



# FCC REPORT

Report Reference No..... : TRE1501001301 R/C.....: 87757  
FCC ID..... : ZF3-LTL-6310WMG  
Applicant's name..... : Shenzhen Ltl Acorn Electronics Co., Ltd.  
Address..... : Room 405, Building No. 9, Wangtang Industrial Park, Xinwei, Xili Town, Nanshan District, Shenzhen, Guangdong, China  
Manufacturer..... : Zhuhai Ltl Acorn Electronics Co., Ltd.  
Address..... : 3rd floor, Kangde Lai Medical Industrial Park, Sanzao Town, Jinwan District, Zhuhai, Guangdong, China.  
Test item description ..... : Infrared Digital Scouting Camera  
Trade Mark ..... : LTL ACORN  
Model/Type reference..... : Ltl-6310WMG-940nm LED  
Listed Model(s) ..... : Ltl-6310MG-940nm LED, Ltl-6310MG-850nm LED, Ltl-6210MG-940nm LED, Ltl-6210MG-850nm LED, Ltl-6510MG-940nm LED, Ltl-6510MG-850nm LED, Ltl-6310WMG-850nm LED  
Standard ..... : FCC Part 22: PUBLIC MOBILE SERVICES  
FCC Part 24: PERSONAL COMMUNICATIONS SERVICES  
Date of receipt of test sample..... : Jan. 07, 2015  
Date of testing..... : Jan. 08, 2015 ~ July 06, 2015  
Date of issue..... : July 06, 2015  
Result..... : Pass

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Testing Laboratory Name ..... : Shenzhen Huatongwei International Inspection Co., Ltd  
Address..... : Bldg3, Hongfa Hi-tech Industrial Park, Genyu Road, Shenzhen, China

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# 1. TEST STANDARDS AND TEST DESCRIPTION

## 1.1. Test Standards

The tests were performed according to following standards:

[FCC Part 22 \(10-1-13 Edition\)](#): PRIVATE LAND MOBILE RADIO SERVICES.

[FCC Part 24\(10-1-13 Edition\)](#): PUBLIC MOBILE SERVICES

[TIA/EIA 603 D June 2010](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[47 CFR FCC Part 15 Subpart B](#): - Unintentional Radiators

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[KDB971168 D01:2013-06-07](#): Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems

[ANSI C63.4:2009](#): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

## 1.2. Test Description

Test Item	Section in CFR 47	Result
AC Power Conducted Emission	Part 15.207	Pass
RF Output Power	Part 2.1046 Part 22.913 (a)(2) Part 24.232 (c)	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917 Part 24.238	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a)	Pass
Out of band emission, Band Edge	Part 22.917 (a) Part 24.238 (a)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

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

## 2. SUMMARY

### 2.1. Client Information

Applicant:	Shenzhen Ltl Acorn Electronics Co., Ltd.
Address:	Room 405, Building No. 9, Wangtang Industrial Park, Xinwei, Xili Town, Nanshan District, Shenzhen, Guangdong, China
Manufacturer:	Zhuhai Ltl Acorn Electronics Co., Ltd.
Address:	3rd floor, Kangde Lai Medical Industrial Park, Sanzao Town, Jinwan District, Zhuhai, Guangdong, China.

### 2.2. Product Description

Name of EUT	Infrared Digital Scouting Camera
Trade Mark:	LTL ACORN
Model No.:	Ltl-6310WMG-940nm LED
Listed Model(s):	Ltl-6310MG-940nm LED,Ltl-6310MG-850nm LED , Ltl-6210MG-940nm LED,Ltl-6210MG-850nm LED , Ltl-6510MG-940nm LED,Ltl-6510MG-850nm LED , Ltl-6310WMG-850nm LED
Power supply:	DC 6.0V From internal battery
Adapter information:	-
<b>2G:</b>	
Support Network:	GPRS
Support Band:	GPRS850, GPRS1900
Modulation:	GPRS: GMSK
Transmit Frequency:	GPRS850: 824.20MHz-848.80MHz GPRS1900: 1850.20MHz-1909.80MHz
Receive Frequency:	GPRS850: 869.20MHz-893.80MHz GPRS1900: 1930.20MHz-1989.80MHz
GPRS Class:	12
Antenna type:	Dedicated Antenna
Antenna gain:	GSM850:2.0dBi PCS1900:2.0dBi
Hardware version:	6210-C-EMC
Software version:	V1.2.119T

Test Frequency:

GPRS 850		GPRS1900	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20
190	836.60	661	1880.00
251	848.80	810	1909.80

### 2.3. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continuous transmitting and receiving mode for testing.

### 2.4. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

<input type="radio"/>	Power Cable	Length (m) :	/
<input type="radio"/>		Shield :	/
<input type="radio"/>		Detachable :	/
<input type="radio"/>	Multimeter	Manufacturer :	/
<input type="radio"/>		Model No. :	/

### 2.5. Modifications

No modifications were implemented to meet testing criteria.

### **3. TEST ENVIRONMENT**

#### **3.1. Address of the test laboratory**

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd. (Gongming)  
Address: Bldg3, Hongfa Hi-tech Industrial Park, Genyu Road, Shenzhen, China  
Phone: 86-755-26748019 Fax: 86-755-26748089

#### **3.2. Test Facility**

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

##### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

##### **A2LA-Lab Cert. No. 2243.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until Sept 30, 2015.

##### **FCC-Registration No.: 662850**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date Jul. 01, 2012, valid time is until Jun. 01, 2015.

##### **FCC-Registration No.: 317478**

Shenzhen Huatongwei International Inspection Co., Ltd. (Gongming EMC Laboratory) has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 317478, Renewal date July 18, 2014, valid time is until July. 18, 2017.

##### **IC-Registration No.: 5377A**

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.

##### **IC-Registration No.: 5377B**

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. (Gongming EMC Laboratory) has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on September 3, 2014, valid time is until September 3, 2017.

##### **ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

##### **VCCI**

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 29, 2015.

Radiated disturbance above 1GHz measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2013. Valid time is until Dec. 23, 2016.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.

Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2013. Valid time is until May 06, 2016.

##### **DNV**

Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2016.

### 3.3. Environmental conditions

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

Normal Temperature/Tnor:	15~35°C
Relative Humidity	30~60 %
Air Pressure	950-1050 hPa

### 3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)
Emission Mask	-----	(1)
Modulation Characteristic	-----	(1)
Transmitter Frequency Behavior	-----	(1)

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

### 3.5. Equipments Used during the Test

AC Power Conducted Emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2014/11/1
2	EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	2014/11/1
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2014/11/1
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/
5	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2014/11/1

Output Power(Conducted) & Occupied Bandwidth & Emission Bandwidth & Band Edge Compliance & Conducted Spurious Emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2014/11/1
2	Spectrum Analyzer	Rohde&Schwarz	FSU26	201141	2014/11/1
3	Splitter	Mini-Circuit	ZAPD-4	400059	2014/11/1

Frequency Stability					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2014/11/1
2	Spectrum Analyzer	Rohde&Schwarz	FSU26	201141	2014/11/1
3	Climate Chamber	ESPEC	EL-10KA	05107008	2014/11/1
4	Splitter	Mini-Circuit	ZAPD-4	400059	2014/11/1

Output Power (Radiated) & Radiated Spurious Emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	UNIVERSAL RADIO COMMUNICATION	Rohde&Schwarz	CMU200	112012	2014/11/1
2	Spectrum Analyzer	Rohde&Schwarz	FSU26	201141	2014/11/1
3	HORN ANTENNA	ShwarzBeck	9120D	1012	2014/11/1
4	HORN ANTENNA	ShwarzBeck	9120D	1011	2014/11/1
5	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2014/11/1
6	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2014/11/1
7	TURNTABLE	MATURO	TT2.0	----	N/A
8	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
9	EMI Test Software	Audix	E3	N/A	N/A
10	EMI Test Receiver	Rohde&Schwarz	ESIB 26	100009	2014/11/1
11	RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
12	High pass filter	Compliance Direction systems	BSU-6	34202	2014/11/1
13	Splitter	Mini-Circuit	ZAPD-4	400059	2014/11/1
14	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2014/11/1
15	Horn Antenna	SCHWARZBECK	BBHA9170	25842	2014/11/1
16	Preamplifier	ShwarzBeck	BBV 9718	BBV 9718	2014/11/1
17	Broadband Preamplifier	ShwarzBeck	BBV743	9743-0079	2014/11/1
18	Signal Generator	Rohde&Schwarz	SMF100A	101932	2014/11/1
19	Amplifier	Compliance Direction systems	PAP1-4060	120	2014/11/1
20	TURNTABLE	ETS	2088	2149	N/A
21	ANTENNA MAST	ETS	2075	2346	N/A
22	HORN ANTENNA	Rohde&Schwarz	HF906	100068	2014/11/1
23	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2014/11/1

The calibration interval was one year.

## 4. TEST CONDITIONS AND RESULTS

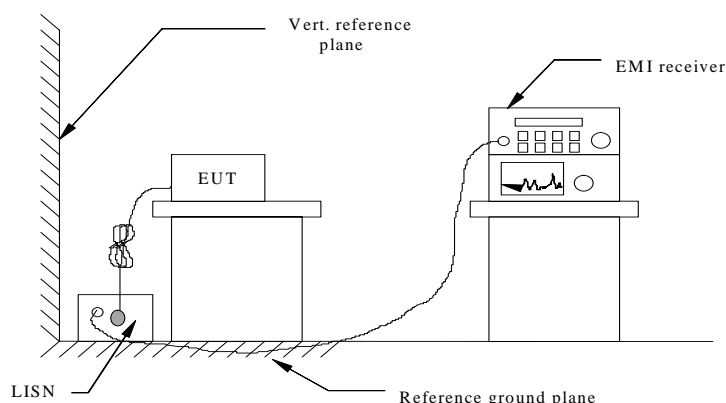
### 4.1. Conducted Emissions Test

#### LIMIT:

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

\* Decreasing linearly with the logarithm of the frequency

#### TEST CONFIGURATION



#### TEST PROCEDURE

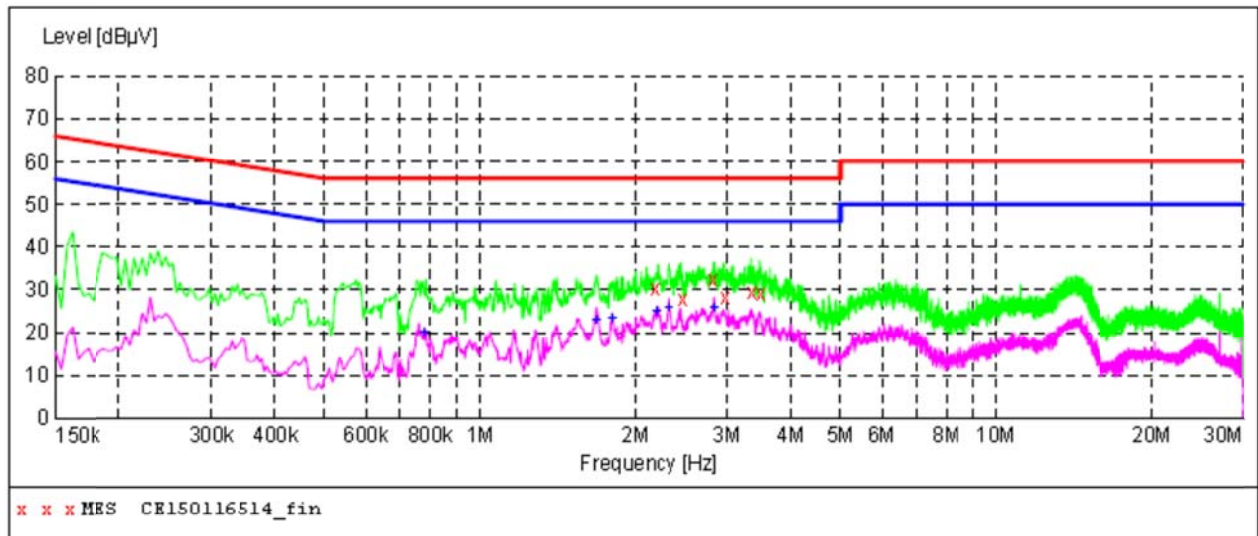
- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
- 2 Support equipment, if needed, was placed as per ANSI C63.4-2009.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009.
- 4 If a EUT received DC power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

#### TEST RESULTS

**Note:** We tested all modes and recorded the worst case at GSM900

**GSM850**

Test mode:	GPRS850	Polarization	L
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**MEASUREMENT RESULT: "CE150116514\_fin"**

1/16/2015 1:56PM

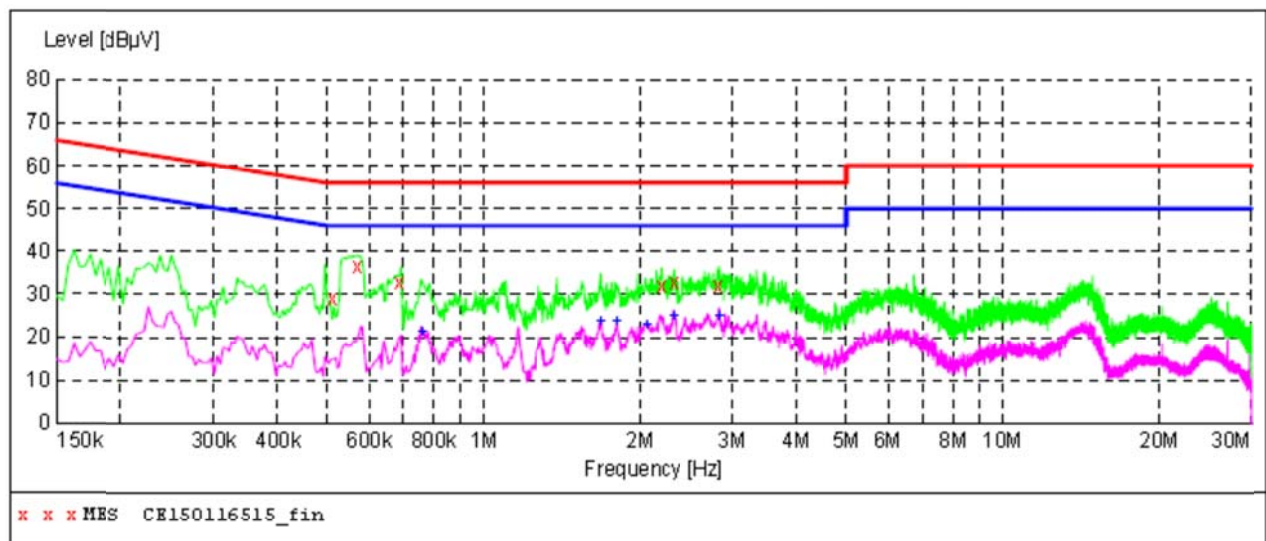
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
2.190000	30.40	10.2	56	25.6	QP	L1	GND
2.466000	28.10	10.3	56	27.9	QP	L1	GND
2.838000	32.40	10.3	56	23.6	QP	L1	GND
2.986000	28.40	10.3	56	27.6	QP	L1	GND
3.362000	29.50	10.3	56	26.5	QP	L1	GND
3.490000	29.20	10.3	56	26.8	QP	L1	GND

**MEASUREMENT RESULT: "CE150116514\_fin2"**

1/16/2015 1:56PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.778000	20.10	10.2	46	25.9	AV	L1	GND
1.674000	22.80	10.2	46	23.2	AV	L1	GND
1.802000	23.40	10.2	46	22.6	AV	L1	GND
2.198000	25.00	10.2	46	21.0	AV	L1	GND
2.318000	25.60	10.3	46	20.4	AV	L1	GND
2.838000	25.80	10.3	46	20.2	AV	L1	GND

Test mode:	GPRS850	Polarization	N
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### MEASUREMENT RESULT: "CE150116515\_fin"

1/16/2015 2:00PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.510000	29.10	10.2	56	26.9	QP	N	GND
0.570000	36.50	10.2	56	19.5	QP	N	GND
0.690000	32.70	10.2	56	23.3	QP	N	GND
2.194000	32.10	10.2	56	23.9	QP	N	GND
2.318000	33.00	10.3	56	23.0	QP	N	GND
2.842000	32.20	10.3	56	23.8	QP	N	GND

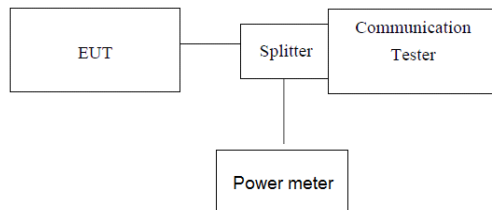
### MEASUREMENT RESULT: "CE150116515\_fin2"

1/16/2015 2:00PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.762000	21.40	10.2	46	24.6	AV	N	GND
1.678000	23.70	10.2	46	22.3	AV	N	GND
1.798000	23.60	10.2	46	22.4	AV	N	GND
2.058000	22.80	10.2	46	23.2	AV	N	GND
2.314000	25.00	10.3	46	21.0	AV	N	GND
2.834000	25.10	10.3	46	20.9	AV	N	GND

## 4.2. Conducted Peak Output Power

### TEST CONFIGURATION



*Note: Measurement setup for testing on Antenna connector*

### TEST PROCEDURE

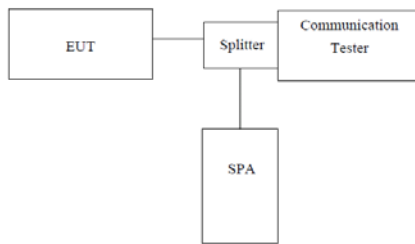
1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure the maximum burst average power.

### TEST RESULTS

EUT Mode	Channel	Frequency (MHz)	Power (dBm)
GPRS850 (GMSK,1Slot)	128	824.20	33.55
	190	836.60	33.30
	251	848.80	33.25
GPRS1900 (GMSK,1Slot)	512	1850.20	30.41
	661	1880.00	30.84
	810	1909.80	30.98

### 4.3. Occupy Bandwidth

#### TEST CONFIGURATION



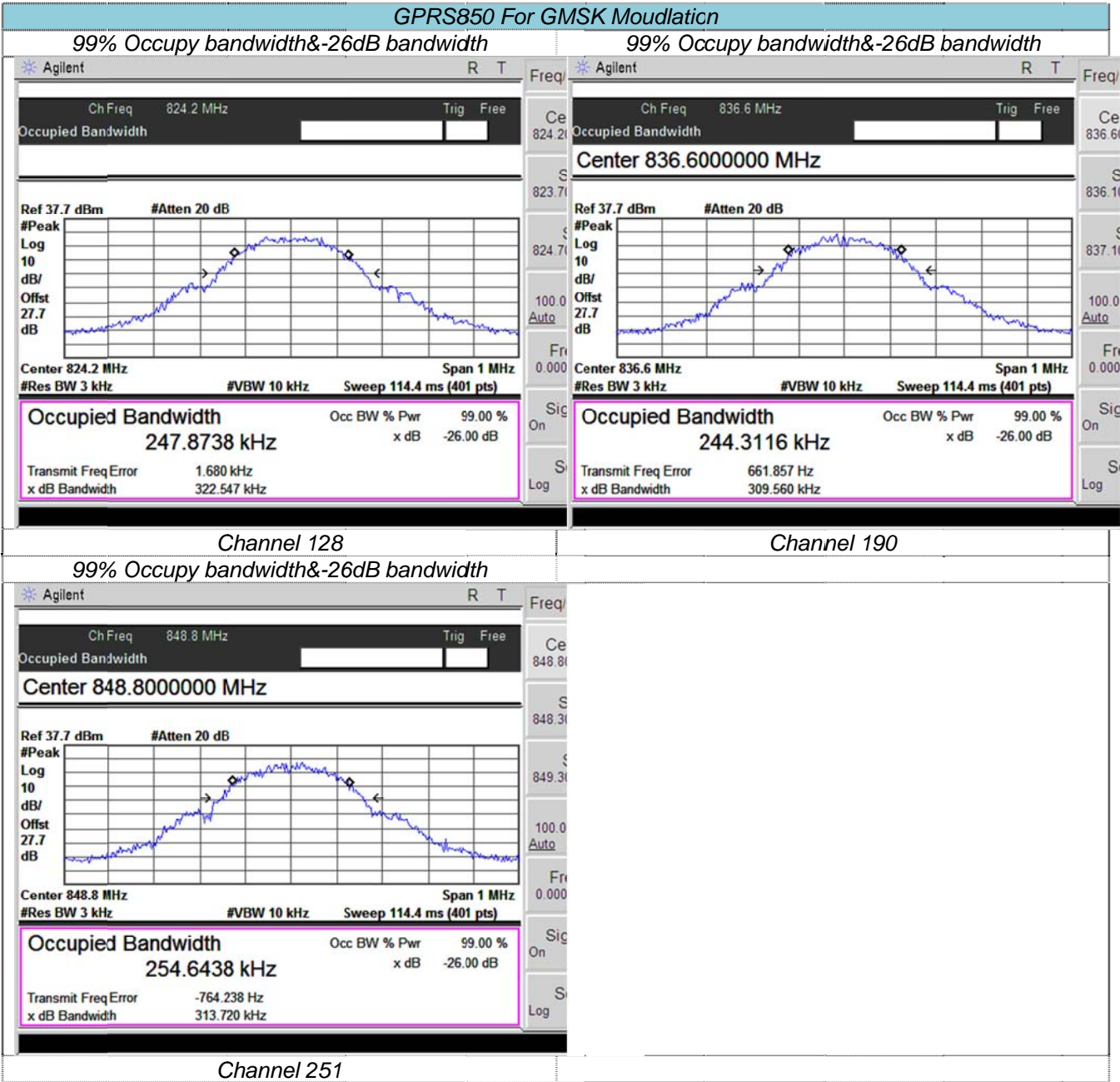
*Note: Measurement setup for testing on Antenna connector*

#### TEST PROCEDURE

1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer
2. RBW was set to about 1% of emission BW, VBW= 3 times RBW.
3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

#### TEST RESULTS

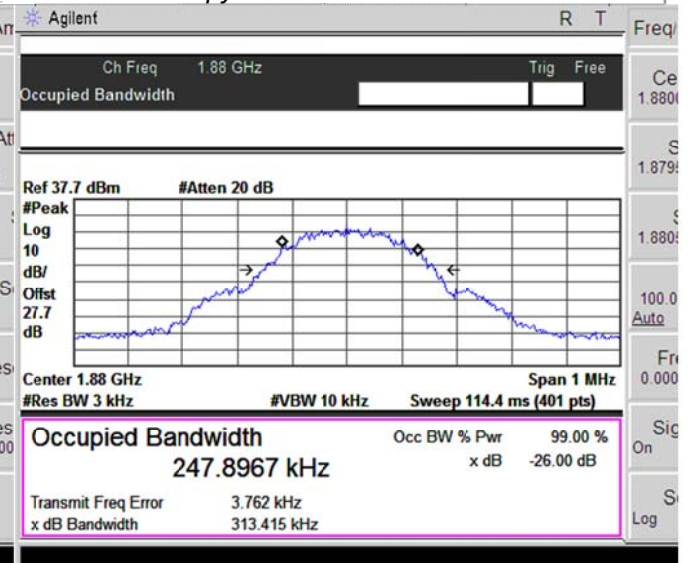
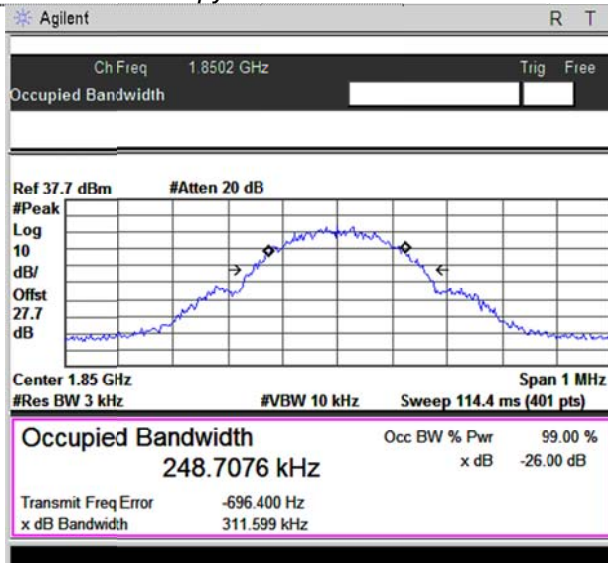
EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GPRS850 (GMSK,1Slot)	128	824.20	247.87	322.54
	190	836.60	244.31	309.56
	251	848.80	254.64	313.72
GPRS1900 (GMSK,1Slot)	512	1850.20	248.70	311.59
	661	1880.00	247.89	313.41
	810	1909.80	243.71	321.38



## GPRS1900 For GMSK Moudlation

99% Occupy bandwidth&amp;-26dB bandwidth

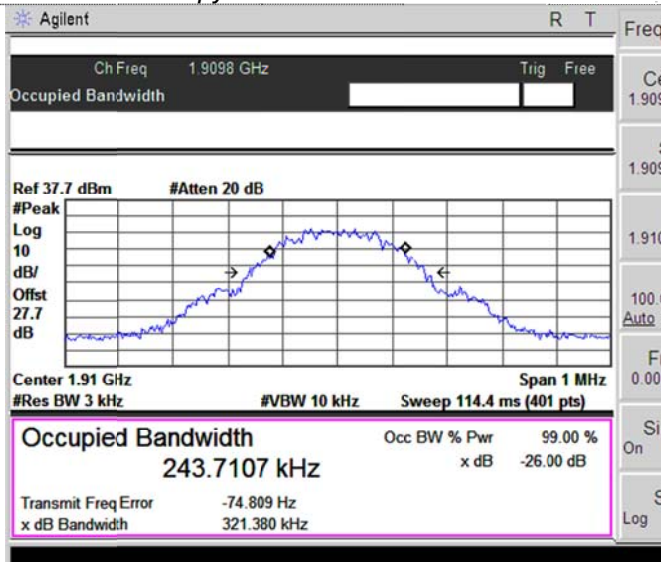
99% Occupy bandwidth&amp;-26dB bandwidth



Channel 512

Channel 661

99% Occupy bandwidth&amp;-26dB bandwidth



Channel 810

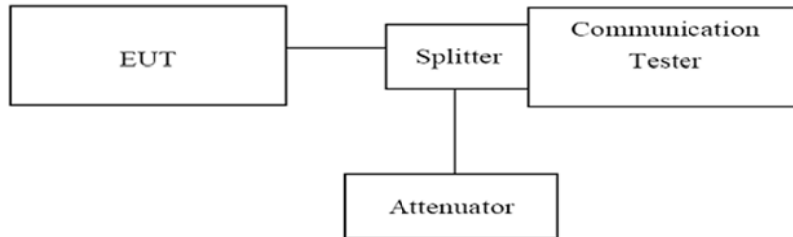
#### 4.4. Out of band emission at antenna terminals

##### LIMIT

Part 24.238 and Part 22.917 specify that 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 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.

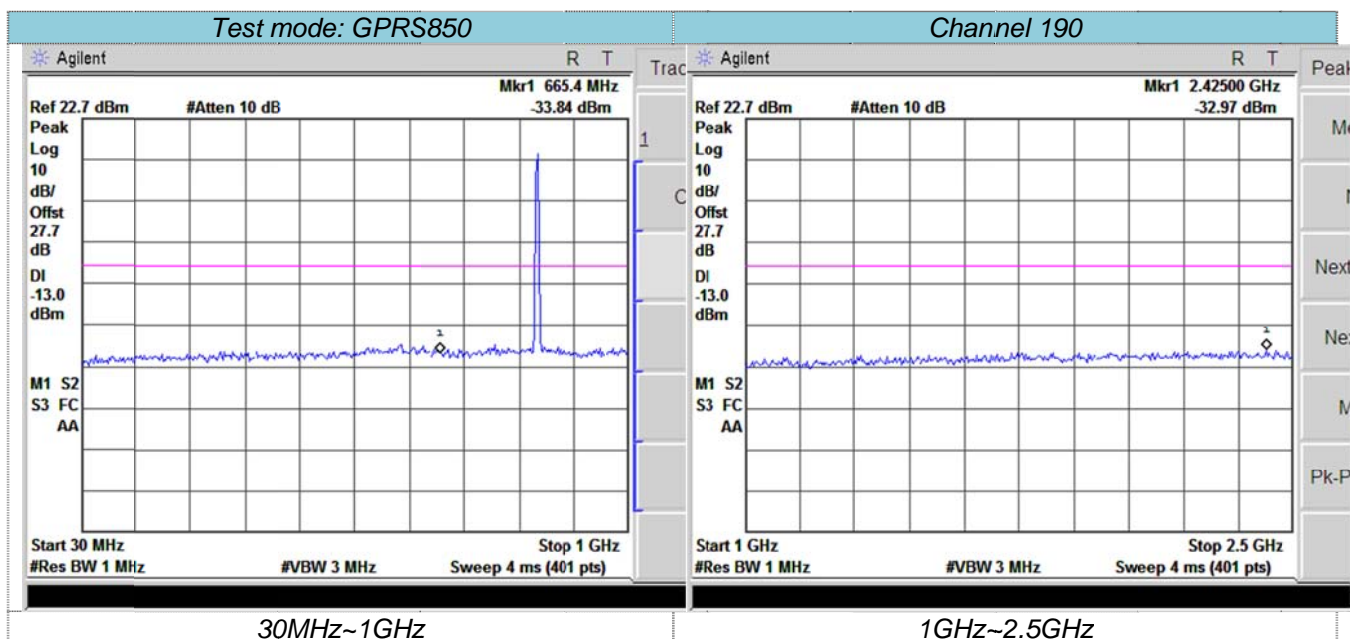
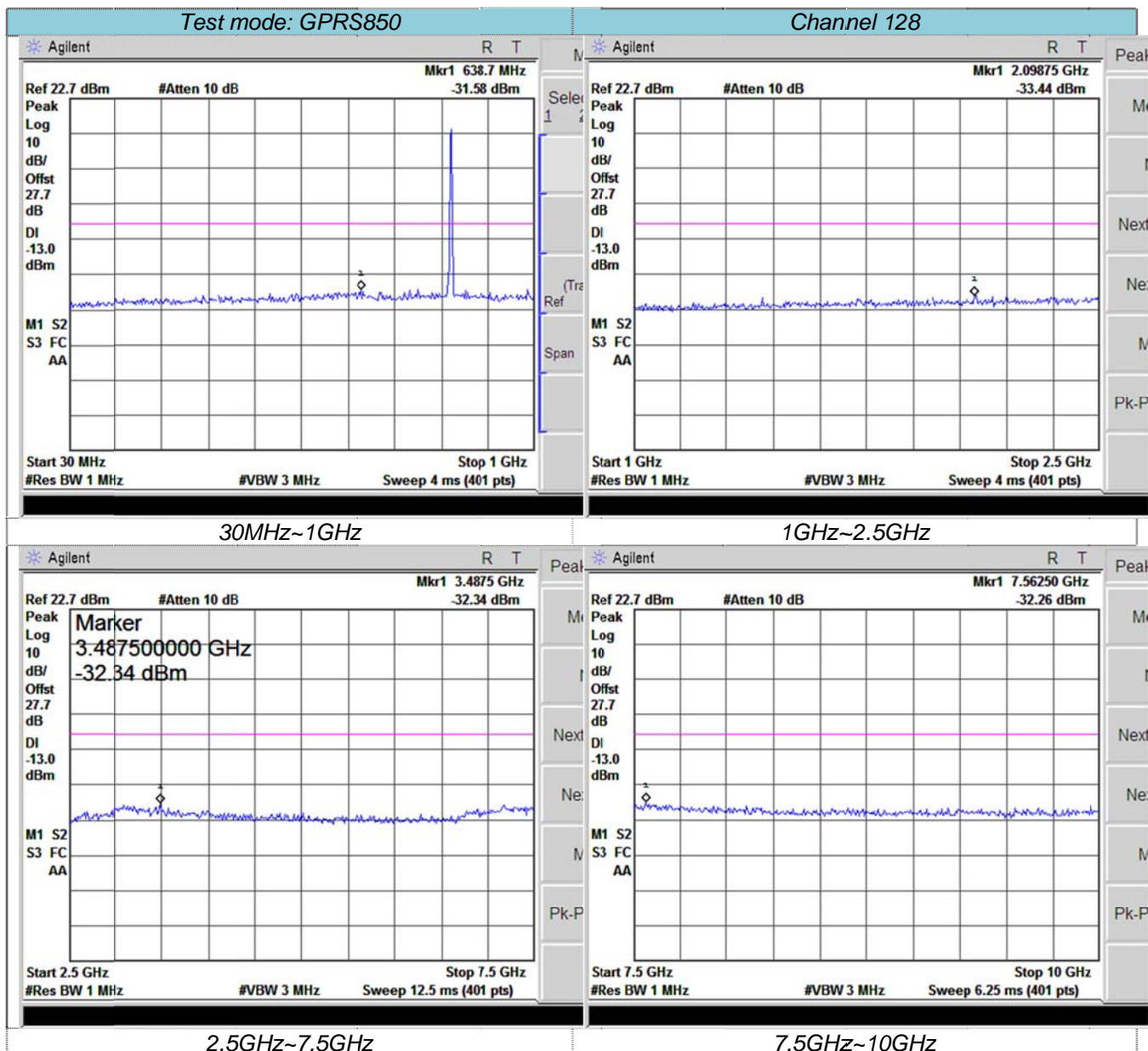
##### TEST CONFIGURATION

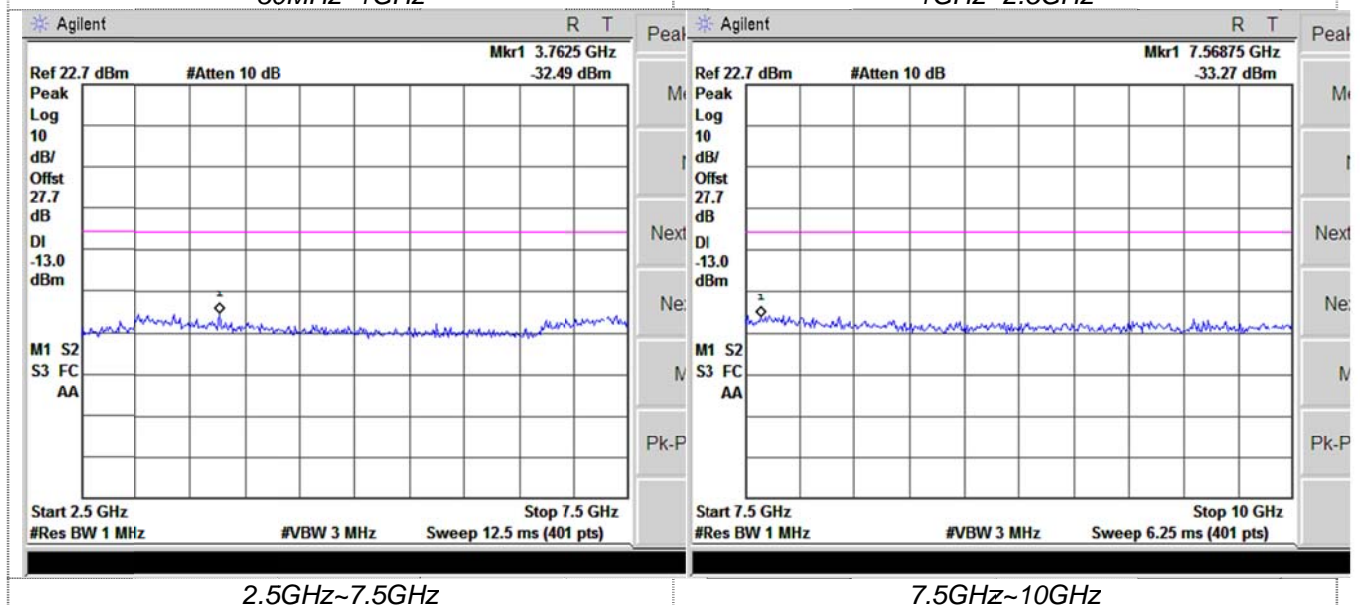
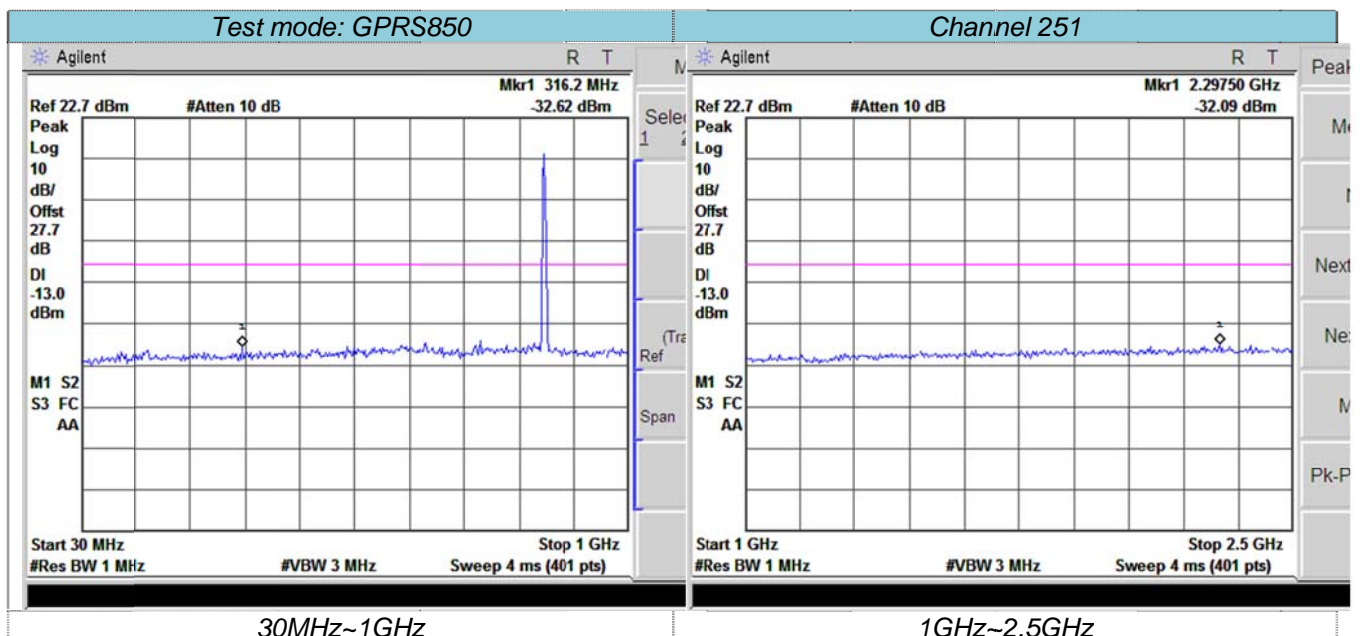
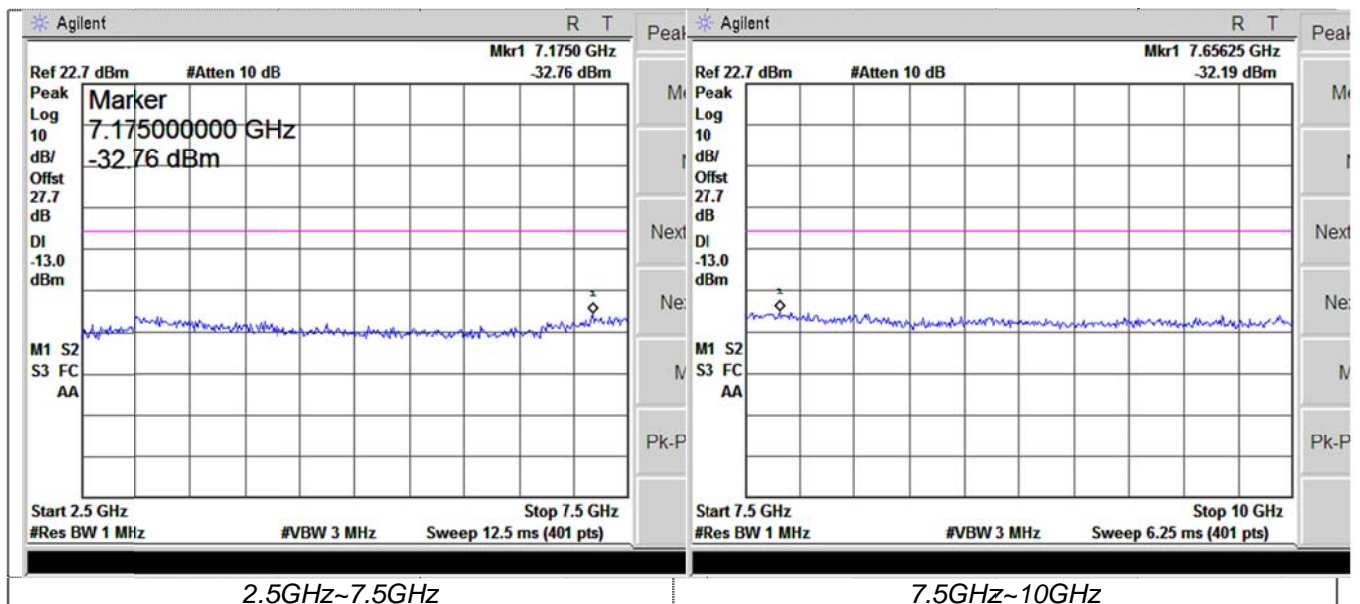


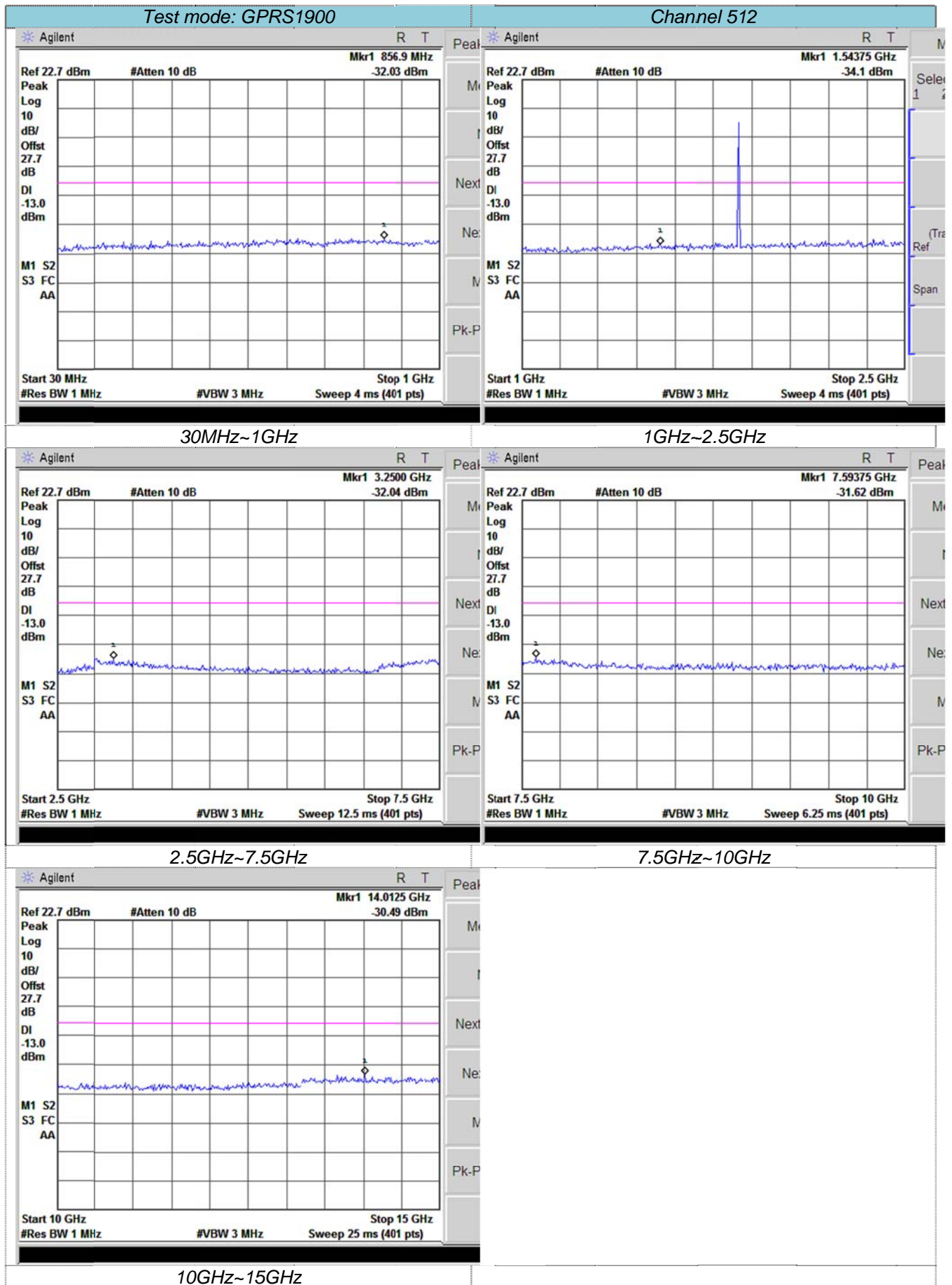
##### TEST PROCEDURE

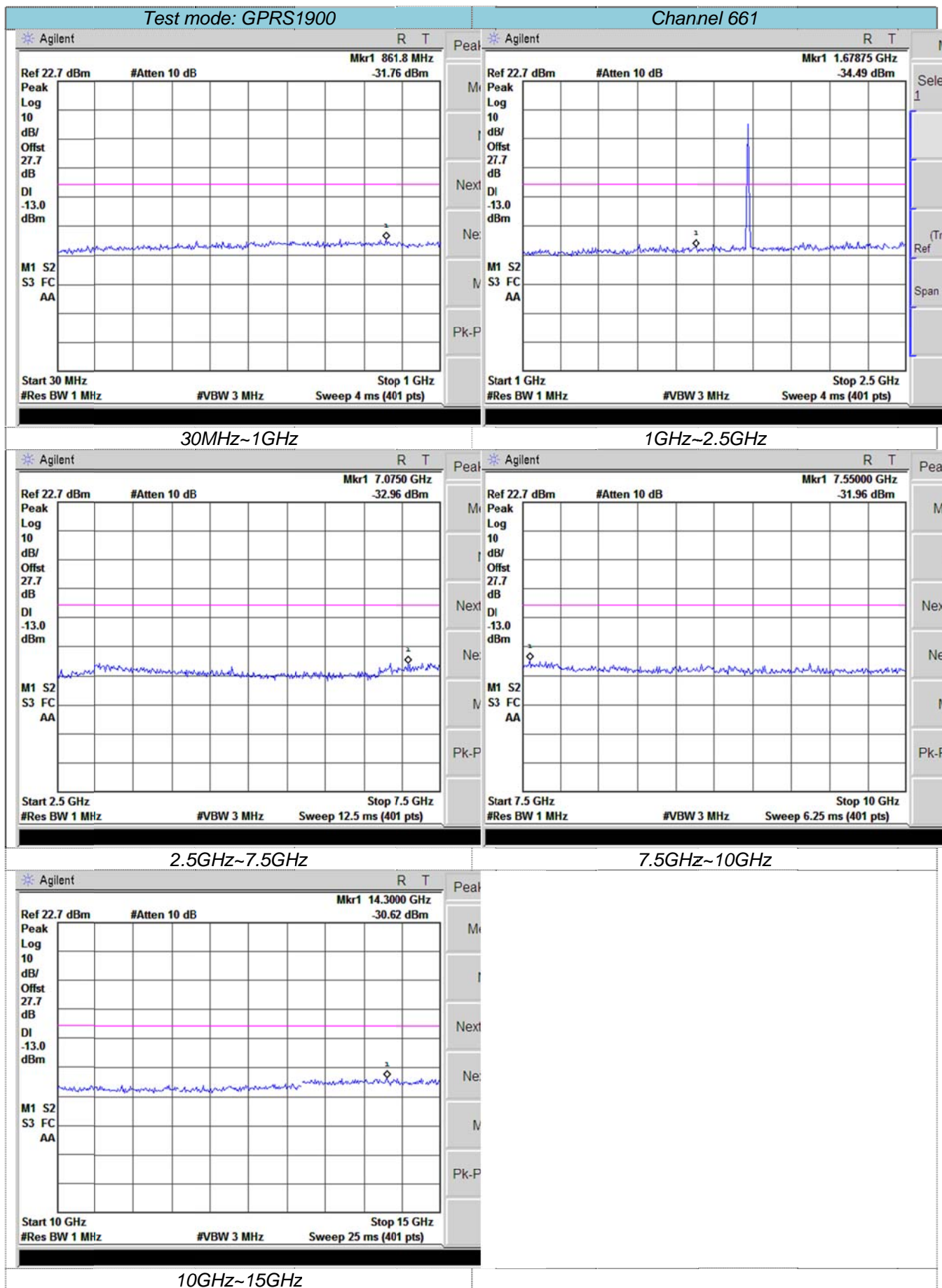
1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
3. For the out of band: Set the RBW= 1MHz, VBW = 3MHz, Start=30MHz, Stop= 10th harmonic.

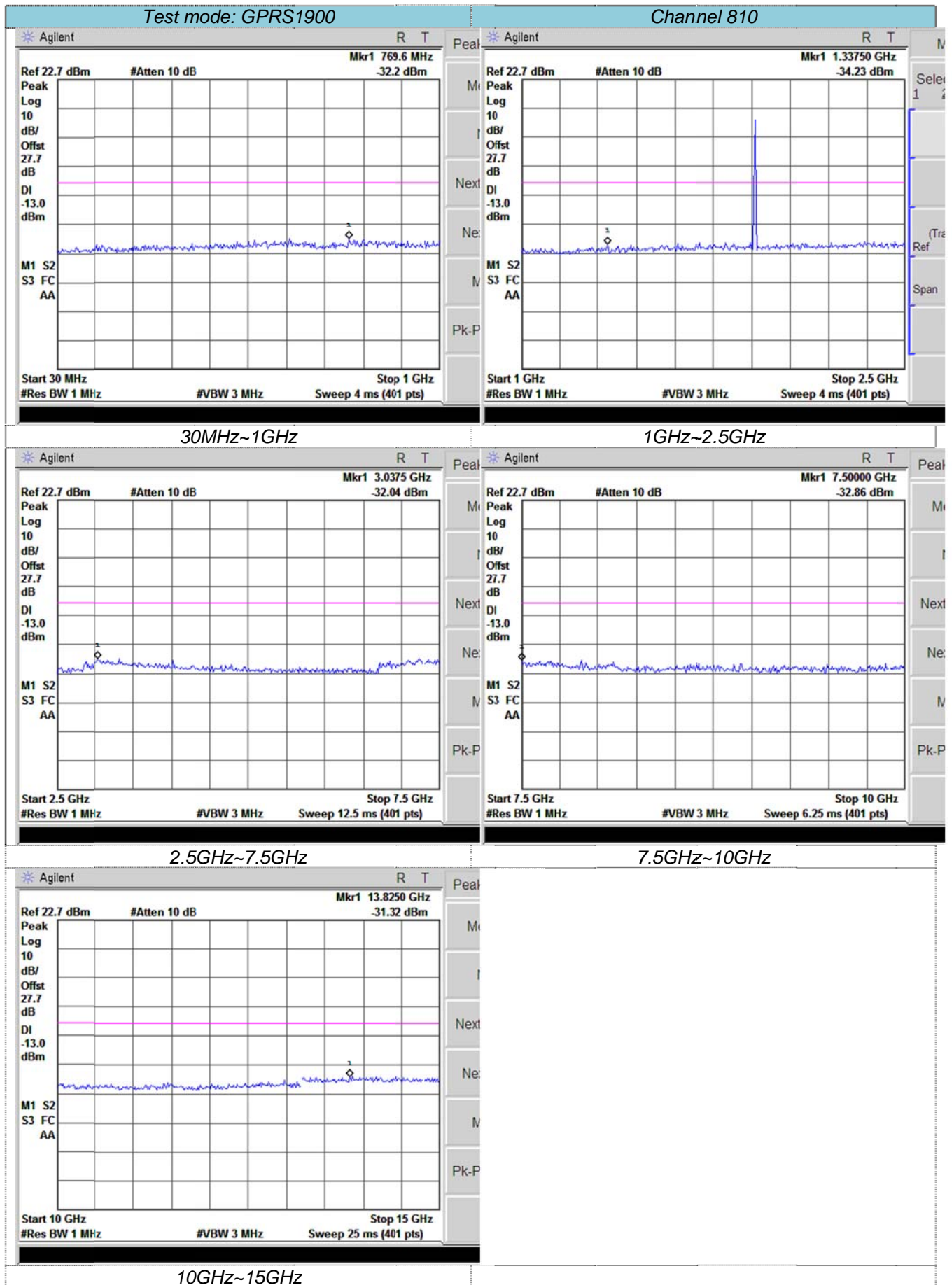
##### TEST RESULTS











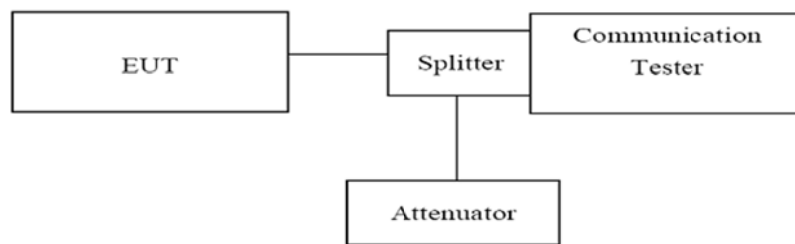
## 4.5. Band Edge compliance

### LIMIT

Part 24.238 and Part 22.917 specify that 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 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.

### TEST CONFIGURATION



### TEST PROCEDURE

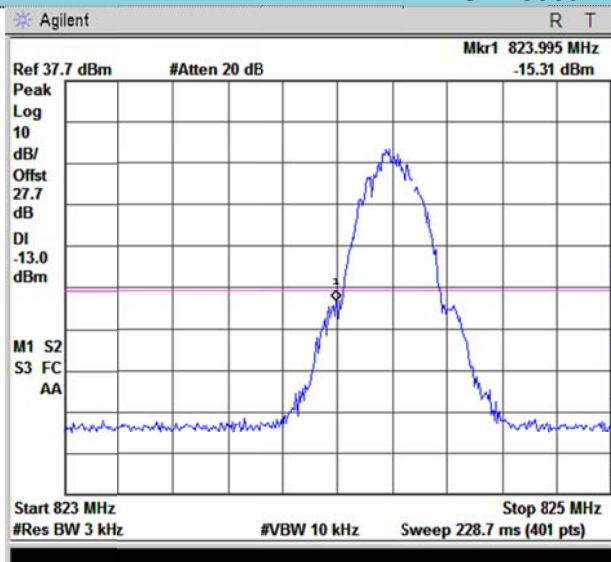
1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. For the bandedge: 2G: Set the RBW=10KHz, VBW = 30KHz, Sweep time= Auto  
3G: Set the RBW=100KHz, VBW = 300KHz, Sweep time= Auto

### TEST RESULTS

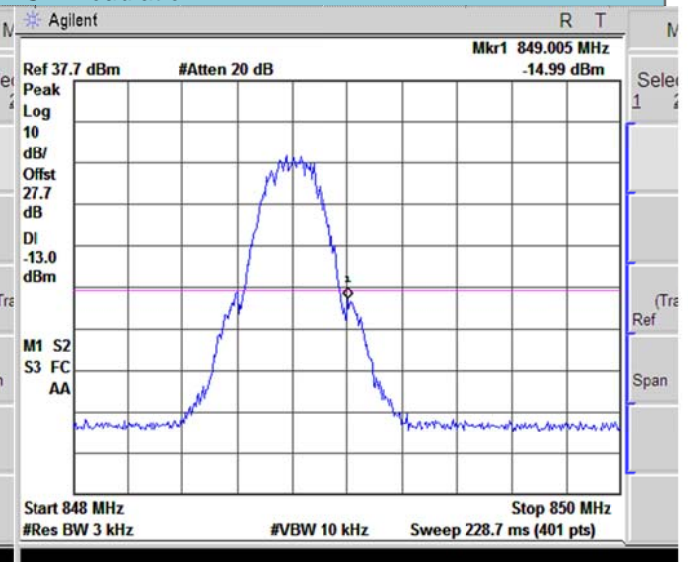
GPRS850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.99	-15.31	-13.00	Pass
251	848.80	849.00	-14.99	-13.00	Pass

GPRS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1850.00	-16.36	-13.00	Pass
810	1909.80	1910.00	-15.82	-13.00	Pass

## GPRS850 For GMSK Moudlation

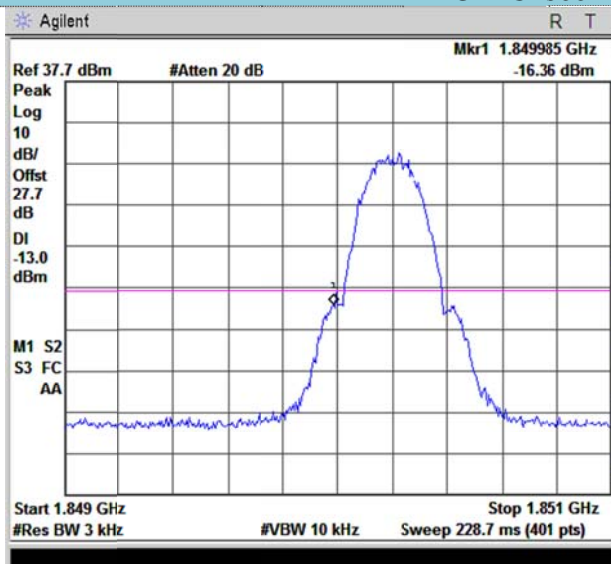


Channel 128

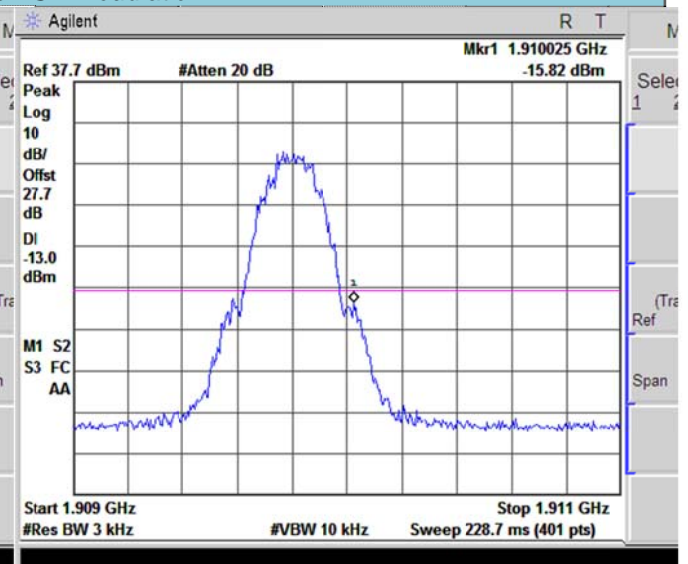


Channel 251

## GPRS1900 For GMSK Moudlation



Channel 512



Channel 810

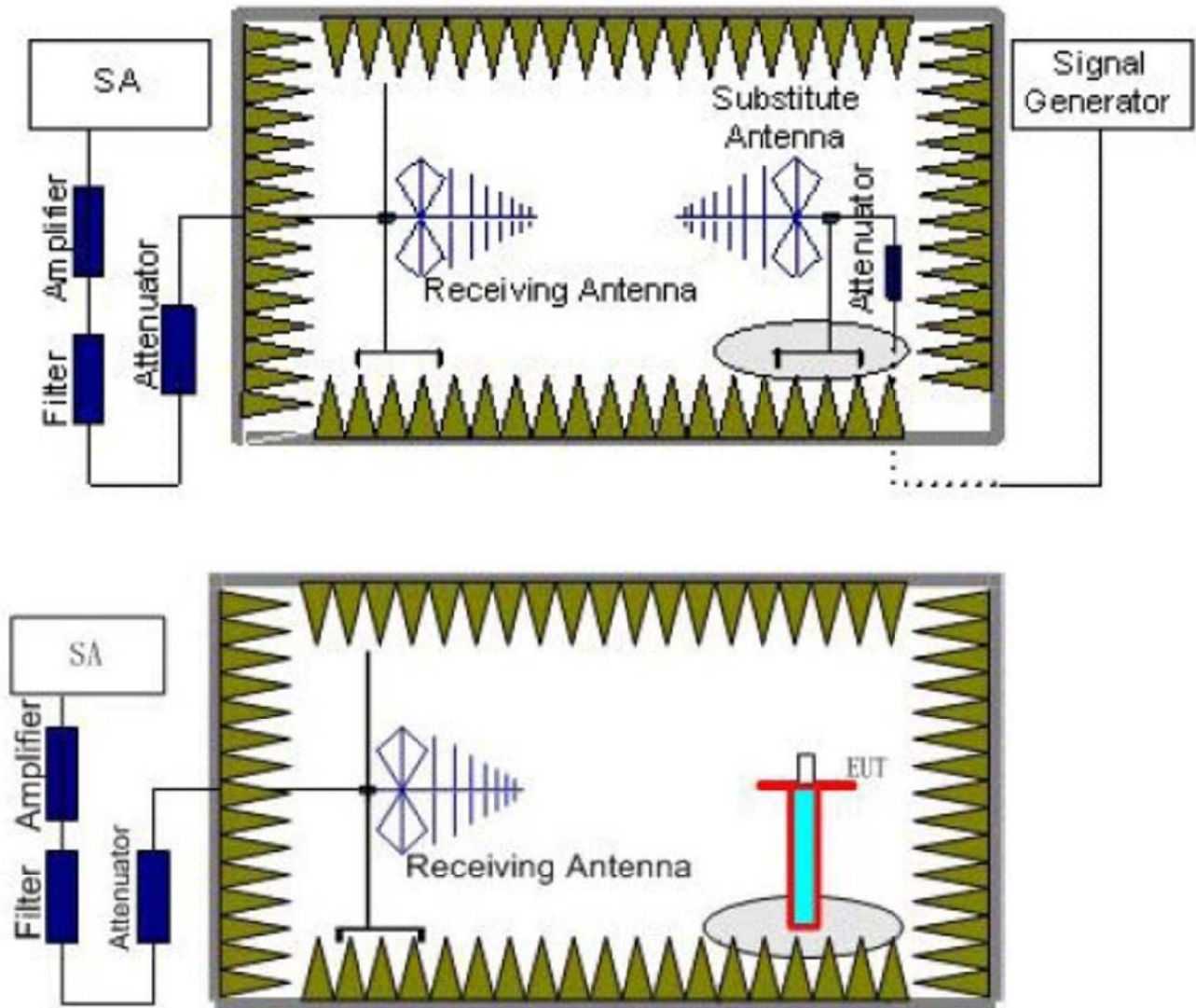
## 4.6. Radiated Power Measurement

### LIMIT

GSM850/WCDMA Band V: 7W ERP

PCS1900/WCDMA Band II: 2W EIRP

### TEST CONFIGURATION



### TEST PROCEDURE

1. EUT was placed on a 1.50 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 EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).

4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:  
 $\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$   
 We used SMF100A microwave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substitution test; The measurement results are amend as described below:  
 $\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.  
 ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

## **TEST RESULTS**

GSM:

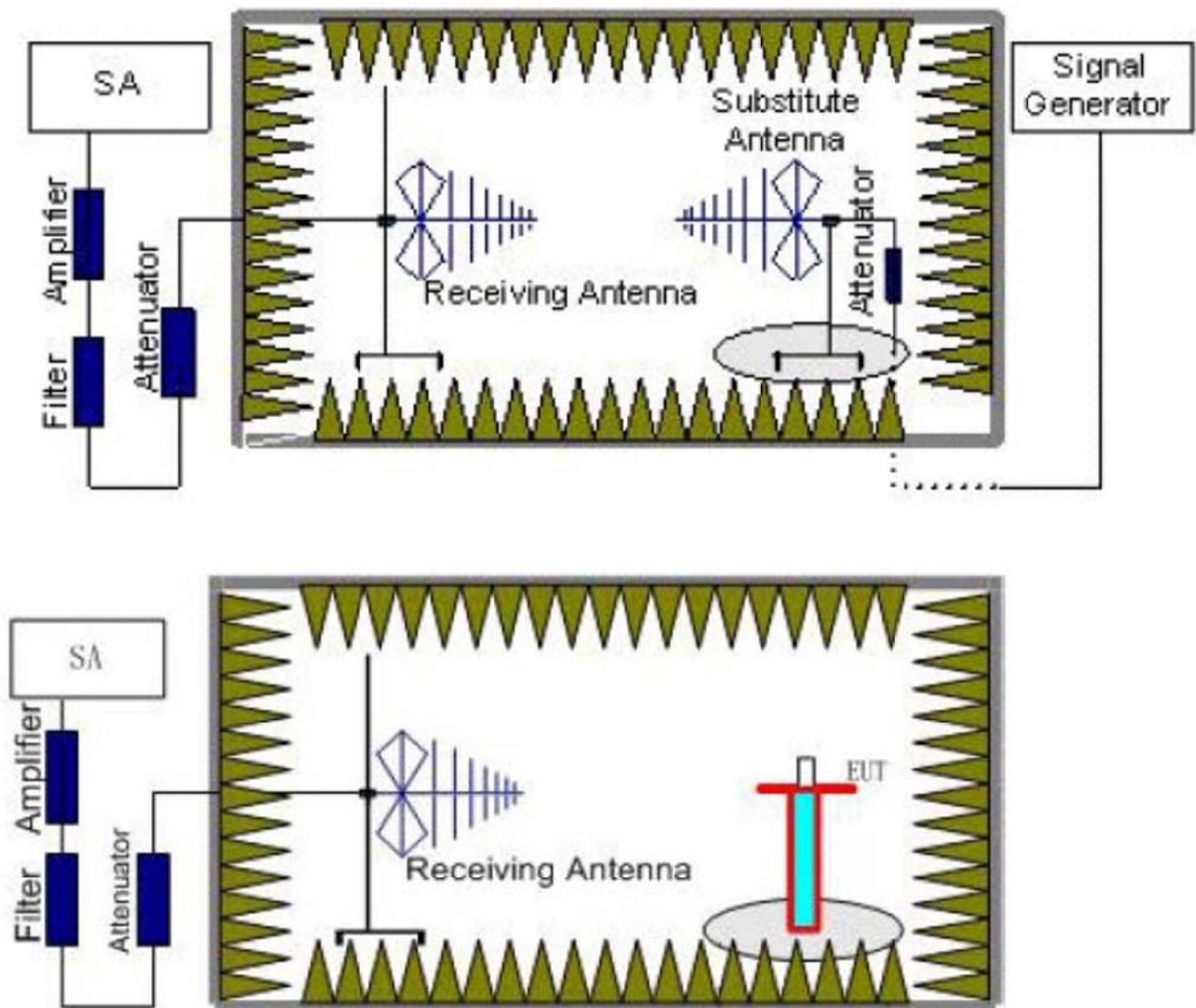
Mode	Channel	Antenna Pol.	ERP	Limit (dBm)	Result
GPRS850	128	V	30.47	38.45	Pass
		H	26.85		
	190	V	29.58		
		H	26.85		
	251	V	30.43		
		H	26.38		
GPRS1900	512	V	26.85	33.01	Pass
		H	23.47		
	661	V	26.24		
		H	23.48		
	810	V	27.45		
		H	23.79		

## 4.7. Radiated Spurious Emission

### LIMIT

-13dBm

### TEST CONFIGURATION



### TEST RESULTS

1. EUT was placed on a 1.50 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 EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).

4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:  
Power(EIRP)=PMea- PAg - Pcl + Ga  
We used SMF100A microwave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substitution test; The measurement results are amend as described below:  
Power(EIRP)=PMea- Pcl + Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.  
ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

## **TEST RESULTS**

GPRS850					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
128	1648.40	Vertical	-40.42	-13.00	Pass
	2472.60	V	-43.27		
	3296.80	V	-45.93		
	4121.00	V	-45.84		
	4945.20	V	---		
	1648.40	Horizontal	-44.79	-13.00	Pass
	2472.60	H	-46.84		
	3296.80	H	-48.57		
	4121.00	H	-48.69		
	4945.20	H	---		
190	1673.20	Vertical	-39.74	-13.00	Pass
	2509.80	V	-44.82		
	3346.40	V	-45.75		
	4183.00	V	-45.47		
	5019.60	V	---		
	1673.20	Horizontal	-43.95	-13.00	Pass
	2509.80	H	-46.72		
	3346.40	H	-48.49		
	4183.00	H	-48.65		
	5019.60	H	---		
251	1697.60	Vertical	-41.82	-13.00	Pass
	2546.40	V	-43.47		
	3395.20	V	-45.53		
	4244.00	V	-45.39		
	5092.80	V	---		
	1697.60	Horizontal	-44.82	-13.00	Pass
	2546.40	H	-46.74		
	3395.20	H	-48.35		
	4244.00	H	-48.46		
	5092.80	H	---		

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.

GPRS1900					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
512	3700.40	Vertical	-42.84	-13.00	Pass
	5550.60	V	-40.38		
	7400.80	V	-44.74		
	9251.00	V	-43.58		
	11101.20	V	---		
	3700.40	Horizontal	-45.85	-13.00	Pass
	5550.60	H	-44.78		
	7400.80	H	-40.58		
	9251.00	H	-47.25		
	11101.20	H	---		
661	3760.00	Vertical	-40.25	-13.00	Pass
	5640.00	V	-40.76		
	7520.00	V	-44.97		
	9400.00	V	-43.52		
	11280.00	V	---		
	3760.00	Horizontal	-43.38	-13.00	Pass
	5640.00	H	-44.58		
	7520.00	H	-48.76		
	9400.00	H	-43.85		
	11280.00	H	---		
810	3819.60	Vertical	-42.97	-13.00	Pass
	5729.40	V	-40.43		
	7639.20	V	-44.65		
	9549.00	V	-43.99		
	11458.80	V	---		
	3819.60	Horizontal	-45.34	-13.00	Pass
	5729.40	H	-44.73		
	7639.20	H	-47.87		
	9549.00	H	-47.69		
	11458.80	H	---		

Remark :

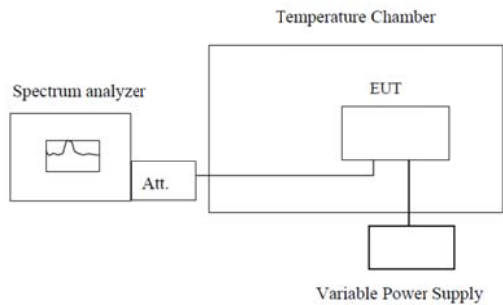
1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

#### 4.8. Frequency stability V.S. Temperature measurement

##### LIMIT

2.5ppm

##### TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

##### TEST PROCEDURE

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

##### TEST RESULTS

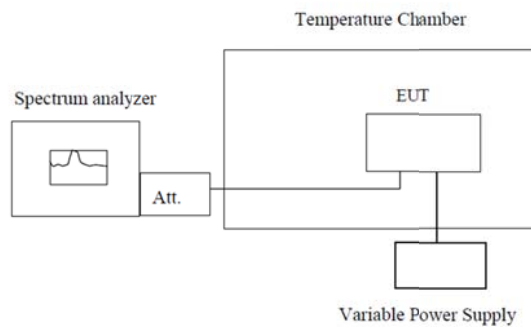
Reference Frequency: GPRS850 Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	28	0.0335	2.5	Pass
	-20	32	0.0383		
	-10	43	0.0514		
	0	33	0.0394		
	10	36	0.0430		
	20	42	0.0502		
	30	38	0.0454		
	40	43	0.0514		
	50	36	0.0430		
Reference Frequency: GPRS1900 Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	38	0.0202	2.5	Pass
	-20	36	0.0191		
	-10	43	0.0229		
	0	48	0.0255		
	10	43	0.0229		
	20	36	0.0191		
	30	34	0.0181		
	40	34	0.0181		
	50	42	0.0223		

## 4.9. Frequency stability V.S. voltage

### LIMIT

2.5ppm

### TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

### TEST PROCEDURE

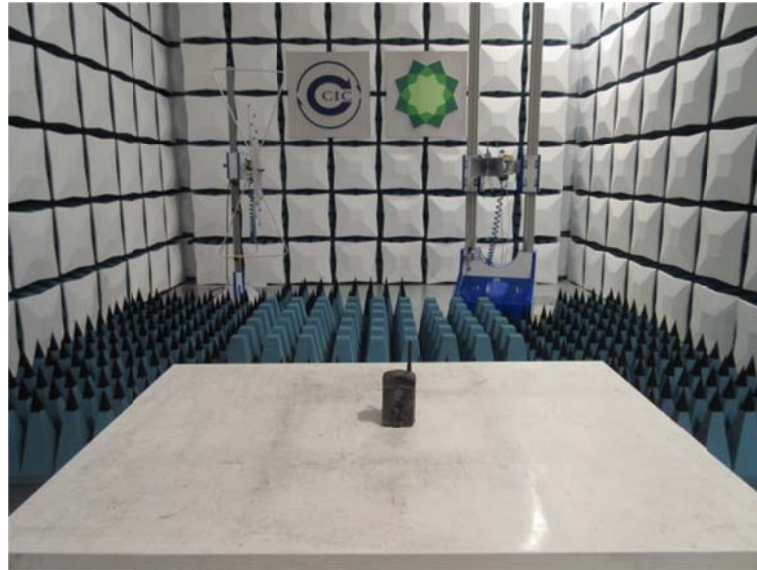
1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

### TEST RESULTS

Reference Frequency: GPRS850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	43	0.0514	2.5	Pass
	3.70	38	0.0454		
	3.40	44	0.0526		
Reference Frequency:GPRS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	39	0.0207	2.5	Pass
	3.70	42	0.0223		
	3.40	33	0.0176		

## 5. Test Setup Photos of the EUT

Radiated emission:



Conducted emission:



## 6. External and Internal Photos of the EUT

### External photos of the EUT

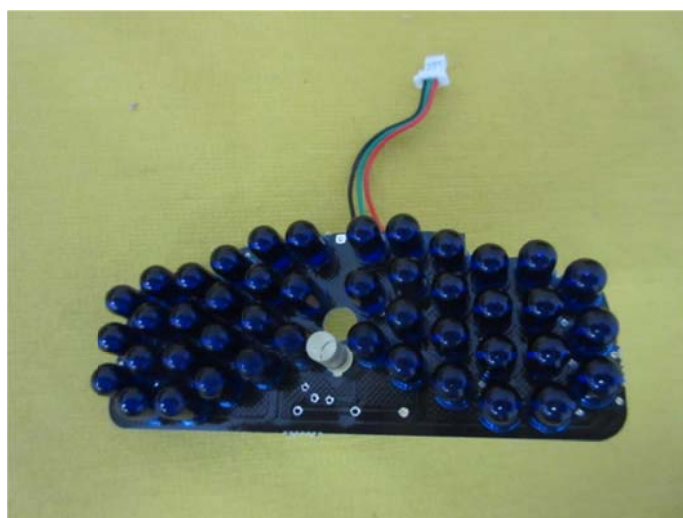
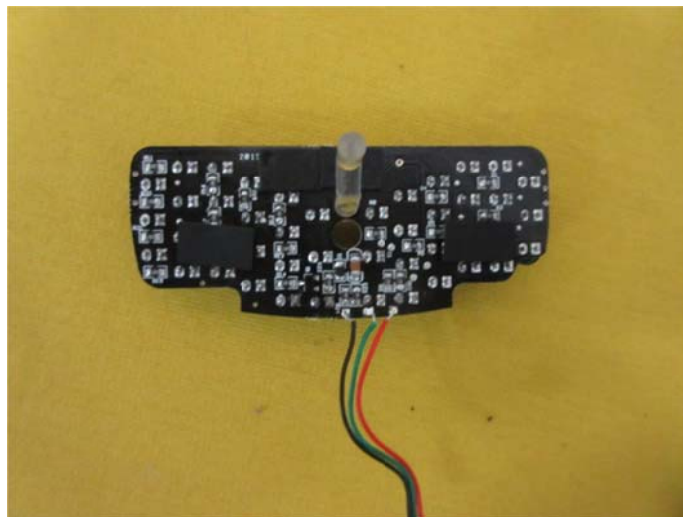


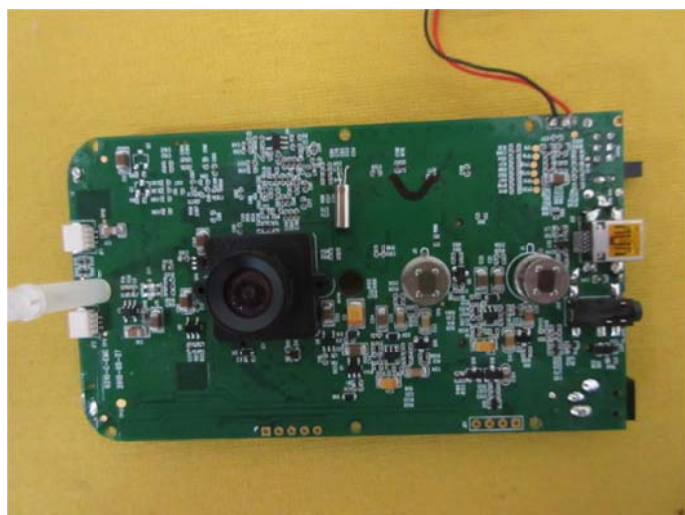
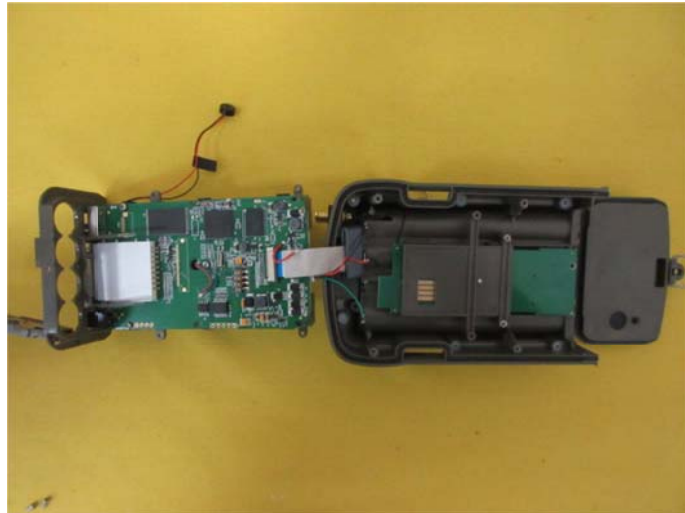


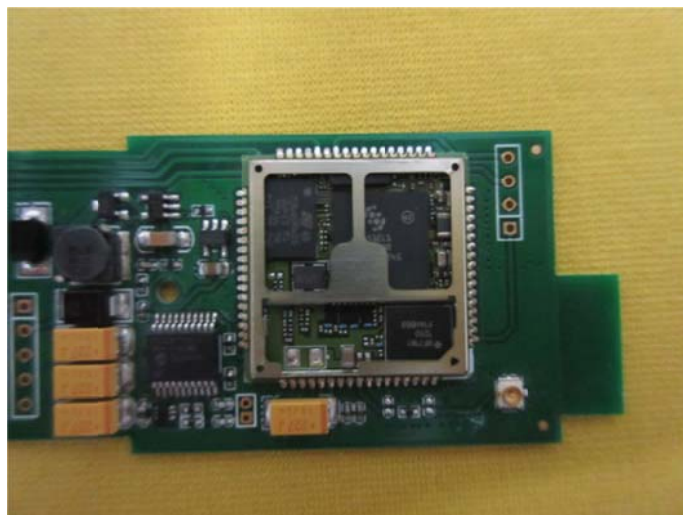
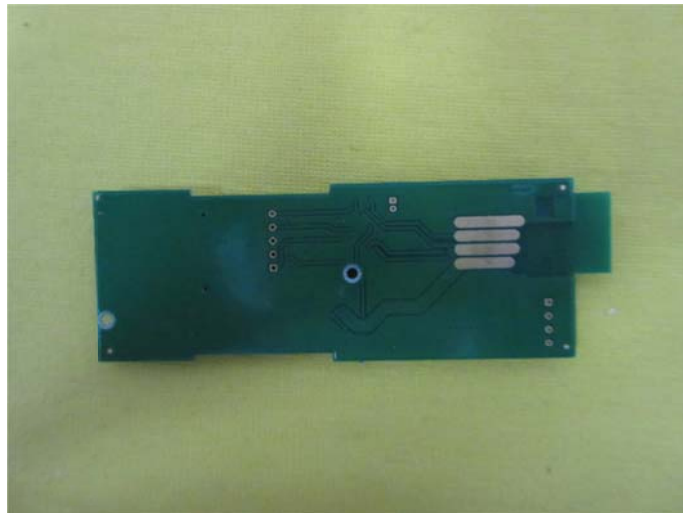


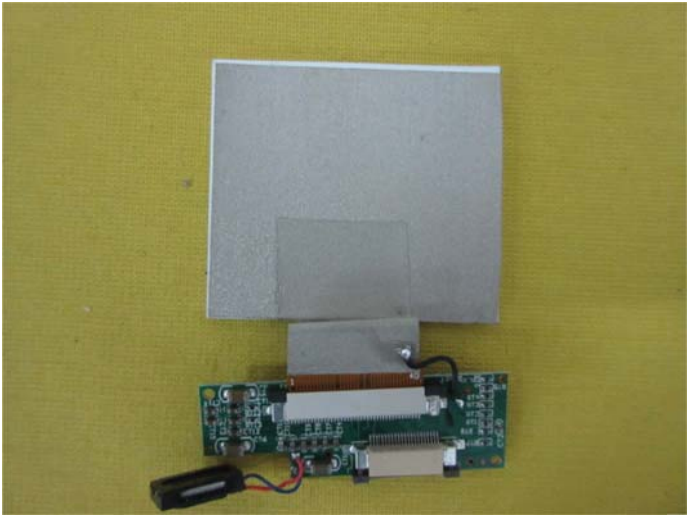


### **Internal photos of the EUT**









.....End of Report.....