TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Panasonic Mobile Comms Dev of Europe Ltd.
VS70 Dual Mode (3G/GSM) Mobile Station

To: FCC Part 24: 2005

Test Report Serial No:
RFI/MPTE3/RP71978JD02A

Supersedes Test Report Serial No:
RFI/MPTE2/RP71978JD02A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: 	
Tested By: Steven Wong 	**Checked By: Tony Henriques**  **pp.**
Report Copy No: PDF01	
Issue Date: 28 September 2006	**Test Dates: 21 June 2006 to 11 July 2006**

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1. Client Information

Company Name:	Panasonic Mobile Comms Dev of Europe Ltd.
Address:	2 Gables Way Colthrop Thatcham Berkshire RG19 4ZB
Contact Name:	Mr M 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:	VS70
IMEI Number:	004401030025858
Hardware Revision:	D
Software Revision:	V705PVA13
FCC ID Number:	UCE206001A
Country of Manufacture:	Japan
Date of Receipt:	21 June 2006

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	DC Charger
Brand Name:	Panasonic
Model Name or Number:	EB-CD001
Serial Number:	None Stated
Cable Length and Type:	2 metre twin core
Connected to Port:	Comms/Charger

Description:	DC Charger
Brand Name:	Panasonic
Model Name or Number:	EB-CD002
Serial Number:	None Stated
Cable Length and Type:	2 metre twin core
Connected to Port:	Comms/Charger

Description:	Personal Hands Free
Brand Name:	Panasonic
Model Name or Number:	EB-EM003
Serial Number:	None Stated
Cable Length and Type:	1.8 metre multi-core
Connected to Port:	Audio

Description:	Mains AC Charger
Brand Name:	Panasonic
Model Name or Number:	EB-CA001
Serial Number:	None Stated
Cable Length and Type:	1.5 metre twin core
Connected to Port:	Comms/Charger

2.3. Description of EUT

The equipment under test is a dual mode (3G/GSM/GPRS) mobile station with *Bluetooth* technology incorporated.

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:	Internal battery supply of 3.7 V Nominal 110 V, 60 Hz AC mains supply (via AC charger) DC supply of 13.6 V (via car charger)		
Equipment Category:	GSM 1900		
Type of Unit:	Portable Transceiver		
Transmit Frequency Range:	1850.2 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 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)	31.9 dBm (measured)		

2.6. Port Identification

Port	Description
1	Hands free Port
2	USIM
3	Communications/Charger

2.7. Support Equipment

No support equipment was used to exercise the EUT during testing:

3. Test Results

Reference:	FCC Part 24 Subpart E: 2005 (Broadband PCS)
Title:	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.

3.1. 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.

3.2. 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

There were no deviations from the test specification.

5. Operation of the EUT during Testing

5.1. Operating Modes

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

Transmitter Modes:

All testing, with the exception of radiated band edge measurements, was performed in GSM mode only as this was found to be worst case mode of operation for output power, occupied bandwidth, and radiated spurious emissions.
Testing was performed at full power on the top, middle and bottom channels of the assigned frequency block. Frequency stability measurements were performed at full power on the top and bottom channels of the assigned frequency block at -30ºC through to +50ºC in 10º increments.
All radiated spurious emissions pre-scans 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 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 unless otherwise stated:

For all tests the EUT was configured with the PHF, model EB-EM003, and AC charger, model EB-CA001, connected. This configuration was tested as it was found to be the worst case configuration after radiated emissions pre-scans were performed with all the other supplied accessories.

6. Summary of Test Results

Devices with an External Antenna Connector

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: 2005 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2005 Section 15.109	Enclosure	Complied
Transmitter Effective Isotropic Radiated Power (EIRP)	C.F.R. 47 FCC Part 24: 2005 Section 24.232	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2005 Section 24.235	Antenna	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2005 Section 24.235	Antenna	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2005 Section 24.238	Antenna	Complied
Transmitter Out of Band Radiated Emissions	C.F.R. 47 FCC Part 24: 2005 Section 2.1053/24.238	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2: 2005 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.

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 emission measurements as described in section 9 of this report.

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

Results:

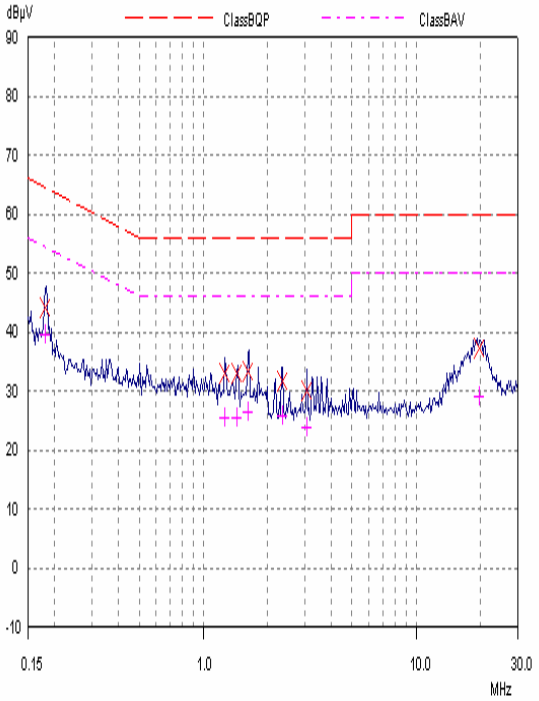
Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.18025	Neutral	44.04	64.47	20.43	Complied
1.26731	Neutral	32.96	56.00	23.04	Complied
1.45062	Neutral	33.04	56.00	22.96	Complied
1.63188	Neutral	33.35	56.00	22.65	Complied
2.35601	Neutral	21.72	56.00	24.28	Complied
3.08307	Neutral	30.17	56.00	25.83	Complied
19.76298	Neutral	37.38	60.00	22.62	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.18025	Neutral	39.62	54.47	14.85	Complied
1.26731	Neutral	25.37	46.00	20.63	Complied
1.45062	Neutral	25.40	46.00	20.60	Complied
1.63188	Neutral	26.36	46.00	19.64	Complied
2.35601	Neutral	25.70	46.00	20.30	Complied
3.08307	Neutral	23.87	46.00	22.13	Complied
19.76298	Neutral	28.95	50.00	21.05	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

