TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Sony Ericsson Mobile Communications AB
GC89 Mobile Station

To: FCC Part 24: 2004 (Subpart E)

Test Report Serial No:
RFI\MPTE1\RP70868JD06A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager:	
Tested By: Fara Razally	**Checked By: Tony Henriques**
Report Copy No: **PDF01**	
Issue Date: 28 April 2005	**Test Dates: 28 February 2005 to 05 April 2005**

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RFI Global Services Ltd
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001
Email: info@rfi-global.com Website: www.rfi-global.com

Registered in England and Wales. Company number:2117901

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1. Client Information

Company Name:	Sony Ericsson Mobile Communications AB
Address:	1 Lakeside Road Aerospace Centre Farnborough Hampshire GU14 6XP
Contact Name:	Mr M Bower

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)

Brand Name:	Sony Ericsson
Model Name or Number:	GC89
Serial Number:	004601016298862
FCC ID Number:	PY7FF051011
Country of Manufacture:	Not Stated
Date of Receipt:	28 February 2005

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	Stick Antenna
Brand Name:	Sony Ericsson
Model Name or Number:	None Stated
Serial Number:	None Stated
Connected to Port:	RF Antenna Port

2.3. Description of EUT

The equipment under test is a dual band (GSM 850 & PCS1900) mobile station incorporating WLAN technologies (PCMCIA Card).

2.4. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

2.5. Additional Information Related to Testing

Power Supply Requirement:	3.6 V DC supplied via PCMCIA interface of host PC		
Intended Operating Environment:	Within GSM network coverage		
Equipment Category:	Mobile Station (PCMCIA Card)		
Type of Unit:	Transceiver		
Transmit Frequency Range:	1850.2 MHz to 1909.8 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	512	1850.2
	Middle	660	1879.8
	Top	810	1909.8
Receive Frequency Range:	1930.2 MHz to 1989.8 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	512	1930.2
	Middle	660	1960.0
	Top	810	1989.8
Maximum Power Output (EIRP)	25.4 dBm		

2.6. Support Equipment

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

Description:	Laptop PC
Brand Name:	Compaq
Model Name or Number:	EVO N610C
Serial Number:	N610CP180X430VC25X0L
Connected to Port:	PCMCIA

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude D600
Serial Number:	CN-0D2125-48643-4CB-6452
Connected to Port:	PCMCIA

Description:	Laptop PC
Brand Name:	Sony
Model Name or Number:	PCG-651M
Serial Number:	28377050 5101146
Connected to Port:	PCMCIA

3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 24 Subpart E: 2004 (Broadband PCS)
Title:	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003
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 (2003)
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.

4. Deviations from the Test Specification

None.

5. Operation of the EUT during Testing

5.1. Operating Modes

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

Preliminary radiated emissions and AC conducted scans were performed on the EUT fitted and operating in each of the three host notebook PCs stated in section 2.6 of this report. The combination that exhibited the worse case mode of operation was then used to perform final measurements. This was found to be with the EUT fitted and operating in the Compaq EVO notebook PC.

Additionally preliminary radiated emissions scans were performed on the EUT with the accessory stated in section 2.2 of this report connected and then disconnected. The combination that exhibited the worst case mode of operation was then used to perform final measurements. In both transmit and idle mode this was to be with the EUT fitted with the external antenna.

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

Receiver/Idle Modes:

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

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

Plugged into the PCMCIA port of the established worst case host notebook PC (Compaq EVO).

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Enclosure	Complied
Transmitter Carrier Output Power	C.F.R. 47 FCC Part 2: 2004 Section 2.1046(a)	Antenna Terminals	Complied
Transmitter Effective Isotropic Radiated Power (EIRP)	C.F.R. 47 FCC Part 24: 2004 Section 24.232	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2004 Section 24.235	Antenna Terminals	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2004 Section 24.235	Antenna Terminals	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2004 Section 24.238	Antenna Terminals	Complied
Transmitter Out of Band Conducted Emissions	C.F.R. 47 FCC Part 24: 2004 Section 2.1051/24.238	Antenna Terminals	Complied
Transmitter Band Edge Conducted Emissions	C.F.R. 47 FCC Part 24: 2004 Section 2.1051/24.238	Antenna Terminals	Complied
Transmitter Out of Band Radiated Emissions	C.F.R. 47 FCC Part 24: 2004 Section 2.1053/24.238	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2: 2004 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 RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

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.

7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

The EUT was configured as for ac conducted emissions measurements as described in section 9 of this report.

Tests were performed to identify the maximum emissions levels on the ac mains line of the EUT.

Results:

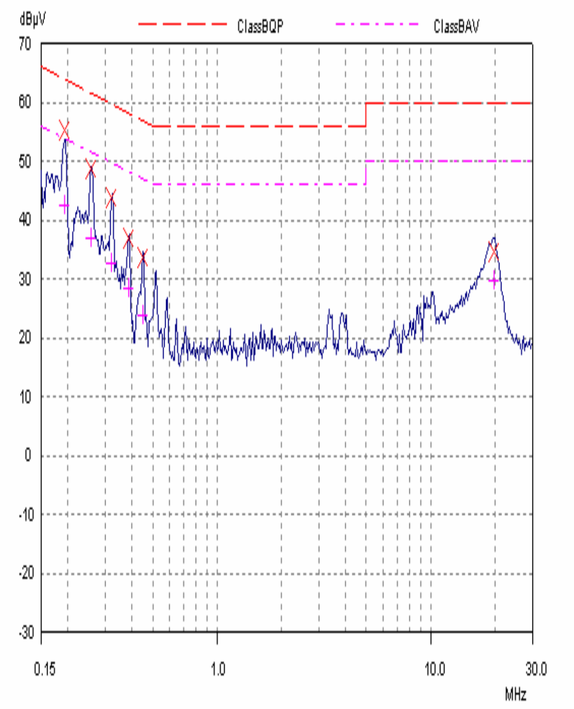
Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.19297	Neutral	55.36	63.91	8.55	Complied
0.25761	Live	48.76	61.51	12.75	Complied
0.32078	Neutral	43.66	59.69	16.03	Complied
0.38589	Neutral	36.98	58.15	21.17	Complied
0.45069	Neutral	33.63	56.86	23.23	Complied
19.69243	Neutral	34.74	60.00	25.26	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.19297	Neutral	42.41	53.91	11.50	Complied
0.25761	Neutral	36.78	51.51	14.73	Complied
0.32078	Neutral	32.66	49.69	17.03	Complied
0.38589	Neutral	28.50	48.15	19.65	Complied
0.45069	Neutral	23.72	46.86	23.14	Complied
19.69243	Neutral	29.61	50.00	20.39	Complied

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



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

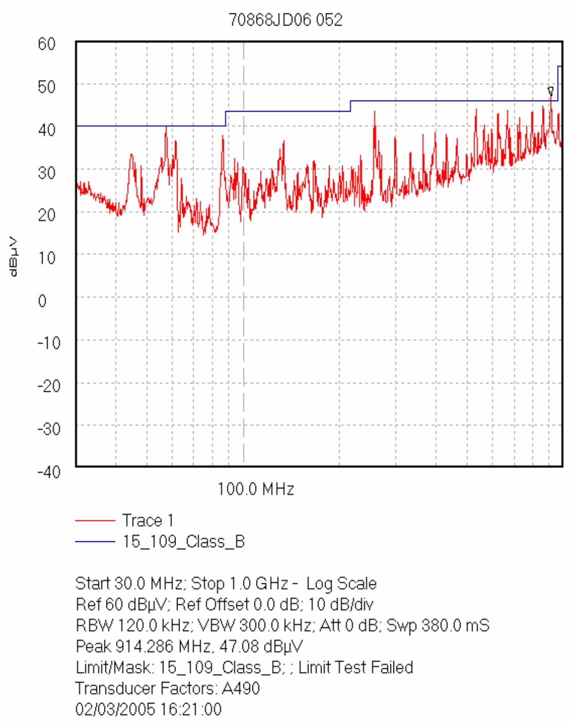
7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

The EUT was configured as for receiver radiated emission testing as described in section 9 of this report.

Tests were performed to identify the maximum receiver or standby radiated emission levels.

