

## 7.5. Power and Radiated Spurious Emissions

### 7.5.1 Test Limit

#### Radiated Power

For FCC Part 90.542 (Band14):

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 3 Watts.

For FCC Part 90.635 (Band26):

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 100 Watts.

#### Radiated Spurious Emissions

For FCC Part 22.917(a)/24.238(a)/27.53(c)/27.53(f)/27.53(h)/90.543/90.691:

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  $43 + 10\log_{10}(P)$  dB.

For FCC Part 90.543(f):

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to  $-70$  dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80$  dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

### 7.5.2 Test Procedure Used

KDB 971168 D01v02r02 - Section 7.0 & ANSI/TIA-603-E-2016

### 7.5.3 Test Setting

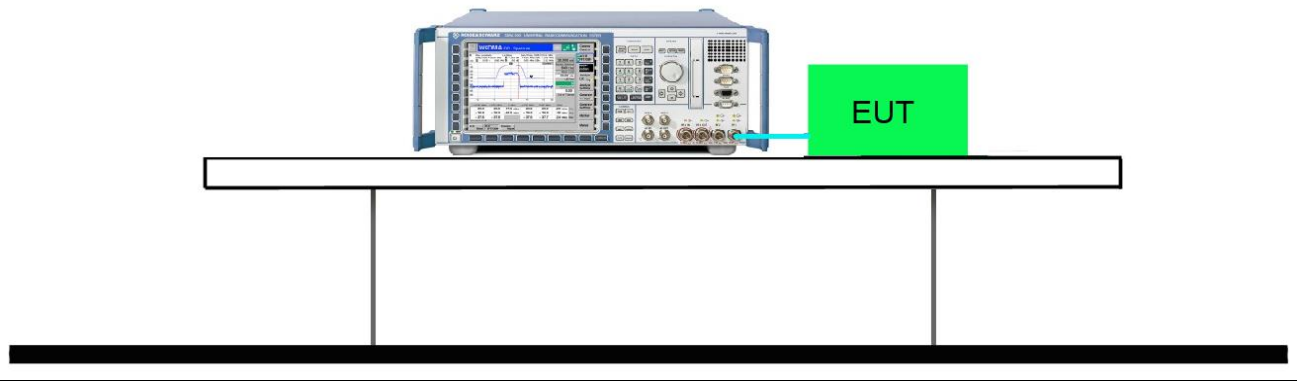
1. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
3. The output of the test antenna shall be connected to the measuring receiver.
4. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a substitution antenna.
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the

measuring receiver.

15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
16. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
17. Test site anechoic chamber refer to ANSI C63.4: 2014.

