FCC Radio Test Report

FCC ID: O57TB3710I

This report concerns (check one): ☒**Original Grant** ☐**Class II Change**

Project No.	: 1512C068
Equipment	: Portable Tablet Computer
Model Name	: Lenovo TB3-710I
Applicant	: LENOVO (SHANGHAI) ELECTRONICS TECHNOLOGY CO LTD
Address	: NO 68 BUILDING 199 FENJU RD, CHINA (SHANGHAI) PILOT FREE TRADE ZONE,SHANGHAI, 200131 CHINA

Date of Receipt	: Dec. 08, 2015
Date of Test	: Dec. 08, 2015 ~ Jan. 07, 2016
Issued Date	: Jan. 07, 2016
Tested by	: BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C**., or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-5-1512C068	Original Issue.	Jan. 07, 2016

1. CERTIFICATION

Equipment	:	Portable Tablet Computer
Brand Name	:	Lenovo
Model Name	:	Lenovo TB3-710I
Applicant	:	LENOVO (SHANGHAI) ELECTRONICS TECHNOLOGY CO LTD
Manufacturer	:	Lenovo PC HK Limited
Address	:	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong
Date of Test	:	Dec. 08, 2015 ~ Jan. 07, 2016
Test Sample	:	Engineering Sample
Standard(s)	:	47 CFR FCC Part 24 Subpart E 47 CFR FCC Part 2 ANSI/TIA-603-D-2010 KDB 971168 D01 Power Meas License Digital Systems v02r02

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-5-1512C068) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

Test result included in this report is only for the DCS1900 and WCDMA Band II part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 22 Subpart H& Part 2			
Standard(s) Section	Test Item	Judgment	Tested By
2.1046 24.232(c)	Radiated power	PASS	Robort Luo
2.1046 24.232(c)	Conducted Output Power	PASS	Allen Li
2.1049 24.238(a)	Occupied Bandwidth	PASS	Allen Li
2.1051 24.238(a)	Conducted Spurious Emissions	PASS	Allen Li
2.1053 24.238(a)	Radiated Spurious Emissions	PASS	Robort Luo
24.238(a)	Band Edge Measurements	PASS	Allen Li
24.232(d)	Peak To Average Ratio	PASS	Allen Li
2.1055 24.235	Frequency Stability	PASS	Allen Li

NOTE:

(1)" N/A" denotes test is not applicable to this device.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.
BTL's test firm number for FCC: 319330

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimatedfor tests performed on the EUT as specified in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

The reported uncertainty of measurement **y** ± **U**, where expanded uncertainty **U** is based on astandard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95**% ◦

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	9KHz~30MHz	V	3.79
		9KHz~30MHz	H	3.57
		30MHz ~ 200MHz	V	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06
		1GHz~18GHz	V	3.12
		1GHz~18GHz	H	3.68
		18GHz~40GHz	V	4.15
		18GHz~40GHz	H	4.14

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Portable Tablet Computer	
Brand Name	Lenovo	
Model Name	Lenovo TB3-710I	
Model Difference	This model has two configurations: main supply, secondary supply. Please refer to note 3.	
Modulation Type	GSM	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	Uplink: BPSK Downlink: QPSK
	WCDMA(HSDPA/HSUPA)	16QAM/64QAM
Operation Frequency	GSM /EDGE	1850.2 ~ 1909.8 MHz
	WCDMA	1852.4 ~ 1907.6 MHz
Max. EIRP Power	GSM	26.83dBm
	EDGE	24.19dBm
	WCDMA	20.87dBm
Antenna Type	Fixed Internal Antenna	
Antenna Gain	0.4dBi	
Hardware Version	A1901_MB_PCB_V4.0	
Softwarre Version	TB3-710I_S000012_151209_ROW	
IMEI No.	868981020013829	
Power Source	#1 DC voltage supplied from AC/DC adapter. #2 Supplied from USB port. #3 Supplied from rechargeable Li-Polymer battery.	
Power Rating	Please refer to note 2	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Huntkey	C-P56	I/P: 100-240V~ 50/60Hz, 0.15A O/P: 5.0V, 1.0A
	Acbel	C-P56	I/P: 100-240V~ 50/60Hz, 0.13A O/P: 5.0V, 1.0A
Battery	lenovo (SUNWODA)	L13D1P31	3.8VDC, 3450mAh
	lenovo (SCUD)	L13D1P31	3.8VDC, 3450mAh
USB Cable	LIQI	L16B-05100070L	70cm shielded cable w/o core

3.

Main Supply			
Part Name	Model Name	Description	Supplier
PCB--MB	A1901_MB_PCB_V4.0_HF	A1901_ PCB_V4.0	HUASHEN
Baseband chip	MT8321A/B	WCDMA	MTK
PMIC	MT6350V/A	-	MTK
PA	AP7169-R95MOG	RFPA_3G_two in one PA_BANDS I, II, III, IV, V, VIII	Airoha
	AP6690-R95MOG	RFPA_ 850/900/1800/1900/TD1900/TD2010	Airoha
Duplexer	RFDIP1608060TM7T62	Electromagnetic interference two-way stopband filters_ 1.575 GHz/2.4 GHz/5GHz	Walsin
	SAYFH897MHA0F00	Electromagnetic interference two-way stopband filters_ W900	MURATA
	SAYFH836MCC0F0A	Electromagnetic interference two-way stopband filters_ _band5_W850	MURATA
	SAYRF1G88CA0B0A	Electromagnetic interference two-way stopband filters_ band2_W1900	MURATA
	SAYRF1G95HQ0F0A	Electromagnetic interference two-way stopband filters_ band1_W2100	MURATA
	MDBF21L914H1897M-DB02H	Electromagnetic interference difference converter _ DCS1800/GSM900/DCS1900/PCS1900	MICROGATE
G-sensor	KXTJ2-1009		Kionix
EMMC+DDR3	KMF820012M-B305	MCP_16GB-eMMC_8Gb-LPDDR3	Samsung
Crystal	7L26002009	26M_0.5ppm_2.8V_2520	TXC
audio frequency amplifier	AW8155AFCR	AB type/Dype_sigle-way	Awinic
RF Switch	SKY13489-001	RF Switch_SPDT	Skyworks
LNA	WS7916	GPS_LNA	Will
SAW FILTER	SAFFB1G56KB0F0A	GPS BEIDOU_RX1109	MURATA
TP	TTCT070121	A1900A	Top-Touch
LCD	TXDT700EPLA-68	7Inch_1024*600	TXD
Camera_Front	BLX0A20H-A1900-F	Camera_5x5x2.95mm_30w	BRODSANDS
Camera_Back	BLX2508H-A1900-B	Camera_6.5x6.5x4.2mm_200w	BRODSANDS
5M AF(3G)	O9B5-AW1507BHQ	Camera_8.5*8.5*4.66mm_500W	HUAQUAN
MIC	OB-F15LX42-1592-C10C33EP	-	HUAFENG
Motor(3G)	HZF-Z04B-RL126B20-90	-	HONGZHIFA
SPK	XHS151118SW43P38-02	-	HAOSHENG
Battery	L13D1P31	3450mAh	SUNWODA
Adapter(US)	C-P56	5V/1A	Huntkey
USB Cable	L16B-05100070L	70cm	LIQI

Secondary Supply			
Part Name	Model Name	Description	Supplier
PCB--MB	A1901_MB_PCB_V4.0_HF	A1901_ PCB_V4.0	HUASHEN
G-sensor	BMA253		Bosch
EMMC+DDR3	H9TQ17A8GTMCUR-KUM	MCP_16GB-eMMC_8Gb-LPDDR3	Hynix
Crystal	X1E000021043400	26M_10ppm_7.4pF_3225	Epson Toyocom
TP	YCB0880700801A	A1900A	YEJI
LCD	KD070D54-39NH-B2	7Inch_1024*600	GUOXIAN
Camera_Front	GI5953A1D-1P0J0	Camera_5x5x2.95mm_30w	QUNHUI
Camera_Back	GV5954B1S-1P0J0	Camera_6.5x6.5x4.25_200w	QUNHUI
5M AF(3G)	HNW5889B1S-0P0J0	Camera_8.5*8.5*4.66mm_500W	QUNHUI
MIC	CM4015BC-423-WR138	-	JINZUN
Motor(3G)	CY0408L-021HB-047	-	KUNWANG
SPK	KFSC1115G3.5-08-0.7W-D	-	XICHUN
Battery	L13D1P31	3450mAh	SCUD
Adapter(US)	C-P56	5V/1A	Acbel
USB Cable	R16B-05100070	70cm	RIDONGSHENG

3.2 DESCRIPTION OF TEST MODES AND TEST CONDITION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports
The worst case was found when positioned on X-plane for EIRP and X-axis for radiated emission.
Following channel(s) was (were) selected for the final test as listed below:

GSM MODE			
Test Item	Available Channel	Tested Channel	Mode
EIRP	512 to 810	512, 661, 810	GSM, EDGE
Conducted Output Power	512 to 810	512, 661, 810	GSM, EDGE
Occupied Bandwidth	512 to 810	512, 661, 810	GSM, EDGE
Condcudeted Emission	512 to 810	661	GSM, EDGE
Radiated Emission	512 to 810	661	GSM, EDGE
Band Edge	512 to 810	512, 810	GSM, EDGE
Peak to Average Ratio	512 to 810	512, 661, 810	GSM, EDGE
Frequency Stability	512 to 810	661	GSM, EDGE

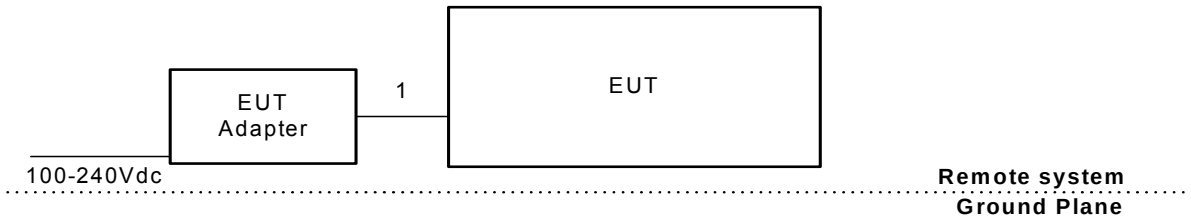
WCDMA MODE			
Test Item	Available Channel	Tested Channel	Mode
EIRP	9262 to 9538	9262, 9400, 9538	WCDMA
Conducted Output Power	9262 to 9538	9262, 9400, 9538	WCDMA
Condcudeted Emission	9262 to 9538	9400	WCDMA
Radiated Emission	9262 to 9538	9400	WCDMA
Band Edge	9262 to 9538	9262, 9538	WCDMA
Peak to Average Ratio	9262 to 9538	9262, 9400, 9538	WCDMA
Frequency Stability	9262 to 9538	9262	WCDMA

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in **QPSK** modulation.

EUT TEST CONDITIONS:

Test Item	Environmental Conditions	Test Voltage
EIRP	24°C, 63%RH	AC120V/60Hz
Conducted Output Power	25°C, 65%RH	AC120V/60Hz
Occupied Bandwidth	25°C, 65%RH	AC120V/60Hz
Conducted Emission	25°C, 65%RH	AC120V/60Hz
Radiated Emission	24°C, 63%RH	AC120V/60Hz
Band Edge	25°C, 65%RH	AC120V/60Hz
Peak to Average Ratio	25°C, 65%RH	AC120V/60Hz
Frequency Stability	25°C, 65%RH	AC120V/60Hz

3.3 BLOCKDIGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED



3.4 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.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
-	-	-	-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	NO	0.7m	USB Cable

4. TEST RESULT

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMIT

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 TEST PROCEDURE

EIRP/ERP:

1. All measurements were done at low, middle and high operational frequency range. RBW and VBW setting:
   Set the RBW ≥ OBW.
   Set VBW ≥ 3 × RBW.
   Set span ≥ 2 × RBW
   Sweep time=auto couple
   Detector=peak
   Ensure that the number of measurement points ≥ span/RBW
   Trace mode=max hold
   Allow trace to fully stabilize
   Use the peak marker function to detemine the peak amplitude level
2. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
3. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G
5. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of Integral, E.R.P power=E.I.P.R power-2.15dBi.