Results:

Frequency (MHz)	Antenna Polarity	Quasi Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
57.510	Horiz	29.5	40.0	10.5	Complied
132.855	Vert	28.5	43.5	15.0	Complied
256.244	Vert	39.8	46.0	6.2	Complied
624.088	Horiz	44.3	46.0	1.7	Complied
864.144	Vert	44.8	46.0	1.2	Complied
912.155	Vert	43.7	46.0	2.3	Complied



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

7.2.3. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz)

Results:

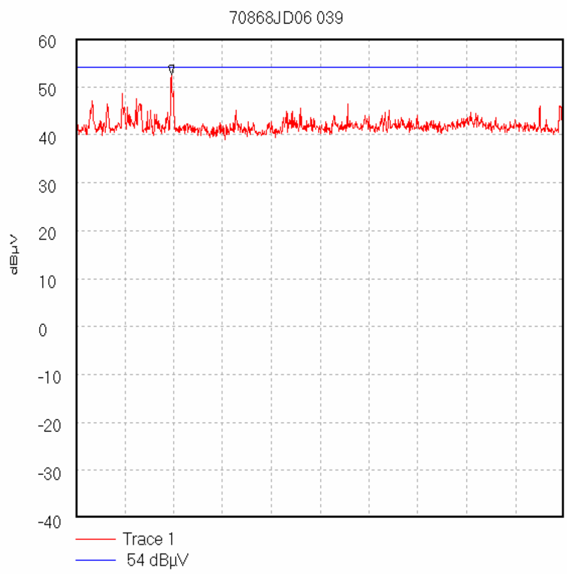
Peak Level:

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1065.126	Horiz	22.0	21.8	6.5	50.3	74.0	23.7	Complied
1093.082	Horiz	22.9	21.8	6.5	51.2	74.0	22.8	Complied
1195.180	Horiz	23.9	20.8	6.7	51.4	74.0	22.6	Complied
3282.513	Horiz	23.4	21.4	11.3	56.1	74.0	17.9	Complied

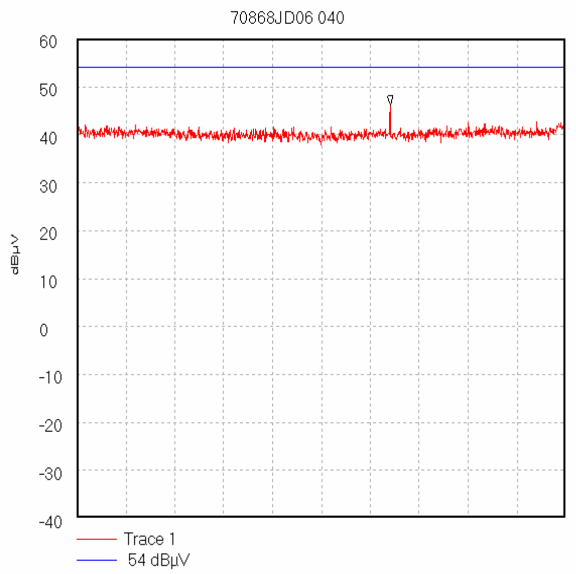
Average Level:

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1065.126	Horiz	9.4	21.8	6.5	37.7	54.0	16.3	Complied
1093.082	Horiz	12.1	21.8	6.5	40.4	54.0	13.6	Complied
1195.180	Horiz	10.7	20.8	6.7	38.2	54.0	15.8	Complied
3282.513	Horiz	10.6	21.4	11.3	43.3	54.0	10.7	Complied

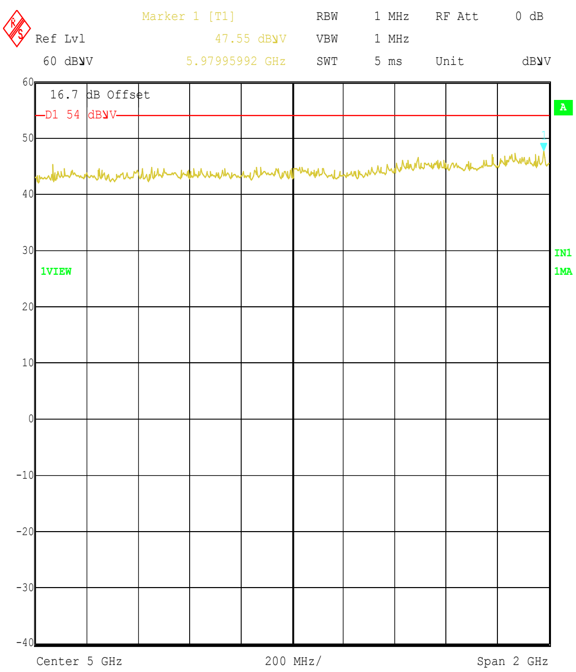
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



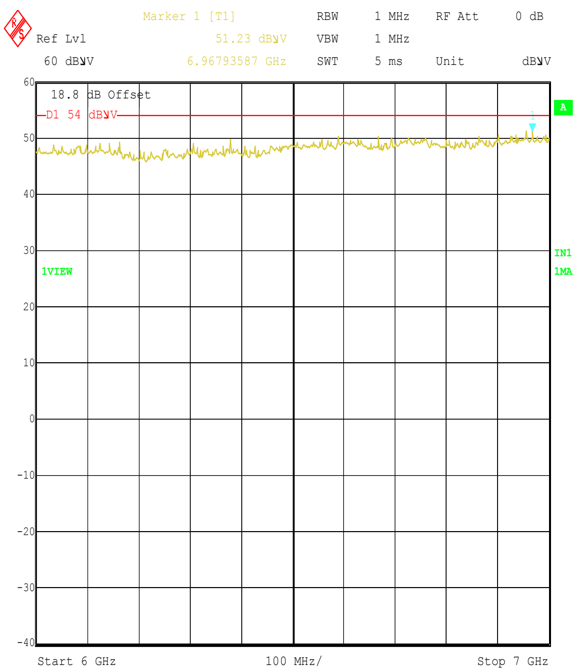
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.196 GHz, 52.64 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
02/03/2005 14:42:34



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.282 GHz, 46.19 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
02/03/2005 14:44:36



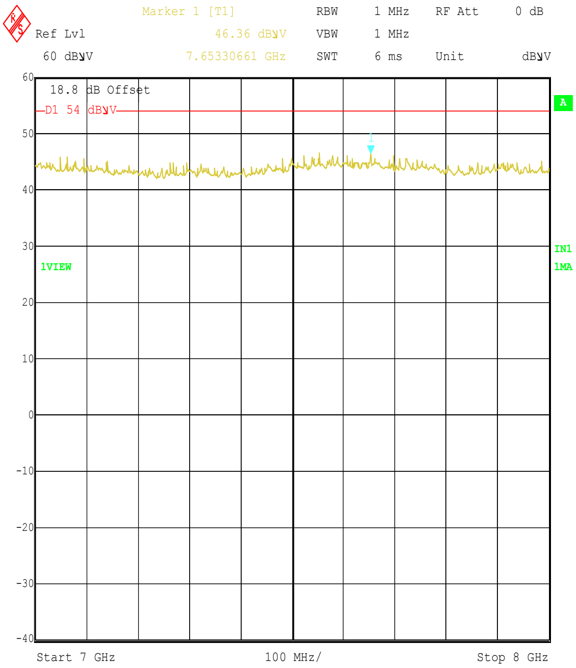
Title: 70868 Sony Ericsson Mobile GC89 FCC Part 22
Comment A: Idle Mode Radiated Spurious Emissions
Date: 21.MAR.2005 13:11:35



Title: 70868 Sony Ericsson Mobile GC89 FCC Part 22
Comment A: Idle Mode Radiated Spurious Emissions
Date: 21.MAR.2005 13:15:10

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

Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



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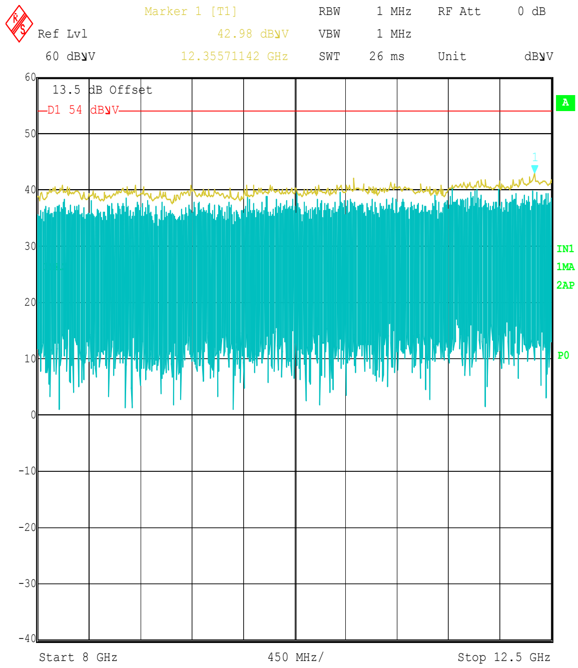

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Comment A: Idle Mode Radiated Spurious Emissions
Date: 21.MAR.2005 13:27:37

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

7.2.4. Transmitter Carrier Output Power: Section 2.1046(a)

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

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

Results:

Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1850.2	28.1	33.0	4.9	Complied
Middle	1879.8	27.6	33.0	5.4	Complied
Top	1909.8	28.5	33.0	4.5	Complied

7.2.5. Transmitter Effective Isotropic Radiated Power (EIRP): Section 24.232

The EUT was configured as for effective isotropic radiated power as described in section 9 of this report.

Tests were performed to identify the maximum effective isotropic radiated power (EIRP).

Results:

Channel	Measured Frequency (MHz)	Antenna Polarity	Maximum Transmitter EIRP (dBm)	Limit EIRP (dBm)	Margin (dB)	Result
Bottom	1850.2	Horiz	23.4	33.0	9.6	Complied
Middle	1879.8	Horiz	25.4	33.0	7.6	Complied
Top	1909.8	Horiz	25.3	33.0	7.7	Complied

7.2.6. Transmitter Frequency Stability (Temperature Variation): Section 24.235

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

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

Results:

Bottom Channel (1850.2 MHz)

Temperature (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	-41	1850.199959	1850.0	0.199959	Complied
-20	-34	1850.199966	1850.0	0.199966	Complied
-10	-43	1850.199957	1850.0	0.199957	Complied
0	-36	1850.199964	1850.0	0.199964	Complied
10	-33	1850.199967	1850.0	0.199967	Complied
20	-38	1850.199962	1850.0	0.199962	Complied
30	-34	1850.199966	1850.0	0.199966	Complied
40	-29	1850.199971	1850.0	0.199971	Complied
50	-38	1850.199962	1850.0	0.199962	Complied

Top Channel (1909.8 MHz)

Temperature (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	-39	1909.799961	1910.0	0.200039	Complied
-20	-36	1909.799964	1910.0	0.200036	Complied
-10	-40	1909.799960	1910.0	0.200040	Complied
0	-33	1909.799967	1910.0	0.200033	Complied
10	-31	1909.799969	1910.0	0.200031	Complied
20	-33	1909.799967	1910.0	0.200033	Complied
30	-28	1909.799972	1910.0	0.200028	Complied
40	-27	1909.799973	1910.0	0.200027	Complied
50	-28	1909.799972	1910.0	0.200028	Complied

7.2.7. Transmitter Frequency Stability (Voltage Variation): Section 24.235

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

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
93.5	-28	1850.199972	1850	0.199972	Complied
126.5	-29	1850.199971	1850	0.199971	Complied

Top Channel (1909.8 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
93.5	-31	1909.799969	1910	0.200031	Complied
126.5	-29	1909.799971	1910	0.200029	Complied

7.2.8. Transmitter Occupied Bandwidth: Section 24.238

The EUT was configured as for occupied bandwidth measurements as described in section 9 of this report.

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

Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	3.0	10.0	240.481
Middle	1879.8	3.0	10.0	242.485
Top	1909.8	3.0	10.0	242.481

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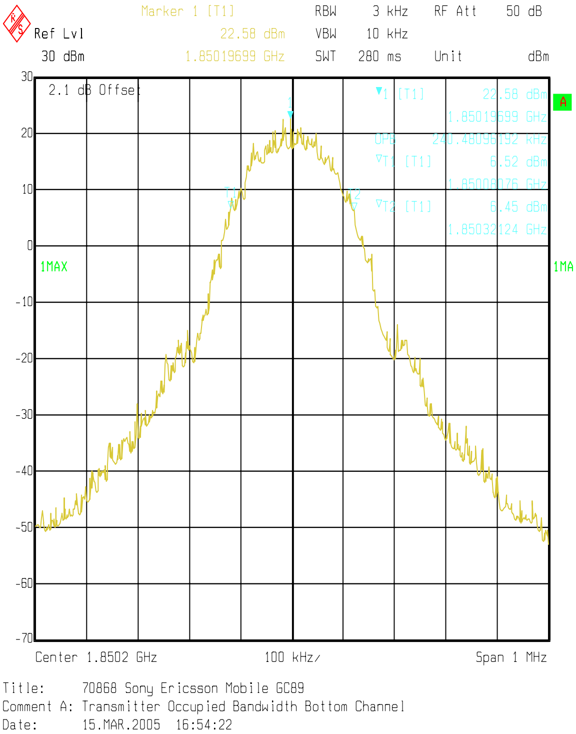
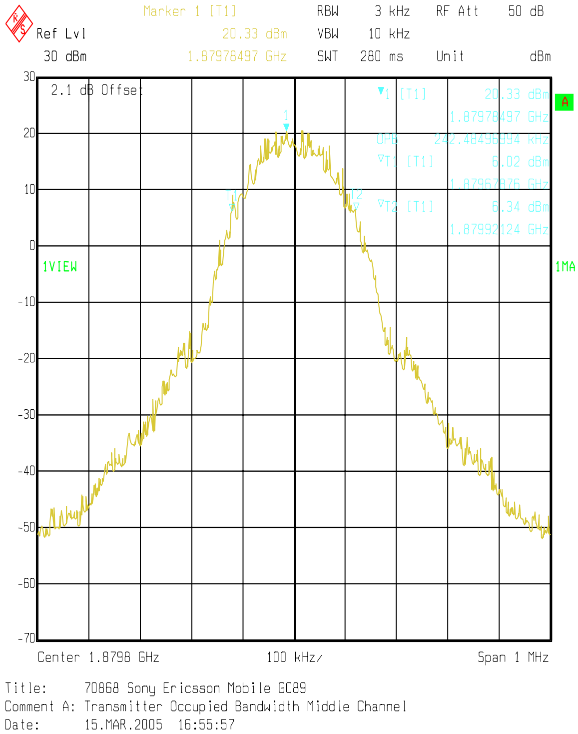
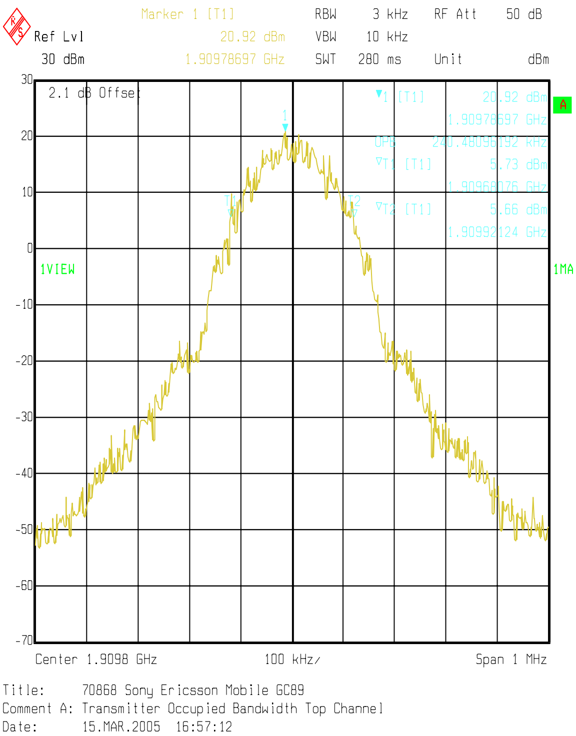
Transmitter Occupied Bandwidth: Section 24.238 (Continued)







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 results can be observed in the right hand corner of the graphs.

7.2.9. Transmitter Out of Band Conducted Emissions: Section 2.1051 & 24.238

The EUT was configured as for transmitter conducted emissions measurements as described in section 9 of this report.

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

Results:

Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3702.936	-33.9	-13.0	20.9	Complied

Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3761.629	-33.9	-13.0	20.9	Complied

Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3821.643	-33.8	-13.0	20.8	Complied

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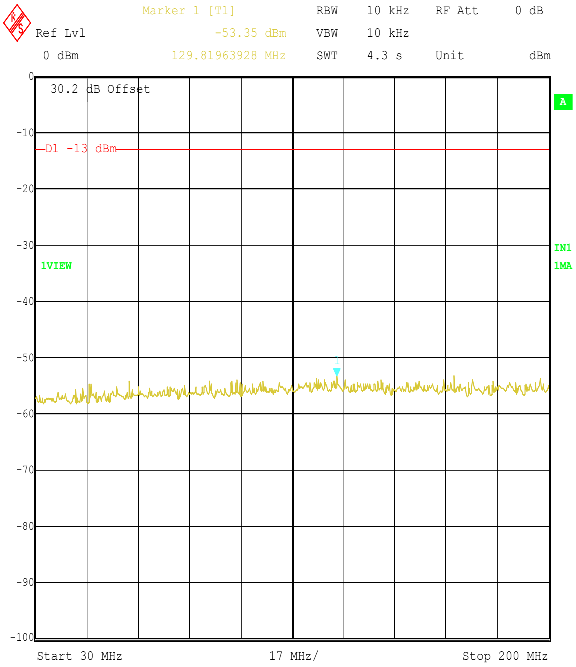
Transmitter Out of Band Conducted Emissions: Section 2.1051 & 24.238 (Continued)



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Comment A: Bottom Channel
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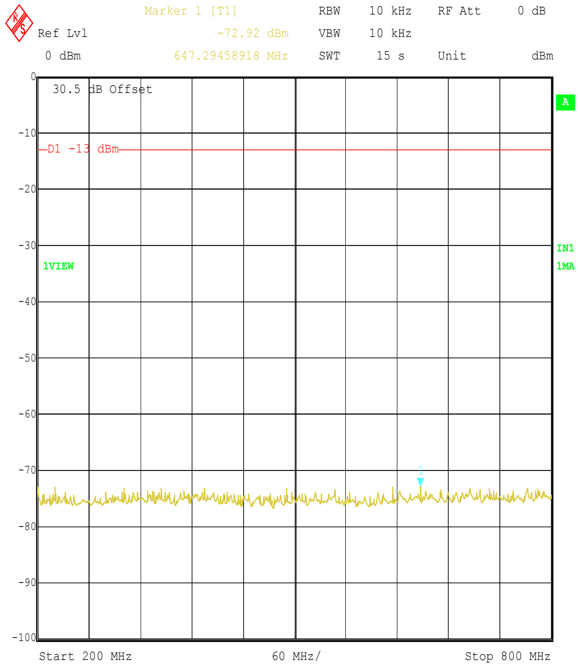

