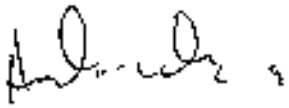
TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Nokia Corporation.
NHL-4 GSM 1900 Mobile Phone

To: FCC Part 24: 2001 and FCC Part 15: 2001

Test Report Serial No:
RFI/MPTB1/RP43814JD01A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By:** 
Tested By: 	**Release Version No:** **PDF01**
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The results in this report apply only to the sample(s) tested.

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1. Client Information

Company Name:	Nokia Corporation
Address:	PO Box 86 FIN-24101 Salo Finland
Contact Name:	Mr I Kojola

2. Equipment Under Test (EUT)

The following information has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Nokia
Model Name or Number:	7210
Unique Type Identification:	NHL-4
Serial Number:	004400/11/164178/1
Country of Manufacture:	Finland
FCC ID Number:	None stated by client
Date of Receipt:	26 July 2002

Brand Name:	Nokia
Model Name or Number:	7210
Unique Type Identification:	NHL-4
Serial Number:	004400/11/164220/1
Country of Manufacture:	Finland
FCC ID Number:	None stated by client
Date of Receipt:	26 July 2002

Brand Name:	Nokia
Model Name or Number:	7210
Unique Type Identification:	NHL-4
Serial Number:	004400/11/164202/9
Country of Manufacture:	Finland
FCC ID Number:	None stated by client
Date of Receipt:	26 July 2002

2.2. Description Of EUT

The equipment under test is a Triple band GSM (900/1800/1900), Colour display, SMS, Integrated Hands-Free Speaker, GPRS, Stereo FM Radio.

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: (non-removable lithium ion battery)	Internal battery supply of 4.1 V
Power Supply Requirement: (AC Battery Charger)	Nominal 115 V / 60 Hz
Intended Operating Environment:	Within GSM Network Coverage
Equipment Category:	Mobile Telephony
Type of Unit:	Mobile Station
Weight:	83g
Dimensions:	106 mm (L) x 44 mm (W) x 17.5 mm (D)
Interface Ports:	System Connector, Charger connector
Transmit Frequency	B, M and T (1850.2, 1880.0 and 1909.8 MHz)
Receive Frequency	B, M and T (1930.2, 1960.0 and 1989.8 MHz)
Maximum Power Output	1 Watt Max
FM-Radio	87 to 108 MHz

2.5. Support Equipment

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

Description:	Power Supply
Brand Name:	Not stated by client
Model Name or Number:	ACP-12E
Serial Number:	Not stated by client
FCC ID Number:	Not stated by client
Cable Length And Type:	Not stated by client
Connected to Port:	Charging Connector

Description:	Battery
Brand Name:	Not stated by client
Model Name or Number:	BLD-3
Serial Number:	Not stated by client
FCC ID Number:	Not stated by client
Cable Length And Type:	Not stated by client
Connected to Port:	Not stated by client

Description:	Mono Headset
Brand Name:	Not stated by client
Model Name or Number:	HDB-4
Serial Number:	Not stated by client
FCC ID Number:	Not stated by client
Cable Length And Type:	Not stated by client
Connected to Port:	System connector of phone

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 24 2001: Subpart E Sections 24.232, 24.235, 24.238
Title:	Code of Federal Regulations, Part 24 (47CFR) Personal Communication Services.
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.

Reference:	FCC Part 15: 2001 Class B, Sections: 15.107 and 15.109
Title:	Code of Federal Regulations, Part 15 (47CFR) Radio Frequency Devices: Digital 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:

47CFR: Part 24 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Personal Communication Services.

47CFR: Part 15 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

47CFR: Part 2 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

ANSI C63.2 (1996)
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 (1998)
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.

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 an internal battery supply of 4.1 Volts DC.

5.2. Operating Modes

The EUT was tested in the following operating modes:

- Call Mode
- Idle Mode with FM Radio Operating

5.3. Configuration and Peripherals

The EUT was tested in the following configuration:

Charger + Phone + Headset.

NB Section 2 of this report contains a full list of support equipment used and Appendix 3 contains a schematic diagram of the test configuration.

6. Summary Of Test Results

6.1. Call Mode

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Carrier Output Power (EIRP)	Part 24 of CFR 47: 2001, Section 24.232	Transmit	Antenna	Complied
Frequency Stability (Temperature Variation)	Part 24 of CFR 47: 2001, Section 24.235	Transmit	Antenna Terminals	Complied
Frequency Stability (Voltage Variation)	Part 24 of CFR 47: 2001, Section 24.235	Transmit	Antenna Terminals	Complied
Occupied Bandwidth	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna Terminals	Complied
Emissions at Band Edges	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna Terminals	Complied
Conducted Emissions (Antenna Terminals)	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna Terminals	Complied
Electric Field Strength, Spurious Emissions (1 MHz to 20000 MHz)	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna	Complied

6.2. Receive/Idle Mode

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Electric Field Strength, Spurious Emissions (1 MHz to 10000 MHz)	Part 15 of CFR 47: 2001, Section 15.109	Receive/ Idle	Enclosure	Complied
Conducted Spurious Emissions (450 kHz to 30 MHz)	Part 15 of CFR 47: 2001, Section 15.107	Receive/ Idle	AC Mains Input	Complied

6.3. 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. Details of the test methods and procedures can be found in Appendix 3 of this report.

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.

7.1.3. The term “Call Mode” is used to signify Transmitter active and in normal mode of operation.

7.1.4. The term “Idle Mode” is used to signify that the phone is in a Standby condition.

7.2. Carrier Output Power: Call Mode: (Antenna Terminals): Section 24.232

7.2.1.The EUT, spectrum analyser and GSM test set were configured as for conducted antenna port measurements.

7.2.2. Tests were performed to identify the maximum transmit power in accordance with FCC Part 24.232 for conducted power.

7.2.3. The applicant provided a temporary antenna port to allow a direct connection to be made for conducted power measurements.

7.2.4. Results are shown for the EUT set to Bottom, Middle and Top channels using a fully charged battery. The battery nominally charged voltage is declared at 4.1 Volts:

Results:

Channel	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Bottom (512)	0.968	2.0	1.032	Complied
Middle (660)	0.845	2.0	1.155	Complied
Top (810)	0.740	2.0	1.260	Complied

7.3. Carrier Output Power: Call Mode: (EIRP): Section 24.232

7.3.1. Tests were performed to identify the maximum transmit power in accordance with FCC Part 24.232 for EIRP.

7.3.2. Results are shown for the EUT set to Bottom, Middle and Top channels using a fully charged battery. The battery nominally charged voltage is declared at 4.1 Volts:

Results

Channel	Frequency (MHz)	Antenna Polarity (H/V)	Maximum Transmitter EIRP (dBm)	Limit EIRP (dBm)	Margin	Result
Bottom (512)	1850.2	Vert	28.0	33.0	5.0	Complied
Middle (660)	1879.8	Vert	27.9	33.0	5.1	Complied
Top (810)	1909.8	Vert	28.0	33.0	5.0	Complied

7.4. Frequency Stability Measurements: Call Mode: (Temperature and Voltage Variation): Section 24.235

7.4.1.The EUT and HP GSM analyser were configured for conducted antenna port measurements.

7.4.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.4.3. Measurements were performed to determine the frequency stability of the fundamental emission from the EUT, when subjected to variation of ambient temperature and variation of supply voltage.

7.4.4. The device is battery operated. The applicant has stated that the nominal voltage of the battery is 4.1 volts with an end point voltage of 3.49 volts. Extreme measurements were performed at these two voltages as requested in FCC Part 2.1055 (d) (2)

7.4.5. The ambient temperature was varied from -30°C to +50°C in 10°C steps. During the test the fundamental frequency of the EUT shall stay within the authorised frequency block.

7.4.6. The client has stated that the authorised frequency block is:-

Lower Block Edge	1850 MHz
Upper Block Edge	1910 MHz

The limit is stated as the frequency stability that is sufficient to ensure that the fundamental emission stays within the authorised frequency block.

Frequency Stability Measurements: Call Mode: (continued)

Results: Bottom Channel (1850.2 MHz)

Temperature (°C)	DC Input Voltage (Volts)	Absolute Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit to band Edge (ppm)	Margin (ppm)	Result
-30	3.49	46.70	0.025	108.921	108.083	Complied
	4.15	36.80	0.020	108.921	108.088	Complied
-20	3.49	30.40	0.016	108.921	108.092	Complied
	4.15	27.70	0.015	108.921	108.093	Complied
-10	3.49	10.26	0.006	108.921	108.103	Complied
	4.15	16.10	0.009	108.921	108.099	Complied
+0	3.49	12.40	0.007	108.921	108.101	Complied
	4.15	11.70	0.006	108.921	108.102	Complied
+10	3.49	14.10	0.008	108.921	108.100	Complied
	4.15	15.90	0.009	108.921	108.100	Complied
+20	3.49	20.70	0.011	108.921	108.097	Complied
	4.15	18.40	0.010	108.921	108.098	Complied
+30	3.49	5.90	0.003	108.921	108.105	Complied
	4.15	4.20	0.002	108.921	108.106	Complied
+40	3.49	20.20	0.011	108.921	108.097	Complied
	4.15	18.80	0.010	108.921	108.098	Complied
+50	3.49	26.30	0.014	108.921	108.094	Complied
	4.15	21.70	0.012	108.921	108.096	Complied

Frequency Stability Measurements: Call Mode: (continued)

Results: Top Channel (1909.8 MHz)

Temperature (°C)	DC Input Voltage (Volts)	Absolute Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	3.49	54.20	0.028	108.921	104.684	Complied
	4.15	40.16	0.021	108.921	104.691	Complied
-20	3.49	28.20	0.015	108.921	104.697	Complied
	4.15	24.60	0.013	108.921	104.699	Complied
-10	3.49	19.20	0.010	108.921	104.702	Complied
	4.15	16.39	0.009	108.921	104.703	Complied
+0	3.49	13.20	0.007	108.921	104.705	Complied
	4.15	13.20	0.007	108.921	104.705	Complied
+10	3.49	14.00	0.007	108.921	104.705	Complied
	4.15	14.40	0.008	108.921	104.705	Complied
+20	3.49	17.60	0.009	108.921	104.703	Complied
	4.15	15.10	0.008	108.921	104.704	Complied
+30	3.49	14.90	0.008	108.921	104.704	Complied
	4.15	12.20	0.006	108.921	104.706	Complied
+40	3.49	17.10	0.009	108.921	104.703	Complied
	4.15	14.49	0.008	108.921	104.704	Complied
+50	3.49	18.90	0.010	108.921	104.702	Complied
	4.15	16.20	0.008	108.921	104.704	Complied

7.5. Transmitter Conducted Measurements: Call Mode: (Occupied Bandwidth): Section 24.238

7.5.1. The EUT, HP GSM test and spectrum analyser were configured for conducted antenna port measurements.

7.5.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.5.3.The device was operating in its normal mode of operation.

7.5.4. Measurements were performed to determine the Occupied Bandwidth of the fundamental emission from the EUT at the bottom middle and top channels.

7.5.5. The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the FSEB user manual for this measurement, i.e. RBW <= 1/20 of occupied bandwidth.

Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom (512)	1850.2	3	3	242.360
Middle (660)	1879.8	3	3	244.238
Top (810)	1909.8	3	3	244.238

7.6. Transmitter Conducted Measurements: Call Mode: (Emissions at Band Edges): Section 24.238

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

7.6.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.6.3.FCC Part 24.238 states that emissions shall be attenuated by at least 43+10 log(P) dB below the transmitter power (P). It also states that the 1st MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found to be 3 kHz.

7.6.4. The highest level within these 1 MHz bands was thus measured and its attenuation relative to the carrier recorded.

Results:

Bottom Band Edge

Frequency (MHz)	Peak Emission Level (Watts)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
1850.000	0.000029	75.4	43.0	32.40	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (Watts)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
1910.000	0.000020	76.9	43.0	33.90	Complied

7.7. Transmitter Conducted Measurements: Call Mode: (Emissions Outside of Authorised Frequency Block): Section 24.238

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

7.7.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.7.3.FCC Part 24.238 states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P).

7.7.4.The spurious attenuation level is defined as: -

$$dB = 10 \log_{10} \left(\frac{TX\ power\ in\ watts}{0.001} \right) - \text{spurious level (dBm)}$$

Result: Bottom Channel

Frequency (MHz)	Peak Emission Level (mW)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
3699.046	0.00263	55.8	43.0	12.8	Complied

Result: Middle Channel

Frequency (MHz)	Peak Emission Level (mW)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
3759.694	0.00649	51.9	43.0	8.9	Complied

Result: Top Channel

Frequency (MHz)	Peak Emission Level (mW)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
3819.664	0.00457	53.4	43.0	10.4	Complied

7.8. Test Results For Radiated Emissions: Call Mode: Section 2.1053

7.8.1. Electric Field Strength Measurements: 30 to 1000 MHz

7.8.1.1. Preliminary Radiated spurious scans were performed with the EUT set to the Middle channel. Any visible spurious was then measured with the device set to top, bottom and middle channels.

7.8.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

7.8.1.3. FCC Part 24.238 states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P_t). However, this is defined for conducted measurements. For radiated field strength measurements the limit is re-defined.

7.8.1.4. A substitution method was performed in order to determine the equivalent field strength limit for 43+10 log (P) at 3 meters.

Results:

Frequency (MHz)	Ant. Pol.	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
116.957	Vert	16.2	82.0	65.8	Complied
119.993	Vert	17.0	82.0	65.0	Complied

*Note: All three channels exhibited the same emission frequency and level.

7.9. Test Results For Radiated Emissions: Call Mode

7.9.1. Electric Field Strength Measurements: 1.0 to 26.0 GHz

7.9.1.1. The client has stated that the highest clock frequency for the EUT was 2.480 GHz. Therefore tests were performed up to 26 GHz.

7.9.1.2. Preliminary radiated spurious scans were performed with the EUT set to Bottom, Middle and Top channels as stated in section 5.2.

7.9.1.3. The following table lists frequencies at which emissions were measured using an Peak detector, a measurement test distance of 3 meters was used for the indicated results (results incorporate antenna factors and cable losses):

Results:- Bottom 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
3.700277	Vert	58.45	21.0	1.5	81.0	85.0	4.0	Complied

Results: - 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
3.759513	Vert.	55.50	21.0	1.5	78.0	85.0	7.0	Complied

Results: - Top 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
3.819555	Vert.	54.87	21.0	1.5	77.4	85.0	7.6	Complied

7.10. Test Results For Radiated Emissions: Receive/Idle Mode: Section 15.109

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

7.10.1.1. The following table indicates measured results with the EUT operating in receive mode to the limits specified in Part 15.109.

7.10.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

Results:

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
157.377	Vert.	23.4	43.5	20.1	Complied
299.970	Vert.	23.8	46.0	22.2	Complied
319.972	Vert.	22.8	46.0	23.2	Complied

Test Results For Radiated Emissions: Receive/Idle Mode (continued)

Electric Field Strength Measurements (Frequency Range: 1.0 to 26.0 GHz)

7.10.1.3. The following table indicates measured results with the EUT operated in receive mode to the limits specified in Part 15.109.

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
1.967266	Vert.	28.46	21.5	1.3	51.3	74.0	22.7	Complied
3.934666	Vert.	27.63	21.0	1.5	50.1	74.0	23.9	Complied

Highest Average Level:-

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
1.967266	Vert.	17.36	21.5	1.3	40.2	54.0	13.8	Complied
3.934666	Vert.	15.89	21.0	1.5	38.4	54.0	15.6	Complied

7.11. Test Results For AC Mains Conducted Emissions: Call Mode: Section 15.207

7.11.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.11.1.1. All emissions were >20dB below the limit, therefore no final measurements were performed.

7.11.1.2. All three channels exhibited similar levels.

7.12. Test Results For AC Mains Conducted Emissions: Receive/Idle Mode: Section 15.107

7.12.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.12.1.1. All emissions were >20dB below the limit, therefore no final measurements were performed.

8. Measurement Uncertainty

8.1. 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.

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

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

8.4. 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
Carrier Output Power (EIRP)	Not applicable	95%	+/- 4.0 dB
Conducted Emissions (AC)	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Conducted Emissions Antenna Port	0.009 kHz to 26 GHz	95%	+/- 2.9 dB
Radiated Emissions at 3.0 metres	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Emissions at 3.0 metres	1 GHz to 26 GHz	95%	+/- 4.18 dB
Frequency Stability	Not applicable	95%	+/- 4.2 dB
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Emissions at Band Edges	1850 to 1910 MHz	95%	+/- 2.9 dB

8.5. 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

Instrument	Manufacturer	Model	RFI No.
Instrument	Maker	Type No.	A027
Horn Antenna	Eaton	9188-2	A028
Horn Antenna	Eaton	91888-2	A031
2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	A1077
3020A	Narda	3020A	A1211
Attenuator	Huber + Suhner	6830.17.B	A1255
Power supply	Farnell	11E302BT	A197
Site 2 Controller SC144	Unknown	SC144	A262
Narda 771-03 Attenuator	Narda	771-03	A428
WG 12 horn	Flann	12240-20	A429
WG 16 horn	Flann	16240-20	A436
WG 20 horn	Flann	20240-20	A438
WG 18 horn	Narda	439	A439
WG 14 horn	Narda	642	C1034
Coaxial Cable	Rosenburger	UFA210A-1-1181-70X70	C225
Cable	Rosenberger	UFA210A-1-1181-70x70	G011
SMGU Signal Generator	Rohde & Schwarz	SMGU	G048
SMY Signal Generator	Rohde & Schwarz	SMY 01	G085
Generator	Hewlett Packard	83650L	M010
NRV Power Meter	Rohde & Schwarz	NRV	M011
NRV-Z1 Power Sensor	Rohde & Schwarz	NRV-Z1	M025
Fluke 87 Multimeter	Fluke	87	M069
ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	M1013
GSM Test set	Hewlett Packard	8922M	M1014
DCS Test set	Hewlett Packard	83220E	M127
Spectrum Analyser	Rohde & Schwarz	FSEB 30	M191
Thermo-Hygro	RS Components	RS212-124	-

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

Appendix 2. Measurement Methods

A2.1 FCC Part 24.232: Effective Isotropic Radiated Power (EIRP)

A2.1.1 EIRP measurements were performed in accordance with the standard, against appropriate limits.

A2.1.2 The EIRP was measured with the EUT arranged on a non-conducting table on an open area test site using an antenna height of 1.5 m and a measurement distance of 3 m

A2.1.3 The level of the EIRP was maximised by rotating the table.

A2.1.4 Once the final amplitude (maximised) had been ascertained, the EIRP was measured using a substitution method whereby the EUT was replaced by a broadband horn antenna and a signal generator. The level of the signal generator is increased or decreased until the amplitude indicated on the measurement receiver matches that from the EUT. Once this has been achieved the final EIRP is calculated as being the signal generator output level minus the interconnecting cable loss plus the substitution antenna gain.

A2.1.5 All measurements were performed using broadband Horn antennas.

A2.1.6 The test equipment settings for EIRP measurements were as follows:

Receiver Function	**Final Measurements**
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	20 dB
Measurement Time:	> 1 s
Observation Time:	> 15 s
Sweep Time:	Coupled

A2.2 FCC Part 24.235: Frequency Stability

A2.2.1 Measurements were performed inside an environmental chamber under extremes of temperature and voltage to determine the frequency stability of the device under test against specified limits.

2.2.2 Measurements were made on the top and bottom channels within the temperature range –30 to 50 Deg C, and at the declared nominal supply voltage and at the declared endpoint voltage.

2.2.3 The EUT was then switched off for a minimum of 30 minutes while the environmental chamber stabilised at the next temperature within the temperature range. .

A2.2.4 FCC Part 24.235 states that the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorised frequency block. As such, the frequency difference from declared was measured in parts per million (ppm) with the difference between this and the authorised band edge being reported., also in (ppm)

A2.3 Conducted Antenna Port Measurements: FCC Part 24.238:

A2.3.1 Spurious measurements at the Antenna port were performed from 1 MHz to the lower frequency of the allocated frequency block and from the top frequency of the allocated frequency block to 10 times the highest EUT generated frequency (26 GHz).

A2.3.2 A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF Attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

A2.3.3 The specified frequency band was investigated with the transmitter operating at full power on the middle channel. Any spurious noted was then measured with the transmitter set to top, bottom and middle channels.

A2.3.4 Measurements were also made in the 1 MHz bands, immediately adjacent to the band edges of the frequency block, using a resolution bandwidth of at least 1% of the occupied bandwidth (300kHz), as per FCC Part 24.238 (b). The resolution bandwidth was thus set to 3kHz.

A2.3.5 The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	100 kHz	120 kHz	1 MHz
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

* The resolution bandwidth used for measurements in the 1 MHz blocks either side of the declared operating frequency block was set to 3 kHz.

A2.4 FCC Part 24.238: Occupied Bandwidth

A2.4.1 The EUT was connected to the spectrum analyser via its temporary antenna port.

A2.4.2 The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser settings were set as per those outlined in the FSEB user manual for this measurement. Ie, RBW <= 1/20 of occupied bandwidth. A value of 3kHz was used.

A2.5 FCC Part 15: AC Mains Conducted Emissions

A2.5.1 AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.5.2 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.

A2.5.3 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.

A2.5.4 During the swept measurements (and also during subsequent final measurements on single frequencies) 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.

A2.5.5 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.

A2.5.6 The test equipment settings for conducted emissions measurements were as follows:

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

* Where measurements were made below 150 kHz a 200 Hz bandwidth was used.

A2.6 Radiated Emissions: FCC Part 15/24

A2.6.1 Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.6.2 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, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.6.3 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. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using a measuring receivers with a Quasi-Peak detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

A2.6.4 For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

A2.6.5 All measurements on the open area test site were performed using broadband antennas.

A2.6.6 On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m. 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.

A2.6.7 For final measurements on the open area test site, for frequencies between 9 kHz and 30 MHz where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna angle through 360°. With the antenna set to a fixed height of 1.5 m. 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.

A2.6.8 The test equipment settings for radiated emissions measurements were as follows:

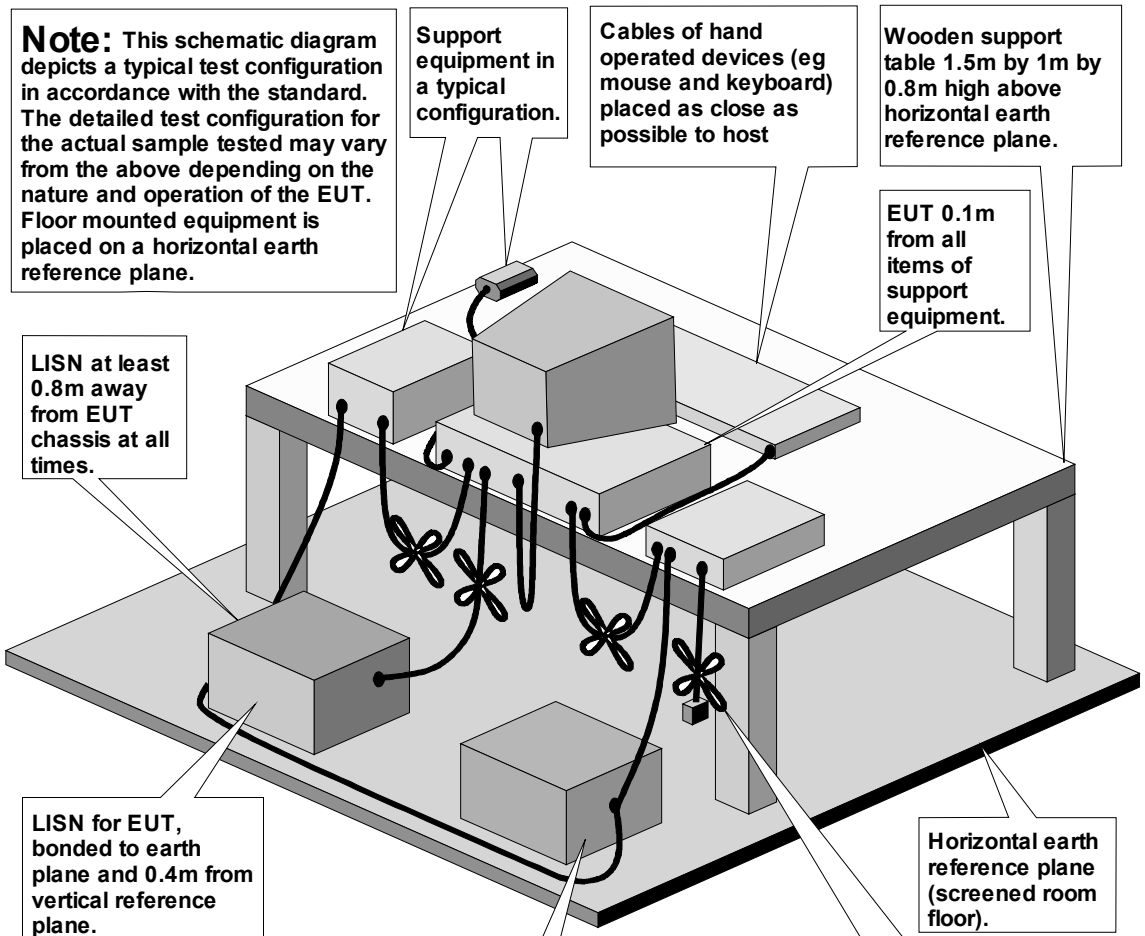
Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1GHz) (1MHz > 1GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\43814JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\43814JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\43814JD01\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test

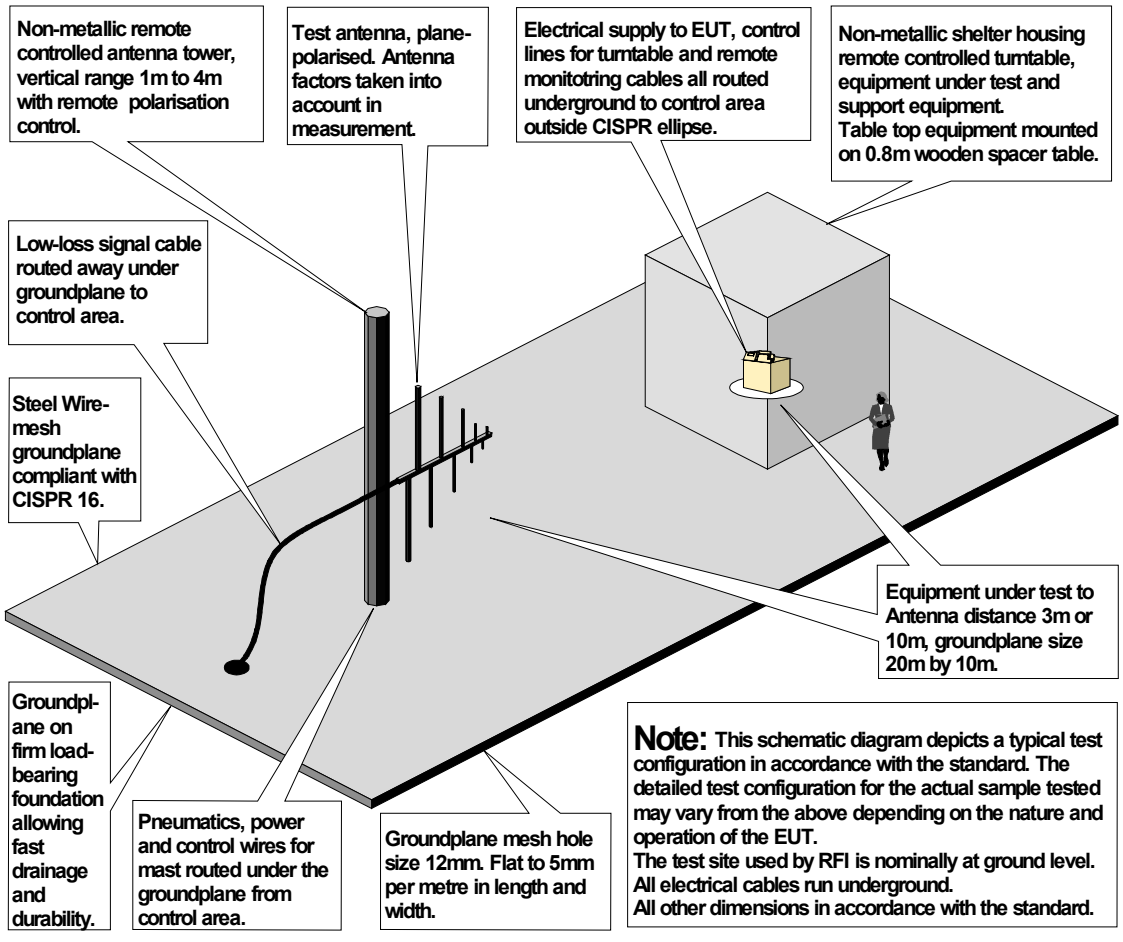
DRG\43814JD01\EMICON



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

Tests performed in a screened enclosure

DRG\43814JD01\EMIRAD



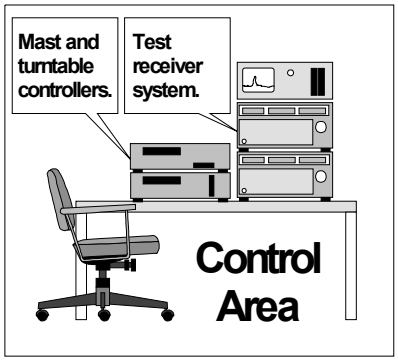
Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m (CISPR ellipse)

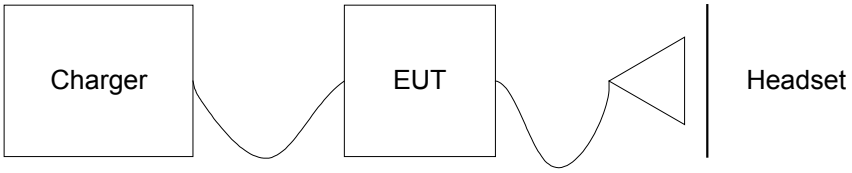
Groundplane Earthed

Control room outside CISPR ellipse



DRG\43814JD01\001

Configuration of EUT and Local Support Equipment



Configuration of Remote Support Equipment

Appendix 4. Graphical Test Results

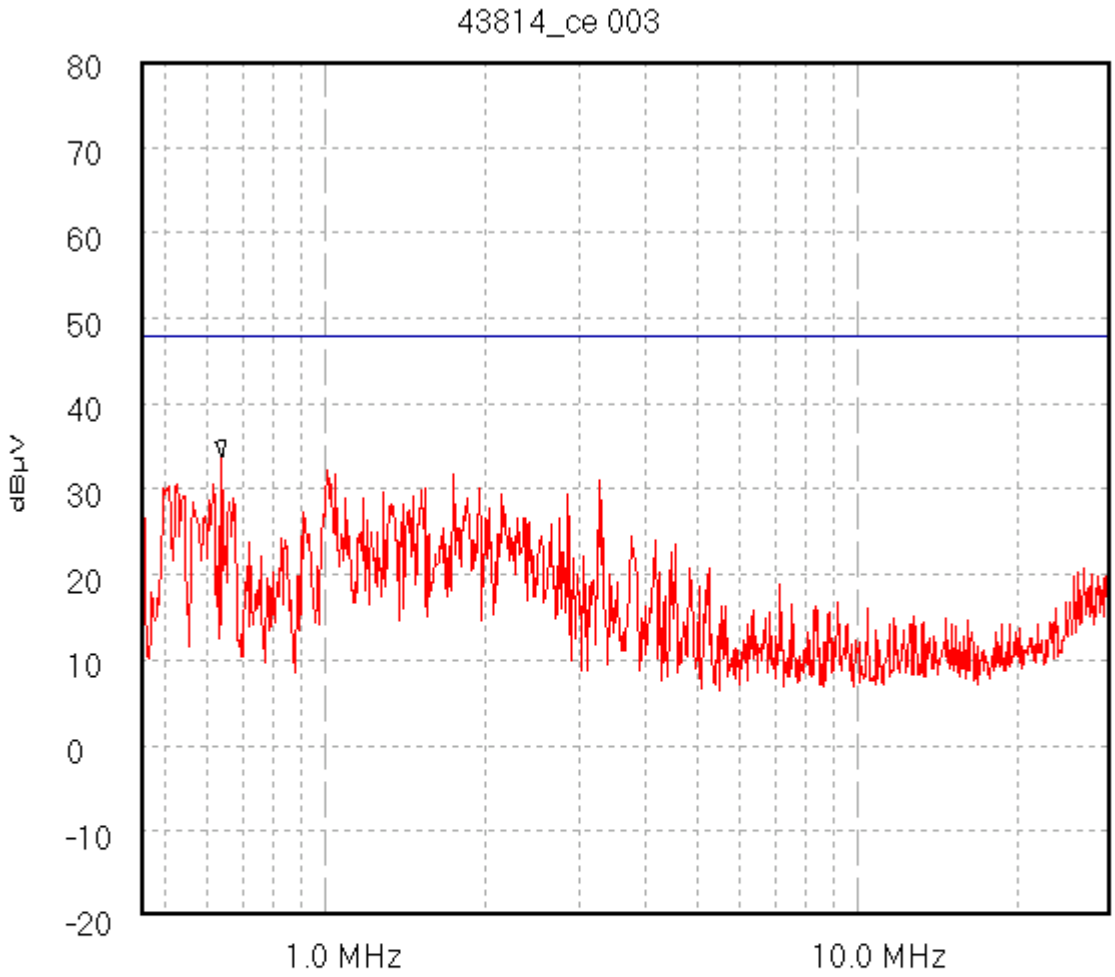
This appendix contains the following graphs:

Graph Reference Number	Title
GPH\43814JD01\CE003	Conducted Emissions, Transmit Mode – Middle Channel (450 kHz to 30 MHz)
GPH\43814JD01\CE002	Conducted Emissions, Idle Mode (450 kHz to 30 MHz)
GPH\43814JD01\24\003	Radiated Emissions, Transmit Mode – Middle Channel (30 MHz to 1 GHz)
GPH\43814JD01\24\002	Radiated Emissions, Transmit Mode – Middle Channel (1 GHz to 2 GHz)
GPH\43814JD01\24\001	Radiated Emissions, Transmit Mode – Middle Channel (2 GHz to 4 GHz)
GPH\43814JD01\S2\001	Radiated Emissions, Transmit Mode – Middle Channel (4 GHz to 6 GHz)
GPH\43814JD01\S2\002	Radiated Emissions, Transmit Mode – Middle Channel (6 GHz to 8 GHz)
GPH\43814JD01\S2\003	Radiated Emissions, Transmit Mode – Middle Channel (8 GHz to 12.5 GHz)
GPH\43814JD01\S2\004	Radiated Emissions, Transmit Mode – Middle Channel (12.5 GHz to 18 GHz)
GPH\43814JD01\S2\005	Radiated Emissions, Transmit Mode – Middle Channel (18 GHz to 22 GHz)
GPH\43814JD01\004	Radiated Emissions, Idle Mode (30 MHz to 1 GHz)
GPH\43814JD01\007	Radiated Emissions, Idle Mode (1 GHz to 2 GHz)
GPH\43814JD01\003	Radiated Emissions, Idle Mode (2 GHz to 4 GHz)
GPH\43814JD01\S2i001	Radiated Emissions, Idle Mode (4 GHz to 5 GHz)
GPH\43814JD01\S2i002	Radiated Emissions, Idle Mode (5 GHz to 6 GHz)
GPH\43814JD01\S2i003	Radiated Emissions, Idle Mode (6 GHz to 8 GHz)
GPH\43814JD01\S2i004	Radiated Emissions, Idle Mode (8 GHz to 10 GHz)

Graphical Test Results (continued)

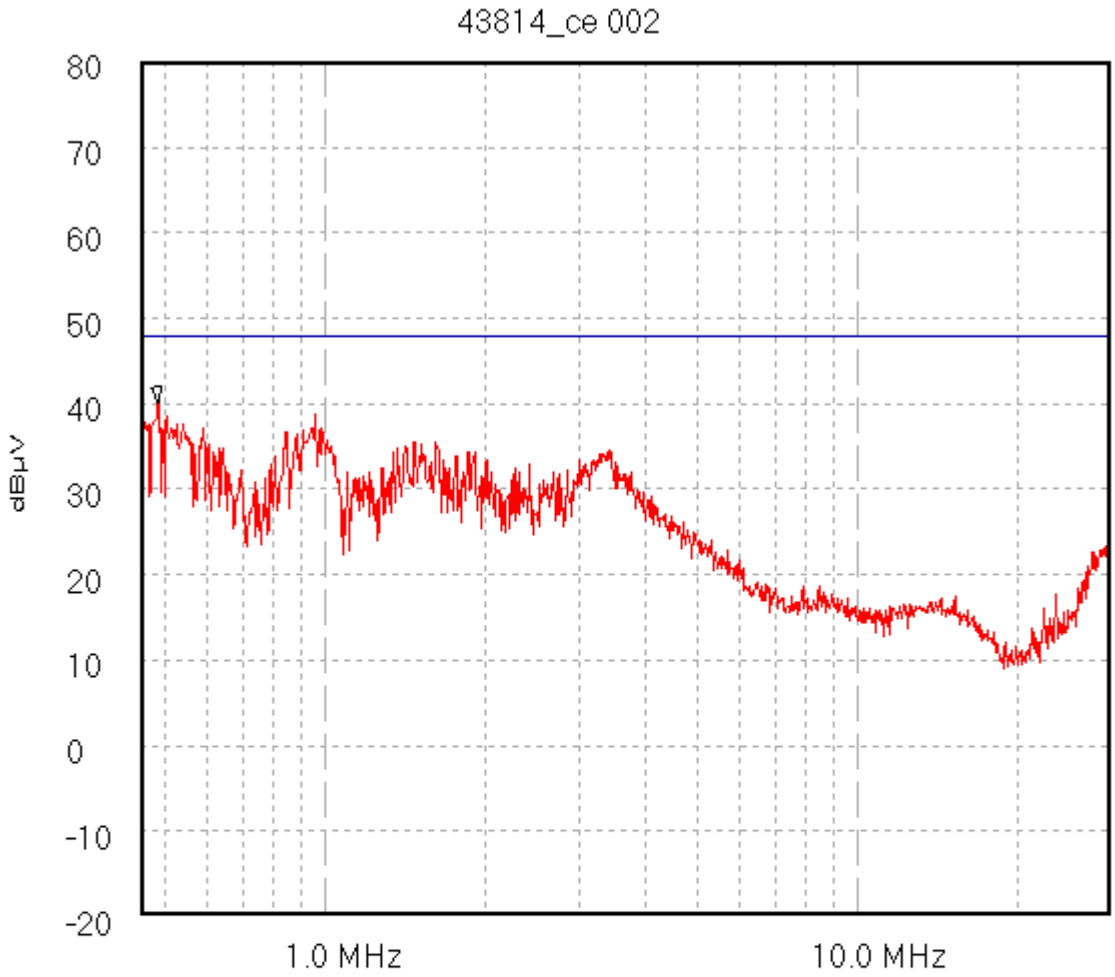
Graph Reference Number	Title
GPH\43814JD01\CEa001	Conducted Emissions, Transmit Mode – Bottom Channel (1 MHz to 1.85 GHz)
GPH\43814JD01\CEa002	Conducted Emissions, Transmit Mode – Bottom Channel (1.91 GHz to 5.0 GHz)
GPH\43814JD01\CEa003	Conducted Emissions, Transmit Mode – Bottom Channel (5 GHz to 15 GHz)
GPH\43814JD01\CEa004	Conducted Emissions, Transmit Mode – Bottom Channel (15 GHz to 22 GHz)
GPH\43814JD01\CEa005	Conducted Emissions, Transmit Mode – Middle Channel (15 GHz to 22 GHz)
GPH\43814JD01\CEa006	Conducted Emissions, Transmit Mode – Middle Channel (5 GHz to 15 GHz)
GPH\43814JD01\CEa007	Conducted Emissions, Transmit Mode – Middle Channel (1.91 GHz to 5 GHz)
GPH\43814JD01\CEa008	Conducted Emissions, Transmit Mode – Middle Channel (1 MHz to 1.85 GHz)
GPH\43814JD01\CEa009	Conducted Emissions, Transmit Mode – Top Channel (1 MHz to 1.85 GHz)
GPH\43814JD01\CEa010	Conducted Emissions, Transmit Mode – Top Channel (1.91 GHz to 5 GHz)
GPH\43814JD01\CEa011	Conducted Emissions, Transmit Mode – Top Channel (5 GHz to 15 GHz)
GPH\43814JD01\CEa012	Conducted Emissions, Transmit Mode – Top Channel (15 GHz to 22 GHz)
GPH\43814JD01\CEa013	Band Edge, Transmit Mode – Bottom Channel (1.849 GHz to 1.85 GHz)
GPH\43814JD01\CEa013	Band Edge, Transmit Mode – Top Channel (1.91 GHz to 1.911 GHz)

