



# TEST REPORT FROM RADIO FREQUENCY INVESTIGATION LTD.

Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 and 24

**Test Report Serial No:**  
RFI/MPTB1/RP45280JD01A

<b>This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director:</b> 	<b>Checked By:</b> 
<b>Tested By:</b> 	<b>Release Version No: PDF01</b>
<b>Issue Date: 28 October 2003</b>	<b>Test Dates: 29 September 2003 to 15 October 2003</b>

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**RADIO FREQUENCY INVESTIGATION LTD**

**TEST REPORT**

**Operations Department**

**S.No. RFI/MPTB1/RP45280JD01A**

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**1. Client Information**

<b>Company Name:</b>	Sony Ericsson Mobile Communications
<b>Address:</b>	1 Lakeside Road Aerospace Centre Farnborough Hampshire GU14 6XP United Kingdom
<b>Contact Name:</b>	Mr J Rodrigo

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**2. Equipment Under Test (EUT)**

The following information (with the exception of the Date of Receipt) has been supplied by the client:

**2.1. Identification Of Equipment Under Test (EUT)**

<b>Brand Name:</b>	Sony Ericsson
<b>Model Name or Number:</b>	GT48
<b>Unique Type Identification:</b>	6220512-BV
<b>IMEI Number:</b>	*001003830338334
<b>FCC ID Number:</b>	PY76220512
<b>Country of Manufacture:</b>	Germany
<b>Date of Receipt:</b>	29 September 2003

*\* This sample was used for all radiated tests*

<b>Brand Name:</b>	Sony Ericsson
<b>Model Name or Number:</b>	GT48
<b>Unique Type Identification:</b>	6220512-BV
<b>IMEI Number:</b>	**001003830337872
<b>FCC ID Number:</b>	PY76220512
<b>Country of Manufacture:</b>	Germany
<b>Date of Receipt:</b>	29 September 2003

*\*\* This sample was used for all conducted tests.*

<b>Brand Name:</b>	SMARTEQ (Antenna)
<b>Model Name or Number:</b>	MiniMag
<b>Unique Type Identification:</b>	A-1140.26
<b>Serial Number:</b>	7393939012545
<b>Country of Manufacture:</b>	Sweden
<b>Date of Receipt:</b>	29 September 2003

**2.2. Description Of EUT**

The equipment under test is a dual band (850 MHz/1900 MHz) GSM transceiver unit intended for use in a wide variety of applications including remote event sensing, fleet control management and data provision for cellular networks.

**2.3. Modifications Incorporated In EUT**

None.

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**2.4. Additional Information Related To Testing**

<b>Power Supply Requirement:</b>	Nominal 115 V, 60 Hz AC Mains Supply
<b>Intended Operating Environment:</b>	Within GSM Network Coverage
<b>Equipment Category:</b>	Mobile
<b>Type of Unit:</b>	Transceiver
<b>Weight:</b>	110 g
<b>Dimensions:</b>	77.4 x 66.4 x 26.2 mm
<b>Interface Ports:</b>	FME Male (Antenna) RJ12 (Power Supply) RJ9 (Handset) High Density 15 Pin (RS232)
<b>Highest Fundamental Frequency</b>	GSM 850 band = 848.8 MHz GSM 1900 band = 1909.8 MHz
<b>Highest Unintentionally Generated Frequency</b>	1989.8 MHz

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Part 22

<b>Transmit Frequency Range</b>	824.0 MHz to 848.0 MHz		
<b>Transmit Channels Tested</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	128	824.2
	Middle	190	836.6
	Top	251	848.8
<b>Receive Frequency Range</b>	824.0 MHz to 848.0 MHz		
<b>Receive Channels Tested</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	128	869.2
	Middle	190	881.6
	Top	251	893.8
<b>Maximum Power Output</b>	32.6 dBm		

Part 24

<b>Transmit Frequency Range</b>	1850.0 MHz to 1910.0 MHz		
<b>Transmit Channels Tested</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	512	1850.2
	Middle	660	1879.8
	Top	810	1909.8
<b>Receive Frequency Range</b>			
<b>Receive Channels Tested</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	512	1930.2
	Middle	660	1960.0
	Top	810	1989.8
<b>Maximum Power Output</b>	29.6 dBm		

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## 2.5. Accessories

The following accessories were used during testing:

<b>Description:</b>	Handset
<b>Brand Name:</b>	Votronic
<b>Model Name or Number:</b>	HH-SI-30/V1.1/0
<b>Serial Number:</b>	021448
<b>Cable Length And Type:</b>	2.7 m
<b>Connected to Port:</b>	Accessory

<b>Description:</b>	AC Adaptor
<b>Brand Name:</b>	TOP TEC
<b>Model Name or Number:</b>	GSU15U-3
<b>Serial Number:</b>	11399
<b>Cable Length And Type:</b>	1.8 m
<b>Connected to Port:</b>	Supply

<b>Description:</b>	RS232 Converter
<b>Brand Name:</b>	None
<b>Model Name or Number:</b>	None
<b>Serial Number:</b>	None
<b>Cable Length And Type:</b>	Not Applicable
<b>Connected to Port:</b>	Serial

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## 2.6. Support Equipment

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Digital Radio Test Set
<b>Brand Name:</b>	Racal
<b>Model Name or Number:</b>	6103E
<b>Serial Number:</b>	1961
<b>Cable Length And Type:</b>	Not Applicable
<b>Connected to Port:</b>	RF Link

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	PPO1X Latitude C840
<b>Serial Number:</b>	03J010-12961-2AQ-5407
<b>Cable Length And Type:</b>	1m serial cable
<b>Connected to Port:</b>	Serial port of EUT

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### 3. Test Specification, Methods And Procedures

#### 3.1. Test Specifications

<b>Reference:</b>	FCC Part 22 Subpart H: 2002 (Cellular Radiotelephone Service)
<b>Title:</b>	Code of Federal Regulations, Part 22 (47CFR22) Personal Communication Services.
<b>Comments:</b>	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
<b>Purpose of Test:</b>	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

<b>Reference:</b>	FCC Part 24 Subpart E: 2002 (Broadband PCS)
<b>Title:</b>	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.
<b>Comments:</b>	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
<b>Purpose of Test:</b>	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

<b>Reference:</b>	FCC Part 15 Subpart B: 2001 (Section 15.107 and 15.109)
<b>Title:</b>	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Radio Frequency Devices.
<b>Comments:</b>	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
<b>Purpose of Test:</b>	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

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### **3.2. Methods And Procedures**

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2002

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

### **3.3. Definition Of Measurement Equipment**

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

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#### **4. Deviations From The Test Specification**

None.

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## **5. Operation Of The EUT During Testing**

### **5.1. Operating Conditions**

The EUT was tested in a normal laboratory environment.

During testing, the EUT was powered by a nominal 115 V, 60 Hz AC Mains supply

### **5.2. Operating Modes**

The EUT was tested in the following operating modes, unless otherwise stated.

Preliminary radiated scans were performed on the EUT with the accessories stated in section 2.5 of this report connected and then disconnected. The combination that exhibited the worst case mode of operation was then used to perform final measurements.

#### **Transmitter Modes:**

For carrier output power, occupied bandwidth and final transmitter radiated measurements, testing was performed at full power on top, middle and bottom channels of the assigned frequency block.

For frequency stability testing, measurements were performed at full power on the top, middle and bottom channels of the assigned frequency block at -30 °C through to +50 °C in 10° increments.

All transmitter radiated spurious pre-scan tests were performed at full power on the middle channel of the assigned frequency block. Final measurements were then performed on the top, middle and bottom channels if an emission was identified.

#### **Idle Mode:**

Testing was performed with the call terminated from the GSM Test Simulator and the EUT left in its idle mode.

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### **5.3. Configuration And Peripherals**

The EUT was tested in the following configuration:

Connected to the accessories detailed in Section 2.1 and via serial link to the support laptop.

All tests were performed with the EUT connected via an air link or directly to a GSM test set via an access point.

The reason for choosing this configuration was that it was defined as likely to be the worst-case configuration.

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**6. Summary Of Test Results****Part 22**

Range Of Measurements	Specification Reference	Port Type	Compliance Status
Receiver/Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2002 Section 15.107	AC Mains Input	Complied
Receiver/Idle Mode Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Antenna	Complied
Transmitter Carrier Output Power (and ERP limitations)	C.F.R. 47 FCC Part 2: 2002 Section 2.1046(a)/22.913(a)	Antenna Terminals	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 22: 2002 Section 22.355	Antenna Terminals	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 22: 2002 Section 22.355	Antenna Terminals	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 22: 2002 Section 2.1049(i)	Antenna Terminals	Complied
Transmitter Conducted Out of Band Emissions	C.F.R. 47 FCC Part 22: 2002 Section 2.1051/22.917	Antenna Terminals	Complied
Transmitter Radiated Out of Band Emissions	C.F.R. 47 FCC Part 22: 2002 Section 2.1053/22.917	Antenna	Complied
Transmitter Conducted Band Edges Emissions	C.F.R. 47 FCC Part 2: 2002 Section 2.1051/22.917	Antenna Terminals	Complied
Transmitter Radiated Band Edges Emissions	C.F.R. 47 FCC Part 2: 2002 Section 2.1053/22.917	Antenna	Complied

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**Summary Of Test Results (Continued)****Part 24**

Range Of Measurements	Specification Reference	Port Type	Compliance Status
Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2002 Section 15.107	AC Mains Input	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Antenna	Complied
Transmitter Carrier Output Power (and EIRP limitations)	C.F.R. 47 FCC Part 2: 2002 Section 2.1046(a)/24.232	Antenna Terminals	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2002 Section 24.235	Antenna Terminals	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2002 Section 24.235	Antenna Terminals	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2002 Section 24.238	Antenna Terminals	Complied
Transmitter Conducted Out of Band Emissions	C.F.R. 47 FCC Part 24: 2002 Section 2.1051/24.238	Antenna Terminals	Complied
Transmitter Radiated Out of Band Emissions	C.F.R. 47 FCC Part 24: 2002 Section 2.1053/24.238	Antenna Terminals	Complied
Transmitter Conducted Band Edges Emissions	C.F.R. 47 FCC Part 2: 2002 Section 2.1051/24.238	Antenna	Complied
Transmitter Radiated Band Edges Emissions	C.F.R. 47 FCC Part 2: 2002 Section 2.1053/24.238	Antenna	Complied

**6.1. Location Of Tests**

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

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## **7. Measurements, Examinations And Derived Results**

### **7.1. General Comments**

7.1.1. This section contains test results only.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 8 for details of measurement uncertainties.

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## **8. Test Results FCC Part 22**

### **8.1. Receiver/Idle Mode AC Conducted Spurious Emissions: Section 15.107**

8.1.1. The EUT was configured as for AC conducted emissions measurements as described in Section 9 of this report.

8.1.2. Tests were performed to identify the maximum emission levels on the AC mains line of the AC adaptor powering the EUT.

#### **Results: Quasi-Peak Detector Measurements On Live And Neutral Lines**

Frequency (MHz)	Line	Q-P Level (dB $\mu$ V)	Q-P Limit (dB $\mu$ V)	Margin (dB)	Result
0.20698	Neutral	45.76	63.33	17.57	Complied
0.36146	Neutral	47.62	58.69	11.07	Complied
0.51676	Neutral	51.10	56.00	4.90	Complied
0.64180	Live	52.52	56.00	3.48	Complied
0.99337	Live	43.02	56.00	12.98	Complied
1.24515	Neutral	49.14	56.00	6.86	Complied
10.37604	Neutral	46.07	60.00	13.93	Complied
16.08173	Live	47.31	60.00	12.69	Complied

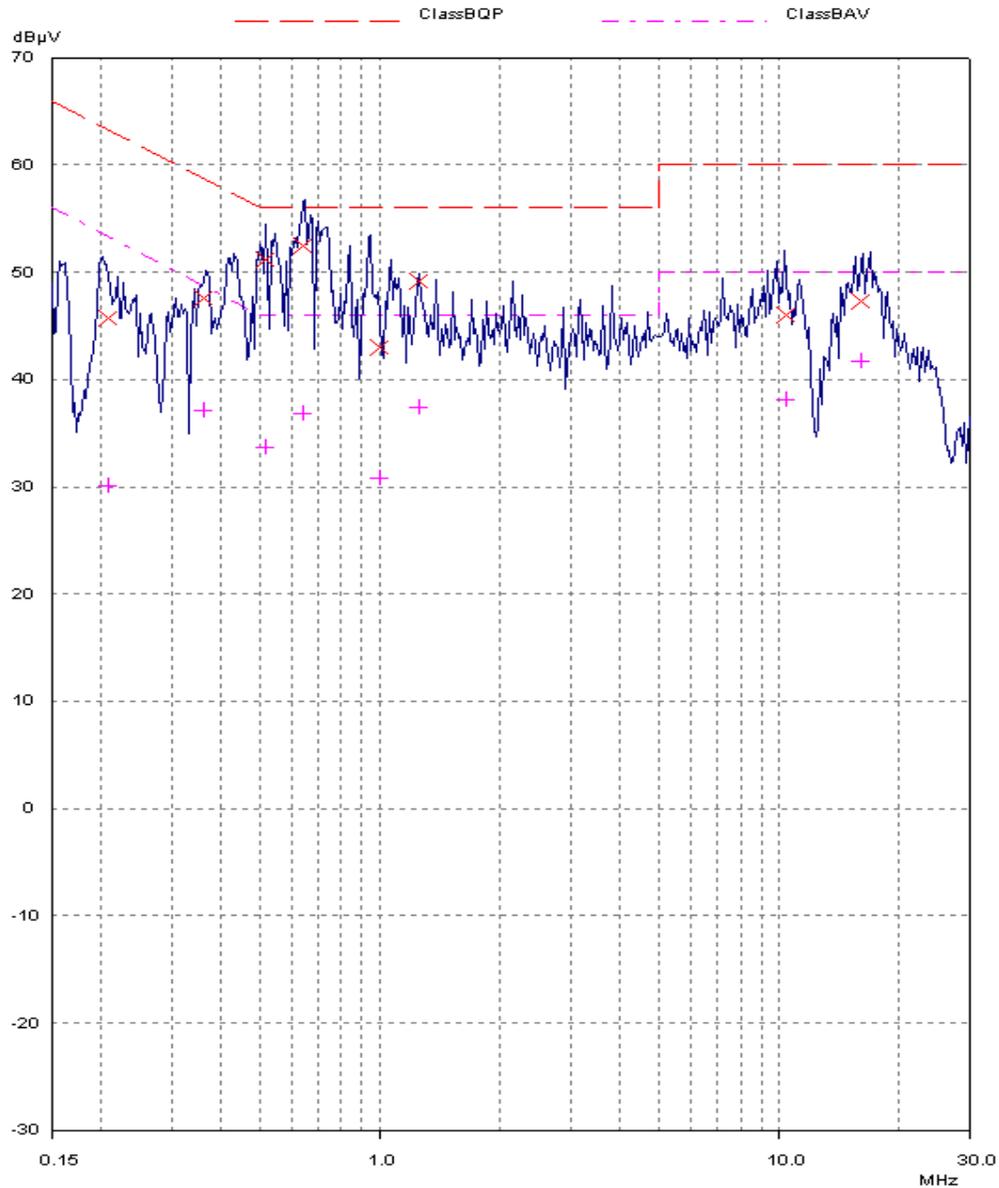
#### **Results: Average Detector Measurements On Live And Neutral Lines**

Frequency (MHz)	Line	Av. Level (dB $\mu$ V)	Av. Limit (dB $\mu$ V)	Margin (dB)	Result
0.20698	Live	30.02	53.33	23.31	Complied
0.36146	Neutral	37.10	48.69	11.59	Complied
0.51676	Live	33.65	46.00	12.35	Complied
0.64180	Live	36.82	46.00	9.18	Complied
0.99337	Neutral	30.86	46.00	15.14	Complied
1.24515	Live	37.38	46.00	8.62	Complied
10.37604	Neutral	38.07	50.00	11.93	Complied
16.08173	Neutral	41.75	50.00	8.25	Complied

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**Receiver/Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)**



*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

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**8.2. Receiver/Idle Mode Radiated Spurious Emission: Section 15.109**

**8.2.1. Electric Field Strength Measurements (Frequency Range 30 to 1000 MHz)**

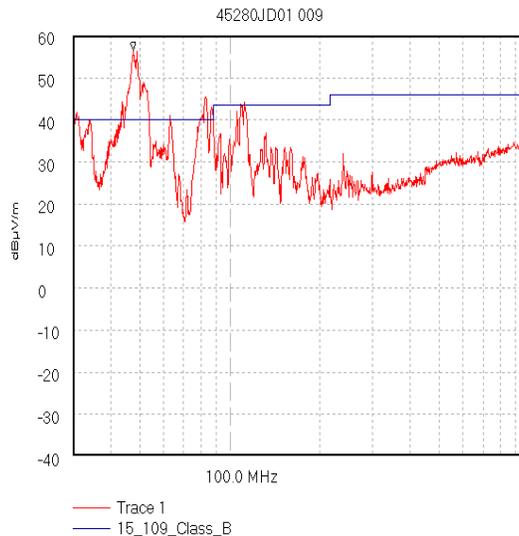
8.2.1.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.2.1.2. Tests were performed to identify the maximum radiated emissions levels while in receiver/idle mode.

**Result:**

Frequency (MHz)	Antenna Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
32.234	Vert.	29.1	40.0	10.9	Complied
47.939	Vert.	34.8	40.0	5.2	Complied
63.027	Vert.	29.3	40.0	10.7	Complied
82.753	Vert.	25.0	40.0	15.0	Complied
108.403	Vert.	26.4	43.5	17.1	Complied
111.757	Vert.	24.9	43.5	18.6	Complied

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables. It can be seen in the tabulated data above that the final measurement on the emissions complies with the relevant limit.



Trace 1  
15\_109\_Class\_B

Start 30.0 MHz; Stop 1.0 GHz - Log Scale  
 Ref 60 dBμV/m; Ref Offset 5.0 dB; 10 dB/div  
 RBW 120.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 380.0 mS  
 Peak 47.996 MHz, 56.48 dBμV/m  
 Limit/Mask: 15\_109\_Class\_B; ; Limit Test Failed  
 Transducer Factors: A1037  
 9/29/2003 4:08:44 PM

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**Receiver/Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)****8.2.2. Electric Field Strength Measurements (Frequency Range 1.0 to 10.0 GHz)**

8.2.2.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.2.2.2. Tests were performed to identify the maximum receiver or idle mode radiated emission level present in the band 30 MHz to 5 x the highest fundamental frequency.

**Result:****Highest Peak Level**

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector Level (dB $\mu$ V)	Antenna Factor	Cable Loss	Actual Peak Level (dB $\mu$ V/m)	Peak Level (dB $\mu$ V/m)	Peak Margin (dB)	Result
1.000833	Horiz.	18.9	21.5	1.6	42.0	74.0	32.0	Complied
1.064261	Vert.	22.5	21.8	1.6	45.9	74.0	28.1	Complied
1.199822	Vert.	14.5	20.8	1.6	36.9	74.0	37.1	Complied
1.307027	Vert.	9.3	20.9	1.6	31.8	74.0	42.2	Complied
1.397661	Vert.	8.7	22.3	1.6	32.6	74.0	41.4	Complied
1.690450	Horiz.	14.7	21.5	1.6	37.8	74.0	36.2	Complied
2.000422	Horiz.	15.6	20.7	2.0	38.3	74.0	35.7	Complied
4.878400	Horiz.	11.9	24.2	2.3	38.4	74.0	35.6	Complied

**Highest Average Level:**

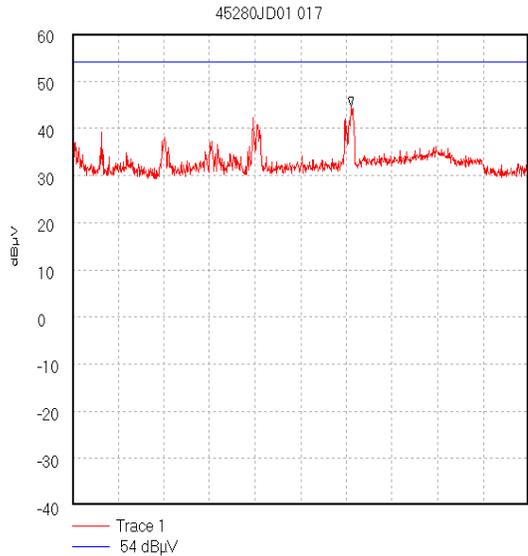
Frequency (GHz)	Antenna Polarity (H/V)	Average Detector Level (dB $\mu$ V)	Antenna Factor	Cable Loss	Actual Average Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Peak Margin (dB)	Result
1.000833	Horiz.	-4.8	21.5	1.6	18.3	54.0	35.7	Complied
1.064261	Vert.	-4.4	21.8	1.6	19.0	54.0	35.0	Complied
1.199822	Vert.	-5.2	20.8	1.6	17.2	54.0	36.8	Complied
1.307027	Vert.	-5.0	20.9	1.6	17.5	54.0	36.5	Complied
1.397661	Vert.	-5.8	22.3	1.6	18.1	54.0	35.9	Complied
1.690450	Horiz.	-2.7	21.5	1.6	20.4	54.0	33.6	Complied
2.000422	Horiz.	-4.4	20.7	2.0	18.3	54.0	35.7	Complied
4.878400	Horiz.	-2.1	24.2	2.3	24.4	54.0	29.6	Complied

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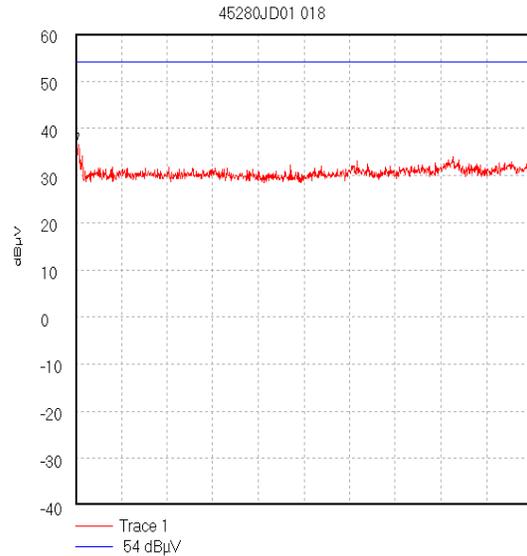
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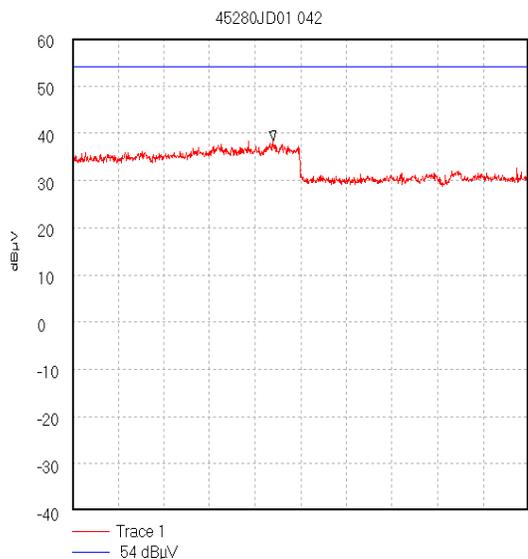
**Receiver/Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)**



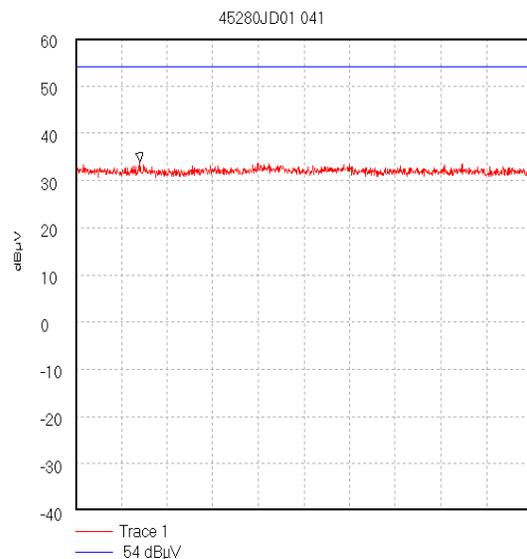
Start 1.0 GHz; Stop 2.0 GHz  
Ref 60 dBµV; Ref Offset 5.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.611 GHz; 44.74 dBµV  
Display Line: 54 dBµV; : Limit Test Failed  
30/09/2003 12:21:20



Start 2.0 GHz; Stop 4.0 GHz  
Ref 60 dBµV; Ref Offset 5.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 2.002 GHz; 37.07 dBµV  
Display Line: 54 dBµV; : Limit Test Passed  
30/09/2003 12:28:52



Start 4.0 GHz; Stop 6.0 GHz  
Ref 60 dBµV; Ref Offset 2.3 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 4.88 GHz; 38.47 dBµV  
Display Line: 54 dBµV; : Limit Test Passed  
02/10/2003 14:06:15



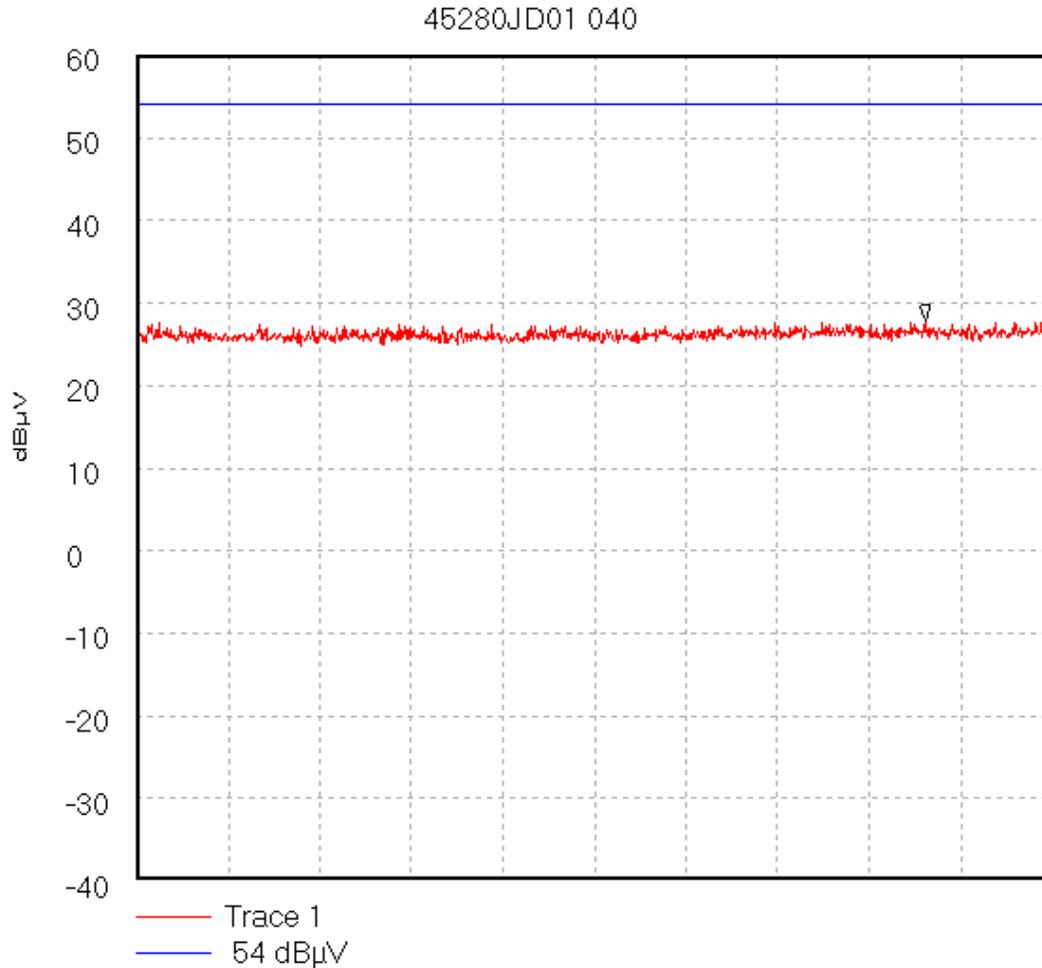
Start 6.0 GHz; Stop 8.0 GHz  
Ref 60 dBµV; Ref Offset 2.3 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 6.282222 GHz; 33.95 dBµV  
Display Line: 54 dBµV; : Limit Test Passed  
02/10/2003 14:01:38

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Receiver/Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)**



Start 8.0 GHz; Stop 10.0 GHz  
Ref 60 dBµV; Ref Offset 2.9 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Marker 9.724444 GHz, 27.91 dBµV  
Display Line: 54 dBµV; ; Limit Test Failed  
02/10/2003 13:52:39

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

### **8.3. Transmitter Carrier Output Power (and ERP Limitations):**

#### **Section 2.1046(a)/ 22.913(a)**

8.3.1. The EUT was configured as for conducted RF output power as described in section 9 of this report.

8.3.2. Tests were performed to identify the EUT's maximum conducted transmit power.

8.3.3. The effective radiated power (ERP) was calculated by adding the maximum allowable antenna gain to the figure measured for conducted RF output power.

