TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Panasonic Mobile Communications Ltd.
X70 Mobile Handset.

To: FCC Part 15 and 24

Test Report Serial No:
RFI/MPTB2/RP45083JD01A

Supersedes Test Report Serial No:
RFI/MPTB1/RP45083JD01A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By: Alan McHale** 
Tested By: 	**Release Version No: PDF01**
Issue Date: 08 October 2003	**Test Dates: 27 August 2003 to 02 September 2003**

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Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, ENGLAND. Tel: +44 (0) 1256 851193 Fax: +44 (0) 1256 851192	Registered in England, No. 211 7901. Registered Office: Ewhurst Park, Ramsdell, Basingstoke, Hampshire RG26 5RQ	UKAS TESTING TESTING 0644

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1. Client Information

Company Name:	Panasonic Mobile Communications Ltd.
Address:	2 Gables Way, Colthrop, Thatcham, Berkshire, RG19 4ZB United Kingdom
Contact Name:	Mr Mike Hargreaves

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:	Panasonic
Model Name or Number:	X70
Unique Type Identification:	X70
IMEI Number:	004400622871349
FCC ID Number:	NWJ22B001A
Country of Manufacture:	China
Date of Receipt:	07 August 2003

Description:	AC Charger
Brand Name:	Panasonic
Model Name or Number:	EB-CAX70UK
Serial Number:	001
Cable Length:	1.5 m
Connected to Port:	Charger Connection

Description:	Headset
Brand Name:	Panasonic
Model Name or Number:	EB-UCX70
Serial Number:	001
Cable Length:	1.2 m
Connected to Port:	Headset Connection

2.2. Description Of EUT

The equipment under test is a GSM tri-band (900, 1800 & 1900) camera mobile handset, which supports IR and Bluetooth. The GSM 900 and 1800 modes are intended for use only outside the USA.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from what is described by the Model Number and Unique Type Identification stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement: (Internal lithium ion battery)	3.6 V DC		
Declared Battery Extreme Voltage Range	4.2 V (Max), 3.46 V (Min)		
Power Supply Requirement: (AC Battery Charger)	Nominal 115 V 60 Hz AC Mains supply		
Intended Operating Environment:	Within GSM Network Coverage		
Equipment Category:	Cellular Telephone		
Type of Unit:	Transceiver		
Weight:	92 g		
Dimensions:	87 mm(H) x 47 mm(W) x 23.9 mm(D)		
Interface Ports:	Charger Connection Headset Connection		
Highest Fundamental Frequency	1909.8 MHz		
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	1959.8
	Top	810	1989.8
Maximum Power Output (EIRP)	30.8 dBm		

2.5. Support Equipment

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

Description:	GSM Test set
Brand Name:	Will Tek
Model Name or Number:	42025
Serial Number:	0513018
Cable Length And Type:	N/A
Connected to Port:	RF Link (Air Interface)

3. Test Specification, Methods And Procedures

3.1. Test Specifications

Reference:	FCC Part 15 Subpart B: 2002 (Section 15.107 and 15.109)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Unintentional Radiators.
Comments:	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.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 24 Subpart E: 2002 (Broadband PCS)
Title:	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.
Comments:	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.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

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.

ANSI/TIA-603-B-2002
Land Mobile Communications Equipment, Measurements and performance Standards.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)
Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

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 Conditions

During testing, the EUT was powered by a nominal 3.6 V DC battery connected to a 115 V 60 Hz AC mains charger.

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 2.1 of this report connected and the disconnected. The combination that exhibited the worse 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 and bottom channels of the assigned frequency block at –30.0 ºC through to +50.0 ºC in 10º 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 Modes:

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

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Configured with hands free kit, AC battery charger, and internal battery.

All tests were performed with the EUT connected via an air link.

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: 2002 Section 15.107	AC Mains Input	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Enclosure	Complied
Transmitter Effective Isotropic Radiated Power (EIRP)	C.F.R. 47 FCC Part 24: 2002 Section 24.232	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2002 Section 24.235	Antenna	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2002 Section 24.235	Antenna	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2002 Section 24.238	Antenna	Complied
Transmitter Out of Band Emissions	C.F.R. 47 FCC Part 24: 2002 Section 2.1053/24.238	Antenna	Complied
Transmitter Band Edges Radiated 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.

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 10 for details of measurement uncertainties.

8. Test Results

8.1. 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 emissions levels on the AC mains line of the EUT.

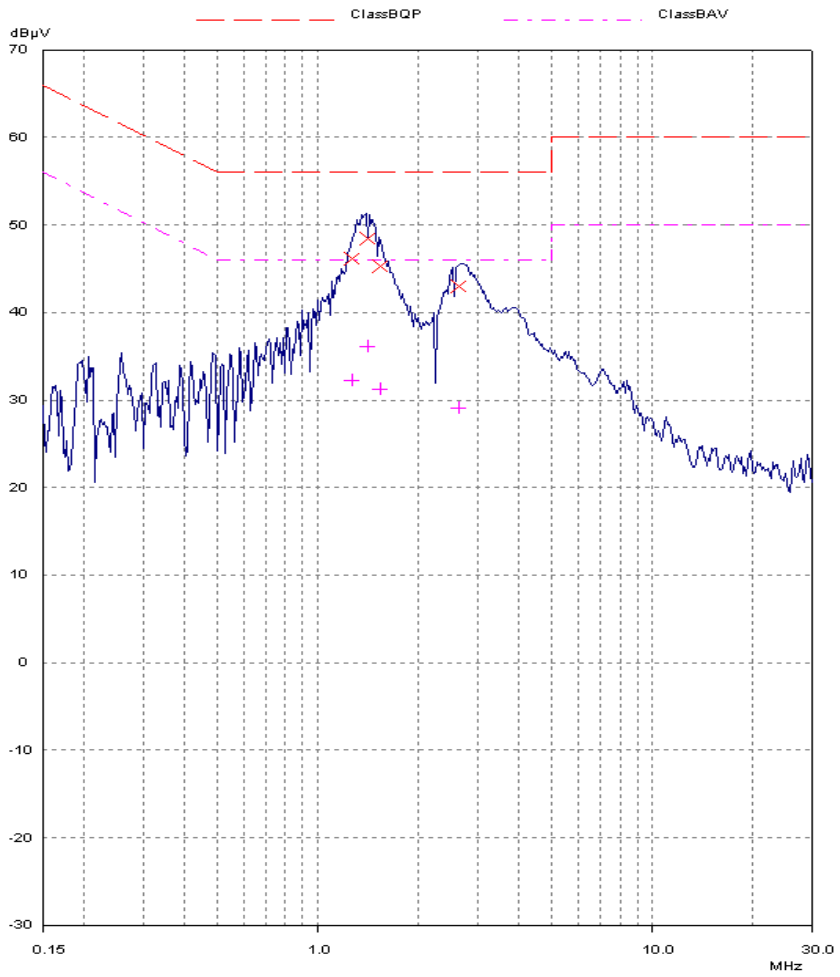
Results: Quasi-Peak Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
1.26088	Neutral	46.15	56.0	9.85	Complied
1.41294	Neutral	48.46	56.0	7.54	Complied
1.53195	Neutral	45.26	56.0	10.74	Complied
2.64668	Neutral	42.93	56.0	13.07	Complied

Results: Average Detector Measurements On Live And Neutral Lines

Frequency (MHz)	Line	Av. Level (dBμV)	Av. Limit (dBμV)	Margin (dB)	Result
1.26088	Neutral	32.26	46.0	13.74	Complied
1.41294	Neutral	36.07	46.0	9.93	Complied
1.53195	Neutral	31.20	46.0	14.80	Complied
2.64668	Neutral	29.11	46.0	16.89	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.

