FCC TEST REPORT

Test report
On Behalf of
PCD, LLC
For
Mobile phone
Model No.: PL04

FCC ID: 2ALJJPL04

Prepared for :	**PCD, LLC** 1500 Tradeport Drive, Suite A, Orlando, Florida, United States
Prepared By :	**Shenzhen Tongzhou Testing Co.,Ltd** **1th Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China**
Date of Test:	**Jul.28, 2023 ~ Aug.9, 2023**
Date of Report:	**Aug.10, 2023**
Report Number:	**TZ230704645-E2**

The test report apply only to the specific sample(s) tested under stated test conditions
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

TEST RESULT CERTIFICATION

Applicant's name ..... :	**PCD, LLC**
Address ..... :	1500 Tradeport Drive, Suite A, Orlando, Florida, United States
Manufacture's Name ..... :	**SHENZHEN HUAYUE WORLDCOM SOFTWARE TECHNOLOGY CO.,LTD**
Address ..... :	Room 703-704, Building B, Phase 1, Wanke Yuncheng Innovation Valley, Xili Street, Nanshan District, Shenzhen, China

Product description

Trade Mark ..... :	N/A
Product name ..... :	Mobile phone
Model and/or type reference . :	PL04
Standards ..... :	FCC Rules and Regulations Part 22 & Part 24 ANSI C63.26:2015

Date of Test ..... :	
Date (s) of performance of tests..... :	**Jul.28, 2023 ~ Aug.9, 2023**
Date of Issue ..... :	**Aug.10, 2023**
Test Result..... :	**Pass**

Testing Engineer : Anna Hu

(Anna Hu)

Technical Manager : Hugo Chen

(Hugo Chen)

Authorized Signatory : Andy Zhang

(Andy Zhang)

Revision History

Revision	Issue Date	Revisions	Revised By
000	Aug.10, 2023	Initial Issue	Andy Zhang

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

FCC Part 22 Subpart H: PRIVATE LAND MOBILE RADIO SERVICES.

FCC Part 24 Subpart E: PUBLIC MOBILE SERVICES

ANSI/TIA-603-E-2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

ANSI C63.26-2015: IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

FCCKDB971168D01 Power Meas License Digital Systems

2 SUMMARY

2.1 Product Description

EUT	:	Mobile phone
Model Number	:	PL04
Model Declaration	:	N/A
Test Model	:	PL04
Power Supply	:	DC 3.7V by battery
Hardware version	:	T03C V1.0
Software version	:	T03C_T1807D_OM8443-22_America_V4.0_20230617
Sample ID	:	TZ230704645–1# TZ230704645–2#
Bluetooth		
Bluetooth Version	:	V2.1+EDR
Operation Frequency	:	2402 – 2480 MHz
Channel Number	:	79 Channels for Bluetooth BR/EDR(DSS)
Modulation Technology	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth BR/EDR (DSS)
Data Rates	:	Bluetooth BR/EDR (DSS): 1/2/3Mbps
Antenna Type And Gain	:	Internal Antenna,1.1dBi
UTRA		
UTRA FCC Operation Frequency	:	WCDMA BAND II (UL: 1850 –1910 MHz/DL: 1930 – 1990 MHz) WCDMA BAND V (UL: 824 – 849 MHz/DL: 869 – 894 MHz)
Channel Separation	:	0.2MHz
Modulation Technology	:	OFDM (16QAM, QPSK)
Antenna Type And Gain	:	Internal Antenna WCDMA BAND II: 0.75dBi WCDMA BAND V: -0.84dBi
E-UTRA		
E-UTRA FCC Operation Frequency	:	☒FDD Band 2 (UL: 1850 – 1910 MHz/DL: 1930 – 1990 MHz) ☒FDD Band 4 (UL: 1710 – 1755 MHz/DL: 2110 – 2155 MHz) ☒FDD Band 7 (UL: 2500 – 2570 MHz/DL: 2620 – 2690 MHz)
Channel Separation	:	0.1 MHz
Modulation Technology	:	OFDM (16QAM, QPSK)
Antenna Type And Gain	:	Internal Antenna FDD Band 2:0.75 dBi, FDD Band 4:0.86 dBi, FDD Band 7:0.65 dBi

Note 1: Antenna position refer to EUT Photos.
Note 2: the above information was supplied by the applicant.

GSM/WCDMA Card Slot :

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
UMTS BAND II			
UMTS BAND V			

2.2 Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate

2.3 Short description of the Equipment under Test (EUT)

EUT is subscriber equipment in the WCDMA/LTE system. Frequency bands Shows in section 2.1.

2.4 Normal Accessory setting

Fully charged battery was used during the test.

2.5 EUT configuration

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

● supplied by the manufacturer
○ - supplied by the lab

		Model:	
		Input:	
		Output:	

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2ALJJPL04** filing to comply with FCC Part 22 and FCC Part 24 Rules.

2.7 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Test Facility

FCC
Designation Number: CN1275
Test Firm Registration Number: 167722
Shenzhen Tongzhou Testing Co.,Ltd has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA
Certificate Number: 5463.01
Shenzhen Tongzhou Testing Co.,Ltd has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC
ISED#: 22033
CAB identifier: CN0099
Shenzhen Tongzhou Testing Co.,Ltd has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010

3.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3 Test Description

UMTS BAND II:

Test Item	FCC Rule No.	Requirements	Judgement	Sample ID
Effective (Isotropic) Radiated Power	2.1046, 24.232(c)	EIRP ≤ 2W(33dBm)	Pass	TZ230704645-2#
Bandwidth	2.1049 24.238(a)	OBW: No limit. EBW: No limit.	Pass	TZ230704645-1#
Band Edges	2.1051, 24.238(a)	-13dBm	Pass	TZ230704645-1#
Spurious Emission at Antenna Terminals	2.1051, 24.238(a)	-13dBm	Pass	TZ230704645-1#
Field Strength of Spurious Radiation	2.1053, 24.238(a)	-13dBm	Pass	TZ230704645-2#
Frequency Stability	2.1055, 24.235	the fundamental emission stays within the authorized frequency block.	Pass	TZ230704645-1#
Peak to average ratio	24.232(d)	<13dB	Pass	TZ230704645-1#

UMTS BAND V:

Test Item	FCC Rule No.	Requirements	Judgement	Sample ID
Effective (Isotropic) Radiated Power	2.1046, 22.913(a)	ERP ≤ 7W(38.5dBm)	Pass	TZ230704645-2#
Occupied Bandwidth	2.1049	OBW: No limit.	Pass	TZ230704645-1#
Emission Bandwidth	22.917(b)	EBW: No limit.	Pass	TZ230704645-1#
Band Edges Compliance	2.1051, 22.917(a)(b)	-13dBm	Pass	TZ230704645-1#
Spurious Emission at Antenna Terminals	2.1051, 22.917	-13dBm	Pass	TZ230704645-1#
Field Strength of Spurious Radiation	2.1053, 22.917	-13dBm	Pass	TZ230704645-2#
Frequency Stability	2.1055, 22.355	the fundamental emissions stay within the authorized bands of operation. (2.5ppm)	Pass	TZ230704645-1#
Peak to average ratio	2.1046, 22.913(a)	<13dB	Pass	TZ230704645-1#

Remark: The measurement uncertainty is not included in the test result.

3.4 Equipment Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2022/12/28	2023/12/27
2	Power Sensor	Agilent	U2021XA	MY5365004	2022/12/28	2023/12/27
3	Loop Antenna	schwarzbeck	FMZB1519B	00023	2022/11/13	2025/11/12
4	Wideband Antenna	schwarzbeck	VULB 9163	958	2022/11/13	2025/11/12
5	Horn Antenna	schwarzbeck	BBHA 9120D	01989	2022/11/13	2025/11/12
6	EMI Test Receiver	R&S	ESCI	100849/003	2022/12/28	2023/12/27
7	Controller	MF	MF7802	N/A	N/A	N/A
8	Amplifier	schwarzbeck	BBV 9743	209	2022/12/28	2023/12/27
9	Amplifier	Tonscend	TSAMP-0518SE	--	2022/12/28	2023/12/27
10	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	N/A	2022/12/28	2023/12/27
11	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	N/A	2022/12/28	2023/12/27
12	RE test software	Tonscend	JS32-RE	V2.0.2.0	N/A	N/A
12	Test Software	Tonscend	JS1120-3	V2.5.77.0418	N/A	N/A
14	Horn Antenna	A-INFO	LB-180400-KF	J211020657	2022/12/28	2023/12/27
15	Amplifier	CDSA	PAP-1840	17021	2022/12/28	2023/12/27
16	Spectrum Analyzer	R&S	FSP40	100550	2023/1/10	2024/1/9
17	UNIVERSAL RADIO COMMUNICATION	R&S	CMW500	101855	2022/12/28	2023/12/27
18	Signal Generator	Keysight	N5182A	MY4620709	2022/12/28	2023/12/27

3.5 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen Tongzhou Testing Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Tongzhou Testing Co.,Ltd is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.70 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occuiped Bandwidth	9KHz~40GHz	-	(1)
Frequency Error	9KHz~40GHz	1×10^{-7}	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4 DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMU 200)to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both GSM and PCS frequency band.

*****Note:** WCDMA/HSPA band II, WCDMA/HSPA band IV,WCDMA/HSPA band V mode have been tested during the test.

The worst condition was recorded in the test report if no other modes test data.

5 TEST CONDITIONS AND RESULTS

5.1 OUTPUT POWER

5.1.1 CONDUCTED OUTPUT POWER

5.1.1.1 MEASUREMENT METHOD

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 modes(WCDMA/HSPA band II, WCDMA/HSPA band V)at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

5.1.1.2 MEASUREMENT RESULT

Pass

Temperature	23.9℃	Humidity	56%
Test Engineer	Anna Hu		

Type	Frequency(MHz)	Mode	Peak Power(dBm)	Average Power(dBm)	Peak to Average(dB)	Limit	Conclusion
UMTS BAND II	1852.4	RMC	25.11	22.12	2.99	13	Pass
UMTS BAND II	1880	RMC	25.07	22.02	3.05	13	Pass
UMTS BAND II	1907.6	RMC	24.83	21.75	3.08	13	Pass
UMTS BAND II	1852.4	HSDPA Subset1	25.26	21.13	4.13	13	Pass
UMTS BAND II	1880	HSDPA Subset1	25	20.67	4.33	13	Pass
UMTS BAND II	1907.6	HSDPA Subset1	25.25	20.65	4.6	13	Pass
UMTS BAND II	1852.4	HSDPA Subset2	25.56	21.1	4.46	13	Pass
UMTS BAND II	1880	HSDPA Subset2	25	20.68	4.32	13	Pass
UMTS BAND II	1907.6	HSDPA Subset2	25.27	20.67	4.6	13	Pass
UMTS BAND II	1852.4	HSDPA Subset3	25.31	21.12	4.19	13	Pass
UMTS BAND II	1880	HSDPA Subset3	25.1	20.68	4.42	13	Pass
UMTS BAND II	1907.6	HSDPA Subset3	25.05	20.65	4.4	13	Pass
UMTS BAND II	1852.4	HSDPA Subset4	25.29	21.12	4.17	13	Pass
UMTS BAND II	1880	HSDPA Subset4	25.19	20.69	4.5	13	Pass
UMTS BAND II	1907.6	HSDPA Subset4	25.19	20.69	4.5	13	Pass
UMTS BAND II	1852.4	HSUPA Subset1	25.64	21.04	4.6	13	Pass
UMTS BAND II	1880	HSUPA Subset1	25.8	20.66	5.14	13	Pass
UMTS BAND II	1907.6	HSUPA Subset1	25.94	20.62	5.32	13	Pass
UMTS BAND II	1852.4	HSUPA Subset2	25.72	21.04	4.68	13	Pass
UMTS BAND II	1880	HSUPA Subset2	25.51	20.64	4.87	13	Pass
UMTS BAND II	1907.6	HSUPA Subset2	25.68	20.6	5.08	13	Pass
UMTS BAND II	1852.4	HSUPA Subset3	25.72	21.02	4.7	13	Pass
UMTS BAND II	1880	HSUPA Subset3	25.7	20.62	5.08	13	Pass
UMTS BAND II	1907.6	HSUPA Subset3	25.79	20.6	5.19	13	Pass
UMTS BAND II	1852.4	HSUPA Subset4	25.87	21.02	4.85	13	Pass
UMTS BAND II	1880	HSUPA Subset4	25.83	20.62	5.21	13	Pass
UMTS BAND II	1907.6	HSUPA Subset4	25.79	20.59	5.2	13	Pass
UMTS BAND II	1852.4	HSUPA Subset5	25.64	21.02	4.62	13	Pass
UMTS BAND II	1880	HSUPA Subset5	25.8	20.59	5.21	13	Pass
UMTS BAND II	1907.6	HSUPA Subset5	25.73	20.56	5.17	13	Pass
UMTS BAND V	826.4	RMC	23.82	20.2	3.62	13	Pass
UMTS BAND V	836.4	RMC	24.61	21.07	3.54	13	Pass
UMTS BAND V	846.6	RMC	24.52	20.96	3.56	13	Pass
UMTS BAND V	826.4	HSDPA Subset1	25.88	20.77	5.11	13	Pass
UMTS BAND V	836.4	HSDPA Subset1	25.87	21.07	4.8	13	Pass
UMTS BAND V	846.6	HSDPA Subset1	25.48	20.6	4.88	13	Pass
UMTS BAND V	826.4	HSDPA Subset2	25.83	20.75	5.08	13	Pass
UMTS BAND V	836.4	HSDPA Subset2	25.87	21.07	4.8	13	Pass
UMTS BAND V	846.6	HSDPA Subset2	25.74	20.6	5.14	13	Pass
UMTS BAND V	826.4	HSDPA Subset3	25.84	20.75	5.09	13	Pass
UMTS BAND V	836.4	HSDPA Subset3	26.06	21.07	4.99	13	Pass
UMTS BAND V	846.6	HSDPA Subset3	25.78	20.6	5.18	13	Pass
UMTS BAND V	826.4	HSDPA Subset4	25.82	20.75	5.07	13	Pass
UMTS BAND V	836.4	HSDPA Subset4	25.93	21.08	4.85	13	Pass
UMTS BAND V	846.6	HSDPA Subset4	25.83	20.61	5.22	13	Pass
UMTS BAND V	826.4	HSUPA Subset1	26.45	20.61	5.84	13	Pass

UMTS BAND V	836.4	HSUPA Subset1	26.73	21.13	5.6	13	Pass
UMTS BAND V	846.6	HSUPA Subset1	26.58	20.64	5.94	13	Pass
UMTS BAND V	826.4	HSUPA Subset2	26.53	20.77	5.76	13	Pass
UMTS BAND V	836.4	HSUPA Subset2	26.6	21.09	5.51	13	Pass
UMTS BAND V	846.6	HSUPA Subset2	26.42	20.62	5.8	13	Pass
UMTS BAND V	826.4	HSUPA Subset3	26.28	20.77	5.51	13	Pass
UMTS BAND V	836.4	HSUPA Subset3	26.55	21.08	5.47	13	Pass
UMTS BAND V	846.6	HSUPA Subset3	26.27	20.62	5.65	13	Pass
UMTS BAND V	826.4	HSUPA Subset4	26.4	20.77	5.63	13	Pass
UMTS BAND V	836.4	HSUPA Subset4	26.69	21.08	5.61	13	Pass
UMTS BAND V	846.6	HSUPA Subset4	26.54	20.62	5.92	13	Pass
UMTS BAND V	826.4	HSUPA Subset5	26.73	20.77	5.96	13	Pass
UMTS BAND V	836.4	HSUPA Subset5	26.62	21.08	5.54	13	Pass
UMTS BAND V	846.6	HSUPA Subset5	26.6	20.6	6	13	Pass

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.

