
REPORT ON

FCC CFR 47: Parts 15 and 24 Testing in support of an
Application for Grant of Equipment Authorisation
of a Maxon Telecom Co. Ltd. MX-C110 Tri-Band Terminal Equipment

COMMERCIAL-IN-CONFIDENCE

FCC ID: RXUMX-C110

Report No RO612158/01 Issue 2

March 2004

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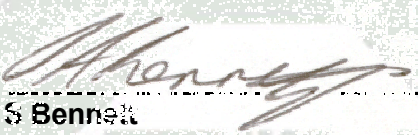
Report No RO612158/01 Issue 2

March 2004

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DATED

25th March 2004

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Maxon Telecom Co. Ltd.

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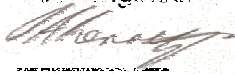
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ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47: Parts 15 and 24. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers:


S Bennett


J Holcombe





CONTENTS

Section	Page No
1	REPORT SUMMARY
1.1	Status..... 4
1.2	Introduction or Test and Assessment Schedule..... 5
1.3	Brief Summary of Results (and Observations)..... 5
1.4	Opinions and Interpretations..... 6
1.5	Product information..... 7
1.6	Test Conditions (Configuration)..... 7
1.7	Deviations from the Standard 7
1.8	Modification Record 7
2	TEST DETAILS
2.1	Maximum Peak Output Power (Conducted)..... 9
2.2	Maximum Peak Output Power (Radiated)..... 11
2.3	Modulation Characteristics 14
2.4	Occupied Bandwidth..... 18
2.5	Spurious Emissions At Antenna Terminals (+/- 1MHz)..... 21
2.6	Radiated Emissions..... 55
2.7	AC Line Conducted Emissions 60
2.8	Conducted Spurious Emissions..... 64
2.9	Frequency Stability Under Temperature Variation..... 108
2.10	Frequency Stability Under Voltage Variation 110
3	TEST EQUIPMENT USED
3.1	Table of Test Equipment Used 113
3.2	Measurement Uncertainty..... 115
4	EUT PHOTOGRAPHS
4.1	List of EUT Photographs..... 117
5	ACCREDITATION, DISCLAIMERS AND COPYRIGHT
5.1	Accreditation, Disclaimers and Copyright 119
APPENDICES	
A	Titchfield FCC Site Compliance Letter 120



SECTION 1

REPORT SUMMARY

FCC CFR 47: Part 24 Testing in support of an
Application for Grant of Equipment Authorisation
of a Maxon Telecom Co. Ltd. MX-C110 Tri-Band Terminal Equipment



1.1 STATUS

EQUIPMENT UNDER TEST	MX-C110 Tri-Band Terminal Equipment
OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
NAME AND ADDRESS OF CLIENT	Maxon Telecom Co. Ltd.
TYPE NUMBER	MX-C110
SERIAL NUMBER	35290500-000014-5
HARDWARE VERSION	V2.2.1
SOFTWARE VERSION	722.20.000.T02
TEST SPECIFICATION / ISSUE / DATE	FCC CFR 47: Part 15, Subparts B and C, August 2002, and Part 24, Subpart D, January 2001
NUMBER OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Commercial In Confidence
DISPOSAL	Held pending disposal
REFERENCE NUMBER	Not Applicable
DATE	Not Applicable
ORDER NUMBER	TCMD0426813
DATE	6 th January 2004
START OF TEST	12 th January 2004
FINISH OF TEST	15 th January 2004
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. FCC Public Notice document (DA 00-705 released 30 March 2000)



1.2 INTRODUCTION

The information contained within this report is intended to show verification of compliance of the Maxon Telecom Co. Ltd. MX-C110 to the requirements of FCC Specification Part 24.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Maxon Telecom Co. Ltd.

1.3 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out is shown below.

Test	Spec Clause	Test Description	Result	Comments
2.1	2.1046, 24.232 (b)	RF Output Power	PASS	-
2.2	2.1046, 24.232 (b)	Maximum Peak Output Power	PASS	-
2.3	2.1047(d)	Modulation Characteristics	PASS	-
2.4	2.1049, 24.238(b)	Occupied Bandwidth	PASS	-
2.5	2.1049, 24.229	Band Edge Measurements	PASS	-
2.6	24.238	Radiated Spurious Emissions	PASS	-
2.7	15.207	Radiated Spurious Emissions (Unintentional Radiator)	PASS	-
2.8	2.1051, 24.238(a)	Conducted Spurious Emissions	PASS	-
2.9	2.1055, 24.235	Frequency Stability Under Temperature Variation	PASS	-
2.10	24.235	Frequency Stability Under Voltage Variation	PASS	-



1.4 OPINIONS AND INTERPRETATIONS

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.



1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Maxon MX-C110 Tri Band Terminal Equipment operates from a 3.7 volt battery. At 1900MHz it is Power Class 1, operating with a maximum output power of 1 watt.

1.5.2 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Applicable testing was carried out with the EUT transmitting and receiving, (duplex), at maximum power or as detailed in Section 1.5.3.

1.5.3 Test Mode 1: PCS1900MHz Transmitting on the following channels and frequencies;

Bottom Channel 512: 1850.2MHz

Middle Channel 661: 1880.0MHz

Top Channel 810: 1909.8MHz

1.6 TEST CONDITIONS

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site identified in Appendix A, and tested in accordance with the applicable specification.

For all tests except AC Line Conducted Emissions, the Maxon MX-C110 was powered by its own internal battery.

For Conducted Emissions tests, the Maxon MX-C110 was powered via an AC to DC charger running from 120V, 60Hz supply.

1.7 DEVIATIONS FROM THE STANDARD

Not Applicable

1.8 MODIFICATION RECORD

Not Applicable



SECTION 2

TEST DETAILS

FCC CFR 47: Parts 15 and 24 Testing in support of an
Application for Grant of Equipment Authorisation
of a Maxon Telecom Co. Ltd. MX-C110 Tri-Band Terminal Equipment



2.1 MAXIMUM PEAK OUTPUT POWER (CONDUCTED)

2.1.1 FCC CFR 47: Part 24 Subpart E, Section 24.232 (b)

2.1.2 Equipment Under Test MX-C110

2.1.3 Date of Test 14th January 2004

2.1.4 Test Equipment Used (See Section 3.1 for details) 1, 2, 3, 4, 5, 6, 7

2.1.5 Test Procedure

Using a spectrum analyser and an 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 mobile. The carrier was modulated by it's normal GMSK modulation and measurements performed with timeslot 3 active. In GPRS mode, timeslots 3 and 4 were active.

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

2.1.6 Test Results

Maximum Power - GSM

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
1850.2	12.45	16.8	29.25	0.841
1880.0	12.19	16.8	28.99	0.793
1909.8	11.77	16.8	28.57	0.719

Minimum Power- GSM

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (mW)
1850.2	-16.50	16.8	+0.30	1.07
1880.0	-16.90	16.8	-0.10	0.98
1909.8	-17.44	16.8	-0.64	0.86



2.1 MAXIMUM PEAK OUTPUT POWER (CONDUCTED) - Continued

Maximum Power - GPRS

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
1850.2	12.37	16.8	29.17	0.826
1880.0	12.03	16.8	28.83	0.764
1909.8	11.69	16.8	28.49	0.706

Minimum Power- GPRS

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (mW)
1850.2	-16.98	16.8	-0.18	0.96
1880.0	-17.44	16.8	-0.64	0.86
1909.8	-17.79	16.8	-0.99	0.80

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.

**2.2 MAXIMUM PEAK OUTPUT POWER (RADIATED)****2.2.1 FCC CFR 47: Part 24 Subpart E, Section 24.232 (b)****2.2.2 Equipment Under Test**
MX-C110**2.2.3 Date of Test**
12th January 2004**2.2.4 Test Equipment Used (See Section 3.1 for details)**
3, 4, 5, 6, 11, 12, 14, 31, 32**2.2.5 Test Procedure**

Test Performed in accordance with ANSI C63.4.

The EUT has an Integral antenna, therefore the Maximum Peak Output Power (EIRP) was made using the Radiated method.

The Spectrum Analyser was tuned to the test frequency. The device Output Power setting was controlled as specified in the Product Information, Section 1.5 of this document. The device was then rotated through 360 degrees, and the measuring antenna height searched (1m – 4m) 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 to the antenna was adjusted until the received level matched that of the previously detected emission.

**2.2 MAXIMUM PEAK OUTPUT POWER** - continued**2.2.6 Test Results**

Measurements were made with the EUT in PCS 1900MHz.

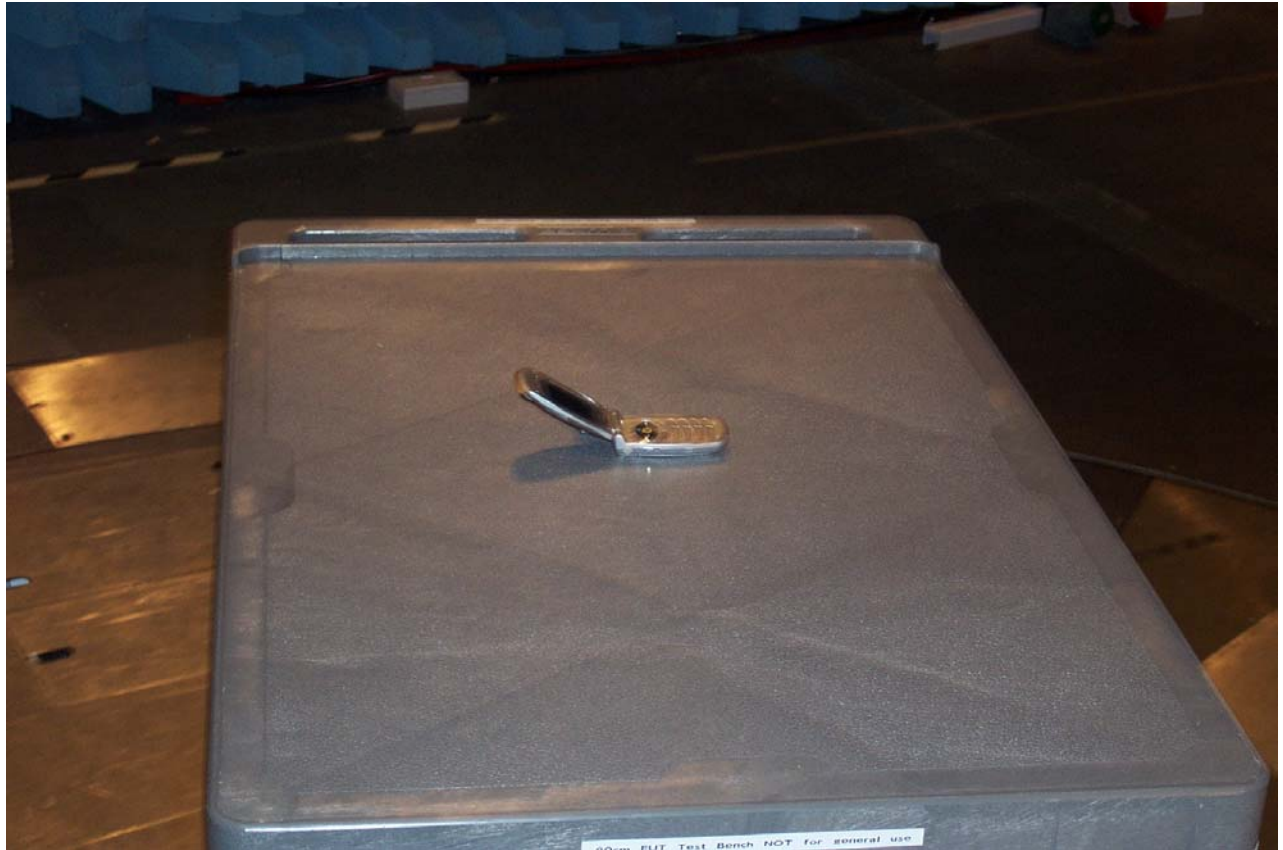
The EUT met the requirements of FCC Part 24, Section 24.232, Power and Antenna Height Limits.

Frequency (MHz)	Raw Result (dBm)	Substitution Level (dBm)	Substitution Antenna Gain (dB)	Result EIRP (dBm)	EIRP Limit (dBm)	Result EIRP (W)
1850.2	-7.5	23.3	8.8	32.1	33.0	1.621
1909.8	-9.0	21.6	8.8	30.4	33.0	1.096



2.2 MAXIMUM PEAK OUTPUT POWER - continued

2.2.7 Set Up Photograph



Maximum Peak Output Power Set Up Photograph



2.3 MODULATION CHARACTERISTICS

2.3.1 FCC CFR 47: Part 24 Subpart E, Section 2.1047(d)

2.3.2 Equipment Under Test MX-C110

2.3.3 Date of Test 14th January 2004

2.3.4 Test Equipment Used 1, 2, 3, 4, 5, 6, 7

2.3.5 Modulation Data supplied by Maxon.

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 summarize 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 multi-frame. The existence of the multi-frame 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

$$h = 2 \cdot F_p \cdot T_b$$

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.



2.3 MODULATION CHARACTERISTICS - Continued

Annex to Description of Modulation Characteristics

The differentially encoded modulating data values α_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

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

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

The phase of the modulated signal is:

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

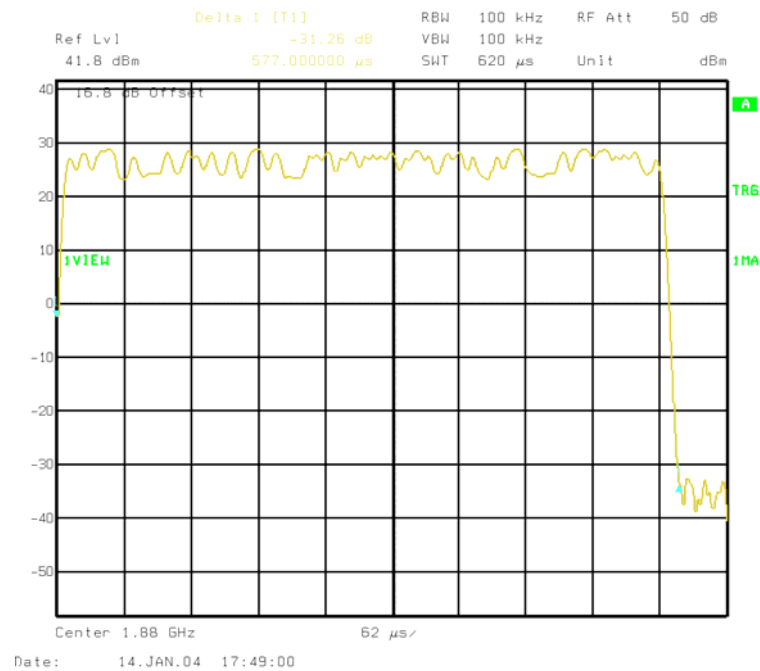
where the modulating index h is $1/2$ (maximum phase change in radians is $\pi/2$ per data interval). The time reference $t' = 0$ is the start of the slot.

The modulated RF carrier is expressed as:

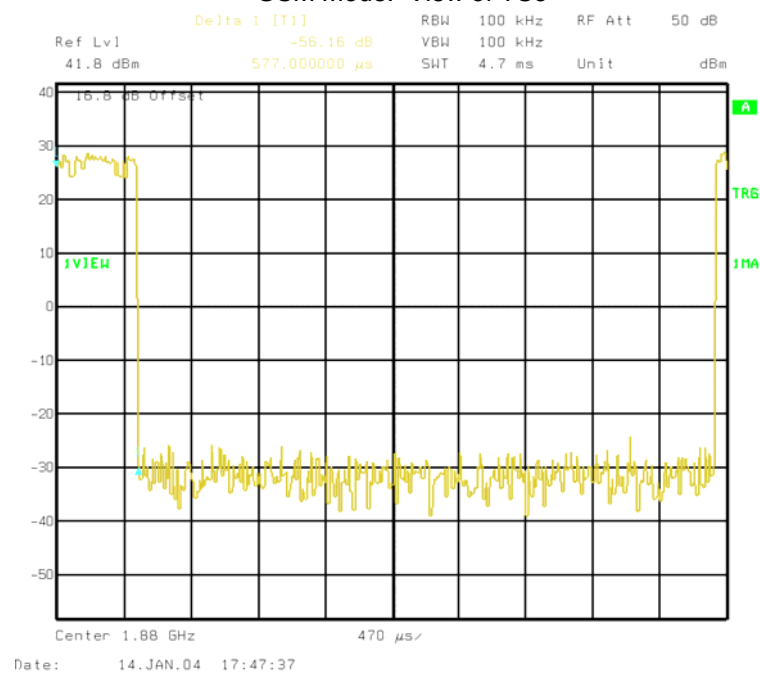
$$x(t') = \sqrt{\frac{2E_c}{T}} \cdot \cos(2\pi f_0 t' + \phi(t') + \phi_0)$$

where E_c is the energy per modulating bit, f_0 is the centre frequency and ϕ_0 is a random phase and is constant during one burst

2.3 MODULATION CHARACTERISTICS - Continued



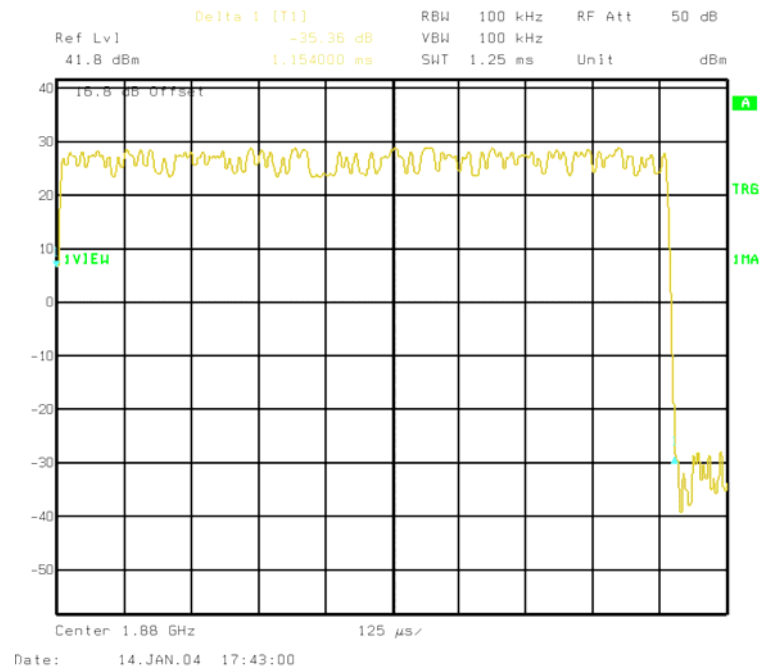
GSM Mode. View of TS3



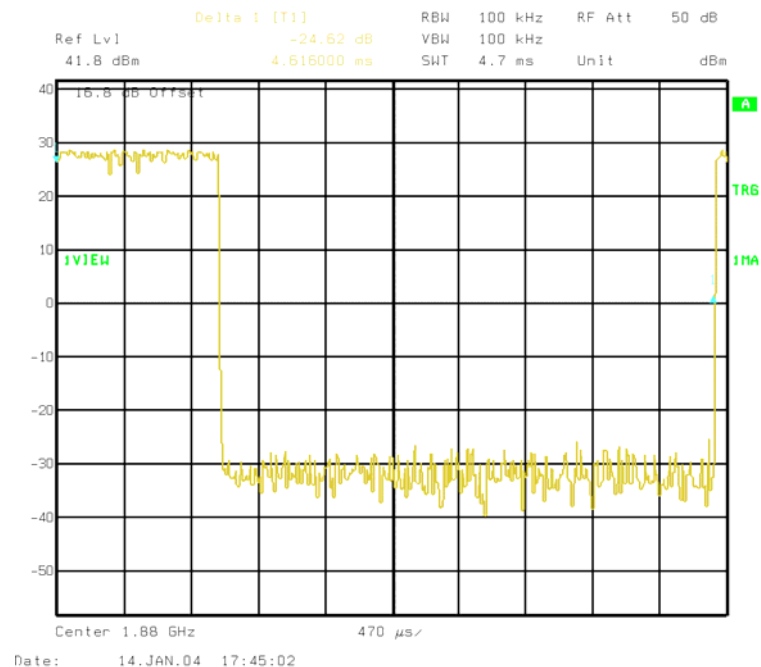
GSM Mode. View of One Complete Frame Showing TS3



2.3 MODULATION CHARACTERISTICS - Continued



GPRS Mode. View of TS3/TS4



GPRS Mode. View of one Complete Frame Showing TS3/TS4

**2.4 OCCUPIED BANDWIDTH****2.4.1 FCC CFR 47: Part 24 Subpart E, Section 24.238(b)****2.4.2 Equipment Under Test**
MX-C110**2.4.3 Date of Test**
14th January 2004**2.4.4 Test Equipment Used (See Section 3.1 for details)**
1, 2, 3, 4, 5, 6, 7**2.4.5 Test Procedure**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.

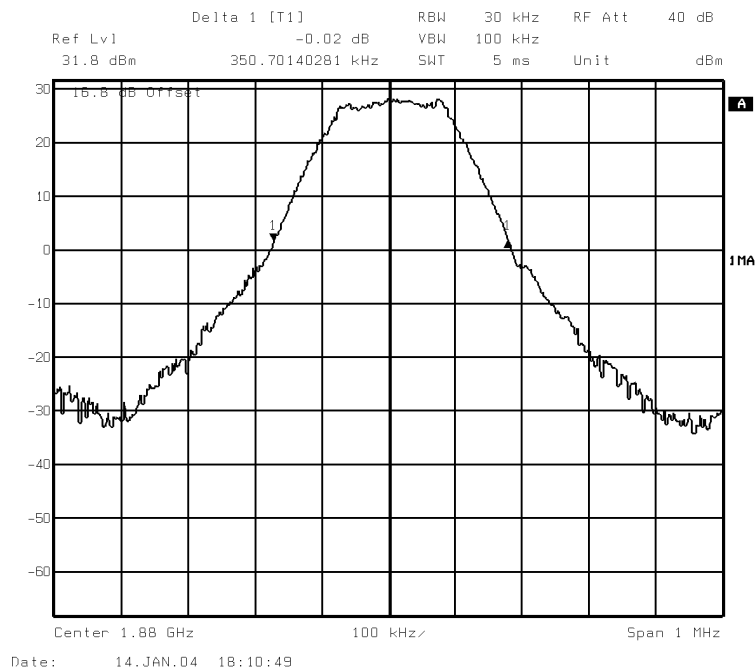
The plots below show the resultant display from the Spectrum Analyser.



