FCC Test Report

Report No.: AGC00338140103FE02

FCC ID	:	Q34-E310
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Mobile Phone
BRAND NAME	:	Argom
MODEL NAME	:	E310
CLIENT	:	Star Computer Group
DATE OF ISSUE	:	Jan. 14, 2014
STANDARD(S)	:	FCC Part 22H & 24E Rules
REPORT VERSION	:	V1.0

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

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 14, 2014	Valid	Original Report

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1.VERIFICATION OF COMPLIANCE

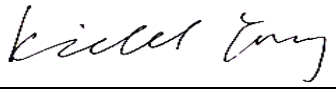
Applicant	Star Computer Group
Address	2175 NW 115th Avenue, Doral, Florida 33172, USA
Manufacturer	GPLUS TELECOM CO., LTD.
Address	2nd, Fl., B Building, Jiada R&D Building 5 Langshan Rd., North, Hi-tech Industrial Park
Product Designation	Mobile Phone
Brand Name	Argom
Test Model	E310
Date of test	Jan. 04, 2014 to Jan.10, 2014
Deviation	None
Condition of Test Sample	Normal

We hereby certify that:

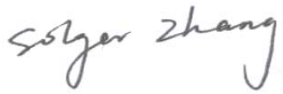
The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2003 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part 22H and 24E.
The test results of this report relate only to the tested sample identified in this report.

Tested By :

Bart Xie Jan. 14, 2014

Reviewed By : 

Kidd Yang Jan. 14, 2014

Approved By: 

Solger Zhang Jan. 14, 2014

2. GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	Mobile Phone
Hardware version:	G31 MAIN V1.1
Software version:	N/A
Frequency Bands:	☒GSM 850 ☒PCS 1900 (U.S. Bands) ☒GSM 900 ☒DCS 1800 (Non-U.S. Bands) ☒UMTS FDD Band II ☒UMTS FDD Band V (U.S. Bands) ☐UMTS FDD Band I ☐UMTS FDD Band VIII (Non-U.S. Bands)
Antenna:	PIFA Antenna
Antenna gain(GSM):	-0.9dBi
Power Supply:	DC 3.7V by Battery
Battery parameter:	DC3.7V/1000 mAh
Adapter Input:	AC100-240V, 50-60Hz, 150mA
Adapter Output:	DC5.0V, 500mA
Dual Card:	WCDMA / GSM Card Slot GSM Card Slot
GPRS Class	12
Extreme Vol. Limits:	DC3.4 V to 4.2 V (Normal: DC3.7 V)
Extreme Temp. Tolerance	-10℃ to +50℃
*** Note: The High Voltage DC4.2V and Low Voltage DC3.4V were declared by manufacturer, The EUT couldn't be operating normally with higher or lower voltage. Other functions have been performed according to verification procedure except for Bluetooth and MS function. Card 1 can't transmit with Card 2 simultaneously.	

WCDMA Card Slot:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	30.67	32.28	31.51
PCS 1900	28.35	29.57	28.89
UMTS BAND II	22.18	23.75	22.83
UMTS BAND V	22.69	23.71	23.45

GSM Card Slot:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	30.41	32.19	31.47
PCS 1900	28.33	29.52	28.73

2.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: Q34-E310**, filing to comply with the FCC Part 22H&24E requirements.

2.3 TEST METHODOLOGY

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

2.4 TEST FACILITY

The test site used to collect the radiated data is located at:
Attestation of Global Compliance (Shenzhen) Co., Ltd.
2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China
FCC register No.: 259865

2.5 MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.
SPECTRUM ANALYZER	AGILENT	E4440A	US41421290	July 17, 2013	July 16, 2014
TEST RECEIVER	R&S	ESCI	100694	July 17, 2013	July 16, 2014
COMMUNICATION TESTER	AGILENT	8960	122500087	Oct.21, 2013	Oct.20, 2014
COMMUNICATION TESTER	R&S	CMU200	122500166	Feb.28,2013	Feb.27,2014
SIGNAL GENERATOR	AGILENT	E4438C	MY44260051	Feb.23,2014	Feb. 22,2015
LISN	R&S	ESH3-Z5	8389791009	July 17, 2013	July 16, 2014
CLIMATE CHAMBER	ALBATROSS	--	--	July 17, 2013	July 16, 2014
Loop Antenna	A.H.	SAS-562B	SEL0097	July 17, 2013	July 16, 2014
Bilogical Antenna	A.H. Systems Inc.	SAS-521-4	26	June 7,2013	June 6, 2014
Horn Antenna	EM	EM-AH-10180	67	Apr.20, 2013	Apr.19, 2014
Horn Antenna	A.H. Systems Inc.	SAS-574	--	June 7,2013	June 6, 2014

2.6 SPECIAL ACCESSORIES

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

2.7 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. SYSTEM TEST CONFIGURATION

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

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

3.3 GENERAL TECHNICAL REQUIREMENTS

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

3.4 CONFIGURATION OF EUT SYSTEM

Fig. 2-1 Configuration of EUT System

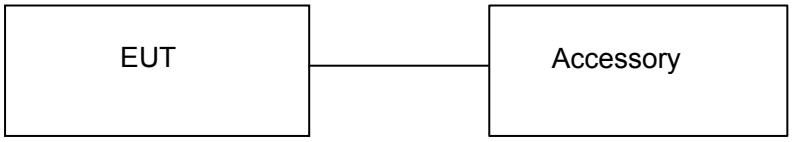


Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	Mobile Phone	E310	FCC ID: Q34-E310	EUT
2	Adapter	E310	DC5.0V /500mA	Accessory
3	Battery	E310	DC3.7V/ 1000 mAh	Accessory
4	Earphone	E310	N/A	Accessory
5	USB Cable	E310	N/A	Accessory

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

4. SUMMARY OF TEST RESULTS

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

5. DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMU 200) to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both GSM and PCS frequency band.

*****Note:** GSM/GPRS850, GSM/GPRS1900, UMTS band II, UMTS band V, mode have been tested during the test.

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

6. OUTPUT POWER

6.1 Conducted Output Power

6.1.1 MEASUREMENT METHOD

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all modes (GSM/GPRS 850, GSM/GPRS1900, UMTS band II, UMTS band V) at 3 typical channels (the Top Channel, the Middle Channel and the Bottom Channel) for each band.

6.1.2 MEASUREMENT RESULT

Conducted Output Power Limits for GSM850 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	33 dBm (2W)	- 1
Conducted Output Power Limits for PCS1900 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	30 dBm (1W)	- 1
Conducted Output Power Limits for UMTS band II		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24 dBm (0.25W)	- 2
Conducted Output Power Limits for UMTS band V		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24 dBm (0.25W)	- 2

GSM 850:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)
GSM850	824.2	33	**32.28**	-0.72	**31.51**	-9	22.51
	836.6	33	32.25	-0.75	31.38	-9	22.38
	848.8	33	32.23	-0.77	31.33	-9	22.33
GPRS850 (1 Slot)	824.2	33	32.32	-0.68	31.27	-9	22.27
	836.6	33	32.20	-0.80	31.20	-9	22.20
	848.8	33	32.17	-0.83	31.21	-9	22.21
GPRS850 (2 Slot)	824.2	30	29.58	-0.42	28.47	-6	22.47
	836.6	30	29.45	-0.55	28.4	-6	22.4
	848.8	30	29.42	-0.58	28.35	-6	22.35
GPRS850 (3 Slot)	824.2	28.23	27.51	-0.72	26.49	-4.26	22.23
	836.6	28.23	27.48	-0.75	26.47	-4.26	22.21
	848.8	28.23	27.40	-0.83	26.49	-4.26	22.23
GPRS850 (4 Slot)	824.2	27	26.42	-0.58	25.41	-3	22.41
	836.6	27	26.35	-0.65	25.35	-3	22.35
	848.8	27	26.30	-0.70	25.29	-3	22.29

PCS 1900:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)
GSM1900	1850.2	30	**29.57**	-0.43	**28.89**	-9	19.89
	1880	30	29.54	-0.46	28.8	-9	19.8
	1909.8	30	29.5	-0.5	28.77	-9	19.77
GPRS1900 (1 Slot)	1850.2	30	29.52	-0.48	28.82	-9	19.82
	1880	30	29.45	-0.55	28.78	-9	19.78
	1909.8	30	29.38	-0.62	28.71	-9	19.71
GPRS1900 (2 Slot)	1850.2	27	26.49	-0.51	25.67	-6	19.67
	1880	27	26.42	-0.58	25.61	-6	19.61
	1909.8	27	26.37	-0.63	25.52	-6	19.52
GPRS1900 (3 Slot)	1850.2	25.23	24.93	-0.3	24.3	-4.26	20.04
	1880	25.23	24.9	-0.33	24.18	-4.26	19.92
	1909.8	25.23	25.01	-0.22	24.11	-4.26	19.85
GPRS1900 (4 Slot)	1850.2	24	23.48	-0.52	22.73	-3	19.73
	1880	24	23.42	-0.58	22.65	-3	19.65
	1909.8	24	23.41	-0.59	22.62	-3	19.62

UMTS BAND II

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power
WCDMA 1900 RMC	1852.4	24	23.66	-0.34	22.74
	1880	24	**23.75**	-0.25	**22.83**
	1907.6	24	23.69	-0.31	22.78
WCDMA 1900 AMR	1852.4	24	23.6	-0.4	22.37
	1880	24	22.5	-1.5	22.32
	1907.6	24	22.63	-1.37	22.23
HSDPA Subtest 1	1852.4	24	22.7	-1.3	22.39
	1880	24	22.79	-1.21	22.31
	1907.6	24	22.88	-1.12	22.36
HSDPA Subtest 2	1852.4	24	22.78	-1.22	22.42
	1880	24	22.65	-1.35	22.36
	1907.6	24	22.77	-1.23	22.4
HSDPA Subtest 3	1852.4	24	22.61	-1.39	22.36
	1880	24	22.46	-1.54	22.4
	1907.6	24	22.66	-1.34	22.52
HSDPA Subtest 4	1852.4	24	22.63	-1.37	22.41
	1880	24	22.44	-1.56	22.33
	1907.6	24	22.46	-1.54	22.35
HSUPA Subtest 1	1852.4	24	22.41	-1.59	22.34
	1880	24	22.42	-1.58	22.26
	1907.6	24	22.46	-1.54	22.23
HSUPA Subtest 2	1852.4	24	22.44	-1.56	22.27
	1880	24	22.36	-1.64	22.17
	1907.6	24	22.45	-1.55	22.32
HSUPA Subtest 3	1852.4	24	22.46	-1.54	22.3
	1880	24	22.5	-1.5	22.38
	1907.6	24	22.53	-1.47	22.36
HSUPA Subtest 4	1852.4	24	22.68	-1.32	22.48
	1880	24	22.46	-1.54	22.25
	1907.6	24	22.52	-1.48	22.23
HSUPA Subtest 5	1852.4	24	22.9	-1.1	22.69
	1880	24	22.72	-1.28	22.52
	1907.6	24	22.51	-1.49	22.32

UMTS BAND V

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power
WCDMA 850 RMC	826.4	24	**23.71**	-0.29	**23.45**
	832.2	24	23.63	-0.37	23.44
	846.6	24	23.53	-0.47	23.24
WCDMA 850 AMR	826.4	24	23.61	-0.39	23.32
	832.2	24	22.49	-1.51	22.15
	846.6	24	22.53	-1.47	22.22
HSDPA Subtest 1	826.4	24	22.73	-1.27	22.44
	832.2	24	22.66	-1.34	22.38
	846.6	24	22.69	-1.31	22.46
HSDPA Subtest 2	826.4	24	22.64	-1.36	22.41
	832.2	24	22.66	-1.34	22.43
	846.6	24	22.63	-1.37	22.4
HSDPA Subtest 3	826.4	24	22.64	-1.36	22.36
	832.2	24	22.62	-1.38	22.3
	846.6	24	22.88	-1.12	22.57
HSDPA Subtest 4	826.4	24	22.86	-1.14	22.54
	832.2	24	22.54	-1.46	22.22
	846.6	24	22.62	-1.38	22.31
HSUPA Subtest 1	826.4	24	22.52	-1.48	22.24
	832.2	24	22.53	-1.47	22.13
	846.6	24	22.44	-1.56	22.16
HSUPA Subtest 2	826.4	24	22.48	-1.52	22.14
	832.2	24	22.42	-1.58	22.09
	846.6	24	22.46	-1.54	22.14
HSUPA Subtest 3	826.4	24	22.54	-1.46	22.26
	832.2	24	22.52	-1.48	22.21
	846.6	24	22.41	-1.59	22.1
HSUPA Subtest 4	826.4	24	22.67	-1.33	22.38
	832.2	24	22.47	-1.53	22.17
	846.6	24	22.45	-1.55	22.19
HSUPA Subtest 5	826.4	24	22.63	-1.37	22.45
	832.2	24	22.53	-1.47	22.42
	846.6	24	22.47	-1.53	22.36

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

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

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15, β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

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

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

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

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

6.2 RADIATED OUTPUT POWER

6.2.1 MEASUREMENT METHOD

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

1 In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.

2 The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. The ARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl

3 The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.

4 From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.

5 The EUT is then put into continuously transmitting mode at its maximum power level.

6 Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.

7 This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).

8 ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi..

6.2.2 PROVISIONS APPLICABLE

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

Mode	Nominal Peak Power
GSM 850	<=38.45 dBm (7W)
PCS 1900	<=33 dBm (2W)
UMTS BAND II	<=33 dBm (2W)
UMTS BANDV	<=38.45 dBm (7W)

6.2.3 MEASUREMENT RESULT

Radiated Power (ERP) for GSM 850 MHZ				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. ERP	
GSM850	824.2	**30.67**	Horizontal	Pass
	836.6	30.63	Horizontal	Pass
	848.8	30.60	Horizontal	Pass

Radiated Power (E.I.R.P) for PCS 1900 MHZ				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P.(dBm)	Polarization Of Max. E.I.R.P.	
GSM 1900	1850.2	**28.35**	Horizontal	Pass
	1880.0	28.30	Horizontal	Pass
	1909.8	28.25	Horizontal	Pass

Radiated Power (E.I.R.P) for UMTS band II				
Mode	Frequency	Result		
		Max. Peak E.I.R.P (dBm)	Polarization Of Max. E.I.R.P	
RMC 12.2kbps	1852.4	22.15	Horizontal	Pass
	1880	**22.18**	Horizontal	Pass
	1907.6	22.09	Horizontal	Pass

Radiated Power (ERP) for UMTS band V				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P.(dBm)	Polarization Of Max. E.I.R.P.	
RMC 12.2kbps	826.4	**22.69**	Horizontal	Pass
	835.0	22.54	Horizontal	Pass
	846.6	22.43	Horizontal	Pass

Note: Above is worst mode data.

6.3. Peak-to-Average Ratio

6.3.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the Peak-to-Average Ratio from the EUT.

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. For GSM/GPRS operating modes:

a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.

b. Set EUT in maximum power output, and triggered the burst signal.

c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.

3. For UMTS operating modes:

a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.

b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

6.3.2 PROVISIONS APPLICABLE

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

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

6.3.3 MEASUREMENT RESULT

Modes	GSM850(GSM)		
Channel	128	190	251
	(Low)	(Mid)	(High)
Frequency (MHz)	824.2	836.6	848.8
Peak-To-Average Ratio (dB)	0.93	1.02	1.06

Modes	PCS 1900 (GSM)		
Channel	512	661	810
	(Low)	(Mid)	(High)
Frequency (MHz)	1850.2	1880	1909.8
Peak-To-Average Ratio (dB)	0.68	0.74	0.73

Modes	UMTS BAND II		
Channel	9662	9800	9938
	(Low)	(Mid)	(High)
Frequency (MHz)	1852.4	1880	1907.6
Peak-To-Average Ratio (dB)	0.92	0.92	0.91

Modes	UMTS BAND V		
Channel	4357	4386	4458
	(Low)	(Mid)	(High)
Frequency (MHz)	826.4	832.2	846.6
Peak-To-Average Ratio (dB)	0.26	0.19	0.29

7. SPURIOUS EMISSION

7.1 CONDUCTED SPURIOUS EMISSION

7.1.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the conducted emissions from the EUT.
1, Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM 850, data taken from 30 MHz to 9 GHz.
2, Determine EUT transmit frequencies: the following typical channels were chosen to conducted emissions testing.

Typical Channels for testing of GSM 850 MHz	
Channel	Frequency (MHz)
128	824.2
190	836.6
251	848.8

Typical Channels for testing of PCS 1900 MHz	
Channel	Frequency (MHz)
512	1850.2
661	1880.0
810	1909.8

Typical Channels for testing of UMTS band II	
Channel	Frequency (MHz)
9662	1852.4
9800	1880
9938	1907.6

Typical Channels for testing of UMTS band V	
Channel	Frequency (MHz)
4357	826.4
4386	832.2
4458	846.6

7.1.2 PROVISIONS APPLICABLE

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

7.1.3 MEASUREMENT RESULT

PLEASE REFER TO: APPENDIX I TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

Note: 1. Below 30MHZ no Spurious found and The GSM modes is the worst condition.
2. As no emission found in standby or receive mode, no recording in this report.

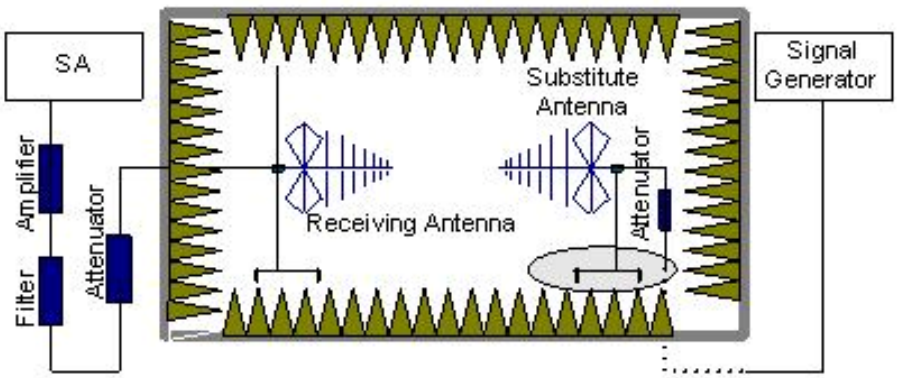
7.2 Radiated Spurious Emission

7.2.1 MEASUREMENT METHOD

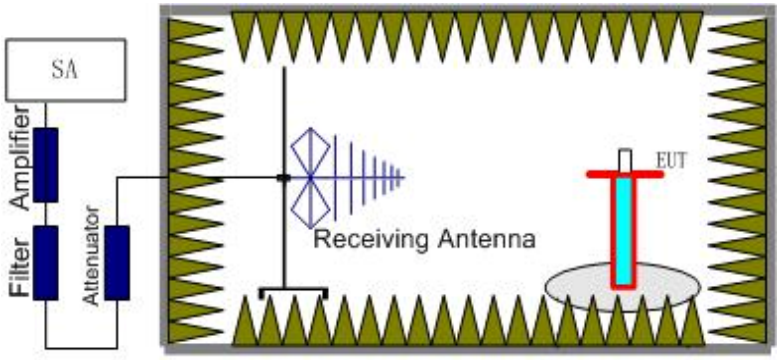
The measurements procedures specified in TIA-603C-2004 were used for testing. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The measurements were performed on all modes(GPRS 850, GPRS1900, UMTS band II, UMTS band V) at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

The procedure of radiated spurious emissions is as follows:

a) Pre-calibration With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as, RSE=Rx（dBuV）+CL（dB）+SA（dB）+Gain（dBi）-107（dBuV to dBm）The SA is calibrated using following setup.



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



Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS 1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) ,GSM850 band (824.2MHz, 836.6MHz, 848.8MHz), UMTS band II(1852.4MHz, 1880MHz, 1907.6MHz), UMTS band V(826.4MHz, 835.0MHz, 846.6MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of any band into any of the other blocks.

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

7.2.2 PROVISIONS APPLICABLE

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

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

7.2.3 MEASUREMENT RESULT

GSM 850:

The Worst Test Results for Channel 251/848.8 MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
1685.23	-35.63	-5.01	-40.64	-13.00	Horizontal
2456.12	-36.35	-2.18	-38.53	-13.00	Vertical
3645.78	-35.53	3.46	-32.07	-13.00	Vertical
4536.58	-35.55	2.79	-32.76	-13.00	Horizontal

PCS 1900:

The Worst Test Results for Channel 810/1909.8MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
1429.36	-42.53	-3.22	-45.75	-13.00	Vertical
2563.47	-40.15	-0.24	-40.39	-13.00	Vertical
3645.26	-38.72	3.98	-34.74	-13.00	Horizontal
4563.56	-38.59	-2.26	-40.85	-13.00	Vertical
5689.25	-37.75	-3.12	-40.87	-13.00	Horizontal

UMTS band II:

The Worst Test Results for Channel 9938/1907.6MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
2000.00	-48.27	9.7	-38.57	-13.00	Vertical
9548.50	-40.42	11.6	-28.82	-13.00	Horizontal
13367.40	-39.18	14.89	-24.29	-13.00	Horizontal
15277.80	-38.57	13.87	-24.70	-13.00	Vertical
17931.60	-38.61	19.76	-18.85	-13.00	Horizontal

UMTS band V:

The Worst Test Results for Channel 4458/846.6MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
1598.26	-38.59	10.02	-28.57	-13.00	Vertical
2365.78	-38.37	11.3	-27.07	-13.00	Horizontal
4967.65	-37.42	12.4	-25.02	-13.00	Horizontal
6457.86	-37.19	18.03	-19.16	-13.00	Vertical
7896.56	-39.53	19	-20.53	-13.00	Horizontal

Note: ARpl= Factor=Antenna Factor+ Cable loss-Amplifier gain.
The “Factor” value can be calculated automatically by software of measurement system.
Below 30MHZ no Spurious found and The GSM modes is the worst condition.