#### **Results:**

Channel	Frequency (MHz)	Conducted Output RF Power (dBm)	*Maximum Allowable Antenna Gain (dBi)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	824.2	32.3	3.4	35.7	38.4	2.5	Complied
Middle	836.6	32.1	3.4	35.5	38.4	2.9	Complied
Top	848.8	32.6	3.4	36.0	38.4	2.4	Complied

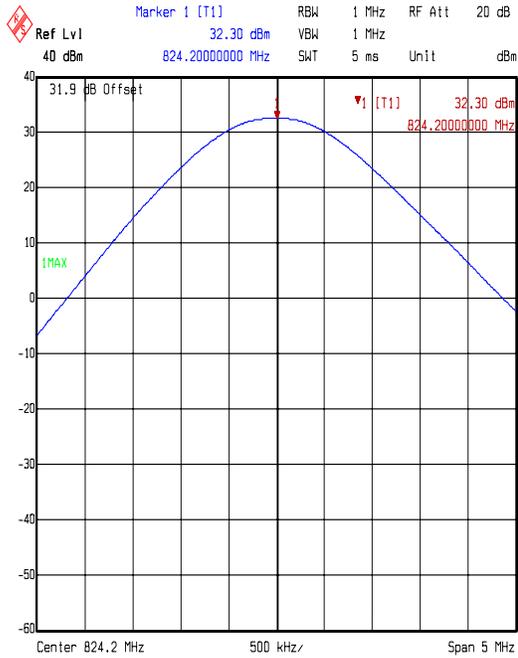
*\*Note : In order that the EIRP limit stated in Part 24.232 of 2 Watts (33 dBm) is not exceeded (refer to page 60 of this report), the maximum allowable antenna gain is 3.4 dBi and, hence, is the figure used in the above table. Under no circumstances can this figure be exceeded.*

Test Of: Sony Ericsson Mobile Communications AB.

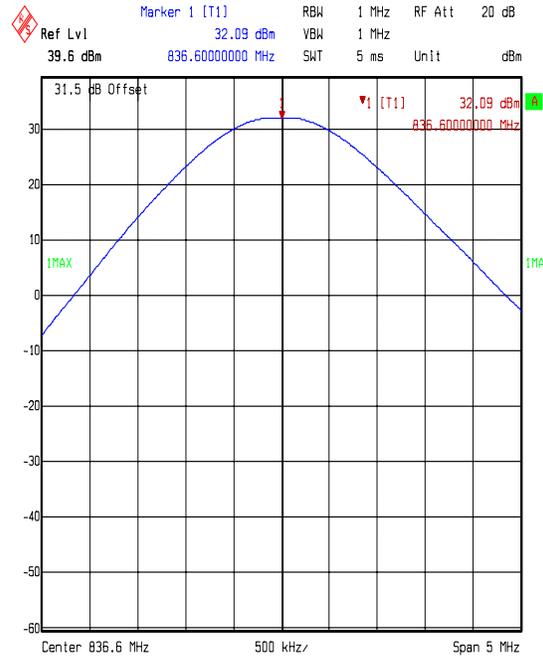
GT48 Mobile Base Unit

To: FCC Part 22 & 24

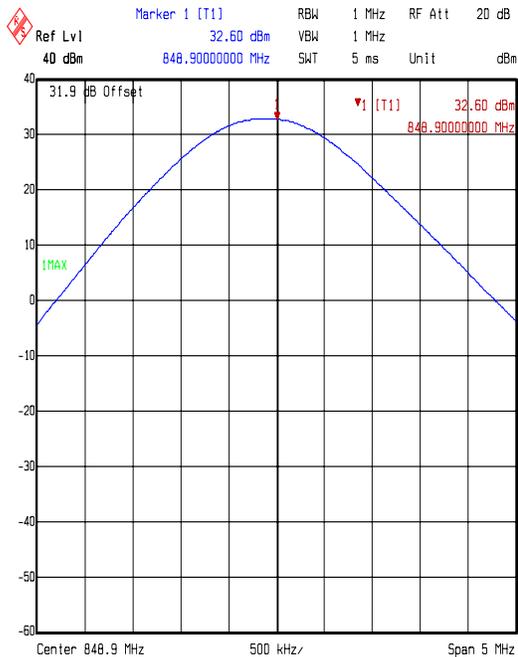
**Transmitter Carrier Output Power: Section 2.1046(a) (Continued)**



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 Carrier  
 Comment A: 45280JD01\_FCCP22\_Bottom Channel GSM850  
 Date: 14.OCT.2003 15:45:11



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 Carrier  
 Comment A: 45280JD01\_FCCP22\_Middle Channel GSM850  
 Date: 14.OCT.2003 15:46:49



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 Carrier  
 Comment A: 45280JD01\_FCCP22\_Top Channel GSM850  
 Date: 14.OCT.2003 15:48:08

Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**8.4. Transmitter Frequency Stability (Temperature Variation): Section 22.355**

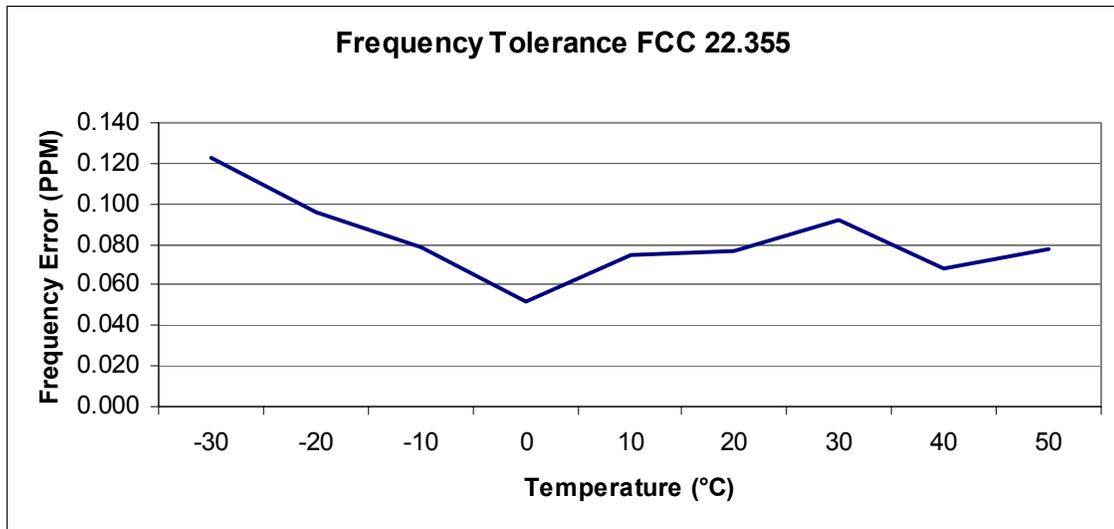
8.4.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

8.4.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

**Results: Bottom Channel (824.2 MHz)**

Temperature (°C)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	824.2	824.200101	101	0.123	2.5	2.377	Complied
-20	824.2	824.200079	79	0.096	2.5	2.404	Complied
-10	824.2	824.200065	65	0.079	2.5	2.421	Complied
0	824.2	824.200043	43	0.052	2.5	2.448	Complied
10	824.2	824.200062	62	0.075	2.5	2.425	Complied
20	824.2	824.200063	63	0.076	2.5	2.424	Complied
30	824.2	824.200076	76	0.092	2.5	2.408	Complied
40	824.2	824.200056	56	0.068	2.5	2.432	Complied
50	824.2	824.200064	64	0.078	2.5	2.422	Complied

**Frequency Variation From 824.2MHz**



Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

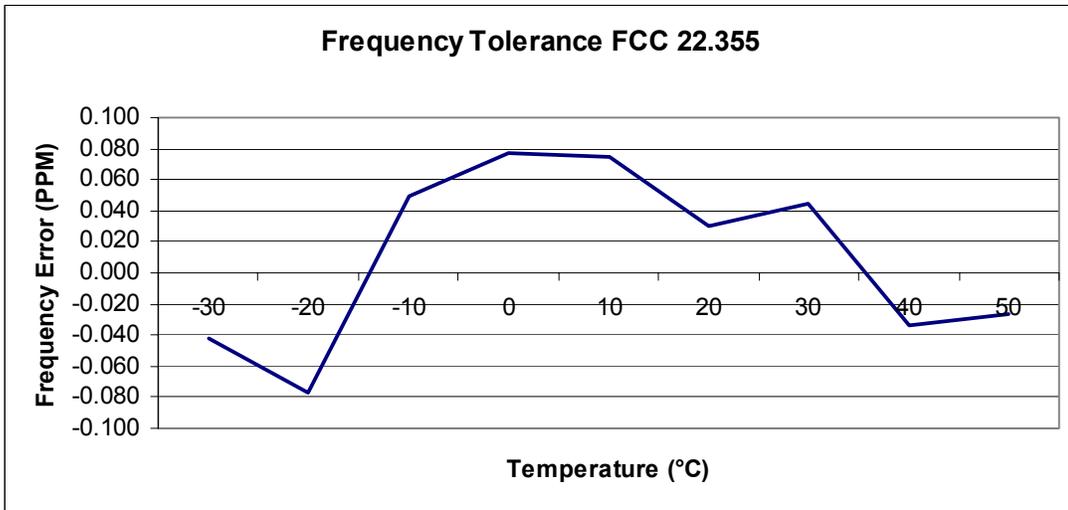
To: FCC Part 22 & 24

**Transmitter Frequency Stability (Temperature Variation): Section 22.355 (Continued)**

**Results Top Channel (848.8 MHz)**

Temperature (°C)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	848.8	848.799964	-36	0.043	2.5	2.457	Complied
-20	848.8	848.799935	-65	0.077	2.5	2.423	Complied
-10	848.8	848.800042	42	0.049	2.5	2.451	Complied
0	848.8	848.800065	65	0.077	2.5	2.423	Complied
10	848.8	848.800063	63	0.074	2.5	2.426	Complied
20	848.8	848.800026	26	0.031	2.5	2.469	Complied
30	848.8	848.800038	38	0.045	2.5	2.455	Complied
40	848.8	848.799971	-29	0.034	2.5	2.466	Complied
50	848.8	848.799978	-22	0.026	2.5	2.474	Complied

**Frequency Variation From 848.8 MHz**



Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**8.5. Transmitter Frequency Stability (Voltage Variation): Section 22.355**

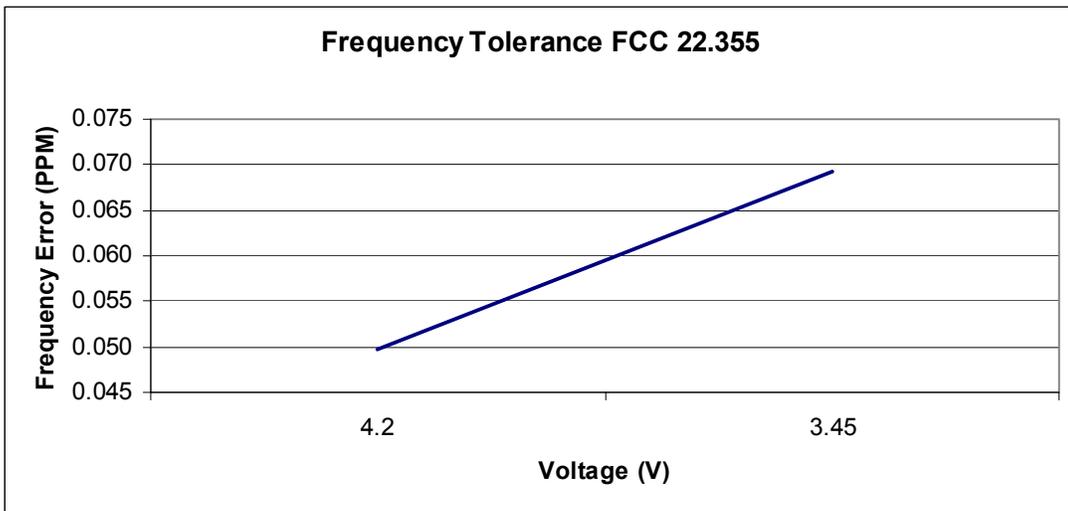
8.5.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

8.5.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

**Results Bottom Channel (824.2 MHz)**

Supply Voltage (V)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
97.75	824.2	824.200041	41	0.050	2.5	2.450	Complied
132.25	824.2	824.200057	57	0.069	2.5	2.431	Complied

**Frequency Variation From 824.2 MHz**



Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

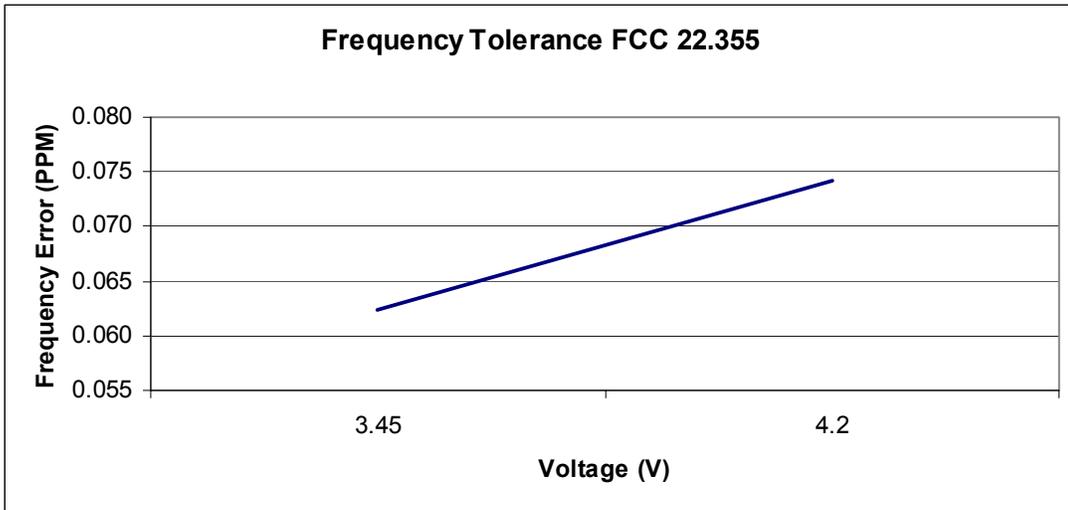
To: FCC Part 22 & 24

**Transmitter Frequency Stability (Voltage Variation): Section 22.355 (Continued)**

**Results Top Channel (848.8 MHz)**

Supply Voltage (V)	Nominal Frequency	Measured Frequency	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
97.75	848.8	848.800053	53	0.062	2.5	2.438	Complied
132.25	848.8	848.800063	63	0.074	2.5	2.426	Complied

**Frequency Variation From 848.8 MHz**



Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

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### **8.6. Transmitter Occupied Bandwidth: Section 2.1049(i)**

8.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 9 of this report.

8.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

#### **Results:**

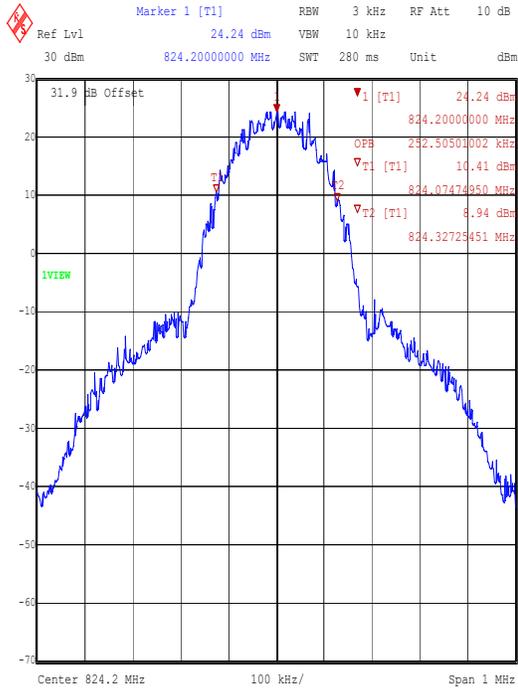
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Resolution Bandwidth (kHz)</b>	<b>Video Bandwidth (kHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	824.2	3.0	10.0	252.505010
Middle	836.6	3.0	10.0	248.496994
Top	848.8	3.0	10.0	254.509018

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

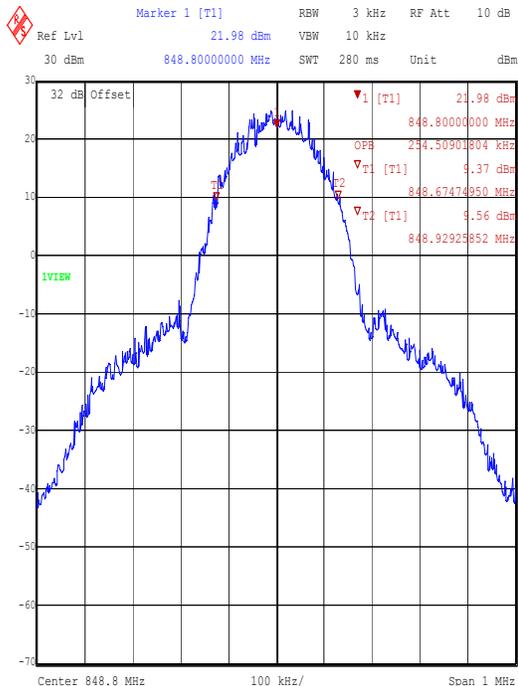
**Transmitter Occupied Bandwidth: Section 2.1049(i) (Continued)**



Date: 9.OCT.2003 15:48:45



Date: 9.OCT.2003 15:47:08



Date: 9.OCT.2003 15:44:17

*Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The vital data is reported in the upper right portion of the screen. See attached graphs.*

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 &amp; 24

**8.7. Transmitter Conducted Out of Band Emissions: Section 2.1051 & 22.917**

8.7.1. The EUT was configured as for conducted emissions testing as described in Section 9 of this report.

8.7.2. Tests were performed to identify the maximum transmitter conducted emission levels.

**Result: Bottom Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1649.299	-28.7	-13.0	15.7	Complied

**Result: Middle Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1673.347	-26.9	-13.0	13.9	Complied
6963.928	-33.5	-13.0	20.5	Complied

**Result: Top Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1697.395	-27.0	-13.0	10.4	Complied

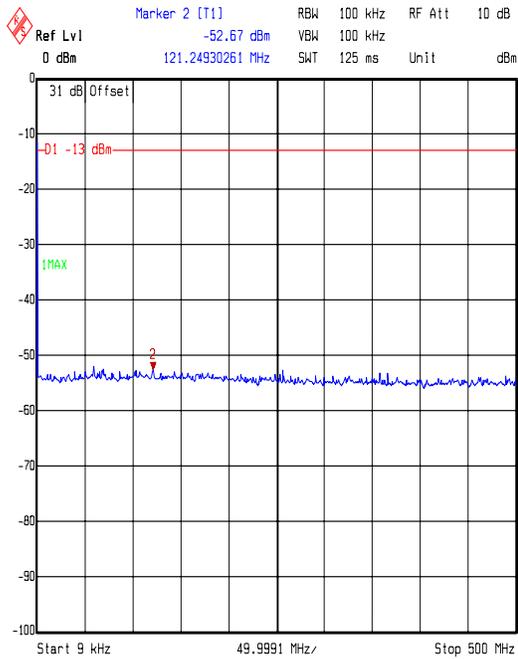
*Note: All other emissions were at least 20 dB better than the stated limit.*

Test Of: Sony Ericsson Mobile Communications AB.

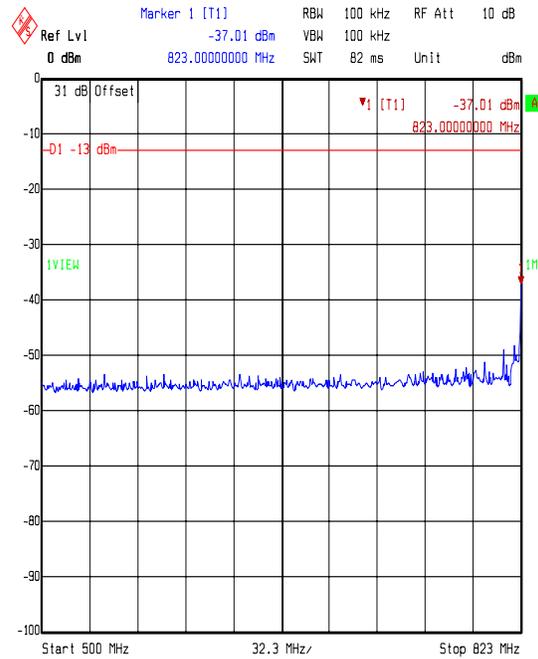
GT48 Mobile Base Unit

To: FCC Part 22 & 24

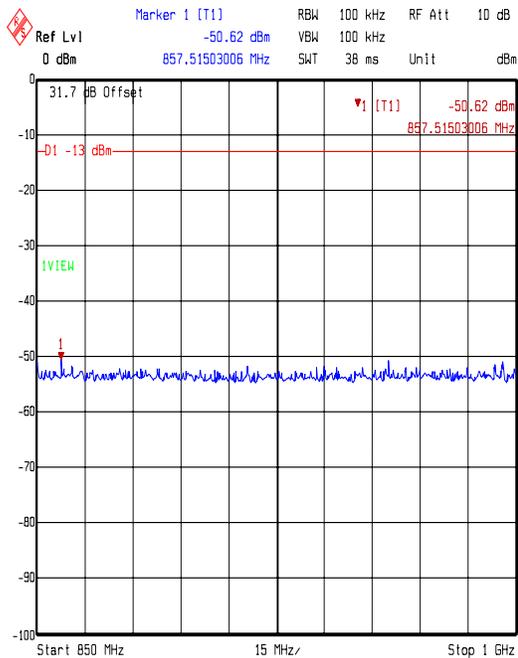
**Transmitter Conducted Out of Band Emissions (Bottom Channel): Section 2.1051 & 22.917 (Continued)**



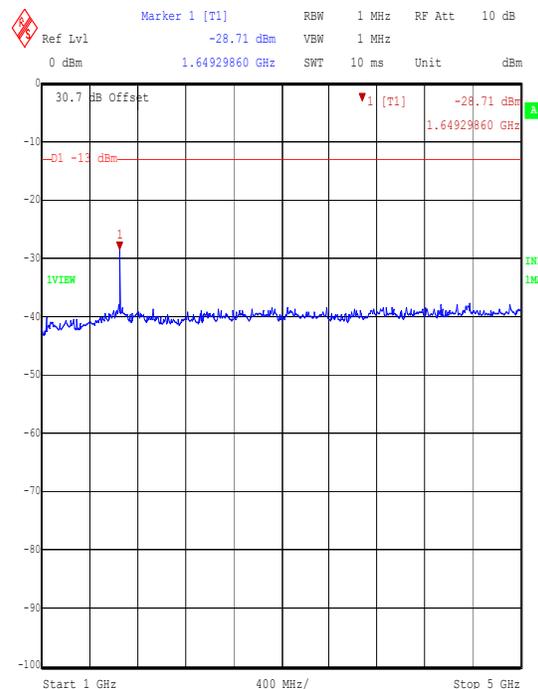
Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 CE  
 Comment A: 45280JD01\_FCCP22\_Bottom Channel GSM850  
 Date: 14.OCT.2003 14:37:49



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 CE  
 Comment A: 45280JD01\_FCCP22\_Bottom Channel GSM850  
 Date: 14.OCT.2003 14:39:34



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 CE  
 Comment A: 45280JD01\_FCCP22\_Bottom Channel GSM850  
 Date: 14.OCT.2003 16:26:54



Date: 9.OCT.2003 14:45:23

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

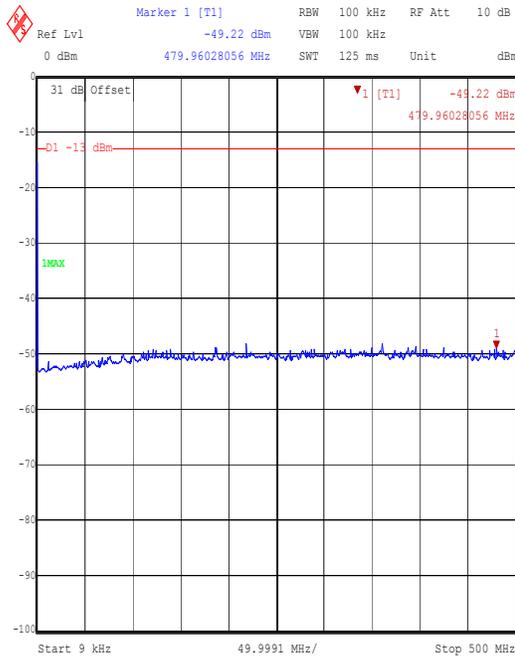


Test Of: Sony Ericsson Mobile Communications AB.

