TCC Nokia

FINAS Finnish Accreditation Service T117 (EN ISO/IEC 17025)

# FCC Part 15C Compliance Test Report

| | | | |
|---|---|---|---|
| **Test Report no.:** | Tre_FCC_0617_04.doc | **Date of Report:** | 24.5.2006 |
| **Number of pages:** | 36 | **Customer's Contact person:** | Harri Vähämiko |
| **Testing laboratory:** | TCC Nokia Tampere Laboratory<br>P.O. Box 68<br>Sinitaival 5<br>FIN-33720 TAMPERE, FINLAND<br>Tel. +358 (0) 7180 46800<br>Fax. +358 (0) 7180 46880 | **Client:** | Nokia Corporation<br>P.O. Box 68<br>Sinitaival 5<br>FIN-33721 TAMPERE, FINLAND<br>Tel. +358 (0) 7180 08000<br>Fax. +358 (0) 7180 46880 |
| **FCC listing no.:**<br>**IC recognition no.:** | 94436<br>3608 | | |
| **Tested devices/ accessories:** | **GSM phone RM-170 / Battery BL-5C, AC charger AC-4, Headset HS-23** | | |
| **FCC ID:** | PDNRM-170 | **IC:** | 661R-RM170 |
| **Supplement reports:** | - | | |
| **Testing has been carried out in accordance with:** | **CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), IC standards RSS-GEN and RSS-210. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".** | | |
| **Documentation:** | The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia. | | |
| **Test Results:** | **The EUT complies with the requirements in respect of all parameters subject to the test.** The test results relate only to devices specified in this document. | | |
| **Date and signature for the contents:** |  Digitally signed by Jan-Erik Lilja<br>DN: cn=Jan-Erik Lilja, c=FI<br>Date: 2006.05.24 13:28:49 +03'00' | | |

**Jan-Erik Lilja, System Manager**

# 1. Summary for FCC Part 15C Compliance Test Report

| | |
|---|---|
| **Date of receipt** | 18.4.2006 |
| **Testing completed** | 4.5.2006 |
| **The customer's contact person** | Harri Vähämiko |
| **Test Plan referred to** | \EMC\TESTPLAN\ |
| **Notes** | - |
| **Document name** | T:\Projects\RM-170\EMC\Results\FCC\Tre_FCC_0617_04.doc |

## 1.1. EUT and Accessory Information

The EUT is a quadri band (GSM850/900/1800/1900) mobile phone with Bluetooth. Bluetooth is tested with maximum rated TX power.

| Product | Type | SN | HW | MV | SW | DUT |
|---|---|---|---|---|---|---|
| GSM phone | RM-170 | 004400811716560 | 5002 | - | V06.12(2) | 40650 |
| GSM phone | RM-170 | 004400811713625 | 5002 | - | V06.12(2) | 40621 |
| Battery | BL-5C | - | 18 | - | - | 40625 |
| Battery | BL-5C | - | 18 | - | - | 40626 |
| Headset | HS-23 | - | 0.8 | 2.1 | 0.2 | 40651 |
| AC-Charger | AC-4 | - | 1.1 | - | - | 40627 |

## 1.2. Summary of Test Results

**Bluetooth:**

| Section in CFR 47 | Section in *RSS-GEN* or RSS-210 | Name of the test | Result |
|---|---|---|---|
| 15.247(b)(1) | A8.4 (2) | Peak output power | PASSED |
| 15.247(c) | A8.5 | Band edge compliance of RF emissions | PASSED |
| 15.247(c) | A8.5 | Spurious RF conducted emissions | PASSED |
| 15.247(c), 15.209 | A8.5 | Spurious radiated emissions | PASSED |
| 15.207 | *7.2.2* | AC powerline conducted emissions | PASSED |
| 15.247(a)(1) | A8.1 (1) | 20 dB bandwidth | PASSED |
| 15.247(a)(1) | A8.1 (2) | Carrier frequency separation | PASSED |
| 15.247(a)(1)(iii) | A8.1 (4) | Number of hopping frequencies | PASSED |
| 15.247(a)(1)(iii) | A8.1 (4) | Time of occupancy | PASSED |

| | |
|---|---|
| PASSED | The EUT complies with the essential requirements in the standard. |
| FAILED | The EUT does not comply with the essential requirements in the standard. |
| NP | The test was not performed by the TCC Nokia Tampere Laboratory. |



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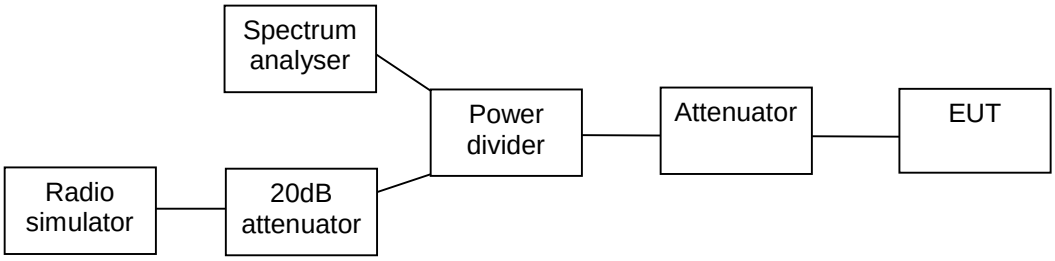
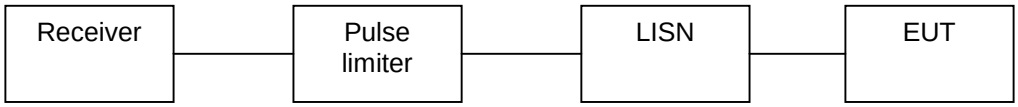
# 2. Test setups

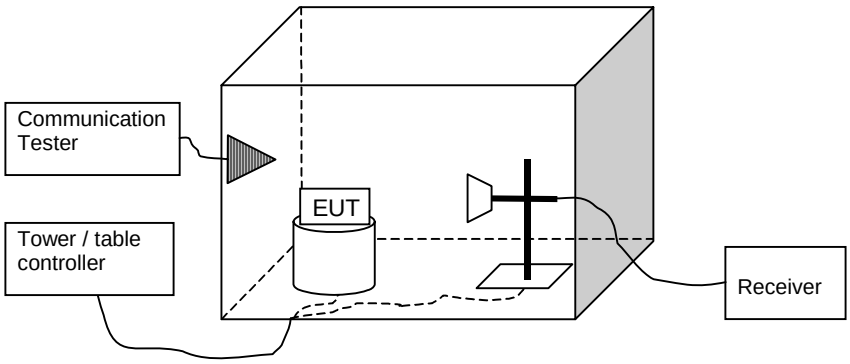
## 2.1. Conducted RF test setup




## 2.2. AC powerline conducted emissions test setup




## 2.3. Spurious radiated emissions test setup



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# 3. Peak output power

**(FCC §15.247(b)(1), RSS-210 A8.4 (2))**

| | |
|---|---|
| **EUT with DUT number** | RM-170: DUT 40650 |
| **Accessories with DUT numbers** | BL-5C: DUT 40625 |
| **Operation Voltage [V] / [Hz]** | - |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21/44/102.5 |
| **Date of measurements** | 25.4.2006, 2.5.2006 |
| **Measured by** | Jan-Erik Lilja |