5.1.2 RADIATED OUTPUT POWER

5.1.2.1 MEASUREMENT METHOD

The measurements procedures specified in ANSI/TIA-603-E-2016 were applied.

1. Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signal operating below 1GHz are performed using dipole antennas. Measurements on signals operating above 1GHz are performed using broadband horn antennas. All measurements are performed as RMS average measurements while the EUT operating at its maximum duty cycle, at maximum power, and at the approximate frequencies.
2. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
3. The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. TheARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl
4. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
5. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
6. The EUT is then put into continuously transmitting mode at its maximum power level.
7. Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
8. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).
9. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi...

5.1.2.2 PROVISIONS APPLICABLE

Mode	FCC Part Section(s)	Nominal Peak Power
UMTS BAND II	24.232(c)	<=33dBm (2W),EIRP
UMTS BANDV	22.913(a)(2)	<=38.45dBm (7W).ERP

5.1.2.3 MEASUREMENT RESULT

Pass

Temperature	24.1℃	Humidity	58%
Test Engineer	Anna Hu		

Radiated Power (E.I.R.P) for UMTS band II				
Mode	**Frequency**	**Result**		**Conclusion**
		Max. Peak E.I.R.P (dBm)	**Polarization Of Max. E.I.R.P**	
UMTS	1852.4	**19.17**	Horizontal	Pass
	1880	19.04	Horizontal	Pass
	1907.6	18.24	Horizontal	Pass
	1852.4	14.11	Vertical	Pass
	1880	12.17	Vertical	Pass
	1907.6	13.60	Vertical	Pass

Radiated Power (ERP) for UMTS band V				
Mode	**Frequency**	**Result**		**Conclusion**
		Max. Peak ERP (dBm)	**Polarization Of Max. E.R.P**	
UMTS	826.4	**18.53**	Horizontal	Pass
	836.4	18.27	Horizontal	Pass
	846.6	18.43	Horizontal	Pass
	826.4	11.76	Vertical	Pass
	836.4	12.98	Vertical	Pass
	846.6	10.83	Vertical	Pass

Note: Above is the worst mode data.

5.2 PEAK-TO-AVERAGE RATIO

5.2.1 MEASUREMENT METHOD

Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to 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:

PAPR (dB) = PPk (dBm) - PAvg (dBm).

5.2.2 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.

5.2.3 MEASUREMENT RESULT

Modes	Max Peak to Average Ratio(dB)	Upper limit(dB)	Result
UMTS BAND II	5.32	13	Pass
UMTS BAND V	6	13	Pass
Note: refer to section of 5.1.1.2.			

5.3 OCCUPIED BANDWIDTH

5.3.1 MEASUREMENT METHOD

1. The Occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper Frequency limits, the mean power radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

2. RBW=1~5% of the expected OBW, VBW>=3 x RBW, Detector=Peak, Trace mode=max hold, Sweep=auto couple, and the trace was allowed to stabilize.

5.3.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

5.3.3 MEASUREMENT RESULT

Pass

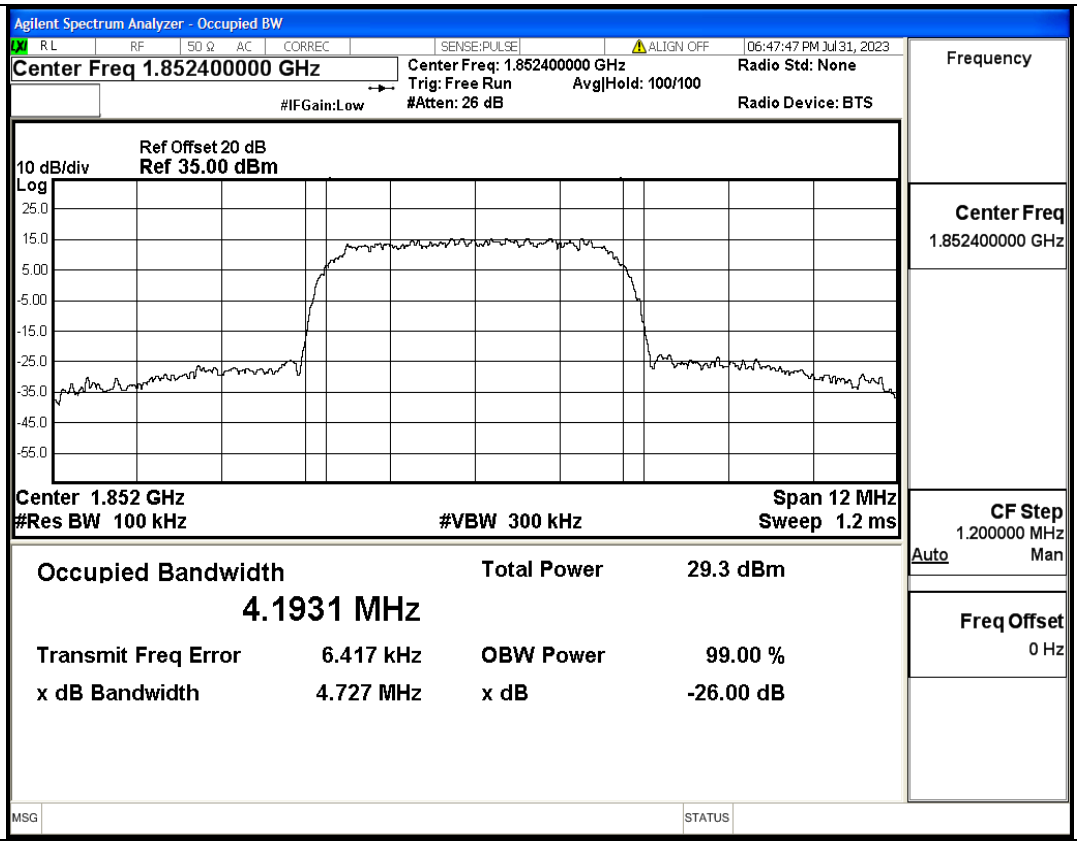
Temperature	23.9℃	Humidity	56%
Test Engineer	Anna Hu		

Type	Frequency(MHz)	Mode	Occupied Bandwidth(KHz)	Emission Bandwidth(KHz)	Limit
UMTS BAND II	1852.4	RMC	4207	4716	No limit
UMTS BAND II	1880	RMC	4140.6	4716	No limit
UMTS BAND II	1907.6	RMC	4160.3	4692	No limit
UMTS BAND V	826.4	RMC	4180	4672	No limit
UMTS BAND V	836.4	RMC	4141.7	4665	No limit
UMTS BAND V	846.6	RMC	4175.8	4674	No limit