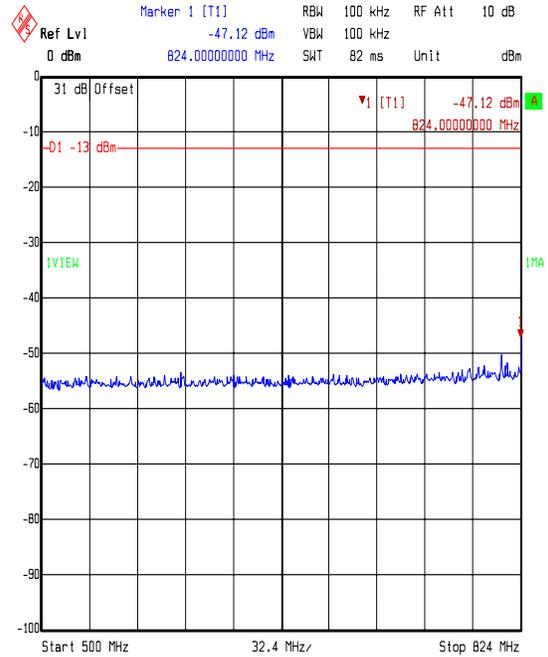
GT48 Mobile Base Unit

To: FCC Part 22 & 24

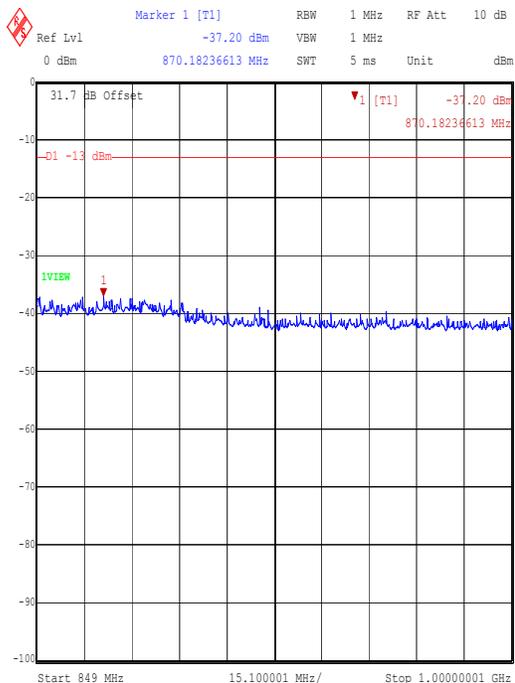
**Transmitter Conducted Out of Band Emissions (Middle Channel): Section 2.1051 & 22.917 (Continued)**



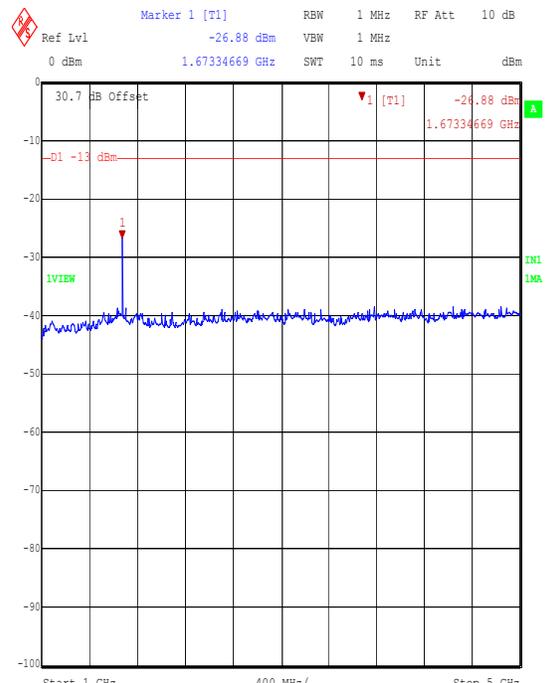
Title: Sony Ericsson EUT GT48. 001003830337872. FCC\_Part22\_CE  
 Comment A: 45280JD01\_FCC\_P22\_Middle Channel GSM850  
 Date: 15.OCT.2003 09:18:09



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 CE  
 Comment A: 45280JD01\_FCCP22\_Middle Channel GSM850  
 Date: 14.OCT.2003 16:41:41



Date: 9.OCT.2003 14:41:05



Date: 9.OCT.2003 14:47:57

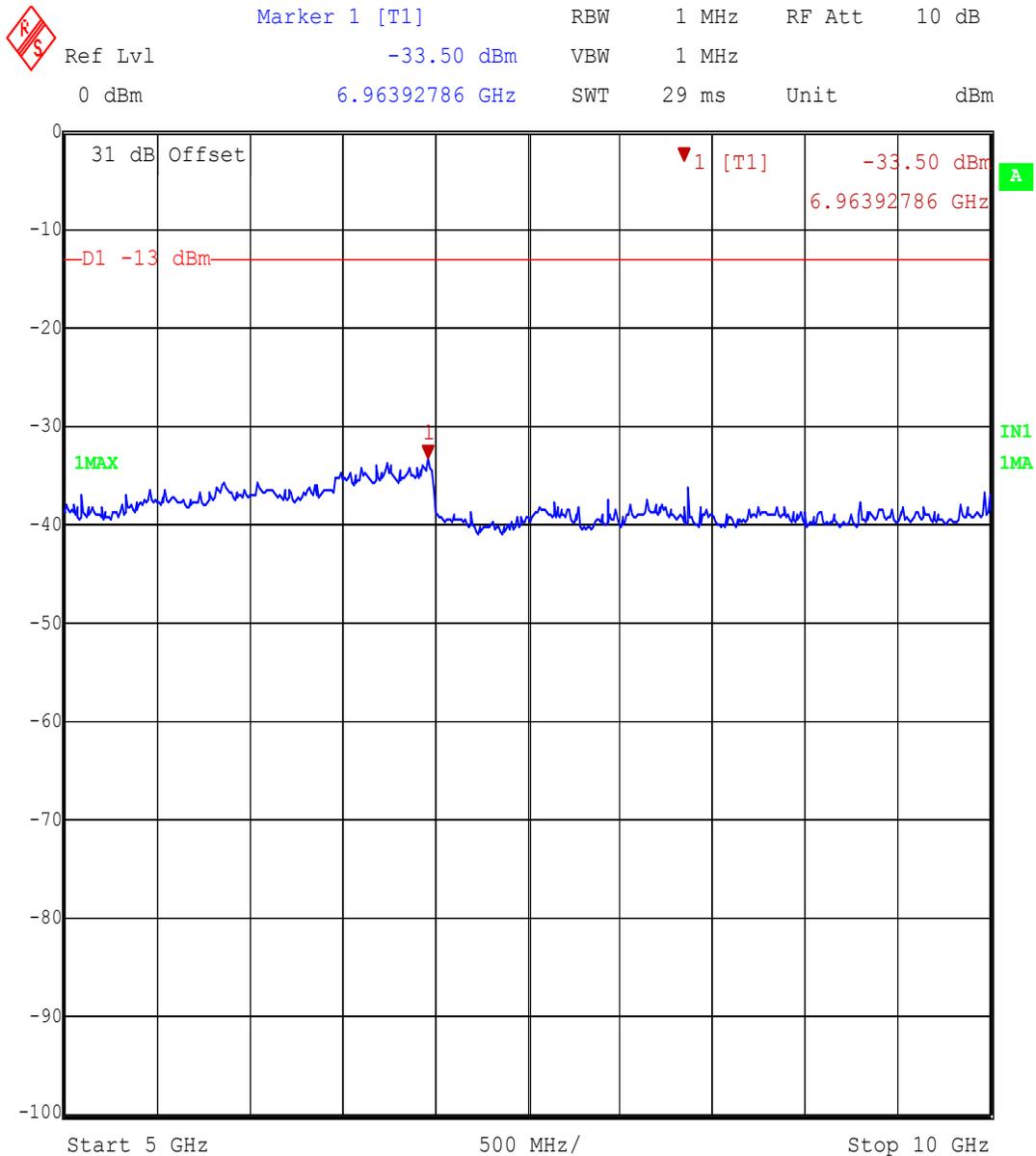
Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Transmitter Conducted Out of Band Emissions (Middle Channel): Section 2.1051 & 22.917 (Continued)**



Date: 9.OCT.2003 14:53:18

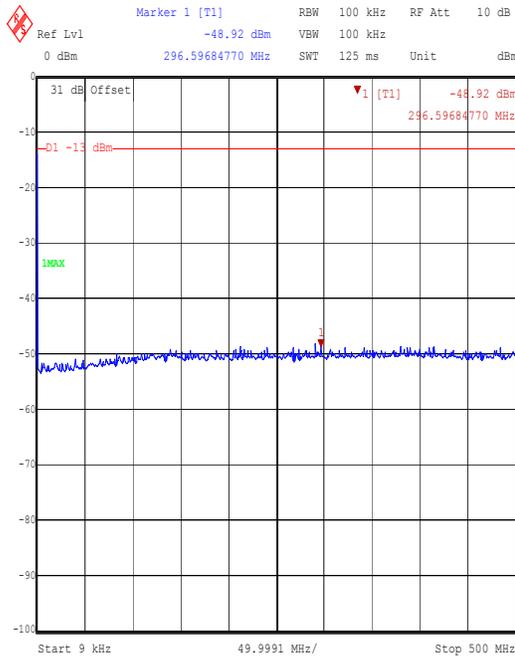
*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test Of: Sony Ericsson Mobile Communications AB.

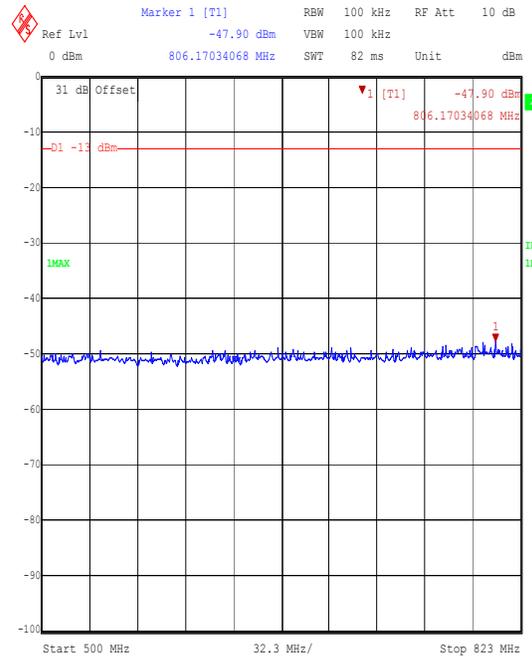
GT48 Mobile Base Unit

To: FCC Part 22 & 24

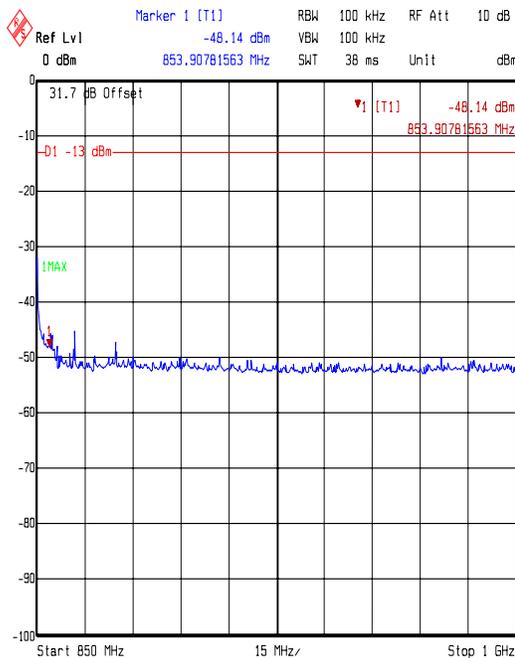
**Transmitter Conducted Out of Band Emissions (Top Channel): Section 2.1051 & 22.917 (Continued)**



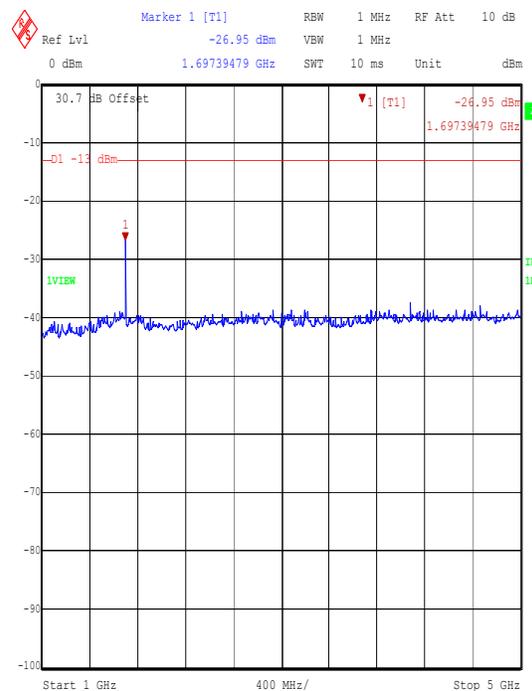
Title: Sony Ericsson EUT GT48. 001003830337872. FCC\_Part22\_CE  
 Comment A: 45280JD01\_FCC\_P22\_Top Channel GSM850  
 Date: 15.OCT.2003 09:24:11



Title: Sony Ericsson EUT GT48. 001003830337872. FCC\_Part22\_CE  
 Comment A: 45280JD01\_FCC\_P22\_Top Channel GSM850  
 Date: 15.OCT.2003 09:25:24



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 CE  
 Comment A: 45280JD01\_FCCP22\_Top Channel GSM850  
 Date: 14.OCT.2003 16:33:56



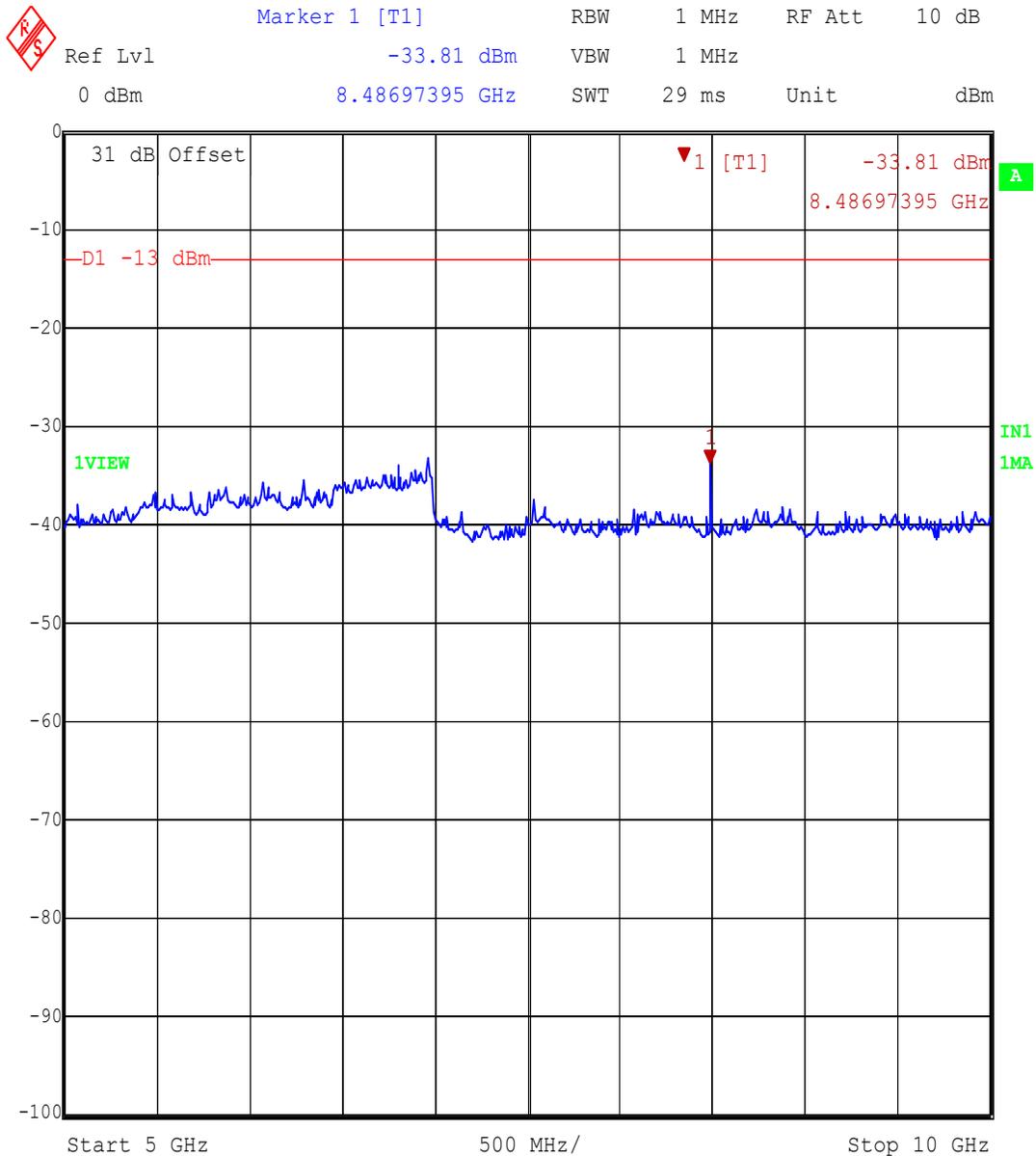
Date: 9.OCT.2003 14:49:29

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Transmitter Conducted Out of Band Emissions (Top Channel): Section 2.1051 & 22.917 (Continued)**



Date: 9.OCT.2003 14:51:50

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 &amp; 24

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**8.8. Transmitter Radiated Out of Band Emissions: Section 2.1053 & 22.917**

8.8.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.8.2. Tests were performed to identify the maximum out of band transmitter radiated spurious emission level present in the band 30 MHz to 10 x the highest fundamental frequency.

**Result: Bottom Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1648.533	-51.7	-13.0	38.7	Complied

**Result: Middle Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1673.322	-49.3	-13.0	36.3	Complied

**Result: Top Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1697.488	-47.0	-13.0	34.0	Complied

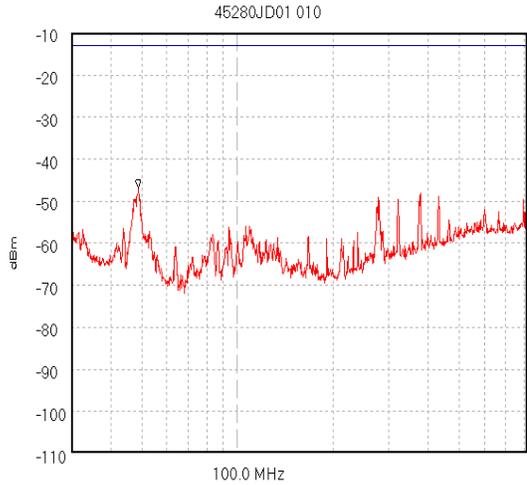
*Note: All other emissions were at least 20 dB better than the stated limit.*

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

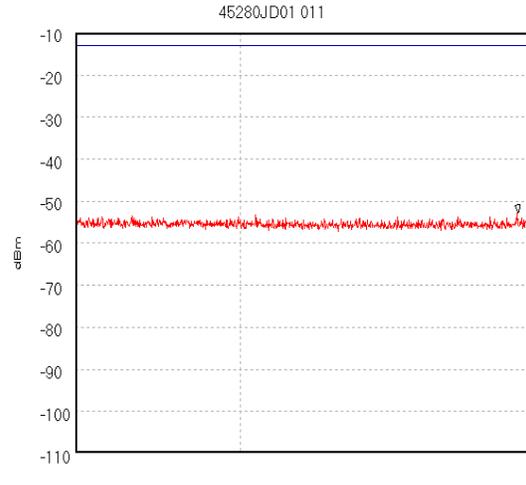
To: FCC Part 22 & 24

**Transmitter Out of Band Emissions: Section 2.1053 & 22.917 (Continued)**



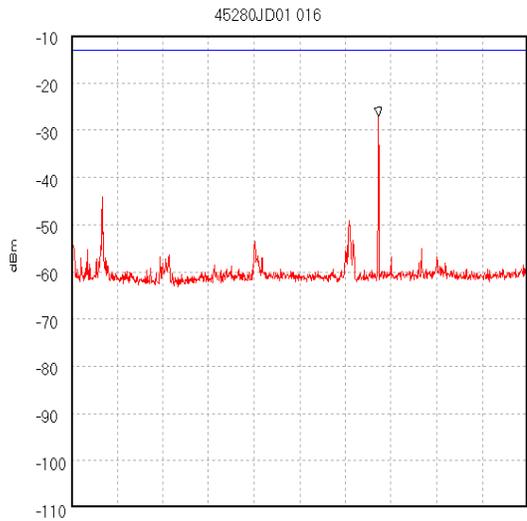
Trace 1  
-13 dBm

Start 30.0 MHz; Stop 824.0 MHz - Log Scale  
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div  
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 200.0 mS  
Peak 48.769 MHz, -46.92 dBm  
Display Line: -13 dBm;  
Transducer Factors: A1037  
9/29/2003 4:42:15 PM



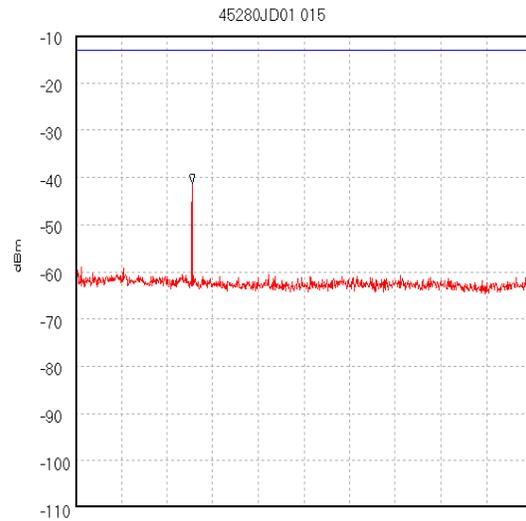
Trace 1  
-13 dBm

Start 848.0 MHz; Stop 1.0 GHz - Log Scale  
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div  
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 60.0 mS  
Peak 995.102 MHz, -52.68 dBm  
Display Line: -13 dBm;  
Transducer Factors: A1037  
9/29/2003 4:55:55 PM



Trace 1  
-13 dBm

Start 1.0 GHz; Stop 2.0 GHz  
Ref -10 dBm; Ref Offset 37.0 dB; 10 dB/div  
RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 640.0 mS  
Peak 1.673 GHz, -27.03 dBm  
Display Line: -13 dBm; ; Limit Test Passed  
30/09/2003 12:13:46



Trace 1  
-13 dBm

Start 2.0 GHz; Stop 4.0 GHz  
Ref -10 dBm; Ref Offset 36.0 dB; 10 dB/div  
RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 1.28 S  
Peak 2.511 GHz, -41.33 dBm  
Display Line: -13 dBm; ; Limit Test Passed  
30/09/2003 12:01:54

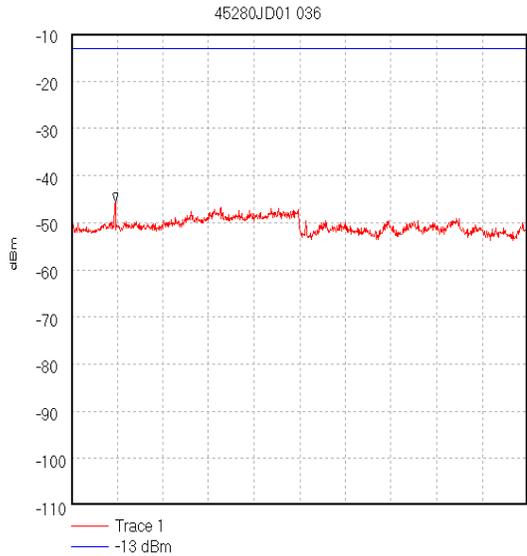
*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test Of: Sony Ericsson Mobile Communications AB.

