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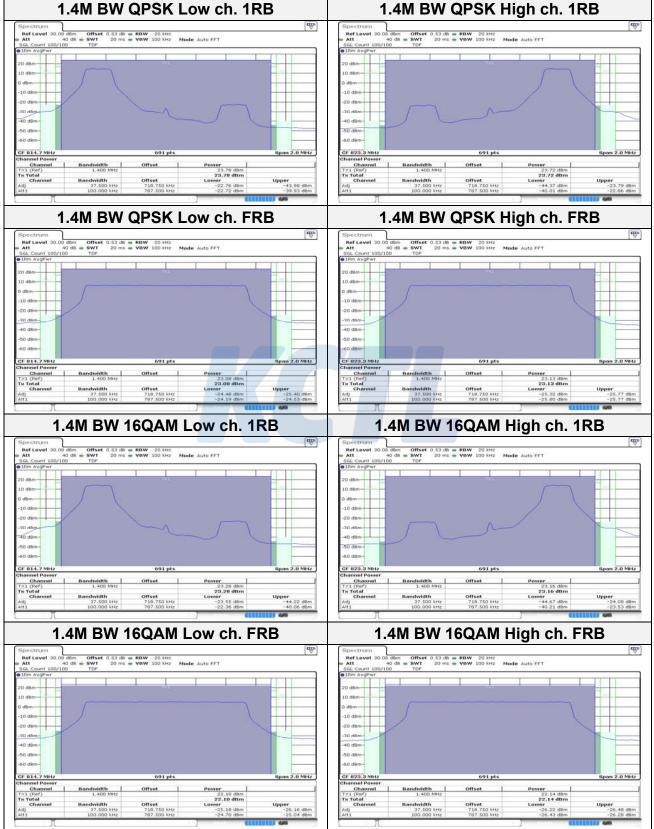
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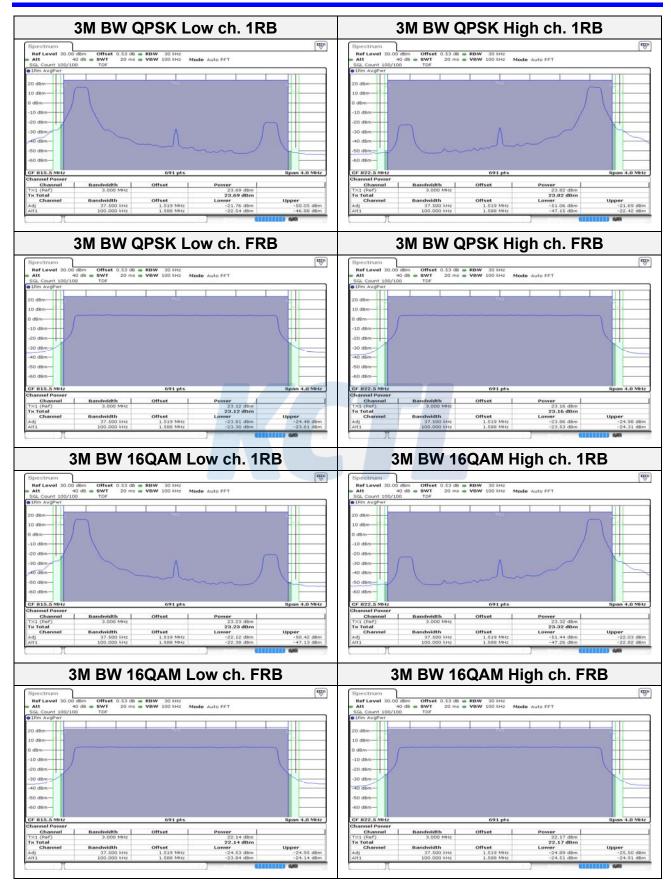
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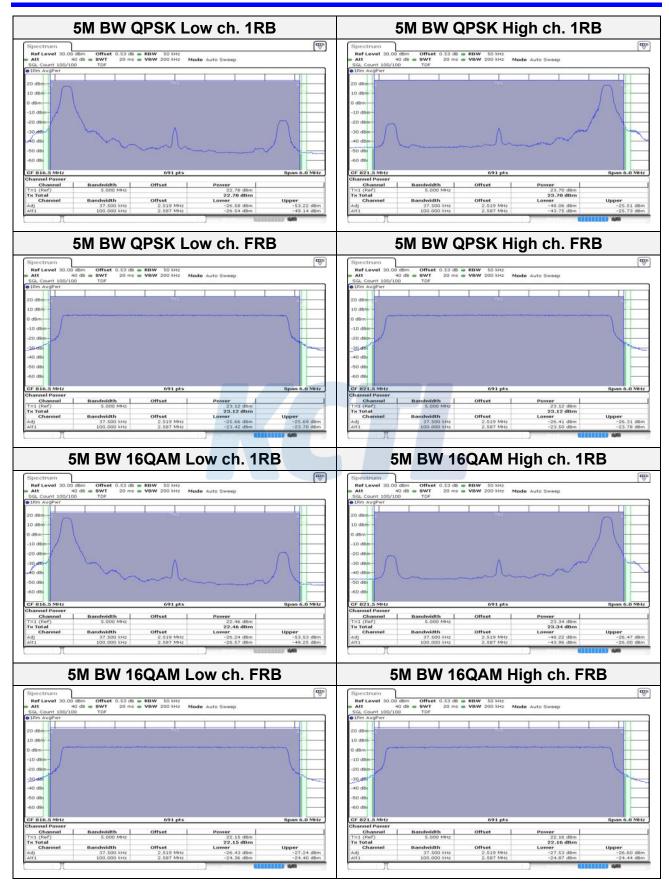