8.2. Idle Mode Radiated Spurious Emissions: Section 15.109

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

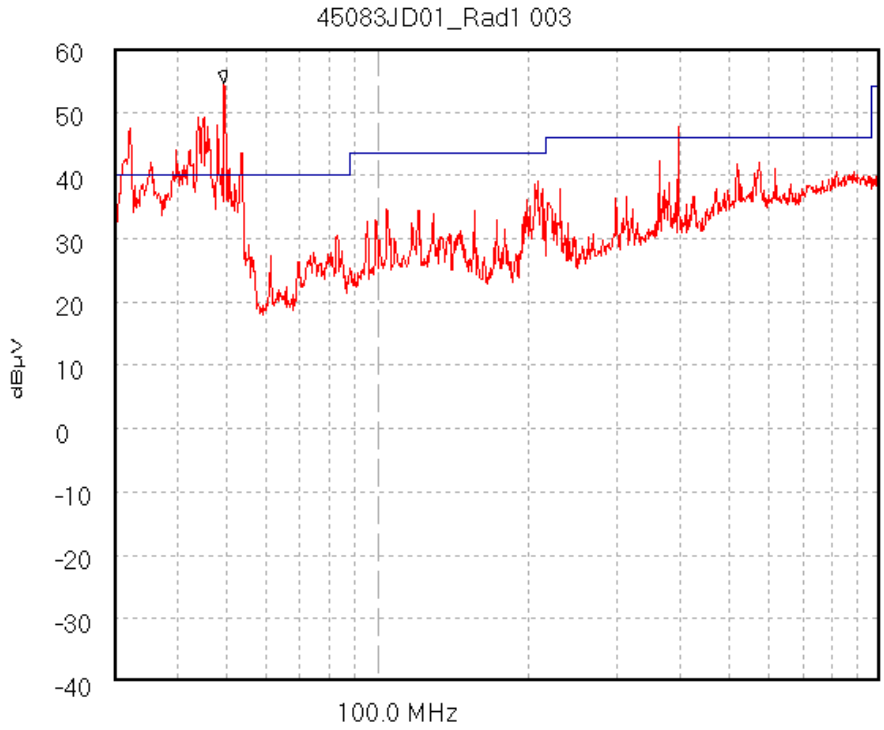
8.2.1.1. The EUT was configured as for idle mode radiated emissions testing as described in Section 9 of this report.

8.2.1.2. Tests were performed to identify the maximum idle mode or standby radiated emissions levels.

Result:

Frequency (MHz)	Antenna. Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
32.140	Horiz.	36.7	40.0	3.3	Complied
43.816	Vert.	39.2	40.0	0.8	Complied
206.383	Horiz.	35.9	43.5	7.6	Complied
396.010	Horiz.	38.4	46.0	7.6	Complied

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV; Ref Offset 10.0 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 380.0 mS
Peak 49.591 MHz, 54.52 dBµV
Limit/Mask: 15_109_Class_B; ; Limit Test Failed
Transducer Factors: A1037
9/1/2003 9:56:12 AM

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

Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)

8.2.2. Electric Field Strength Measurements (Frequency Range 1.0 to 20.0 GHz)

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

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

Result:

Highest Peak Level

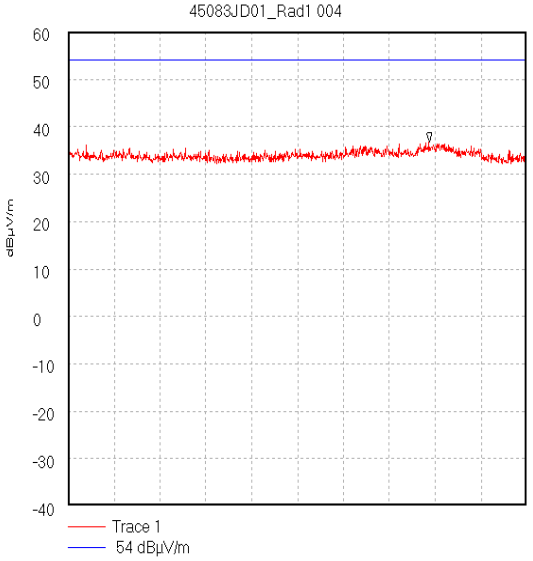
Frequency (GHz)	Antenna. Polarity (H/V)	Peak Detector Level (dBµV)	Antenna Factor	Cable Loss	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
18.653	Horiz.	-0.8	37.0	5.0	41.2	74.0	32.8	Complied

Note: No spurious emissions were detected above the noise floor of the measuring receiver; the highest peak noise floor reading of the measuring receiver recorded was 41.2 dBµV/m at 18.653 GHz.

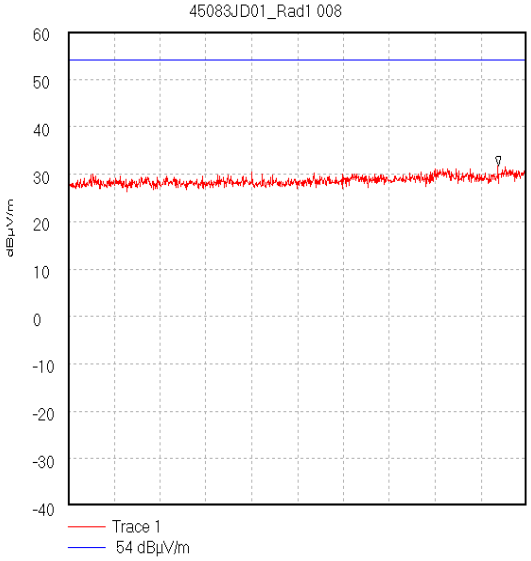
Highest Average Level:

Note: No spurious emissions were detected above the noise floor of the measuring receiver. No results were recorded.

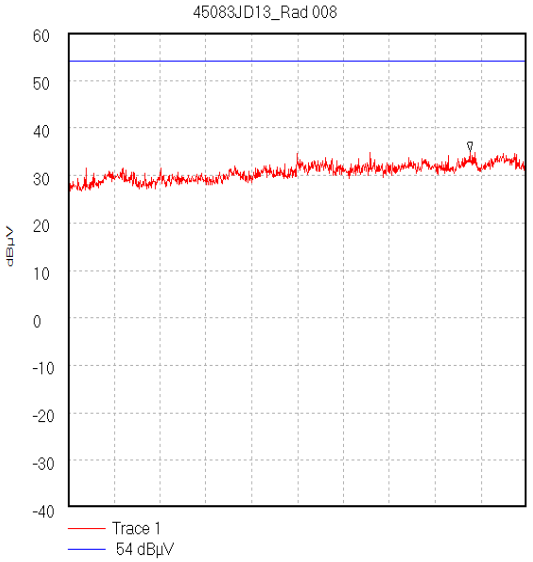
Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



