TCT 通测检测
TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2AAWC-MAGNUSIII

Product: 2 in 1 Tablet

Model No.: MAGNUS III

Additional Model No.: N/A

Trade Mark: iVIEW

Report No.: TCT200521E018

Issued Date: Jun. 16, 2020

Issued for:

Wiltronic Corporation

13939 Central Ave, Chino, California 91710, United States

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

Product:	2 in 1 Tablet
Model No.:	MAGNUS III
Additional Model No.:	N/A
Trade Mark:	iVIEW®
Applicant:	Wiltronic Corporation
Address:	13939 Central Ave, Chino, California 91710, United States
Manufacturer:	Wiltronic Corporation
Address:	13939 Central Ave, Chino, California 91710, United States
Date of Test:	May 22, 2020 – Jun. 15, 2020
Applicable Standards:	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part22 FCC CFR Title 47 Part24 FCC CFR Title 47 Part27

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:	***Rleo***	***Date:***	***Jun. 15, 2020***
Reviewed By:	***Beryl Zhao***	***Date:***	***Jun. 16, 2020***
Approved By:	***Tomsin***	***Date:***	***Jun. 16, 2020***

2. Test Result Summary

Requirement	CFR 47 Section	Result
Conducted Output Power	§22.913; §2.1046 §24.232; §27.50(d)	PASS
Peak-to-Average Ratio	§2.1046; §24.232(d) §22.913; §27.50(d)	PASS
Effective Radiated Power	§2.1046; §22.913(a) §24.232; §27.50(d)	PASS
Equivalent Isotropic Radiated Power	§2.1046; §22.913(a) §24.232; §27.50(d)	PASS
Occupied Bandwidth	§2.1049	PASS
Band Edge	§2.1051 §22.917(a) §24.238(a) §27.53(g)	PASS
Conducted Spurious Emission	§2.1051; §22.917 §24.238; §27.53(h)	PASS
Field Strength of Spurious Radiation	§2.1053; §22.917(a) §24.238; §27.53(g)	PASS
Frequency Stability for Temperature & Voltage	§2.1055;§22.355 §24.235; ;§27.54	PASS

Note:

1. PASS: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

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3. EUT Description

Product:	2 in 1 Tablet
Model No.:	MAGNUS III
Additional Model No.:	N/A
Trade Mark:	iVIEW
3G Version:	WCDMA: R99 HSDPA: Release 5 HSUPA: Release 6
Tx Frequency:	WCDMA Band V: 826.4MHz ~ 846.6MHz WCDMA Band IV: 1712.4MHz ~ 1752.6MHz WCDMA Band II: 1852.4MHz ~ 1907.6MHz
Rx Frequency:	WCDMA Band V: 871.4MHz ~ 891.6MHz WCDMA Band IV: 2112.4MHz ~ 2152.6MHz WCDMA Band II: 1932.4MHz ~ 1987.6MHz
Maximum Output Power to Antenna:	WCDMA Band V: 23.71dBm WCDMA Band IV: 23.04dBm WCDMA Band II: 23.05dBm
99% Occupied Bandwidth:	WCDMA Band V: 4M15F9W WCDMA Band IV: 4M13F9W WCDMA Band II: 4M14F9W
Type of Modulation:	WCDMA/HSDPA/HSUPA: QPSK
Antenna Type:	Internal Antenna
Antenna Gain:	WCDMA Band V: 1.45dBi WCDMA Band IV: 1.45dBi WCDMA Band II: 1.45dBi
Power Supply:	Rechargeable Li-ion Battery DC 3.7V
AC adapter:	Adapter Information1: MODEL: K-E3F0502000U2 INPUT: AC 100-240V, 50/60Hz, 0.35A Max OUTPUT: DC 5V, 2000mA Adapter Information2: MODEL: JZB012-050200UX INPUT: AC 100-240V, 50/60Hz, 0.35A OUTPUT: DC 5V, 2000mA

Note: *The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.*

4. General Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Operation mode:	Keep the EUT in communication with CMU200 and select channel with modulation
The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case(Z axis) are shown in Test Results of the following pages.	

Description Operation Frequency

WCDMA Band IV		WCDMA Band V		WCDMA Band II	
Channel:	Frequency (MHz)	Channel:	Frequency (MHz)	Channel:	Frequency (MHz)
1312	1712.4	4132	826.40	9262	1852.40
….	….	4133	826.60	9263	1852.60
….	….	….	….	….	….
….	….	4182	836.40	9399	1879.80
1413	1732.6	4183	836.60	9400	1880.00
….	….	4184	836.80	9401	1880.20
….	….	…	…	…	…
1513	1752.6	4233	846.60	9538	1907.60

4.2. Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power. Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 10000 MHz for WCDMA Band V.
2. 30 MHz to 20000 MHz for WCDMA Band II and WCDMA Band IV.

All modes and data rates and positions were investigated.

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

Test Mode		
Band	**Radiated TCs**	**Conducted TCs**
WCDMA Band V	HSPA Link	HSPA Link
WCDMA Band IV	HSPA Link	HSPA Link
WCDM Band II	HSPA Link	HSPA Link

Note: *The maximum power levels are chosen to test as the worst case configuration as follows: HSPA Link mode for WCDMA band V, WCDMA band IV and WCDMA band II, only these modes were used for all tests. In addition to above worst-case test, below investigating on all data rates and all modes are compliance with each FCC test case which has specific test limits. For spurious emissions at antenna port, the EUT was investigated the band edges on low and high channels, and the unwanted spurious emissions on middle channel for all modes, the results are PASS, then only the worst-results were reported in the test report. The Radiated Spurious emissions for HSUPA were investigated on the middle channel and the PASS results were not worst than those data tested from the highest power channels.*

4.3. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

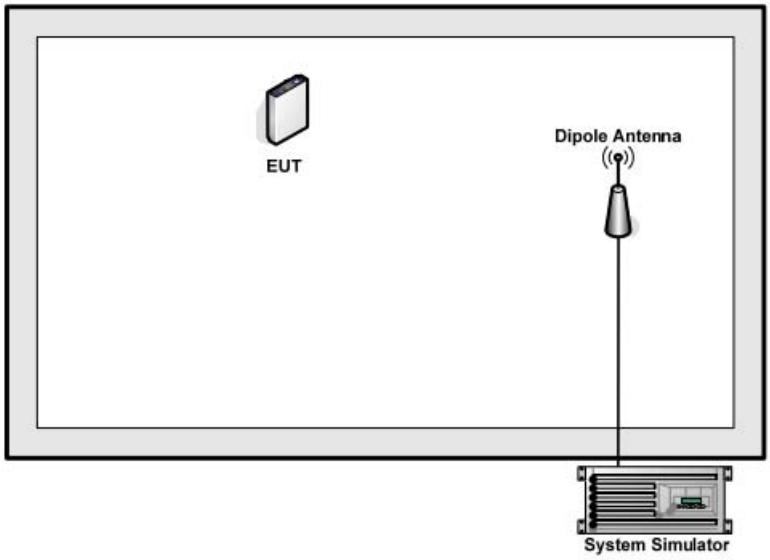
Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4. Configuration of Tested System



4.5. Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level. The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

The following shows an offset computation example with RF cable loss 3 dB and a 5dB attenuator.

Example: *Offset (dB) = RF cable loss (dB) + attenuator factor (dB).*

= 8(dB)

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098
  Shenzhen Tongce Testing Lab.
  The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.
- IC - Registration No.: 10668A-1
  The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab.
Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China
TEL: +86-755-27673339

5.3. Measurement Uncertainty

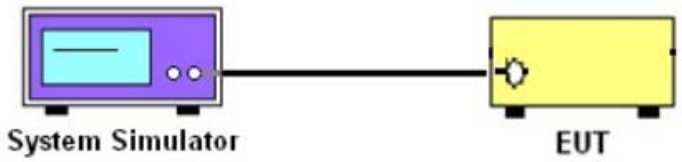
The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1G)	±3.92dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

6. Test Results and Measurement Data

6.1. Conducted Output Power Measurement

6.1.1. Test Specification

Test Requirement:	FCC part 22.913(a) and FCC part 24.232(c) FCC part 27.50(d)
Test Method:	FCC KDB 971168 D01 v03r01
Operation mode:	Refer to item 4.1
Test Setup:	
Test Procedure:	1. The transmitter output port was connected to the system simulator. 2. Set EUT at maximum power through system simulator. 3. Select lowest, middle, and highest channels for each band and different modulation. 4. Measure the maximum burst average power for WCDMA and maximum average power for other modulation signal.
Test Result:	PASS

6.1.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 11, 2020
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 08, 2020
Antenna Connector	TCT	RFC-02	N/A	Sep. 08, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.1.3. Test data