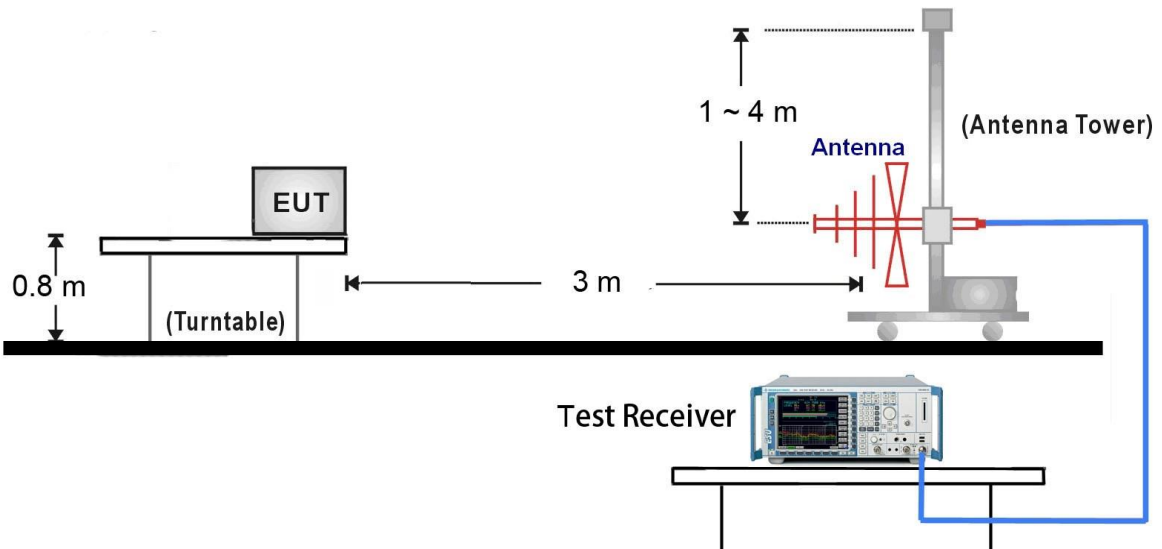
### 7.5.4 Test Setup

#### Conducted Power

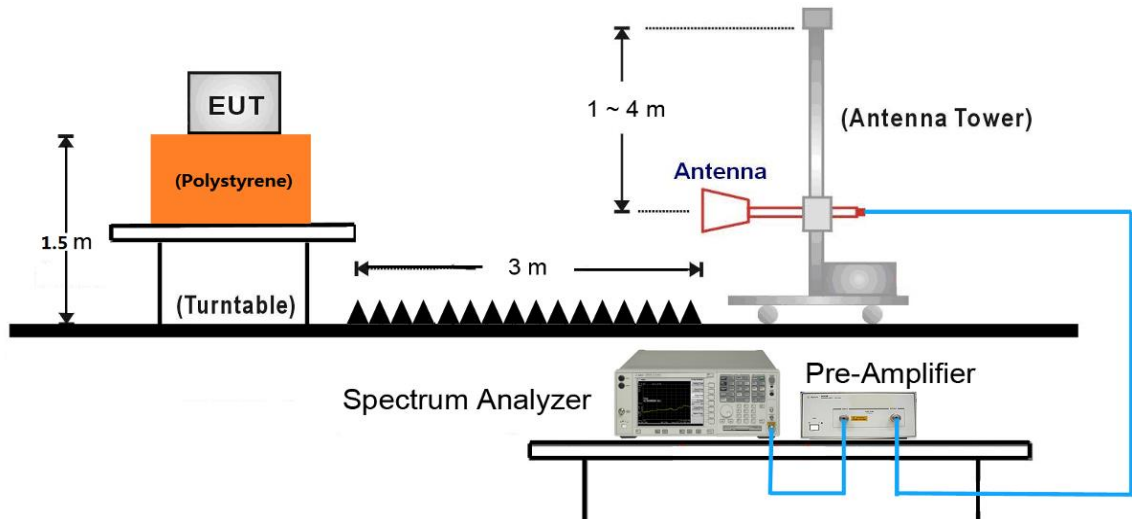


#### Radiated Power & Radiated Spurious Emissions

##### 30MHz ~ 1GHz Test Setup:



##### 1GHz ~ 10GHz Test Setup:



## 7.5.5 Test Result

### Conducted Power

#### Monarch 12

LTE Band26			Maximum Conducted Output Power (Channel / Frequency (MHz))											
Modulation	Bandwidth		1.4MHz			3MHz			5MHz			10MHz		
	RB	RB	26697	26740	26783	26705	26740	26775	26715	26740	26765	--	26740	--
	No.	Offset	814.7	819	823.3	815.5	819	822.5	816.5	819	821.5	--	819	--
QPSK	1	#0	24.29	23.95	24.08	24.17	23.93	23.72	23.86	23.71	23.81	--	23.95	--
	1	#Mid	24.30	23.97	23.90	23.54	23.68	23.76	24.04	23.85	23.79	--	23.67	--
	1	#High	24.22	23.84	23.82	23.43	23.63	23.63	23.54	23.89	23.66	--	23.89	--
	50%	#0	24.17	23.70	23.88	22.79	22.58	22.90	22.82	22.63	23.93	--	22.58	--
	50%	#Mid	24.15	23.61	23.67	22.81	22.74	22.69	22.72	22.69	22.87	--	22.77	--
	50%	#High	24.08	23.85	23.87	22.67	22.67	22.80	22.64	22.75	23.76	--	22.68	--
	100%	#0	22.89	22.76	22.72	22.77	22.66	23.01	22.76	22.75	22.79	--	22.74	--
16QAM	1	#0	23.40	23.07	23.20	23.67	23.35	22.98	22.39	22.73	22.34	--	23.58	--
	1	#Mid	23.52	23.24	23.19	23.43	23.56	23.06	22.41	22.50	22.49	--	23.73	--
	1	#High	23.43	23.17	23.09	23.39	23.46	23.05	22.39	22.50	22.41	--	23.21	--
	50%	#0	23.37	23.06	22.98	22.02	21.49	22.20	21.78	21.65	21.57	--	21.64	--
	50%	#Mid	22.83	22.71	22.96	21.78	21.91	21.86	21.67	21.74	21.70	--	21.97	--
	50%	#High	23.37	23.21	23.04	21.86	21.97	22.15	21.68	21.70	21.84	--	21.90	--
	100%	#0	21.99	21.81	21.81	21.37	21.57	21.67	21.92	21.63	21.89	--	21.72	--

