



RF TEST REPORT

Applicant Quectel Wireless Solutions Co., Ltd
FCC ID XMR2019SC650TNA
Product Smart Module
Brand Quectel
Model SC650T-NA
Report No. R2210A0926-R3V2
Issue Date November 8, 2022

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2021)/ FCC CFR47 Part 27C (2021)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Version	Revision description	Issue Date
Rev.0	Initial issue of report.	October 25, 2022
Rev.1	Update FCC ID.	November 7, 2022
Rev.2	Update Model.	November 8, 2022
Note: This revised report (Report No. R2210A0926-R3V2) supersedes and replaces the previously issued report (Report No. R2210A0926-R3V1). Please discard or destroy the previously issued report and dispose of it accordingly.		

Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Isotropic Radiated Power	2.1046 /27.50(d)(4) /27.50(b)(10) /27.50(c)(10) /27.50(h)(2)	PASS
2	Occupied Bandwidth	2.1049	PASS
3	Band Edge Compliance	27.53(h) /27.53(g) /27.53(f) /27.53(c) /27.53(m)	PASS
4	Peak-to-Average Power Ratio	27.50(d)/KDB971168 D01(5.7)	PASS
5	Frequency Stability	2.1055 / 27.54	PASS
6	Spurious Emissions at Antenna Terminals	2.1051 /27.53(h) /27.53(g) /27.53(f) /27.53(c) /27.53(m)	PASS
7	Radiated Spurious Emission	2.1053 /27.53(h) /27.53(g) /27.53(f) /27.53(c) /27.53(m)	PASS
Date of Testing: October 12, 2022 ~ October 18, 2022			
Date of Sample Received: October 12, 2022			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			



1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
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City: Shanghai
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2 General Description of Equipment under Test

2.1 Applicant and Manufacturer Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

2.2 General information

EUT Description		
Model	SC650T-NA	
IMEI	IMEI1:865920060000042 IMEI2:865920060000059	
Hardware Version	R1.0	
Software Version	SC650TNALPAR05A01	
Power Supply	External power supply	
Antenna Type	The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna)	
Antenna Gain	Band	Gain (dBi)
	WCDMA Band IV:	2.00
	LTE Band 4:	2.00
	LTE Band 7:	3.00
	LTE Band 12:	3.95
	LTE Band 13:	4.45
	LTE Band 66:	2.00
Test Mode(s)	WCDMA Band IV; LTE Band 4/7/12/13/66;	
Test Modulation	(WCDMA) BPSK, QPSK; (LTE) QPSK, 16QAM;	
HSDPA UE Category	24	
HSUPA UE Category	6	
Maximum E.I.R.P./ E.R.P.	WCDMA Band IV:	25.28 dBm
	LTE Band 4:	26.41 dBm
	LTE Band 7:	26.49 dBm
	LTE Band 12:	26.09 dBm
	LTE Band 13:	26.53 dBm



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	LTE Band 66:	26.17 dBm	
Rated Power Supply Voltage	DC 3.8V		
Operating Voltage	Minimum: 3.55V Maximum: 4.40V		
Operating Temperature	Lowest: -35°C Highest: +75°C		
Testing Temperature	Lowest: -30°C Highest: +50°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	WCDMA Band IV	1710 ~ 1755	2110 ~ 2155
	LTE Band 4	1710 ~ 1755	2110 ~ 2155
	LTE Band 7	2500 ~ 2570	2620 ~ 2690
	LTE Band 12	699 ~ 716	729 ~ 746
	LTE Band 13	777 ~ 787	746 ~ 756
	LTE Band 66	1710 ~ 1780	2110 ~ 2180
Note:			
1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.			



3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 27C (2021)

FCC CFR47 Part 2 (2021)

Reference standard:

ANSI C63.26-2015

KDB 971168 D01 Power Meas License Digital Systems v03r01

4 Test Configuration

There is more than one SIM card slot, each one should be applied throughout the compliance test respectively, and however, only the worst case (SIM 1) will be recorded in this report

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (X axis, horizontal polarization for WCDMA Band and Z axis, vertical polarization for LTE Band) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in WCDMA/LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detail in the following table:

Test modes are chosen to be reported as the worst case configuration below:

Test items	Modes/Modulation
	WCDMA Band IV
RF Power Output and Effective Isotropic Radiated Power	RMC HSDPA/HSUPA DC-HSDPA
Occupied Bandwidth	RMC
Band Edge Compliance	RMC
Peak-to-Average Power Ratio	RMC
Frequency Stability	RMC
Spurious Emissions at Antenna Terminals	RMC
Radiated Spurious Emission	RMC



Test modes are chosen to be reported as the worst case configuration below for LTE Band 4/7/12/13/66:

Test items	Modes	Bandwidth (MHz)						Modulation		RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF Power Output and Effective Isotropic Radiated Power	LTE 4	O	-	-	-	-	-	O	O	O	O	O	O	O	O
	LTE 7	-	-	O	-	-	-	O	O	O	O	O	O	O	O
	LTE 12	-	-	-	O	-	-	O	O	O	O	O	O	O	O
	LTE 13	-	-	O	-	-	-	O	O	O	O	O	O	O	O
	LTE 66	-	-	O	-	-	-	O	O	O	O	O	O	O	O
Band Edge Compliance	LTE 4	O	-	-	-	-	-	O	O	O	-	O	O	-	O
	LTE 7	-	-	O	-	-	-	O	O	O	-	O	O	-	O
	LTE 12	-	-	-	O	-	-	O	O	O	-	O	O	-	O
	LTE 13	-	-	O	-	-	-	O	O	O	-	O	O	-	O
	LTE 66	-	-	O	-	-	-	O	O	O	-	O	O	-	O
Spurious Emissions at Antenna Terminals	LTE 4	O	-	-	-	-	-	O	-	O	-	-	O	O	O
	LTE 7	-	-	O	-	-	-	O	-	O	-	-	O	O	O
	LTE 12	-	-	-	O	-	-	O	-	O	-	-	O	O	O
	LTE 13	-	-	O	-	-	-	O	-	O	-	-	O	O	O
	LTE 66	-	-	O	-	-	-	O	-	O	-	-	O	O	O
Radiated Spurious Emission	LTE 4	O	-	-	-	-	-	O	-	O	-	-	-	O	-
	LTE 7	-	-	O	-	-	-	O	-	O	-	-	-	O	-
	LTE 12	-	-	-	O	-	-	O	-	O	-	-	-	O	-
	LTE 13	-	-	O	-	-	-	O	-	O	-	-	-	O	-
	LTE 66	-	-	O	-	-	-	O	-	O	-	-	-	O	-
Note	1. The mark "O" means that this configuration is chosen for testing. 2. The mark "-" means that this configuration is not testing.														

5 Test Case

5.1 RF Power Output and Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the Base Station Simulator with a known loss. The EUT is controlled by the Base Station Simulator test set to ensure max power transmission with proper modulation.

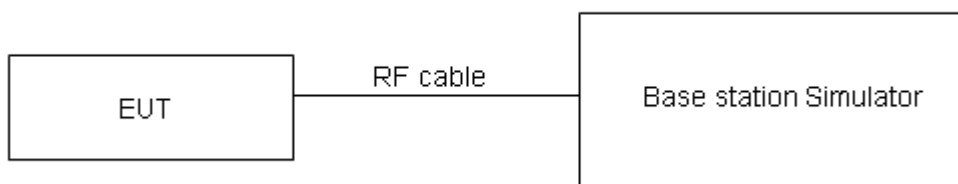
ERP can then be calculated as follows:

$EIRP \text{ (dBm)} = \text{Output Power (dBm)} + \text{Antenna Gain (dBi)}$

where: dBd refers to gain relative to an ideal dipole.

$EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$

Test Setup



Limits

No specific RF power output requirements in part 2.1046.

Rule Part 27.50(b) (10) specifies that “Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP”

Rule Part 27.50(c) (10) specifies that “Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP”

Rule Part 27.50(d) (4) specifies that “Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”

Rule Part 27.50(h) (2) specifies that “Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.”

Rule Part 27.50(a) (3) specifies that “(i) For mobile and portable stations transmitting in the

2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. ”

Rule Part 27.50(k) (3) Mobile devices are limited to 1Watt (30 dBm) EIRP. Mobile devices operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

Rule Part 27.50(j) (3) Mobile and portable stations are limited to 1 Watt EIRP. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

Part 27.50(b)(10)Limit	$\leq$ 3 W (34.77 dBm)
Part 27.50(c)(10)Limit	$\leq$ 3 W (34.77 dBm)
Part 27.50(d)(4)Limit	$\leq$ 1 W (30 dBm)
Part 27.50(h)(2) Limit	$\leq$ 2 W (33 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=0.4$ dB for RF power output, $k = 2$, $U= 1.19$ dB for ERP/EIRP.

Test Results

Refer to the section 6.1 of this report for test data.

5.2 Occupied Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

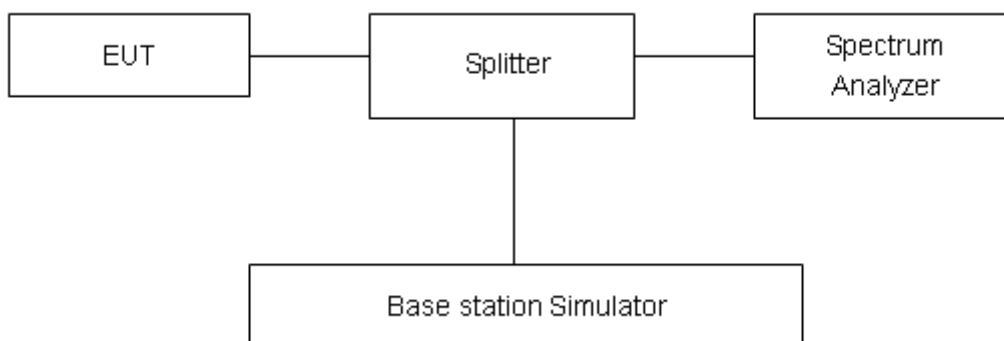
Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to $\geq 1\%EBW$, VBW is set to 3x RBW.

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=624\text{Hz}$.

Test Results

Refer to the section 6.2 of this report for test data.

5.3 Band Edge Compliance

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured.

The testing follows KDB 971168 D01 v03r01 Section 6.0

The EUT was connected to spectrum analyzer and system simulator via a power divider.

The band edges of low and high channels for the highest RF powers were measured.

For LTE Band 7/38 set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.

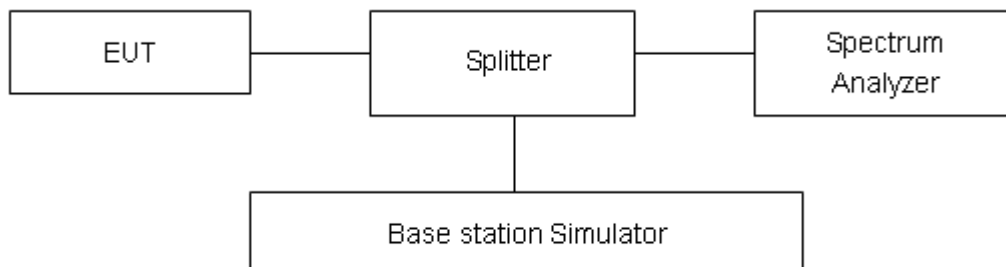
RBW is set to $\geq 1\%$ EBW, VBW is set to 3x RBW on spectrum analyzer.

Set spectrum analyzer with RMS detector.

The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

Checked that all the results comply with the emission limit line.

Test Setup



Limits

Rule Part 27.53(i) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz.

LTE 4/66 Rule Part 27.53(h) specifies that “ for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB”

LTE 12/71 Rule Part 27.53(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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.

LTE 7/38/41 Rule Part 27.53(m) (4) specifies that “for BRS and EBS stations. For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(4) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Example:

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

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

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

LTE 13 Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

LTE 13 Rule Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, 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 any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
- (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) 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 at least 30 kHz may be employed;



Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=0.684\text{dB}$.

Test Results

Refer to the section 6.3 of this report for test data.

