TEST REPORT

Report Number: 3077715DAL-001
Project Number: 3077715

Evaluation of the
Wireless MODEM
Model Number: EDG0100
FCC ID: MIVEDG0100

FCC Part 2
FCC Part 15
FCC Part 22 Subpart H
FCC Part 24 Subpart E

For

Enfora

Test Performed by:	Test Authorized by:
Intertek 420 N Dorothy Drive Richardson, TX 75081	Enfora 661 E. 18th Street Plano, TX 75074

Prepared By:_____ **Date:** 9-16-05

Sudesh Kamble, EMC Team Leader

Approved By:_____ **Date:** 9-16-05

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1 JOB DESCRIPTION

1.1 General Information

Applicant Name / Address:	Enfora 661 E. 18th Street, Plano, TX 75074
Name of contact:	Scott Yarberry
Telephone:	001 972 663-4400
Fax:	001 972 663-4444

FCCID	**MIVEDG0100**
Product	Wireless MODEM
EUT Model Number	EDG0100
EUT Serial Number	None
Quantity Production Planned	Quantity production is planned.
Modulation(s)	GSM 1900 and GSM 850
Emission Designators	300KGXW; 300KG7W
Frequency Tolerance	± 2.5 ppm
Maximum conducted power averaged over burst duration	32.16 dBm (GSM 850); 29.48 dBm (GSM 1900)
Frequency Range	**FCC Rules** — **Freq.(MHz)** 22H — 824.0 – 849.0 24E — 1850.0 – 1910.0
Antenna & Gain	Max antenna Gain calculated: 3.52 dBi to meet the limits.
Detachable Antenna	Yes
Related Submittals / Grants	None
EUT receive date:	05/23/2005
EUT receive condition:	The EUT was received in good condition with no apparent damage.
Test start date:	05/23/2005
Test completion date:	09/08/2005
FCC Rule Part(s)	FCC Part 22 Subpart H, Part 24 Subpart E, Part 15, Part 2
Industry Canada Rule Part(s)	RSS-132, RSS-133, ICES-003
Modifications Required For Compliance	No modifications were implemented by the Intertek staff.

The test results in this report pertain only to the item tested.

1.1.1 System Support Equipment

Table 1-1 contains the details of the support equipment associated with the Equipment Under Test during the FCC Part 15 testing.

Table 1-1: System Support Equipment

Description	Manufacturer	Model Number	Serial Number
AC Adapter	CUI STACk	DV-091A-5720	DPD090100-P5-TC
PC	Toshiba	430CDT	03721952
Test Jig	ENFORA	SDK0107MG001 Rev D	206

1.1.2 Cables associated with EUT

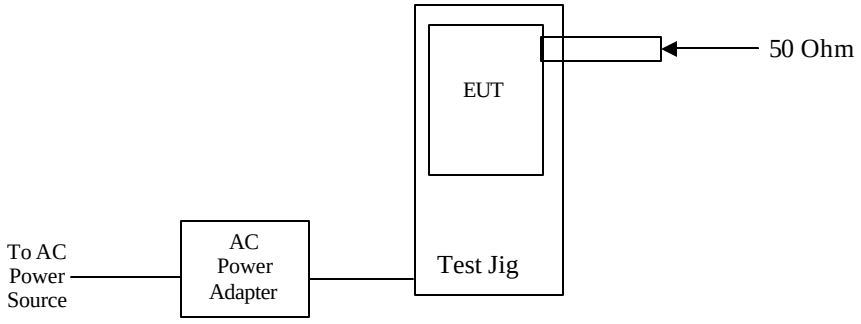
Table 1-2 contains the details of the cables associated with the EUT.

Table 1-2: Interconnecting cables between modules of EUT

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
DC Power Cord	5 ft	None	None	AC Power Adapter	Test Jig

1.1.3 System Block Diagram

The diagram shown below details the interconnection of the EUT and its accessories during FCC Part 15 testing. For specific layout, refer to the test configuration photograph in the relevant section of this report.



1.1.4 Mode(s) of operation

The Wireless MODEM was powered by the AC to DC power supply provided with the sample and tested in the stand alone configuration.

The appliance under test was operated with **GMSK modulation mode** during the testing and not on 8-PSK modulation mode. During the initial investigation on antenna conducted power; GMSK modulation mode was higher than 8PSK mode.

2 EXECUTIVE SUMMARY

Testing performed for: Enfora

Equipment Under Test: Wireless Modem Model EDG0100

FCC RULE	IC RULE	DESCRIPTION OF TEST	RESULT	PAGE	Test Date
§2.1046	RSS-132 §6.4 RSS-133 §6.2	RF Power Output	**Compliant**	9	09/07/05
§22.913, §24.232	RSS-132 §6.4 RSS-133 §6.2	ERP, EIRP	**Compliant**	10	09/07/05
§1.1310, §2.1091, §2.1093	RSS-132 §5.7 RSS-133 §8	Maximum Permissible Exposure Calculations	**Compliant**	12	09/07/05
§2.1049 §22.917(b)(d)	RSS-132 §6.5 RSS-133 §6.3	Emission Limitation, Occupied Bandwidth	**Compliant**	13	09/08/05
§2.1051 §22.917(e) §22.917(f) §24.238(a)	RSS-132 §6.5 RSS-133 §6.3	Out of Band Emissions at Antenna Terminals	**Compliant**	20	09/07/05
§2.1053, §22.917, §24.238	RSS-132 §6.6	Field Strength of Spurious Radiation	**Compliant**	30	05/25/05
§15.107, §15.207	IC ES-003	Power Line Conducted Emissions	**Compliant**	33	05/27/05
§15.109, §15.209	IC ES-003 RSS-132 §6.6 RSS-133 §9	Receiver Spurious Emission	**Compliant**	36	05/26/05
§2.1055, §22.355, §24.235	RSS-132 §6.3 RSS-133 §7	Frequency Stability vs. Temperature	**Compliant**	38	06/07/05
§2.1055, §22.355, §24.235	--	Frequency Stability vs. Voltage	**Compliant**	39	06/07/05

N/S: Not under scope of this evaluation

3 TEST FACILITY

The INTERTEK-Lexington is located at 420 N Dorothy Drive, Richardson, TX 75081. The radiated emission test site is a 3-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The FCC site registration number for this site is 10157.

The Industry Canada file no. is IC 6018.

3.1 Test Equipment Used

Description	Manufacturer	Model Number	Serial Number	Calibration due date	Eqpt. ID
Signal Generator	Hewlett Packard	83620A	3213A01244	01/12/06	HEW62
Environmental Chamber	Thermotron	SE-600-5-5	29513	12/21/05	124
EMI Receiver	Rohde & Schwarz	ESI 7	100044	10/11/05	77
Spectrum Analyzer	Agilent Technologies	E7405A	US40240235	11/22/05	87
Horn Antenna	EMCO	3115	9512	11/15/05	HORN1
Horn Antenna	EMCO	3115	6579	01/26/06	15580
Bi-coniLog Antenna	Schaffner	CBL6112B	2726	05/28/05	82
Antenna	CDI	B100	00632	04/22/06	9960
Antenna	CDI	B200	00623	04/22/06	9960
Antenna	CDI	B300	00615	05/02/06	9960
RF Cable	custom made	#1	none	08/04/05	128
RF Cable	Custom made	#4	none	08/07/05	131
RF Cable	Custom made	#3	none	08/07/05	130
Preamplifier	Miteq, Inc.	AMF-4D-001180-24-10P	1020106	09/07/05	222
Attenuator	JFW	50FHC-020-20	50FHC-020-20	VBU	223
Digital Multimeter	Fluke	8060A	6636042	6/21/2006	11
Power Meter	HP	HP 8482H	3318A07268	11/15/05	95
Frequency Counter	HP	5386A	3206A03335	05/19/06	000689
LISN11	Solar	9252-50-R-24-BNC	941713	06/06/05	LISN11
Base Station Simulator	Agilent	8960 Series 10, E5515C	GB44400984	01/31/06	N/A
DMM	Fluke	52	72850141	1/3/2006	28
DC Power supply	Topward P.S.	33010D	697464	VBU	106
Power Source	Pacific Power	140TMX	00724/0248	07/13/05	85

Note: The calibration due dates of test equipments used are noted as on the day of testing.

4 CONDUCTED RF POWER

FCC Rule: §2.1046

IC Rule: RSS-132 §6.4 and RSS-133 §6.2

4.1 Test Procedure

The transmitter output was connected to a calibrated coaxial cable. The EUT was set to its maximum power setting. The EUT was placed into a call and the 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 cable insertion loss.

Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters.

The transmission was exercised in burst mode to generate maximum power, the power was averaged shall be averaged over the burst duration, during which its power value is at its maximum. The power measurement was averaged only over the durations of actual transmission. Gated Average detector was used during transmitted and out of band power measurements.
EUT's internal test mode was accesses and programmed by an external PC for operation.

4.2 Test Results

The EUT met the RF power output requirements of FCC Part 22 Subpart H and FCC Part FCC Part 24 Subpart E. The test results are located in Table 4-1.

Table 4-1 RF Power Variation with temperature

Power Variation (peak) Vs. Temperature (dBm)						
Temp. (Celcius)	**GSM 850 Channel #**			**GSM 1900 Channel #**		
	128	**190**	**251**	**512**	**662**	**810**
60	-1.81	-0.55	-0.59	-1.83	-1.83	-1.03
20	**0**	0	0	0	0	0
-30	-0.70	0.43	0.58	-0.06	**0.48**	1.20

	Power (Avg.) at ambient (dBm)						
Modulation	**Temp. (Celcius)**	**GSM 850 Channel #**			**GSM 1900 Channel #**		
		128	**190**	**251**	**512**	**662**	**810**
GMSK	20	32.09	**32.16**	31.95	**29.48**	28.91	28.36
8PSK	20	**29.13**	27.92	28.09	**28.72**	27.12	26.36

NOTE: Maximum conducted output power, averaged over the entire duty cycle: 8.62dBm (GSM 850 Band); 5.36dBm (GSM 1900 Band)

5 RADIATED RF POWER

FCC Rule §22.913

FCC Rule §24.232; RSS-133 §6.2

RSS-132 §6.4

5.1 Test Limits

For the GSM Cell band the Effective Radiated Power (ERP) of mobile transmitters was not allowed to exceed 7 Watts. For the GSM band the Equivalent Isotropic Radiated Power (EIRP) was not allowed to exceed 2 Watts.

5.2 Test Procedure

The EUT does not include antenna during testing the Radiated RF power was calculated from the Antenna conducted power and Max. antenna gain (as declared by manufacturer)

The receiver reading was recorded for antenna conducted power and EIRP was calculated as follows:

$$EIRP = E_1 + G_{(dBi)}$$

$$ERP = E_1 + G_{(dBd)}$$

where,

E_1 is the receiver reading in dBm when measured at antenna port with average detector.

G is the gain of the transmitting antenna (as declared by manufacturer) in dBi or dBd.

5.3 Test Results

The EUT met the radiated power requirements of FCC §24.232. The test results are located in Table 5-1. The maximum EIRP for the GSM 1900 band was **29.48** dBm. The maximum ERP for the GSM 850 band was **30.01**dBm.

Table 5-1 Radiated RF Power

EUT Mode	Channel	Freq.	Conducted Power Reading	Tx Antenna Gain	ERP	Output Power
		(MHz)	(dBm Avg.)	(dBi)	(dBm)	(mW)
GSM 850	128	824.10220	32.09	0	29.94	986.3
	190	836.60521	32.16	0	**30.01**	**1002**
	251	848.8637	31.95	0	29.80	955

Max ERP 30.01dBm = 1002 mW

Typical antenna gain is 8.39 dBi. Thus the maximum ERP from above would be 33.01+6.39 = 38.4 dBm (7 watts).

