TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)

To: FCC Part 15.247

Test Report Serial No:
RFI/MPTB2/RP44497JD02A

Supersedes Test Report Serial No:
RFI/MPTB1/RP44497JD02A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director:	**Checked By:**
Tested By: pp	**Release Version No: PDF01**
Issue Date: 04 June 2003	**Test Dates: 17 April 2003 to 14 May 2003**

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields. Furthermore, the date of creation must match the issue date stated above.

This report may be copied in full.

The results in this report apply only to the sample(s) tested.

This page has been left intentionally blank.

Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)
To: FCC Part 15.247

Table of Contents

Note: Test Report Serial No: RFI/MPTB2/RP44497JD02A supersedes Test Report Serial No: RFI/MPTB1/RP44497JD02A.

1. Client Information

Company Name:	Nokia Mobile Phones
Address:	Nokia House Summit Avenue Southwood Farnborough Hants GU14 0NG UK
Contact Name:	Mr A White

2. Equipment Under Test (EUT)

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

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Nokia
Model Name or Number:	3600
Unique Type Identification:	NHM-10
IMEI Number:	004400071717365
Country of Manufacture:	Finland
Date of Receipt:	17 April 2003

2.2. Description Of EUT

The equipment under test is a dual-band (900, 1900) camera mobile handset, which supports IR and Bluetooth.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from what is described by the Model Number and Unique Type Identification stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement: (Internal, non-removable lithium ion battery)	4.2 V DC		
Declared Battery End Point Voltage	3.45 V DC		
Power Supply Requirement: (AC Battery Charger)	Nominal 115 V 60 Hz AC Mains supply		
Intended Operating Environment:	Within GSM/Bluetooth Network Coverage		
Equipment Category:	Portable		
Type of Unit:	Handset		
Weight:	130 g		
Dimensions:	130 x 55 x 23 mm		
Interface Ports:	Charger Connection Accessory Connection		
Highest Fundamental Frequency	1989.8 MHz		
Highest Oscillator Frequency	3980.0 MHz		
Transmit Frequency Range	2402 MHz to 2481 MHz		
Transmit Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2402
	Middle	39	2441
	Top	79	2480
Receive Frequency Range	2402 MHz to 2481 MHz		
Receive Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2402
	Middle	39	2441
	Top	79	2480
Maximum Power Output (EIRP)	1.19 dBm		

2.5. Support Equipment

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

Description:	Universal Radio Communications Tester
Brand Name:	Rohde & Schwartz
Model Name or Number:	CMU200
Serial Number:	1100.0008.02
Connected to Port:	RF Link

Description:	Li-ion Battery
Brand Name:	Nokia
Model Name or Number:	BL-5C
Serial Number:	067040063663222411
Cable Length And Type:	N/A
Connected to Port:	Battery

Description:	AC Power Supply
Brand Name:	Nokia
Model Name or Number:	Travel Charger
Serial Number:	ACP-12U
Cable Length And Type:	175 cm
Connected to Port:	Charger

Description:	Headset
Brand Name:	Nokia
Model Name or Number:	Headset
Serial Number:	HDE-2
Cable Length And Type:	108 cm
Connected to Port:	Headset Jack

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 15 Subpart C: 2002 (Section 15.247)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

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 (2001)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

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

3.3. Definition Of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations From The Test Specification

None.

5. Operation Of The EUT During Testing

5.1. Operating Conditions

The EUT was tested in a normal laboratory environment.

During testing, the EUT was powered by a Nominal 115 V 60 Hz AC Mains supply

5.2. Operating Modes

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

Preliminary radiated scans were performed on the DUT with the accessories stated in section 2.1 of this report connected and then disconnected. The combination that exhibited the worse case mode of operation was then used to perform final measurements.

Bluetooth mode Transmitting on Top, Middle, Bottom channels or in receive mode.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Configured with hands free kit, AC battery charger and internal battery.

The EUT was programmed to operate on specific channels using an Anritsu Bluetooth test set.

6. Summary Of Test Results

Range Of Measurements	Specification Reference	Port Type	Compliancy Status
Receiver Conducted Emissions (AC Mains)	C.F.R. 47 FCC Part 15: 2002 Section 15.107	AC Mains Terminals	Complied
Receiver Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Antenna	Complied
Transmitter Conducted Emissions (AC Mains)	C.F.R. 47 FCC Part 15: 2002 Section 15.207	AC Mains Terminals	Complied
Transmitter 20dB Bandwidth	C.F.R. 47 FCC Part 15: 2002 Section 15.247(a)(1)(iii)	Antenna Terminals	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2002 Section 15.247(a)(1)	Antenna Terminals	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2002 Section 15.247(a)(1)(iii)	Antenna Terminals	Complied
Effective Isotropic Radiated Power	C.F.R. 47 FCC Part 15: 2002 Section 15.247(b)(1)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.247(c) Section 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emission	C.F.R. 47 FCC Part 15: 2002 Section 15.247(c) Section 15.209(a)	Antenna	Complied

6.1. Location Of Tests

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

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only.

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

Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)
To: FCC Part 15.247

7.2. Receiver Conducted Emissions AC Mains: Section 15.107

7.2.1. The EUT was configured as for AC conducted emissions measurements as described in section 8 of this report.

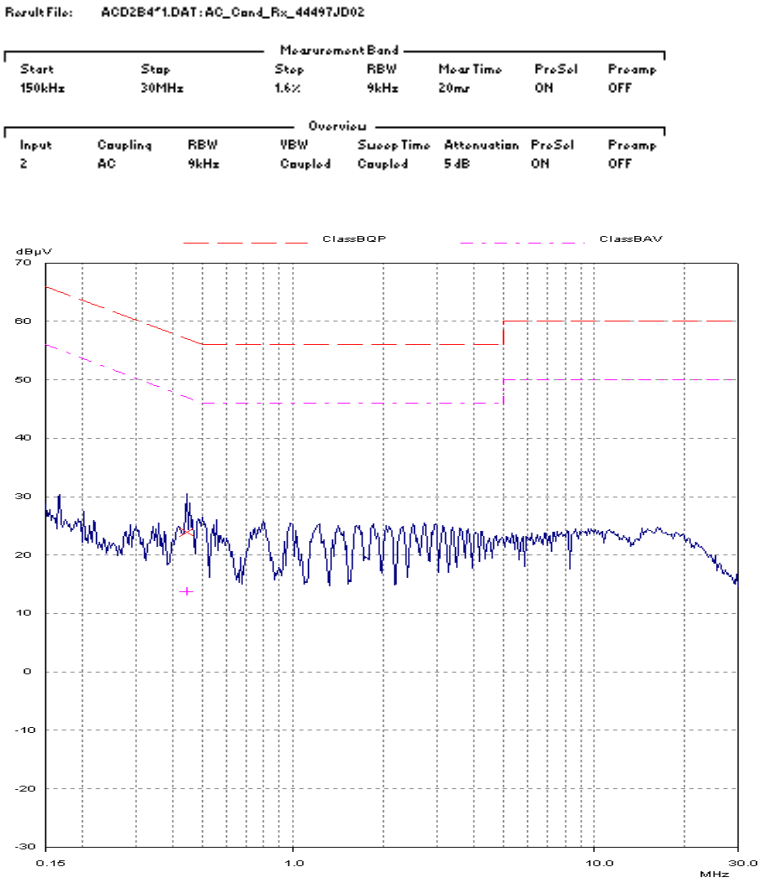
7.2.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.44338	Live	23.95	57.0	33.05	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Avg Level (dBµV)	Avg Limit (dBµV)	Margin (dB)	Result
0.44338	Live	13.74	47.0	33.26	Complied



Test Of: **Nokia Mobile Phones. 3600 Imaging Phone (Bluetooth Mode)**
To: **FCC Part 15.247**

