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**TEST REPORT**

In support of the Application for Grant of Equipment Authorisation of the  
BENQ W10 1900MHz Module  
FCC ID: JVP56W10

Report Number RO611122 Issue 2

December 2003

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**Equipment:** Wireless LAN PC Card

**FCC ID:** JVP56W10

**Report Number:** RO611122 Issue 2  
Issue 2 has been produced to correct errors in the original test report due to the incorrect transcription of test results into the final report.

**Specification:** 47 CFR 2 & 47 CFR 24

**Applicant:** BENQ Corporation  
157 Shan-Ying Road  
Gueishan  
Taoyuan 333, Taiwan, ROC

**Manufacturer:** As above

**Manufacturer's Representative:** Mr James Soong

**Approved by:**   
**M JENKINS**  
Wireless Group Leader

**Dated:** 19<sup>th</sup> December 2003

**Start of Test:** 1<sup>st</sup> July 2003

**Completion of Test:** 10<sup>th</sup> July 2003

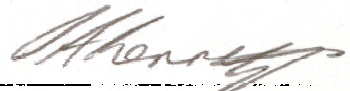
**Report Distribution:**

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ENGINEERING STATEMENT

**I ATTEST:** the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the applicable limits. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 2, Part 15 and Part 24 of the FCC Rules under normal use and maintenance.



  
Simon Bennett  
Test Manager



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### Introduction

The information contained within this report is intended to show verification of compliance of the BENQ 1900MHz WLAN PC Card to the requirements of 47 CFR 2 and 47 CFR 24.

The BENQ 1900MHz WLAN PC Card operates from a 5 V DC power supply and is Power Class 1, operating with a maximum output power of 1 watt.

### Location Of Testing

All testing was conducted at the premises of BABT, Segensworth Road, Fareham, Hants, PO15 5RH. Testing at BABT was carried out by BABT Personnel, S Bennett and A Guy, Test Engineers. Radiated Emissions measurements were performed in a 3 metre semi-anechoic screened room. A complete room description is on file with the FCC Laboratory Division, Registration Number: 90987.

### Test Equipment and Ancillaries Used For Test

| No | Instrument/Ancillary                    | Type                 | Manufacturer     | Serial No.           | Cal Due  |
|----|---|----------------------|------------------|----------------------|----------|
| 1  | Thermohygraph                           | 1-1000               | Rotronic         | 182615               | 2/10/03  |
| 2  | Digital Multimeter                      | 8050A                | Fluke            | 494008               | 29/4/04  |
| 3  | Power Supply                            | 6253A                | Hewlett Packard  | 2412A065579          | T/U      |
| 4  | Universal Radio Communications Analyser | CMU200               | Rohde & Schwarz  | 833810/015           | 17/6/04  |
| 5  | Spectrum Analyser                       | FSEM                 | Rohde & Schwarz  | 827285/006           |          |
| 6  | Attenuator                              | 6810.17.B            | Huber and Suhner | 5929                 | 10/7/03  |
| 7  | Combiner                                | 1506A                | Weinschel        | AC4911               | T/U      |
| 8  | Signal Generator                        | ESG4000A             | Hewlett Packard  | GB37040125           | 21/1/04  |
| 9  | Signal Generator                        | 8673B                | Hewlett Packard  | 2823A01302           | 14/6/03  |
| 10 | High Pass Filter                        | F-100-4000-5-R       | RLC              | 0012                 | T/U      |
| 11 | Climatic Chamber                        | VM 04/100            | Heraeus Votsch   | BLD8                 | T/U      |
| 12 | Digital Thermometer                     | 51                   | Fluke            | 73860035             | 24/2/04  |
| 13 | Thermohygraph                           | 1-1000               | Rotronic         | 1826 14              | 7/4/04   |
| 14 | EMI Receiver                            | 8542E                | Hewlett Packard  | 3617A00165_00<br>154 | 12/11/03 |
| 15 | Bilog Antenna                           | CBL 6143             | Chase            | -                    | 11/4/04  |
| 16 | Turntable & Controller                  | HD 020               | HD Gmbh          | 050/396              | -        |
| 17 | Antenna Mast                            | 2070                 | EMCO             | -                    | -        |
| 18 | Antenna Mast Controller                 | 2090                 | EMCO             | -                    | -        |
| 19 | Screened Room 5                         | EAC54300             | Siemens          | -                    | 18/09/99 |
| 20 | Low Noise Amplifier (1-8GHz)            | AMF-3D-001080-18-13P | Miteq            | UNK                  | -        |
| 21 | Low Noise Amplifier (8-18GHz)           | AMF-4E-080180-15-10P | Miteq            | 492562               | -        |
| 22 | Spectrum Analyser                       | ESIB40               | Rhode & Schwarz  | 100142/240           | 4/2/04   |



| No | Instrument/Ancillary | Type          | Manufacturer      | Serial No.  | Cal Due  |
|----|----------------------|---------------|-------------------|-------------|----------|
| 23 | Horn                 | 3115          | EMCO              | 96964848    | 04/07/04 |
| 24 | Horn                 | 3115          | EMCO              | 97015079    | 04/07/04 |
| 25 | Signal Generator     | 8672A         | Hewlett Packard   | 2016a01097  | 26/02/04 |
| 26 | Amp 8-180 GHz        | AWT18036      | Avantek           | F13365 8452 | 26/6/04  |
| 27 | Antenna              | AM180HA-K-TU2 | Link Microtek Ltd | 2007        | 15/8/04  |
| 28 | Test Equipment       | CMU200        | Rohde & Schwarz   | 833810/015  | 17/6/04  |
| 29 | Amp (18-26GHz)       | AMT 26177-33  | Aventek           | -           | -        |

Note(s)

- 1) All items are calibrated annually, except where labelled T/U (Traceability Unscheduled). These items are calibrated within the test configurations using calibrated equipment.
- 2) Throughout the test report the test equipment used for each test is referenced using the number indicated in the table above.



Description of Equipment Under Test Configuration

The equipment under test is made up of the following component parts.

| <u>Module</u> | <u>Vendor</u> | <u>Kit Number</u> | <u>IMEI Number</u> |
|---------------|---------------|-------------------|--------------------|
| GSM 1900      | BENQ          | W10               | 55453486575840/0   |

TABLE 1

List of Performed Measurements using the configuration in Table 1

- i) Power Output
- ii) Modulation Characteristics
- iii) Occupied Bandwidth
- iv) Band Edge Measurements
- v) Frequency Stability –  
Temperature Variations
- vi) Frequency Stability –  
Voltage Variations

| <u>Module</u> | <u>Vendor</u> | <u>Kit Number</u> | <u>IMEI Number</u> |
|---------------|---------------|-------------------|--------------------|
| GSM 1900      | BENQ          | W10               | 55453486575840/1   |

TABLE 2

List of Performed Measurements using the configuration in Table 2

- i) Radiated Emissions
- vi) Conducted Emissions



Test Case : Radiated Emissions  
 Test Date : 4<sup>th</sup> July 2003  
 Rule Parts : 24.238

#### Measurement Method

A preliminary profile of the Radiated Electric Field Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 20GHz. The list of worst case emissions was then confirmed or updated. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured. The details of the worst case emissions were then recorded in the Job Log Book. Details of the worst case emissions are presented on page 7.

Radiated Electric Field Emissions measurements were made using a Hewlett Packard 8542E EMI Receiver in the frequency range 30MHz to 1000MHz and an Agilent E4407B Spectrum Analyser in the frequency range 1GHz to 20GHz. Measurements in the range 30MHz to 1000MHz were made using a Peak Detector in a 120kHz bandwidth and measurements above 1GHz were made using a Peak Detector in a 1MHz bandwidth.

#### Limit Calculation

In order to determine the Radiated Emission Limits, measurements of transmitter power (P) were first carried out on the top, middle and bottom channels as shown on page 10.

The limit for spurious emissions in accordance with FCC 47CFR 24.238(a) is  $43 + 10\log(P)$  down on the carrier where P is the power in Watts.

Field Strength at 1850.2MHz = 120.9 dB $\mu$ V/m  
 EIRP at 1850.2MHz = 0.269W

Therefore the limit is  $120.9 - (43 + 10\log(0.269)) = 120.9 - 37.3 = 83.6$  dB $\mu$ V/m

Field Strength at 1880.0MHz = 121.9dB $\mu$ V/m  
 EIRP at 1880.0MHz = 0.324W

Therefore the limit is  $121.9 - (43 + 10\log(0.324)) = 121.9 - 38.1 = 83.8$  dB $\mu$ V/m

Field Strength at 1909.8MHz = 120.6 dB $\mu$ V/m  
 EIRP at 1909.8MHz = 0.309W

Therefore the limit is  $120.6 - (43 + 10\log(0.309)) = 120.6 - 37.9 = 82.7$  dB $\mu$ V/m







Test Case : RF Output Power (Conducted)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1046, 24.232

Measurement Method

Using a spectrum analyser and attenuator(s), the output power of the EUT was measured at the antenna terminals. The EUT supports both GSM and GPRS. The device is a class 10 module. The carrier was modulated by it's normal GMSK modulation and measurements performed with TS3 active.

The spectrum analyser RBW and VBW were set to 1MHz and the path loss measured and entered as a reference level offset.

Results

Maximum Power - GSM

| Frequency (MHz) | Output Power (dBm) | Path Loss (dB) | Result (dBm) | Result (W) |
|-----------------|--------------------|----------------|--------------|------------|
| 1850.2          | 8.51               | 21.0           | 29.51        | 0.893      |
| 1880.0          | 8.94               | 20.4           | 29.34        | 0.859      |
| 1909.8          | 8.84               | 20.7           | 29.54        | 0.899      |

Minimum Power- GSM

| Frequency (MHz) | Output Power (dBm) | Path Loss (dB) | Result (dBm) | Result (mW) |
|-----------------|--------------------|----------------|--------------|-------------|
| 1850.2          | -20.0              | 21.0           | 1.00         | 1.259       |
| 1880.0          | -19.57             | 20.4           | 0.83         | 1.211       |
| 1909.8          | -19.88             | 20.7           | 0.82         | 1.208       |

|       |                |
|-------|----------------|
| Limit | <2W or <+33dBm |
|-------|----------------|

Remarks

EUT complies with CFR 47 2.1046 and 24.232(b). The EUT does not exceed 2W or +33dBm at the measured frequencies.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : RF Output Power (Conducted) - continued  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1046, 24.232

Maximum Power - GPRS

| Frequency (MHz) | Output Power (dBm) | Path Loss (dB) | Result (dBm) | Result (W) |
|-----------------|--------------------|----------------|--------------|------------|
| 1850.2          | 8.66               | 21.0           | 29.66        | 0.925      |
| 1880.0          | 9.01               | 20.4           | 29.41        | 0.873      |
| 1909.8          | 8.91               | 20.7           | 29.61        | 0.914      |

Minimum Power- GPRS

| Frequency (MHz) | Output Power (dBm) | Path Loss (dB) | Result (dBm) | Result (mW) |
|-----------------|--------------------|----------------|--------------|-------------|
| 1850.2          | -20.22             | 21.0           | 0.78         | 1.197       |
| 1880.0          | -19.82             | 20.4           | 0.58         | 1.143       |
| 1909.8          | -20.48             | 20.7           | 0.22         | 1.052       |

|       |                |
|-------|----------------|
| Limit | <2W or <+33dBm |
|-------|----------------|

Remarks

EUT complies with CFR 47 2.1046 and 24.232(b). The EUT does not exceed 2W or +33dBm at the measured frequencies.

Test Equipment Used:  
 1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : RF Output Power (Radiated)  
 Test Date : 4<sup>th</sup> July 2003  
 Rule Parts : 2.1046, 24.232

Measurement Method

Test Performed in accordance with ANSI C63.4.

The Spectrum Analyser was tuned to the test frequency. The device was put into Transmit mode then rotated through 360 degrees until the highest power level was observed in both horizontal and vertical polarisation. The device was then replaced with a substitution antenna, who's input signal the antenna was adjusted until the received level matched that of the previously detected emission.

Results

The EUT met the requirements of FCC CFR 47: Part 24, Section 24.232(b) for Effective Radiated Power.

| Frequency (MHz) | Raw Result (dBm) | Substitution Level(dBm) | Substitution Antenna Gain (dB) | Cable Loss (dB) | Result EIRP (dBm) | Result EIRP (W) |
|-----------------|------------------|-------------------------|--------------------------------|-----------------|-------------------|-----------------|
| 1850.2          | -17.5            | +21.0                   | 7.3                            | 4.0             | +24.3             | 0.269           |
| 1880.0          | -16.7            | +21.5                   | 7.5                            | 3.9             | +25.1             | 0.324           |
| 1909.8          | -17.8            | +21.0                   | 7.7                            | 3.8             | +24.9             | 0.309           |

|       |                |
|-------|----------------|
| Limit | <2W or <+33dBm |
|-------|----------------|

Test Equipment Used:  
 16, 17, 18, 19, 20, 22, 23, 24, 25, 28  
 .....



Test Case: Modulation Characteristics

Test Date: 14<sup>th</sup> May 2003

Rule Parts: 2.1047(d)

#### Description Of Modulation Technique

The system is designed to meet the PCS requirements as defined in the 3GPP specifications: 3GPP TS 05:01, TS 05:02 and TS 05:04 are the most relevant. To summarise the system uses time division multiplexed access (TDMA) to separate eight users on a channel and frequency multiplexing for the up and down links.

There are 299 channels on a 200kHz raster. The frequency band 1930~1990MHz is allocated to the downlink and 1850~1910MHz to the uplink. The duplex frequency is 80MHz and the up and down link is offset in time by three TDMA slots.

The bit rate is 13MHz/48 ( $\approx 270.833\text{kHz}$ ). There are 1250 bits in a frame that contains the eight slots; one of which is allocated to each user. Therefore each slot is 156.25 bits in length and lasts  $\approx 577\mu\text{s}$ . To allow control information to be interleaved amongst the user data there is a larger data unit comprising 26 frames called a multiframe. The existence of the multiframe and the associated timing allows extra protection against data corruption by interleaving frames.

The modulation described by TS 05:04 is a differentially encoded scheme where the data are represented by phase shifts of  $\pm\pi/2$  over a bit period. The modulation scheme implemented is Gaussian filtered minimum shift keying (GMSK). Minimum shift keying is a special case of frequency shift keying (FSK) with a modulation index of  $h = 0.5$ . FSK is a binary modulation scheme with each of the two logical states represented by a different offset from the nominal carrier frequency.

From the well known equation

$$h = 2 * F_p * T_b$$

where  $h$  is the modulation index,  $F_p$  is the peak frequency deviation and  $T_b$  is the bit period the peak frequency deviation is shown to be  $\approx \pm 67.7\text{kHz}$ .

Minimum shift keying has a relatively wide frequency spectrum. To improve spectral efficiency Gaussian filtering is applied to modulation source resulting in a sinusoidal, rather than instantaneous, transition between the two offset frequencies determined by the modulation data and, therefore, a reduced signal bandwidth. The 3dB bandwidth of the Gaussian filter is 81.25kHz.

A complete description of the modulation and filtering is attached in the following annex.



## Annex to Description of Modulation Characteristics

The differentially encoded modulating data values  $\alpha_i$  ( $\alpha_i \in \{-1, +1\}$ ) as represented by Dirac pulses excite a linear filter with impulse response at time  $t$  defined by:

$$g(t) = h(t) * \text{rect}\left(\frac{t}{T}\right)$$

where  $T$  is the bit period and the function  $\text{rect}(x)$  is defined by:

$$\text{rect}\left(\frac{t}{T}\right) = \frac{1}{T} \quad \text{for } |t| < \frac{T}{2}$$

$$\text{rect}\left(\frac{t}{T}\right) = 0 \quad \text{otherwise}$$

and  $*$  means convolution.  $h(t)$  is defined by:

$$h(t) = \frac{\exp\left(\frac{-t^2}{2\delta^2 T^2}\right)}{\sqrt{(2\pi)} \cdot \delta T}$$

where  $\delta = \frac{\sqrt{\ln(2)}}{2\pi BT}$  and  $BT = 0.3$

where  $B$  is the 3 dB bandwidth of the filter with impulse response  $h(t)$ .

The phase of the modulated signal is:

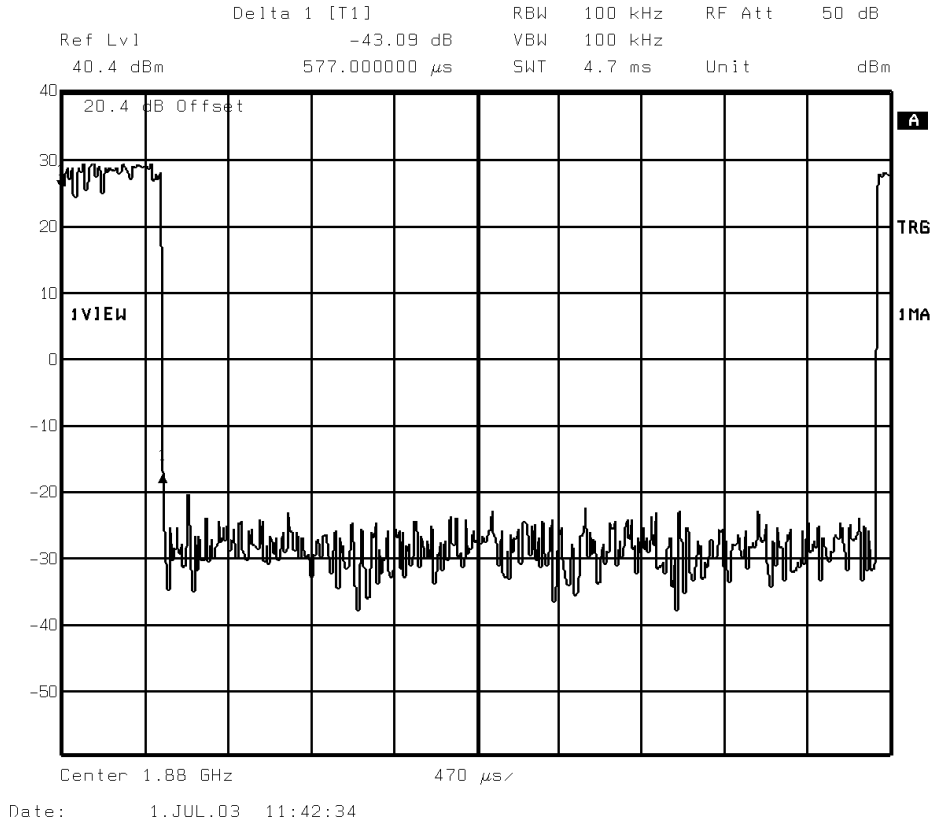
$$\varphi(t') = \sum_i \alpha_i \pi h \int_{-\infty}^{t'-iT} g(u) du$$

where the modulating index  $h$  is  $1/2$  (maximum phase change in radians is  $\pi/2$  per data interval). The time reference  $t' = 0$  is the start of the slot.

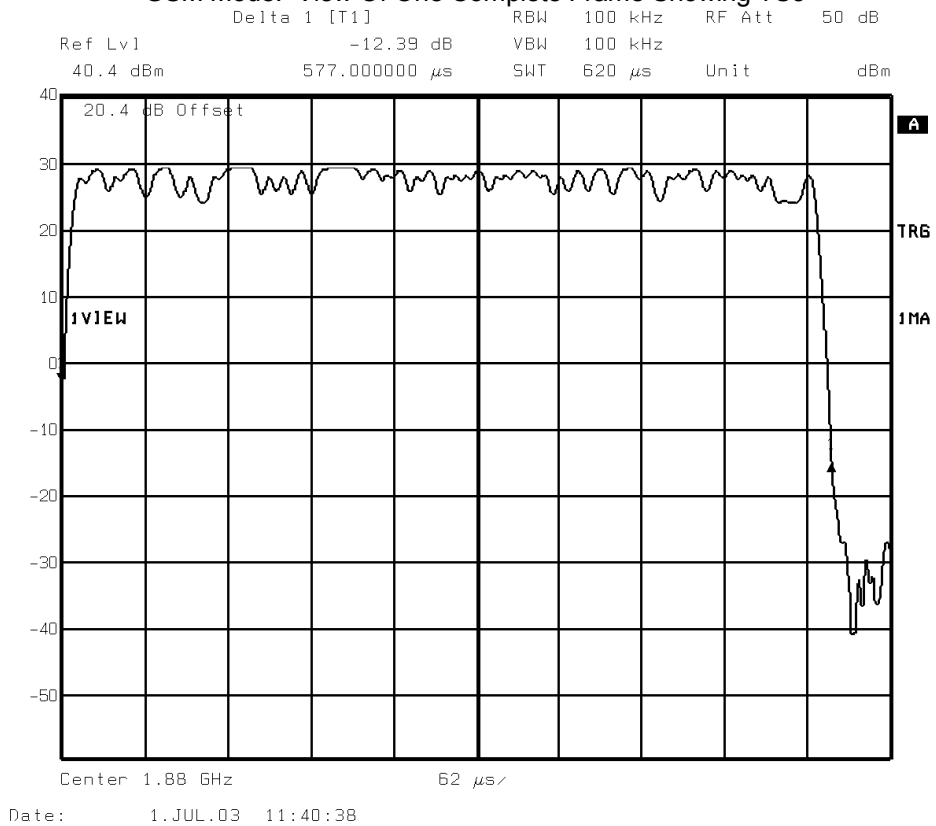
The modulated RF carrier is expressed as:

$$x(t') = \sqrt{\frac{2E_c}{T}} \cdot \cos(2\pi f_0 t' + \varphi(t') + \varphi_0)$$

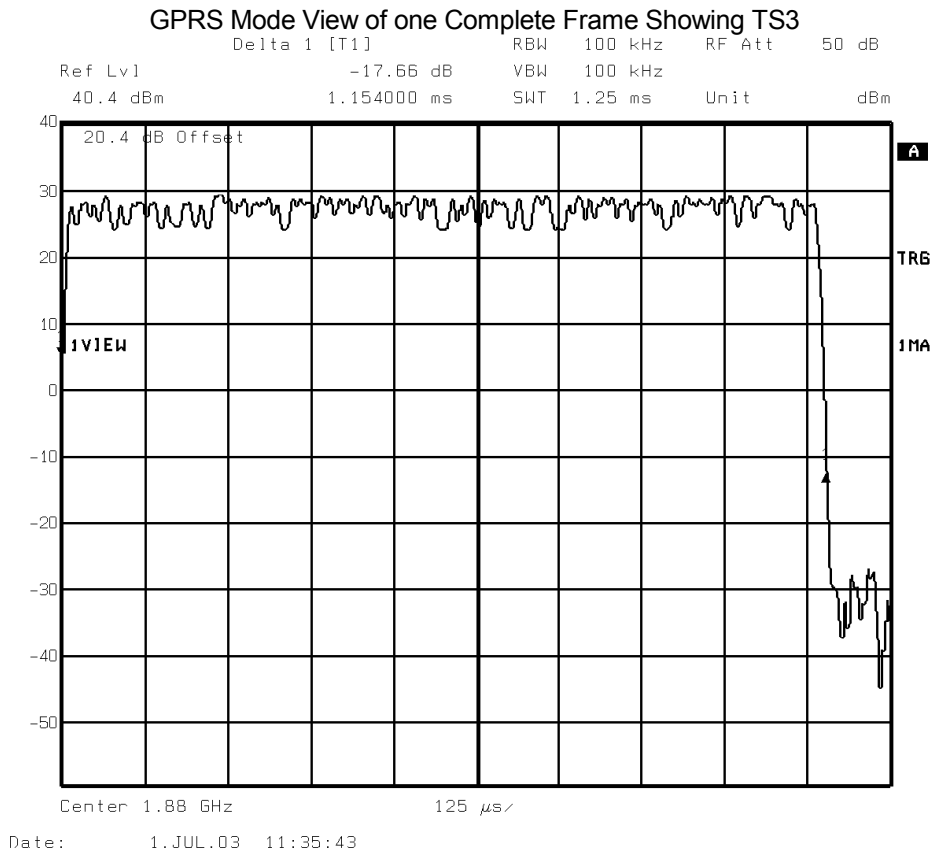
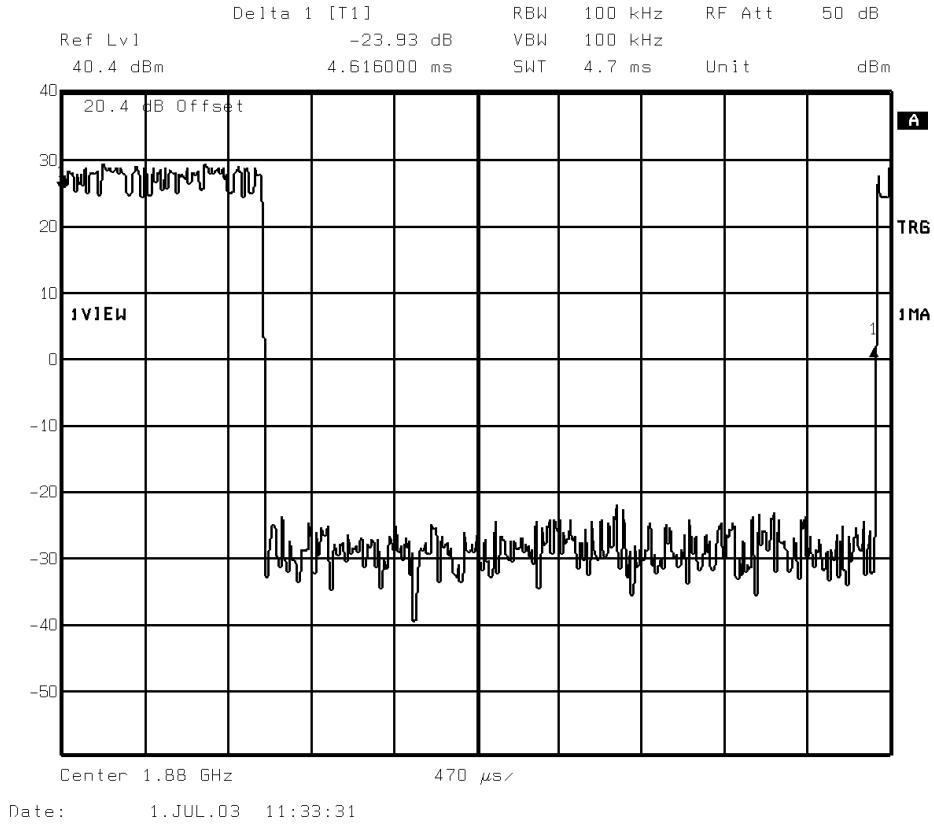
where  $E_c$  is the energy per modulating bit,  $f_0$  is the centre frequency and  $\varphi_0$  is a random phase and is constant during one burst



GSM Mode. View Of One Complete Frame Showing TS3



GSM Mode. View of TS3.