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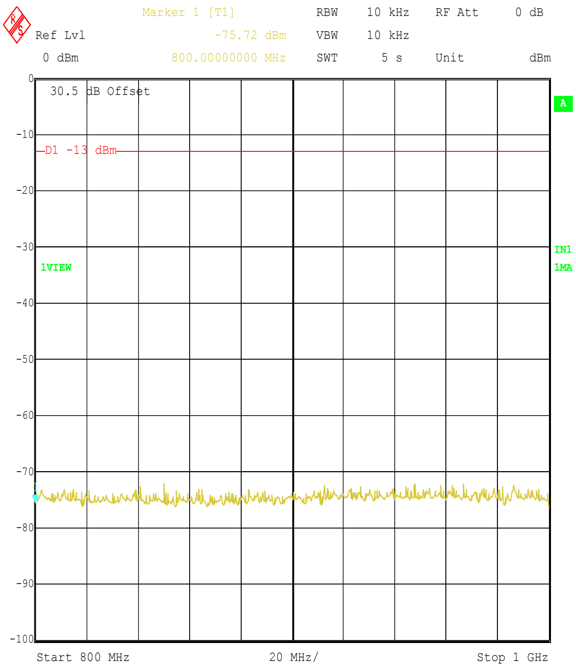
Comment A: Bottom Channel
Date: 5.APR.2005 00:01:26



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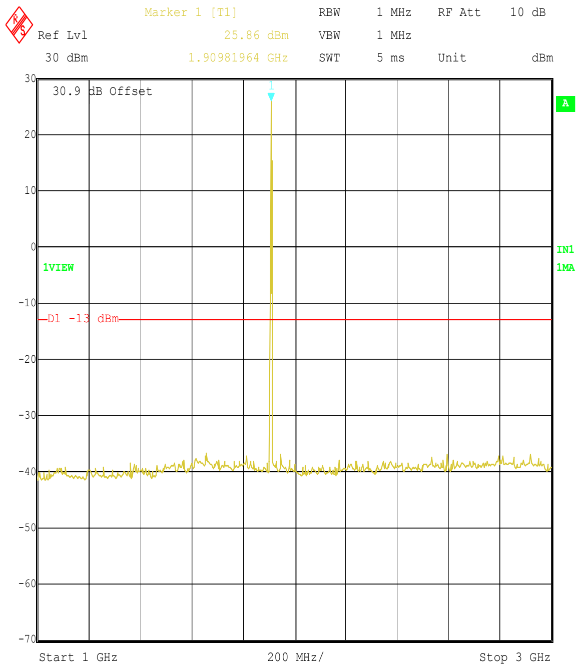

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Comment A: Bottom Channel
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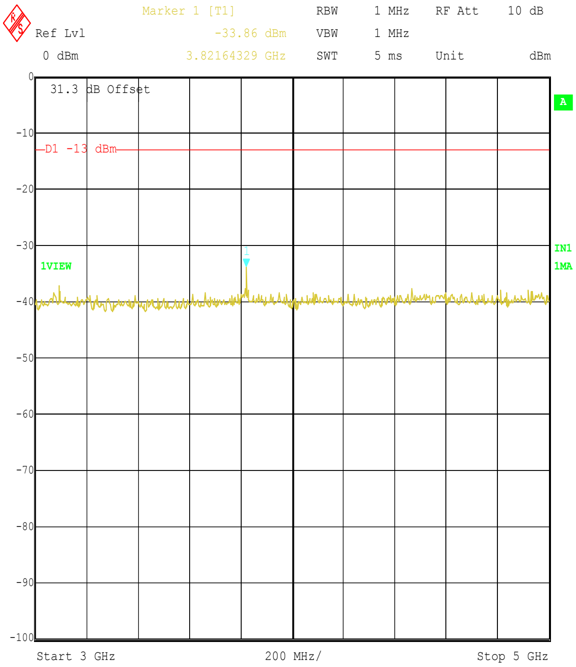
Transmitter Out of Band Conducted Emissions: Section 2.1051 & 24.238 (Continued)



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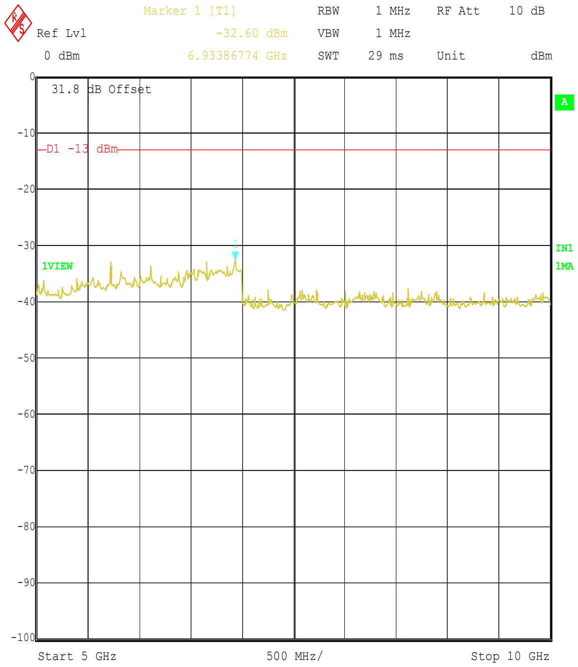
Date: 5.APR.2005 00:18:19



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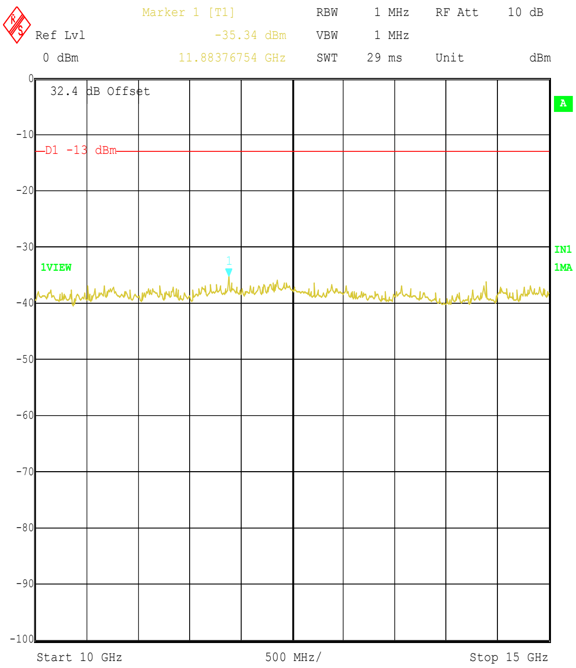
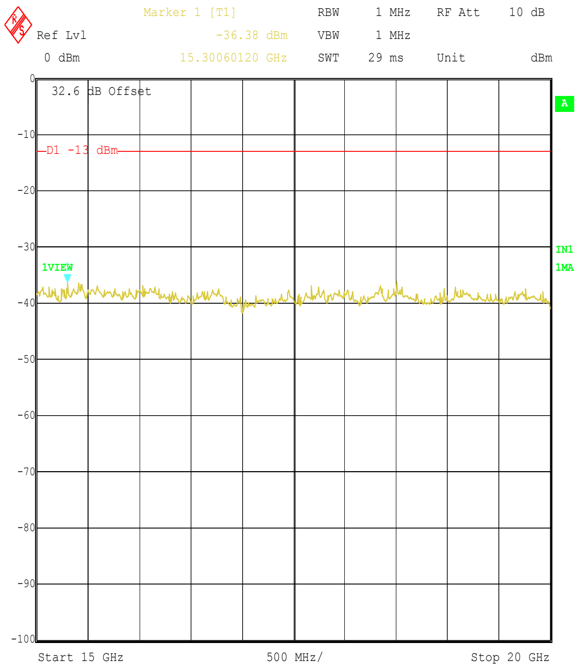
Comment A: Bottom Channel
Date: 5.APR.2005 00:18:54



Title: Tx Out of Band Conducted Emissions Top Channel
Comment A: Bottom Channel
Date: 5.APR.2005 00:19:26



Title: Tx Out of Band Conducted Emissions Top Channel
Comment A: Bottom Channel
Date: 5.APR.2005 00:19:58

Transmitter Out of Band Conducted Emissions: Section 2.1051 & 24.238 (Continued)

Integrated Power Over 1 MHz Strip Band: 1911 to 1912 MHz

1st 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	245.064	6	16.460
2	34.398	7	15.051
3	21.275	8	10.663
4	24.313	9	11.439
5	18.996	10	10.906
Total Peak Power:	408.565 nW/MHz		

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

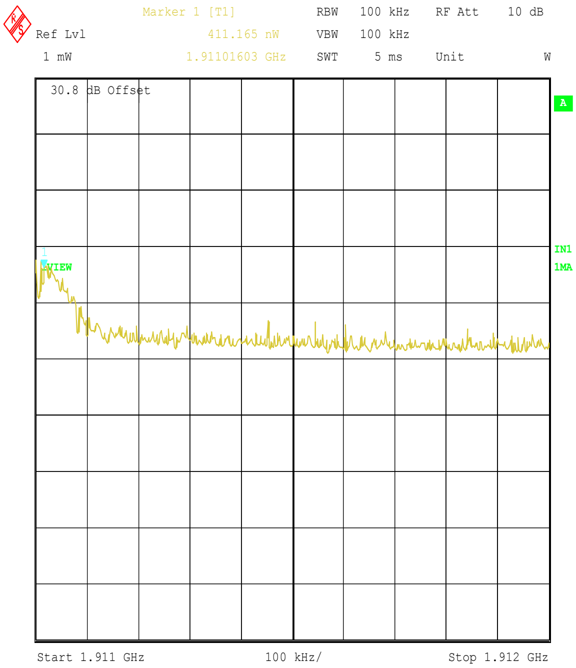
2nd 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	24.404	6	15.315
2	17.144	7	14.758
3	12.999	8	16.475
4	14.163	9	16.019
5	16.537	10	14.269
Total Peak Power:	162.083 nW/MHz		

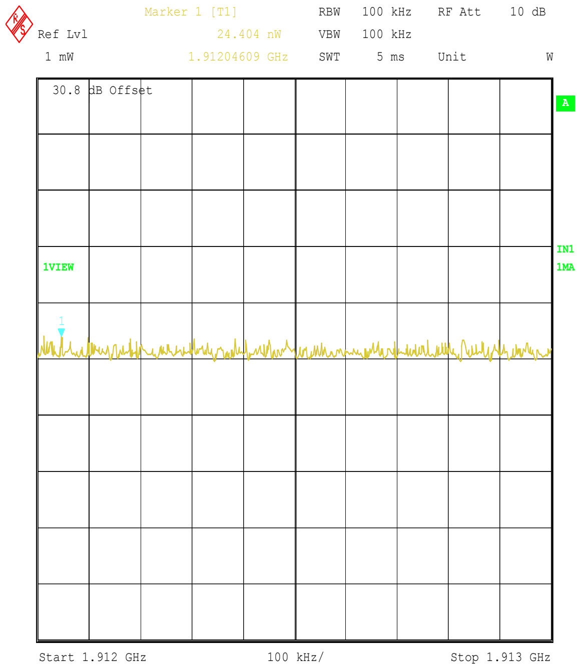
Results:

Band (MHz)	Peak Power (nW/MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1911 to 1912	408.565	-33.9	-13.0	20.9	Complied
1912 to 1913	162.083	-37.9	-13.0	24.9	Complied

Transmitter Out of Band Conducted Emissions: Section 2.1051 & 24.238 (Continued)



Title: Tx Out of Band Conducted Emissions Top Channel
Comment A: Integrated Power Over 1 MHz Strip Band
Date: 5.APR.2005 00:35:06



Title: Tx Out of Band Conducted Emissions Top Channel
Comment A: Integrated Power Over 1 MHz Strip Band
Date: 5.APR.2005 00:35:49

7.2.10. Transmitter Conducted Emissions at Band Edges: Section 2.1051 & 24.238

The EUT was configured as for transmitter conducted emission testing described in section 9 of this report.

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

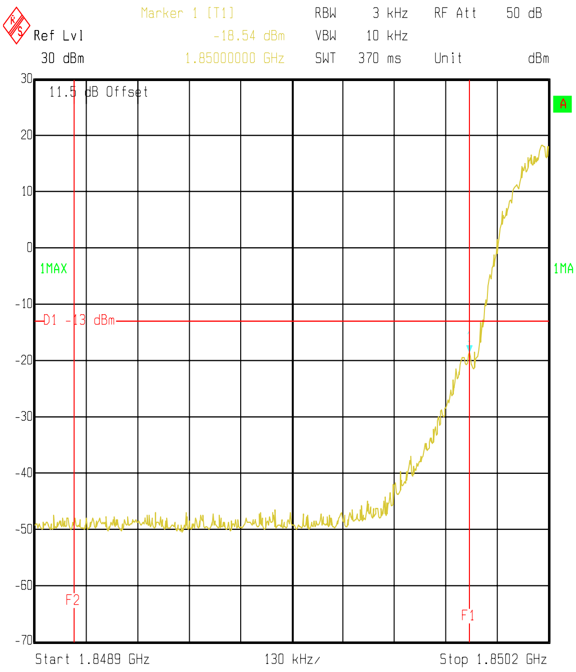
Results:

Bottom Band Edge

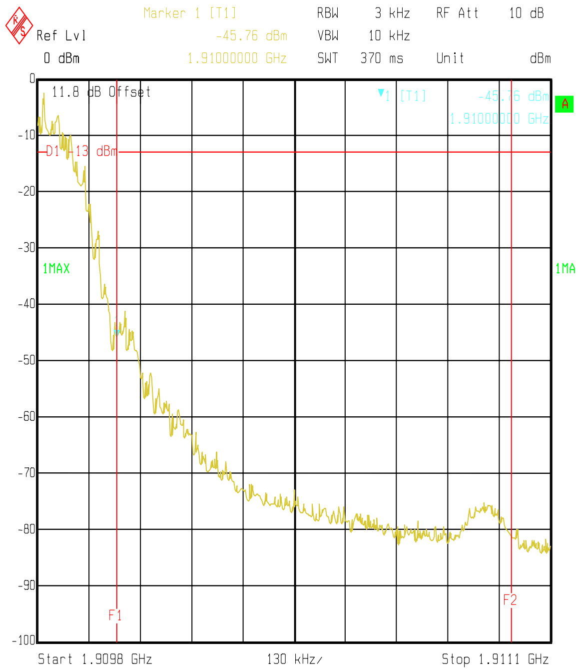
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-18.5	-13.0	5.5	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910	-45.8	-13.0	32.8	Complied



Title: Sony Ericsson Mobile GC89 70868
Comment A: Transmitter Conducted Emissions at Bottom Band Edges
Date: 15.MAR.2005 21:52:02



Title: 70868 Sony Ericsson Mobile GC89
Comment A: Transmitter Band Edge Conducted Emissions Top Channel
Date: 15.MAR.2005 21:30:39

7.2.11. Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238

The EUT was configured as for transmitter radiated emission testing as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Bottom Channel

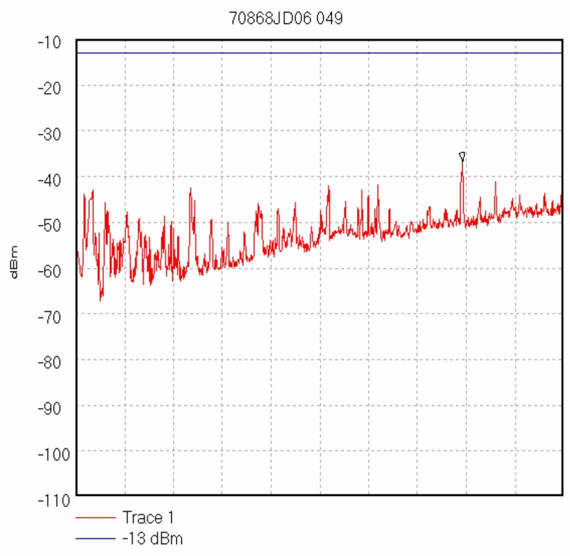
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1196.050	-39.7	-13.0	26.7	Complied

Middle Channel

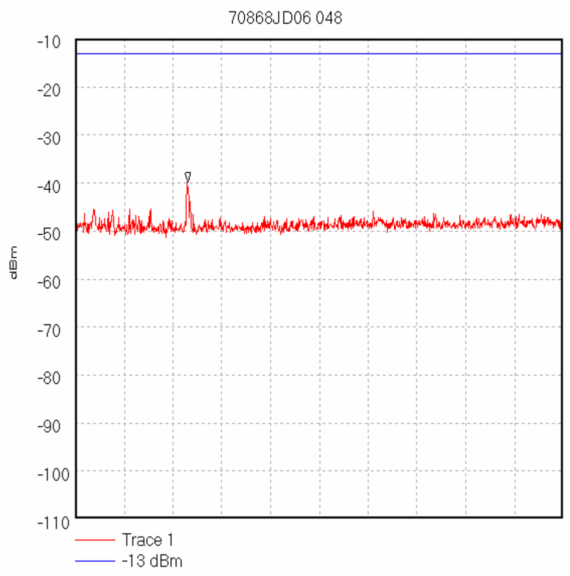
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1196.050	-40.5	-13.0	27.5	Complied

Top Channel

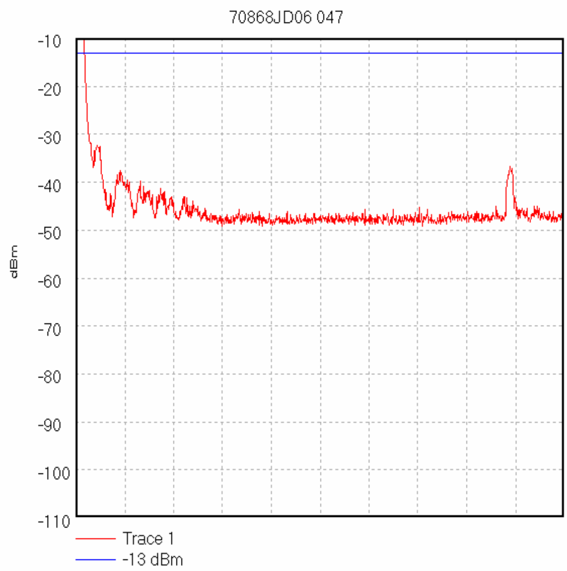
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1196.050	-39.7	-13.0	26.7	Complied



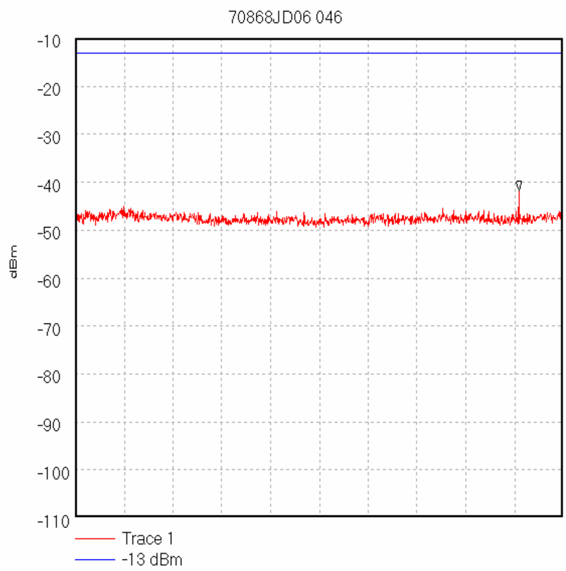
Start 30.0 MHz; Stop 1.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 799.533 MHz, -36.73 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
02/03/2005 16:05:54



Start 1.0 GHz; Stop 1.85 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.196 GHz, -39.73 dBm
Display Line: -13 dBm; ; Limit Test Passed
02/03/2005 15:54:44



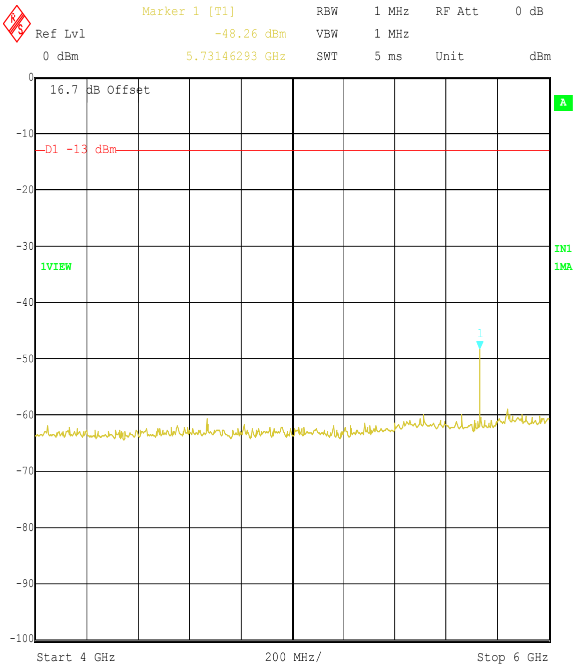
Start 1.91 GHz; Stop 2.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.911 GHz, -6.02 dBm
Display Line: -13 dBm; ; Limit Test Failed
02/03/2005 15:52:18



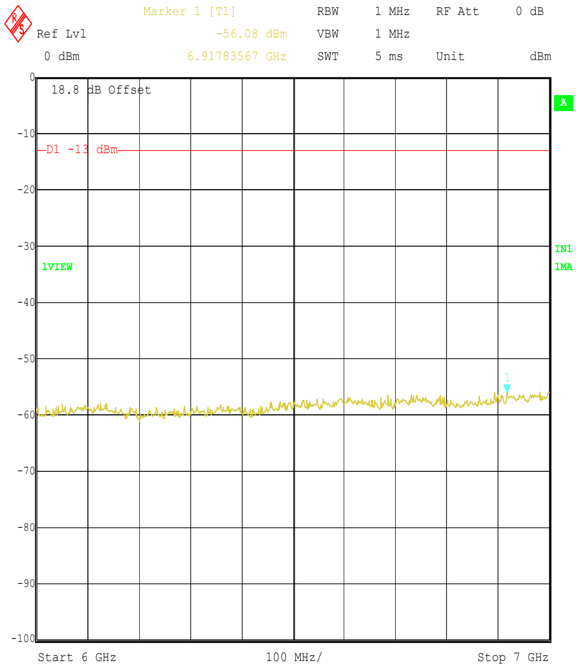
Start 2.0 GHz; Stop 4.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.82 GHz, -41.66 dBm
Display Line: -13 dBm; ; Limit Test Passed
02/03/2005 15:49:49

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

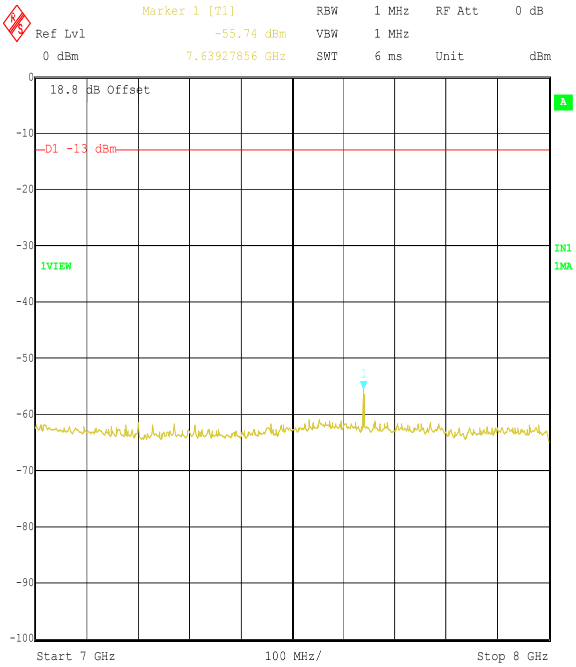
Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



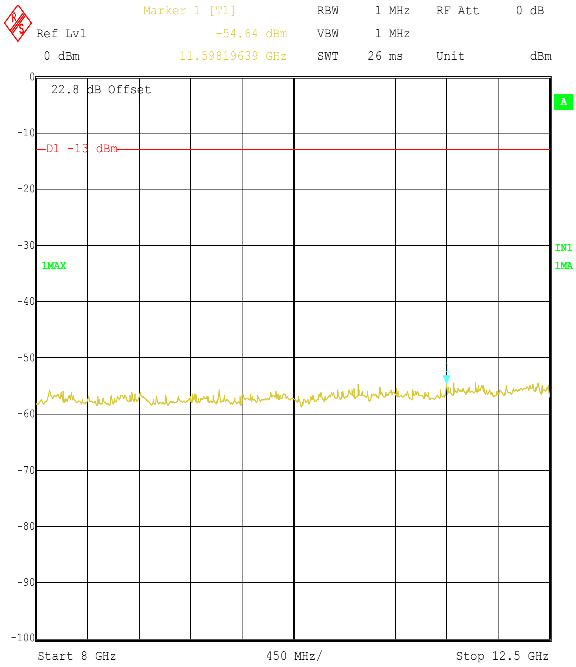
Title: 70868 Sony Ericsson Mobile GC89 FCC Part 24
Comment A: Transmitter Radiated Spurious Emissions Top Channel
Date: 21.MAR.2005 12:22:36



Title: 70868 Sony Ericsson Mobile GC89 FCC Part 24
Comment A: Transmitter Radiated Spurious Emissions Top Channel
Date: 21.MAR.2005 12:17:53

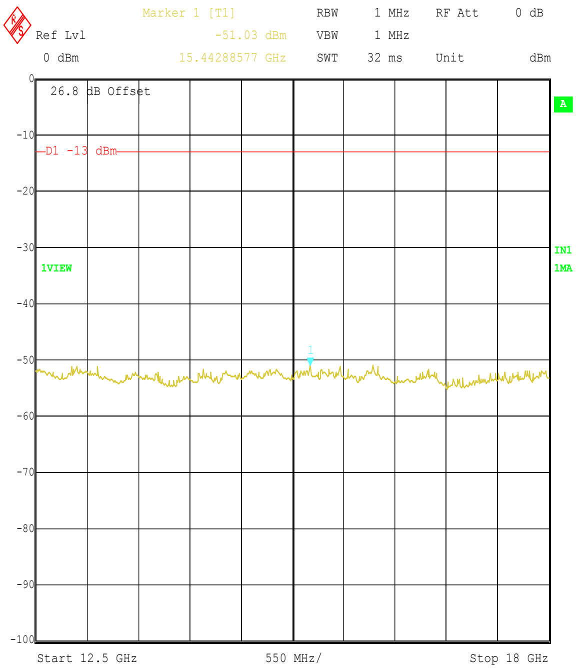


Title: 70868 Sony Ericsson Mobile GC89 FCC Part 24
Comment A: Transmitter Radiated Spurious Emissions Top Channel
Date: 21.MAR.2005 12:16:34

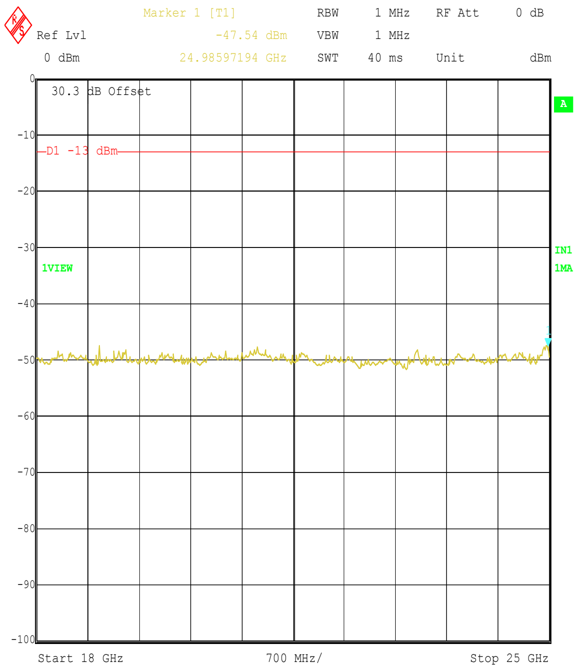


Title: 70868 Sony Ericsson Mobile GC89 FCC Part 24
Comment A: Transmitter Radiated Spurious Emissions Top Channel
Date: 21.MAR.2005 12:14:03

Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



Title: 70868 Sony Ericsson Mobile GC89 FCC Part 24
Comment A: Transmitter Radiated Spurious Emissions Top Channel
Date: 21.MAR.2005 12:11:18



Title: 70868 Sony Ericsson Mobile GC89 FCC Part 24
Comment A: Transmitter Radiated Spurious Emissions Top Channel
Date: 21.MAR.2005 12:07:59

7.3. Transmitter Radiated Emissions at Band Edges: Section 2.1053 & 24.238

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

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

Results:

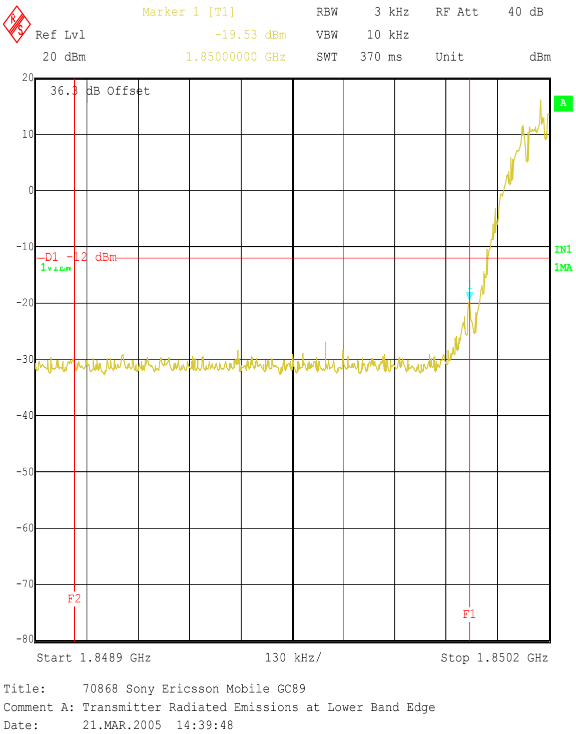
Bottom Band Edge

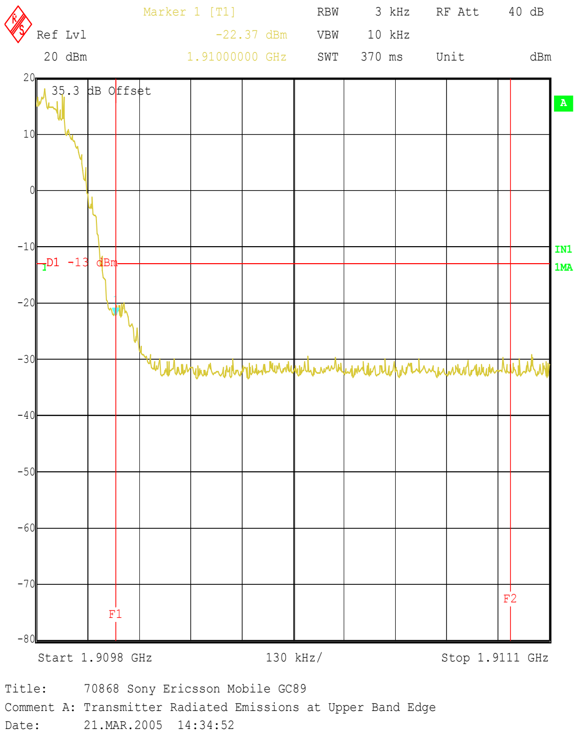
Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-19.5	-13.0	-6.5	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910	-22.4	-13.0	9.4	Complied

Transmitter Radiated Emissions at Band Edges: Section 2.1053 & 24.238 (Continued)





8. Measurement Uncertainty

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.

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

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

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”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 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
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	±1.2 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	±1.78 dB
Frequency Stability	Not applicable	95%	±20 Hz
Minimum Bandwidth	Not applicable	95%	±0.12%
Occupied Bandwidth	1850 to 1910 MHz	95%	±0.12%
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±5.26 dB
Radiated Spurious Emissions	1 GHz to 26 GHz	95%	±4.2 dB

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.

9. Measurement Methods

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 required channel and the transmitter set to operate at full power.

A marker 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:

Receiver Function	Setting
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Step Size:	Continuous sweep
Sweep Time:	Coupled

9.2. 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 – 2003 Clause 5.4. The transmitter was fitted with an integral antenna; therefore 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 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 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:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

All measurements were performed using broadband Horn antennas.

Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired power 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.

Delta (dB) = EUT – 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:

EIRP SG= Signal Generator Level - Cable Loss + Antenna Gain

The EUT EIRP is calculated as:

EIRP EUT = EIRP SG + Delta.

The test equipment settings for EIRP measurements were as follows:

Receiver Function	Setting
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

9.3. Frequency Stability

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

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

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for hand carried 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.

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 non-compliance. There is also a frequency graph presented offering the frequency variation around nominal frequency.

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.

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 ≥1% of occupied bandwidth. A value of 3 kHz was used.

9.5. Transmitter Conducted Emissions Measurements

The test was performed in a laboratory environment.

Spurious emission 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 dBm therefore, the limit line presented on the accompanying plots is set to -13 dBm.

The frequency band described above was investigated with the transmitter operating at full power on the top, bottom and middle channels. Any spurious observed were then recorded and 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 24.238 states that the 1st 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 kHz

The measurements in the 2nd and 3rd 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 a 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:	1 MHz >1 GHz
Bandwidth:	10 kHz <1 GHz
Amplitude Range:	100 dB
Step Size:	Continuous sweep
Sweep Time:	Coupled

The resolution bandwidth used for measurements in the 1 MHz blocks either side of the declared operating frequency block were set as described in the procedure above.

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. The EUT was powered with 110V 60 Hz AC mains supplied via a line impedance stabilisation network (LISN).

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.

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:

Receiver Function	Initial Scan	Final Measurements
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

9.7. Transmitter Radiated Emissions

Radiated emission 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:-

EIRP = Signal Generator Level - Cable Loss + 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.

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.

Transmitter Radiated Emissions (Continued)

It should be noted that FCC Part 24.238 states that the 1st 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.

The measurements in the 2nd and 3rd 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 a 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.

9.8. Receiver Radiated Emissions

Radiated emission 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 the upper frequency detailed in Section 15.33(b) 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 – 2003 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 dBμV plus cable loss and antenna factor.

