FCC Test Report

Report No.: AGC02762230903FR02

FCC ID	:	2BCTG-S10
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	4G Feature Phone
BRAND NAME	:	QLYX
MODEL NAME	:	S10, S10+
APPLICANT	:	A.V. World of Technology Ltd
DATE OF ISSUE	:	Sep. 26, 2023
STANDARD(S)	:	FCC Part 22 Subpart H
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd.

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Sep. 26, 2023	Valid	Initial Release

Table of Contents

1. General Information

Applicant	A.V. World of Technology Ltd
Address	Avinadav 3 Jerusalem Israel
Manufacturer	A.V. World of Technology Ltd
Address	Avinadav 3 Jerusalem Israel
Factory	N/A
Address	N/A
Product Designation	4G Feature Phone
Brand Name	QLYX
Test Model	S10
Series Model(s)	S10+
Difference Description	All the same except the model name
Date of receipt of test item	Sep. 09, 2023
Date of Test	Sep. 09, 2023~Sep. 26, 2023
Deviation from Standard	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Test Report Form No	AGCER-FCC-GSM&WCDMA-V1

Note:The test results of this report relate only to the tested sample identified in this report.

Prepared By	Bibo Zhang (Project Engineer)	Sep. 26, 2023
Reviewed By	Calvin Liu (Reviewer)	Sep. 26, 2023
Approved By	Max Zhang Authorized Officer	Sep. 26, 2023

2. Product Information

2.1 Product Technical Description

Support Networks	WCDMA, HSDPA, HSUPA		
Hardware Version	L900B_MB_V0.1		
Software Version	L900B_RSK_T242A_S10_US_V02		
Support Frequency Band	☐GPRS 850	☐PCS1900	☐UMTS FDD Band II
	☐UMTS FDD Band IV	☒UMTS FDD Band V	(U.S. Bands)
	☐GSM 900	☐DCS 1800	☒UMTS FDD Band I
	☒UMTS FDD Band VIII	(Non-U.S. Bands)	
Frequency Range	826.4MHz-846.6 MHz (WCDMA Band V)		
Type of Modulation	BPSK/QPSK Modulation For WCDMA/HSDPA/HSUPA		
Emission Designator	WCDMA Band V:	4M18F9W	
Antenna Designation	PIFA Antenna		
Antenna Gain	WCDMA850:-1.41dBi		
Power Supply	DC 3.7V by Built-in Li-ion Battery		
Dual Card	WCDMA Card Slot		
Extreme Vol. Limits	DC3.15V to 4.20V (Normal: DC 3.7V)		
Extreme Temp. Tolerance	-30 °C to +50 °C		
Temperature Range	-20℃ to +50℃		

GSM/WCDMA SLOT 1:

	Maximum ERP/EIRP (dBm)	Max. Average Burst Power (dBm)
UMTS BAND V	19.05	21.23

GSM/WCDMA SLOT 2:

	Maximum ERP/EIRP (dBm)	Max. Average Burst Power (dBm)
UMTS BAND V	18.26	20.15

2.2 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **2BCTG-S10,** filing to comply with Part 2, Part 22 of the Federal Communication Commission rules.

2.3 Test Methodology

The tests were performed according to following standards:

No.	Identity	Document Title
1	47 CFR FCC Part 2	Frequency allocations and radio treaty matters, general rules and regulations.
2	47 CFR FCC Part 22	Public Mobile Services.
3	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
4	ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
5	KDB 971168	D01 v03r01 Measurement Guidance For Certification Of Licensed Digital Transmitters.

2.4 Device Capabilities

850WCDMA/HSPA, Multi-Band LTE, Bluetooth (1X, EDR).

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration.

The emissions below 1GHz and above 18GHz were tested with the highest transmitting power channel and the worst case configuration.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape),and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

This device supports dual-SIM communication, and only the data corresponding to the worst card slot (SIM Card 1) is reflected in the report.

2.5 Special Accessories

The battery was supplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

2.6 Equipment Modifications

Not available for this EUT intended for grant.

2.7 Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

3. Test Environment

3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories).

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

IC-Registration No.: 24842 (CAB identifier: CN0063)

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

3.3 Environmental Conditions

	Normal Conditions	Extreme Conditions
Temperature range	15~35℃	-30℃~50℃
Humidty range	20 % to 75 %.	20 % to 75 %.
Pressure range	86-106kPa	86-106kPa
Power supply	DC 3.70V	LV DC 3.15V or HV 4.2V
Note: The Extreme Temperature and Extreme Voltages declared by the manufacturer.		

3.4 Measurement Uncertainty

Test	Measurement Uncertainty
Transmitter power conducted	±0.57 dB
Transmitter power Radiated	±2.20 dB
Conducted spurious emission 9kHz-40 GHz	±2.20 dB
Occupied Bandwidth	±0.01ppm
Radiated Emission 30~1000MHz	±4.10dB
Radiated Emission Above 1GHz	±4.32dB
Conducted Disturbance:0.15~30MHz	±3.20dB
Radio Frequency	± 6.5 x 10-8
RF Power, Conducted	± 0.9 dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5 List of Test Equipment

● RF Conducted Test System

Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☒	AGC-ER-E087	Spectrum Analyzer	KEYSIGHT	N9020B	MY56101792	2023-06-01	2024-05-31
☒	AGC-ER-E032	Universal Radio Communication Tester	R&S	CMW500	120909	2023-07-05	2024-07-04
☒	AGC-ER-E075	Small Environmental Tester	SH-242	ESPEC	93008290	2022-08-03	2024-08-02
☒	--	Universal Switch Control Unit	Tonscend	JS	N/A	N/A	N/A
☐	AGC-ER-E033	RF Test Plat (DECT)	RTX	RTX-2012-HS-RF	N/A	2022-08-04	2024-08-03
☒	--	RF Connection Cable	N/A	1#	N/A	Each time	N/A
☒	--	RF Connection Cable	N/A	2#	N/A	Each time	N/A

● Radiated Spurious Emission

Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☒	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2023-02-18	2024-02-17
☒	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2023-06-01	2024-05-31
☒	AGC-ER-E032	Universal Radio Communication Tester	R&S	CMW500	120909	2023-07-05	2024-07-04
☒	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2022-03-12	2024-03-11
☒	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2023-05-11	2025-05-10
☒	AGC-EM-E005	Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-494	2023-01-05	2024-01-04
☒	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2023-03-23	2024-03-22
☒	AGC-EM-E102	Broadband Ridged Horn Antenna	ETS	3117	00154520	2023-06-03	2024-06-02
☐	AGC-EM-E082	Horn Antenna	SCHWARZBECK	BBHA 9170	#768	2021-10-31	2023-10-30
☒	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2022-08-04	2024-08-03
☒	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2024-06-08