GPRS Mode View of TS3



Test Case : Occupied Bandwidth  
Test Date : 1<sup>st</sup> July 2003  
Rule Parts : 2.1049, 24.238(b)

Measurement Method

GSM

The EUT was set to transmit on maximum power and measurements were made on Timeslot 3.

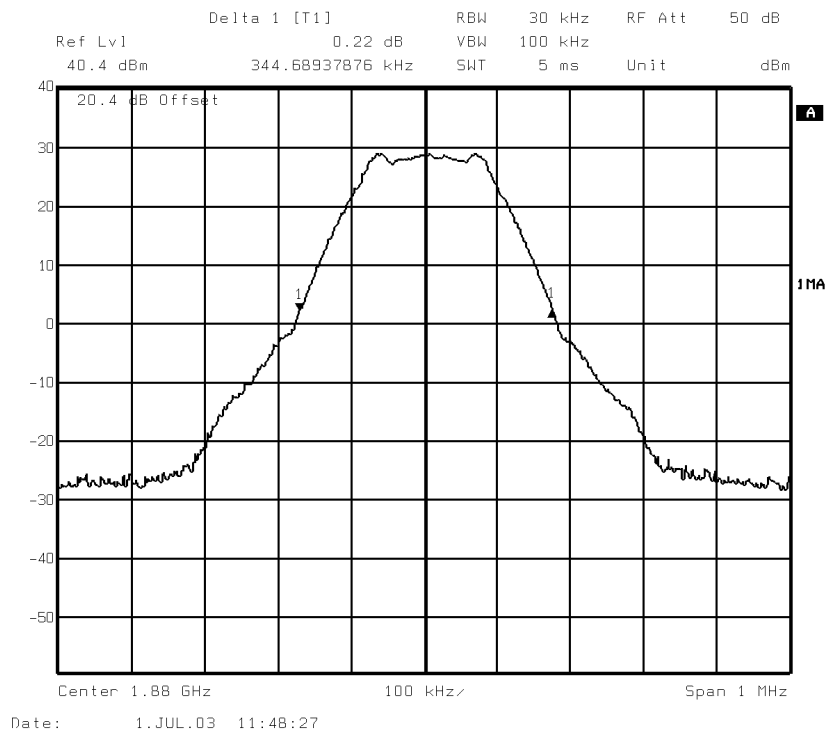
GPRS

The EUT was set to transmit on maximum power, (timeslots 3 and 4 active), and measurements were performed on Timeslot 3.

Using a resolution bandwidth of 30kHz and a video bandwidth of 100kHz, the -26dBc points were established and the emission bandwidth determined.

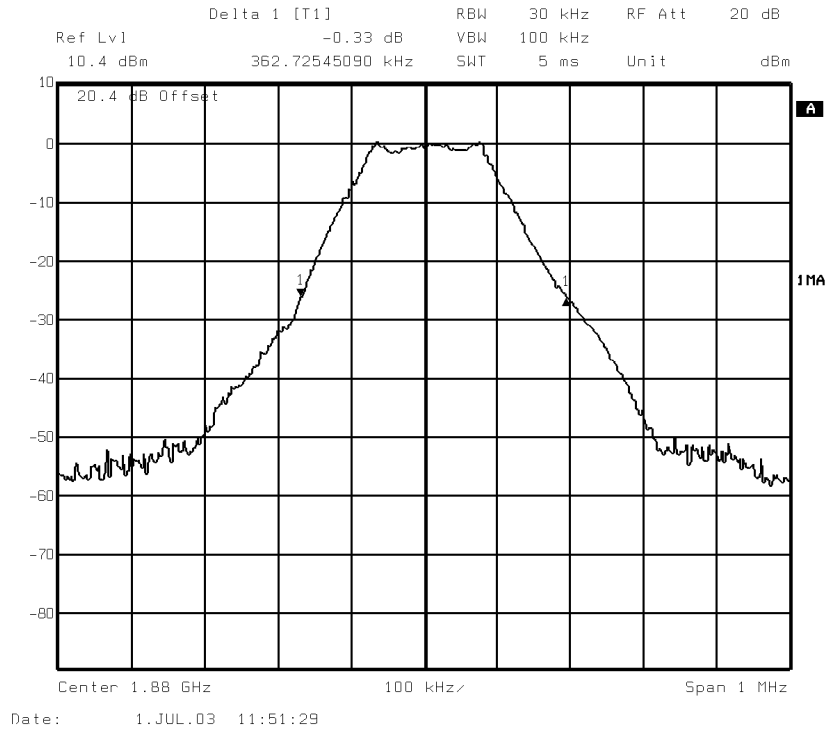
The plots below show the resultant display from the Spectrum Analyser.

Occupied Bandwidth As Defined By The - 26dBc Points

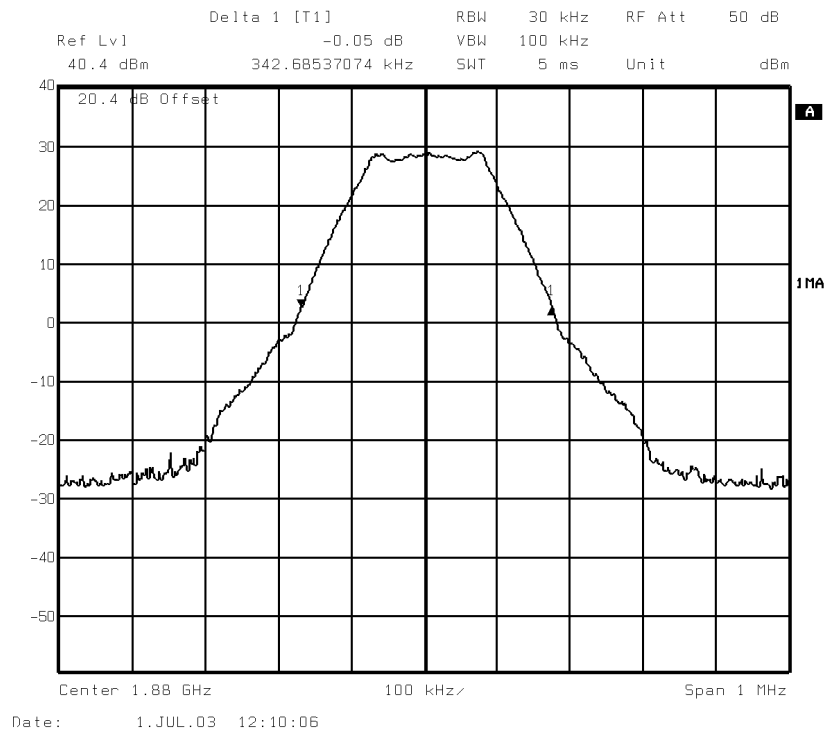


Maximum Power – Circuit Switched (GSM)

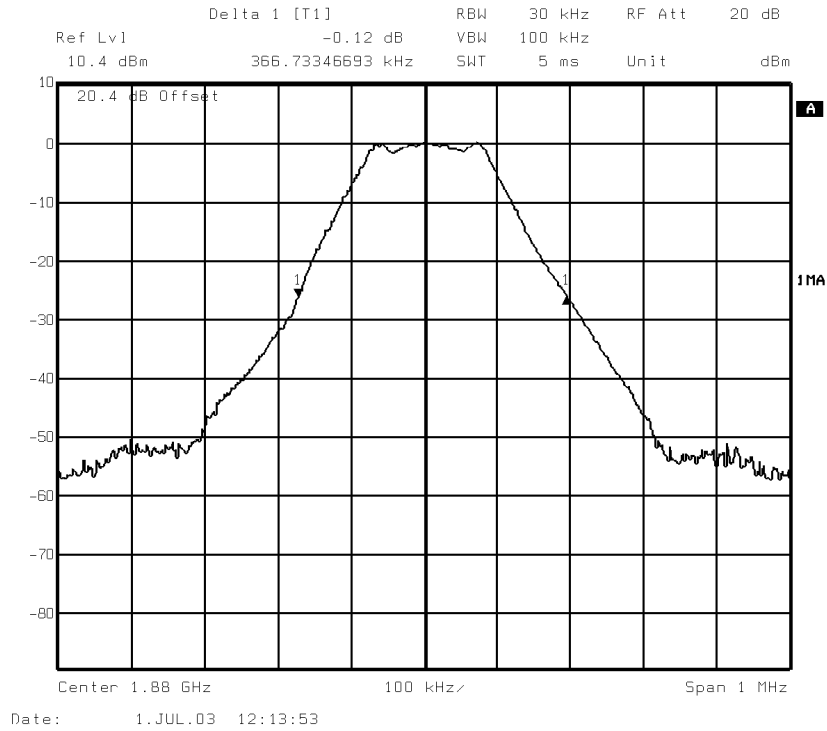




Minimum Power – Circuit Switched (GSM)



Maximum Power – Packet Data, (GPRS)



Minimum Power – Packet Data, (GPRS)

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case: Spurious Emissions At Antenna Terminals (+/-1MHz)

Test Date : 1<sup>st</sup> July 2003

Rule Parts : 2.1049, 24.238(b)

#### Measurement Method

In accordance with Part 24.238, at least 1% of the 26dB bandwidth was used for the resolution and video bandwidths up to 1MHz away from the Block Edge. At greater than 1MHz, the resolution and video bandwidths were increased to 1MHz.

The reference power and path losses of all channels used for testing in each frequency block were measured. It was found that there was <0.6dB variation in all channels, thus the worst case reference level offset was used throughout. Having entered the reference level offset, the limit line was displayed, showing the -13dBm, (43+10logP), limit.

The EUT was tested in GSM and GPRS modes of operation.

Below are the Frequency Blocks the EUT was tested against along with the tested channels.

| Frequency Block (MHz) | Lower Block Edge Test Channels/Frequencies | Upper Block Edge Test Channels/Frequencies |
|-----------------------|--|--|
| A                     | Channel : 513<br>Frequency : 1850.4 MHz    | Channel : 584<br>Frequency : 1864.6 MHz    |
| B                     | Channel : 613<br>Frequency : 1870.4 MHz    | Channel : 684<br>Frequency : 1884.6 MHz    |
| C                     | Channel : 738<br>Frequency : 1895.4 MHz    | Channel : 809<br>Frequency : 1909.6 MHz    |
| D                     | Channel : 588<br>Frequency : 1865.4 MHz    | Channel : 609<br>Frequency : 1869.6 MHz    |
| E                     | Channel : 688<br>Frequency : 1885.4 MHz    | Channel : 709<br>Frequency : 1889.6 MHz    |
| F                     | Channel : 713<br>Frequency : 1890.4 MHz    | Channel : 734<br>Frequency : 1894.6 MHz    |

#### Remarks

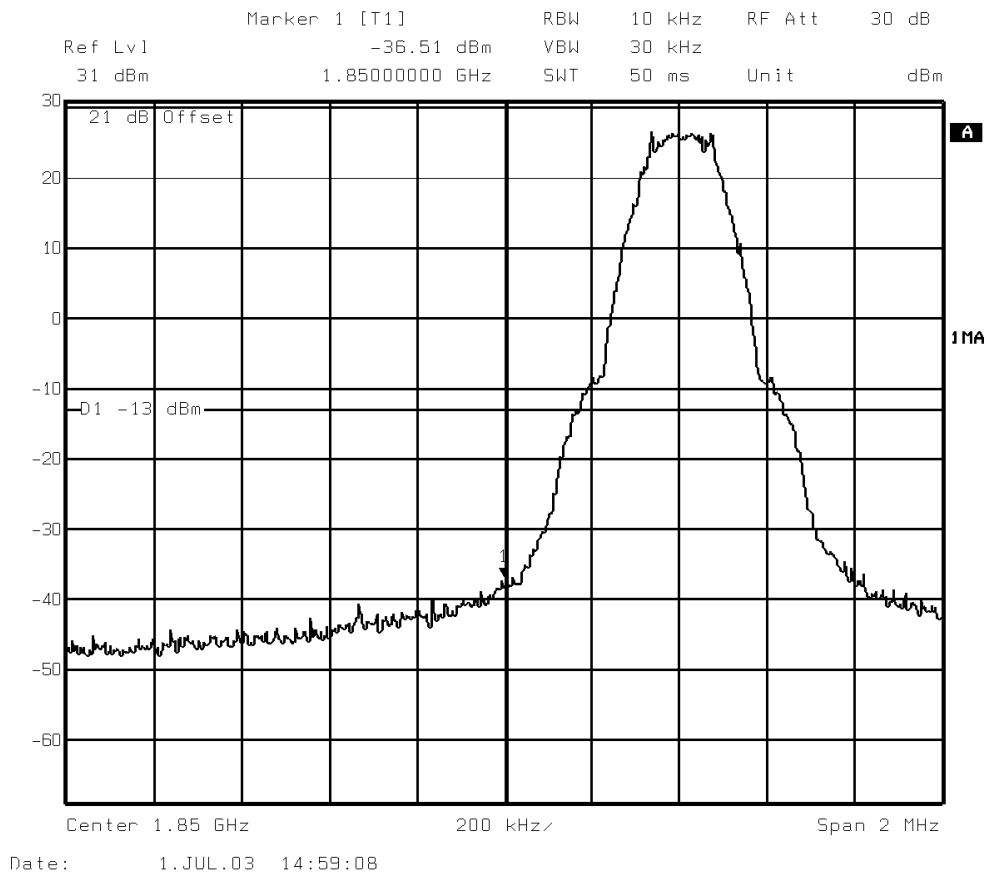
The measurement plots are shown on the following pages.



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 513, (1850.4MHz)

Block A



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

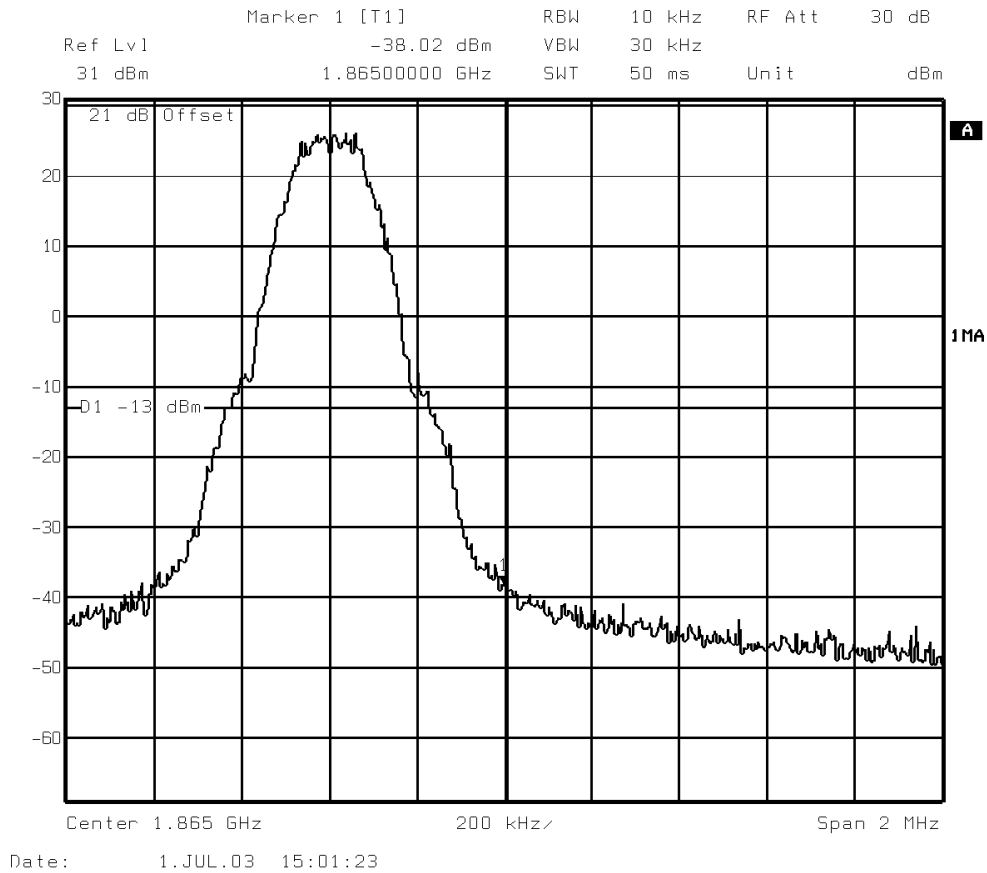
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Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 584, (1864.6MHz)

Block A



GSM – Circuit Switched

Remarks

All emissions are below -13 dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

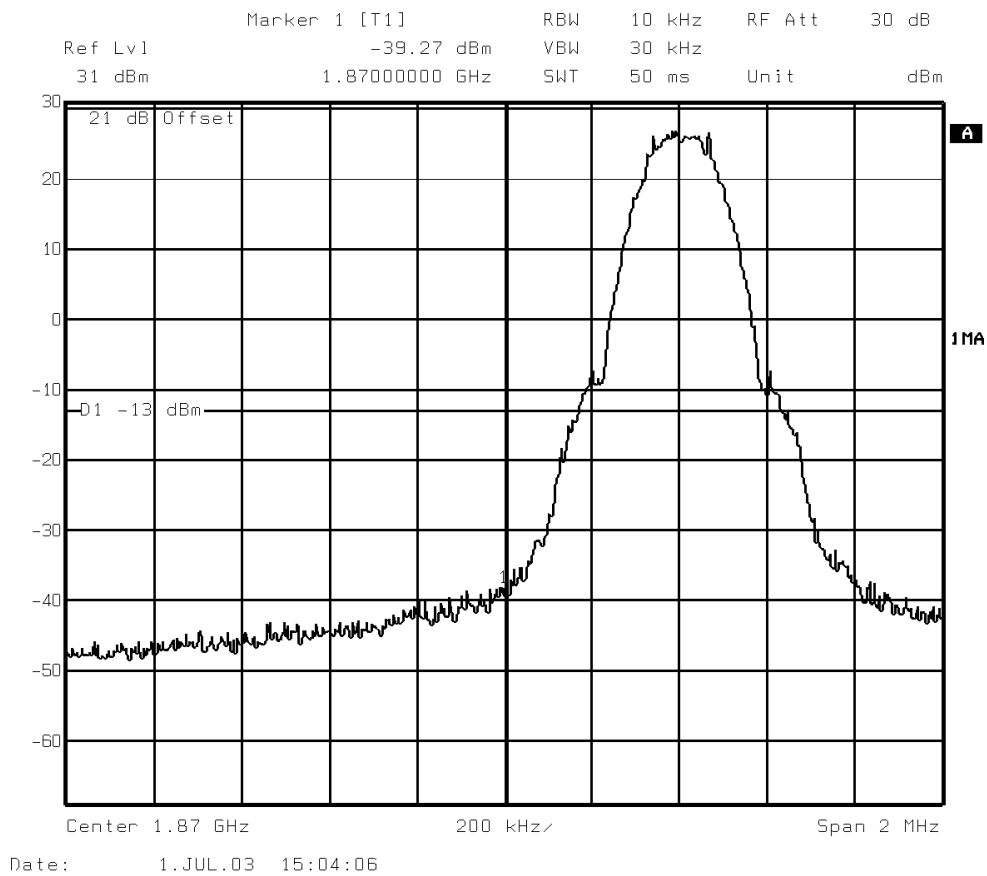
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Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 613, (1870.4MHz)

Block B



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

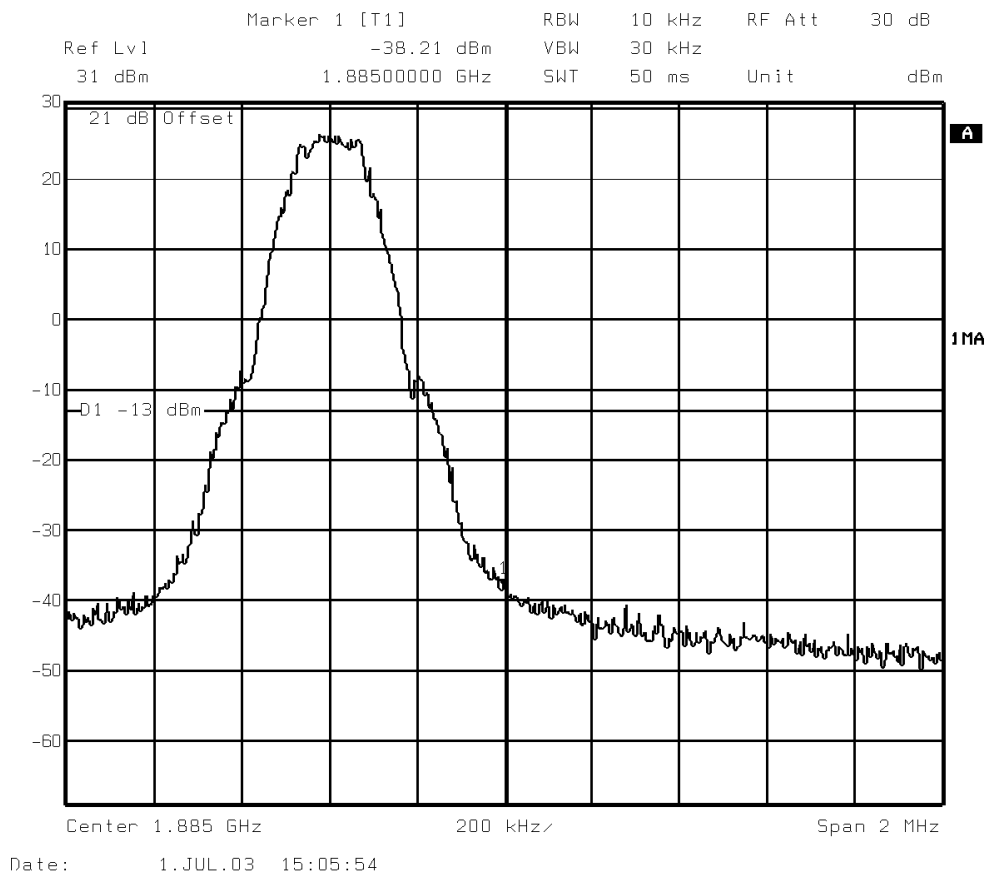
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Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 684, (1884.6MHz)

Block B



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

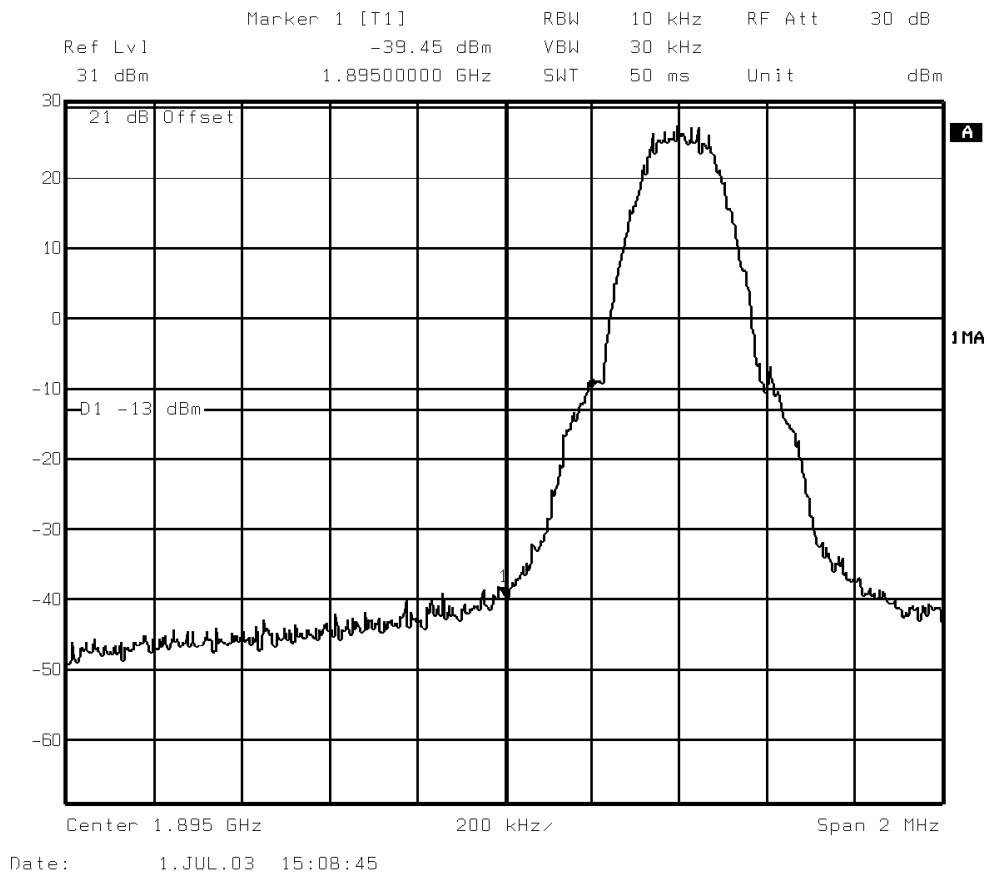
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Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 738, (1895.4MHz)

Block C



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

.....

