TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Datalogic S.p.A
DLBJET portable computer with Bluetooth transceiver

To: FCC Part 15.247: 2005 (Subpart C)

Test Report Serial No:
RFI/MPTE3/RP48517JD03A

Test Report Serial No:
RFI/MPTE2/RP48517JD03A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: 	
Tested By: Ian Watch **pp** 	**Checked By: Michael Derby**  **pp**
Report Copy No: PDF01	
Issue Date: 31 October 2006	**Test Dates: 30 August 2006 to 06 September 2006**

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RFI Global Services Ltd
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001
Email: info@rfi-global.com Website: www.rfi-global.com

Registered in England and Wales. Company number:2117901

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1. Client Information

Company Name:	Datalogic S.p.A
Address:	Via Candini 2 40012 Lippo di Calderara di Reno Bologna Italy
Contact Name:	Mr P Guerzoni

2. Equipment Under Test (EUT)

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

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Datalogic
Model Name or Number:	DLBJET 511-104-455
Serial Number:	D06G02799
Hardware Version:	None Stated
Software Version:	None Stated
FCC ID Number:	OMJ0019
Country of Manufacture:	Italy
Date of Receipt:	30 August 2006

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	USB Data Cable
Brand Name:	None Stated
Model Name or Number:	94A051009
Serial Number:	None Stated
Cable Length and Type:	2m, Multicore
Connected to Port:	Data

Description:	Serial Data Cable
Brand Name:	None Stated
Model Name or Number:	94A051008
Serial Number:	None Stated
Cable Length and Type:	2m, Multicore
Connected to Port:	Data

Description:	AC Charger
Brand Name:	ONTOP
Model Name or Number:	SAL115A-1213U-6
Serial Number:	None Stated
Cable Length and Type:	3.3m, 2 Wire
Connected to Port:	AC Charger

Description:	Handsfree Cable
Brand Name:	None Stated
Model Name or Number:	None Stated
Serial Number:	None Stated
Cable Length and Type:	1m, Multicore
Connected to Port:	Audio

2.3. Description of EUT

The DLBJET model is a battery powered portable computer with *Bluetooth* (2.4 GHz), WI-FI (2.4 GHz), GSM/GPRS radio capabilities. It also has a laser scanner in order to capture a bar code.

The work performed for this report (48517JD03) is to address the *Bluetooth* capabilities.

2.4. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

2.5. Additional Information Related to Testing

Power Supply Requirement:	Nominal 110 V, 60 Hz AC mains supply via AC Charger. Internal battery supply of 7.4V		
Intended Operating Environment:	Within *Bluetooth* coverage.		
Equipment Category:	*Bluetooth* Technology		
Type of Unit:	Portable (Standalone battery powered device)		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Receive Frequency Range:	2402 MHz to 2480 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Maximum Power Output (EIRP)	-1.5 dBm		

2.6. Port Identification

Port	Description	Type
1	Data Port	Multipin (serial and USB)
2	AC Charger Port	2 Pin Socket
3	Audio Port	2.5mm Socket, 3 Wire
4	Handsfree Kit	1m multicore

3. Test Specification

Reference:	FCC Part 15.247: 2005 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR22) (Intentional Radiators operating within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz)

3.1. 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.

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

During the course of testing no deviations were made.

5. Operation of the EUT during Testing

5.1. Operating Modes

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

For all transmit mode measurements the *Bluetooth* test mode was active and set to transmit on top, middle and bottom channels and hopping on all channels as necessary with the longest data packet size.

Receiver mode measurements were performed with the EUT set to receive mode only.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

The EUT was configured with the communication/charger port connected to an external 110 V AC supply via an AC Charger.

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2005 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2005 Section 15.109	Antenna	Complied
Transmitter AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2005 Section 15.207	AC Mains	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2005 Section 15.247(a)(1)	Antenna	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2005 Section 15.247(a)(1)	Antenna	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2005 Section 15.247(a)(1)(iii)	Antenna	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2005 Section 15.247(b)(1)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2005 Sections 15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2005 Sections 15.247(d) & 15.209(a)	Antenna	Complied

6.1. Location of Tests

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

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

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

7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

The EUT was configured as for AC conducted emission measurements as described in section 9 of this report.

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

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

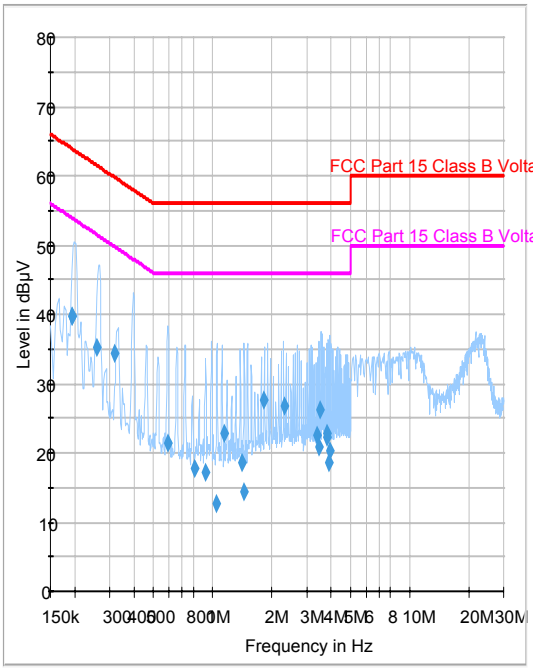
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.194490	Neutral	41.6	63.9	22.3	Complied
0.256733	Live	35.2	61.5	26.3	Complied
0.384289	Neutral	39.8	58.2	18.4	Complied
0.592966	Live	21.4	56.0	34.6	Complied
0.967778	Neutral	29.7	56.0	26.3	Complied
3.393608	Neutral	28.0	56.0	28.0	Complied

Average Detector Measurements on Live and Neutral Lines

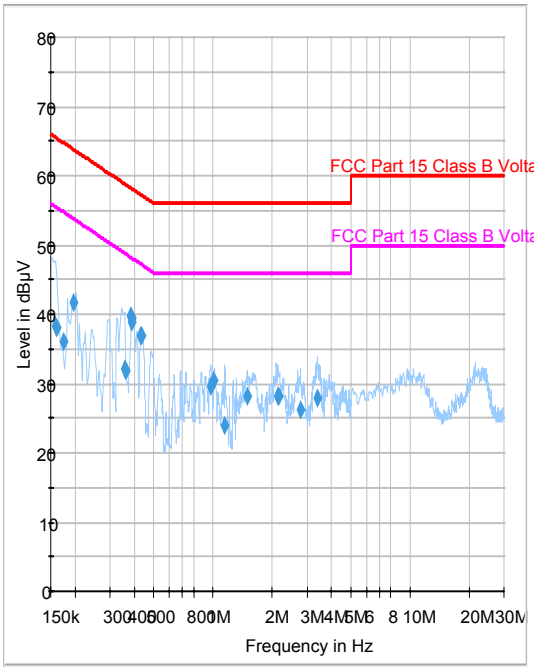
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.194490	Neutral	36.2	53.9	17.7	Complied
0.256733	Live	14.2	51.5	37.3	Complied
0.384289	Neutral	36.7	48.2	11.5	Complied
0.592966	Live	16.3	46.0	29.7	Complied
0.967778	Neutral	23.8	46.0	22.2	Complied
3.393608	Neutral	21.4	46.0	24.6	Complied

Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)

Live



Neutral



Note: These plots are pre-scans 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 for radiated emission testing, as described in section 9 of this report.

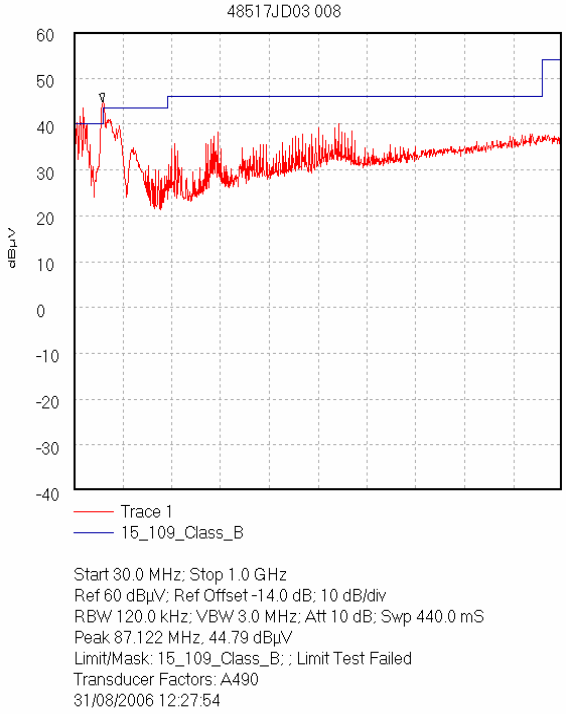
Tests were performed to identify the maximum receiver or standby radiated emission levels.

Results:

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

Frequency (MHz)	Antenna Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
48.760	Horizontal	10.5	40.0	29.5	Complied
85.410	Horizontal	15.7	40.0	24.3	Complied
147.459	Horizontal	27.5	43.5	16.0	Complied

Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



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

7.2.3. Idle Mode Radiated Spurious Emissions: Section 15.109

Results:

Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.04990	Vertical	46.5	-12.6	33.9	74.0	40.1	Complied
2.47329	Vertical	50.8	-11.1	39.7	74.0	34.3	Complied

Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.04990	Vertical	43.2	-12.6	30.6	54.0	23.4	Complied
2.47329	Vertical	44.0	-11.1	32.9	54.0	21.1	Complied

Note(s):

1. *The emissions shown in the 4 GHz to 6 GHz plot are not spurious emissions from the EUT. These are ambient background noise signals.*
2. *The emission at 10.69 GHz in the plot from 8 GHz to 12 GHz is not a spurious emission from the EUT. This is an ambient background noise signal.*

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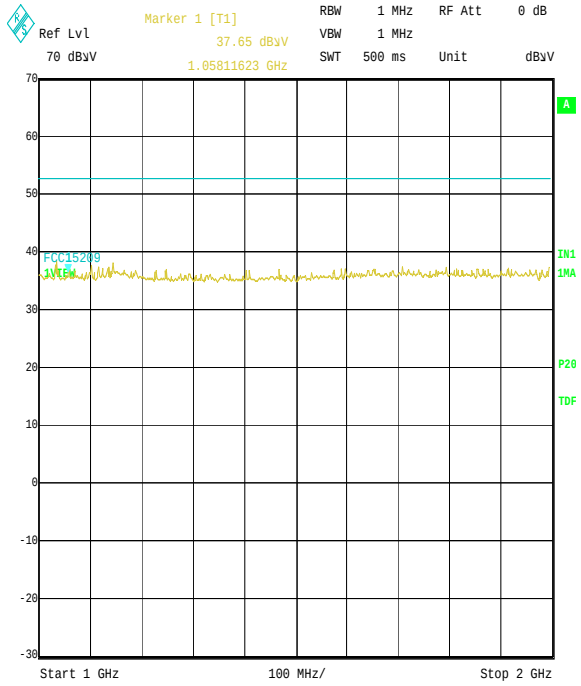
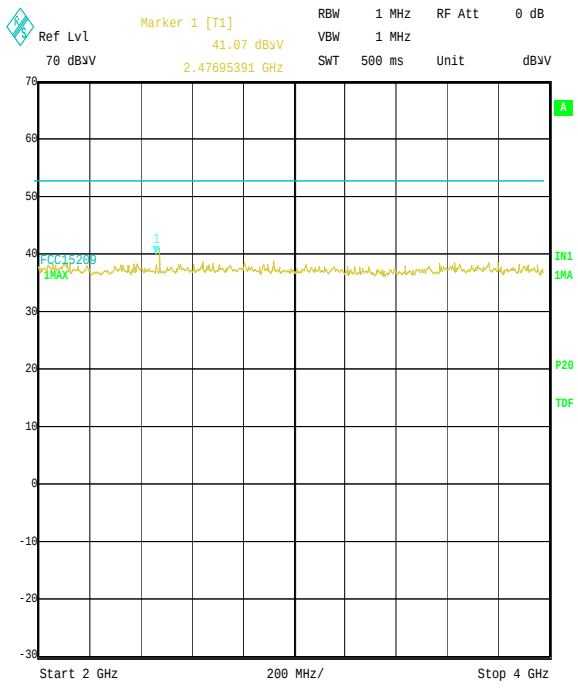
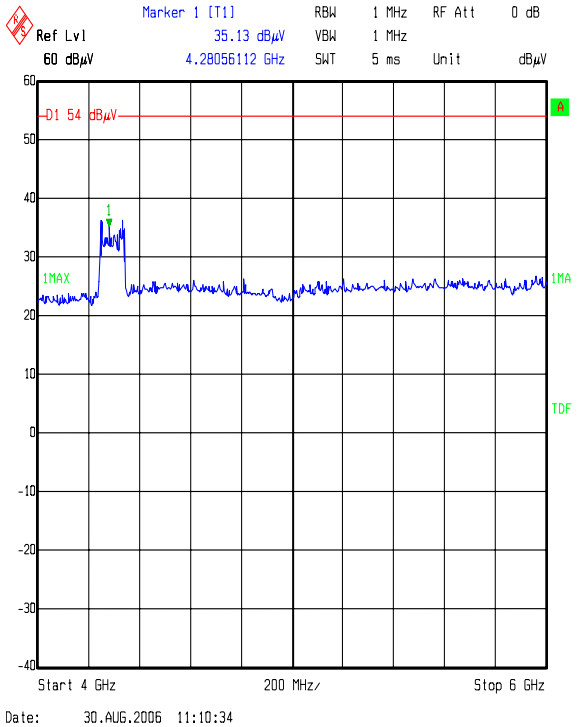
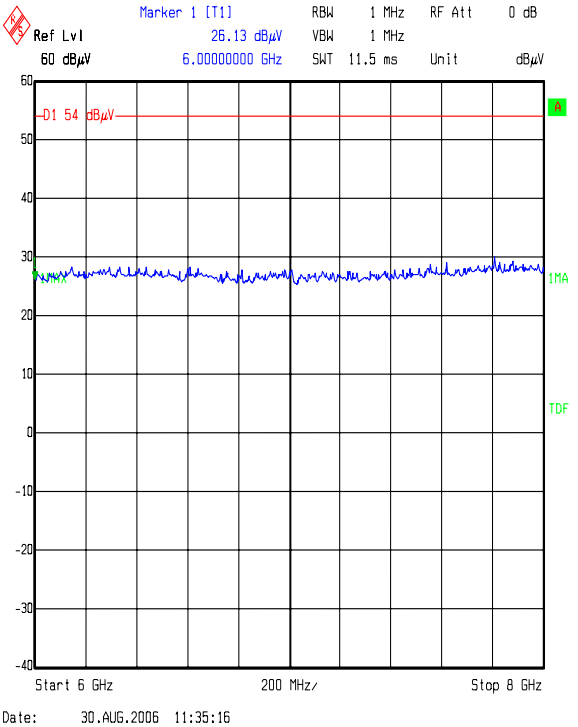
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)









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

Test of: **Datalogic S.p.A**
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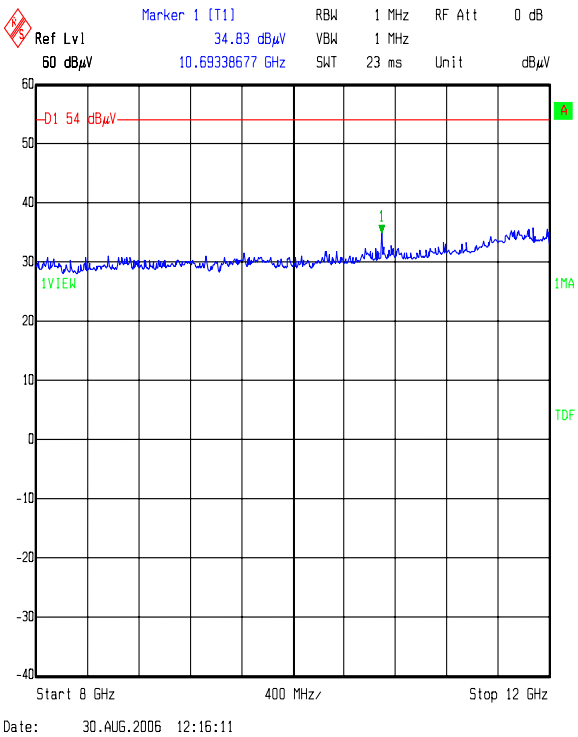
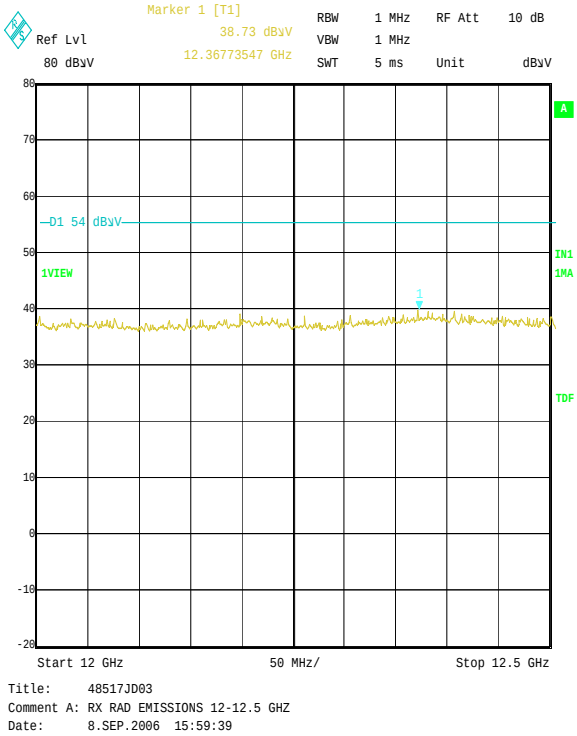
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)





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

7.2.4. Transmitter AC Conducted Spurious Emissions: Section 15.207

The EUT was configured for ac conducted emission measurements, as described in section 9 of this report.

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

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Top Channel

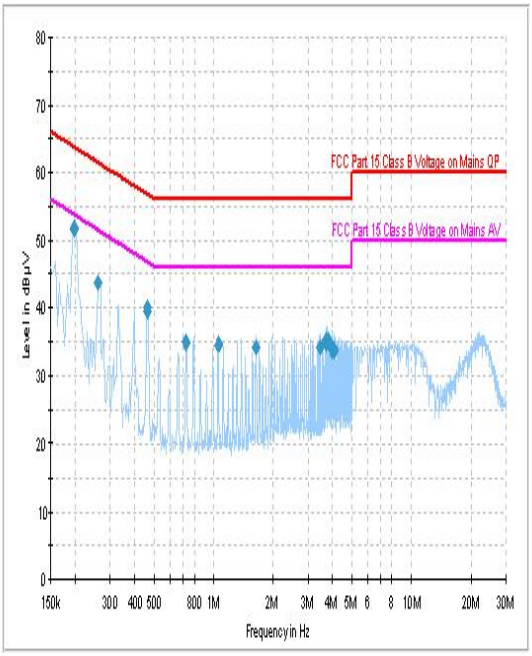
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.196993	Live	51.9	63.7	11.8	Complied
0.459499	Live	39.9	56.7	16.8	Complied
1.638137	Live	34.6	49.8	15.2	Complied
2.620461	Neutral	36.4	56.0	19.6	Complied
3.405471	Neutral	36.4	60.0	23.6	Complied
4.060661	Neutral	36.2	60.0	23.8	Complied

Average Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.196993	Live	42.7	53.7	11.0	Complied
0.459499	Live	38.9	46.7	7.8	Complied
1.638137	Live	32.7	39.8	7.1	Complied
2.620461	Neutral	33.7	46.0	12.3	Complied
3.405471	Neutral	31.6	50.0	18.4	Complied
4.060661	Neutral	31.4	50.0	18.6	Complied

Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)



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

7.2.5. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

The EUT was configured for 20 dB bandwidth measurements, as described in section 9 of this report.

Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
841.683367	None specified

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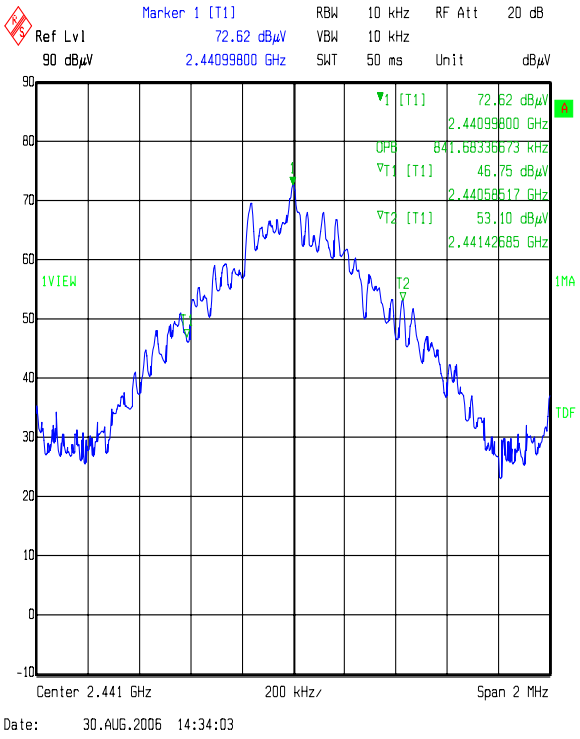
Transmitter 20 dB Bandwidth: Section 15.247(a)(1) (Continued)



7.2.6. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

The EUT was configured for carrier frequency separation measurements, as described in section 9 of this report.

Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit (kHz)	Margin (kHz)	Result
1002.004	841.683	160.321	Complied

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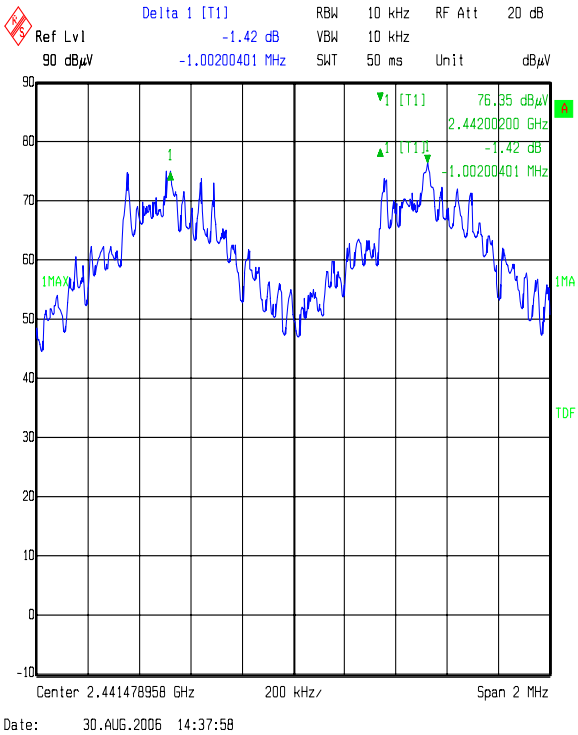
Transmitter Carrier Frequency Separation: Section 15.247(a)(1) (Continued)



7.2.7. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

The EUT was configured for average time of occupancy measurements, as described in section 9 of this report.

Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Results:

Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2939.872	119	0.350	0.4	0.050	Complied

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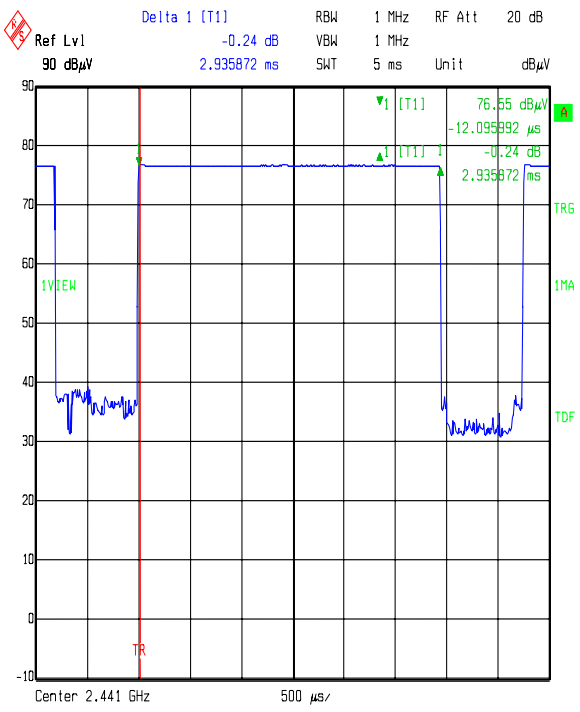
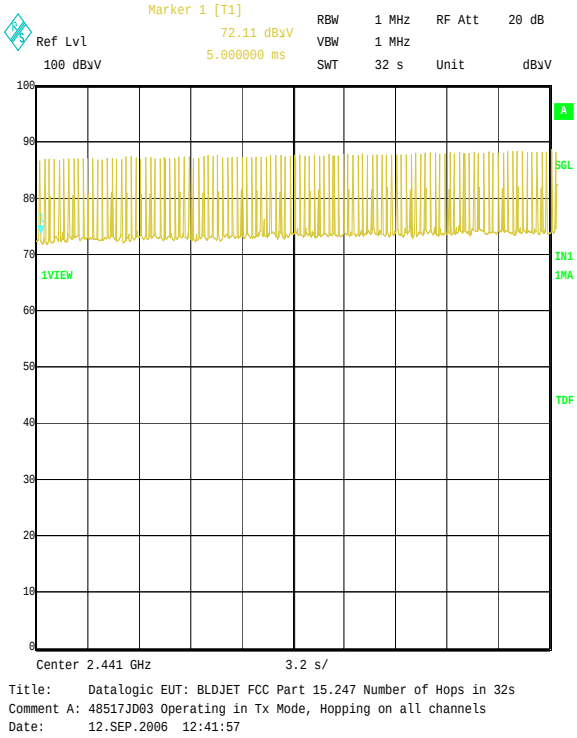
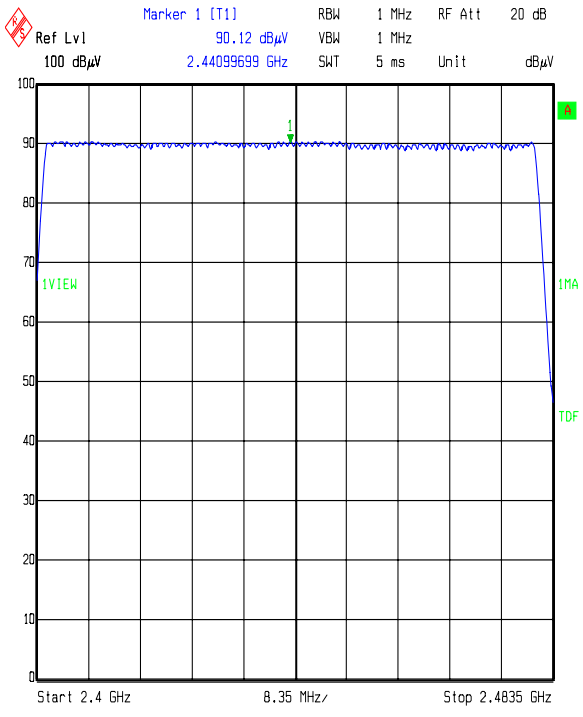
Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)







7.2.8. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1)

The EUT was configured for transmitter peak output power measurements, as described in Section 9 of this report.

Tests were performed to identify the transmitter maximum peak output power (EIRP) of the EUT.

Results:

Battery Powered Devices

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-4.3	30.0	34.3	Complied
Middle	-4.3	30.0	34.3	Complied
Top	-1.4	30.0	31.5	Complied

Note(s):

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

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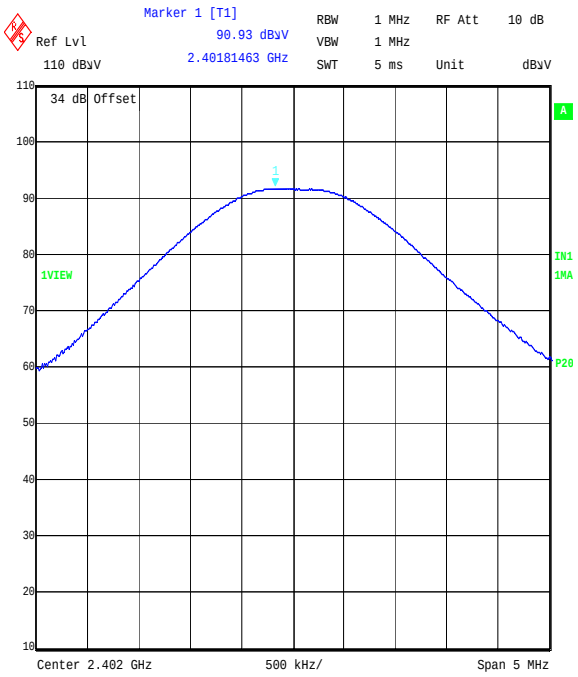
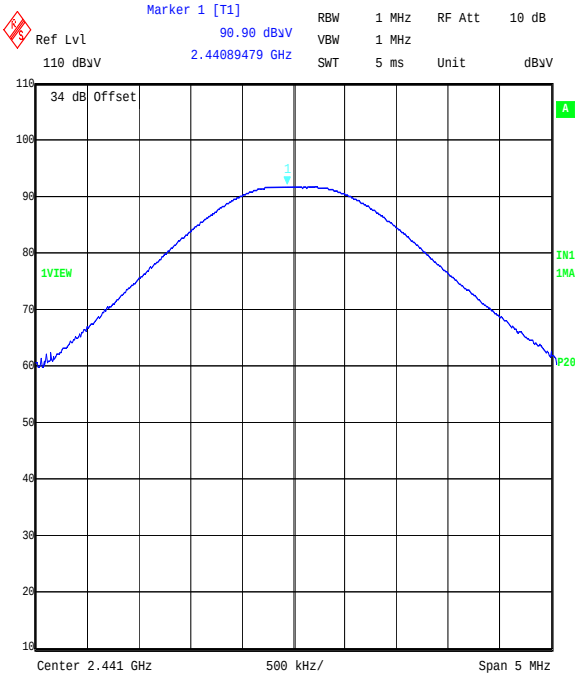
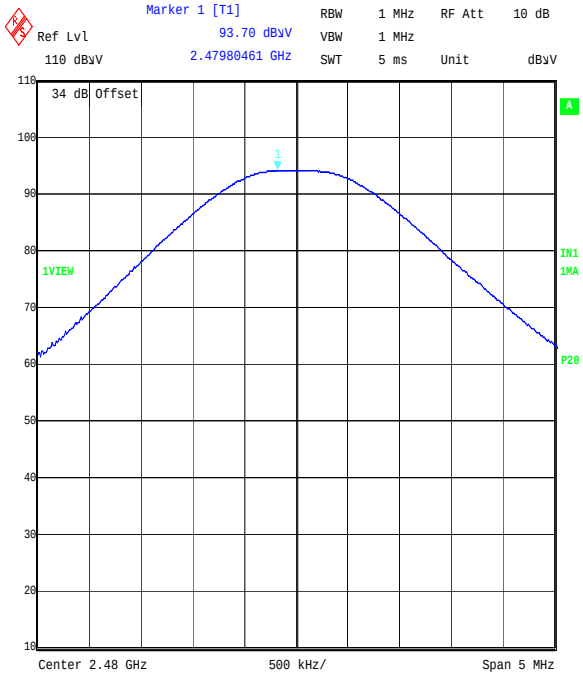
Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)



Title: 48517JD01
Comment A: BOTTOM CHANNEL
Date: 27.SEP.2006 14:31:59



Title: 48517JD01
Comment A: MIDDLE CHANNEL
Date: 27.SEP.2006 14:33:58



Title: 48517JD01
Comment A: TOP CHANNEL
Date: 27.SEP.2006 14:36:15

7.2.9. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a)

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

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

Results:

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

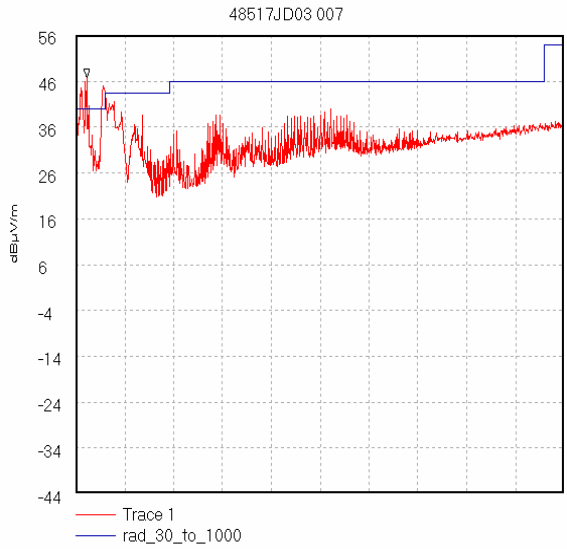
Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
48.754	Vertical	25.4	73.8	48.4	Complied
55.304	Vertical	24.0	73.8	49.8	Complied
86.656	Vertical	30.5	73.8	43.3	Complied
159.220	Vertical	20.1	73.8	53.7	Complied

Note(s):

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

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)



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

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
3.64747	Vertical	54.8	-10.2	44.6	54.0	9.4	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.*

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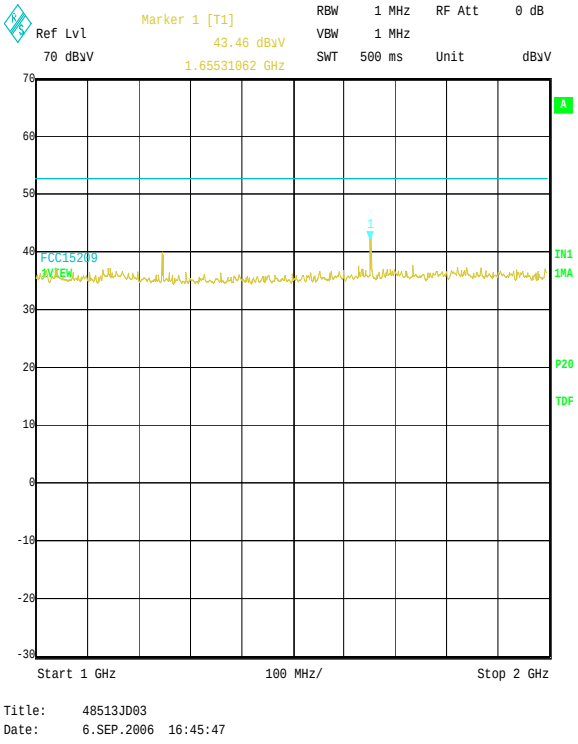
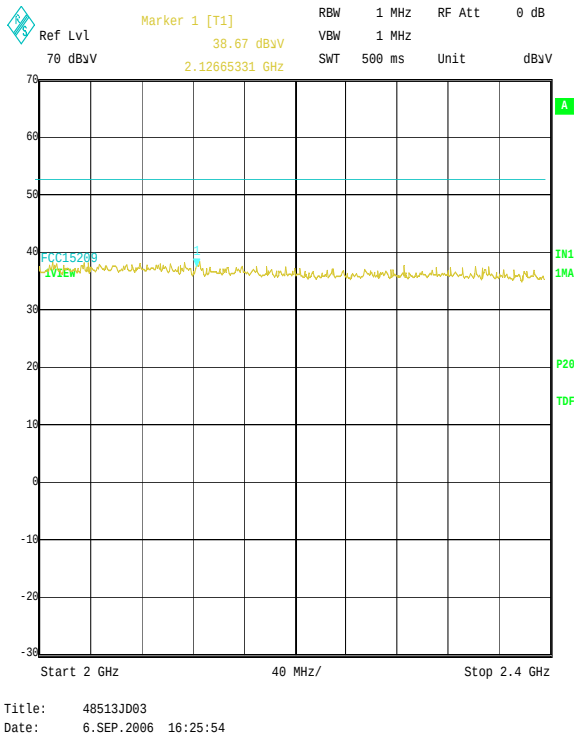
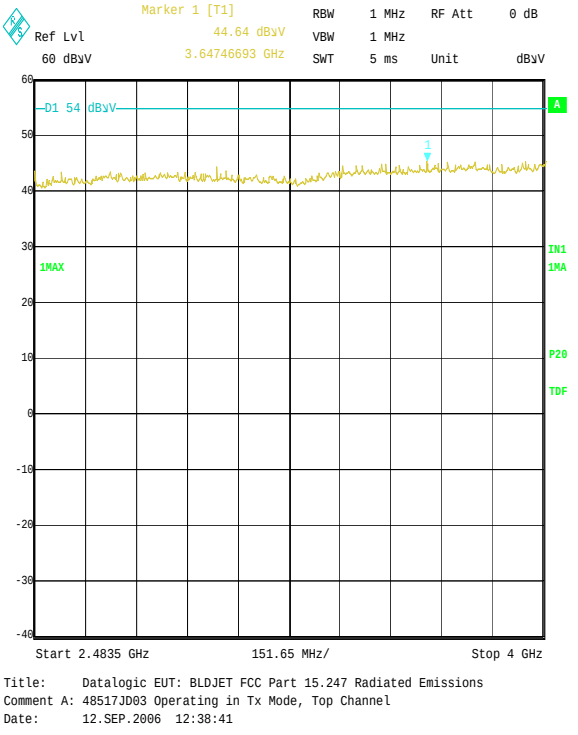
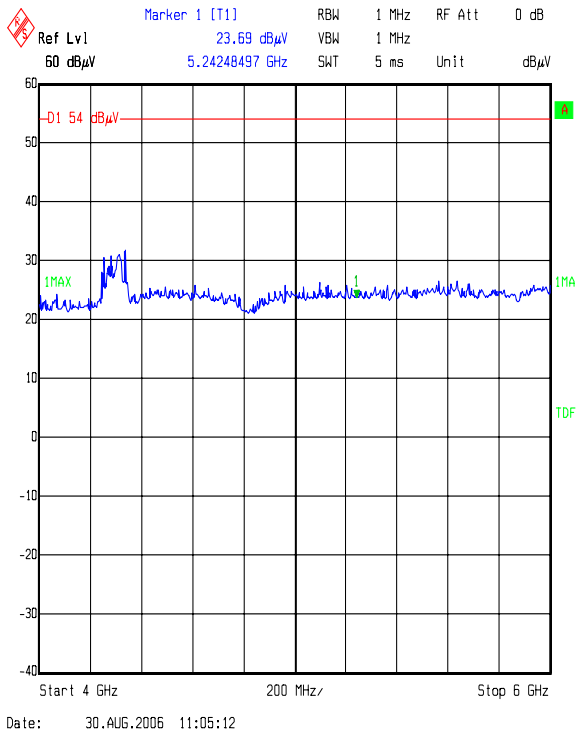
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)









Note 1: The plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Note 2: The plot from 1 GHz to 4 GHz incorrectly shows job number 48513JD03. The job number is 48517JD03.

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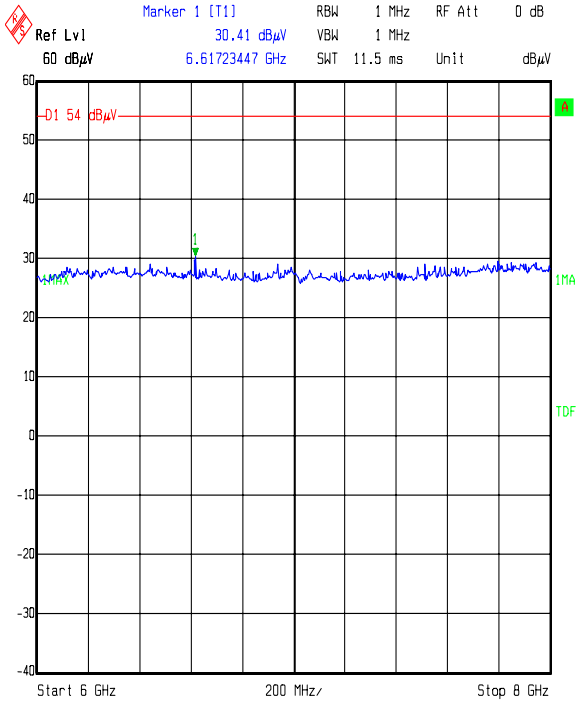
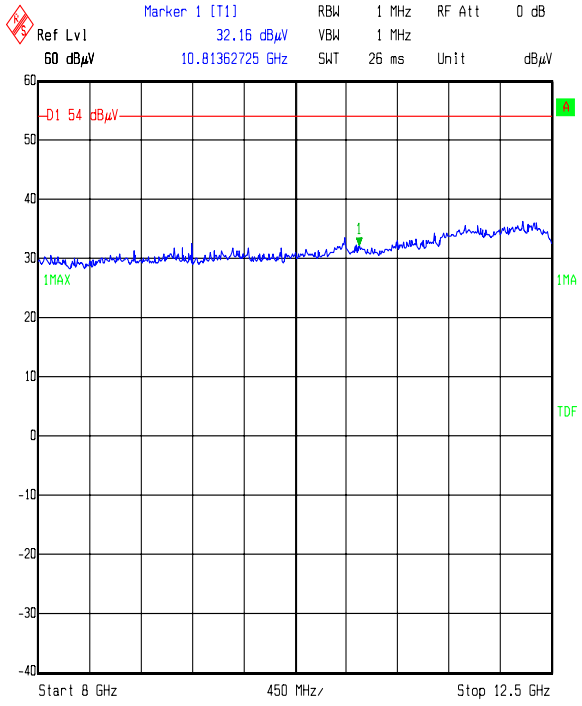
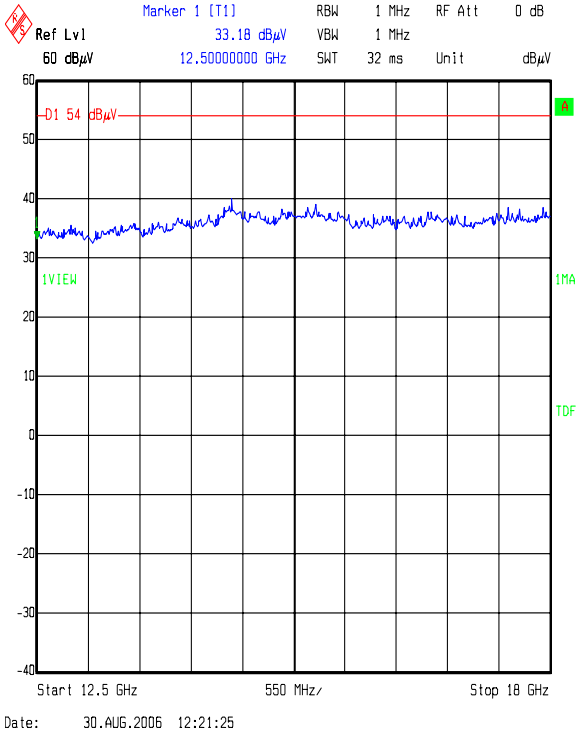
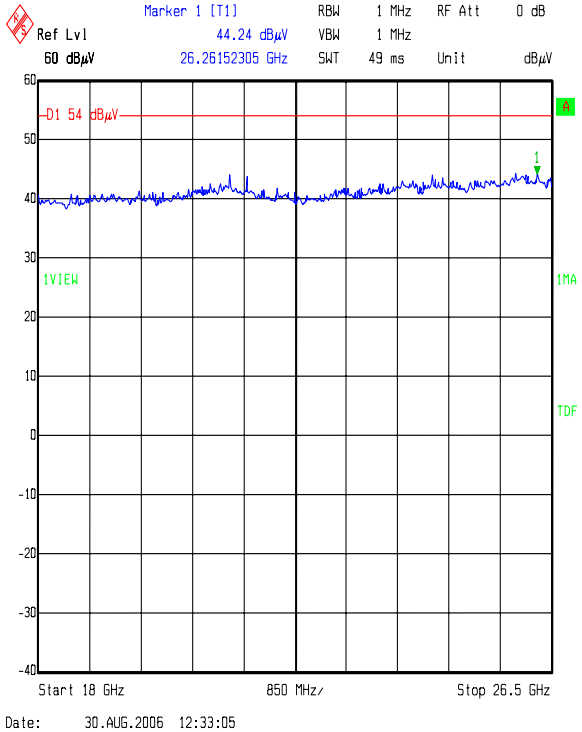
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)









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

7.2.10. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a)

The EUT was configured for band edge compliance of radiated emission measurements, as described in section 9 of this report.

Tests were performed to identify the maximum radiated band edge 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
2.4000	Vertical	49.2	-11.4	37.8	73.8*	36.0	Complied
2.4835	Vertical	61.1	-11.0	50.1	74.0	23.9	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
2.4835	Vertical	48.9	-11.0	37.9	54.0	16.1	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.*

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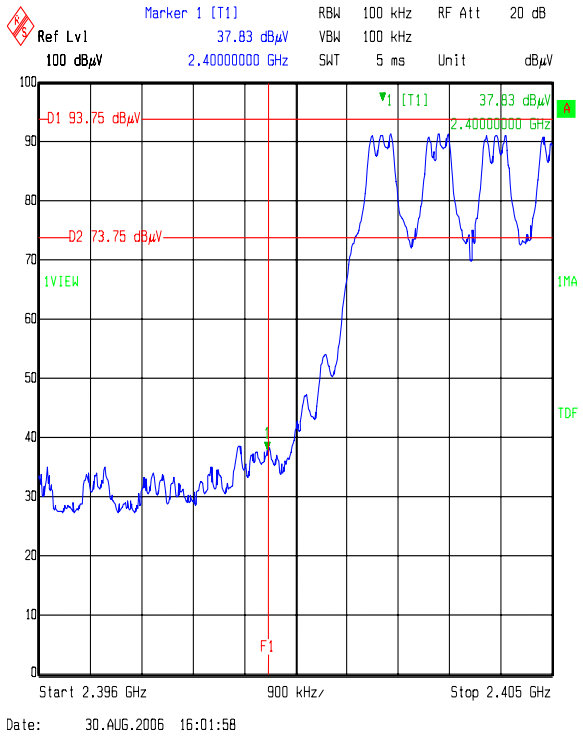
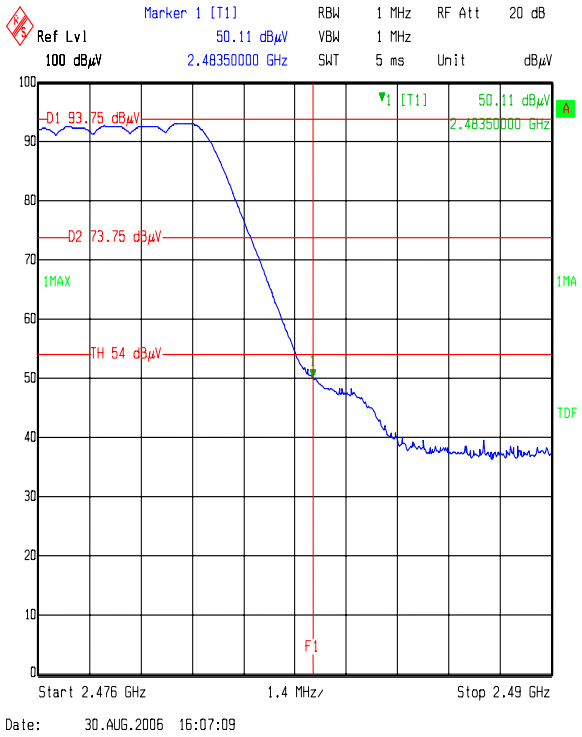
Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)





7.2.11. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a)

The EUT was configured for band edge compliance of radiated emission measurements as described in section 9 of this report.

Tests were performed to identify the average radiated band edge emissions.

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
2.4000	Vertical	54.7	-11.4	43.3	69.7*	26.4	Complied
2.4835	Vertical	60.2	-11.0	49.2	74.0	24.8	Complied

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
2.4835	Vertical	51.2	-11.0	40.2	54.0	13.8	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.*

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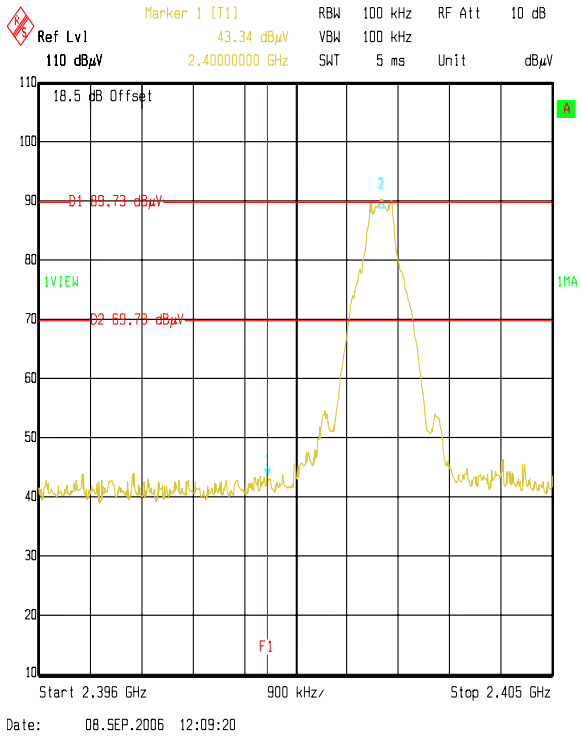
Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)



8. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.72 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	±2.94 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.

9. Measurement Methods

9.1. 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

9.2. 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 horns.

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

9.3. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was 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 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 approximately 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.

The 20db 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 ie. RBW≥1% of occupied bandwidth. A valve of 3 KHz was used.

9.4. Average Time of Occupancy

The EUT and spectrum analyser was configured as 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 i.e. in the time domain and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 31.6 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.

9.5. 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 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

Effective 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

9.6. 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
A027	Horn Antenna	Eaton	9188-2	301	08 Jun 06	36
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557	08 Jun 06	36
A1069	ESH3-Z5	Rohde & Schwarz	ESH3-Z5	837469/012	31 Jan 06	12
A1310	RF Pre_Amplifier 0.1 to 1300 MHz, 26dB	Hewlett Packard	8447F	1644A00465	Cal not required	-
A1360	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1360-20112003	Cal not required	-
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	29 July 06	12
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139	06 Oct 06	36
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519	06 Oct 06	36
A428	WG 12 horn	Flann	12240-20	134	06 Oct 06	36
A430	WG 18 horn	Flann	18240-20	425	06 Oct 06	36
A553	Bi-log Antenna	Chase	CBL6111 A	1593	18 Oct 06	12
C1161	Utiflex	Rosenberger	05 42448-1	33	19 Aug 06	12
C1164	1.5m N-type Cable	Rosenberger Micro-Coax	FA210A1 0150070 70	43188-1	27 Oct 06	12
C1166	2m N-Type Cable	Rosenberger Micro-Coax	FA210A1 0200070 70	43189-02	27 Oct 06	12

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
C151	Cable	Rosenberger	UFA210 A-1-1181-70x70	None	22 Sept 06	12
C341	Cable	Andrews	None	None	30 Jan 06	12
C347	Cable	Rosenberger	UFA210 A-1-1181-70x70	3007	22 Jan 06	12
C363	BNC Cable	Rosenberger	RG142	None	29 Jan 06	12
C364	BNC Cable	Rosenberger	RG142	None	29 Jan 06	12
C461	Cable	Rosenberger	UFA210 A-1-1182-704704	98H0305	30 Jan 06	12
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008	Cal not required	-
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027	10 Apr 06	12
M090	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:838494/005 RU:836833/001	08 Nov 06	12
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K	23 Nov 05	12
M1242	FSEM30 Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986_022	22 Sept 05	12

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
M1263	ESIB7	Rohde & Schwarz	ESIB7	100265	12 Jan 06	12
M1264	Thermo Hygro	RS	212-124	0	18 Feb 06	12
M242	Thermometer/Barometer/Hygrometer	Oregon Scientific	BA 116	None	11 Feb 06	12
S201	Site 1	RFI	1		18 July 06	12
S202	Site 2	RFI	2	S202-15011990	Cal before use	12
S209	Site 9	RFI	9		Cal not required	-
S212	Site 12	RFI	12		Cal not required	-

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\48517JD03\EMICON	Test configuration for measurement of conducted emissions.
DRG\48517JD03\EMIRAD	Test configuration for measurement of radiated emissions.

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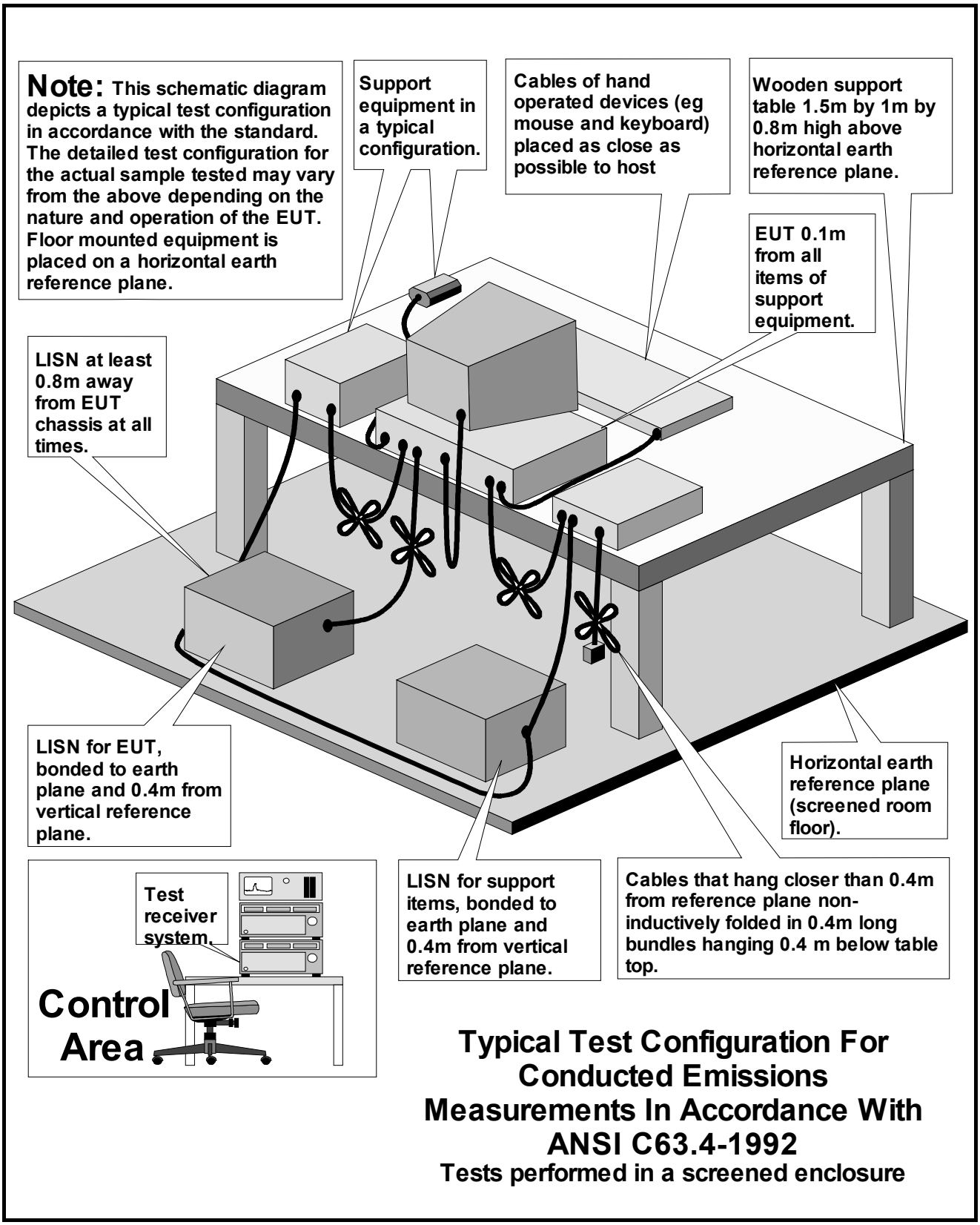
DRG\48517JD03\EMICON



Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992

Tests performed in a screened enclosure

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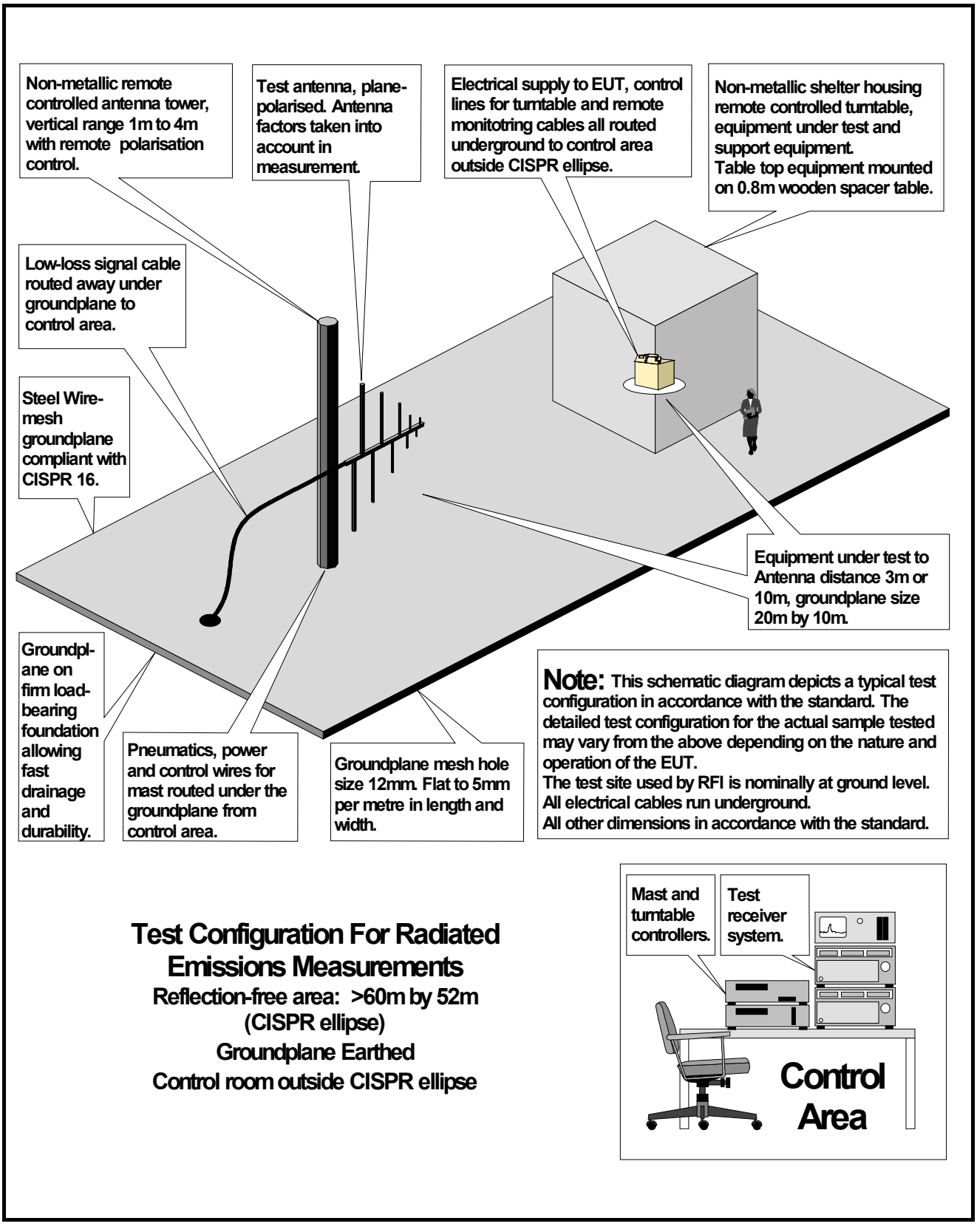
DRG\48517JD03\EMIRAD



Test Configuration For Radiated Emissions Measurements

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