



TTI-P-G-166/98-30

Accredited Bluetooth Test Facility (BQTF)

Test report no.: 4_0551-01-03/02

FCC Part 24 and Part 22

GM48

FCC ID: PY76220501-BV

CETECOM – ICT Services GmbH

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

1.2 Testing laboratory

CETECOM ICT Services GmbH

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66117 Saarbrücken

Germany

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Internet : www.cetecom.de

Accredited testing laboratory

DAR-registration number : TTI-P-G-166/98-30

Accredited Bluetooth™ Test Facility (BQTF)

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REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

1.3 Details of applicant

Name : Sony Ericsson Mobile Communication AB
Street : Nya Vattentornet
City : 22188 Lund
Country : Sweden
Telephone : +46-46-193-242
Telefax : +46-46-193-295
Contact : Mr. Bo Johansson
Telephone : +46-46-193-242

1.4 Application details

Date of receipt of application : 25.02.2002
Date of receipt of test item : 25.02.2002
Date of test : 25.02.-26.02.2002

1.5 Test item

Type of equipment : **Dual Band PCS module (PCS 850 and PCS1900)**
Type designation : GM48 / 6220501-BV
Manufacturer : Applicant
Street :
City :
Country :
Serial number : IMEI 001003-83-033173-5

Additional informations:

Frequency : 1850 – 1910 MHz and 824 – 849 MHz
Type of modulation : 300KF2D
Number of channels : 300 (PCS1900) and 125 (PCS850)
Antenna : coax socket and dedicated dual band antenna
Power supply : 3.6V DC via socket
Output power PCS 850 : cond. 30.47 dBm Peak , ERP 27.0 dBm (Burst);
EIRP: 29.0 dBm (Burst)
Output power PCS 1900 : cond. 31.45 dBm Peak , ERP 27.51 dBm (Burst);
EIRP: 29.61 dBm (Burst)
Type of equipment : Temperature range : -30°C - +60°C
FCC – ID : PY76220501-BV
Hardware : PID
Software : R1A017

1.6 Test standards: **FCC Part 22 and Part 24**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

2 Technical test

The radiated measurements were performed vertical and horizontal over the whole frequency range. We start at 1 m high with vertical receiving antenna and rotate the dish continuously. During rotation we use the antenna lift system to vary the high from 1 to 4 m. So we find maximum radiation output. At this points we do manual remeasurements. After this we do the same measurements in horizontal position of the receiving antenna. This (horizontal and vertical) is made for all the three planes of the test sample. We use the maximum received results.

The detector function and selection of bandwidth are according ANSI C63.2-1996 item 8.2.1 and ANSI C63.4-1992 Item 4.2.

Antennas are conform with ANSI C63.2-1996 item 15.

150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna

200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna

1GHz: Average, RBW 1MHz, VBW 10 MHz, wave guide horn

2.1 Summary of test results

We did measurements for PCS 850 with the same parameters as for PCS 1900. No deviations from the technical specification(s) were ascertained in the course of the tests performed.

FINAL VERDICT: PASS

Technical responsibility for area of testing :

2002-03-11 RSC 8414 Ames H..

| Date | Section | Name | Signature |
|------------|----------|---------------|-----------|
| 2002-03-11 | RSC 8414 | Ames H.. | |
| 2002-03-11 | RSC8412 | Hausknecht D. | |

Technical responsibility for area of testing :

2002-03-11 RSC8412 Hausknecht D.

Date Section Name Signature

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED (for reference numbers see test equipment listing)

2.2 Testreport

TEST REPORT

Test report no. : 4_0551-01-03/02

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

| PARAMETER TO BE MEASURED | Paragraph | PAGE |
|---|--------------------|------|
| <u>Part PCS 1900</u> | | |
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| FREQUENCY STABILITY | SUBCLAUSE § 24.235 | 10 |
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| AFC FREQ ERROR vs. TEMPERATURE | | 11 |
| EMISSIONS LIMITS | §24.238 | 13 |
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| <u>PART PCS 850</u> | | |
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| CONDUCTED EMISSIONS REFERENCE NUMBER(S) OF TEST EQUIPMENT USED (for reference numbers see test equipment listing) | § 15.107/207 | 84 |

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|--|-----------|
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REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

PART PCS1900

POWER OUTPUT

SUBCLAUSE § 24.232

Summary:

This paragraph contains both average , peak output powers and EIRP measurements for the mobile station.

In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Method of Measurements:

The mobile was set up for the max. output power with pseudo random data modulation.

The power was measured with R&S Spectrum Analyzer FSIQ 26 (peak and average)

This measurements were done at 3 frequencies, 1850,2 MHz, 1880,0 MHz and 1909,8 MHz (bottom, middle and top of operational frequency range)

Limits:

| Power Step | Nominal Peak Output Power (dBm) | Tolerance (dB) |
|------------|---------------------------------|----------------|
| 0 | +30 | ± 2 |

Power Measurements:

Conducted:

| Frequency (MHz) | Power Step | Peak Output Power (dBm) | Average Output Power (dBm) |
|-------------------------|------------|-------------------------|----------------------------|
| 1850.2 | 0 | 31.45 | 31.32 |
| 1880.0 | 0 | 30.05 | 29.96 |
| 1909.8 | 0 | 30.46 | 30.35 |
| Measurement uncertainty | | ±0.5 dB | |

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

EIRP Measurements

Description: This is the test for the maximum radiated power from the phone.

Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts e.i.r.p. peak power..." and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Method of Measurement:

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference center of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as $Pin + 2.1 - Pr$.
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the co-ordinates determined in Step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.1 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.1 \text{ dBi}$.

Limits:

| Power Step | Burst Average EIRP (dBm) |
|-------------------|---------------------------------|
| 0 | <33 |

Power Measurements:

Radiated:

| Frequency (MHz) | Power Step | BURST AVERAGE (dBm) | | MODULATION AVERAGE (dBm) | |
|--------------------------------|-------------------|----------------------------|--------------|---------------------------------|--------------|
| | | EIRP | ERP | EIRP | ERP |
| 1850.2 | 0 | 29.61 | 27.51 | 20.61 | 18.51 |
| 1880.0 | 0 | 29.32 | 27.22 | 20.32 | 18.22 |
| 1909.8 | 0 | 29.05 | 26.95 | 20.05 | 17.95 |
| Measurement uncertainty | | ±3 dB | | | |

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

FREQUENCY STABILITY

SUBCLAUSE § 24.235

Method of Measurement:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMD 65 DIGITAL RADIOCOMMUNICATION TESTER..

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with 3.6 Volts, connected to the CMD 65 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal 3.6 Volts. Vary supply voltage from minimum 3.4 Volts to maximum 4.0 Volts, in 0.05 Volt increments remeasuring carrier frequency at each voltage. Pause at 3.6 Volts for 1 1/2 hours unpowered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with 3.6 Volts, connected to the CMD 65 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Limit:

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment...", Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.4 Vdc and 4.0 Vdc, with a nominal voltage of 3.6 Vdc . Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of +11.1% and - 5.4 %. For the purposes of measuring frequency stability these voltage limits are to be used.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

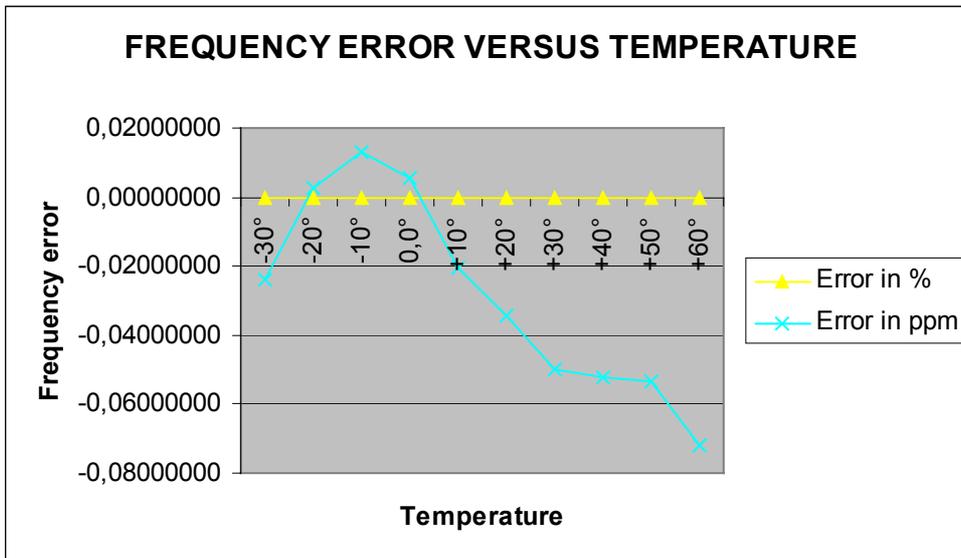
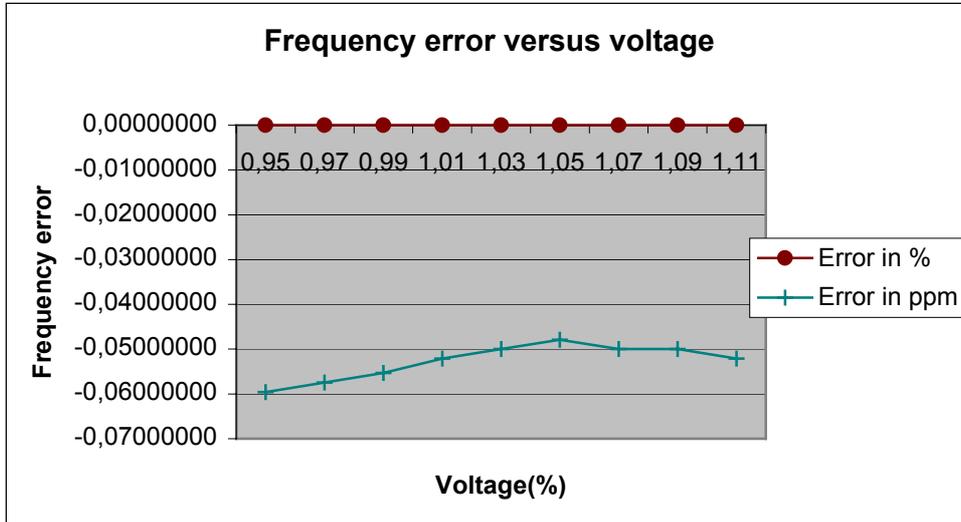
AFC FREQ ERROR vs. VOLTAGE

| Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|---------------------------------|----------------------------------|--------------------------------|
| 3.40 | -112 | 0.06 | |
| 3.45 | -112 | 0.06 | |
| 3.50 | -108 | 0.06 | |
| 3.55 | -104 | 0.06 | |
| 3.60 | -98 | 0.05 | |
| 3.65 | -98 | 0.05 | |
| 3.70 | -94 | 0.05 | |
| 3.75 | -90 | 0.05 | |
| 3.80 | -90 | 0.05 | |
| 3.85 | -94 | 0.05 | |
| 3.90 | -94 | 0.05 | |
| 3.95 | -98 | 0.05 | |
| 4.00 | -98 | 0.05 | |

AFC FREQ ERROR vs. TEMPERATURE

| TEMPERATURE (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|-----------------------------|---------------------------------|----------------------------------|--------------------------------|
| -30 | -45 | 0.02 | |
| -20 | +5 | 0.00 | |
| -10 | +25 | 0.01 | |
| ±0.0 | +10 | 0.01 | |
| +10 | -38 | 0.02 | |
| +20 | -65 | 0.03 | |
| +30 | -98 | 0.05 | |
| +40 | -98 | 0.05 | |
| +50 | -100 | 0.05 | |
| +60 | -125 | 0.07 | |

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

EMISSIONS LIMITS

§24.238

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

The final open field emission test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$P_g = E^2 4\pi d^2 / 120\pi = E^2 d^2 / 30$$

where : P = power in watts
 g = arithmetic gain of transmitting antenna over isotropic radiator.
 E = maximum field strength in volts/meter
 d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3 meters, this equation reduces to:

$$P(\text{dBm}) = E(\text{dBuV/m}) - 97.2\text{dB}$$

Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43 + 10\log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10\log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Measurement Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1879.8 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:

The final open field radiated levels are presented on the next pages.

As can be seen from this data, the emissions from the test item were within the specification limit.

Channel 512

Data File : /40552_15.DOC

27 Feb 2002

| No | EMISSION | SPEC | MEASUREMENTS | | | SITE | | CORR | COMMENTS | |
|----|------------------|------|-----------------|------|------------|------|-----|------|----------|-----------|
| | FREQUENCY MHz | | LIMIT dBuV/m | ABS | dLIM dB | MODE | POL | | | HGT cm |
| 1 | 31.951 | 29.5 | 26.6 | -2.9 | QP | V | 104 | 252 | 18.1 | |

Channel 661

Data File : /40552_05.DOC

27 Feb 2002

| No | EMISSION | SPEC | MEASUREMENTS | | | SITE | | CORR | COMMENTS | |
|----|------------------|------|-----------------|------|------------|------|-----|------|----------|-----------|
| | FREQUENCY MHz | | LIMIT dBuV/m | ABS | dLIM dB | MODE | POL | | | HGT cm |
| 1 | 31.886 | 29.5 | 27.0 | -2.5 | QP | V | 102 | 17 | 18.1 | |
| 2 | 45.6 | 29.5 | 22.7 | -6.8 | PK | V | 97 | 310 | N/T | |

Channel 810

Data File : /40552_10.DOC

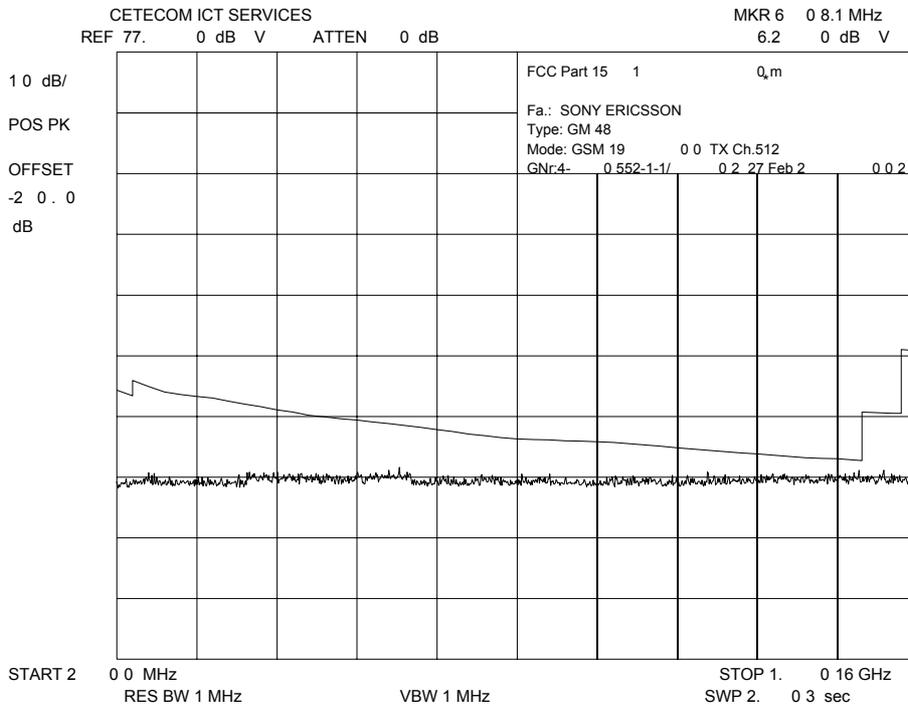
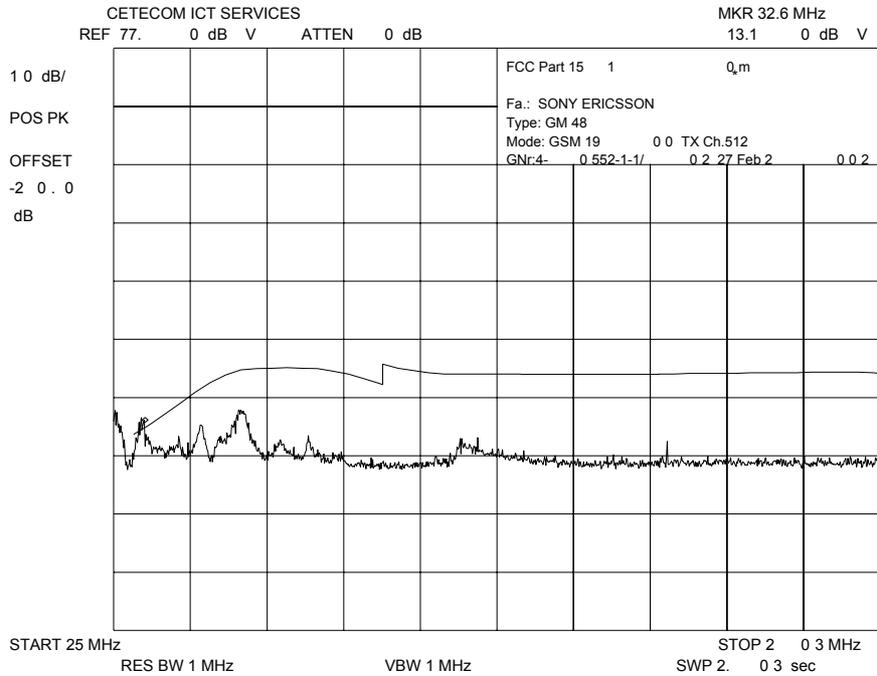
27 Feb 2002

| No | EMISSION | SPEC | MEASUREMENTS | | | SITE | | CORR | COMMENTS | |
|----|------------------|------|-----------------|------|------------|------|-----|------|----------|-----------|
| | FREQUENCY MHz | | LIMIT dBuV/m | ABS | dLIM dB | MODE | POL | | | HGT cm |
| 1 | 31.898 | 29.5 | 26.6 | -2.9 | QP | V | 173 | 360 | 18.1 | |
| 2 | 45.6 | 29.5 | 23.4 | -6.1 | PK | V | 97 | 155 | N/T | |

N/T in CORR FACTOR column denotes a non-traceable signal.

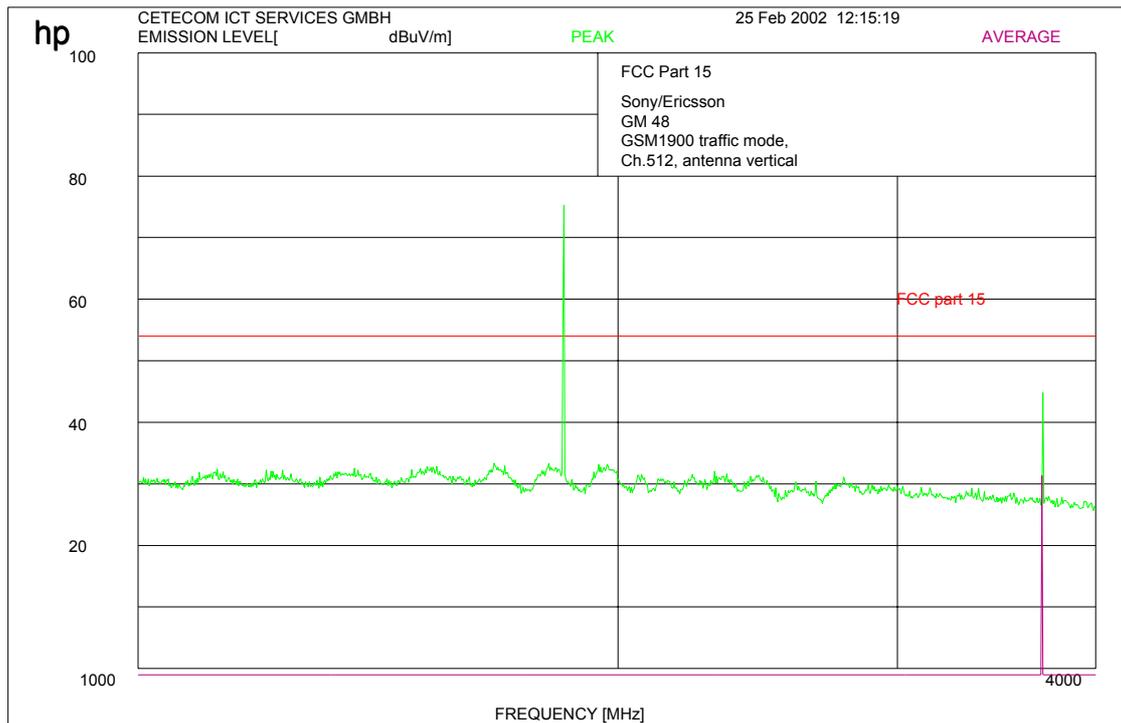
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 512 (up to 1 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

Channel 512 (up to 4 GHz)

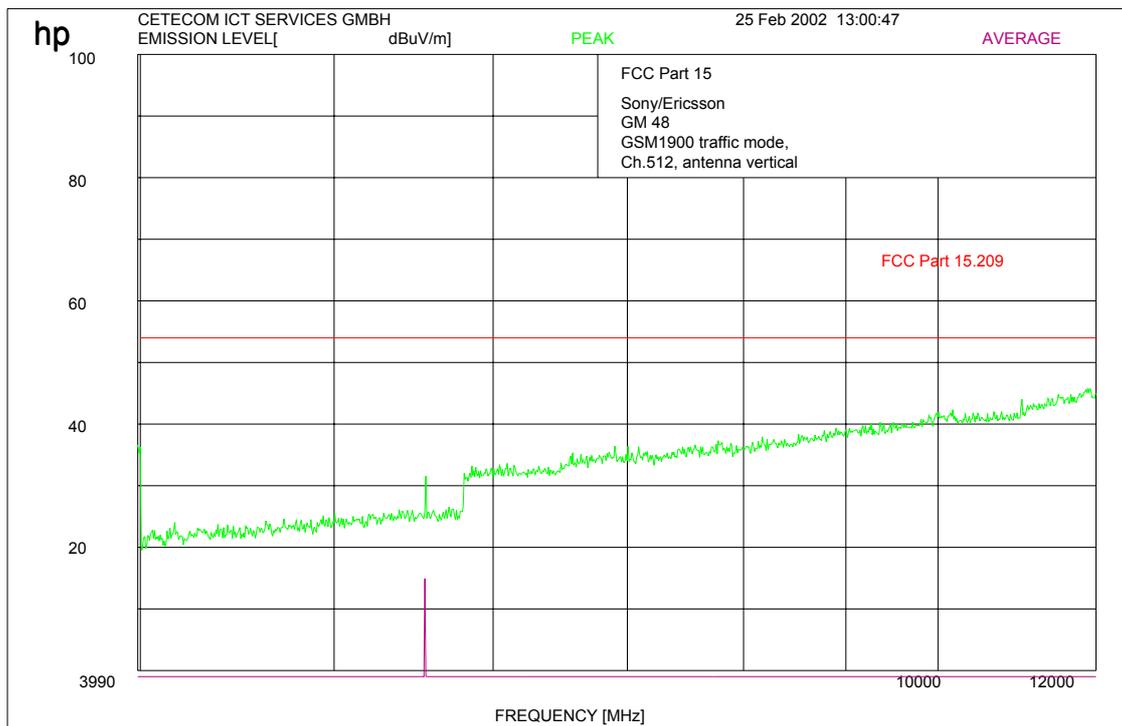


3696.4 MHz

31.3 dB μ V/m AV

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 512 :- 12 GHz



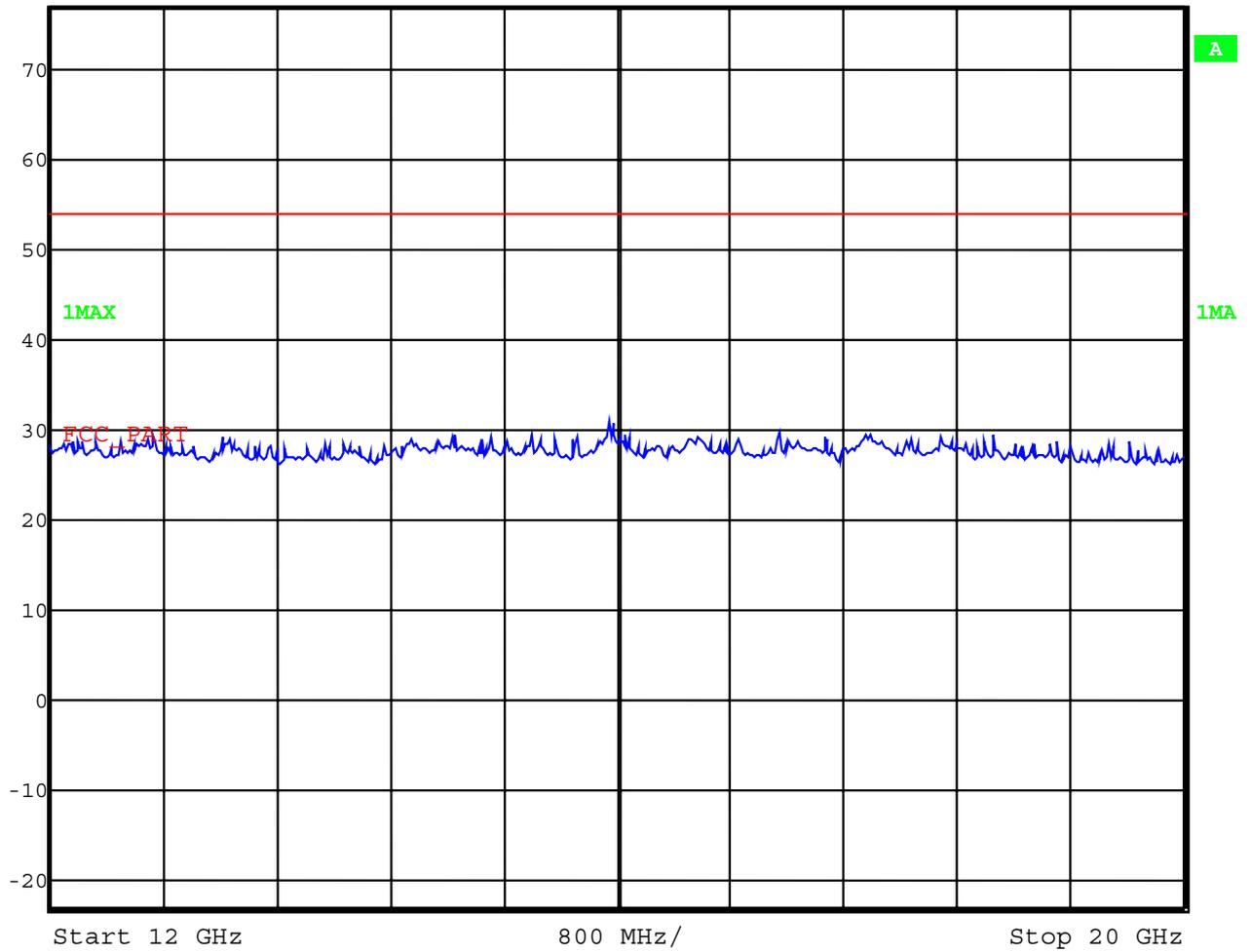
5550 MHz 16.9 dB μ V/m AV

Channel 512 : 12 – 20 GHz



Ref Lvl
77 dB μ V

| | | | |
|-----|-------|--------|------------|
| RBW | 1 MHz | RF Att | 0 dB |
| VBW | 1 MHz | | |
| SWT | 46 ms | Unit | dB μ V |

