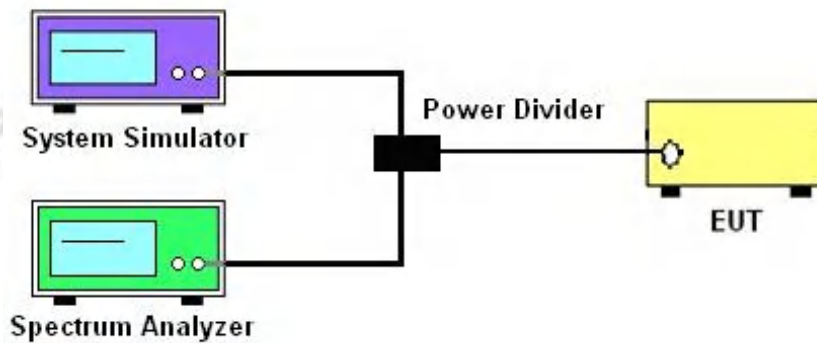


3.4. Occupied Bandwidth

3.4.1. Test Setup



3.4.2. Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.4.3. Test Procedures

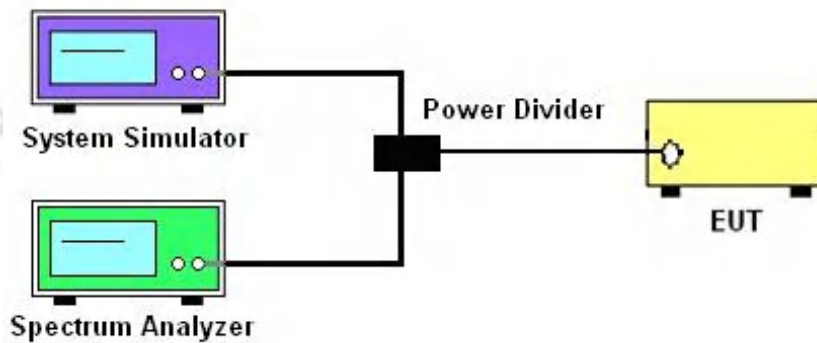
1. The testing follows ANSI C63.26 Section 5.4.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.(this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.4.4. Test Result of Occupied Bandwidth

Please refer to the Appendix A.

3.5. Conducted Band Edge

3.5.1. Test Setup



3.5.2. Description of Conducted Band Edge Measurement

22.917(a):

For operations in the 824 – 849 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

24.238 (a):

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 1MHz bandwidth. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53 (g):

For operations in the 600MHz band and 698 -746 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 100 kHz bandwidth. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

27.53 (h):

For operations in the 1710 – 1755 MHz and 1710 – 1780 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.5.3. Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used and the measured power was integrated over the full required measurement bandwidth of 1 MHz.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.

Example:

The limit line is derived from $43 + 10\log(P)\text{dB}$ below the transmitter power $P(\text{Watts})$

$$= P(\text{W}) - [43 + 10\log(P)] (\text{dB})$$

$$= [30 + 10\log(P)] (\text{dBm}) - [43 + 10\log(P)] (\text{dB}) = -13\text{dBm}$$

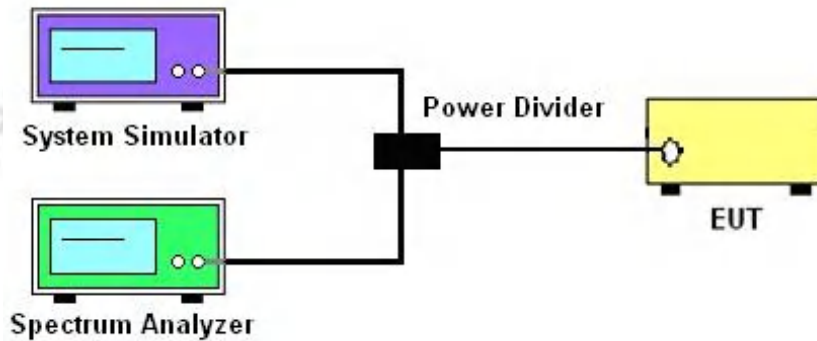
9. When using the integration method, the starting frequency of the integration shall be centered at one-half of the RBW away from the band edge.

3.5.4. Test Result of Conducted Band Edge

Please refer to the Appendix A.

3.6. Conducted Spurious Emission

3.6.1. Test Setup



3.6.2. Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

3.6.3. Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
10. The limit line is derived from $43 + 10\log(P)\text{dB}$ below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)} = [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm}.$$

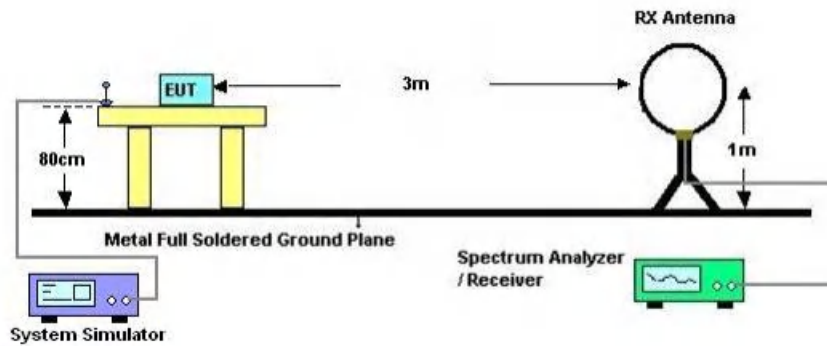
3.6.4. Test Result of Conducted Spurious Emission

Please refer to the Appendix A.

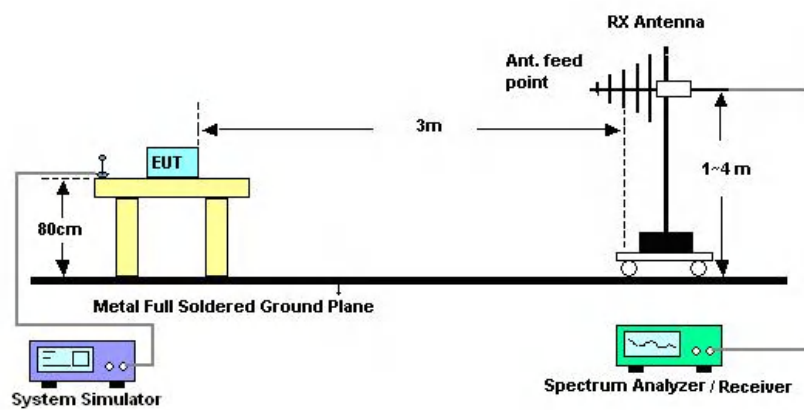
3.7. Radiated Spurious Emission

3.7.1. Test Setup

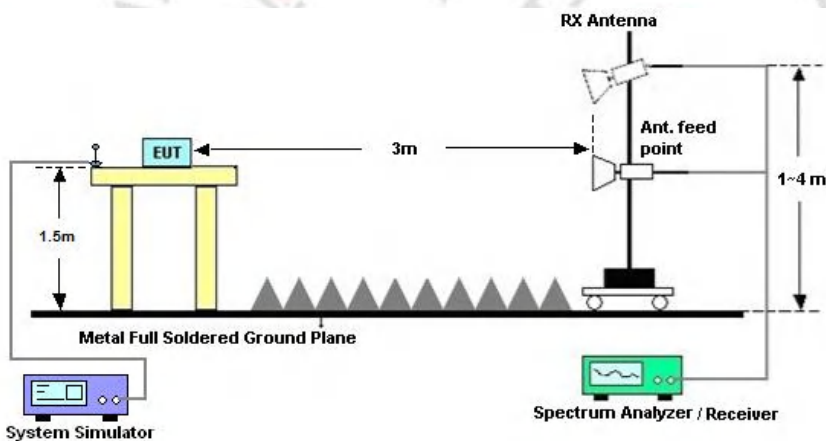
3.7.1.1. For radiated test below 30MHz



3.7.1.2. For radiated test from 30MHz to 1GHz



3.7.1.3. For radiated test above 1GHz



3.7.2. Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI C63.26.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.7.3. Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11. $ERP \text{ (dBm)} = EIRP - 2.15$
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from $43 + 10\log(P)\text{dB}$ below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

3.7.4. Test Result of Radiated Spurious Emission

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

The frequency which above 30 MHz, please refer to the Appendix B.

4. TEST SETUP PHOTOGRAPHS

Please refer to the Appendix C.

*****END OF THE REPORT*****

Appendix A _ Conducted Test Data

LTE Band 2

01 Conducted output power

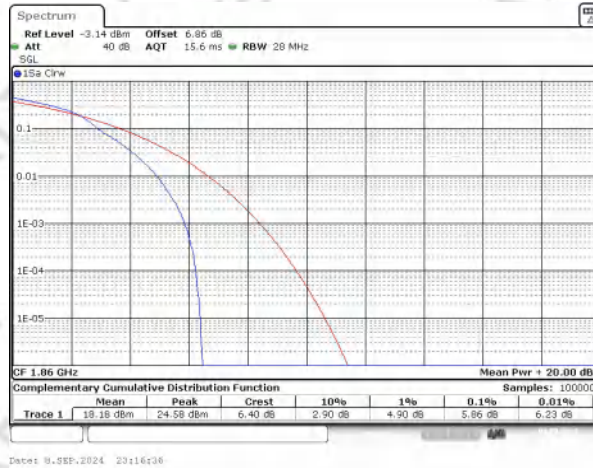
Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Power (dBm)	Gain (dBm)	ERP (dBm)	ERP (dBm)	EIRP Limit (dBm)	Verdict
Band2	1.4	18607	1	#0	QAM16	20.30	1.55	19.7	21.85	33	PASS
Band2	1.4	18900	1	#0	QAM16	19.54	1.55	18.94	21.09	33	PASS
Band2	1.4	19193	1	#0	QAM16	20.29	1.55	19.69	21.84	33	PASS
Band2	3	18615	1	#0	QAM16	20.70	1.55	20.1	22.25	33	PASS
Band2	3	18900	1	#0	QAM16	19.20	1.55	18.6	20.75	33	PASS
Band2	3	19185	1	#0	QAM16	20.23	1.55	19.63	21.78	33	PASS
Band2	5	18625	1	#0	QAM16	20.05	1.55	19.45	21.6	33	PASS
Band2	5	18900	1	#0	QAM16	19.20	1.55	18.6	20.75	33	PASS
Band2	5	19175	1	#0	QAM16	20.15	1.55	19.55	21.7	33	PASS
Band2	10	18650	1	#0	QAM16	19.41	1.55	18.81	20.96	33	PASS
Band2	10	18900	1	#0	QAM16	19.49	1.55	18.89	21.04	33	PASS
Band2	10	19150	1	#0	QAM16	19.03	1.55	18.43	20.58	33	PASS
Band2	15	18675	1	#0	QAM16	19	1.55	18.4	20.55	33	PASS
Band2	15	18900	1	#0	QAM16	19.56	1.55	18.96	21.11	33	PASS
Band2	15	19125	1	#0	QAM16	19.35	1.55	18.75	20.9	33	PASS
Band2	20	18700	1	#0	QAM16	19.18	1.55	18.58	20.73	33	PASS
Band2	20	18900	1	#0	QAM16	19.22	1.55	18.62	20.77	33	PASS
Band2	20	19100	1	#0	QAM16	19.58	1.55	18.98	21.13	33	PASS
Band2	1.4	18607	1	#0	QPSK	21.52	1.55	20.92	23.07	33	PASS
Band2	1.4	18900	1	#0	QPSK	21.29	1.55	20.69	22.84	33	PASS
Band2	1.4	19193	1	#0	QPSK	21.64	1.55	21.04	23.19	33	PASS
Band2	3	18615	1	#0	QPSK	21.56	1.55	20.96	23.11	33	PASS
Band2	3	18900	1	#0	QPSK	21.18	1.55	20.58	22.73	33	PASS
Band2	3	19185	1	#0	QPSK	21.71	1.55	21.11	23.26	33	PASS
Band2	5	18625	1	#0	QPSK	21.22	1.55	20.62	22.77	33	PASS
Band2	5	18900	1	#0	QPSK	20.74	1.55	20.14	22.29	33	PASS
Band2	5	19175	1	#0	QPSK	21.31	1.55	20.71	22.86	33	PASS
Band2	10	18650	1	#0	QPSK	21.54	1.55	20.94	23.09	33	PASS
Band2	10	18900	1	#0	QPSK	21.21	1.55	20.61	22.76	33	PASS
Band2	10	19150	1	#0	QPSK	21.29	1.55	20.69	22.84	33	PASS
Band2	15	18675	1	#0	QPSK	21.38	1.55	20.78	22.93	33	PASS
Band2	15	18900	1	#0	QPSK	21.04	1.55	20.44	22.59	33	PASS
Band2	15	19125	1	#0	QPSK	21.03	1.55	20.43	22.58	33	PASS
Band2	20	18700	1	#0	QPSK	21.19	1.55	20.59	22.74	33	PASS
Band2	20	18900	1	#0	QPSK	21.43	1.55	20.83	22.98	33	PASS
Band2	20	19100	1	#0	QPSK	21.28	1.55	20.68	22.83	33	PASS

02 Frequency stability

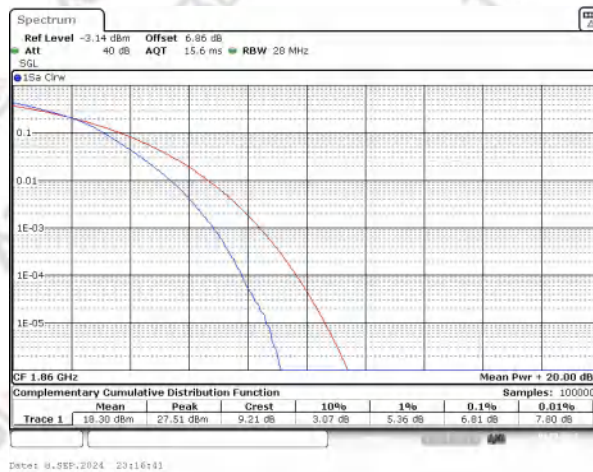
Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Result(Hz)	Result (ppm)	Low Limit (MHz)	high Limit (MHz)	Verdict
Band2	1.4	18607	6	#0	QAM16	-2.43	-0.001	1850	1910	PASS
Band2	1.4	18900	6	#0	QAM16	-1.79	-0.001	1850	1910	PASS
Band2	1.4	19193	6	#0	QAM16	1.01	0.001	1850	1910	PASS
Band2	3	18615	15	#0	QAM16	-2.20	-0.001	1850	1910	PASS
Band2	3	18900	15	#0	QAM16	-2.38	-0.001	1850	1910	PASS
Band2	3	19185	15	#0	QAM16	1.85	0.001	1850	1910	PASS
Band2	5	18625	25	#0	QAM16	-1.50	-0.001	1850	1910	PASS
Band2	5	18900	25	#0	QAM16	-6.18	-0.003	1850	1910	PASS
Band2	5	19175	25	#0	QAM16	1.96	0.001	1850	1910	PASS
Band2	10	18650	50	#0	QAM16	-5.42	-0.003	1850	1910	PASS
Band2	10	18900	50	#0	QAM16	-5.18	-0.003	1850	1910	PASS
Band2	10	19150	50	#0	QAM16	5.79	0.003	1850	1910	PASS
Band2	15	18675	75	#0	QAM16	0.06	0.000	1850	1910	PASS
Band2	15	18900	75	#0	QAM16	-3.98	-0.002	1850	1910	PASS
Band2	15	19125	75	#0	QAM16	2.69	0.001	1850	1910	PASS
Band2	20	18700	100	#0	QAM16	-8.20	-0.004	1850	1910	PASS
Band2	20	18900	100	#0	QAM16	-1.10	-0.001	1850	1910	PASS
Band2	20	19100	100	#0	QAM16	0.41	0.000	1850	1910	PASS
Band2	1.4	18607	6	#0	QPSK	-2.30	-0.001	1850	1910	PASS
Band2	1.4	18900	6	#0	QPSK	-3.42	-0.002	1850	1910	PASS
Band2	1.4	19193	6	#0	QPSK	2.50	0.001	1850	1910	PASS
Band2	3	18615	15	#0	QPSK	-2.66	-0.001	1850	1910	PASS
Band2	3	18900	15	#0	QPSK	-2.58	-0.001	1850	1910	PASS
Band2	3	19185	15	#0	QPSK	1.97	0.001	1850	1910	PASS
Band2	5	18625	25	#0	QPSK	-2.40	-0.001	1850	1910	PASS
Band2	5	18900	25	#0	QPSK	-2.04	-0.001	1850	1910	PASS
Band2	5	19175	25	#0	QPSK	0.01	0.000	1850	1910	PASS
Band2	10	18650	50	#0	QPSK	-3.09	-0.002	1850	1910	PASS
Band2	10	18900	50	#0	QPSK	-3.48	-0.002	1850	1910	PASS
Band2	10	19150	50	#0	QPSK	1.67	0.001	1850	1910	PASS
Band2	15	18675	75	#0	QPSK	-3.03	-0.002	1850	1910	PASS
Band2	15	18900	75	#0	QPSK	-2.19	-0.001	1850	1910	PASS
Band2	15	19125	75	#0	QPSK	-3.25	-0.002	1850	1910	PASS
Band2	20	18700	100	#0	QPSK	1.31	0.001	1850	1910	PASS
Band2	20	18900	100	#0	QPSK	-2.59	-0.001	1850	1910	PASS
Band2	20	19100	100	#0	QPSK	-1.66	-0.001	1850	1910	PASS

03 Peak-to-Average Ratio

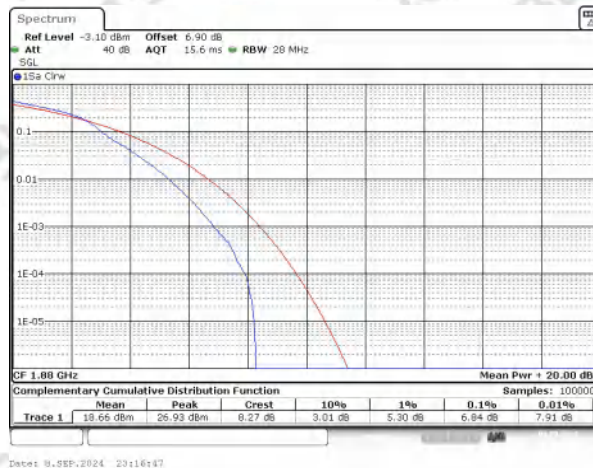
Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Result (dB)	high Limit (dB)	Verdict
Band2	20	18700	1	#0	QAM16	5.86	13	PASS
Band2	20	18700	100	#0	QAM16	6.81	13	PASS
Band2	20	18900	1	#0	QAM16	6.84	13	PASS
Band2	20	18900	100	#0	QAM16	6.81	13	PASS
Band2	20	19100	1	#0	QAM16	6.99	13	PASS
Band2	20	19100	100	#0	QAM16	6.61	13	PASS
Band2	20	18700	1	#0	QPSK	5.13	13	PASS
Band2	20	18700	100	#0	QPSK	5.07	13	PASS
Band2	20	18900	1	#0	QPSK	5.07	13	PASS
Band2	20	18900	100	#0	QPSK	5.57	13	PASS
Band2	20	19100	1	#0	QPSK	4.81	13	PASS
Band2	20	19100	100	#0	QPSK	5.74	13	PASS



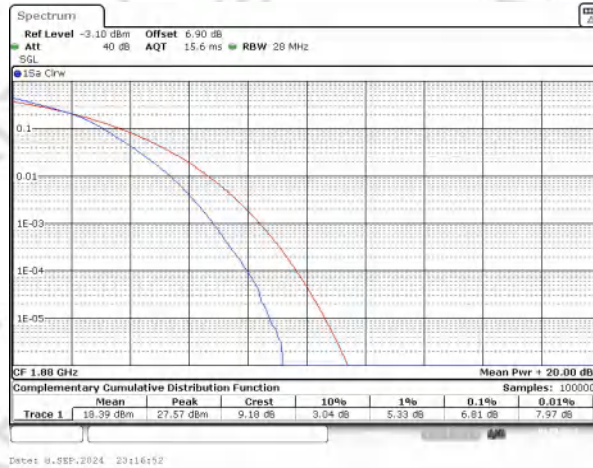
Band2 QAM16 BW=20MHz Channel=18700 RB Size=1 Position=#0 NVNT



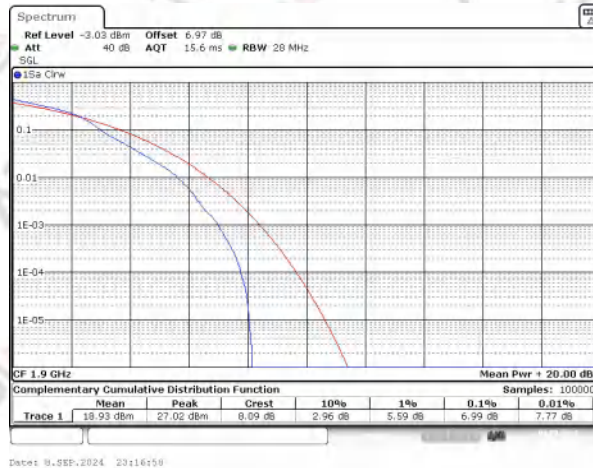
Band2 QAM16 BW=20MHz Channel=18700 RB Size=100 Position=#0
NVNT



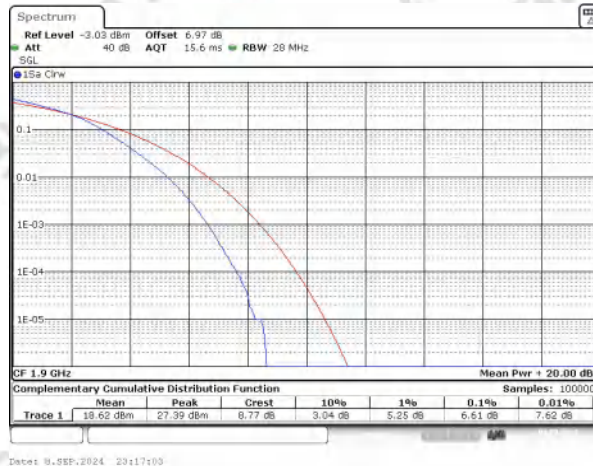
Band2 QAM16 BW=20MHz Channel=18900 RB Size=1 Position=#0 NVNT



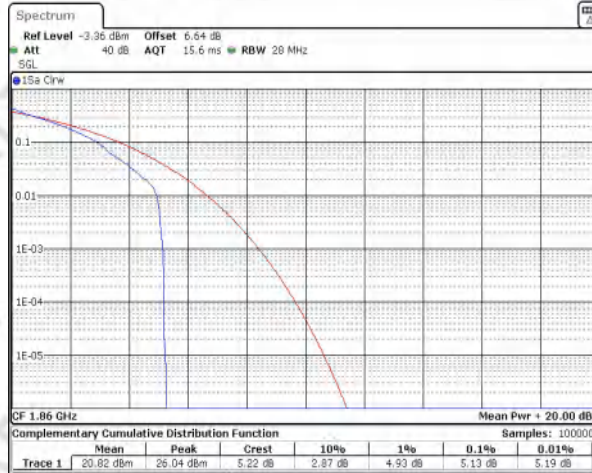
Band2 QAM16 BW=20MHz Channel=18900 RB Size=100 Position=#0
NVNT



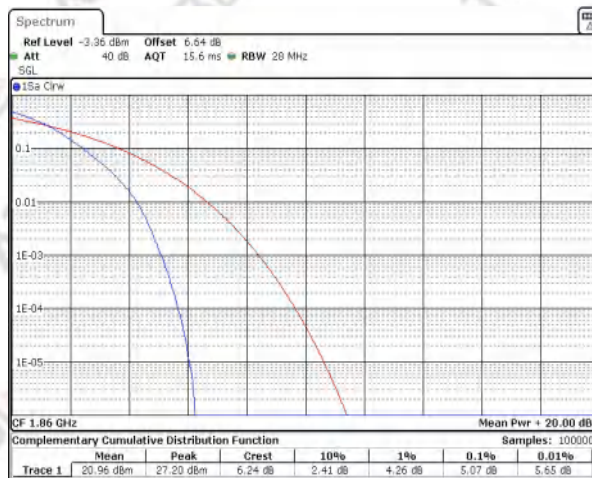
Band2 QAM16 BW=20MHz Channel=19100 RB Size=1 Position=#0 NVNT



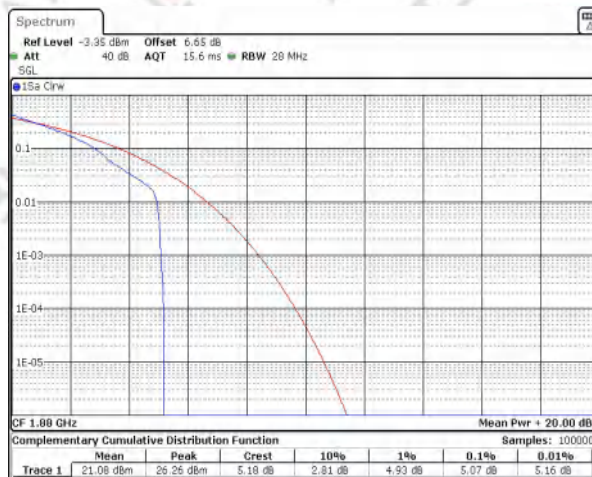
Band2 QAM16 BW=20MHz Channel=19100 RB Size=100 Position=#0
NVNT



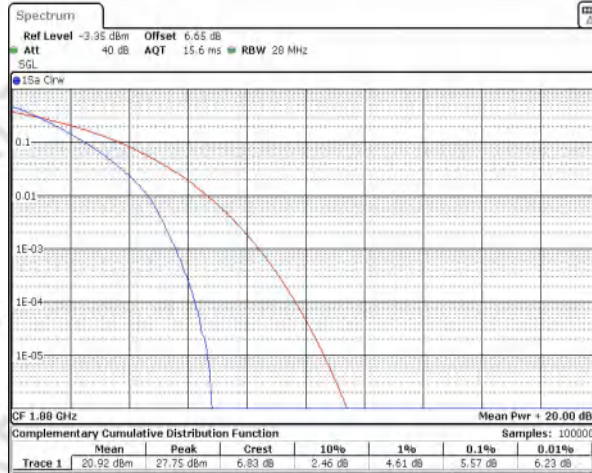
Band2 QPSK BW=20MHz Channel=18700 RB Size=1 Position=#0 NVNT



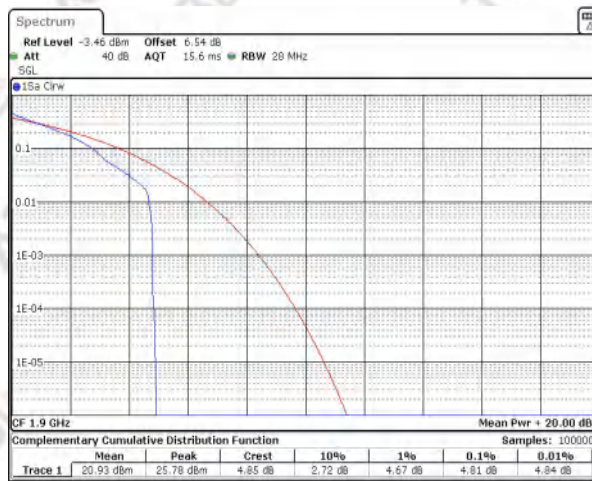
Band2 QPSK BW=20MHz Channel=18700 RB Size=100 Position=#0 NVNT



Band2 QPSK BW=20MHz Channel=18900 RB Size=1 Position=#0 NVNT



Band2 QPSK BW=20MHz Channel=18900 RB Size=100 Position=#0 NVNT



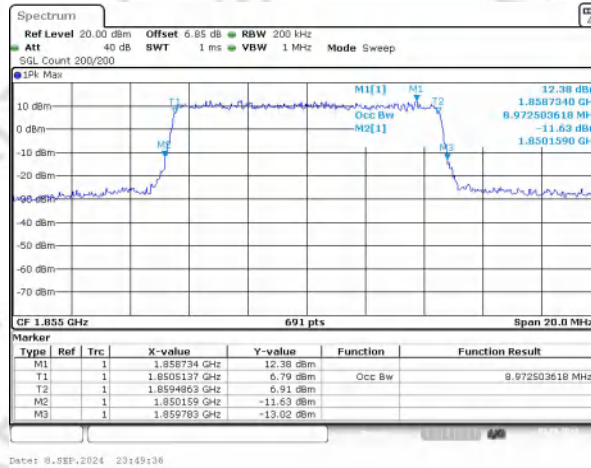
Band2 QPSK BW=20MHz Channel=19100 RB Size=100 Position=#0 NVNT



Band2 QPSK BW=20MHz Channel=19100 RB Size=100 Position=#0 NVNT

04 Occupied bandwidth

Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	99% OBW (MHz)	-26dB EBW (MHz)	Verdict
Band2	1.4	18607	6	#0	QAM16	1.102	1.303	PASS
Band2	1.4	18900	6	#0	QAM16	1.098	1.315	PASS
Band2	1.4	19193	6	#0	QAM16	1.090	1.270	PASS
Band2	3	18615	15	#0	QAM16	2.726	3.043	PASS
Band2	3	18900	15	#0	QAM16	2.735	3.017	PASS
Band2	3	19185	15	#0	QAM16	2.726	3.061	PASS
Band2	5	18625	25	#0	QAM16	4.515	4.942	PASS
Band2	5	18900	25	#0	QAM16	4.501	4.971	PASS
Band2	5	19175	25	#0	QAM16	4.515	4.986	PASS
Band2	10	18650	50	#0	QAM16	8.973	9.623	PASS
Band2	10	18900	50	#0	QAM16	9.001	9.710	PASS
Band2	10	19150	50	#0	QAM16	9.001	9.768	PASS
Band2	15	18675	75	#0	QAM16	13.459	14.565	PASS
Band2	15	18900	75	#0	QAM16	13.502	14.522	PASS
Band2	15	19125	75	#0	QAM16	13.502	14.609	PASS
Band2	20	18700	100	#0	QAM16	18.061	19.652	PASS
Band2	20	18900	100	#0	QAM16	18.119	19.478	PASS
Band2	20	19100	100	#0	QAM16	18.119	19.362	PASS
Band2	1.4	18607	6	#0	QPSK	1.102	1.266	PASS
Band2	1.4	18900	6	#0	QPSK	1.094	1.303	PASS
Band2	1.4	19193	6	#0	QPSK	1.098	1.286	PASS
Band2	10	18650	50	#0	QPSK	8.944	9.739	PASS
Band2	10	18900	50	#0	QPSK	8.973	9.826	PASS
Band2	10	19150	50	#0	QPSK	9.001	9.768	PASS
Band2	15	18675	75	#0	QPSK	13.372	14.478	PASS
Band2	15	18900	75	#0	QPSK	13.459	14.522	PASS
Band2	15	19125	75	#0	QPSK	13.502	14.522	PASS
Band2	20	18700	100	#0	QPSK	17.887	19.420	PASS
Band2	20	18900	100	#0	QPSK	17.945	19.594	PASS
Band2	20	19100	100	#0	QPSK	18.119	19.594	PASS
Band2	3	18615	15	#0	QPSK	2.744	3.026	PASS
Band2	3	18900	15	#0	QPSK	2.744	3.061	PASS
Band2	3	19185	15	#0	QPSK	2.735	3.017	PASS
Band2	5	18625	25	#0	QPSK	4.515	4.971	PASS
Band2	5	18900	25	#0	QPSK	4.515	4.957	PASS
Band2	5	19175	25	#0	QPSK	4.501	4.884	PASS



Band2 QAM16 BW=10MHz Channel=18650 RB Size=50 Position=#0 NVNT



Band2 QAM16 BW=10MHz Channel=18900 RB Size=50 Position=#0 NVNT



Band2 QAM16 BW=10MHz Channel=19150 RB Size=50 Position=#0 NVNT



Band2 QAM16 BW=15MHz Channel=18675 RB Size=75 Position=#0 NVNT



Band2 QAM16 BW=15MHz Channel=18900 RB Size=75 Position=#0 NVNT



Band2 QAM16 BW=15MHz Channel=19125 RB Size=75 Position=#0 NVNT