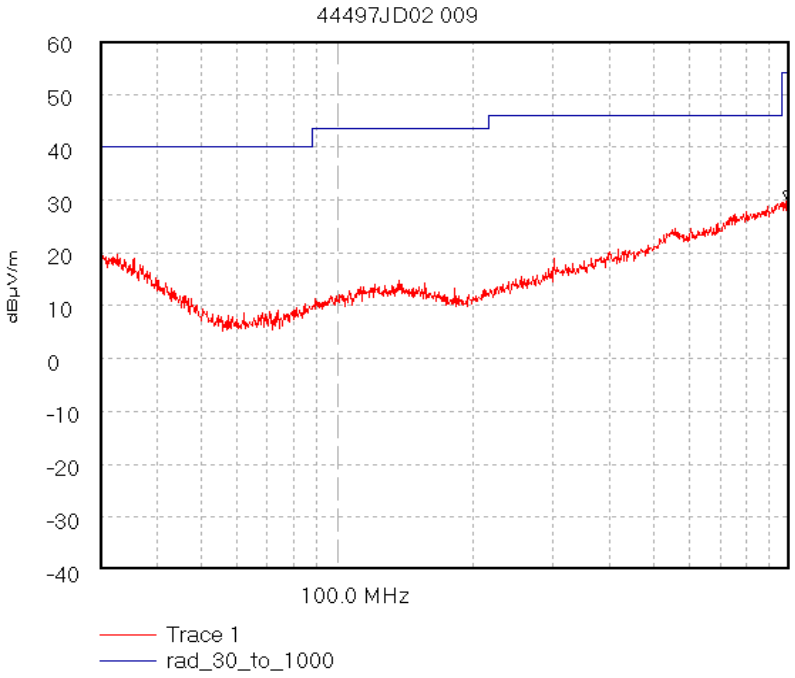
7.3. Receiver Radiated Emissions: Section 15.109

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

7.3.1.1. The EUT was configured as for radiated field strength emissions testing as described in Section 8 of this report.

7.3.1.2. Tests were performed to identify the maximum radiated spurious emissions levels.

Frequency (MHz)	Ant. Pol.	Q-P Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
984.536	Vert.	29.76	54.0	24.24	Complied



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 80.0 mS
Peak 984.536 MHz, 29.76 dBµV/m
Limit/Mask: rad_30_to_1000; ; Limit Test Passed
Transducer Factors: A490
17/04/2003 16:38:11

Receiver Radiated Emissions: Section 15.109 (Continued)

7.3.2. Electric Field Strength Measurements (Frequency Range: 1.0 to 26.5 GHz)

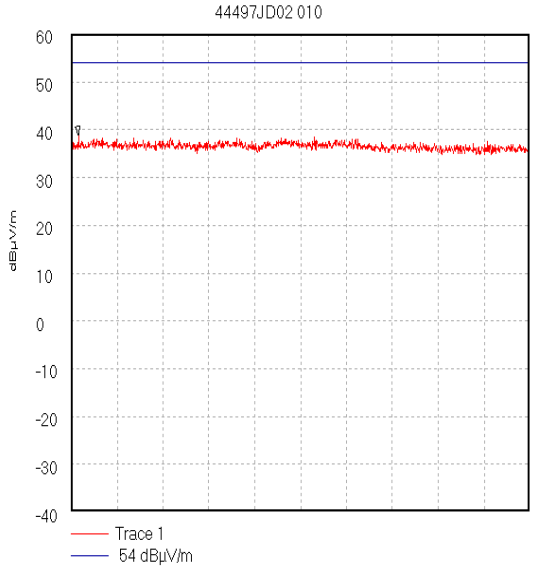
Highest Average Level:

**Note: Nothing recorded, No emissions were present.*

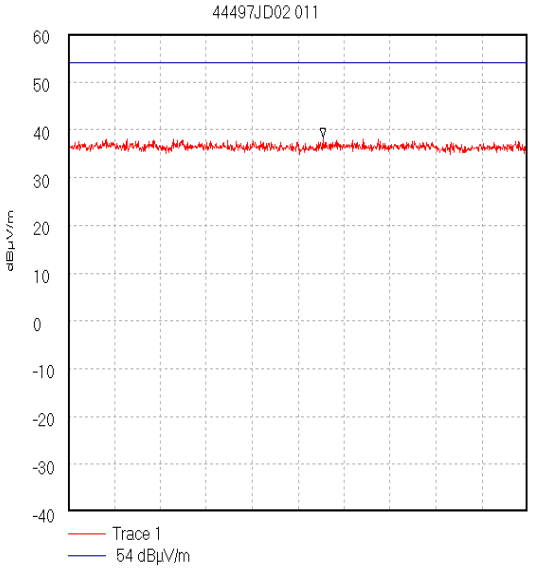
Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
*7.496667	Vert	25.4	26.1	1.7	53.2	54.0	0.8	Complied

*Note: No spurious emissions were present; therefore the highest peak noise floor reading of the measuring receiver was recorded.

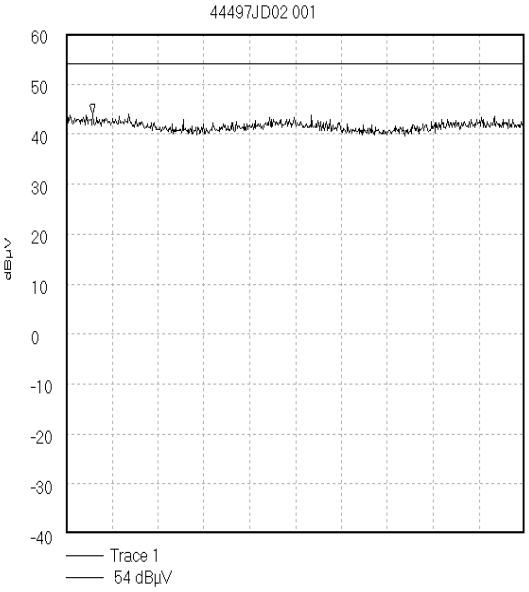


Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.016 GHz, 38.83 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
Transducer Factors: 1 to 2
17/04/2003 16:43:25

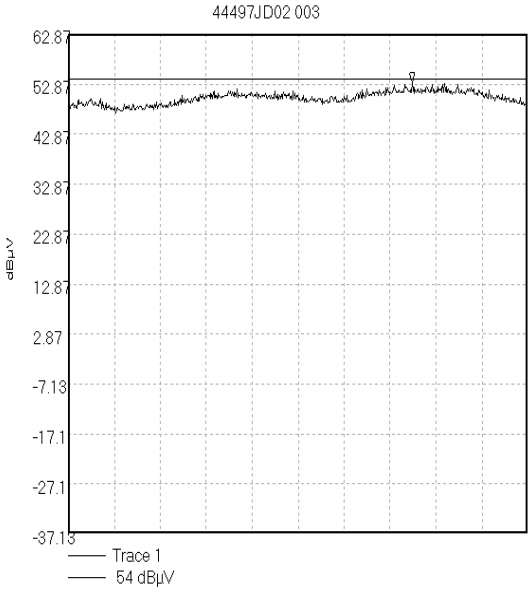


Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.109 GHz, 38.37 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
Transducer Factors: 2 to 4
17/04/2003 16:48:50

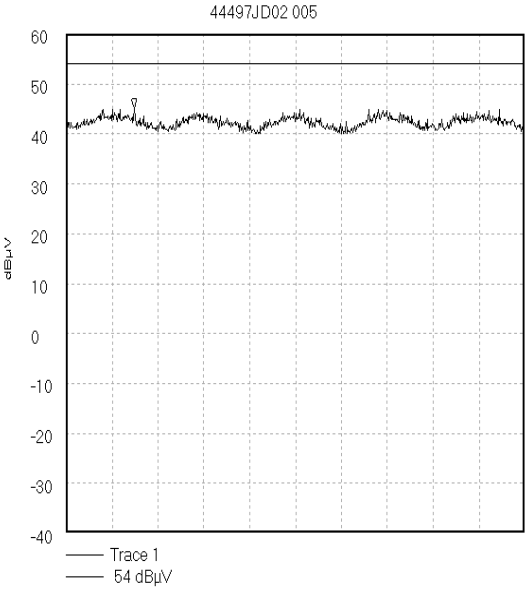
Test Of: **Nokia Mobile Phones.**
3600 Imaging Phone
(Bluetooth Mode)
To: **FCC Part 15.247**



Start 4.0 GHz; Stop 6.0 GHz
Ref 60 dBµV; Ref Offset 17.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 4.116667 GHz, 44.0 dBµV
Display Line: 54 dBµV;
16/05/2003 11:32:15



Start 6.0 GHz; Stop 8.0 GHz
Ref 62.87 dBµV; Ref Offset 20.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 7.496667 GHz, 53.2 dBµV
Display Line: 54 dBµV;
16/05/2003 11:44:13