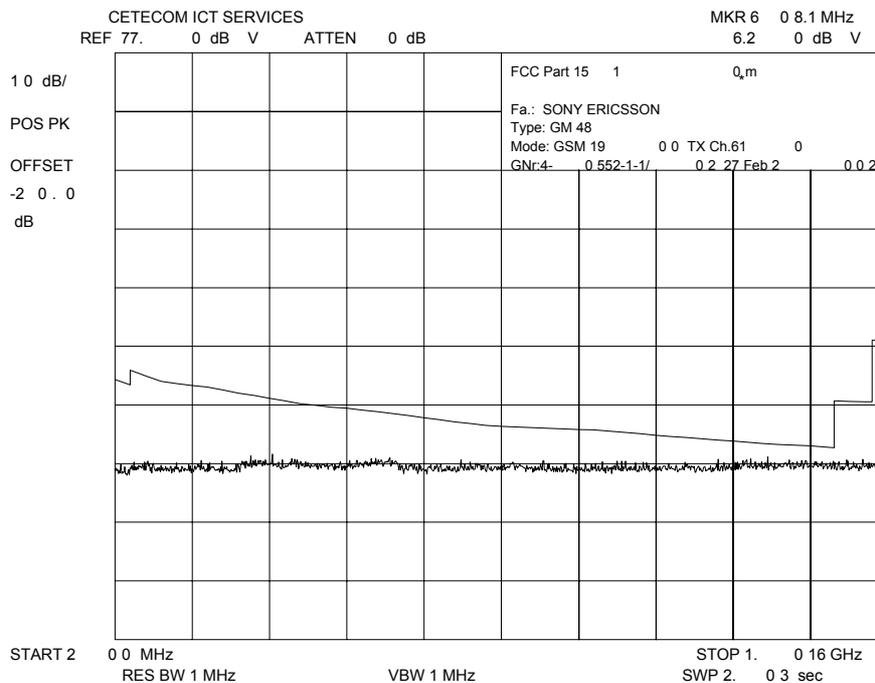
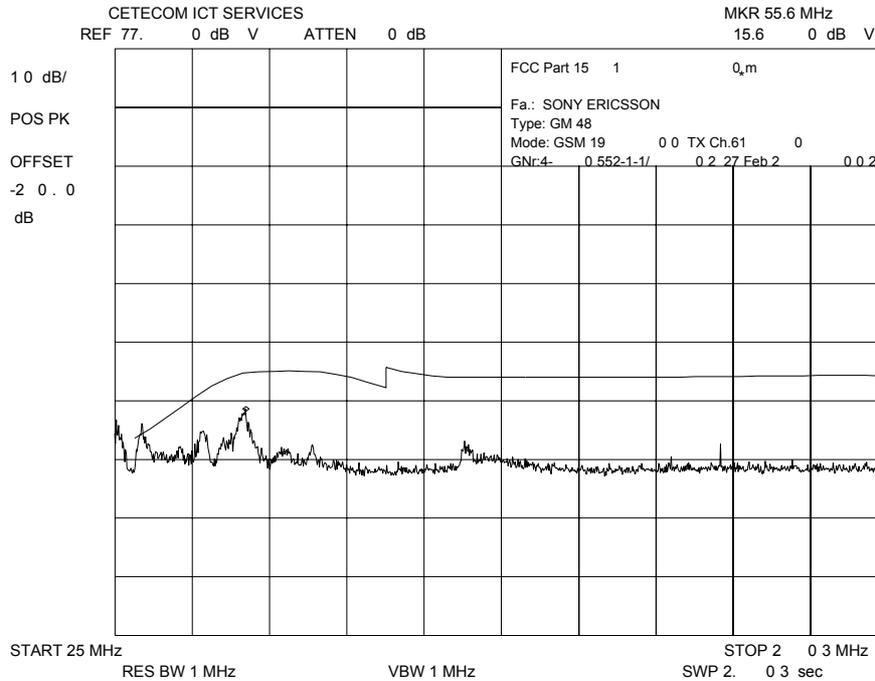


Date: 26.FEB.2002 13:12:03

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

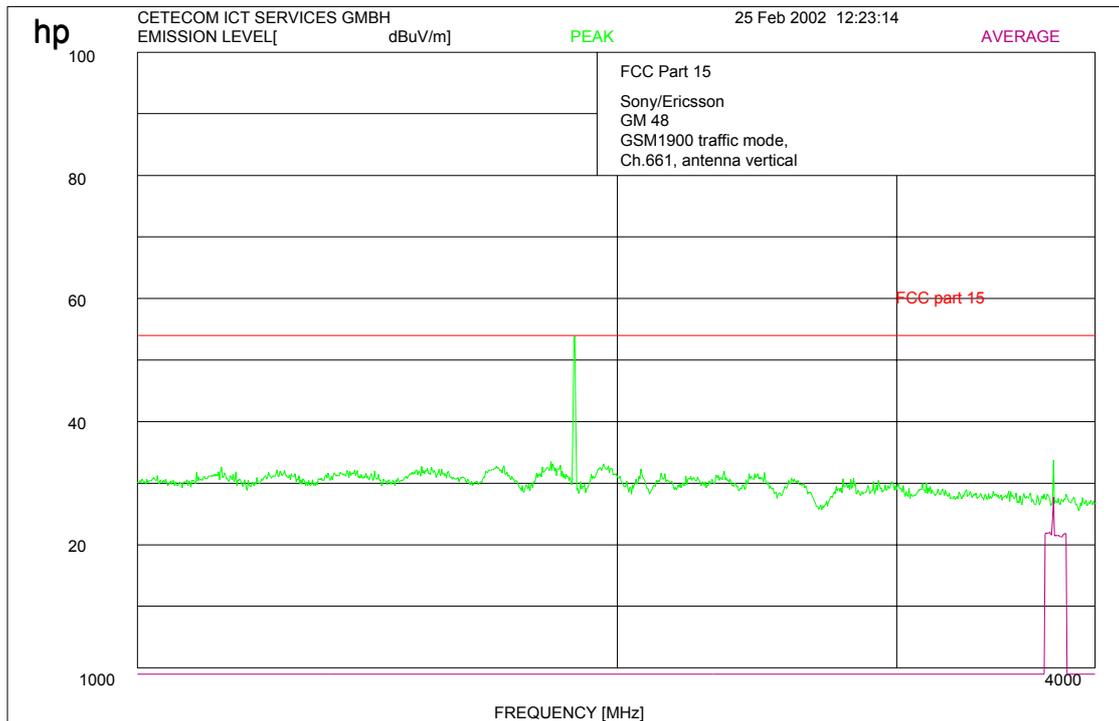
(for reference numbers see test equipment listing)

Channel 661 (up to 1 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

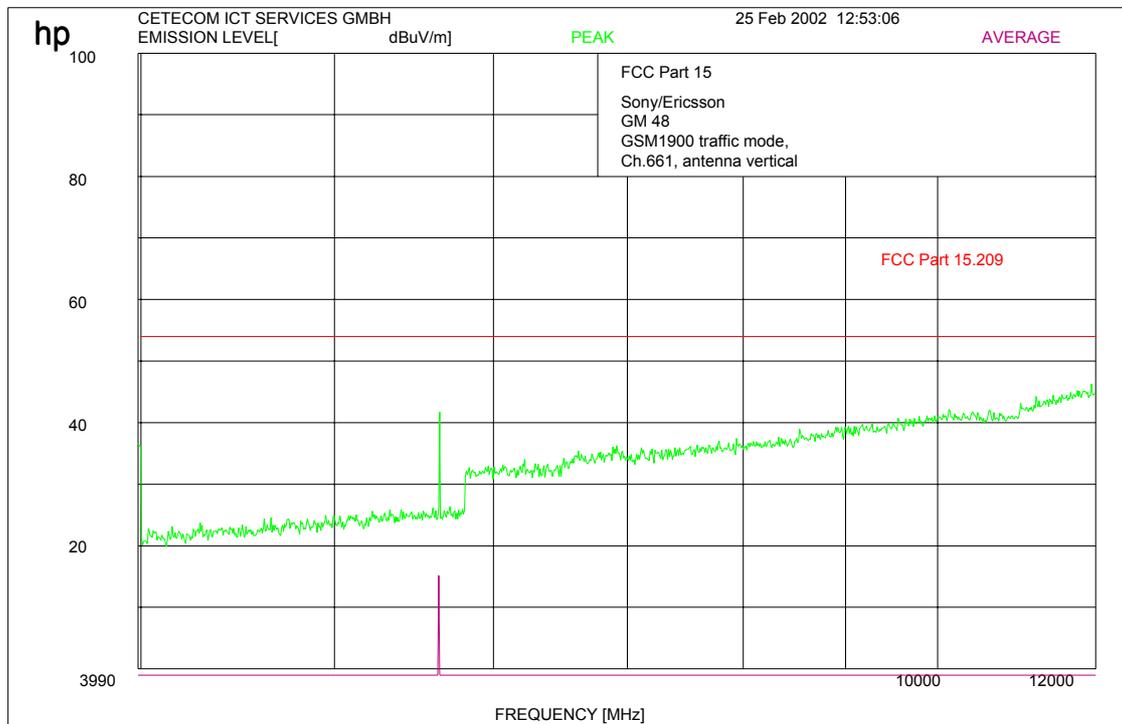
Channel 661 (up to 4 GHz)



3763.5 MHz

27.7dB μ V/m AV

Channel 661 : 4 – 12 GHz



5636.1 MHz 15.1 dB μ V/m AV

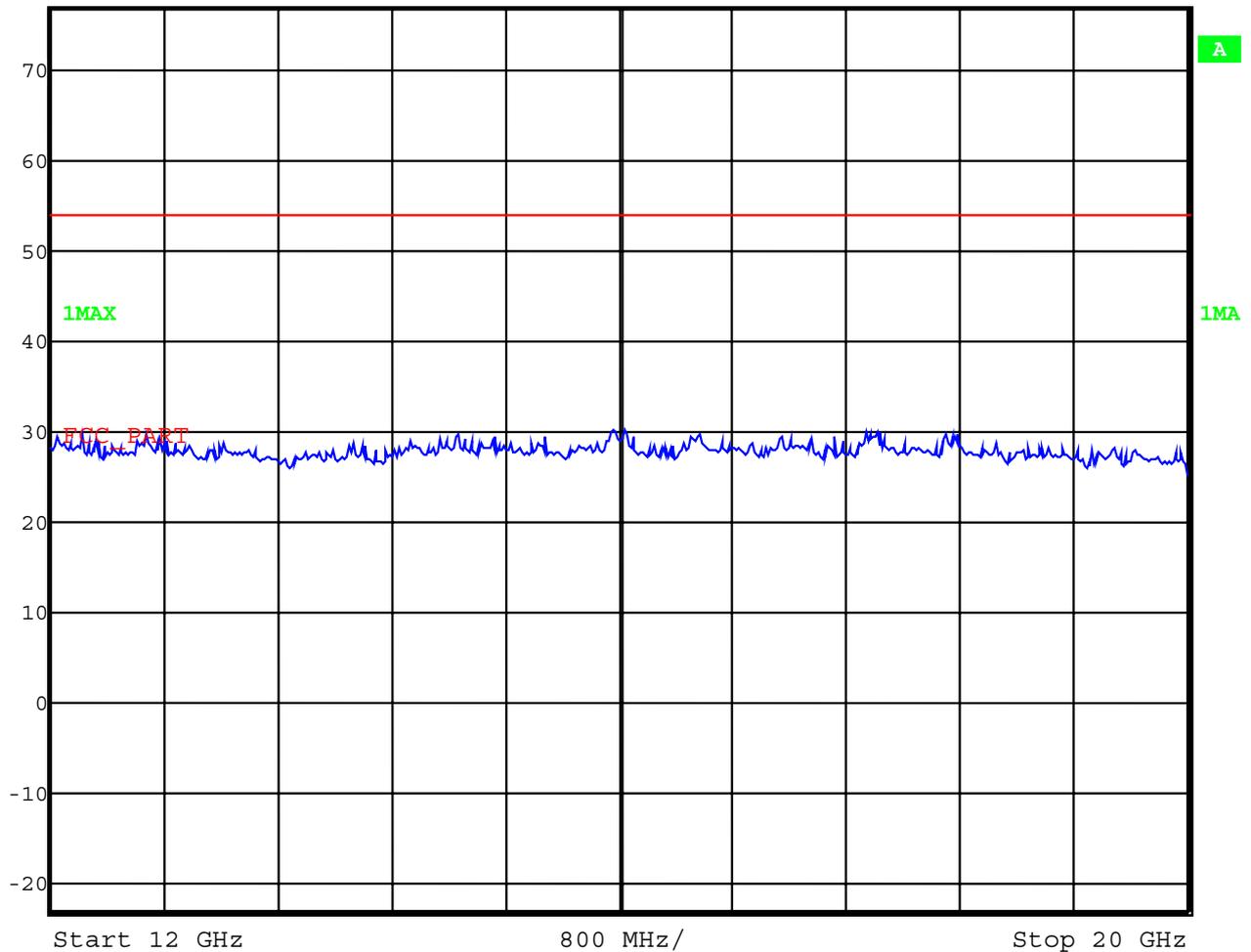
**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)**

Channel 661 : 12 – 20 GHz



Ref Lvl
77 dB μ V

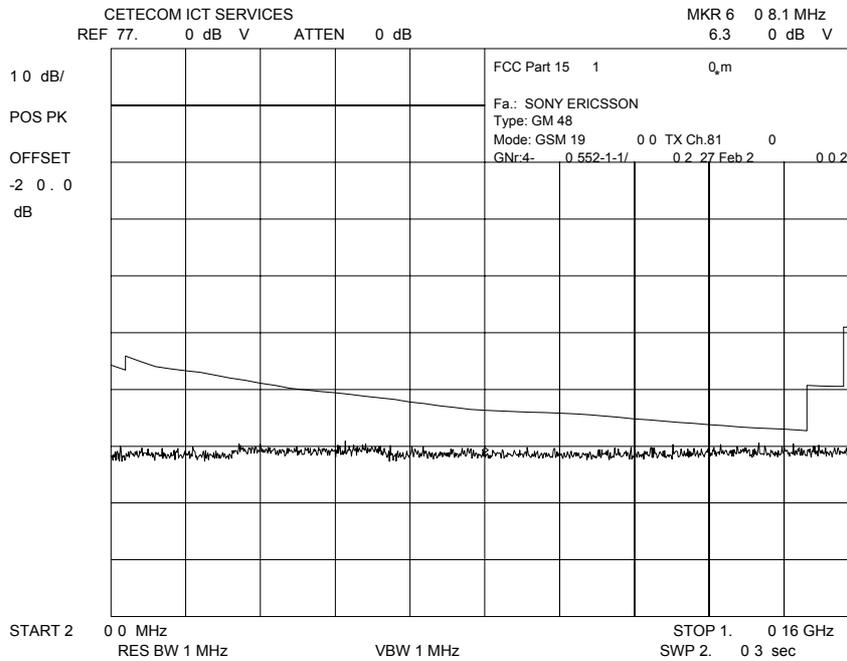
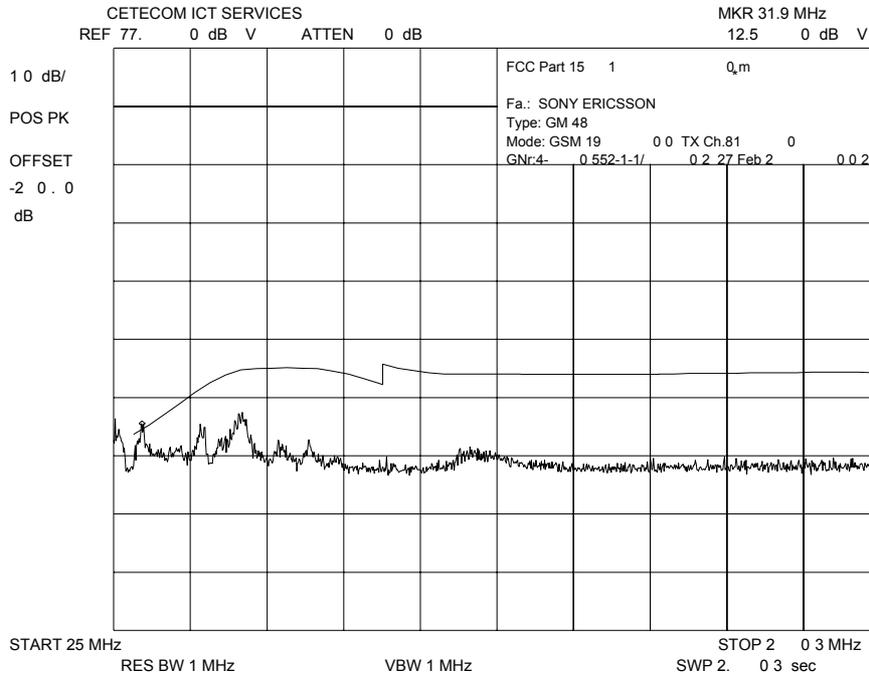
RBW 1 MHz RF Att 0 dB
VBW 1 MHz
SWT 46 ms Unit dB μ V



Date: 26.FEB.2002 13:19:11

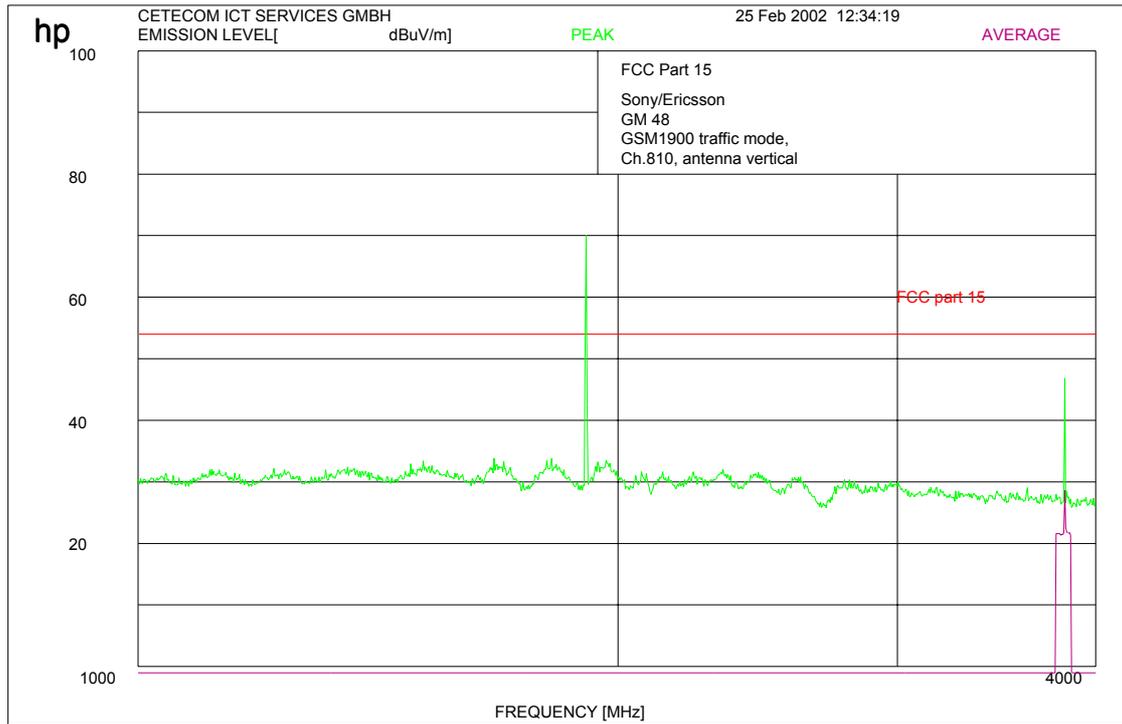
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 810 up to 1 GHz



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

Channel 810 up to 4 GHz

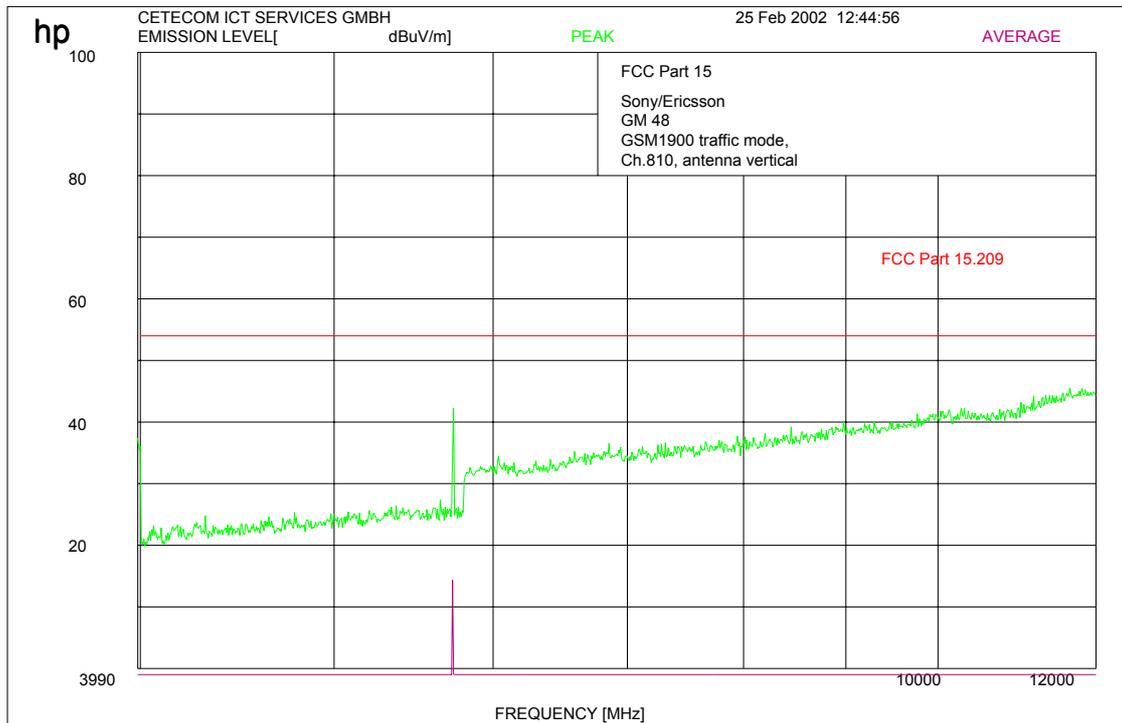


3821.3 MHz

28.6 dB μ V/m AV

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 810 : 4 –12 GHz



5729.9 MHz 14.3 dB μ V/m AV

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

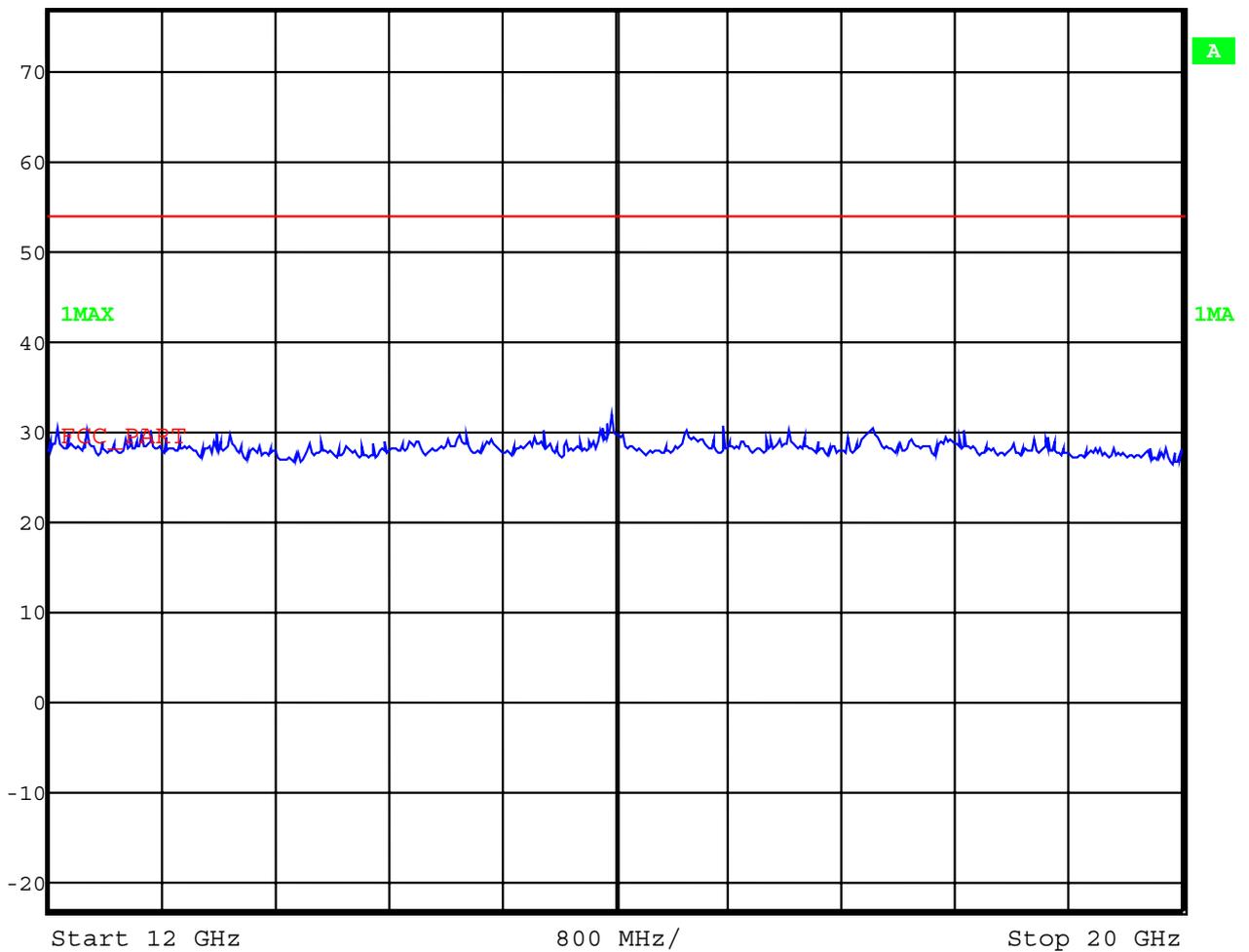
(for reference numbers see test equipment listing)

Channel 810 : 12 – 20 GHz



Ref Lvl
77 dB μ V

| | | | |
|-----|-------|--------|------------|
| RBW | 1 MHz | RF Att | 0 dB |
| VBW | 1 MHz | | |
| SWT | 46 ms | Unit | dB μ V |



Date: 26.FEB.2002 14:05:04

Channel 661 (this is valid for all 3 channels and up to 1 GHz) Idle-Mode

Test: Rad. Emission

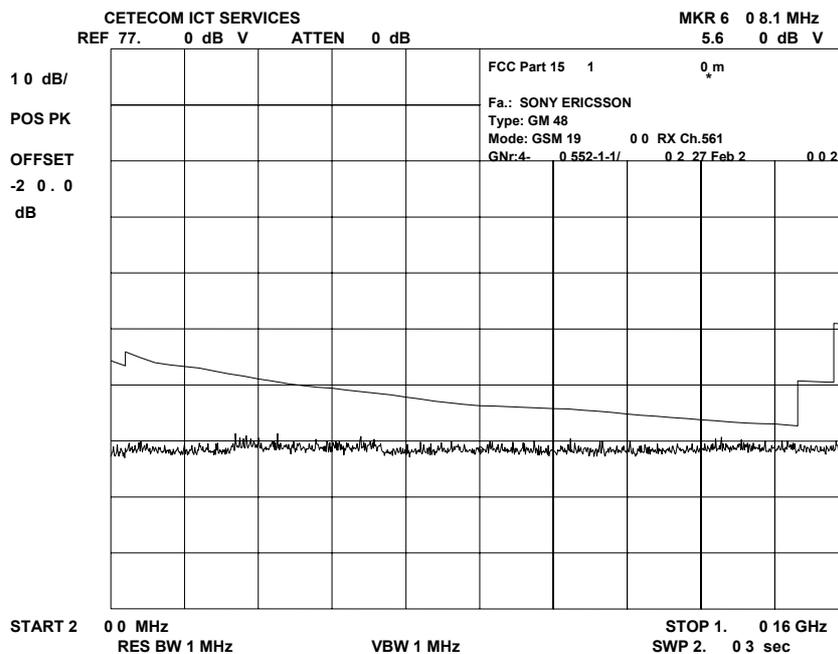
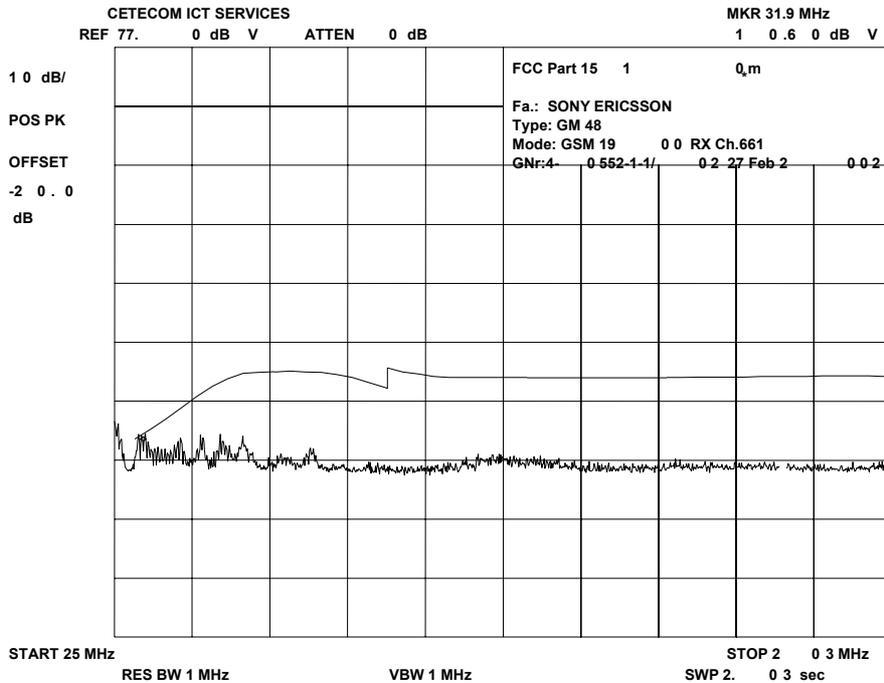
Data File : /10138_60_DOC

30 Jan 2002

| No | EMISSION | SPEC | MEASUREMENTS | | | SITE | | CORR | COMMENTS | |
|----|------------------|-----------------|--------------|------------|------|------|-----------|------------|----------|--------------|
| | FREQUENCY MHz | LIMIT dBuV/m | ABS | dLIM dB | MODE | POL | HGT cm | AZM deg | | FACTOR dB |
| 1 | 48.3 | 29.5 | 19.0 | -10.5 | PK | V | 97 | 360 | N/T | |
| 2 | 154.5 | 33.0 | 21.8 | -11.2 | PK | V | 97 | 360 | N/T | |
| 3 | 159.9 | 33.0 | 24.7 | -8.3 | PK | V | 97 | 360 | N/T | |

N/T in CORR FACTOR column denotes a non-traceable signal.

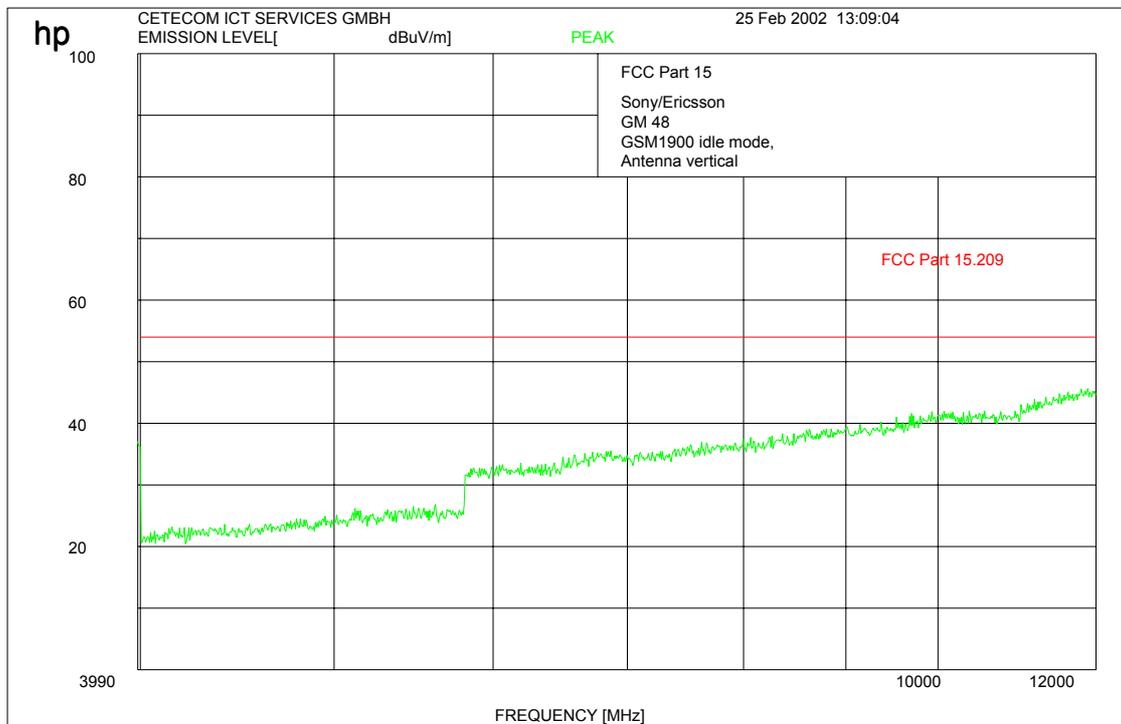
Channel 661 (this is valid for all 3 channels and up to 1 GHz) Idle-Mode



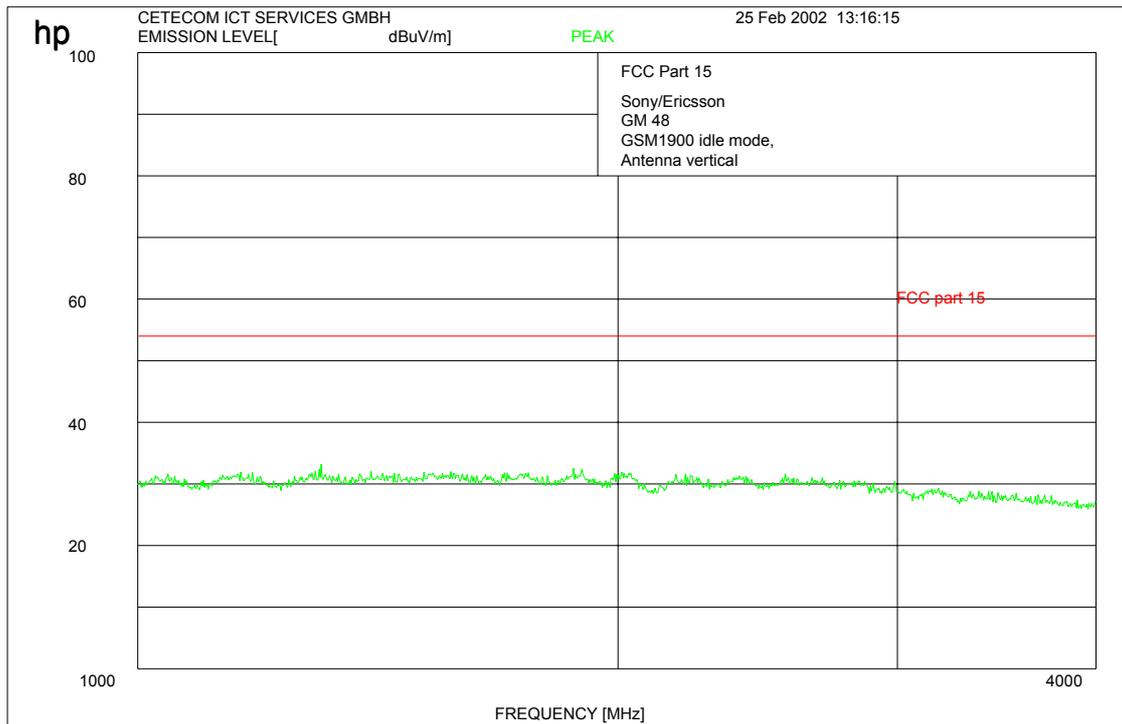
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

Channel 661 (this is valid for all 3 channels and up to 4 GHz) Idle-Mode



Channel 661 (this is valid for all 3 channels and 4 to 12 GHz) Idle-Mode



CONDUCTED SPURIOUS EMISSIONS

Measurement Procedure:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

USPCS Transmitter

Channel Frequency

512 1850.2 MHz

661 1880.0 MHz

810 1909.8 MHz

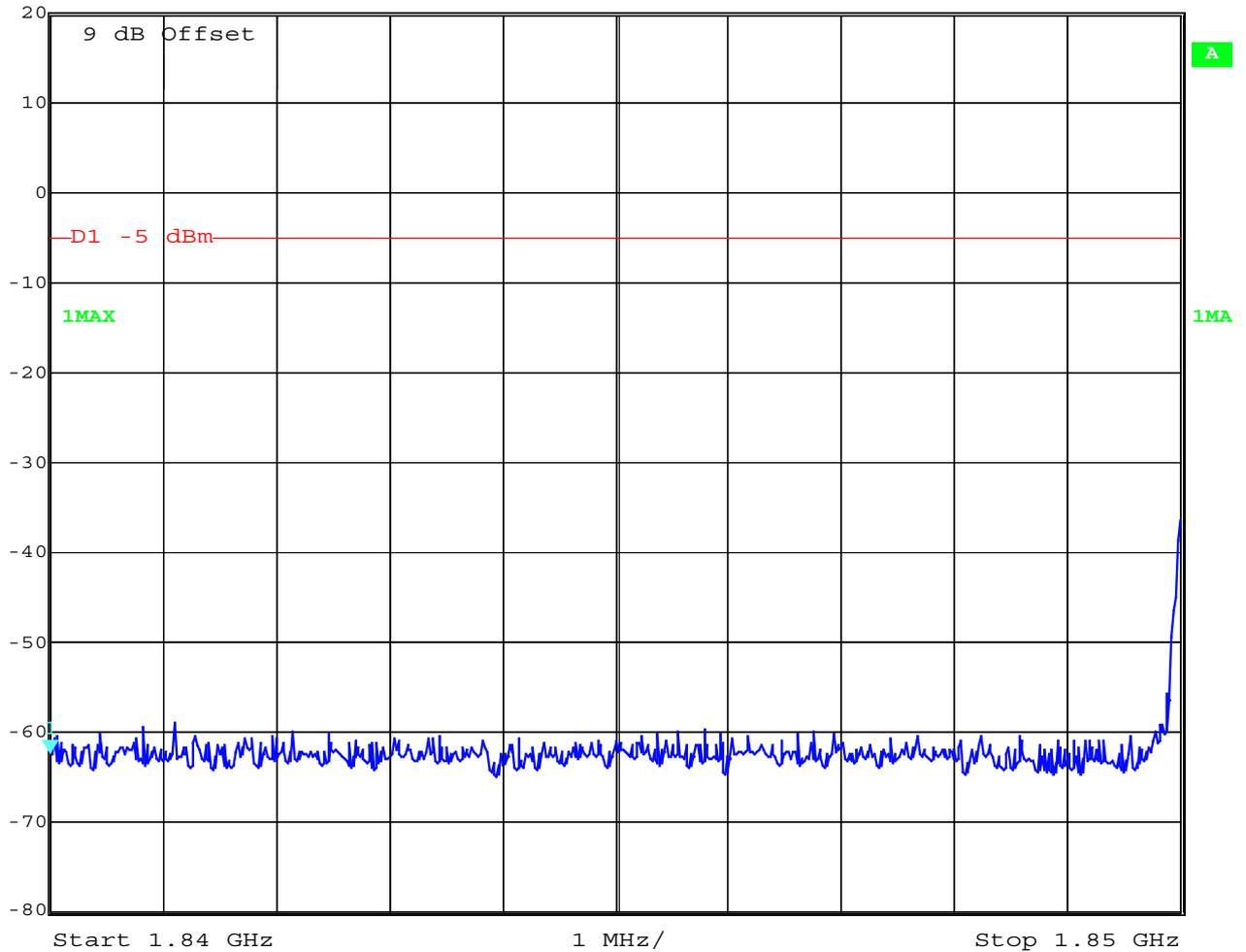
Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Channel 512

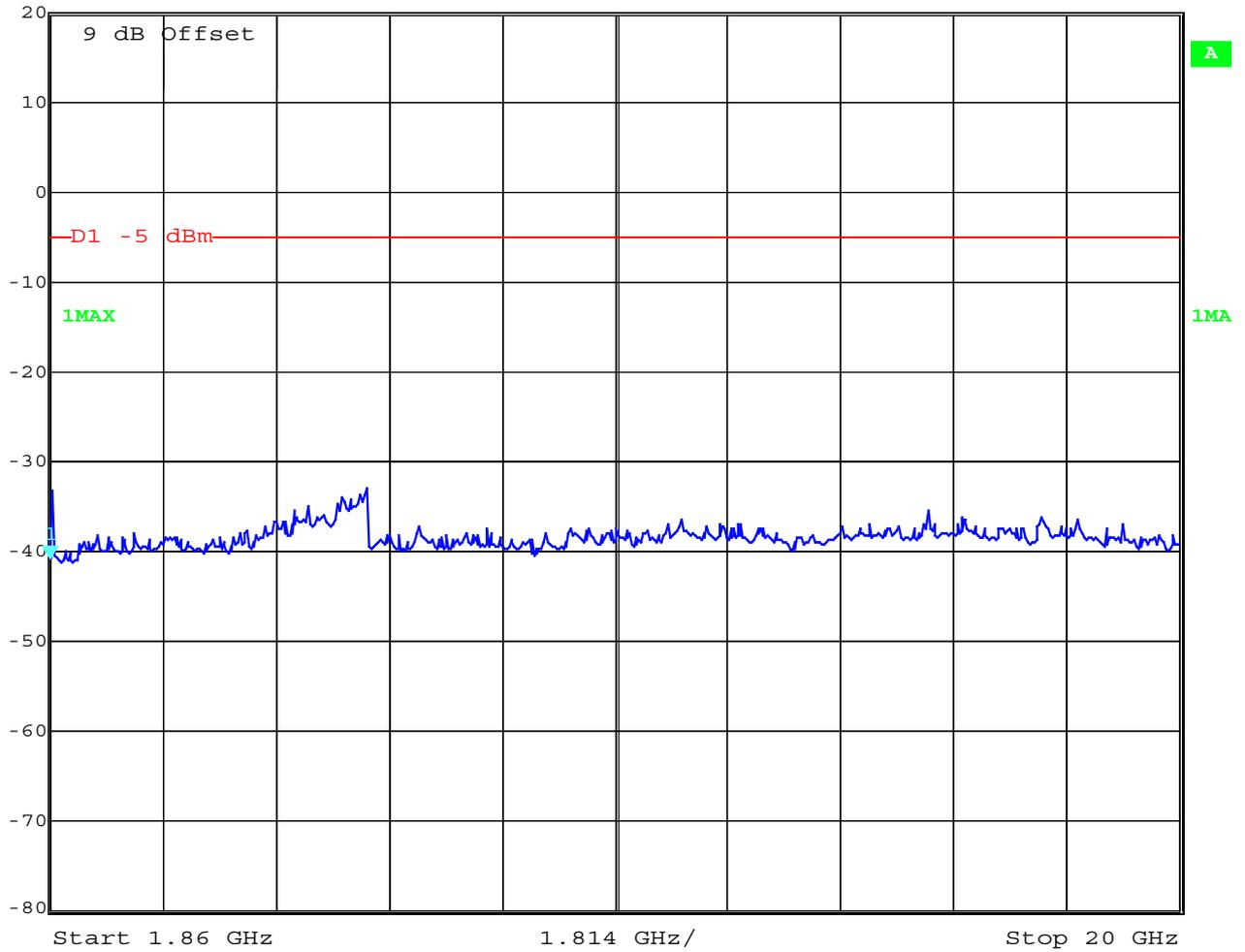
| | | | | | |
|--|---------------|----------------|-------|--------|-------|
| | Marker 1 [T1] | RBW | 3 kHz | RF Att | 40 dB |
| | Ref Lvl | -62.26 dBm | VBW | 3 kHz | |
| | 20 dBm | 1.84000000 GHz | SWT | 2.8 s | Unit |
| | | | | | dBm |



Date: 25.FEB.2002 14:04:46

Channel 512

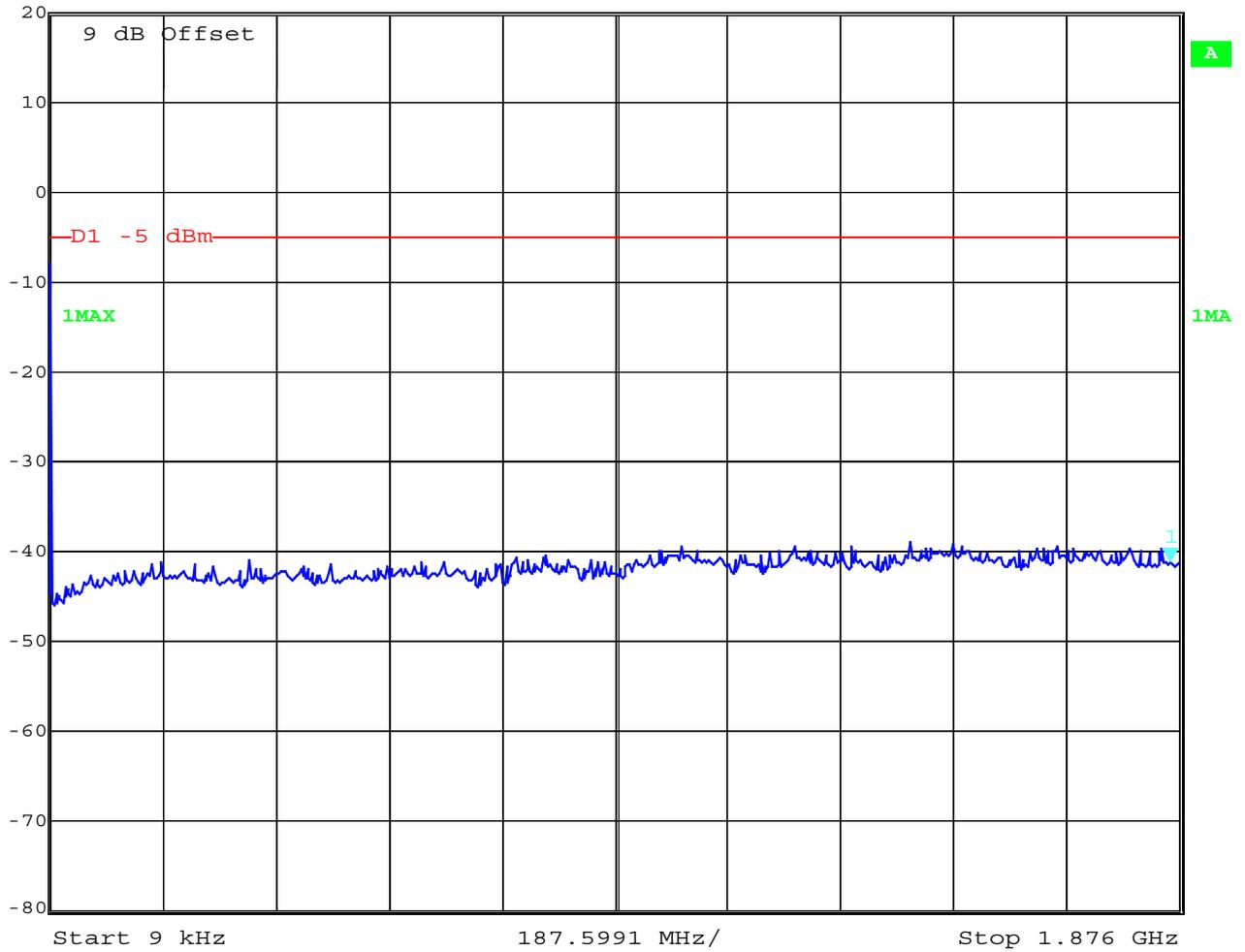
Marker 1 [T1]
RBW 100 kHz
RF Att 40 dB
Ref Lvl -40.85 dBm
VBW 100 kHz
20 dBm
1.86000000 GHz
SWT 4.6 s
Unit dBm



Date: 25.FEB.2002 14:06:20

Channel 661

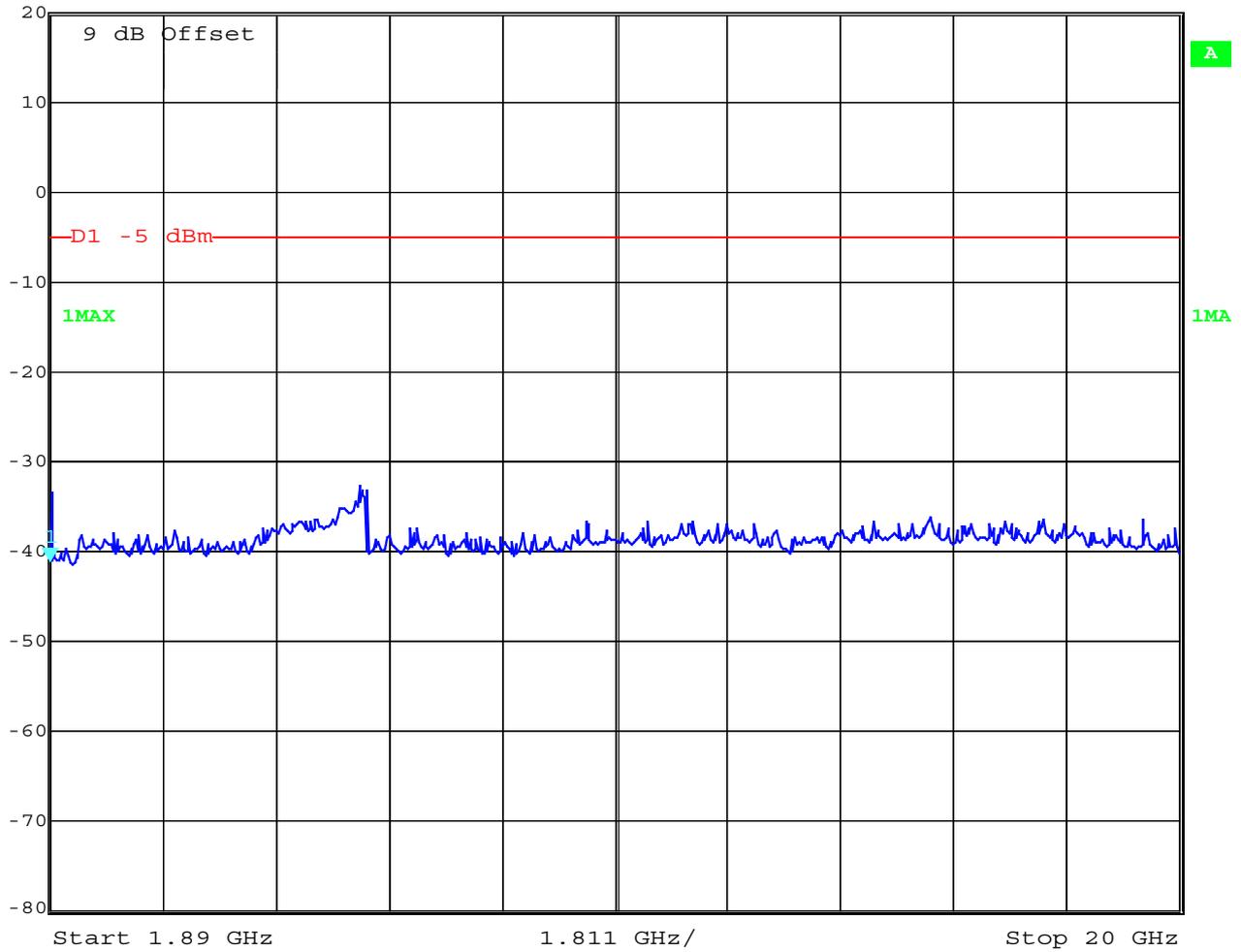
Marker 1 [T1]
RBW 100 kHz
RF Att 40 dB
Ref Lvl -41.18 dBm
VBW 100 kHz
20 dBm
1.86000000 GHz
SWT 470 ms
Unit dBm



Date: 25.FEB.2002 14:07:16

Channel 661

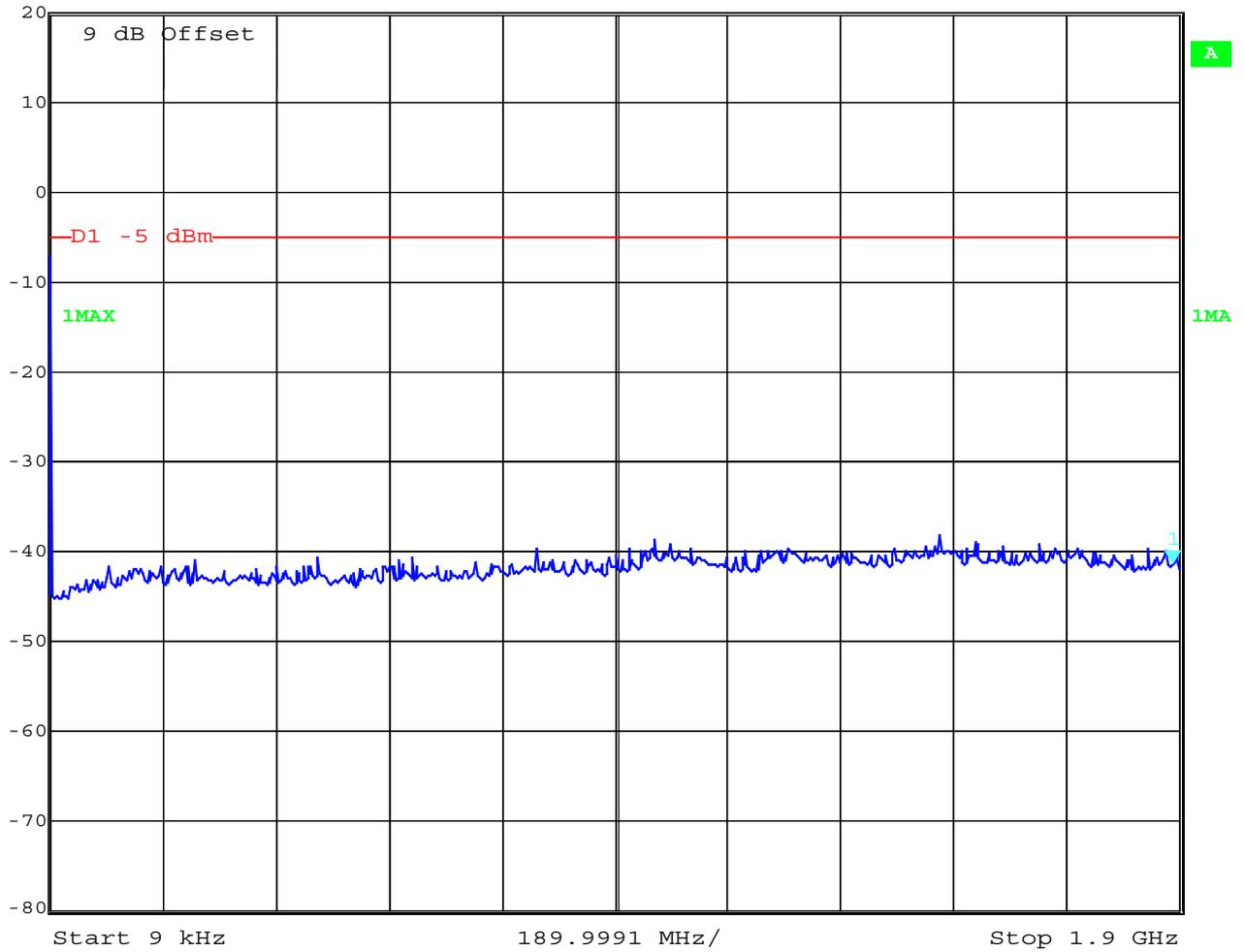
Marker 1 [T1]
RBW 100 kHz
RF Att 40 dB
Ref Lvl -41.17 dBm
VBW 100 kHz
20 dBm
1.89000000 GHz
SWT 4.6 s
Unit dBm



Date: 25.FEB.2002 14:07:58

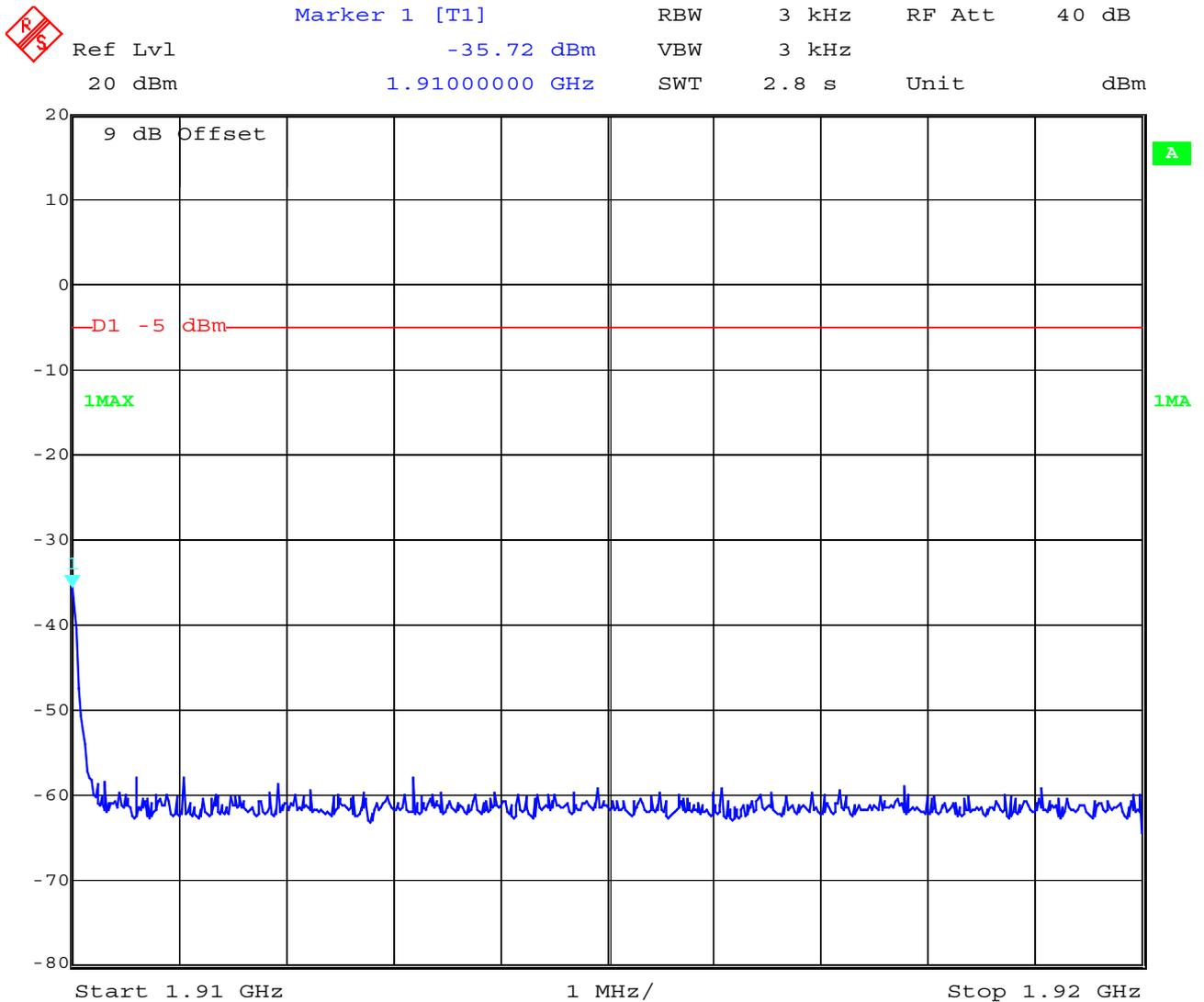
Channel 810

| | | | | | |
|--|---------------|----------------|---------|---------|----------|
| | Marker 1 [T1] | RBW | 100 kHz | RF Att | 40 dB |
| | Ref Lvl | -41.45 dBm | VBW | 100 kHz | |
| | 20 dBm | 1.89000000 GHz | SWT | 480 ms | Unit dBm |



Date: 25.FEB.2002 14:08:51

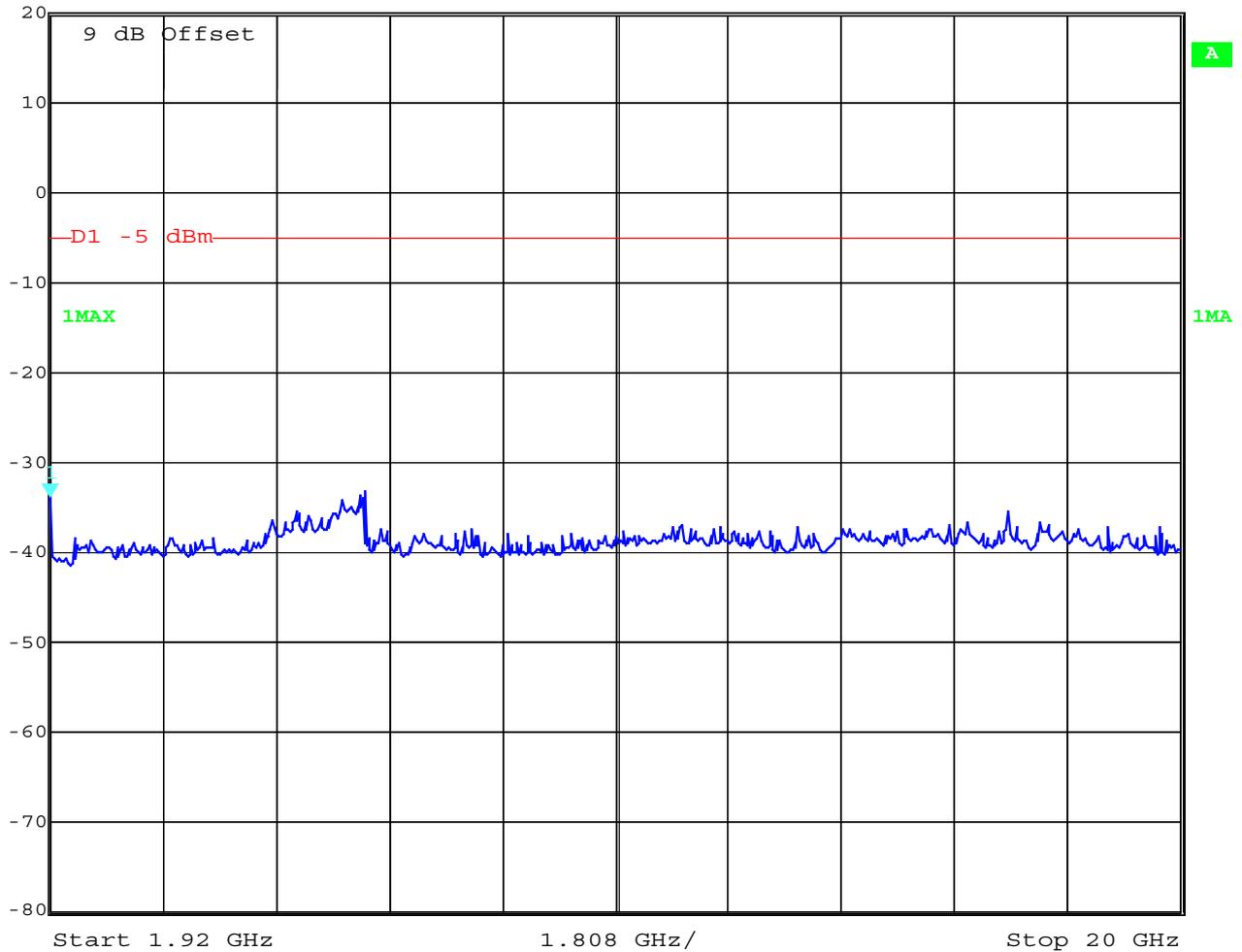
Channel 810



Date: 25.FEB.2002 14:15:34

Channel 810

| | | | | | |
|--|---------------|----------------|---------|---------|---------------|
| | Marker 1 [T1] | RBW | 100 kHz | RF Att | 40 dB |
| | Ref Lvl | -33.80 dBm | VBW | 100 kHz | |
| | 20 dBm | 1.92000000 GHz | SWT | 4.6 s | Unit dBm |



Date: 25.FEB.2002 14:16:47

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

17 - 24, 64

OCCUPIED BANDWIDTH

§2.989

Occupied Bandwidth Results

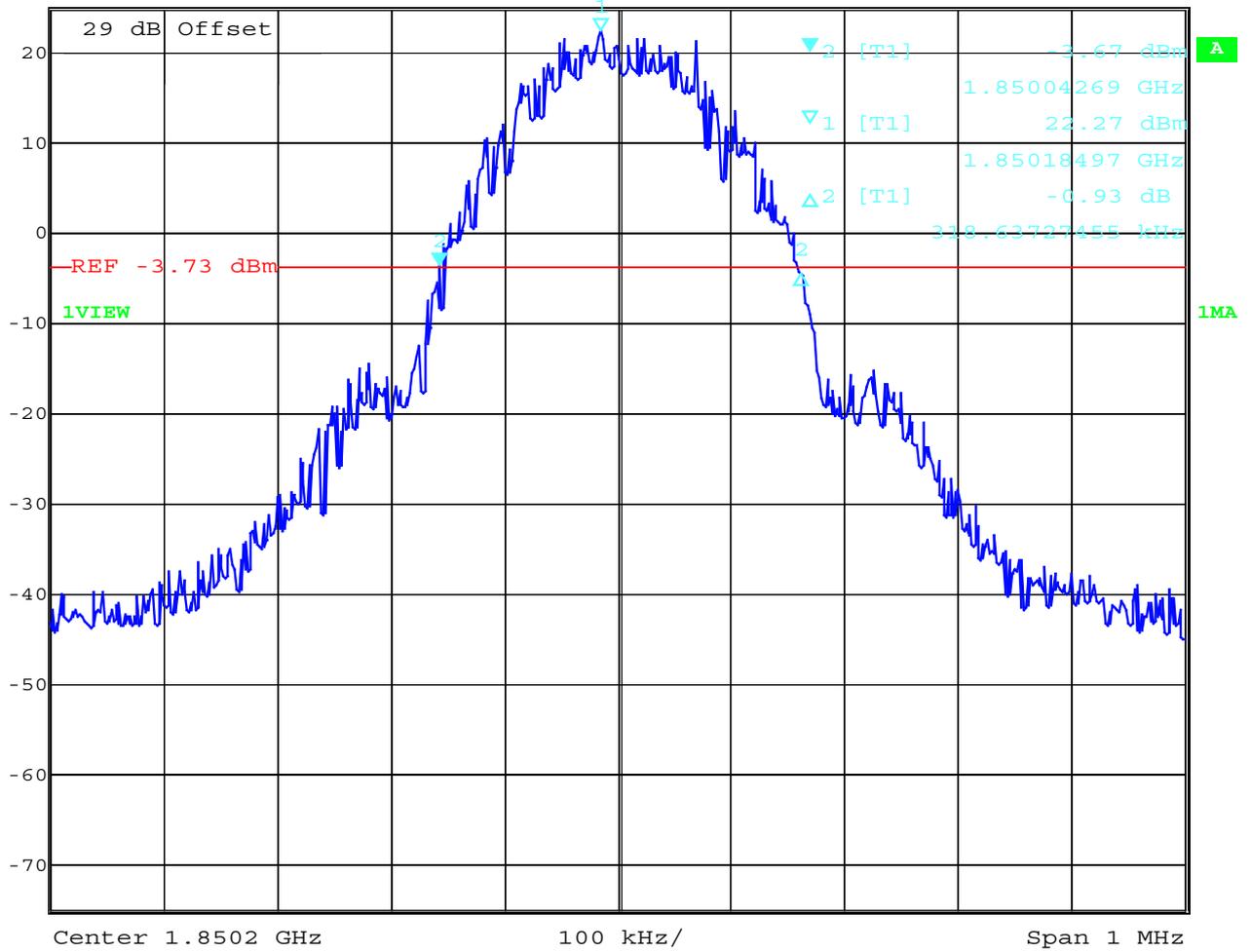
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

| Frequency | 99% Occupied Bandwidth | -26 dBc Bandwidth |
|-------------------|-------------------------------|--------------------------|
| 1850.2 MHz | 286.6 | 318.6 |
| 1880.0 MHz | 274.5 | 310.6 |
| 1909.2 MHz | 266.5 | 310.6 |

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 290 kHz, this equates to a resolution bandwidth of at least 2.96 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

Channel 512
-26 dBc Bandwidth

| | | | | | |
|--|---------------|----------------|-------|--------|-------|
| | Marker 2 [T1] | RBW | 3 kHz | RF Att | 40 dB |
| | Ref Lvl | -3.67 dBm | VBW | 3 kHz | |
| | 25 dBm | 1.85004269 GHz | SWT | 280 ms | Unit |



Date: 25.FEB.2002 14:24:16

PART PCS850

POWER OUTPUT

SUBCLAUSE § 24.232

Summery:

This paragraph contains both average , peak output powers and EIRP measurements for the mobile station.

In all cases, the peak output power is wthin the required mask (this mask is specified in the JTC standart, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Method of Measurements:

The mobile was set up for the max. output power with pseudo random data modulation.

The power was measured with R&S Spectrum Analyzer FSIQ 26 (peak and average)

This measurements were done at 3 frequencies, 824.2 MHz, 836.4 MHz and 848.8 MHz (bottom, middle and top of operational frequency range)

Limits:

| Power Step | Nominal Peak Output Power (dBm) | Tolerance (dB) |
|------------|---------------------------------|----------------|
| 0 | +30 | ± 2 |

Power Measurements:

Conducted:

| Frequency (MHz) | Power Step | Peak Output Power (dBm) | Average Output Power (dBm) |
|-------------------------|------------|-------------------------|----------------------------|
| 824.2 | 0 | 30.47 | 30.36 |
| 836.4 | 0 | 29.12 | 29.02 |
| 848.8 | 0 | 29.46 | 29.35 |
| Measurement uncertainty | | ±0.5 dB | |

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

EIRP Measurements

Description: This is the test for the maximum radiated power from the phone.

Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts e.i.r.p. peak power..." and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Method of Measurement:

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference center of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as $Pin + 2.1 - Pr$.
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the co-ordinates determined in Step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.1 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.1 \text{ dBi}$.

Limits:

| Power Step | Burst Average EIRP (dBm) |
|-------------------|---------------------------------|
| 0 | <33 |

Power Measurements:

Radiated:

| Frequency (MHz) | Power Step | BURST AVERAGE (dBm) | | MODULATION AVERAGE (dBm) | |
|--------------------------------|-------------------|----------------------------|--------------|---------------------------------|--------------|
| | | EIRP | ERP | EIRP | ERP |
| 824.2 | 0 | 28.51 | 26.41 | 19.51 | 17.41 |
| 836.4 | 0 | 29.00 | 26.90 | 20.00 | 17.90 |
| 848.8 | 0 | 28.80 | 26.70 | 19.80 | 17.70 |
| Measurement uncertainty | | ±3 dB | | | |

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

FREQUENCY STABILITY

SUBCLAUSE § 24.235

Method of Measurement:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMD 65 DIGITAL RADIOCOMMUNICATION TESTER..