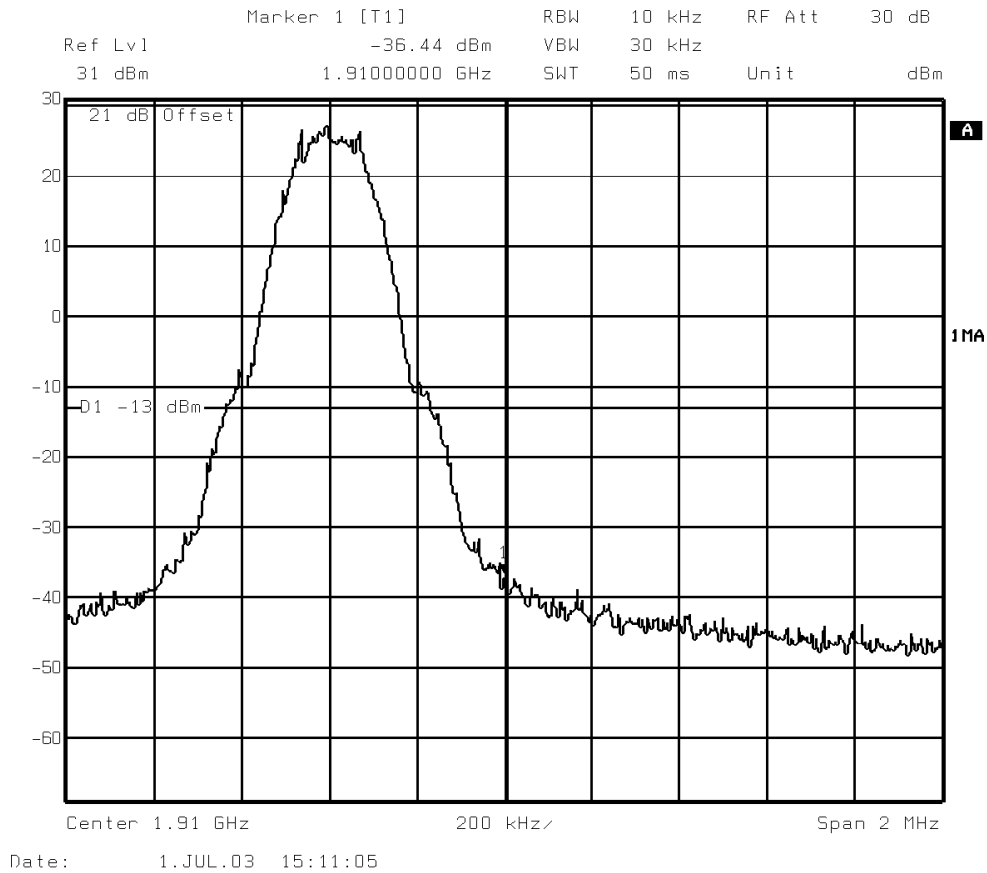




Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 809, (1909.6MHz)

Block C



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7

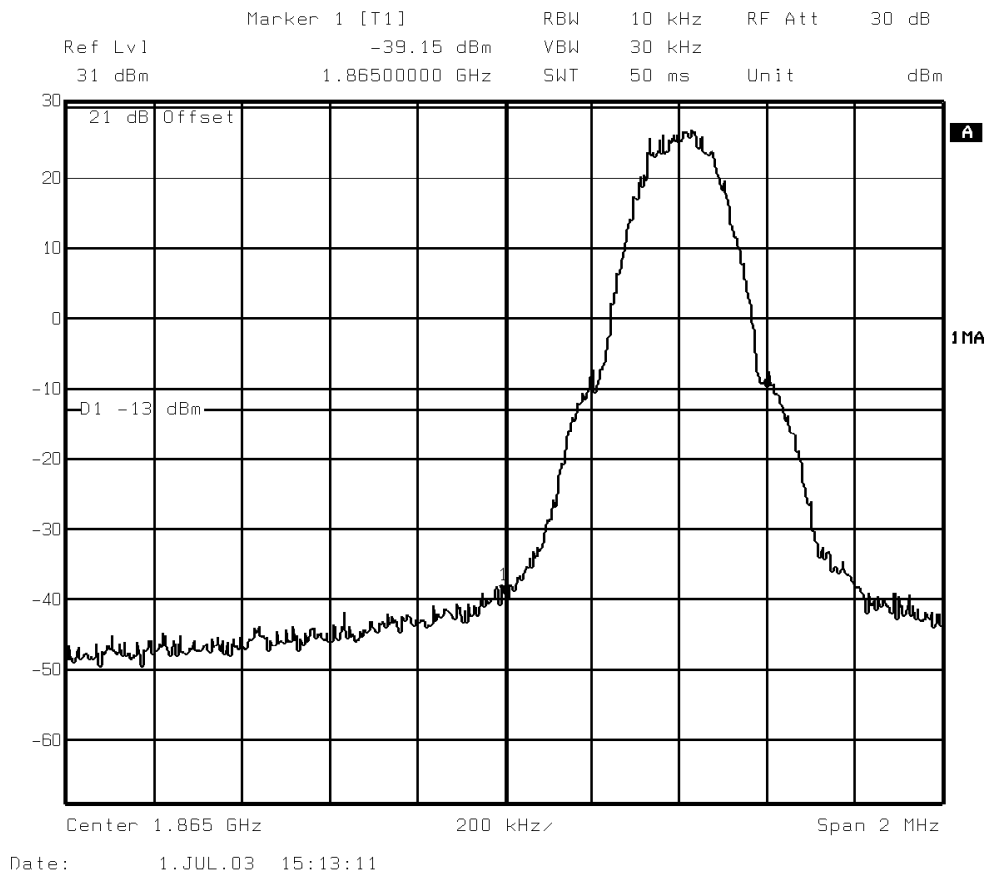
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 15<sup>th</sup> January 2002  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 588, (1865.4MHz)

Block D



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

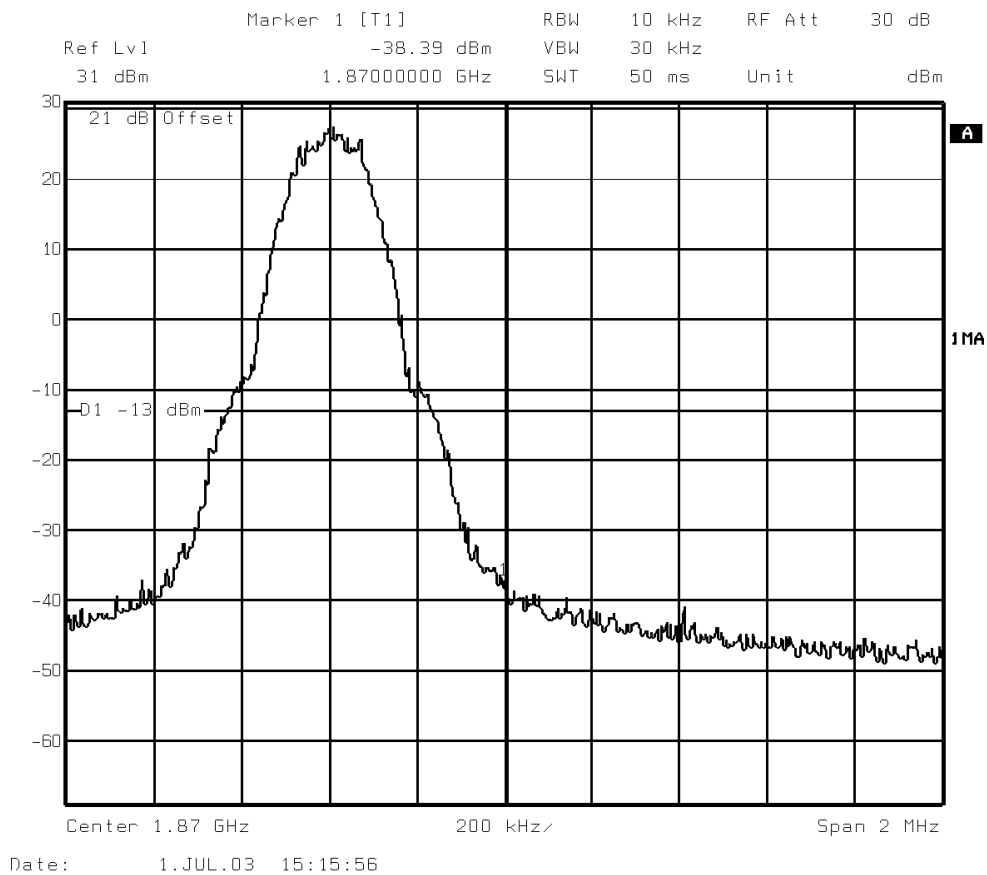
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 609, (1869.6MHz)

Block D



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

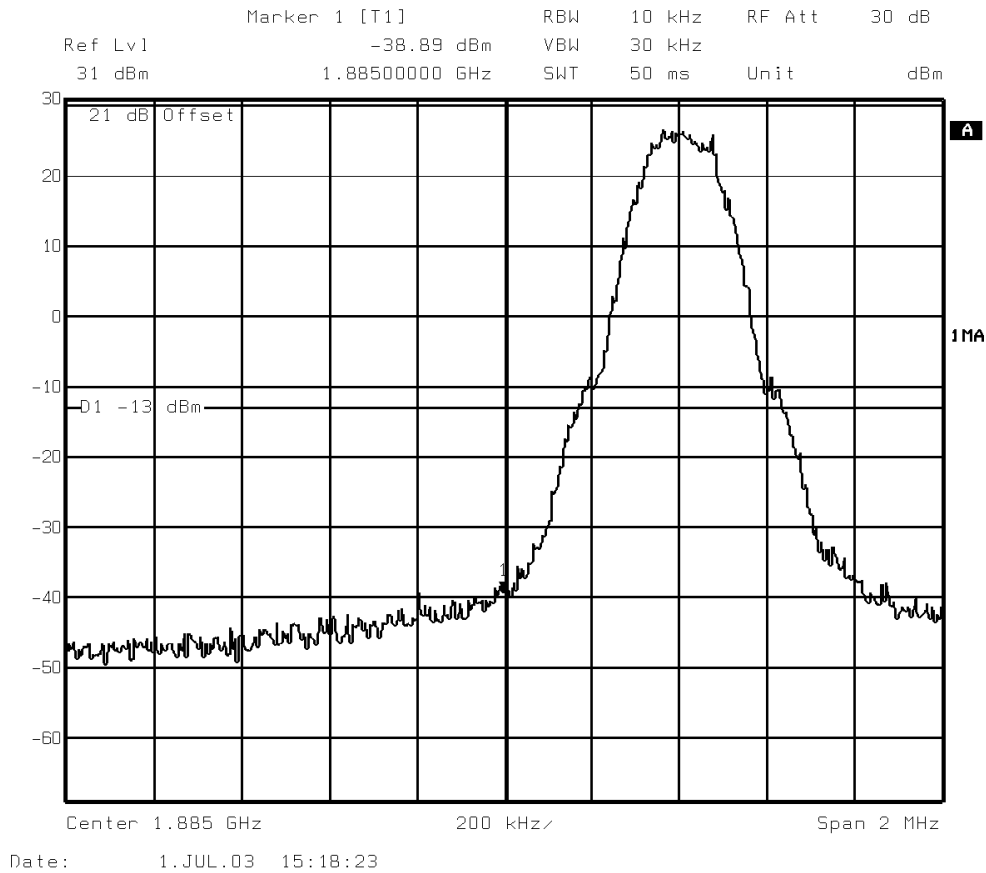
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 688, (1885.4MHz)

Block E



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

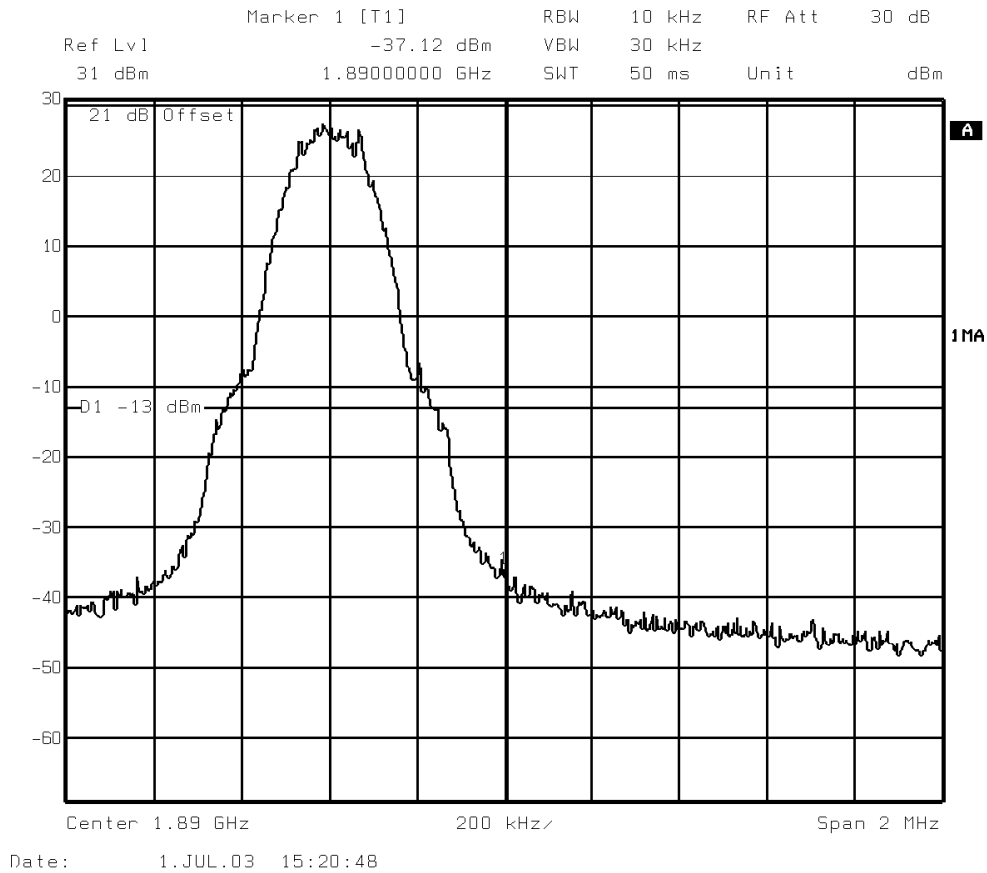
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 710 (1889.8MHz)

Block E



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

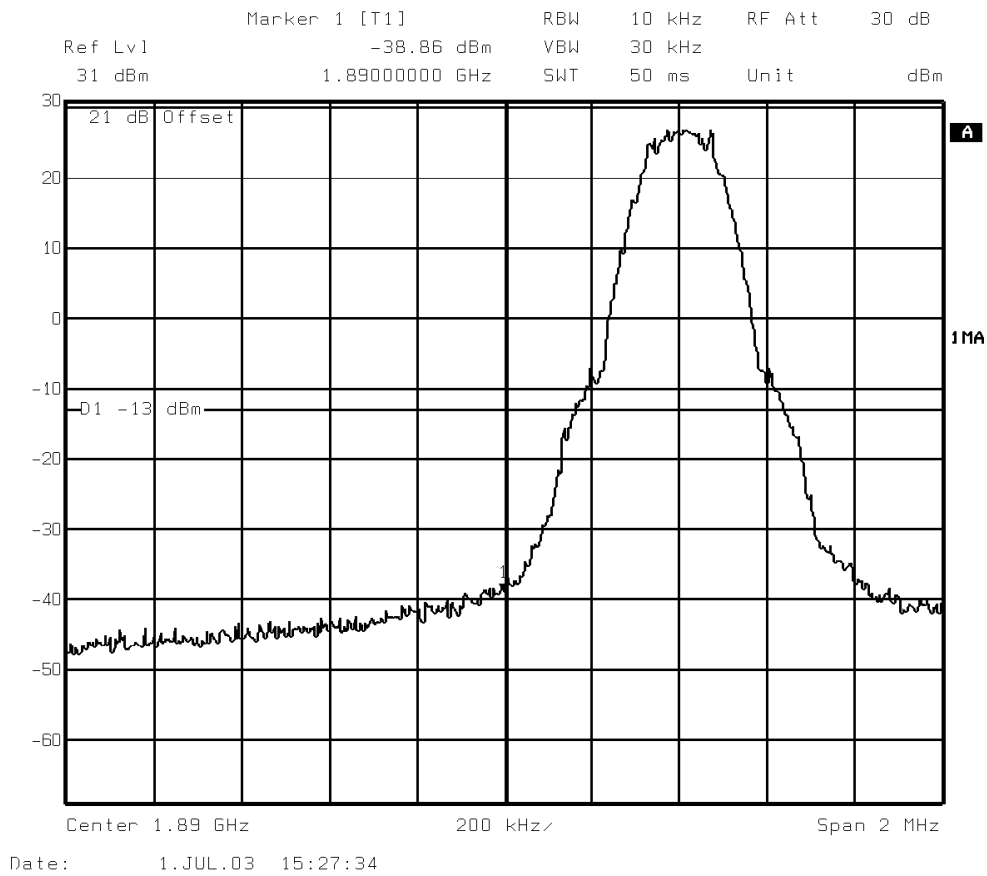
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 713, (1890.4MHz)

Block F



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7

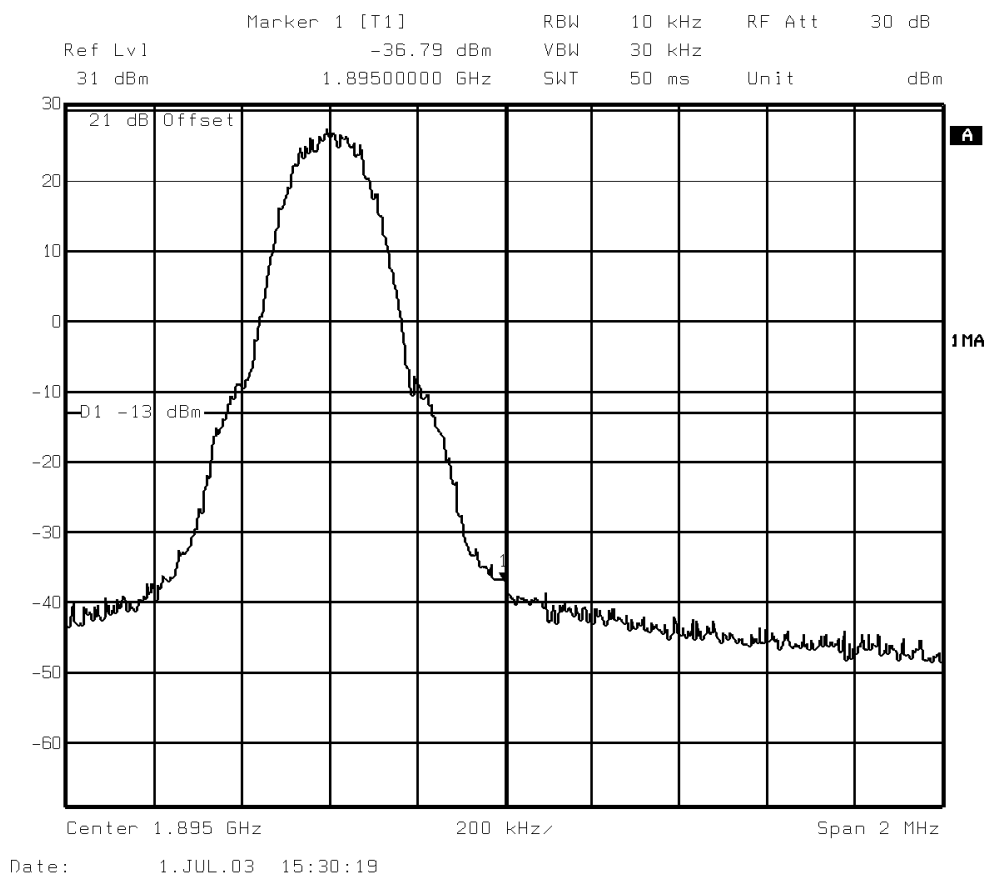
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 734, (1894.6MHz)

Block F



GSM – Circuit Switched

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

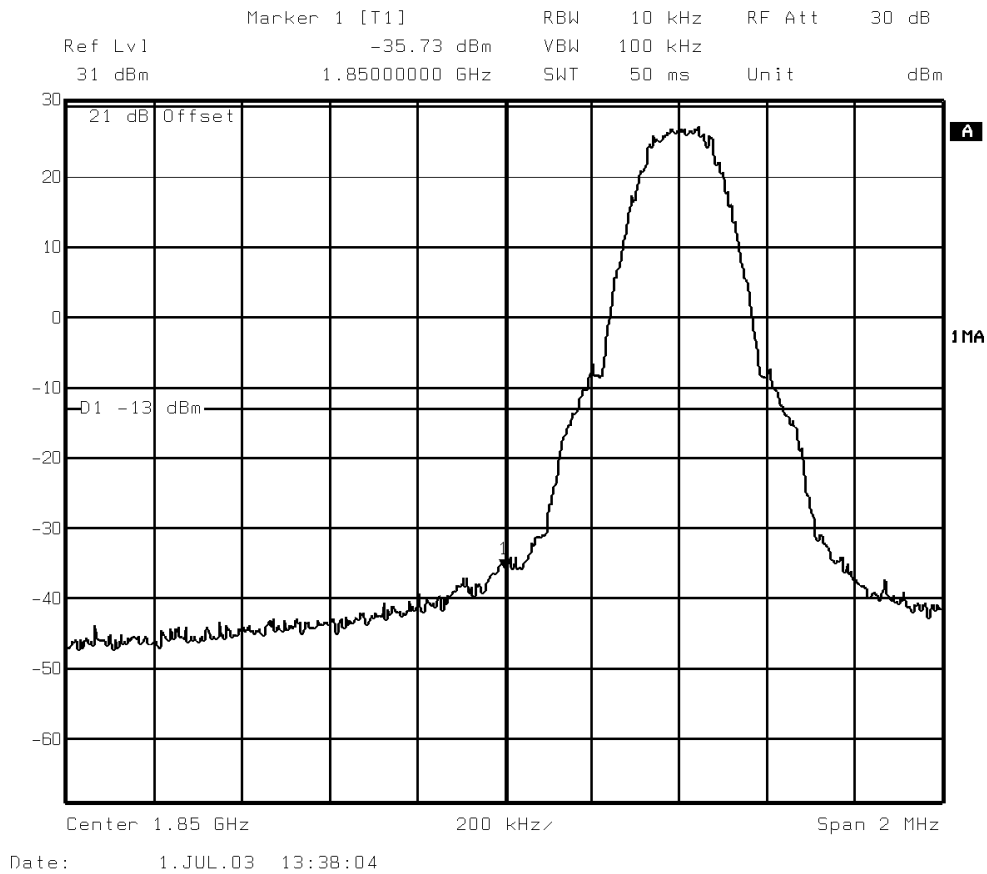
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 513, (1850.4MHz)

Block A



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

.....