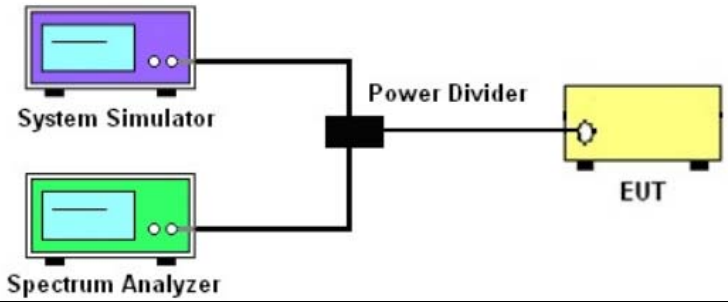
Conducted Power Measurement Results:

Average Conducted Power (*Unit: dBm)						
Band	**WCDMA Band V**			**WCDMA Band II**		
Channel	4132	4183	4233	9262	9400	9538
Frequency(MHz)	826.4	836.6	846.6	1852.4	1880.0	1907.6
HSDPA Subtest-1	23.54	23.45	23.67	22.82	22.72	22.91
HSDPA Subtest-2	23.01	23.05	23.16	22.51	22.44	22.68
HSDPA Subtest-3	22.94	22.86	23.09	21.60	21.57	21.96
HSDPA Subtest-4	22.97	23.02	23.41	21.44	21.40	21.98
HSUPA Subtest-1	23.64	23.54	23.71	22.97	22.86	23.05
HSUPA Subtest-2	23.53	23.46	23.67	22.75	22.65	22.77
HSUPA Subtest-3	23.00	23.15	23.08	22.52	22.46	22.62
HSUPA Subtest-4	23.55	23.48	23.64	22.85	22.79	22.92
HSUPA Subtest-5	23.14	23.04	23.25	22.51	22.49	22.56

Conducted Power (*Unit: dBm)			
Band	**WCDMA Band IV**		
Channel	1312	1413	1513
Frequency(MHz)	1712.4	1732.6	1752.6
HSDPA Subtest-1	22.80	22.76	23.04
HSDPA Subtest-2	22.18	22.09	22.41
HSDPA Subtest-3	22.20	22.24	22.36
HSDPA Subtest-4	22.11	22.08	22.38
HSUPA Subtest-1	22.69	22.56	22.73
HSUPA Subtest-2	22.76	22.68	23.04
HSUPA Subtest-3	22.10	22.32	22.48
HSUPA Subtest-4	22.77	22.56	22.81
HSUPA Subtest-5	22.12	22.34	22.27

6.2. Peak to Average Ratio

6.2.1. Test Specification

Test Requirement:	FCC part 24.232(d) ; FCC part 22.913; FCC part 27.50(d)
Test Method:	ANSI C63.26:2015
Operation mode:	Refer to item 4.1
Limit:	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.
Test Setup:	
Test Procedure:	1. The testing follows ANSI C63.26:2015 2. The EUT was connected to spectrum analyzer and system simulator via a power divider. 3. Set EUT to transmit at maximum output power. 4. For GSM/EGPRS operating modes, signal gating is implemented on the spectrum analyzer by triggering from the system simulator. 5. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer. Record the maximum PAPR level associated with a probability of 0.1%.
Test Result:	PASS

6.2.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 11, 2020
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 08, 2020
Antenna Connector	TCT	RFC-02	N/A	Sep. 08, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

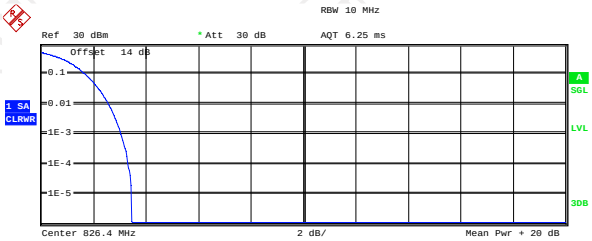
6.2.3. Test Data

Cellular Band									
Mode	**WCDMA Band V (HSUPA)**			**WCDMA Band IV (HSUPA)**			**WCDMA Band II (HSUPA)**		
Channel	**4132**	**4183**	**4233**	**1312**	**1413**	**1513**	**9262**	**9400**	**9538**
Frequency (MHz)	826.4	836.6	846.6	1712.4	1732.6	1752.6	1852.4	1880	1907.6
Peak-to-Average Ratio (dB)	3.04	3.17	3.04	3.27	3.33	3.30	3.17	3.01	3.08

Test plots as follows:

WCDMA Band V 12.2K

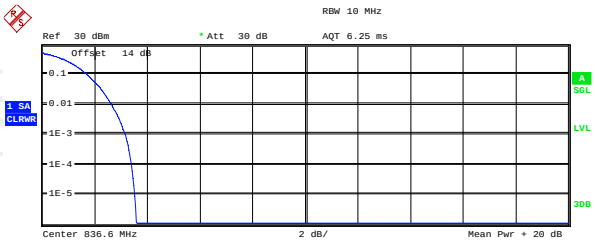
Peak-to-Average Ratio on Channel 4132



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	13.37 dBm
Peak	16.81 dBm
Crest	3.45 dB
10 %	1.67 dB
1 %	2.56 dB
.1 %	3.04 dB
.01 %	3.30 dB

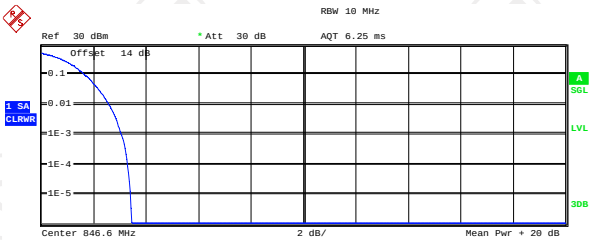
Peak-to-Average Ratio on Channel 4183



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	13.75 dBm
Peak	17.33 dBm
Crest	3.58 dB
10 %	1.70 dB
1 %	2.63 dB
.1 %	3.17 dB
.01 %	3.40 dB

Peak-to-Average Ratio on Channel 4233

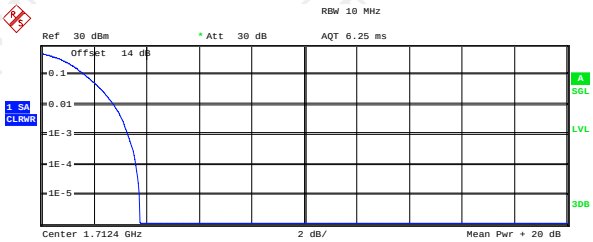


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	14.19 dBm
Peak	17.62 dBm
Crest	3.44 dB
10 %	1.63 dB
1 %	2.56 dB
.1 %	3.04 dB
.01 %	3.30 dB

WCDMA Band IV 12.2Kbps

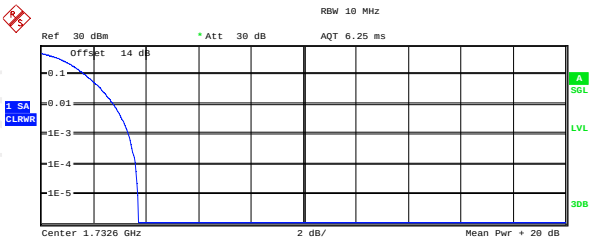
Peak-to-Average Ratio on Channel 1312



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	16.84 dBm
Peak	20.58 dBm
Crest	3.74 dB
10 %	1.63 dB
1 %	2.72 dB
.1 %	3.27 dB
.01 %	3.59 dB

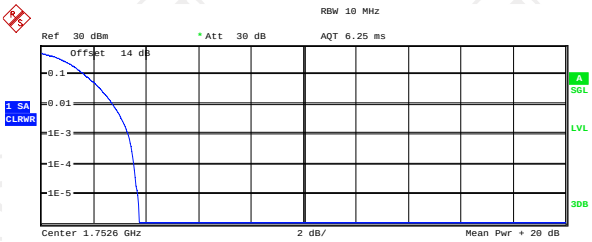
Peak-to-Average Ratio on Channel 1413



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	16.95 dBm
Peak	20.65 dBm
Crest	3.70 dB
10 %	1.67 dB
1 %	2.76 dB
.1 %	3.33 dB
.01 %	3.59 dB

Peak-to-Average Ratio on Channel 1513

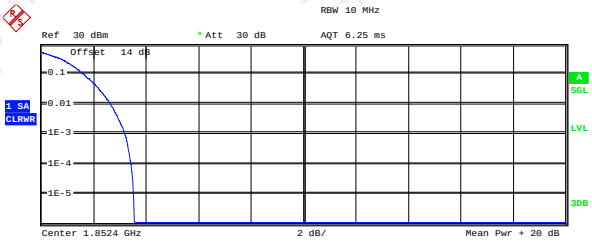


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	17.33 dBm
Peak	21.07 dBm
Crest	3.74 dB
10 %	1.63 dB
1 %	2.72 dB
.1 %	3.30 dB
.01 %	3.53 dB

WCDMA Band II 12.2Kbps

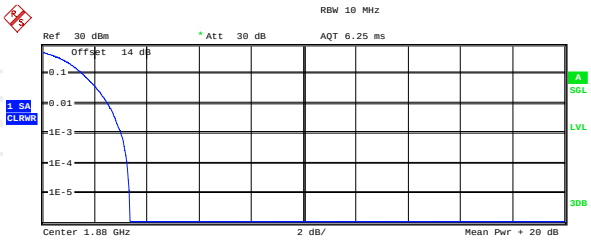
Peak-to-Average Ratio on Channel 9262



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	17.80 dBm
Peak	21.33 dBm
Crest	3.53 dB
10 %	1.60 dB
1 %	2.63 dB
.1 %	3.17 dB
.01 %	3.43 dB

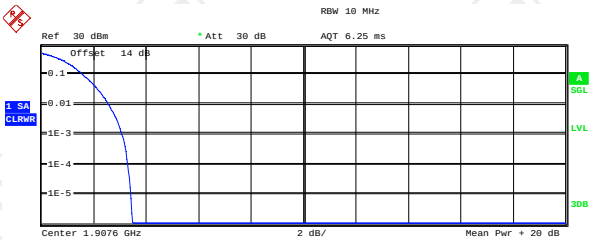
Peak-to-Average Ratio on Channel 9400



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	17.65 dBm
Peak	21.01 dBm
Crest	3.36 dB
10 %	1.54 dB
1 %	2.50 dB
.1 %	3.01 dB
.01 %	3.24 dB

Peak-to-Average Ratio on Channel 9538

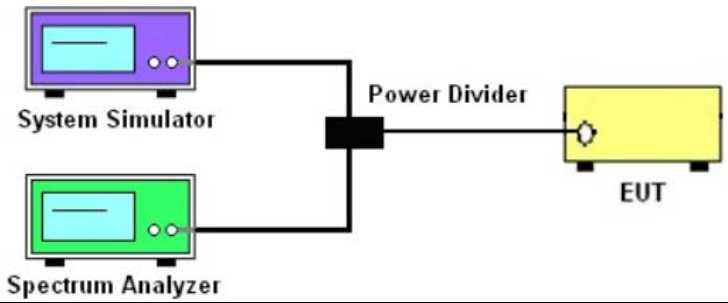


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	17.96 dBm
Peak	21.43 dBm
Crest	3.47 dB
10 %	1.57 dB
1 %	2.56 dB
.1 %	3.08 dB
.01 %	3.30 dB

6.3. 99% Occupied Bandwidth and 26dB Bandwidth Measurement

6.3.1. Test Specification

Test Requirement:	FCC part 2.1049
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	N/A
Test Setup:	
Test Procedure:	1. The testing follows FCC KDB 971168 D01v03r01 Section 4.2. 2. The EUT was connected to the spectrum analyzer and system simulator via a power divider. 3. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 4. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold. 5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.
Test Result:	PASS

6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 11, 2020
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 08, 2020
Antenna Connector	TCT	RFC-02	N/A	Sep. 08, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.3.3. Test data

Cellular Band			
Mode	**WCDMA Band V (HSUPA)**		
Channel	**4132**	**4183**	**4233**
Frequency (MHz)	**826.4**	**836.6**	**846.6**
99% OBW (MHz)	4.15	4.15	4.14
26dB BW (MHz)	4.73	4.72	4.74

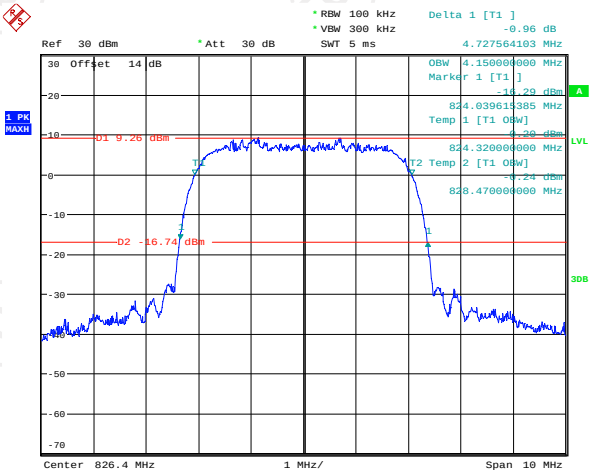
Cellular Band			
Mode	**WCDMA Band IV (HSUPA)**		
Channel	**1312**	**1413**	**1513**
Frequency (MHz)	1712.4	1732.6	1752.6
99% OBW (MHz)	4.12	4.13	4.13
26dB BW (MHz)	4.74	4.73	4.75

Cellular Band			
Mode	**WCDMA Band II (HSUPA)**		
Channel	**9262**	**9400**	**9538**
Frequency (MHz)	**1852.4**	**1880**	**1907.6**
99% OBW (MHz)	4.13	4.13	4.14
26dB BW (MHz)	4.74	4.75	4.71

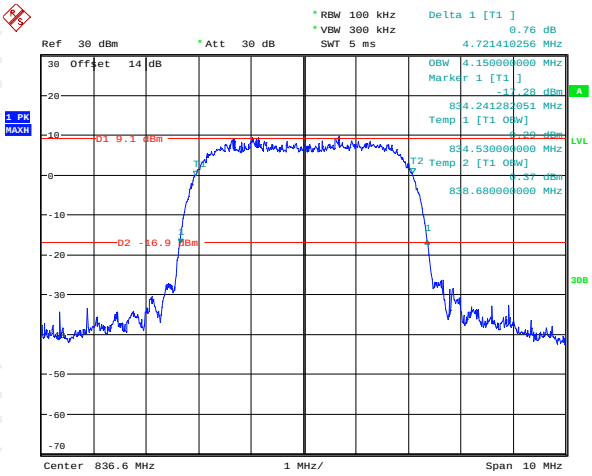
Test plots as follows:

Band:	WCDMA Band V	Test Mode:	HSUPA Link (QPSK)

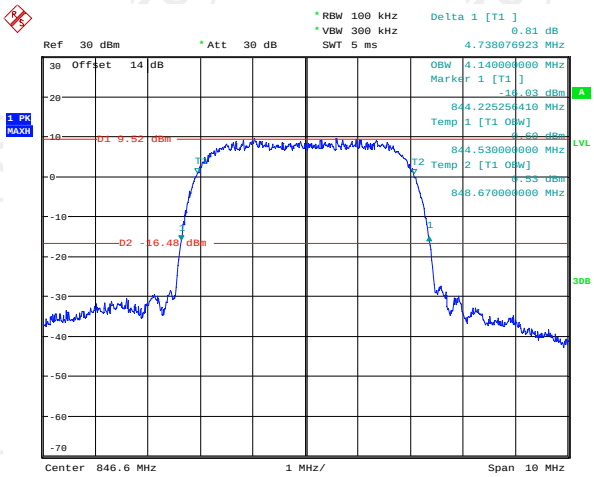
26dB&99% Occupied Bandwidth Plot on Channel 4132



26dB&99% Occupied Bandwidth Plot on Channel 4183

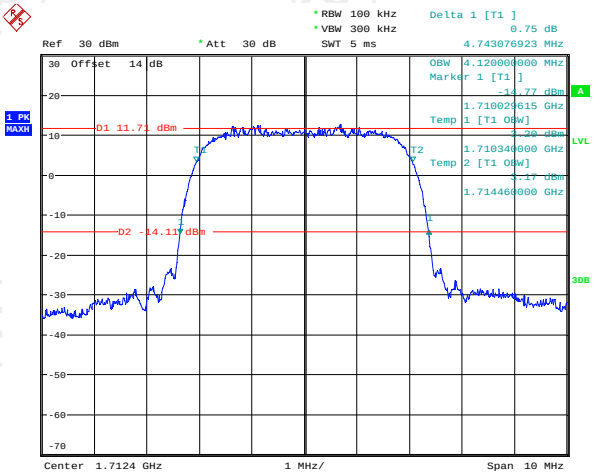


26dB&99% Occupied Bandwidth Plot on Channel 4233

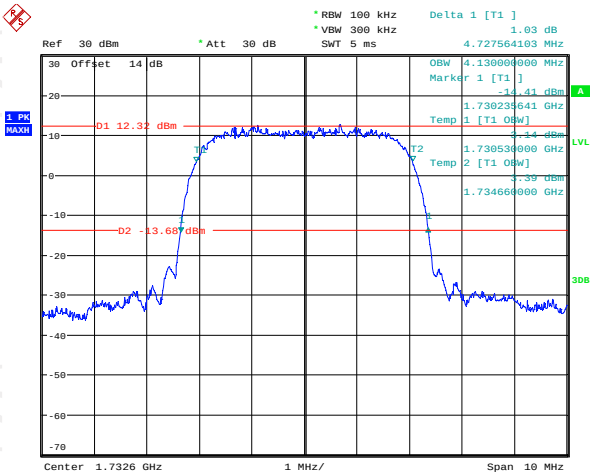


Band:	WCDMA Band IV	Test Mode:	HSUPA Link (QPSK)

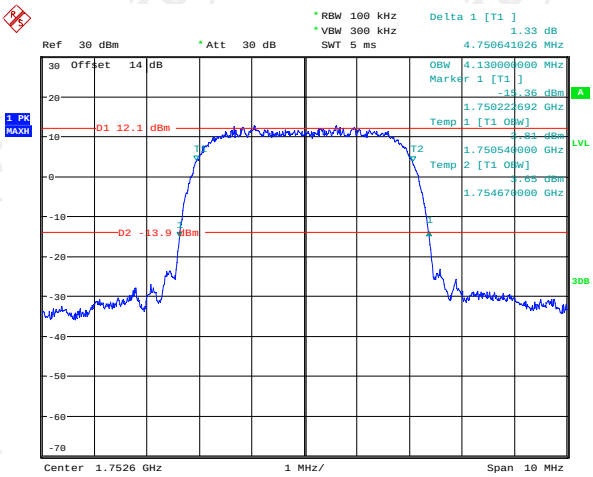
26dB&99% Occupied Bandwidth Plot on Channel 1312



26dB&99% Occupied Bandwidth Plot on Channel 1413

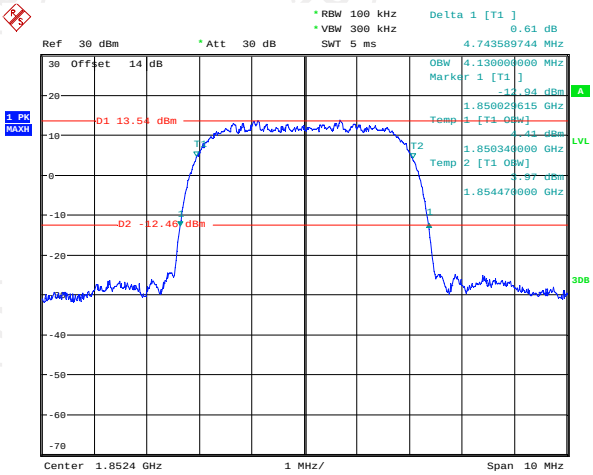


26dB&99% Occupied Bandwidth Plot on Channel 1513

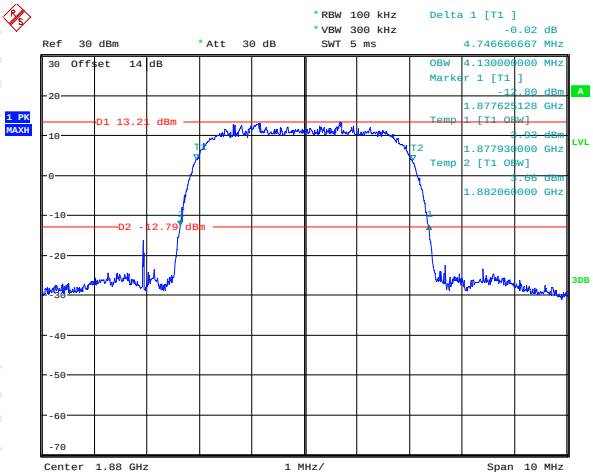


Band:	WCDMA Band II	Test Mode:	HSUPA Link (QPSK)

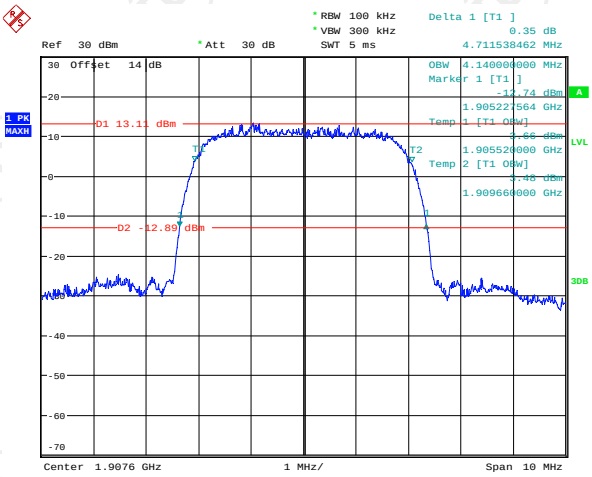
26dB&99% Occupied Bandwidth Plot on Channel 9262



26dB&99% Occupied Bandwidth Plot on Channel 9400

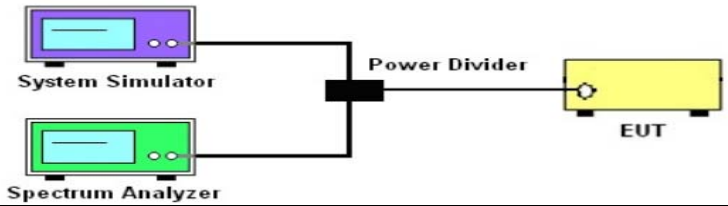


26dB&99% Occupied Bandwidth Plot on Channel 9538



6.4. Band Edge and Conducted Spurious Emission Measurement

6.4.1. Test Specification

Test Requirement:	FCC part22.917(a) and FCC part24.238(a) FCC part27.53(h)
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	-13dBm
Test Setup:	
Test Procedure:	1. The testing follows FCC KDB 971168 D01v03r01 Section 6.0. 2. The EUT was connected to the spectrum analyzer and system simulator via a power divider. 3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement. 4. The band edges of low and high channels for the highest RF powers were measured. 5. The conducted spurious emission for the whole frequency range was taken. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band. 7. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts) = P(W) - [43 + 10log(P)] (dB) = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.
Test Result:	PASS

6.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 11, 2020
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 08, 2020
Antenna Connector	TCT	RFC-02	N/A	Sep. 08, 2020

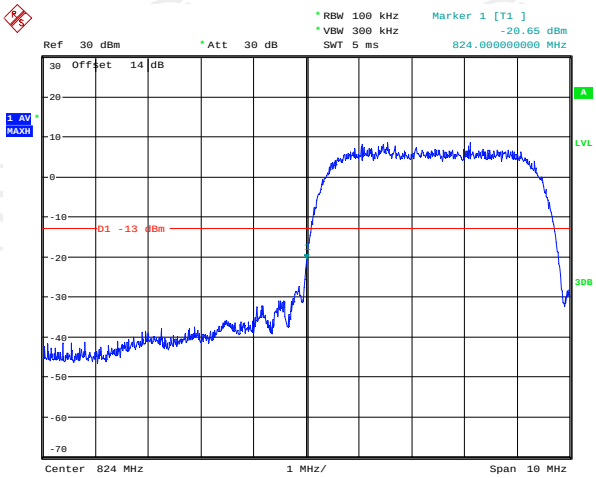
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.4.3. Test data

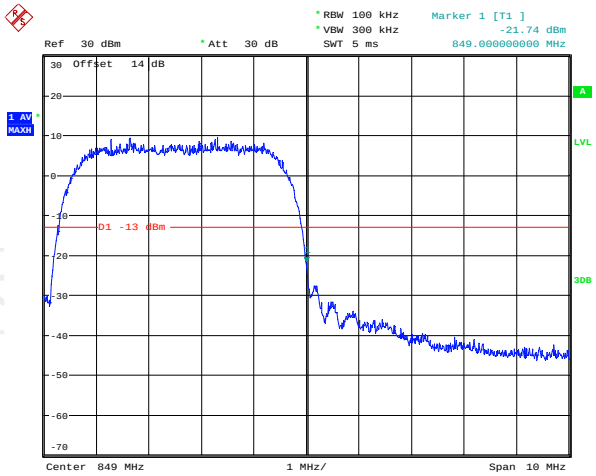
Test plots as follows:

Band:	WCDMA Band V	Test Mode:	HSUPA Link (QPSK)

Lower Band Edge Plot on Channel 4132

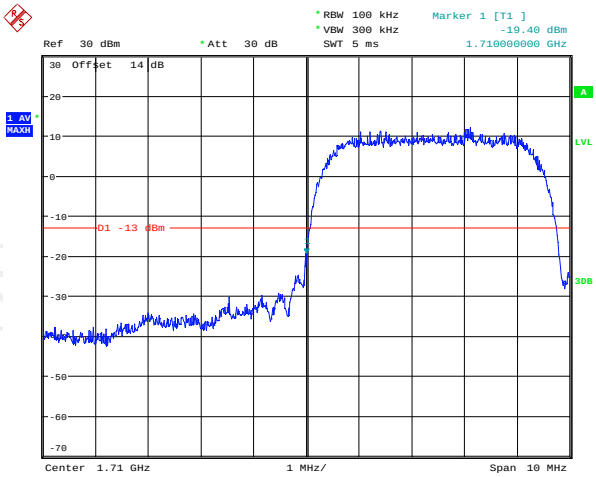


Higher Band Edge Plot on Channel 4233

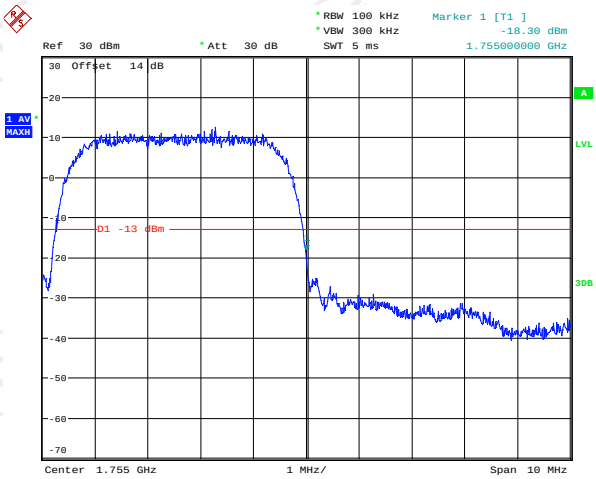


Band:	WCDMA Band IV	Test Mode:	HSUPA Link (QPSK)

Lower Band Edge Plot on Channel 1312

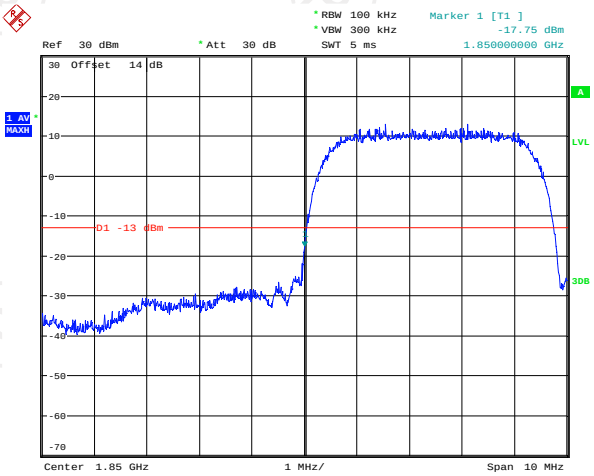


Higher Band Edge Plot on Channel 1513

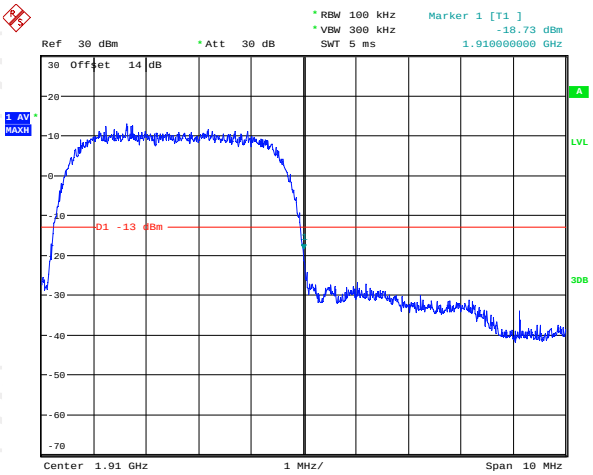


Band:	WCDMA Band II	Test Mode:	HSUPA Link (QPSK)

Lower Band Edge Plot on Channel 9262



Higher Band Edge Plot on Channel 9538



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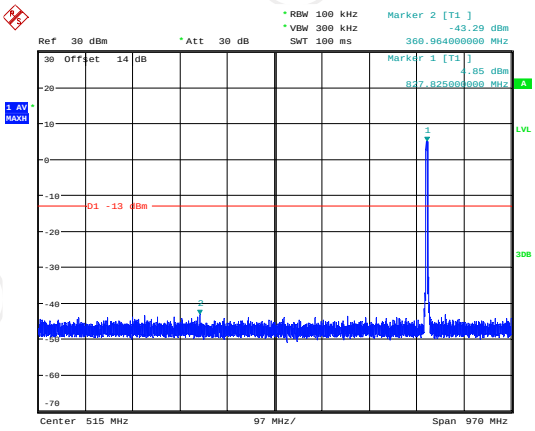
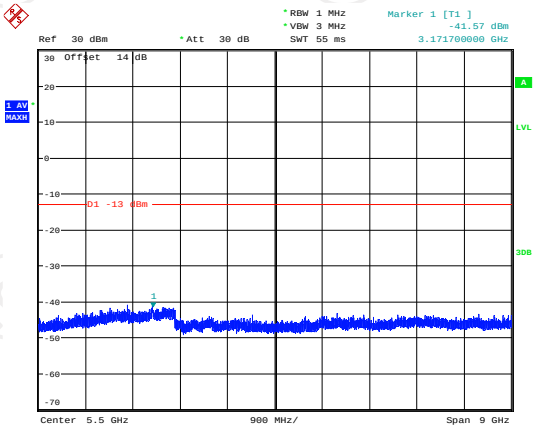
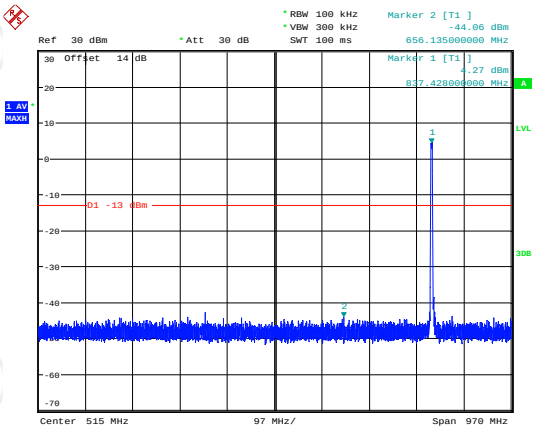
Band:	WCDMA Band V	Test Mode:	HSUPA Link (QPSK)

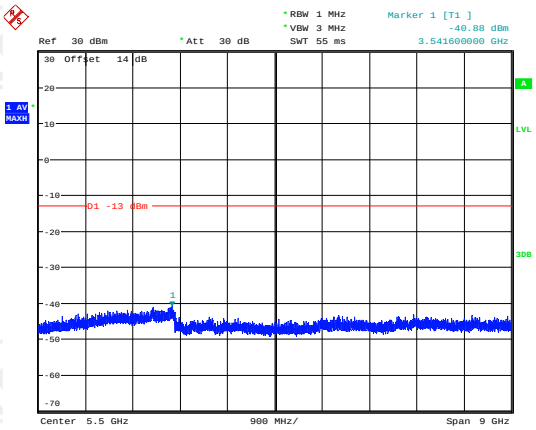
Conducted Spurious Emission on Channel 4132



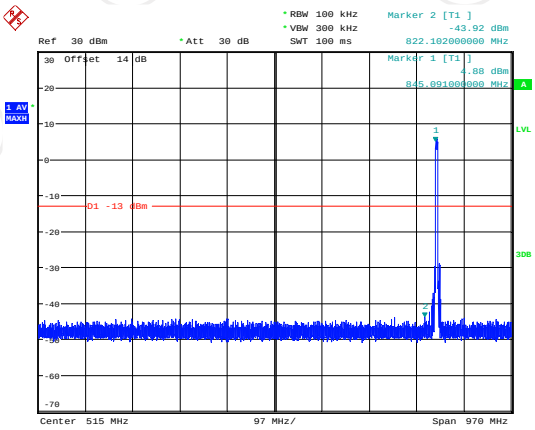


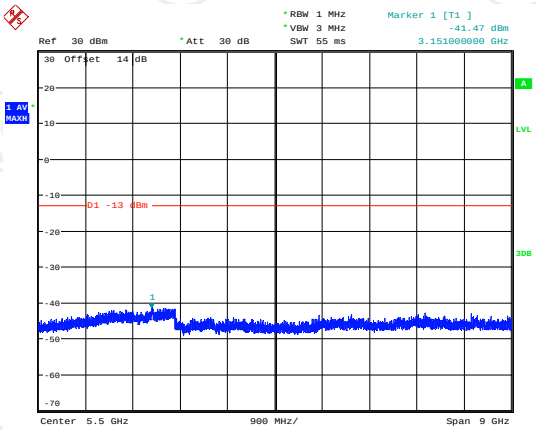
Conducted Spurious Emission on Channel 4183





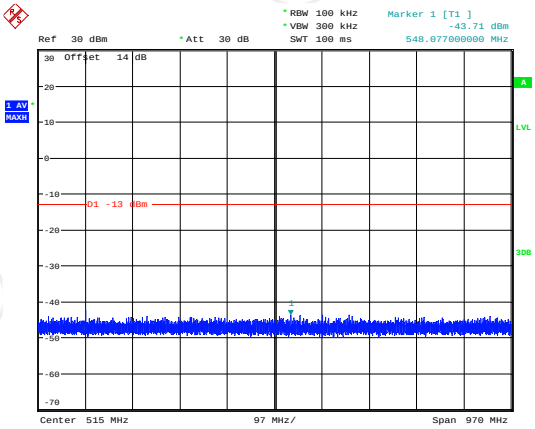
Conducted Spurious Emission on Channel 4233

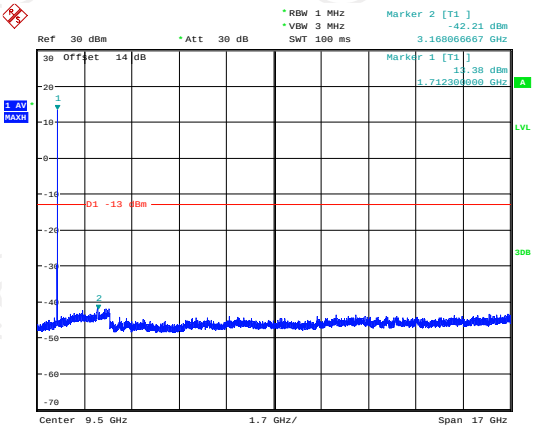




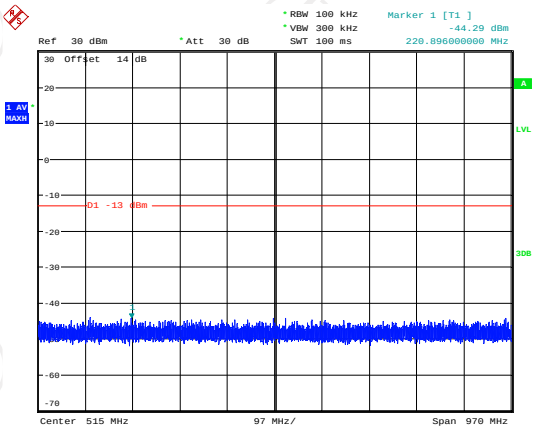
Band:	WCDMA Band IV	Test Mode:	HSUPA Link (QPSK)

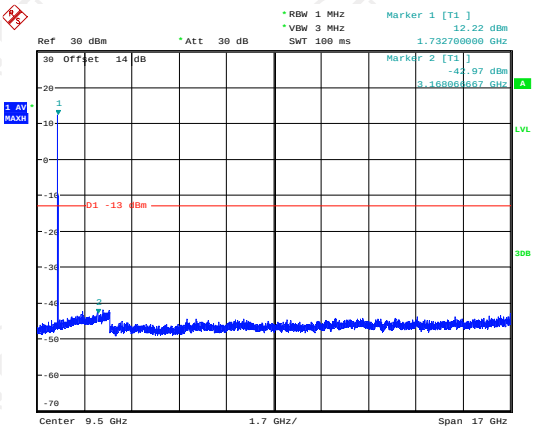
Conducted Spurious Emission on Channel 1312



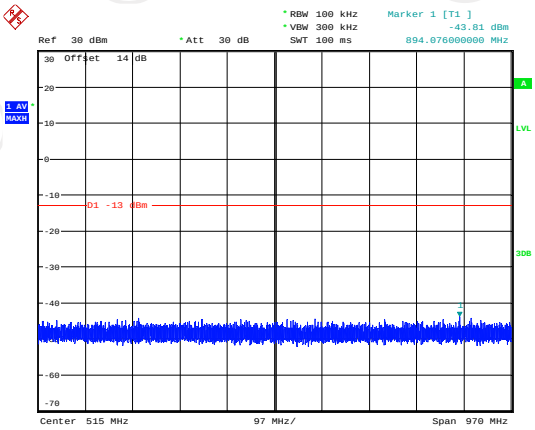


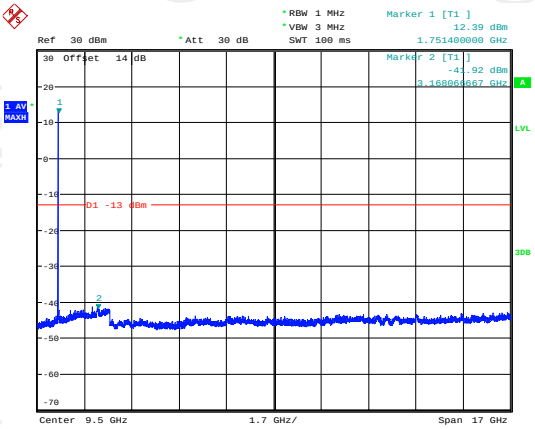
Conducted Spurious Emission on Channel 1413





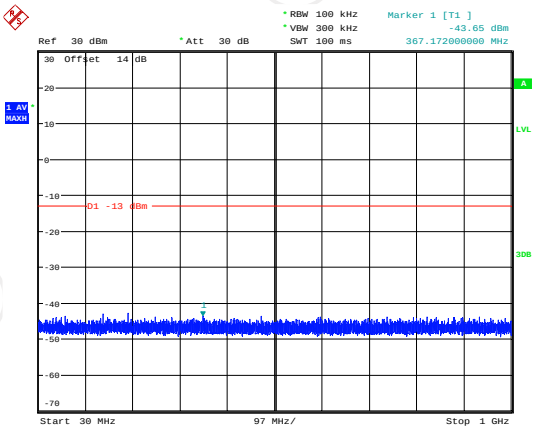
Conducted Spurious Emission on Channel 1513

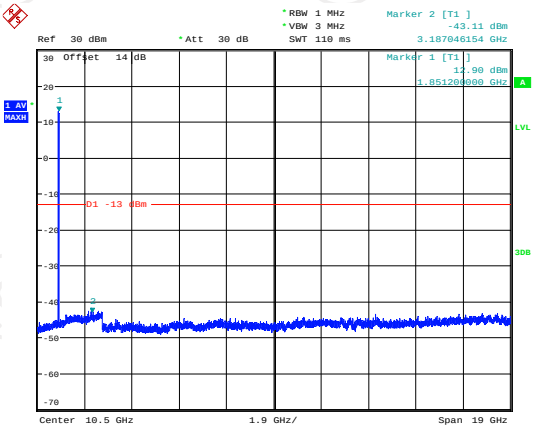




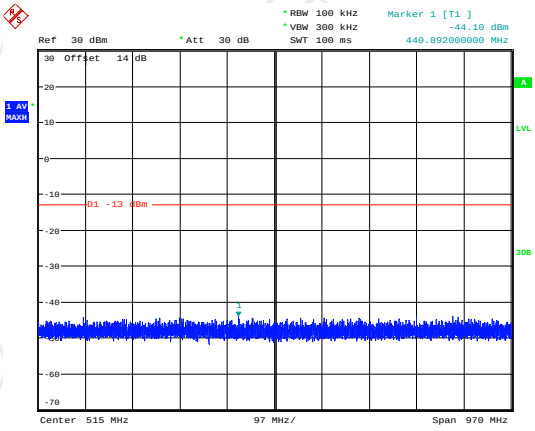
Band:	WCDMA Band II	Test Mode:	HSUPA Link (QPSK)

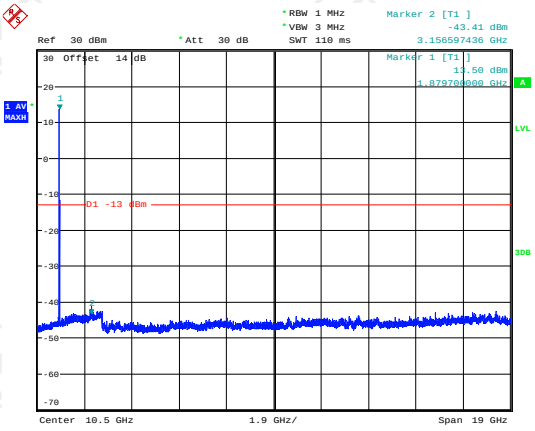
Conducted Spurious Emission on Channel 9262



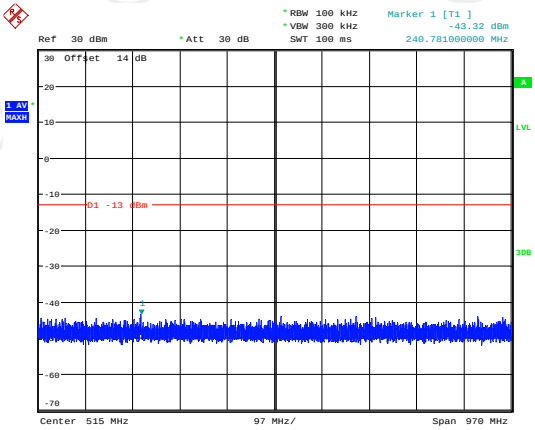


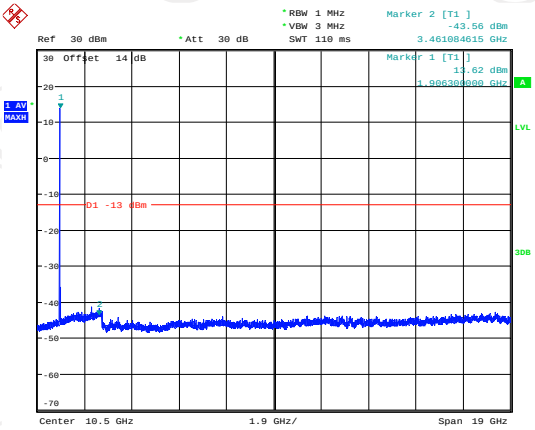
Conducted Spurious Emission on Channel 9400





Conducted Spurious Emission on Channel 9538





WCDMA Band II Conducted Spurious Emission for Below 1G					
Channel	**RBW (KHz)**	**Test result (dBm)**	**RBW (MHz)**	**Calculate result (dBm)**	**Limit (-13dBm)**
9262	100	-43.65	1	-33.65	Pass
9400	100	-44.10	1	-34.10	Pass
9538	100	-43.32	1	-33.32	Pass
WCDMA Band IV Conducted Spurious Emission for Below 1G					
Channel	**RBW (KHz)**	**Test result (dBm)**	**RBW (MHz)**	**Calculate result (dBm)**	**Limit (-13dBm)**
1312	100	-43.71	1	-33.71	Pass
1413	100	-44.29	1	-34.29	Pass
1513	100	-43.81	1	-33.81	Pass
Compensate 10dB is for Exchange rate of RBW *Exchange rate of RBW = 10*log10(Reference bandwidth/RBW at measurement) =10[dB]* *where Reference bandwidth = 1 MHz*					

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6.5. Effective Radiated Power and Effective Isotropic Radiated Power Measurement

6.5.1. Test Specification

Test Requirement:

FCC part 22.913(a) and FCC part 24.232(c)
FCC part 27.50(d)

Test Method:

FCC KDB 971168 D01v03r01

Receiver Setup:

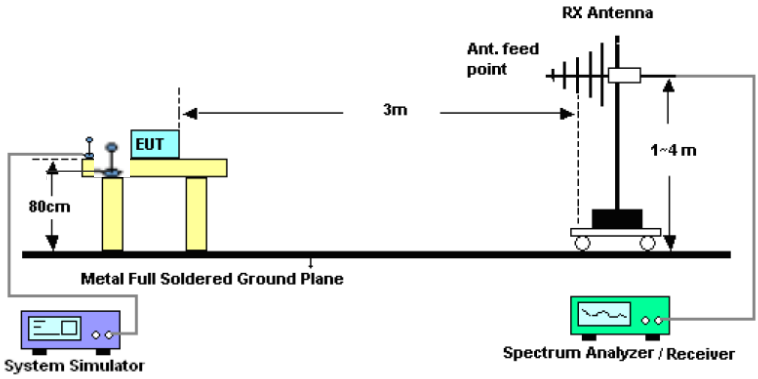
	GSM/GPRS/EDGE	WCDMA/HSPA
SPAN	500kHz	10MHz
RBW	10kHz	100kHz
VBW	30kHz	300kHz
Detector	RMS	RMS
Trace	Average	Average
Average Type	Power	Power
Sweep Count	100	100

Limit:

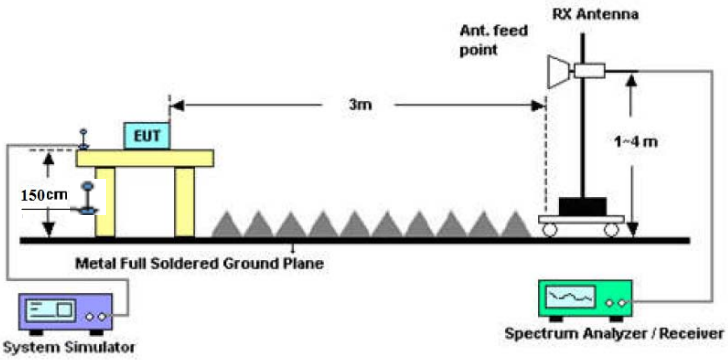
WCDMA Band V: 7W ERP
WCDMA Band II: 2W EIRP
WCDMA Band IV: 1W EIRP

Test Setup:

From 30MHz to 1GHz



Above 1GHz



Test Procedure:

1. The testing follows FCC KDB 971168 D01v03r01

	Section 5.8. and ANSI / TIA-603-D-2010 Section 2.2.17. 2. The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01v03r01. 3. Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. 4. Replace the transmitter under test with a substitution antenna. The center of the antenna should be at the same location as the center of the antenna under test. 5. Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading. LOSS = Generator Output Power (dBm) – Analyzer reading (dBm) 6. Determine the effective radiated output power at each angular position from the readings in steps 3) and 5) using the following equation: ERP (dBm) = LVL (dBm) + LOSS (dB) 7. The maximum ERP is the maximum value determined in the preceding step. 8. Calculating ERP: ERP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBd) Antenna Gain (dBd) = Antenna Gain (dBi) - 2.15 EIRP = ERP – 2.15
Test results:	PASS

6.5.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
System simulator	R&S	CMU200	111382	Sep. 11, 2020
Spectrum Analyzer	ROHDE&SCHWARZ	R&S	FSQ40	Sep. 11, 2020
Signal Generator	HP	83623B	3614A00396	Sep. 08, 2020
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 06, 2020
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 06, 2020
Broadband Antenna	Schwarzbeck	VULB9163	412	Sep. 06, 2020
Horn Antenna	Schwarzbeck	BBHA 9120D	1201	Sep. 06, 2020
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 06, 2020
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 08, 2020
Coax cable (9kHz-40GHz)	TCT	RE-high-02	N/A	Sep. 08, 2020
Coax cable (9kHz-40GHz)	TCT	RE-High-04	N/A	Sep. 08, 2020
Antenna Mast	Keleto	RE-AM	N/A	N/A
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.5.3. Test Data

Test Result of ERP

WCDMA Band V (HSUPA) Radiated Power ERP					
Horizontal Polarization (Antenna Pol.)					
Frequency (MHz)	**(EUT Pol.)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (W)**
826.4	H	3.58	21.62	23.05	0.20
836.6	H	3.71	21.54	23.10	0.20
846.6	H	3.95	21.44	23.24	0.21
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	**(EUT Pol.)**	**LVL (dBm)**	**Correction Factor (dB)**	**ERP (dBm)**	**ERP (W)**
826.4	H	3.47	21.62	22.94	0.20
836.6	H	3.93	21.54	23.32	0.21
846.6	H	4.18	21.44	23.47	0.22

** ERP = LVL (dBm) + Correction Factor (dB) – 2.15*
Correction Factor= S.G. Power - Cable loss + Antenna Gain- SPA. Reading

Test Result of EIRP

WCDMA Band IV (HSUPA) Radiated Power EIRP					
Horizontal Polarization (Antenna Pol.)					
Frequency (MHz)	**(EUT Pol.)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (W)**
1712.4	H	3.98	18.33	22.31	0.17
1732.6	H	4.12	18.15	22.27	0.17
1752.6	H	4.25	18.24	22.49	0.18
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	**(EUT Pol.)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (W)**
1712.4	H	3.85	18.33	22.18	0.17
1732.6	H	4.07	18.15	22.22	0.17
1752.6	H	4.19	18.24	22.43	0.17

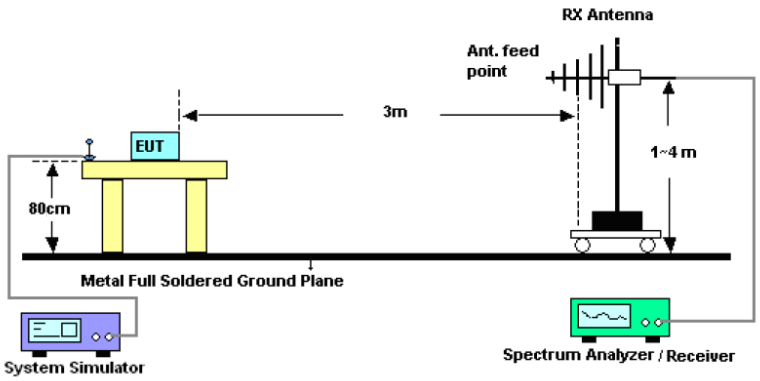
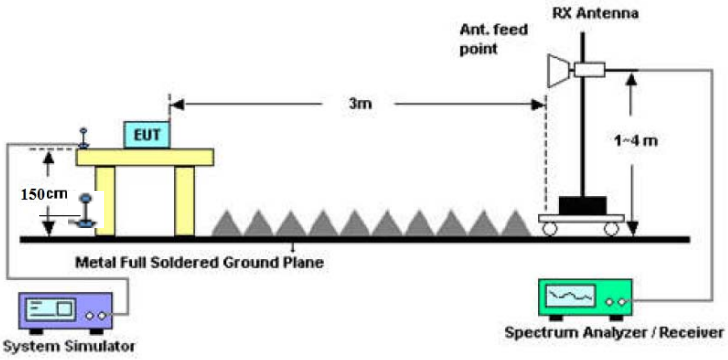
** EIRP = LVL (dBm) + Correction Factor (dB)*
Correction Factor= S.G. Power - Cable loss + Antenna Gain- SPA. Reading

WCDMA Band II (HSUPA) Radiated Power EIRP					
Horizontal Polarization (Antenna Pol.)					
Frequency (MHz)	**(EUT Pol.)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (W)**
1852.4	H	1.03	21.62	22.65	0.18
1880.0	H	1.27	21.54	22.81	0.19
1907.6	H	1.19	21.48	22.67	0.18
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	**(EUT Pol.)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (W)**
1852.4	H	0.98	21.62	22.60	0.18
1880.0	H	1.04	21.54	22.58	0.18
1907.6	H	1.26	21.48	22.74	0.19

** EIRP = LVL (dBm) + Correction Factor (dB)*
Correction Factor= S.G. Power - Cable loss + Substitution Antenna Gain- SPA. Reading

6.6. Field Strength of Spurious Radiation Measurement

6.6.1. Test Specification

Test Requirement:	FCC part 22.917(a) and FCC part 24.238(a) FCC part 27.53(h)
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	-13dBm
Test setup:	For 30MHz~1GHz  Above 1GHz 
Test Procedure:	1. The testing follows FCC KDB 971168 D01v03r01 Section 6 and ANSI / TIA-603-D-2010 Section 2.2.12. 2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground. 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower. 4. The table was rotated 360 degrees to determine the position of the highest spurious emission. 5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations. 6. Make the measurement with the spectrum analyzer's

	RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission. 7. A horn antenna was substituted in place of the EUT and was driven by a signal generator. 8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission. 9. Taking the record of output power at antenna port. 10. Repeat step 7 to step 8 for another polarization. 11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain 12. ERP (dBm) = EIRP - 2.15 13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band. 14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts) = P(W) - [43 + 10log(P)] (dB) = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.
Test results:	PASS
Remark:	All modulations have been tested, but only the worst modulation show in this test item.

6.6.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
System simulator	R&S	CMU200	111382	Sep. 11, 2020
Spectrum Analyzer	ROHDE&SCHWARZ	R&S	FSQ40	Sep. 11, 2020
Signal Generator	HP	83623B	3614A00396	Sep. 08, 2020
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 06, 2020
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 06, 2020
Broadband Antenna	Schwarzbeck	VULB9163	412	Sep. 06, 2020
Horn Antenna	Schwarzbeck	BBHA 9120D	1201	Sep. 06, 2020
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 06, 2020
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 08, 2020
Coax cable (9kHz-40GHz)	TCT	RE-high-02	N/A	Sep. 08, 2020
Coax cable (9kHz-40GHz)	TCT	RE-High-04	N/A	Sep. 08, 2020
Antenna Mast	Keleto	RE-AM	N/A	N/A
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.6.3. Test Data

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
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Note: *1. Emission Level=Reading+ Cable loss+Antenna factor-Amp factor*

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Band	WCDMA Band V		Test channel:	Lowest
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-43.35	-13.00	PASS
2479.20	V	-52.48		
3305.60	V	-51.01		
1652.80	Horizontal	-41.69		
2479.20	H	-51.24		
3305.60	H	-53.13		
Test mode:	WCDMA Band V		Test channel:	Middle
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-42.48	-13.00	PASS
2509.80	V	-51.76		
3346.40	V	-51.32		
1673.20	Horizontal	-40.51		
2509.80	H	-54.69		
3346.40	H	-52.27		
Test mode:	WCDMA Band V		Test channel:	Highest
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-45.47	-13.00	PASS
2539.80	V	-52.86		
3386.40	V	-57.53		
1693.20	Horizontal	-42.04		
2539.80	H	-52.18		
3386.40	H	-55.39		

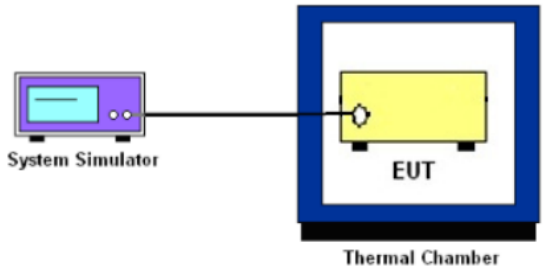
Band	WCDMA Band IV		Test channel:	Lowest
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
2452.3	Vertical	-53.25	-13.00	PASS
3424.8	V	-52.67		
5137.2	V	-54.41		
2452.3	Horizontal	-52.75		
3424.8	H	-53.04		
5137.2	H	-51.13		
Test mode:	WCDMA Band IV		Test channel:	Middle
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
2641.3	Vertical	-53.44	-13.00	PASS
3465.2	V	-50.65		
5197.8	V	-54.32		
2641.3	Horizontal	-51.79		
3465.2	H	-56.81		
5197.8	H	-53.45		
Test mode:	WCDMA Band IV		Test channel:	Highest
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3102.2	Vertical	-51.74	-13.00	PASS
3505.2	V	-52.23		
5257.8	V	-49.05		
3102.2	Horizontal	-53.19		
3505.2	H	-51.56		
5257.8	H	-55.33		

Band	WCDMA Band II		Test channel:	Lowest
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3704.80	Vertical	-41.62	-13.00	PASS
5557.20	V	-53.44		
7409.60	V	-57.83		
3704.80	Horizontal	-43.12		
5557.20	H	-51.05		
7409.60	H	-56.38		
Test mode:	WCDMA Band II		Test channel:	Middle
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-43.72	-13.00	PASS
5640.00	V	-52.39		
7520.00	V	-55.60		
3760.00	Horizontal	-44.27		
5640.00	H	-50.05		
7520.00	H	-58.94		
Test mode:	WCDMA Band II		Test channel:	Highest
Test mode:	HSUPA Link (QPSK)		Temperature :	25°C
			Relative Humidity:	56%
Note:	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.			
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3815.20	Vertical	-45.66	-13.00	PASS
5722.80	V	-55.81		
7630.40	V	-58.43		
3815.20	Horizontal	-42.27		
5722.80	H	-51.05		
7630.40	H	-59.31		

Note: *When both WiFi and WCDMA turn on simultaneously, the result also comply with the limit.*

6.7. Frequency Stability Measurement

6.7.1. Test Specification

Test Requirement:	FCC Part 2.1055 ; FCC Part 22.355 ; FCC Part 24.235 FCC Part 27.54
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	FCC Part 22.355 : ±2.5 ppm FCC Part 24.235 : The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
Test Setup:	
Test Procedure:	**Test Procedures for Temperature Variation** 1. The testing follows FCC KDB 971168 D01v03r01 Section 9.0. 2. The EUT was set up in the thermal chamber and connected with the system simulator. 3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute. 4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute. **Test Procedures for Voltage Variation** 1. The testing follows FCC KDB 971168 D01v03r01 Section 9.0. 2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator. 3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT. 4. The variation in frequency was measured for the worst case.
Test Result:	PASS
Remark:	All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.

6.7.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 11, 2020
Programable tempratuce and humidity chamber	JQ	JQ-2000	N/A	Sep. 08, 2020
DC power supply	Kingrang	KR3005K	N/A	Sep. 08, 2020
RF cable (9kHz-40GHz)	TCT	RE-04	N/A	Sep. 08, 2020
Antenna Connector	TCT	RFC-03	N/A	Sep. 08, 2020

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.7.3. Test Data

Test Result of Temperature Variation

Band :	WCDMA Band V	Channel:	4183
Limit (ppm) :	2.5ppm	Frequency:	836.6MHz

Temperature (°C)	HSUPA Deviation (ppm)	Result
50	0.016	PASS
40	0.014	
30	0.007	
20	0.010	
10	0.013	
0	0.012	
-10	0.017	
-20	0.011	
-30	0.010	

Band :	WCDMA Band IV	Channel:	1413
Limit (ppm) :	*Note1*	Frequency:	1732.6

Temperature (°C)	HSUPA Deviation (ppm)	Result
50	0.014	PASS
40	0.016	
30	0.018	
20	0.012	
10	0.009	
0	0.013	
-10	0.011	
-20	0.015	
-30	0.016	

Band :	WCDMA Band II	Channel:	9400
Limit (ppm) :	*Note1*	Frequency:	1880MHz

Temperature (°C)	HSUPA Deviation (ppm)	Result
50	0.012	PASS
40	0.018	
30	0.013	
20	0.014	
10	0.016	
0	0.021	
-10	0.015	
-20	0.019	
-30	0.020	

Note1: *The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.*

Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Deviation (ppm)	Limit (ppm)	Result
WCDMA Band IV CH1413	HSUPA	3.7	-0.009	(Note 3.)	PASS
		3.4	-0.011		
		BEP	-0.014		
WCDMA Band V CH4182	HSUPA	3.7	-0.020	2.5	
		3.4	-0.017		
		BEP	-0.018		
WCDMA Band II CH9400	HSUPA	3.7	-0.015	(Note 3.)	
		3.4	-0.018		
		BEP	-0.017		

Note:

1. Normal Voltage = 3.7V.
2. Battery End Point (BEP) = 3.4 V.
3. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

Appendix A: Photographs of Test Setup

Refer to the test report No. TCT200521E013

Appendix B: Photographs of EUT

Refer to the test report No. TCT200521E013

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