## 3.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for peak output power measurements

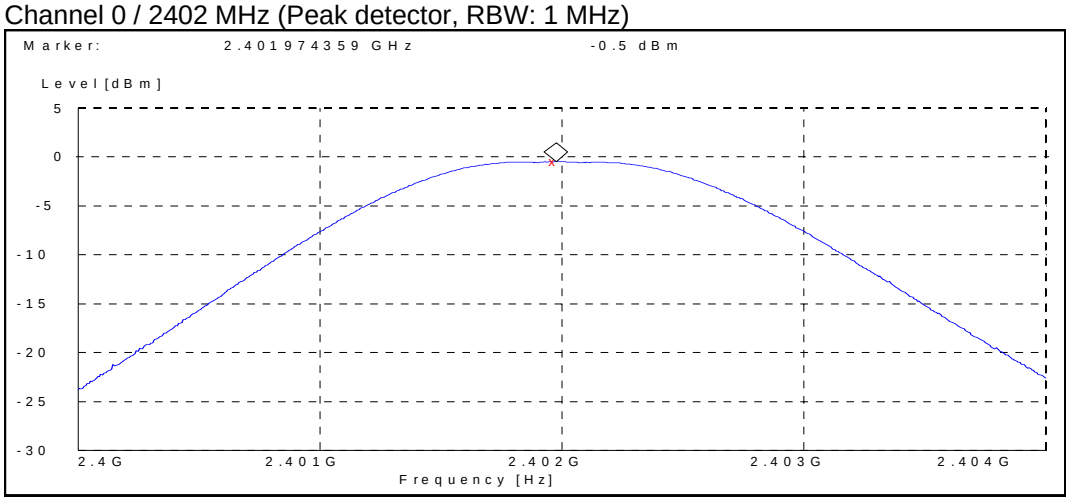
| Frequency range [MHz] | Limit [W] | Limit [dBm] |
|---|---|---|
| 2400 – 2483.5 | ≤ 1 | ≤ 30 |

## 3.2. Bluetooth Test results

### 3.2.1 GSFK modulation, PRBS packet type

| Channel / $f_C$ [MHz] | P [dBm] | P [mW] | Result |
|---|---|---|---|
| 0 / 2402 | -0.50 | 0.891 | Passed |
| 40 / 2442 | -0.30 | 0.933 | Passed |
| 78 / 2480 | 0.30 | 1.072 | Passed |

Channel 0 / 2402 MHz (Peak detector, RBW: 1 MHz)



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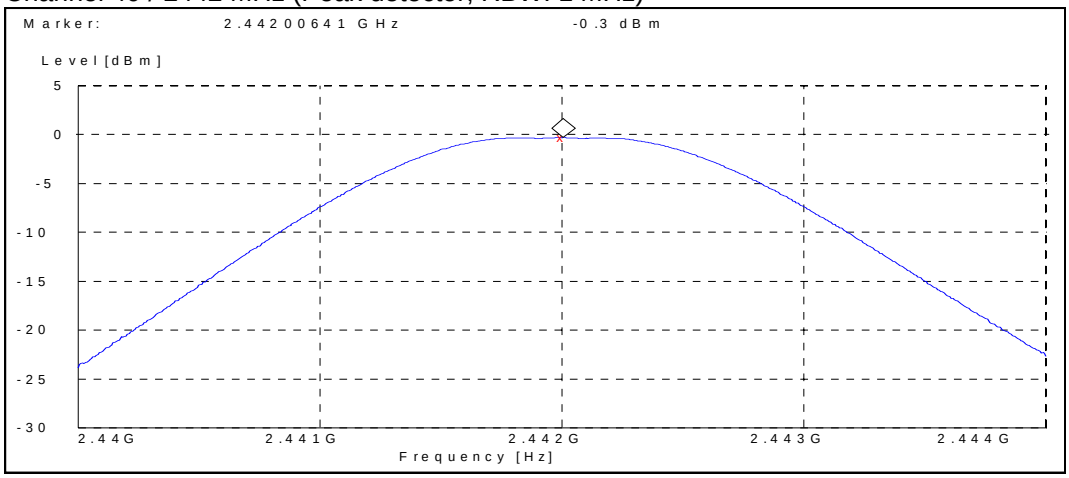
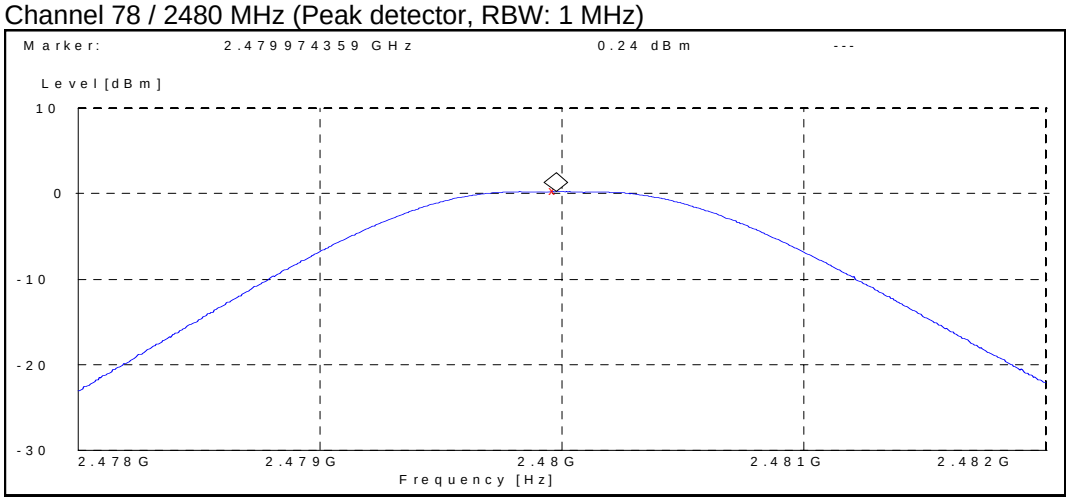
Channel 40 / 2442 MHz (Peak detector, RBW: 1 MHz)




Channel 78 / 2480 MHz (Peak detector, RBW: 1 MHz)




### 3.2.2 8DPSK modulation, PRBS packet type

| Channel / $f_C$ [MHz] | P [dBm] | P [mW] | Result |
|---|---|---|---|
| 0 / 2402 | 2.20 | 1.660 | Passed |
| 39 / 2441 | 1.80 | 1.514 | Passed |
| 78 / 2480 | 1.70 | 1.479 | Passed |