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with 3.6 Volts, connected to the CMD 65 and in a simulated call on channel 189 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal 3.6 Volts. Vary supply voltage from minimum 3.4 Volts to maximum 4.0 Volts, in 0.05 Volt increments remeasuring carrier frequency at each voltage. Pause at 3.6 Volts for 1 1/2 hours unpowered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with 3.6 Volts, connected to the CMD 65 and in a simulated call on channel 189 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Limit:

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment...", Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.4 Vdc and 4.0 Vdc, with a nominal voltage of 3.6 Vdc. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of + 11.1 % and - 5.4 %. For the purposes of measuring frequency stability these voltage limits are to be used.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

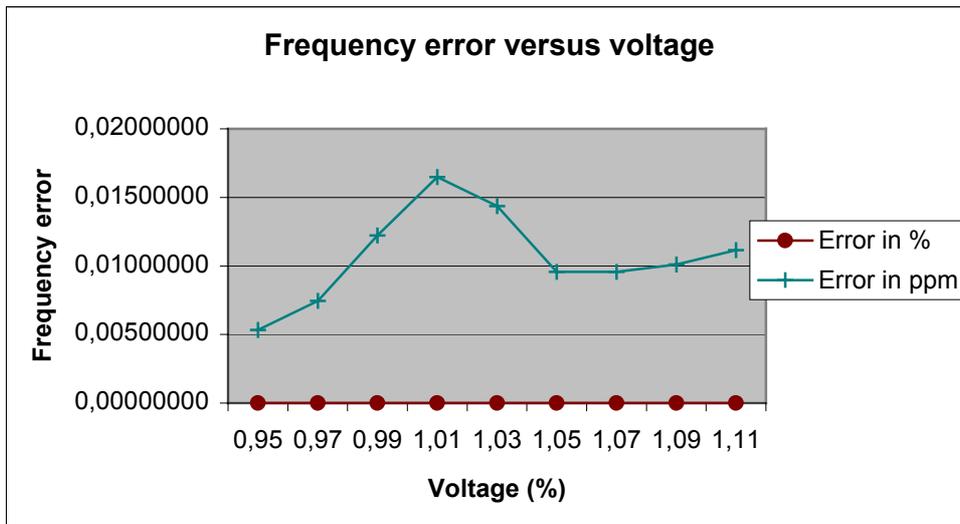
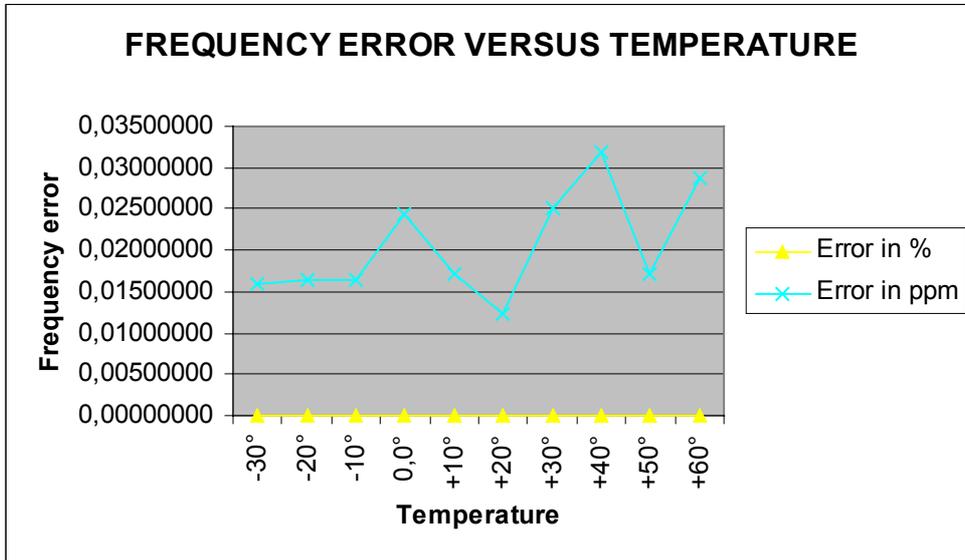
AFC FREQ ERROR vs. VOLTAGE

| Voltage (V) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|------------------------|---------------------------------|----------------------------------|--------------------------------|
| 3.40 | +10 | 0.01 | |
| 3.45 | +14 | 0.02 | |
| 3.50 | +23 | 0.03 | |
| 3.55 | +23 | 0.03 | |
| 3.60 | +23 | 0.03 | |
| 3.65 | +31 | 0.04 | |
| 3.70 | +27 | 0.03 | |
| 3.75 | +21 | 0.03 | |
| 3.80 | +18 | 0.02 | |
| 3.85 | +18 | 0.02 | |
| 3.90 | +19 | 0.02 | |
| 3.95 | +21 | 0.03 | |
| 4.00 | +21 | 0.03 | |

AFC FREQ ERROR vs. TEMPERATURE

| TEMPERATURE (°C) | Frequency Error (Hz) | Frequency Error (ppm) | Frequency Error (%) |
|-----------------------------|---------------------------------|----------------------------------|--------------------------------|
| -30 | +30 | 0.04 | |
| -20 | +31 | 0.04 | |
| -10 | +31 | 0.04 | |
| ±0.0 | +46 | 0.05 | |
| +10 | +32 | 0.04 | |
| +20 | +23 | 0.03 | |
| +30 | +47 | 0.06 | |
| +40 | +60 | 0.07 | |
| +50 | +32 | 0.04 | |
| +60 | +54 | 0.06 | |

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

EMISSIONS LIMITS

§24.238

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 848.8 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

The final open field emission test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$Pg = E^2 4\pi d^2 / 120\pi = E^2 d^2 / 30$$

where : P = power in watts
 g = arithmetic gain of transmitting antenna over isotropic radiator.
 E = maximum field strength in volts/meter
 d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3 meters, this equation reduces to:

$$P(\text{dBm}) = E(\text{dBuV/m}) - 97.2\text{dB}$$

Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43 + 10\log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10\log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Measurement Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (824.2 MHz, 836.4 MHz and 848.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:

The final open field radiated levels are presented on the next pages.

As can be seen from this data, the emissions from the test item were within the specification limit.

Channel 128

Data File : /40552_30.DOC

27 Feb 2002

| No | EMISSION | SPEC LIMIT | MEASUREMENTS | | | POL | SITE | | CORR FACTOR | COMMENTS |
|----|------------------|---------------|--------------|------|------|-----|------|-----|----------------|----------|
| | FREQUENCY MHz | | ABS | dLIM | MODE | | HGT | AZM | | |
| 1 | 32.466 | 29.5 | 25.9 | -3.6 | QP | V | 105 | 33 | 17.8 | |
| 8 | 812.1 | 35.5 | 32.8 | -2.7 | PK | V | 97 | 360 | N/T | UPLINK |
| 9 | 822.7 | 35.5 | 102. | 67.0 | PK | V | 97 | 360 | N/T | CARRIER |
| 10 | 866.8 | 35.5 | 42.1 | 6.6 | PK | H | 332 | 0 | N/T | DOWNLINK |
| 11 | 874.1 | 35.5 | 42.4 | 6.9 | PK | H | 332 | 0 | N/T | DOWNLINK |

Channel 189

Data File : /40552_25.DOC

27 Feb 1902 2002

| No | EMISSION | SPEC LIMIT | MEASUREMENTS | | | POL | SITE | | CORR FACTOR | COMMENTS |
|----|------------------|---------------|--------------|------|------|-----|------|-----|----------------|----------|
| | FREQUENCY MHz | | ABS | dLIM | MODE | | HGT | AZM | | |
| 1 | 31.684 | 29.5 | 25.9 | -3.6 | QP | V | 103 | 12 | 18.2 | |
| 5 | 824.3 | 35.5 | 34.8 | -0.7 | PK | H | 331 | 0 | N/T | UPLINK |
| 6 | 834.9 | 35.5 | 100. | 64.9 | PK | V | 97 | 360 | N/T | CARRIER |
| 7 | 874.1 | 35.5 | 42.2 | 6.7 | PK | H | 331 | 92 | N/T | DOWNLINK |
| 8 | 879.8 | 35.5 | 41.9 | 6.4 | PK | H | 331 | 32 | N/T | DOWNLINK |

Channel 251

Data File : /40552_35.DOC

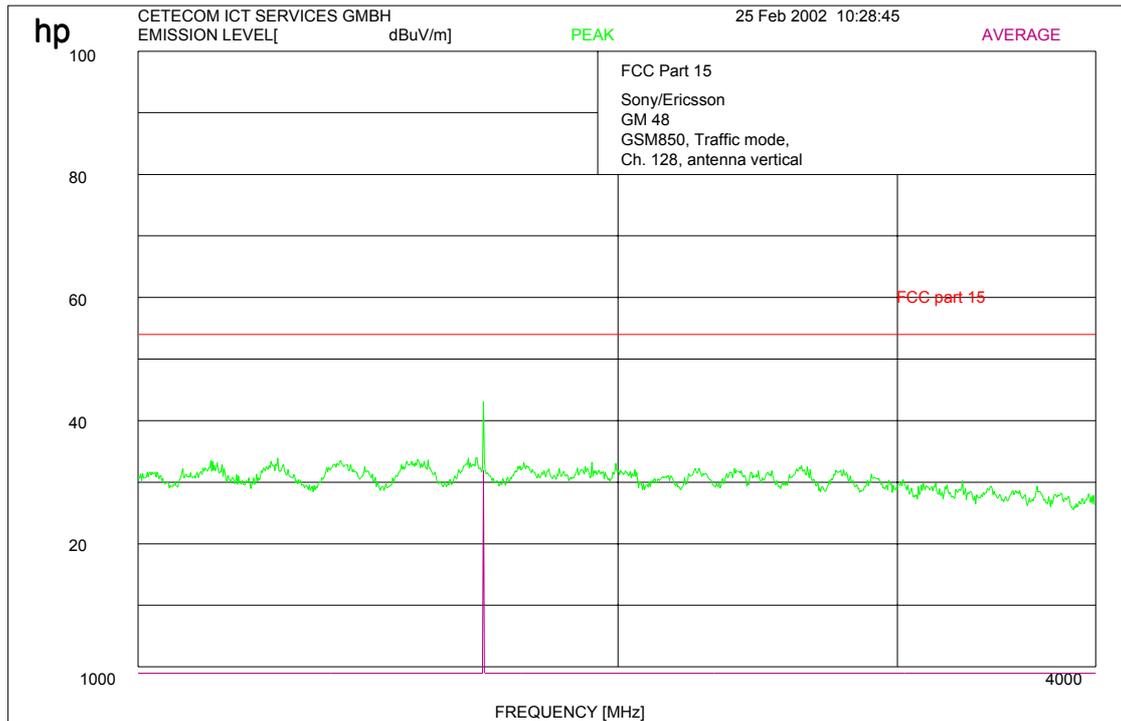
27 Feb 2002

| No | EMISSION | SPEC LIMIT | MEASUREMENTS | | | POL | SITE | | CORR FACTOR | COMMENTS |
|----|------------------|---------------|--------------|------|------|-----|------|-----|----------------|----------|
| | FREQUENCY MHz | | ABS | dLIM | MODE | | HGT | AZM | | |
| 1 | 31.928 | 29.5 | 27.2 | -2.3 | QP | V | 97 | 355 | 18.1 | |
| 7 | 845.5 | 35.5 | 37.7 | 2.2 | PK | V | 97 | 0 | N/T | UPLINK |
| 8 | 846.4 | 35.5 | 100. | 65.1 | PK | V | 97 | 122 | N/T | CARRIER |
| 9 | 874.1 | 35.5 | 42.5 | 7.0 | PK | H | 331 | 214 | N/T | DOWNLINK |
| 10 | 891.2 | 35.5 | 42.5 | 7.0 | PK | H | 331 | 303 | N/T | DOWNLINK |

N/T in CORR FACTOR column denotes a non-traceable signal.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

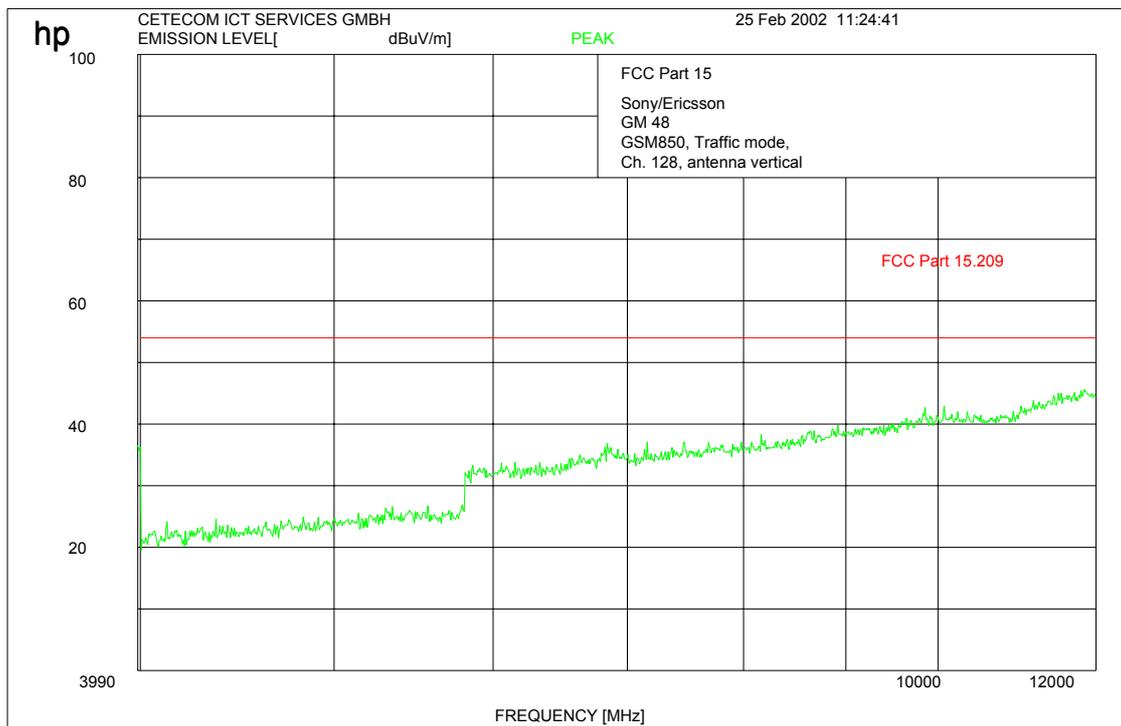
Channel 128 (up to 4 GHz)



371648.6MHz

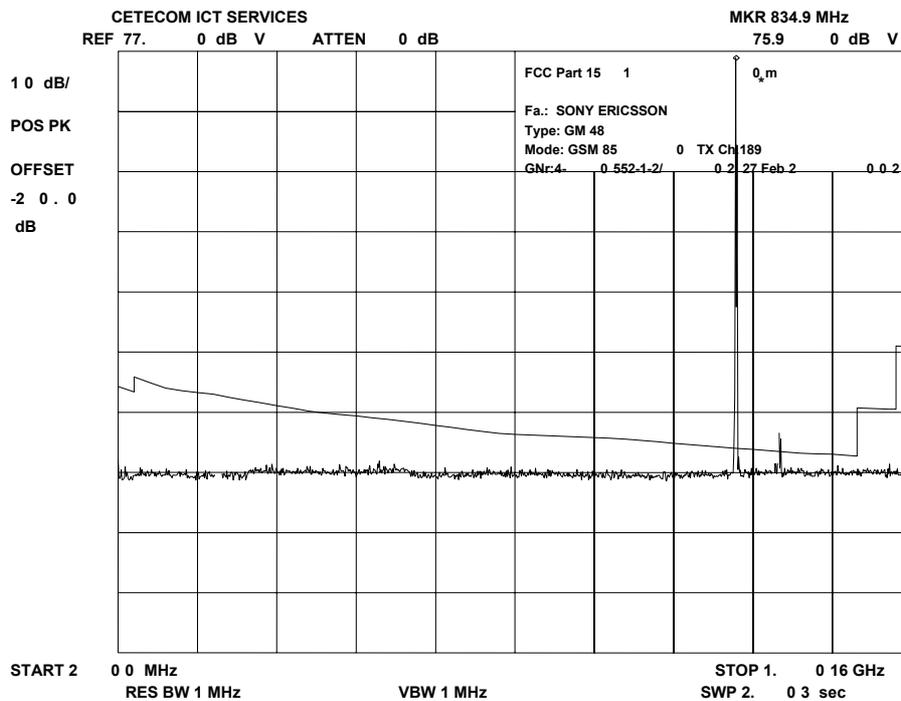
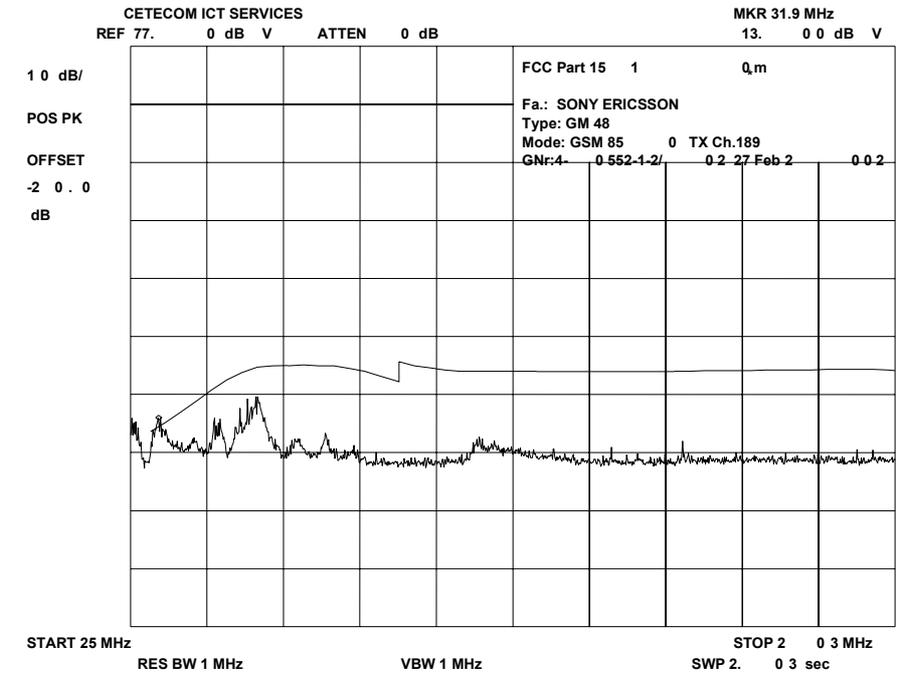
31.9 dB μ V/m AV

Channel 128 :- 12 GHz



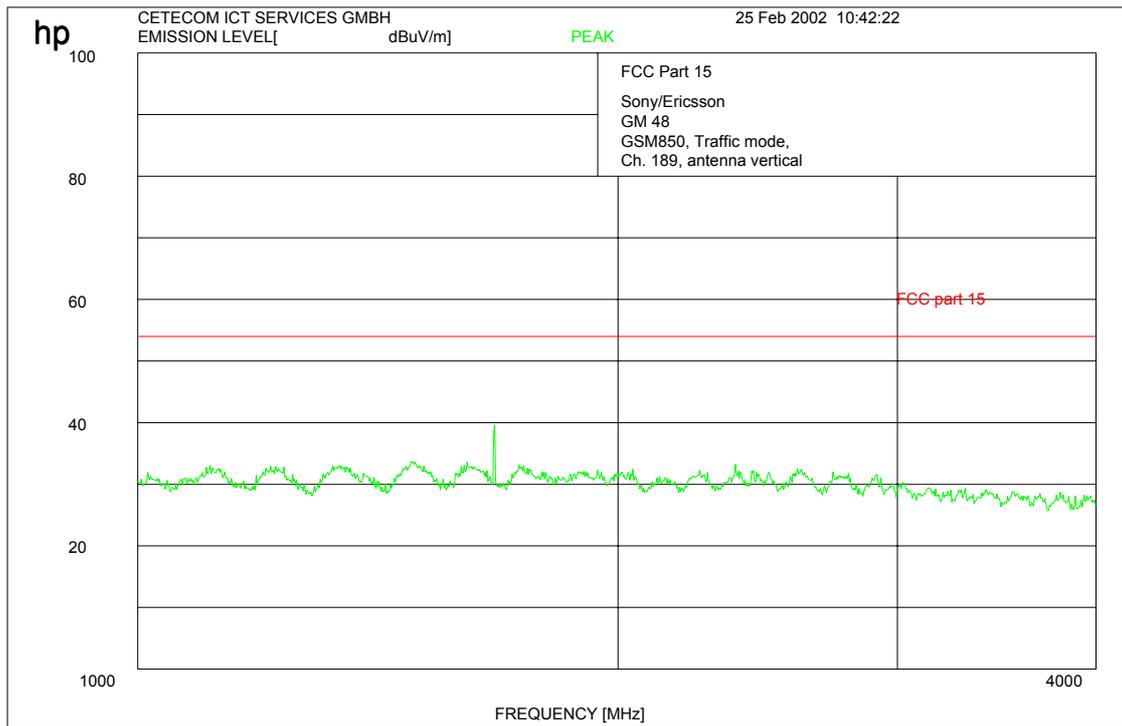
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 189 (up to 1 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

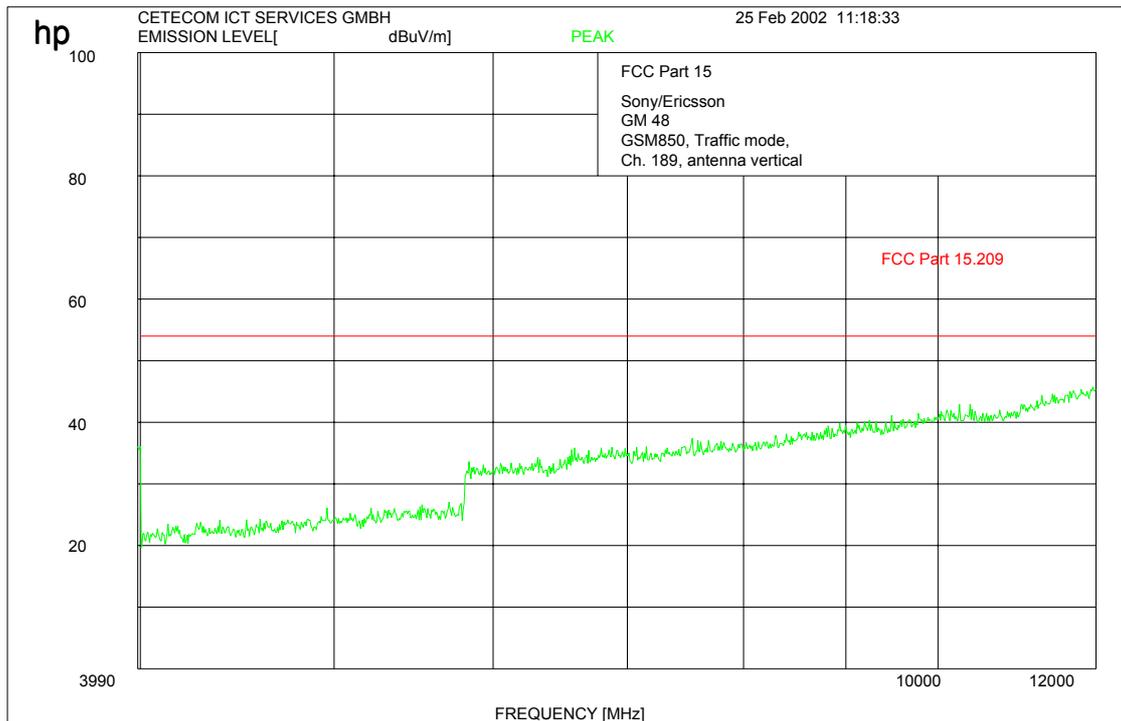
Channel 189 (up to 4 GHz)



1676.3 MHz

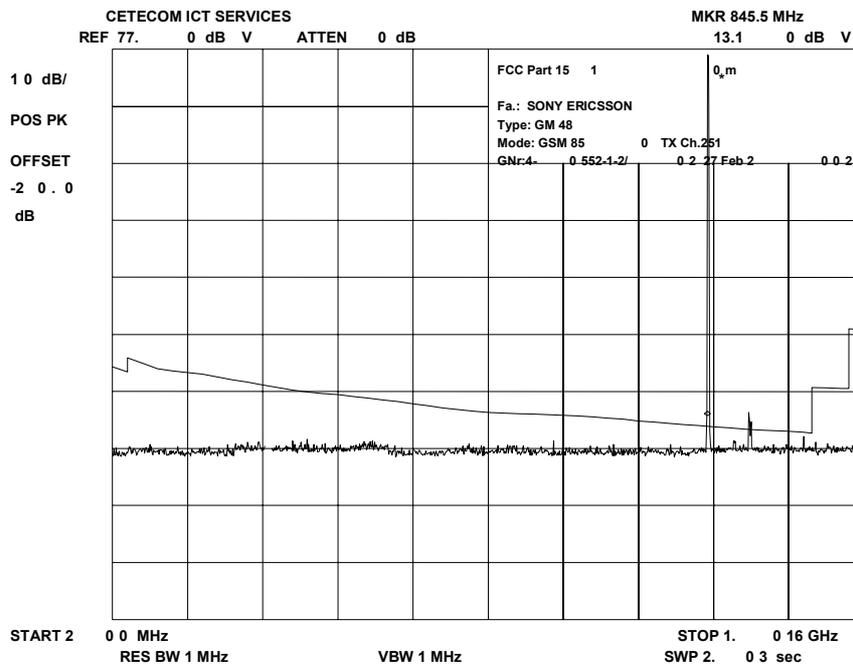
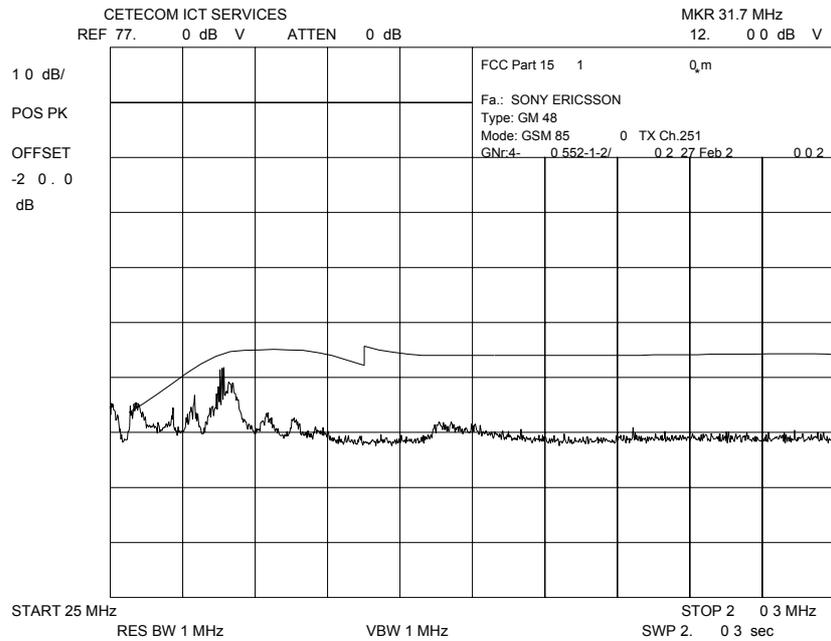
25.0 dB μ V/m AV