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

Receiver Function	Initial Scan	Final Measurements <1 GHz	Final Measurements ≥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

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A027	Horn Antenna	Eaton	9188-2	301
A031	Horn Antenna	Eaton	91889-2	557
A032	Horn Antenna	EMCO	3115	2874
A1069	LISN	Rohde & Schwarz	ESH3-Z5	837469/012
A1256	Power supply	Farnell	11E30/1B	000378
A1361	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1361-20112003
A1428	Attenuator	Narda	3292-1	02439
A244	Attenuator	Schaffner	6820-17-B	None
A254	Horn Antenna	Flann	14240-20	139
A428	Horn Antenna	Flann	12240-20	134
A429	Horn Antenna	Flann	16240-20	561
A430	Horn Antenna	Flann	18240-20	425
A436	Horn Antenna	Flann	20240-20	330
E013	Environmental Chamber	Sanyo	ATMOS	None
G013	Signal Generator	Rohde & Schwarz	SMHU	894 055/003
M028	Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RU); 860 161/007 (DU)
M1123	Power Meter	Boonton	4531	138201
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K
M1138	Radio Communications Tester	Rohde & Schwarz	CMU 200	836202/093
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016
M128	DVM	Fluke	76	65340273
M505/ M506	Spectrum Analyser	Rohde & Schwarz	ESBI	825316/010(DU); 827060/004(RU)
S003	Power Control	Zen	E08	736699
S011	D.C. PSU	INSTEK	PR-3010H	9401270
S202	Site 2	RFI	2	S202-15011990

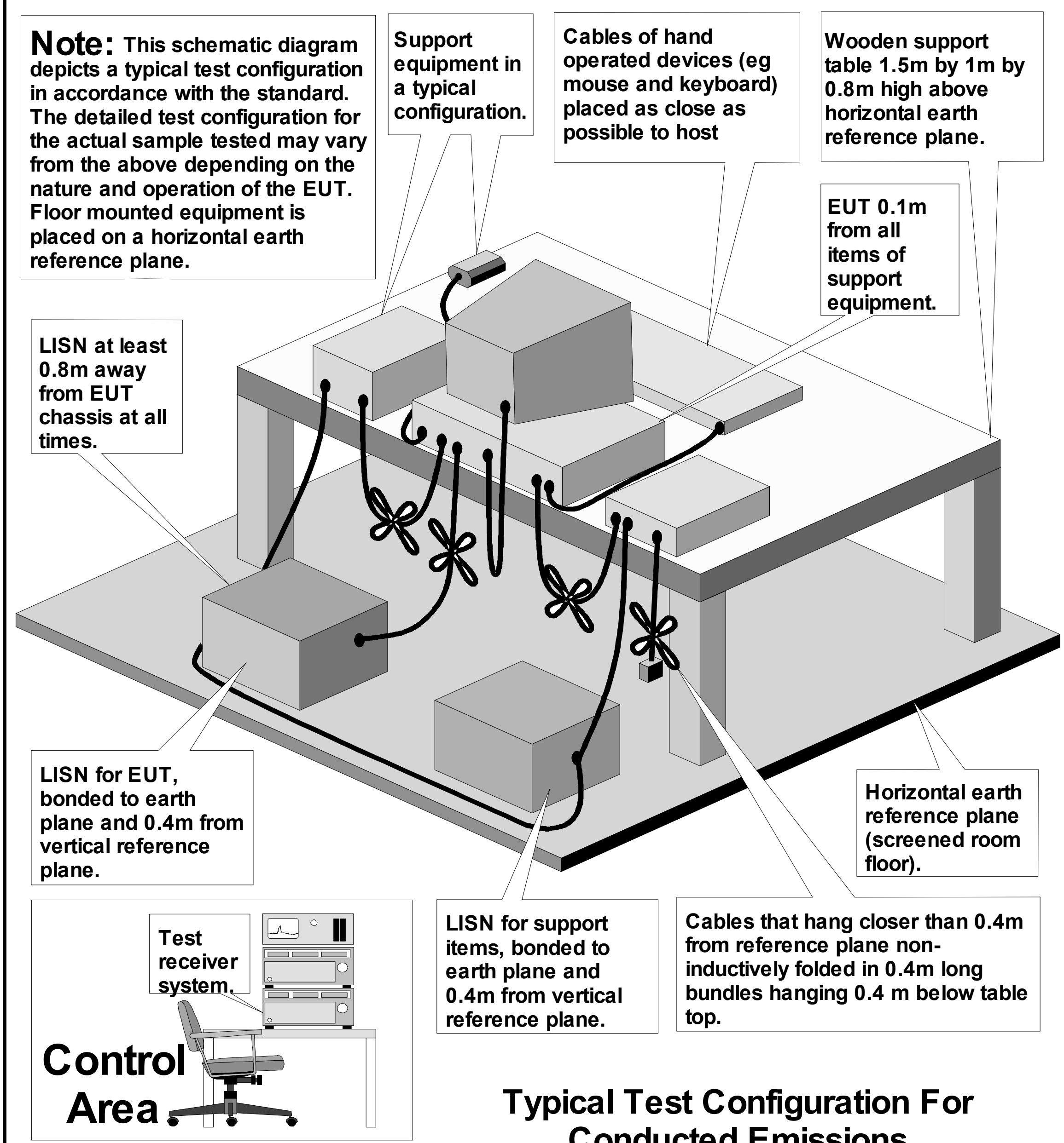
NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

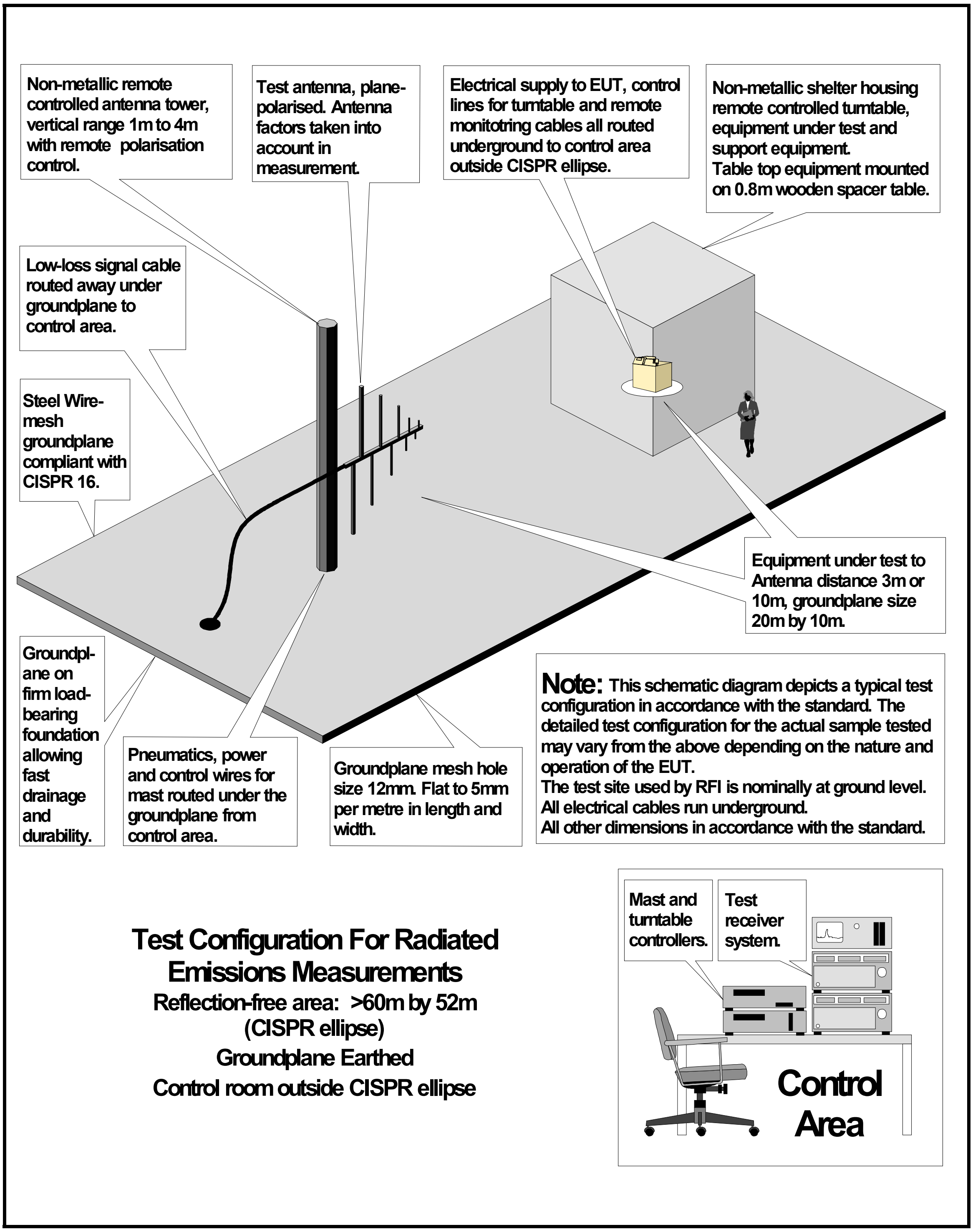
Drawing Reference Number	Title
DRG\70868JD06\EMICON	Test configuration for measurement of conducted emissions.
DRG\70868JD06\EMIRAD	Test configuration for measurement of radiated emissions.

DRG\70868JD06\EMICON



Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992
Tests performed in a screened enclosure

DRG\70868JD06\EMIRAD



Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse

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