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-C99 Tri-Band Terminal Equipment

COMMERCIAL-IN-CONFIDENCE

FCC ID: RXUMX-C99

Report No OR612307/01 Issue 1 April 2004

TÜV PRODUCT SERVICE

BABT

TÜV Product Service Ltd, Segensworth Road,
Fareham, Hampshire, PO15 5RH, United Kingdom
Tel: +44 (0)1329 443300
Website: www.tuvps.co.uk

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PREPARED FOR

Maxon Telecom Co. Ltd.
10F Sewon Venture Town Bldg.
705-18, Yeuksam-dong
Kangnam-gu
Seoul, 135-080
Korea

PREPARED BY

R Small

Telecoms Engineer

APPROVED BY

C Gould
EMC Signatory

M Jenkins
Radio Signatory

DATED

8th April 2004

DISTRIBUTION

Maxon Telecom Co. Ltd.	Copy 1
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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;

R Small

J Hold

UKAS TESTING 0141 Group

CONTENTS

SECTION 1

REPORT SUMMARY

FCC CFR 47: Parts 15 and 24 Testing in support of an
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1.1 STATUS

EQUIPMENT UNDER TEST	MX-C99 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-C99
SERIAL NUMBER	353425000000028 (EMC Sample) 353425000000085 (Radio Sample)
HARDWARE VERSION	BASEBAND Section MX-C99 V.2.2.3 Transceiver MX-C99 V.2.2.3 Keypad PCB V.3.1.3
HARDWARE REVISION LEVEL	Issue 12th January 2004
SOFTWARE VERSION	761.09.001.bif
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	TCMD0436804
DATE	9th February 2004
START OF TEST	1st March 2004
FINISH OF TEST	10th March 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-C99 to the requirements of FCC Specification Part 24 and Part 15.

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)	Maximum Peak Output Power (conducted)	PASS	-
2.2	2.1046, 24.232 (b)	Maximum Peak Output Power (radiated)	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	Spurious Emissions at Antenna Terminal (+/- 1MHz)	PASS	-
2.6	24.238	Radiated Emissions	PASS	-
2.7	2.1051, 24.238(a)	Conducted Spurious Emissions	PASS	-
2.8	2.1055, 24.135(a)	Frequency Stability Under Temperature Variation	PASS	-
2.9	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-C99 Tri Band Terminal Equipment operates from a 3.8 volt battery. At 1900MHz it is Power Class 10, 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 at maximum power or receiving as detailed in Section 1.5.3.

1.5.3 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

For Radiated tests, the Maxon MX-C99 was powered by its own internal battery.
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 remaining tests the MX-C99 was powered using a battery eliminator.

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-C99 Tri-Band Terminal Equipment

2.1 MAXIMUM PEAK OUTPUT POWER (CONDUCTED)

2.1.1 FCC CFR 47: Part 24 Subpart E, Section 2.1046 (a), 24.232 (b)

2.1.2 Equipment Under Test
MX-C99

2.1.3 Date of Test
1st March 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 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 its 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	11.13	17.8	28.93	0.782
1880.0	11.47	17.8	29.27	0.845
1909.8	10.88	18.0	28.88	0.773

Minimum Power- GSM

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (mW)
1850.2	-17.31	17.8	0.49	1.119
1880.0	-16.72	17.8	1.08	1.282
1909.8	-17.41	18.0	0.59	1.146

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	11.09	17.8	28.89	0.774
1880.0	11.39	17.8	29.19	0.830
1909.8	10.85	18.0	28.85	0.767

Minimum Power- GPRS

Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)	Result (mW)
1850.2	-17.47	17.8	0.33	1.079
1880.0	-16.90	17.8	0.90	1.230
1909.8	-17.58	18.0	0.42	1.102

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 Specification Reference

FCC CFR 47: Part 24 Subpart E, Section 24.232

2.2.2 Equipment Under Test

MX-C99

2.2.3 Date of Test

8th March 2004

2.2.4 Test Equipment Used (See Section 3.1 for details)

17,18,21,24,26.

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.

2.2.6 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 (mW)
1850.2	-15.8	20.2	8.8	29.0	33.0	794.33
1880.0	-14.8	21.1	8.8	29.9	33.0	977.24
1909.8	-13.9	21.9	8.8	30.7	33.0	1174.89

2.2 MAXIMUM PEAK OUTPUT POWER (RADIATED) - 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-C99

2.3.3 Date of Test
10th March 2004

2.3.4 Test Equipment Used
3, 4, 5, 8, 9, 12, 13

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 (≈270.833kHz). 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 ≈577μs. 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 ±π/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

$$h = 2*Fp*Tb$$

where h is the modulation index, Fp is the peak frequency deviation and Tb is the bit period the peak frequency deviation is shown to be ≈±67.7kHz.

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:

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

where T is the bit period and the function *rect(x)* is defined by:

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

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

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

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

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

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

The phase of the modulated signal is:

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

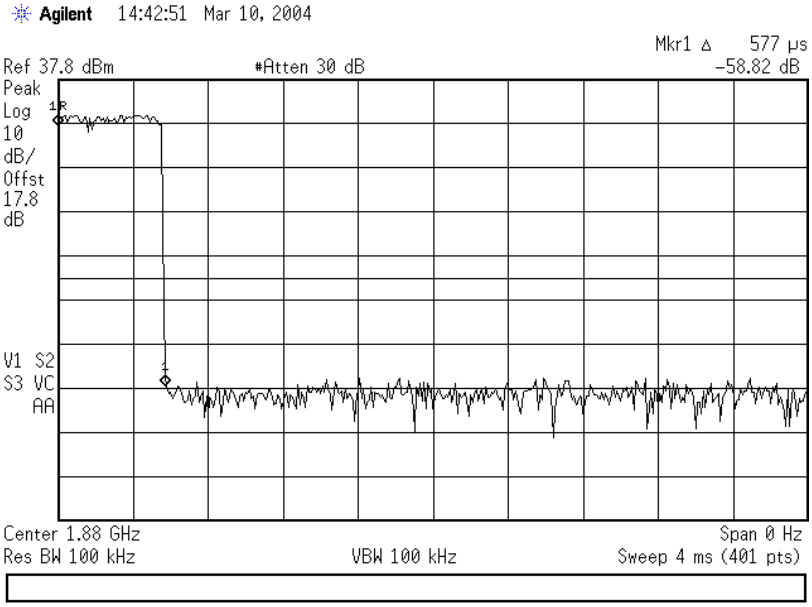
where the modulating index *h* is 1/2 (maximum phase change in radians is $\pi/2$ per data interval). The time reference *t' = 0* is the start of the slot.

The modulated RF carrier is expressed as:

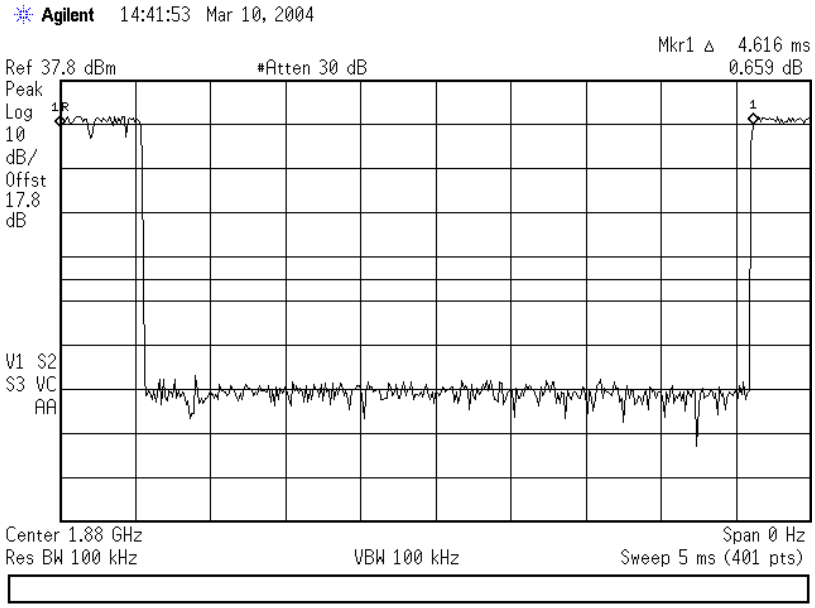
$$x(t') = \sqrt{\frac{2E_c}{T}}\ .\ \cos(2\pi f_0 t' + \varphi(t') + \varphi_0)$$

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

2.3 MODULATION CHARACTERISTICS - Continued

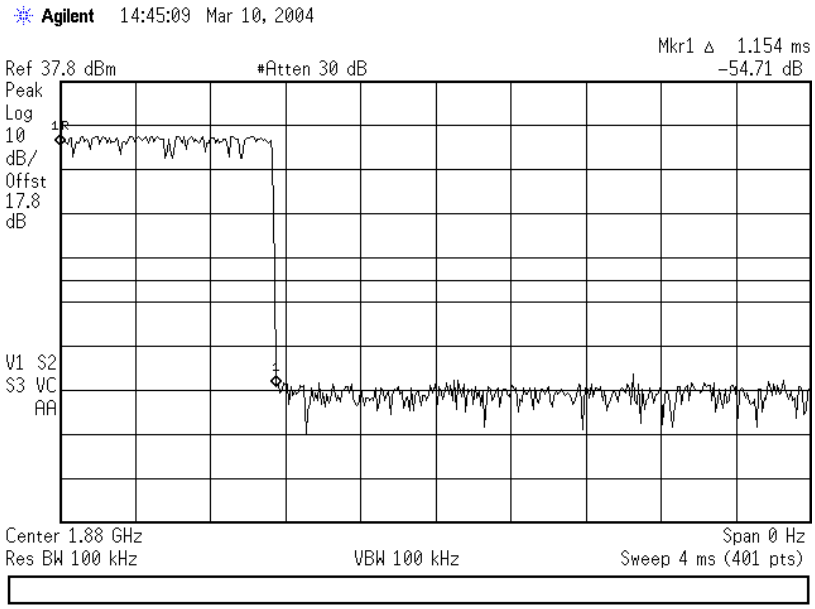


GSM Mode. View of TS3

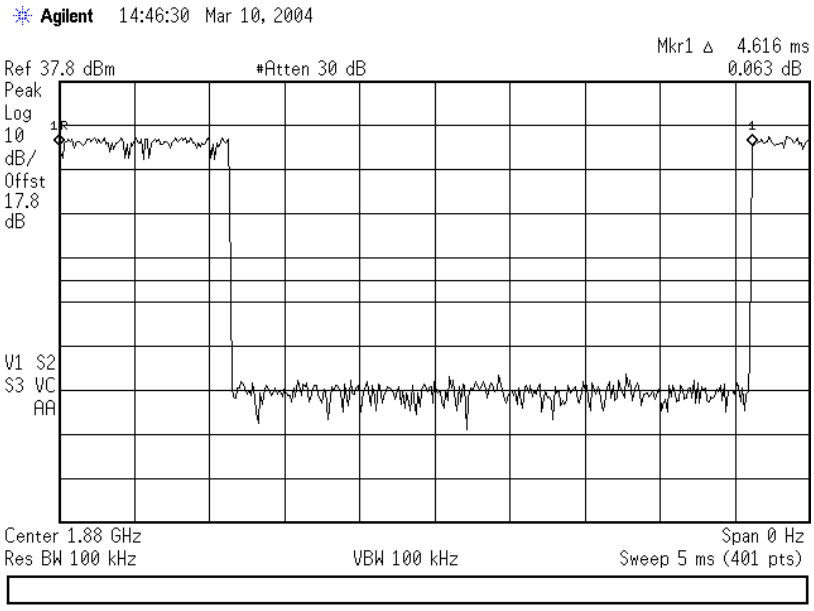


GSM Mode. View of One Complete Frame Showing TS3

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-C99

2.43 Date of Test
1st and 2nd March 2004

2.4.4 Test Equipment Used (See Section 3.1 for details)
1, 3, 4, 5, 6, 7, 8

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.

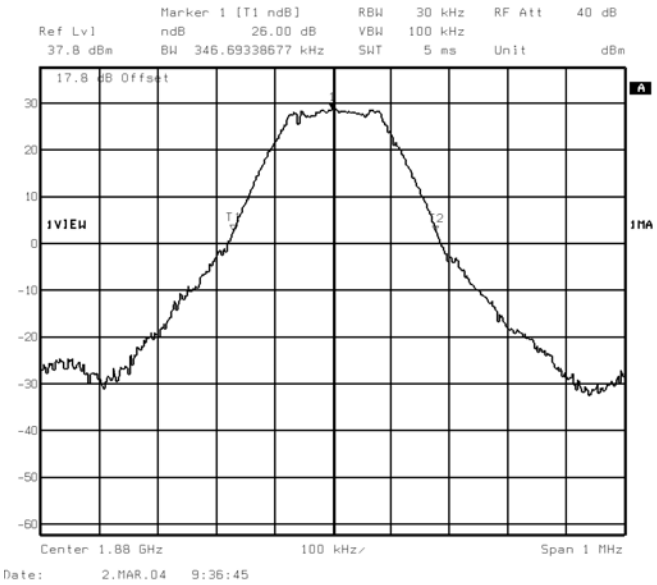
Using a resolution bandwidth of 30kHz and a video bandwidth of 100kHz, the –26dBc points were established and the emission bandwidth determined.

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

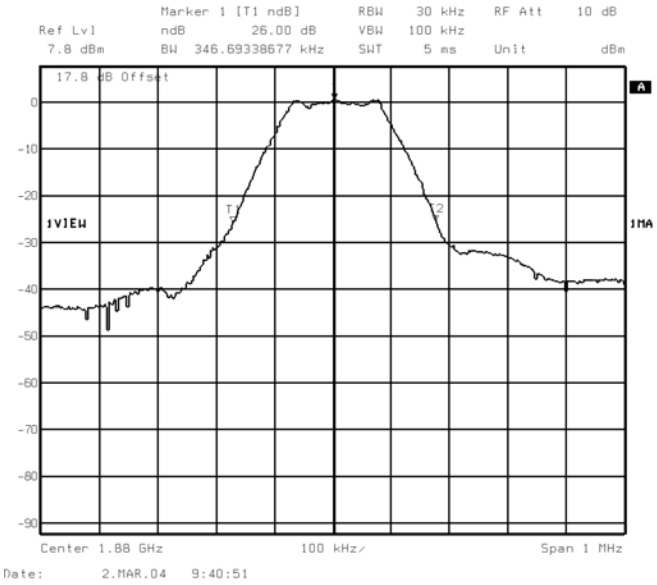
2.4 OCCUPIED BANDWIDTH - Continued

2.4.5 Test Results

Occupied Bandwidth As Defined By The - 26dBc Points

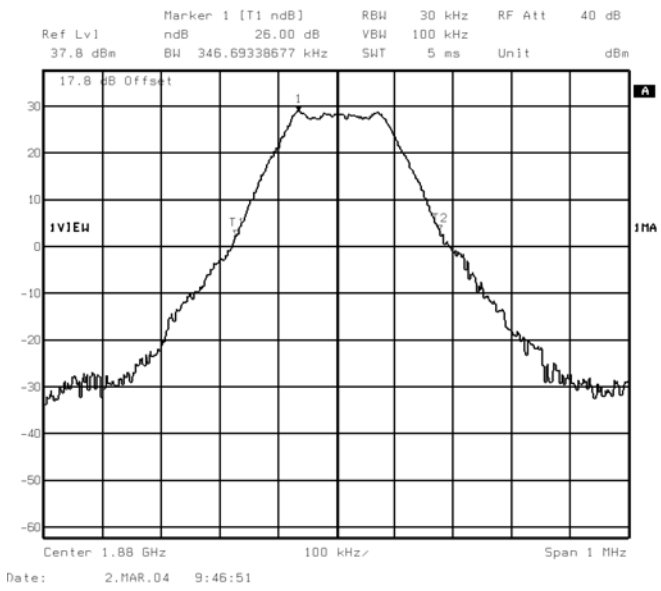


Maximum Power – Circuit Switched (GSM)

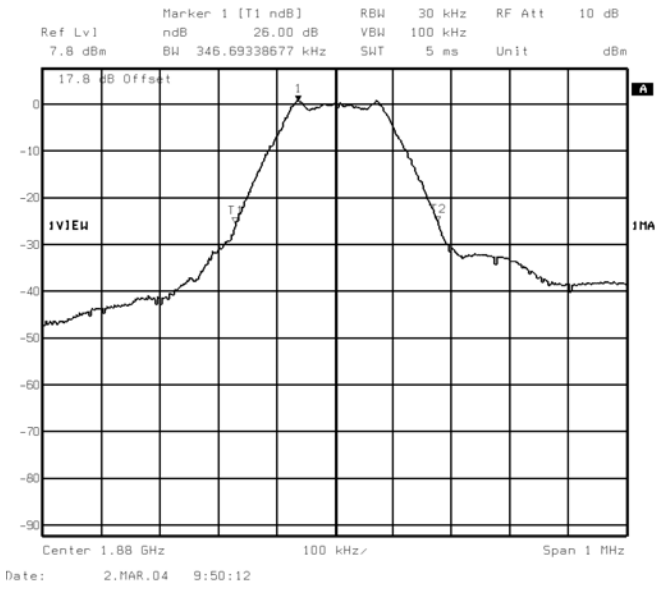


Minimum Power – Circuit Switched (GSM)

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-C99

2.5.3 Date of Test
10th March 2004

2.5.4 Test Equipment Used (See Section 3.1 for details)
3, 4, 5, 8, 9, 12, 13

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. 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 : 788 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

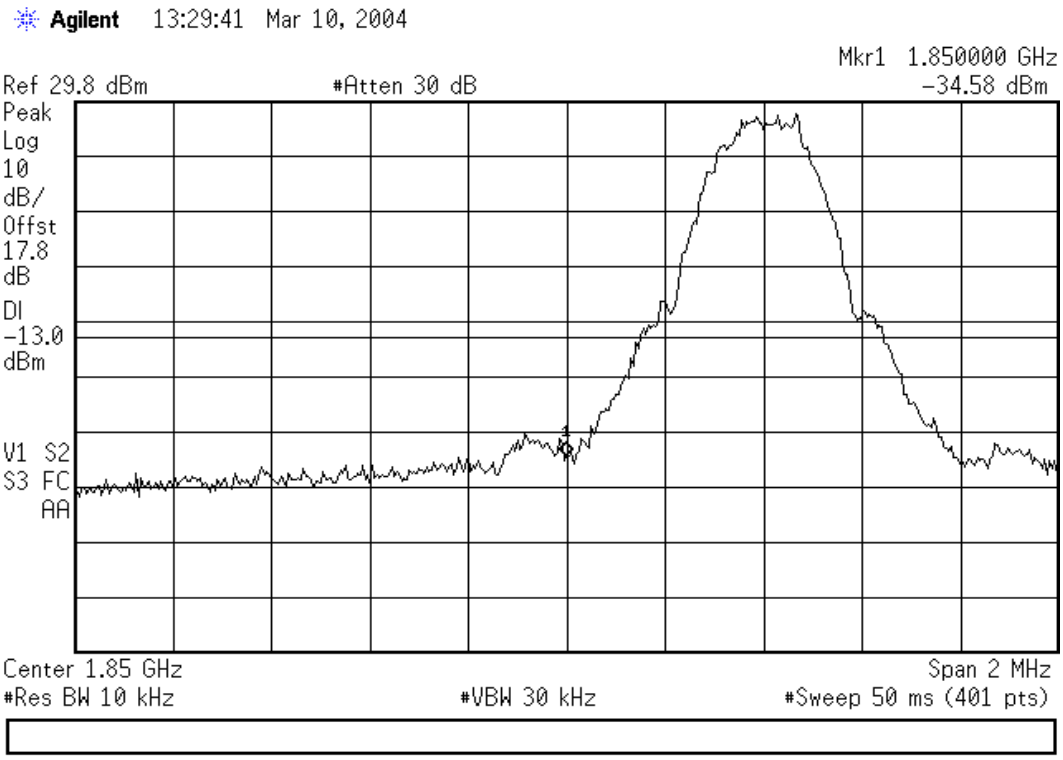
2.5.6 Test Results

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

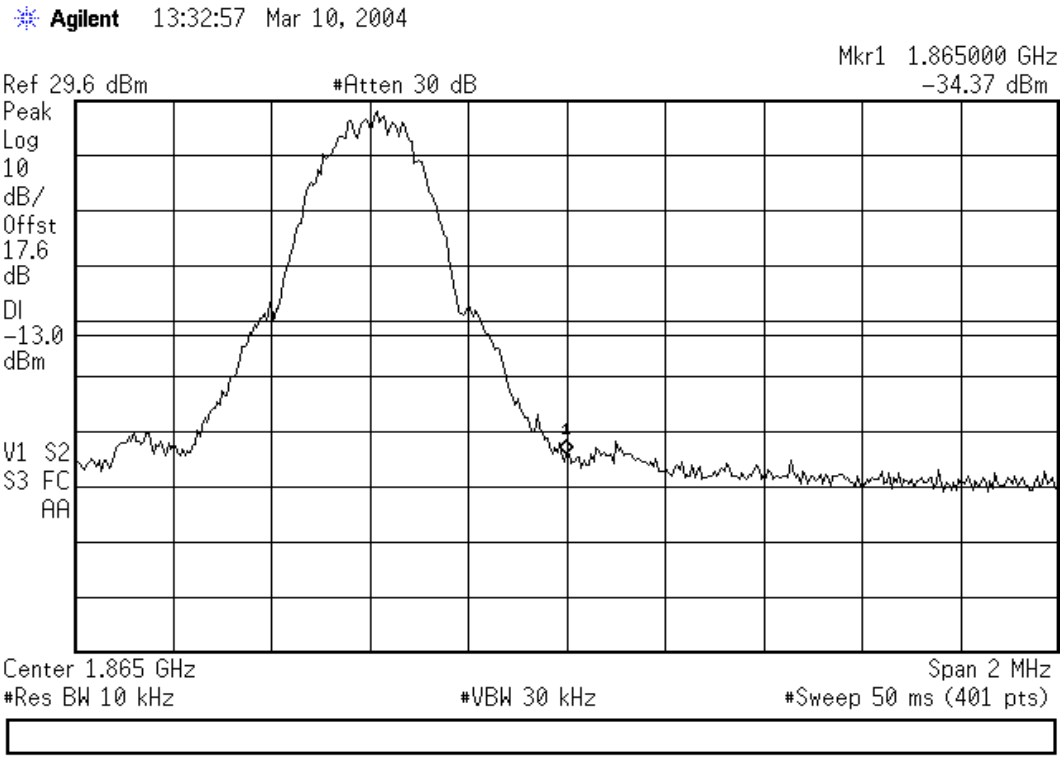


GSM – Circuit Switched

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

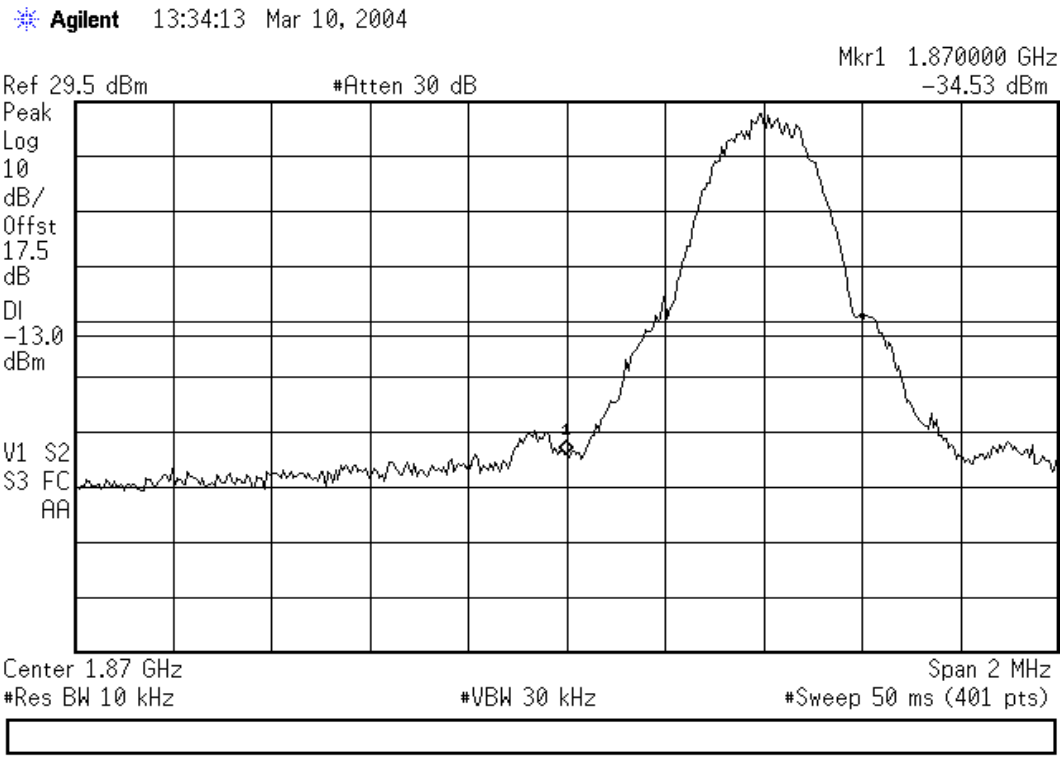


GSM – Circuit Switched

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

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

Block B

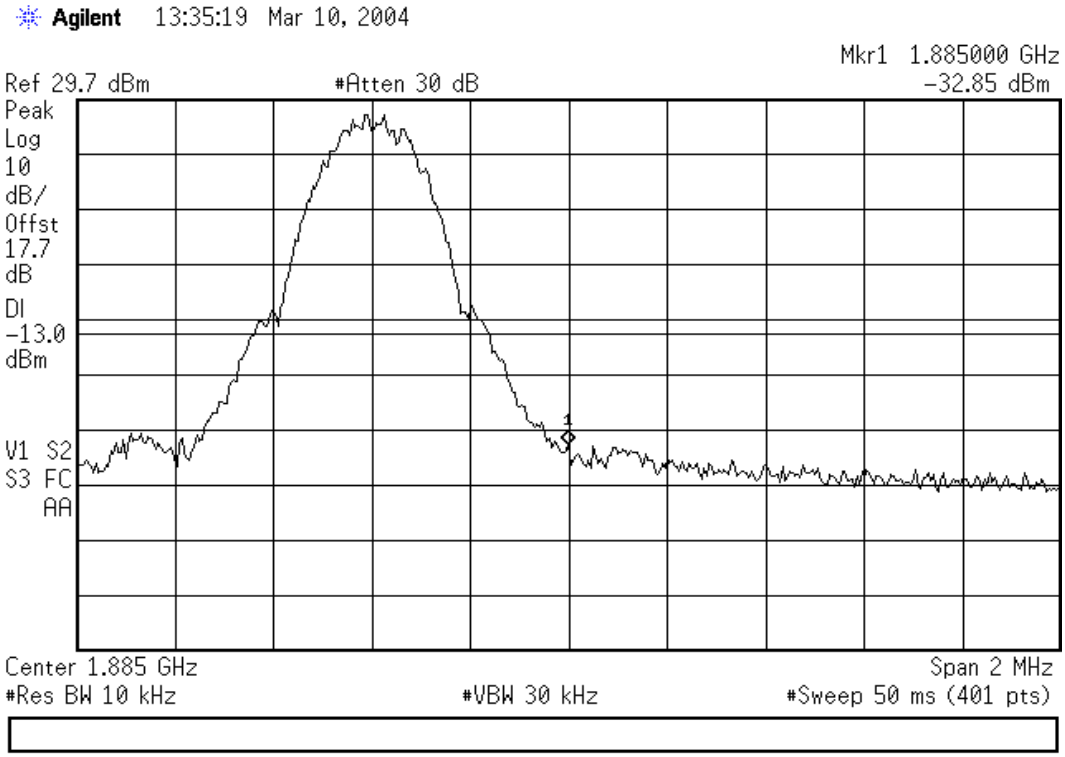


GSM – Circuit Switched

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

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

Block B

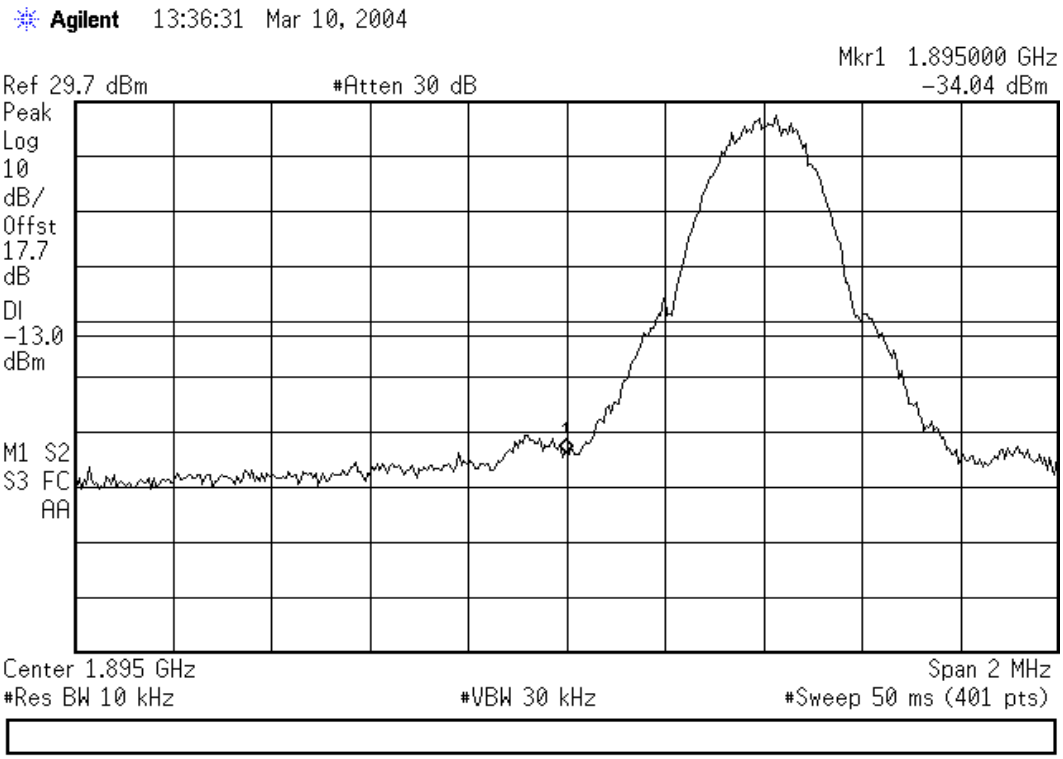


GSM – Circuit Switched

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

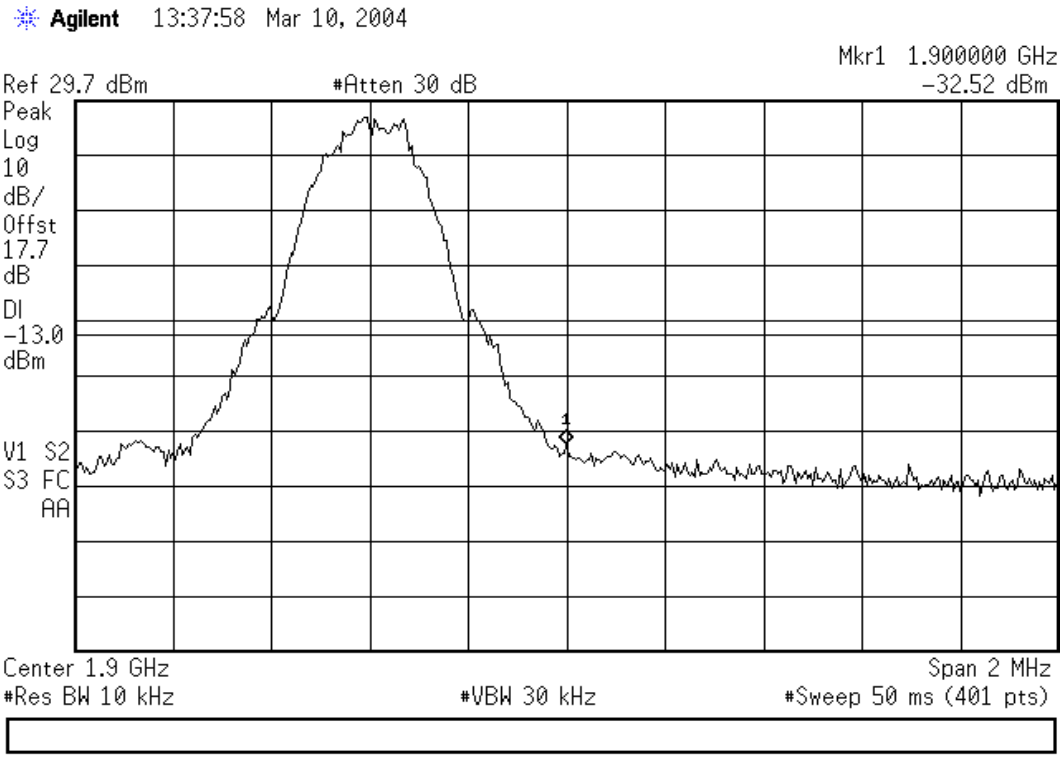


GSM – Circuit Switched

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

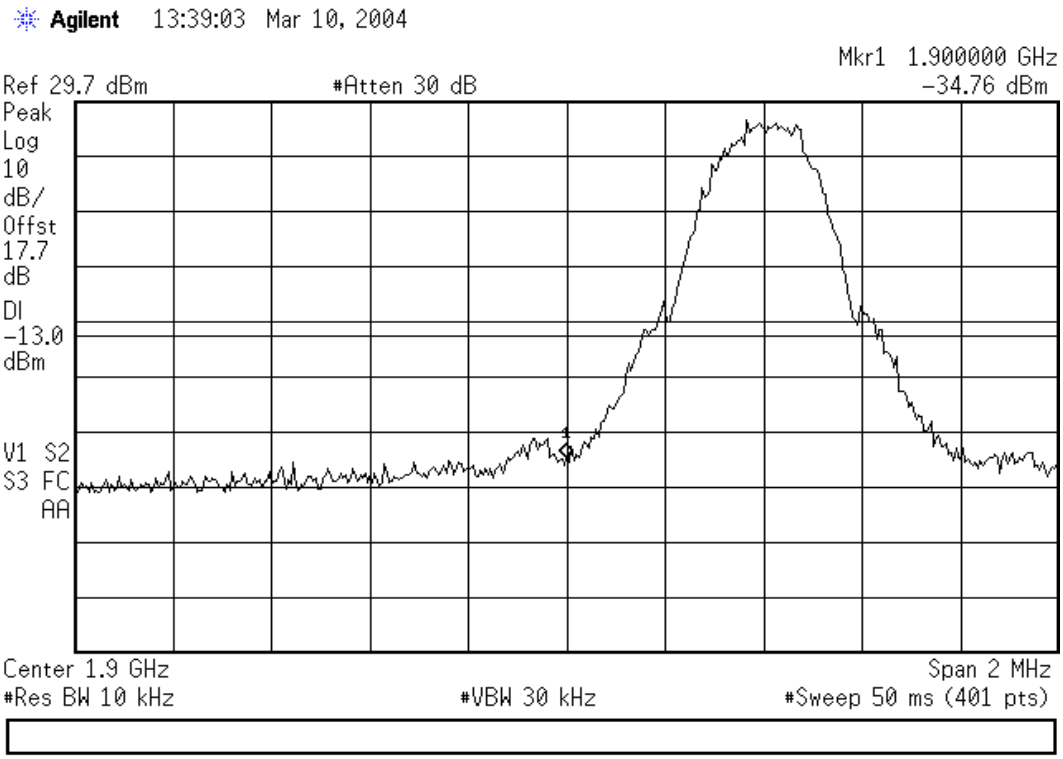


GSM – Circuit Switched

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

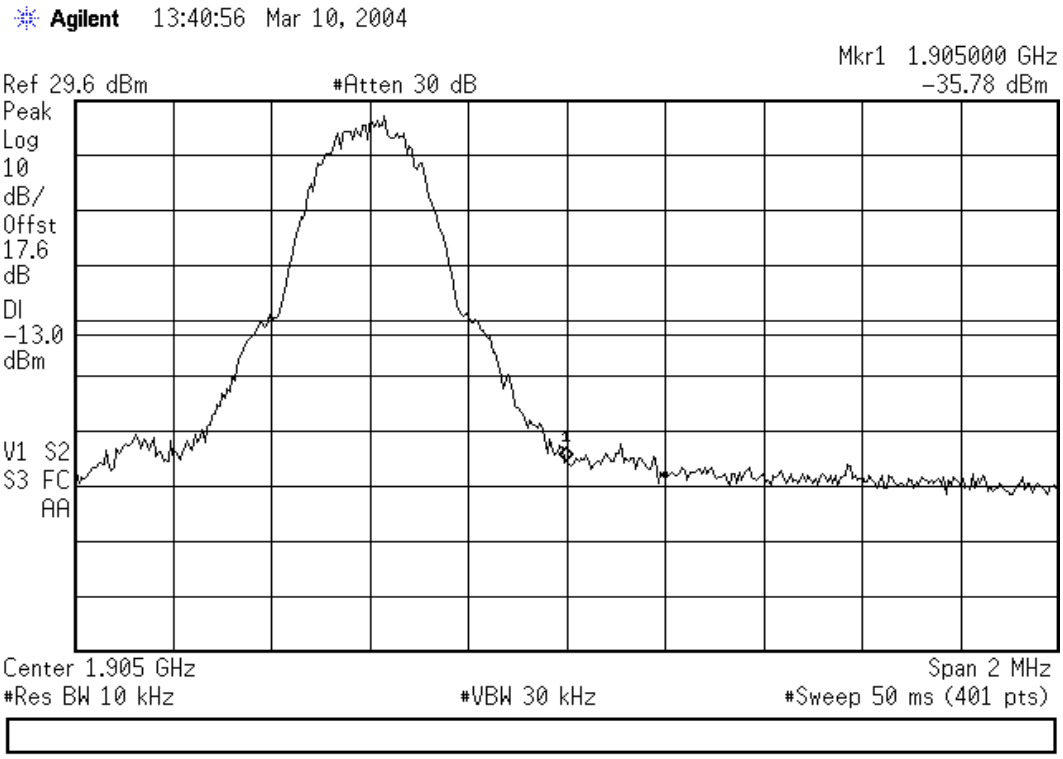


GSM – Circuit Switched

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

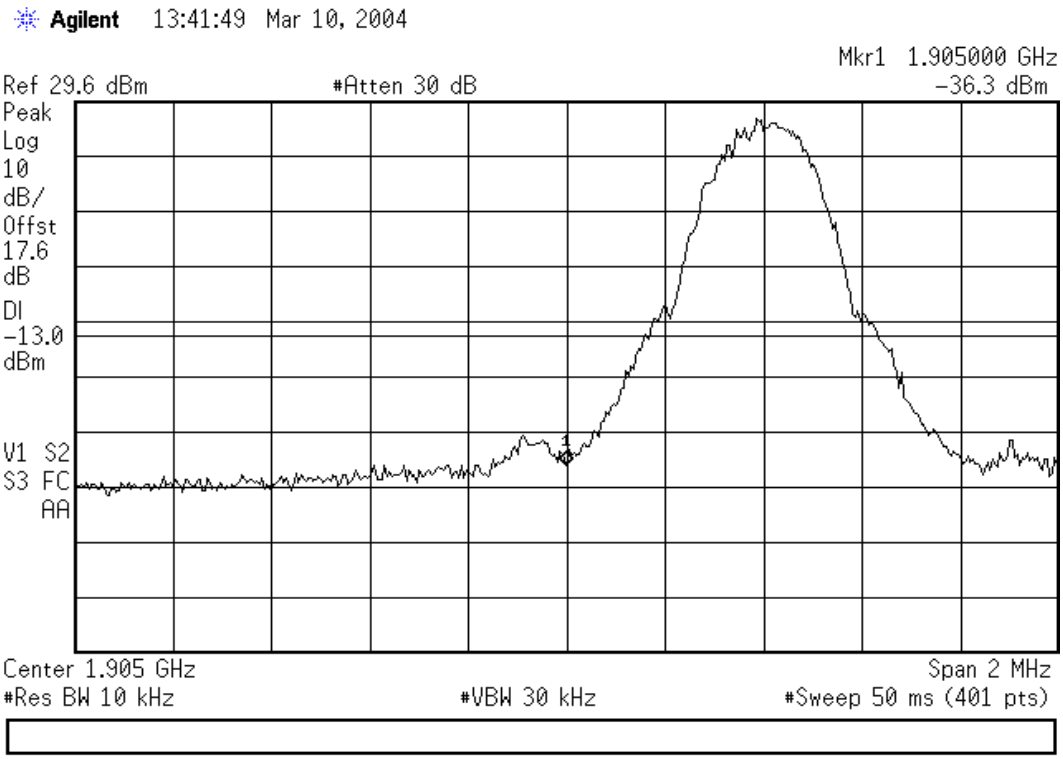


GSM – Circuit Switched

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

Block Edge Measurement with EUT Transmitting on full power on Channel 788, (1905.4MHz)

Block C

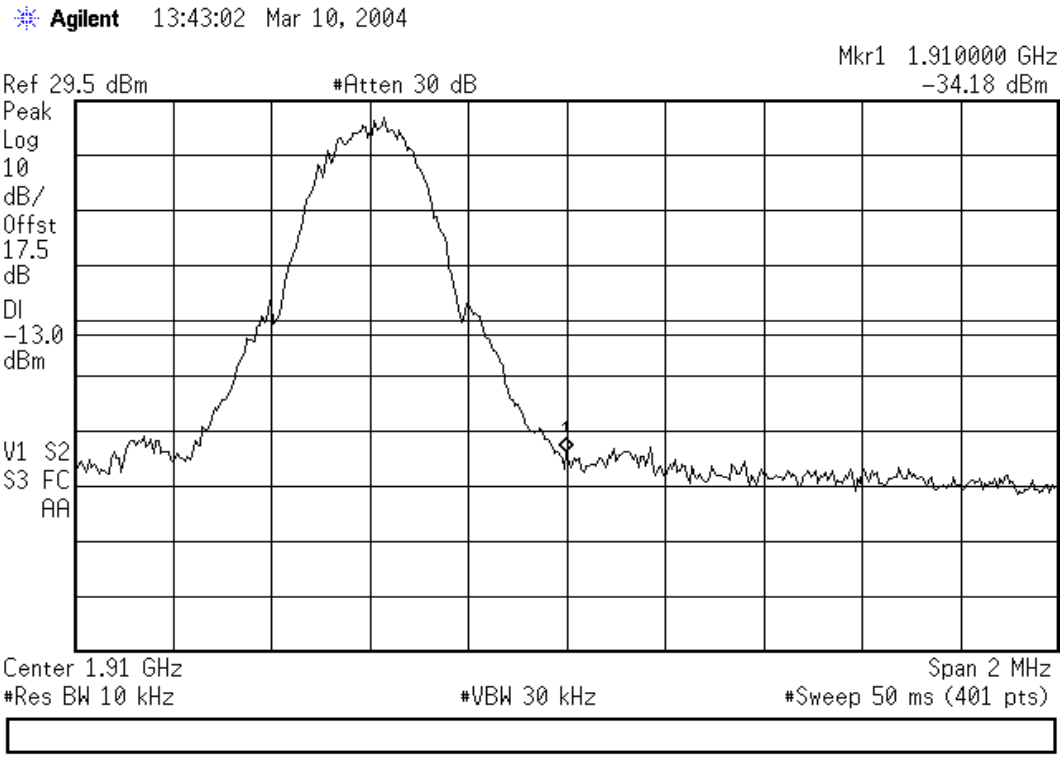


GSM – Circuit Switched

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

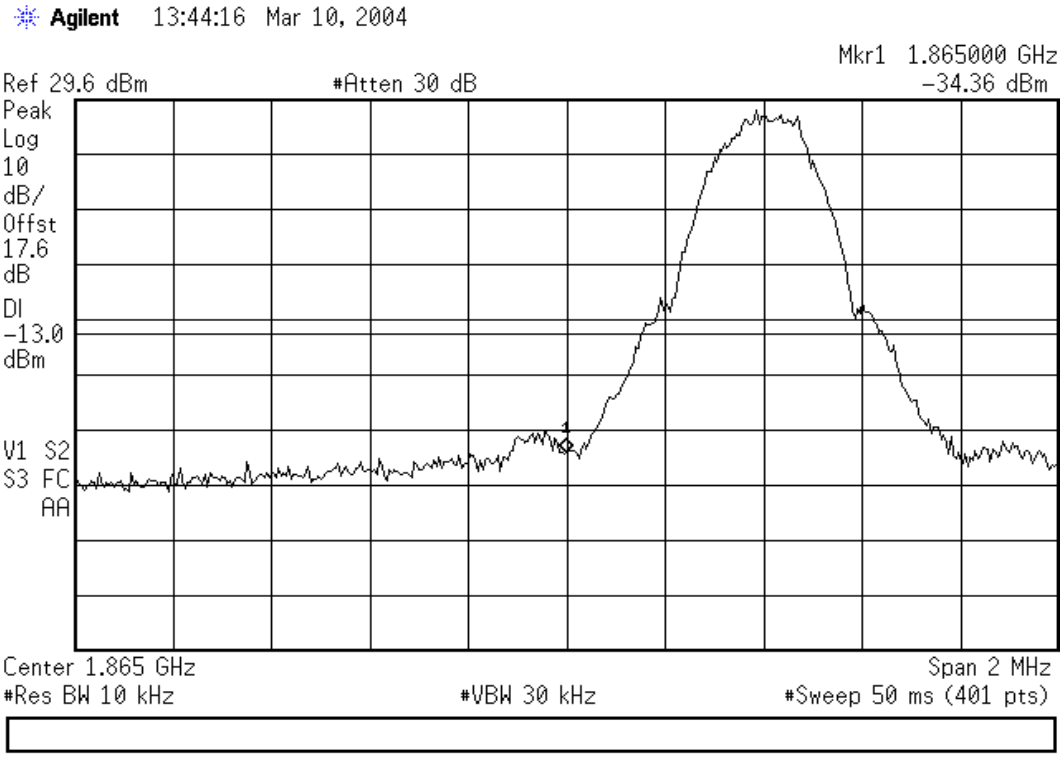


GSM – Circuit Switched

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

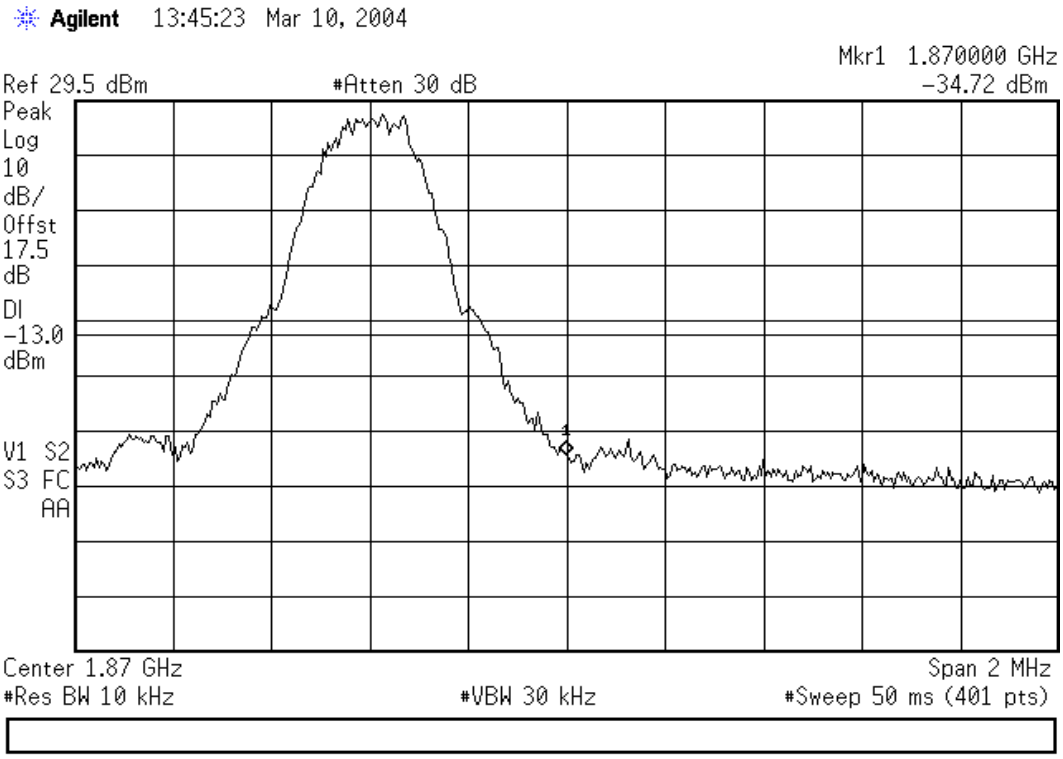


GSM – Circuit Switched

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

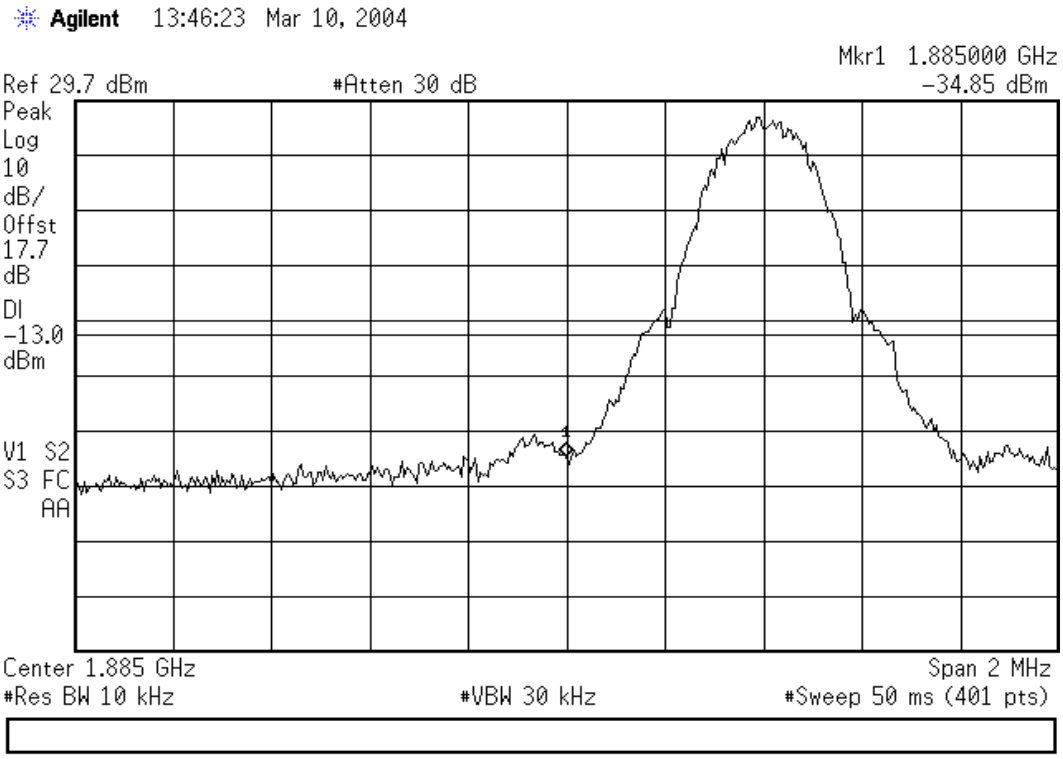


GSM – Circuit Switched

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

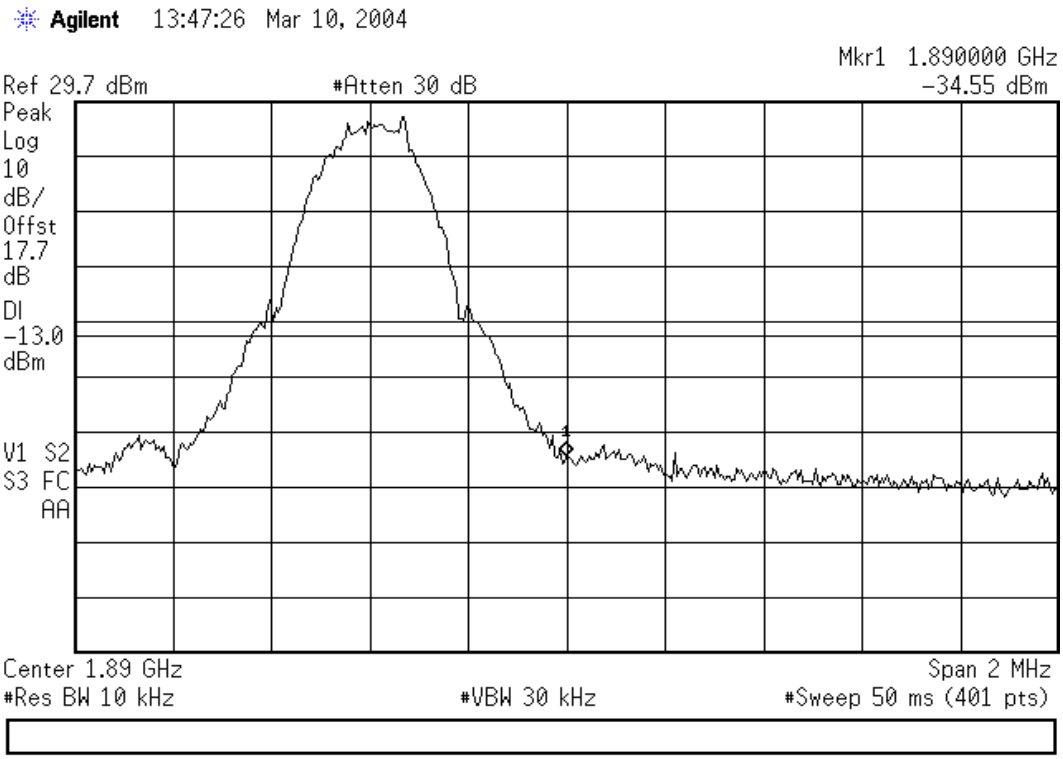


GSM – Circuit Switched

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

Block Edge Measurement with EUT Transmitting on full power on Channel 709 (1889.6MHz)

Block E

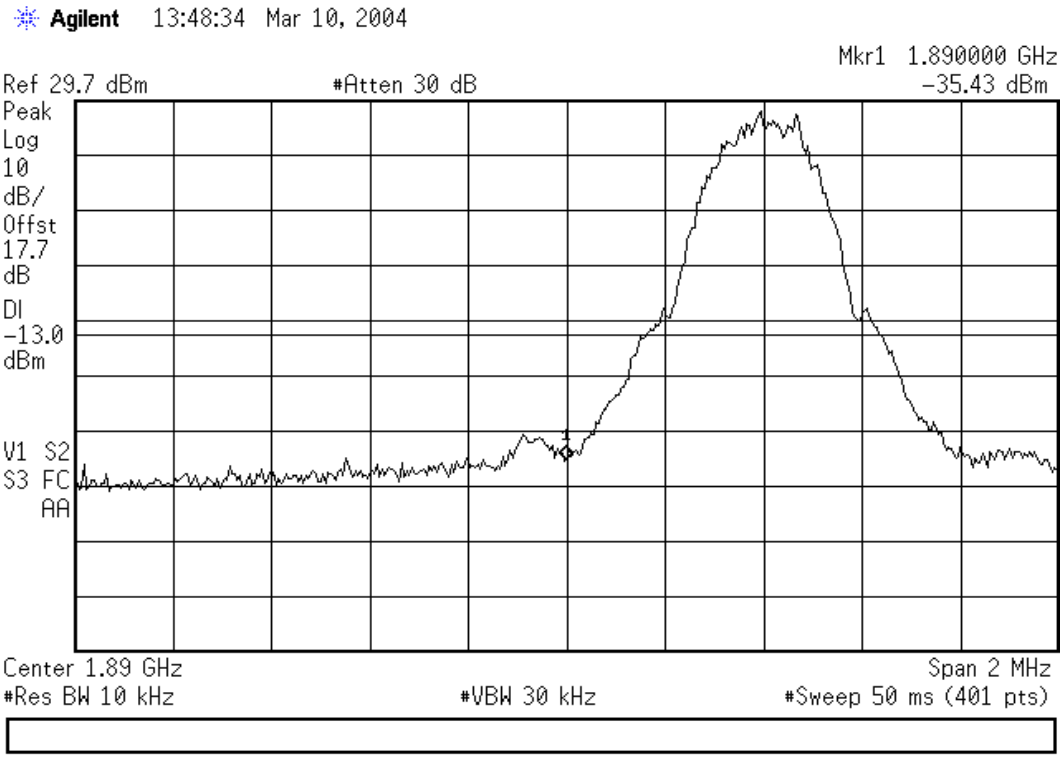


GSM – Circuit Switched

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

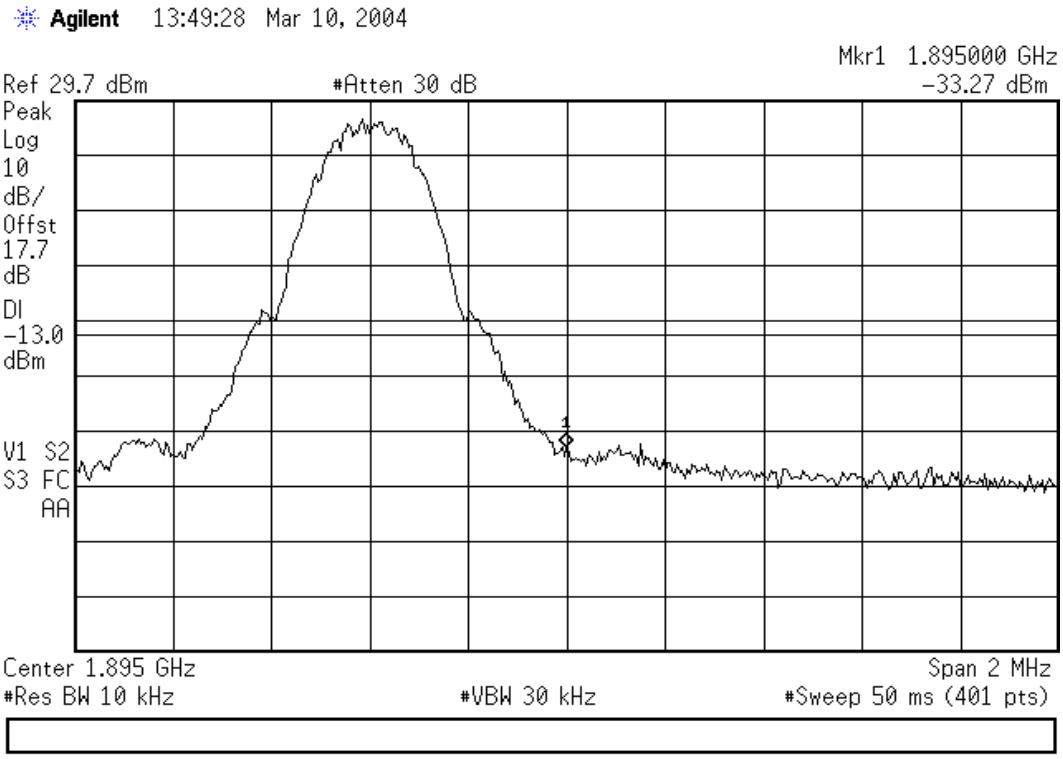


GSM – Circuit Switched

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

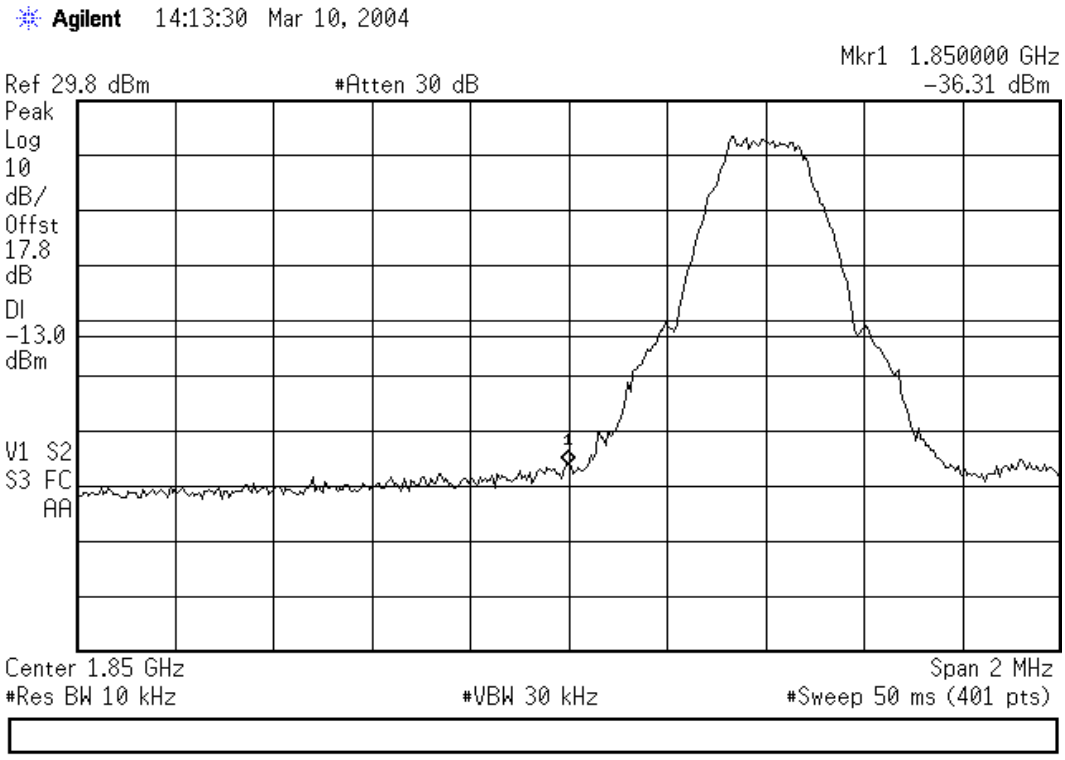


GSM – Circuit Switched

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

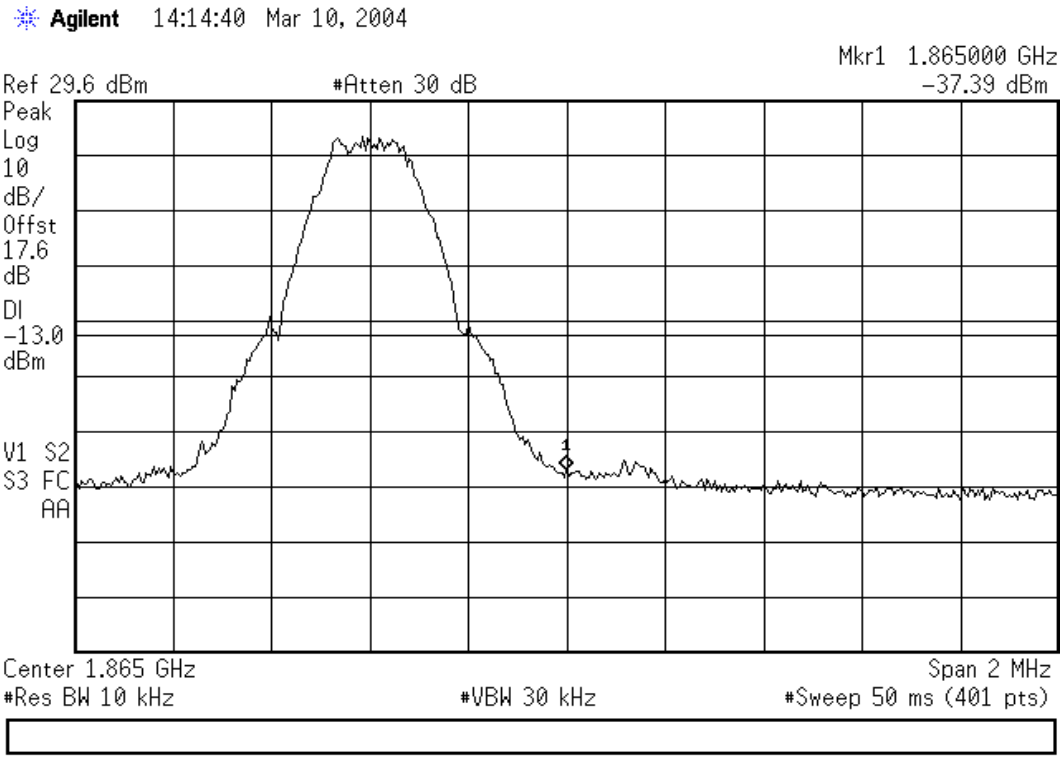


GPRS – Packet Data

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

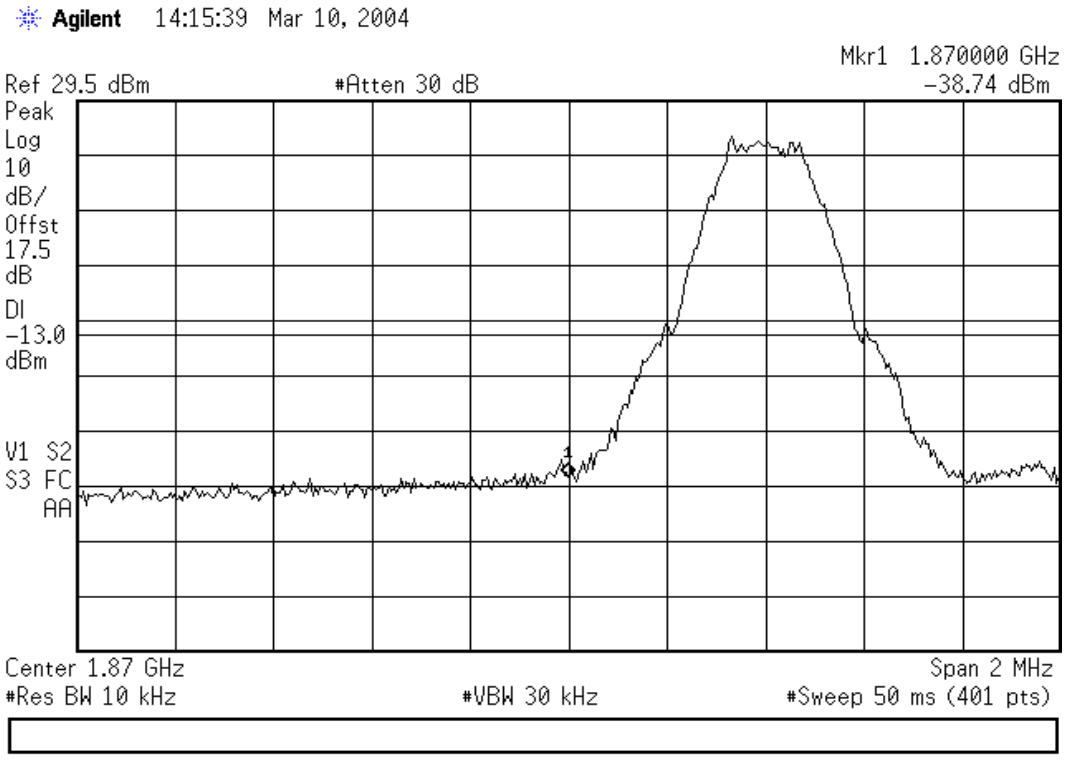


GPRS – Packet Data

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

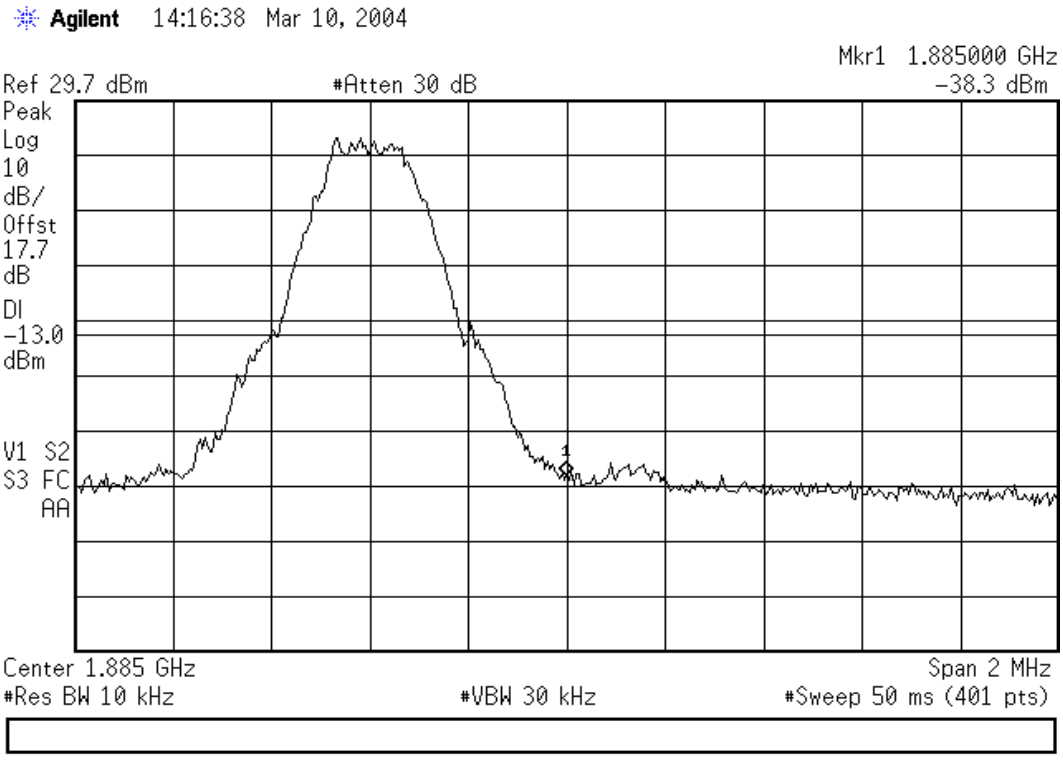


GPRS – Packet Data

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

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

Block B

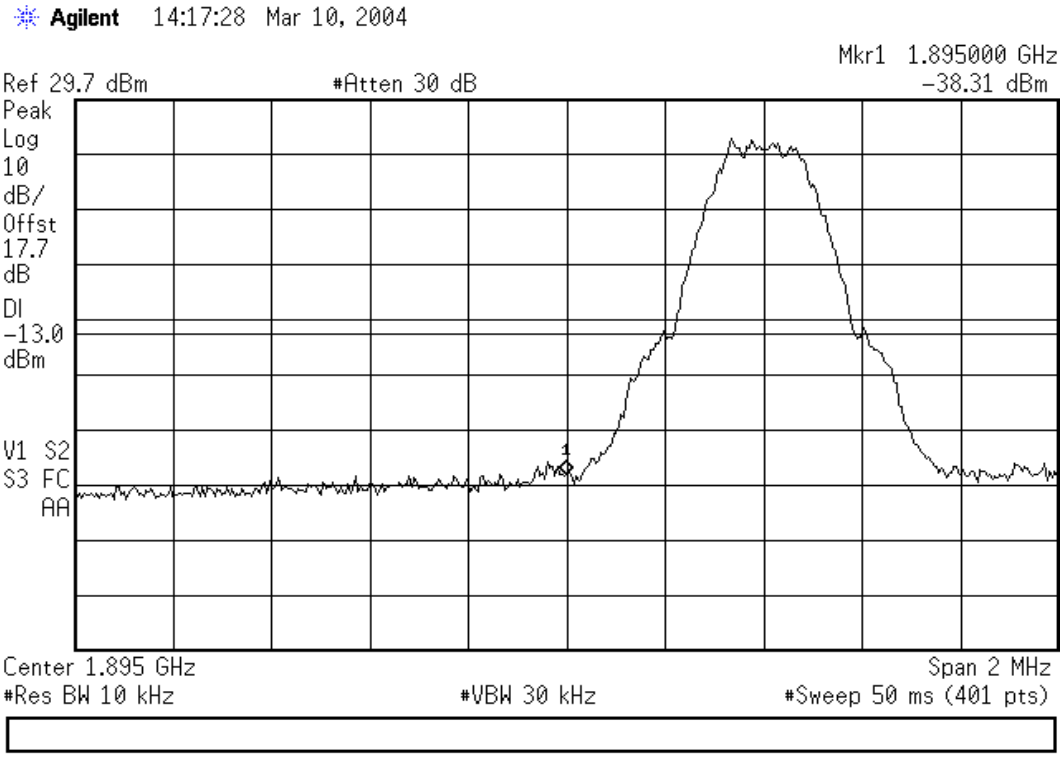


GPRS – Packet Data

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

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

Block C

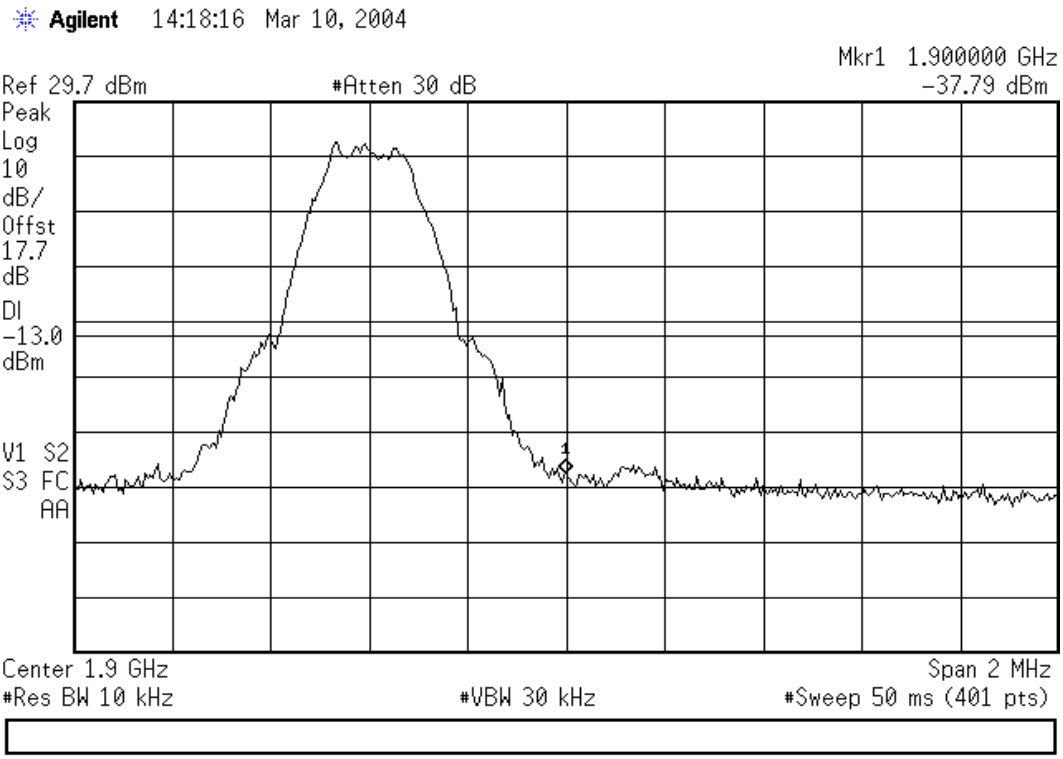


GPRS – Packet Data

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

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

Block C

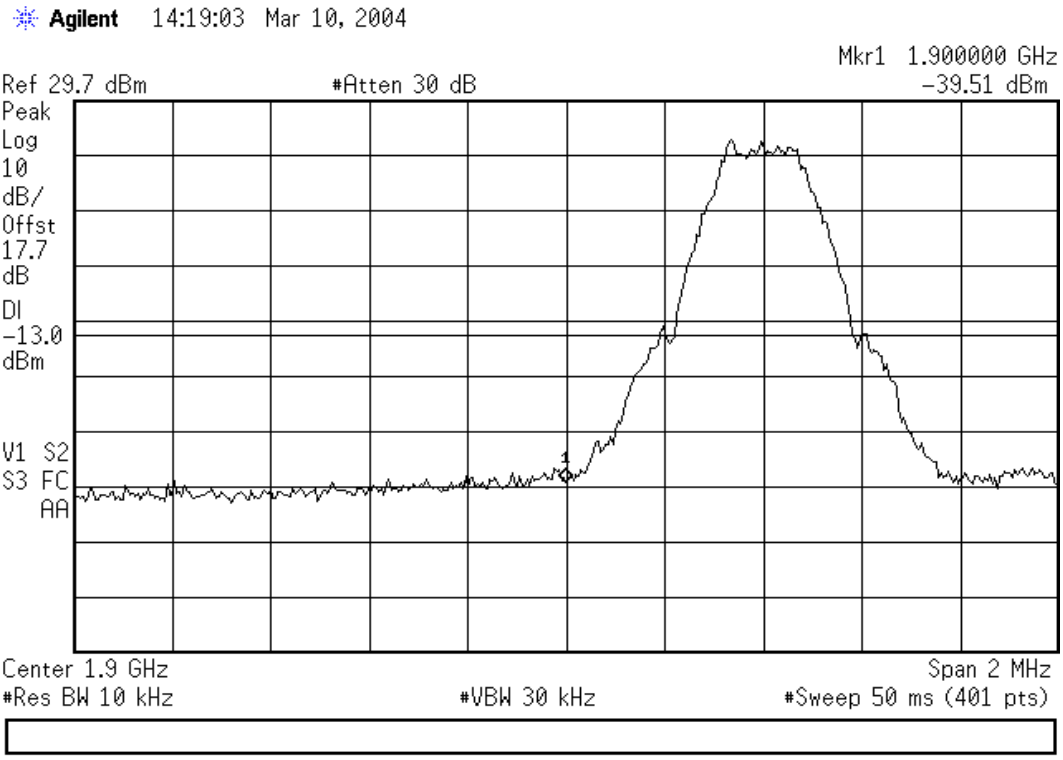


GPRS – Packet Data

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

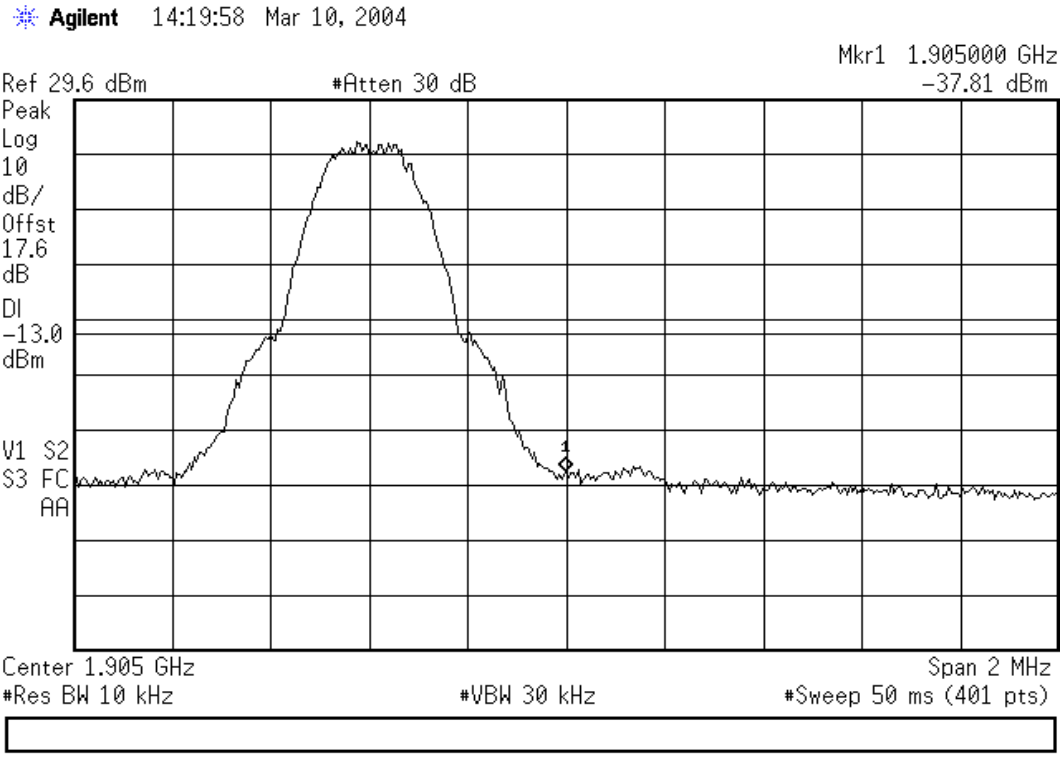


GPRS – Packet Data

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

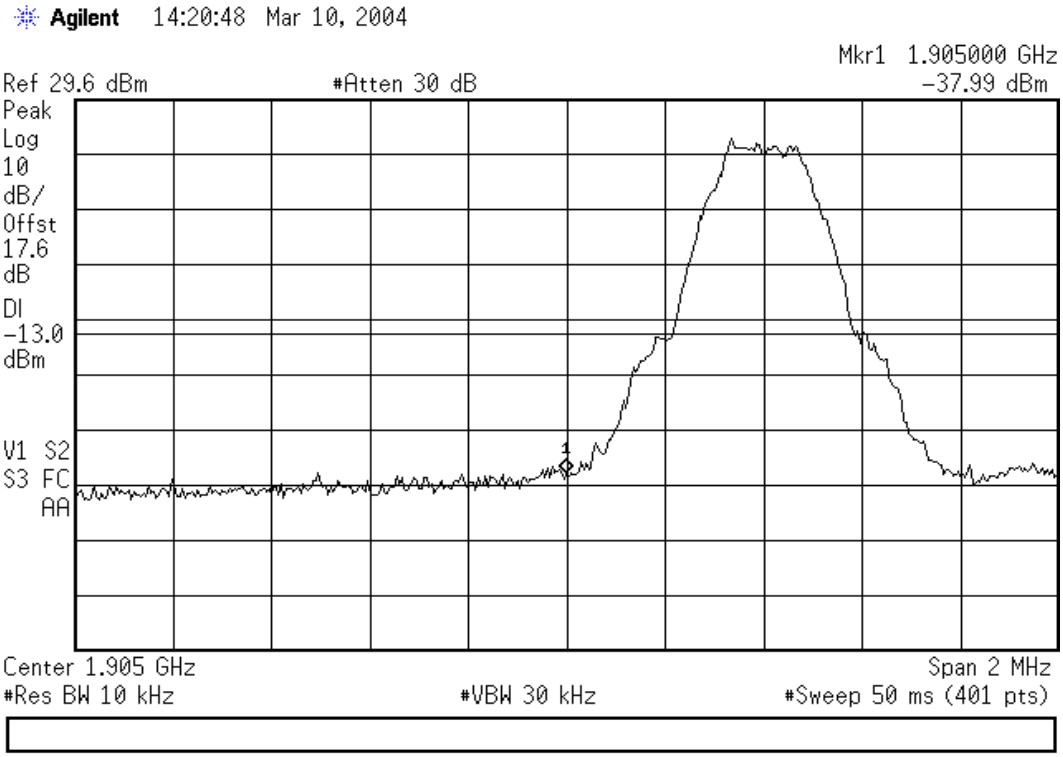


GPRS – Packet Data

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

Block Edge Measurement with EUT Transmitting on full power on Channel 788, (1905.4MHz)