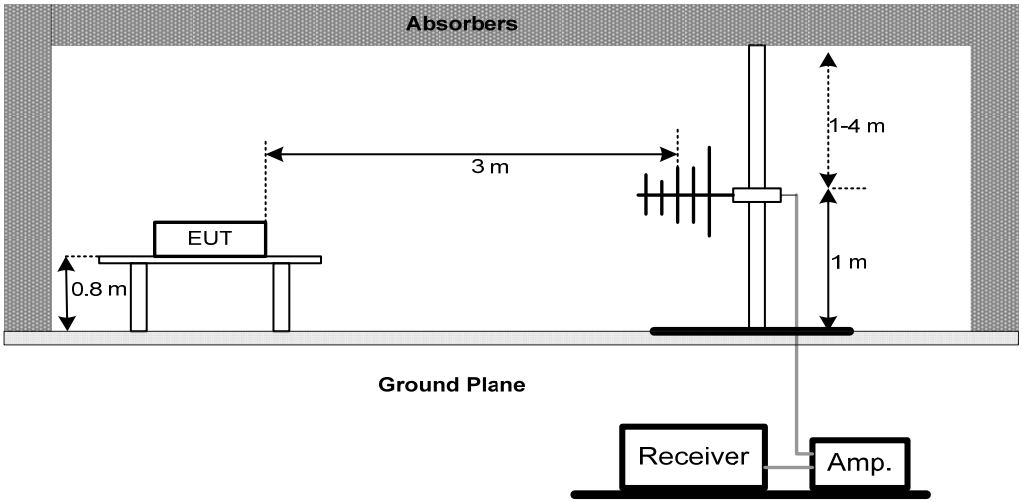
Conducted Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 TESTSETUP LAYOUT

ERP Power Measurement

Below 1G



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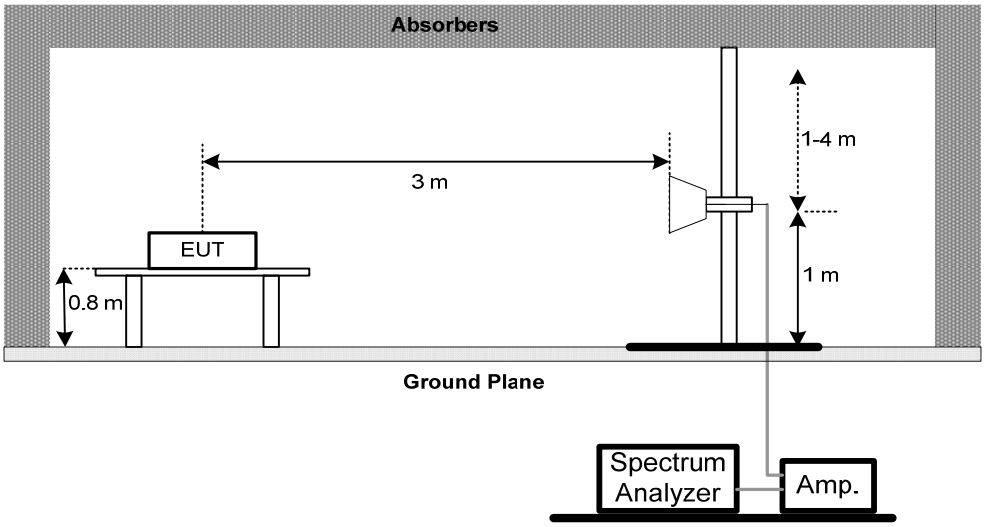
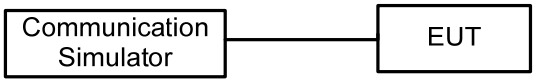


Conducted Power Measurement



4.1.4 TEST DEVIATION

No deviation

4.1.5 TEST RESULTS

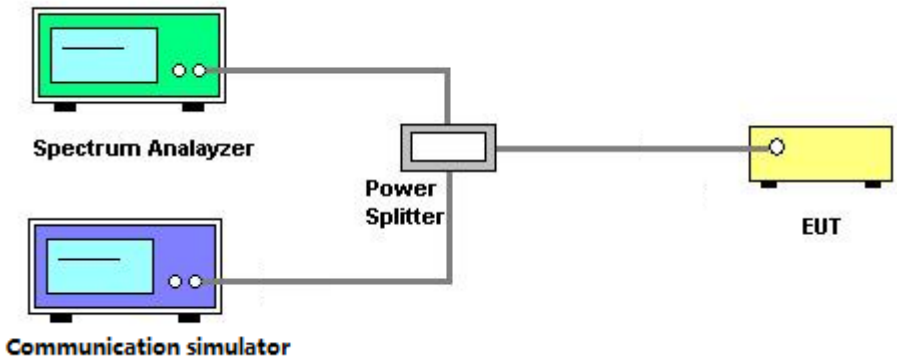
Please refer to the Attachment A.

4.2 OCCUPIED BANDWIDTH MEASUREMENT

4.2.1 TEST PROCEDURE

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth and 26dB bandwidth.

4.2.2 TEST SETUP LAYOUT



4.2.3 TEST DEVIATION

No deviation

4.2.4 TEST RESULTS

Please refer to the Attachment B.

4.3 CONDUCTED EMISSIONS MEASUREMENT

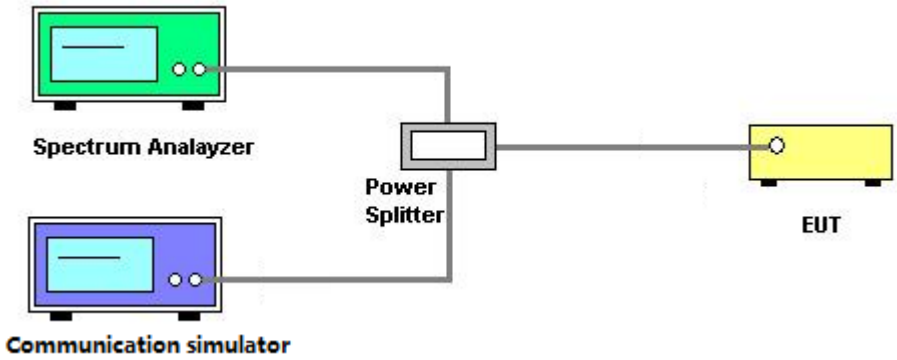
4.3.1 LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

4.3.2 TEST PROCEDURES

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured. Set RBW>=1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. 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

4.3.3 TESTSETUP LAYOUT



4.3.4 TESTDEVIATION

No deviation

4.3.5 TEST RESULTS

Please refer to the Attachment C.

4.4 RADIATED EMISSIONS MEASUREMENT

4.4.1 LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

4.4.2 TEST PROCEDURES

1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step a. Record the power level of S.G
3. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.4.3 TESTSETUP LAYOUT

This test setup layout is the same as that shown in **section 4.1.3.**

4.4.4 TESTDEVIATION

No deviation

4.4.5 TEST RESULTS

Please refer to the Attachment D.

4.5 BAND EDGE MEASUREMENT

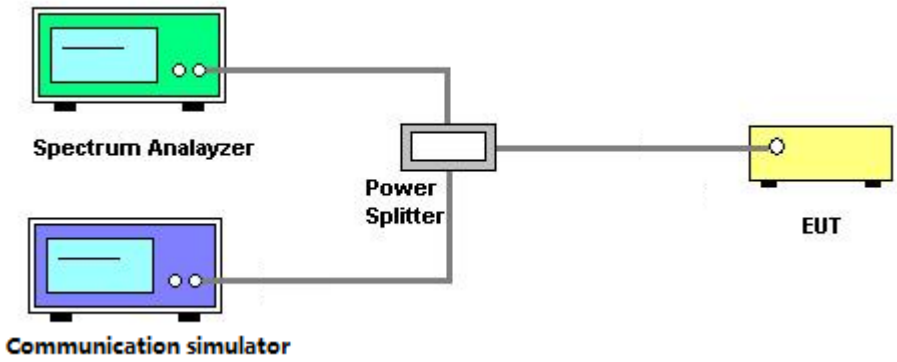
4.5.1 LIMIT

A Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.5.2 TEST PROCEDURES

1. All measurements were done at low and high operational frequency range.
2. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 3kHz and VB of the spectrum is 10kHz (GSM/GPRS/EDGE).
3. The center frequency of spectrum is the band edge frequency and span is 5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA).
4. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 13kHz and VB of the spectrum is 51kHz (LTE Bandwidth 1.4MHz).
5. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz (LTE Bandwidth 3MHz).
6. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Bandwidth 5MHz/10MHz).
7. Record the max trace plot into the test report.

4.5.3 TESTSETUP LAYOUT



4.5.4 TESTDEVIATION

No deviation

4.5.5 TEST RESULTS

Please refer to the Attachment E.

4.6 PEAK TO AVERAGE RATIO MEASUREMENT

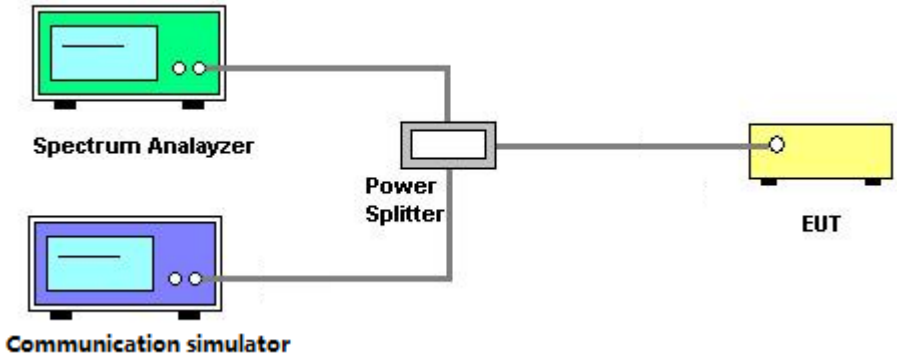
4.6.1 LIMIT

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.

4.6.2 TEST PROCEDURES

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.3 TESTSETUP LAYOUT



4.6.4 TESTDEVIATION

No deviation

4.6.5 TEST RESULTS

Please refer to the Attachment F.

4.7 FREQUENCY STABILITY MEASUREMENT

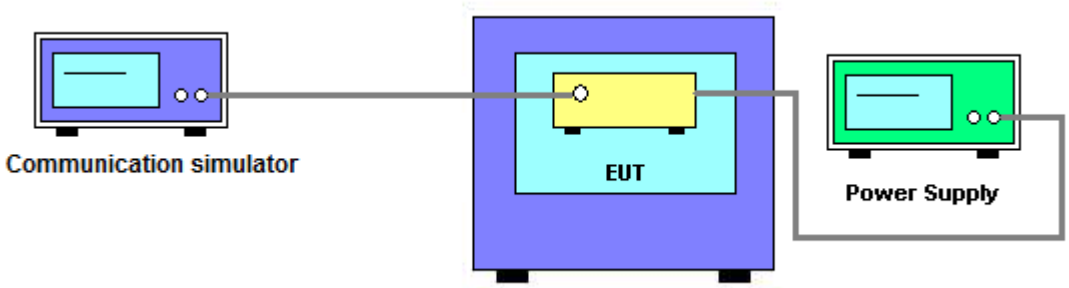
4.7.1 LIMIT

1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.7.2 TEST PROCEDURES

1. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
2. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5°C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.
4. The frequency error was recorded frequency error from the communication simulator.