Start 8.0 GHz; Stop 12.5 GHz
Ref 60 dBµV; Ref Offset 14.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 90.0 mS
Peak 8.6675 GHz, 45.17 dBµV
Display Line: 54 dBµV;
16/05/2003 12:01:40

7.4. Transmitter Conducted Emissions AC Mains: Section 15.207

Quasi-Peak Detector Measurements on Live and Neutral Lines

7.4.1. The EUT was configured as for AC conducted emissions measurements as described in Section 8 of this report.

7.4.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

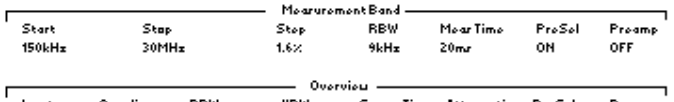
Bottom Channel

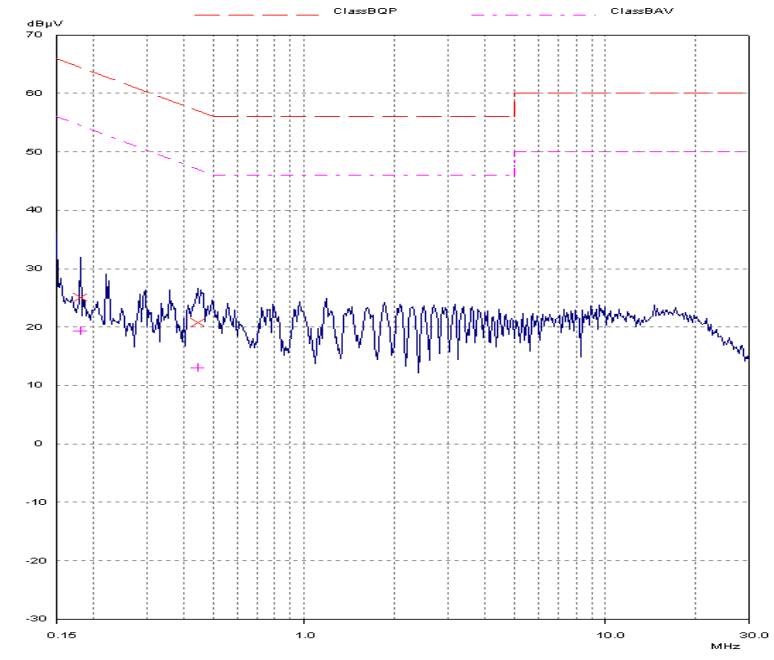
Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.18111	Live	24.99	64.43	39.44	Complied
0.44078	Neutral	20.75	57.05	36.30	Complied

Average Detector Measurements on Live and Neutral Lines

Bottom Channel

Frequency (MHz)	Line	Avg Level (dBµV)	Avg Limit (dBµV)	Margin (dB)	Result
0.18111	Live	19.28	54.43	35.15	Complied
0.44078	Live	13.06	47.05	33.19	Complied





Transmitter Conducted Emissions AC Mains: Section 15.207 (Continued)

Quasi-Peak Detector Measurements on Live and Neutral Lines

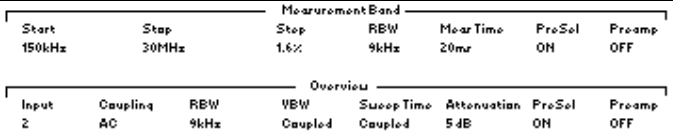
Middle Channel

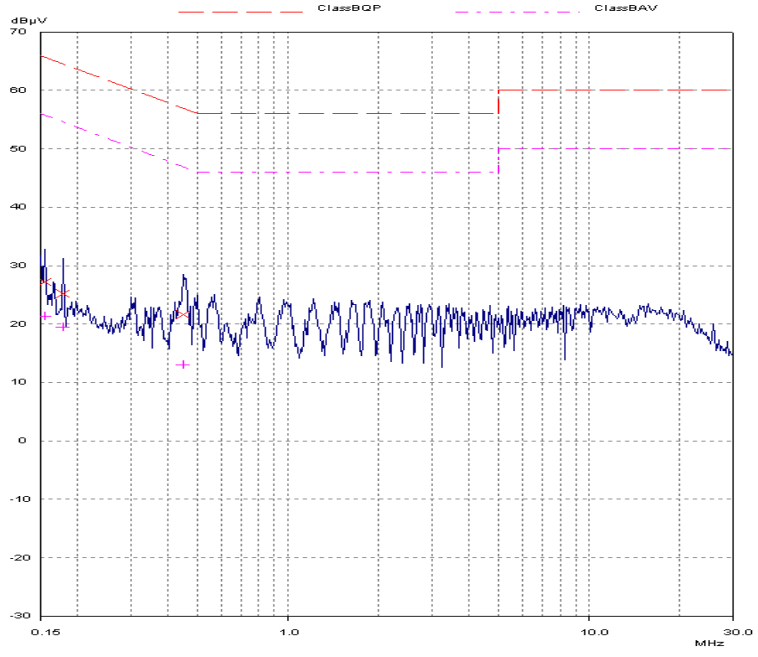
Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.15448	Neutral	27.28	65.76	38.48	Complied
0.17794	Neutral	25.25	65.58	39.33	Complied
0.44864	Live	21.64	56.90	35.26	Complied

Average Detector Measurements on Live and Neutral Lines

Middle Channel

Frequency (MHz)	Line	Avg Level (dBµV)	Avg Limit (dBµV)	Margin (dB)	Result
0.15448	Neutral	21.39	55.76	34.37	Complied
0.17794	Neutral	19.46	54.58	35.12	Complied
0.44864	Live	13.08	46.90	33.82	Complied





Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)
To: FCC Part 15.247

Transmitter Conducted Emissions AC Mains: Section 15.207 (Continued)

Quasi-Peak Detector Measurements on Live and Neutral Lines

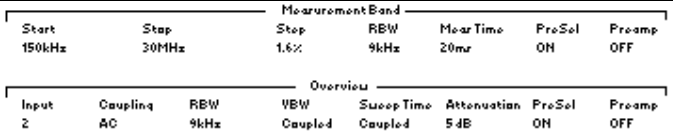
Top Channel

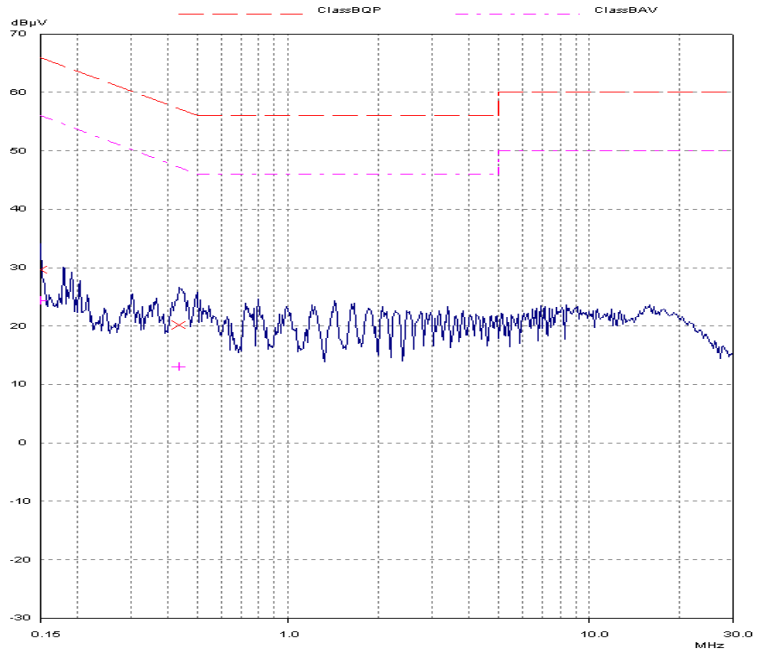
Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.15000	Live	29.59	66.00	36.41	Complied
0.43306	Live	20.25	57.19	36.94	Complied

Average Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Avg Level (dBµV)	Avg Limit (dBµV)	Margin (dB)	Result
0.15000	Live	24.41	56.00	31.59	Complied
0.43306	Neutral	12.96	47.19	34.23	Complied





Transmitter Conducted Emissions AC Mains: Section 15.207 (Continued)

Quasi-Peak Detector Measurements on Live and Neutral Lines

Hopping All Channels

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.43819	Neutral	23.67	57.10	33.43	Complied

Average Detector Measurements on Live and Neutral Lines

Hopping All Channels

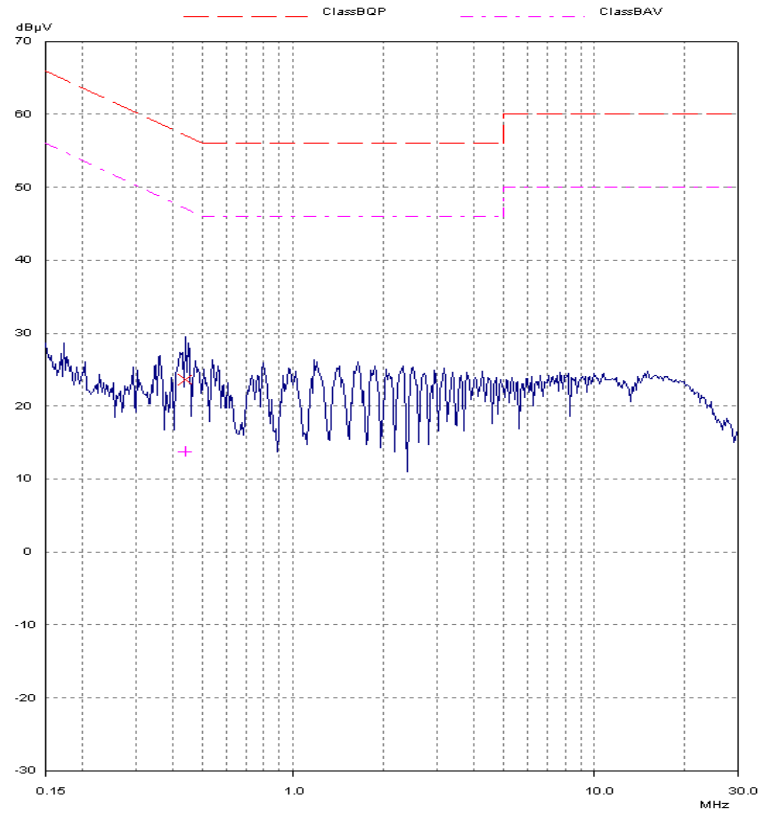
Frequency (MHz)	Line	Avg Level (dBµV)	Avg Limit (dBµV)	Margin (dB)	Result
0.43819	Neutral	13.72	47.10	33.38	Complied

Measurement Band

Start	Stop	Step	RBW	MeasTime	PreSel	Preamp
150kHz	30MHz	1.6%	9kHz	20ms	ON	OFF

Overview

Input	Coupling	RBW	VBW	SweepTime	Attenuation	PreSel	Preamp
2	AC	9kHz	Coupled	Coupled	5 dB	ON	OFF



Test Of: **Nokia Mobile Phones. 3600 Imaging Phone (Bluetooth Mode)**
To: **FCC Part 15.247**

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

7.5.1. The EUT was configured as for carrier frequency seperation/20dB bandwidth measurements as described in Section 8 of this report.

7.5.2. Tests were performed to identify the 20dB bandwidth.

Transmitter 20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
577.15	None Specified	N/A	N/A

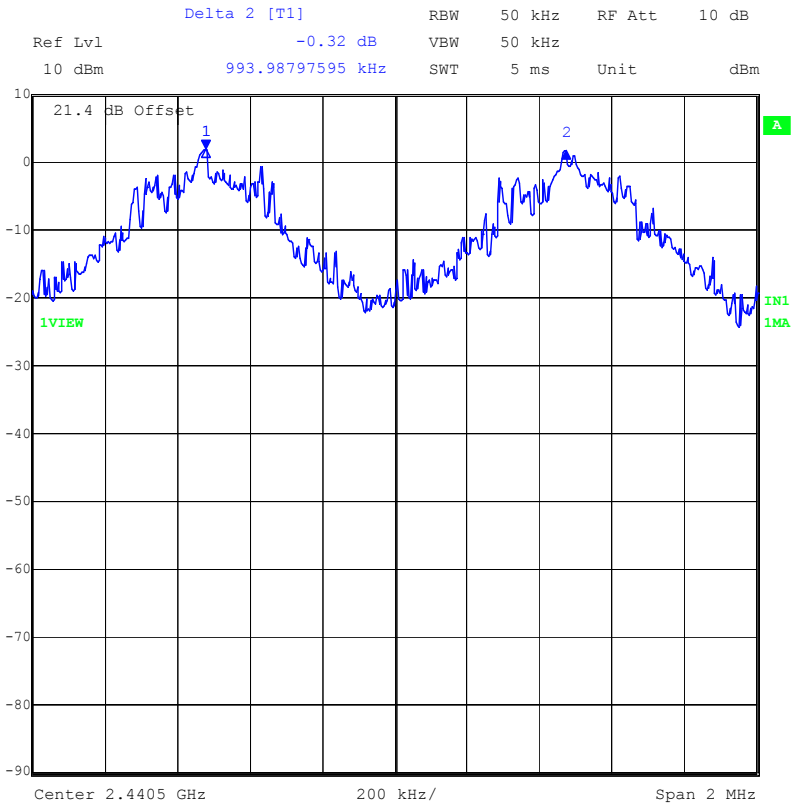
Title: Testing for Nokia Mobile Phones. EUT:Calista Mobile Handset.
Comment A: 20dB Bandwidth. FCC Part 15.247 (a)1)ii). Tx Mode - Hopping on All Channels.
Date: 22.APR.2003 16:30:07

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

7.6.1. The EUT was configured as for carrier frequency separation measurements as described in Section 8 of this report.

7.6.2. Tests were performed to identify the carrier frequency separation.

Transmitter Carrier Frequency Separation (kHz)	Limit (25kHz or 20dB BW which ever is greater) (kHz)	Margin (kHz)	Result
993.89	577.15	416.74	Complied



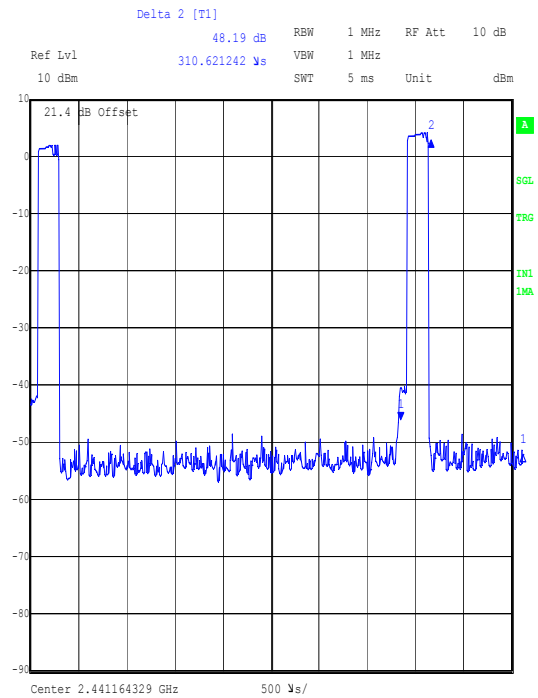
Title: Testing for Nokia Mobile Phones. EUT:Calista Mobile Handset.
Comment A: Carrier Frequency Seperation. FCC Part 15.247 (a)(1). Tx Mode - Hopping on All Channels.
Date: 22.APR.2003 15:40:53

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

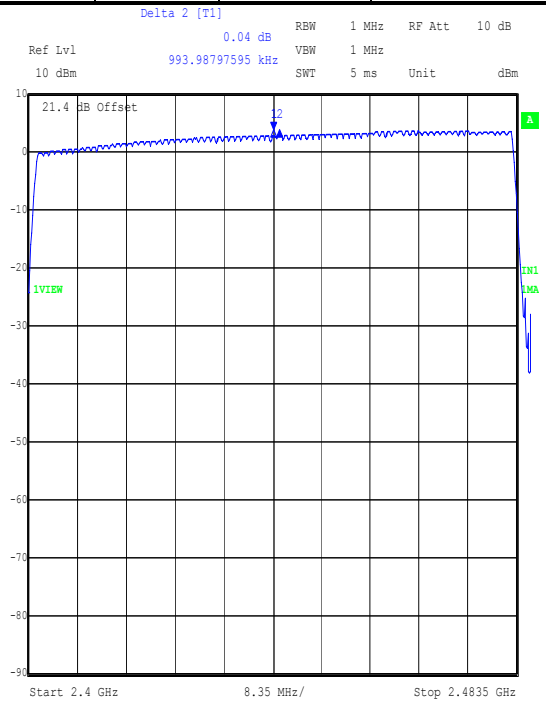
7.7.1. The EUT was configured as for average time of occupancy measurements as described in Section 8 of this report.

7.7.2. Tests were performed to identify the average time of occupancy.

Emission Width (µs)	Number of Hopping Channels Employed	Average Time of Occupancy (S)	Limit (S)	Margin (S)	Result
310.6	79	0.024537	0.4	0.375463	Complied



Title: Testing for Nokia Mobile Phones. EUT:Calista Mobile Handset.
Comment A: Time of Occupancy. FCC Part 15.247 (a)1)ii). Tx Mode - Hopping on Middle Channel.
Date: 22.APR.2003 15:58:30



Title: Testing for Nokia Mobile Phones. EUT:Calista Mobile Handset.
Comment A: Number of Hopping Frequencies. FCC Part 15.247 (a)1)ii). Tx Mode - Hopping on All Channels.
Date: 22.APR.2003 15:45:40

7.8. Effective Isotropic Radiated Power: Section 15.247

7.8.1. The EUT was configured as for Effective Isotropic Radiated Power measurements as described in Section 8 of this report.

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

Channel	Input Voltage (AC)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	93.50	-1.23	30	31.23	Complied
Bottom	110.00	-1.23	30	31.23	Complied
Bottom	126.50	-1.23	30	31.23	Complied

Channel	Input Voltage (AC)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Middle	93.50	1.17	30.0	28.83	Complied
Middle	110.00	1.16	30.0	28.84	Complied
Middle	126.50	1.19	30.0	28.81	Complied

Channel	Input Voltage (AC)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Top	93.50	1.08	30.0	28.92	Complied
Top	110.00	0.31	30.0	29.69	Complied
Top	126.50	0.31	30.0	29.69	Complied

7.9. Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a)

7.9.1. Electric Field Strength Measurements: 30 to 1000 MHz.

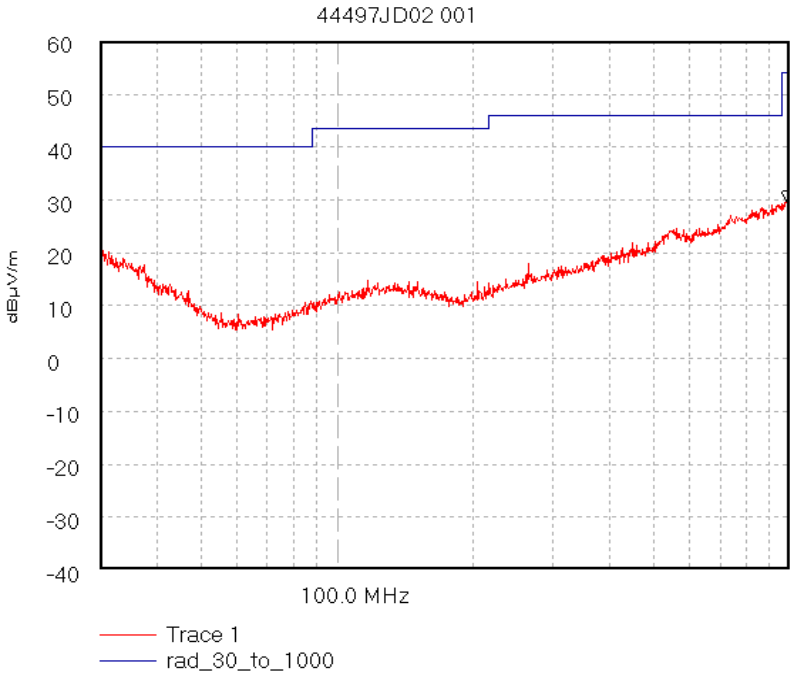
7.9.1.1. The EUT was configured as for radiated field strength measurements as described in Section 8 of this report.

7.9.1.2. Tests were performed to identify the maximum radiated emissions levels.

Bottom Channel

Frequency (MHz)	Ant. Pol.	Q-P Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
980.707	Vert	29.69	54.0	24.31	Complied

Note: 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 Middle channel only.



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 80.0 mS
Peak 980.707 MHz, 29.69 dBµV/m
Limit/Mask: rad_30_to_1000; ; Limit Test Passed
Transducer Factors: A490
16/04/2003 15:59:32

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (continued)

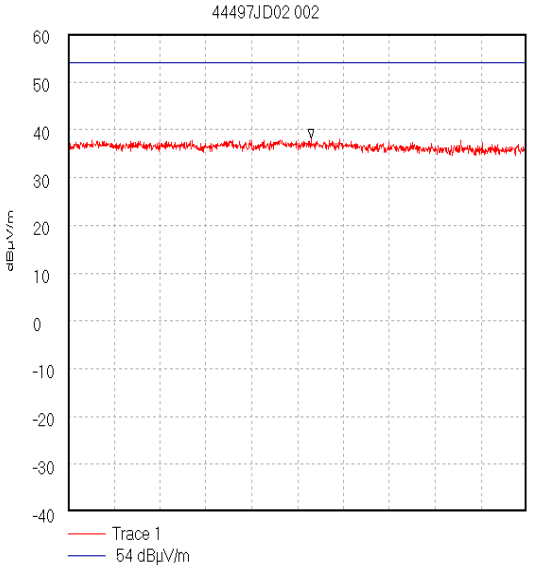
7.9.2. Electric Field Strength Measurements: 1.0 to 26.0 GHz

Highest Average Level: Middle Channel

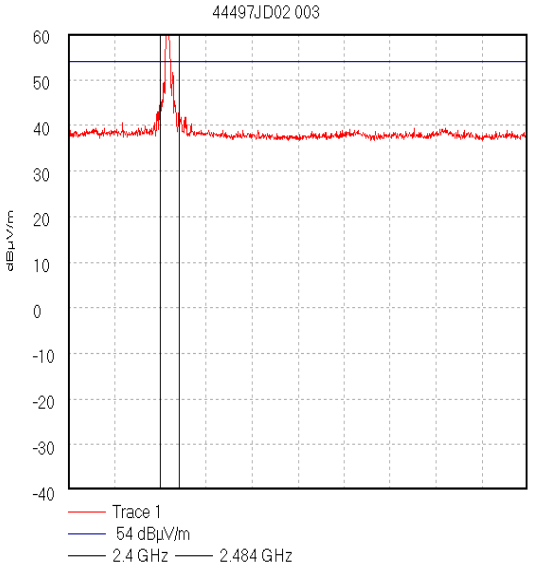
Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Result
4.88212	Vert	16.5	24.2	1.8	42.5	54.0	11.5	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
4.88212	Vert	22.2	24.2	1.8	48.2	74.0	25.8	Complied

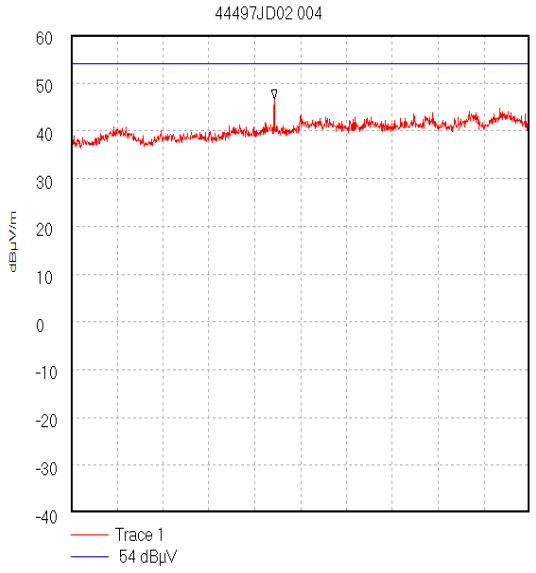


Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.53 GHz, 38.14 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
Transducer Factors: 1 to 2
16/04/2003 16:18:13

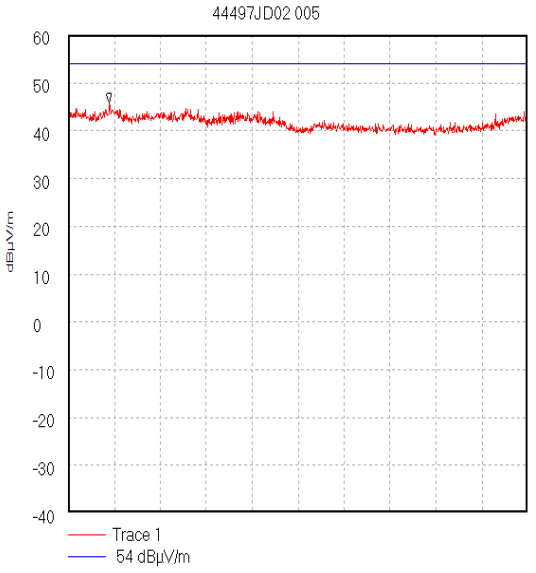


Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 2.431 GHz, 63.98 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Failed
Transducer Factors: 2 to 4
16/04/2003 16:26:52

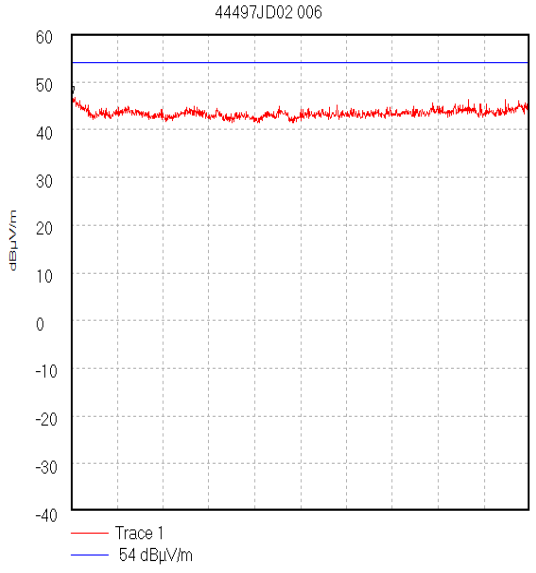
Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)
To: FCC Part 15.247



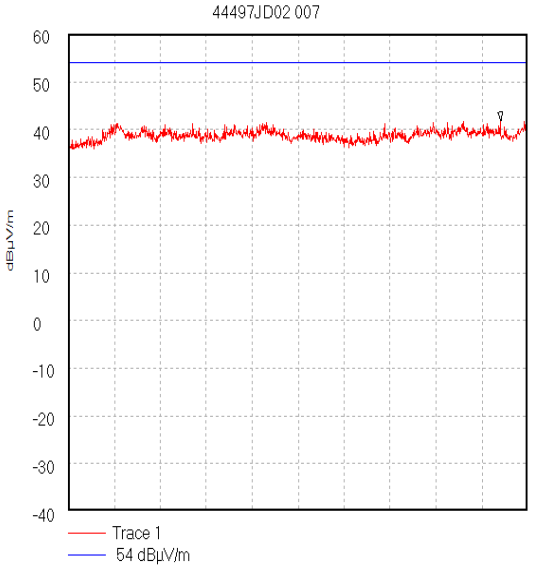
Start 4.0 GHz; Stop 6.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.887 GHz, 46.67 dBµV/m
Display Line: 54 dBµV;
Transducer Factors: 4to6g_Horn
17/04/2003 11:43:02



Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 6.178 GHz, 45.76 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 6to8g_Horn
17/04/2003 11:59:13

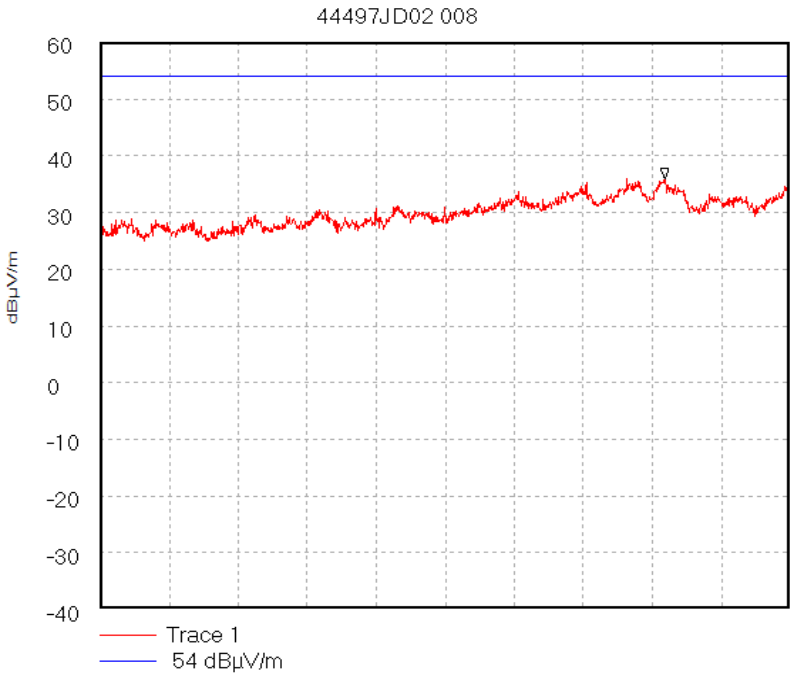


Start 8.0 GHz; Stop 12.5 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 8.01 GHz, 47.08 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 8to12G_Horn
17/04/2003 12:06:46



Start 12.5 GHz; Stop 18.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 17.676 GHz, 41.77 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 12to18G_Horn
17/04/2003 12:11:23

Test Of: **Nokia Mobile Phones. 3600 Imaging Phone (Bluetooth Mode)**
To: **FCC Part 15.247**



Start 18.0 GHz; Stop 26.5 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 24.961 GHz, 35.91 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 18to26
17/04/2003 12:16:07

7.10. Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a)

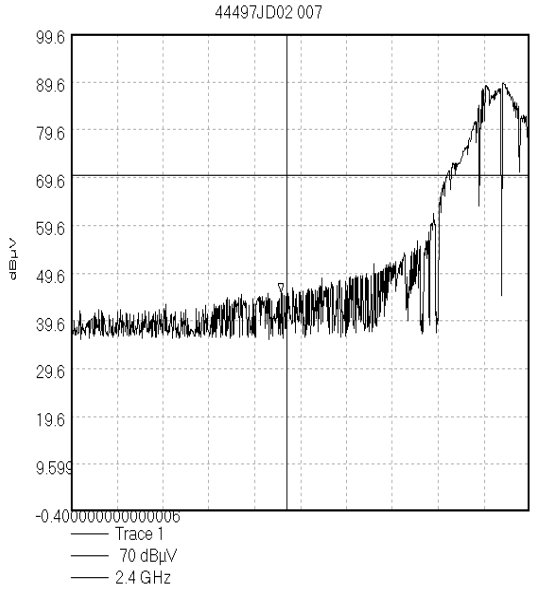
7.10.1. Electric Field Strength Measurements

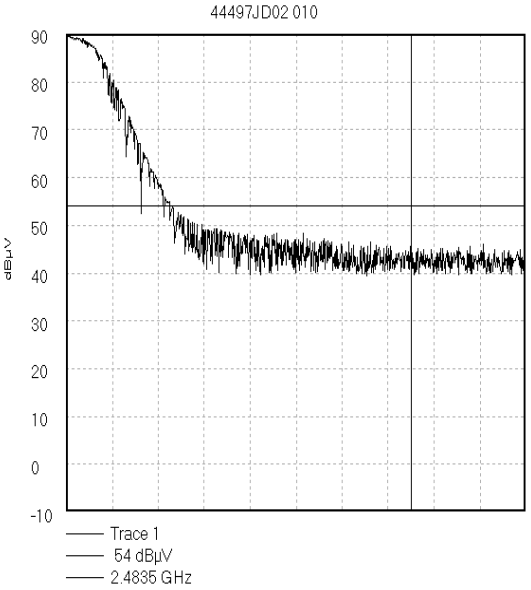
7.10.1.1. The EUT was configured as for band edge compliance of radiated emissions measurements as described in Section 8 of this report.

7.10.1.2. Tests were performed to identify the maximum radiated band edge emissions.

Peak Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
2.3999	Vert.	23.49	20.5	1.5	45.49	70.0	24.51	Complied
2.4790	Vert.	22.80	20.5	1.5	44.80	54.0	9.20	Complied



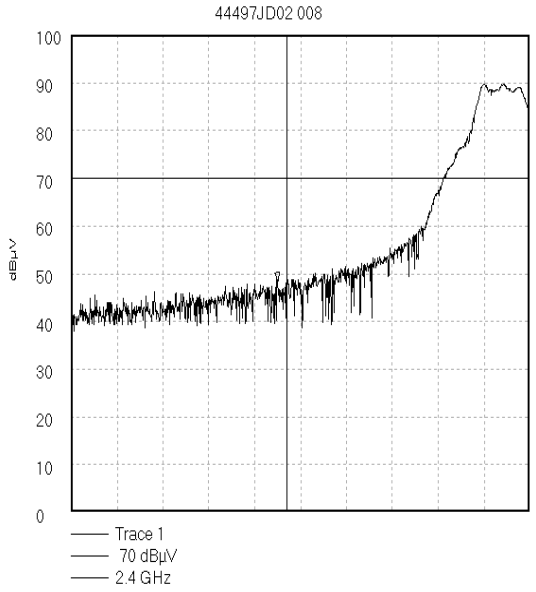


Test Of: **Nokia Mobile Phones. 3600 Imaging Phone (Bluetooth Mode)**
To: **FCC Part 15.247**

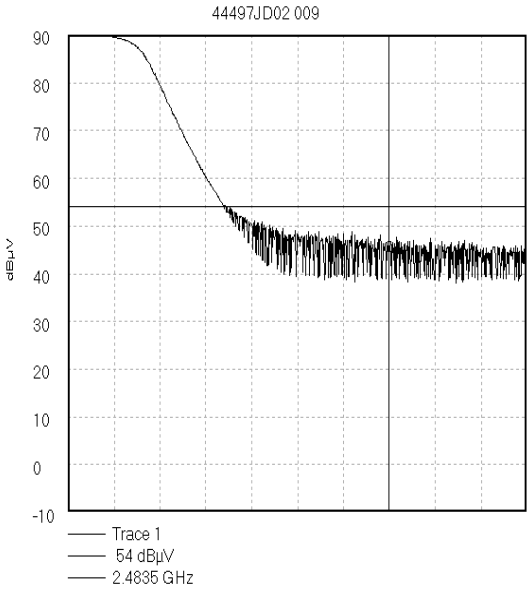
Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a) (Continued)

Peak Power Level Static Mode:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
2.3999	Vert.	26.38	20.5	1.5	48.38	70.0	21.62	Complied
2.4835	Vert.	22.80	20.5	1.5	44.80	54.0	9.20	Complied



Start 2.398 GHz; Stop 2.40225 GHz
Ref 100 dBµV; Ref Offset 27.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 20.0 mS
Marker 2.399913 GHz, 48.38 dBµV
Display Line: 70 dBµV;
27/05/2003 20:40:20



Start 2.48 GHz; Stop 2.485 GHz
Ref 90 dBµV; Ref Offset 27.0 dB; 10 dB/div
RBW 1.45 MHz; VBW 100.0 kHz; Att 0 dB; Swp 20.0 mS
Marker 2.4835 GHz, 44.8 dBµV
Display Line: 54 dBµV;
27/05/2003 20:57:52

8. Measurement Methods

8.1. 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 powered with 115V 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 EUT was configured in accordance with section 5.2 of this report.

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

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)*
Mode:	Max Hold	Not applicable
Bandwidth:	9 kHz	9 kHz
Amplitude Range:	100 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

* In some instances an Average detector function may also have been used, where this was the case it would have been documented in the relevant section.

8.2. Radiated Field Strength 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 from the EUT that 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 dBs of the limit were then measured on the open area test site, except in cases where the noise floor was within 20dBs of the limit, in these cases the emission between the noise floor and the limit line or the highest point of the noise floor was measured.

In either case the measurement was made at the appropriate 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.

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

On the open area test site, at each frequency where a signal was 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.

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 limit as stated in 15.33(a)(1)

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

Radiated Field Strength Emissions (Continued)

The EUT was configured in accordance with section 5.2 of this report for radiated emissions testing.

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

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

Receiver Function	**Initial Scan Above 1000 MHz**	**Final Measurements Above 1000 MHz**
Detector Type:	Peak	Peak/Average
Mode:	Max Hold	Max Hold where applicable
Bandwidth:	1 MHz	1 MHz
Amplitude Range:	100 dB	100 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

8.3. Carrier Frequency Separation/20dB Bandwidth

The EUT and spectrum analyser was 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.

To determine the bandwidth and separation of each transmission channel the analyser was configured to measure two adjacent channels.

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 a least the same value was used. The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20dB below the peak level. The bandwidth was determined at the points where the 20dB reference crossed the profile of the emission.

8.4. Average Time of Occupancy

The EUT and spectrum analyser was configured as for conducted antenna port measurements

To determine the maximum packet length on any given channel, the analyser was configured in the time domain mode and the EUT was configured to operate as intended.

To determine the average occupancy time on any given channel the analyser was configured in the time domain and a 30 second sweep carried out. The number of times the channel was occupied in any 30 second period multiplied by the maximum packet length will give the total time on the given channel.

8.5. Minimum Bandwidth

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.

To determine the occupied bandwidth, a resolution bandwidth of 30 kHz was used, which is greater than 1% of the 6 dB bandwidth. A video bandwidth of a least the same value was used. The spectrum analyser was set to maximum hold to capture the profile of the signal under investigation. The peak level was then determined and a reference line established 6 dB below the peak level. The minimum bandwidth was calculated by working out the delta from the upper and lower frequencies where the power envelope intercepted the 6dB reference line.

The EUT was configured in accordance with section 5.2 of this report.

8.6. 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 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; as such 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 substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. 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 6dB or greater PAD. 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

All measurements were performed using broadband Horn antennas.

Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired 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.

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

8.7. 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 no less than 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 upper band edge of the allocated frequency band was produced. A limit line was set to the level of the highest in-band emission with a further limit line set to 20 dB below this. A 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 lower band edge.

It the upper or lower band edges fell on a restricted band edge then the limit set for the restricted band would be applied instead of the 20 dBc limit.

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

The EUT was configured in accordance with section 5.2 of this report

8.8. Spectral Power Density

The EUT and spectrum analyser was 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 test frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the measurement set up.

A spectrum analyser was tuned to the fundamental frequency of the EUT with a resolution bandwidth setting of 3KHz set. The analyser was set to use a zero span with the trace being set to max hold. A reading in dBm/3kHz was then taken at the maximum point of the trace.

The EUT was configured in accordance with section 5.2 of this report.

9. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30.0 MHz	95%	+/- 3.25 dB
Carrier Output Power	Not applicable	95%	+/- 0.46 dB
Conducted Emissions	0.009 kHz to 26 GHz	95%	+/- 1.2 dB
Conducted Emissions Antenna Port	30.0 MHz to 40.0 GHz	95%	+/- 1.2 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	+/- 1.78 dB
Frequency Stability	Not applicable	95%	+/- 20 Hz
Minimum Bandwidth	Not applicable	95%	+/- 0.12 %
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Radiated Spurious Emissions	30.0 MHz to 1000.0 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1.0 GHz to 26.0 GHz	95%	+/- 1.78 dB
Spectral Power Density	Not applicable	95%	+/- 1.2 dB

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

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A003	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	357 881/052
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002
A1141	HP 11691D	Hewlett Packard	11691D	1212A02494
A145	10 dB Attenuator	Narda	None	None
A197	Site 2 Controller SC144	Unknown	SC144	150720
A247	10 dB Attenuator	Narda	769-10	03712
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A428	WG 12 horn	Flann	12240-20	134
A430	WG 18 horn	Flann	18240-20	425
A433	WG 27 Straight	Flann	27441	None
A553	Bi-log Antenna	Chase	CBL6111A	1593
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008
C1067	Rosenberger	Rosenberger	001	001
C1071	3m Rosenberger Cable	Rosenberger	FA21A1030M5050	Not Stated
C1077	1m Rosenberger Cable	Rosenberger	FA210A1010M5050	28462-2
C1079	Rosenberger 1m Cable	Rosenberger	FA210A1010M5050	28462-1
C1082	Rosenberger Cable 2m	Rosenberger	FA210A1020M5050	28463-1
C160	Cables	Rosenberger	UFA210A-1-1181-70x70	None
C202	Rosenberger cable	Rosenberger	UFA 210A-1-1180-70X70	1543
C222	Cable	Rosenberger	UFA210A-1-1181-70x70	None
C346	Coaxial Cable	Rosenberger	UFA210A-1-1181-70x70	1932
C363	BNC Cable	Rosenberger	RG142	None
C364	BNC Cable	Rosenberger	RG142	None