☐	AGC-EM-A090	High Pass Filter 1 (2500-18000MHz)	N/A	N/A	N/A	2023-06-01	2024-05-31
☐	AGC-EM-A091	High Pass Filter 2 (1200-18000MHz)	N/A	N/A	N/A	2023-06-01	2024-05-31
☒	AGC-EM-A113	Band Stop Filter (825-850MHz)	MICRO-TRONICS	BRC50717	N/A	2023-06-01	2024-05-31
☐	AGC-EM-A114	Band Stop Filter (880-890MHz)	MICRO-TRONICS	BRC50718	N/A	2023-06-01	2024-05-31
☐	AGC-EM-A115	Band Stop Filter (1710-1785MHz)	MICRO-TRONICS	BRC50719	N/A	2023-06-01	2024-05-31
☐	AGC-EM-A116	Band Stop Filter (1850-1950MHz)	MICRO-TRONICS	BRC50720	N/A	2023-06-01	2024-05-31
☐	AGC-EM-A117	Band Stop Filter (1920-1980MHz)	MICRO-TRONICS	BRC50721	N/A	2023-06-01	2024-05-31

● Test Software

Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information
☒	AGC-ER-S007	WCDMA Test System	Tonscend	JS1120-3	2.1.5.10
☒	AGC-EM-S011	RSE Test System	Tonscend	TS^{+} Ver2.1(JS36-RSE)	4.0.0.0

4. System Test Configuration

4.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT Exercise

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

4.3 Configuration of EUT System

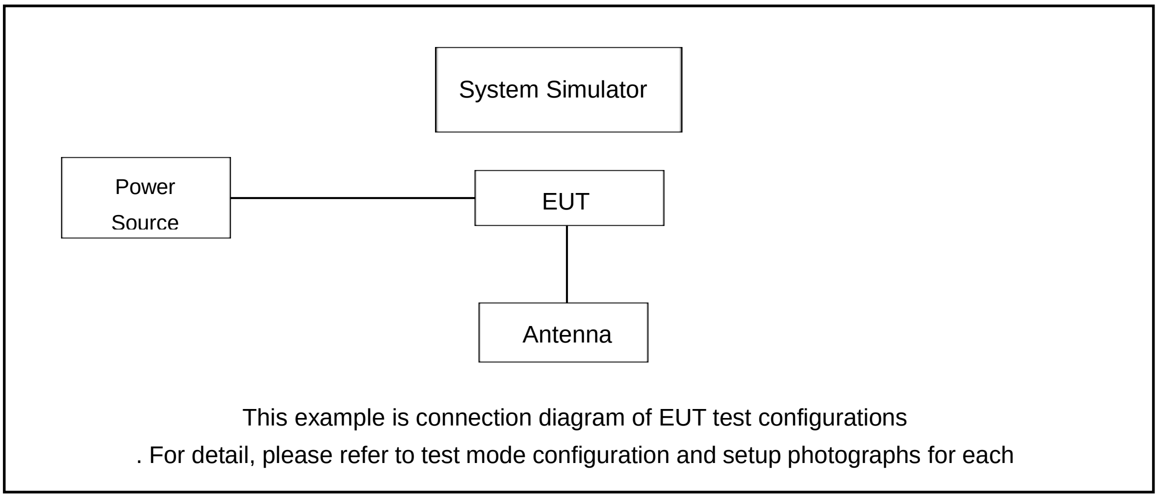


Table 2-1 Equipment Used in EUT System

4.4 Equipment Used in Tested System

The following peripheral devices and interface cables were connected during the measurement:

☐ Test Accessories Come From The Laboratory

☒ Test Accessories Come From The Manufacturer

No.	Equipment	Model No.	Manufacturer	Specification Information	Cable
1	Adapter	ZFX007	Shenzhen Zhongfuxin Technology Co.,Ltd	Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V 0.5A	1.5m unshielded
2	Battery	S10	Raisecom International Technology Limited	DC 3.7V 1200mAh	--
3	Earphone	--	--	--	1.0m unshielded

5. Summary of Test Results

5.1 Test Condition: Conducted Test

Item	Test Description	FCC Rules	Result
1	Occupied Bandwidth	§2.1049	Pass
2	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal	§2.1051, §22.917(a)	Pass
3	Conducted Output Power	§2.1046	Pass
4	Frequency stability / variation of ambient temperature	§2.1055, § 22.355	Pass
5	Peak- to- Average Ratio	-	Pass

5.2 Test Condition: Radiated Test

Item	Test Description	FCC Rules	Result
1	Effective Radiated Power	§22.913(a)(5)	Pass
2	Radiated Spurious and Harmonic Emissions	§2.1053, §22.917(a)	Pass

6. Description of Test Modes

Bands	Tx/Rx Frequency	RF Channel		
		Low(L)	Middle(M)	High(H)
WCDMA band V	TX (824 MHz ~ 849 MHz)	Channel 4132	Channel 4182	Channel 4233
		826.4 MHz	836.4 MHz	846.6 MHz

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the worse mode applicability and tested channel detail as below:

Band	Radiated	Conducted
WCDMA Band V	RMC 12.2kbps Link	RMC 12.2kbps Link

According to 3GPP 25.101 sub-clause 6.2.2, the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15,β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

7. Conducted Output Power

7.1 Provisions Applicable

The conduction test is carried out in a shielded room. According to the test, connect the device under test to the antenna port on the non-conductive platform directly to the test device for evaluation and measurement (ANSI-C63.26-2015 Clause 5.4)

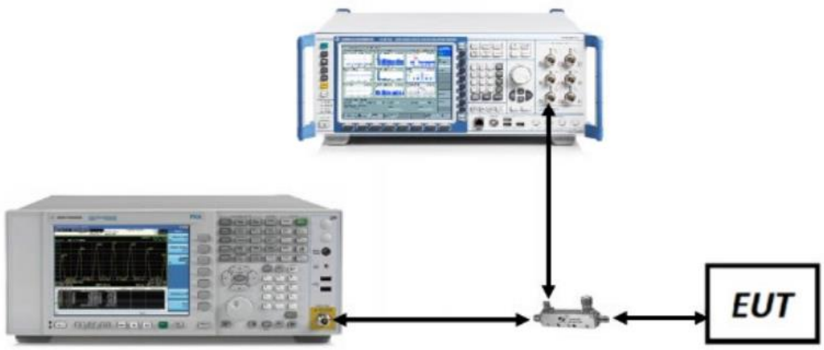
7.2 Measurement Procedure

- The transmitter output port was connected to base station.
- 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.

Measure the maximum burst average power and average power for other modulation signal.

