

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 22 SUBPART H, PART 24 SUBPART E

OF

**Product Name:** Smartphone

**Brand Name:** HTC

**Marketing Name:** Desire 310

**Model No.:** 0PA2110

**Model Difference:** N/A

**FCC ID:** NM80PA2110

**Report No.:** ER/2014/10037

**Issue Date:** Feb. 13, 2014

**FCC Rule Part:** 2, 22H & 24E

**HTC Corporation**

**Prepared for:** 1F, 6-3 Baoqiang Road, Xindian District, New Taipei City, Taiwan

**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

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## VERIFICATION OF COMPLIANCE

**Applicant:** HTC Corporation  
 1F, 6-3 Baoqiang Road, Xindian District, New Taipei City, Taiwan

**Product Name:** Smartphone

**Brand Name:** HTC

**Marketing Name:** Desire 310

**Model No.:** 0PA2110

**Model Difference:** N/A

**File Number:** ER/2014/10037

**FCC ID:** NM80PA2110

**Date of test:** Jan. 22, 2014 ~ Feb. 13, 2014

**Date of EUT Received:** Jan. 22, 2014

**We hereby certify that:**

The above equipment was tested by SGS Lionwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA-603-C-2004 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rule PART 22 subpart H, PART 24 subpart E.

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

**Test By:** *Marcus Tseng* **Date:** Feb. 13, 2014

*Marcus Tseng / Engineer*

**Prepared By:** *Tiffany Kao* **Date:** Feb. 13, 2014

*Tiffany Kao / Clerk*

**Approved By:** *Jim Chang* **Date:** Feb. 13, 2014

*Jim Chang / Supervisor*

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## Version

Version No.	Date	Description
00	Feb. 13, 2014	Initial creation of document

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## 1. GENERAL PRODUCT INFORMATION

General:

Product Name:	Smartphone	
Brand Name:	HTC	
Marketing Name:	Desire 310	
Model No.:	0PA2110	
Model difference:	N/A	
Hardware Version:	DVT	
Software Version:	0.84.161.2	
Data Cable	Model: PCB042100307-4,, Supplier: JESS-LINK PRODUCTS CO. LTD	
Simple Hands-Free	1. Model No.: KJAH4012AEOCB, Supplier: KINGSTATE 2. Model No.: HS250, Supplier: Merry Electronics Co., Ltd	
Power Supply:	3.8Vdc from rechargeable battery or 100-240V by AC/DC power adapter	
	Battery:	Model: B0PA2100, Supplier: SUNWODA
	Adapter:	1. Model No.: TC U250, Supplier: phihong 2. Model No.: TC U250, Supplier: Salcomp

GSM / GPRS:

Cellular Phone Standards Frequency Range and Power:	Operating Frequency		Rated Power
	GSM/GPRS 850, Class 12	824.2 MHz– 848.8 MHz	33 dBm
	EDGE 850, Class 12	824.2 MHz– 848.8 MHz	33 dBm
	GSM/GPRS 1900, Class 12	1850.2MHz – 1909.8MHz	30 dBm
	EDGE 1900, Class 12	1850.2MHz – 1909.8MHz	30 dBm
Type of Emission	GSM 850: 248KGXW, GSM 1900: 248KGXW GPRS 850: 247KGXW, GPRS 1900: 247KGXW EDGE 850: 258KG7W, EDGE 1900: 252KG7W		
IMEI:	351912060011070		

This test report applies for 850 /1900 GSM/GPRS/EDGE.

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Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
GSM 850	3.8	249
GSM 1900	3.8	282
GPRS 850	3.8	293
GPRS 1900	3.8	278
EDGE 850	3.8	269
EDGE 1900	3.8	302

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**1.1. Related Submittal(s) / Grant (s)**

This submittal(s) (test report) is intended for **FCC ID: NM80PA2110** filing to comply with Section Part 22 subpart H, Part 24 subpart E of the FCC CFR 47 Rules.

**1.2. Test Methodology**

Both conducted and radiated testing were performed according to the procedures document of TIA/EIA 603C and FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

The setting as describes in TS 151 010-1, TS 134 121-1, TS136 521-1 is followed to apply the setting on the simulator in order to simulate the environment of respective wireless technology.

The Output power Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, WCDMA / HSPA / LTE) was used for EUT and Base station setting.

KDB971168 D01 Power Meas license Digital System v01 as the supplemental guideline to conduct the measurement, including Peak to Power Average Ratio, Average Power over the fundamental signal BW (EIRP/ERP), Signal Bandwidth, and Spurious Emission.

**1.3. Test Facility**

The measurement facilities used to collect the 3m/10m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number (2.948 listed) is: 990257

All equipment is calibrated externally and traceable to SI (International System of Unit).

**1.4. Special Accessories**

Not available for this EUT intended for grant.

**1.5. Equipment Modifications**

Not available for this EUT intended for grant.

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## 2. SYSTEM TEST CONFIGURATION

### 2.1. EUT Configuration

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

### 2.2. EUT Exercise

The EUT (Transmitter) was utilized in base-station simulator to fixate the Tx frequency of default test, and establish the communication for the purpose of the measurements.

### 2.3. Test Procedure

#### 2.3.1 AC Power Line Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4: 2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

#### 2.3.2 Conducted Measurement at Antenna Port:

According to measurement procured TIA/EIA 603C, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

#### 2.3.3 Radiated Emissions (ERP/EIRP):

According to measurement procured TIA/EIA 603C, The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13 of ANSI C63.4:2009.

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**2.4. Measurement Equipment Used:**

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014
Spectrum Analyzer	Agilent	E4440A	US41160416	03/15/2013	03/14/2014
Radio Communication Analyzer	R & S	CMU200	102189	06/17/2013	06/16/2014
Radio Communication Analyzer	Anritsu	MT8820C	6200995019	10/21/2013	10/20/2014
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2013	05/05/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014
DC Power Supply	Agilent	E3640A	KR93300208	07/24/2013	07/23/2014

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ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	01/20/2014	01/19/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/22/2013	10/21/2014
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/02/2014	01/02/2015
Bilog Antenna	SCHWAZBECK	VULB9160	3158	11/27/2013	11/26/2014
Horn antenna	ETS.LINDGREN	3117	123995	05/31/2013	05/30/2014
Horn antenna	ETS.LINDGREN	3117	123991	01/20/2014	01/19/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	01/23/2014	01/22/2015
Horn Antenna	Schwarzbeck	BBHA9170	185	07/19/2013	07/18/2014
Network Analyze	Anritsu	MS4644A	1216312	05/23/2013	05/22/2014
Signal Generator	Agilent	E4438C	MY45093613	07/30/2013	07/29/2014
Pre-Amplifier	Agilent	8447D	1937A02834	01/03/2014	01/02/2015
Pre-Amplifier	Agilent	8449B	3008A00578	01/03/2014	01/02/2015
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/24/2014	01/23/2015
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2013	02/27/2014
Radio Communication Analyzer	R & S	CMU200	102189	06/17/2013	06/16/2014
Radio Communication	Anritsu	MT8820C	6200995019	10/21/2013	10/20/2014
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	HUBER+SUHNER	966_Tx	10m	01/03/2014	01/02/2015
Low Loss Cable	HUBER+SUHNER	966_Rx	3m	01/03/2014	01/02/2015
Filter 800-1000	Micro-Tronics	EWT	M2	02/28/2013	02/28/2014
Filter 1800-2000	Micro-Tronics	EWT	M2	02/28/2013	02/28/2014
Filter 1700-1800	Micro-Tronics	BRC15751	001	02/28/2013	02/28/2014
1GHz High Pass Filter	Micro-Tronics	HPM50108	32	02/28/2013	02/28/2014
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	02/28/2013	02/28/2014
3m Site NSA	SGS	966 chamber	N/A	07/15/2013	07/14/2014

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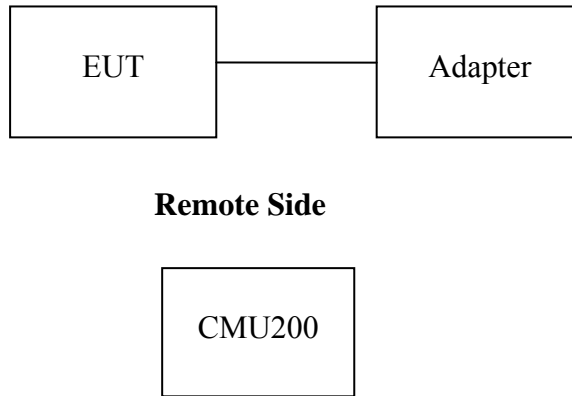
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## 2.5. Configuration of Tested System

**Fig. 2-1 Configuration of Tested System (Fixed Channel)**



**Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Universal Radio Communication Tester	R&S	CMU200	102189	shielded	Un-shielded

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### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §22.913(a)(2) §24.232(c)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% Occupied Bandwidth	Compliant
§2.1051 §22.917(a) §24.238(a)	Out of Band Emissions at Antenna Terminals and Band Edge	Compliant
§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	Compliant
§24.232(d)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235	Frequency Stability vs. Temperature	Compliant
§2.1055(d)(1) §22.355 §24.235	Frequency Stability vs. Voltage	Compliant

Max ERP/EIRP measurement result:

	dBm		W
GSM 850 Band	27.89	ERP	0.615
GSM 1900 Band	32.43	EIRP	1.750
GPRS 850 Band	27.47	ERP	0.558
GPRS 1900 Band	32.79	EIRP	1.901
EDGE 850 Band	24.68	ERP	0.294
EDGE 1900 Band	31.61	EIRP	1.449

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#### 4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition with continuous transmitting mode, linking to simulator.

Channel Low, Mid and High is set to test against each supported band with rated data rate that yields the highest emission.

The list of channel selected to conduct the measurements

GSM/GPRS/EDGE 850:

Channel Low: AFRCN 128 at 824.2MHz, Channel Mid: AFRCN 190 at 836.6MHz, Channel High: AFRCN 251 at 848.8MHz.

GSM/GPRS/EDGE 1900:

Channel Low: AFRCN 512 at 1850.2MHz, Channel Mid: AFRCN 661 at 1880.0MHz, Channel High AFRCN 810 at 1909.8MHz

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for GSM/GPRS/EDGE. The worst-case of E2 position for GSM/GPRS 850/ 1900 were reported.

#### The evaluation of Test Mode as configured in UE presented on the Test Report:

**GSM/GPRS:**

#### Radiated Spurious Emission

The Measurement Data of field strength of spurious emission with respect to supported configuration of given application (Transmission Band, Modulation Scheme, Resource Block) have been pre-scanned, and the result that yields in the highest emission close to the limit are presented on the test report.

GSM 850 and GPRS 1900 is the worst-case found in the pre-scanned measurement, and only data that yields the worst case is revealed on the test report.

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## 5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.42 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization = +/- 4.62dB
99% Occupied Bandwidth	+/- 123.36 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 1.55 dB
Peak to Average Ratio	+/- 1.55 dB
Frequency Stability vs. Temperature	+/- 123.36 Hz
Frequency Stability vs. Voltage	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC= +/- 0.2%

### Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB
	180MHz - 417MHz: +/- 3.19dB
	0.417GHz - 1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB
	167MHz - 500MHz: +/- 3.44dB
	0.5GHz - 1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

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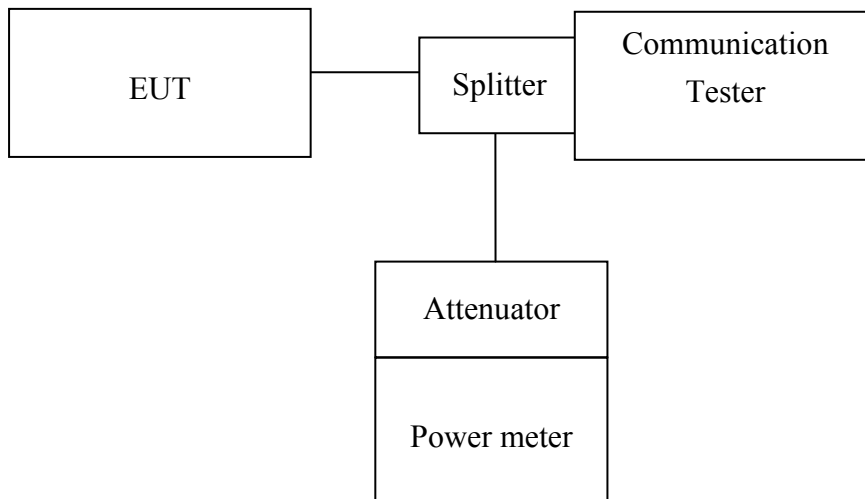
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## 6. RF POWER OUTPUT MEASUREMENT

### 6.1. Standard Applicable:

According to FCC §2.1046

### 6.2. Test Set-up:



*Note: Measurement setup for testing on Antenna connector*

### 6.3. Measurement Procedure:

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

TS 151 010-1 is reference to conduct the test measurement of output power. The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices) was used for EUT and Base station setting. RMC 12.2kps is used for this testing

Necessary Communication complying with 24.232 (c)

Set CMU200 (base-station simulator) MS Signal with packet data submenu; SLOT Configuration

Set appropriate level to verify if or not power on mobile station's link with simulator still exists.

### 6.4. Measurement Equipment Used:

Refer to section 2.4 in this report

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6.5. Measurement Result:

6.5.1. RF Conducted Output Power

6.5.1.1.: GPRS/EDGE (GMSK; 8-PSK)

Result:

EUT Mode	Frequency (MHz)	CH	Peak Power (dBm)	Average Burst Power (dBm)
GSM 850	824.2	128	32.60	32.40
	836.6	190	32.60	32.40
	848.8	251	32.50	32.30

EUT Mode	Frequency (MHz)	CH	Peak Power (dBm)	Average Burst Power (dBm)
GSM 1900	1850.2	512	29.80	29.70
	1880.0	661	29.60	29.50
	1909.8	810	29.50	29.30

EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 1UP) Class 8 (dBm)	Average Burst Power (4DN 1UP) Class 8 (dBm)	Peak Power (4DN 2UP) Class 10 (dBm)	Average Burst Power (4DN 2UP) Class 10 (dBm)
GPRS 850	824.2	128	32.60	32.40	30.50	30.30
	836.6	190	32.60	32.40	30.50	30.30
	848.8	251	32.50	32.30	30.40	30.20

EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 3UP) Class 11 (dBm)	Average Burst Power (4DN 3UP) Class 11 (dBm)	Peak Power (4DN 4UP) Class 12 (dBm)	Average Burst Power (4DN 4UP) Class 12 (dBm)
GPRS 850	824.2	128	29.00	28.90	28.00	27.90
	836.6	190	29.00	28.80	28.00	27.90
	848.8	251	28.80	28.70	27.80	27.70

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EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 1UP) Class 8 (dBm)	Average Burst Power (4DN 1UP) Class 8 (dBm)	Peak Power (4DN 2UP) Class 10 (dBm)	Average Burst Power (4DN 2UP) Class 10 (dBm)
GPRS 1900	1850.2	512	29.80	29.70	26.40	26.30
	1880.0	661	29.60	29.50	26.50	26.40
	1909.8	810	29.50	29.30	26.50	26.40

EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 3UP) Class 11 (dBm)	Average Burst Power (4DN 3UP) Class 11 (dBm)	Peak Power (4DN 4UP) Class 12 (dBm)	Average Burst Power (4DN 4UP) Class 12 (dBm)
GPRS 1900	1850.2	512	25.10	25.00	24.00	23.90
	1880.0	661	25.20	25.10	24.20	24.00
	1909.8	810	25.30	25.10	24.20	24.00

EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 1UP) Class 8 (dBm)	Average Burst Power (4DN 1UP) Class 8 (dBm)	Peak Power (4DN 2UP) Class 10 (dBm)	Average Burst Power (4DN 2UP) Class 10 (dBm)
EDGE 850	824.2	128	30.00	27.00	27.00	24.00
	836.6	190	30.00	26.80	27.00	24.00
	848.8	251	30.00	26.80	27.00	24.00

EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 3UP) Class 11 (dBm)	Average Burst Power (4DN 3UP) Class 11 (dBm)	Peak Power (4DN 4UP) Class 12 (dBm)	Average Burst Power (4DN 4UP) Class 12 (dBm)
EDGE 850	824.2	128	27.10	24.20	27.10	24.10
	836.6	190	27.00	24.00	27.00	23.90
	848.8	251	27.00	24.00	27.00	23.90

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EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 1UP) Class 8 (dBm)	Average Burst Power (4DN 1UP) Class 8 (dBm)	Peak Power (4DN 2UP) Class 10 (dBm)	Average Burst Power (4DN 2UP) Class 10 (dBm)
EDGE 1900	1850.2	512	29.20	26.50	25.90	22.70
	1880.0	661	29.00	26.30	25.90	22.70
	1909.8	810	28.80	26.30	25.90	22.70

EUT Mode	Frequency (MHz)	CH	Peak Power (4DN 3UP) Class 11 (dBm)	Average Burst Power (4DN 3UP) Class 11 (dBm)	Peak Power (4DN 4UP) Class 12 (dBm)	Average Burst Power (4DN 4UP) Class 12 (dBm)
EDGE 1900	1850.2	512	25.90	22.70	25.90	22.70
	1880.0	661	25.90	22.70	25.90	22.70
	1909.8	810	25.80	22.70	25.90	22.70

Cable loss offset Low Band (Low Band): 0.5dBm  
 Cable loss offset High Band (High Band): 0.9dBm

**6.5.2. Minimum Communications Power Measurement PCS 1900 band**

PCL	0	1	2	3	4	5	6	7	8
Output power (dBm)	29.6	28.2	26.3	24.3	22.2	20.2	18.2	16.3	14.2

PCL	9	10	11	12	13	14	15
Output power (dBm)	12.2	10.1	8.1	6.2	4.1	2.5	1.3

Note: The EUT output power was controlled by simulator. Set Communication Tester CMU200 PCL as above, and get the mobile phone output power reading.

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## 7. PEAK TO AVERAGE RATIO

### 7.1. Standard Applicable:

FCC 24.232 (d)

Peak transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of rms-equivalent voltage.

The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

To measure transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission shall not exceed 13 dB.

### 7.2. Test SET-UP (Block Diagram of Configuration):

Refer to section 2.4 in this report

### 7.3. Measurement Procedure:

Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;

Set the number of counts to a value that stabilizes the measured CCDF curve;

### 7.4. Measurement Result:

Refer to next page for plot.

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Figure 7-1: GSM 1900 Channel Low

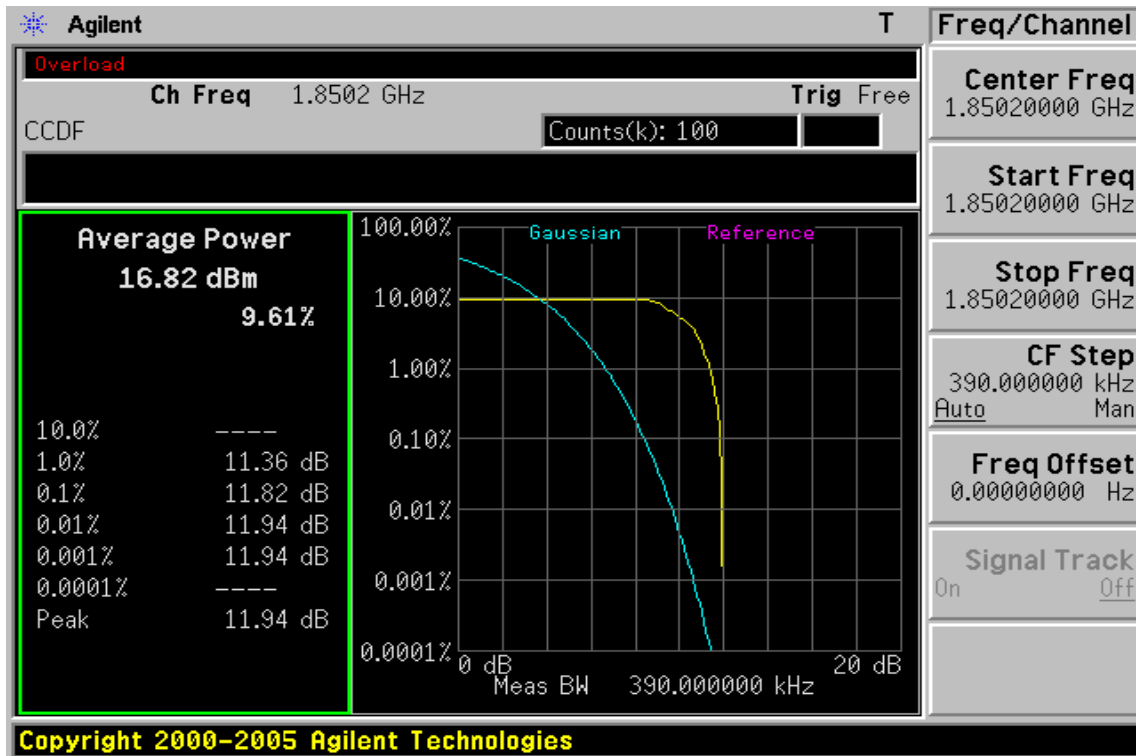
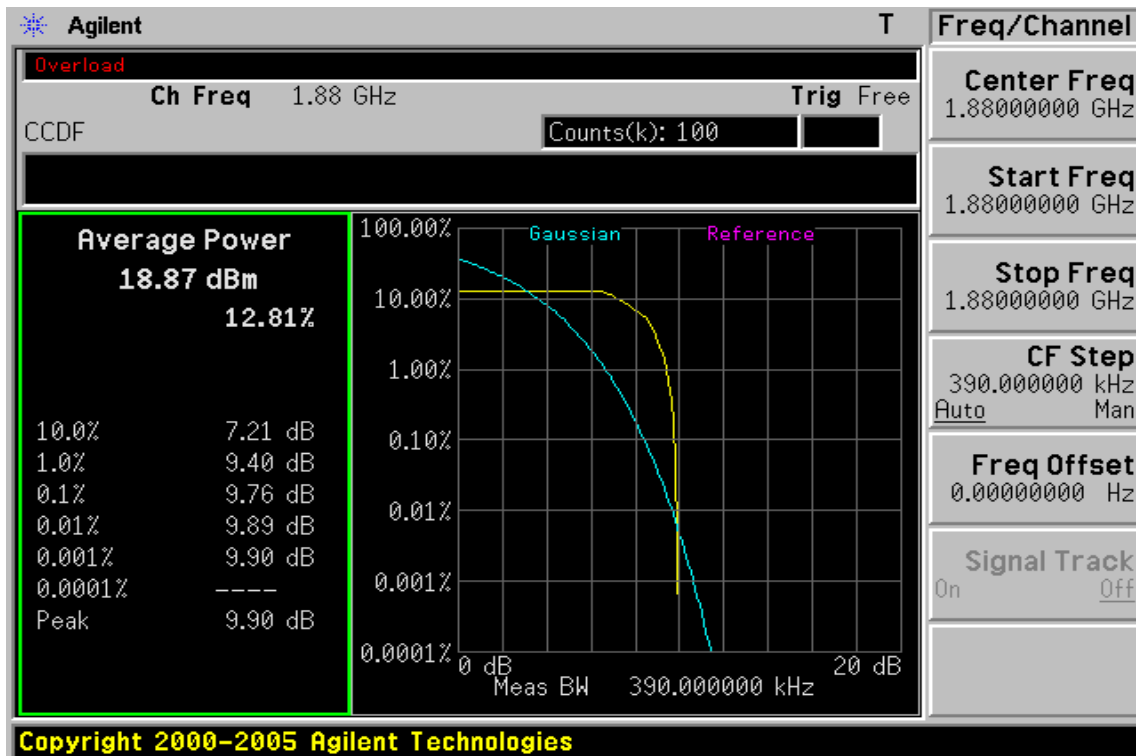


Figure 7-2: GSM 1900 Channel Mid



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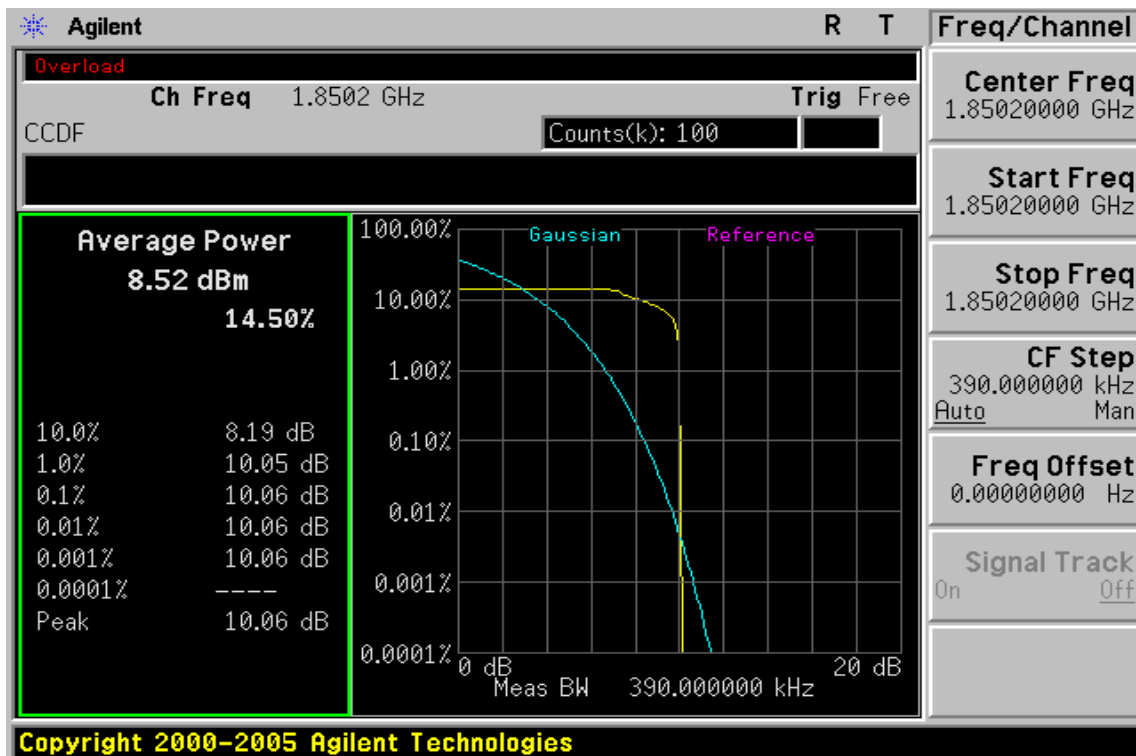
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Figure 7-3: GSM 1900 Channel High



Figure 7-4: GPRS 1900 Channel Low



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Figure 7-5: GPRS 1900 Channel Mid

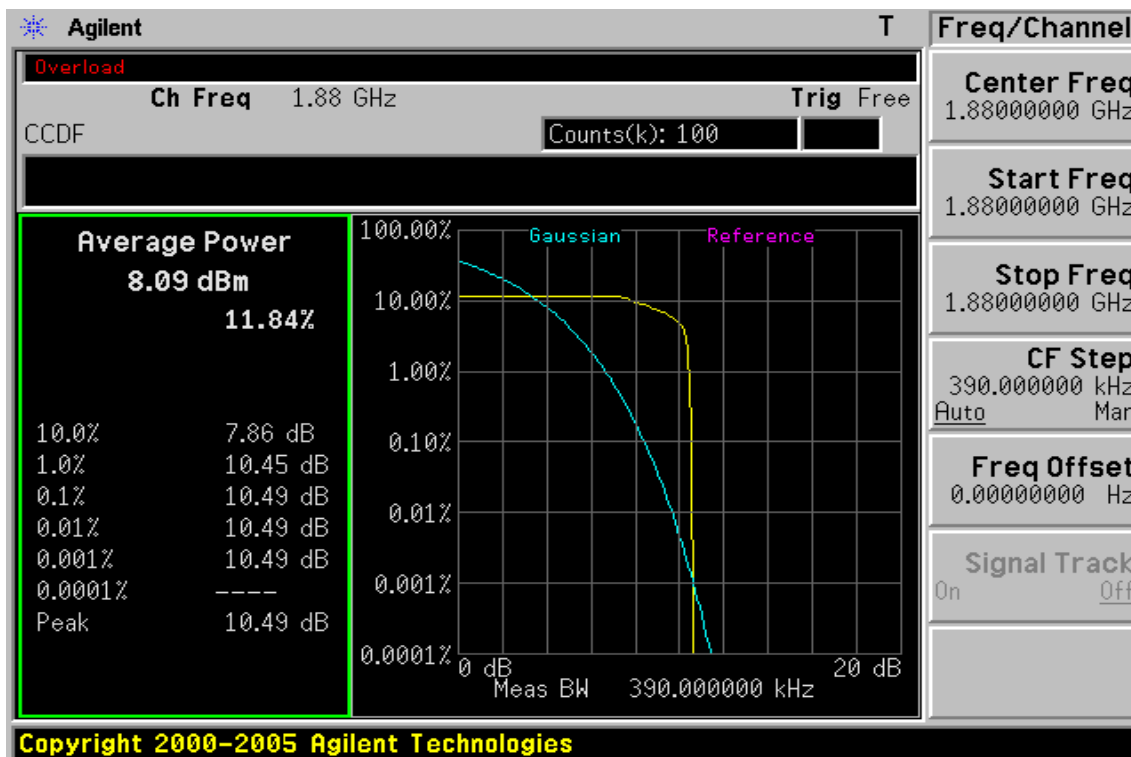
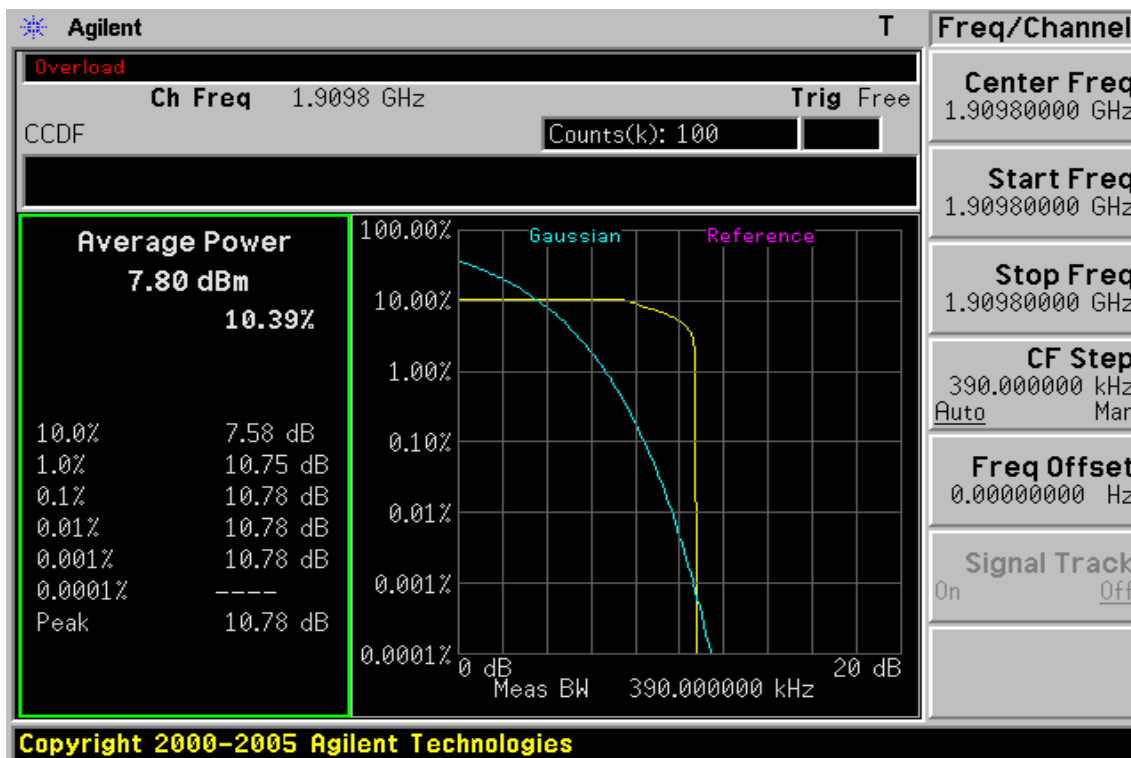


Figure 7-6: GPRS 1900 Channel High



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Figure 7-7: EDGE 1900 Channel Low