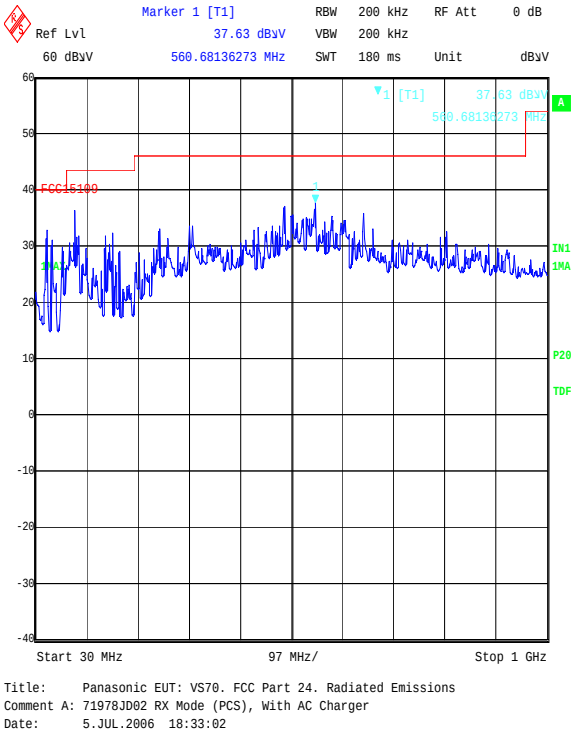
The EUT was configured as for receiver radiated emission testing as described in section 9 of this report.

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

Results:

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

Frequency (MHz)	Antenna Polarity	Quasi Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
52.720	Vertical	23.1	40.0	16.9	Complied
104.033	Vertical	21.1	43.5	22.3	Complied
175.466	Vertical	15.7	43.5	27.8	Complied
264.263	Vertical	16.6	46.0	29.4	Complied
327.520	Vertical	20.5	46.0	25.5	Complied
500.035	Vertical	23.5	46.0	22.5	Complied
558.682	Horizontal	26.9	46.0	19.1	Complied
667.389	Vertical	25.2	46.0	20.8	Complied
809.499	Vertical	29.3	46.0	16.7	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

Results:

Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
3.991984	Vertical	48.9	-9.6	39.3	54.0	14.7	Complied

Note(s):

1. *No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.*

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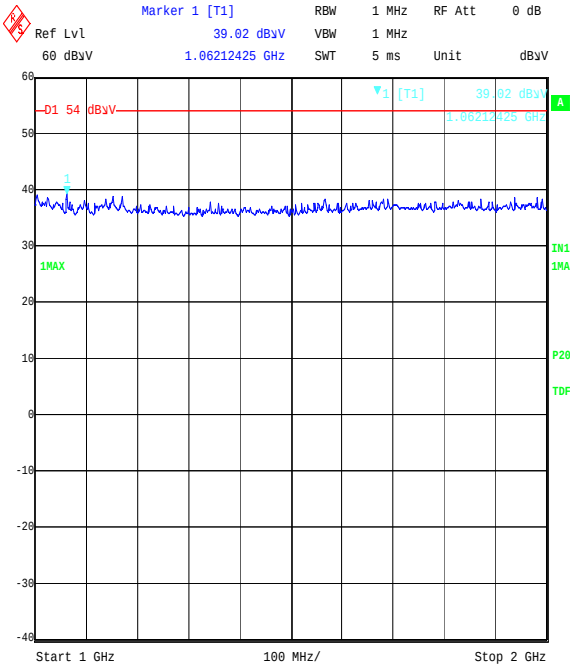
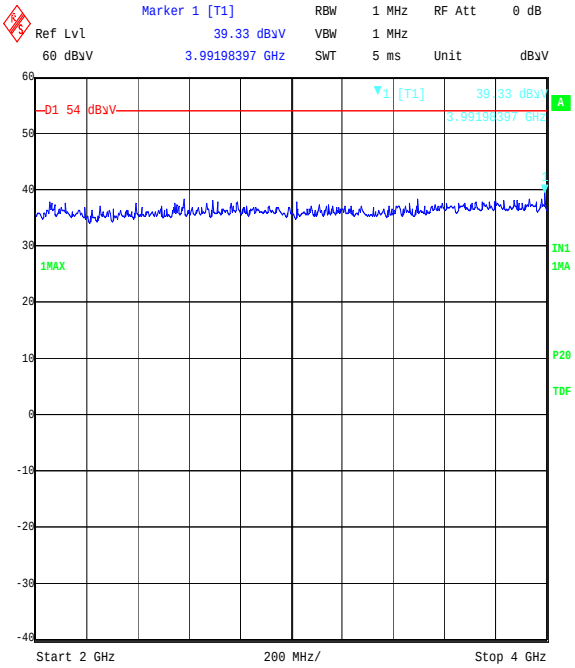
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Title: Panasonic EUT: VS70. FCC Part 24. Radiated Emissions
Comment A: 71978JD02 RX Mode (PCS), GSM Mode
Date: 5.JUL.2006 18:15:21



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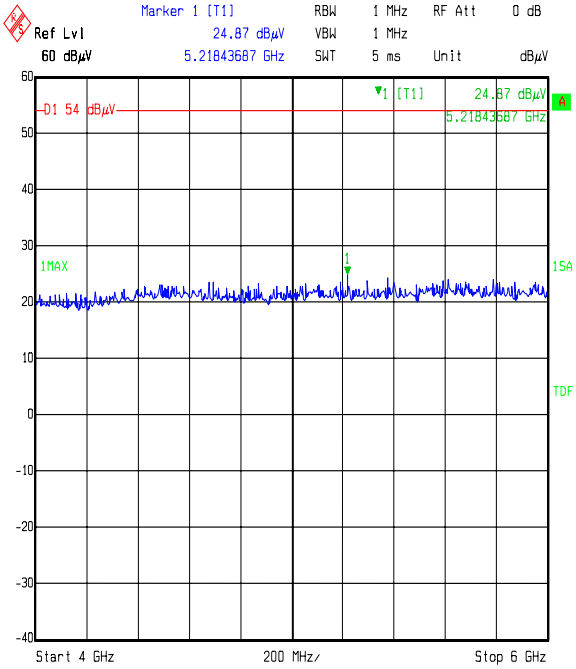