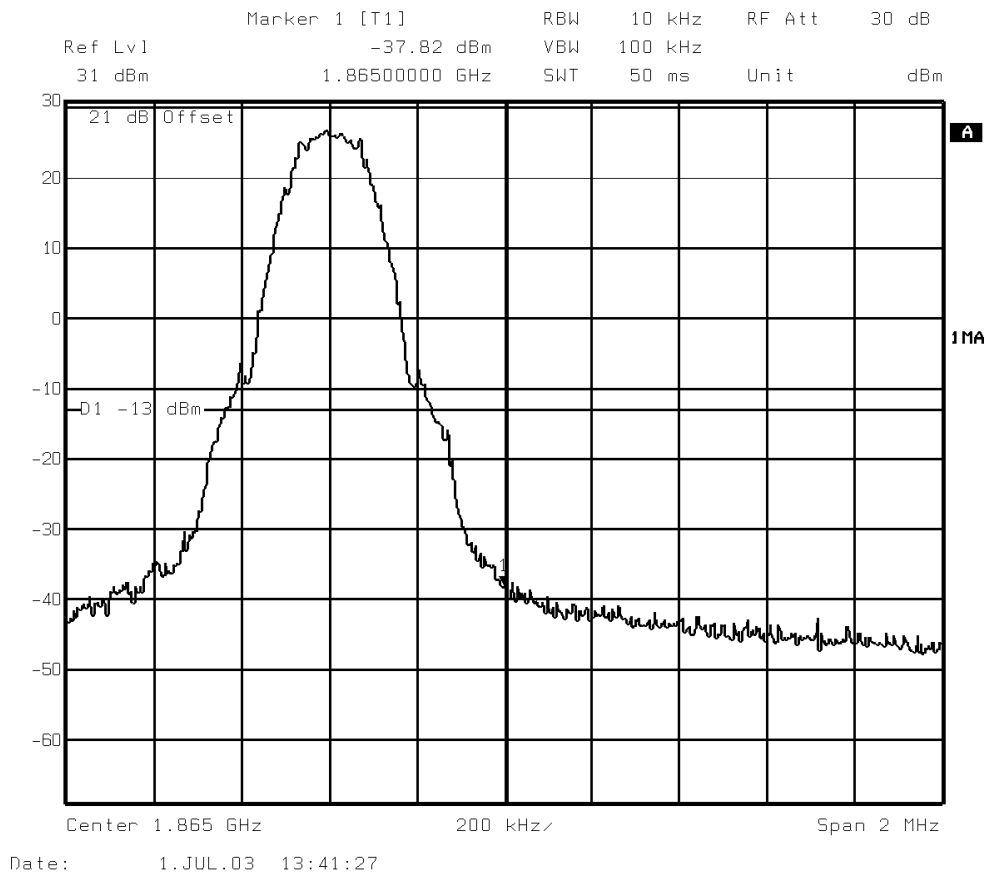




Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 584, (1864.6MHz)

Block A



GPRS – Packet Data

Remarks

All emissions are below -13 dBm up to 1MHz away from the block edge.

Test Equipment Used:

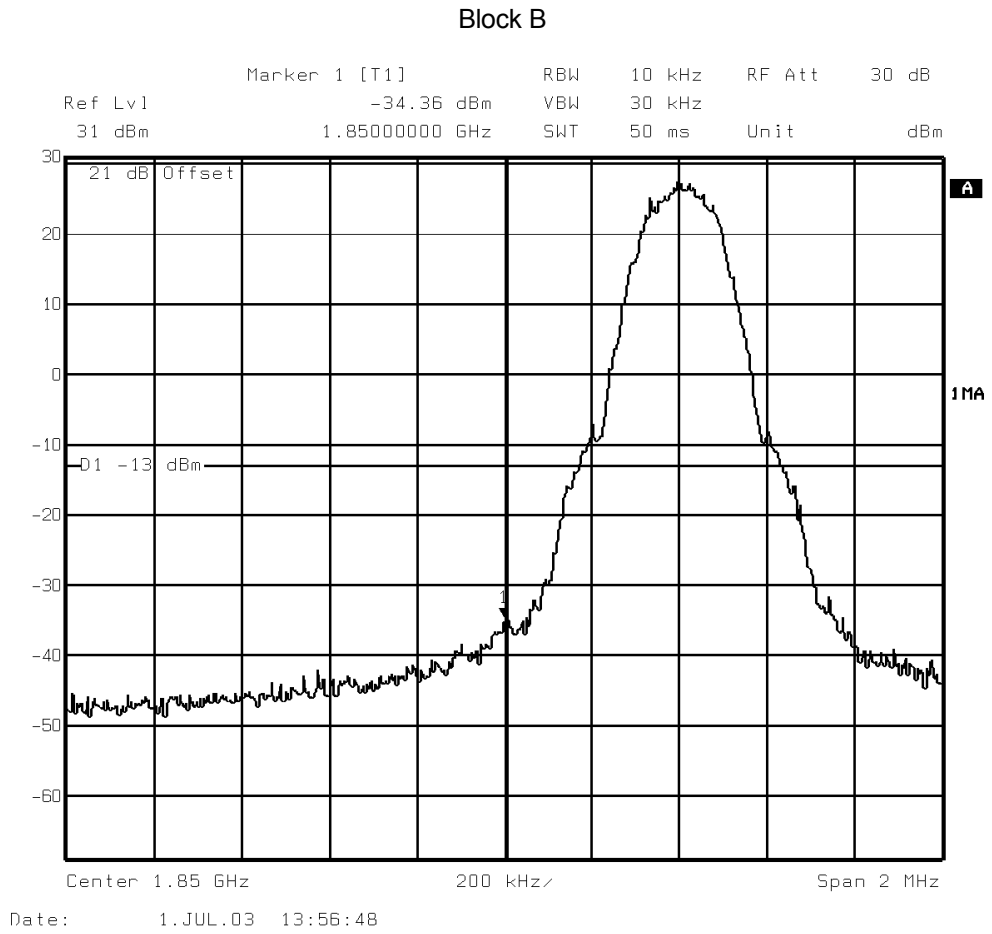
1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 613, (1870.4MHz)



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

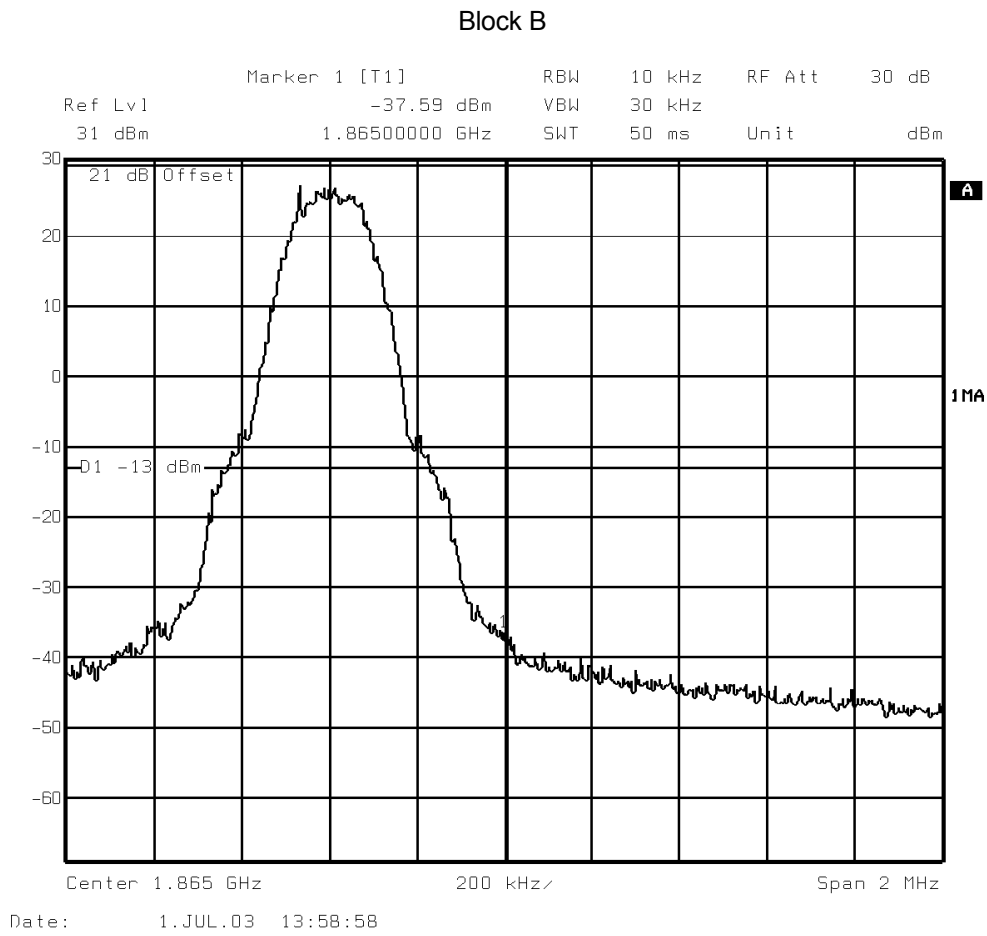
Test Equipment Used:

- 1, 2, 3, 4, 5, 6, 7, 8
- .....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 684, (1884.6MHz)



**GPRS – Packet Data**

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

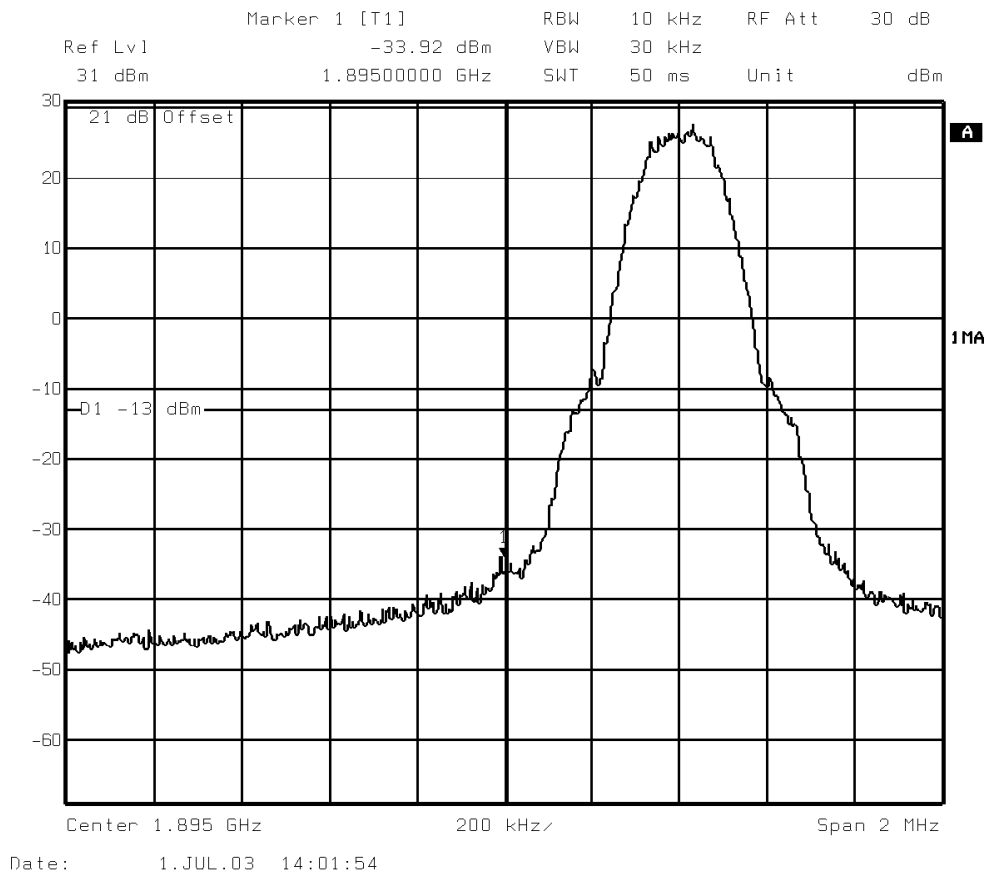
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 738, (1895.4MHz)

Block C



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

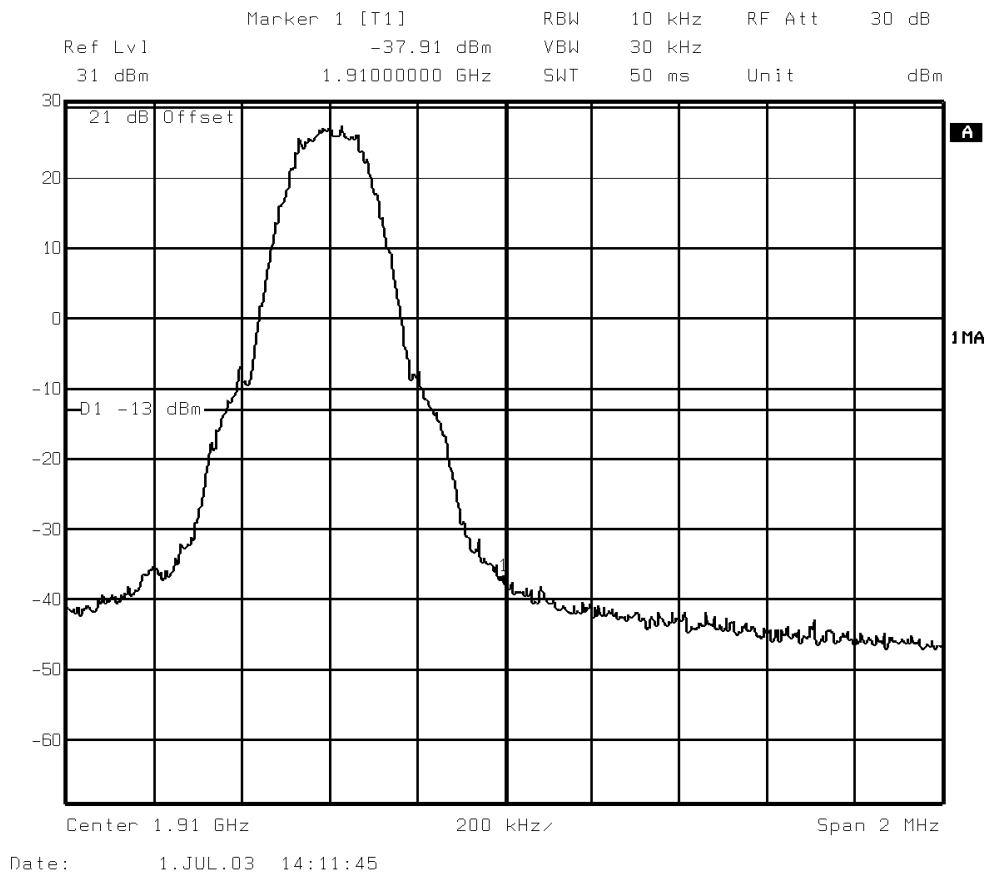
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 809, (1909.6MHz)

Block C



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7

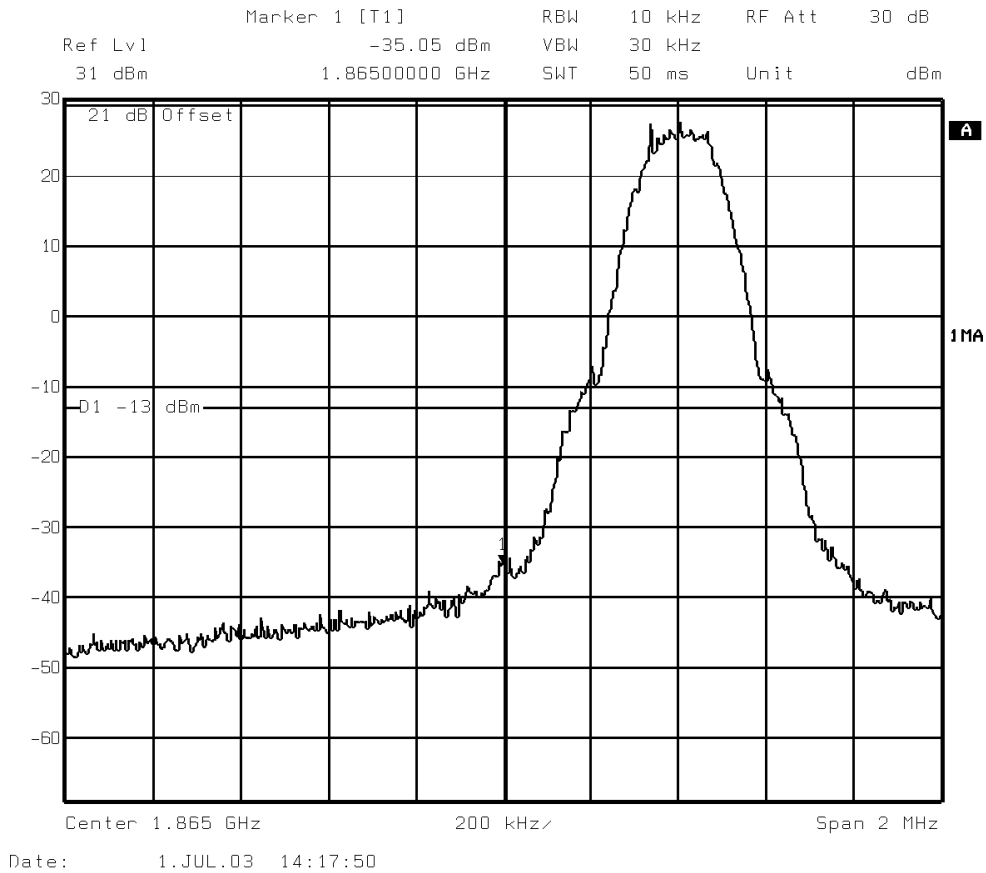
.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 588, (1865.4MHz)

Block D



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

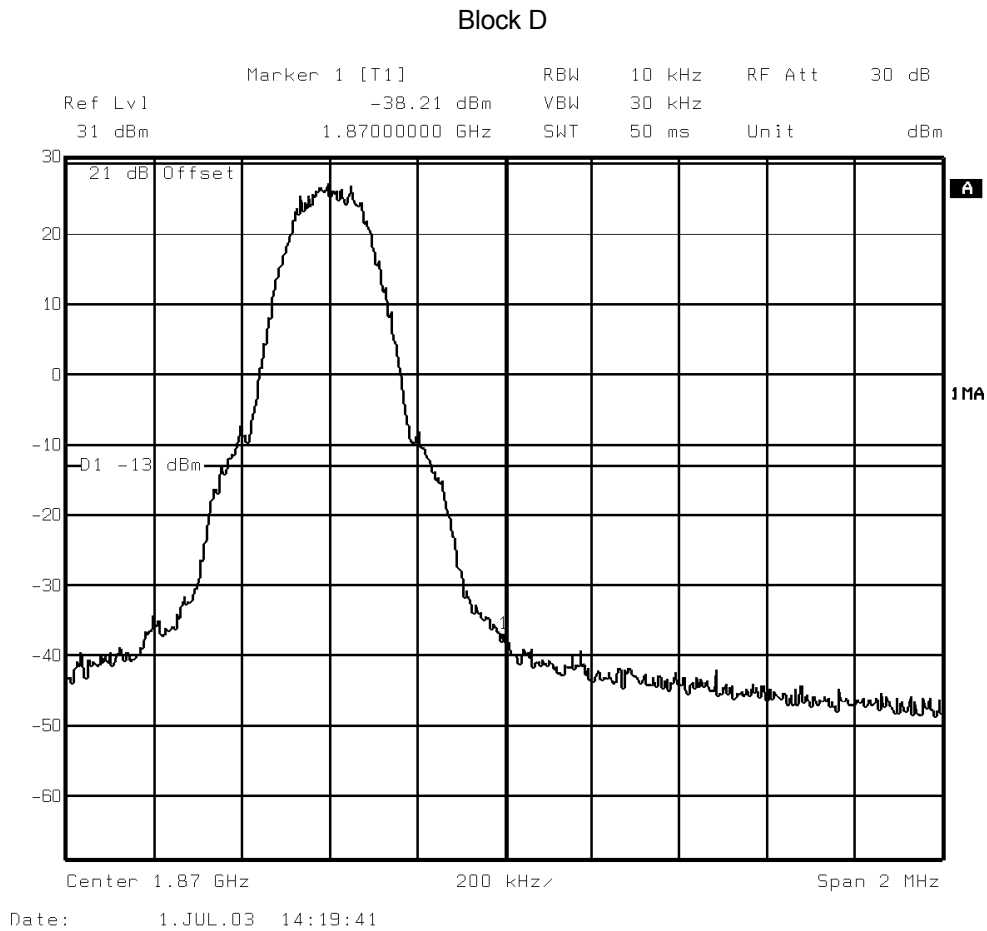
1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 609, (1869.6MHz)



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

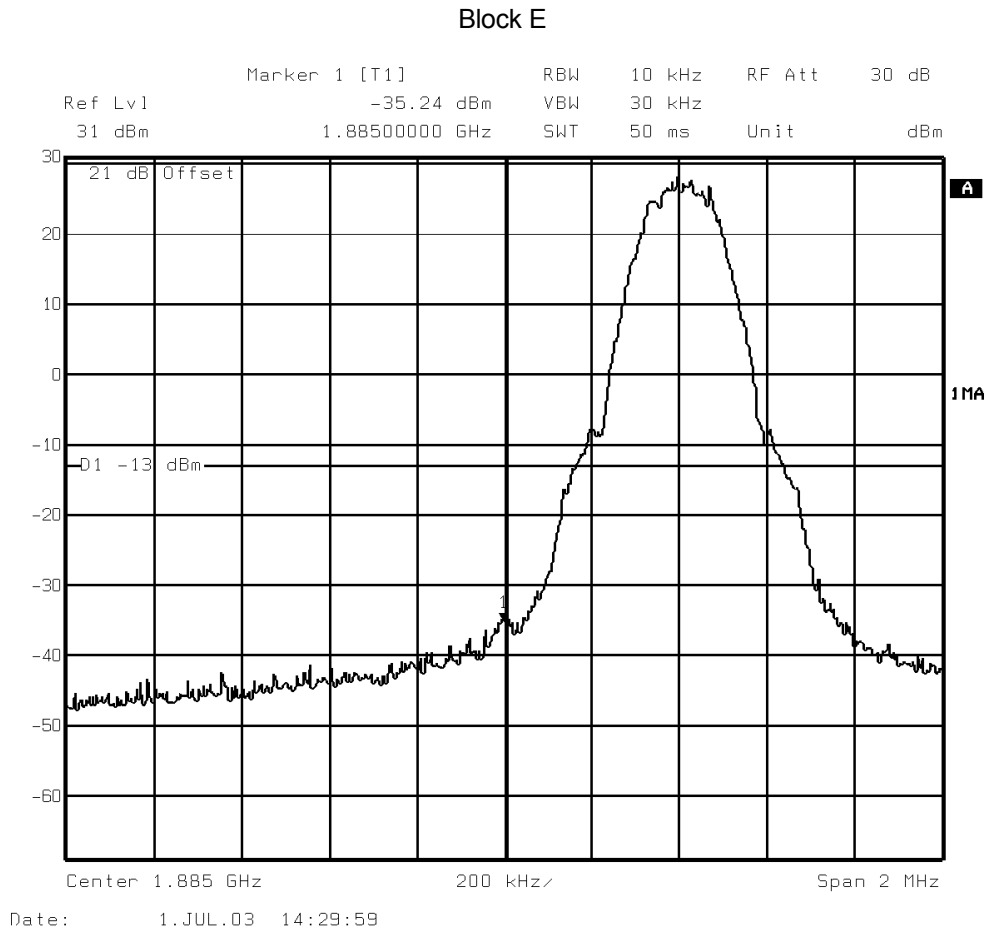
1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 688, (1885.4MHz)