5.4 Peak-to-Average Power Ratio (PAPR)

Ambient condition

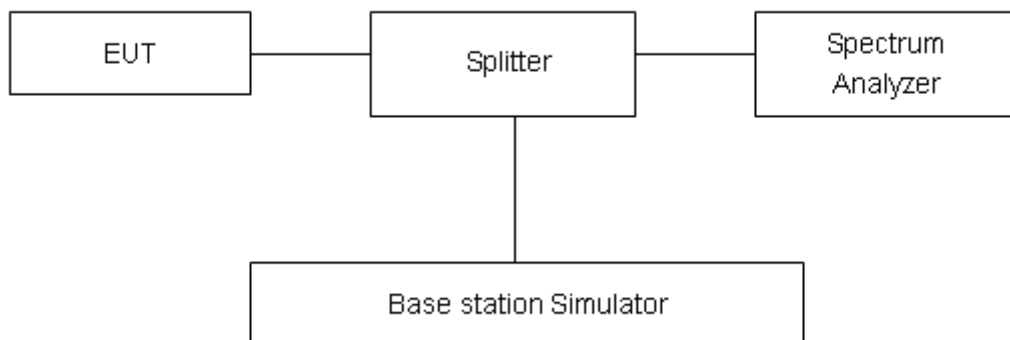
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$\text{PAPR (dB)} = \text{PPk (dBm)} - \text{PAvg (dBm)}.$$

Test Setup



Limits

Rule Part 27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.

Test Results

Refer to the section 6.4 of this report for test data.

5.5 Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30°C to +50°C in 10°C step size.

(1)With all power removed, the temperature was decreased to -10°C and permitted to stabilize for three hours.

(2)Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

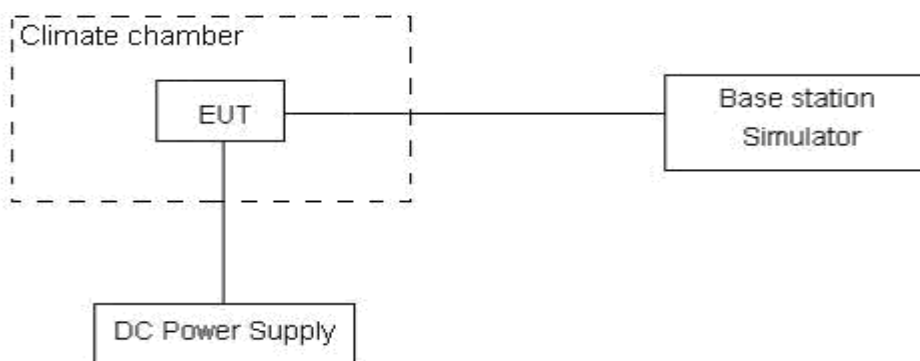
Frequency Stability (Voltage Variation)

The frequency stability shall be measured with variation of primary supply voltage as follows:

Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 3.55 V and 4.40 V, with a nominal voltage of 3.8V.

Test setup



Limits

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 3$, $U=0.01\text{ppm}$.

Test Results

Refer to the section 6.5 of this report for test data.

5.6 Spurious Emissions at Antenna Terminals

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used.

RBW is set to 1 kHz (0.009MHz~ 0.15 MHz),

RBW is set to 10 kHz (0.15 MHz~ 30 MHz)

RBW is set to 100 kHz (30MHz~1000 MHz)

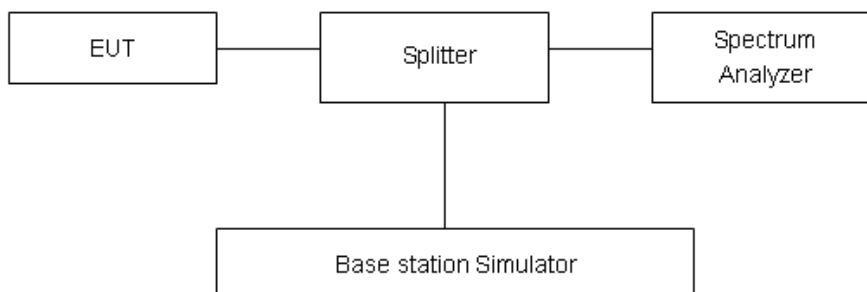
RBW is set to 1000 kHz (above 1000MHz)

Sweep is set to ATUO.

Of those disturbances below (limit – 20 dB), the mark is not required for the EUT.

The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.”

Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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.

Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands,

emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation. Rule Part 27.53(m) $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(4) of this section.

Part 27.53(h)/(g) Limit		-13 dBm
Part 27.53(f) Limit	Limit out of the band 1559-1610 MHz	-13 dBm
	Limit in the band 1559-1610 MHz	-40 dBm
Part 27.53(m) Limit		-25 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-27GHz	1.407 dB

Test Results

Refer to the section 6.6 of this report for test data.

5.7 Radiated Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26-2015.
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=100kHz, VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz, and the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAG) should be recorded after test.
7. The measurement results are obtained as described below:

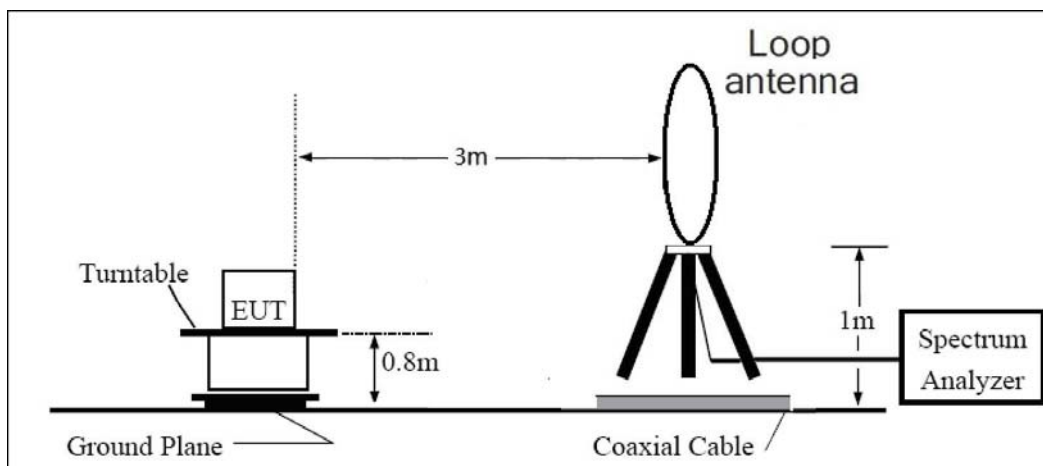
$$\text{Power(EIRP)} = \text{PMea} - \text{PAG} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:

$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dB}$.

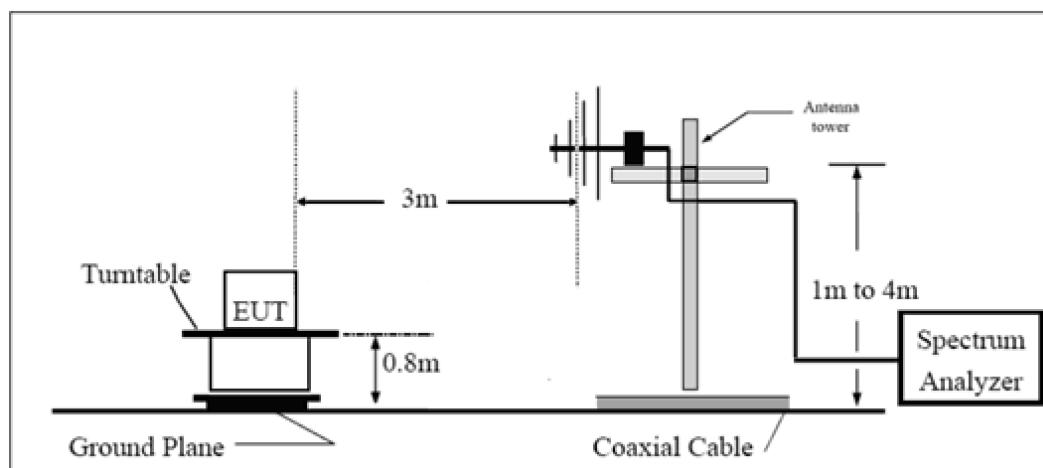
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

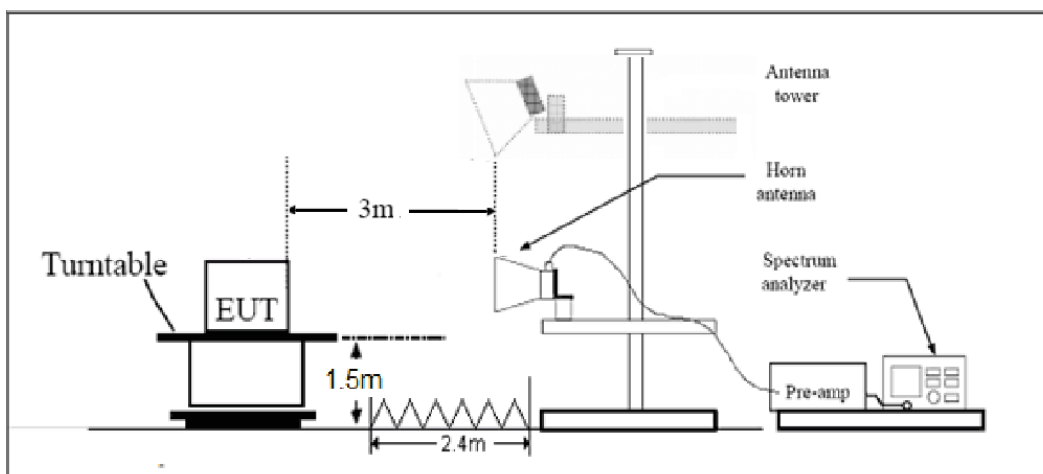
9KHz~ 30MHz



30MHz~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m



Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.”

Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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.

Rule Part 27.53(m) $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(4) of this section.

Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, 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 any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;
- (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;
- (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) 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 at least 30 kHz may be employed;

Part 27.53 (h)/(g) Limit		-13 dBm
Part 27.53(f) Limit	Limit out of the band 1559-1610 MHz	-13 dBm
	Limit in the band 1559-1610 MHz	-40 dBm
Part 27.53(m) Limit		-25 dBm



Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = \pm 1.96$, $U = \pm 3.55$ dB.

Test Results

Refer to the section 6.7 of this report for test data.

6 Test Results

6.1 RF Power Output and Effective Isotropic Radiated Power

WCDMA Band IV		Maximum Output Power (dBm)			EIRP (dBm)		
		Channel 1312	Channel 1413	Channel 1513	Channel 1312	Channel 1413	Channel 1513
		1712.4 (MHz)	1732.6 (MHz)	1752.6 (MHz)	1712.4 (MHz)	1732.6 (MHz)	1752.6 (MHz)
RMC		23.06	23.11	23.24	25.06	25.11	25.24
HSDPA	Sub - Test 1	22.46	22.59	22.84	24.46	24.59	24.84
	Sub - Test 2	22.66	22.53	22.82	24.66	24.53	24.82
	Sub - Test 3	22.06	22.11	22.12	24.06	24.11	24.12
	Sub - Test 4	22.00	22.17	22.38	24.00	24.17	24.38
HSUPA	Sub - Test 1	21.42	21.77	21.80	23.42	23.77	23.80
	Sub - Test 2	19.56	19.67	19.58	21.56	21.67	21.58
	Sub - Test 3	20.70	20.69	20.72	22.70	22.69	22.72
	Sub - Test 4	19.56	19.65	19.82	21.56	21.65	21.82
	Sub - Test 5	23.02	22.99	23.28	25.02	24.99	25.28
DC-HSDPA	Sub - Test 1	22.58	22.53	22.80	24.58	24.53	24.80
	Sub - Test 2	22.52	22.61	22.86	24.52	24.61	24.86
	Sub - Test 3	22.10	22.23	22.24	24.10	24.23	24.24
	Sub - Test 4	22.02	22.13	22.34	24.02	24.13	24.34



LTE Band 4						
Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Maximum Output Power (dBm)	EIRP (dBm)
1.4	19957	1	#0	QPSK	24.30	26.30
1.4	19957	1	#Mid	QPSK	24.38	26.38
1.4	19957	1	#Max	QPSK	24.30	26.30
1.4	19957	3	#0	QPSK	24.19	26.19
1.4	19957	3	#Mid	QPSK	24.19	26.19
1.4	19957	3	#Max	QPSK	24.13	26.13
1.4	19957	6	#0	QPSK	23.05	25.05
1.4	19957	1	#0	16QAM	23.25	25.25
1.4	19957	1	#Mid	16QAM	23.40	25.40
1.4	19957	1	#Max	16QAM	23.24	25.24
1.4	19957	3	#0	16QAM	23.22	25.22
1.4	19957	3	#Mid	16QAM	23.18	25.18
1.4	19957	3	#Max	16QAM	22.80	24.80
1.4	19957	6	#0	16QAM	22.22	24.22
1.4	20175	1	#0	QPSK	24.05	26.05
1.4	20175	1	#Mid	QPSK	24.09	26.09
1.4	20175	1	#Max	QPSK	24.12	26.12
1.4	20175	3	#0	QPSK	24.22	26.22
1.4	20175	3	#Mid	QPSK	24.22	26.22
1.4	20175	3	#Max	QPSK	24.23	26.23
1.4	20175	6	#0	QPSK	23.18	25.18
1.4	20175	1	#0	16QAM	23.31	25.31
1.4	20175	1	#Mid	16QAM	23.46	25.46
1.4	20175	1	#Max	16QAM	23.36	25.36
1.4	20175	3	#0	16QAM	23.07	25.07
1.4	20175	3	#Mid	16QAM	23.08	25.08
1.4	20175	3	#Max	16QAM	23.30	25.30
1.4	20175	6	#0	16QAM	21.70	23.70
1.4	20393	1	#0	QPSK	24.34	26.34
1.4	20393	1	#Mid	QPSK	24.40	26.40
1.4	20393	1	#Max	QPSK	24.30	26.30
1.4	20393	3	#0	QPSK	24.41	26.41
1.4	20393	3	#Mid	QPSK	24.37	26.37
1.4	20393	3	#Max	QPSK	24.23	26.23
1.4	20393	6	#0	QPSK	22.87	24.87
1.4	20393	1	#0	16QAM	22.83	24.83
1.4	20393	1	#Mid	16QAM	22.97	24.97