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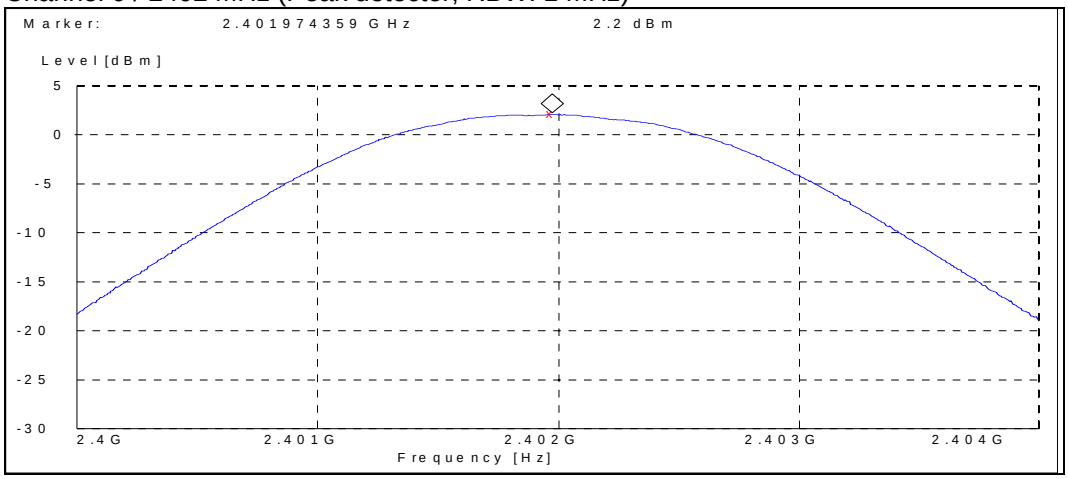
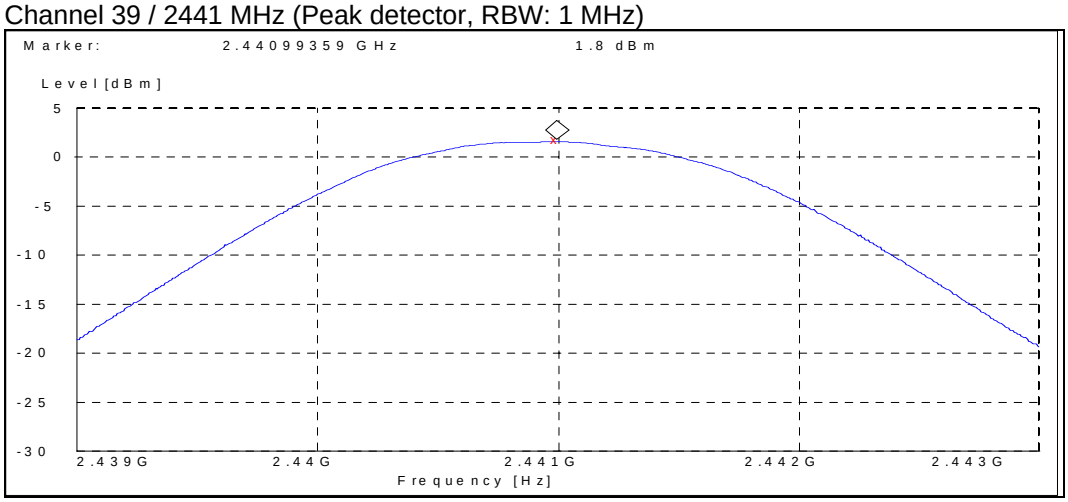
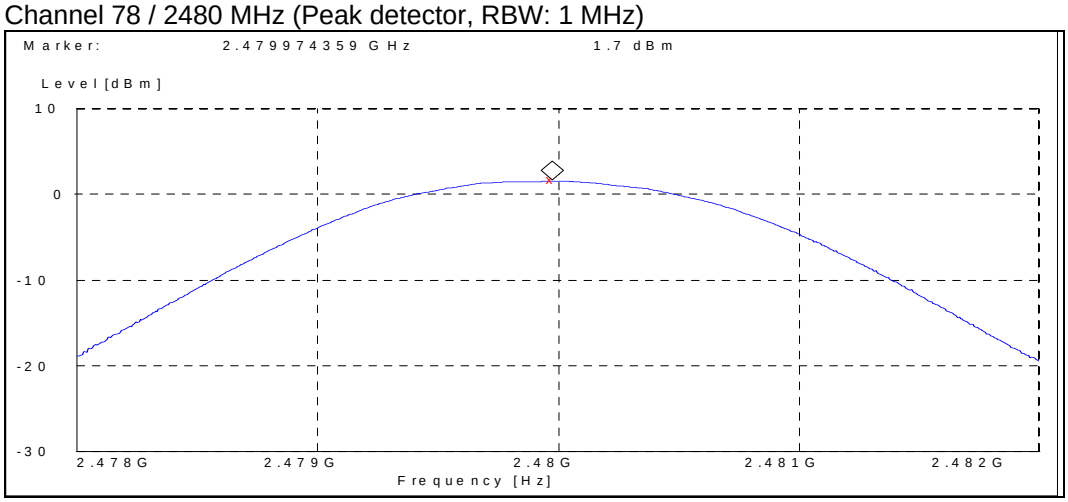
Channel 0 / 2402 MHz (Peak detector, RBW: 1 MHz)




Channel 39 / 2441 MHz (Peak detector, RBW: 1 MHz)




Channel 78 / 2480 MHz (Peak detector, RBW: 1 MHz)



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# 4. Band edge compliance of RF emissions

**(FCC §15.247(c), RSS-210 A8.5)**

| | |
|---|---|
| **EUT with DUT number** | RM-170 DUT 40621 |
| **Accessories with DUT numbers** | BL-5C DUT 40625, AC-4 DUT 40627, HS-23 DUT 40651 |
| **Operation Voltage [V] / [Hz]** | 115 / 60 |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 22/47/102.5 |
| **Date of measurements** | 26.4.2006 |
| **Measured by** | Jari Jantunen |

## 4.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

| Frequency range [MHz] | Limit Average [dBµV/m] | Limit Peak [dBµV/m] |
|---|---|---|
| Below 2390 and above 2483.5 | ≤ 54 | ≤ 74 |

## 4.2. Bluetooth Test results

### 4.2.1 GFSK modulation, PRBS packet type

Average (RBW: 1 MHz)

| Channel / $f_C$ [MHz] | E [dBµV/m] | Result |
|---|---|---|
| 0 / 2402 | 30.19 | PASSED |
| 78 / 2480 | 38.76 | PASSED |
| Hopping on, low end | 28.59 | PASSED |
| Hopping on, high end | 31.31 | PASSED |

Peak (RBW: 1 MHz)

| Channel / $f_C$ [MHz] | E [dBµV/m] | Result |
|---|---|---|
| 0 / 2402 | 51.30 | PASSED |
| 78 / 2480 | 55.95 | PASSED |
| Hopping on, low end | 52.68 | PASSED |
| Hopping on, high end | 52.75 | PASSED |