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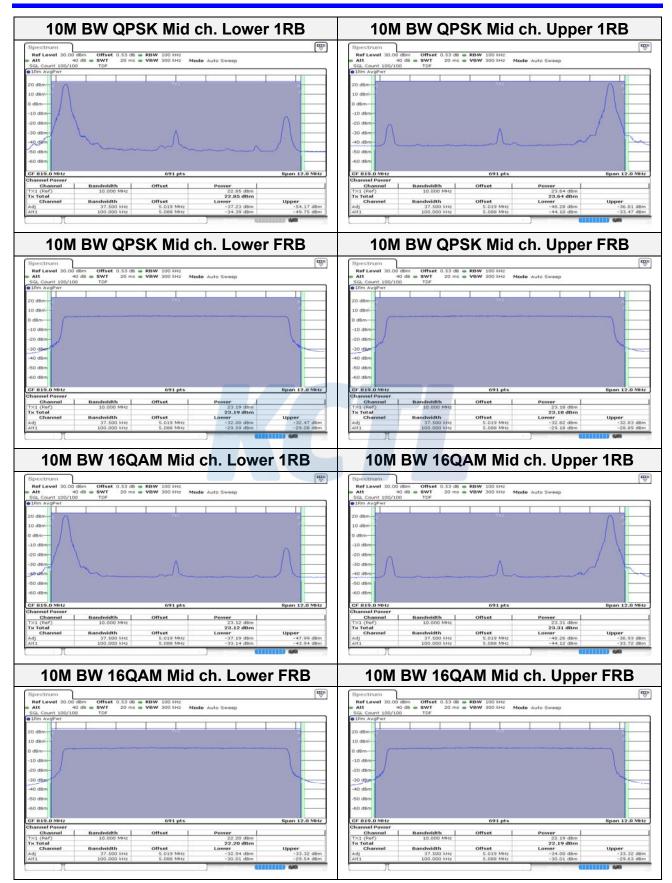
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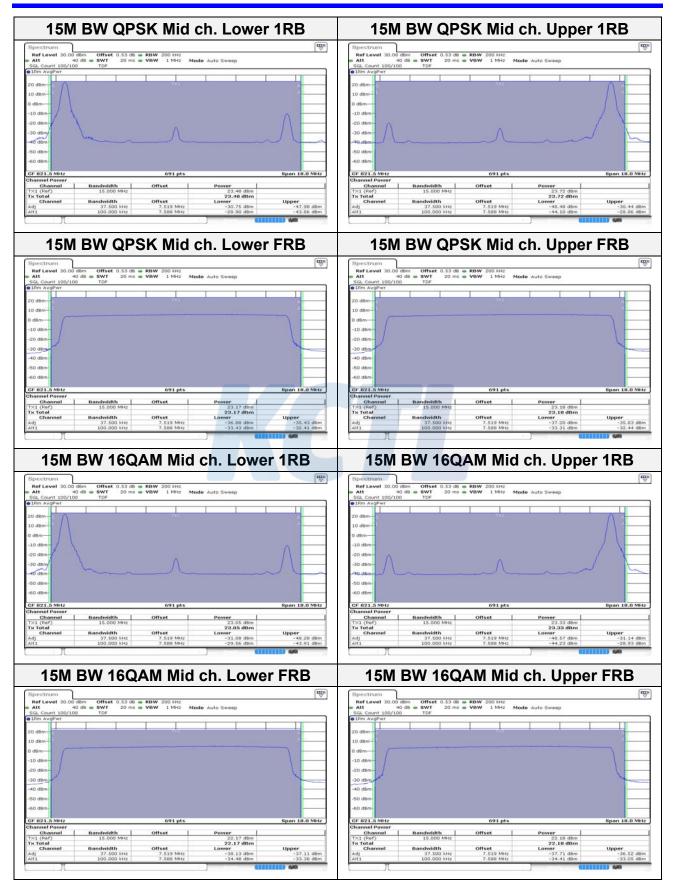
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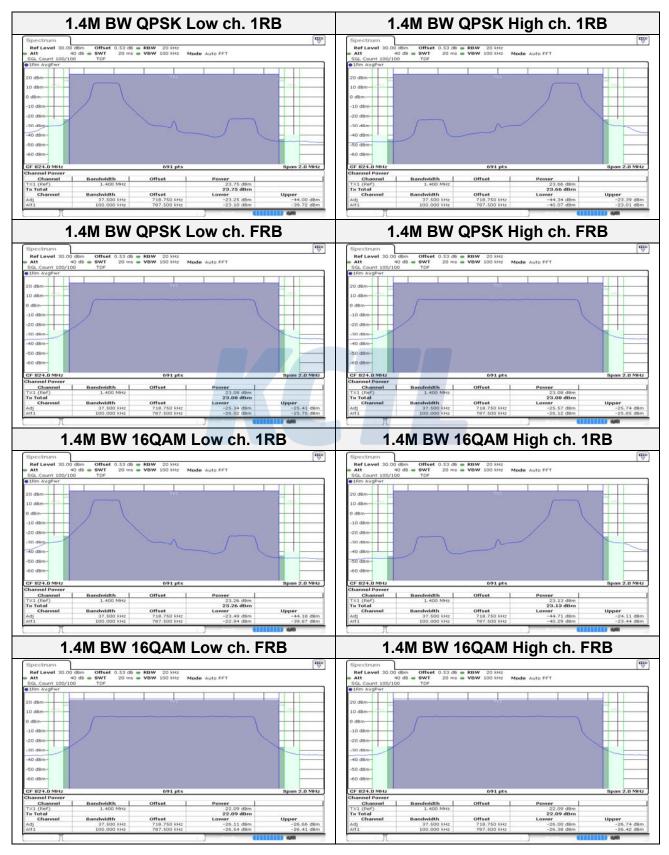
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Straddle channel