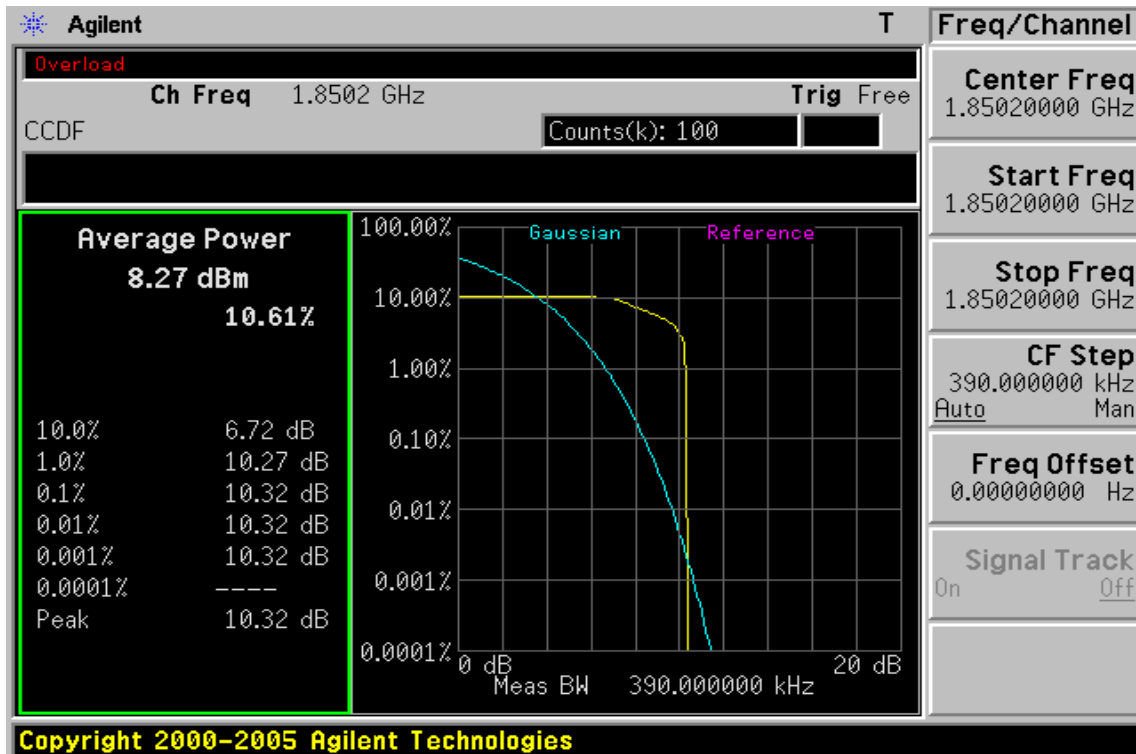
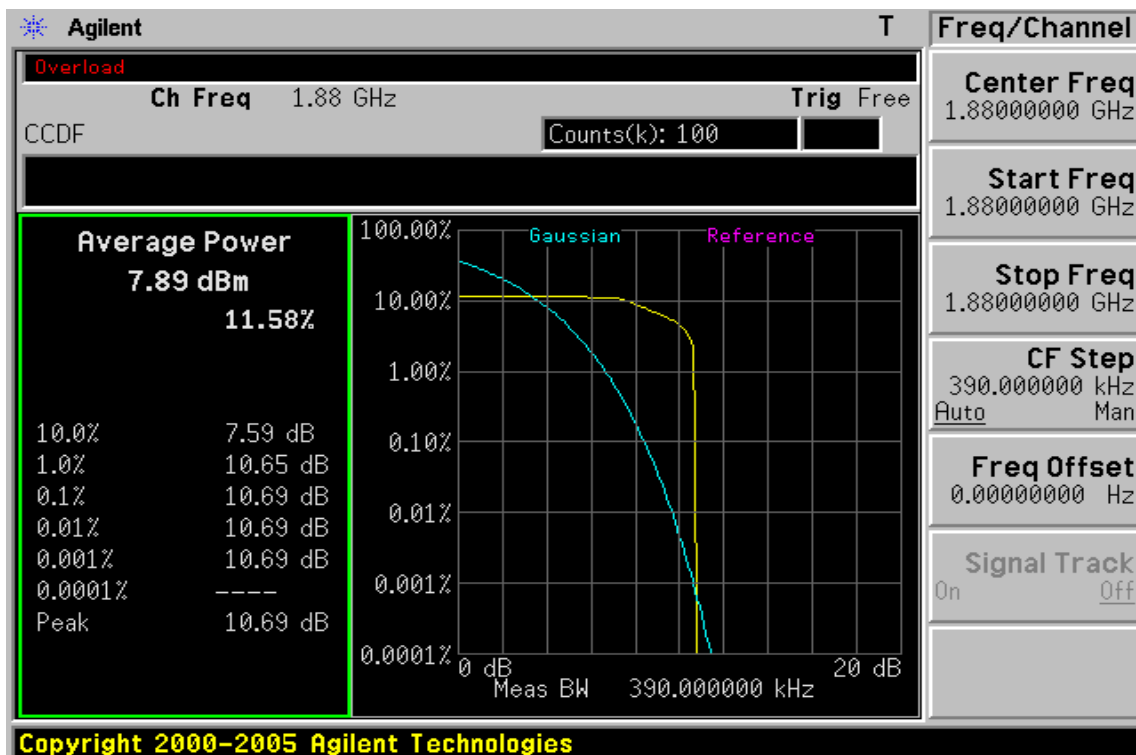


Figure 7-8: EDGE 1900 Channel Mid



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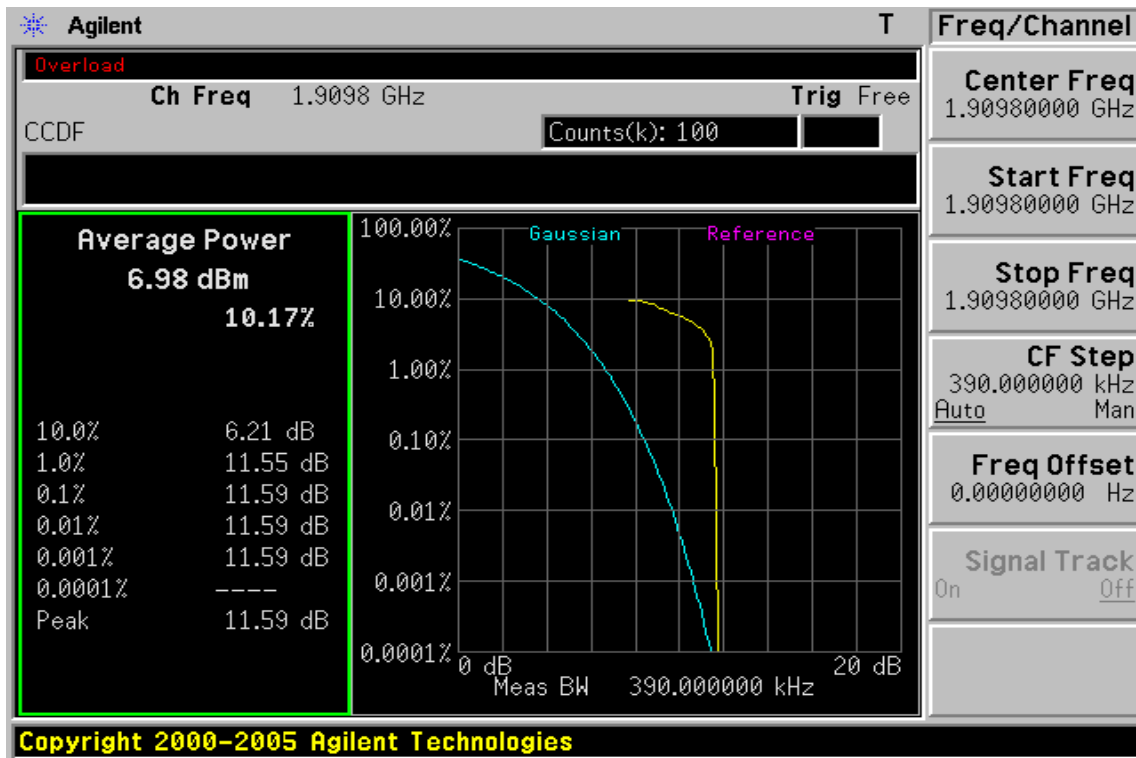
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Figure 7-9: EDGE 1900 Channel High



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## 8. ERP, EIRP MEASUREMENT

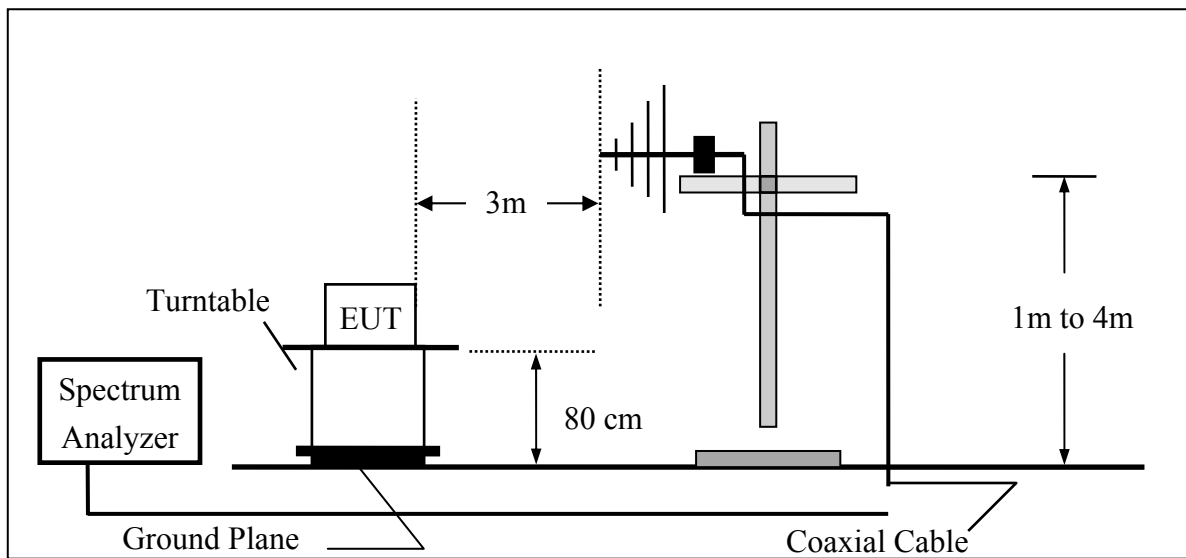
### 8.1. Standard Applicable:

FCC 22.913(a) Mobile station is limited to 7W ERP.

FCC 24.232(b) Mobile station is limited to 2W EIRP.

### 8.2. Test SET-UP (Block Diagram of Configuration):

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz

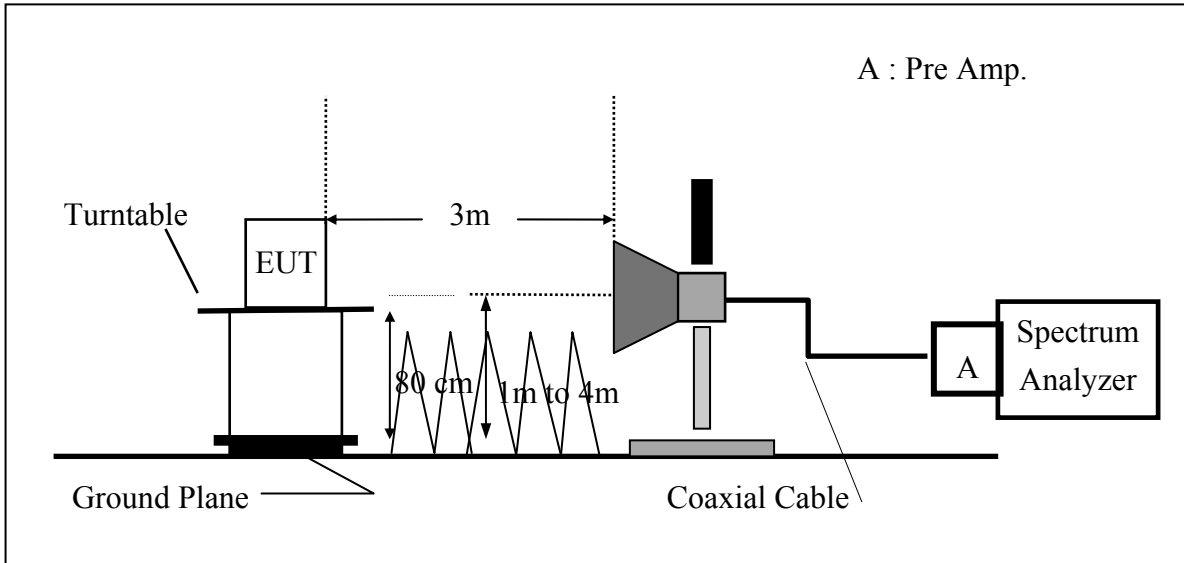


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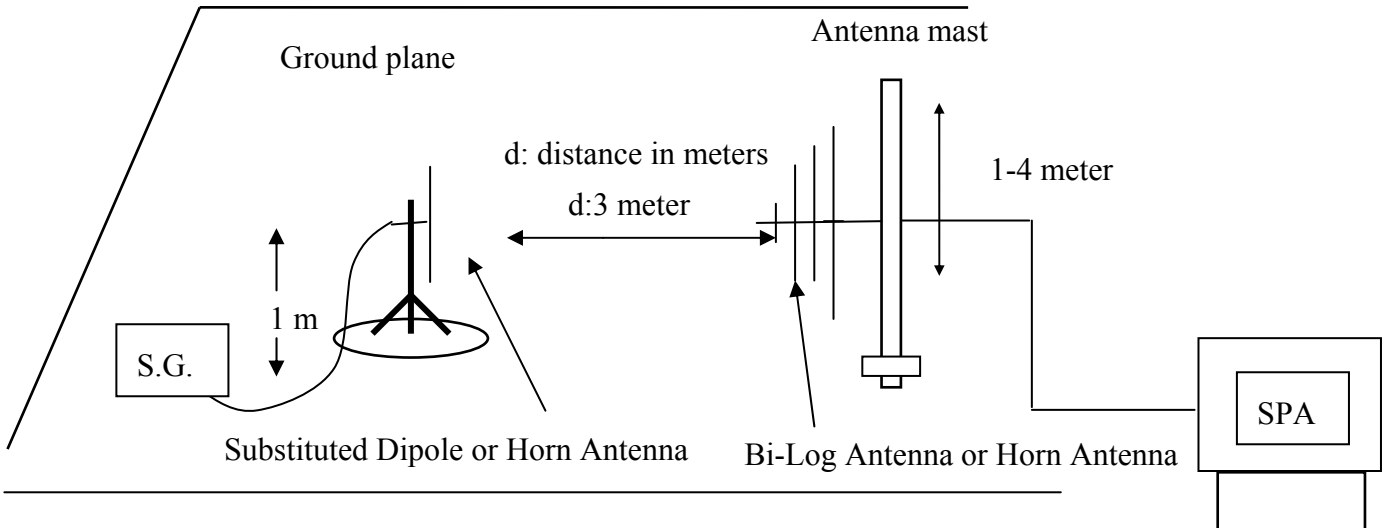
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(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



(C) Substituted Method Test Set-UP



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### 8.3. Measurement Procedure:

The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.

During the measurement, the EUT was in communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated and converted.

ERP in frequency band 824.2–848.80MHz were measured using a substitution method. The EUT was replaced by a dipole antenna connected, the S.G. output was recorded and ERP was calculated as follows

EIRP in frequency band 1850.2-1909.8MHz were measured using a substitution method. The EUT was replaced by a horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows:

$$\text{ERP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$$

$$\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$$

Spectrum setting:

1. Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and  $\text{VBW} \geq 3 \times \text{RBW}$ .

Or,

2. KDB 971168 D01 Power Meas License Digital Systems v01 is adopted, and the procedure as listed under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.

Set frequency = nominal signal center frequency;

Set span = 2 X occupied BW;

Set RBW  $\approx$  1~5% of the span, not to exceed 1 MHz

Set VBW = 3 x RBW;

Select average power (RMS) detector

Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt integration time (ex. Point = 601points, then sweep time =  $601 \times 10^{-3} = 6\text{s}$ ).

Activate trace averaging routine over a minimum of 10 sweeps;

Activate marker/span pair and set span = signal or channel bandwidth;

Activate the band/interval power marker function;

Record the band power level;

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Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

The proper adjustment due to limitation of spectrum capability is given compensated to spectrum with conversion factor of  $10 \cdot \log(TBW/RBW)$ , where TBW is the transmission of UE exceeding the maximum BW UE can extend, and RBW is the resolution BW in UE.

#### 8.4. Measurement Equipment Used:

Refer to section 2.4 in this report

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8.5. Measurement Result:

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
GSM 850	824.2	128	V	22.59	3.91	-3.03	23.47	38.45
			H	26.29	3.91	-3.03	27.16	38.45
	836.6	190	V	23.72	3.89	-3.07	24.54	38.45
			H	27.07	3.89	-3.07	<b>27.89</b>	38.45
	848.8	251	V	20.83	3.87	-3.11	21.60	38.45
			H	26.28	3.87	-3.11	27.05	38.45

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
GPRS 850	824.2	128	V	22.89	3.91	-3.03	23.77	38.45
			H	26.33	3.91	-3.03	27.21	38.45
	836.6	190	V	22.96	3.89	-3.07	23.78	38.45
			H	26.65	3.89	-3.07	<b>27.47</b>	38.45
	848.8	251	V	21.08	3.87	-3.11	21.85	38.45
			H	26.32	3.87	-3.11	27.08	38.45

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
EDGE 850	824.2	128	V	18.22	3.91	-3.03	19.10	38.45
			H	23.32	3.91	-3.03	24.20	38.45
	836.6	190	V	18.3	3.89	-3.07	19.12	38.45
			H	23.86	3.89	-3.07	<b>24.68</b>	38.45
	848.8	251	V	16.45	3.87	-3.11	17.21	38.45
			H	23.79	3.87	-3.11	24.56	38.45

Remark :

- (1) The RBW,VBW of SPA for frequency RBW=300 KHz, VBW=1MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
GSM 1900	1850.2	512	V	24.31	5.08	-4.67	24.72	33.00
			H	32.02	5.08	-4.67	<b>32.43</b>	33.00
	1880.0	661	V	24.69	5.00	-4.7	24.99	33.00
			H	32.09	5.00	-4.7	32.39	33.00
	1909.8	810	V	25.29	4.92	-4.74	25.47	33.00
			H	32.15	4.92	-4.74	32.34	33.00

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
GPRS 1900	1850.2	512	V	24.23	5.08	-4.67	24.64	33.00
			H	32.38	5.08	-4.67	<b>32.79</b>	33.00
	1880.0	661	V	24.8	5.00	-4.7	25.10	33.00
			H	31.08	5.00	-4.7	31.38	33.00
	1909.8	810	V	25.54	4.92	-4.74	25.73	33.00
			H	32.1	4.92	-4.74	32.29	33.00

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
EDGE 1900	1850.2	512	V	22.61	5.08	-4.67	23.02	33.00
			H	30.98	5.08	-4.67	31.39	33.00
	1880.0	661	V	22.47	5.00	-4.7	22.76	33.00
			H	30.95	5.00	-4.7	31.25	33.00
	1909.8	810	V	23.06	4.92	-4.74	23.25	33.00
			H	31.42	4.92	-4.74	<b>31.61</b>	33.00

**Remark :**

- (1) The RBW,VBW of SPA for frequency RBW=300K, VBW=1MHz

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## 9. 99% OCCUPIED BANDWIDTH MEASUREMENT

### 9.1. Standard Applicable:

According to §FCC 2.1049.

### 9.2. Test Set-up:

Refer to section 5.2 in this report

### 9.3. Measurement Procedure:

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW (10/30KHz) was set to about 1% of emission BW, VBW= 3 times RBW(30/100kHz), -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.

### 9.4. Measurement Equipment Used:

Refer to section 2.4 in this report

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**9.5. Measurement Result:**

**99% Bandwidth**

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
GSM 850	824.20	128	0.248
	836.60	190	0.242
	848.80	251	0.246

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
GPRS 850	824.20	128	0.243
	836.60	190	0.246
	848.80	251	0.247

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
GSM 1900	1850.20	512	0.248
	1880.00	661	0.247
	1909.80	810	0.247

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
GPRS 1900	1850.20	512	0.244
	1880.00	661	0.247
	1909.80	810	0.238

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EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
EDGE 850	824.20	128	0.258
	836.60	190	0.240
	848.80	251	0.245

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
EDGE 1900	1850.20	512	0.251
	1880.00	661	0.252
	1909.80	810	0.252

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99% Bandwidth Test Data

Figure 9-1: GSM 850 Channel Low

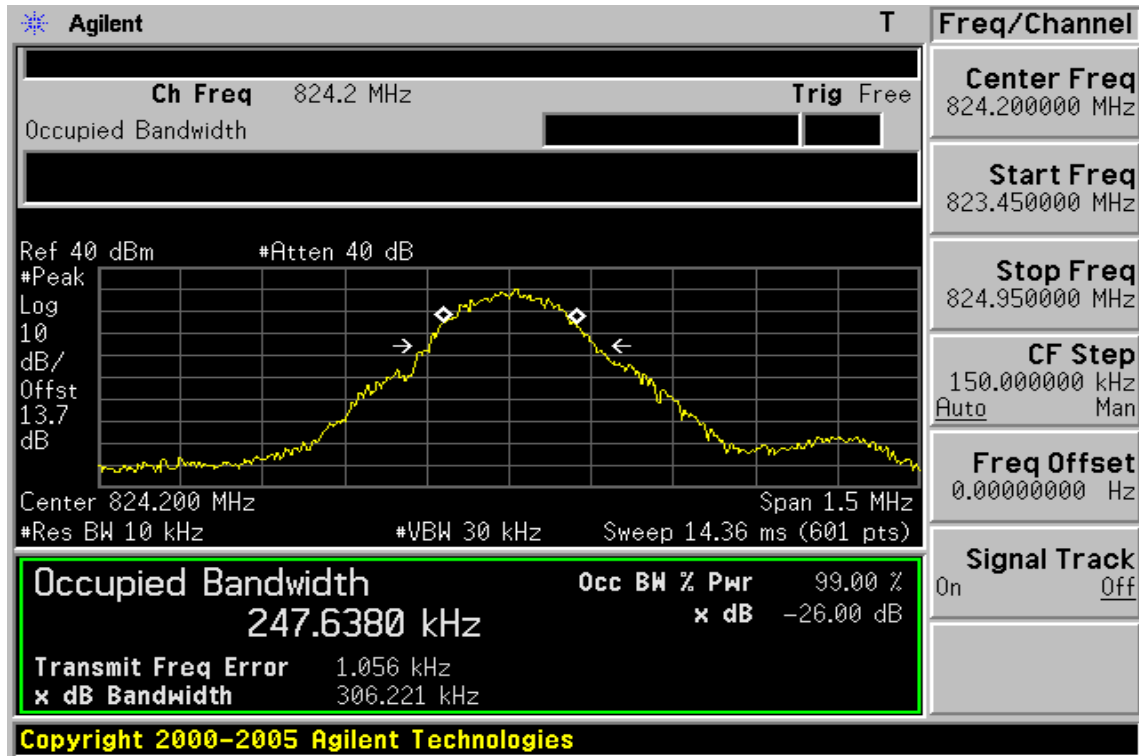
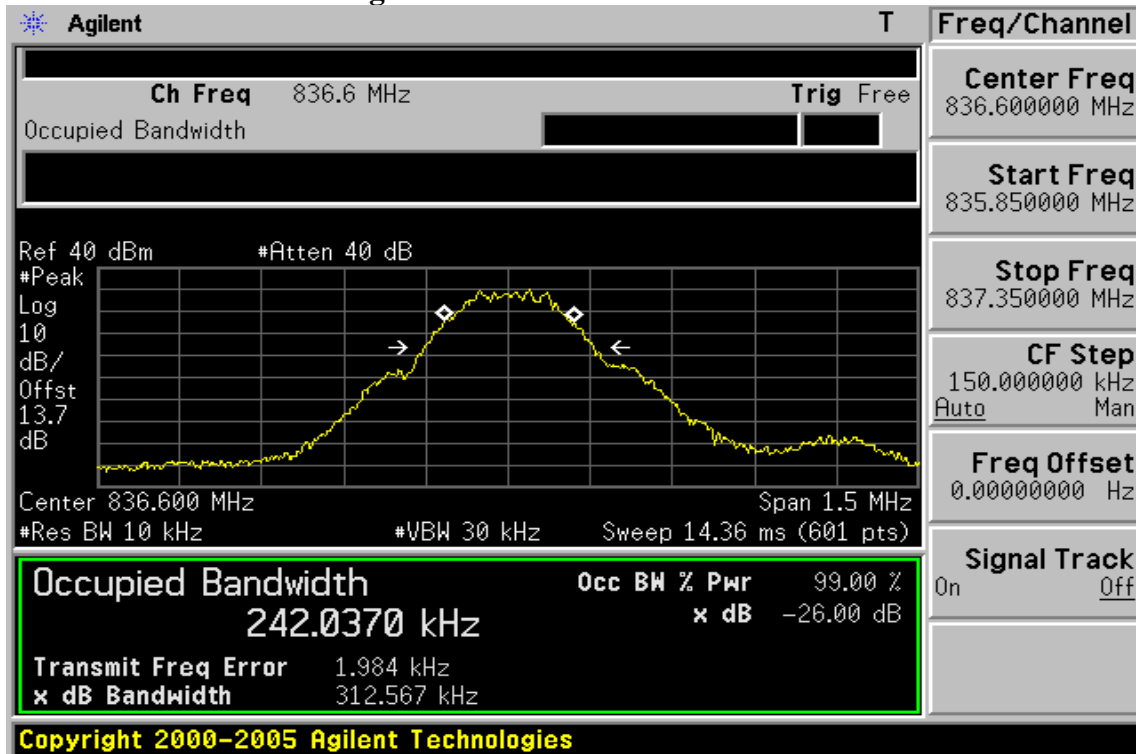


Figure 9-2: GSM 850 Channel Mid



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Figure 9-3: GSM 850 Channel High

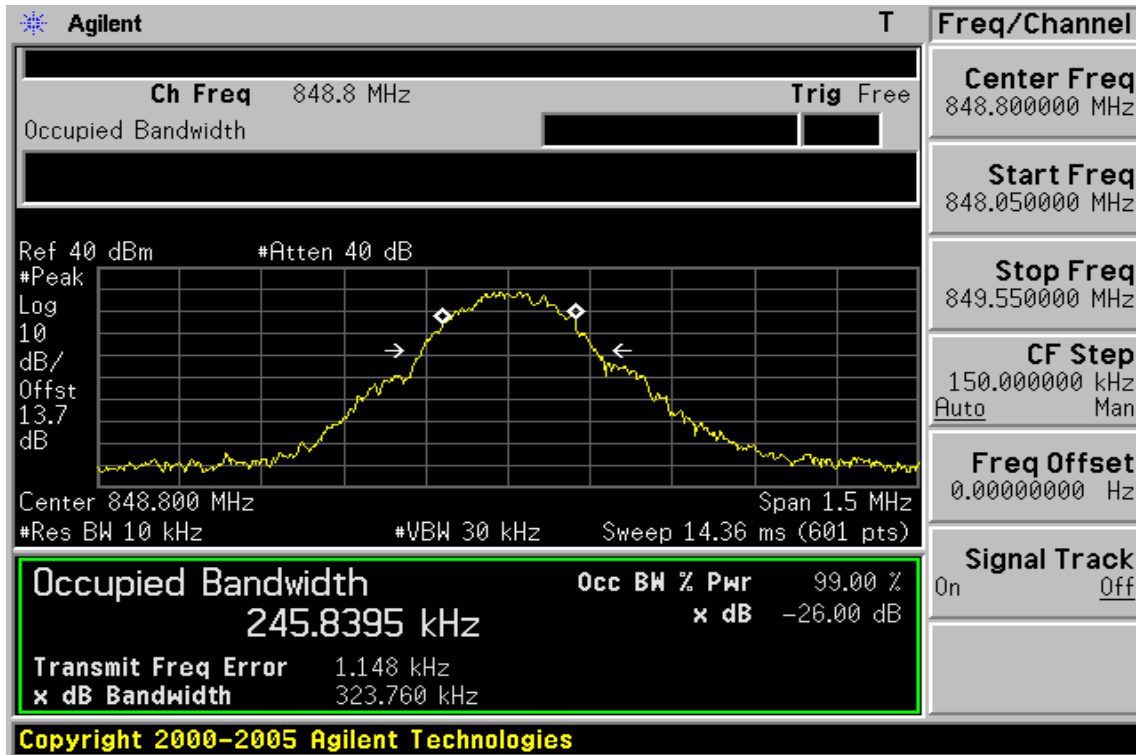
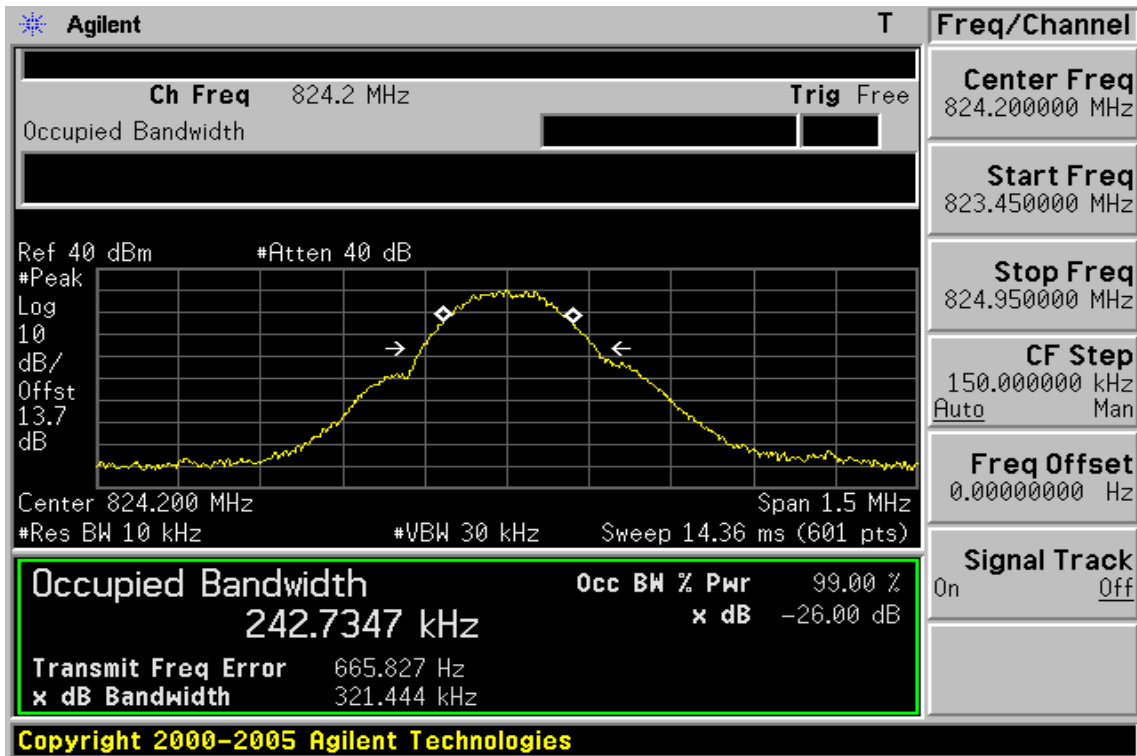


Figure 9-4: GPRS 850 Channel Low



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Figure 9-5: GPRS 850Channel Mid

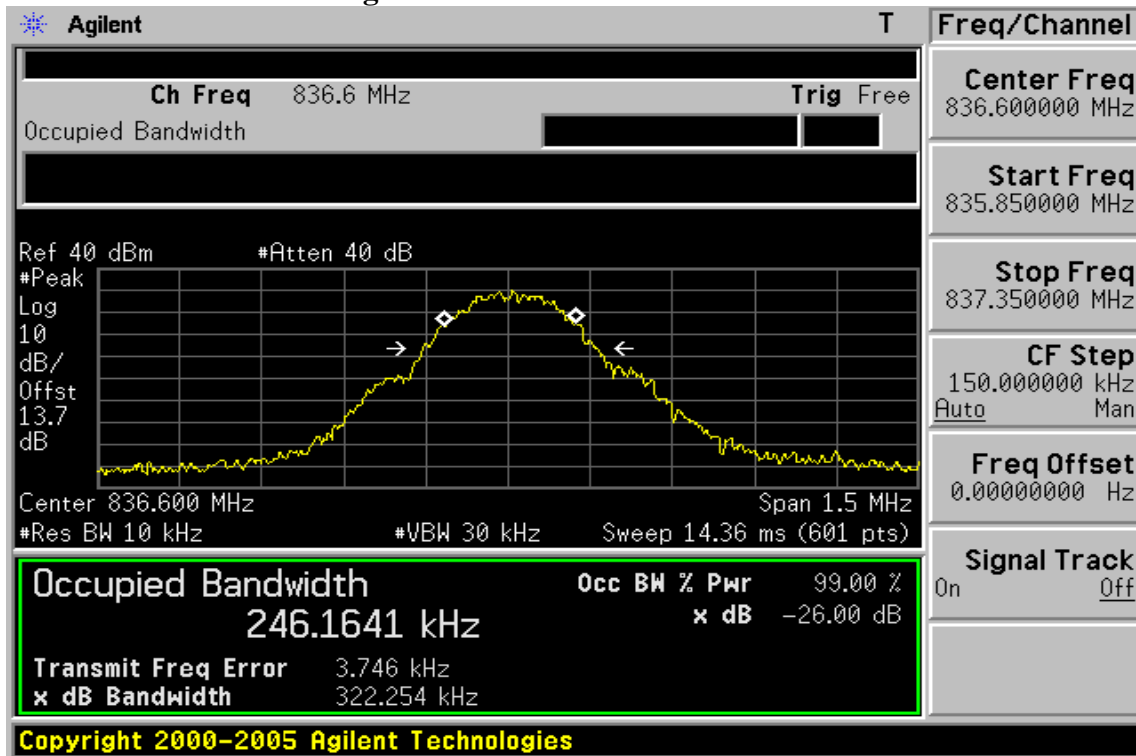
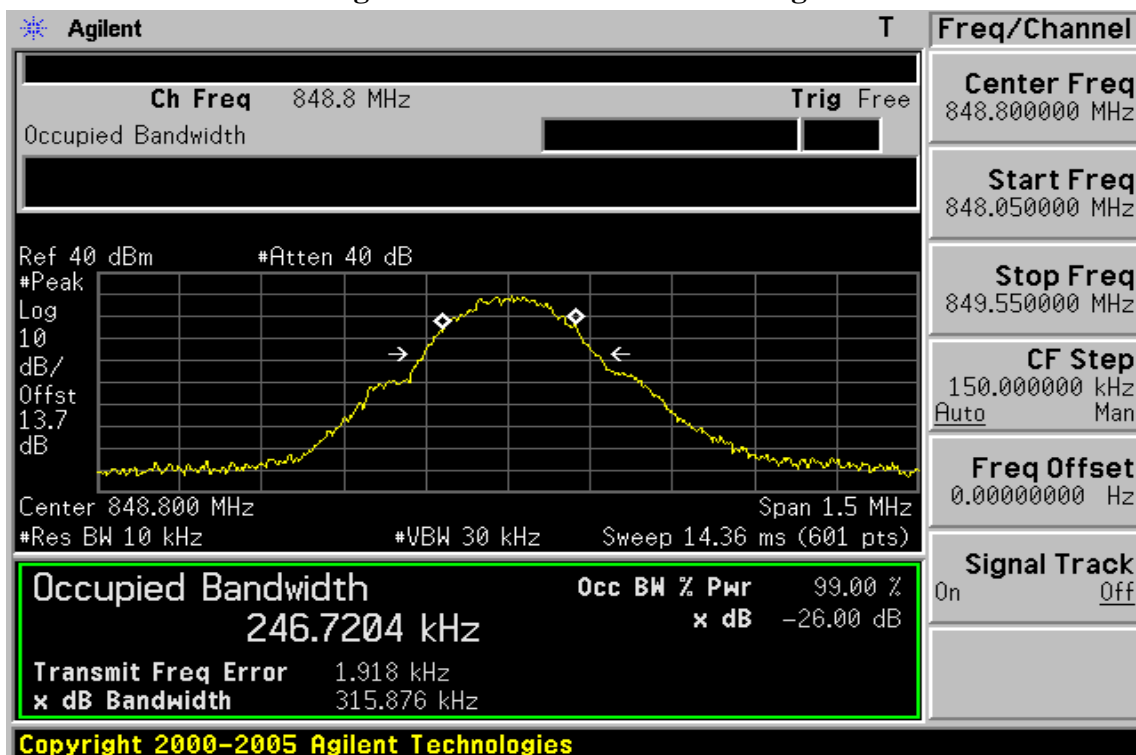


Figure 9-6: GPRS 850 Channel High



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Figure 9-7: GSM 1900 Channel Low

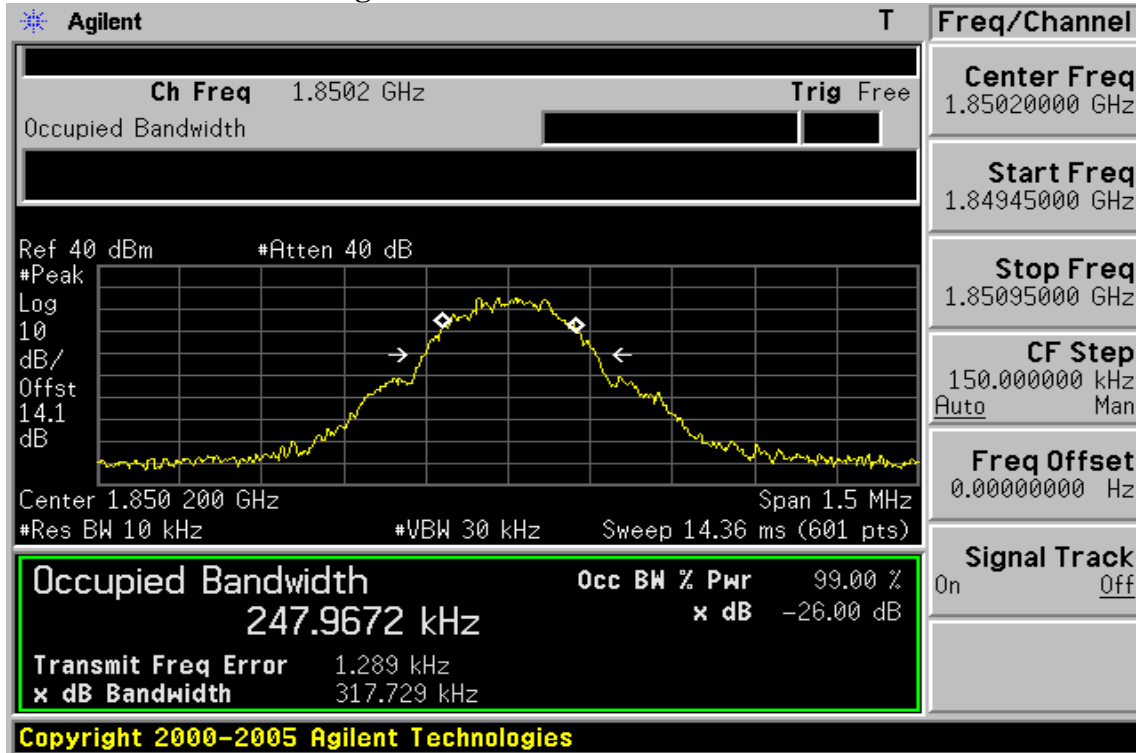
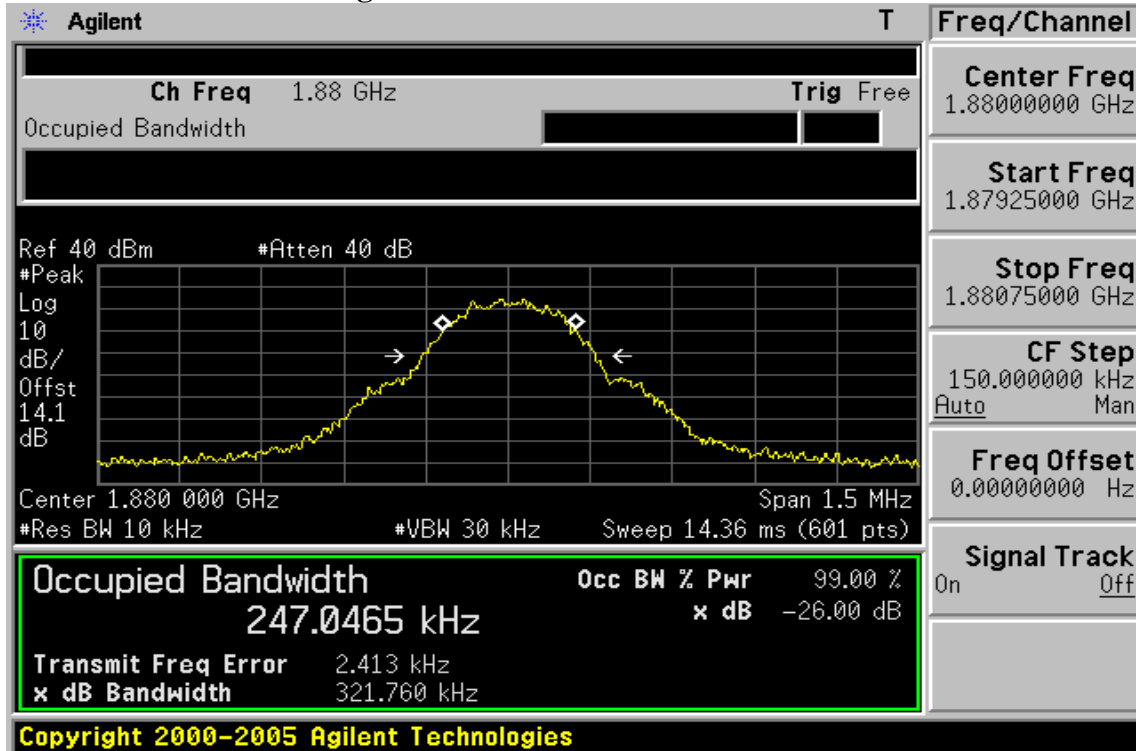


Figure 9-8: GSM 1900 Channel Mid



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Figure 9-9: GSM 1900 Channel High

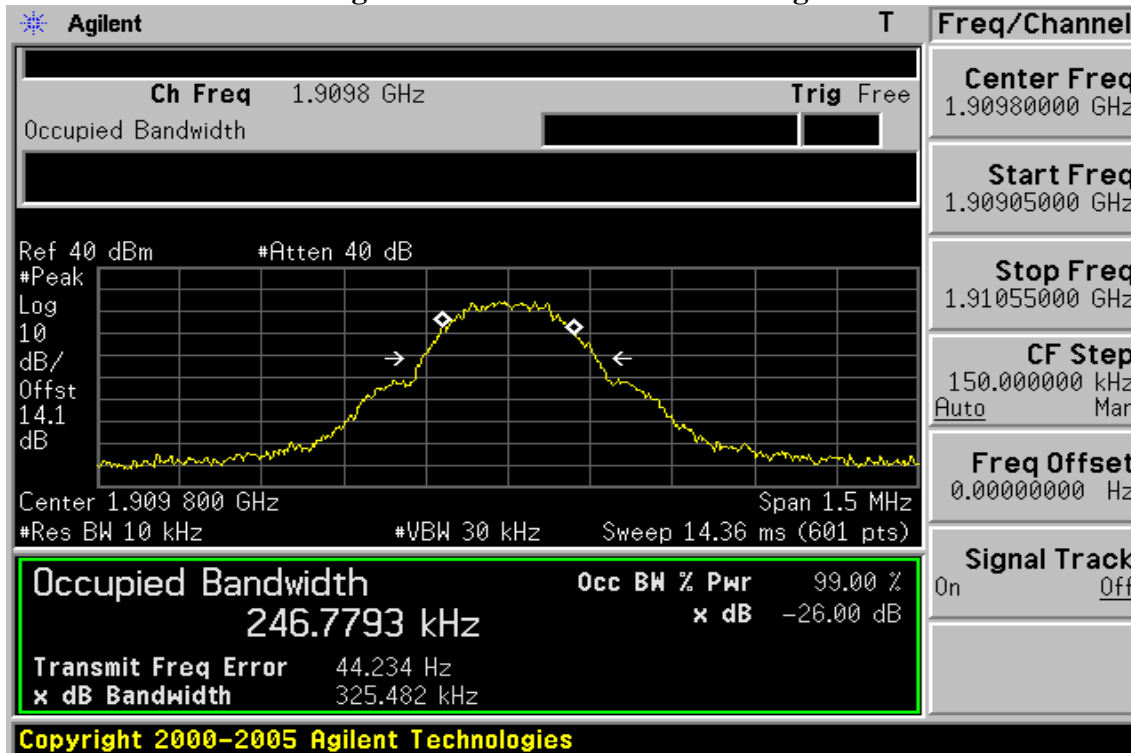
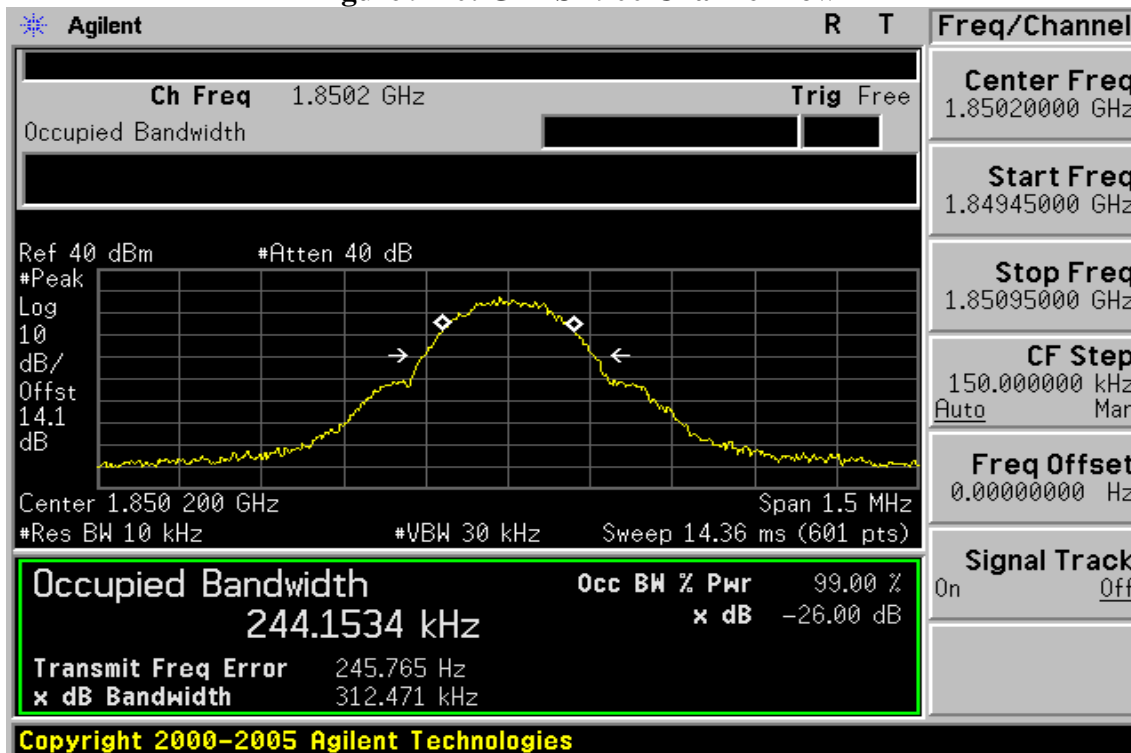


Figure 9-10: GPRS 1900 Channel Low



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Figure 9-11: GPRS 1900 Channel Mid

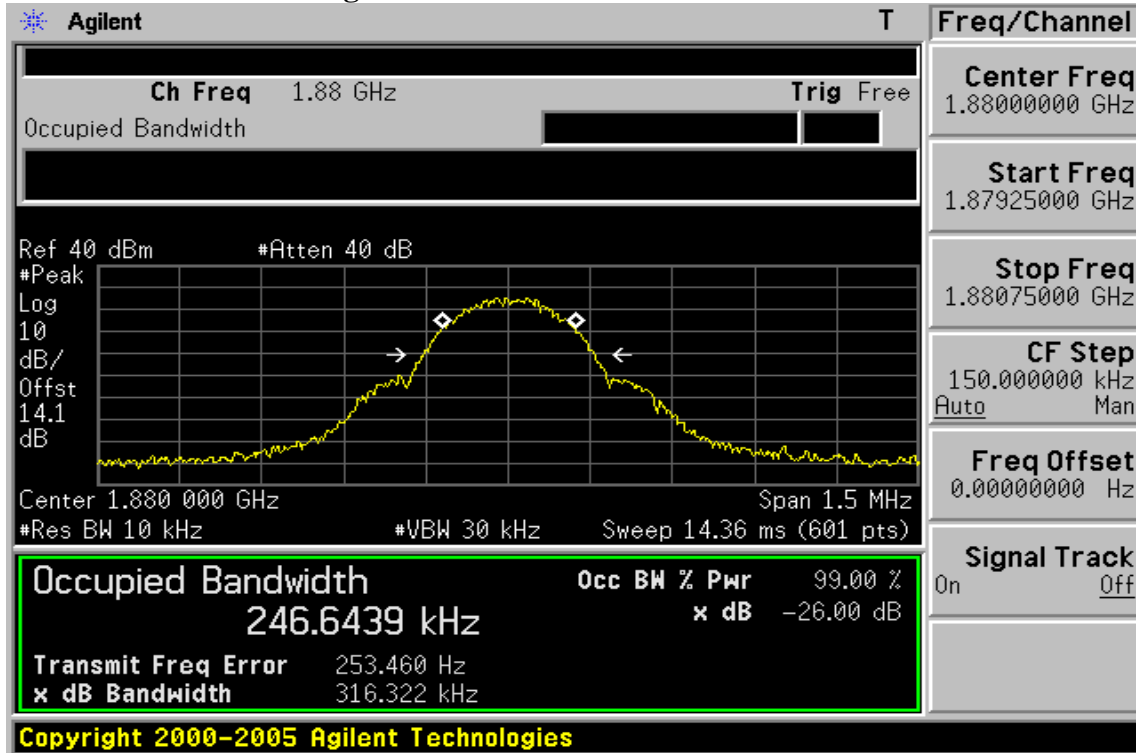
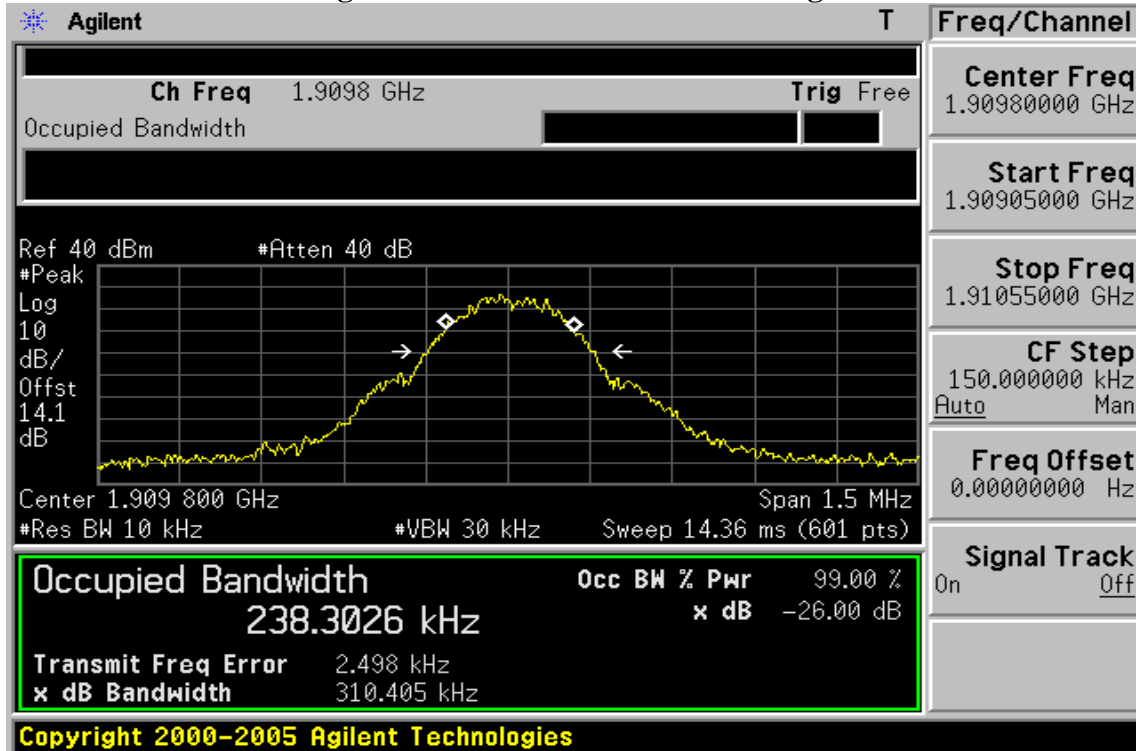


Figure 9-12: GPRS 1900 Channel High



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Figure 9-13: EDGE 850 Channel Low

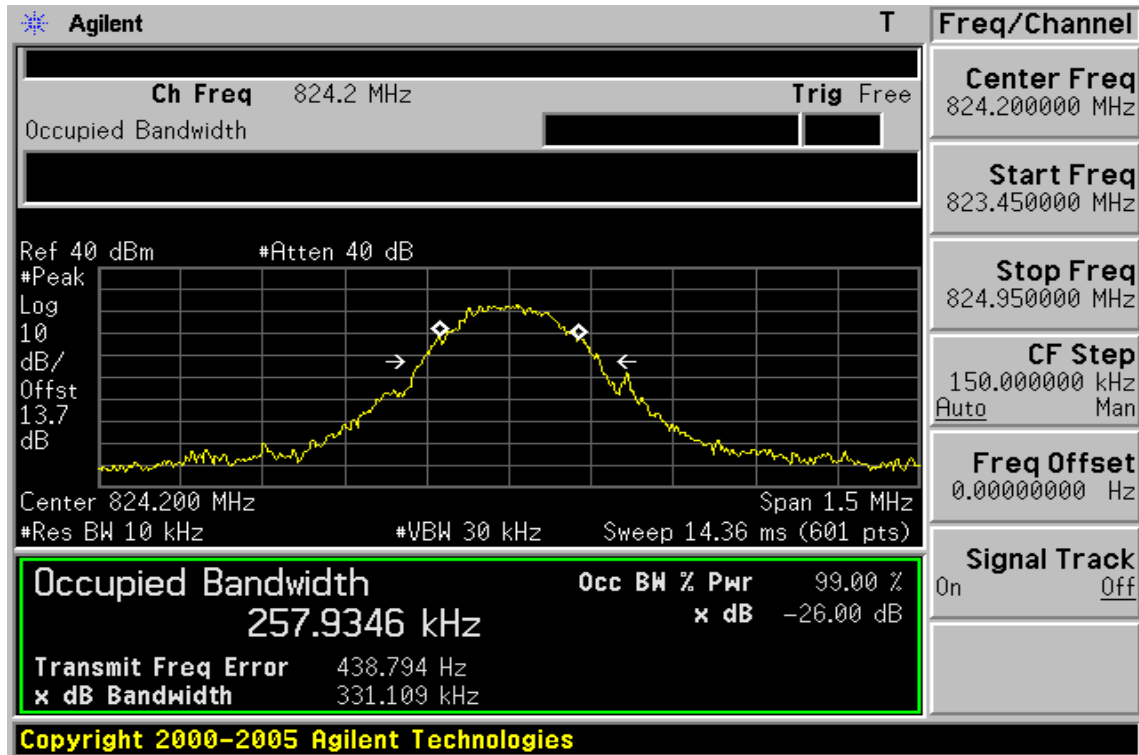
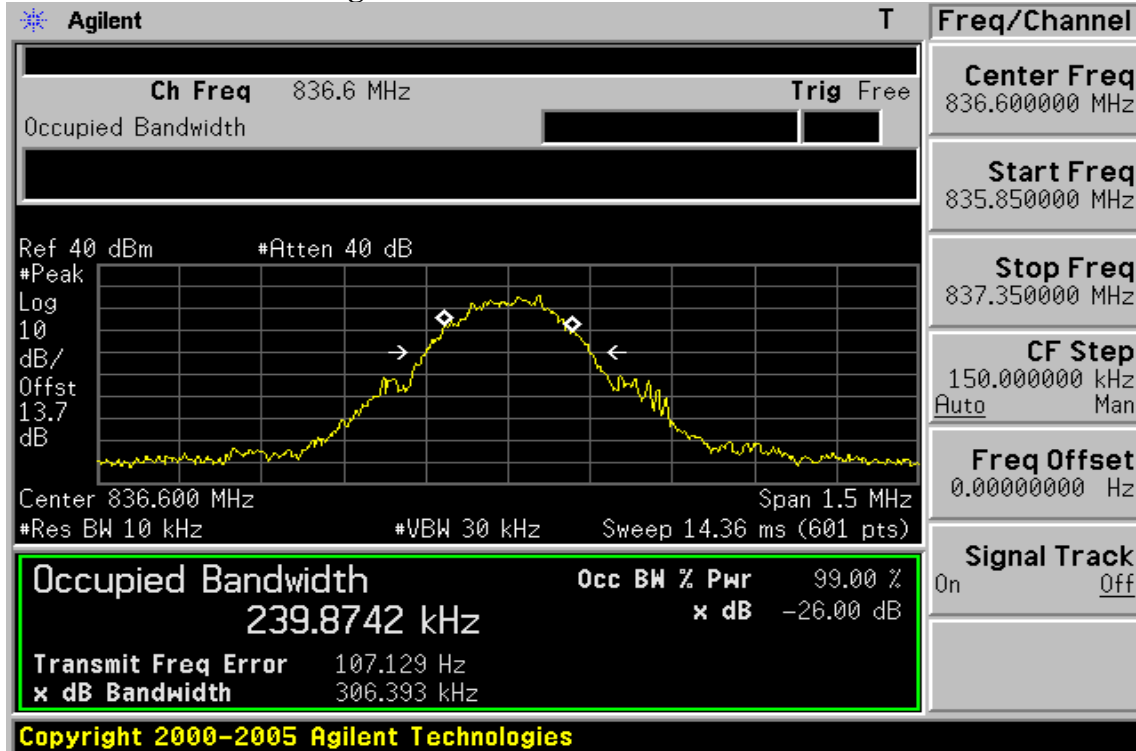


Figure 9-14: EDGE 850 Channel Mid



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Figure 9-15: EDGE 850 Channel High

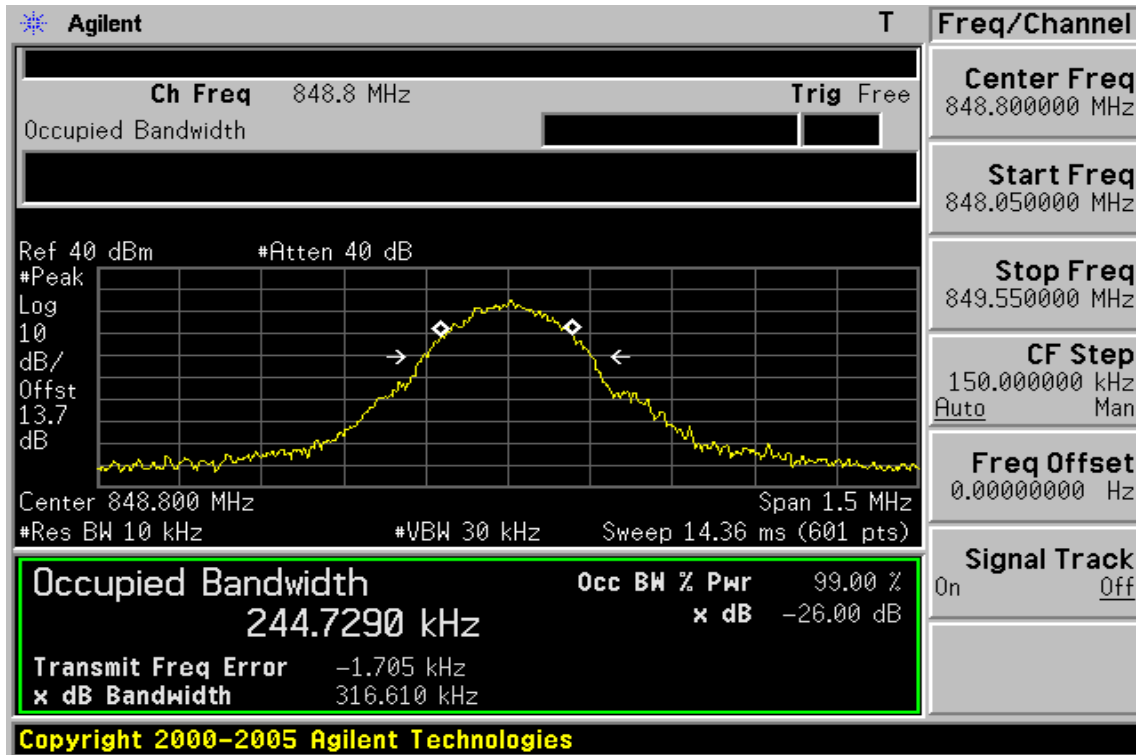
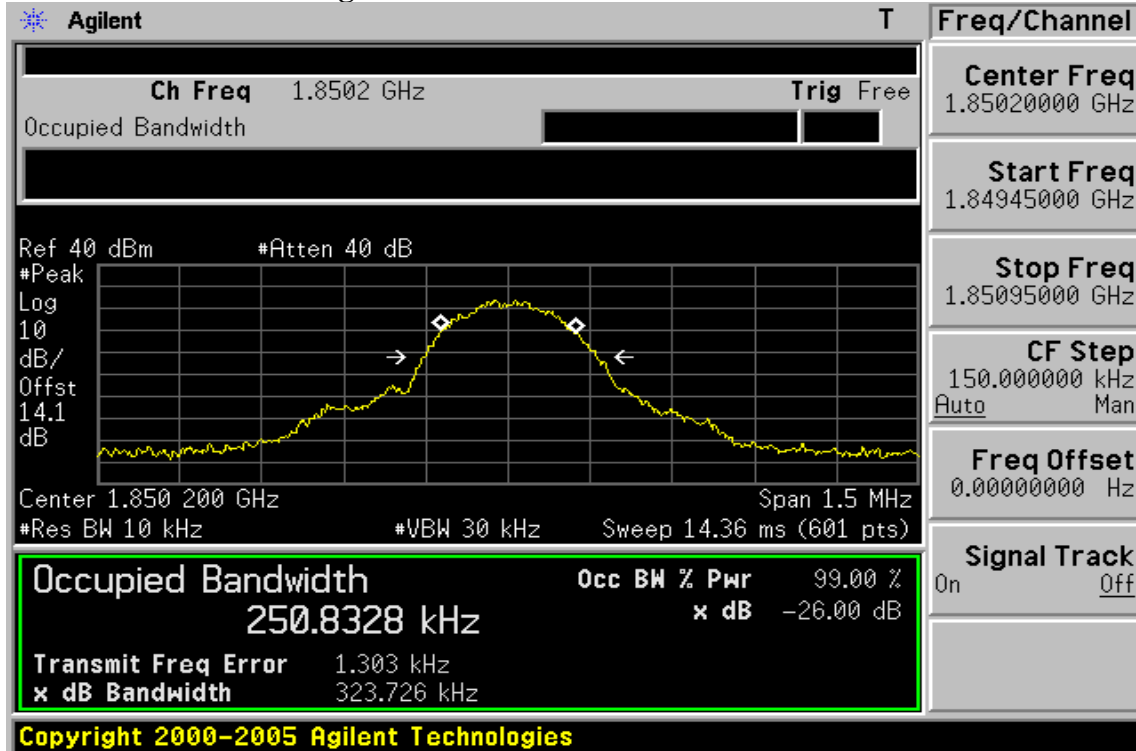


Figure 9-16: EDGE 1900 Channel Low



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Figure 9-17: EDGE 1900 Channel Mid

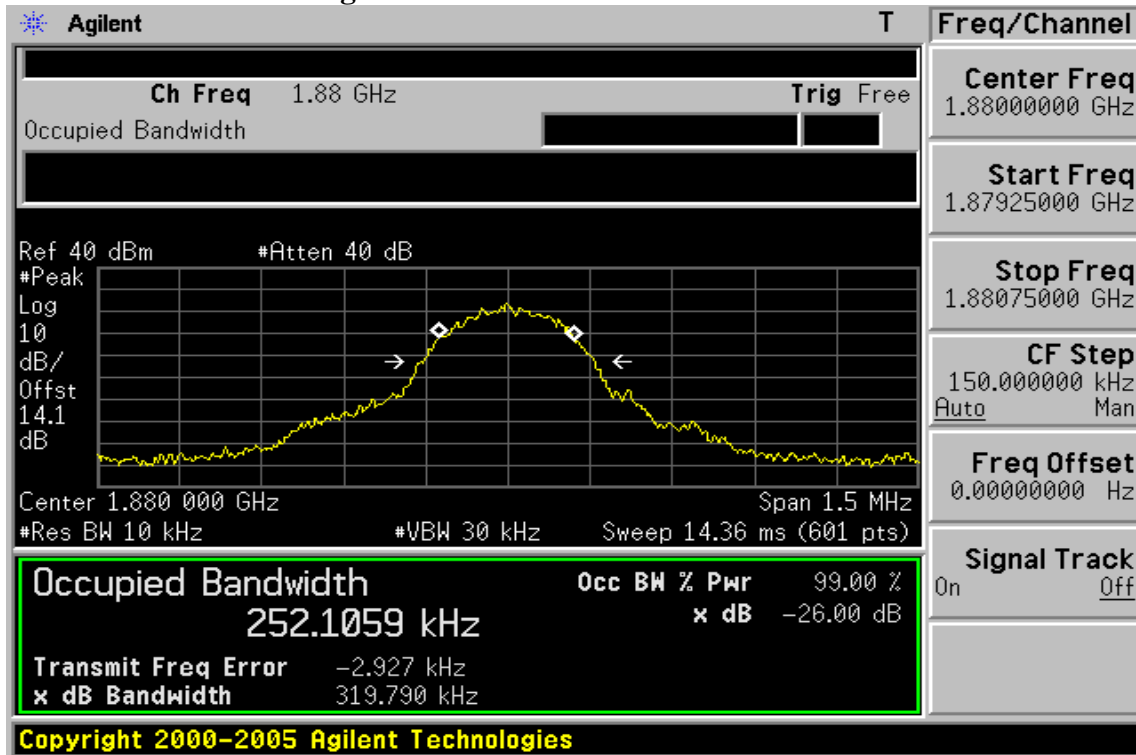
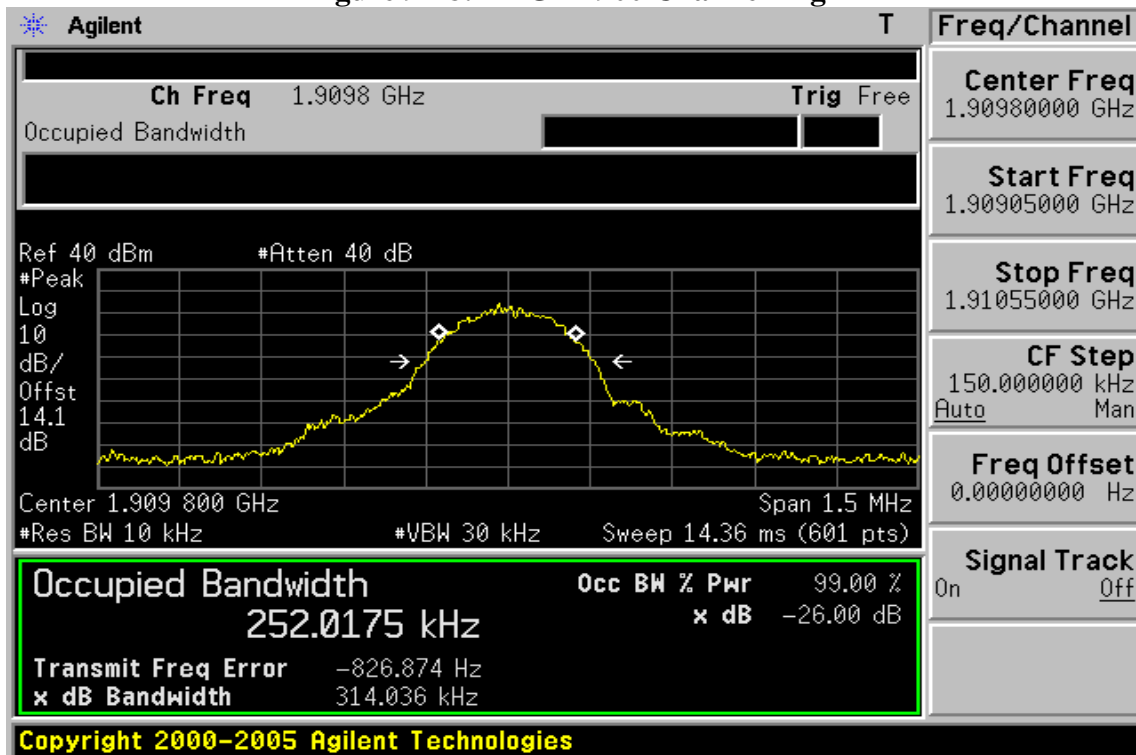


Figure 9-18: EDGE 1900 Channel High



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## 10. OUT OF BAND EMISSION AT ANTENNA TERMINALS

### 10.1. Standard Applicable:

According to FCC §2.1051.