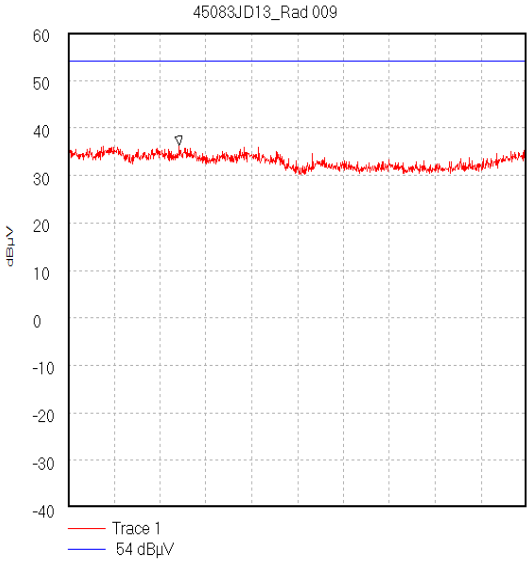
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 5.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.787 GHz, 36.82 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
9/1/2003 10:24:25 AM



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.876 GHz, 31.79 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Failed
9/1/2003 11:36:18 AM



Start 4.0 GHz; Stop 6.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.753 GHz, 34.99 dBµV
Display Line: 54 dBµV;
27/08/2003 20:49:24

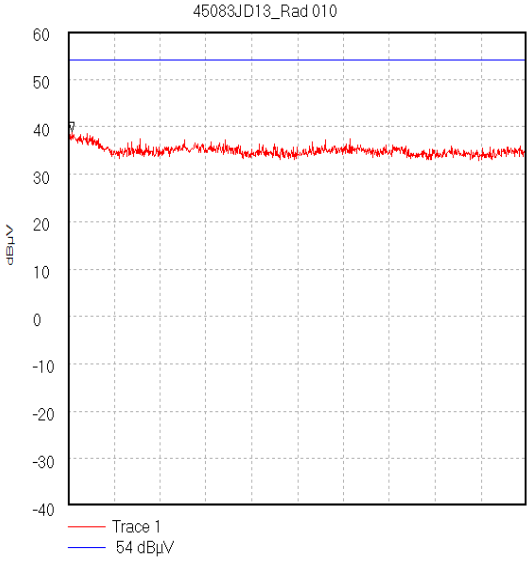


Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 6.484 GHz, 36.34 dBµV
Display Line: 54 dBµV;
27/08/2003 20:51:14

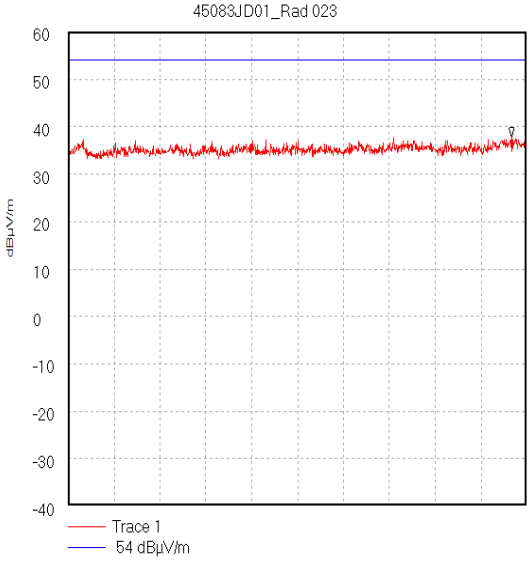
Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Panasonic Mobile Communications Ltd.**
X70 Mobile Handset.
To: **FCC Part 15 & 24**

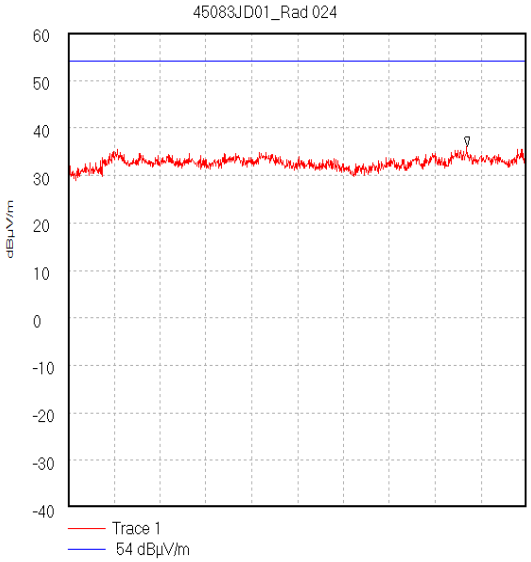
Idle Mode Radiated Spurious Emission: Section 15.109 (Continued)



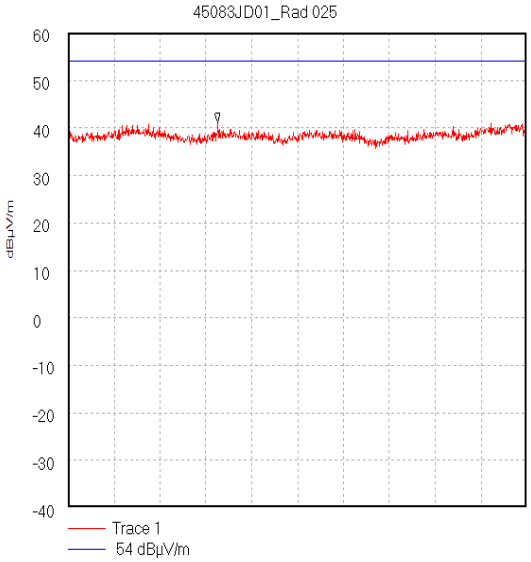
Start 8.0 GHz; Stop 10.0 GHz
Ref 60 dBµV; Ref Offset 2.9 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 8.018 GHz, 38.98 dBµV
Display Line: 54 dBµV;
27/08/2003 20:53:48



Start 10.0 GHz; Stop 12.5 GHz
Ref 60 dBµV/m; Ref Offset 2.9 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 12.419 GHz, 37.79 dBµV/m
Display Line: 54 dBµV/m;
28/08/2003 16:49:31



Start 12.5 GHz; Stop 18.0 GHz
Ref 60 dBµV/m; Ref Offset 3.6 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 17.285 GHz, 36.16 dBµV/m
Display Line: 54 dBµV/m;
28/08/2003 16:51:30



Start 18.0 GHz; Stop 20.0 GHz
Ref 60 dBµV/m; Ref Offset 5.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 18.653 GHz, 41.19 dBµV/m
Display Line: 54 dBµV/m;
28/08/2003 16:53:35

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

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

8.3.1. The EUT was configured as for Effective Isotropic Radiated Power as described in Section 9 of this report.

8.3.2. 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	Vert.	30.8	33.0	2.2	Complied
Middle	1879.8	Vert.	30.1	33.0	2.9	Complied
Top	1909.8	Vert.	30.5	33.0	2.5	Complied

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

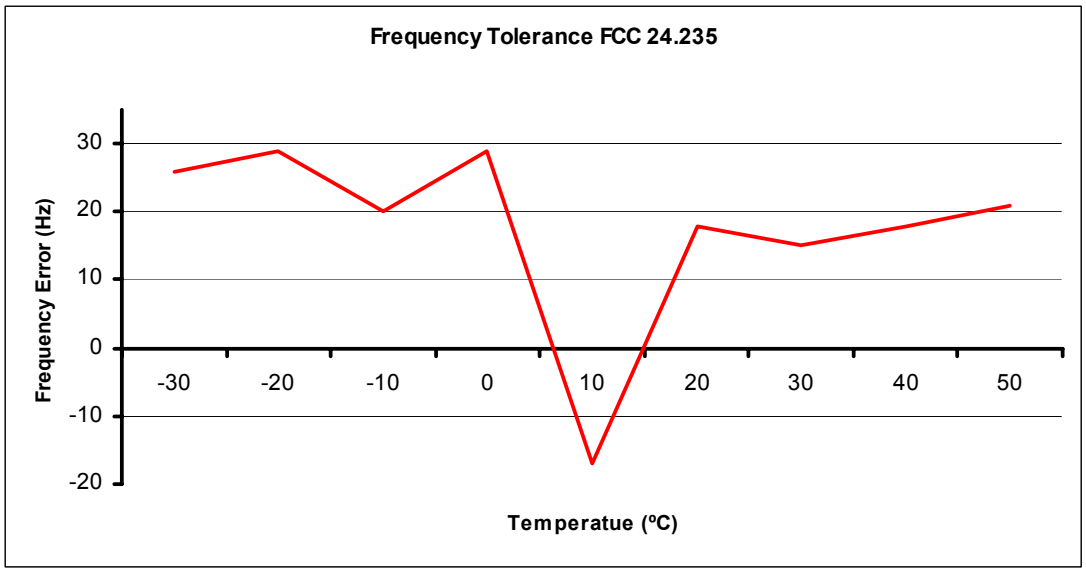
8.4.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

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

Results Bottom Channel (1850.2 MHz)

Temp (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	26	1850.200026	1850.0	0.200026	Complied
-20	29	1850.200029	1850.0	0.200029	Complied
-10	20	1850.200020	1850.0	0.200020	Complied
0	29	1850.200029	1850.0	0.200029	Complied
10	-17	1850.199983	1850.0	0.199983	Complied
20	18	1850.200018	1850.0	0.200018	Complied
30	15	1850.200015	1850.0	0.200015	Complied
40	18	1850.200018	1850.0	0.200018	Complied
50	21	1850.200021	1850.0	0.200021	Complied

Frequency Variation From 1850.2 MHz

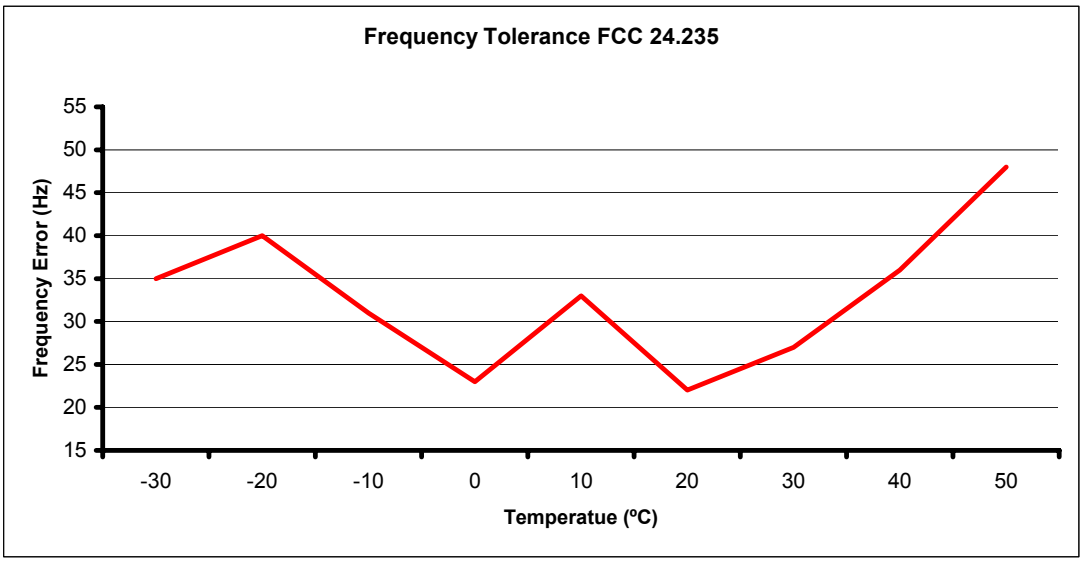


Transmitter Frequency Stability (Temperature Variation): Section 24.235 (continued)

Results Top Channel (1909.8 MHz)

Temp (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	35	1909.800035	1910.0	0.199965	Complied
-20	40	1909.800040	1910.0	0.199960	Complied
-10	31	1909.800031	1910.0	0.199969	Complied
0	23	1909.800023	1910.0	0.199977	Complied
10	33	1909.800033	1910.0	0.199967	Complied
20	22	1909.800022	1910.0	0.199978	Complied
30	27	1909.800027	1910.0	0.199973	Complied
40	36	1909.800036	1910.0	0.199964	Complied
50	48	1909.800048	1910.0	0.199952	Complied

Frequency Variation From 1909.8 MHz



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

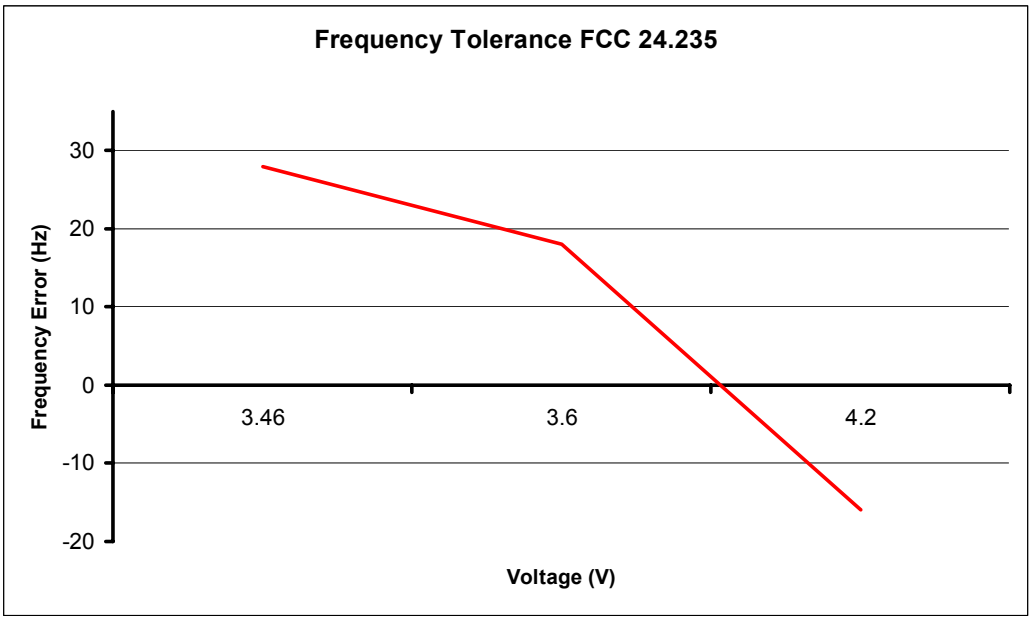
8.5.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

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

Results Bottom Channel (1850.2 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.46	28	1850.200028	1850.0	0.200028	Complied
3.6	18	1850.200018	1850.0	0.200018	Complied
4.2	-16	1850.199984	1850.0	0.199984	Complied