### **Maximum Conducted Power and ERP/EIRP Power**

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows

$$ERP \text{ or } EIRP = P_{Meas} + G_T$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively. (expressed in the same units as  $P_{Meas}$ , e.g., dBm or dBW)

$P_{Meas}$  measured transmitter output power or PSD, in dBm or dBW

$G_T$  gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

$$ERP = EIRP - 2.15$$

### **Monarch 12**

LTE Band	BW	Modulation	Conducted Peak Power (dBm)	Conducted Peak Power (W)	Antenna Gain (dBi)	Maximum ERP (W)	ERP Limit (W)
LTE Band26	1.4M	QPSK	24.30	0.269	-3.00	0.082	100
		16QAM	23.52	0.225	-3.00	0.069	100
	3M	QPSK	24.17	0.261	-3.00	0.080	100
		16QAM	23.67	0.233	-3.00	0.071	100
	5M	QPSK	24.04	0.254	-3.00	0.077	100
		16QAM	22.73	0.187	-3.00	0.057	100
	10M	QPSK	23.95	0.248	-3.00	0.076	100
		16QAM	23.73	0.236	-3.00	0.072	100



### Radiated Spurious Emission

#### Monarch 12

LTE Band26							
Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Ant Gain (dBi)	EIRP Measure (dBm)	Limit (dBm)	Margin (dB)
QPSK, CH26715 / 816.5MHz, Bandwidth 5MHz							
1633	H	-47.18	1.06	5.17	-43.07	-13	-30.07
2449.5	H	-22.19	1.10	5.50	-17.79	-13	-4.79
3266	H	-64.01	1.30	6.78	-58.54	-13	-45.54
1633	V	-42.20	1.06	5.17	-38.09	-13	-25.09
2449.5	V	-34.98	1.10	5.50	-30.58	-13	-17.58
3266	V	-65.84	1.30	6.78	-60.37	-13	-47.37
QPSK, CH26740 /819MHz, Bandwidth 5MHz							
1638	H	-43.85	1.06	5.16	-39.75	-13	-26.75
2457	H	-46.54	1.11	5.52	-42.13	-13	-29.13
3276	H	-61.14	1.30	6.82	-55.62	-13	-42.62
1638	V	-45.33	1.06	5.16	-41.23	-13	-28.23
2457	V	-28.41	1.11	5.52	-24.00	-13	-11.00
3276	V	-61.52	1.30	6.82	-56.00	-13	-43.00
QPSK, CH26765 / 821.5MHz, Bandwidth 5MHz							
1643	H	-45.07	1.05	5.14	-40.98	-13	-27.98
2464.5	H	-27.24	1.11	5.53	-22.82	-13	-9.82
3286	H	-59.49	1.30	6.86	-53.92	-13	-40.92
1643	V	-42.07	1.05	5.14	-37.98	-13	-24.98
2464.5	V	-22.29	1.11	5.53	-17.87	-13	-4.87
3286	V	-60.82	1.30	6.86	-55.25	-13	-42.25

Note:

- Spurious emissions within 30-1000MHz & Other harmonic were found more than 20dB below limit line.
- $EIRP \text{ or } ERP \text{ (dBm)} = SG \text{ Reading (dBm)} - Cable \text{ Loss (dB)} + Substitute \text{ Antenna Gain (dBi)}$

## 7.6. Peak-Average Ratio

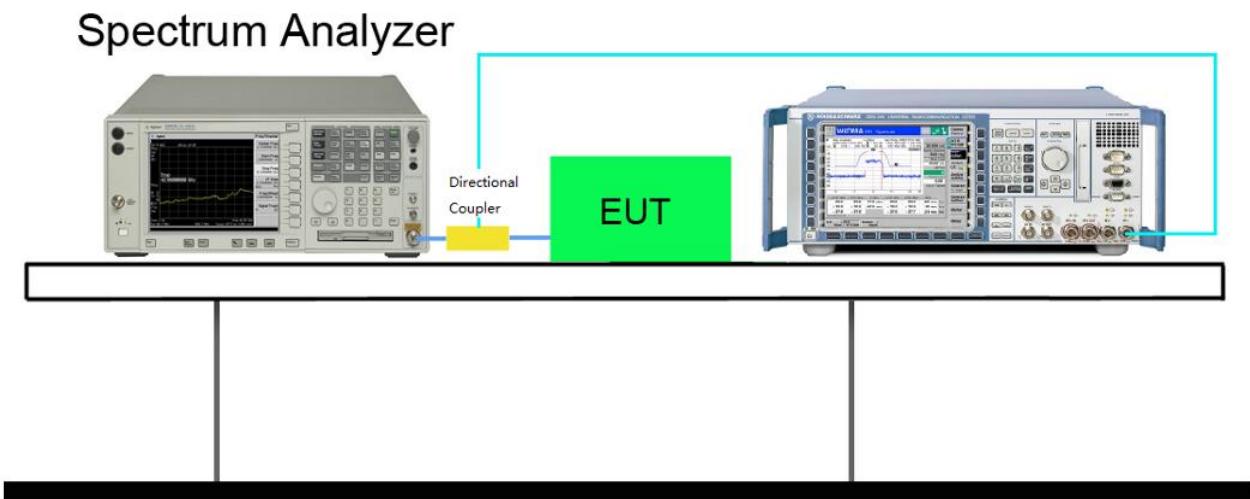
### 7.6.1 Test Limit

The transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

### 7.6.2 Test Procedure

KDB 971168 D01v02r02 - Section 5.7 & ANSI/TIA-603-E-2016

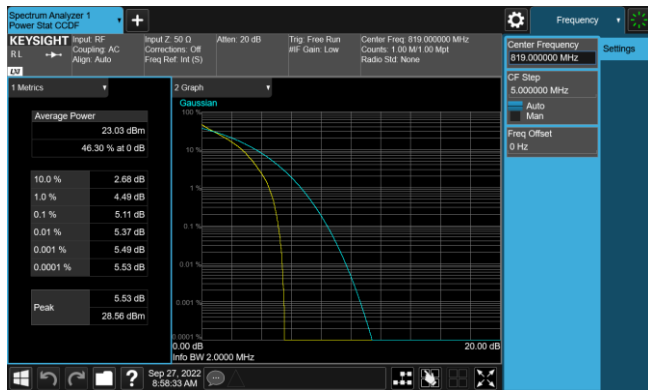
### 7.6.3 Test Setup



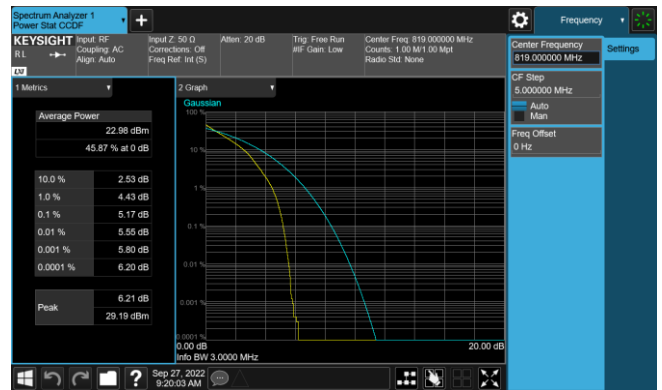
### 7.6.4 Test Result

Test Mode	Channel/ Frequency (MHz)	Modulation	Bandwidth (MHz)	RB Size	RB Offset	Test Result
LTE Band 26	CH26740 (819MHz)	QPSK	1.4	6	0	Pass
			3	15	0	Pass
			5	25	0	Pass
			10	50	0	Pass
	CH26740 (819MHz)	16QAM	1.4	6	0	Pass
			3	15	0	Pass
			5	25	0	Pass
			10	50	0	Pass

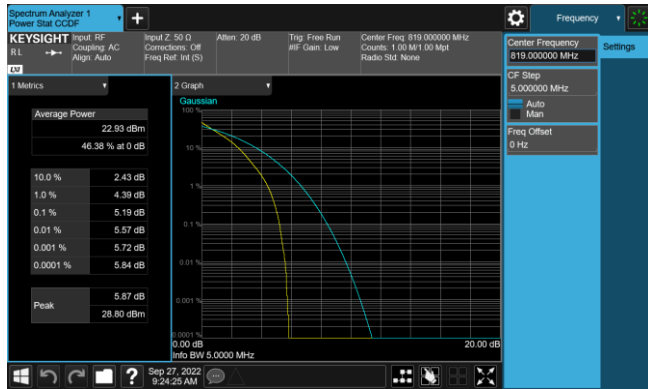
**LTE Band 26 QPSK 1.4MHz CH26740 6RB#0**