8. MAINS CONDUCTED EMISSION

8.1 MEASUREMENT METHOD

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

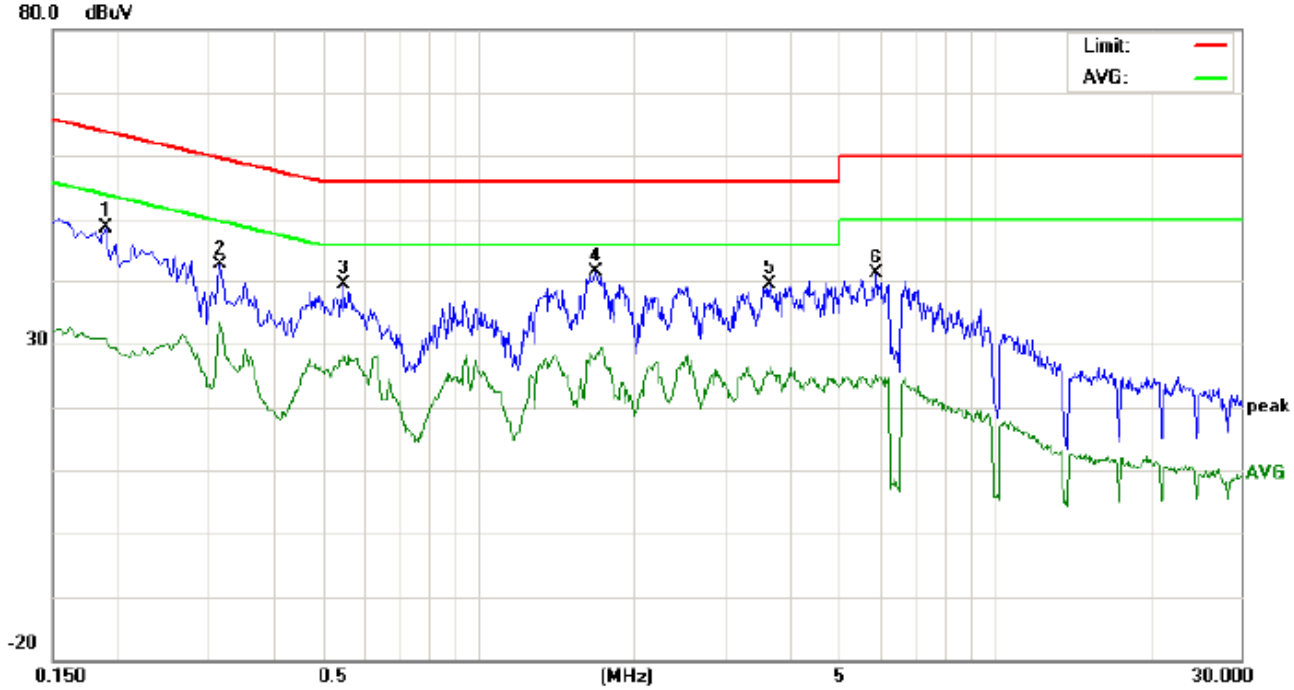
8.2 PROVISIONS APPLICABLE

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

Note: The GSM850 mode is the worst condition and the test result as following:

8.3 MEASUREMENT RESULT

LINE CONDUCTED EMISSION - L



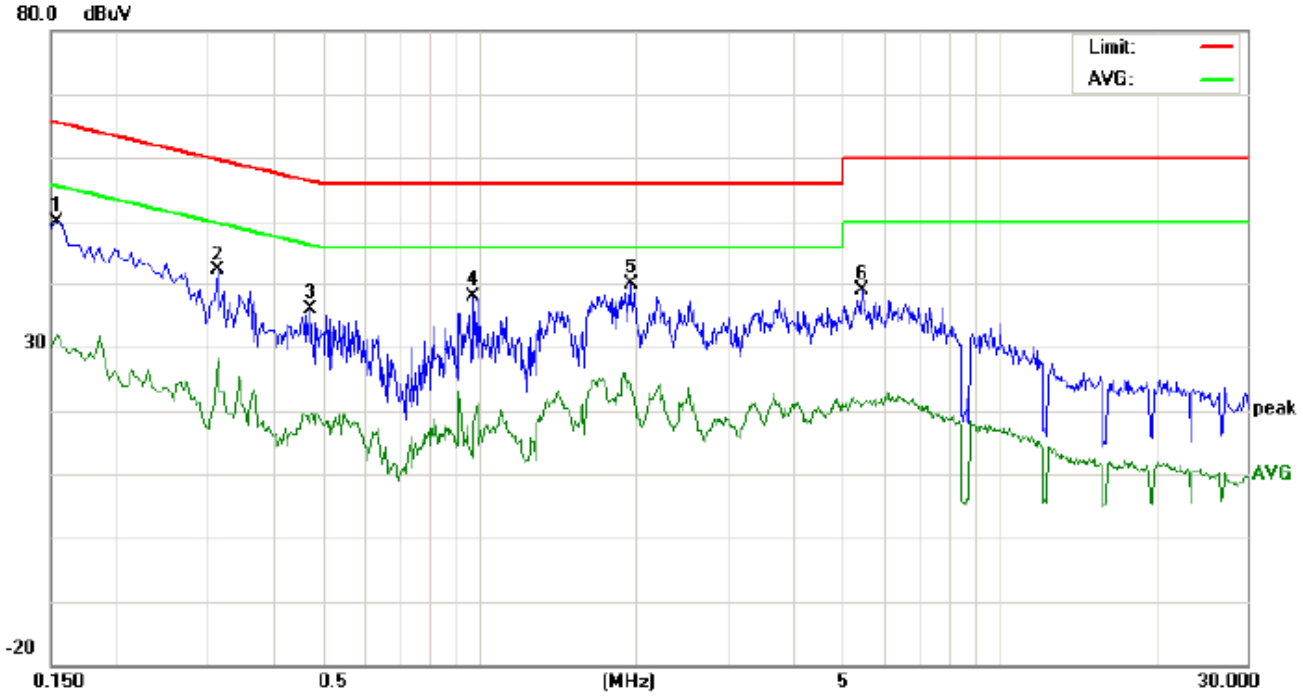
Site: Conduction
Limit: FCC Class B Conduction(QP)
EUT: Mobile Phone
M/N: E310
Mode: Call
Note:

Phase: *L1*
Power: AC 120V/60Hz

Temperature: 26
Humidity: 60 %

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1900	38.41		20.64	10.20	48.61		30.84	64.03	54.03	-15.42	-23.19	P	
2	0.3180	32.39		22.72	10.30	42.69		33.02	59.76	49.76	-17.07	-16.74	P	
3	0.5500	28.92		17.84	10.35	39.27		28.19	56.00	46.00	-16.73	-17.81	P	
4	1.6860	31.07		17.34	10.32	41.39		27.66	56.00	46.00	-14.61	-18.34	P	
5	3.6660	28.86		14.94	10.48	39.34		25.42	56.00	46.00	-16.66	-20.58	P	
6	5.9139	30.86		14.95	10.27	41.13		25.22	60.00	50.00	-18.87	-24.78	P	

LINE CONDUCTED EMISSION - N



Site: Conduction
Limit: FCC Class B Conduction(QP)
EUT: Mobile Phone
M/N: E310
Mode: Call
Note:

Phase: *N*
Power: AC 120V/60Hz

Temperature: 26
Humidity: 60 %

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1539	38.69		19.64	10.16	48.85		29.80	65.78	55.78	-16.93	-25.98	P	
2	0.3140	31.94		18.10	10.30	42.24		28.40	59.86	49.86	-17.62	-21.46	P	
3	0.4740	25.46		8.62	10.38	35.84		19.00	56.44	46.44	-20.60	-27.44	P	
4	0.9780	27.59		8.10	10.38	37.97		18.48	56.00	46.00	-18.03	-27.52	P	
5	1.9500	29.66		13.97	10.24	39.90		24.21	56.00	46.00	-16.10	-21.79	P	
6	5.4699	28.68		10.71	10.25	38.93		20.96	60.00	50.00	-21.07	-29.04	P	

Note: The GSM850 mode is the worst condition.

9. FREQUENCY STABILITY

9.1 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1 , Measure the carrier frequency at room temperature.

2 , Subject the EUT to overnight soak at -10℃.

3 , With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 for PCS 1900 band , channel 190 for GSM 850 band, channel 9400 for UMTS band II and channel 4175 for UMTS band V measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

4 , Repeat the above measurements at 10℃ increments from -10℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

5 , Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

6 , Subject the EUT to overnight soak at +50℃.

7 , With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

8 , Repeat the above measurements at 10℃ increments from +50℃ to -10℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

9 , At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

9.2 PROVISIONS APPLICABLE

9.2.1 For Hand carried battery powered equipment

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

9.2.2 For equipment powered by primary supply voltage

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

9.3 MEASUREMENT RESULT (WORST)

Frequency Error Against Voltage for GSM850 band		
Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.4	22	0.026
3.7	17	0.020
4.2	25	0.030

Frequency Error Against Temperature for GSM850 band		
temperature(℃)	Frequency error(Hz)	Frequency error(ppm)
-10	27	0.032
0	24	0.029
10	23	0.028
20	21	0.025
30	23	0.028
40	25	0.030
50	28	0.033

Note: The EUT doesn't work below -10℃

Frequency Error Against Voltage for PCS1900 band		
Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.4	23	0.012
3.7	20	0.011
4.2	25	0.013

Frequency Error Against Temperature for PCS1900 band		
temperature(℃)	Frequency error(Hz)	Frequency error(ppm)
-10	25	0.013
0	22	0.012
10	21	0.011
20	19	0.010
30	25	0.013
40	26	0.014
50	22	0.012

Note: The EUT doesn't work below -10℃

Frequency Error Against Voltage for UMTS band II		
Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.4	34	0.018
3.7	22	0.012
4.2	23	0.012

Frequency Error Against Temperature for UMTS band II		
temperature(℃)	Frequency error(Hz)	Frequency error(ppm)
-10	37	0.020
0	33	0.018
10	45	0.024
20	31	0.016
30	35	0.019
40	33	0.018
50	36	0.019

Note: The EUT doesn't work below -10℃

Frequency Error Against Voltage for UMTS band V		
Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
6.3	23	0.028
7.4	22	0.026
8.5	26	0.031

Frequency Error Against Temperature for UMTS band V		
temperature(℃)	Frequency error(Hz)	Frequency error(ppm)
-10	23	0.028
0	27	0.032
10	24	0.029
20	23	0.028
30	31	0.037
40	34	0.041
50	32	0.038

Note: The EUT doesn't work below -10℃

10. OCCUPIED BANDWIDTH

10.1 MEASUREMENT METHOD

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

10.2 PROVISIONS APPLICABLE

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

10.3 MEASUREMENT RESULT

Occupied Bandwidth (99%) for GSM850 band		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
Low Channel	824.2	246.69
Middle Channel	836.6	243.17
High Channel	848.8	249.05

Occupied Bandwidth (99%) for PCS1900 band		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
Low Channel	1850.2	244.67
Middle Channel	1880.0	248.52
High Channel	1909.8	245.50

Occupied Bandwidth (99%) for UMTS band II		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(MHz)
Low Channel	1852.4	4.17
Middle Channel	1880	4.18
High Channel	1907.6	4.17

Occupied Bandwidth (99%) for UMTS band V		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(MHz)
Low Channel	826.4	4.16
Middle Channel	832.2	4.19
High Channel	846.6	4.16

11. EMISSION BANDWIDTH

11.1 MEASUREMENT METHOD

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

11.2 PROVISIONS APPLICABLE

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

11.3 MEASUREMENT RESULT

Emission Bandwidth (-26dBc) for GSM850 band		
Mode	Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)
Low Channel	824.2	311.14
Middle Channel	836.6	307.56
High Channel	848.8	302.90

Emission Bandwidth (-26dBc) for PCS1900 band		
Mode	Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)
Low Channel	1850.2	304.08
Middle Channel	1880.0	304.55
High Channel	1909.8	309.55

Occupied Bandwidth (99%) for UMTS band II		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(MHz)
Low Channel	1852.4	4.70
Middle Channel	1880	4.66
High Channel	1907.6	4.69

Occupied Bandwidth (99%) for UMTS band V		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(MHz)
Low Channel	826.4	4.65
Middle Channel	832.2	4.76
High Channel	846.6	4.66

12. BAND EDGE

12.1 MEASUREMENT METHOD

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

12.2 PROVISIONS APPLICABLE

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

12.3 MEASUREMENT RESULT

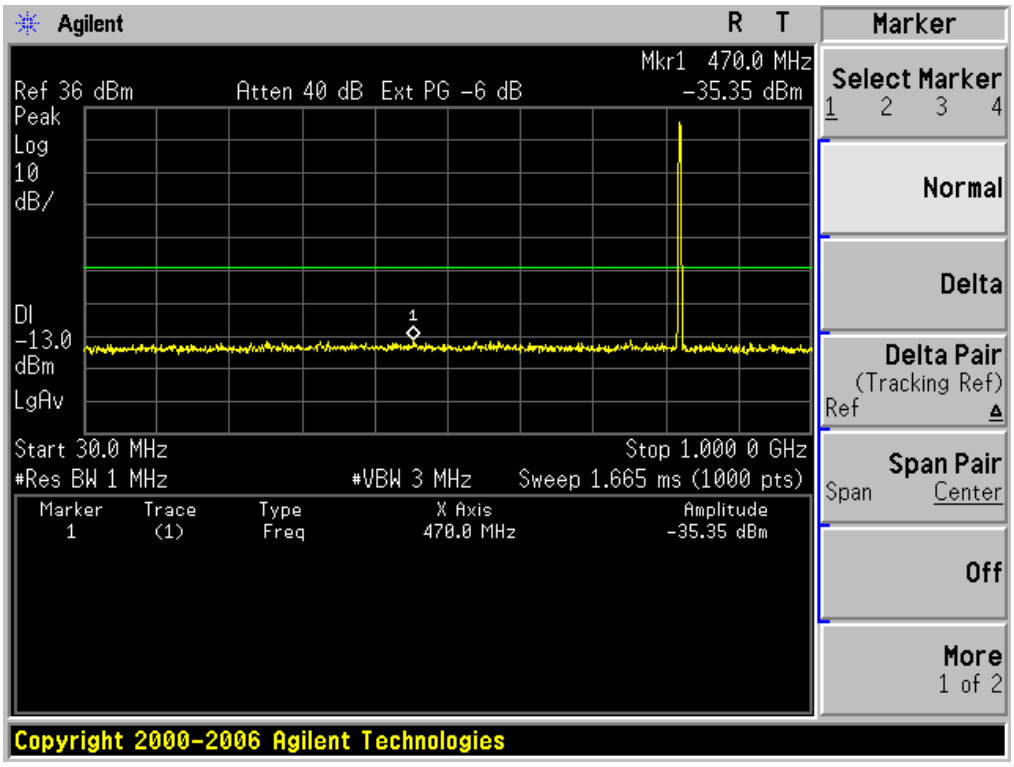
Please refers to Appendix III for compliance test plots for band edges

APPENDIX A

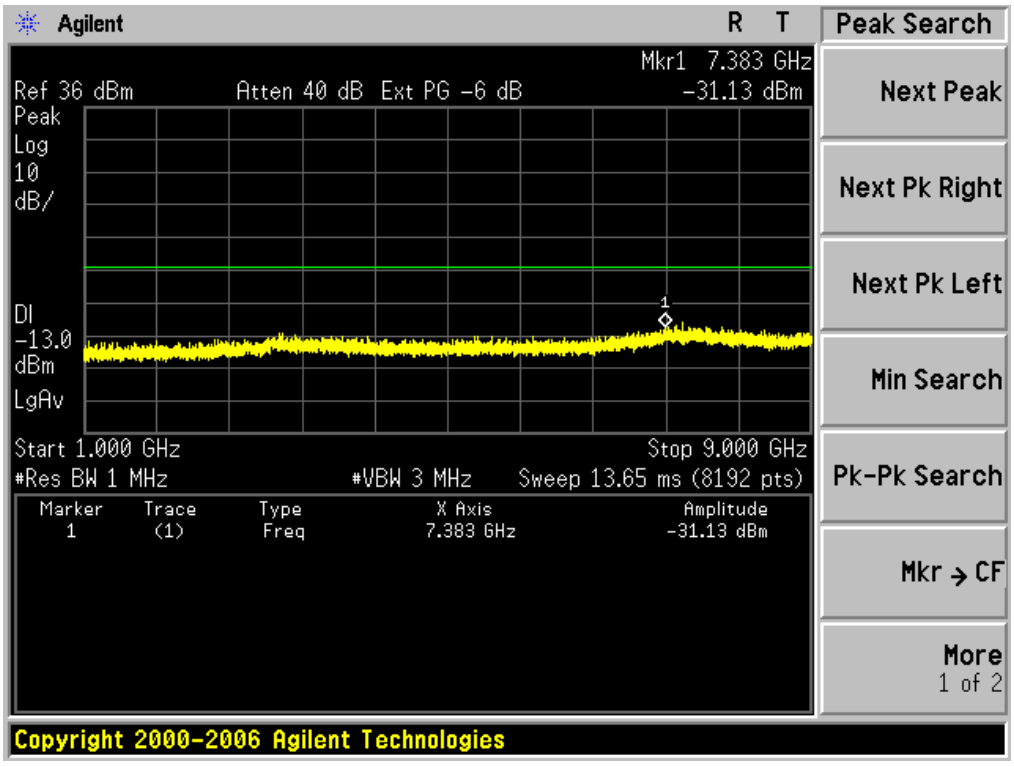
TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

CONDUCTED EMISSION IN GSM850 BAND

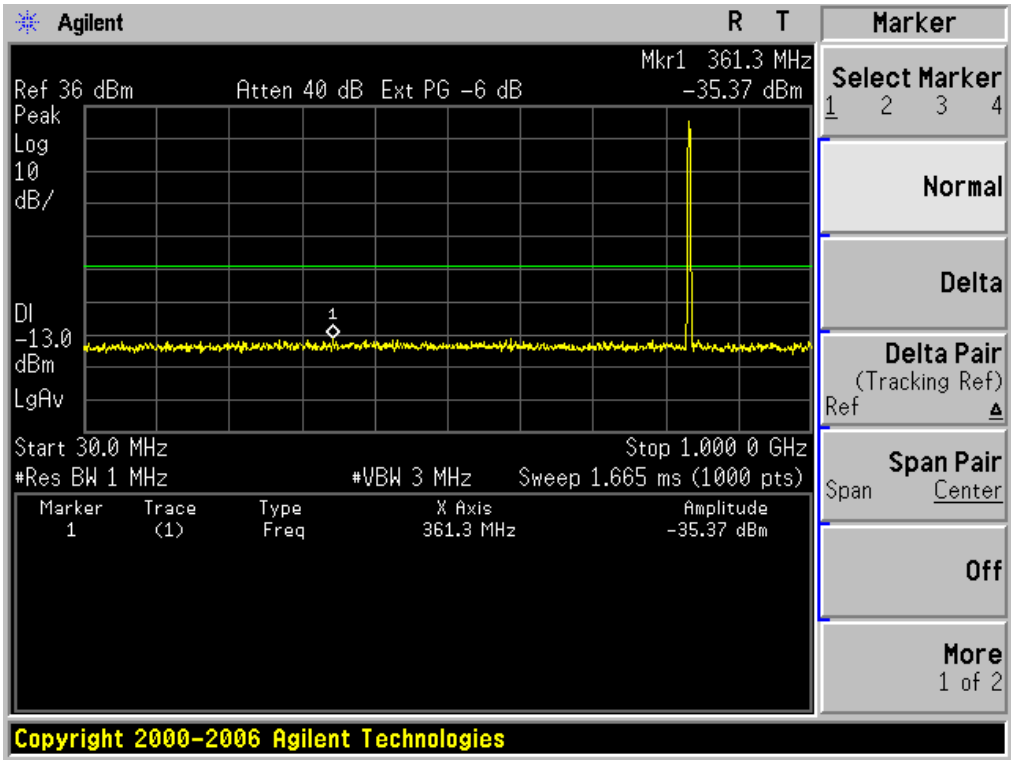
Conducted Emission Transmitting Mode CH 128 30MHz – 1GHz



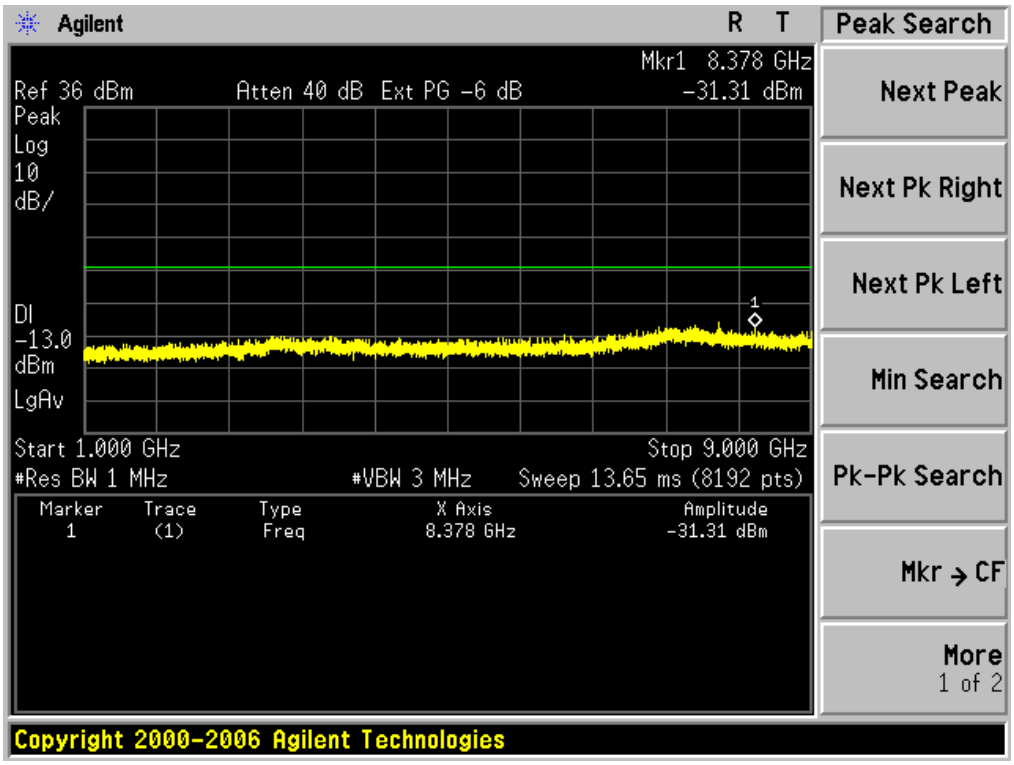
Conducted Emission Transmitting Mode CH 128 1GHz – 9GHz



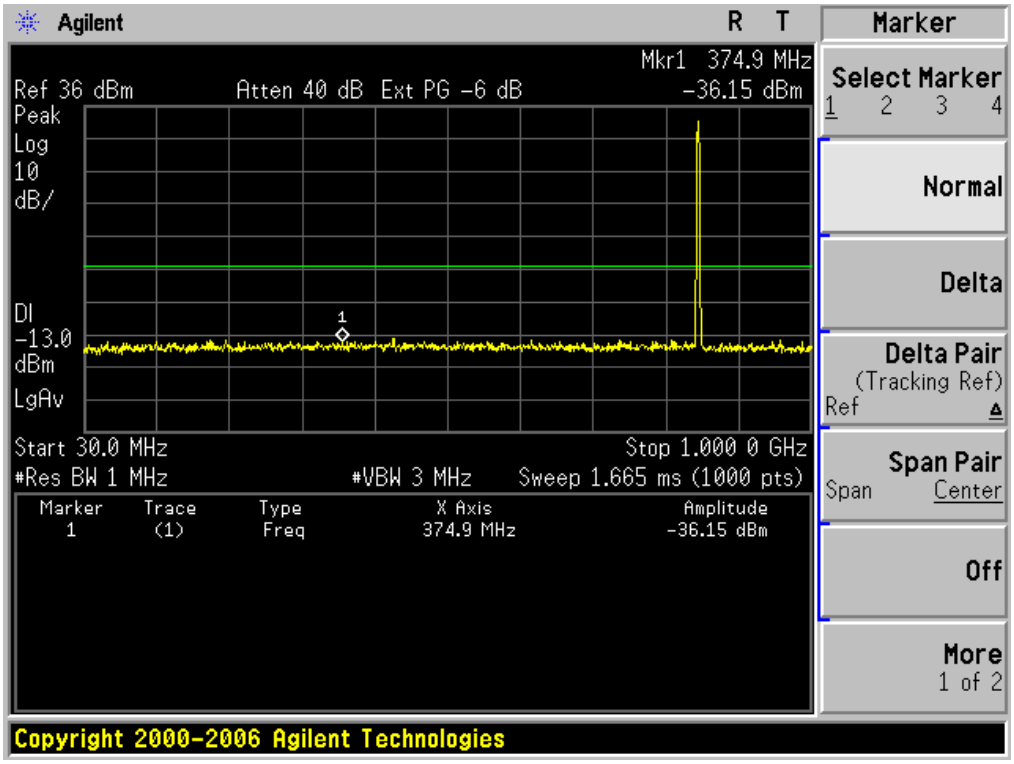
Conducted Emission Transmitting Mode CH 190 30MHz – 1GHz



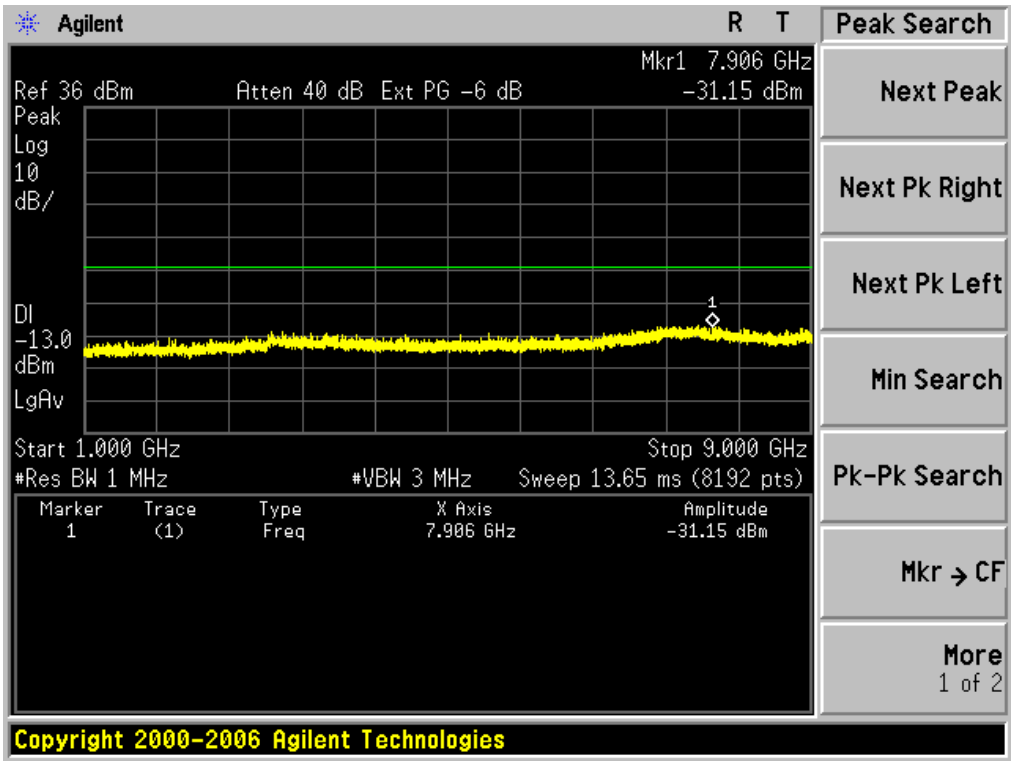
Conducted Emission Transmitting Mode CH 190 1GHz – 9GHz