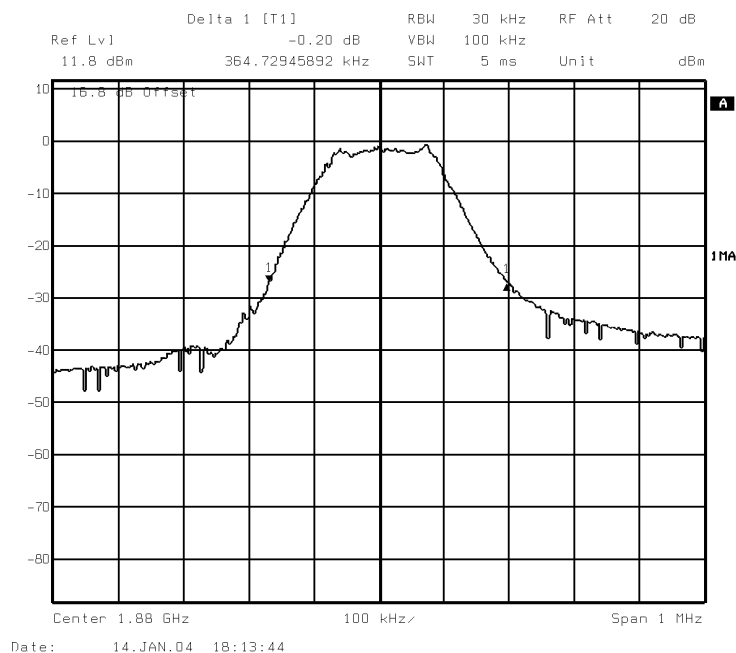
2.4 OCCUPIED BANDWIDTH - Continued

2.4.5 Test Results

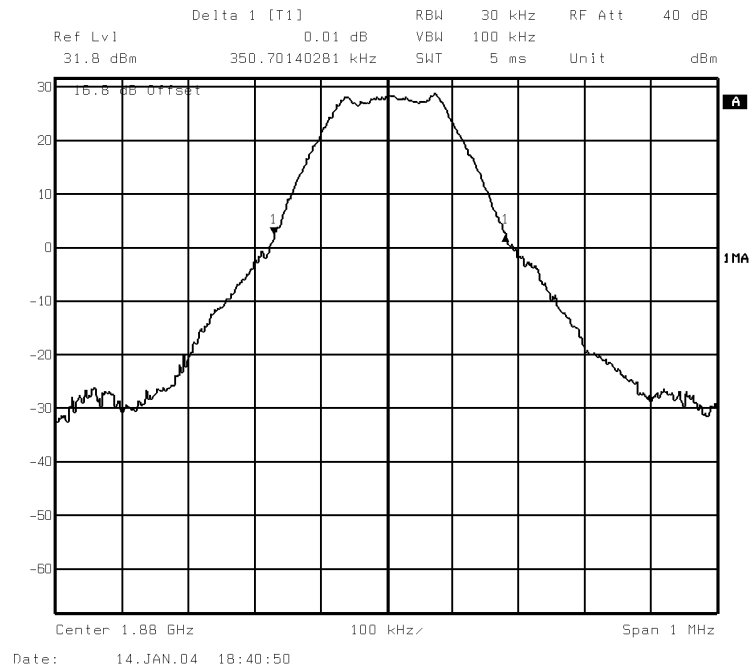
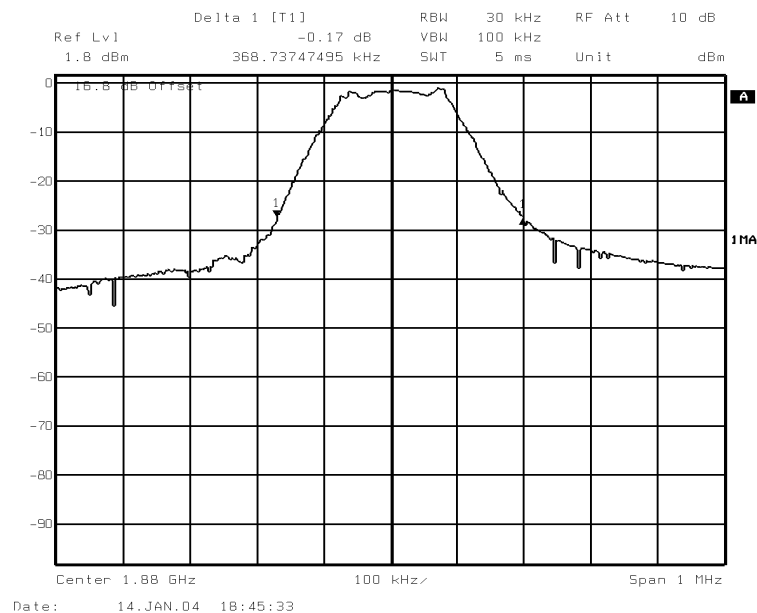
Occupied Bandwidth As Defined By The - 26dBc Points



Maximum Power – Circuit Switched (GSM)



Minimum Power – Circuit Switched (GSM)

**2.4 OCCUPIED BANDWIDTH - Continued****Maximum Power – Packet Data, (GPRS)****Minimum Power – Packet Data, (GPRS)**



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz)

2.5.1 FCC CFR 47: Part 24 Subpart E, Section 24.229

2.5.2 Equipment Under Test MX-C110

2.5.3 Date of Test 14th January 2004

2.5.4 Test Equipment Used (See Section 3.1 for details) 1, 2, 3, 4, 5, 6, 7

2.5.5 Test Procedure

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.

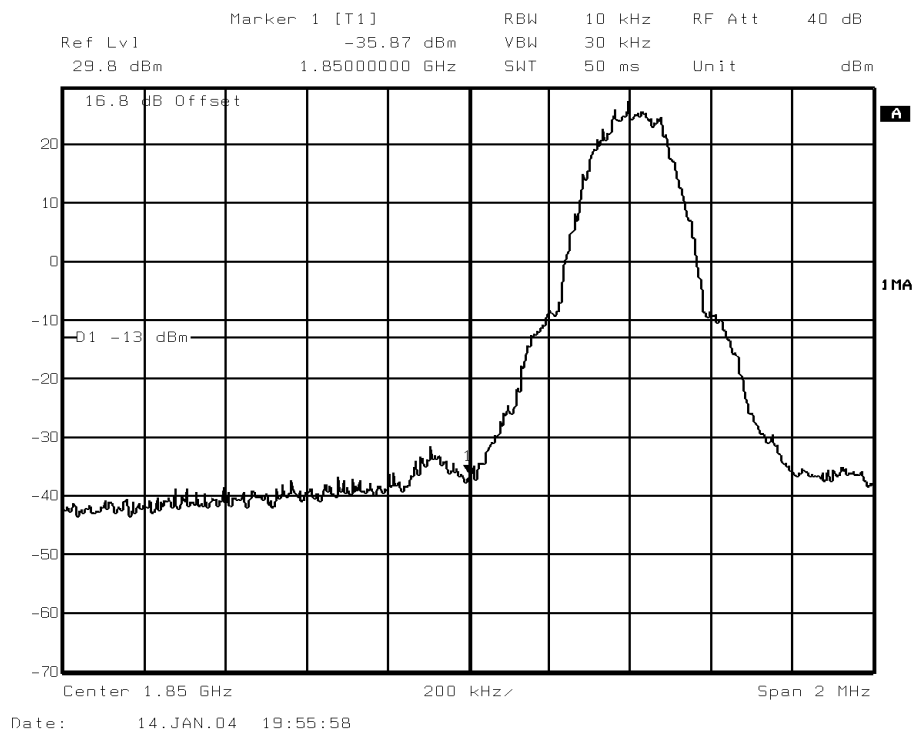
Frequency Block (MHz)	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A	Channel : 513 Frequency : 1850.4 MHz	Channel : 584 Frequency : 1864.6 MHz
B	Channel : 613 Frequency : 1870.4 MHz	Channel : 684 Frequency : 1884.6 MHz
C	Channel : 738 Frequency : 1895.4 MHz	Channel : 759 Frequency : 1899.6 MHz
C	Channel : 763 Frequency : 1900.4 MHz	Channel : 784 Frequency : 1904.6MHz
C	Channel : 789 Frequency : 1905.4 MHz	Channel : 809 Frequency : 1909.6 MHz
D	Channel : 588 Frequency : 1865.4 MHz	Channel : 609 Frequency : 1869.6 MHz
E	Channel : 688 Frequency : 1885.4 MHz	Channel : 709 Frequency : 1889.6 MHz
F	Channel : 713 Frequency : 1890.4 MHz	Channel : 734 Frequency : 1894.6 MHz

2.5.6 Test Results

The measurement plots are shown on the following pages.

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

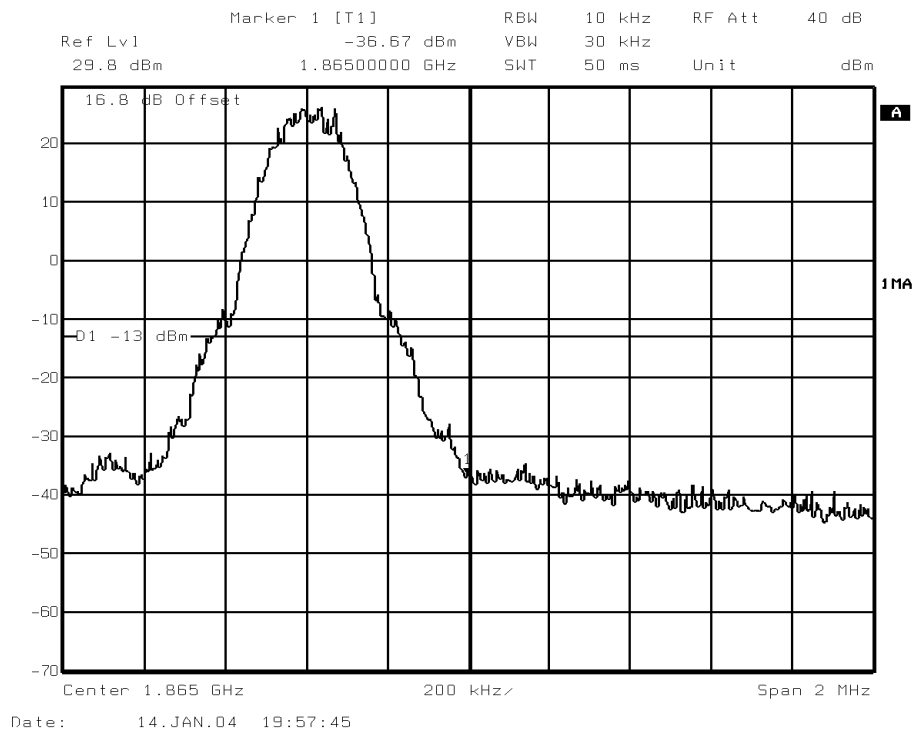
Block A**GSM – Circuit Switched**



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block A



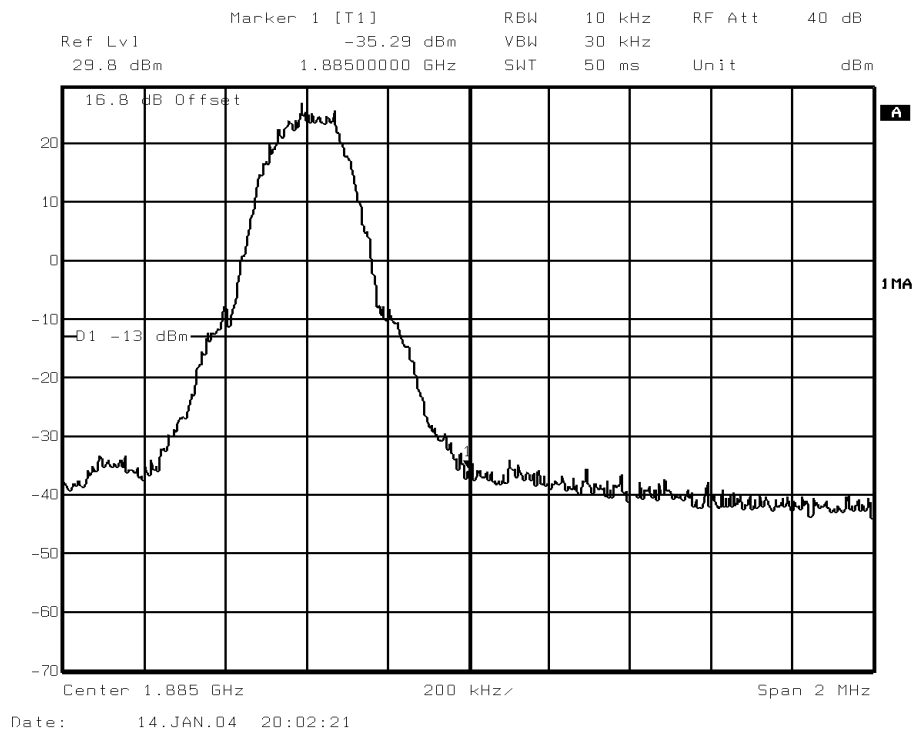
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

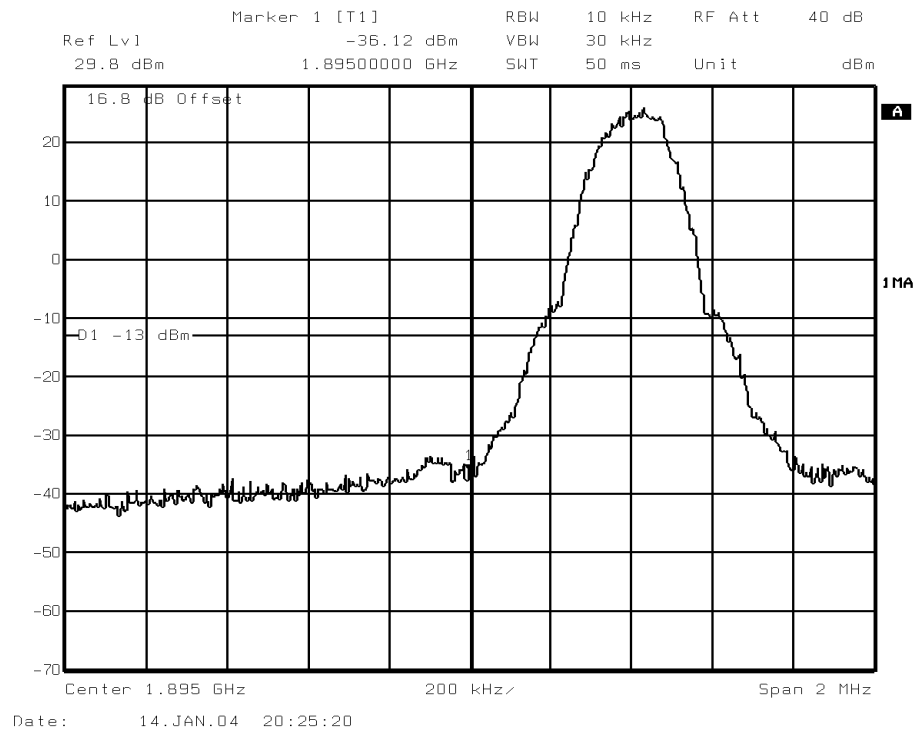
Block B



GSM – Circuit Switched

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

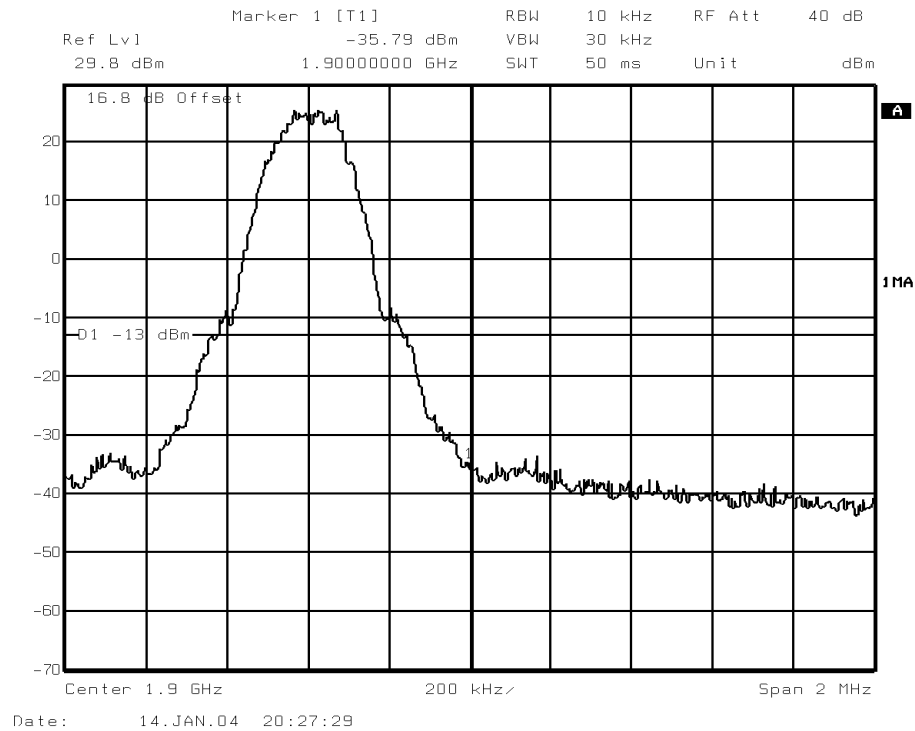
Block C**GSM – Circuit Switched**



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 759, (1899.6MHz)

Block C



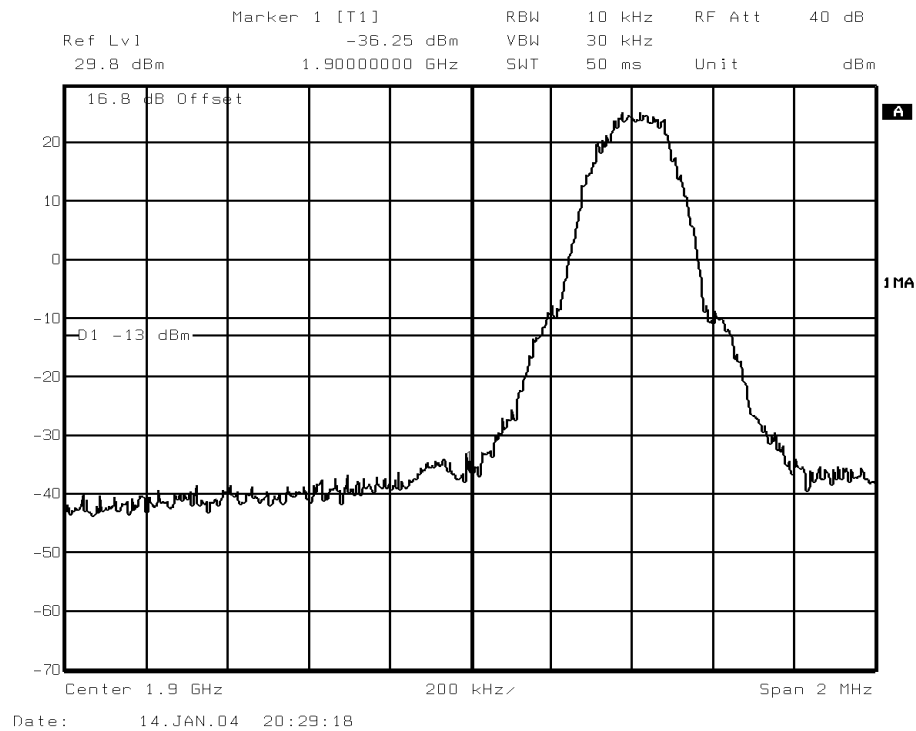
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 763, (1900.4MHz)

Block C



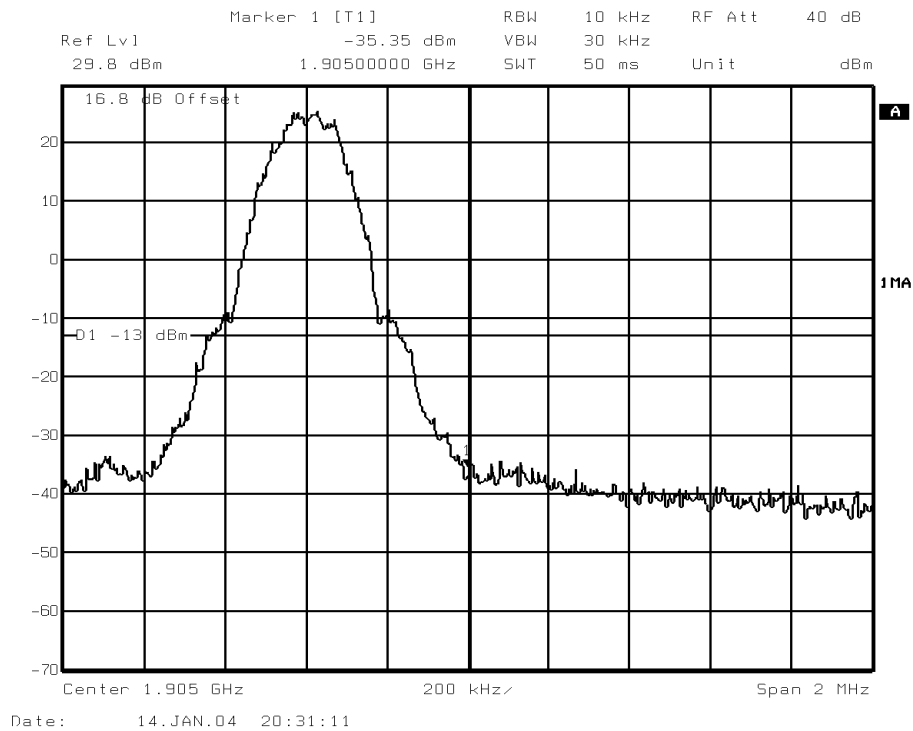
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 784, (1904.6MHz)

Block C



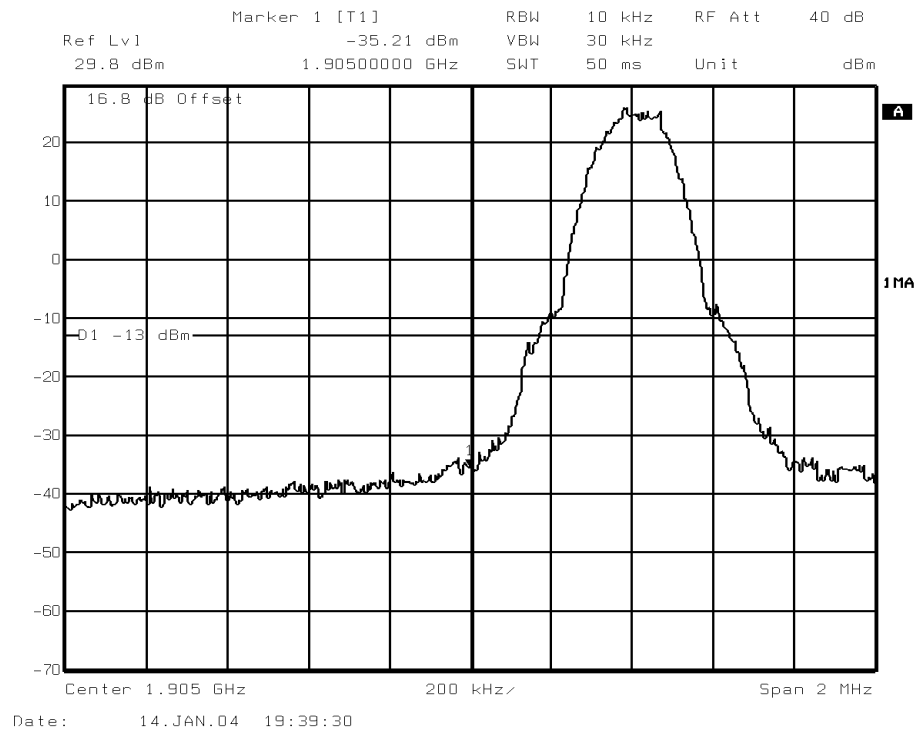
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 789, (1905.4MHz)

Block C



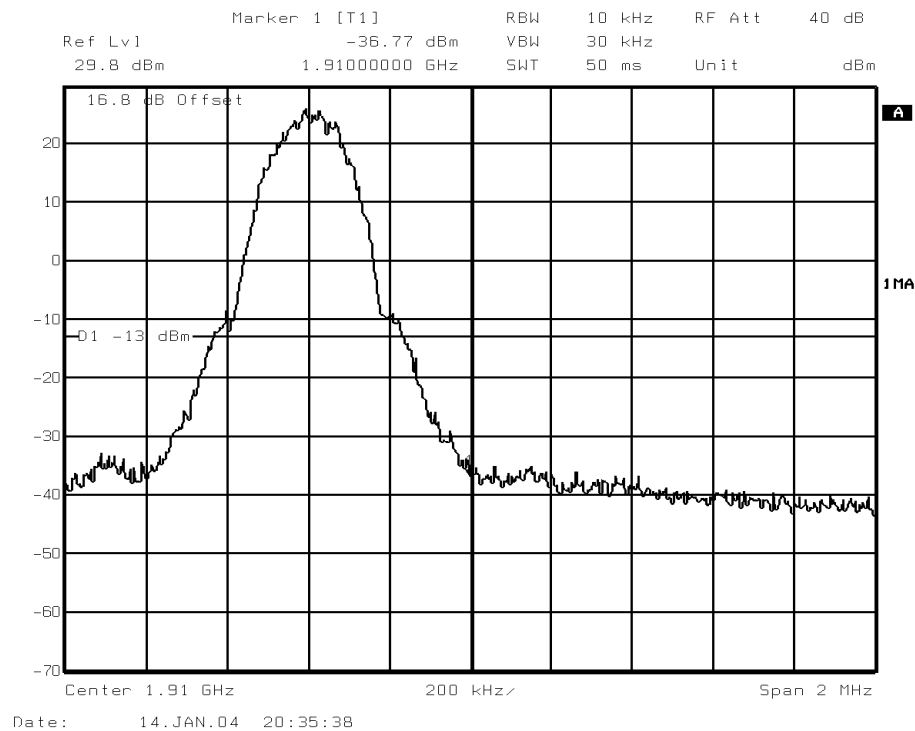
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block C

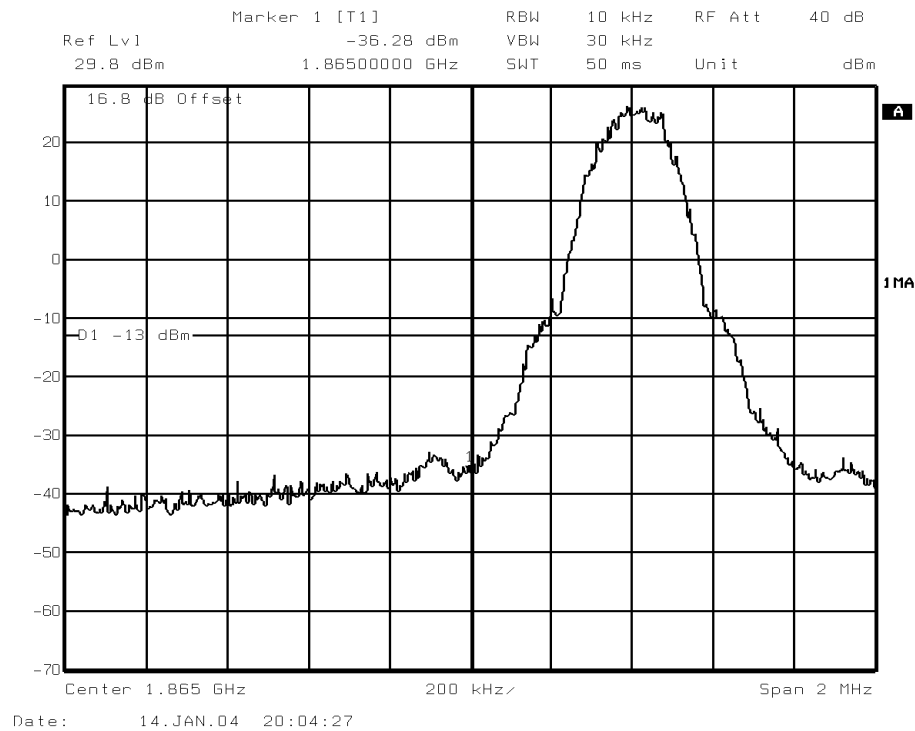


GSM – Circuit Switched

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

Block D

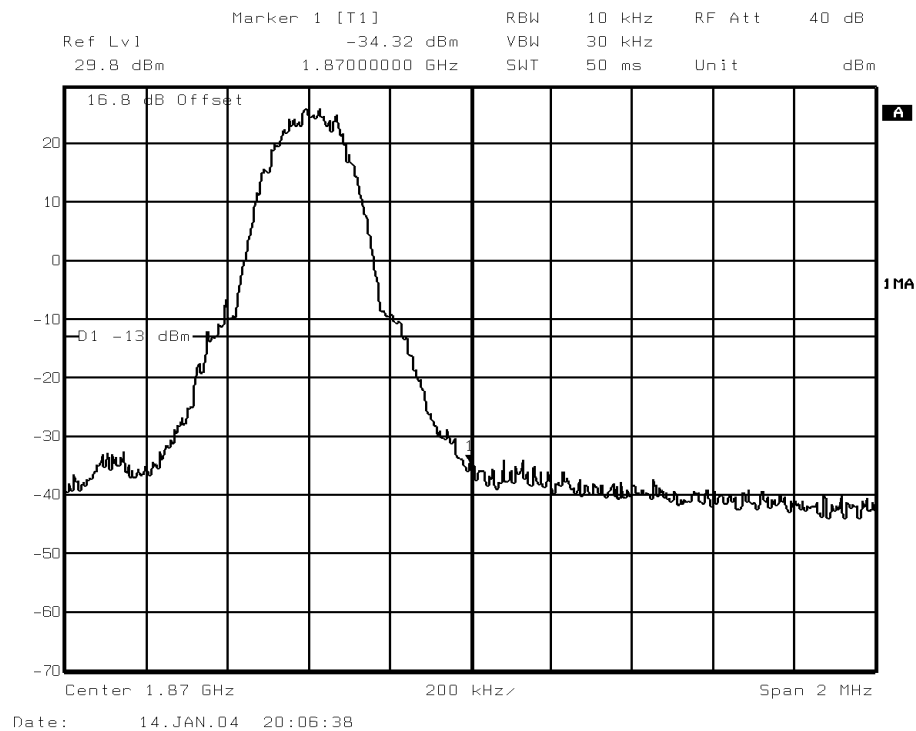


GSM – Circuit Switched

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

Block D



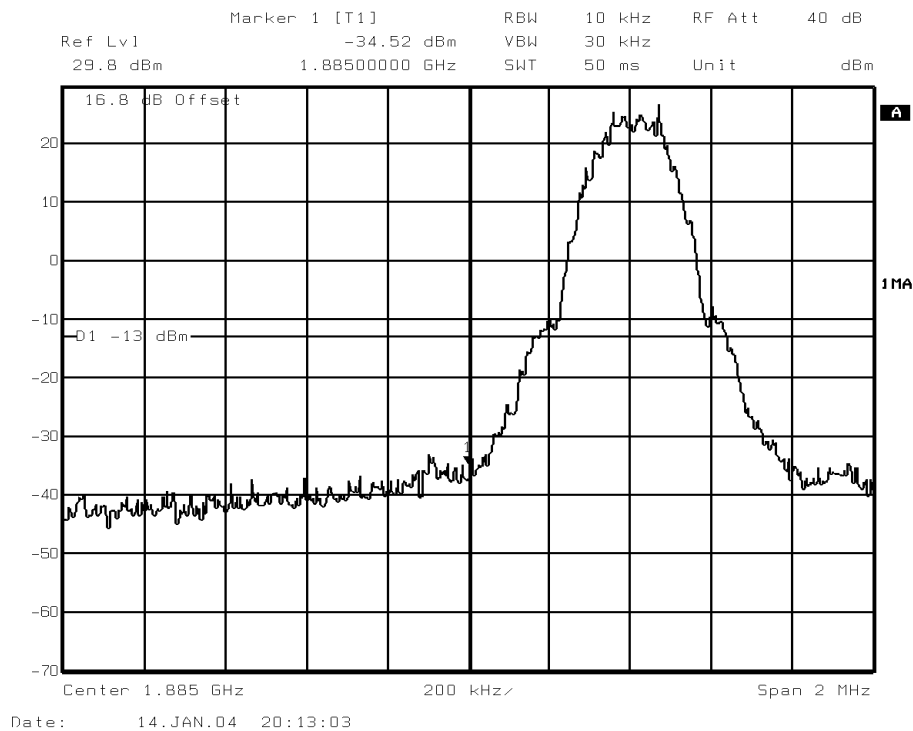
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block E



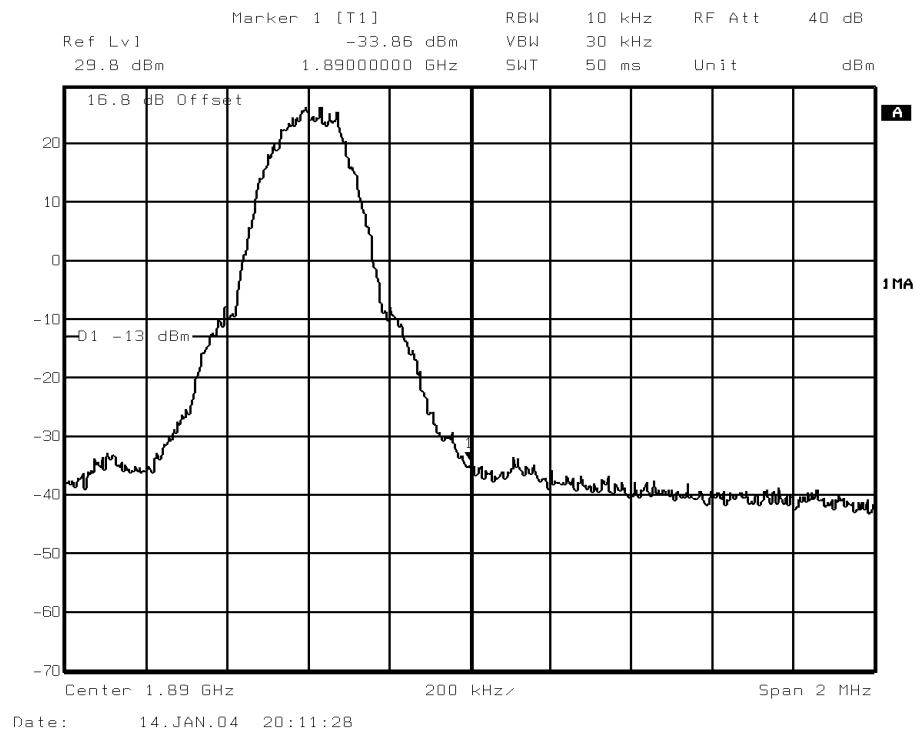
GSM – Circuit Switched



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 709 (1889.8MHz)

Block E

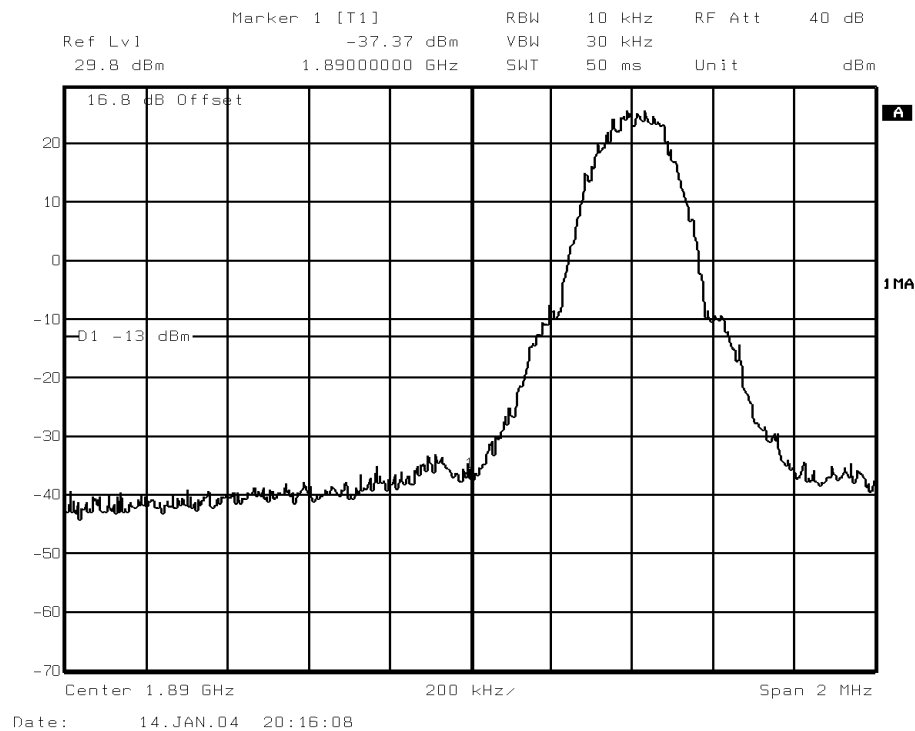


GSM – Circuit Switched

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

Block F

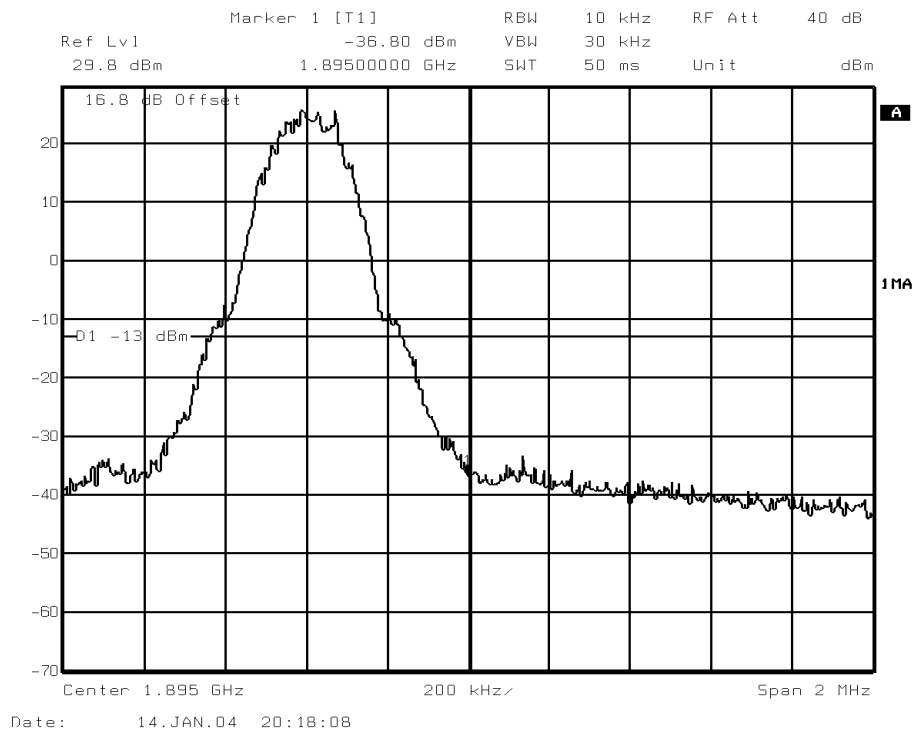


GSM – Circuit Switched

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

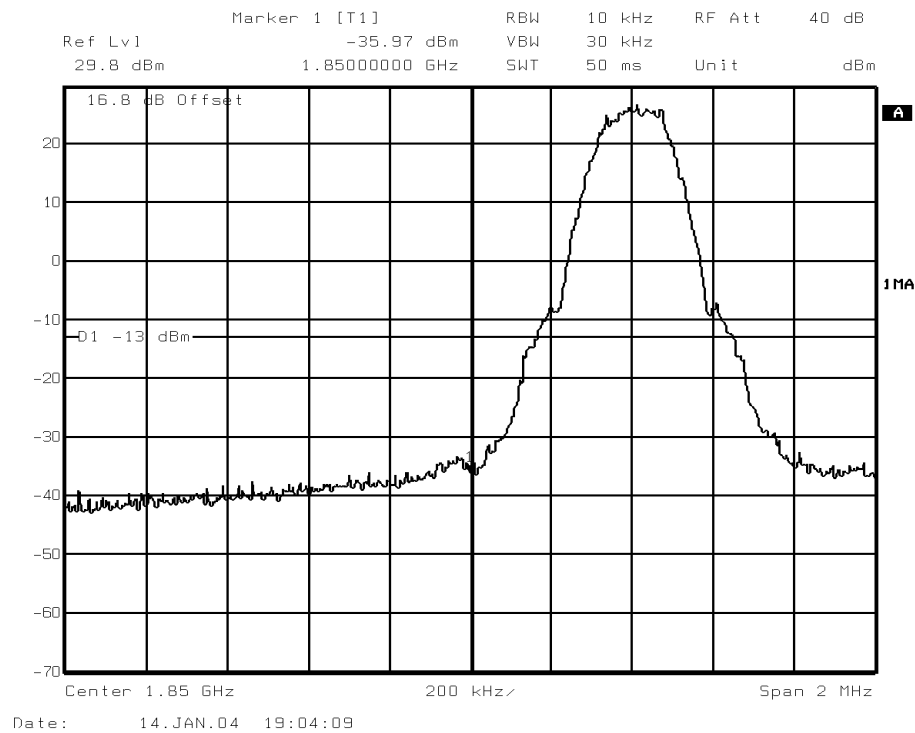
Block F



GSM – Circuit Switched

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

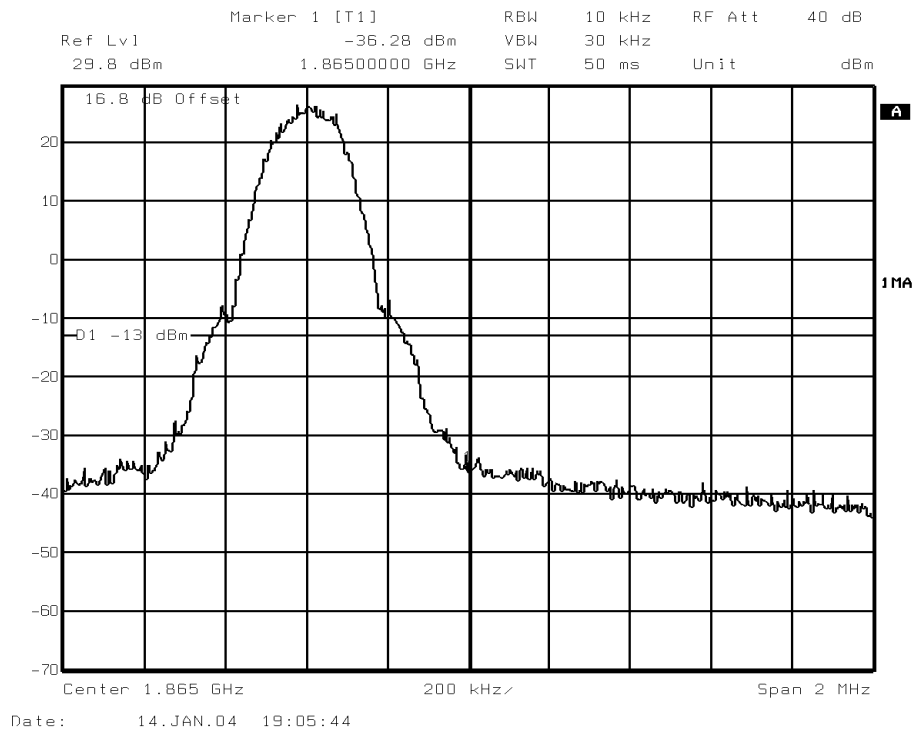
Block A**GPRS – Packet Data**



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block A



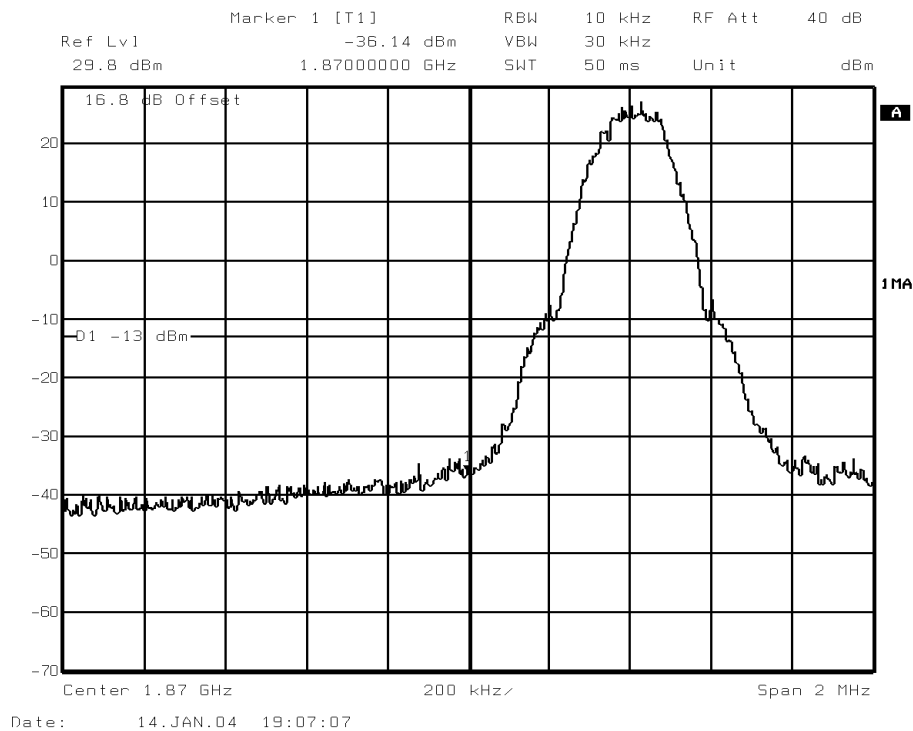
GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block B

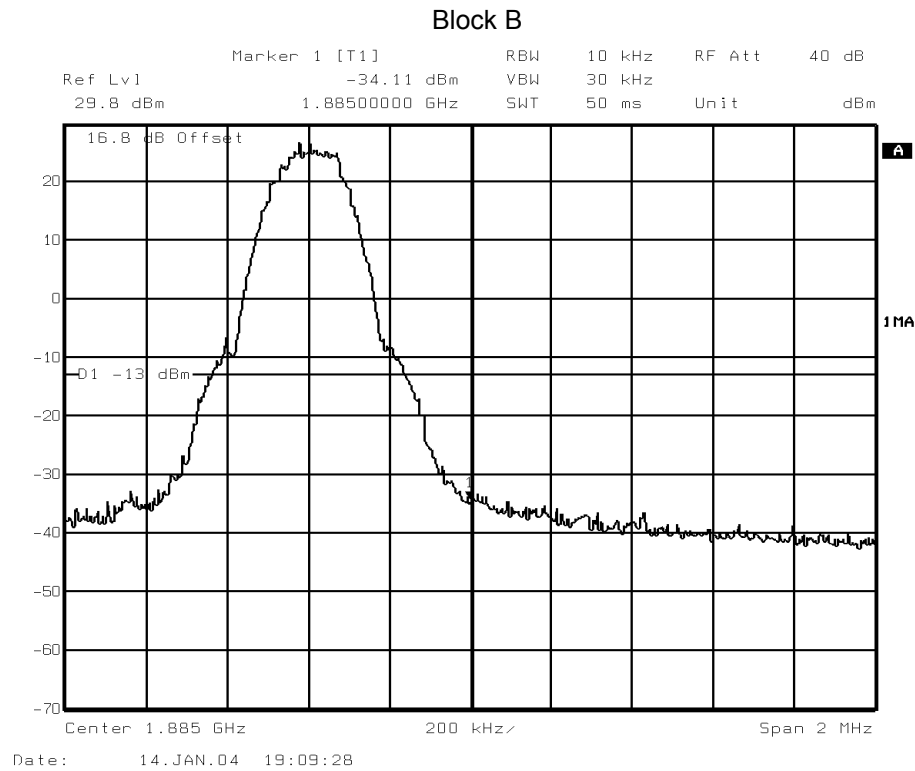


GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

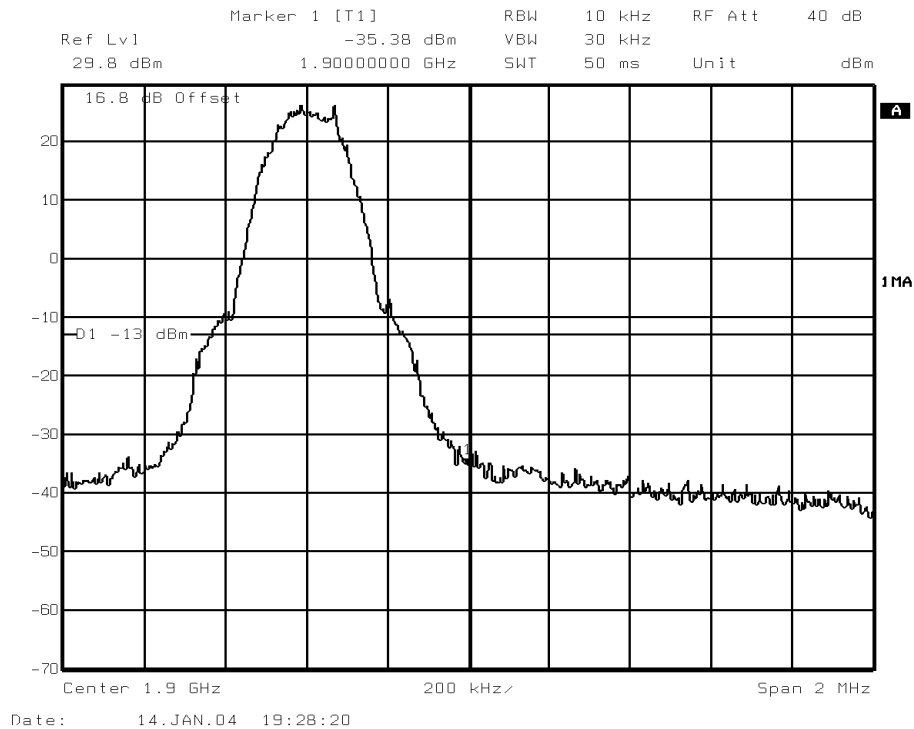


GPRS – Packet Data

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

Block Edge Measurement with EUT Transmitting on full power on Channel 759, (1899.6MHz)

