# TEST REPORT
# FROM
# RADIO FREQUENCY
# INVESTIGATION LTD.

Test Of: Nokia Mobile Phones.
3600 Imaging Phone

To: FCC Part 22 and 24

**Test Report Serial No:**
RFI/MPTB3/RP44497JD02C

**Supersedes Test Report Serial No:**
RFI/MPTB1/RP44497JD02A &
RFI/MPTB1/RP44497JD02C&
RFI/MPTB2/RP44497JD02C

| | |
|---|---|
| **This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director:** | **Checked By:** |
| **Tested By: pp** | **Release Version No: PDF01** |
| **Issue Date: 09 June 2003** | **Test Dates: 17 April 2003 to 14 May 2003** |

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This report may be copied in full.

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

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**Test Of:** Nokia Mobile Phones.
3600 Imaging Phone

**To:** FCC Part 22 & 24

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**Note: Test Report Serial No: RFI/MPTB1/RP44497JD02C supersedes Test Report Serial No: RFI/MPTB1/RP44497JD02A, RFI/MPTB1/RP44497JD02C & RFI/MPTB2/RP44497JD02C**

## 1. Client Information

| | |
|---|---|
| **Company Name:** | Nokia Mobile Phones |
| **Address:** | Nokia House<br>Summit Avenue<br>Southwood<br>Farnborough<br>Hants<br>GU14 0NG<br>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 (850, 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<br>Accessory Connection |
| **Highest Fundamental Frequency** | 1989.8 MHz |
| **Highest Oscillator Frequency** | 3980.0 MHz |

**Part 22**

| | | | |
|---|---|---|---|
| **Transmit Frequency Range** | 824 MHz to 848 MHz | | |
| **Transmit Channels Tested** | **Channel ID** | **Channel Number** | **Channel Frequency (MHz)** |
| | Bottom | 128 | 824.2 |
| | Middle | 190 | 836.6 |
| | Top | 251 | 848.8 |
| **Receive Frequency Range** | 869 MHz to 894 MHz | | |
| **Receive Channels Tested** | **Channel ID** | **Channel Number** | **Channel Frequency (MHz)** |
| | Bottom | 128 | 869.2 |
| | Middle | 190 | 881.6 |
| | Top | 251 | 893.8 |
| **Maximum Power Output (ERP)** | 31.7 dBm | | |

**Part 24**

| | | | |
|---|---|---|---|
| **Transmit Frequency Range** | 1850 MHz to 1910 MHz | | |
| **Transmit Channels Tested** | **Channel ID** | **Channel Number** | **Channel Frequency (MHz)** |
| | Bottom | 512 | 1850.2 |
| | Middle | 660 | 1879.8 |
| | Top | 810 | 1909.8 |
| **Receive Frequency Range** | 1930 MHz to 1990 MHz | | |
| **Receive Channels Tested** | **Channel ID** | **Channel Number** | **Channel Frequency (MHz)** |
| | Bottom | 512 | 1930.2 |
| | Middle | 660 | 1960.0 |
| | Top | 810 | 1989.8 |
| **Maximum Power Output (EIRP)** | 29.2 dBm | | |

## 2.5. Support Equipment

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

| | |
|---|---|
| **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 Specifications

| | |
|---|---|
| **Reference:** | FCC Part 22 Subpart H: 2002 (Cellular Radiotelephone Service) |
| **Title:** | Code of Federal Regulations, Part 22 (47CFR22)<br>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 24 Subpart E: 2002 (Broadband PCS) |
| **Title:** | Code of Federal Regulations, Part 24 (47CFR24)<br>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. |

## 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.

**Transmitter Modes:**

For carrier EIRP, occupied bandwidth and final transmitter radiated measurements, testing was performed at full power on top, middle and bottom channels of the assigned frequency block.

For frequency stability testing, measurements were performed at full power on the top and bottom channels of the assigned frequency block at –30.0 ºC through to +50.0 ºC in 10 degree increments.

All transmitter radiated spurious pre-scan tests were performed at full power on the middle channel of the assigned frequency block. Final measurements were then performed on the Top, Middle and Bottom channels if an emission was identified.

**Receiver Modes:**

Testing was performed with the call terminated from the GSM Test Simulator and the phone left in its 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.

All tests were performed with the EUT connected via an air link or directly to a GSM test set.

## 6. Summary Of Test Results

### Part 22

| Range Of Measurements | Specification Reference | Port Type | Compliancy Status |
|---|---|---|---|
| Receiver AC Conducted Spurious Emissions (150 kHz to 30 MHz) | C.F.R. 47 FCC Part 15: 2002 Section 15.107 | AC Mains Input | Complied |
| Receiver Radiated Emissions | C.F.R. 47 FCC Part 15: 2002 Section 15.109 | Antenna | Complied |
| Transmitter Effective Radiated Power (ERP) | C.F.R. 47 FCC Part 22: 2002 Section 22.913(a) | Antenna | Complied |
| Transmitter Frequency Stability (Temperature Variation) | C.F.R. 47 FCC Part 22: 2002 Section 22.355 | Antenna Terminals | Complied |
| Transmitter Frequency Stability (Voltage Variation) | C.F.R. 47 FCC Part 22: 2002 Section 22.355 | Antenna Terminals | Complied |
| Transmitter Occupied Bandwidth | C.F.R. 47 FCC Part 22: 2002 Section 2.1049(i) | Antenna Terminals | Complied |
| Transmitter Conducted Emissions at Block Edges | C.F.R. 47 FCC Part 22: 2002 Section 2.1051/22.917 | Antenna Terminals | Complied |
| Transmitter Radiated Out of Band Emissions | C.F.R. 47 FCC Part 22: 2002 Section 2.1053/22.917 | Antenna | Complied |
| Radiated Band Edges | C.F.R. 47 FCC Part 2: 2002 Section 2.1053 | Antenna | Complied |

## Summary Of Test Results (Continued)

### Part 24

| Range Of Measurements | Specification Reference | Port Type | Compliancy Status |
|---|---|---|---|
| Receiver AC Conducted Spurious Emissions (150 kHz to 30 MHz) | C.F.R. 47 FCC Part 15: 2002 Section 15.107 | AC Mains Input | Complied |
| Receiver/Idle Radiated Spurious Emissions | C.F.R. 47 FCC Part 15: 2002 Section 15.109 | Enclosure | Complied |
| Transmitter Effective Isotropic Radiated Power (EIRP) | C.F.R. 47 FCC Part 24: 2002 Section 24.232 | Antenna | Complied |
| Transmitter Frequency Stability (Temperature Variation) | C.F.R. 47 FCC Part 24: 2002 Section 24.235 | Antenna Terminals | Complied |
| Transmitter Frequency Stability (Voltage Variation) | C.F.R. 47 FCC Part 24: 2002 Section 24.235 | Antenna Terminals | Complied |
| Transmitter Occupied Bandwidth | C.F.R. 47 FCC Part 24: 2002 Section 24.238 | Antenna Terminals | Complied |
| Transmitter Conducted Emissions at Block Edges | C.F.R. 47 FCC Part 24: 2002 Section 2.1051/24.238 | Antenna Terminals | Complied |
| Transmitter Out of Band Emissions | C.F.R. 47 FCC Part 24: 2002 Section 2.1053/24.238 | Antenna | Complied |
| Radiated Band Edges | C.F.R. 47 FCC Part 2: 2002 Section 2.1053/24.238 | 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.

# 8. Test Results FCC Part 22

## 8.1. Receiver AC Conducted Spurious Emissions: Section 15.107

8.1.1. The EUT was configured as for AC conducted emissions measurements as described in Section 9 of this report.

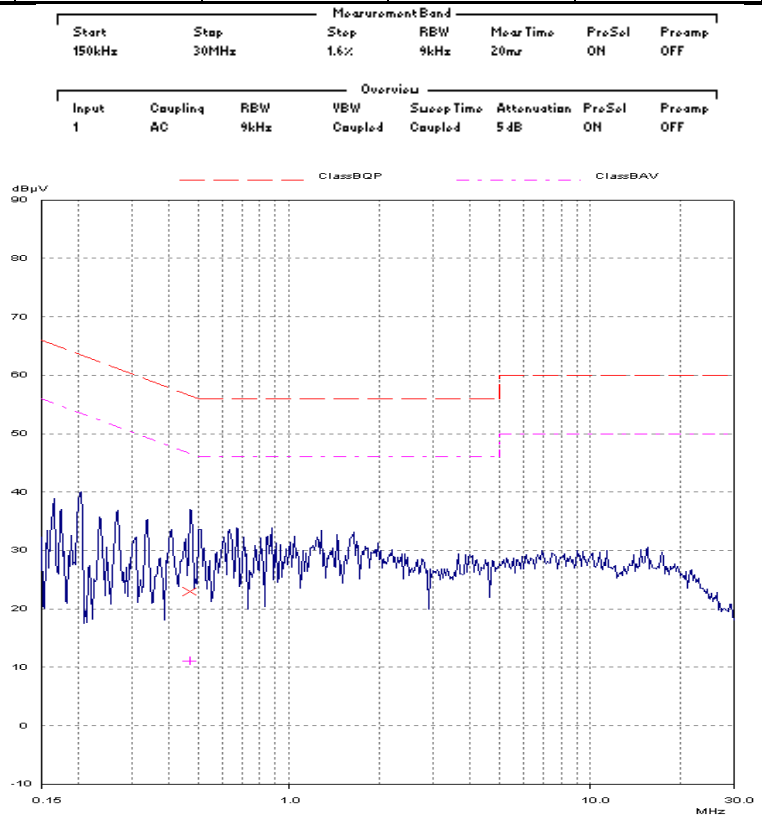
8.1.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

**Results: Quasi-Peak Detector Measurements On Live And Neutral Lines**

| Frequency (MHz) | Line | Q-P Level (dBµV) | Q-P Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.46752 | Live | 22.91 | 56.56 | 33.65 | Complied |

**Results: Average Detector Measurements On Live And Neutral Lines**

| Frequency (MHz) | Line | Av. Level (dBµV) | Av. Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.46752 | Neutral | 11.10 | 46.56 | 35.46 | Complied |

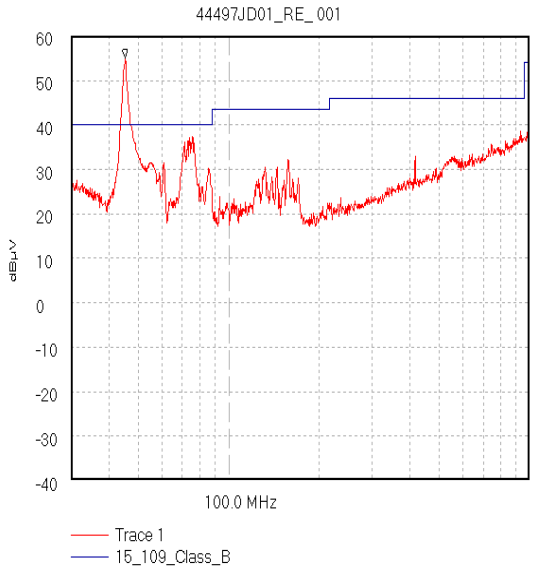


## 8.2. Receiver Radiated Emission: Section 15.109

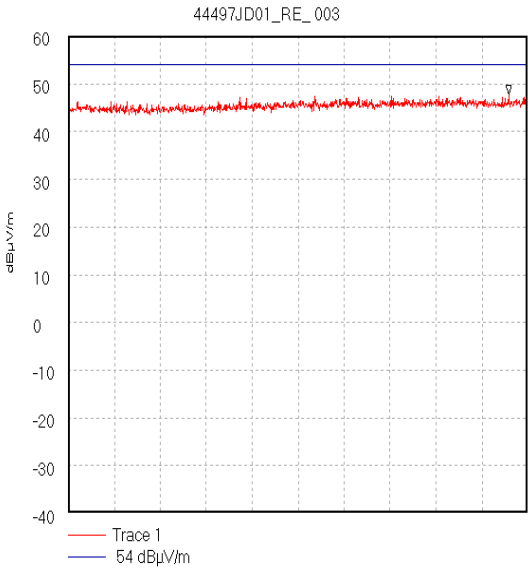
8.2.1. The EUT was configured as for receiver-radiated emissions testing as described in Section 9 of this report.

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

**Result:**

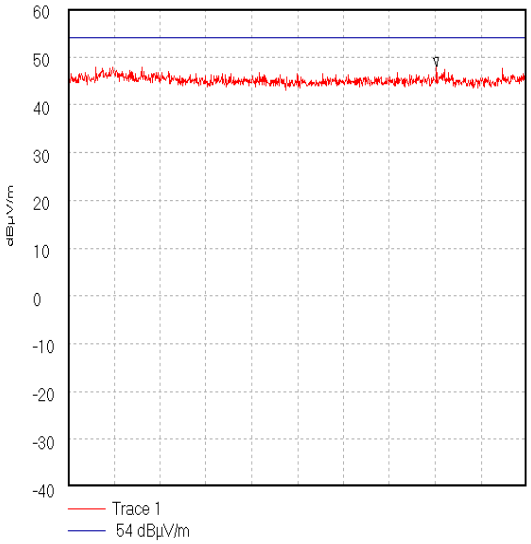



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 121.65 kHz; VBW 100.0 kHz; Att 0 dB; Swp 220.0 mS
Peak 45.340108 MHz, 55.1 dBµV
Limit/Mask: 15_109_Class_B;
Transducer Factors: A490
30/04/2003 13:18:57



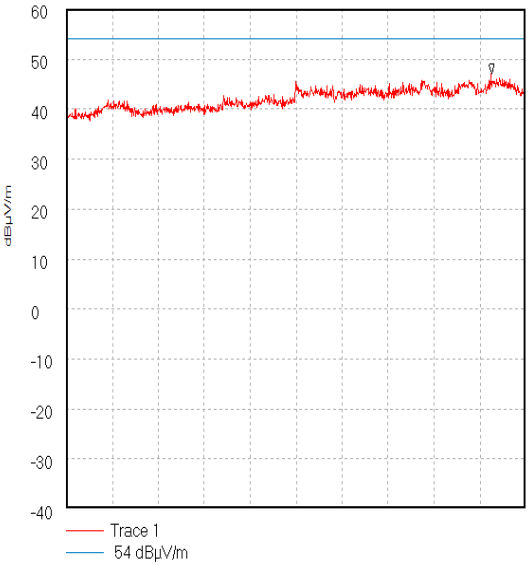

Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.958889 GHz, 47.74 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 1 to 2
30/04/2003 13:23:58

44497JD01_RE_ 007



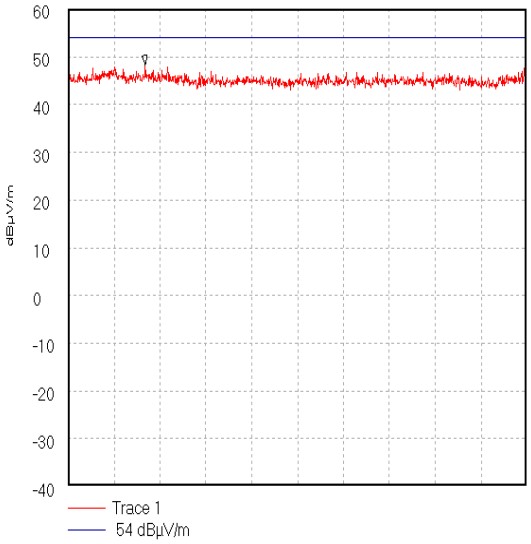

Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.606667 GHz, 47.99 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 2 to 4
30/04/2003 13:35:19