Block C

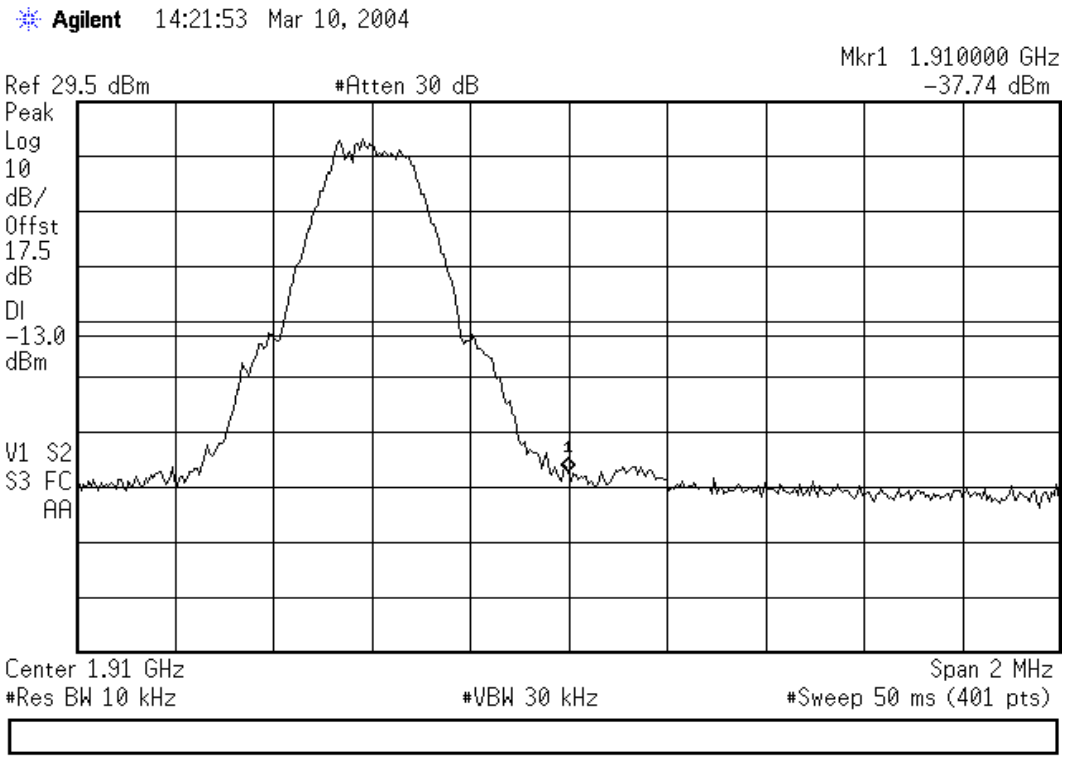


GPRS – Packet Data

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

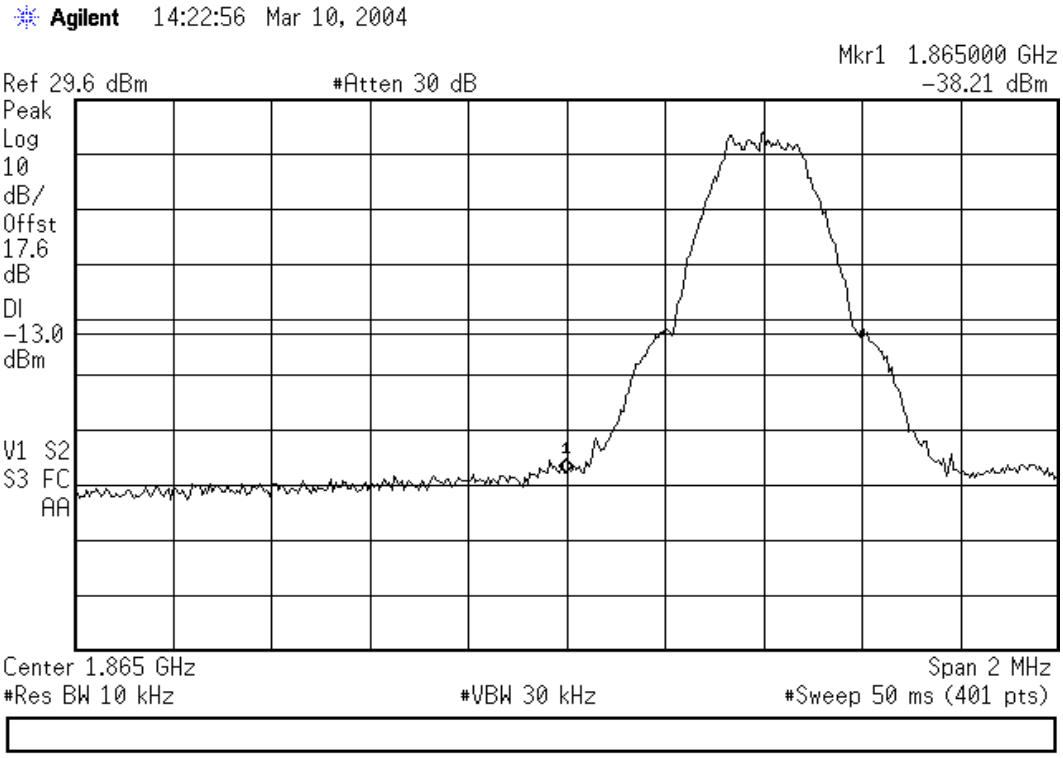


GPRS – Packet Data

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

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

Block D

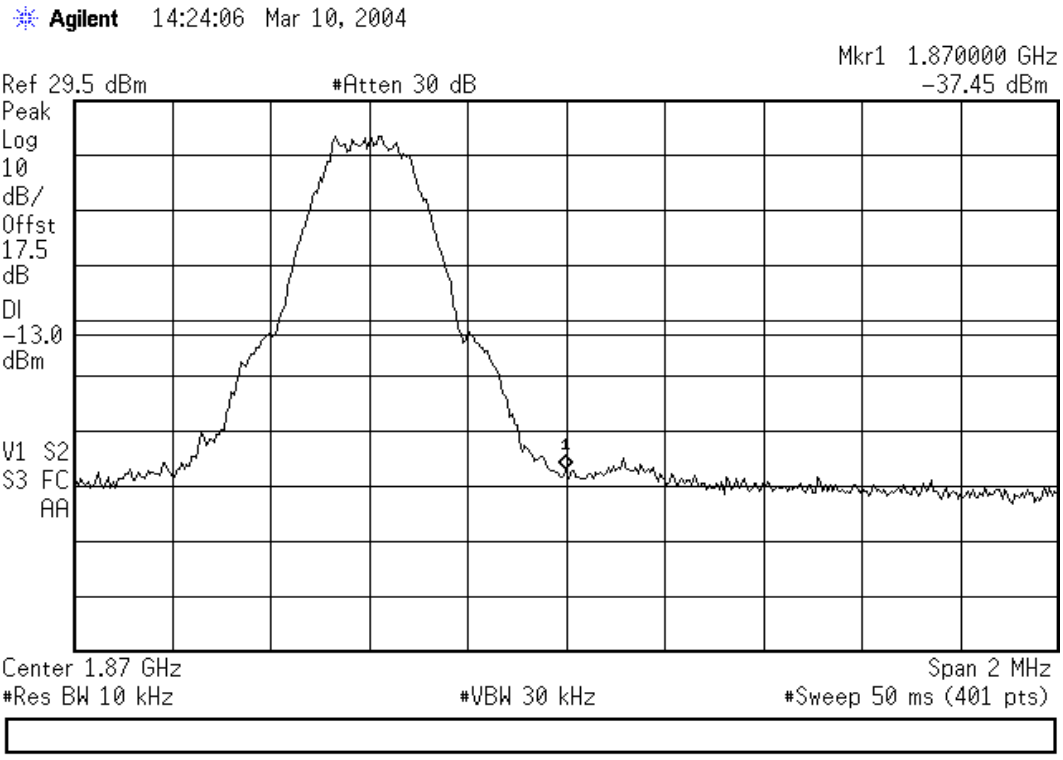


GPRS – Packet Data

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

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

Block D

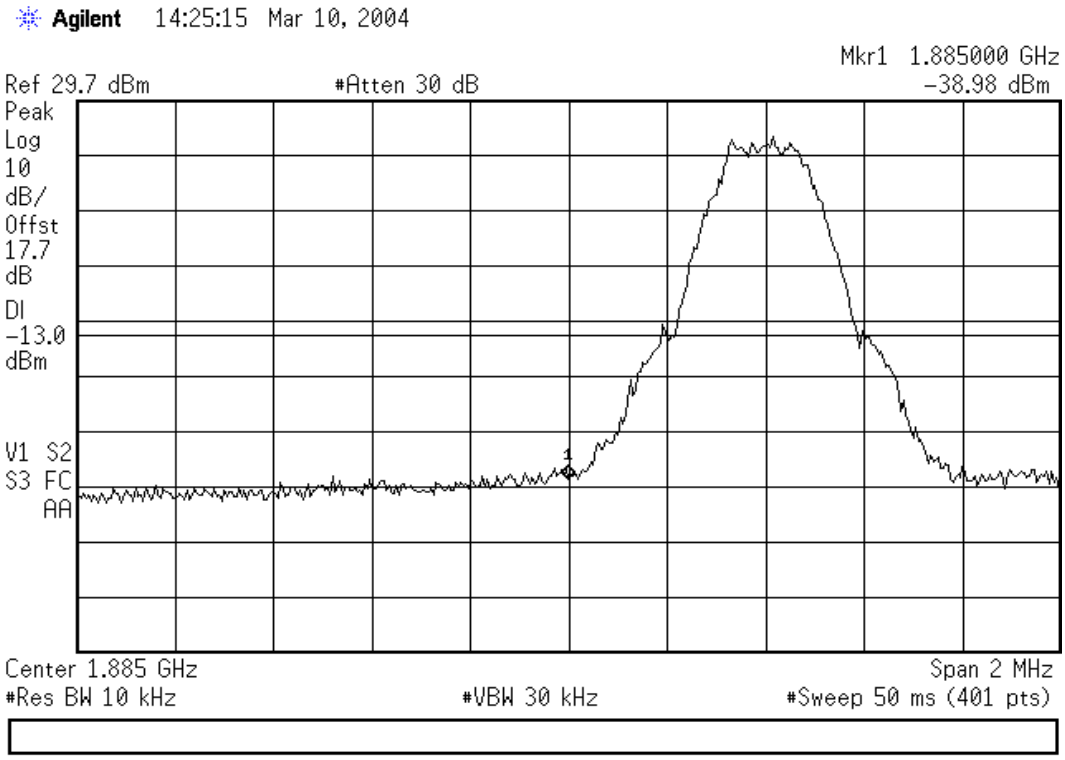


GPRS – Packet Data

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

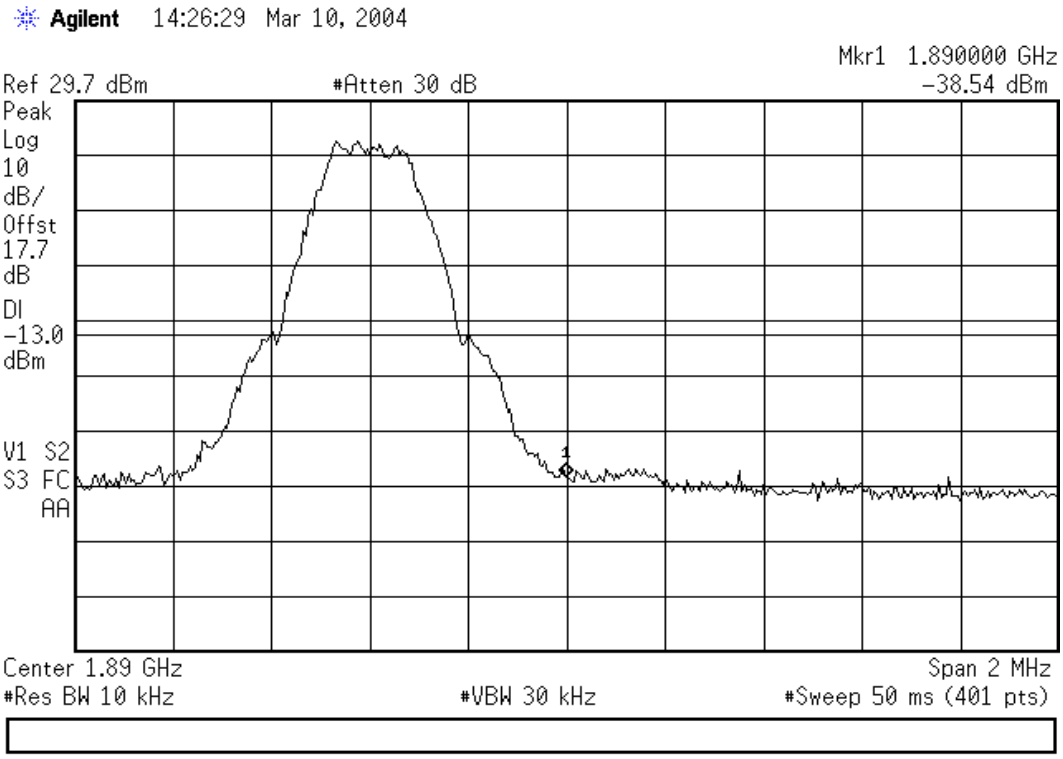


GPRS – Packet Data

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

Block Edge Measurement with EUT Transmitting on full power on Channel 709 (1889.6MHz)

Block E

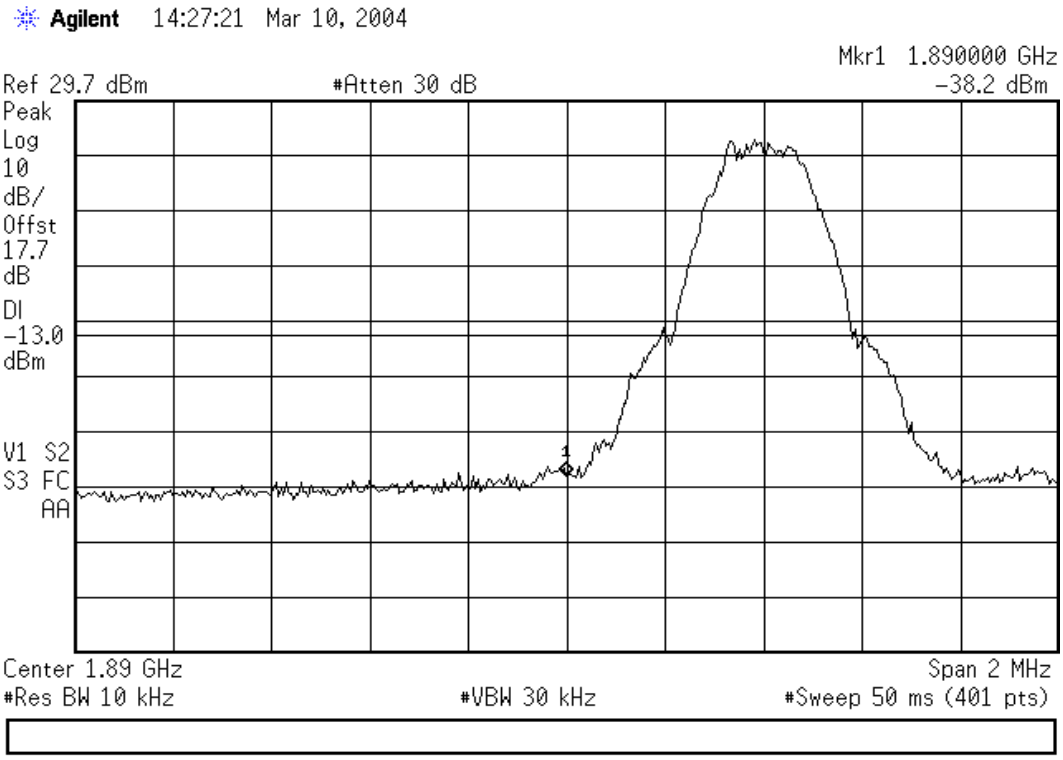


GPRS – Packet Data

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

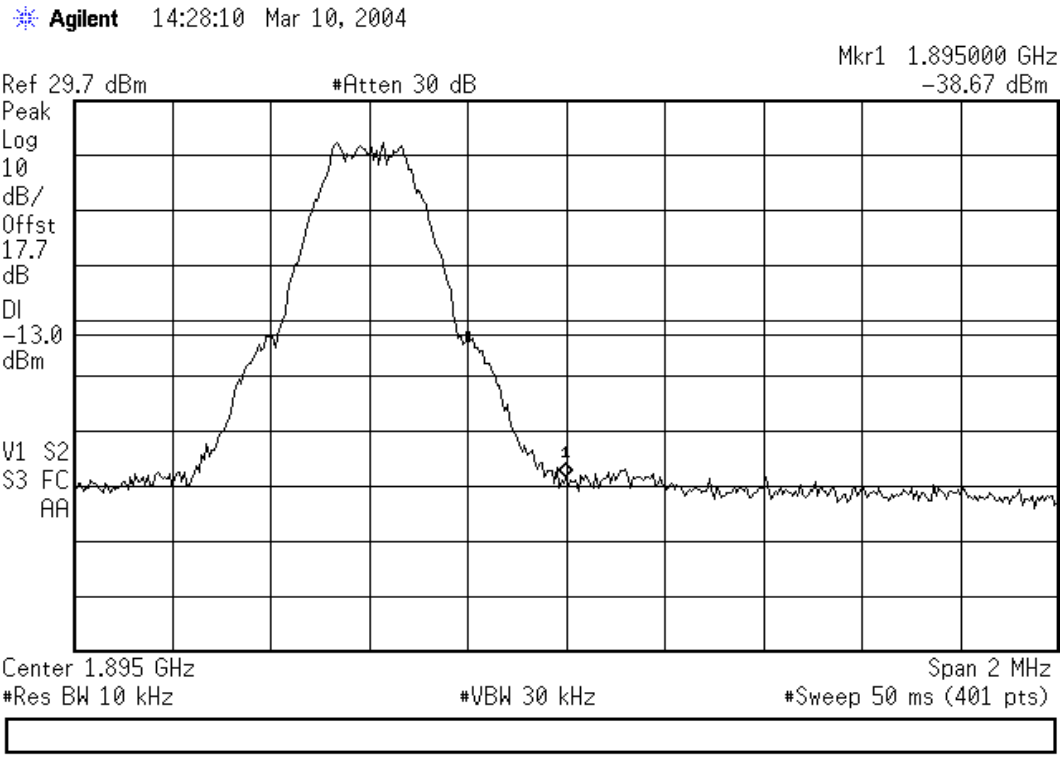


GPRS – Packet Data

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 Specification Reference

FCC CFR 47: Part 24 Subpart E, Section 24.238

2.6.2 Equipment Under Test

MX-C99

2.6.3 Date of Test

8th to 10th March 2004

2.6.4 Test Equipment Used (See Section 3.1 for details)

15,16,17,18,19,20,22,23,24,25,26.

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, (PCS 1900 Link Modes) to meet Part 24.238 specification requirements, 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 MHz	Vid BW MHz	Ant Pol V/H	Ant Hgt cm	EUT Azi Deg	Raw PEAK dBµV	Cable loss dB	Antenna Factor dB	Result Peak dBµV/m
Tx Channel 512									
1850.2	1	1	H	122	300	92.1	8.8	26.7	127.5
Tx Channel 661									
1880.0	1	1	H	120	303	91.9	8.8	26.7	127.4
Tx Channel 810									
1909.8	1	1	H	117	310	93.2	8.9	27.0	129.1

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

As the EIRP for the Top Channel is 1.17489W the spurious limit is 43 +10Log(P) = 43.7 dB down on the carrier.

As the EIRP for the Middle Channel is 0.97724W the spurious limit is 43 +10Log(P) = 42.9 dB down on the carrier.

As the EIRP for the Bottom Channel is 0.79433W the spurious limit is 43 +10Log(P) = 42.0 dB down on the carrier.

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

Top Channel 512: 129.1dBµV/m – 43.7dB = 85.4dBµV/m

Middle Channel 661: 127.4dBµV/m – 42.9dB = 84.5dBµV/m

Bottom channel 810: 127.5dBµV/m – 42.0dB = 85.5dBµV/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

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	dBµV/m	dBµV/m
30.0	H	100	0	57.0	85.5
30.0	V	100	0	56.7	85.5
872.5	V	100	0	61.3	85.5
982.5	H	100	0	61.9	85.5

EUT Tx on Middle Channel (1880.0MHz)

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
30	H	100	0	57.6	84.5
31.2	V	100	0	56.9	84.5
982.5	V	100	0	61.9	84.5
960.0	H	100	0	62.3	84.5

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
30.0	V	100	0	56.9	85.4
30.0	H	100	0	56.9	85.4
918.8	H	100	0	62.4	85.4
961.3	V	100	0	63.0	85.4

2.6 RADIATED EMISSIONS - continued

2.6.6 Test Results - continued

Note: the measurements in the above tables are Peak System Noise Floor Measurements, as no emissions attributable to the EUT were detected above the Measuring System Noise Floor which has a minimum of 20dB below the test limit.

EUT Rx on Middle Channel (1880.0MHz)

Measurements were made with the EUT in PCS 1900MHz.

Frequency	Antenna Polarisation	Height	Azimuth	Quasi-Peak Field Strength	Specification limit
MHz	H/V	cm	Deg	dBµV/m	dBµV/m
42.00	V	100	0	21.3	40.0
62.99	V	100	0	20.2	40.0
74.03	V	100	0	12.0	40.0

2.6 RADIATED EMISSIONS - continued

2.6.6 Test Results - continued

1GHz – 20GHz Frequency Range

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
GHz	H/V	cm	deg	dBµV/m	dBµV/m
3.701	H	100	007	66.6	85.5
4.619	V	100	143	53.2	85.5
5.550	V	10	172	66.1	85.5
7.401	V	100	202	80.0	85.5
9.251	V	116	196	71.8	85.5
11.101	V	103	196	73.2	85.5
12.950	V	150	207	73.5	85.5
14.801	V	100	060	67.7	85.5

EUT Tx on Middle Channel (1880.0MHz)

Measurements were made with the EUT in PCS 1900MHz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Specification Limit
GHz	H/V	cm	deg	dBµV/m	dBµV/m
3.760	V	113	61	64.4	84.5
5.640	V	100	200	65.4	84.5
7.519	V	100	187	81.6	84.5
9.3999	V	100	226	67.2	84.5
11.279	V	100	301	74.4	84.5
13.160	V	170	187	76.0	84.5
15.040	V	100	354	70.2	84.5

2.6 RADIATED EMISSIONS - continued

2.6.6 Test Results - continued

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
GHz	H/V	cm	deg	dBµV/m	dBµV/m
3.8196	V	101	010	68.4	85.4
5.7294	V	101	190	62.4	85.4
7.6389	V	100	182	81.6	85.4
9.5490	V	101	163	72.1	85.4
11.549	V	181	183	82.5	85.4
13.368	V	170	164	78.1	85.4
15.278	V	100	172	71.5	85.4

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 SPURIOUS EMISSIONS

2.7.1 FCC CFR 47: Part 24 Subpart E, Section 2.1051, 24.238(a)

2.7.2 Equipment Under Test
MX-C99

2.7.3 Date of Test
5th and 10th March 2004

2.7.4 Test Equipment Used (See Section 3.1 for details)
1, 3, 4, 5, 8, 9, 10, 11, 12

2.7.5 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 10^{th} harmonic of the fundamental.

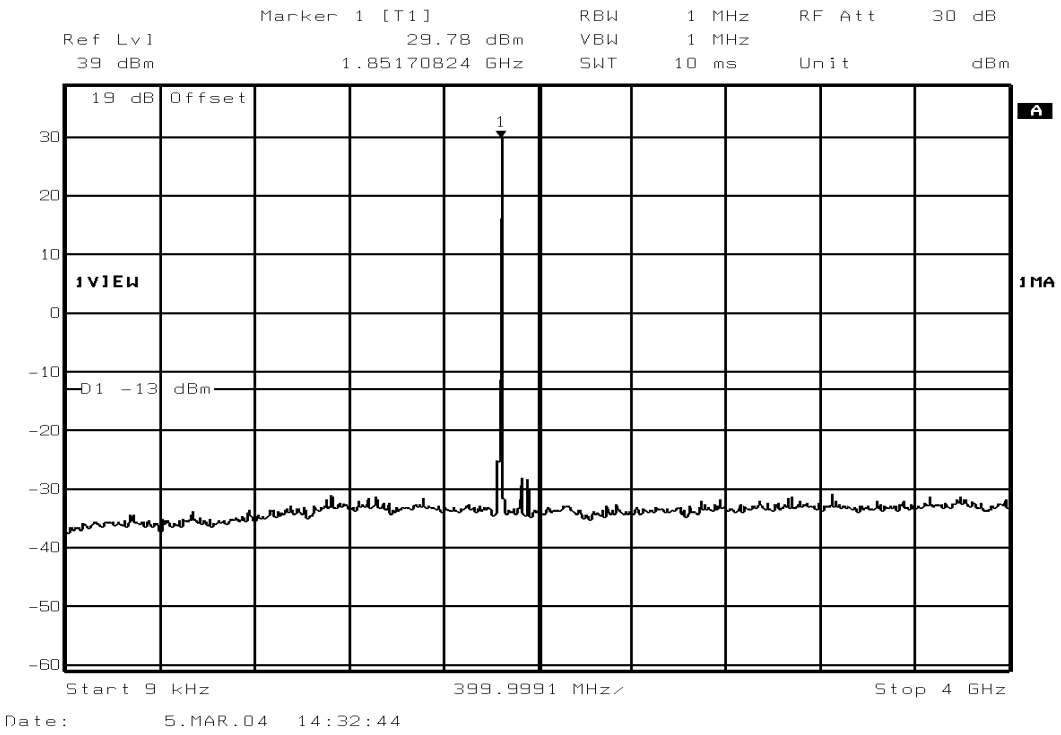
For GPRS, all test conditions were the same except 2 timeslots were active, (3 and 4).

2.7.6 Test Results

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.

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

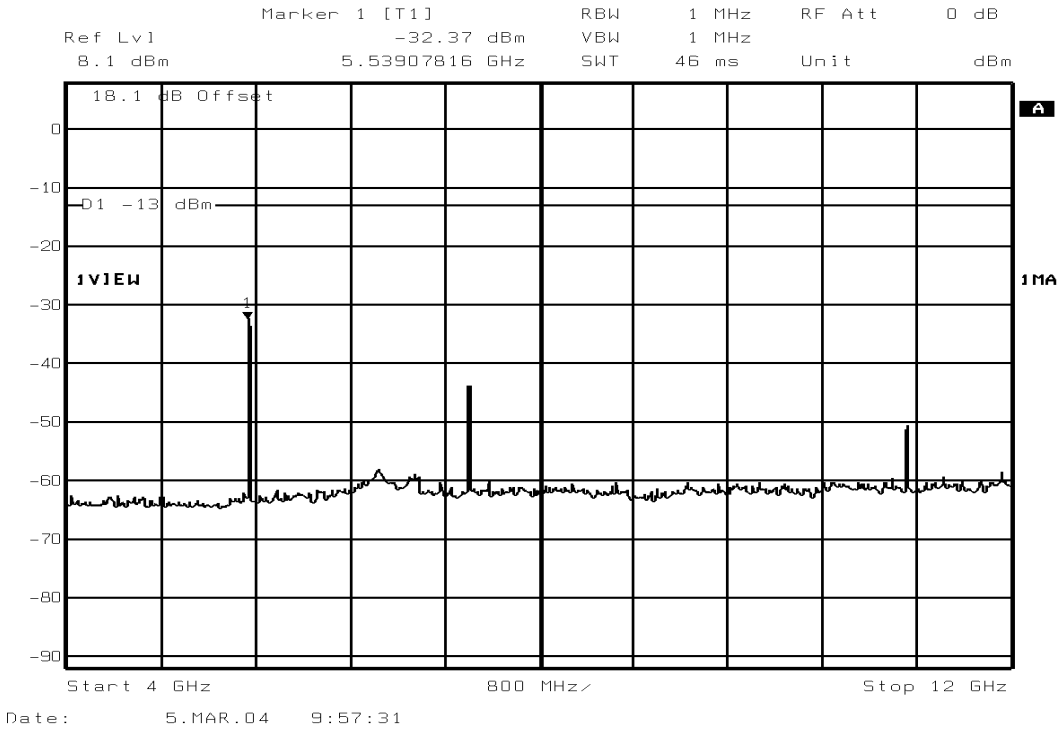
Spurious Emissions (9kHz – 4GHz)
Channel 512 (1850.2MHz) - Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS – Continued

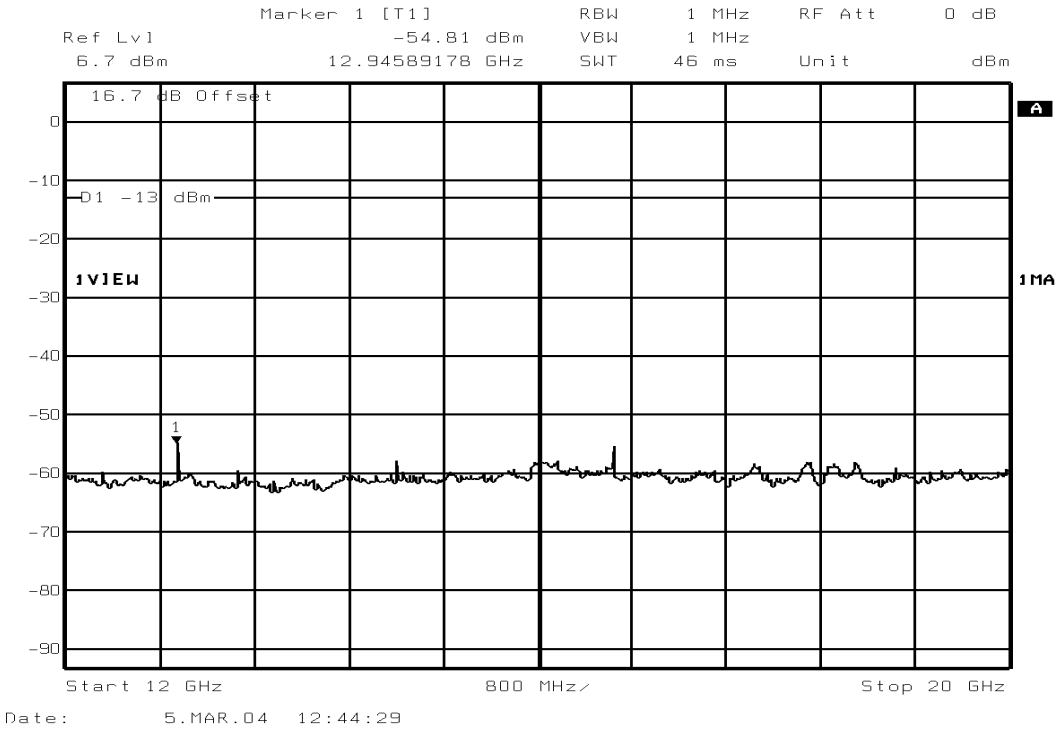
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

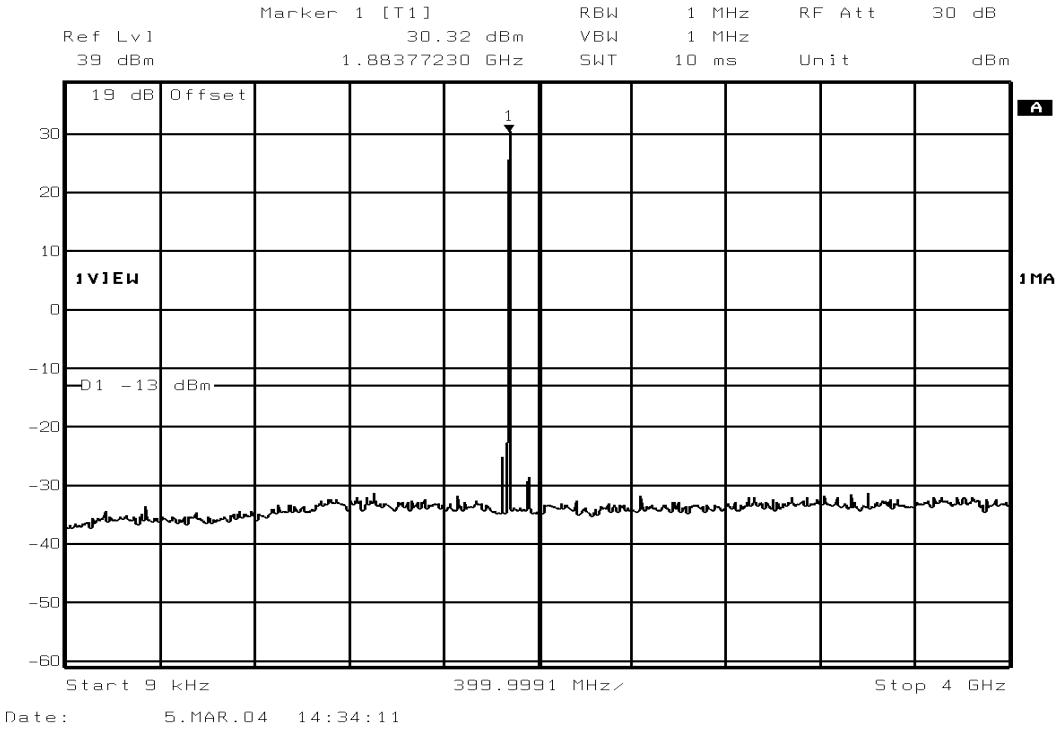
Spurious Emissions (12GHz – 20GHz)
Channel 512 (1850.2MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

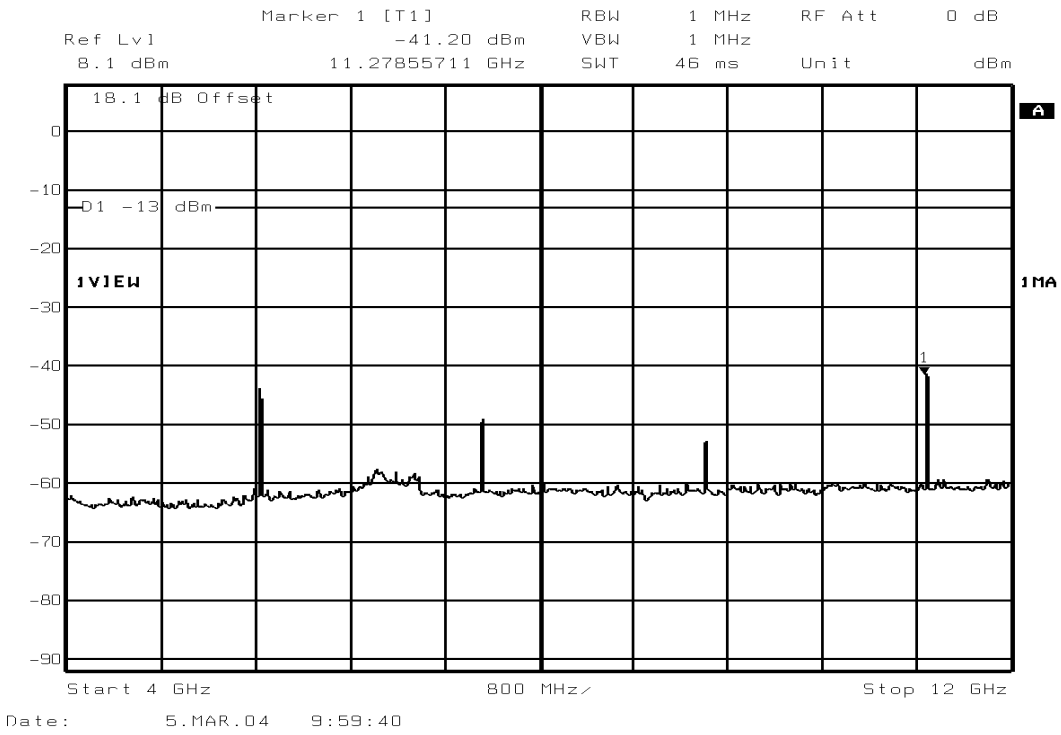
Spurious Emissions (9kHz – 4GHz)
Channel 661 (1880.0MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

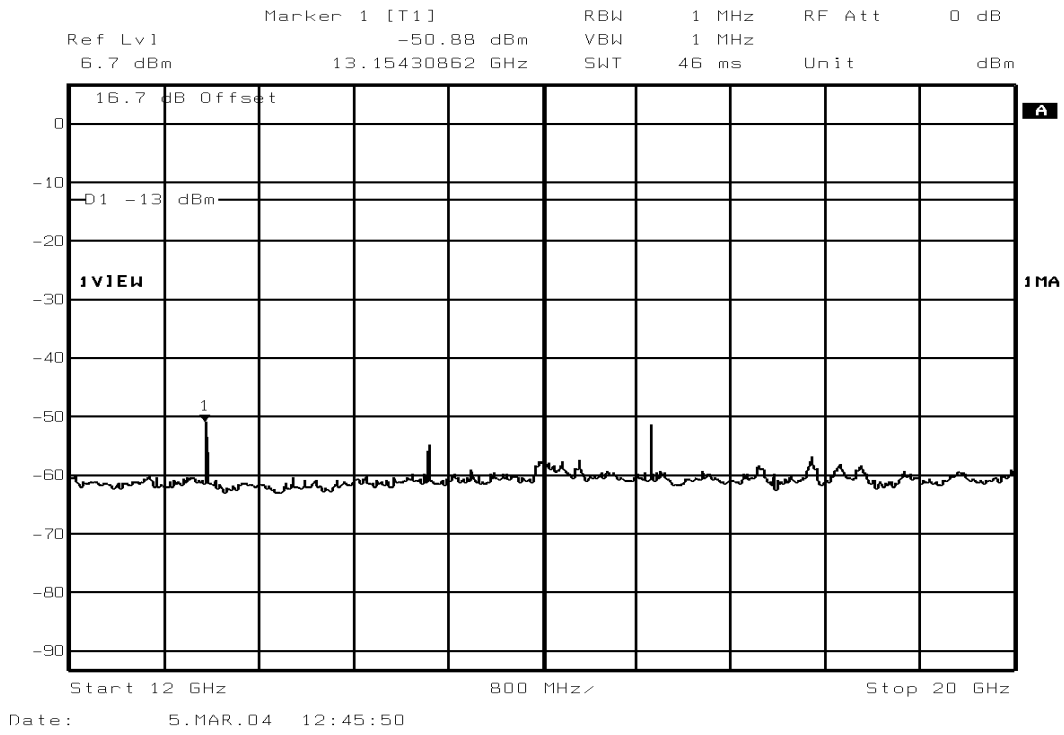
Spurious Emissions (4GHz - 12GHz)
Channel 661 (1880.0MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

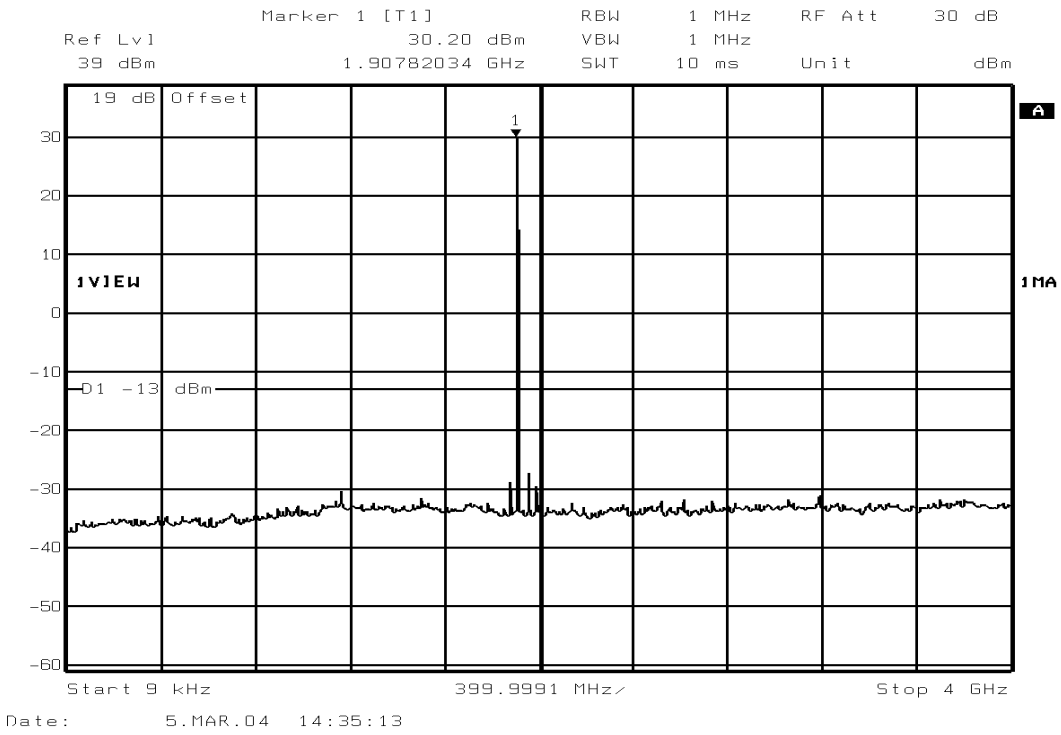
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

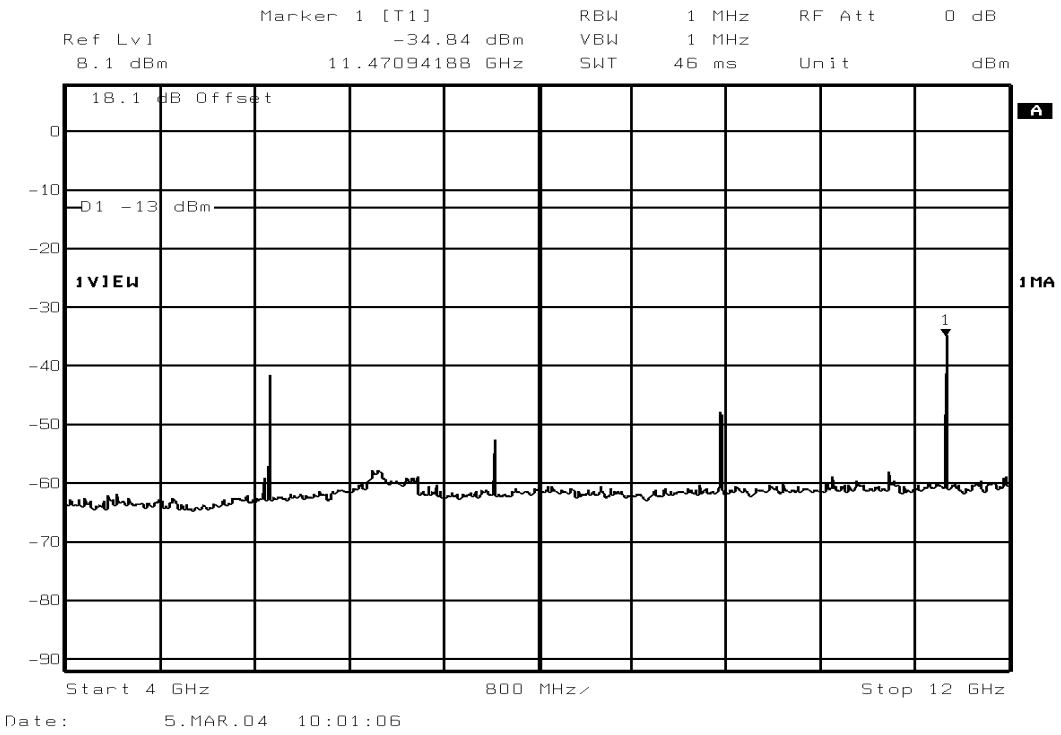
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

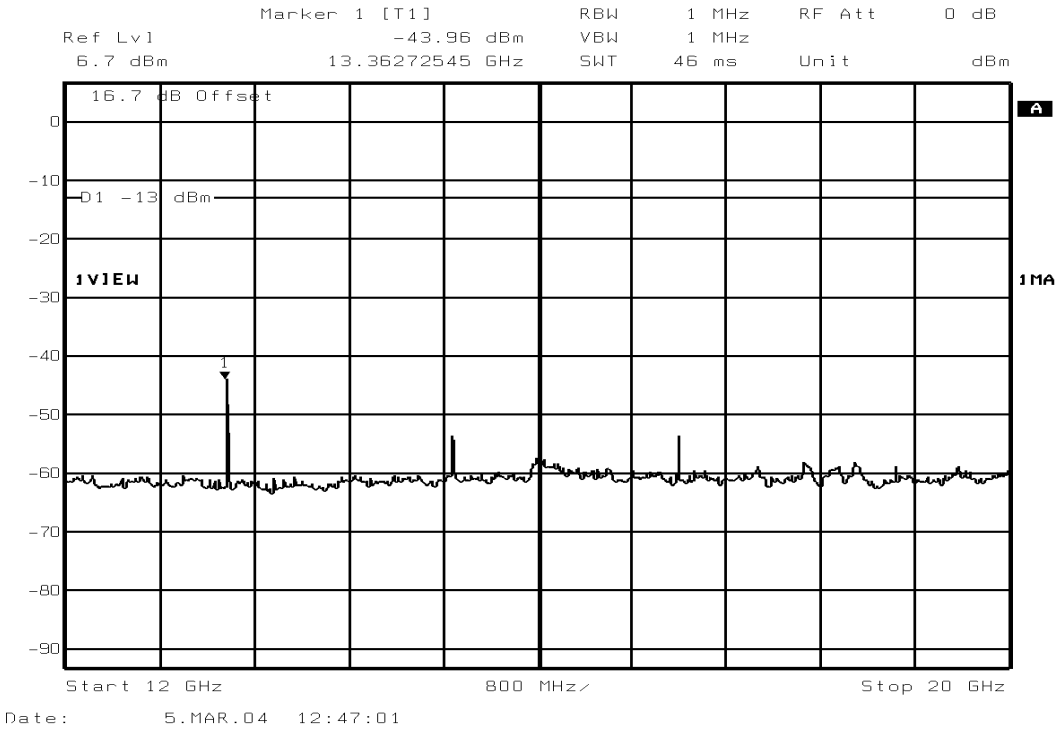
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

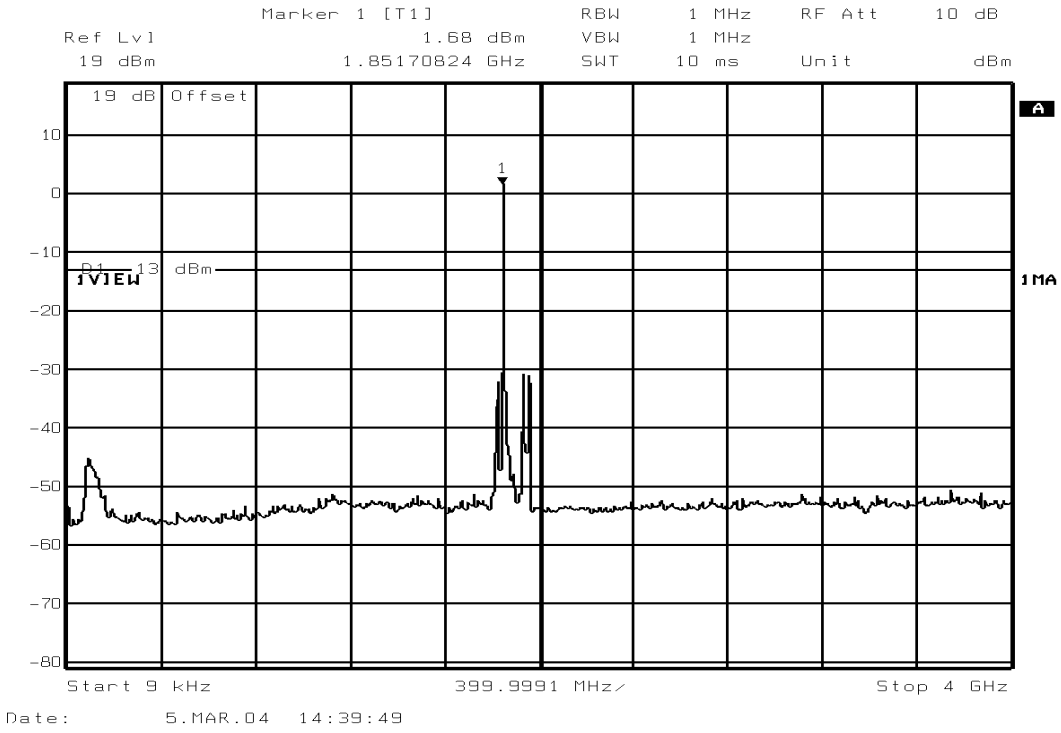
Spurious Emissions (12GHz – 20GHz)
Channel 810 (1909.8MHz) – Maximum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

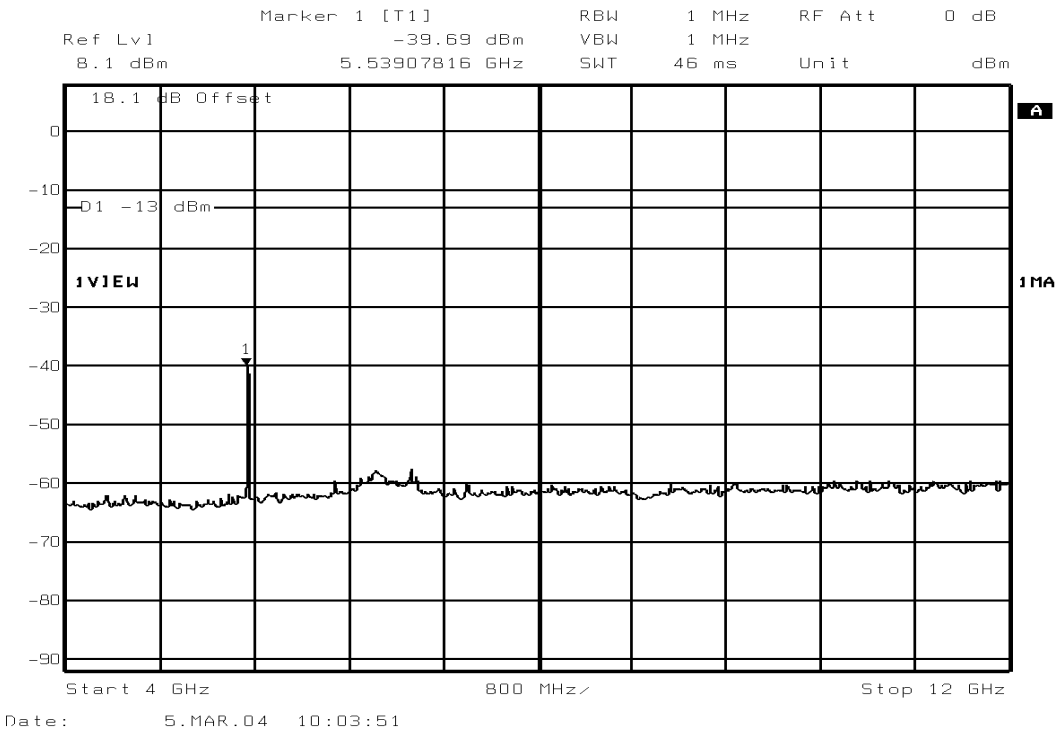
Spurious Emissions (9kHz – 4GHz)
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

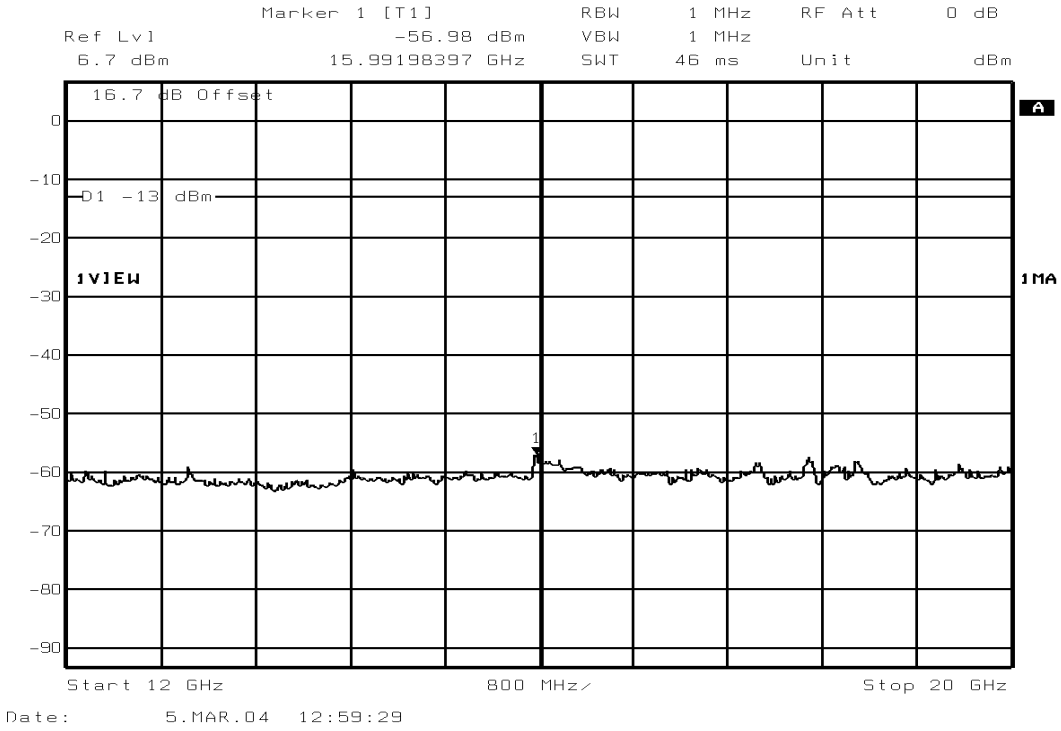
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

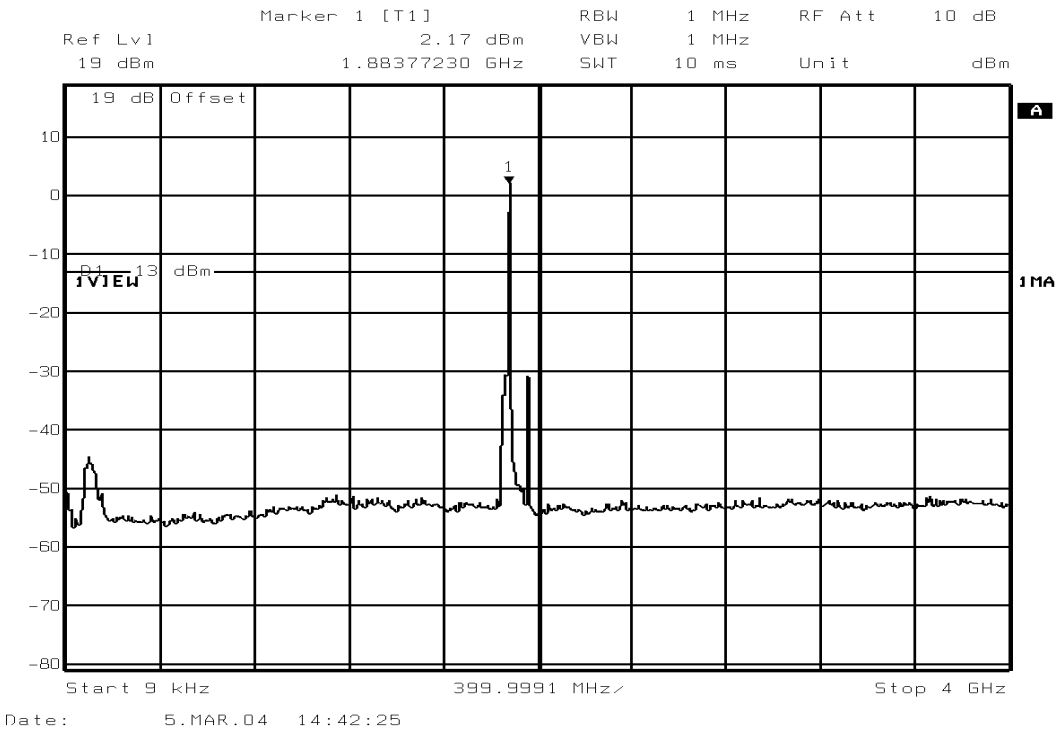
Spurious Emissions (12GHz-20GHz)
Channel 512 (1850.2MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

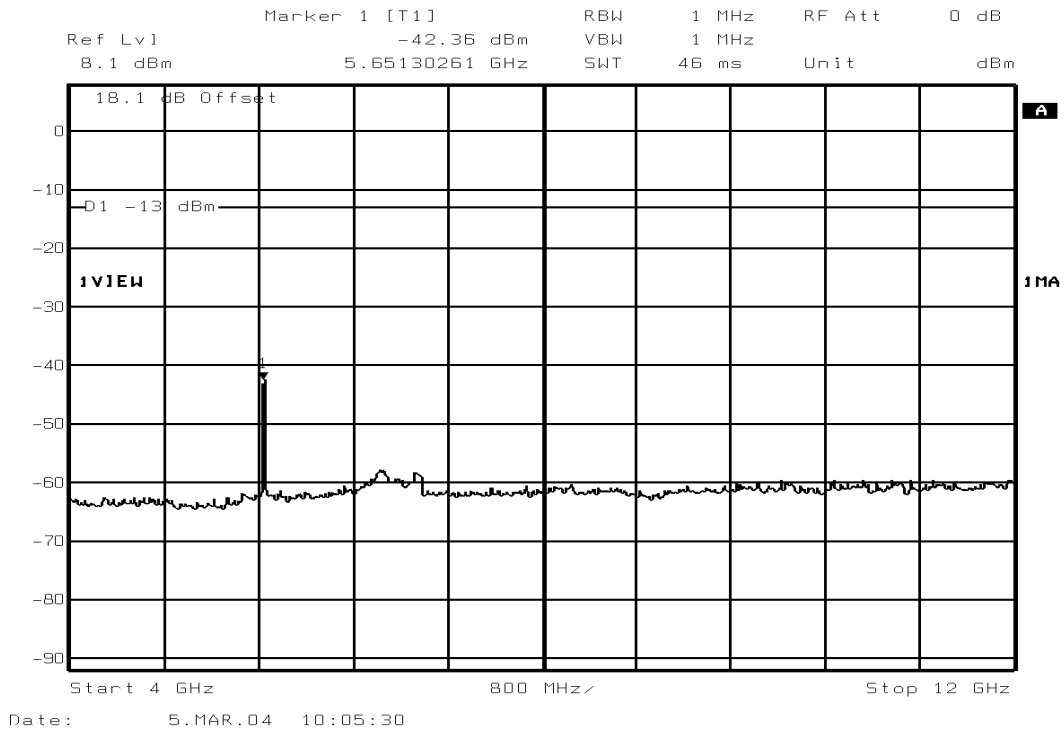
Spurious Emissions (9kHz – 4GHz)
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

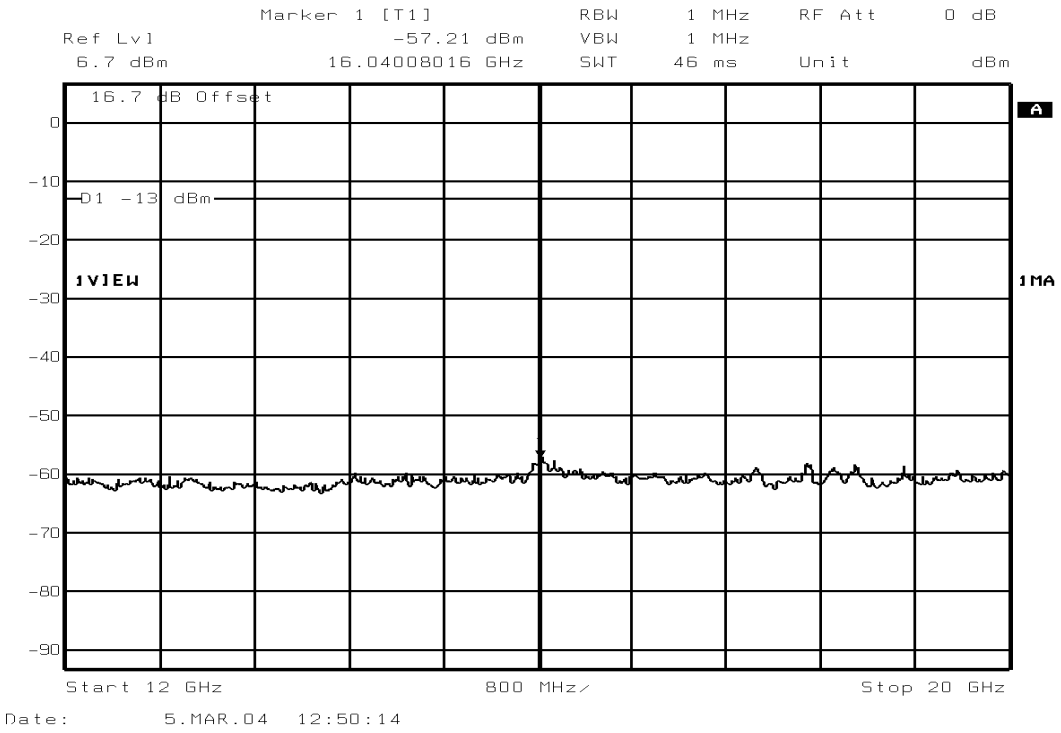
Spurious Emissions (4GHz – 12GHz)
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

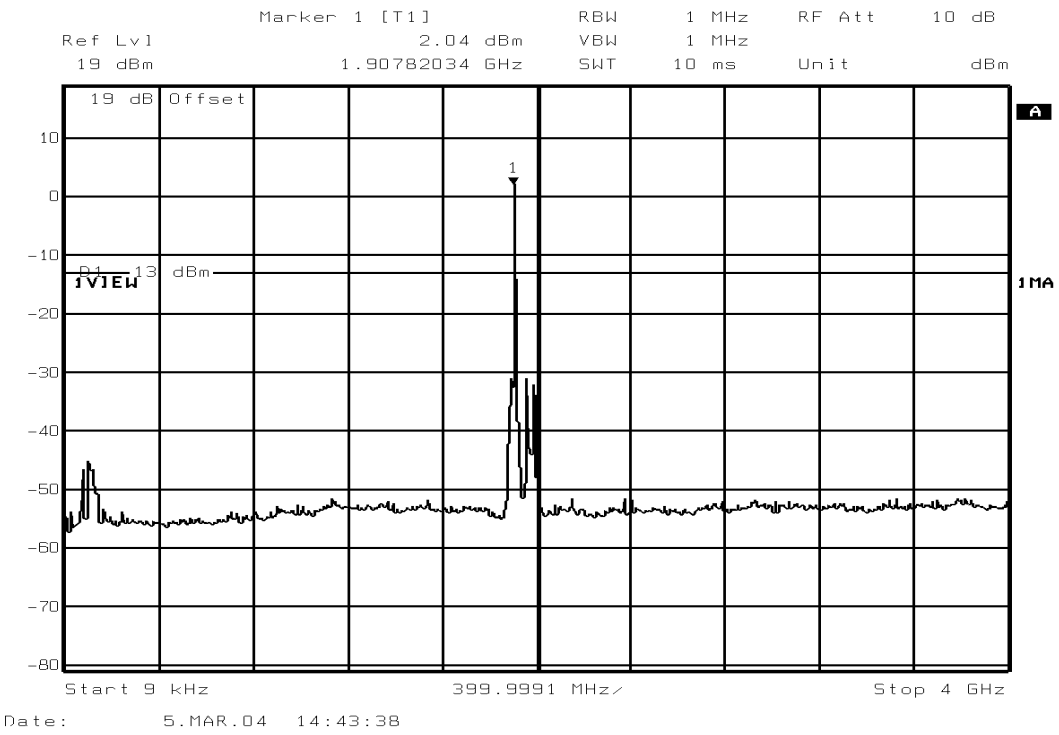
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

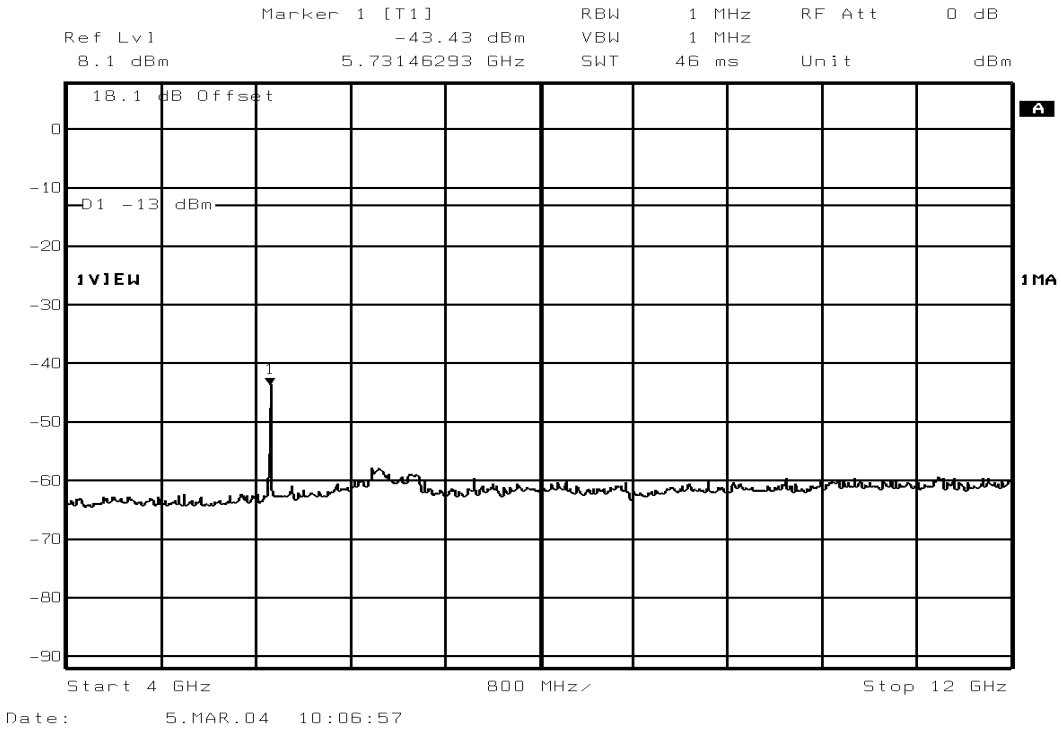
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

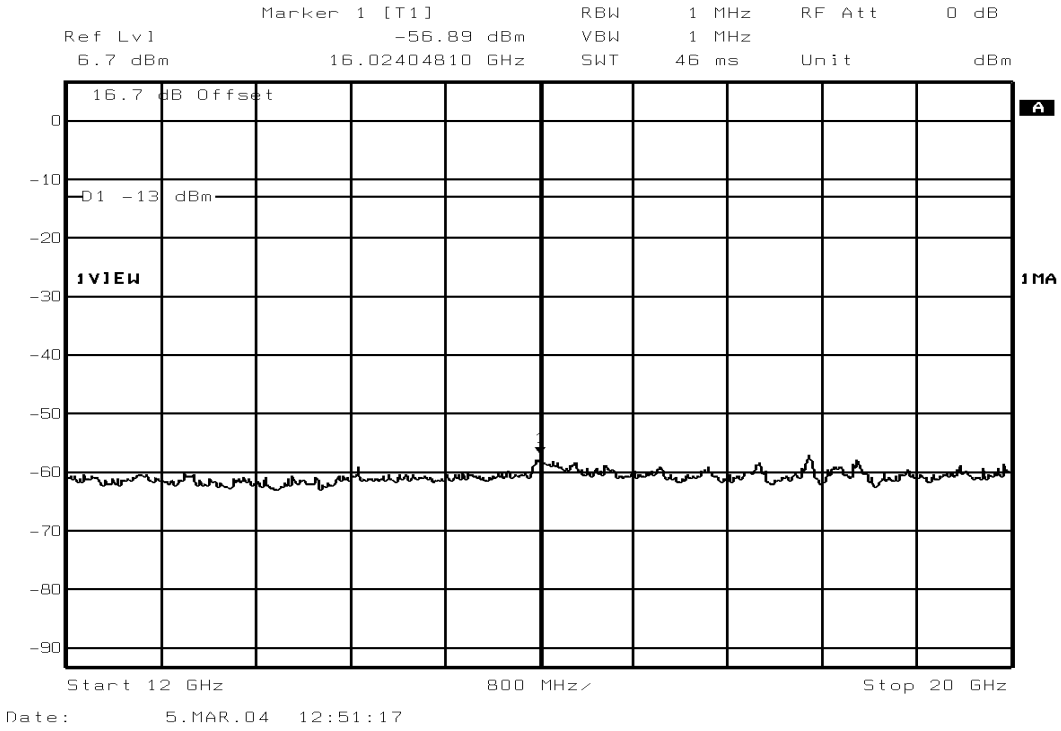
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

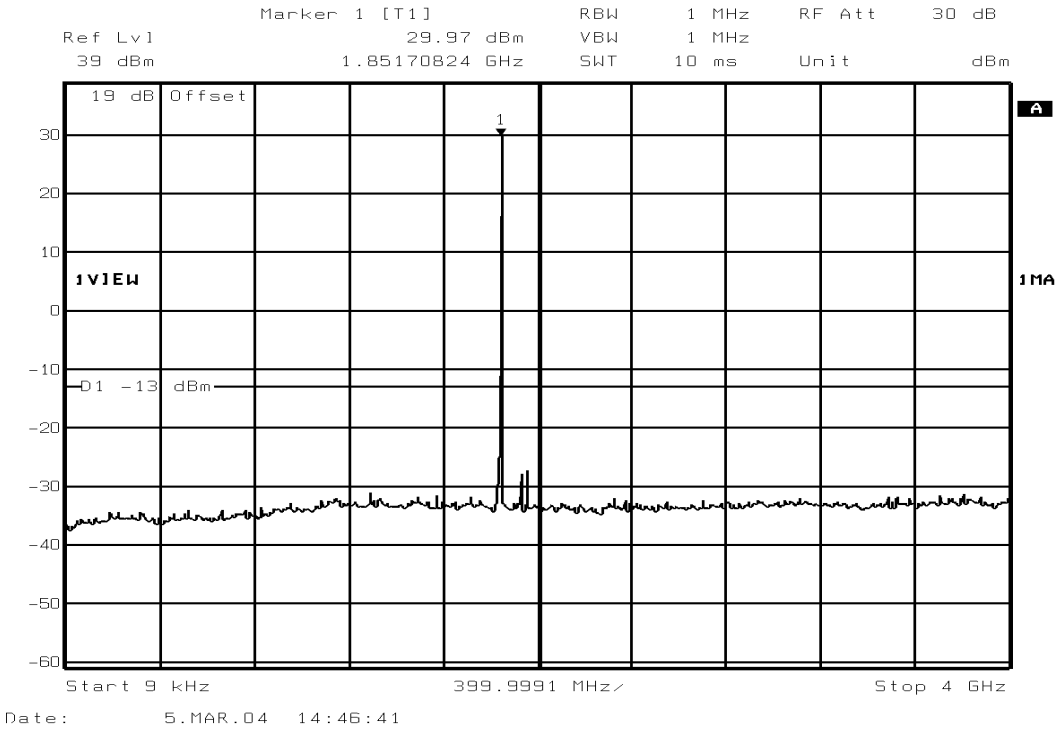
Spurious Emissions (12GHz – 20GHz)
Channel 810 (1909.8MHz) – Minimum Power



GSM – Circuit Switched

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

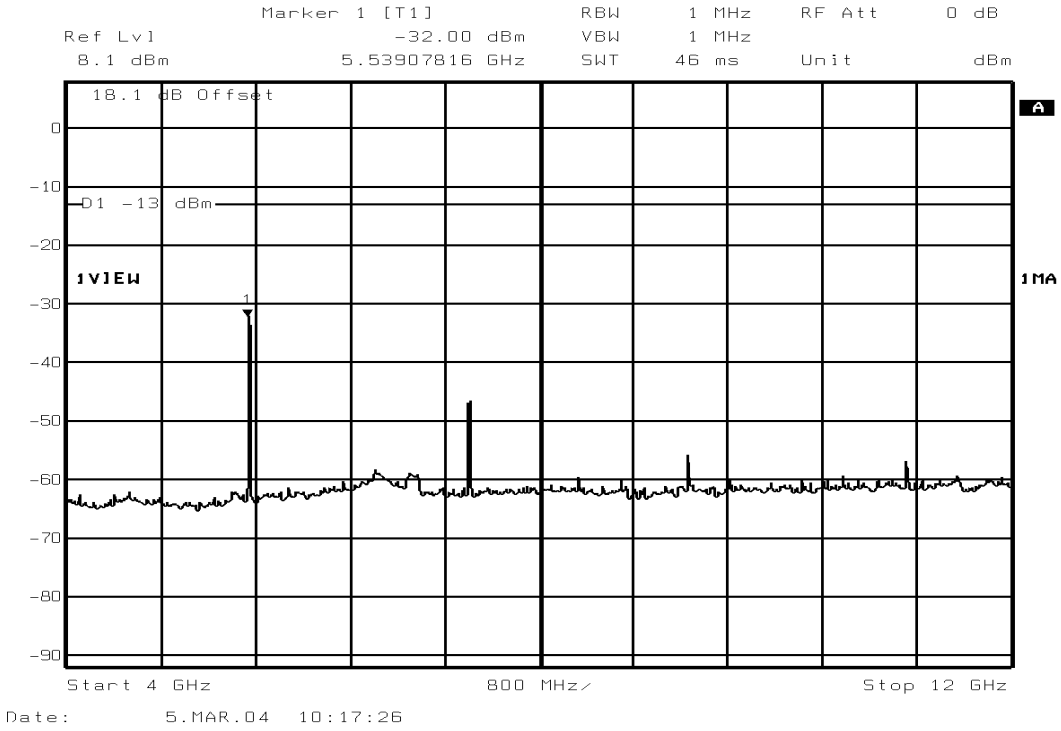
Spurious Emissions (9kHz – 4GHz)
Channel 512 (1850.2MHz) - Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

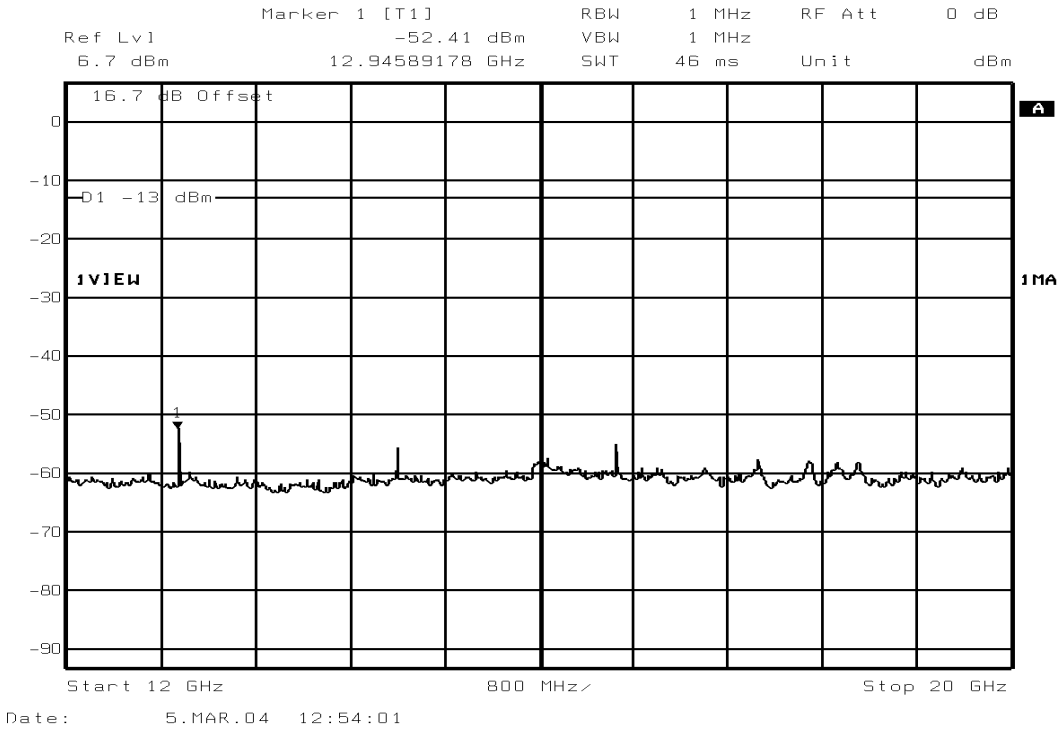
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

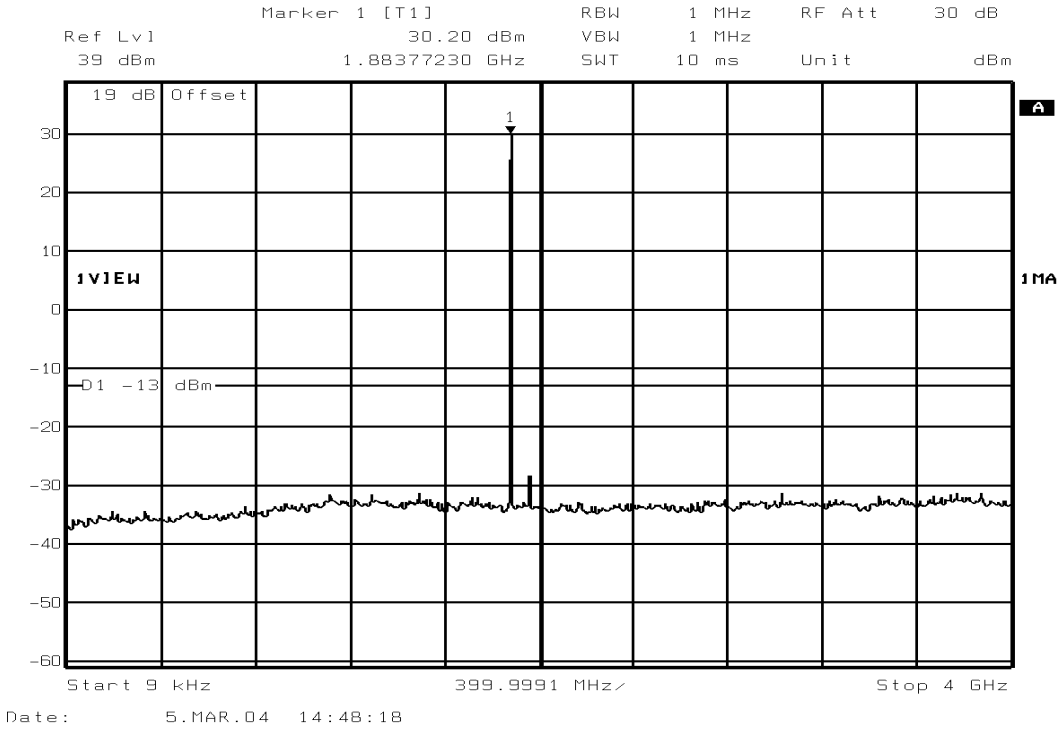
Spurious Emissions (12GHz – 20GHz)
Channel 512 (1850.2MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

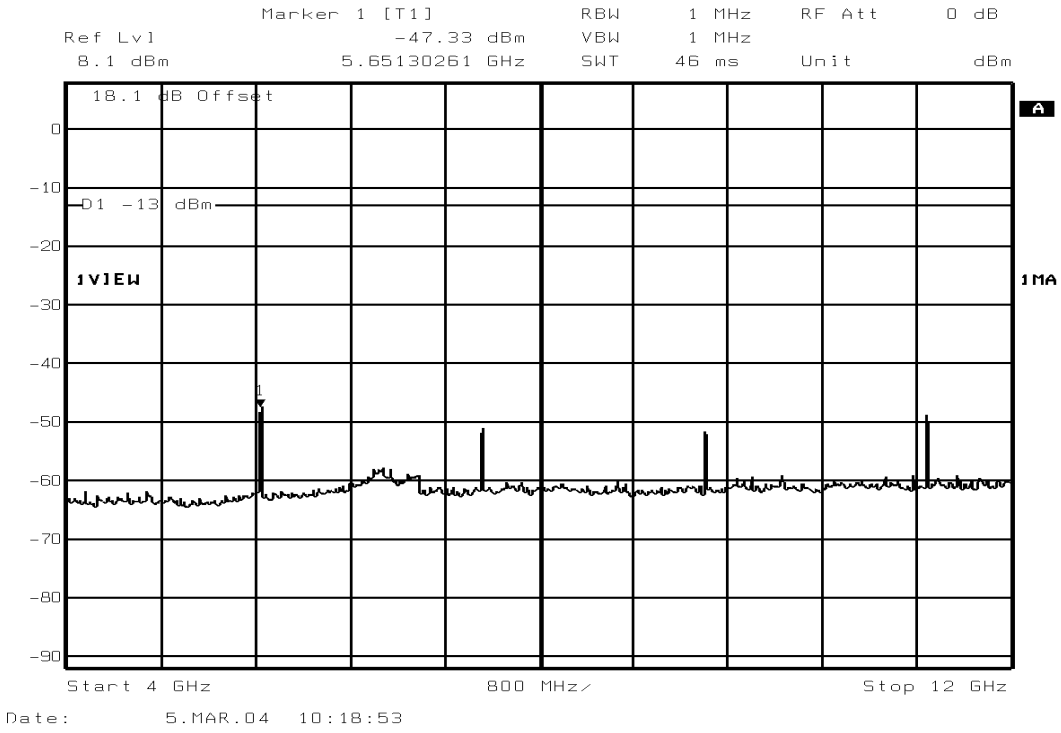
Spurious Emissions (9kHz – 4GHz)
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

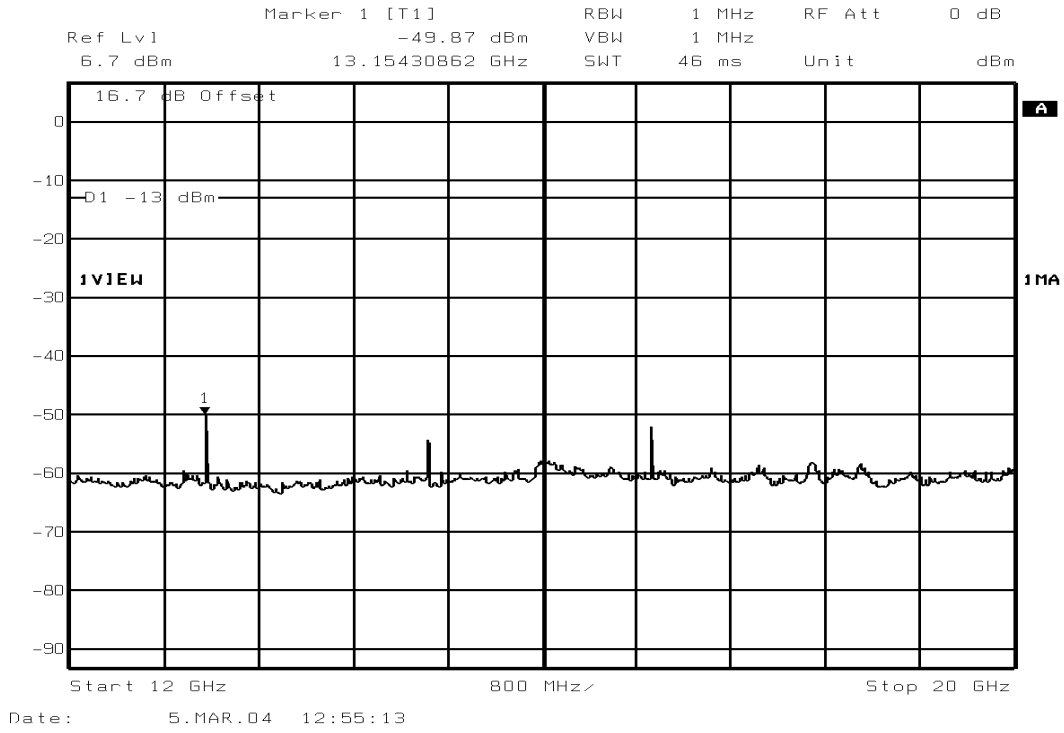
Spurious Emissions (4GHz - 12GHz)
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

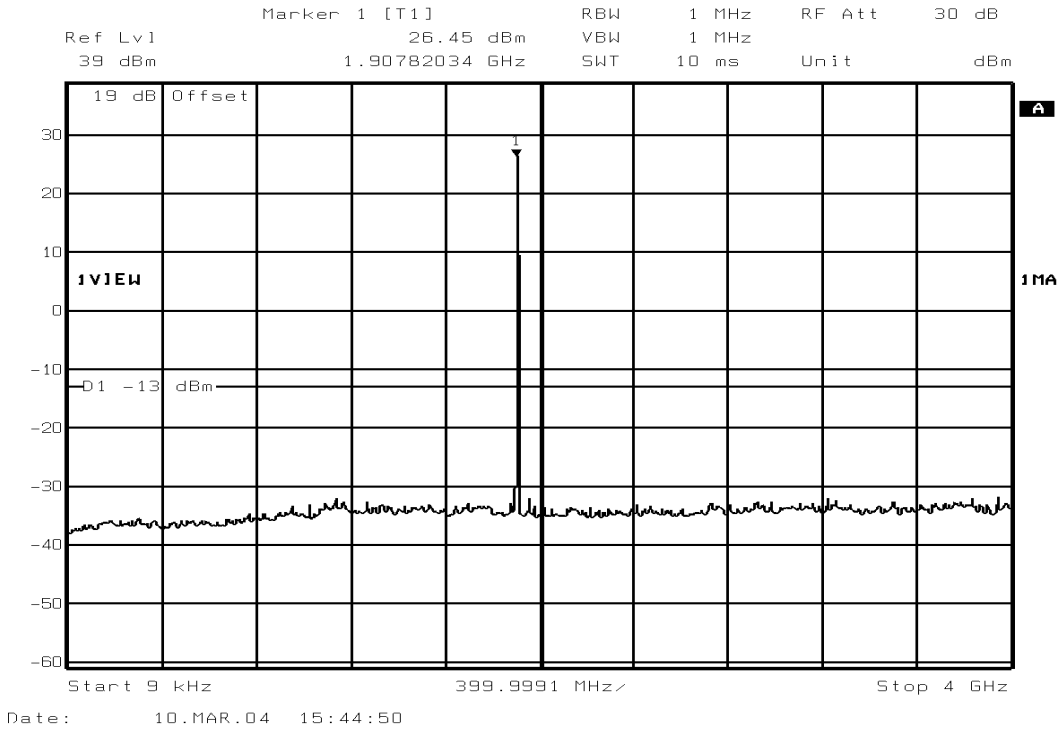
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

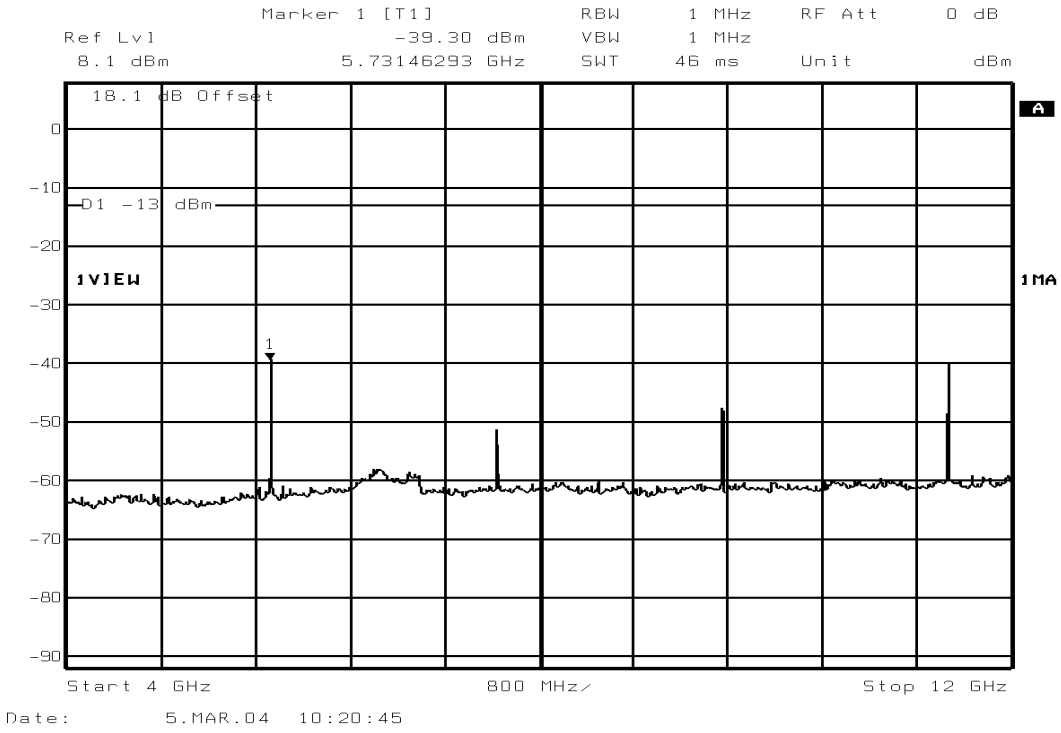
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

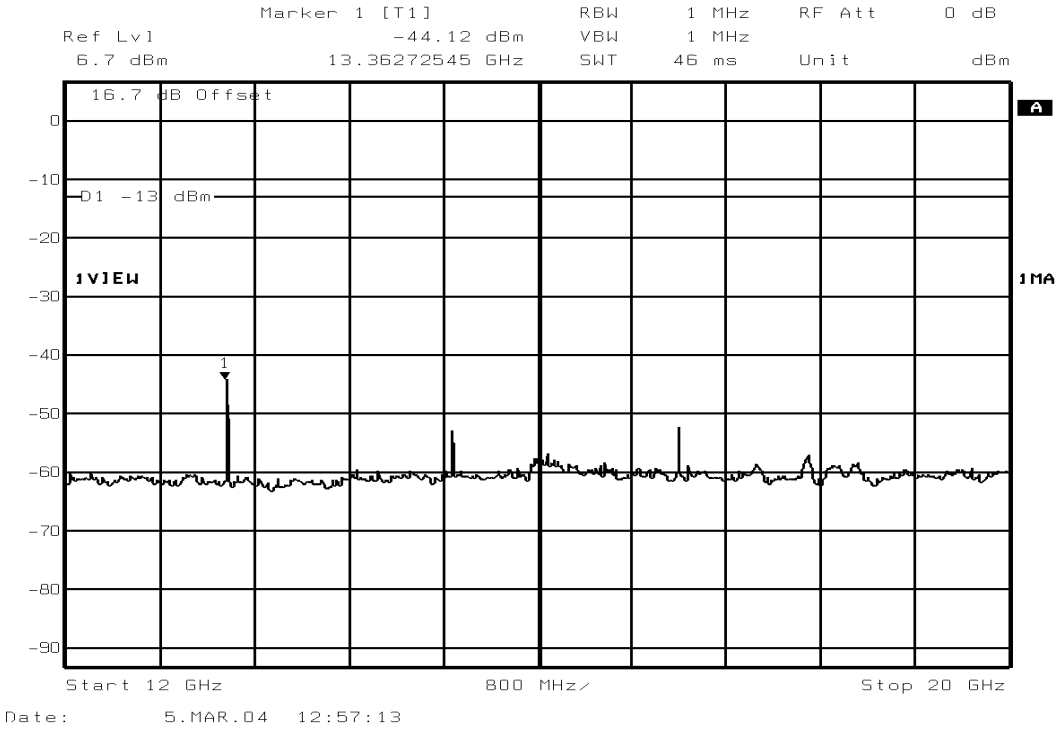
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

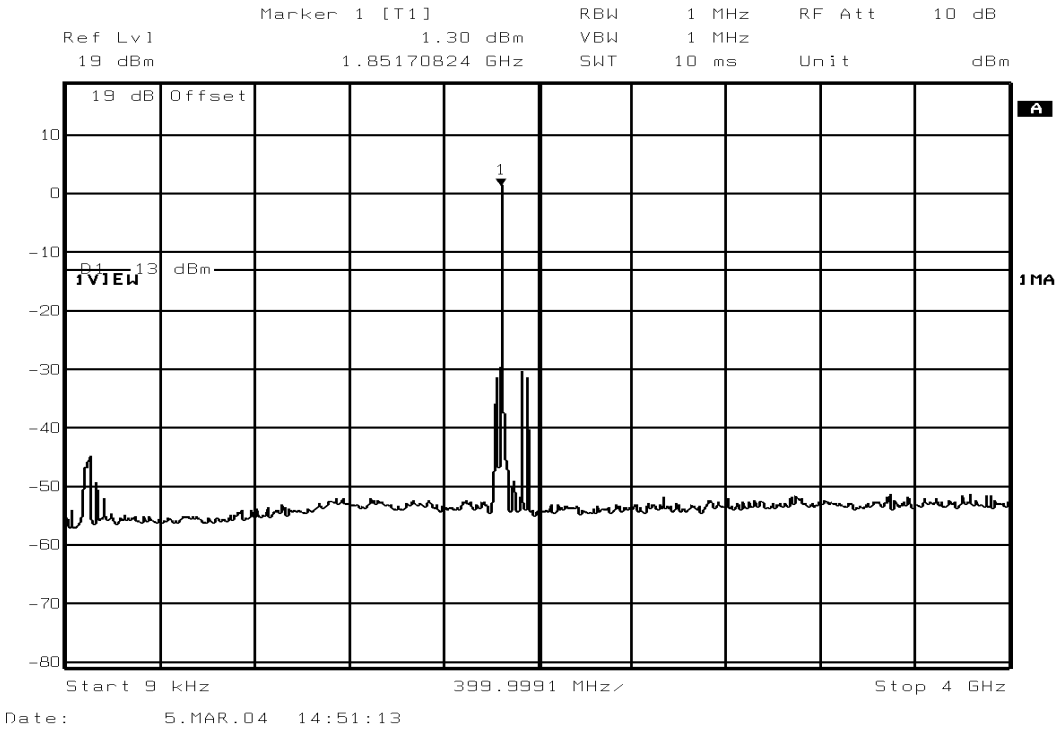
Spurious Emissions (12GHz – 20GHz)
Channel 810 (1909.8MHz) – Maximum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

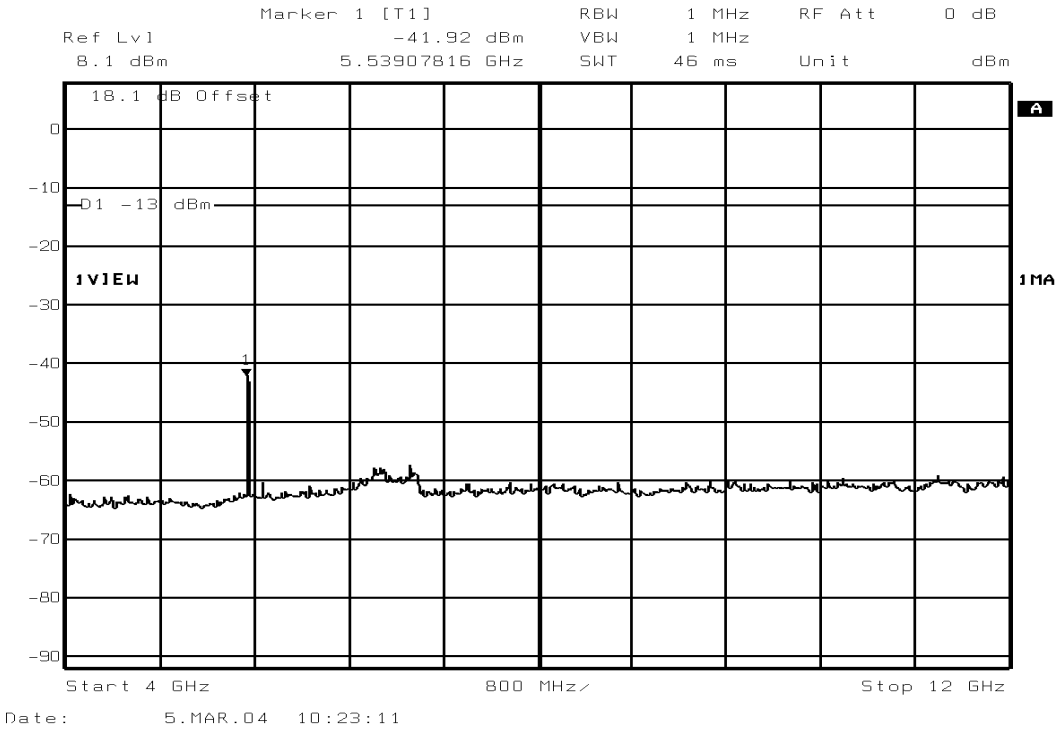
Spurious Emissions (9kHz – 4GHz)
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

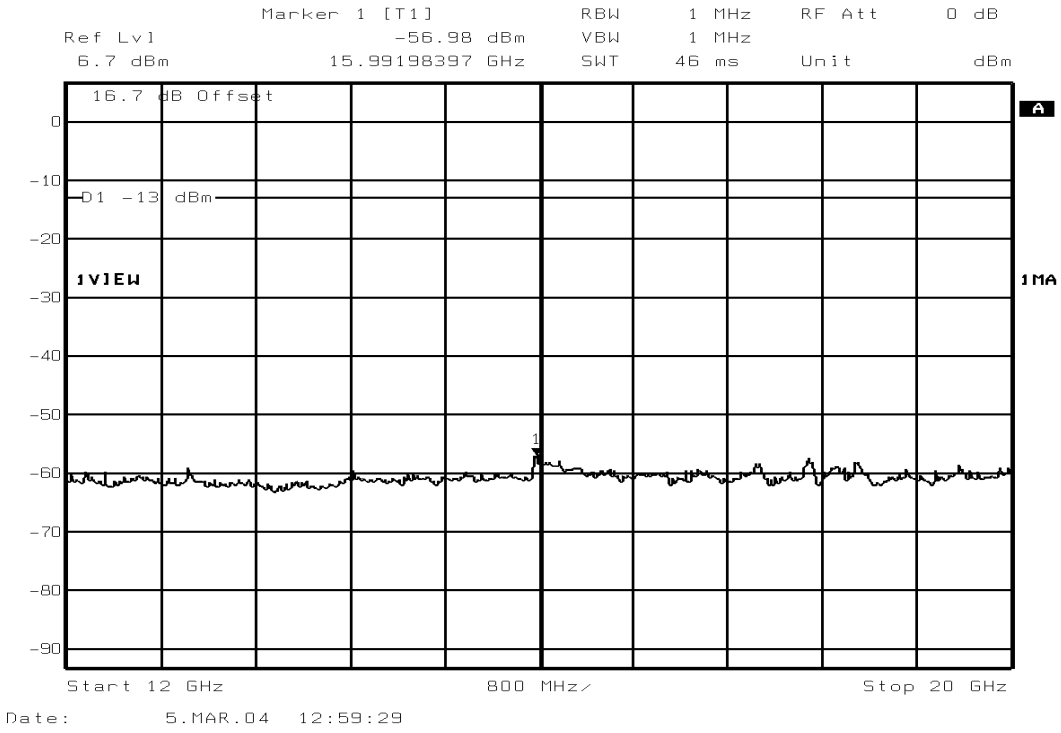
Spurious Emissions (4GHz – 12GHz)
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

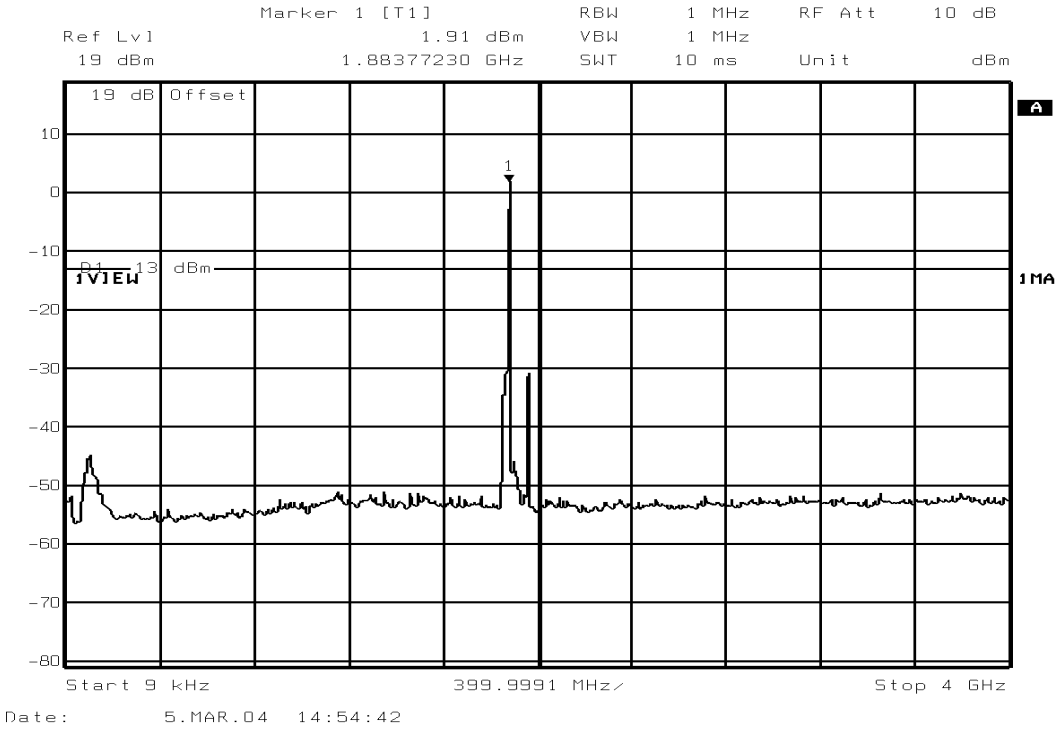
Spurious Emissions (12GHz-20GHz)
Channel 512 (1850.2MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

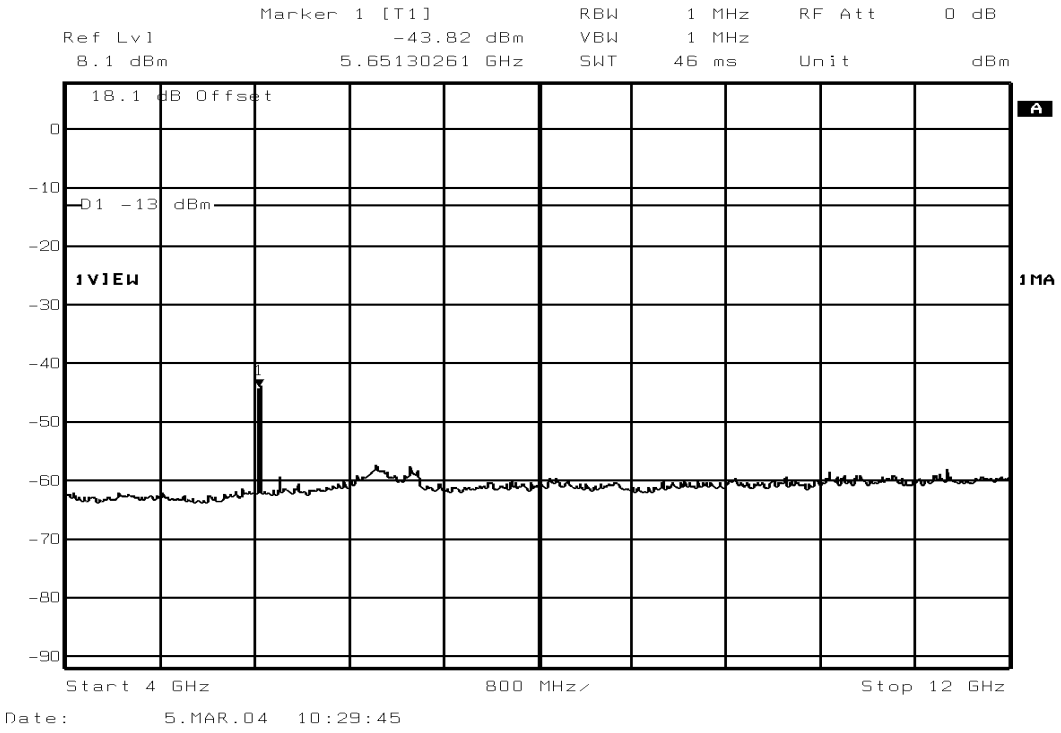
Spurious Emissions (9kHz – 4GHz)
Channel 661 (1880.0MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

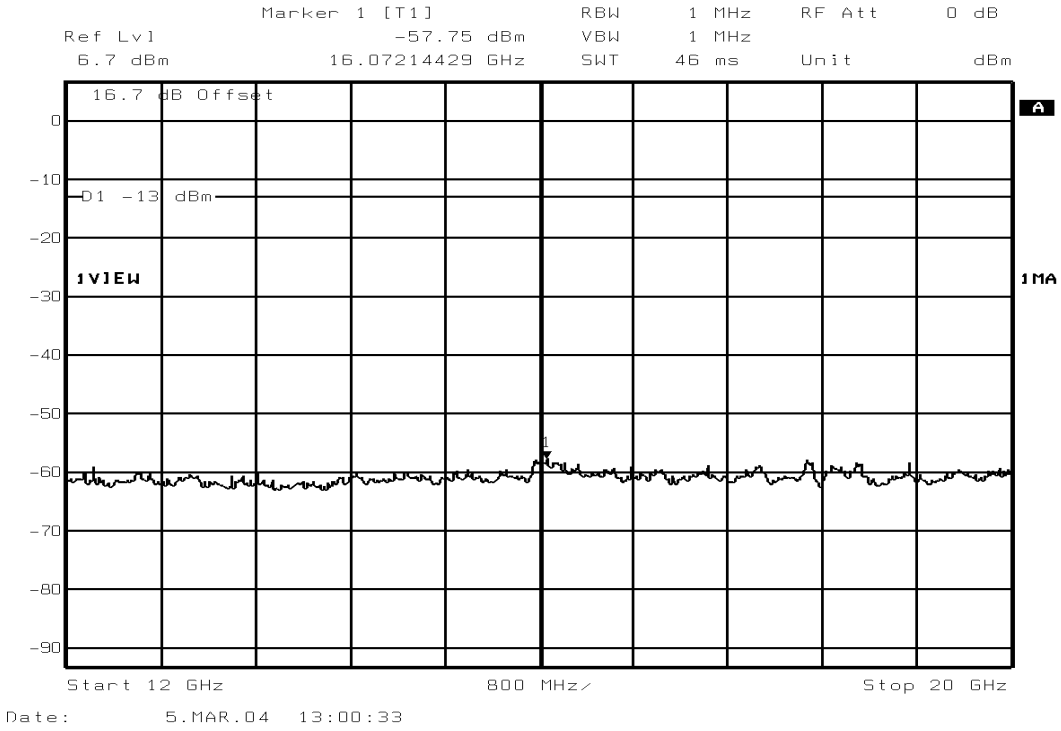
Spurious Emissions (4GHz – 12GHz)
Channel 661 (1880.0MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

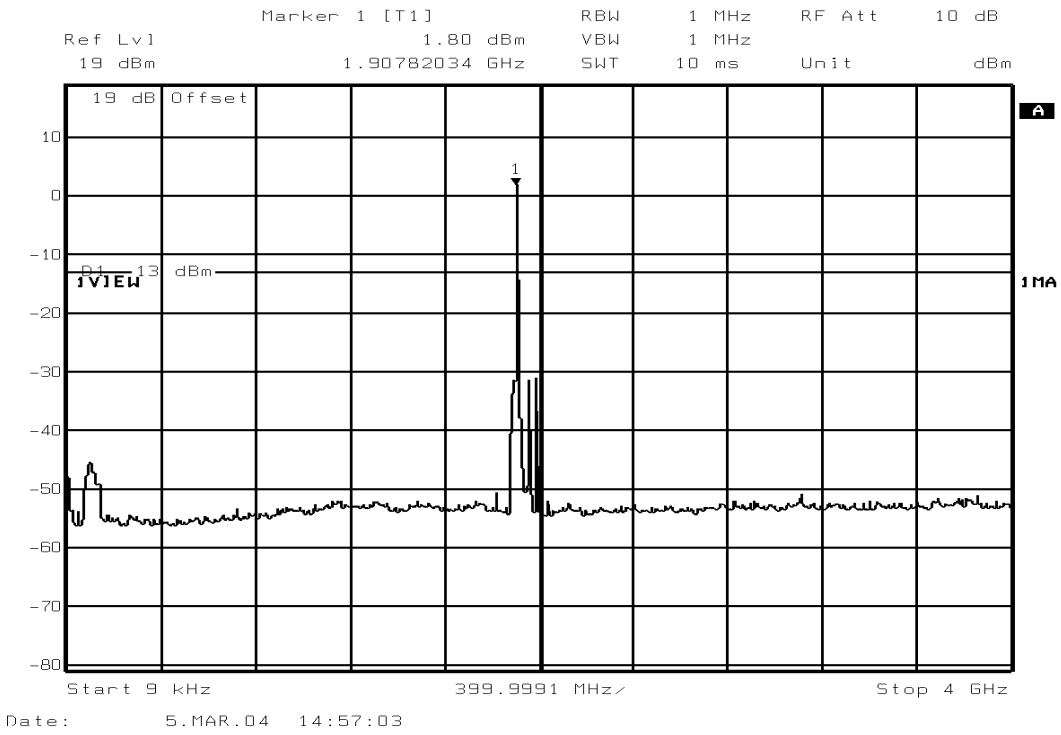
Spurious Emissions (12GHz – 20GHz)
Channel 661 (1880.0MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

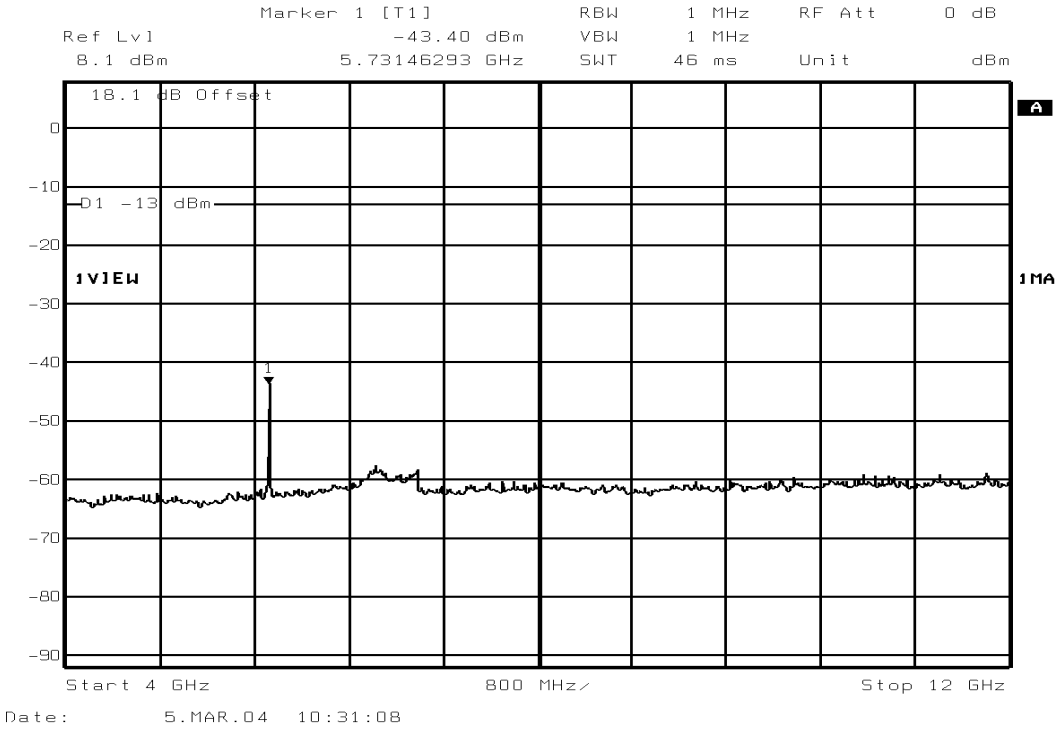
Spurious Emissions (9kHz – 4GHz)
Channel 810 (1909.8MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

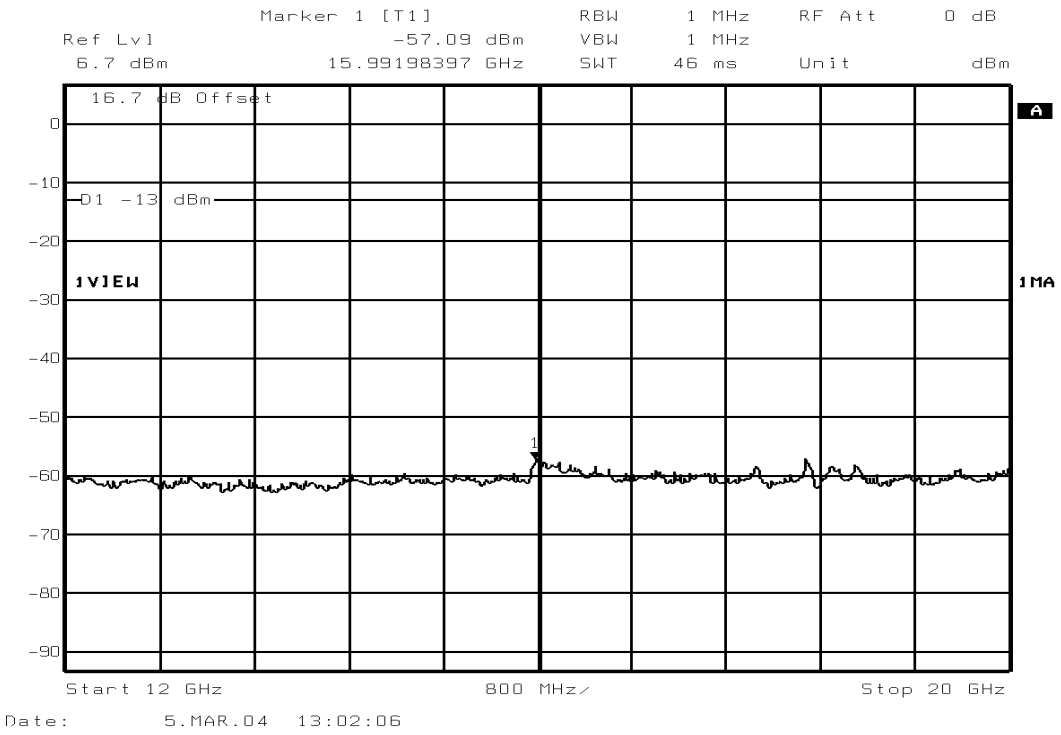
Spurious Emissions (4GHz – 12GHz)
Channel 810 (1909.8MHz) – Minimum Power



GPRS – Packet Data

2.7 CONDUCTED SPURIOUS EMISSIONS - Continued

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



GPRS – Packet Data

2.7 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	-57.10	18.3	-38.80	-13
5.5506	-49.27	12.8	-36.47	-13
7.4008	-62.44	10.0	-52.44	-13
9.2510	-75.06	11.6	-63.46	-13
11.1012	-68.24	11.5	-56.74	-13
12.9514	-67.51	11.4	-56.11	-13
14.8016	-70.99	13.2	-57.79	-13
16.6518	-70.27	12.2	-58.07	-13
18.5020	-74.73	15.6	-59.13	-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	-57.61	18.9	-38.71	- 13
5.640	-59.61	11.8	-47.81	- 13
7.520	-67.98	10.4	-57.58	- 13
9.400	-67.22	11.0	-56.22	- 13
11.280	-59.62	10.6	-49.02	- 13
13.160	-64.43	12.1	-52.33	- 13
15.040	-68.59	12.3	-56.29	- 13
16.920	-68.30	13.3	-55.00	- 13
18.800	-76.76	14.2	-62.56	- 13

*Instrumentation Noise Floor

2.7 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	-59.43	18.6	-40.83	-13
5.7294	-60.02	12.0	-48.02	-13
7.6392	-69.30	10.2	-59.10	-13
9.5490	-64.18	11.4	-52.78	-13
11.4588	-52.82	10.7	-42.12	-13
13.3686	-59.71	12.1	-47.61	-13
15.2784	-69.74	11.9	-57.84	-13
17.1882	-69.20	11.7	-57.50	-13
19.0980	-75.31*	14.6	-60.71	-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	-79.38	18.3	-61.08	-13
5.5506	-57.82	12.8	-45.02	-13
7.4008	-77.16	10.0	-67.16	-13
9.2510	-77.85*	11.6	-66.25	-13
11.1012	-77.89*	11.5	-66.39	-13
12.9514	-77.33*	11.4	-65.93	-13
14.8016	-76.77*	13.2	-63.57	-13
16.6518	-76.09*	12.2	-63.89	-13
18.5020	-75.07*	15.6	-59.47	-13

*Instrumentation Noise Floor

2.7 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	-79.34*	18.9	-60.44	- 13
5.640	-59.76	11.8	-47.96	- 13
7.520	-78.28*	10.4	-67.88	- 13
9.400	-76.91	11.0	-65.91	- 13
11.280	-77.54*	10.6	-66.94	- 13
13.160	-77.44*	12.1	-65.34	- 13
15.040	-76.32*	12.3	-64.02	- 13
16.920	-75.80*	13.3	-62.50	- 13
18.800	-76.99*	14.2	-62.79	- 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	-78.73*	18.6	-60.13	- 13
5.7294	-60.10	12.0	-48.10	- 13
7.6392	-78.68*	10.2	-68.48	- 13
9.5490	-77.93*	11.4	-66.53	- 13
11.4588	-77.62*	10.7	-66.92	- 13
13.3686	-77.35*	12.1	-65.25	- 13
15.2784	-75.76*	11.9	-63.86	- 13
17.1882	-75.82*	11.7	-64.12	- 13
19.0980	-75.57*	14.6	-60.97	- 13

* Instrumentation Noise Floor

2.7 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	-57.21	18.3	-38.91	-13
5.5506	-49.51	12.8	-36.71	-13
7.4008	-61.73	10.0	-51.73	-13
9.2510	-75.00	11.6	-63.40	-13
11.1012	-69.64	11.5	-58.14	-13
12.9514	-68.17	11.4	-56.77	-13
14.8016	-71.05	13.2	-57.85	-13
16.6518	-70.92	12.2	-58.72	-13
18.5020	-74.35	15.6	-58.75	-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	-57.61	18.9	-38.71	- 13
5.640	-59.55	11.8	-47.75	- 13
7.520	-67.00	10.4	-56.60	- 13
9.400	-66.80	11.0	-55.80	- 13
11.280	-67.72	10.6	-57.12	- 13
13.160	-64.73	12.1	-52.63	- 13
15.040	-68.70	12.3	-56.40	- 13
16.920	-68.19	13.3	-54.89	- 13
18.800	-75.77	14.2	-61.57	- 13

*Instrumentation Noise Floor

2.7 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	-58.57	18.6	-39.97	-13
5.7294	-58.31	12.0	-46.31	-13
7.6392	-68.07	10.2	-57.87	-13
9.5490	-64.50	11.4	-53.10	-13
11.4588	-52.96	10.7	-42.26	-13
13.3686	-60.15	12.1	-48.05	-13
15.2784	-70.46	11.9	-58.56	-13
17.1882	-67.56	11.7	-55.86	-13
19.0980	-75.40	14.6	-60.80	-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	-70.05*	18.3	-51.75	-13
5.5506	-58.03	12.8	-45.23	-13
7.4008	-76.49	10.0	-66.49	-13
9.2510	-77.35*	11.6	-65.75	-13
11.1012	-77.29*	11.5	-65.79	-13
12.9514	-76.41*	11.4	-65.01	-13
14.8016	-76.57*	13.2	-63.37	-13
16.6518	-75.87*	12.2	-63.67	-13
18.5020	-74.68*	15.6	-59.08	-13

*Instrumentation Noise Floor

2.7 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	-69.27*	18.9	-50.37	- 13
5.640	-59.79	11.8	-47.99	- 13
7.520	-77.69*	10.4	-67.29	- 13
9.400	-78.10*	11.0	-67.10	- 13
11.280	-77.60*	10.6	-67.00	- 13
13.160	-77.27*	12.1	-65.17	- 13
15.040	-76.73*	12.3	-64.43	- 13
16.920	-76.39*	13.3	-63.09	- 13
18.800	-76.81*	14.2	-62.61	- 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	-68.86*	18.6	-50.26	- 13
5.7294	-60.32	12.0	-48.32	- 13
7.6392	-78.71*	10.2	-68.51	- 13
9.5490	-78.37*	11.4	-66.97	- 13
11.4588	-77.33*	10.7	-66.63	- 13
13.3686	-77.72*	12.1	-65.62	- 13
15.2784	-76.27*	11.9	-64.37	- 13
17.1882	-77.01*	11.7	-65.31	- 13
19.0980	-74.89*	14.6	-60.29	- 13

* Instrumentation Noise Floor

2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

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

2.8.2 Equipment Under Test
MX-C99

2.8.3 Date of Test
11th March 2004

2.8.4 Test Equipment Used (See Section 3.1 for details)
3, 4, 5, 8, 9, 12, 13, 14

2.8.5 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.

2.8.6 Test Results

GSM – Circuit Switched

Temperature Interval(ºC)	Test Frequency (GHz)	Deviation (Hz)
- 30	1.88	-36
- 20	1.88	+21
- 10	1.88	+21
0	1.88	+32
+ 10	1.88	+17
+ 20	1.88	-17
+ 30	1.88	+26
+ 40	1.88	+31
+ 50	1.88	-27

2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS – Continued

GPRS – Packet Data

Temperature Interval(ºC)	Test Frequency (GHz)	Deviation (Hz)
- 30	1.88	-49
- 20	1.88	-39
- 10	1.88	+22
0	1.88	+25
+ 10	1.88	-38
+ 20	1.88	+19
+ 30	1.88	-38
+ 40	1.88	+23
+ 50	1.88	-42

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.

2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

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

2.9.2 Equipment Under Test
MX-C99

2.9.3 Date of Test
11th March 2004

2.9.4 Test Equipment Used (See Section 3.1 for details)
3, 4, 5, 8, 9, 12, 13

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

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)
4.2	1.88	-23
3.8	1.88	-20
3.5	1.88	+20

2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS - Continued

GPRS

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)
4.2	1.88	-42
3.8	1.88	-35
3.5	1.88	-38

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	827156/006	INV 4034	05/01/05
2	GSM Test Set	Rohde & Schwarz	CMU 200	103944	INV 4937	11/13/04
3	Attenuator	Weinschel	23-10-34	BG4169	INV 4063	01/07/04
4	Combiner	Weinschel	1506A	KA845	INV 4494	01/08/04
5	Signal Generator	Hewlett Packard	ESG-4000A	GB37040124	INV 3710	03/02/05
6	PSU	Farnell	L30_2	003191	INV 2738	T/U
7	DVM	Fluke	79 III	74730810	INV 4267	13/01/05
8	GSM Test Set	Rohde & Schwarz	CMU 200	833870/015	INV 4858	17/06/04
9	DVM	Fluke	8050A	4940010	EMC 1544	29/04/04
10	High Pass Filter	RLC	F-100-4000-S-R	INV4468	INV 4468	TU
11	Signal Generator	Hewlett Packard	8673B	2823A01302	EMC 2551	14/06/04
12	PSU	Farnell	LT 30/2	000919	EMC 28	TU
13	Spectrum Analyser	Agilent	E4407B	US41442853	EMC 2783	18/03/04
14	Climatic Chamber	Vőtsch	VT 4002	56602229	INV 4510	10/11/04
15	Spectrum Analyser	Hewlett Packard	8542E	3617A00165_ 00154	2286	09/12/04
16	Bilog Antenna	Schaffner	CBL6143	-	2860	11/04/04
17	Turtable Controller>D&A	H-D	HD 050	050/396	2528	TU
18	Screened Room 5	Siemens	EAC54300	NA	2533	U
19	Low Noise Amplifier	Miteq	AMF-3d-001080-18-13P	-	2457	TU
20	H.F. Amplifier	Miteq	AMF-4F-080180	492562	2430	TU
21	Emco Drg Horn Ant (Civil)	Emco	3115	96964848	2297	04/07/04
22	18-40GHz L.N Amp	Narda	DB02-0447	002	2936	23/04/04
23	18-40GHz Horn	Flan Microwave	2024-20	164	1396	TU
24	Emco 3115 Drg Ant	Emco	3115	97015079	2397	04/07/04
25	Signal Generator	Hewlett Packard	8673B	2147A00423	954	14/06/04
26	Emi Test Receiver	Rohde & Schwarz	ESIB40	100142/040	2917	11/02/05

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

SECTION 4

EUT PHOTOGRAPH

4.1.1 EUT PHOTOGRAPHS

Front View

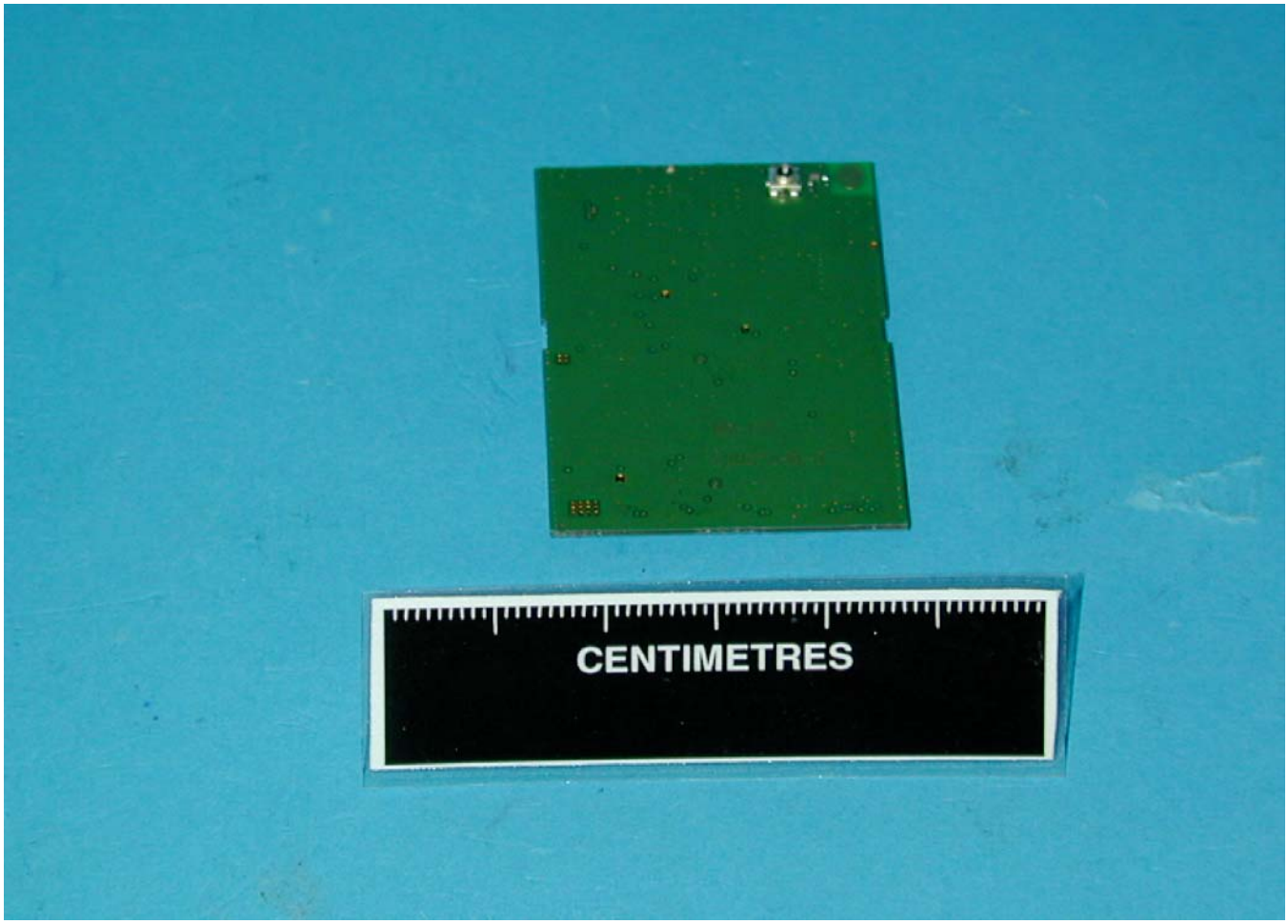
4.1.2 EUT PHOTOGRAPHS- Continued

Rear View

4.1.3 **EUT PHOTOGRAPHS**- Continued

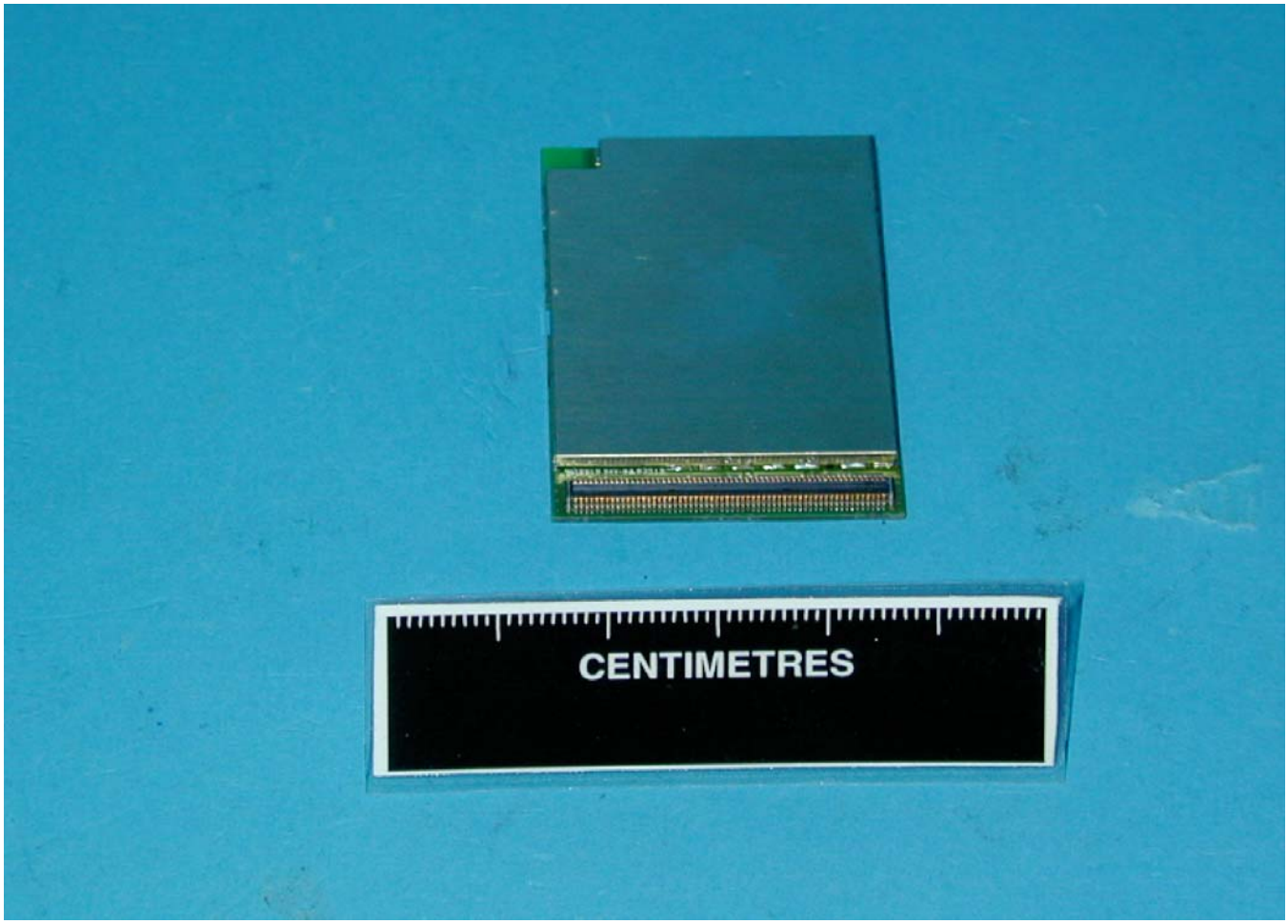
Rear View (Battery Removed)

4.1.4 EUT PHOTOGRAPHS- Continued



Internal View 1

4.1.5 EUT PHOTOGRAPHS - Continued



Internal View 2

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).

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

Thomas W Phillips
Electronics Engineer