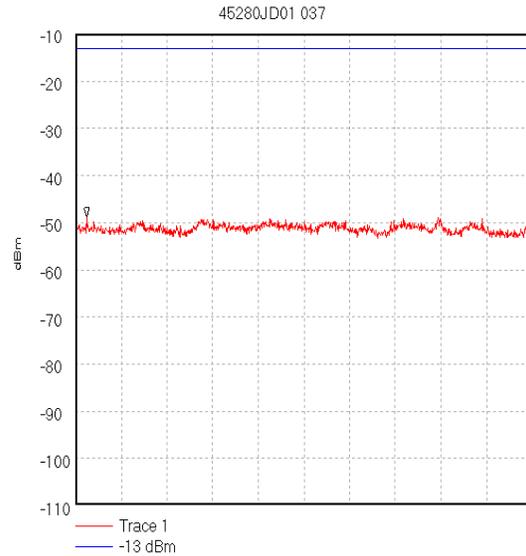
GT48 Mobile Base Unit

To: FCC Part 22 & 24

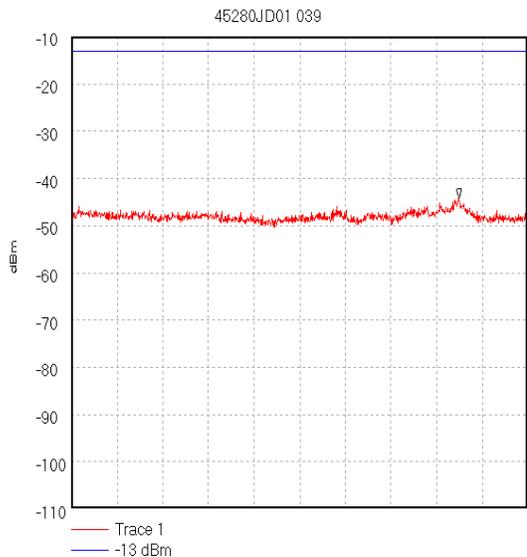
**Transmitter Out of Band Emissions: Section 2.1053 & 22.917 (Continued)**



Start 4.0 GHz; Stop 6.0 GHz  
Ref -10 dBm; Ref Offset 30.8 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 4.193333 GHz, -45.65 dBm  
Display Line: -13 dBm;  
02/10/2003 12:09:11



Start 6.0 GHz; Stop 8.0 GHz  
Ref -10 dBm; Ref Offset 33.4 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 6.048889 GHz, -48.82 dBm  
Display Line: -13 dBm;  
02/10/2003 12:19:49



Start 8.0 GHz; Stop 10.0 GHz  
Ref -10 dBm; Ref Offset 38.1 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 9.697778 GHz, -44.17 dBm  
Display Line: -13 dBm;  
02/10/2003 12:24:01

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Operations Department

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

**8.9. Transmitter Conducted Emissions At Band Edges: Section 2.1053/22.917**

8.9.1. The EUT was configured as transmitter conducted emissions testing as described in Section 9 of this report.

8.9.2. Tests were performed to identify the maximum emission levels at the band edges of the frequency block of operation.

**Results:**

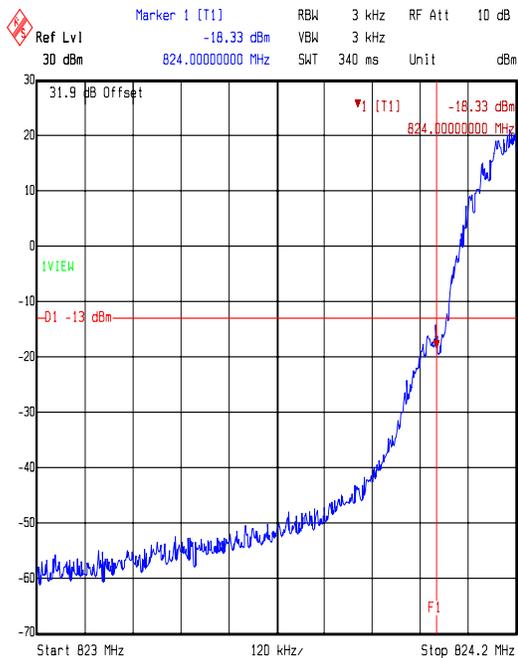
**Bottom Band Edge**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824.0	-18.3	-13.0	5.3	Complied

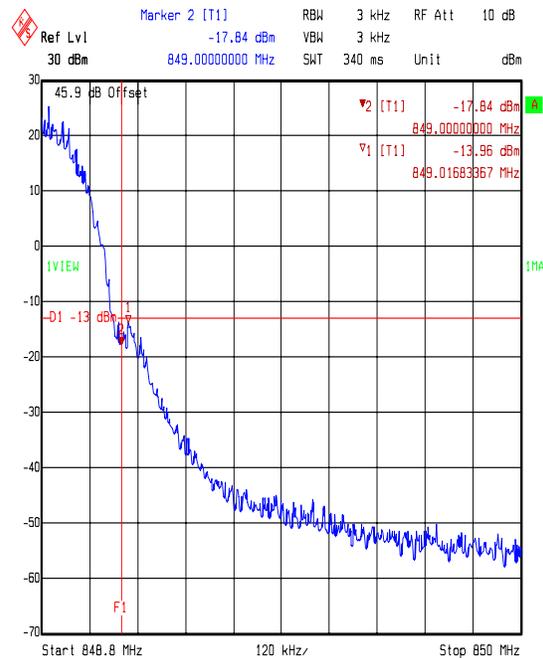
**Top Band Edge**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
849.0	-17.8	-13.0	4.8	Complied
849.017*	-14.0	-13.0	1.0	Complied

\*Note: this level was noted as the highest modulation product outside of the band



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 Band Edge  
 Comment A: 45280JD01\_FCCP22\_Bottom Channel GSM850  
 Date: 14.OCT.2003 12:23:48



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part22 Band Edge  
 Comment A: 45280JD01\_FCCP22\_Top Channel GSM850  
 Date: 14.OCT.2003 12:34:52

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

**8.10. Transmitter Radiated Emissions At Band Edges: Section 2.1053**

8.10.1. The EUT was configured as for radiated emissions testing as described in Section 9 of this report.

8.10.2. Tests were performed to identify the maximum emission levels at the band edges of the frequency block of operation.

**Results:**

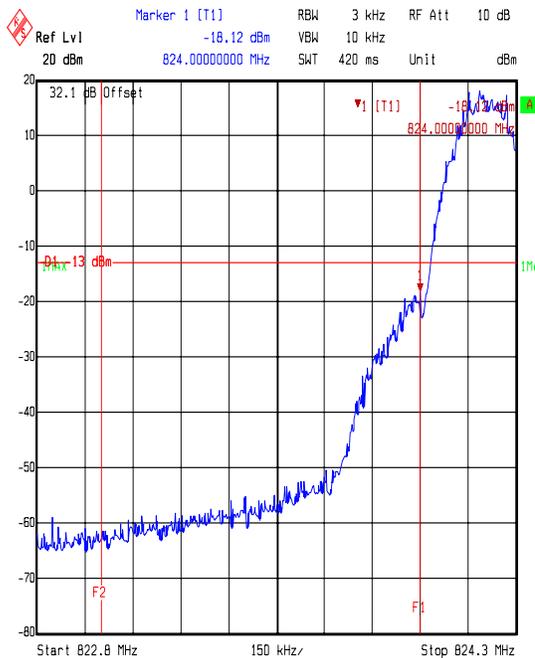
**Bottom Band Edge**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
824.0	-18.1	-13.0	5.1	Complied

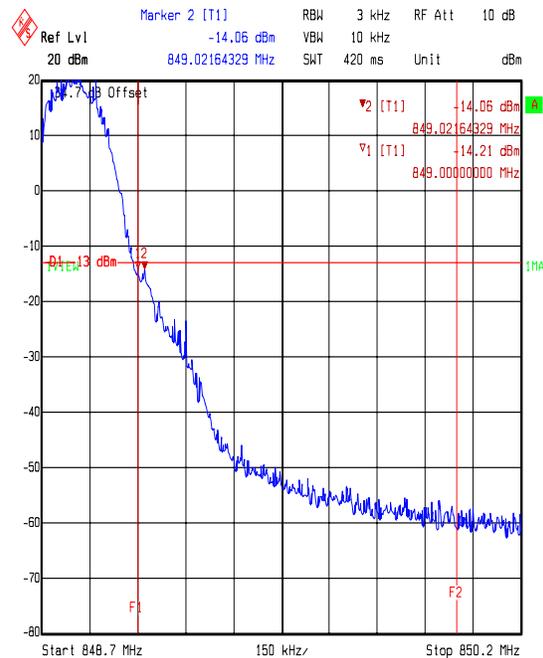
**Top Band Edge**

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
849.0	-14.2	-13.0	1.2	Complied
*849.021	-14.1	-13.0	1.1	Complied

*\*Note: this level was noted as the highest modulation product outside of the band*



Title: Sony Ericsson EUT: GT48, FCC P22, Radiated Lower Band-Edge  
 Comment A: 45280JD1\_FCC\_P22\_Bottom\_Channel\_GSM850  
 Date: 14.OCT.2003 21:18:23



Title: Sony Ericsson EUT: GT48, FCC P22, Radiated Upper Band-Edge  
 Comment A: 45280JD1\_FCC\_P22\_Top\_Channel\_GSM850  
 Date: 14.OCT.2003 21:21:38

Test Of: Sony Ericsson Mobile Communications AB.

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To: FCC Part 22 & 24

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## **9. Measurement Methods – Part 22**

### **9.1. Conducted Output Power**

The EUT was connected to a spectrum analyser and to a GSM test set via suitable cables, RF attenuators and combiners.

The connection was made to the EUT either via an antenna port or by antenna terminals made available by the client.

The total loss of the cables, attenuators and combiner were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The EUT was set to the maximum indicated peak and the conducted power was recorded.

This test was performed on the bottom, middle and top channels.

The test equipment settings for conducted antenna port measurements were as follows:

<b>Receiver Function</b>	<b>Setting</b>
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	>=Emission Bandwidth
Amplitude Range:	100 dB
Step Size:	Continuous Sweep
Sweep Time:	Coupled

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## **9.2. Effective Radiated Power (ERP)**

ERP measurements were performed in accordance with the standard, against appropriate limits.

The ERP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4 as requested by EIA/TIA-603-B. The transmitter was fitted with an integral antenna; as such all radiated tests were performed with the unit operating into the integral antenna.

The level of the ERP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane.

The EUT was oriented in the X plane.

The test antenna was then raised and lowered until a maximum peak level was observed.

The turntable was then rotated through 360 degrees and a maximum peak reading obtained.

The height search was then repeated to take into consideration the new angular position of the turntable.

The maximum reading observed was then recorded.

This procedure was repeated with the EUT oriented in the Y and Z planes.

The highest peak reading taken in all 3 planes was recorded.

The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once a final maximum amplitude had been obtained, the EUT was substituted with a dipole antenna.

The centre of the substitution antenna was set to approximately the same centre location as the EUT.

The substitution antenna was set to the horizontal polarity.

The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator.

The signal generator was tuned to the EUT frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser.

The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed.

The signal generator level was noted.

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**Effective Radiated Power (ERP) (Continued)**

This procedure was repeated with both test antenna and substitution antenna vertically polarised. The ERP was calculated as:-

$$\text{ERP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

Circumstances where the signal generator could not produce the desired power level, substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The ERP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated ERP to obtain the substituted EUT EIRP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

Where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual ERP is calculated as:

$$\text{ERP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT ERP is calculated as:

$$\text{ERP EUT} = \text{ERP SG} + \text{Delta.}$$

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### **9.3. Frequency Stability**

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via its antenna port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30 to 50 °C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

Measurements were made on the top, middle and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

The frequency error measured was converted to an error in ppm using the following formula as defined by TIA\_EIA\_603A :-

ppm error =

where  $MCF_{MHz}$  is the measured carrier frequency in MHz  
 $ACF_{MHz}$  is the assigned carrier frequency in MHz

The measured ppm had to be less than the relevant limits in order to comply.

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#### **9.4. Occupied Bandwidth**

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via a bi-directional coupler to its antenna port.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom, middle and top channels.

As the EUT is a PCS phone, no modulation input port was available. A call was thus set up using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW  $\leq$  1% of occupied bandwidth. A value of 3 kHz was used.

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### **9.5. Transmitter Conducted Emissions**

The test was performed in a laboratory environment.

Spurious emissions measurements at the antenna port were performed from the lowest declared frequency to 10 times the highest EUT fundamental frequency.

A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The limit in the standard states that emissions shall be attenuated by at least  $43=10 \log(P)$  dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to  $-13.0$  dBm therefore, the limit line presented on the accompanying plots is set to  $-13.0$  dBm.

The frequency band described above was investigated with the transmitter operating at full power on the top, middle and bottom channels. Any spurious observed were then recorded and compared to the  $-13.0$  dBm limit. The requirement is for the emission to be less than  $-13.0$  dBm. The margin between the emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 22.917 states that the 1<sup>st</sup> MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. The bandwidth was found to be 3.0 kHz.

The test equipment settings for conducted antenna port measurements were as follows:

<b>Receiver Function</b>	<b>Settings</b>
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	100 kHz <1.0 GHz
Bandwidth:	1 MHz >1.0 GHz
Amplitude Range:	100 dB
Step Size:	Continuous Sweep
Sweep Time:	Coupled

The resolution bandwidth used for measurements in the 1.0 MHz blocks either side of the declared operating frequency block were set as described in the procedure above.

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### **9.6. AC Mains Conducted Emissions**

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane.

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

During the swept measurements (and also during subsequent final measurements on single frequencies) any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements</b>
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

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### **9.7. Transmitter Radiated Emissions**

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The radiated power was calculated as:-

$$\text{EIRP/ERP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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### **Transmitter Radiated Emissions (Continued)**

The limit in the standard states that emissions shall be attenuated by at least  $43+10 \log (P)$  dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to  $-13$  dBm therefore, the limit line presented on the accompanying plots is set to  $-13$  dBm.

Any spurious measured were then compared to the  $-13$  dBm limit. The requirement is for the emission to be less than  $-13$  dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 22.917 states that the 1<sup>st</sup> MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

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### **9.8. Receiver Radiated Emissions**

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 5 times the highest unintentionally generated frequency were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dB $\mu$ V plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements Below 1 GHz</b>	<b>Final Measurements Above 1 GHz</b>
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

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## **10. Test Results FCC Part 24**

### **10.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107**

10.1.1. The EUT was configured as for AC conducted emissions measurements as described in Section 11 of this report.

10.1.2. Tests were performed to identify the maximum emission levels on the AC mains line of the AC adaptor powering the EUT.

#### **Results: Quasi-Peak Detector Measurements On Live And Neutral Lines**

Frequency (MHz)	Line	Q-P Level (dB $\mu$ V)	Q-P Limit (dB $\mu$ V)	Margin (dB)	Result
0.33901	Live	46.25	59.23	12.98	Complied
0.53093	Neutral	50.11	56.00	5.89	Complied
0.65800	Neutral	52.75	56.00	3.25	Complied
0.83005	Neutral	51.25	56.00	4.75	Complied
1.04441	Neutral	45.84	56.00	10.16	Complied
2.27044	Neutral	42.72	56.00	13.28	Complied
10.28309	Live	48.99	60.00	11.01	Complied
16.09053	Live	46.98	60.00	13.02	Complied

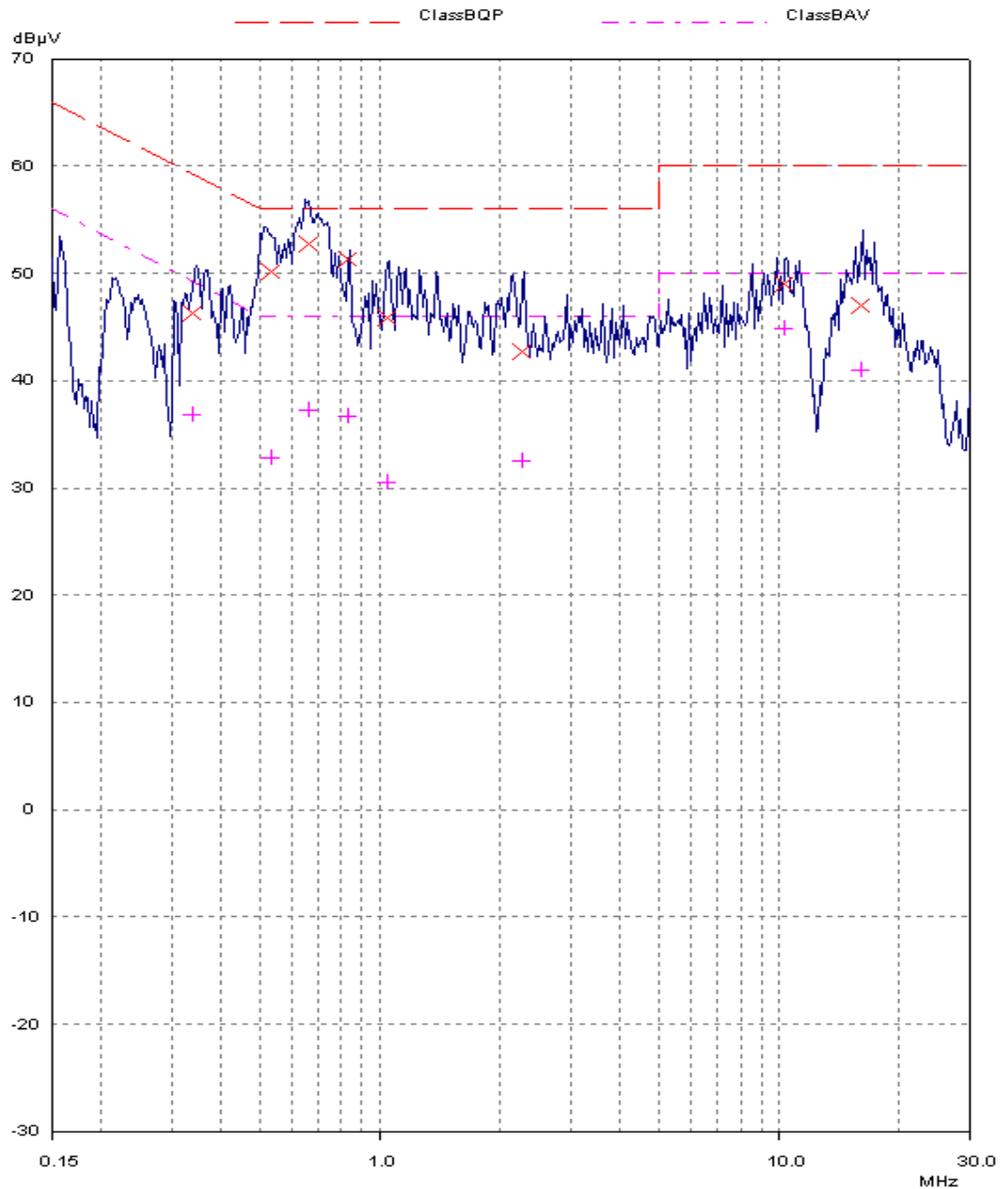
#### **Results: Average Detector Measurements On Live And Neutral Lines**

Frequency (MHz)	Line	Av. Level (dB $\mu$ V)	Av. Limit (dB $\mu$ V)	Margin (dB)	Result
0.33901	Neutral	36.88	49.23	12.35	Complied
0.53093	Neutral	32.76	46.00	13.24	Complied
0.65800	Live	37.23	46.00	8.77	Complied
0.83005	Neutral	36.72	46.00	9.28	Complied
1.04441	Live	30.58	46.00	15.42	Complied
2.27044	Neutral	32.53	46.00	13.47	Complied
10.28309	Neutral	44.87	50.00	5.13	Complied
16.09053	Neutral	41.01	50.00	8.99	Complied

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**Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)**



*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

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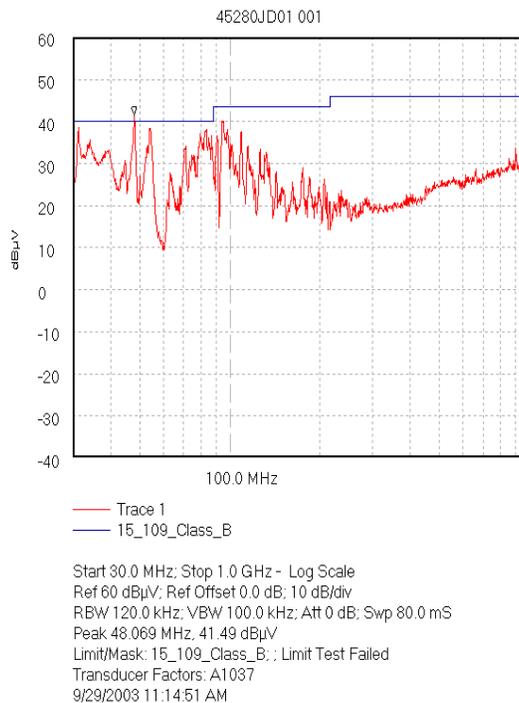
**10.2. Idle Mode Radiated Spurious Emission: Section 15.109**

10.2.1. The EUT was configured as for radiated emissions testing as described in Section 11 of this report.

10.2.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

**Result:**

Frequency (MHz)	Antenna Polarity (H/V)	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
32.234	Vert.	30.1	40.0	9.9	Complied
47.939	Vert.	34.7	40.0	5.3	Complied
54.430	Vert.	32.3	40.0	7.7	Complied
82.753	Vert.	24.3	40.0	15.7	Complied
94.553	Vert.	34.4	40.0	5.6	Complied



*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

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**Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)****10.2.1. Electric Field Strength Measurements (Frequency Range 1.0 to 10.0 GHz)**

10.2.1.1. The EUT was configured as for radiated emissions testing as described in Section 11 of this report.

10.2.1.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

**Result:****Highest Peak Level**

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector Level (dB $\mu$ V)	Antenna Factor	Cable Loss	Actual Peak Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Peak Margin (dB)	Result
1.000311	Vert.	19.9	21.5	1.6	43.0	74.0	31.0	Complied
1.064261	Vert.	28.7	21.5	1.6	51.8	74.0	22.2	Complied
1.216005	Vert.	20.1	20.8	1.6	42.5	74.0	31.5	Complied
1.499411	Vert.	20.5	21.1	1.6	43.2	74.0	30.8	Complied
1.619388	Vert.	22.0	20.9	1.6	44.5	74.0	29.5	Complied
3.649563	Horiz.	11.2	22.4	2.0	33.6	74.0	40.4	Complied
4.76887	Horiz.	11.3	24.2	2.3	37.8	74.0	36.2	Complied
7.51859	Horiz.	7.4	26.8	2.9	37.1	74.0	36.9	Complied

**Highest Average Level:**

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector Level (dB $\mu$ V)	Antenna Factor	Cable Loss	Actual Average Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Peak Margin (dB)	Result
1.000311	Vert.	4.2	21.5	1.6	27.3	54.0	26.7	Complied
1.064261	Vert.	17.4	21.5	1.6	40.5	54.0	13.5	Complied
1.216005	Vert.	4.1	20.8	1.6	26.5	54.0	27.5	Complied
1.499411	Vert.	5.4	21.1	1.6	28.1	54.0	25.9	Complied
1.619388	Vert.	7.0	20.9	1.6	29.5	54.0	24.5	Complied
3.649563	Horiz.	-4.3	22.4	2.0	20.1	54.0	33.9	Complied
4.76887	Horiz.	-2.5	24.2	2.3	24.0	54.0	30.0	Complied
7.51859	Horiz.	-9.7	26.8	2.9	20.0	54.0	34.0	Complied

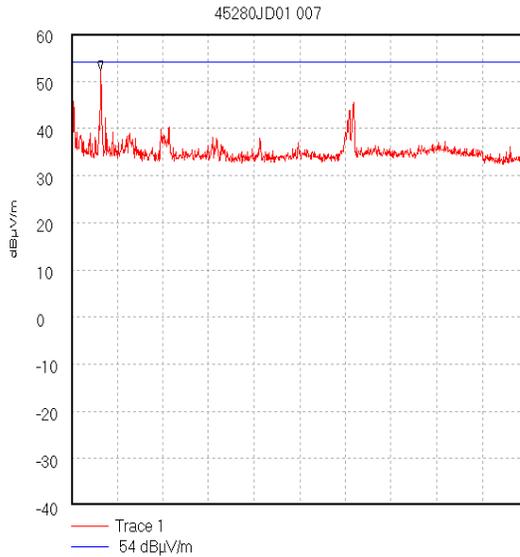
Operations Department

Test Of: Sony Ericsson Mobile Communications AB.

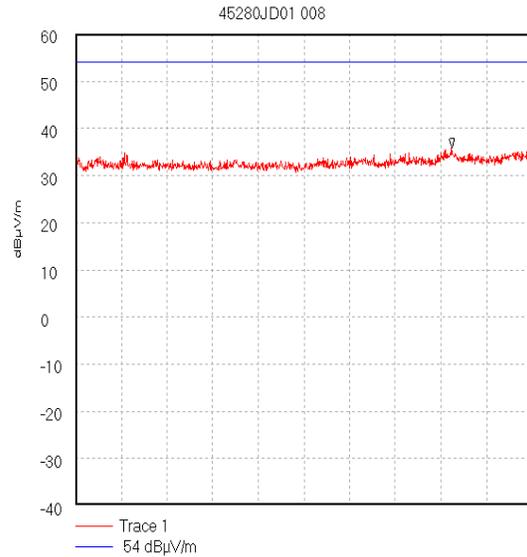
GT48 Mobile Base Unit

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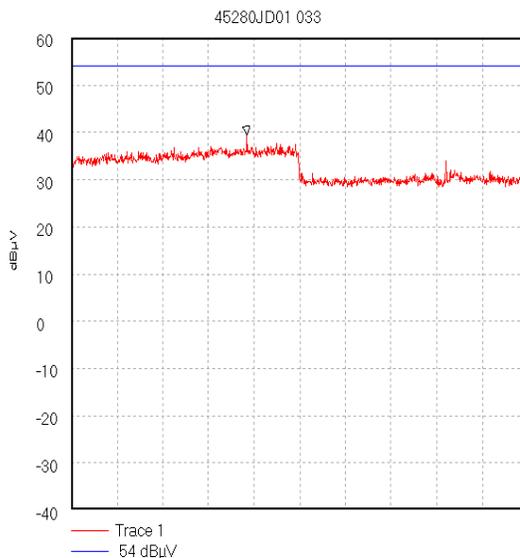
**Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)**



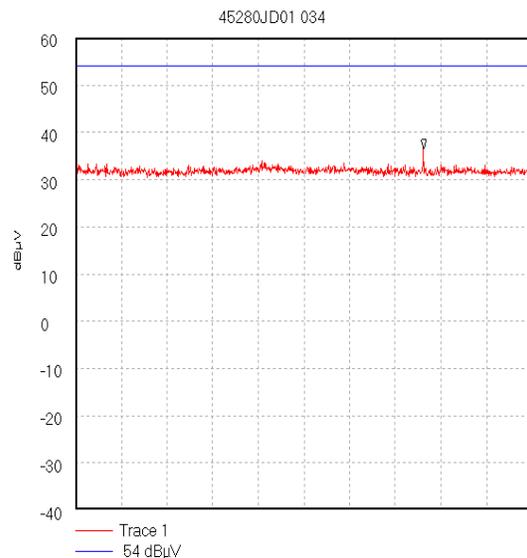
Start 1.0 GHz; Stop 2.0 GHz  
Ref 60 dBµV/m; Ref Offset 5.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.064 GHz; 52.34 dBµV/m  
Display Line: 54 dBµV/m; ; Limit Test Passed  
9/29/2003 3:34:57 PM



Start 2.0 GHz; Stop 4.0 GHz  
Ref 60 dBµV/m; Ref Offset 5.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 3.649 GHz; 36.01 dBµV/m  
Display Line: 54 dBµV/m; ; Limit Test Passed  
9/29/2003 3:40:04 PM



Start 4.0 GHz; Stop 6.0 GHz  
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 4.768889 GHz; 39.39 dBµV  
Display Line: 54 dBµV; ; Limit Test Failed  
02/10/2003 11:52:14



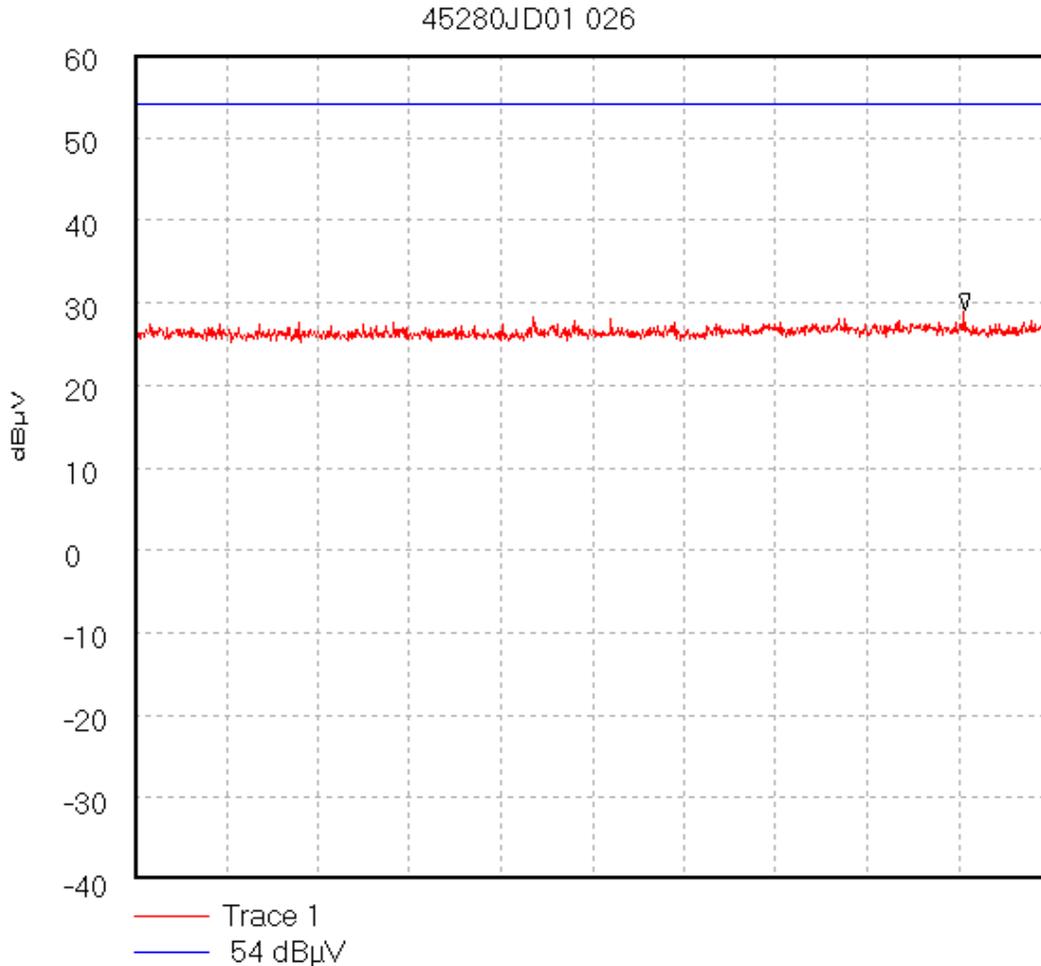
Start 6.0 GHz; Stop 8.0 GHz  
Ref 60 dBµV; Ref Offset 2.3 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 7.524444 GHz; 36.49 dBµV  
Display Line: 54 dBµV; ; Limit Test Passed  
02/10/2003 11:57:46

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

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To: FCC Part 22 & 24

**Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)**



Start 8.0 GHz; Stop 10.0 GHz  
Ref 60 dBµV; Ref Offset 2.9 dB; 10 dB/div  
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 9.813333 GHz, 29.02 dBµV  
Display Line: 54 dBµV; ; Limit Test Passed  
02/10/2003 11:18:26

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

### **10.3. Transmitter Carrier Output Power (and EIRP Limitations):**

#### **Section 2.1046(a)/ 24.232**

10.3.1. The EUT was configured as for conducted RF output power as described in section 11 of this report.

10.3.2. Tests were performed to identify the EUT's maximum conducted transmit power.

10.3.3. The effective isotropic radiated power (EIRP) was calculated by adding the maximum allowable antenna gain to the figure measured for conducted RF output power.

#### **Results:**

Channel	Frequency (MHz)	Conducted Output RF Power (dBm)	*Maximum Allowable Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	29.6	3.4	33.0	33.0	0.0	Complied
Middle	1879.8	29.4	3.4	32.8	33.0	0.2	Complied
Top	1909.8	29.3	3.4	32.7	33.0	0.3	Complied

*\*Note : In order that the EIRP limit stated in Part 24.232 of 2 Watts (33 dBm) is not exceeded, the maximum allowable antenna gain is 3.4 dBi and, hence, is the figure used in the above table. Under no circumstances can this figure be exceeded.*

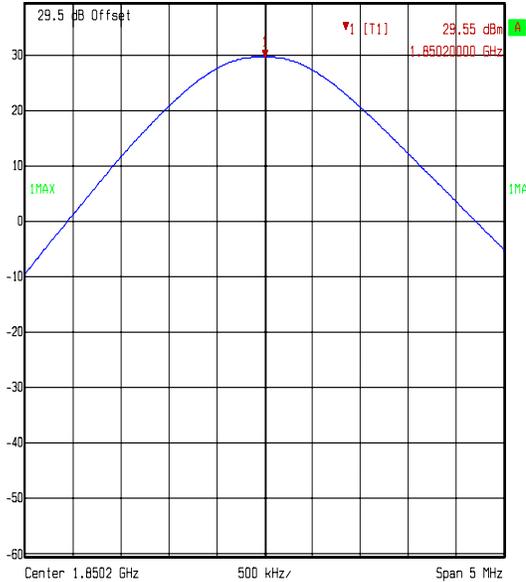
Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

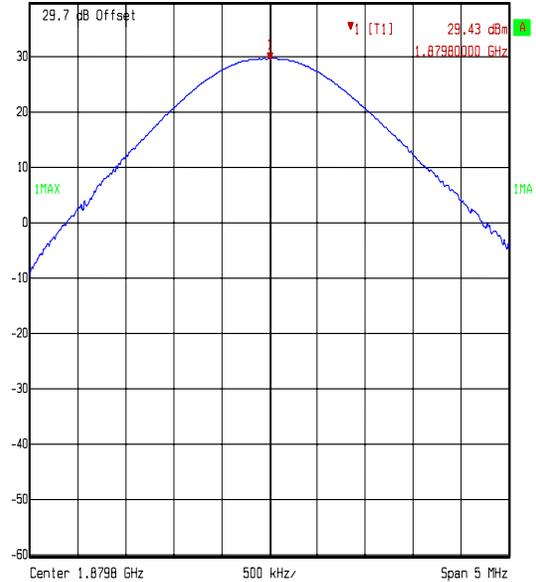
**Transmitter Carrier Output Power: Section 2.1046(a) (Continued)**

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl 29.55 dBm VBW 1 MHz  
 39.5 dBm 1.8502000 GHz SWT 5 ms Unit dBm



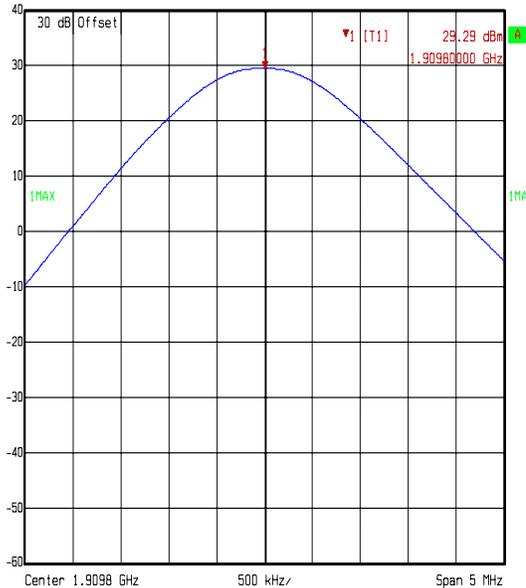
Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 Carrier  
 Comment A: 45280JD01\_FCCP24\_Bottom Channel PCS1900  
 Date: 14.OCT.2003 15:41:35

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl 29.43 dBm VBW 1 MHz  
 39.7 dBm 1.8798000 GHz SWT 5 ms Unit dBm



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 Carrier  
 Comment A: 45280JD01\_FCCP24\_Middle Channel PCS1900  
 Date: 14.OCT.2003 15:40:17

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl 29.29 dBm VBW 1 MHz  
 40 dBm 1.9098000 GHz SWT 5 ms Unit dBm



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 Carrier  
 Comment A: 45280JD01\_FCCP24\_Top Channel PCS1900  
 Date: 14.OCT.2003 15:38:46

Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**10.4. Transmitter Frequency Stability (Temperature Variation): Section 24.235**

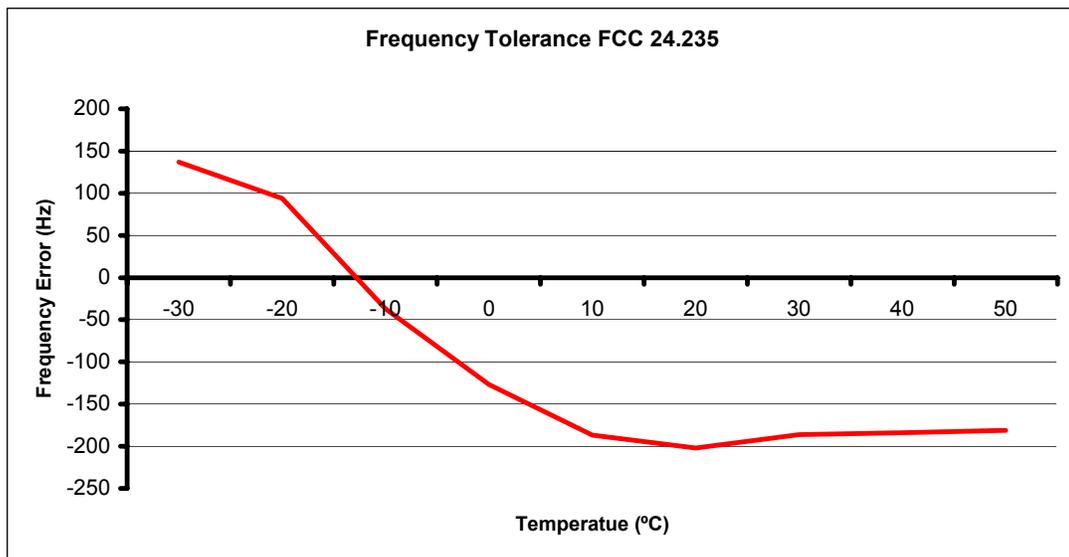
10.4.1. The EUT was configured as for frequency stability measurements as described in Section 11 of this report.

10.4.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

**Results Bottom Channel (1850.2 MHz)**

Temp (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	137	1850.200137	1850.0	0.200137	Complied
-20	94	1850.200094	1850.0	0.200094	Complied
-10	-37	1850.199963	1850.0	0.199963	Complied
0	-127	1850.199873	1850.0	0.199873	Complied
10	-187	1850.199813	1850.0	0.199813	Complied
20	-202	1850.199798	1850.0	0.199788	Complied
30	-186	1850.199814	1850.0	0.199814	Complied
40	-184	1850.199816	1850.0	0.199816	Complied
50	-181	1850.199819	1850.0	0.199819	Complied

**Frequency Variation From 1850.2MHz**



Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

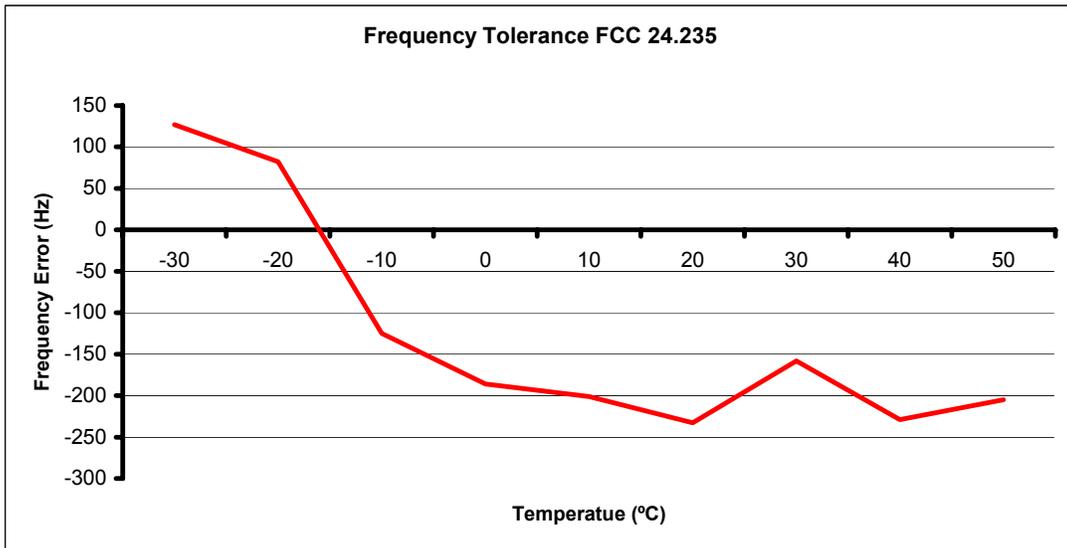
To: FCC Part 22 & 24

**Transmitter Frequency Stability (Temperature Variation): Section 24.235 (continued)**

**Results Top Channel (1909.8 MHz)**

Temp (°C)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	127	1909.800127	1910.0	0.199873	Complied
-20	82	1909.800028	1910.0	0.199972	Complied
-10	-125	1909.799875	1910.0	0.200125	Complied
0	-186	1909.799814	1910.0	0.200186	Complied
10	-201	1909.799709	1910.0	0.200201	Complied
20	-233	1909.799767	1910.0	0.200233	Complied
30	-158	1909.799842	1910.0	0.200158	Complied
40	-229	1909.799771	1910.0	0.200229	Complied
50	-205	1909.799795	1910.0	0.200205	Complied

**Frequency Variation From 1909.8MHz**



Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**10.5. Transmitter Frequency Stability (Voltage Variation): Section 24.235**

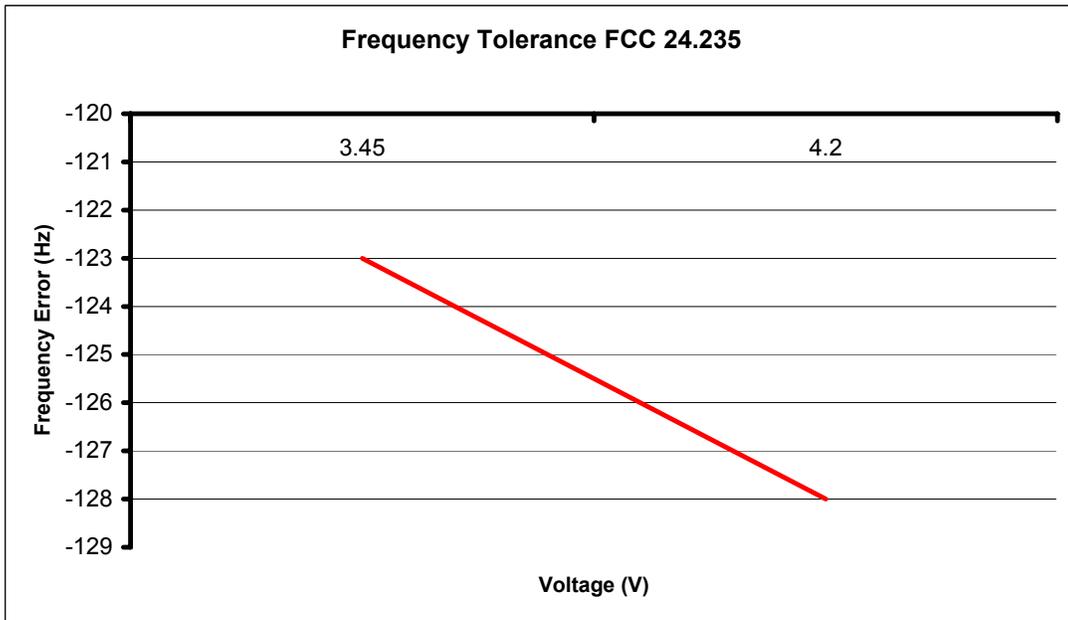
10.5.1. The EUT was configured as for frequency stability measurements as described in Section 11 of this report.

10.5.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

**Results Bottom Channel (1850.2 MHz)**

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
97.75	-123	1850.199877	1850.0	0.199877	Complied
132.25	-128	1850.199872	1850.0	0.199872	Complied

**Frequency Variation From 1850.2MHz**



Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

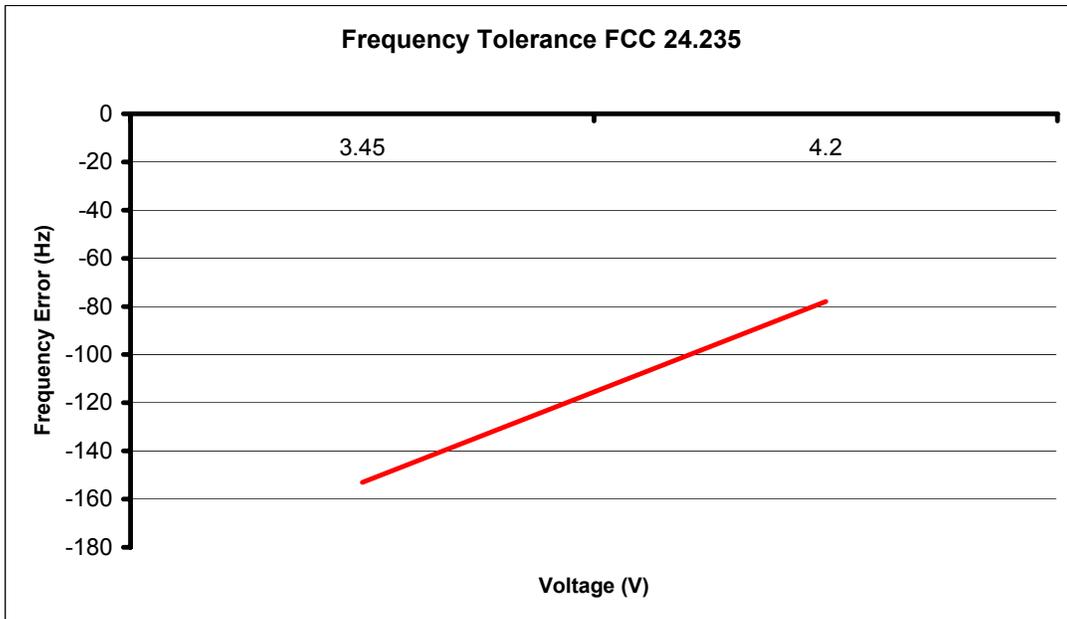
To: FCC Part 22 & 24

**Transmitter Frequency Stability (Voltage Variation): Section 24.235**  
**(Continued)**

Results Top Channel (1909.8 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
97.75	-153	1909.799847	1910.0	0.200153	Complied
132.25	-78	1909.799922	1910.0	0.200078	Complied

**Frequency Variation From 1909.8MHz**



Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

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### **10.6. Transmitter Occupied Bandwidth: Section 24.238**

10.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 11 of this report.

10.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental of the EUT.

#### **Results:**

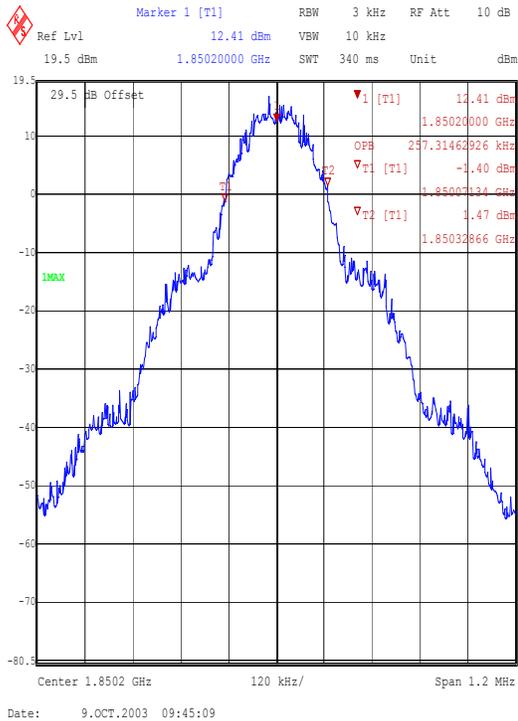
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Resolution Bandwidth (kHz)</b>	<b>Video Bandwidth (kHz)</b>	<b>Occupied Bandwidth (kHz)</b>
Bottom	1850.2	3.0	10.0	257.314629
Middle	1879.8	3.0	10.0	252.505010
Top	1909.8	3.0	10.0	259.719439

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Transmitter Occupied Bandwidth: Section 24.238 (Continued)**



*Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The vital data is reported in the upper right portion of the screen. See attached graphs.*

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 &amp; 24

**10.7. Transmitter Conducted Out of Band Emissions: Section 2.1051 & 22.917**

10.7.1. The EUT was configured as for conducted emissions testing as described in Section 11 of this report.

10.7.2. Tests were performed to identify the maximum transmitter conducted emission levels.

**Result: Bottom Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3701.403	-31.3	-13.0	18.3	Complied
16172.345	-33.4	-13.0	20.4	Complied

**Result: Middle Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3761.523	-30.5	-13.0	17.5	Complied
15541.082	-33.4	-13.0	20.4	Complied

**Result: Top Channel**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3821.643	-30.8	-13.0	17.8	Complied
16102.204	-33.3	-13.0	20.3	Complied

*Note: All other emissions were at least 20 dB better than the stated limit.*

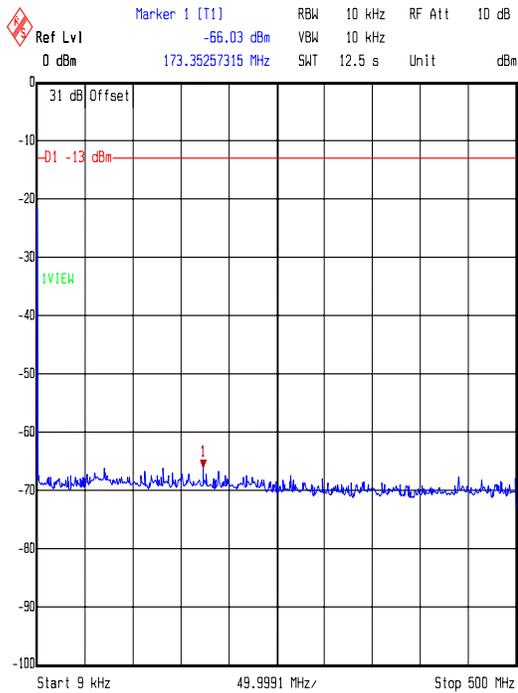
Operations Department

Test Of: Sony Ericsson Mobile Communications AB.

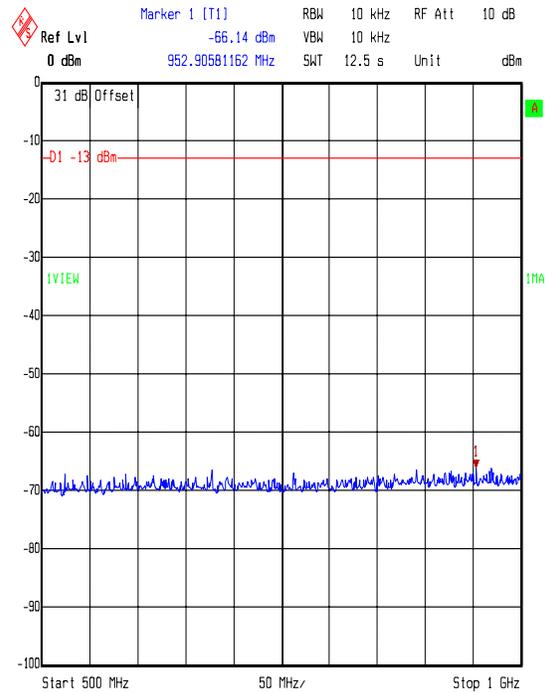
GT48 Mobile Base Unit

To: FCC Part 22 & 24

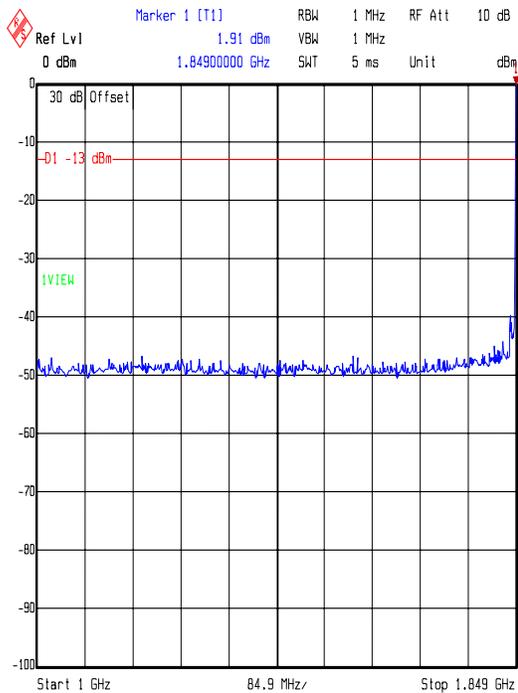
**Transmitter Conducted Out of Band Emissions (Bottom Channel): Section 2.1051 & 22.917 (Continued)**



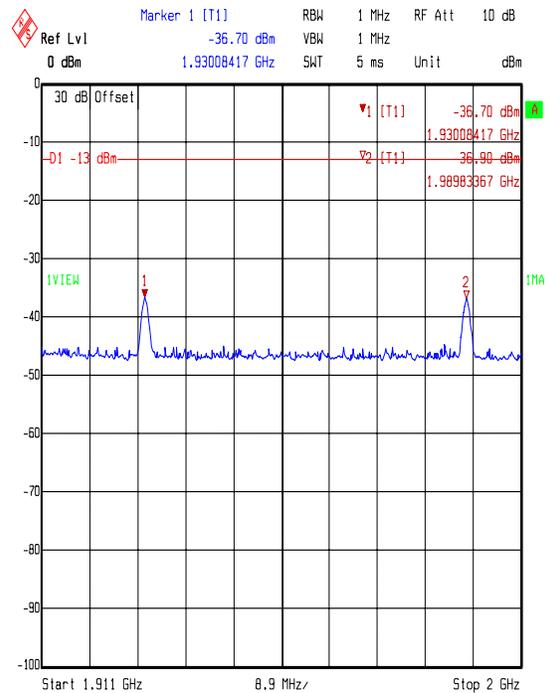
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Date: 8.OCT.2003 11:12:50



Date: 8.OCT.2003 9:43:48



Date: 8.OCT.2003 9:48:21

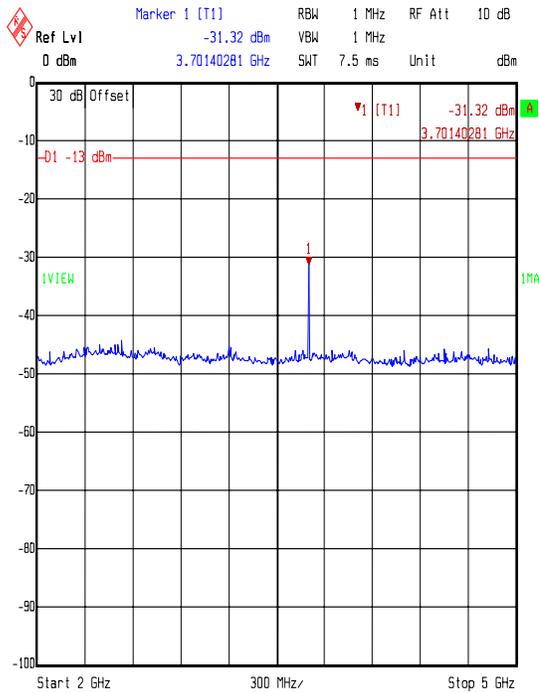
Operations Department

Test Of: Sony Ericsson Mobile Communications AB.

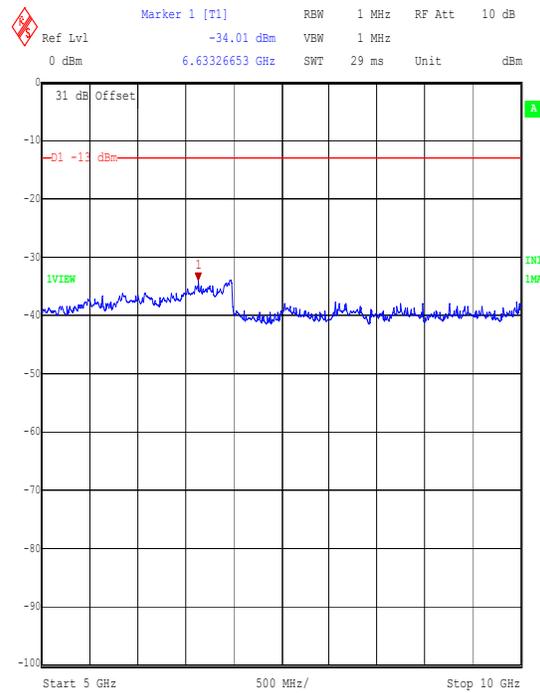
GT48 Mobile Base Unit

To: FCC Part 22 & 24

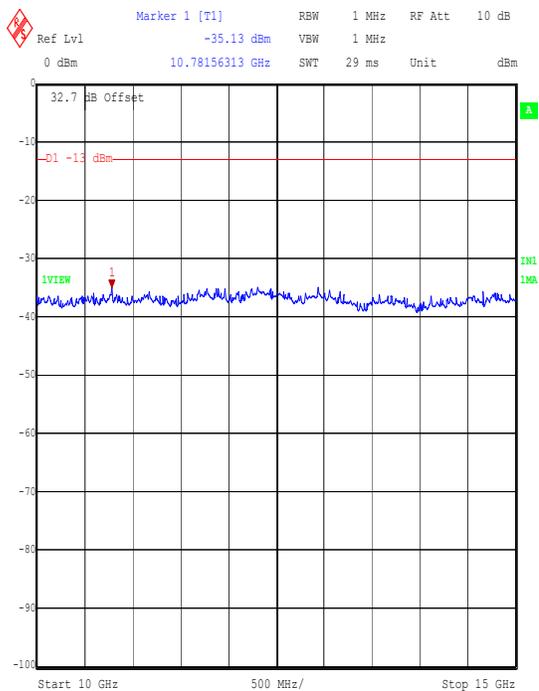
**Transmitter Conducted Out of Band Emissions (Bottom Channel): Section 2.1051 & 22.917 (Continued)**



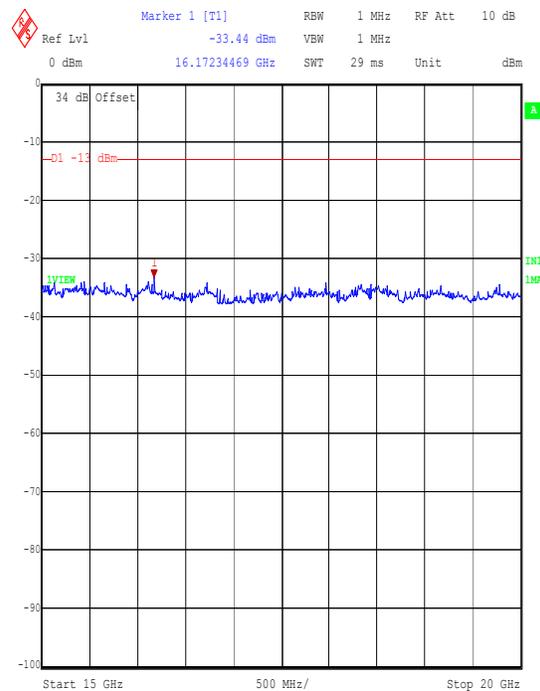
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Date: 8.OCT.2003 14:56:51



Date: 8.OCT.2003 14:46:45



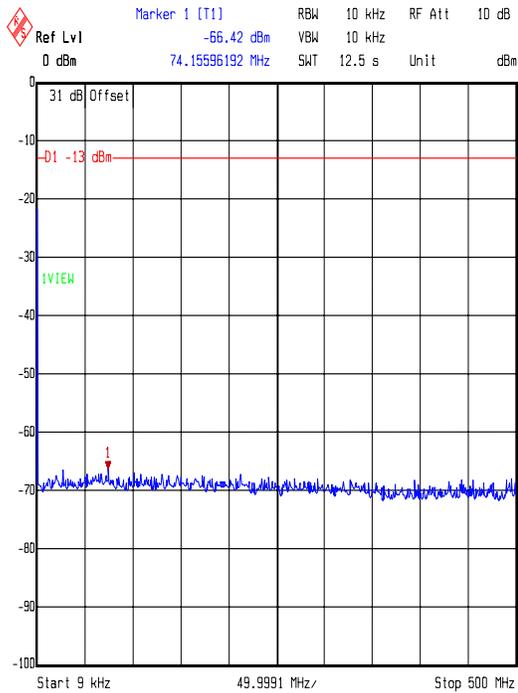
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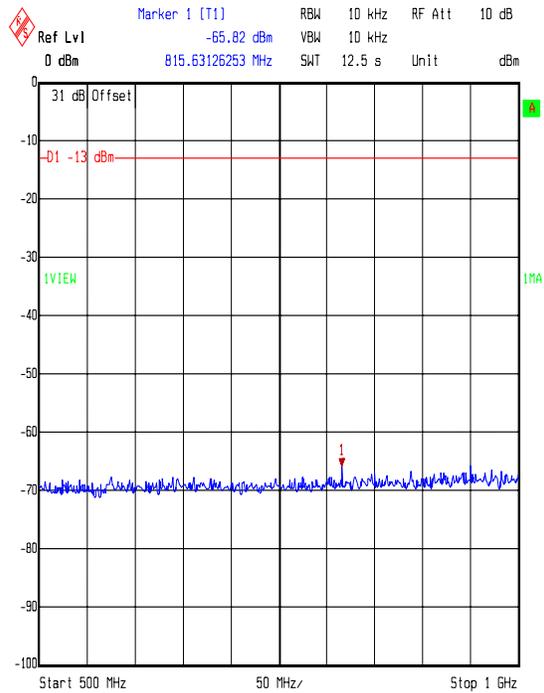
GT48 Mobile Base Unit

To: FCC Part 22 & 24

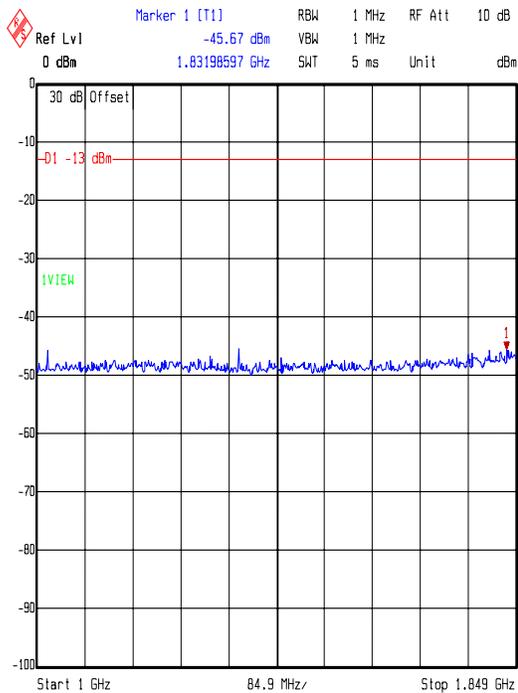
**Transmitter Conducted Out of Band Emissions (Middle Channel): Section 2.1051 & 22.917 (Continued)**



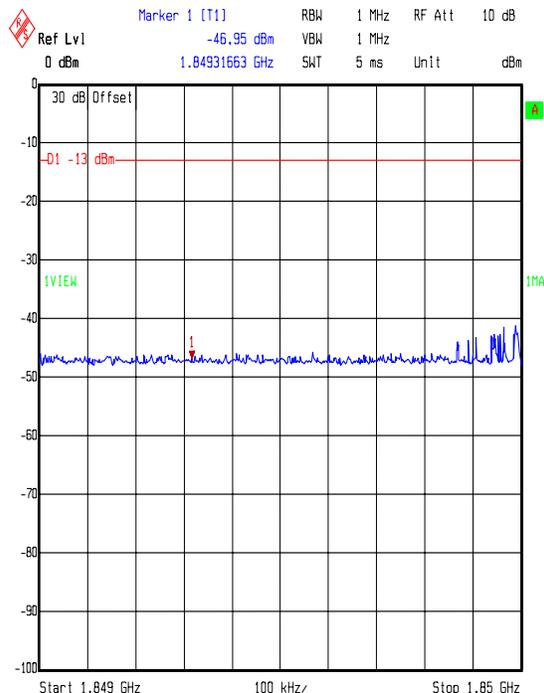
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Date: 8.OCT.2003 11:11:16



Date: 8.OCT.2003 9:59:22



Date: 8.OCT.2003 10:00:48

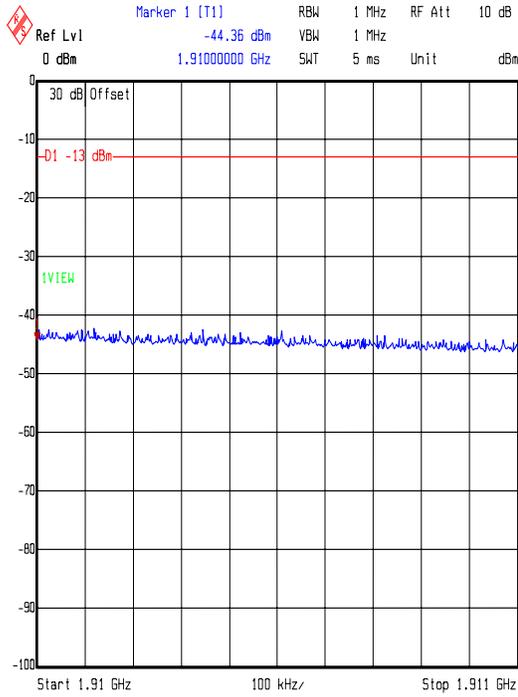
Operations Department

Test Of: Sony Ericsson Mobile Communications AB.

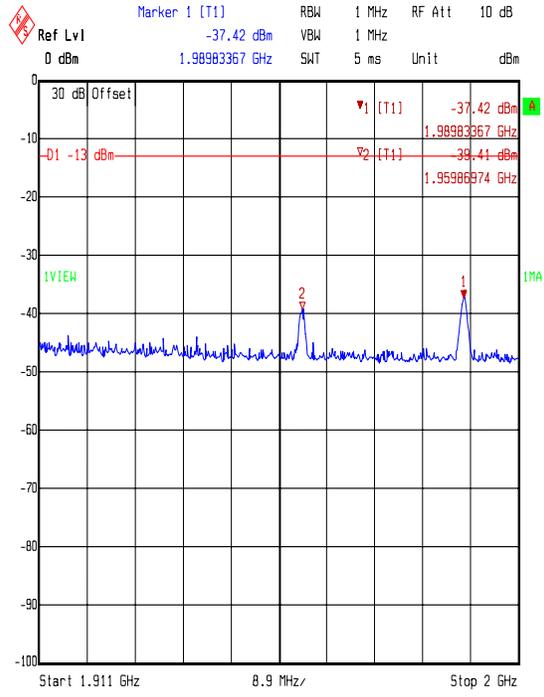
GT48 Mobile Base Unit

To: FCC Part 22 & 24

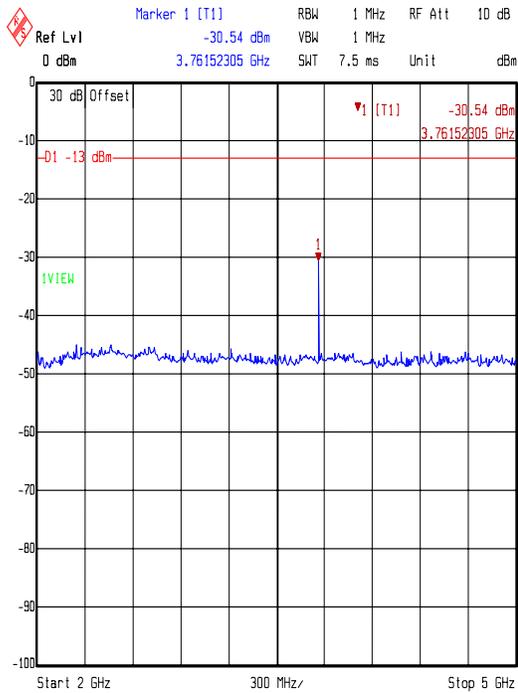
**Transmitter Conducted Out of Band Emissions (Middle Channel): Section 2.1051 & 22.917 (Continued)**



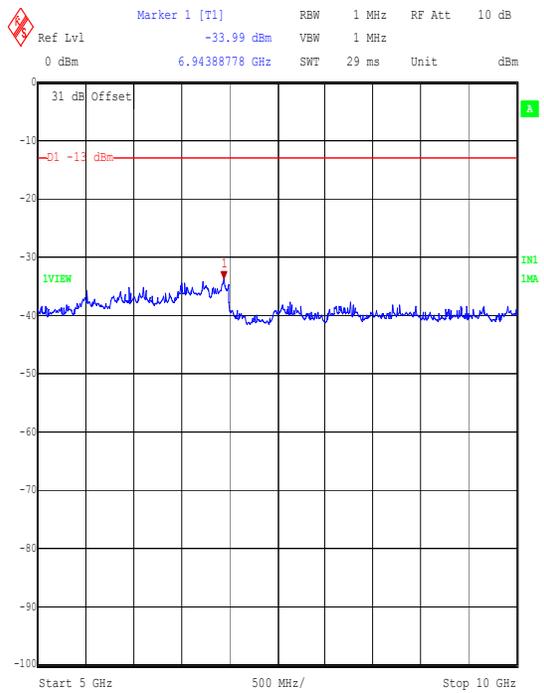
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Date: 8.OCT.2003 9:54:37



Date: 8.OCT.2003 9:52:42



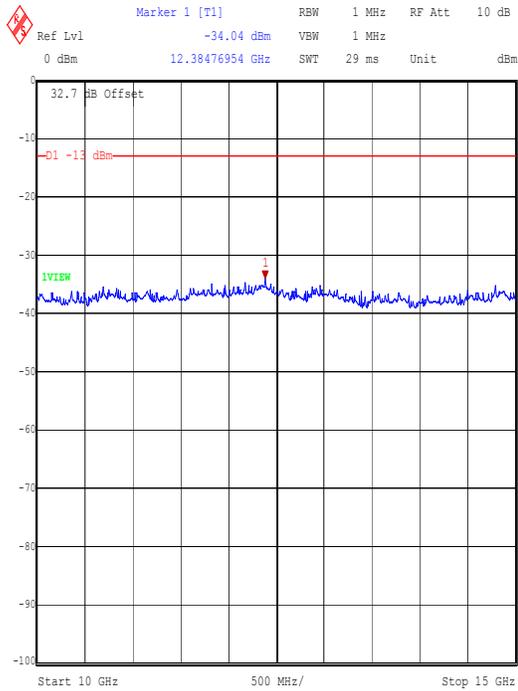
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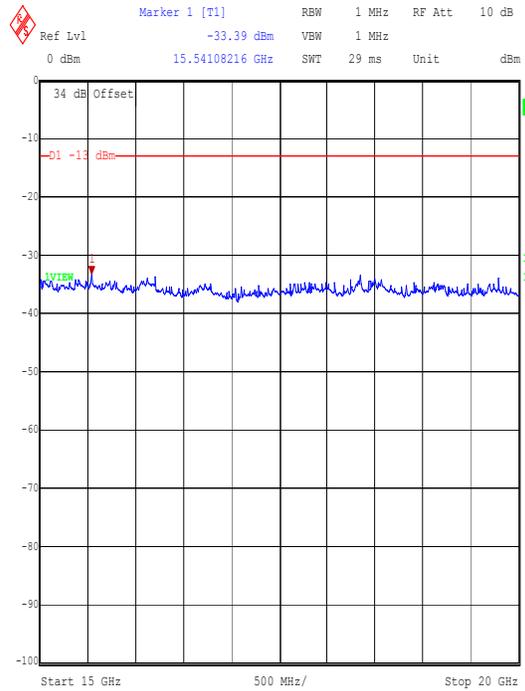
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Transmitter Conducted Out of Band Emissions (Middle Channel): Section 2.1051 & 22.917 (Continued)**



Date: 8.OCT.2003 14:47:37



Date: 8.OCT.2003 14:44:10

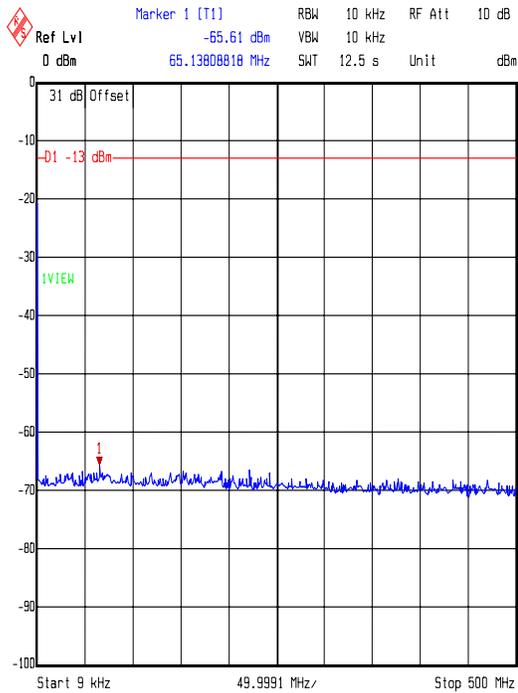
Operations Department

Test Of: Sony Ericsson Mobile Communications AB.

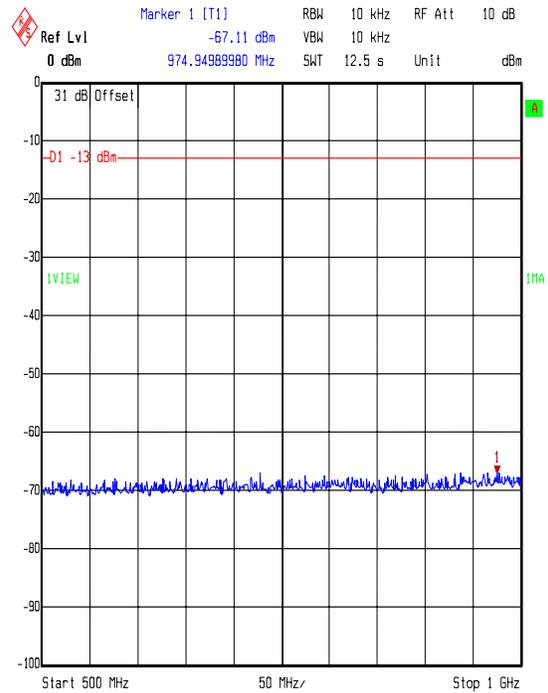
GT48 Mobile Base Unit

To: FCC Part 22 & 24

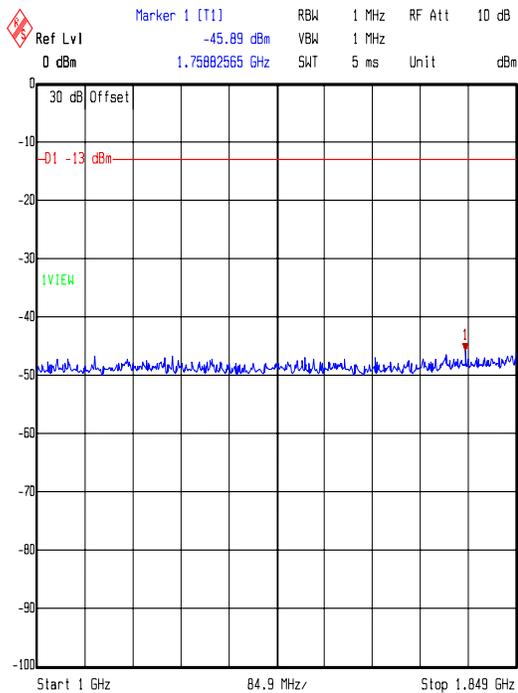
**Transmitter Conducted Out of Band Emissions (Top Channel): Section 2.1051 & 22.917 (Continued)**



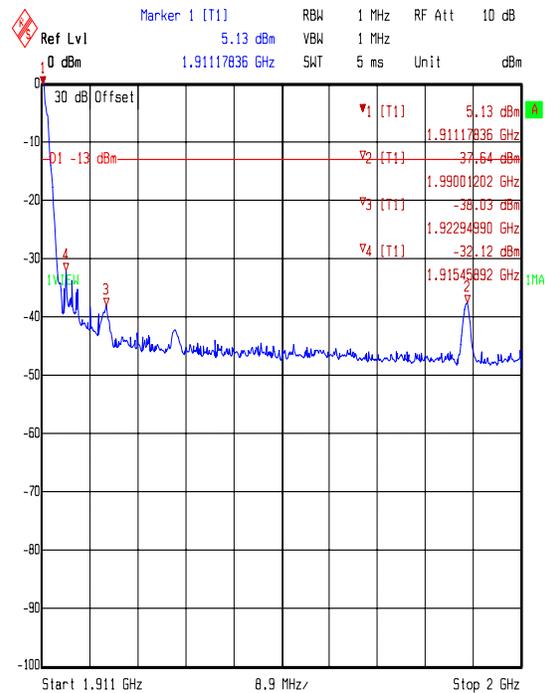
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Date: 8.OCT.2003 10:59:36



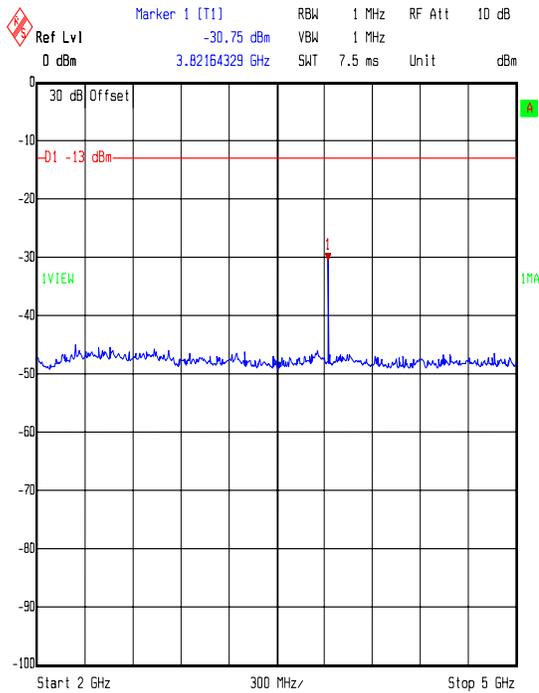
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Test Of: Sony Ericsson Mobile Communications AB.

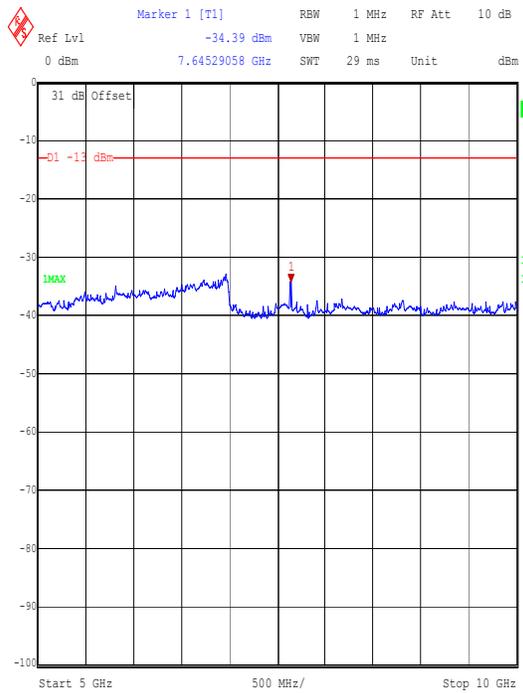
GT48 Mobile Base Unit

To: FCC Part 22 & 24

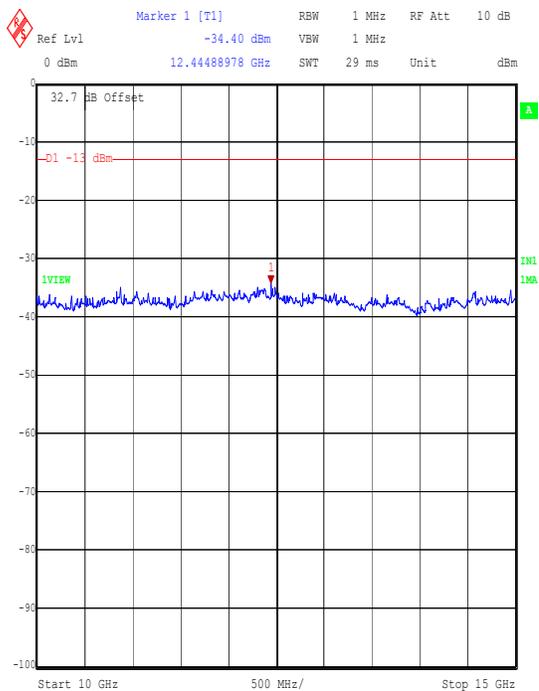
**Transmitter Conducted Out of Band Emissions (Top Channel): Section 2.1051 & 22.917 (Continued)**



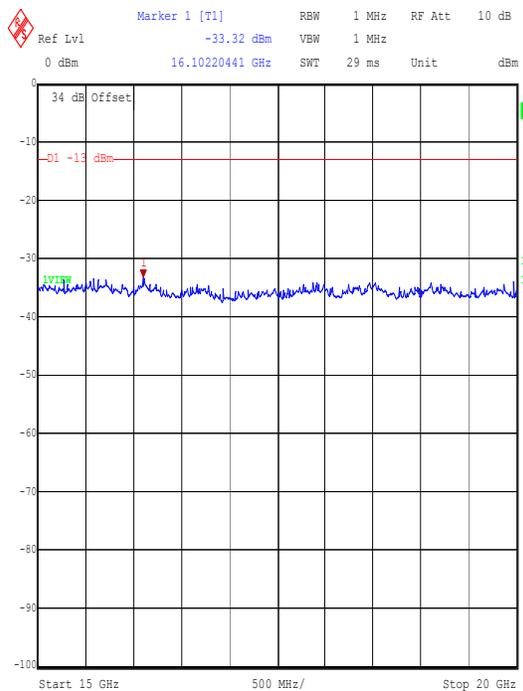
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Date: 8.OCT.2003 14:50:07



Date: 8.OCT.2003 14:42:49

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 &amp; 24

**Transmitter Conducted Out of Band Emissions : Section 2.1051 & 22.917**  
**(Continued)****Integrated Power Over 1 MHz Strip; Band: 1847 to 1848 MHz**

100 kHz Strip Number	Peak Power (nW/100kHz)	100 kHz Strip Number	Peak Power (nW/100kHz)
1	7.665	6	11.259
2	4.915	7	11.264
3	7.828	8	6.413
4	7.913	9	8.473
5	9.861	10	9.009
<b>Total Peak Power:</b>		84.6 nW/MHz	

**Integrated Power Over 1 MHz Strip Band: 1848 to 1849 MHz**

100 kHz Strip Number	Peak Power (nW/100kHz)	100 kHz Strip Number	Peak Power (nW/100kHz)
1	10.668	6	13.382
2	9.687	7	11.926
3	9.945	8	13.258
4	8.690	9	17.966
5	9.490	10	22.877
<b>Total Peak Power:</b>		127.889 nW/MHz	

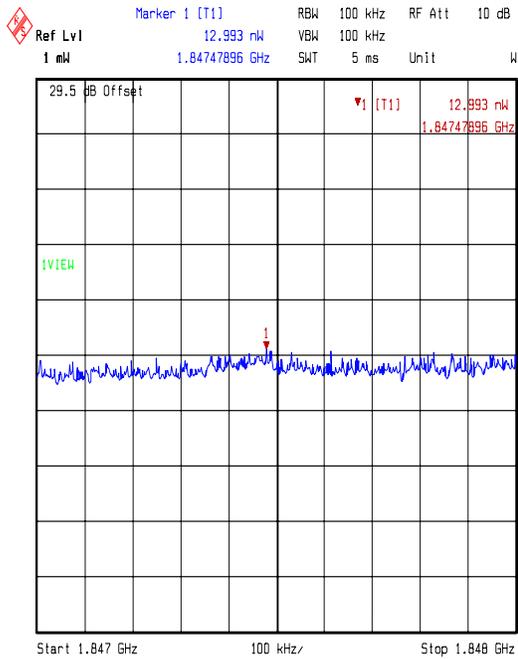
Band (MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1848 to 1849	-38.9	-13.0	25.9	Complied
1847 to 1848	-40.7	-13.0	27.7	Complied

Test Of: Sony Ericsson Mobile Communications AB.

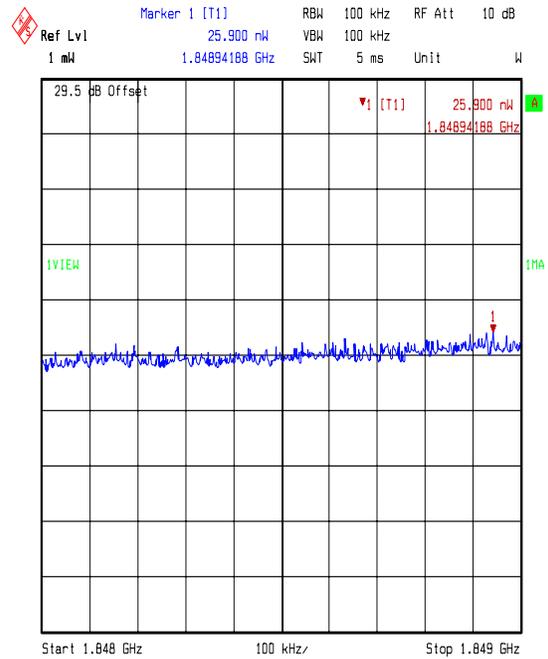
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Transmitter Conducted Out of Band Emissions : Section 2.1051 & 22.917 (Continued)**



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 Comment A: 45280JD01\_FCCP24\_Bottom Channel PCS1900  
 Date: 14.OCT.2003 16:12:04



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 CE  
 Comment A: 45280JD01\_FCCP24\_Bottom Channel PCS1900  
 Date: 14.OCT.2003 16:08:45

Test Of: Sony Ericsson Mobile Communications AB.

GT48 Mobile Base Unit

To: FCC Part 22 &amp; 24

**Transmitter Conducted Out of Band Emissions : Section 2.1051 & 22.917**  
**(Continued)****Integrated Power Over 1 MHz Strip Band: 1911 to 1912 MHz**

100 kHz Strip Number	Peak Power (nW/100kHz)	100 kHz Strip Number	Peak Power (nW/100kHz)
1	85.287	6	54.456
2	97.054	7	50.667
3	79.964	8	45.450
4	60.399	9	36.643
5	65.706	10	35.661
<b>Total Peak Power:</b>		611.287 nW/MHz	

**Integrated Power Over 1 MHz Strip Band: 1912 to 1913 MHz**

100 kHz Strip Number	Peak Power (nW/100kHz)	100 kHz Strip Number	Peak Power (nW/100kHz)
1	37.900	6	31.279
2	32.230	7	21.579
3	29.584	8	19.014
4	27.384	9	19.049
5	25.742	10	20.541
<b>Total Peak Power:</b>		264.302 nW/MHz	

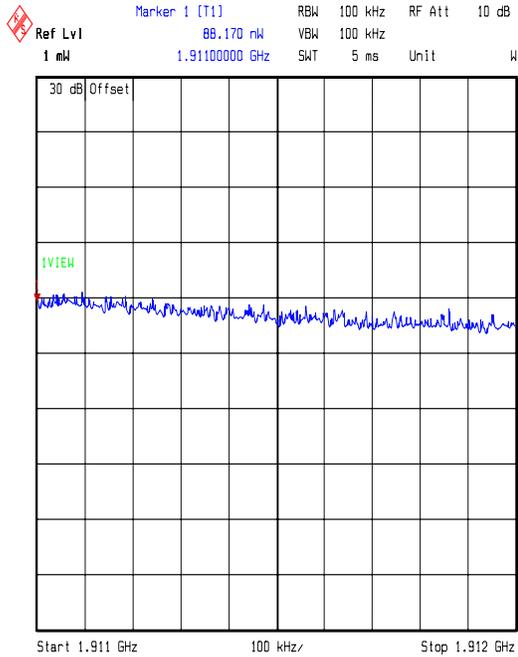
Band (MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1911 to 1912	-32.1	-13.0	19.1	Complied
1912 to 1913	-35.8	-13.0	22.8	Complied

Test Of: Sony Ericsson Mobile Communications AB.

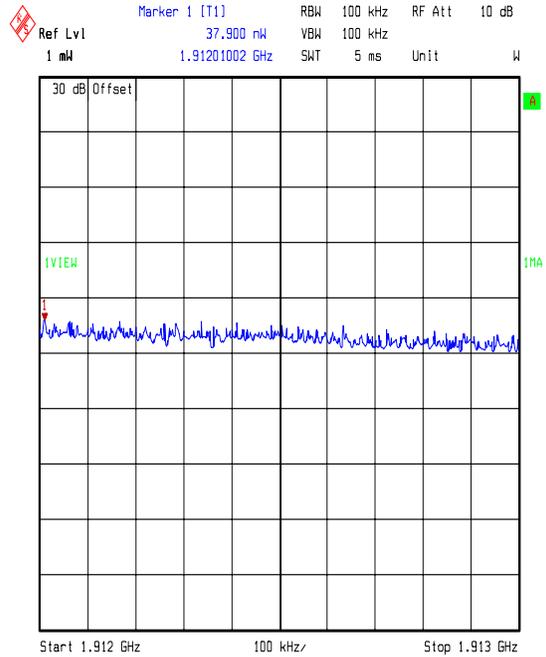
GT48 Mobile Base Unit

To: FCC Part 22 & 24

**Transmitter Conducted Out of Band Emissions : Section 2.1051 & 22.917 (Continued)**



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 CE  
 Comment A: 45280JD01\_FCCP24\_Top Channel PCS1900  
 Date: 14.OCT.2003 15:24:23



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 CE  
 Comment A: 45280JD01\_FCCP24\_Top Channel PCS1900  
 Date: 14.OCT.2003 15:31:05

Test Of: Sony Ericsson Mobile Communications AB.  
GT48 Mobile Base Unit

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### **10.8. Transmitter Out of Band Emissions: Section 2.1053/24.238**

10.8.1. The EUT was configured as for radiated emissions testing as described in Section 11 of this report.

10.8.2. Tests were performed to identify the maximum out of band transmitter radiated spurious emission level present in the band 30 MHz to 10 x the highest fundamental frequency.

#### **Result:**

<b>Frequency (MHz)</b>	<b>Peak Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
14040.0	-33.6	-13.0	20.6	Complied

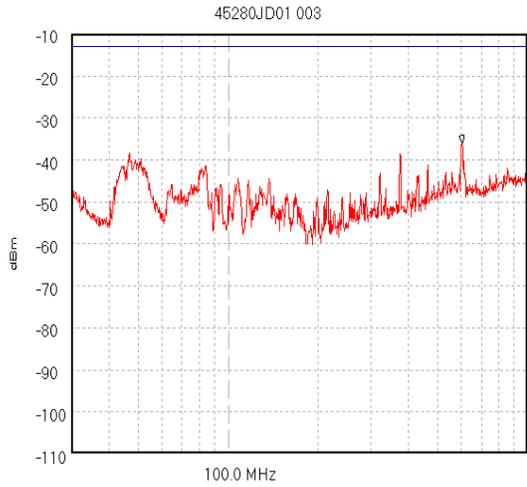
Note: No emissions were found within 20 dB of the limit, therefore the highest peak noise floor level was recorded.

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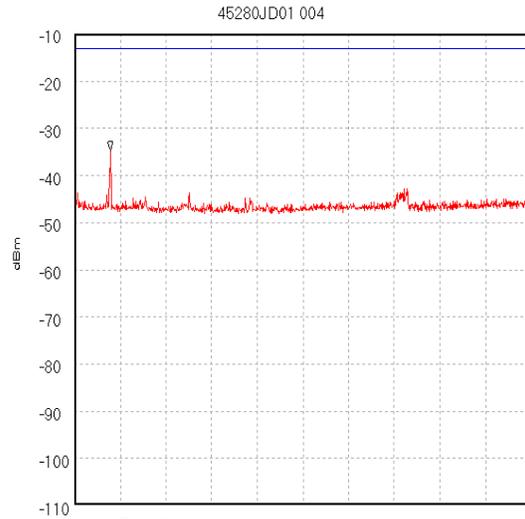
To: FCC Part 22 & 24

**Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)**



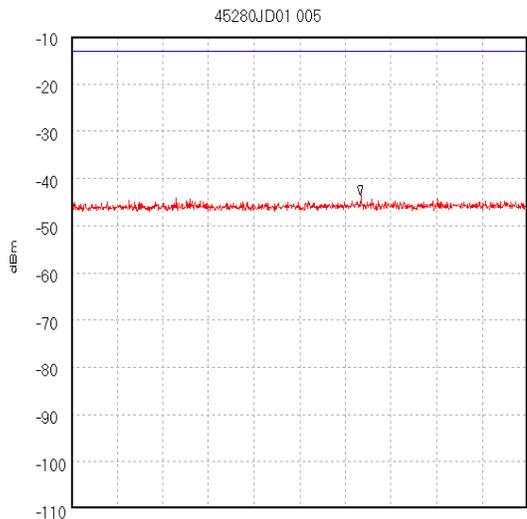
Trace 1  
-13 dBm

Start 30.0 MHz; Stop 1.0 GHz - Log Scale  
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS  
Peak 604.952 MHz, -36.05 dBm  
Display Line: -13 dBm;  
Transducer Factors: A1037  
9/29/2003 2:37:33 PM



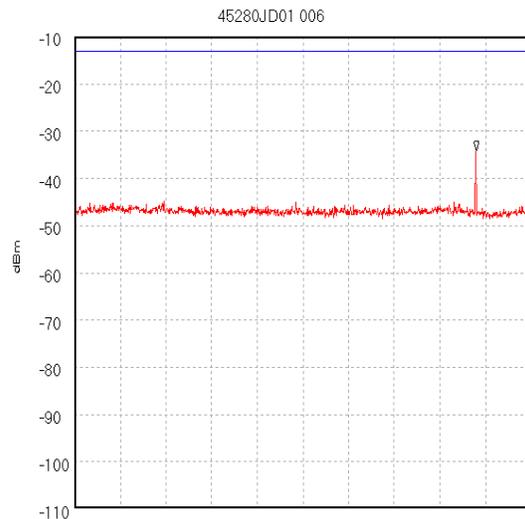
Trace 1  
-13 dBm

Start 1.0 GHz; Stop 1.85 GHz  
Ref -10 dBm; Ref Offset 37.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.067 GHz, -34.68 dBm  
Display Line: -13 dBm;  
9/29/2003 3:15:41 PM



Trace 1  
-13 dBm

Start 1.91 GHz; Stop 2.0 GHz  
Ref -10 dBm; Ref Offset 37.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 1.967 GHz, -43.57 dBm  
Display Line: -13 dBm;  
9/29/2003 3:19:24 PM



Trace 1  
-13 dBm

Start 2.0 GHz; Stop 4.0 GHz  
Ref -10 dBm; Ref Offset 36.0 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 3.76 GHz, -34.2 dBm  
Display Line: -13 dBm;  
9/29/2003 3:24:50 PM

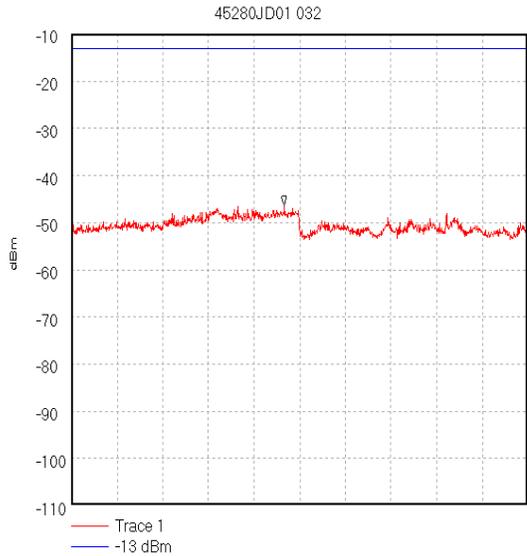
*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables. If any final emission measurement fell below the limit by more than 20dB it was not recorded.*

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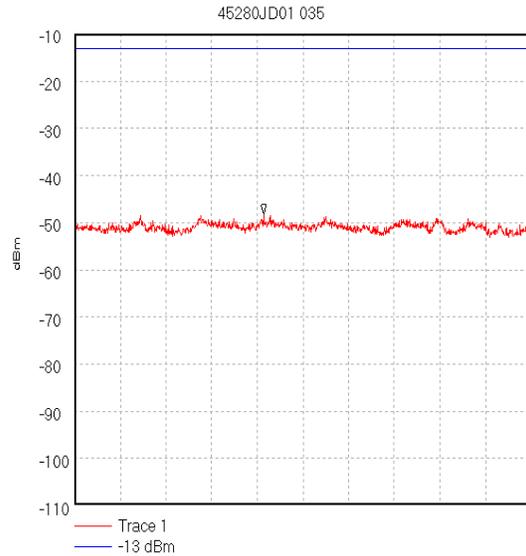
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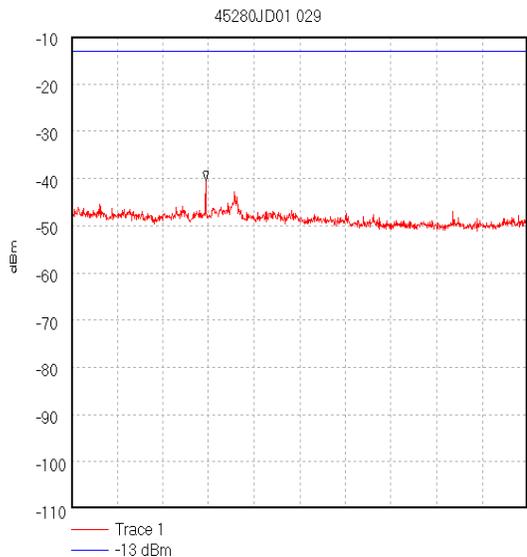
**Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)**



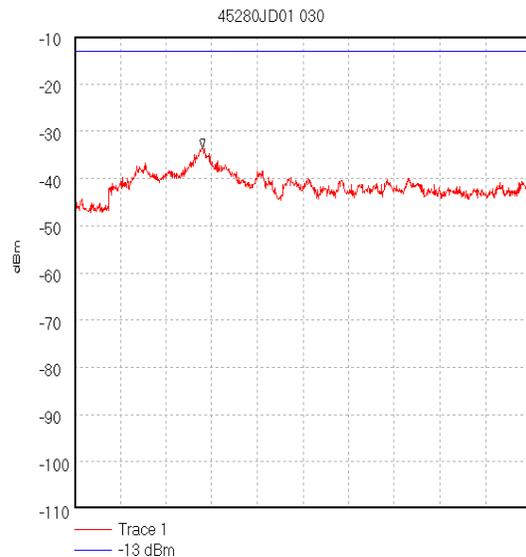
Start 4.0 GHz; Stop 6.0 GHz  
Ref -10 dBm; Ref Offset 30.8 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 4.933333 GHz; -46.38 dBm  
Display Line: -13 dBm;  
02/10/2003 11:49:20



Start 6.0 GHz; Stop 8.0 GHz  
Ref -10 dBm; Ref Offset 33.4 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 6.828889 GHz; -48.21 dBm  
Display Line: -13 dBm;  
02/10/2003 12:03:51



Start 8.0 GHz; Stop 12.75 GHz  
Ref -10 dBm; Ref Offset 38.1 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 9.398611 GHz; -40.39 dBm  
Display Line: -13 dBm;  
02/10/2003 11:32:12



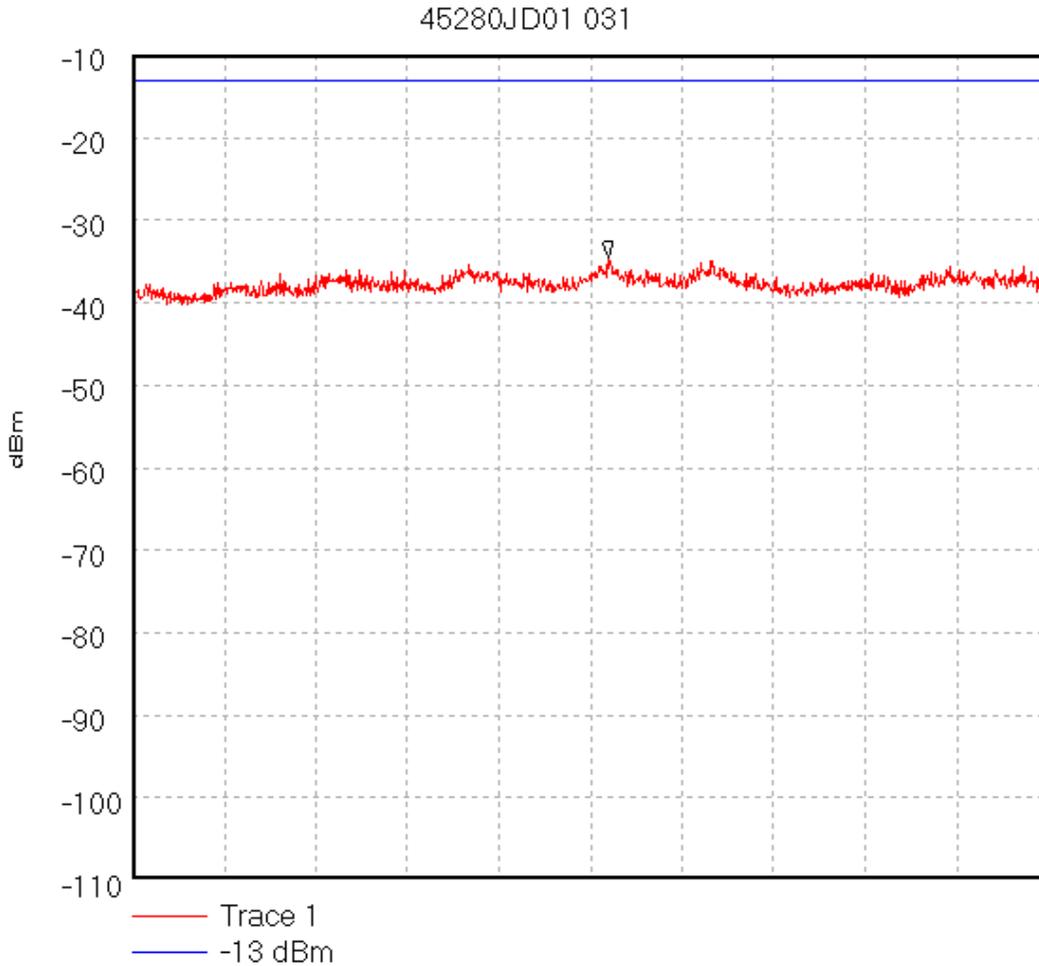
Start 12.5 GHz; Stop 18.0 GHz  
Ref -10 dBm; Ref Offset 41.9 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS  
Peak 14.04 GHz; -33.59 dBm  
Display Line: -13 dBm;  
02/10/2003 11:35:50

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables. If any final emission measurement fell below the limit by more than 20dB it was not recorded.*

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**Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)**



Start 18.0 GHz; Stop 20.0 GHz  
Ref -10 dBm; Ref Offset 46.7 dB; 10 dB/div  
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS  
Peak 19.04 GHz, -34.5 dBm  
Display Line: -13 dBm;  
02/10/2003 11:41:53

*Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables. If any final emission measurement fell below the limit by more than 20dB it was not recorded.*

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**10.9. Transmitter Conducted Emissions At Band Edges: Section 2.1053/24.238**

10.9.1. The EUT was configured as for Transmitter conducted emissions testing described in Section 11 of this report.

10.9.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency band that the EUT will operate over.

**Results:**

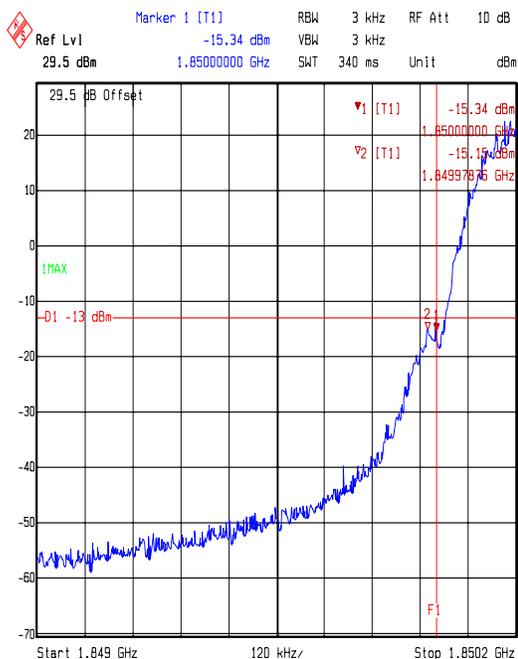
**Bottom Band Edge**

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1849.979*	-15.1	-13.0	2.1	Complied
1850.0	-15.3	-13.0	2.3	Complied

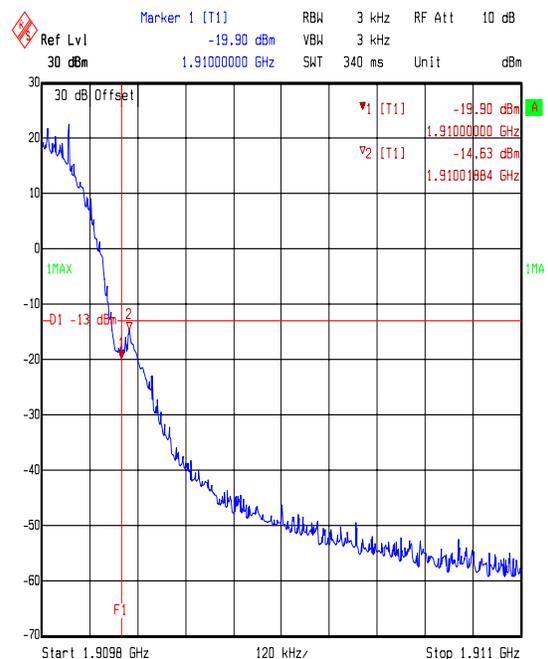
**Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.0	-19.9	-13.0	6.9	Complied
1910.019*	-14.6	-13.0	1.6	Complied

\*Note: this level was noted as the highest modulation product outside of the band



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 Band Edge  
 Comment A: 45280JD01\_FCCP24\_Bottom Channel PCS1900  
 Date: 14.OCT.2003 12:49:15



Title: Sony Ericsson EUT GT48 001003830337872. FCC Part24 Band Edge  
 Comment A: 45280JD01\_FCCP24\_Top Channel PCS1900  
 Date: 14.OCT.2003 12:46:30

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**10.10. Transmitter Radiated Emissions At Band Edges: Section 2.1053/24.238**

10.10.1. The EUT was configured as for radiated emissions testing described in Section 11 of this report.

10.10.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency band that the EUT will operate over.

**Results:**

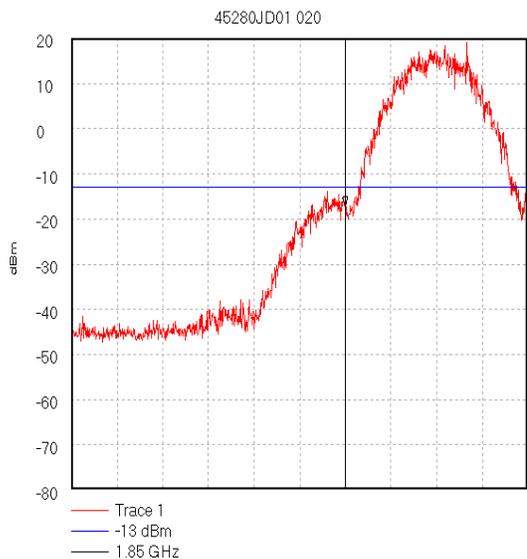
**Bottom Band Edge**

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1849.962*	-13.9	-13.0	0.9	Complied
1850.0	-17.0	-13.0	4.0	Complied

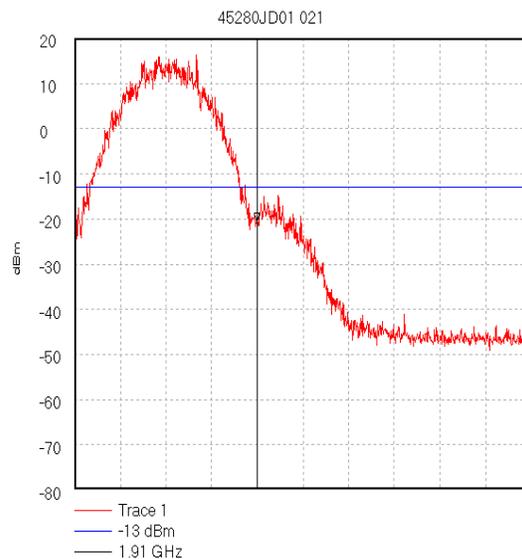
**Top Band Edge**

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.0	-20.6	-13.0	7.6	Complied
1910.045*	-15.0	-13.0	2.0	Complied

*\*Note: this level was noted as the highest modulation product outside of the band*



Start 1.8494 GHz; Stop 1.8504 GHz  
Ref 20 dBm; Ref Offset 46.8 dB; 10 dB/div  
RBW 3.0 kHz; VBW 10.0 kHz; Att 20 dB; Swp 340.0 mS  
Marker 1.85 GHz, -17.02 dBm  
Display Line: -13 dBm;  
02/10/2003 10:29:21



Start 1.9096 GHz; Stop 1.9106 GHz  
Ref 20 dBm; Ref Offset 44.8 dB; 10 dB/div  
RBW 3.0 kHz; VBW 10.0 kHz; Att 20 dB; Swp 340.0 mS  
Marker 1.91 GHz, -20.62 dBm  
Display Line: -13 dBm;  
02/10/2003 10:31:46

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## **11. Measurement Methods – Part 24**

### **11.1. Conducted Output Power**

The EUT was connected to a spectrum analyser and to a GSM test set via suitable cables, RF attenuators and combiners.

The connection was made to the EUT either via an antenna port or by antenna terminals made available by the client.

The total loss of the cables, attenuators and combiner were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The EUT was set to the maximum indicated peak and the conducted power was recorded.

This test was performed on the bottom, middle and top channels.

The test equipment settings for conducted antenna port measurements were as follows:

<b>Receiver Function</b>	<b>Setting</b>
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	>=Emission Bandwidth
Amplitude Range:	100 dB
Step Size:	Continuous Sweep
Sweep Time:	Coupled

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## **11.2. Effective Isotropic Radiated Power (EIRP)**

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4 as required by EIA/TIA-603-B.

The transmitter was fitted with an integral antenna; as such all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane.

The EUT was oriented in the X plane.

The test antenna was then raised and lowered until a maximum peak level was observed.

The turntable was then rotated through 360 degrees and the maximum peak reading obtained.

The height search was then repeated to take into consideration the new angular position of the turntable.

The maximum reading observed was then recorded.

This procedure was then repeated with the EUT oriented in the Y and Z planes.

The highest reading taken in all 3 planes was recorded.

The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once the final maximum amplitude had been obtained, the EUT was substituted with a horn antenna.

The centre of the substitution antenna was set to approximately the same centre location as the EUT.

The substitution antenna was set to the horizontal polarity.

The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator.

The signal generator was tuned to the EUT's frequency under test.

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### Effective Isotropic Radiated Power (EIRP) (Continued)

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser.

The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed.

The signal generator level was noted.

This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

Circumstances where the signal generator could not produce the desired power level, substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

Where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

$$\text{EIRP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT EIRP is calculated as:

$$\text{EIRP EUT} = \text{EIRP SG} + \text{Delta.}$$

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### **11.3. Frequency Stability**

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via its antenna port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30 to 50 °C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions and ensure they remained within specified operating parameters.

Measurements were made on the top, and bottom channels using the GSM test set described in Appendix 1.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded. The recorded frequency was compared to the applicants declared operating frequency band edges.

In order to show compliance, the measured frequency must remain within the declared frequency band.

The reported data shows the nominal frequency drift and its margin from the band edge. If this margin is positive, the result is compliant. If it goes negative, the result is a none compliance. There is also a frequency graph presented offering the frequency variation around nominal frequency.

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#### **11.4. Occupied Bandwidth**

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via a bi-directional coupler to its antenna port.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom middle and top channels.

As the EUT is a PCS phone, no modulation input port was available. A call was thus setup using the PCS/GSM simulator and using normal modulation. This was deemed as being worst case. The Occupied Bandwidth was measured in this configuration.

The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW  $\leq$  1% of occupied bandwidth. A value of 3 kHz was used.

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### **11.5. Transmitter Conducted Emissions**

The test was performed in a laboratory environment.

Spurious emissions measurements at the antenna port were performed from the lowest declared frequency to 10 times the highest EUT fundamental frequency.

A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

The limit in the standard states that emissions shall be attenuated by at least  $43=10 \log(P)$  dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to  $-13.0$  dBm therefore, the limit line presented on the accompanying plots is set to  $-13.0$  dBm.

The frequency band described above was investigated with the transmitter operating at full power on the top, middle and bottom channels. Any spurious observed were then recorded and compared to the  $-13.0$  dBm limit. The requirement is for the emission to be less than  $-13.0$  dBm. The margin between the emission and limit is recorded and should always be positive to indicate compliance.

It should be noted that FCC Part 24.238 states that the 1<sup>st</sup> MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found to be 3.0 kHz.

The measurements in the 2<sup>nd</sup> and 3<sup>rd</sup> 1 MHz blocks away from the adjacent 1 MHz block from 1911 MHz to 1912 MHz and 1912 MHz to 1913 MHz were carried out using an analyser span of 1 MHz and 100 kHz receiver resolution bandwidth (RBW). 10 linear readings were taken for each 100 kHz strip across the 1 MHz band. These readings were integrated to give the emission level in an equivalent 1 MHz bandwidth.

The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	Settings
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	10 kHz <1.0 GHz
Bandwidth:	1 MHz >1.0 GHz
Amplitude Range:	100 dB
Step Size:	Continuous Sweep
Sweep Time:	Coupled

The resolution bandwidth used for measurements in the 1.0 MHz blocks either side of the declared operating frequency block were set as described in the procedure above.

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### **11.6. AC Mains Conducted Emissions**

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane.

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

During the swept measurements (and also during subsequent final measurements on single frequencies) any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements</b>
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

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### **11.7. Transmitter Radiated Emissions**

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The limit in the standard states that emissions shall be attenuated by at least  $43+10 \log (P)$  dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to -13 dBm therefore, the limit line presented on the accompanying plots is set to -13 dBm.

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### **Transmitter Radiated Emissions (continued)**

Any spurious measured were then compared to the  $-13$  dBm limit. The requirement is for the emission to be less than  $-13$  dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

All measurements were performed using broadband Horn antennas.

It should be noted that FCC Part 24.238 states that the 1<sup>st</sup> MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

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### **11.8. Receiver Radiated Emissions**

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 5 times the highest unintentionally generated frequency were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dB $\mu$ V plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements Below 1 GHz	Final Measurements Above 1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

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### **11.9. Measurement Uncertainty**

11.9.1. No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

11.9.2. The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

11.9.3. The uncertainty of the result may need to be taken into account when interpreting the measurement results.

11.9.4. The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
AC Conducted Spurious Emissions	0.15 MHz to 30.0 MHz	95%	+/- 3.25 dB
Carrier Output Power	Not applicable	95%	+/- 0.46 dB
Conducted Emissions	9 kHz to 26 GHz	95%	+/-1.2 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	+/- 1.78 dB
Effective Radiated Power (ERP)	Not applicable	95%	+/- 1.78 dB
Frequency Stability	Not applicable	95%	+/- 0.01 ppm
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Radiated Spurious Emissions	30.0 MHz to 1000.0 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1.0 GHz to 26.0 GHz	95%	+/- 1.78 dB

11.9.5. The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

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**Appendix 1. Test Equipment Used**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A003	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	357 881/052
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A059	3146 Log Periodic Antenna	EMCO	3146	8902-2378
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002
A1141	HP 11691D	Hewlett Packerd	11691D	1212A02494
A197	Site 2 Controller SC144	Unknown	SC144	150720
A247	10 dB Attenuator	Narda	769-10	03712
A248	60 dB Variable Attenuator	Narda	743-60	01411
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A256	WG 18 Microwave Horn	Flann Microwave	18240-20	400
A258	Zenith Variable Power Supply	Zenith Electric	SVA 10	None
A259	Bilog Antenna	Chase	CBL6111	1513
A276	OATS Positioning Controller	Rohde & Schwarz	HCC	
A392	3 dB attenuator (9)	Suhner	6803.17.B	None
A436	WG 20 horn	Flann	20240-20	330
C1000	Cable	Rosenberger	FA210A1020 M30309	002
C1001	Cable	Rosenberger	FA210A1020 M30309	003
C1065	Rosenberger	Rosenberger	UFA210-1- 7872	0985
C1078	Rosenberger 3m Cable	Rosenberger	FA210A1030 M5050	28464-2
C1080	Rosenberger Cable 3m	Rosenberger	FA210A1030 M5050	28464-1
C1081	Rosenberger Cable 2m	Rosenberger	FA210A1020 M5050	28463-2
C360	Cable	Rosenberger	UFA210A-1- 1181-70x70	1927
C453	Cable	Rosenberger	RG142XX- 001-RFIB	C453-10081998
C457	Cable	Rosenberger	RG142XX- 002-RFIB	C457-10081998

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**Test Equipment Used (Continued)**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305
C468	N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	98L0440
E013	PCN Environmental Chamber	Sanyo	ATMOS chamber	None
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M1093	Will tek	Will tek	4202S	0513018
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020
S203	Site 3	RFI	3	
S503	Antenna Mast	EMCO	1051-25	9205 1670

**NB** In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

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## **Appendix 2. Test Configuration Drawings**

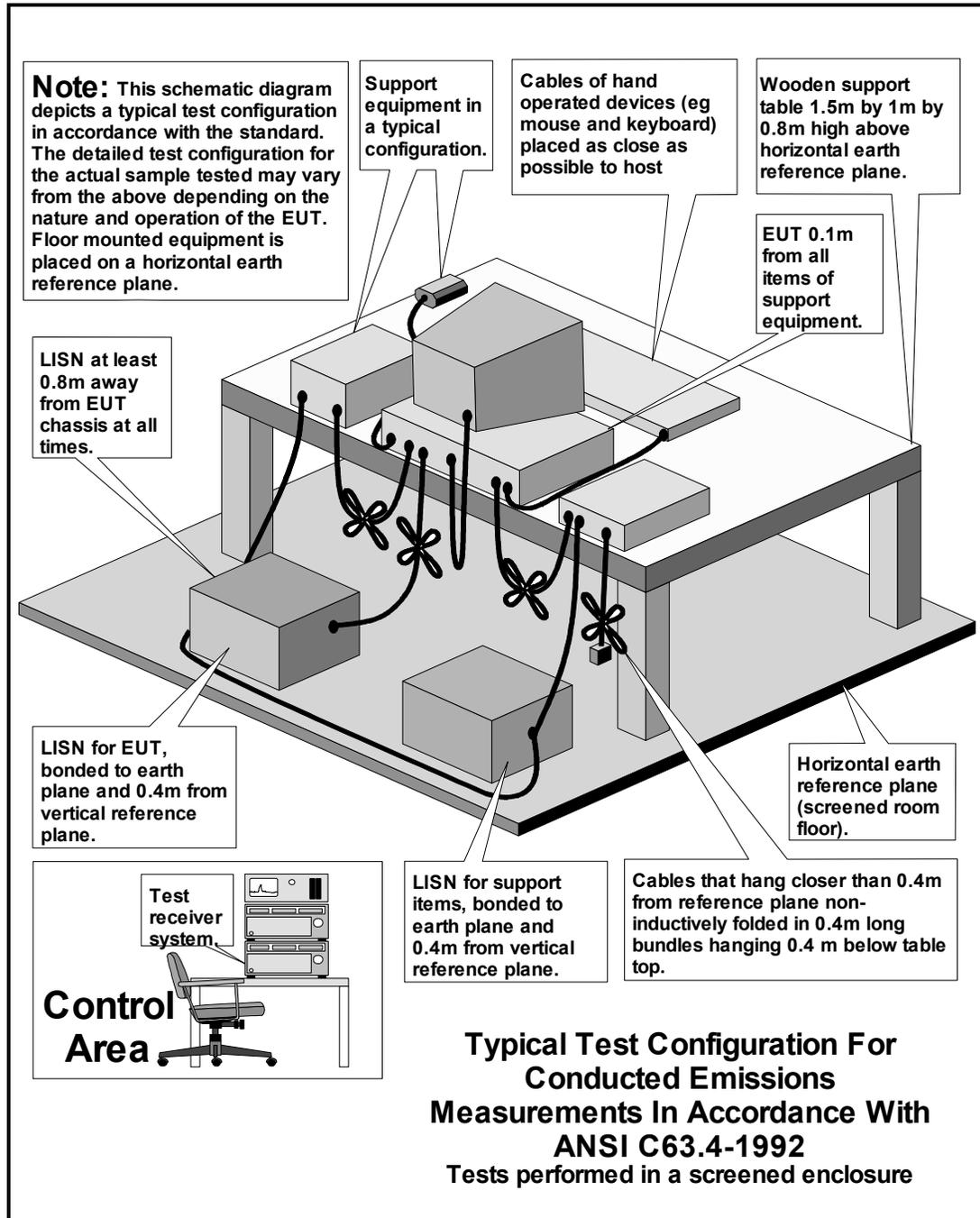
This appendix contains the following drawings:

<b>Drawing Reference Number</b>	<b>Title</b>
DRG\45280JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\45280JD01\EMIRAD	Test configuration for measurement of radiated emissions

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DRG\45280JD01\EMICON

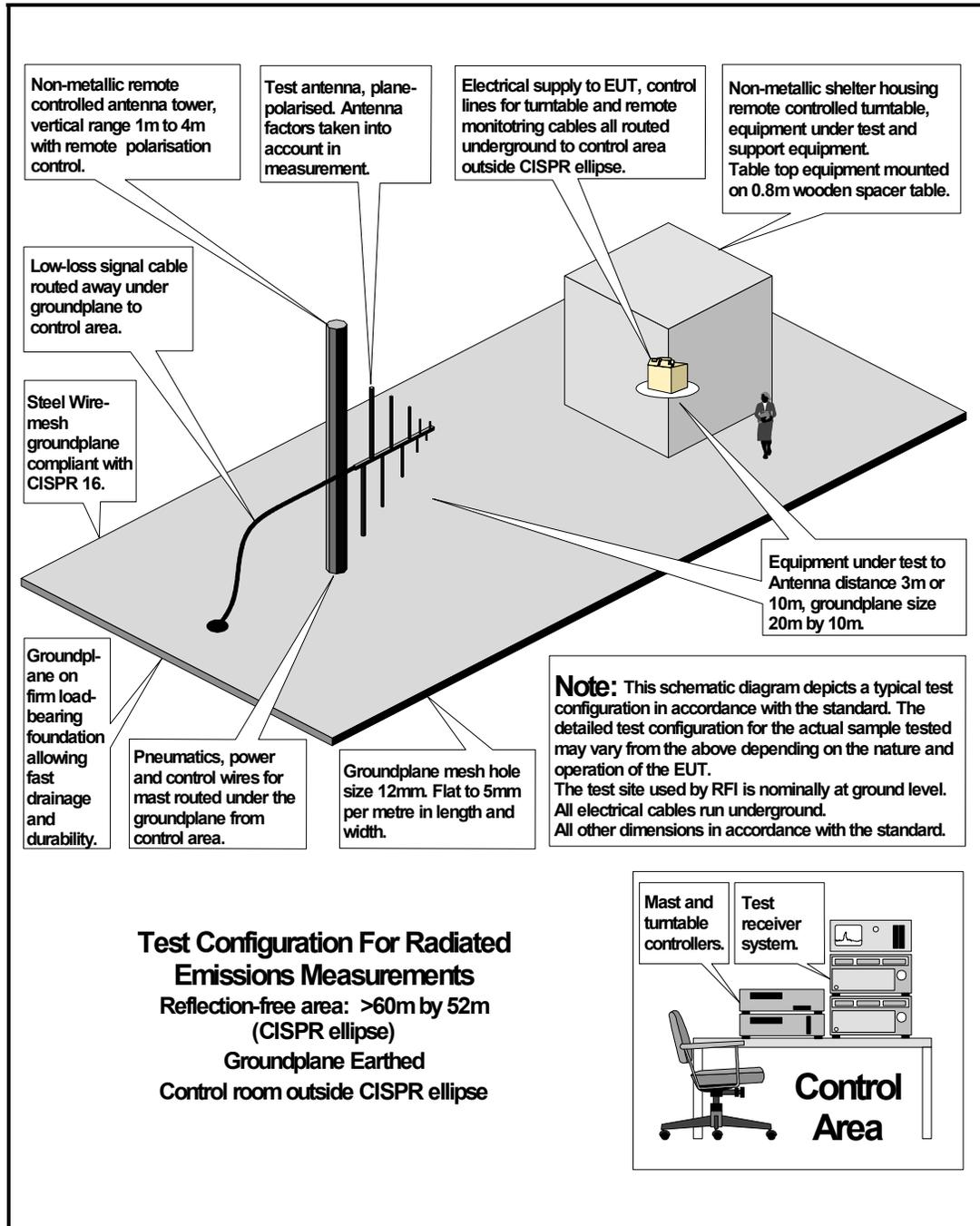


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DRG\45280JD01\EMIRAD



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