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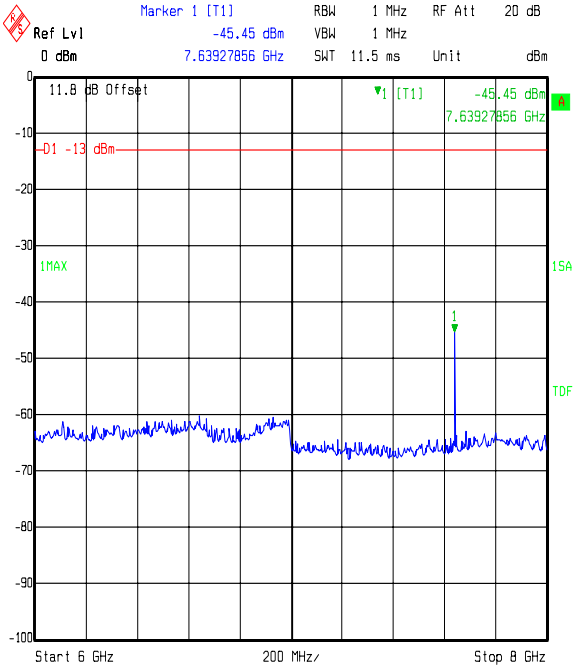
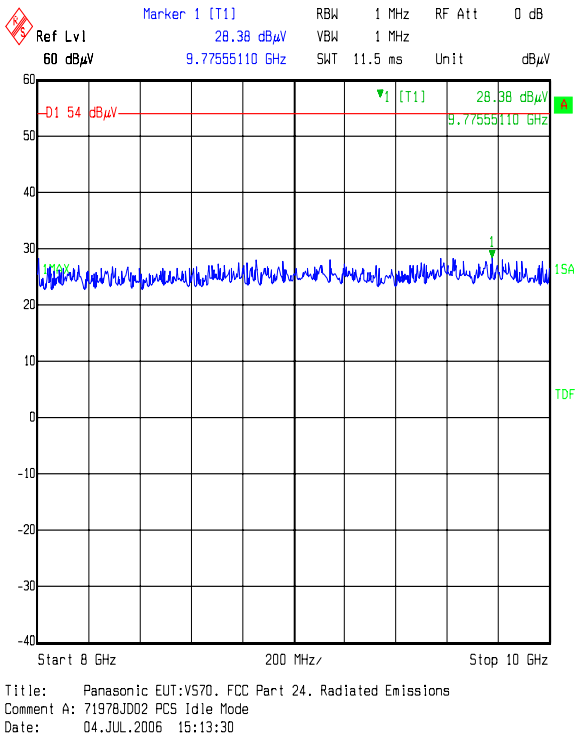


Title: Panasonic EUT:VS70. FCC Part 24. Radiated Emissions
Comment A: 71978JD02 Tx Mode (PCS), Top Channel.
Date: 04.JUL.2006 14:42:32

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)



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

7.2.4. 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	Horizontal	30.6	33.0	2.4	Complied
Middle	1879.8	Horizontal	31.2	33.0	1.8	Complied
Top	1909.8	Horizontal	31.9	33.0	1.1	Complied

7.2.5. 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	-52	1850.199948	1850.0	0.199948	Complied
-20	-38	1850.199962	1850.0	0.199962	Complied
-10	-44	1850.199956	1850.0	0.199956	Complied
0	-61	1850.199939	1850.0	0.199939	Complied
10	-92	1850.199908	1850.0	0.199908	Complied
20	-20	1850.199980	1850.0	0.199980	Complied
30	-21	1850.199979	1850.0	0.199979	Complied
40	-32	1850.199968	1850.0	0.199968	Complied
50	-24	1850.199979	1850.0	0.199976	Complied

Top Channel (1910.8 MHz)

Temperature (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	5	1909.800005	1910.0	0.199995	Complied
-20	5	1909.800005	1910.0	0.199995	Complied
-10	6	1909.800006	1910.0	0.199994	Complied
0	-2	1909.799998	1910.0	0.200002	Complied
10	5	1909.799995	1910.0	0.200005	Complied
20	-2	1909.799998	1910.0	0.200002	Complied
30	1	1909.800001	1910.0	0.199999	Complied
40	8	1909.800008	1910.0	0.199992	Complied
50	-3	1909.799997	1910.0	0.200003	Complied

7.2.6. 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
4.2	-13	1850.199987	1850	0.199987	Complied
3.2	-39	1850.199961	1850	0.199961	Complied

Top Channel (1909.8 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
4.2	29	1909.800029	1910	0.199971	Complied
3.3	10	1909.800010	1910	0.199990	Complied

7.2.7. Transmitter Occupied Bandwidth: Section 24.238

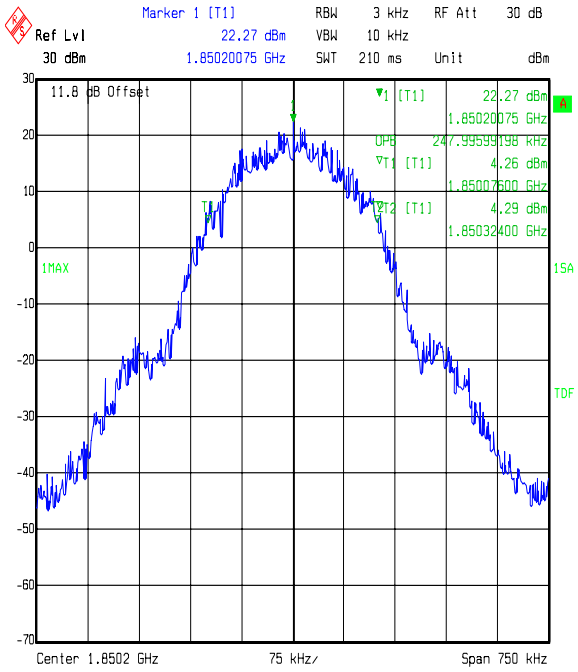
The EUT was configured as for occupied bandwidth measurements as described in section 9 of this report.

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	247.996
Middle	1879.8	3.0	10.0	247.996
Top	1909.8	3.0	10.0	244.990

Transmitter Occupied Bandwidth: Section 24.238 (Continued)



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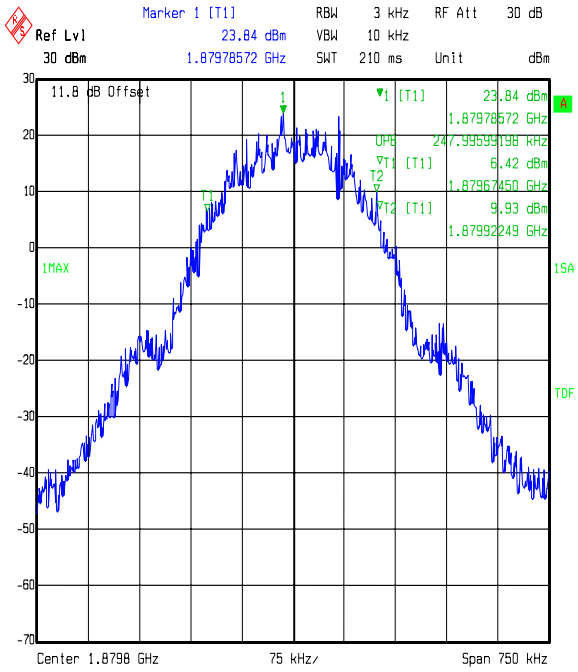
Comment A: 71978JD02 Tx Mode (PCS), Bottom Channel.
Date: 04.JUL.2006 14:20:56