Block C



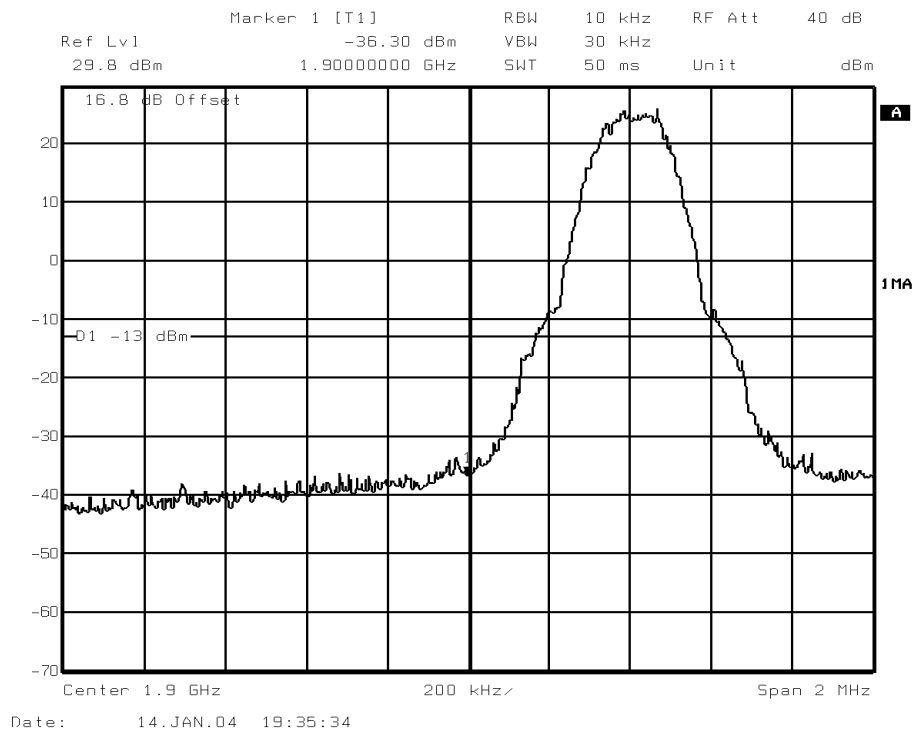
GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 763, (1900.4MHz)

Block C



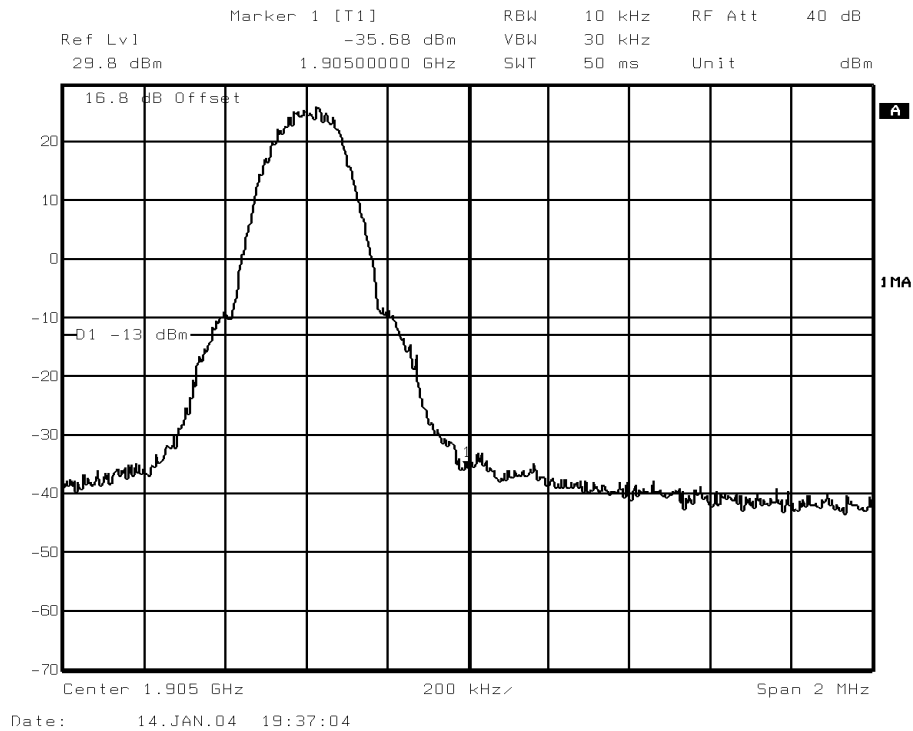
GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

Block Edge Measurement with EUT Transmitting on full power on Channel 784, (1904.6MHz)

Block C

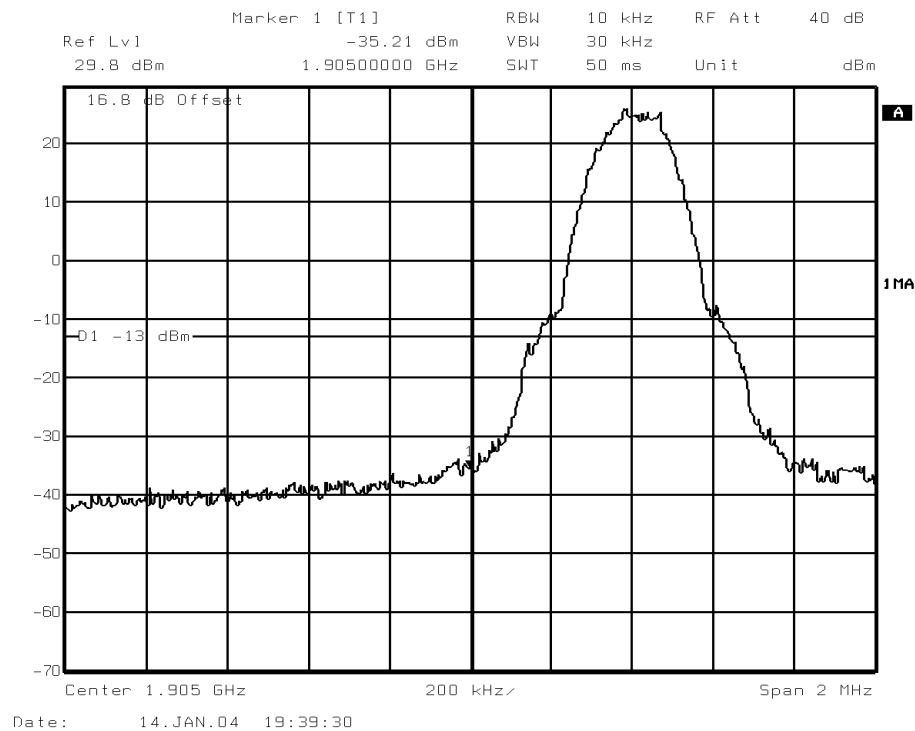


GPRS – Packet Data

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

Block Edge Measurement with EUT Transmitting on full power on Channel 789, (1905.4MHz)

Block C



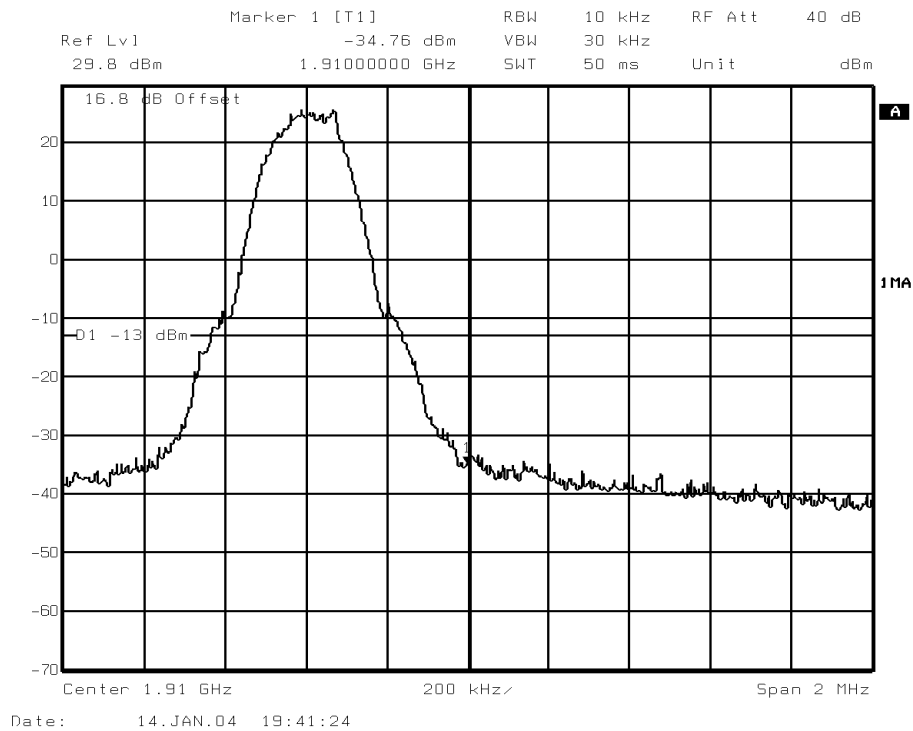
GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block C

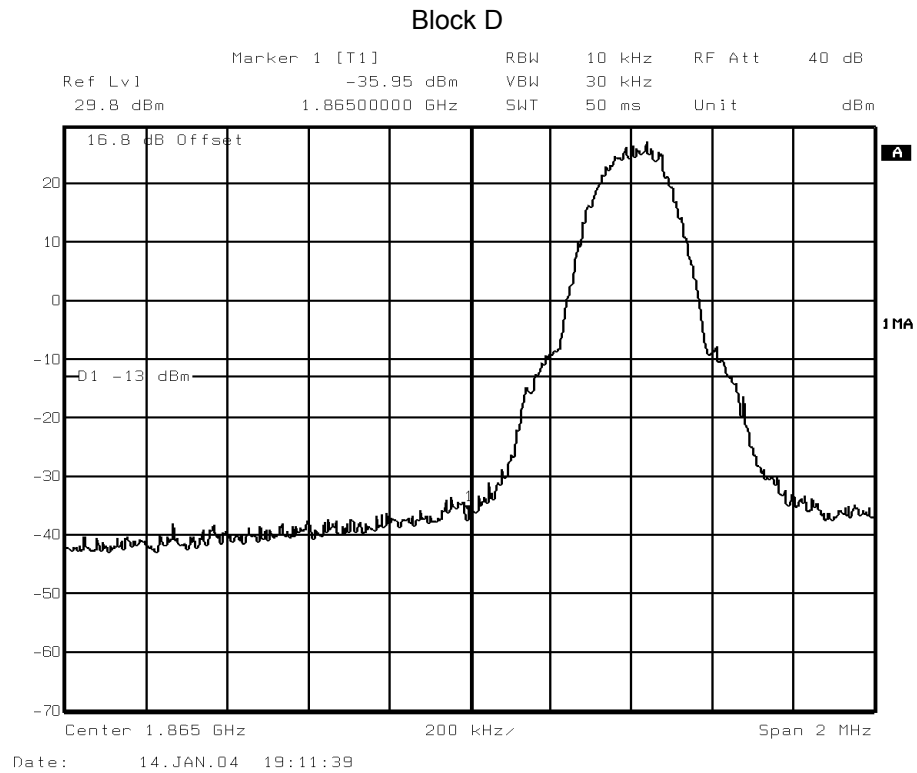


GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

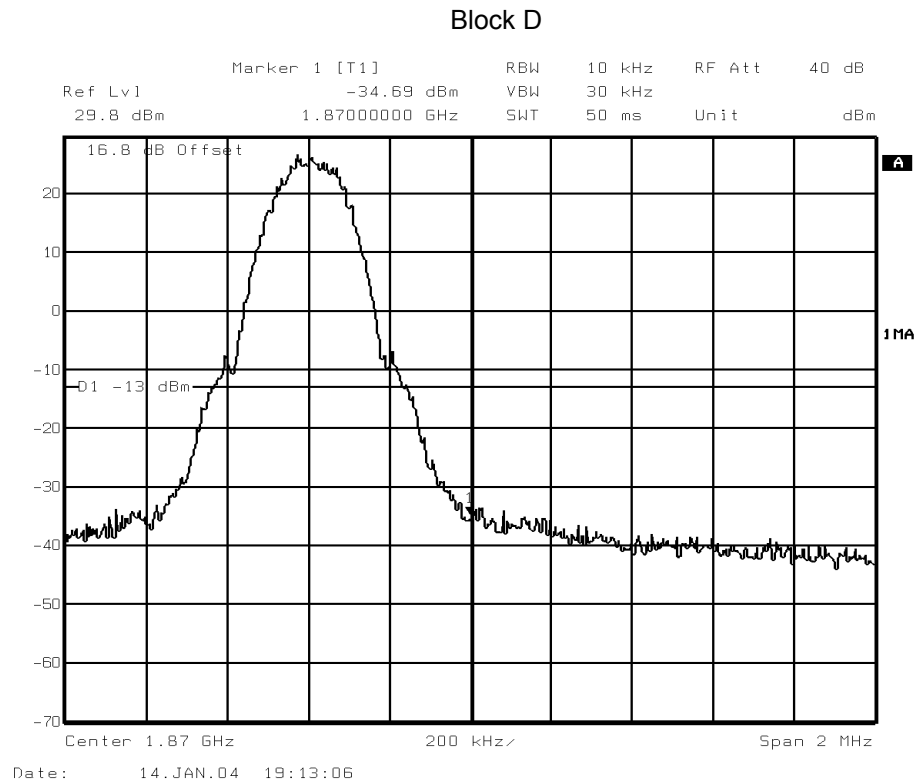


GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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



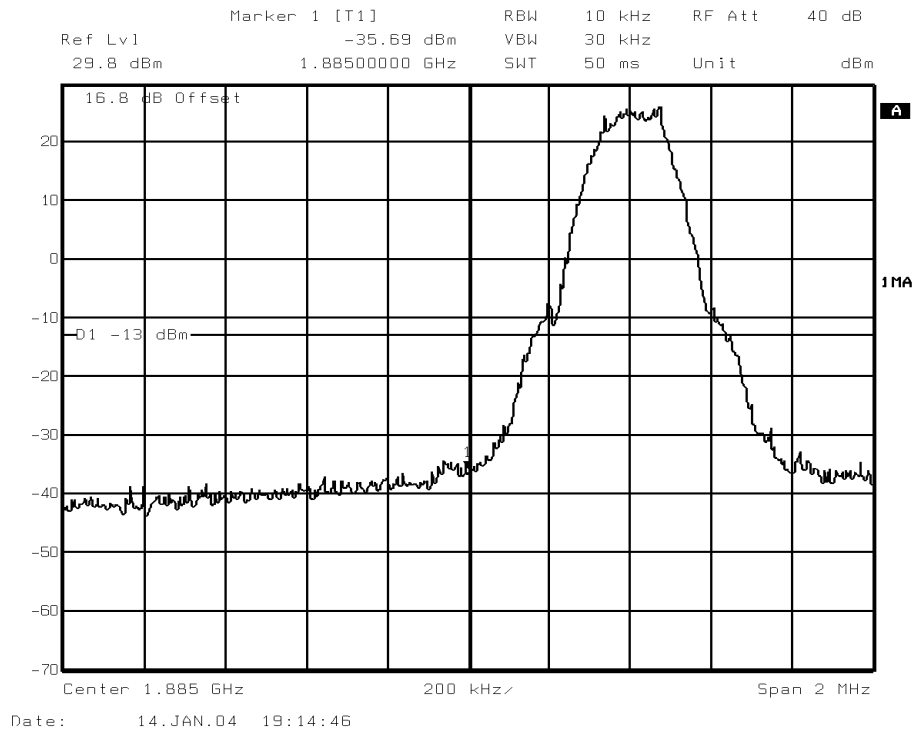
GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

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

Block E

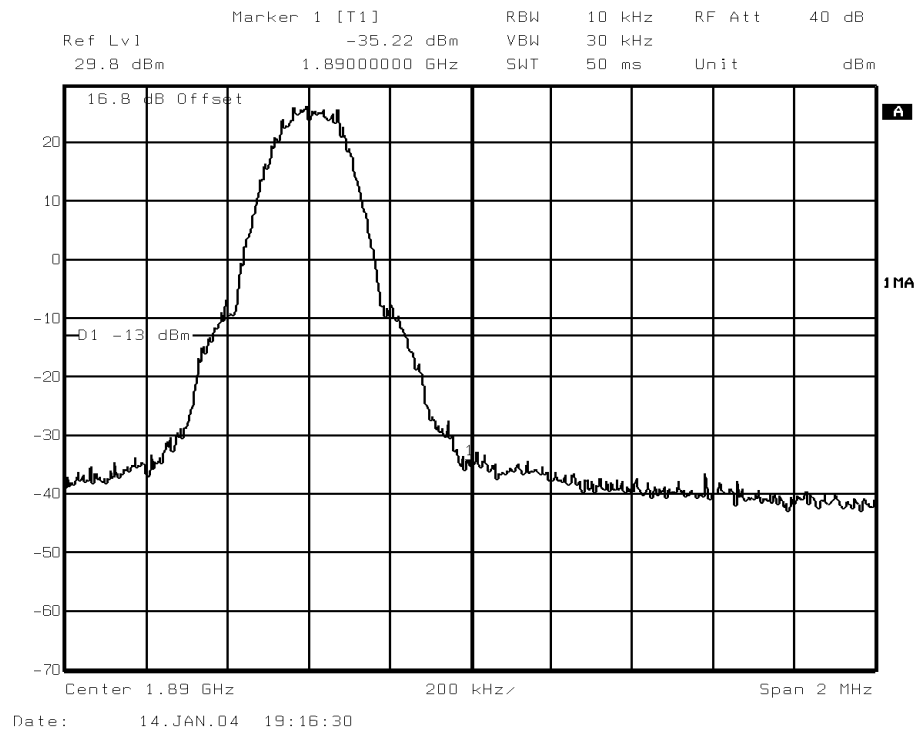


GPRS – Packet Data

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

Block Edge Measurement with EUT Transmitting on full power on Channel 709 (1889.8MHz)

Block E

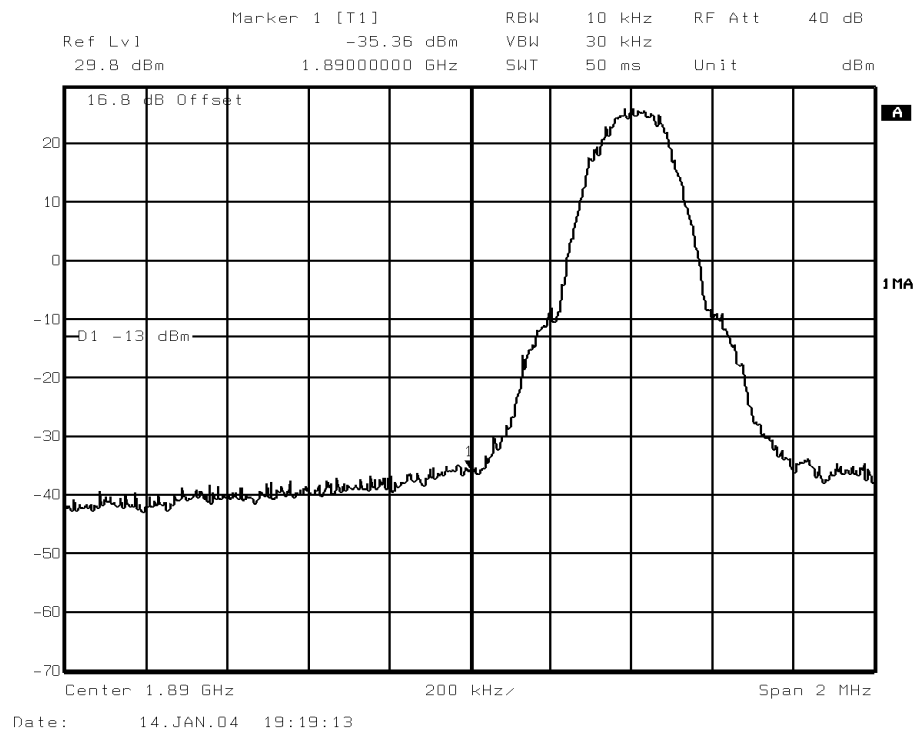


GPRS – Packet Data

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

Block F

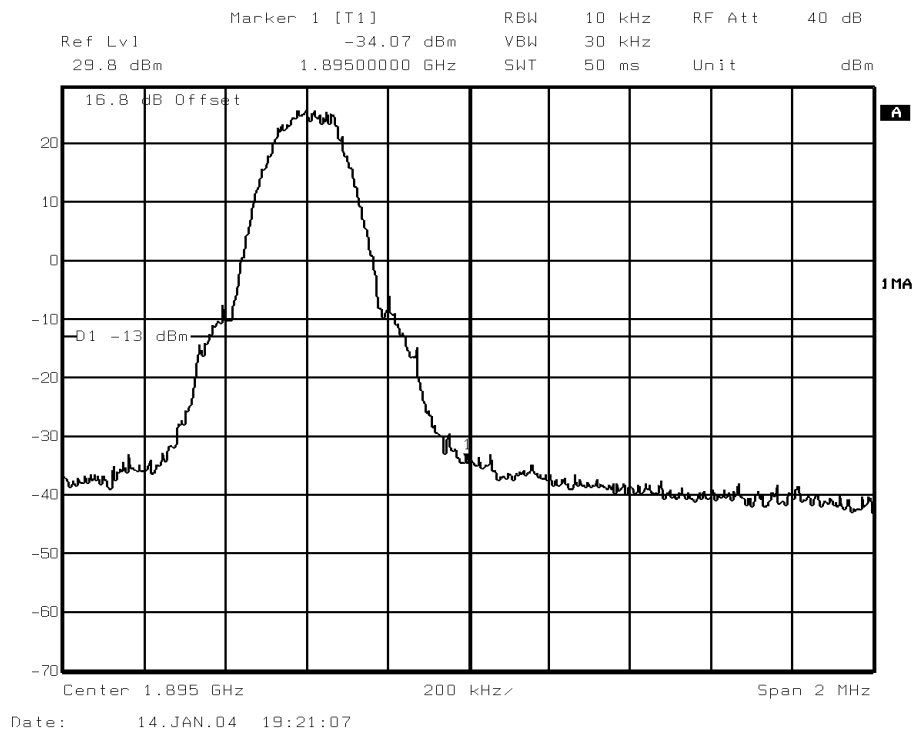


GPRS – Packet Data

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued**

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

Block F



GPRS – Packet Data



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (+/-1MHz) – Continued

2.5.6 Test Results

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



2.6 RADIATED EMISSIONS

2.6.1 FCC CFR 47: Part 24 Subpart E, Section 24.238

2.6.2 Equipment Under Test MX-C110

2.6.3 Date of Test 12th and 13th January 2004

2.6.4 Test Equipment Used (See Section 3.1 for details) 3, 4, 5, 6, 7, 8, 11, 12, 14, 28, 35, 31, 32

2.6.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

In order to determine the Radiated Emission Limits, measurements of transmitter power (P) were first carried out on the top and bottom channels using a peak detector, and the results are shown in the following table.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. 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. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector (PCS 1900 Idle Mode) to meet Part 15B specification requirements.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a Peak detector (PCS 1900 Link Modes) to meet Part 24.238 specification requirements.