Frequency Variation From 1850.2 MHz

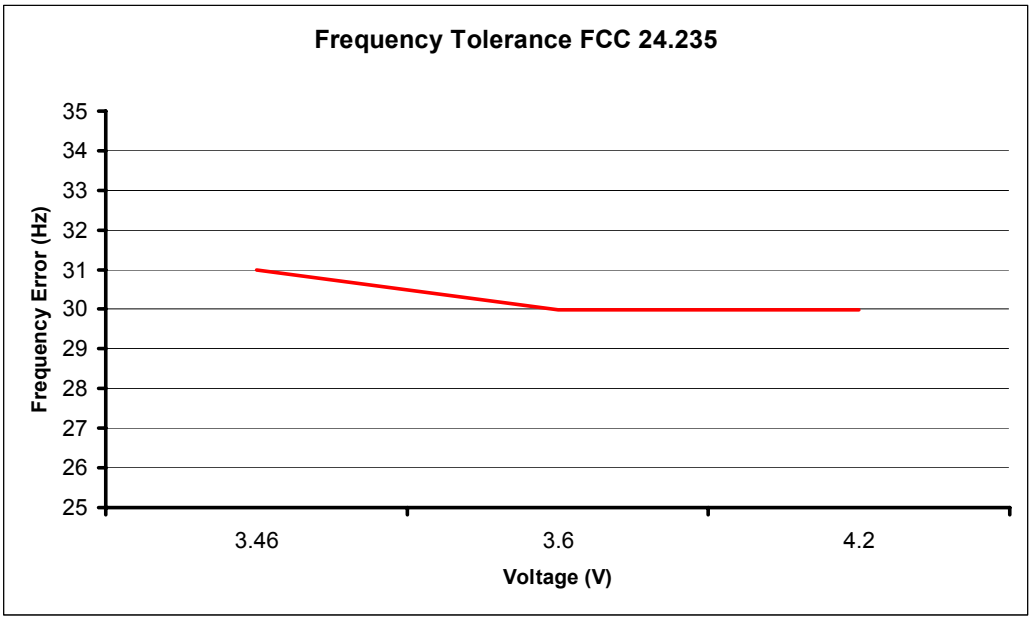


Transmitter Frequency Stability (Voltage Variation): Section 24.235 (Continued)

Results Top Channel (1909.8 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.46	31	1909.800031	1910.0	0.199969	Complied
3.6	30	1909.800030	1910.0	0.199970	Complied
4.2	30	1909.800030	1910.0	0.199970	Complied

Frequency Variation From 1909.8 MHz



8.6. Transmitter Occupied Bandwidth: Section 24.238

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

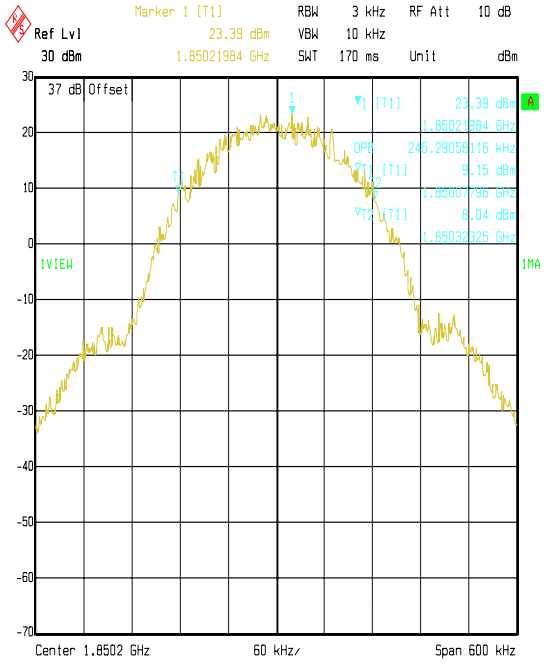
8.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

Results:

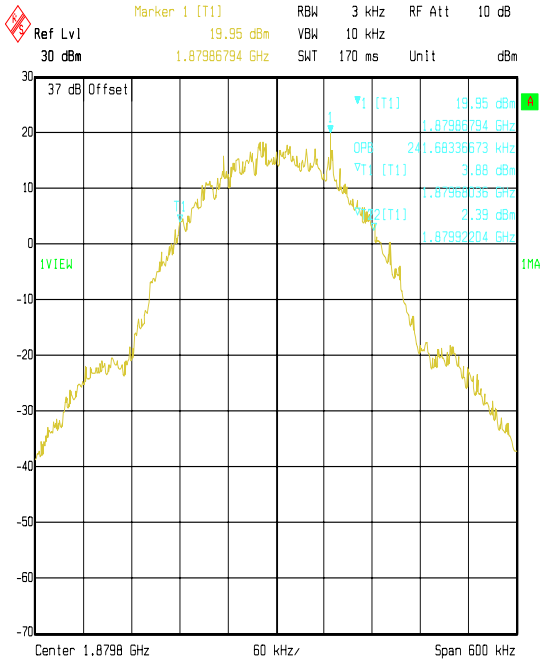
Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	3.0	10.0	245.3
Middle	1879.8	3.0	10.0	241.7
Top	1909.8	3.0	10.0	242.9

Test Of: **Panasonic Mobile Communications Ltd.**
X70 Mobile Handset.
To: **FCC Part 15 & 24**

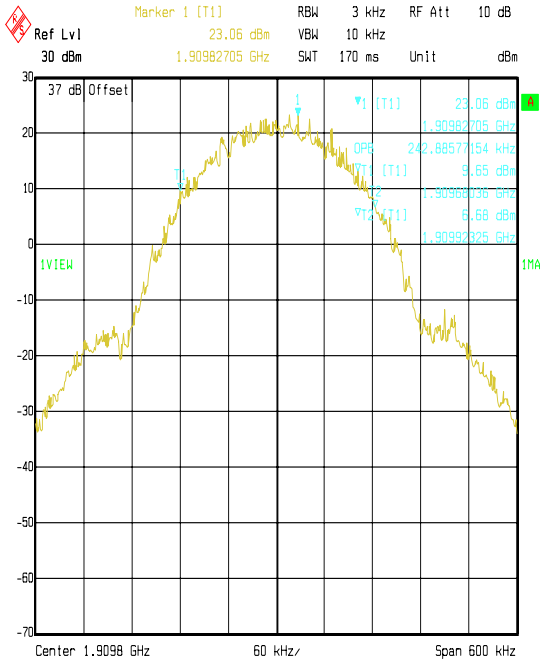
Transmitter Occupied Bandwidth: Section 24.238 (Continued)



Title: Panasonic EUT: X70 004400622871349 Occupied Bandwidth.
Comment A: 45083JD01_FCC_P24_OCBW_TX_Bottom_Channel_001
Date: 29.AUG.2003 9:13:44



Title: Panasonic EUT: X70 004400622871349 Occupied Bandwidth.
Comment A: 45083JD01_FCC_P24_OCBW_TX_Middle_Channel_002
Date: 29.AUG.2003 9:09:39



Title: Panasonic EUT: X70 004400622871349 Occupied Bandwidth.
Comment A: 45083JD01_FCC_P24_OCBW_TX_Top_Channel_003
Date: 29.AUG.2003 9:12:15

8.7. Transmitter Out of Band Emissions: Section 2.1053/24.238

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

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

Result: Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1916.5	-37.9	-13.0	24.9	Complied
3700.7	-28.6	-13.0	15.6	Complied
18860.4	-23.0	-13.0	10.0	Complied