44497JD01_RE_ 016



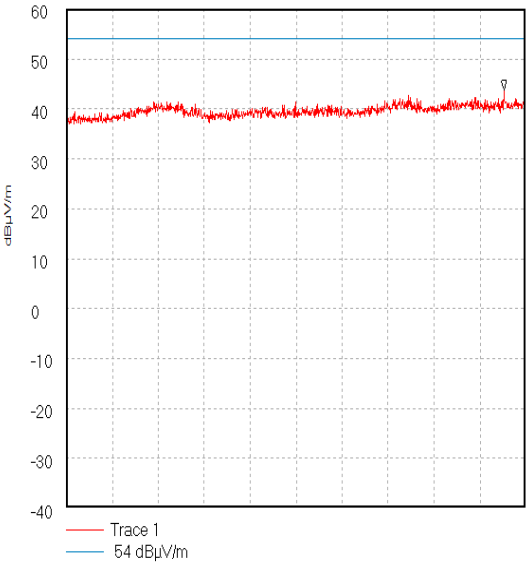

Start 4.0 GHz; Stop 6.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.851111 GHz, 47.11 dBµV/m
Display Line: 54 dBµV/m;
02/05/2003 11:37:02

44497JD01_RE_ 004




Start 2.0 GHz; Stop 4.0 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 2.335556 GHz, 48.32 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 2 to 4
30/04/2003 13:26:47

44497JD01_RE_ 014




Start 4.0 GHz; Stop 5.0 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 4.953333 GHz, 43.83 dBµV/m
Display Line: 54 dBµV/m;
02/05/2003 11:29:46

## 8.3. Transmitter Effective Radiated Power (ERP): Section 22.913(a)

8.3.1. The EUT was configured as for Effective Radiated Power as described in Section 9 of this report.

8.3.2. Tests were performed to identify the maximum Effective Radiated Power (ERP).

**Results:**

| Channel | Measured Frequency (MHz) | Antenna Polarity | Maximum Transmitter ERP (dBm) | Limit ERP (dBm) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| Bottom | 824.2 | V | 29.3 | 38.45 | 9.15 | Complied |
| Middle | 836.6 | V | 31.7 | 38.45 | 6.75 | Complied |
| Top | 848.8 | V | 31.6 | 38.45 | 6.85 | Complied |

## 8.4. Transmitter Frequency Stability (Temperature Variation): Section 22.355

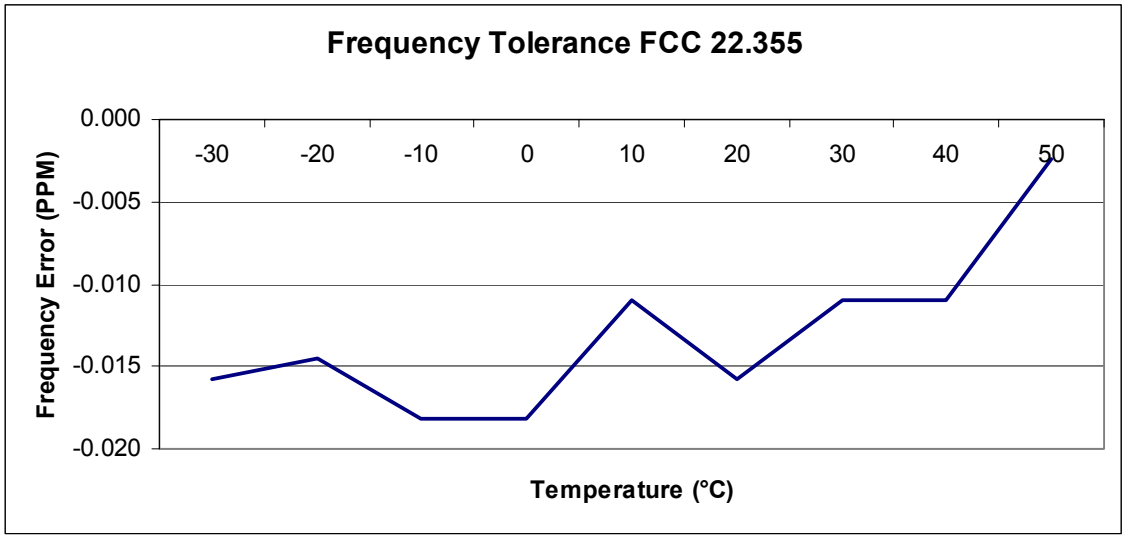
8.4.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

8.4.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

**Results Bottom Channel (824.2 MHz)**

| Temperature (°C) | Nominal Frequency | Measured Frequency | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result |
|---|---|---|---|---|---|---|---|
| -30 | 824.2 | 824.199987 | -13 | -0.016 | 2.5 | 2.484 | Complied |
| -20 | 824.2 | 824.199988 | -12 | -0.015 | 2.5 | 2.485 | Complied |
| -10 | 824.2 | 824.199985 | -15 | -0.018 | 2.5 | 2.482 | Complied |
| 0 | 824.2 | 824.199985 | -15 | -0.018 | 2.5 | 2.482 | Complied |
| 10 | 824.2 | 824.199991 | -9 | -0.011 | 2.5 | 2.489 | Complied |
| 20 | 824.2 | 824.199987 | -13 | -0.016 | 2.5 | 2.484 | Complied |
| 30 | 824.2 | 824.199991 | -9 | -0.011 | 2.5 | 2.489 | Complied |
| 40 | 824.2 | 824.199991 | -9 | -0.011 | 2.5 | 2.489 | Complied |
| 50 | 824.2 | 824.199998 | -2 | -0.002 | 2.5 | 2.498 | Complied |

**Frequency Variation From 824.2MHz**

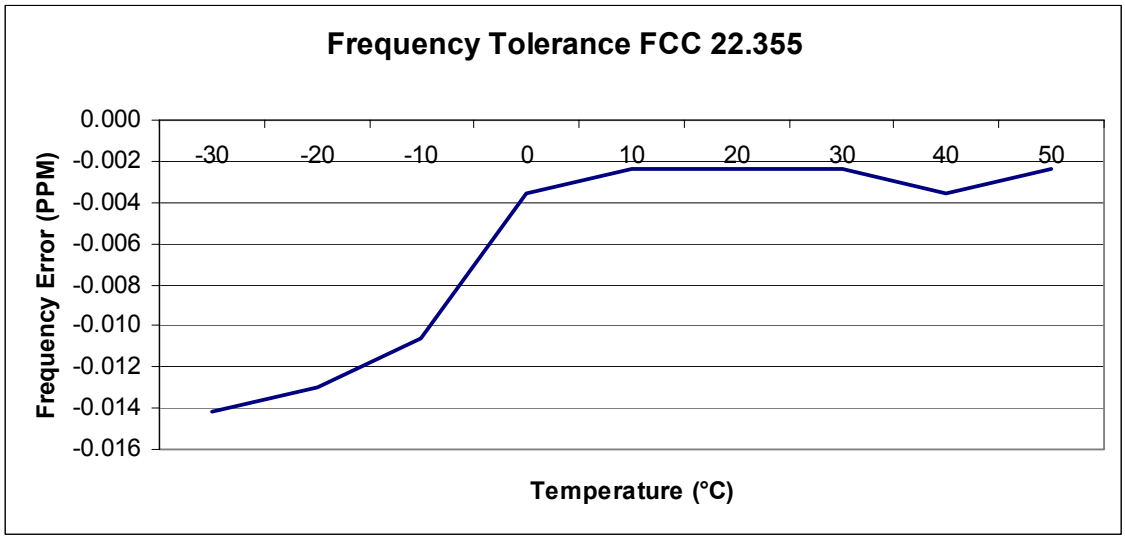


## Transmitter Frequency Stability (Temperature Variation): Section 22.355 (Continued)

### Results Top Channel (848.8 MHz)

| Supply Voltage (V) | Nominal Frequency | Measured Frequency | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result |
|---|---|---|---|---|---|---|---|
| -30 | 848.8 | 848.799988 | -12 | -0.014 | 2.5 | 2.486 | Complied |
| -20 | 848.8 | 848.799989 | -11 | -0.013 | 2.5 | 2.487 | Complied |
| -10 | 848.8 | 848.799991 | -9 | -0.011 | 2.5 | 2.489 | Complied |
| 0 | 848.8 | 848.799997 | -3 | -0.004 | 2.5 | 2.496 | Complied |
| 10 | 848.8 | 848.799998 | -2 | -0.002 | 2.5 | 2.498 | Complied |
| 20 | 848.8 | 848.799998 | -2 | -0.002 | 2.5 | 2.498 | Complied |
| 30 | 848.8 | 848.799998 | -2 | -0.002 | 2.5 | 2.498 | Complied |
| 40 | 848.8 | 848.799997 | -3 | -0.004 | 2.5 | 2.496 | Complied |
| 50 | 848.8 | 848.799998 | -2 | -0.002 | 2.5 | 2.498 | Complied |

### Frequency Variation From 848.8MHz



## 8.5. Transmitter Frequency Stability (Voltage Variation): Section 22.355

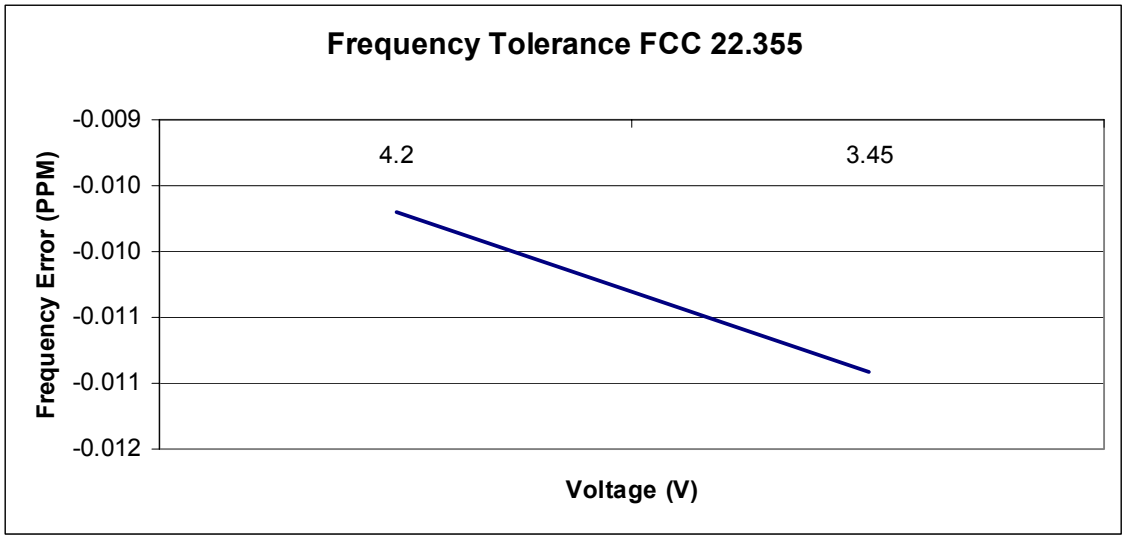
8.5.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

8.5.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

**Results Bottom Channel (824.2 MHz)**

| Supply Voltage (V) | Nominal Frequency | Measured Frequency | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result |
|---|---|---|---|---|---|---|---|
| 4.2 | 824.2 | 824.199992 | -8 | -0.010 | 2.5 | 2.490 | Complied |
| 3.45 | 824.2 | 824.199991 | -9 | -0.011 | 2.5 | 2.489 | Complied |

**Frequency Variation From 824.2MHz**

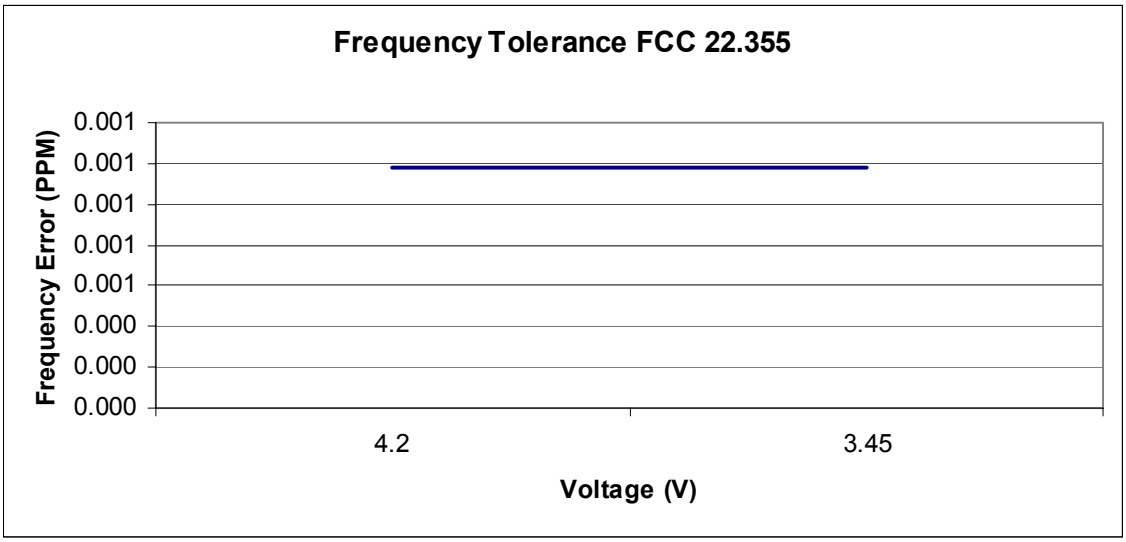


## Transmitter Frequency Stability (Voltage Variation): Section 22.355 (Continued)

**Results Top Channel (848.8 MHz)**

| Supply Voltage (V) | Nominal Frequency | Measured Frequency | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) | Margin (ppm) | Result |
|---|---|---|---|---|---|---|---|
| 4.2 | 848.8 | 848.800001 | 1 | 0.001 | 2.5 | 2.501 | Complied |
| 3.45 | 848.8 | 848.800001 | 1 | 0.001 | 2.5 | 2.501 | Complied |

**Frequency Variation From 848.8MHz**



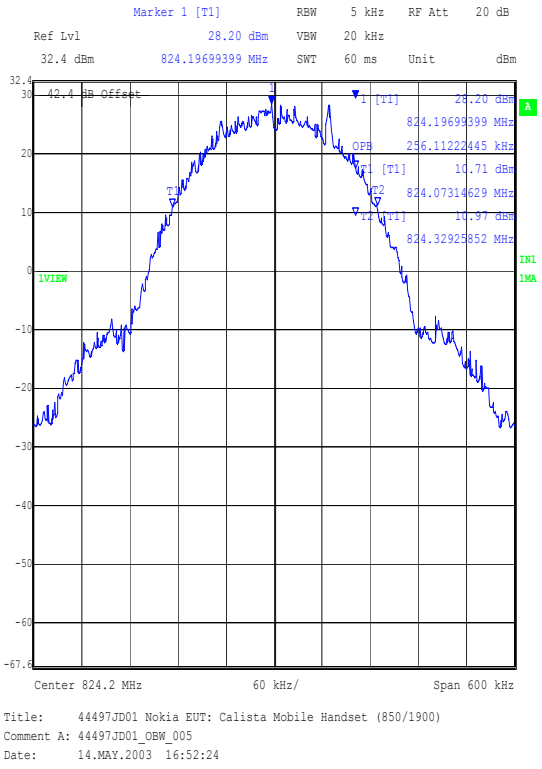
## 8.6. Transmitter Occupied Bandwidth: Section 2.1049(i)

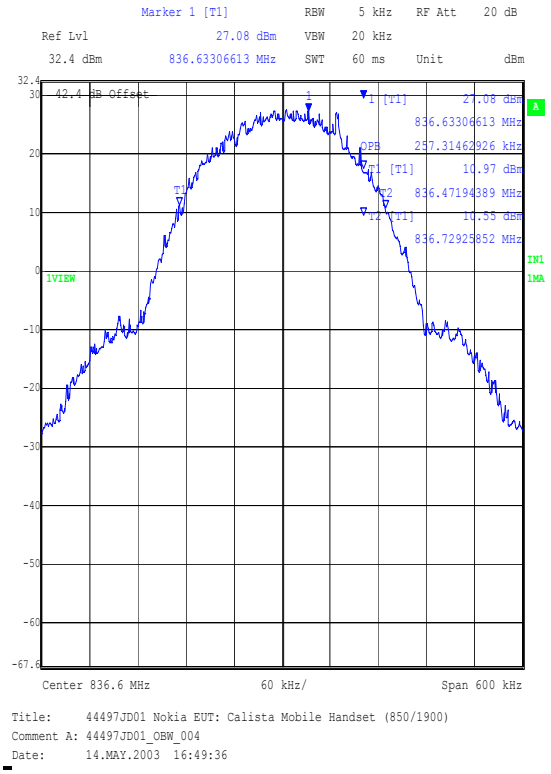
8.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 9 of this report.

8.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

**Results:**

| Channel | Frequency (MHz) | Resolution Bandwidth (kHz) | Video Bandwidth (kHz) | Occupied Bandwidth (kHz) |
|---|---|---|---|---|
| Bottom | 824.2 | 5.0 | 20.0 | 256.112 |
| Middle | 836.6 | 5.0 | 20.0 | 257.314 |
| Top | 848.8 | 5.0 | 20.0 | 256.112 |



**Test Of:** **Nokia Mobile Phones.**
**3600 Imaging Phone**

**To:** **FCC Part 22 & 24**

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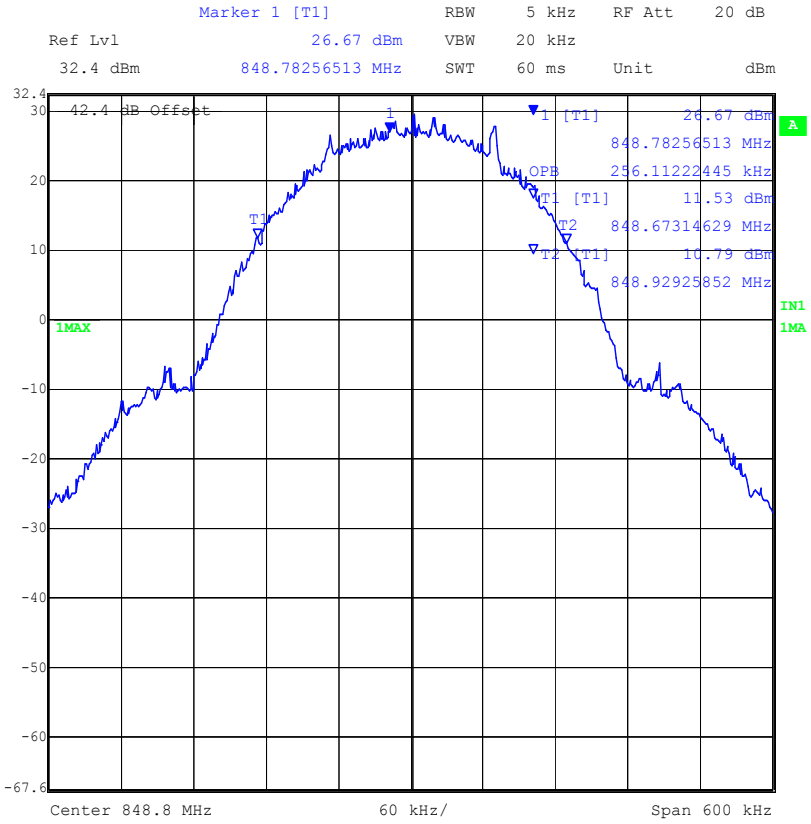



Title: 44497JD01 Nokia EUT: Calista Mobile Handset (850/1900)
Comment A: 44497JD01_OBW_001
Date: 14.MAY.2003 16:39:14

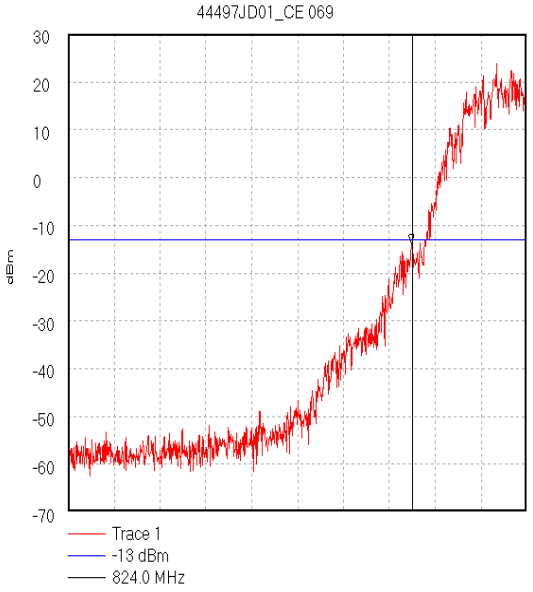
## 8.7. Transmitter Conducted Emissions at Block Edges: Section 2.1051 & 22.917

8.7.1. Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

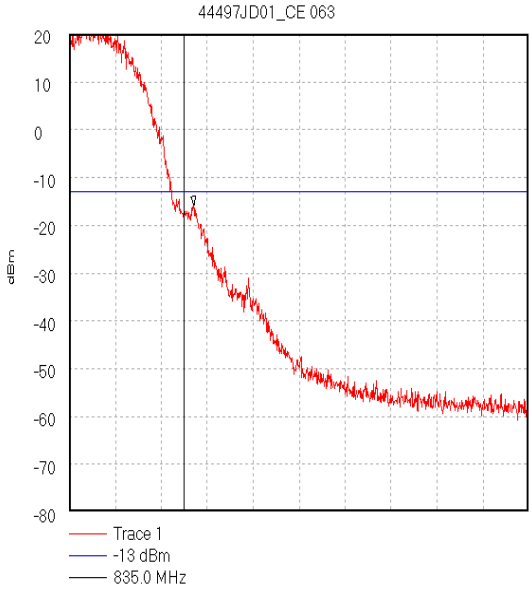
**Results: Block A**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 823.999 | -13.90 | -13.0 | 0.9 | Complied |
| 835.021 | -15.77 | -13.0 | 2.77 | Complied |




Start 823.25 MHz; Stop 824.25 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 823.998889 MHz, -13.9 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 20:38:05




Start 834.75 MHz; Stop 835.75 MHz
Ref 20 dBm; Ref Offset 42.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 835.021111 MHz, -15.77 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 19:21:22

**Test Of:** **Nokia Mobile Phones.**
**3600 Imaging Phone**

**To:** **FCC Part 22 & 24**

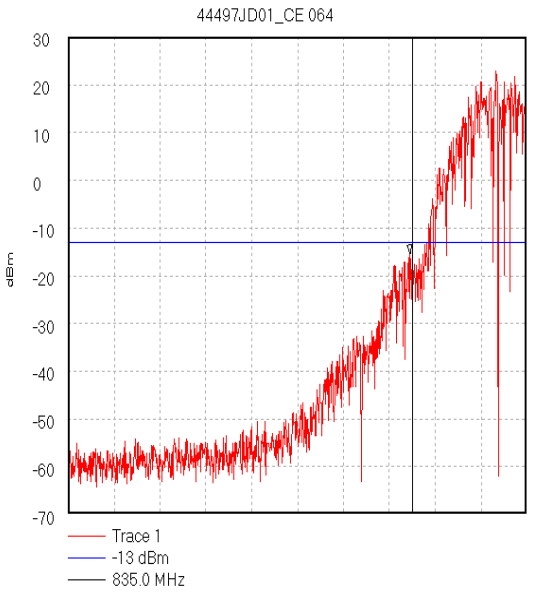
---

## Transmitter Conducted Emissions at Block Edges: Section 2.1051 & 22.917 (Continued)

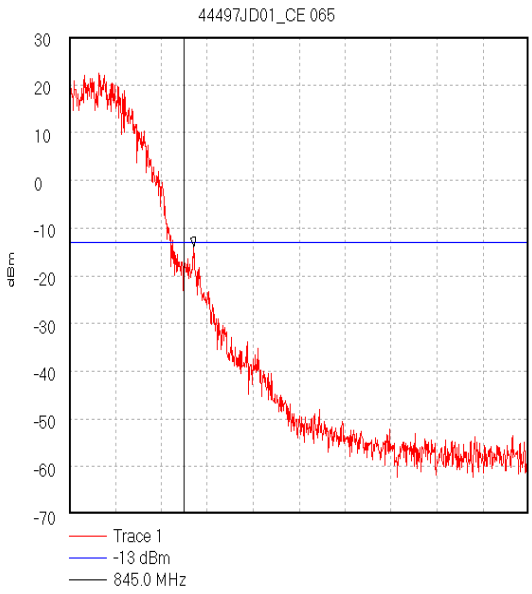
**Results: Block B**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 834.996 | -15.37 | -13.0 | 2.37 | Complied |
| 845.021 | -13.98 | -13.0 | 0.98 | Complied |




Start 834.25 MHz; Stop 835.25 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 834.995556 MHz, -15.37 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 19:38:04




Start 844.75 MHz; Stop 845.75 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 845.021111 MHz, -13.98 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 19:40:09

**Test Of:** **Nokia Mobile Phones.**
**3600 Imaging Phone**

**To:** **FCC Part 22 & 24**

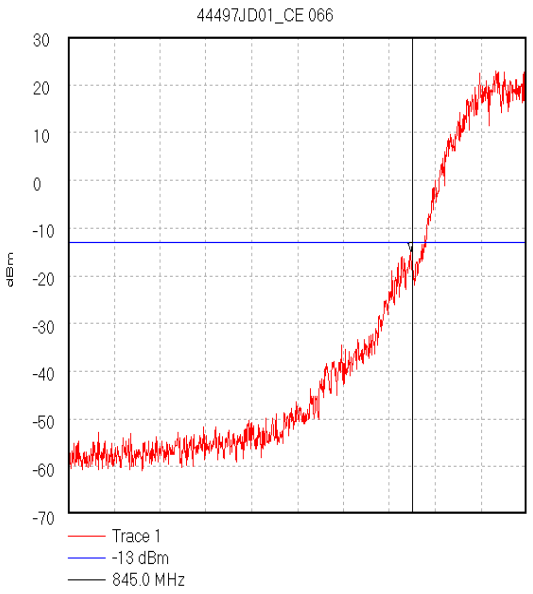
---

## Transmitter Conducted Emissions at Block Edges: Section 2.1051 & 22.917 (Continued)

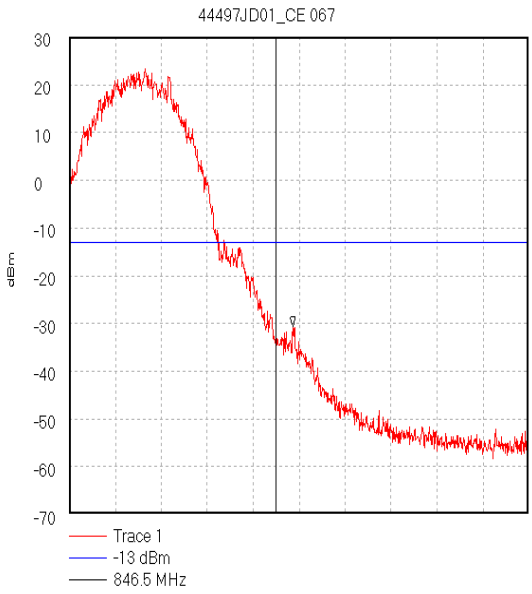
**Results: Block A**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 844.998 | -14.99 | -13.0 | 1.99 | Complied |
| 846.537 | -30.63 | -13.0 | 17.63 | Complied |




Start 844.25 MHz; Stop 845.25 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 844.997778 MHz, -14.99 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 19:41:39



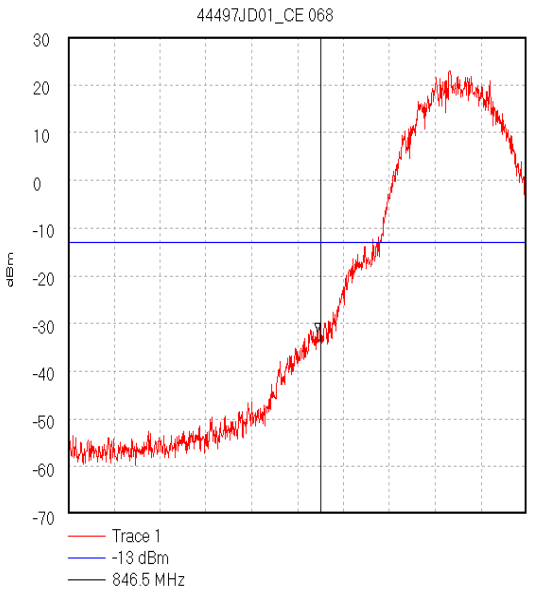

Start 846.05 MHz; Stop 847.05 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 846.536667 MHz, -30.63 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 20:11:08

## Transmitter Conducted Emissions at Block Edges: Section 2.1051 & 22.917 (Continued)

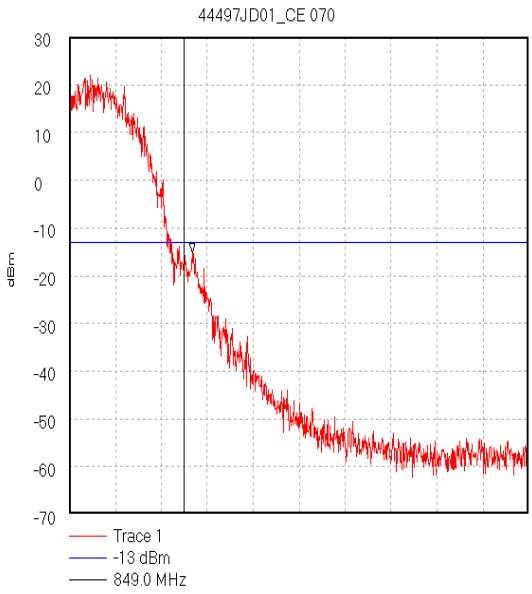
**Results: Block B**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 846.494 | -31.85 | -13.0 | 18.85 | Complied |
| 849.017 | -15.22 | -13.0 | 2.22 | Complied |




Start 845.95 MHz; Stop 846.95 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 846.494444 MHz, -31.85 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 20:14:35




Start 848.75 MHz; Stop 849.75 MHz
Ref 30 dBm; Ref Offset 41.4 dB; 10 dB/div
RBW 2.068966 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 849.017778 MHz, -15.22 dBm
Display Line: -13 dBm; ; Limit Test Failed
14/05/2003 20:39:41

## 8.8. Transmitter Out of Band Emissions: Section 2.1053 & 22.917

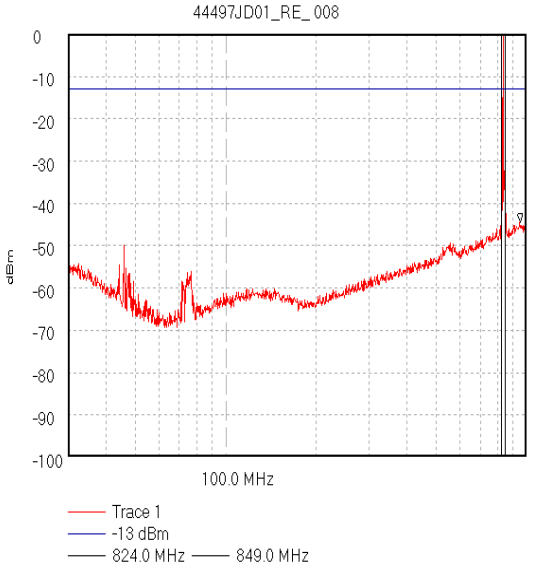
8.8.1. The EUT was configured as for transmitter-radiated emissions testing as described in Section 9 of this report.