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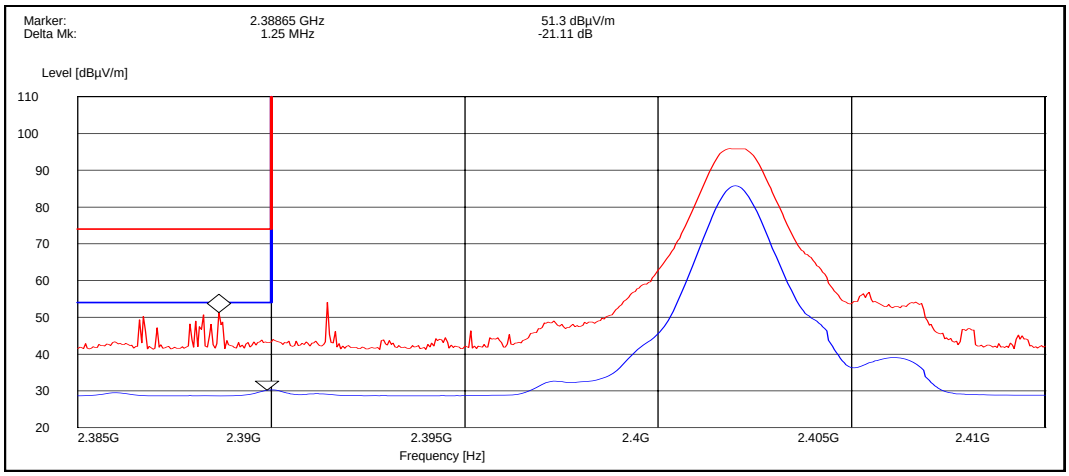
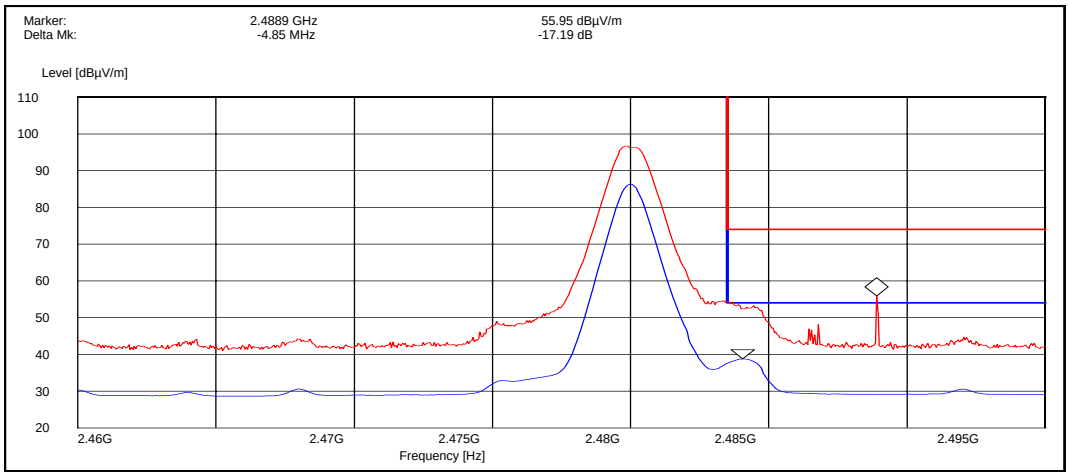
Channel 0 / 2402 MHz




Channel 78 / 2480 MHz



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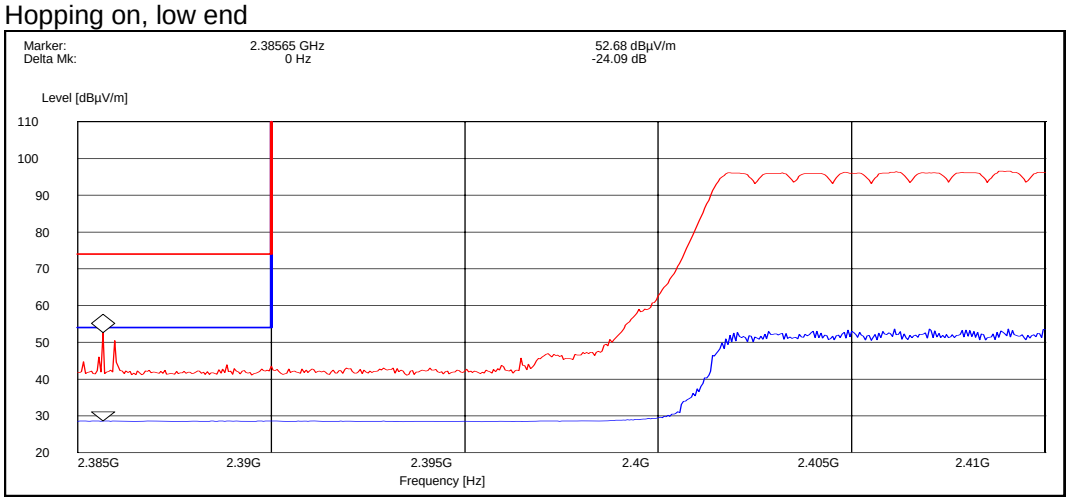
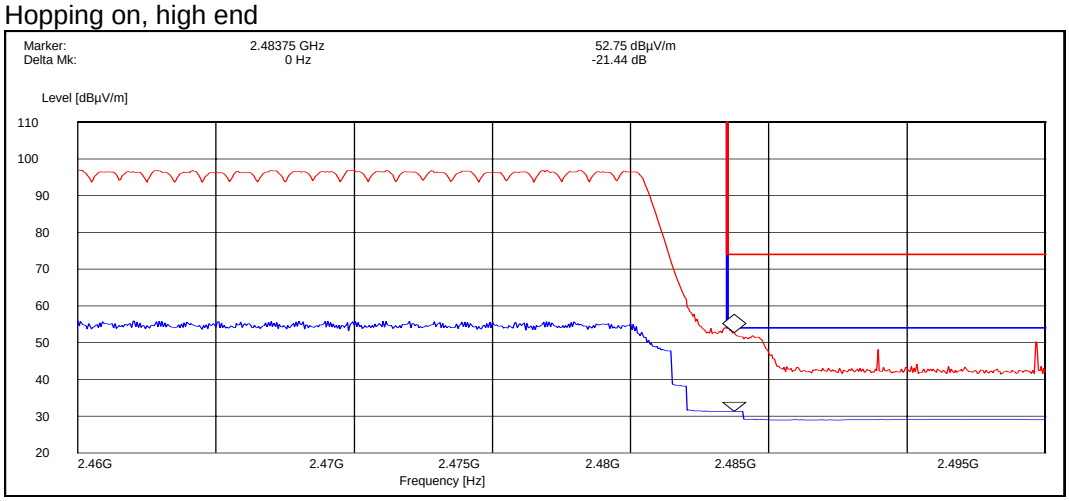
Hopping on, low end




Hopping on, high end



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### 4.2.2 8DPSK modulation, PRBS packet type

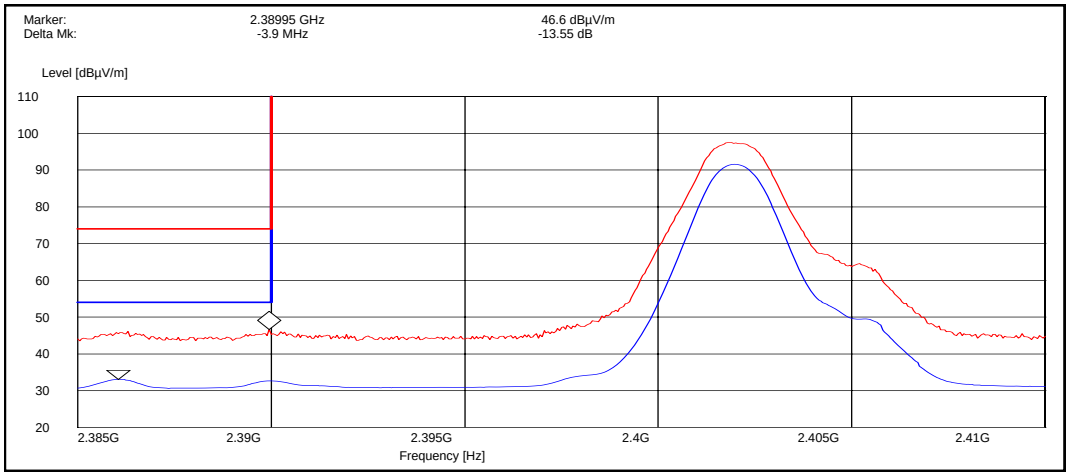
Average (RBW: 1 MHz)

| Channel / $f_C$ [MHz] | E [dBµV/m] | Result |
|---|---|---|
| 0 / 2402 | 33.05 | PASSED |
| 78 / 2480 | 46.25 | PASSED |
| Hopping on, low end | 29.11 | PASSED |
| Hopping on, high end | 32.02 | PASSED |

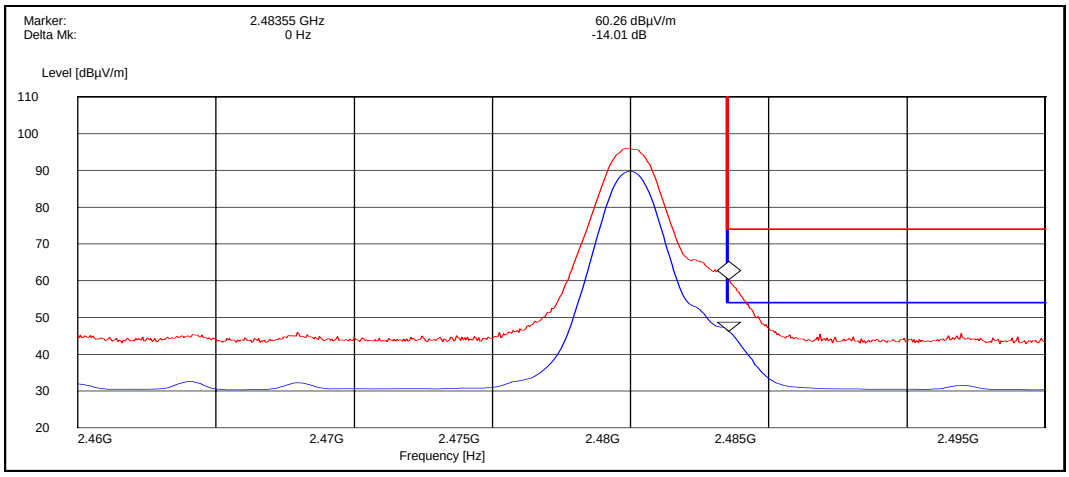
Peak (RBW: 1 MHz)

| Channel / $f_C$ [MHz] | E [dBµV/m] | Result |
|---|---|---|
| 0 / 2402 | 46.60 | PASSED |
| 78 / 2480 | 60.26 | PASSED |
| Hopping on, low end | 44.89 | PASSED |
| Hopping on, high end | 58.98 | PASSED |

Channel 0 / 2402 MHz




Channel 78 / 2480 MHz



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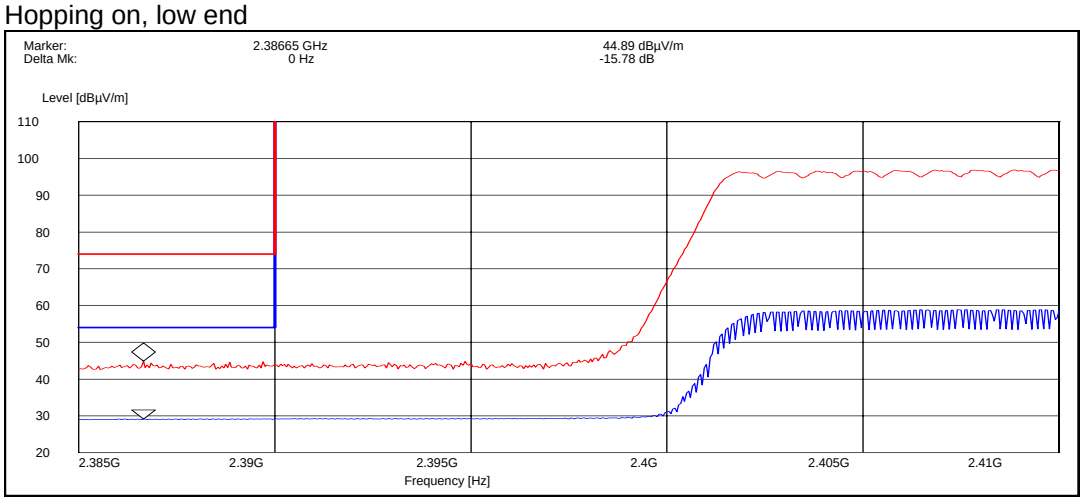
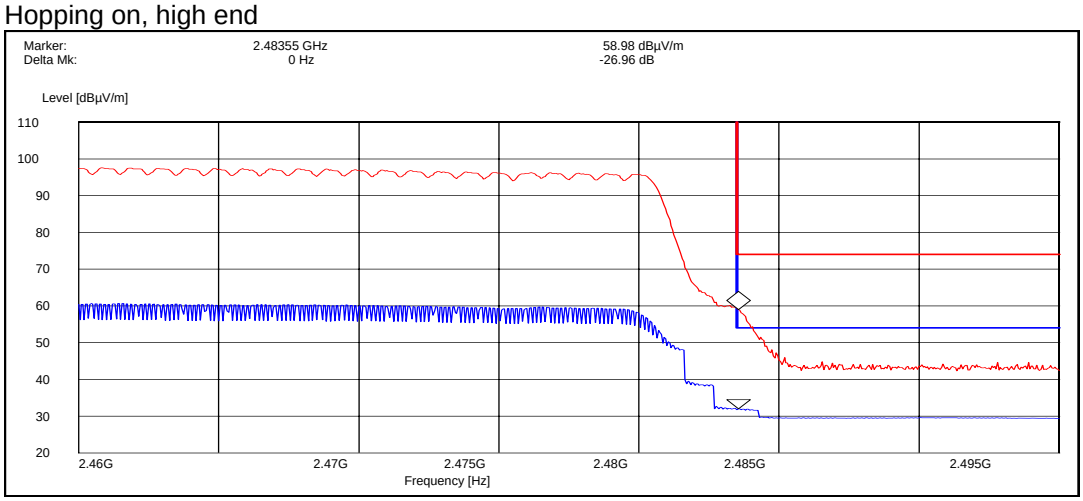
Hopping on, low end




