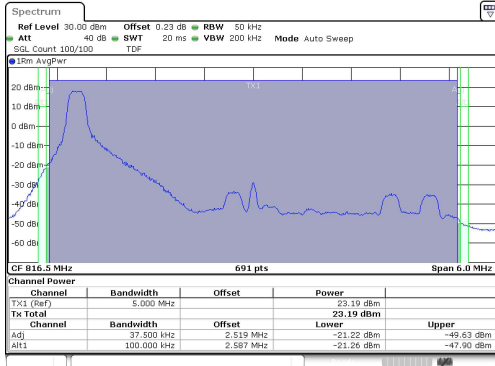
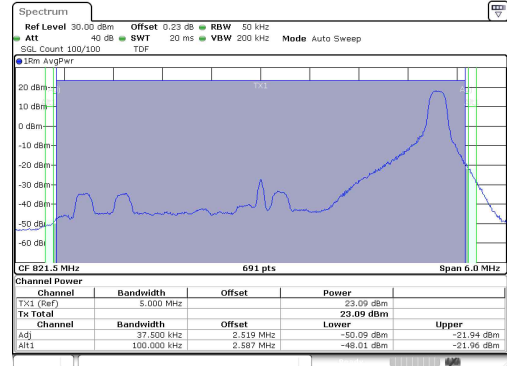


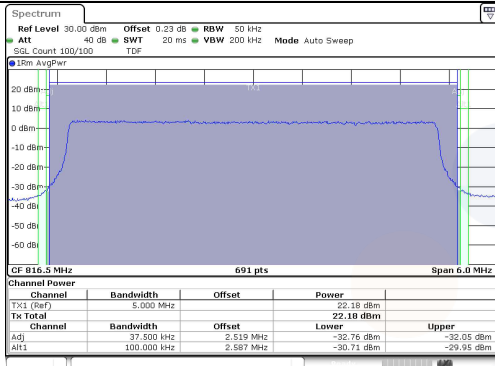
5M BW QPSK Low ch. 1RB



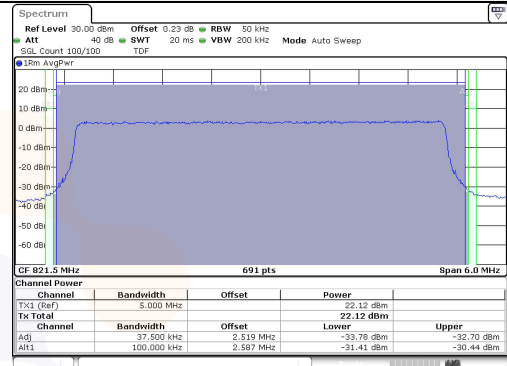
5M BW QPSK High ch. 1RB



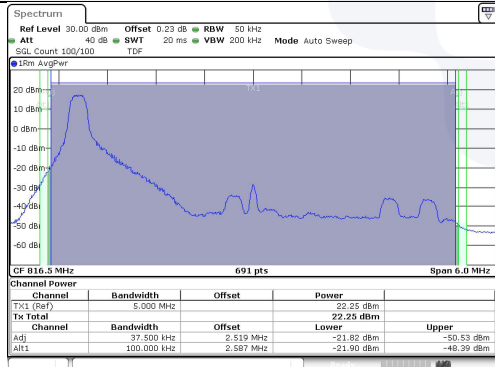
5M BW QPSK Low ch. FRB



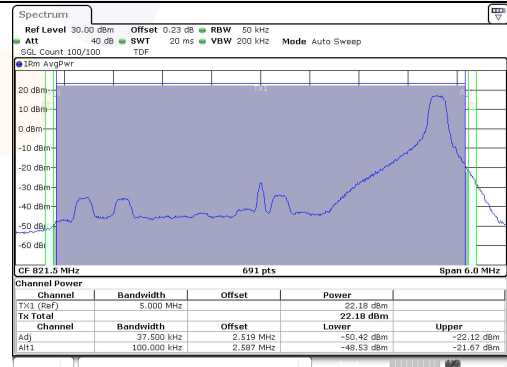
5M BW QPSK High ch. FRB



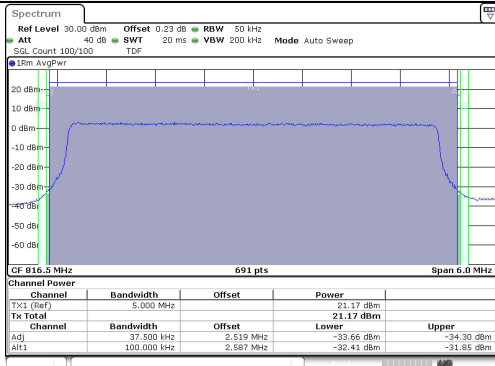
5M BW 16QAM Low ch. 1RB



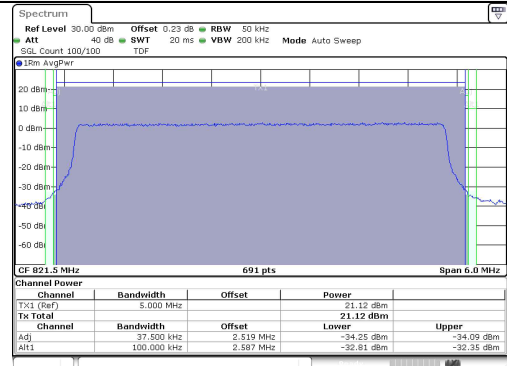
5M BW 16QAM High ch. 1RB



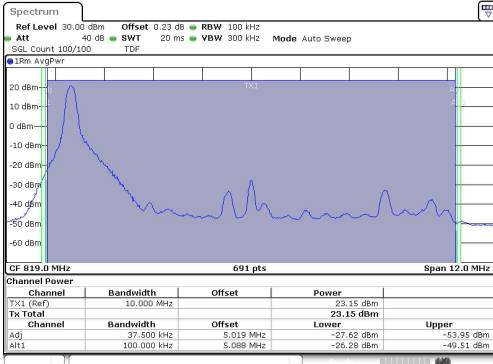
5M BW 16QAM Low ch. FRB



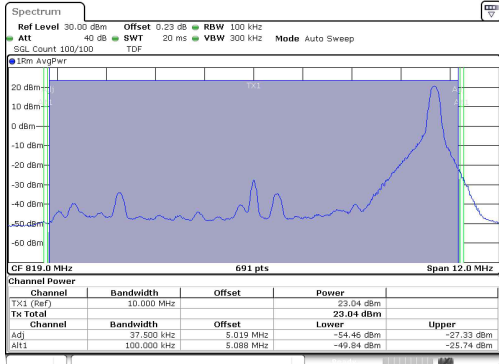
5M BW 16QAM High ch. FRB



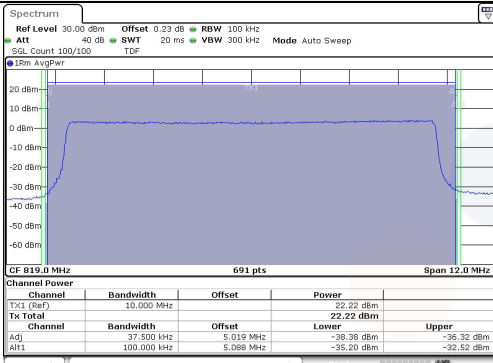
10M BW QPSK Mid ch. Lower 1RB



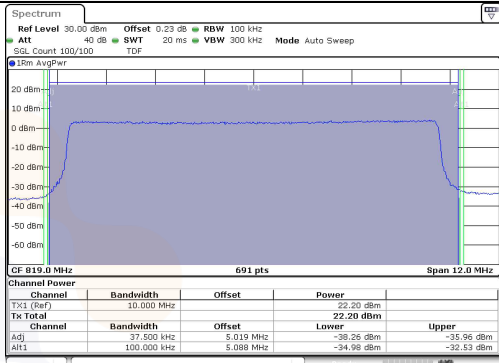
10M BW QPSK Mid ch. Upper 1RB



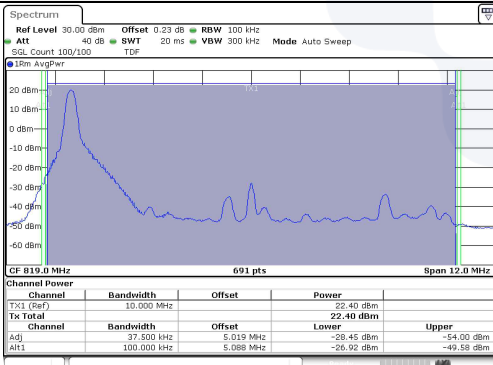
10M BW QPSK Mid ch. Lower FRB



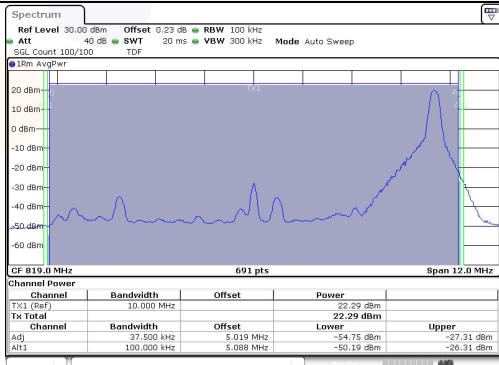
10M BW QPSK Mid ch. Upper FRB



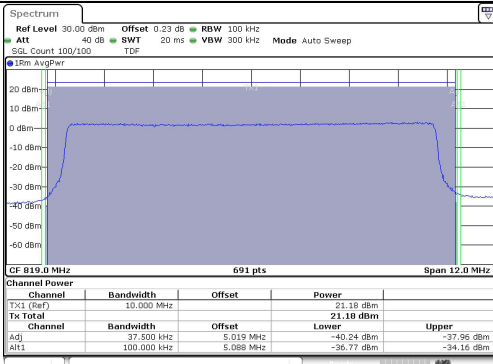
10M BW 16QAM Mid ch. Lower 1RB



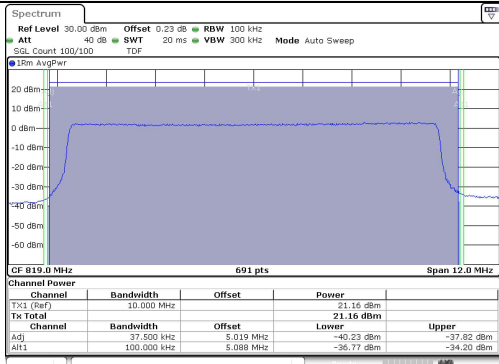
10M BW 16QAM Mid ch. Upper 1RB



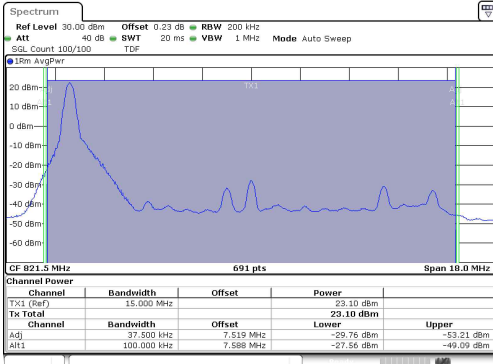
10M BW 16QAM Mid ch. Lower FRB



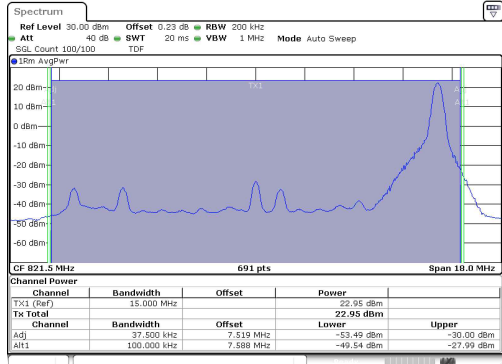
10M BW 16QAM Mid ch. Upper FRB



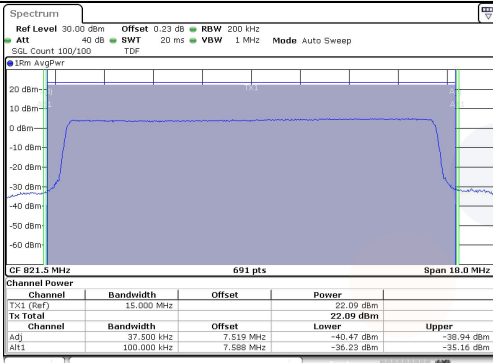
15M BW QPSK Mid ch. Lower 1RB



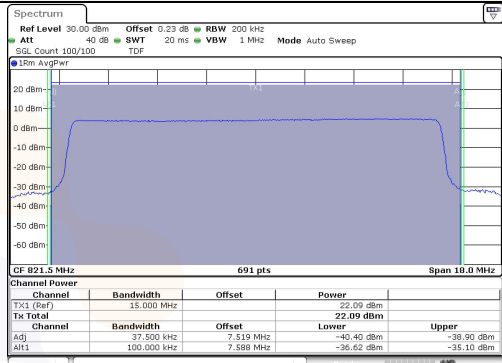
15M BW QPSK Mid ch. Upper 1RB



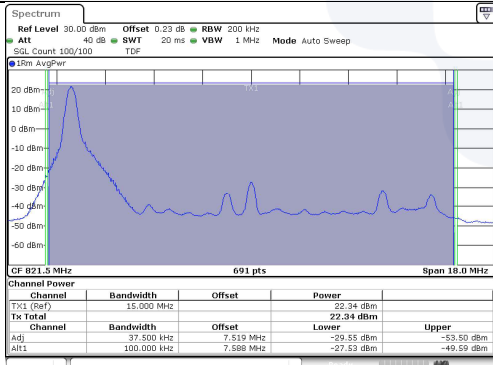
15M BW QPSK Mid ch. Lower FRB



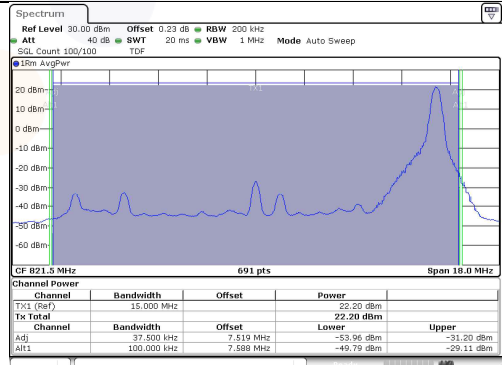
15M BW QPSK Mid ch. Upper FRB



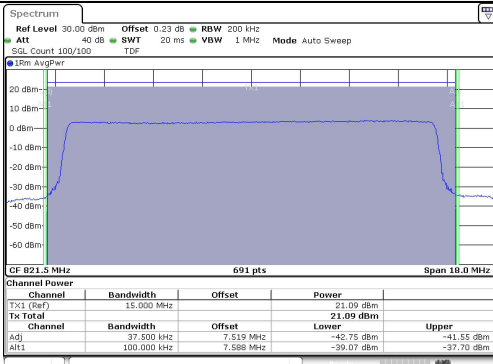
15M BW 16QAM Mid ch. Lower 1RB



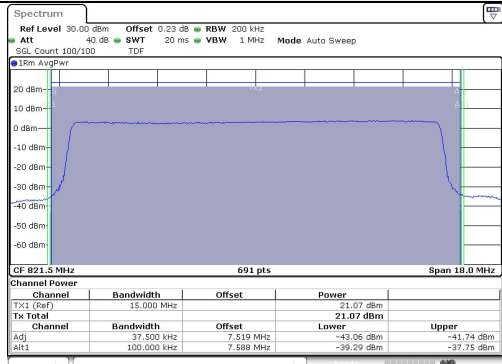
15M BW 16QAM Mid ch. Upper 1RB



15M BW 16QAM Mid ch. Lower FRB

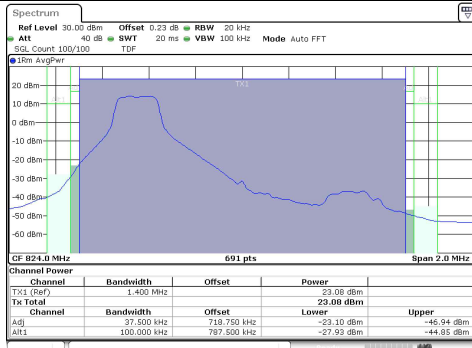


15M BW 16QAM Mid ch. Upper FRB

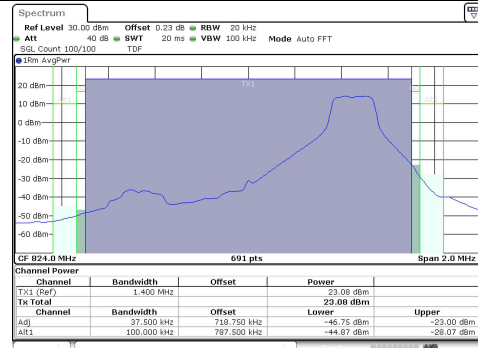


Straddle channel

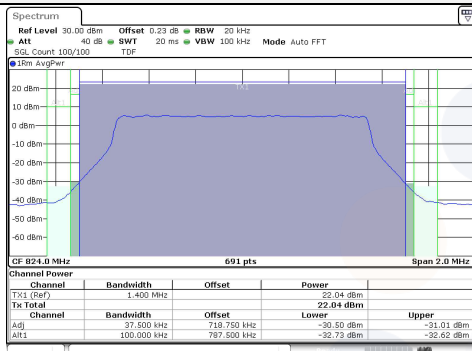
1.4M BW QPSK Low ch. 1RB



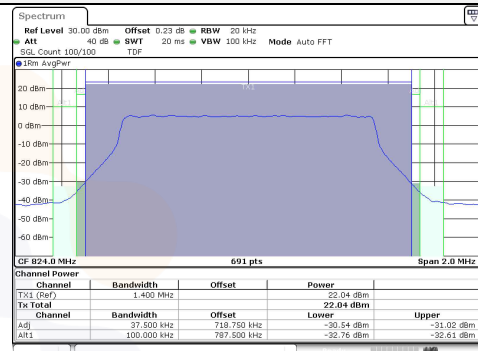
1.4M BW QPSK High ch. 1RB



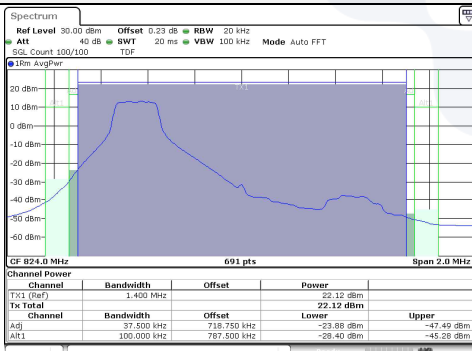
1.4M BW QPSK Low ch. FRB



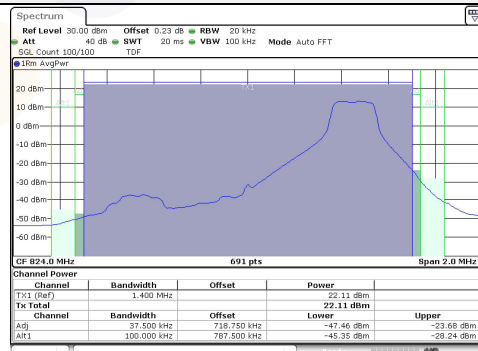
1.4M BW QPSK High ch. FRB



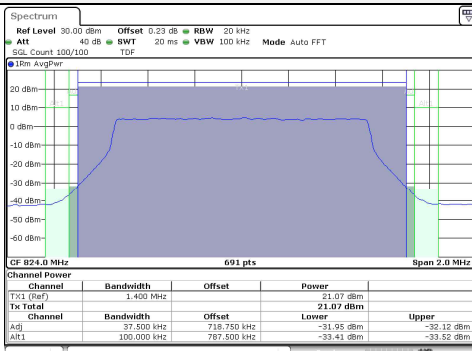
1.4M BW 16QAM Low ch. 1RB



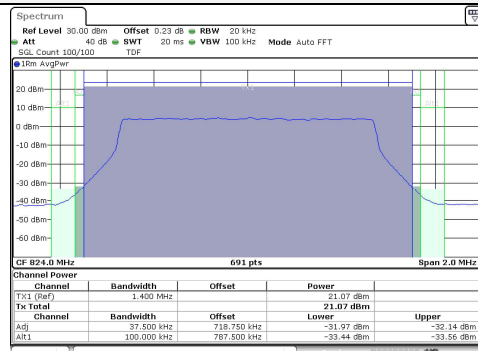
1.4M BW 16QAM High ch. 1RB



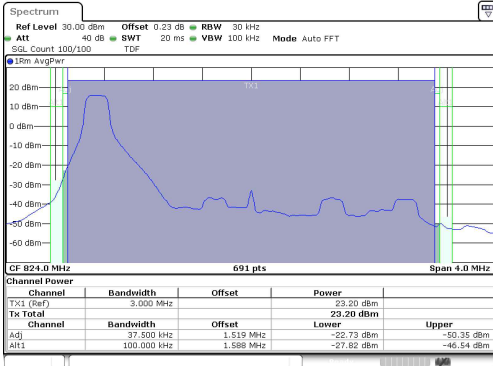
1.4M BW 16QAM Low ch. FRB



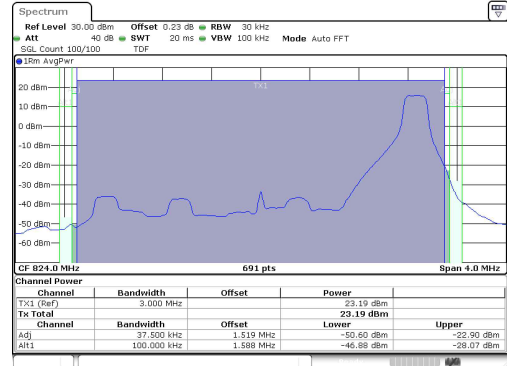
1.4M BW 16QAM High ch. FRB



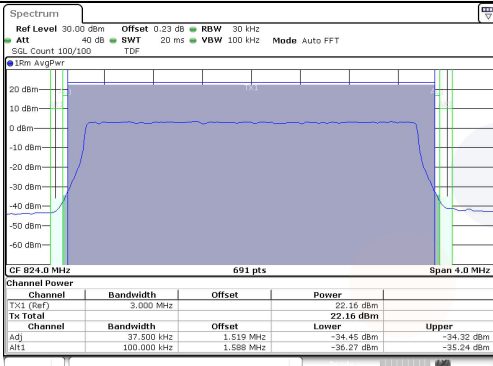
3M BW QPSK Low ch. 1RB



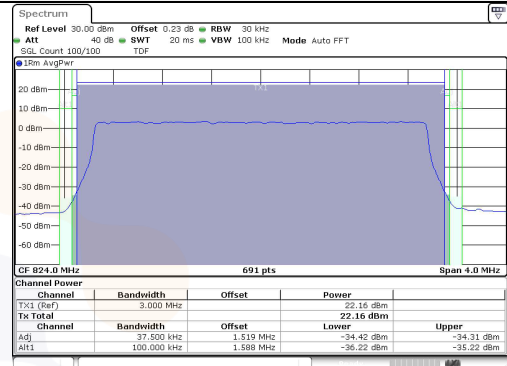
3M BW QPSK High ch. 1RB



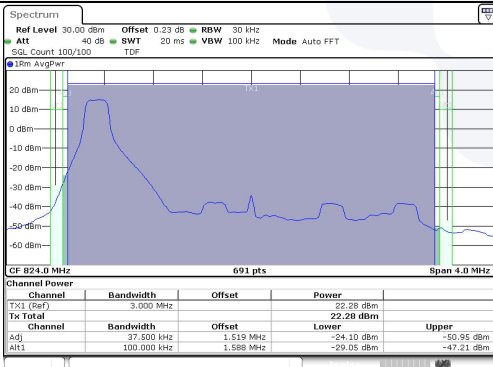
3M BW QPSK Low ch. FRB



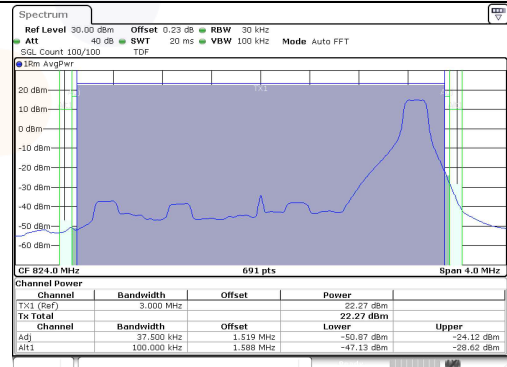
3M BW QPSK High ch. FRB



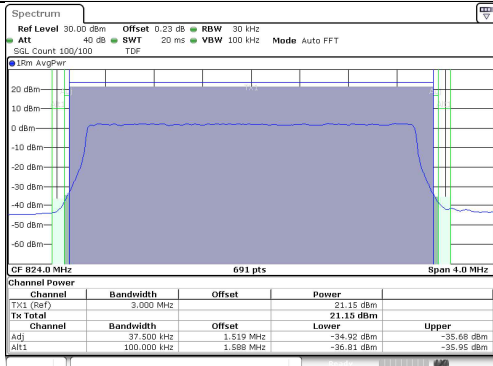
3M BW 16QAM Low ch. 1RB



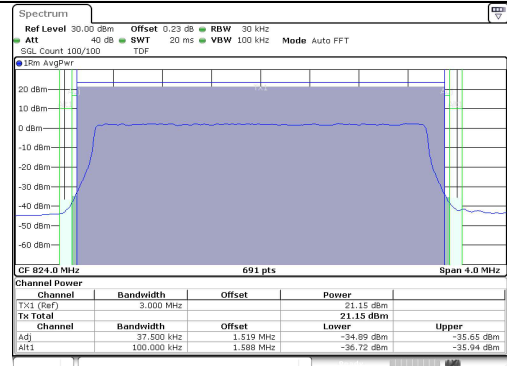
3M BW 16QAM High ch. 1RB



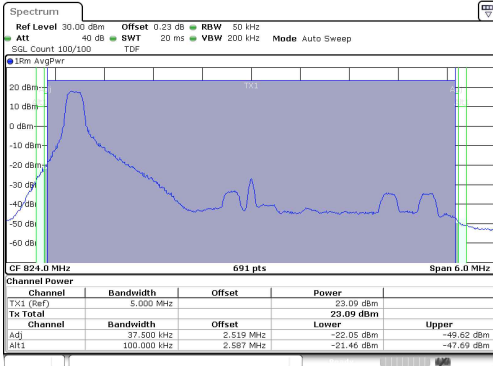
3M BW 16QAM Low ch. FRB



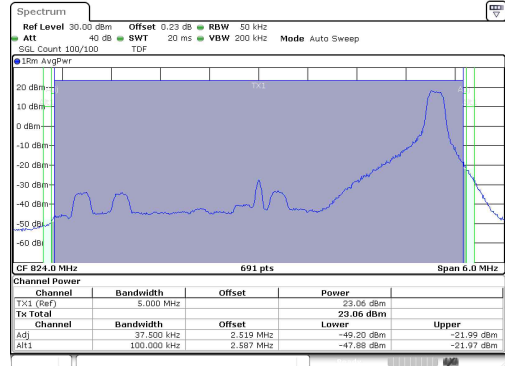
3M BW 16QAM High ch. FRB



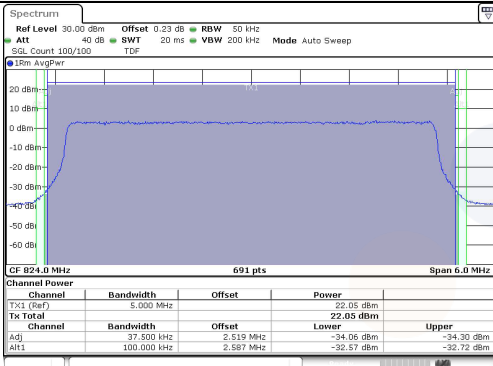
5M BW QPSK Low ch. 1RB



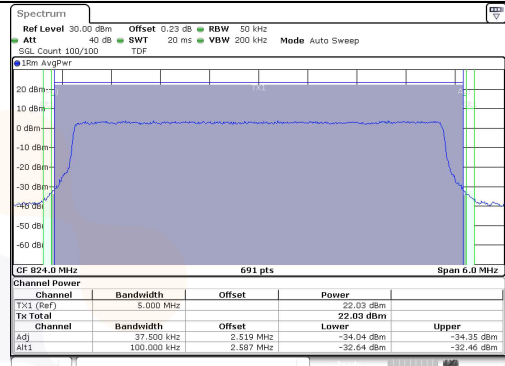
5M BW QPSK High ch. 1RB



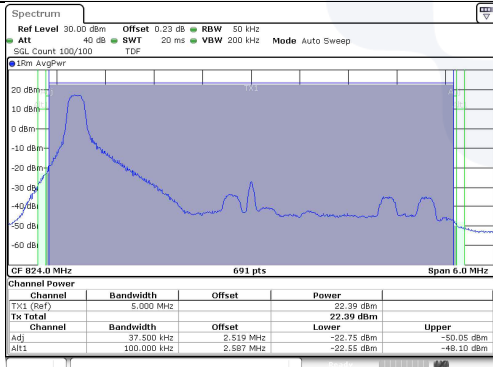
5M BW QPSK Low ch. FRB



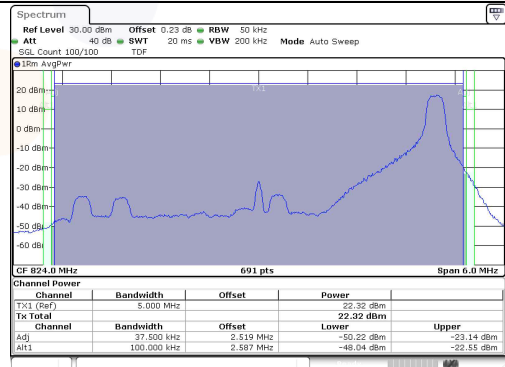
5M BW QPSK High ch. FRB



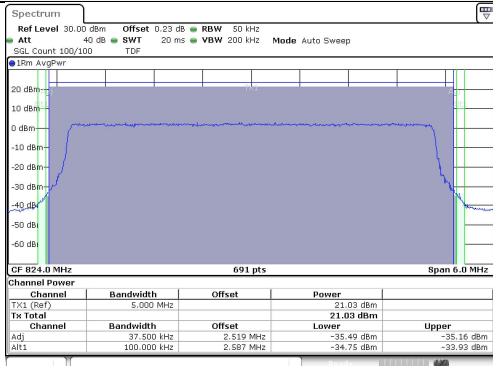
5M BW 16QAM Low ch. 1RB



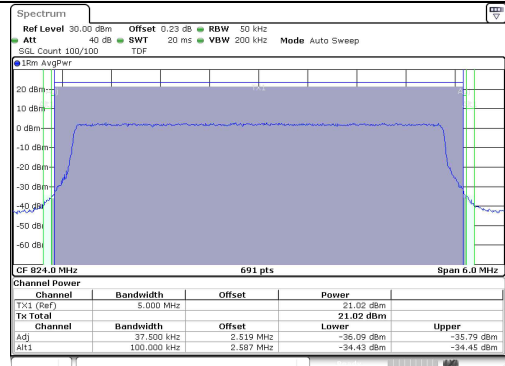
5M BW 16QAM High ch. 1RB



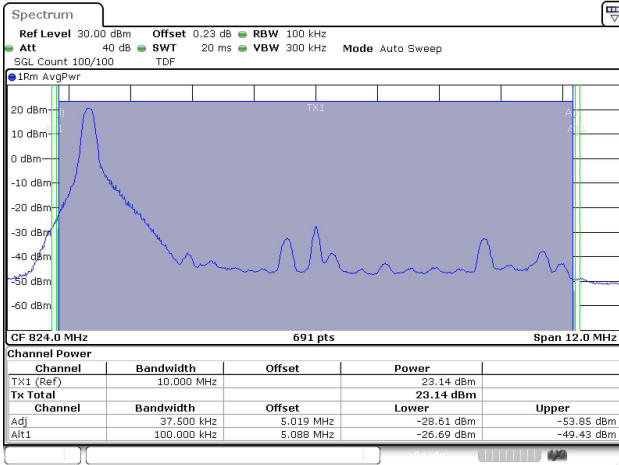
5M BW 16QAM Low ch. FRB



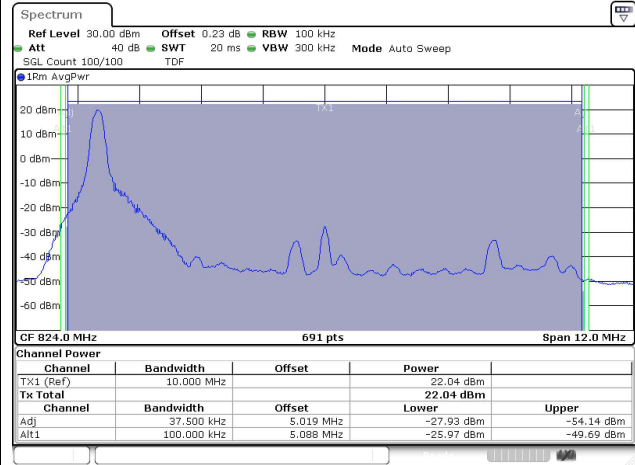
5M BW 16QAM High ch. FRB



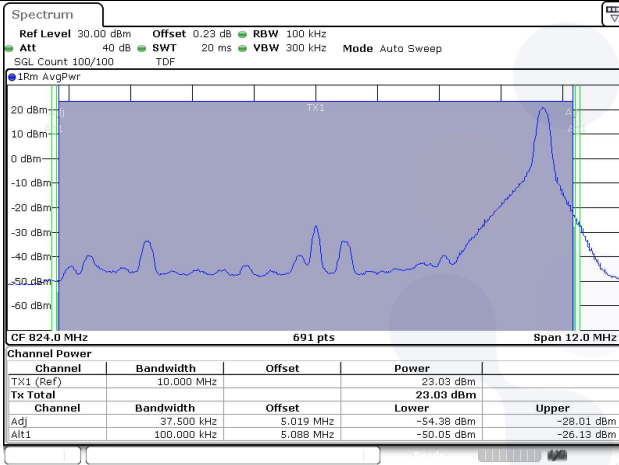
10M BW QPSK Mid ch. Lower 1RB



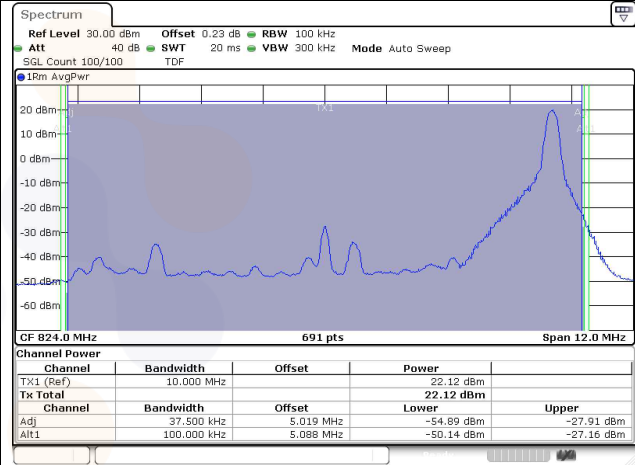
10M BW 16QAM Mid ch. Lower 1RB



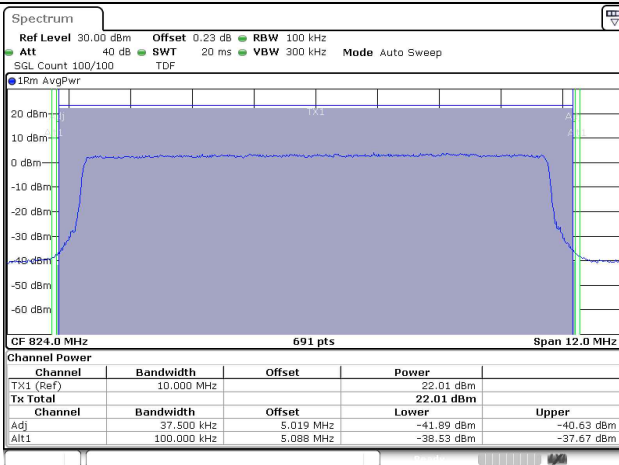
10M BW QPSK Mid ch. Upper 1RB



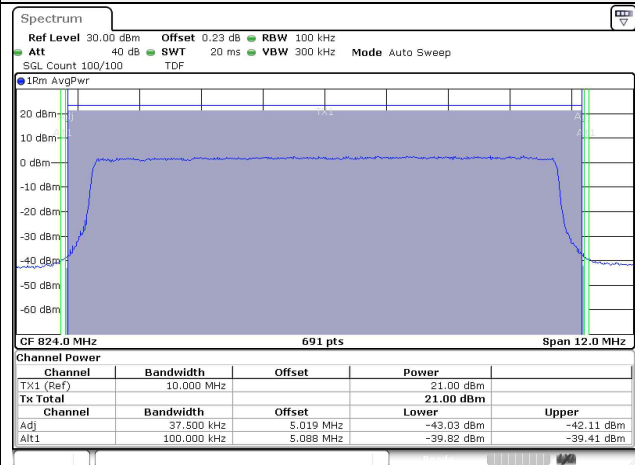
10M BW 16QAM Mid ch. Upper 1RB



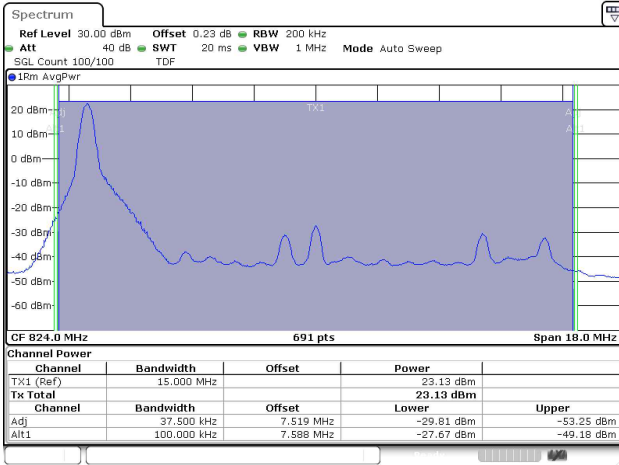
10M BW QPSK Mid ch. FRB



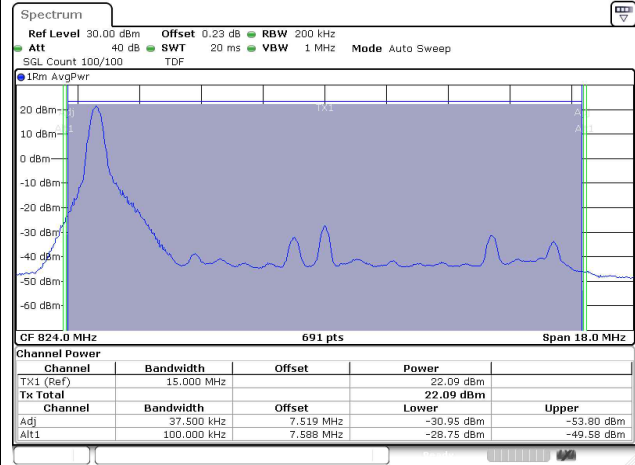
10M BW 16QAM Mid ch. FRB



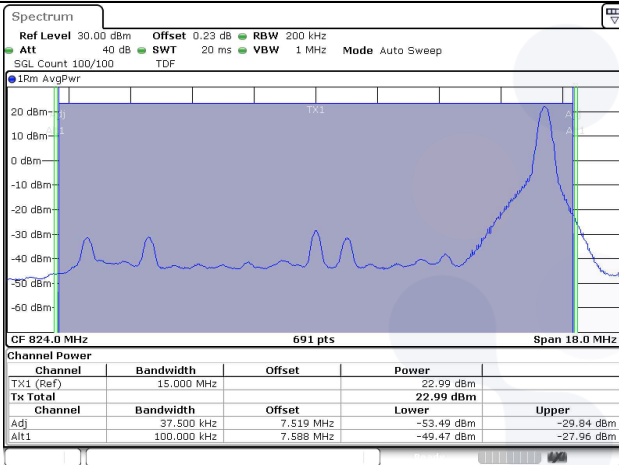
15M BW QPSK Mid ch. Lower 1RB



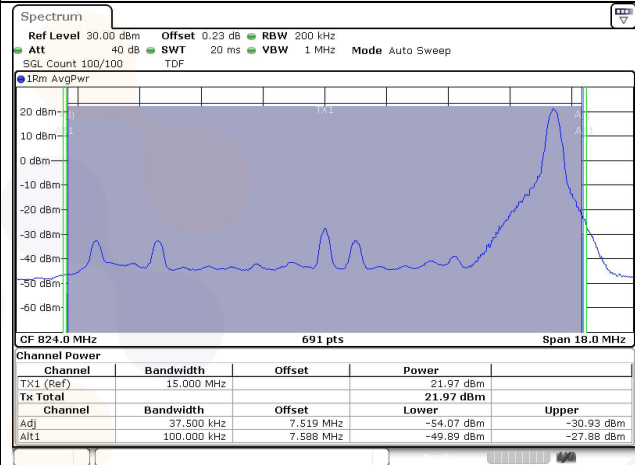
15M BW 16QAM Mid ch. Lower 1RB



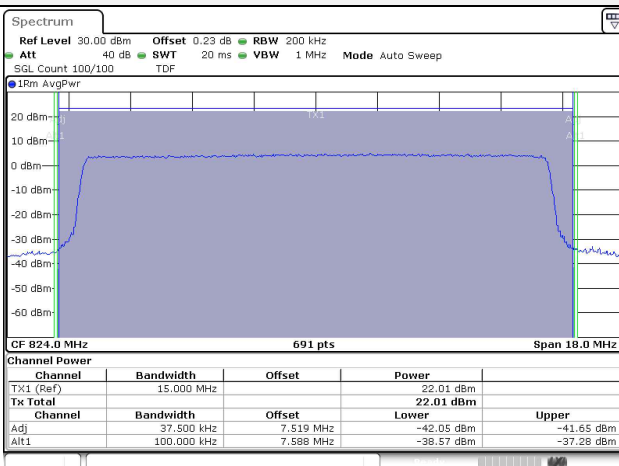
15M BW QPSK Mid ch. Upper 1RB



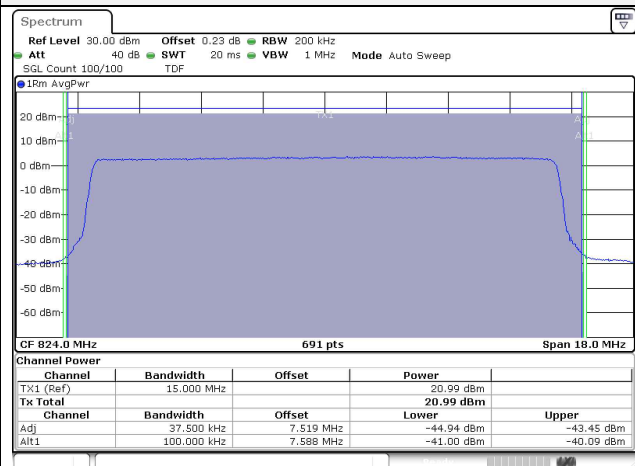
15M BW 16QAM Mid ch. Upper 1RB



15M BW QPSK Mid ch. FRB

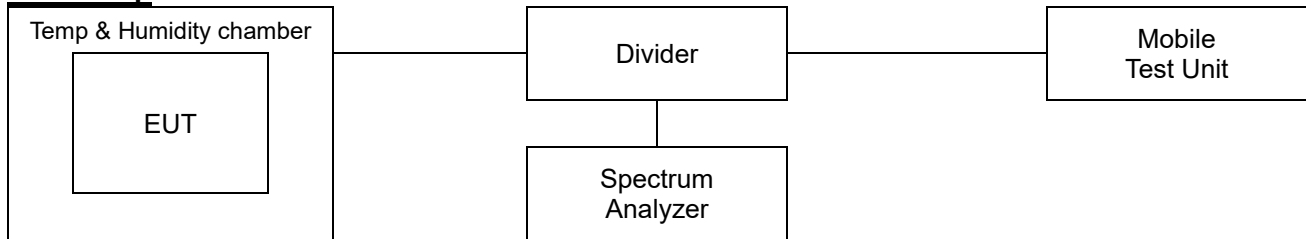


15M BW 16QAM Mid ch. FRB



7.5. 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 $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
- 2) From -20° to $+50^{\circ}$ 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 MHz 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 $+50^{\circ}$ 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.

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0010-A Page (51) of (61)</p>	<p> KCTL</p>
---	---	--

Test procedure

ANSI 63.26-2015 – Section 5.6

Test settings

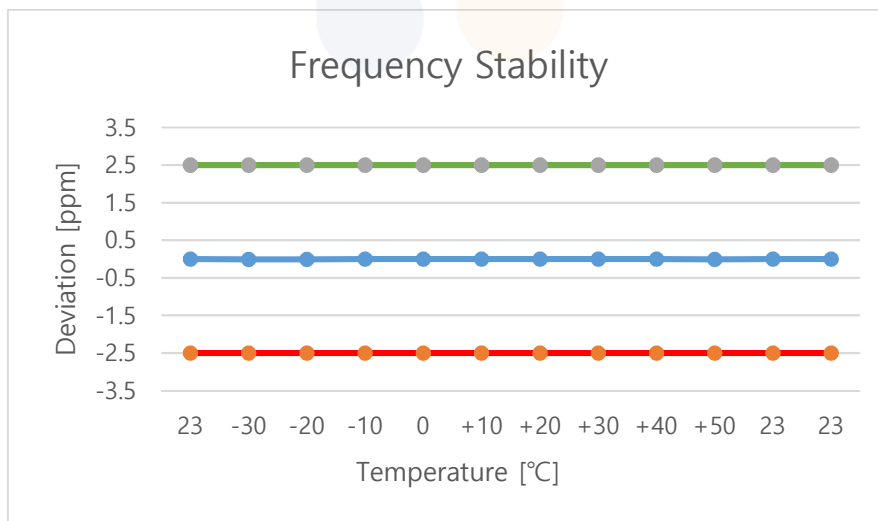
- 1) The carrier frequency of the transmitter is measured at room temperature. (20°C to provide a reference)
- 2) The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute 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 26
 Frequency (Hz) : 823 300 000
 Channel : 26783
 Deviation limit(FCC) : ±0.00025% or 2.5ppm

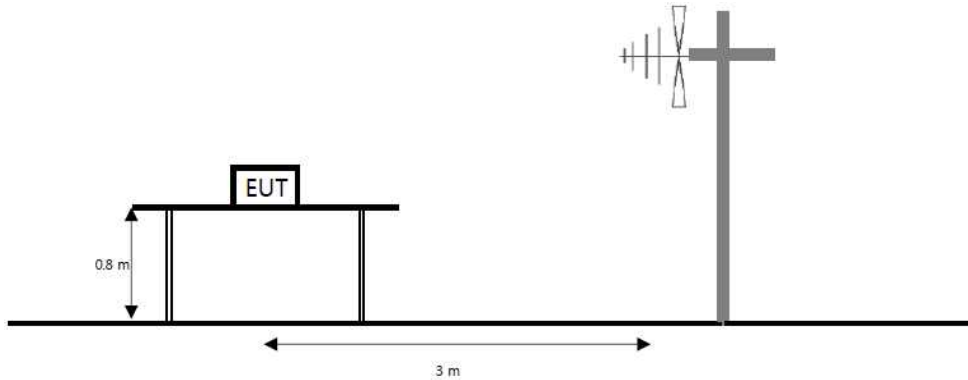
Voltage (%)	Power (V)	Temp. (°C)	Frequency (Hz)	Frequency error (Hz)	Deviation	
					(ppm)	(%)
100%	3.88	+23(Ref)	823,299,998	1.52	0.0	0.000000
		-30	823,299,992	8.11	0.0	-0.000001
		-20	823,299,995	5.04	0.0	-0.000001
		-10	823,299,997	3.38	0.0	0.000000
		0	823,299,997	2.93	0.0	0.000000
		+10	823,300,000	0.31	0.0	0.000000
		+20	823,299,999	0.69	0.0	0.000000
		+30	823,299,999	1.32	0.0	0.000000
		+40	823,299,997	3.13	0.0	0.000000
		+50	823,299,994	5.72	0.0	-0.000001
115%	4.46	+23(Ref)	823,299,999	1.09	0.0	0.000000
End point	3.40	+23(Ref)	823,299,998	1.97	0.0	0.000000



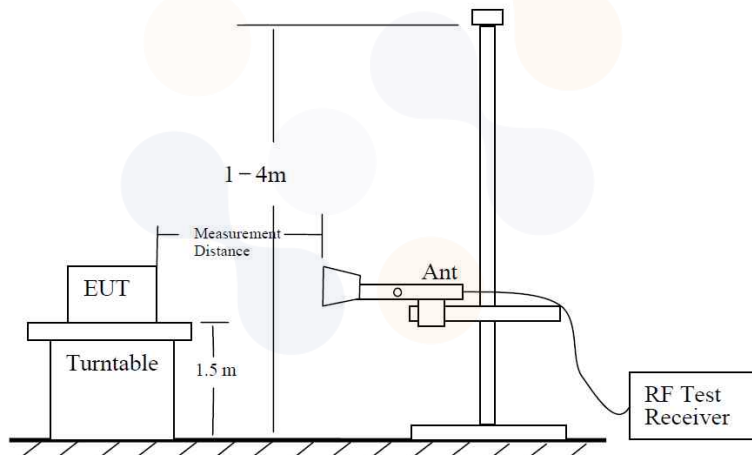
7.6. Radiated Power (ERP/EIRP)

Test setup

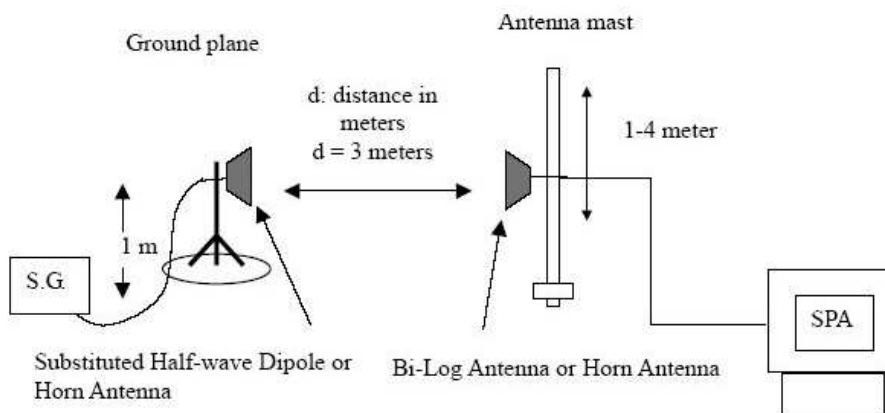
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.





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



The diagram below shows the test setup for substituted method.



<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0010-A Page (54) of (61)</p>	 
---	---	---

Limit



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

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 $\geq 3 \times$ RBW.
- 3) SPAN = 2 \times to 3 \times the OBW.
- 4) Number of measurement points in sweep $\geq 2 \times$ span / RBW.
- 5) Sweep time :
 - 1) Auto couple, or
 - 2) $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$ 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.

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0010-A Page (55) of (61)</p>	 
---	---	---

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

The power is calculated by the following formula;

$$Pd(\text{dBm}) = Pg(\text{dBm}) - \text{Cable loss (dB)} + \text{Antenna gain (dB)}$$

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.

Test results

Test mode: LTE Band 26

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[MHz]	[V/H]	[dBd]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	814.7	H	0.37	4.83	24.95	20.49	0.112
		823.3	H	0.07	4.87	25.58	20.78	0.120
	16QAM	814.7	H	0.37	4.83	23.85	19.39	0.087
		823.3	H	0.07	4.87	24.65	19.85	0.097
3 M	QPSK	815.5	H	0.32	4.83	24.93	20.41	0.110
		822.5	H	0.05	4.86	25.50	20.69	0.117
	16QAM	815.5	H	0.32	4.83	23.66	19.14	0.082
		822.5	H	0.05	4.86	24.47	19.66	0.092
5 M	QPSK	816.5	H	0.25	4.83	25.08	20.49	0.112
		821.5	H	0.03	4.86	25.42	20.59	0.115
	16QAM	816.5	H	0.25	4.83	24.19	19.60	0.091
		821.5	H	0.03	4.86	24.30	19.47	0.089
10 M	QPSK	819.0	H	0.07	4.85	25.52	20.74	0.119
	16QAM	819.0	H	0.07	4.85	24.43	19.65	0.092
15 M	QPSK	821.5	H	0.03	4.86	25.42	20.59	0.115
	16QAM	821.5	H	0.03	4.86	24.58	19.75	0.094

Straddle channel

Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[MHz]	[V/H]	[dBd]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	824.0	H	0.08	4.88	25.36	20.56	0.114
	16QAM		H	0.08	4.88	24.48	19.68	0.093
3 M	QPSK		H	0.08	4.88	25.55	20.75	0.119
	16QAM		H	0.08	4.88	24.71	19.91	0.098
5 M	QPSK		H	0.08	4.88	25.56	20.76	0.119
	16QAM		H	0.08	4.88	24.50	19.70	0.093
10 M	QPSK		H	0.08	4.88	25.40	20.60	0.115
	16QAM		H	0.08	4.88	24.39	19.59	0.091
15 M	QPSK		H	0.08	4.88	26.06	21.26	0.134
	16QAM		H	0.08	4.88	24.51	19.71	0.094

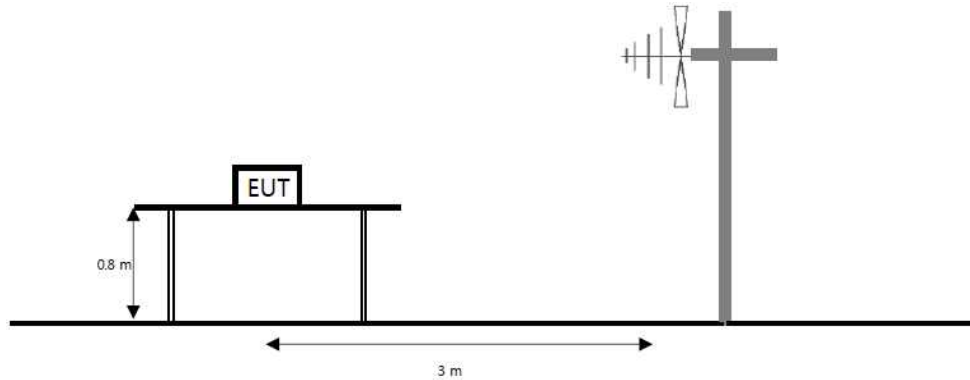
Note.

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

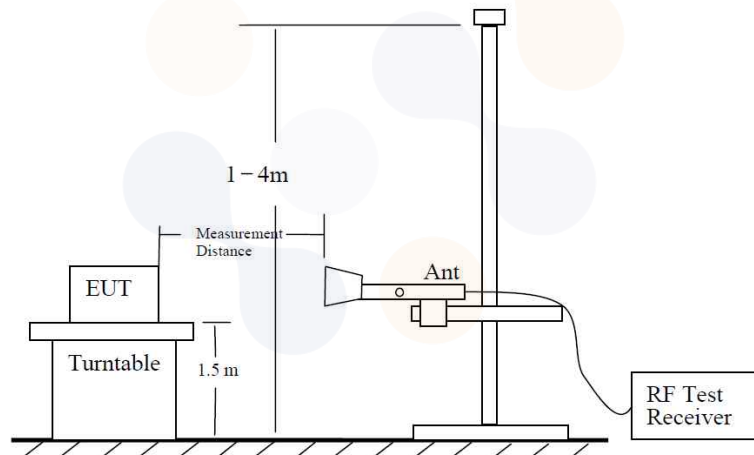
7.7. Radiated Spurious Emissions

Test setup

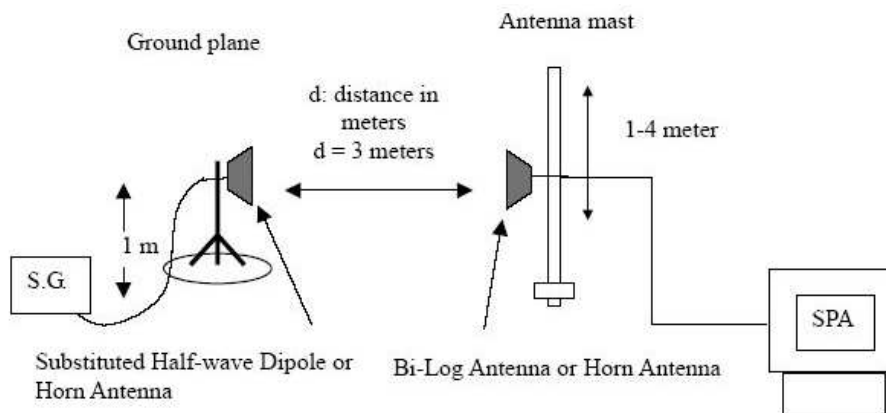
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



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



The diagram below shows the test setup for substituted method.



Limit

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 $116 \log_{10}(f/6.1)$ decibels or $50 + 10\log_{10}(P)$ 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 $43 + 10\log_{10}(P)$ 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 and where f is greater than 37.5 kHz.

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 $\geq 3 \times$ RBW.
- 3) Detector = RMS
- 4) Trace mode = Max hold
- 5) Sweep time = Auto couple
- 6) Number of sweep points $\geq 2 \times$ span / RBW
- 7) Allow trace to fully stabilize.

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0010-A Page (59) of (61)</p>	<p> </p>
---	---	--

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 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.

Test results (Above 1 000 MHz)

Test mode : LTE Band 26

Frequency(MHz) : 821.5

Channel : 26765

Bandwidth(MHz) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 656.44	H	5.56	6.68	-55.28	-56.40	-13.00	43.40
	2 484.38	H	6.05	8.36	-50.79	-53.10	-13.00	40.10
	3 314.79	H	7.73	10.15	-56.68	-59.10	-13.00	46.10
	4 146.01	V	8.99	11.66	-55.93	-58.60	-13.00	45.60

Test mode : LTE Band 26

Frequency(MHz) : 824

Channel : 26790

Bandwidth(MHz) : 15

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[MHz]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 661.37	H	5.55	6.69	-59.36	-60.50	-13.00	47.50
	2 492.18	H	6.08	8.37	-51.41	-53.70	-13.00	40.70
	3 325.86	V	7.75	10.18	-54.97	-57.40	-13.00	44.40
	4 156.67	V	8.99	11.39	-55.20	-57.60	-13.00	44.60

Note.

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

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	101204	23.02.21
DC Power Supply	AGILENT	E3632A	KR73001026	23.03.28
Divider	Marki Microwave, Inc.	PD-0040	D0002	23.08.10
Wide band Radio Communication Tester	R&S	CMW500	141780	23.03.28
Temp & Humid Chamber	Daejin Engineering	DJ-THR11000	10041	23.01.19
Vector Signal Generator	R&S	SMBV100A	257566	23.07.04
Signal Generator	R&S	SMB100A	176206	23.01.19
Bilog Antenna	Teseq GmbH	CBL 6143A	35039	23.05.12
Bilog Antenna	ETS.LINDGREN	3143B	00228420	23.09.28
Horn Antenna	ETS.LINDGREN	3117	161225	23.05.04
Horn Antenna	ETS.LINDGREN	3117	00227509	23.09.20
Horn Antenna	ETS.lindgren	3116	00086632	23.01.25
Horn Antenna	Steatite Antennas	QMS-00225	17790	23.07.14
Horn Antenna	Steatite Antennas	QMS-00238	17791	23.07.14
Band Reject Filter	Wainwright Instruments GmbH	WRCG 824/849-814/859-60/10SS	32	23.07.11
High Pass Filter	Wainwright Instruments GmbH	WHKX10-900-1000-15000-40SS	11	23.08.10
High Pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40SS	32	23.08.10
Broadband Amplifier	SONOMA INSTRUMENT	315	300314	23.01.19
Low Noise Amplifier	TESTEK	TK-PA18H	220123-L	23.12.02*
Amplifier	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	23.01.21
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	-	-
Antenna Stand	innco systems GmbH	AS1500-EP-10kg	-	-
Compact Table	innco systems GmbH	CT1000	-	-

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

End of test report