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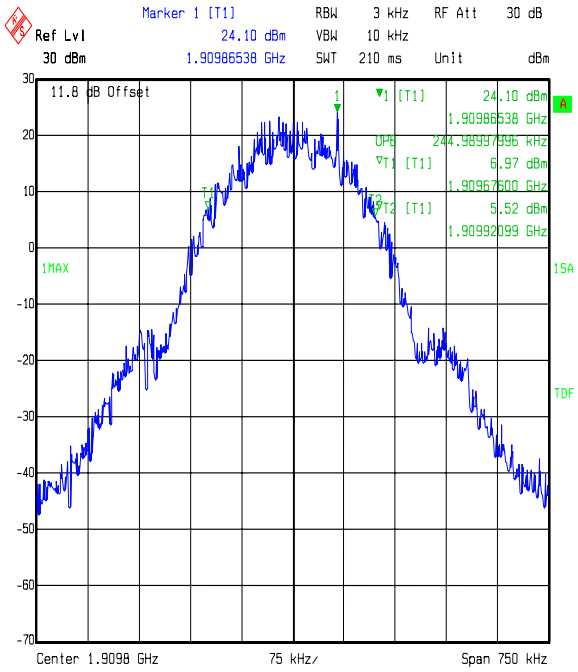

Title: Panasonic EUT:VS70. FCC Part 24. 20dB Bandwidth
Comment A: 71978JD02 Tx Mode (PCS), Top Channel.
Date: 04.JUL.2006 14:21:57

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

The EUT was configured as for transmitter conducted emission 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
3700.415	-34.9	-13.0	21.9	Complied

Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3759.735	-33.5	-13.0	20.5	Complied

Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3819.755	-34.1	-13.0	21.1	Complied

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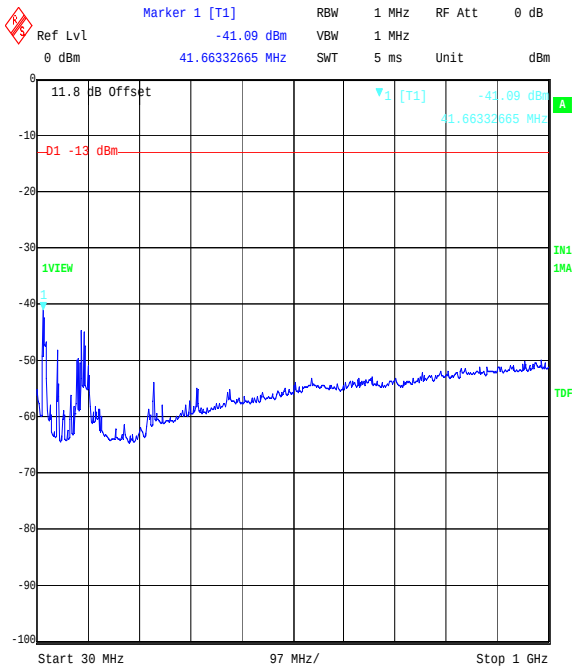
Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



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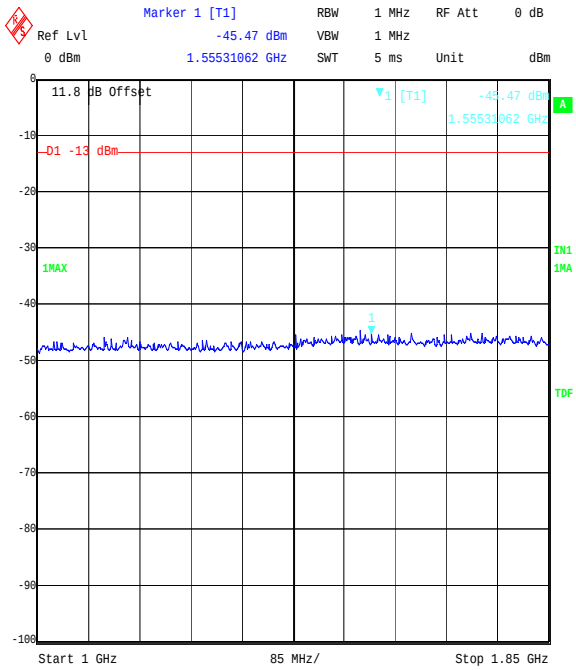
Date: 5.JUL.2006 17:10:25



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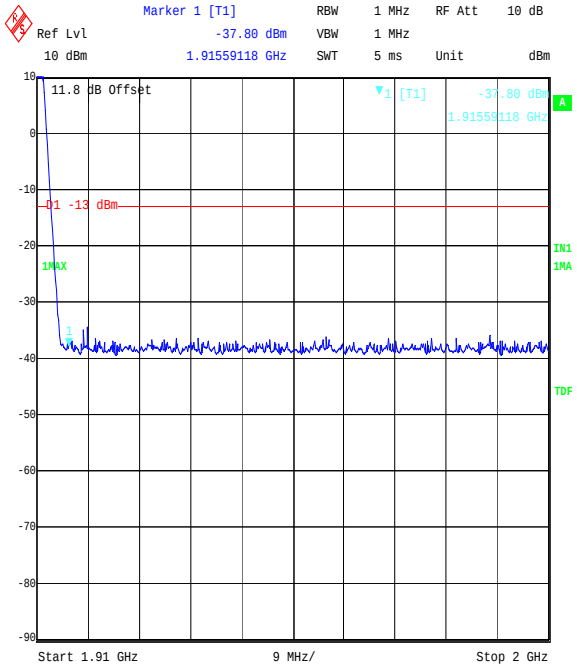

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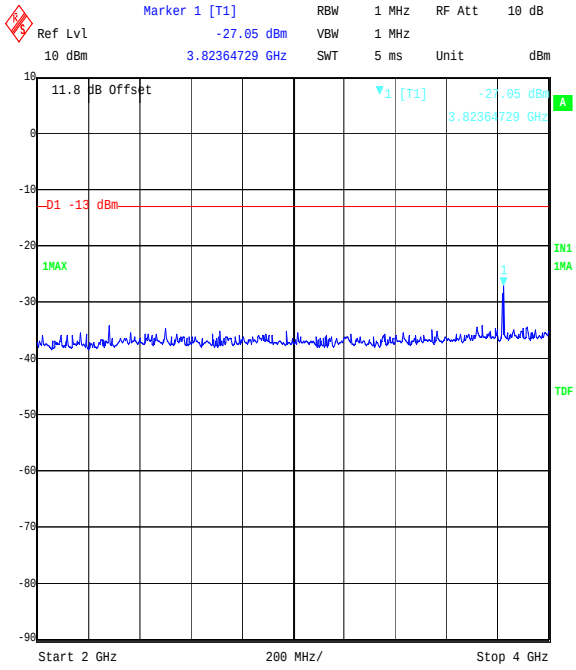

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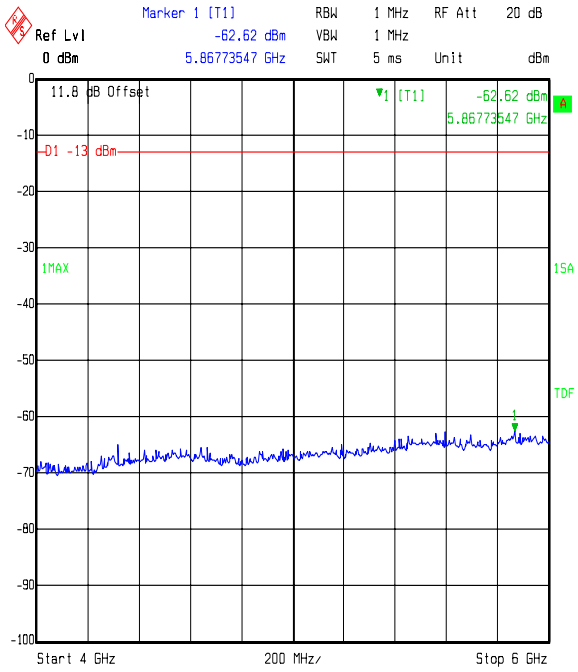
Comment A: 71978JD02 TX Mode (PCS), Top Channel, GSM Mode
Date: 5.JUL.2006 18:20:39

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)



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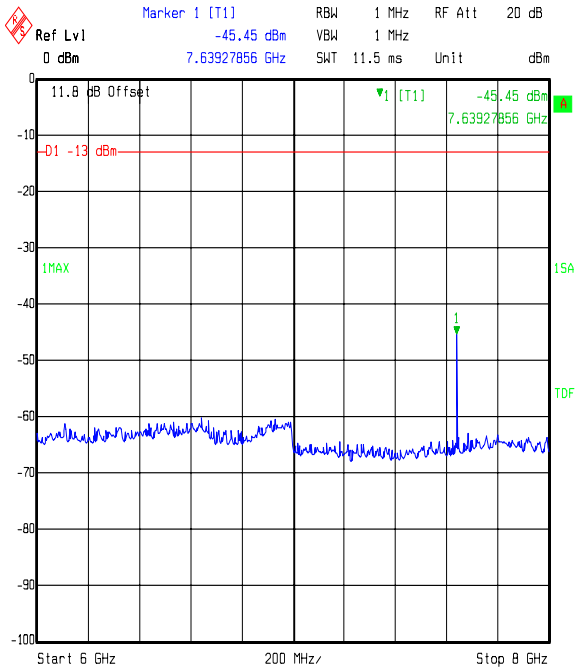

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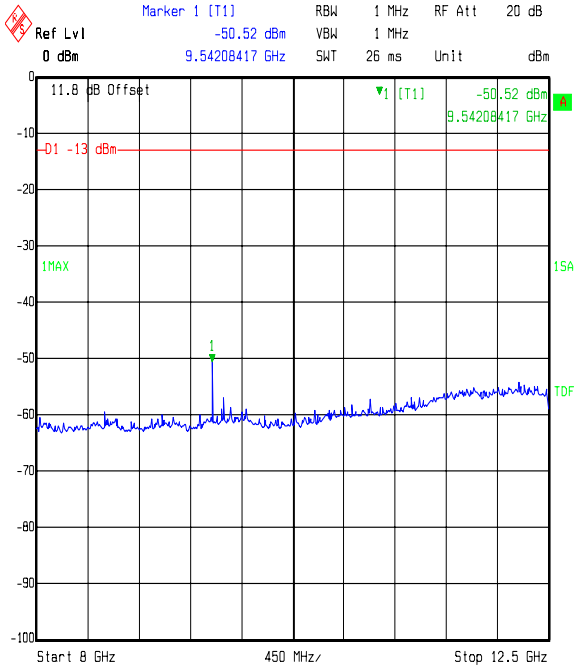

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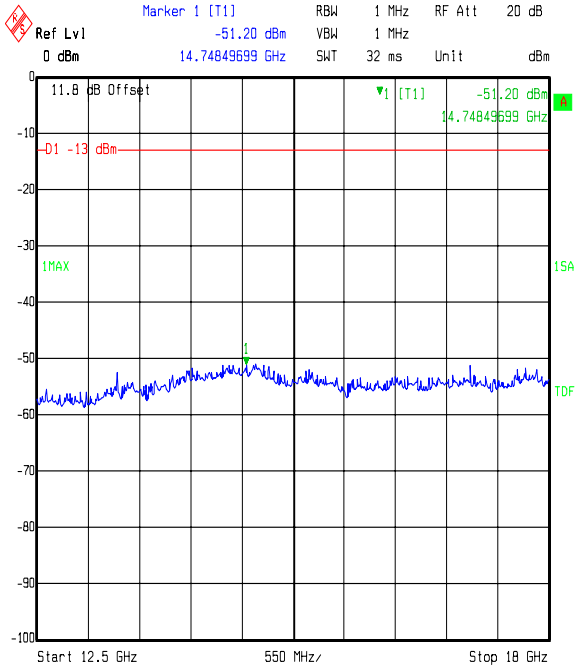
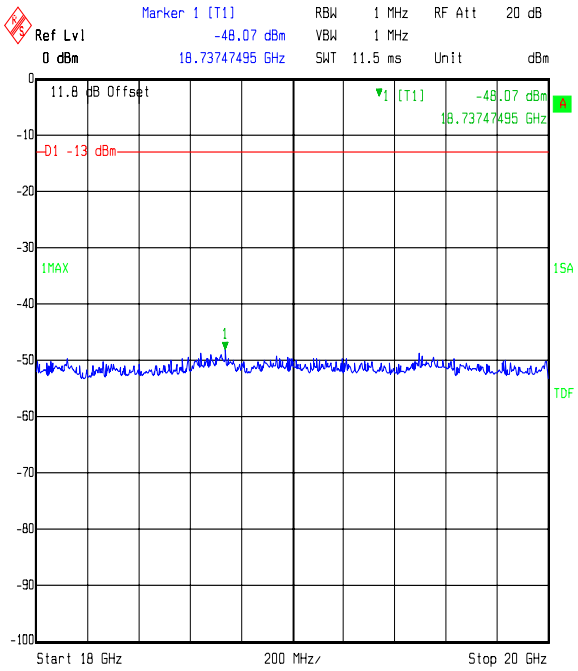
Comment A: 71978JD02 Tx Mode (PCS), Top Channel.
Date: 04.JUL.2006 14:56:56



Title: Panasonic EUT:VS70. FCC Part 24. Radiated Emissions
Comment A: 71978JD02 Tx Mode (PCS), Top Channel.
Date: 04.JUL.2006 15:02:33

