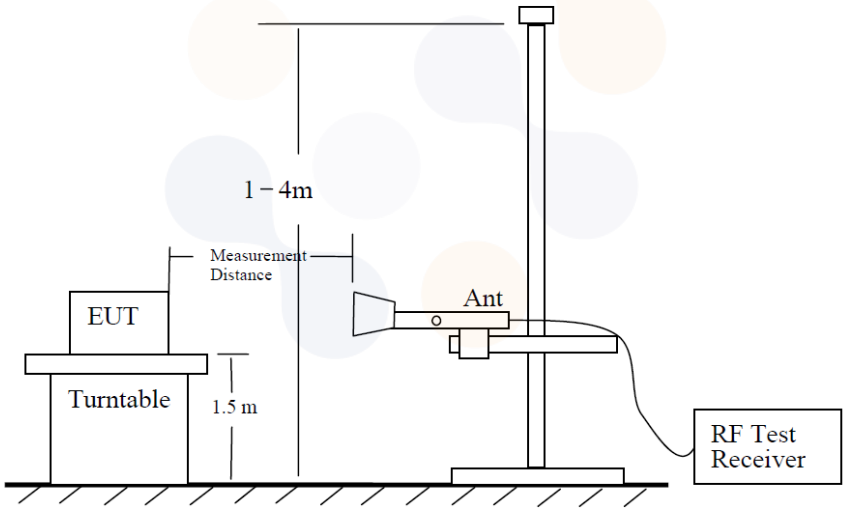
## 7.8. Radiated Spurious Emissions

**Test setup**

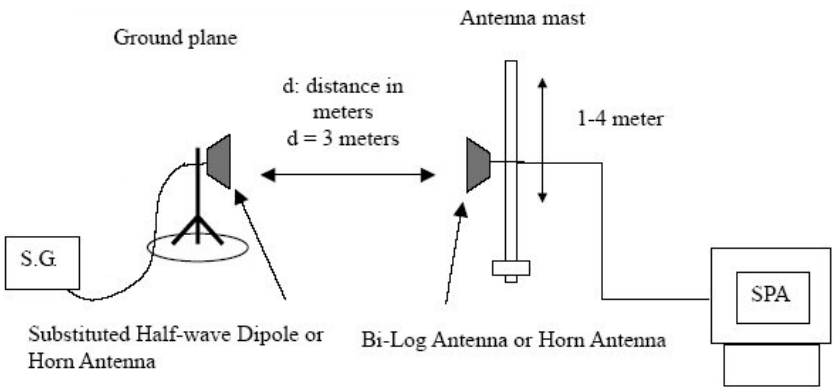
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




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(g), for operations in the 600 ㎒ band and the 698-746 ㎒ band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10log($P_{[Watts]}$) ㏈.

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

**Test procedure**

971168 D01 v03r01 - Section 6.2
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.

**Notes:**

1. On a test site, the EUT shall be placed at 80 cm or 1.5 m 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 | 1 659.32 | H | 5.92 | 7.20 | -59.22 | -60.50 | -13.00 | 47.50 |
| | 2 487.26 | H | 6.17 | 8.92 | -45.15 | -47.90 | -13.00 | 34.90 |
| | 3 315.61 | H | 7.78 | 10.59 | -54.89 | -57.70 | -13.00 | 44.70 |
| | 4 145.19 | V | 8.81 | 11.98 | -53.23 | -56.40 | -13.00 | 43.40 |

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 | 1 661.37 | H | 5.91 | 7.21 | -58.20 | -59.50 | -13.00 | 46.50 |
| | 2 496.28 | H | 6.19 | 8.94 | -48.95 | -51.70 | -13.00 | 38.70 |
| | 3 326.27 | H | 7.81 | 10.61 | -55.80 | -58.60 | -13.00 | 45.60 |
| | 4 159.14 | V | 8.80 | 11.73 | -53.47 | -56.40 | -13.00 | 43.40 |

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 | 1 686.80 | V | 5.85 | 7.28 | -59.97 | -61.40 | -13.00 | 48.40 |
| | 2 532.39 | H | 6.25 | 8.98 | -45.07 | -47.80 | -13.00 | 34.80 |
| | 3 374.28 | V | 7.95 | 10.70 | -54.85 | -57.60 | -13.00 | 44.60 |
| | 4 220.68 | H | 8.77 | 11.83 | -53.34 | -56.40 | -13.00 | 43.40 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

Test mode : LTE Band 12
Frequency(㎒) : 701.5
Channel : 23035
Bandwidth(㎒) : 5

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 407.82 | V | 5.69 | 6.68 | -62.41 | -63.40 | -13.00 | 50.40 |
| | 2 111.03 | H | 5.34 | 8.18 | -44.06 | -46.90 | -13.00 | 33.90 |
| | 2 815.07 | H | 6.64 | 9.58 | -54.96 | -57.90 | -13.00 | 44.90 |
| | 3 518.69 | H | 8.32 | 10.99 | -52.43 | -55.10 | -13.00 | 42.10 |

Test mode : LTE Band 12
Frequency(㎒) : 707.5
Channel : 23095
Bandwidth(㎒) : 5

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 415.20 | H | 5.74 | 6.70 | -61.84 | -62.80 | -13.00 | 49.80 |
| | 2 122.93 | H | 5.37 | 8.21 | -44.26 | -47.10 | -13.00 | 34.10 |
| | 2 828.61 | V | 6.66 | 9.60 | -54.36 | -57.30 | -13.00 | 44.30 |
| | 3 538.39 | H | 8.35 | 11.03 | -50.42 | -53.10 | -13.00 | 40.10 |

Test mode : LTE Band 12
Frequency(㎒) : 713.5
Channel : 23155
Bandwidth(㎒) : 5

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 431.20 | V | 5.85 | 6.73 | -61.82 | -62.70 | -13.00 | 49.70 |
| | 2 147.14 | H | 5.42 | 8.25 | -44.57 | -47.40 | -13.00 | 34.40 |
| | 2 864.71 | V | 6.71 | 9.68 | -54.73 | -57.70 | -13.00 | 44.70 |
| | 3 578.18 | H | 8.39 | 10.78 | -52.51 | -54.90 | -13.00 | 41.90 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

Test mode : LTE Band 41
Frequency(㎒) : 2 506.0
Channel : 39750
Bandwidth(㎒) : 20

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 4 994.13 | H | 10.08 | 13.13 | -40.35 | -43.40 | -25.00 | 18.40 |
| | 7 491.26 | H | 12.09 | 16.12 | -31.97 | -36.00 | -25.00 | 11.00 |
| | 9 986.47 | H | 13.10 | 18.84 | -46.66 | -52.40 | -25.00 | 27.40 |
| | 12 479.13 | H | 13.20 | 20.91 | -43.59 | -51.30 | -25.00 | 26.30 |

Test mode : LTE Band 41
Frequency(㎒) : 2 593.0
Channel : 40620
Bandwidth(㎒) : 20

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 5 167.75 | V | 10.23 | 13.53 | -38.80 | -42.10 | -25.00 | 17.10 |
| | 7 752.33 | V | 12.30 | 16.43 | -40.37 | -44.50 | -25.00 | 19.50 |
| | 10 331.80 | H | 13.10 | 19.02 | -46.88 | -52.80 | -25.00 | 27.80 |
| | 12 915.10 | V | 13.45 | 21.37 | -42.88 | -50.80 | -25.00 | 25.80 |

Test mode : LTE Band 41
Frequency(㎒) : 2 680.0
Channel : 41490
Bandwidth(㎒) : 20

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 5 342.01 | H | 10.37 | 13.62 | -29.85 | -33.10 | -25.00 | 8.10 |
| | 8 013.40 | V | 12.51 | 17.05 | -35.96 | -40.50 | -25.00 | 15.50 |
| | 10 680.33 | H | 13.14 | 19.35 | -46.49 | -52.70 | -25.00 | 27.70 |
| | 13 352.35 | H | 13.92 | 21.53 | -42.39 | -50.00 | -25.00 | 25.00 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

## 8. Measurement equipment

| Equipment Name | Manufacturer | Model No. | Serial No. | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV30 | 100807 | 22.07.27 |
| Spectrum Analyzer | KEYSIGHT | N9040B | MY57010132 | 22.12.31 |
| Vector Signal Generator | R&S | SMBV100A | 257566 | 22.07.29 |
| Signal Generator | R&S | SMB100A | 176206 | 23.01.19 |
| Power Divider | Aeroflex/ Weinschel,Inc | 1580-1 | NX380 | 22.07.29 |
| DC Power Supply | AGILENT | E3632A | KR75304571 | 22.05.10 |
| Wideband Radio Communication Tester | R&S | CMW500 | 141780 | 22.04.01 |
| Temp & Humid Chamber | ESPEC CORP. | SH-642 | 93016978 | 23.03.04* |
| Biconical VHF-UHF Broadband Antenna | SCHWARZBECK | VUBA9117 | 275 | 22.04.09 |
| Bilog Antenna | ETS.LINDGREN | 3143B | 00228420 | 23.09.28 |
| Horn Antenna | ETS.LINDGREN | 3117 | 161225 | 22.05.11 |
| Horn Antenna | ETS.LINDGREN | 3117 | 00227509 | 22.09.27 |
| Horn Antenna | ETS.lindgren | 3116 | 00086632 | 23.01.25 |
| Horn Antenna | ETS.lindgren | 3116 | 00086635 | 22.05.17 |
| High pass Filter | Wainwright Instruments GmbH | WHKX12-2805-3000-18000-40SS | 32 | 22.08.20 |
| High pass Filter | Wainwright Instruments GmbH | WHKX10-900-1000-15000-40SS | 11 | 22.08.20 |
| Broadband Amplifier | SONOMA INSTRUMENT | 315 | 300314 | 23.01.19 |
| Amplifier | LTC MICROWAVE | LLA01185522Q-B | 139 | 22.07.19 |
| Amplifier | L-3 Narda-MITEQ | JS44-18004000-33-8P | 2000996 | 23.01.21 |
| 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 |

* Tests related to this equipment were progressed after the calibration was completed.

**End of test report**