EUT Mode	Channel	Freq.	Conducted Power Reading	Tx Antenna Gain	EIRP	Output Power
		(GHz)	(dBm Avg.)	(dBi)	(dBm)	(mW)
GSM 1900	512	1.85012	29.48	0	**29.48**	887.2
	662	1.88018	28.91	0	28.91	**778**
	810	1.90974	28.36	0	28.36	685.5

Max EIRP 29.48 dBm = 887.2 mW

Typical antenna gain is 3.52 dBi. Thus the maximum ERP from above would be 29.48+3.52 = 33.0 dBm (2 watts).

6 MAXIMUM PERMISSIBLE EXPOSURE (MPE) CALCULATIONS

6.1 Test Limits

The Radio frequency radiation exposure limits for FCC Rule § 1.1310 are listed in the table below.

	Frequency Range (MHz)	Power Density Limit (mW/cm^2)
Limits for Occupational/Controlled Exposures	0.3-3.0	100
	3.0-30	$900/ Frequency^2$
	30-300	1.0
	300-1500	Frequency/300
	1500-100,000	5.0
Limits for General Population/Uncontrolled Exposure	0.3-1.34	100
	1.34-30	$180/Frequency^2$
	30-300	0.2
	300-1500	Frequency/1500
	1500-100,000	1.0

6.2 Test Procedure

The ERP and EIRP were measured in section 5. The radiated RF power was used to calculate the maximum RF exposure at a 20 cm distance using the formula:

$$\text{Maximum RF Exposure at 20cm} = (\text{EIRP in mW})/(4\text{Pi}(20\text{cm})^2)$$

Where ERP was measured in section 5, a 2.15dB conversion factor was added to the reading to convert it to EIRP before applying the Maximum RF Exposure formula above. Once the Maximum RF Exposure calculations were complete the results were compared to the MPE limits above.

6.3 Test Results

The following calculations show the Maximum RF Exposure from the EUT at 20cm for GSM and GSM bands. Both bands are well below the limits for the general population described in the table above.

Antenna conducted power used as reference for calculation of MPE measurements.

Max .$MPE_{GSM(800mhZ)}$: 32.16 dBm(EIRP) = 1644 mW

**MPE_{GSM} = mW / $(4\text{Pi}(20\text{cm})^2)$ = 0.32693 mW/cm^2

Max .$MPE_{GSM(19000mhZ)}$: 29.48 dBm(EIRP) = 887.2 mW

**MPE_{GSM} = mW / $(4\text{Pi}(20\text{cm})^2)$ = 0.1764 mW/cm^2

7 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

CFR 47 §2.1049

RSS-132 §6.5; RSS-133 §6.3

7.1 Test Limits

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

7.2 Test Procedure

In both GSM and GSM modes the antenna port of the EUT was connected to a spectrum analyzer using a calibrated coaxial cable and power divider. The EUT was placed maximum power using the support computer. The MODEM was set to force the EUT to its maximum power setting. The occupied bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots below.

EUT's internal test mode was accesses and programmed by an external PC for operation.

7.3 Test Results

The following is the occupied bandwidth data for the EUT.

Table 7-1: Occupied bandwidth measurements

Mode	Channel	Resolution Bandwidth	Video Bandwidth	Sweep time	Measured Bandwidth kHz
GSM 850	128	3KHz	3KHz	5s	248.49
	190	3KHz	3KHz	5s	252.50
	251	3KHz	3KHz	5s	256.51
GSM 1900	512	3KHz	3KHz	5s	256.51
	662	3KHz	3KHz	5s	252.50
	810	3KHz	3KHz	5s	252.50

Figure 7-1: Occupied Bandwidth – GSM 128

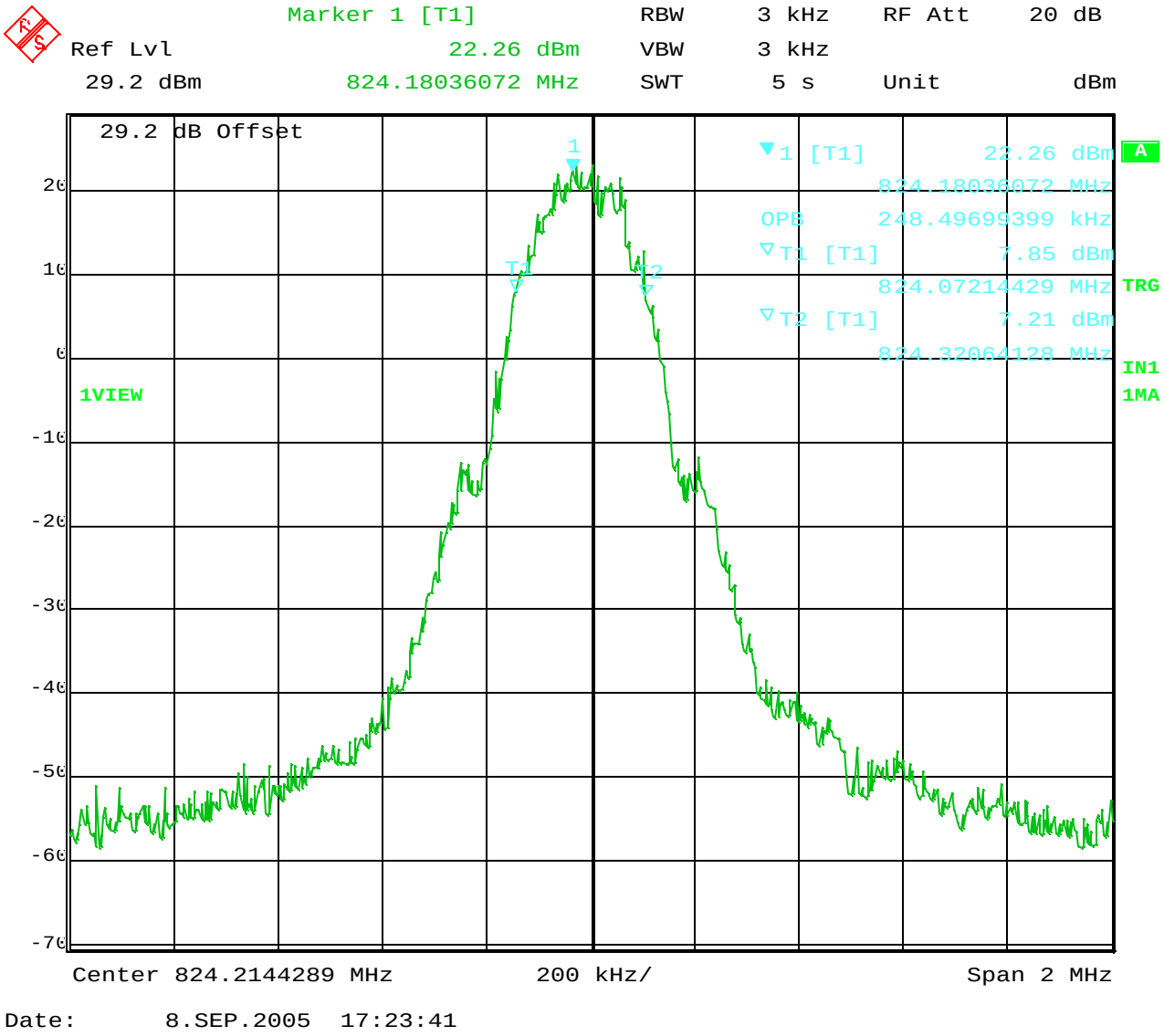


Figure 7-2: Occupied Bandwidth – GSM 190

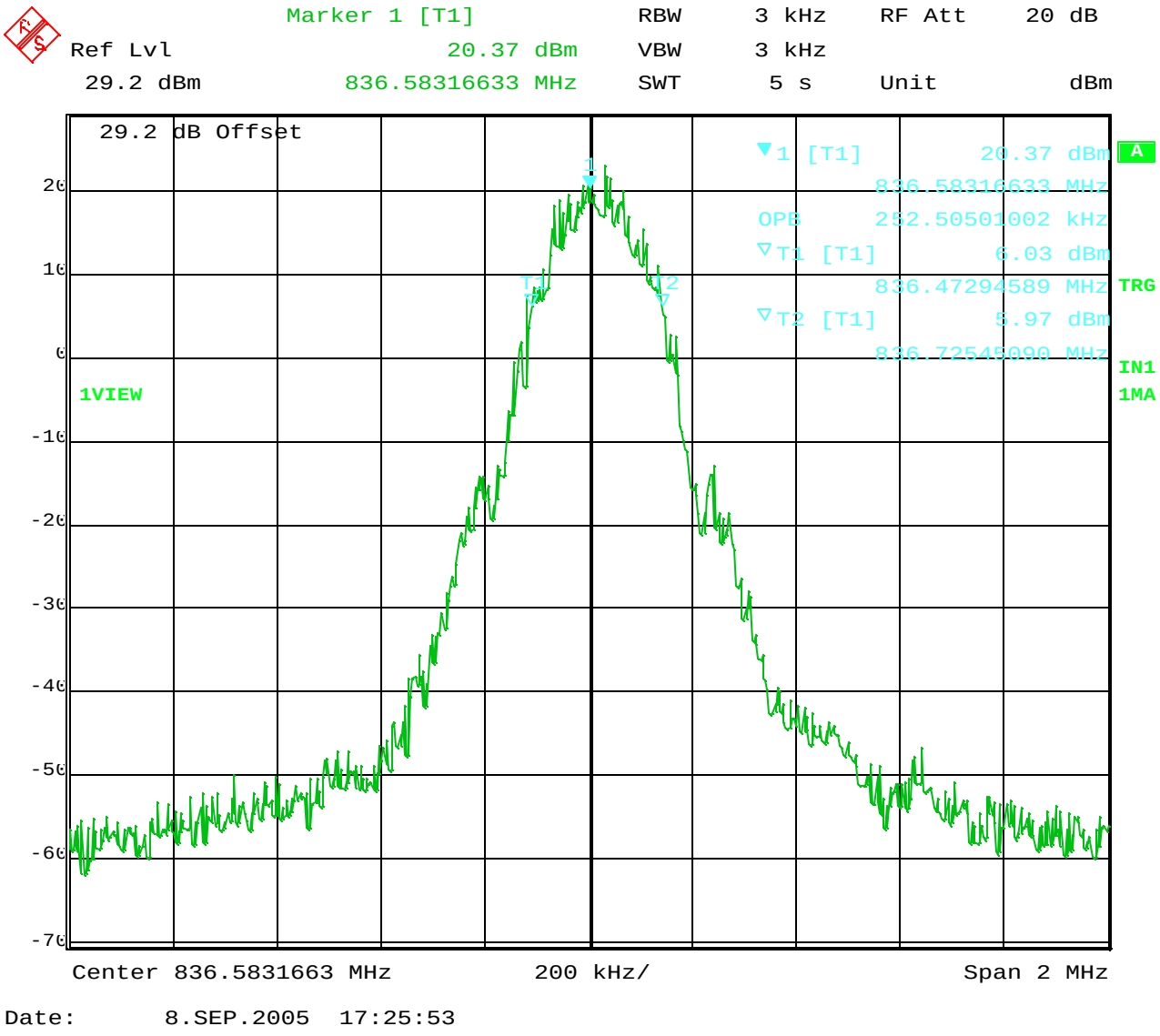


Figure 7-3: Occupied Bandwidth – GSM 251

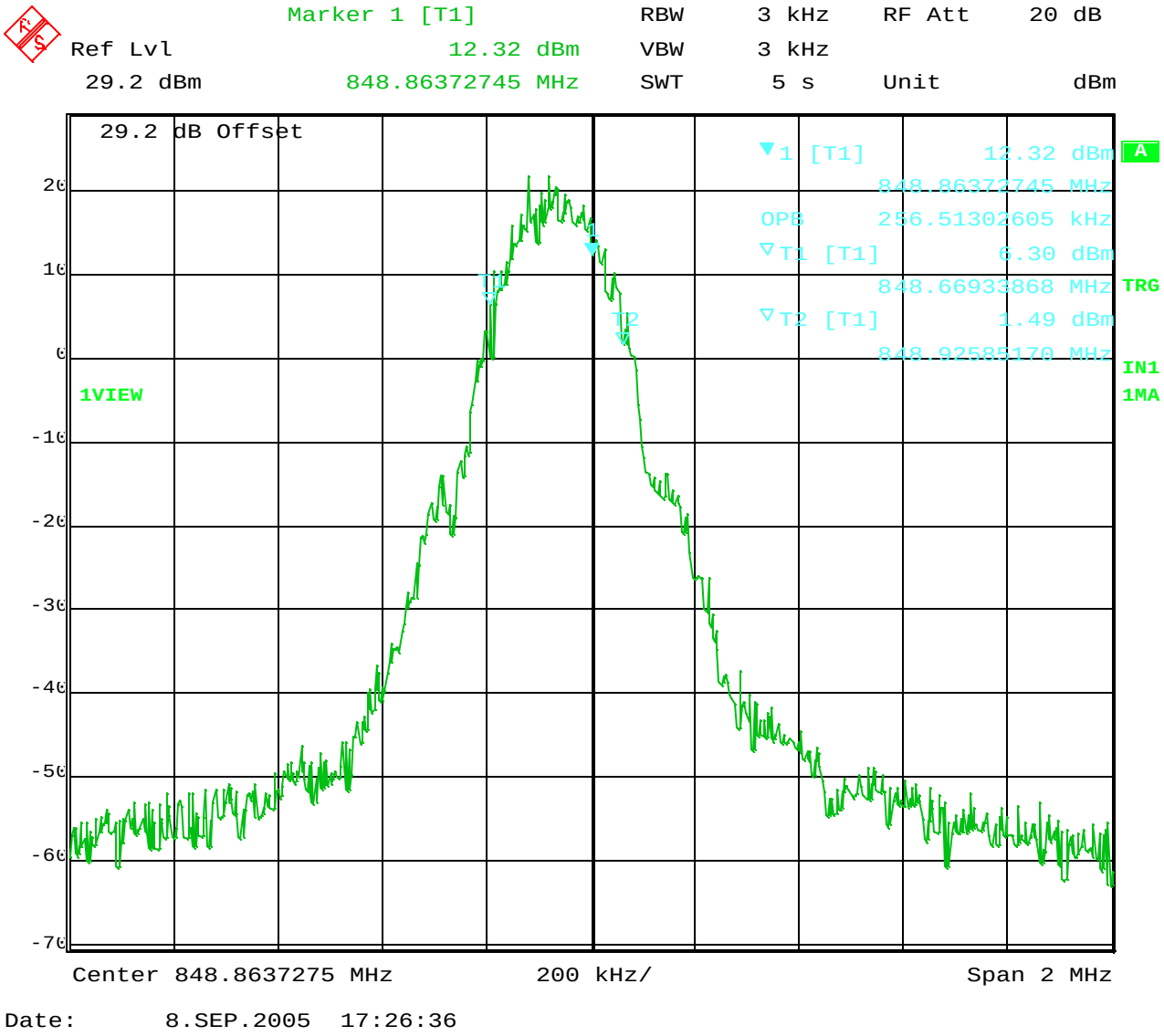


Figure 7-4: Occupied Bandwidth – GSM 512

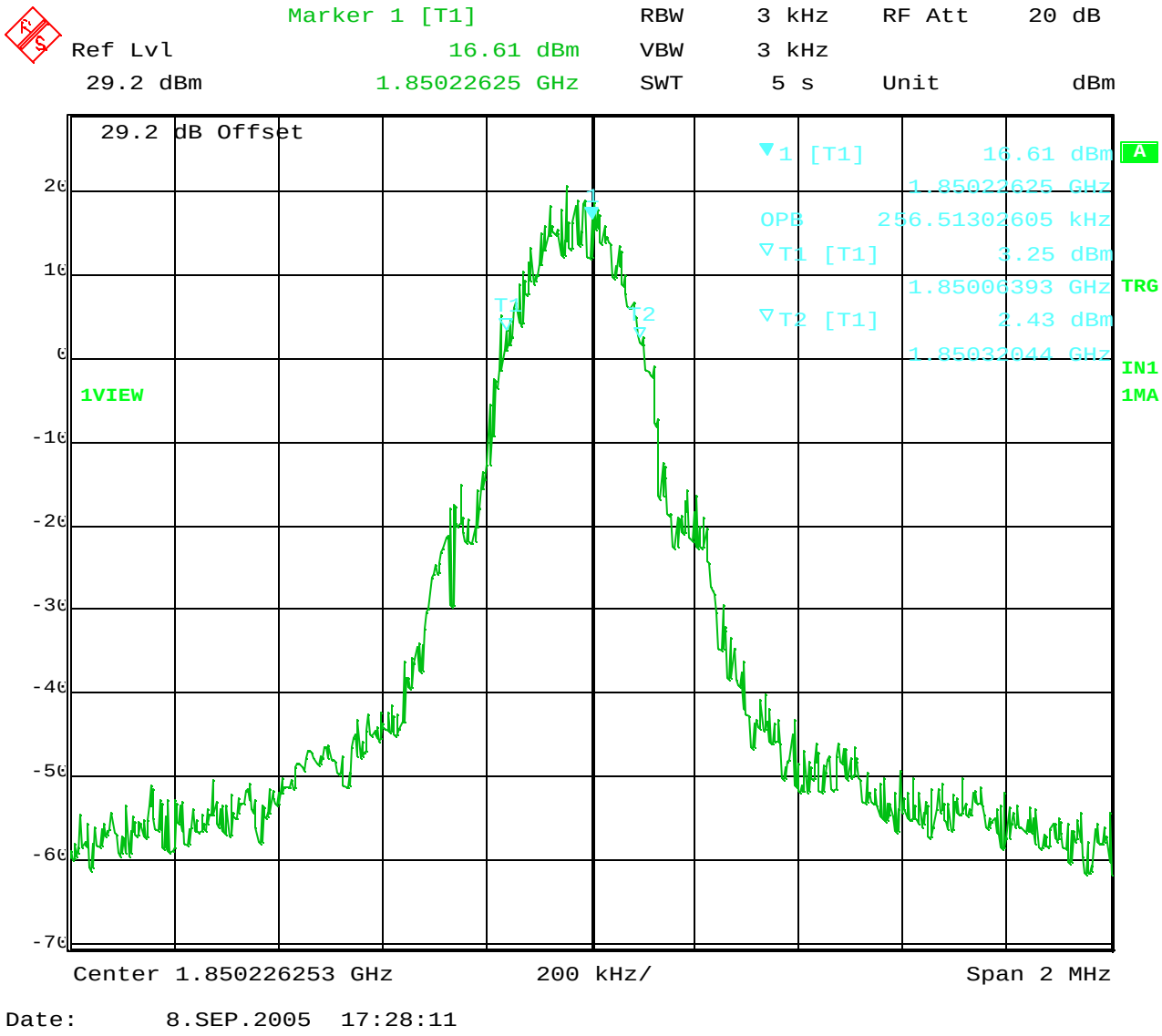


Figure 7-5: Occupied Bandwidth – GSM 662

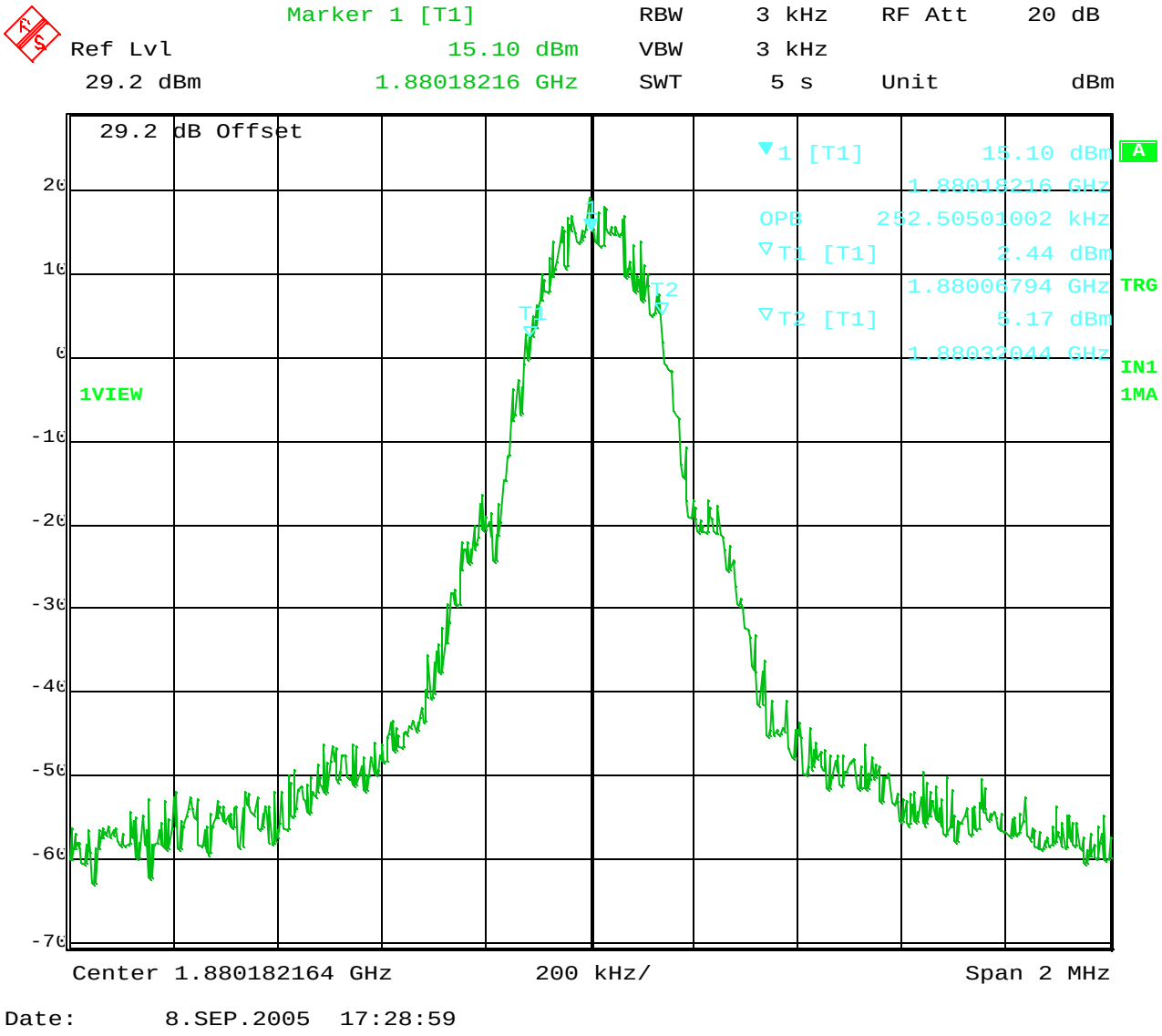
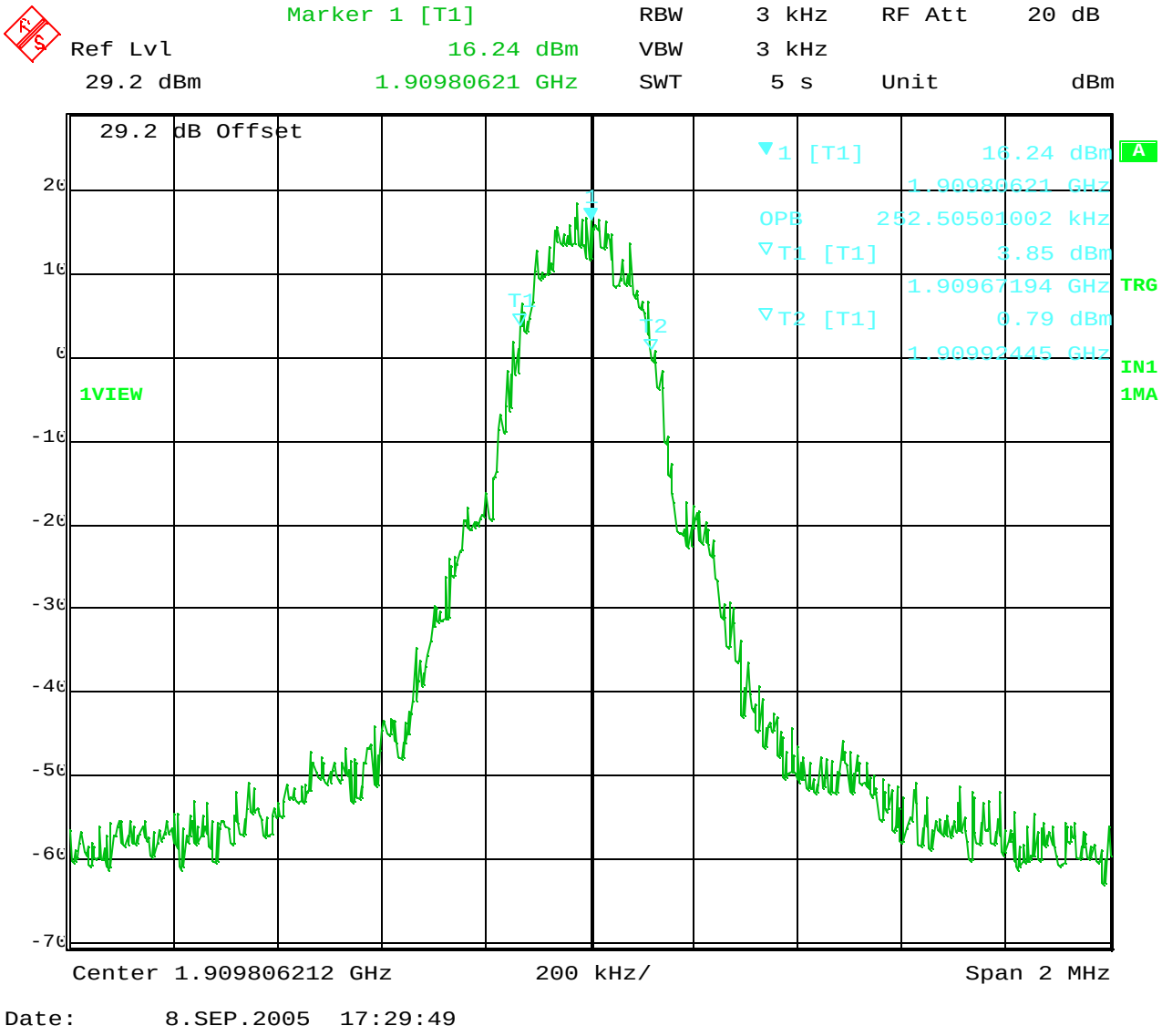


Figure 7-6: Occupied Bandwidth – GSM 810



8 OUT OF BAND EMISSION AT ANTENNA TERMINALS

FCC §2.1049, FCC §2.1051, §22.917(a), FCC §24.238(a)

RSS-132 §6.5

RSS-133 §6.3

8.1 Test Limits

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Therefore, the test limit is defined by the following formula:

Test Limit (dBm) = Tx Power (dBm) - (43 + 10 log (Tx Power (Watts))) = -13dBm

8.2 Test Procedure

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for the GSM band and 1 MHz or greater in the GSM band. 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.* 100 kHz 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.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The EUT was set to force its maximum power setting. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

The transmission was exercised in burst mode to generate maximum power, the power was averaged shall be averaged over the burst duration, during which its power value is at its maximum. The power measurement was averaged only over the durations of actual transmission. Gated Average detector was used during transmitted and out of band power measurements.

8.3 Test Results

The MODEM met the out of band emission at antenna terminal requirements.

Table 8-1: Summary of test result locations

Location	Mode (Band)	Channel	Description
Figure 8-1	GSM 850	128, 190, 251	Conducted spurious emissions, 30MHz to 7 GHz
Figure 8-2	GSM 850	128, 190, 251	Zoom Graph of the Carrier Frequencies
Figure 8-3	GSM 1900	512, 662, 810	Conducted spurious emissions, 30MHz to 7 GHz
Figure 8-4	GSM 1900	512, 662, 810	Zoom Graph of the Carrier Frequencies
Figure 8-5	GSM 850	128	Emissions within 1 MHz of band edge
Figure 8-6	GSM 850	251	Emissions within 1 MHz of band edge
Figure 8-7	GSM 1900	512	Emissions within 1 MHz of band edge
Figure 8-8	GSM 1900	810	Emissions within 1 MHz of band edge

NOTE: Figures 8-1 and 8-2 contain plots that start at 30 MHz and stop at 7 GHz.

The harmonics are shown only up to 7 GHz. Harmonics above 7GHz were equal or less than the measuring receiver's noise floor.

Figure 8-1: Out of band emissions at antenna terminals – GSM 850 Channels 128, 190, 251

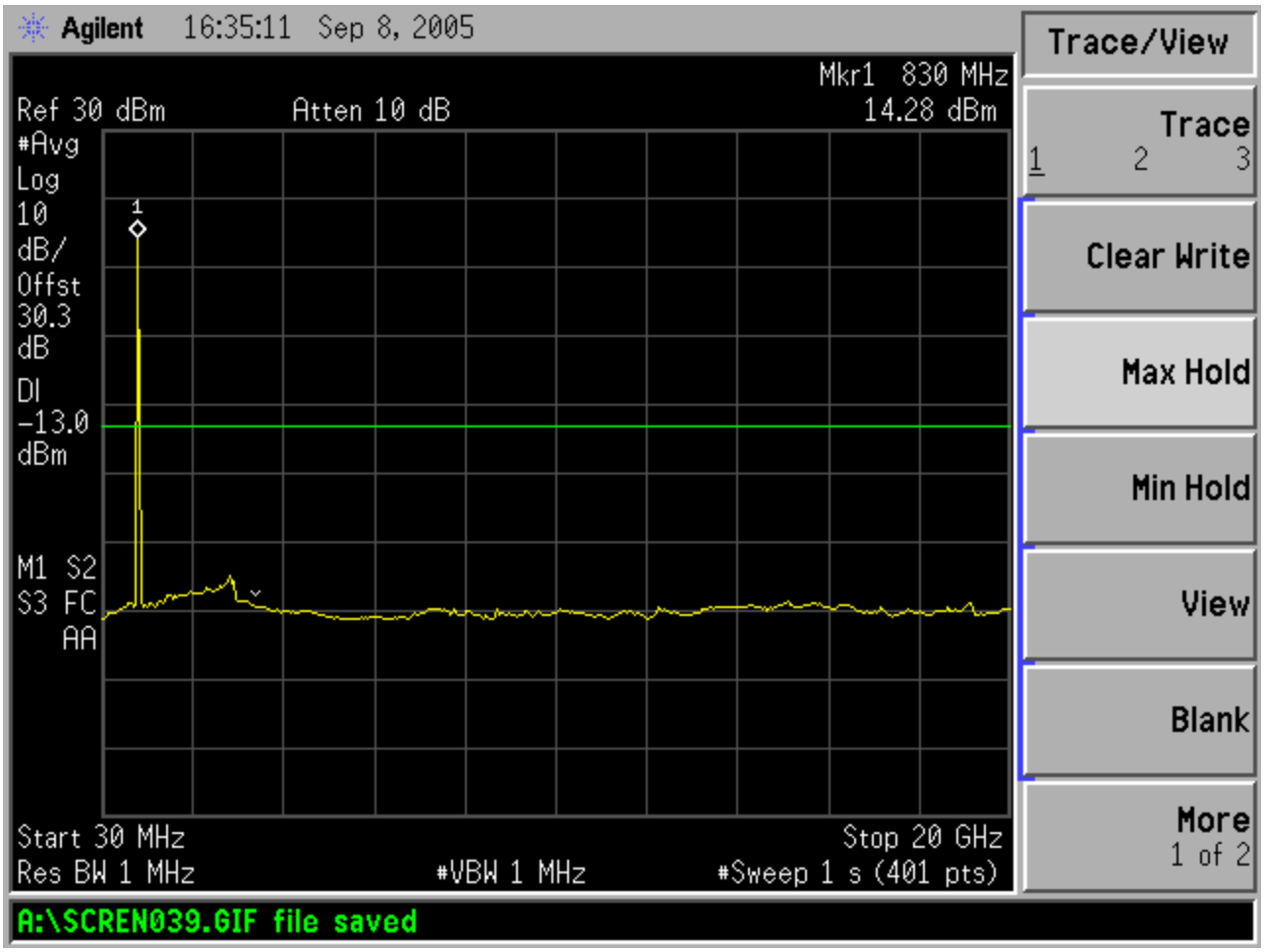
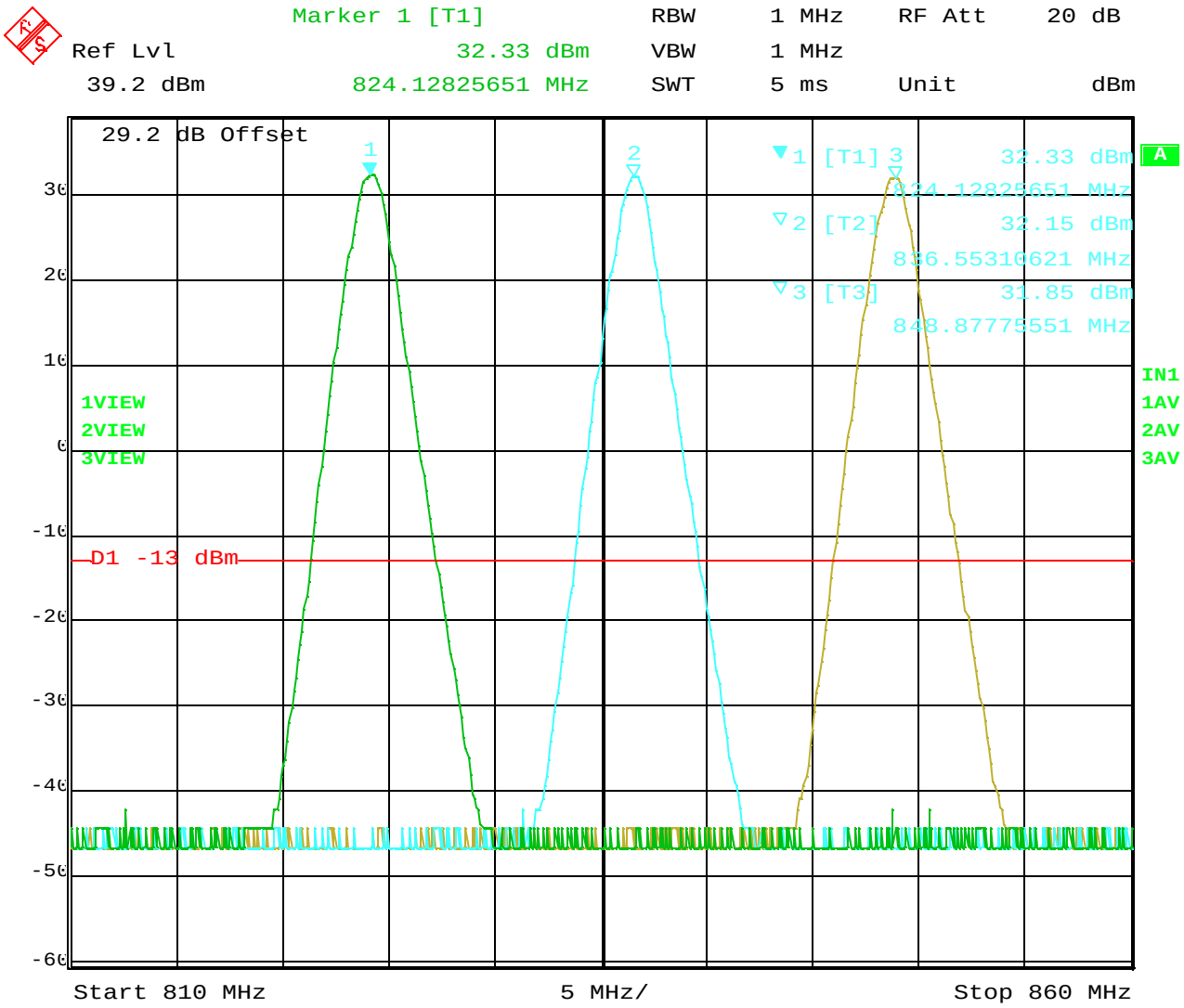


Figure 8-2: Out of band emissions at antenna terminals – GSM 850 Channels 128, 190, 251



(Zoomed Around Carrier Frequencies)

Figure 8-3: Out of band emissions at antenna terminals – GSM 1900 Channels 512, 662, 810

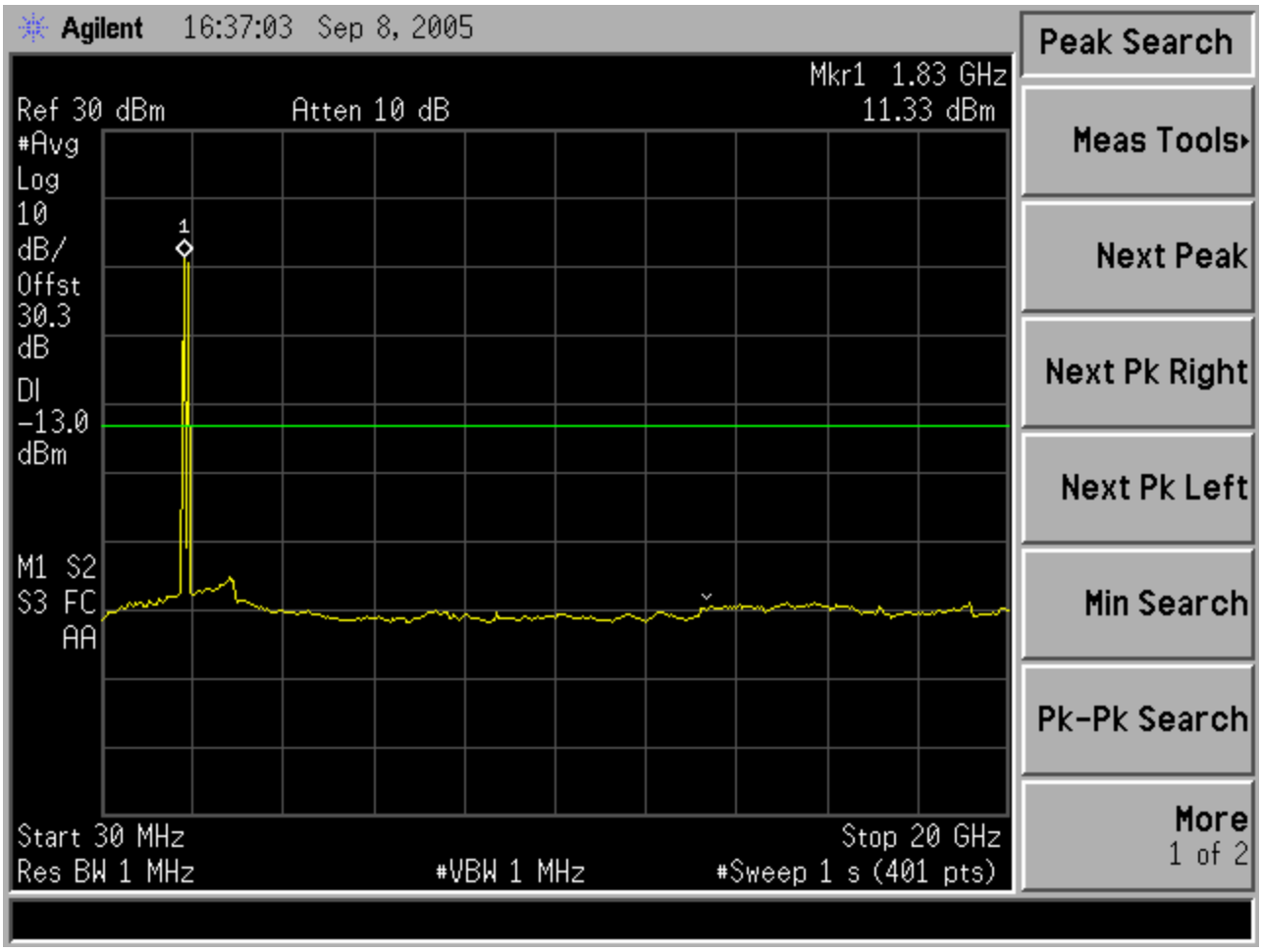


Figure 8-4: Out of band emissions at antenna terminals – GSM 1900 Channels 512, 662, 810 (Zoomed In on Carrier Frequencies)

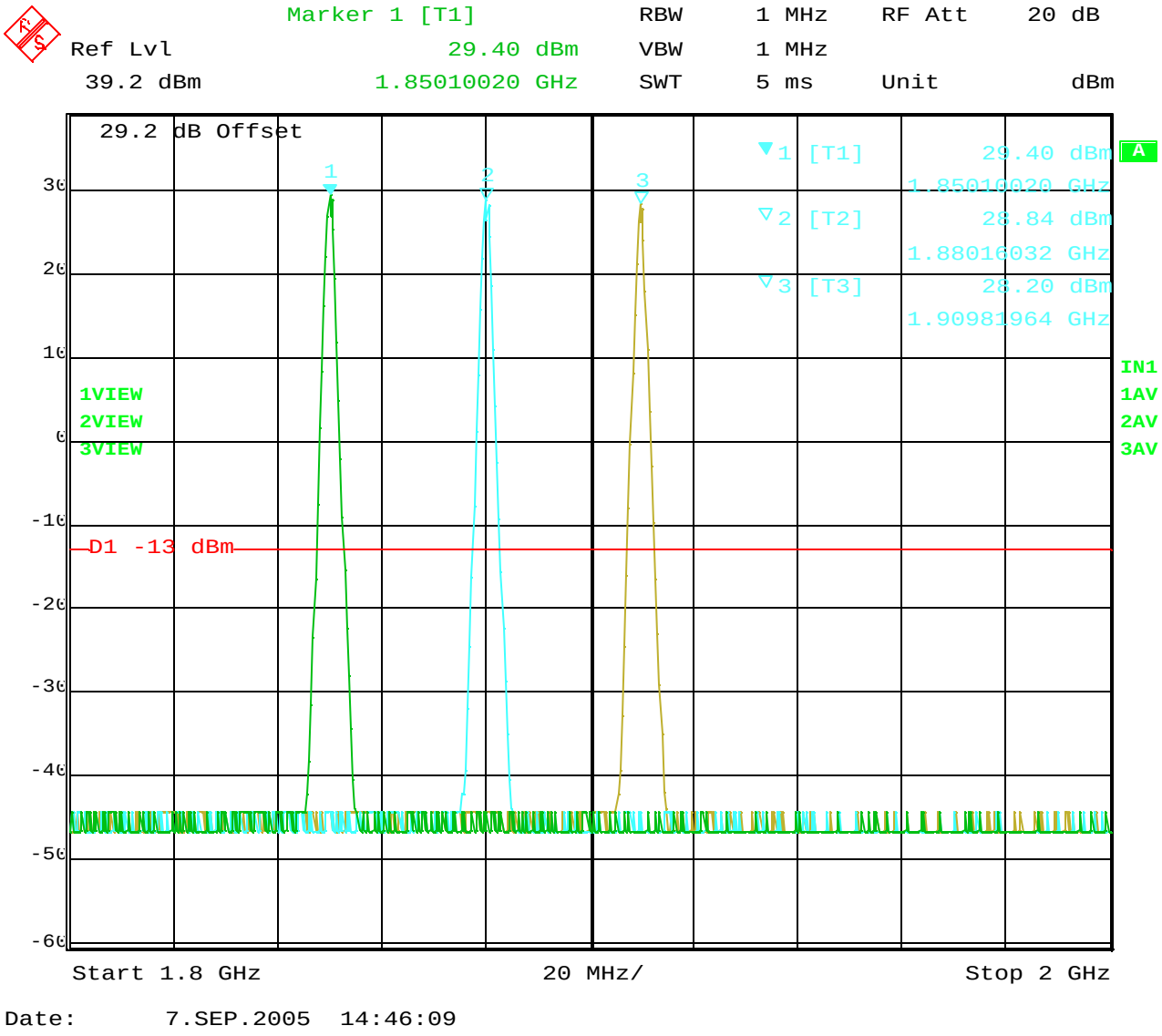


Figure 8-5: Emissions within 1 MHz of band edge, GSM 850 Lower Band Edge

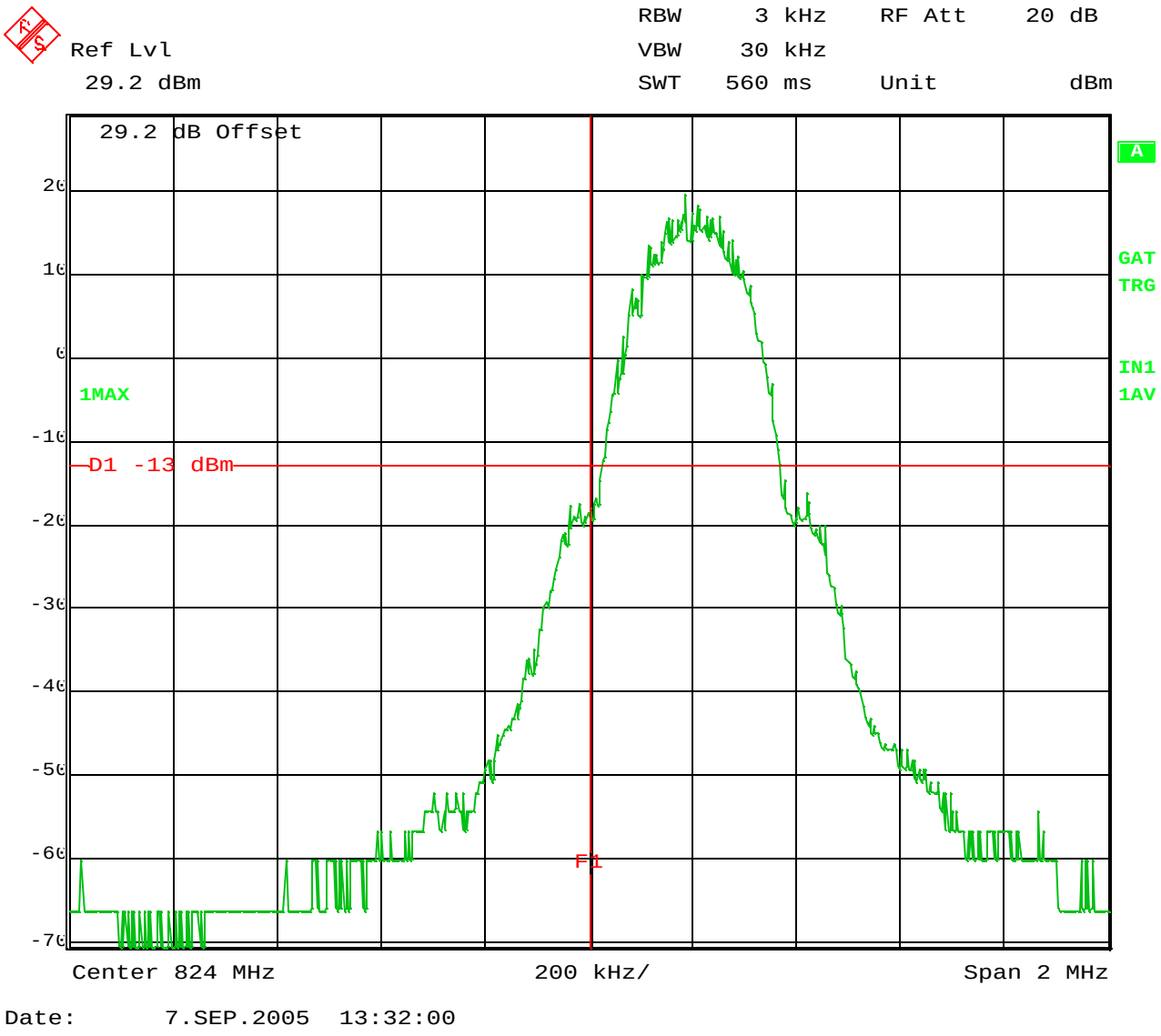
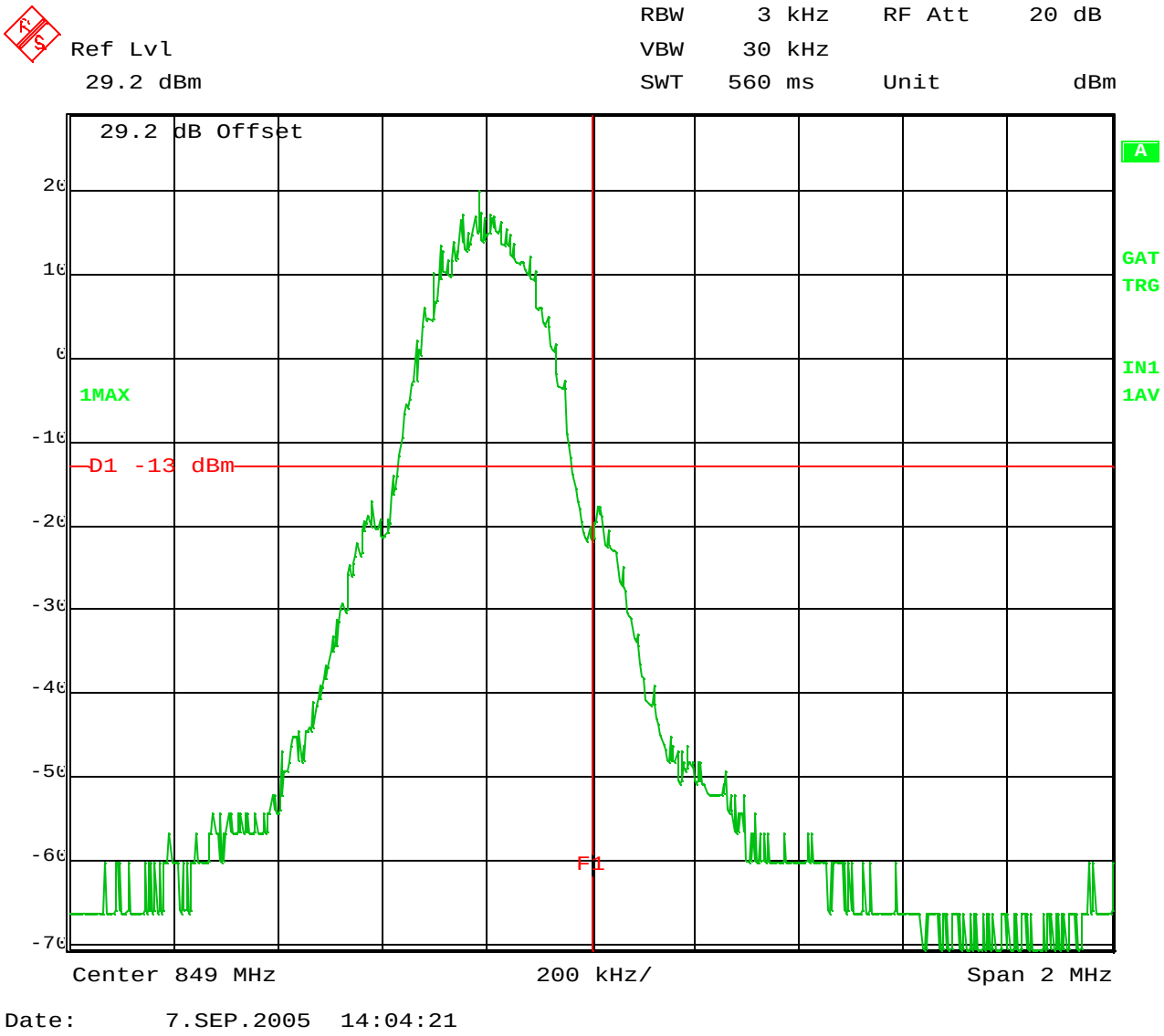


Figure 8-6: Emissions within 1 MHz of band edge, GSM 850 Upper Band Edge[1]



[1] To show compliance with the upper band edge requirement, a 3 kHz RBW was used.

Figure 8-7: Emissions within 1 MHz of band edge, GSM 1900 Lower Band Edge

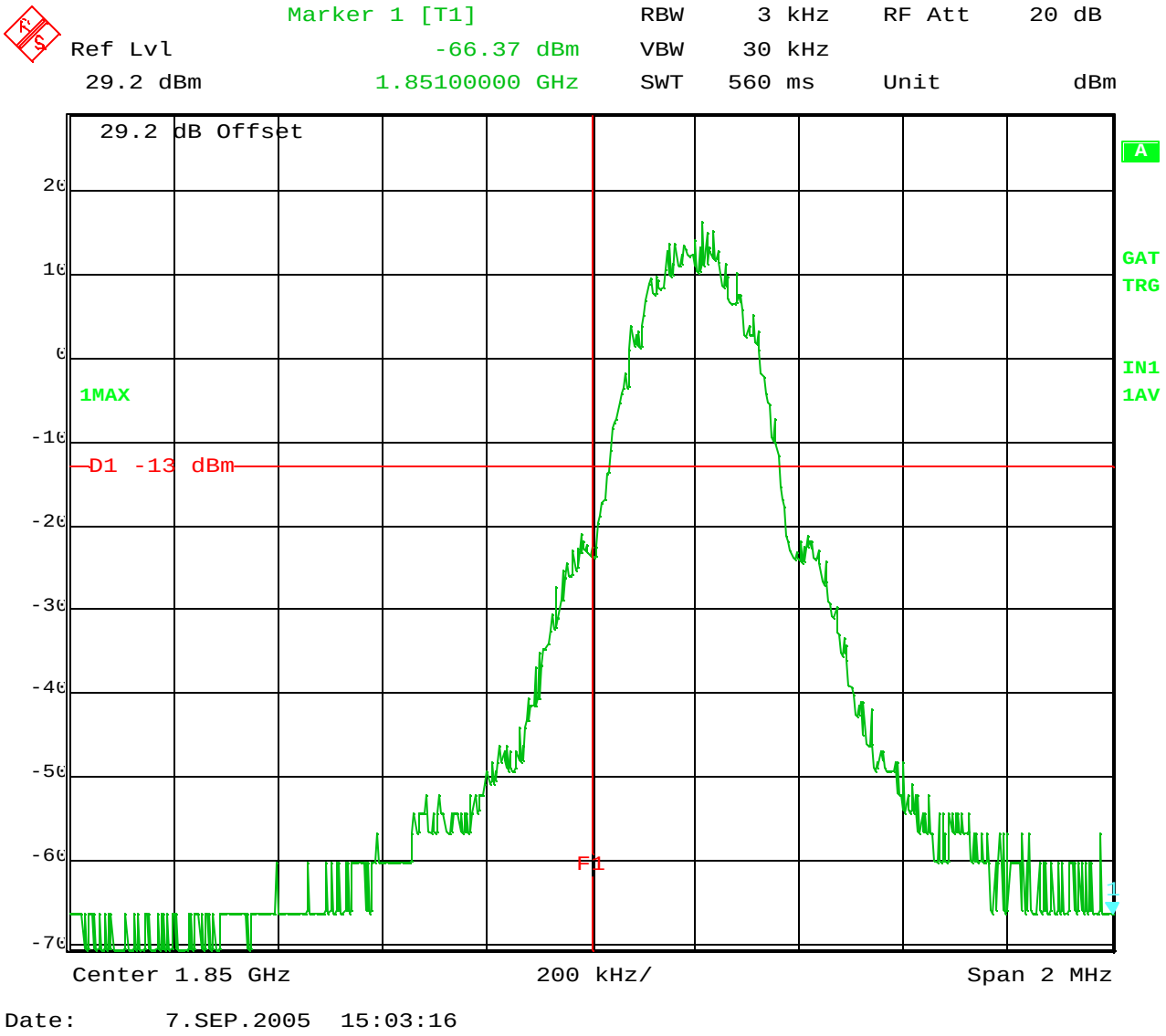
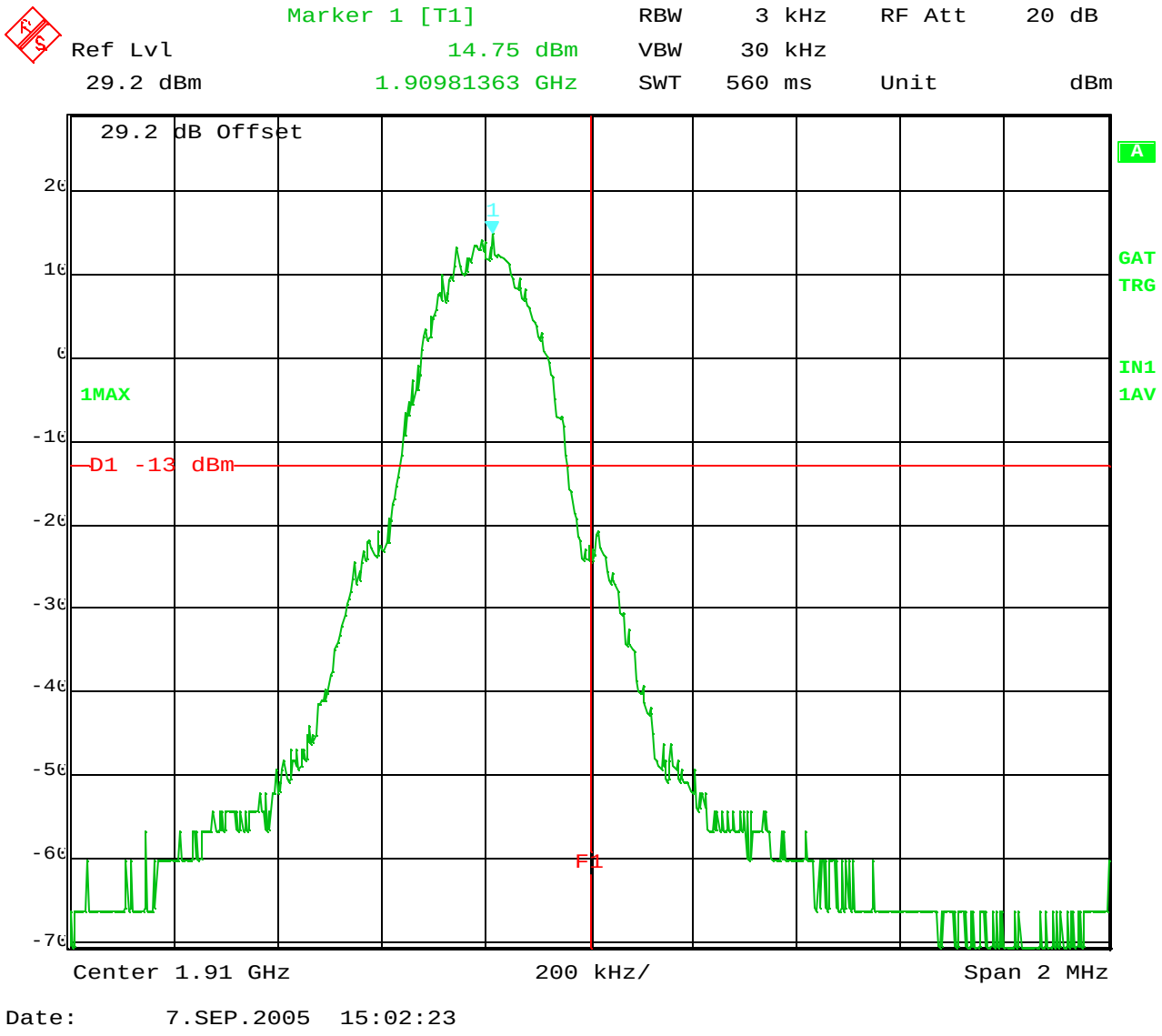


Figure 8-8: Emissions within 1 MHz of band edge, GSM 1900 Upper Band Edge



9 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053; FCC §22.917; FCC §24.238

RSS-132 §6.6

9.1 Test Limits

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Therefore, the test limit is defined by the following formula:

Test Limit (dBm) = Tx Power (dBm) - (43 + 10 log (Tx Power (Watts))) = -13dBm

9.2 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The EUT was set to force its maximum power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels) in each operating band. Once spurious emissions were identified, the power of the emission was determined using the substitution method described in TIA-603-B section 2.2.12 (Radiated Spurious Emissions).

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

The antenna port was terminated with non-radiating 50 Ohm termination during the test.

9.3 Test Results

The EUT met the field strength of spurious radiation requirements of FCC §2.1053, FCC §22.917, and FCC §24.238. See Table 9-1 for measured radiated spurious emission power for emissions within 20 dB of the limit. All other emissions not reported are at least 20dB below the limit.

Table 9-1: Field Strength of Spurious Radiation Substitution Measurements

EUT Mode	Channel	Polarity	Frequency (GHz)	Device Reading (dBuV/m)	Sub Reading (dBuV/m)	Cable Loss (dB)	Tx Antenna Gain (dBi)	Signal Generator Output (dBm)	ERP (dBm)
GSM 850	128	H	1.00003	36.560	97.988	4.039	5.800	0.000	-61.767
		H	2.47111	38.095	97.871	6.400	7.771	0.000	-60.505
	190	H	1.00779	34.323	99.518	4.075	5.827	0.000	-65.543
		H	1.67299	49.368	101.093	5.229	7.431	0.000	-51.623
	251	H	1.00697	35.198	99.272	4.071	5.824	0.000	-64.421
		H	3.3992	45.645	100.207	7.533	8.260	0.000	-55.935

EUT Mode	Channel	Polarity	Frequency (GHz)	Device Reading (dBuV/m)	Sub Reading (dBuV/m)	Cable Loss (dB)	Tx Antenna Gain (dBi)	Signal Generator Output (dBm)	EIRP (dBm)
GSM 1900	512	H	3.70152	46.226	98.708	7.744	8.219	0.000	-52.007
		H	15.0848	64.870	85.569	15.724	12.107	0.000	-24.316
	662	H	3.75979	53.748	96.462	7.785	8.196	0.000	-42.303
		H	7.53042	50.613	97.191	11.692	10.000	0.000	-48.27
		H	11.2809	69.120	100.984	14.058	11.031	0.000	-34.891
	810	H	3.81947	55.365	97.499	8.037	8.172	0.000	-41.999
		H	5.72919	55.367	100.736	9.724	9.229	0.000	-45.864
		H	7.63891	53.879	97.743	11.594	10.000	0.000	-45.458

Evaluation For:Enfora
Model No: EDG0100
Contd…

FCC ID: **MIVEDG0100**

EUT Mode	Channel	Polarity	Frequency (GHz)	Device Reading (dBuV/m)	Sub Reading (dBuV/m)	Cable Loss (dB)	Tx Antenna Gain (dBi)	Signal Generator Output (dBm)	ERP (dBm)
GSM 850	128	V	1.09999	35.776	98.976	4.134	6.140	0.000	-63.294
		V	1.6482	45.657	101.115	5.188	7.441	0.000	-55.305
		V	3.2969	47.010	98.376	7.713	8.219	0.000	-52.96
	190	V	1.00718	34.594	100.087	4.072	5.824	0.000	-65.841
		V	1.67519	36.365	100.653	5.230	7.430	0.000	-64.188
		V	3.3384	44.858	98.637	7.685	8.235	0.000	-55.329
		V	4.18254	52.847	103.368	8.499	8.465	0.000	-52.655
	251	V	1.09999	36.272	98.976	4.134	6.140	0.000	-62.798
		V	1.69702	37.953	100.272	5.236	7.421	0.000	-62.234
		V	2.54483	38.730	95.327	6.398	7.827	0.000	-57.268
		V	5.09243	52.032	101.547	9.233	9.000	0.000	-51.848
		V	6.78244	49.392	97.310	11.319	10.244	0.000	-51.093

EUT Mode	Channel	Polarity	Frequency (GHz)	Device Reading (dBuV/m)	Sub Reading (dBuV/m)	Cable Loss (dB)	Tx Antenna Gain (dBi)	Signal Generator Output (dBm)	EIRP (dBm)
GSM 1900	512	V	5.55015	62.195	99.524	9.633	9.050	0.000	-37.912
		V	7.4011	56.061	98.269	11.602	10.040	0.000	-43.77
		V	9.25498	54.459	91.235	12.863	10.351	0.000	-39.288
		V	11.1011	70.179	98.774	13.693	11.139	0.000	-31.149
		V	12.9521	68.579	100.226	15.460	11.771	0.000	-35.336
	662	V	1.00793	34.510	99.633	4.075	5.827	0.000	-63.371
		V	2.43215	39.019	96.993	6.291	7.732	0.000	-56.533
		V	5.64017	62.876	100.683	9.750	9.140	0.000	-38.417
		V	7.52603	50.913	97.617	11.693	10.000	0.000	-48.397
		V	11.2807	71.113	98.218	14.057	11.032	0.000	-30.13
		V	13.1612	75.603	98.000	15.421	11.897	0.000	-25.921
	810	V	1.29999	34.492	97.976	4.528	6.820	0.000	-61.192
		V	5.73108	52.755	100.597	9.737	9.231	0.000	-48.348
		V	11.4587	71.648	102.202	14.414	10.925	0.000	-34.043

10 POWER LINE CONDUCTED EMISSIONS

FCC §15.107, FCC §15.207

IC ES-003

10.1 Test Limits

Table 10-1 lists the conducted emission limits for both class A and B devices.

Table 10-1 Conducted Emission Limit for FCC §15.207(a)

Frequency Range (MHz)	Class A Limits		Class B Limits	
	FCC Part 15.107(a) Quasi Peak Limit (dBuV)	FCC Part 15.107(a) Average Limit (dBuV)	FCC Part 15.107(a) Quasi Peak Limit (dBuV)	FCC Part 15.107(a) Average Limit (dBuV)
0.15 – 0.5	79	66	66 to 56	56 to 46
0.5 – 5.0	73	60	56	46
5.0 - 30	73	60	60	50

10.2 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

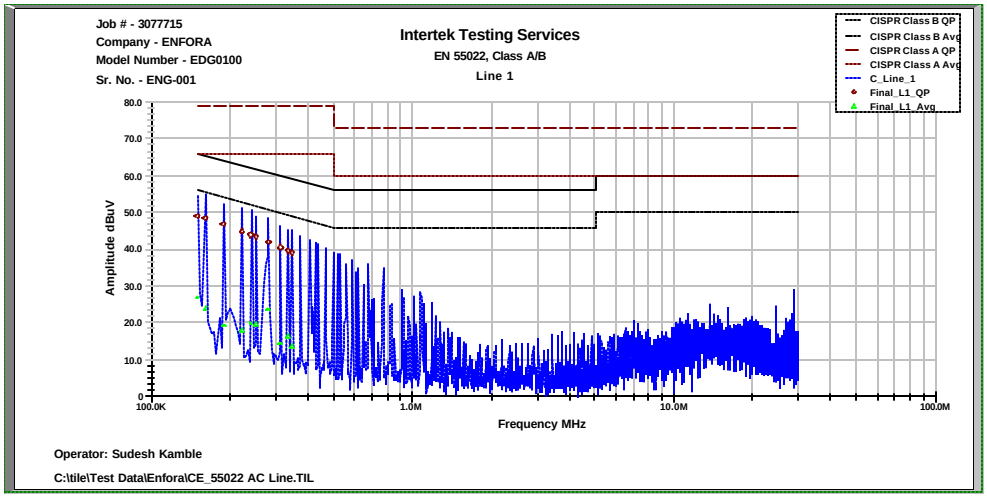
Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

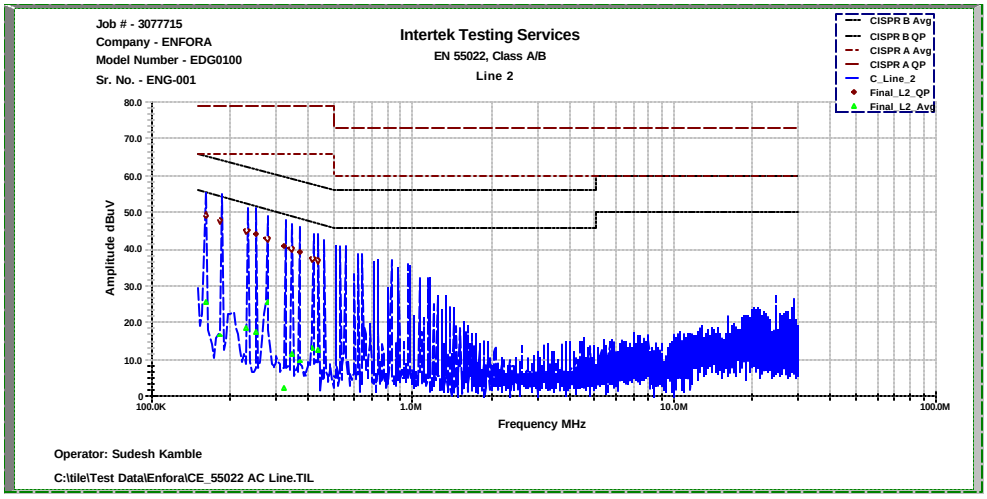
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4: 1992.

10.3 Test Results

The EUT met the power line conducted emission requirements of FCC §15.107 and §15.207. The test results are located in Figure 10-1. The graphical data, measured with peak detection, was all below the class B quasi-peak and average limits.

Figure 10-1: FCC §15.107 and §15.207 power line conducted emissions (Lines 1 and 2)





Line 1

Frequency MHz	L1 QP dBµV	L1 Avg dBµV	QP Class B Limit dBµV	QP Margin dB	Avg. Class B Limit dBµV	Avg. Margin dB
0.15	48.881	26.931	66.000	-17.119	56.000	-29.069
0.161	48.468	23.895	65.686	-17.217	55.686	-31.791
0.189	46.711	19.176	64.886	-18.175	54.886	-35.710
0.222	44.892	17.802	63.943	-19.051	53.943	-36.141
0.241	43.927	19.929	63.400	-19.473	53.400	-33.471
0.253	43.309	19.650	63.057	-19.749	53.057	-33.407
0.282	41.964	23.570	62.229	-20.265	52.229	-28.659
0.313	40.455	14.434	61.343	-20.888	51.343	-36.908
0.333	39.591	16.368	60.771	-21.181	50.771	-34.403
0.345	38.964	13.616	60.429	-21.464	50.429	-36.813

Line 2

Frequency MHz	L2 QP dBµV	L2 Avg dBµV	QP Class B Limit dBµV	QP Margin dB	Avg. Class B Limit dBµV	Avg. Margin dB
0.162	49.236	25.563	65.657	-16.421	55.657	-30.094
0.184	47.649	16.451	65.029	-17.379	55.029	-38.577
0.232	44.927	18.567	63.657	-18.730	53.657	-35.090
0.252	43.977	17.290	63.086	-19.108	53.086	-35.796
0.278	42.862	25.670	62.343	-19.481	52.343	-26.672
0.324	40.891	2.228	61.029	-20.138	51.029	-48.801
0.344	40.132	11.357	60.457	-20.325	50.457	-39.100
0.37	39.112	9.432	59.714	-20.603	49.714	-40.282
0.416	37.407	12.963	58.400	-20.993	48.400	-35.437
0.436	36.768	12.343	57.829	-21.060	47.829	-35.485

11 RECEIVER SPURIOUS EMISSIONS

FCC §15.109

IC ES-003, RSS-132 §6.6, RSS-133 §9

11.1 Test Limits

Table 11-1 lists the Class A and B limits for spurious using quasi-peak detection below 1GHz and average detection above 1GHz.

Table 11-1 Radiated Emission Limit for FCC §15.109

	3 Meter Limits		10 Meter Limits	
	Class A	Class B	Class A	Class B
Frequency (MHz)	Quasi-Peak limits dB(μV/m)	Quasi-Peak limits, dB(μV/m)	Quasi-Peak limits dB(μV/m)	Quasi-Peak limits, dB(μV/m)
30 to 88	49.6	40	39.1	29.5
88 to 216	54.0	43.5	43.5	33.1
216 to 960	56.9	46.0	46.4	35.6
960 and up	60.0	54.0	49.5	43.5

11.2 Test Procedure

Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole. From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.

Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 3m cannot be made because of high ambient noise level or for other reasons, measurements may be made at a closer distance, for example 1m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4: 1992.

The transmitter was turned of during the test by accessing the EUT's internal test mode by an external PC.

11.3 Test Results

The EUT was **compliant** with the radiated disturbance requirements of FCC §15.109 for a **class B** device. The maximized quasi peak and average data can be found in Figure 11-1.

Figure 11-1 FCC §15.109 Maximized Quasi Peak and Average Emissions (Max Emissions sorted by Margin)

Polarity	Frequency MHz	Ant Height cm	Azimuth deg.	QP dBµV /m	Limit dBµV /m	Margin dB
H	795.25	196	332	43.57	47.460	-3.888
H	621.25	242	98	39.01	47.460	-8.454
H	549.25	194	308	38.62	47.460	-8.845
H	868.57	210	22	37.63	47.460	-9.833
H	893.37	150	96	36.98	47.460	-10.484
H	125.31	184	331	29.19	40.460	-11.272
H	918.65	381	36	35.25	47.460	-12.213
V	795.25	112	47	44.3	47.460	-3.162
H	881.29	234	34	34.54	47.460	-12.923
V	795.26	133	177	43.75	47.460	-3.705
H	795.24	231	180	43.35	47.460	-3.55
V	795.25	153	349	43.27	47.460	-3.63
H	32.11	159	349	25.8	40.460	-14.657
V	621.25	235	281	40.78	47.460	-6.115
V	621.25	252	105	40.76	47.460	-6.696
V	891.63	368	256	40.63	47.460	-6.269

Polarity	Freq.** (GHz)	Ant Height (cm)	Azimuth (Deg)	Device Reading (Avg) (dBµV /m)	Limit (dBµV /m)	Margin (dB)
H	1.00661	112	289	23.286	54	-30.714
H	2.98754	111	311	30.443	54	-23.557
V	1.01	103	345	26.58	54	-27.42
V	2.91	171	169	29.5	54	-24.5
V	4.23	184	192	40.65	54	-13.35
H	1.00656	152	360	23.772	54	-30.228
V	1.007	111	92	28.107	54	-25.893
V	7.167	181	32	37.873	54	-16.127

** The max clock frequency is 1900 MHz and the max emissions reported are only up to 5th harmonic of the highest frequency.

12 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355, FCC §24.235

RSS-132 §6.3 and RSS-133 §7

12.1 Test Limits

The frequency tolerance shall be maintained within: ±2.5ppm (or 0.000025MHz)

12.2 Test Procedure

The transmitter output was connected to a calibrated coaxial cable. The EUT was set to its maximum power setting. The EUT was placed into a call and the transmitter output was read off the frequency counter. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss.

The equipment under test was powered and the RF output was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed inside the temperature chamber. The RF output cable exited the chamber through an opening made for that purpose. After the temperature stabilized for approximately 30 minutes, the frequency error was read from the Base Station Simulator.

12.3 Test Results

The EUT met the frequency stability requirements of FCC §2.1055, FCC §22.355and FCC §24.235. The test results are located in Table 12-1.

Table 12-1: Frequency stability vs. Temperature

Frequency Stability** Vs. Temperature (Hz)						
Temp. (Celcius)	GSM 850 Channel #			GSM 1900 Channel #		
	128	190	251	512	662	810
60	31	26	31	37	38	37
50	26	27	25	34	33	37
40	26	25	28	39	43	34
30	25	31	35	48	49	45
20	26	26	27	36	43	37
10	18	21	21	32	36	29
0	24	22	21	42	57	34
-10	22	24	21	39	27	32
-20	22	23	21	19	23	26
-30	21	22	20	33	40	44

** Noted as deviation from the reference frequency (absolute).

13 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355, FCC §24.235

13.1 Test Limits

The frequency tolerance shall be maintained within: ±2.5ppm (or 0.000025MHz)

13.2 Test Procedure

The AC supply of the test Jig was replaced with a variable output AC using Power supply adapter supplying power to the test jig. The EUT was set to force the EUT to its maximum power setting. The voltage was set to 115% of the nominal value and was then decreased to 85% of the nominal value. The output frequency was recorded for each input voltage.

For DC supply voltage measurement, The DC supply to the EUT was connected to a variable output DC power supply. The Base Station Simulator was set to force the EUT to its maximum power setting. The voltage was set to 115% of the nominal value and was then decreased to 85% of the nominal value. The output frequency was recorded for each input voltage.

13.3 Test Results

The EUT met the frequency stability requirements of FCC §2.1055, FCC §22.355, and §24.235. The test results are located in Table 13-1.

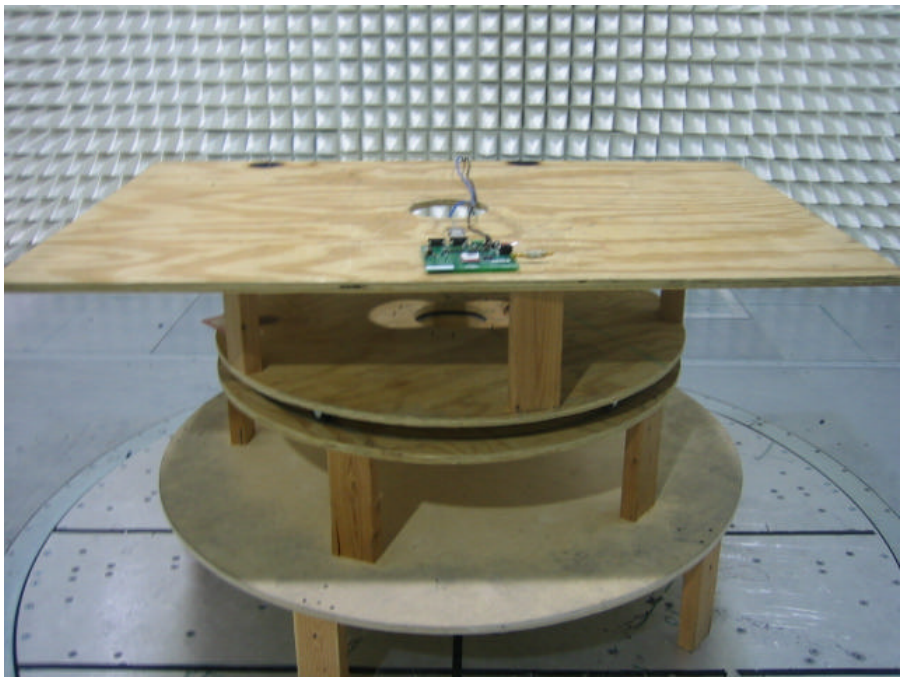
Table 13-1: Frequency stability vs. input voltage

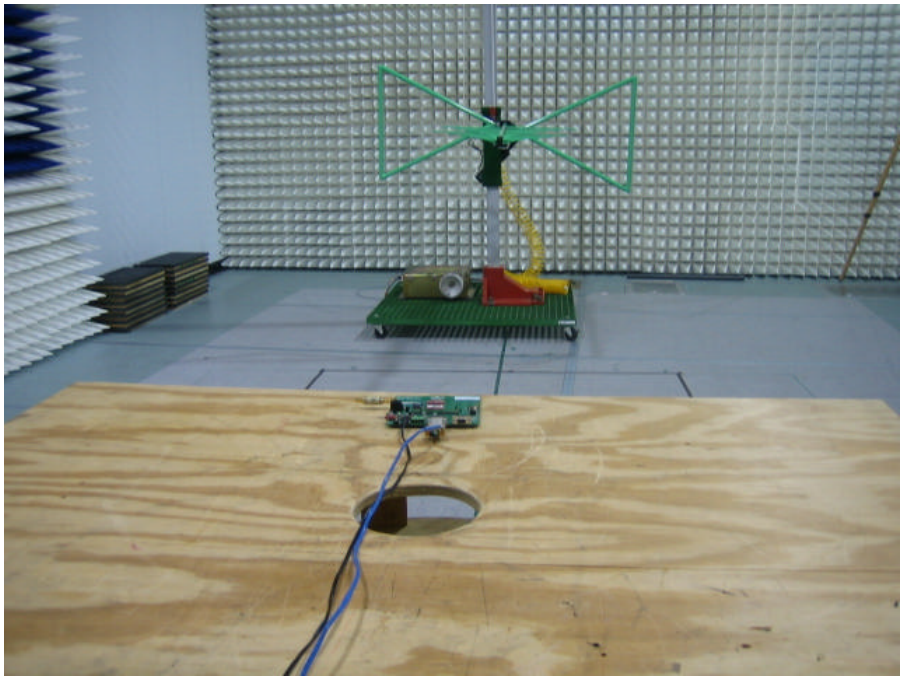
Frequency Stability Vs. Voltage						
Voltage (Vac)	GSM 850 Channel #			GSM 1900 Channel #		
	128	190	251	512	662	810
138	24	24	22	39	47	39
120	26	26	27	36	43	37
102	20	23	23	43	38	42

Frequency Stability Vs. Voltage						
Voltage (Vdc)	GSM 850 Channel #			GSM 1900 Channel #		
	128	190	251	512	662	810
4.37	19	22	23	39	41	36
3.8	19	23	24	32	30	40
3.23	39	40	47	35	36	33

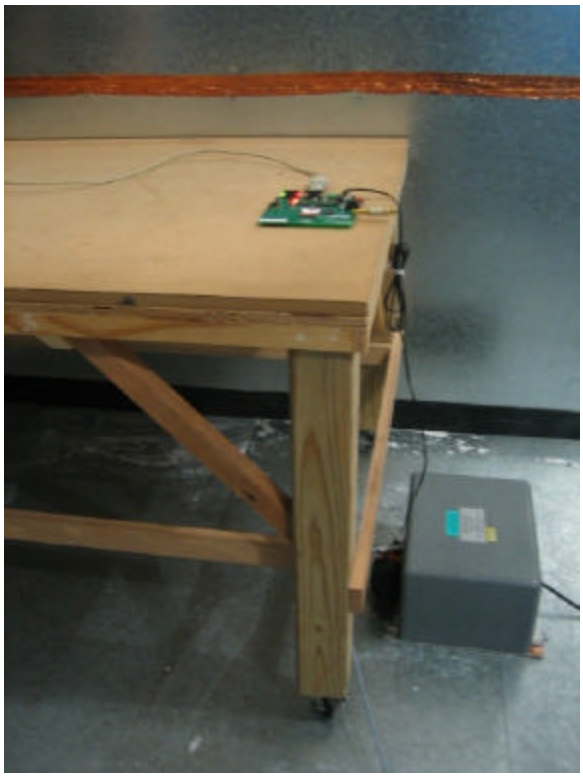
14 TEST SET UP PICTURES

14.1 Radiated Emissions





14.2 AC Line Conducted Emissions



15 EUT PICTURES