TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Panasonic Mobile Comms Dev of Europe Ltd
VS71

To: FCC Part 24: 2006 (Subpart E)

Test Report Serial No:
RFI/RPTE1/RP72511JD02B

This Test Report Is Issued Under The Authority Of Michael Derby, Wireless Radio Performance Group Leader: 	
Tested By: Ian Watch 	**Checked By: Tony Henriques** 
Report Copy No: PDF01	
Issue Date: 28 March 2007	**Test Dates: 13 March 2007 to 21 March 2007**

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Test of: Panasonic Mobile Comms Dev of Europe Ltd
VS71

To: FCC Part 24: 2006 (Subpart E)

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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. Description of EUT

The equipment under test is a dual mode (W-CDMA/GSM) mobile telephone handset with *Bluetooth* capability.

2.2. Identification of Equipment Under Test (EUT)

Description:	Dual Mode Mobile Station
Brand Name:	Panasonic
Model Name or Number:	VS71
IMEI Numbers:	Sample #1: 004401220203646[1]; Sample #2: 004401220203380[2]
Hardware Version Number:	REV C
Software Version Number:	810PVA13
FCC ID Number:	UCE207001B
Country of Manufacture:	Japan
Date of Receipt:	13 March 2007

[1]*Used for all radiated measurements i.e. transmitter EIRP, transmitter out of band radiated emissions (including band edge) and idle mode radiated spurious emissions. Additionally this sample was used for Idle Mode AC Conducted Emissions*
[2]*Used for all the other measurements not covered by sample #1.*

2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	AC Charger
Brand Name:	Panasonic
Model Name or Number:	PMCAA1
Serial Number:	None Stated
Cable Length and Type:	1.5m / 2 core
Connected to Port	Charge / Data

Description:	DC Charger
Brand Name:	Panasonic
Model Name or Number:	EB-CD002
Serial Number:	None Stated
Cable Length and Type:	2.0m / 2 core curl-cord
Connected to Port:	Charge/Data

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

Description:	Micro SD Memory Card
Brand Name:	Panasonic
Model Name or Number:	None Stated
Serial Number:	None Stated
Cable Length and Type:	Not Applicable
Connected to Port:	Dedicated Micro-SD

2.5. Support Equipment

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

2.6. Additional Information Related to Testing

Power Supply Requirement:	Nominal 110 V, 60 Hz AC Mains supply (via AC charger); DC Supply of: 12/24 V via DC charger; Internal battery supply 3.7 V (Nominal)		
Intended Operating Environment:	Within GSM network coverage		
Equipment Category:	GSM		
Type of Unit:	Portable Transceiver		
Transmit Frequency Range:	1850 to 1910 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 to 1990 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)	27.0 dBm		

2.7. Port Identification

Port	Description	Type/Length	Applicable
1	Charge / Data	-	-
2	Audio PHF	-	-
3	USIM	-	-
4	Micro-SD	-	-

3. Test Standard, Methods and Procedures

Reference:	FCC Part 24 Subpart E: 2006 (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.

Preliminary radiated scans were performed on the EUT with the accessories stated in section 2.4 of this report connected and then disconnected. The combination that exhibited the worse case mode of operation was then used to perform final measurements.

Transmitter Mode:

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 -30ºC through to 50ºC in 10º increments.

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

Idle Mode:

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

5.2. Configuration and Peripherals

The EUT was tested in the following configuration unless otherwise stated:

For all radiated tests the EUT was configured with the PHF, model EB-EM003, and AC charger, model PMCAA1, 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 Section Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Spurious Emissions (150 kHz to 30 MHz)	Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	Section 15.109	Enclosure	Complied
Transmitter Effective Isotropic Radiated Power	Section 24.232	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	Section 24.235	*Antenna Terminals	Complied
Transmitter Frequency Stability (Voltage Variation)	Section 24.235	*Antenna Terminals	Complied
Transmitter Occupied Bandwidth	Section 24.238	*Antenna Terminals	Complied
Transmitter Out of Band Radiated Emissions	Sections 2.1053 & 24.238	Antenna	Complied
Transmitter Band Edge Radiated Emissions	Sections 2.1053 & 24.238	Antenna	Complied

** This is an access point on the EUT provided by the manufacturer for the purpose of this test.*

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

FCC Site Registration Number: 90895

IC Site Registration Number: 3485

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:

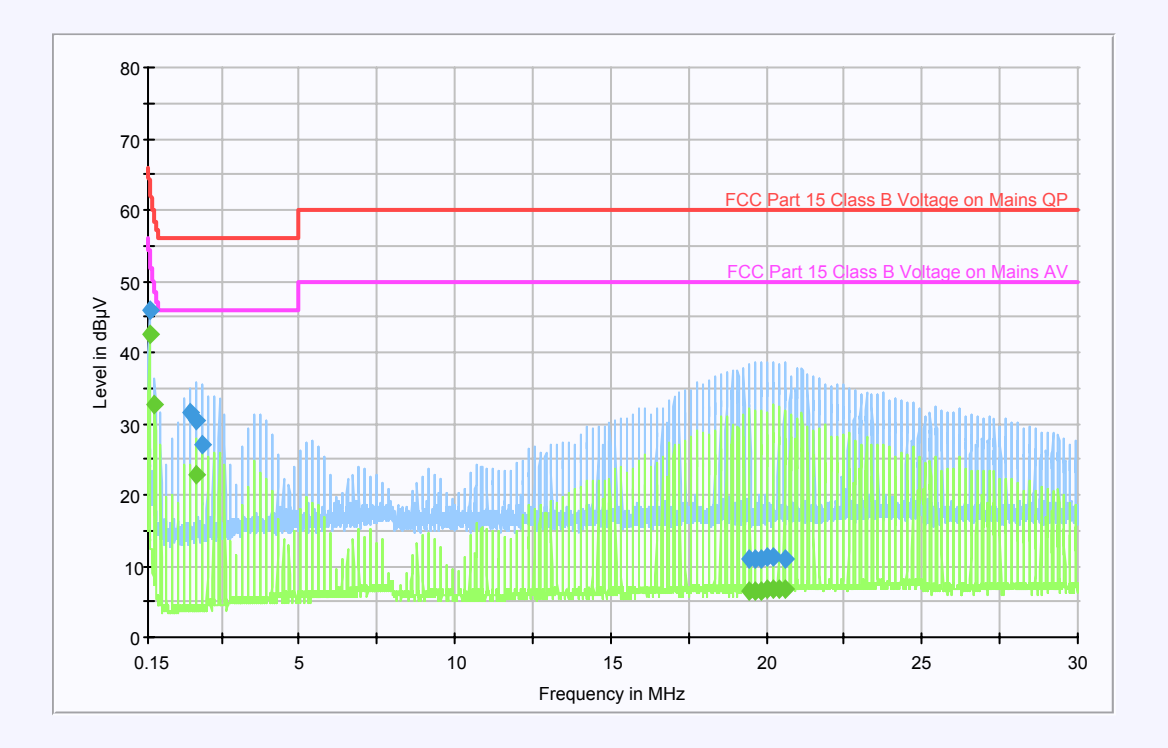
Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.186000	Live	46.0	64.2	18.2	Complied
1.498000	Live	31.4	56.0	24.6	Complied
1.686000	Live	30.3	56.0	25.7	Complied
1.874000	Live	26.9	56.0	29.1	Complied
19.470000	Live	10.9	60.0	49.1	Complied
19.658000	Live	10.9	60.0	49.1	Complied
19.846000	Live	10.9	60.0	49.1	Complied
20.030000	Live	11.4	60.0	48.6	Complied
20.218000	Live	11.4	60.0	48.6	Complied
20.594000	Live	10.9	60.0	49.1	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.186000	Live	42.7	54.2	11.6	Complied
0.374000	Live	32.6	48.4	15.8	Complied
1.686000	Live	22.8	46.0	23.2	Complied
19.470000	Live	6.6	50.0	43.4	Complied
19.658000	Live	6.6	50.0	43.4	Complied
19.846000	Live	6.6	50.0	43.4	Complied
20.030000	Live	6.6	50.0	43.4	Complied
20.218000	Live	6.6	50.0	43.4	Complied
20.406000	Live	6.6	50.0	43.4	Complied
20.594000	Live	6.6	50.0	43.4	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.

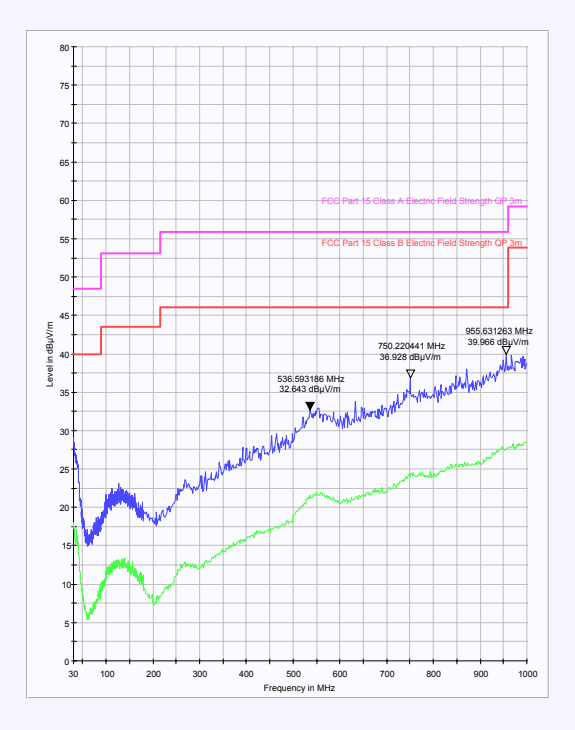
Results:

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

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
955.631	Horizontal	40.0	46.0	6.0	Complied

Note(s):

1. *The emissions shown in the plot at approximately 536.6 MHz and 750.2 MHz were ambient emissions produced by the test set.*
2. *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.*



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)

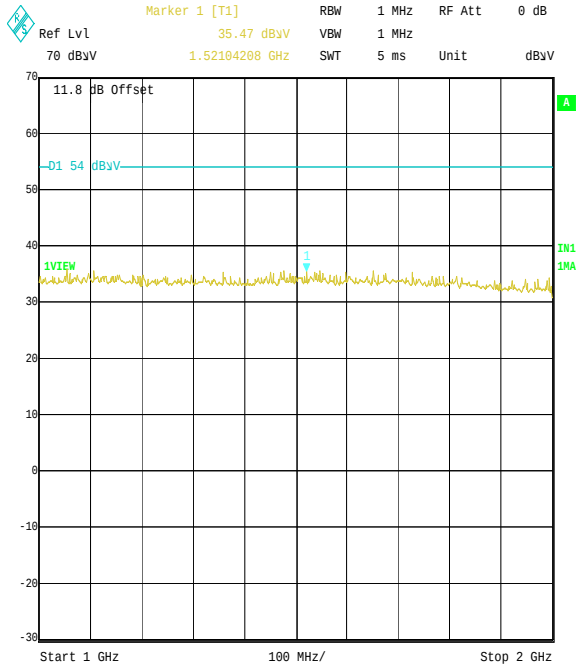
Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
7.527054	Horizontal	33.7	7.1	40.8*	54.0**	13.2	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.*

Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



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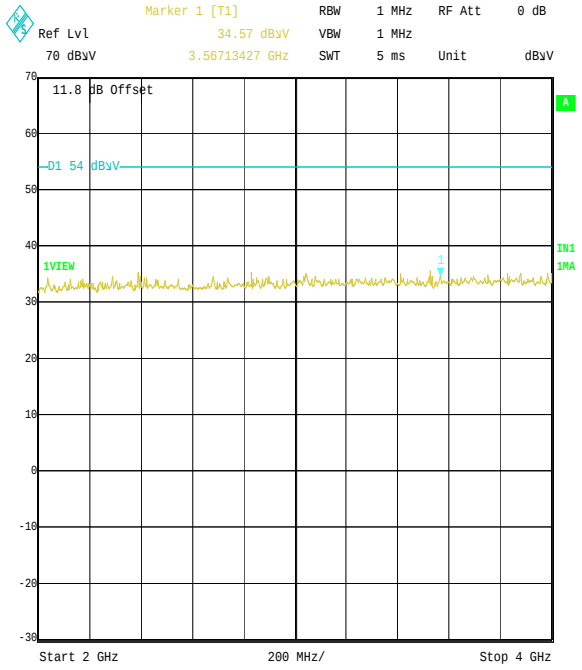

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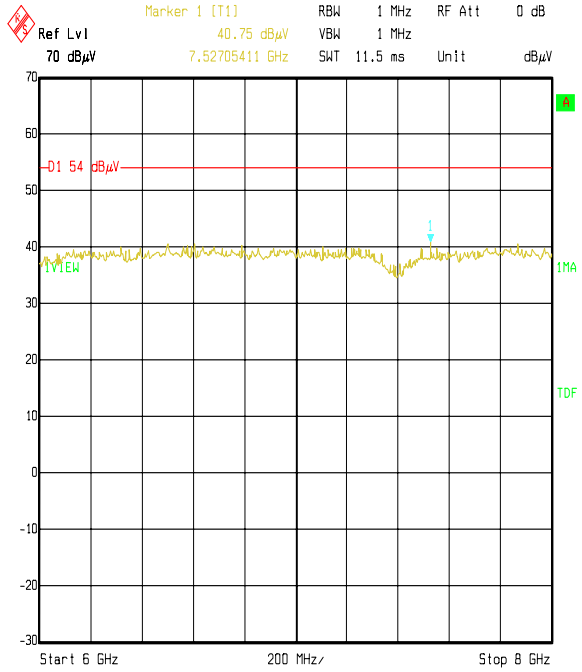

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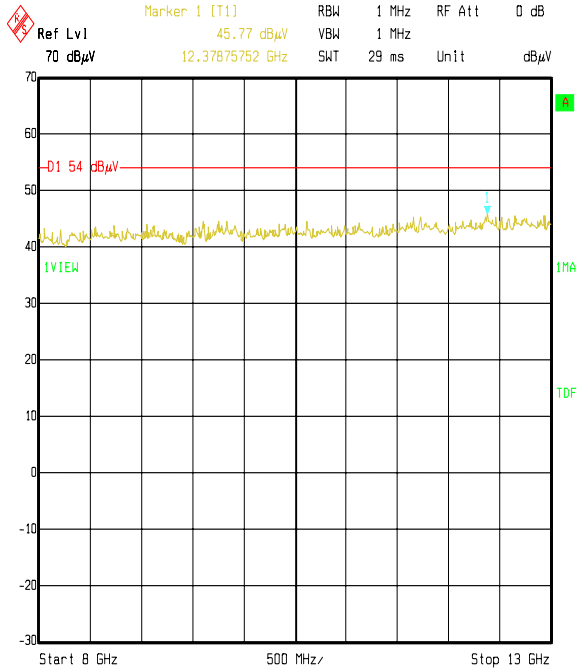

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Comment A: RX RADIATED EMISSIONS
Date: 17.MAR.2007 12:30:06

Note: These plots are pre-scans 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	25.6	33.0	7.4	Complied
Middle	1879.8	Horizontal	26.3	33.0	6.7	Complied
Top	1909.8	Horizontal	27.0	33.0	6.0	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	-23	1850.199977	1850.0	0.199977	Complied
-20	-16	1850.199984	1850.0	0.199984	Complied
-10	-36	1850.199964	1850.0	0.199964	Complied
0	-51	1850.199949	1850.0	0.199949	Complied
10	-49	1850.199951	1850.0	0.199951	Complied
20	30	1850.200030	1850.0	0.200030	Complied
30	-23	1850.199977	1850.0	0.199977	Complied
40	-25	1850.199975	1850.0	0.199975	Complied
50	-20	1850.199980	1850.0	0.199980	Complied

Top Channel (1909.8 MHz)

Temperature (ºC)	Frequency Error (Hz)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	-18	1909.799982	1910.0	0.200018	Complied
-20	-14	1909.799986	1910.0	0.200014	Complied
-10	-50	1909.799950	1910.0	0.200050	Complied
0	-61	1909.799939	1910.0	0.200061	Complied
10	-58	1909.799942	1910.0	0.200058	Complied
20	25	1909.800025	1910.0	0.199975	Complied
30	15	1909.800015	1910.0	0.199985	Complied
40	-20	1909.799980	1910.0	0.200020	Complied
50	14	1909.800014	1910.0	0.199986	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
3.4	-20	1850.199980	1850	0.199980	Complied
4.2	-17	1850.199983	1850	0.199983	Complied

Top Channel (1909.8 MHz)

Supply Voltage (V)	Frequency Error (Hz)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.4	13	1909.800013	1910	0.199987	Complied
4.2	15	1909.800015	1910	0.199985	Complied

7.2.7. Transmitter Occupied Bandwidth: Section 24.238

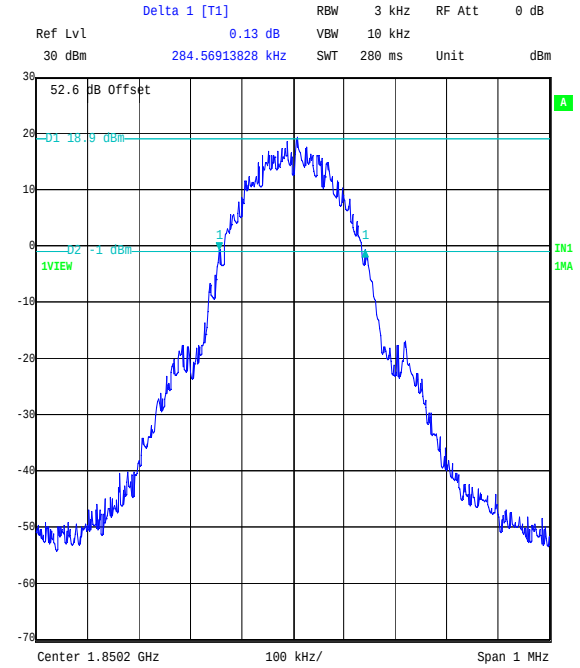
The EUT was configured as for occupied bandwidth measurements as described in section 9 of this report.

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	284.569
Middle	1879.8	3.0	10.0	264.529
Top	1909.8	3.0	10.0	292.585

Transmitter Occupied Bandwidth: Section 24.238 (Continued)



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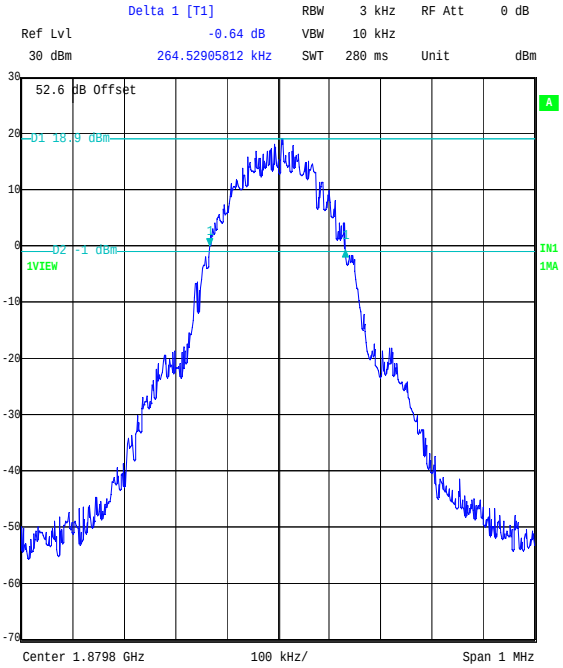

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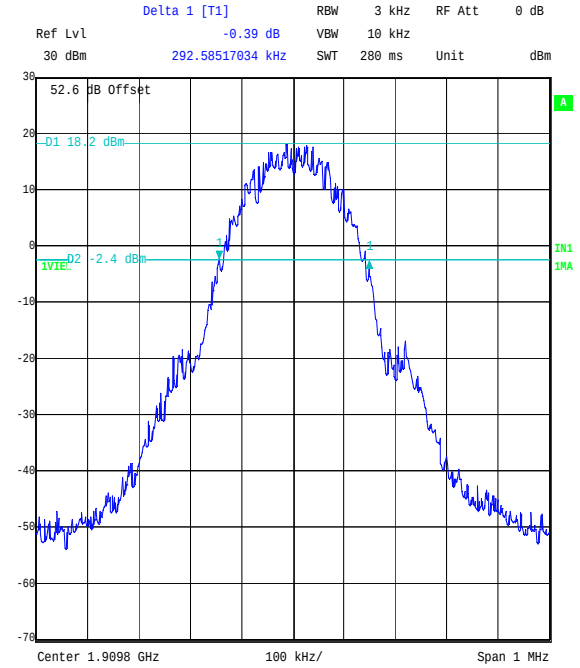

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7.2.8. Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238

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

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

Results:

Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5550.651	-32.4	-13.0	19.4	Complied
7400.791	-45.8	-13.0	32.8	Complied

Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5639.388	-34.0	-13.0	21.0	Complied
7519.148	-46.9	-13.0	33.9	Complied

Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5729.448	-29.5	-13.0	16.5	Complied
7639.248	-48.9	-13.0	35.9	Complied

Test of: Panasonic Mobile Comms Dev of Europe Ltd
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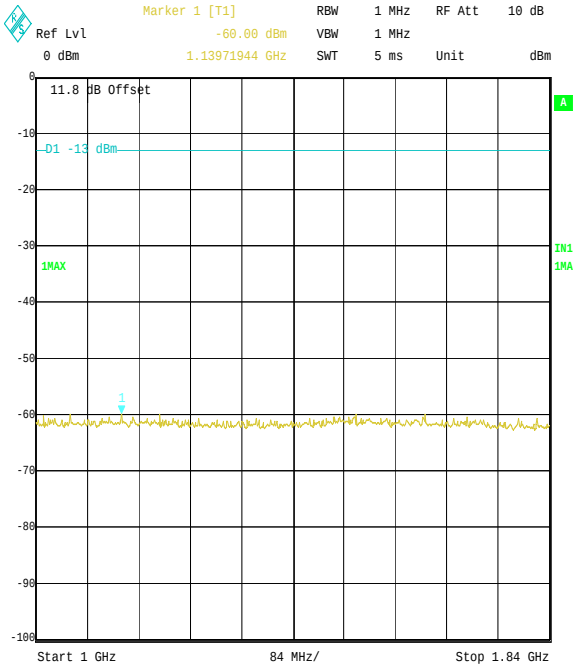
Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



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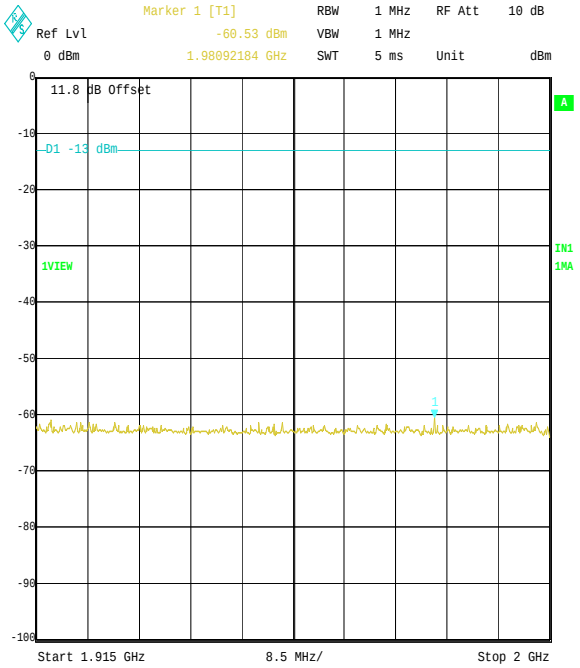

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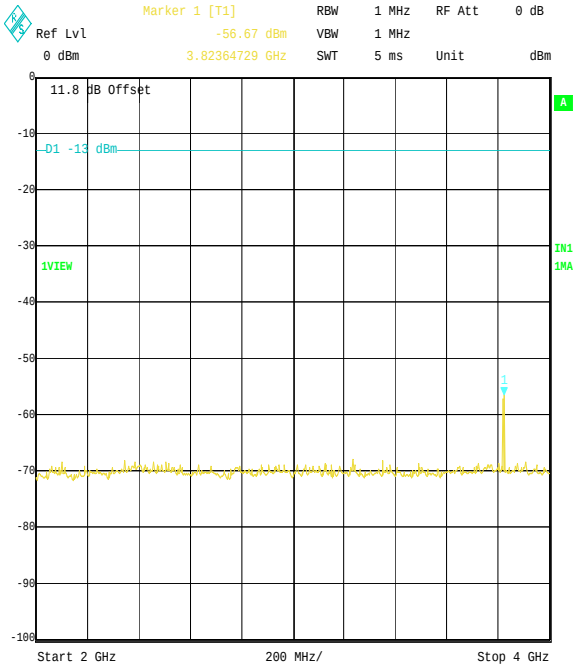

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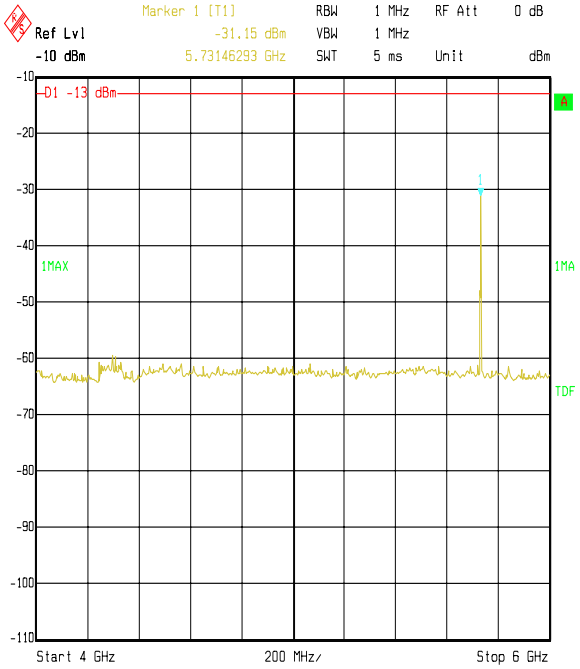

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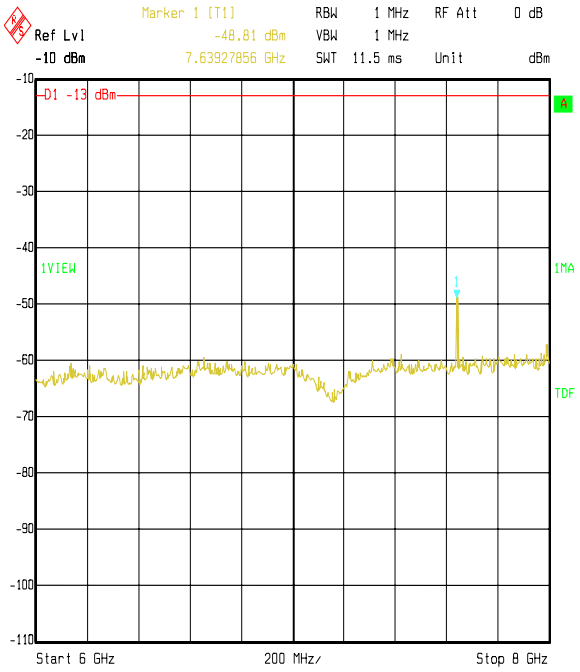
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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



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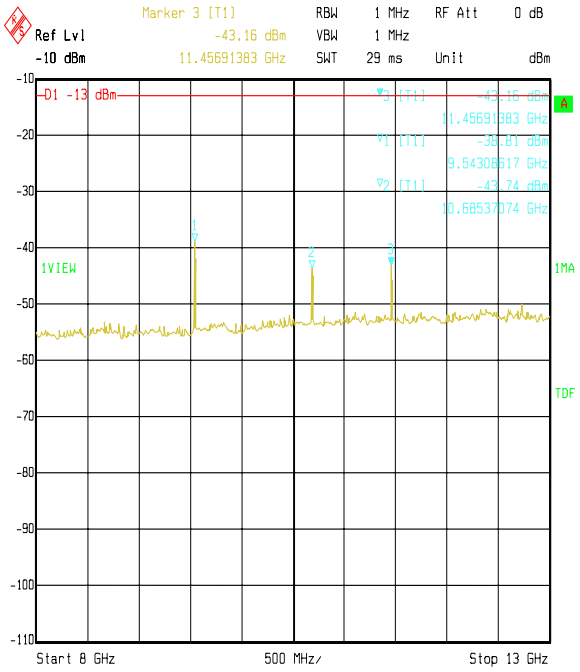

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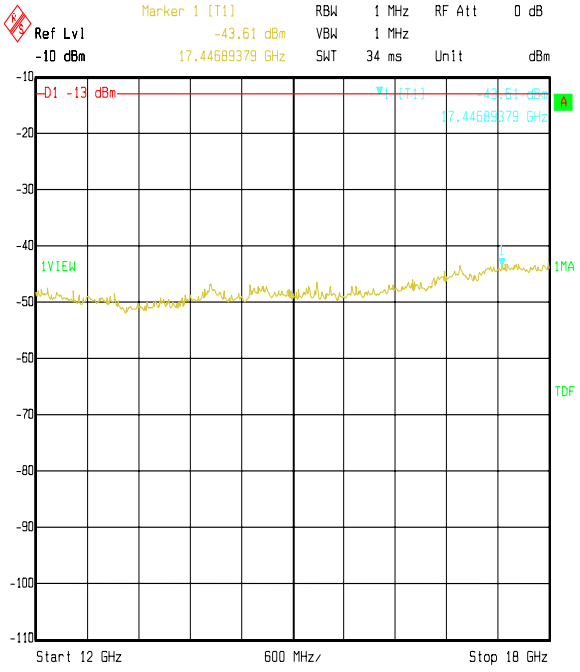

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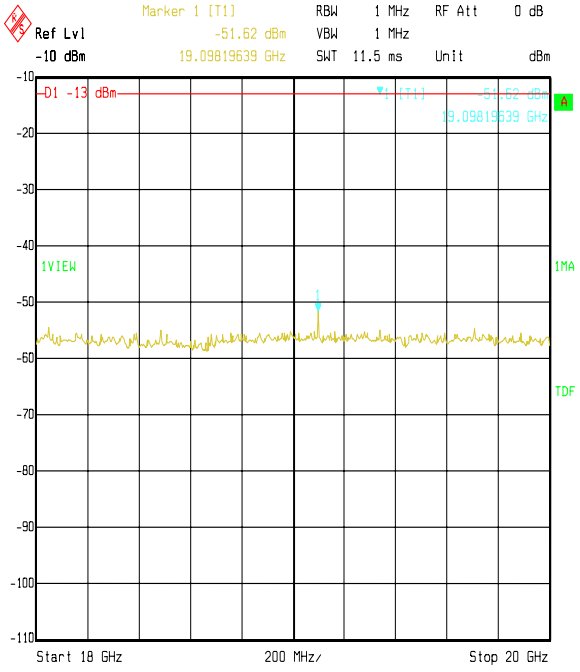

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Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 17.MAR.2007 12:10:04

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)

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	34	6	30
2	34	7	35
3	28	8	28
4	32	9	32
5	29	10	29
Total Peak Power:	309 nW/MHz		

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

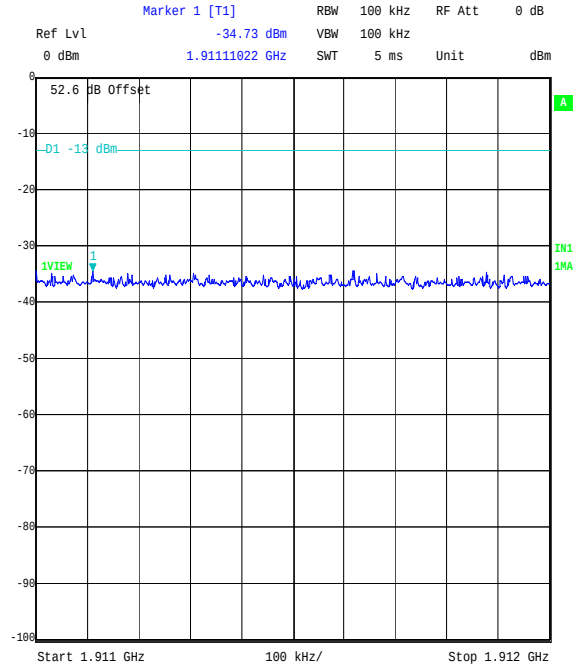
2nd 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	34	6	35
2	37	7	35
3	37	8	35
4	31	9	34
5	32	10	36
Total Peak Power:	347 nW/MHz		

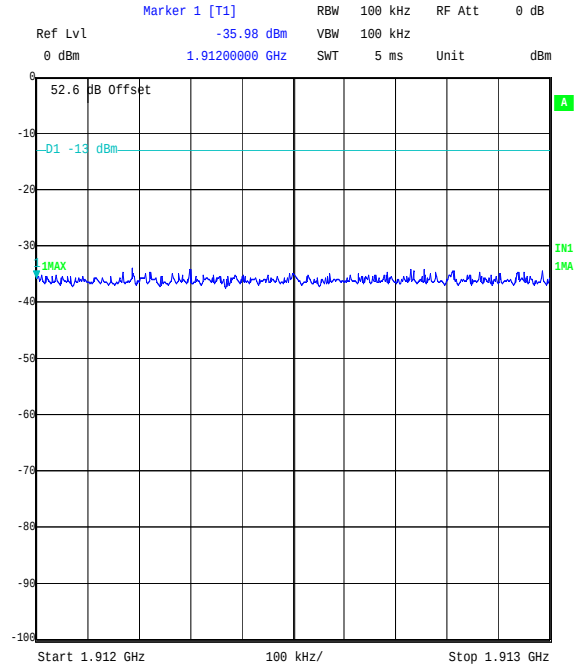
Results:

Band (MHz)	Peak Power (nW/MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1911 to 1912	309	-25.1	-13.0	12.1	Complied
1912 to 1913	347	-24.6	-13.0	11.6	Complied

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



Title: 72511JD02 FCC PART 24
Comment A: OUT OF BAND EMISSIONS 1911 - 1912 MHz
Date: 21.MAR.2007 14:27:42



Title: 72511JD02 FCC PART 24
Comment A: OUT OF BAND EMISSIONS 1912 - 1913 MHz
Date: 21.MAR.2007 14:16:31

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

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

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

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

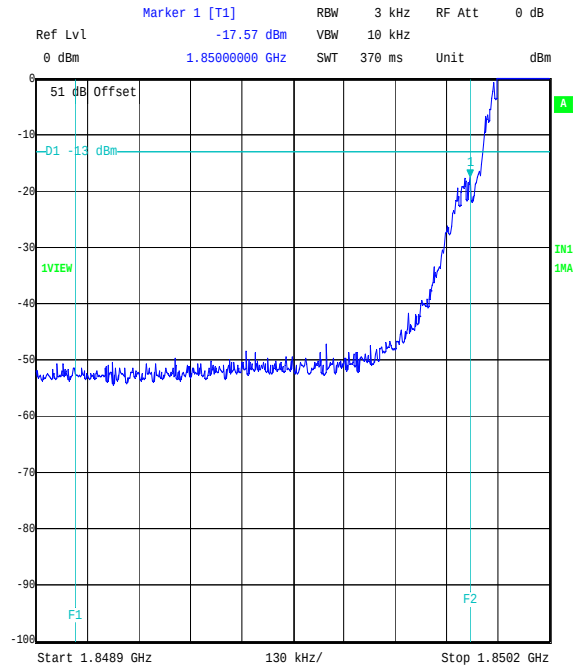
Results:

Bottom Band Edge

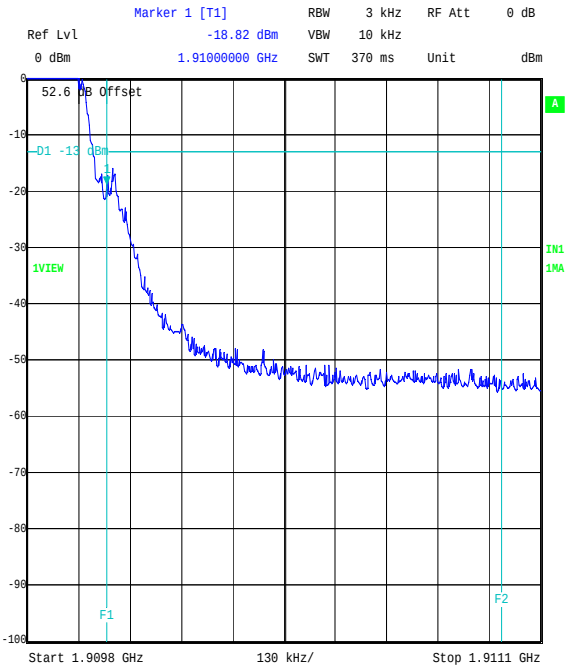
Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-17.6	-13.0	4.6	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910	-18.8	-13.0	5.8	Complied



Title: 72511JD02 FCC PART 24
Comment A: TX RADIATED EMISSIONS GSM 1900 LOWER BAND EDGE
Date: 21.MAR.2007 12:33:29



Title: 72511JD02 FCC PART 24
Comment A: TX RADIATED EMISSIONS GSM 1900 UPPER BAND EDGE
Date: 21.MAR.2007 12:54:59

8. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	+/- 2.94 dB
Frequency Stability	Not applicable	95%	+/- 24.3 Hz
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 26 GHz	95%	+/- 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.

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 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 115V 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
A028	Horn Antenna	Eaton	91888-2	304	08/06/06	36
A031	Horn Antenna	Eaton	91889-2	557	08/06/06	36
A1069	LISN	Rohde & Schwarz	ESH3-Z5	837469/012	09/02/07	12
A1141	Directional Coupler	Hewlett Packerd	11691D	1212A02494	Cal Before Use	N/A
A1534	Preamplifier	Hewlett Packard	8449B OPT H02	3008A00405	Cal Before Use	N/A
A248	Attenuator	Narda	743-60	01411	Cal Before Use	N/A
A253	Horn Antenna	Flann Microwave	12240-20	128	17/11/06	36
A254	Horn Antenna	Flann Microwave	14240-20	139	17/11/06	36
A255	Horn Antenna	Flann Microwave	16240-20	519	17/11/06	36
A256	Horn Antenna	Flann Microwave	18240-20	400	17/11/06	36
A436	Horn Antenna	Flann Microwave	20240-20	330	24/04/06	36
A553	Bi-log Antenna	Chase	CBL6111A	1593	01/11/06	12
E013	Environmental Chamber	Sanyo	ATMOS chamber	None	Cal Before Use	N/A
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	08/09/06	12
M1169	GSM Test Set	Racal Instruments	6103	2135	Calibrate Before Use	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986_022	08/09/06	12
M1269	Multimeter	Fluke	179	90250210	05/03/07	12
M1273	Test Receiver	Rhode & Schwarz	ESIB 26	100275	20/02/07	12
S0520	Power Supply	GW Instek	GPC-3030	E835141	Cal Before Use	N/A
S202	3m OATS	RFI	2	-	17/11/06	12

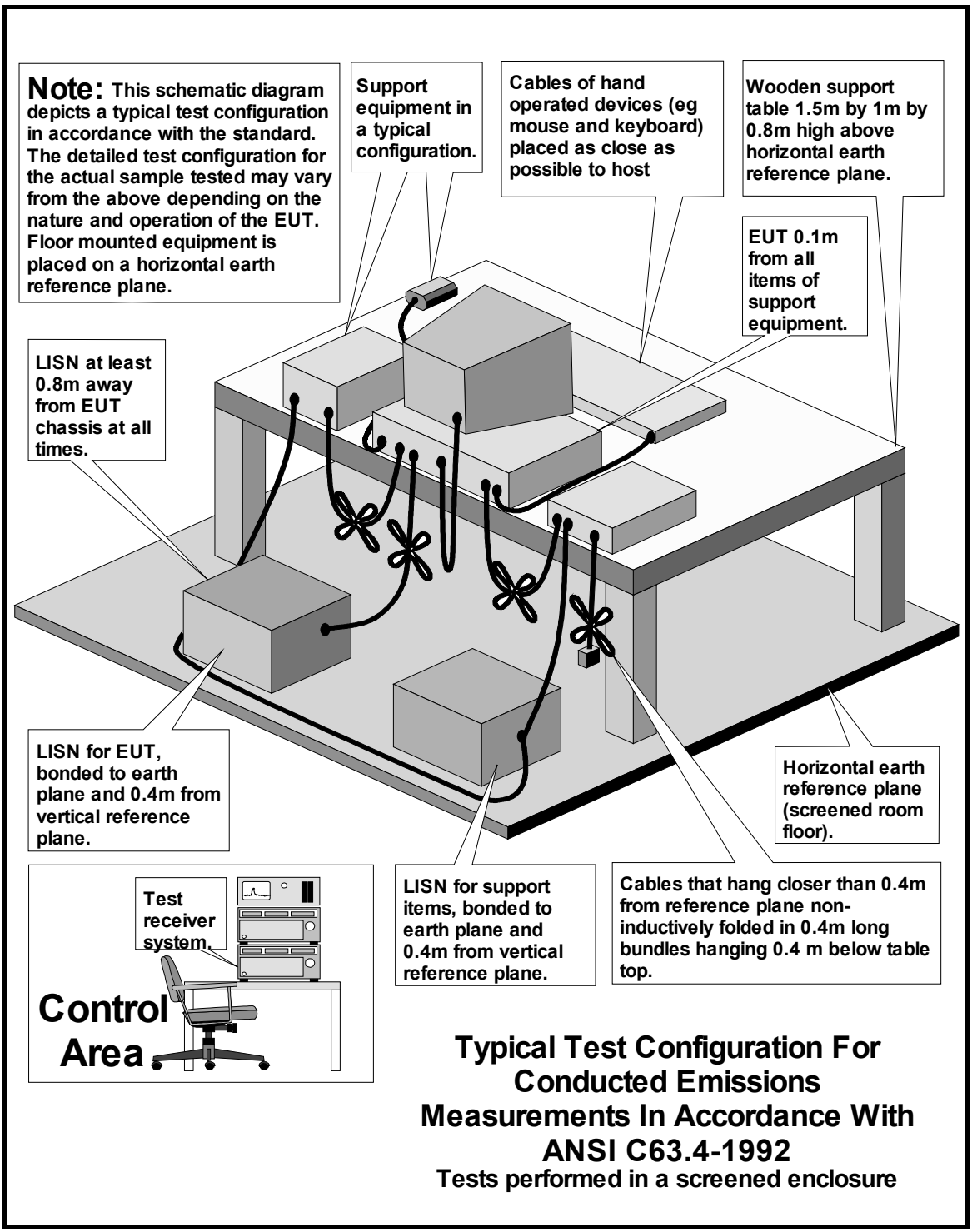
NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\72511JD02\EMICON	Test configuration for measurement of conducted emissions.
DRG\72511JD02\EMIRAD	Test configuration for measurement of radiated emissions.

DRG\72511JD02\EMICON



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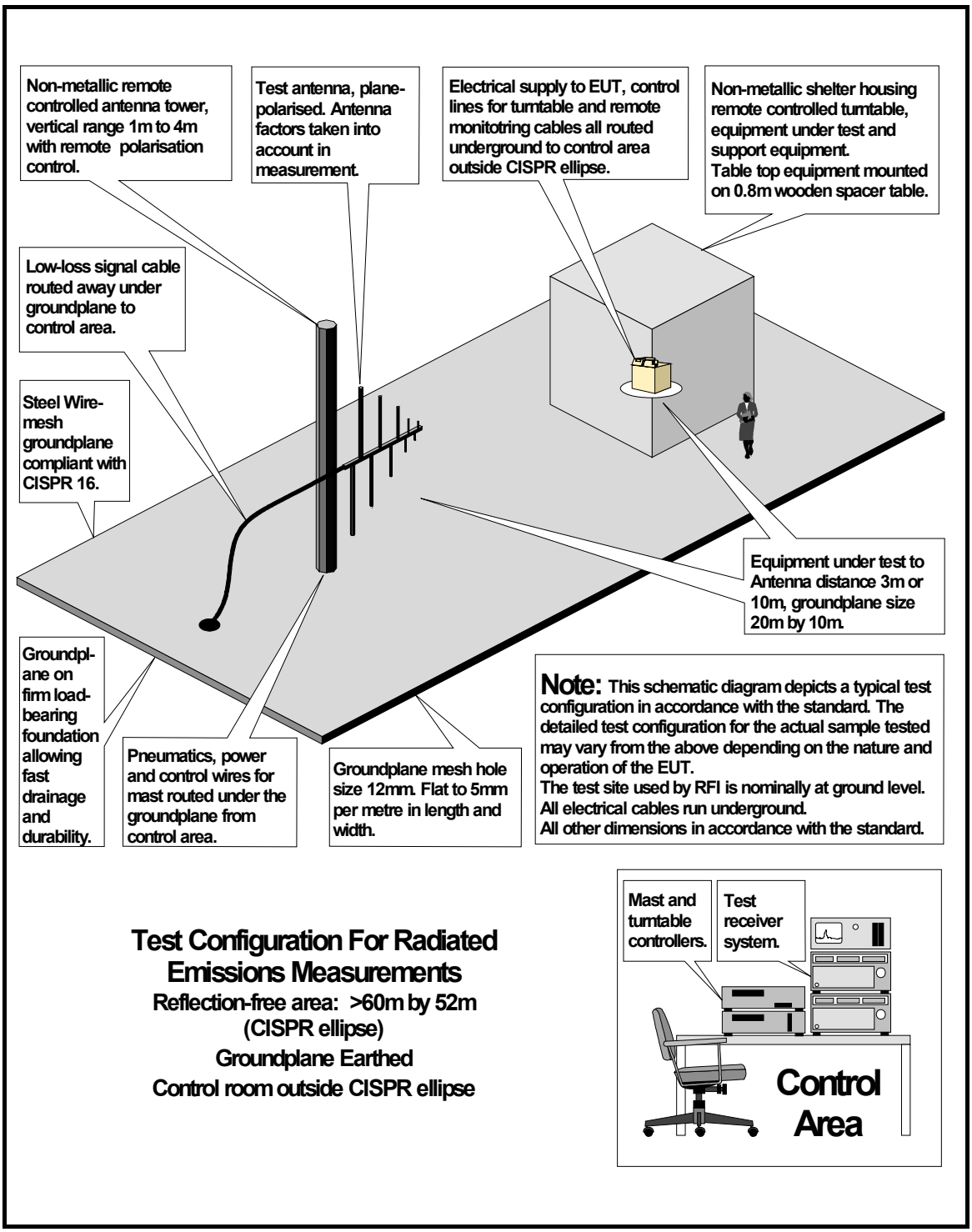

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