

# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Panasonic Mobile Comms Dev of Europe Ltd P906i

To: FCC Part 15 Subpart B: 2007 (Sections 15.225)

Test Report Serial No: RFI/RPTE2/RP73067JD05A

Supersedes Test Report Serial No: RFI/RPTE1/RP73067JD05A

This Test Report Is Issued Under The Authority Of Steve Flooks, Service Leader RPG:	pp Brian Watson
Checked By: Brian Watson	Report Copy No: PDF01
Issue Date: 27 March 2008	Test Dates: 13 February 2008 to 03 March 2008

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## 1. Client Information

Company Name:	Panasonic Mobile Communications Development of Europe Ltd
Address:	2 Gables Way Colthrop Thatcham Berkshire RG19 4ZB
Contact Name:	Mr M Hargreaves

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## 2. Equipment Under Test (EUT)

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

## 2.1. Identification of Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	DoCoMo
Model Name or Number:	P906i
Serial Number:	None Stated
IMEI Number:	357015010018932
Hardware Version Number:	Rev C
Software Version Number:	B-WN905S-01.03.001 P7isCv05.01.02.00
FCC ID:	UCE208006A
Country of Manufacture:	Japan
Date of Receipt:	12 February 2008

Description:	Battery
Brand Name:	DoCoMo
Model Name or Number:	P16
Serial Number:	None Stated
Country of Manufacture:	Japan
Date of Receipt:	12 February 2008

#### 2.2. Description of EUT

The equipment under test is a dual mode (W-CDMA/GSM) Cellular Mobile Telephone with *Bluetooth* & RFID.

### 2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

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### 2.4. Additional Information Related to Testing

Power Supply Requirement:	Internal battery supply of 3.7 V (nominal)
Intended Operating Environment:	Within GSM coverage UTMS Coverage Area
Equipment Category:	Bluetooth, GSM/GPRS, Shot Range Device, UMTS FDD I
Type of Unit:	Portable (standalone battery powered device) Transceiver
Transmitter Output Power:	3.64 dBμV/m
Transmit Frequency:	13.56 MHz (Single Channel)

## 2.5. Port Identification

Port	Description	Type/Length
1	Charge/Data port	Not Applicable
2	AV Out	1.8m multi-core
3	USIM	Not Applicable
4	Micro-SD	Dedicated micro-SD card port

## 2.6. Accessories

The following accessories were supplied with the EUT during testing:

Description:	AC Charger
Brand Name:	DoCoMo
Model Name or Number:	FOMA AC Adapter 01 for Global use MAS-BH0008-A 002
Serial Number:	None Stated
Cable Length and Type:	1.5m round twin core
Connected to Port:	Charge/Data port

Description:	DC Charger
Brand Name:	DoCoMo
Model Name or Number:	FOMA DC Adapter 02
Serial Number:	None Stated
Cable Length and Type:	2.0m approx / 2 core curl-cord
Connected to Port:	Charge/Data port

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## **Accessories (continued)**

Description:	Personal Hands Free (Stereo)
Brand Name:	DoCoMo
Model Name or Number:	Flat-plug Stereo Earphone Set P01
Serial Number:	None Stated
Cable Length and Type:	1.8m / multi-core
Connected to Port:	AV Out port

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

Description:	Charge/ Data Cable
Brand Name:	None Stated
Model Name or Number:	FOMA USB Cable with Charge Function 01
Serial Number:	Not Applicable
Cable Length and Type:	0.5m / multi-core
Connected to Port:	Charge/ Data port

## 2.7. Support Equipment

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

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## 3. Test Specification, Methods and Procedures

## 3.1. Test Specifications

Reference:	FCC Part 15 Subpart B: 2007 (Sections 15.225).
Title:	Code of Federal Regulations, Part 15 (47CFR225) Radio Frequency Devices.

#### 3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

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

ANSI C63.4 (2001)

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

ANSI C63.5 (1988)

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

ANSI C63.7 (1988)

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

CISPR 16-1: (1999)

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

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.

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## 4. Deviations from the Test Specification

There were no deviations from the test specification.

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## 5. Operation of the EUT During Testing

## 5.1. Operating Modes

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

- RFID transmit mode on a single channel.
- RFID idle mode.

#### 5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- The EUT was tested with the personal hands free attached for transmit mode, as this was found to be the worst case.
- The EUT was tested with the 110V AC charger connected for idle mode.

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## **6. Summary of Test Results**

Range of Measurements	Section Reference	Port Type	Compliancy Status
Receiver/Idle Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2007 Section 15.109	Enclosure	Complied
Transmitter Fundamental Fieldstrength	C.F.R. 47 FCC Part 15: 2007 Section 15.225(a)	Antenna	Complied
Transmitter Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2007 Section 15.209	Enclosure	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2007 Section 15.209	Antenna	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 2: 2007 Section 2.1049	Antenna	Complied
Transmitter Frequency Stability (Temperature & Voltage Variation)	C.F.R. 47 FCC Part 15: 2007 Section 15.225(c)	Antenna	Complied

## 6.1. Location of Tests

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

FCC Site Registration Number: 90895 IC Site Registration Number: 3485

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## 7. Measurements, Examinations and Derived Results

#### 7.1. General Comments

7.1.1. This section contains test results only.

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

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### 7.2. Test Results

#### 7.2.1. Idle Mode: Radiated Spurious Emissions

#### 7.2.2. Electric Field Strength Measurements (Frequency Range: 9kHz to 1000 MHz)

- 7.2.2.1. The EUT was configured for radiated emissions testing as described in Section 9 of this report.
- 7.2.2.2. Tests were performed to identify the maximum idle mode radiated emission levels.
- 7.2.2.3. Tests were performed in accordance with C63.4 Section 8 and relevant annexes.

#### Results:

Frequency (MHz)	Antenna Orientation	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
16.252894	Orthogonal*	43.23	46.0	2.77	Complied

<sup>\*90°</sup> to EUT.

#### Note(s):

1. 16.252894MHz level is an ambient reading.

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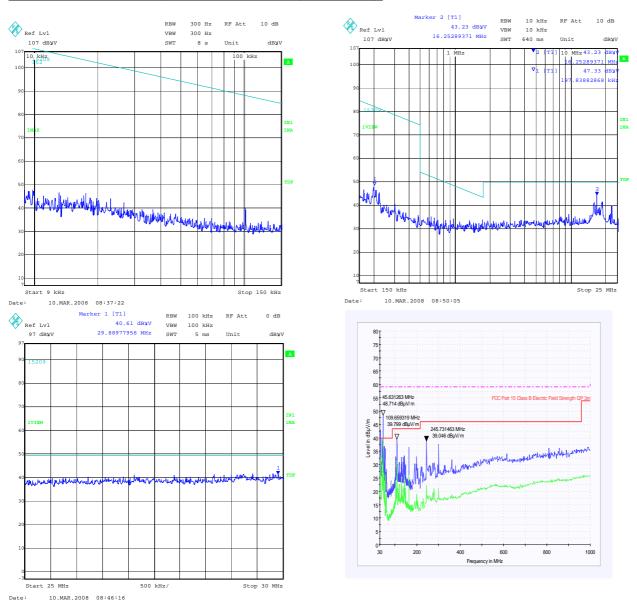
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#### **Idle Mode: Radiated Spurious Emissions (Continued)**



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

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## 7.2.3. Transmitter Fundamental Fieldstrength

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

- 7.2.3.2. Tests were performed to identify the maximum fieldstrength of the fundamental frequency.
- 7.2.3.3. Tests were performed in accordance with C63.4 Section 8 and relevant annexes.

7.2.3.4. The limit is specified at a test distance of 30 metres. However as specified by section 15.31 (f(2)), measurements may be performed at a closer distance, and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

#### Results:

Frequency	Q-P Level	Limit at 30 metres	Margin
(MHz)	(dBμV/m)	(dBμV/m)	(dB)
13.56	3.64	84.0	87.64

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## 7.2.4. Transmitter Radiated Spurious Emissions

#### 7.2.5. Electric Field Strength Measurements (Frequency Range: 9 kHz to 1000 MHz)

- 7.2.5.1. The EUT was configured for radiated emissions testing as described in Section 9 of this report.
- 7.2.5.2. Tests were performed to identify the maximum radiated spurious emission levels.
- 7.2.5.3. Tests were performed in accordance with C63.4 Section 8 and relevant annexes.

7.2.5.4. Limits below 30 MHz are specified at test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However as specified by section 15.31 (f)(2), measurements may be performed at a closer distance, and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

#### Results:

Frequency (MHz)	Antenna Orientation	Q-P Level (dBμV/m)	Limit (dBμV/m)	Measurement Distance (m)	Margin (dB)
0.010658	Orthogonal**	47.09	106.2*	10	59.11
0.201937	Orthogonal**	51.89	80.6*	10	28.71
16.420384	Orthogonal**	47.65	48.6	10	0.95
25.841683	Orthogonal**	40.06	48.6	10	8.54

<sup>\*</sup>Limit extrapolated to 10 metre test distance, limit at 30 metres is 29.5 dBµV/m

#### Note(s):

1. In the frequency range 30MHz to 1GHz all final emissions measurements were greater than 20dB below the limit and were not recorded in the table above.

<sup>\*\*90°</sup> to EUT.

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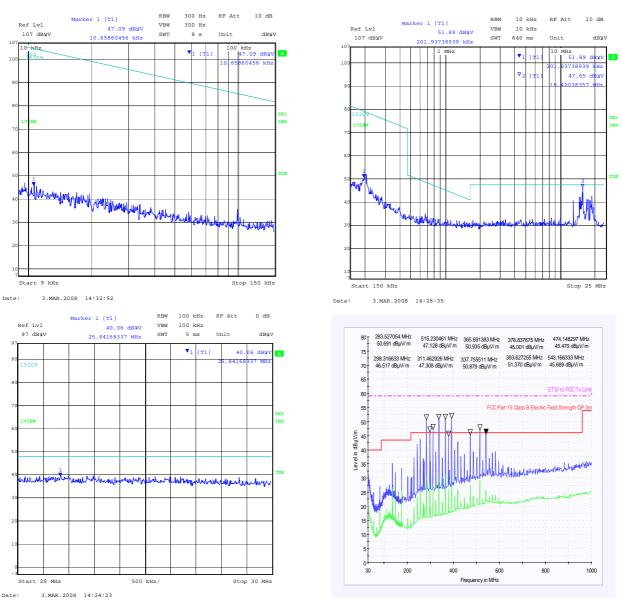
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## <u>Transmitter Radiated Spurious Emissions (Continued)</u>



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

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## 7.2.6. Transmitter Radiated Emissions at Band Edges

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

- 7.2.6.2. Tests were performed in accordance with C63.4 Section 8 and relevant annexes.
- 7.2.6.3. Tests were performed to identify the maximum emissions level at the band edges of the frequency band that the EUT will operate over.

7.2.6.4. Limits below 30 MHz are specified at test distance of 30 metres, whilst below 0.49 MHz they are specified at a test distance of 300 metres. However as specified by section 15.31 (f)(2), measurements may be performed at a closer distance, and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

#### Results:

Tests were performed at 3m.

#### **Bottom Band Edge**

Frequency	Q-P Level	Limit	Margin
(MHz)	(dBμV/m)	(dBμV/m)	(dB)
13.553000	7.84	29.5	21.66

#### **Top Band Edge**

Frequency	Q-P Level	Limit	Margin
(MHz)	(dBμV/m)	(dBμV/m)	(dB)
13.567000	8.23	29.5	21.27

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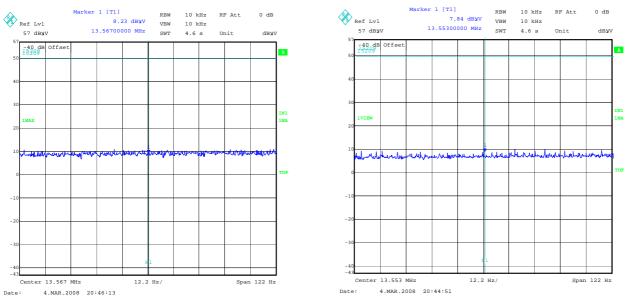
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## <u>Transmitter Radiated Emissions at Band Edges (Continued)</u>



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

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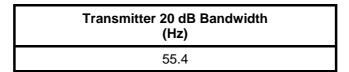
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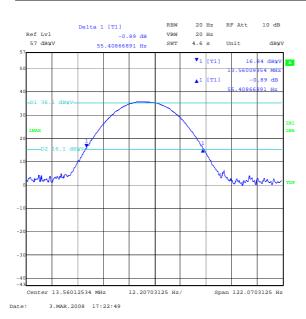
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## 7.2.7.Transmitter 20 dB Bandwidth

- 7.2.7.1. The EUT was configured for 20 dB bandwidth measurements as described in Section 9 of this report.
- 7.2.7.2. Tests were performed to identify the 20 dB bandwidth.
- 7.2.7.3. This test is not required to show compliance to 15.225 but has been included for information sake to aid Industry Canada (IC) applications.
- 7.2.7.4. Tests were performed in accordance with C63.4 Section 10.1.8.8 and 13.1.7 and relevant annexes with the only deviation being that the 20 dBc bandwidth was reported.





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

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### 7.2.8. Transmitter Frequency Stability (Temperature & Voltage Variation)

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

7.2.8.2. Tests were performed in accordance with FCC Part 2.1055 but over the frequency range specified in FCC Part 15.225.

#### Results:

#### Maximum frequency error of the EUT with variations in ambient temperature

Temp (°C)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)
-20	13.56	13.560175	175	0.001291	0.01	0.008709
20	13.56	13.560074	74	0.000546	0.01	0.009454
50	13.56	13.559989	11	0.000081	0.01	0.009919

#### Maximum frequency error of the EUT with variations in supply voltage

Tests were performed in accordance with FCC Part 2.1055. The upper voltage is set to 115% of the nominal voltage. The lower voltage is set to 85% of the nominal voltage, or the EUT cut-off voltage.

#### **Results:**

Voltage (V)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)
3.2	13.56	13.560068	68	0.000501	0.01	0.009499
3.7	13.56	13.560067	67	0.000494	0.01	0.009506
4.3	13.56	13.560065	65	0.000479	0.01	0.009521

#### Note(s):

- 1. The client stated upper voltage is 4.2 and lower voltage is 3.4. These values were 114% of the nominal voltage and 92% of the nominal voltage respectively.
- 2. The tests were performed at the upper, nominal and lower voltage extremes via a dummy battery supply attached to a power supply unit.

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## 8. Measurement Uncertainty

8.1. 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.

- 8.2. The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.
- 8.3. The uncertainty of the result may need to be taken into account when interpreting the measurement results.
- 8.4. 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
Occupied Bandwidth	N/A	95%	+/- 0.12 %
Frequency Stability	N/A	95%	+/- 11.37 ppm
Radiated Emissions	9 kHz to 30 MHz	95%	+/- 3.53 dB
Radiated Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB

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

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## 9. Measurement Methods

#### 9.1. 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 were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF 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 test configuration was the same for the initial scans as for the final measurements.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were 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 on the open area test site, at the appropriate distance, using a measuring receivers with a Quasi-Peak (or Average) detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

All measurements on the open area test site were performed using broadband antennas.

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. 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.

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## **Radiated Emissions (Continued)**

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

Receiver Function	Initial Scan (Below 30 MHz)	Final Measurements (Below 30 MHz)
Detector Type:	Peak	Quasi-Peak (CISPR) or Average
Mode:	Max Hold	Not applicable
Bandwidth:	9 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	>1s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Receiver Function	Initial Scan (30 to 1000 MHz)	Final Measurements (30 to 1000 MHz)
Detector Type:	Peak	Quasi-Peak (CISPR)
Mode:	Max Hold	Not applicable
Bandwidth:	100 kHz	120 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	>1s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

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#### **Transmitter 20 dB Bandwidth**

The EUT and spectrum analyser was configured for transmitter radiated emissions measurements.

To determine the occupied bandwidth, a resolution bandwidth of 20 Hz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of a least the same value was used. The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level. The bandwidth was determined at the points where the 20 dB reference crossed the profile of the emission.

#### FCC Part 2.1055: Frequency Stability

The EUT was situated within an environmental test chamber and monitored on the test equipment via an antenna test fixture.

Measurements were performed with the EUT operating under extremes of temperatures within the range -20°C to 50°C.

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.

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

The frequency error measured was converted to an error in % using the following formula as defined by TIA-603-B:-

$$ppm error = \frac{(MCF_{MHz})^* 10^6}{(ACF_{MHz})^* 10^6}$$

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

The measured % had to be less then the relevant limits in order to comply

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# **Appendix 1. Test Equipment Used**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A004	Line Impedance Stabilization Network	Rohde & Schwarz	ESH3-Z5	890 604/027	23 April 2007	12
A1037	Antenna	Chase EMC Ltd	CBL6112B	2413	13 Feb 2008	12
A007	Loop Antenna	Rohde & Schwarz	HFH2-Z2	880 458/020	28 Feb 2008	12
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	16 Jan 2008	12
A253	Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A256	Antenna	Flann Microwave	18240-20	400	17 Nov 2006	36
A259	Antenna	Chase	CBL6111	1513	13 Mar 2007	12
A436	Antenna	Flann	20240-20	330	24 Apr 2006	36
A512	Antenna	EMCO	3115	3993	17 Sep 2004 (monitoring purpose only)	-
C1025	Cable	Rosenberger	FA210A-1-020m	FA00B 7564	Calibrated before use	-
C1164	Cable	Rosenberger Micro-Coax	FA210 A1015007070	43188-1	Calibrated before use	-
C1167	Cable	Rosenberger	FA210A1030007070	43190-01	Calibrated before use	-
C1268	Cable	Rosenberger	FA210A0075008080	49356-1	Calibrated before use	-
C151	Cable	Rosenberger	UFA210A-1-1181- 70x70	None	Calibrated before use	-
C160	Cable	Rosenberger	UFA210A-1-1181- 70x70	None	Calibrated before use	-
C172	Cable	Rosenberger	UFA210A-1-1181- 70x70	None	Calibrated before use	-

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## <u>Test Equipment Used – Continued</u>

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
C341	Cable	Andrews	None	None	Calibrated before use	-
C348	Cable	Rosenberger	UFA210A-1-1181- 70x70	2993	Calibrated before use	-
C363	Cable	Rosenberger	RG142	None	Calibrated before use	-
C468	Cable	Rosenberger	UFA210A-1-3937- 504504	98L0440	Calibrated before use	-
E0511	VTM 7004	Votsch Industrietechnik	VTM 7004	58566087700 010	Calibrated before use	-
G088	Power Supply Unit	Thurlby Thandar	CPX200	100700	Calibrated before use	-
M023	Test Receiver	Rohde & Schwarz	ESVP	872 991/027	24 Apr 2007	12
M024	Spectrum Monitor	Rohde & Schwarz	EZM	873 952/006	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	20 Apr 2007	12
M1242	Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986/022	29 Nov 2007	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	06 Feb 2008	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	15 Aug 2007	12
M1379	Test Receiver	Rohde and Schwarz	ESIB7	100330	02 Aug 2007	12
M1447	СВТ	Rohde and Schwarz	1153.9000.35	100329	24 Jan 2008	12
S201	Open Area Test Site	RFI	Site1	-	25 May 2007	12
S202	Open Area Test Site	RFI	Site2	S202- 15011990	28 Jan 2008	12
S503	Antenna Mast	EMCO	1051-25	9205 1670	Calibration not required	-

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

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# **Appendix 2. Test Configuration Drawings**

This appendix contains the following drawings:

Drawing Reference Number	Title	
DRG\73067JD05\EMIRAD	Test configuration for measurement of radiated emissions.	

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