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

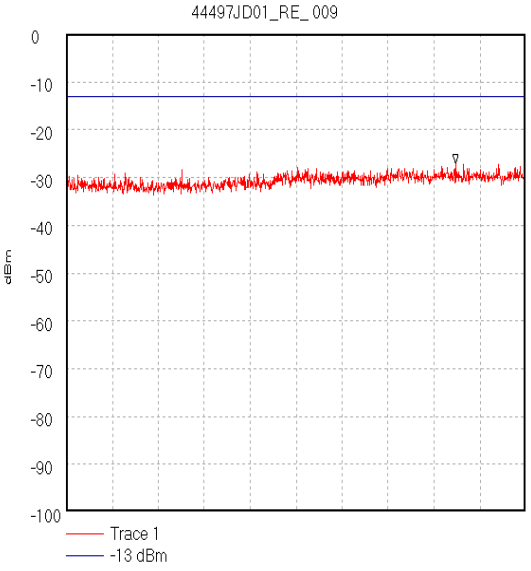
**Result: Middle Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 17957.222 | -32.8 | -13.0 | 19.8 | Complied |

*Note: As no radiated spurious emissions were present in the pre-scans, the highest noise floor level was recorded.*

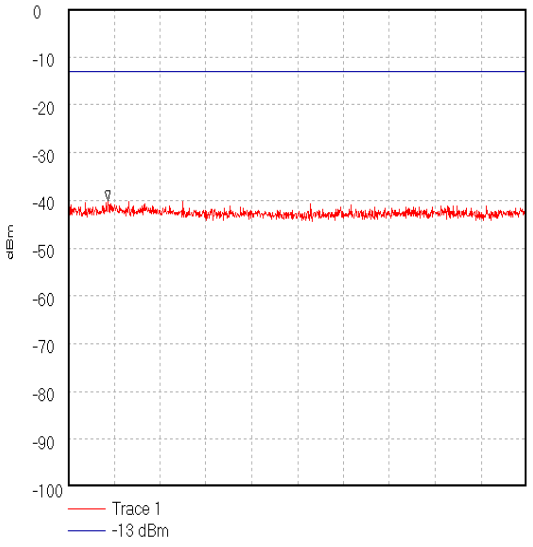



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 121.65 kHz; VBW 100.0 kHz; Att 0 dB; Swp 220.0 mS
Marker 950.611072 MHz, -44.48 dBm
Display Line: -13 dBm;
Transducer Factors: A490
30/04/2003 13:50:21



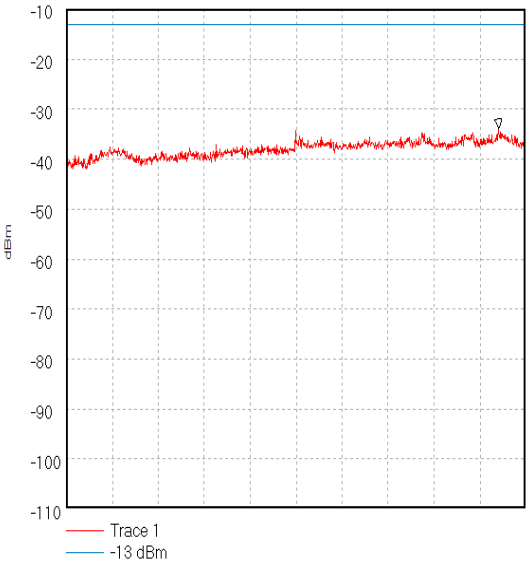

Start 1.0 GHz; Stop 2.0 GHz
Ref 0 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 20 dB; Swp 20.0 mS
Peak 1.847778 GHz, -27.06 dBm
Display Line: -13 dBm;
Transducer Factors: 1 to 2
30/04/2003 14:17:45

44497JD01_RE_ 010



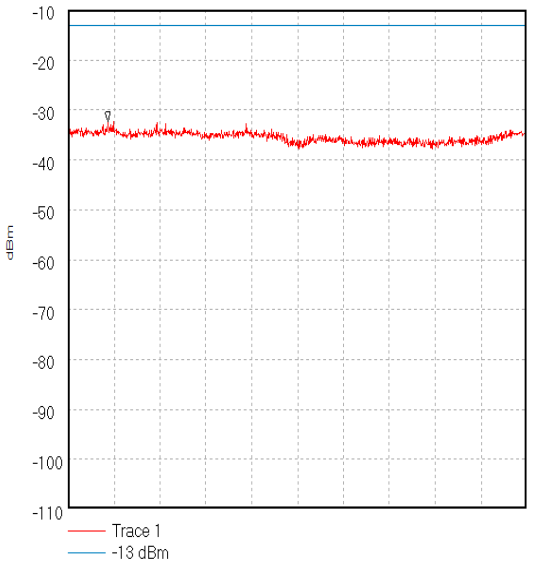

Start 2.0 GHz; Stop 4.0 GHz
Ref 0 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 2.173333 GHz, -40.04 dBm
Display Line: -13 dBm;
Transducer Factors: 2 to 4
30/04/2003 14:21:07

44497JD01_RE_ 020



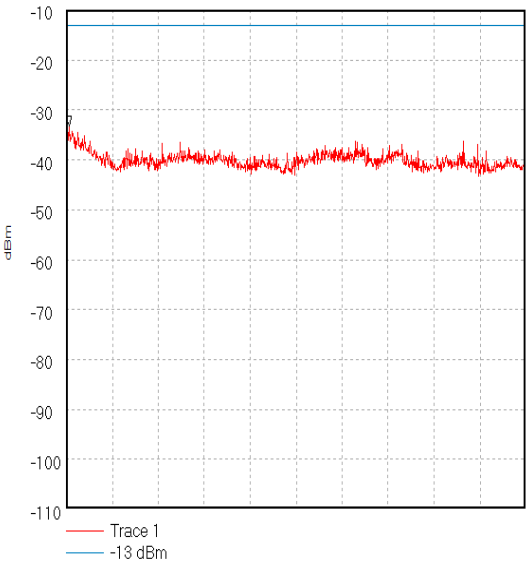

Start 4.0 GHz; Stop 6.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 15 dB; Swp 20.0 mS
Peak 5.882222 GHz, -33.92 dBm
Display Line: -13 dBm;
02/05/2003 14:22:37

44497JD01_RE_ 021




Start 6.0 GHz; Stop 8.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 15 dB; Swp 20.0 mS
Peak 6.173333 GHz, -32.32 dBm
Display Line: -13 dBm;
02/05/2003 14:26:53

44497JD01_RE_ 022




Start 8.0 GHz; Stop 10.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 8.011111 GHz, -33.15 dBm
Display Line: -13 dBm;
02/05/2003 14:31:55

## 8.9. Transmitter Radiated Emissions At Band Edges: Section 2.1053

8.9.1. The EUT was configured as for transmitter radiated emissions testing described in Section 9 of this report.

8.9.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

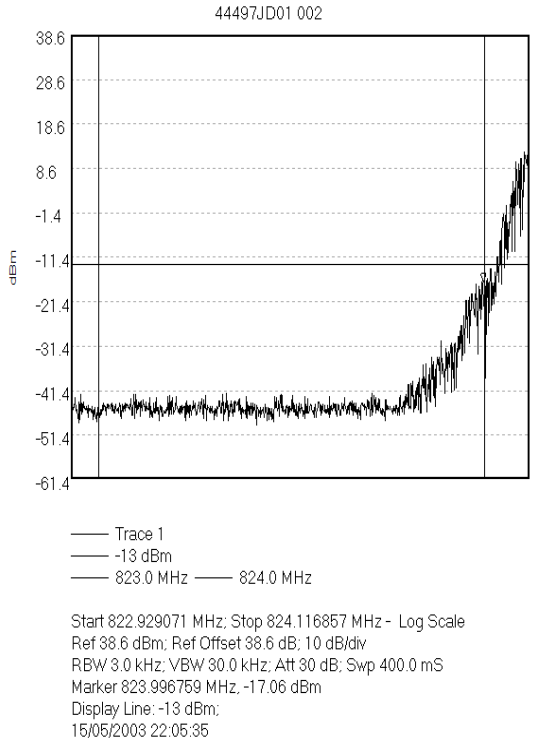
**Results:**

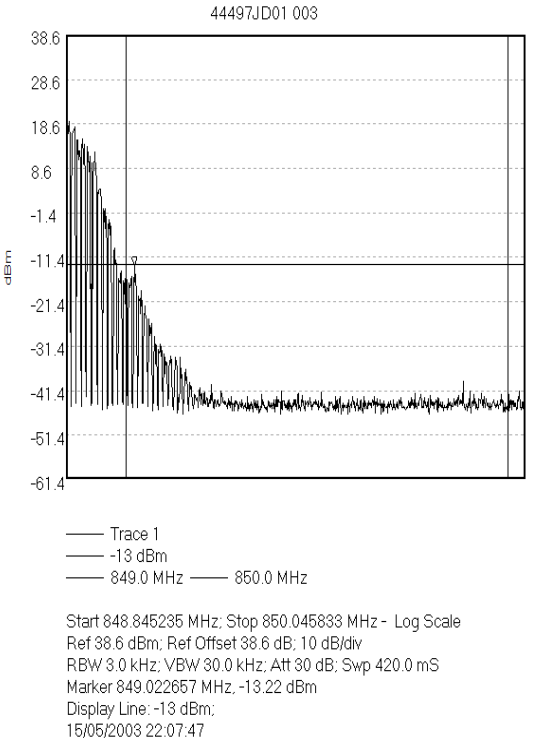
**Bottom Band Edge**

| Frequency (MHz) | Spurious Emission (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 823.998 | -17.06 | -13.0 | 4.06 | Complied |

**Top Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 849.023 | -13.22 | -13.0 | 0.22 | Complied |



# 9. Measurement Methods – Part 22

## 9.1. Effective Radiated Power (ERP)

ERP measurements were performed in accordance with the standard, against appropriate limits.

The ERP 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 ERP 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 ERP measurements a dipole antenna was used. 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 ERP was calculated as:-

ERP = Signal Generator Level - Cable Loss + Antenna Gain

Note that an ideal dipole has 0dBd of gain, however, realistically this isn't the case and any gain/or loss present is taken into consideration.

**Effective Radiated Power (ERP) (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 ERP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated ERP to obtain the substituted EUT ERP.

The test equipment settings for ERP measurements were as follows:

| Receiver Function | Setting |
|---|---|
| Detector Type: | Peak |
| Mode: | Not applicable |
| Bandwidth: | >= Emission Bandwidth |
| Amplitude Range: | 100 dB |
| Sweep Time: | Coupled |

## 9.2. FCC Part 2.1055: Frequency Stability

The EUT was situated within an environmental test chamber and connected to test equipment via and access port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range –30 to 50 Deg C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

Measurements were made on the top, middle and bottom channels.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

The frequency error measured was converted to an error in ppm using the following formula as defined by TIA_EIA_603A :-

$$\text{ppm error} = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1\right) * 10^6$$

where $MCF_{MHz}$ is the measured carrier frequency in MHz
$ACF_{MHz}$ is the assigned carrier frequency in MHz

The measured ppm had to be less then the relevant limits in order to comply.

## 9.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via a bi-directional coupler to its antenna port. If the EUT was not fitted with an antenna port as standard, the client made a temporary antenna port available.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom middle and top channels.

As EUT is a PCS phone, no modulation input port was available. A call was thus setup using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

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. A value of 3kHz was used.

## 9.4. FCC Part 15: 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.

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.

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.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

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

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

## 9.5. Transmitter Radiated Emissions

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

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency stated in section 2.5 of this report. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. 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. The procedure was repeated for the horizontal polarisation.

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 radiated power was calculated as:-

EIRP/ERP = Signal Generator Level - Cable Loss + Antenna Gain

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**Transmitter Radiated Emissions (Continued)**

The limit in the standard states that emissions shall be attenuated by at least 43+10 Log(P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to –13dBm as such, the limit line presented on the accompanying plots is set to –13dBm.

Any spurious measured were then compared to the –13dBm limit. The requirement is for the emission to be less than –13dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

All measurements were performed using broadband Horn antennas.

It should be noted that FCC Part 22.917 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

## 9.6. Receiver Radiated Emissions

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

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 5 times the highest clock frequency stated in section 2.5 of this report were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector 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 initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

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 in the horizontal polarisation. 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. The procedure was repeated for the vertical polarisation.

**Receiver Radiated Emissions (Continued)**

The final field strength was determined as the indicated level in dBuV plus cable loss and antenna factor.

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)<br>(1MHz > 1GHz) | 120 kHz | 1 MHz<br>(If Applicable) |
| Amplitude Range: | 60 dB | 20 dB | 20 dB (typical) |
| Step Size: | Continuous sweep | Not applicable | Not applicable |
| Sweep Time: | Coupled | Not applicable | Not applicable |

# 10. Test Results FCC Part 24

## 10.1. Receive AC Conducted Spurious Emissions: Section 15.107

10.1.1. The EUT was configured as for AC conducted emissions measurements as described in Section 11 of this report.

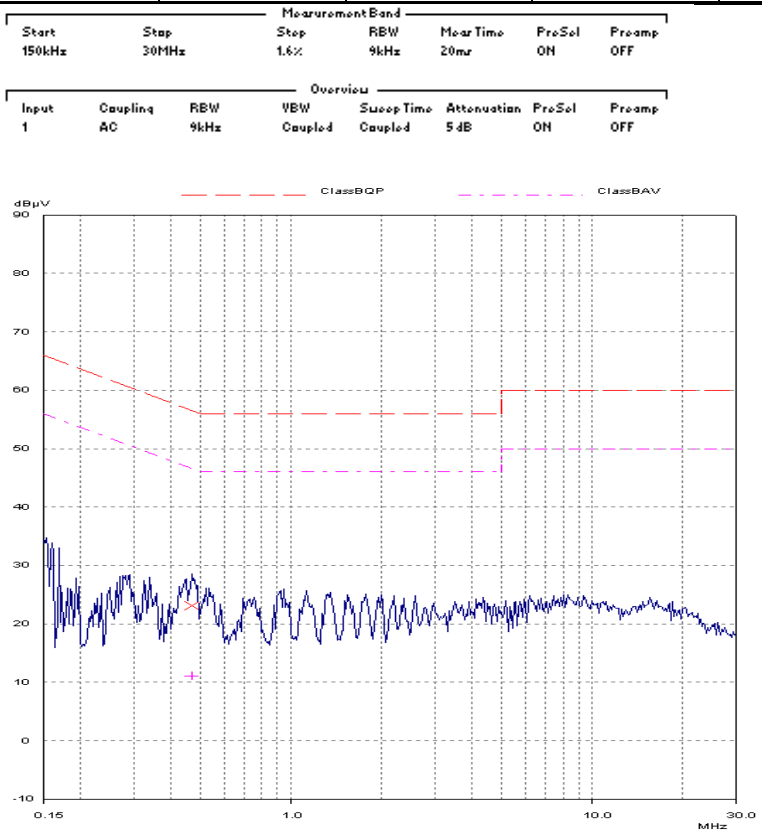
10.1.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

**Results: Quasi-Peak Detector Measurements On Live And Neutral Lines**

| Frequency (MHz) | Line | Q-P Level (dBµV) | Q-P Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.46752 | Live | 23.15 | 56.56 | 33.42 | Complied |

**Results: Average Detector Measurements On Live And Neutral Lines**

| Frequency (MHz) | Line | Av. Level (dBµV) | Av. Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 0.46752 | Neutral | 11.13 | 46.56 | 35.43 | Complied |

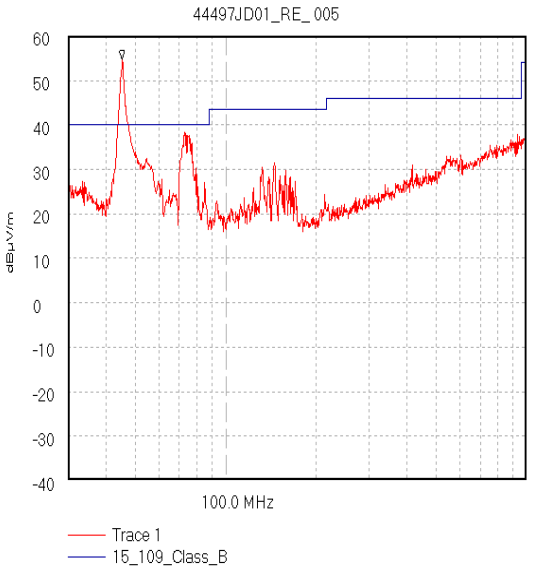


## 10.2. Receiver/Idle Radiated Spurious Emission: Section 15.109

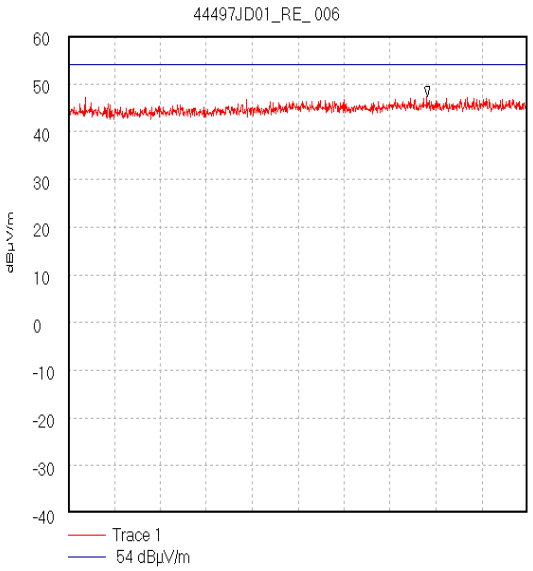
10.2.1. The EUT was configured as for receiver radiated emissions testing as described in Section 11 of this report.

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

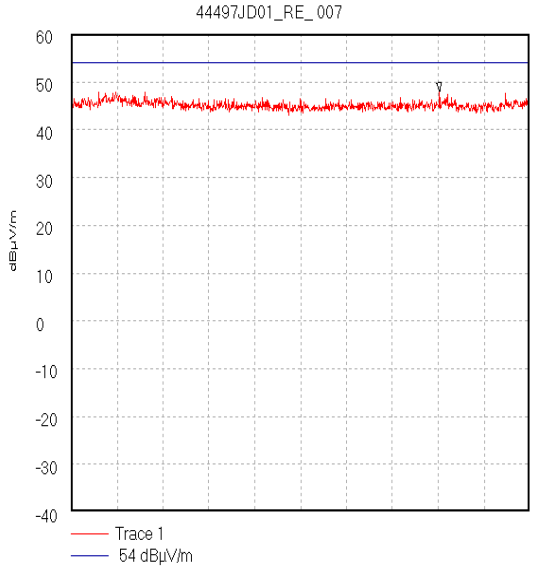
**Result:**



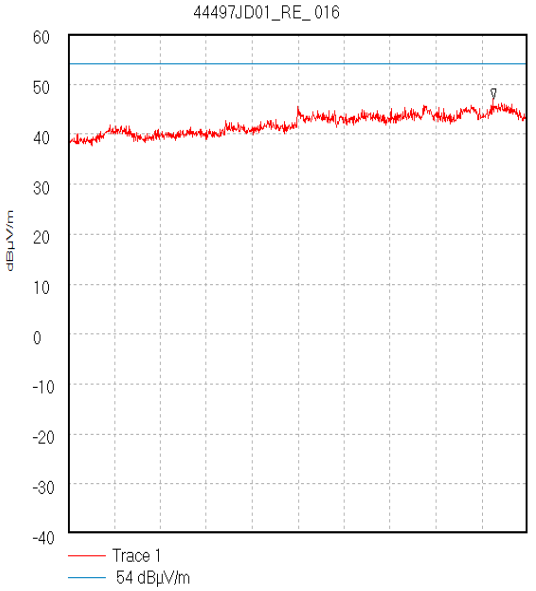

Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 121.65 kHz; VBW 100.0 kHz; Att 0 dB; Swp 40.0 mS
Peak 45.340108 MHz, 54.7 dBµV/m
Limit/Mask: 15_109_Class_B;
Transducer Factors: A490
30/04/2003 13:30:36



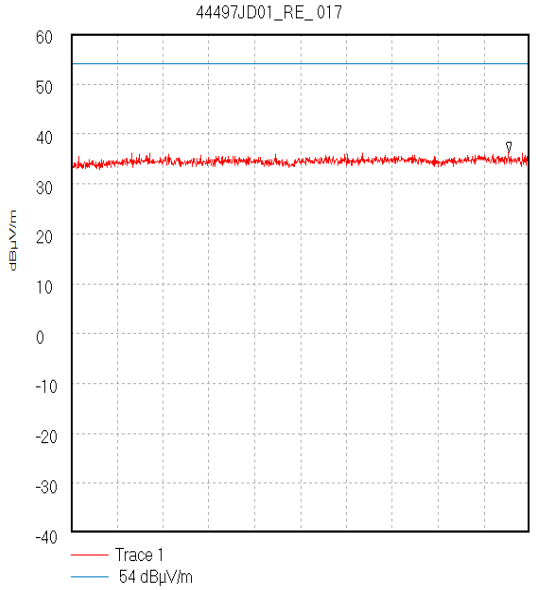

Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.781111 GHz, 47.41 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 1 to 2
30/04/2003 13:34:23



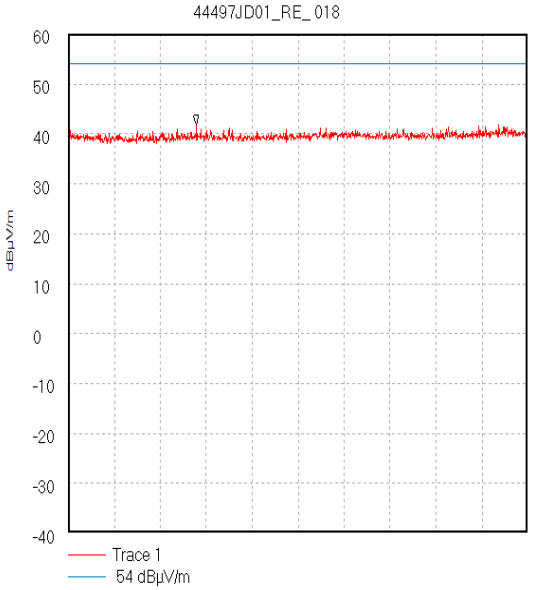

Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.606667 GHz, 47.99 dBµV/m
Display Line: 54 dBµV/m;
Transducer Factors: 2 to 4
30/04/2003 13:35:19




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 5.851111 GHz, 47.11 dBµV/m
Display Line: 54 dBµV/m;
02/05/2003 11:37:02




Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV/m; Ref Offset -30.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 7.908889 GHz, 36.34 dBµV/m
Display Line: 54 dBµV/m;
02/05/2003 11:52:09




Start 8.0 GHz; Stop 10.0 GHz
Ref 60 dBµV/m; Ref Offset -30.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 15 dB; Swp 20.0 mS
Peak 8.557778 GHz, 41.82 dBµV/m
Display Line: 54 dBµV/m;
02/05/2003 13:53:15

## 10.3. Transmitter Effective Isotropic Radiated Power (EIRP): Section 24.232

10.3.1. The EUT was configured as for Effective Isotropic Radiated Power as described in Section 11 of this report.

10.3.2. Tests were performed to identify the maximum Effective Isotropic Radiated Power (EIRP).

**Results:**

| Channel | Measured Frequency (MHz) | Antenna Polarity | Maximum Transmitter EIRP (dBm) | Limit EIRP (dBm) | Margin (dB) | Result |
|---|---|---|---|---|---|---|
| Bottom | 1850.2 | V | 29.2 | 33.0 | 3.8 | Complied |
| Middle | 1879.8 | V | 28.4 | 33.0 | 4.6 | Complied |
| Top | 1909.8 | V | 27.8 | 33.0 | 5.2 | Complied |

## 10.4. Transmitter Frequency Stability (Temperature Variation): Section 24.235

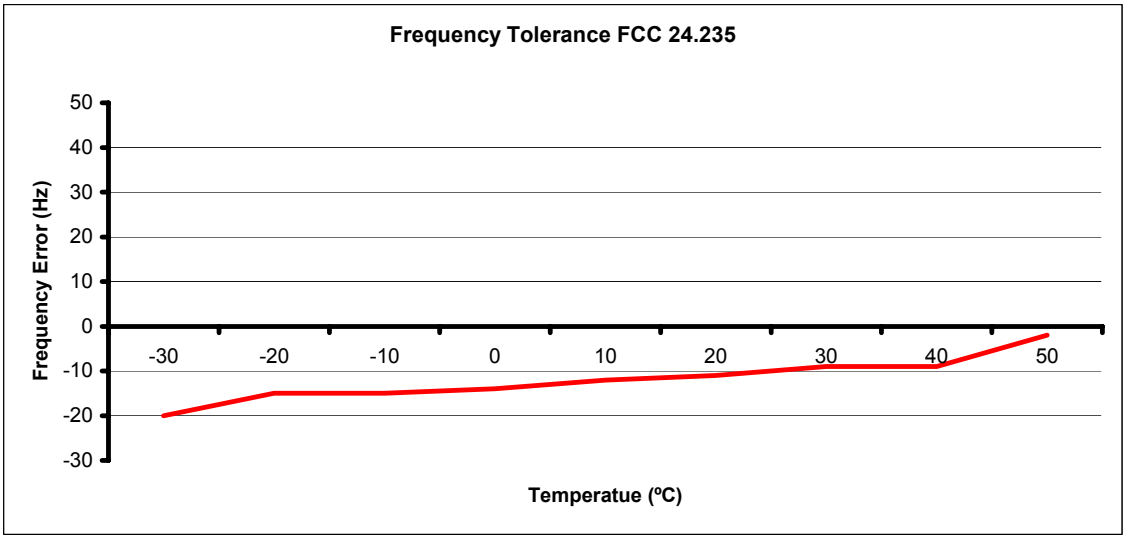
10.4.1. The EUT was configured as for frequency stability measurements as described in Section 11 of this report.

10.4.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

**Results Bottom Channel (1850.2 MHz)**

| Temp (ºC) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|---|
| -30 | -20 | 1850.199980 | 1850.0 | 0.199980 | Complied |
| -20 | -15 | 1850.199985 | 1850.0 | 0.199985 | Complied |
| -10 | -15 | 1850.199985 | 1850.0 | 0.199985 | Complied |
| 0 | -14 | 1850.199986 | 1850.0 | 0.199986 | Complied |
| 10 | -12 | 1850.199988 | 1850.0 | 0.199988 | Complied |
| 20 | -11 | 1850.199989 | 1850.0 | 0.199989 | Complied |
| 30 | -9 | 1850.199991 | 1850.0 | 0.199991 | Complied |
| 40 | -9 | 1850.199991 | 1850.0 | 0.199991 | Complied |
| 50 | -2 | 1850.199998 | 1850.0 | 0.199998 | Complied |

**Frequency Variation From 1850.2MHz**

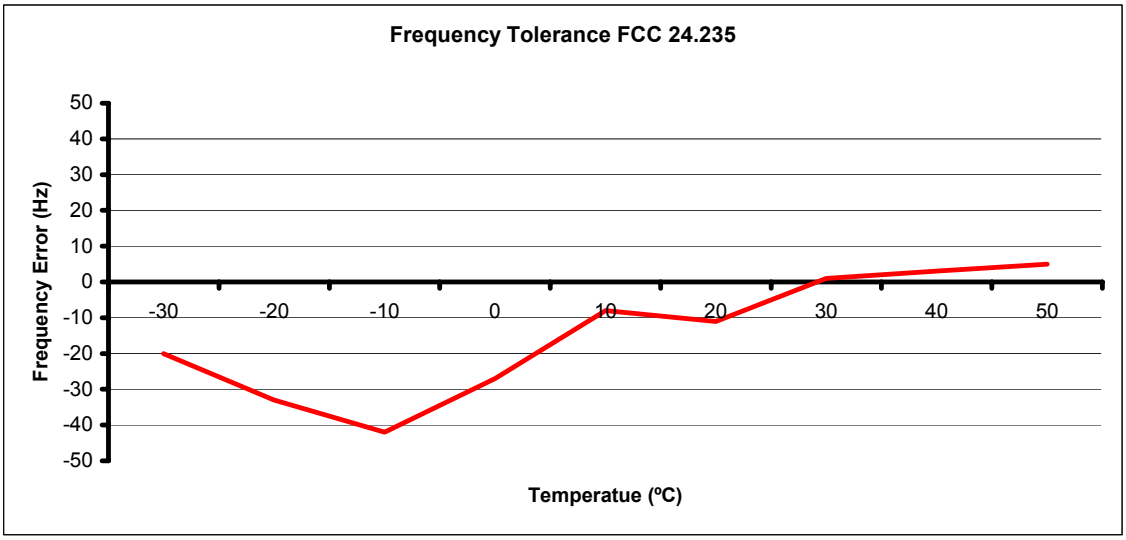


## Transmitter Frequency Stability (Temperature Variation): Section 24.235 (continued)

### Results Top Channel (1909.8 MHz)

| Temp (ºC) | Frequency Error (Hz) | Measured Frequency (MHz) | Upper Band Edge Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|---|
| -30 | -20 | 1909.799980 | 1910.0 | 0.200020 | Complied |
| -20 | -33 | 1909.799967 | 1910.0 | 0.200033 | Complied |
| -10 | -42 | 1909.799958 | 1910.0 | 0.200042 | Complied |
| 0 | -27 | 1909.799973 | 1910.0 | 0.200027 | Complied |
| 10 | -8 | 1909.799992 | 1910.0 | 0.200008 | Complied |
| 20 | -11 | 1909.799989 | 1910.0 | 0.200011 | Complied |
| 30 | 1 | 1909.799999 | 1910.0 | 0.200001 | Complied |
| 40 | 3 | 1909.799997 | 1910.0 | 0.200003 | Complied |
| 50 | 5 | 1909.799995 | 1910.0 | 0.200005 | Complied |

### Frequency Variation From 1909.8MHz



## 10.5. Transmitter Frequency Stability (Voltage Variation): Section 24.235

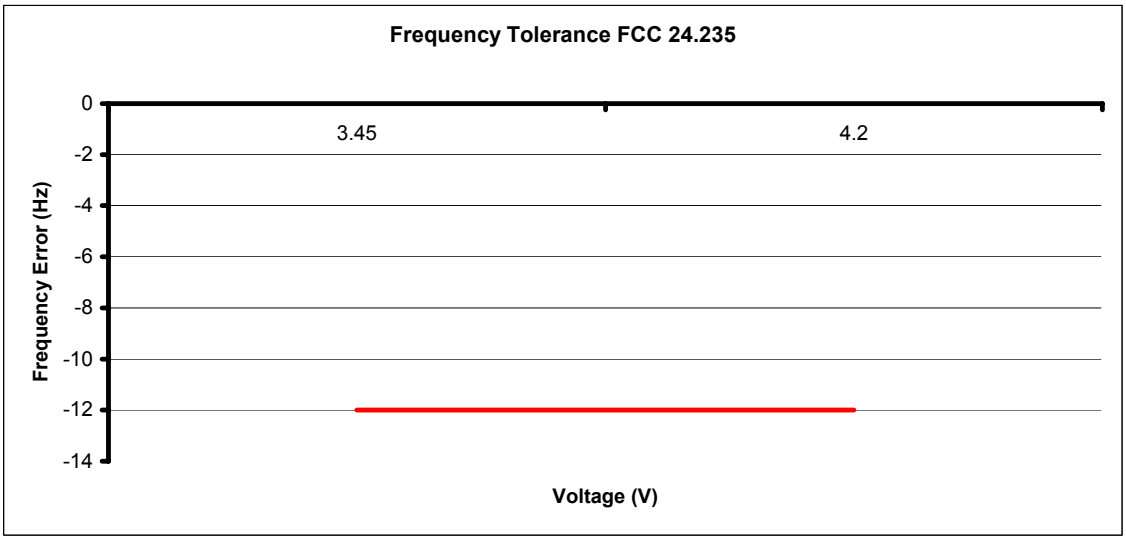
10.5.1. The EUT was configured as for frequency stability measurements as described in Section 11 of this report.

10.5.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

**Results Bottom Channel (1850.2 MHz)**

| Supply Voltage (V) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|---|
| 4.2 | -12 | 1850.199988 | 1850 | 0.199988 | Complied |
| 3.45 | -12 | 1850.199988 | 1850 | 0.199988 | Complied |

**Frequency Variation From 1850.2MHz**

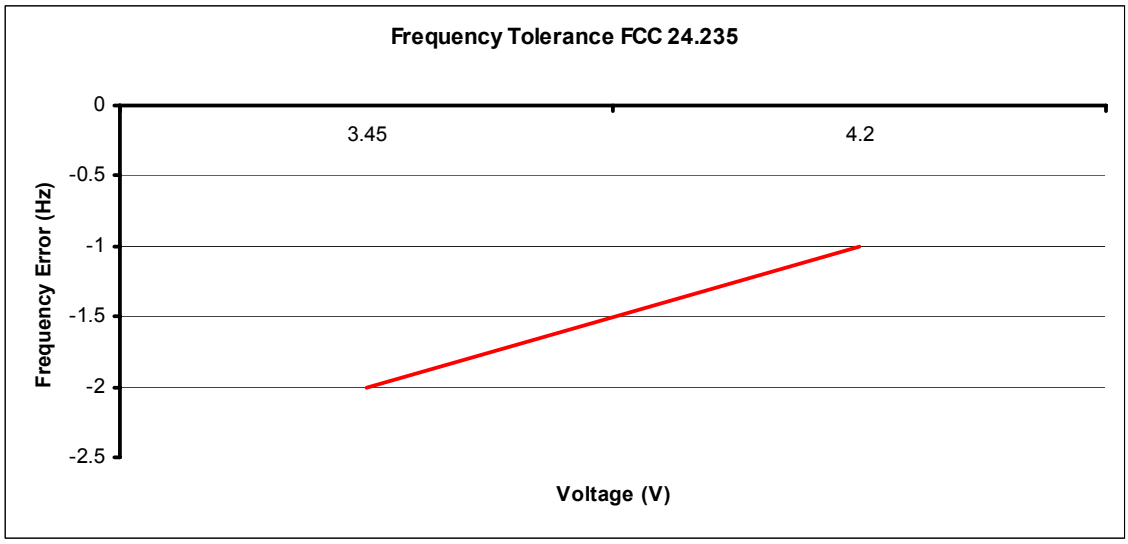


## Transmitter Frequency Stability (Voltage Variation): Section 24.235 (Continued)

**Results Top Channel (1909.8 MHz)**

| Supply Voltage (V) | Frequency Error (Hz) | Measured Frequency (MHz) | Lower Band Edge Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|---|
| 4.2 | -1 | 1909.799999 | 1910 | 0.200001 | Complied |
| 3.45 | -2 | 1909.799998 | 1910 | 0.200002 | Complied |

**Frequency Variation From 1909.8MHz**



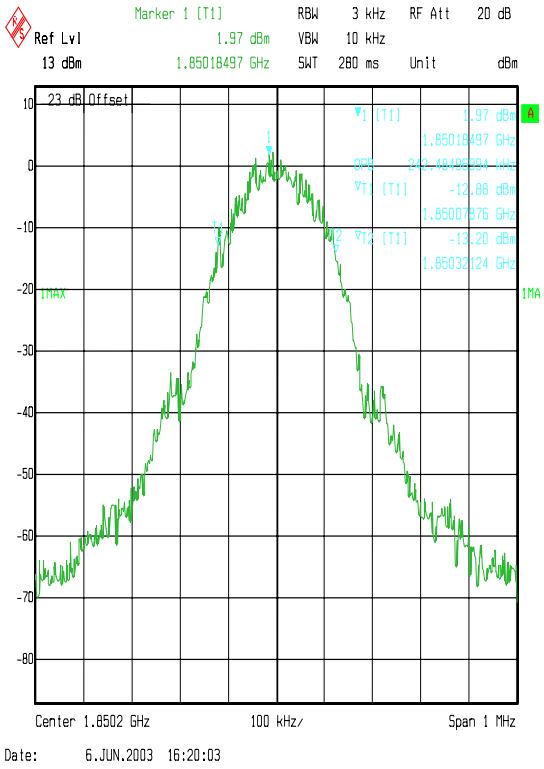
## 10.6. Transmitter Occupied Bandwidth: Section 24.238

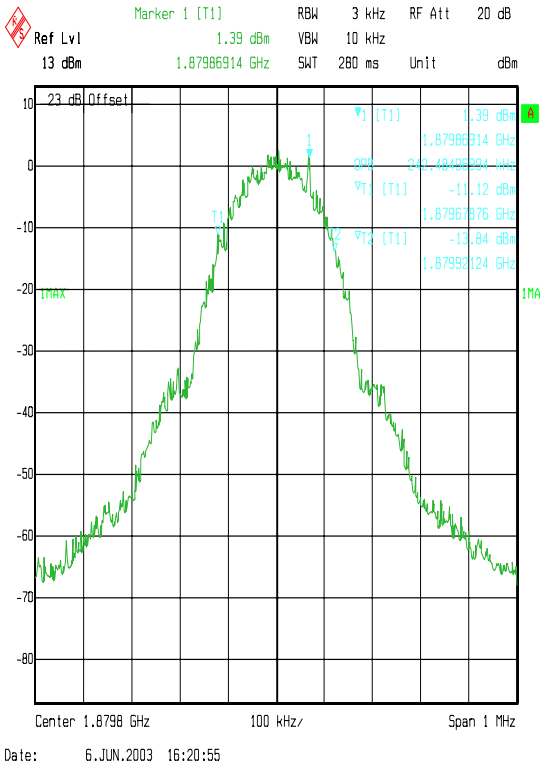
10.6.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 11 of this report.

10.6.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

**Results:**

| Channel | Frequency (MHz) | Resolution Bandwidth (kHz) | Video Bandwidth (kHz) | Occupied Bandwidth (kHz) |
|---|---|---|---|---|
| Bottom | 1850.2 | 3.0 | 10.0 | 242.485 |
| Middle | 1879.8 | 3.0 | 10.0 | 242.485 |
| Top | 1909.8 | 3.0 | 10.0 | 242.485 |



**Test Of:** **Nokia Mobile Phones.**
**3600 Imaging Phone**

**To:** **FCC Part 22 & 24**

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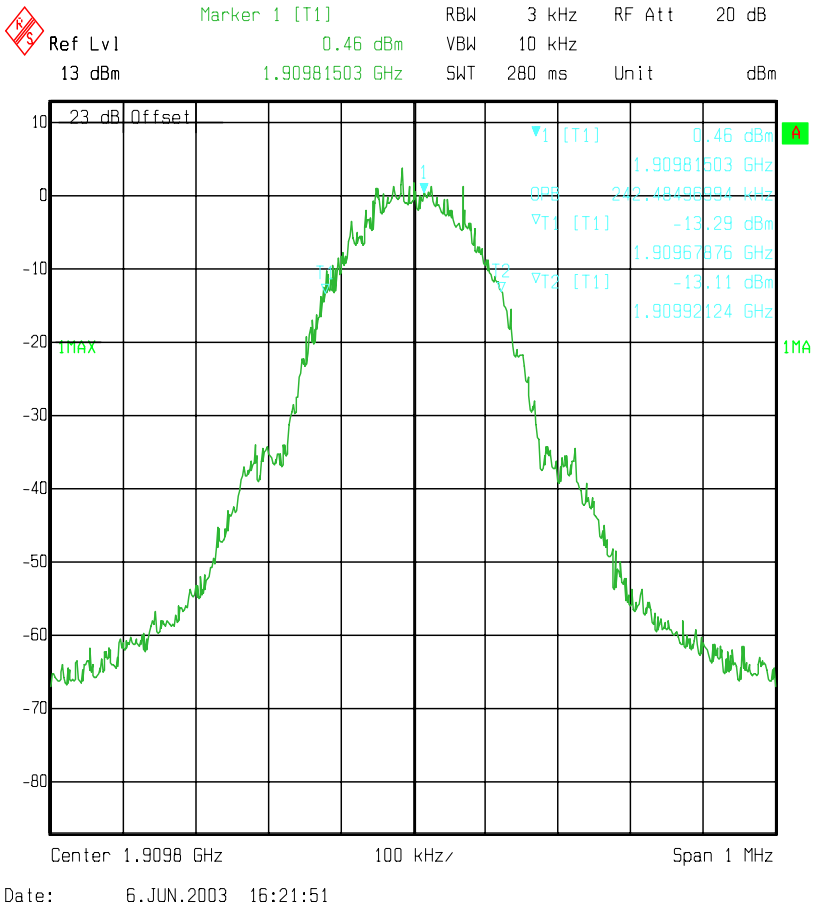


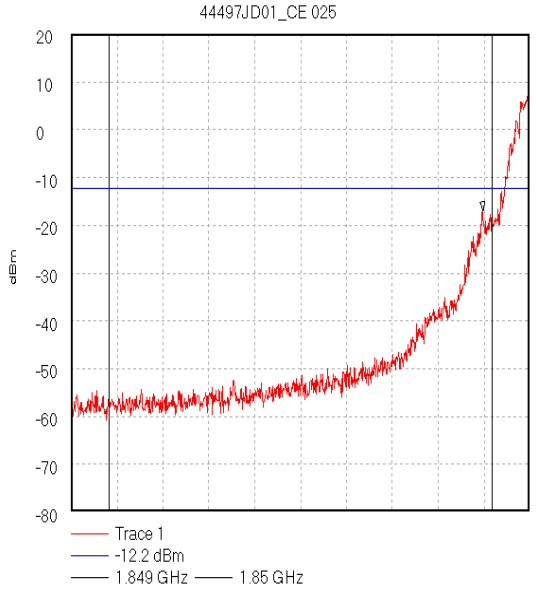
## 10.7.Transmitter Conducted Emissions at Block Edges: Section 2.1051/24.238

10.7.1. Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

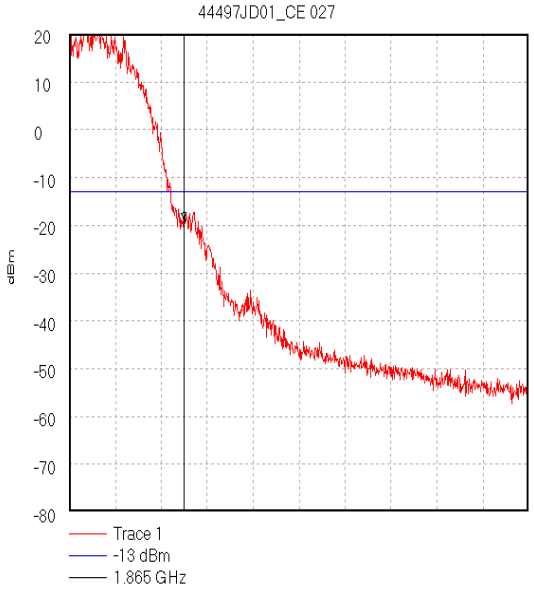
**Results: Block A**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 1849.977 | -16.94 | -13.0 | 3.94 | Complied |
| 1865.001 | -19.30 | -13.0 | 6.30 | Complied |




Start 1.8489 GHz; Stop 1.8501 GHz
Ref 20 dBm; Ref Offset 42.7 dB; 10 dB/div
RBW 3.0 kHz; VBW 3.0 kHz; Att 10 dB; Swp 400.0 mS
Marker 1.849977 GHz, -16.94 dBm
Display Line: -12.2 dBm;
12/05/2003 16:11:36




Start 1.86475 GHz; Stop 1.86575 GHz
Ref 20 dBm; Ref Offset 42.7 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.865001 GHz, -19.3 dBm
Display Line: -13 dBm;
14/05/2003 10:37:27

**Test Of:** **Nokia Mobile Phones.**
**3600 Imaging Phone**

**To:** **FCC Part 22 & 24**

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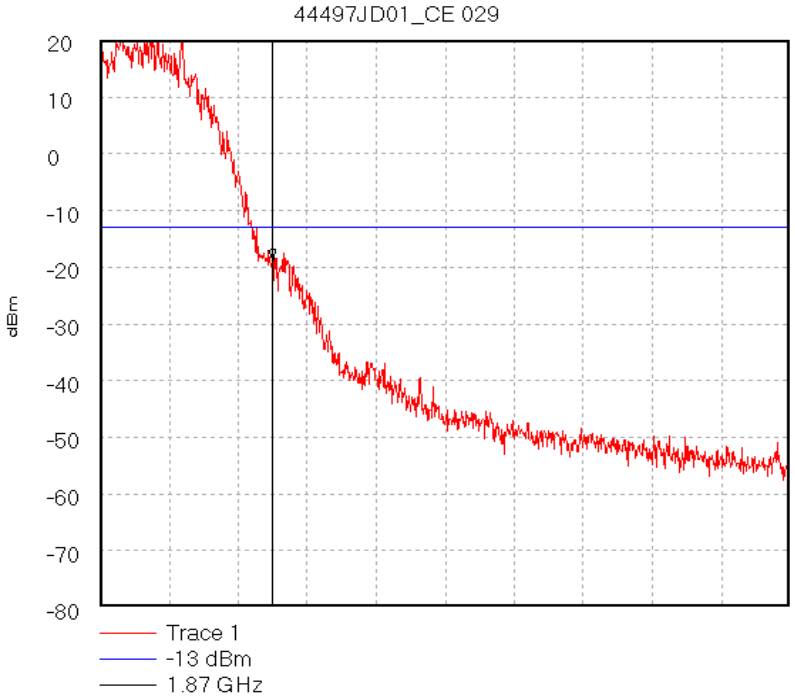
## Transmitter Conducted Emissions at Block Edges: Section 2.1051/24.238 (Continued)

**Results: Block D**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 1865.000 | -17.48 | -13.0 | 4.48 | Complied |
| 1870.001 | -18.80 | -13.0 | 5.80 | Complied |



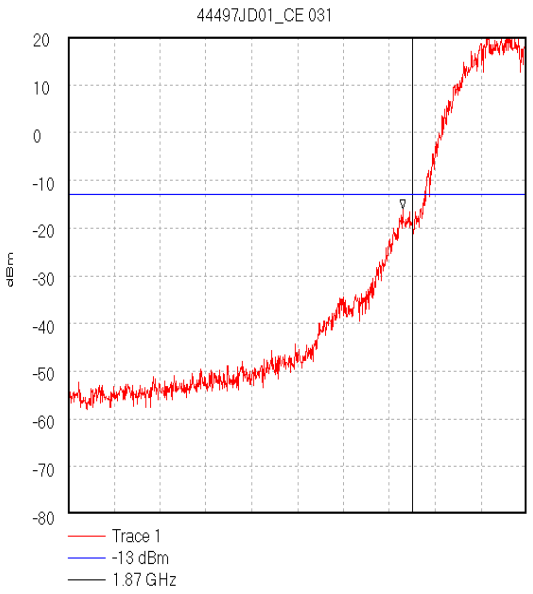

Start 1.86975 GHz; Stop 1.87075 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.870001 GHz, -18.8 dBm
Display Line: -13 dBm;
14/05/2003 10:46:40

## Transmitter Conducted Emissions at Block Edges: Section 2.1051/24.238 (Continued)

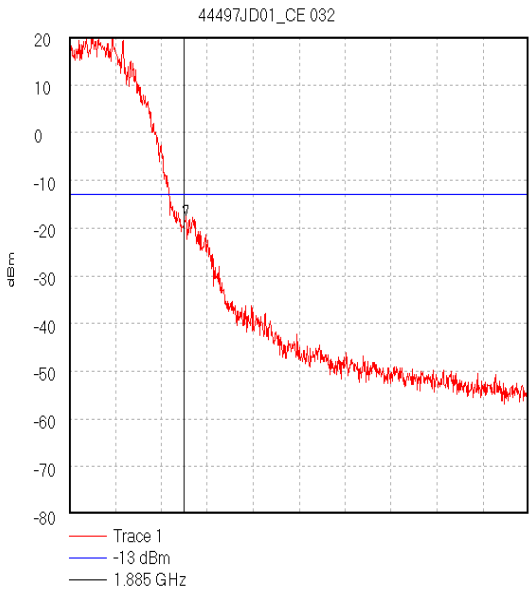
**Results: Block B**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 1869.980 | -16.05 | 42.2 | 3.05 | Complied |
| 1885.004 | -17.30 | 42.2 | 4.30 | Complied |




Start 1.86925 GHz; Stop 1.87025 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.86998 GHz, -16.05 dBm
Display Line: -13 dBm;
14/05/2003 10:50:29



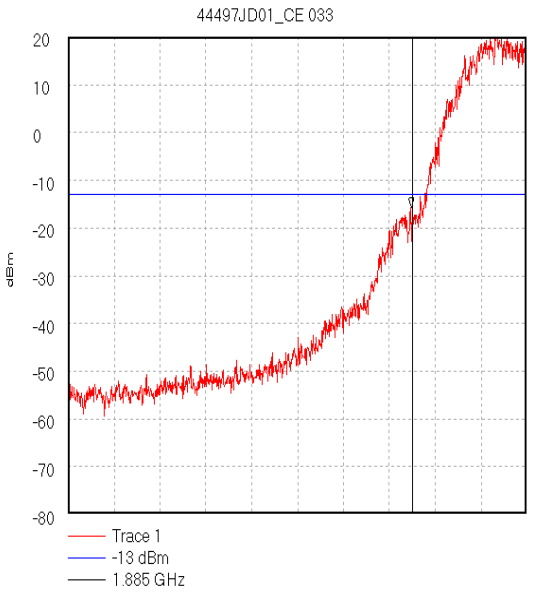

Start 1.88475 GHz; Stop 1.88575 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.885004 GHz, -17.3 dBm
Display Line: -13 dBm;
14/05/2003 10:54:34

## Transmitter Conducted Emissions at Block Edges: Section 2.1051/24.238 (Continued)

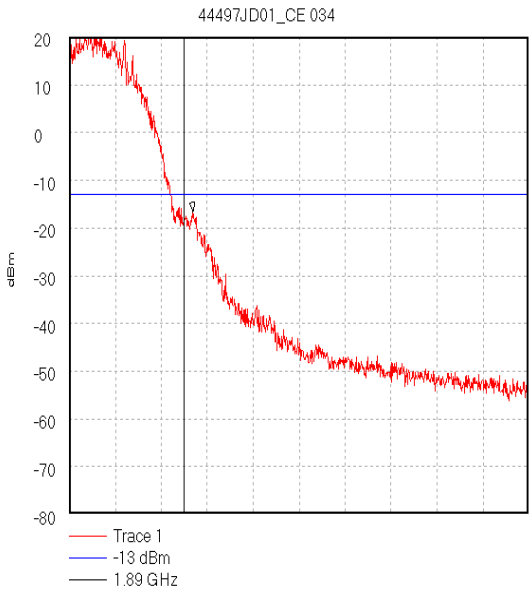
**Results: Block E**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 1884.998 | -15.70 | -13.0 | 2.70 | Complied |
| 1890.019 | -16.66 | -13.0 | 3.66 | Complied |




Start 1.88425 GHz; Stop 1.88525 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.884998 GHz, -15.7 dBm
Display Line: -13 dBm;
14/05/2003 10:56:23



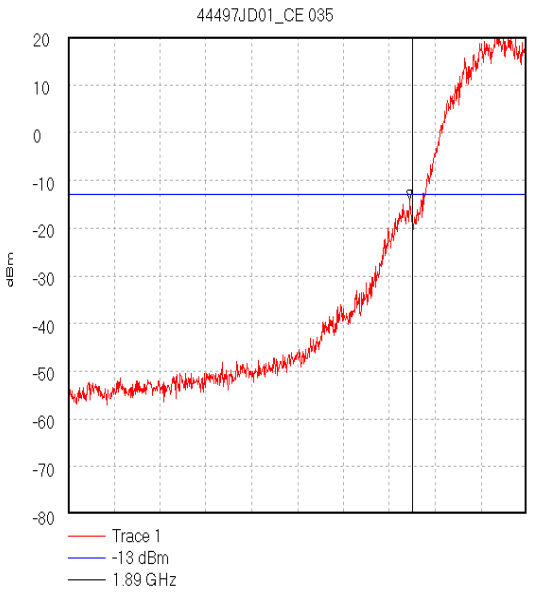

Start 1.88975 GHz; Stop 1.89075 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.890019 GHz, -16.66 dBm
Display Line: -13 dBm;
14/05/2003 10:58:30

## Transmitter Conducted Emissions at Block Edges: Section 2.1051/24.238 (Continued)

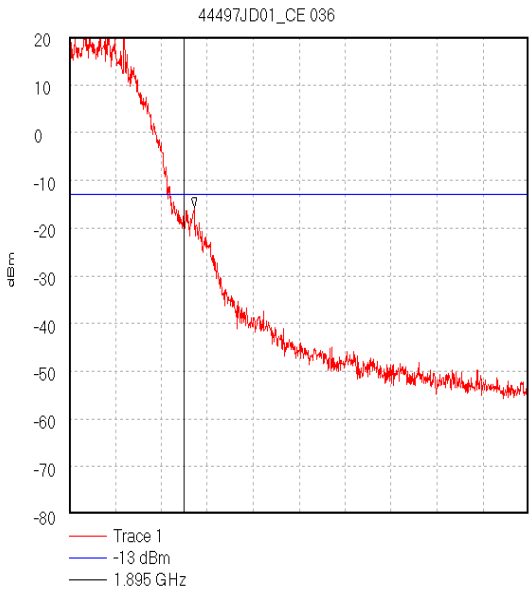
**Results: Block F**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 1889.994 | -14.12 | -13.0 | 1.12 | Complied |
| 1895.022 | -15.72 | -13.0 | 2.72 | Complied |




Start 1.88925 GHz; Stop 1.89025 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.889994 GHz, -14.12 dBm
Display Line: -13 dBm;
14/05/2003 11:00:56



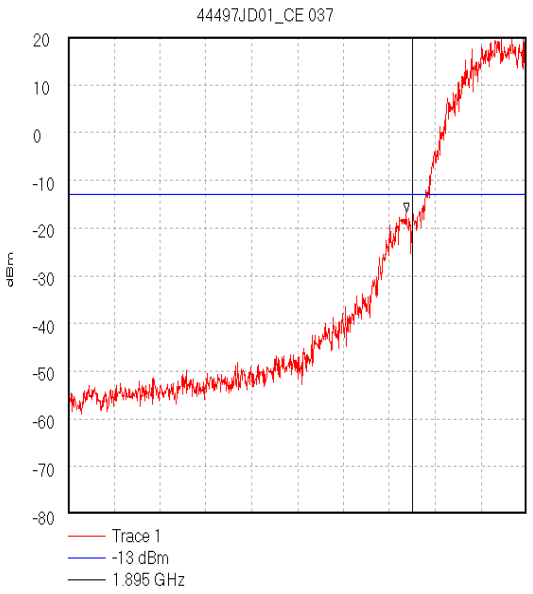

Start 1.89475 GHz; Stop 1.89575 GHz
Ref 20 dBm; Ref Offset 42.8 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.895022 GHz, -15.72 dBm
Display Line: -13 dBm;
14/05/2003 11:03:14

## Transmitter Conducted Emissions at Block Edges: Section 2.1051/24.238 (Continued)

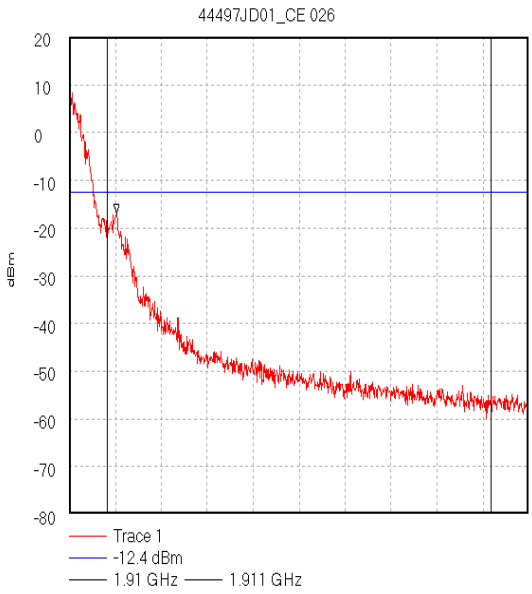
**Results: Block C**

**Lower Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm | Margin (dB) | Result |
|---|---|---|---|---|
| 1894.988 | -16.76 | -13.0 | 3.76 | Complied |
| 1910.024 | -16.99 | -13.0 | 3.99 | Complied |




Start 1.89425 GHz; Stop 1.89525 GHz
Ref 20 dBm; Ref Offset 42.5 dB; 10 dB/div
RBW 3.0 kHz; VBW 10.0 kHz; Att 0 dB; Swp 340.0 mS
Marker 1.894988 GHz, -16.76 dBm
Display Line: -13 dBm;
14/05/2003 11:06:17




Start 1.9099 GHz; Stop 1.9111 GHz
Ref 20 dBm; Ref Offset 42.4 dB; 10 dB/div
RBW 3.0 kHz; VBW 3.0 kHz; Att 10 dB; Swp 400.0 mS
Marker 1.910024 GHz, -16.99 dBm
Display Line: -12.4 dBm;
12/05/2003 16:14:04

## 10.8. Transmitter Out of Band Emissions: Section 2.1053/24.238

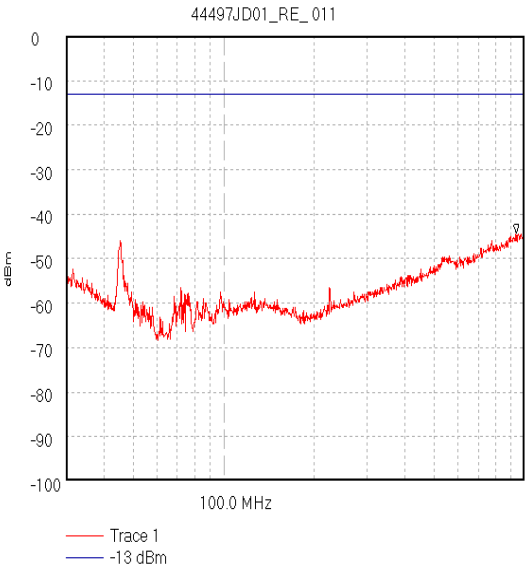
10.8.1. The EUT was configured as for transmitter radiated emissions testing as described in Section 11 of this report.

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

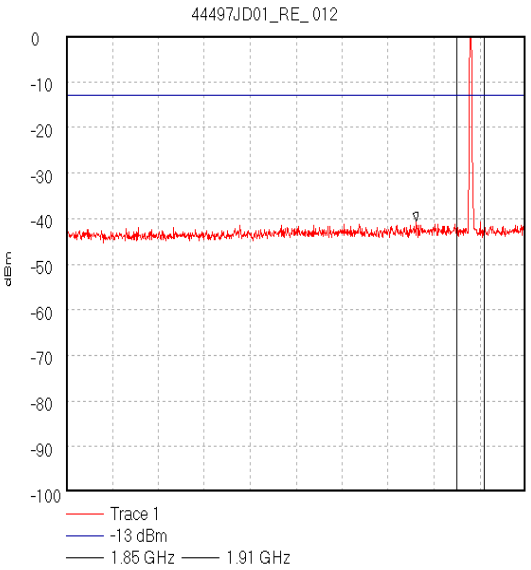
**Result: Middle Channel**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 17957.222 | -32.8 | -13.0 | 19.8 | Complied |

*Note: As no radiated spurious emissions were present in the pre-scans, the highest noise floor level was recorded.*




Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 121.65 kHz; VBW 100.0 kHz; Att 0 dB; Swp 220.0 mS
Peak 935.91072 MHz, -44.36 dBm
Display Line: -13 dBm;
Transducer Factors: A490
30/04/2003 15:25:13




Start 1.0 GHz; Stop 2.0 GHz
Ref 0 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Marker 1.762222 GHz, -40.5 dBm
Display Line: -13 dBm;
Transducer Factors: 1 to 2
30/04/2003 15:51:04

**Test Of:** **Nokia Mobile Phones.**
**3600 Imaging Phone**

**To:** **FCC Part 22 & 24**

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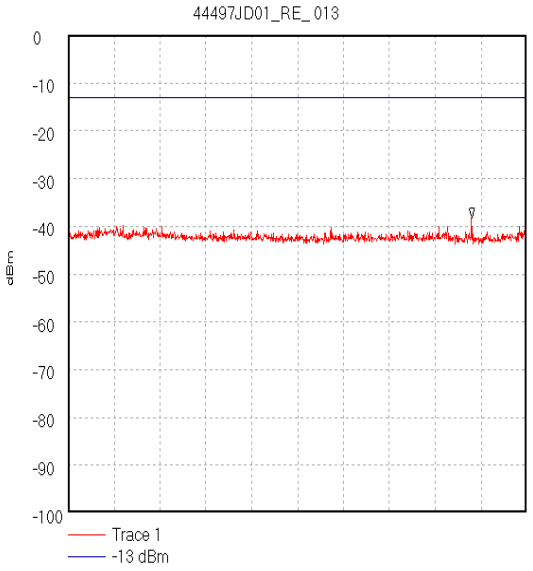
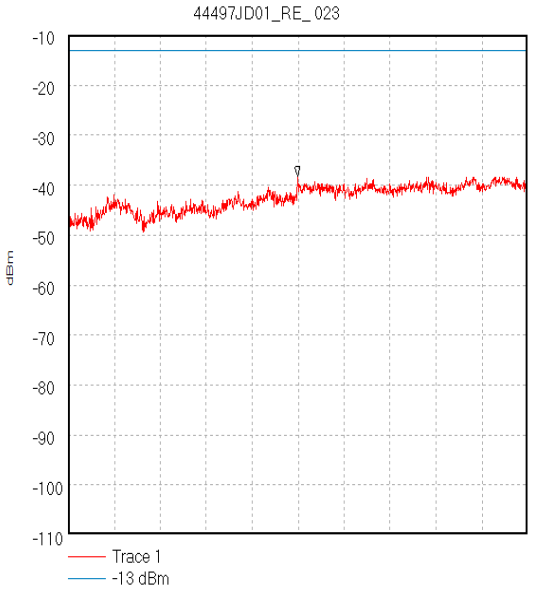
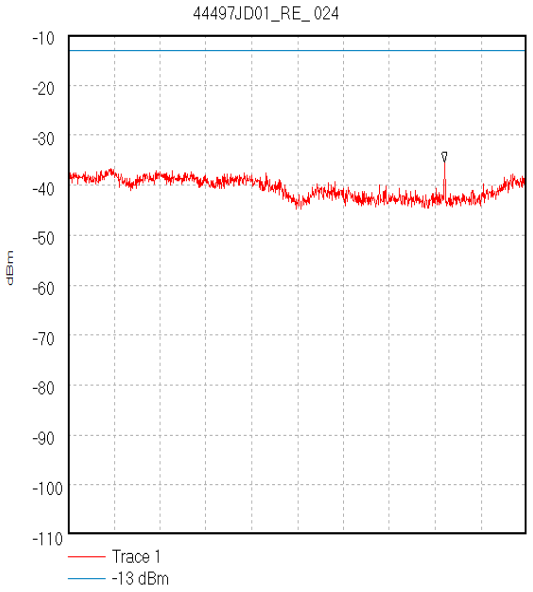


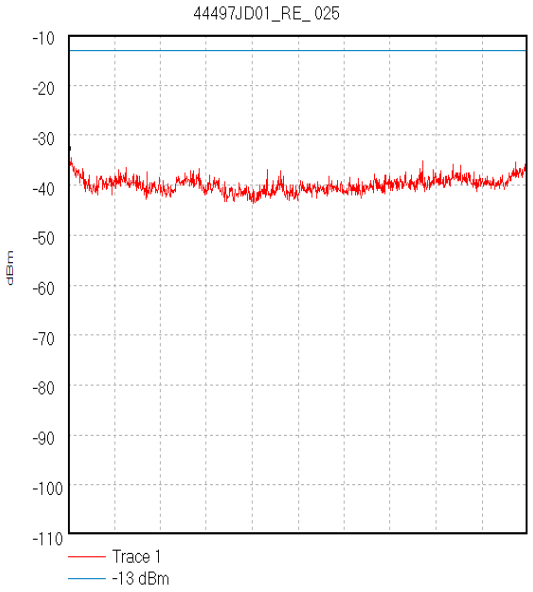

Start 2.0 GHz; Stop 4.0 GHz
Ref 0 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.76 GHz, -38.19 dBm
Display Line: -13 dBm;
Transducer Factors: 2 to 4
30/04/2003 15:56:11



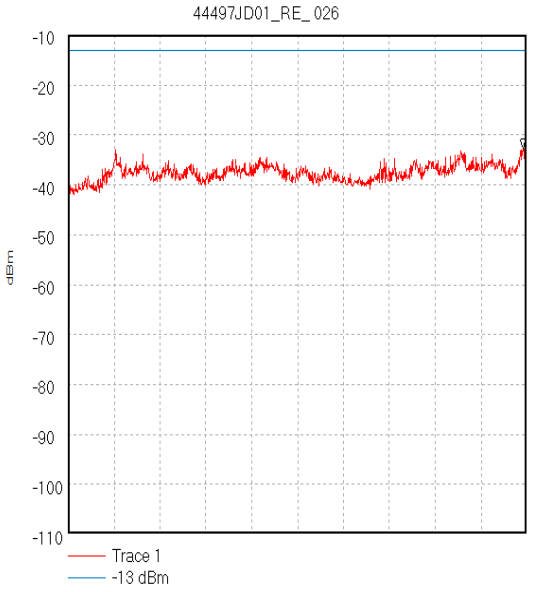

Start 4.0 GHz; Stop 6.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 4.997778 GHz, -38.23 dBm
Display Line: -13 dBm;
02/05/2003 14:40:10



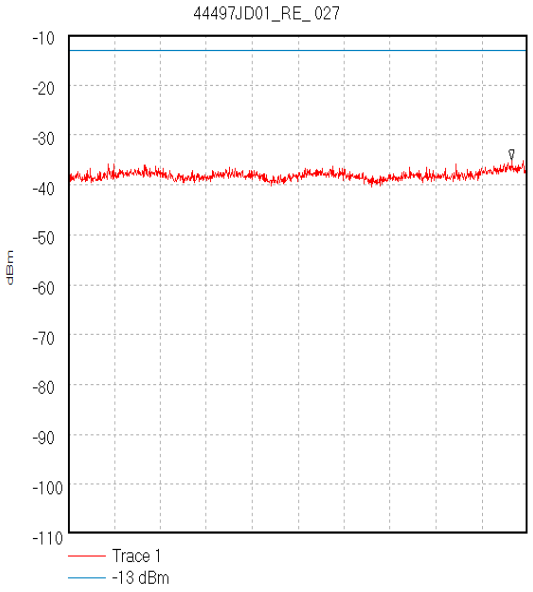

Start 6.0 GHz; Stop 8.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 7.642222 GHz, -35.52 dBm
Display Line: -13 dBm;
02/05/2003 14:44:32




Start 8.0 GHz; Stop 12.5 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 8.0 GHz, -34.32 dBm
Display Line: -13 dBm;
02/05/2003 14:48:32




Start 12.5 GHz; Stop 18.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 5 dB; Swp 40.0 mS
Peak 17.957222 GHz, -32.8 dBm
Display Line: -13 dBm;
02/05/2003 14:54:39




Start 18.0 GHz; Stop 20.0 GHz
Ref -10 dBm; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 19.931111 GHz, -35.08 dBm
Display Line: -13 dBm;
02/05/2003 14:59:50

## 10.9. Transmitter Radiated Emissions At Band Edges: Section 2.1053/24.238

10.9.1. The EUT was configured as for transmitter radiated emissions testing described in Section 11 of this report.

10.9.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

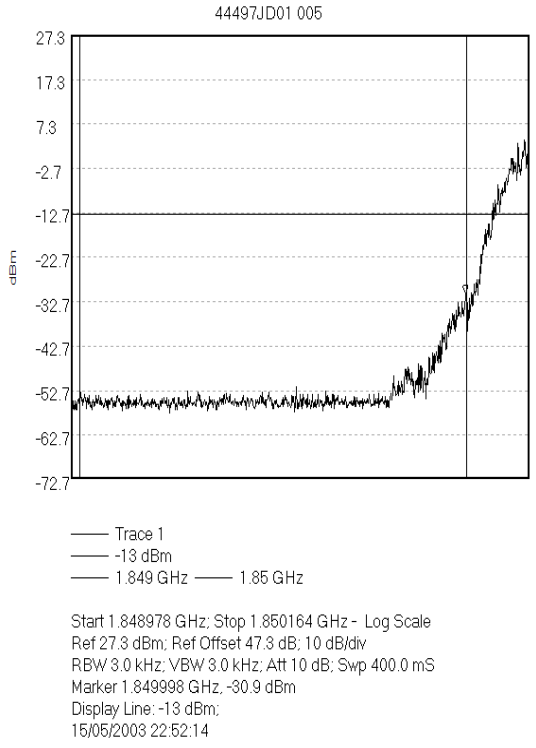
**Results:**

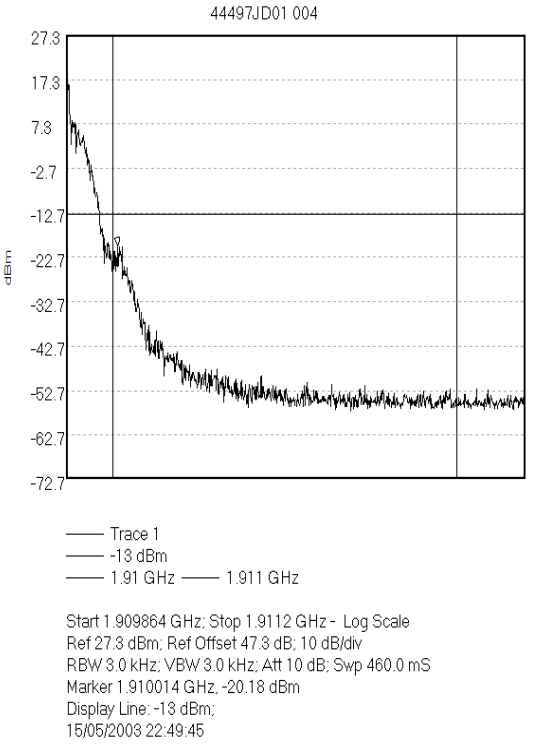
**Bottom Band Edge**

| Frequency (MHz) | Spurious Emission (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 1849.998 | -30.9 | -13.0 | 17.9 | Complied |

**Top Band Edge**

| Frequency (MHz) | Peak Emission Level (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| 1910.014 | -20.18 | -13.0 | 7.18 | Complied |



# 11. Measurement Methods – Part 24

## 11.1. 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 |

## 11.2. Frequency Stability

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via an access port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range –30 to 50 Deg C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions and ensure they remained within specified operating parameters.

Measurements were made on the top, and bottom channels using the GSM test set described in Appendix 1.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded. The recorded frequency was compared to the applicants declared operating frequency band edges.

In order to show compliance, the measured frequency must remain within the declared frequency band.

The reported data shows the nominal frequency drift and its margin from the band edge. If this margin is positive, the result is compliant. If it goes negative, the result is a none compliance. There is also a frequency graph presented offering the frequency variation around nominal frequency.

## 11.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via a bi-directional coupler to its antenna port. If the EUT was not fitted with an antenna port as standard, the client made a temporary antenna port available.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom middle and top channels.

As EUT is a PCS phone, no modulation input port was available. A call was thus setup using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

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. A value of 3kHz was used.

## 11.4. 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.

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.

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.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

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

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

## 11.5. Transmitter Radiated Emissions

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

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency stated in section 2.5 of this report. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. 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. The procedure was repeated for the horizontal polarisation.

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

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**Transmitter Radiated Emissions (Continued)**

The limit in the standard states that emissions shall be attenuated by at least 43+10 Log(P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to –13dBm as such, the limit line presented on the accompanying plots is set to –13dBm.

Any spurious measured were then compared to the –13dBm limit. The requirement is for the emission to be less than –13dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

All measurements were performed using broadband Horn antennas.

It should be noted that FCC Part 24.238 states that the 1$^{st}$ 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

## 11.6. Receiver Radiated Emissions

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

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 5 times the highest clock frequency stated in section 2.5 of this report were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector 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 initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

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 in the horizontal polarisation. 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. The procedure was repeated for the vertical polarisation.

**Receiver Radiated Emissions (Continued)**

The final field strength was determined as the indicated level in dBuV plus cable loss and antenna factor.

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)<br>(1MHz > 1GHz) | 120 kHz | 1 MHz<br>(If Applicable) |
| Amplitude Range: | 60 dB | 20 dB | 20 dB (typical) |
| Step Size: | Continuous sweep | Not applicable | Not applicable |
| Sweep Time: | Coupled | Not applicable | Not applicable |

## 12. Measurement Uncertainty

12.1. 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.

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

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

12.4. 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 |
| 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 |

12.5. 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 |
| M1013 | GSM Test set | Hewlett Packard | 8922M | 3503U00372 |
| M1014 | DCS Test set | Hewlett Packard | 83220E | 3741U02702 |
| 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

**To:** FCC Part 22 & 24

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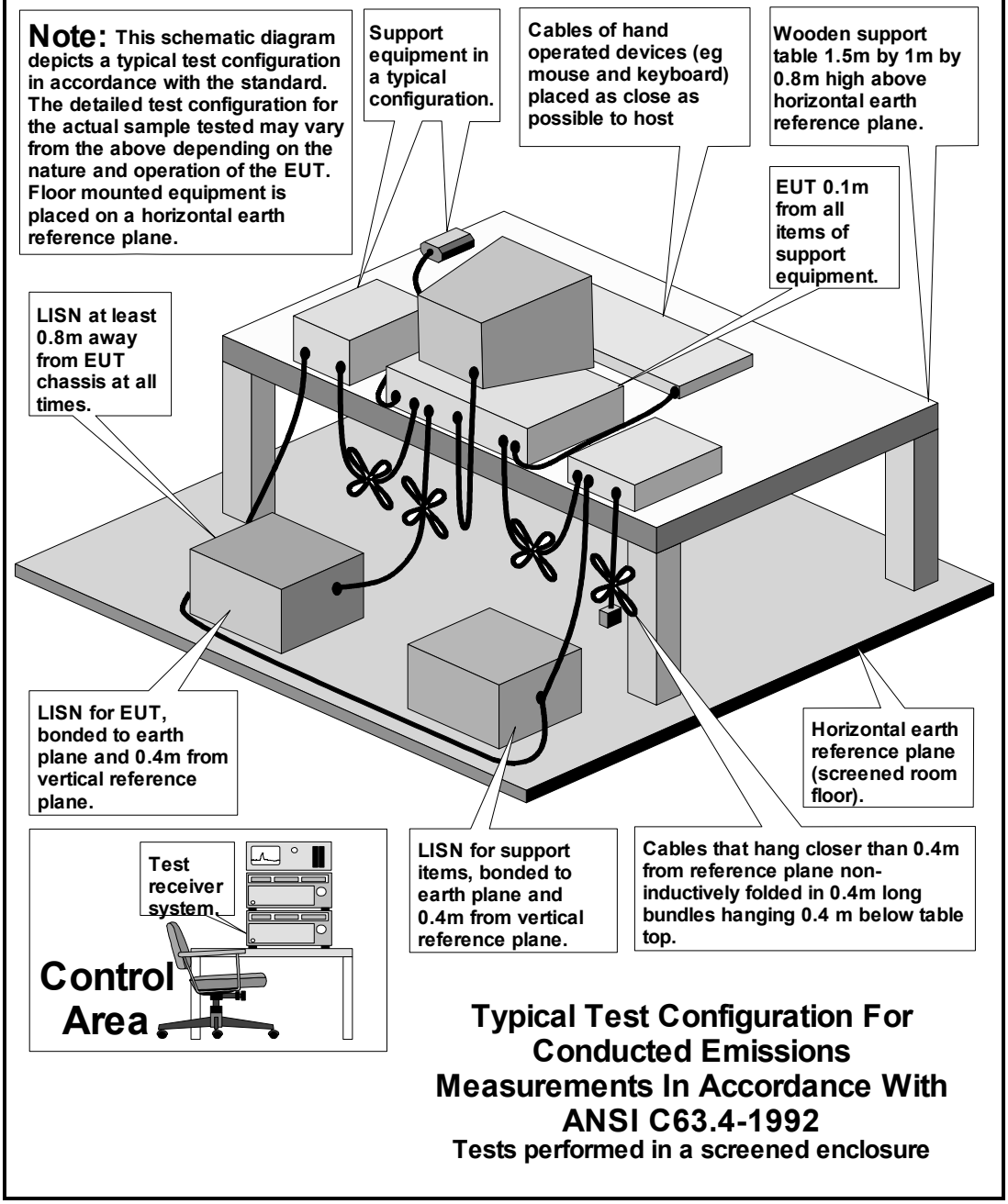
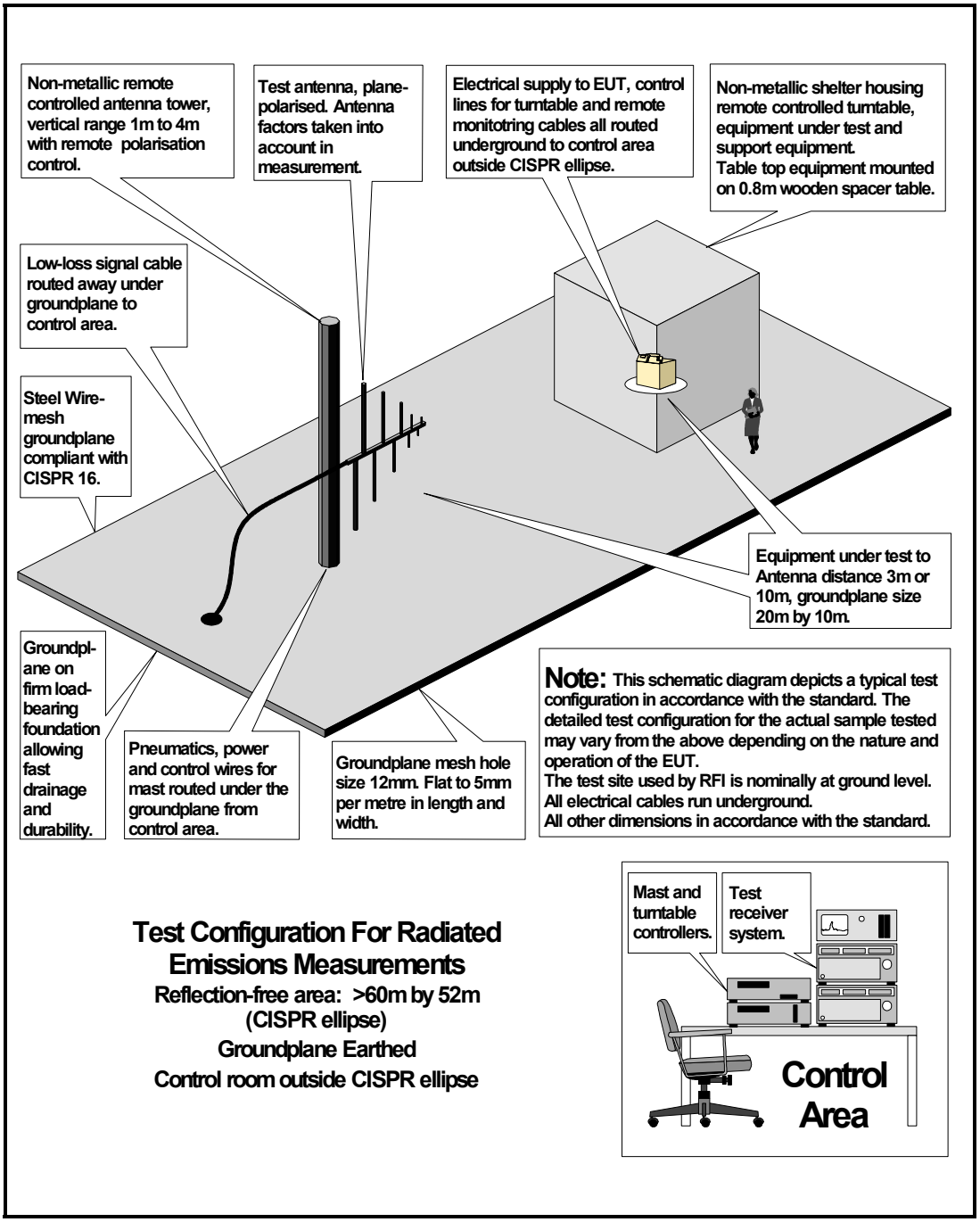
**DRG\44497JD02\EMICON**




**Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992**
**Tests performed in a screened enclosure**

**DRG\44497JD02\EMIRAD**




## Test Configuration For Radiated Emissions Measurements

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