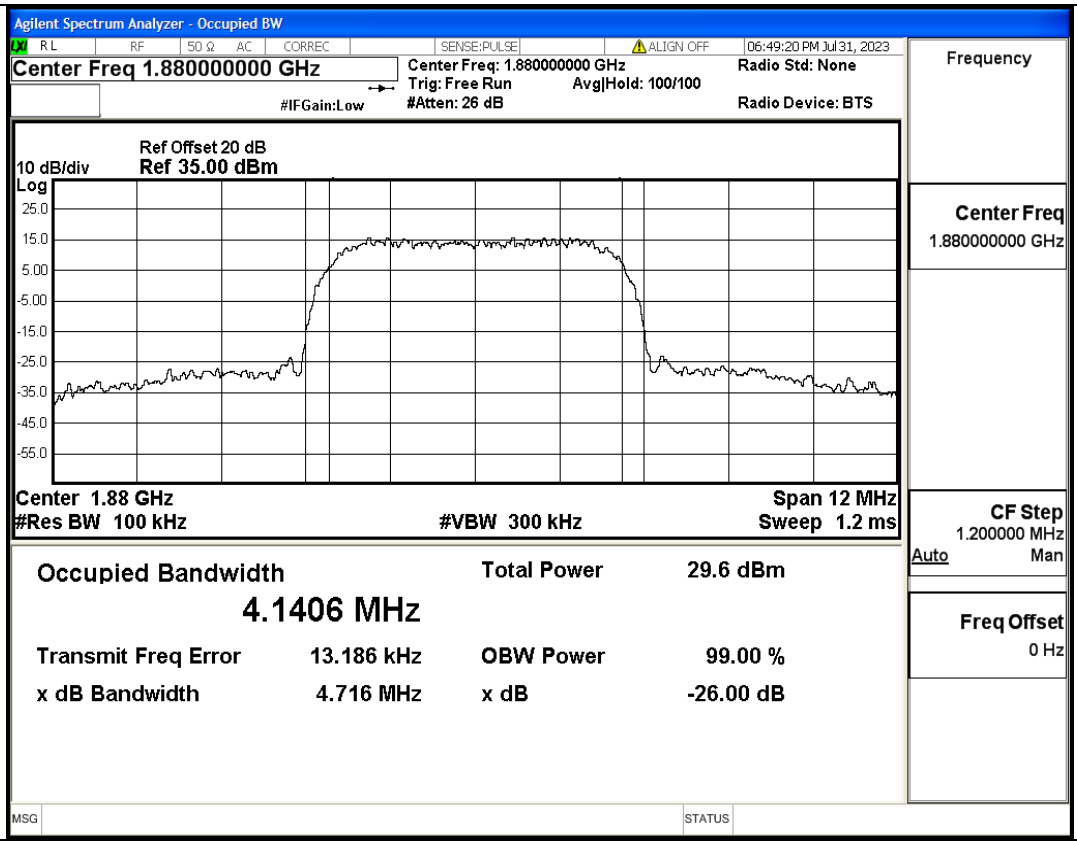
For WCDMA

Test Band=WCDMA850/WCDMA1900

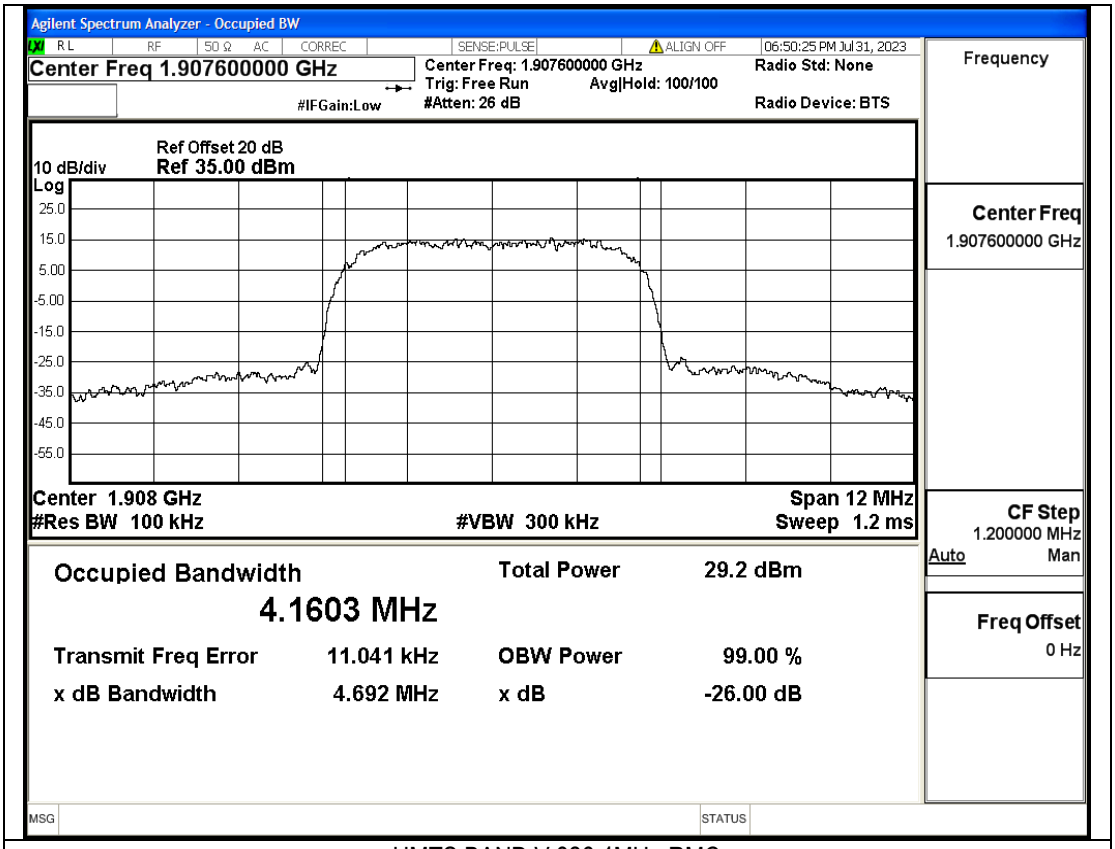
UMTS BAND II-1852.4MHz-RMC



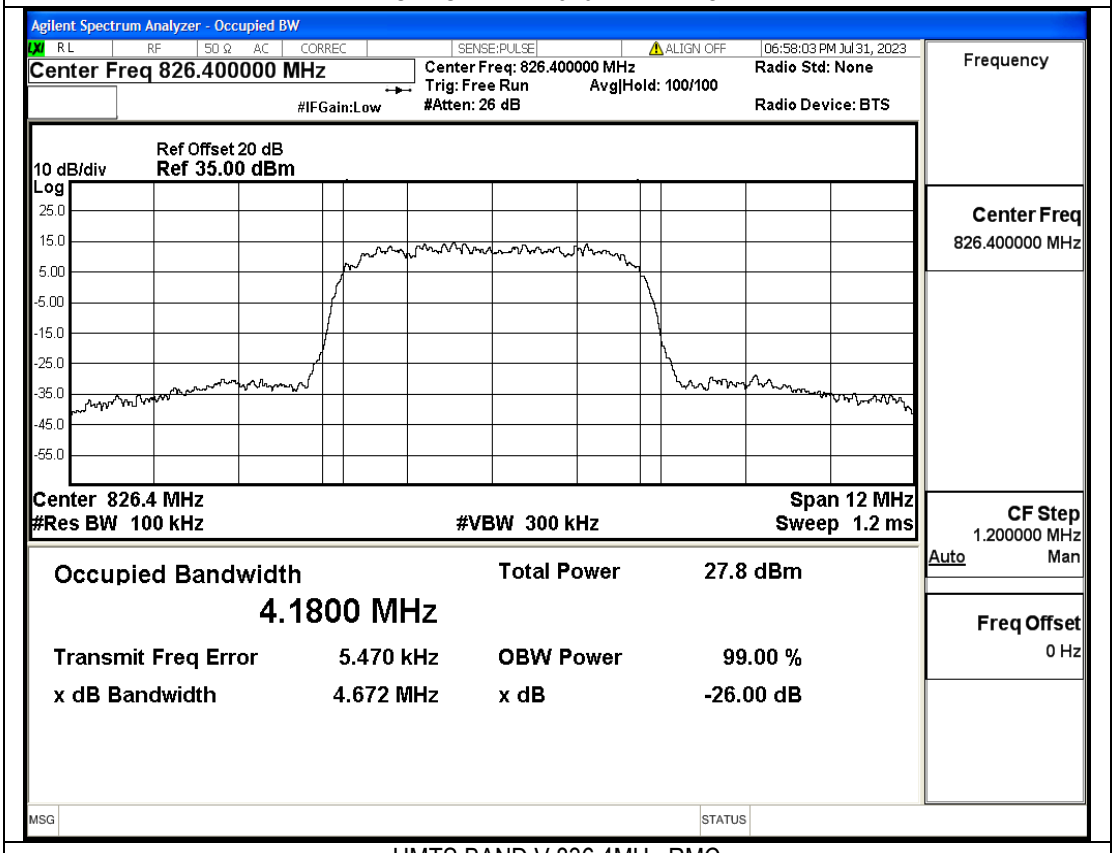
UMTS BAND II-1880MHz-RMC



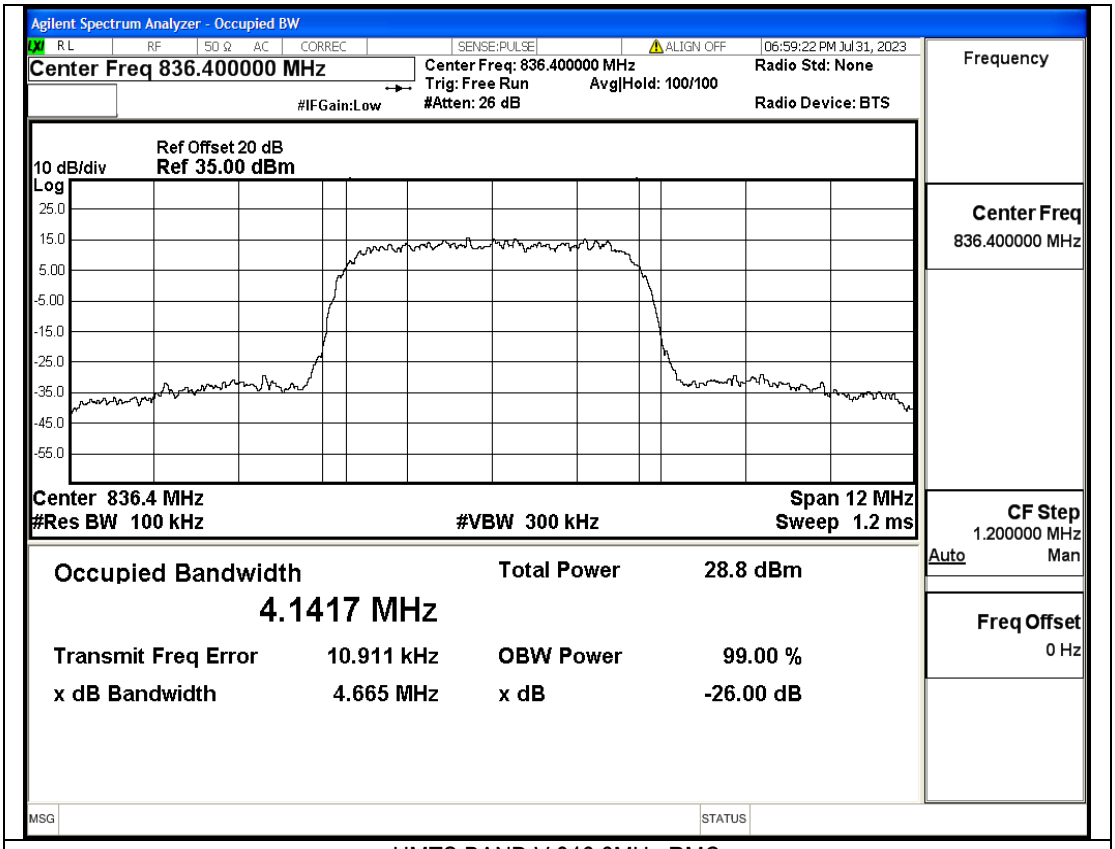
UMTS BAND II-1907.6MHz-RMC



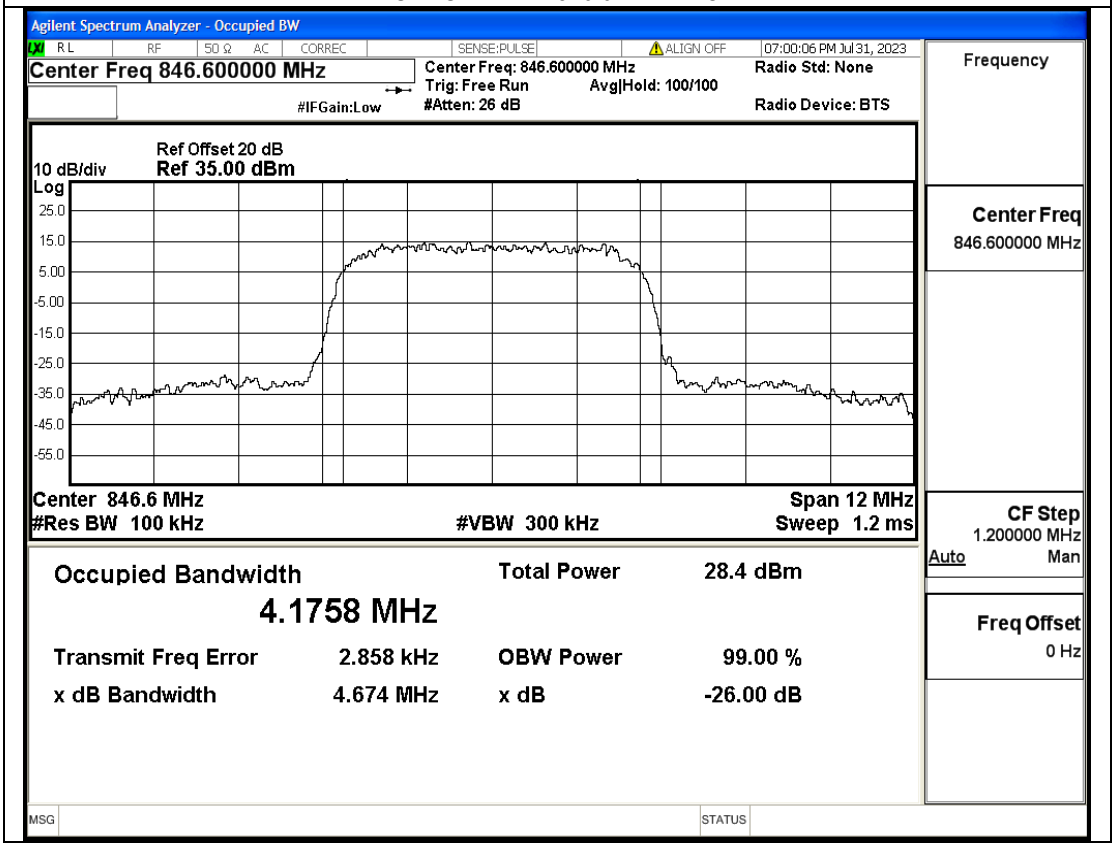
UMTS BAND V-826.4MHz-RMC



UMTS BAND V-836.4MHz-RMC



UMTS BAND V-846.6MHz-RMC



5.4 BAND EDGE

5.4.1 MEASUREMENT METHOD

1. All out of band emissions are measured with an analyzer spectrum connected to the antenna terminal of the EUT while the EUT at its maximum duty cycle, at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration
2. The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.
3. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
4. Span was set large enough so as to capture all out of band emissions near the band edge.
5. RBW>1% of the emission bandwidth, VBW >=3 x RBW, Detector=RMS, Number of points>=2 x Span/RBW, Trace mode=max hold, Sweep time=auto couple, and the trace was allowed to stabilize

5.4.2 PROVISIONS APPLICABLE

As Specified in FCC rules of 22.917(a), 24.238(a)and KDB 971168 D1 V03R01.

5.4.3 MEASUREMENT RESULT

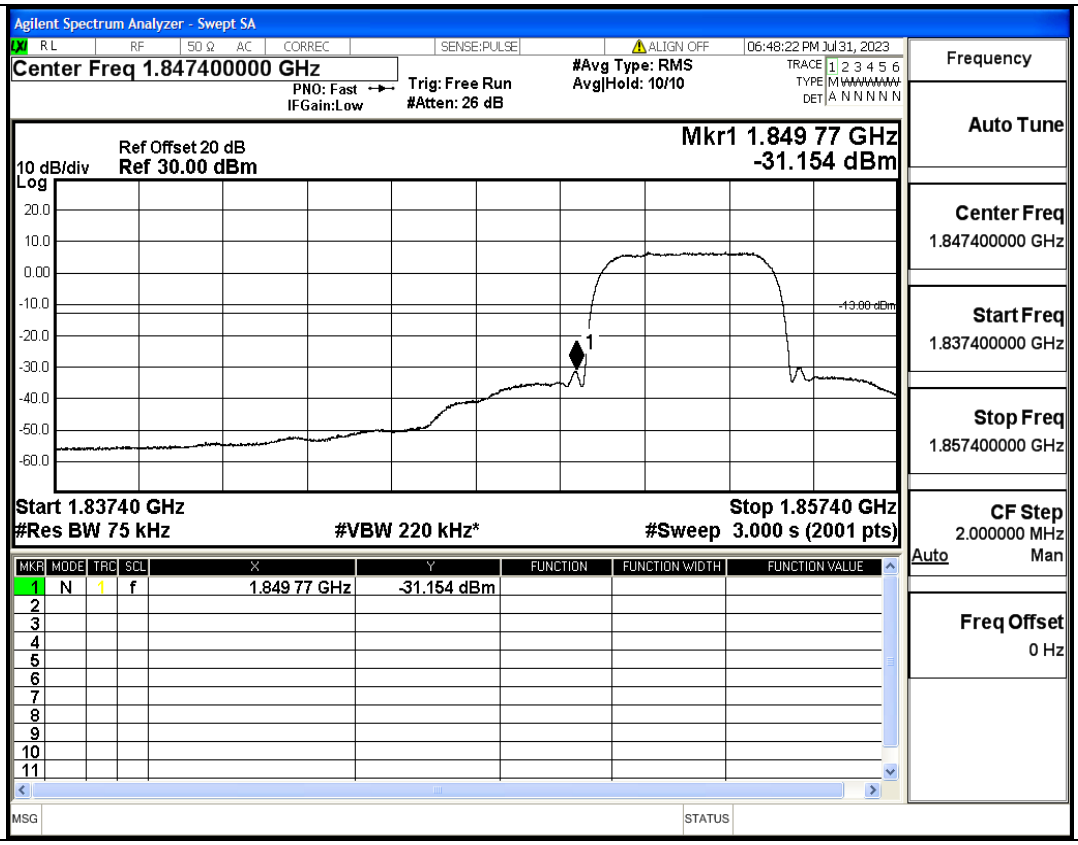
Pass

Temperature	23.9℃	Humidity	56%
Test Engineer	Anna Hu		

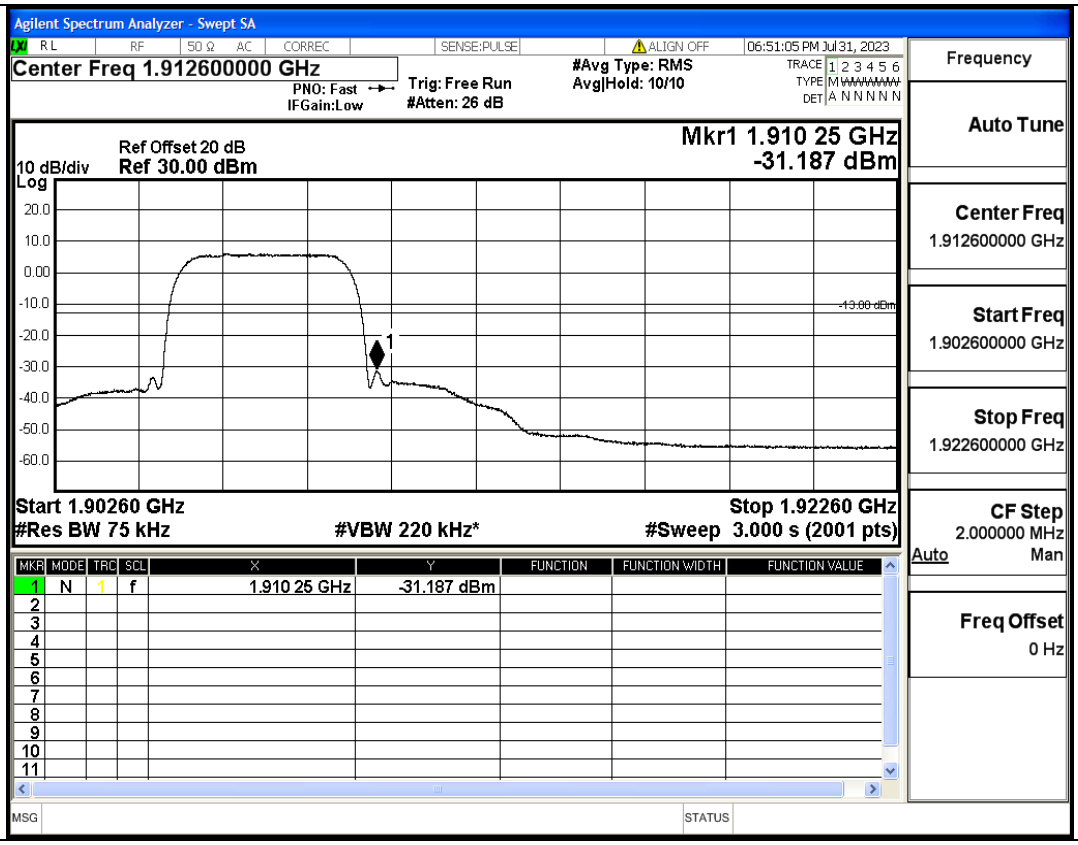
For WCDMA

Test Band=WCDMA850/WCDMA1900

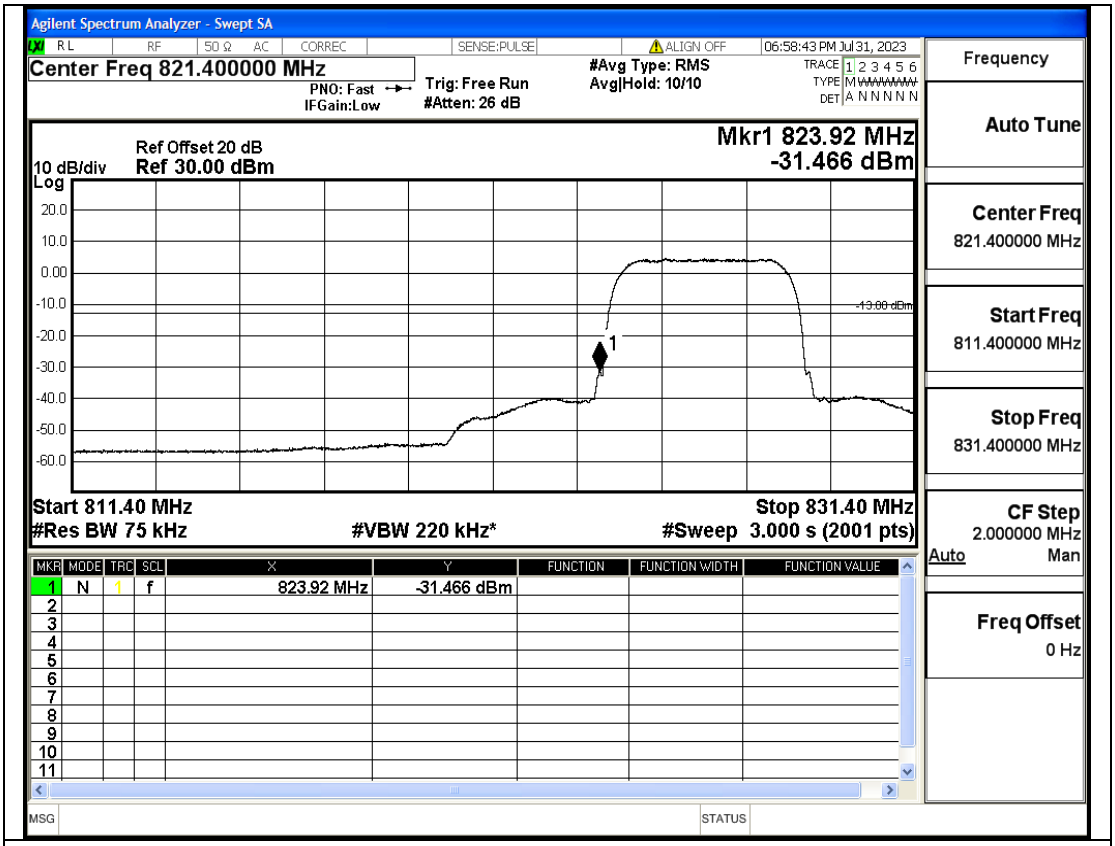
UMTS BAND II-1852.4MHz-RMC



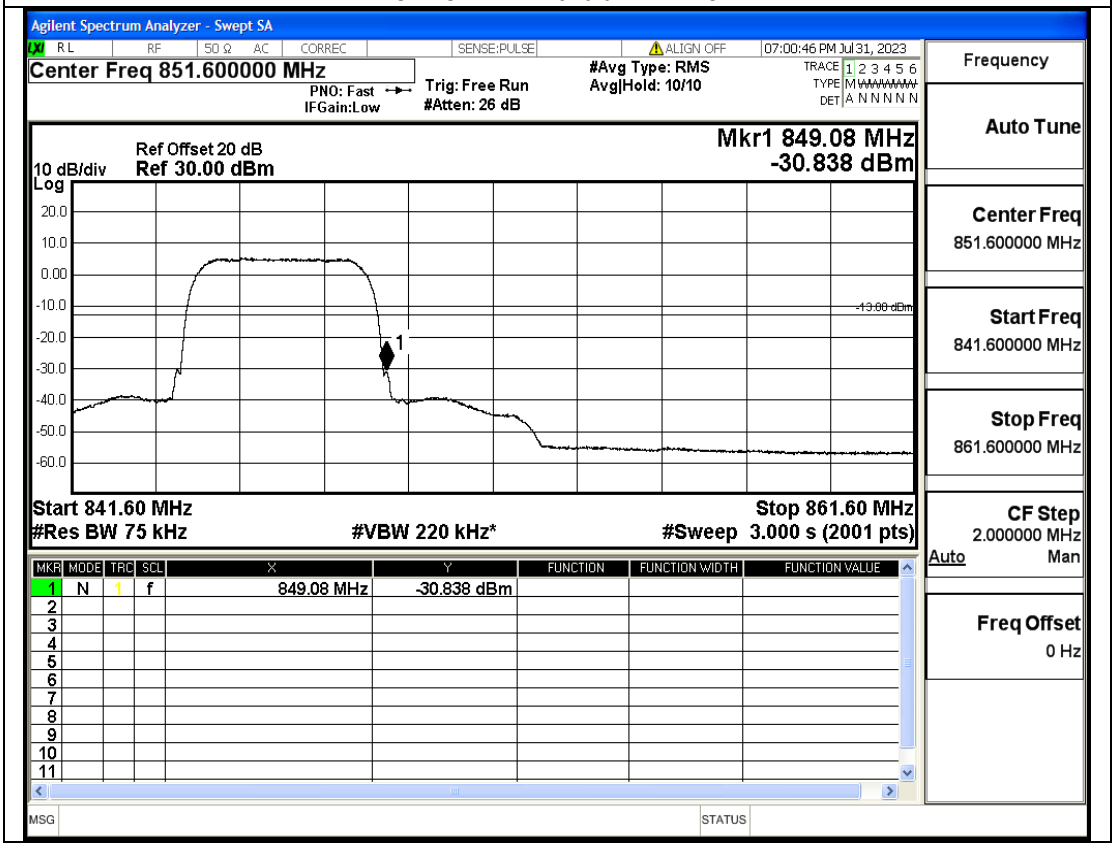
UMTS BAND II-1907.6MHz-RMC



UMTS BAND V-826.4MHz-RMC



UMTS BAND V-846.6MHz-RMC



5.5 SPURIOUS EMISSION

5.5.1 CONDUCTED SPURIOUS EMISSION

5.5.1.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. The level of the carrier and the various conducted spurious and harmonic frequency 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 10^{th} 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 maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration.

2. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

3. Determine EUT transmit frequencies: the following typical channels were chosen to conducted emissions testing.

Typical Channels for testing of UMTS band II	
Channel	Frequency (MHz)
9262	1852.4
9400	1880
9538	1907.6

Typical Channels for testing of UMTS band V	
Channel	Frequency (MHz)
4132	826.4
4182	836.4
4233	846.6

5.5.1.2 PROVISIONS APPLICABLE

On any frequency outside frequency band of 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. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

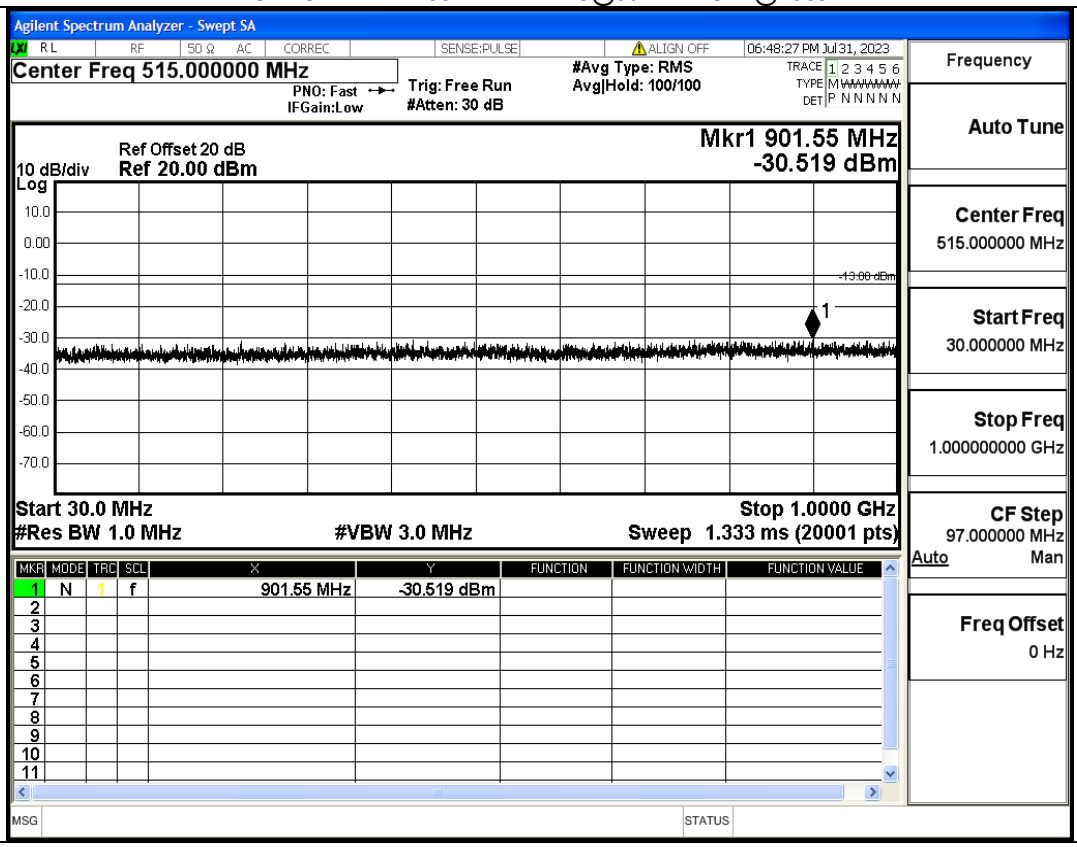
5.5.1.3 MEASUREMENT RESULT

Pass

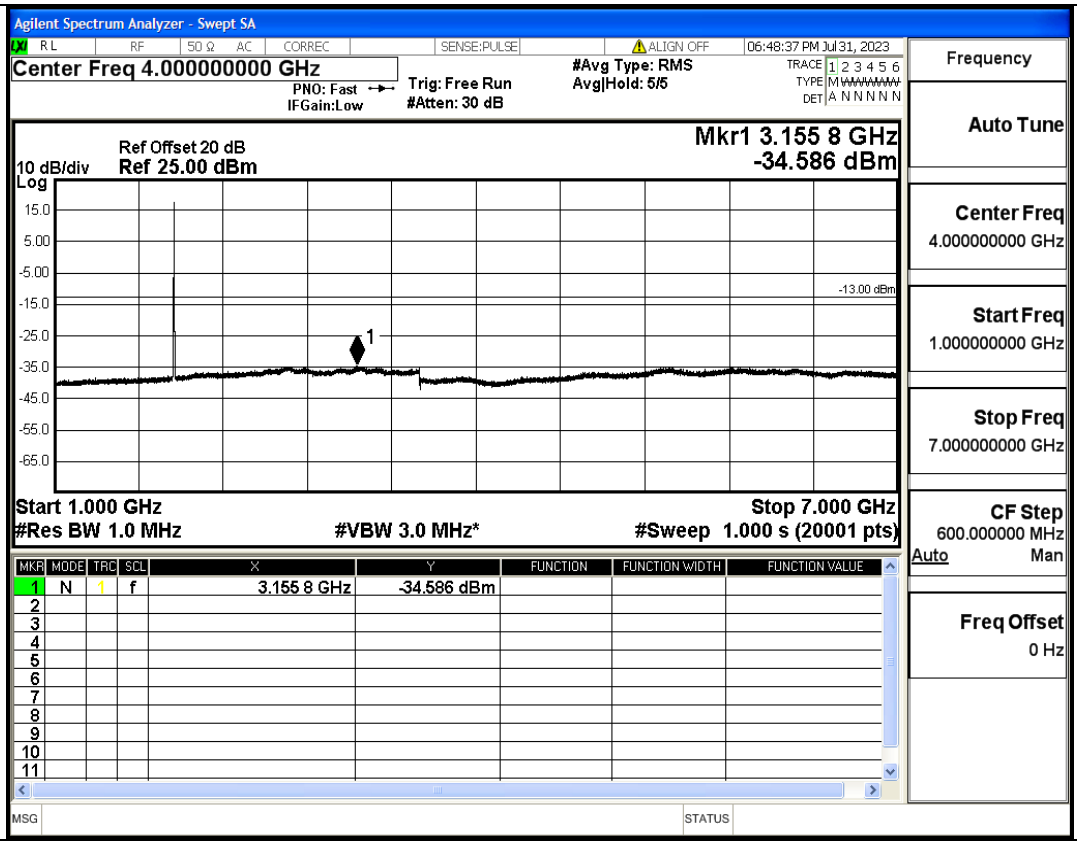
Temperature	23.9℃	Humidity	56%
Test Engineer	Anna Hu		

Test Band
WCDMA850/ WCDMA1900

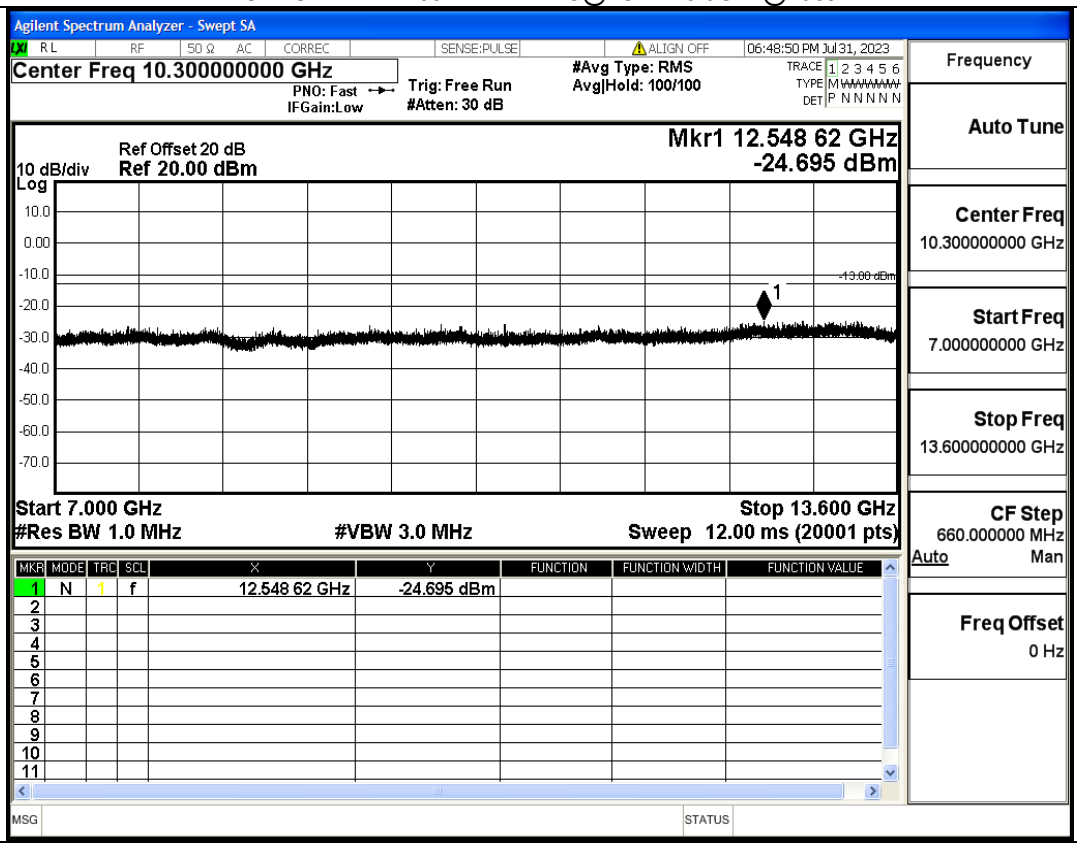
UMTS BAND II-1852.4MHz-RMC@30mHz-1GHz@Pass



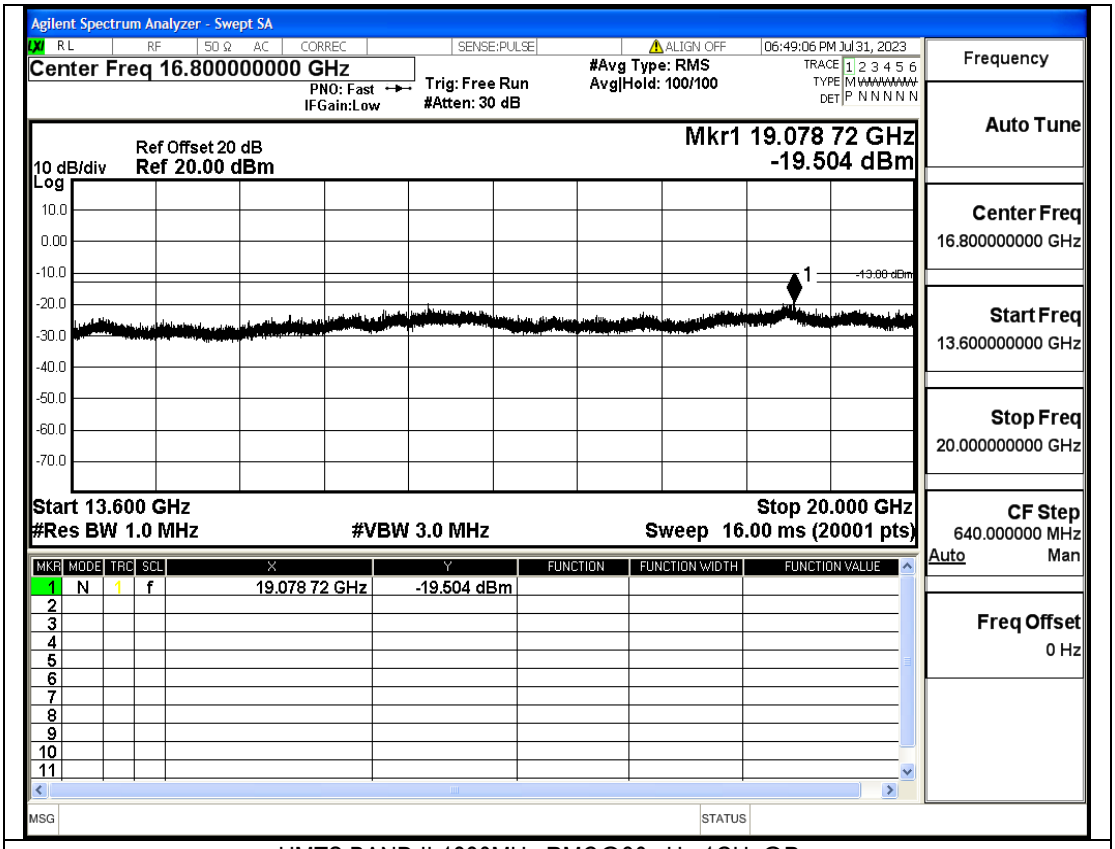
UMTS BAND II-1852.4MHz-RMC@1GHz-7GHz@Pass



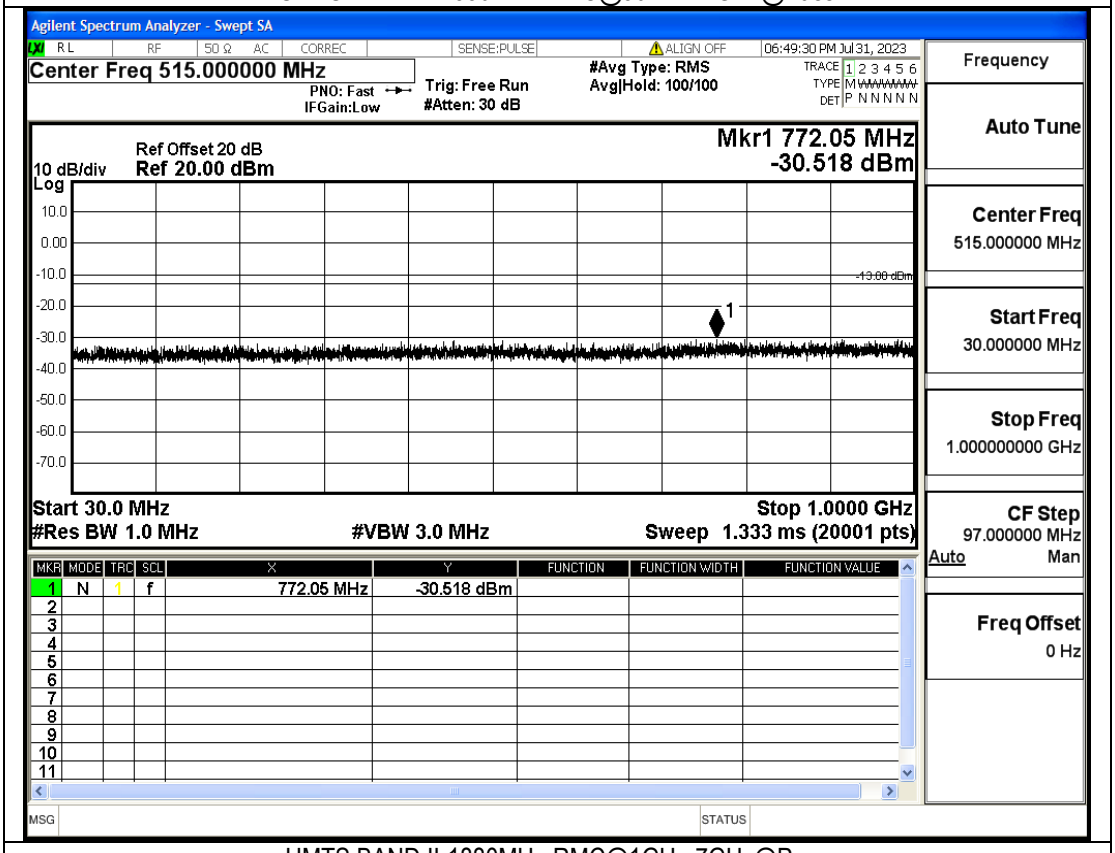
UMTS BAND II-1852.4MHz-RMC@7GHz-13.6GHz@Pass



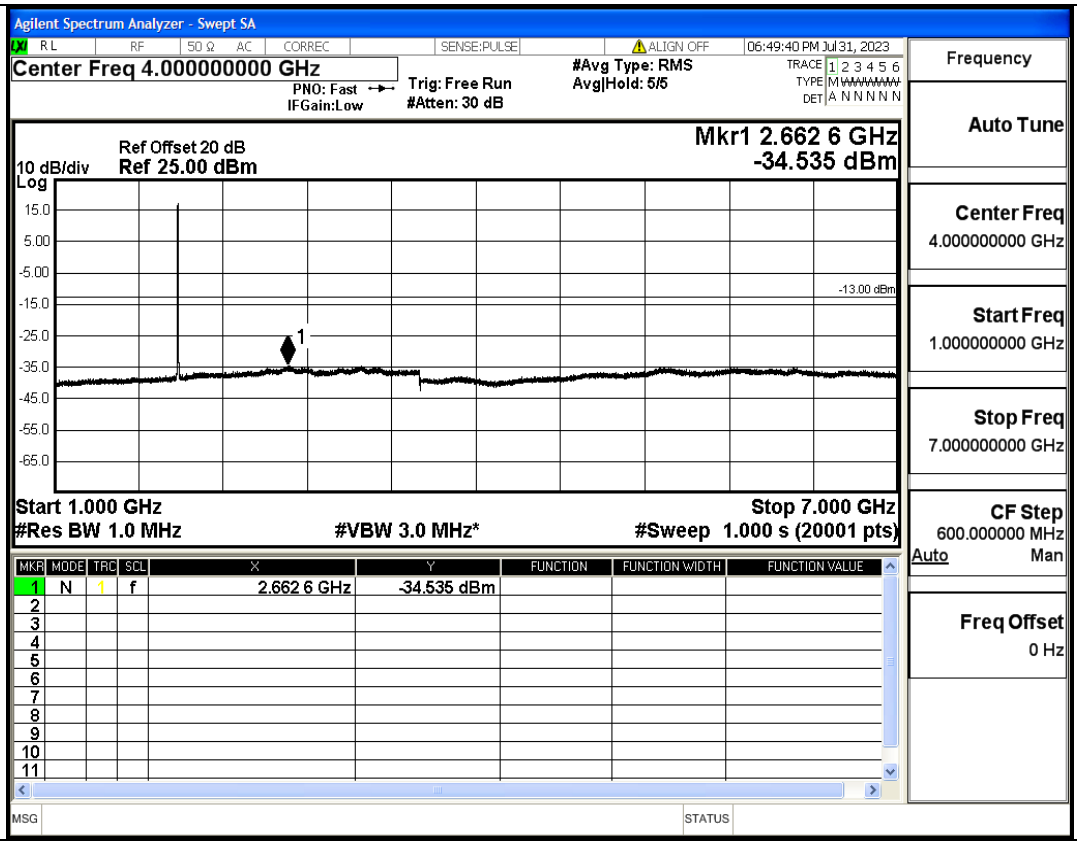
UMTS BAND II-1852.4MHz-RMC@13.6GHz-20GHz@Pass



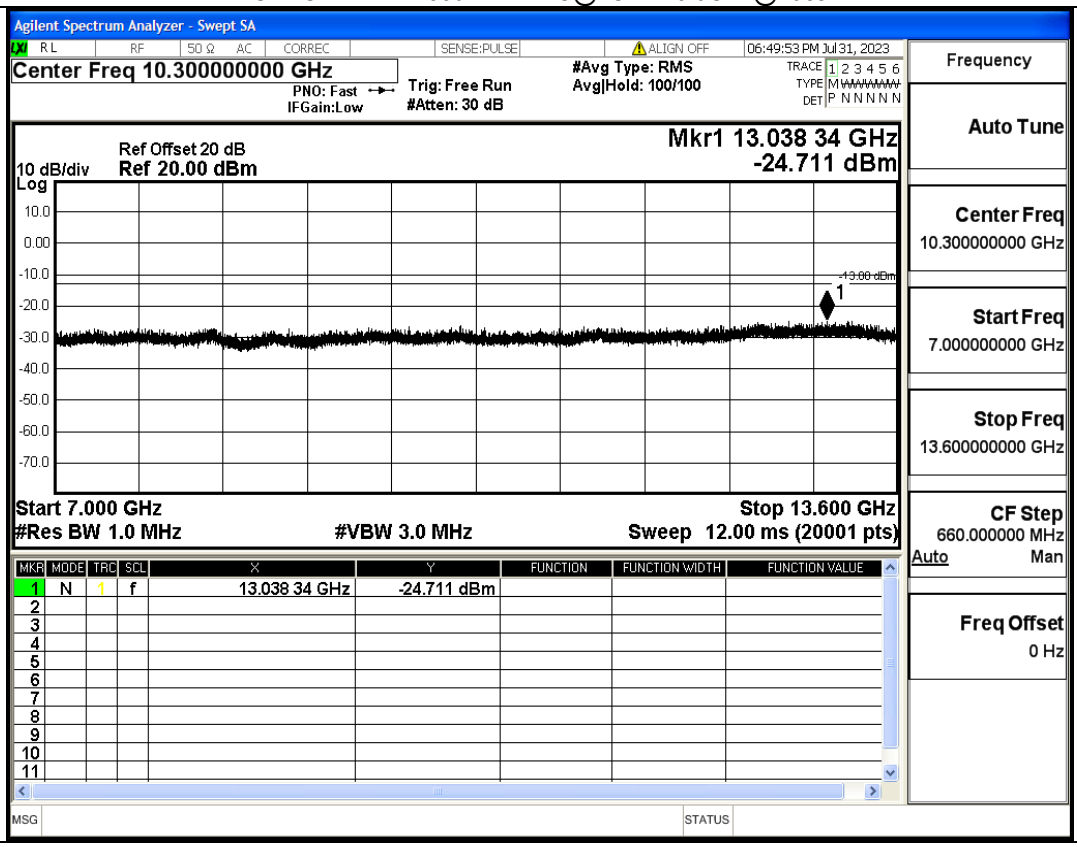
UMTS BAND II-1880MHz-RMC@30mHz-1GHz@Pass



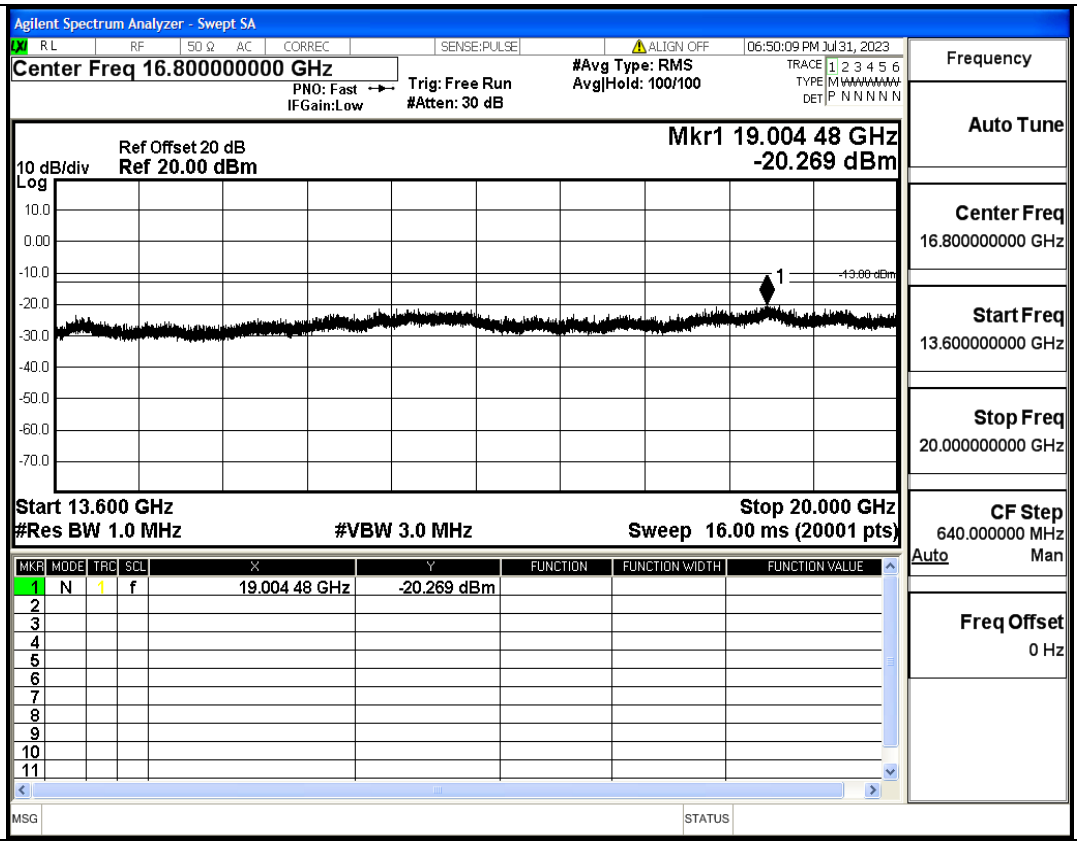
UMTS BAND II-1880MHz-RMC@1GHz-7GHz@Pass



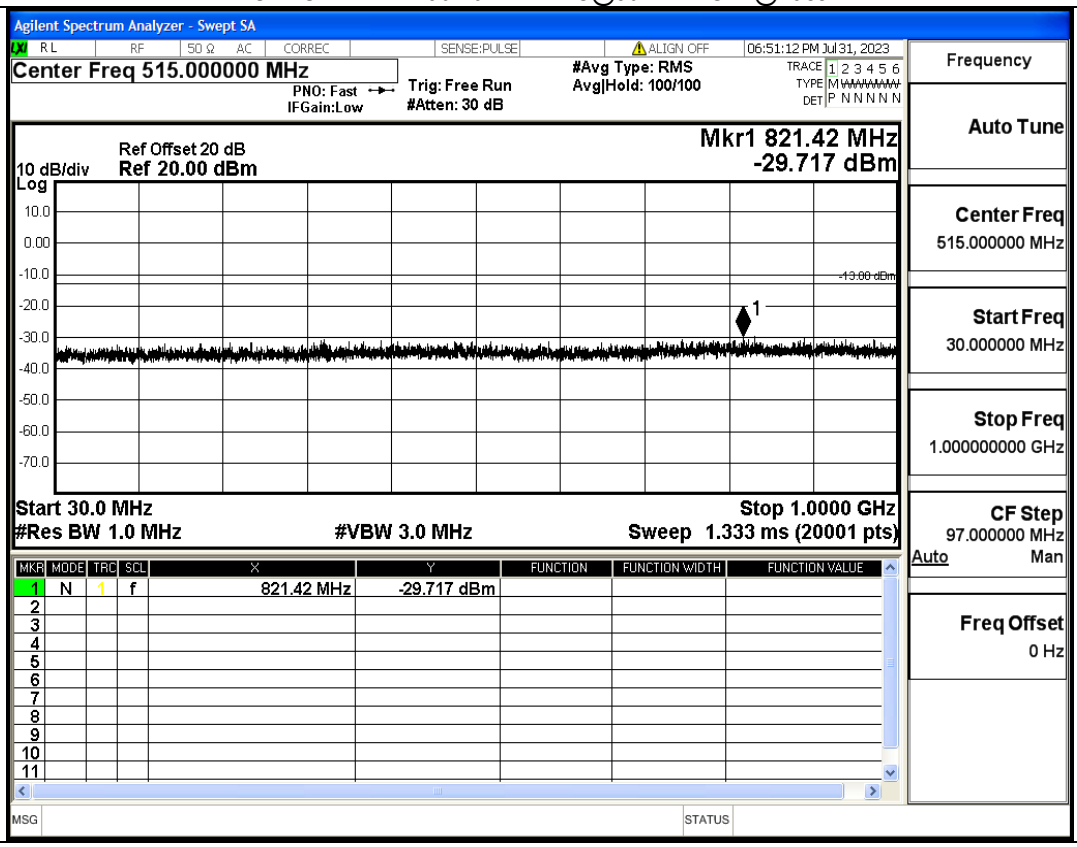
UMTS BAND II-1880MHz-RMC@7GHz-13.6GHz@Pass



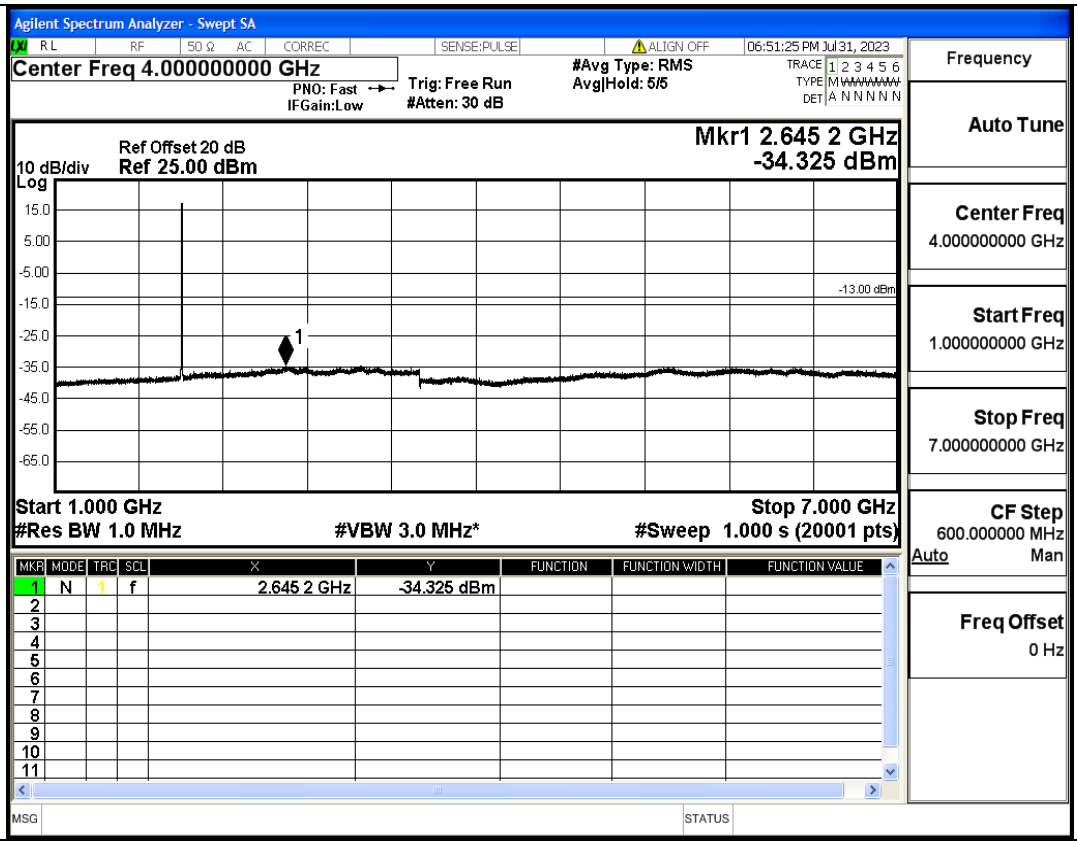
UMTS BAND II-1880MHz-RMC@13.6GHz-20GHz@Pass



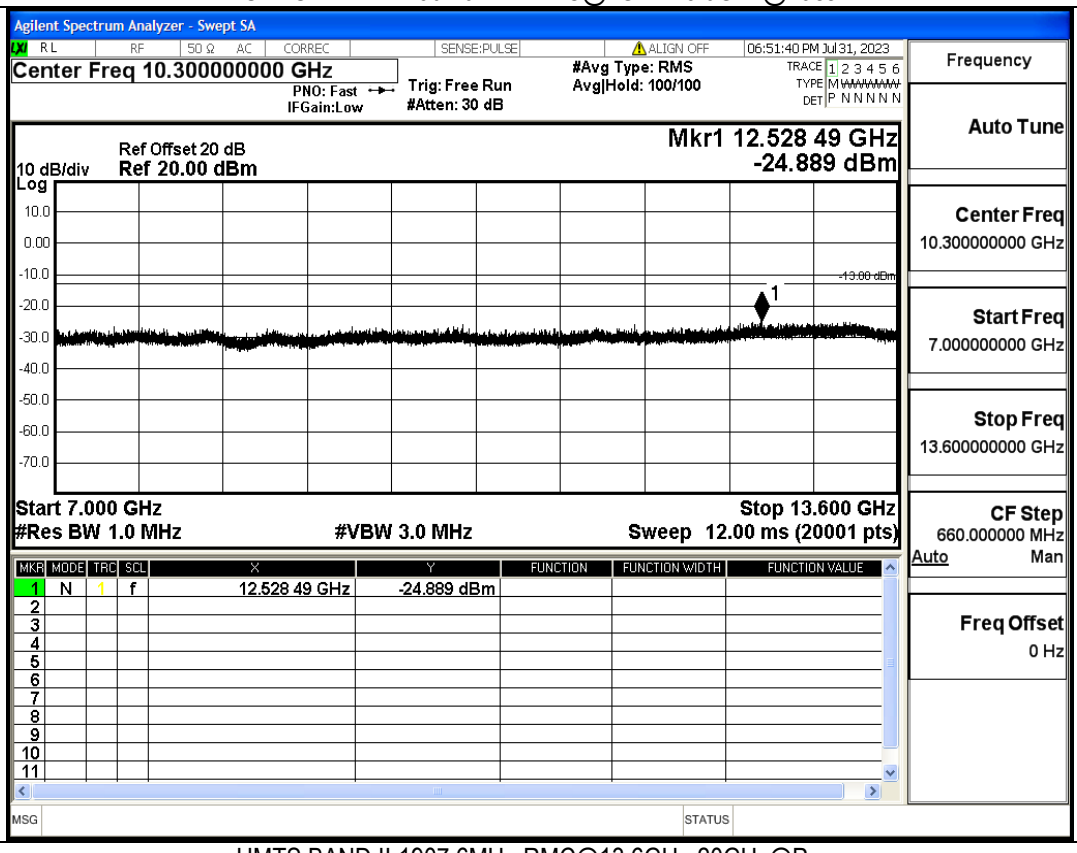
UMTS BAND II-1907.6MHz-RMC@30mHz-1GHz@Pass



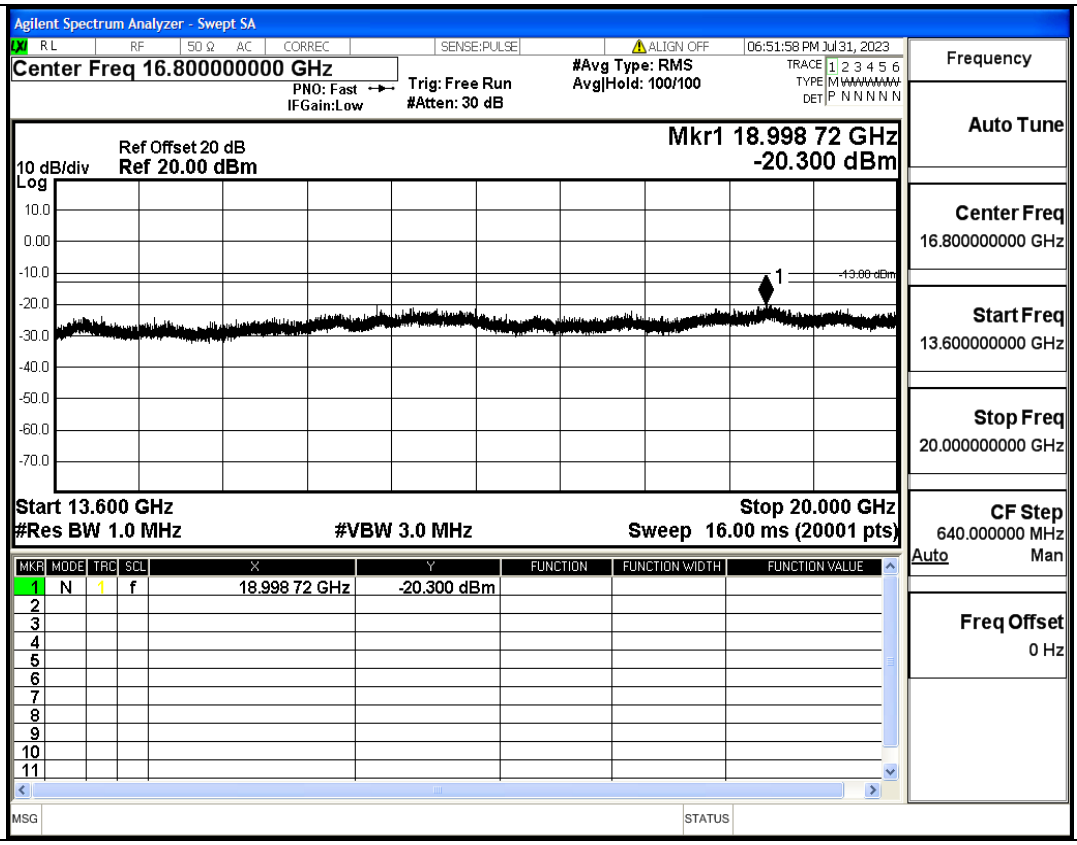
UMTS BAND II-1907.6MHz-RMC@1GHz-7GHz@Pass



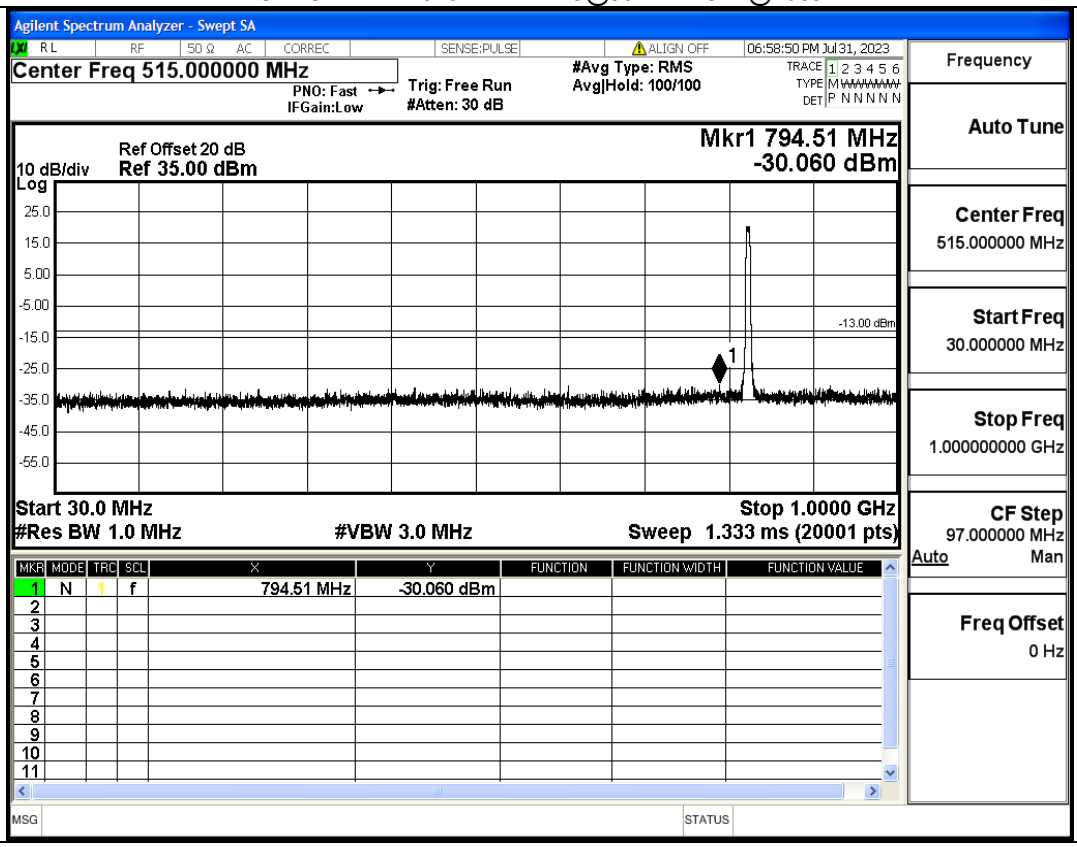
UMTS BAND II-1907.6MHz-RMC@7GHz-13.6GHz@Pass



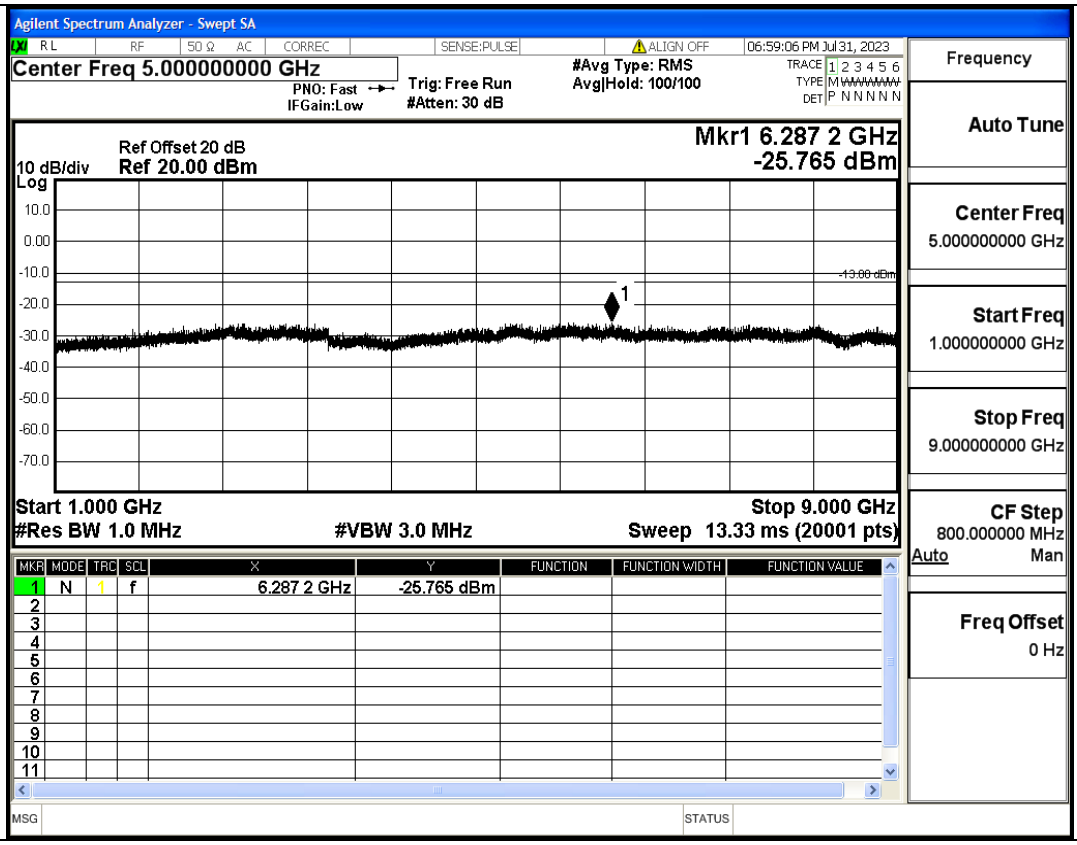
UMTS BAND II-1907.6MHz-RMC@13.6GHz-20GHz@Pass



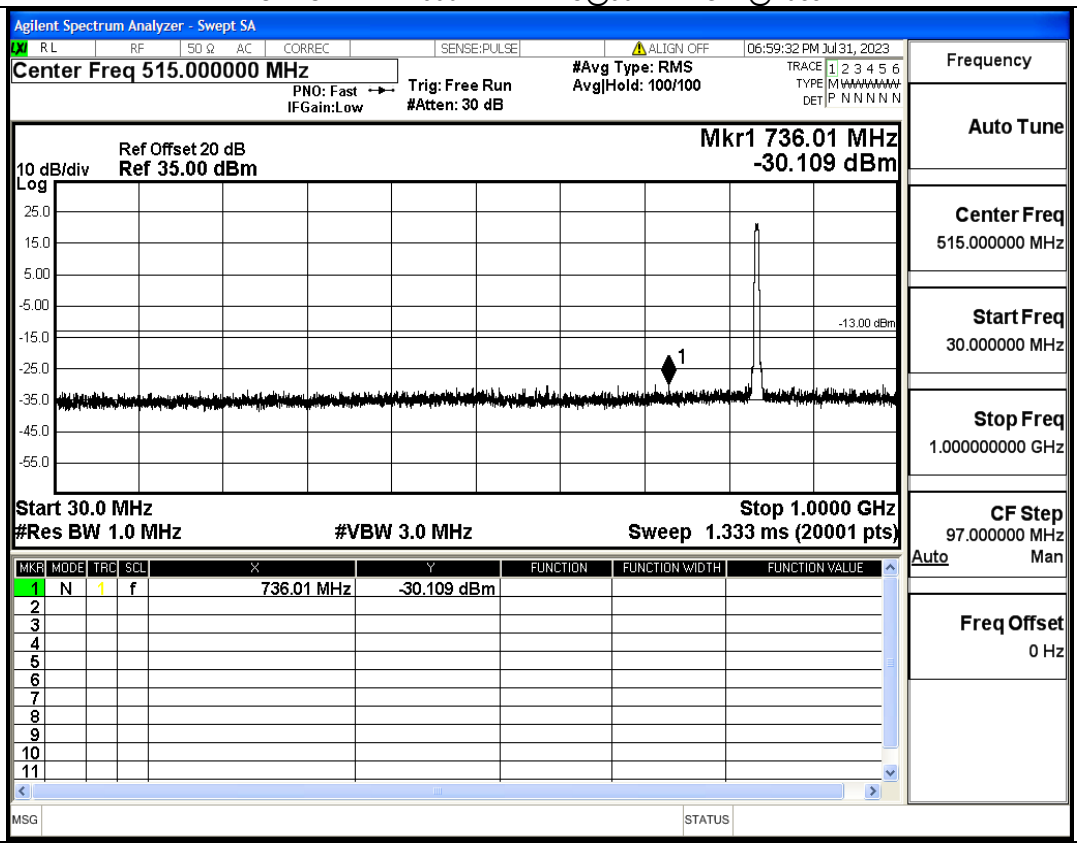
UMTS BAND V-826.4MHz-RMC@30mHz-1GHz@Pass



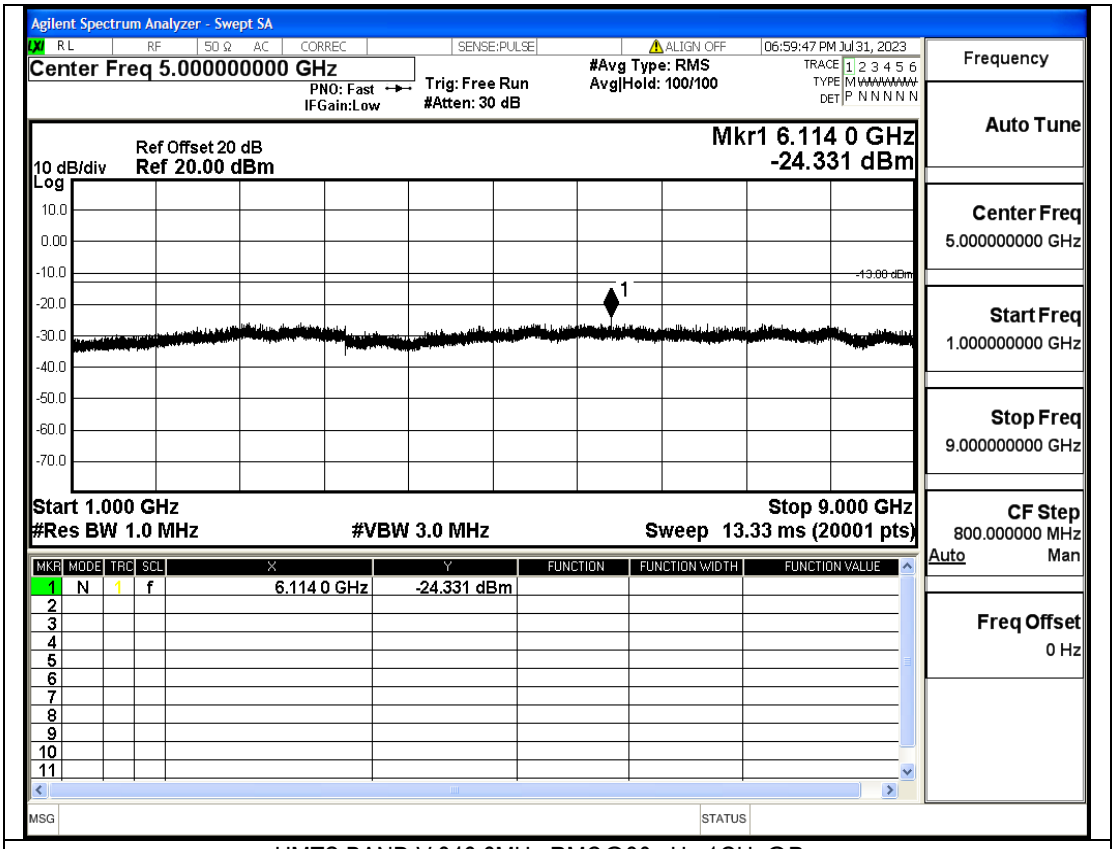
UMTS BAND V-826.4MHz-RMC@1GHz-9GHz@Pass



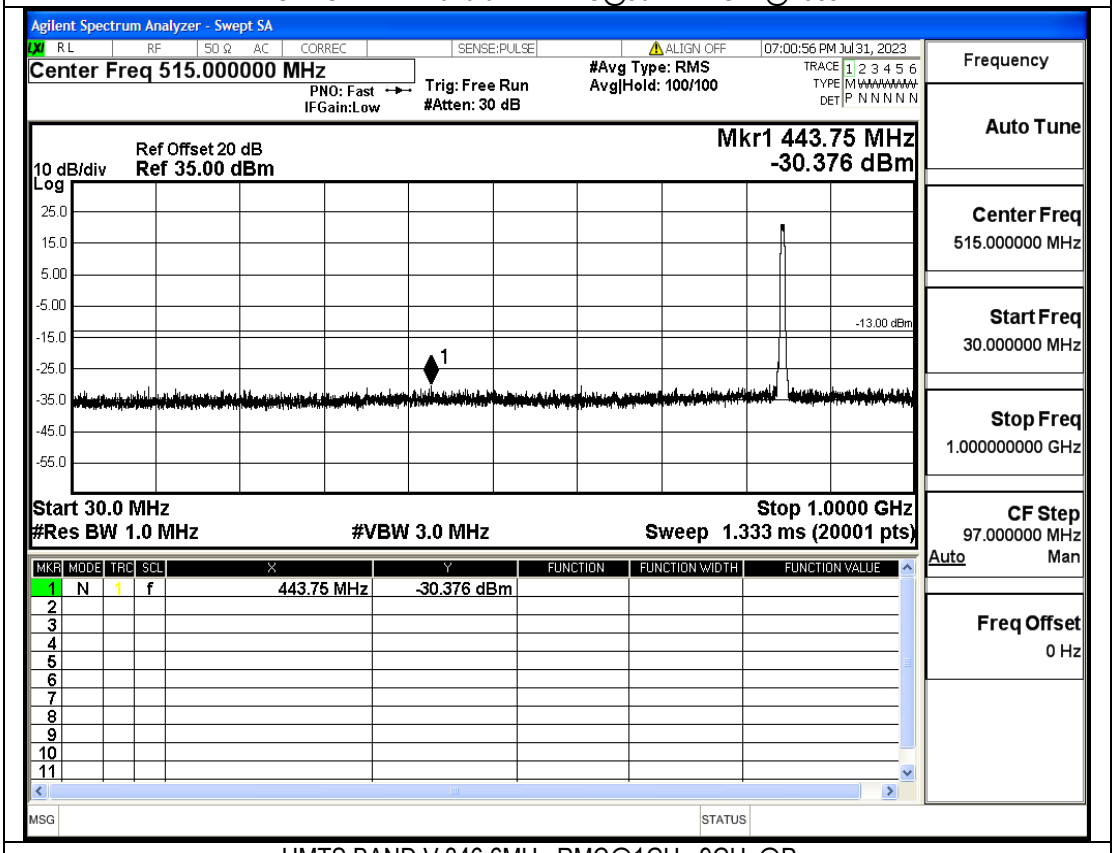
UMTS BAND V-836.4MHz-RMC@30mHz-1GHz@Pass



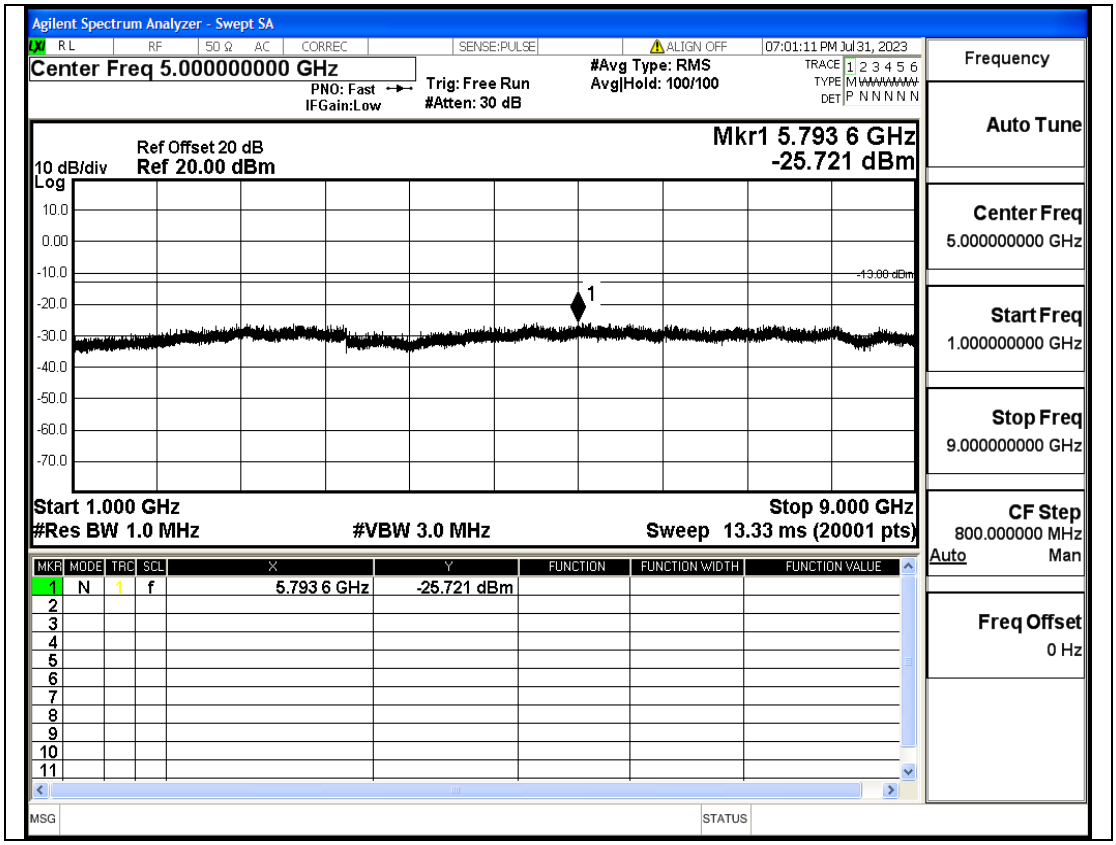
UMTS BAND V-836.4MHz-RMC@1GHz-9GHz@Pass



UMTS BAND V-846.6MHz-RMC@30mHz-1GHz@Pass



UMTS BAND V-846.6MHz-RMC@1GHz-9GHz@Pass



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.

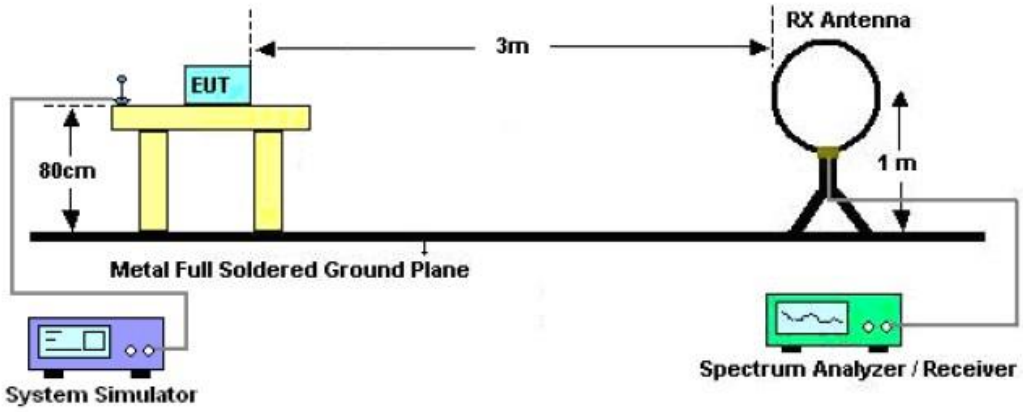
5.5.2 RADIATED SPURIOUS EMISSION

5.5.2.1 MEASUREMENT METHOD

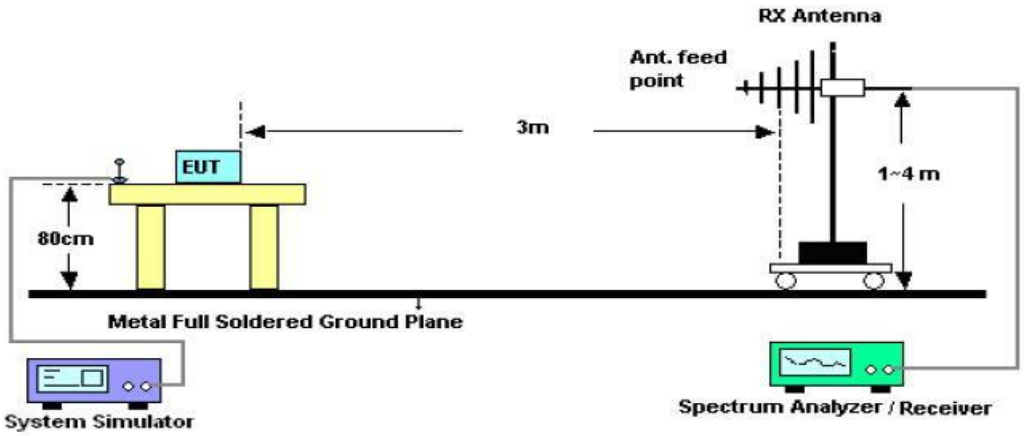
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated 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.

5.5.2.2 TEST SETUP

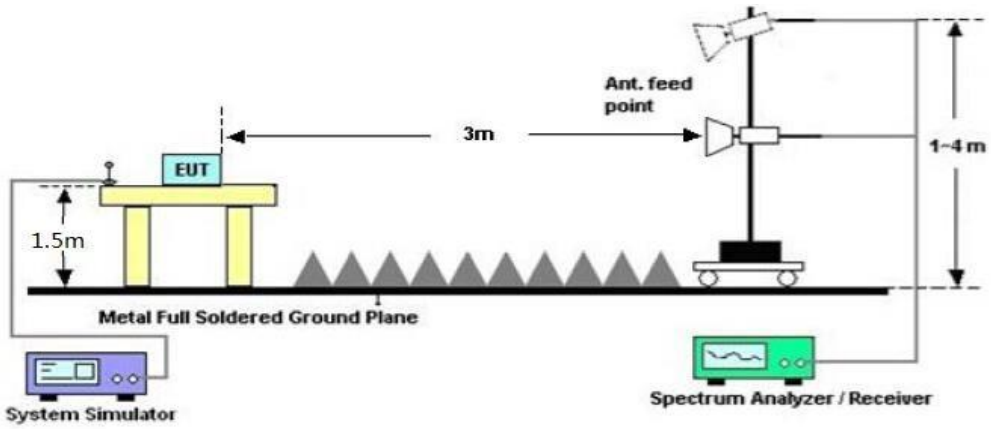
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



5.5.2.3 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.

Note: only result the worst condition of each test mode:

5.5.2.4 MEASUREMENT RESULT

Pass

Temperature	24.1℃	Humidity	58%
Test Engineer	Anna Hu		

GSM 850:

The Worst Test Results for Channel 128/824.2 MHz				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1648.09	-60.69	-13	47.69	Horizontal
3296.46	-41.43	-13	28.43	Horizontal
4944.83	-55.13	-13	42.13	Horizontal
1648.06	-40.10	-13	27.10	Vertical
3296.46	-49.57	-13	36.57	Vertical
4944.84	-44.72	-13	31.72	Vertical

PCS 1900:

The Worst Test Results for Channel 512/1850.2 MHz				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
3700.16	-55.76	-13	42.76	Horizontal
7400.42	-37.14	-13	24.14	Horizontal
11100.93	-51.21	-13	38.21	Horizontal
3700.02	-40.68	-13	27.68	Vertical
7400.43	-51.34	-13	38.34	Vertical
11100.95	-46.76	-13	33.76	Vertical

WCDMA BAND II:

The Worst Test Results for Channel 9400/1880MHz				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
3754.08	-57.99	-13	44.99	Horizontal
7513.61	-41.45	-13	28.45	Horizontal
11271.19	-51.38	-13	38.38	Horizontal
3752.43	-38.22	-13	25.22	Vertical
7510.94	-53.56	-13	40.56	Vertical
11274.77	-44.43	-13	31.43	Vertical

WCDMA BAND V:

The Worst Test Results for Channel 4132/826.4MHz				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1647.78	-55.80	-13	42.80	Horizontal
3300.20	-41.64	-13	28.64	Horizontal
4951.63	-52.09	-13	39.09	Horizontal
1645.66	-40.70	-13	27.70	Vertical
3297.70	-52.68	-13	39.68	Vertical
4951.08	-47.65	-13	34.65	Vertical

RESULT: PASS

Note:

11. Margin = Limit - Emission Level
12. Below 30MHZ no Spurious found and Above is the worst mode data.

5.6 FREQUENCY STABILITY

5.6.1 MEASUREMENT METHOD

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 CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1 Measure the carrier frequency at room temperature.

2 Subject the EUT to overnight soak at -30℃.

3 With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 for PCS 1900 band , channel 190 for GSM 850 band, channel 9400 for UMTS band II, channel 1412 for UMTS band IV and channel 4175 for UMTS band V measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

4 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.

5 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.

6 Subject the EUT to overnight soak at +50℃.

7 With the EUT, powered via nominal voltage, connected to the CMU200 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.

8 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.

9 At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

5.6.2 PROVISIONS APPLICABLE

5.6.2.1 FOR HAND CARRIED BATTERY POWERED EQUIPMENT

According to the ANSI/TIA-603-E-2016, the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5VDC and 4.2VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

5.6.2.2 FOR EQUIPMENT POWERED BY PRIMARY SUPPLY VOLTAGE

According to the ANSI/TIA-603-E-2016,the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment, the normal environment temperature is 20^{o}C.

5.6.3 MEASUREMENT RESULT

Pass

For WCDMA

Test Band=WCDMA850/WCDMA1900

Voltage							
Band	Channel	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
Band II	9262	VL	TN	-24.53	-0.0130	2.5	PASS
Band II	9262	VN	TN	-27.37	-0.0146	2.5	PASS
Band II	9262	VH	TN	-26.64	-0.0142	2.5	PASS
Band II	9400	VL	TN	-20.86	-0.0111	2.5	PASS
Band II	9400	VN	TN	-27.56	-0.0147	2.5	PASS
Band II	9400	VH	TN	-24.39	-0.0130	2.5	PASS
Band II	9538	VL	TN	-25.18	-0.0134	2.5	PASS
Band II	9538	VN	TN	-23.21	-0.0123	2.5	PASS
Band II	9538	VH	TN	-28.6	-0.0152	2.5	PASS
Band V	4132	VL	TN	-12.16	-0.0145	2.5	PASS
Band V	4132	VN	TN	-11.79	-0.0141	2.5	PASS
Band V	4132	VH	TN	-15	-0.0179	2.5	PASS
Band V	4182	VL	TN	-3.53	-0.0042	2.5	PASS
Band V	4182	VN	TN	-6.99	-0.0084	2.5	PASS
Band V	4182	VH	TN	-13.92	-0.0167	2.5	PASS
Band V	4233	VL	TN	-7.11	-0.0085	2.5	PASS
Band V	4233	VN	TN	-9.11	-0.0109	2.5	PASS
Band V	4233	VH	TN	-18.1	-0.0217	2.5	PASS

Temperature							
Band	Channel	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
Band II	9262	VN	-30	-22.28	-0.0119	2.5	PASS
Band II	9262	VN	-20	-21.34	-0.0114	2.5	PASS
Band II	9262	VN	-10	-29.13	-0.0155	2.5	PASS
Band II	9262	VN	0	-18.86	-0.0100	2.5	PASS
Band II	9262	VN	10	-24.89	-0.0132	2.5	PASS
Band II	9262	VN	20	-28.98	-0.0154	2.5	PASS
Band II	9262	VN	30	-25.71	-0.0137	2.5	PASS
Band II	9262	VN	40	-18.3	-0.0097	2.5	PASS
Band II	9262	VN	50	-25.12	-0.0134	2.5	PASS
Band II	9400	VN	-30	-28.66	-0.0152	2.5	PASS
Band II	9400	VN	-20	-23.81	-0.0127	2.5	PASS
Band II	9400	VN	-10	-23.3	-0.0124	2.5	PASS
Band II	9400	VN	0	-24.22	-0.0129	2.5	PASS

Band II	9400	VN	10	-21.68	-0.0115	2.5	PASS
Band II	9400	VN	20	-25.37	-0.0135	2.5	PASS
Band II	9400	VN	30	-19.6	-0.0104	2.5	PASS
Band II	9400	VN	40	-21.62	-0.0115	2.5	PASS
Band II	9400	VN	50	-19.45	-0.0103	2.5	PASS
Band II	9538	VN	-30	-22.32	-0.0119	2.5	PASS
Band II	9538	VN	-20	-24.21	-0.0129	2.5	PASS
Band II	9538	VN	-10	-27.18	-0.0145	2.5	PASS
Band II	9538	VN	0	-21.36	-0.0114	2.5	PASS
Band II	9538	VN	10	-20.86	-0.0111	2.5	PASS
Band II	9538	VN	20	-23.43	-0.0125	2.5	PASS
Band II	9538	VN	30	-20.82	-0.0111	2.5	PASS
Band II	9538	VN	40	-24.34	-0.0129	2.5	PASS
Band II	9538	VN	50	-20.89	-0.0111	2.5	PASS
Band V	4132	VN	-30	-8.74	-0.0105	2.5	PASS
Band V	4132	VN	-20	-10.84	-0.0130	2.5	PASS
Band V	4132	VN	-10	-10.82	-0.0129	2.5	PASS
Band V	4132	VN	0	-13.72	-0.0164	2.5	PASS
Band V	4132	VN	10	-11.18	-0.0134	2.5	PASS
Band V	4132	VN	20	-13.38	-0.0160	2.5	PASS
Band V	4132	VN	30	-9.69	-0.0116	2.5	PASS
Band V	4132	VN	40	-10.94	-0.0131	2.5	PASS
Band V	4132	VN	50	-12.7	-0.0152	2.5	PASS
Band V	4182	VN	-30	-13.42	-0.0161	2.5	PASS
Band V	4182	VN	-20	-10.66	-0.0128	2.5	PASS
Band V	4182	VN	-10	-13.8	-0.0165	2.5	PASS
Band V	4182	VN	0	-6.59	-0.0079	2.5	PASS
Band V	4182	VN	10	-10.61	-0.0127	2.5	PASS
Band V	4182	VN	20	-15.36	-0.0184	2.5	PASS
Band V	4182	VN	30	-6	-0.0072	2.5	PASS
Band V	4182	VN	40	-6.18	-0.0074	2.5	PASS
Band V	4182	VN	50	-8.09	-0.0097	2.5	PASS
Band V	4233	VN	-30	-10.38	-0.0124	2.5	PASS
Band V	4233	VN	-20	-6.82	-0.0082	2.5	PASS
Band V	4233	VN	-10	-9.57	-0.0114	2.5	PASS
Band V	4233	VN	0	-8.69	-0.0104	2.5	PASS
Band V	4233	VN	10	-11.17	-0.0134	2.5	PASS
Band V	4233	VN	20	-4.98	-0.0060	2.5	PASS
Band V	4233	VN	30	-7.61	-0.0091	2.5	PASS
Band V	4233	VN	40	-2.47	-0.0030	2.5	PASS
Band V	4233	VN	50	-8.19	-0.0098	2.5	PASS

6 Test Set up Photos of the E UT

Please refer to separated files for Test Setup Photos of the EUT.

7 External Photos of the EUT

Please refer to separated files for External Photos of the EUT.

8 Internal Photos of the EUT

Please refer to separated files for Internal Photos of the EUT.

**********End of Report **********