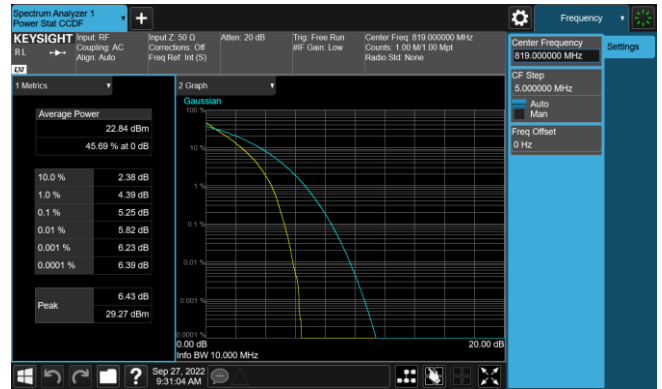
**LTE Band 26 QPSK 3MHz CH26740 15RB#0**



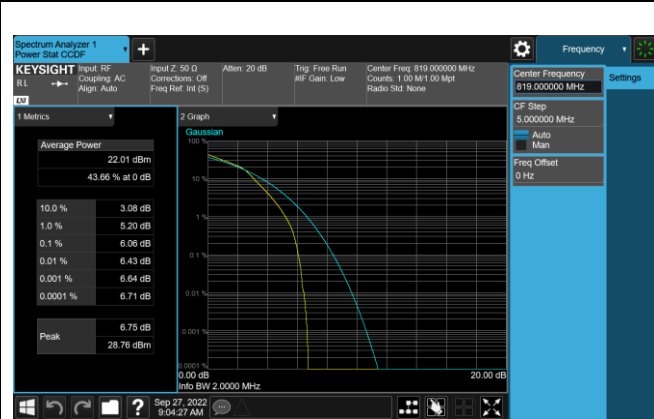
**LTE Band 26 QPSK 5MHz CH26740 25RB#0**



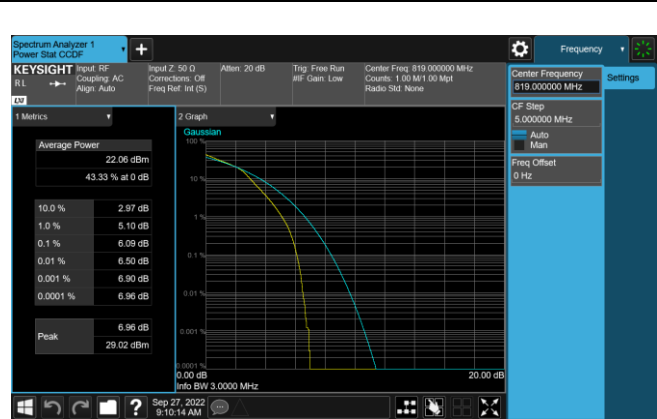
**LTE Band 26 QPSK 10MHz CH26740 50RB#0**



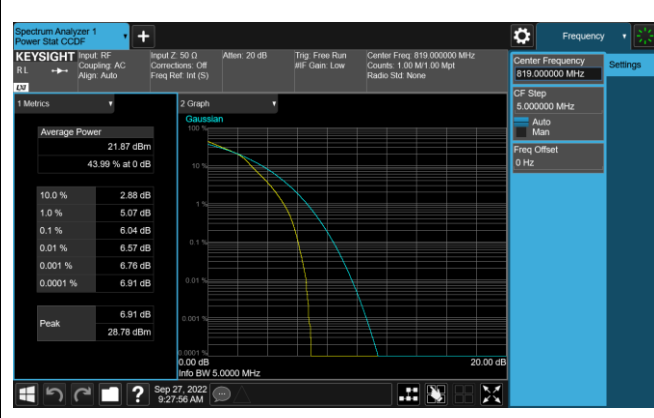
**LTE Band 26 16QAM 1.4MHz CH26740 6RB#0**