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

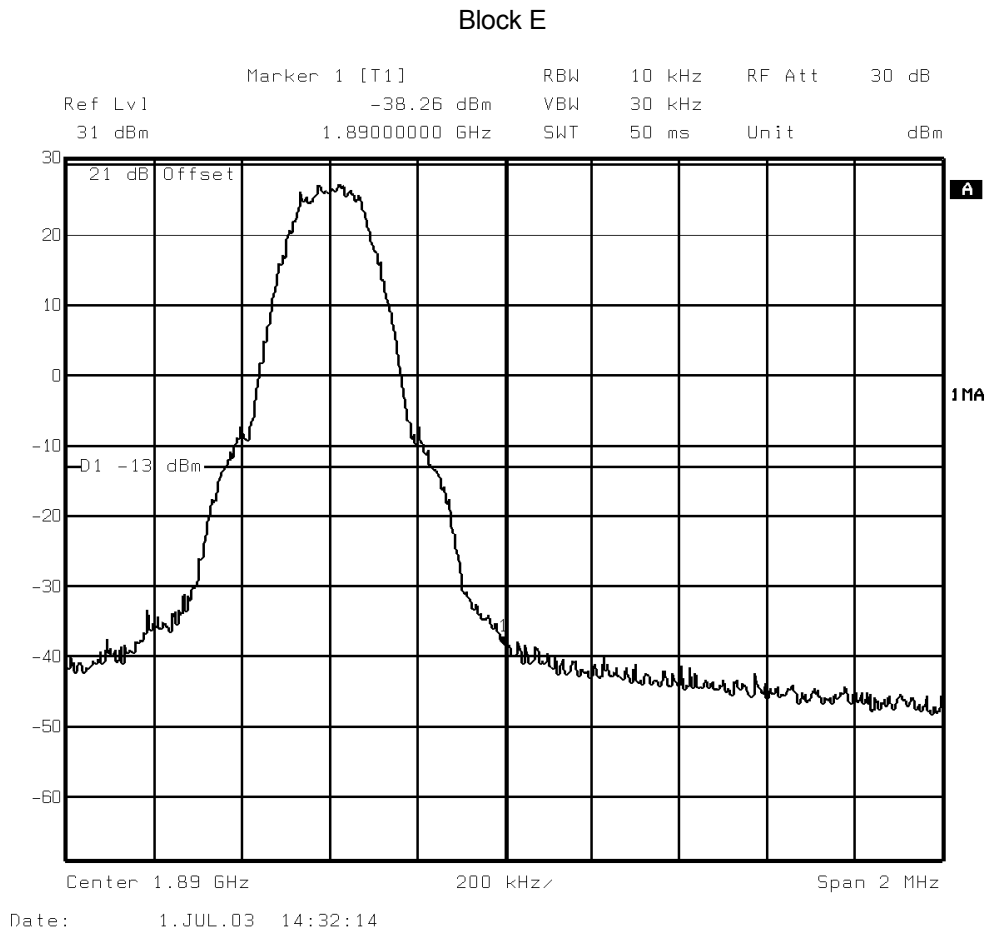
.....





Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 710 (1889.8MHz)



GPRS – Packet Data

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

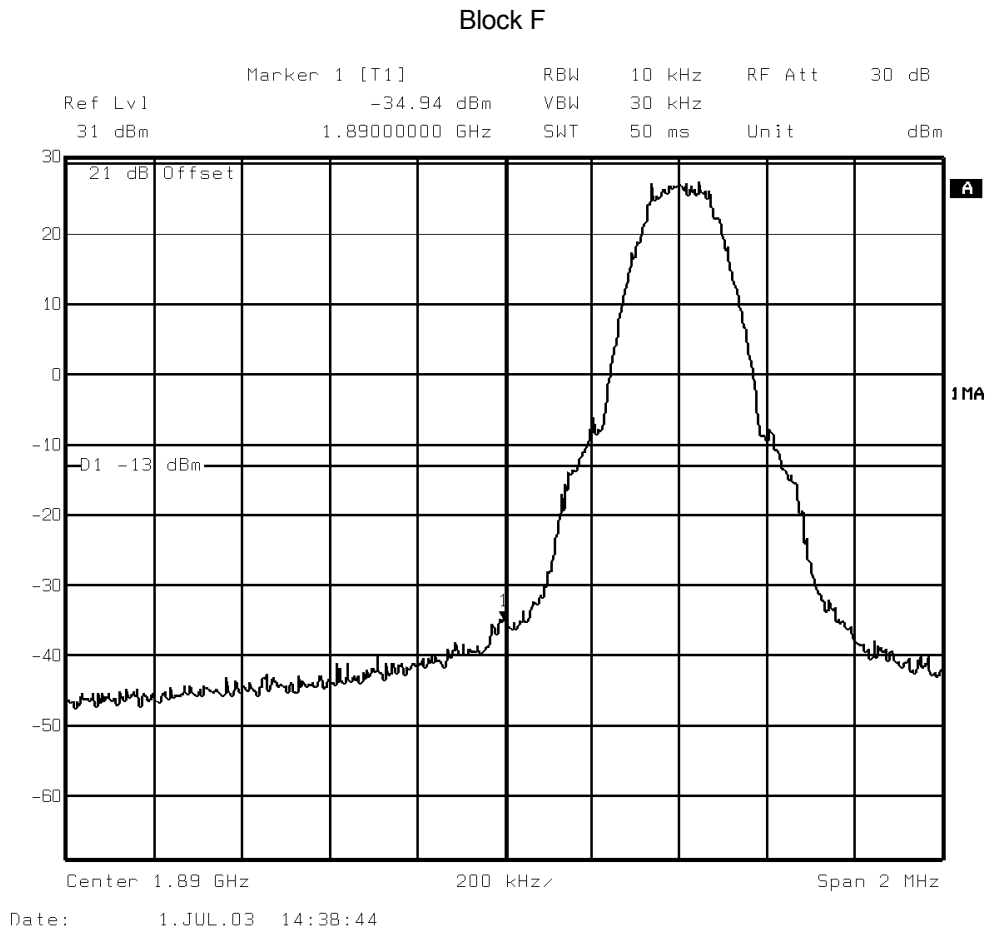
1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 713, (1890.4MHz)



**GPRS – Packet Data**

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge

Test Equipment Used:

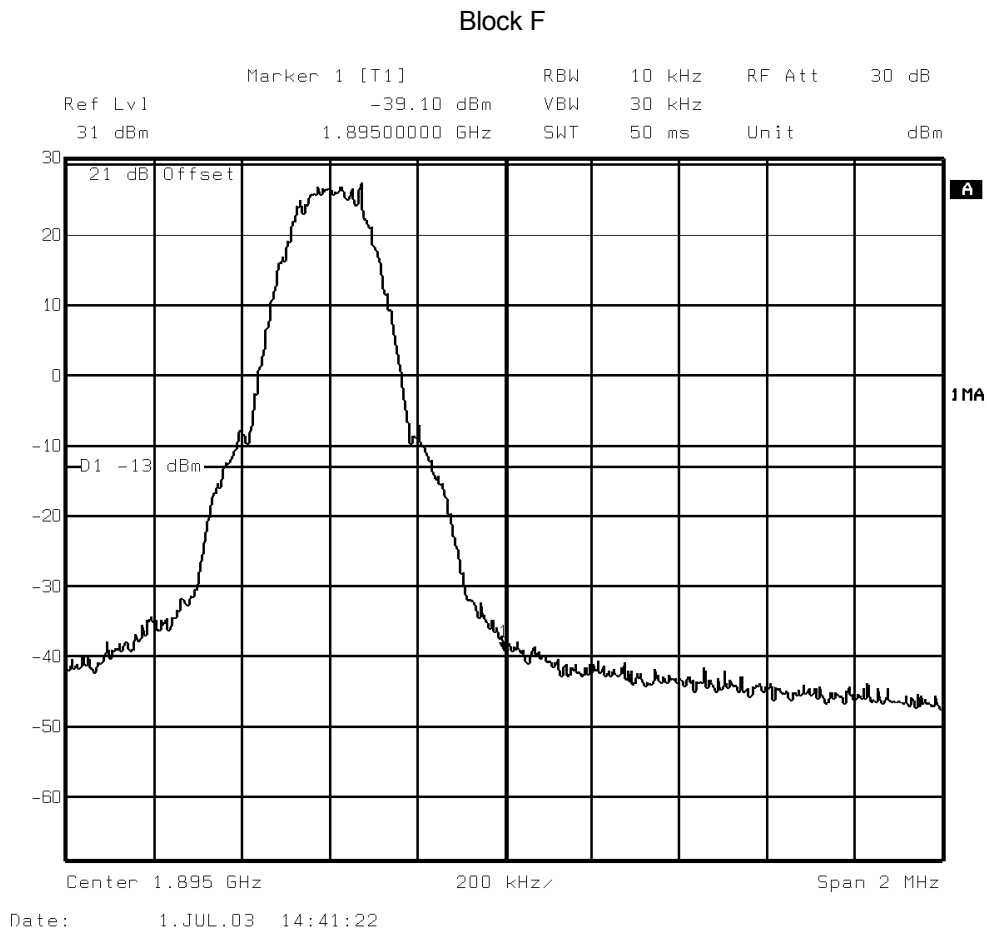
1, 2, 3, 4, 5, 6, 7

.....



Test Case : Spurious Emissions At Antenna Terminals (+/-1MHz)  
 Test Date : 1<sup>st</sup> July 2003  
 Rule Parts : 2.1049a, 24.238(b)

Block Edge Measurement with EUT Transmitting on full power on Channel 734, (1894.6MHz)



**GPRS – Packet Data**

Remarks

All emissions are below -13dBm up to 1MHz away from the block edge.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

#### Measurement Method

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9kHz to 20 GHz. The EUT was set to transmit on full power with all timeslots active and minimum power with all timeslots active. The EUT was tested on Bottom, Middle and Top channels for both power levels. The resolution and video bandwidths were set to 1MHz in accordance with Part 24.238. The spectrum analyser detector was set to Max Hold.

For measuring the range 9kHz to 4GHz, on maximum power, a 10dB attenuator was used. From 4 to 20GHz, attenuators and a high pass filter were used.

The maximum path loss across the measurement band was used as the reference level offset to ensure worst case

In addition, measurements were made up to the 10<sup>th</sup> harmonic of the fundamental.

#### Summary Of Results

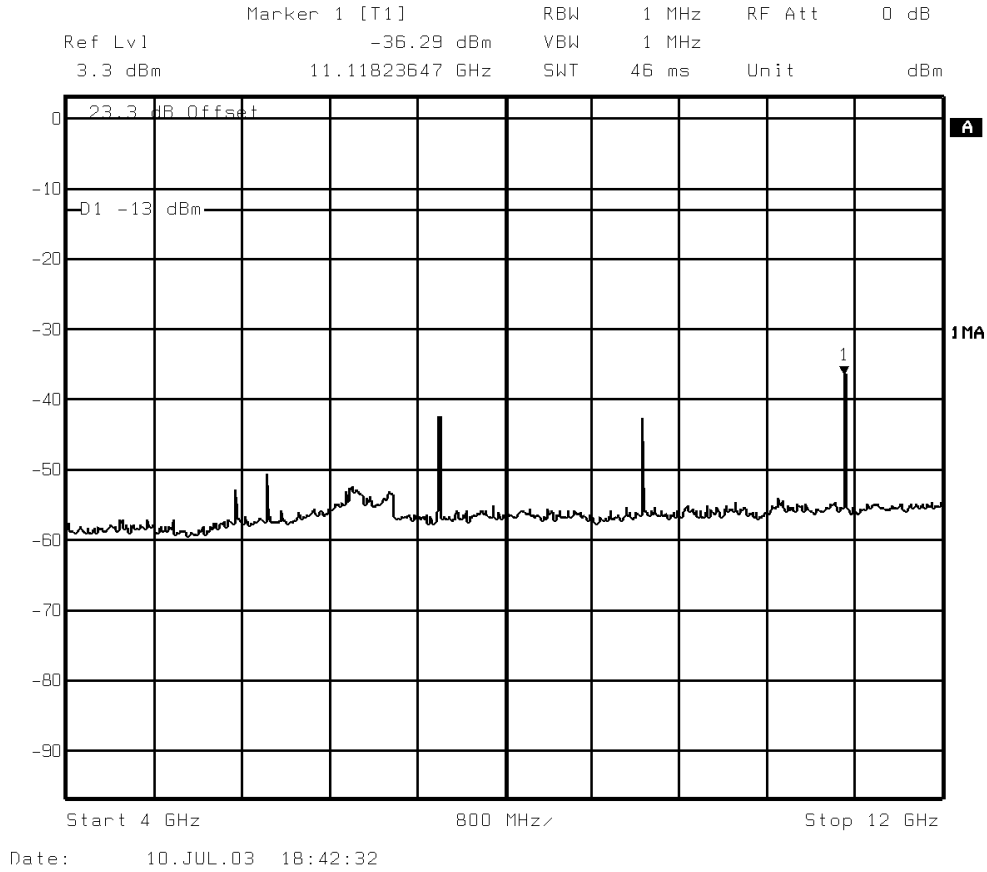
No emissions, other than the harmonics shown on pages 57 to 60, were within 20dB of the limit. The EUT passed the requirements laid out in 24.238. The plots on the following pages show the frequency spectrum from 9kHz to 20GHz of the EUT.





Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 512 (1850.2MHz) – Maximum Power



GSM – Circuit Switched

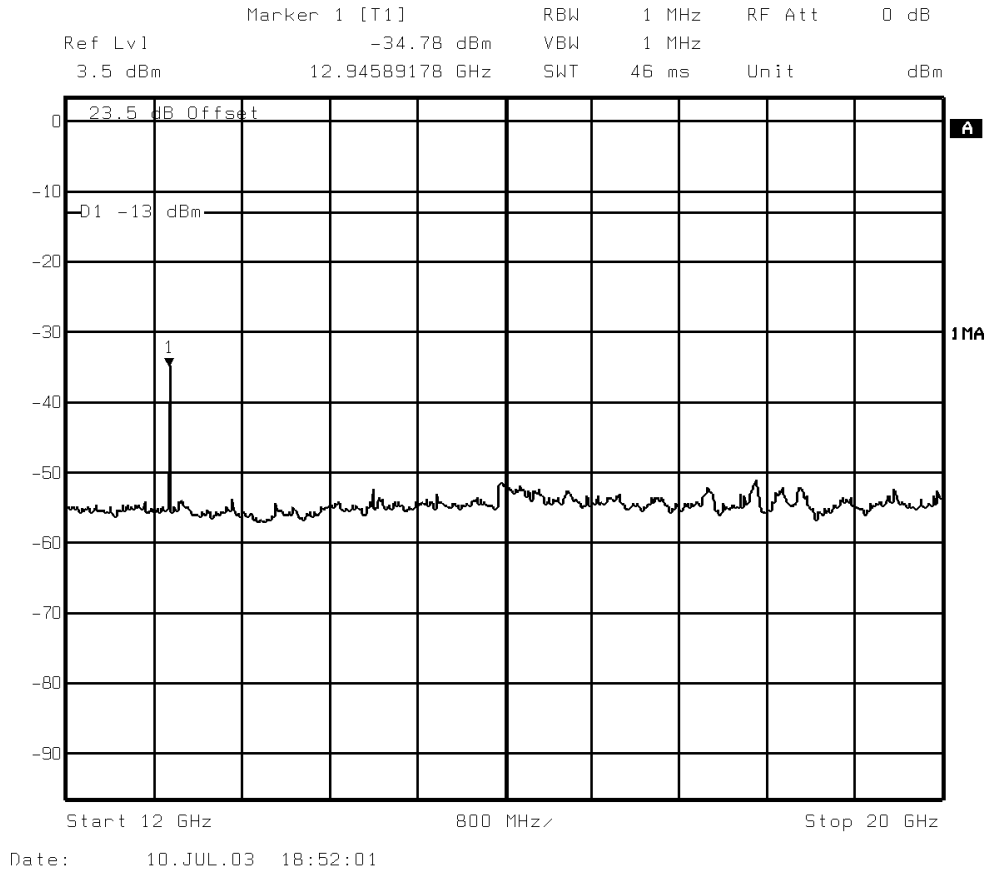
Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....



Test Case : Spurious Emissions
Test Date : 10th July 2003
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)
Channel 512 (1850.2MHz) – Maximum Power



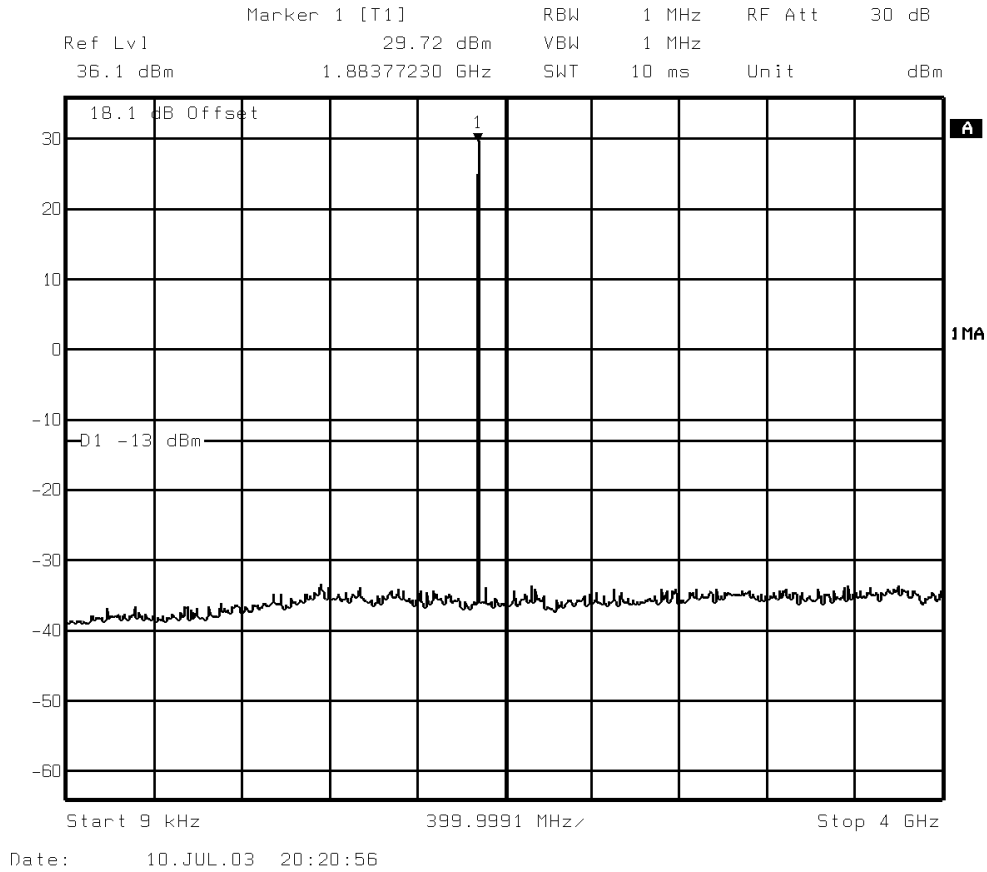
GSM – Circuit Switched

Test Equipment Used:
1, 2, 3, 4, 5, 6, 7, 9, 10



Test Case : Spurious Emissions  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (9kHz – 4GHz)  
Channel 661 (1880.0MHz) – Maximum Power



GSM – Circuit Switched

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8

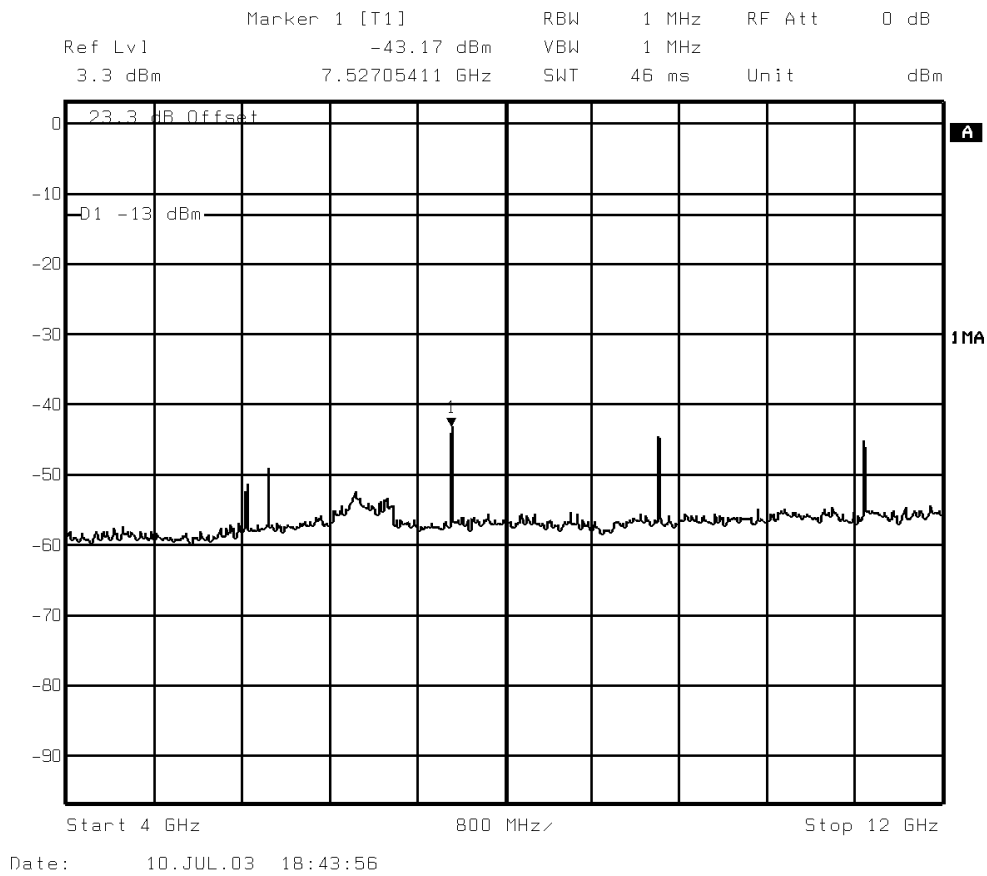
.....





