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# FCC Test Report

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Report No.: AGC01826150601FE02

**FCC ID** : 2ACHAT80

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION** : rugged tablet

**BRAND NAME** : HUGEROCK

**MODEL NAME** : T80, T81, T82

**CLIENT** : Shenzhen SOTEN Technology Co., Ltd.

**DATE OF ISSUE** : July 02, 2015

**STANDARD(S)** : FCC Part 22H & 24E Rules

**REPORT VERSION** : V1.0

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



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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	July 02, 2015	Valid	Original Report

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## 1. VERIFICATION OF COMPLIANCE

<b>Applicant</b>	Shenzhen SOTEN Technology Co., Ltd.
<b>Address</b>	7c, Baisha Technology Industrial Park, No.3011, Shahe West Road, Nanshan District, Shenzhen, Guangdong, China
<b>Manufacturer</b>	EARNING SPRING GROUP
<b>Address</b>	Chitat Industrial Park, Longping West Road, Central City, Longgang District, Shenzhen, Guangdong, China
<b>Product Designation</b>	rugged tablet
<b>Brand Name</b>	HUGEROCK
<b>Test Model</b>	T80
<b>Series Model</b>	T81, T82
<b>Difference description</b>	All the same except for the model name.
<b>Date of test</b>	June 17, 2015 to June 30, 2015
<b>Deviation</b>	None
<b>Condition of Test Sample</b>	Normal

### We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd., The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2009 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part 22H and 24E.

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

Tested By :



Bart Xie

July 02, 2015

Reviewed By :



Forrest Lei

July 02, 2015

Approved By:



Solger Zhang

July 02, 2015

## 2. GENERAL INFORMATION

### 2.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	rugged tablet
Hardware version:	T80-V2.0
Software version:	T80-20150601
Frequency Bands:	<input type="checkbox"/> UMTS FDD Band II <input checked="" type="checkbox"/> UMTS FDD Band V (U.S. Bands) <input checked="" type="checkbox"/> UMTS FDD Band I <input type="checkbox"/> UMTS FDD Band VIII (Non-U.S. Bands)
Antenna:	PIFA Antenna
Type of Modulation	WCDMA : QPSK
Antenna gain(WCDMA):	-1.0dBi
Power Supply:	DC 3.7V by battery
Battery parameter:	DC3.7V/10000mAh
Adapter Input:	AC100-240V, 50-60Hz, 0.3A
Adapter Output:	DC5.35V/ 1.5A
Single Card:	WCDMA Card Slot
Extreme Vol. Limits:	DC3.4 V to 4.2 V (Normal: DC3.7 V)
Extreme Temp. Tolerance	-10°C to +50°C
<p>*** Note: The High Voltage DC4.2V and Low Voltage DC3.4V were declared by manufacturer, The EUT couldn't be operating normally with higher or lower voltage.</p> <p>Other functions have been performed according to verification procedure except for Bluetooth and MS function.</p>	

\*\*\* **Note:** The maximum power levels are RMC 12.2kbps mode for WCDMA band V, only these modes were used for all tests.

We found out the test mode with the highest power level after we analyze all the data rates. So we chose worst case as a representative.

**WCDMA Card Slot:**

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
UMTS BAND V	21.49	23.51	21.28

## 2.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2ACHAT80**, filing to comply with the FCC Part 22H&24E requirements.

## 2.3 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI C 63.4: 2003; TIA/EIA 603 and FCC CFR 47 Rules of 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057.

KDB 971168 D01 Power Meas License Digital Systems v02r01

## 2.4 TEST FACILITY

<b>Site</b>	Dongguan Precise Testing Service Co., Ltd.
<b>Location</b>	Building D,Baoding Technology Park,Guangming Road2,Dongcheng District, Dongguan, Guangdong, China,
<b>FCC Registration No.</b>	371540
<b>Description</b>	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009.

## 2.5 MEASUREMENT INSTRUMENTS

Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 4, 2014	July 3, 2015
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 4, 2014	July 3, 2015
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 4, 2014	July 3, 2015
RF Cable	SCHWARZBECK	AK9515E	96221	July 4, 2014	July 3, 2015
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 6, 2015	June 5, 2016
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	June 6, 2015	June 5, 2016
Spectrum analyzer	Agilent	E4407B	MY46185649	June 6, 2015	June 5, 2016
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	July 11, 2014	July 10, 2015
Spectrum Analyzer	Agilent	E4411B	MY4511453	July 4, 2014	July 3, 2015
Signal Amplifier	SCHWARZBECK	BBV 9718	9718-269	July 7, 2014	July 6, 2015
RF Cable	SCHWARZBECK	AK9515H	96220	July 8, 2014	July 7, 2015
Horn Ant (18G-40GHz)	Schwarzbeck	BBHA 9170	9170-181	June 6, 2015	June 5, 2016

Artificial Mains Network	Narda	L2-16B	000WX31025	July 8, 2014	July 7, 2015
Artificial Mains Network (AUX)	Narda	L2-16B	000WX31026	July 8, 2014	July 7, 2015
RF Cable	SCHWARZBECK	AK9515E	96222	July 4, 2014	July 3, 2015
Shielded Room	CHENGYU	843	PTS-002	June 6,2015	June 5,2016
COMMUNICATION TESTER	AGILENT	8960	GB46490550	July 25, 2015	July 24, 2016

## **2.6 SPECIAL ACCESSORIES**

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

## **2.7 EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

### 3. SYSTEM TEST CONFIGURATION

#### 3.1 EUT CONFIGURATION

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

#### 3.2 EUT EXERCISE

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

#### 3.3 GENERAL TECHNICAL REQUIREMENTS

Item Number	Item Description		FCC Rules
1	Output Power	Conducted output power	2.1046/22.913(a) (2) / 24.232 (c)
		Radiated output power	
2	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)
3	Spurious Emission	Conducted spurious emission	2.1051 / 22.917 / 24.238
		Radiated spurious emission	
4	Mains Conducted Emission		15.107 / 15.207
5	Frequency Stability		2.1055/22.355 /24.235
6	Occupied Bandwidth		2.1049 (h)(i)
7	Emission Bandwidth		22.917(a)/24.238(a)
8	Band Edge		22.917(a)/24.238(a)

3.4 CONFIGURATION OF EUT SYSTEM

Fig. 2-1 Configuration of EUT System

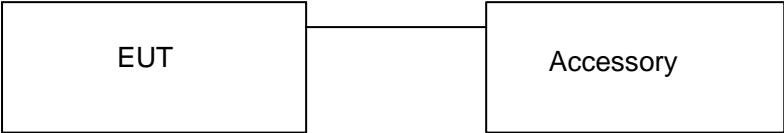


Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	rugged tablet	T80	FCC ID: 2ACHAT80	EUT
2	Adapter	W12-010N3B	DC5.35V/1.5A	Accessory
3	Battery	7090152	DC3.7V/ 10000mAh	Accessory
4	USB Cable	T80	N/A	Accessory

\*\*\*Note: All the accessories have been used during the test. The following “EUT” in setup diagram means EUT system.

#### 4. SUMMARY OF TEST RESULTS

Item Number	Item Description		FCC Rules	Result
1	Output Power	Conducted Output Power	2.1046/22.913(a) (2) / 24.232 (c)	Pass
		Radiated Output Power		
2	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)	Pass
3	Spurious Emission	Conducted Spurious Emission	2.1051 / 22.917 / 24.238	Pass
		Radiated Spurious Emission		
4	Mains Conducted Emission		15.107 / 15.207	Pass
5	Frequency Stability		2.1055/22.355 /24.235	Pass
6	Occupied Bandwidth		2.1049 (h)(i)	Pass
7	Emission Bandwidth		22.917(a)/24.238(a)	Pass
8	Band Edge		22.917(a)/24.238(a)	Pass

#### 5. DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Digital Radio Communication Tester (AGILENT8960) to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on band V.

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

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

## 6. OUTPUT POWER

### 6.1 CONDUCTED OUTPUT POWER

#### 6.1.1 MEASUREMENT METHOD

The transmitter output port was connected to base station.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

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

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

#### 6.1.2 MEASUREMENT RESULT

Conducted Output Power Limits for UMTS band V		
Mode	Nominal Peak Power	Tolerance(dB)
WCDMA	24 dBm (0.25W)	- 2

**UMTS BAND V**

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power
WCDMA 850 RMC	826.6	24	<b>23.51</b>	-0.49	21.28
	836.4	24	23.48	-0.52	21.24
	846.4	24	23.43	-0.57	21.21
WCDMA 850 AMR	826.6	24	23.37	-0.63	21.16
	836.4	24	23.35	-0.65	21.14
	846.4	24	23.32	-0.68	21.13
HSDPA Subtest 1	826.6	24	22.84	-1.16	20.51
	836.4	24	22.81	-1.19	20.49
	846.4	24	22.77	-1.23	20.42
HSDPA Subtest 2	826.6	24	22.69	-1.31	20.33
	836.4	24	22.67	-1.33	20.29
	846.4	24	22.66	-1.34	20.27
HSDPA Subtest 3	826.6	24	22.71	-1.29	20.36
	836.4	24	22.68	-1.32	20.34
	846.4	24	22.64	-1.36	20.31
HSDPA Subtest 4	826.6	24	22.78	-1.22	20.35
	836.4	24	22.75	-1.25	20.36
	846.4	24	22.72	-1.28	20.38
HSUPA Subtest 1	826.6	24	22.64	-1.36	20.29
	836.4	24	22.66	-1.34	20.26
	846.4	24	22.69	-1.31	20.27
HSUPA Subtest 2	826.6	24	22.72	-1.28	20.34
	836.4	24	22.67	-1.33	20.31
	846.4	24	22.66	-1.34	20.39
HSUPA Subtest 3	826.6	24	22.75	-1.25	20.25
	836.4	24	22.74	-1.26	20.28
	846.4	24	22.71	-1.29	20.24
HSUPA Subtest 4	826.6	24	22.72	-1.28	20.28
	836.4	24	22.76	-1.24	20.25
	846.4	24	22.79	-1.21	20.16
HSUPA Subtest 5	826.6	24	22.65	-1.35	20.37
	836.4	24	22.68	-1.32	20.35
	846.4	24	22.67	-1.33	20.29

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

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

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	$0 \leq CM \leq 3.5$	$\text{MAX}(CM-1,0)$
Note: $CM=1$ for $\beta_o/\beta_d=12/15$ , $\beta_{hs}/\beta_c=24/15$ .For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

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

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

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

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

## 6.2 RADIATED OUTPUT POWER

### 6.2.1 MEASUREMENT METHOD

The measurements procedures specified in TIA-603C-2004 were applied.

- 1 In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power ( $P_{in}$ ) is applied to the input of the dipole, and the power received ( $P_r$ ) at the chamber's probe antenna is recorded.
- 2 The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as  $AR_{pl} = P_{in} + 2.15 - P_r$ . The  $AR_{pl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below:  $Power = P_{Mea} + AR_{pl}$
- 3 The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
- 4 From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
- 5 The EUT is then put into continuously transmitting mode at its maximum power level.
- 6 Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
- 7 This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power ( $P_{in}$ ).
- 8 ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15dBi$ .

### 6.2.2 PROVISIONS APPLICABLE

This is the test for the maximum radiated power from the EUT. Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage." Rule Part 22.913(a) specifies "Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Mode	Nominal Peak Power
UMTS BANDV	$\leq 38.45$ dBm (7W)

### 6.2.3 MEASUREMENT RESULT

Radiated Power (ERP) for UMTS band V				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. E.I.R.P.	
RMC 12.2kbps	826.6	<b>21.49</b>	Horizontal	Pass
	836.4	20.89	Horizontal	Pass
	846.4	21.37	Horizontal	Pass
	826.6	20.72	Vertical	Pass
	836.4	20.84	Vertical	Pass
	846.4	21.05	Vertical	Pass

Note: Above is worst mode data.

## 6.3. PEAK-TO-AVERAGE RATIO

### 6.3.1 MEASUREMENT METHOD

Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

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

### 6.3.2 PROVISIONS APPLICABLE

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

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 6.3.3 MEASUREMENT RESULT

Modes	UMTS BAND V		
Channel	4358	4407	4457
	(Low)	(Mid)	(High)
Frequency (MHz)	826.6	836.6	846.4
Peak-To-Average Ratio (dB)	2.23	2.24	2.22

## **7. OCCUPIED BANDWIDTH**

### **7.1 MEASUREMENT METHOD**

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

### **7.2 PROVISIONS APPLICABLE**

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

### 7.3 MEASUREMENT RESULT

#### APPENDIX A: BANDWIDTH

##### Test Results

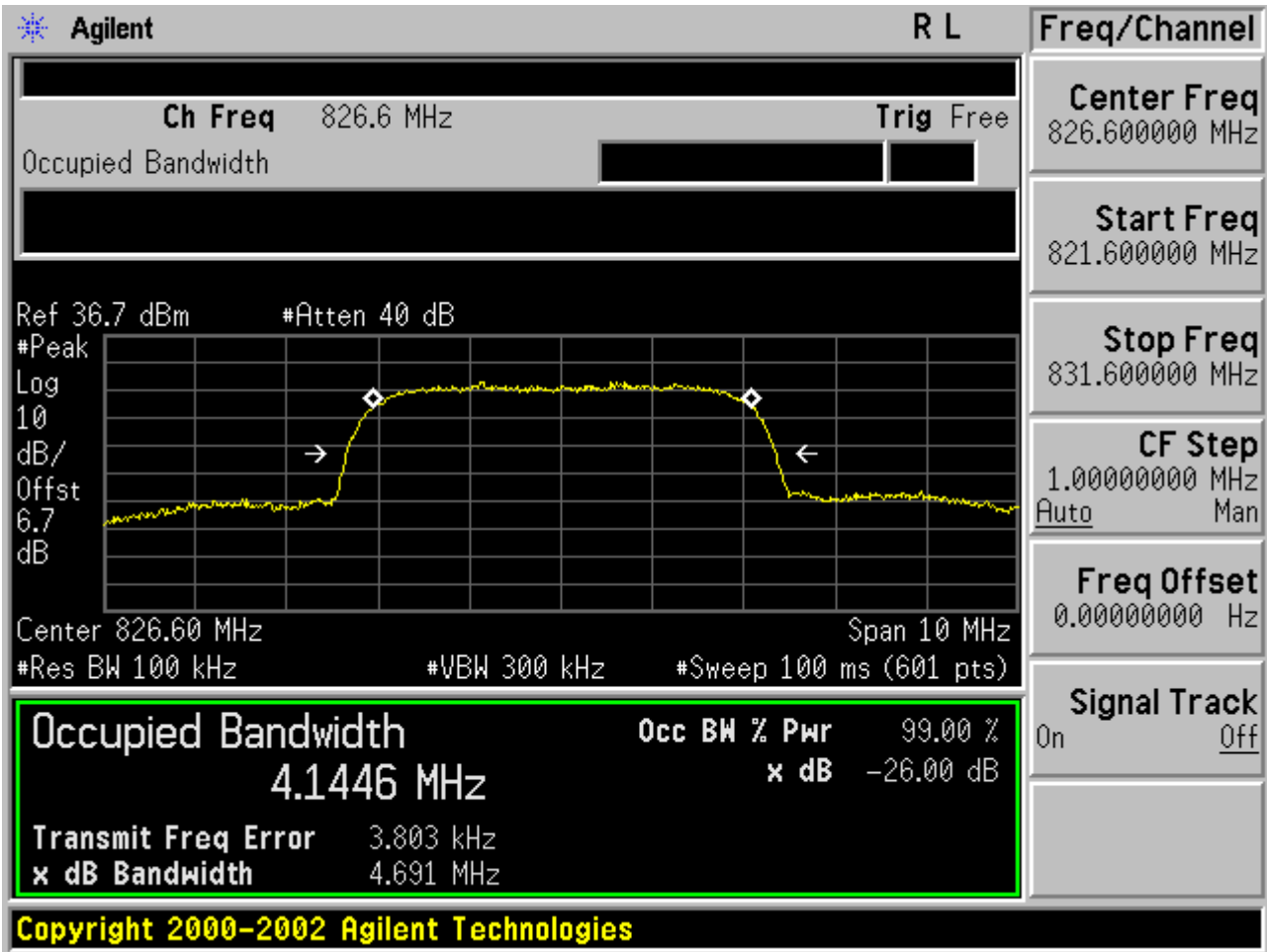
Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHZ)	Emission Bandwidth (KHZ)	Verdict
WCDMA8 50	UMTS	LCH	4144.6	4691	PASS
		MCH	4149.9	4701	PASS
		HCH	4141.5	4691	PASS

For WCDMA

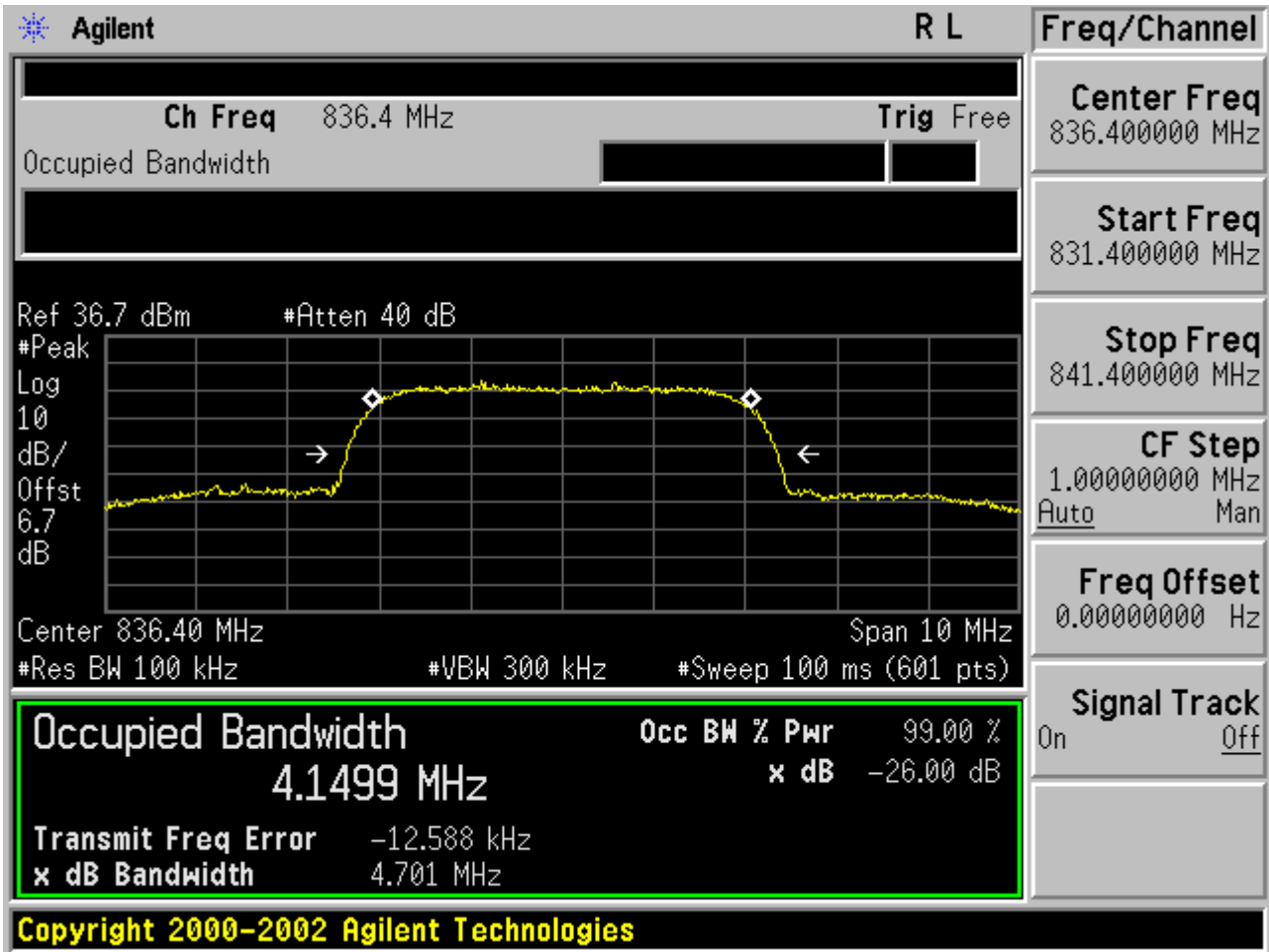
Test Band=WCDMA850

Test Mode=UMTS

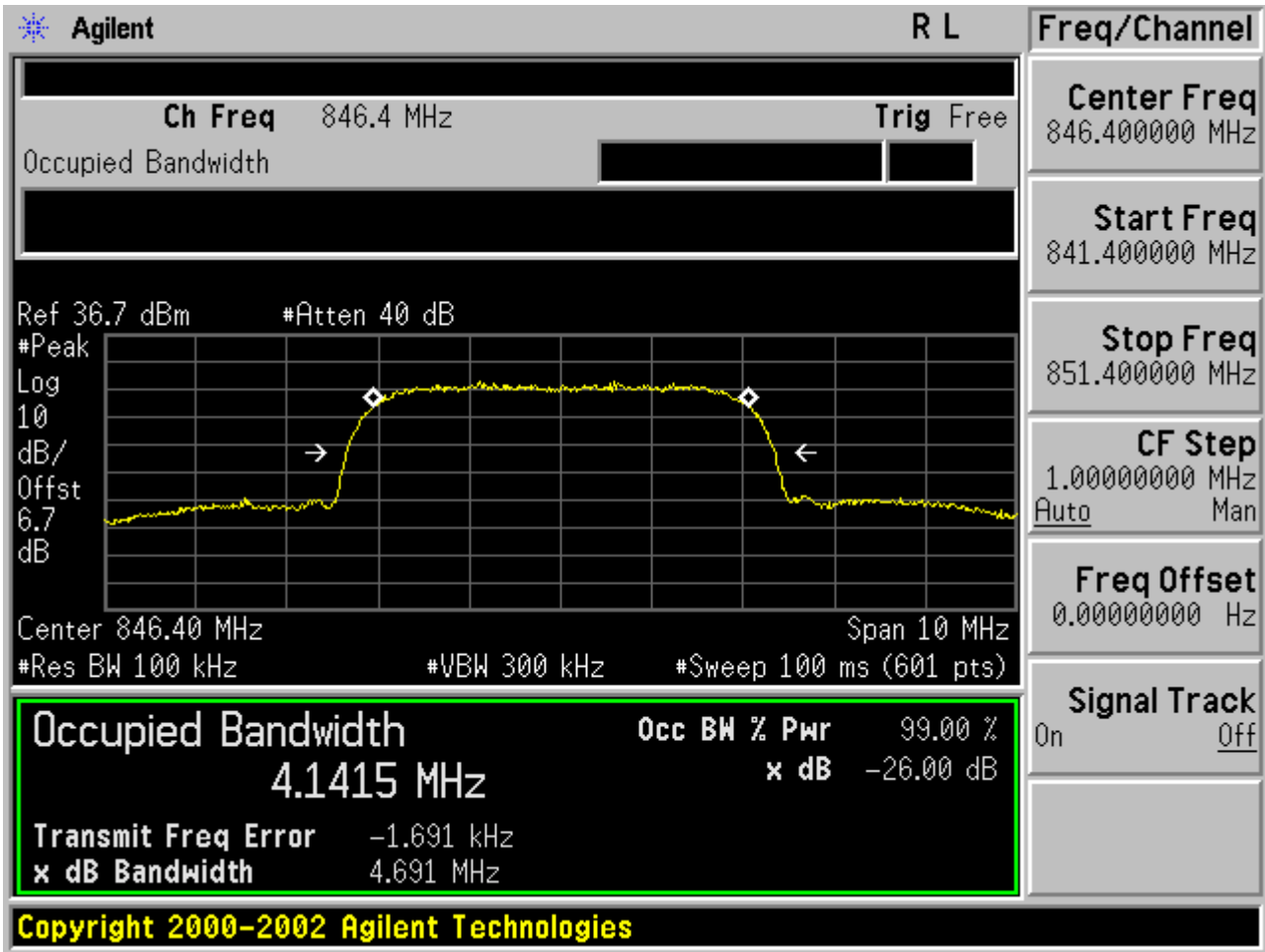
Test Channel=LCH



Test Channel=MCH



Test Channel=HCH



## **8. BAND EDGE**

### **8.1 MEASUREMENT METHOD**

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

### **8.2 PROVISIONS APPLICABLE**

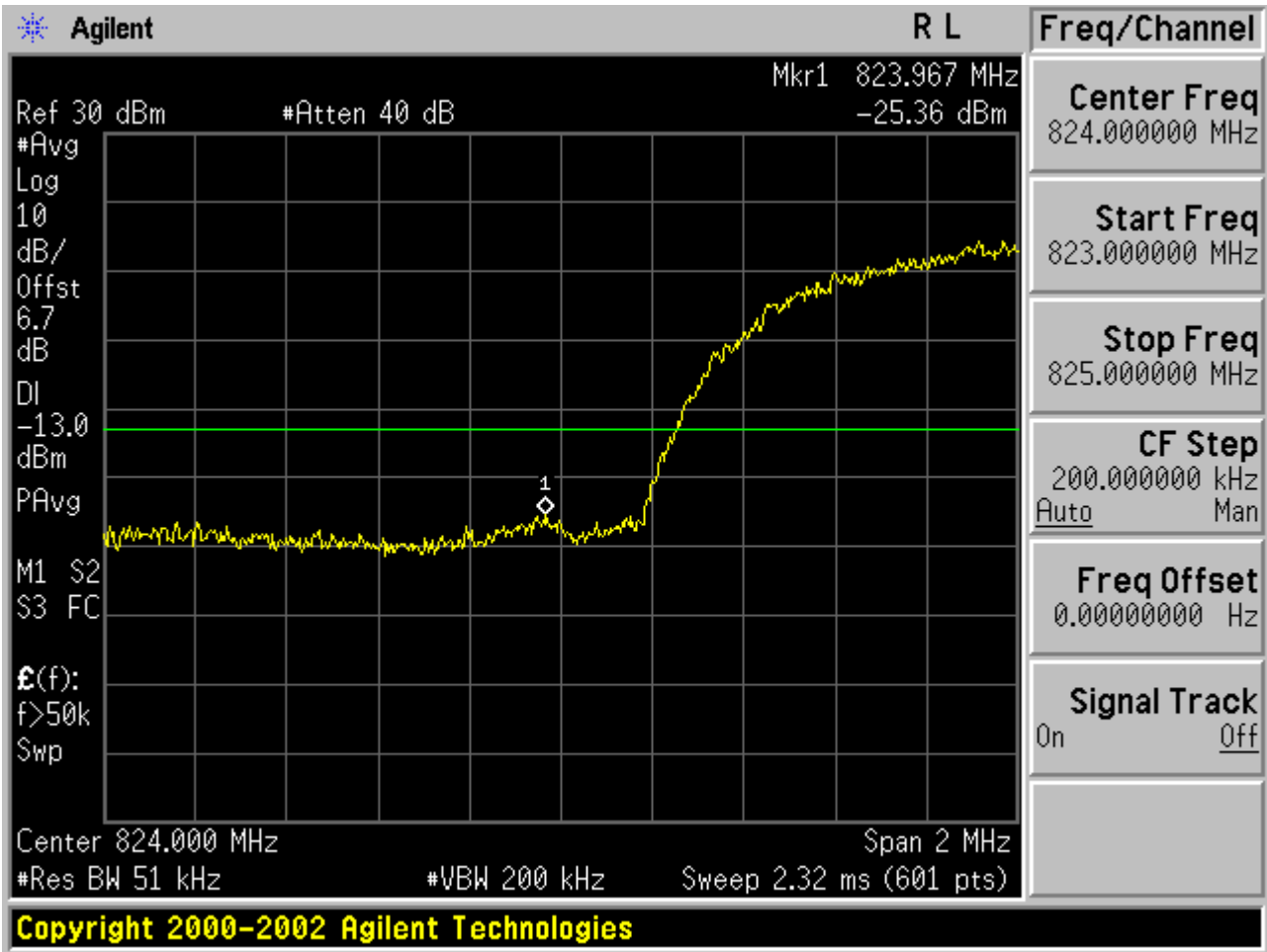
As Specified in FCC rules of 22.917(a) and 24.238(a)

8.3 MEASUREMENT RESULT

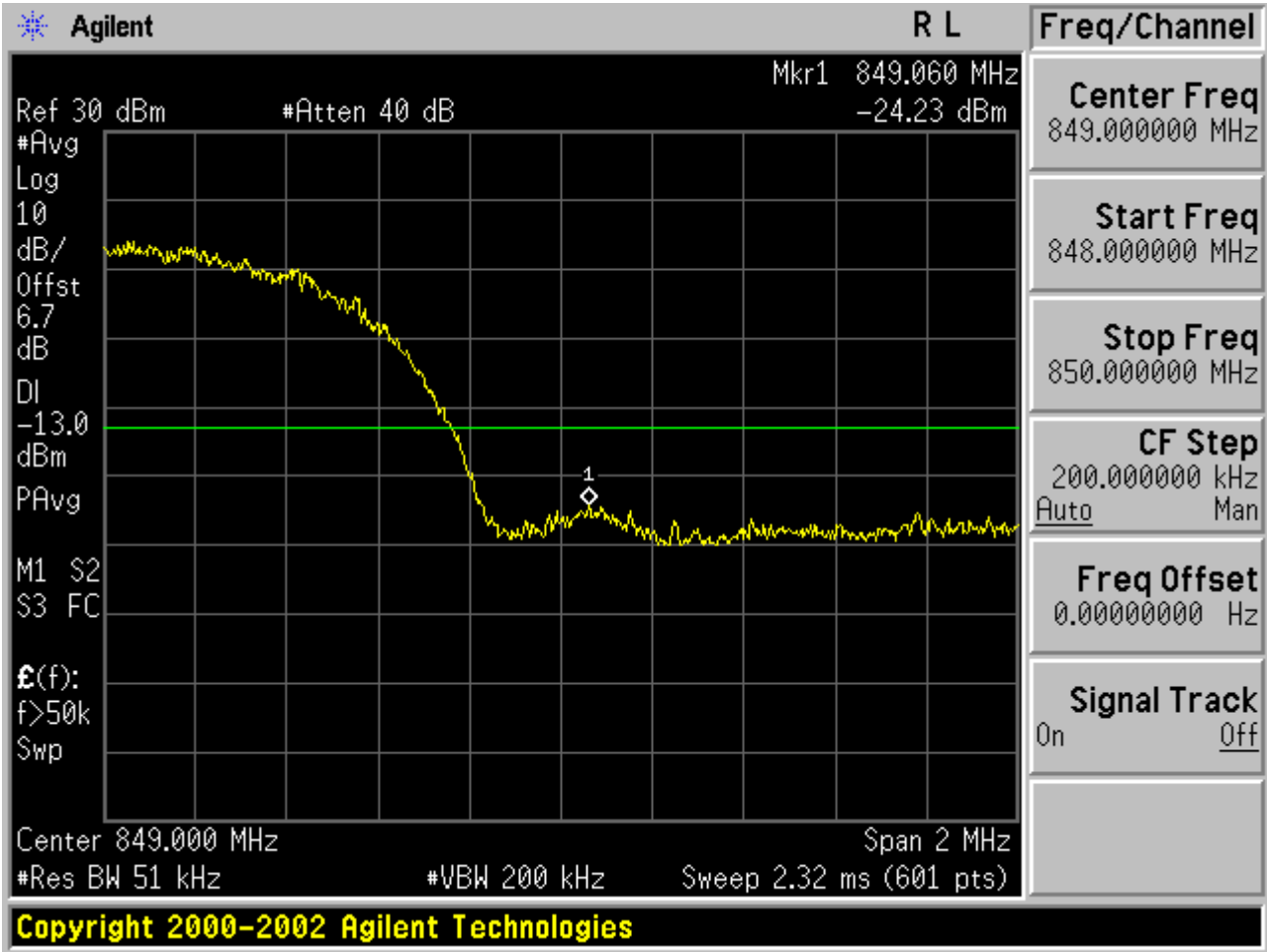
APPENDIX B: BAND EDGES COMPLIANCE

Test Results  
For WCDMA

Test Band=WCDMA850  
Test Mode=UMTS  
Test Channel=LCH



Test Channel=HCH



## 9. SPURIOUS EMISSION

### 9.1 CONDUCTED SPURIOUS EMISSION

#### 9.1.1 MEASUREMENT METHOD

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

1, Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM 850, data taken from 30 MHz to 9 GHz.

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

Typical Channels for testing of UMTS band V	
Channel	Frequency (MHz)
4358	826.6
4407	836.4
4457	846.4

#### 9.1.2 PROVISIONS APPLICABLE

On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power ( $P$ , in Watts) by at least  $43+10\log(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

9.1.3 MEASUREMENT RESULT

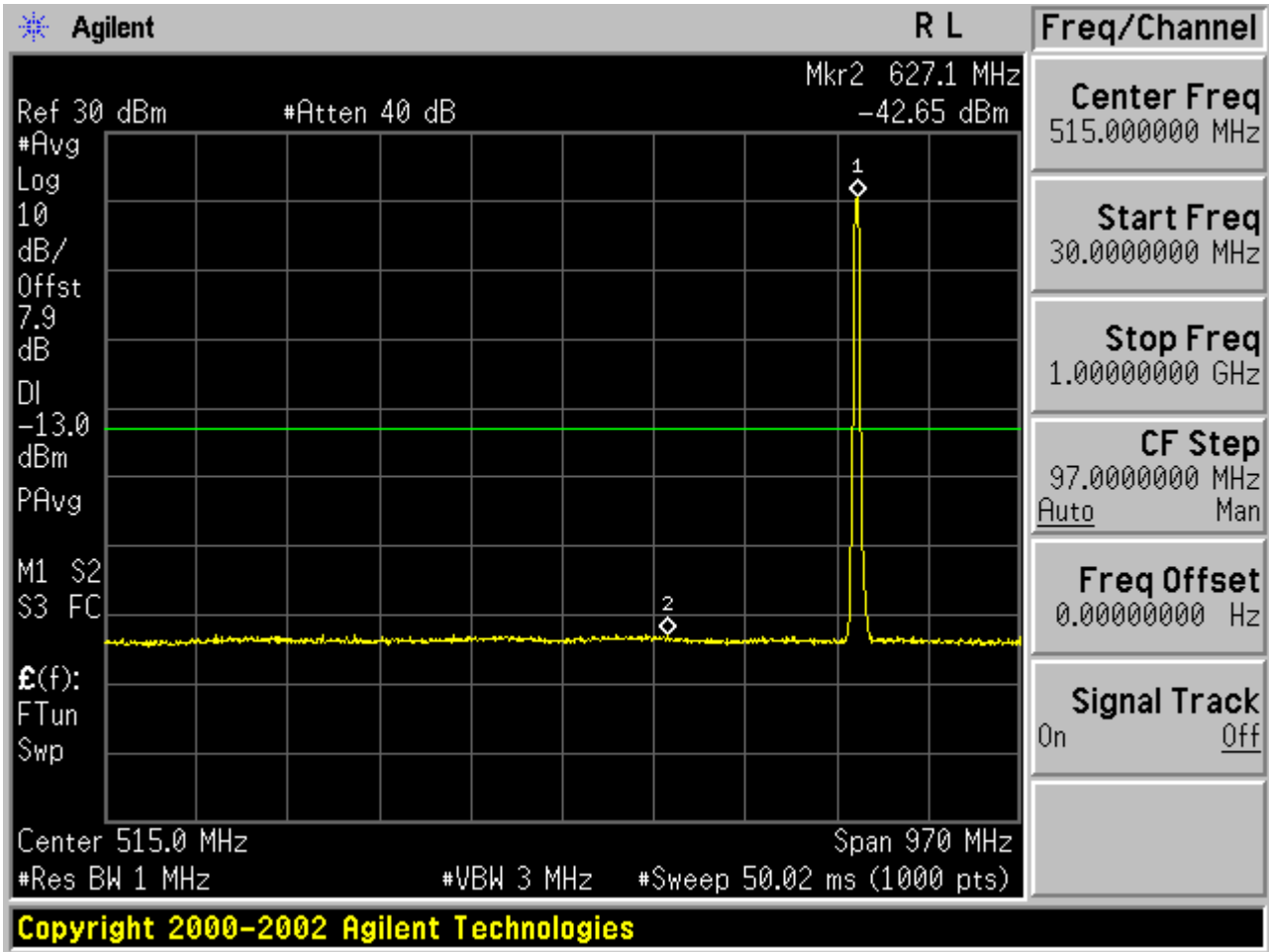
APPENDIX C: SPURIOUS EMISSION AT ANTENNA TERMINAL

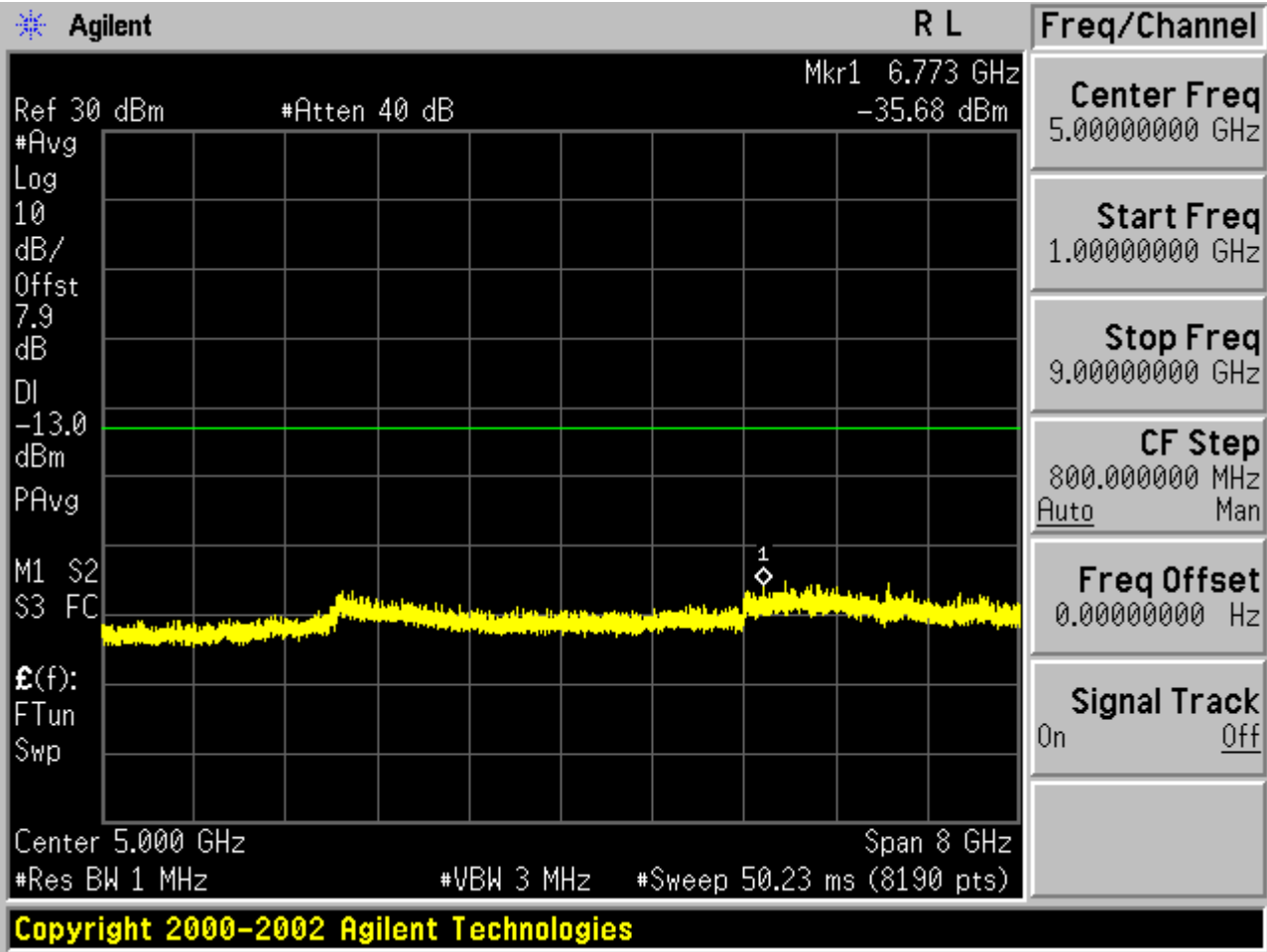
Test Results

Test Band=WCDMA850

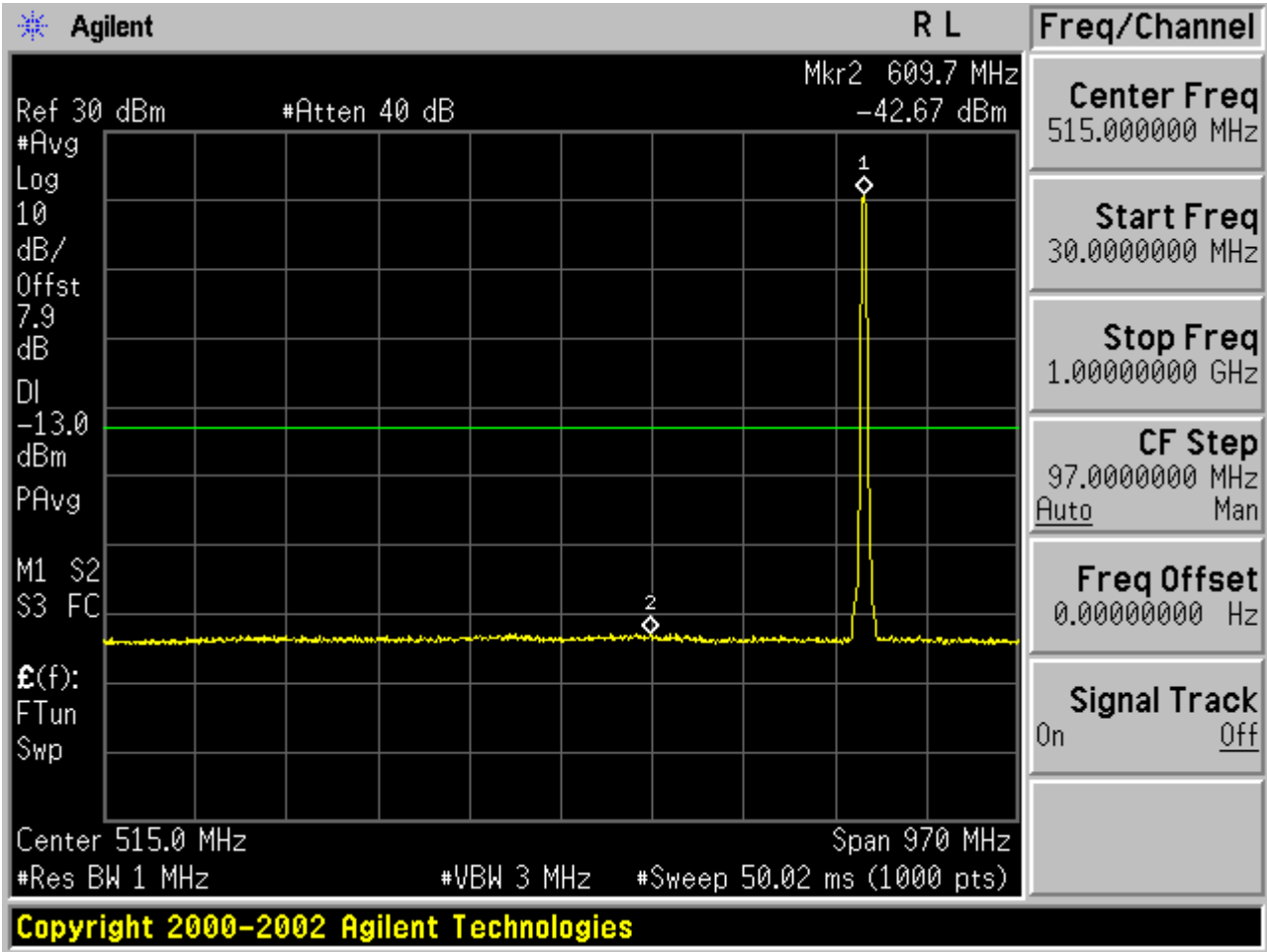
Test Mode=UMTS

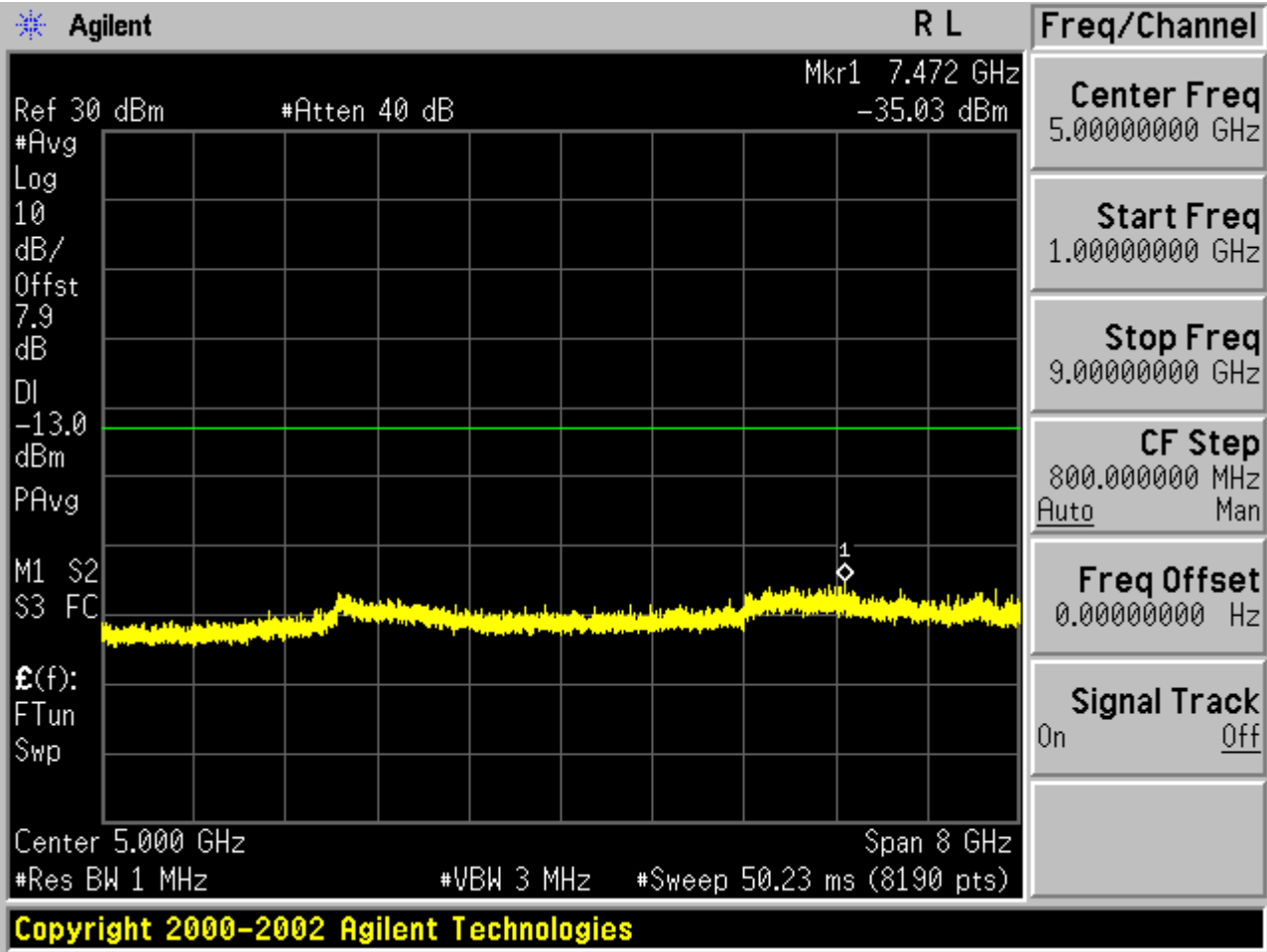
Test Channel=LCH



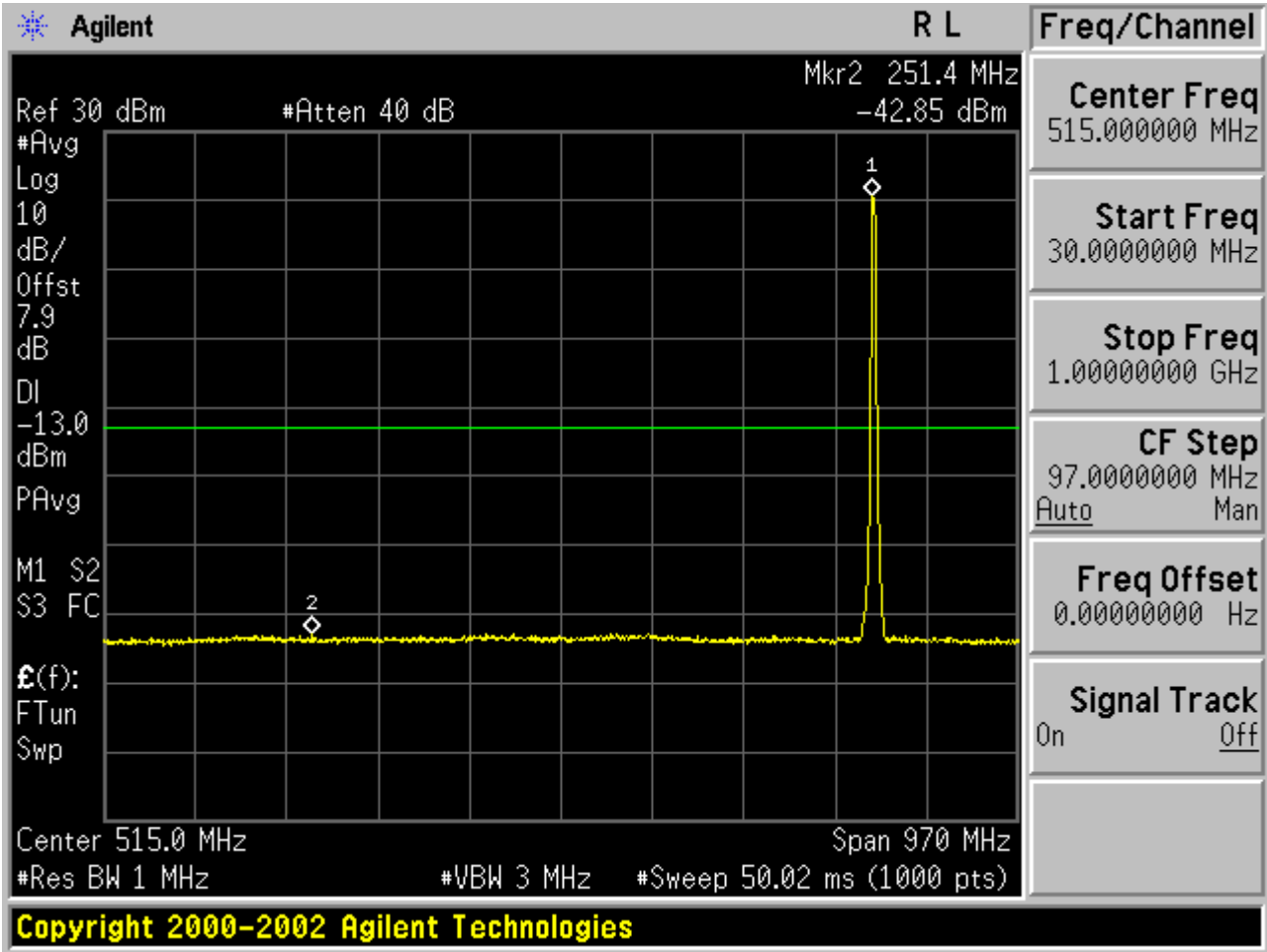


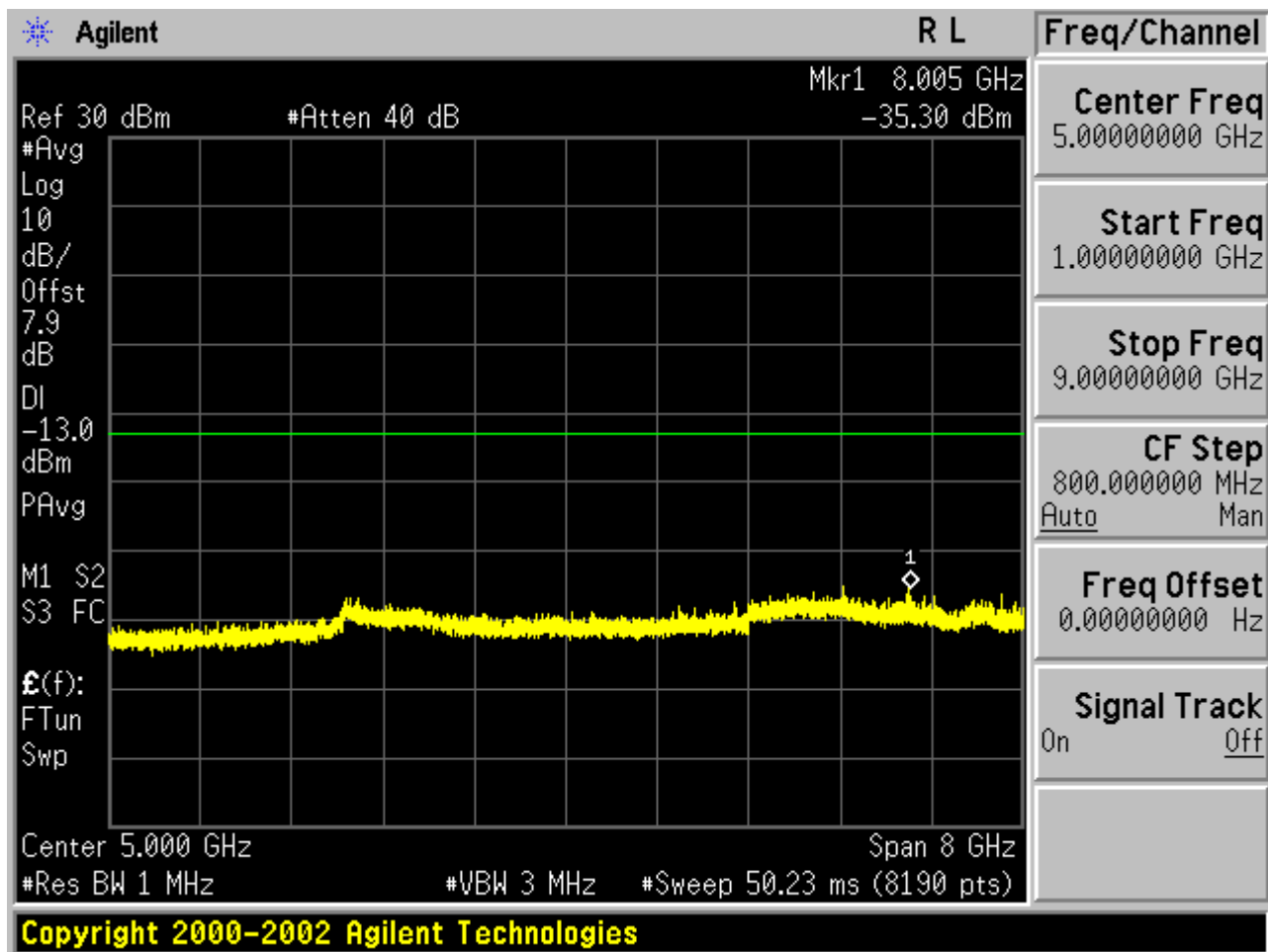
Test Channel=MCH





Test Channel=HCH





**Note:** 1. Below 30MHz no Spurious found.

2. As no emission found in standby or receive mode, no recording in this report.

## 9.2 RADIATED SPURIOUS EMISSION

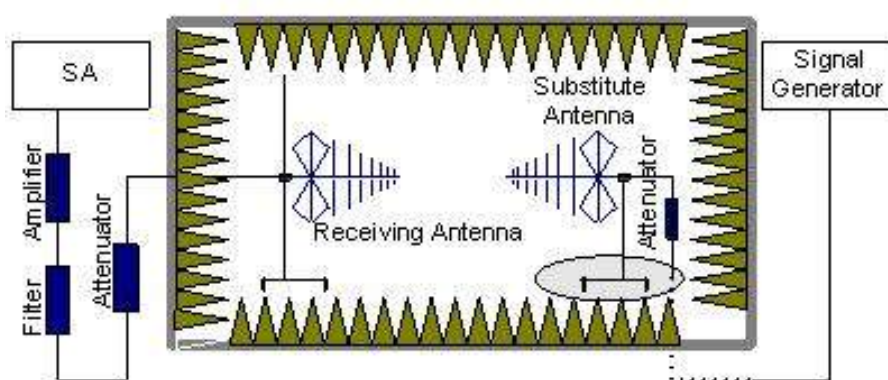
### 9.2.1 MEASUREMENT METHOD

The measurements procedures specified in TIA-603C-2004 were used for testing. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The measurements were performed on all modes(HSPA band V) at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

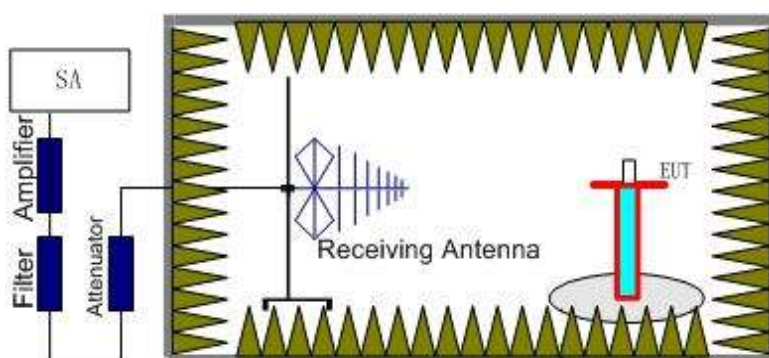
The procedure of radiated spurious emissions is as follows:

a) Pre-calibration With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as,  

$$RSE = R_x (\text{dBuV}) + CL (\text{dB}) + SA (\text{dB}) + \text{Gain} (\text{dBi}) - 107 (\text{dBuV to dBm})$$
 The SA is calibrated using following setup.



b) EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the test item for emission measurements. The height of receiving antenna is 0.8m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the test item and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth.



Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the UMTS band V(826.6MHz, 836.4MHz, 846.4MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of any band into any of the other blocks.

The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss and the air loss. The measurement results are obtained as described below:  $Power = P_{Mea} + A_{Rpl}$

### 9.2.2 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power ( $P$ , in Watts) by at least  $43 + 10 \log(P)$  dB. The specification that emissions shall be attenuated below the transmitter power ( $P$ ) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

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

### 9.2.3 MEASUREMENT RESULT

#### UMTS band V:

The Worst Test Results for Channel 4458/846.4MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit (dBm)	Polarity
1598.26	-41.62	-2.26	-43.88	-13.00	Vertical
2365.78	-41.87	-3.12	-44.99	-13.00	Horizontal
4967.65	-42.29	-1.74	-44.03	-13.00	Horizontal
6457.86	-42.73	8.74	-33.99	-13.00	Vertical
7896.56	-43.18	17.89	-25.29	-13.00	Horizontal

**Note:** ARpl= Factor=Antenna Factor+ Cable loss-Amplifier gain.

The “Factor” value can be calculated automatically by software of measurement system.

Below 30MHZ no Spurious found.

## 10. MAINS CONDUCTED EMISSION

### 10.1 MEASUREMENT METHOD

The measurement procedure specified in ANSI C63.4-2003 was used for testing. Conducted Emission was measured with travel charger.

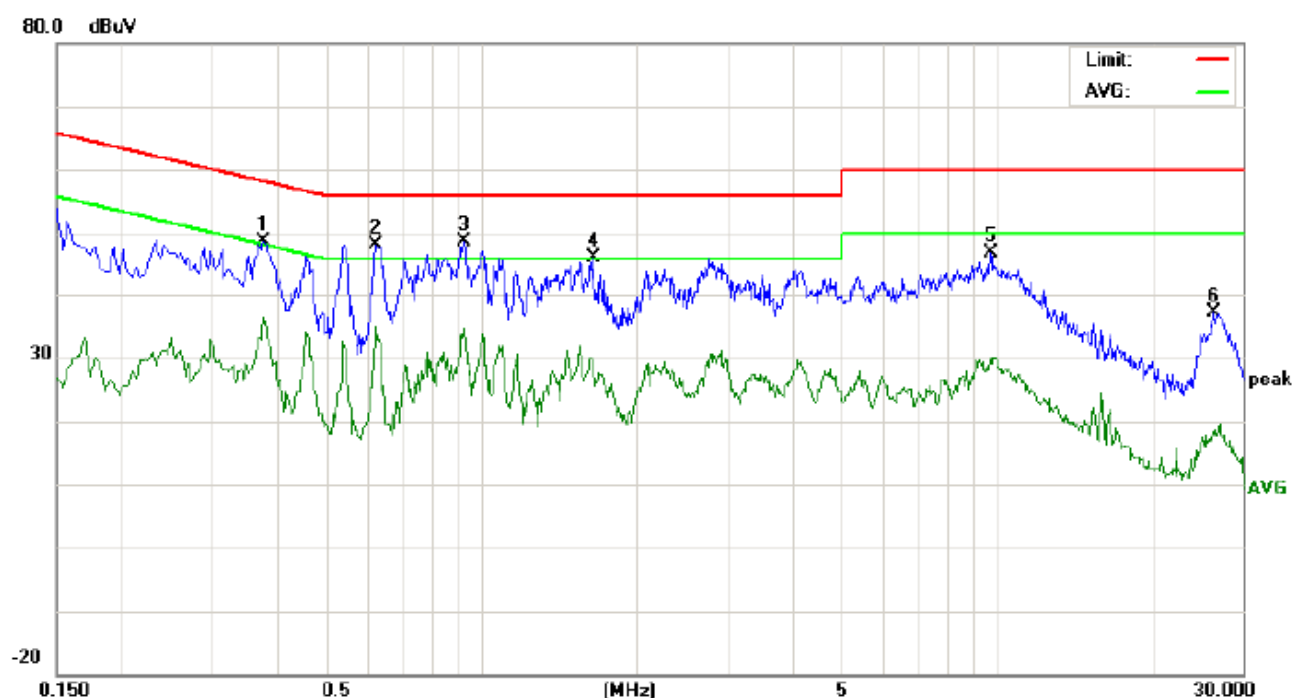
### 10.2 PROVISIONS APPLICABLE

Frequency of Emission (MHz)	Conducted Limit(dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50
*Decreases with the logarithm of the frequency.		
*The lower limit shall apply at the transition frequency.		

**Note:** The WCDMA850 mode is the worst condition and the test result as following:

## 10.3 MEASUREMENT RESULT

### LINE CONDUCTED EMISSION – L



Site: Conduction

Phase: **L1**

Temperature: 24.2

Limit: FCC Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 53.7 %

EUT: rugged tablet

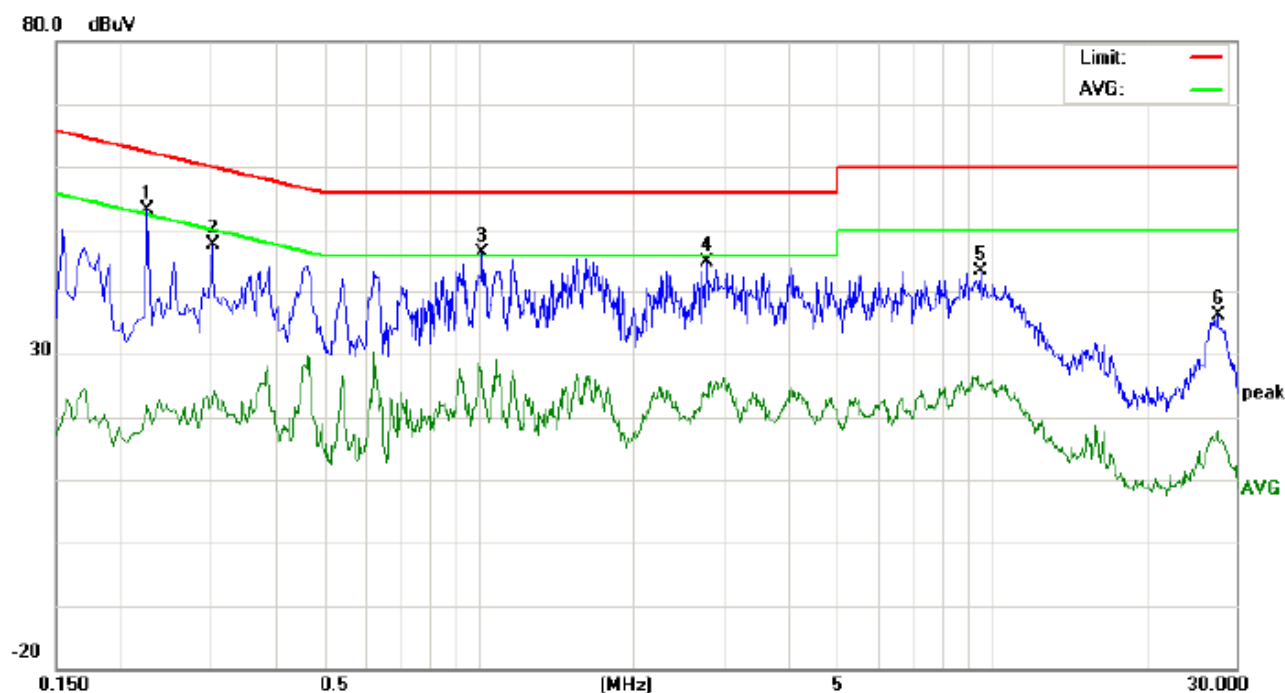
M/N: T80

Mode: Call

Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.3780	38.29		26.18	10.32	48.61		36.50	58.32	48.32	-9.71	-11.82	P	
2	0.6220	37.92		22.26	10.32	48.24		32.58	56.00	46.00	-7.76	-13.42	P	
3	0.9260	38.16		24.12	10.40	48.56		34.52	56.00	46.00	-7.44	-11.48	P	
4	1.6460	35.69		18.87	10.33	46.02		29.20	56.00	46.00	-9.98	-16.80	P	
5	9.7180	36.53		19.55	10.25	46.78		29.80	60.00	50.00	-13.22	-20.20	P	
6	26.4060	27.13		8.17	10.11	37.24		18.28	60.00	50.00	-22.76	-31.72	P	

# LINE CONDUCTED EMISSION – N



Site: Conduction  
Limit: FCC Class B Conduction(QP)  
EUT: rugged tablet  
M/N: T80  
Mode: Call  
Note:

Phase: **N**  
Power: AC 120V/60Hz  
Temperature: 24.2  
Humidity: 53.7 %

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2260	42.90		11.75	10.24	53.14		21.99	62.59	52.59	-9.45	-30.60	P	
2	0.3020	37.38		11.88	10.29	47.67		22.17	60.19	50.19	-12.52	-28.02	P	
3	1.0180	35.97		16.13	10.37	46.34		26.50	56.00	46.00	-9.66	-19.50	P	
4	2.7900	34.28		13.09	10.50	44.78		23.59	56.00	46.00	-11.22	-22.41	P	
5	9.5300	32.91		14.82	10.36	43.27		25.18	60.00	50.00	-16.73	-24.82	P	
6	27.5620	25.95		7.78	10.13	36.08		17.91	60.00	50.00	-23.92	-32.09	P	

**Note:** The WCDMA850 mode is the worst condition.

## 11. FREQUENCY STABILITY

### 11.1 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of agilent8960 DIGITAL RADIO COMMUNICATION TESTER.

- 1 , Measure the carrier frequency at room temperature.
- 2 , Subject the EUT to overnight soak at -10°C.
- 3 , With the EUT, powered via nominal voltage, connected to the agilent8960 and in a simulated call on channel 4175 for UMTS band V measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
- 4 , Repeat the above measurements at 10°C increments from -10°C to +50°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
- 5 , Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
- 6 , Subject the EUT to overnight soak at +50°C.
- 7 , With the EUT, powered via nominal voltage, connected to the agilent8960 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
- 8 , Repeat the above measurements at 10°C increments from +50°C to -10°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
- 9 , At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

## **11.2 PROVISIONS APPLICABLE**

### **11.2.1 For Hand carried battery powered equipment**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 6.3VDC and 8.5VDC, with a nominal voltage of 7.4VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

### **11.2.2 For equipment powered by primary supply voltage**

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

### 11.3 MEASUREMENT RESULT

#### Appendix D:Frequency Stability

Test Results

##### Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt. (V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA 850	UMTS	LCH	TN	3.4	19.00	0.02	±2.5	PASS
			TN	3.7	11.44	0.01	±2.5	PASS
			TN	4.2	23.80	0.03	±2.5	PASS
		MCH	TN	3.4	21.74	0.03	±2.5	PASS
			TN	3.7	11.44	0.02	±2.5	PASS
			TN	4.2	19.91	0.02	±2.5	PASS
		HCH	TN	3.4	17.17	0.02	±2.5	PASS
			TN	3.7	11.44	0.02	±2.5	PASS
			TN	4.2	22.20	0.03	±2.5	PASS

**Frequency Error vs. Temperature:**

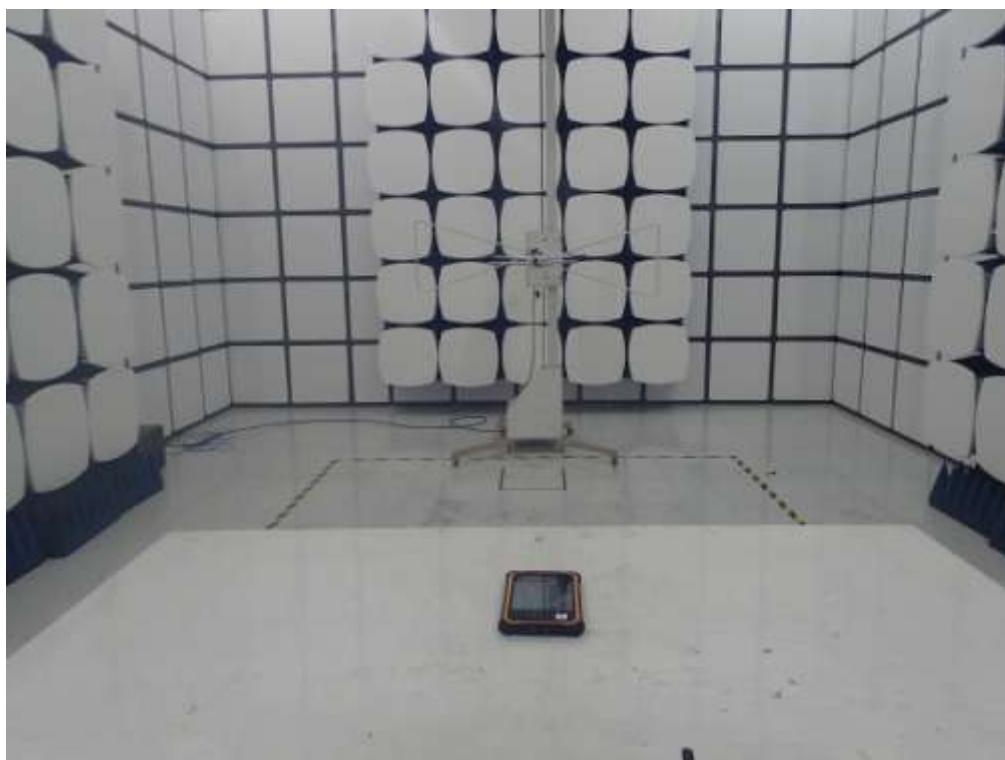
Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA 850	UMTS	LCH	VN	-10	19.45	0.02	±2.5	PASS
			VN	0	16.25	0.02	±2.5	PASS
			VN	10	15.56	0.02	±2.5	PASS
			VN	20	9.38	0.01	±2.5	PASS
			VN	30	25.41	0.03	±2.5	PASS
			VN	40	19.23	0.02	±2.5	PASS
			VN	50	22.43	0.03	±2.5	PASS
WCDMA 850	UMTS	MCH	VN	-10	24.72	0.03	±2.5	PASS
			VN	0	16.02	0.02	±2.5	PASS
			VN	10	16.02	0.02	±2.5	PASS
			VN	20	15.11	0.02	±2.5	PASS
			VN	30	18.54	0.02	±2.5	PASS
			VN	40	21.97	0.03	±2.5	PASS
			VN	50	23.57	0.03	±2.5	PASS
WCDMA 850	UMTS	HCH	VN	-10	21.51	0.03	±2.5	PASS
			VN	0	11.22	0.01	±2.5	PASS
			VN	10	18.31	0.02	±2.5	PASS
			VN	20	15.56	0.02	±2.5	PASS
			VN	30	13.50	0.02	±2.5	PASS
			VN	40	23.80	0.03	±2.5	PASS
			VN	50	18.08	0.02	±2.5	PASS

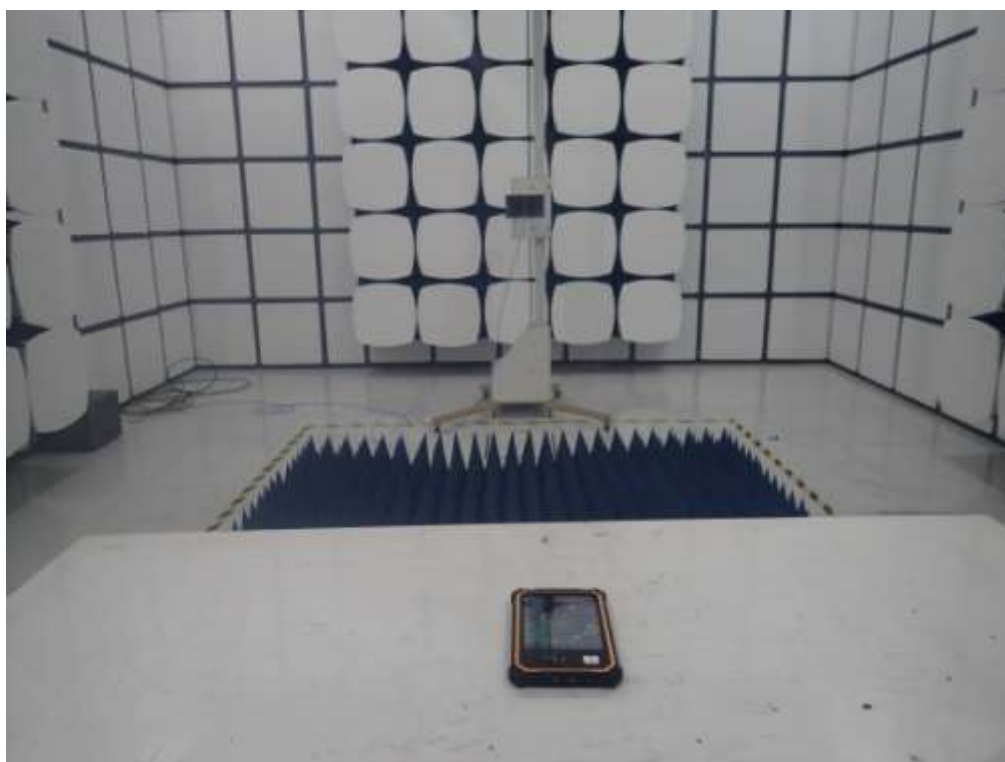
## PHOTOGRAPHS OF TEST SETUP

### CONDUCTED EMISSION



### RADIATED SPURIOUS EMISSION





### CONDUCTED MEASUREMENTS



## PHOTOGRAPHS OF EUT

### TOTAL VIEW OF EUT



### TOP VIEW OF EUT



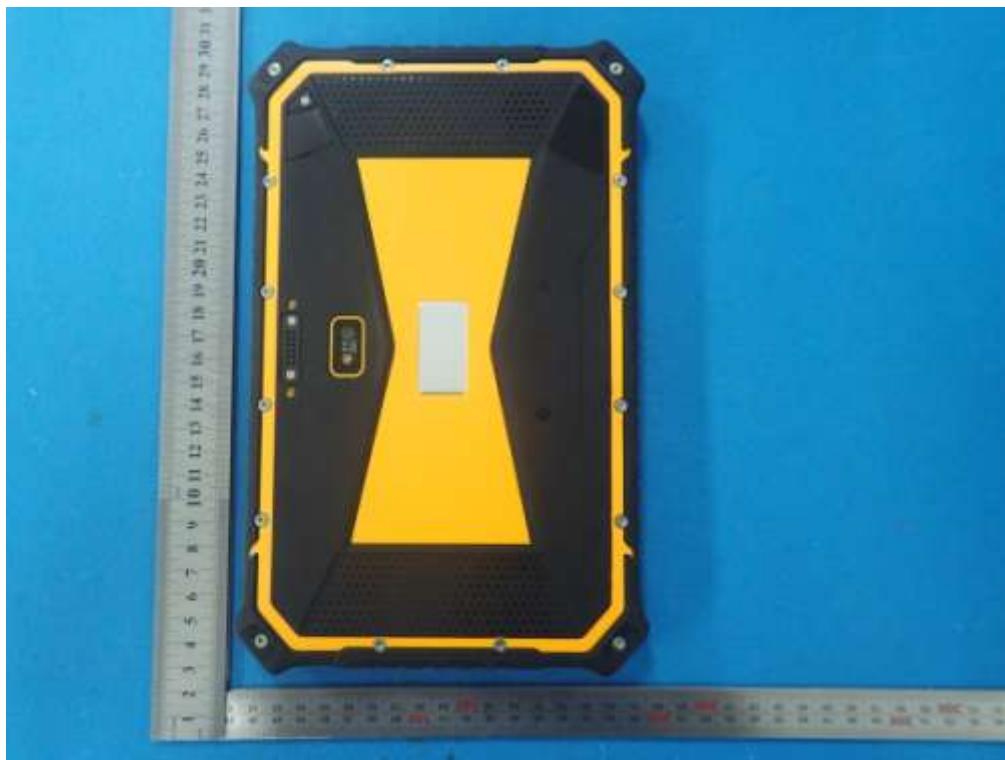
BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT



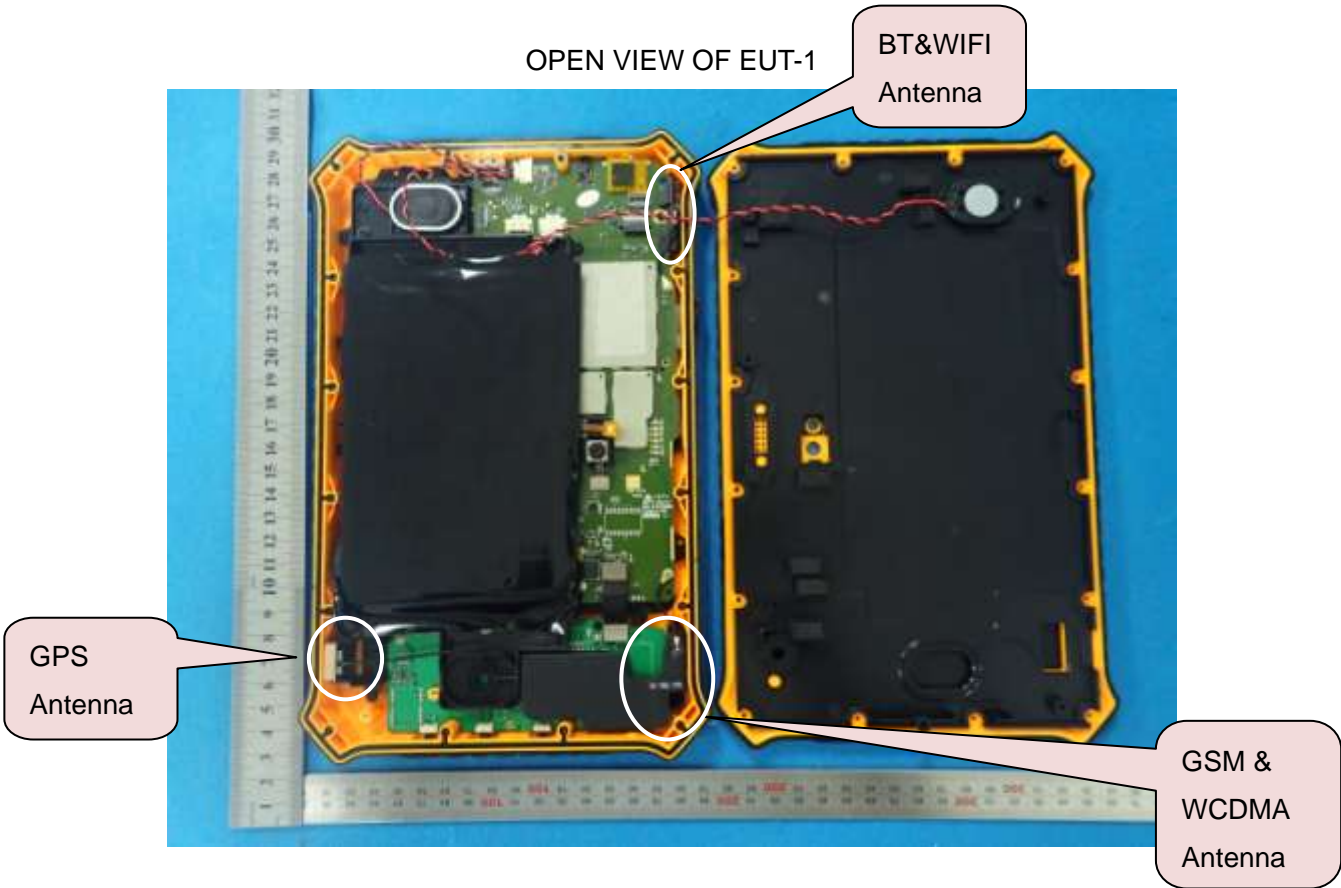
LEFT VIEW OF EUT



RIGHT VIEW OF EUT



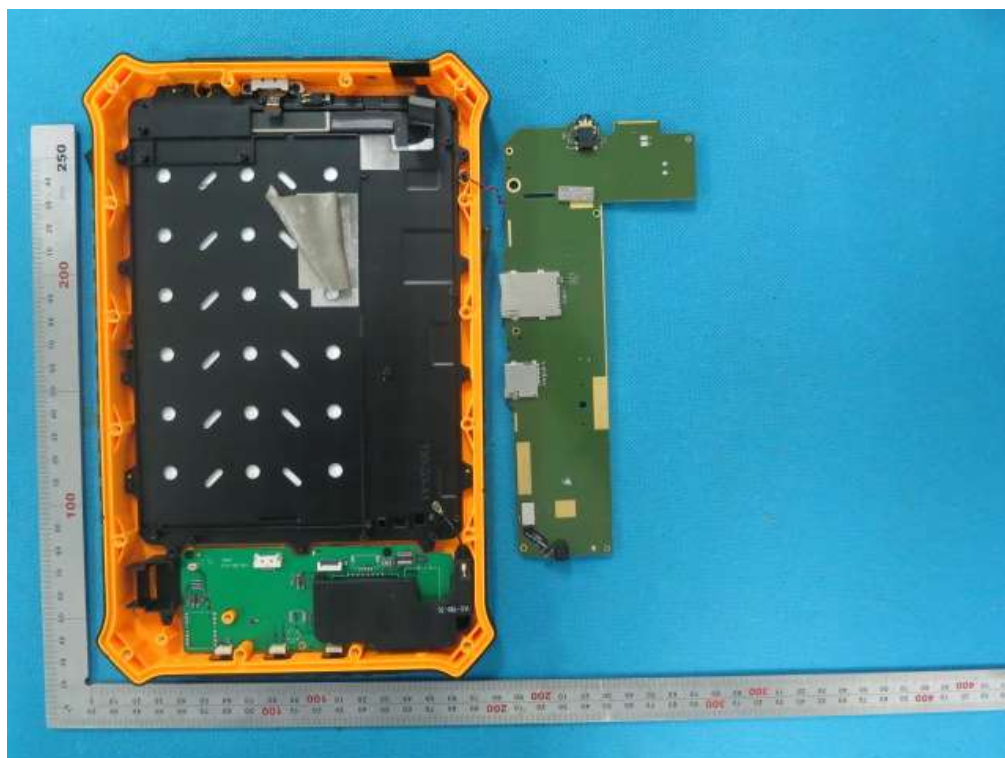
OPEN VIEW OF EUT-1



OPEN VIEW OF EUT-2



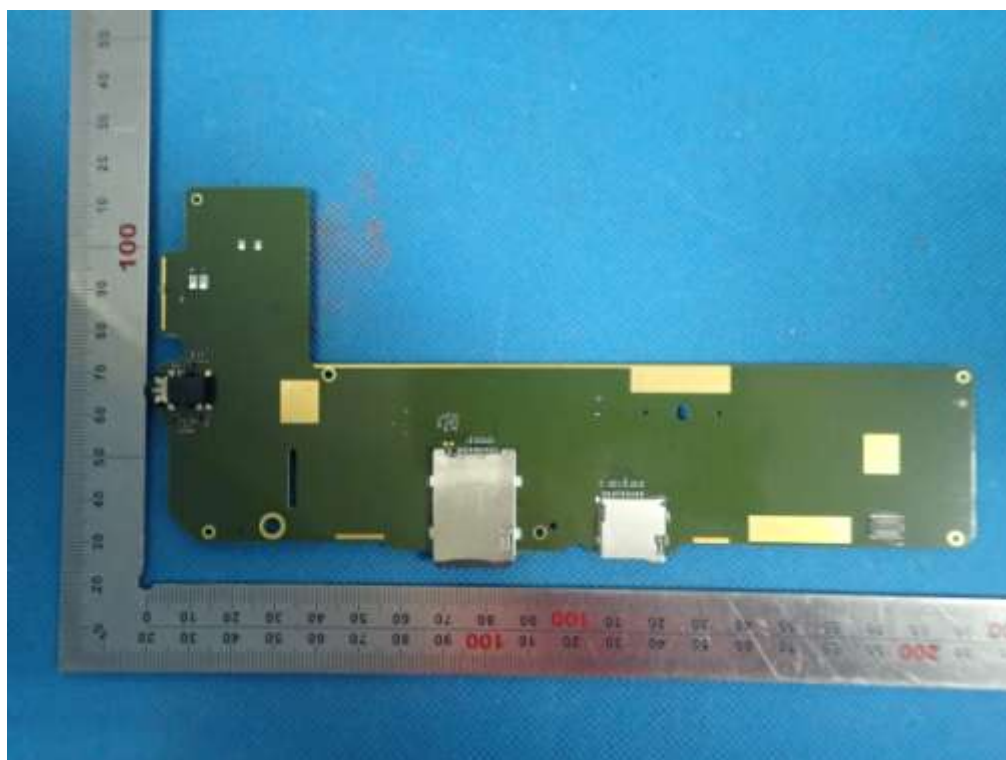
OPEN VIEW OF EUT-3



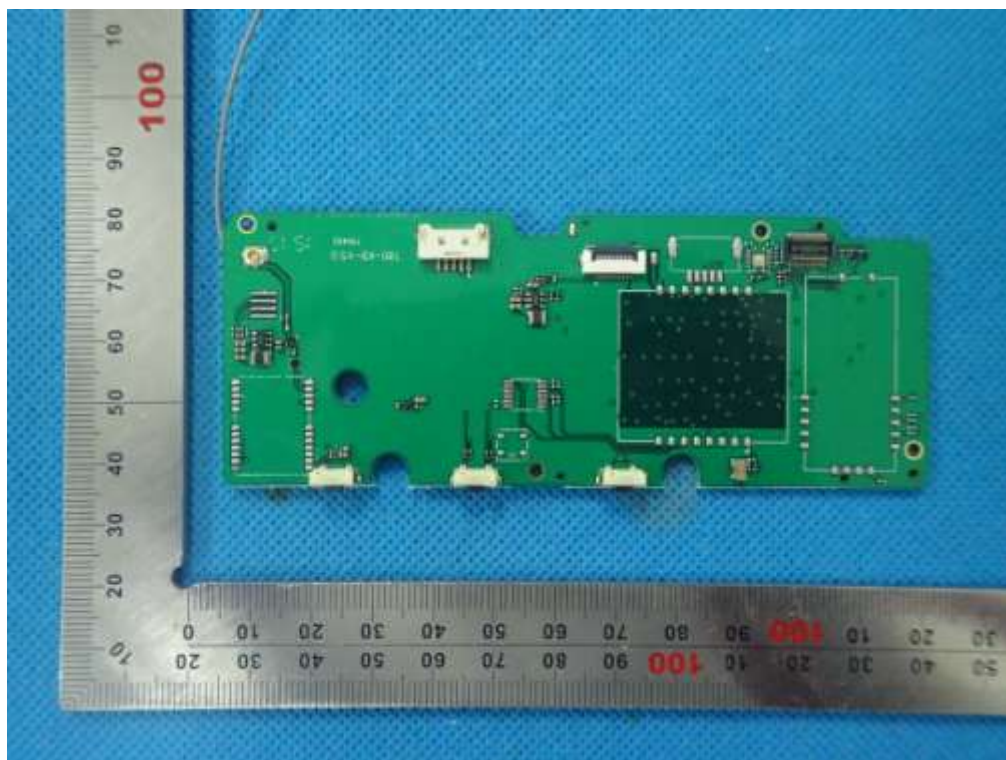
INTERNAL VIEW OF EUT-1



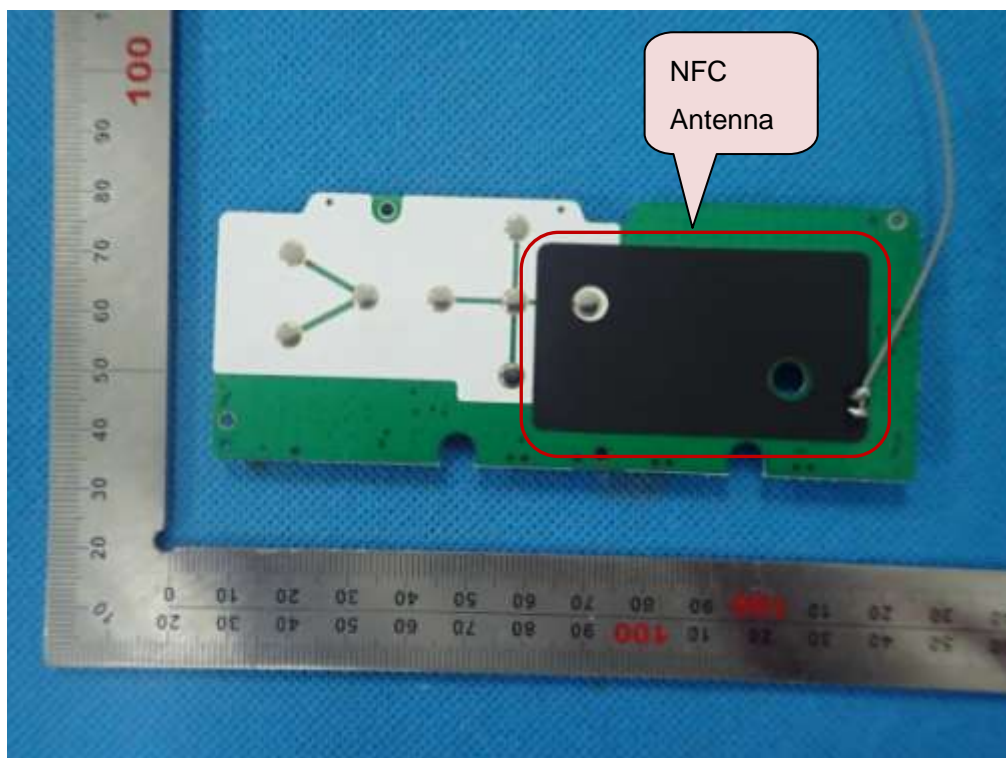
INTERNAL VIEW OF EUT-2



INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



-----END OF REPORT-----