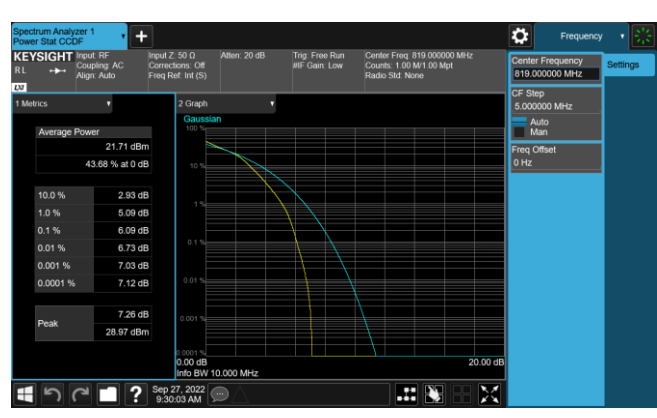
**LTE Band 26 16QAM 3MHz CH26740 15RB#0**



**LTE Band 26 16QAM 5MHz CH26740 25RB#0**



**LTE Band 26 16QAM 10MHz CH26740 50RB#0**



## 7.7. Frequency Stability Under Temperature & Voltage Variations

### 7.7.1 Test Limit

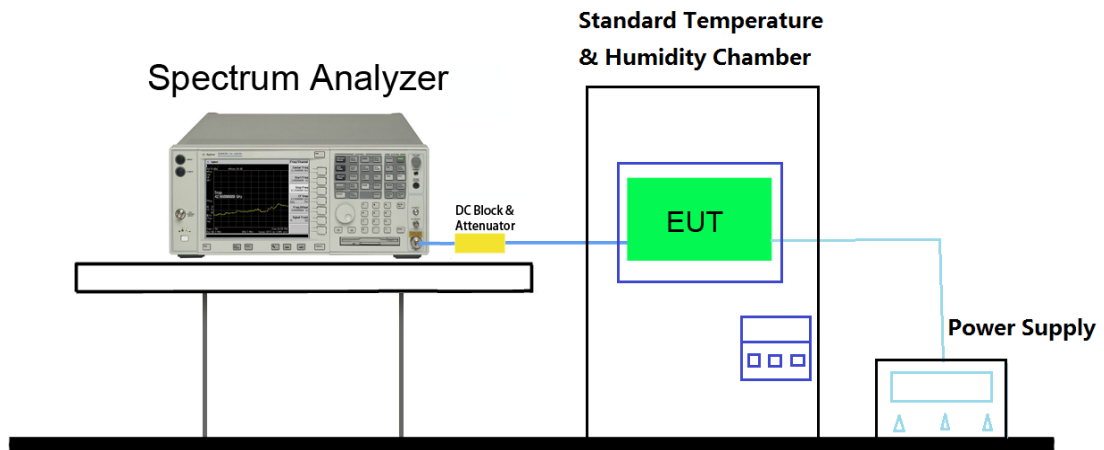
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Limit	$< \pm 2.5$ ppm
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### 7.7.2 Test Procedure

KDB 971168 D01v02r02 - Section 9.0 & ANSI/TIA-603-E-2016

### 7.7.3 Test Setup



### 7.7.4 Test Result

Operating Frequency	819MHz
Channel	CH26740
Test Mode	LTE Band 26
Reference Voltage	AC 120V/60Hz

Temperature vs. Frequency Stability						
Voltage (%)	Power (VAC)	Temp (°C)	Declared Frequency (MHz)	Measured Frequency (Hz)	Frequency Tolerance (ppm)	Limit (ppm)
100%	120V/60Hz	-30	819	-3.76	-0.005	±2.5
		-20	819	-2.37	-0.003	±2.5
		-10	819	-4.15	-0.005	±2.5
		0	819	-3.46	-0.004	±2.5
		10	819	-4.66	-0.006	±2.5
		+ 20 (Ref)	819	-5.42	-0.007	±2.5
		30	819	-4.49	-0.005	±2.5
		40	819	-4.86	-0.006	±2.5
		50	819	-3.85	-0.005	±2.5
Voltage vs. Frequency Stability						
Voltage (%)	Power (VAC)	Temp (°C)	Declared Frequency (MHz)	Measured Frequency (Hz)	Frequency Tolerance (ppm)	Limit (ppm)
100%	120V/60Hz	20	819	-5.42	-0.007	±2.5
115%	138V/60Hz	20	819	-4.38	-0.005	±2.5
85%	102V/60Hz	20	819	-5.29	-0.006	±2.5

————— The End —————