

# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Nextlink. To A/S.  
AX3 Bluetooth headset/earpiece

To: FCC Part 15.247: 2005 (Subpart C)

**Test Report Serial No: Test Report Serial No:**  
RFI/RPGE1/RP48681JD01A

This Test Report Is Issued Under The Authority  
Of Andrew Brown, Operations Manager:



PP

Tested By: Barry Eshgi



pp

Checked By: Michael Derby



Report Copy No: PDF01

Issue Date: 16 November 2006

Test Dates: 27 September 2006 to 26 October 2006

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## **1. Client Information**

<b>Company Name:</b>	Nextlink. To A/S
<b>Address:</b>	Sandtoften 10 2820 Gentofte DENMARK
<b>Contact Name:</b>	Ms E Mujan

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## **2. Equipment Under Test (EUT)**

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

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

<b>Description:</b>	Headset/Earpiece
<b>Brand Name:</b>	Nextlink
<b>Model Name or Number:</b>	AX3
<b>Unique Type Identification:</b>	Not Applicable
<b>Serial Number:</b>	None Stated
<b>Hardware Version:</b>	BC3-Audio Flash
<b>Software Version:</b>	1.00a
<b>FCC ID Number:</b>	QNYNXLVS600
<b>Country of Manufacture:</b>	Denmark
<b>Date of Receipt:</b>	27 September 2006

### **2.2. Accessories**

<b>Description:</b>	AC Charger
<b>Brand Name:</b>	Voice Star
<b>Model Name or Number:</b>	None Stated
<b>Serial Number:</b>	2506 HB
<b>Cable Length and Type:</b>	1.5m DC to USB
<b>Connected to Port:</b>	USB port

### **2.3. Description of EUT**

The equipment under test is a *Bluetooth* Earpiece – mono. For the purpose of testing, the EUT was supplied connected to a development control board.

### **2.4. Modifications Incorporated in EUT**

The EUT was not modified during the testing.

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## 2.5. Additional Information Related to Testing

<b>Power Supply Requirement:</b>	Via the AC charger, a DC Supply of + 5 V and an Internal battery supply of + 3.7 V		
<b>Intended Operating Environment:</b>	Residential		
<b>Equipment Category:</b>	Short Range		
<b>Type of Unit:</b>	Portable (Standalone battery powered device)		
<b>Transmit Frequency Range:</b>	2402 to 2480		
<b>Transmit Channels Tested:</b>	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
<b>Receive Frequency Range:</b>	2402 to 2480		
<b>Receive Channels Tested:</b>	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
<b>Maximum Power Output (EIRP)</b>	1.7 dBm		

## 2.6. Port Identification

Port	Description	Type/Length	Applicable
1	5 Pin USB	2 core DC, 1.5m	Y

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## **2.7. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Development Board
<b>Brand Name:</b>	CSR
<b>Model Name or Number:</b>	CASI-SP
<b>Serial Number:</b>	None Stated
<b>Cable Length and Type:</b>	2.0 m USB
<b>Connected to Port:</b>	USB port

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### **3. Test Results**

<b>Reference:</b>	FCC Part 15.247: 2005 Subpart C
<b>Title:</b>	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/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

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

ANSI C63.4 (2003)

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

ANSI C63.5 (1988)

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

ANSI C63.7 (1988)

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

CISPR 16-1: (1999)

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

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.

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#### **4. Deviations from the Test Specification**

There were no deviations from the test specification.

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## **5. Operation of the EUT during Testing**

### **5.1. Operating Modes**

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

The EUT was placed into a *Bluetooth* test mode, to transmit on the bottom or top channel, or hopping over all channels and Idle mode.

### **5.2. Configuration and Peripherals**

The EUT was tested in the following configuration:

The EUT was connected and controlled through a custom development board, supplied by Nextlink.

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

Range of Measurements	Specification Reference	Port Type	Compliance 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.

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## **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.

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## **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 (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.378000	Live	57.3	58.3	1.0	Complied
0.394000	Live	49.3	58.0	8.7	Complied
0.402000	Live	49.0	57.8	8.8	Complied
0.466000	Live	48.5	56.6	8.1	Complied
0.534000	Live	46.0	56.0	10.0	Complied
0.554000	Live	39.1	56.0	16.9	Complied
0.618000	Live	48.4	56.0	7.6	Complied
0.654000	Live	46.4	56.0	9.6	Complied
0.666000	Live	48.0	56.0	8.0	Complied
0.702000	Live	43.4	56.0	12.6	Complied

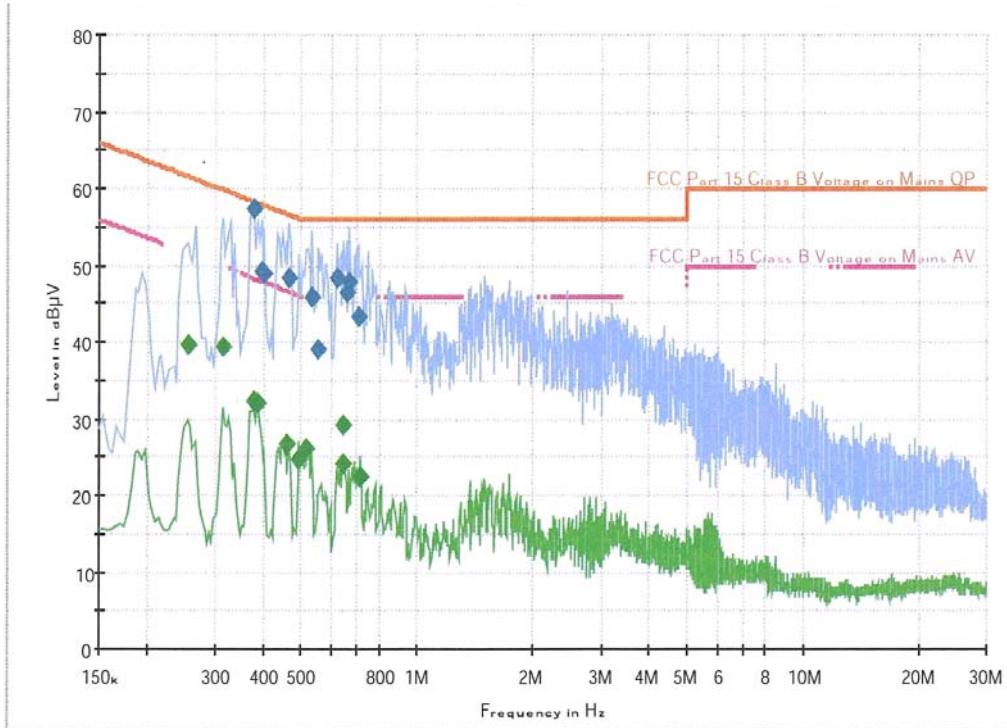
##### **Average Detector Measurements on Live and Neutral Lines**

Frequency (MHz)	Line	Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.378000	Live	39.7	51.6	11.9	Complied
0.394000	Live	39.5	49.9	10.4	Complied
0.402000	Live	32.4	48.3	15.9	Complied
0.466000	Live	32.1	48.1	16	Complied
0.534000	Live	26.8	46.7	19.9	Complied
0.554000	Live	24.9	46.1	21.2	Complied
0.618000	Live	26.1	46.0	19.9	Complied
0.654000	Live	24.3	46.0	21.7	Complied
0.666000	Live	29.2	46.0	16.8	Complied
0.702000	Live	22.6	46.0	23.4	Complied

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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.*

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### **7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109**

The EUT was configured as 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 (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
See Note Below					

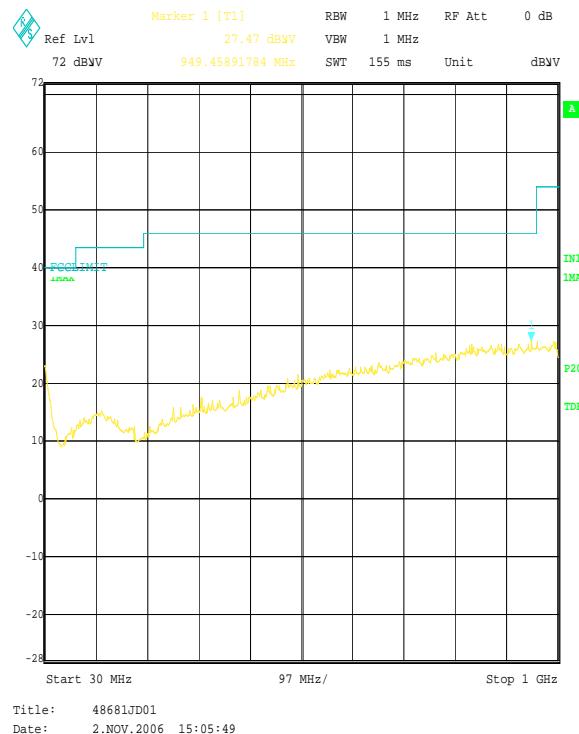
#### **Note(s):**

1. *No emissions were observed within 20dB of the limit.*

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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.*

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**7.2.3. Idle Mode Radiated Spurious Emissions: Section 15.109**

**Results:**

**Electric Field Strength Measurements (Frequency Range: 1 to 12 GHz)**

**Highest Peak Level:**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
See Note Below							

**Highest Average Level:**

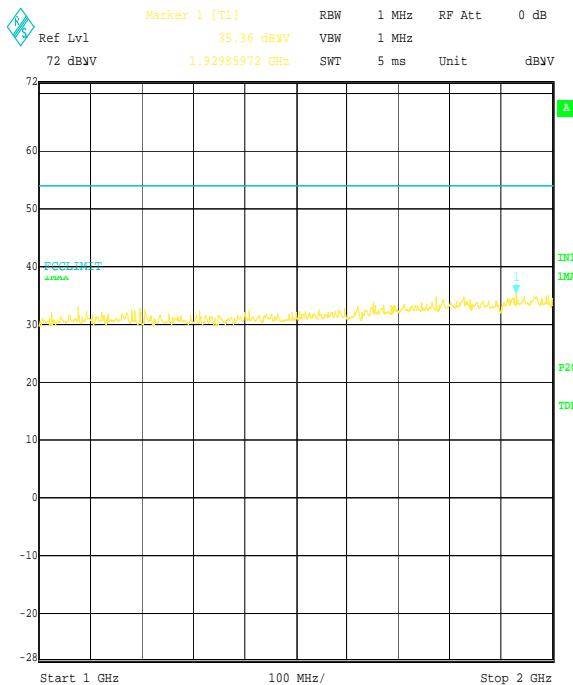
Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
See Note Below							

**Note(s):**

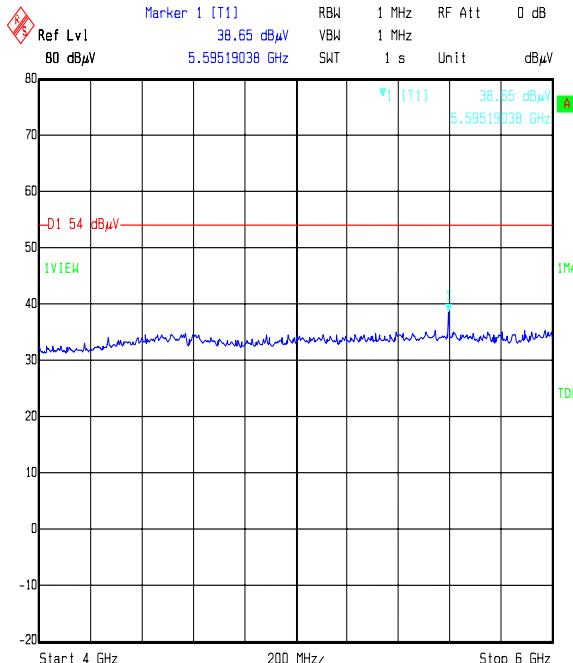
1. No emissions were observed within 20dB of the limit.

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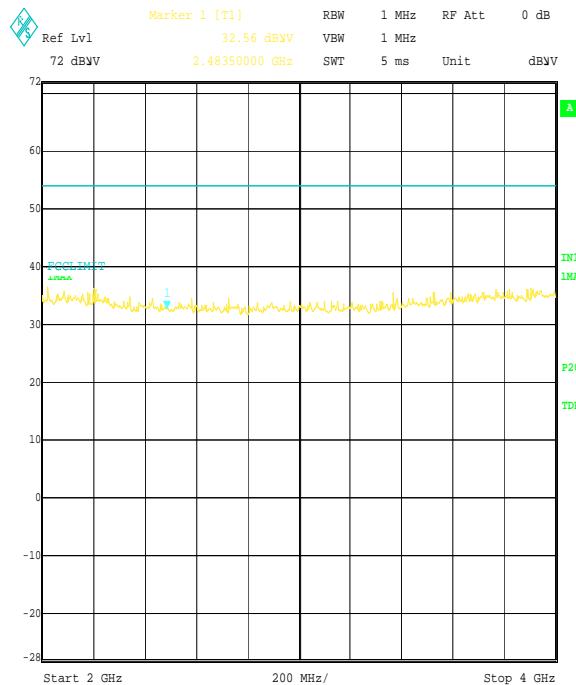
**Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)**



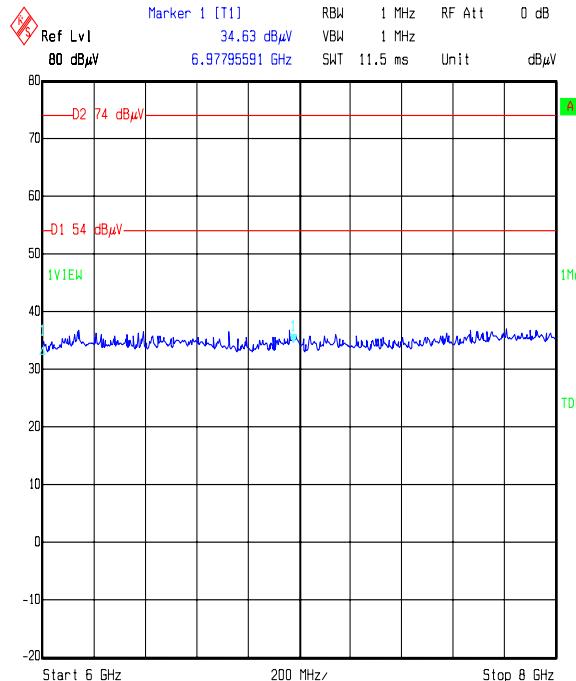
Title: 48681JD01  
Date: 2.NOV.2006 15:04:17



Title: 48681JD01  
Comment A: Radiated emissions  
Date: 09.OCT.2006 15:44:35



Title: 48681JD01  
Date: 2.NOV.2006 14:51:20

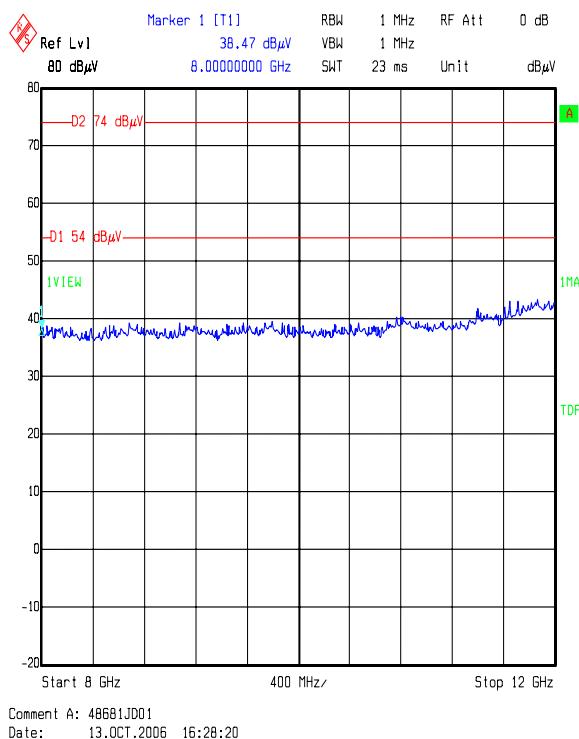


Comment A: 48681JD01  
Date: 13.OCT.2006 16:26:38

*Note: 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: Section 15.109 (Continued)**



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

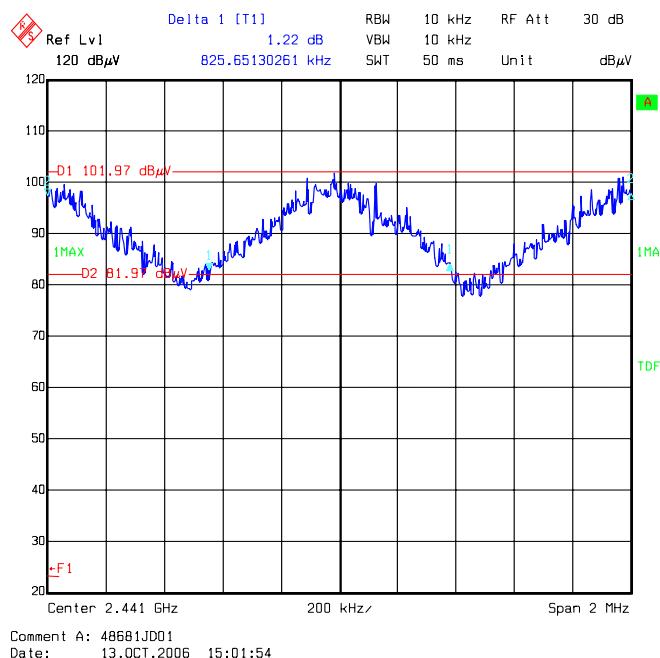
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**7.2.4. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)**

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)
825.651	None specified



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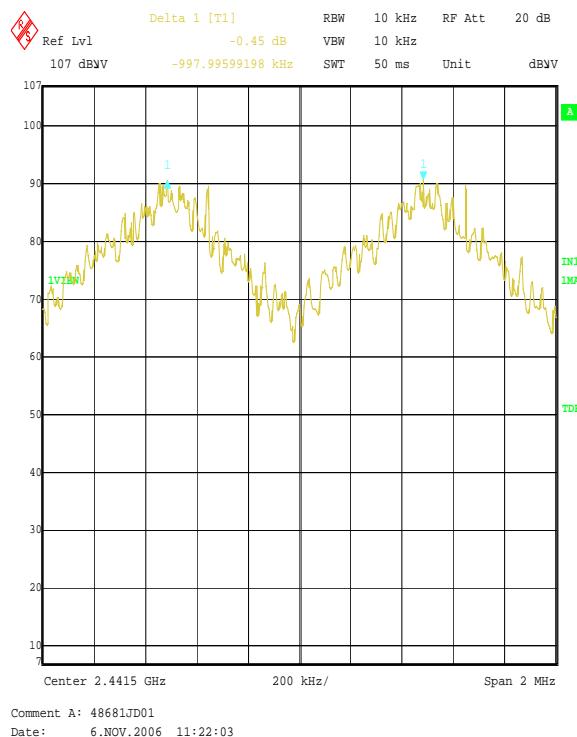
### 7.2.5. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

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 $\frac{2}{3}$ of 20 dB BW (kHz))	Margin (kHz)	Result
997.99599	550.434	447.562	Complied



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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.

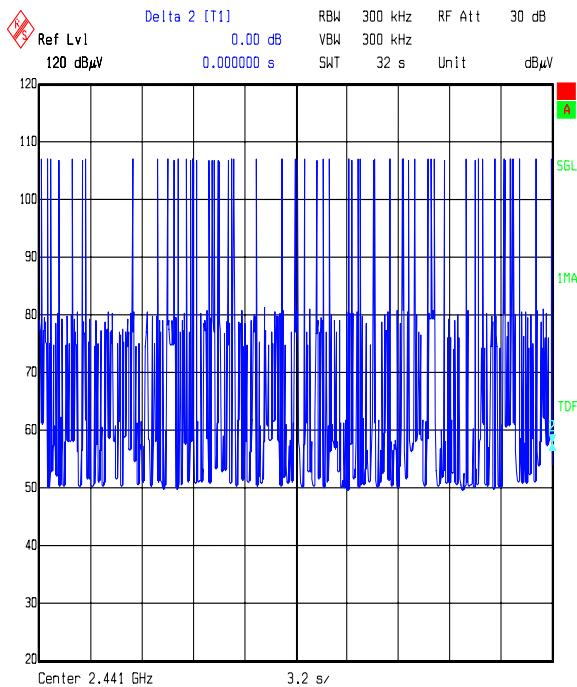
Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

#### **Results:**

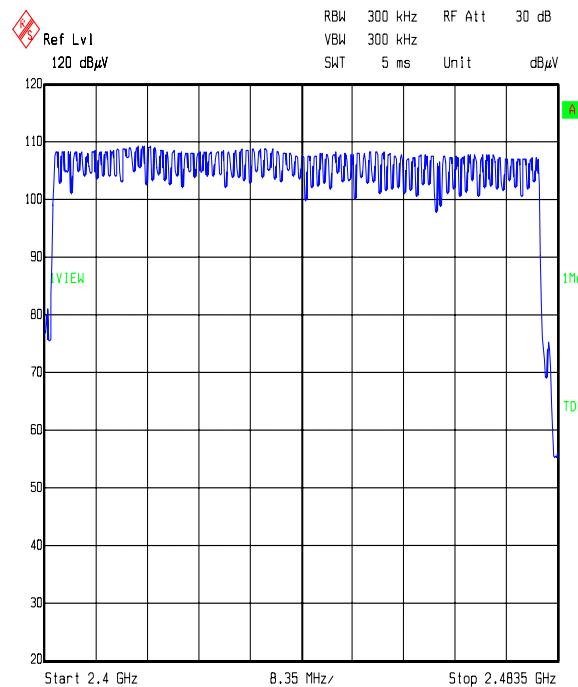
Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2941.88	63	0.185	0.4	0.214	Complied

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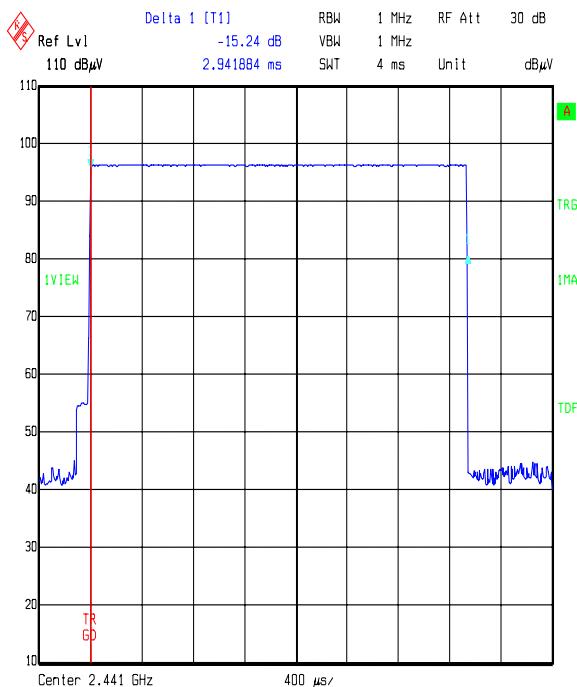
**Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)**



Comment A: 48681JD01  
 Date: 13.OCT.2006 15:26:14



Comment A: 48681JD01  
 Date: 13.OCT.2006 15:29:01



Comment A: 48681JD01  
 Date: 13.OCT.2006 15:57:50

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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**

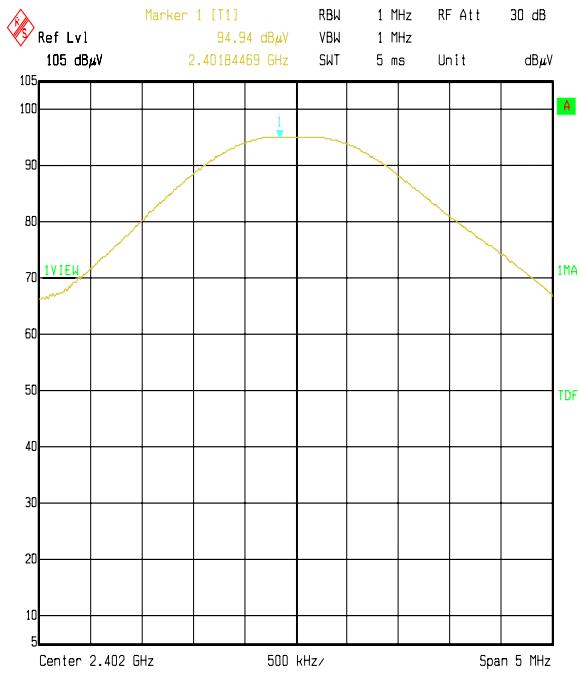
Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	0.7	30.0	29.3	Complied
Middle	1.7	30.0	28.3	Complied
Top	1.0	30.0	29.0	Complied

#### **Note(s):**

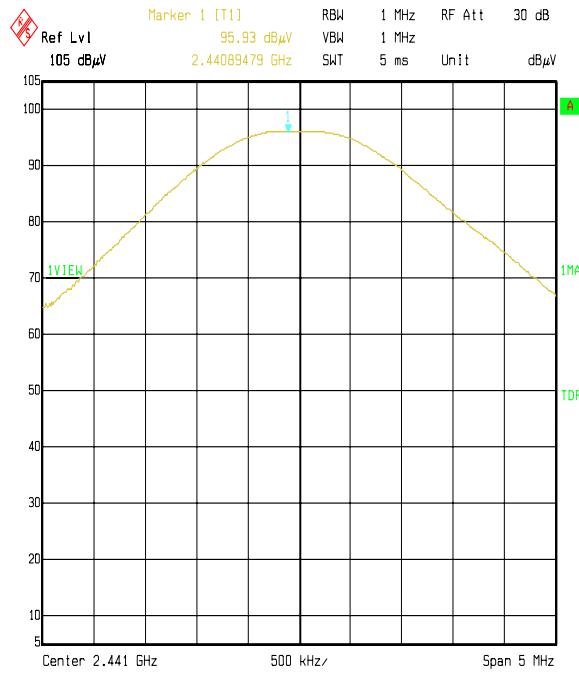
1. *These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.*

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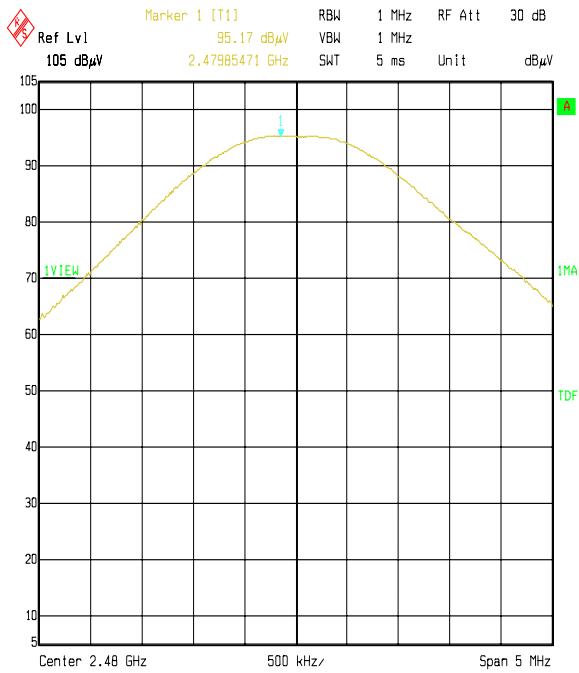
**Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)**



Title: FCC 15.247  
 Comment A: TX MAXIMUM PEAK OUTPUT POWER BOT CHANNEL  
 Date: 30.OCT.2006 15:57:48



Title: 48143JD07 FCC 15.247  
 Comment A: TX MAXIMUM PEAK OUTPUT POWER MID CHANNEL  
 Date: 30.OCT.2006 15:45:53



Title: FCC 15.247  
 Comment A: TX MAXIMUM PEAK OUTPUT POWER TOP CHANNEL  
 Date: 30.OCT.2006 15:49:18

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#### **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 to 1000 MHz (emissions occurring in the restricted bands)**

###### **Top Channel**

Frequency (MHz)	Antenna Polarity	Q-P Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
260.120	Vertical	40.1	46.0	5.9	Complied

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**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 (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
88.278	Vertical	40.0	75.2	35.2	Complied
160.240	Vertical	41.3	75.2	33.9	Complied
234.869	Vertical	43.1	75.2	32.1	Complied
321.443	Horizontal	41.6	75.2	33.6	Complied
482.565	Horizontal	37.5	75.2	37.7	Complied
562.615	Horizontal	40.1	75.2	35.7	Complied

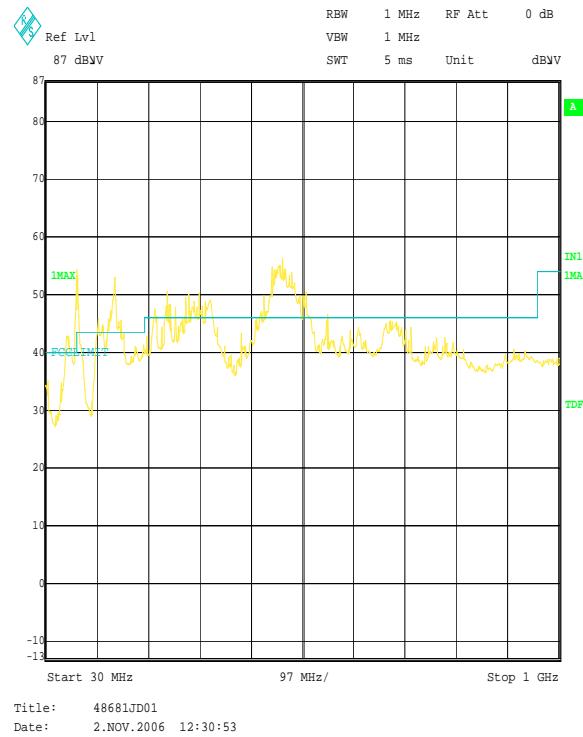
**Note(s):**

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

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



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

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**7.2.10. 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 (Frequency Range: 1 to 25 GHz)  
(emissions occurring in the restricted bands)**

**Highest Peak Level: Bottom Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.8016	Vertical	73.5	-6.5	67.0	74.0	7.0	Complied
1.6019	Horizontal	66.5	-11.8	54.7	74.0	19.3	Complied

**Highest Average Level: Bottom Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.8056	Vertical	56.5	-6.5	50.0	54.0	4.0	Complied
1.6019	Horizontal	60.1	-11.8	48.3	54.0	5.7	Complied

**Highest Peak Level: Middle Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.8817	Vertical	73.7	-6.5	67.2	74.0	6.8	Complied

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
**To:** FCC Part 15.247: 2005 (Subpart C)

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

**Highest Average Level: Middle Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.8817	Vertical	58.0	-6.5	51.5	54.0	2.5	Complied

**Highest Peak Level: Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.9619	Vertical	56.2	-5.8	68.6	74.0	5.4	Complied

**Highest Average Level: Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.9619	Vertical	56.2	-5.8	50.4	54.0	3.6	Complied

**Highest Peak Level: Hopping Mode**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.9259	Vertical	61.73	-5.8	67.2	74.0	6.8	Complied
1.6457	Horizontal	68.7	-11.8	56.9	74.0	17.1	Complied

**Highest Average Level: Hopping Mode**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4.8558	Vertical	56.9	-5.8	51.1	54.0	2.9	Complied
1.6236	Horizontal	51.4	-11.8	39.6	54.0	17.1	Complied

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
**To:** FCC Part 15.247: 2005 (Subpart C)

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**7.2.11. 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 (Frequency Range: 1 to 25 GHz)  
(emissions outside the restricted bands)**

**Highest Peak Level: Bottom Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
See Note 1							

**Highest Peak Level: Bottom Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
1.6280	Horizontal	69.2	-11.8	57.41	76.9	19.5	Complied

**Highest Peak Level: Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
1.6540	Horizontal	70.3	-11.7	58.6	76.2	17.6	Complied

**Highest Peak Level: Hopping Mode**

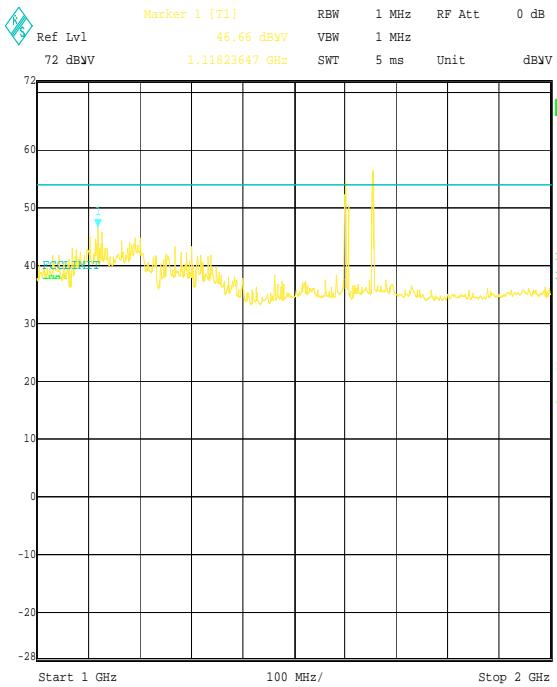
Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	-20 dBc Limit (dB $\mu$ V/m)	Margin (dB)	Result
1.6540	Horizontal	68.6	-11.2	56.9	76.2	19.3	Complied

**Note(s):**

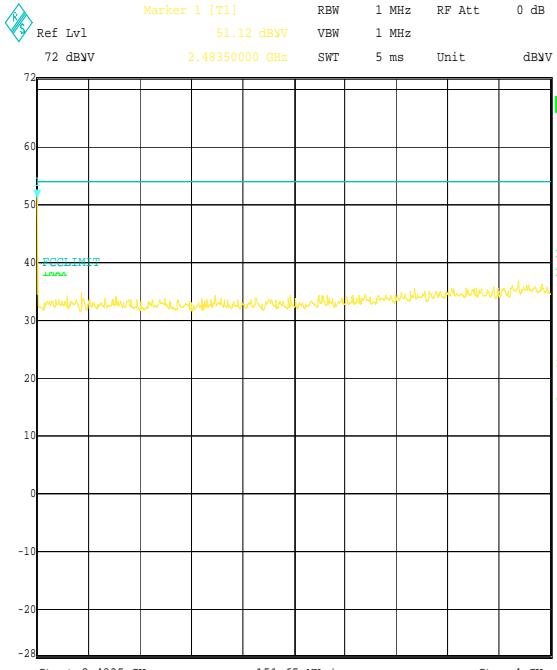
1. No emissions has been observed in 20 dB below the limit.

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
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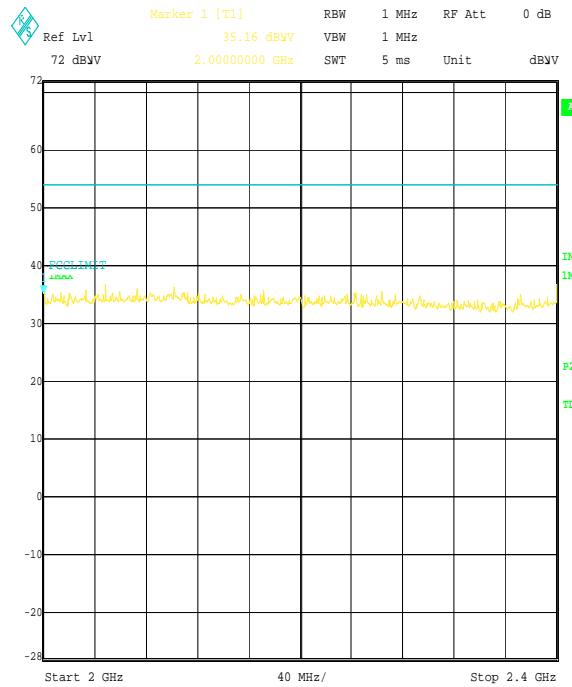
**Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)**



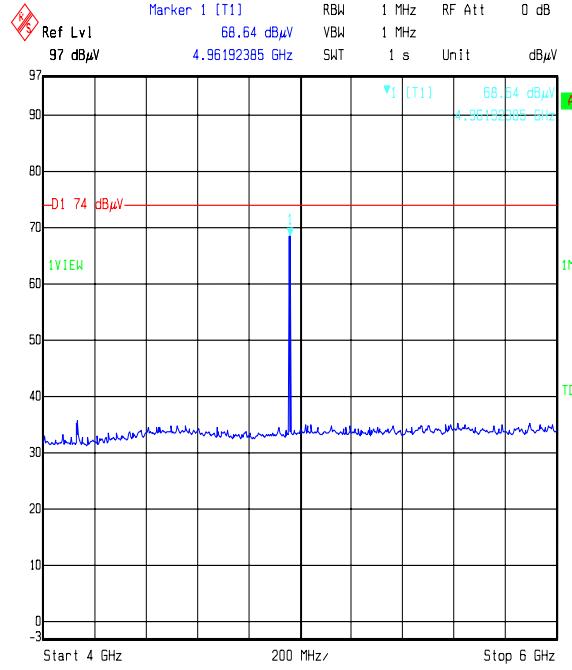
Title: 48681JD01  
 Date: 2.NOV.2006 12:57:30



Title: 48681JD01  
 Date: 2.NOV.2006 14:49:40



Title: 48681JD01  
 Date: 2.NOV.2006 14:48:41

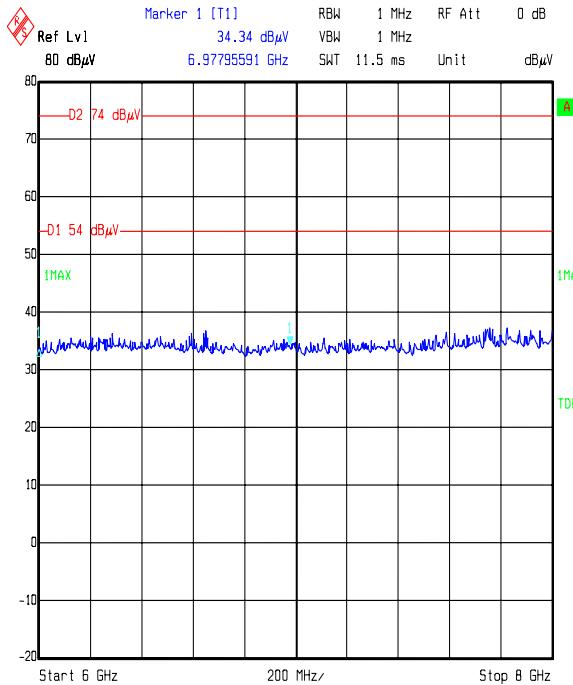


Title: 48681JD01  
 Comment A: Radiated emissions  
 Date: 09.OCT.2006 16:58:27

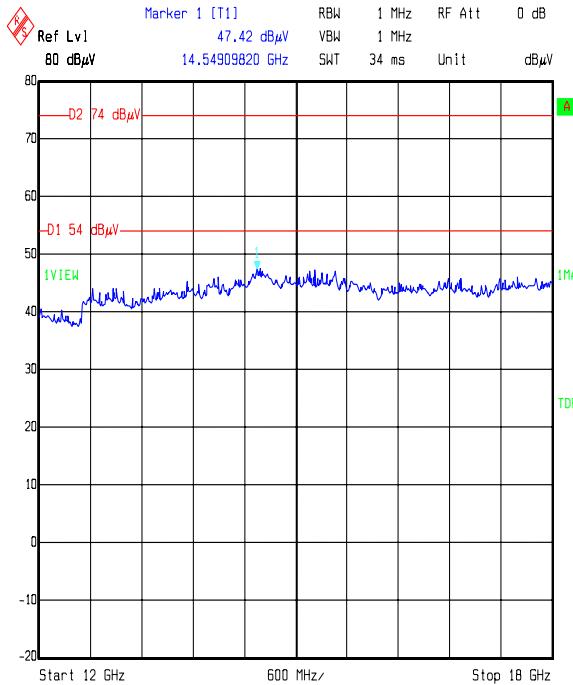
*Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.*

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
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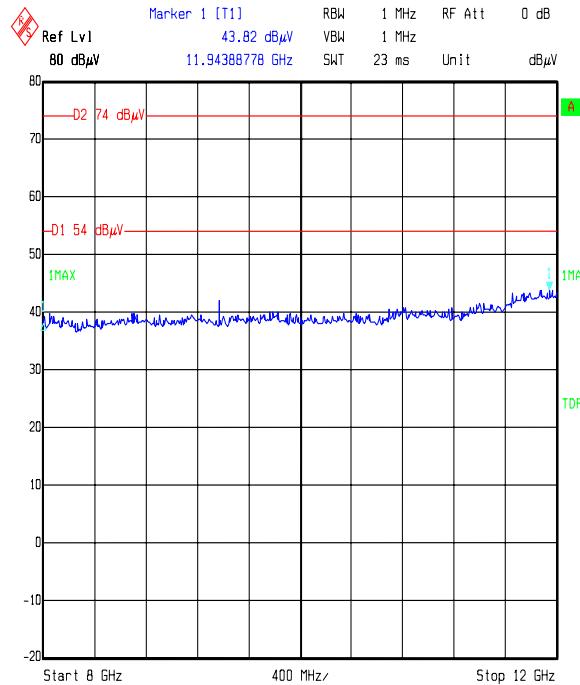
**Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)**



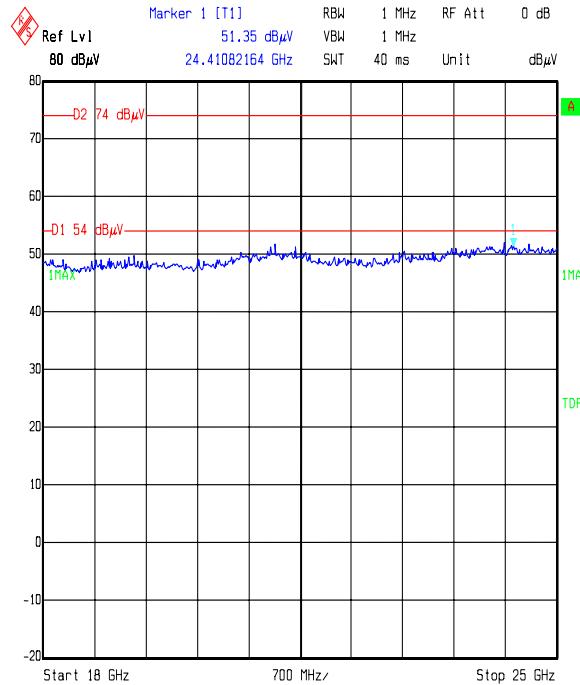
Comment A: 48681JD01  
Date: 13.OCT.2006 16:25:17



Comment A: 48681JD01  
Date: 13.OCT.2006 16:31:33



Comment A: 48681JD01  
Date: 13.OCT.2006 16:29:19



Comment A: 48681JD01  
Date: 13.OCT.2006 16:35:51

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

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
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**7.2.12. 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 Static Mode:**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2.4000	Vertical	78.3	-11.4	66.9	77.0*	10.1	Complied
2.4835	Vertical	69.2	-11.0	53.2	74.0	20.8	Complied

**Average Power Level Hopping Mode:**

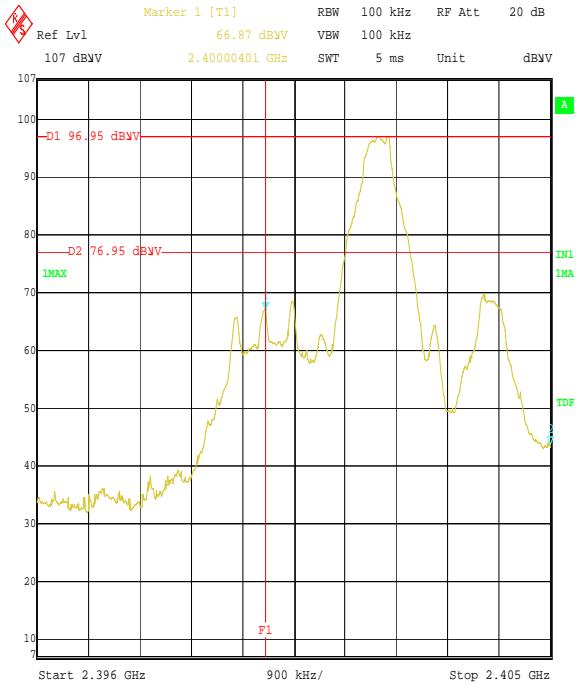
Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2.4835	Vertical	53.1	-11.0	42.1	54.0	11.9	Complied

**Note(s):**

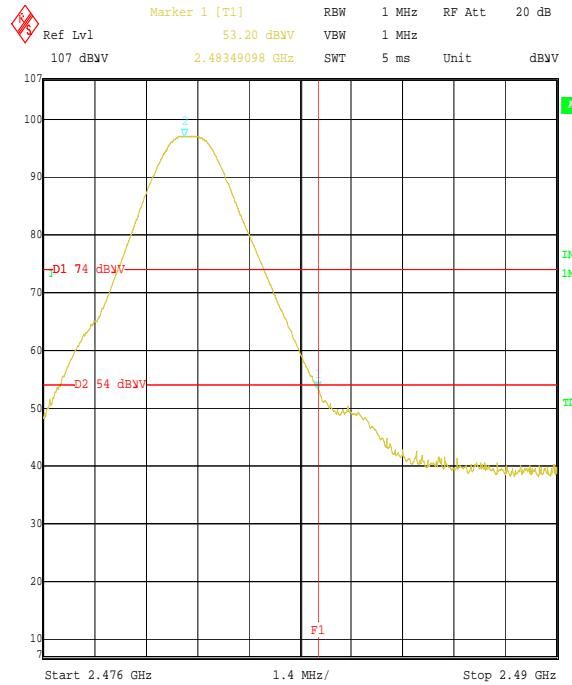
1. \*-20 dBc limit

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**AX3 Bluetooth headset/earpiece**  
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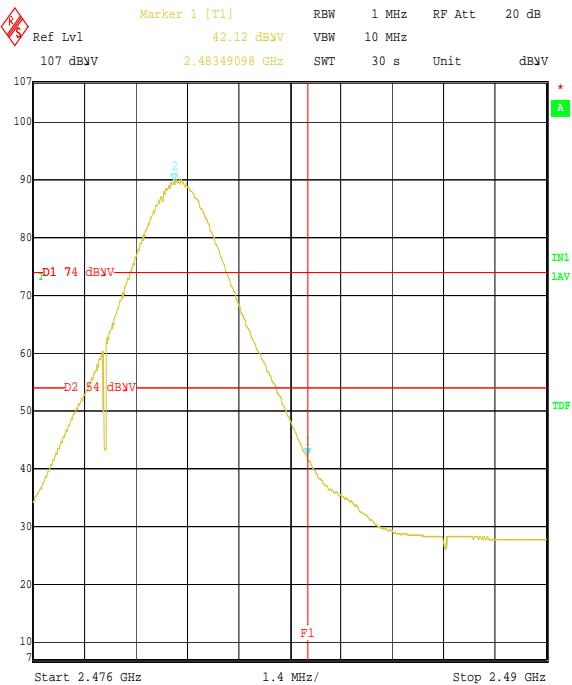
**Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)**



Comment A: 48681JD01  
Date: 6.NOV.2006 10:48:00



Comment A: 48681JD01  
Date: 6.NOV.2006 10:38:12



Comment A: 48681JD01  
Date: 6.NOV.2006 10:43:21

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
**To:** FCC Part 15.247: 2005 (Subpart C)

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**7.2.13. 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 Hopping Mode:**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2.4000	Vertical	77.6	-11.4	66.2	77.0*	10.8	Complied
2.4835	Vertical	67.3	-11.0	51.3	74.0	22.7	Complied

**Average Power Level Static Mode:**

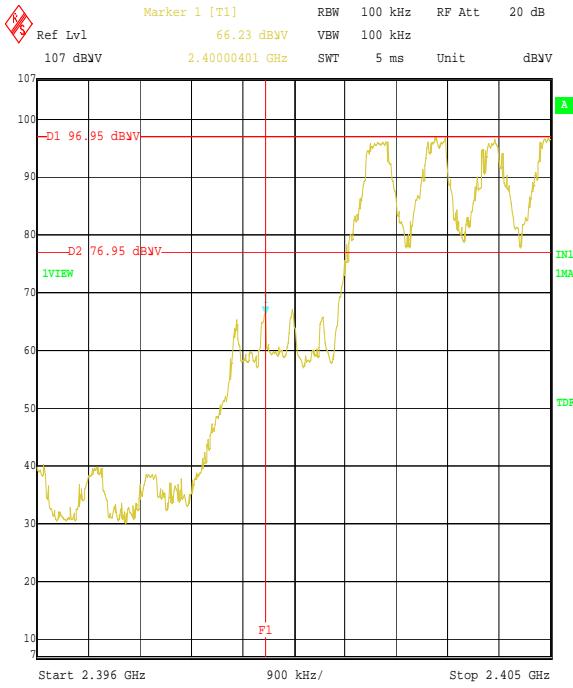
Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2.4835	Vertical	41.2	-11.0	30.2	54.0	23.8	Complied

**Note(s):**

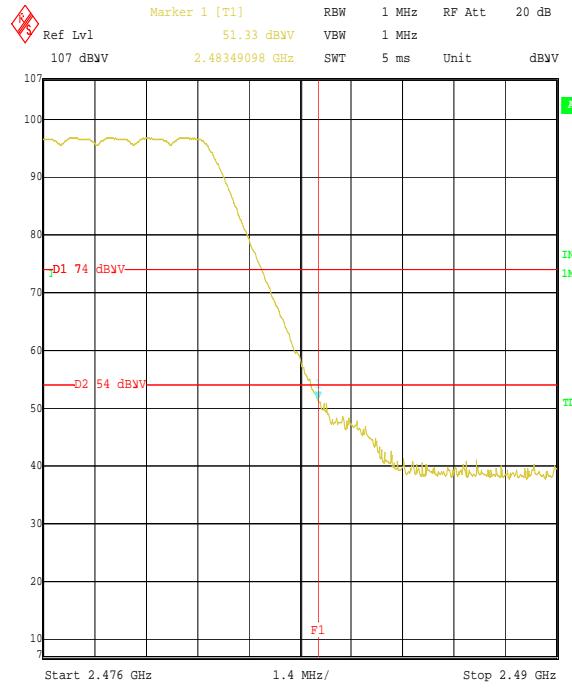
1. \*-20 dBc limit

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**AX3 Bluetooth headset/earpiece**  
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**Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)**



Comment A: 48681JD01  
 Date: 6.NOV.2006 10:51:26



Comment A: 48681JD01  
 Date: 6.NOV.2006 10:54:09



Comment A: 48681JD01  
 Date: 6.NOV.2006 11:05:37

**Test of:** Nextlink. To A/S.  
**AX3 Bluetooth headset/earpiece**  
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## **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
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.

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## **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:

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements</b>
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

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**AX3 Bluetooth headset/earpiece**  
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## **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.

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**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 dB $\mu$ V 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 $\geq$ 1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz <1 GHz) (1 MHz $\geq$ 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

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### **9.3. Conducted Antenna Port Emissions**

Conducted antenna port emissions measurements were performed using a 100 kHz bandwidth in accordance with the standard against the appropriate limits.

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

Initial measurements covering the entire measurement band in the form of swept scans were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which final measurements were necessary. To make the final measurements a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth.

Repetitive scans were performed to allow for emissions with low repetition rates.

Scans were performed to the upper frequency limits as stated in 15.33(a)(1)

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#### **9.4. 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 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.

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**AX3 Bluetooth headset/earpiece**  
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### **9.5. 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.

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### **9.6. Peak Output Power**

The EUT and spectrum analyser were configured as 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.

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### **9.7. 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:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

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**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

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### **9.8. 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  $\geq 1\%$  of the analyser span. The video bandwidth was set to be  $\geq$  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).

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## **Appendix 1. Test Equipment Used**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
A004	ESH3-Z5 LISN	Rohde & Schwarz	ESH3-Z5	890 604/027	05 Apr 2006	12
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A259	Chase Bilog Antenna	Chase EMC Ltd	CBL6111	1513	27 Feb 2006	12
A1360	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1360-20112003	06 Sept 2006	12
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	12 July 2006	12
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128	02 Jul 2004	36
A427	WG 14 horn	Flann	14240-20	150	06 Oct 2006	36
A429	WG 16 horn	Flann	16240-20	561	06 Oct 2006	36
A442	WG 8 horn	Narda	645	8608	06 Oct 2006	36
C1082	Cable 2m	Rosenberger	FA210A102 0M5050	28463-1	12 July 2006	12
C1164	1.5m N-type Cable	Rosenberger Micro-Coax	FA210A101 5007070	43188-1	12 July 2006	12
C1166	2m N-Type Cable	Rosenberger Micro-Coax	FA210A102 0007070	43189-02	12 July 2006	12
C151	Cable	Rosenberger	UFA210A-1-1181-70x70	None	12 July 2006	12

**Test of:** Nextlink. To A/S.  
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**Test Equipment Used (Continued)**

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval
C160	Cables	Rosenberger	UFA210A-1-1181-70x70	None	12 July 2006	12
C323	Cable	Rosenberger	UFA 210A-1-0788-50x50	96A0121	12 July 2006	12
C347	Cable	Rosenberger	UFA210A-1-1181-70x70	3007	06 Set 2006	12
C348	Cable	Rosenberger	UFA210A-1-1181-70x70	2993	12 July 2006	12
C363	BNC Cable	Rosenberger	RG142	None	29 Jan 2006	12
M1149	Anritsu	Anritsu	MT8852A	6K00001529	No calibration required	-
M1239	N4010A	Agilent	N4010A	GB45140361	No calibration required	-
M1242	FSEM30 Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986_022	22 Sept 2006	12
M1263	ESIB7	Rohde & Schwarz	ESIB7	100265	12 Jan 2006	12
S011	D.C. PSU	INSTEK	PR-3010H	9401270	Calibrated at time of test	-
S0520	DC Power Supply	GW instek	GPC-3030	E835141	Calibrated at time of test	-

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

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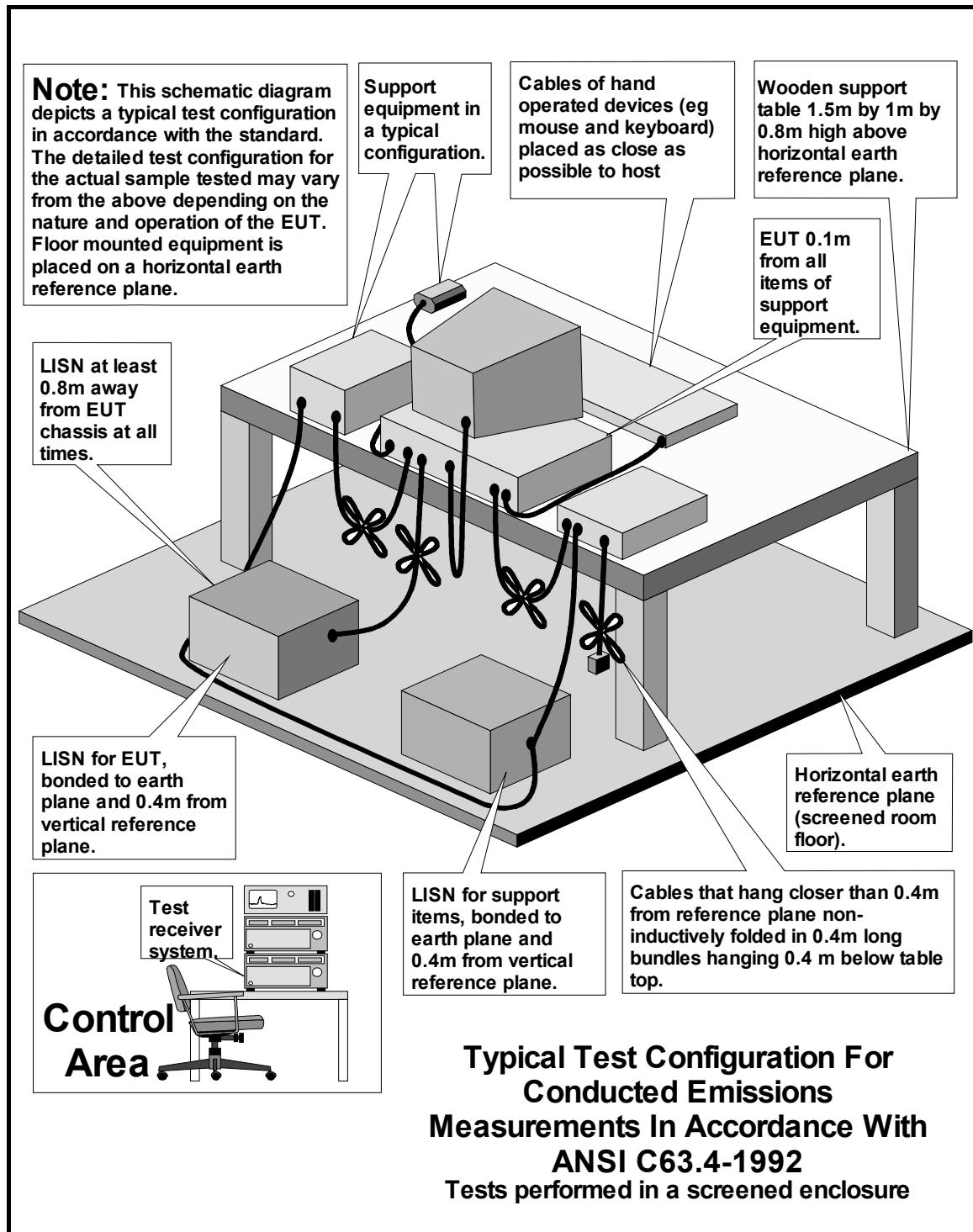
## **Appendix 2. Test Configuration Drawings**

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\48681JD01\EMICON	Test configuration for measurement of conducted emissions.
DRG\48681JD01\EMIRAD	Test configuration for measurement of radiated emissions.

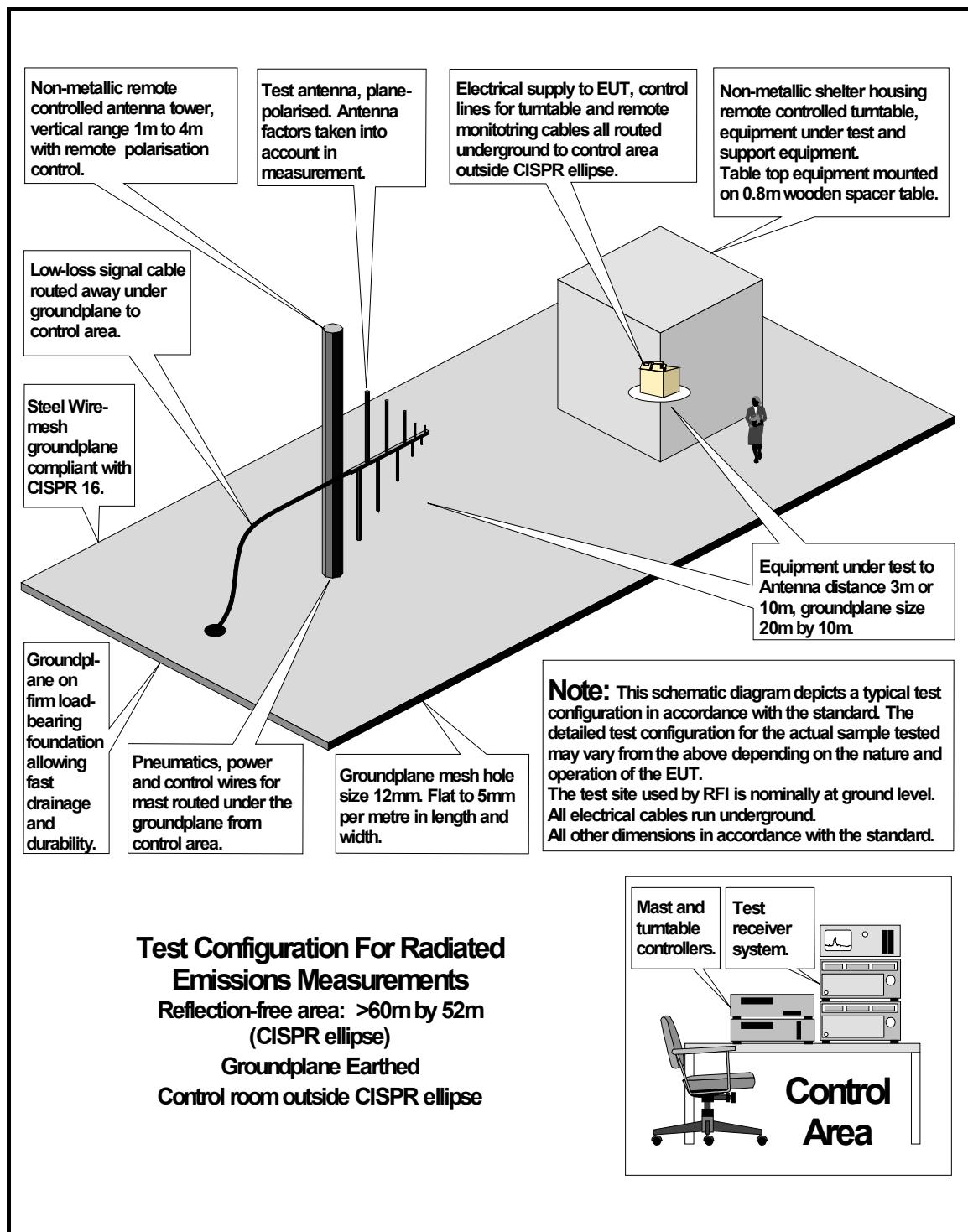
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DRG\48681JD01\EMICON



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DRG\48681JD01\EMIRAD



**Test of:** **Nextlink. To A/S.**  
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