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
C453	Cable	Rosenberger	RG142XX-001-RFIB	C453-10081998
C457	Cable	Rosenberger	RG142XX-002-RFIB	C457-10081998
C564	C564-N-2	Rosenberger	UFA 210A-1-0787-70x70	96L0226
G085	Generator	Hewlett Packard	83650L	3614A00104
M072	FSM Spectrum Analyser	Rohde & Schwarz	FSM	862 967/010 (RF) & 863 912/048 (Display)
M090	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:838494/005 RU:836833/001
M115	Temperature/ Humidity Meter	RS Components	212-146	None
M139	Digital Multimeter	Fluke	11	65830028
M505	Analyser Display Unit	Rohde & Schwarz	ESAI-D	825316/010
M506	RF unit	Rohde & Schwarz	ESBI-RF	827060/004
S003	Power Control	Zen	E08	736699
S202	Site 2	RFI	2	S202-15011990
S207	Site 7	RFI	7	862 967/010 (RF) & 863 912/048 (Display)
S209	Site 9	RFI	9	-
S212	Site 12	RFI	12	-

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

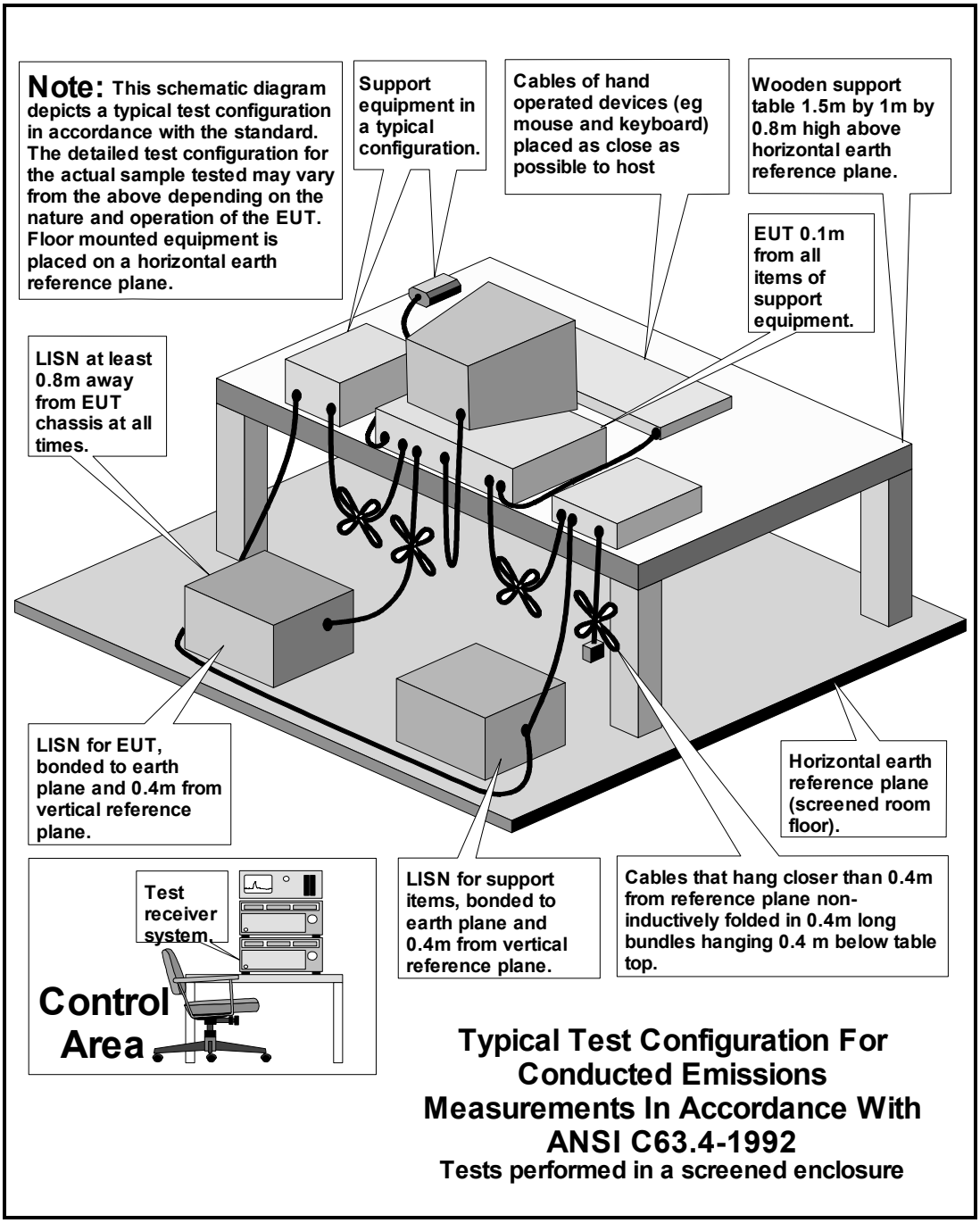
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\44497JD02\EMICON	Test configuration for measurement of conducted emissions
DRG\44497JD02\EMIRAD	Test configuration for measurement of radiated emissions

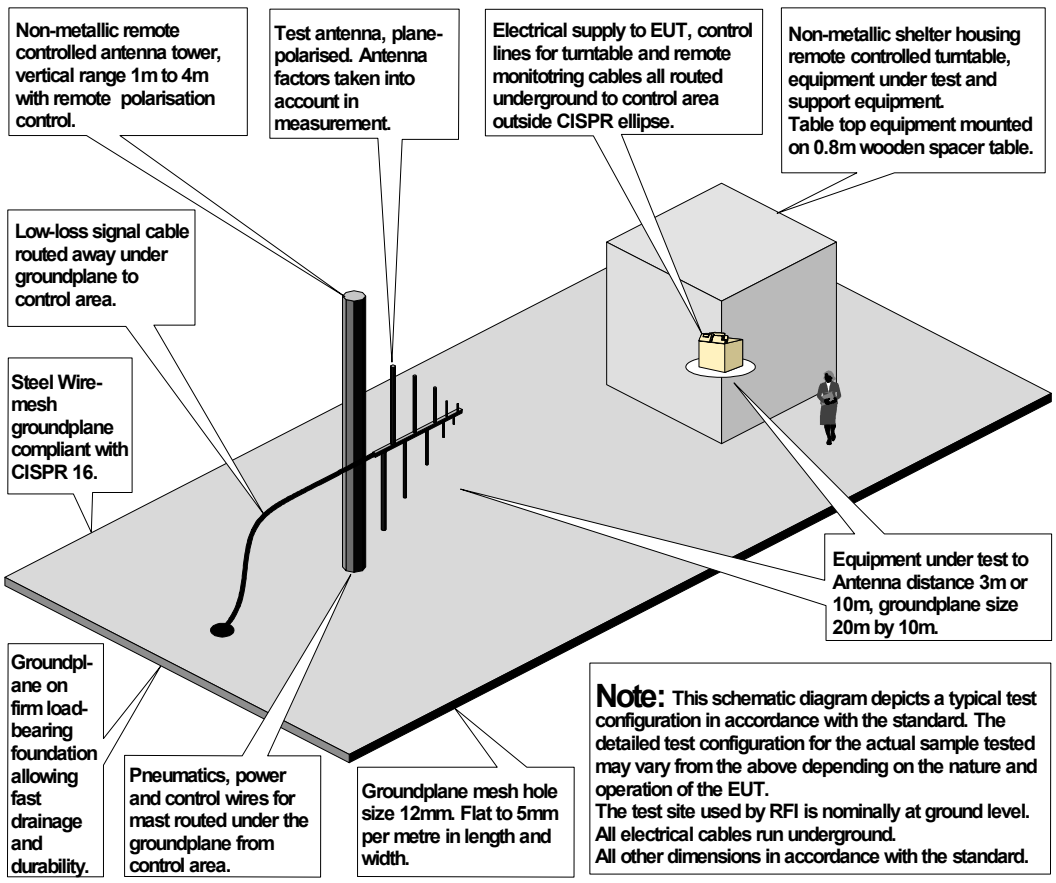
Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)
To: FCC Part 15.247

DRG\44497JD02\EMICON



Test Of: Nokia Mobile Phones.
3600 Imaging Phone
(Bluetooth Mode)
To: FCC Part 15.247

DRG\44497JD02\EMIRAD



Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse