TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

Test Report Serial No:
RFI/RPTE1/RP49055JD16A

This Test Report Is Issued Under The Authority Of Michael Derby, Wireless Radio Performance Group Leader: 	
Tested By: Ian Watch 	**Checked By: Tony Henriques** 
Report Copy No: PDF01	
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1. Client Information

Company Name:	GN A/S
Address:	Lautrupbjerg 7 Balllerup DK-2750 Denmark
Contact Name:	Mr T Ringtved

2. Equipment Under Test (EUT)

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

2.1. Description of EUT

The equipment under test is a *Bluetooth* Headset.

2.2. Identification of Equipment Under Test (EUT)

Description:	*Bluetooth* Headset
Brand Name:	Jabra
Model Name or Number:	OTE-1
Serial Number:	Sample #1: RAD 1[1]; Sample #2: NORM 2[2]
Hardware Version Number:	28-00578
Software Version Number:	21f
FCC ID Number:	BCE-OTE1
Country of Manufacture:	China
Date of Receipt:	20 March 2007

[1]*Used for all transmitter tests and was in Bluetooth test mode.*
[2]*Used for idle mode tests and was in its normal operating condition.*

2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Charger
Brand Name:	Jabra / Sunfone
Model Name or Number:	ACW003B-05
Serial Number:	No 2
Cable Length and Type:	1.5m multicore
Connected to Port:	Mini-USB charging

2.5. Support Equipment

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

2.6. Additional Information Related to Testing

Equipment Category:	*Bluetooth*		
Type of Unit:	Portable Transceiver		
Power Supply Requirement:	Internal Battery Supply of 3.7 V		
Maximum Power Output (EIRP)	2.3 dBm (measured)		
Transmit Frequency Range:	2402 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 to 2480 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Middle	39	2441
	Top	78	2480

2.7. Port Identification

Port	Description
1	Charging – Mini-USB

3. Test Specification, Methods and Procedures

3.1. 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)

3.2. 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.

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.

4. Deviations from the Test Specification

There were no deviations from the test specification.

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

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

Transmitting on the top, middle and bottom channels as required
Standby mode.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

Without the charger connected for all the transmitter tests and idle mode radiated spurious emissions test (as connecting the charger causes the EUT to power down) and with the charger connected for the Idle Mode AC Conducted Emissions test.

6. Summary of Test Results

Range of Measurements	Specification Section 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 20 dB Bandwidth	Section 15.247(a)(1)	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)(1)	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

6.1. Location of Tests

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

FCC Site Registration Number: 90895

IC Site Registration Number: 3485

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

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

7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

The EUT was configured 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)	Note(s)
See Note Below					

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Note(s)
See Note Below					

Note(s):

1. *All emissions were at least 20 dB below the specified limit.*

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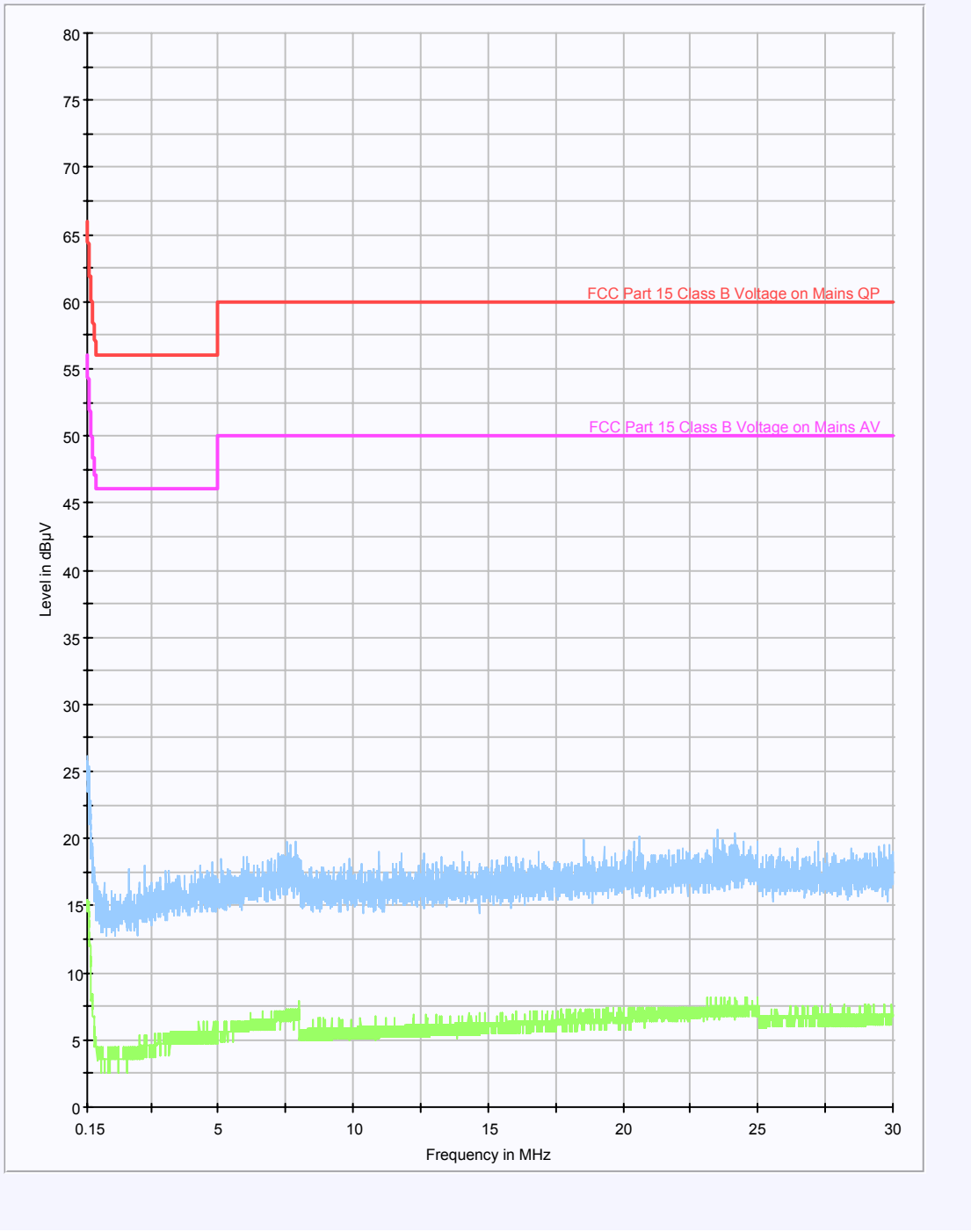
Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



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

7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109

The EUT was configured 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.

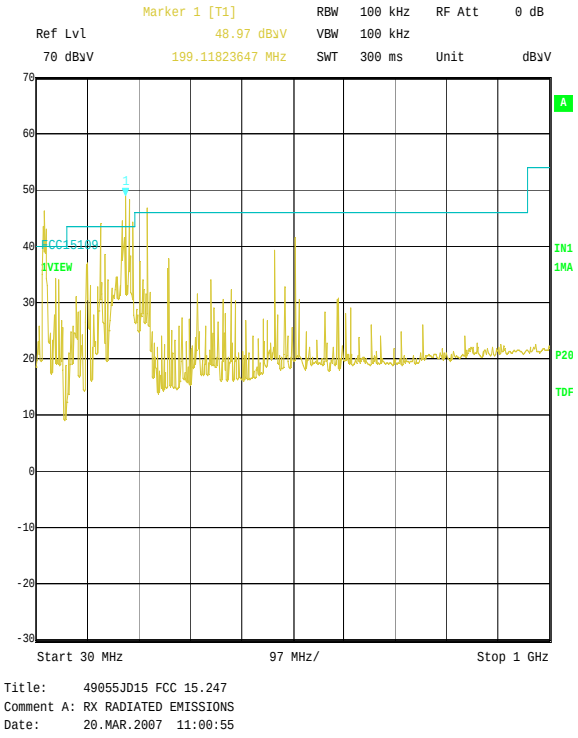
Results:

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

Frequency (MHz)	Antenna Polarity	Quasi-Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Note(s)
See Note Below					

Note(s):

1. *All the emissions were found to be radiating from the support test equipment and were not produced by the EUT.*



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 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)	Note(s)
See Note Below							

Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Note(s)
See Note Below							

Note(s):

1. *No spurious emissions were detected within 20 dB of the specified limits.*

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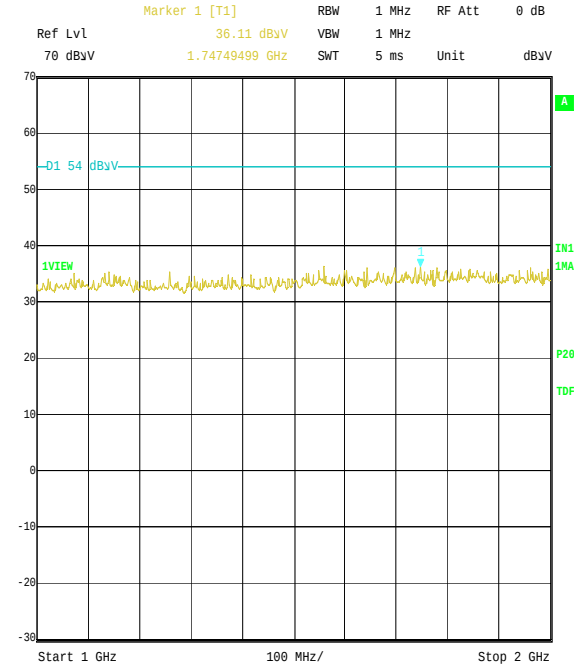
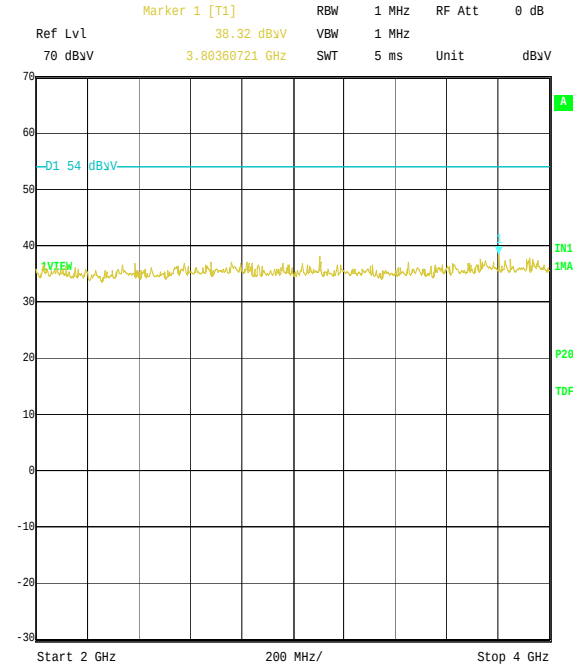
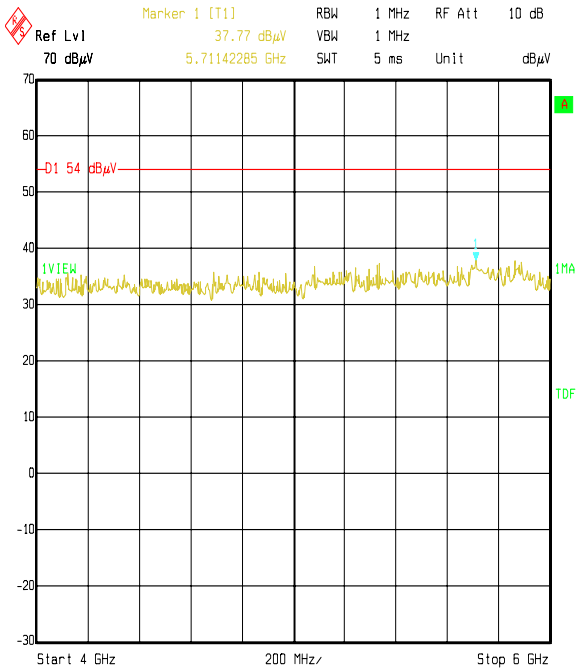
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



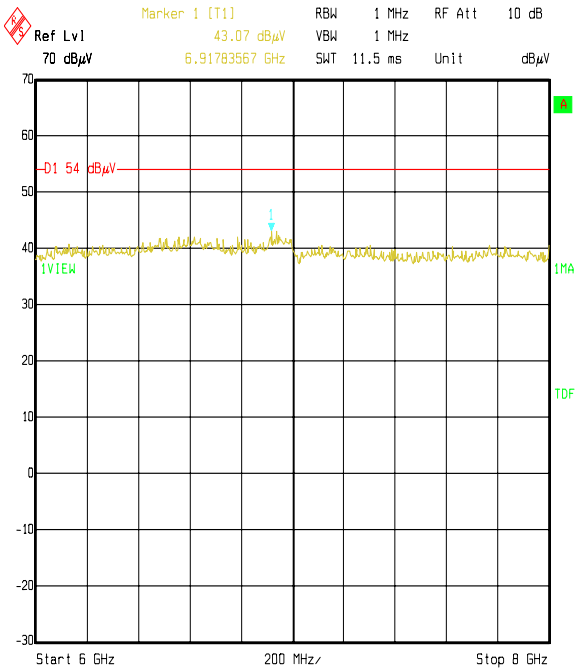
Title: 49055JD15 FCC 15.247
Comment A: RX RADIATED EMISSIONS
Date: 20.MAR.2007 11:17:44



Title: 49055JD15 FCC 15.247
Comment A: RX RADIATED EMISSIONS
Date: 20.MAR.2007 12:14:32



Title: 49055JD16 FCC 15.247
Comment A: RX RADIATED EMISSIONS
Date: 27.MAR.2007 11:11:02



Title: 49055JD16 FCC 15.247
Comment A: RX RADIATED EMISSIONS
Date: 27.MAR.2007 11:38:08

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

Test of: GN A/S
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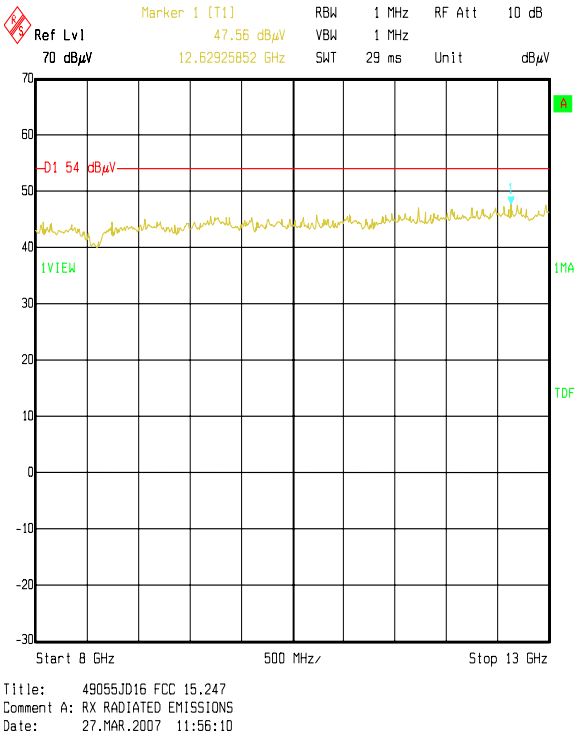
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



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

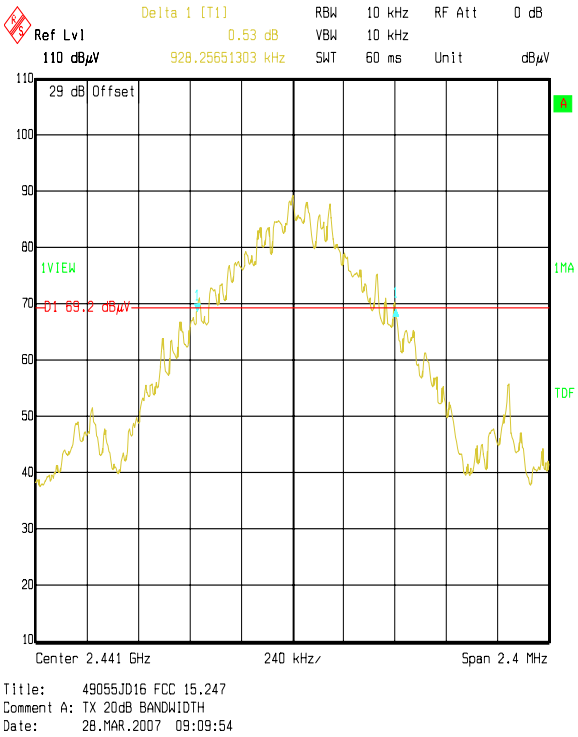
7.2.4. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

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)
928.256	None specified



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

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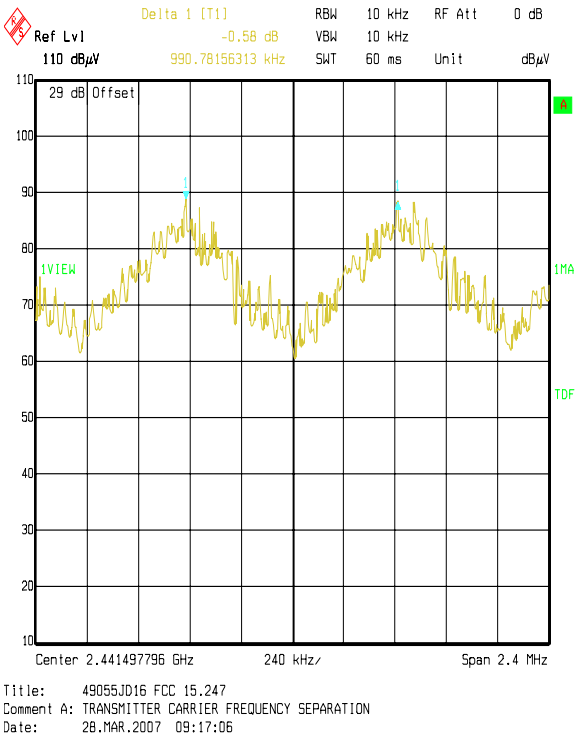
7.2.5. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

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 (> 20 dB or $^2/_3$ of 20 dB BW) (kHz)	Margin (kHz)	Results
990.781	618.837	371.944	Complied



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

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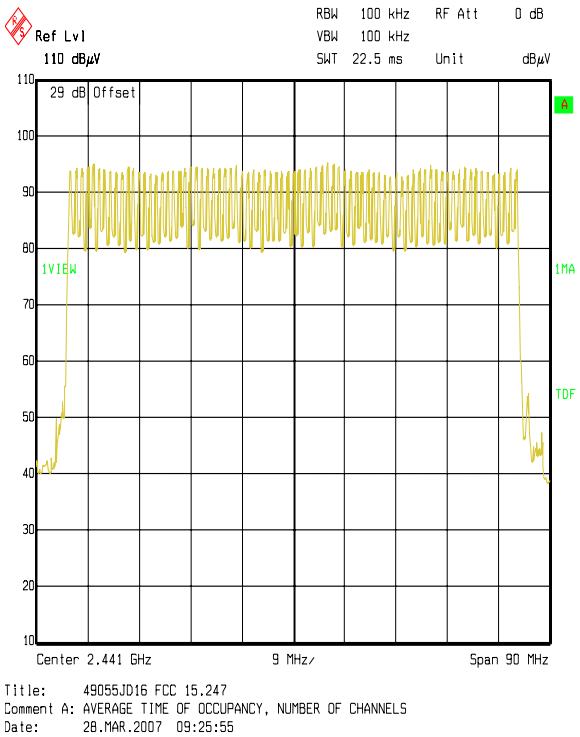
7.2.6. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

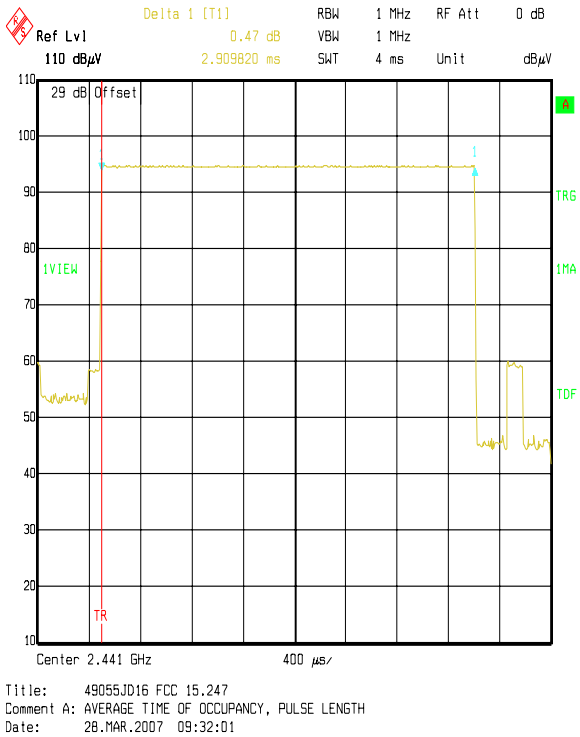
The EUT was configured for average time of occupancy measurements, as described in section 9 of this report.

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)	Results
2909.820	105	0.3055	0.4	0.0945	Complied





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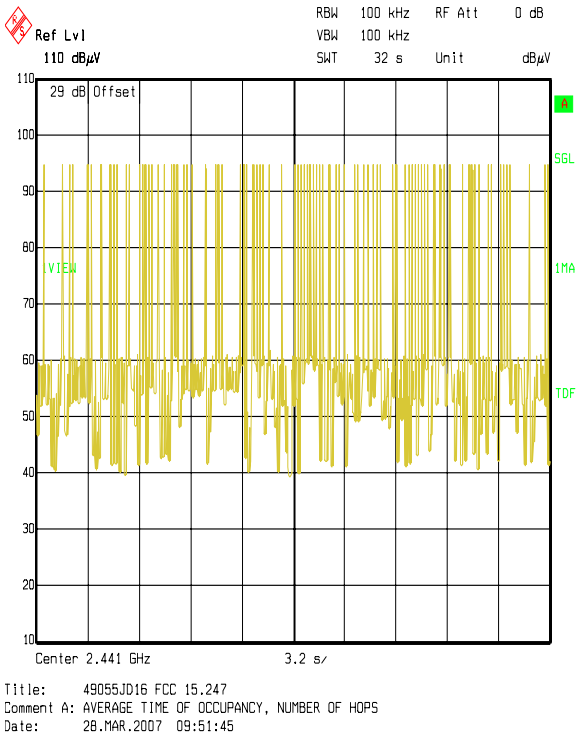

7.2.7. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1)

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)	Results
Bottom	2.3	30.0	27.7	Complied
Middle	2.1	30.0	27.9	Complied
Top	1.5	30.0	28.5	Complied

Note(s):

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

Test of: GN A/S
Jabra OTE1

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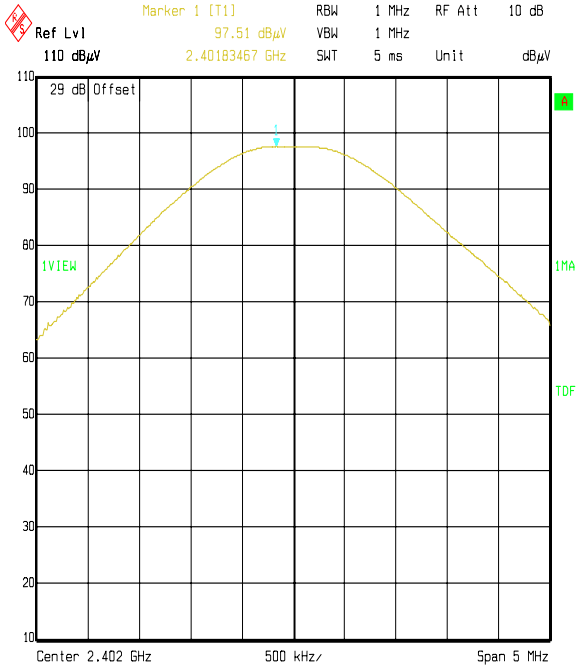
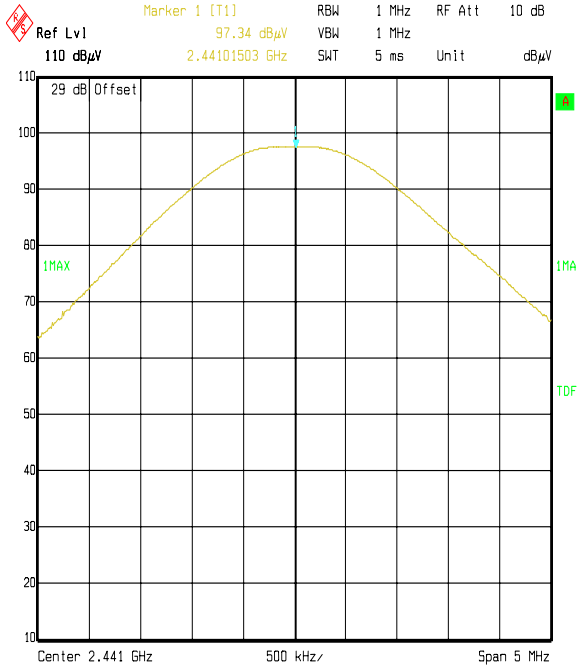
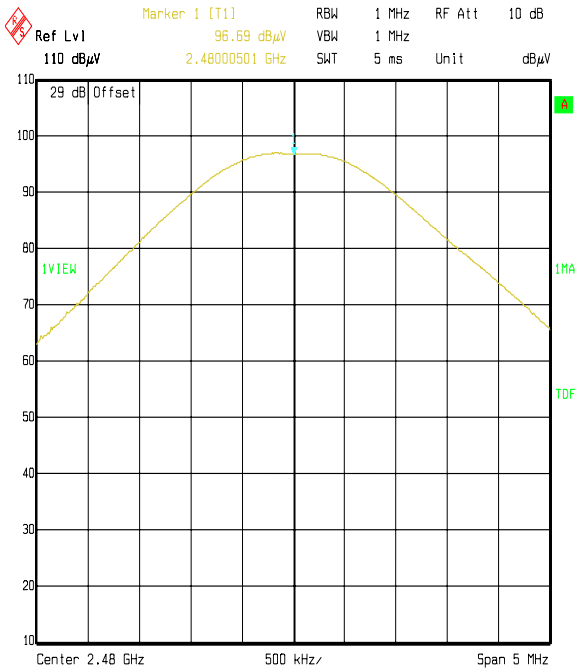
Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)



Title: 49055JD16 FCC 15.247
Comment A: EIRP BOTTOM CHANNEL
Date: 27.MAR.2007 14:42:26



Title: 49055JD16 FCC 15.247
Comment A: EIRP CENTRE CHANNEL
Date: 27.MAR.2007 14:39:50



Title: 49055JD16 FCC 15.247
Comment A: EIRP TOP CHANNEL
Date: 27.MAR.2007 14:47:30

7.2.8. 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 MHz to 1000 MHz
(Emissions Occurring in the Restricted Bands)

Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
See Note Below					

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
See Note Below					

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.*
2. *All emissions were found to be radiating from the support equipment.*

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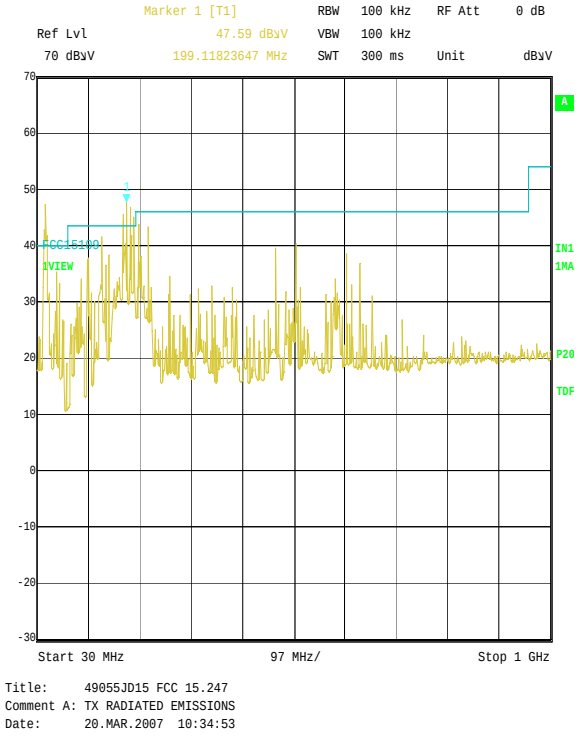
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)



Title: 49055JD15 FCC 15.247
Comment A: TX RADIATED EMISSIONS
Date: 20.MAR.2007 10:34:53

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

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

Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 25 GHz)
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
1.600415	Vertical	50.3	-7.7	42.6	74.0	31.4	Complied
4.804091	Vertical	59.9	-3.3	56.0	74.0	18.0	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
1.600415	Vertical	42.9	-7.7	35.2	54.0	18.8	Complied
4.804091	Vertical	51.4	-3.3	48.1	54.0	5.9	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
1.600415	Vertical	50.3	-7.7	42.6	74.0	31.4	Complied
4.882024	Vertical	59.8	-3.4	56.4	74.0	17.6	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
1.600415	Vertical	42.9	-7.7	35.2	54.0	18.8	Complied
4.882024	Vertical	52.4	-3.4	49.0	54.0	5.0	Complied

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
1.600415	Vertical	50.3	-7.7	42.6	74.0	31.4	Complied
4.960035	Vertical	59.9	-3.5	56.4	74.0	17.6	Complied

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

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
1.600415	Vertical	42.9	-7.7	35.2	54.0	18.8	Complied
4.960035	Vertical	51.3	-3.5	47.8	54.0	6.2	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
1.600415	Vertical	50.3	-7.7	42.6	74.0	31.4	Complied
4.882024	Vertical	51.4	-3.4	56.2	74.0	17.8	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
1.600415	Vertical	42.9	-7.7	35.2	54.0	18.8	Complied
4.882024	Vertical	37.1	-3.4	33.7	54.0	20.3	Complied

Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

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

Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 25 GHz)
(Emissions Outside the Restricted Bands)

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
2.505944	Horizontal	50.1	-8.2	42.8	77.5	34.7	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
2.505944	Horizontal	50.1	-8.2	42.8	76.7	33.9	Complied

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
2.505944	Horizontal	50.1	-8.2	42.8	77.3	34.5	Complied

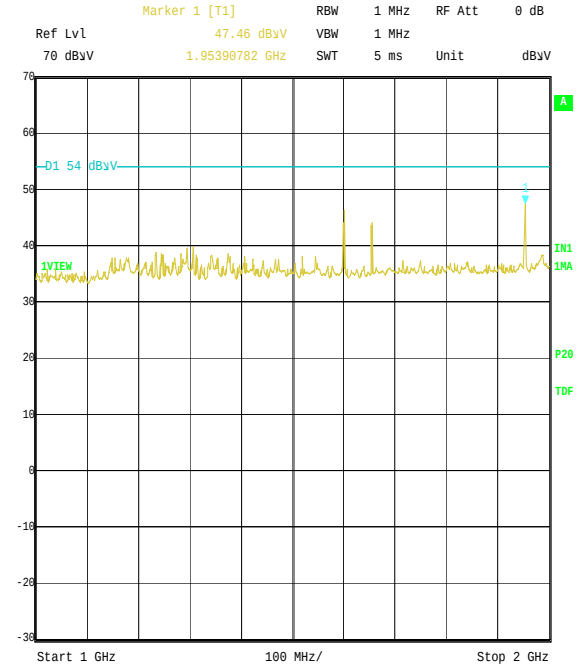
Highest Peak Level: Hopping Mode

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
2.505944	Horizontal	50.1	-8.2	42.8	77.1	34.3	Complied

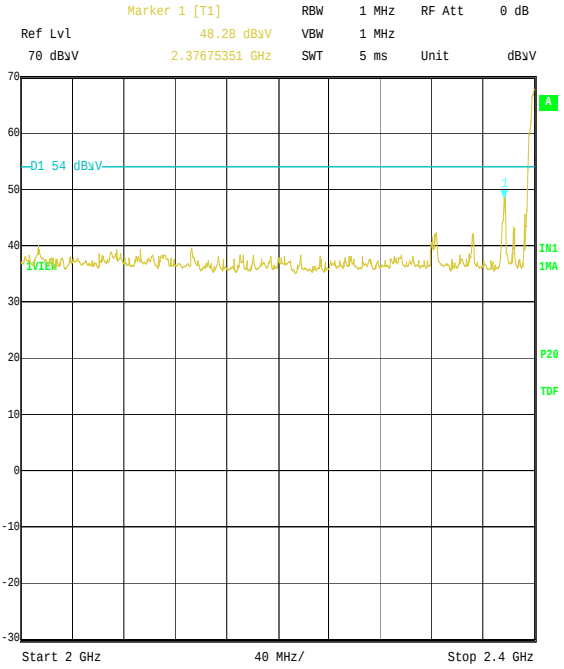
Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

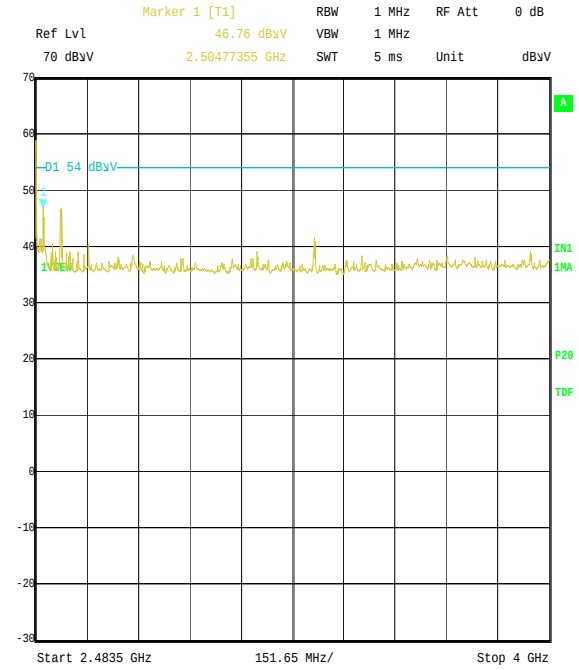
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)



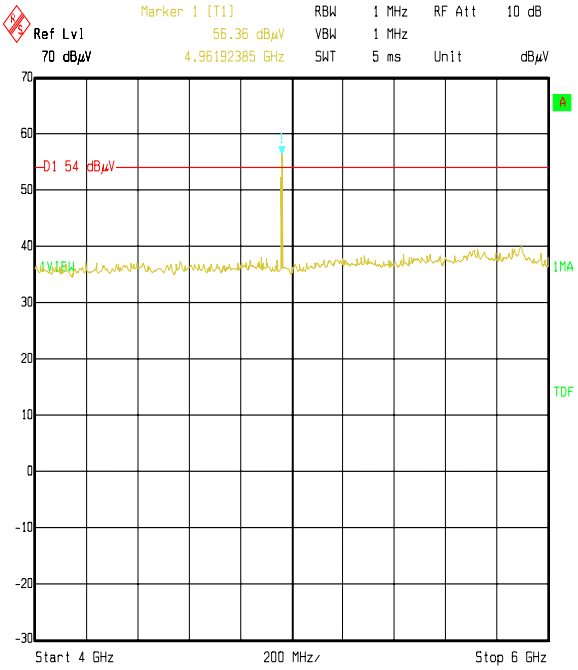
Title: 49055JD15 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 20.MAR.2007 11:24:17



Title: 49055JD15 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 20.MAR.2007 11:44:26



Title: 49055JD15 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 20.MAR.2007 11:56:17



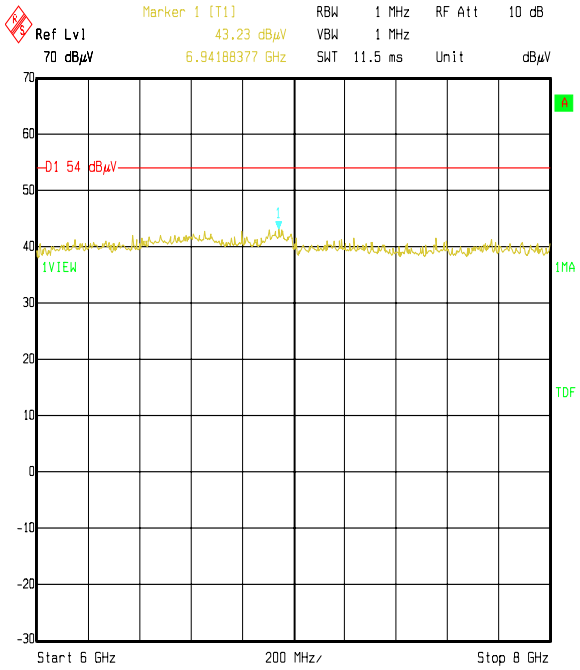
Title: 49055JD16 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 27.MAR.2007 11:08:01

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

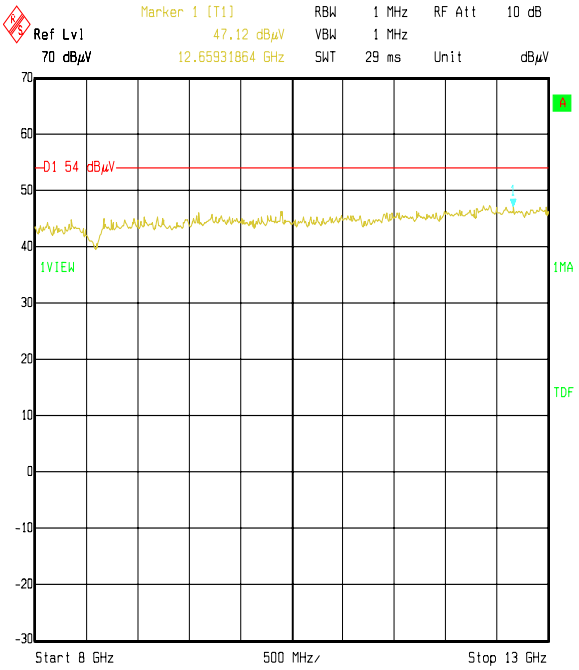
Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

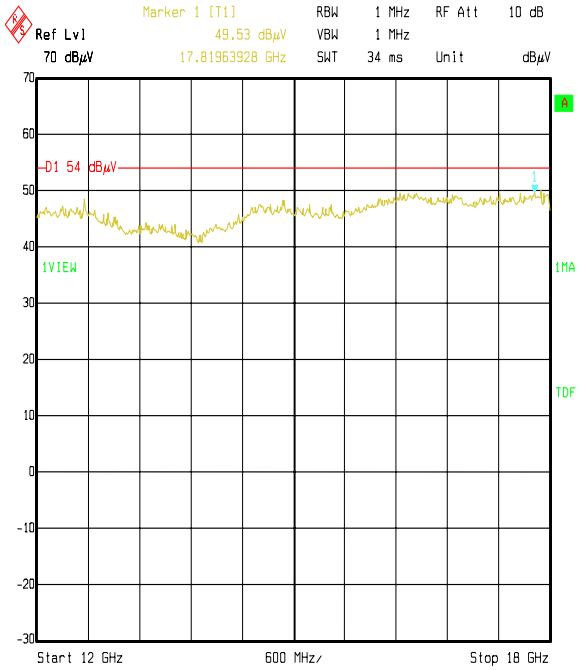
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)



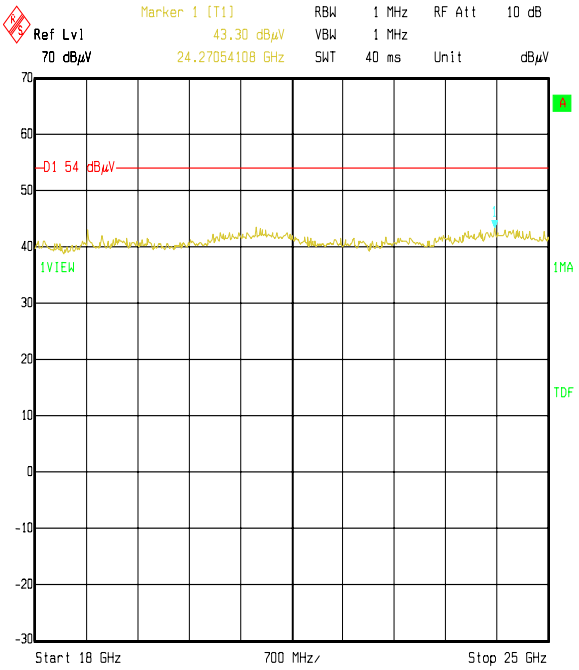
Title: 49055JD16 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 27.MAR.2007 11:42:16



Title: 49055JD16 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 27.MAR.2007 11:51:25



Title: 49055JD16 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 27.MAR.2007 12:15:08



Title: 49055JD16 FCC 15.247
Comment A: TX RADIATED EMISSIONS TOP CHANNEL
Date: 27.MAR.2007 12:20:38

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

7.2.9. 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

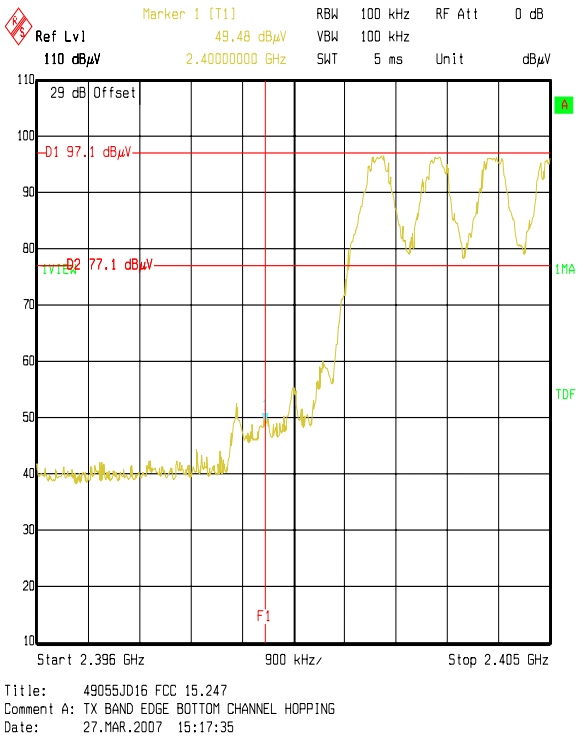
Peak Power Level Hopping Mode:

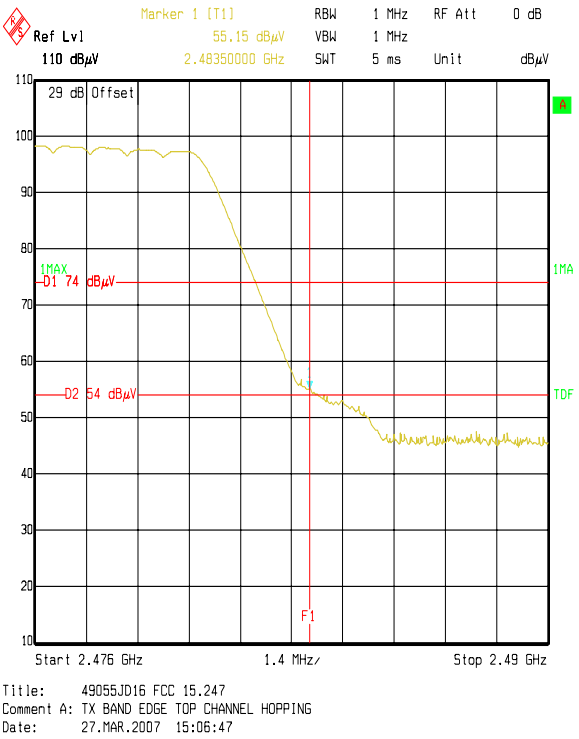
Frequency (MHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2.4000	Vertical	47.0	2.5	49.5	77.1*	27.6	Complied
2.4835	Vertical	52.8	2.4	55.2	74.0	18.8	Complied

** -20 dBc limit*

Average Power Level Hopping Mode:

Frequency (MHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2.4835	Vertical	32.0	2.4	34.5	54.0	19.5	Complied





Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

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

Results:

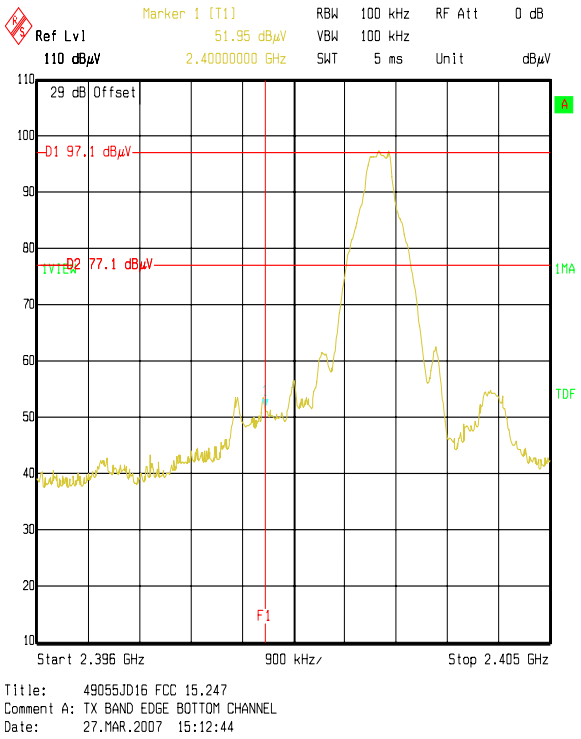
Peak Power Level Static Mode:

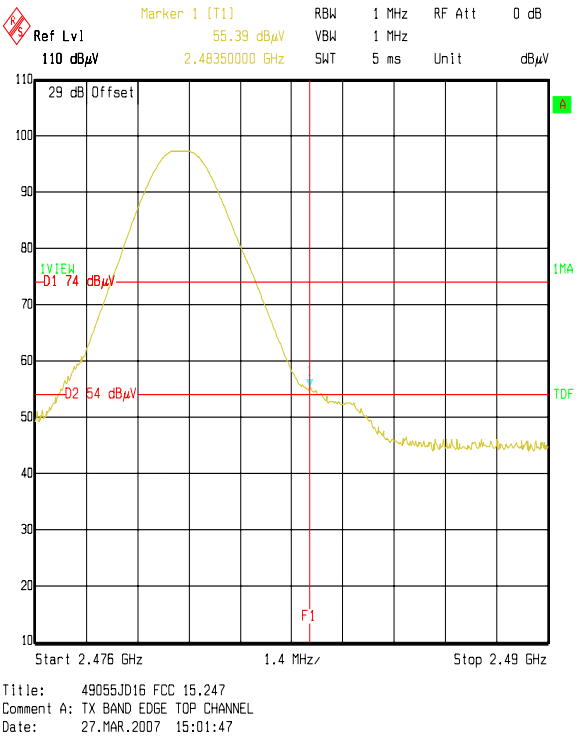
Frequency (MHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2.4000	Vertical	49.5	2.5	52.0	77.1*	25.1	Complied
2.4835	Vertical	53.0	2.4	55.4	74.0	18.6	Complied

** -20 dBc limit*

Average Power Level Static Mode:

Frequency (MHz)	Antenna Polarity	Detector Level (dBµV)	Transducer Factor (dB)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2843.5	Vertical	44.2	2.4	46.6	54.0	7.4	Complied





8. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	+/- 2.94 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	+/- 0.01 ppm
Transmitter Average Time of Occupancy	Not applicable	95%	+/- 10 %
20 dB Bandwidth	Not applicable	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 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 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

9.3. 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.

9.4. 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.

9.5. Peak Output Power

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

Prior to testing being performed a suitable RF attenuator and cable were calibrated for the required frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into a spectrum analyser to compensate for the measurement set up.

To determine the transmitter output power, the EUT was operated at maximum power and a result was obtained from the spectrum analyser using peak detector and trace Max Hold

9.6. 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 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

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

9.7. 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
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	CBL6112B	2413	20 Sep 2006	12
A1069	LISN	Rohde & Schwarz	ESH3-Z5	837469/012	09 Feb 2007	12
A1534	Preamplifier	Hewlett Packard	8449B OPT H02	3008A00405	Cal Before Use	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
A436	Horn Antenna	Flann	20240-20	330	24 Apr 2006	36
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986_022	08 Sep 2006	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12
S201	3m OATS	RFI	1	-	16 Jun 2006	12
S202	3m OATS	RFI	2	-	17 Nov 2006	12

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

Appendix 2. Test Configuration Drawings

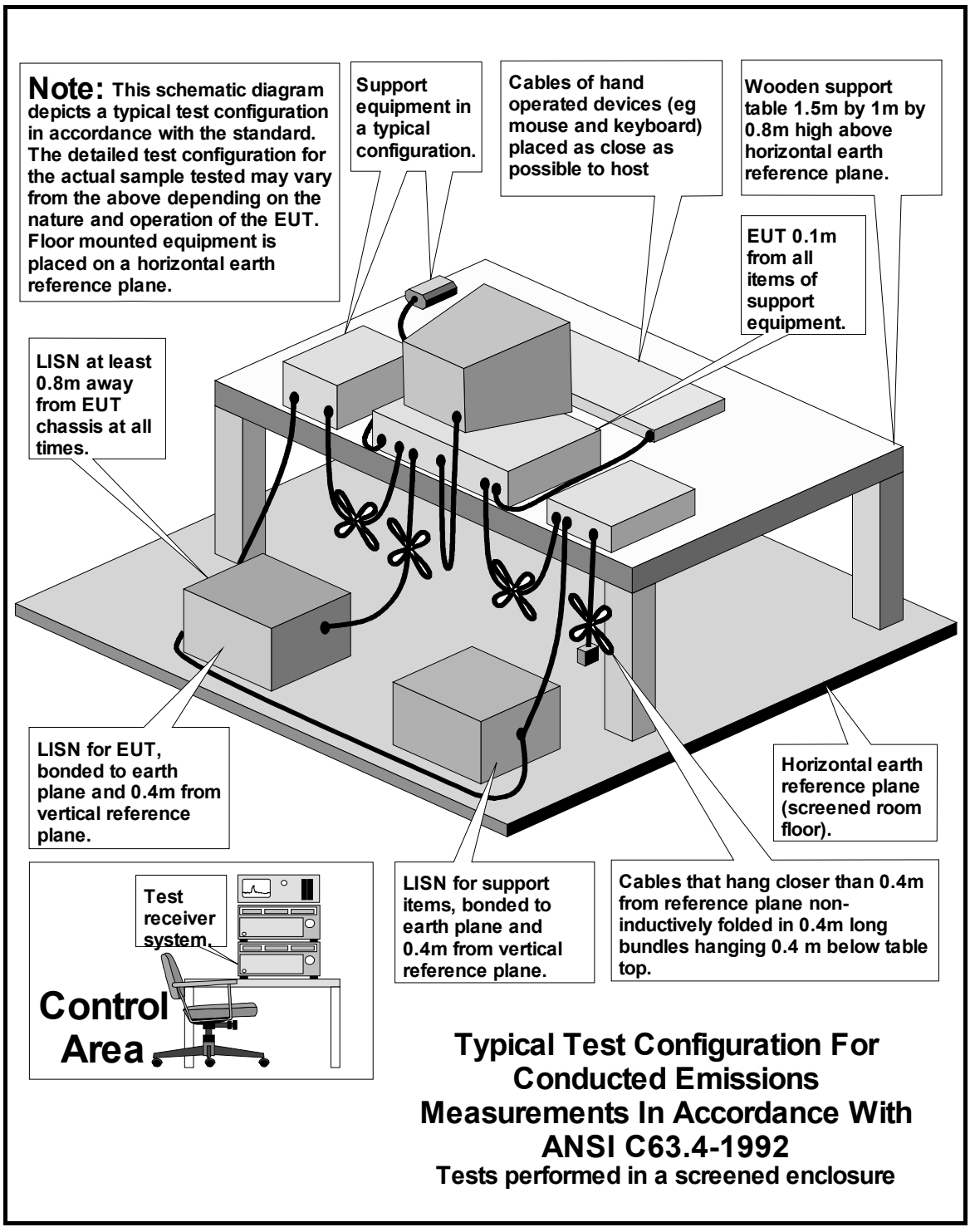
This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\49055JD16A\EMICON	Test configuration for measurement of conducted emissions.
DRG\49055JD16A\EMIRAD	Test configuration for measurement of radiated emissions.

Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

DRG\49055JD16A**EMICON**



Test of: GN A/S
Jabra OTE1

To: FCC Part 15.247: 2006 (Subpart C)

DRG\49055JD16A**EMIRAD**