Conducted Emission Transmitting Mode CH 251 30MHz – 1GHz

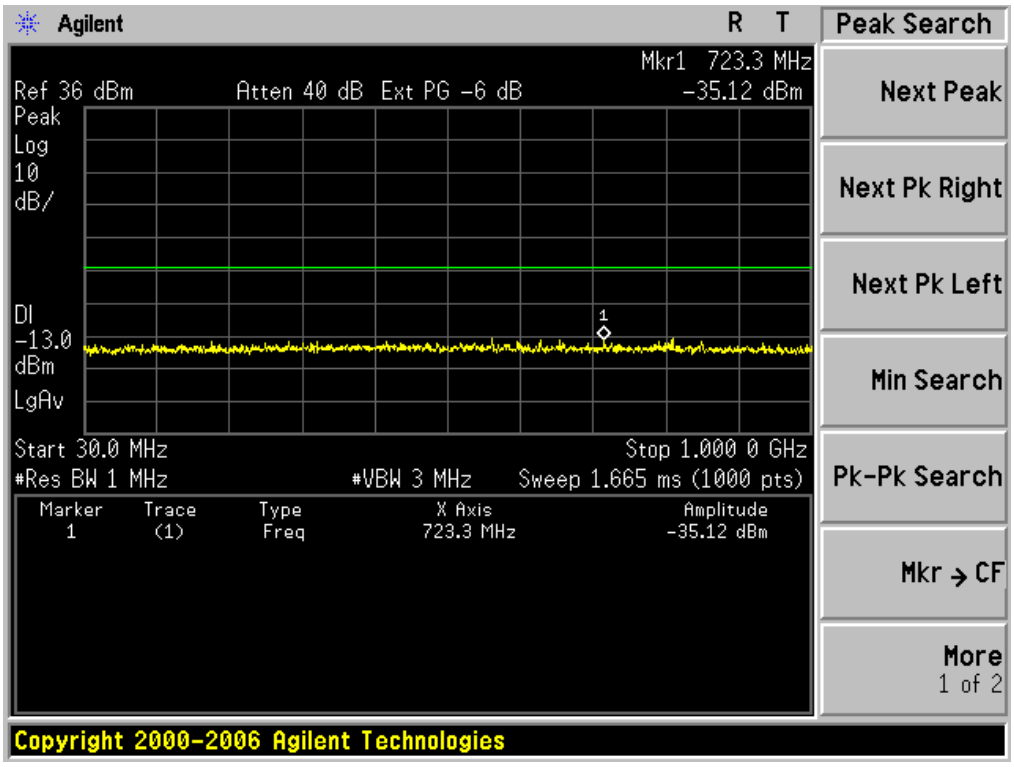


Conducted Emission Transmitting Mode CH 251 1GHz – 9GHz

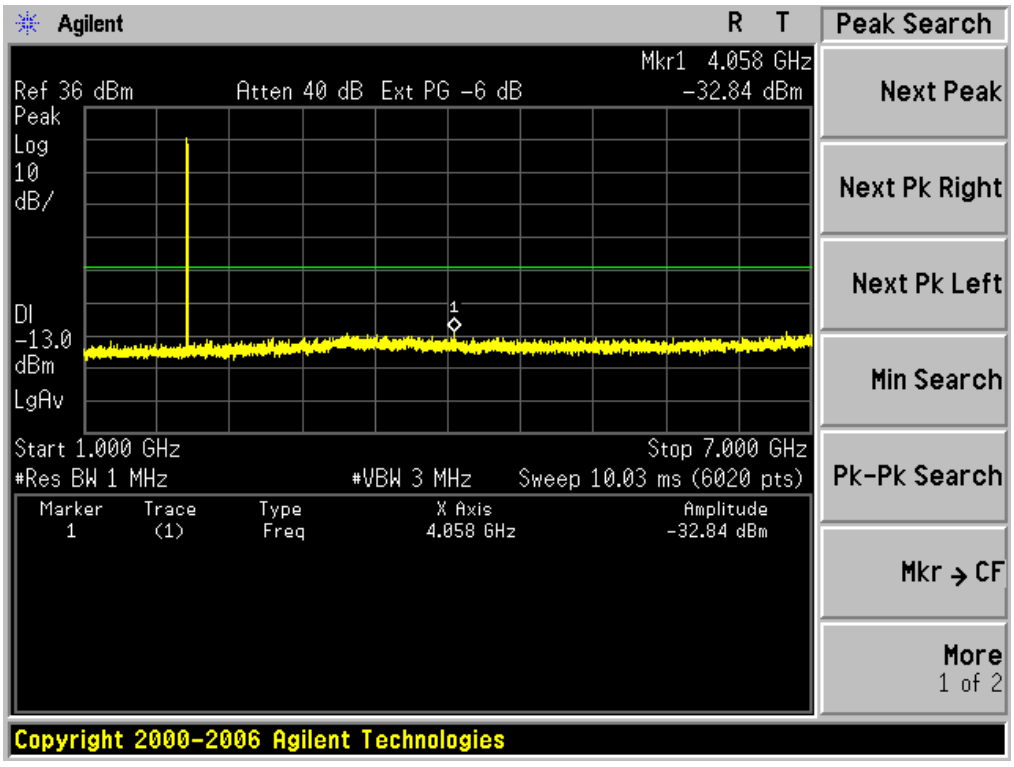


CONDUCTED EMISSION IN PCS1900 BAND

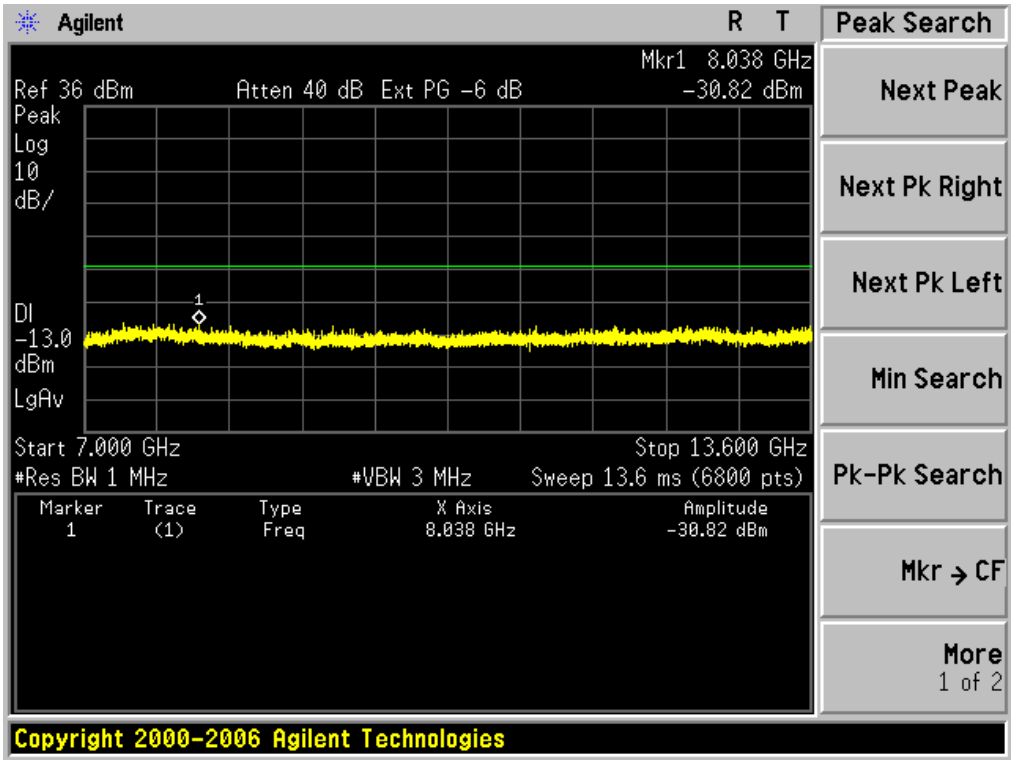
Conducted Emission Transmitting Mode CH 512 30MHz – 1GHz



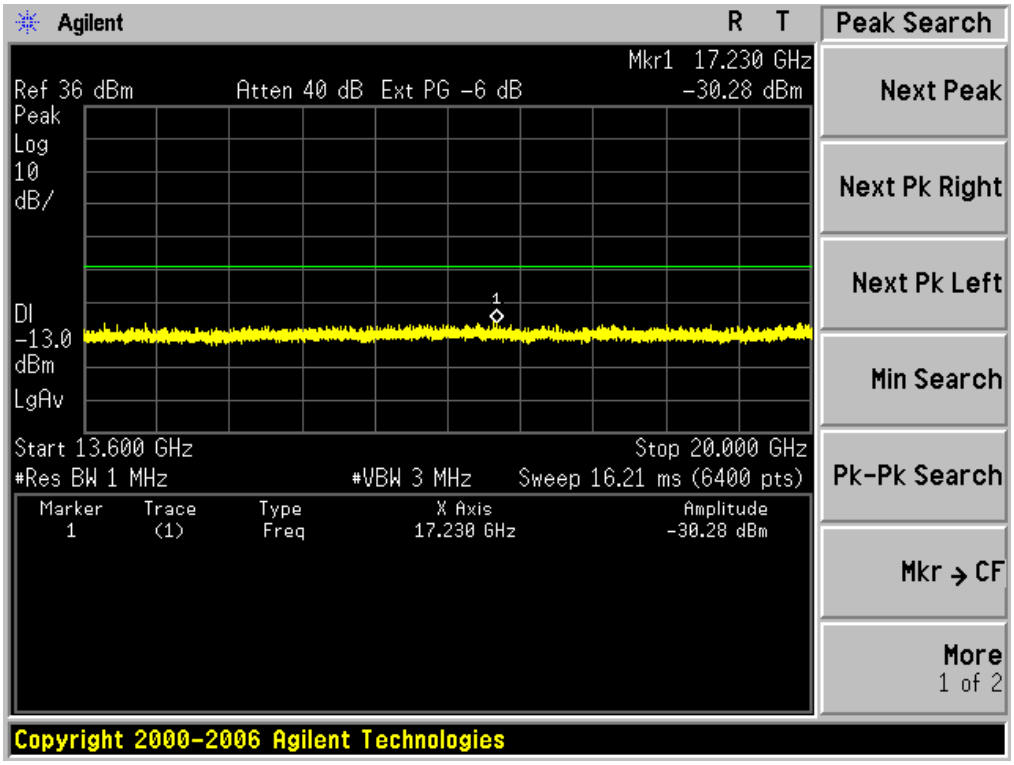
Conducted Emission Transmitting Mode CH 512 1GHz – 7GHz



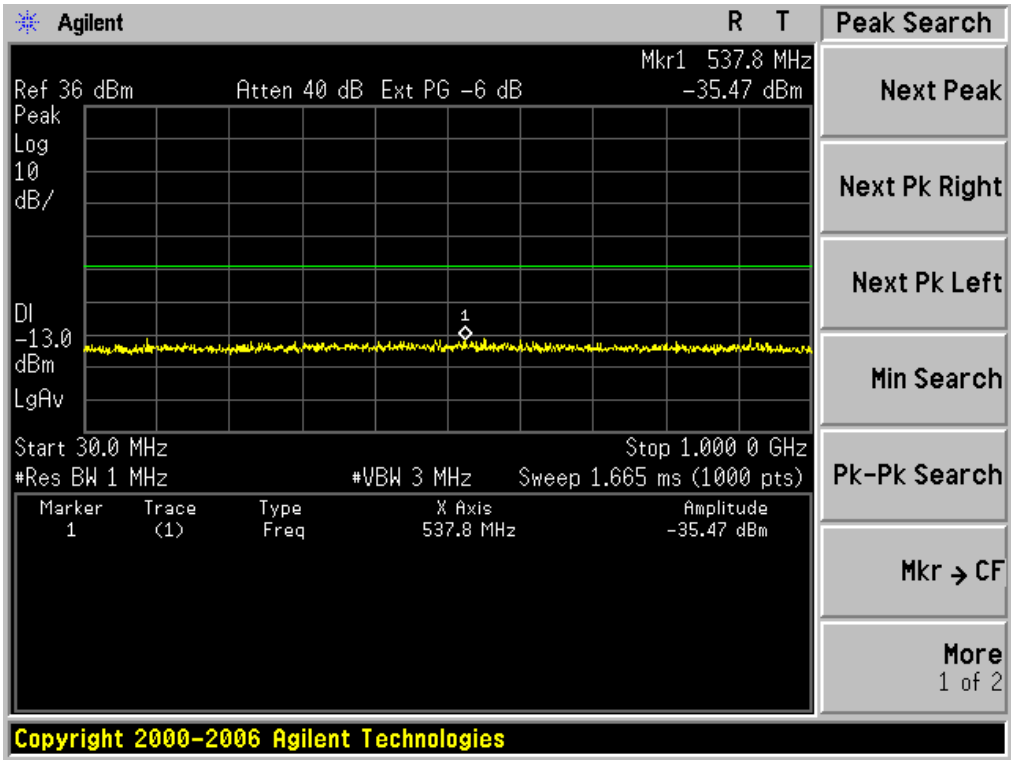
Conducted Emission Transmitting Mode CH 512 7GHz – 13.6GHz



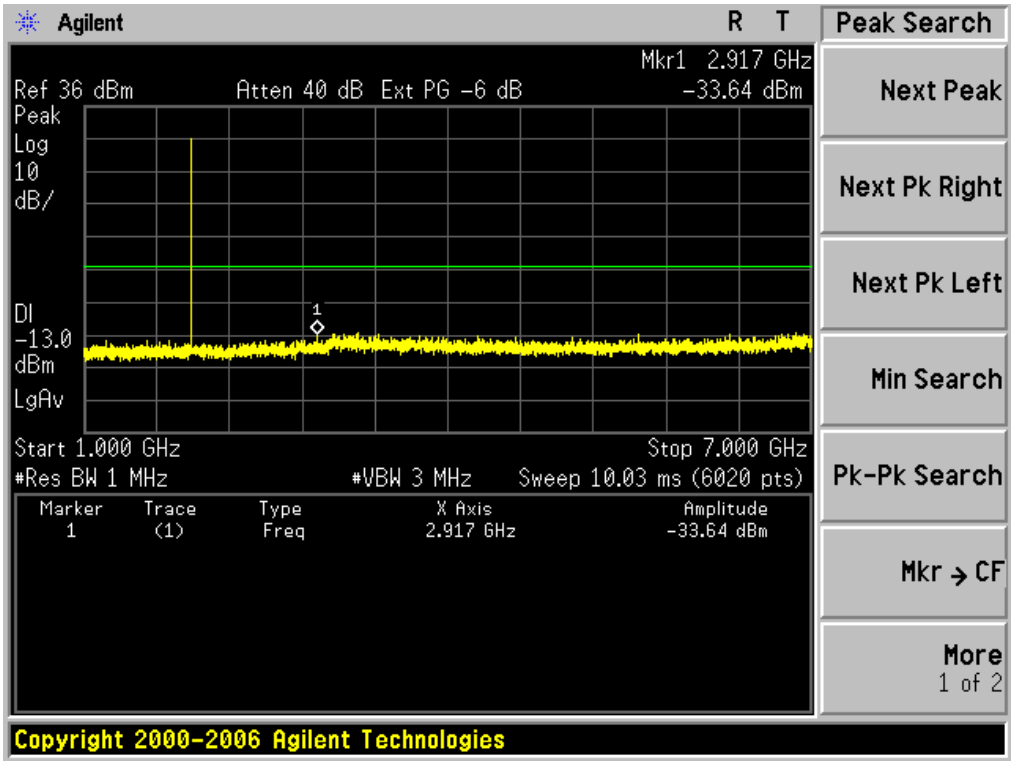
Conducted Emission Transmitting Mode CH 512 13.6GHz – 20GHz



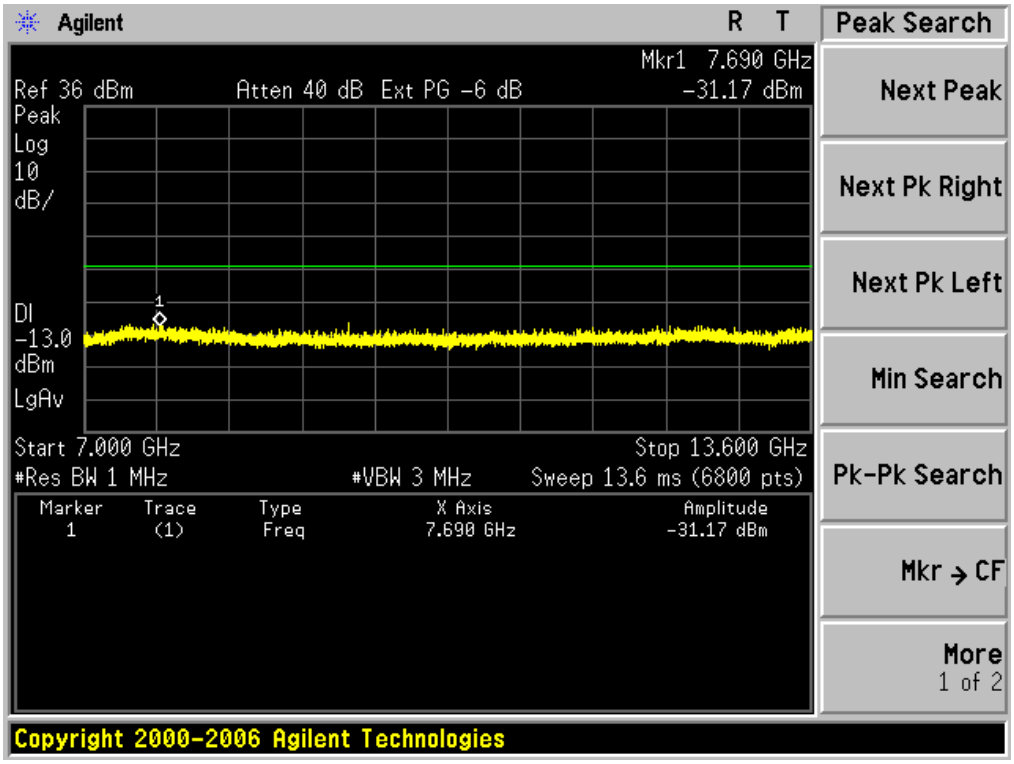
Conducted Emission Transmitting Mode CH 661 30MHz – 1GHz



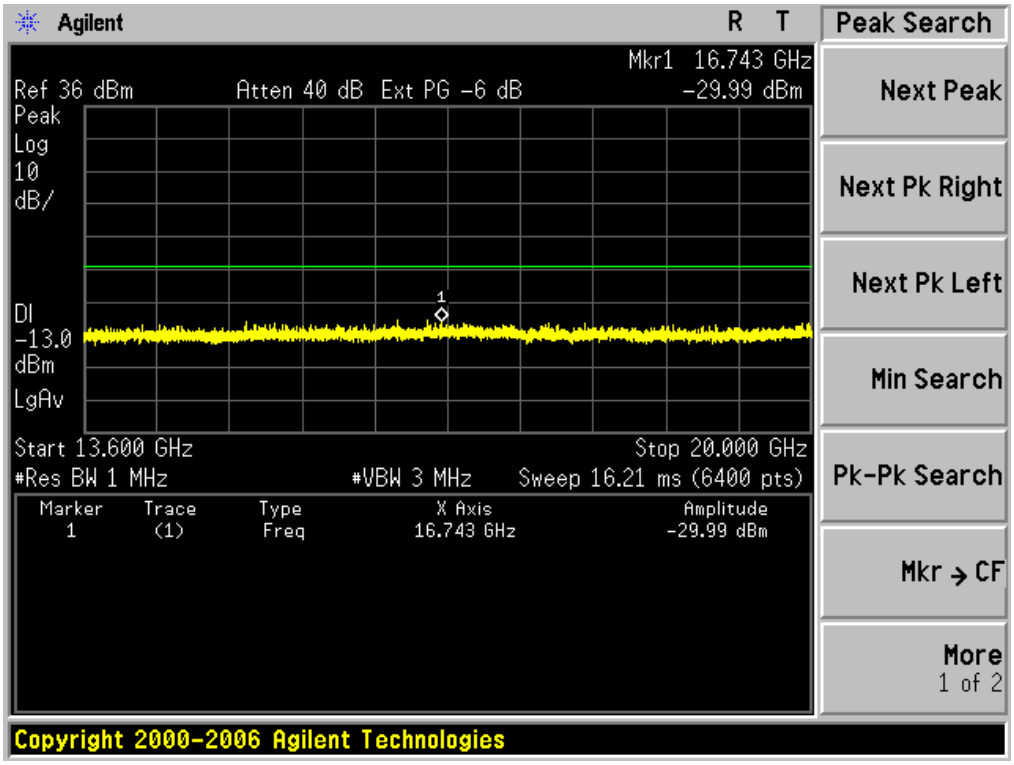
Conducted Emission Transmitting Mode CH 661 1GHz – 7GHz



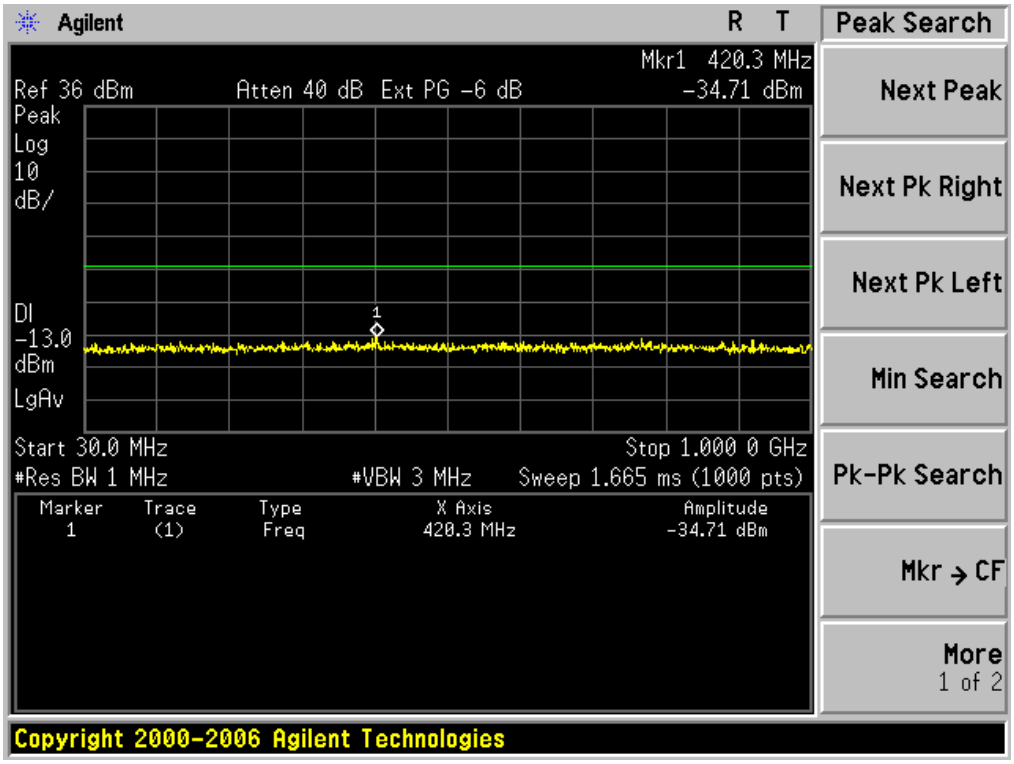
Conducted Emission Transmitting Mode CH 661 7GHz – 13.6GHz