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all mode (WCDMA/HSPA band V)at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

7.3 Measurement Setup



7.4 Measurement Result

WCDMA Band V Maximum Average Power (dBm)			
Channel	**4132**	**4182**	**4233**
Frequency(MHz)	**826.4 MHz**	**836.4 MHz**	**846.6 MHz**
RMC 12.2kbps	**21.23**	21.17	21.21
HSDPA Subtest-1	20.63	17.14	19.38
HSDPA Subtest-2	20.21	18.54	18.80
HSDPA Subtest-3	18.94	19.46	17.64
HSDPA Subtest-4	18.99	19.44	17.68
HSUPA Subtest-1	18.40	19.62	20.79
HSUPA Subtest-2	18.68	20.08	19.27
HSUPA Subtest-3	18.41	19.75	20.87
HSUPA Subtest-4	18.34	19.87	19.95
HSUPA Subtest-5	21.21	20.51	19.71

8. Radiated Output Power

8.1 Provisions Applicable

The radiation test is carried out in a semi-anechoic chamber.

According to the test, put the device under test on a non-conductive platform 3 meters away from the receiving antenna (ANSI/TIA-603-E-2016 Article 2.2.17).

The following rules are for the maximum radiated power limit requirements of the product:

Mode	Nominal Peak Power
WCDMA Band V	< 7 Watts max. ERP (38.45dBm)

8.2 Measurement Procedure

1. Radiated power measurements are performed using the signal analyzer's "channel power"
2. measurement capability for signals with continuous operation.
3. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
4. VBW ≥ 3 x RBW
5. Span = 1.5 times the OBW
6. No. of sweep points > 2 x span / RBW
7. Detector = RMS
8. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
9. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
10. Trace mode = trace averaging (RMS) over 100 sweeps
11. The trace was allowed to stabilize.

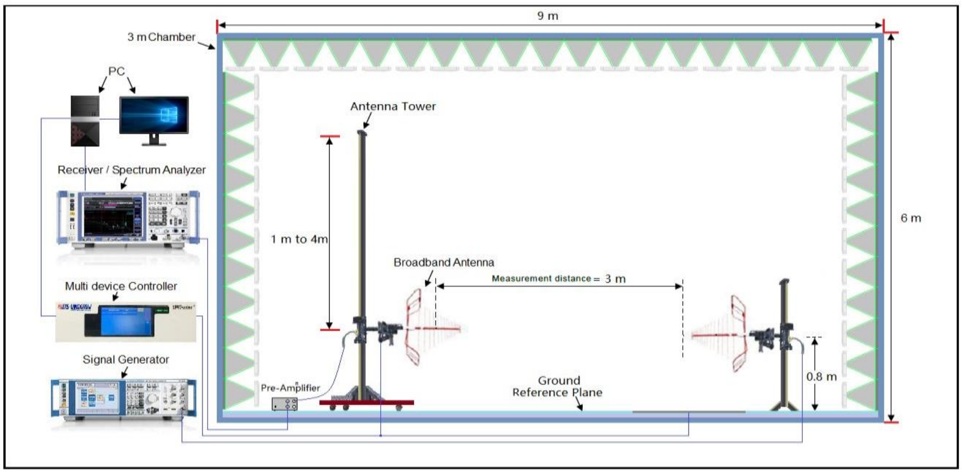
- **Radiation Construction Method：**

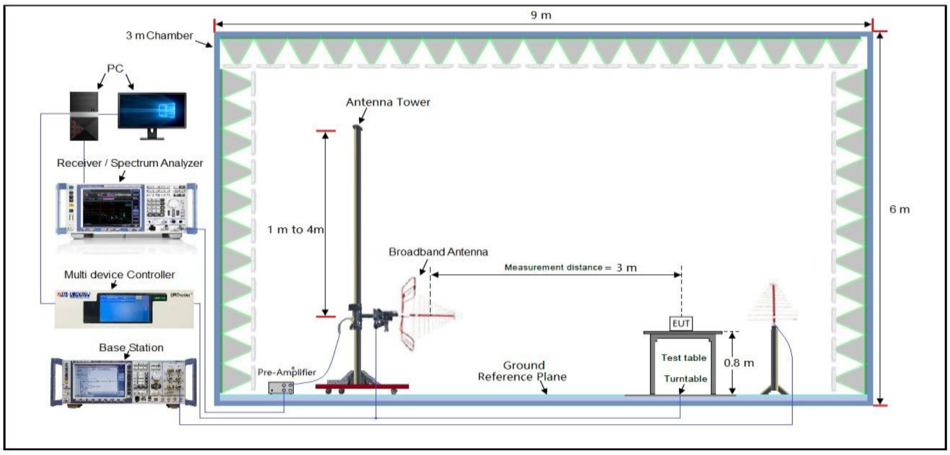
1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
3. The power is calculated by the following formula：

   Pd(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dB)
4. Where: Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.
5. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration
6. The EUT was tested in three orthogonal planes (X, Y, Z) and in all possible test configurations and positioning.
7. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

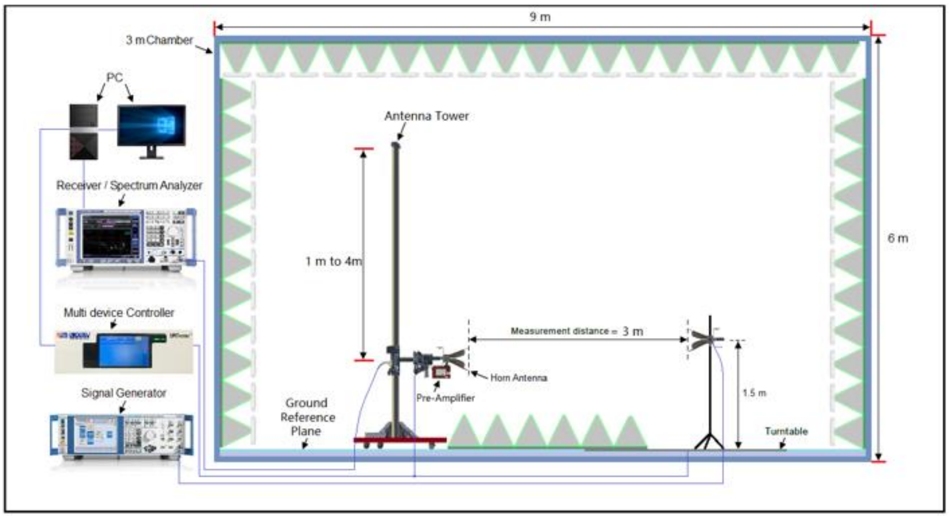
8.3 Measurement Setup

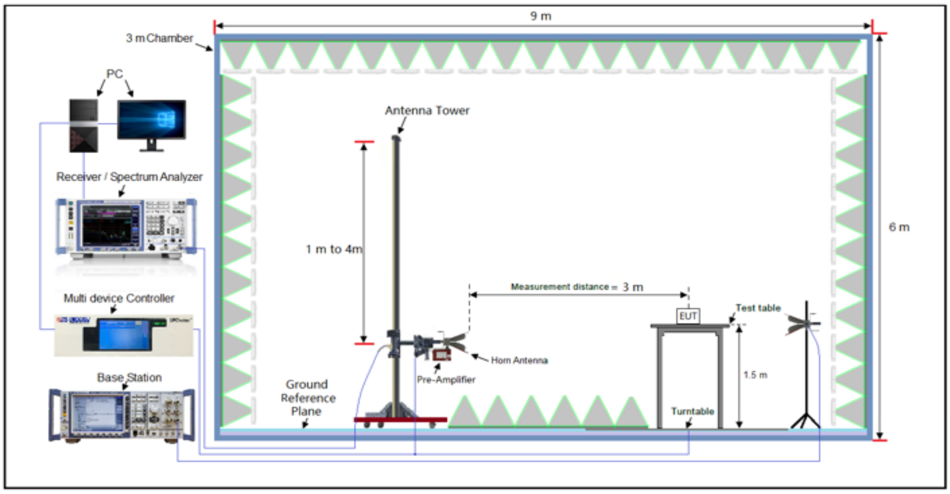
Radiated Power 30MHz to 1GHz Test setup





Radiated Power Above 1GHz Test setup





8.4 Measurement Result

Mode	Ch./ Freq.		Substitute Level (dBm)	Ant. Gain (dBi)	C.L	Pol.	Limit	ERP	
	channel	Freq. (MHz)					W	W	dBm
WCDMA850	4132	826.4	13.54	5.90	1.21	H	< 7.00	0.067	18.23
	4183	836.6	13.54	5.90	1.25	H		0.066	18.19
	4233	846.6	14.39	5.90	1.24	H		0.080	19.05
HSPA	4132	826.4	12.16	5.90	1.21	H		0.048	16.85
	4183	836.6	12.34	5.90	1.25	H		0.050	16.99
	4233	846.6	12.16	5.90	1.24	H		0.048	16.82

Note:

1. EIRP/ERP = Substitute Level (dBm) + Ant. Gain – C.L (Cable Loss)
2. All polarizations and modes have been tested, only the worst mode is recorded in the report

9. Peak-to-Average Ratio

9.1 Provisions Applicable

This is the test for the Peak-to-Average Ratio from the EUT.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. 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

9.2 Measurement Procedure

- **CCDF Procedure for PAPR:**

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:
   - for continuous transmissions, set to 1 ms,
   - or burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time
4. that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

- **Alternate Procedure for PAPR:**

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as P_{Pk} Use one of the applicable procedures presented 5.2(ANSI C63.26-2015) to measure the total average power and recordas PAvg. Determine the P.A.R. from:

P.A.R(dB) = P_{Pk} (dBm) – P_{Avg} (dBm) (P_{Avg} = Average Power + Duty cycle Factor)

Allow trace to fully stabilize.

Use the peak marker function to determine the peak amplitude level.

- **<u>Test Settings (Peak Power):</u>**

The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

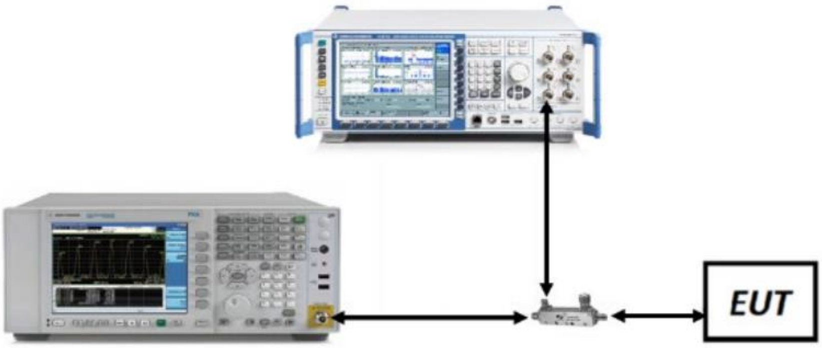
1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period).

5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

■ **Test Settings (Average Power)**

1. Set span to 2 × to 3 × the OBW.
2. Set RBW ≥ OBW.
3. Set VBW ≥ 3 × RBW.
4. Set number of measurement points in sweep ≥ 2 × span / RBW.
5. Sweep time: Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (Automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to “free run.”
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. (To accurately determine the average power over the on and off period of the transmitter, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add [10 log (1/duty cycle)] to the measured maximum power level to compute the average power during continuous transmission. For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is a constant 25%.

9.3 Measurement Setup



9.4 Measurement Result

Bands	Modulation	Peak-to-average ratio (dB)			Limit	Result
		Lowest	Middle	Highest	(dB)	
WCDMA Band V	RMC 12.2kbps	3.10	3.12	3.16	13	Pass
WCDMA Band V	HSUPA	3.21	3.19	3.27	13	Pass
WCDMA Band V	HSDPA	4.4	4.27	4.41	13	Pass

10. 99% Occupied Bandwidth and 26dB Emission Bandwidth

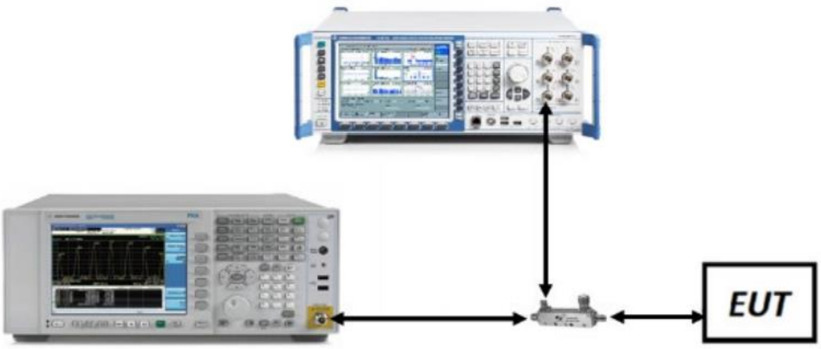
10.1 Provisions Applicable

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 power of a given emission.
The EUT makes a call to the communication simulator.
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

10.2 Measurement Procedure

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99%
2. Occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by
3. any intermediate power nulls in the fundamental emission.
4. RBW = 1 – 5% of the expected OBW
5. VBW ≥ 3 x RBW
6. Detector = Peak
7. Trace mode = max hold
8. Sweep = auto couple
9. The trace was allowed to stabilize
10. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within
11. 1 – 5% of the 99% occupied bandwidth observed in Step 7

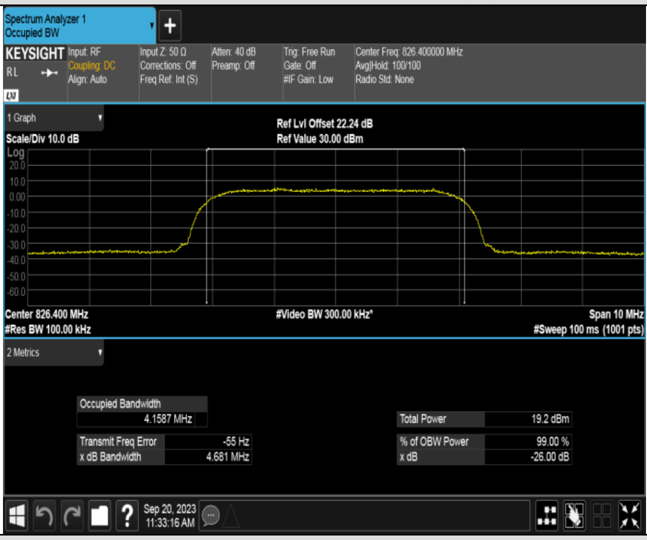
10.3 Measurement Setup



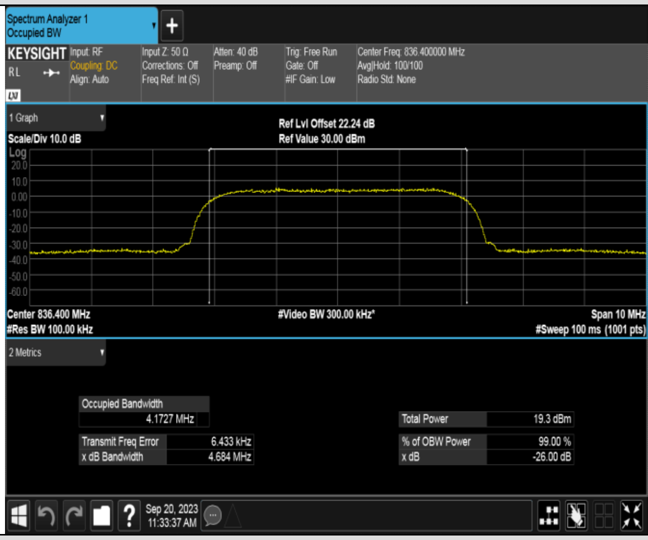
10.4 Measurement Result

Test Band	Test Mode	Test Channel	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Verdict
WCDMA 850	UMTS	LCH	4.1587	4.681	Pass
		MCH	4.1727	4.684	Pass
		HCH	4.1753	4.685	Pass

WCDMA 850_LCH



WCDMA 850_MCH



WCDMA 850_HCH

11. Band Edge Emissions at Antenna Terminal

11.1 Provisions Applicable

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

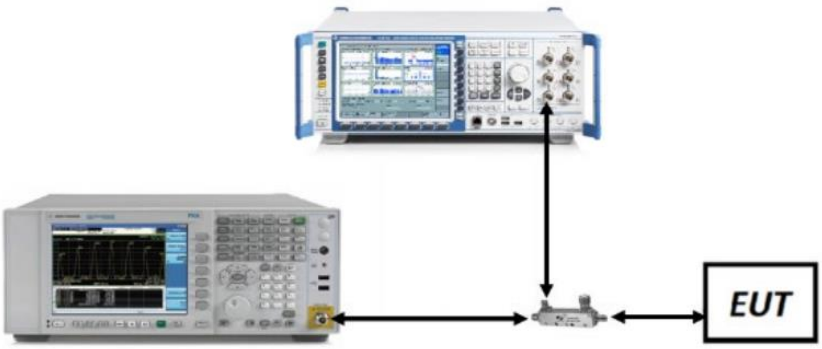
11.2 Measurement Procedure

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

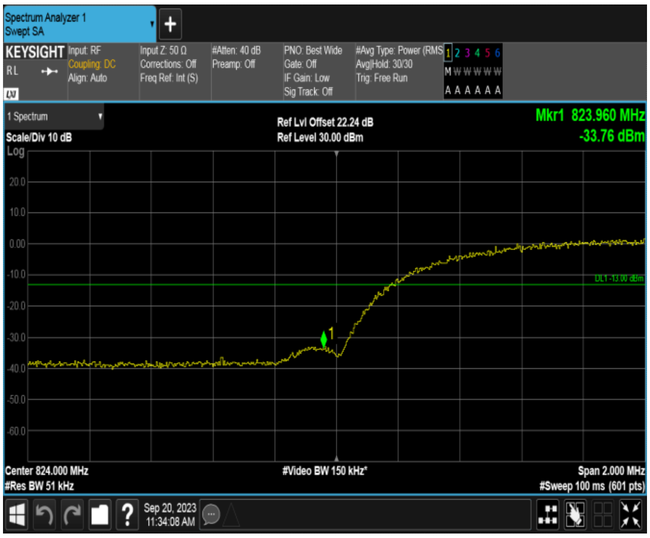
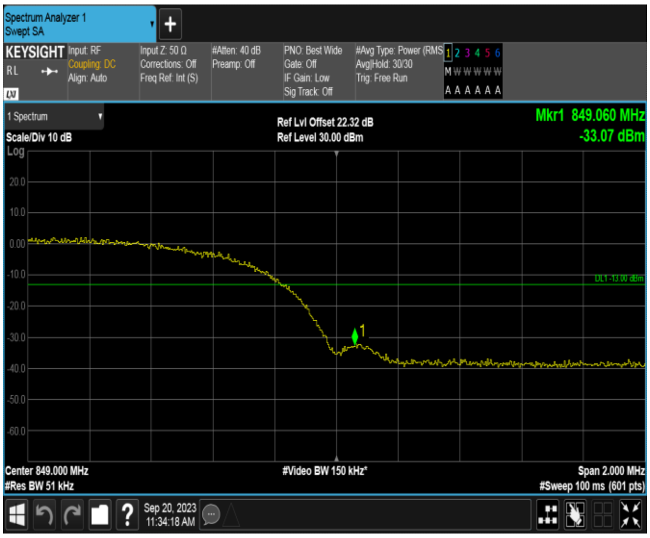
Test Note

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.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. All measurements were done at 2 channels(low and high operational frequency range.)
The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