4.7.3 TESTSETUP LAYOUT



4.7.4 TESTDEVIATION

No deviation

4.7.5 TEST RESULTS

Please refer to the Attachment G.

5. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emission & ERP or EIRP Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 28, 2016
2	Amplifier	HP	8447D	2944A09673	Nov. 09, 2016
3	Receiver	AGILENT	N9038A	MY52130039	Oct. 11, 2016
4	Test Cable	emci	LMR-400(30MHz-1GHz)	C-01	Jun. 28, 2016
5	Controller	CT	SC100	N/A	N/A
6	Antenna	ETS	3115	00075789	Mar. 28, 2016
7	Amplifier	Agilent	8449B	3008A02274	Nov. 01, 2016
8	Test Cable	emci	EMC104-SM-SM-10000(1GHz－26.5GHz)	C-68	Jun. 28, 2016
9	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Mar. 28, 2016
10	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 28, 2016
11	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
12	Wireless Communication Test Set	(8960 Series) Agilent	E5515C	MY48364183	Mar. 28, 2016
13	Band Reject Filter	Wairrwright Instruments Gmbh	WRCG 1850/1910-1830/1930-60/10SS	17	Mar. 04, 2016
14	HighPass Filter	Wairrwright Instruments Gmbh Gmbh	WHK 1.5/15G-10ST	11	Jul. 06, 2016
15	HighPass Filter	Wairrwright Instruments Gmbh	WHK 3.1/18G-10SS	24	Mar. 04, 2016
16	HighPass Filter	ZHPF-M1000-4000-1	WHK 1000-4000MHz	B2015073762	Aug. 05, 2016
17	HighPass Filter	ZHPF-M3-12.75G-3869	WHK 3000-12750MHz	B2015073763	Aug. 05, 2016
18	HighPass Filter	ZHPF-M6-18G-1727	WHK 6000-18000MHz	B2015073764	Aug. 05, 2016
19	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 07, 2016

Conducted Emission & Band Edge & Occupied Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA SpectrumAnalyzer	Agilent	N9010A	MY50520044	Mar. 28, 2016
2	Wireless Communication Test Set	(8960 Series)Agilent	E5515C	MY48364183	Mar. 28, 2016
3	wideband radio communication tester	R&S	CMW500	152372	Jan.30, 2016
4	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Mar. 17, 2016
5	Test Cable	N/A	RG316	Cable4-001	Jul. 15, 2016
6	Test Cable	N/A	RG316	Cable4-002	Jul. 15, 2016
7	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 11, 2016

Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test Set	(8960 Series)Agilent	E5515C	MY48364183	Mar. 28, 2016
2	wideband radio communication tester	R&S	CMW500	152372	Jan.30, 2016
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Mar. 17, 2016
4	Test Cable	N/A	RG316	Cable4-001	Jul. 15, 2016
5	Const Temp. & Humidity Chamber	GIANT FORCE	ITH-225-20-S	IAB0309-001	Dec.04, 2016
6	DC power supply	GW Instek	GPC-30300N	EK880675	Oct. 13, 2016

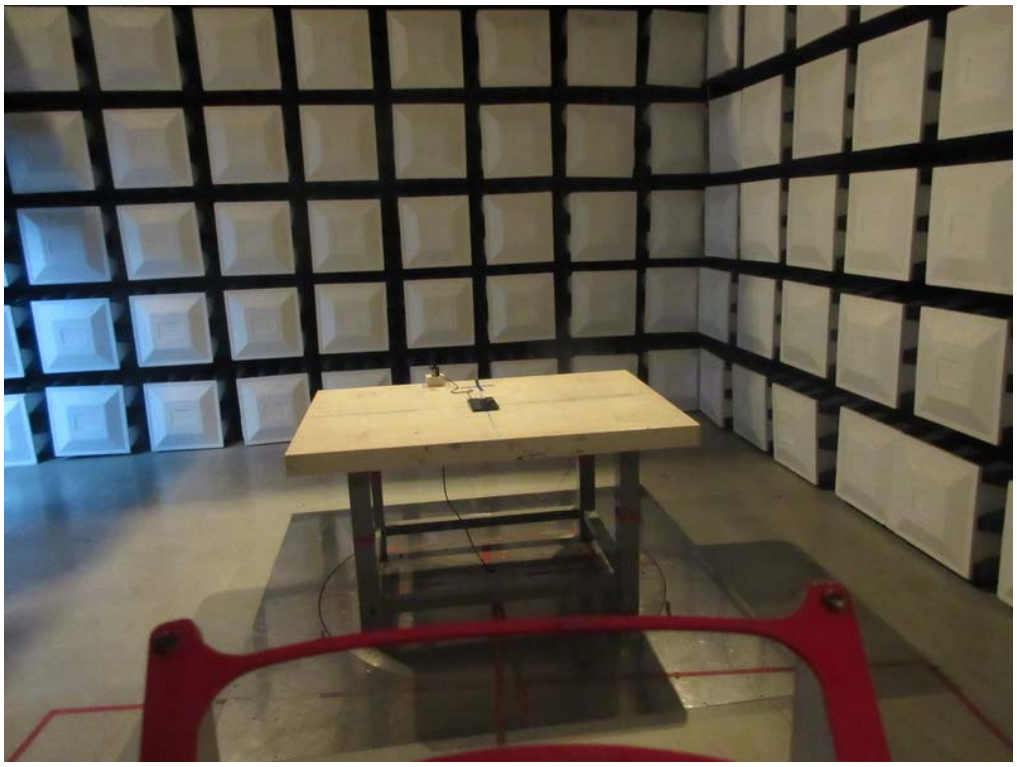
Remark: ”N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

6. EUT TEST PHOTO

Radiated Measurement Photos
9KHz to 30MHz

Radiated Measurement Photos
Below 1G

Radiated Measurement Photos
Above 1G



ATTACHMENT A - OUTPUT POWER

Conducted Power:

DCS1900 (Capsensor Off)	Tune-up	Max Burst Average Power (dBm)			Tune-up	Max Frame Average Power (dBm)		
		512CH	661CH	810CH		512CH	661CH	810CH
		1850.2MHz	1880MHz	1909.8MHz		1850.2MHz	1880MHz	1909.8MHz
GSM (CS)	30.00	29.54	29.56	29.36	20.81	20.35	20.37	20.17
GPRS/EDGE (GMSK)	30.00	29.58	29.60	29.33	20.81	20.39	20.41	20.14
	29.00	28.88	28.86	28.68	22.87	22.75	22.73	22.55
	27.50	27.12	27.15	27.08	23.08	22.70	22.73	22.66
	26.50	26.28	26.38	26.34	23.32	23.10	23.20	23.16
EDGE (8PSK)	27.00	26.37	26.41	26.21	17.81	17.18	17.22	17.02
	25.50	25.29	25.36	25.07	19.37	19.16	19.23	18.94
	24.00	23.45	23.51	23.33	19.58	19.03	19.09	18.91
	22.50	21.97	22.02	21.78	19.32	18.79	18.84	18.60

Band	WCDMA Band II(Capsensor Off)			
Tx Channel	Max. Tune-up Power	9262CH	9400CH	9538CH
Rx Channel		9662CH	9800CH	9938CH
Frequency		1852.4MHz	1880MHz	1907.6MHz
RMC 12.2K	22.50	22.30	22.32	22.27
RMC 64K	22.50	22.24	22.29	22.18
RMC 144K	22.50	22.23	22.23	22.15
RMC 384K	22.50	22.23	22.24	22.17
HSDPA Subtest-1	21.50	21.42	21.18	21.16
HSDPA Subtest-2	21.50	21.41	21.20	21.14
HSDPA Subtest-3	21.50	20.93	20.64	20.24
HSDPA Subtest-4	21.50	20.89	20.63	20.27
HSUPA Subtest-1	21.50	21.41	21.15	21.42
HSUPA Subtest-2	21.50	21.45	21.21	20.75
HSUPA Subtest-3	21.50	20.96	20.68	20.31
HSUPA Subtest-4	21.50	21.42	21.21	20.81
HSUPA Subtest-5	21.50	21.42	21.22	20.78

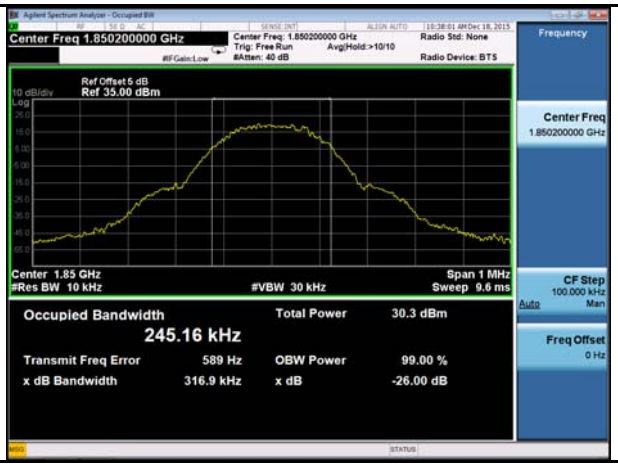
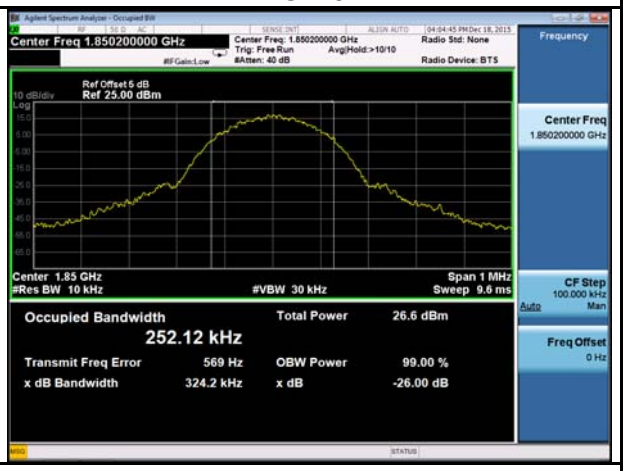
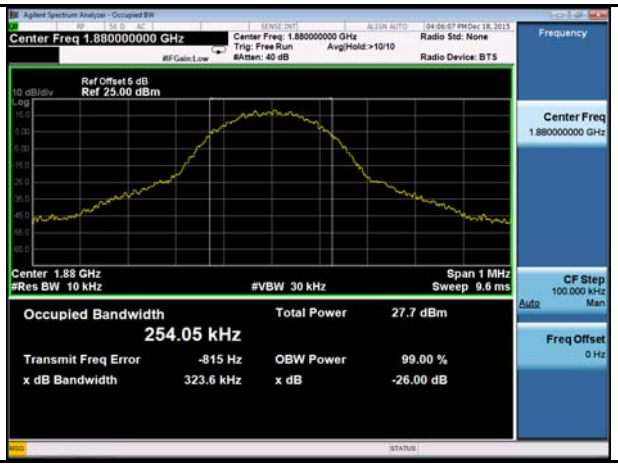
E.I.R.P Power

DCS1900					
Plane	Channel	Frequency (MHz)	GSM EIRP(dBm)	EDGE EIRP(dBm)	Polarization (H/V)
X	512	1850.2	26.63	23.97	H
	661	1880	26.83	23.45	H
	810	1909.8	25.59	24.19	H
	512	1850.2	19.36	15.71	V
	661	1880	20.38	16.44	V
	810	1909.8	22.12	17.24	V

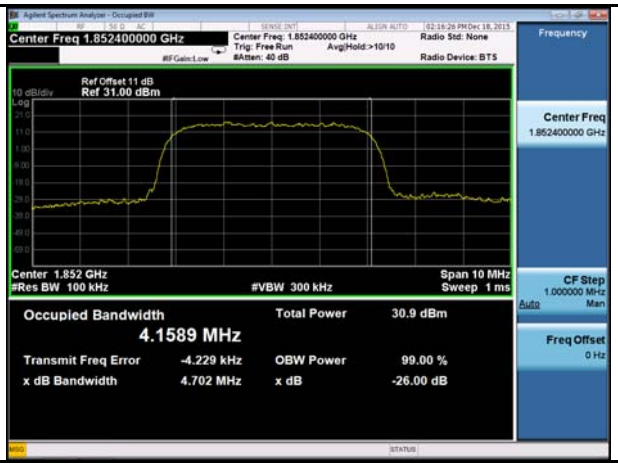
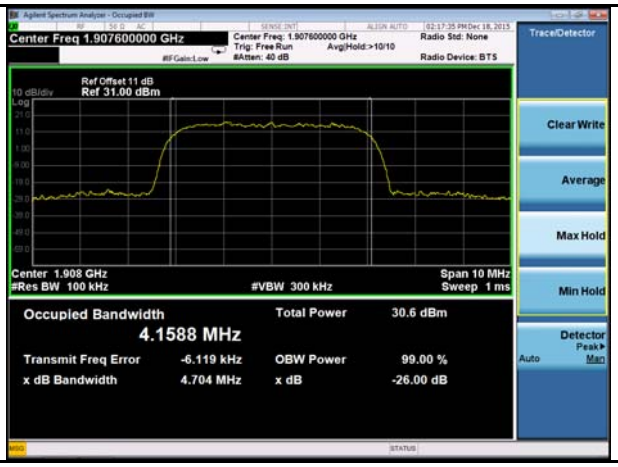
WCDMA Band II				
Plane	Channel	Frequency (MHz)	EIRP(dBm)	Polarization (H/V)
X	9262	1852.4	20.87	H
	9400	1880	20.68	H
	9538	1907.6	20.67	H
	9262	1852.4	13.30	V
	9400	1880	15.48	V
	9538	1907.6	16.32	V

ATTACHMENT B - OCCUPIED BANDWIDTH

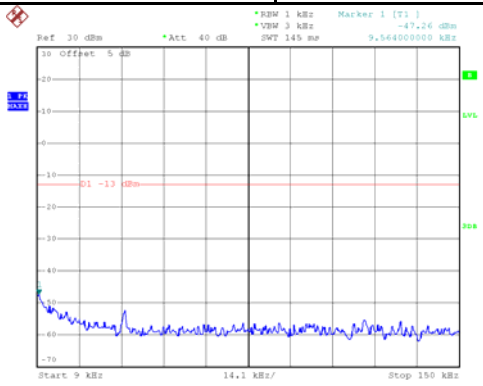
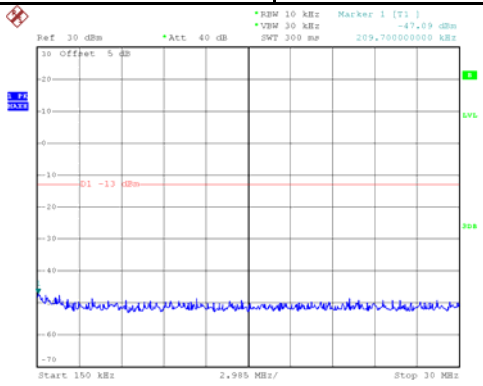
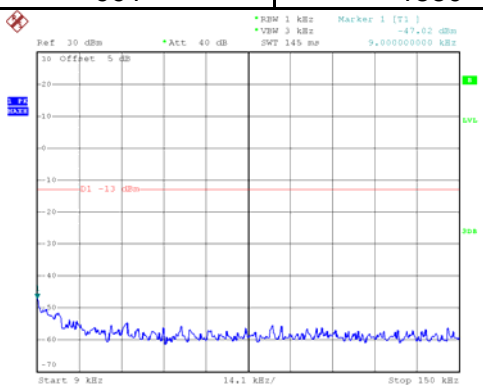
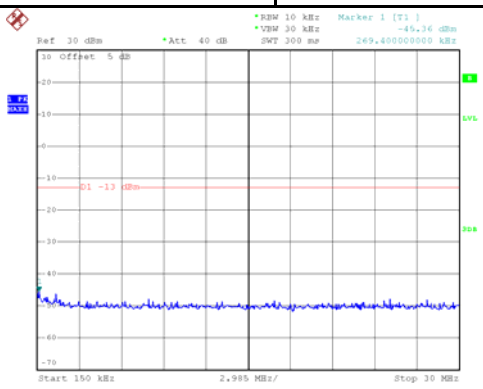
DCS1900					
GSM			EDGE		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
512	1850.2	0.245	512	1850.2	0.252
661	1880	0.246	661	1880	0.254
810	1909.8	0.246	810	1909.8	0.253
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
512	1850.2	0.317	512	1850.2	0.324
661	1880	0.315	661	1880	0.324
810	1909.8	0.314	810	1909.8	0.326

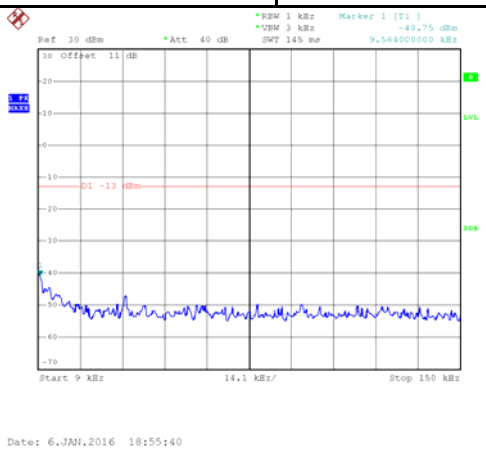
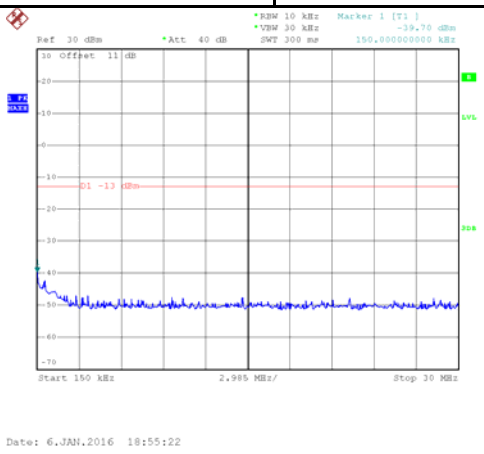
Spectrum Plot	
GSM -512	GSM-661
	
GSM-810	EDGE-512
	
EDGE-661	EDGE-810
	

WCDMA Band II					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
9262	1852.4	4.159	9262	1852.4	4.702
9400	1880	4.155	9400	1880	4.700
9538	1907.6	4.159	9538	1907.6	4.704

Spectrum Plot	
9262	9400
	
9538	-
	

ATTACHMENT C – CONDUCTED EMISSIONS

DCS1900			
GSM		GSM	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
661	1880	661	1880
			
GSM		EDGE	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
661	1880	661	1880
			
EDGE		EDGE	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
661	1880	661	1880
			

WCDMA Band II			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
9400	1880	9400	1880
			
Channel	Frequency(MHz)	-	-
9400	1880	-	-

ATTACHMENT D - RADIATED EMISSION

Test Mode:	DCS1900_TX CH661_GSM

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0132	0°	13.75	24.73	38.48	125.19	-86.71	AVG
0.0132	0°	14.29	24.73	39.02	145.19	-106.17	PK
0.0244	0°	6.17	24.02	30.19	119.86	-89.67	AVG
0.0244	0°	8.34	24.02	32.36	139.86	-107.50	PK
0.0357	0°	3.64	23.31	26.95	116.55	-89.61	AVG
0.0357	0°	5.32	23.31	28.63	136.55	-107.93	PK
0.0573	0°	1.86	22.25	24.11	112.44	-88.33	AVG
0.0573	0°	2.43	22.25	24.68	132.44	-107.76	PK
0.5076	0°	19.29	19.82	39.11	73.49	-34.38	QP
1.9552	0°	23.38	19.50	42.88	69.54	-26.66	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0121	90°	13.33	24.30	37.63	125.95	-88.32	AVG
0.0121	90°	14.54	24.30	38.84	145.95	-107.11	PK
0.0219	90°	7.13	24.18	31.31	120.80	-89.49	AVG
0.0219	90°	8.54	24.18	32.72	140.80	-108.08	PK
0.0465	90°	5.39	22.62	28.01	114.26	-86.24	AVG
0.0465	90°	6.16	22.62	28.78	134.26	-105.47	PK
0.0557	90°	1.49	22.29	23.78	112.69	-88.91	AVG
0.0557	90°	2.17	22.29	24.46	132.69	-108.23	PK
0.6283	90°	22.27	20.21	42.48	71.64	-29.16	QP
2.0563	90°	24.48	19.47	43.95	69.54	-25.59	QP

Test Mode:	DCS1900_TX CH661_EDGE

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0125	0°	13.38	24.78	38.16	125.67	-87.51	AVG
0.0125	0°	14.71	24.78	39.49	145.67	-106.18	PK
0.0228	0°	6.53	24.12	30.65	120.45	-89.79	AVG
0.0228	0°	8.61	24.12	32.73	140.45	-107.71	PK
0.0367	0°	3.75	23.24	26.99	116.31	-89.32	AVG
0.0367	0°	5.28	23.24	28.52	136.31	-107.79	PK
0.0562	0°	1.42	22.28	23.70	112.61	-88.91	AVG
0.0562	0°	2.57	22.28	24.85	132.61	-107.76	PK
0.5061	0°	19.63	19.82	39.45	73.52	-34.07	QP
1.9576	0°	23.74	19.50	43.24	69.54	-26.30	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0118	90°	13.24	24.30	37.54	126.17	-88.63	AVG
0.0118	90°	14.17	24.30	38.47	146.17	-107.70	PK
0.0251	90°	7.24	23.98	31.22	119.61	-88.39	AVG
0.0251	90°	8.31	23.98	32.29	139.61	-107.32	PK
0.0472	90°	5.33	22.58	27.91	114.13	-86.22	AVG
0.0472	90°	6.93	22.58	29.51	134.13	-104.62	PK
0.0564	90°	1.79	22.27	24.06	112.58	-88.52	AVG
0.0564	90°	2.38	22.27	24.65	132.58	-107.93	PK
0.6267	90°	22.52	20.21	42.73	71.66	-28.94	QP
2.0527	90°	24.88	19.47	44.35	69.54	-25.19	QP

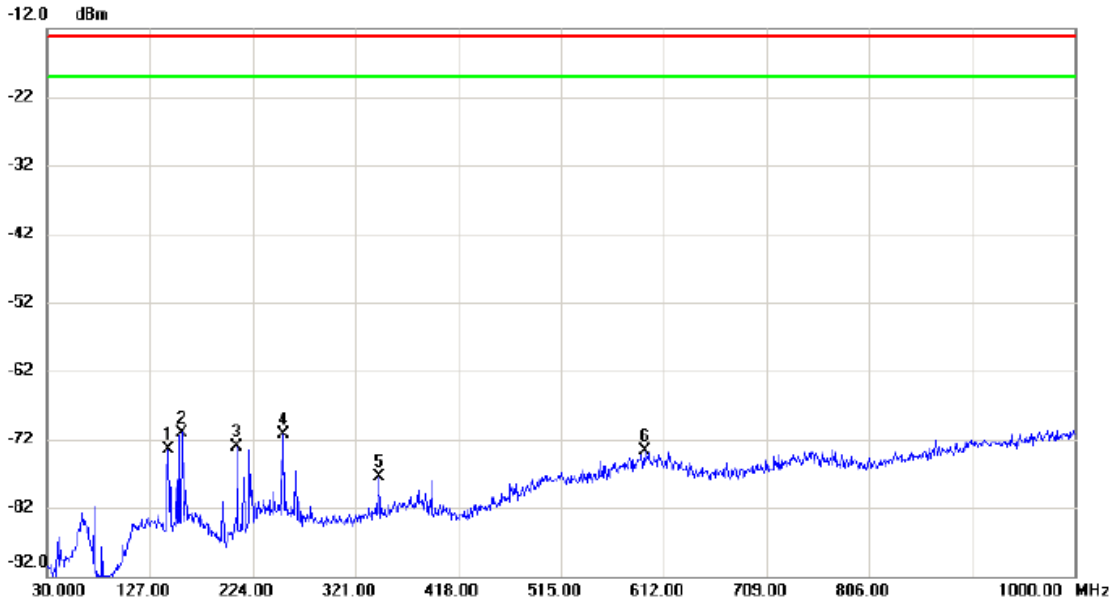
Test Mode:	WCDMA Band II_TX CH9400

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0114	0°	13.13	24.84	37.97	126.47	-88.49	AVG
0.0114	0°	14.23	24.84	39.07	146.47	-107.39	PK
0.0275	0°	6.94	23.83	30.77	118.82	-88.05	AVG
0.0275	0°	8.63	23.83	32.46	138.82	-106.36	PK
0.0372	0°	3.81	23.21	27.02	116.19	-89.17	AVG
0.0372	0°	5.67	23.21	28.88	136.19	-107.31	PK
0.0516	0°	1.79	22.37	24.16	113.35	-89.19	AVG
0.0516	0°	2.58	22.37	24.95	133.35	-108.40	PK
0.5014	0°	19.09	19.80	38.89	73.60	-34.71	QP
1.9523	0°	23.16	19.50	42.66	69.54	-26.88	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0122	90°	13.42	24.30	37.72	125.88	-88.16	AVG
0.0122	90°	14.63	24.30	38.93	145.88	-106.95	PK
0.0234	90°	7.17	24.08	31.25	120.22	-88.97	AVG
0.0234	90°	8.29	24.08	32.37	140.22	-107.85	PK
0.0439	90°	5.39	22.79	28.18	114.75	-86.58	AVG
0.0439	90°	6.33	22.79	29.12	134.75	-105.64	PK
0.0571	90°	1.26	22.26	23.52	112.47	-88.95	AVG
0.0571	90°	2.27	22.26	24.53	132.47	-107.94	PK
0.6292	90°	22.07	20.21	42.28	71.63	-29.35	QP
2.0516	90°	24.03	19.47	43.50	69.54	-26.04	QP

Test Mode:	DCS1900_TX CH661_GSM

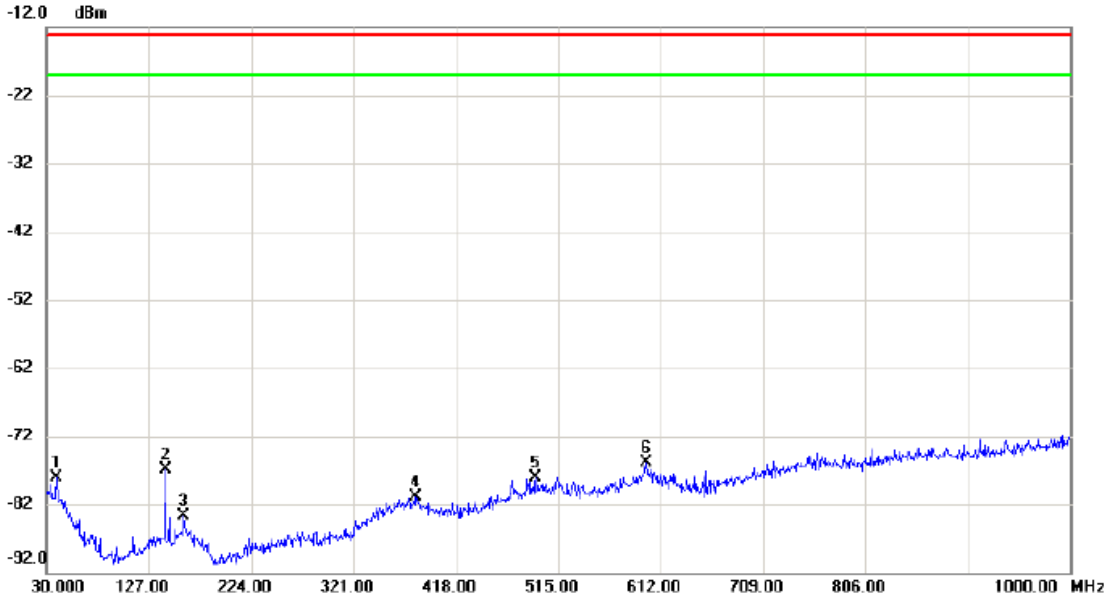
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		144.5746	-70.64	-2.85	-73.49	-13.00	-60.49	peak	
2	*	157.1972	-69.02	-1.98	-71.00	-13.00	-58.00	peak	
3		209.6296	-69.43	-3.69	-73.12	-13.00	-60.12	peak	
4		253.3233	-70.81	-0.52	-71.33	-13.00	-58.33	peak	
5		343.6235	-76.53	-1.03	-77.56	-13.00	-64.56	peak	
6		594.1341	-79.06	5.33	-73.73	-13.00	-60.73	peak	

Test Mode:	DCS1900_TX CH661_GSM

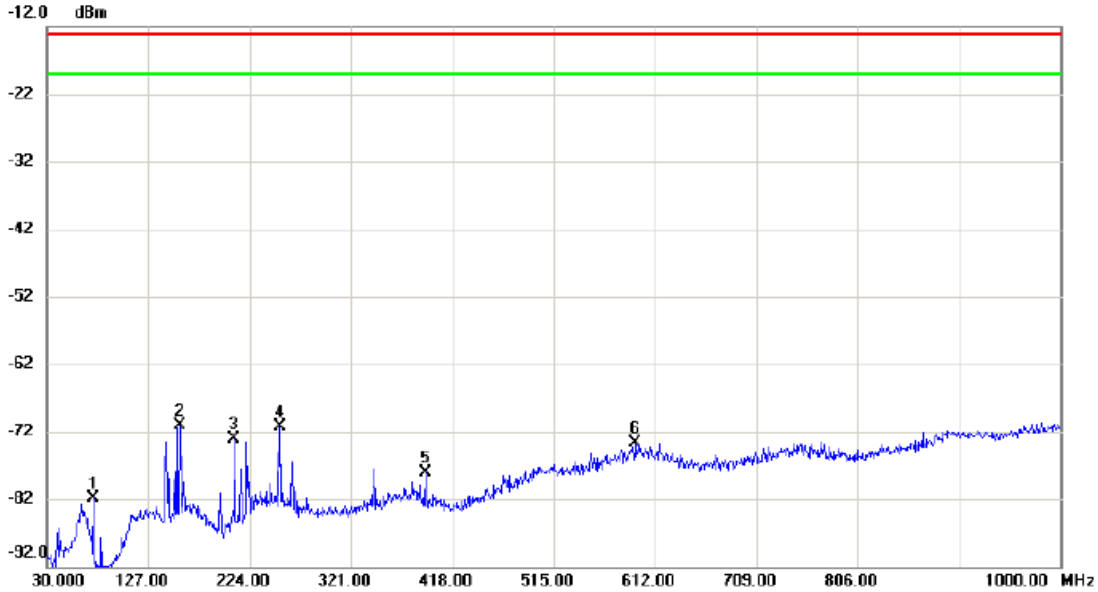
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		39.7000	-78.48	0.45	-78.03	-13.00	-65.03	peak	
2		142.5200	-71.66	-5.18	-76.84	-13.00	-63.84	peak	
3		159.9800	-79.45	-4.21	-83.66	-13.00	-70.66	peak	
4		379.2000	-80.36	-0.54	-80.90	-13.00	-67.90	peak	
5		493.6600	-78.85	0.74	-78.11	-13.00	-65.11	peak	
6	*	598.4200	-78.31	2.47	-75.84	-13.00	-62.84	peak	

Test Mode:	DCS1900_TX CH661_EDGE

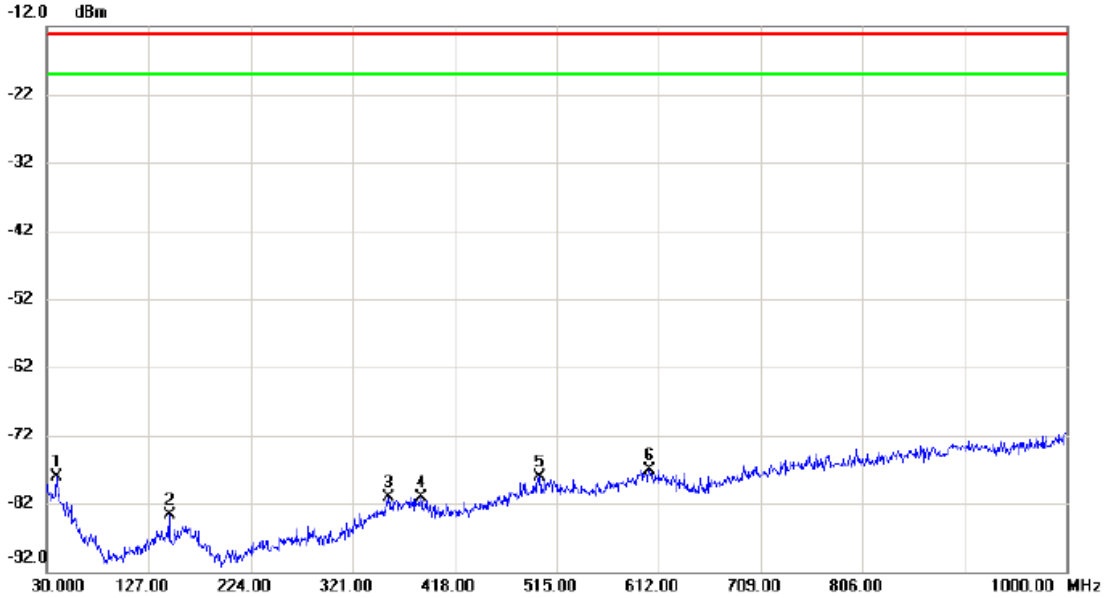
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		74.6200	-72.86	-9.06	-81.92	-13.00	-68.92	peak	
2	*	157.0700	-69.02	-1.99	-71.01	-13.00	-58.01	peak	
3		209.4500	-69.43	-3.71	-73.14	-13.00	-60.14	peak	
4		253.1000	-70.81	-0.51	-71.32	-13.00	-58.32	peak	
5		392.7800	-77.00	-1.01	-78.01	-13.00	-65.01	peak	
6		593.5700	-79.06	5.30	-73.76	-13.00	-60.76	peak	

Test Mode:	DCS1900_TX CH661_EDGE

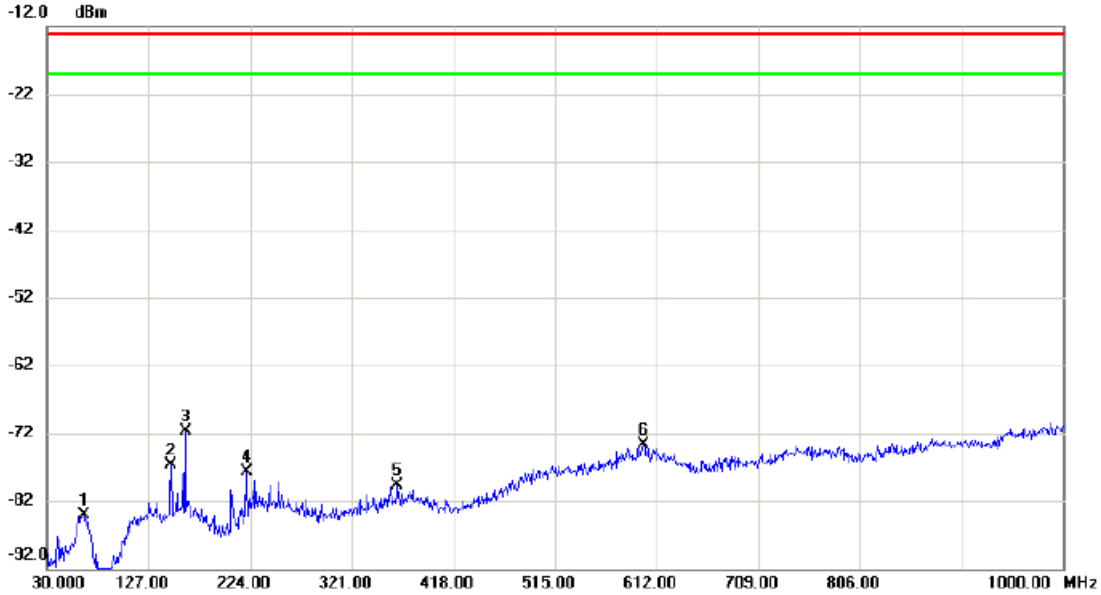
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		39.7000	-78.47	0.45	-78.02	-13.00	-65.02	peak	
2		146.4000	-78.33	-5.46	-83.79	-13.00	-70.79	peak	
3		354.9500	-79.93	-1.14	-81.07	-13.00	-68.07	peak	
4		385.9900	-80.13	-0.94	-81.07	-13.00	-68.07	peak	
5		498.5100	-79.09	0.91	-78.18	-13.00	-65.18	peak	
6	*	603.2700	-79.41	2.41	-77.00	-13.00	-64.00	peak	

Test Mode:	WCDMA Band II_TX CH9400

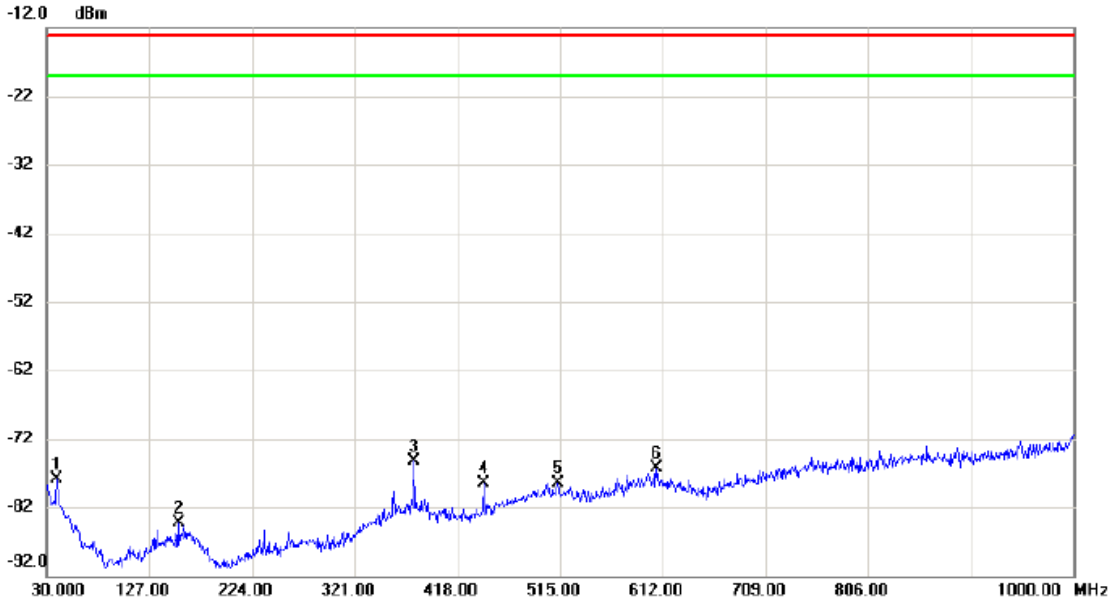
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		65.8900	-80.94	-3.14	-84.08	-13.00	-71.08	peak	
2		148.3400	-73.94	-2.81	-76.75	-13.00	-63.75	peak	
3	*	161.9200	-70.03	-1.68	-71.71	-13.00	-58.71	peak	
4		220.1200	-74.62	-2.99	-77.61	-13.00	-64.61	peak	
5		364.6500	-79.53	-0.23	-79.76	-13.00	-66.76	peak	
6		599.3900	-79.38	5.59	-73.79	-13.00	-60.79	peak	

Test Mode:	WCDMA Band II_TX CH9400

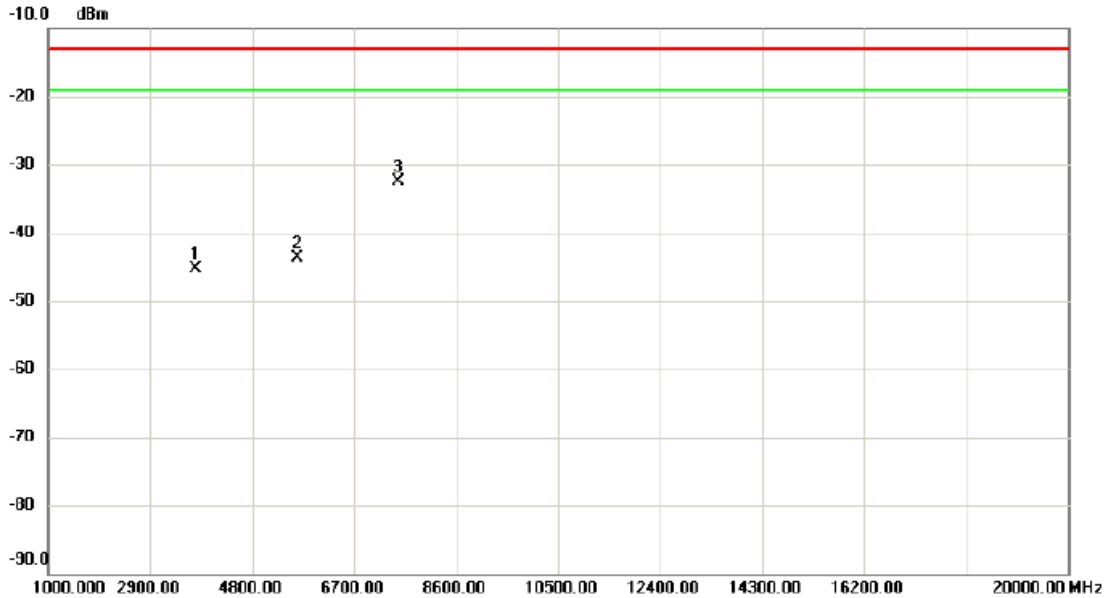
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		39.7000	-78.27	0.45	-77.82	-13.00	-64.82	peak	
2		154.1600	-79.12	-5.09	-84.21	-13.00	-71.21	peak	
3	*	377.2600	-74.66	-0.57	-75.23	-13.00	-62.23	peak	
4		443.2200	-77.12	-1.41	-78.53	-13.00	-65.53	peak	
5		513.0600	-79.23	0.76	-78.47	-13.00	-65.47	peak	
6		606.1800	-78.60	2.30	-76.30	-13.00	-63.30	peak	

Test Mode:	DCS1900_TX CH661_GSM

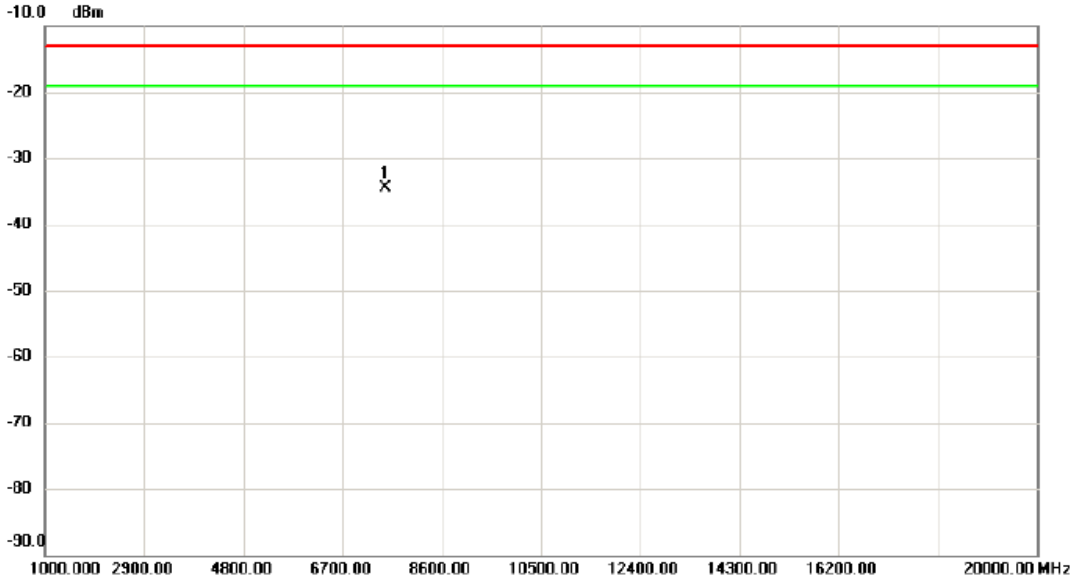
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		3755.000	-59.78	14.50	-45.28	-13.00	-32.28	peak	
2		5636.000	-59.91	16.30	-43.61	-13.00	-30.61	peak	
3	*	7517.000	-50.52	17.93	-32.59	-13.00	-19.59	peak	

Test Mode:	DCS1900_TX CH661_GSM

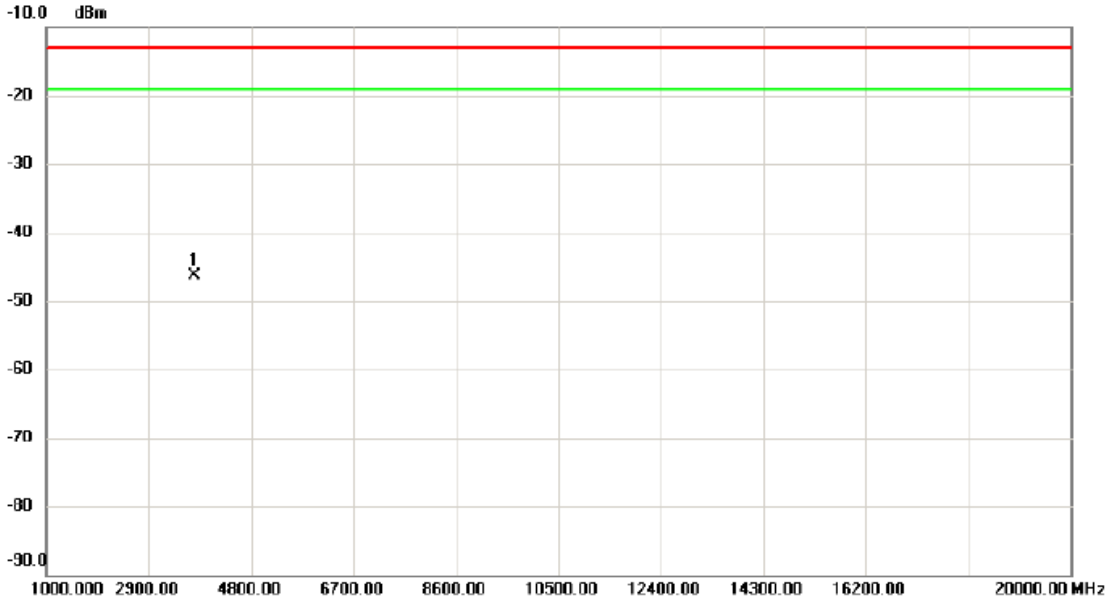
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	7517.000	-55.26	20.67	-34.59	-13.00	-21.59	peak	

Test Mode:	DCS1900_TX CH661_EDGE

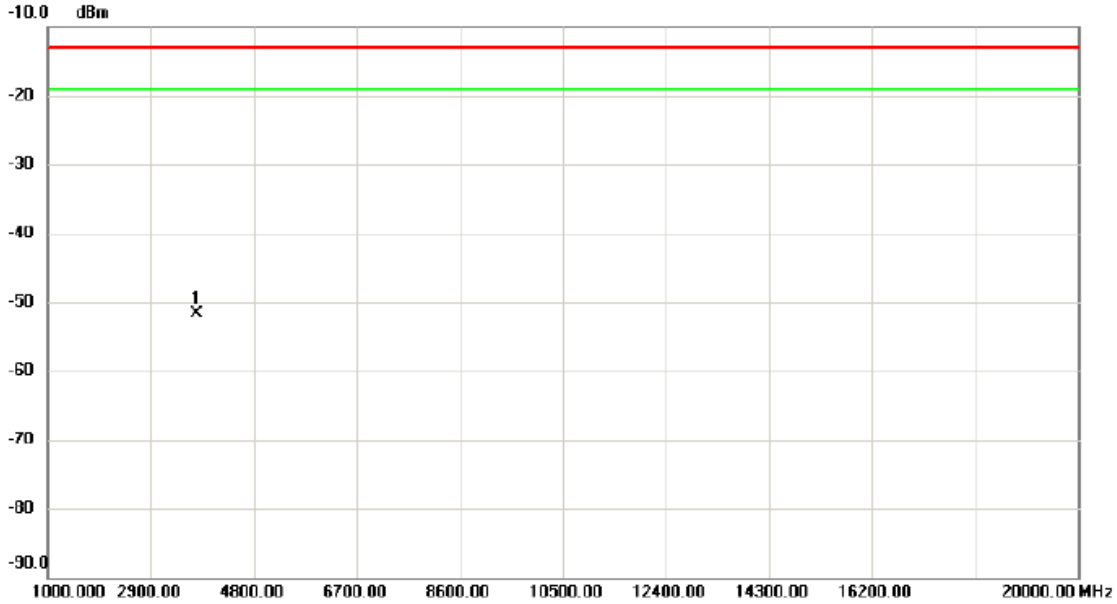
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	3759.650	-60.80	14.51	-46.29	-13.00	-33.29	peak	

Test Mode:	DCS1900_TX CH661_EDGE

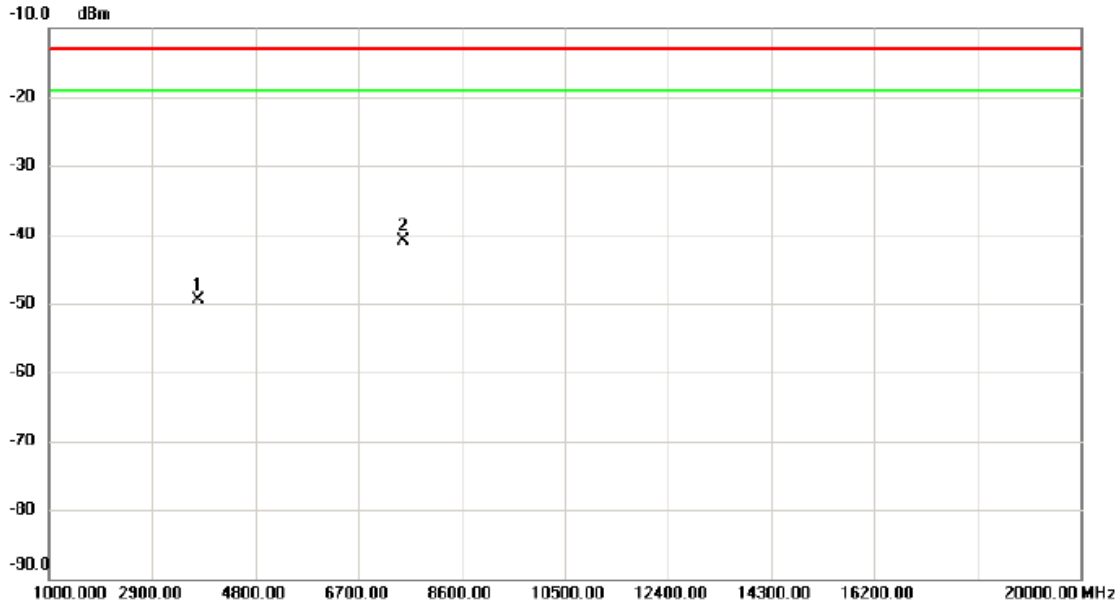
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	3760.000	-63.04	11.34	-51.70	-13.00	-38.70	peak	

Test Mode:	WCDMA Band II_TX CH9262

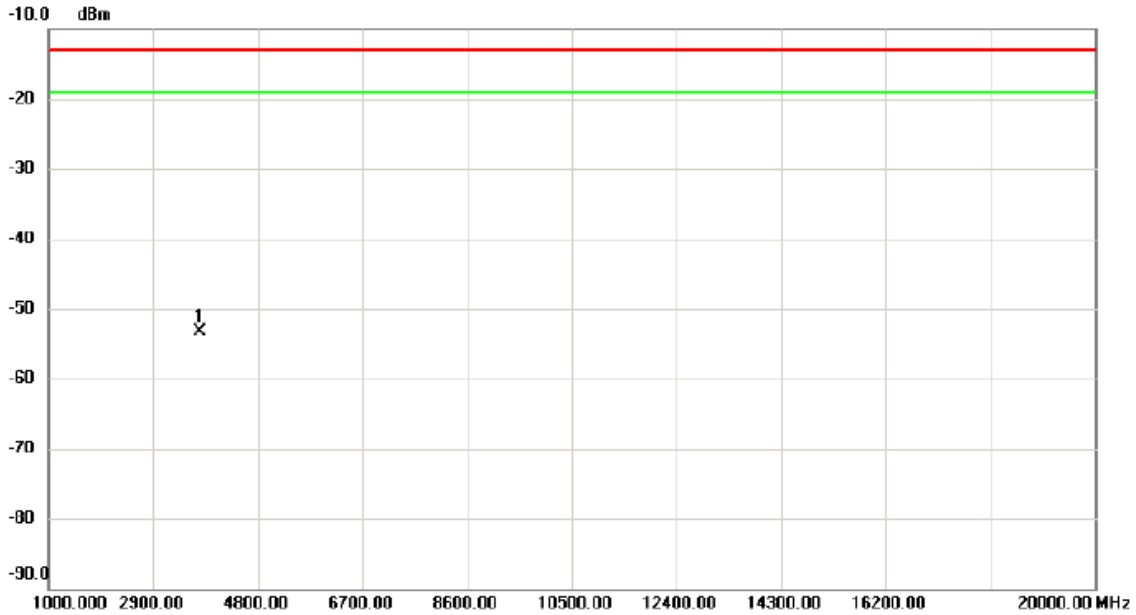
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		3755.000	-64.01	14.50	-49.51	-13.00	-36.51	peak	
2	*	7517.000	-58.86	17.93	-40.93	-13.00	-27.93	peak	

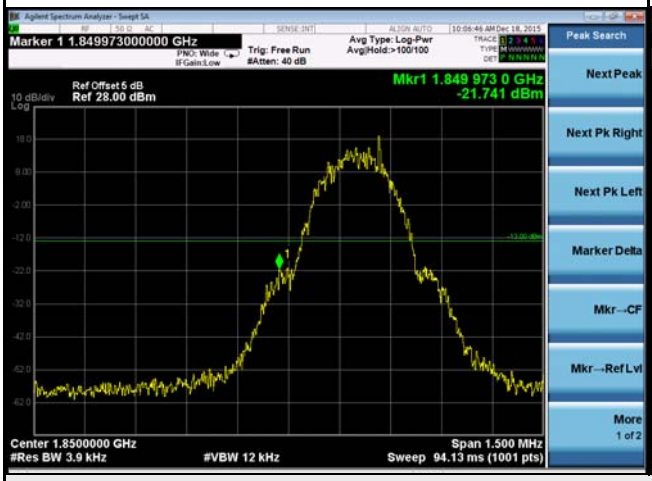
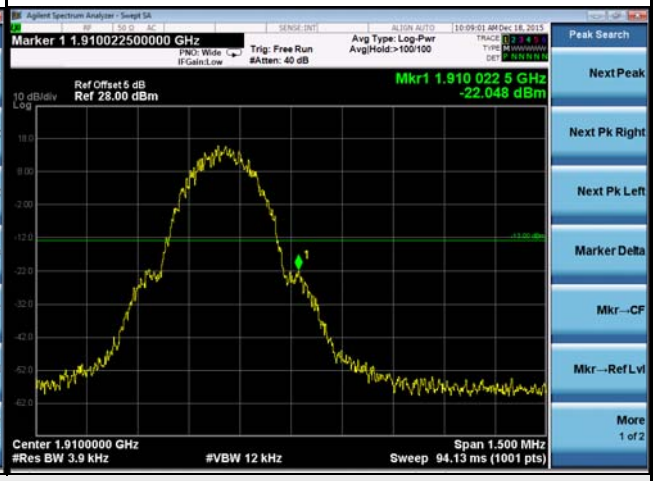
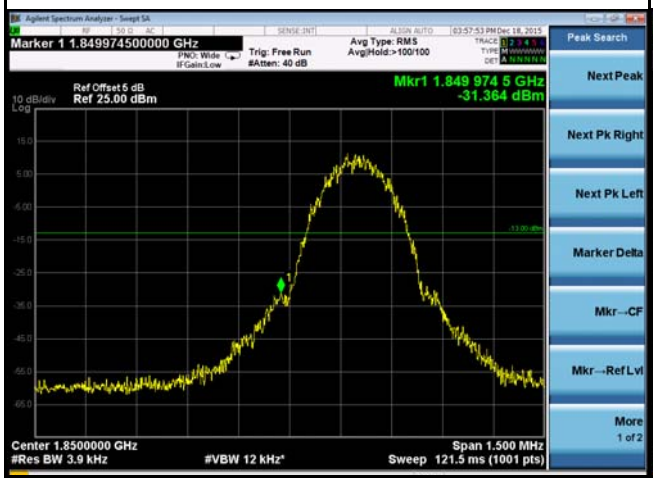
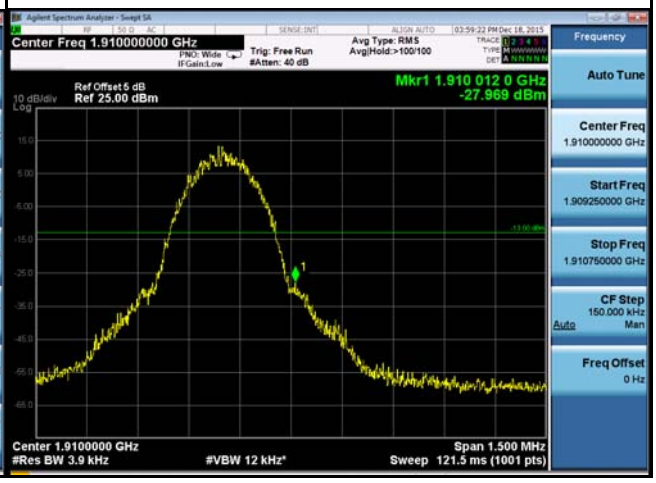
Test Mode:	WCDMA Band II_TX CH9262

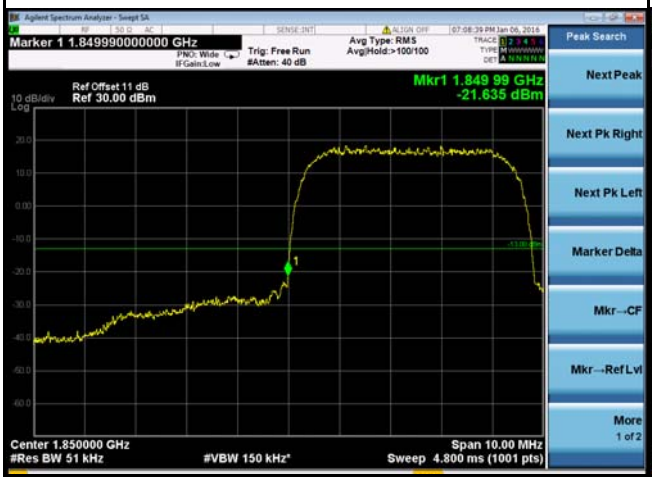
Horizontal



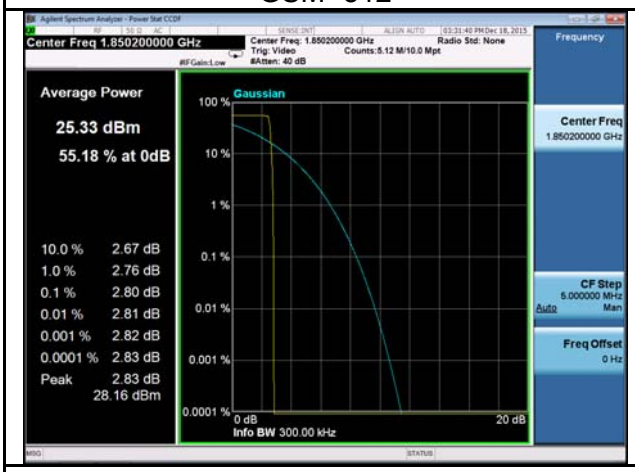
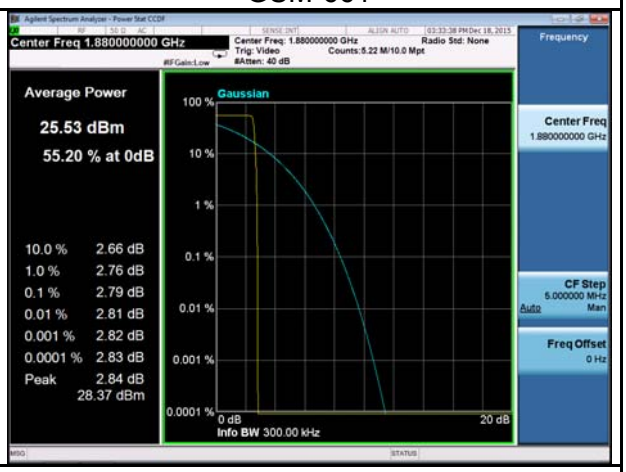
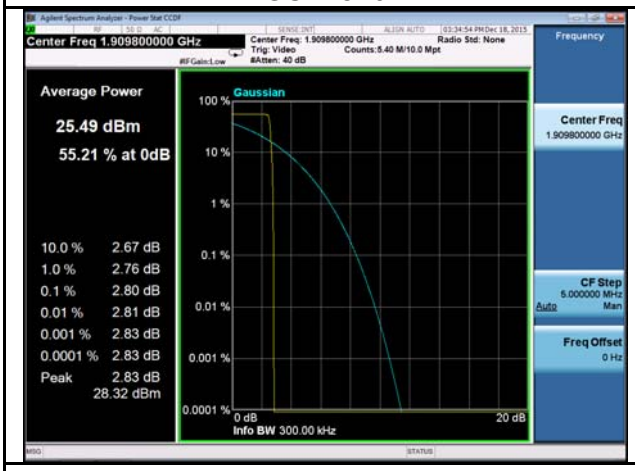
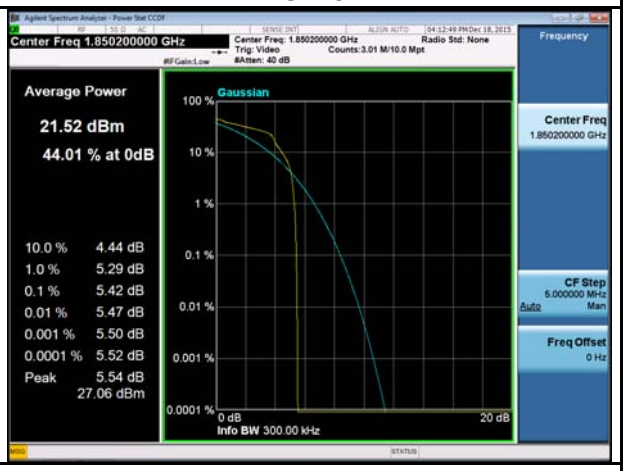
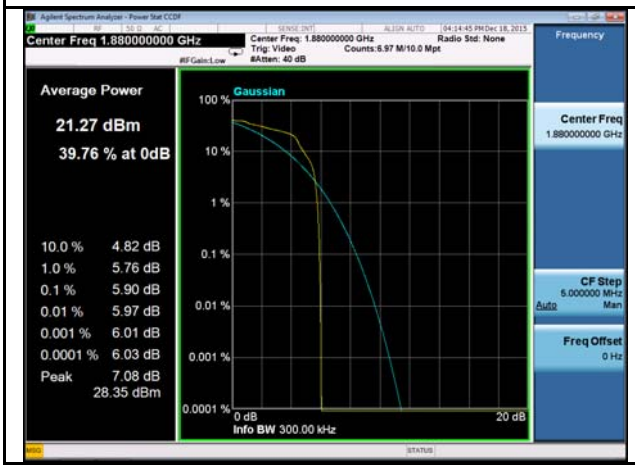
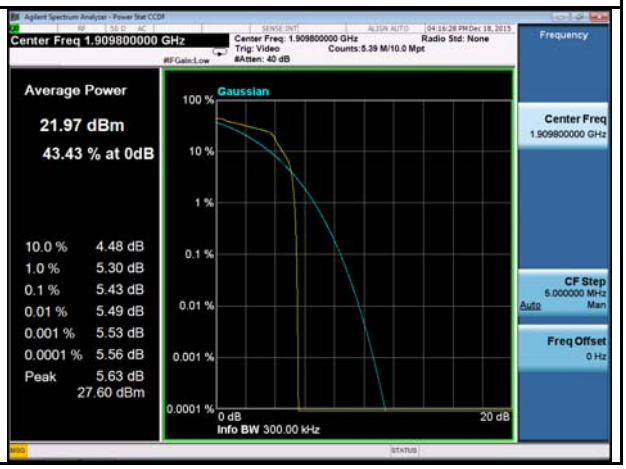
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	3755.000	-64.70	11.33	-53.37	-13.00	-40.37	peak	

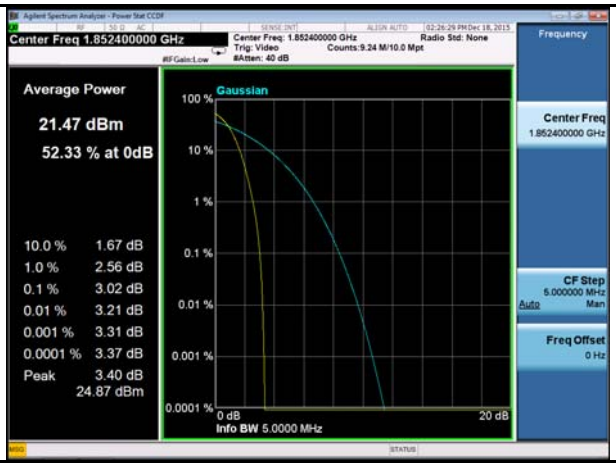
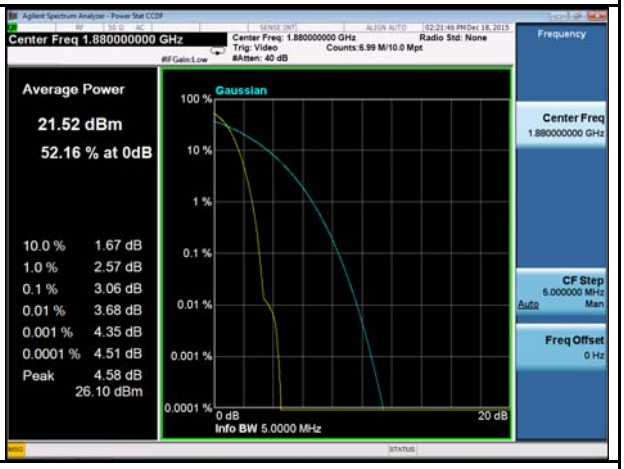
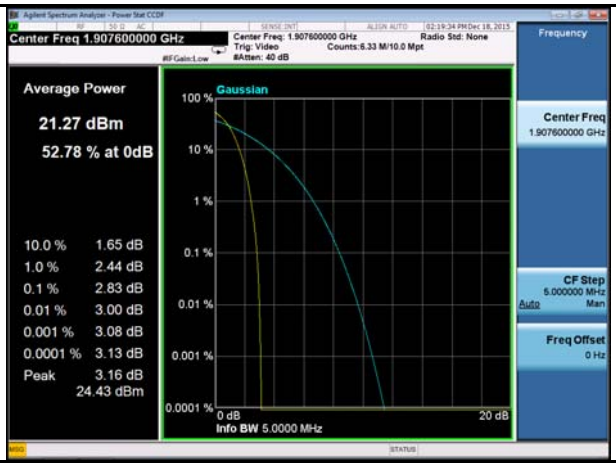
ATTACHMENT E - BAND EDGE

DCS1900			
GSM			
Channel	512	Channel	810
			
EDGE			
Channel	512	Channel	810
			

WCDMA Band II			
Channel	9262	Channel	9538
			

ATTACHMENT F – PEAK TO AVERAGE RATIO

GSM 850 Spectrum Plot	
GSM -512	GSM-661
	
GSM-810	EDGE-512
	
EDGE-661	EDGE-810
	

WCDMA Band II Spectrum Plot	
9262	9400
	
9538	-
	

ATTACHMENT G - FREQUENCY STABILITY

Test Mode:	DCS1900_CH661

Temperature vs. Frequency Stabiility

Temperature(℃)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
-30	2.97	0.001605232	2.5
-20	5.9	0.003188844	2.5
-10	1.55	0.000837747	2.5
0	2.73	0.001475516	2.5
10	3.46	0.001870068	2.5
20	4.88	0.002637553	2.5
30	4.21	0.00227543	2.5
40	2.59	0.001399849	2.5
50	3.69	0.001994379	2.5
Max. Deviation (ppm)	5.9	0.003188844	2.5

Voltage vs. Frequency Stability

Voltage(Volts)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
3.8	6.82	0.003686088	2.5
3.5	1.45	0.000783699	2.5
4.2	4.52	0.002442979	2.5
Max. Deviation (ppm)	6.82	0.003686088	2.5

Test Mode:	WCDMA Band II_CH9400

Temperature vs. Frequency Stabiility

Temperature(℃)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
-30	1.33	0.000707447	2.5
-20	3.75	0.001994681	2.5
-10	4.96	0.002638298	2.5
0	3.25	0.001728723	2.5
10	2.16	0.001148936	2.5
20	1.58	0.000840426	2.5
30	3.23	0.001718085	2.5
40	4.26	0.002265957	2.5
50	4.97	0.002643617	2.5
Max. Deviation (ppm)	4.97	0.002643617	2.5

Voltage vs. Frequency Stability

Voltage(Volts)	Frequency Error (Hz)	Frequency Error (ppm)	Limit(ppm)
3.8	7.36	0.003914894	2.5
3.5	3.54	0.001882979	2.5
4.2	5.55	0.002952128	2.5
Max. Deviation (ppm)	7.36	0.003914894	2.5