



FCC Test Report

According to

47 CFR Part 24E

Equipment : Navigation Device
Trade Name : Mio
Model No. : N171
FCC ID : P4Q-N171
Tx Frequency Range : 1850.2 ~ 1909.8 MHz
Max. EIRP Power : 0.94 W
Emission Designator : 300KGXW
Applicant : **MiTAC International Corp.**
No. 1, Yen-Fa 2nd Rd., Hsin-Chu Science Based Industrial Park,
Hsin-Chu Hsien, Taiwan, R.O.C.

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- The data shown in this test report were carried out on May 07, 2008 at **Sporton International Inc. LAB.**
- Report No.: FG832501-01, Report Version: Rev. 01.

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Report Version: Rev. 01



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1. General Information

1.1 Applicant

MiTAC International Corp.

No. 1, Yen-Fa 2nd Rd., Hsin-Chu Science Based Industrial Park, Hsin-Chu Hsien, Taiwan, R.O.C.

1.2 Manufacturer

MiTAC Computer (KunShan) Co., Ltd.

No. 269, 2nd Road, Export Processing Zone, Changjiang South Road, KunShan, JiangSu Prov., China

1.3 Basic Description of Equipment under Test

Equipment		Navigation Device
Trade Name		Mio
Model Name		N171
FCC ID		P4Q-N171
AC Adapter 1	Brand Name	PHIHONG
	Model Name	PSAA05R-050
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.3A, 13-16VA; O/P: 5Vdc, 1A
	AC Power Cord Type	1.8 meter non-shielded cable without ferrite core
AC Adapter 2	Brand Name	TPT
	Model Name	MII050100
	Power Rating	I/P:100-240Vac, 13~17VA, 50-60Hz, 0.5A; O/P: 5Vdc, 1A
	AC Power Cord Type	1.6 meter shielded cable without ferrite core
Car Charger	Brand Name	MiTAC
	Model Name	CA-051-00U-09
	Power Rating	I/P: 12V/24V; O/P: 5V, 1A
	Power Cord Type	1.3 meter non-shielded cable without ferrite core
Battery	Brand Name	Welldone Company
	Model Name	E4MT291K1002
	Power Rating	3.7Vdc, 1350mAh
	Type	Li-ion
Earphone	Brand Name	Peter
	Model Name	D-AS-117-071128A
	Type	1.3 meter non-shielded cable without ferrite core
USB Cable	Brand Name	MPT
	Model Name	422145700005
	Signal Line Type	1.3 meter shielded cable without ferrite core
Cradle	Brand Name	Cradle
	Model Name	N171 Cradle

Remark: Above EUT's information was declared by manufacturer. Please refer to the specifications of manufacturer or User's Manual for more detailed features description.



1.4 Feature of Equipment under Test

Product Feature & Specification	
DUT Type :	Navigation Device
Trade Name :	Mio
Model Name :	N171
FCC ID :	P4Q-N171
Tx Frequency :	1850 MHz ~ 1910 MHz
Rx Frequency :	1930 MHz ~ 1990 MHz
Channel Spacing :	200 KHz
Maximum Output Power to Antenna :	28.63 dBm
Maximum EIRP :	0.94 W (29.75 dBm)
Antenna Type :	Fixed Internal
HW Version :	R02
SW Version :	R10
Power Rating (DC/AC , Voltage and Current of RF element or PA) :	DC 2.9V / 75µA
GPRS Multislot class :	10
Type of Modulation :	GMSK
Type of Emission :	300KGXW
Device Power Class :	1
DUT Stage :	Identical Prototype

1.5 Report Date

EUT Received : Apr. 28, 2008

Report Date : May 27, 2008

2 Test Configuration of Equipment under Test

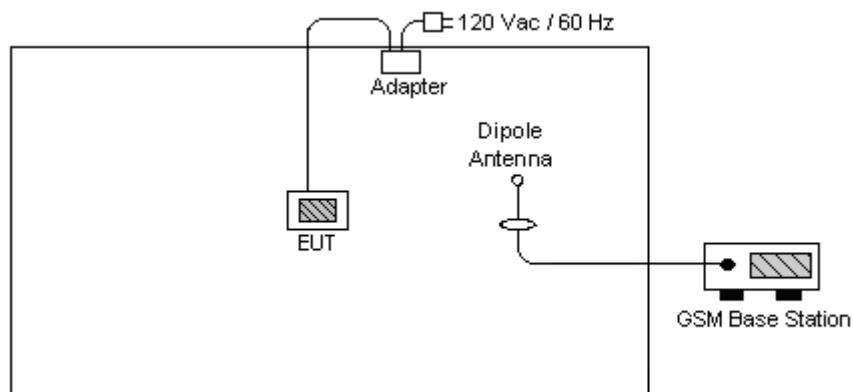
2.1 Test Manner

- a. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range.
- b. During all testings, EUT is in link mode with base station emulator at maximum power level.
- c. Frequency range investigated: radiated emission 30MHz to 19000 MHz for GSM1900.

2.2 Test Mode

Application	GSM1900
Radiated Emission	<input checked="" type="checkbox"/> Mode 1: GSM Link Mode
Conducted Measurement	<input checked="" type="checkbox"/> Mode 1: GSM Link Mode

2.3 Connection Diagram of Test System



2.4 Ancillary Equipment List

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Code
1.	Base Station	R&S	CMU200	N/A	N/A	Unshielded, 1.8m



3. General Information of Test Site

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-328-4978
Test Site No : 03CH07-HY, TH02-HY
FCC Designation No : TW1022

The chamber meets the characteristics of ANSI C63.4-2003. This site is on file with the FCC.

3.1 Test Voltage

AC 120V / 60Hz

3.2 Test Compliance

47 CFR Part 24E

3.3 Frequency Range

Radiation: from 30 MHz to 19000 MHz for GSM1900

3.4 Test Distance

The test distance of radiated emission from antenna to EUT is 3 m.



4. Test Data and Test Result

4.1 List of Measurements and Examinations

FCC Rule	Description of Test	Result	Section
§2.1046	RF Output Power	Passed	4.2
§24.232	EIRP	Passed	4.3
§2.1049 §24.238(b)	Occupied Bandwidth & Band Edge Measurement	Passed	4.4
§2.1051	Conducted Emission	Passed	4.5
§2.1053	Field Strength of Spurious Radiation	Passed	4.6
§2.1055 §24.235	Frequency Stability vs. Temperature	Passed	4.7
§2.1055 §24.235	Frequency Stability vs. Voltage	Passed	4.8

4.2 RF Output Power

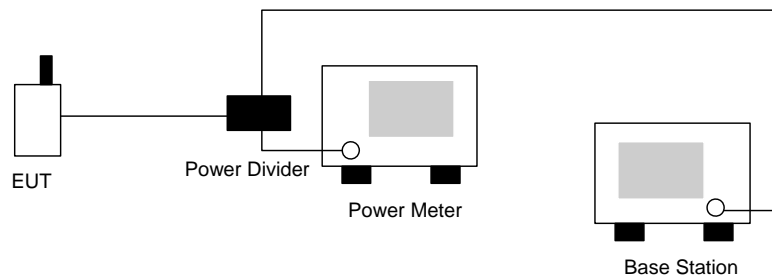
4.2.1 Measurement Instruments

As described in chapter 5 of this test report.

4.2.2 Test Procedure

- a. The transmitter output was connected to power meter and base station through power divider.
- b. Set EUT at PCL=0 for GSM1900 maximum power through base station.
- c. Select lowest, middle, and highest channels for each band.

4.2.3 Test Setup Layout



4.2.4 Test Result

Bands	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watts)
GSM1900 (GSM)	512	1850.2 (Low)	28.62	0.728
	661	1880.0 (Mid)	28.30	0.676
	810	1909.8 (High)	28.63	0.729



4.3 EIRP Measurement

Equivalent isotropic radiated power measurements by substitution method according to ANSI/TIA/EIA-603-C.

4.3.1 Measurement Instruments

As described in chapter 5 of this test report.

4.3.2 Test Procedure

- a. The EUT was placed on a turntable with 1.0 meter height in an fully anechoic chamber.
- b. The EUT was set 1.2 meters from the receiving antenna which was mounted on the antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiated power.
- d. The height of the receiving antenna is also kept at 1.0M height.
- e. Taking the record of maximum EIRP.
- f. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
- g. The conducted power at the terminal of the dipole antenna is measured.
- h. Repeat step 3 to step 5 to get the maximum EIRP of the substitution antenna.
- i. $EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$

P_s (dBm) : Input power to substitution antenna.