11.3 Measurement Setup



11.4 Measurement Result

WCDMA Band V_RMC 12.2kbps	
Lowest Channel	Highest Channel
	

12. Spurious Emissions at Antenna Terminal

12.1 Provisions Applicable

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

12.2 Measurement Procedure

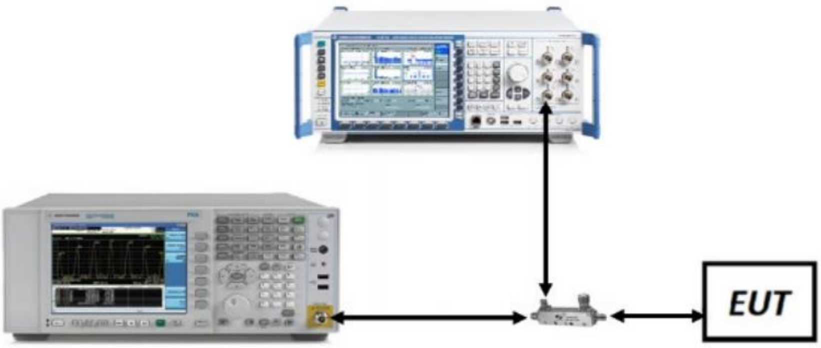
- **Test Settings (GSM)**

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = Peak
4. Trace Mode = max hold
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

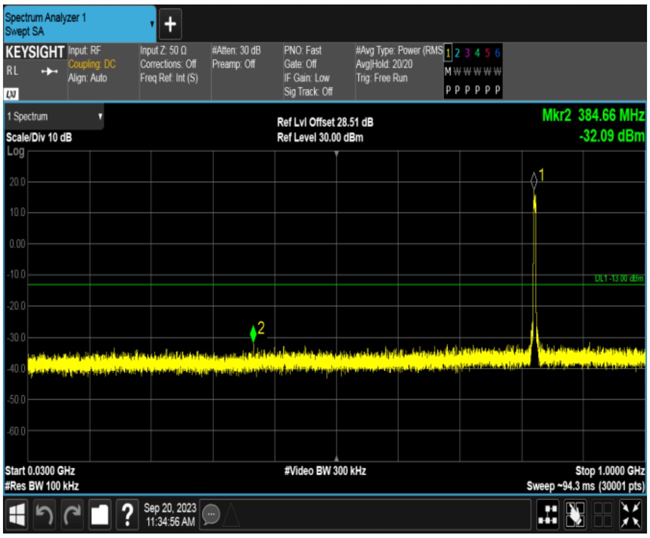
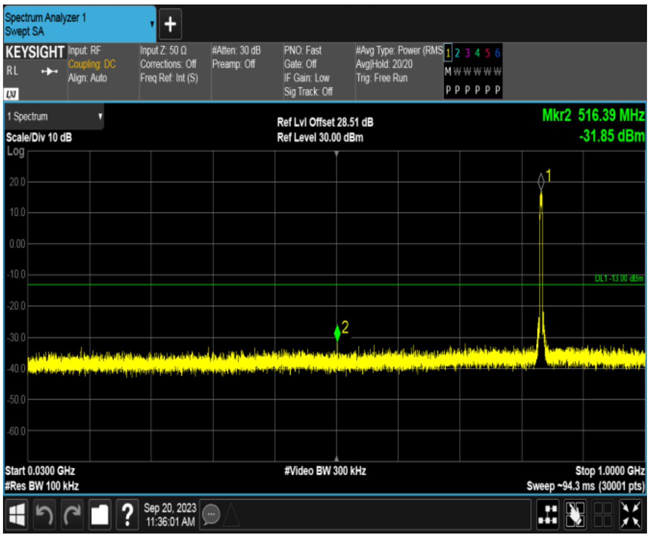
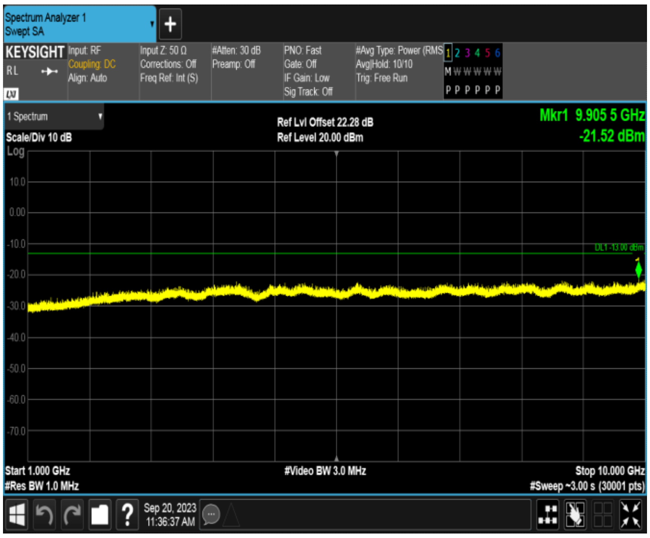
- **Test Settings (WCDMA)**

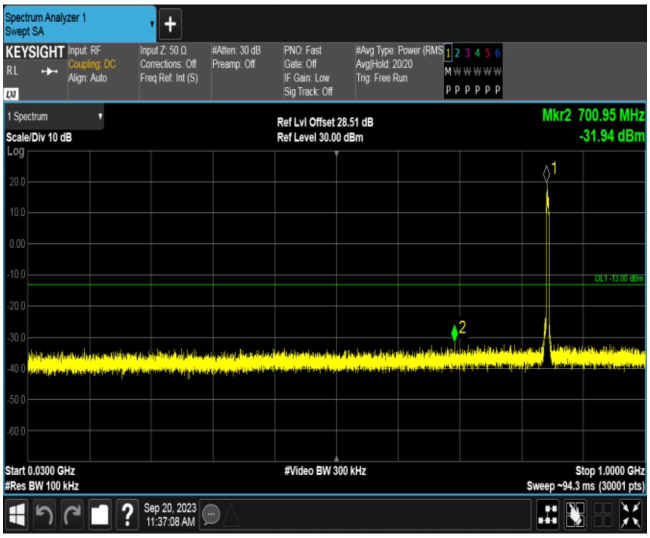
1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

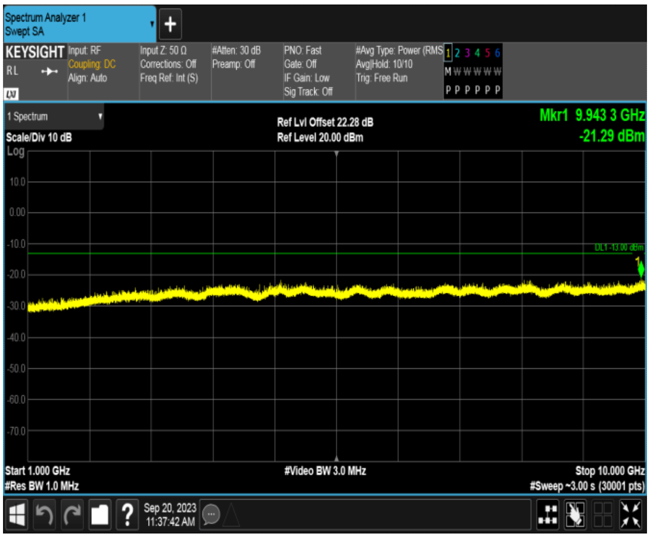
12.3 Measurement Setup



12.4 Measurement Result

WCDMA 850_RMC 12.2kps_LCH	WCDMA 850_RMC 12.2kps_LCH
	
WCDMA 850_RMC 12.2kps_MCH	WCDMA 850_RMC 12.2kps_MCH
	
WCDMA 850_RMC 12.2kps_HCH	WCDMA 850_RMC 12.2kps_HCH





Note:

1. Below 30MHz no Spurious found and above is the worst mode data.
2. As no emission found in standby or receive mode, no recording in this report.

13. Radiated Spurious Emission

13.1. Provisions Applicable

(A) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm.

At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

(B) For specific criteria, please refer to the description in section 9.2 of the report for corresponding evaluation.

13.2. Measurement Procedure

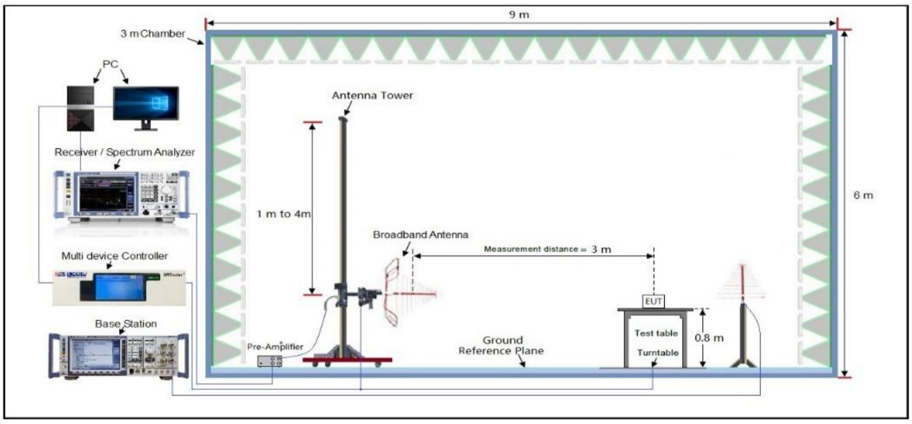
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the

pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.

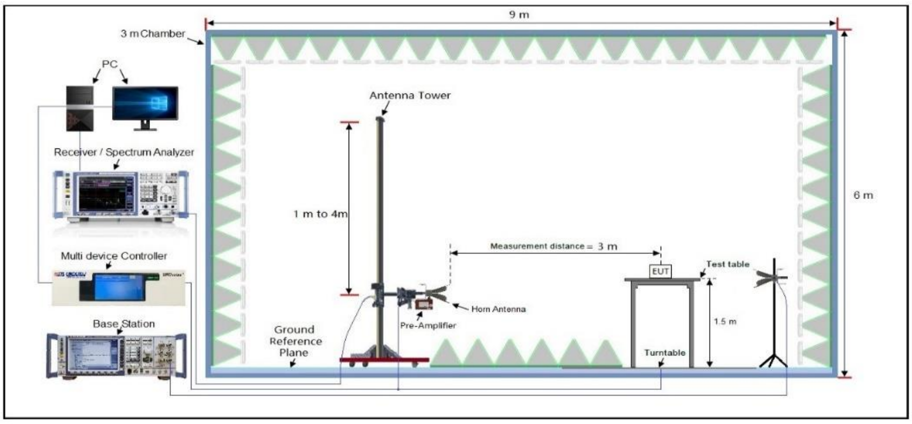
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.
11. For spurious emissions above 1GHz, a horn antenna is substituted in place of the EUT.
12. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
13. The spurious emissions is calculated by the following formula;
    - ✧ Result(dBm) = Pg(dBm) +Factor(dB)
    - ✧ Factor(dB) = Ant Gain(dB)-Cable Loss(dB) + Power Splitter(dB) (Above 1GHz)
    - ✧ Factor(dB) = Ant Gain(dB)-Cable Loss(dB) (Below 1GHz)
14. Where: P_{gis} the generator output power into the substitution antenna.
15. If the Fundamental frequency is below 1GHz, RF output power has been converted to EIRP.
    - ✧ EIRP (dBm) = ERP (dBm) + 2.15

13.3. Measurement Setup

Radiated Emissions 30MHz to 1GHz Test setup



Radiated Emissions Above 1GHz Test setup



13.4 Measurement Result

The measurement Below 1GHz data as follows:

WCDMA Band V							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
RMC 12.2kbps_ Lowest Channel							
1	155.412	-63.82	15.52	-48.30	-13.00	-35.30	Horizontal
2	245.391	-62.25	16.75	-45.50	-13.00	-32.50	Horizontal
3	758.23	-57.38	19.35	-38.03	-13.00	-25.03	Horizontal
4	46.562	-62.34	10.44	-51.90	-13.00	-38.90	Vertical
5	433.784	-59.38	17.75	-41.63	-13.00	-28.63	Vertical
6	550.126	-56.77	18.66	-38.11	-13.00	-25.11	Vertical
RMC 12.2kbps_ Middle Channel							
1	30.596	-62.12	9.78	-52.34	-13.00	-39.34	Horizontal
2	160.742	-61.43	13.75	-47.68	-13.00	-34.68	Horizontal
3	245.125	-61.57	16.75	-44.82	-13.00	-31.82	Horizontal
4	47.369	-62.71	10.23	-52.48	-13.00	-39.48	Vertical
5	451.553	-61.41	17.75	-43.66	-13.00	-30.66	Vertical
6	480.427	-57.36	18.02	-39.34	-13.00	-26.34	Vertical
RMC 12.2kbps_ Highest Channel							
1	159.355	-64.12	13.75	-50.37	-13.00	-37.37	Horizontal
2	240.452	-59.79	16.75	-43.04	-13.00	-30.04	Horizontal
3	679.398	-58.71	19.01	-39.70	-13.00	-26.70	Horizontal
4	43.782	-62.47	10.23	-52.24	-13.00	-39.24	Vertical
5	433.419	-59.92	17.75	-42.17	-13.00	-29.17	Vertical
6	498.336	-58.17	18.02	-40.15	-13.00	-27.15	Vertical

The measurement Above 1GHz data as follows:

WCDMA Band V							
No.	Frequency	SA Reading	Correction factor	EIRP Result	Limit	Margin	Ant. Pol.
	(MHz)	(dBm)	(dB/m)	(dBm)	(dBm)	(dB)	
RMC 12.2kbps_ Lowest Channel							
1	1652.800	-84.07	23.12	-60.95	-13.00	-47.95	Horizontal
2	2479.200	-86.20	28.47	-57.73	-13.00	-44.73	Horizontal
3	1652.800	-83.89	23.12	-60.77	-13.00	-47.77	Vertical
4	2479.200	-83.49	28.47	-55.02	-13.00	-42.02	Vertical
RMC 12.2kbps_ Middle Channel							
1	1672.800	-82.17	23.12	-59.05	-13.00	-46.05	Horizontal
2	2509.200	-84.19	28.47	-55.72	-13.00	-42.72	Horizontal
3	1672.800	-83.32	23.12	-60.20	-13.00	-47.20	Vertical
4	2509.200	-82.56	28.47	-54.09	-13.00	-41.09	Vertical
RMC 12.2kbps_ Highest Channel							
1	1693.200	-80.77	23.12	-57.65	-13.00	-44.65	Horizontal
2	2539.800	-82.51	28.47	-54.04	-13.00	-41.04	Horizontal
3	1693.200	-81.58	23.12	-58.46	-13.00	-45.46	Vertical
4	2539.800	-81.23	28.47	-52.76	-13.00	-39.76	Vertical

Note:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test. Subsequently, only the worst case emissions are reported.

14. Frequency Stability / Variation of Ambient Temperature

14.1 Provisions Applicable

14.1.1 For Hand carried battery powered equipment

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a) Temperature: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b) 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.

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

14.1.2 For equipment powered by primary supply voltage

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a
2. reference).
3. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to
4. the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
5. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at
6. least one half-hour is provided to allow stabilization of the equipment at each temperature level.

14.2 Measurement Procedure

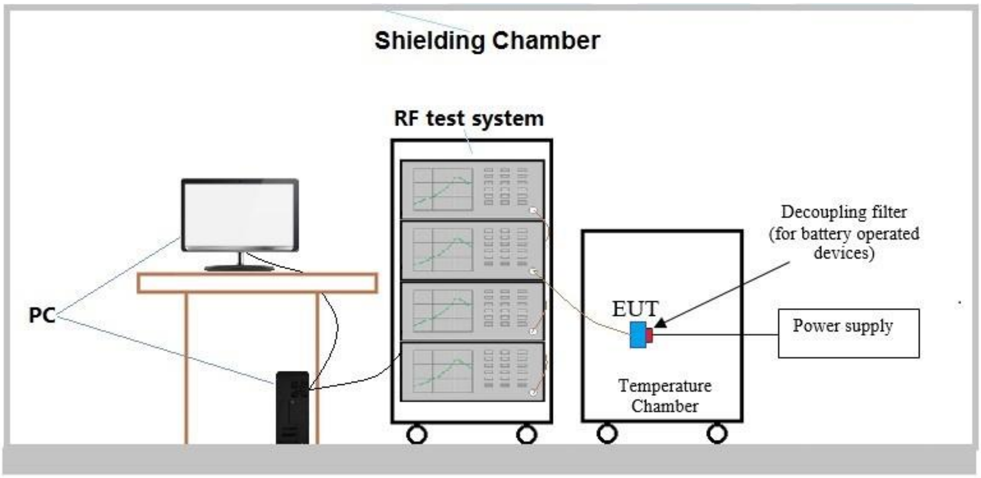
In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on channel 20175 for LTE band 4 measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
3. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
4. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each

voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

5. Subject the EUT to overnight soak at +50℃.
6. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
7. Repeat the above measurements at 10℃ increments from +50℃ to -30℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
8. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

14.3 Measurement Setup



14.4 Measurement Result

- **Frequency Error vs. Voltage:**

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq. Error (Hz)	Freq. vs Rated (ppm)	Limit (ppm)	Verdict
WCDMA850	UMTS	LCH	TN	VL	2.01	0.002432	±2.5	Pass
			TN	VN	-1.88	-0.002275	±2.5	Pass
			TN	VH	-0.19	-0.000230	±2.5	Pass
		MCH	TN	VL	1.10	0.001315	±2.5	Pass
			TN	VN	-0.94	-0.001124	±2.5	Pass
			TN	VH	-0.03	-0.000036	±2.5	Pass
		HCH	TN	VL	-0.29	-0.000343	±2.5	Pass
			TN	VN	-1.34	-0.001583	±2.5	Pass
			TN	VH	-0.48	-0.000567	±2.5	Pass

- **Frequency Error vs. Temperature:**

Test Band	Test Mode	Test Channel	Test Volt.	Test Tem. (℃)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Verdict	Test Band
WCDMA850	UMTS	LCH	VN	-30	2.68	0.003243	±2.5	PASS
			VN	-20	0.19	0.000230	±2.5	PASS
			VN	-10	0.44	0.000532	±2.5	PASS
			VN	0	1.54	0.001864	±2.5	PASS
			VN	10	0.48	0.000581	±2.5	PASS
			VN	20	0.06	0.000073	±2.5	PASS
			VN	30	2.13	0.002577	±2.5	PASS
			VN	40	0.68	0.000823	±2.5	PASS
			VN	50	2.09	0.002529	±2.5	PASS
WCDMA850	UMTS	MCH	VN	-30	0.49	0.000593	±2.5	PASS
			VN	-20	0.69	0.000835	±2.5	PASS
			VN	-10	-0.19	-0.000230	±2.5	PASS
			VN	0	1.78	0.002154	±2.5	PASS
			VN	10	1.92	0.002323	±2.5	PASS
			VN	20	2.20	0.002662	±2.5	PASS
			VN	30	-2.27	-0.002747	±2.5	PASS
			VN	40	0.32	0.000387	±2.5	PASS
			VN	50	1.18	0.001428	±2.5	PASS
WCDMA850	UMTS	HCH	VN	-30	-0.11	-0.000133	±2.5	PASS
			VN	-20	0.68	0.000823	±2.5	PASS
			VN	-10	0.06	0.000072	±2.5	PASS
			VN	0	-0.26	-0.000311	±2.5	PASS
			VN	10	1.20	0.001435	±2.5	PASS
			VN	20	1.11	0.001327	±2.5	PASS
			VN	30	0.67	0.000801	±2.5	PASS
			VN	40	-2.76	-0.003300	±2.5	PASS
			VN	50	-0.24	-0.000287	±2.5	PASS

Appendix I: Photographs of Test Setup

Refer to the Report No.: AGC02762230903AP03

Appendix II: Photographs of EUT

Refer to the Report No.: AGC02762230903AP02

----End of Report----

Attestation of Global Compliance(Shenzhen)Co., Ltd
Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/

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