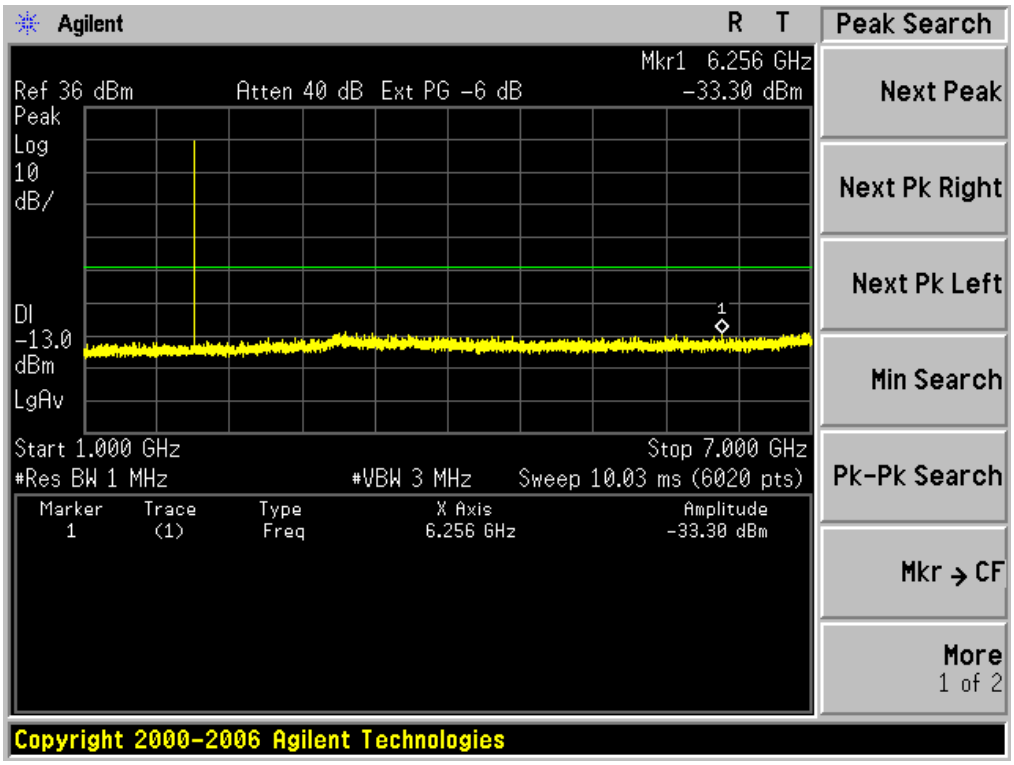
Conducted Emission Transmitting Mode CH 661 13.6GHz – 20GHz



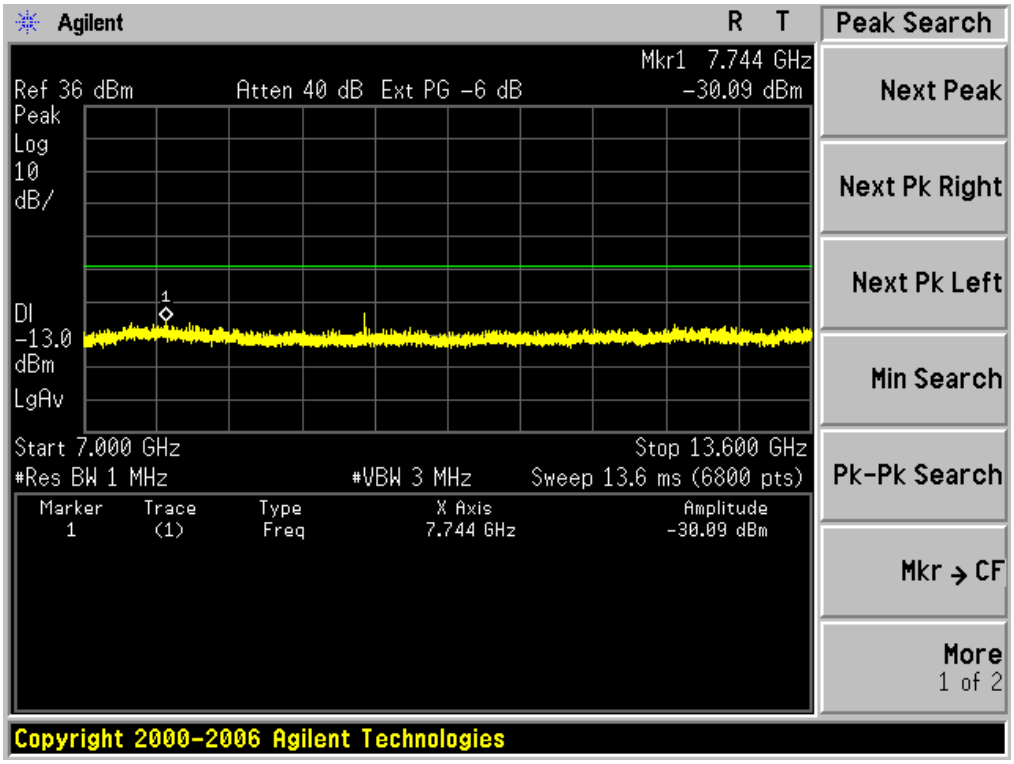
Conducted Emission Transmitting Mode CH 810 30MHz – 1GHz



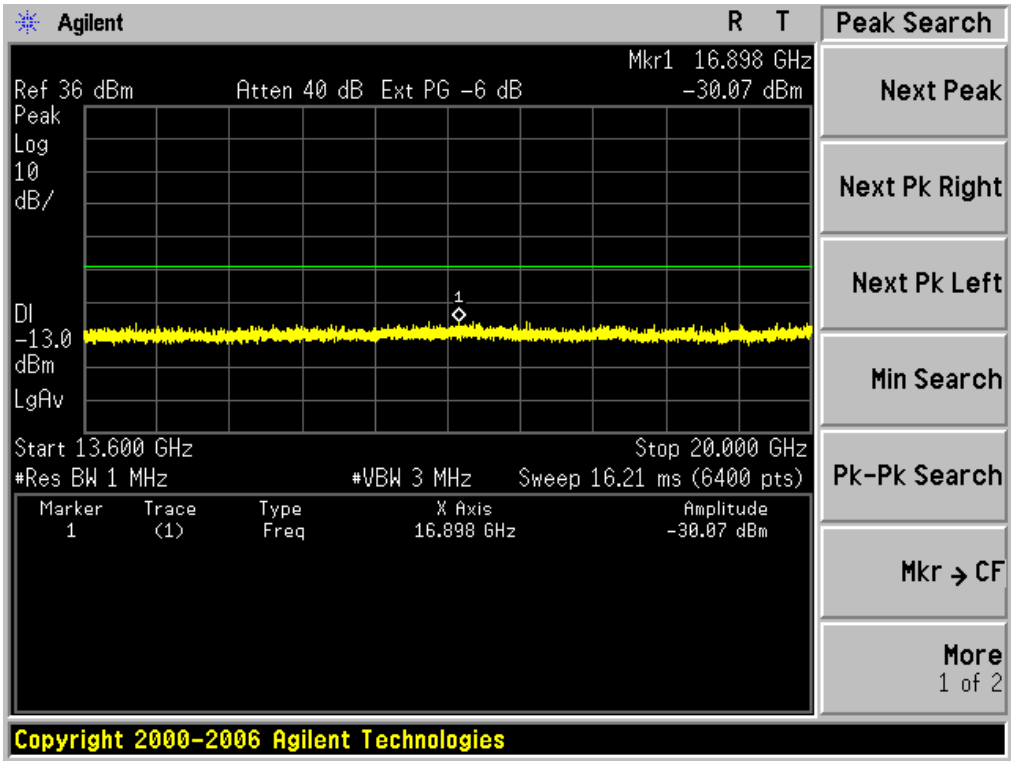
Conducted Emission Transmitting Mode CH 810 1GHz – 7GHz



Conducted Emission Transmitting Mode CH 810 7GHz – 13.6GHz

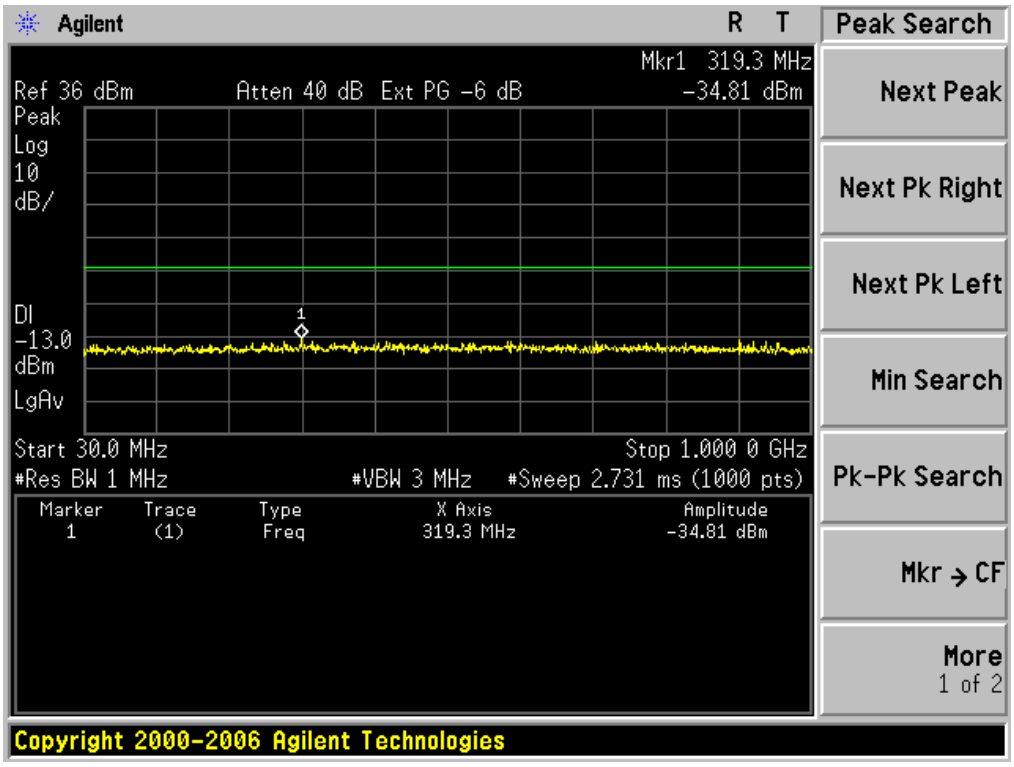


Conducted Emission Transmitting Mode CH 810 13.6GHz – 20GHz

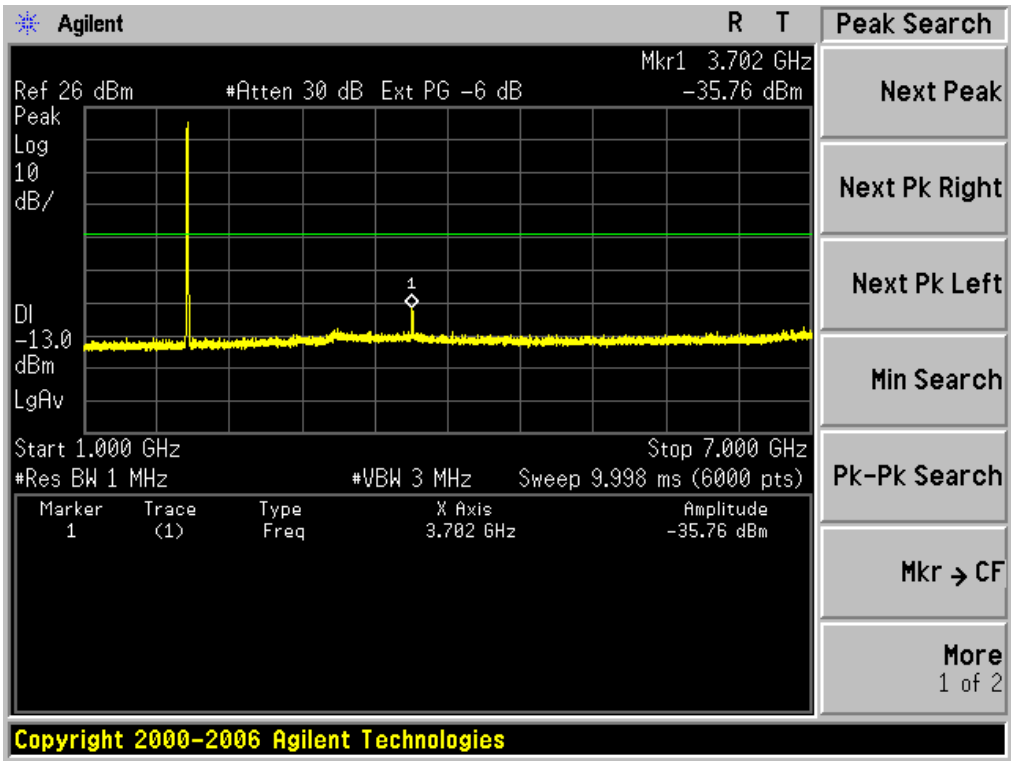


CONDUCTED EMISSION IN UMTS band II

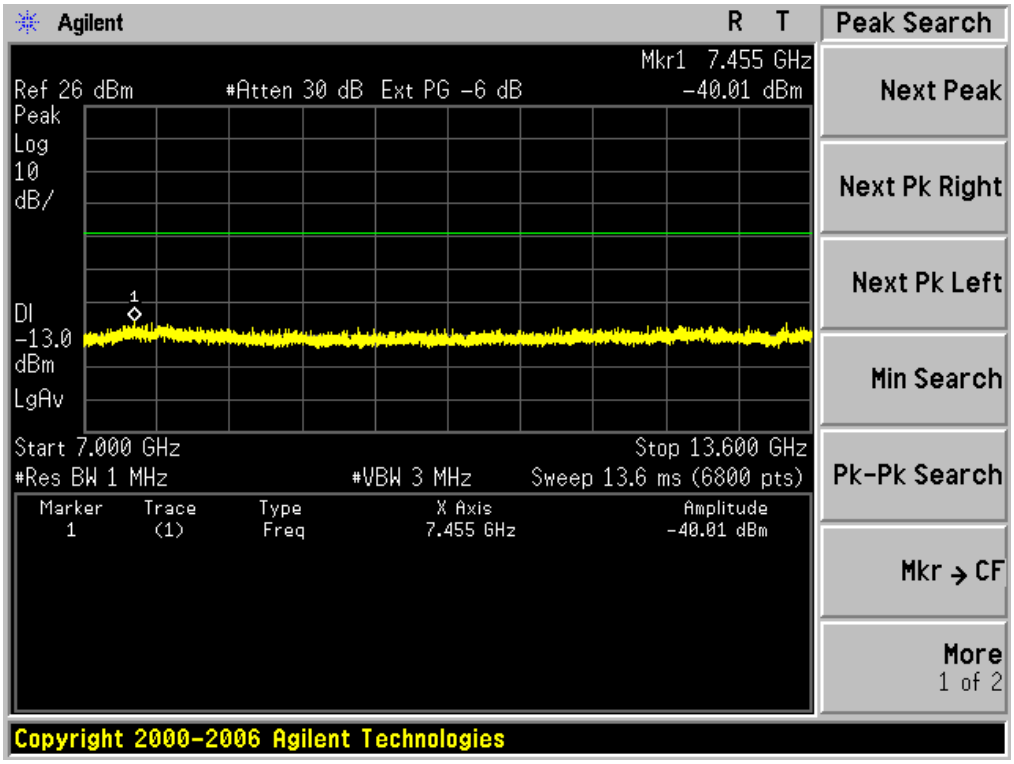
Conducted Emission Transmitting Mode CH 9662 30MHz – 1GHz



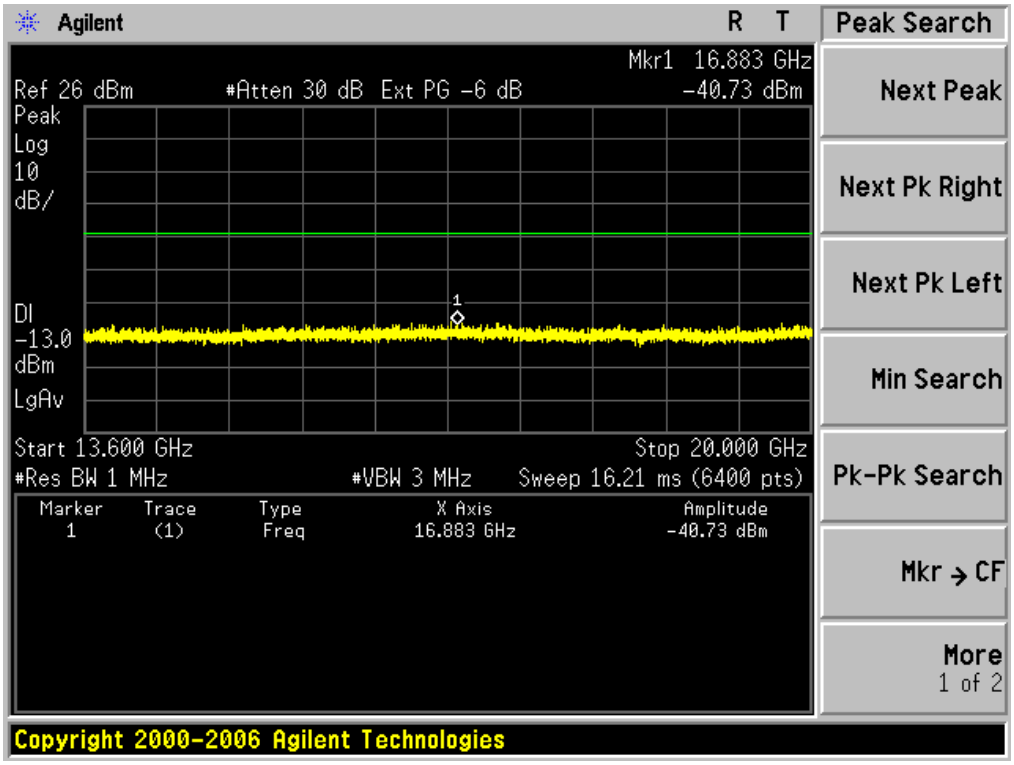
Conducted Emission Transmitting Mode CH 9662 1GHz – 7GHz



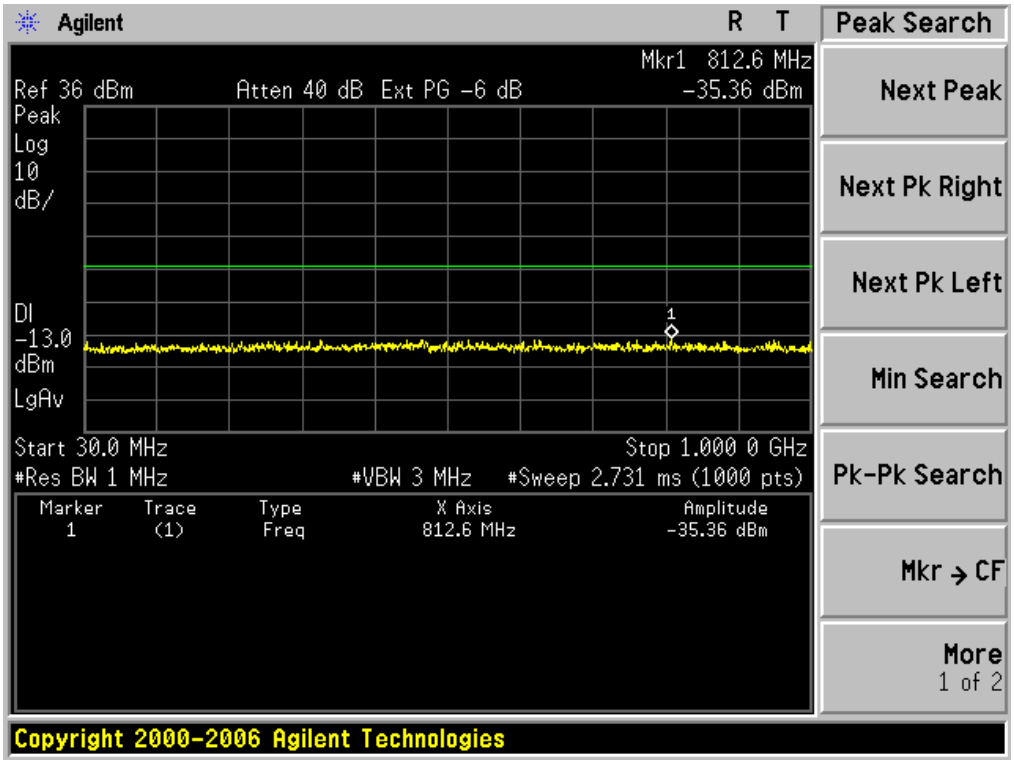
Conducted Emission Transmitting Mode CH 9662 7GHz – 13.6GHz



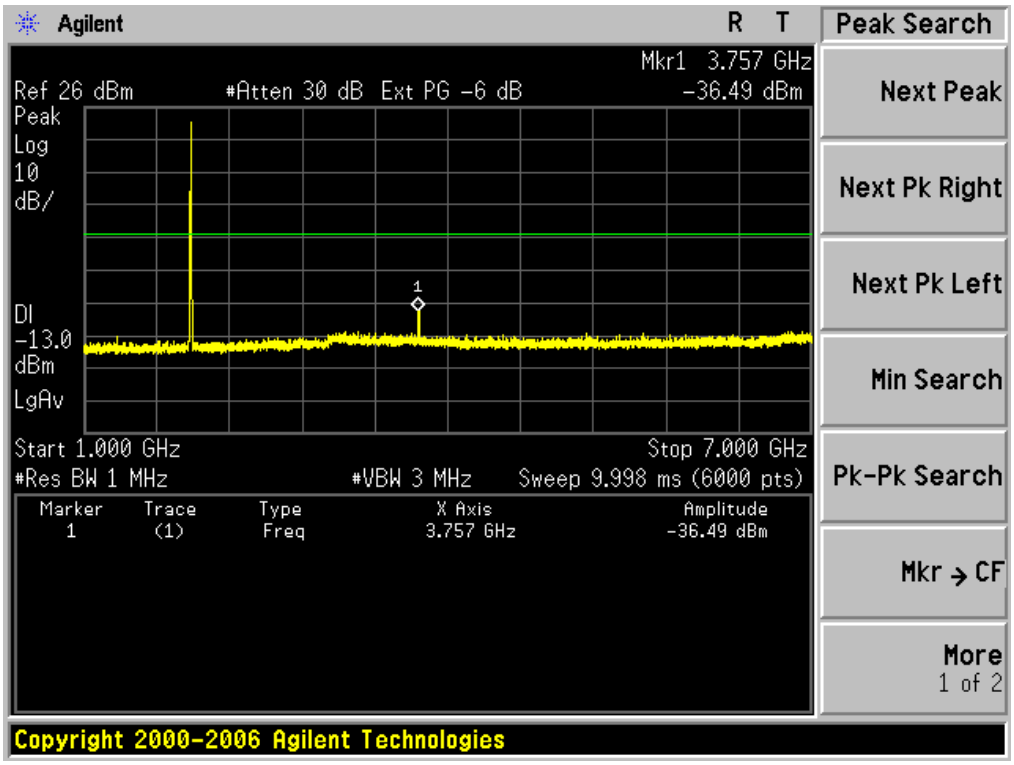
Conducted Emission Transmitting Mode CH 9662 13.6GHz – 20GHz



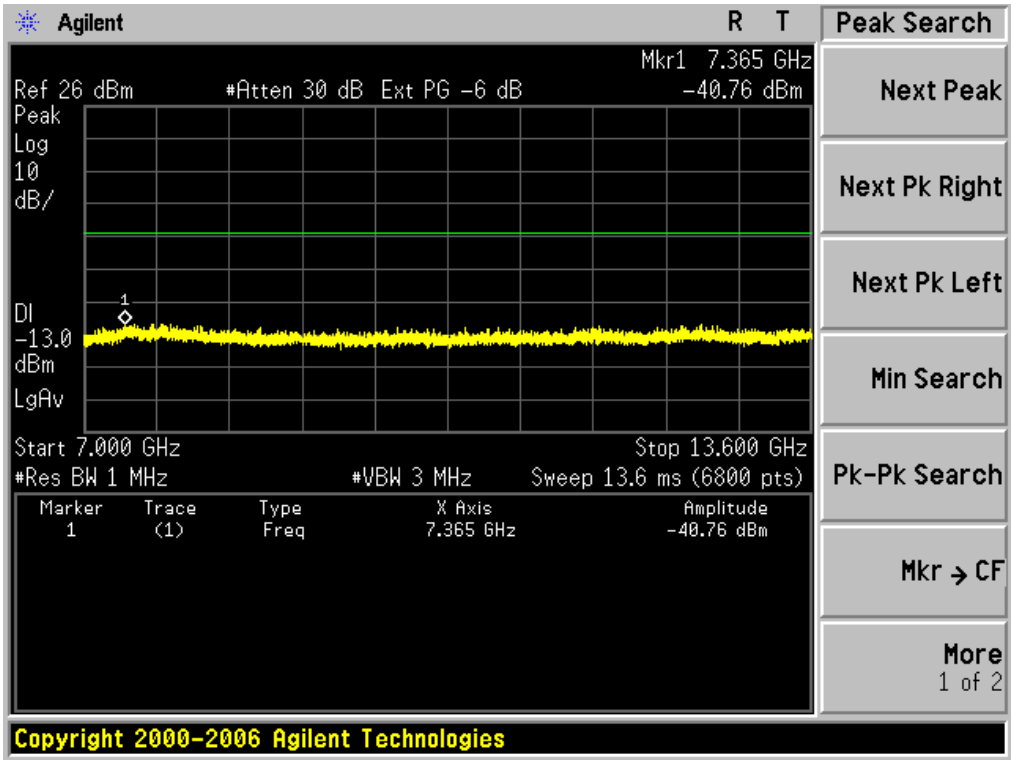
Conducted Emission Transmitting Mode CH 9800 30MHz – 1GHz



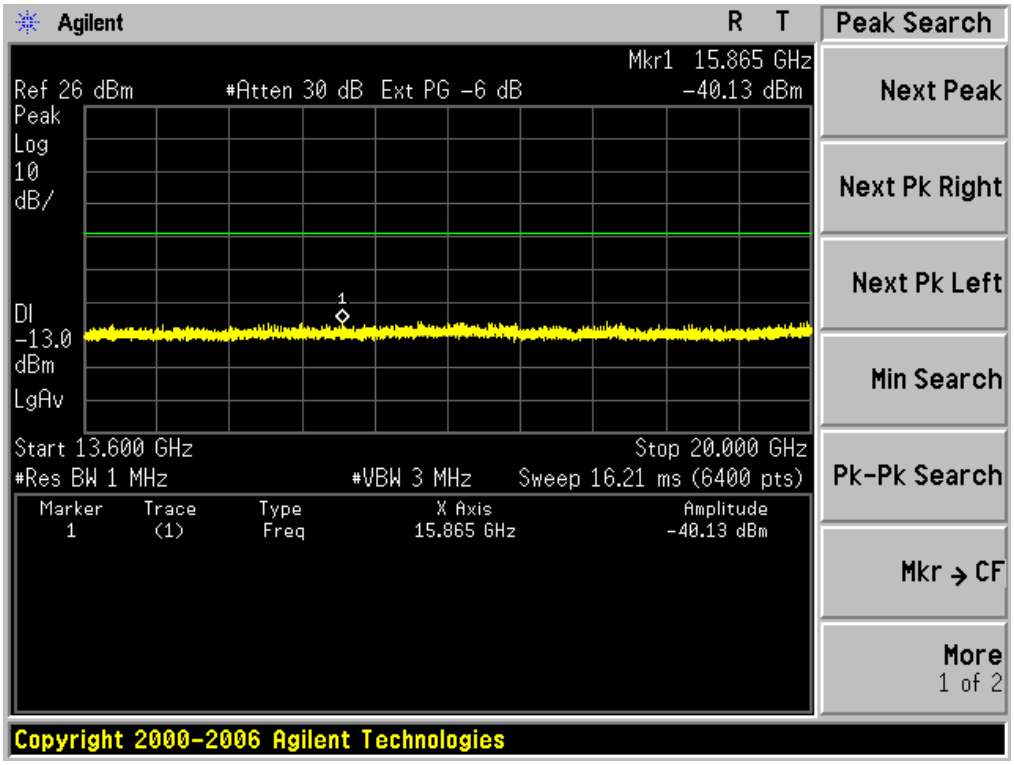
Conducted Emission Transmitting Mode CH 9800 1GHz – 7GHz



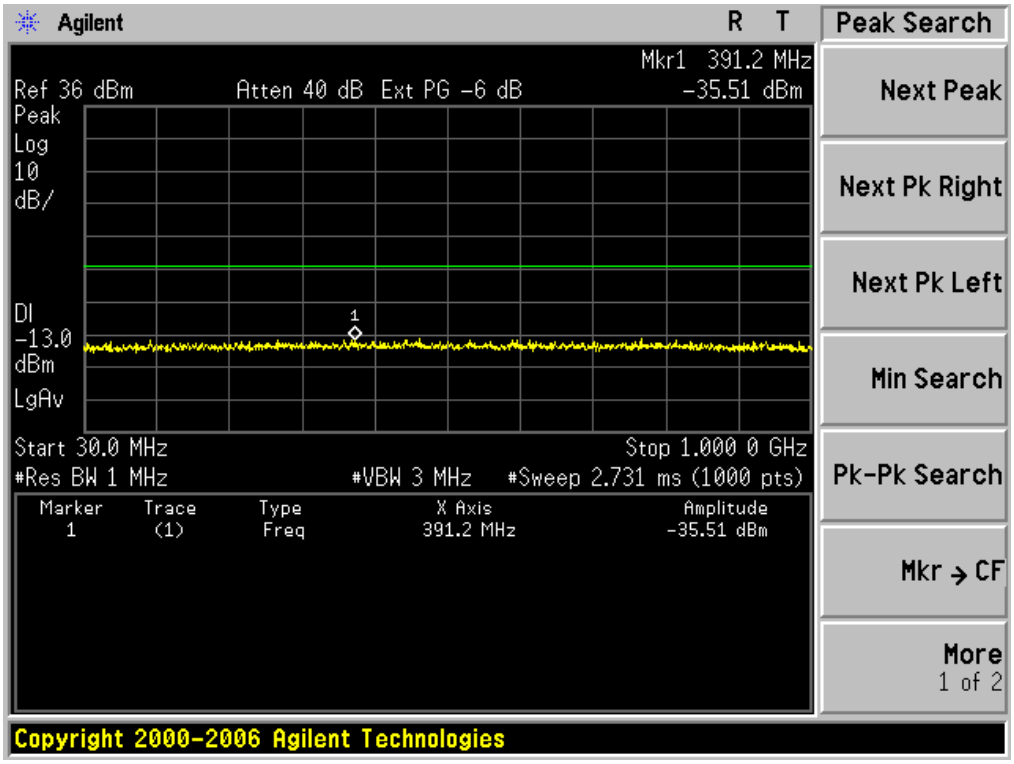
Conducted Emission Transmitting Mode CH 9800 7GHz – 13.6GHz



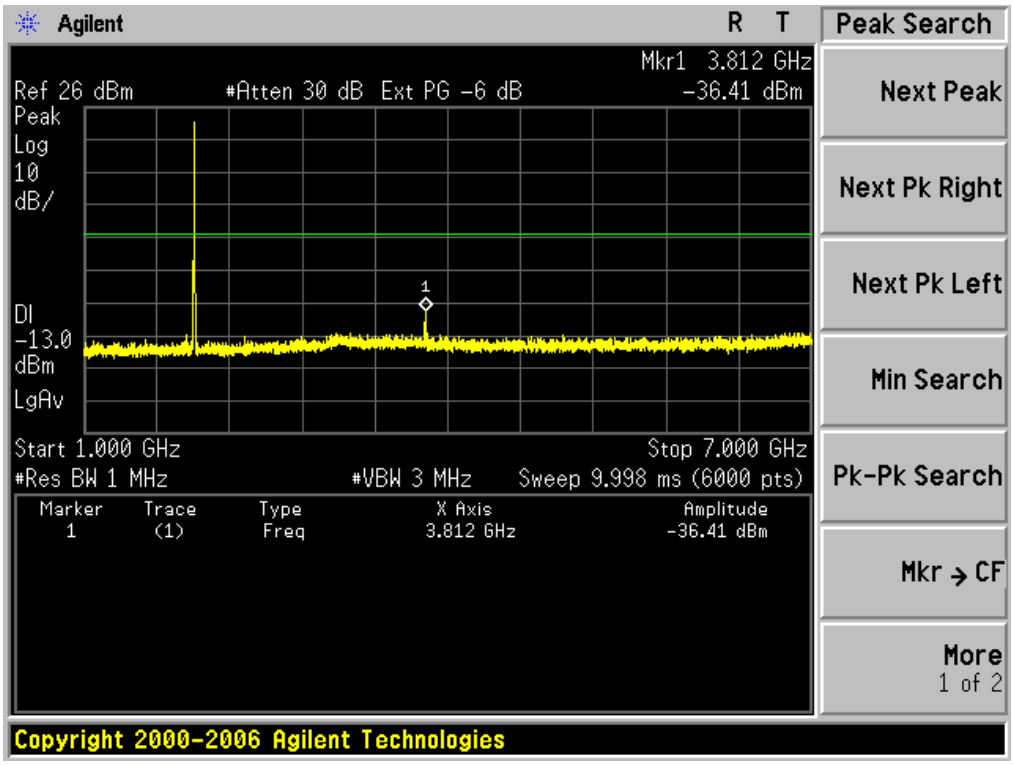
Conducted Emission Transmitting Mode CH 9800 13.6GHz – 20GHz



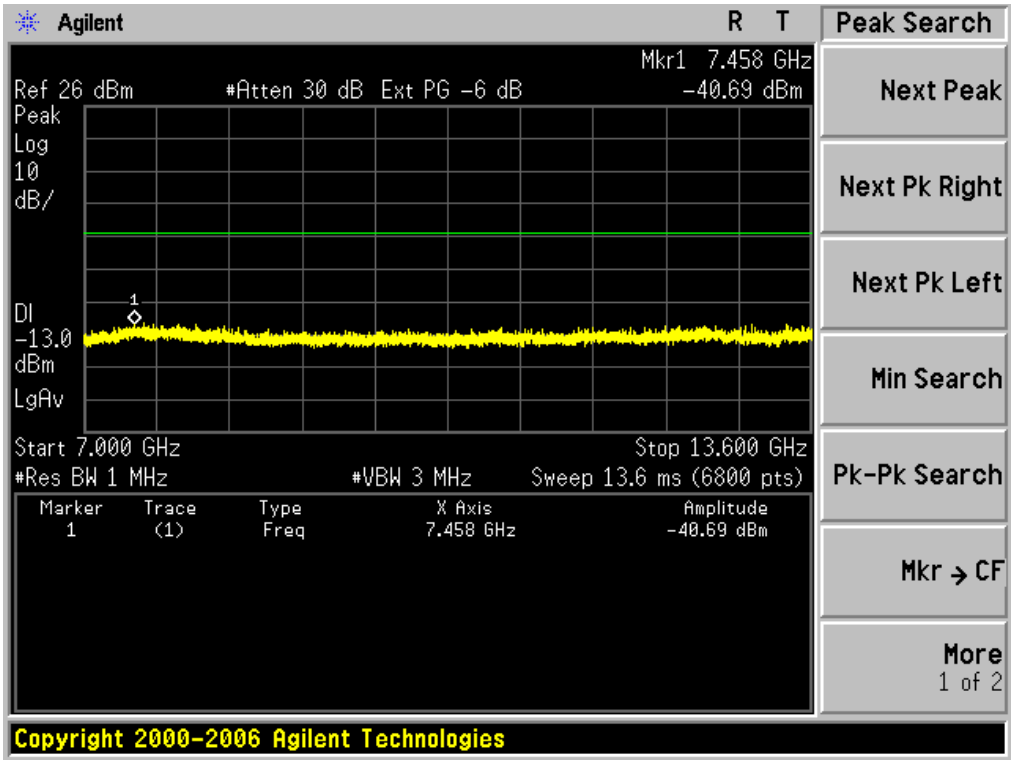
Conducted Emission Transmitting Mode CH 9938 30MHz – 1GHz



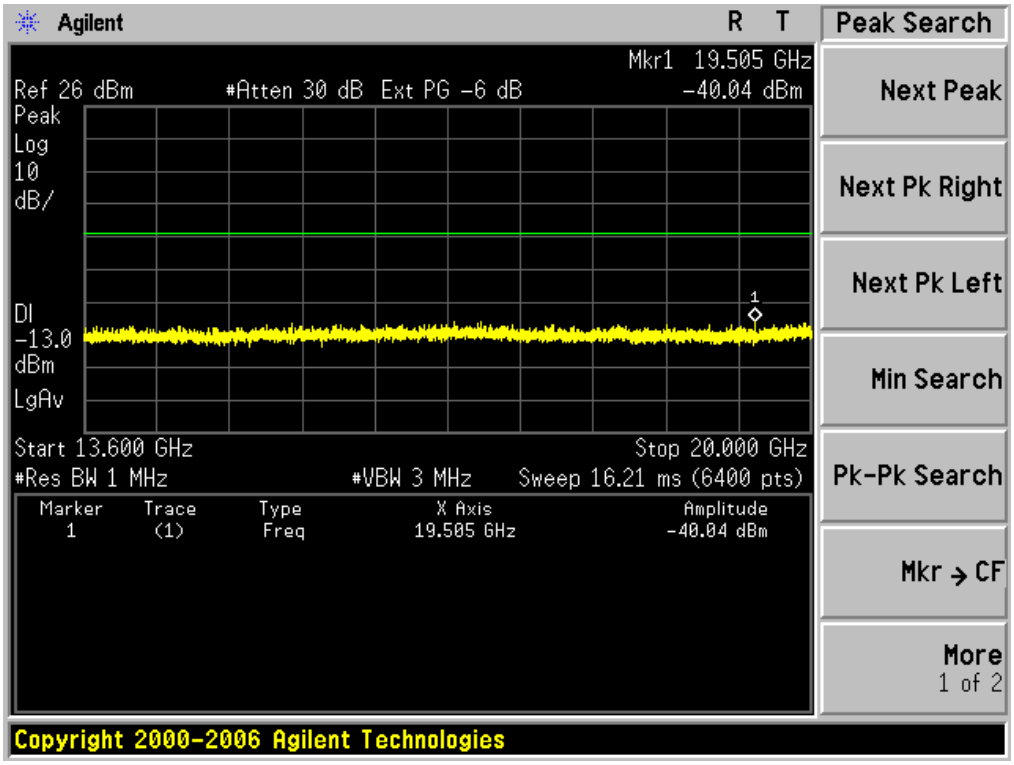
Conducted Emission Transmitting Mode CH 9938 1GHz – 7GHz



Conducted Emission Transmitting Mode CH 9938 7GHz – 13.6GHz

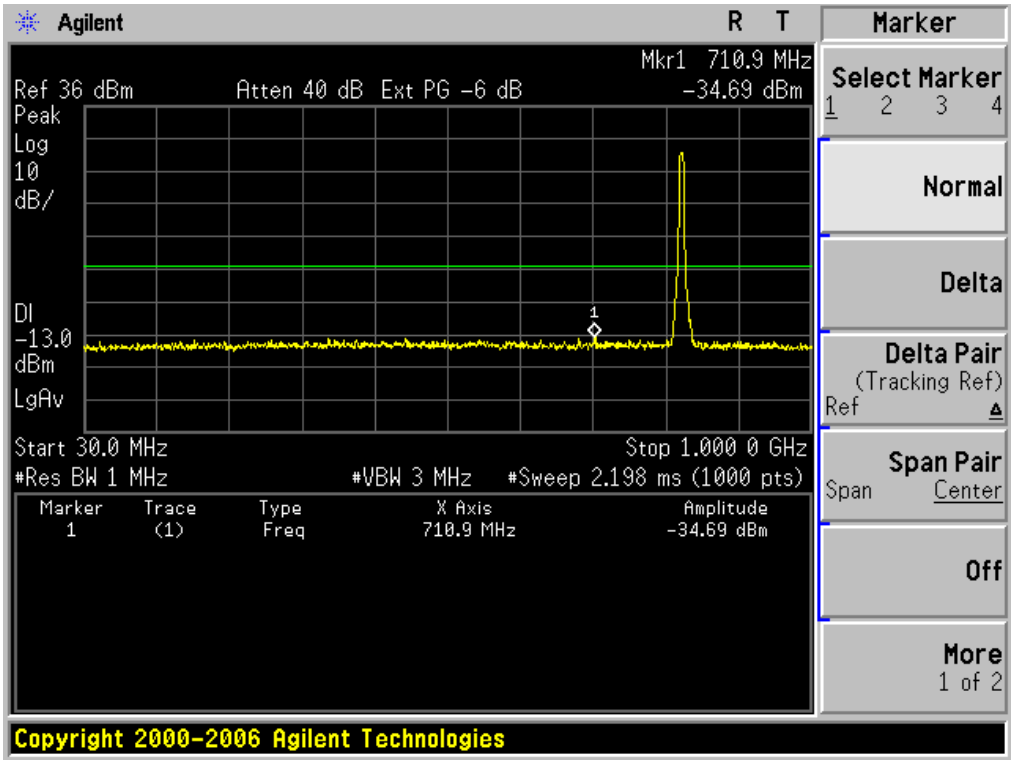


Conducted Emission Transmitting Mode CH 9938 13.6GHz – 20GHz

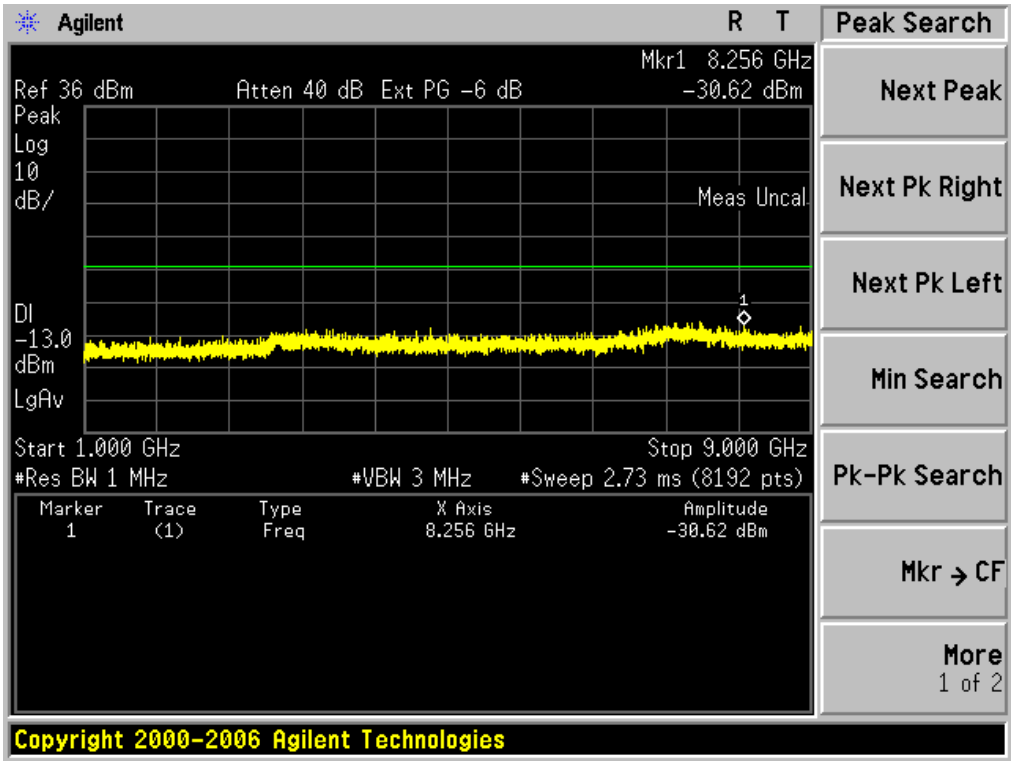


CONDUCTED EMISSION IN UMTS band V

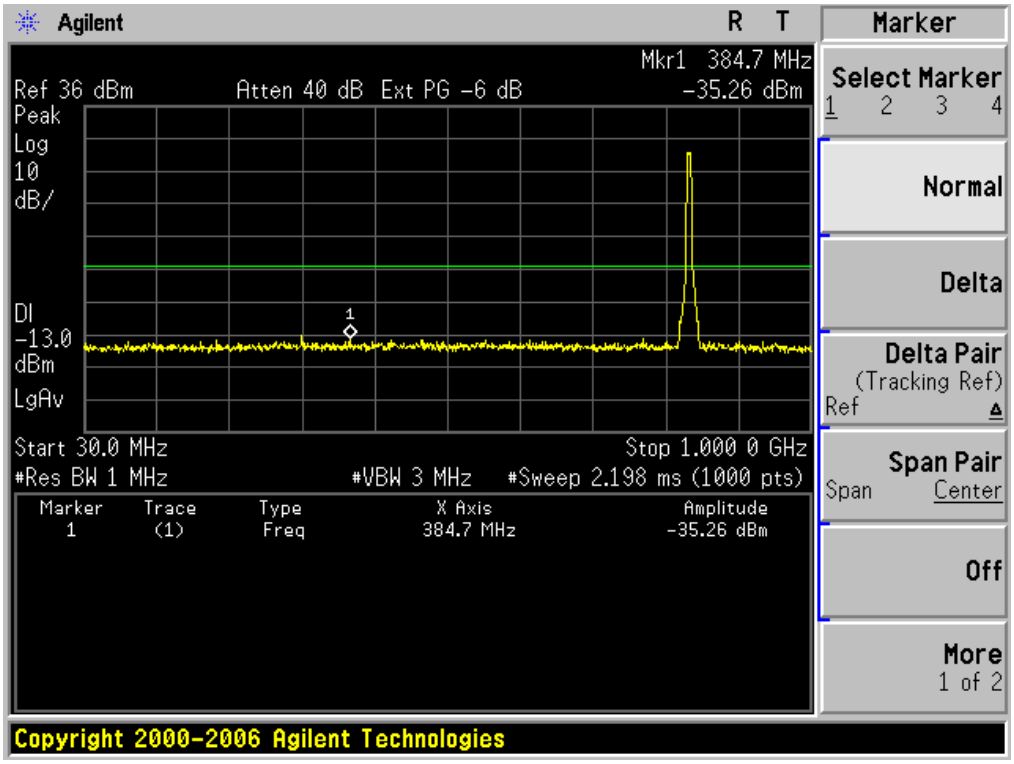
Conducted Emission Transmitting Mode CH 4357 30MHz – 1GHz



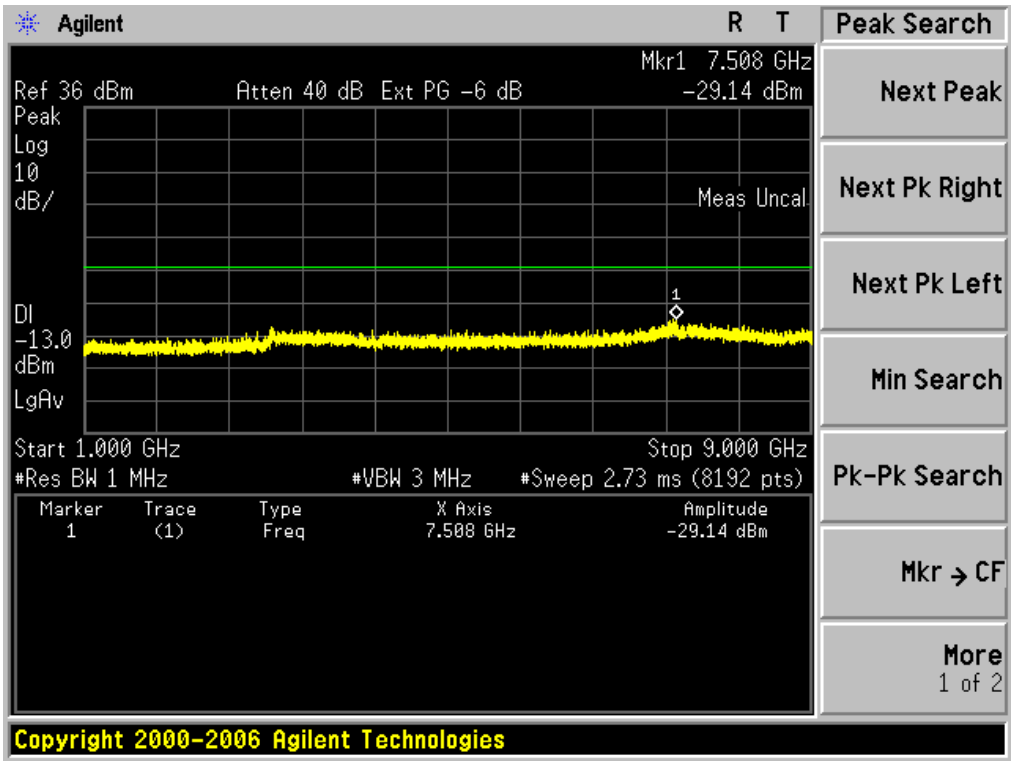
Conducted Emission Transmitting Mode CH 4357 1GHz – 20GHz



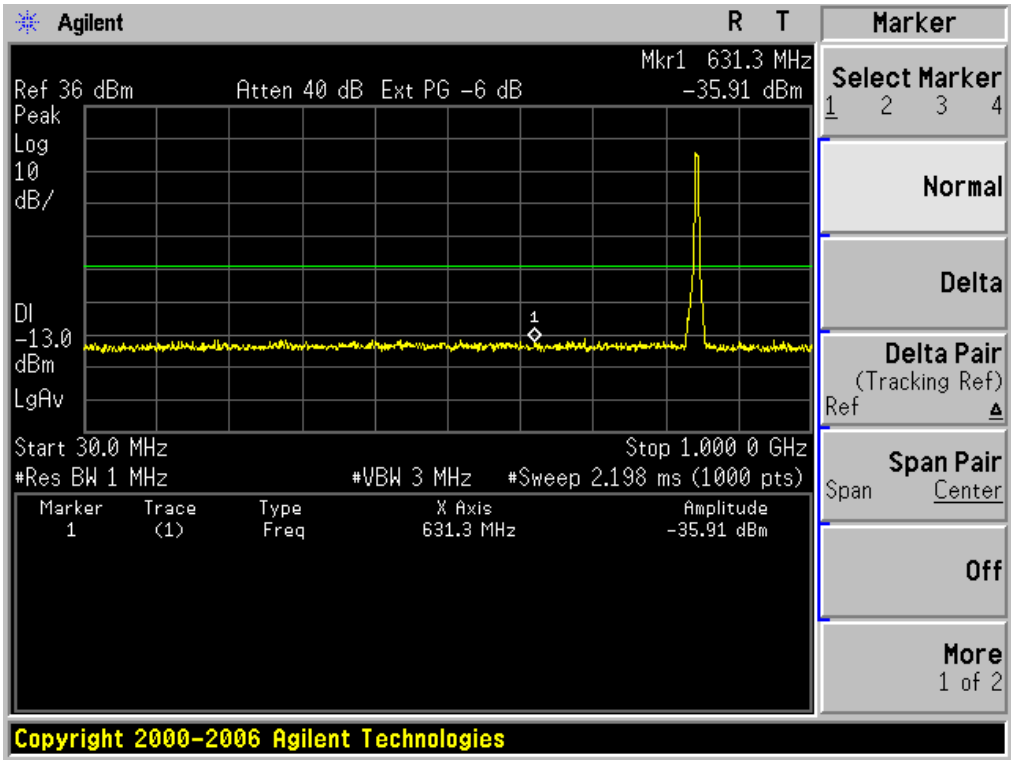
Conducted Emission Transmitting Mode CH 4386 30MHz – 1GHz



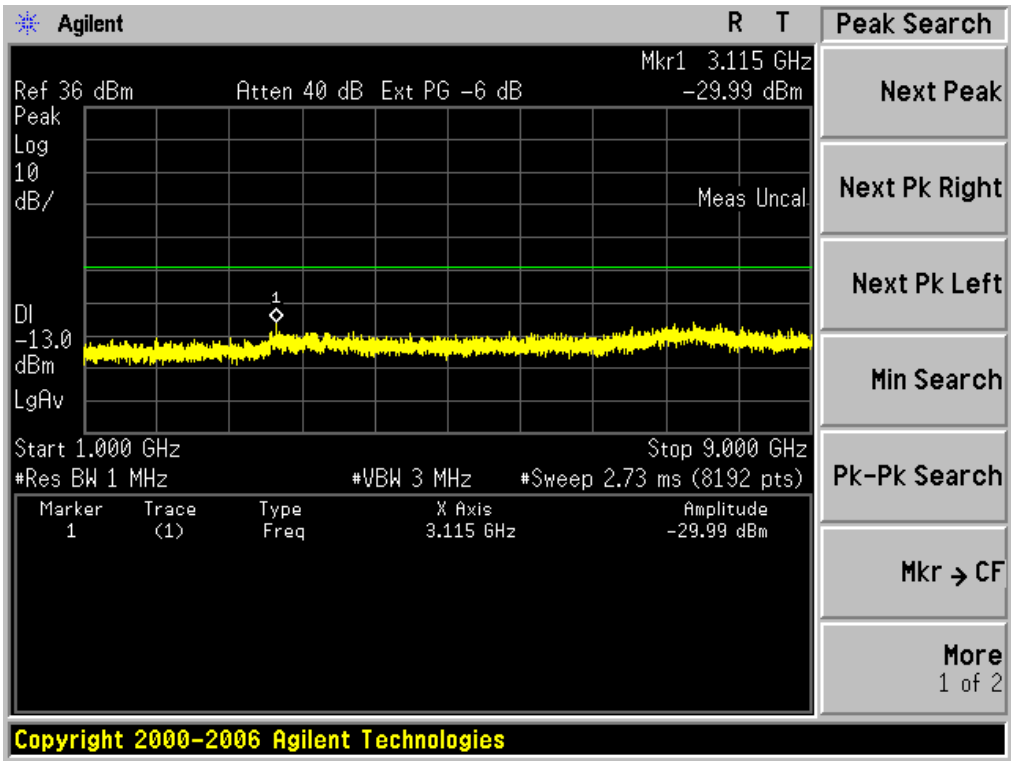
Conducted Emission Transmitting Mode CH 4386 1GHz – 20GHz



Conducted Emission Transmitting Mode CH 4458 30MHz – 1GHz



Conducted Emission Transmitting Mode CH 4458 1GHz – 20GHz

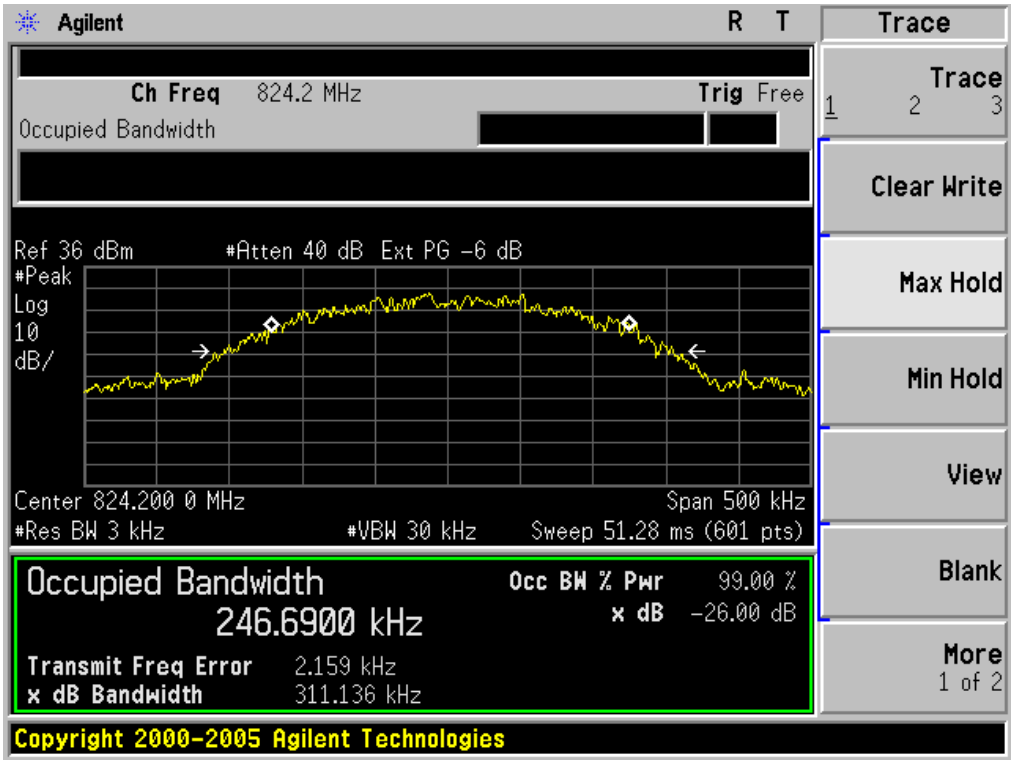


APPENDIX B

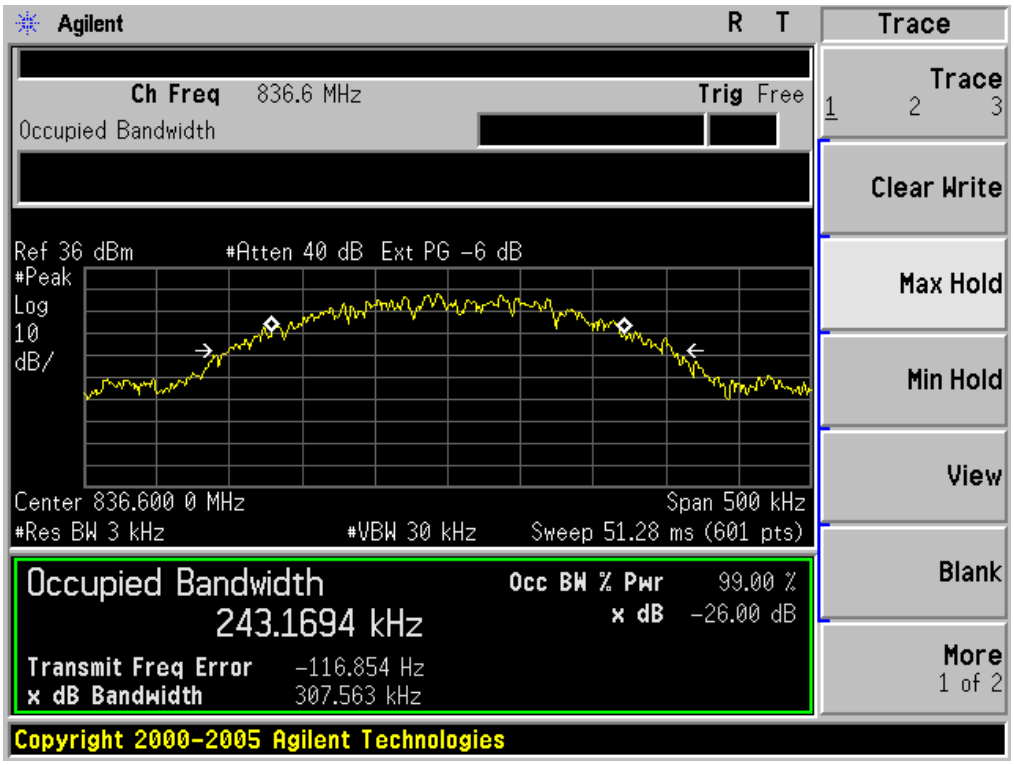
TEST PLOTS FOR OCCUPIED BANDWIDTH (99%)

EMISSION BANDWIDTH (-26dBC)

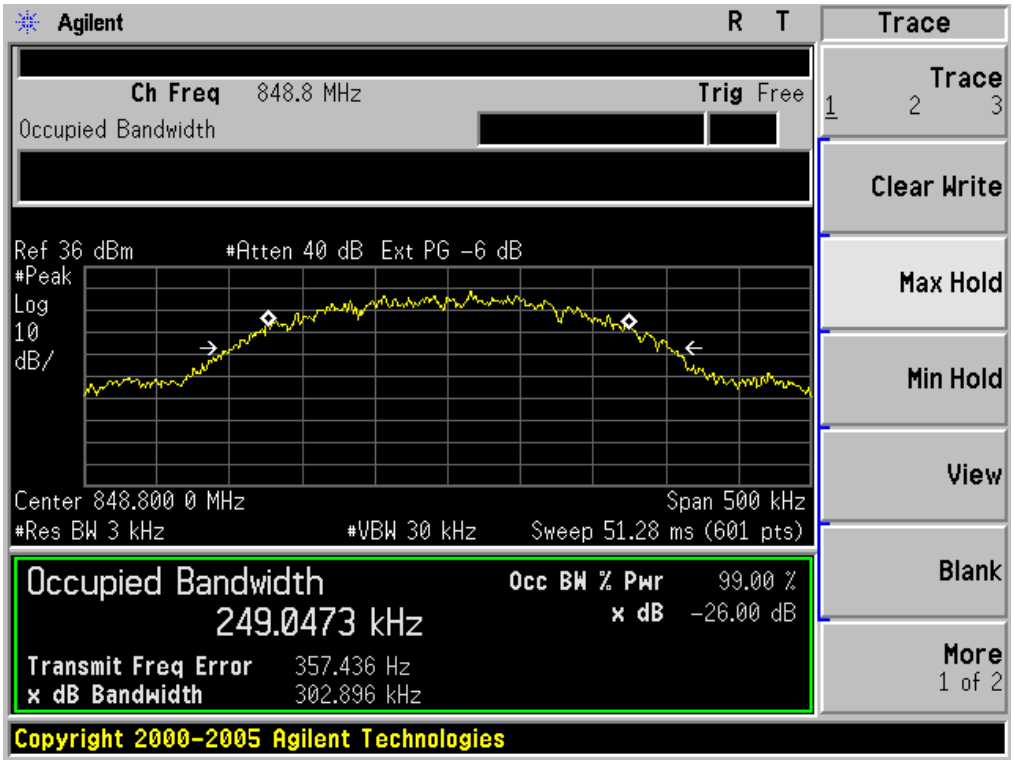
Occupied Bandwidth (99%) GSM 850 BAND CH 128



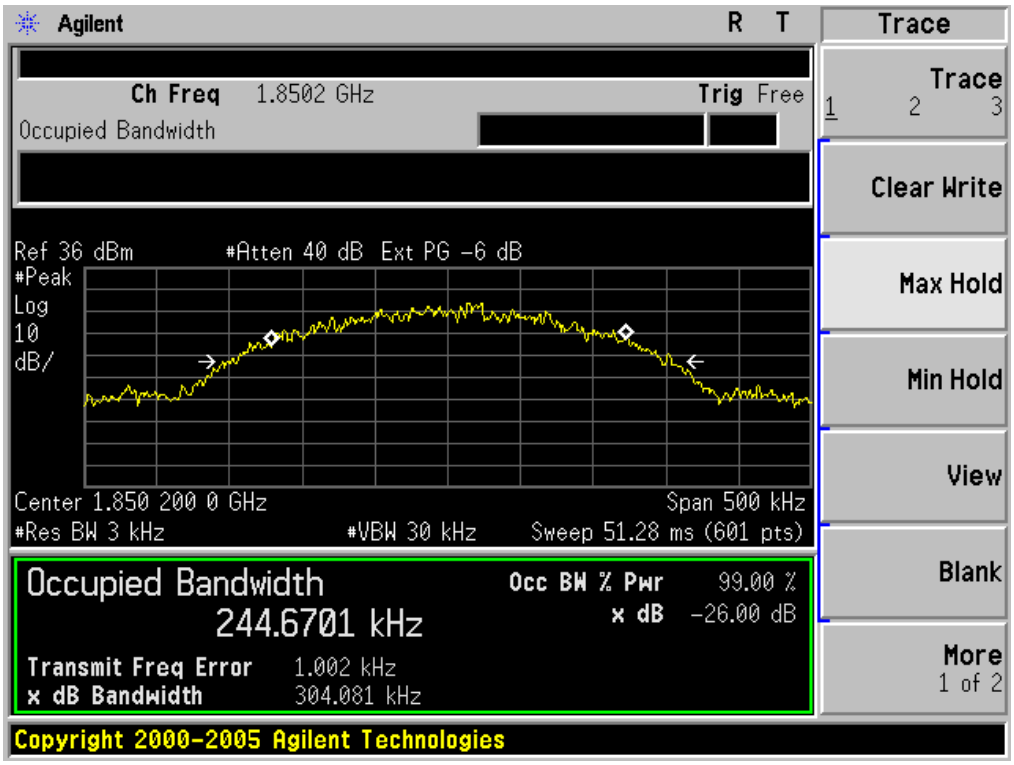
Occupied Bandwidth (99%) GSM 850 BAND CH 190



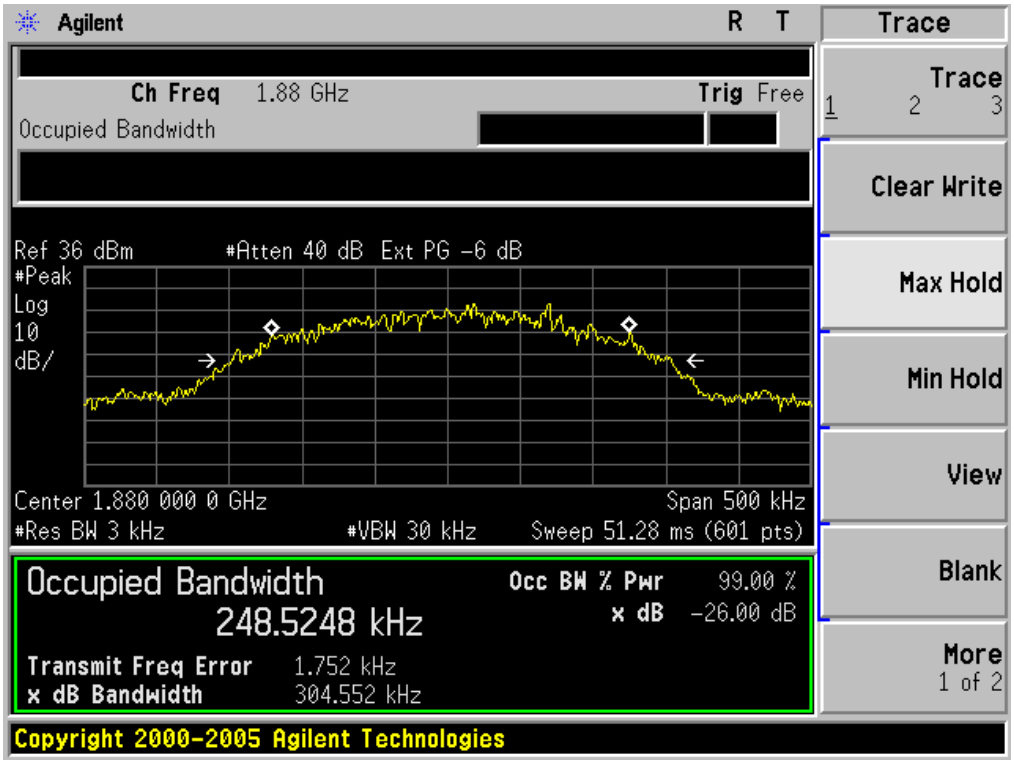
Occupied Bandwidth (99%) GSM 850 BAND CH 251



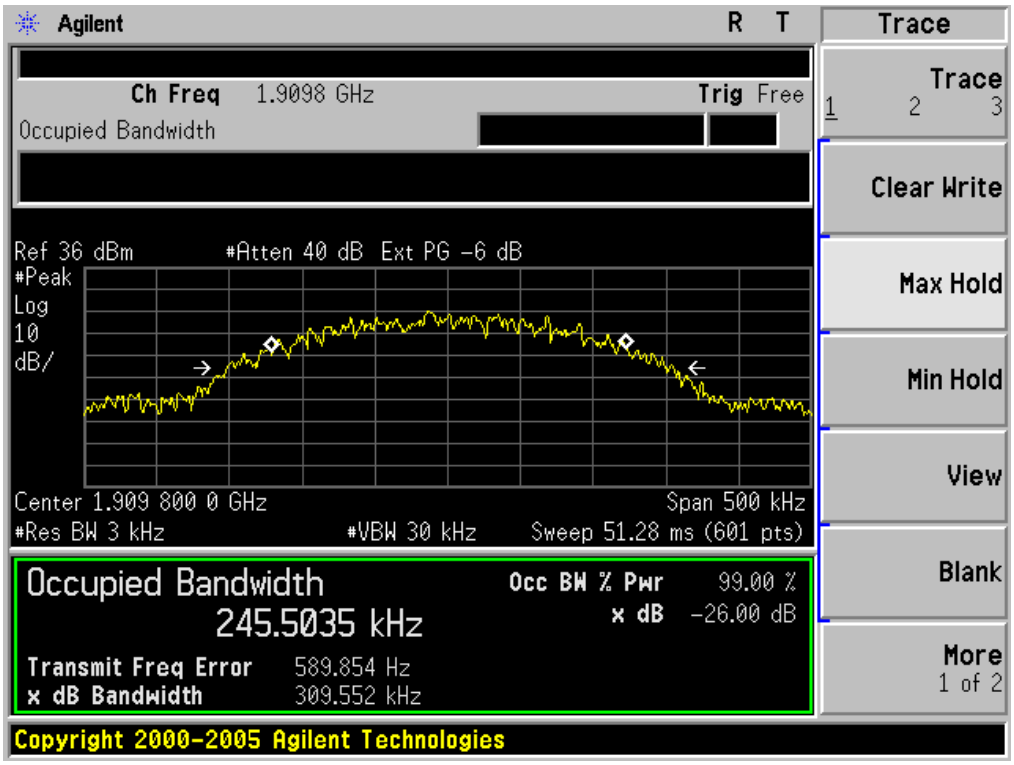
Occupied Bandwidth (99%) PCS 1900 BAND CH 512



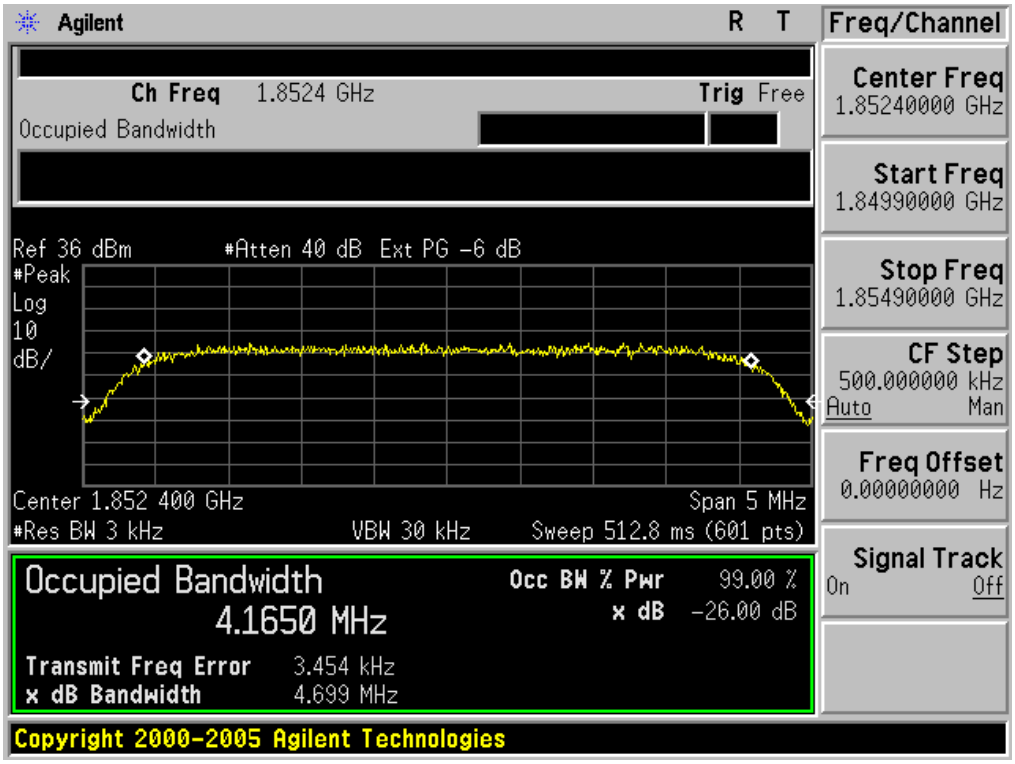
Occupied Bandwidth (99%) PCS 1900 BAND CH 661



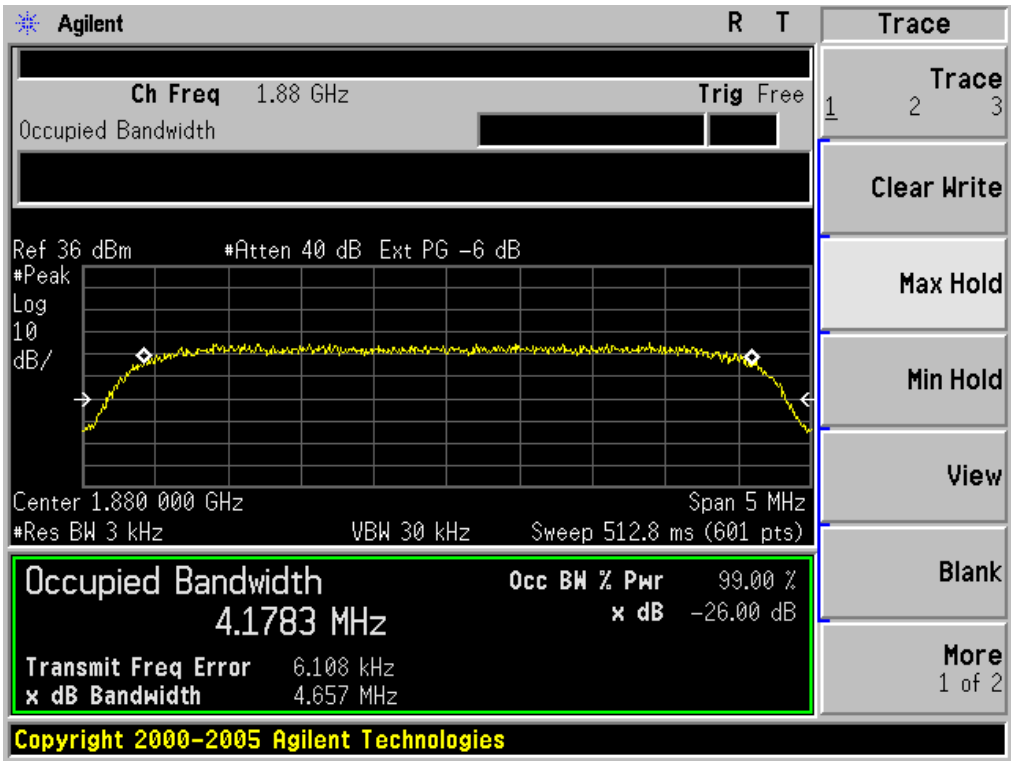
Occupied Bandwidth (99%) PCS 1900 BAND CH 810



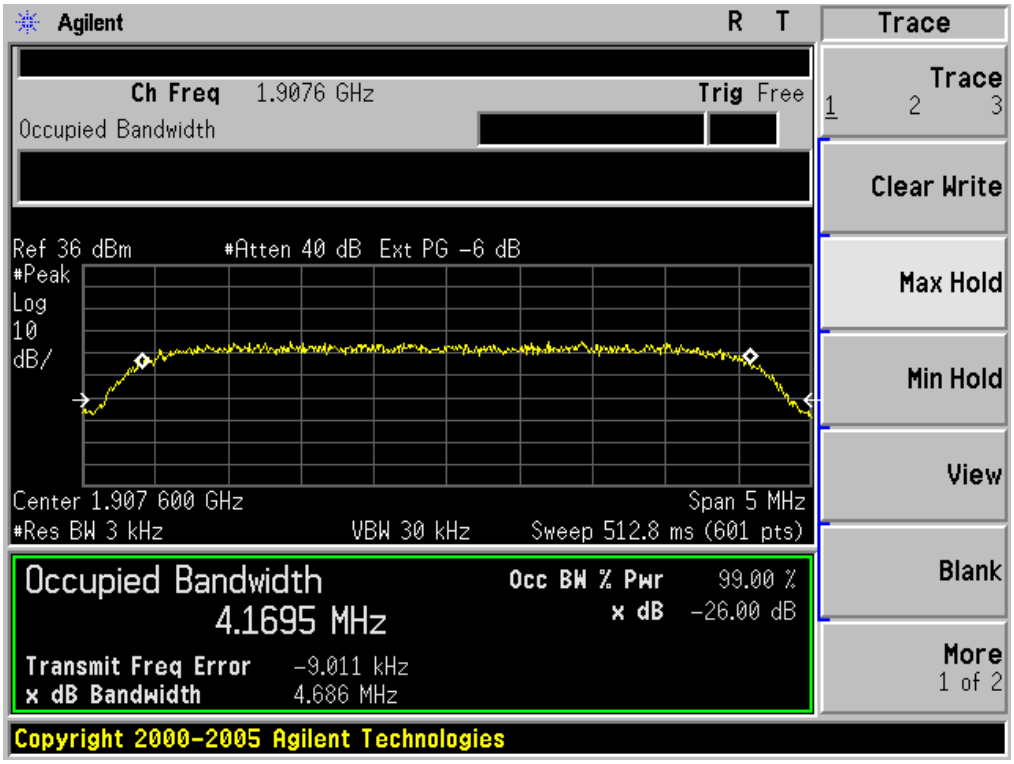
Occupied Bandwidth (99%) UMTS band II CH 9662



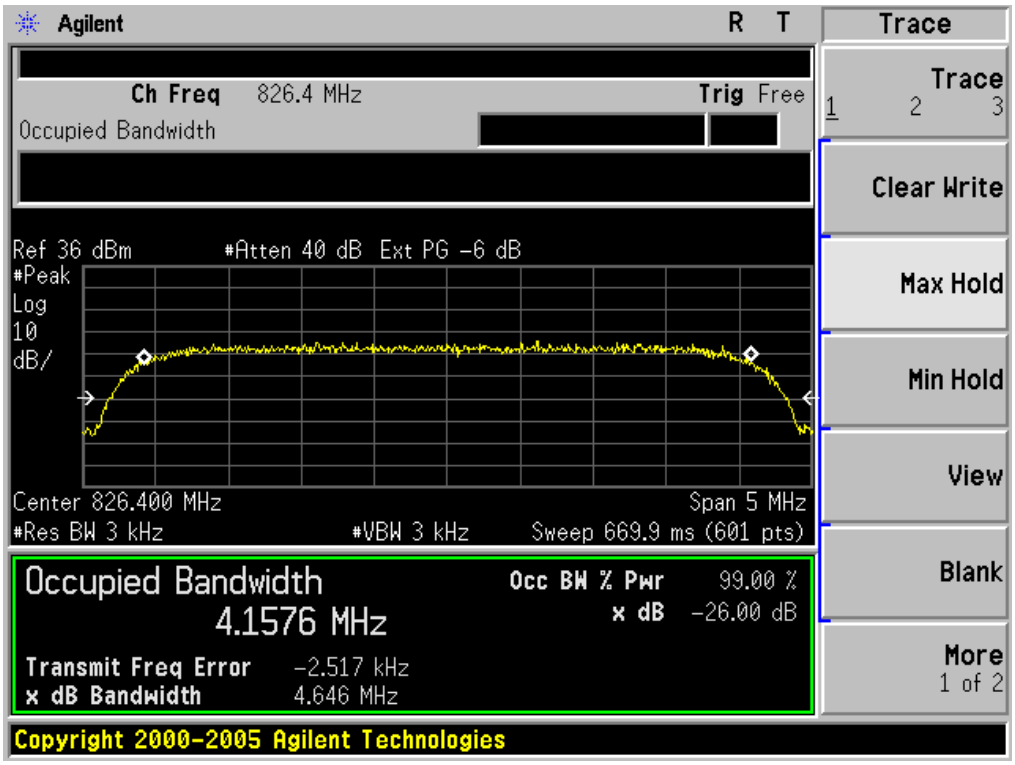
Occupied Bandwidth (99%) UMTS band II CH 9800



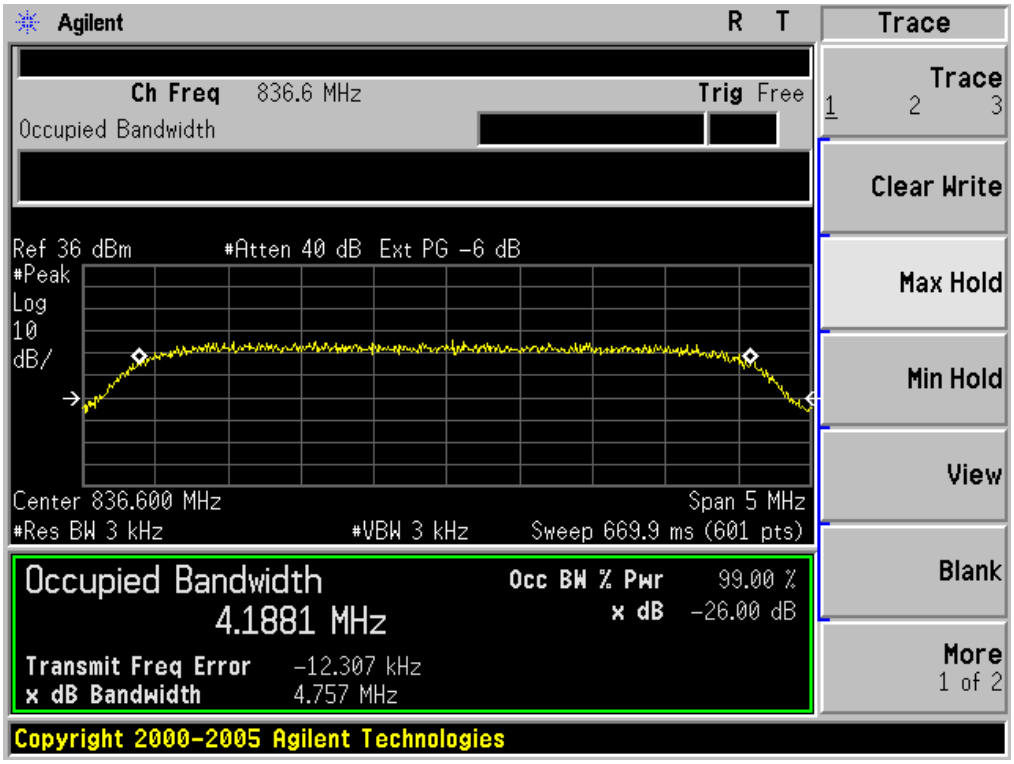
Occupied Bandwidth (99%) UMTS band II CH 9938



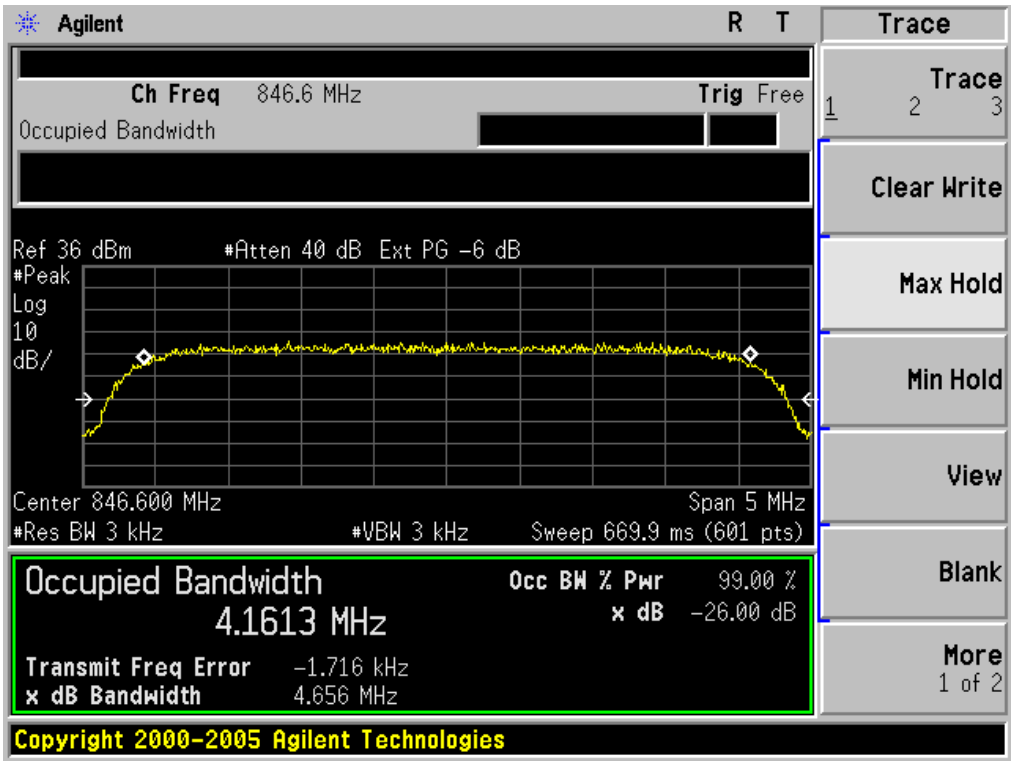
Occupied Bandwidth (99%) UMTS band V CH 4357



Occupied Bandwidth (99%) UMTS band V CH 4386



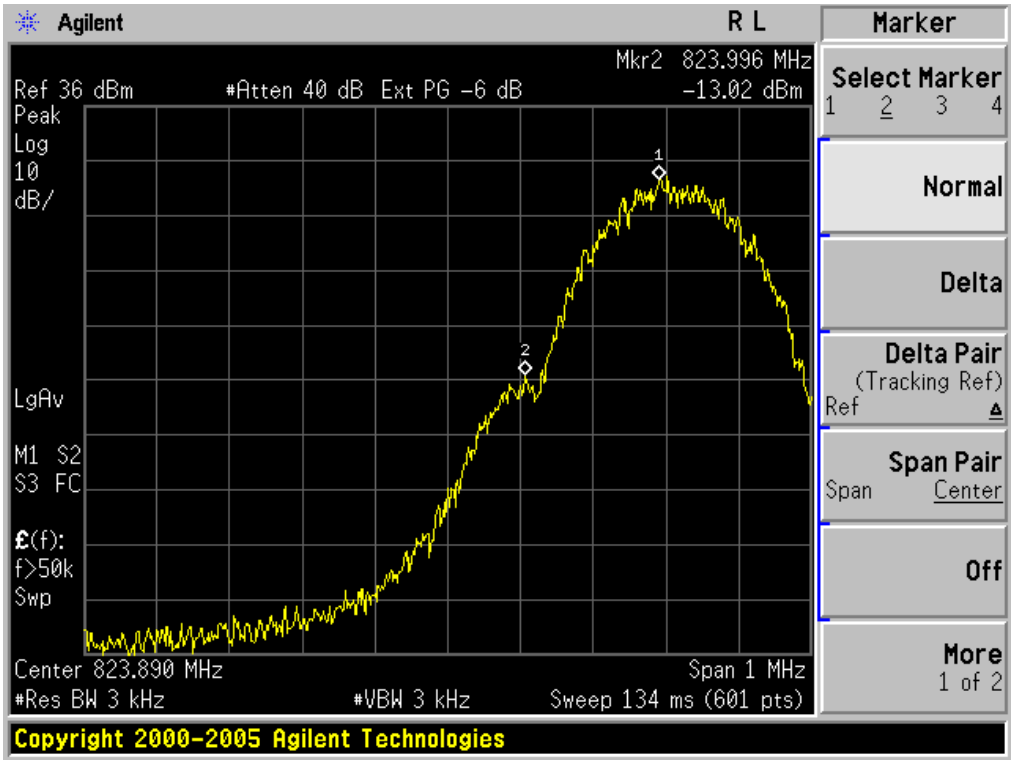
Occupied Bandwidth (99%) UMTS band V CH 4458



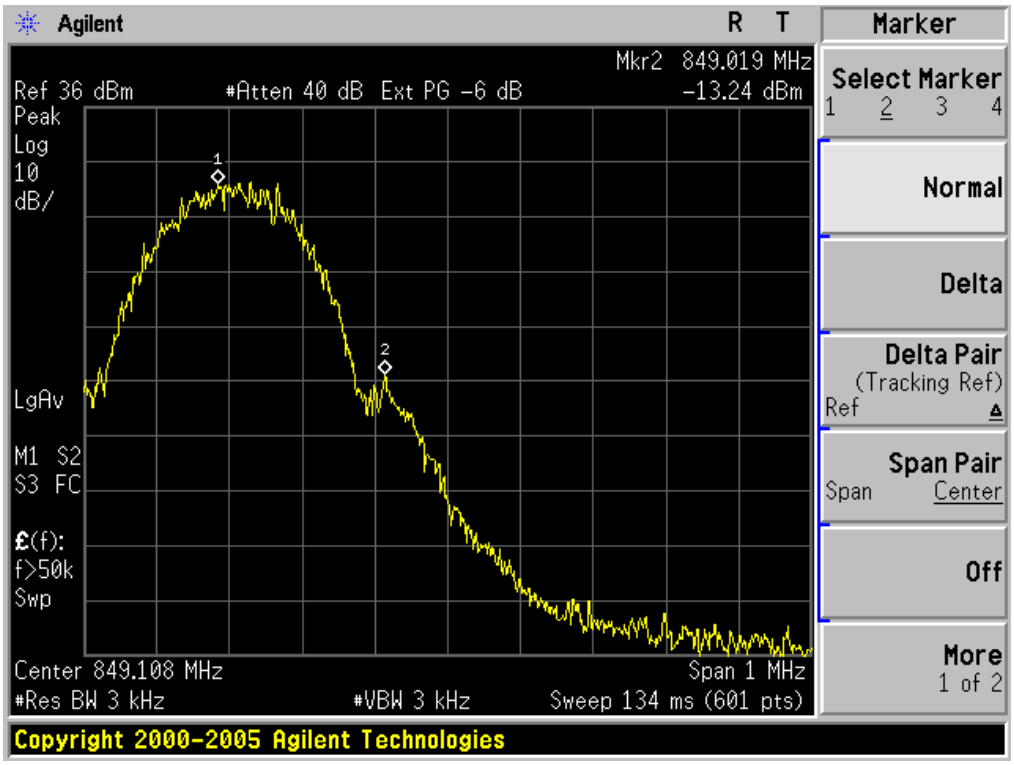
APPENDIX C

TEST PLOTS FOR BAND EDGES

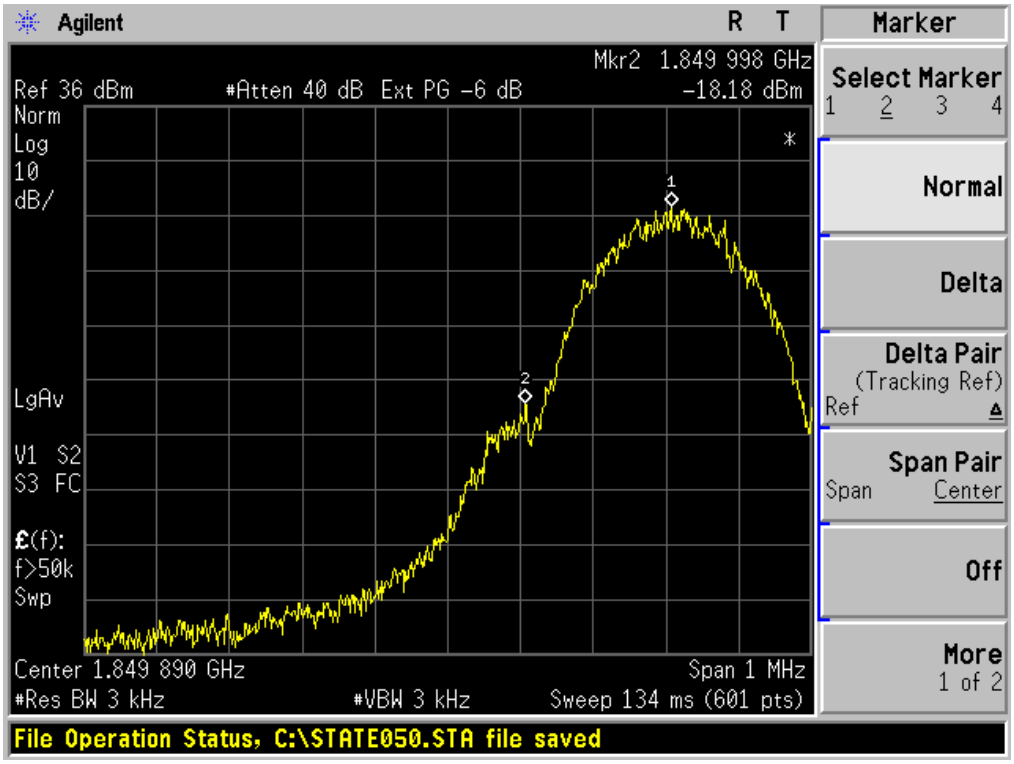
Low Band Edge GSM 850 BAND CH 128



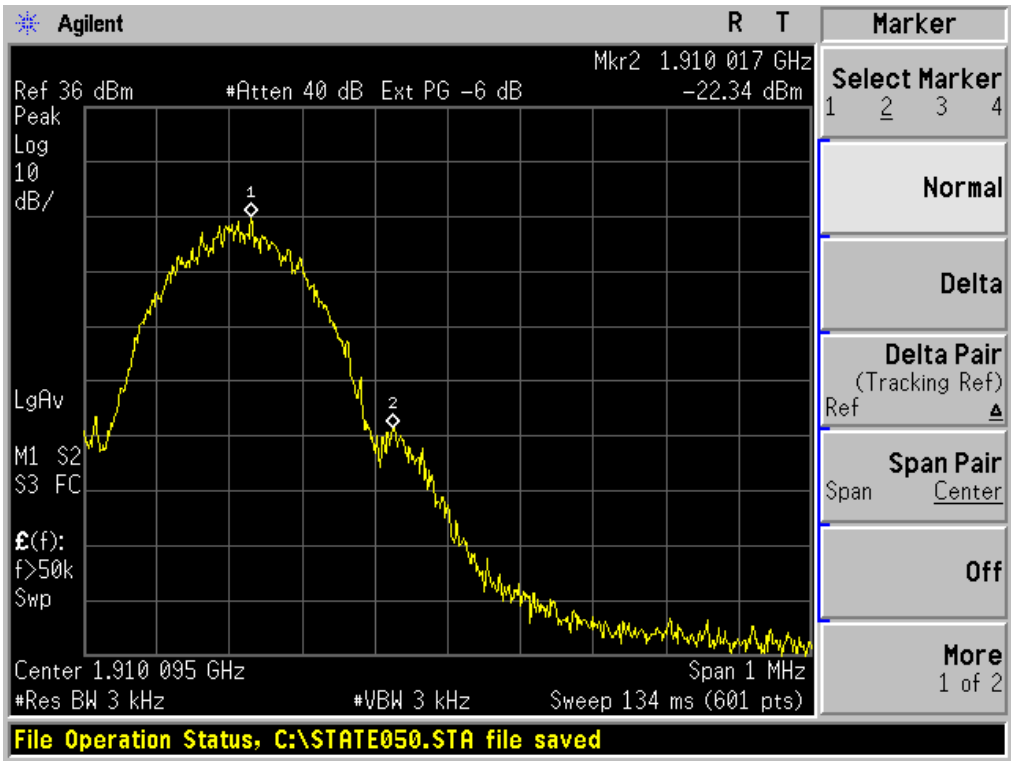
High Band Edge GSM 850 BAND CH 251



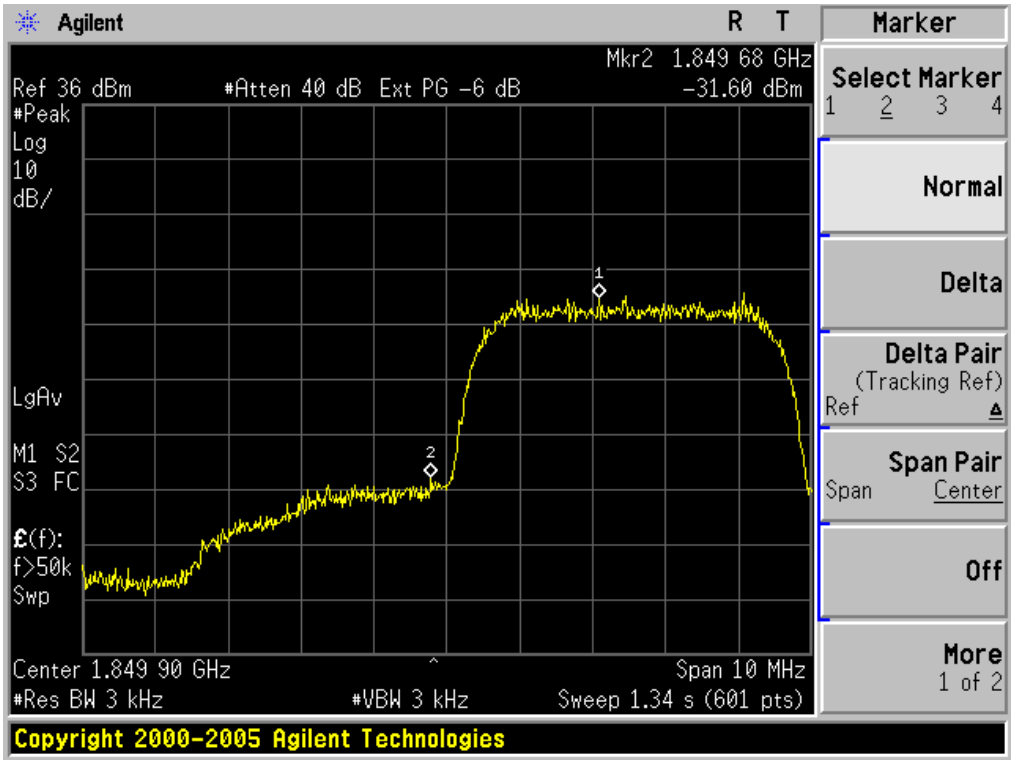
Low Band Edge PCS 1900 BAND CH 512



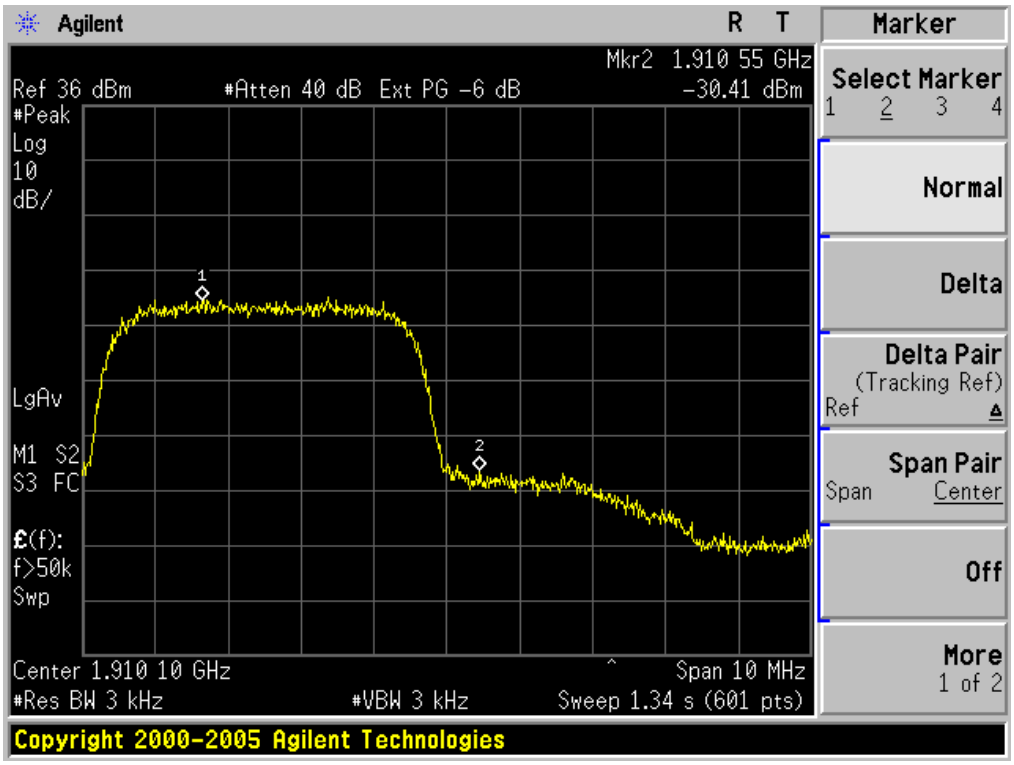
High Band Edge PCS 1900 BAND CH 810



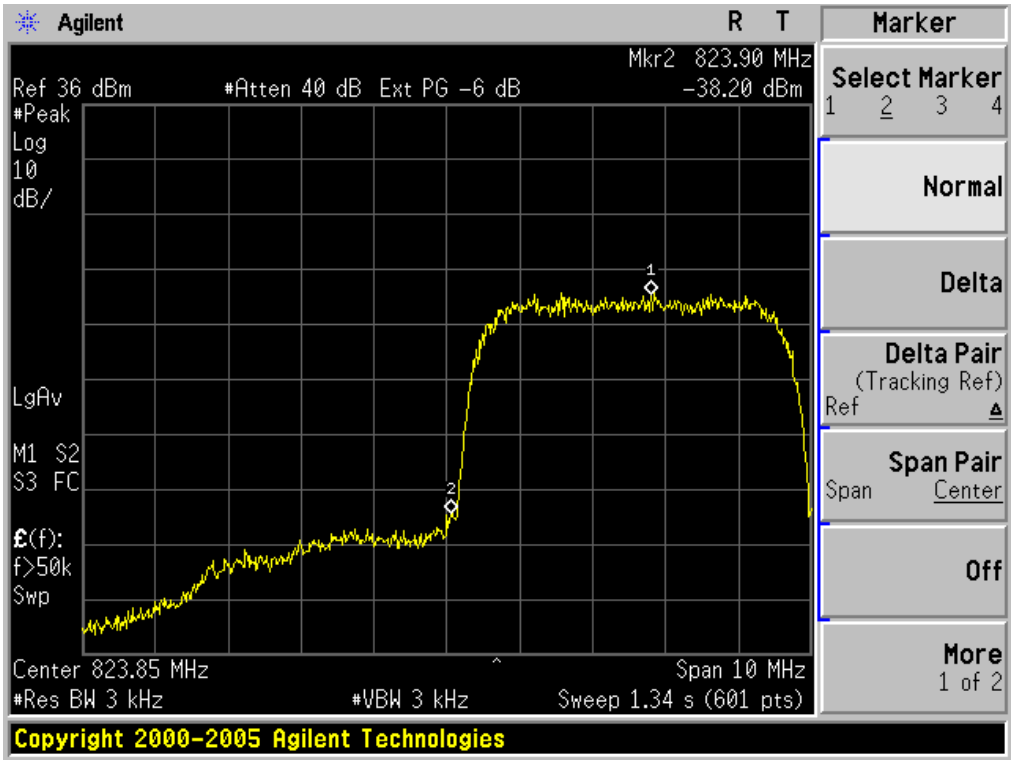
Low Band Edge UMTS BAND II CH 9662



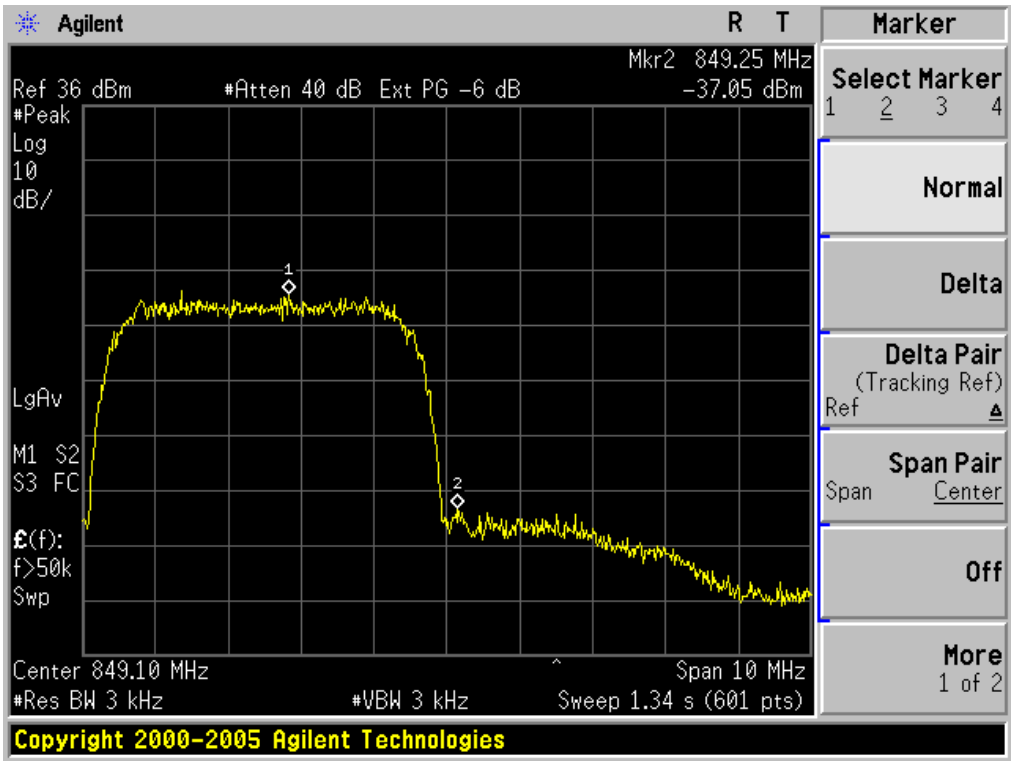
High Band Edge UMTS BAND II CH 9938



Low Band Edge UMTS BAND V CH 4357



High Band Edge UMTS BAND V CH 4458

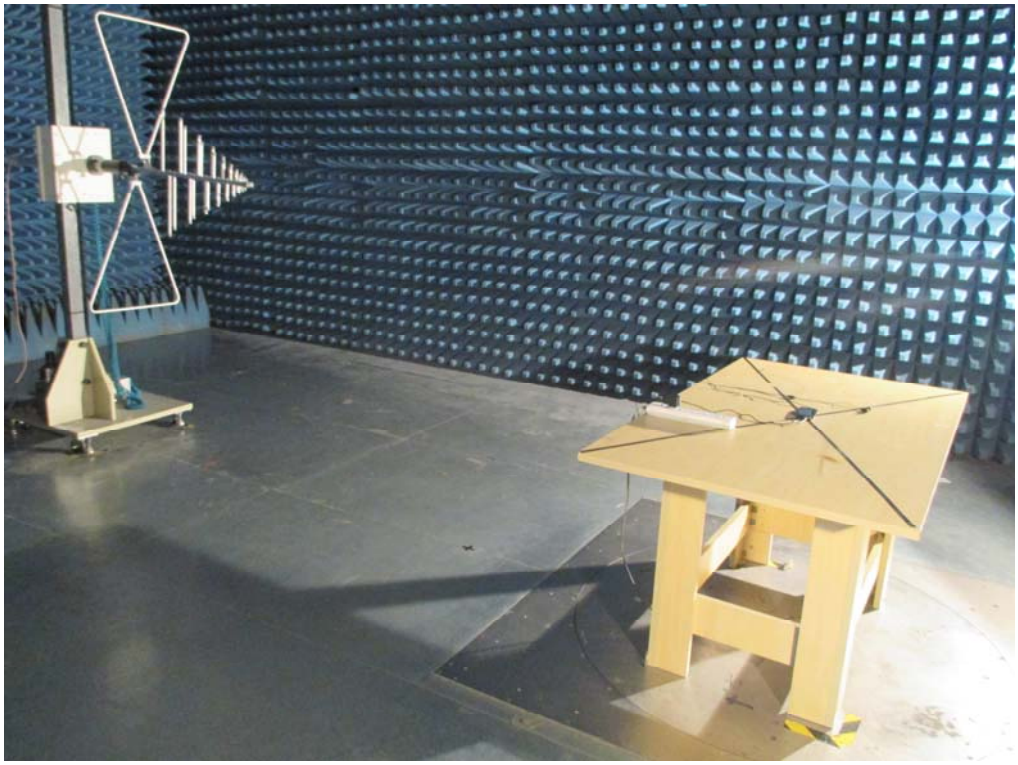


APPENDIX D

PHOTOGRAPHS OF TEST SETUP

CONDUCTED EMISSION

RADIATED SPURIOUS EMISSION



APPENDIX E
PHOTOGRAPHS OF EUT

TOTAL VIEW OF EUT

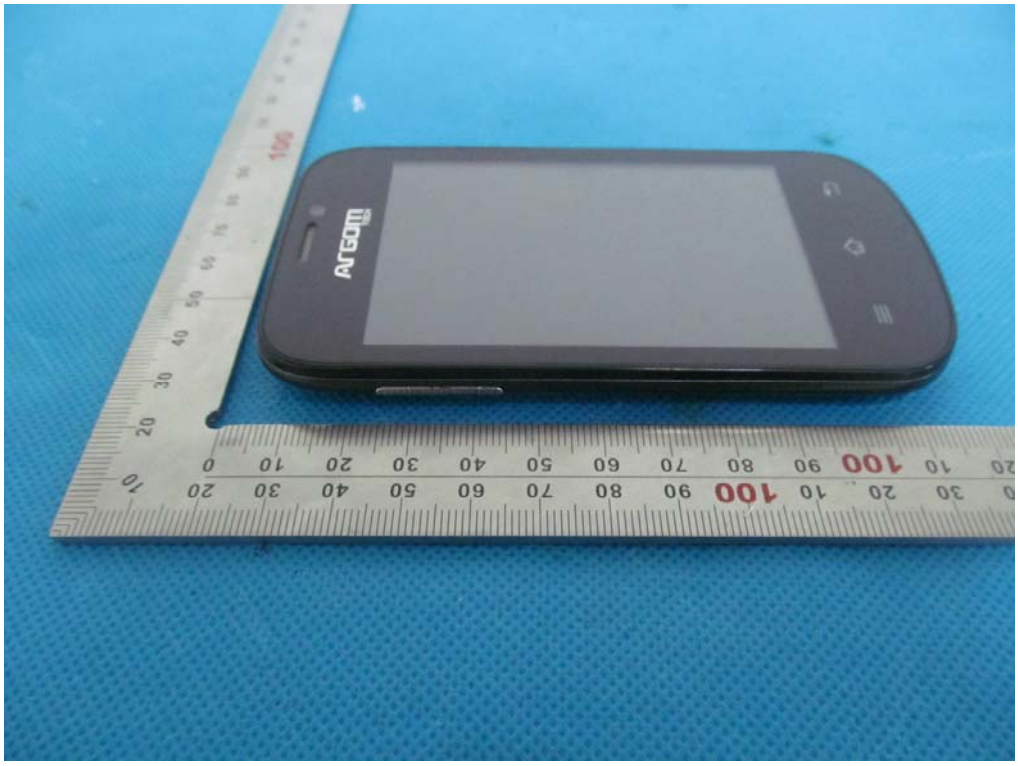
TOP VIEW OF EUT

BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

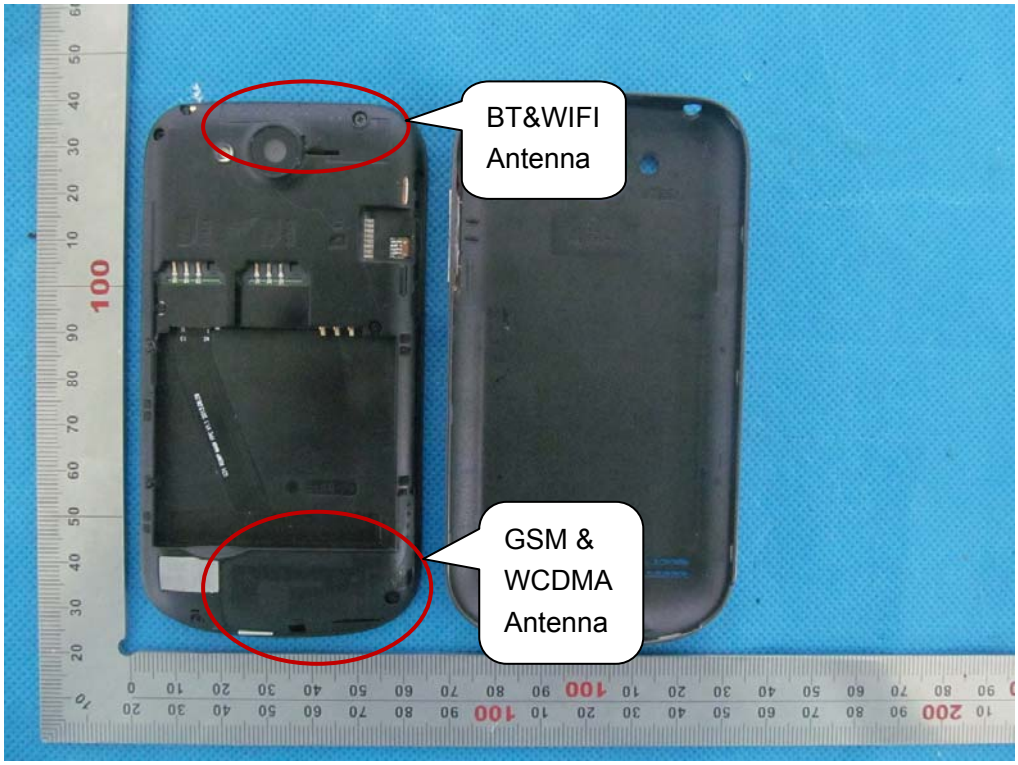
BACK VIEW OF EUT

LEFT VIEW OF EUT



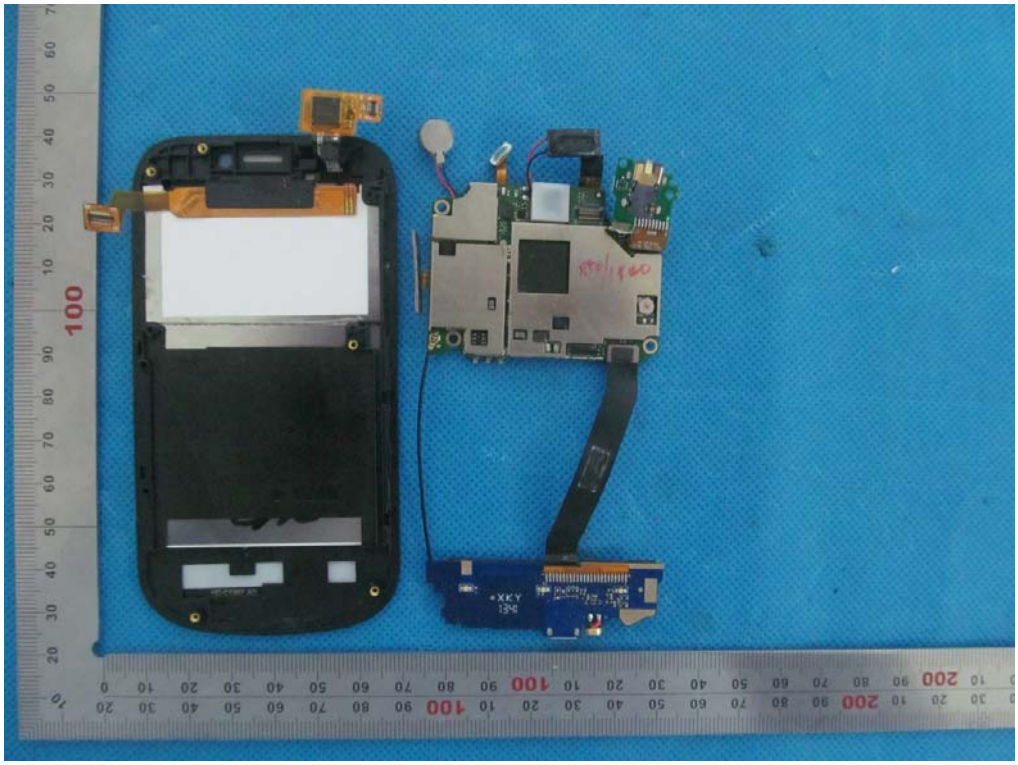
RIGHT VIEW OF EUT

OPEN VIEW OF EUT-1

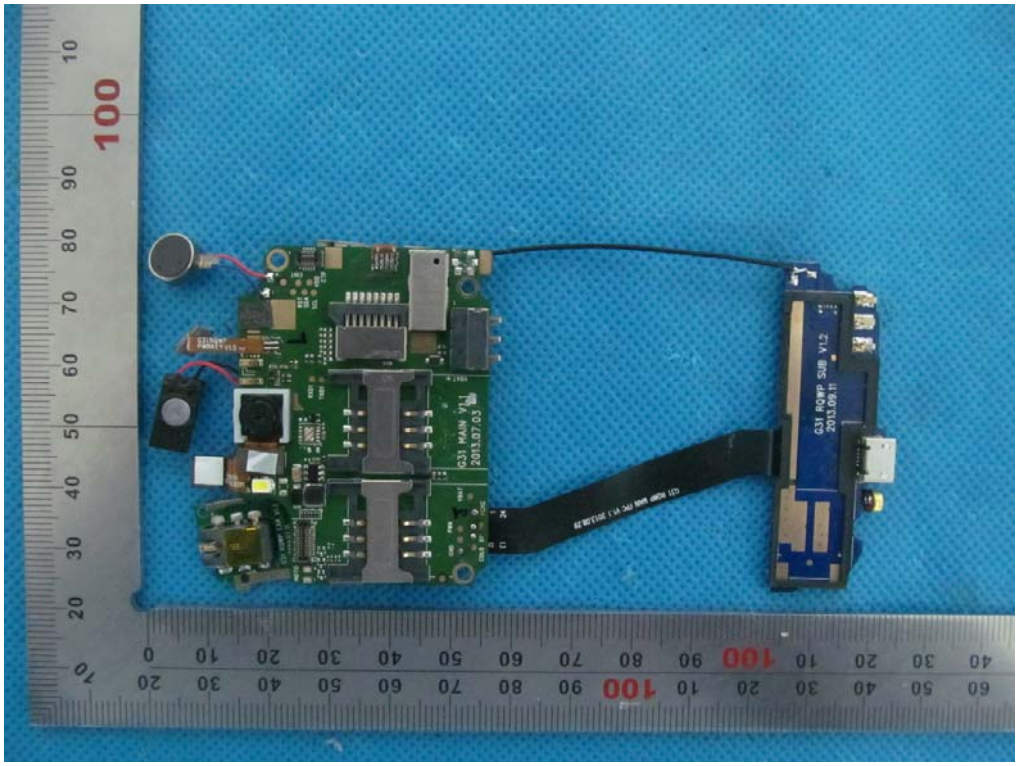


OPEN VIEW OF EUT-2

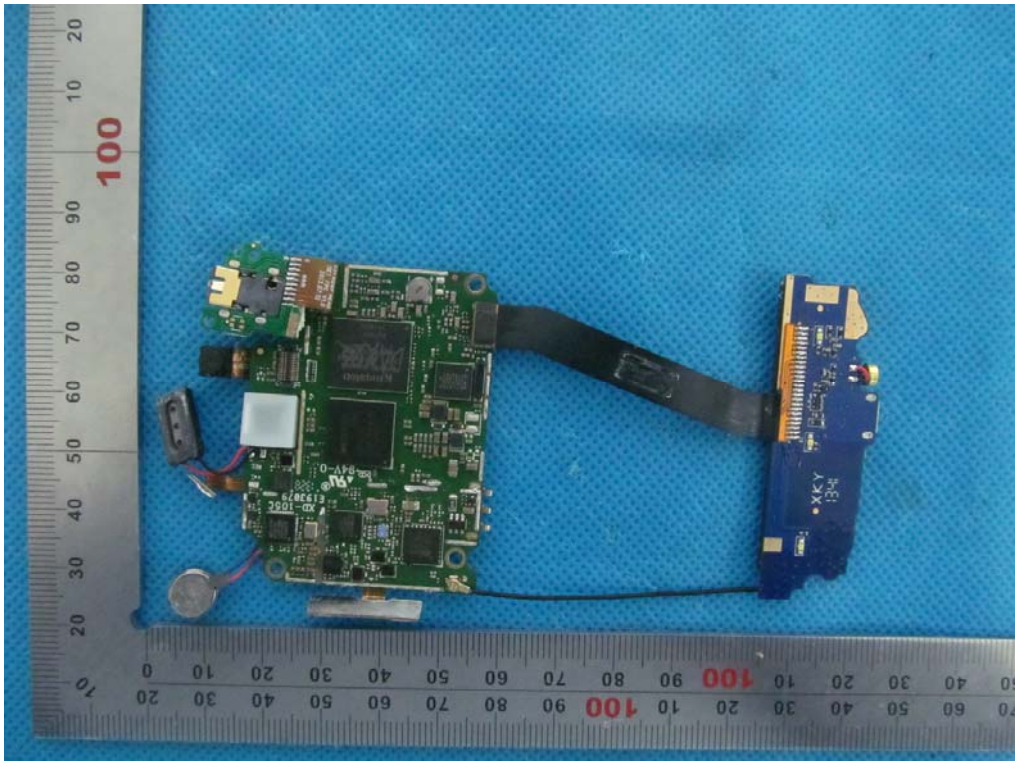
OPEN VIEW OF EUT-3



INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



----END OF REPORT----