G_s (dBi) : Substitution antenna Gain.

$E_t = R_t + AF$

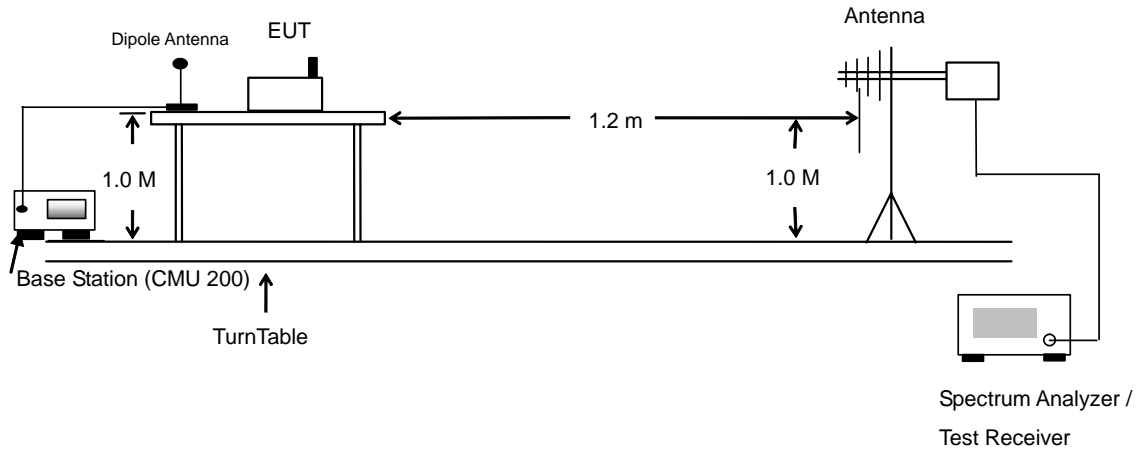
$E_s = R_s + AF$

AF (dB/m) : Receive antenna factor

R_t : The highest received signal in Spectrum Analyzer for EUT.

R_s : The highest received signal in spectrum analyzer for substitution antenna.

4.3.3 Test Setup Layout of EIRP





4.3.4 Test Result

GSM1900 (GSM) Radiated Power EIRP						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-27.08	-51.88	0.00	1.96	26.76	0.47
1880.00	-27.35	-52.99	0.00	2.00	27.64	0.58
1909.80	-29.64	-54.28	0.00	1.98	26.62	0.46
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-25.92	-52.13	0.00	1.96	28.17	0.66
1880.00	-25.42	-53.17	0.00	2.00	29.75	0.94
1909.80	-26.57	-54.13	0.00	1.98	29.54	0.90

4.4 Occupied Bandwidth and Band Edge Measurement

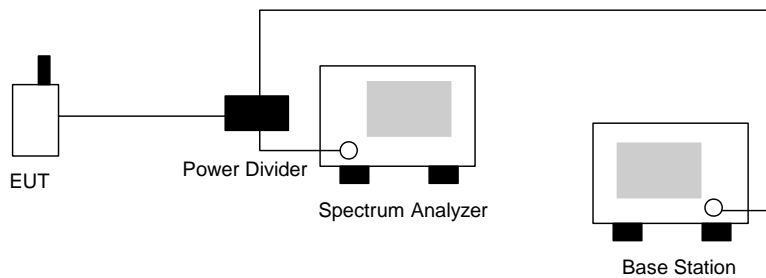
4.4.1 Measurement Instruments

As described in chapter 5 of this test report.

4.4.2 Test Procedure

- a. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
- b. The 99% occupied bandwidth of middle channel for the highest and lowest RF powers were measured.
- c. The bandedge of low and high channels for the highest RF powers within the transmitting frequency band were measured. Setting RBW as roughly $BW/100$.

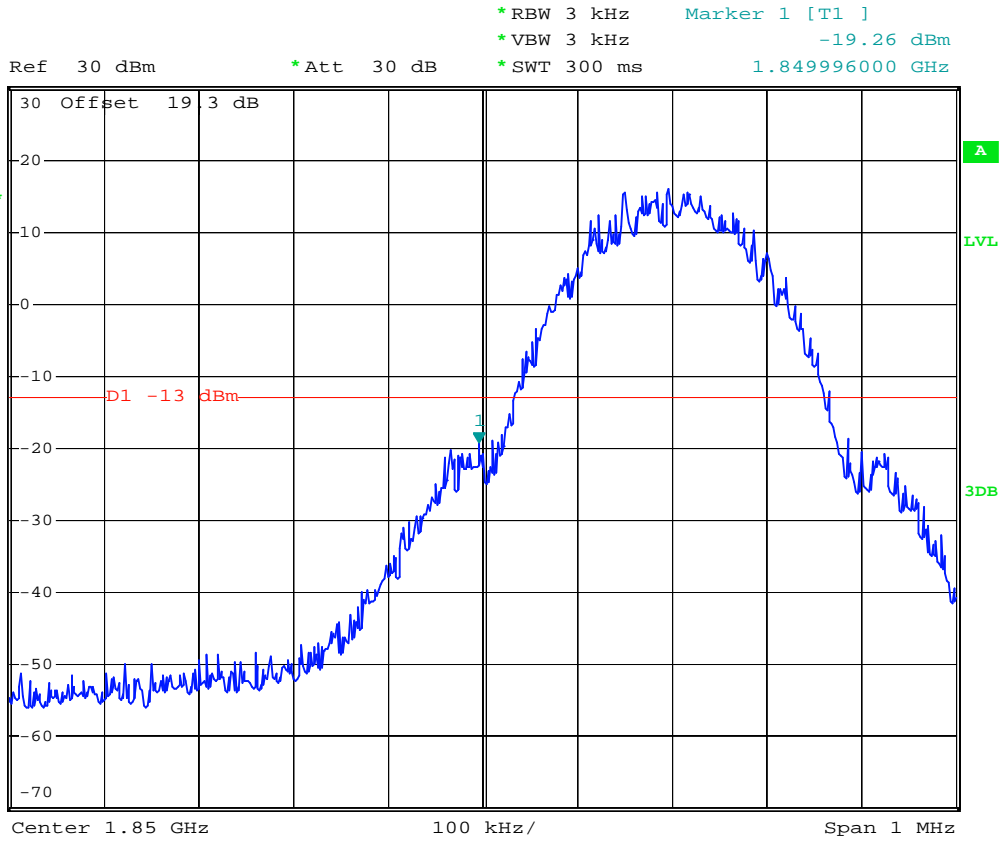
4.4.3 Test Setup Layout





4.4.4 Test Result

- Mode 1
- Test Mode : GSM1900 (GSM) CH512 Lower Band Edge
- Power State : High



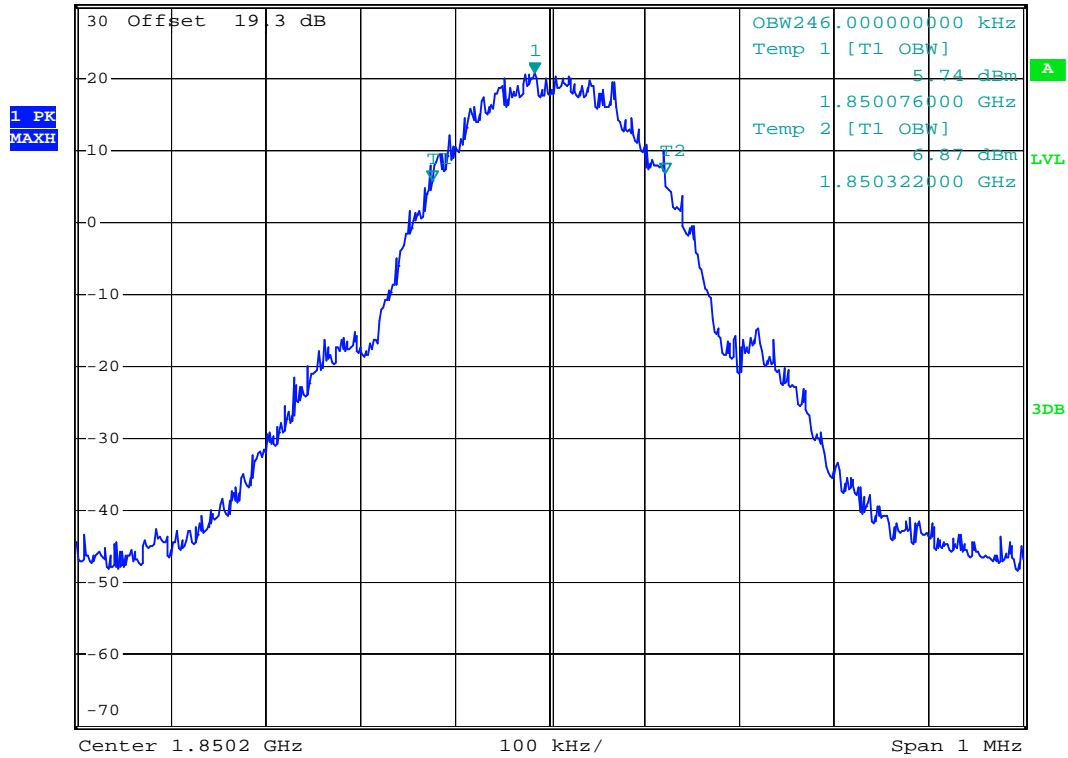
Date: 7.MAY.2008 10:09:39



- Test Mode : GSM1900 (GSM) CH512 99% Occupied Bandwidth
- Power State : High



*RBW 3 kHz Marker 1 [T1]
 *VBW 10 kHz 20.75 dBm
 *SWT 300 ms 1.850184000 GHz
 Ref 30 dBm *Att 30 dB



Date: 7.MAY.2008 10:04:05



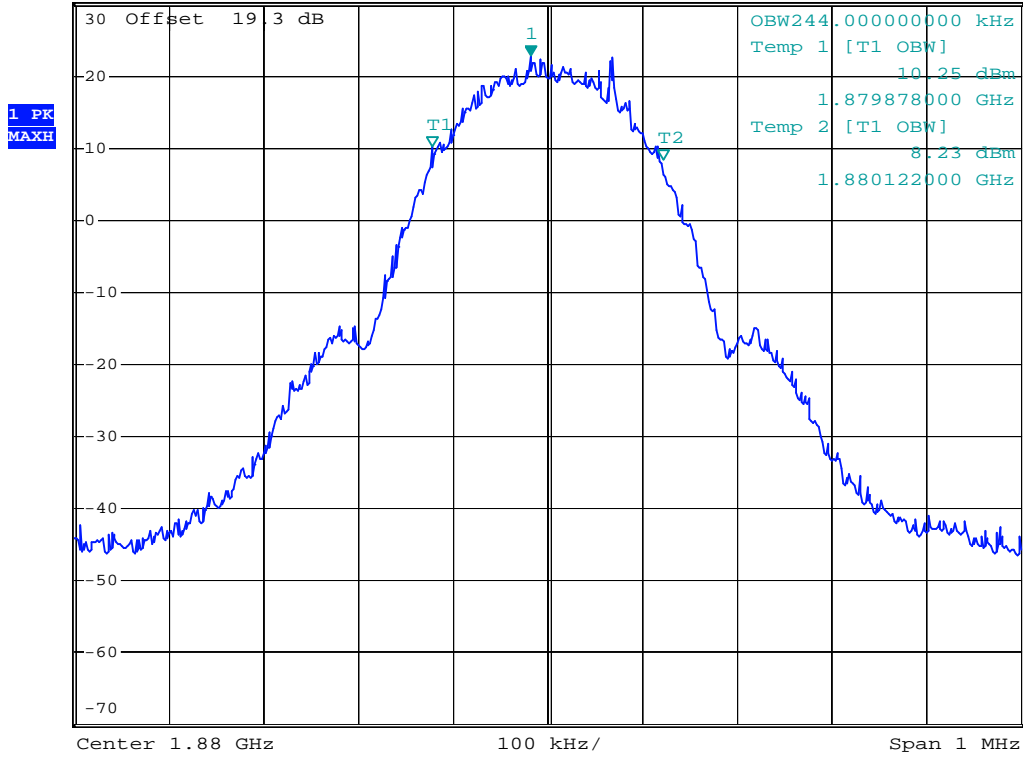
- Test Mode : GSM1900 (GSM) CH661 99% Occupied Bandwidth
- Power State : High



*RBW 3 kHz Marker 1 [T1]
 *VBW 10 kHz 22.71 dBm
 *SWT 300 ms 1.879982000 GHz

Ref 30 dBm

*Att 30 dB



Date: 7.MAY.2008 10:07:35



- Test Mode : GSM1900 (GSM) CH810 99% Occupied Bandwidth
- Power State : High

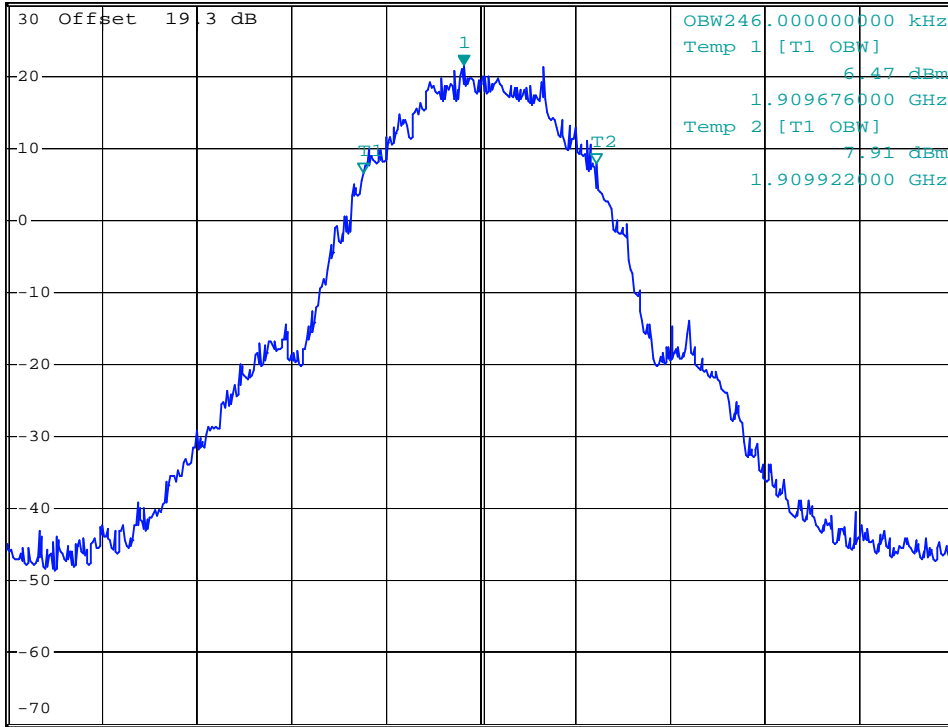


*RBW 3 kHz Marker 1 [T1]
 *VBW 10 kHz 21.49 dBm
 *SWT 300 ms 1.909782000 GHz

Ref 30 dBm

*Att 30 dB

1 PK
MAXH



Center 1.9098 GHz

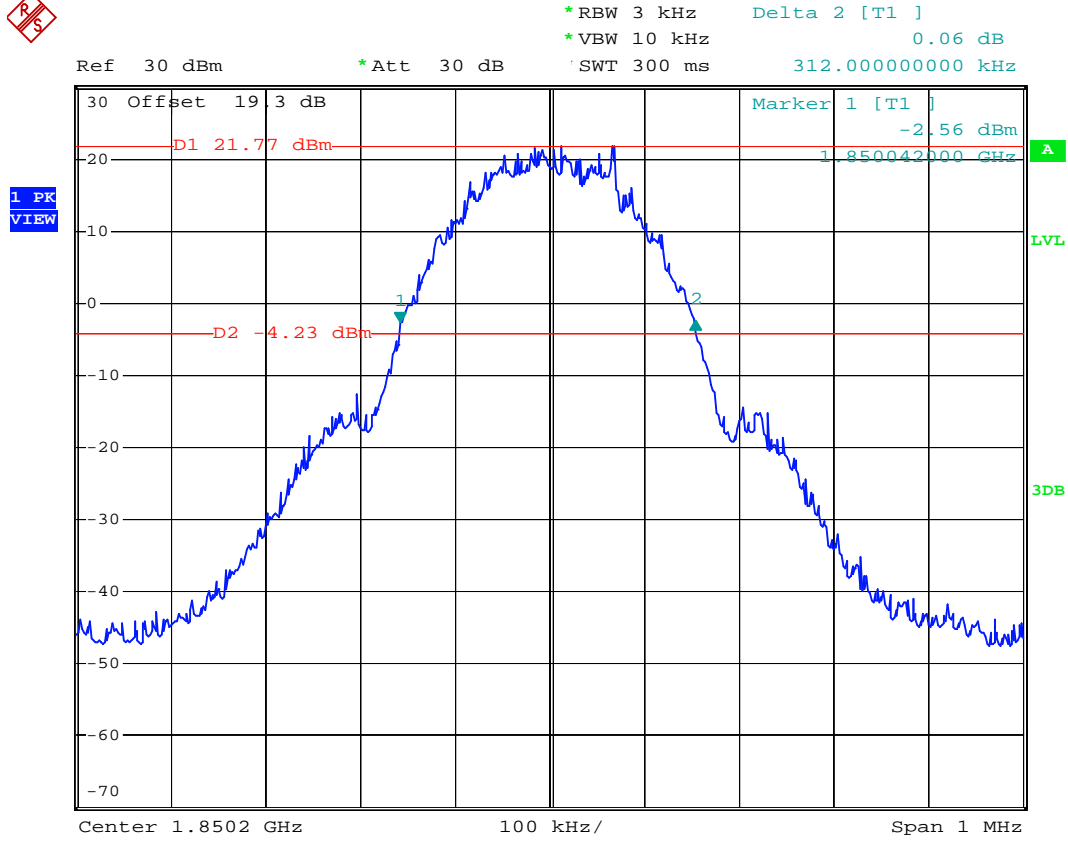
100 kHz/

Span 1 MHz

Date: 7.MAY.2008 10:33:54



- Test Mode : GSM1900 (GSM) CH512 26dB Bandwidth
- Power State : High



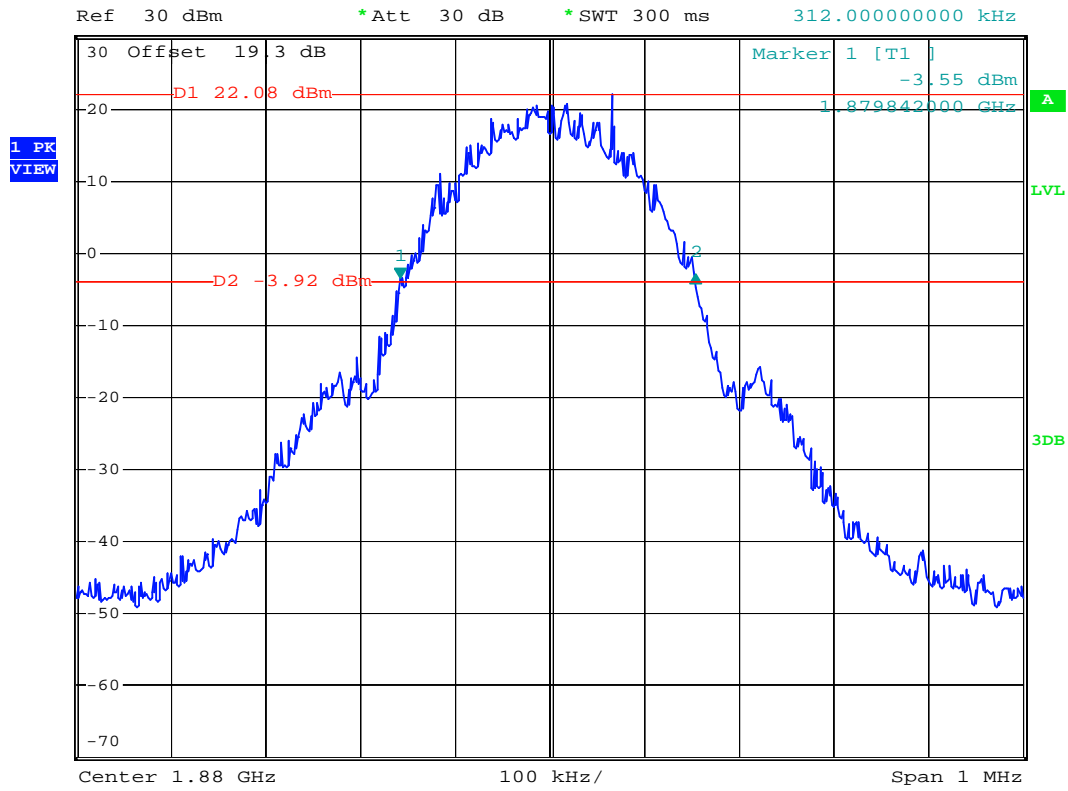
Date: 7.MAY.2008 09:57:14



- Test Mode : GSM1900 (GSM) CH661 26dB Bandwidth
- Power State : High



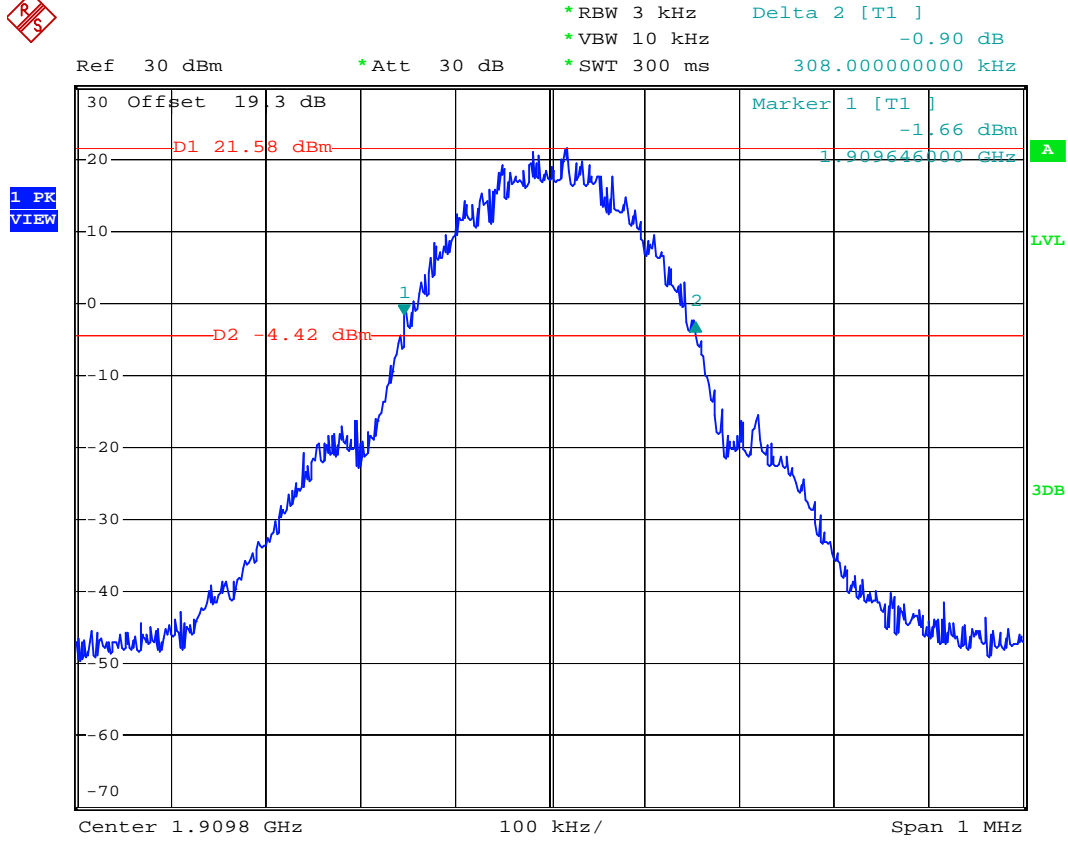
*RBW 3 kHz Delta 2 [T1]
 *VBW 10 kHz 0.61 dB
 *SWT 300 ms 312.000000000 kHz



Date: 7.MAY.2008 09:58:14



- Test Mode : GSM1900 (GSM) CH810 26dB Bandwidth
- Power State : High



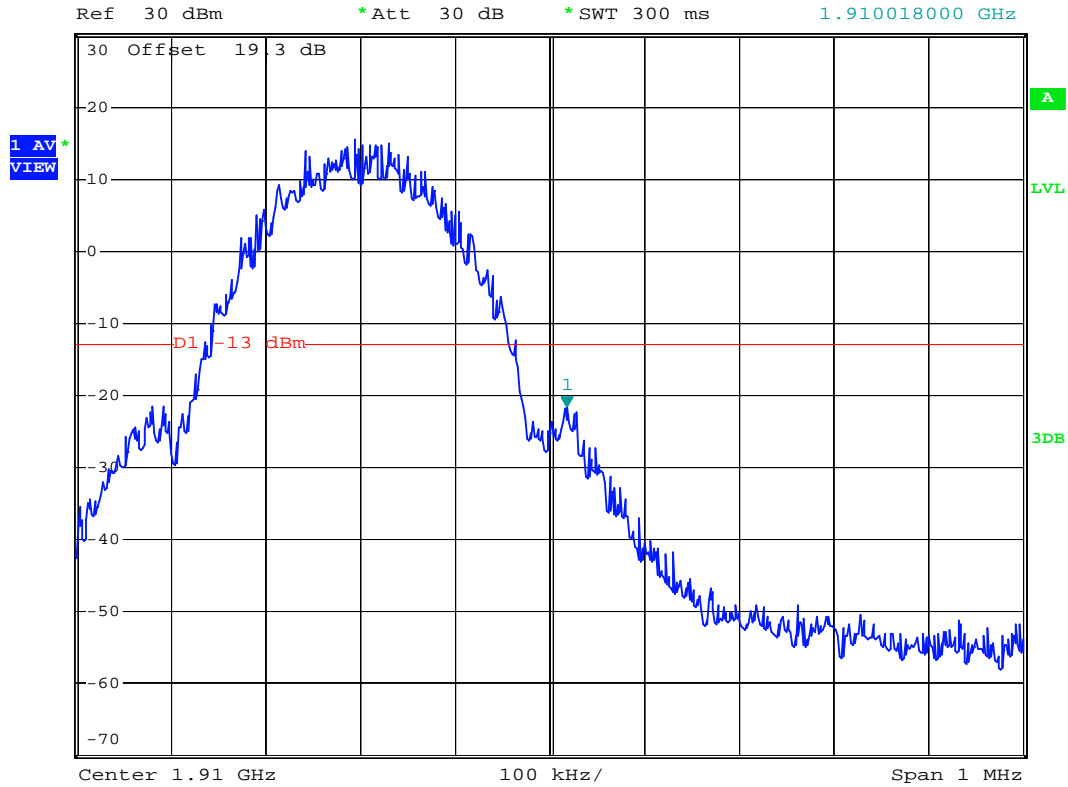
Date: 7.MAY.2008 10:02:34



- Test Mode : GSM1900 (GSM) CH810 Higher Band Edge
- Power State : High



*RBW 3 kHz Marker 1 [T1]
*VBW 3 kHz -21.48 dBm
*SWT 300 ms 1.910018000 GHz



Date: 7.MAY.2008 10:12:41

4.5 Conducted Emission

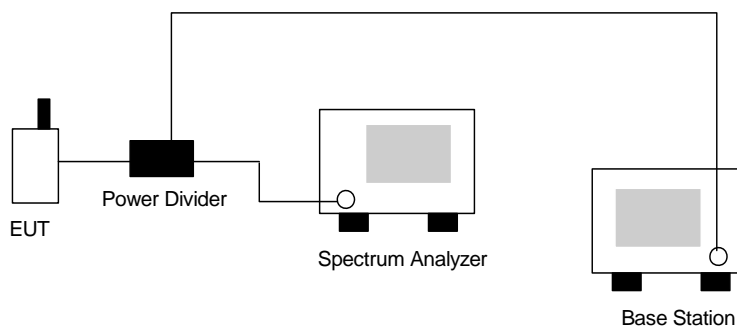
4.5.1 Measurement Instruments

As described in chapter 5 of this test report.

4.5.2 Test Procedure

- a. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
- b. The middle channel for the highest RF power within the transmitting frequency was measured.
- c. The conducted spurious emission for the whole frequency range was taken.

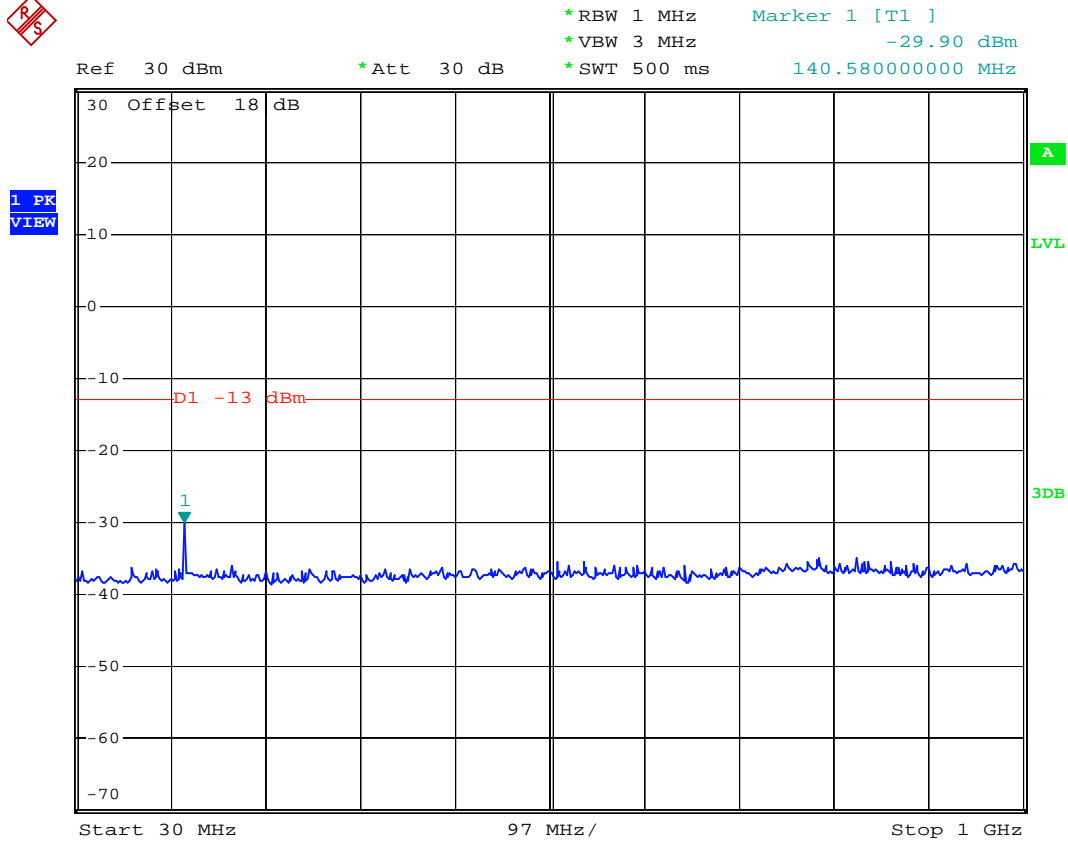
4.5.3 Test Setup Layout





4.5.4 Test Result

- Mode 1
- Test Mode : GSM1900 (GSM) CH661
- Frequency Range : 30M-1G



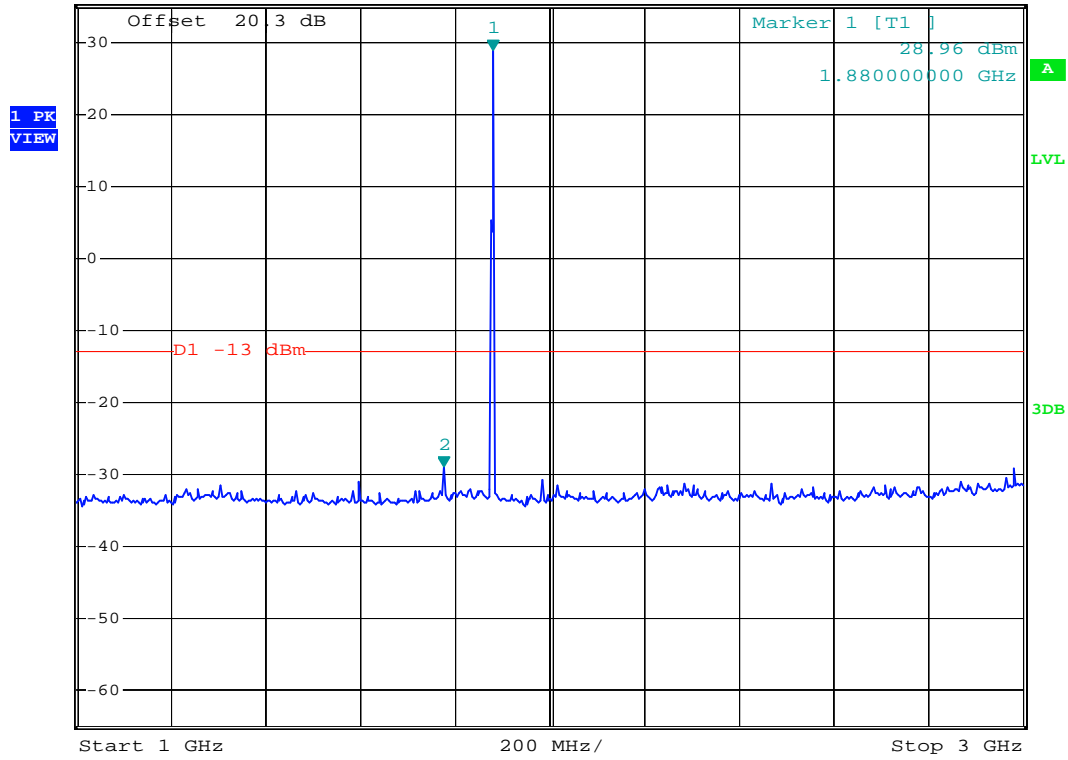
Date: 7.MAY.2008 10:23:38



- Test Mode : GSM1900 (GSM) CH661
- Frequency Range : 1G-3G



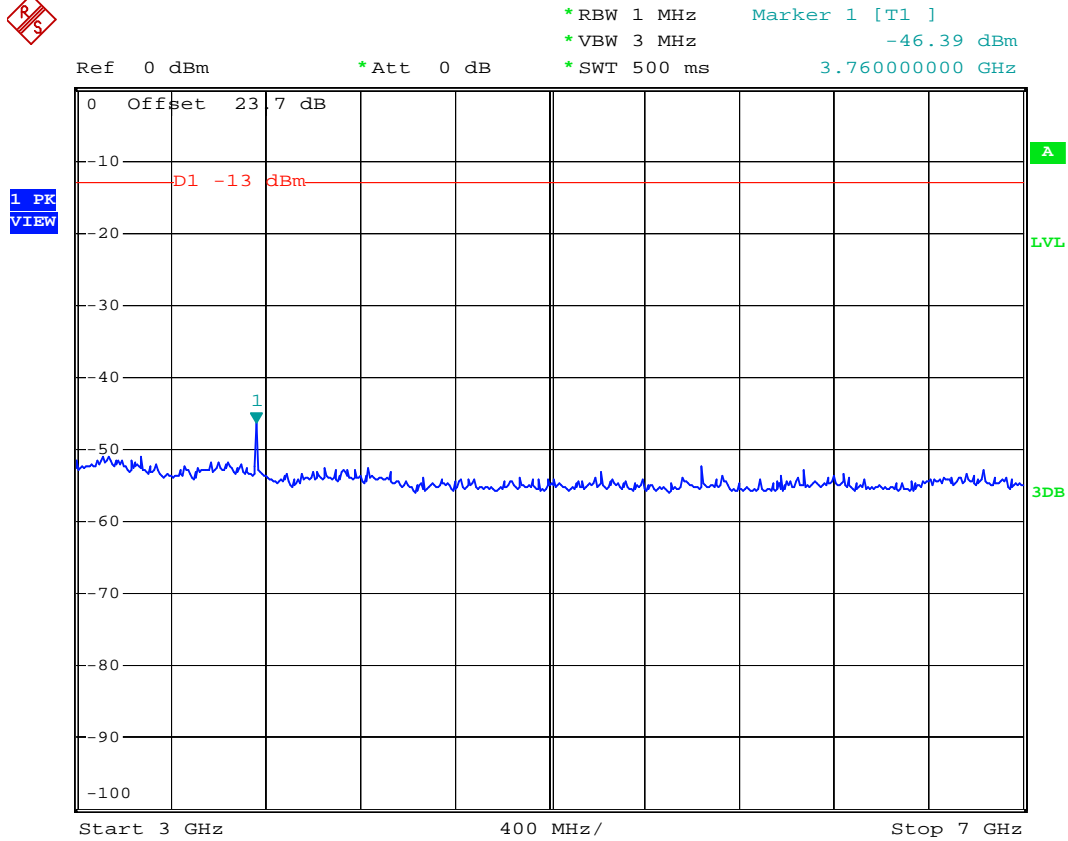
Ref 35 dBm *Att 30 dB *RBW 1 MHz Marker 2 [T1]
 *VBW 3 MHz -29.03 dBm
 *SWT 500 ms 1.776000000 GHz



Date: 7.MAY.2008 10:24:37



- Test Mode : GSM1900 (GSM) CH661
- Frequency Range : 3G-7G



Date: 7.MAY.2008 10:25:29



- Test Mode : GSM1900 (GSM) CH661
- Frequency Range : 7G-13.6G

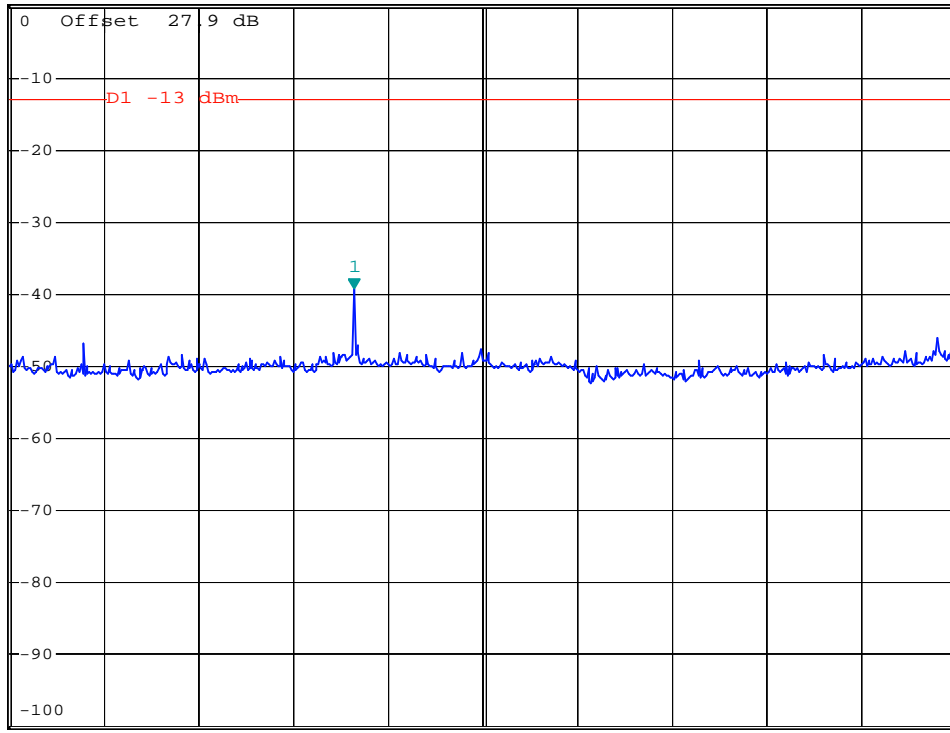


*RBW 1 MHz Marker 1 [T1]
 *VBW 3 MHz -39.23 dBm
 *SWT 500 ms 9.402400000 GHz

Ref 0 dBm

*Att 0 dB

1 PK
VIEW



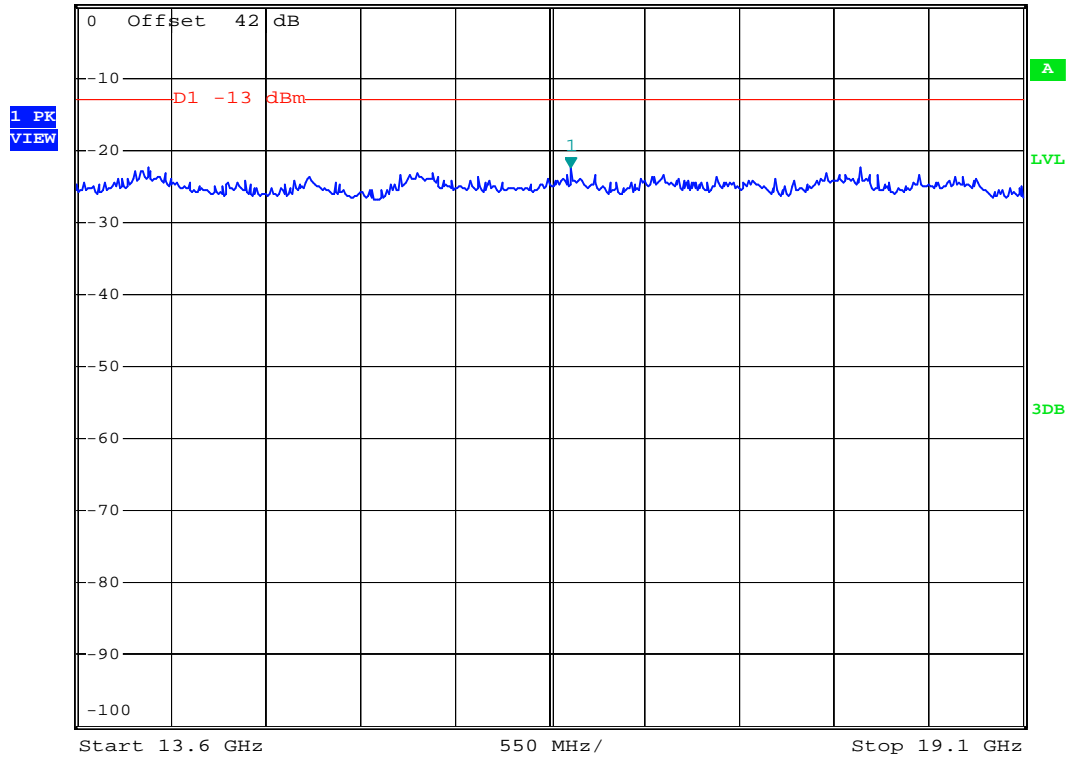
Date: 7.MAY.2008 10:26:43



- Test Mode : GSM1900 (GSM) CH661
- Frequency Range : 13.6G-19.1G



Ref 0 dBm *Att 0 dB *RBW 1 MHz Marker 1 [T1]
*VBW 3 MHz -22.34 dBm
*SWT 500 ms 16.471000000 GHz



Date: 7.MAY.2008 10:27:27



4.6 Field Strength of Spurious Radiation

Equivalent isotropic radiated Power Measurements by substitution method according to ANSI/TIA/EIA-603-C.

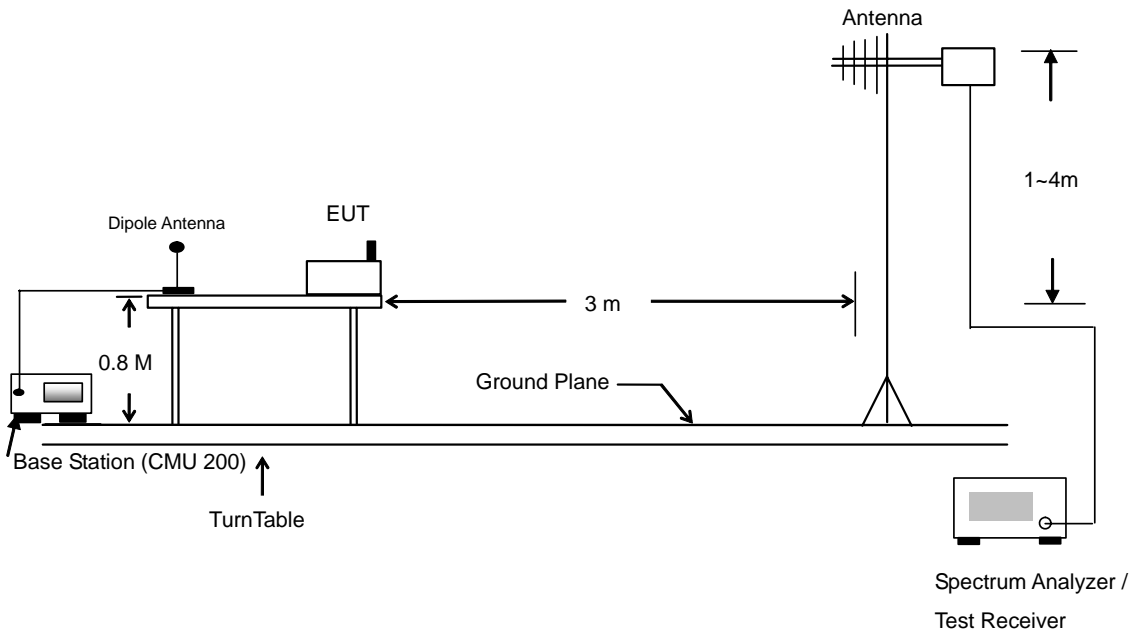
4.6.1 Measurement Instruments

As described in chapter 5 of this test report.

4.6.2 Test Procedure

- a. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
- b. The EUT was set 3 meters from the receiving antenna which was mounted on the antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest spurious emission.
- d. The height of the receiving antenna is varied between one meter and four meters to reach the maximum spurious emission for both horizontal and vertical polarizations.
- e. Taking the record of maximum spurious emission.
- f. A Horn antenna was substituted in place of the EUT and was driven by a signal generator.
- g. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
- h. Taking the recored of output power at antenna port.
- i. Repeat step 7 to step 8 for another polarization.
- j. Emission level (dBm) = output power + substitution Gain.

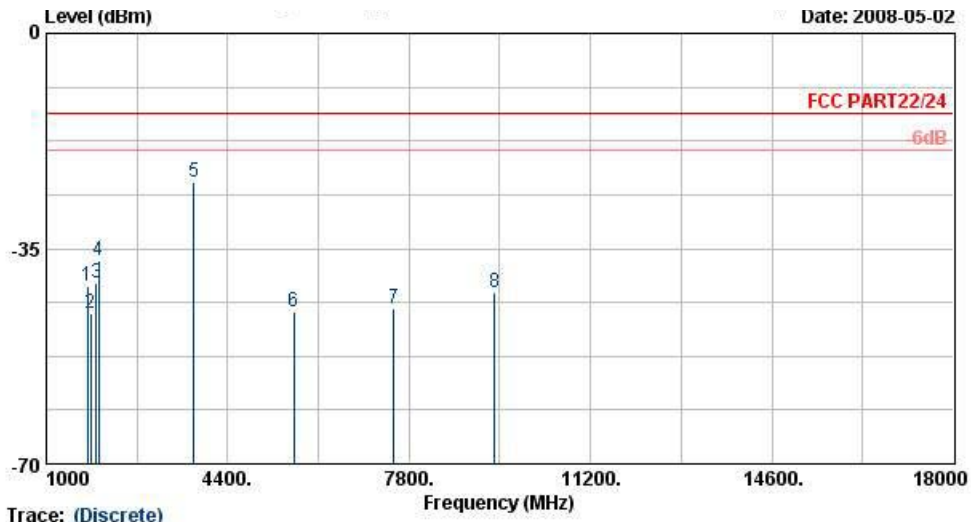
4.6.3 Test Setup Layout





4.6.4 Test Data

- Mode 1
- Horizontal Polarization



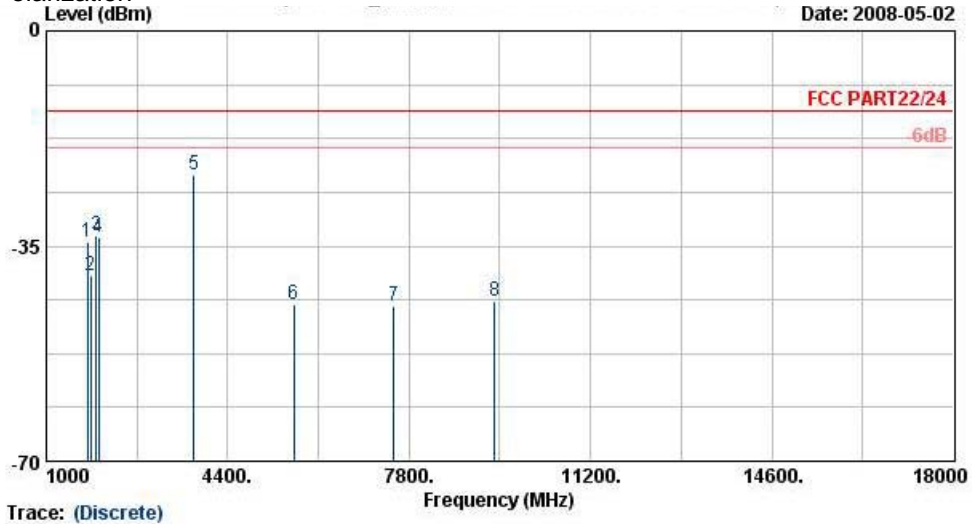
Site : 03CH07-HY
 Condition : FCC PART22/24 HF-EIRP(080306) HORIZONTAL
 EUT : Pocket PC
 Power : 120Vac/60Hz
 Model : FG 832501-01
 Mode : PCS 1900 Link Mode ; Ch661 + Adaptor
 Plane : H
 IMEI : 353236020002591

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1774	-41.14	-13	-28.14	-51.56	-41.8	3.39	4.05	H	Pass
1828	-45.54	-13	-32.54	-55.32	-46.2	3.39	4.05	H	Pass
1932	-40.49	-13	-27.49	-52.42	-40.8	3.39	3.70	H	Pass
1982	-36.99	-13	-23.99	-47.44	-37.3	3.39	3.70	H	Pass
3760	-24.33	-13	-11.33	-38.69	-27.7	4.03	7.40	H	Pass
5636	-45.36	-13	17.94	-62.71	-50.3	3.87	8.81	H	Pass
7520	-44.82	-13	16.88	-66.24	-48.7	5.83	9.71	H	Pass
9396	-42.20	-13	17.70	-64.32	-46.9	6.02	10.72	H	Pass

Remark : Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



Vertical Polarization



Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC PART22/24 HF-EIRP(080306) VERTICAL
 EUT : Pocket PC
 Power : 120Vac/60Hz
 Model : FG 832501-01
 Mode : PCS 1900 Link Mode ; Ch661 + Adaptor
 Plane : H
 IMEI : 353236020002591

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1774	-34.39	-13	-21.39	-47.78	-35.4	3.39	4.40	V	Pass
1828	-39.79	-13	-26.79	-53.75	-40.8	3.39	4.40	V	Pass
1932	-33.39	-13	-20.39	-49.25	-33.9	3.39	3.90	V	Pass
1982	-33.69	-13	-20.69	-48.62	-34.2	3.39	3.90	V	Pass
3760	-23.32	-13	-10.32	-40.14	-27.2	4.03	7.91	V	Pass
5636	-44.40	-13	18.90	-61.72	-50.3	3.87	9.77	V	Pass
7520	-44.82	-13	17.98	-67.30	-49.8	5.83	10.81	V	Pass
9396	-43.90	-13	18.50	-65.95	-49.4	6.02	11.52	V	Pass

Remark : Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

4.7 Frequency Stability (Temperature Variation)

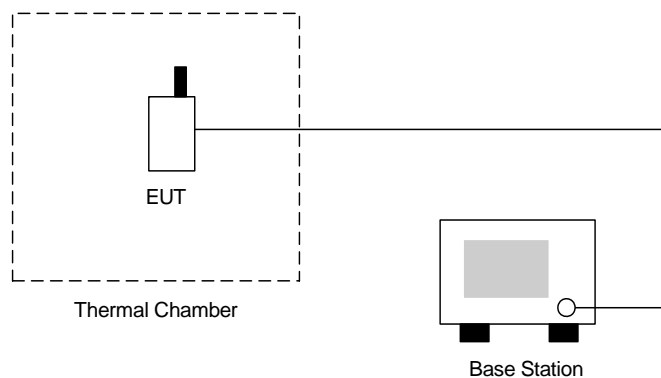
4.7.1 Measurement Instrument

As described in chapter 5 of this test report.

4.7.2 Test Procedure

- a. The EUT and test equipment were set up as shown on the following section.
- b. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
- c. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
- d. The temperature tests were performed for the worst case.
- e. Test data was recorded.

4.7.3 Test Setup Layout





4.7.4 Test Result

• Test Mode : GSM1900 (GSM) CH661

Temperature(°C)	Change (Hz)	Change (ppm)	Limit (ppm)	Result
-30	24	0.01	2.5	Passed
-20	37	0.02		
-10	33	0.02		
0	36	0.02		
10	26	0.01		
20	34	0.02		
30	32	0.02		
40	28	0.01		
50	34	0.02		

4.8 Frequency Stability (Voltage Variation)

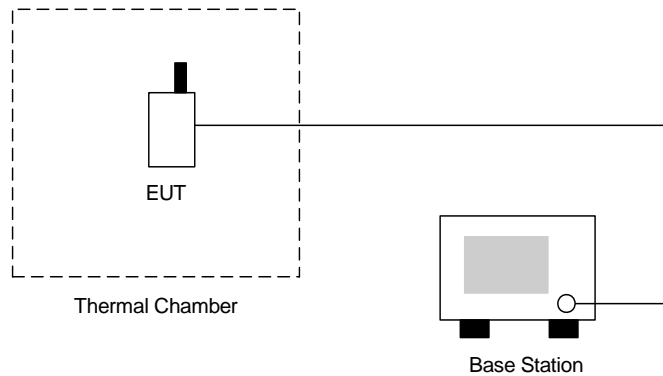
4.8.1 Measurement Instrument

As described in chapter 5 of this test report.

4.8.2 Test Procedure

- a. The EUT was placed in a temperature chamber at $25\pm 5^{\circ}\text{C}$ and connected as the following section.
- a. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
- b. The variation in frequency was measured for the worst case.

4.8.3 Test Setup Layout



4.8.4 Test Result

- Test Mode : GSM1900 (GSM) CH661

Voltage(Volt)	Change (Hz)	Change (ppm)	Limit (ppm)	Result
3.7	36.0	0.02	2.5	Passed
BEP	34.0	0.02		
4.2	29.0	0.02		

Remark:

- 1. Normal Voltage= 3.7V.
- 2. Battery End Point (BEP)= 3.2 V.



5. List of Measurement Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY44211028	9KHz-26.5GHz	Oct. 17, 2007	Oct. 16, 2008	Radiation (03CH07-HY)
EMI Test Receiver	R&S	ESCS30	100356	9KHz-2.75GHz	Jul. 26, 2007	Jul. 25, 2008	Radiation (03CH07-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Dec. 01, 2007	Nov. 30, 2008	Radiation (03CH07-HY)
Double Ridge Horn Antenna	Com-Power	AH118	071025	1G~18G	Jun. 04, 2007	Jun. 03, 2008	Radiation (03CH07-HY)
SHF-EHF Horn	SCHWARZBEC K	BBHA 9170	9170-251	14G - 40G	Oct. 17, 2007	Oct. 16, 2008	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1G - 26.5G	Nov. 22, 2007	Nov. 21, 2008	Radiation (03CH07-HY)
Pre Amplifier	EMEC	PA303	PA303-SMA-	100K~3GHz	Nov. 26, 2007	Nov. 25, 2008	Radiation (03CH07-HY)
Base Station Simulator	R & S	CMU200	103937	Third-Band	Oct. 19, 2007	Oct. 18, 2008	Radiation (03CH07-HY)
Thermal Chamber	Tenyi technology	TTH-D35P	TBN-930701	N/A	Aug. 02, 2007	Aug. 01, 2008	Conducted (TH02-HY)
Spectrum	R&S	FSP40	100055	9KHz~40GHz	Jun. 25, 2007	Jun. 24, 2008	Conducted (TH02-HY)
Bluetooth Test	ANRITSU	MT8852A	6K00003939	N/A	N/A	N/A	Conducted (TH02-HY)
Power Divider	ARRA	5200-1	3871	N/A	Oct. 01, 2007	Sep. 30, 2008	Conducted (TH02-HY)
DC Power Supply	TOPWARD	3303D	740889	N/A	May 25, 2007	May 24, 2009	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Feb. 21, 2008	Feb. 20, 2009	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	N/A	Feb. 21, 2008	Feb. 20, 2009	Conducted (TH02-HY)

6. Uncertainty Evaluation

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.41	Normal(k=2)	0.21
Antenna factor calibration	0.83	Normal(k=2)	0.42
Cable loss calibration	0.25	Normal(k=2)	0.13
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14
RCV/SPA specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site imperfection	1.43	Rectangular	0.83
Mismatch	+0.39/-0.41	U-shaped	0.28
Combined standard uncertainty Uc(y)	1.27		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	2.54		

Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of x_i		$u(x_i)$	C_i	$C_i * u(x_i)$
	dB	Probability Distribution			
Receiver reading	±0.10	Normal(k=1)	0.10	1	0.10
Antenna factor calibration	±1.70	Normal(k=2)	0.85	1	0.85
Cable loss calibration	±0.50	Normal(k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20 \log(1 - \Gamma_1 * \Gamma_2 * \Gamma_3)$	+0.34/-0.35	U-shaped	0.244	1	0.244
Combined standard uncertainty Uc(y)	2.36				
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	4.72				

END OF TEST REPORT



Appendix A. Photographs of EUT

Please refer to Sporton report number EP832501-01 as below.