GPH\43814_ce\003
Conducted AC Mains Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 15.107



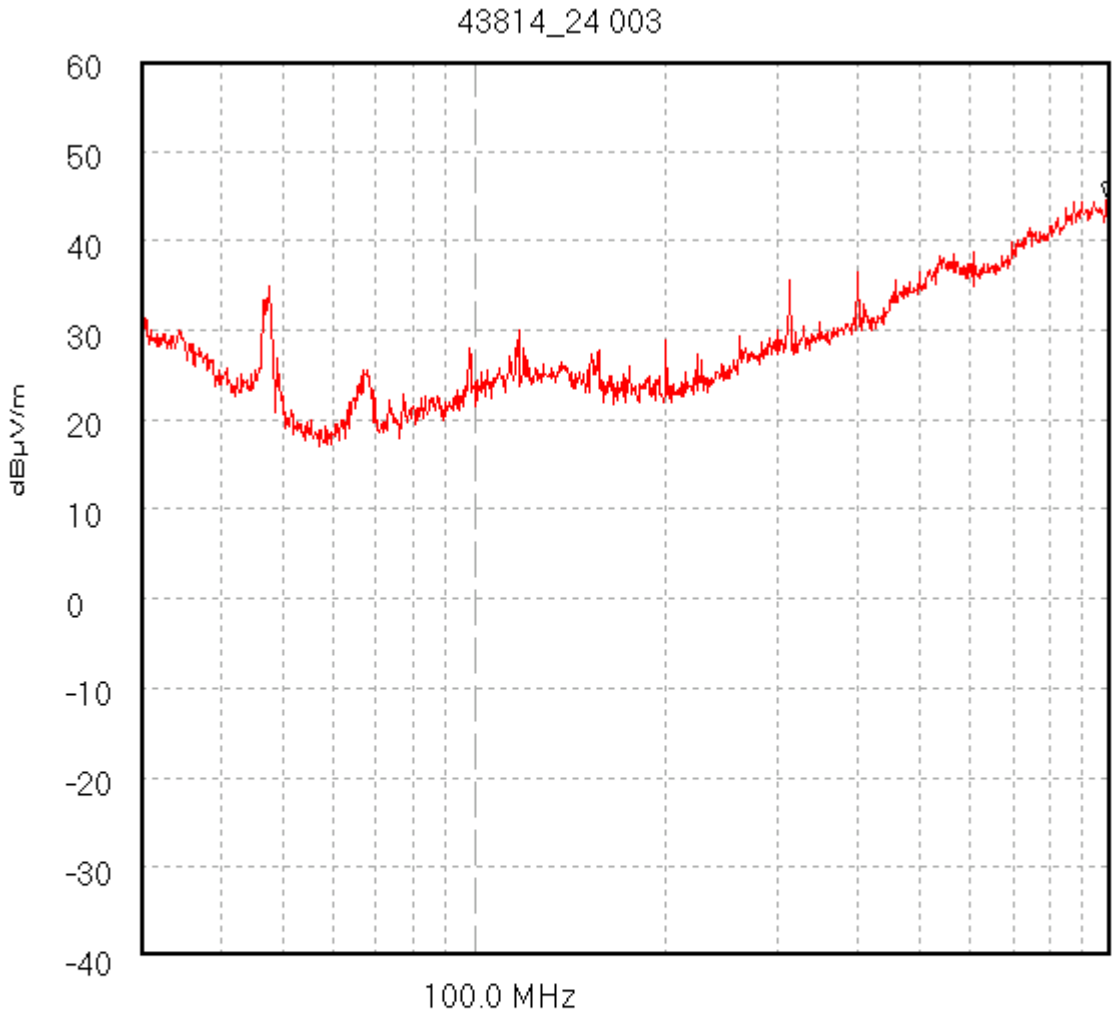
Start 450.0 kHz; Stop 30.0 MHz - Log Scale
Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 9.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 2.2 S
Peak 638.564 kHz, 33.69 dBµV
Limit/Mask: 15_107_Class_B_QP; ; Limit Test Passed
26/07/2002 1:56:11 PM

GPH\43814_ce\002
Conducted AC Mains Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.107



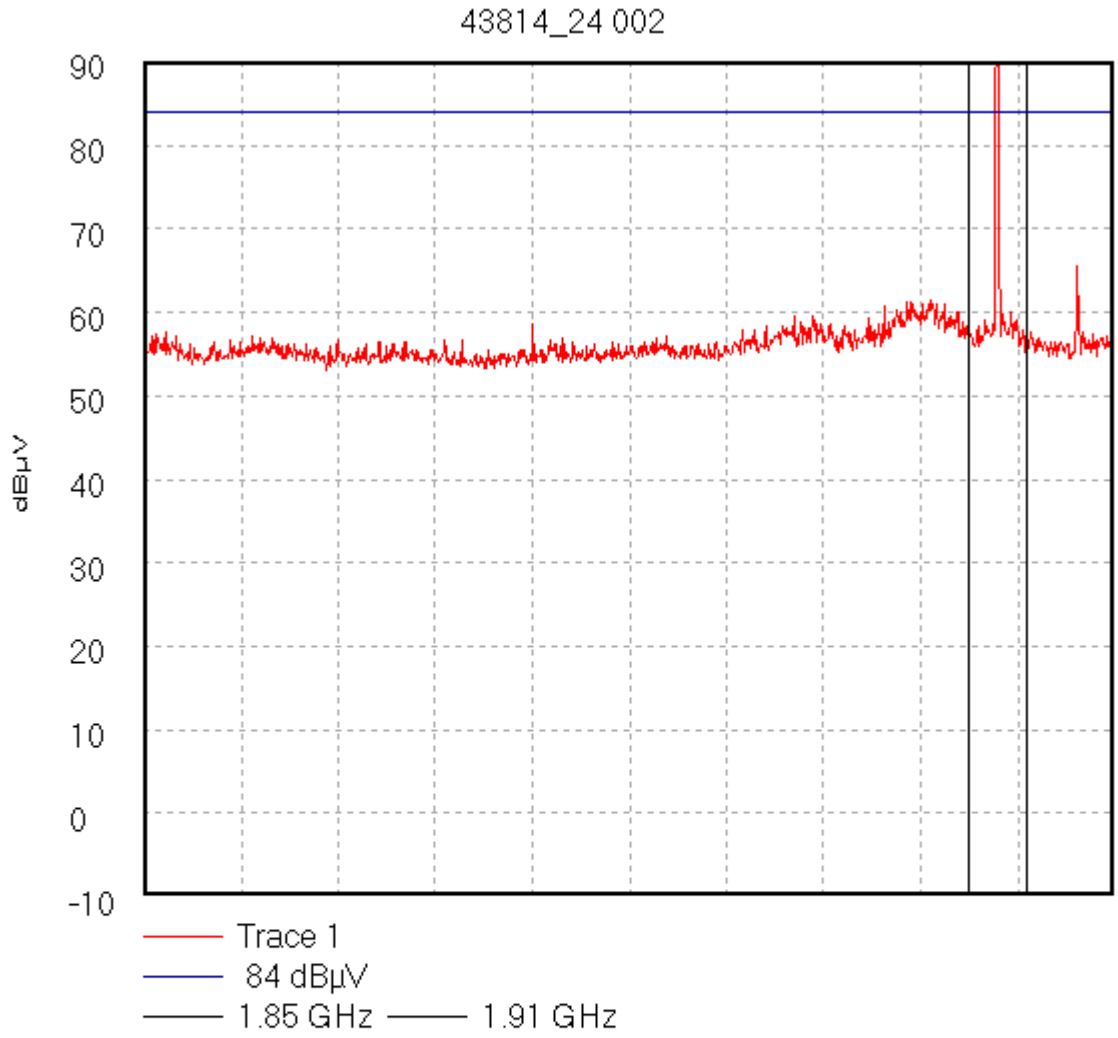
Start 450.0 kHz; Stop 30.0 MHz - Log Scale
Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 9.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 2.2 S
Peak 484.883 kHz, 40.16 dBµV
Limit/Mask: 15_107_Class_B_QP; ; Limit Test Passed
26/07/2002 12:15:33 PM

GPH\43814_24\003
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



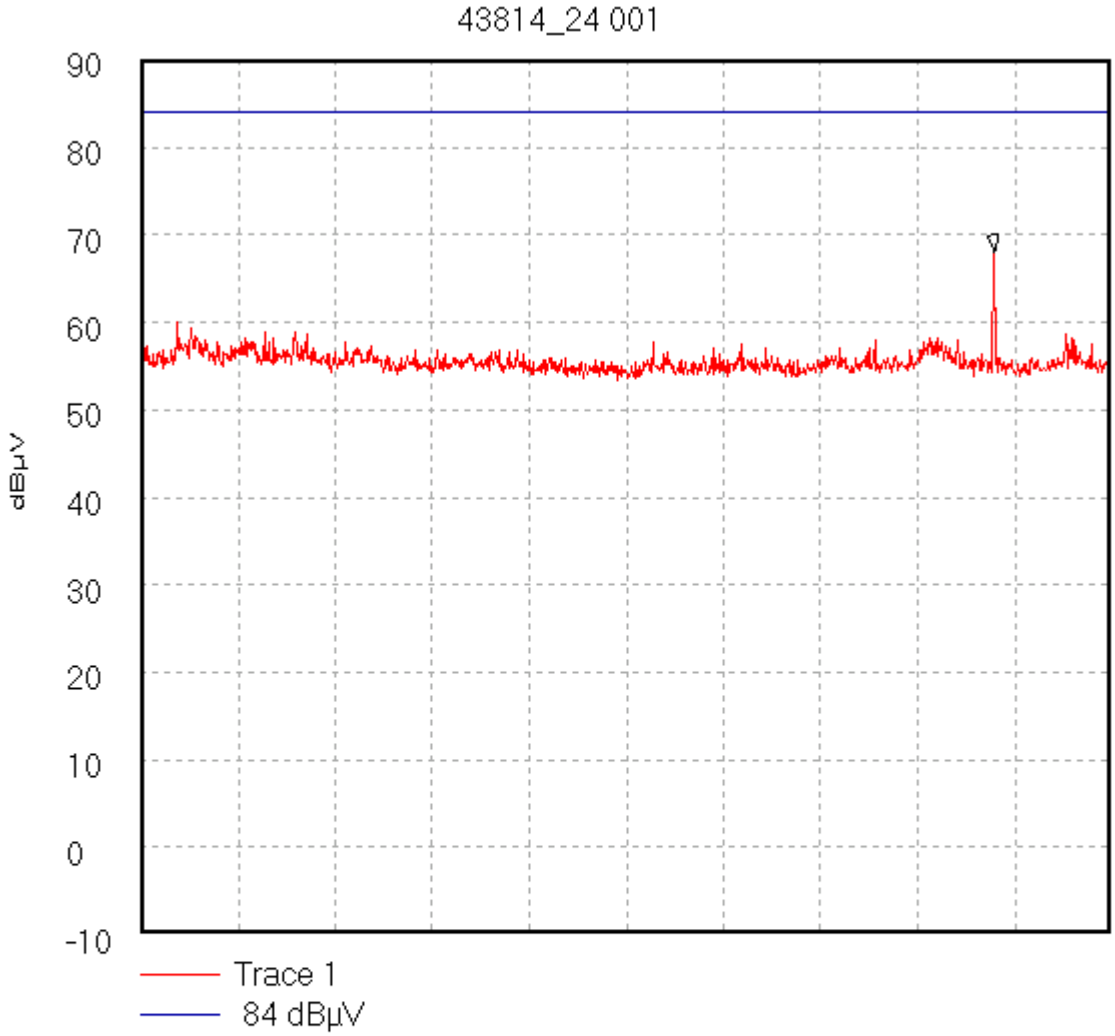
Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 80.0 mS
Peak 984.536 MHz, 44.54 dBµV/m
Transducer Factors: A490
26/07/2002 11:49:56 AM

GPH\43814_24\002
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



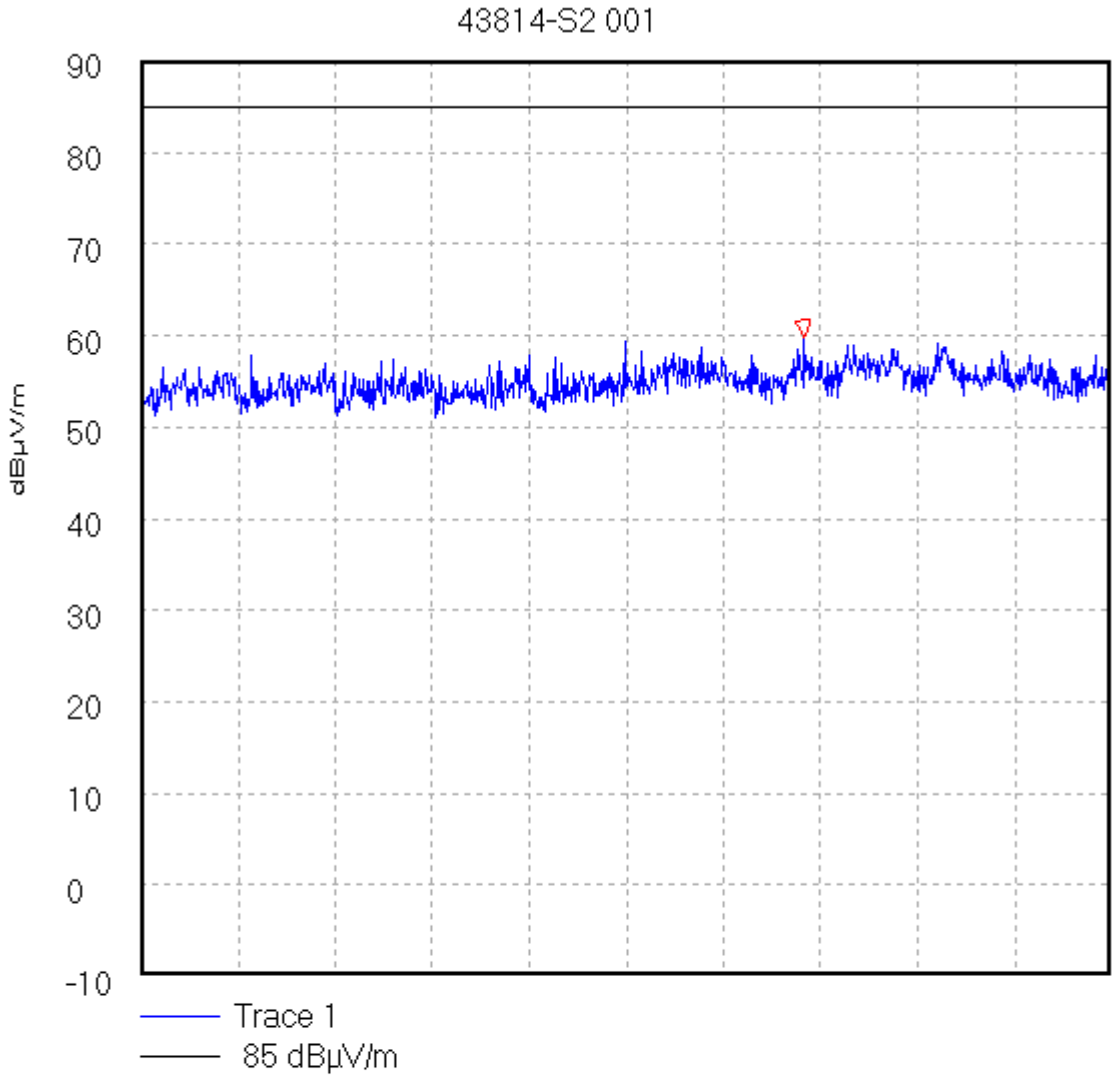
Start 1.0 GHz; Stop 2.0 GHz
Ref 90 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 1.88 GHz, 93.98 dBµV
Display Line: 84 dBµV; ; Limit Test Failed
Transducer Factors: 1 to 2
26/07/2002 11:39:06 AM

GPH\43814_24\001
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



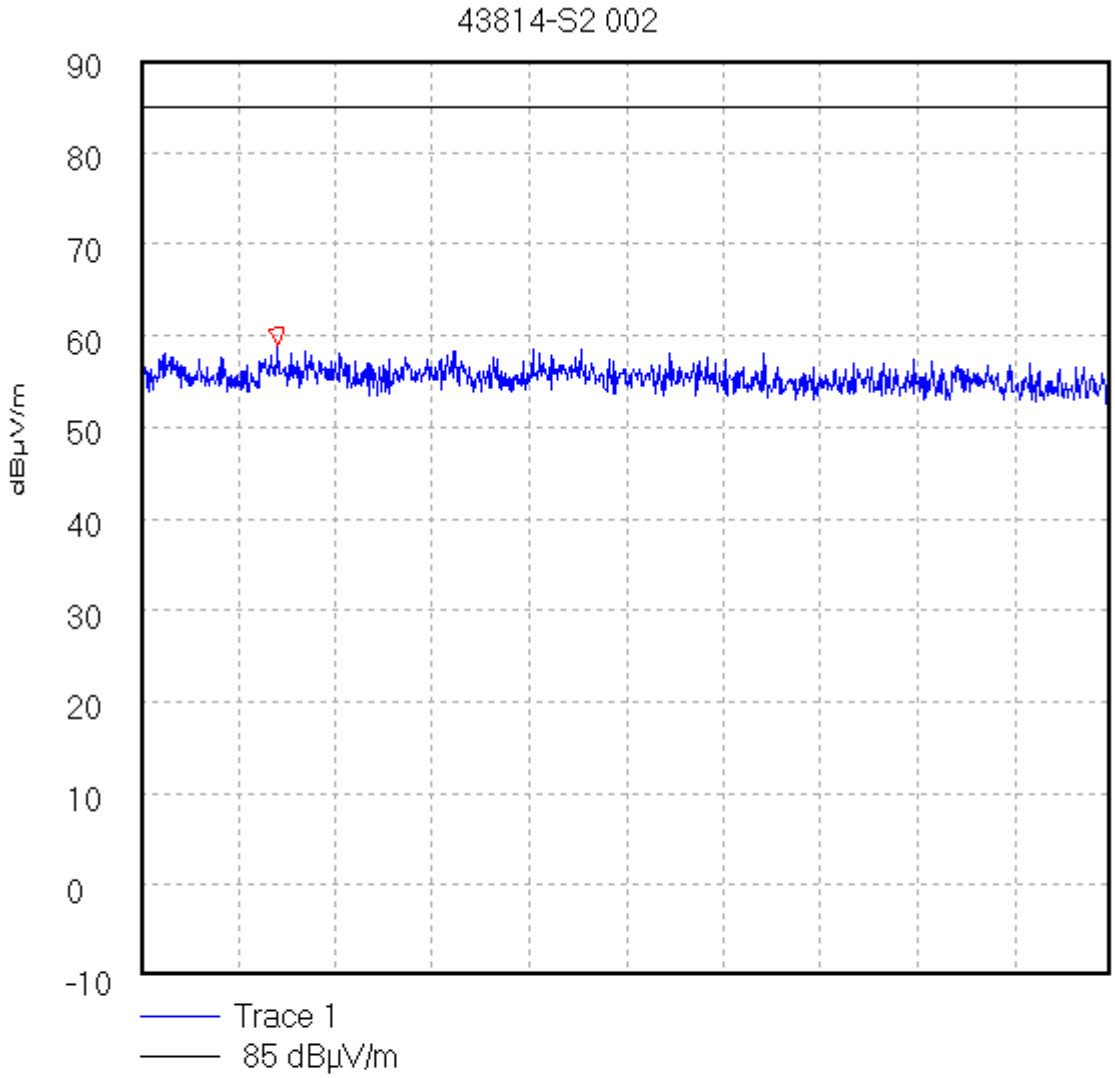
Start 2.0 GHz; Stop 4.0 GHz
Ref 90 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 3.758 GHz, 68.04 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
Transducer Factors: 2 to 4
26/07/2002 11:34:55 AM

GPH\43814-S2\001
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



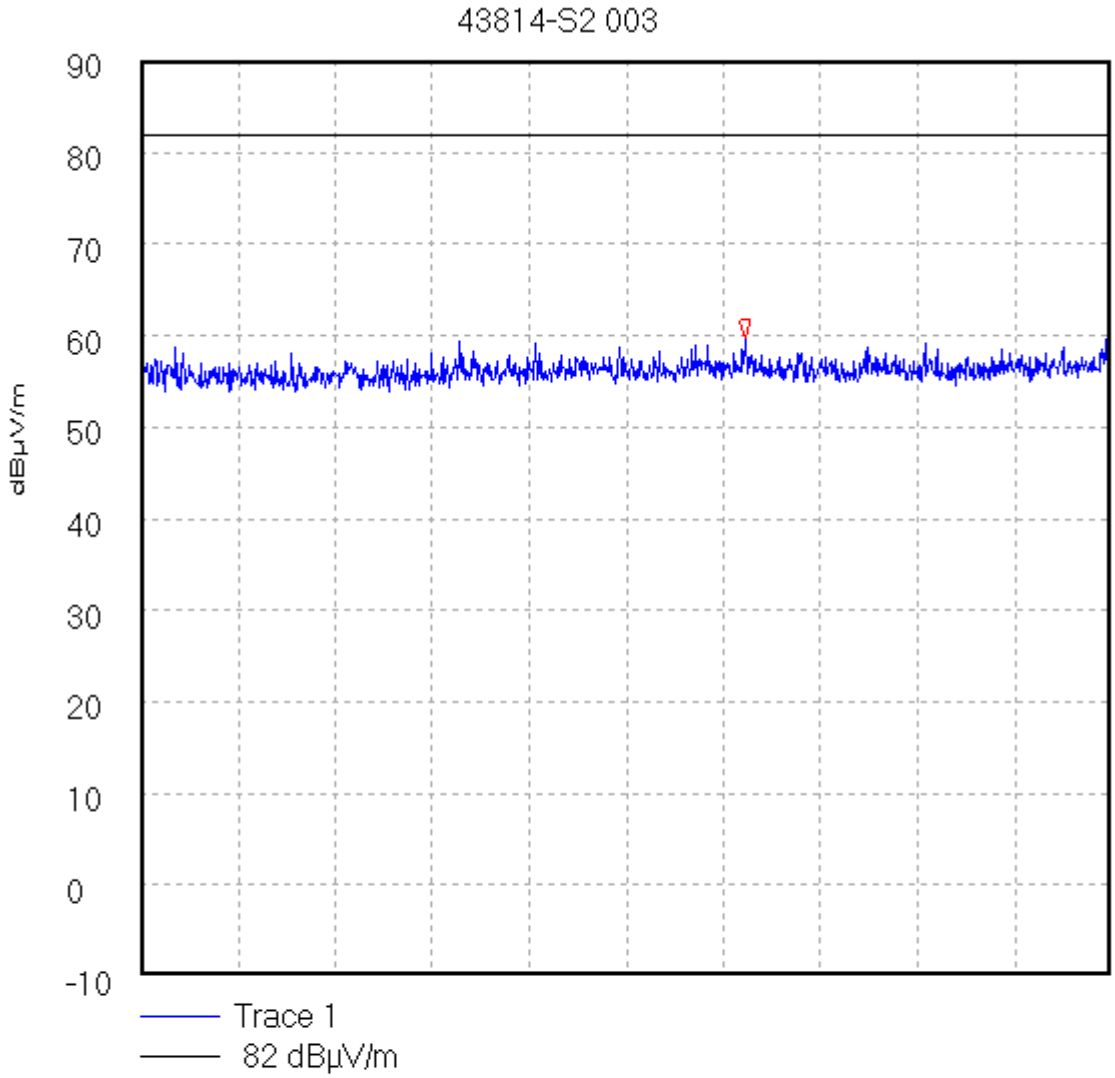
Start 4.0 GHz; Stop 6.0 GHz
Ref 90 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 5.367 GHz, 59.76 dBµV/m
Display Line: 85 dBµV/m; ; Limit Test Passed
7/29/02 10:53:03 AM

GPH\43814-S2\002
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



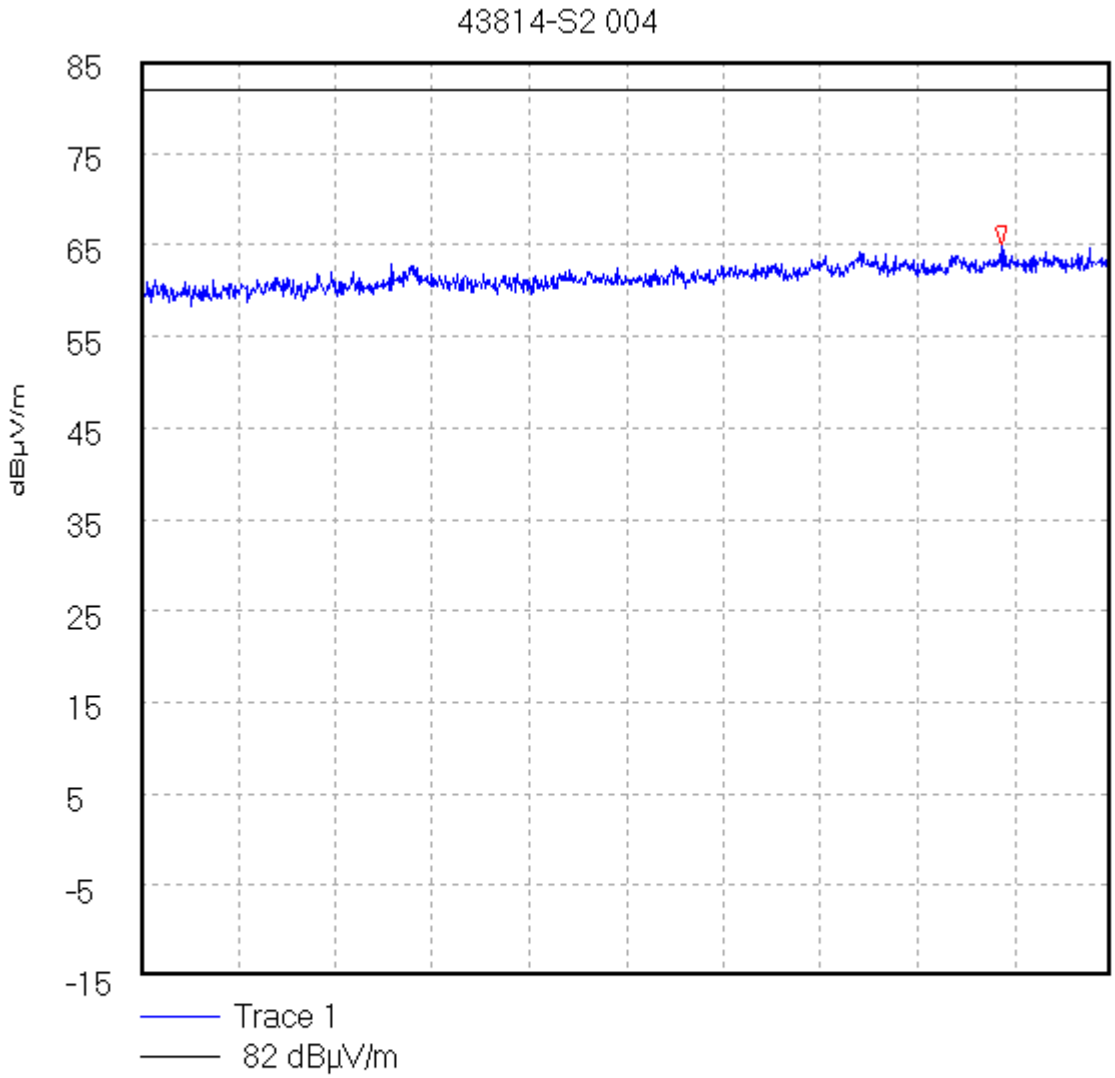
Start 6.0 GHz; Stop 8.0 GHz
Ref 90 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 6.282 GHz, 58.92 dBµV/m
Display Line: 85 dBµV/m; ; Limit Test Passed
7/29/02 10:56:05 AM

GPH\43814-S2\003
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



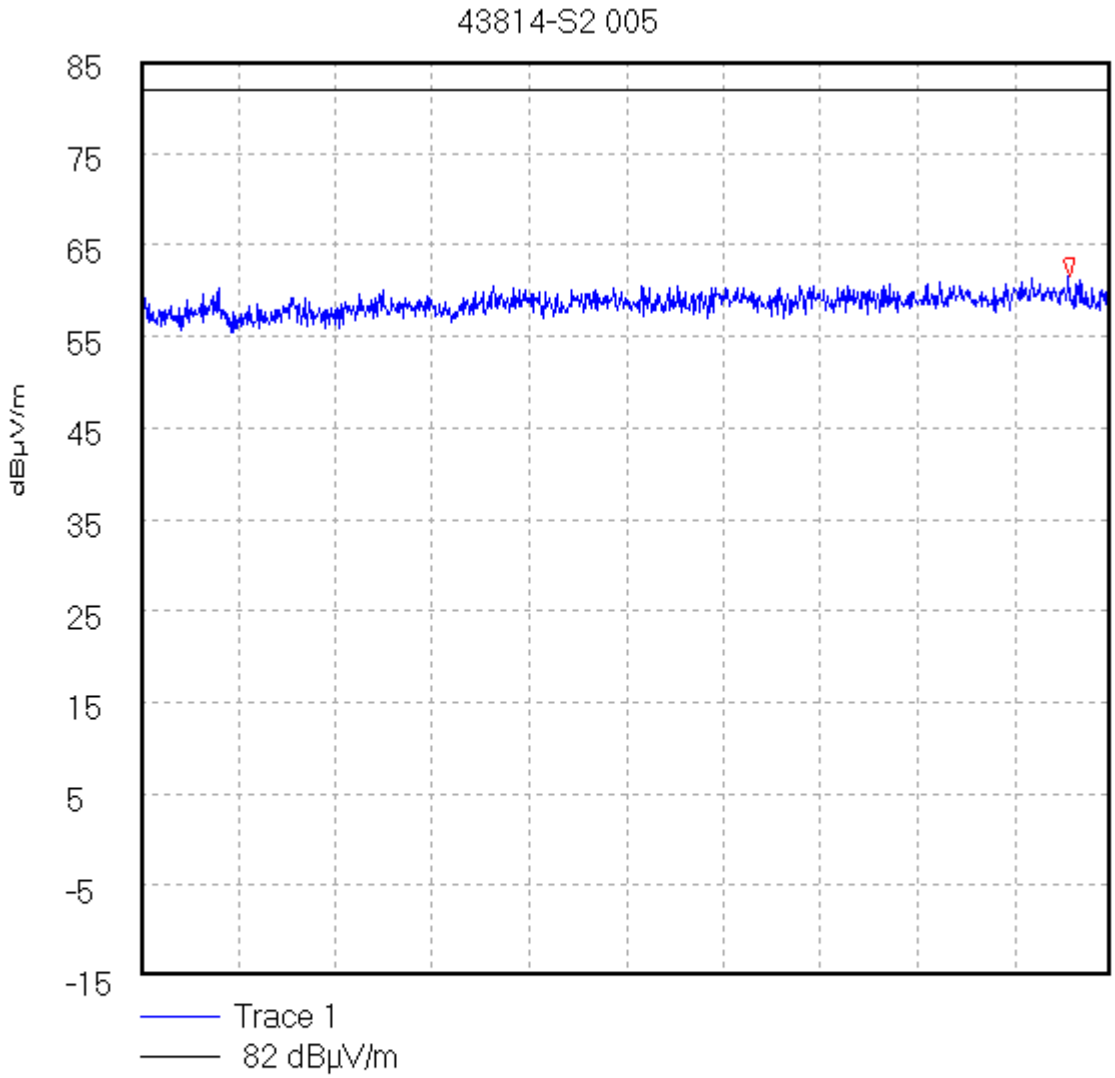
Start 8.0 GHz; Stop 12.5 GHz
Ref 90 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 5 dB; Swp 40.0 mS
Peak 10.805 GHz, 59.69 dBµV/m
Display Line: 82 dBµV/m; ; Limit Test Passed
7/29/02 10:59:13 AM

GPH\43814-S2\004
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



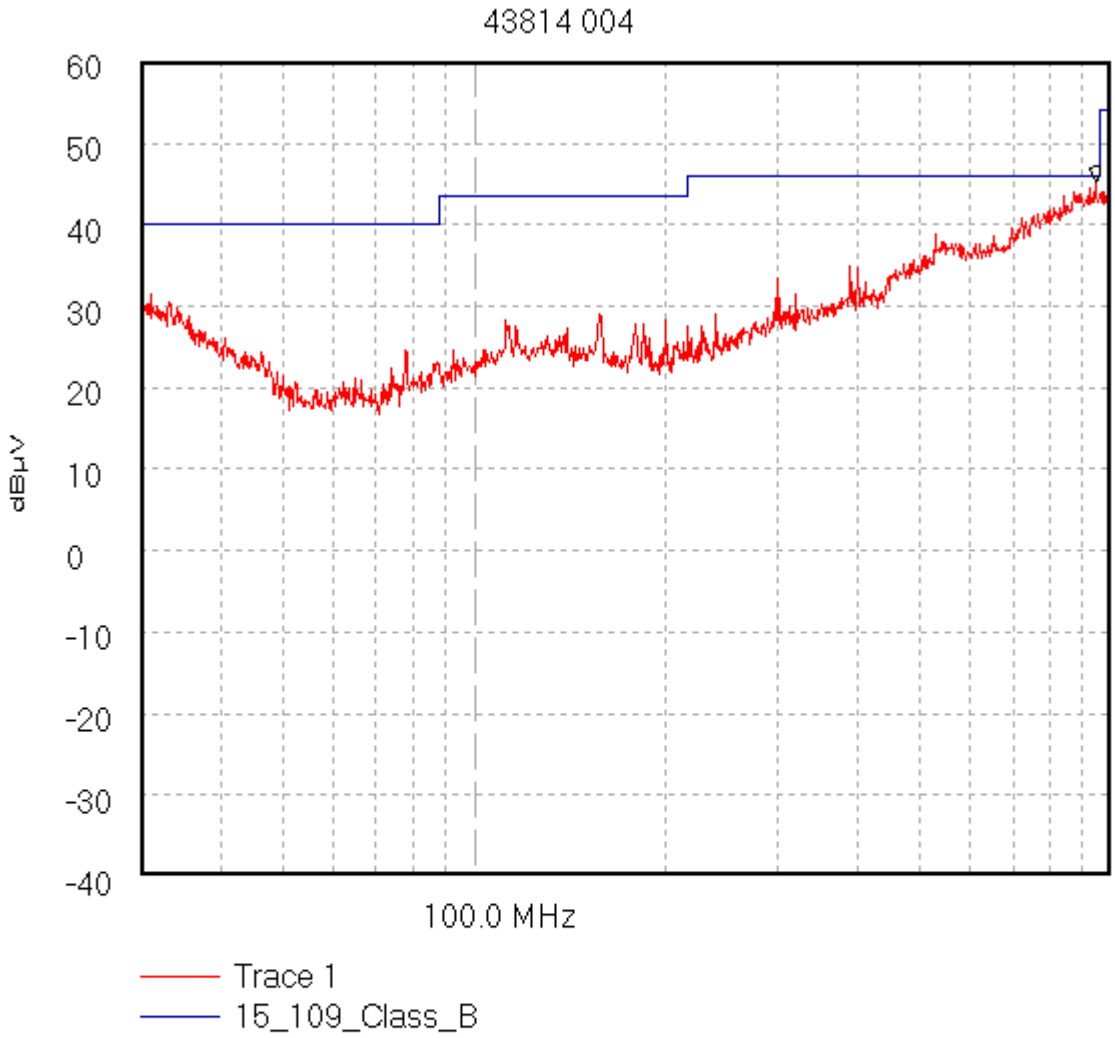
Start 12.5 GHz; Stop 18.0 GHz
Ref 85 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 5 dB; Swp 40.0 mS
Peak 17.377 GHz, 64.97 dBµV/m
Display Line: 82 dBµV/m; ; Limit Test Passed
7/29/02 11:02:53 AM

GPH\43814-S2\005
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4 GSM 900/1800/1900 MS. Active Mode Middle Channel (PCS). Spec: FCC Part 24



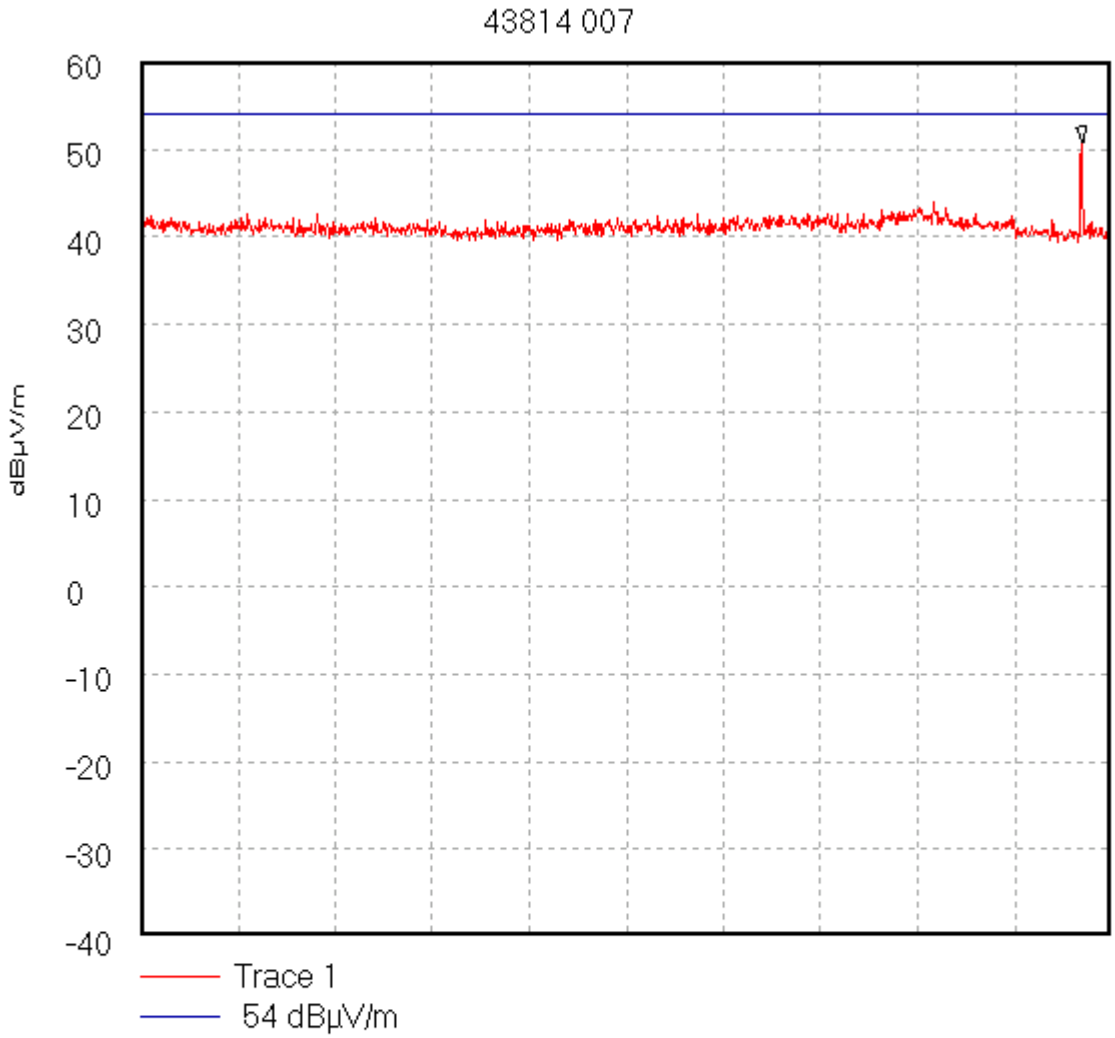
Start 18.0 GHz; Stop 22.0 GHz
Ref 85 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 21.827 GHz, 61.59 dBµV/m
Display Line: 82 dBµV/m; ; Limit Test Passed
7/29/02 11:08:15 AM

GPH\43814\004
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



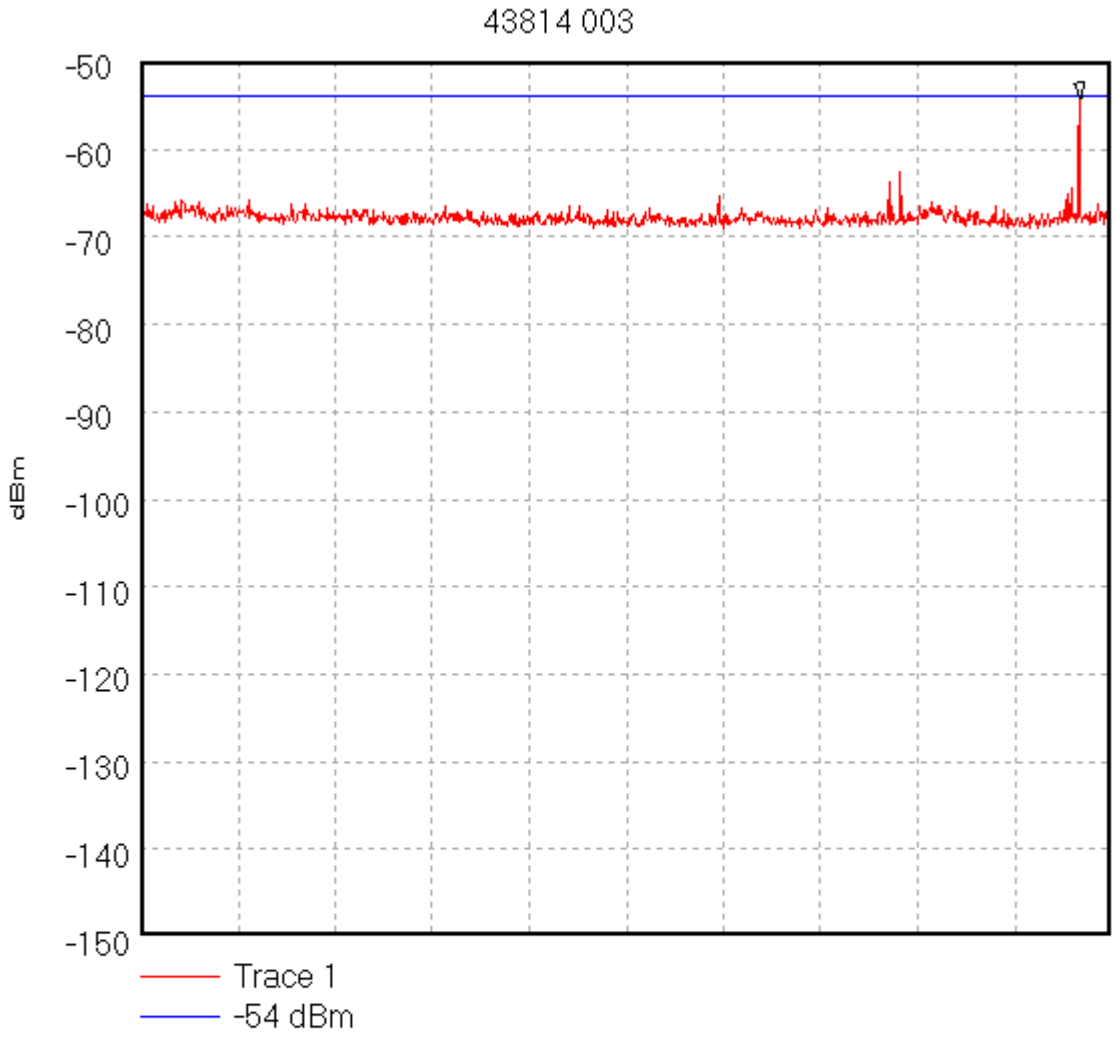
Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 120.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 380.0 mS
Peak 946.915 MHz, 45.28 dBµV
Limit/Mask: 15_109_Class_B; ; Limit Test Passed
Transducer Factors: A490
26/07/2002 2:24:41 PM

GPH\43814\007
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



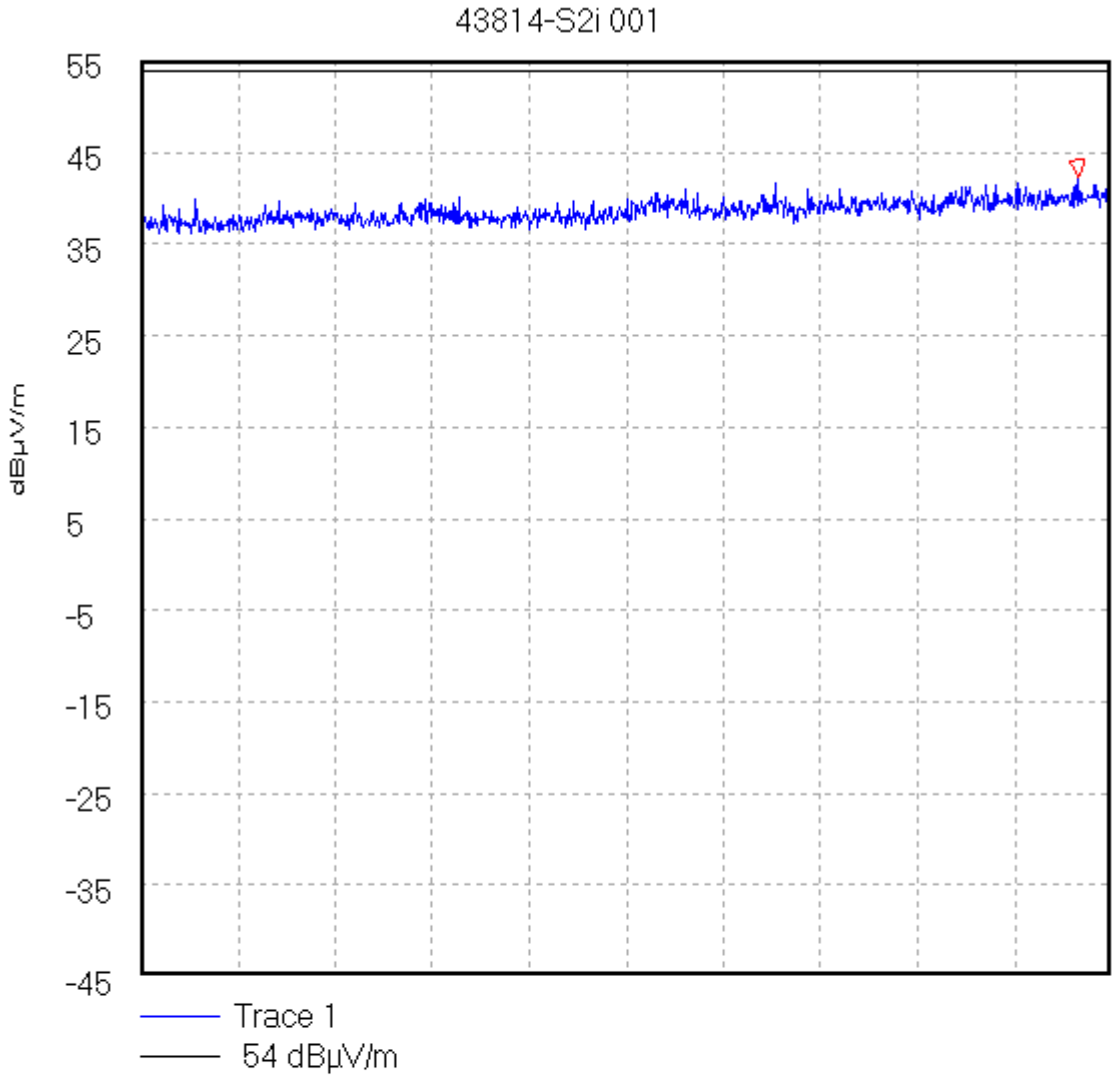
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.97 GHz, 50.76 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
Transducer Factors: 1 to 2
26/07/2002 2:47:43 PM

GPH\43814\003
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



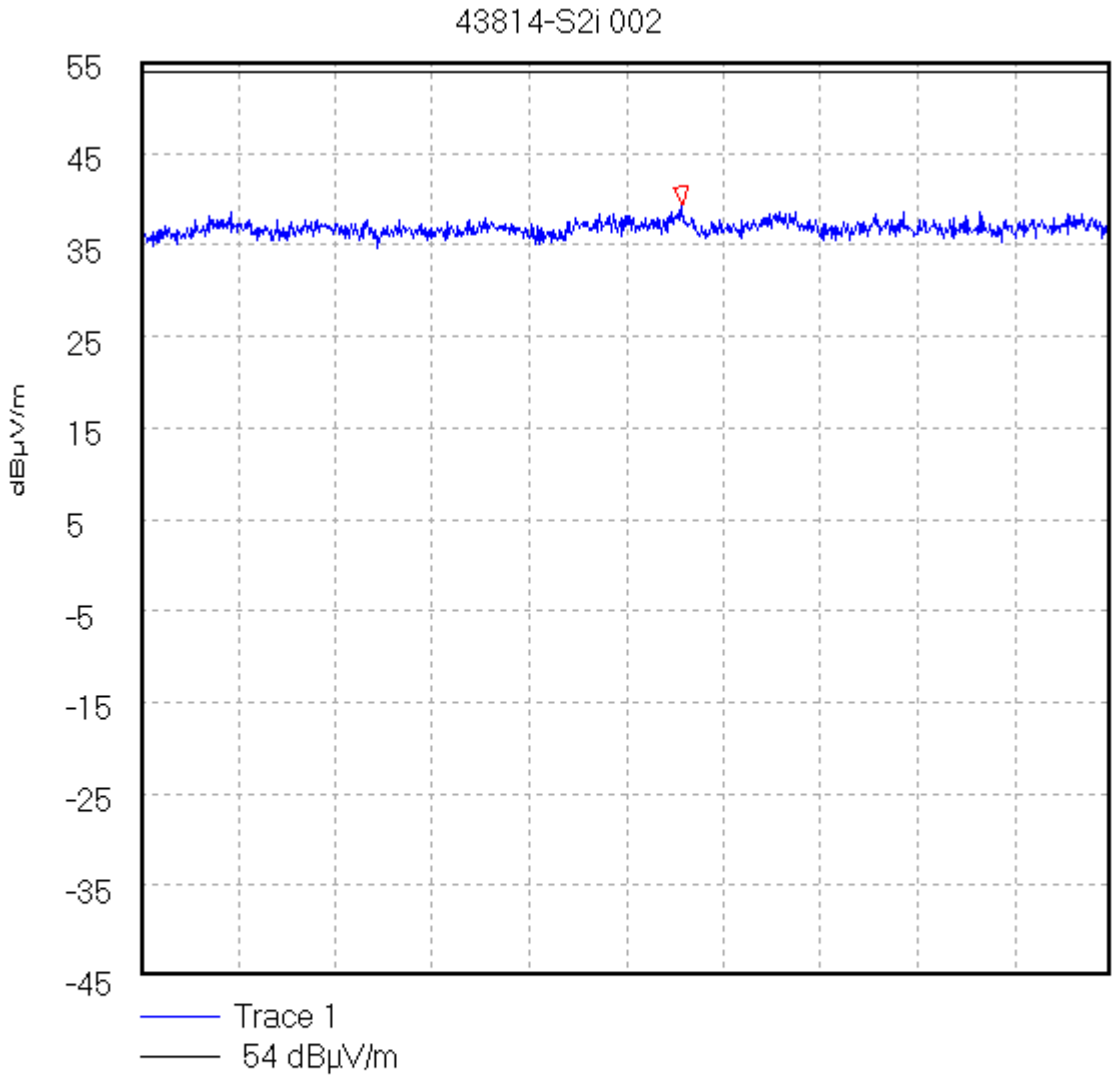
Start 2.0 GHz; Stop 4.0 GHz
Ref -50 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.936 GHz, -54.24 dBm
Display Line: -54 dBm; ; Limit Test Passed
Transducer Factors: 2 to 4
26/07/2002 10:41:28 AM

GPH\43814-S2i\001
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



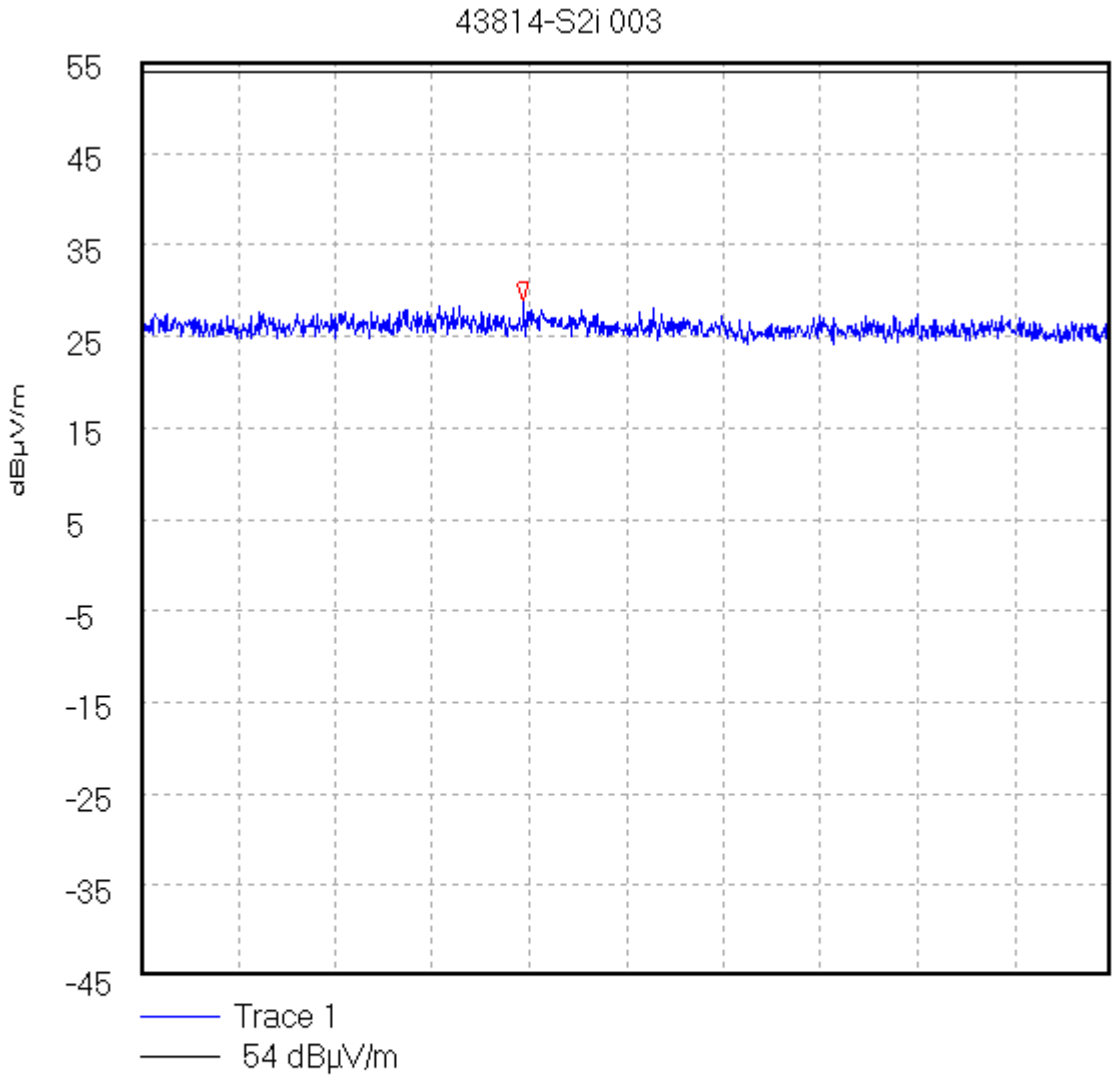
Start 4.0 GHz; Stop 5.0 GHz
Ref 55 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.966 GHz, 42.38 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
7/29/02 11:14:41 AM

GPH\43814-S2i\002
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



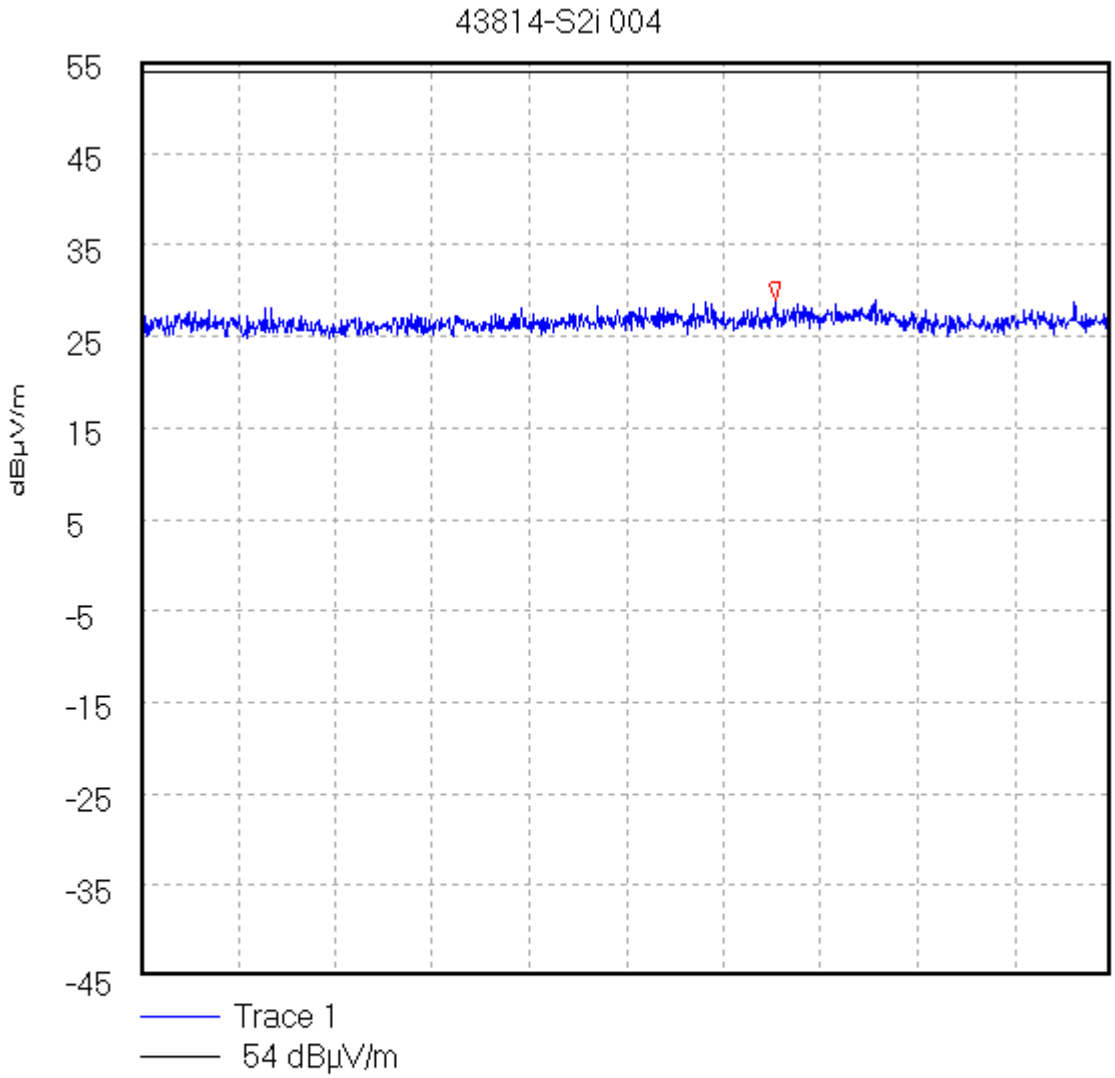
Start 5.0 GHz; Stop 6.0 GHz
Ref 55 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.558 GHz, 39.34 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
7/29/02 11:16:18 AM

GPH\43814-S2i\003
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



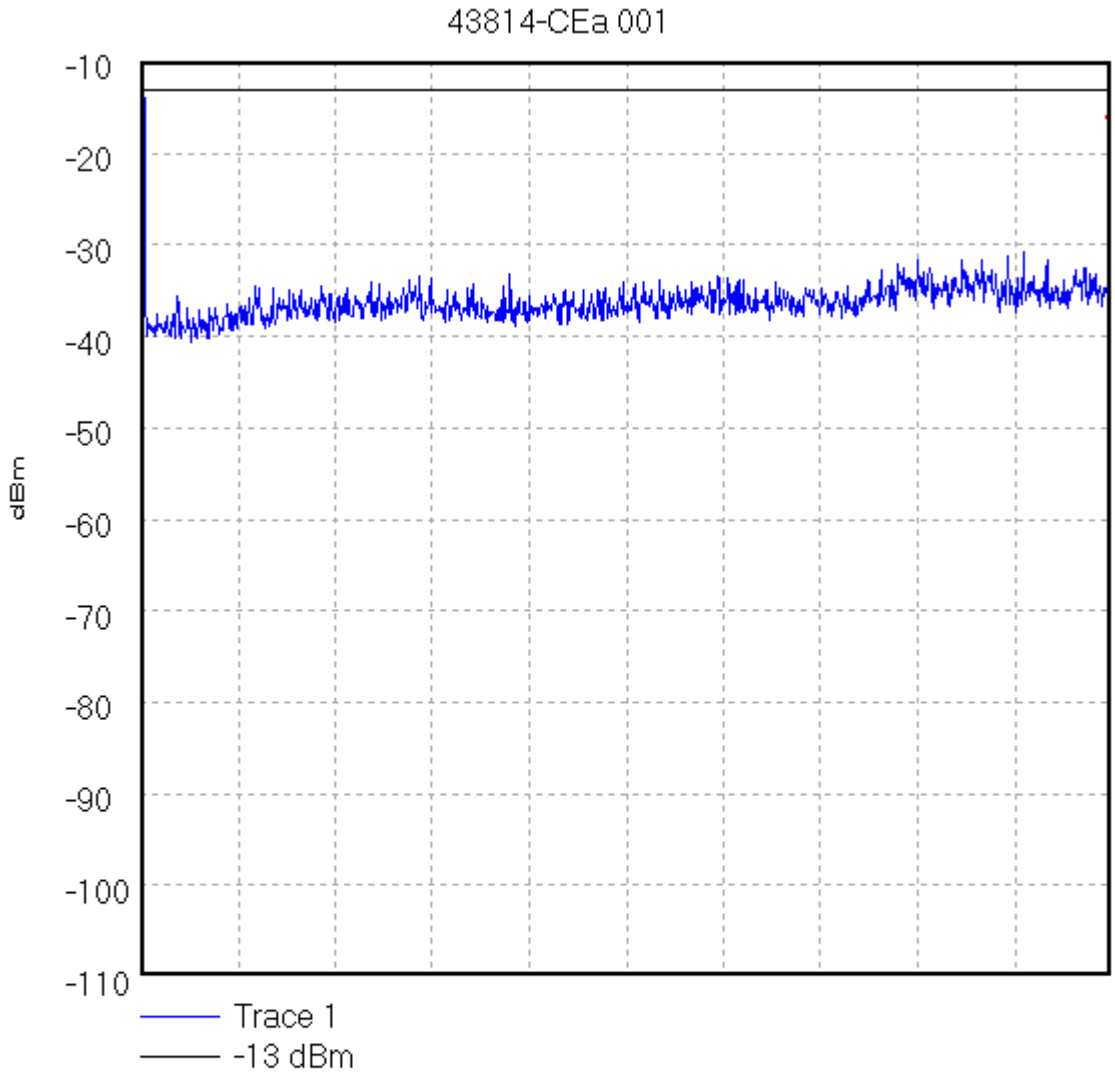
Start 6.0 GHz; Stop 8.0 GHz
Ref 55 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 6.789 GHz, 28.87 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
7/29/02 11:55:40 AM

GPH\43814-S2i\004
Radiated Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Idle Mode (Radio Enabled) (PCS). Spec: FCC Part 15.109



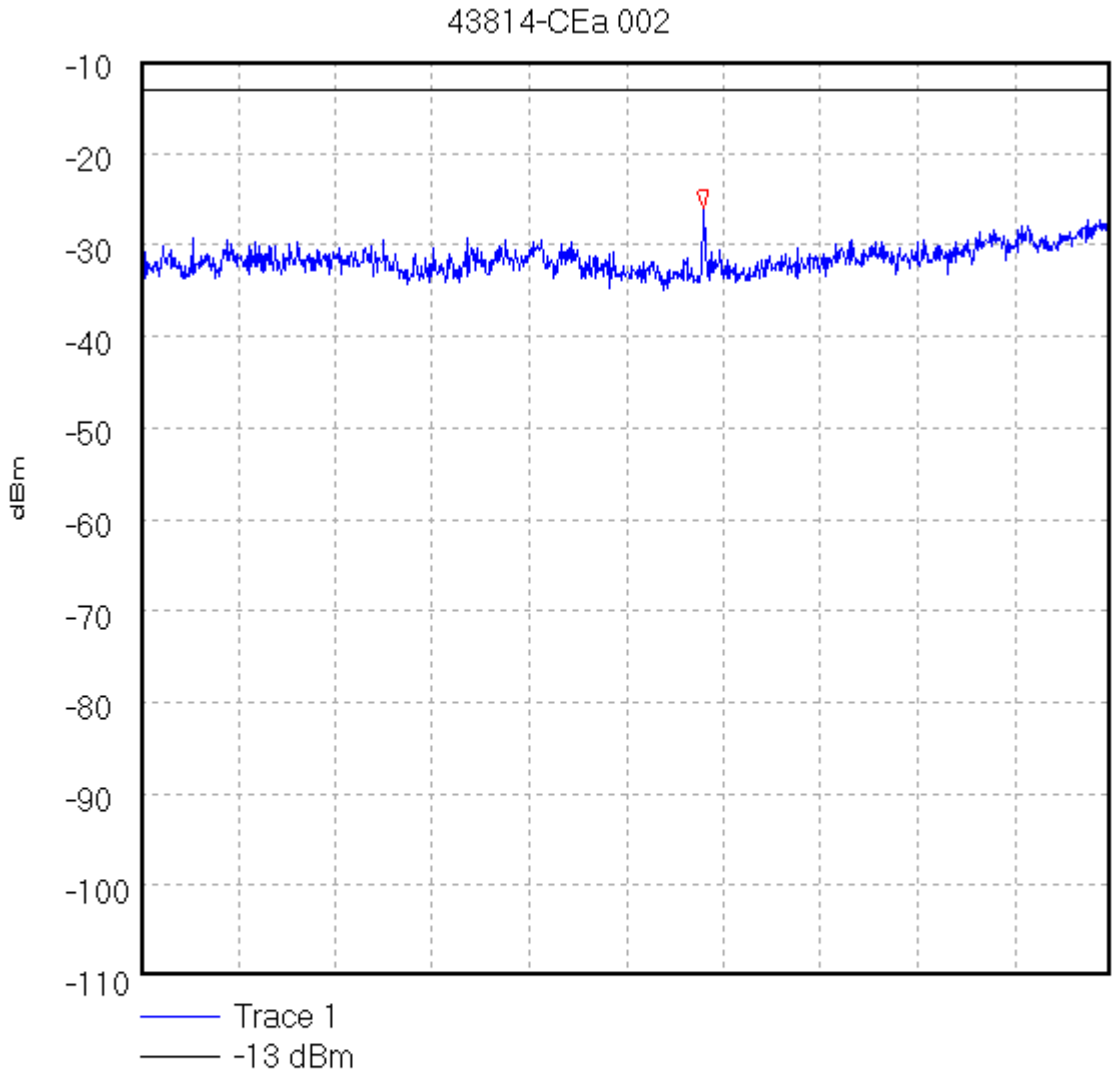
Start 8.0 GHz; Stop 10.0 GHz
Ref 55 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 9.307 GHz, 28.95 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Passed
7/29/02 11:59:16 AM

GPH\43814-CEa\001
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Bottom Channel (PCS). Spec: FCC Part 24



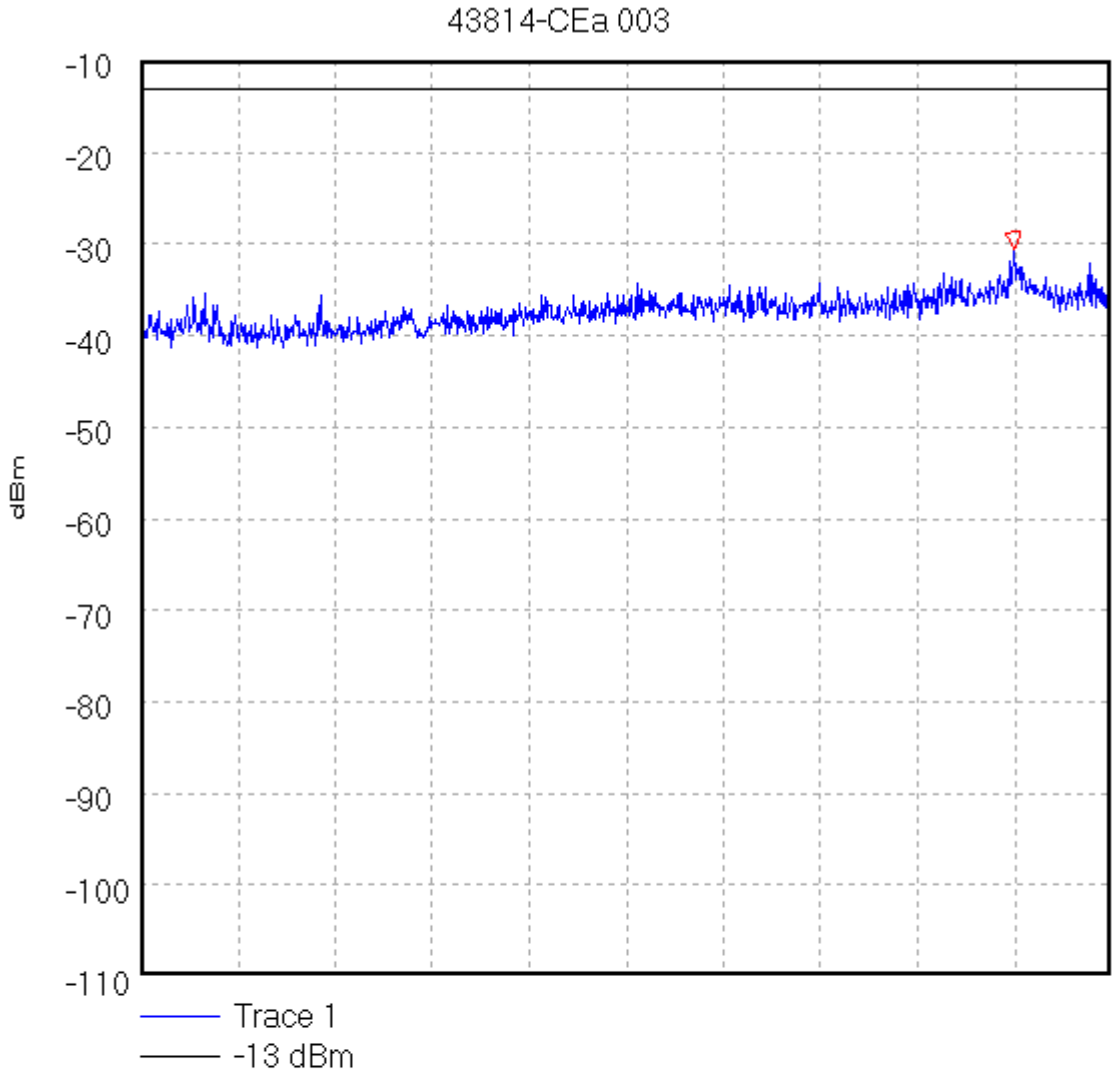
Start 1.0 MHz; Stop 1.85 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Peak 1.85 GHz, -17.59 dBm
Display Line: -13 dBm;
7/29/02 3:49:42 PM

GPH\43814-CEa\002
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Bottom Channel (PCS). Spec: FCC Part 24



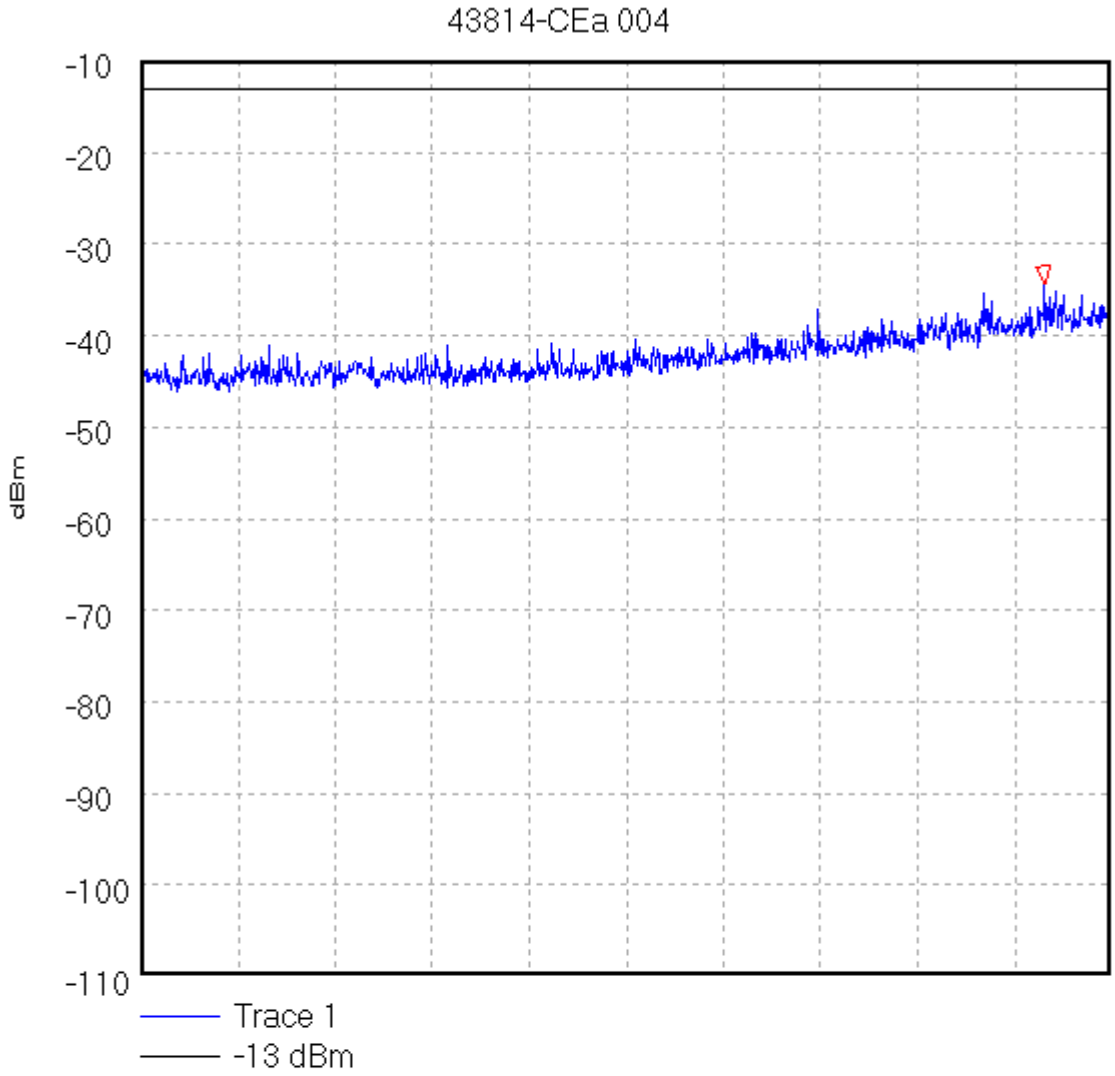
Start 1.91 GHz; Stop 5.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 20.0 mS
Marker 3.702 GHz, -25.92 dBm
Display Line: -13 dBm;
7/29/02 3:52:28 PM

GPH\43814-CEa\003
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, CSM 900/1800/1900 MS. Active Mode, Bottom Channel (PCS). Spec: FCC Part 24



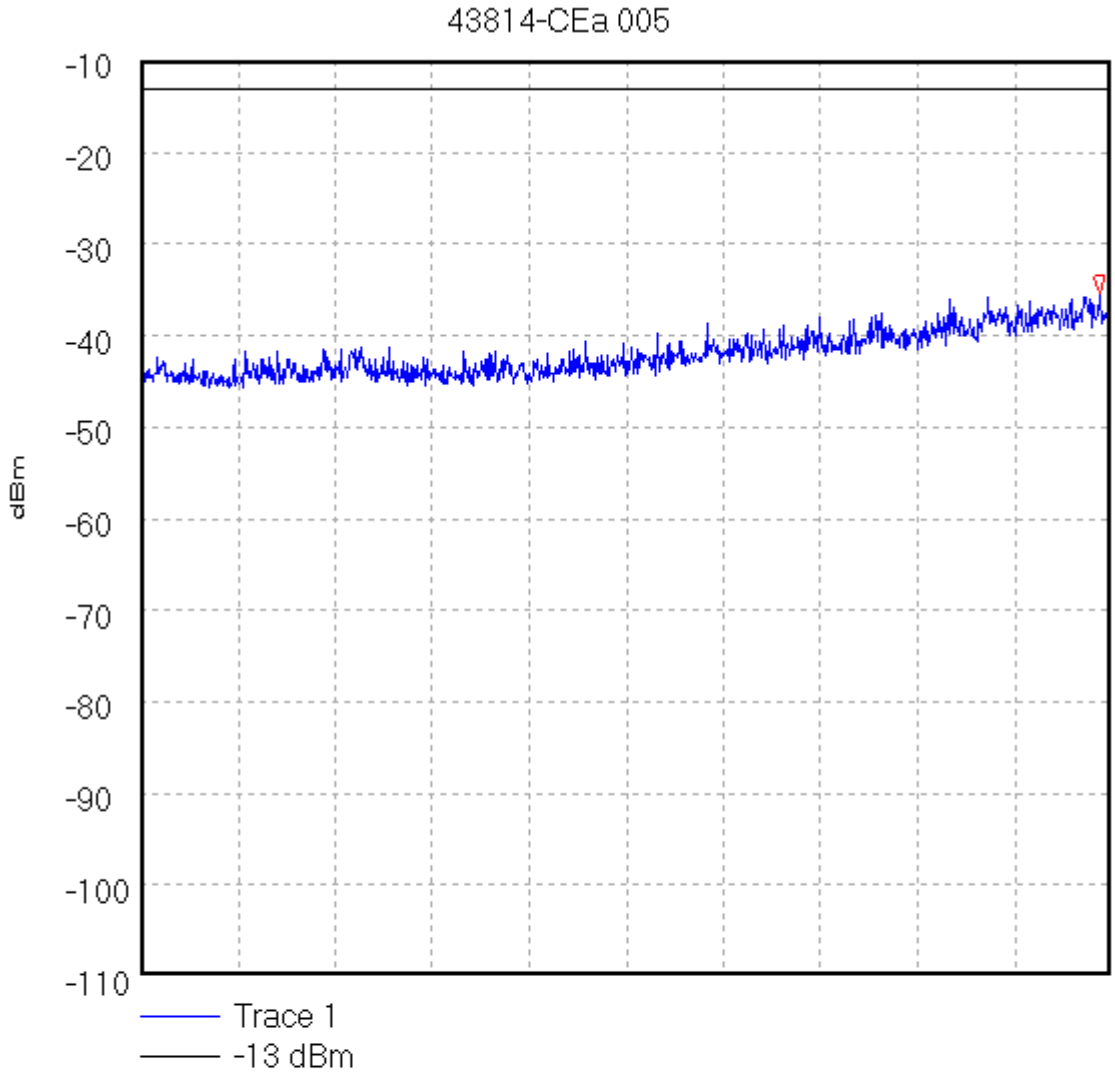
Start 5.0 GHz; Stop 15.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.0 GHz, -30.59 dBm
Display Line: -13 dBm;
7/29/02 4:00:42 PM

GPH\43814-CEa\004
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Bottom Channel (PCS). Spec: FCC Part 24



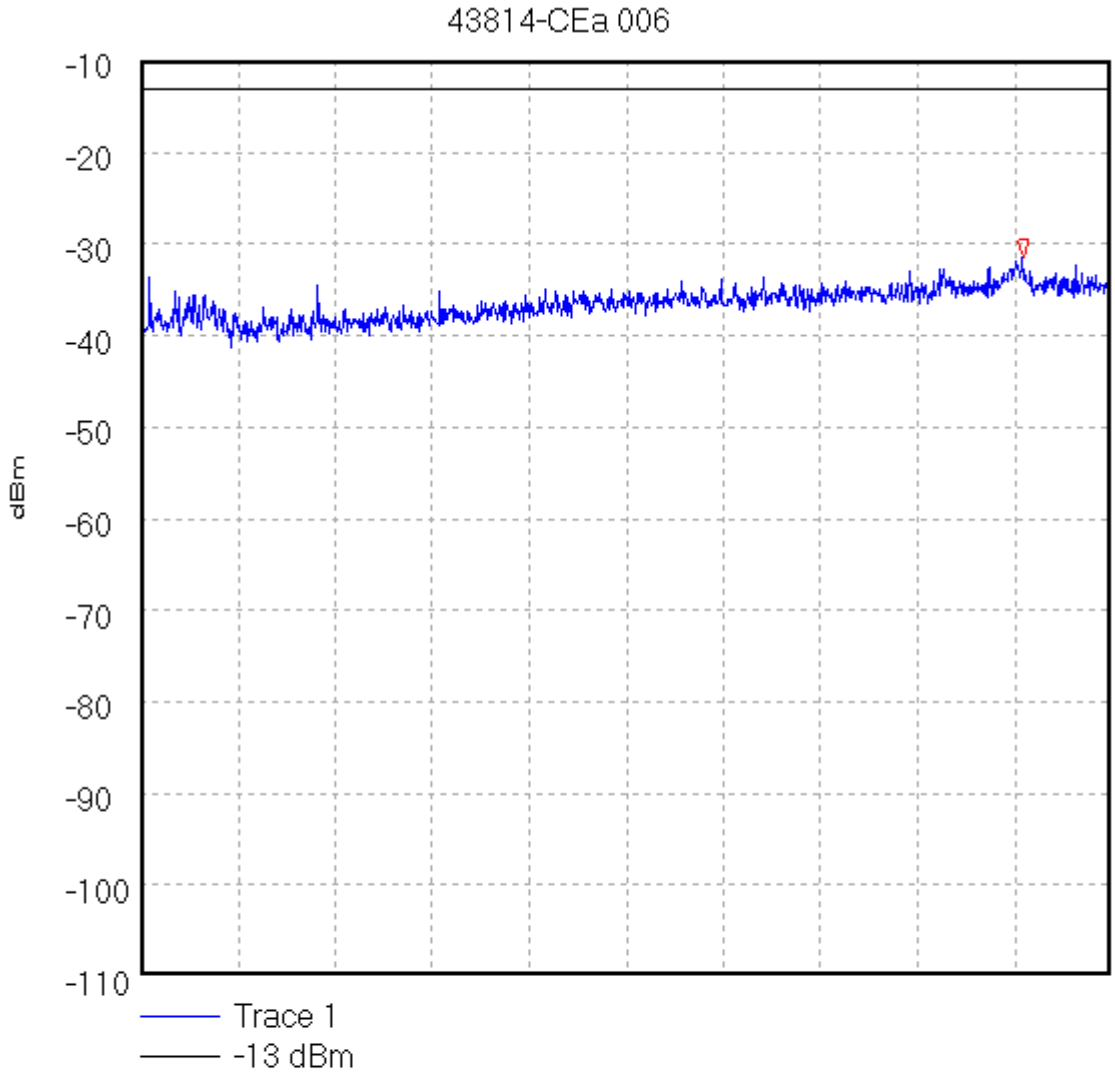
Start 15.0 GHz; Stop 22.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 21.518 GHz, -34.42 dBm
Display Line: -13 dBm;
7/29/02 4:02:59 PM

GPH\43814-CEa\005
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Middle Channel (PCS). Spec: FCC Part 24



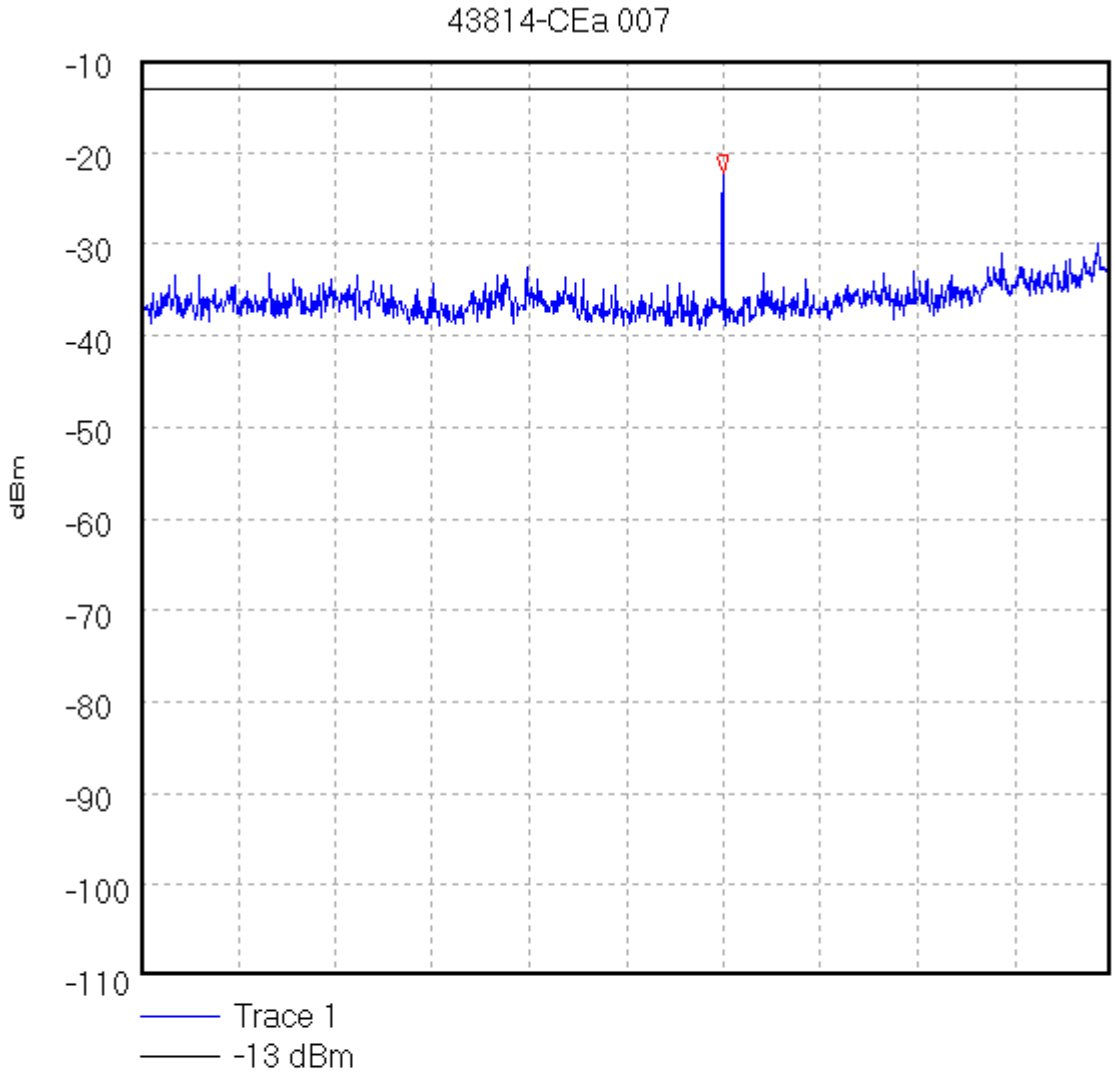
Start 15.0 GHz; Stop 22.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 21.914 GHz, -35.31 dBm
Display Line: -13 dBm;
7/29/02 4:06:17 PM

GPH\43814-CEa\006
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Middle Channel (PCS). Spec: FCC Part 24



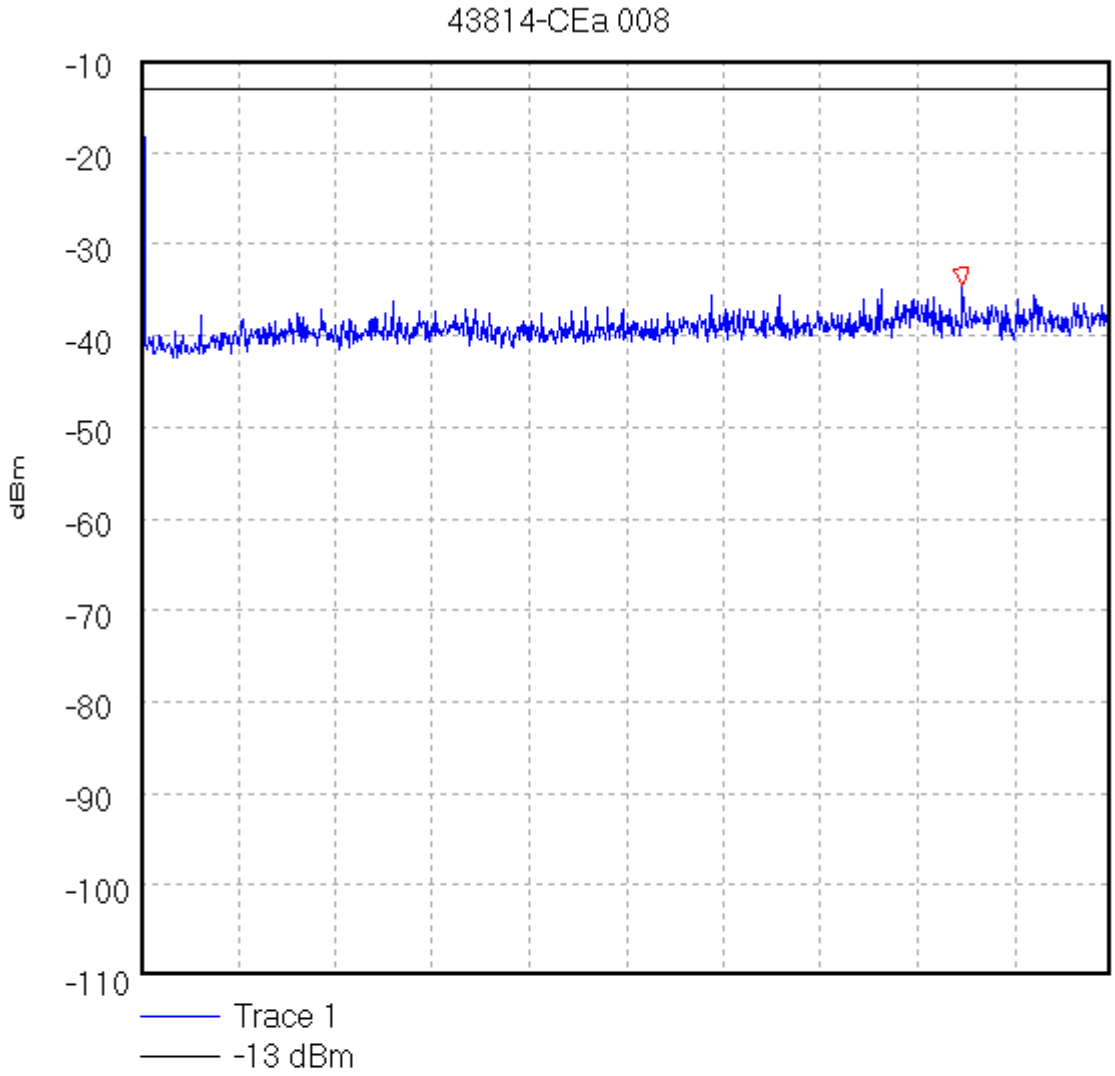
Start 5.0 GHz; Stop 15.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.089 GHz, -31.48 dBm
Display Line: -13 dBm;
7/29/02 4:07:43 PM

GPH\43814-CEa\007
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Middle Channel (PCS). Spec: FCC Part 24

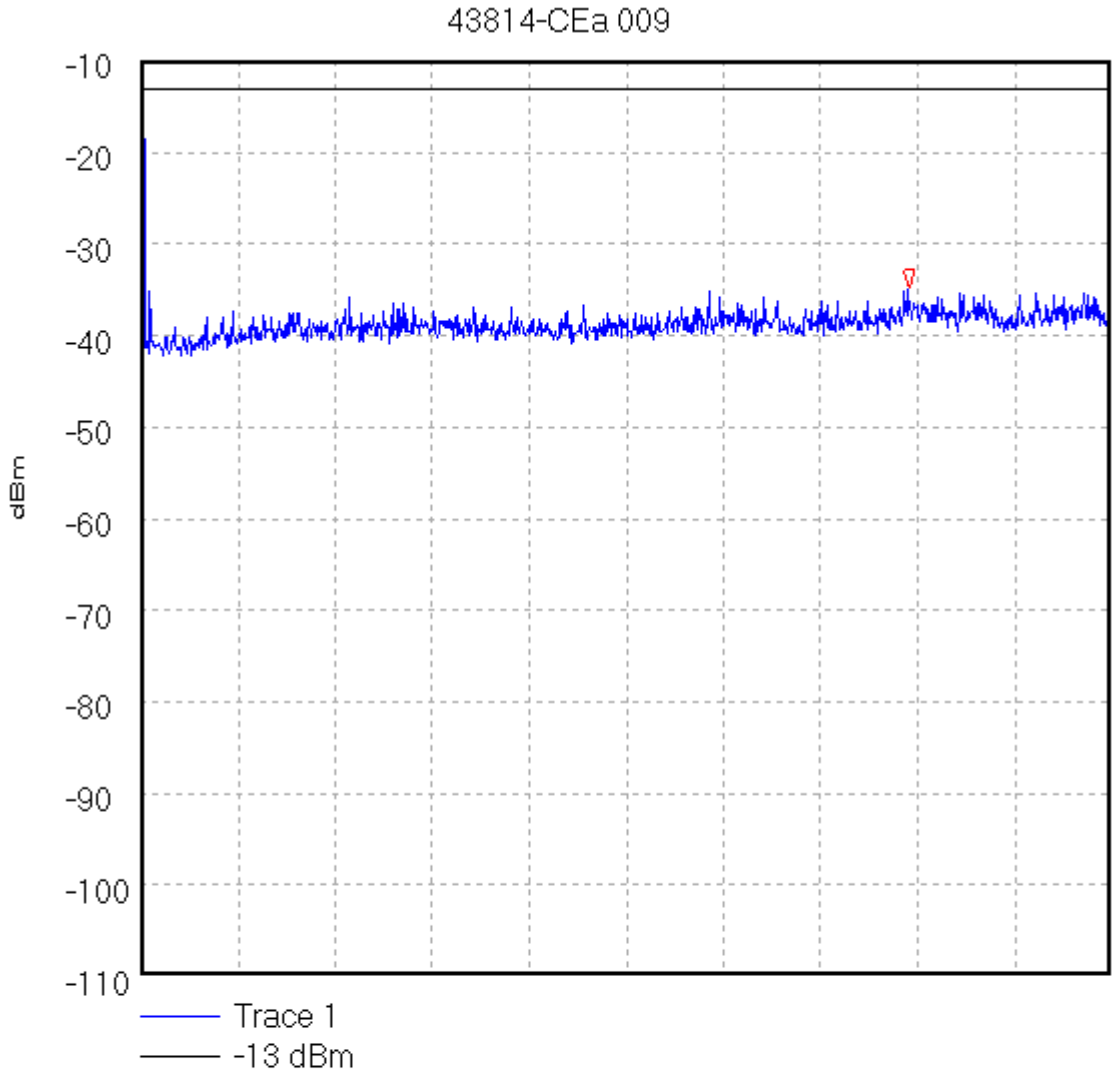


Start 1.91 GHz; Stop 5.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.764 GHz, -22.21 dBm
Display Line: -13 dBm;
7/29/02 4:08:33 PM

GPH\43814-CEa\008
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Middle Channel (PCS). Spec: FCC Part 24

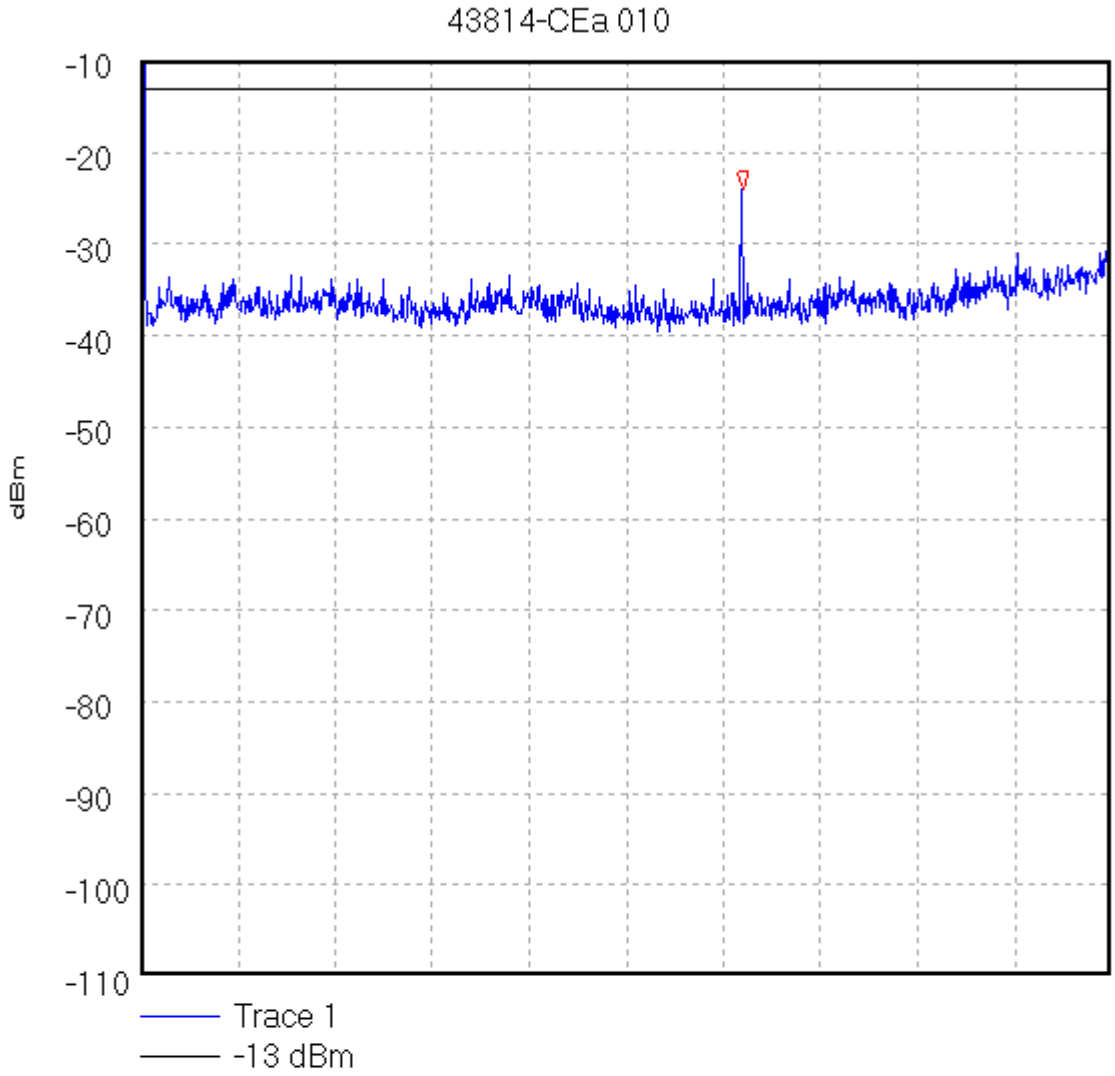


GPH\43814-CEa\009
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Top Channel (PCS). Spec: FCC Part 24



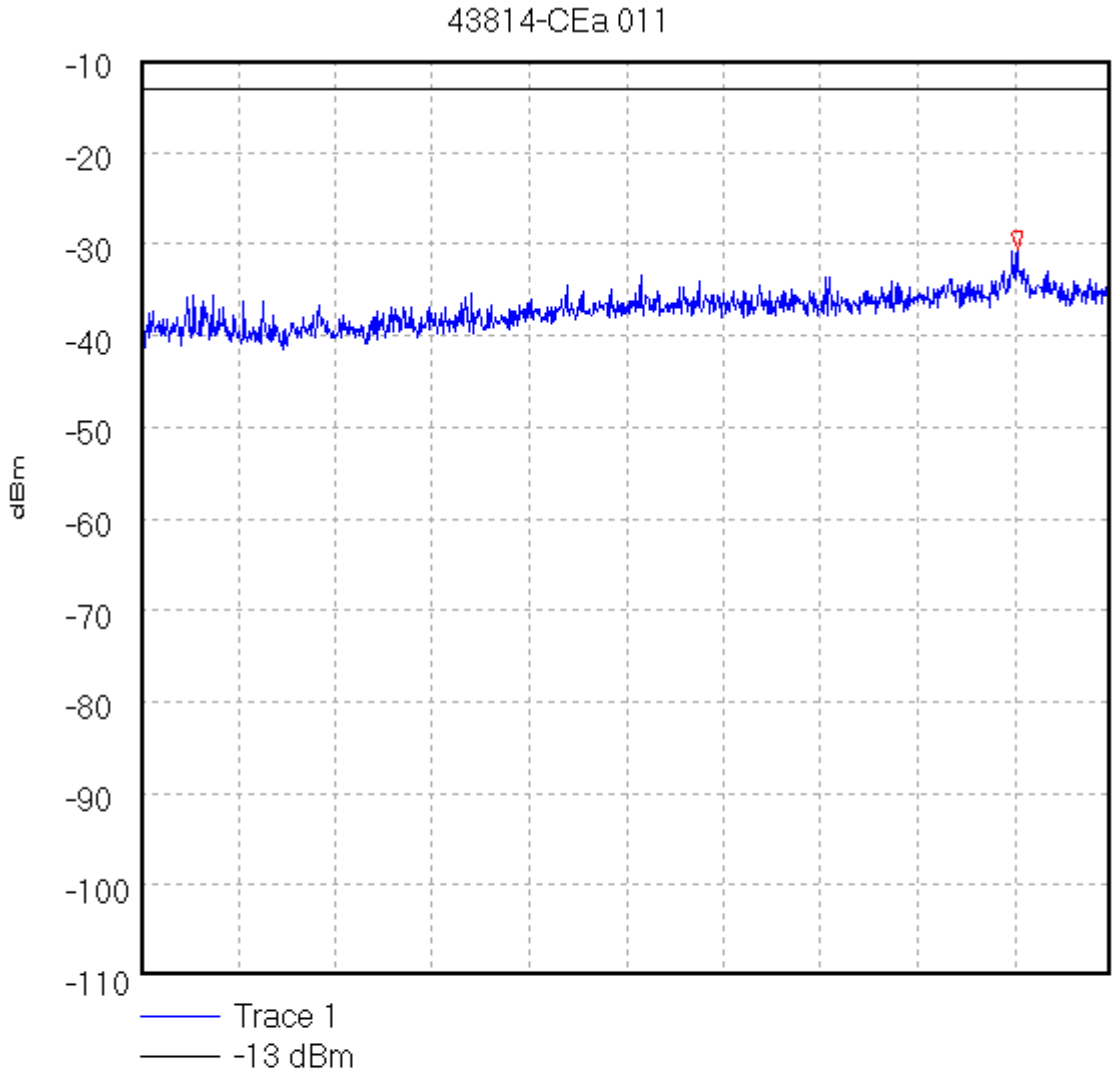
Start 1.0 MHz; Stop 1.85 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.464 GHz, -34.86 dBm
Display Line: -13 dBm;
7/29/02 4:10:55 PM

GPH\43814-CEa\010
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Top Channel (PCS). Spec: FCC Part 24



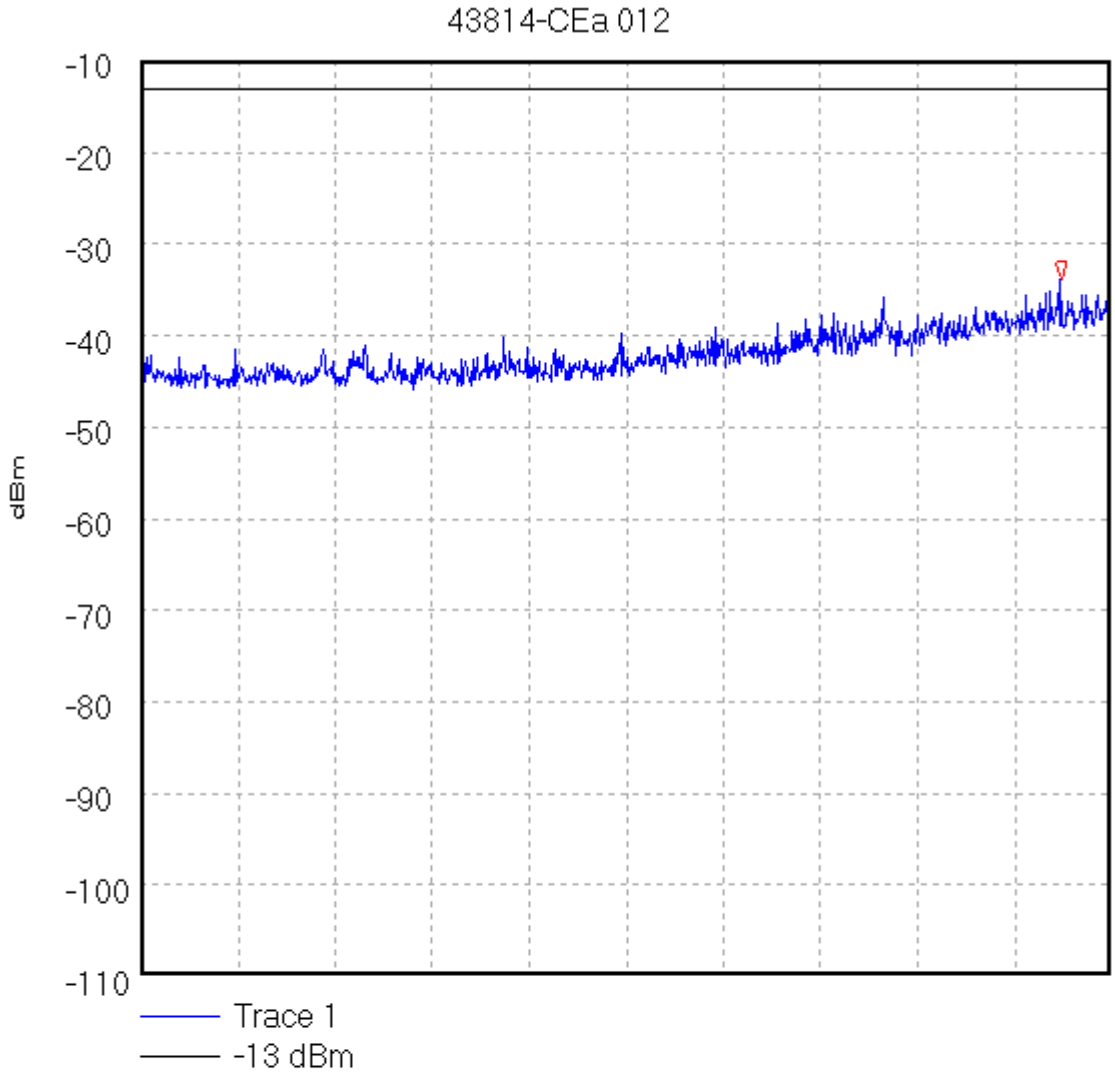
Start 1.91 GHz; Stop 5.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Marker 3.826 GHz, -24.04 dBm
Display Line: -13 dBm;
7/29/02 4:12:07 PM

GPH\43814-CEa\011
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Top Channel (PCS). Spec: FCC Part 24



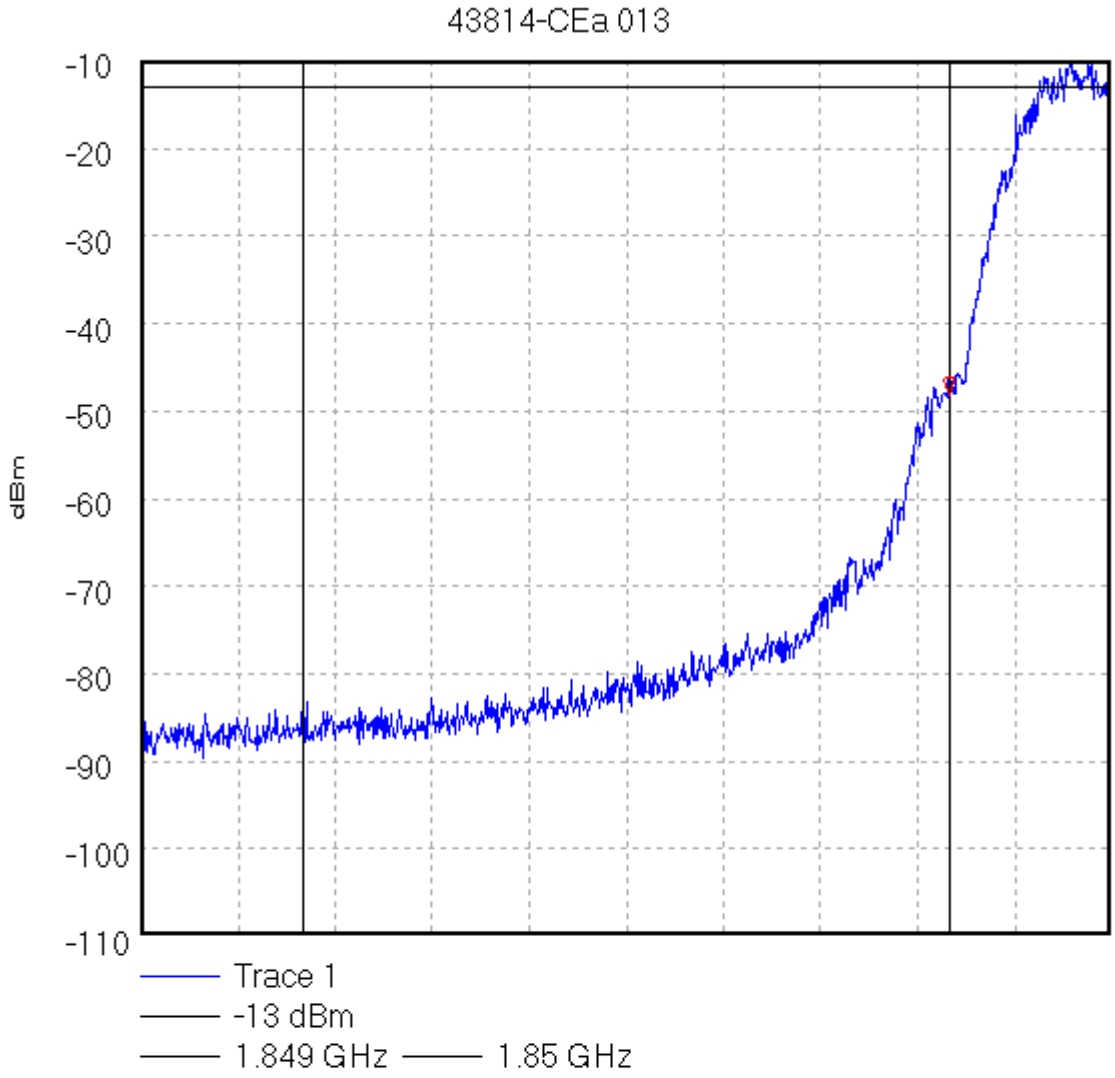
Start 5.0 GHz; Stop 15.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.033 GHz, -30.56 dBm
Display Line: -13 dBm;
7/29/02 4:15:46 PM

GPH\43814-CEa\012
Conducted Emissions Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Top Channel (PCS). Spec: FCC Part 24



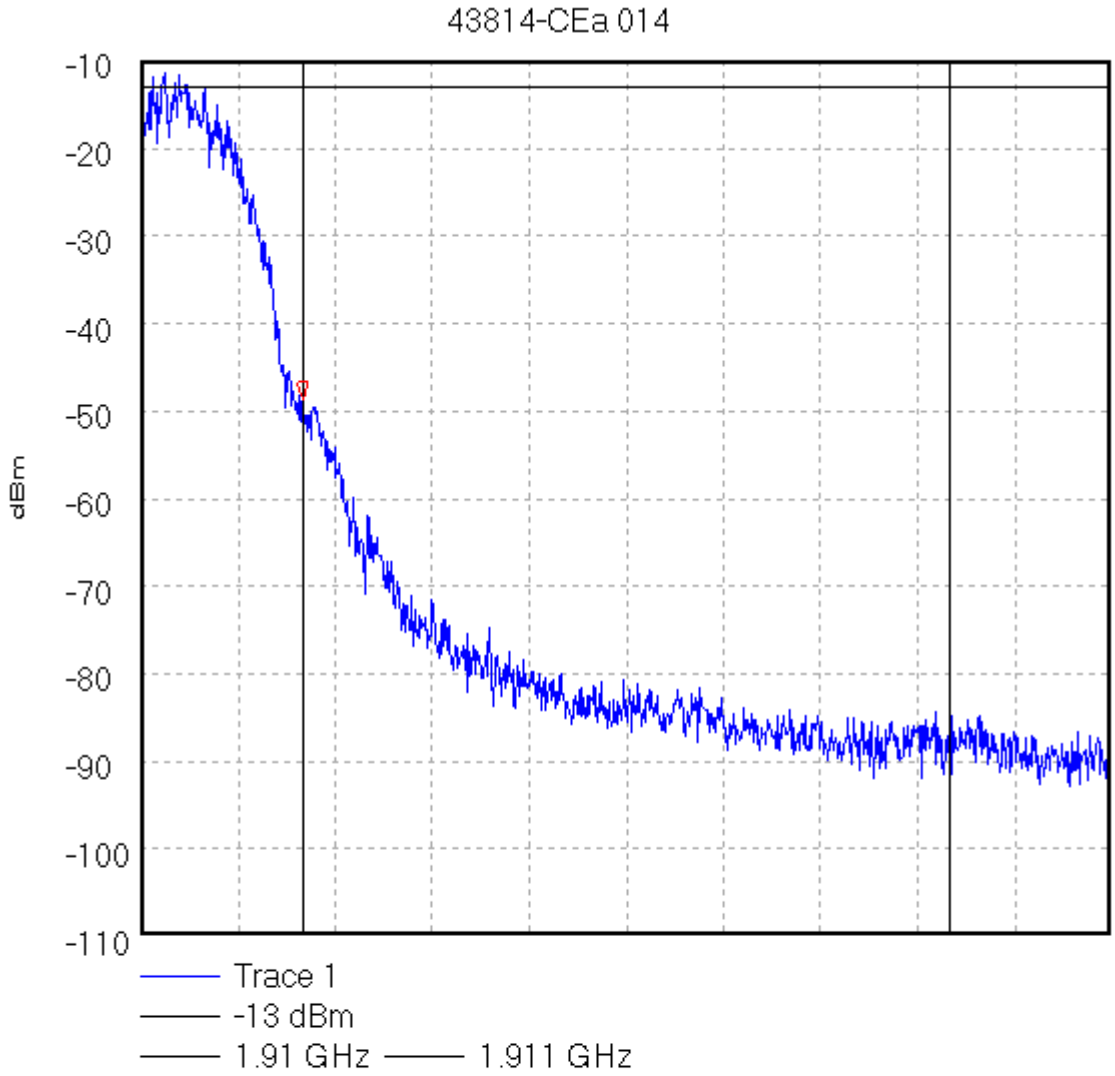
Start 15.0 GHz; Stop 22.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 21.634 GHz, -33.89 dBm
Display Line: -13 dBm;
7/29/02 4:17:39 PM

GPH\43814-CEa\013
Band Edge Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Bottom Channel (PCS). Spec: FCC Part 24



Start 1.849 GHz; Stop 1.85 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 3.0 kHz; VBW 3.0 kHz; Att 10 dB; Swp 500.0 mS
Marker 1.85 GHz, -48.21 dBm
Display Line: -13 dBm;
7/29/02 4:26:34 PM

GPH\43814-CEa\014
Band Edge Tested For Nokia Corporation. EUT: NHL-4, GSM 900/1800/1900 MS. Active Mode, Top Channel (PCS). Spec: FCC Part 24



Start 1.91 GHz; Stop 1.911 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 3.0 kHz; VBW 3.0 kHz; Att 10 dB; Swp 500.0 mS
Marker 1.91 GHz, -48.69 dBm
Display Line: -13 dBm;
7/29/02 4:28:45 PM

Appendix 5. Photographs of EUT

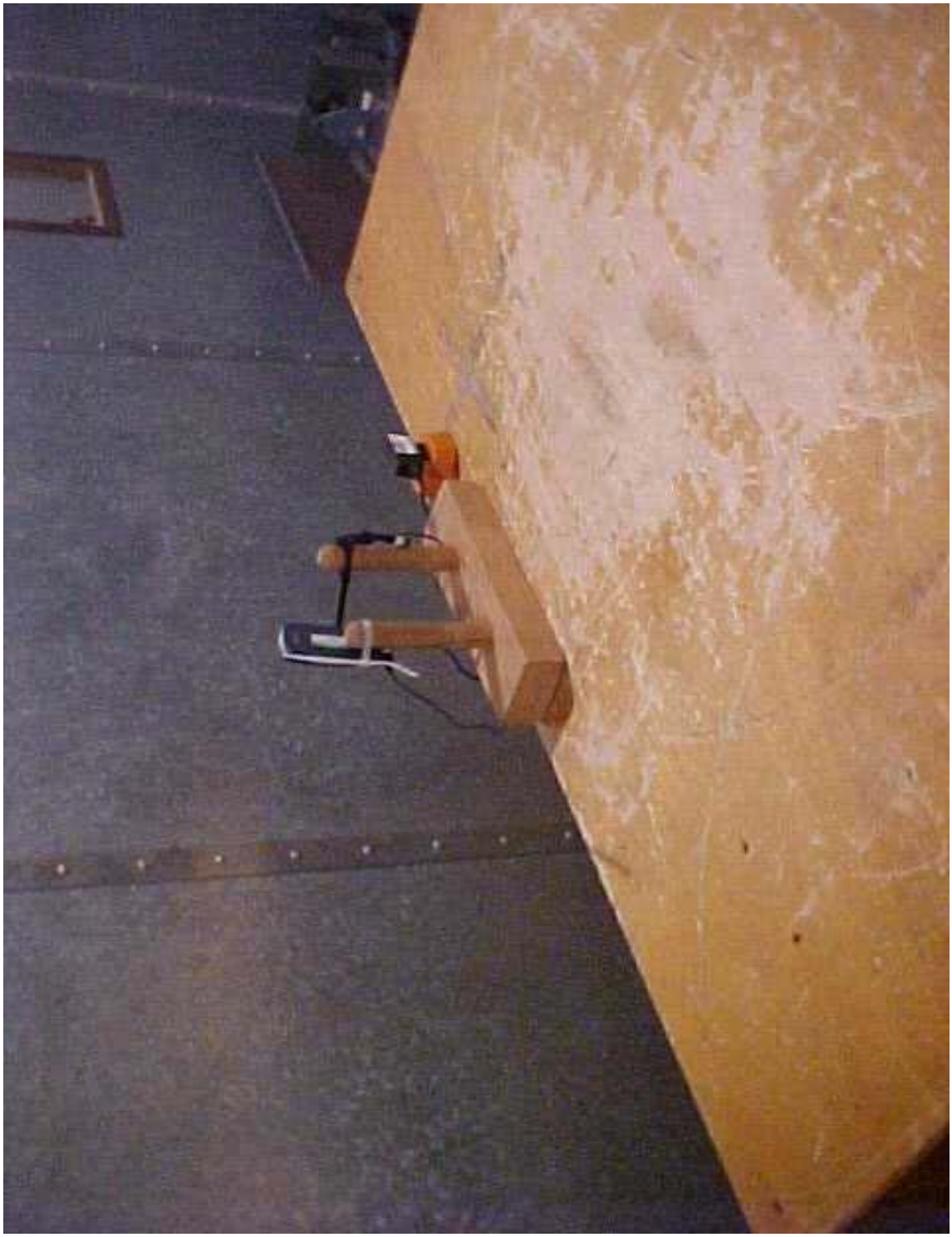
This appendix contains the following photographs:

Photo Reference Number	Title
PHT\43814JD01\001	Left hand side view of conducted emissions.
PHT\43814JD01\002	Rear view of conducted emissions.
PHT\43814JD01\003	Right hand side view of conducted emissions.
PHT\43814JD01\004	Front view of radiated emissions.
PHT\43814JD01\005	Rear view of radiated emissions.

These pages are not included in the total number of pages for this report.

PHT\43814JD01\001 Left hand side view of conducted emissions.

PHT\43814JD01\002 Rear view of conducted emissions.



PHT\43814JD01\003 Right hand side view of conducted emissions.

PHT\43814JD01\004 Front view of radiated emissions.

PHT\43814JD01\005 Rear view of radiated emissions.