1.4	20393	1	#Max	16QAM	22.84	24.84
1.4	20393	3	#0	16QAM	23.15	25.15
1.4	20393	3	#Mid	16QAM	23.15	25.15
1.4	20393	3	#Max	16QAM	23.06	25.06
1.4	20393	6	#0	16QAM	21.74	23.74

LTE Band 7						
Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Maximum Output Power (dBm)	EIRP (dBm)
5	20775	1	#0	QPSK	23.49	26.49
5	20775	1	#Mid	QPSK	23.35	26.35
5	20775	1	#Max	QPSK	23.20	26.20
5	20775	12	#0	QPSK	22.35	25.35
5	20775	12	#Mid	QPSK	22.34	25.34
5	20775	12	#Max	QPSK	22.34	25.34
5	20775	25	#0	QPSK	22.27	25.27
5	20775	1	#0	16QAM	22.11	25.11
5	20775	1	#Mid	16QAM	22.30	25.30
5	20775	1	#Max	16QAM	22.10	25.10
5	20775	12	#0	16QAM	21.29	24.29
5	20775	12	#Mid	16QAM	21.24	24.24
5	20775	12	#Max	16QAM	21.19	24.19
5	20775	25	#0	16QAM	21.17	24.17
5	21100	1	#0	QPSK	23.28	26.28
5	21100	1	#Mid	QPSK	23.26	26.26
5	21100	1	#Max	QPSK	23.21	26.21
5	21100	12	#0	QPSK	22.36	25.36
5	21100	12	#Mid	QPSK	22.37	25.37
5	21100	12	#Max	QPSK	22.43	25.43
5	21100	25	#0	QPSK	22.46	25.46
5	21100	1	#0	16QAM	22.36	25.36
5	21100	1	#Mid	16QAM	22.34	25.34
5	21100	1	#Max	16QAM	22.12	25.12
5	21100	12	#0	16QAM	21.15	24.15
5	21100	12	#Mid	16QAM	21.14	24.14
5	21100	12	#Max	16QAM	21.08	24.08
5	21100	25	#0	16QAM	21.41	24.41
5	21425	1	#0	QPSK	23.13	26.13
5	21425	1	#Mid	QPSK	23.37	26.37
5	21425	1	#Max	QPSK	23.36	26.36



5	21425	12	#0	QPSK	22.40	25.40
5	21425	12	#Mid	QPSK	22.42	25.42
5	21425	12	#Max	QPSK	22.32	25.32
5	21425	25	#0	QPSK	22.37	25.37
5	21425	1	#0	16QAM	22.30	25.30
5	21425	1	#Mid	16QAM	22.67	25.67
5	21425	1	#Max	16QAM	22.50	25.50
5	21425	12	#0	16QAM	21.47	24.47
5	21425	12	#Mid	16QAM	21.20	24.20
5	21425	12	#Max	16QAM	21.29	24.29
5	21425	25	#0	16QAM	21.36	24.36

LTE Band 12						
Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Maximum Output Power (dBm)	ERP (dBm)
10	23060	1	#0	QPSK	23.84	25.64
10	23060	1	#Mid	QPSK	24.05	25.85
10	23060	1	#Max	QPSK	23.85	25.65
10	23060	25	#0	QPSK	22.90	24.70
10	23060	25	#Mid	QPSK	22.91	24.71
10	23060	25	#Max	QPSK	23.10	24.90
10	23060	50	#0	QPSK	22.97	24.77
10	23060	1	#0	16QAM	23.00	24.80
10	23060	1	#Mid	16QAM	23.54	25.34
10	23060	1	#Max	16QAM	22.78	24.58
10	23060	25	#0	16QAM	22.00	23.80
10	23060	25	#Mid	16QAM	22.00	23.80
10	23060	25	#Max	16QAM	22.09	23.89
10	23060	50	#0	16QAM	22.02	23.82
10	23095	1	#0	QPSK	23.75	25.55
10	23095	1	#Mid	QPSK	24.20	26.00
10	23095	1	#Max	QPSK	23.79	25.59
10	23095	25	#0	QPSK	22.99	24.79
10	23095	25	#Mid	QPSK	22.99	24.79
10	23095	25	#Max	QPSK	22.95	24.75
10	23095	50	#0	QPSK	22.99	24.79
10	23095	1	#0	16QAM	23.53	25.33
10	23095	1	#Mid	16QAM	23.69	25.49
10	23095	1	#Max	16QAM	23.55	25.35
10	23095	25	#0	16QAM	21.94	23.74



10	23095	25	#Mid	16QAM	21.94	23.74
10	23095	25	#Max	16QAM	21.85	23.65
10	23095	50	#0	16QAM	21.87	23.67
10	23130	1	#0	QPSK	23.90	25.70
10	23130	1	#Mid	QPSK	24.29	26.09
10	23130	1	#Max	QPSK	23.74	25.54
10	23130	25	#0	QPSK	23.08	24.88
10	23130	25	#Mid	QPSK	23.08	24.88
10	23130	25	#Max	QPSK	22.96	24.76
10	23130	50	#0	QPSK	23.02	24.82
10	23130	1	#0	16QAM	22.58	24.38
10	23130	1	#Mid	16QAM	21.75	23.55
10	23130	1	#Max	16QAM	22.34	24.14
10	23130	25	#0	16QAM	21.99	23.79
10	23130	25	#Mid	16QAM	21.99	23.79
10	23130	25	#Max	16QAM	21.94	23.74
10	23130	50	#0	16QAM	21.96	23.76

LTE Band 13						
Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Maximum Output Power (dBm)	ERP (dBm)
5	23205	1	#0	QPSK	24.06	26.36
5	23205	1	#Mid	QPSK	24.06	26.36
5	23205	1	#Max	QPSK	24.01	26.31
5	23205	12	#0	QPSK	23.28	25.58
5	23205	12	#Mid	QPSK	23.27	25.57
5	23205	12	#Max	QPSK	23.16	25.46
5	23205	25	#0	QPSK	23.33	25.63
5	23205	1	#0	16QAM	23.10	25.40
5	23205	1	#Mid	16QAM	23.09	25.39
5	23205	1	#Max	16QAM	22.90	25.20
5	23205	12	#0	16QAM	21.82	24.12
5	23205	12	#Mid	16QAM	21.82	24.12
5	23205	12	#Max	16QAM	21.88	24.18
5	23205	25	#0	16QAM	22.01	24.31
5	23230	1	#0	QPSK	24.23	26.53
5	23230	1	#Mid	QPSK	24.19	26.49
5	23230	1	#Max	QPSK	24.03	26.33
5	23230	12	#0	QPSK	23.19	25.49
5	23230	12	#Mid	QPSK	23.21	25.51
5	23230	12	#Max	QPSK	23.30	25.60



5	23230	25	#0	QPSK	23.15	25.45
5	23230	1	#0	16QAM	23.53	25.83
5	23230	1	#Mid	16QAM	23.19	25.49
5	23230	1	#Max	16QAM	23.08	25.38
5	23230	12	#0	16QAM	22.16	24.46
5	23230	12	#Mid	16QAM	22.17	24.47
5	23230	12	#Max	16QAM	22.27	24.57
5	23230	25	#0	16QAM	22.01	24.31
5	23255	1	#0	QPSK	24.12	26.42
5	23255	1	#Mid	QPSK	24.16	26.46
5	23255	1	#Max	QPSK	24.20	26.50
5	23255	12	#0	QPSK	23.34	25.64
5	23255	12	#Mid	QPSK	23.35	25.65
5	23255	12	#Max	QPSK	23.25	25.55
5	23255	25	#0	QPSK	23.31	25.61
5	23255	1	#0	16QAM	23.14	25.44
5	23255	1	#Mid	16QAM	23.14	25.44
5	23255	1	#Max	16QAM	22.76	25.06
5	23255	12	#0	16QAM	21.84	24.14
5	23255	12	#Mid	16QAM	22.05	24.35
5	23255	12	#Max	16QAM	22.02	24.32
5	23255	25	#0	16QAM	22.05	24.35

LTE Band 66						
Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Maximum Output Power (dBm)	EIRP (dBm)
5	131997	1	#0	QPSK	23.86	25.86
5	131997	1	#Mid	QPSK	24.17	26.17
5	131997	1	#Max	QPSK	23.91	25.91
5	131997	12	#0	QPSK	22.98	24.98
5	131997	12	#Mid	QPSK	22.98	24.98
5	131997	12	#Max	QPSK	23.02	25.02
5	131997	25	#0	QPSK	23.09	25.09
5	131997	1	#0	16QAM	22.65	24.65
5	131997	1	#Mid	16QAM	22.83	24.83
5	131997	1	#Max	16QAM	22.05	24.05
5	131997	12	#0	16QAM	21.80	23.80
5	131997	12	#Mid	16QAM	21.80	23.80
5	131997	12	#Max	16QAM	21.99	23.99
5	131997	25	#0	16QAM	21.91	23.91
5	132322	1	#0	QPSK	23.94	25.94

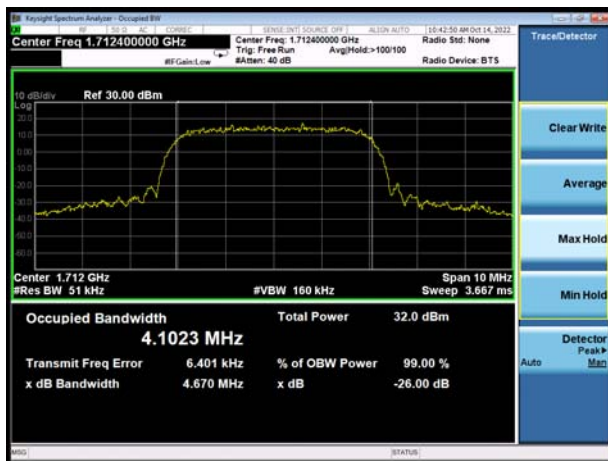


5	132322	1	#Mid	QPSK	24.03	26.03
5	132322	1	#Max	QPSK	23.89	25.89
5	132322	12	#0	QPSK	23.16	25.16
5	132322	12	#Mid	QPSK	23.16	25.16
5	132322	12	#Max	QPSK	23.15	25.15
5	132322	25	#0	QPSK	23.18	25.18
5	132322	1	#0	16QAM	23.12	25.12
5	132322	1	#Mid	16QAM	22.78	24.78
5	132322	1	#Max	16QAM	22.76	24.76
5	132322	12	#0	16QAM	22.09	24.09
5	132322	12	#Mid	16QAM	22.16	24.16
5	132322	12	#Max	16QAM	22.01	24.01
5	132322	25	#0	16QAM	22.23	24.23
5	132647	1	#0	QPSK	23.81	25.81
5	132647	1	#Mid	QPSK	24.16	26.16
5	132647	1	#Max	QPSK	23.77	25.77
5	132647	12	#0	QPSK	23.07	25.07
5	132647	12	#Mid	QPSK	23.01	25.01
5	132647	12	#Max	QPSK	23.13	25.13
5	132647	25	#0	QPSK	23.01	25.01
5	132647	1	#0	16QAM	22.94	24.94
5	132647	1	#Mid	16QAM	23.26	25.26
5	132647	1	#Max	16QAM	22.54	24.54
5	132647	12	#0	16QAM	21.92	23.92
5	132647	12	#Mid	16QAM	21.93	23.93
5	132647	12	#Max	16QAM	21.96	23.96
5	132647	25	#0	16QAM	21.97	23.97

6.2 Occupied Bandwidth

Mode	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
WCDMA Band IV (RMC)	1312	1712.4	4.102	4.670
	1413	1732.6	4.101	4.671
	1513	1752.6	4.119	4.700

WCDMA Band IV CH-Low



WCDMA Band IV CH Middle



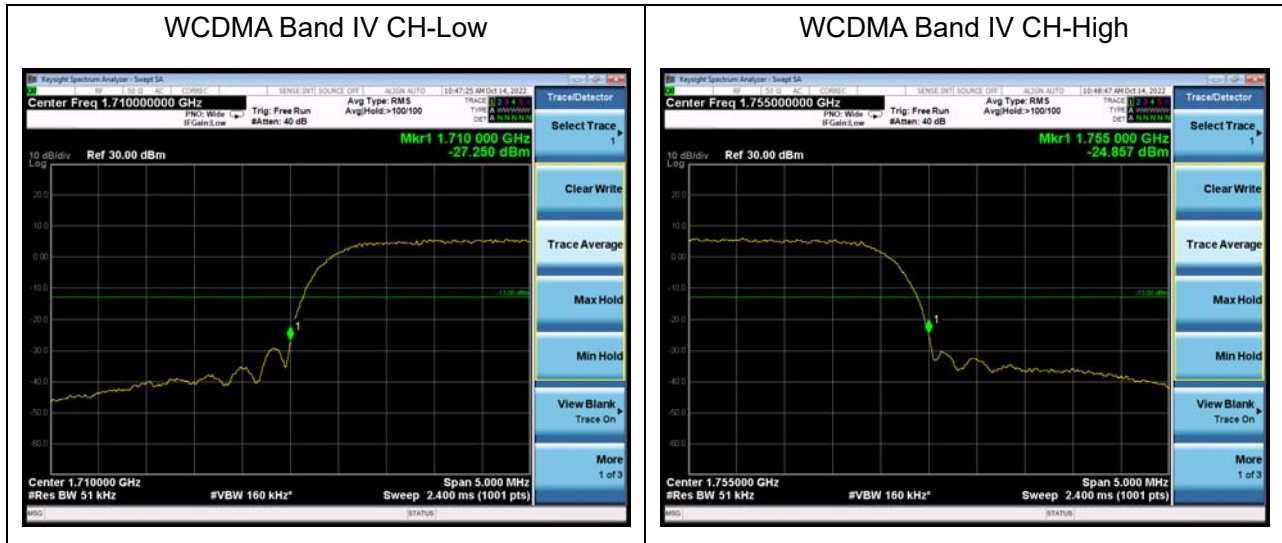
WCDMA Band IV CH High





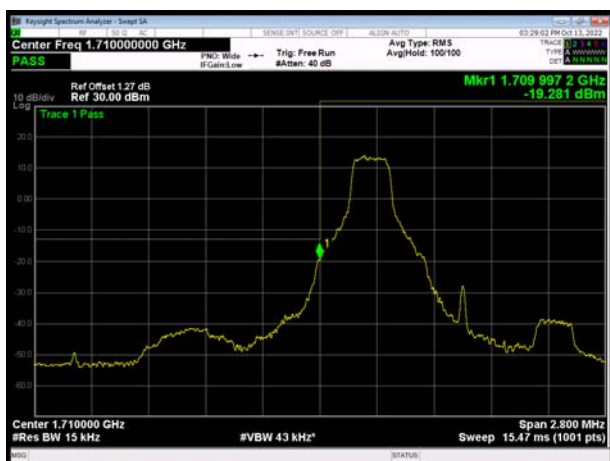
6.3 Band Edge Compliance

All the test traces in the plots shows the test results clearly.

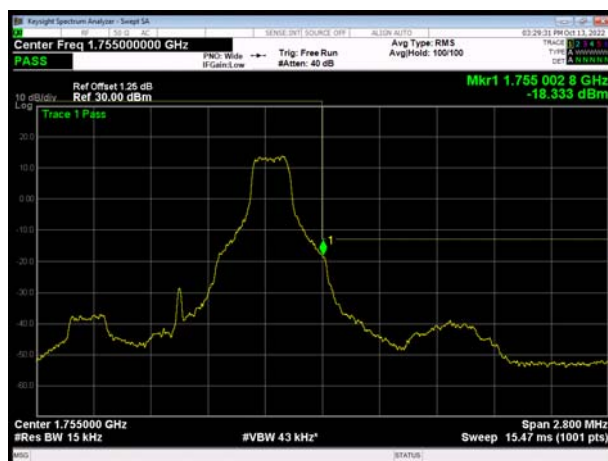




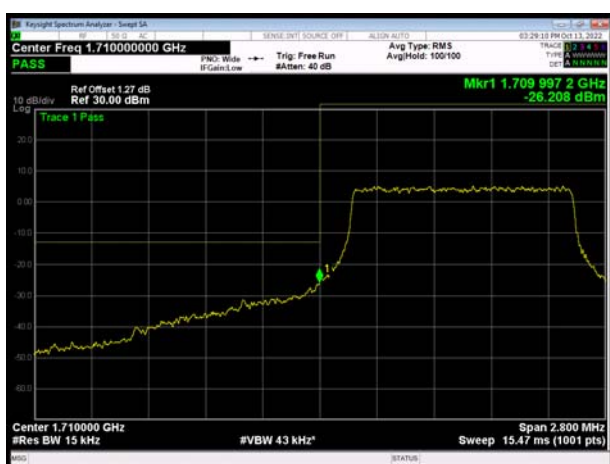
LTE Band 4 QPSK 1.4MHz CH-Low, 1 RB



LTE Band 4 QPSK 1.4MHz CH-High, 1 RB



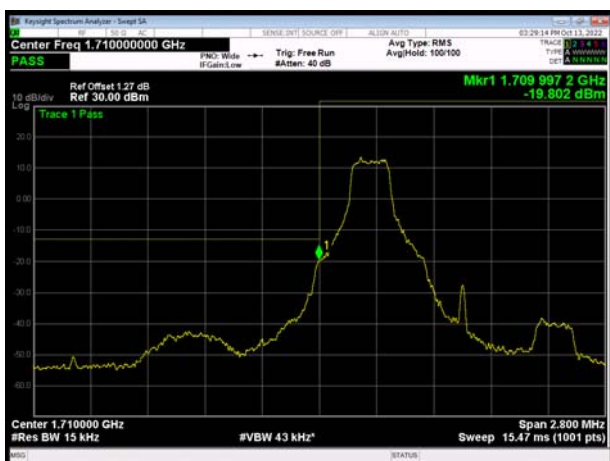
LTE Band 4 QPSK 1.4MHz CH-Low, 100%RB



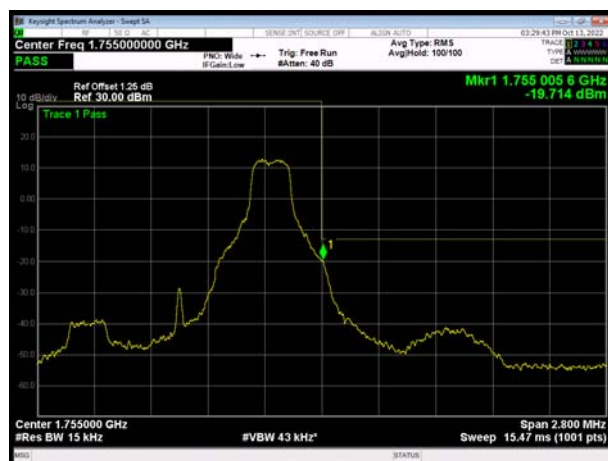
LTE Band 4 QPSK 1.4MHz CH-High, 100%RB



LTE Band 4 16QAM 1.4MHz CH-Low, 1 RB



LTE Band 4 16QAM 1.4MHz CH-High, 1 RB





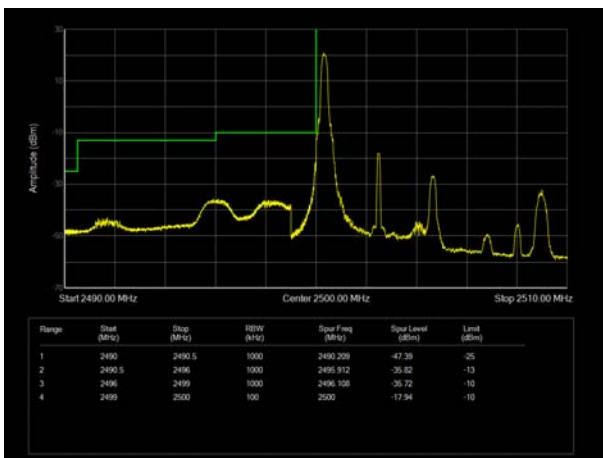
LTE Band 4 16QAM 1.4MHz CH-Low, 100%RB



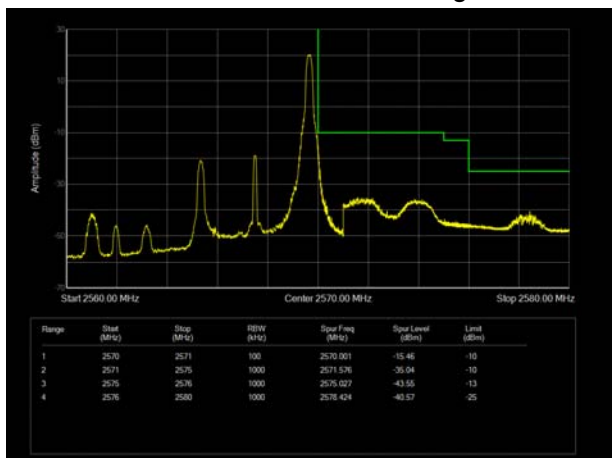
LTE Band 4 16QAM 1.4MHz CH-High, 100%RB



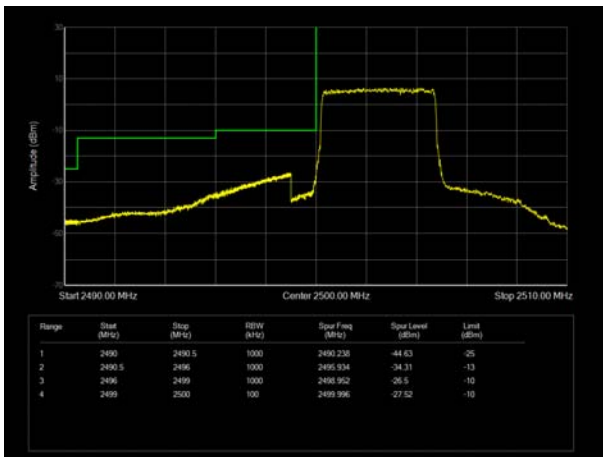
LTE Band 7 QPSK 5MHz CH-Low, 1 RB



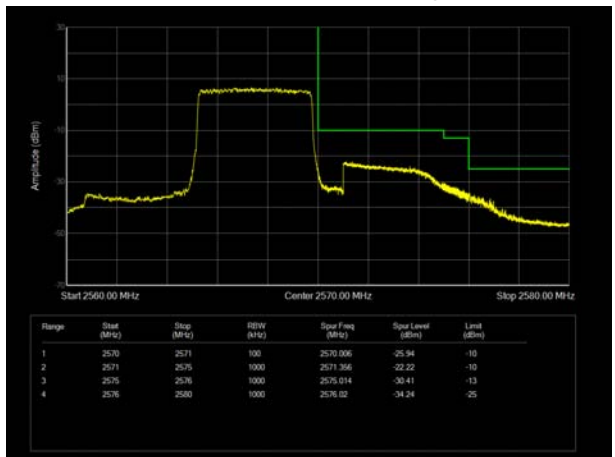
LTE Band 7 QPSK 5MHz CH-High, 1 RB



LTE Band 7 QPSK 5MHz CH-Low, 100%RB

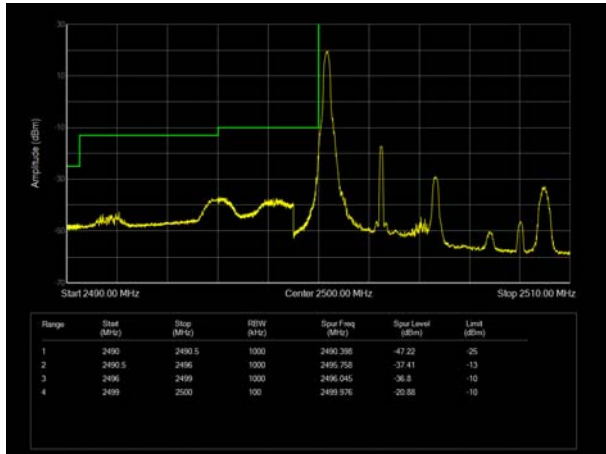


LTE Band 7 QPSK 5MHz CH-High, 100%RB

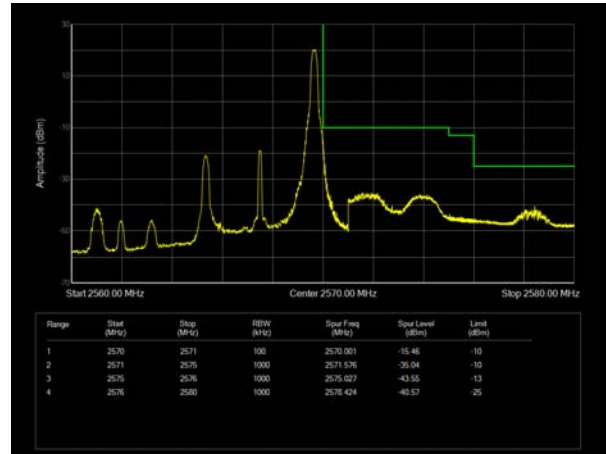




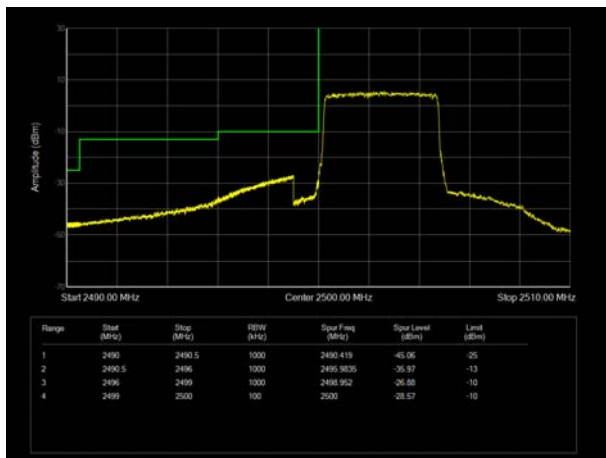
LTE Band 7 16QAM 5MHz CH-Low, 1 RB



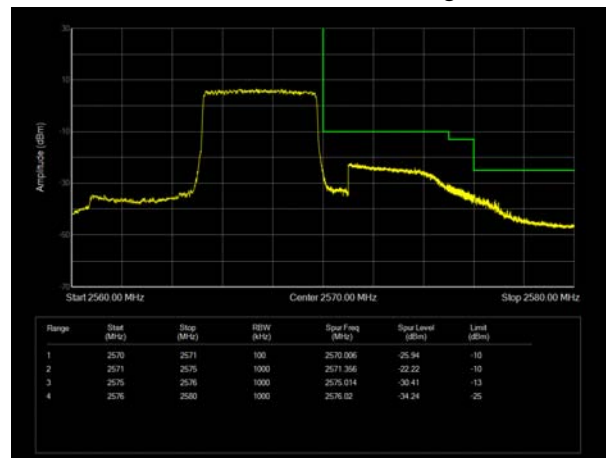
LTE Band 7 16QAM 5MHz CH-High, 1 RB



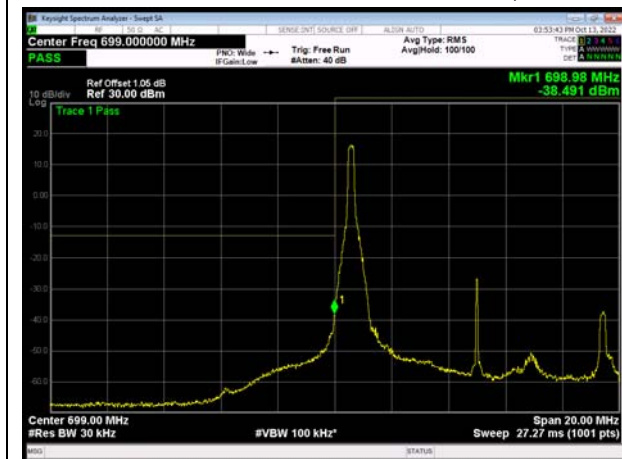
LTE Band 7 16QAM 5MHz CH-Low, 100%RB



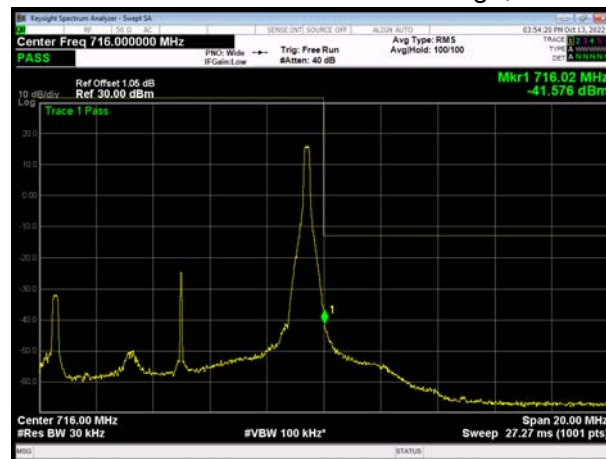
LTE Band 7 16QAM 5MHz CH-High, 100%RB



LTE Band 12 QPSK 10MHz CH-Low, 1 RB

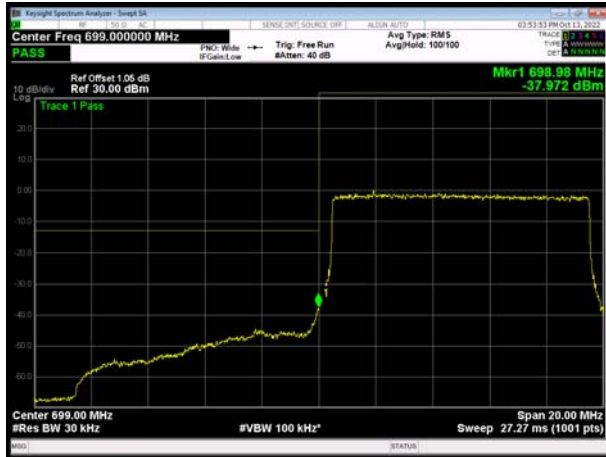


LTE Band 12 QPSK 10MHz CH-High, 1 RB





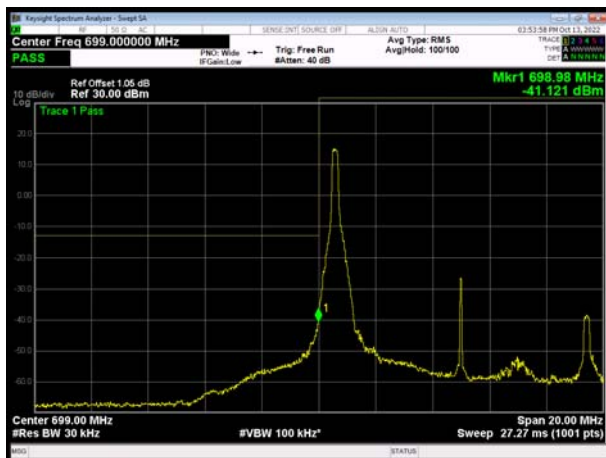
LTE Band 12 QPSK 10MHz CH-Low, 100%RB



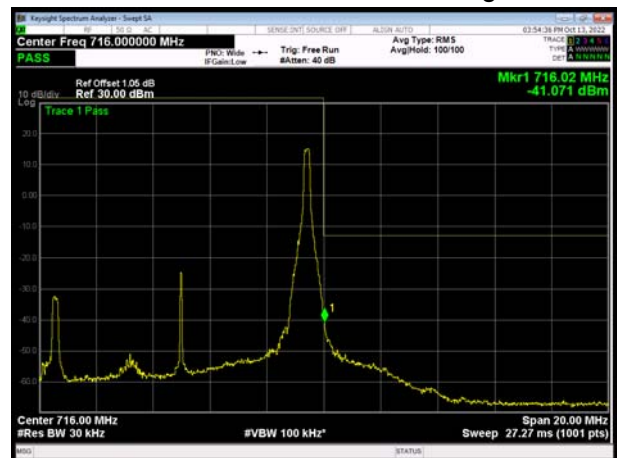
LTE Band 12 QPSK 10MHz CH-High, 100%RB



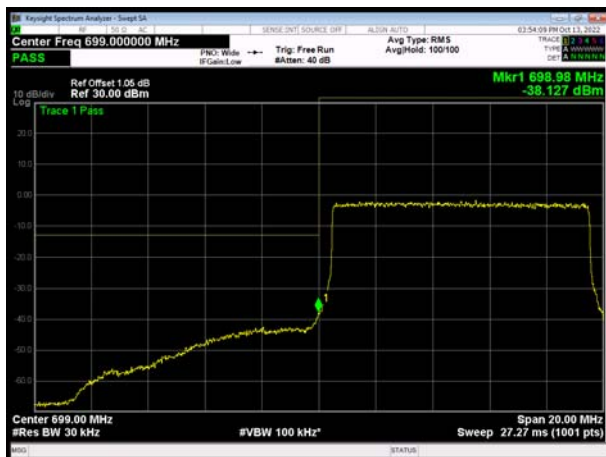
LTE Band 12 16QAM 10MHz CH-Low, 1 RB



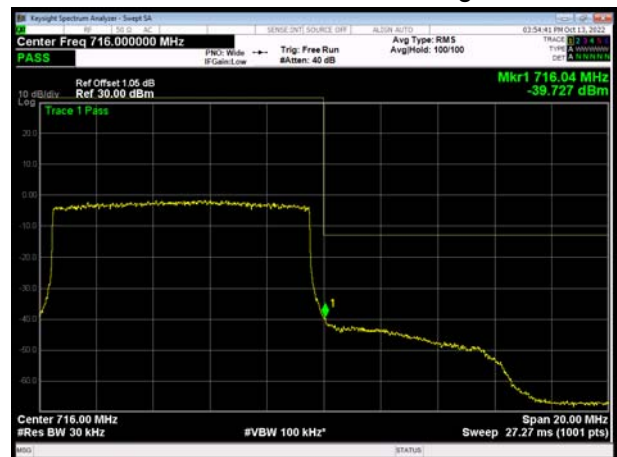
LTE Band 12 16QAM 10MHz CH-High, 1 RB



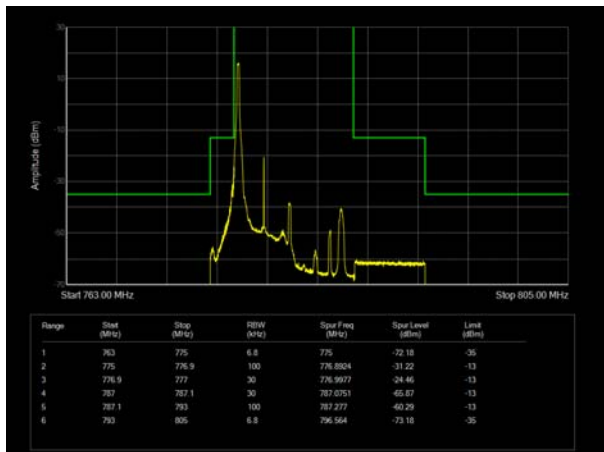
LTE Band 12 16QAM 10MHz CH-Low, 100%RB



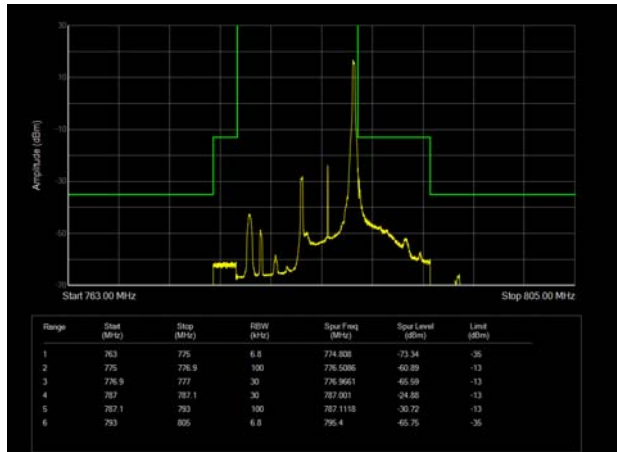
LTE Band 12 16QAM 10MHz CH-High, 100%RB



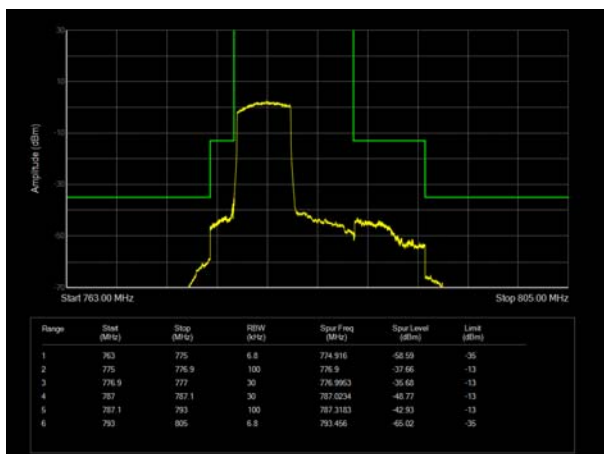
LTE Band 13 QPSK 5MHz CH-Low, 1 RB



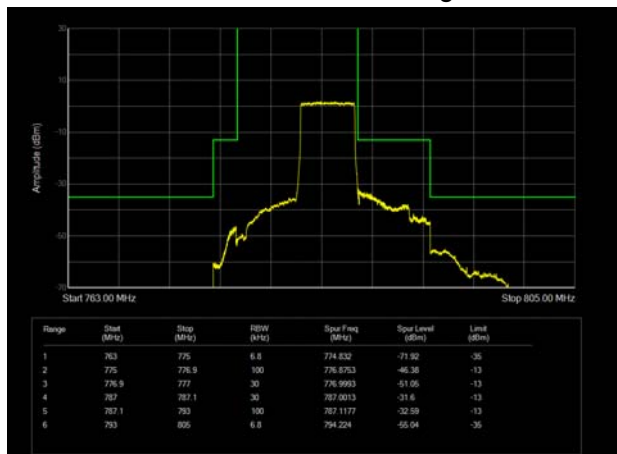
LTE Band 13 QPSK 5MHz CH-High, 1 RB



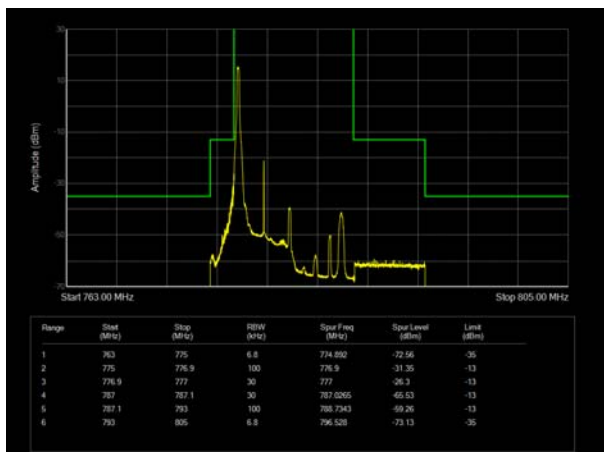
LTE Band 13 QPSK 5MHz CH-Low, 100%RB



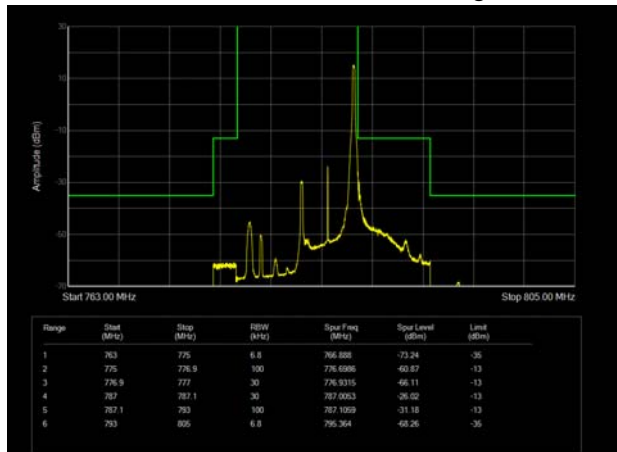
LTE Band 13 QPSK 5MHz CH-High, 100%RB



LTE Band 13 16QAM 5MHz CH-Low, 1 RB

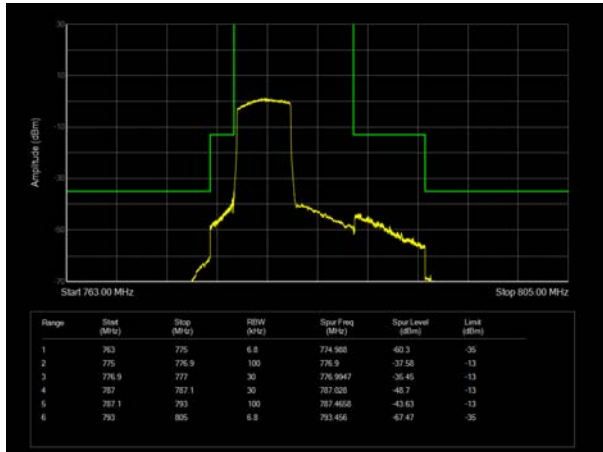


LTE Band 13 16QAM 5MHz CH-High, 1 RB

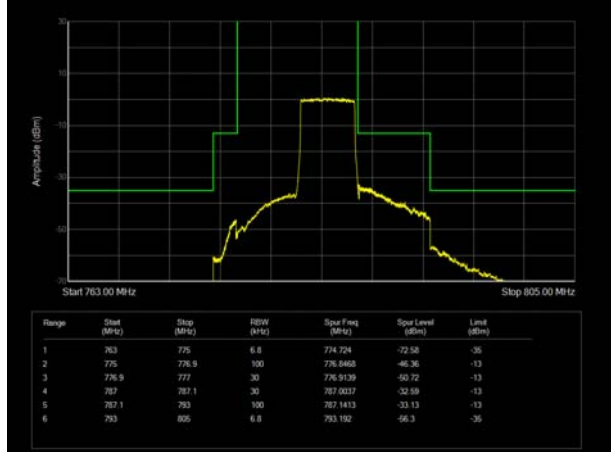




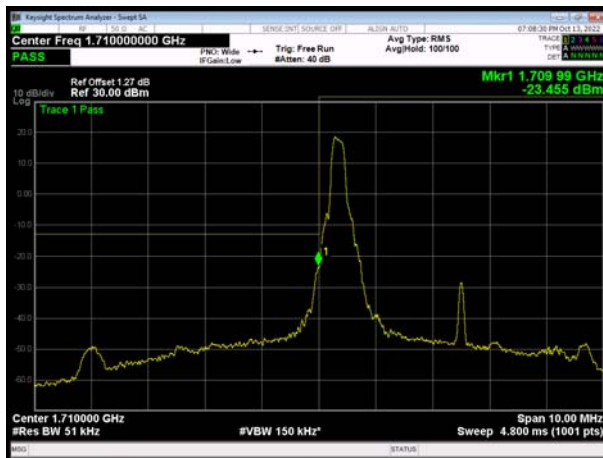
LTE Band 13 16QAM 5MHz CH-Low, 100%RB



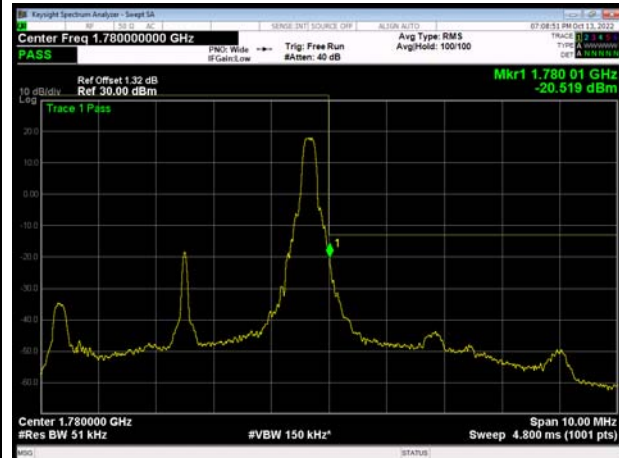
LTE Band 13 16QAM 5MHz CH-High, 100%RB



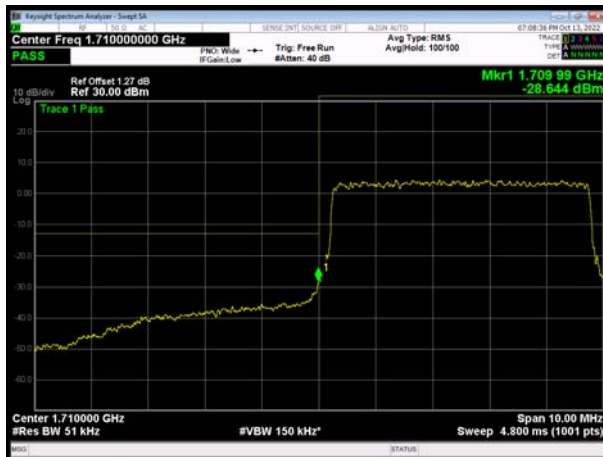
LTE Band 66 QPSK 5MHz CH-Low, 1 RB



LTE Band 66 QPSK 5MHz CH-High, 1 RB



LTE Band 66 QPSK 5MHz CH-Low, 100%RB

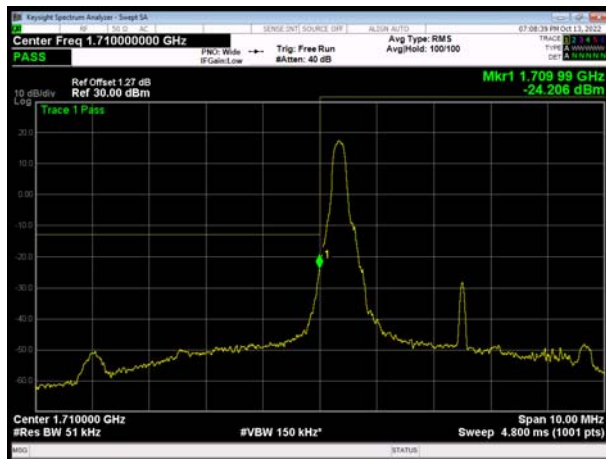


LTE Band 66 QPSK 5MHz CH-High, 100%RB

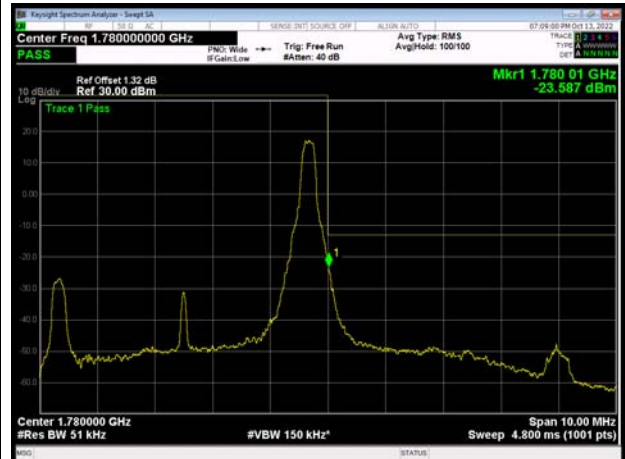




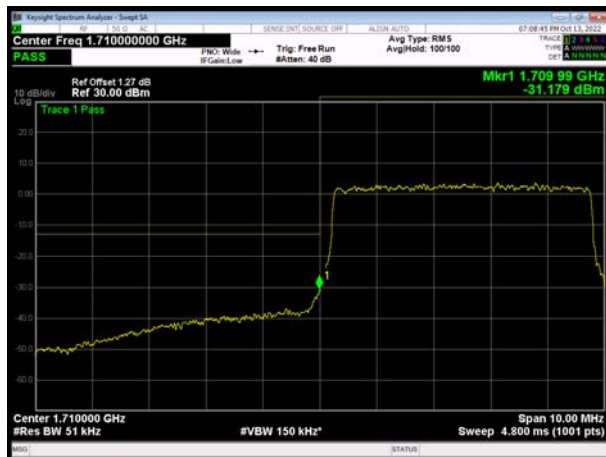
LTE Band 66 16QAM 5MHz CH-Low, 1 RB



LTE Band 66 16QAM 5MHz CH-High, 1 RB



LTE Band 66 16QAM 5MHz CH-Low, 100%RB



LTE Band 66 16QAM 5MHz CH-High, 100%RB



6.4 Peak-to-Average Power Ratio (PAPR)

WCDMA Band IV	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
RMC	1312	1712.4	26.40	23.41	2.99	≤13	PASS
	1413	1732.6	26.51	23.57	2.94	≤13	PASS
	1513	1752.6	26.27	23.36	2.91	≤13	PASS

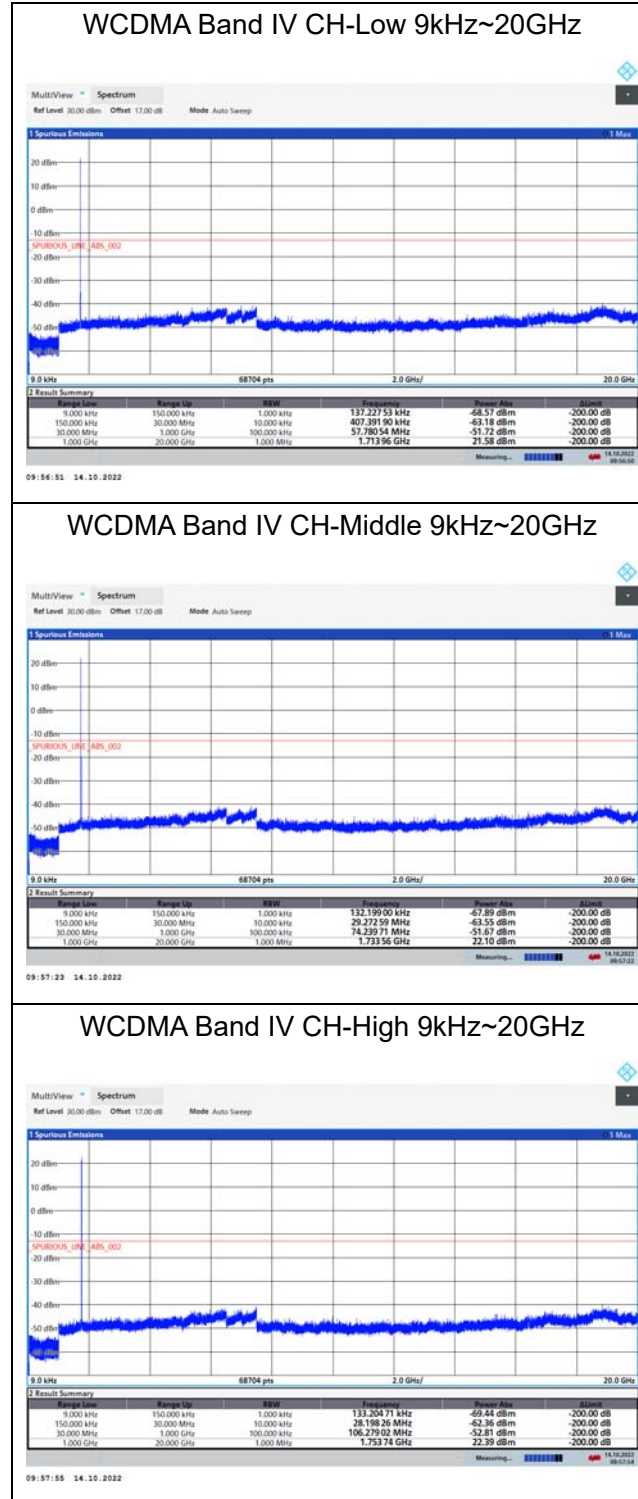
6.5 Frequency Stability

WCDMA Band IV						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
Temperature	Voltage	QPSK	BPSK	QPSK	BPSK	
Normal (25℃)	Normal	6.49	2.81	0.00375	0.00162	PASS
Extreme (50℃)		2.98	12.75	0.00172	0.00736	PASS
Extreme (40℃)		2.59	15.47	0.00150	0.00893	PASS
Extreme (30℃)		14.41	12.78	0.00832	0.00738	PASS
Extreme (20℃)		16.32	7.82	0.00942	0.00451	PASS
Extreme (10℃)		3.67	1.32	0.00212	0.00076	PASS
Extreme (0℃)		3.94	9.51	0.00227	0.00549	PASS
Extreme (-10℃)		13.76	1.16	0.00794	0.00067	PASS
Extreme (-20℃)		6.22	15.18	0.00359	0.00876	PASS
Extreme (-30℃)		2.07	11.13	0.00120	0.00642	PASS
25℃	LV	14.85	6.24	0.00857	0.00360	PASS
	HV	8.55	14.54	0.00494	0.00839	PASS

6.6 Spurious Emissions at Antenna Terminals

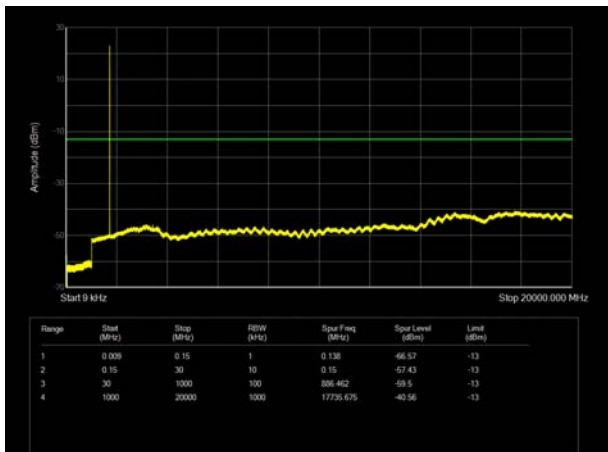
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The signal beyond the limit is carrier.

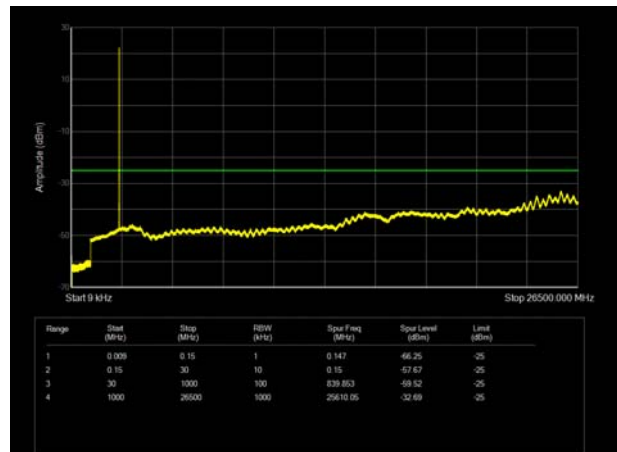




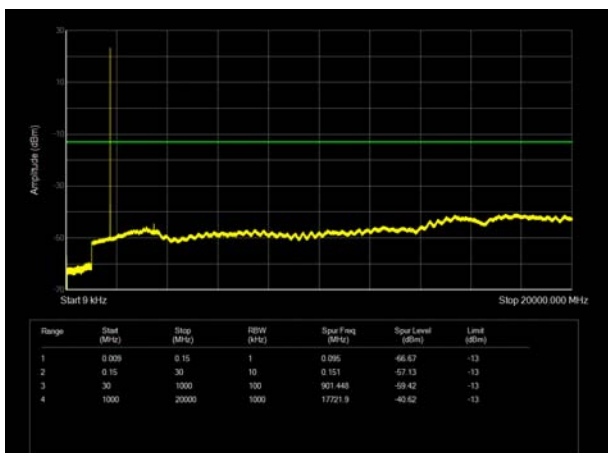
LTE Band 4 1.4MHz CH-Low 9kHz~20GHz



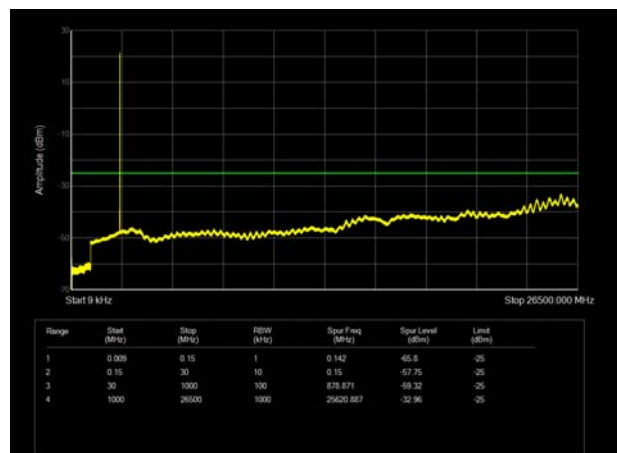
LTE Band 7 5MHz CH- Low 9kHz~26.5GHz



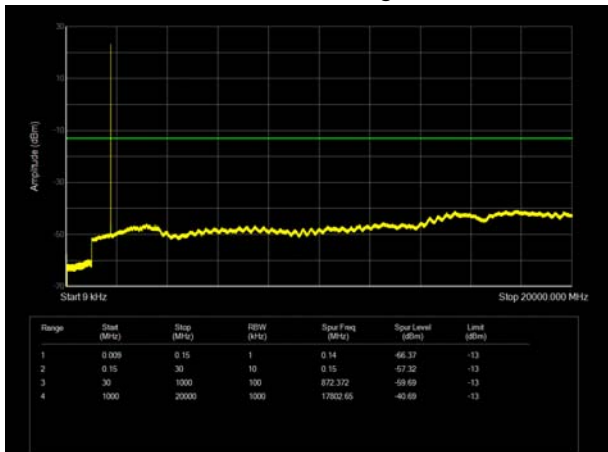
LTE Band 4 1.4MHz CH- Middle 9kHz~20GHz



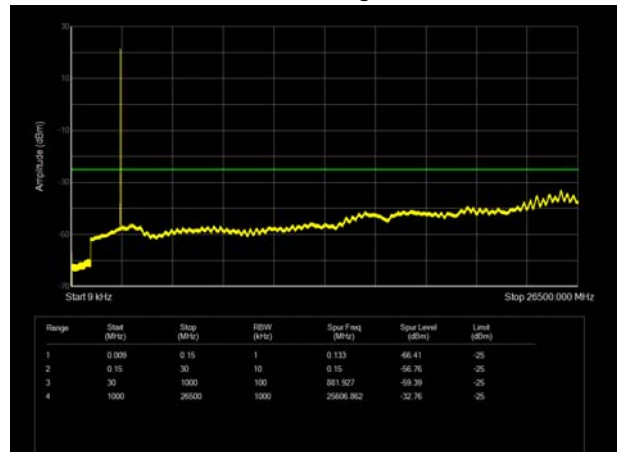
LTE Band 7 5MHz CH- Middle 9kHz~26.5GHz



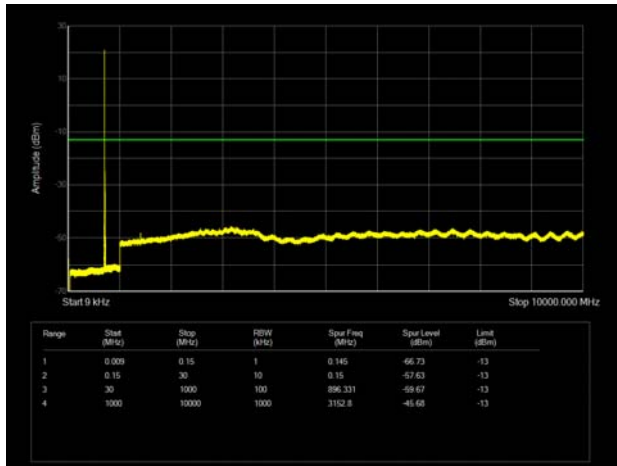
LTE Band 4 1.4MHz CH- High 9kHz~20GHz



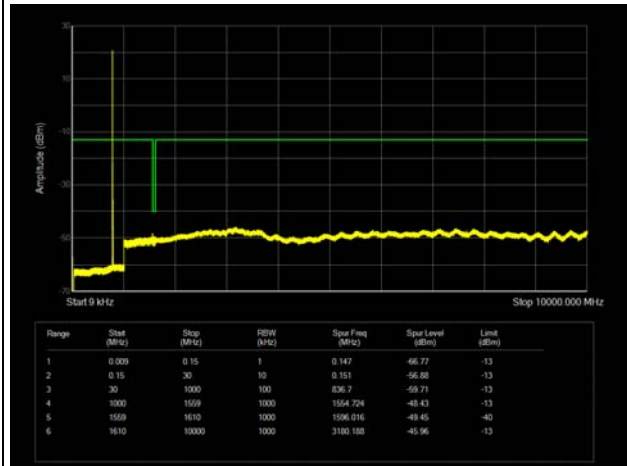
LTE Band 7 5MHz CH-High 9kHz~26.5GHz



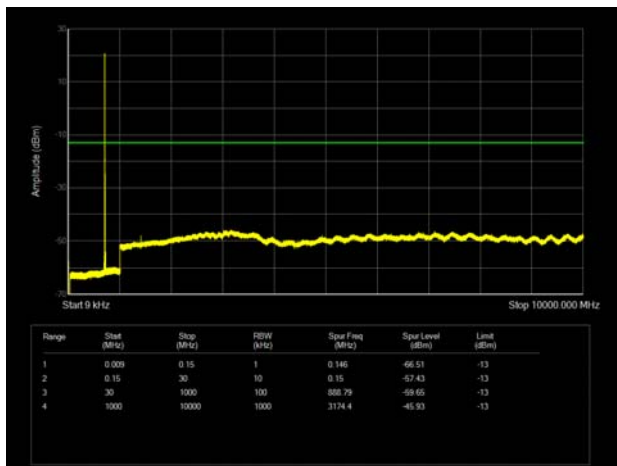
LTE Band 12 10MHz CH-Low 9kHz ~10GHz



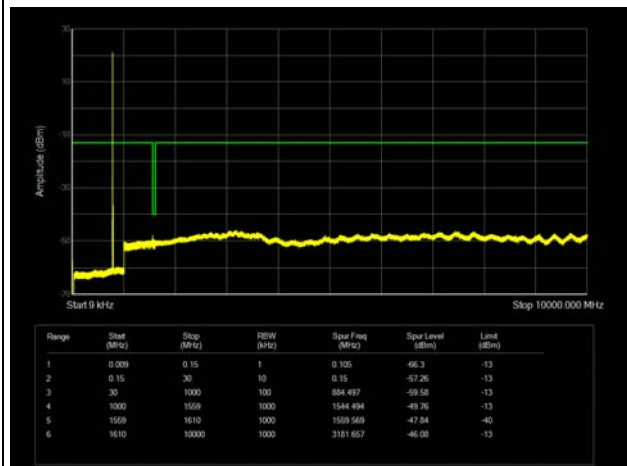
LTE Band 13 5MHz CH-Low 9kHz ~10GHz



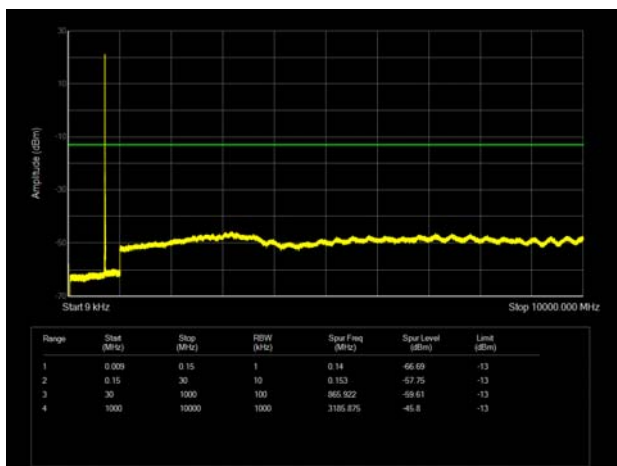
LTE Band 12 10MHz CH- Middle 9kHz ~10GHz



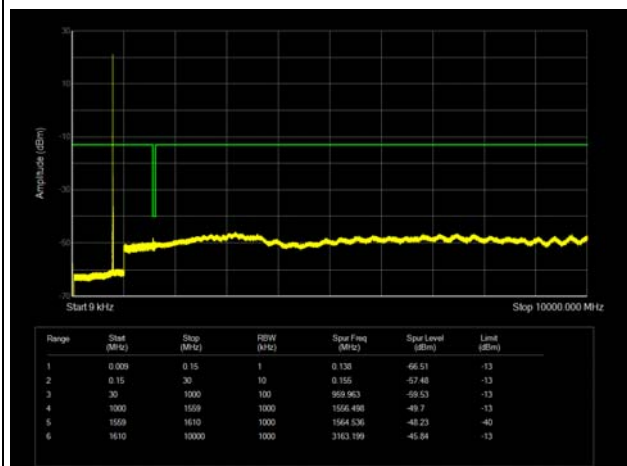
LTE Band 13 5MHz CH-Middle 9kHz ~10GHz



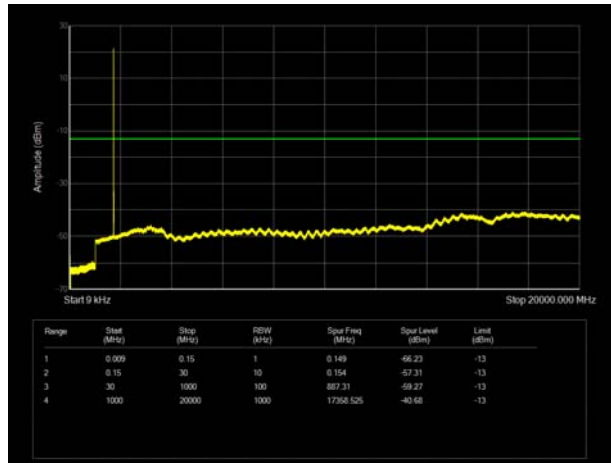
LTE Band 12 10MHz CH-High 9kHz ~10GHz



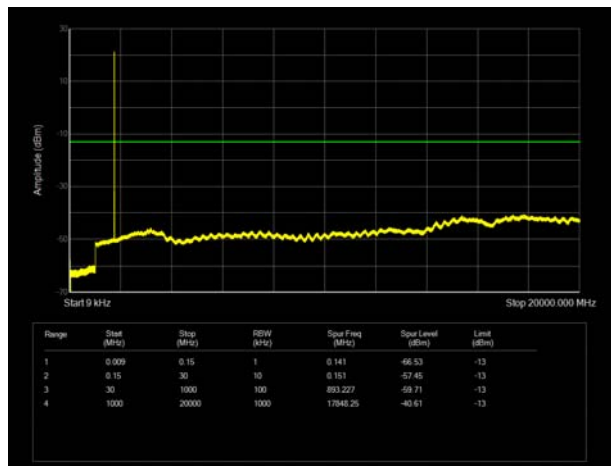
LTE Band 13 5MHz CH-High 9kHz ~10GHz



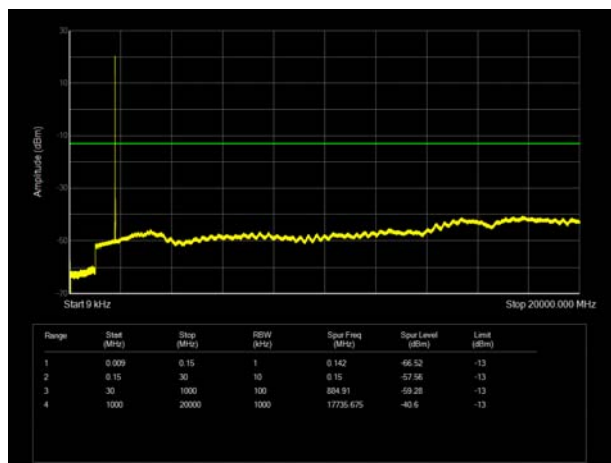
LTE Band 66 5MHz CH-Low 9kHz ~20GHz



LTE Band 66 5MHz CH-Middle 9kHz ~20GHz



LTE Band 66 5MHz CH-High 9kHz ~20GHz



6.7 Radiated Spurious Emission

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

WCDMA Band IV CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3465.20	-54.78	2.70	12.70	Horizontal	-44.78	-13.00	31.78	180
3	5197.80	-60.63	3.20	12.50	Horizontal	-51.33	-13.00	38.33	0
4	6930.40	-60.85	4.20	11.80	Horizontal	-53.25	-13.00	40.25	315
5	8663.00	-56.42	4.40	12.50	Horizontal	-48.32	-13.00	35.32	45
6	10395.60	-51.99	4.70	11.30	Horizontal	-45.39	-13.00	32.39	225
7	12128.20	-51.08	5.20	13.80	Horizontal	-42.48	-13.00	29.48	90
8	13860.80	-51.26	5.70	11.30	Horizontal	-45.66	-13.00	32.66	135
9	15593.40	-52.89	6.10	16.80	Horizontal	-42.19	-13.00	29.19	180
10	17326.00	-50.42	6.10	14.20	Horizontal	-42.32	-13.00	29.32	45
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

LTE Band 4 QPSK 1.4MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3464.25	-48.88	2.70	12.70	Vertical	-38.88	-13.00	25.88	45
3	5197.50	-60.32	3.20	12.50	Vertical	-51.02	-13.00	38.02	0
4	6930.00	-60.27	4.20	11.80	Vertical	-52.67	-13.00	39.67	315
5	8662.50	-56.56	4.40	12.50	Vertical	-48.46	-13.00	35.46	225
6	10395.00	-52.87	4.70	11.30	Vertical	-46.27	-13.00	33.27	90
7	12127.50	-54.45	5.20	13.80	Vertical	-45.85	-13.00	32.85	45
8	13860.00	-49.26	5.70	11.30	Vertical	-43.66	-13.00	30.66	0
9	15592.50	-52.11	6.10	16.80	Vertical	-41.41	-13.00	28.41	90
10	17325.00	-51.14	6.10	14.20	Vertical	-43.04	-13.00	30.04	45
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									



LTE Band 7 QPSK 5MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5065.80	-59.85	3.40	12.50	Vertical	-50.75	-25.00	25.75	45
3	7598.60	-58.02	4.40	12.20	Vertical	-50.22	-25.00	25.22	0
4	10130.63	-50.45	4.70	11.30	Vertical	-43.85	-25.00	18.85	90
5	12675.00	-50.78	5.40	13.20	Vertical	-42.98	-25.00	17.98	45
6	15210.00	-47.44	6.10	13.10	Vertical	-40.44	-25.00	15.44	0
7	17745.00	-51.38	6.10	14.20	Vertical	-43.28	-25.00	18.28	315
8	20280.00	--	--	--	--	--	--	--	--
9	22815.00	--	--	--	--	--	--	--	--
10	25350.00	--	--	--	--	--	--	--	--

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.

LTE Band 12 QPSK 10MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1406.40	-54.32	1.70	8.70	Vertical	-49.47	-13.00	36.47	135
3	2109.60	-53.68	2.10	11.10	Vertical	-46.83	-13.00	33.83	90
4	2812.80	-52.43	2.30	13.10	Vertical	-43.78	-13.00	30.78	315
5	3537.50	-63.83	2.60	12.70	Vertical	-55.88	-13.00	42.88	225
6	4245.00	-61.78	3.30	12.50	Vertical	-54.73	-13.00	41.73	45
7	4952.50	-59.72	3.40	12.50	Vertical	-52.77	-13.00	39.77	0
8	5660.00	-58.84	3.30	12.50	Vertical	-51.79	-13.00	38.79	90
9	6367.50	-57.40	3.80	11.50	Vertical	-51.85	-13.00	38.85	45
10	7075.00	-57.48	4.20	11.80	Vertical	-52.03	-13.00	39.03	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.



LTE Band 13 QPSK 5MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1559.66	-53.66	1.70	8.70	Vertical	-46.66	-40.00	6.66	135
Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
3	2339.73	-49.89	2.10	12.00	Vertical	-42.14	-13.00	29.14	180
4	3118.00	-64.35	2.30	13.10	Vertical	-55.70	-13.00	42.70	135
5	3897.50	-62.90	2.90	12.50	Vertical	-55.45	-13.00	42.45	90
6	4677.00	-59.69	3.10	12.50	Vertical	-52.44	-13.00	39.44	45
7	5456.50	-59.00	3.30	12.50	Vertical	-51.95	-13.00	38.95	225
8	6236.00	-58.41	3.50	12.80	Vertical	-51.26	-13.00	38.26	135
9	7015.50	-56.64	4.20	11.80	Vertical	-51.19	-13.00	38.19	0
10	7795.00	-54.02	4.40	12.30	Vertical	-48.27	-13.00	35.27	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.

LTE Band 66 QPSK 5MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3486.00	-56.40	2.70	12.70	Vertical	-46.40	-13.00	33.40	225
3	5229.00	-71.86	3.20	12.50	Vertical	-62.56	-13.00	49.56	135
4	6972.00	-70.84	4.20	11.80	Vertical	-63.24	-13.00	50.24	90
5	8715.00	-67.27	4.40	12.50	Vertical	-59.17	-13.00	46.17	0
6	10458.00	-62.21	4.70	11.80	Vertical	-55.11	-13.00	42.11	180
7	12201.00	-62.67	5.20	13.80	Vertical	-54.07	-13.00	41.07	135
8	13944.00	-62.18	5.70	13.20	Vertical	-54.68	-13.00	41.68	90
9	15687.00	-63.04	6.10	16.80	Vertical	-52.34	-13.00	39.34	45
10	17430.00	-61.06	6.10	14.20	Vertical	-52.96	-13.00	39.96	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.



7 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	150415	2022-05-14	2023-05-13
Spectrum Analyzer	Keysight	N9020A	MY50510203	2021-12-12	2022-12-11
Signal Analyzer	R&S	FSV3030	101411	2021-12-12	2022-12-11
Climatic Chamber	ESPEC	SU-242	93000506	2021-12-12	2022-12-11
Universal Radio Communication Tester	Agilent	E5515C	GB44400275	2021-12-12	2022-12-11
Radiated Spurious Emissions					
Signal Analyzer	R&S	FSV30	100815	2021-12-12	2022-12-11
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2020-04-02	2023-04-01
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	01439	2021-06-30	2024-06-29
Horn Antenna	Schwarzbeck	BBHA 9120D	01799	2022-09-01	2025-08-31
Horn Antenna	ETS-Lindgren	3160-09	00102643	2021-10-10	2024-10-09
Software	R&S	EMC32	10.35.10	/	/

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



ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.



ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.