Emissions identified within the range 1GHz – 20GHz were then formally measured using a Peak Detector, as appropriate.

The measurements were performed at a 3m distance unless otherwise stated.



2.6 RADIATED EMISSIONS - continued

2.6.6 Test Results

Measurements were made with the EUT in PCS 1900MHz.

The measurements of transmitter power, (P), on top and bottom channels are detailed in the table below.

Freq MHz	Res BW Hz	Vid BW Hz	Ant Pol V/H	Ant Hgt cm	EUT Azi Deg	Raw PEAK dBμV	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dBμV/m
Tx Channel 512									
1850.2	1M	1M	H	122	280	99.5	4.8	26.9	131.2
Tx Channel 810									
1909.8	1M	1M	H	108	293	98.0	4.8	27.0	129.8

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

As the EIRP for the Top Channel is 1.621W the spurious limit is $43 + 10\log(1.621) = 45.1\text{dB}$ down on the carrier.

As the EIRP for the Bottom Channel is 1.096W the spurious limit is $43 + 10\log(1.096) = 43.4\text{dB}$ down on the carrier.

Using the results obtained on the two channels the following limits were calculated:

Bottom channel 512: $131.2\text{dB}\mu\text{V/m} - 45.1\text{dB} = 86.1\text{dB}\mu\text{V/m}$

Top channel 810: $129.8\text{dB}\mu\text{V/m} - 43.4\text{dB} = 86.4\text{dB}\mu\text{V/m}$

These limits have been used to determine Pass or Fail for the harmonics or spurious emissions measured and detailed in the following tables.

Abbreviation for Table

Res BW	Resolution Bandwidth
Vid BW	Video Bandwidth
Ant Pol	Antenna Polarisation
Ant Hgt	Antenna Height
Azm	Azimuth
V	Vertical
H	Horizontal



2.6 RADIATED EMISSIONS - continued

2.6.6 Test Results - continued

30MHz – 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 24.238 and FCC Part 15.109 for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Bottom Channel (1850.2MHz)

Measurements were made with the EUT in PCS 1900MHz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Specification limit
MHz	H/V	cm	Deg	dB μ V/m	dB μ V/m
125.0	H	100	0	29.7	86.1
300.0	H	100	0	32.1	86.1
450.0	H	100	0	35.2	86.1
600.0	H	100	0	38.1	86.1
800.0	H	100	0	40.2	86.1
950.0	H	100	0	42.4	86.1

EUT Tx on Top Channel (1909.8MHz)

Measurements were made with the EUT in PCS 1900MHz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Specification limit
MHz	H/V	cm	Deg	dB μ V/m	dB μ V/m
125.0	H	100	0	29.7	86.4
300.0	H	100	0	32.4	86.4
450.0	H	100	0	35.9	86.4
600.0	H	100	0	37.7	86.4
800.0	H	100	0	41.3	86.4
950.0	H	100	0	41.0	86.4

Note: the measurements in the above tables are Peak System Noise Floor Measurements, as no emissions attributable to the EUT were detected above the System Noise Floor.



2.6 RADIATED EMISSIONS - continued

2.6.6 Test Results - continued

1GHz – 20GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 24.238 for Radiated Emissions (1GHz- 20GHz).

EUT Tx on Bottom Channel (1850.2MHz)

Measurements were made with the EUT in PCS 1900MHz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Specification Limit
MHz	H/V	cm	deg	dBμV/m	dBμV/m
5550.7	V	100	337	77.9	86.1
7400.1	H	100	156	75.5	86.1
9251.2	H	100	303	73.2	86.1
11101.5	H	102	238	76.7	86.1
12951.4	V	106	60	74.0	86.1
14801.0	V	106	358	72.5	86.1

EUT Tx on Top Channel (1909.8MHz)

Measurements were made with the EUT in PCS 1900MHz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Specification Limit
MHz	H/V	cm	deg	dBμV/m	dBμV/m
3819.7	H	112	12	71.7	86.4
5729.2	V	100	204	71.7	86.4
7640.0	H	117	271	79.0	86.4
9549.2	H	100	89	75.1	86.4
11458.8	H	100	240	81.2	86.4
13366.7	V	100	336	73.4	86.4

ABBREVIATIONS FOR ABOVE TABLES

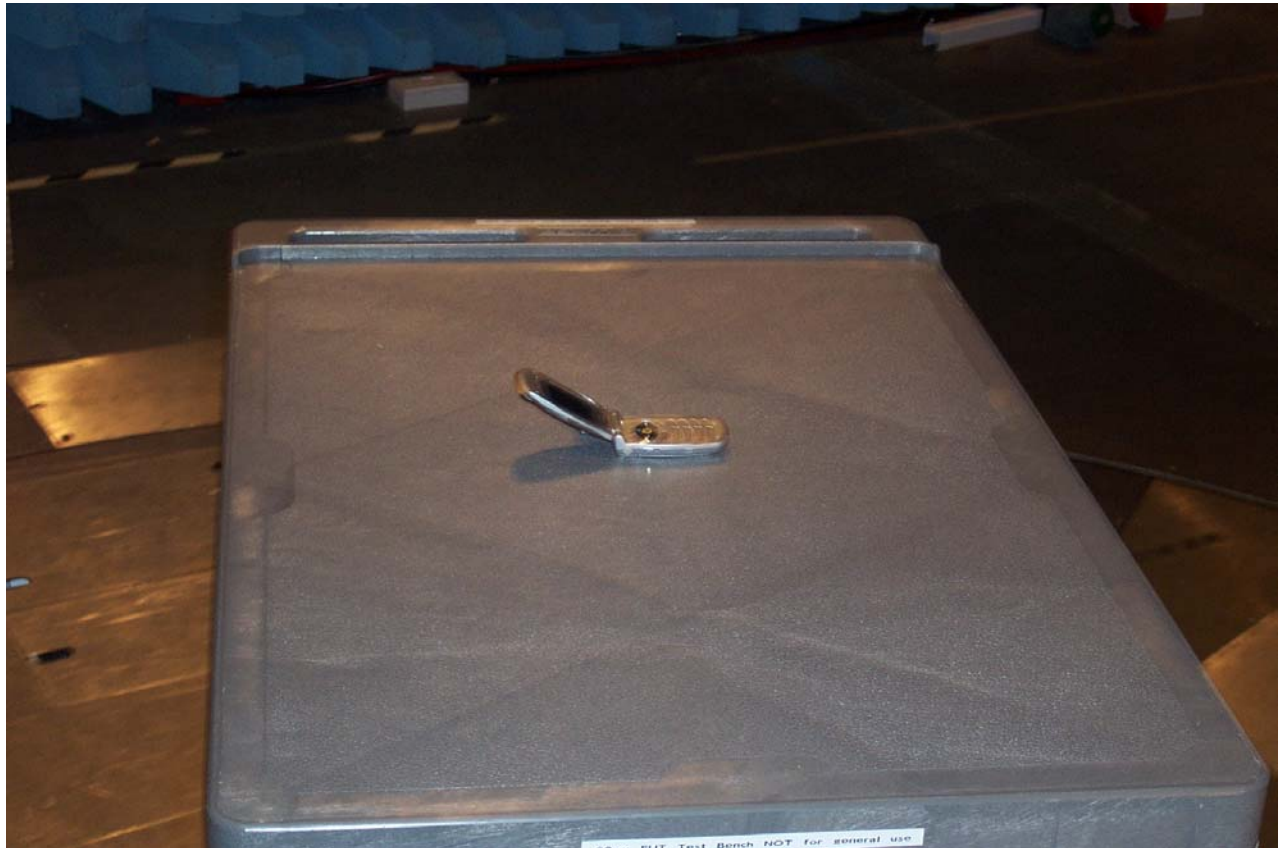
H Horizontal Polarisation

V Vertical Polarisation



2.6 RADIATED EMISSIONS - continued

2.6.7 Set Up Photograph



Radiated Emissions Set Up Photograph

**2.7 CONDUCTED EMISSIONS ON POWER LINES****2.7.1 FCC CFR 47: Part 15 Subpart C, Section 15.207****2.7.2 Equipment Under Test**
MX-C110**2.7.3 Date of Test**
14th January 2004**2.7.4 Test Equipment Used (See Section 3.1 for details)**
26, 27, 28, 29, 30, 31, 32**2.7.5 Test Procedure**

Test performed in accordance with ANSI C63.4.

Conducted Emission Measurements were undertaken on the Live and Neutral lines of the AC Power Adaptor, and were performed within the semi-anechoic chamber.

Emissions were formally measured using a Quasi-Peak and Average Detectors, which meet the CISPR requirements. The details of the worst-case emissions for the Live and Neutral Lines are presented in Tables 2.3.1 – 2.3.6 respectively.

The Power Adaptor was supplied from a 120V, 60Hz supply.



2.7 CONDUCTED EMISSIONS ON POWER LINES - continued

2.7.6 Test Results

The EUT met the Class B requirements of FCC CFR 47: Part 15 Subpart C, Section 15.207 for Conducted Emissions on the Live and Neutral Lines.

EUT Tx on Top Channel (1908.8MHz) – Live Line

Measurements were made with the PCS 1900MHz.

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4131	44.9	57.6	37.0	47.6
1.1783	47.3	56.0	38.4	46.0
1.3547	48.8	56.0	40.7	46.0
2.6506	44.6	56.0	34.0	46.0
2.7073	45.1	56.0	35.5	46.0
3.0628	47.0	56.0	36.7	46.0

The margin between the specification requirements and all other emissions were 15.8dB or more below the specified Quasi-Peak limit and 16.2dB or more below the Average limit.

EUT Tx on Top Channel (1908.8MHz) – Neutral Line

Measurements were made with the EUT in PCS 1900MHz.

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.1766	41.1	64.7	33.0	54.6
0.6470	36.5	54.7	32.8	46.0
0.8820	35.7	54.7	32.4	46.0
0.9410	35.7	54.7	31.6	46.0
3.0596	37.3	54.7	30.5	46.0
3.4110	36.4	54.7	29.2	46.0

The margin between the specification requirements and all other emissions were 27.3dB or more below the specified Quasi-peak limit and 26.0dB or more below the specified Average limit.



2.7 CONDUCTED EMISSIONS ON POWER LINES - continued

2.7.7 Set Up Photographs –



Conducted Emissions Set Up Photograph



2.7 CONDUCTED EMISSIONS ON POWER LINES - continued

2.7.7 Set Up Photographs -



Conducted Emissions Set Up Photograph



2.8 CONDUCTED SPURIOUS EMISSIONS

2.8.1 FCC CFR 47: Part 24 Subpart E, Section 24.238(a)

2.8.2 Equipment Under Test MX-C110

2.8.3 Date of Test 15th January 2004

2.8.4 Test Equipment Used (See Section 3.1 for details) 1, 2, 3, 4, 5, 6, 7

2.8.5 Test Procedure

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 timeslot 3 active and minimum power with timeslot 3 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, an attenuator 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 10th harmonic of the fundamental.

For GPRS, all test conditions were the same except 2 timeslots were active, (3 and 4).

2.8.6 Test Results

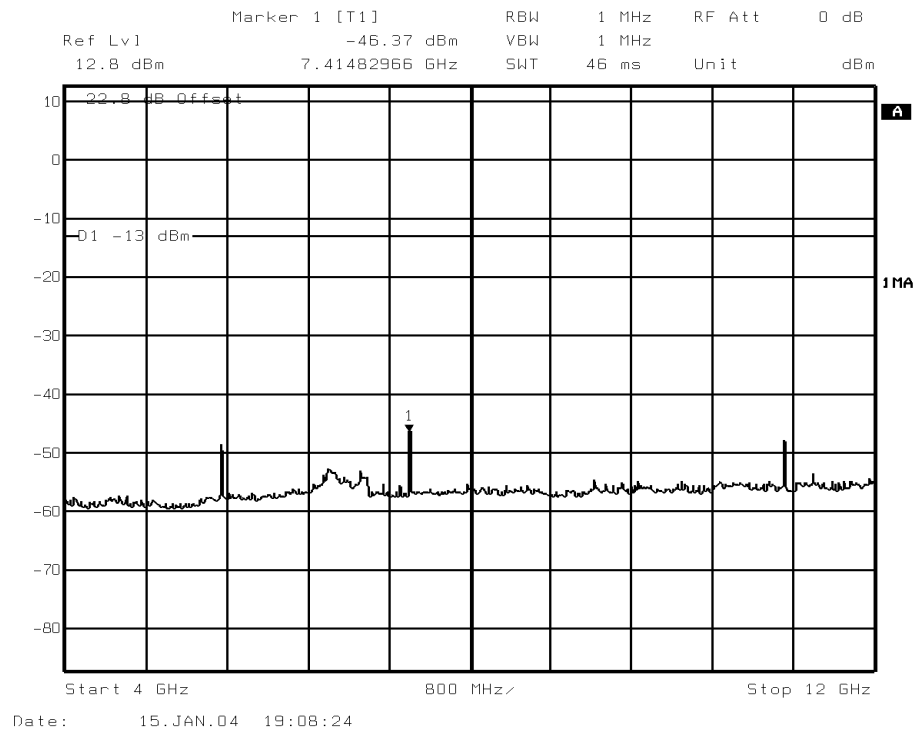
No emissions, other than the harmonics shown on pages 57 to 60, were within 20dB of the limit. The EUT passed the requirements laid out in 24.238. The plots on the following pages show the frequency spectrum from 9kHz to 20GHz of the EUT.

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



**2.8 CONDUCTED SPURIOUS EMISSIONS – Continued**

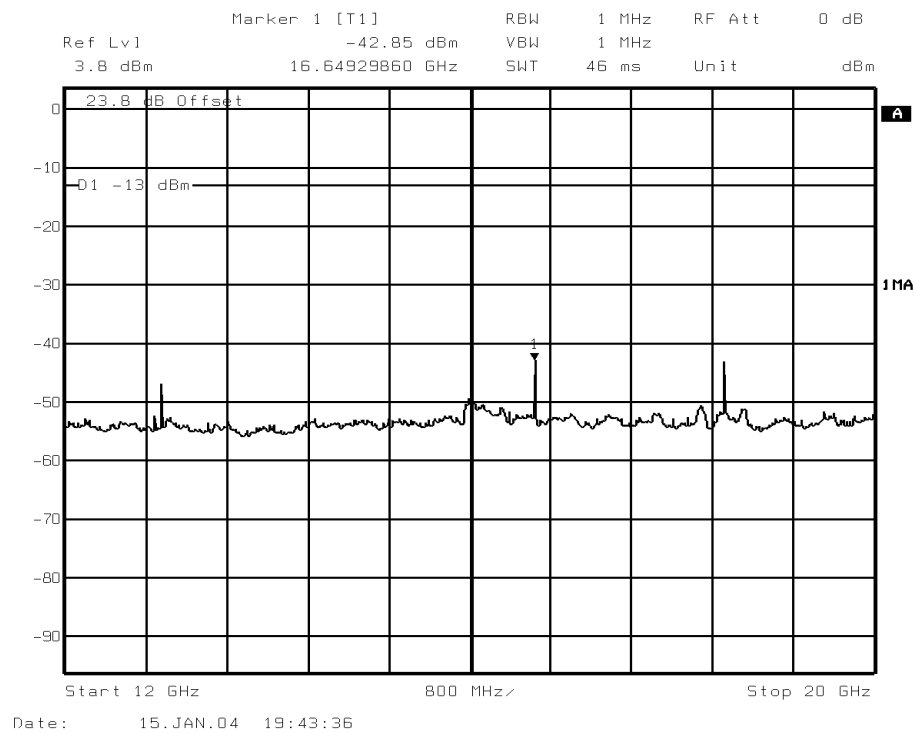
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Maximum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

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



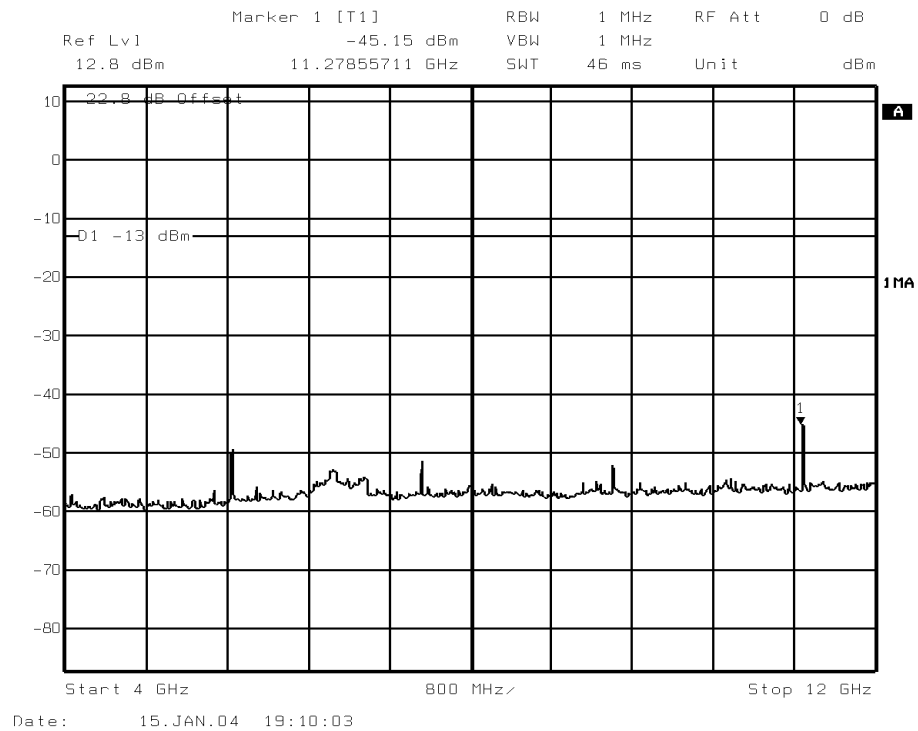
GSM – Circuit Switched

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



**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

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

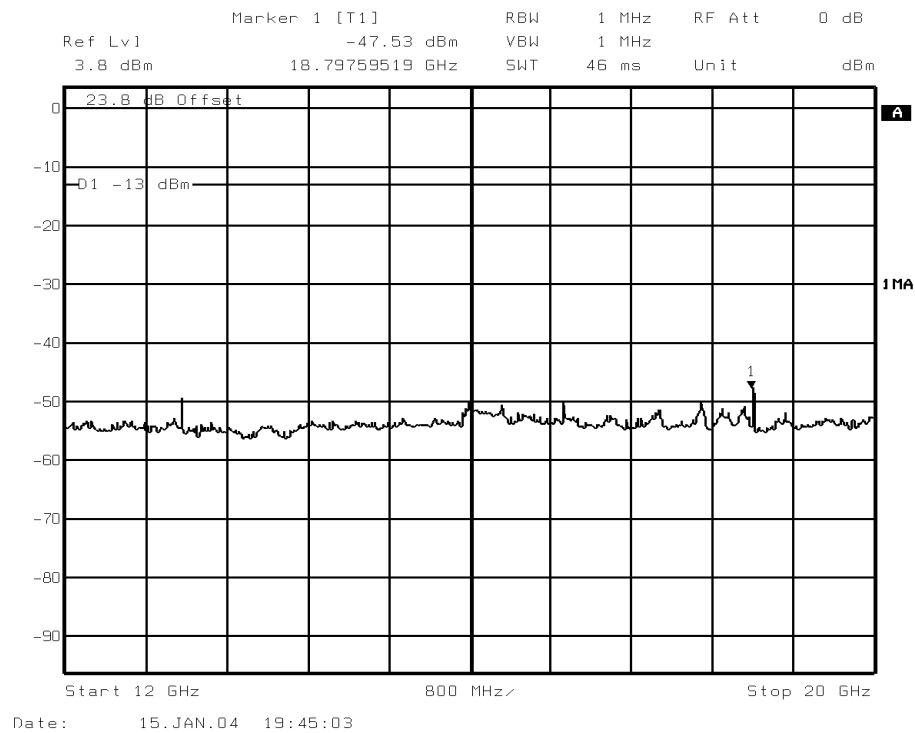


GSM – Circuit Switched



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

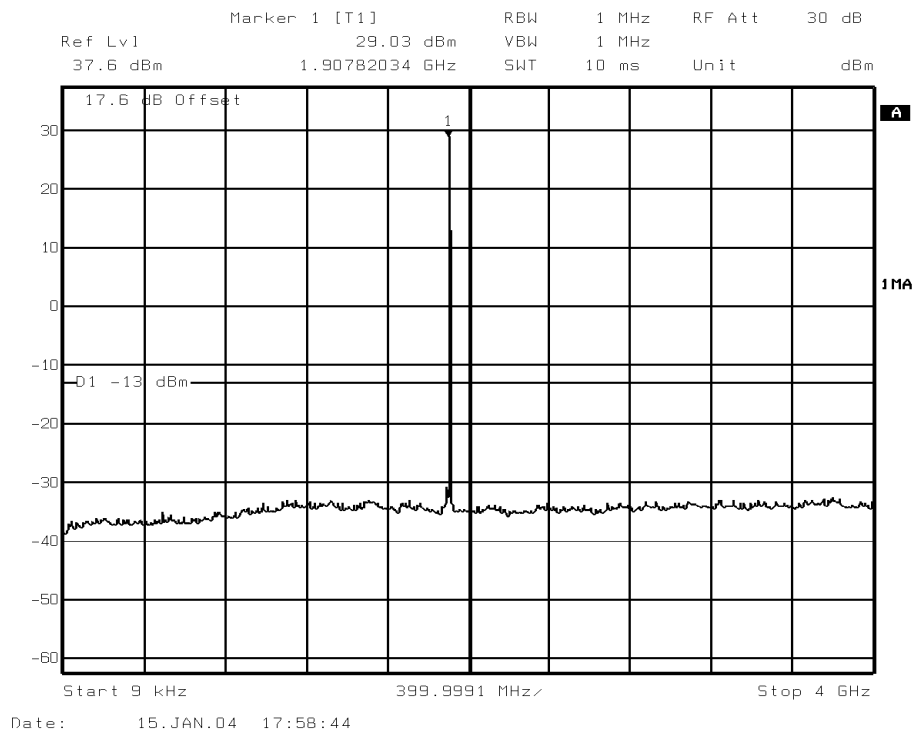
Spurious Emissions (12GHz – 20GHz) Channel 661 (1880.0MHz) – Maximum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

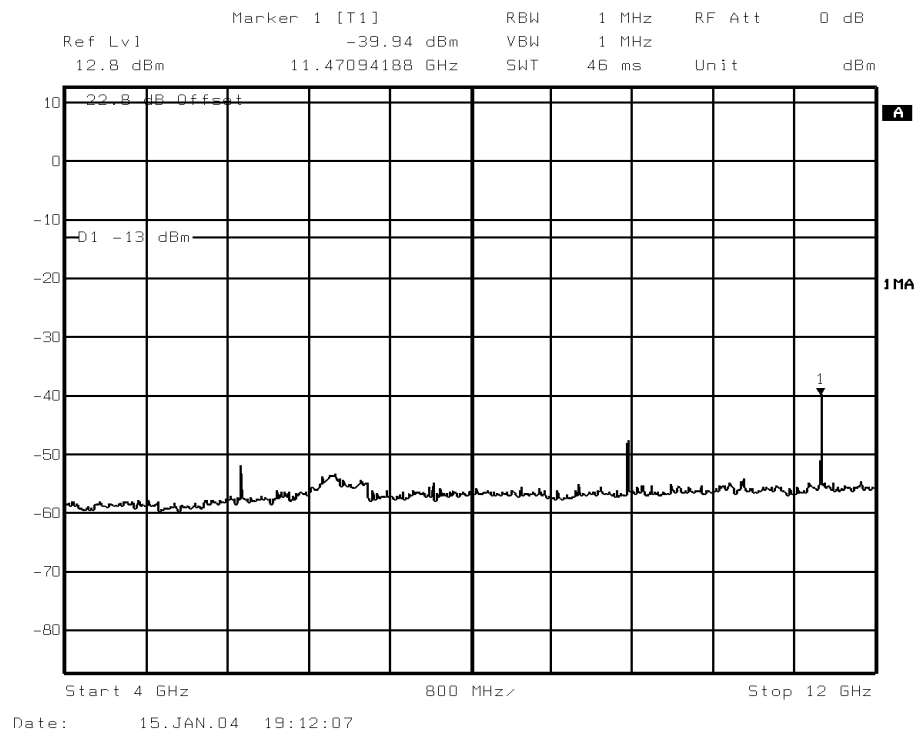
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

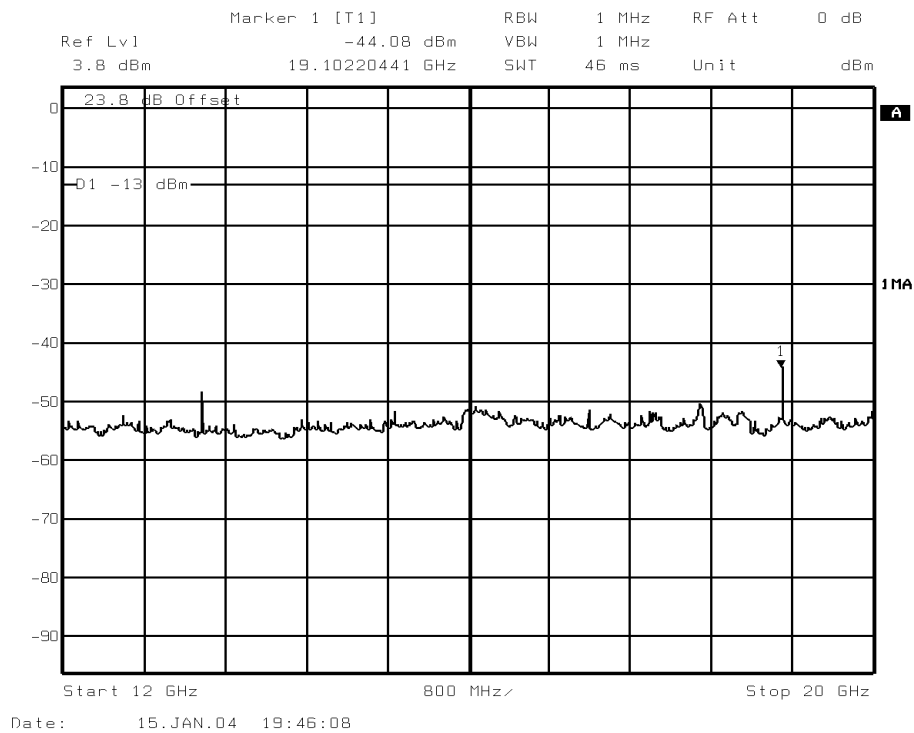
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

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



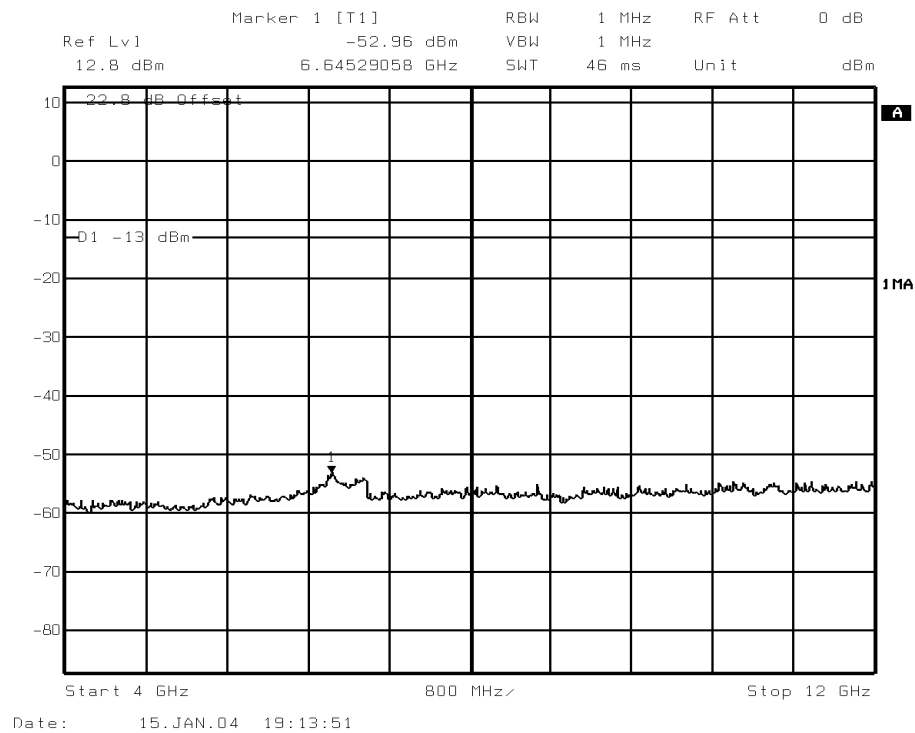
GSM – Circuit Switched

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



**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

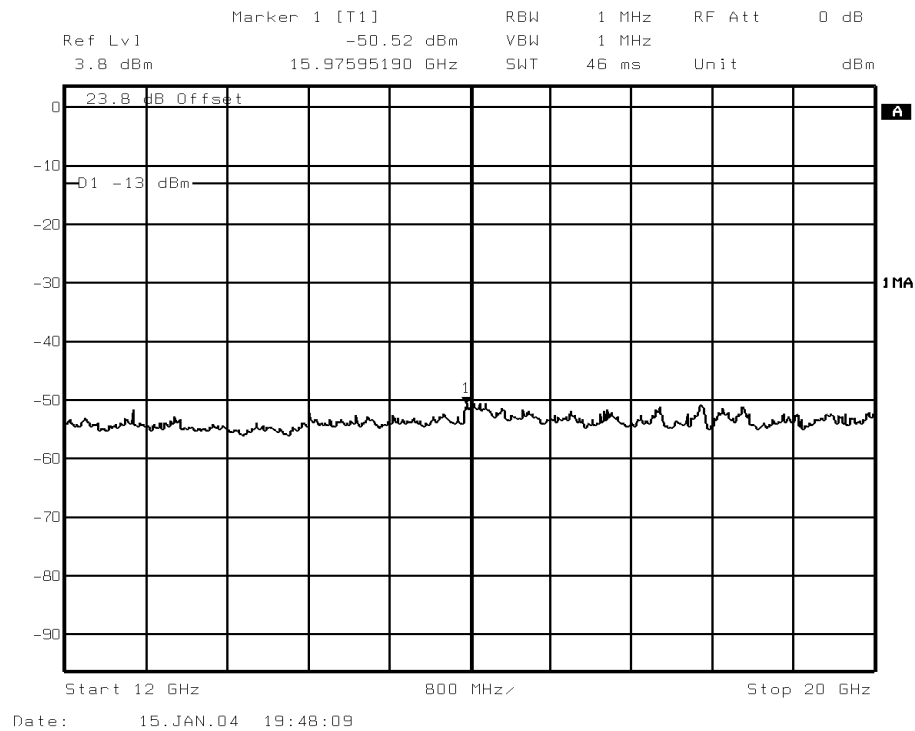
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

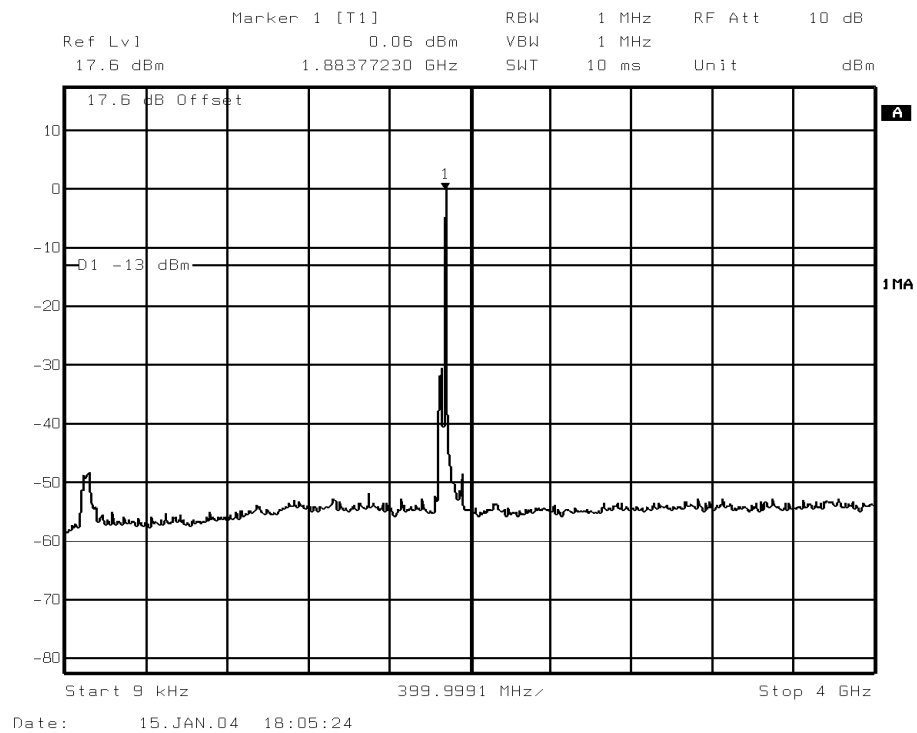
Spurious Emissions (12GHz-20GHz)
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

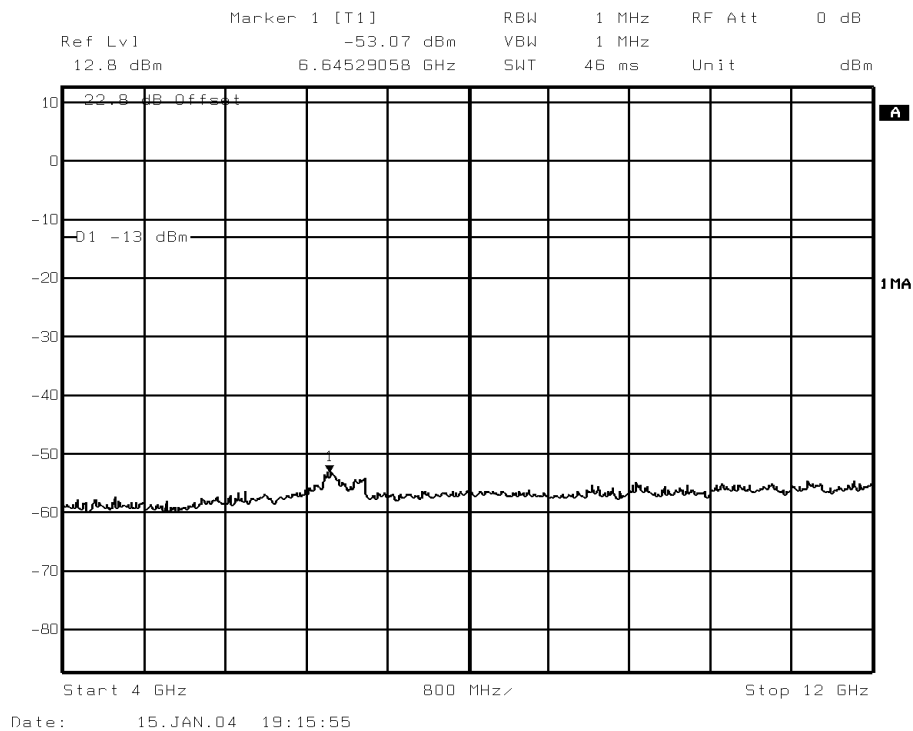
Spurious Emissions (9kHz – 4GHz)
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

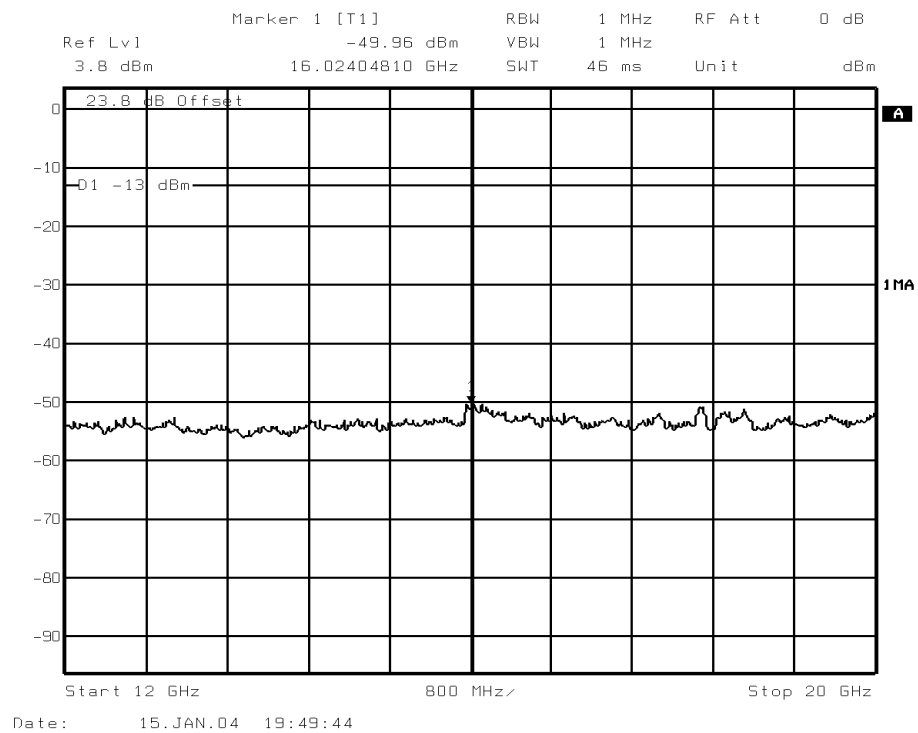
Spurious Emissions (4GHz – 12GHz)
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

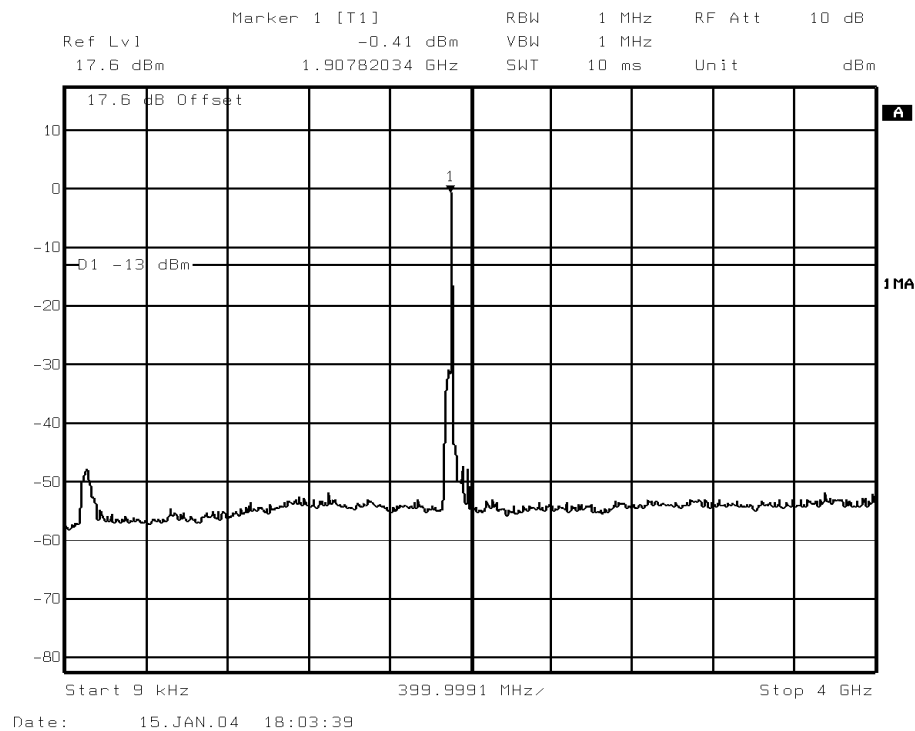
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

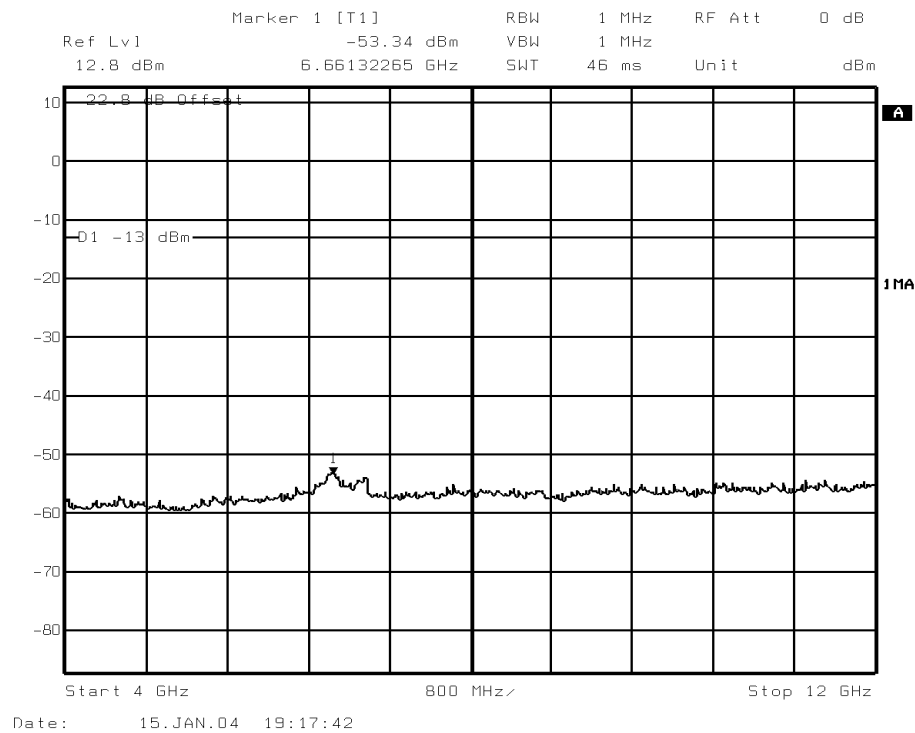
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

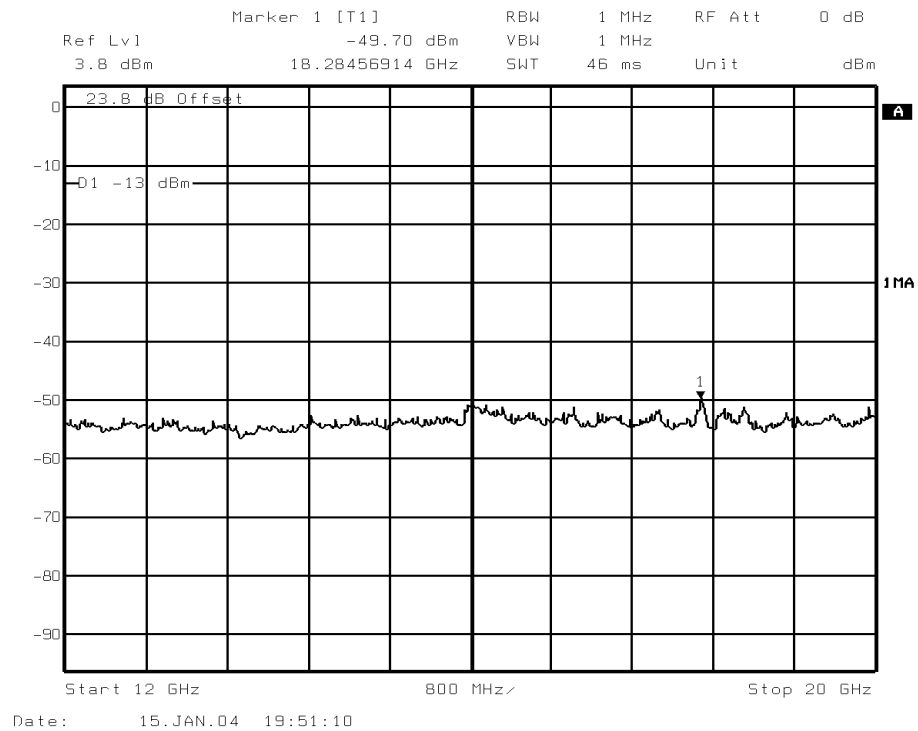
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

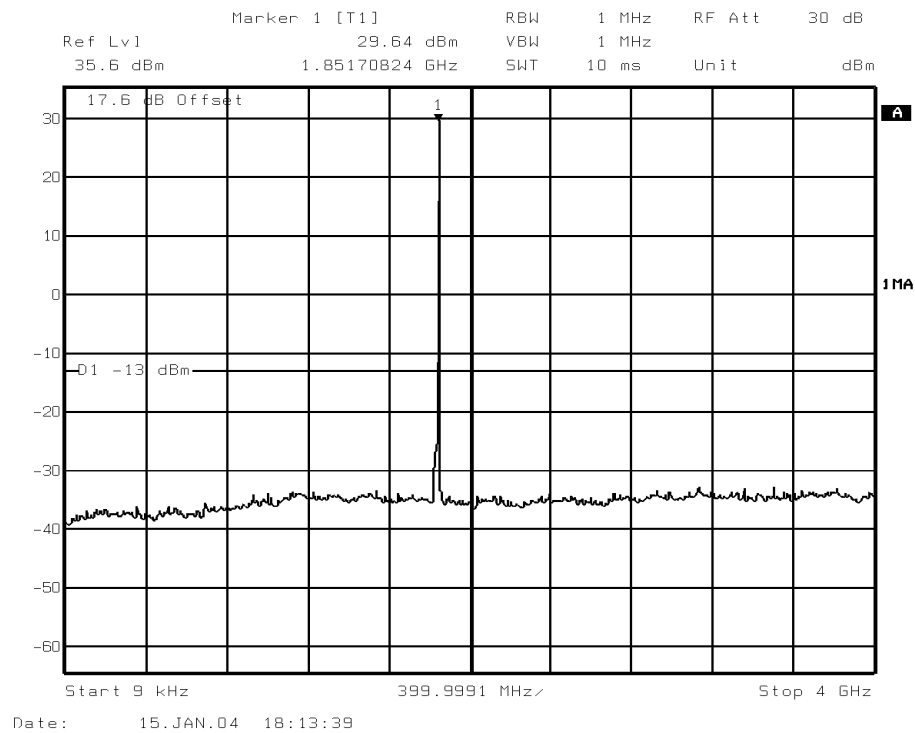
Spurious Emissions (12GHz – 20GHz)
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

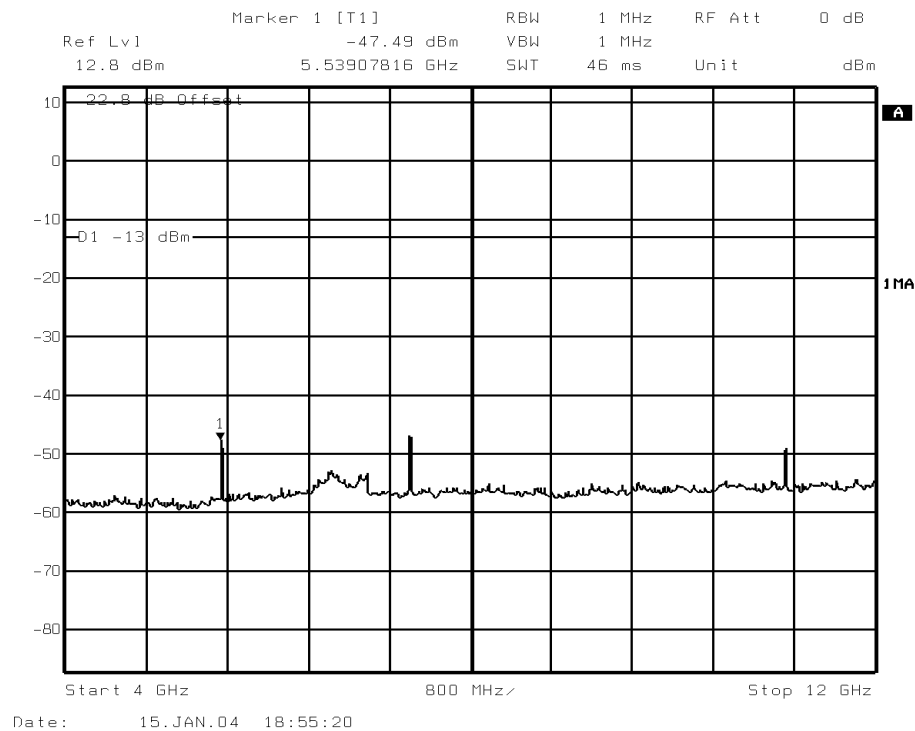
Spurious Emissions (9kHz – 4GHz)
Channel 512 (1850.2MHz) - Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