Result: Middle Channel

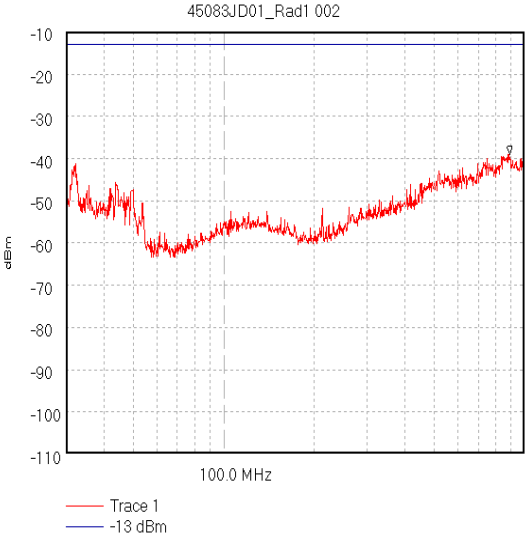
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1986.5	-37.1	-13.0	24.1	Complied
3759.6	-24.4	-13.0	11.4	Complied
18860.6	-23.3	-13.0	10.3	Complied

Result: Top Channel

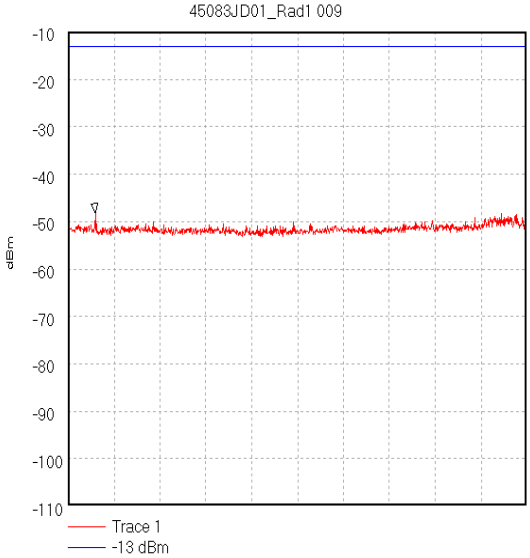
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2061.7	-38.0	-13.0	25.0	Complied
3819.8	-22.9	-13.0	9.9	Complied
18861.1	-22.4	-13.0	9.4	Complied

Test Of: **Panasonic Mobile Communications Ltd.**
X70 Mobile Handset.
To: **FCC Part 15 & 24**

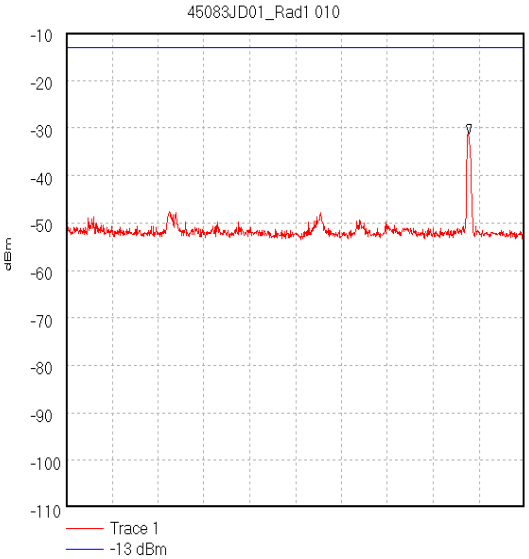
Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



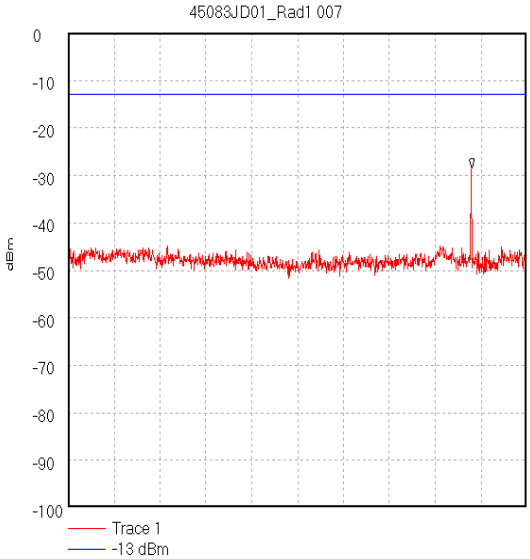
Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 889.687 MHz, -38.94 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A1037
9/1/2003 9:49:18 AM



Start 1.0 GHz; Stop 1.85 GHz
Ref -10 dBm; Ref Offset 37.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.05 GHz, -48.19 dBm
Display Line: -13 dBm; ; Limit Test Passed
9/1/2003 11:59:09 AM



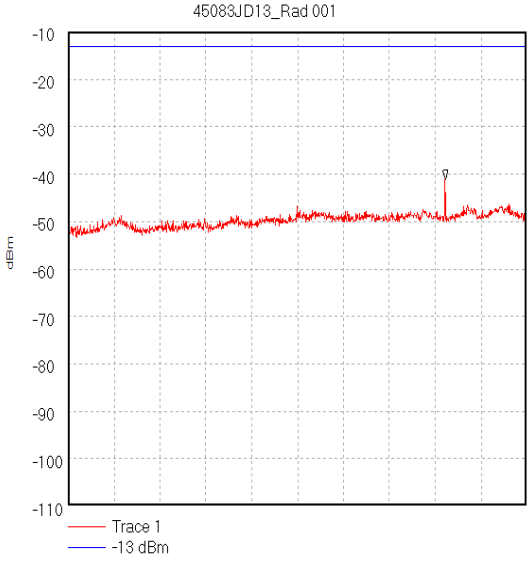
Start 1.91 GHz; Stop 2.0 GHz
Ref -10 dBm; Ref Offset 37.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.989 GHz, -31.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
9/1/2003 12:01:51 PM



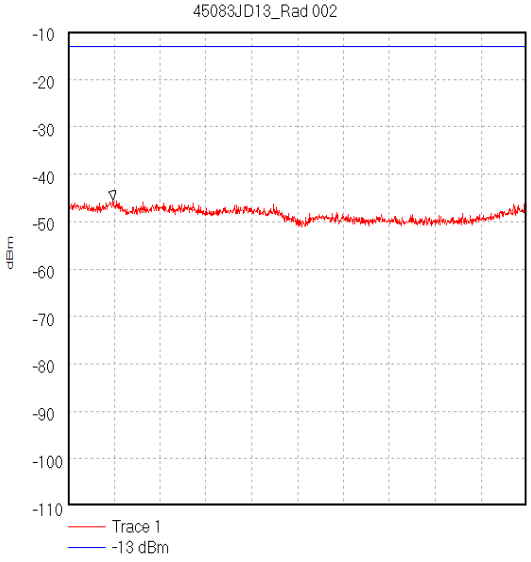
Start 2.0 GHz; Stop 4.0 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.76 GHz, -28.56 dBm
Display Line: -13 dBm; ; Limit Test Passed
9/1/2003 11:23:19 AM

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

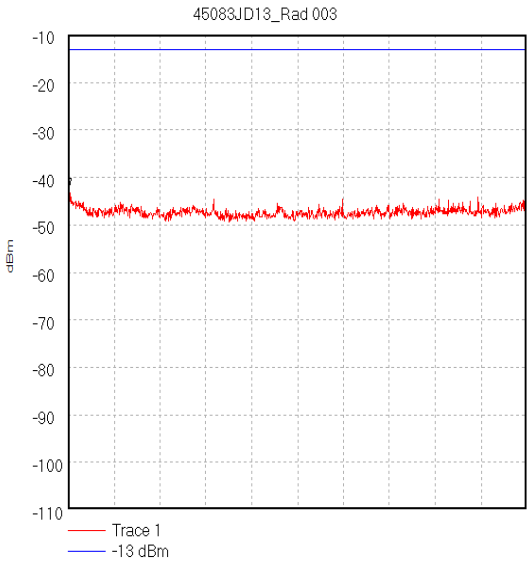
Transmitter Out of Band Emissions: Section 2.1053/24.238 (Continued)



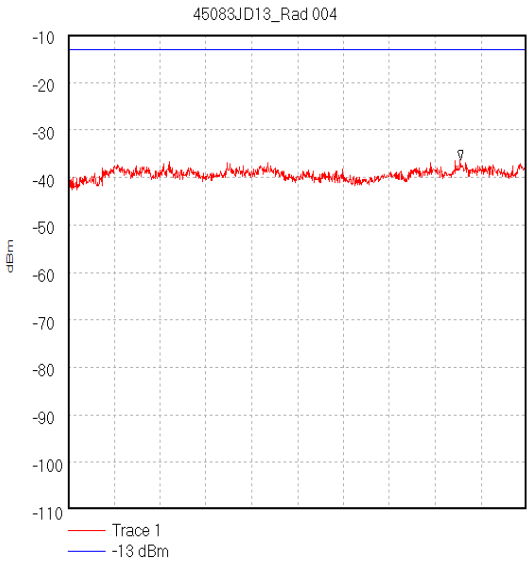
Start 4.0 GHz; Stop 6.0 GHz
Ref -10 dBm; Ref Offset 30.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.644 GHz, -41.15 dBm
Display Line: -13 dBm;
27/08/2003 20:20:20



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 6.196 GHz, -45.44 dBm
Display Line: -13 dBm;
27/08/2003 20:23:24



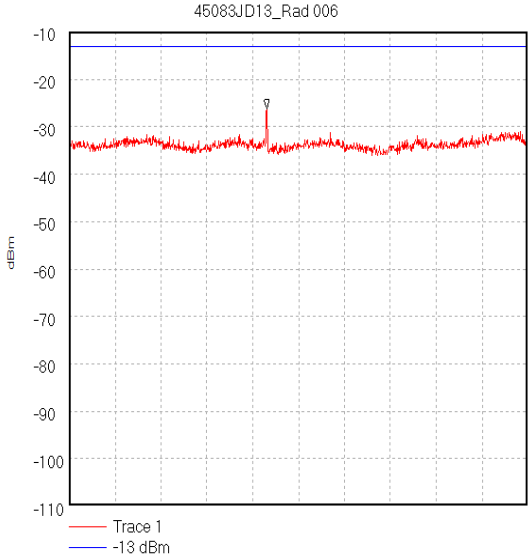
Start 8.0 GHz; Stop 12.5 GHz
Ref -10 dBm; Ref Offset 38.1 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 8.005 GHz, -42.3 dBm
Display Line: -13 dBm;
27/08/2003 20:26:52



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 17.206 GHz, -36.23 dBm
Display Line: -13 dBm;
27/08/2003 20:29:27

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

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



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

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

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

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

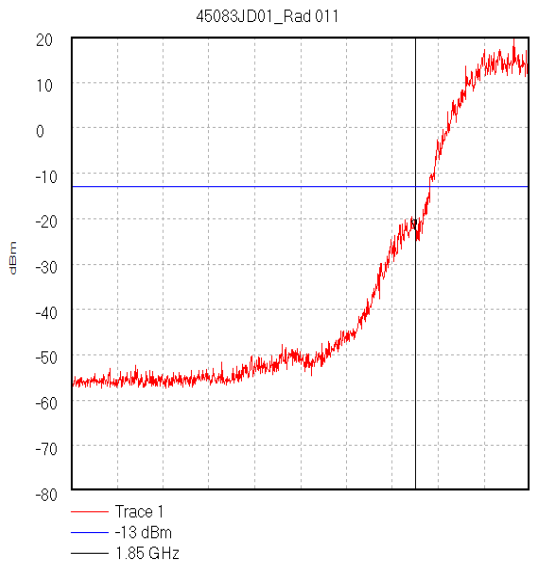
Results:

Bottom Band Edge

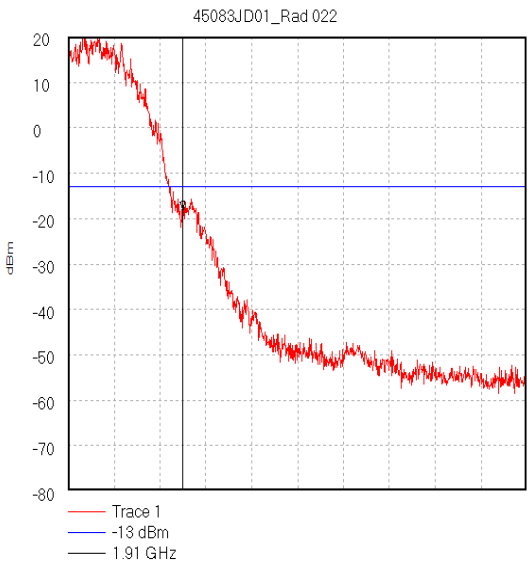
Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1850.0	-19.4	-13.0	6.4	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910.0	-15.7	-13.0	2.7	Complied



Start 1.84925 GHz; Stop 1.85025 GHz
Ref 20 dBm; Ref Offset 55.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 3.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.85 GHz, -22.33 dBm
Display Line: -13 dBm;
28/08/2003 16:13:46



Start 1.90975 GHz; Stop 1.91075 GHz
Ref 20 dBm; Ref Offset 54.5 dB; 10 dB/div
RBW 3.0 kHz; VBW 3.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.91 GHz, -18.11 dBm
Display Line: -13 dBm;
28/08/2003 16:41:17

9. Measurement Methods

9.1. 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. 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 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.

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

9.2. Frequency Stability

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via an air link radiated from the antenna.

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

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage.

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

9.3. Occupied Bandwidth

The EUT was coupled to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set.

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 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 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 FSEB user manual for this measurement, i.e., RBW <= 1/20 of occupied bandwidth. A value of 3 kHz was used.

9.4. 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:

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

9.5. 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 stated in section 2.5 of this report. 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

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 as such, 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.

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

9.6. Idle Mode / 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 clock frequency stated in section 2.5 of this report 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.

Receiver Radiated Emissions (Continued)

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 Below 1GHz	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

10. Measurement Uncertainty

10.1. 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.

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

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

10.4. 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”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30.0 MHz	95%	+/- 3.25 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	30.0 MHz to 1000.0 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1.0 GHz to 26.0 GHz	95%	+/- 1.78 dB

10.5. 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.

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
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002
A1037	Chase Bilog Antenna	Chase EMC Ltd	CBL6112B	2413
A197	Site 2 Controller SC144	Unknown	SC144	150720
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
A259	Bilog Antenna	Chase	CBL6111	1513
A276	OATS Positioning Controller	Rohde & Schwarz	HCC	
A392	3 dB attenuator (9)	Suhner	6803.17.B	None
A427	WG 14 horn	Flann	14240-20	150
A428	WG 12 horn	Flann	12240-20	134
A429	WG 16 horn	Flann	16240-20	561
A430	WG 18 horn	Flann	18240-20	425
A436	WG 20 horn	Flann	20240-20	330
C1080	Rosenberger Cable 3m	Rosenberger	FA210A1030M5 050	28464-1
C1081	Rosenberger Cable 2m	Rosenberger	FA210A1020M5 050	28463-2
C160	Cables	Rosenberger	UFA210A-1-1181-70x70	None
C202	Rosenberger cable	Rosenberger	UFA 210A-1-1180-70X70	1543
C360	Cable	Rosenberger	UFA210A-1-1181-70x70	1927
C453	Cable	Rosenberger	RG142XX-001-RFIB	C453-10081998
C457	Cable	Rosenberger	RG142XX-002-RFIB	C457-10081998
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
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
M072	FSM Spectrum Analyser	Rohde & Schwarz	FSM	862 967/010 (RF) & 863 912/048 (Display)
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M1093	Will tek	Will tek	4202S	0513018
M114	Temperature/Humidity Meter	RS Components	212-146	None
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020
S202	Site 2	RFI	2	S202-15011990

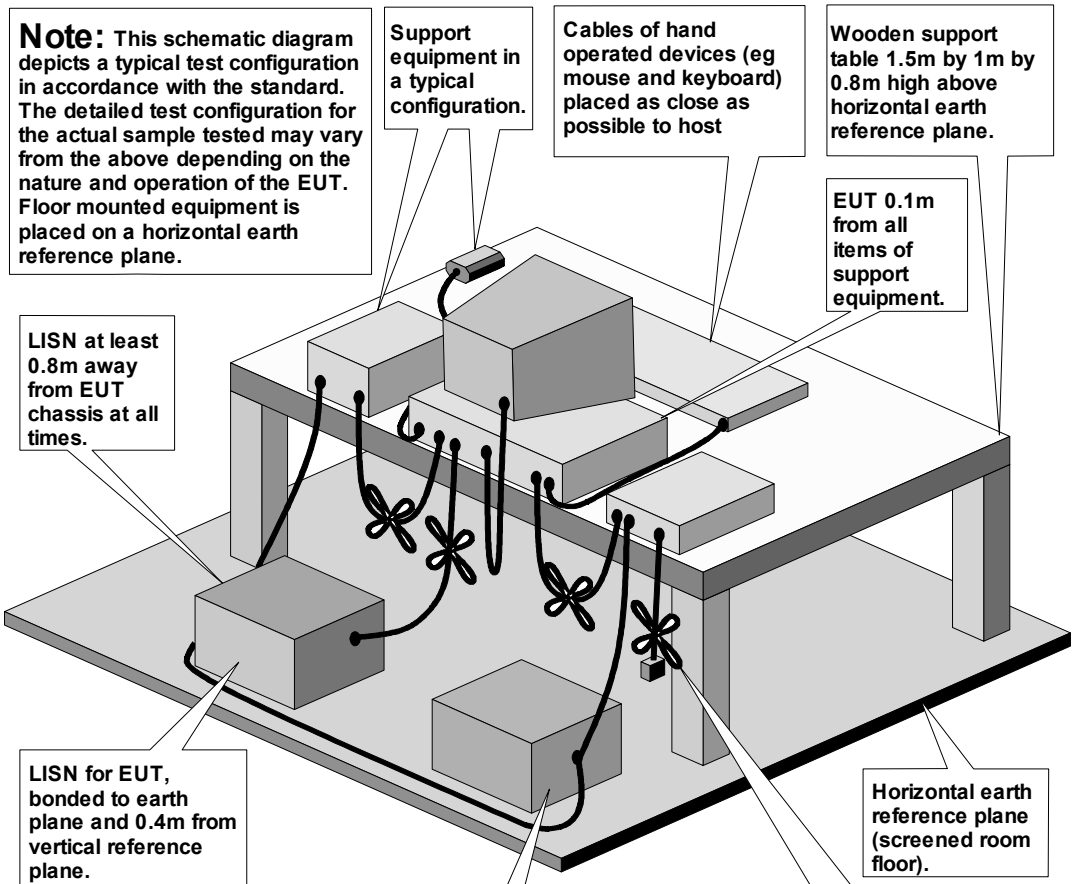
NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

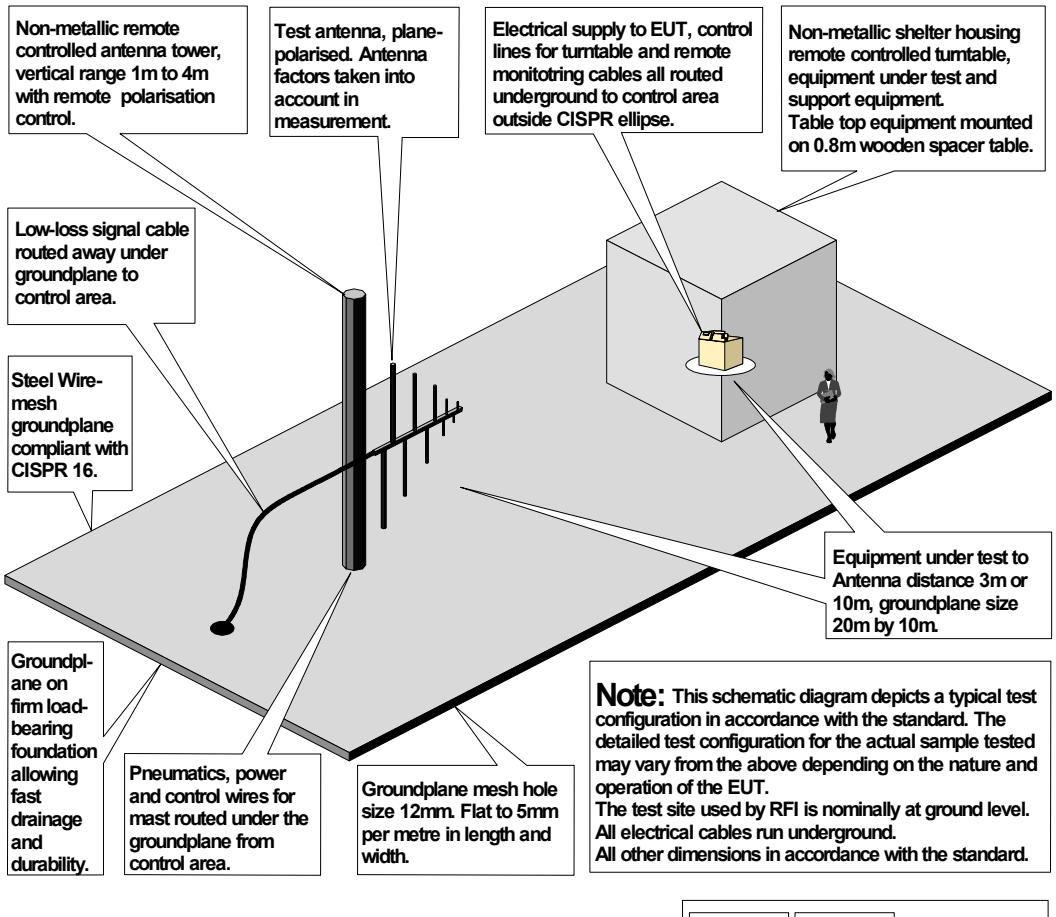
Drawing Reference Number	Title
DRG\45083JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\45083JD01\EMIRAD	Test configuration for measurement of radiated emissions

DRG\45083JD01\EMICON



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

DRG\45083JD01\EMIRAD

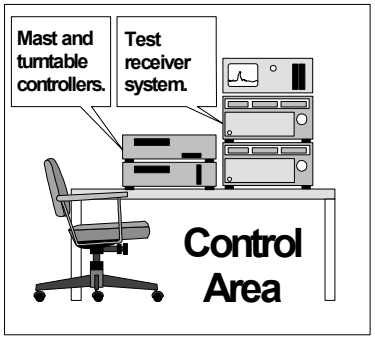


Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m (CISPR ellipse)

Groundplane Earthed

Control room outside CISPR ellipse



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