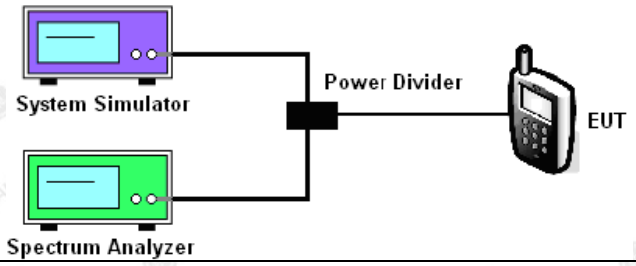
5.4. Band Edge and Conducted Spurious Emission Measurement

5.4.1. Test Specification

Test Requirement:	FCC part 90.691
Test Method:	FCC part2.1051
Limit:	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 and where f is greater than 12.5 kHz.
Test Setup:	
Test Procedure:	1. The testing follows FCC KDB 971168 D01v03 Section 6.0. 2. The EUT was connected to the spectrum analyzer and system simulator via a power divider. 3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement. 4. The band edges of low and high channels for the highest RF powers were measured. 5. The conducted spurious emission for the whole frequency range was taken. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

.

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 26; recorded worst case for each Channel Bandwidth of LTE FDD Band 26.*

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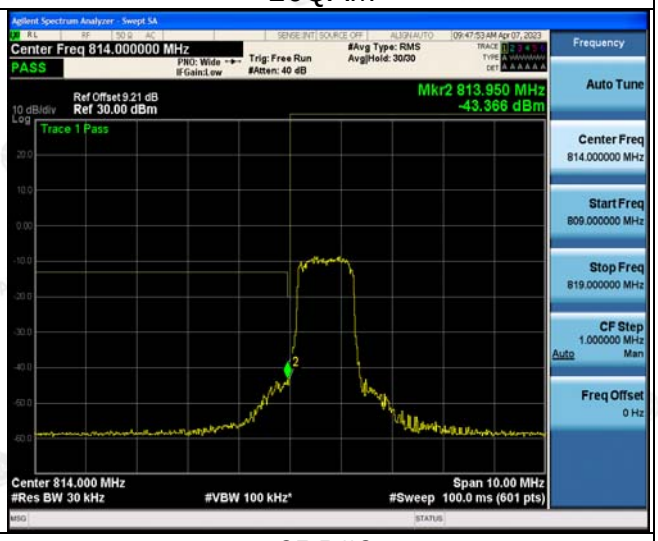
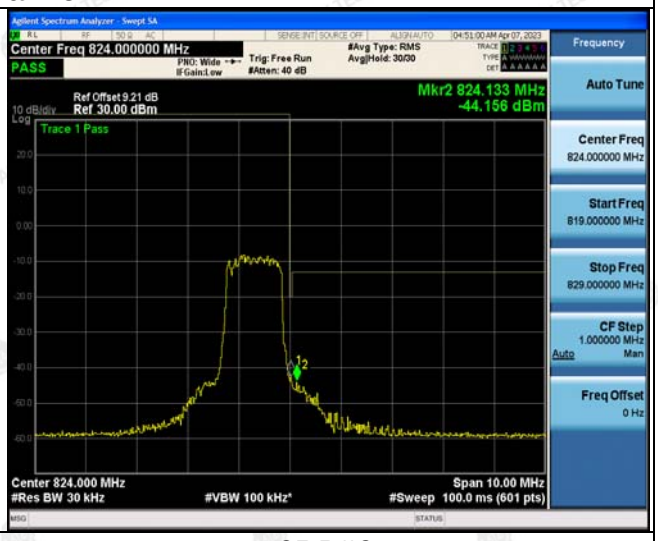
LTE FDD Band 26-1.4MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
6RB#0	6RB#0
Low Channel	
	
6RB#0	6RB#0
High Channel	

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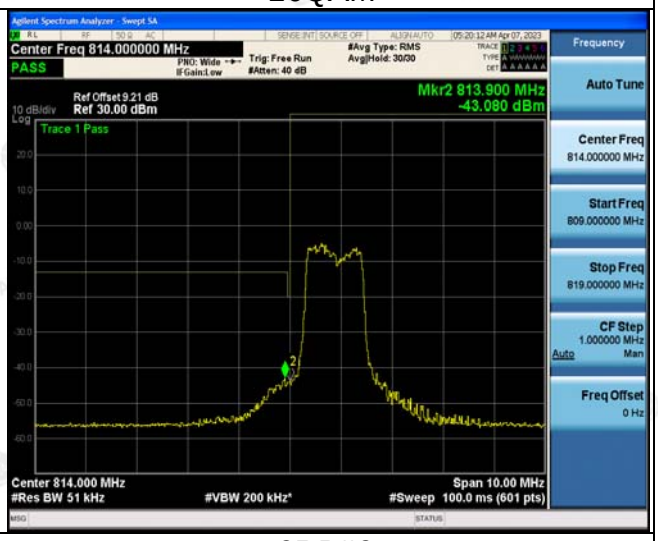
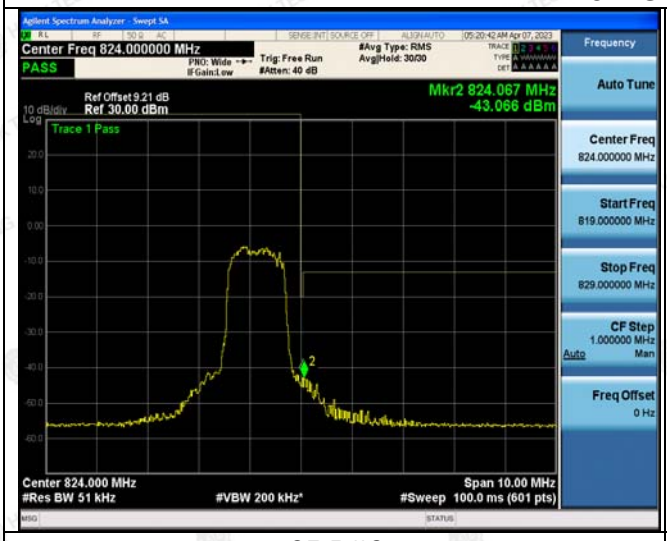
LTE FDD Band 26-3MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
6RB#0	6RB#0
Low Channel	
	
6RB#0	6RB#0
High Channel	

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LTE FDD Band 26-5MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
6RB#0	6RB#0
Low Channel	
6RB#0	6RB#0
High Channel	

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LTE FDD Band 26-10MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
6RB#0	6RB#0

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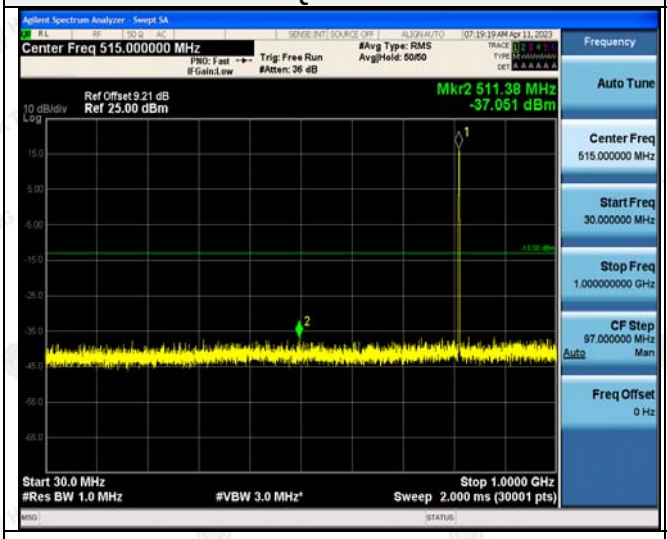
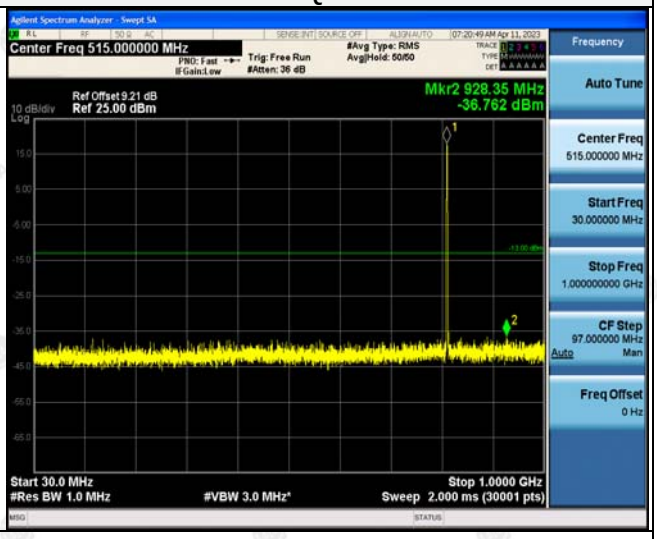
Conducted Measurement:

LTE FDD Band 26-1.4MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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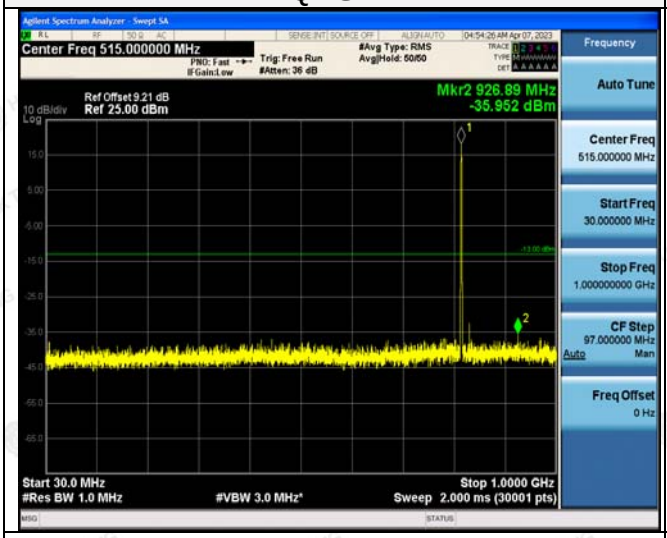
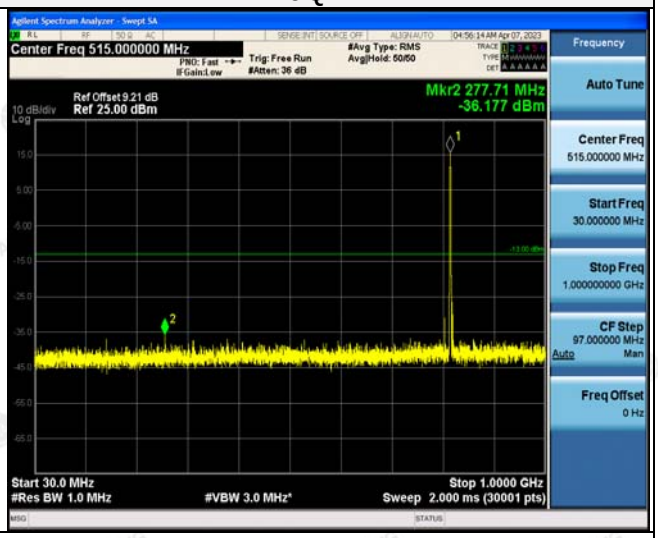
LTE FDD Band 26-1.4MHz Channel Bandwidth	
Middle Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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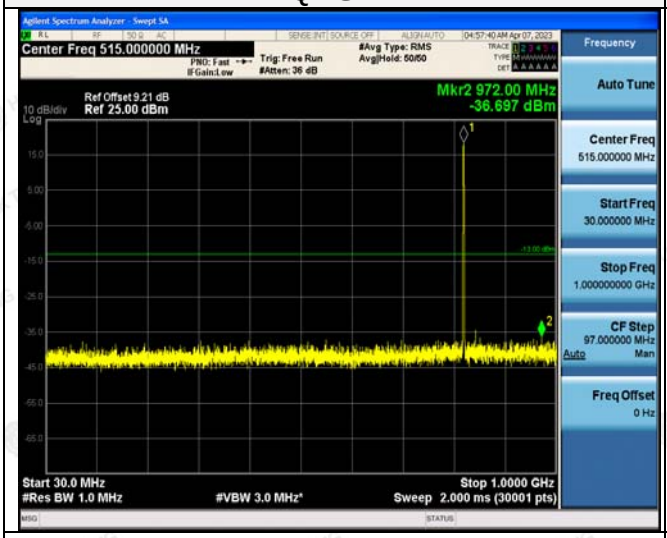
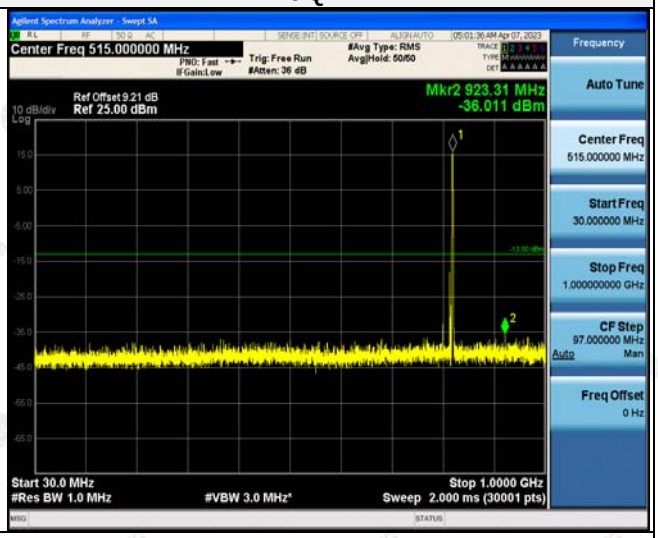
LTE FDD Band 26-1.4MHz Channel Bandwidth	
High Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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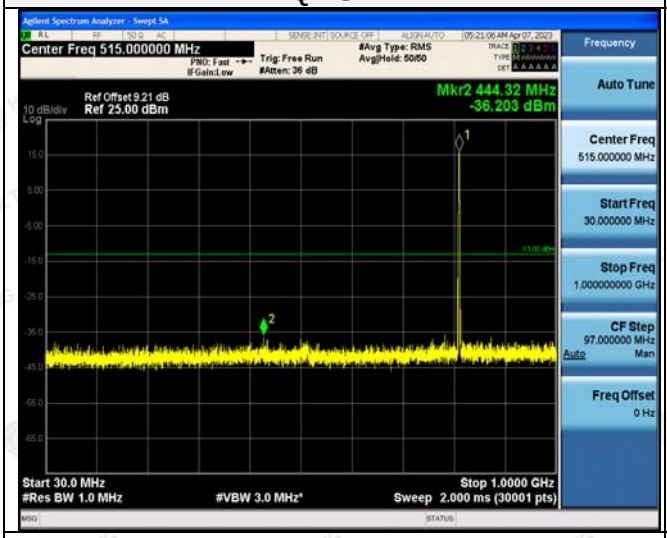
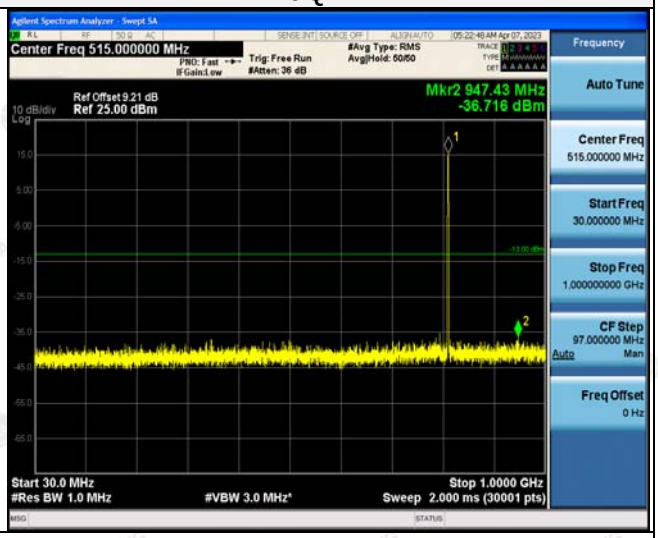
LTE FDD Band 26-3MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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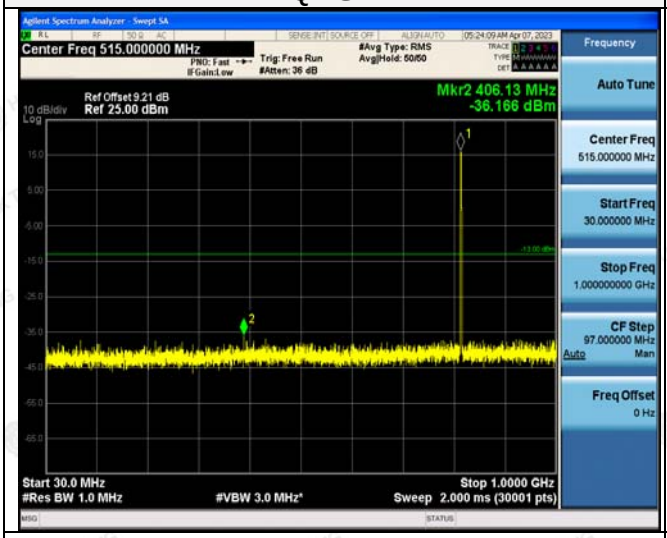
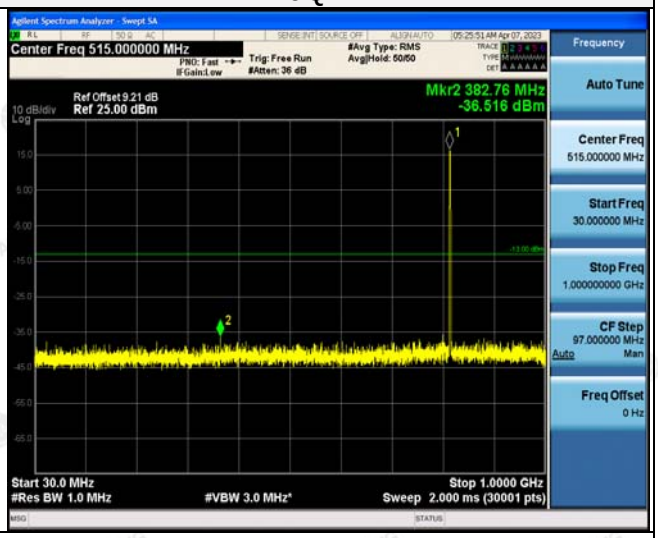
LTE FDD Band 26-3MHz Channel Bandwidth	
Middle Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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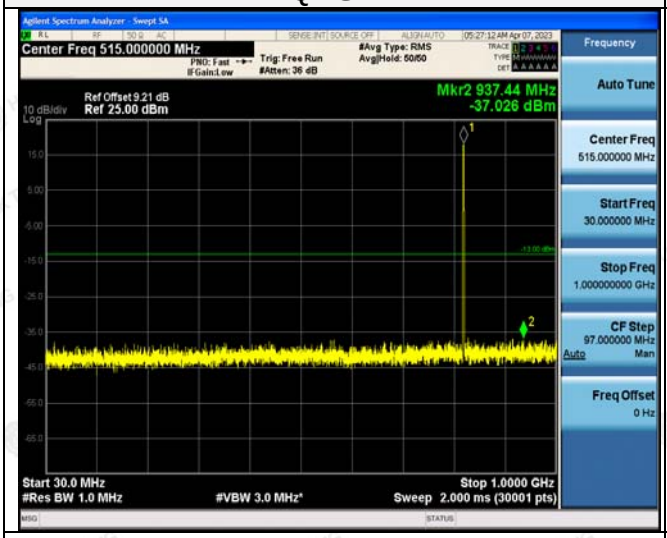
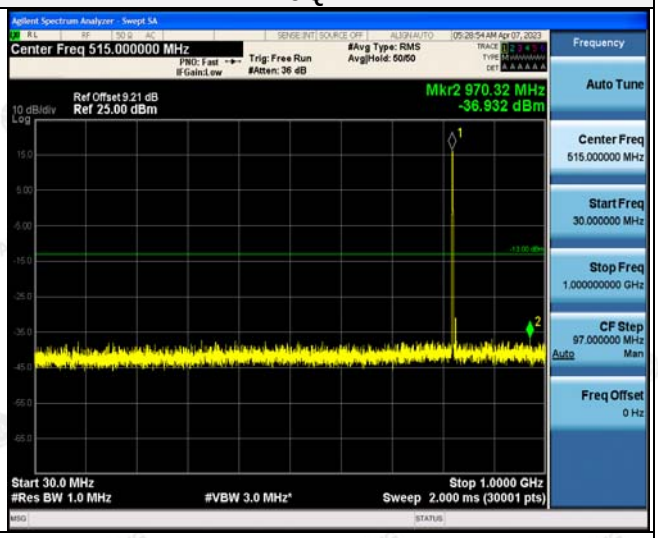
LTE FDD Band 26-3MHz Channel Bandwidth	
High Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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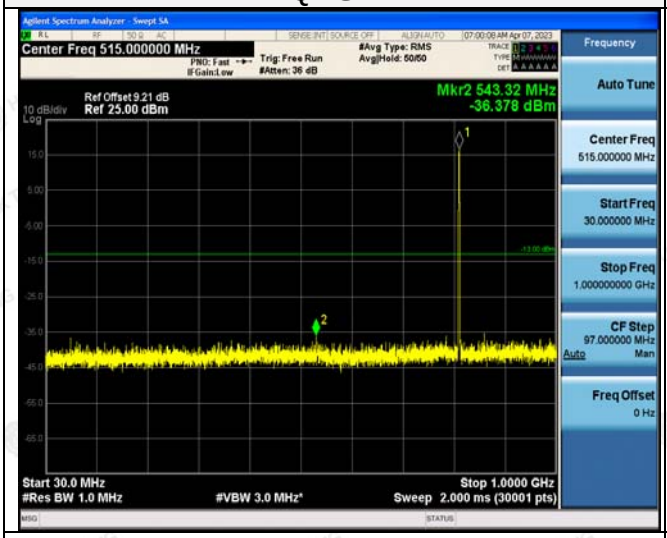
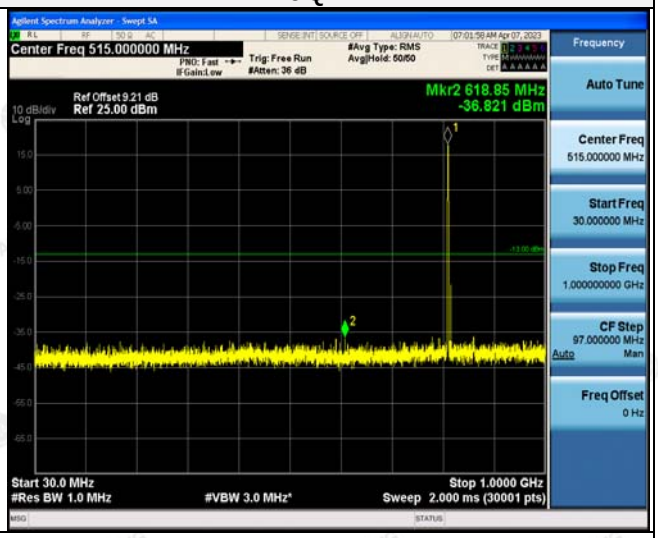
LTE FDD Band 26-5MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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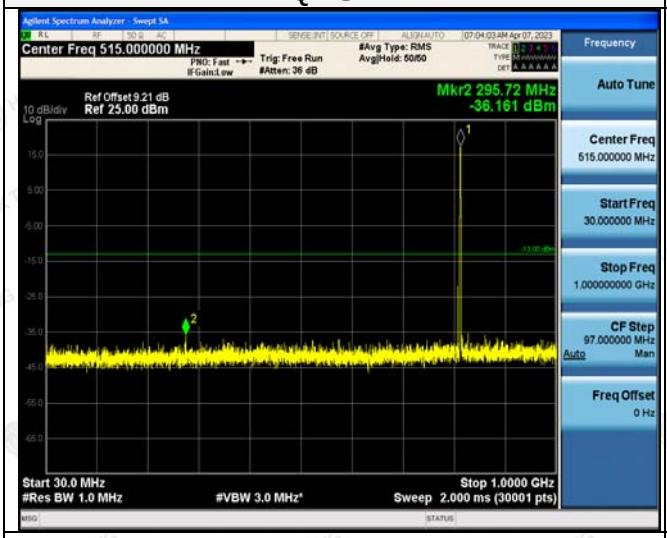
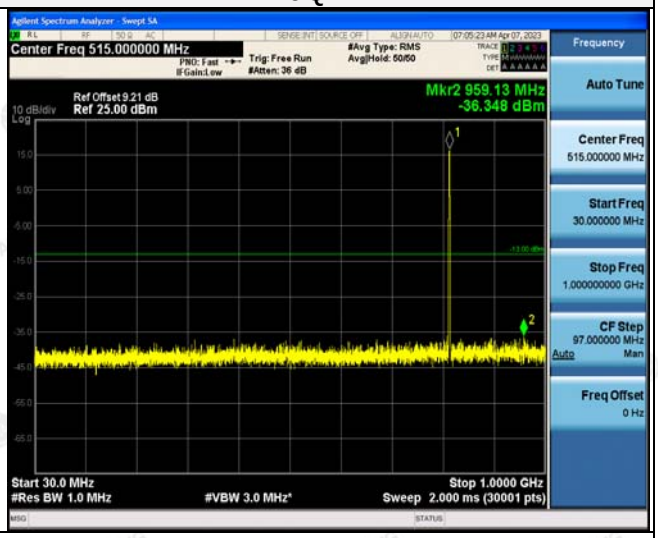
LTE FDD Band 26-5MHz Channel Bandwidth	
Middle Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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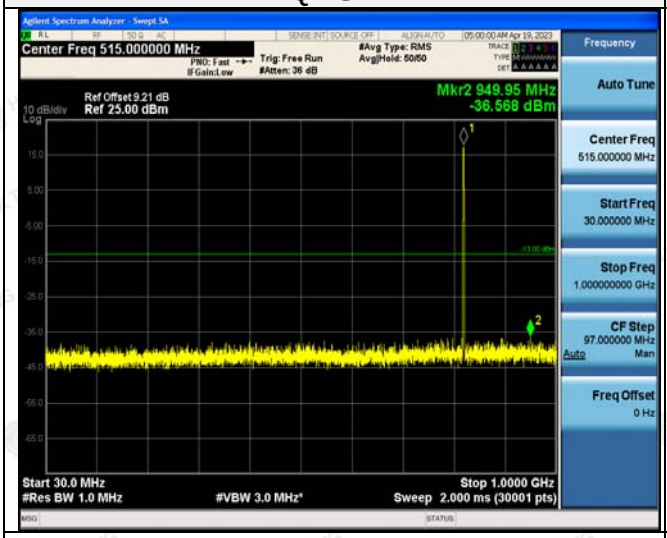
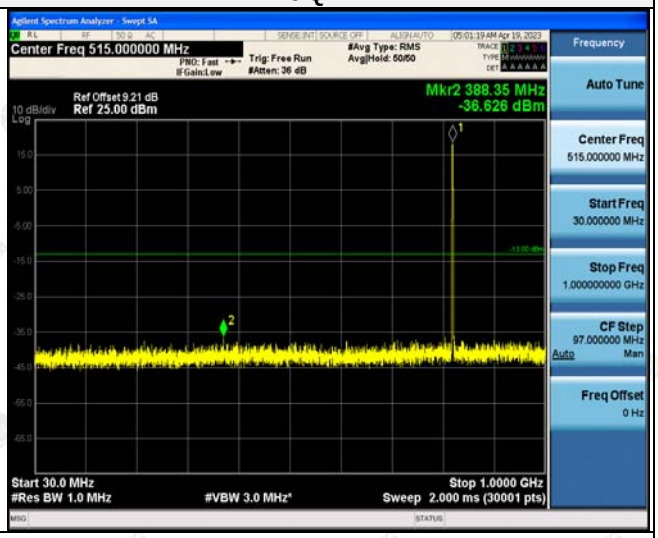
LTE FDD Band 26-5MHz Channel Bandwidth	
High Channel	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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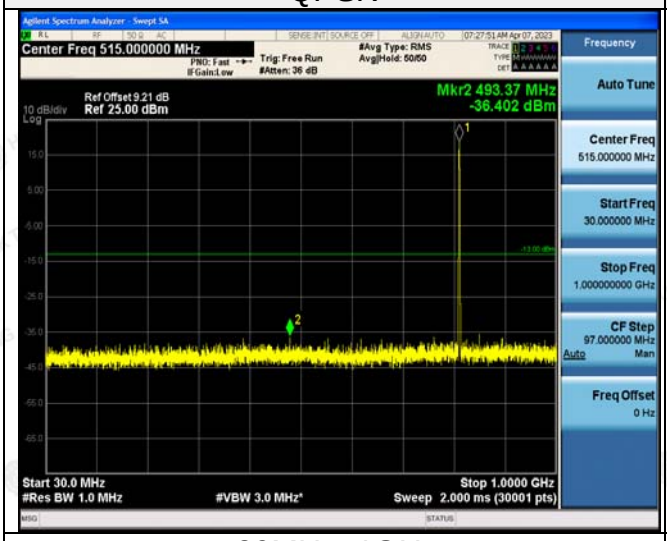
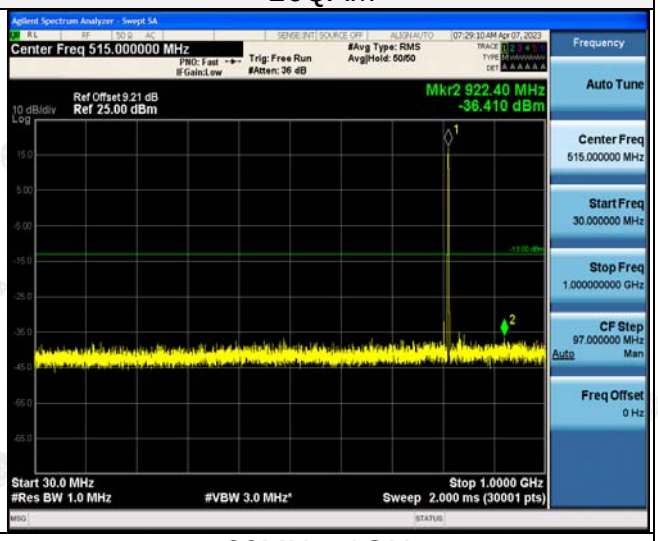
LTE FDD Band 26-10MHz Channel Bandwidth	
QPSK	16QAM
	
30MHz~1GHz	30MHz~1GHz
1GHz~5GHz	1GHz~5GHz

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5GHz~12GHz

5GHz~12GHz

12GHz~26.5GHz

1RB#0

12GHz~26.5GHz

1RB#0

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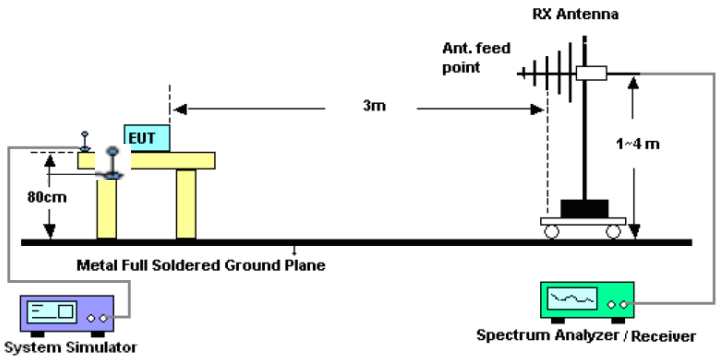
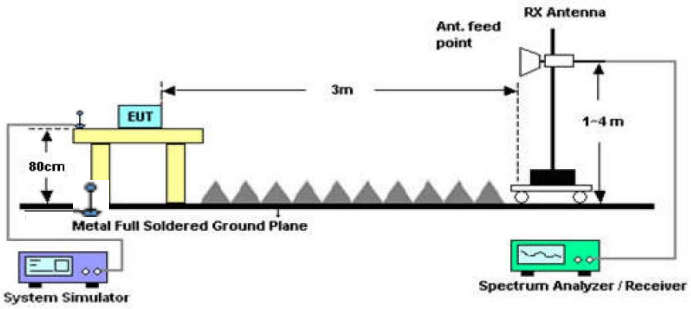
Field Strength of Spurious Radiation Measurement

5.4.2. Test Specification

Test Requirement:	FCC part90.691
Test Method:	FCC part 2.1053
Limit:	30MHz~20GHz -13dBm
Test setup:	From 30MHz to 1GHz  Above 1GHz 
Test Procedure:	1. The testing follows FCC KDB 971168 D01v03 Section 5.8 and ANSI / TIA-603-D-2010Section 2.2.12. 2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground. 3. The EUT was set 3 meters from the receiving antenna, which was 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 one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.

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	6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission. 7. A horn antenna was substituted in place of the EUT and was driven by a signal generator. 8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission. 9. Taking the record of output power at antenna port. 10. Repeat step 7 to step 8 for another polarization. 11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain 12. ERP (dBm) = EIRP - 2.15 13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test results:	PASS

Radiated Measurement:

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 26; recorded worst case for each Channel Bandwidth of LTE FDD Band 26.*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)*
3. *We were not recorded other points as values lower than limits.*
4. *Margin = Limit - EIRP*

LTE FDD Band 26_Channel Bandwidth 1.4MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1629.4	-35.36	2.86	3.00	7.25	-33.12	-13.00	20.12	H
2444.1	-42.35	2.94	3.00	9.53	-37.91	-13.00	24.91	H
1629.4	-44.75	2.86	3.00	7.25	-42.51	-13.00	29.51	V
2444.1	-46.66	2.94	3.00	9.53	-42.22	-13.00	29.22	V

LTE FDD Band 26_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-40.94	2.86	3.00	7.25	-38.7	-13.00	25.7	H
2457.0	-44.12	2.94	3.00	9.53	-39.68	-13.00	26.68	H
1638.0	-49.78	2.86	3.00	7.25	-47.54	-13.00	34.54	V
2457.0	-53.71	2.94	3.00	9.53	-49.27	-13.00	36.27	V

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LTE FDD Band 26_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1646.6	-41.27	2.86	3.00	7.82	-38.46	-13.00	25.46	H
2469.9	-44.53	2.94	3.00	9.35	-40.27	-13.00	27.27	H
1646.6	-50.15	2.86	3.00	7.82	-47.34	-13.00	34.34	V
2469.9	-53.64	2.94	3.00	9.35	-49.38	-13.00	36.38	V

LTE FDD Band 26_Channel Bandwidth 3MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1631.0	-36.42	2.86	3.00	7.25	-34.18	-13.00	21.18	H
2446.5	-42.19	2.94	3.00	9.53	-37.75	-13.00	24.75	H
1631.0	-45.55	2.86	3.00	7.25	-43.31	-13.00	30.31	V
2446.5	-47.99	2.94	3.00	9.53	-43.55	-13.00	30.55	V

LTE FDD Band 26_Channel Bandwidth 3MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-34.34	2.86	3.00	7.25	-32.1	-13.00	19.1	H
2457.0	-40.58	2.94	3.00	9.53	-36.14	-13.00	23.14	H
1638.0	-41.88	2.86	3.00	7.25	-39.64	-13.00	26.64	V
2457.0	-48.02	2.94	3.00	9.53	-43.58	-13.00	30.58	V

LTE FDD Band 26_Channel Bandwidth 3MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1645.0	-41.06	2.86	3.00	7.82	-38.25	-13.00	25.25	H
2467.5	-44.04	2.94	3.00	9.35	-39.78	-13.00	26.78	H
1645.0	-50.29	2.86	3.00	7.82	-47.48	-13.00	34.48	V
2467.5	-53.31	2.94	3.00	9.35	-49.05	-13.00	36.05	V

LTE FDD Band 26_Channel Bandwidth 5MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1633.0	-34.6	2.86	3.00	7.25	-32.36	-13.00	19.36	H
2449.5	-42.66	2.94	3.00	9.53	-38.22	-13.00	25.22	H
1633.0	-45.05	2.86	3.00	7.25	-42.81	-13.00	29.81	V
2449.5	-47.64	2.94	3.00	9.53	-43.2	-13.00	30.2	V

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LTE FDD Band 26_Channel Bandwidth 5MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-33.45	2.86	3.00	7.25	-31.21	-13.00	18.21	H
2457.0	-39.72	2.94	3.00	9.53	-35.28	-13.00	22.28	H
1638.0	-41.76	2.86	3.00	7.25	-39.52	-13.00	26.52	V
2457.0	-49.84	2.94	3.00	9.53	-45.4	-13.00	32.4	V

LTE FDD Band 26_Channel Bandwidth 5MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1643.0	-41.23	2.86	3.00	7.82	-38.42	-13.00	25.42	H
2464.5	-44.66	2.94	3.00	9.35	-40.4	-13.00	27.4	H
1643.0	-50.35	2.86	3.00	7.82	-47.54	-13.00	34.54	V
2464.5	-53.41	2.94	3.00	9.35	-49.15	-13.00	36.15	V

LTE FDD Band 26_Channel Bandwidth 10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-35.24	2.86	3.00	7.25	-33	-13.00	20	H
2457.0	-42.33	2.94	3.00	9.53	-37.89	-13.00	24.89	H
1638.0	-44.81	2.86	3.00	7.25	-42.57	-13.00	29.57	V
2457.0	-46.72	2.94	3.00	9.53	-42.28	-13.00	29.28	V

LTE FDD Band 26_Channel Bandwidth 1.4MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1629.4	-35.7	2.86	3.00	7.25	-33.46	-13.00	20.46	H
2444.1	-43.07	2.94	3.00	9.53	-38.63	-13.00	25.63	H
1629.4	-43.77	2.86	3.00	7.25	-41.53	-13.00	28.53	V
2444.1	-46.82	2.94	3.00	9.53	-42.38	-13.00	29.38	V

LTE FDD Band 26_Channel Bandwidth 1.4MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-34.06	2.86	3.00	7.25	-31.82	-13.00	18.82	H
2457.0	-39.63	2.94	3.00	9.53	-35.19	-13.00	22.19	H
1638.0	-40.81	2.86	3.00	7.25	-38.57	-13.00	25.57	V
2457.0	-49.15	2.94	3.00	9.53	-44.71	-13.00	31.71	V

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LTE FDD Band 26_Channel Bandwidth 1.4MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1646.6	-41.58	2.86	3.00	7.82	-38.77	-13.00	25.77	H
2469.9	-44.03	2.94	3.00	9.35	-39.77	-13.00	26.77	H
1646.6	-50.18	2.86	3.00	7.82	-47.37	-13.00	34.37	V
2469.9	-54.42	2.94	3.00	9.35	-50.16	-13.00	37.16	V

LTE FDD Band 26_Channel Bandwidth 3MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1631.0	-35.24	2.86	3.00	7.25	-33	-13.00	20	H
2446.5	-43.56	2.94	3.00	9.53	-39.12	-13.00	26.12	H
1631.0	-44.52	2.86	3.00	7.25	-42.28	-13.00	29.28	V
2446.5	-48.26	2.94	3.00	9.53	-43.82	-13.00	30.82	V

LTE FDD Band 26_Channel Bandwidth 3MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-35.09	2.86	3.00	7.25	-32.85	-13.00	19.85	H
2457.0	-40.22	2.94	3.00	9.53	-35.78	-13.00	22.78	H
1638.0	-41.41	2.86	3.00	7.25	-39.17	-13.00	26.17	V
2457.0	-49.51	2.94	3.00	9.53	-45.07	-13.00	32.07	V

LTE FDD Band 26_Channel Bandwidth 3MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1645.0	-40.32	2.86	3.00	7.82	-37.51	-13.00	24.51	H
2467.5	-44.26	2.94	3.00	9.35	-40	-13.00	27	H
1645.0	-48.73	2.86	3.00	7.82	-45.92	-13.00	32.92	V
2467.5	-53.38	2.94	3.00	9.35	-49.12	-13.00	36.12	V

LTE FDD Band 26_Channel Bandwidth 5MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1633.0	-34.7	2.86	3.00	7.25	-32.46	-13.00	19.46	H
2449.5	-42.41	2.94	3.00	9.53	-37.97	-13.00	24.97	H
1633.0	-44.76	2.86	3.00	7.25	-42.52	-13.00	29.52	V
2449.5	-48.1	2.94	3.00	9.53	-43.66	-13.00	30.66	V

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LTE FDD Band 26_Channel Bandwidth 5MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-33.88	2.86	3.00	7.25	-31.64	-13.00	18.64	H
2457.0	-40.3	2.94	3.00	9.53	-35.86	-13.00	22.86	H
1638.0	-40.21	2.86	3.00	7.25	-37.97	-13.00	24.97	V
2457.0	-49.77	2.94	3.00	9.53	-45.33	-13.00	32.33	V

LTE FDD Band 26_Channel Bandwidth 5MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1643.0	-40.1	2.86	3.00	7.82	-37.29	-13.00	24.29	H
2464.5	-44.51	2.94	3.00	9.35	-40.25	-13.00	27.25	H
1643.0	-48.88	2.86	3.00	7.82	-46.07	-13.00	33.07	V
2464.5	-54.25	2.94	3.00	9.35	-49.99	-13.00	36.99	V

LTE FDD Band 26_Channel Bandwidth 10MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1638.0	-35.83	2.86	3.00	7.25	-33.59	-13.00	20.59	H
2457.0	-42.66	2.94	3.00	9.53	-38.22	-13.00	25.22	H
1638.0	-44.13	2.86	3.00	7.25	-41.89	-13.00	28.89	V
2457.0	-46.78	2.94	3.00	9.53	-42.34	-13.00	29.34	V

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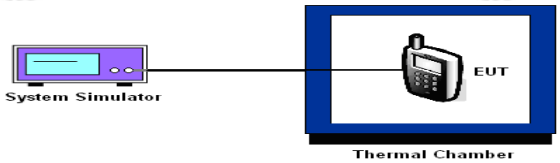
5.5. Frequency Stability Measurement

5.5.1. Test Specification

Test Requirement:	FCC part 90.213
Test Method:	FCC Part 2.1055
Limit:	±2.5 ppm
Test Setup:	
Test Procedure:	**Test Procedures for Temperature Variation** 1. The testing follows FCC KDB 971168 D01v03 Section 9.0. 2. The EUT was set up in the thermal chamber and connected with the system simulator. 3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute. 4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute. **Test Procedures for Voltage Variation** 1. The testing follows FCC KDB 971168 D01v03 Section 9.0. 2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator. 3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT. 4. The variation in frequency was measured for the worst case.
Test Result:	PASS

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TEST RESULTS

Remark:
1. We tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 26; recorded worst case.

LTE Band 26, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
3.15	-6.55	-10.73	-0.007973	-0.013061	2.50
3.70	-7.37	-10.23	-0.008971	-0.012453	2.50
4.26	-8.47	-9.94	-0.010310	-0.012100	2.50

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-30°	-10.17	-9.21	-0.012380	-0.011211	2.50
-20°	-7.20	-10.28	-0.008764	-0.012514	2.50
-10°	-7.37	-9.06	-0.008971	-0.011029	2.50
0°	-6.82	-9.27	-0.008302	-0.011284	2.50
10°	-6.92	-10.02	-0.008424	-0.012197	2.50
20°	-7.69	-9.50	-0.009361	-0.011564	2.50
30°	-8.02	-7.46	-0.009763	-0.009081	2.50
40°	-7.35	-8.50	-0.008947	-0.010347	2.50
50°	-9.30	-9.03	-0.011321	-0.010992	2.50

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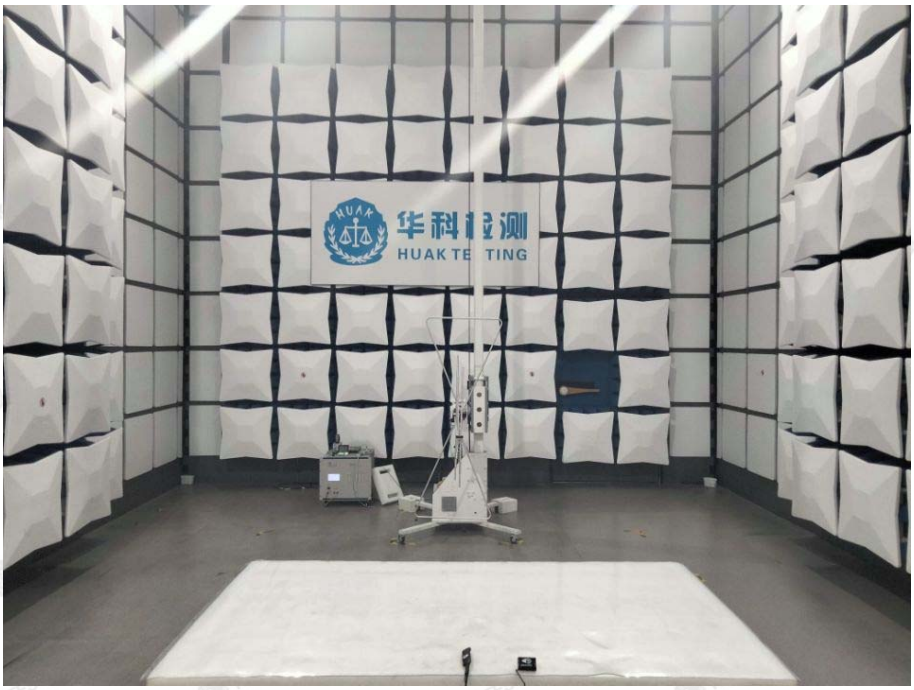
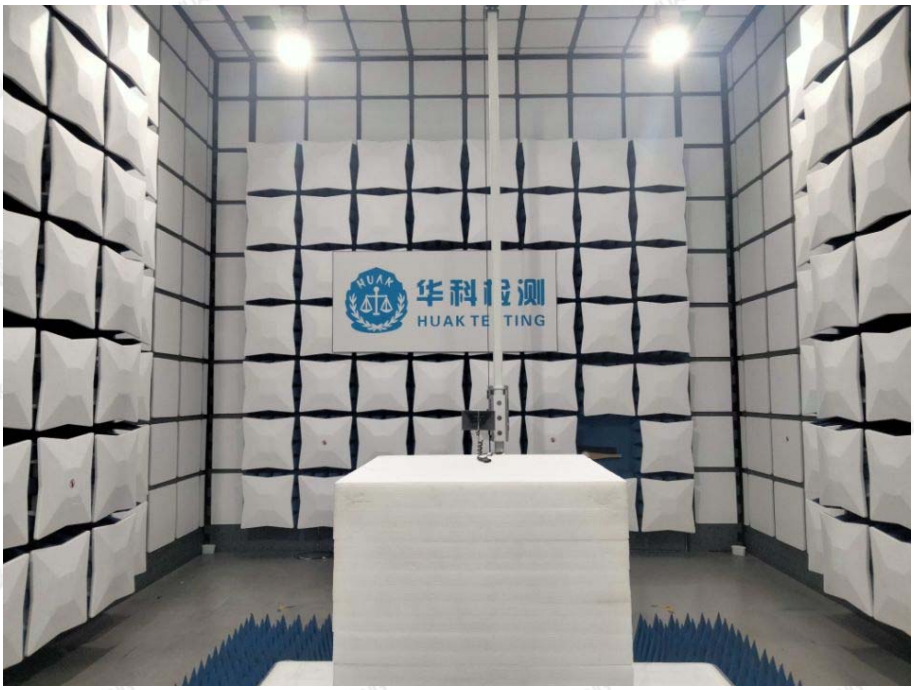
6. Photographs of Test Setup

Radiated Emission





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7. Photographs of EUT

Refer to test report ANNEX A of external photos and ANNEX B of internal photos

.....End of Report.....

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TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com
Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China