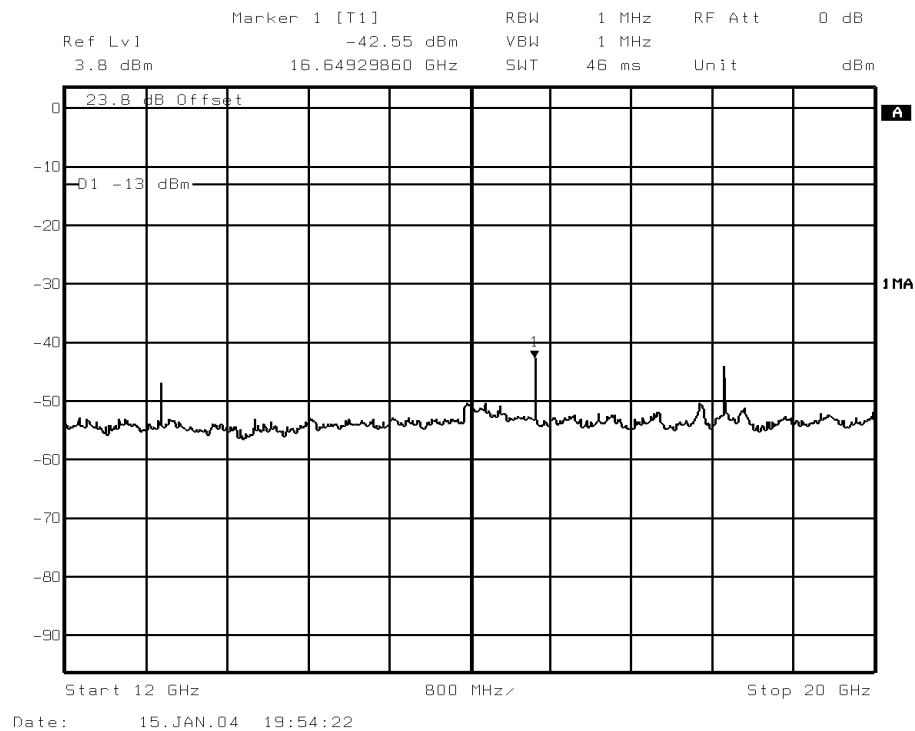
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Maximum Power



GPRS – Packet Data

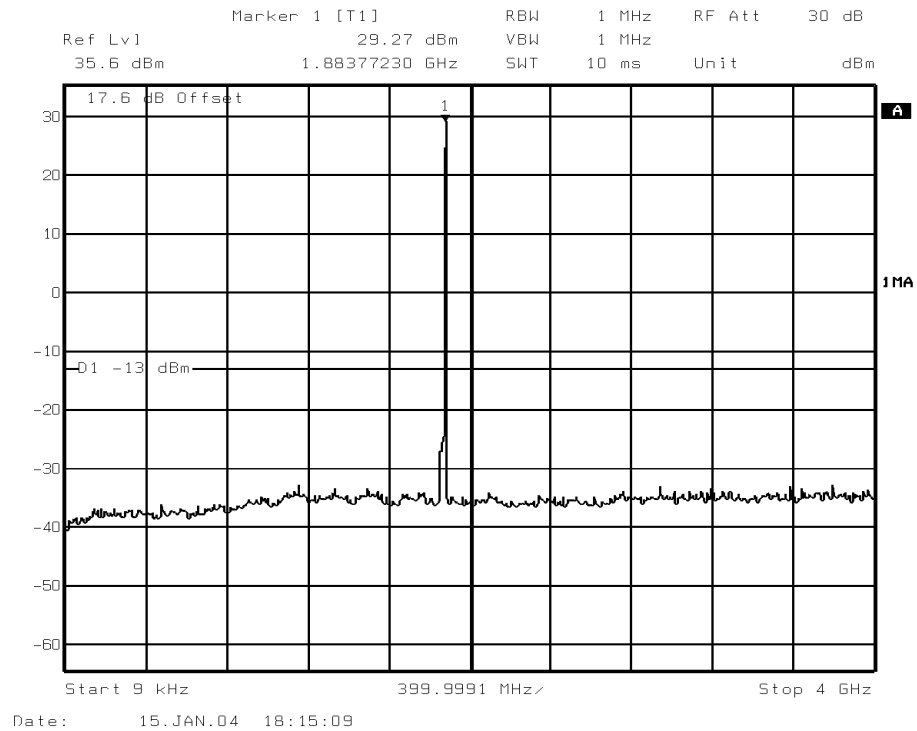
**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

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

**GPRS – Packet Data**

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

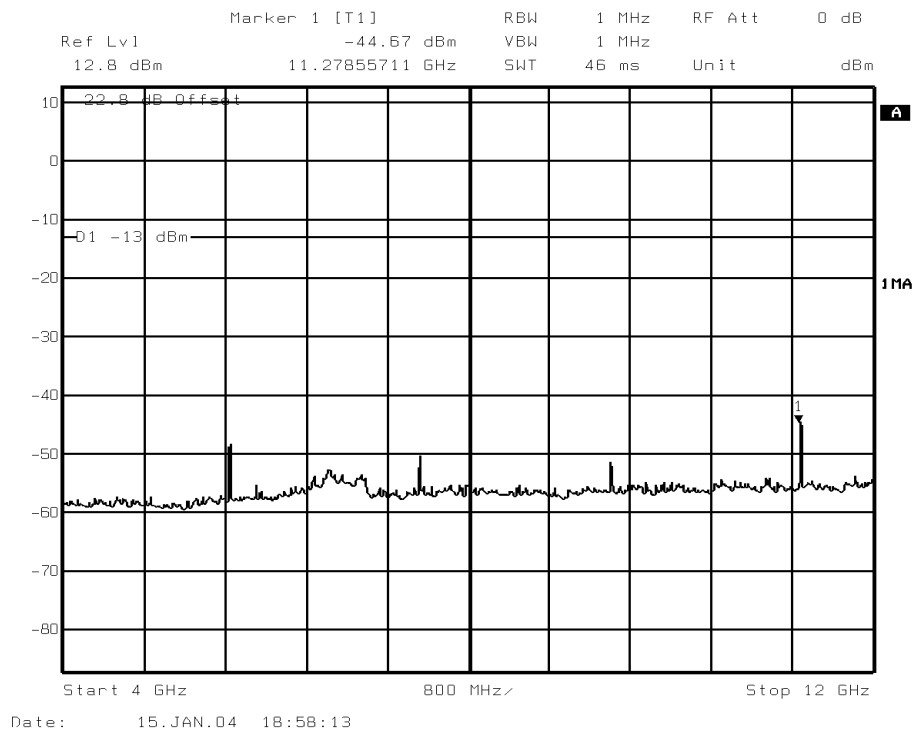
Spurious Emissions (9kHz – 4GHz)
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

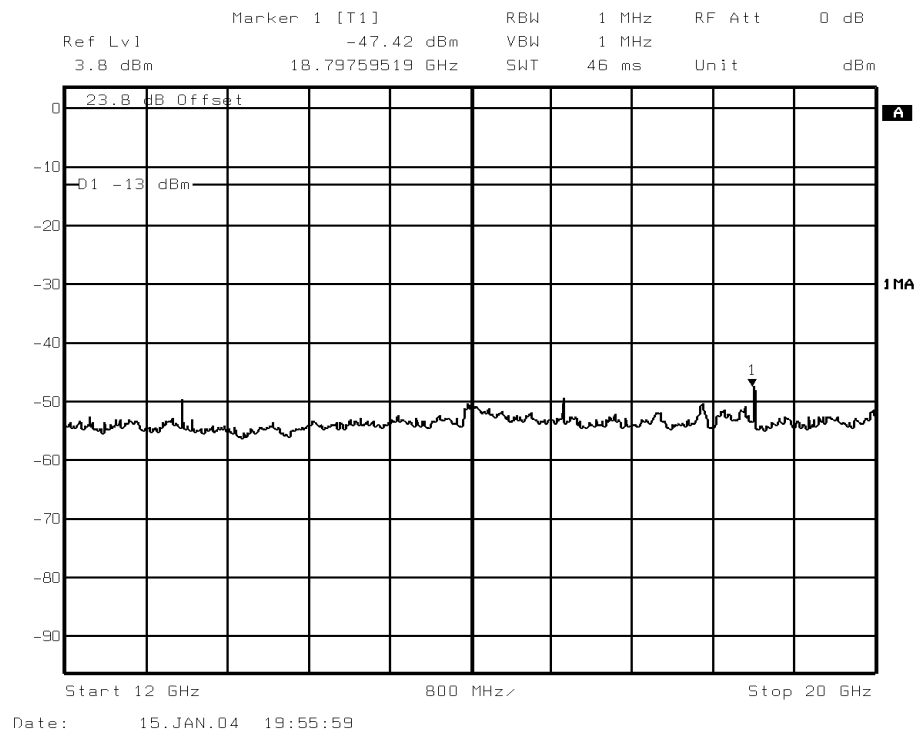
Spurious Emissions (4GHz - 12GHz)
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

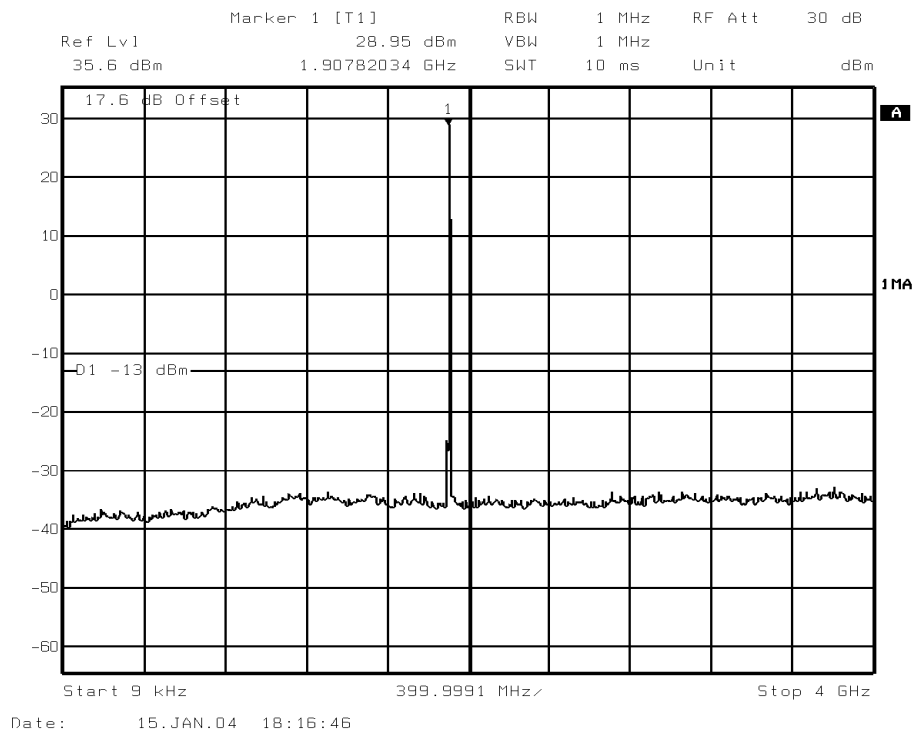
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

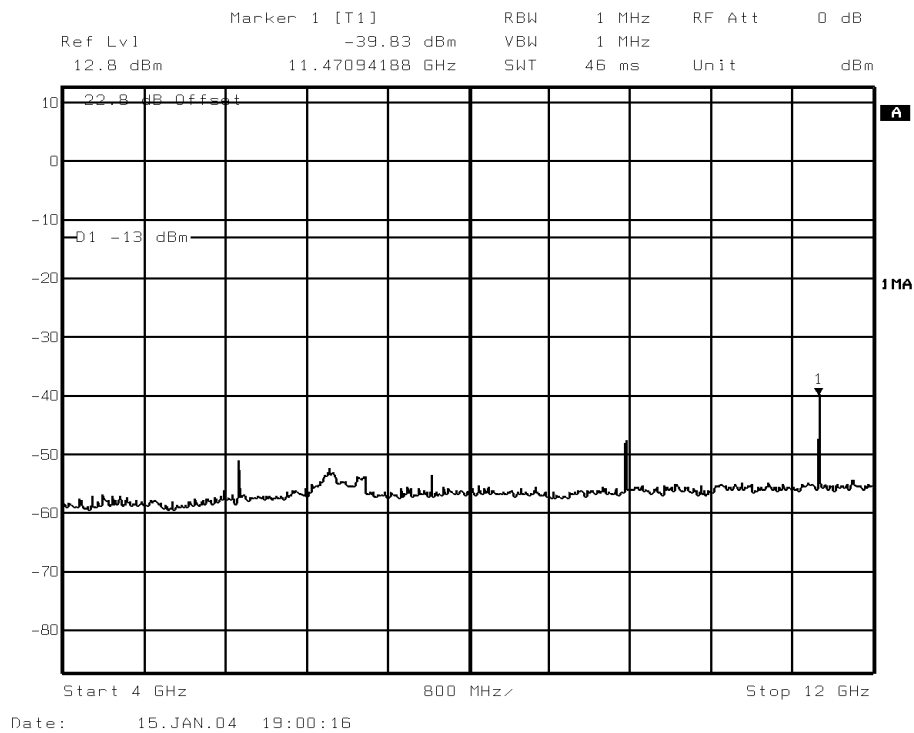
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

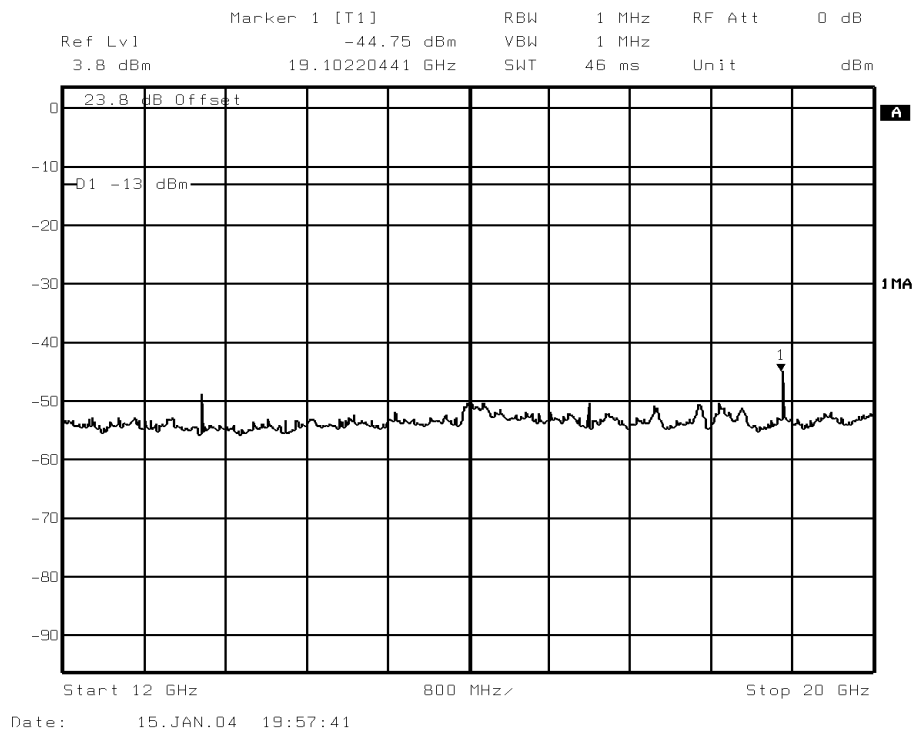
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

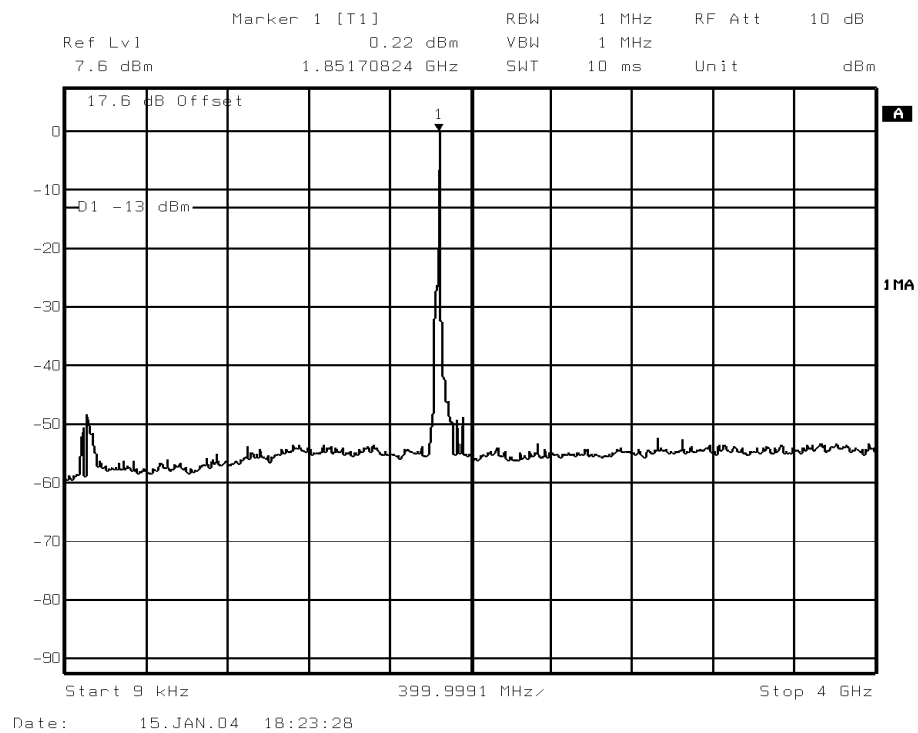
Spurious Emissions (12GHz – 20GHz)
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

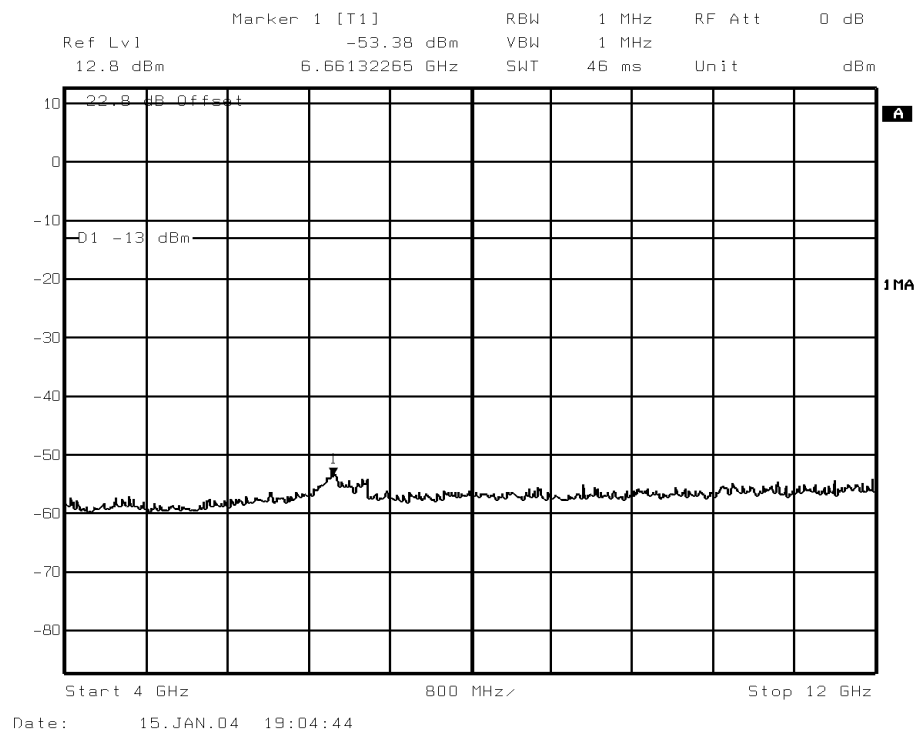
Spurious Emissions (9kHz – 4GHz)
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

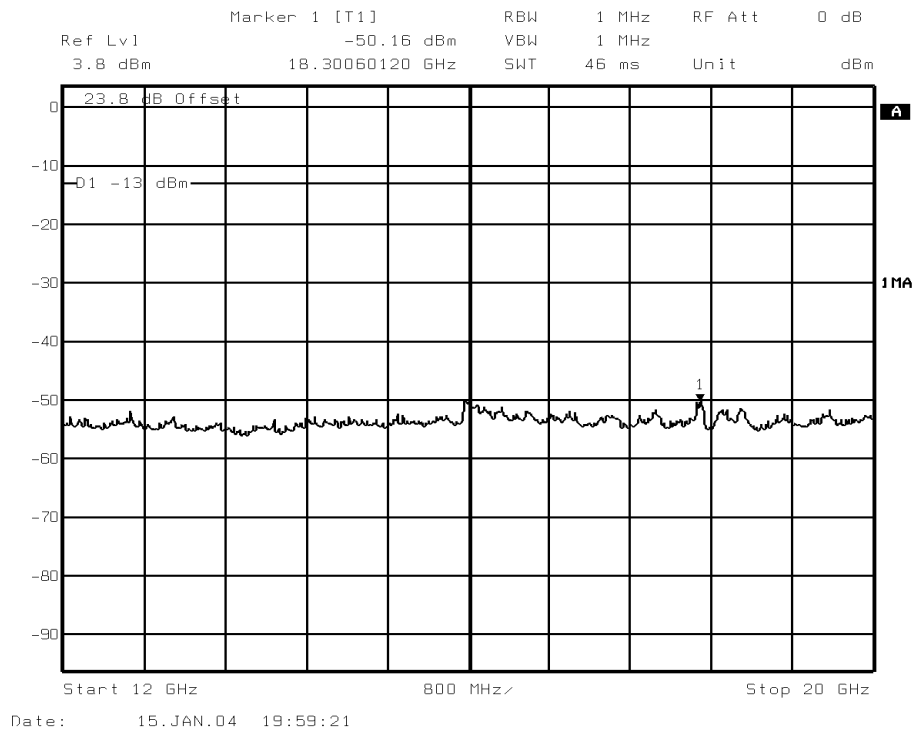
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

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



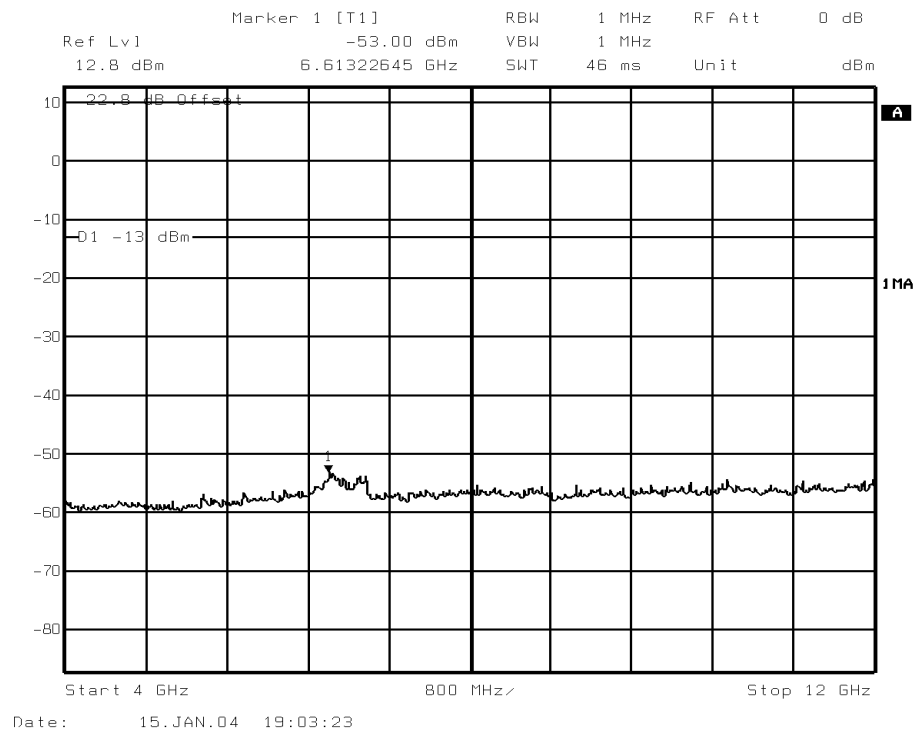
GPRS – Packet Data

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



**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

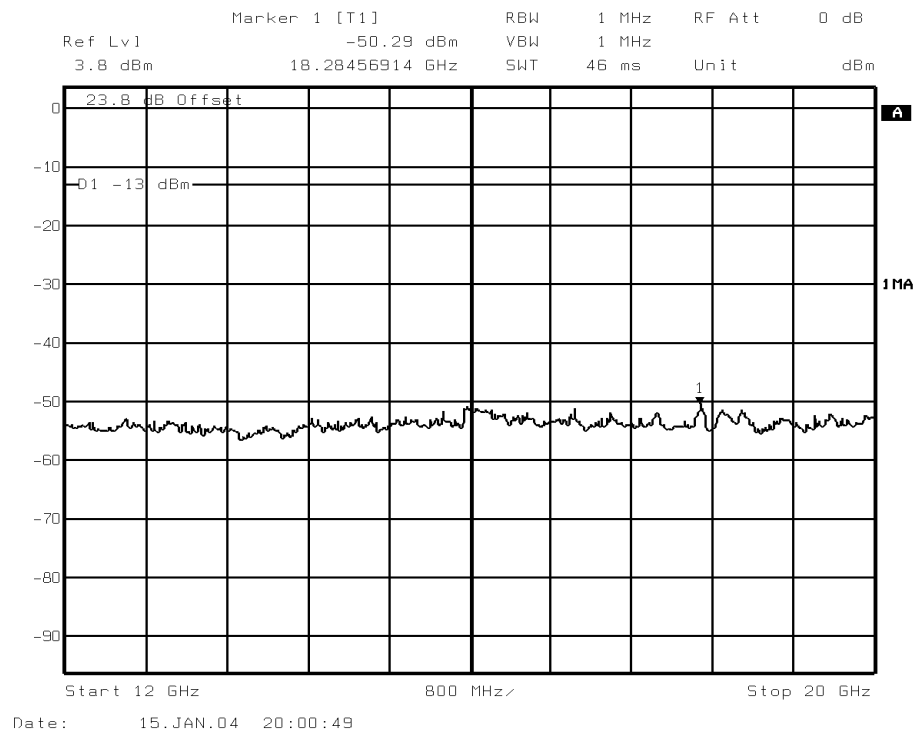
Spurious Emissions (4GHz – 12GHz)
Channel 661 (1880.0MHz) – Minimum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

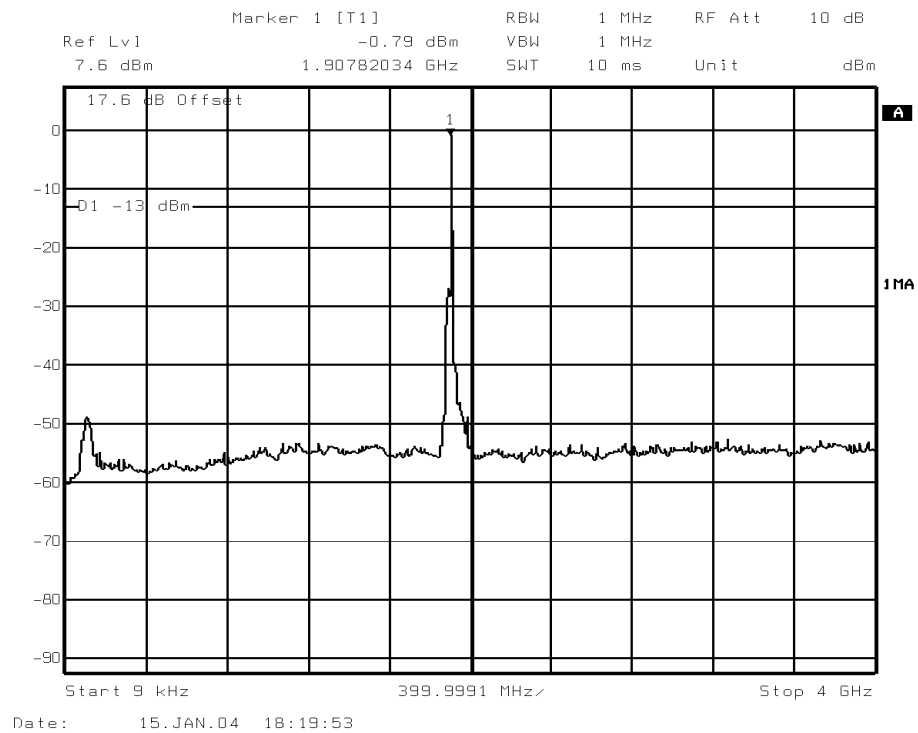
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Minimum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

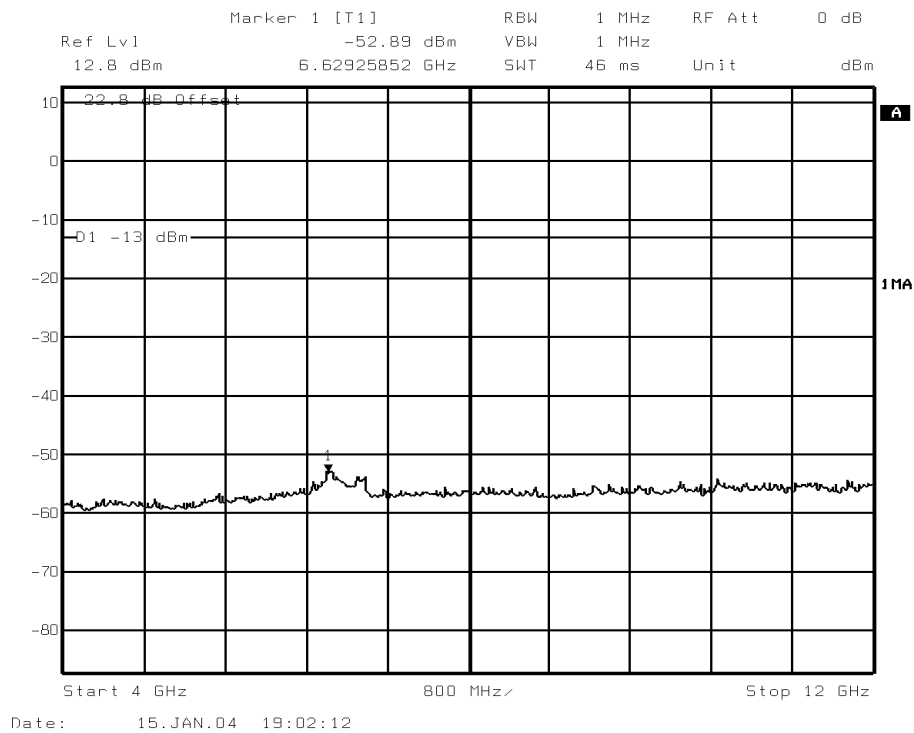
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Minimum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

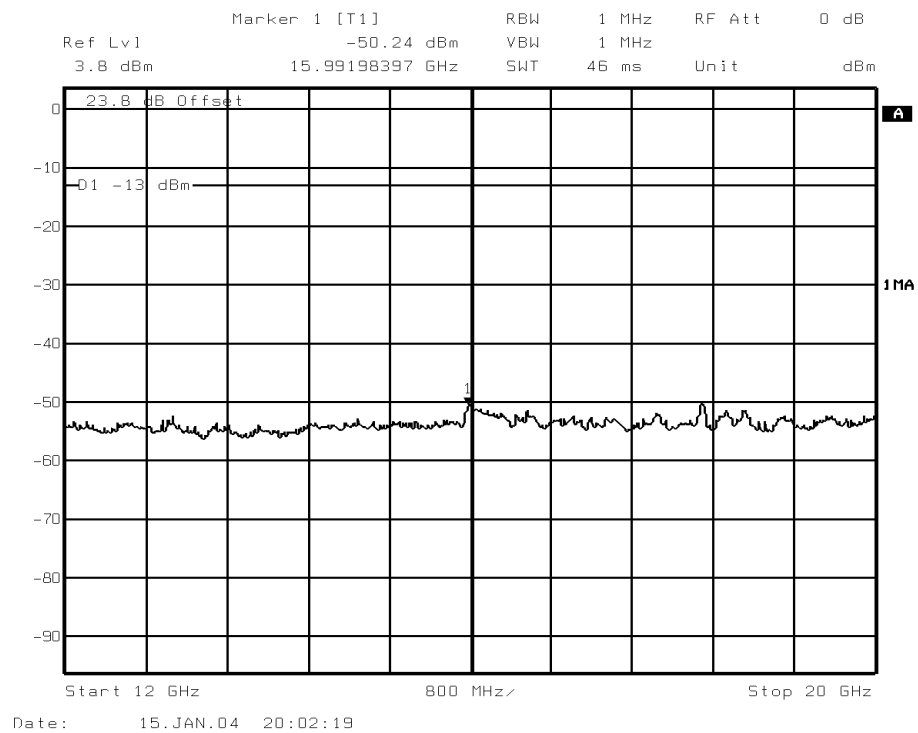
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Minimum Power



GPRS – Packet Data

**2.8 CONDUCTED SPURIOUS EMISSIONS - Continued**

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



GPRS – Packet Data



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

Harmonic Emissions - GSM

Channel 512 (1850.2MHz) – Maximum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.7004	-51.62	18.0	-33.62	-13
5.5506	-69.47	21.2	-48.27	-13
7.4008	-65.64	17.3	-48.34	-13
9.2510	-74.66	18.7	-55.96	-13
11.1012	-72.63	20.8	-51.83	-13
12.9514	-68.44	20.1	-48.34	-13
14.8016	-73.30*	20.3	-57.00	-13
16.6068	-75.66*	20.5	-55.16	-13
18.4120	-76.74*	20.5	-56.24	-13

*Instrumentation Noise Floor

Harmonic Emissions - GSM

Channel 661 (1880.0MHz)– Maximum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.760	-53.10	19.2	-33.90	- 13
5.640	-69.41	18.9	-50.51	- 13
7.520	-70.47	19.8	-50.67	- 13
9.400	-71.18	18.8	-52.38	- 13
11.280	-72.11	20.1	-52.01	- 13
13.160	-71.23	22.5	-48.73	- 13
15.040	-76.83*	20.0	-56.83	- 13
16.920	-72.75	24.2	-48.55	- 13
18.800	-71.06	23.0	-48.06	- 13

*Instrumentation Noise Floor



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

Harmonic Emissions - GSM

Channel 810 (1909.8MHz) – Maximum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.8196	-51.91	19.3	-32.61	-13
5.7294	-70.34	16.7	-53.64	-13
7.6392	-72.65	20.0	-52.65	-13
9.5490	-67.40	17.4	-50.00	-13
11.4588	-69.95	19.9	-50.05	-13
13.3686	-71.10	22.9	-48.20	-13
15.2784	-74.52	19.4	-55.12	-13
17.1882	-72.84	20.7	-52.14	-13
19.0980	-67.12	19.6	-47.52	-13

* Instrumentation Noise Floor

Harmonic Emissions - GSM

Channel 512 (1850.2MHz) – Minimum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.7004	-80.83*	18.0	-62.83	-13
5.5506	-79.60*	21.2	-58.40	-13
7.4008	-75.60	17.3	-58.30	-13
9.2510	-77.69	18.7	-58.99	-13
11.1012	-78.19*	20.8	-57.39	-13
12.9514	-77.19*	20.1	-57.09	-13
14.8016	-77.34*	20.3	-57.04	-13
16.6068	-75.66*	20.5	-55.16	-13
18.4120	-76.98*	20.5	-56.48	-13

*Instrumentation Noise Floor



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

Harmonic Emissions - GSM

Channel 661 (1880.0MHz) – Minimum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.760	-80.67*	19.2	-61.47	- 13
5.640	-79.45*	18.9	-60.55	- 13
7.520	-79.07*	19.8	-59.27	- 13
9.400	-78.28*	18.8	-59.48	- 13
11.280	-77.42*	20.1	-57.32	- 13
13.160	-77.54*	22.5	-55.04	- 13
15.040	-77.40*	20.0	-57.40	- 13
16.920	-76.42*	24.2	-52.22	- 13
18.800	-77.25*	23.0	-54.25	- 13

*Instrumentation Noise Floor

Harmonic Emissions - GSM

Channel 810 (1909.8MHz) – Minimum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.8196	-80.88*	19.3	-61.58	- 13
5.7294	-78.67*	16.7	-61.97	- 13
7.6392	-79.11*	20.0	-59.11	- 13
9.5490	-77.99*	17.4	-60.54	- 13
11.4588	-78.16*	19.9	-58.23	- 13
13.3686	-78.23*	22.9	-55.33	- 13
15.2784	-76.71*	19.4	-57.31	- 13
17.1882	-76.29*	20.7	-55.59	- 13
19.0980	-75.90*	19.6	-56.30	- 13

* Instrumentation Noise Floor



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

Harmonic Emissions - GPRS

Channel 512 (1850.2MHz) – Maximum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.7004	-56.41	18.0	-38.41	-13
5.5506	-70.01	21.2	-48.81	-13
7.4008	-66.18	17.3	-48.88	-13
9.2510	-73.34	18.7	-54.64	-13
11.1012	-71.44	20.8	-50.64	-13
12.9514	-68.97	20.1	-48.87	-13
14.8016	-76.94*	20.3	-56.64	-13
16.6068	-74.32*	20.5	-53.62	-13
18.4120	-76.31*	20.5	-55.81	-13

*Instrumentation Noise Floor

Harmonic Emissions - GPRS

Channel 661 (1880.0MHz)– Maximum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.760	-57.88	19.2	-38.68	-13
5.640	-69.42	18.9	-50.52	-13
7.520	-69.46	19.8	-49.96	-13
9.400	-71.30	18.8	-52.50	-13
11.280	-69.57	20.1	-49.47	-13
13.160	-71.72	22.5	-49.22	-13
15.040	-76.48*	20.0	-59.48	-13
16.920	-73.72	24.2	-49.52	-13
18.800	-70.79	23.0	-47.79	-13

*Instrumentation Noise Floor



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

Harmonic Emissions – GPRS

Channel 810 (1909.8MHz) – Maximum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.8196	-56.56	19.3	-37.26	-13
5.7294	-70.19	16.7	-53.49	-13
7.6392	-72.29	20.0	-52.29	-13
9.5490	-68.17	17.4	-50.77	-13
11.4588	-63.21	19.9	-43.31	-13
13.3686	-71.85	22.9	-48.95	-13
15.2784	-74.20	19.4	-54.80	-13
17.1882	-73.47	20.7	-52.77	-13
19.0980	-67.27	19.6	-47.67	-13

Harmonic Emissions - GPRS

Channel 512 (1850.2MHz) – Minimum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.7004	-81.39*	18.0	-63.39	-13
5.5506	-78.90	21.2	-57.70	-13
7.4008	-76.11	17.3	-58.81	-13
9.2510	-78.21*	18.7	-59.51	-13
11.1012	-78.21*	20.8	-57.41	-13
12.9514	-77.49*	20.1	-57.39	-13
14.8016	-76.52*	20.3	-56.22	-13
16.6068	-75.64*	20.5	-55.14	-13
18.4120	-75.23*	20.5	-54.73	-13

*Instrumentation Noise Floor



2.8 CONDUCTED SPURIOUS EMISSIONS - Continued

Harmonic Emissions - GPRS

Channel 661 (1880.0MHz) – Minimum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.760	-80.25*	19.2	-61.05	- 13
5.640	-79.12	18.9	-60.22	- 13
7.520	-78.96*	19.8	-59.16	- 13
9.400	-78.30*	18.8	-59.50	- 13
11.280	-77.25*	20.1	-57.15	- 13
13.160	-77.12*	22.5	-54.62	- 13
15.040	-76.62*	20.0	-56.62	- 13
16.920	-75.09*	24.2	-50.89	- 13
18.800	-77.10*	23.0	-54.10	- 13

*Instrumentation Noise Floor

Harmonic Emissions - GPRS

Channel 810 (1909.8MHz) – Minimum Power

Frequency (GHz)	Raw Result (dBm)	Path Loss (dB)	Corrected Result (dBm)	Limit (dBm)
3.8196	-81.04*	19.3	-61.74	- 13
5.7294	-78.29	16.7	-61.59	- 13
7.6392	-79.19*	20.0	-59.19	- 13
9.5490	-79.73*	17.4	-62.33	- 13
11.4588	-76.89*	19.9	-56.99	- 13
13.3686	-78.39*	22.9	-55.49	- 13
15.2784	-76.29*	19.4	-56.89	- 13
17.1882	-77.20*	20.7	-56.50	- 13
19.0980	-76.63*	19.6	-57.03	- 13

* Instrumentation Noise Floor



2.9 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.9.1 FCC CFR 47: Part 24 Subpart E, Section 2.1055, 24.235

2.9.2 Equipment Under Test MX-C110

2.9.3 Date of Test 14th January 2004

2.9.4 Test Equipment Used (See Section 3.1 for details) 6, 7, 10, 11, 12

2.9.5 Test Procedure

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.

2.9.6 Test Results

GSM – Circuit Switched

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (Hz)
- 30	1.88	58
- 20	1.88	35
- 10	1.88	41
0	1.88	-25
+ 10	1.88	28
+ 20	1.88	18
+ 30	1.88	-26
+ 40	1.88	24
+ 50	1.88	24



2.9 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS – Continued

GPRS – Packet Data

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (Hz)
- 30	1.88	37
- 20	1.88	27
- 10	1.88	33
0	1.88	-19
+ 10	1.88	30
+ 20	1.88	-25
+ 30	1.88	-26
+ 40	1.88	-38
+ 50	1.88	-40

Remarks

EUT complies with CFR 47 Part 24.235. The frequency drift of the EUT over the temperature range is sufficiently stable to keep it within the authorised frequency blocks.

**2.10 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS****2.10.1 FCC CFR 47: Part 24 Subpart E, Section 24.235****2.10.2 Equipment Under Test**
MX-C110**2.10.3 Date of Test**
15th January 2004**2.10.4 Test Equipment Used (See Section 3.1 for details)**
6, 7, 11, 12**2.10.5 Test Procedure**

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.

2.10.6 Test Results

GSM

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)
3.7	1.88	35
3.4	1.88	27

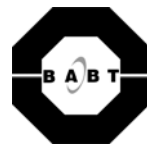
**2.10 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS - Continued**

GPRS

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)
3.7	1.88	28
3.4	1.88	22

Remarks

EUT complies with CFR 47 Part 24.235. The frequency drift of the EUT under voltage variation is sufficiently stable to keep it within the authorised frequency blocks.



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

Item	Instrument	Manufacturer	Type No	Serial No	EMC / INV No	Cal. Due
1	Spectrum Analyser	Rohde & Schwarz	FSEM	827/56/006	INV 4034	05/01/05
2	GSM Test Set	Rohde & Schwarz	CMU 200	833870/015	INV 4858	17/06/04
3	Attenuator	Weinschel	23-10-34	BC4169	1957	01/07/04
4	Combiner	Weinschel	1506A	AC5343	453	28/07/04
5	Signal Generator	Hewlett Packard	ESG-4000A	GB37040125	INV 3709	21/01/04
6	PSU	Farnell	D30 4	355	-	TU
7	DVM	Fluke	70 III	72320985	INV 4159	16/09/04
8	High Pass Filter	RLC	-	-	INV 4968	10/03/05
9	Signal Generator	Hewlett Packard	8673B	2417A00437	-	30/05/02
10	Climatic Chamber	Vötsch	VM 04/100	BLD 8	INV 1755	TU
11	Thermometer	Jenco	7000 APL	5139	INV 2394	09/05/04
12	GSM Test Set	Rohde & Schwarz	CMU 200	130944	INV 4937	13/11/04
13	Turntable & Controller	HD Gmbh	HD 050	050/396	2528	TU
14	Antenna Mast	Emco	2070	-	-	TU
15	Antenna Mast Controller	Emco	2090	-	-	TU
16	Screened Room 5	Siemens	EAC54300	NA	2533	-
17	High Pass Filter	RLC Electronics	F-100-3000-5-R	-	4467	TU
18	Low Noise Amplifier	Miteq	AMF-3d-001080-18-13P	UNK	2457	TU
19	Low Noise Amplifier	Avantek	AWT-18036	UNK	1081	TU
20	Horn Antenna	Emco	3115	96964848	2297	07/04/04
21	Horn Antenna	Emco	3115	97015079	2397	07/04/04
22	Test Receiver	Rohde & Schwarz	ESIB26	100163/026	2958	08/05/04
23	High Pass Filter	Sematron	F-100-40000-S-R	-	INV4467	TU
24	Spectrum Analyser	Hewlett Packard	8542E	3617A00165_00154	2286	12/09/04



3.1 TEST EQUIPMENT USED – Continued

Item	Instrument	Manufacturer	Type No	Serial No	EMC / INV No	Cal. Due
25	Bilog Antenna	Chase	CBL6143	5064	2860	04/11/04
26	Test Receiver	Rohde & Schwarz	ESH3	872742/002	1020	08/16/04
27	Spectrum Analyser	Rohde & Schwarz	EZM	892242-023	1416	TU
28	Plotter	Hewlett Packard	7550A	-	-	TU
29	Transient Limiter	Hewlett Packard	11947A	3107A01649	2244	05/07/04
30	LISN	Rohde & Schwarz	ESH2-Z5	892107-019	1584	10/02/04
31	GSM Test Set	Hewlett Packard	8922M	3741U02494	INV3803	TU
32	DCS Test Set	Hewlett Packard	8922E	3639U01810	INV3804	TU



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

IN THE FREQUENCY RANGE 30MHz TO 1000MHz		
TEST	FREQUENCY	AMPLITUDE
For Occupied Bandwidth	$\pm 210.894\text{kHz}$	$\pm 0.5\text{dB}$
For Maximum Output Power	Not Applicable	$\pm 0.5\text{dB}$
For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard EMI Receiver and Bilog Antenna	$\pm 2 \times 10^{-7} \times \text{Centre Frequency}$	5.15dB calculated in accordance with CISPR 16-4
For Spurious Conducted Emissions	Not Applicable	$\pm 3.0\text{dB}$
IN THE FREQUENCY RANGE 1GHz TO 20GHz		
TEST	FREQUENCY	AMPLITUDE
For Spurious Radiated Emissions measurements	$\pm 2 \times 10^{-7} \times \text{Centre Frequency}$	$\pm 3.4\text{dB}$
For Effective Radiated Power (ERP) measurements	Not Applicable	$\pm 1.45\text{dBm}$



SECTION 4

EUT PHOTOGRAPHS



4.1.1 EUT PHOTOGRAPHS



Front View



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

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APPENDIX A

TITCHFIELD FCC SITE 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

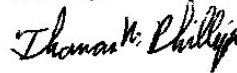
Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002

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 under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,



Thomas W Phillips
Electronics Engineer