TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Panasonic Mobile Comms Dev of Europe Ltd
VS7a Mobile Handset

To: FCC Part 15.247: 2006 (Subpart C)

Test Report Serial No:
RFI/RPTE3/RP72749JD04A

Supersedes Test Report Serial No:
RFI/RPTE2/RP72749JD04A

This Test Report Is Issued Under The Authority Of Michael Derby, Radio Performance Group Leader:  **pp**	
Checked By: Michael Derby  **pp**	**Issued To:** **Panasonic Mobile Comms Dev of Europe Ltd** **2 Gables Way** **Colthrop** **Thatcham** **Berkshire** **RG19 4ZB** **UK**
Report Copy No: PDF01	
Test Date: 29 August 2007 to 03 September 2007	**Issue Date: 24 October 2007**

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Test of: **Panasonic Mobile Comms Dev of Europe Ltd**
VS7a Mobile Handset

To: **FCC Part 15.247: 2006 (Subpart C)**

Executive Summary

RFI Global Services Ltd (RFI) was commissioned to perform an independent series of conformance tests to assess compliance with FCC Part 15.247: 2006 (Subpart C)

Summary of Results

Range of Measurements	Clause Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Emissions	Section 15.107	AC Mains	**Complied**
Idle Mode Radiated Spurious Emissions	Section 15.109	Antenna	**Complied**
Transmitter AC Conducted Emissions	Section 15.207	AC Mains	**Complied**
Transmitter 20 dB Bandwidth	Section 2.1049	Antenna	**Complied**
Transmitter Carrier Frequency Separation	Section 15.247(a)(1)	Antenna	**Complied**
Transmitter Average Time of Occupancy	Section 15.247(a)(1)(iii)	Antenna	**Complied**
Transmitter Maximum Peak Output Power	Section 15.247(b)(3)	Antenna	**Complied**
Transmitter Radiated Emissions	Sections 15.247(d) & 15.209(a)	Antenna	**Complied**
Transmitter Band Edge Radiated Emissions	Sections 15.247(d) & 15.209(a)	Antenna	**Complied**

Key to Compliance Colours used in this report:

Colour	Definition
	Compliant
	Indeterminate*
	Not compliant

* Indeterminate because the measurements were within measurement uncertainty.

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1. Equipment Under Test (EUT)

The following information (with the exception of the date of receipt) has been supplied by the customer:

1.1. Description of EUT

The equipment under test is a mobile telephone handset

1.2. Identification of Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	Panasonic
Model Name or Number:	VS7a (Sample C13)
Serial Number:	None stated
IMEI Number:	004401220316554
Hardware Version Number:	Rev B
Software Version Number:	820PVA11
FCC ID Number:	UCE207003A
Country of Manufacture:	Japan
Date of Receipt:	29 August 2007

1.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

1.4. Accessories

The following accessories were supplied with the EUT during testing.

Description:	Personal Hands free kit
Brand Name:	Panasonic
Model Name or Number:	None stated
Serial Number:	None stated
Cable Length and Type:	1.8m, Multicore
Connected to Port	Audio port unique to manufacturer

Accessories (Continued)

Description:	Micro SD memory Card
Brand Name:	Panasonic
Model Name or Number:	Micro SD
Serial Number:	None stated
Cable Length and Type:	Not applicable, fitted internally
Connected to Port	Dedicated Micro SD

Description:	AC Charger
Brand Name:	JET Kyushu Mitsumi
Model Name or Number:	ZTDAA1
Serial Number:	None stated
Cable Length and Type:	2m, Charger Cable
Connected to Port	Charger port on EUT

1.5. Support Equipment

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

1.6. Additional Information Related to Testing

Intended Operating Environment:	Within GSM coverage		
Equipment Category:	*Bluetooth*, GSM/GPRS		
Type of Unit:	Portable (standalone battery powered device)		
Power Supply Requirement:	Internal battery supply of 3.7 V		
Maximum Power Output (ERP)	+8.2 dBm		
Temperature Range and Humidity over which test were performed:	22ºC to 24ºC		
	38% to 40%		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480
Receive Frequency Range:	2402 MHz to 2480 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

1.7. Port Identification

Port	Description
1	Charge/Data
2	Audio PHF
3	Micro SD

2. Test Specification, Methods and Procedures

2.1. Test Specification

Reference:	FCC Part 15.247: 2006 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR15) (Intentional Radiators operating within the band 2400 MHz to 2483.5 MHz)

2.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (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.

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

2.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above.

3. Deviations from the Test Specification

There were no deviations from the test specification.

4. Operation and Configuration of the EUT during Testing

4.1. Operating Modes

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

The EUT was set to transmit in *Bluetooth* mode, on the top, middle and bottom channels, or hopping over all channels as requested for each test case.

The EUT was set into a *Bluetooth* receiver mode.

4.2. Configuration and Peripherals

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

The EUT was connected to the AC charger during the final measurements and a wireless link to a *Bluetooth* test set was established.

5. Measurements, Examinations and Derived Results

5.1. 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 6 for details of measurement uncertainties.

5.2. 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, UK.

FCC Site Registration Number: 90895

IC Site Registration Number: 3485

5.3. Test Results

Idle Mode AC Conducted Spurious Emissions

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result(s)
0.214000	Live	31.5	63.0	31.5	Complied
0.254000	Live	36.5	61.6	25.1	Complied
0.258000	Live	36.5	61.5	25.0	Complied
0.290000	Live	36.1	60.5	24.4	Complied
0.514000	Live	25.7	56.0	30.3	Complied
1.686000	Live	23.1	56.0	32.9	Complied
1.786000	Live	23.5	56.0	32.5	Complied
1.882000	Live	22.7	56.0	33.3	Complied
2.930000	Live	23.6	56.0	32.4	Complied
3.474000	Live	26.8	56.0	29.2	Complied

Average Detector Measurements on Live and Neutral Lines

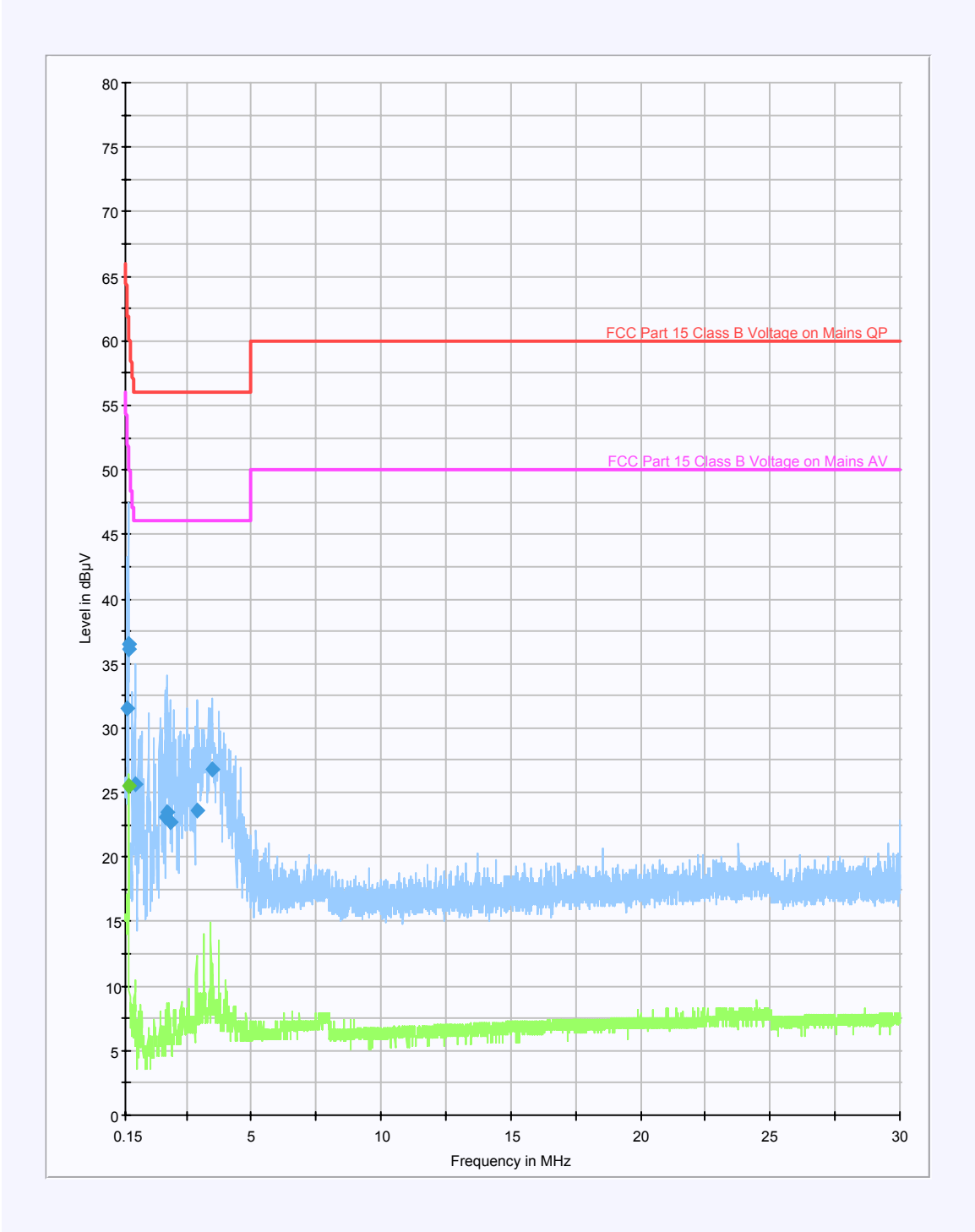
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result(s)
0.290000	L1	25.5	50.5	25.0	Complied

Test Equipment Used:

A1067, A1830, C363, M1263, M166, S212

Idle Mode AC Conducted Spurious Emissions (Continued)

Graph(s):



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

Idle Mode Radiated Spurious Emissions

Results:

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

Frequency (MHz)	Antenna Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
49.082	Vertical	24.8	40.0	15.2	Complied
54.280	Vertical	27.2	40.0	12.8	Complied
79.326	Vertical	16.5	40.0	23.5	Complied
82.841	Vertical	23.4	40.0	16.6	Complied
125.081	Vertical	19.6	43.5	23.9	Complied
151.318	Vertical	17.3	43.5	26.2	Complied
177.447	Vertical	18.0	43.5	25.5	Complied
500.027	Vertical	23.7	46.0	22.3	Complied

Test Equipment Used:

A028, A031, A1037, A1534, A253, A254, A255, A256, A259, A436, C1165, C160, C348, M1242, M1263, M166, S201, S202, S212

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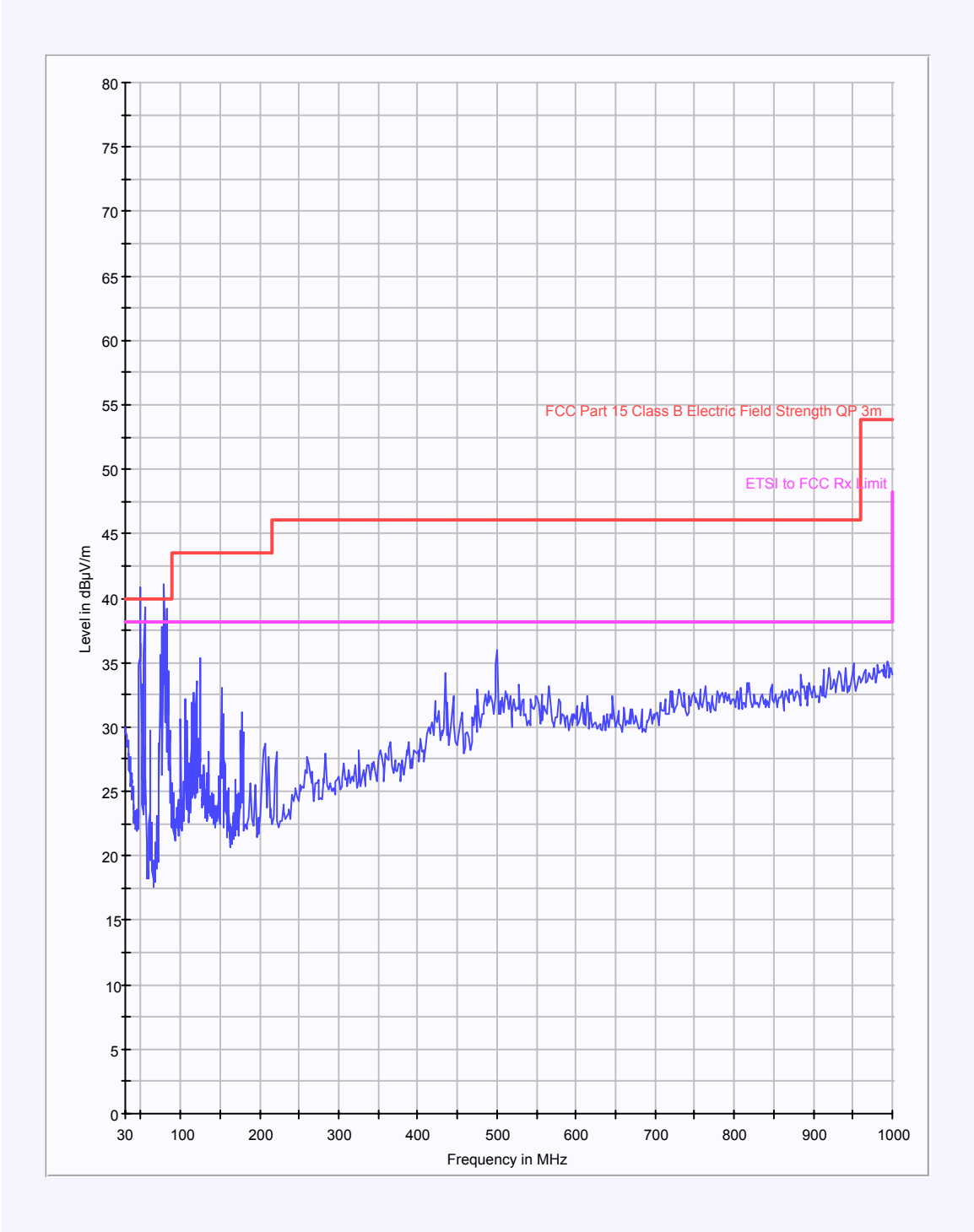
Idle Mode Radiated Spurious Emissions (Continued)

Graph(s):



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

Idle Mode Radiated Spurious Emissions (Continued)

Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 12.75 GHz)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
12.712	Vertical	39.3	5.7	45.0	74.0	29.0	Complied

Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
12.712	Vertical	39.3	5.7	45.0	54.0	9.0	Complied

Note(s):

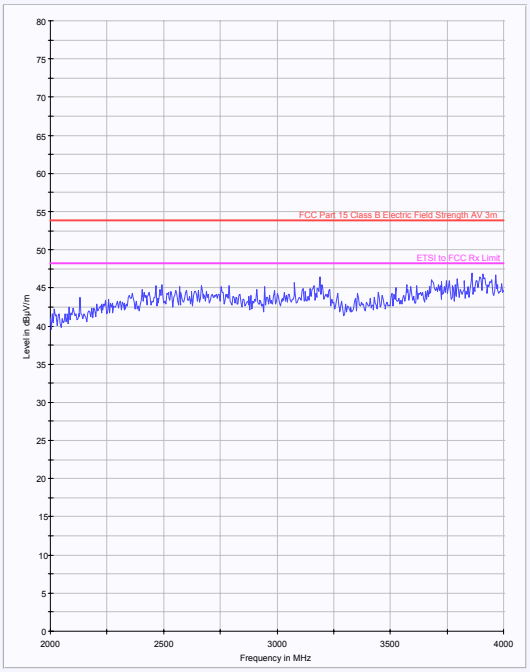
1. *Measurements were performed with a peak detector and are compared to an average limit.*
2. *The pre-scan plot shows a known ambient signal at 10.6 GHz. This is not produced by the EUT.*

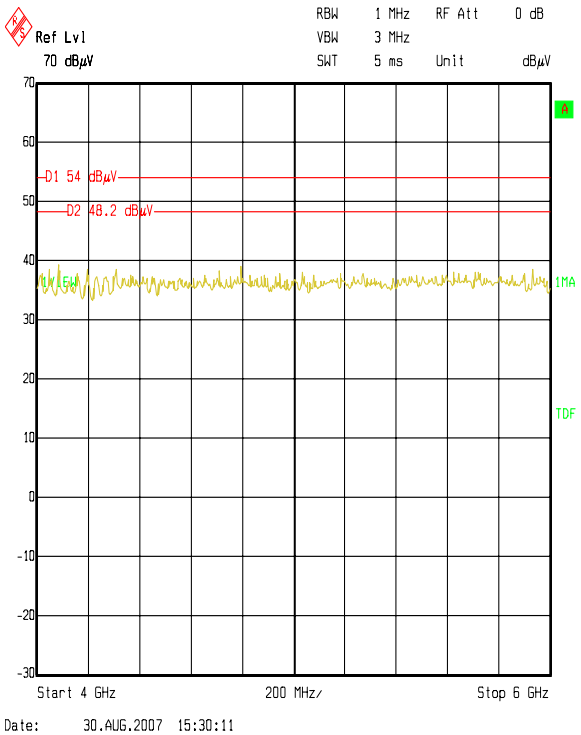
Test Equipment Used:

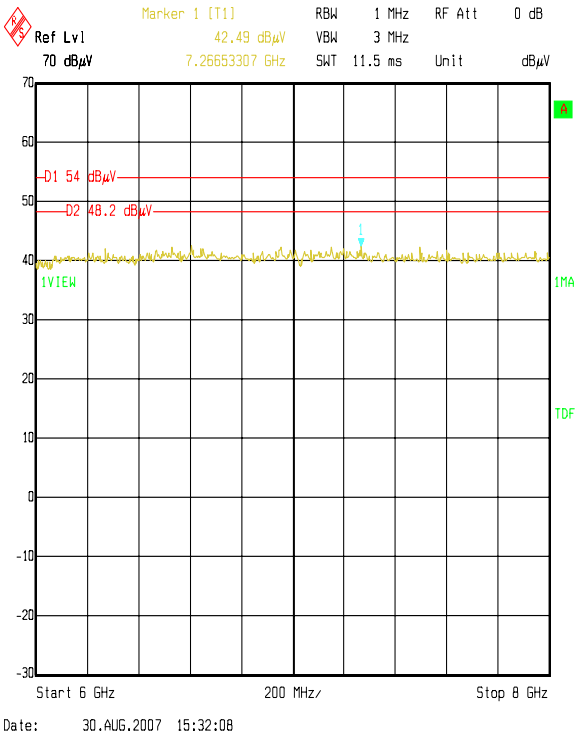
A028, A031, A1037, A1534, A253, A254, A255, A256, A259, A436, C1165, C160, C348, M1242, M1263, M166, S201, S202, S212

Idle Mode Radiated Spurious Emissions (Continued)

Graph(s):







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

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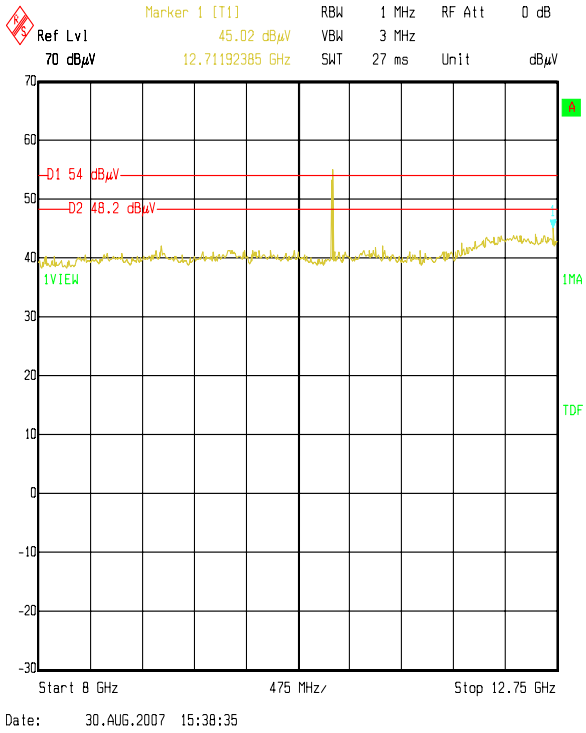
Idle Mode Radiated Spurious Emissions (Continued)

Graph(s):



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

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Transmitter AC Conducted Spurious Emissions

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result(s)
0.218000	Live	48.1	62.9	14.8	Complied
1.526000	Neutral	41.2	56.0	14.8	Complied
1.758000	Neutral	40.9	56.0	15.1	Complied
2.198000	Neutral	38.4	56.0	17.6	Complied
2.834000	Neutral	38.3	56.0	17.7	Complied
3.050000	Live	40.9	56.0	15.1	Complied
3.278000	Live	43.0	56.0	13.0	Complied
3.498000	Live	41.2	56.0	14.8	Complied
3.710000	Live	40.6	56.0	15.4	Complied
3.926000	Live	39.1	56.0	16.9	Complied

Average Detector Measurements on Live and Neutral Lines

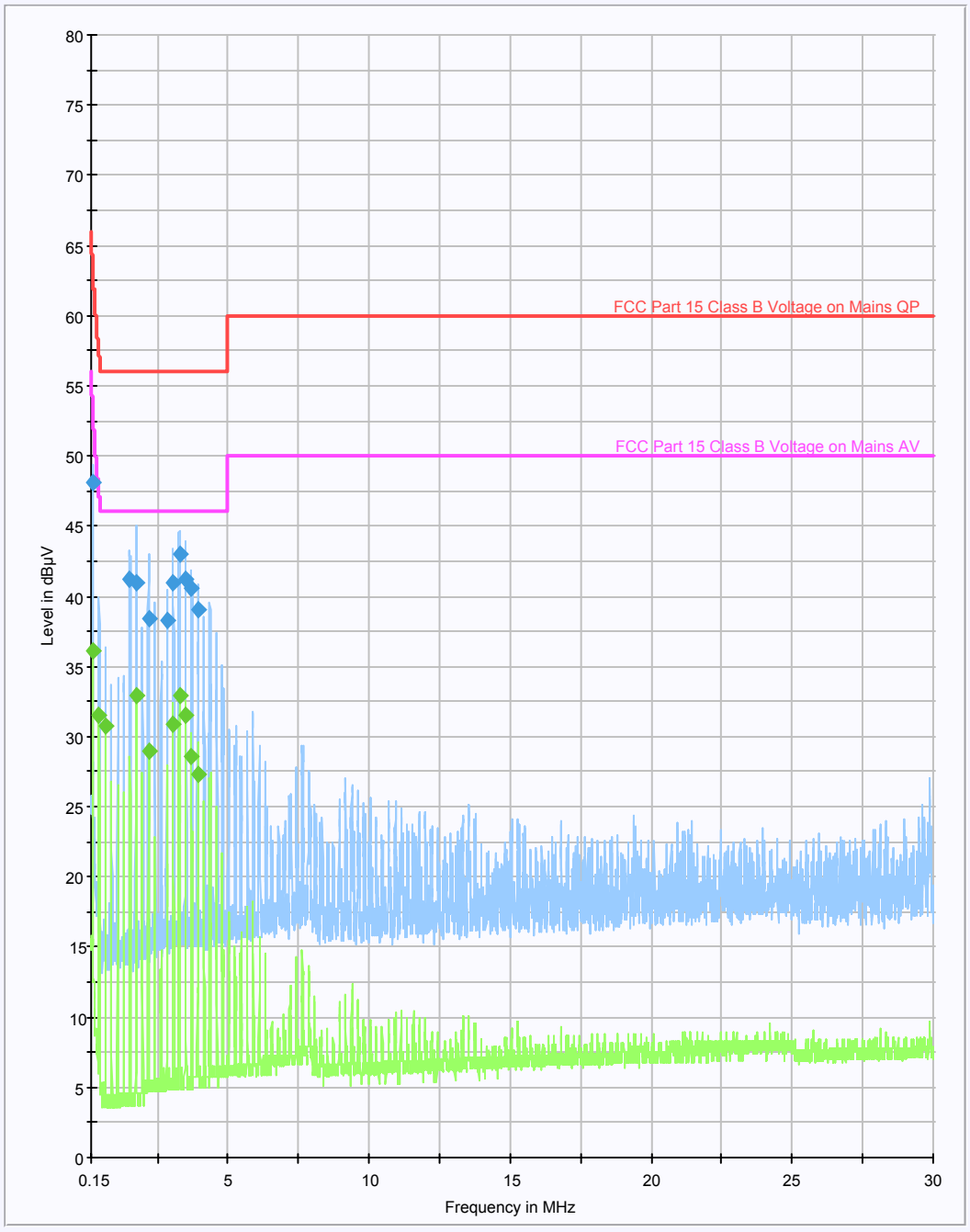
Top Channel

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result(s)
0.218000	Live	36.1	52.9	16.8	Complied
0.438000	Live	31.5	47.1	15.6	Complied
0.658000	Live	30.7	46.0	15.3	Complied
1.746000	Live	32.9	46.0	13.1	Complied
2.182000	Live	29.0	46.0	17.0	Complied
3.058000	Live	30.8	46.0	15.2	Complied
3.274000	Live	32.9	46.0	13.1	Complied
3.490000	Live	31.5	46.0	14.5	Complied
3.714000	Live	28.6	46.0	17.4	Complied
3.930000	Live	27.3	46.0	18.7	Complied

Test Equipment Used:

A1067, A1830, C363, M1263, M166, S212

Transmitter AC Conducted Spurious Emissions (Continued)



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

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Transmitter 20 dB Bandwidth

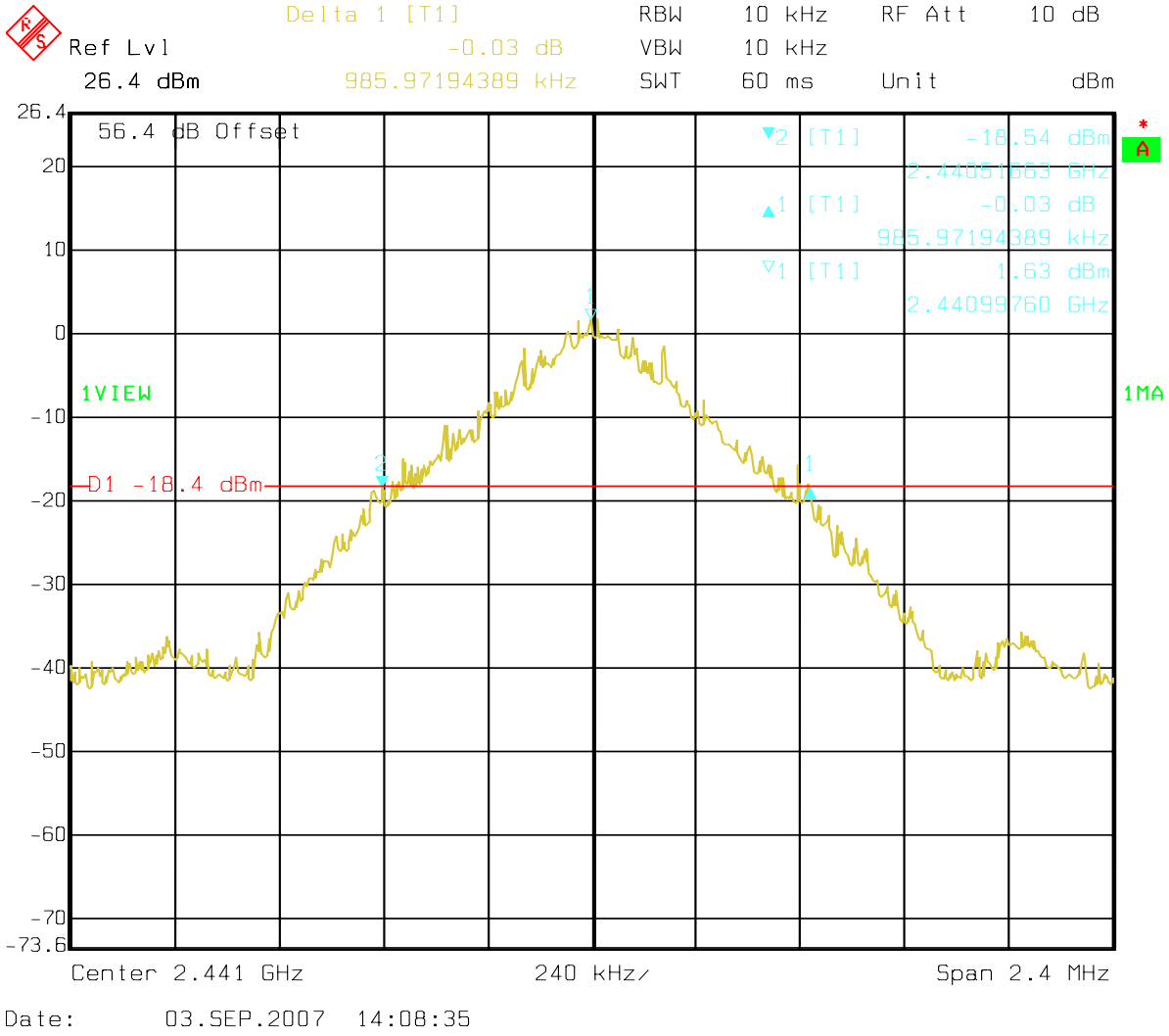
Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
985.972	None specified

Test Equipment Used:

C1192, M127, S207

Graph(s):



Test of: **Panasonic Mobile Comms Dev of Europe Ltd**
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To: **FCC Part 15.247: 2006 (Subpart C)**

Transmitter Carrier Frequency Separation

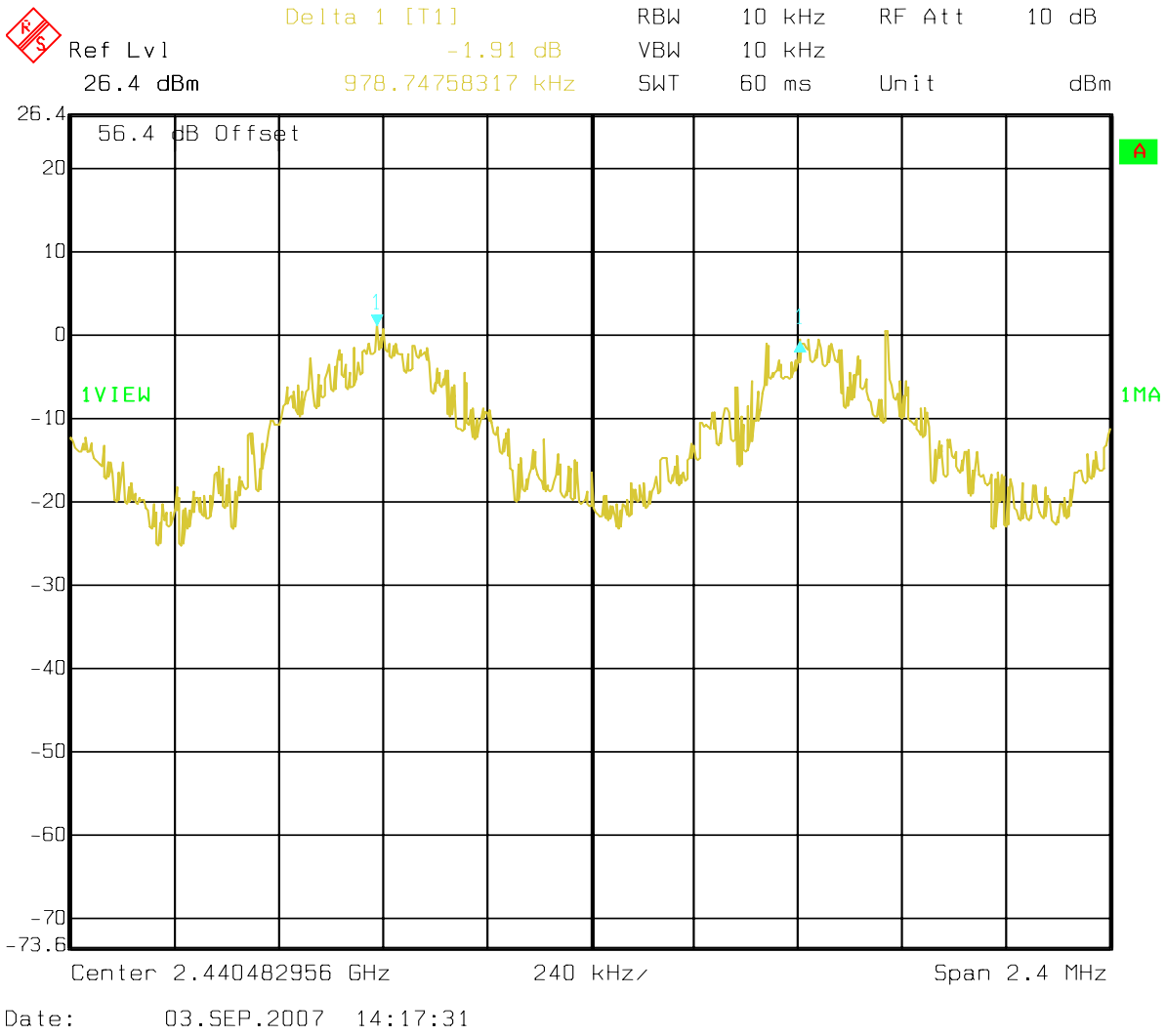
Results:

Transmitter Carrier Frequency Separation (kHz)	Limit (> $^2/_3$ of 20 dB BW) (kHz)	Margin (kHz)	Result(s)
978.748	657.315	321.433	Complied

Test Equipment Used:

C1192, M127, S207

Graph(s):



Transmitter Average Time of Occupancy

Results:

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result(s)
2905.812	74	0.215	0.4	0.185	Complied

Test Equipment Used:

C1192, M127, S207

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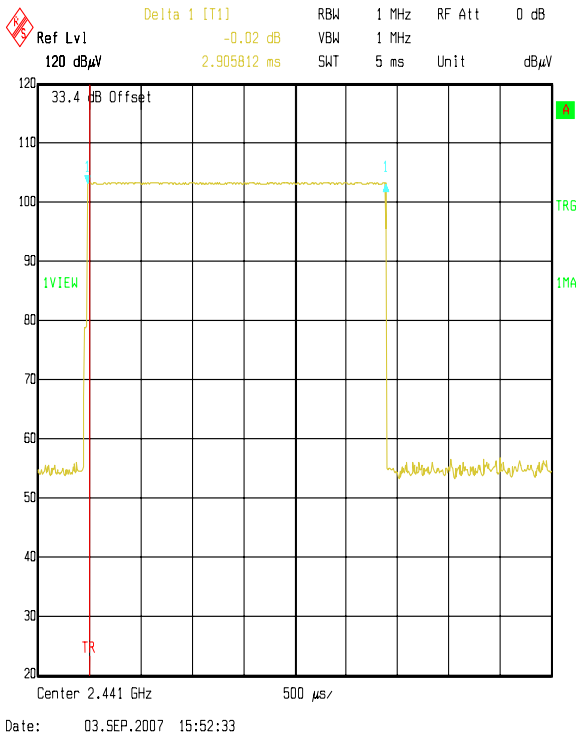
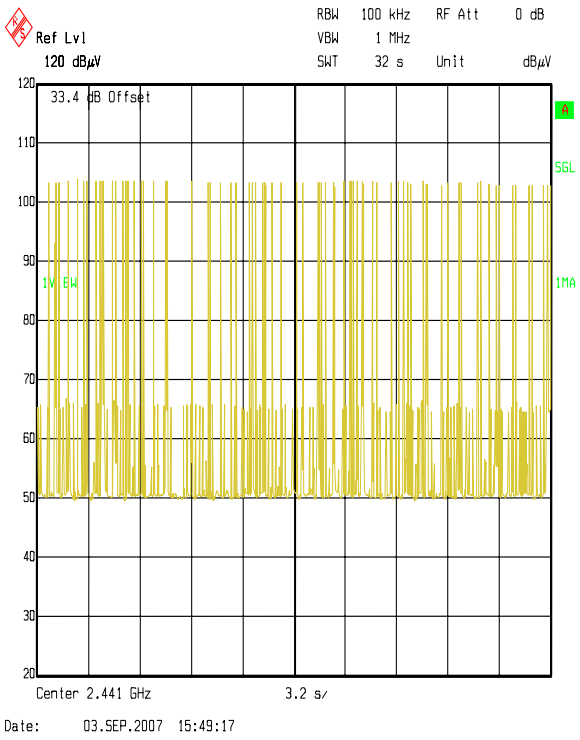
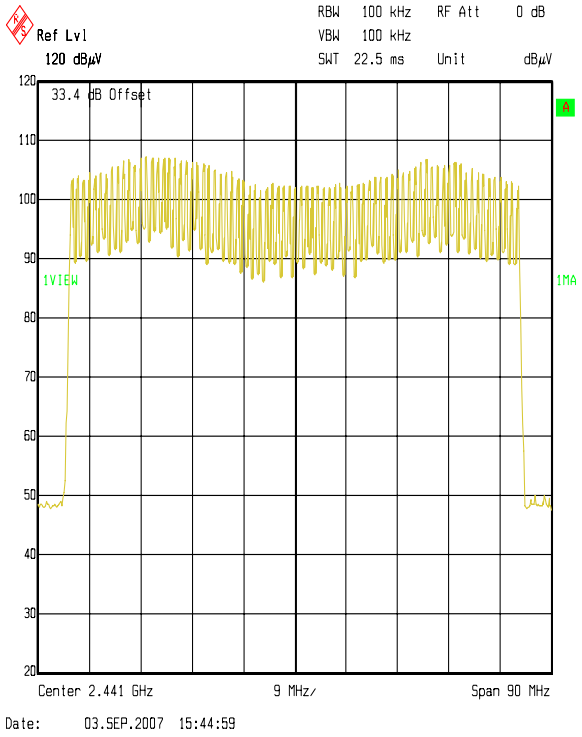
Transmitter Average Time of Occupancy

Graph(s):







Transmitter Maximum Peak Output Power: (EIRP)

Results:

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result(s)
Bottom	8.2	30.0	21.8	Complied
Middle	8.0	30.0	22.0	Complied
Top	7.9	30.0	22.1	Complied

Note(s):

1. *These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.*

Test Equipment Used:

A028, A031, A1037, C160, C348, M1263

Transmitter Radiated Emissions

Results:

Electric Field Strength Measurements: 30 MHz to 1000 MHz (emissions occurring in the restricted bands)

Top Channel

Frequency (MHz)	Antenna Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
119.880	Vertical	18.1	43.5	25.4	Complied

Note(s):

1. *The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.*

Test Equipment Used:

A028, A031, A1037, A1534, A253, A254, A255, A256, A259, A436, C1165, C160, C348, M1242, M1263, M166, S201, S202, S212

Transmitter Radiated Emissions

Results:

Electric Field Strength Measurements: 30 MHz to 1000 MHz (emissions outside the restricted bands)

Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result(s)
48.461	Vertical	23.9	83.1	59.2	Complied
53.002	Vertical	26.9	83.1	56.2	Complied
77.795	Vertical	18.0	83.1	65.1	Complied
87.114	Vertical	17.7	83.1	65.4	Complied
155.050	Vertical	16.9	83.1	66.2	Complied
177.595	Vertical	18.0	83.1	65.1	Complied
513.587	Vertical	24.7	83.1	58.4	Complied

Note(s):

1. *The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.*

Test Equipment Used:

A028, A031, A1037, A1534, A253, A254, A255, A256, A259, A436, C1165, C160, C348, M1242, M1263, M166, S201, S202, S212

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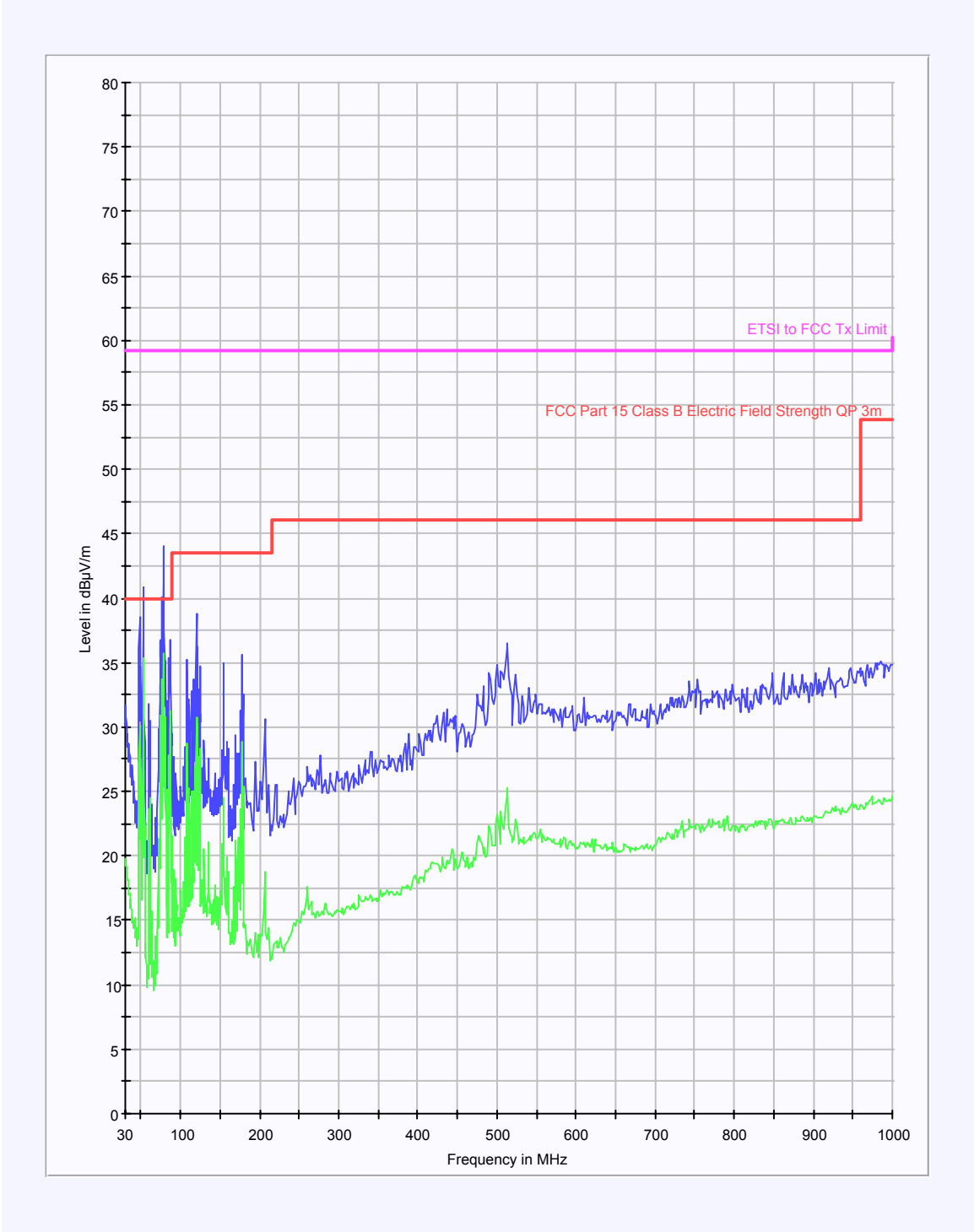
Transmitter Radiated Emissions (Continued)

Graph(s):



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

Transmitter Radiated Emissions (Continued)

Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 26.5 GHz) (emissions occurring in the restricted bands)

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
4.804	Vertical	58.8	-3.3	55.5	74.0	18.5	Complied

Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
4.804	Vertical	40.7	-3.3	37.4	54.0	16.6	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
4.882	Vertical	59.9	-3.3	56.6	74.0	17.4	Complied

Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
4.882	Vertical	41.4	-3.3	38.1	54.0	12.6	Complied

Transmitter Radiated Emissions (Continued)

Results:

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result(s)
4.960	Vertical	61.1	-3.3	57.8	74.0	16.2	Complied

Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result(s)
4.960	Vertical	42.0	-3.3	38.7	54.0	15.3	Complied

Highest Peak Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result(s)
4.912	Vertical	60.5	-3.3	57.2	74.0	16.8	Complied

Highest Average Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result(s)
4.912	Vertical	41.2	-3.3	37.9	54.0	16.1	Complied

Test Equipment Used:

A028, A031, A1037, A1534, A253, A254, A255, A256, A259, A436, C1165, C160, C348, M1242, M1263, M166, S201, S202, S212

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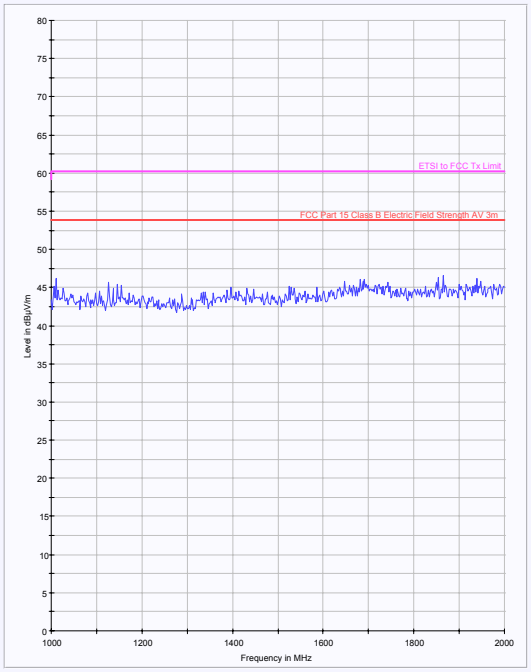
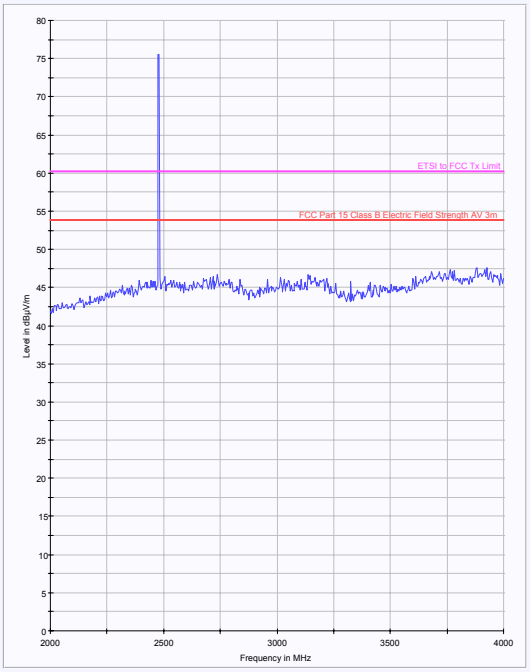
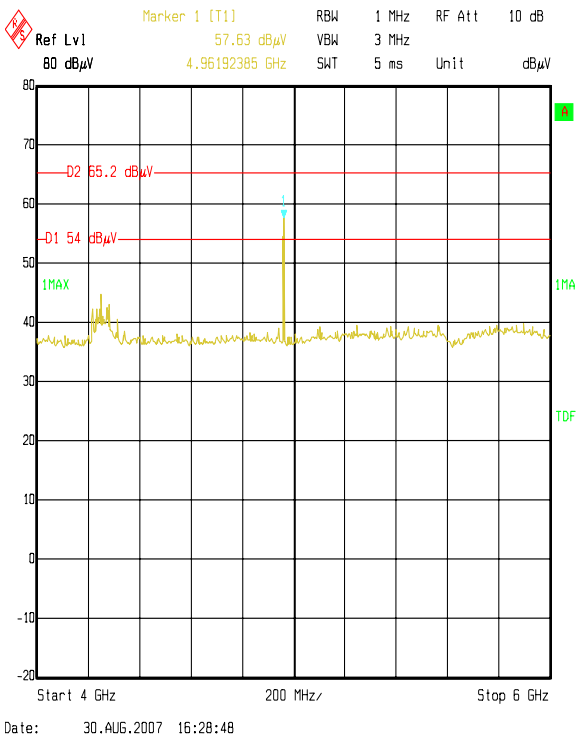
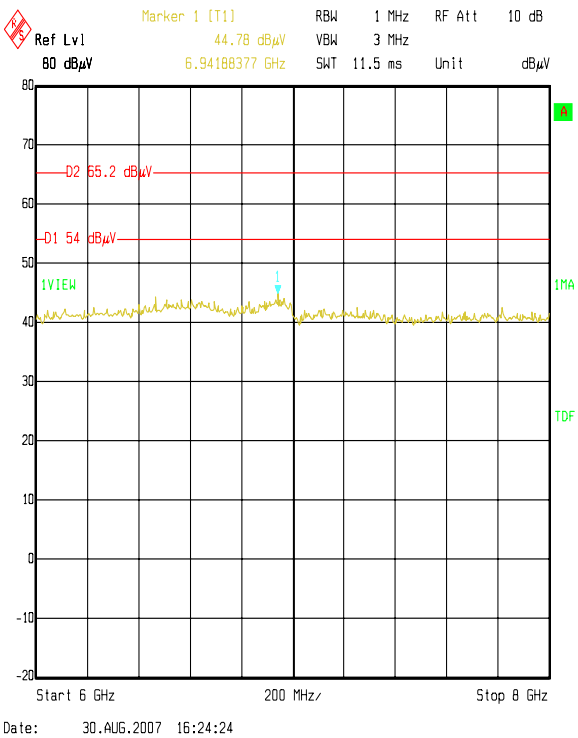
Transmitter Radiated Emissions (Continued)

Graph(s): Static





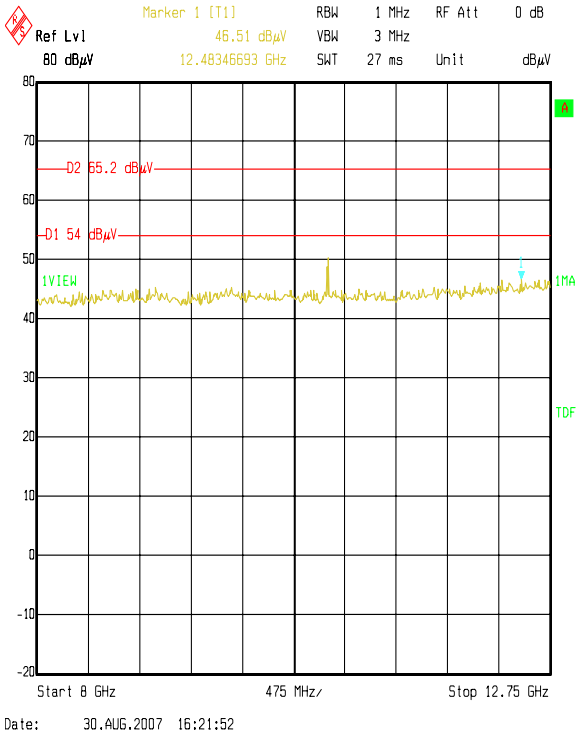


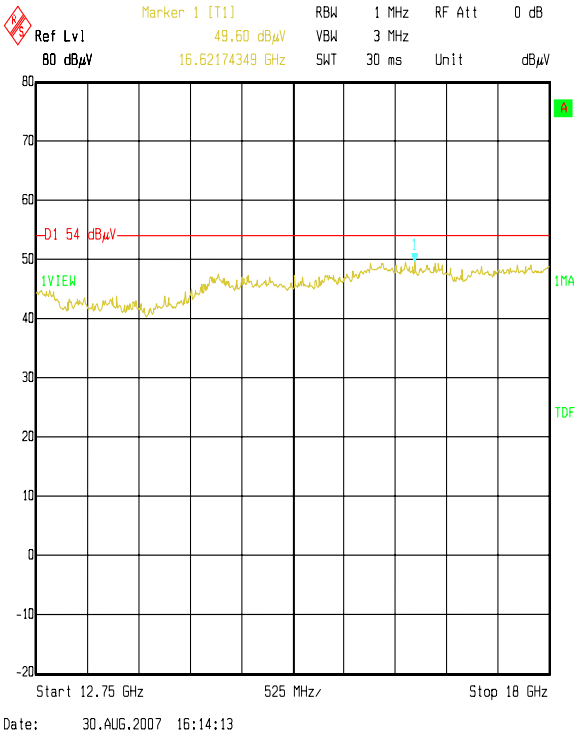


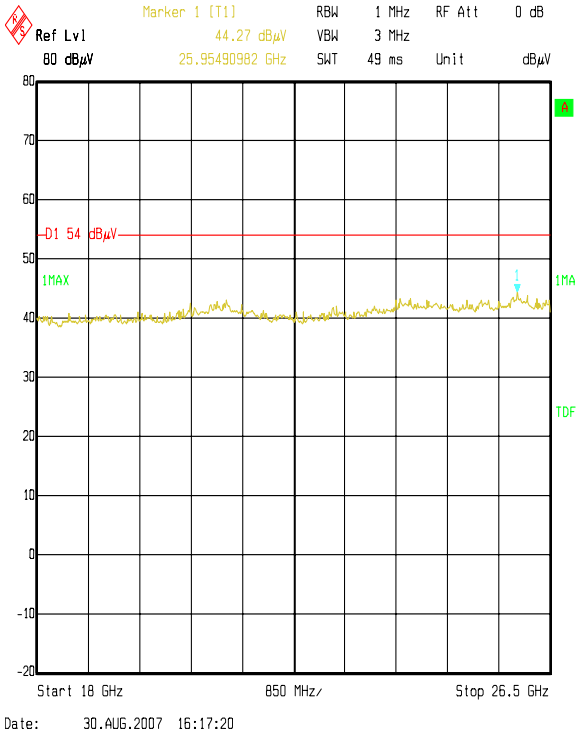
These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions (Continued)

Graph(s): Static







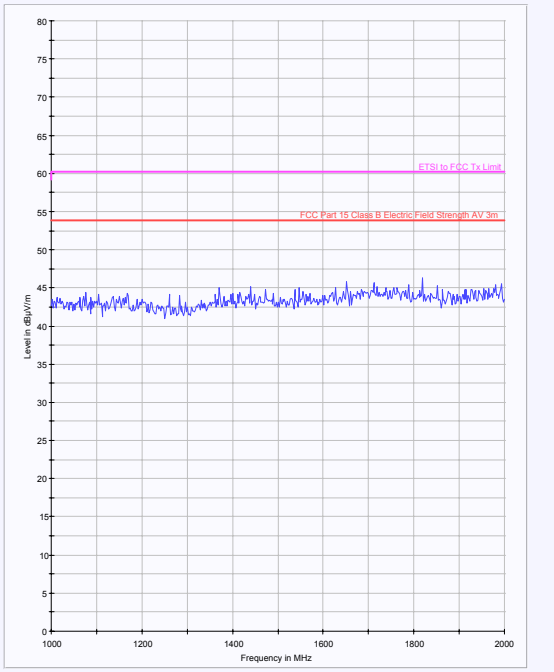
These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

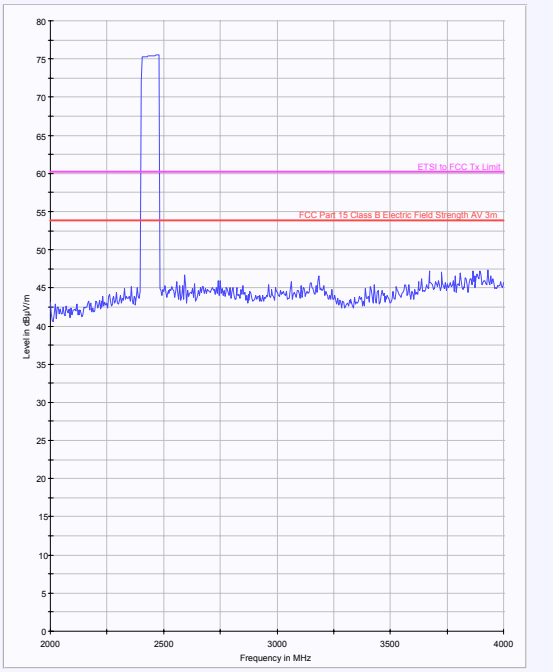
Test of: Panasonic Mobile Comms Dev of Europe Ltd
VS7a Mobile Handset

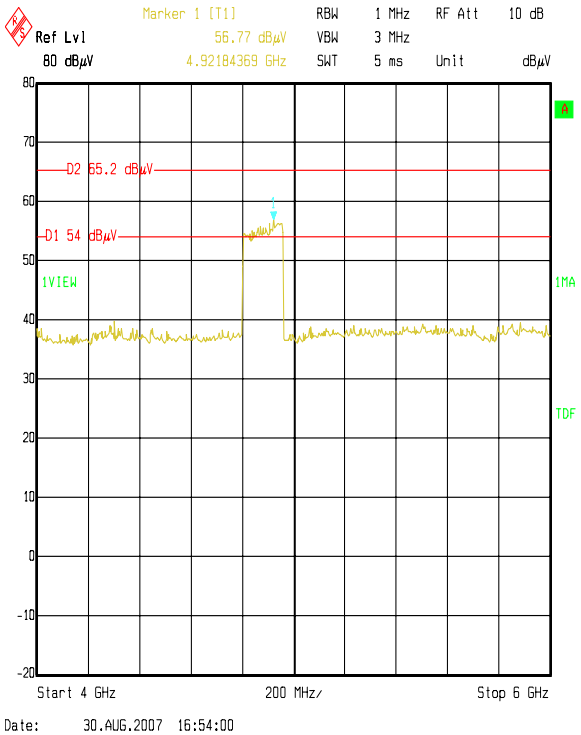
To: FCC Part 15.247: 2006 (Subpart C)

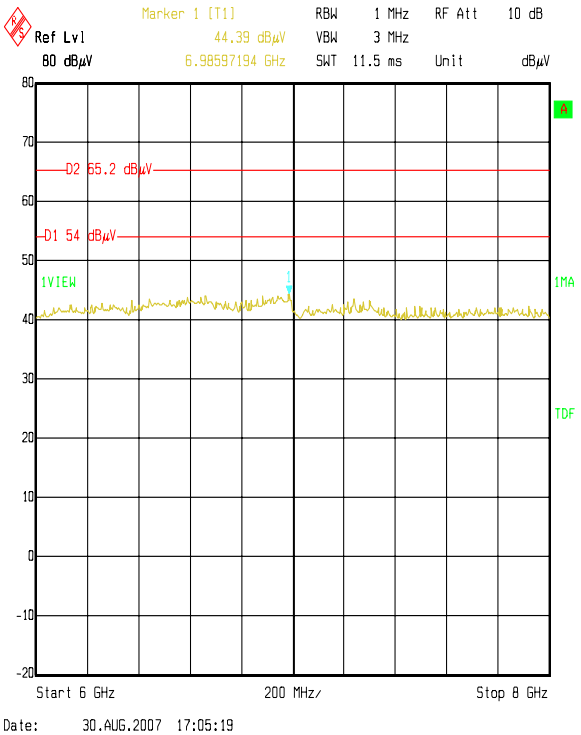
Transmitter Radiated Emissions (Continued)

Graph(s): Hopping









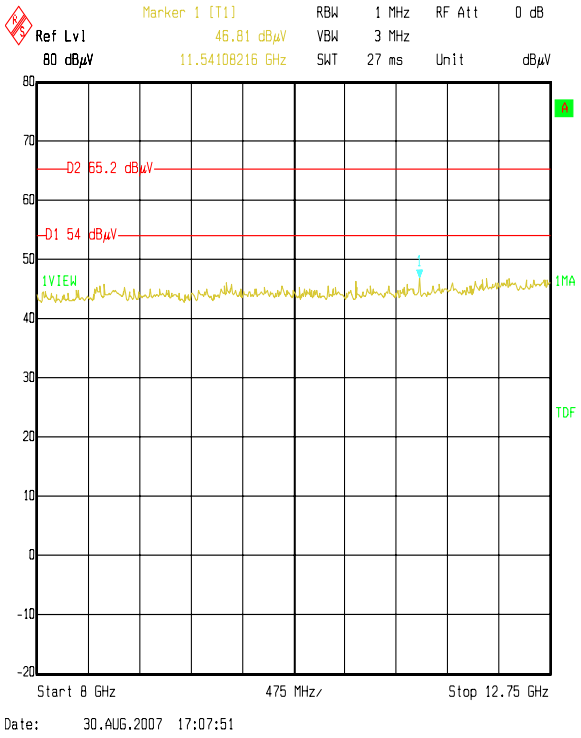
These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

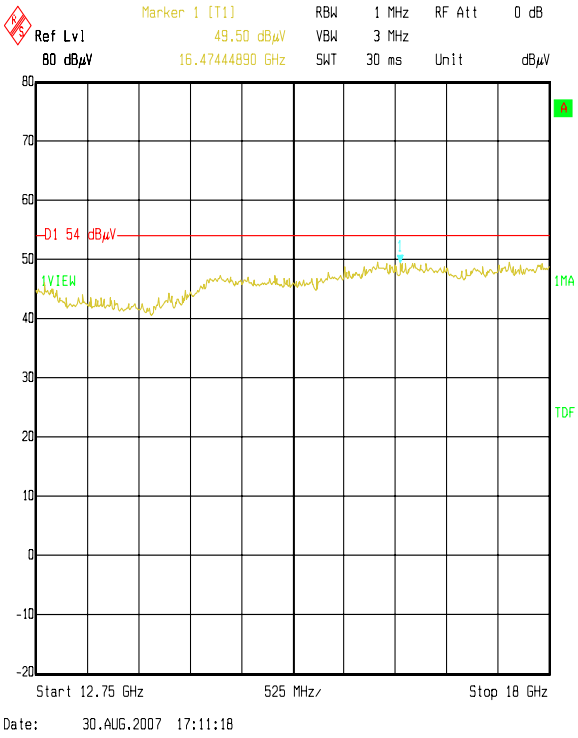
Test of: **Panasonic Mobile Comms Dev of Europe Ltd**
VS7a Mobile Handset

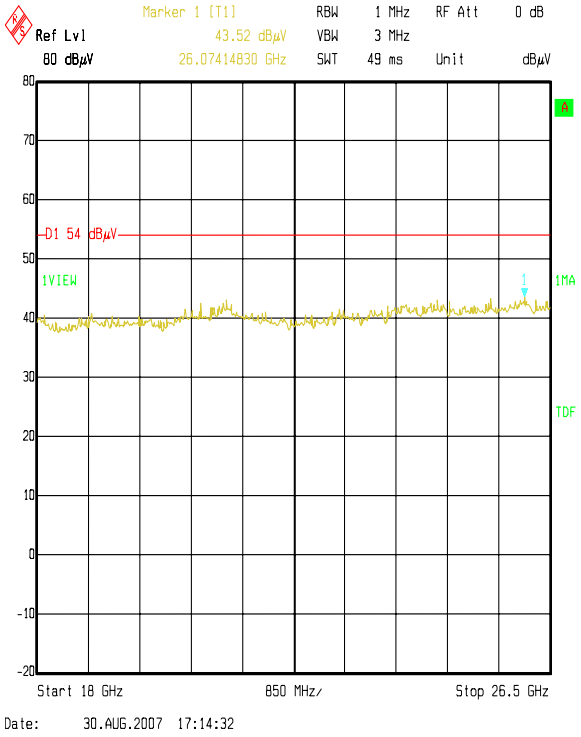
To: **FCC Part 15.247: 2006 (Subpart C)**

Transmitter Radiated Emissions (Continued)

Graph(s): Hopping







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

Transmitter Band Edge Radiated Emissions

Results:

Electric Field Strength Measurements

Peak Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
2.4000	Vertical	55.4	-6.5	48.9	84.4	35.5	Complied
2.4835	Vertical	64.0	-6.5	57.5	74.0	16.5	Complied

Average Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result(s)
2.4835	Vertical	50.8	-6.5	44.3	54.0	9.7	Complied

Note(s):

1. *The band edge at 2.400 GHz in not within a restricted band; therefore the limit is -20 dBc.*
2. *The band edge at 2.4835 GHz is within a restricted band; therefore the limit is that of FCC 15.209.*

Test Equipment Used:

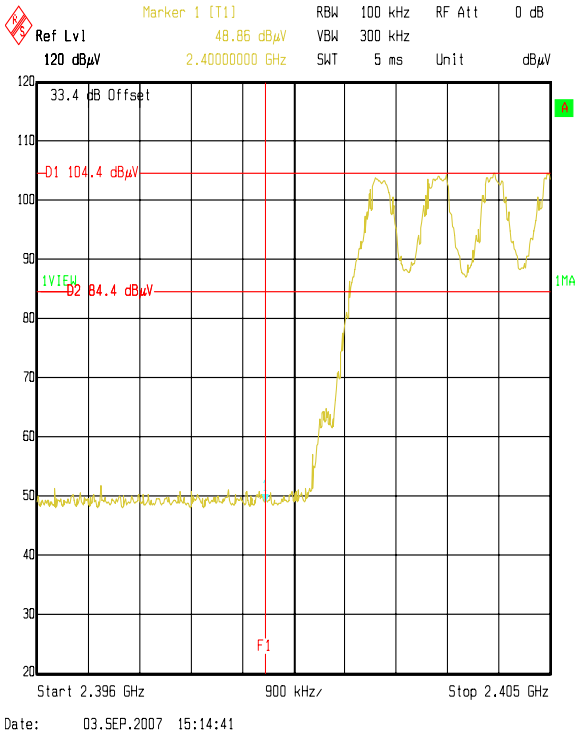
C1192, M127, S207

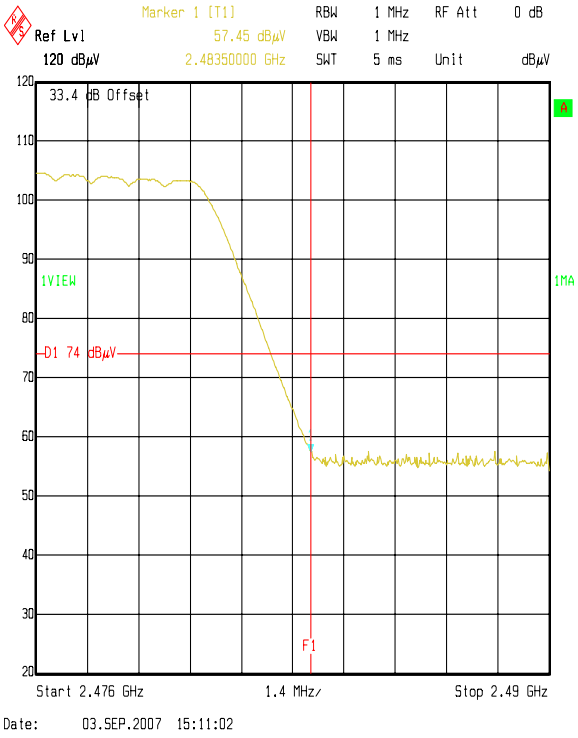
Test of: Panasonic Mobile Comms Dev of Europe Ltd
VS7a Mobile Handset

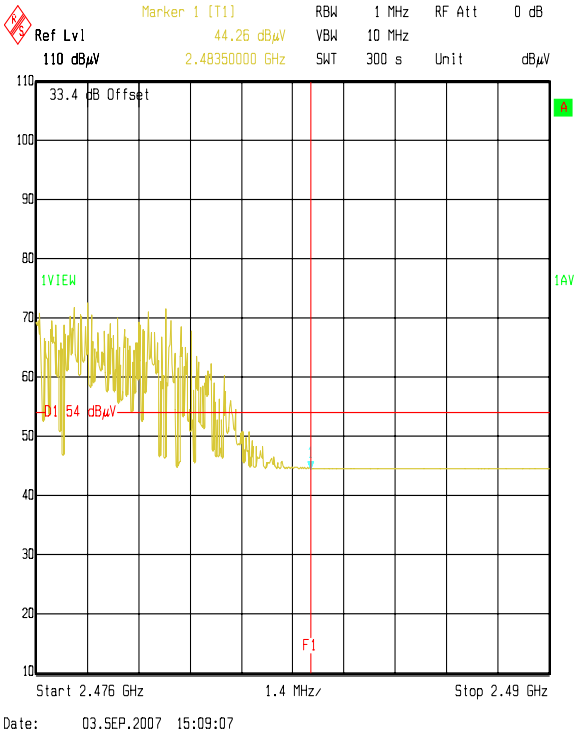
To: FCC Part 15.247: 2006 (Subpart C)

Transmitter Band Edge Radiated Emissions (Continued)

Graph(s):







Transmitter Band Edge Radiated Emissions (Continued)

Results:

Peak Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result(s)
2.4000	Vertical	55.4	-6.5	48.9	84.0	35.1	Complied
2.4835	Vertical	64.2	-6.5	57.7	74.0	16.3	Complied

***Note:** -20 dBc limit*

Average Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result(s)
2.4835	Vertical	56.4	-6.5	49.9	54.0	4.1	Complied

Note(s):

1. *The band edge at 2.400 GHz in not within a restricted band; therefore the limit is -20 dBc.*
2. *The band edge at 2.4835 GHz is within a restricted band; therefore the limit is that of FCC 15.209.*

Test Equipment Used:

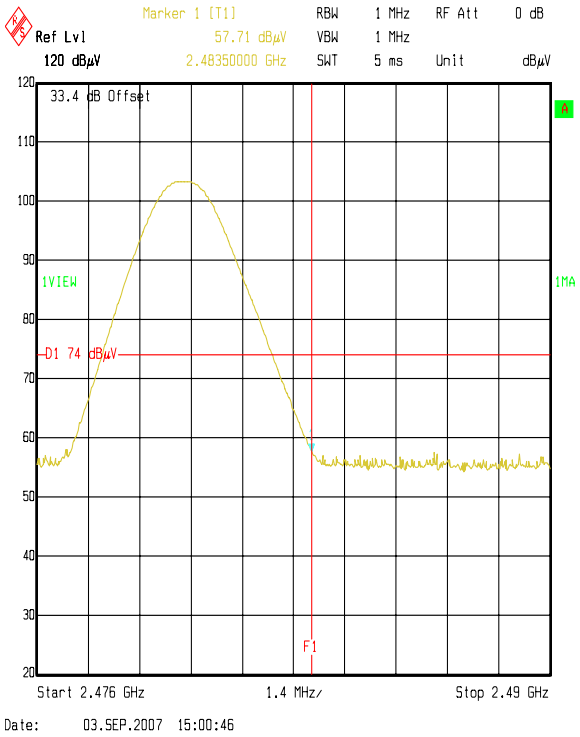
C1192, M127, S207

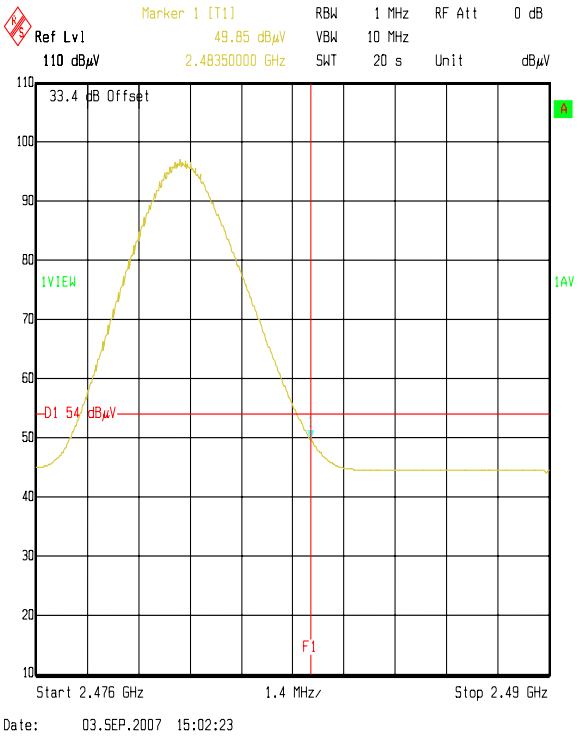
Test of: **Panasonic Mobile Comms Dev of Europe Ltd**
VS7a Mobile Handset

To: **FCC Part 15.247: 2006 (Subpart C)**

Transmitter Band Edge Radiated Emissions (Continued)

Graph(s):





6. 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
Transmitter Maximum Peak Output Power	Not Applicable	95%	±2.94 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	±0.28 dB
Transmitter Carrier Frequency Separation	Not Applicable	95%	±11.4 ppm
Transmitter Average Time of Occupancy	Not Applicable	95%	±0.3 ns
20 dB Bandwidth	Not Applicable	95%	± 11.4 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±4.64 dB
Radiated Spurious Emissions	1 GHz to 40 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.

7. Measurement Methods

7.1. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 110V 60 Hz ac mains supplied via a line impedance stabilisation network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

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

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	>1 s
Observation Time:	Not applicable	>15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

7.2. Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed 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.

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. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a quasi peak detector for measurements below 1000 MHz and an average and peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

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.

All measurements on the open area test site were performed using broadband antennas in both vertical and horizontal polarisations.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horn antennas.

Radiated Emissions (Continued)

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.

Scans were performed to the upper frequency limits as stated in section 15.33.

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

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

Receiver Function	Initial Scan	Final Measurements <1 GHz	Final Measurements ≥1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz <1 GHz) (1 MHz ≥1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

7.3. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the bandwidth and separation of each transmission channel the measurement analyser was configured to measure two adjacent channels whilst the EUT was in hopping mode. The spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak points on the two adjacent channels were noted and the separation between them recorded.

To determine the occupied bandwidth, a resolution bandwidth of 10 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of at 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 line intercepted the power envelope of the emission.

7.4. Average Time of Occupancy

The EUT and spectrum analyser was configured for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

First the maximum packet length was determined on the centre channel.

The measurement analyser was configured to the time domain mode by setting the span to zero with a sweep time sufficiently wide enough to measure one pulse.

The EUT was configured to operate in normal mode of operation. The pulse width of one transmission was then recorded. The measurement analyser was then configured in zero span (in the time domain) and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 32 second period was determined by multiplying the number of channels the device operates over (79) by 0.4 seconds.

The number of transmissions within this period was noted and multiplied by the pulse width recorded earlier. This gives the maximum occupancy over 31.6 seconds.

7.5. Equivalent 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 polarity. 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 horn antenna. 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

Equivaalent Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired a 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

7.6. Band Edge Compliance of RF Radiated Emissions

The EUT and spectrum analyser were configured as for radiated measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine band edge compliance, the analyser resolution bandwidth was set to >= 1% of the analyser span. The video bandwidth was set to be ≥ to the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A plot of the lower band edge of the allocated frequency band was produced. A marker was set to the level of the highest in band emission with a limit line set to 20 dB below this. The marker was then placed on the highest out of band emission (the specification states that either the band edge level must be measured or the highest out of band emission, whichever is the greater). The plots show that the highest out of band emission complies with the -20 dBc limit.

The above procedure was then repeated for the upper band edge except that, as the upper band edge fell on a restricted band edge (as defined in section 15.205(a)), the limit for the restricted band was applied instead of the -20 dBc limit, i.e. the general limits defined in section 15.209(a).

Final measurements were performed on the worst-case configuration as described in Part 15.31(i).

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A028	Horn Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1037	Bilog Antenna	Chase EMC Ltd	CBL6112B	2413	20 Sep 2006	12
A1534	Preamplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	8 Jan 2007	12
A253	Horn Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Horn Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Horn Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A256	Horn Antenna	Flann Microwave	18240-20	400	17 Nov 2006	36
A259	Bilog Antenna	Chase	CBL6111	1513	13 Mar 2007	12
A436	Horn Antenna	Flann Microwave	20240-20	330	24 Apr 2006	36
C1165	Cable	Rosenberger	FA210A1020007070	43189-1	05 Jun 2007	12
C1192	Cable	Rosenberger	FA210A1015M3030	27141-07	31 May 2007	12
C160	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Calibrated before use	-
C348	Cable	Rosenberger	UFA210A-1-1181-70x70	2993	Calibrated before use	-
C363	Cable	Rosenberger	RG142	None	Calibrated before use	-
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	08 Sep 2006	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	15 Aug 2007	12
M166	Environment Meter	EuroCom	None	None	19 Apr 2007	12
S201	3m & 10m OATS	RFI	1		25 May 2007	12
S202	3m OATS	RFI	2	S202-15011990	17 Nov 2006	12
S207	PMR Bench Site	RFI	7		Calibrated before use	-
S212	Screened Room	RFI	12		Calibrated before use	-

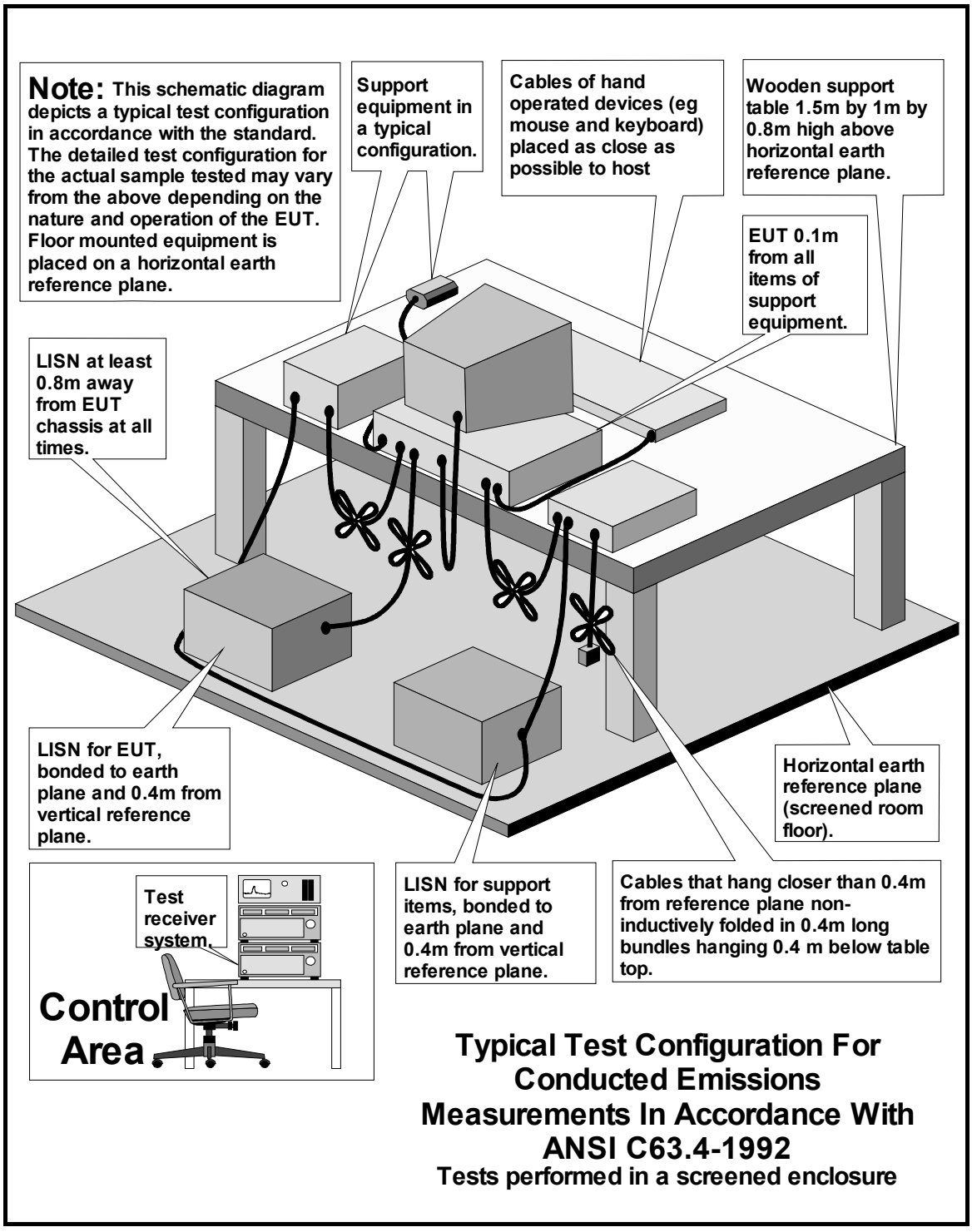
NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule. All equipment was within calibration at the time of the test.

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\72749JD04\EMICON	Test configuration for measurement of conducted emissions.
DRG\72749JD04\EMIRAD	Test configuration for measurement of radiated emissions.

DRG\72749JD04\EMICON



Note: This diagram is also applicable for the latest version of ANSI C63.4-2003

DRG\72749JD04\EMIRAD