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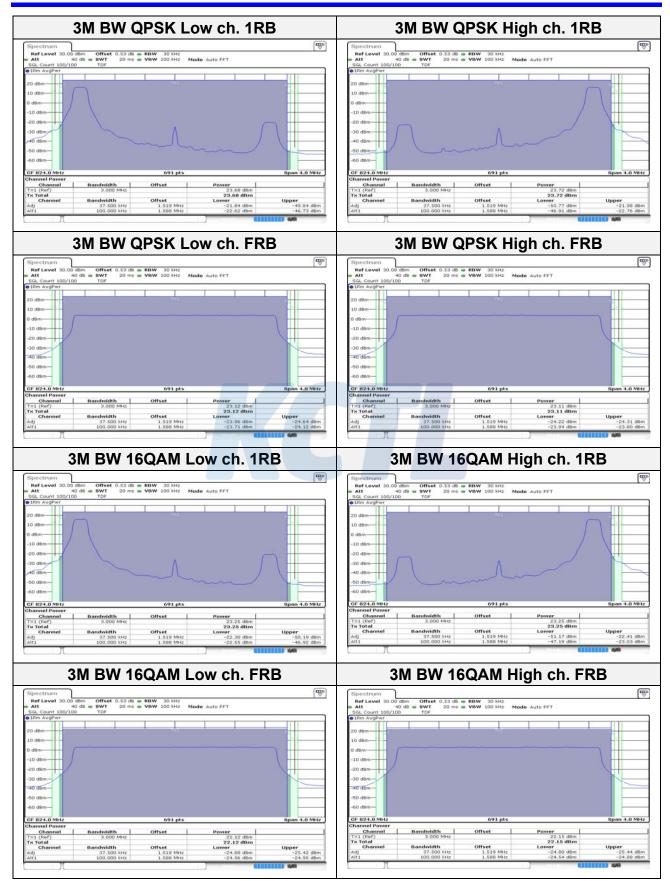
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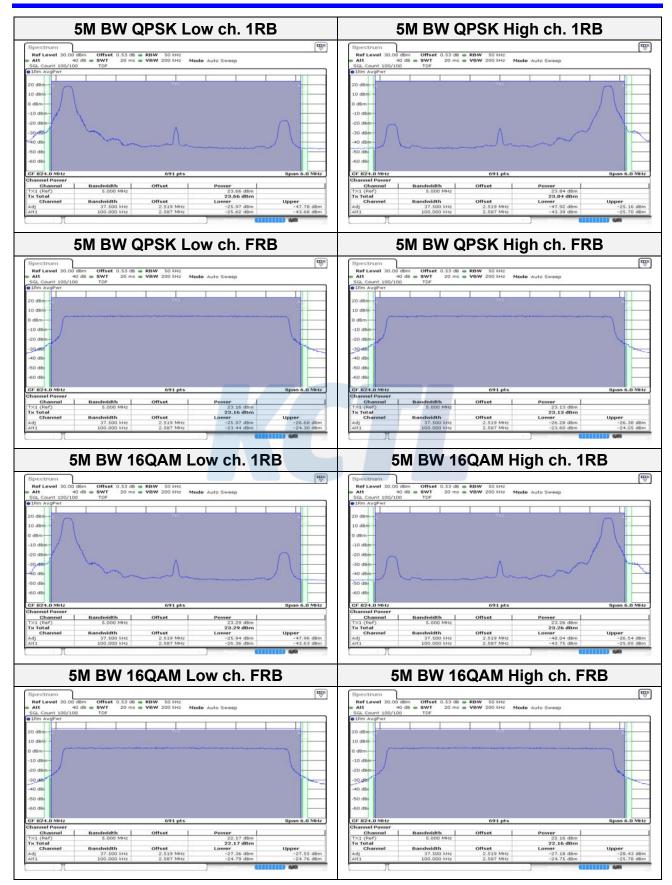
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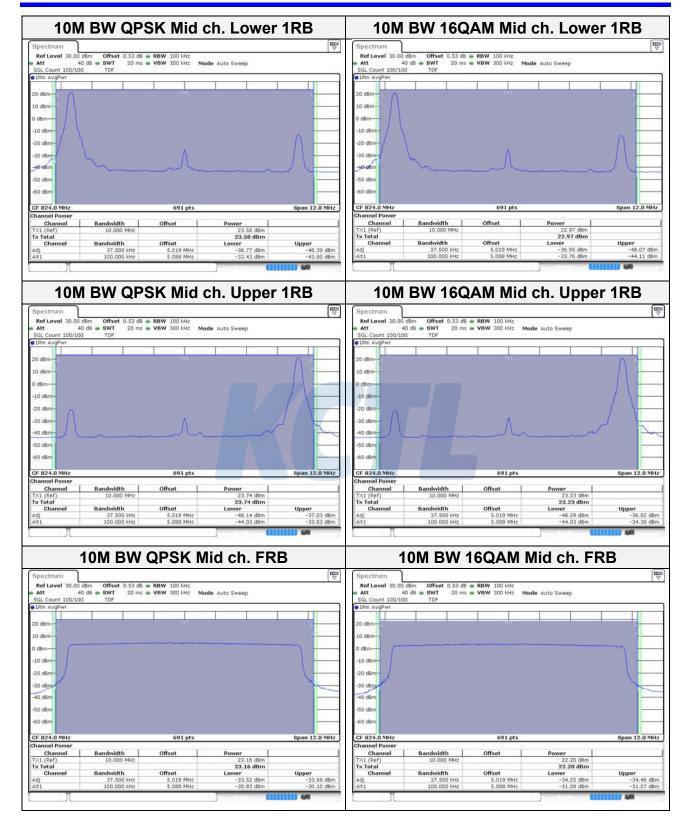


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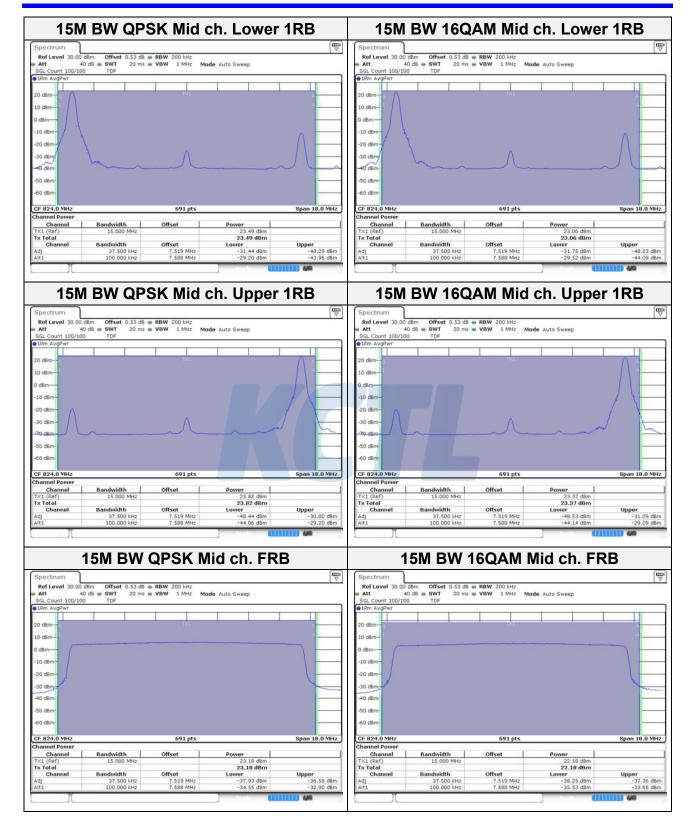
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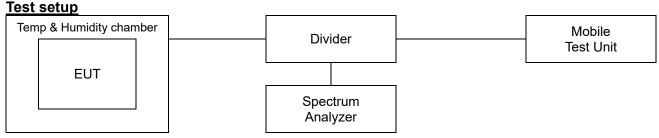


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7.5. Frequency stability



<u>Limit</u>

According to §2.1055(a),

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

- 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 Mt 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 §90.213

For mobile devices operating in the 809 to 824 MHz band at a power level 2 Watts or less, the limit specified in Table is ± 2.5 ppm.

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Test procedure

ANSI 63.26-2015 - Section 5.6

Test settings

- 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.
- 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.



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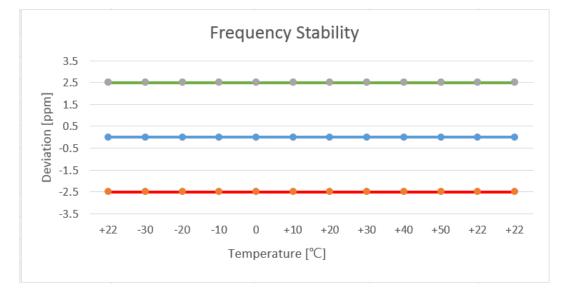


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Test results

Test mode	: <u>LTE Band 14</u>
Frequency (Hz)	: <u>793 000 000</u>
Channel	: <u>23330</u>
Deviation limit(FCC)	: <u>±0.00025% or 2.5ppm</u>

Voltage	Power	Temp.	Frequency	Frequency	Devi	ation
(%)	(V)	(°C)	(Hz)	error (Hz)	(ppm)	(%)
		+22(Ref)	792,999,996	-3.66	0.0	0.000 000
		-30	792,999,994	-5.63	0.0	-0.000 001
		-20	792,999,994	-6.18	0.0	-0.000 001
		-10	792,999,996	-4.27	0.0	-0.000 001
100%	3.85	0	792,999,996	-3.51	0.0	0.000 000
100 /0	5.05	+10	792,999,996	-4.28	0.0	-0.000 001
		+20	792,999,995	-4.89	0.0	-0.000 001
		+30	792,999,995	-5.11	0.0	-0.000 001
		+40	792,999,994	-6.27	0.0	-0.000 001
		+50	792,999,994	-5.71	0.0	-0.000 001
115%	4.43	+22(Ref)	792,999,996	-4.11	0.0	-0.000 001
End point	3.55	+22(Ref)	792,999,996	-4.28	0.0	-0.000 001



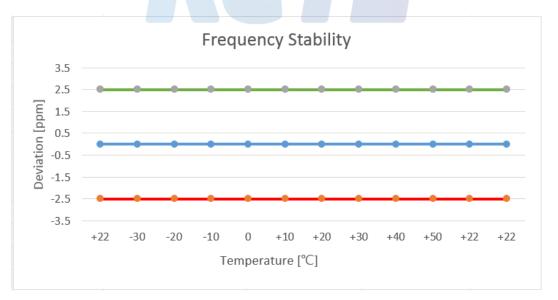
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Test mode	:	LTE Band 26
Frequency (Hz)	:	<u>823 300 000</u>
Channel	:	<u>26783</u>
Deviation limit(FCC)	:	$\pm 0.00025\%$ or 2.5ppm

Voltage	Power	Temp.	Frequency	Frequency	Devi	ation
(%)	(V)	(°C)	(Hz)	error (Hz)	(ppm)	(%)
		+22(Ref)	823,299,995	-4.68	0.0	-0.000 001
		-30	823,299,994	-6.18	0.0	-0.000 001
		-20	823,299,995	-5.37	0.0	-0.000 001
		-10	823,299,996	-4.20	0.0	-0.000 001
100%	3.85	0	823,299,995	-4.66	0.0	-0.000 001
10070	0.00	+10	823,299,996	-3.71	0.0	0.000 000
		+20	823,299,995	-4.97	0.0	-0.000 001
		+30	823,299,995	-5.32	0.0	-0.000 001
		+40	823,299,994	-5.73	0.0	-0.000 001
		+50	823,299,994	-6.22	0.0	-0.000 001
115%	4.43	+22(Ref)	823,299,995	-5.38	0.0	-0.000 001
End point	3.55	+22(Ref)	823,299,994	-5.55	0.0	-0.000 001



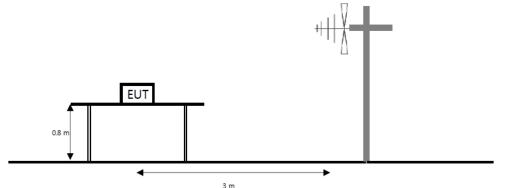
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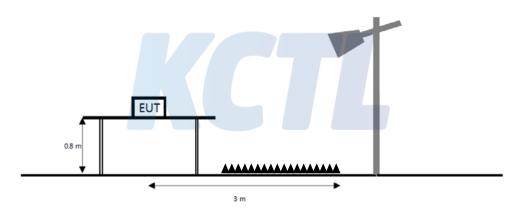
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7.6. Radiated Power (ERP/EIRP) Test setup

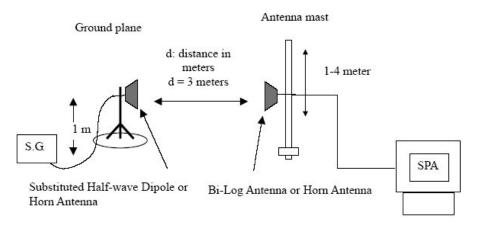
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 Mz to 1 Gz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 $\mathbb{G}_{\mathbb{Z}}$ to the tenth harmonic of the highest fundamental frequency or to 40 $\mathbb{G}_{\mathbb{Z}}$ emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



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<u>Limit</u>

According to §90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts(20 dBw).

According to §90.542(a)(7), Portable stations (hand-held devices) transmitting in the 758-768 Mb band and the 788-798 Mb band are limited to 3 watts ERP.

Test procedure

971168 D01 v03r01 - Section 5.2 and 5.8 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 \geq 3 × RBW.
- 3) SPAN = $2 \times \text{to } 3 \times \text{the OBW}$.
- 4) Number of measurement points in sweep $\geq 2 \times \text{span} / \text{RBW}$.
- 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.

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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 ^{GHz} below) or horn antenna (1 ^{GHz} above) connected to a signal generator.

The power is calculated by the following formula;

Pd(dBm) = Pg(dBm) – Cable loss (dB) + Antenna gain (dB)

- 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 dBm, 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.

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Test results

Test mode: LTE Band 14

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EF	RP.
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dB m]	[W]
		790.50	Н	0.60	3.64	22.54	19.50	0.089
	QPSK	793.00	Н	0.60	3.65	22.63	19.58	0.091
5 M		795.50	Н	0.10	3.65	22.98	19.43	0.088
5 101		790.50	Н	0.60	3.64	21.60	18.56	0.072
	16QAM	793.00	Н	0.60	3.65	21.85	18.80	0.076
		795.50	Н	0.10	3.65	22.07	18.52	0.071
10 M	QPSK	793.00	Н	0.60	3.65	22.74	19.69	0.093
	16QAM	793.00	Н	0.60	3.65	21.71	18.66	0.073

Note.

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



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Test mode: LTE Band 26								
Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EF	RP
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dB m]	[W]
	QPSK	814.7	Н	0.40	3.72	24.14	20.82	0.121
1 4 14	QFSK	823.3	Н	-0.30	3.74	25.69	21.65	0.146
1.4 M	160AM	814.7	Н	0.40	3.72	23.33	20.01	0.100
	16QAM	823.3	Н	-0.30	3.74	24.58	20.54	0.113
	ODSK	815.5	Н	0.40	3.72	24.65	21.33	0.136
2.14	QPSK	822.5	Н	-0.30	3.73	25.56	21.53	0.142
3 M	1604M	815.5	Н	0.40	3.72	23.67	20.35	0.108
	16QAM	822.5	Н	-0.30	3.73	24.33	20.30	0.107
	QPSK	816.5	Н	0.40	3.72	24.48	21.16	0.131
5 M	QPSK	821.5	Н	-0.30	3.72	25.46	21.44	0.139
D IVI	16QAM	816.5	Н	0.40	3.72	23.59	20.27	0.106
	IOQAIVI	821.5	Н	-0.30	3.72	24.55	20.53	0.113
10 M	QPSK	819.0	Н	-0.30	3.72	25.27	21.25	0.133
	10 M 16QAM	819.0	Н	-0.30	3.72	24.27	20.25	0.106
15 M	QPSK	821.5	Н	-0.30	3.72	25.45	21.43	0.139
15 M	16QAM	821.5	Н	-0.30	3.72	24.50	20.48	0.112

Straddle channel

Bandwidth	Bandwidth Modulation		Pol.	Antenna Gain	C.L	Substitute Level	EF	RP
		[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dB m]	[W]
1.4 M	QPSK		Н	-0.30	3.75	25.77	21.72	0.149
1.4 10	16QAM		Н	-0.30	3.75	24.87	20.82	0.121
3 M	QPSK		Н	-0.30	3.75	25.72	21.67	0.147
3 101	16QAM		Н	-0.30	3.75	24.82	20.77	0.119
5 M	QPSK	824	Н	-0.30	3.75	25.76	21.71	0.148
5 M	16QAM	024	Н	-0.30	3.75	24.81	20.76	0.119
10 M	QPSK		Н	-0.30	3.75	25.82	21.77	0.150
10 M	16QAM		Н	-0.30	3.75	24.74	20.69	0.117
15 M	QPSK	QPSK	Н	-0.30	3.75	25.95	21.90	0.155
13 M	16QAM		Н	-0.30	3.75	25.13	21.08	0.128

Note.

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

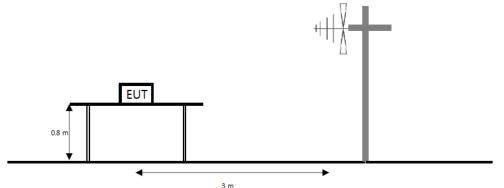
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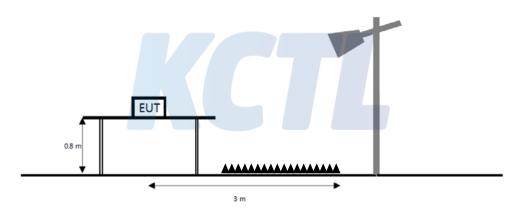
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7.7. Radiated Spurious Emissions Test setup

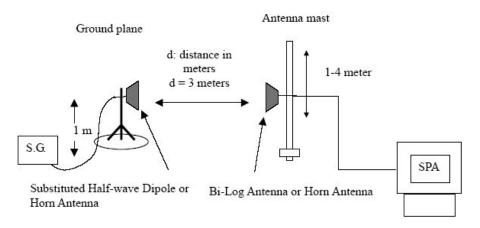
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 Mz to 1 Gz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 $\mathbb{G}_{\mathbb{Z}}$ to the tenth harmonic of the highest fundamental frequency or to 40 $\mathbb{G}_{\mathbb{Z}}$ emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



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<u>Limit</u>

According to §90.691(a), Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $\text{Log}_{10}(f/6.1)$ decibels or 50 + 10 $\text{Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

According to §90.543 (e), For operations in the 758-768 Mt and the 788-798 Mt bands, the power of any emission outside the 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, in accordance with the following:

(1) On all frequencies between 769-775 Mb and 799-805 Mb, by a factor not less than 76 + 10 log (P) dB in a 6.25 kb band segment, for base and fixed stations.

(2) On all frequencies between 769-775 Mz and 799-805 Mz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 $\,\rm Me$, above 805 $\,\rm Me$, and below 758 $\,\rm Me$, by at least 43 + 10 log (P) $\rm dB$

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 km segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

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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 = 1 kHz for below 1 GHz and 1 MHz for above 1 GHz.
- 2) VBW \geq 3 × RBW.
- 3) Detector = RMS
- 4) Trace mode = Max hold
- 5) Sweep time = Auto couple
- 6) Number of sweep points $\geq 2 \times \text{span} / \text{RBW}$
- 7) 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 ^{GHz} below) or horn antenna (1 ^{GHz} 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 dBm, 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.

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Test results (Above 1 000 M拉)

<u>Test mode</u>	: <u>LTE Band 14</u>
<u>Frequency(Mz)</u>	: <u>793.0</u>
<u>Channel</u>	: <u>23330</u>

Bandwidth(Mb) : <u>10</u>

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
	*1 594.90	Н	6.32	5.15	-57.07	-55.90	-50.00	5.90
ODEK	2 394.30	Н	5.34	6.39	-55.95	-57.00	-13.00	44.00
QPSK	3 192.73	Н	8.03	8.08	-55.85	-55.90	-13.00	42.90
	3 990.84	V	8.60	9.37	-55.33	-56.10	-13.00	43.10

Note.

1. Limit Calculation(dBm)= 43 + 10log(P_[Watts]) Limit Calculation of wide-band (dBm/Mtz) = -70dBW/Mtz (-40 dBm/Mtz) Limit Calculation of narrow-band (dBm) = -80dBW (-50dBm)

2. ERP & E.I.R.P(dB m)= Substitute Level(dB) + Antenna gain(dBi) – Cable Loss(dB)

3. "*" Narrow-band (1 559 - 1 610 Mz)

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Test mode	: <u>LTE Band 26</u>

Frequency(Mbz)	:	<u>821.5</u>
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<u>Channel</u>	:	<u>26765</u>
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<u>Bandwidth(₩z)</u> : <u>15</u>

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 656.35	Н	6.13	5.21	-52.32	-51.40	-13.00	38.40
	2 484.54	Н	5.39	6.52	-46.17	-47.30	-13.00	34.30
	3 316.89	Н	8.18	8.41	-55.67	-55.90	-13.00	42.90
	4 145.41	V	8.48	9.71	-54.57	-55.80	-13.00	42.80

Test mode : LTE Band 26

Frequency(Mlz) : 824

<u>Channel</u> : <u>26790</u>

 $\underline{Bandwidth(ML)}$: <u>10</u>

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 661.15	Н	6.12	5.22	-52.50	-51.60	-13.00	38.60
	2 491.90	Н	5.40	6.53	-46.87	-48.00	-13.00	35.00
	3 326.81	V	8.19	8.44	-55.85	-56.10	-13.00	43.10
	4 157.89	Н	8.47	9.74	-56.13	-57.40	-13.00	44.40

Note.

1. Limit Calculation(dBm)= 43 + 10log(P_[Watts])

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8_ Measurement equipment Manufacturer Model No. **Equipment Name** Serial No. Next Cal. Date Spectrum Analyzer R&S FSV40 100988 21.01.03 AGILENT Spectrum Analyzer N9040B MY57010132 21.07.29 Vector Signal R&S SMBV100A 257566 21.07.13 Generator Signal Generator R&S SMR40 100007 21.04.08 Signal Generator R&S SMB100A 176206 21.01.21 Wideband Radio R&S CMW500 141780 21.04.16 **Communication Tester** Wideband Radio R&S CMW500 132423 21.03.12 **Communication Tester DC Power Supply** AGILENT E3632A KR73001026 21.04.09 Power Divider AGILENT 11636B 54456 21.01.06 92004048 Temp & Humid Chamber ESPEC CORP. SH-661 21.01.03 **Biconical VHF-UHF** SCHWARZBECK 275 VUBA9117 22.04.09 **Broadband Antenna Bilog Antenna** Teseq GmbH CBL 6143A 35039 21.05.21 Horn Antenna ETS.lindgren 3115 62589 21.07.16 Horn Antenna ETS.lindgren 3117 161225 21.05.12 Horn Antenna ETS.lindgren 3116 00086632 21.02.17 Horn Antenna ETS.lindgren 3116 00086635 21.05.12 Wainwright Instruments WHKX3.0/18G-12SS High pass Filter 44 21.01.21 GmbH Wainwright Instruments High pass Filter WHKX1.0/1.5S-10SS 14 21.01.21 GmbH Weinschel Attenuator 10 AJ1239 21.05.15 ENGINEERING Attenuator **API** Inmet 40AH2W-10 12 21.05.12 SONOMA Amplifier 310N 186280 21.01.21 INSTRUMENT AMF-7D-01001800-22-21.02.12 Amplifier L-3 Narda-MITEQ 2031196 10P JS44-18004000-33-8P Amplifier L-3 Narda-MITEQ 2000997 21.07.29 Antenna Mast MATURO EAS 1.5 042/8941211 N/A Antenna Mast MATURO EAS 1.5 043/8941211 N/A **Turn Table** MATURO TT 0.8 PF 041/8941211 N/A

End of test report