Channel 189 : 4 – 12 GHz



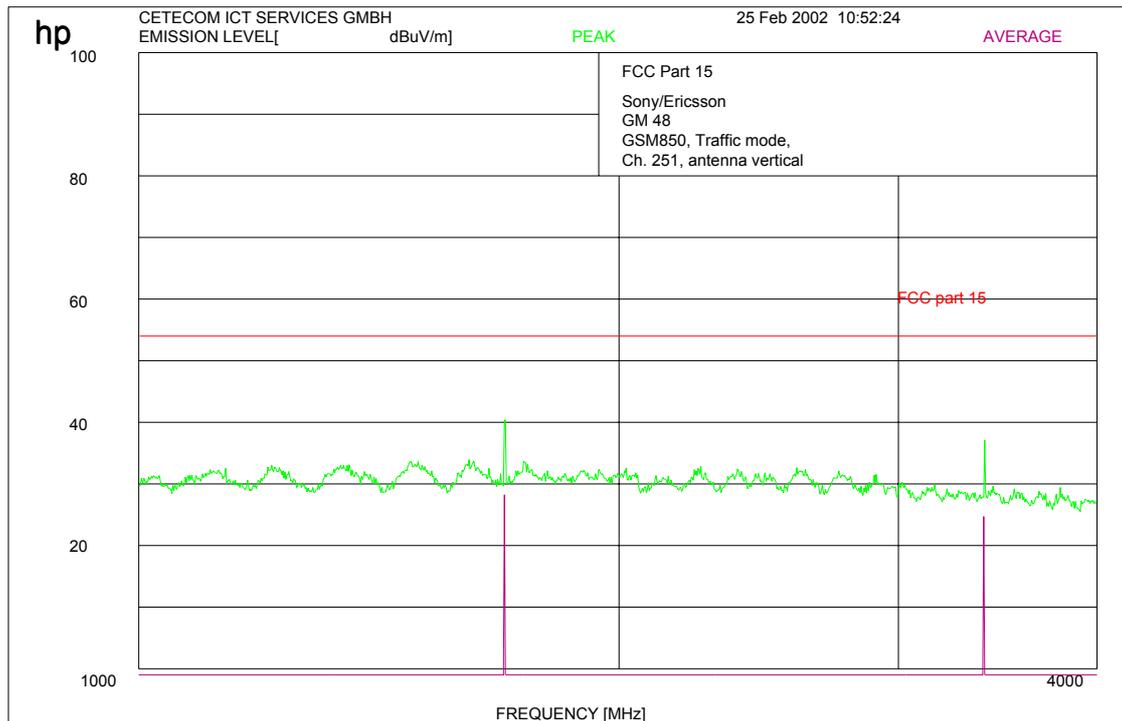
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 251 up to 1 GHz



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

Channel 251 up to 4 GHz

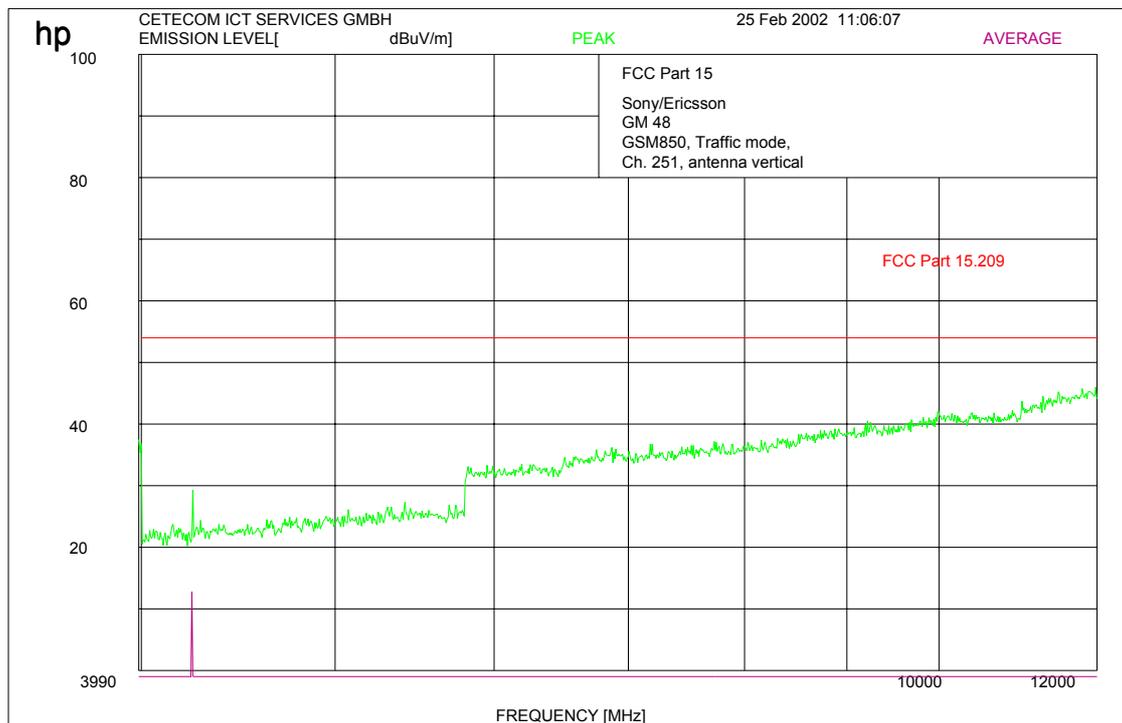


1697.3 MHz 28.2 dB μ V/m AV

3392.2 MHz 24.7 dB μ V/m AV

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)**

Channel 251 : 4 –12 GHz



4243.5 MHz 12.8 dB μ V/m AV

Channel 189 (this is valid for all 3 channels and up to 1 GHz) Idle-Mode

Test: Rad. Emission

Data File : /40552_40.DOC

27 Feb 2002

| No | EMISSION | SPEC | MEASUREMENTS | | | SITE | | CORR | COMMENTS | |
|----|------------------|-----------------|--------------|------------|------|------|-----------|------------|----------|--------------|
| | FREQUENCY MHz | LIMIT dBuV/m | ABS | dLIM dB | MODE | POL | HGT cm | AZM deg | | FACTOR dB |
| 1 | 31.642 | 29.5 | 26.4 | -3.1 | QP | V | 105 | 349 | 18.2 | |
| 2 | 40.4 | 29.9 | 24.2 | -5.3 | PK | V | 97 | 360 | N/T | |
| 3 | 45.4 | 29.5 | 22.2 | -7.3 | PK | V | 97 | 360 | N/T | |
| 4 | 50.6 | 29.5 | 19.6 | -9.9 | PK | V | 97 | 360 | N/T | |
| 5 | 54.8 | 29.5 | 19.0 | -10.5 | PK | V | 97 | 360 | N/T | |

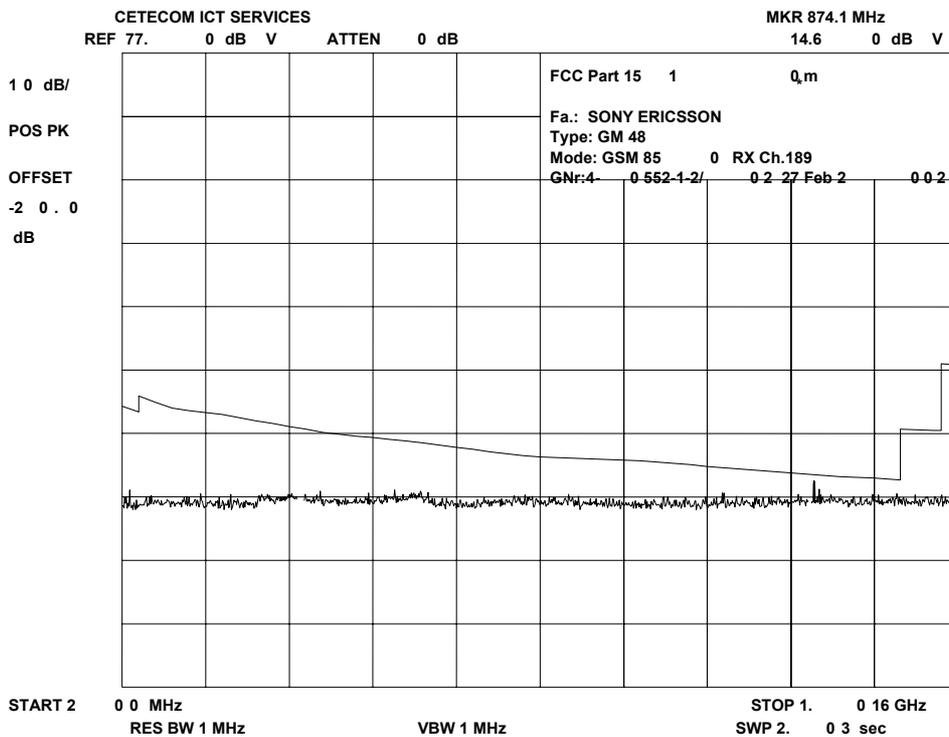
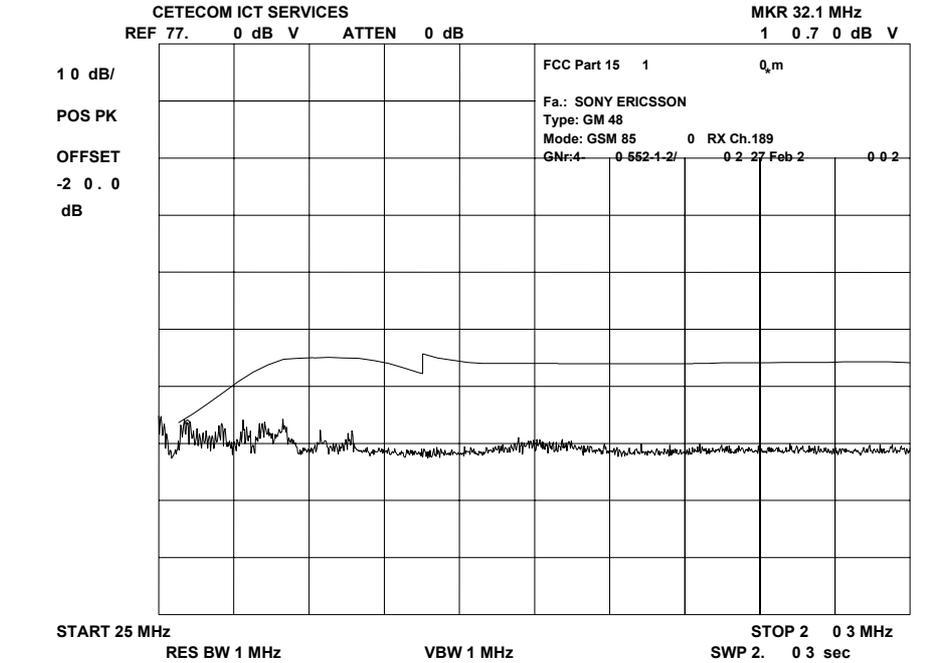
N/T in CORR FACTOR column denotes a non-traceable signal.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

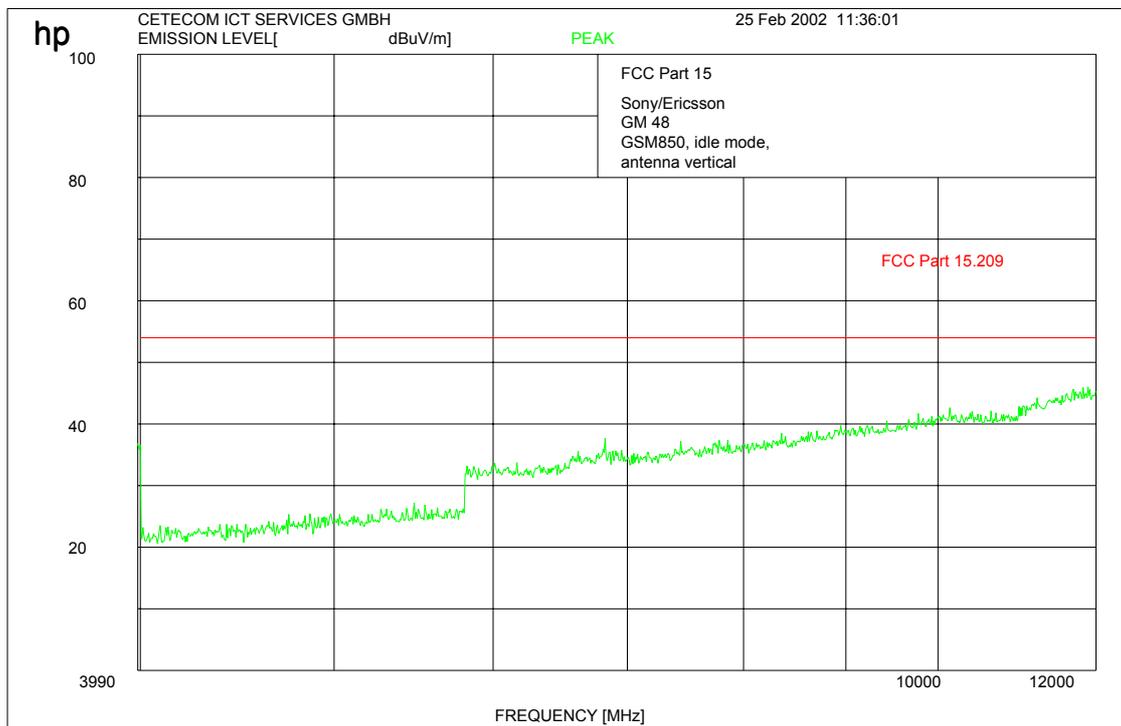
17 – 24, 64

Channel 189 (this is valid for all 3 channels and up to 1 GHz) Idle-Mode

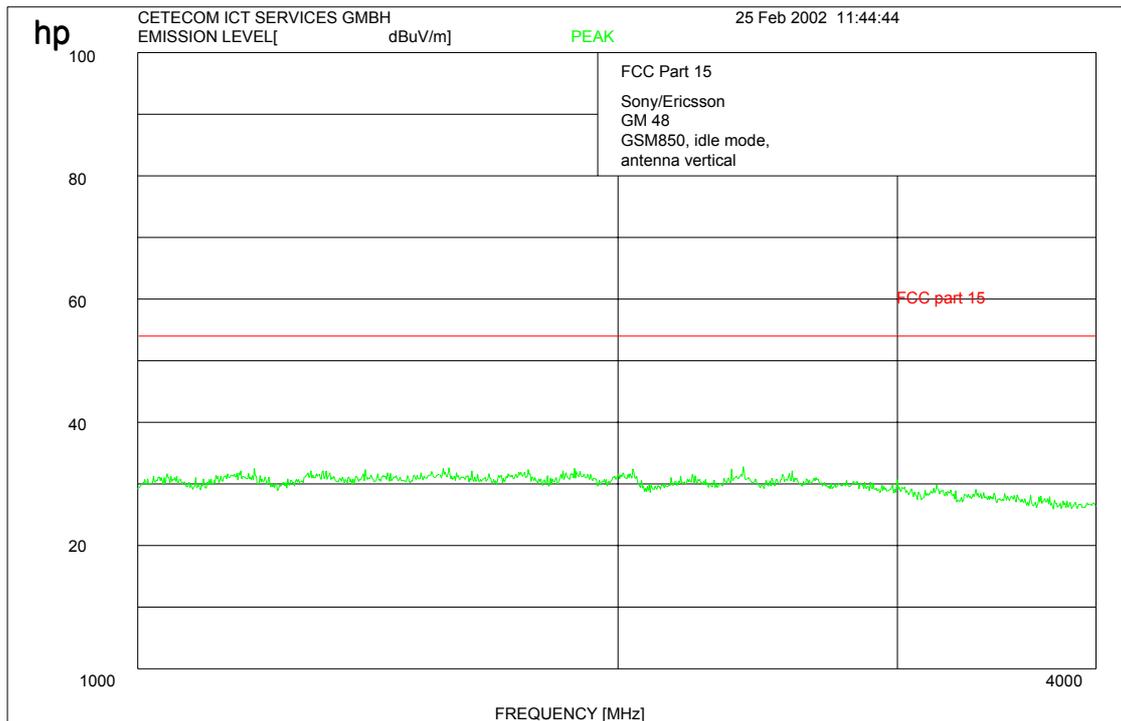


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Channel 189 (this is valid for all 3 channels and up to 4 GHz) Idle-Mode



Channel 189 (this is valid for all 3 channels and 4 to 12 GHz) Idle-Mode



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

CONDUCTED SPURIOUS EMISSIONS

Measurement Procedure:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.
2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

USPCS Transmitter

Channel Frequency

128 824.2 MHz

189 836.2 MHz

251 848.8 MHz

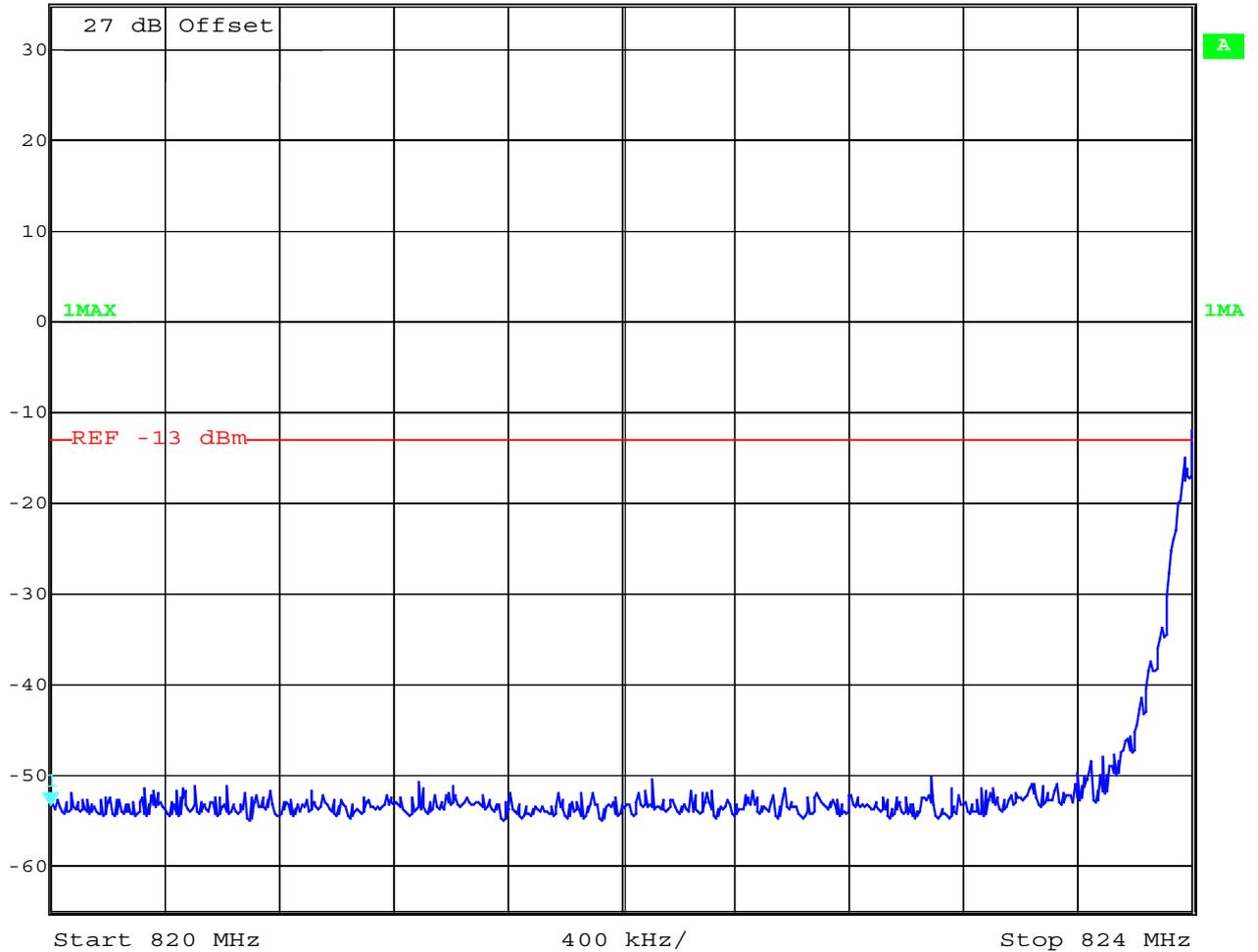
Measurement Limit:

Sec. 24.238 Emission Limits.

- (a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Channel 128


Marker 1 [T1]
RBW 3 kHz
RF Att 30 dB
Ref Lvl -53.45 dBm
VBW 3 kHz
35 dBm
820.0000000 MHz
SWT 1.15 s
Unit dBm

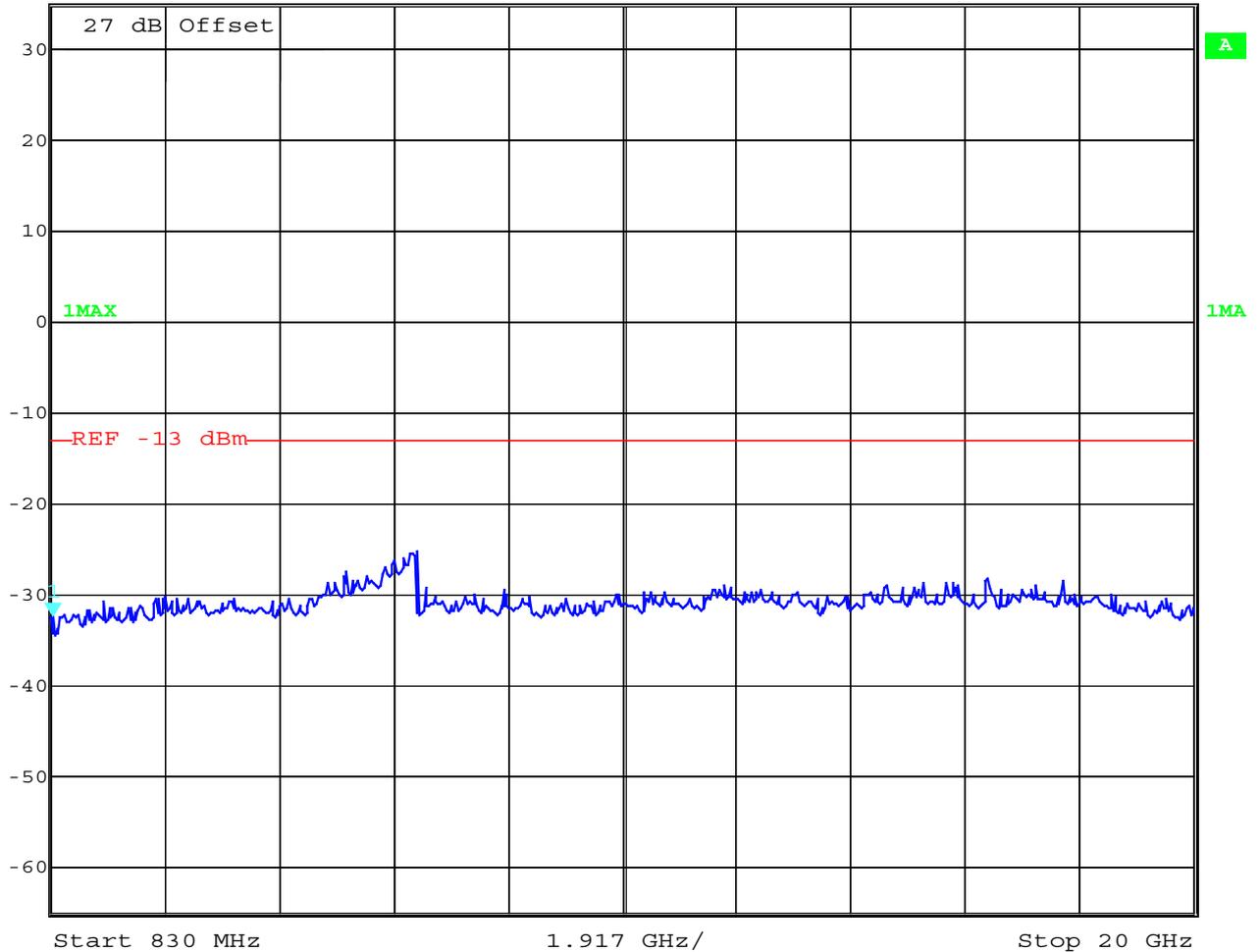


Date: 26.FEB.2002 11:52:21

Channel 128 Average



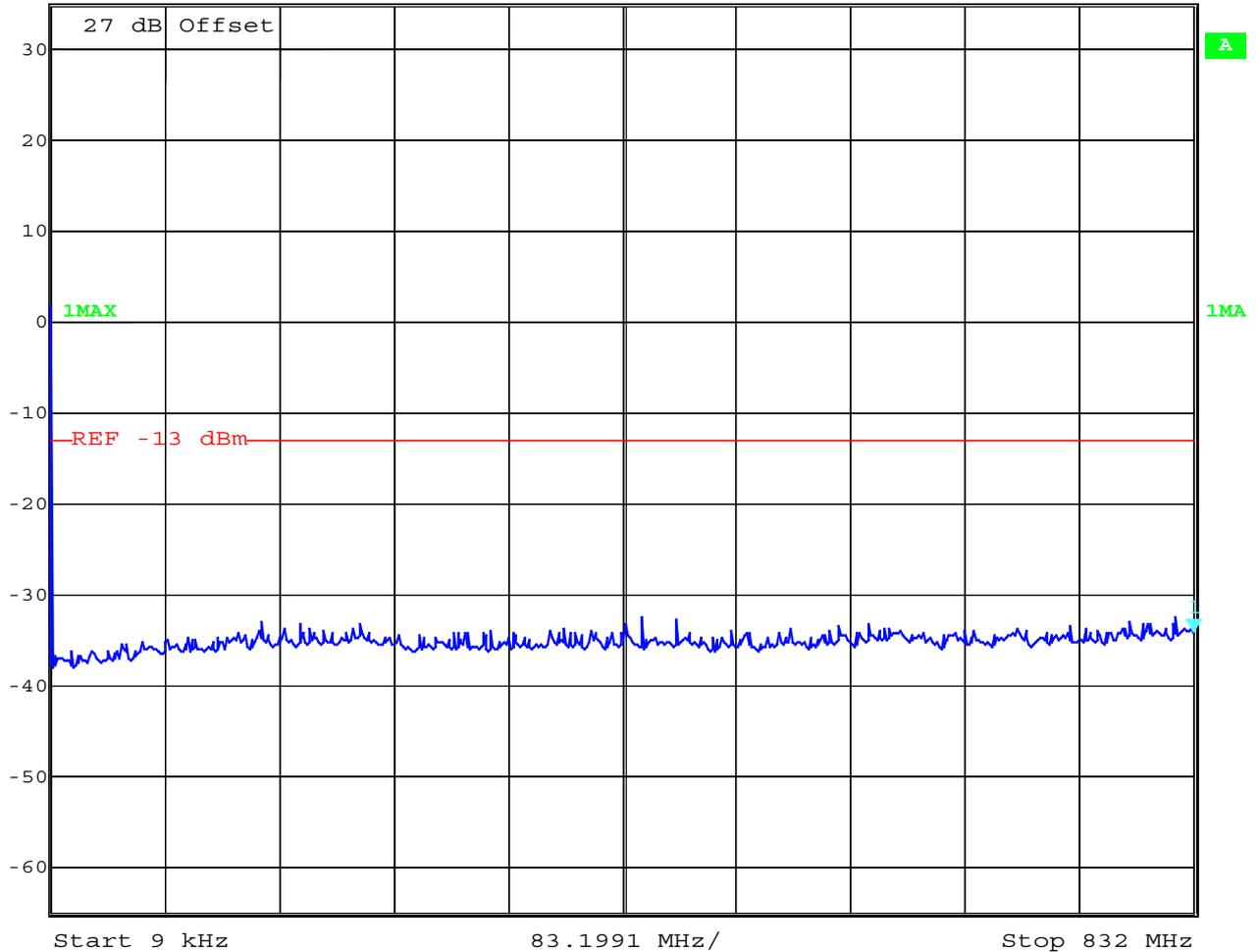
Marker 1 [T1] RBW 100 kHz RF Att 30 dB
 Ref Lvl -32.49 dBm VBW 100 kHz
 35 dBm 855.00000000 MHz SWT 4.8 s Unit dBm



Date: 26.FEB.2002 12:01:26

Channel 189

| | | | | | |
|--|---------------|------------------|---------|---------|-------|
| | Marker 1 [T1] | RBW | 100 kHz | RF Att | 30 dB |
| | Ref Lvl | -34.08 dBm | VBW | 100 kHz | |
| | 35 dBm | 832.00000000 MHz | SWT | 210 ms | Unit |
| | | | | | dBm |

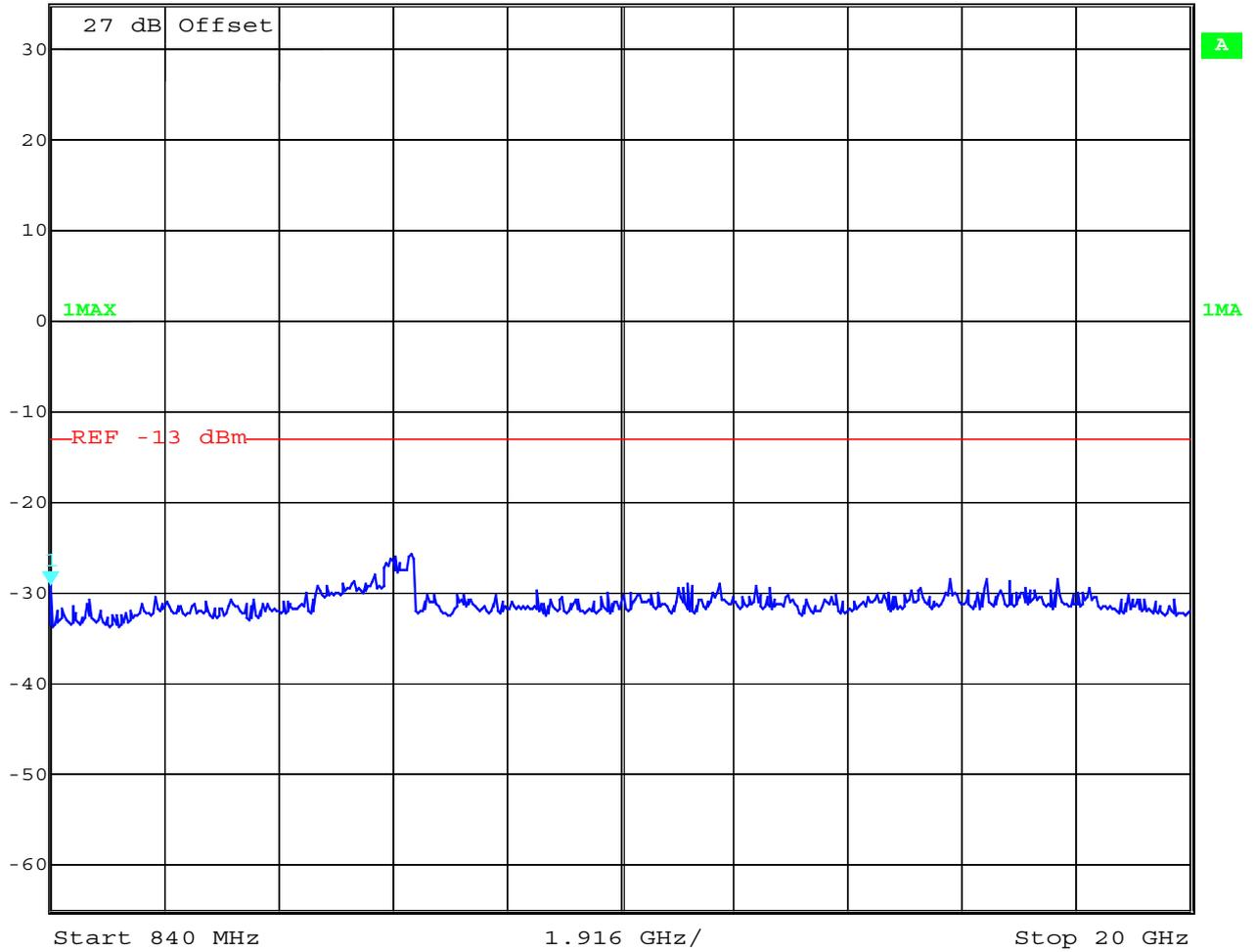


Date: 26.FEB.2002 11:55:47

Channel 189



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
 Ref Lvl -29.15 dBm VBW 100 kHz
 35 dBm 855.00000000 MHz SWT 4.8 s Unit dBm



Date: 26.FEB.2002 12:00:20

Channel 251



Marker 1 [T1]

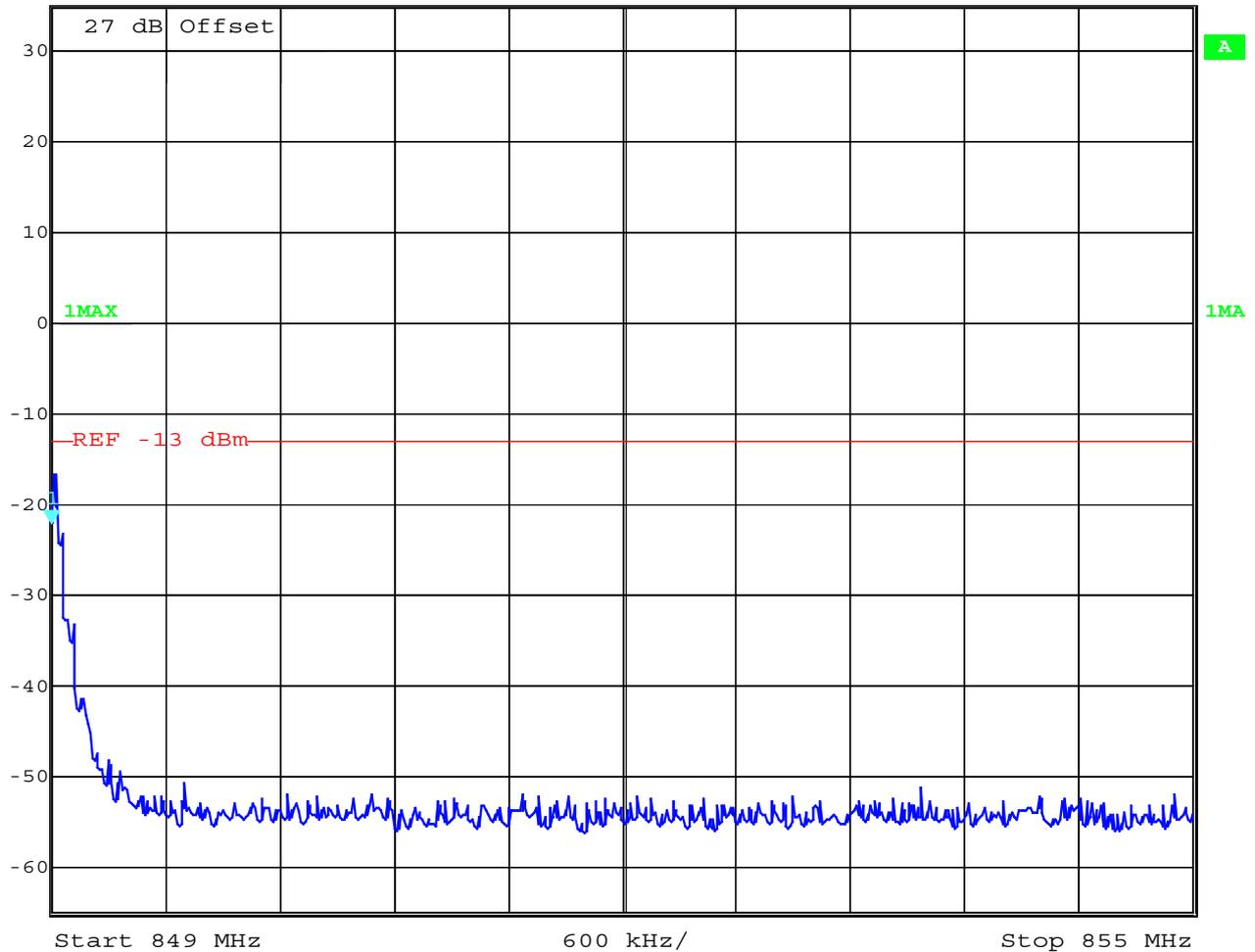
RBW 3 kHz RF Att 30 dB

Ref Lvl -22.19 dBm

VBW 3 kHz

35 dBm 849.0000000 MHz

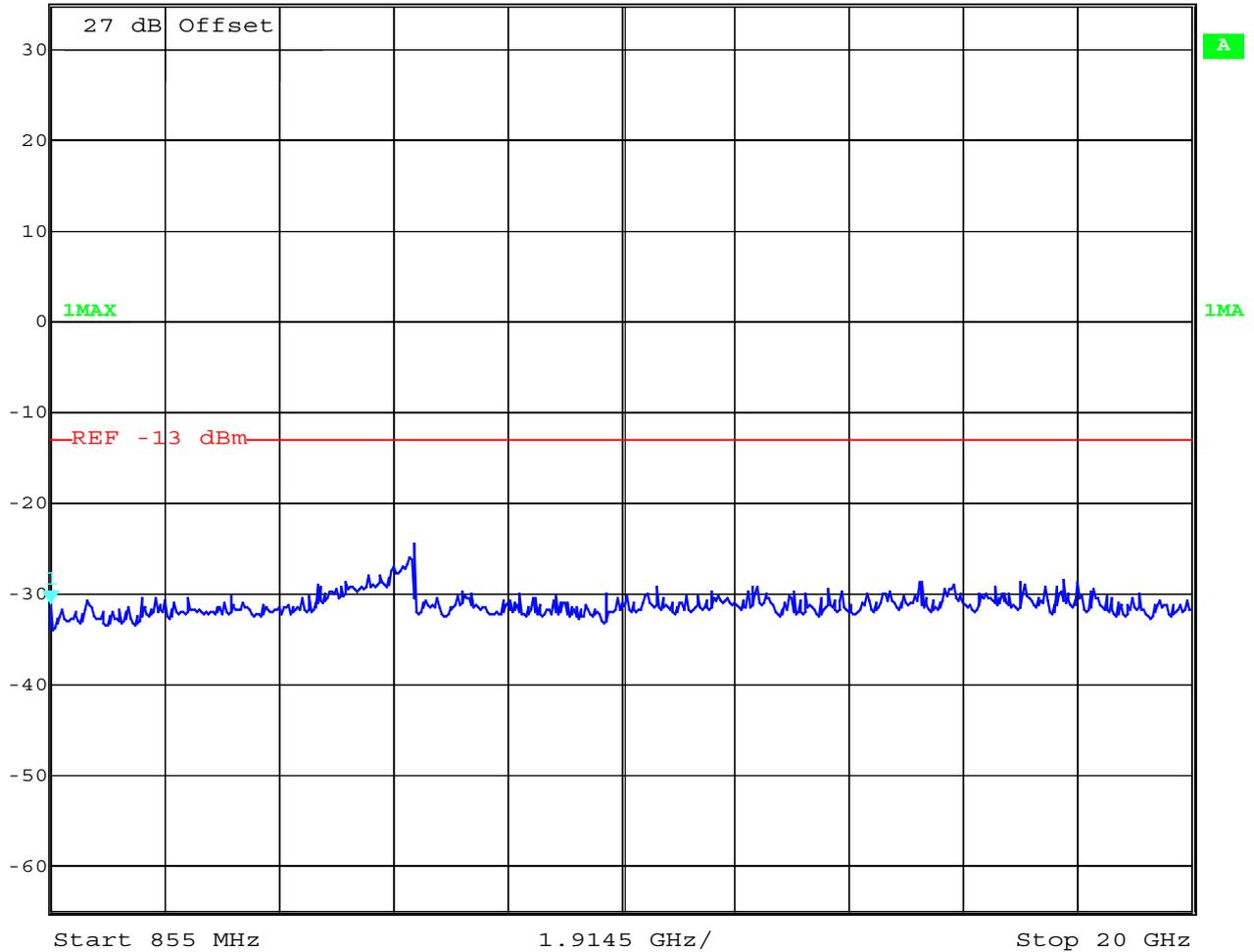
SWT 1.7 s Unit dBm



Date: 26.FEB.2002 11:58:25

Channel 251

| | | | | | |
|--|---------------|-----------------|---------|---------|---------------------------|
| | Marker 1 [T1] | RBW | 100 kHz | RF Att | 30 dB |
| | Ref Lvl | -31.20 dBm | VBW | 100 kHz | |
| | 35 dBm | 855.0000000 MHz | SWT | 4.8 s | Unit dBm |



Date: 26.FEB.2002 11:59:48

OCCUPIED BANDWIDTH **§2.989**

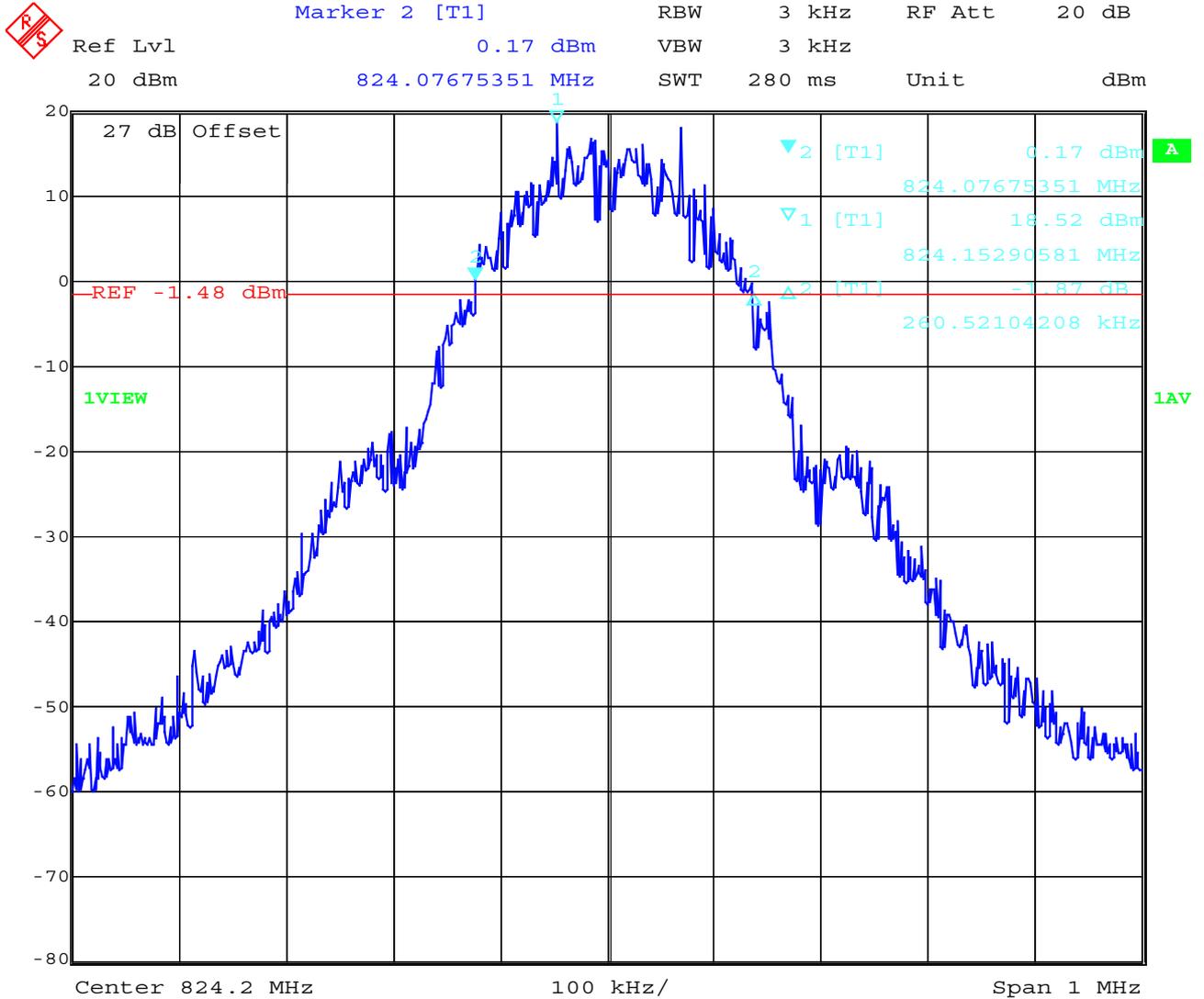
Occupied Bandwidth Results

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

| Frequency | 99% Occupied Bandwidth | -26 dBc Bandwidth |
|-----------|------------------------|-------------------|
| 824.2 MHz | 282.525 | 310.621 |
| 836.2 MHz | 274.549 | 310.621 |
| 848.8 MHz | 270.541 | 304.609 |

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 290 kHz, this equates to a resolution bandwidth of at least 2.96 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

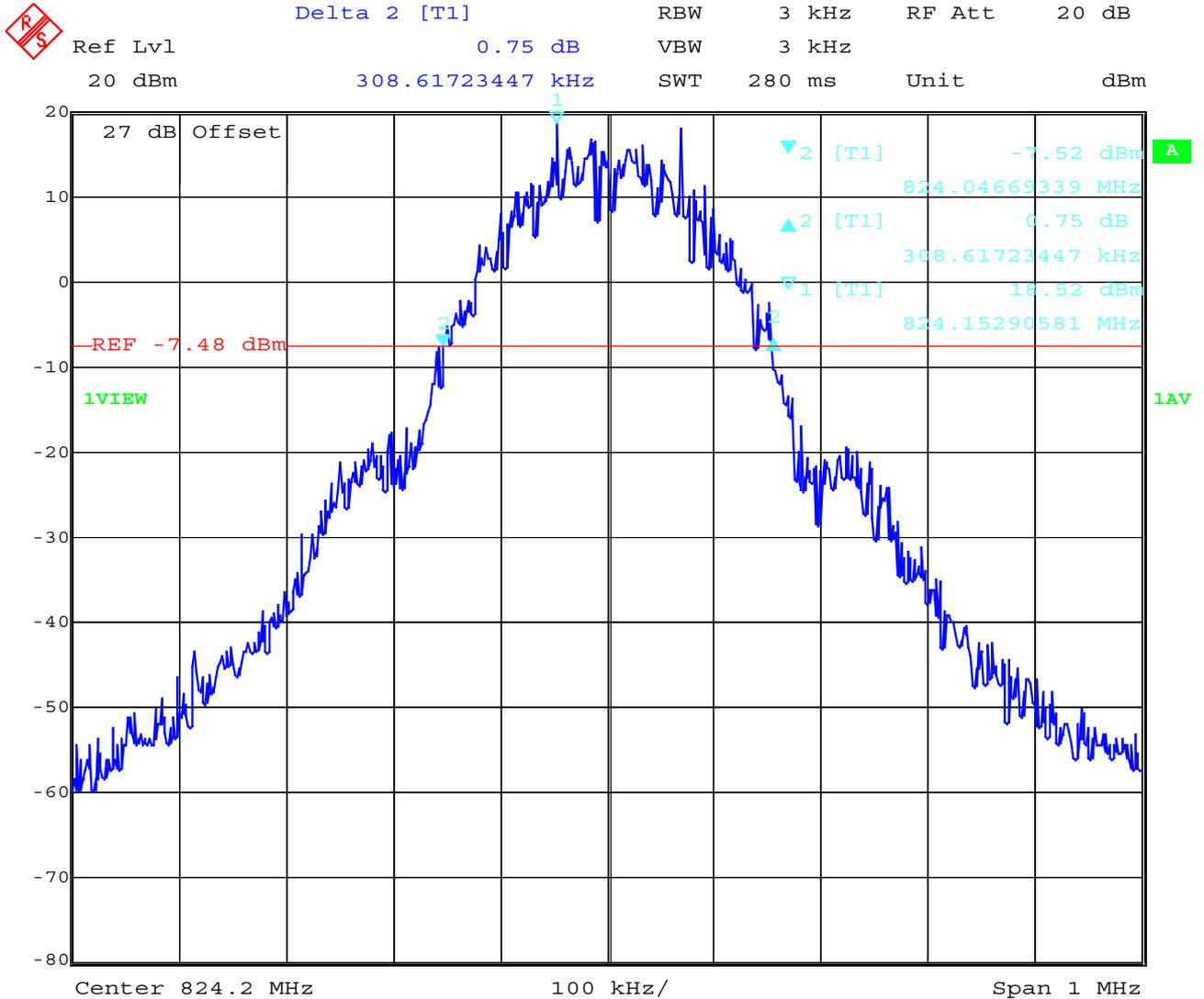
Channel 128
99% Occupied Bandwidth



Date: 26.FEB.2002 12:05:00

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

Channel 128
-26 dBc Bandwidth

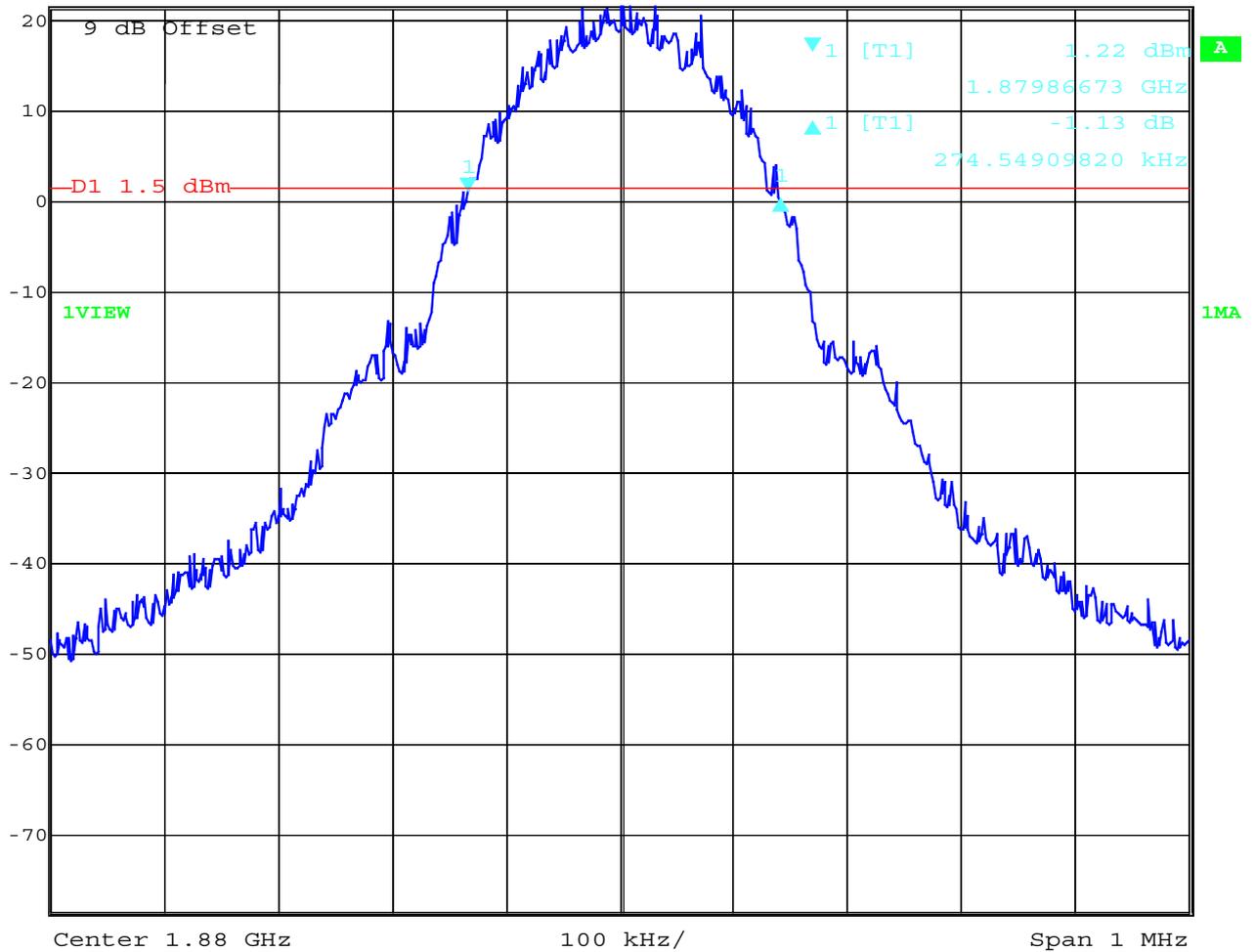


Date: 26.FEB.2002 12:05:41

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

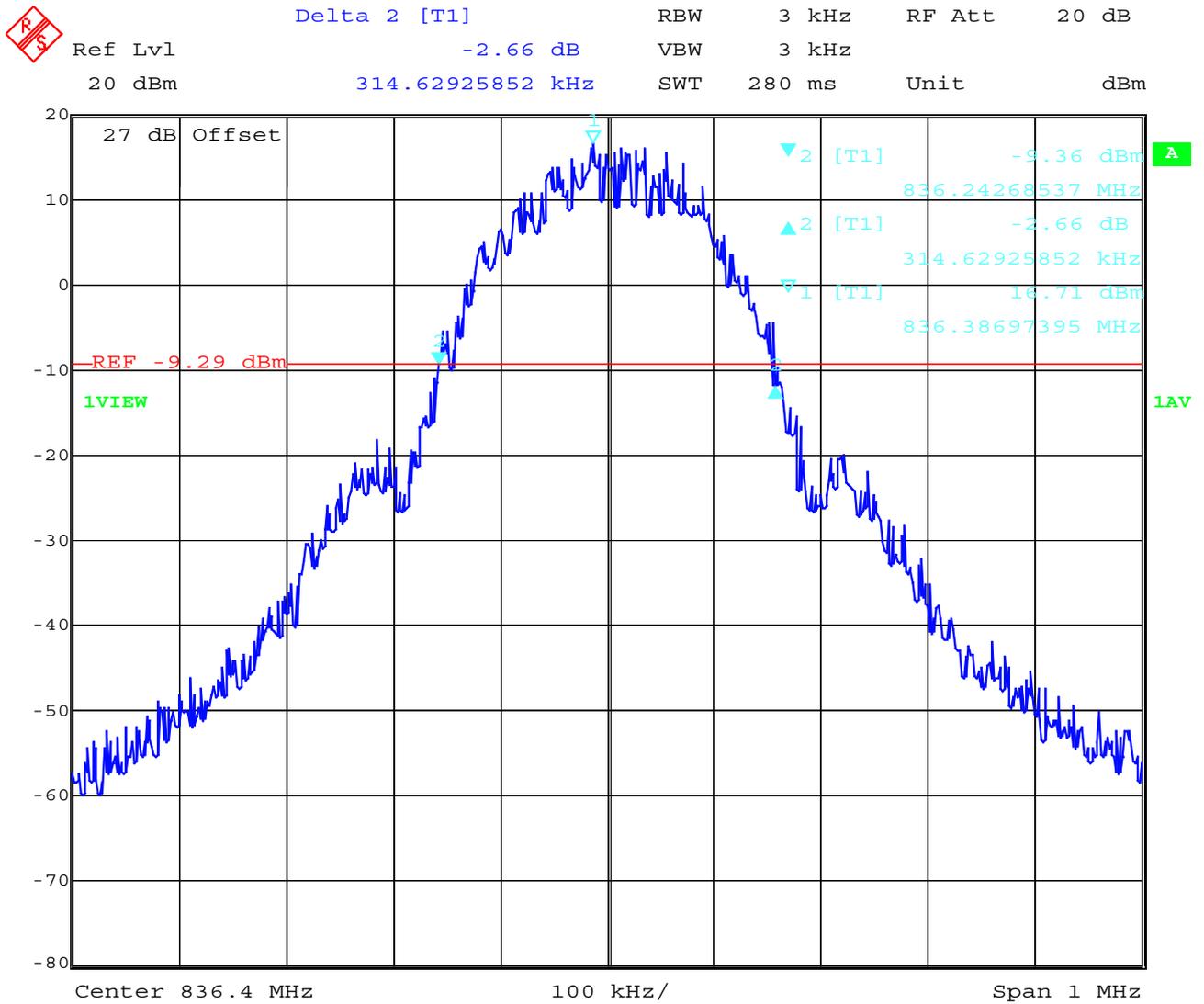
Channel 189
99% Occupied Bandwidth

| | | | | | |
|--|--------------|------------------|-------|--------|-------|
| | Delta 1 [T1] | RBW | 3 kHz | RF Att | 40 dB |
| | Ref Lvl | -1.13 dB | VBW | 3 kHz | |
| | 21.5 dBm | 274.54909820 kHz | SWT | 280 ms | Unit |



Date: 31.JAN.2002 14:01:39

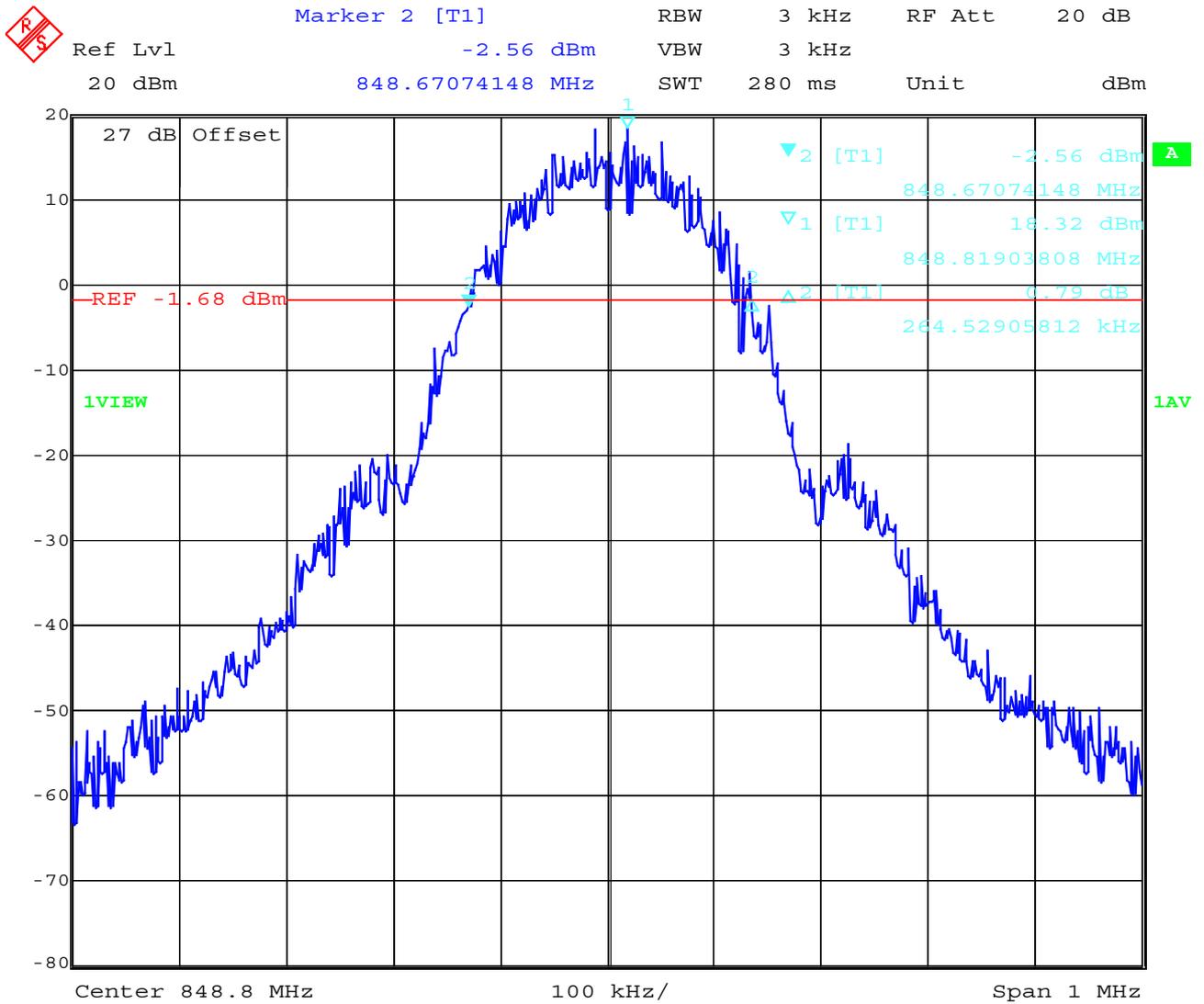
Channel 189
-26 dBc Bandwidth



Date: 26.FEB.2002 12:08:26

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

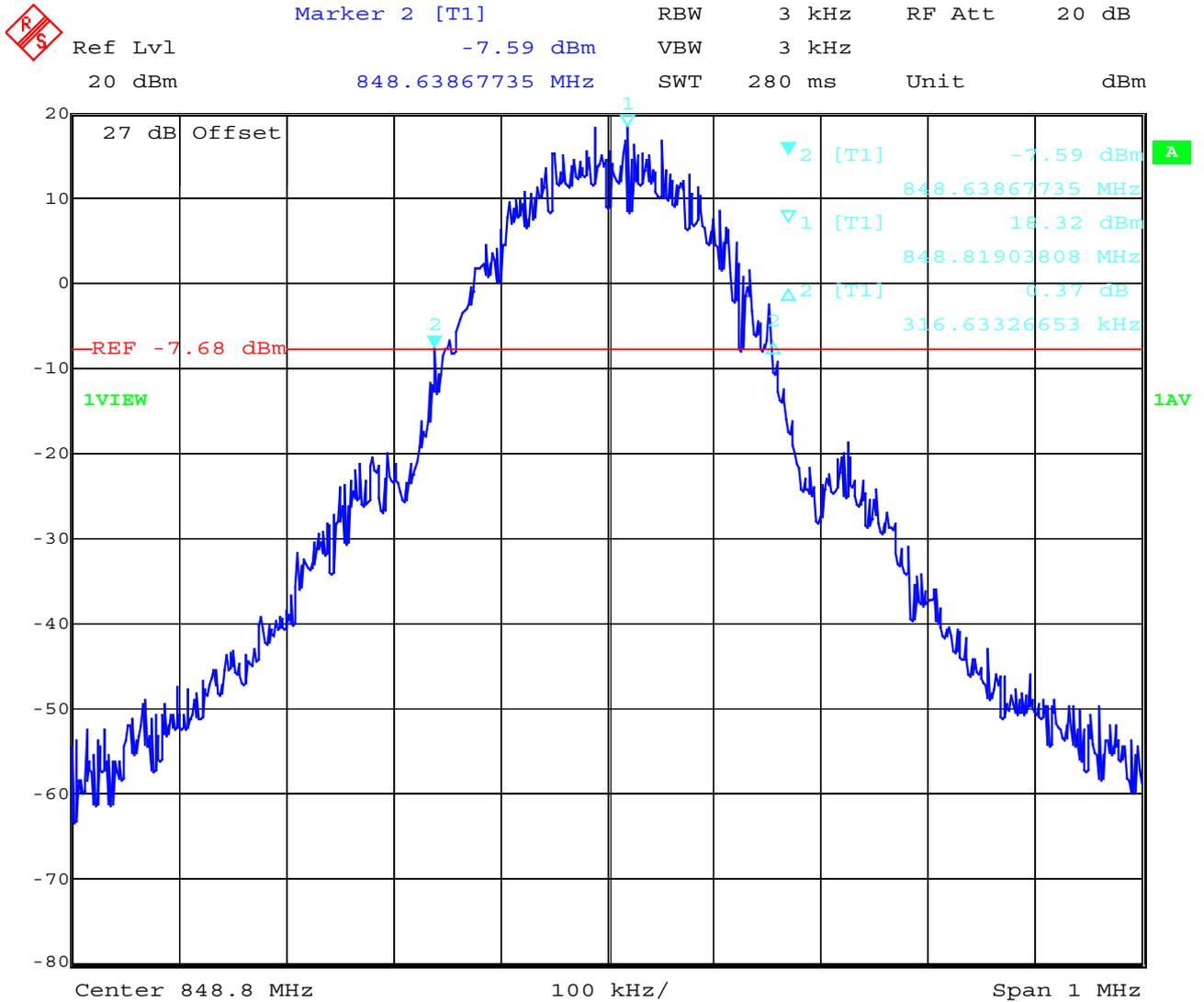
Channel 251
99% Occupied Bandwidth



Date: 26.FEB.2002 12:09:27

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 810
-26 dBc Bandwidth



Date: 26.FEB.2002 12:09:54

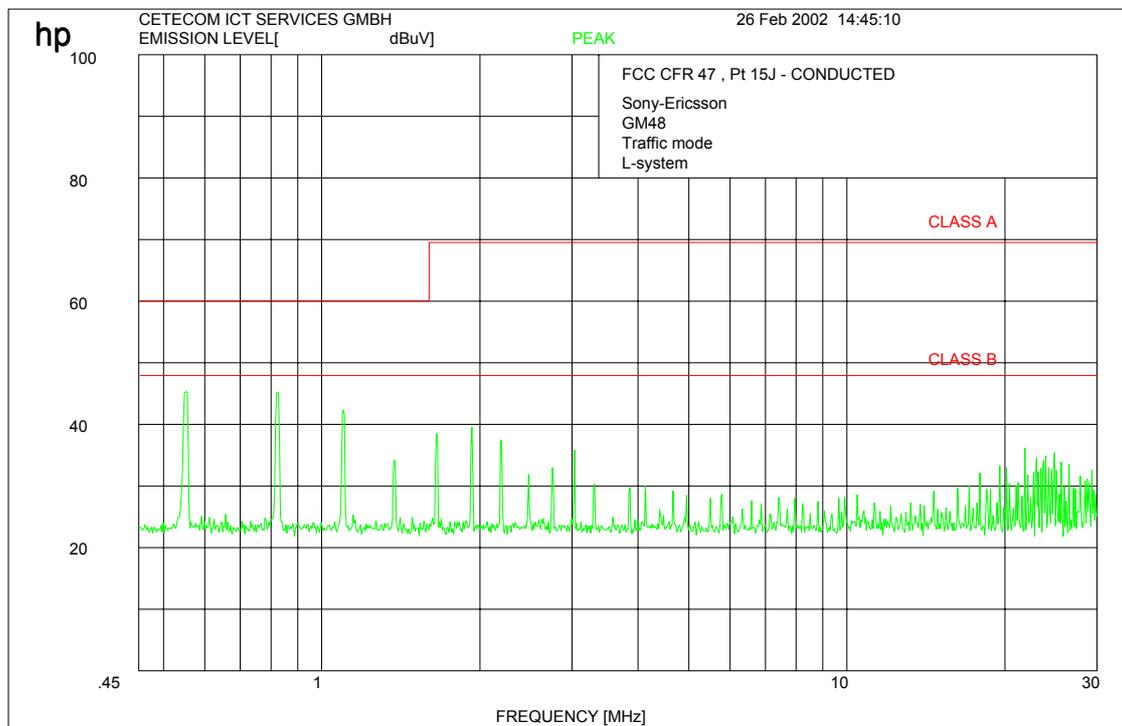
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

CONDUCTED EMISSIONS

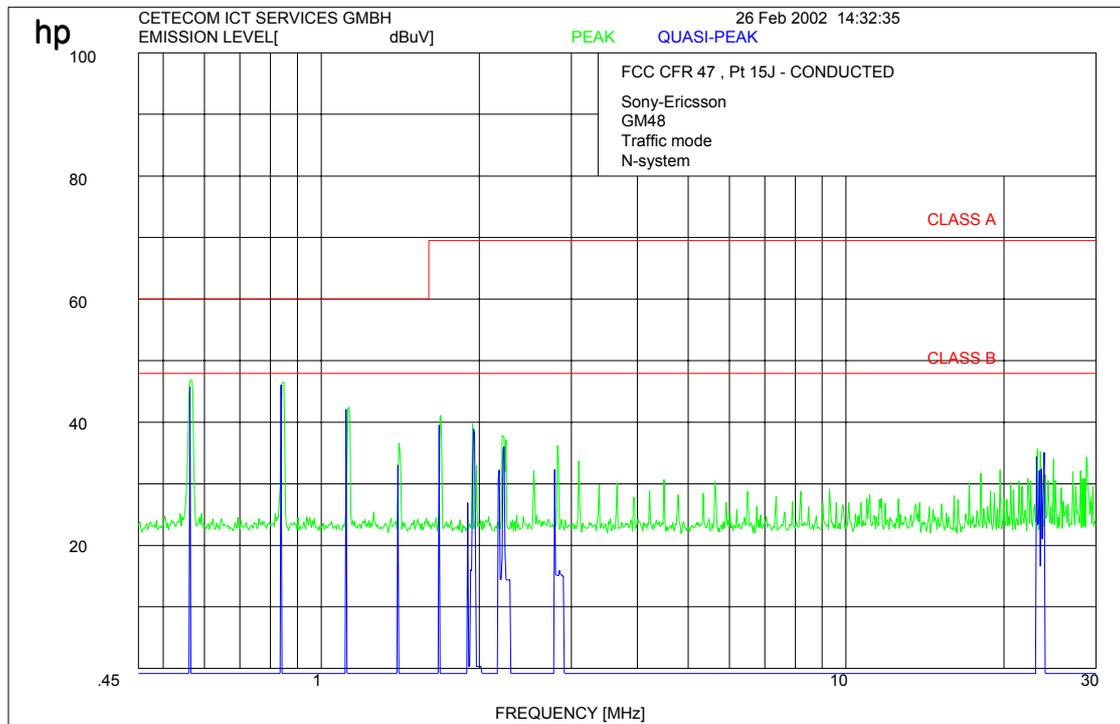
§ 15.107/207

Line-L1



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Line N



| | | |
|------------|-------------------|----|
| 0.5644 MHz | 45.7 dB μ V/m | QP |
| 0.8408 MHz | 46.0 dB μ V/m | QP |
| 1.118 MHz | 42.1 dB μ V/m | QP |
| 1.403 MHz | 33.0 dB μ V/m | QP |
| 1.680 MHz | 39.5 dB μ V/m | QP |
| 1.954 MHz | 38.9 dB μ V/m | QP |
| 2.188 MHz | 32.2 dB μ V/m | QP |
| 2.235 MHz | 36.0 dB μ V/m | QP |
| 2.791 MHz | 32.3 dB μ V/m | QP |
| 23.03 MHz | 34.4 dB μ V/m | QP |
| 23.32 MHz | 32.1 dB μ V/m | QP |
| 23.52 MHz | 32.4 dB μ V/m | QP |
| 23.82 MHz | 35.1 dB μ V/m | QP |

All spurious are below limit

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

| No | Instrument/Ancillary | Type | Manufacturer | Serial No. |
|----|------------------------------|-----------|-----------------|-------------|
| 01 | Spectrum Analyzer | 8566 A | Hewlett-Packard | 1925A00257 |
| 02 | Analyzer Display | 8566 A | Hewlett-Packard | 1925A00860 |
| 03 | Oscilloscope | 7633 | Tektronix | 230054 |
| 04 | Radio Communication Analyzer | CMTA 54 | Rohde & Schwarz | 894 043/010 |
| 05 | System Power Supply | 6038 A | Hewlett-Packard | 2848A07027 |
| 06 | Signal Generator | 8111 A | Hewlett-Packard | 2215G00867 |
| 07 | Signal Generator | 8662 A | Hewlett-Packard | 2224A01012 |
| 08 | Function Generator | AFGU | Rohde & Schwarz | 862 480/032 |
| 09 | Regulating Transformer | MPL | Erfi | 91350 |
| 10 | LISN | NNLA 8120 | Schwarzbeck | 8120331 |
| 11 | Relay-Matrix | PSU | Rohde & Schwarz | 893 285/020 |
| 12 | Power-Meter | 436 A | Hewlett-Packard | 2101A12378 |
| 13 | Power-Sensor | 8484 A | Hewlett-Packard | 2237A10156 |
| 14 | Power-Sensor | 8482 A | Hewlett-Packard | 2237A00616 |
| 15 | Modulation Meter | 9008 | Racal-Dana | 2647 |
| 16 | Frequency Counter | 5340 A | Hewlett-Packard | 1532A03899 |
| 17 | Anechoic Chamber | --- | MWB | 87400/002 |
| 18 | Spectrum Analyzer | 85660 B | Hewlett-Packard | 2747A05306 |
| 19 | Analyzer Display | 85662 A | Hewlett-Packard | 2816A16541 |
| 20 | Quasi Peak Adapter | 85650 A | Hewlett-Packard | 2811A01131 |
| 21 | RF-Preselector | 85685 A | Hewlett-Packard | 2833A00768 |
| 22 | Biconical Antenna | 3104 | Emco | 3758 |
| 23 | Log. Per. Antenna | 3146 | Emco | 2130 |
| 24 | Double Ridged Horn | 3115 | Emco | 3088 |
| 25 | EMI-Testreceiver | ESAI | Rohde & Schwarz | 863 180/013 |
| 26 | EMI-Analyzer-Display | ESAI-D | Rohde & Schwarz | 862 771/008 |
| 27 | Biconical Antenna | HK 116 | Rohde & Schwarz | 888 945/013 |
| 28 | Log. Per. Antenna | HL 223 | Rohde & Schwarz | 825 584/002 |
| 29 | Relay-Switch-Unit | RSU | Rohde & Schwarz | 375 339/002 |
| 30 | Highpass | HM985955 | FSY Microwave | 001 |
| 31 | Amplifier | P42-GA29 | Tron-Tech | B 23602 |
| 32 | Anechoic Chamber | | Frankonia | |
| 33 | Control Computer | PSM 7 | Rohde & Schwarz | 834 621/004 |
| 34 | EMI Test Receiver | ESMI | Rohde & Schwarz | 827 063/010 |
| 35 | EMI Test Receiver | Display | Rohde & Schwarz | 829 808/010 |

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

| No | Instrument/Ancillary | Type | Manufacturer | Serial No. |
|----|---------------------------------------|-----------|-----------------|--------------|
| 36 | Control Computer | HD 100 | Deisel | 100/322/93 |
| 37 | Relay Matrix | PSN | Rohde & Schwarz | 829 065/003 |
| 38 | Control Unit | GB 016 A2 | Rohde & Schwarz | 344 122/008 |
| 39 | Relay Switch Unit | RSU | Rohde & Schwarz | 316 790/001 |
| 40 | Power Supply | 6032A | Hewlett Packard | 2846A04063 |
| 41 | Spectrum Monitor | EZM | Rohde & Schwarz | 883 720/006 |
| 42 | Measuring Receiver | ESH 3 | Rohde & Schwarz | 890 174/002 |
| 43 | Measuring Receiver | ESVP | Rohde & Schwarz | 891 752/005 |
| 44 | Bicon Ant. 20-300MHz | HK 116 | Rohde & Schwarz | 833 162/011 |
| 45 | Logper Ant. 0.3-1 GHz | HL 223 | Rohde & Schwarz | 832 914/010 |
| 46 | Amplifier 0.1-4 GHz | AFS4 | Miteq Inc. | 206461 |
| 47 | Logper Ant. 1-18 GHz | HL 024 A2 | Rohde & Schwarz | 342 662/002 |
| 48 | Polarisation Network | HL 024 Z1 | Rohde & Schwarz | 341 570/002 |
| 49 | Double Ridged Horn Antenna 1-26.5 GHz | 3115 | EMCO | 9107-3696 |
| 50 | Microw. Sys. Amplifier 0.5- 26.5 GHz | 8317A | Hewlett Packard | 3123A00105 |
| 51 | Audio Analyzer | UPD | Rohde & Schwarz | 1030.7500.04 |
| 52 | Controler | PSM 7 | Rohde & Schwarz | 883 086/026 |
| 53 | DC V-Network | ESH3-Z6 | Rohde & Schwarz | 861 406/005 |
| 54 | DC V-Network | ESH3-Z6 | Rohde & Schwarz | 893 689/012 |
| 55 | AC 2 Phase V-Network | ESH3-Z5 | Rohde & Schwarz | 861 189/014 |
| 56 | AC 2 Phase V-Network | ESH3-Z5 | Rohde & Schwarz | 894 981/019 |
| 57 | AC-3 Phase V-Network | ESH2-Z5 | Rohde & Schwarz | 882 394/007 |
| 58 | Power Supply | 6032A | Rohde & Schwarz | 2933A05441 |
| 59 | RF-Test Receiver | ESVP.52 | Rohde & Schwarz | 881 487/021 |
| 60 | Spectrum Monitor | EZM | Rohde & Schwarz | 883 086/026 |
| 61 | RF-Test Receiver | ESH3 | Rohde & Schwarz | 881 515/002 |
| 62 | Relay Matrix | PSU | Rohde & Schwarz | 882 943/029 |
| 63 | Relay Matrix | PSU | Rohde & Schwarz | 828 628/007 |
| 64 | Spectrum Analyzer | FSIQ 26 | Rohde & Schwarz | 119.6001.27 |
| 65 | Spectrum Analyzer | HP 8565E | Hewlett Packard | 3473A00773 |
| 66 | | | | |
| 67 | | | | |
| 68 | | | | |