Hopping on, high end



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# 5. Spurious RF conducted emissions
**(FCC §15.247(c), RSS-A8.5)**

| | |
|---|---|
| **EUT with DUT number** | RM-170: DUT 40650 |
| **Accessories with DUT numbers** | BL-5C: DUT 40625 |
| **Operation Voltage [V] / [Hz]** | - |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21/44/102.5 |
| **Date of measurements** | 25.4.2006, 2.5.2006 |
| **Measured by** | Jan-Erik Lilja |

## 5.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

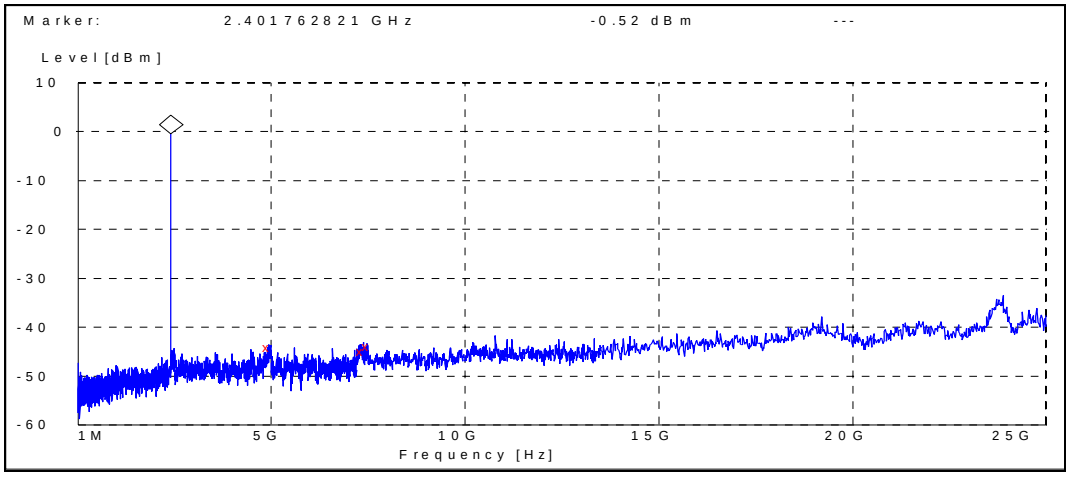
Limits for spurious RF conducted emissions measurements

| Frequency range [MHz] | Limit [dBc] |
|---|---|
| 1 – 25000 | ≤ -20 |

## 5.2. Bluetooth Test results

### 5.2.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz




| Frequency [MHz] | P [dBc] | Result |
|---|---|---|
| 4929.166667 | -43.677919 | Passed |
| 7370.192308 | -44.377919 | Passed |
| 7500.000000 | -43.477919 | Passed |



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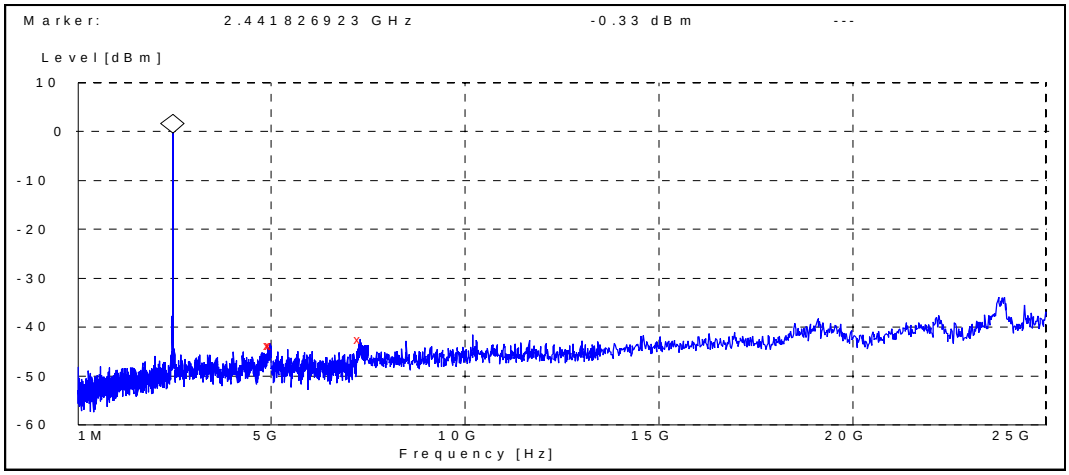
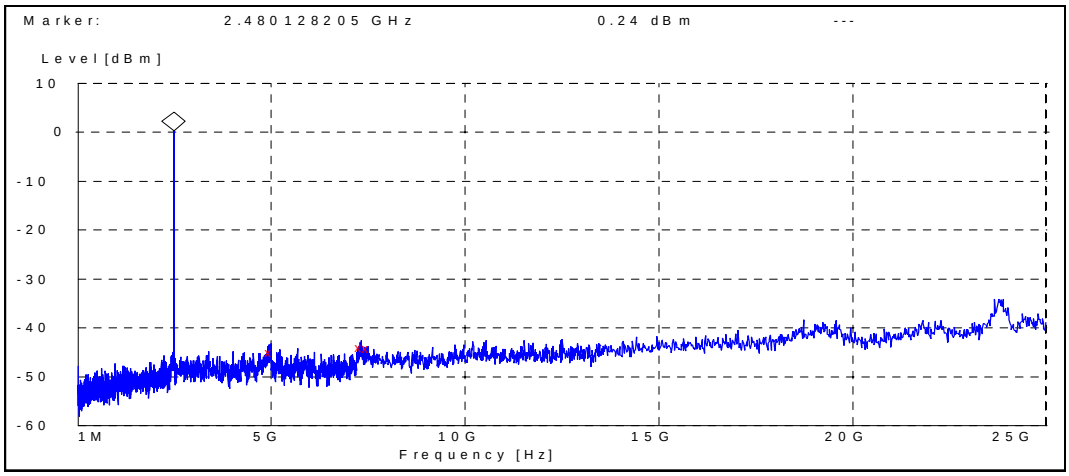
Channel 40 / 2442 MHz




| Frequency [MHz] | P [dBc] | Result |
|---|---|---|
| 4963.141026 | -43.474382 | Passed |
| 5000.000000 | -43.374382 | Passed |
| 7286.538462 | -42.174382 | Passed |

Channel 78 / 2480 MHz




| Frequency [MHz] | P [dBc] | Result |
|---|---|---|
| 4992.307692 | -45.138580 | Passed |
| 7307.692308 | -44.338580 | Passed |
| 7500.000000 | -44.538580 | Passed |

### 5.2.2 8DPSK modulation, PRBS packet type



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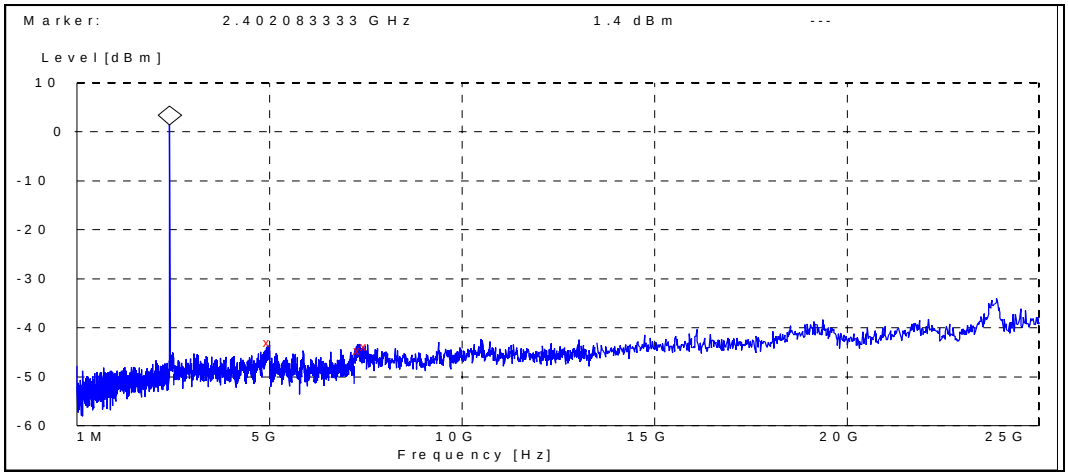
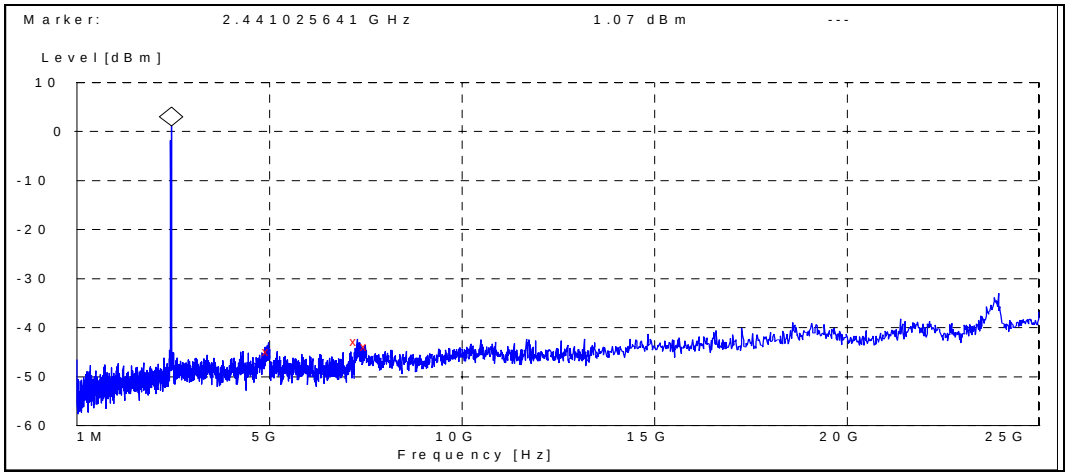
Channel 0 / 2402 MHz




| Frequency [MHz] | P [dBc] | Result |
|---|---|---|
| 4993.910256 | -44.398445 | Passed |
| 7355.769231 | -45.998445 | Passed |
| 7500.000000 | -45.198445 | Passed |

Channel 39 / 2441 MHz




| Frequency [MHz] | P [dBc] | Result |
|---|---|---|
| 4977.884615 | -46.065046 | Passed |
| 7275.000000 | -44.065046 | Passed |
| 7500.000000 | -45.065046 | Passed |



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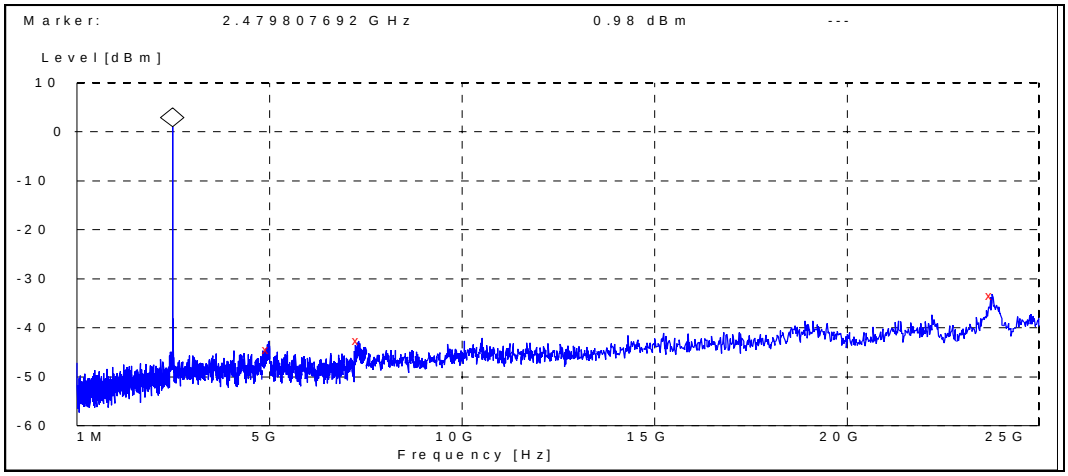
Channel 78 / 2480 MHz




| Frequency [MHz] | P [dBc] | Result |
|---|---|---|
| 4976.923077 | -45.381003 | Passed |
| 7318.750000 | -43.681003 | Passed |
| 23783.653846 | -34.481003 | Passed |



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# 6. Spurious radiated emissions

**(FCC §15.247(c), §15.209, RSS-210 A8.5)**

| | |
|---|---|
| **EUT with DUT number** | RM-170 DUT 40621 |
| **Accessories with DUT numbers** | BL-5C DUT 40626, AC-4 DUT 40627, HS-23 DUT 40651 |
| **Operation Voltage [V] / [Hz]** | 115 / 60 |
| **Result** | PASSED |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 22/48/102.4 |
| **Date of measurements** | 2.5.2006 |
| **Measured by** | Jari Jantunen |

## 6.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E\ [\mu V/m] = U_{RX} + A_{TOT}$$

Where $U_{RX}$ is receiver reading and $A_{TOT}$ is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + AF - G_{PREAMP}$).