Test Case : Spurious Emissions  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz - 12GHz)  
Channel 661 (1880.0MHz) – Maximum Power



GSM – Circuit Switched

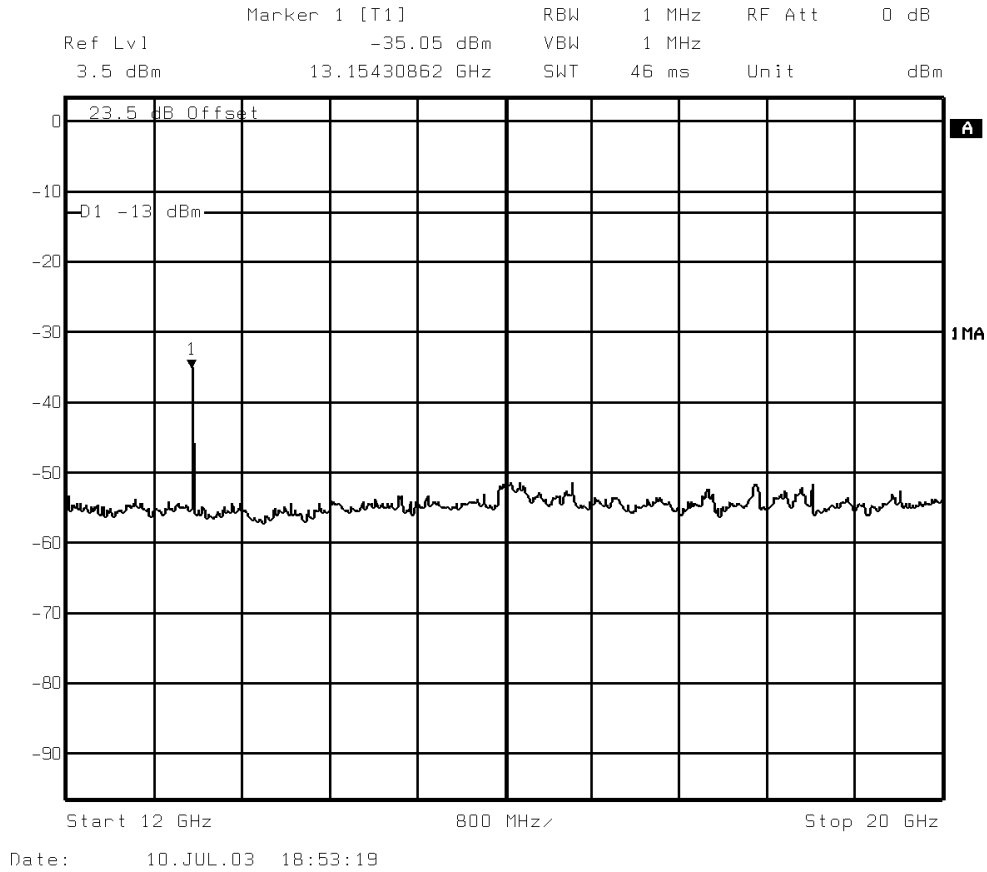
Test Equipment Used:  
 1, 2, 3, 4, 5, 6, 7, 9, 10

.....



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 661 (1880.0MHz) – Maximum Power



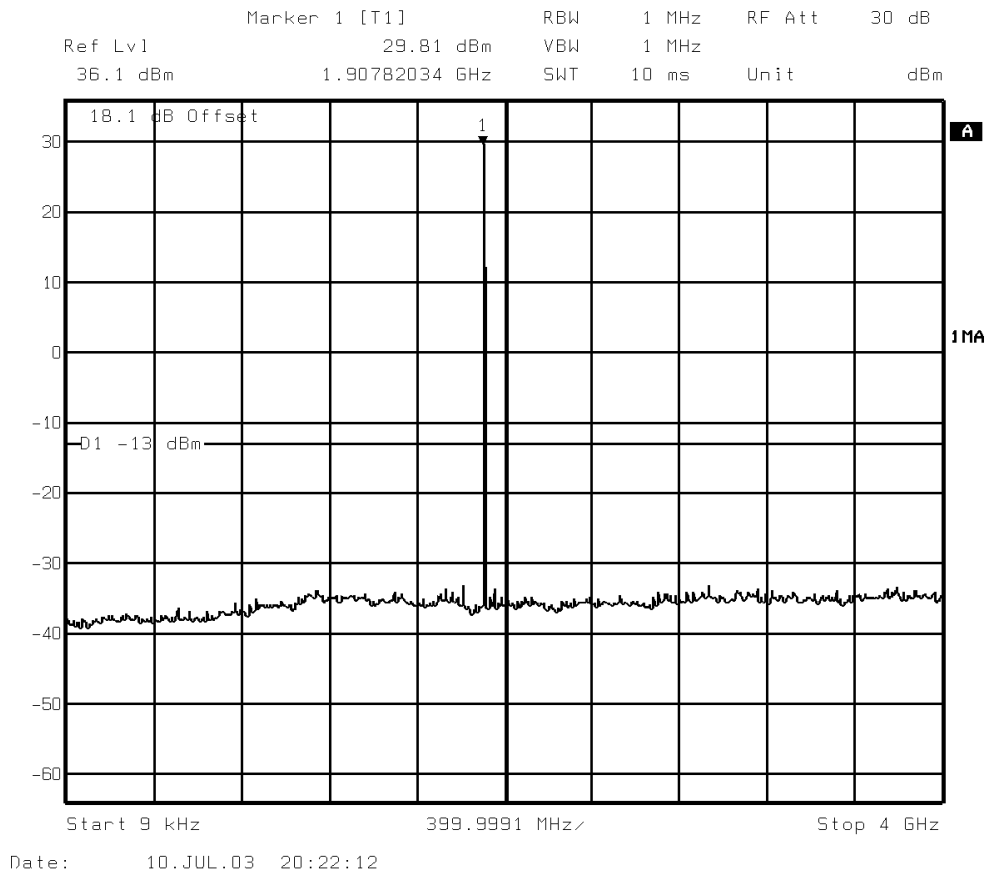
GSM – Circuit Switched

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10



Test Case : Spurious Emissions  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (9kHz – 4GHz)  
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

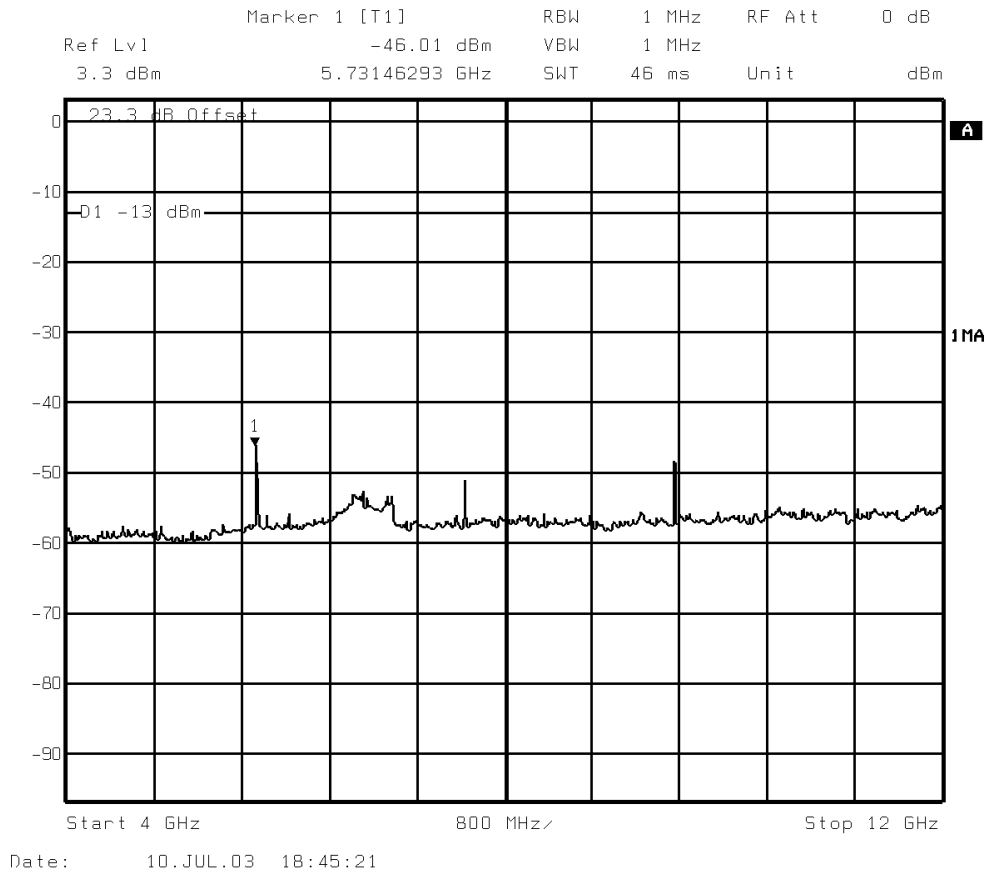
Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 810 (1909.8MHz) – Maximum Power



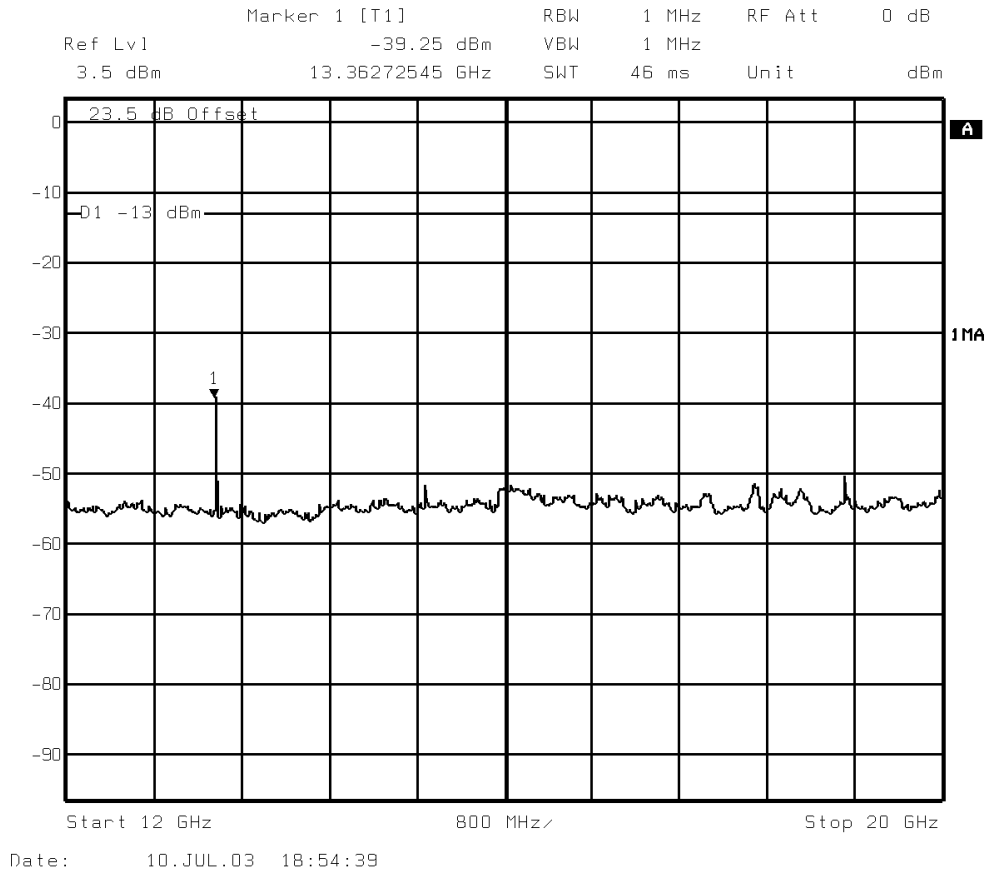
GSM – Circuit Switched

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....

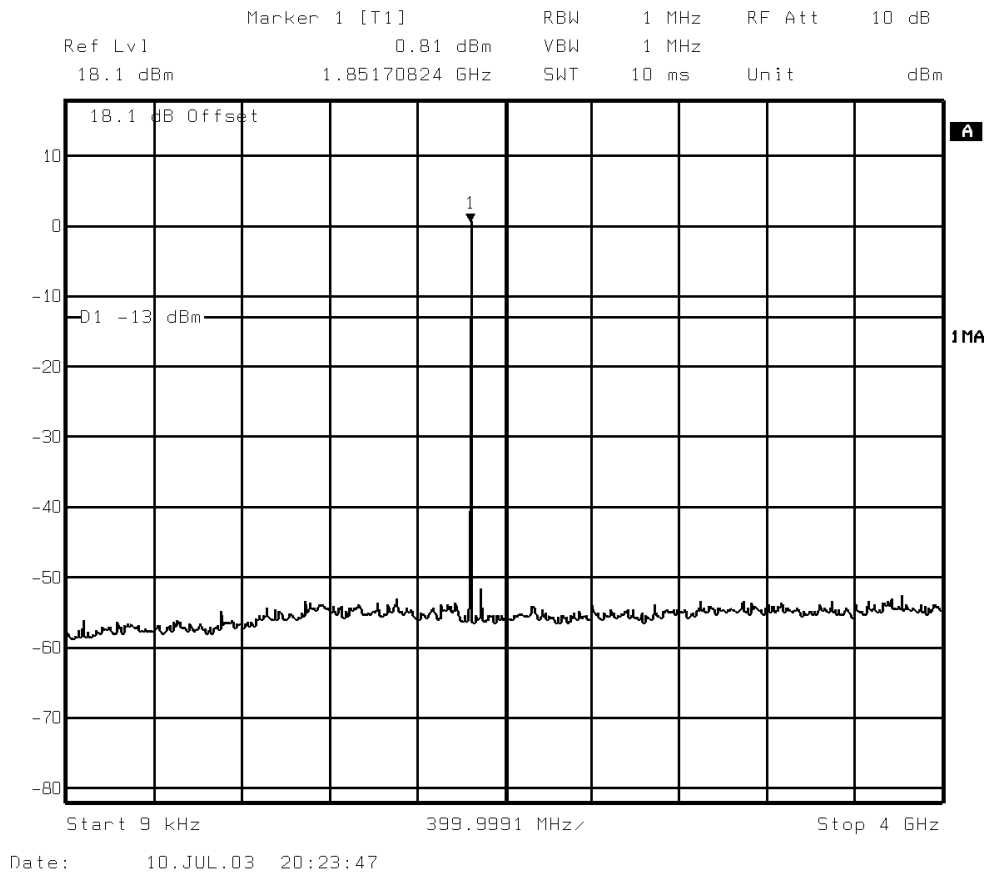


Test Case : Spurious Emissions

Test Date : 10<sup>th</sup> July 2003

Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (9kHz – 4GHz)  
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

Test Equipment Used:

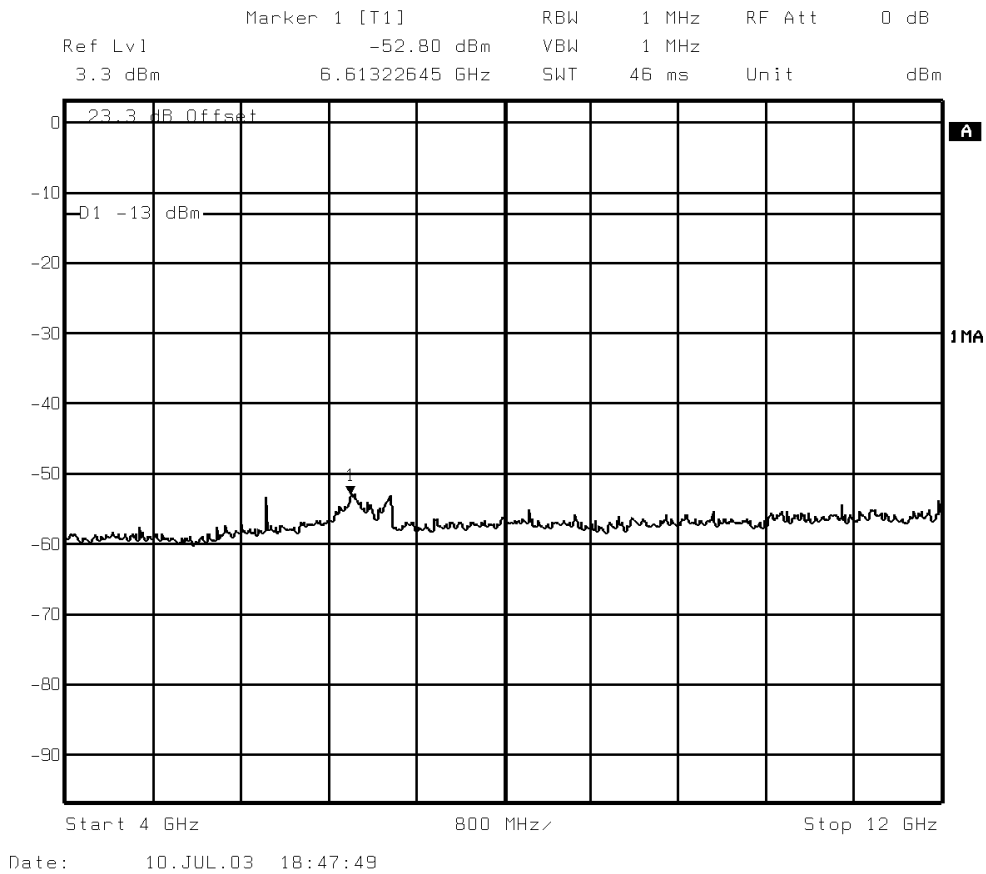
1, 2, 3, 4, 5, 6, 7, 8

.....



Test Case : Spurious Emissions  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

Test Equipment Used:  
 1, 2, 3, 4, 5, 6, 7, 9, 10

.....



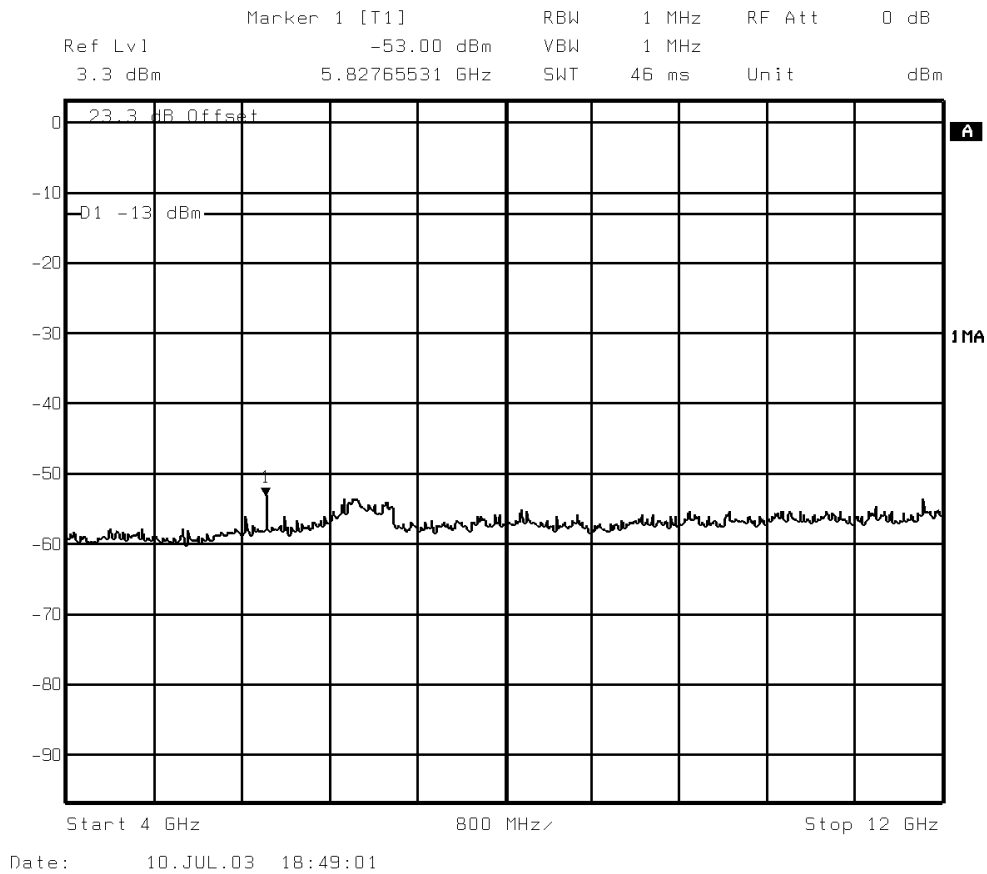






Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....

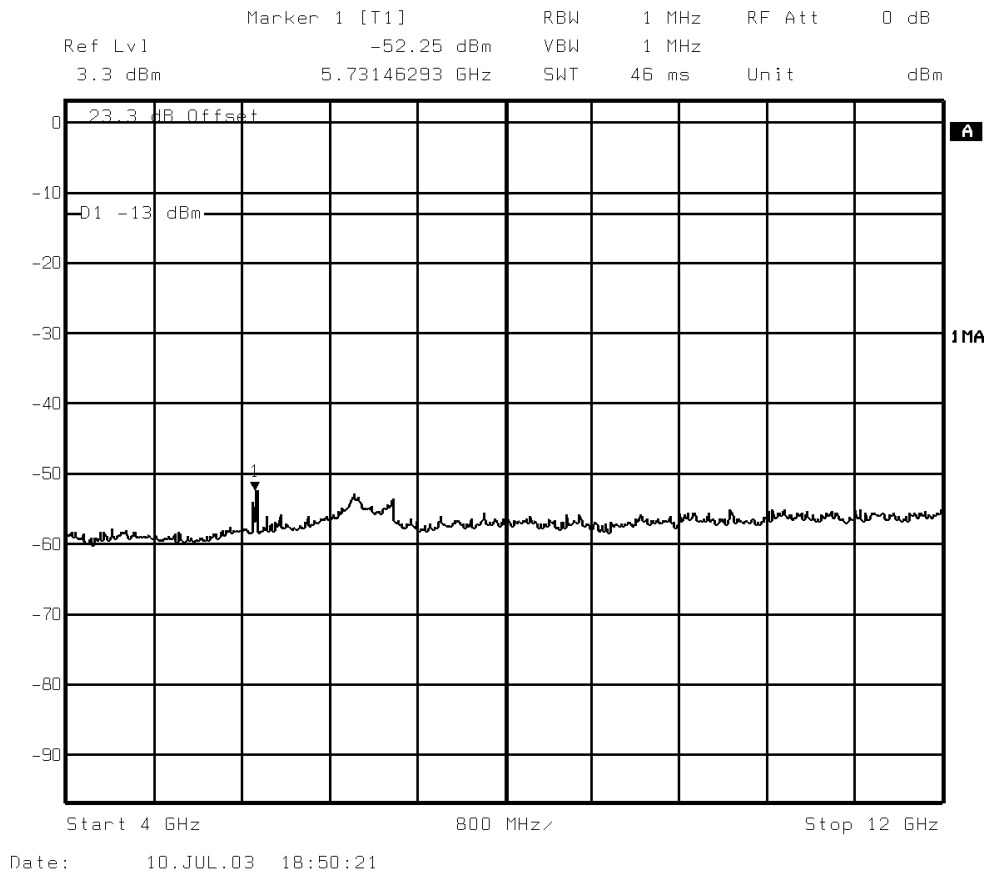






Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 810 (1909.8MHz) – Minimum Power



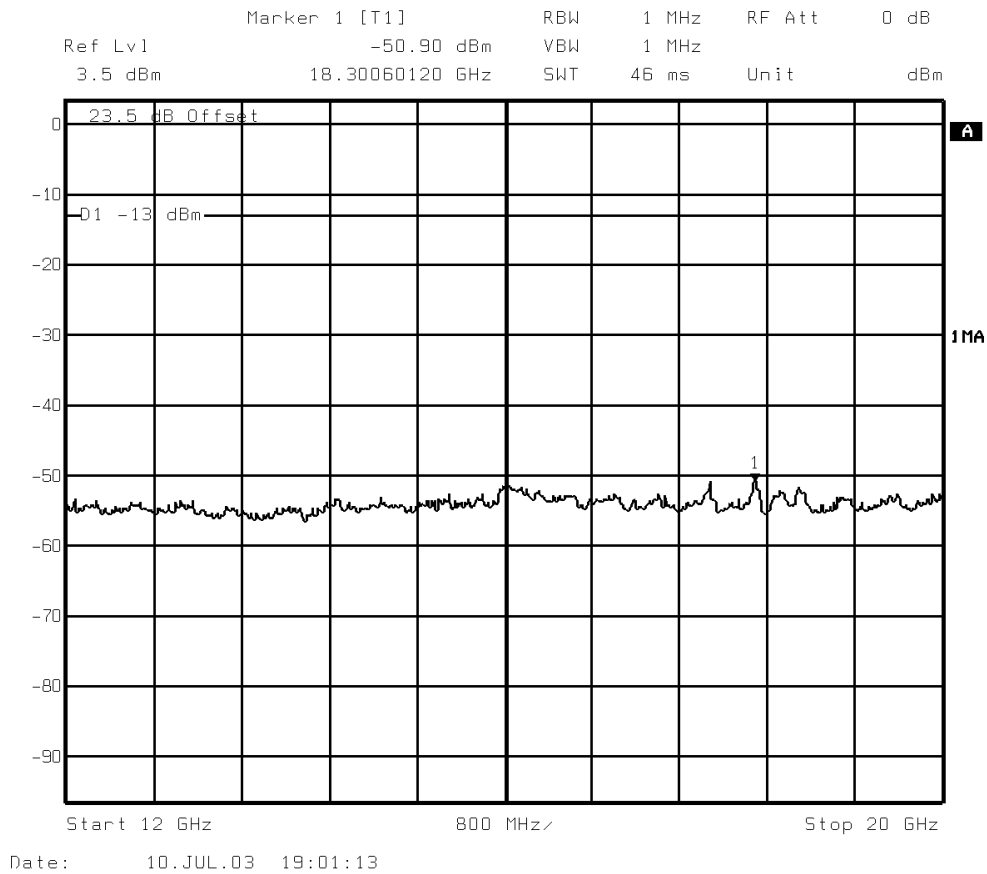
GSM – Circuit Switched

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10



Test Case : Spurious Emissions  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

Test Equipment Used:  
 1, 2, 3, 4, 5, 6, 7, 9, 10

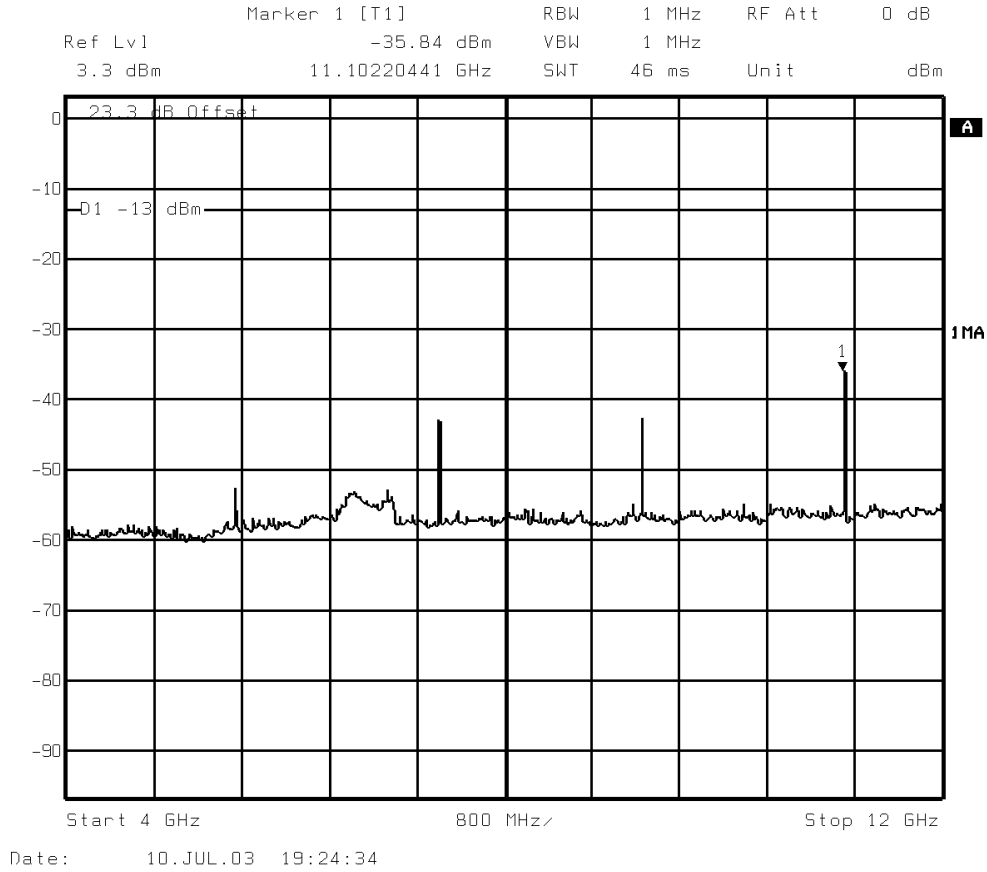
.....





Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 512 (1850.2MHz) – Maximum Power



GPRS – Packet Data

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....





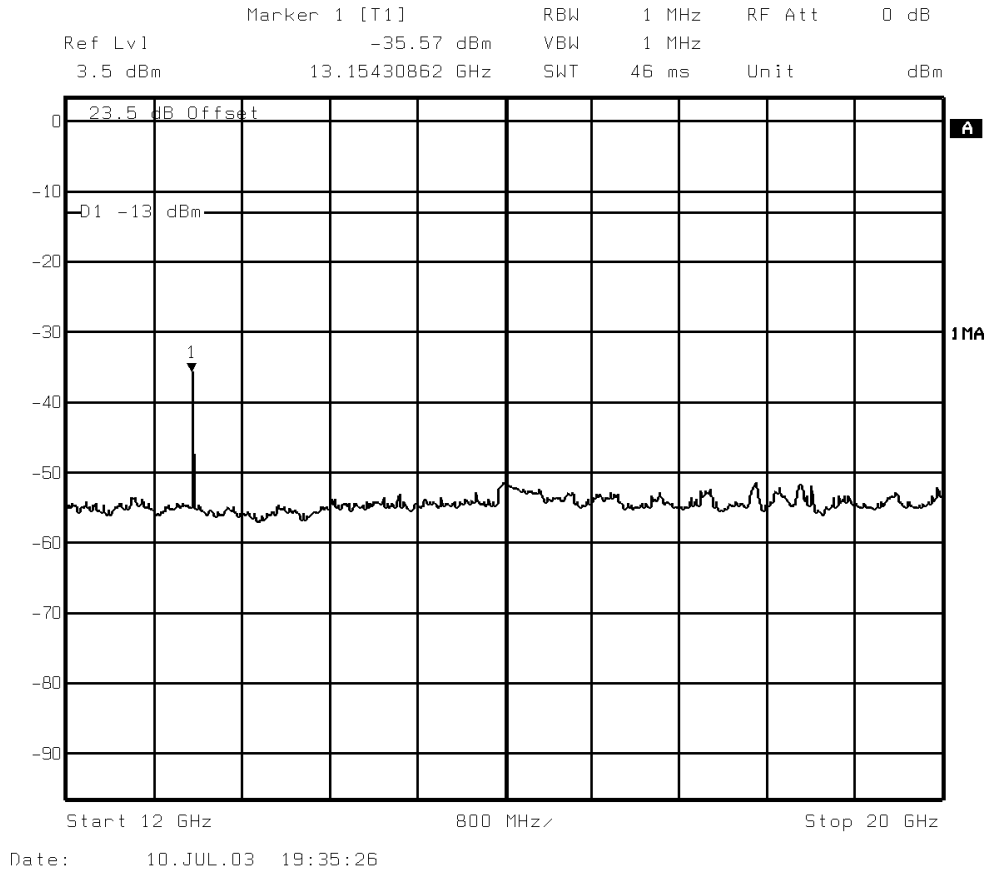






Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

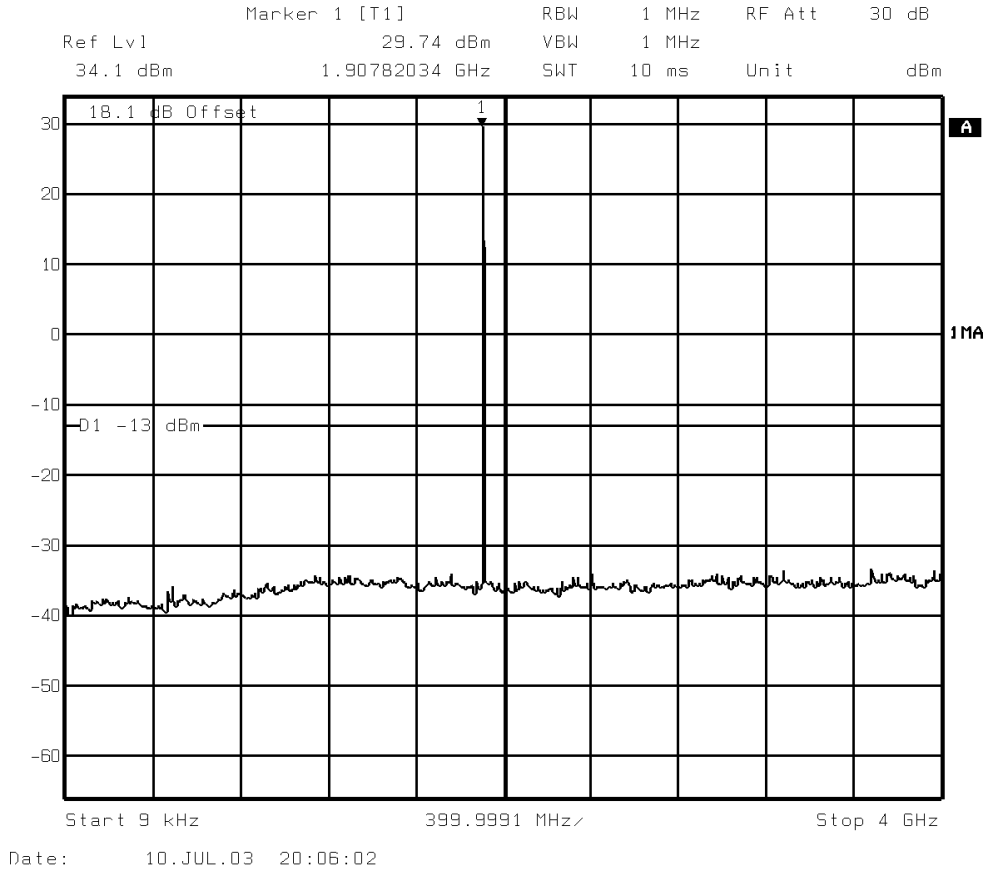
Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (9kHz – 4GHz)  
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

Test Equipment Used:

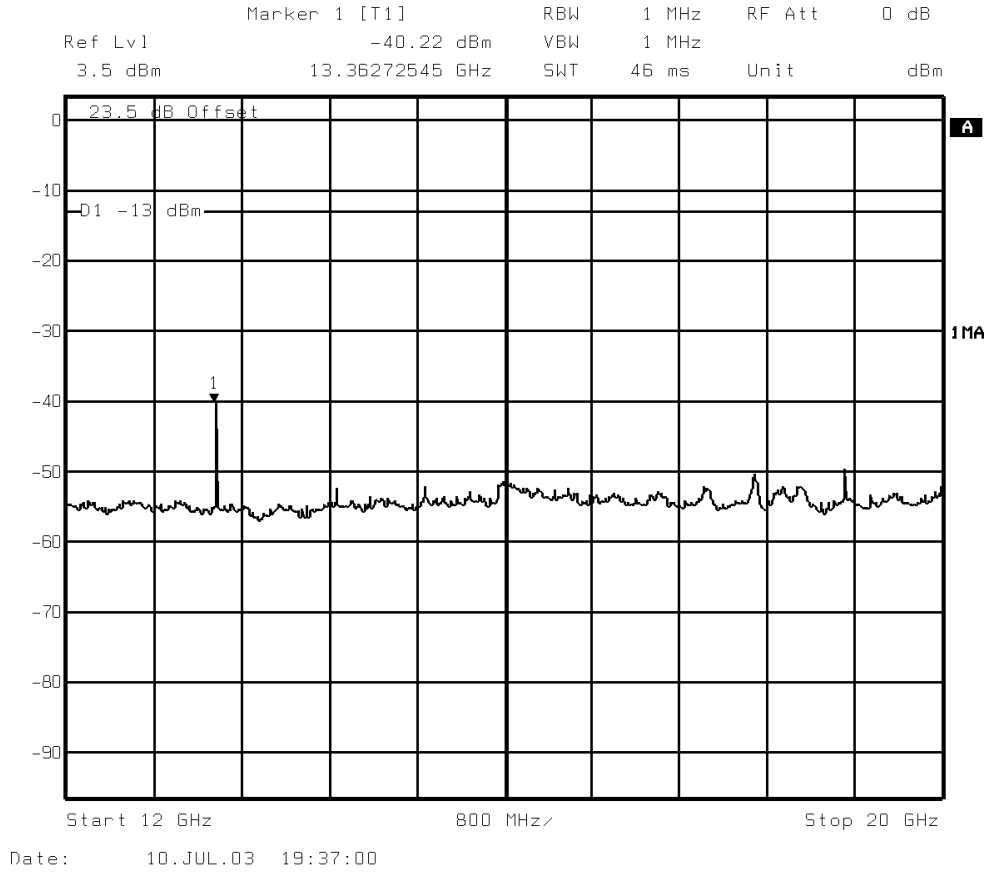
1, 2, 3, 4, 5, 6, 7, 8





Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

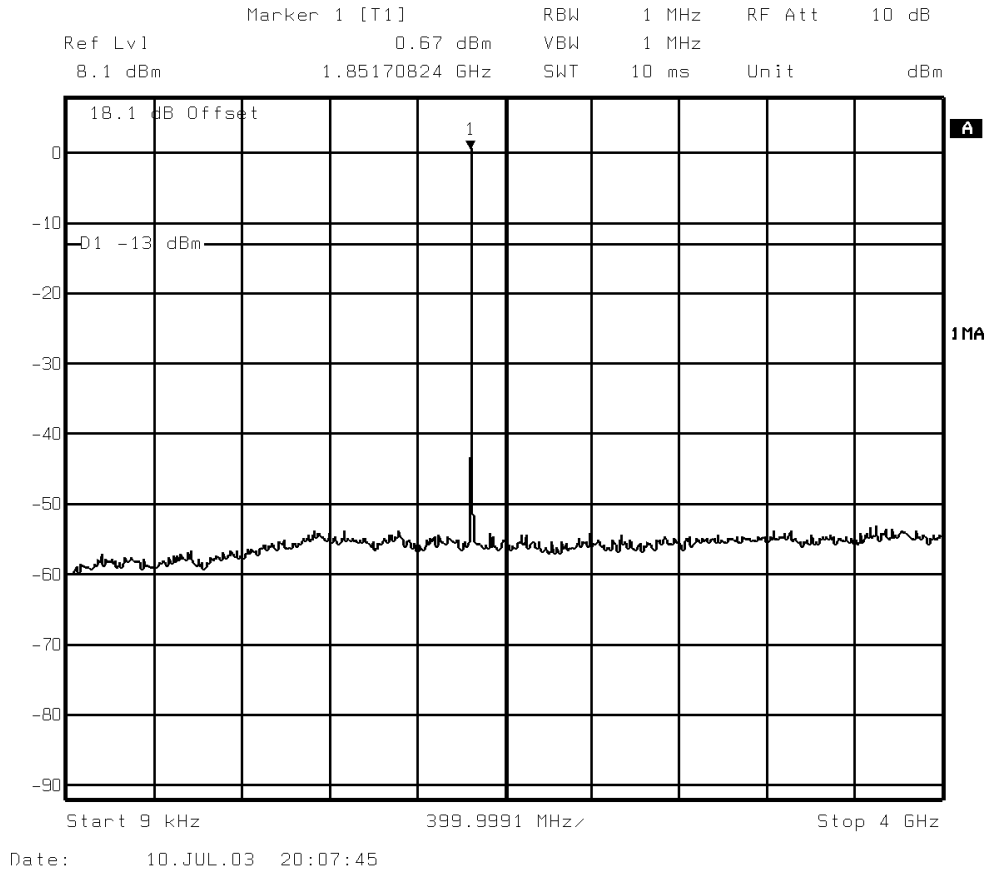
Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (9kHz – 4GHz)  
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 8

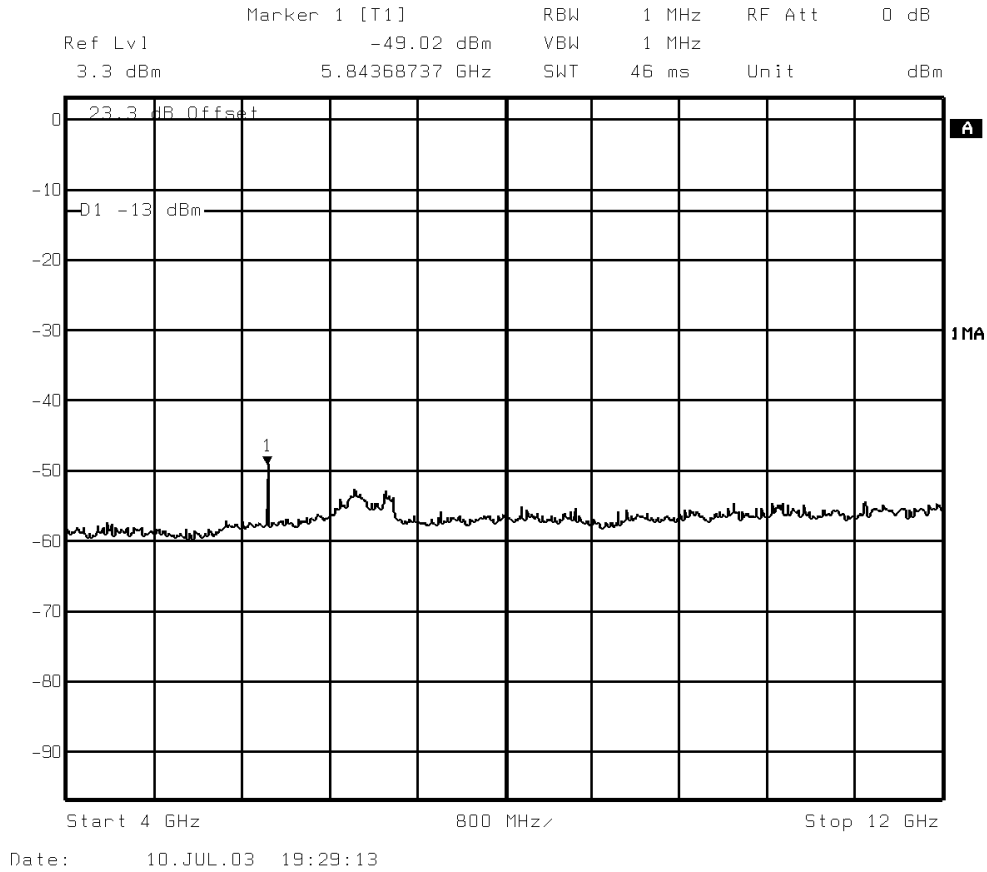
.....





Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

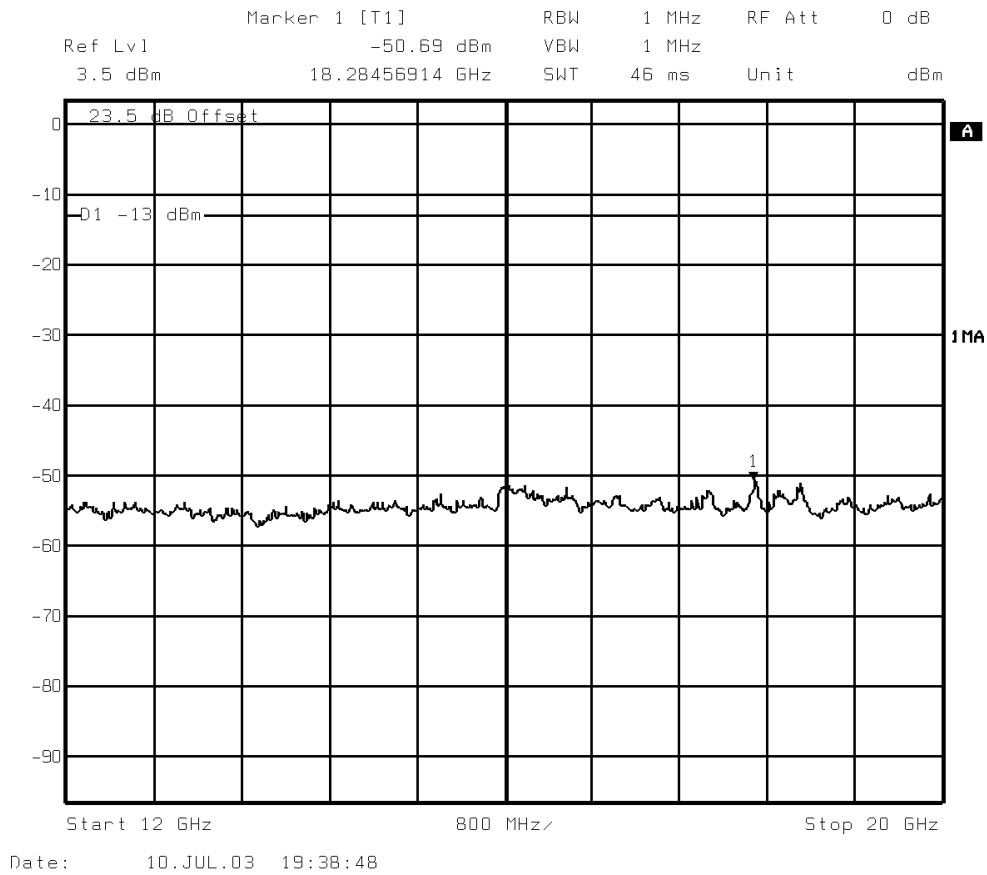
Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....



Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz-20GHz)  
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

.....

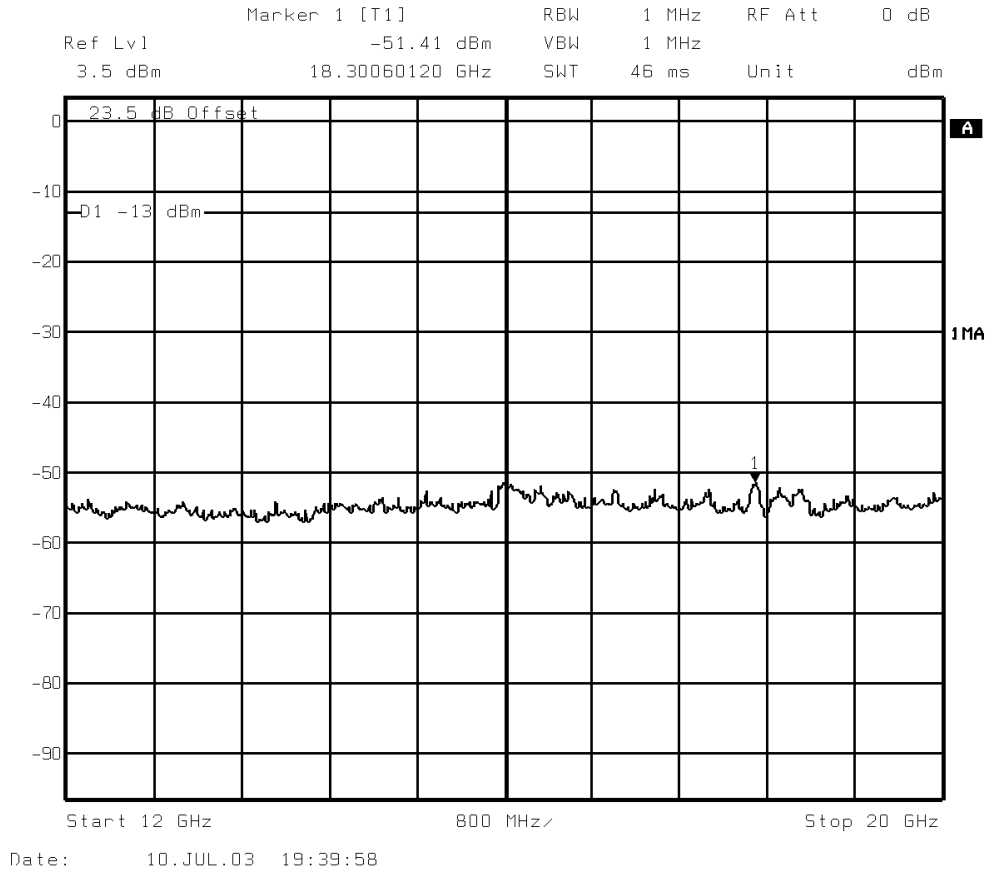






Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 661 (1880.0MHz) – Minimum Power



GPRS – Packet Data

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

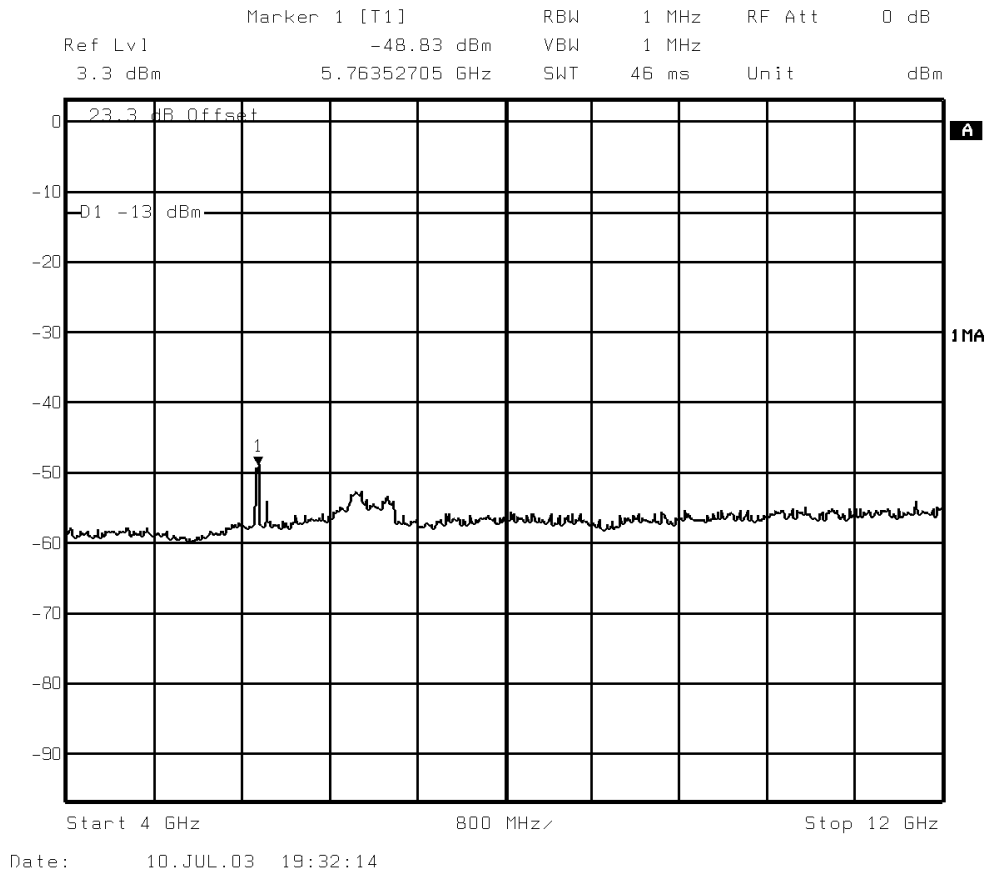
.....





Test Case : Spurious Emissions  
Test Date : 10<sup>th</sup> July 2003  
Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (4GHz – 12GHz)  
Channel 810 (1909.8MHz) – Minimum Power



GPRS – Packet Data

Test Equipment Used:  
1, 2, 3, 4, 5, 6, 7, 9, 10

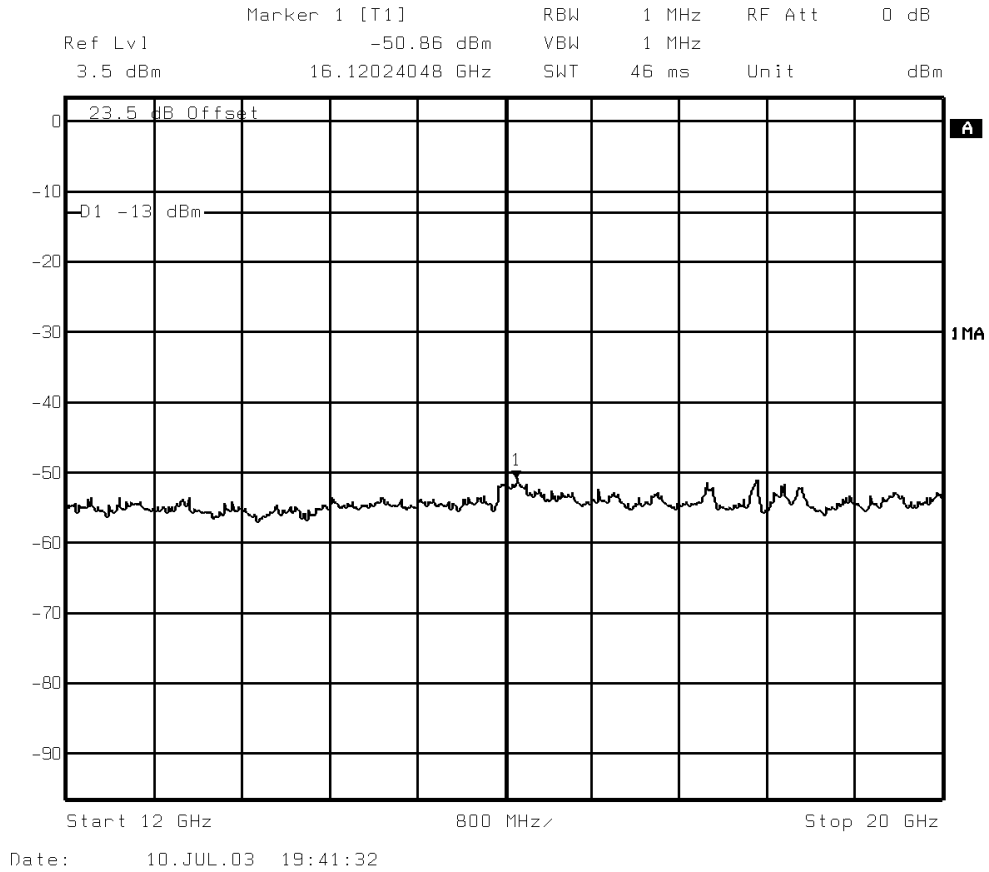


Test Case : Spurious Emissions

Test Date : 10<sup>th</sup> July 2003

Rule Parts : 2.1051, 24.238(a)

Spurious Emissions (12GHz – 20GHz)  
Channel 810 (1909.8MHz) – Minimum Power



GPRS – Packet Data

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 9, 10

.....





Test Case : Spurious Emissions  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

## Harmonic Emissions

Channel 512 (1850.2MHz) – Maximum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.7004          | -61.0            | 19.9           | -41.1                  | -13         |
| 5.5506          | -77.2            | 20.3           | -56.9                  | -13         |
| 7.4008          | -68.5            | 20.0           | -48.5                  | -13         |
| 9.2510          | -61.9            | 21.0           | -40.9                  | -13         |
| 11.1012         | -59.2            | 21.3           | -37.9                  | -13         |
| 12.9514         | -59.6            | 21.9           | -37.7                  | -13         |
| 14.8016         | -75.0            | 21.6           | -53.4                  | -13         |
| 16.6068         | -77.4*           | 22.5           | -54.9                  | -13         |
| 18.4120         | -77.4*           | 22.3           | -55.1                  | -13         |

\*Instrumentation Noise Floor

## Harmonic Emissions

Channel 661 (1880.0MHz)– Maximum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.760           | -59.4            | 19.9           | -40.5                  | - 13        |
| 5.640           | -71.4            | 20.3           | -51.1                  | - 13        |
| 7.520           | -63.3            | 20.0           | -43.3                  | - 13        |
| 9.400           | -62.3            | 21.0           | -41.4                  | - 13        |
| 11.280          | -60.3            | 21.3           | -38.9                  | - 13        |
| 13.160          | -55.6            | 21.9           | -34.3                  | - 13        |
| 15.040          | -69.0            | 21.6           | -47.2                  | - 13        |
| 16.920          | -77.2*           | 22.5           | -54.6                  | - 13        |
| 18.800          | -77.2*           | 22.3           | -54.6                  | - 13        |

\*Instrumentation Noise Floor



Test Case : Spurious Emissions (continued)

Test Date : 10<sup>th</sup> July 2003

Harmonic Emissions

Channel 810 (1909.8MHz) – Maximum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.8196          | -61.5            | 19.9           | -42.5                  | -13         |
| 5.7294          | -68.4            | 20.3           | -48.1                  | -13         |
| 7.6392          | -67.3            | 20.0           | -47.3                  | -13         |
| 9.5490          | -64.7            | 21.0           | -44.0                  | -13         |
| 11.4588         | -72.5            | 21.3           | -50.9                  | -13         |
| 13.3686         | -58.1            | 21.9           | -36.5                  | -13         |
| 15.2784         | -66.5            | 21.6           | -45.2                  | -13         |
| 17.1882         | -77.4*           | 22.5           | -55.3                  | -13         |
| 19.0980         | -77.4*           | 22.3           | -54.5                  | -13         |

\* Instrumental Noise Floor

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

.....



Test Case : Spurious Emissions

Test Date : 10<sup>th</sup> July 2003

Rule Parts : 2.1051, 24.238(a)

Harmonic Emissions

Channel 512 (1850.2MHz) – Minimum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.7004          | -79.5*           | 19.9           | -59.6                  | -13         |
| 5.5506          | -79.5*           | 20.3           | -59.2                  | -13         |
| 7.4008          | -74.7*           | 20.0           | -54.7                  | -13         |
| 9.2510          | -74.1*           | 21.0           | -53.1                  | -13         |
| 11.1012         | -73.1*           | 21.3           | -51.8                  | -13         |
| 12.9514         | -70.5*           | 21.9           | -48.6                  | -13         |
| 14.8016         | -69.0*           | 21.6           | -47.4                  | -13         |
| 16.6068         | -70.4*           | 22.5           | -47.9                  | -13         |
| 18.4120         | -69.5*           | 22.3           | -47.2                  | -13         |

\*Instrumentation Noise Floor

Harmonic Emissions

Channel 661 (1880.0MHz) – Minimum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.760           | -80.2*           | 19.9           | -61.3                  | - 13        |
| 5.640           | -82.8*           | 20.3           | -62.5                  | - 13        |
| 7.520           | -73.6*           | 20.0           | -53.6                  | - 13        |
| 9.400           | -73.9*           | 21.0           | -53.0                  | - 13        |
| 11.280          | -74.4*           | 21.3           | -53.0                  | - 13        |
| 13.160          | -70.5*           | 21.9           | -49.2                  | - 13        |
| 15.040          | -69.1*           | 21.6           | -47.3                  | - 13        |
| 16.920          | -69.9*           | 22.5           | -47.3                  | - 13        |
| 18.800          | -68.8*           | 22.3           | -46.2                  | - 13        |

\*Instrumentation Noise Floor



Test Case : Spurious Emissions (continued)

Test Date : 10<sup>th</sup> July 2003

Harmonic Emissions

Channel 810 (1909.8MHz) – Minimum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.8196          | -80.1*           | 19.9           | -61.1                  | - 13        |
| 5.7294          | -79.7            | 20.3           | -59.4                  | - 13        |
| 7.6392          | -73.8*           | 20.0           | -53.8                  | - 13        |
| 9.5490          | -74.8*           | 21.0           | -54.1                  | - 13        |
| 11.4588         | -75.0*           | 21.3           | -53.4                  | - 13        |
| 13.3686         | -69.5*           | 21.9           | -47.9                  | - 13        |
| 15.2784         | -69.4*           | 21.6           | -48.1                  | - 13        |
| 17.1882         | -70.1*           | 22.5           | -48.0                  | - 13        |
| 19.0980         | -65.9*           | 22.3           | -43.0                  | - 13        |

\* Instrumental Noise Floor

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

.....



Test Case : Spurious Emissions - GPRS  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Harmonic Emissions Channel 512 (1850.2MHz) – Maximum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.7004          | -59.3            | 19.9           | -39.4                  | -13         |
| 5.5506          | -82.7            | 20.3           | -62.4                  | -13         |
| 7.4008          | -64.5            | 20.0           | -44.5                  | -13         |
| 9.2510          | -61.0            | 21.0           | -40.0                  | -13         |
| 11.1012         | -54.8            | 21.3           | -33.5                  | -13         |
| 12.9514         | -56.9            | 21.9           | -35.0                  | -13         |
| 14.8016         | -71.1            | 21.6           | -49.5                  | -13         |
| 16.6068         | -75.1*           | 22.5           | -52.6                  | -13         |
| 18.4120         | -75.1*           | 22.3           | -52.8                  | -13         |

\*Instrumentation Noise Floor

Harmonic Emissions Channel 661 (1880.0MHz)– Maximum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.760           | -61.3            | 19.9           | -42.4                  | - 13        |
| 5.640           | -74.7            | 20.3           | -54.4                  | - 13        |
| 7.520           | -62.7            | 20.0           | -42.7                  | - 13        |
| 9.400           | -61.0            | 21.0           | -40.1                  | - 13        |
| 11.280          | -60.5            | 21.3           | -39.1                  | - 13        |
| 13.160          | -52.6            | 21.9           | -31.3                  | - 13        |
| 15.040          | -66.5            | 21.6           | -44.7                  | - 13        |
| 16.920          | -69.9*           | 22.5           | -47.3                  | - 13        |
| 18.800          | -65.5*           | 22.3           | -42.9                  | - 13        |

\*Instrumentation Noise Floor



Test Case : Spurious Emissions - GPRS (continued)  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Harmonic Emissions

Channel 810 (1909.8MHz) – Maximum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.8196          | -61.3            | 19.9           | -42.3                  | -13         |
| 5.7294          | -68.5            | 20.3           | -48.2                  | -13         |
| 7.6392          | -66.3            | 20.0           | -46.3                  | -13         |
| 9.5490          | -64.3            | 21.0           | -43.6                  | -13         |
| 11.4588         | -70.7            | 21.3           | -49.1                  | -13         |
| 13.3686         | -56.2            | 21.9           | -34.6                  | -13         |
| 15.2784         | -67.1            | 21.6           | -45.8                  | -13         |
| 17.1882         | -70.5            | 22.5           | -48.4                  | -13         |
| 19.0980         | -65.4            | 22.3           | -42.5                  | -13         |

Test Equipment Used:  
 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

.....  
 Test Case : Spurious Emissions - GPRS



Test Date : 10<sup>th</sup> July 2003

Rule Parts : 2.1051, 24.238(a)

Harmonic Emissions

Channel 512 (1850.2MHz) – Minimum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.7004          | -79.6*           | 19.9           | -59.7                  | -13         |
| 5.5506          | -79.6*           | 20.3           | -59.3                  | -13         |
| 7.4008          | -74.6*           | 20.0           | -54.6                  | -13         |
| 9.2510          | -73.7*           | 21.0           | -52.7                  | -13         |
| 11.1012         | -74.3*           | 21.3           | -53.0                  | -13         |
| 12.9514         | -70.4*           | 21.9           | -48.5                  | -13         |
| 14.8016         | -69.3*           | 21.6           | -47.7                  | -13         |
| 16.6068         | -70.7*           | 22.5           | -48.2                  | -13         |
| 18.4120         | -70.1*           | 22.3           | -47.8                  | -13         |

\*Instrumentation Noise Floor

Harmonic Emissions

Channel 661 (1880.0MHz) – Minimum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.760           | -79.7*           | 19.9           | -60.8                  | - 13        |
| 5.640           | -79.6*           | 20.3           | -59.3                  | - 13        |
| 7.520           | -74.1*           | 20.0           | -54.1                  | - 13        |
| 9.400           | -73.4*           | 21.0           | -52.5                  | - 13        |
| 11.280          | -73.9*           | 21.3           | -52.5                  | - 13        |
| 13.160          | -70.2*           | 21.9           | -48.9                  | - 13        |
| 15.040          | -68.6*           | 21.6           | -46.8                  | - 13        |
| 16.920          | -70.2*           | 22.5           | -47.6                  | - 13        |
| 18.800          | -65.6*           | 22.3           | -43.0                  | - 13        |

\*Instrumentation Noise Floor



Test Case : Spurious Emissions (continued)  
 Test Date : 10<sup>th</sup> July 2003  
 Rule Parts : 2.1051, 24.238(a)

Harmonic Emissions

Channel 810 (1909.8MHz) – Minimum Power

| Frequency (GHz) | Raw Result (dBm) | Path Loss (dB) | Corrected Result (dBm) | Limit (dBm) |
|-----------------|------------------|----------------|------------------------|-------------|
| 3.8196          | -80.1*           | 19.9           | -61.1                  | - 13        |
| 5.7294          | -74.3*           | 20.3           | -54.0                  | - 13        |
| 7.6392          | -75.0*           | 20.0           | -55.0                  | - 13        |
| 9.5490          | -73.6*           | 21.0           | -52.9                  | - 13        |
| 11.4588         | -74.4*           | 21.3           | -52.8                  | - 13        |
| 13.3686         | -69.2*           | 21.9           | -47.6                  | - 13        |
| 15.2784         | -69.7*           | 21.6           | -48.4                  | - 13        |
| 17.1882         | -70.4*           | 22.5           | -48.3                  | - 13        |
| 19.0980         | -65.2*           | 22.3           | -42.3                  | - 13        |

\* Instrumental Noise Floor

Test Equipment Used:  
 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

.....





Test Case : Frequency Stability Under Temperature Variations  
 Test Date : 2<sup>nd</sup> July 2003  
 Rule Parts : 2.1055, 24.135(a)

#### Measurement Method

##### GSM

The EUT was set to transmit on maximum power and measurements were made on Timeslot 3. A Digital Communications Analyser, (CMU200), was used to measure the Frequency Error. The maximum result of measurements made over 200 bursts was recorded.

##### GPRS

The EUT was set to transmit on maximum power, (timeslots 3 and 4 active), and measurements performed on Timeslot 3. A Digital Communications Analyser, (CMU200), was used to measure the Frequency Error. The maximum result of measurements made over 200 bursts was recorded.

#### Results

##### GSM – Circuit Switched

| Temperature Interval(°C) | Test Frequency (GHz) | Deviation (Hz) | Limit (kHz) |
|--------------------------|----------------------|----------------|-------------|
| - 30                     | 1.88                 | +40            | ± 1.88      |
| - 20                     | 1.88                 | +58            | ± 1.88      |
| - 10                     | 1.88                 | +25            | ± 1.88      |
| 0                        | 1.88                 | -26            | ± 1.88      |
| + 10                     | 1.88                 | +28            | ± 1.88      |
| + 20                     | 1.88                 | -25            | ± 1.88      |
| + 30                     | 1.88                 | -33            | ± 1.88      |
| + 40                     | 1.88                 | +26            | ± 1.88      |
| + 50                     | 1.88                 | +26            | ± 1.88      |



Test Case : Frequency Stability Under Temperature Variations – (continued)  
 Test Date : 2<sup>nd</sup> July 2003  
 Rule Parts : 2.1055, 24.135(a)

GPRS – Packet Data

| Temperature Interval(°C) | Test Frequency (GHz) | Deviation (Hz) | Limit (kHz) |
|--------------------------|----------------------|----------------|-------------|
| - 30                     | 1.88                 | -30            | ± 1.88      |
| - 20                     | 1.88                 | +60            | ± 1.88      |
| - 10                     | 1.88                 | -42            | ± 1.88      |
| 0                        | 1.88                 | -38            | ± 1.88      |
| + 10                     | 1.88                 | -32            | ± 1.88      |
| + 20                     | 1.88                 | -26            | ± 1.88      |
| + 30                     | 1.88                 | +31            | ± 1.88      |
| + 40                     | 1.88                 | -35            | ± 1.88      |
| + 50                     | 1.88                 | -25            | ± 1.88      |

|       |                  |
|-------|------------------|
| Limit | ±0.0001% or 1ppm |
|-------|------------------|

Remarks

EUT complies with CFR 47 Part 24.135(a). The EUT does not exceed ±1.88kHz at the measured frequency at any temperature interval across the measured range.

Test Equipment Used:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

.....



Test Case : Frequency Stability Under Voltage Variations  
 Test Date : 16<sup>th</sup> July 2003  
 Rule Parts : 24.135(a)

Measurement Method

Results

GSM

| DC Voltage (V) | Test Frequency (GHz) | Deviation (Hz) | Deviation Limit (kHz) |
|----------------|----------------------|----------------|-----------------------|
| 4.25           | 1.88                 | -23            | ± 1.88                |
| 5.00           | 1.88                 | 28             | ± 1.88                |
| 5.75           | 1.88                 | -25            | ± 1.88                |

GPRS

| DC Voltage (V) | Test Frequency (GHz) | Deviation (Hz) | Deviation Limit (kHz) |
|----------------|----------------------|----------------|-----------------------|
| 4.25           | 1.88                 | -41            | ± 1.88                |
| 5.00           | 1.88                 | -44            | ± 1.88                |
| 5.75           | 1.88                 | -42            | ± 1.88                |

|       |                  |
|-------|------------------|
| Limit | ±0.0001% or 1ppm |
|-------|------------------|

Remarks

EUT complies with CFR 47 Part 24.135(a). The EUT does not exceed ±1.88kHz at the measured frequency either at nominal or voltage variation.

Test Equipment Used:

1, 2, 3, 4, 6, 7, 8

.....



**TEST SAMPLE PHOTOGRAPHS**



Figure One : Front View of the BENQ 56W10 Sample.



2.6 TEST SAMPLE PHOTOGRAPHS Continued

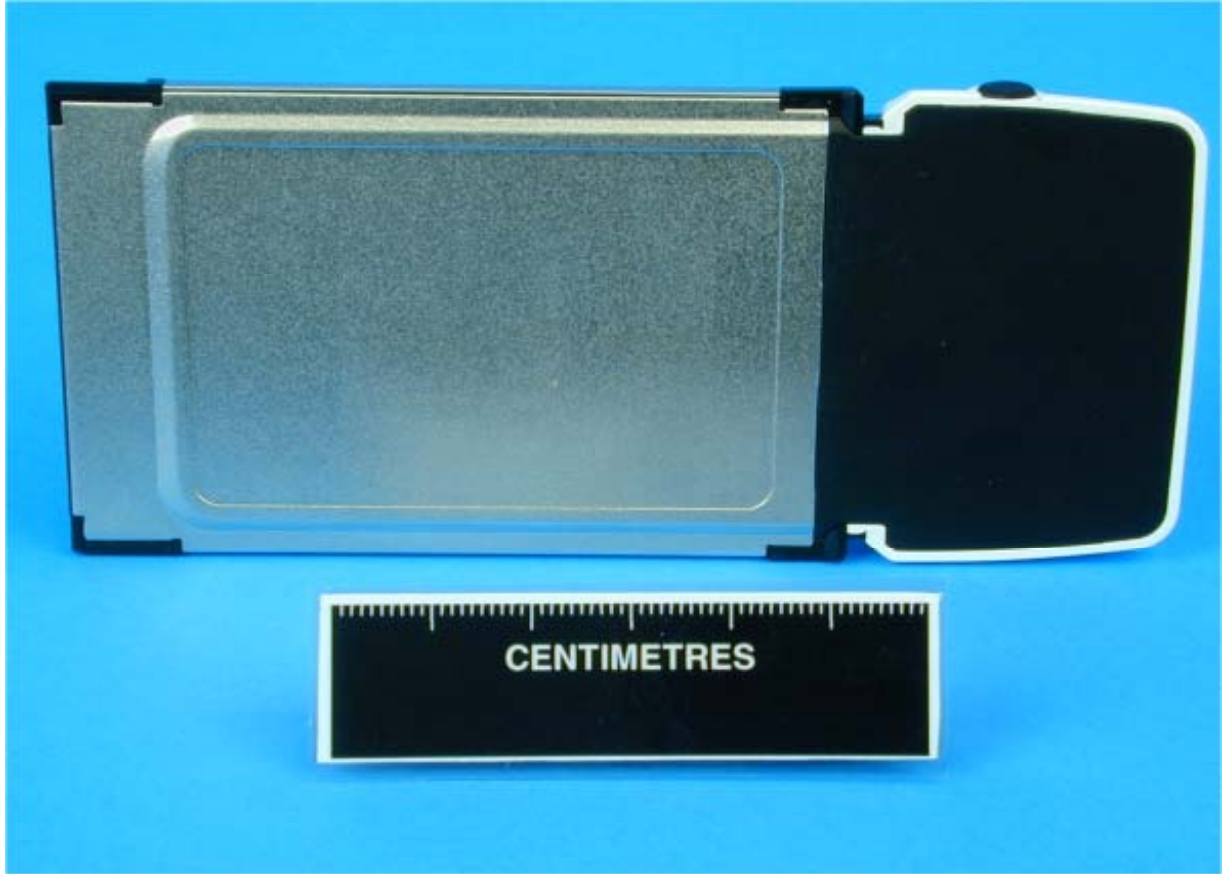


Figure Two : Rear View of the BENQ 56W10 Sample.



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Group

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Results of tests not yet included in our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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**Annex A**

FCC Measurement Facility Compliance Letter



**FEDERAL COMMUNICATIONS COMMISSION**

**Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046**

October 18, 2002

Registration Number: 90987

TUV Product Service Ltd  
Segensworth Road  
Titchfield  
Fareham, Hampshire, PO15 5RH  
United Kingdom  
Attention: Kevan Adsetts

Re: Measurement facility located at Titchfield  
Anechoic chamber (3 meters) and 3 & 10 meter OATS  
Date of Listing: October 18, 2002

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Thomas W Phillips  
Electronics Engineer