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: Panasonic EUT:VS70, FCC Part 24, Radiated Emissions
Comment A: 71978JD02 Tx Mode (PCS), Top Channel.
Date: 04.JUL.2006 15:06:24

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

Transmitter Out of Band Radiated Emissions: Section 2.1053 & 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	310.095	6	162.418
2	252.472	7	149.149
3	231.520	8	137.929
4	190.629	9	116.150
5	183.705	10	112.246
Total Peak Power:	1846.313 nW/MHz		

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

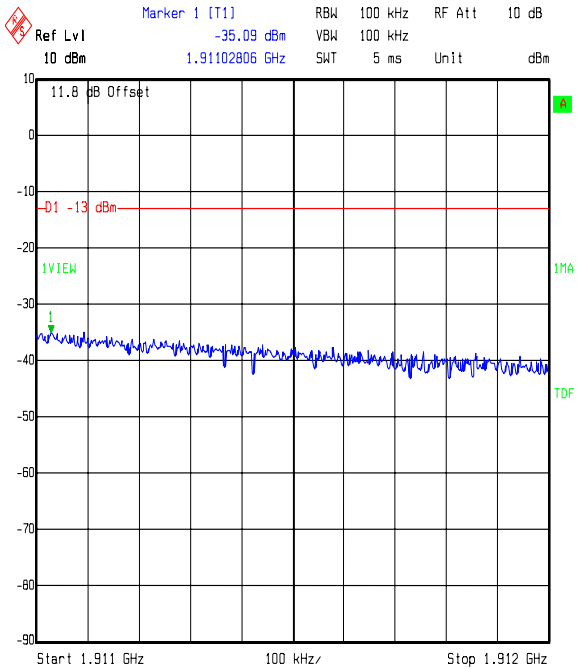
2nd 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	68.422	6	48.634
2	56.761	7	49.183
3	55.525	8	37.084
4	54.470	9	37.520
5	45.654	10	32.269
Total Peak Power:	485.522 nW/MHz		

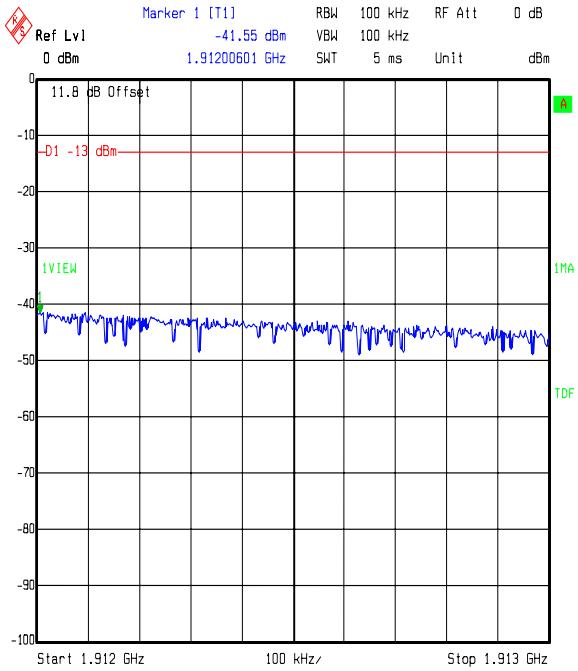
Results:

Band (MHz)	Peak Power (nW/MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1911 to 1912	1846.313	-27.3	-13.0	14.3	Complied
1912 to 1913	485.522	-33.1	-13.0	20.1	Complied

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



Title: Panasonic EUT; VS70 FCC Part 24 Radiated Band Strip
Comment A: 71978JD03 Operating in Tx Mode, Top Channel (GSM Mode)
Date: 10.JUL.2006 16:04:26



Title: Panasonic EUT; VS70 FCC Part 24 Radiated Band Strip
Comment A: 71978JD03 Operating in Tx Mode, Top Channel (GSM Mode)
Date: 10.JUL.2006 16:18:44

7.2.9. 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: (GSM Mode)

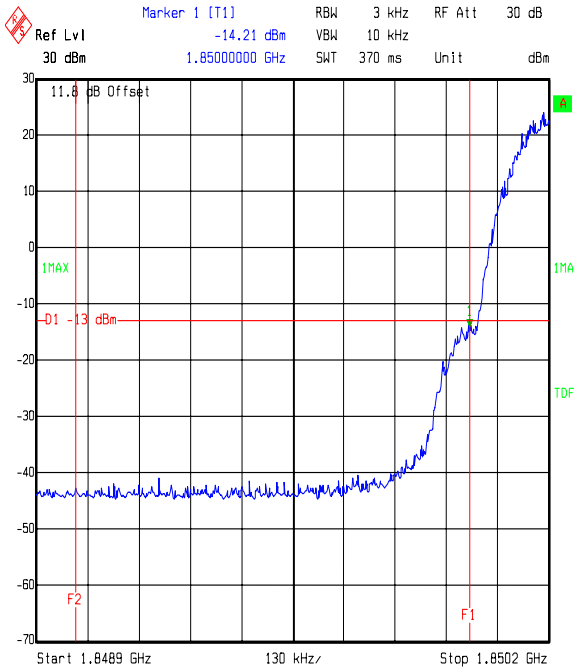
Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-14.2	-13.0	1.2	Complied

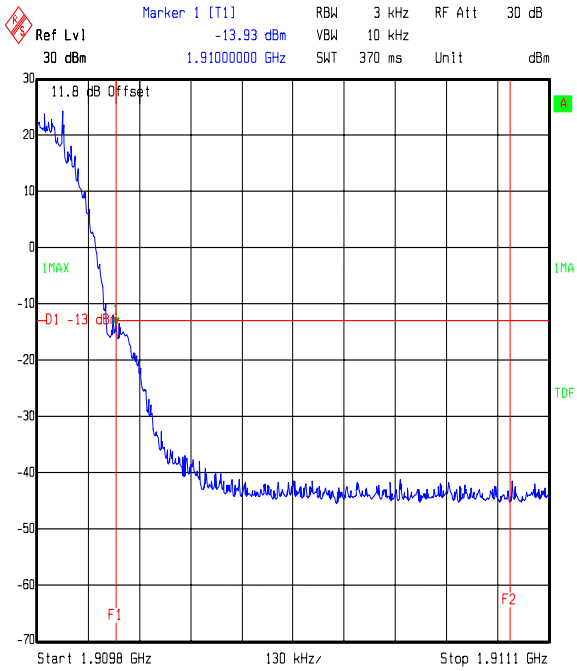
Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910	-13.9	-13.0	0.9	Complied

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



Title: Panasonic EUT:VS70. FCC Part 24. Radiated BandEdge
Comment A: 71978JD02 Tx Mode (PCS), Bottom Channel.
Date: 04.JUL.2006 12:38:08



Title: Panasonic EUT:VS70. FCC Part 24. Radiated BandEdge
Comment A: 71978JD02 Tx Mode (PCS), Top Channel.
Date: 04.JUL.2006 12:43:36

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

7.2.10. 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: (GPRS Mode)

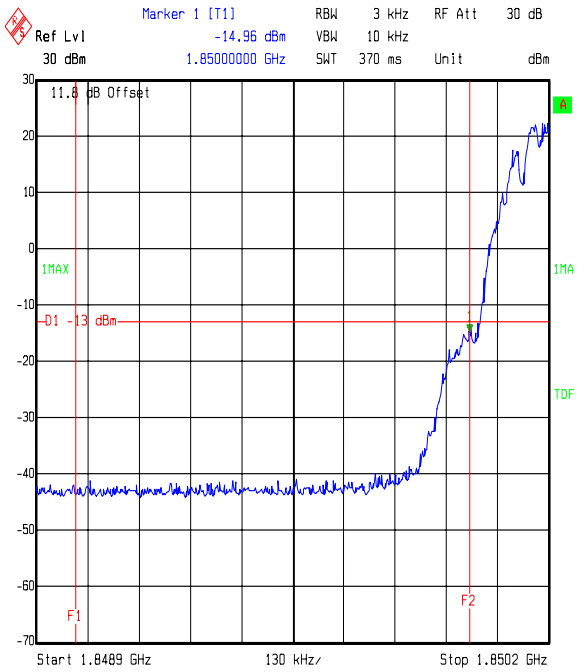
Bottom Band Edge

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-15.0	-13.0	2.0	Complied

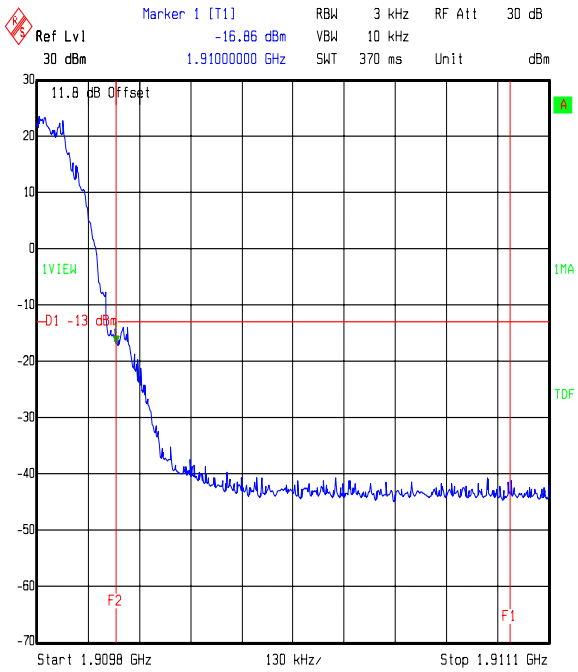
Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910	-16.9	-13.0	3.9	Complied

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



Title: Panasonic EUT; VS70 FCC Part 24 Radiated Band Strip
Comment A: 71978JD03 Operating in Tx Mode, Top Channel (GSM Mode)
Date: 11.JUL.2006 10:34:55



Title: Panasonic EUT; VS70 FCC Part 24 Radiated Band Strip
Comment A: 71978JD03 Operating in Tx Mode, Top Channel (GSM Mode)
Date: 11.JUL.2006 10:25:13

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%	±3.72 dB
Effective Isotropic Radiated Power (EIRP)	30 MHz to 2000 MHz	95%	±2.94 dB
Frequency Stability	30 MHz to 2000 MHz	95%	±11.4 ppm
Occupied Bandwidth	30 MHz to 2000 MHz	95%	±11.4 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±4.64 dB
Radiated Spurious Emissions	1 GHz to 26 GHz	95%	±2.94 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. 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

9.2. 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.

9.3. Occupied Bandwidth

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

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

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

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

9.4. AC Mains Conducted Emissions

AC mains conducted emission 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

9.5. 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.

9.6. 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 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 20dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20dB 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 <1GHz	Final Measurements ≥1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz <1GHz) (1MHz ≥1GHz)	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.	Date Last Calibrated	Cal. Interval
A027	Horn Antenna	Eaton	9188-2	301	08 Jun 2006	36
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1069	LISN	Rohde & Schwarz	ESH3-Z5	837469/012	31 Jan 2006	12
A1242	Gain horn antenna	Dorado international corp	12-GH-12-2	0002	29 Apr 2006	12
A1361	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1361-20112003	Cal Not Required	-
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	21 Feb 2006	-
A1537	Dual Directional Coupler	Hewlett Packard	778D	1144A05122	Cal Before Use	-
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139	12 Jan 2006	36
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519	12 Jan 2006	36
A259	Bilog Antenna	Chase	CBL6111	1513	06 Mar 2006	12
A428	WG 12 horn	Flann	12240-20	134	12 Jan 2006	36
A430	WG 18 horn	Flann	18240-20	425	12 Jan 2006	36
A436	WG 20 horn	Flann	20240-20	330	12 Jan 2006	36
A442	WG 8 horn	Narda	645	8608	12 Jan 2006	36
A553	Bi-log Antenna	Chase	CBL6111A	1593	18 Oct 2005	12
L0816	Environmental Chamber	Unitemp	None	None	Cal Not Required	-
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008	Cal Not Required	-

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027	10 April 2006	12
M090	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:838494/005 RU:836833/001	08 Nov 2005	12
M1068	Thermometer Digital	Iso-Tech	RS55	93102884	09 Jun 2006	12
M1140	Radio Communications Analyser	Anritsu	MT8820A	6K0000647	Cal Not Required	-
M1242	FSEM30 Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986_022	25 Aug 2005	12
M1263	ESIB7	Rohde & Schwarz	ESIB7	100265	12 Jan 2006	12
S0520	DC Power Supply	GW instek	GPC-3030	E835141	Cal Not Required	-
S0529	DC Power Supply	ISO-Tech	IPS2302A	504E005G2	Cal Not Required	-
S201	Site 1	RFI	1	-	17 Jul 2006	12
S202	Site 2	RFI	2	S202-15011990	Cal Before Use	-

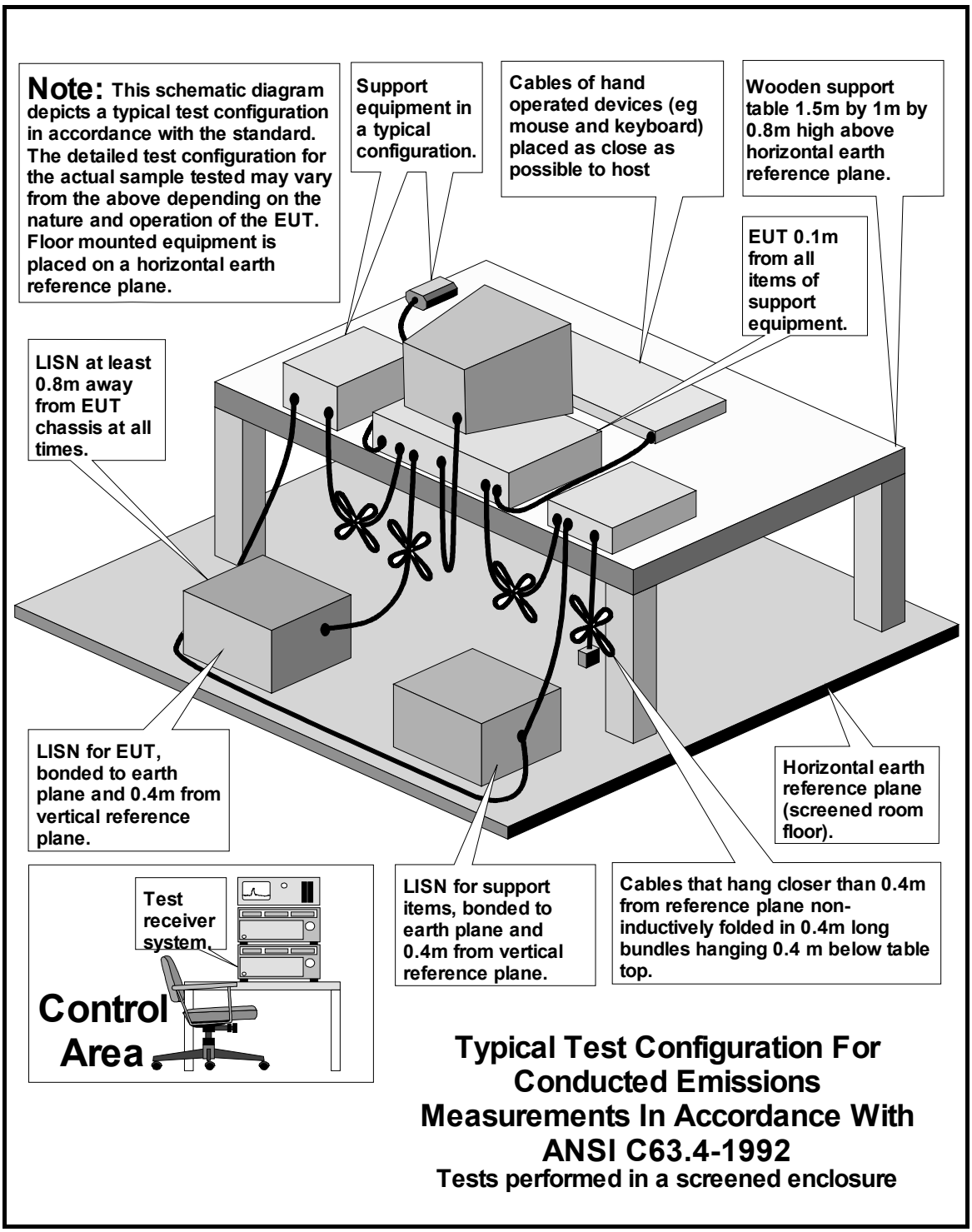
NB: In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Test Configuration Drawings

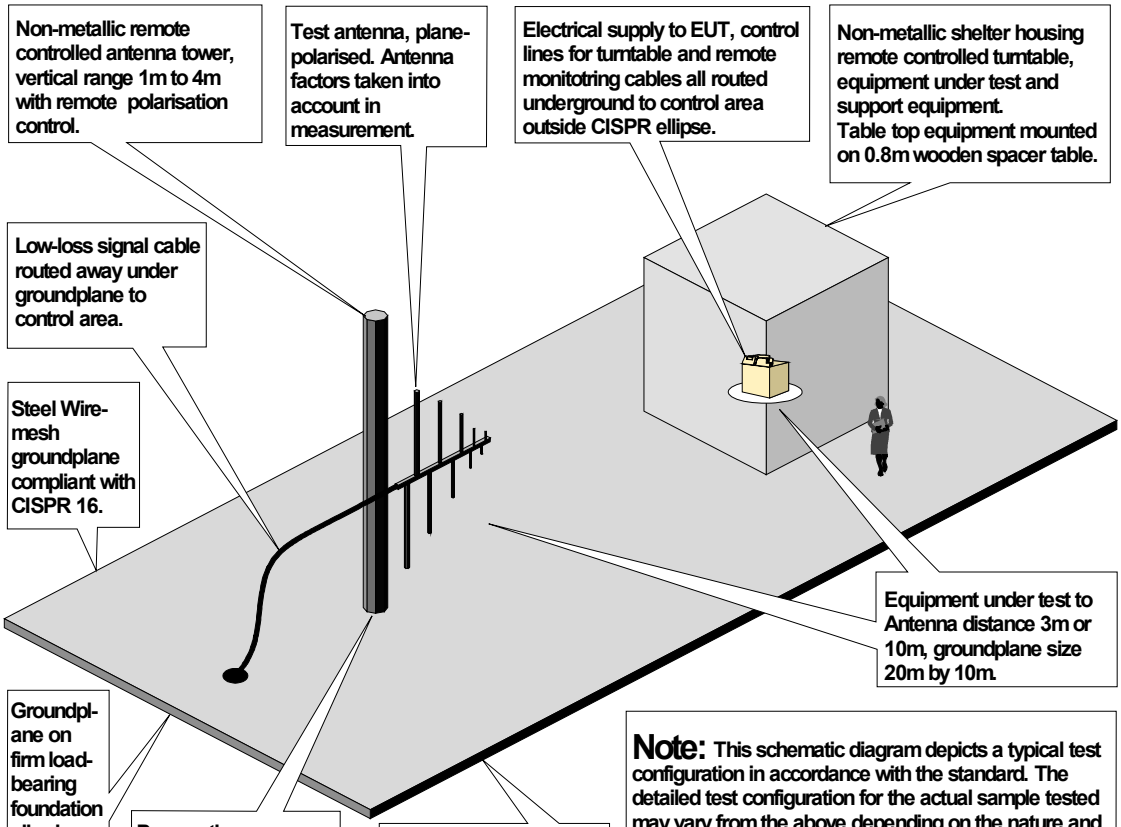
This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\71978JD02\EMICON	Test configuration for measurement of conducted emissions.
DRG\71978JD02\EMIRAD	Test configuration for measurement of radiated emissions.

DRG\71978JD02\EMICON



DRG\71978JD02\EMIRAD



Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse