TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: SY4-B01010

Product: Handheld GNSS Data Collector

Model No.: HCE320

Additional Model No.: N/A

Trade Mark: CHCNAV

Report No.: TCT180111E028

Issued Date: June 27, 2018

Issued for:

Shanghai Huace Navigation Technology LTD.

Building C, 599 Gaojing Road, Qingpu District, Shanghai, China

Issued By:

Shenzhen Tongce Testing Lab.

1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

FAX: +86-755-27673332

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. Test Certification

Product:	Handheld GNSS Data Collector
Model No.:	HCE320
Additional Model No.:	N/A
Trade Mark:	CHCNAV
Applicant:	Shanghai Huace Navigation Technology LTD.
Address:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China
Manufacturer:	Shanghai Huace Navigation Technology LTD.
Address:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China
Date of Test:	Dec. 29, 2017-June 27, 2018
Applicable Standards:	FCC CFR Title 47 Part 2; FCC CFR Title 47 Part 22H; FCC CFR Title 47 Part FCC PART 24E

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:	Brews Xu	***Date:***	***June 27, 2018***
Reviewed By:	Joe Zhou	***Date:***	***June 27, 2018***
Approved By:	Tomsin	***Date:***	***June 27, 2018***

SHENZHEN TONGCE TESTING LAB TCT

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Conducted Output Power	§22.913; §2.1046 §24.232;	PASS
Peak-to-Average Ratio	§2.1046; §24.232(d)	PASS
Effective Radiated Power	§2.1046; §22.913(a) §24.232;	PASS
Equivalent Isotropic Radiated Power	§2.1046; §22.913(a) §24.232;	PASS
Occupied Bandwidth	§2.1049	PASS
Band Edge	§2.1051 §22.917(a) §24.238(a)	PASS
Conducted Spurious Emission	§2.1051; §22.917 §24.238;	PASS
Field Strength of Spurious Radiation	§2.1053; §22.917(a) §24.238;	PASS
Frequency Stability for Temperature & Voltage	§2.1055;§22.355 §24.235;	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:	Handheld GNSS Data Collector
Model No.:	HCE320
Additional Model No.:	N/A
Trade Mark:	CHCNAV
3G Version:	Rel-6
Tx Frequency:	GSM 850: 824.2MHz—848.8MHz GSM 1900: 1850.2MHz—1909.8MHz WCDMA BAND II: 1852.4MHz—1907.6MHz WCDMA BAND V: 826.4MHz—846.6MHz
Maximum Output Power to Antenna:	GSM 850: 33.66dBm GSM 1900: 33.07dBm WCDMA BAND II: 23.19dBm WCDMA BAND V: 23.73dBm
99% Occupied Bandwidth:	GSM 850: 248.51KHz GSM 1900: 247.72KHz WCDMA BAND II: 4133.2KHz WCDMA BAND V: 4138.8KHz
Type of Modulation:	GSM: GMSK, 8PSK WCDMA: QPSK
Antenna Type:	Internal Antenna
Antenna Gain:	GSM 850:0.775dBi GSM 1900:0.775dBi WCDMA BAND II:0.775dBi WCDMA BAND V:0.775 dBi
Power Supply:	DC 3.8V by battery or DC 5V from adapter
Remark:	N/A

4. Genera 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
Remark: This product has a built-in rechargeable battery, so in an independent test, the EUT battery was fully-charged.	
The sample was placed (0.8m below 1GHz, 0.8m 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 are shown in Test Results of the following pages.	

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Description Operation Frequency

GSM 850		PCS1900	
Channel:	Frequency (MHz)	Channel:	Frequency (MHz)
128	824.20	512	1850.20
129	824.40	513	1850.40
….	….	….	….
189	836.40	660	1879.80
190	836.60	661	1880.00
191	836.80	662	1880.20
…	…	…	…
250	848.60	809	1909.60
251	848.80	810	1909.80

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

Final test channel:

GSM 850		**PCS1900**		**WCDMA Band V**		**WCDMA Band II**	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20	4132	826.40	9262	1852.40
190	836.60	661	1880.00	4183	836.60	9400	1880.00
251	848.80	810	1909.80	4233	846.60	9538	1907.60

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4.2. Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 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 GSM850 and WCDMA Band V.
2. 30 MHz to 20000 MHz for PCS1900, 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**
GSM 850	GSM Link GPRS class 12 Link EGPRS class 12 Link	GSM Link GPRS class 12 Link EGPRS class 12 Link
PCS 1900	GSM Link GPRS class 12 Link EGPRS class 12 Link	GSM Link GPRS class 12 Link EGPRS class 12 Link
WCDMA Band V	RMC 12.2Kbps Link	RMC 12.2Kbps Link
WCDM Band II	RMC 12.2Kbps Link	RMC 12.2Kbps Link

Note: *The maximum power levels are chosen to test as the worst case configuration as follows: GPRS multi-slot class 12 mode for GMSK modulation, EDGE multi-slot class 10 mode for 8PSK modulation. RMC 12.2Kbps mode for WCDMA band V 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 GPRS and EDGE modes were investigated on the middle channel and the PASS results were not worst than those data tested from the highest power channels.*

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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.

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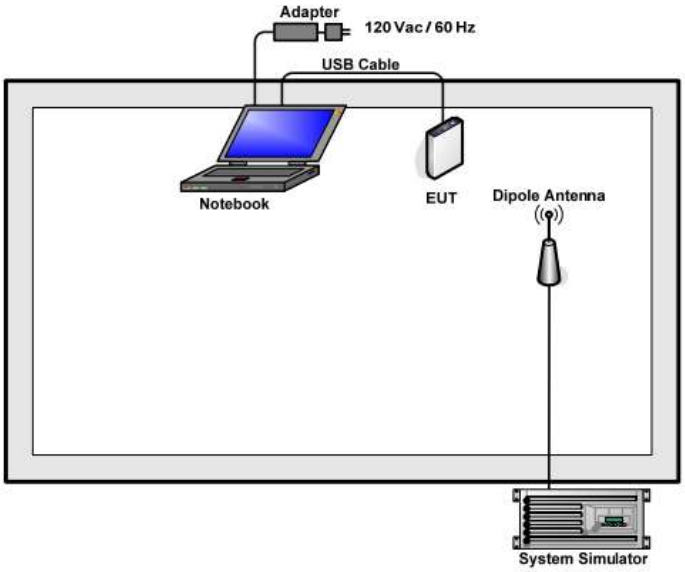
4.4. Configuration of Tested System



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%

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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(b) FCC part 27.50(d);
Test Method:	FCC part 2.1046
Operation mode:	Refer to item 4.1
Limits:	GSM 850 7W PCS 1900 2W WCDMA Band V:7W WCDMA Band II: 2W
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 GSM 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. 27, 2018
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-02	N/A	Sep. 27, 2018

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

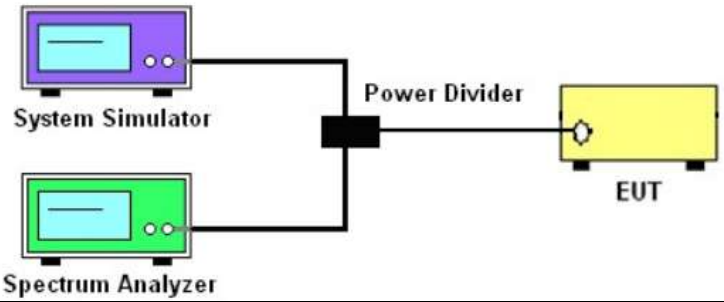
Conducted Power Measurement Results:

Average Conducted Power (*Unit: dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency	824.20	836.60	848.80	1850.20	1880.00	1909.80
GSM (GMSK, 1 TX slot)	32.26	32.38	32.42	28.95	29.27	29.22
GPRS (GMSK, 1 TX slot)	32.20	32.33	32.41	28.97	29.32	29.32
GPRS (GMSK, 2 TX slot)	32.33	32.41	33.00	28.94	28.40	29.45
GPRS (GMSK, 3 TX slot)	30.22	30.63	30.87	27.09	27.41	27.23
GPRS (GMSK, 4 TX slot)	28.87	29.68	29.58	25.83	25.56	26.82
EGPRS (8PSK, 1 TX slot)	32.28	32.35	32.42	29.00	29.27	29.29
EGPRS (8PSK, 2 TX slot)	33.07	32.95	33.66	28.67	33.07	28.91
EGPRS (8PSK, 3 TX slot)	31.91	31.63	32.68	26.50	31.91	27.33
EGPRS (8PSK, 4 TX slot)	29.80	30.80	30.72	25.54	29.80	26.91

Average Conducted Power (*Unit: dBm)						
Band	WCDMA Band II			WCDMA Band V		
Channel	9262	9400	9538	4132	4183	4233
Frequency	1852.4	1880.0	1907.6	826.4	836.6	846.6
RMC 12.2Kbps	23.13	23.11	23.19	23.73	23.66	23.63
HSDPA Subtest-1	21.99	22.11	22.09	22.69	22.63	22.65
HSDPA Subtest-2	22.31	22.61	22.54	20.66	22.31	20.98
HSDPA Subtest-3	22.20	22.49	21.52	19.89	22.20	20.61
HSDPA Subtest-4	22.11	22.64	21.66	20.73	22.11	20.22
HSUPA Subtest-1	21.73	21.94	21.98	22.18	22.63	22.19
HSUPA Subtest-2	19.45	19.08	19.56	19.16	20.05	20.02
HSUPA Subtest-3	20.71	21.14	20.95	19.28	21.38	21.42
HSUPA Subtest-4	19.25	19.45	20.02	18.89	20.09	20.36
HSUPA Subtest-5	21.14	22.07	22.03	20.42	22.92	22.24

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:	FCC KDB 971168 v02r02 Section 5.7.1
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 FCC KDB 971168 v02r02 Section 5.7.1. 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

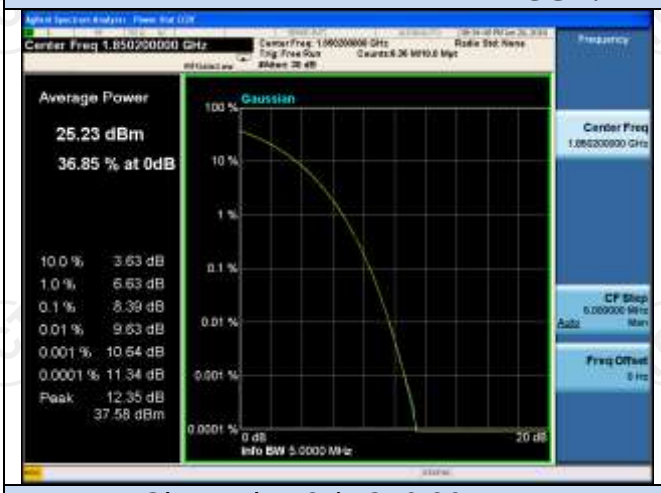
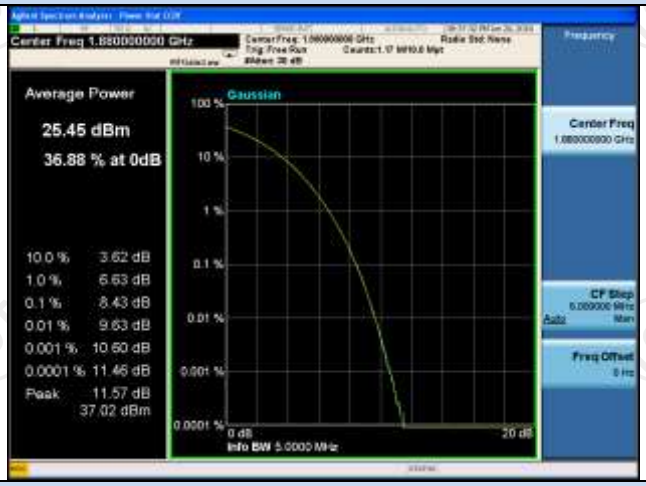
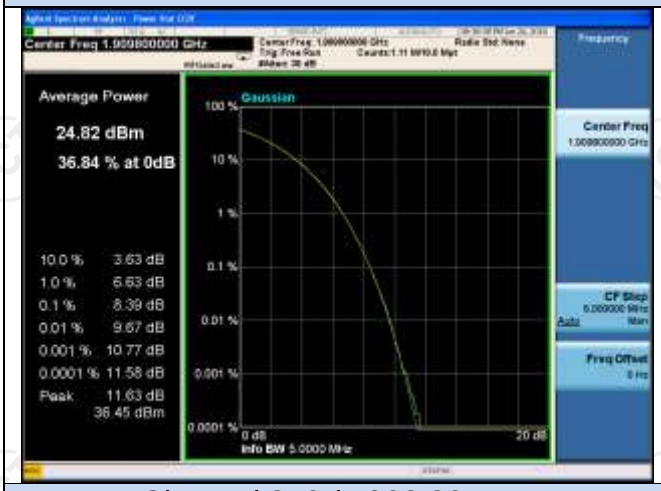
Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 27, 2018
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-02	N/A	Sep. 27, 2018

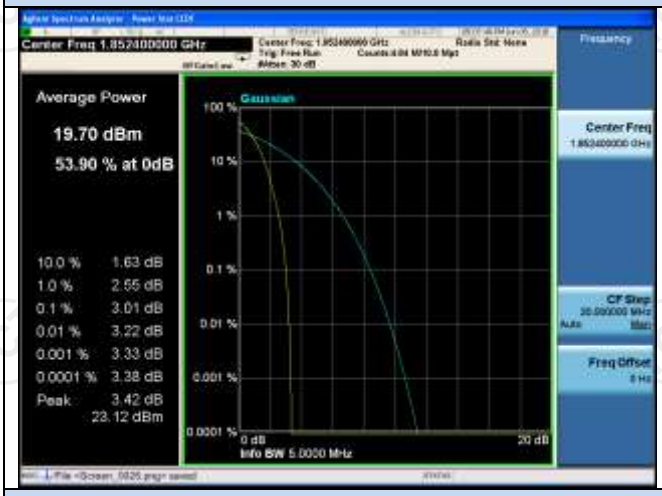
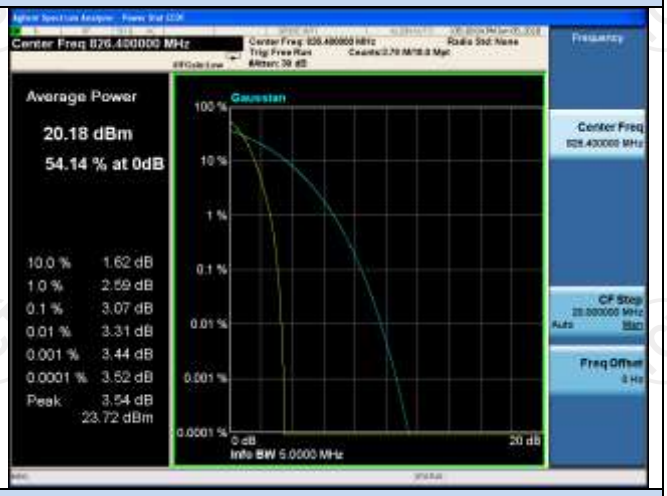
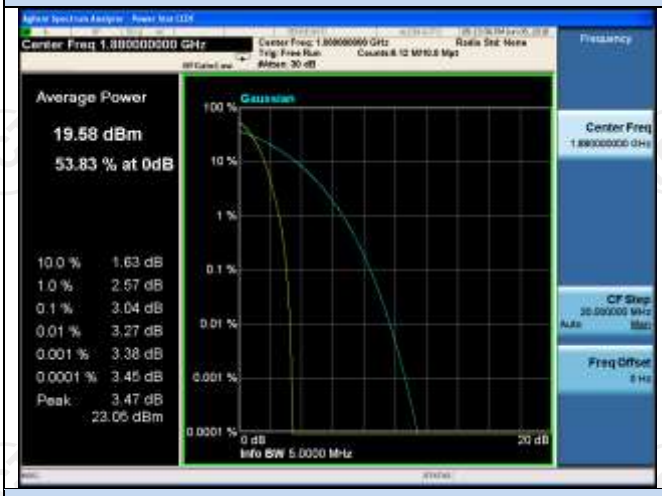
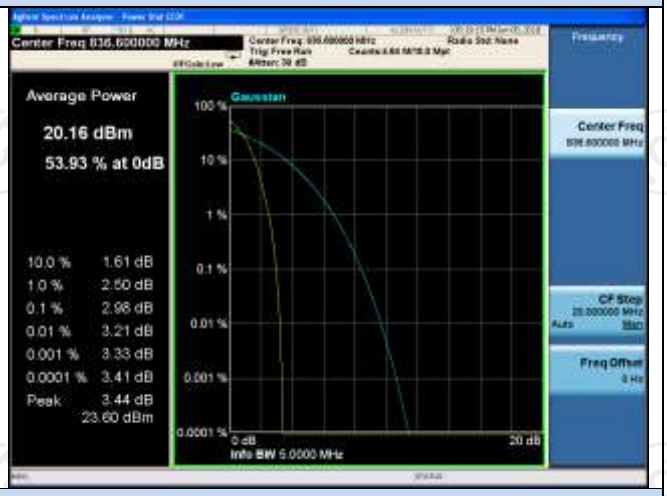
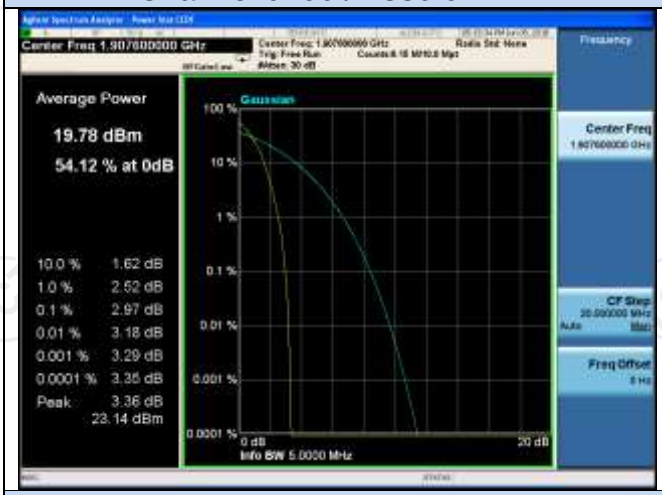
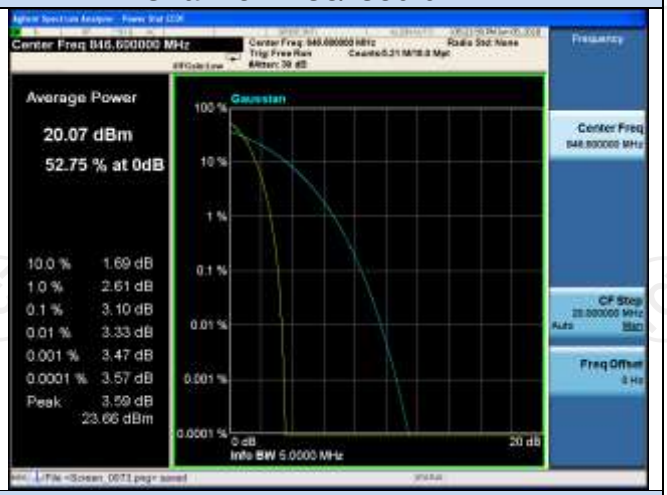
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.2.3. Test Data

Test mode	Peak to Average Ratio (dB)			Limit (dB)	Result
	Low Ch.	Middle Ch.	High Ch.		
GSM/TM1/GSM1900	8.39	8.43	8.39	13	PASS

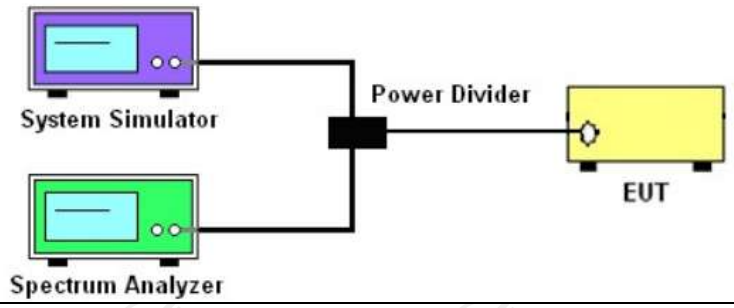
Test mode	Peak to Average Ratio (dB)			Limit (dB)	Result
	Low Ch.	Middle Ch.	High Ch.		
WCDMA Band II	3.01	3.04	2.52	13	PASS
WCDMA Band V	3.07	2.98	3.10		

Peak-to-Average Ratio (PAR)	
GSM/TM1/GSM1900	
	
Channel 512 / 1850.20 MHz	Channel 661/ 1880.00 MHz
	
Channel 810 / 1908.80 MHz	

Peak-to-Average Ratio (PAR)	
UMTS/TM1/ WCDMA Band II	UMTS/TM1/ WCDMA Band V
	
Channel 9262 / 1852.4 MHz	Channel 4132/ 826.4 MHz
	
Channel 9400 / 1880.0 MHz	Channel 4183/ 836.6 MHz
	
Channel 9538 / 1907.6 MHz	Channel 4233/ 846.6 MHz

6.3. 99% Occupied Bandwidth and 26dB Bandwidth Measurement

6.3.1. Test Specification

Test Requirement:	FCC part 2.1049
Test Method:	FCC part 2.1049
Operation mode:	Refer to item 4.1
Limit:	N/A
Test Setup:	
Test Procedure:	1. The testing follows FCC KDB 971168 v02r02 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. 27, 2018
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-02	N/A	Sep. 27, 2018

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

EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GSM 850 (GSM link)	128	824.20	243.56	320.7
	190	836.60	246.77	319.5
	251	848.80	246.05	323.1
GSM 850 (GPRS 1 link)	128	824.20	243.35	311.3
	190	836.60	244.94	314.4
	251	848.80	244.89	320.4
GSM 850 (EGPRS 1 link)	128	824.20	248.51	314.4
	190	836.60	247.14	322.5
	251	848.80	245.79	320.8
PCS 1900 (GSM link)	512	1850.20	242.27	317.4
	661	1880.00	244.10	317.8
	810	1909.80	246.71	316.8
PCS 1900 (GPRS 1 link)	512	1850.20	243.25	313.7
	661	1880.00	241.84	318.7
	810	1909.80	244.07	310.5
PCS 1900 (EGPRS 1 link)	512	1850.20	242.14	318.0
	661	1880.00	242.84	319.5
	810	1909.80	247.72	316.0
WCDMA Band V (RMC 12.2Kbps link)	4132	826.40	4104.2	4712
	4183	836.60	4133.2	4706
	4233	846.60	4100.8	4709
WCDMA Band II (RMC 12.2Kbps link)	9262	1852.4	4110.8	4723
	9400	1880.0	4138.8	4722
	9538	1907.6	4129.2	4768

Test plots as follows:

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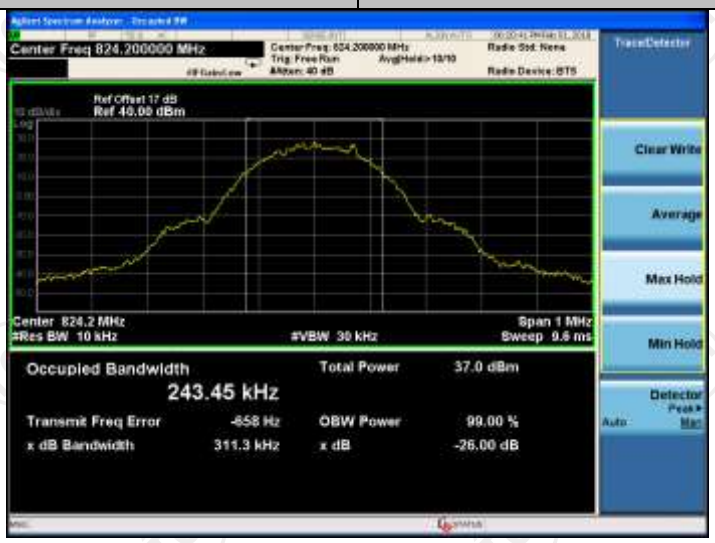
Test band:	GSM 850 (GSM link)

Lowest channel

Middle channel

Highest channel

Test band:	GSM 850 (GPRS 1 link)

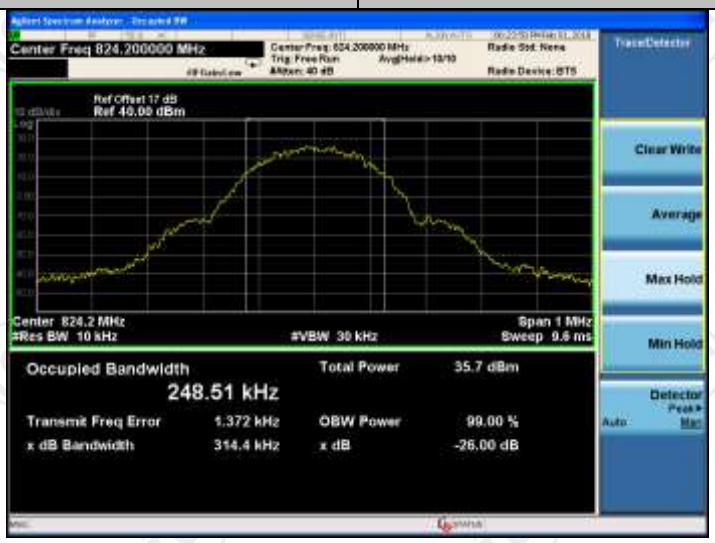


Lowest channel

Middle channel

Highest channel

Test band:	GSM 850 (EGPRS 1 link)



Lowest channel

Middle channel

Highest channel

Test band:	PCS 1900 (GSM link)

Lowest channel

Middle channel

Highest channel

Test band:	PCS 1900 (GPRS 1 link)

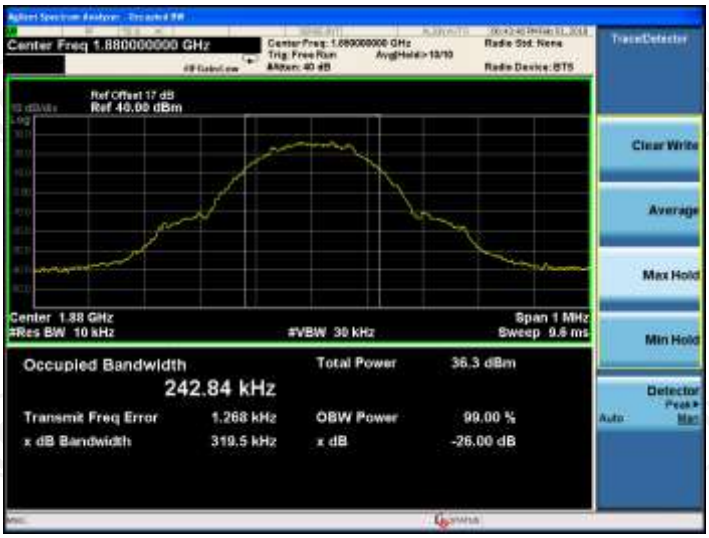
Lowest channel

Middle channel

Highest channel

Test band:	PCS 1900 (EGPRS 1 link)

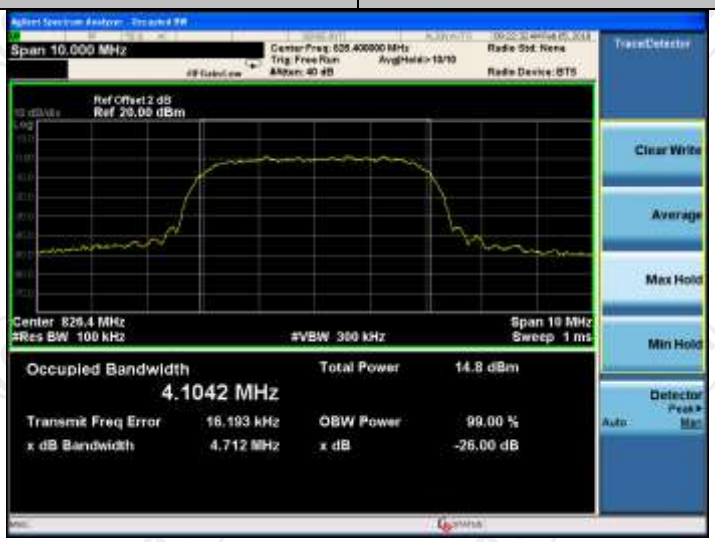
Lowest channel



Middle channel

Highest channel

Test band:	WCDMA Band V (RMC 12.2Kbps link)

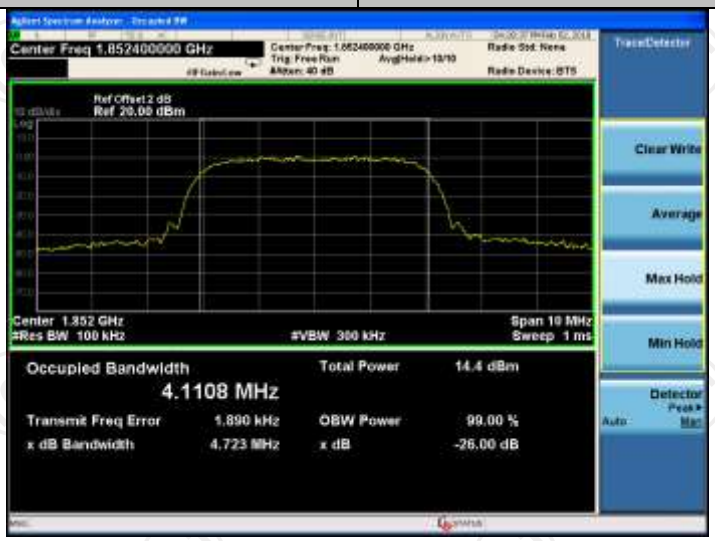


Lowest channel

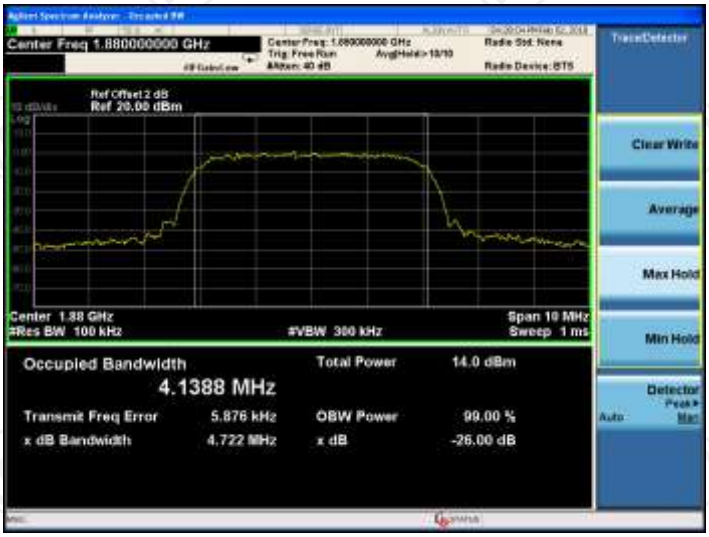
Middle channel

Highest channel

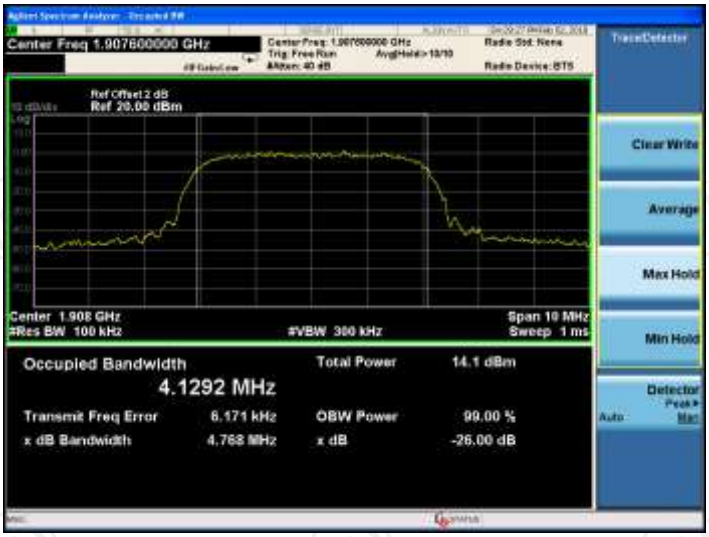
Test band:	WCDMA Band II (RMC 12.2Kbps link)



Lowest channel



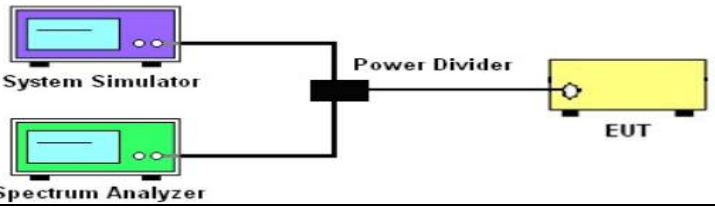
Middle channel



Highest channel

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(g)
Test Method:	FCC part2.1051
Operation mode:	Refer to item 4.1
Limit:	-13dBm
Test Setup:	
Test Procedure:	1. The testing follows FCC KDB 971168 v02r02 Section 6. 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

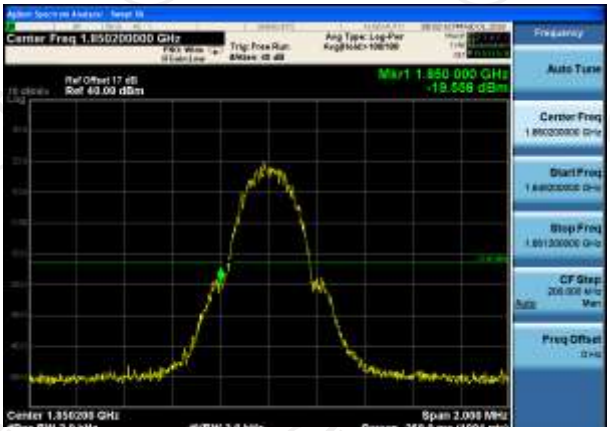
Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	111382	Sep. 27, 2018
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-02	N/A	Sep. 27, 2018

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

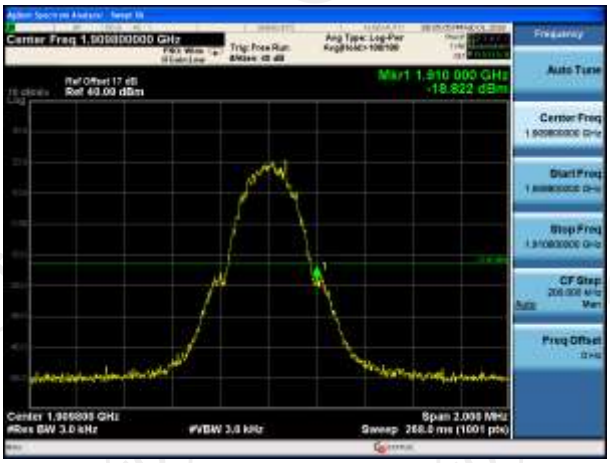
Test plots as follows:

Test Mode: Traffic mode	PCS1900 (GSM link)



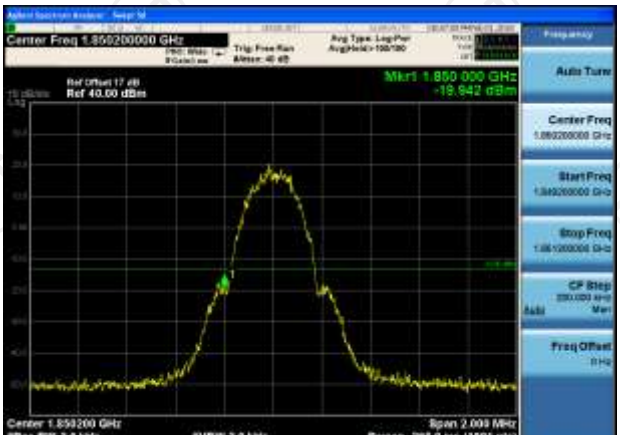
Lowest channel

Middle channel



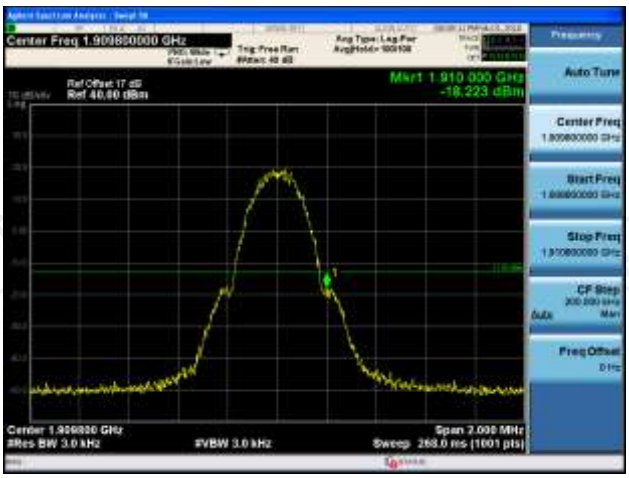
Highest channel

Test Mode: Traffic mode	PCS1900 (GPRS 1 link)



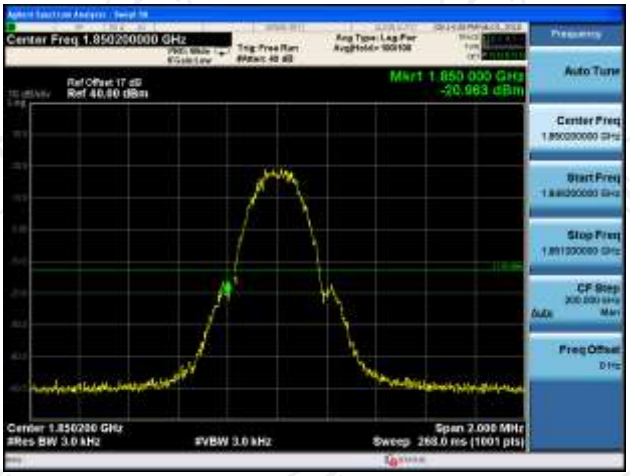
Lowest channel

Middle channel



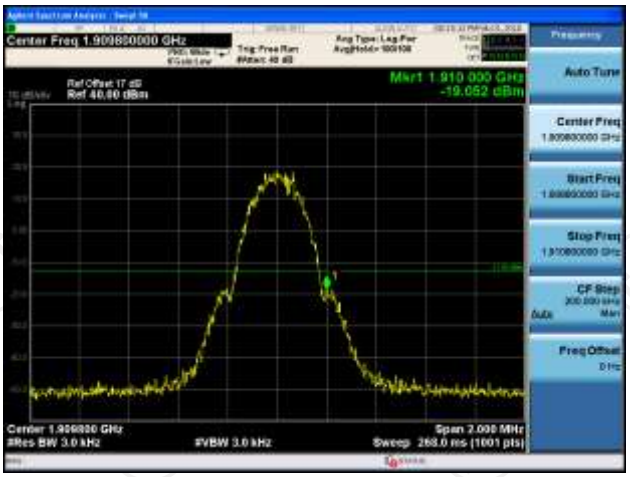
Highest channel

Test Mode: Traffic mode	PCS1900 (EGPRS 1 link)



Lowest channel

Middle channel

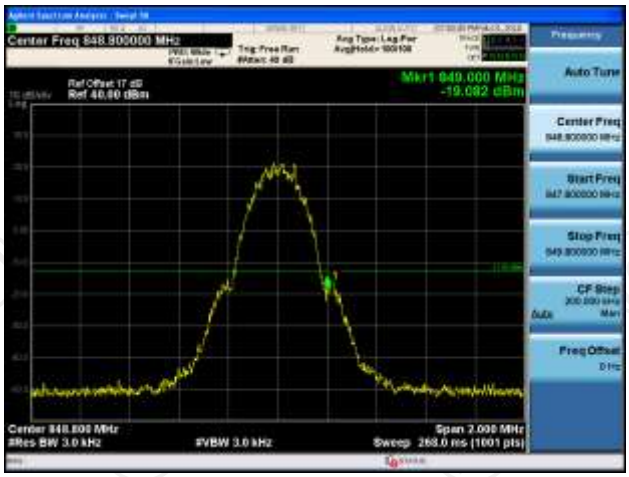


Highest channel

Test Mode: Traffic mode	GSM 850 (GSM link)

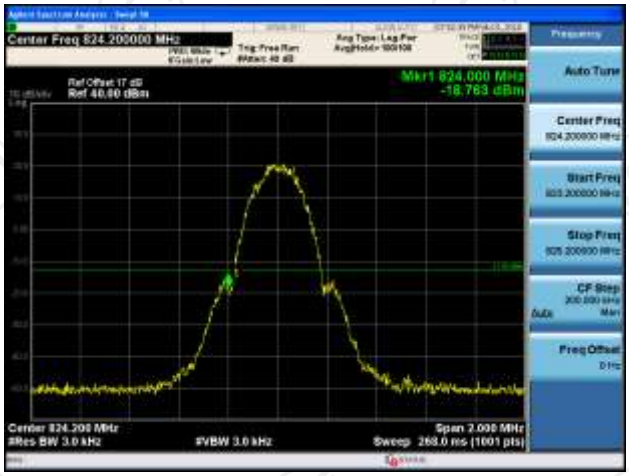
Lowest channel

Middle channel



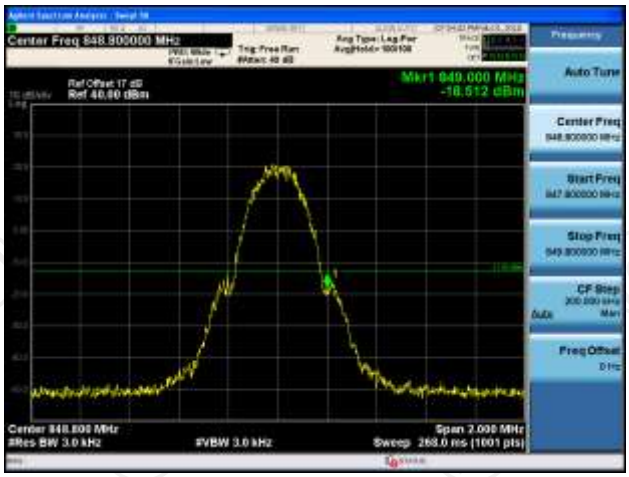
Highest channel

Test Mode: Traffic mode	GSM 850 (GPRS 1 link)



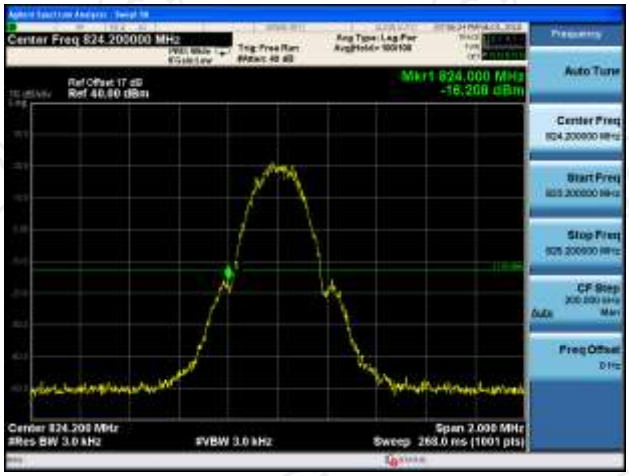
Lowest channel

Middle channel



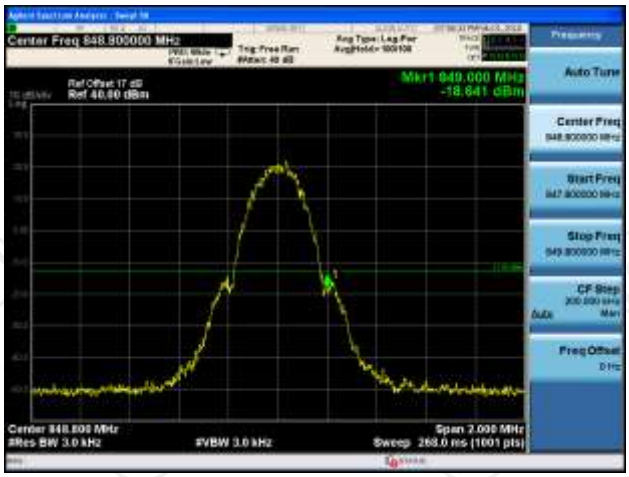
Highest channel

Test Mode: Traffic mode	GSM 850 (EGPRS 1 link)



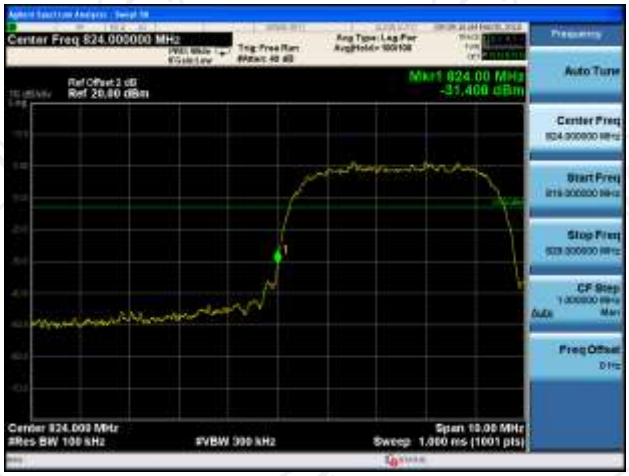
Lowest channel

Middle channel



Highest channel

Test Mode: Traffic mode	WCDMA Band V (RMC 12.2Kbps link)



Lowest channel

Middle channel

Highest channel

Test Mode: Traffic mode	WCDMA Band II (RMC 12.2Kbps link)

Lowest channel

Middle channel

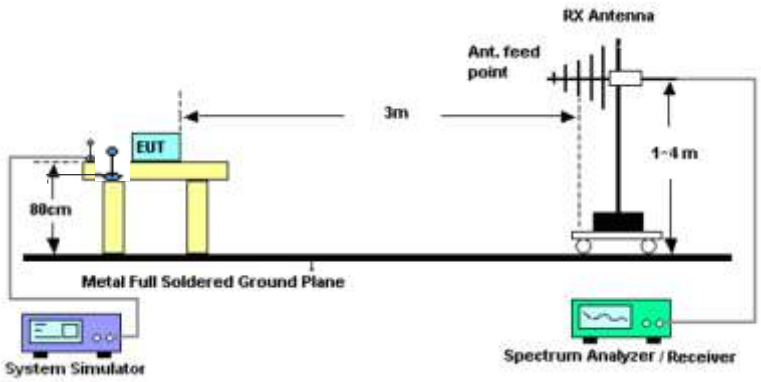
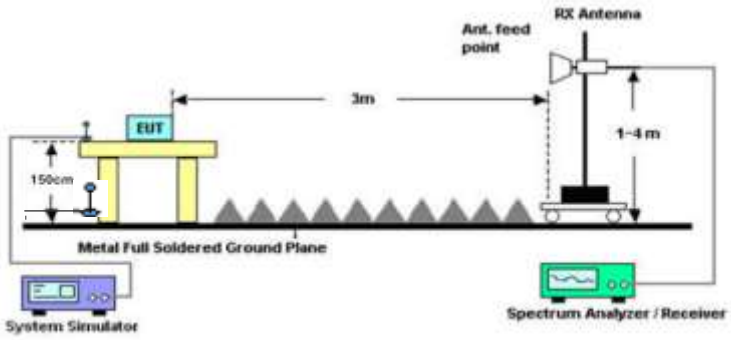
Highest channel

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(b) FCC part 27.50(d)
Test Method:	FCC part 2.1046
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:	GSM850 7W ERP PCS1900 2W EIRP WCDMA Band V: 7W ERP WCDMA Band II: 2W EIRP
Test Setup：	From 30MHz to 1GHz  Above 1GHz 
Test Procedure:	1. The testing follows FCC KDB 971168 v02r02 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 below 1GHz and a non-conductive rotating platform 1.5 meters high above 1GHz 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 D01. 3. Key the transmitter, then rotate the EUT 360^{o} 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. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	R&S	FSQ	Sep. 27, 2018
Signal Generator	HP	83623B	3614A00396	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	412	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	1201	Mar. 05, 2018
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 27, 2018
Coax cable (9kHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9kHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	RE-High-04	N/A	Sep. 27, 2018
Antenna Mast	Keleto	CC-A-4M	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

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (GSM link)	Lowest	H	V	26.57	38.45	Pass
			H	30.07		
		E1	V	25.74		
			H	29.09		
		E2	V	26.28		
			H	30.29		
	Middle	H	V	26.43	38.45	Pass
			H	30.27		
		E1	V	26.11		
			H	29.56		
		E2	V	25.71		
			H	28.99		
	Highest	H	V	26.22	38.45	Pass
			H	29.96		
		E1	V	26.59		
			H	30.53		
		E2	V	26.01		
			H	29.45		

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EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (GPRS 1 link)	Lowest	H	V	27.17	38.45	Pass
			H	30.86		
		E1	V	26.24		
			H	29.80		
		E2	V	26.34		
			H	30.45		
	Middle	H	V	27.02	38.45	Pass
			H	30.69		
		E1	V	26.86		
			H	29.75		
		E2	V	25.73		
			H	29.49		
	Highest	H	V	26.57	38.45	Pass
			H	30.53		
		E1	V	26.61		
			H	30.82		
		E2	V	26.25		
			H	30.05		

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EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (EGPRS 1 link)	Lowest	H	V	26.96	38.45	Pass
			H	30.49		
		E1	V	27.20		
			H	30.54		
		E2	V	26.56		
			H	29.30		
	Middle	H	V	26.19	38.45	Pass
			H	30.12		
		E1	V	25.38		
			H	29.37		
		E2	V	25.42		
			H	28.64		
	Highest	H	V	27.74	38.45	Pass
			H	30.75		
		E1	V	26.84		
			H	29.58		
		E2	V	24.99		
			H	28.25		

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EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (GSM link)	Lowest	H	V	23.71	33.01	Pass
			H	27.51		
		E1	V	23.64		
			H	26.60		
		E2	V	22.50		
			H	26.08		
	Middle	H	V	24.14	33.01	Pass
			H	27.41		
		E1	V	23.54		
			H	27.09		
		E2	V	23.16		
			H	26.48		
	Highest	H	V	24.70	33.01	Pass
			H	27.71		
		E1	V	23.82		
			H	26.88		
		E2	V	23.33		
			H	26.92		

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EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (GPRS 1 link)	Lowest	H	V	20.85	33.01	Pass
			H	24.22		
		E1	V	20.28		
			H	23.62		
		E2	V	22.72		
			H	26.20		
	Middle	H	V	22.77	33.01	Pass
			H	26.04		
		E1	V	21.76		
			H	24.40		
		E2	V	21.57		
			H	23.86		
	Highest	H	V	23.54	33.01	Pass
			H	27.15		
		E1	V	23.81		
			H	26.99		
		E2	V	22.72		
			H	25.40		

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EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (EGPRS 1 link)	Lowest	H	V	22.98	33.01	Pass
			H	25.81		
		E1	V	22.81		
			H	25.63		
		E2	V	22.23		
			H	26.04		
	Middle	H	V	22.39	33.01	Pass
			H	26.26		
		E1	V	22.94		
			H	25.44		
		E2	V	21.94		
			H	24.88		
	Highest	H	V	23.82	33.01	Pass
			H	26.59		
		E1	V	23.81		
			H	26.50		
		E2	V	23.74		
			H	26.85		

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EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
WCDMA Band V	Lowest	H	V	16.80	38.45	Pass
			H	20.14		
		E1	V	16.42		
			H	19.15		
		E2	V	16.51		
			H	19.45		
	Middle	H	V	17.64	38.45	Pass
			H	19.83		
		E1	V	16.05		
			H	19.44		
		E2	V	15.29		
			H	18.85		
	Highest	H	V	17.20	38.45	Pass
			H	19.94		
		E1	V	16.30		
			H	18.50		
		E2	V	15.58		
			H	19.03		

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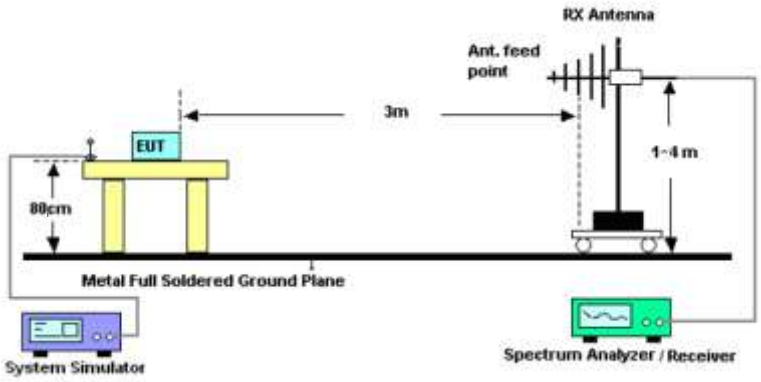
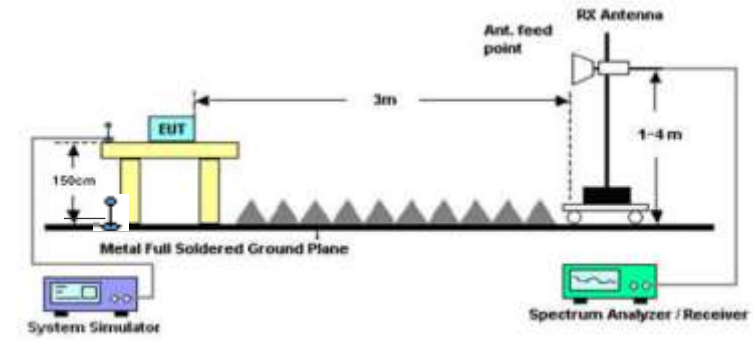
EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
WCDMA Band II	Lowest	H	V	16.58	33.01	Pass
			H	19.85		
		E1	V	15.54		
			H	19.08		
		E2	V	15.88		
			H	19.06		
	Middle	H	V	16.61	33.01	Pass
			H	19.99		
		E1	V	15.60		
			H	19.10		
		E2	V	15.55		
			H	18.72		
	Highest	H	V	16.57	33.01	Pass
			H	19.70		
		E1	V	15.30		
			H	18.93		
		E2	V	15.52		
			H	18.61		

Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

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(g)
Test Method:	FCC part 2.1053
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 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12. 2. The EUT was placed on a rotatable wooden table 0.8 meters below 1GHz and a rotatable wooden table 1.5 meters above 1GHz 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. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	R&S	FSQ	Sep. 27, 2018
Signal Generator	HP	83623B	3614A00396	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	412	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	1201	Mar. 05, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 27, 2018
Coax cable (9kHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9kHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9kHz-40GHz)	TCT	RE-High-04	N/A	Sep. 27, 2018
Antenna Mast	Keleto	CC-A-4M	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).*

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6.6.3. Test Data

Test mode:	GSM850		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1648.40	Vertical	-53.85	-13.00	Pass
2472.60	V	-50.45		
3296.80	V	-47.01		
4121.00	V	-44.27		
4945.20	V	-42.05		
1648.40	Horizontal	-53.54	-13.00	Pass
2472.60	H	-51.04		
3296.80	H	-47.70		
4121.00	H	-45.20		
4945.20	H	-42.40		
Test mode:	**GSM850**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-53.25	-13.00	Pass
2509.80	V	-50.71		
3346.40	V	-47.45		
4183.00	V	-44.79		
5019.60	V	-41.81		
1673.20	Horizontal	-53.84	-13.00	Pass
2509.80	H	-51.56		
3346.40	H	-47.31		
4183.00	H	-44.45		
5019.60	H	-42.25		
Test mode:	**GSM850**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1697.60	Vertical	-53.22	-13.00	Pass
2546.40	V	-50.79		
3395.20	V	-47.44		
4244.00	V	-45.12		
5092.80	V	-42.35		
1697.60	Horizontal	-53.32	-13.00	Pass
2546.40	H	-51.46		
3395.20	H	-48.21		
4244.00	H	-45.30		
5092.80	H	-41.66		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	PCS1900		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3700.40	Vertical	-53.07	-13.00	Pass
5550.60	V	-50.97		
7400.80	V	-47.54		
9251.00	V	-44.29		
11101.20	V	-42.17		
3700.40	Horizontal	-53.65	-13.00	Pass
5550.60	H	-51.45		
7400.80	H	-47.79		
9251.00	H	-44.89		
11101.20	H	-42.70		
Test mode:	**PCS1900**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-53.26	-13.00	Pass
5640.00	V	-51.28		
7520.00	V	-47.13		
9400.00	V	-45.30		
11280.00	V	-42.05		
3760.00	Horizontal	-53.39	-13.00	Pass
5640.00	H	-51.41		
7520.00	H	-47.99		
9400.00	H	-44.83		
11280.00	H	-42.40		
Test mode:	**PCS1900**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3819.60	Vertical	-52.86	-13.00	Pass
5729.40	V	-50.94		
7639.20	V	-48.11		
9549.00	V	-44.39		
11458.80	V	-42.59		
3819.60	Horizontal	-53.22	-13.00	Pass
5729.40	H	-50.90		
7639.20	H	-47.65		
9549.00	H	-44.83		
11458.80	H	-42.79		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

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Test mode:	WCDMA Band V		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-53.33	-13.00	Pass
2479.20	V	-50.83		
3305.60	V	-47.25		
4132.00	V	-44.63		
4958.40	V	-41.75		
1652.80	Horizontal	-53.35	-13.00	Pass
2479.20	H	-50.59		
3305.60	H	-47.37		
4132.00	H	-44.82		
4958.40	H	-42.59		
Test mode:	**WCDMA Band V**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1672.80	Vertical	-53.32	-13.00	Pass
2509.20	V	-51.61		
3345.60	V	-48.06		
4182.00	V	-45.43		
5018.40	V	-42.00		
1672.80	Horizontal	-53.90	-13.00	Pass
2509.20	H	-51.50		
3345.60	H	-47.33		
4182.00	H	-44.98		
5018.40	H	-42.34		
Test mode:	**WCDMA Band V**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-53.30	-13.00	Pass
2539.80	V	-51.23		
3386.40	V	-48.00		
4233.00	V	-45.43		
5079.60	V	-41.78		
1693.20	Horizontal	-52.92	-13.00	Pass
2539.80	H	-51.07		
3386.40	H	-47.45		
4233.00	H	-44.44		
5079.60	H	-42.46		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

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Test mode:	WCDMA Band II		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3704.80	Vertical	-53.56	-13.00	Pass
5557.20	V	-51.06		
7409.60	V	-47.53		
9262.00	V	-44.79		
11114.40	V	-42.17		
3704.80	Horizontal	-53.32	-13.00	Pass
5557.20	H	-50.77		
7409.60	H	-47.72		
9262.00	H	-44.70		
11114.40	H	-42.73		
Test mode:	**WCDMA Band II**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-53.00	-13.00	Pass
5640.00	V	-51.28		
7520.00	V	-48.22		
9400.00	V	-45.29		
11280.00	V	-42.69		
3760.00	Horizontal	-53.97	-13.00	Pass
5640.00	H	-50.54		
7520.00	H	-47.53		
9400.00	H	-45.38		
11280.00	H	-42.05		
Test mode:	**WCDMA Band II**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3815.20	Vertical	-53.19	-13.00	Pass
5722.80	V	-50.39		
7630.40	V	-48.00		
9538.00	V	-44.47		
11445.60	V	-42.28		
3815.20	Horizontal	-53.23	-13.00	Pass
5722.80	H	-50.63		
7630.40	H	-47.97		
9538.00	H	-45.26		
11445.60	H	-42.55		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

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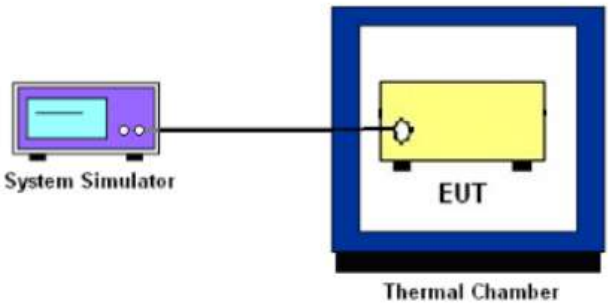
6.7. Frequency Stability Measurement

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 Part 2.1055(a)(1)(b)
Operation mode:	Refer to item 4.1
Limit:	±2.5 ppm
Test Setup:	
Test Procedure:	**Test Procedures for Temperature Variation** 1. The testing follows FCC KDB 971168 v02r02 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 v02r02 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. 27, 2018
Programable tempratuce and humidity chamber	JQ	JQ-2000	N/A	Sep. 27, 2018
DC power supply	Kingrang	KR3005K 30V/5A	N/A	Sep. 27, 2018
RF cable (9kHz-40GHz)	TCT	RE-04	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

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

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	3.8	0.005	2.5	Pass
	-20	4.3	0.005		
	-10	4.4	0.005		
	0	3.7	0.004		
	10	3.4	0.004		
	20	2.5	0.003		
	30	2.8	0.003		
	40	3.1	0.004		
	50	3.6	0.004		
Reference Frequency: GSM850 (GPRS 1 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	3.3	0.004	2.5	Pass
	-20	4.1	0.005		
	-10	3.9	0.005		
	0	3.3	0.004		
	10	3.4	0.004		
	20	2.4	0.003		
	30	1.5	0.002		
	40	2.7	0.003		
	50	3.7	0.004		
Reference Frequency: GSM850 (EGPRS 1 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	3.3	0.004	2.5	Pass
	-20	4.0	0.005		
	-10	3.4	0.004		
	0	3.6	0.004		
	10	2.6	0.003		
	20	2.4	0.003		
	30	2.1	0.002		
	40	2.0	0.002		
	50	3.6	0.004		

Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	3.9	0.002	2.5	Pass
	-20	4.0	0.002		
	-10	3.7	0.002		
	0	2.8	0.002		
	10	2.6	0.001		
	20	2.6	0.001		
	30	2.1	0.001		
	40	3.0	0.002		
	50	4.2	0.002		
Reference Frequency: PCS1900 (GPRS 1 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	3.9	0.002	2.5	Pass
	-20	3.2	0.002		
	-10	4.0	0.002		
	0	3.2	0.002		
	10	2.5	0.001		
	20	2.5	0.001		
	30	1.5	0.001		
	40	3.1	0.002		
	50	3.8	0.002		
Reference Frequency: PCS1900 (EGPRS 1 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	3.4	0.002	2.5	Pass
	-20	4.5	0.002		
	-10	3.2	0.002		
	0	3.7	0.002		
	10	2.4	0.001		
	20	2.7	0.001		
	30	2.8	0.001		
	40	3.2	0.002		
	50	4.2	0.002		

Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	3.8	0.004	2.5	Pass
	-20	3.4	0.004		
	-10	3.3	0.004		
	0	3.4	0.004		
	10	3.4	0.004		
	20	2.7	0.003		
	30	2.6	0.003		
	40	2.9	0.003		
	50	4.3	0.005		
Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880.0MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	3.5	0.002	2.5	Pass
	-20	3.9	0.002		
	-10	3.2	0.002		
	0	3.0	0.002		
	10	2.7	0.001		
	20	3.2	0.002		
	30	2.1	0.001		
	40	2.8	0.001		
	50	3.7	0.002		

Test Result of Voltage Variation

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.6	0.004	2.5	Pass
	3.7	1.9	0.002		
	3.3	3.7	0.004		
Reference Frequency: GSM850 (GPRS 1 link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.7	0.004	2.5	Pass
	3.7	1.7	0.002		
	3.3	3.1	0.004		
Reference Frequency: GSM850 (EGPRS 1 link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.2	0.004	2.5	Pass
	3.7	1.3	0.002		
	3.3	2.7	0.003		

Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.8	0.002	2.5	Pass
	3.7	1.4	0.001		
	3.3	2.5	0.001		
Reference Frequency: PCS1900 (GPRS 1 link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.7	0.002	2.5	Pass
	3.7	1.8	0.001		
	3.3	2.4	0.001		
Reference Frequency: PCS1900 (EGPRS 1 link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.8	0.002	2.5	Pass
	3.7	1.1	0.001		
	3.3	2.7	0.001		

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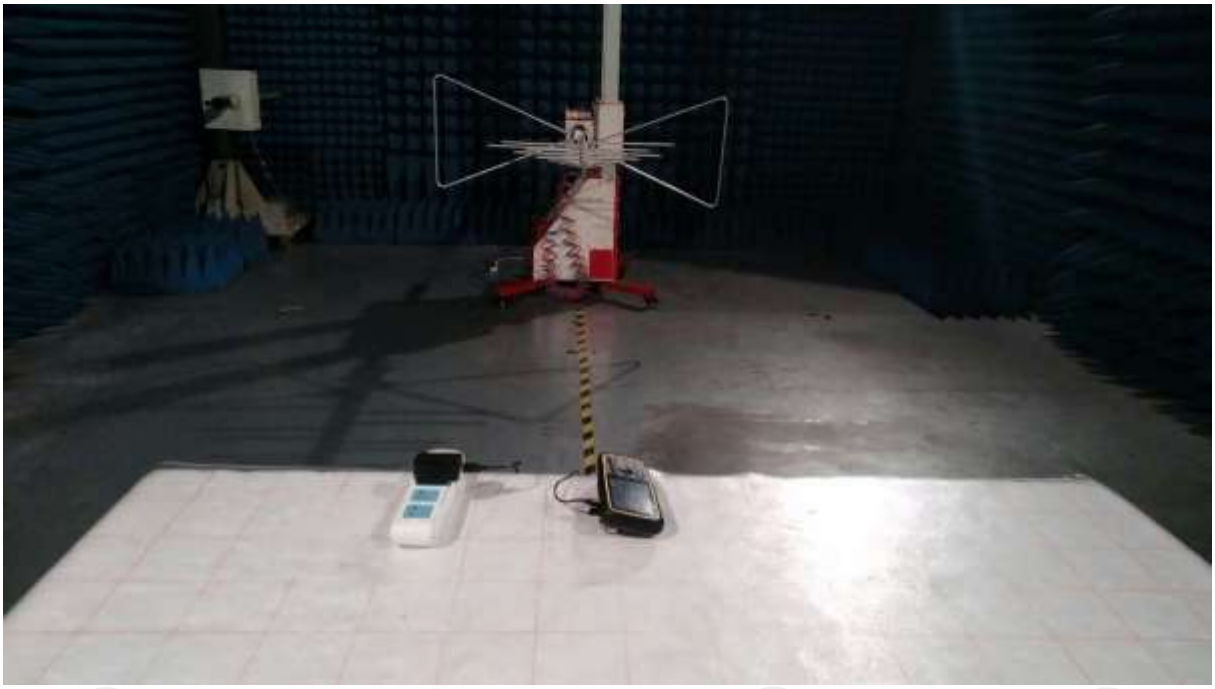
Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	3.9	0.005	2.5	Pass
	3.7	1.9	0.002		
	3.3	2.7	0.003		
Reference Frequency: WCDMA Band II Middle channel=940 channel=1880.0MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.2	4.0	0.005	2.5	Pass
	3.7	1.3	0.002		
	3.3	2.6	0.003		

Appendix A: Photographs of Test Setup

Product: Handheld GNSS Data Collector
Model: HCE320
Radiated Emission



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Appendix B: Photographs of EUT

Refer to test report TCT180111E031

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

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