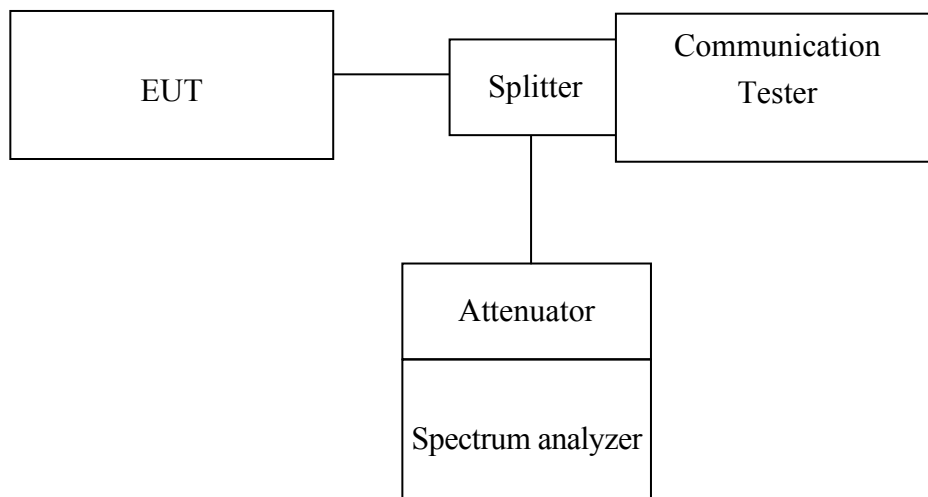
#### Out-of-Band Emission

FCC §22.917(a), §24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than  $43 + 10 \log$  (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

### 10.2. Test SET-UP:

#### Out of band emission & Bandedge



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### 10.3. Measurement Procedure:

#### Out of Band Emission:

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 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.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum
3. Set Line = -13dBm as the limit line
4. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 1G, 1G to 2.5G, 2.5G to 7.5G, 7.5G to 10G, 10G to 15G and 15G to 20GHz
5. Via Software, combine 6 spans of frequency range into one plot
6. Repeat the measurement on other default test channels

#### Band Edge Requirements:

1. To connect Antenna Port of EUT to Spectrum.
2. Set Span enough to capture entire signal of emission Bandwidth of UE, RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Marker the point of signal 1MHz immediately outside of edge of frequency band of test channel, Marker the point of signal 100KHz immediately outside of edge of frequency band of test channel
4. Set Line = -13dBm as the limit line
5. Repeat the measurement on other default test channels

### 10.4. Measurement Equipment Used:

Refer to section 2.4 in this report

Band Rejecter is not used; the occurrence of the spike on plot shows the signal of the fundamental emission.

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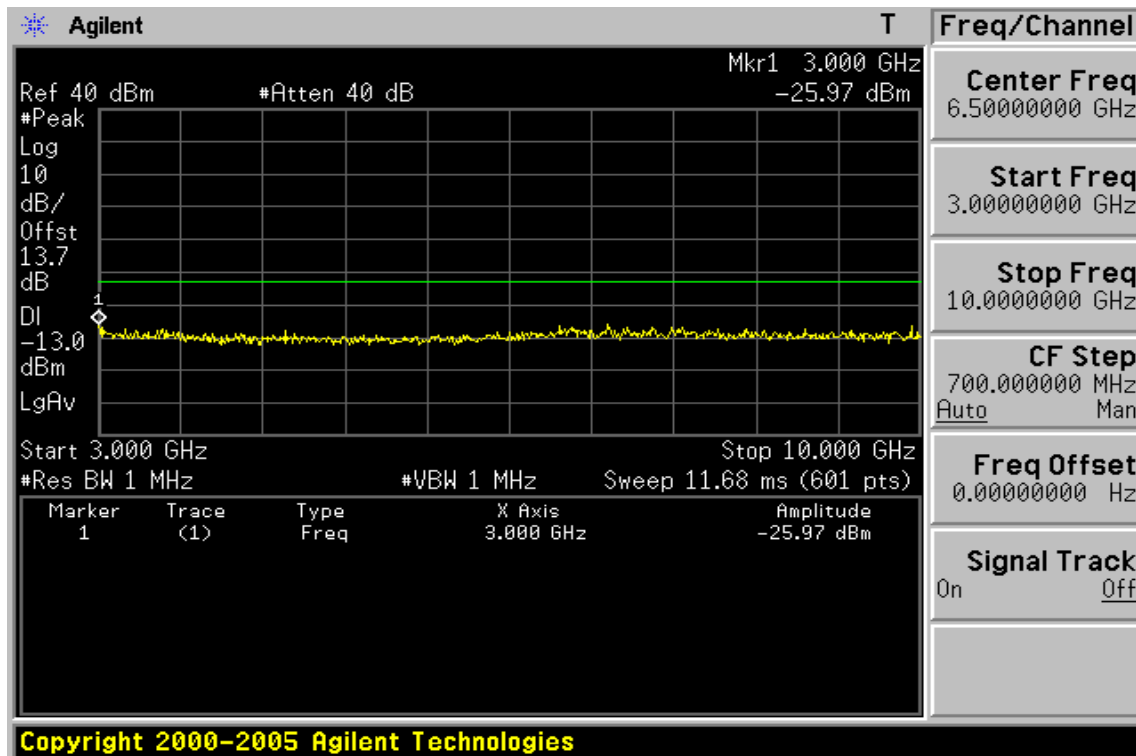
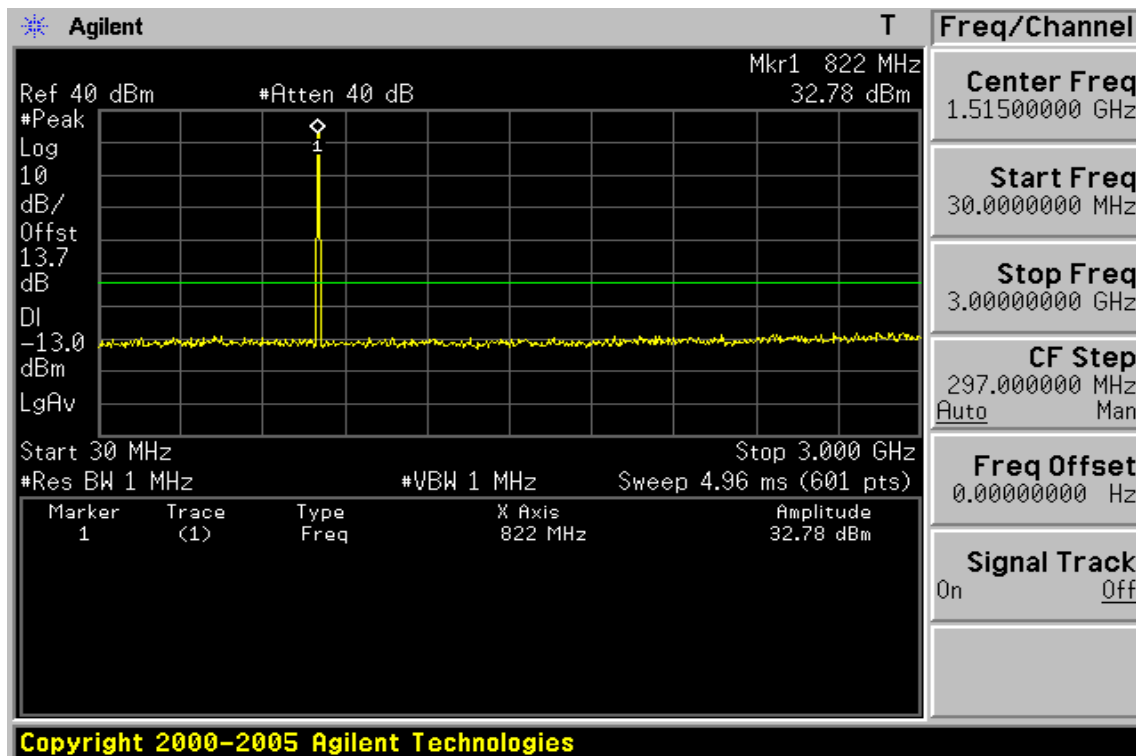
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10.5. Measurement Result:

Figure 10-1: Out of Band emission at antenna terminals – GSM 850 Channel Lowest



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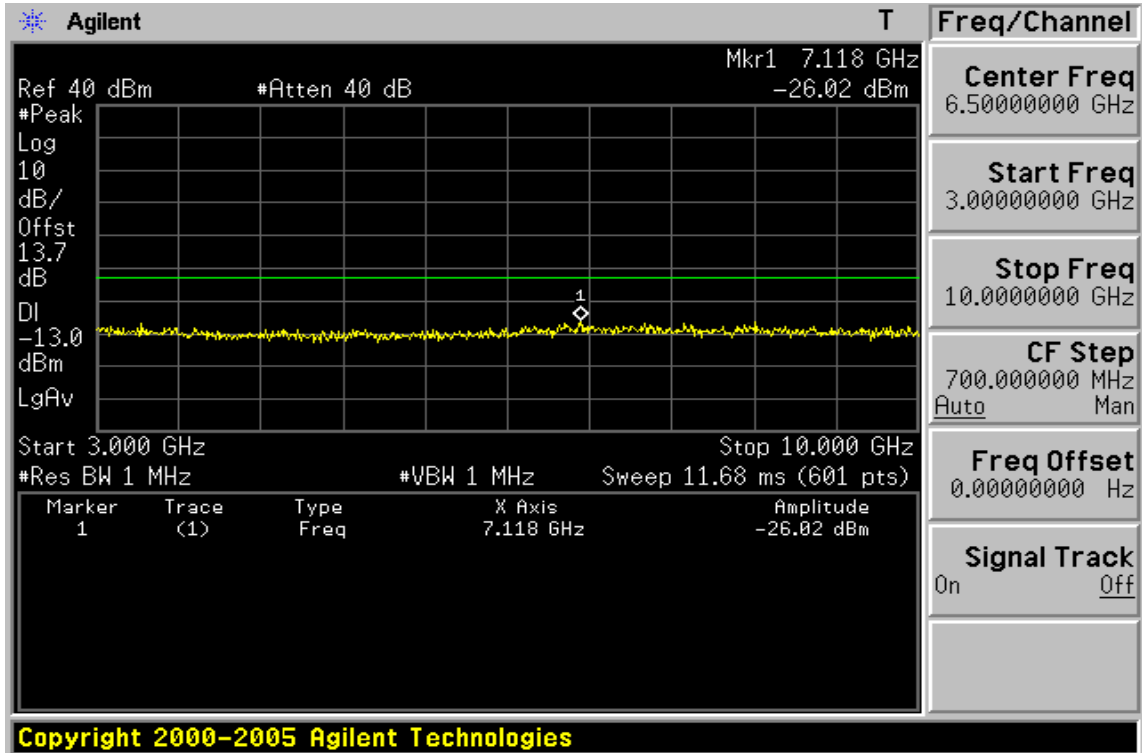
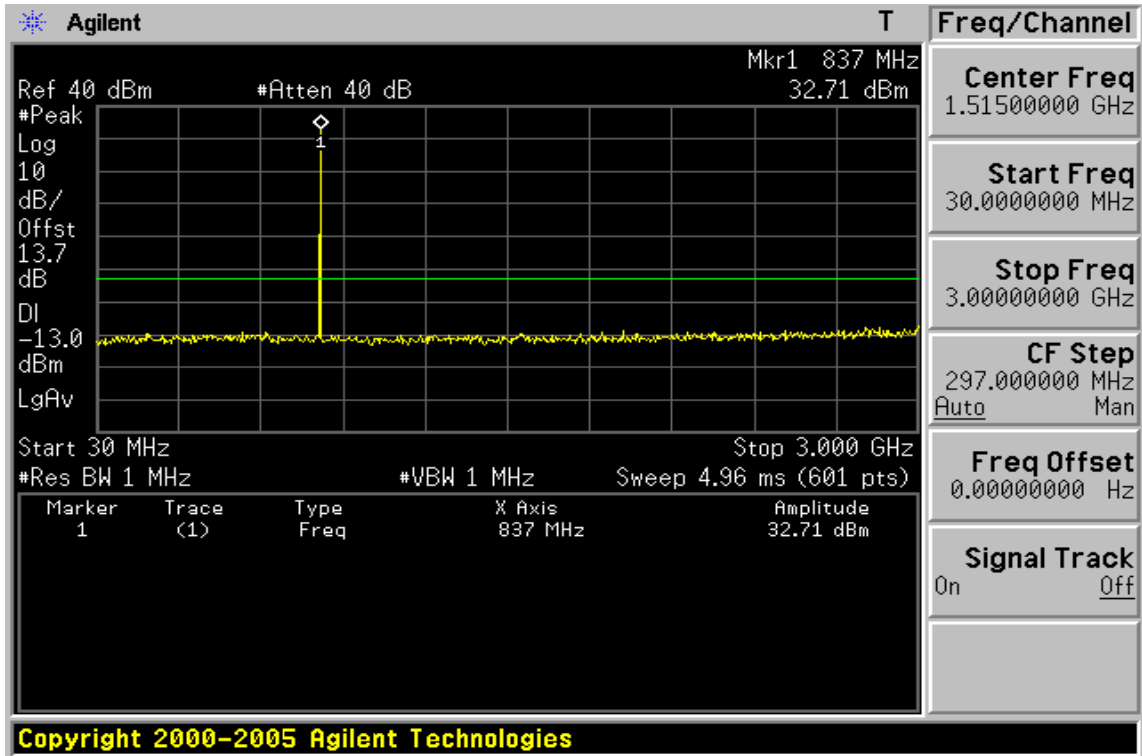
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**Figure10-2: Out of Band emission at antenna terminals –GSM 850 Channel Mid**



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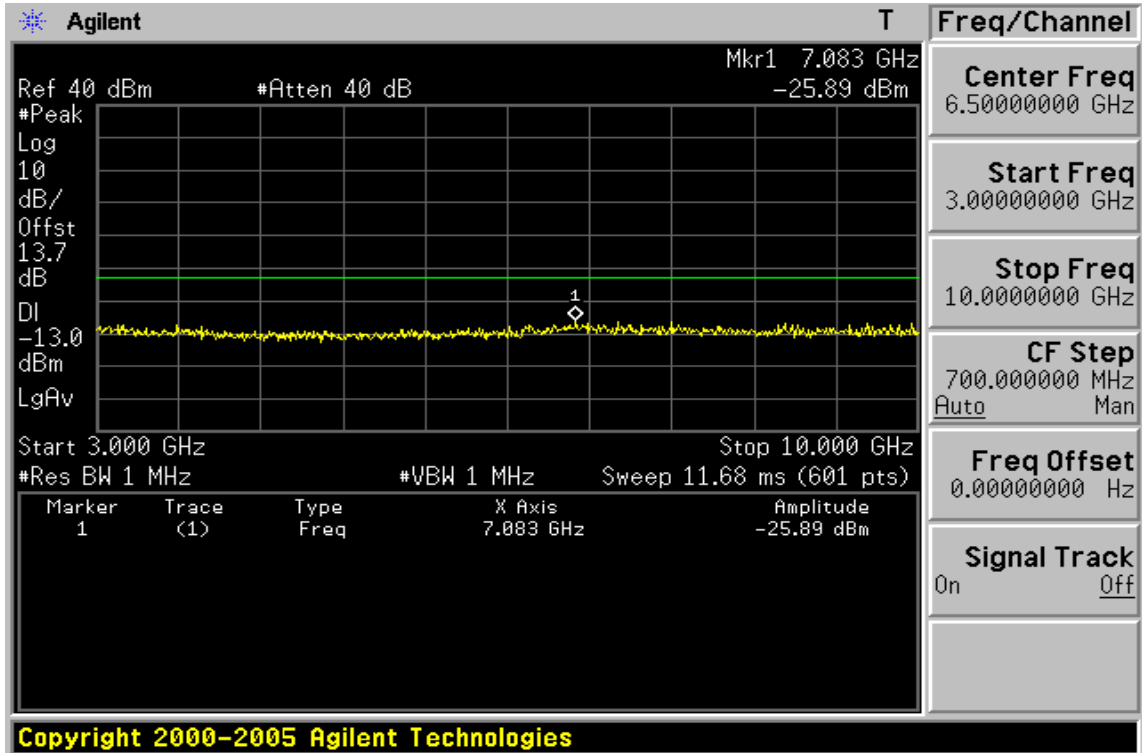
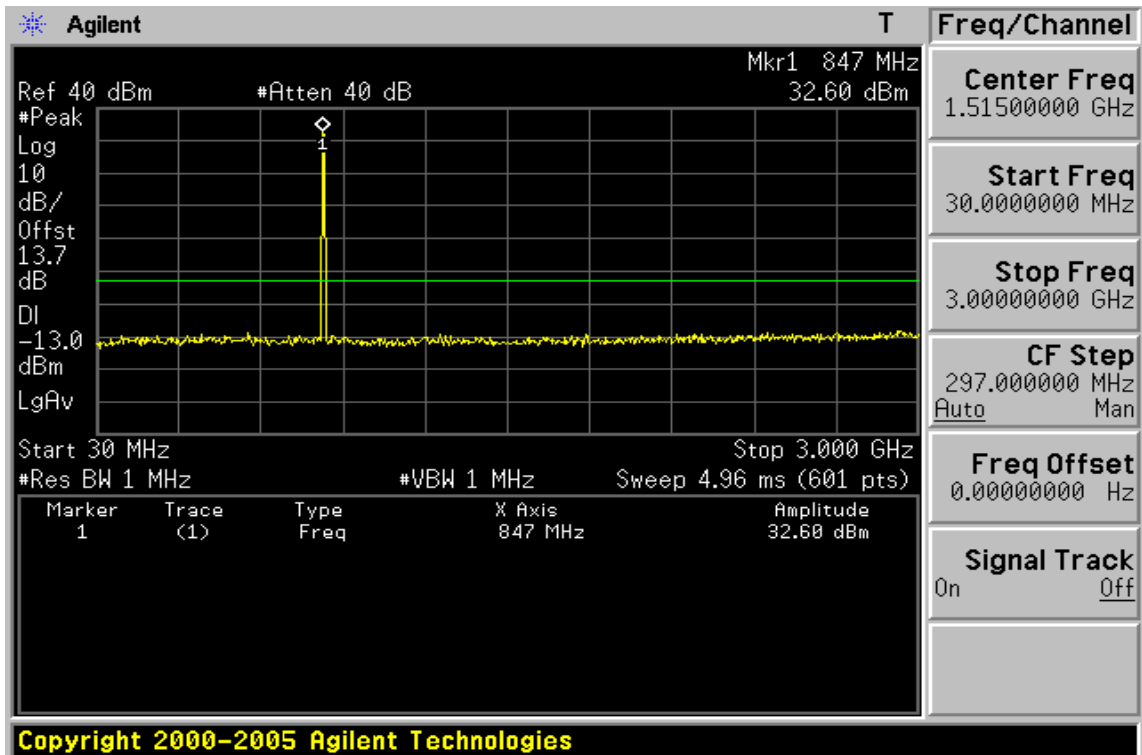
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**Figure 10-3: Out of Band emission at antenna terminals –GSM 850 Channel Highest**



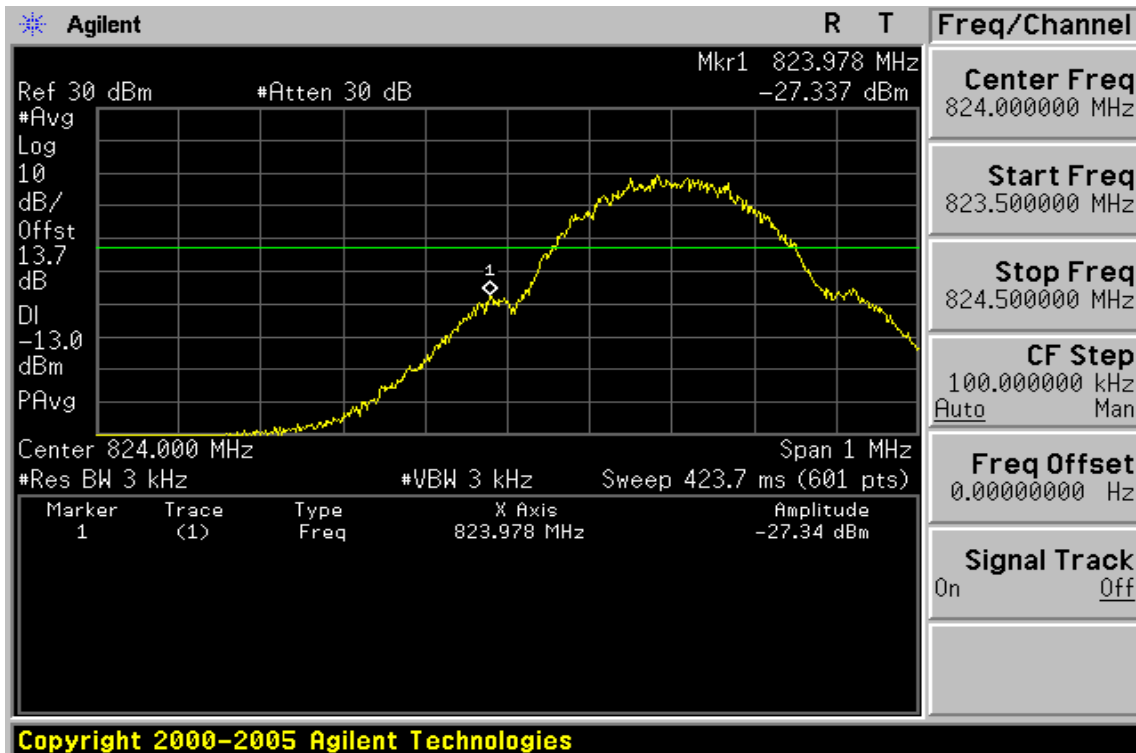
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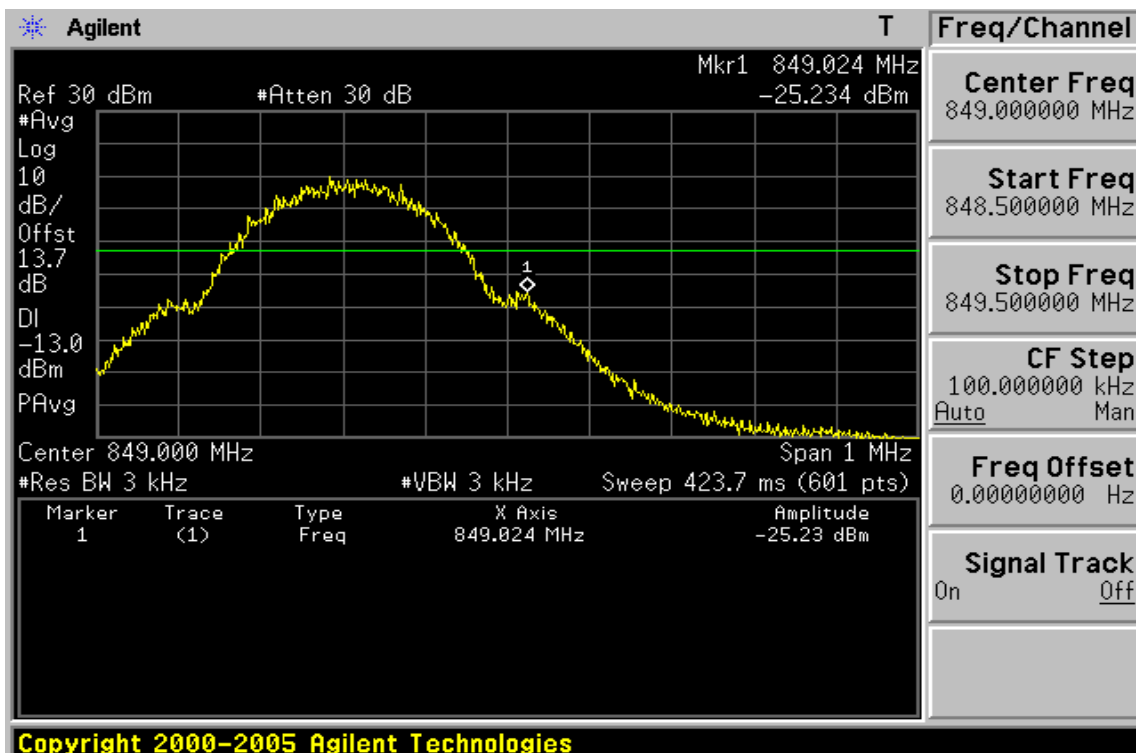
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**Figure 10-4: Band edge emission at antenna terminals –GSM 850 Channel Lowest**



**Figure 10-5: Band edge emission at antenna terminals –GSM 850 Channel Highest**

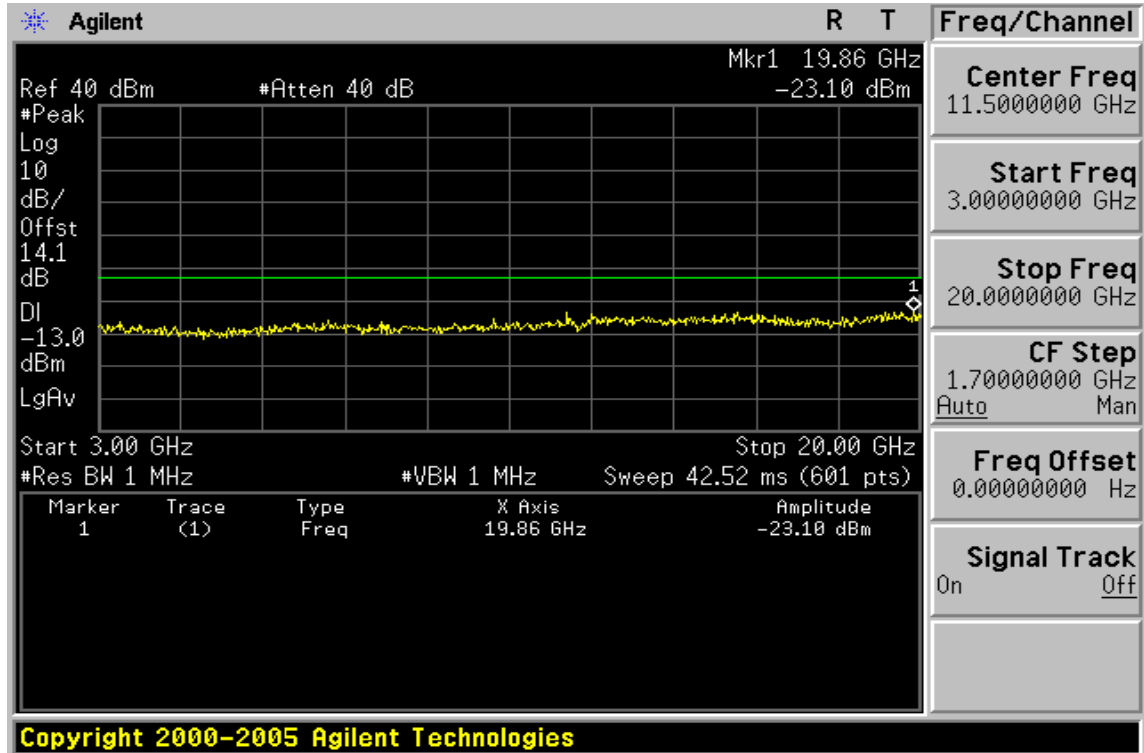
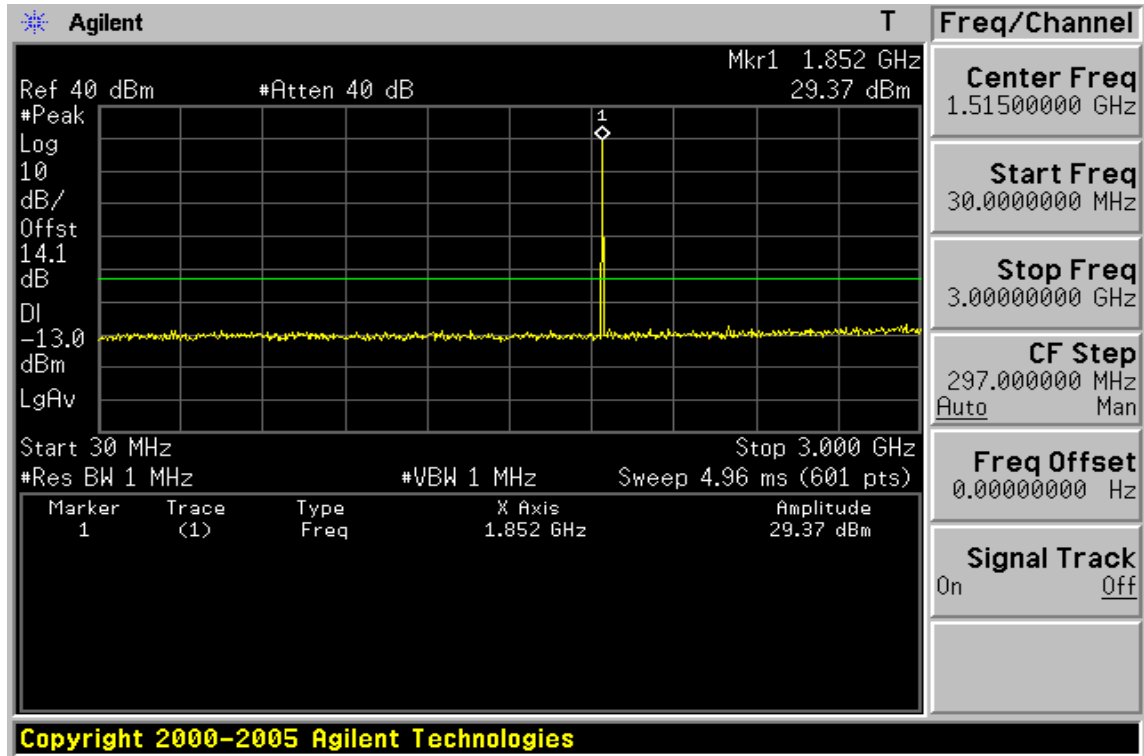


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Figure 10-6: Out of Band emission at antenna terminals – GSM 1900 Channel Lowest



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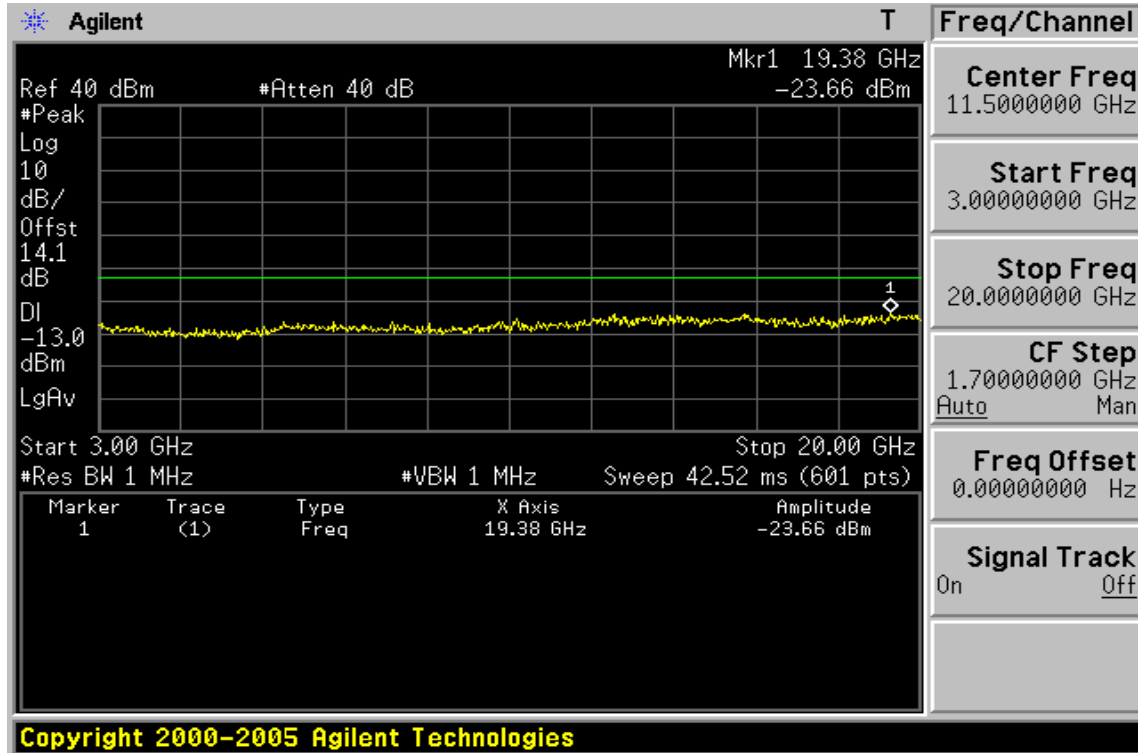
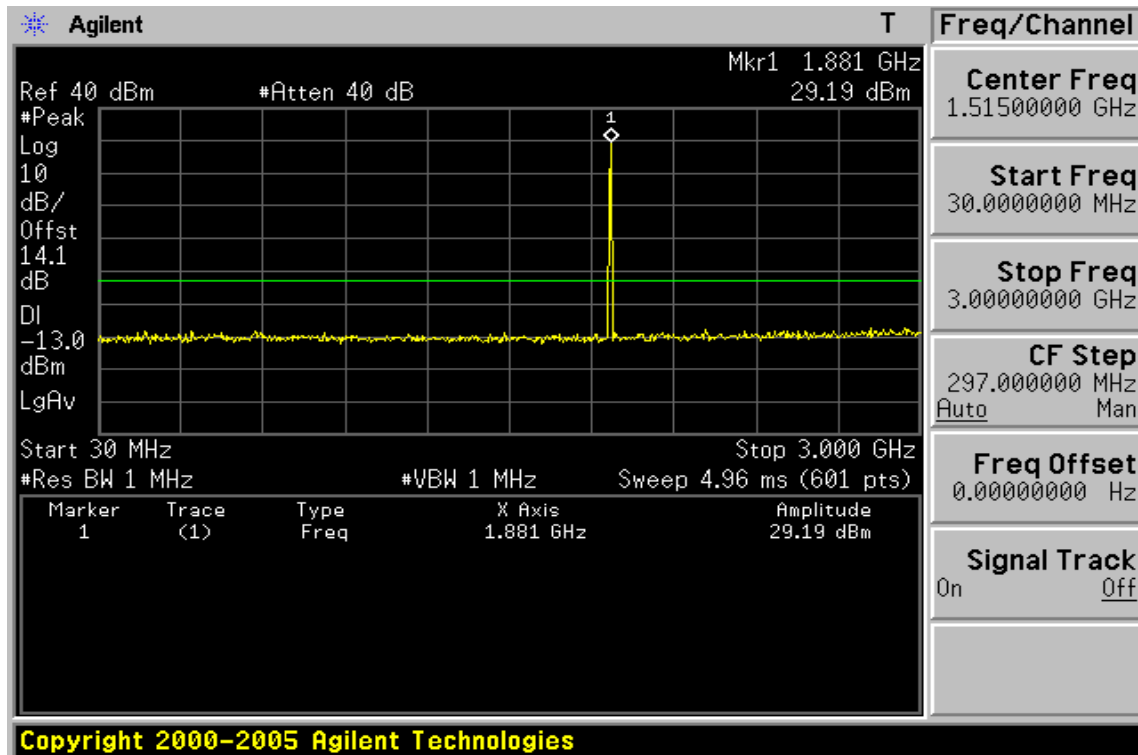
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Figure 10-7: Out of Band emission at antenna terminals – GSM 1900 Channel Mid

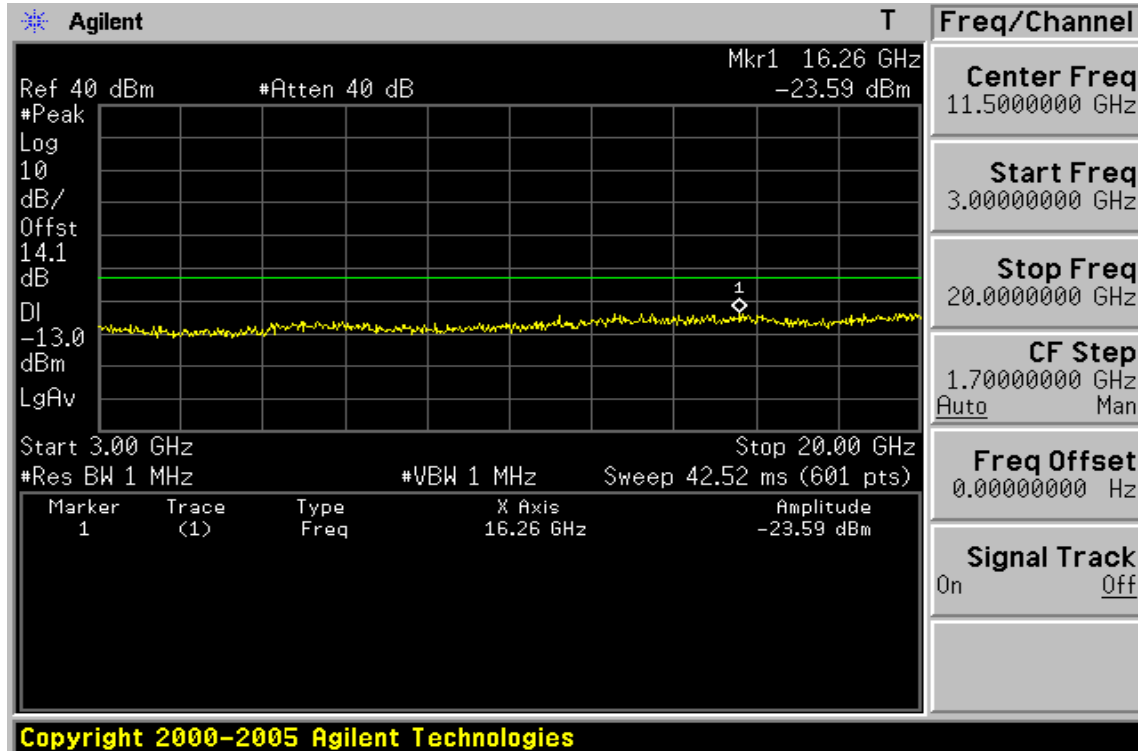
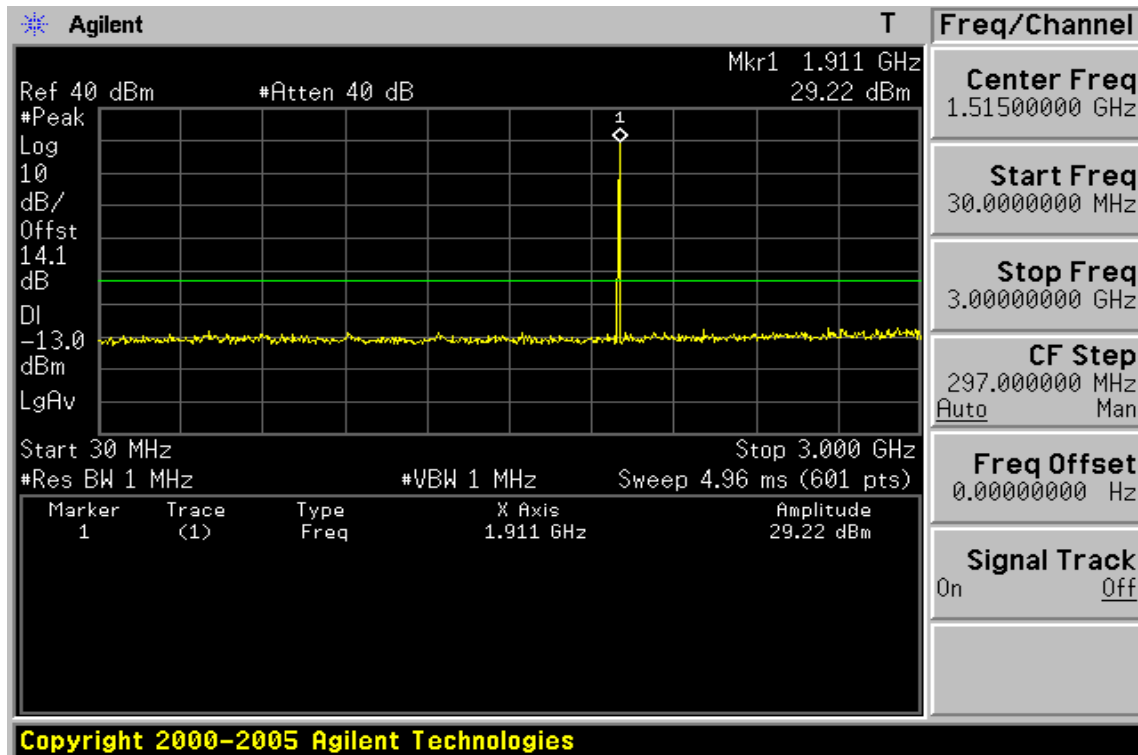


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**Figure 10-8: Out of Band emission at antenna terminals –GSM 1900 Channel Highest**

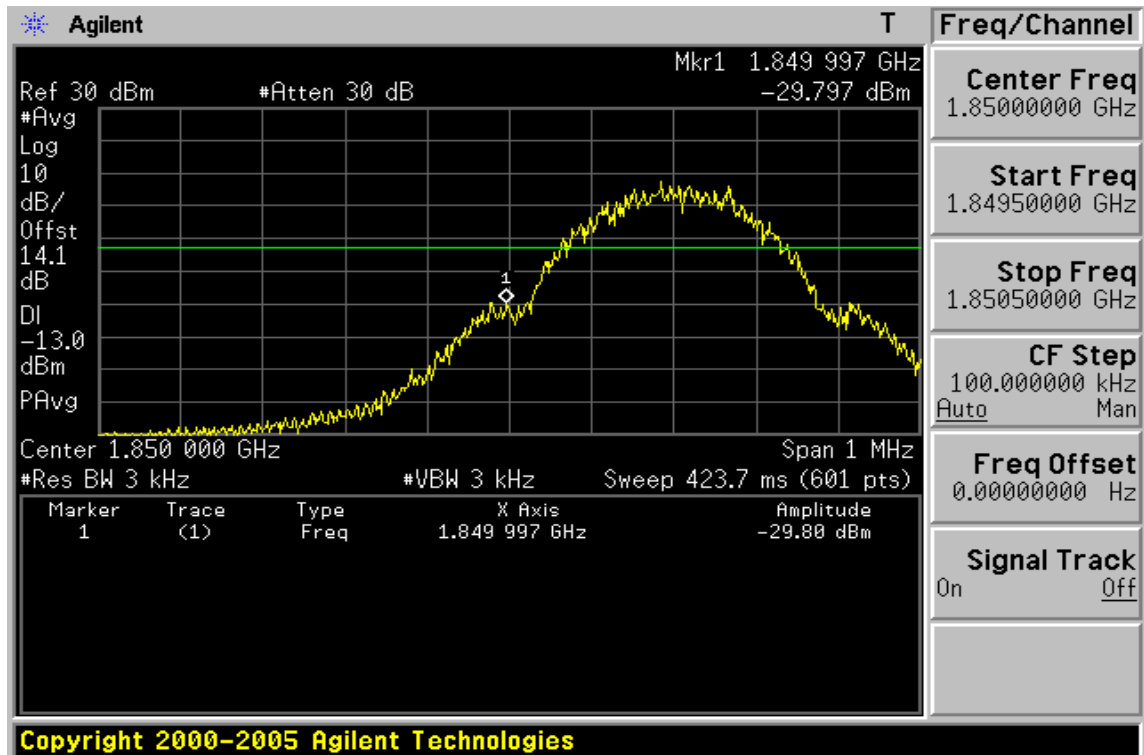


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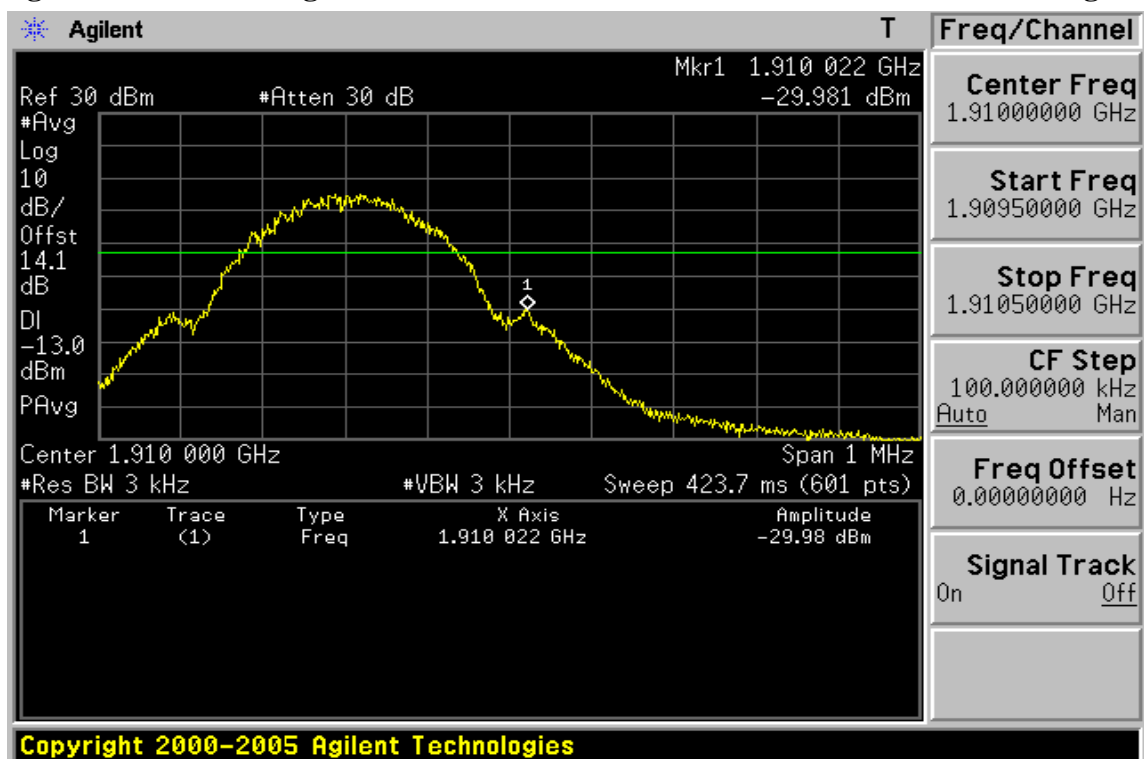
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**Figure 10-9: Band edge emission at antenna terminals –GSM 1900 Channel Lowest**



**Figure 10-10: Band edge emission at antenna terminals –GSM 1900 Channel Highest**

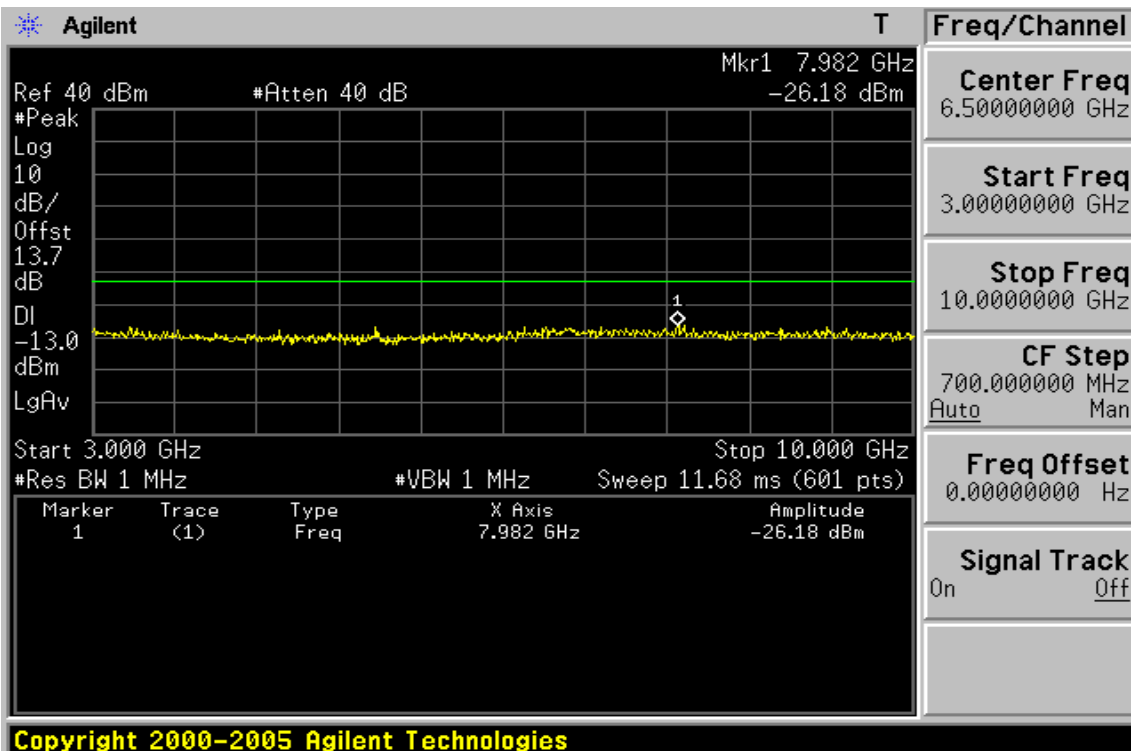
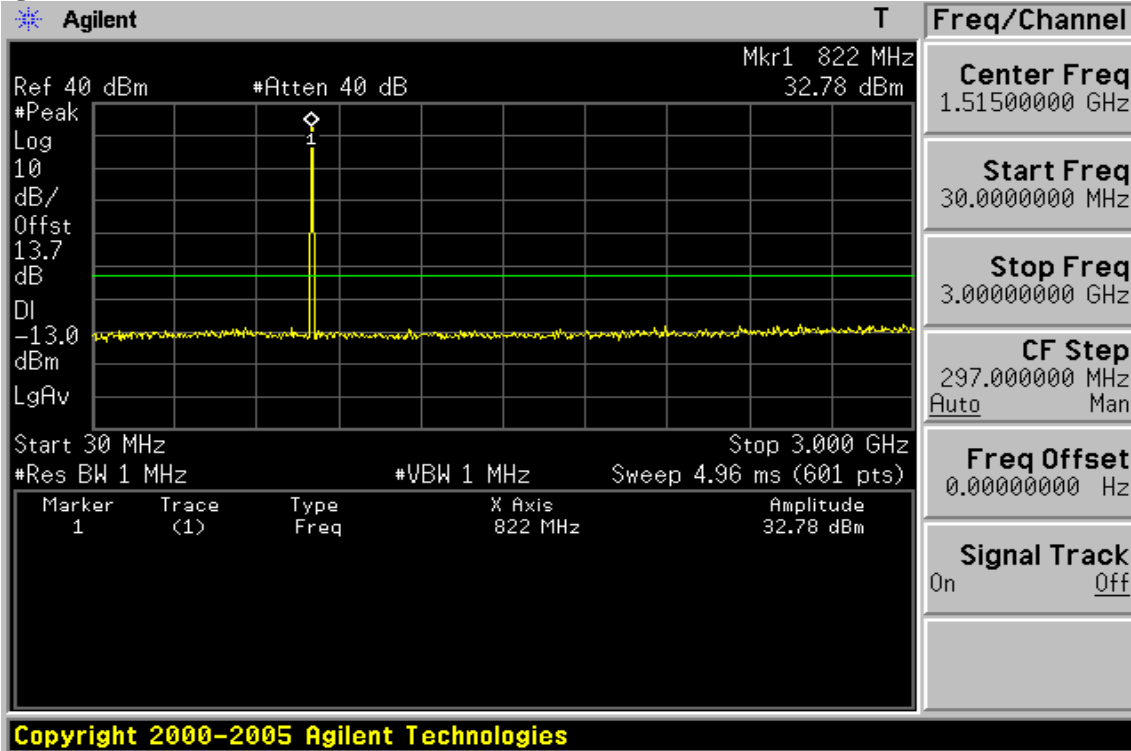


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Figure 10-11: Out of Band emission at antenna terminals– GPRS 850 Channel Lowest



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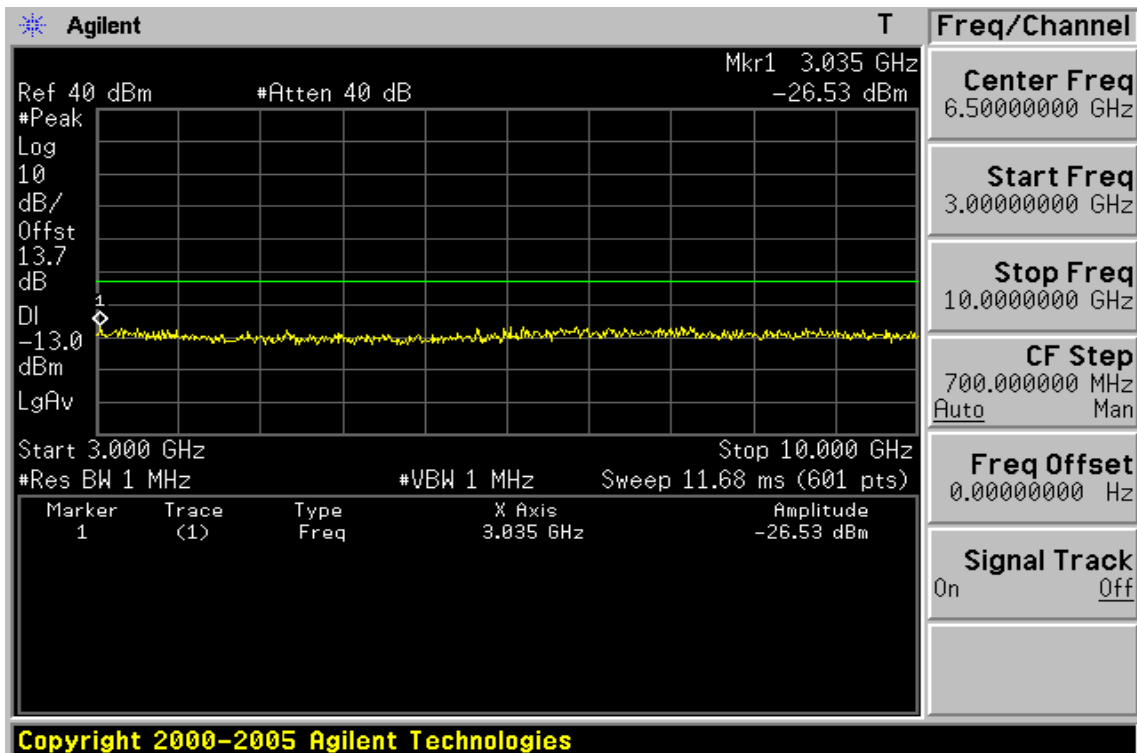
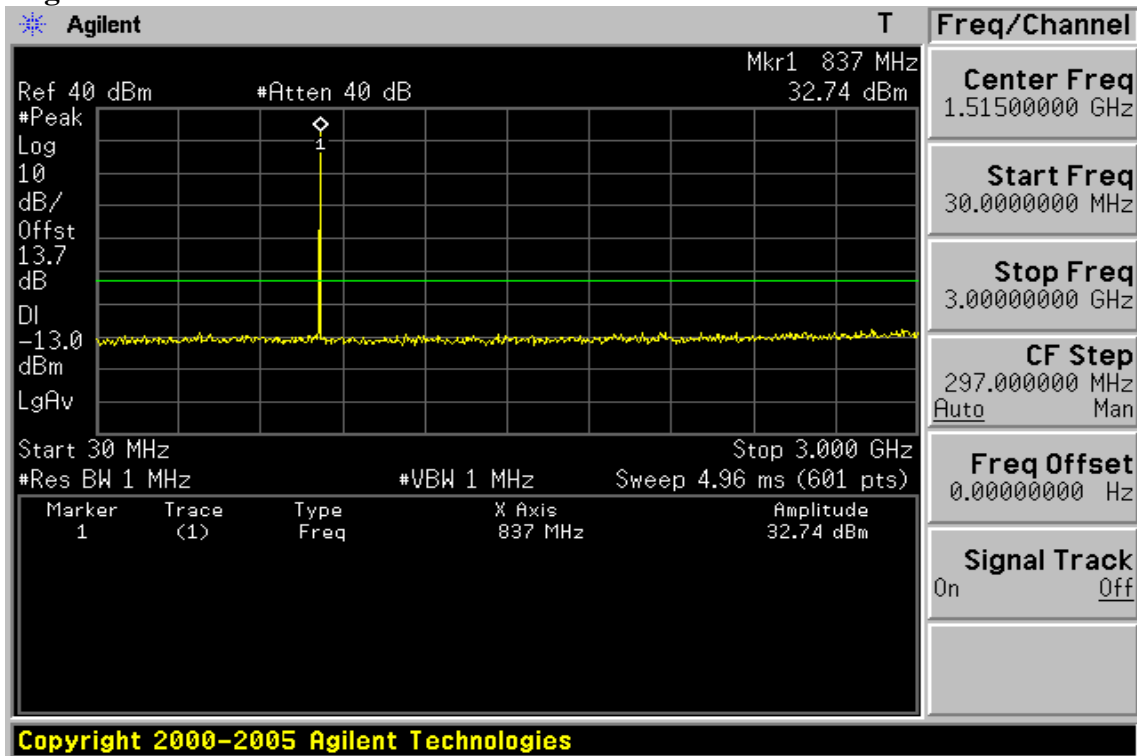
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Figure 10-12: Out of Band emission at antenna terminals –GPRS 850 Channel Mid



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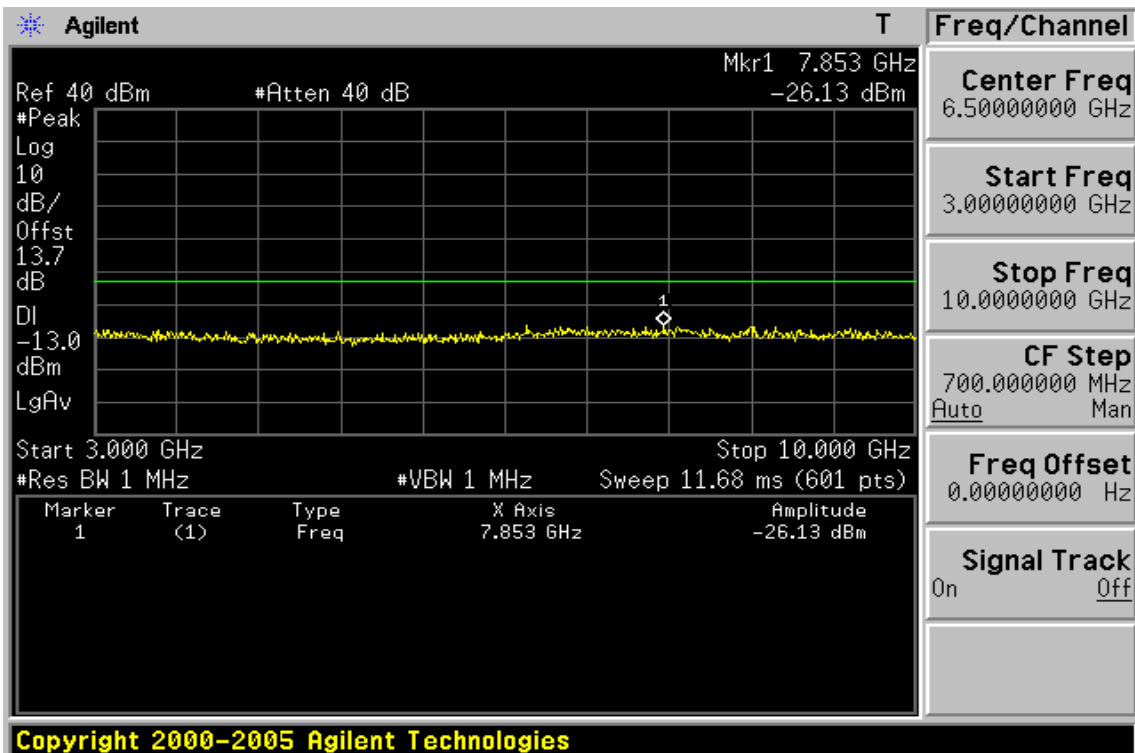
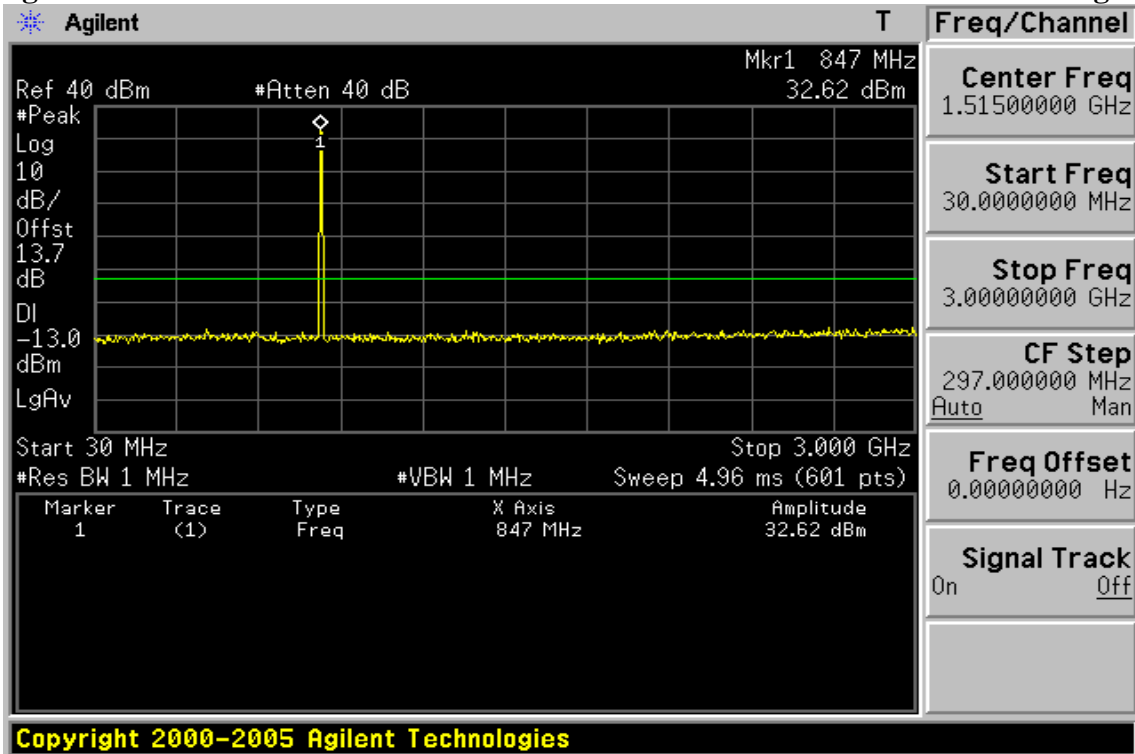
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**Figure 10-13: Out of Band emission at antenna terminals–GPRS 850 Channel Highest**



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Figure 10-14: Band edge emission at antenna terminals –GPRS 850 Channel Lowest

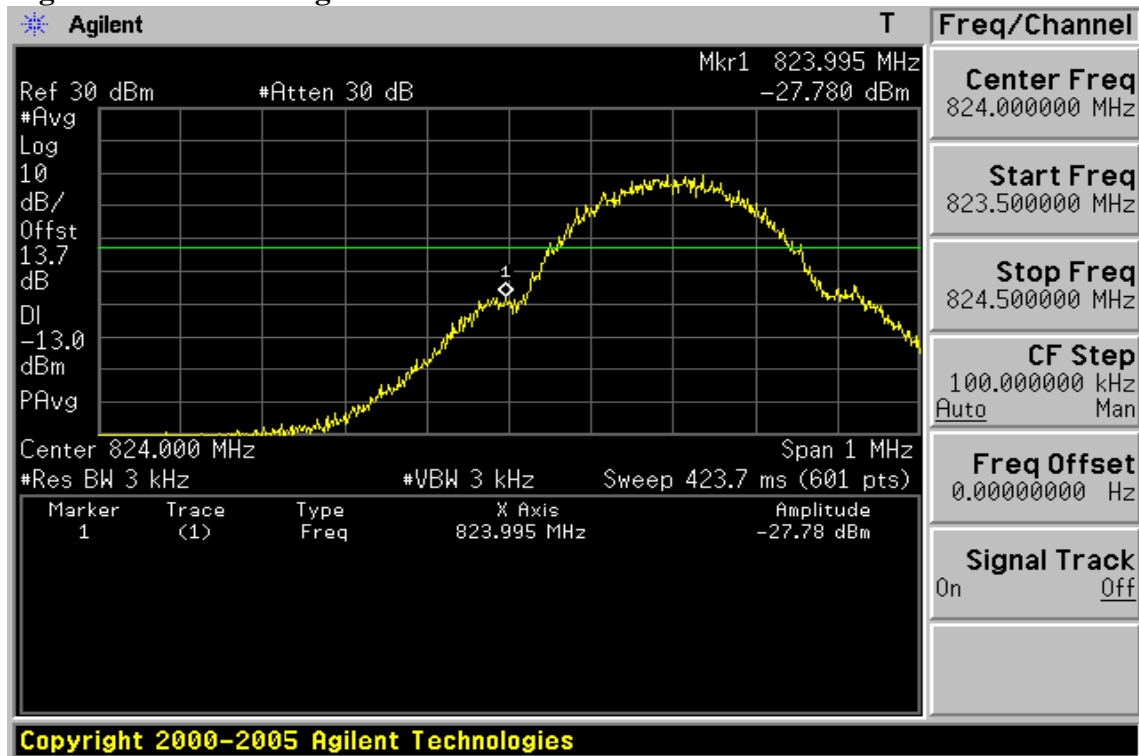
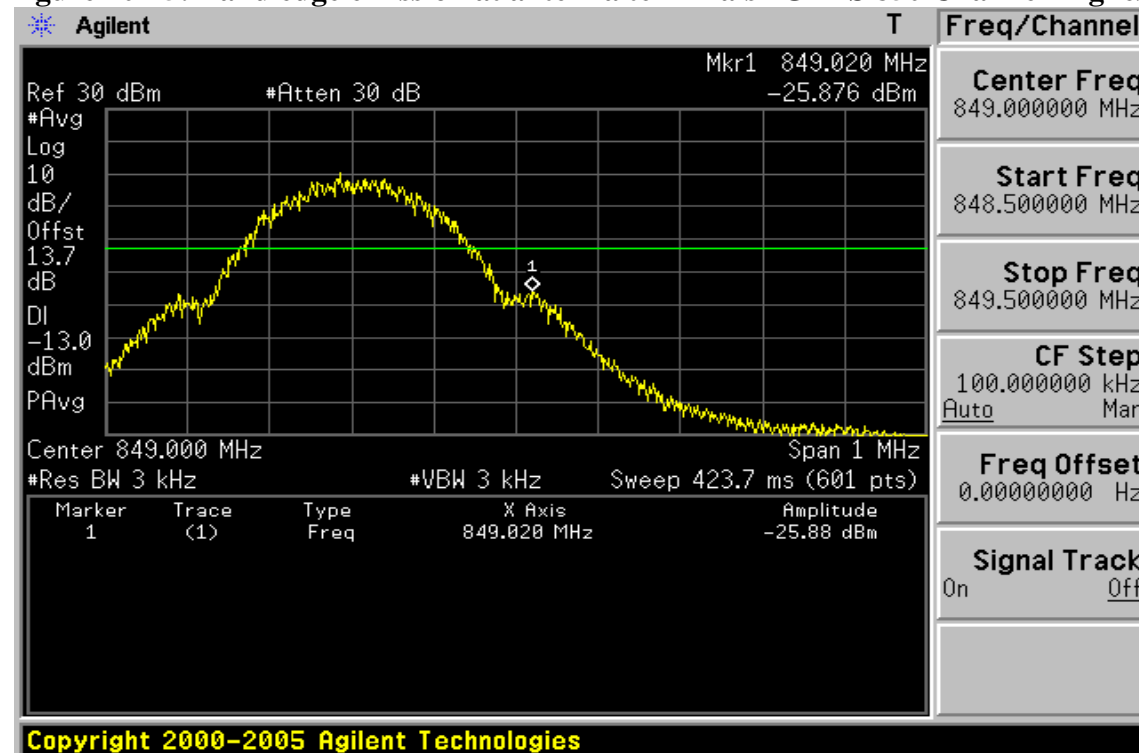


Figure 10-15: Band edge emission at antenna terminals –GPRS 850 Channel Highest

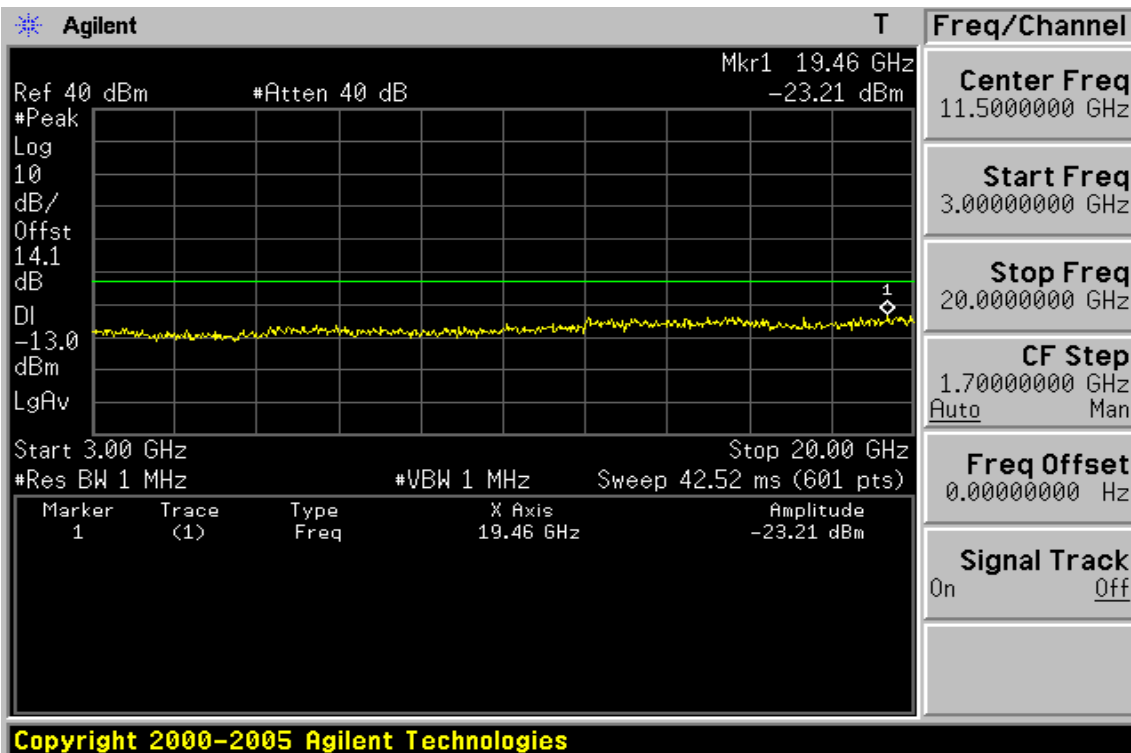
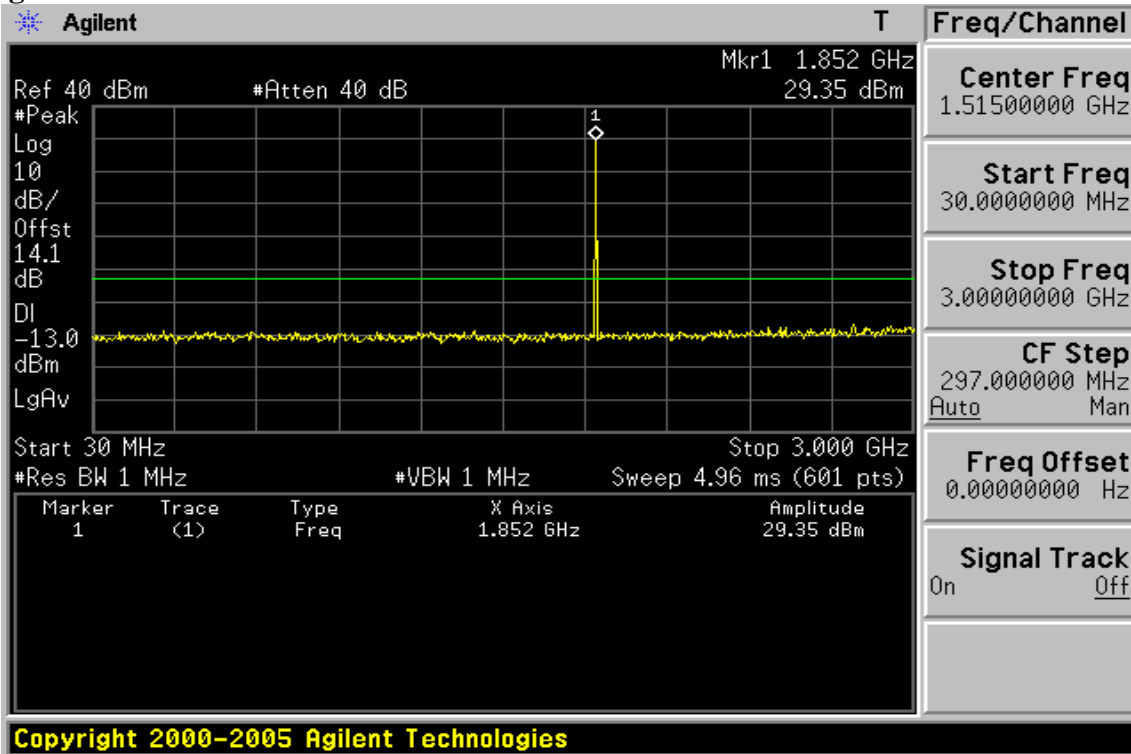


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Figure 10-16: Out of Band emission at antenna terminals–GPRS 1900 Channel Lowest



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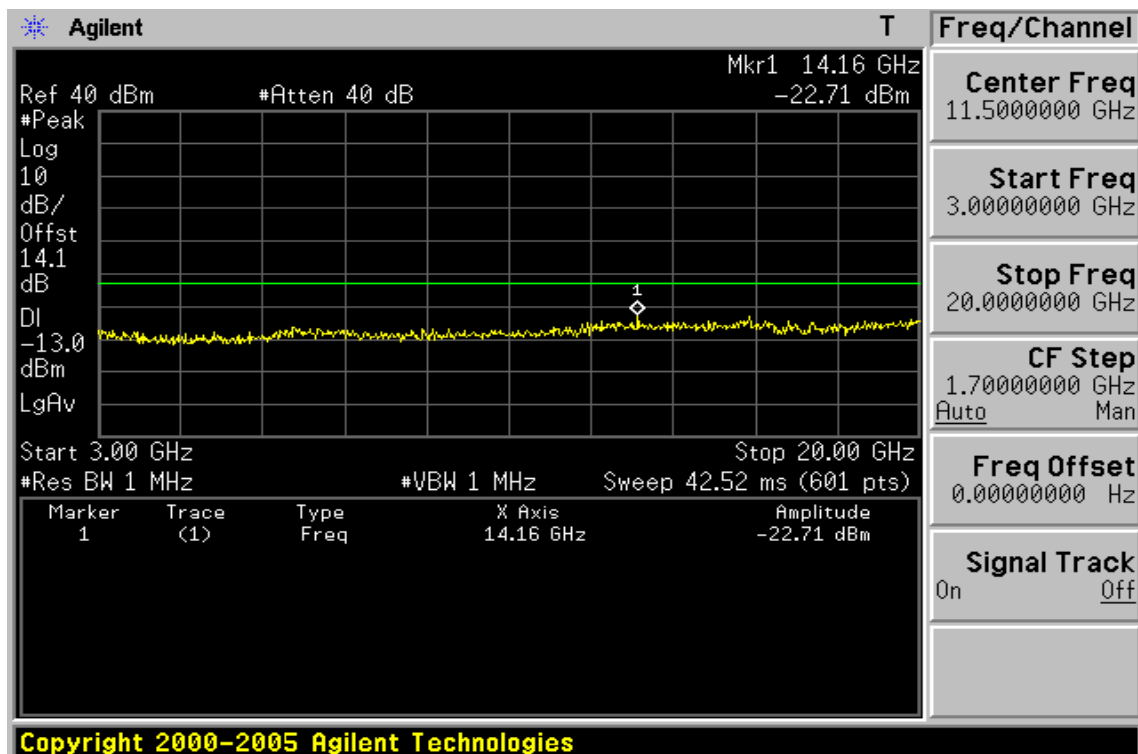
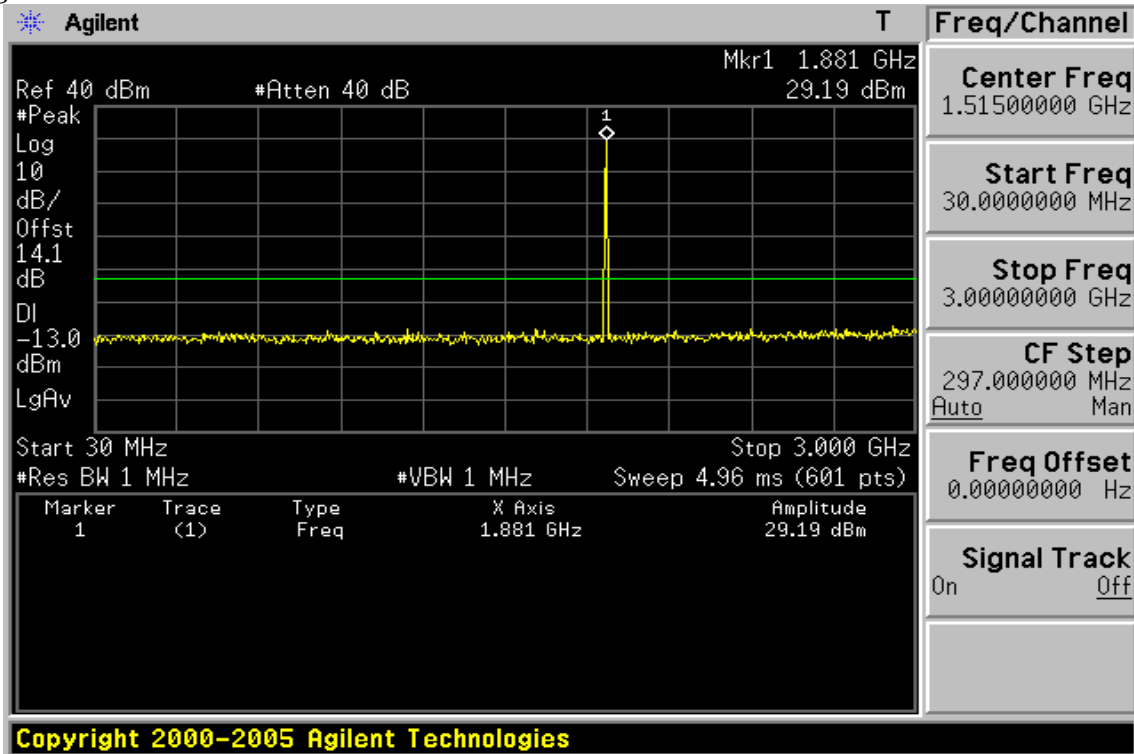
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Figure 10-17: Out of Band emission at antenna terminals –GPRS 1900 Channel Mid

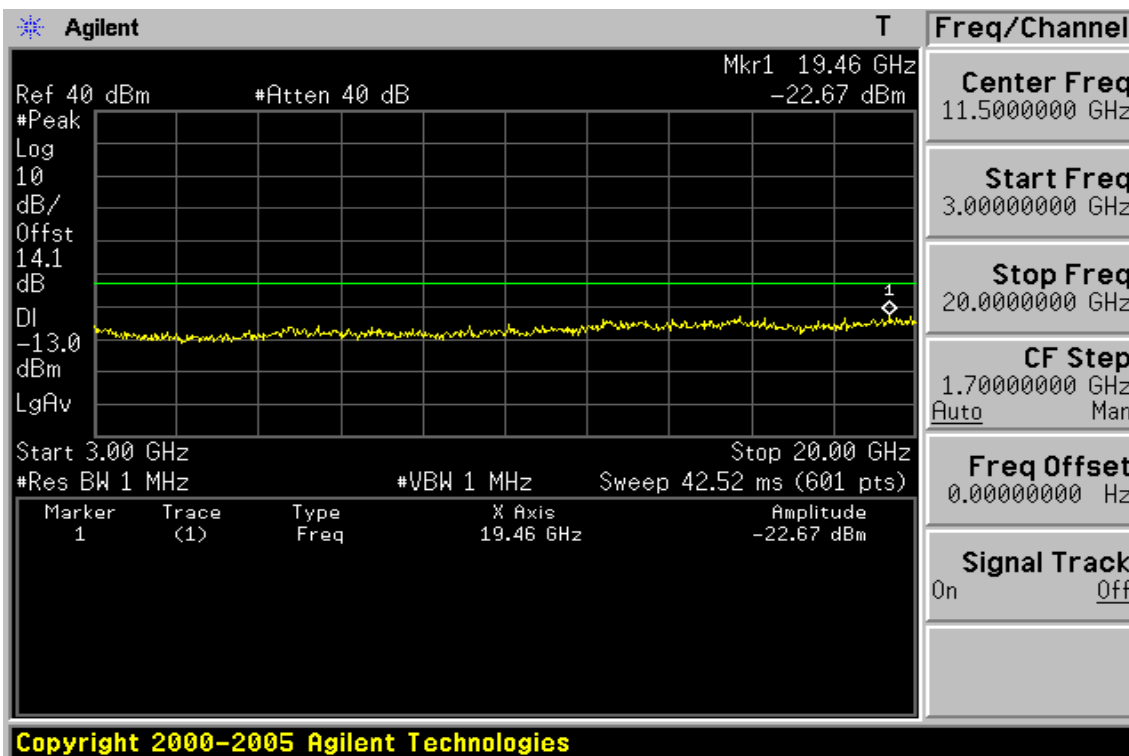
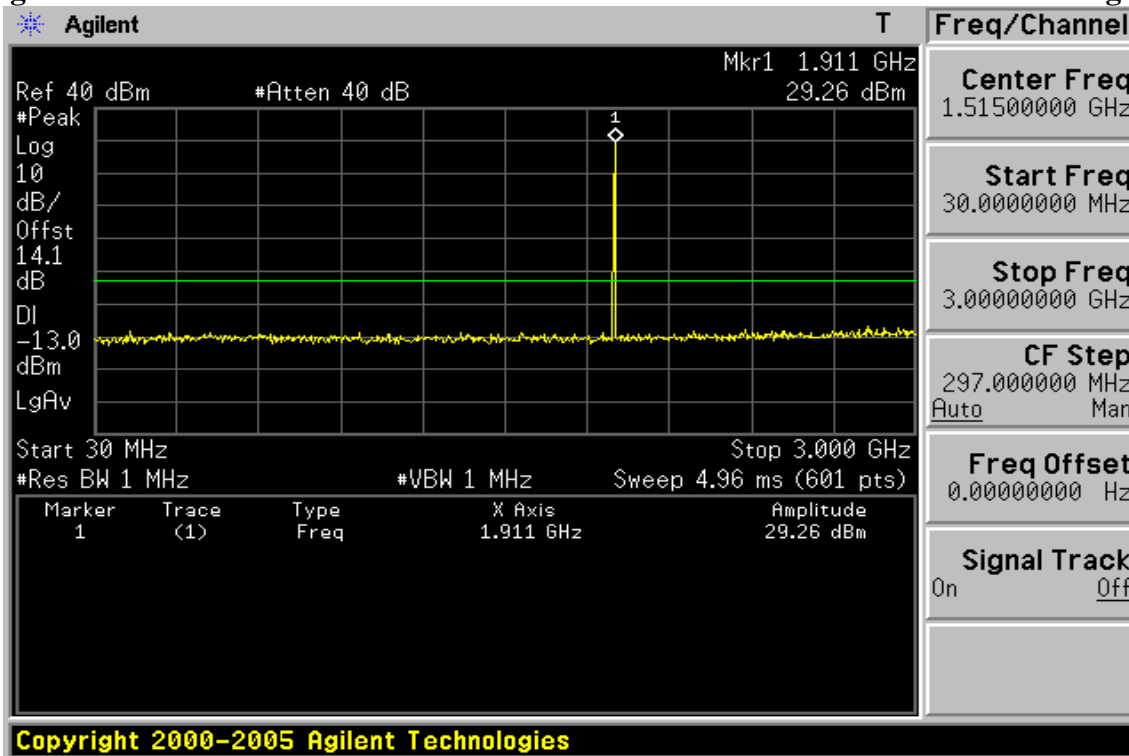


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Figure 10-18: Out of Band emission at antenna terminals –GPRS 1900 Channel Highest



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Figure 10-19: Bad edge emission at antenna terminals –GPRS 1900 Channel Lowest

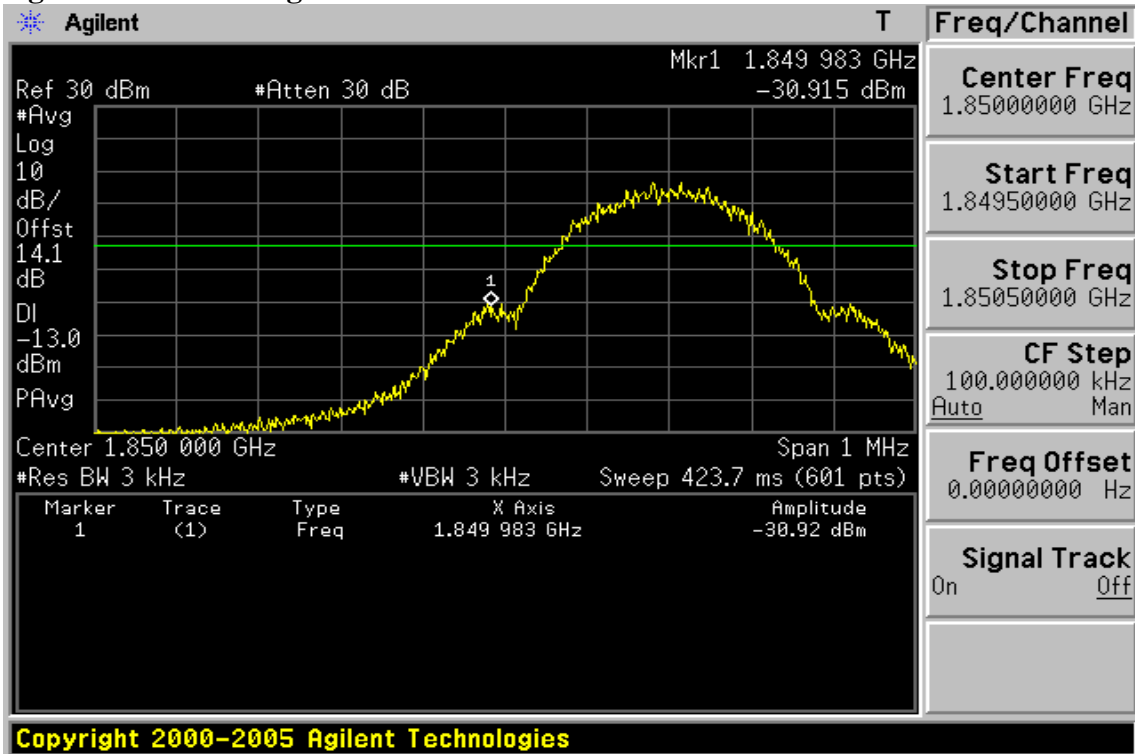
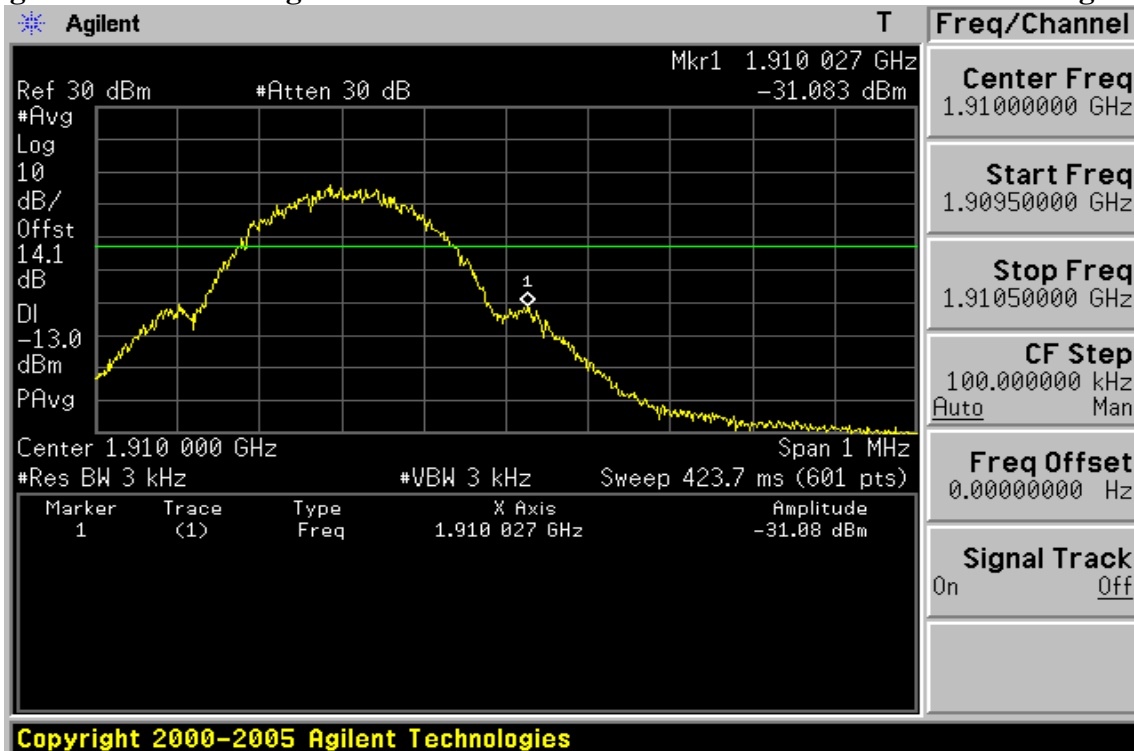


Figure 10-20: Band edge emission at antenna terminals –GPRS 1900 Channel Highest



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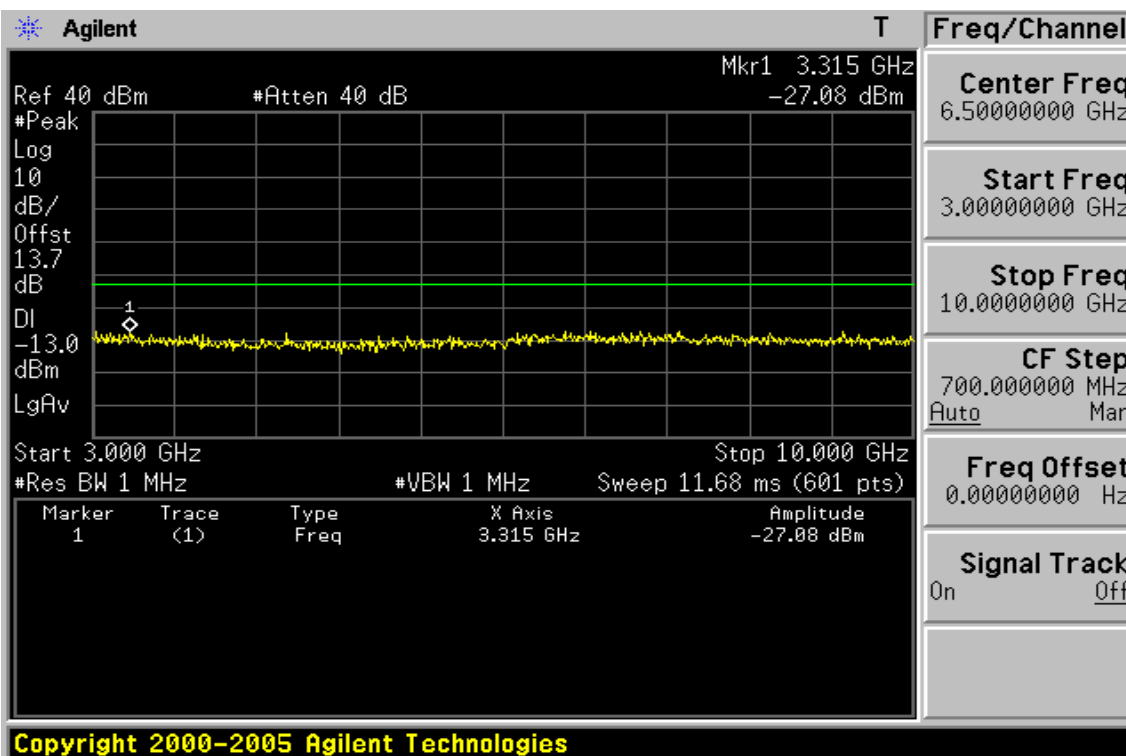
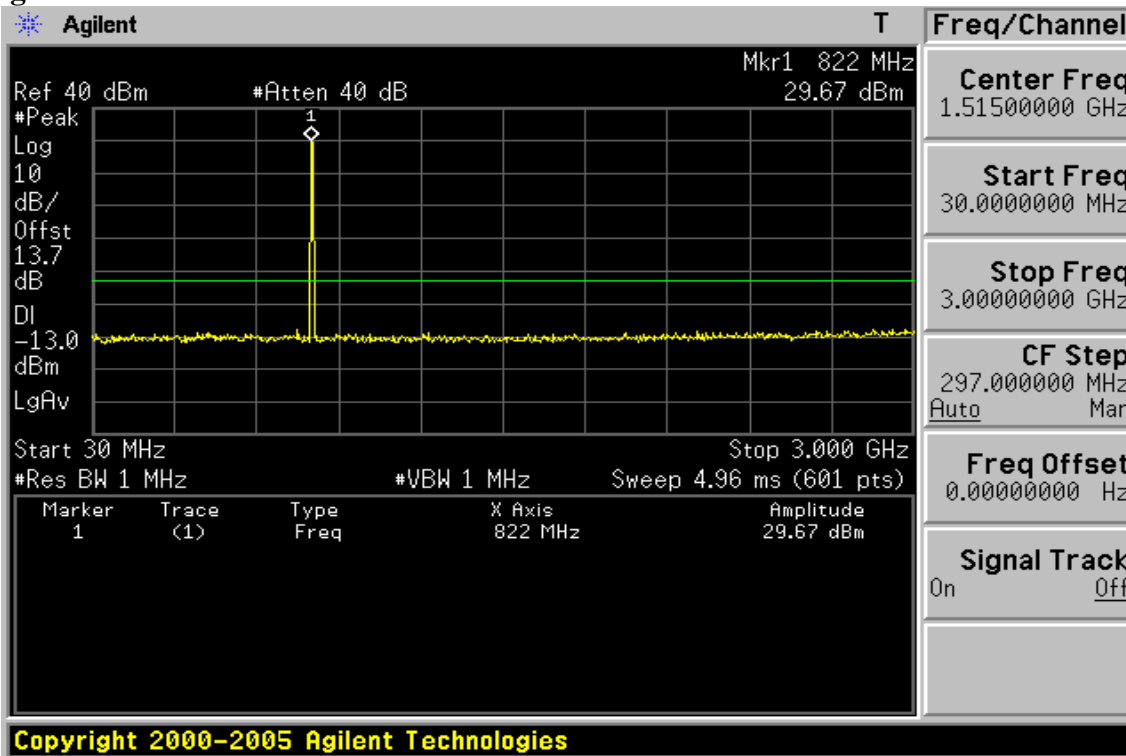
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Figure 10-21: Out of Band emission at antenna terminals– EDGE 850 Channel Lowest



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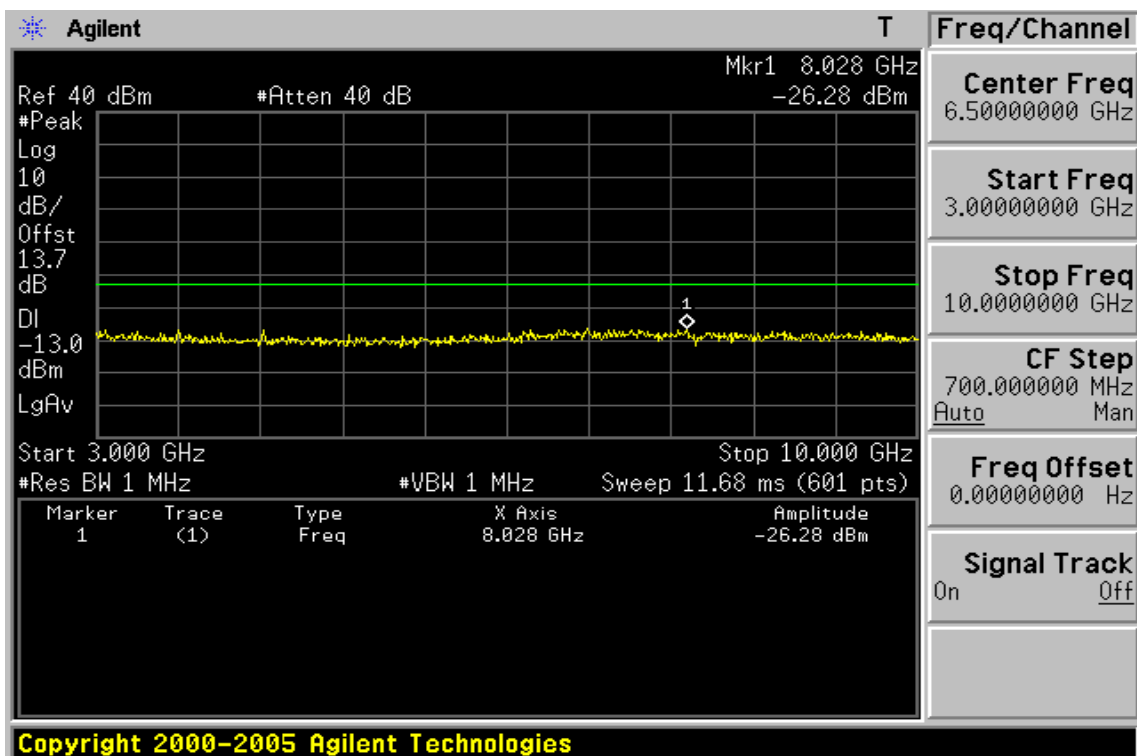
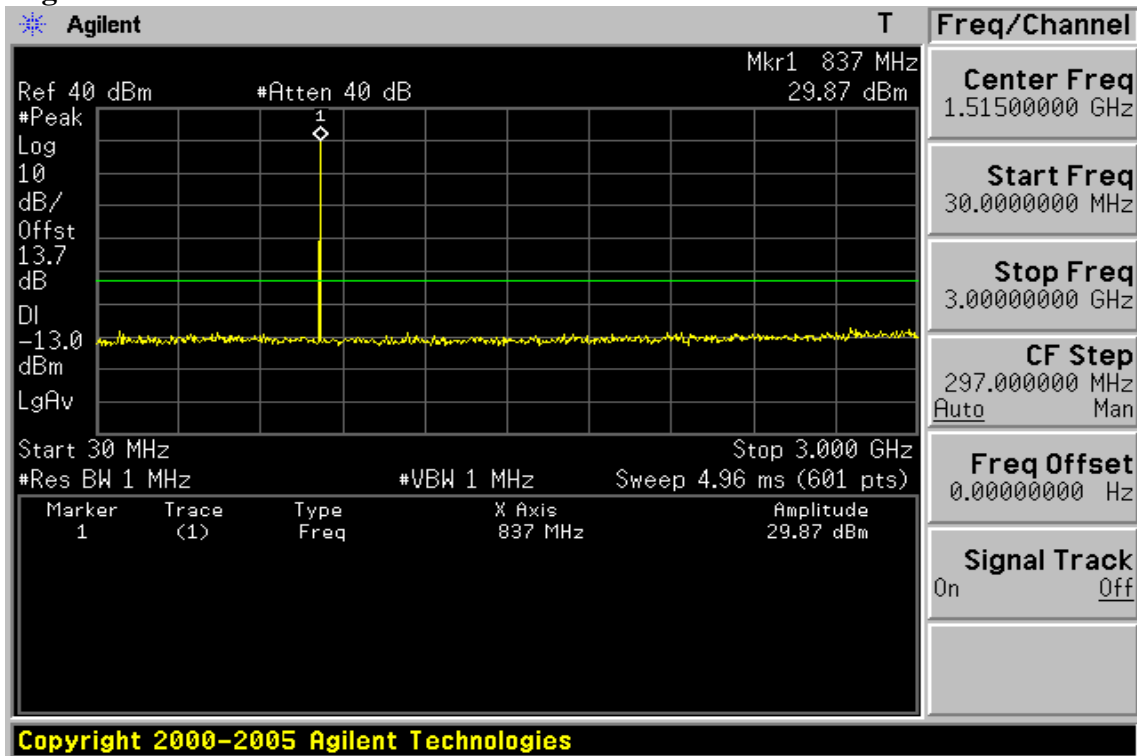
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Figure 10-22: Out of Band emission at antenna terminals –EDGE 850 Channel Mid



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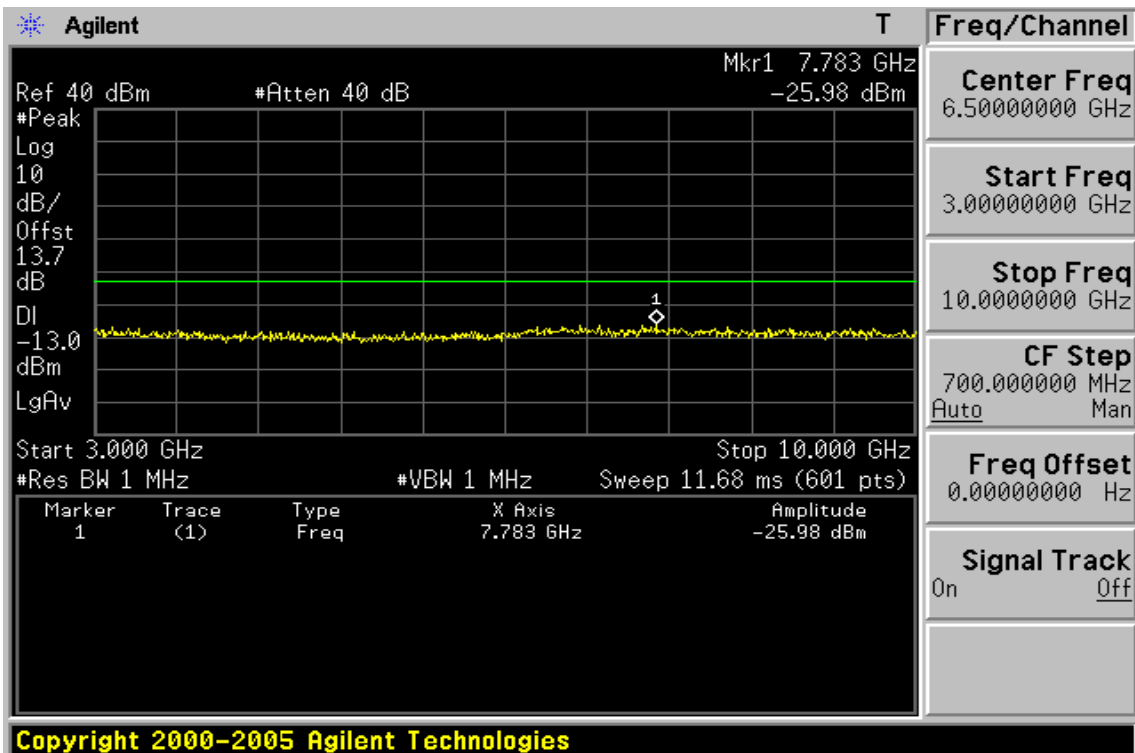
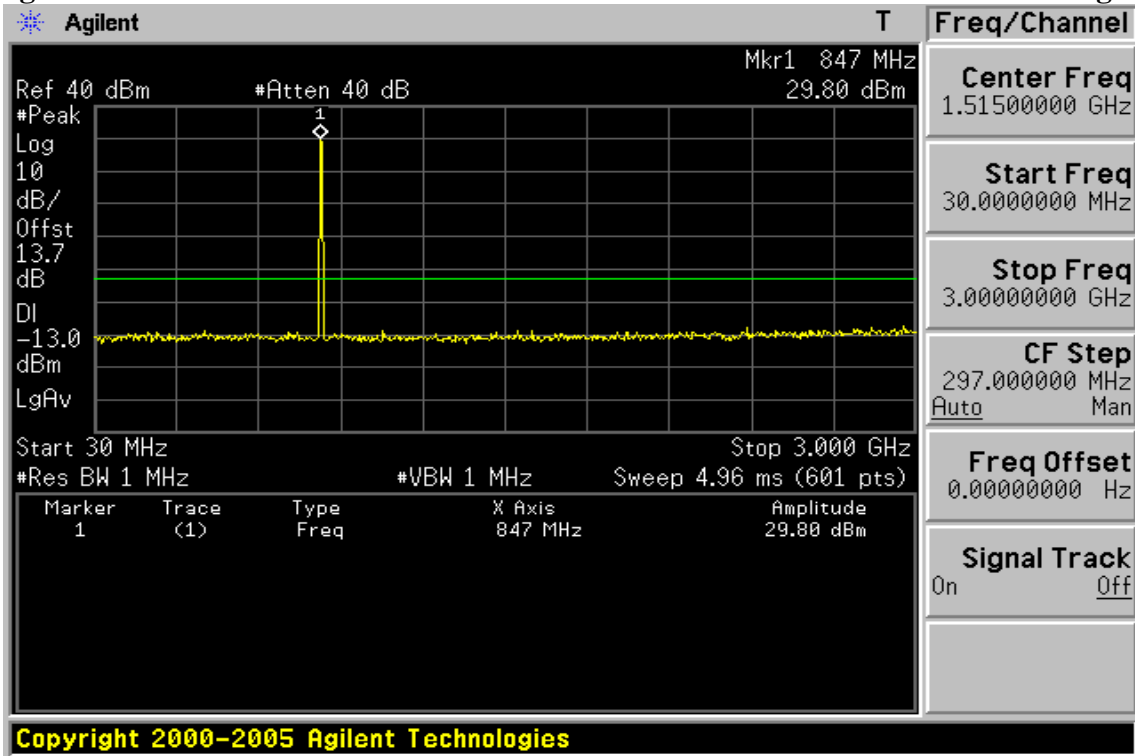
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Figure 10-23: Out of Band emission at antenna terminals–EDGE 850 Channel Highest



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Figure 10-24: Band edge emission at antenna terminals –EDGE 850 Channel Lowest

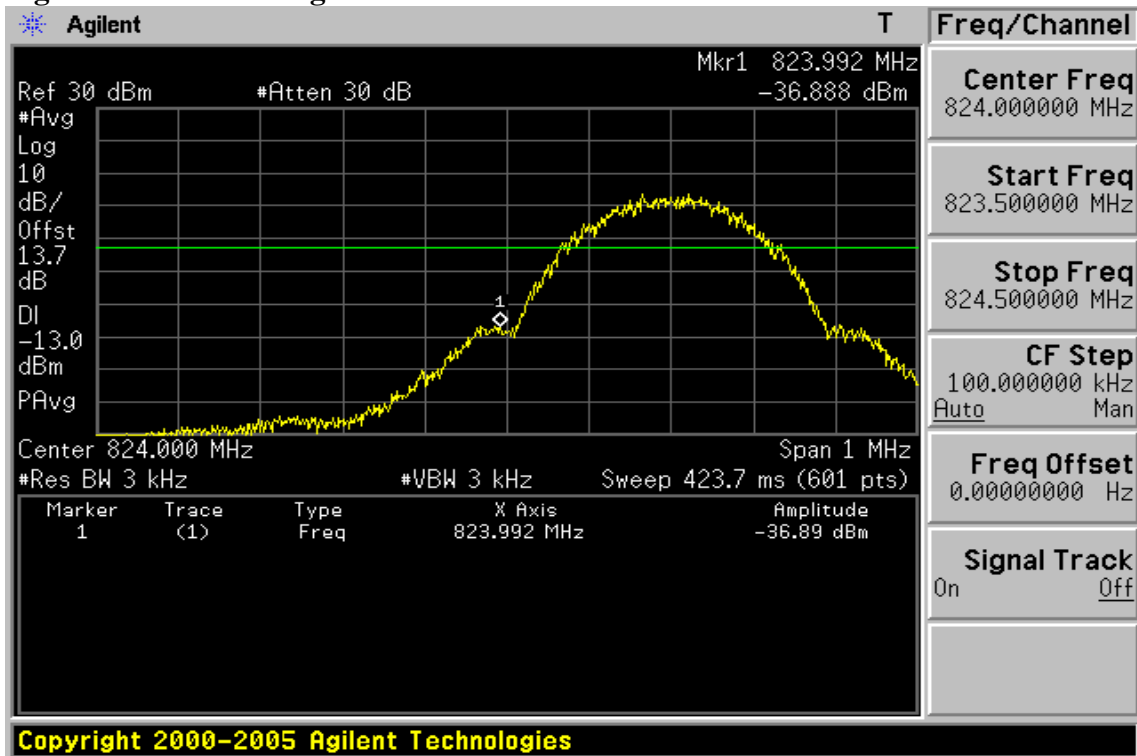
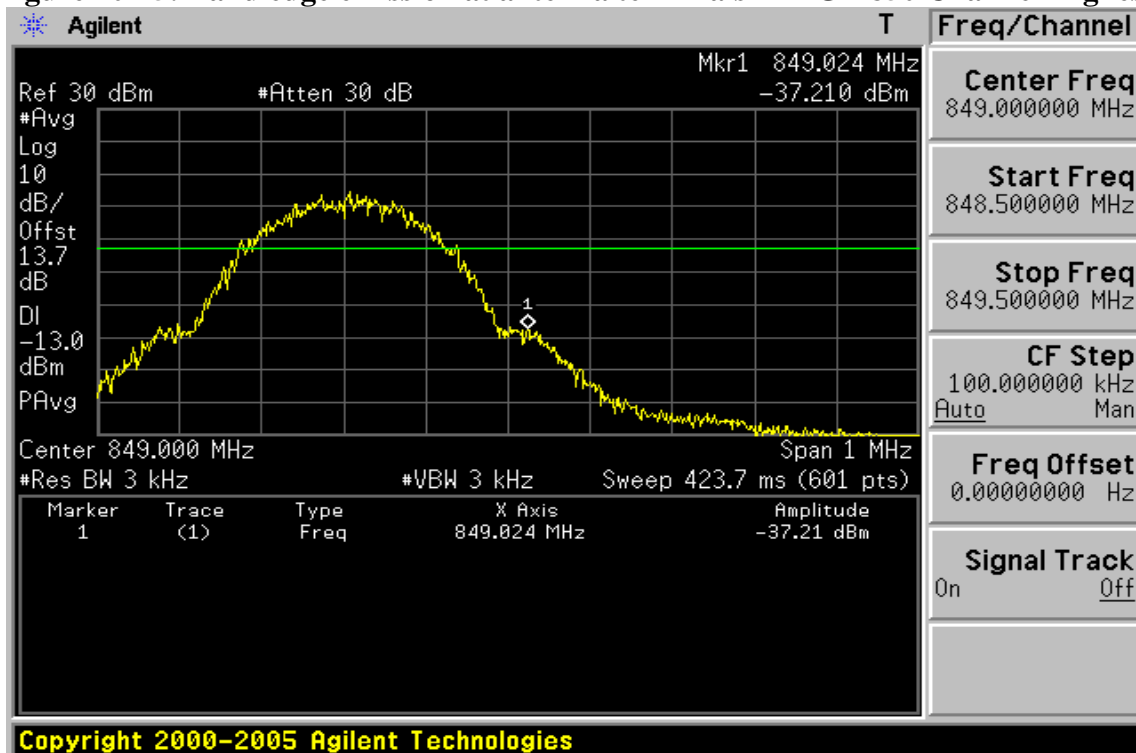


Figure 10-25: Band edge emission at antenna terminals –EDGE 850 Channel Highest

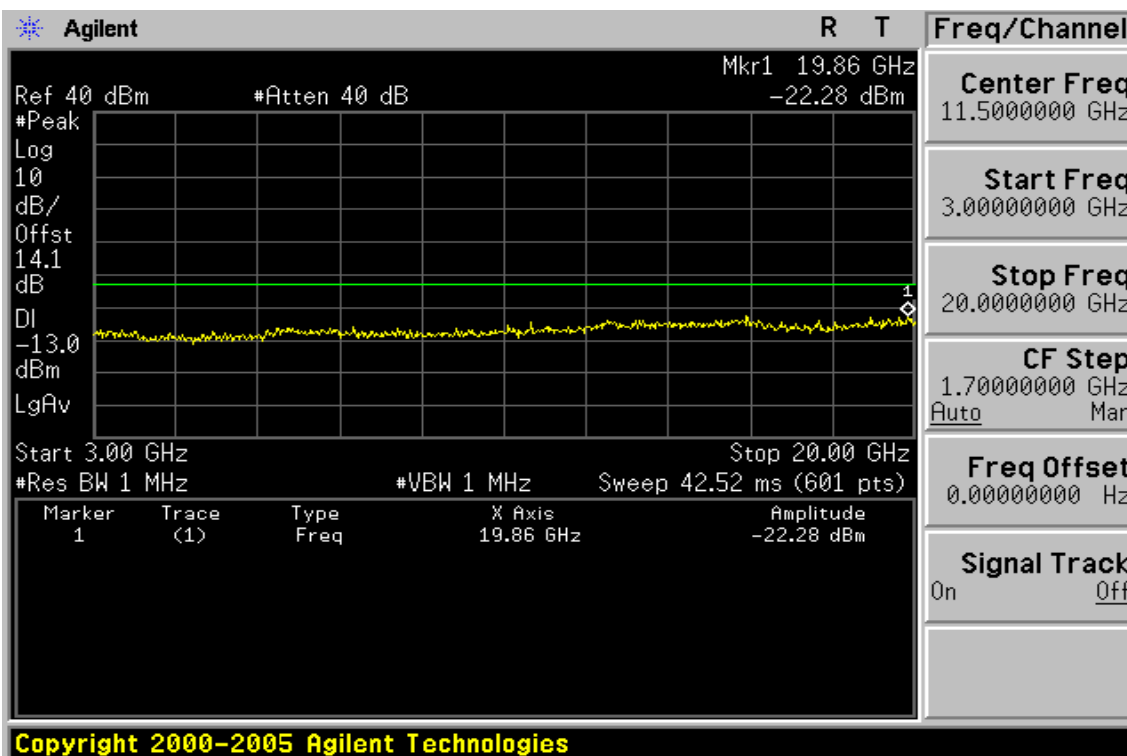
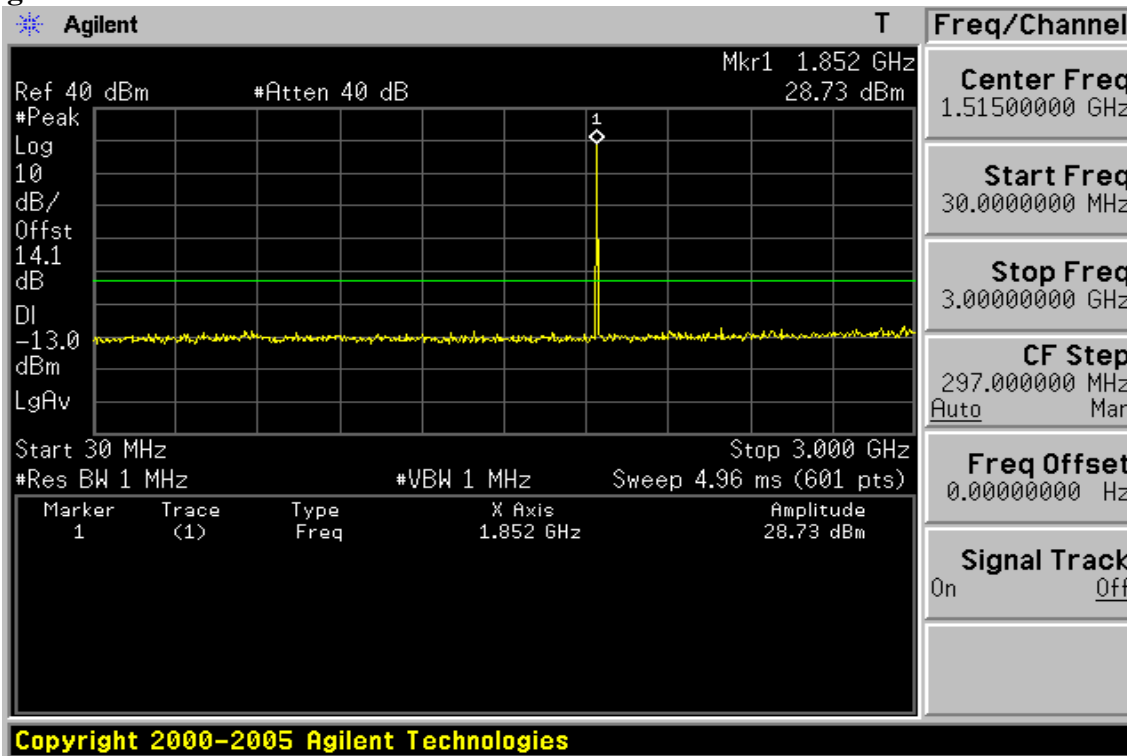


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Figure 10-26: Out of Band emission at antenna terminals–EDGE 1900 Channel Lowest



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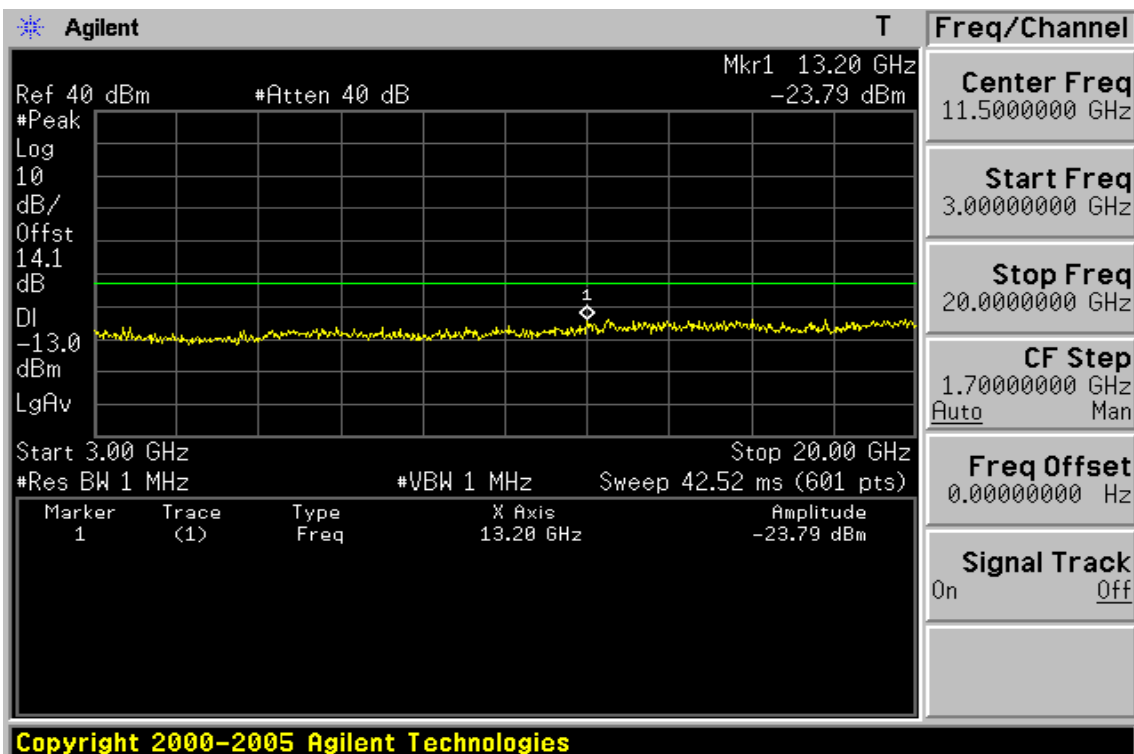
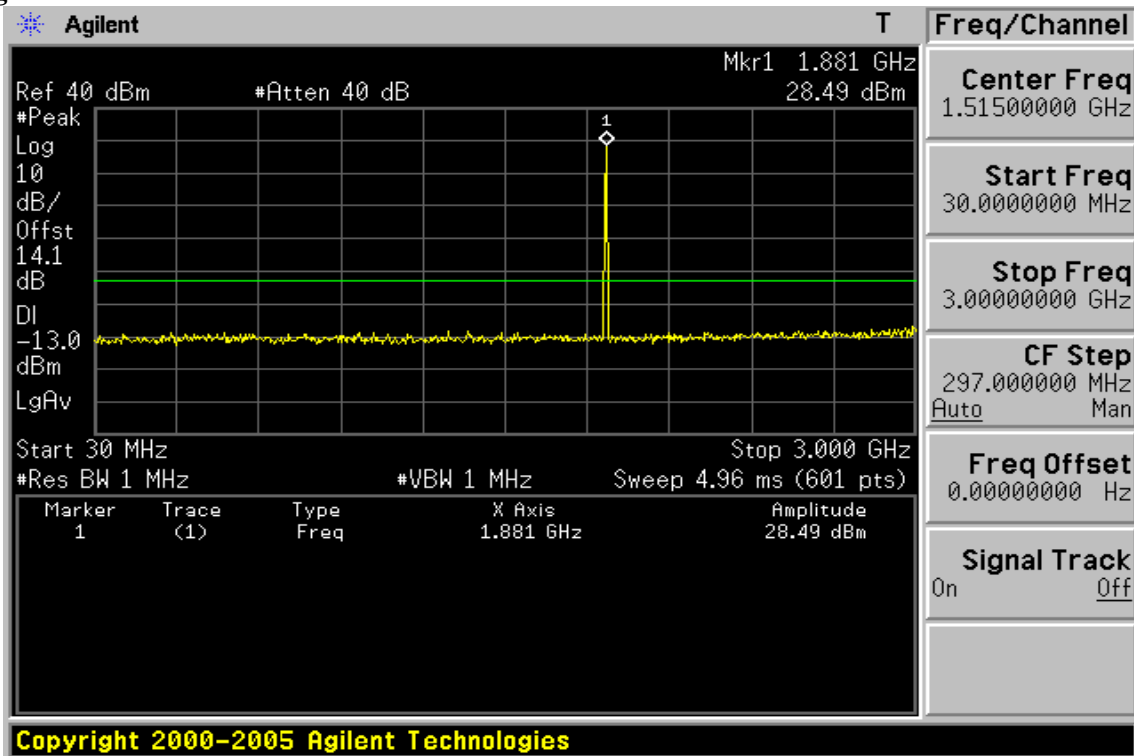
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Figure 10-27: Out of Band emission at antenna terminals –EDGE 1900 Channel Mid

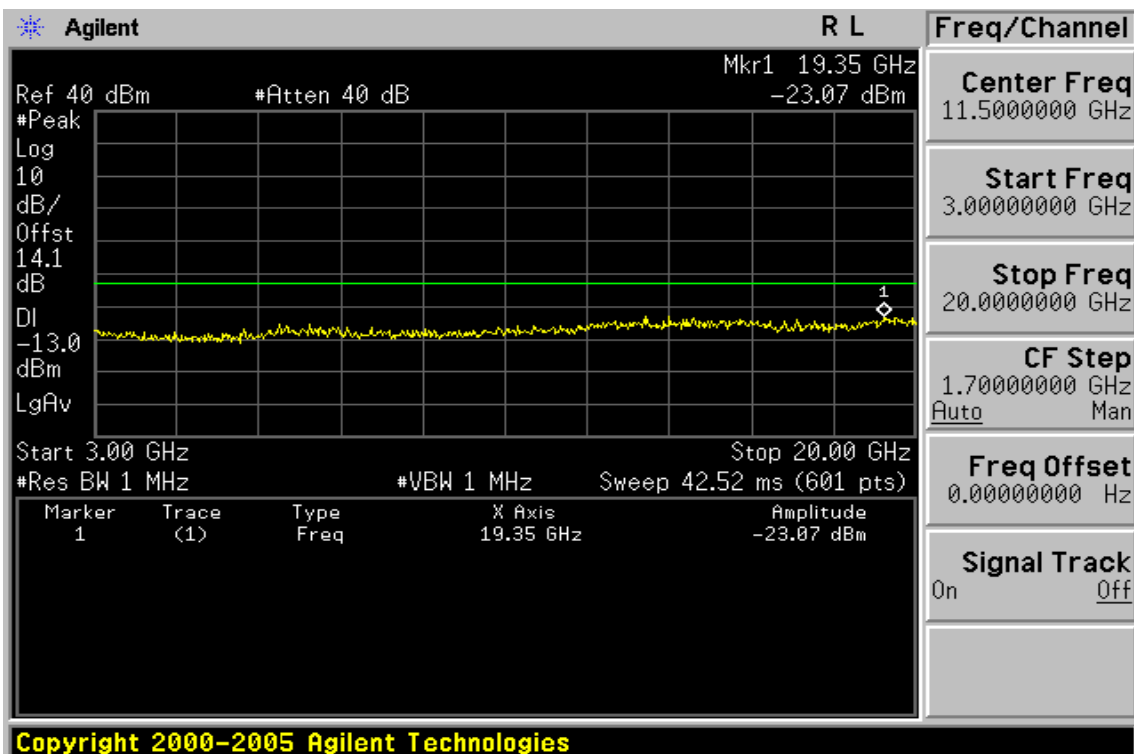
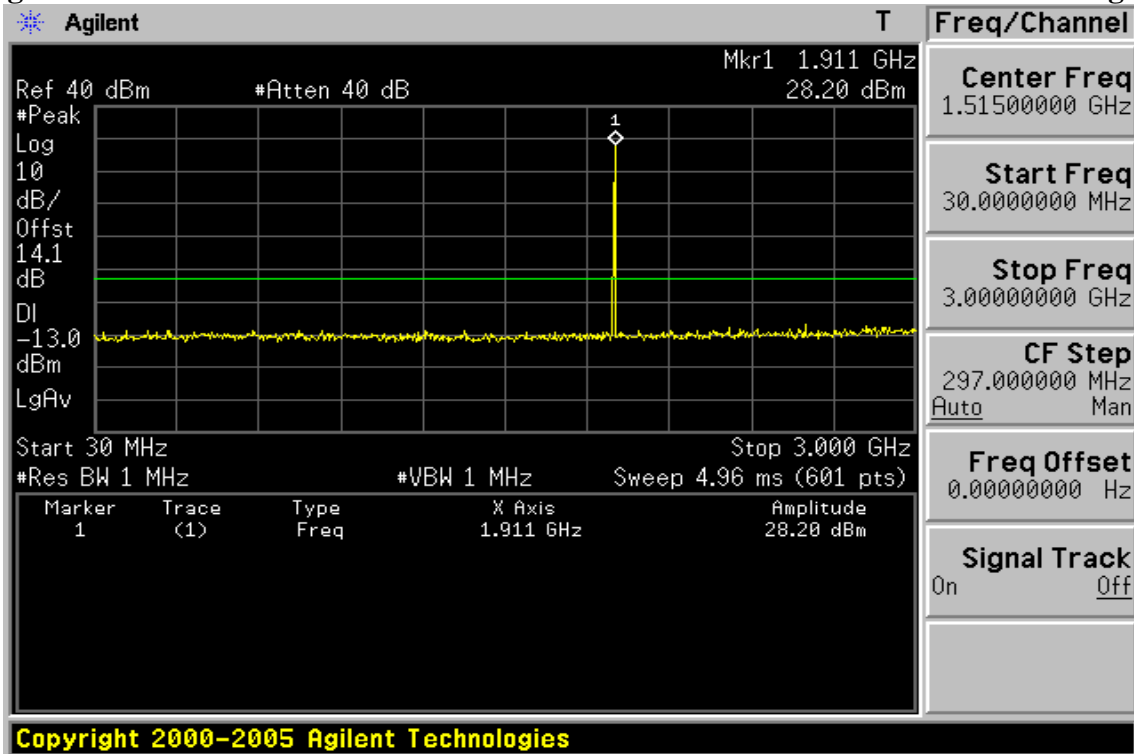


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Figure 10-28: Out of Band emission at antenna terminals –EDGE 1900 Channel Highest



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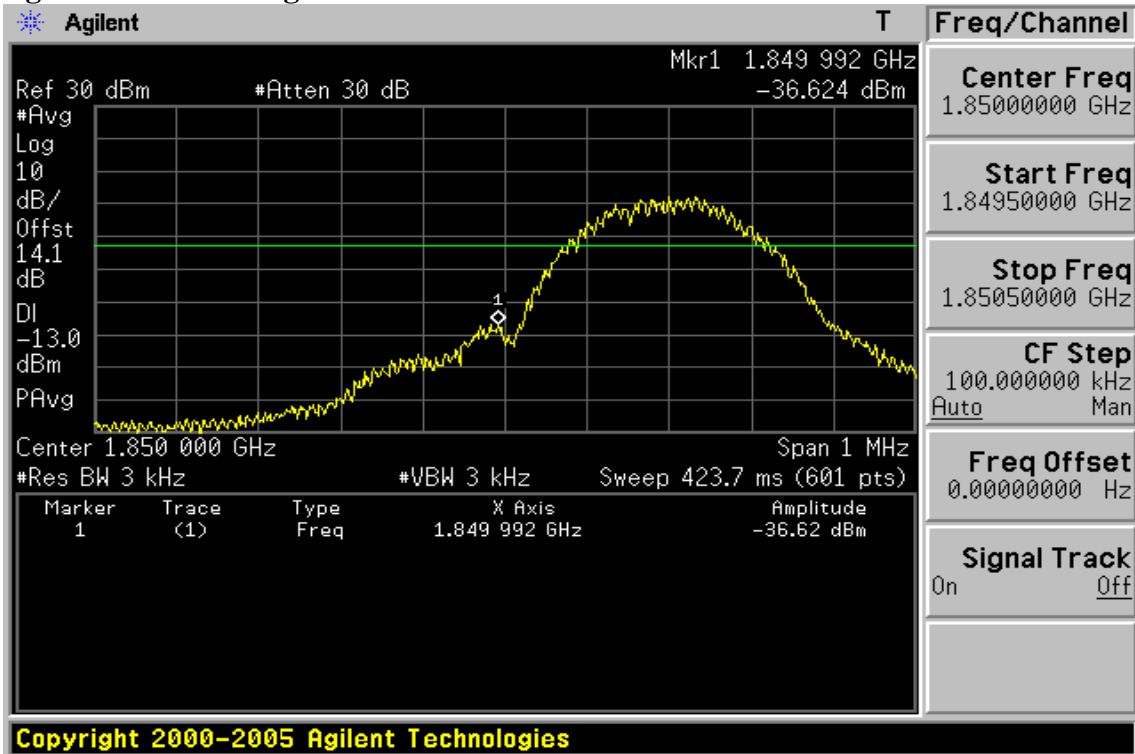
t (886-2) 2299-3279

f (886-2) 2298-0488

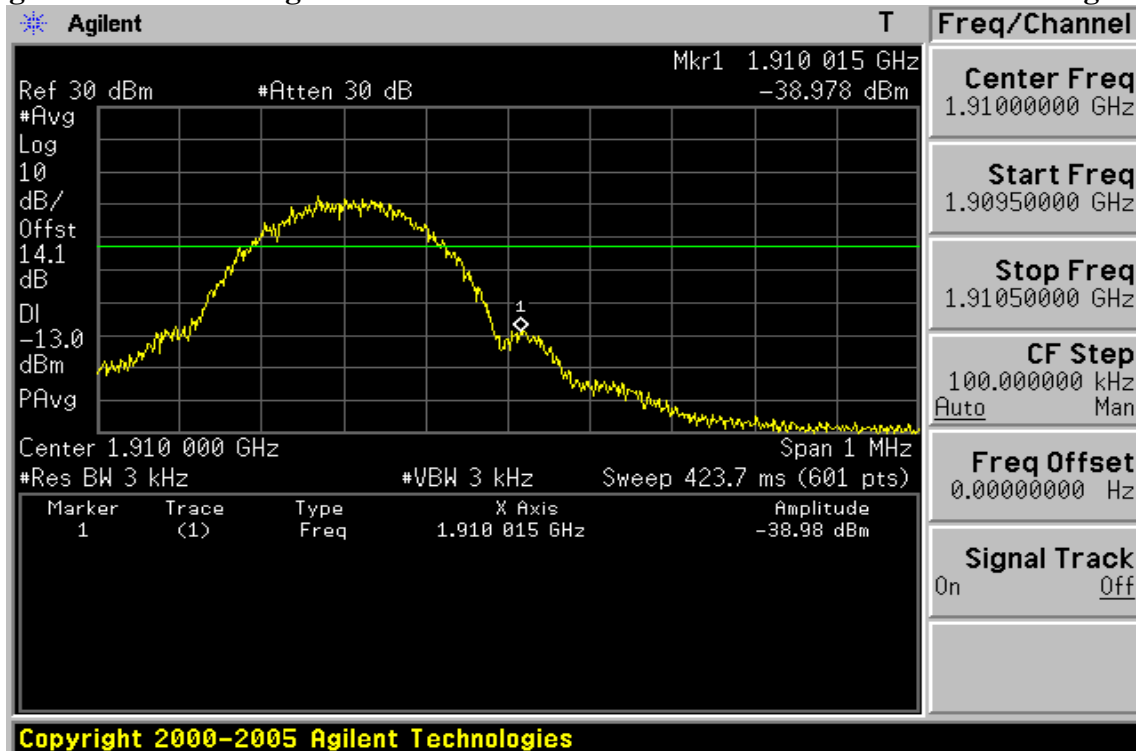
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**Figure 10-29: Bad edge emission at antenna terminals –EDGE 1900 Channel Lowest**



**Figure 10-30: Band edge emission at antenna terminals –EDGE 1900 Channel Highest**



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## 11. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

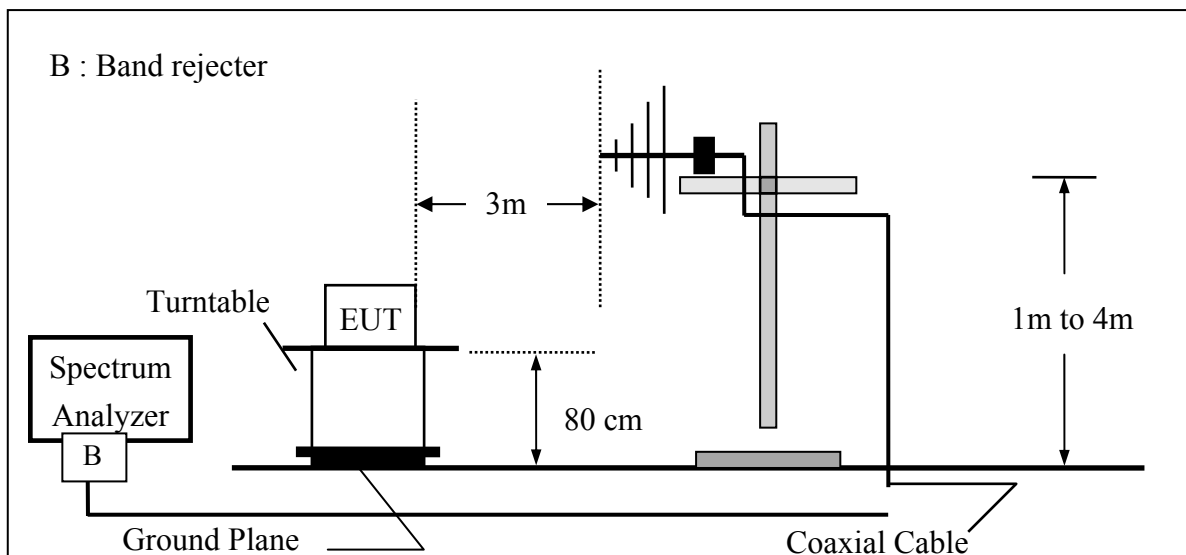
### 11.1. Standard Applicable:

According to FCC §2.1053,

FCC §22.917(a), §24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than  $43 + 10 \log$  (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

### 11.2. EUT Setup (Block Diagram of Configuration):

Radiated Emission Test Set-Up, Frequency Below 1000MHz



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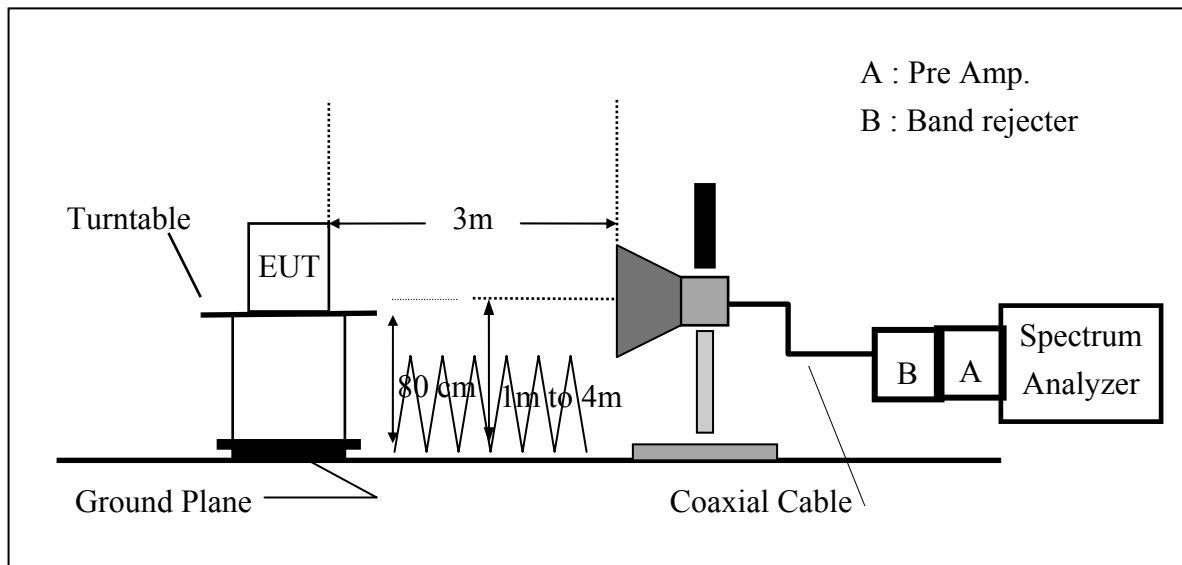
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Radiated Emission Test Set-UP Frequency Over 1 GHz



**11.3. Measurement Procedure:**

The EUT was placed on a non-conductive; The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$ERP = \text{S.G. output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$$

$$EIRP = \text{S.G. output (dBm)} + \text{Antenna Gain(dBi)} - \text{Cable Loss (dB)}$$

Spectrum Setting: RBW, VBW = 1MHz, Detector = Peak (GPRS1900)

RBW, VBW = 100kHz, Detector = Peak (GPRS850).

**11.4. Measurement Equipment Used:**

Refer to section 2.4 in this report

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**11.5. Measurement Result:**

**Radiated Spurious Emission Measurement Result: GSM 850 Mode**

Operation Band	:GSM 850	Test Date	:2014-01-24
ARFCN	:CH 128	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:824.2 MHz	Engineer	:Allen
Operation Mode	:TX LOW		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	ERP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBd	Loss dB	dBm	dB
96.93	S	-71.85	-69.70	-0.95	-1.20	-13.00	-58.85
260.86	S	-72.60	-74.42	3.57	-1.75	-13.00	-59.60
368.53	S	-72.25	-74.26	4.03	-2.01	-13.00	-59.25
521.79	S	-71.46	-72.87	3.82	-2.41	-13.00	-58.46
640.13	S	-66.42	-67.59	3.84	-2.67	-13.00	-53.42
773.02	S	-65.74	-66.65	3.80	-2.90	-13.00	-52.74
1648.40	H	-45.62	-44.74	3.54	-4.42	-13.00	-32.62
2472.60	H	-33.02	-31.22	3.65	-5.45	-13.00	-20.02
3296.80	H	-47.96	-47.06	5.52	-6.42	-13.00	-34.96
4121.00	H	-48.14	-48.08	7.10	-7.16	-13.00	-35.14
4945.20	H	---					
5769.40	H	---					
6593.60	H	---					
7417.80	H	---					
8242.00	H	---					

ERP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GSM 850	Test Date	:2014-01-24
ARFCN	:CH 128	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:824.2 MHz	Engineer	:Allen
Operation Mode	:TX LOW		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	ERP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBd	Loss dB	dBm	dB
39.70	S	-69.79	-54.67	-14.32	-0.80	-13.00	-56.79
275.41	S	-74.57	-76.14	3.36	-1.79	-13.00	-61.57
314.21	S	-72.13	-74.01	3.78	-1.90	-13.00	-59.13
521.79	S	-71.44	-72.85	3.82	-2.41	-13.00	-58.44
598.42	S	-71.04	-71.88	3.45	-2.62	-13.00	-58.04
668.26	S	-65.04	-66.26	3.92	-2.70	-13.00	-52.04
1648.40	H	-39.93	-39.05	3.54	-4.42	-13.00	-26.93
2472.60	H	-33.69	-31.88	3.65	-5.45	-13.00	-20.69
3296.80	H	-47.77	-46.87	5.52	-6.42	-13.00	-34.77
4121.00	H	-55.79	-55.73	7.10	-7.16	-13.00	-42.79
4945.20	H	---					
5769.40	H	---					
6593.60	H	---					
7417.80	H	---					
8242.00	H	---					

ERP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GSM 850	Test Date	:2014-01-24
ARFCN	:CH 190	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Allen
Operation Mode	:TX MID		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	ERP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBd	Loss dB	dBm	dB
93.05	S	-72.20	-70.27	-0.72	-1.20	-13.00	-59.20
272.50	S	-71.72	-73.32	3.39	-1.78	-13.00	-58.72
376.29	S	-72.16	-74.11	3.98	-2.03	-13.00	-59.16
610.06	S	-68.76	-69.67	3.54	-2.63	-13.00	-55.76
678.93	S	-66.08	-67.27	3.90	-2.72	-13.00	-53.08
773.99	S	-65.80	-66.71	3.81	-2.90	-13.00	-52.80
1673.20	H	-45.62	-44.63	3.47	-4.45	-13.00	-32.62
2509.80	H	-32.34	-30.57	3.72	-5.49	-13.00	-19.34
3346.40	H	-50.62	-49.81	5.66	-6.47	-13.00	-37.62
4183.00	H	-53.55	-53.43	7.10	-7.22	-13.00	-40.55
5019.60	H	---					
5856.20	H	---					
6692.80	H	---					
7529.40	H	---					
8366.00	H	---					

ERP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
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Operation Band	:GSM 850	Test Date	:2014-01-24
ARFCN	:CH 190	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:836.6 MHz	Engineer	:Allen
Operation Mode	:TX MID		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	ERP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBd	Loss dB	dBm	dB
40.67	S	-70.04	-55.06	-14.16	-0.81	-13.00	-57.04
200.72	S	-75.32	-77.01	3.21	-1.51	-13.00	-62.32
269.59	S	-76.11	-77.75	3.42	-1.78	-13.00	-63.11
493.66	S	-72.24	-73.64	3.73	-2.33	-13.00	-59.24
588.72	S	-71.18	-72.12	3.54	-2.59	-13.00	-58.18
680.87	S	-66.18	-67.37	3.90	-2.72	-13.00	-53.18
1673.20	H	-39.54	-38.56	3.47	-4.45	-13.00	-26.54
2509.80	H	-36.70	-34.92	3.72	-5.49	-13.00	-23.70
3346.40	H	-51.55	-50.74	5.66	-6.47	-13.00	-38.55
4183.00	H	-55.89	-55.78	7.10	-7.22	-13.00	-42.89
5019.60	H	---					
5856.20	H	---					
6692.80	H	---					
7529.40	H	---					
8366.00	H	---					

ERP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
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Operation Band	:GSM 850	Test Date	:2014-01-24
ARFCN	:CH 251	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Allen
Operation Mode	:TX HIGH		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	ERP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBd	Loss dB	dBm	dB
91.11	S	-73.40	-71.59	-0.61	-1.20	-13.00	-60.40
178.41	S	-73.10	-72.13	0.49	-1.46	-13.00	-60.10
344.28	S	-72.01	-74.15	4.10	-1.97	-13.00	-59.01
516.94	S	-70.72	-72.13	3.81	-2.40	-13.00	-57.72
642.07	S	-65.26	-66.45	3.86	-2.67	-13.00	-52.26
770.11	S	-65.78	-66.68	3.79	-2.89	-13.00	-52.78
1697.60	H	-49.88	-48.80	3.40	-4.48	-13.00	-36.88
2546.40	H	-30.74	-28.99	3.79	-5.54	-13.00	-17.74
3395.20	H	-52.25	-51.54	5.80	-6.52	-13.00	-39.25
4244.00	H	-48.21	-48.04	7.10	-7.27	-13.00	-35.21
5092.80	H	---					
5941.60	H	---					
6790.40	H	---					
7639.20	H	---					
8488.00	H	---					

ERP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
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Operation Band	:GSM 850	Test Date	:2014-01-24
ARFCN	:CH 251	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:848.8 MHz	Engineer	:Allen
Operation Mode	:TX HIGH		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	ERP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBd	Loss dB	dBm	dB
38.73	S	-69.79	-54.55	-14.44	-0.80	-13.00	-56.79
117.30	S	-76.29	-72.79	-2.23	-1.27	-13.00	-63.29
285.11	S	-76.01	-77.56	3.38	-1.82	-13.00	-63.01
443.22	S	-72.04	-73.41	3.58	-2.20	-13.00	-59.04
600.36	S	-70.80	-71.63	3.44	-2.62	-13.00	-57.80
693.48	S	-67.18	-68.34	3.89	-2.73	-13.00	-54.18
1697.60	H	-43.53	-42.45	3.40	-4.48	-13.00	-30.53
2546.40	H	-37.13	-35.38	3.79	-5.54	-13.00	-24.13
3395.20	H	-51.37	-50.66	5.80	-6.52	-13.00	-38.37
4244.00	H	-51.31	-51.14	7.10	-7.27	-13.00	-38.31
5092.80	H	---					
5941.60	H	---					
6790.40	H	---					
7639.20	H	---					
8488.00	H	---					

ERP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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**Radiated Spurious Emission Measurement Result: GPRS 1900 Mode**

Operation Band	:GPRS 1900	Test Date	:2014-01-24
ARFCN	:CH 512	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:1850.2 MHz	Engineer	:Allen
Operation Mode	:TX LOW		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
138.64	S	-69.29	-67.32	-0.62	-1.35	-13.00	-56.29
251.16	S	-69.39	-73.29	5.61	-1.71	-13.00	-56.39
579.99	S	-67.57	-70.77	5.77	-2.57	-13.00	-54.57
645.95	S	-64.20	-67.57	6.05	-2.68	-13.00	-51.20
752.65	S	-63.37	-66.36	5.84	-2.85	-13.00	-50.37
873.90	S	-62.75	-65.48	5.92	-3.18	-13.00	-49.75
3700.40	H	-34.93	-36.74	8.62	-6.80	-13.00	-21.93
5550.60	H	-39.47	-41.37	10.30	-8.40	-13.00	-26.47
7400.80	H	-44.40	-46.58	11.96	-9.78	-13.00	-31.40
9251.00	H	-45.05	-47.38	13.35	-11.02	-13.00	-32.05
11101.20	H	---					
12951.40	H	---					
14801.60	H	---					
16651.80	H	---					
18502.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GPRS 1900	Test Date	:2014-01-24
ARFCN	:CH 512	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:1850.2 MHz	Engineer	:Allen
Operation Mode	:TX LOW		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
42.61	S	-68.17	-55.62	-11.69	-0.86	-13.00	-55.17
213.33	S	-71.82	-75.83	5.57	-1.57	-13.00	-58.82
425.76	S	-70.13	-73.80	5.82	-2.15	-13.00	-57.13
655.65	S	-66.86	-70.26	6.08	-2.69	-13.00	-53.86
820.55	S	-63.61	-66.66	6.06	-3.02	-13.00	-50.61
923.37	S	-63.03	-65.53	5.80	-3.30	-13.00	-50.03
3700.40	H	-42.55	-44.37	8.62	-6.80	-13.00	-29.55
5550.60	H	-45.26	-47.16	10.30	-8.40	-13.00	-32.26
7400.80	H	-45.36	-47.54	11.96	-9.78	-13.00	-32.36
9251.00	H	-47.49	-49.82	13.35	-11.02	-13.00	-34.49
11101.20	H	---					
12951.40	H	---					
14801.60	H	---					
16651.80	H	---					
18502.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GPRS 1900	Test Date	:2014-01-24
ARFCN	:CH 661	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:1880.0 MHz	Engineer	:Allen
Operation Mode	:TX MID		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	EIRP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBi	Loss dB	dBm	dB
90.14	S	-69.21	-69.62	1.60	-1.20	-13.00	-56.21
137.67	S	-69.58	-67.64	-0.59	-1.34	-13.00	-56.58
248.25	S	-69.58	-73.45	5.58	-1.70	-13.00	-56.58
647.89	S	-63.52	-66.91	6.07	-2.68	-13.00	-50.52
773.99	S	-63.38	-66.44	5.96	-2.90	-13.00	-50.38
903.97	S	-63.09	-65.63	5.81	-3.27	-13.00	-50.09
3760.00	H	-35.93	-37.81	8.74	-6.85	-13.00	-22.93
5640.00	H	-38.30	-40.13	10.30	-8.47	-13.00	-25.30
7520.00	H	-44.71	-46.96	12.12	-9.87	-13.00	-31.71
9400.00	H	-45.55	-47.88	13.44	-11.11	-13.00	-32.55
11280.00	H	---					
13160.00	H	---					
15040.00	H	---					
16920.00	H	---					
18800.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GPRS 1900	Test Date	:2014-01-24
ARFCN	:CH 661	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:1880.0 MHz	Engineer	:Allen
Operation Mode	:TX MID		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit dBm	Margin dB
40.67	S	-67.43	-54.60	-12.01	-0.81	-13.00	-54.43
134.76	S	-70.98	-69.13	-0.52	-1.33	-13.00	-57.98
258.92	S	-67.25	-71.23	5.72	-1.74	-13.00	-54.25
519.85	S	-68.26	-71.82	5.96	-2.41	-13.00	-55.26
714.82	S	-67.07	-70.27	5.97	-2.77	-13.00	-54.07
941.80	S	-63.48	-65.94	5.78	-3.32	-13.00	-50.48
3760.00	H	-42.65	-44.53	8.74	-6.85	-13.00	-29.65
5640.00	H	-44.24	-46.07	10.30	-8.47	-13.00	-31.24
7520.00	H	-48.58	-50.83	12.12	-9.87	-13.00	-35.58
9400.00	H	-49.95	-52.28	13.44	-11.11	-13.00	-36.95
11280.00	H	---					
13160.00	H	---					
15040.00	H	---					
16920.00	H	---					
18800.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GPRS 1900	Test Date	:2014-01-24
ARFCN	:CH 810	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Allen
Operation Mode	:TX HIGH		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	EIRP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBi	Loss dB	dBm	dB
138.64	S	-69.37	-67.41	-0.62	-1.35	-13.00	-56.37
200.72	S	-69.00	-72.85	5.36	-1.51	-13.00	-56.00
303.54	S	-68.27	-72.20	5.81	-1.88	-13.00	-55.27
648.86	S	-64.07	-67.47	6.08	-2.68	-13.00	-51.07
771.08	S	-62.84	-65.89	5.94	-2.89	-13.00	-49.84
822.49	S	-62.96	-66.00	6.06	-3.02	-13.00	-49.96
3819.60	H	-37.88	-39.84	8.85	-6.90	-13.00	-24.88
5729.40	H	-37.38	-39.14	10.30	-8.54	-13.00	-24.38
7639.20	H	-45.37	-47.64	12.21	-9.94	-13.00	-32.37
9549.00	H	-47.93	-50.17	13.45	-11.21	-13.00	-34.93
11458.80	H	---					
13368.60	H	---					
15278.40	H	---					
17188.20	H	---					
19098.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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Operation Band	:GPRS 1900	Test Date	:2014-01-24
ARFCN	:CH 810	Temp./Humi.	:22.1 deg_C / 61 RH
Fundamental Frequency	:1909.8 MHz	Engineer	:Allen
Operation Mode	:TX HIGH		
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	EIRP	SG	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Output Level dBm	Gain dBi	Loss dB	dBm	dB
44.55	S	-67.23	-54.95	-11.38	-0.90	-13.00	-54.23
206.54	S	-70.77	-74.66	5.43	-1.54	-13.00	-57.77
303.54	S	-67.36	-71.30	5.81	-1.88	-13.00	-54.36
553.80	S	-68.75	-72.26	6.00	-2.50	-13.00	-55.75
777.87	S	-64.12	-67.20	5.98	-2.91	-13.00	-51.12
915.61	S	-63.12	-65.64	5.80	-3.28	-13.00	-50.12
3819.60	H	-45.03	-46.99	8.85	-6.90	-13.00	-32.03
5729.40	H	-44.95	-46.71	10.30	-8.54	-13.00	-31.95
7639.20	H	-47.83	-50.10	12.21	-9.94	-13.00	-34.83
9549.00	H	-48.62	-50.86	13.45	-11.21	-13.00	-35.62
11458.80	H	---					
13368.60	H	---					
15278.40	H	---					
17188.20	H	---					
19098.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
 “E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.  
 “---” : denotes Noise Floor.

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## 12. FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

### 12.1. Standard Applicable:

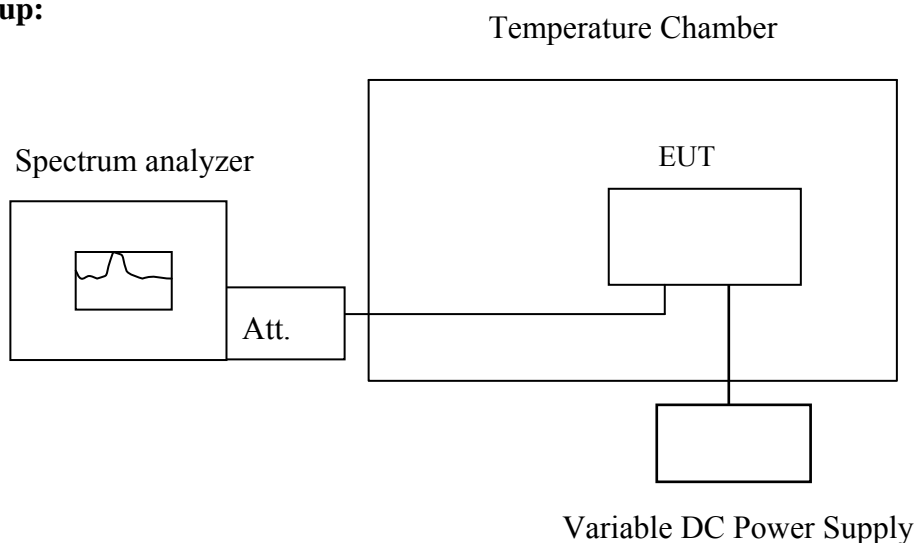
According to FCC §2.1055(a) (1)

Frequency Tolerance: +/-2.5ppm for 850MHz band

+/-2.5ppm for 1900MHz band

The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations

### 12.2. Test Set-up:



**Note :** Measurement setup for testing on Antenna connector

### 12.3. Measurement Procedure:

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

### 12.4. Measurement Equipment Used:

Refer to section 2.4 in this report

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12.5. Measurement Result:

Reference Frequency: GPRS 850 Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm = 2091 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature ( )	(Hz)		
3.8	50	836599995	12	2091
3.8	40	836599985	2	2091
3.8	30	836599982	-1	2091
3.8	20	836599983	0	2091
3.8	10	836599984	1	2091
3.8	0	836599987	4	2091
3.8	-10	836599984	1	2091
3.8	-20	836599991	8	2091
3.8	-30	836599989	6	2091

Reference Frequency: GPRS 1900 Mid Channel 1880 MHz				
Limit: +/- 2.5 ppm = 4700 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature ( )	(Hz)		
3.8	50	1879999994	2	4700
3.8	40	1879999987	-5	4700
3.8	30	1879999988	-4	4700
3.8	20	1879999992	0	4700
3.8	10	1879999995	3	4700
3.8	0	1879999993	1	4700
3.8	-10	1879999990	-2	4700
3.8	-20	1879999992	0	4700
3.8	-30	1879999989	-3	4700

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## 13. FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

### 13.1. Standard Applicable:

According to FCC §2.1055(d) (2)

Frequency Tolerance: +/-2.5ppm for 850MHz band

+/-2.5ppm for 1900MHz band

The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

### 13.2. Test Set-up:

Refer to section 10.2 in this report

### 13.3. Measurement Procedure:

Set chamber temperature to 25 . Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specified extreme-voltage-variation (+/- 15%) and endpoint, record the maximum frequency change.

### 13.4. Measurement Equipment Used:

Refer to section 2.4 in this report

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13.5. Measurement Result:

Reference Frequency: GPRS 850 Mid Channel 836.6 MHz				
Limit: +/- 2.5 ppm = 2091 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature ( )	(Hz)		
4.3	20	836599986	3	2091
3.8	20	836599983	0	2091
3.6	20	836600006	23	2091
shutdown point				
2.9	20	836599990	7	2091

Reference Frequency: GPRS Mid Channel 1880 MHz				
Limit: +/- 2.5 ppm = 4700 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature ( )	(Hz)		
4.3	20	1879999991	-1	4700
3.8	20	1879999992	0	4700
3.6	20	1879999988	-4	4700
shutdown point				
2.8	20	1880000002	10	4700

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