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Limits for spurious radiated emissions measurements (3 m measurement distance)

| Frequency range [MHz[ | Limit [µV/m] | Limit [dBµV/m] | Detector |
|---|---|---|---|
| 30 – 88 | 100 | 40 | Quasi peak |
| 88 – 216 | 150 | 43.5 | Quasi peak |
| 216 – 960 | 200 | 46 | Quasi peak |
| 960 – 1000 | 500 | 54 | Quasi peak |
| Above 1000 | 500 | 54 | Average |
| Above 1000 | 5000 | 74 | Peak |

## 6.2. Bluetooth Test results

### 6.2.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz

Peak (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4804.000000 | 39.90 | 98.86 | 41.20 | -1.30 | VERTICAL | PASSED |
| 7206.000000 | 42.00 | 125.89 | 40.00 | 2.00 | VERTICAL | PASSED |

Average (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4804.000000 | 27.20 | 22.91 | 28.50 | -1.30 | VERTICAL | PASSED |
| 7206.000000 | 29.00 | 28.18 | 27.00 | 2.00 | HORIZONTAL | PASSED |

Channel 40 / 2442 MHz

Quasi peak (RBW: 120 kHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 38.235872 | 30.00 | 31.62 | 42.80 | -12.80 | VERTICAL | PASSED |
| 74.869940 | 19.80 | 9.77 | 45.60 | -25.80 | HORIZONTAL | PASSED |
| 74.948497 | 19.80 | 9.77 | 45.60 | -25.80 | HORIZONTAL | PASSED |

Peak (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4888.779559 | 39.90 | 98.86 | 41.50 | -1.60 | VERTICAL | PASSED |
| 7279.565130 | 43.20 | 144.54 | 40.50 | 2.70 | VERTICAL | PASSED |
| 7297.089178 | 42.70 | 136.46 | 40.00 | 2.70 | HORIZONTAL | PASSED |
| 7417.337675 | 43.00 | 141.25 | 39.70 | 3.30 | HORIZONTAL | PASSED |
| 17952.905812 | 55.20 | 575.44 | 33.80 | 21.40 | HORIZONTAL | PASSED |

Average (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4893.779559 | 27.10 | 22.65 | 28.80 | -1.70 | VERTICAL | PASSED |
| 7285.565130 | 30.20 | 32.36 | 27.50 | 2.70 | VERTICAL | PASSED |
| 7295.589178 | 30.10 | 31.99 | 27.40 | 2.70 | HORIZONTAL | PASSED |
| 7422.837675 | 30.40 | 33.11 | 27.10 | 3.30 | HORIZONTAL | PASSED |
| 17953.405812 | 42.70 | 136.46 | 21.30 | 21.40 | HORIZONTAL | PASSED |



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Channel 78 / 2480 MHz

Peak (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4960.000000 | 40.60 | 107.15 | 41.60 | -1.00 | HORIZONTAL | PASSED |
| 7440.000000 | 44.50 | 167.88 | 41.30 | 3.20 | HORIZONTAL | PASSED |

Average (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4960.000000 | 27.80 | 24.55 | 28.80 | -1.00 | VERTICAL | PASSED |
| 7440.000000 | 30.40 | 33.11 | 27.20 | 3.20 | HORIZONTAL | PASSED |

### 6.2.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz

Peak (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4804.000000 | 40.10 | 101.16 | 41.40 | -1.30 | VERTICAL | PASSED |
| 7206.000000 | 41.70 | 121.62 | 39.70 | 2.00 | HORIZONTAL | PASSED |

Average (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4804.000000 | 27.10 | 22.65 | 28.40 | -1.30 | VERTICAL | PASSED |
| 7206.000000 | 29.20 | 28.84 | 27.20 | 2.00 | VERTICAL | PASSED |

Channel 39 / 2441 MHz

Quasi peak (RBW: 120 kHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 38.095391 | 21.90 | 12.45 | 34.60 | -12.70 | VERTICAL | PASSED |
| 74.369940 | 19.40 | 9.33 | 45.20 | -25.80 | HORIZONTAL | PASSED |
| 74.388978 | 19.50 | 9.44 | 45.30 | -25.80 | HORIZONTAL | PASSED |
| 127.413828 | 4.10 | 1.60 | 28.70 | -24.60 | VERTICAL | PASSED |

Peak (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4884.000000 | 39.90 | 98.86 | 41.50 | -1.60 | HORIZONTAL | PASSED |
| 7286.065130 | 43.20 | 144.54 | 40.50 | 2.70 | VERTICAL | PASSED |
| 7334.169339 | 42.90 | 139.64 | 40.20 | 2.70 | VERTICAL | PASSED |
| 7416.331663 | 43.60 | 151.36 | 40.30 | 3.30 | HORIZONTAL | PASSED |
| 17991.975952 | 56.10 | 638.26 | 34.60 | 21.50 | HORIZONTAL | PASSED |



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Average (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4884.000000 | 27.30 | 23.17 | 28.90 | -1.60 | VERTICAL | PASSED |
| 7282.565130 | 30.30 | 32.73 | 27.60 | 2.70 | VERTICAL | PASSED |
| 7336.169339 | 30.00 | 31.62 | 27.20 | 2.80 | VERTICAL | PASSED |
| 7414.331663 | 30.50 | 33.50 | 27.20 | 3.30 | HORIZONTAL | PASSED |
| 17989.475952 | 42.80 | 138.04 | 21.30 | 21.50 | HORIZONTAL | PASSED |

Channel 78 / 2480 MHz

Peak (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4960.000000 | 41.10 | 113.50 | 42.10 | -1.00 | VERTICAL | PASSED |
| 7440.000000 | 43.60 | 151.36 | 40.40 | 3.20 | HORIZONTAL | PASSED |

Average (RBW: 1 MHz)

| Frequency [MHz] | E [dBµV/m] | E [µV/m] | $U_{RX}$ [dBµV] | $A_{TOT}$ [dB] | Polarisation | Result |
|---|---|---|---|---|---|---|
| 4960.000000 | 28.00 | 25.12 | 29.00 | -1.00 | VERTICAL | PASSED |
| 7440.000000 | 30.40 | 33.11 | 27.20 | 3.20 | VERTICAL | PASSED |



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# 7. AC powerline conducted emissions

**(FCC §15.207, RSS-GEN 7.2.2)**

| | |
|---|---|
| **EUT with DUT number** | RM-170 DUT 40621 |
| **Accessories with DUT numbers** | BL-5C DUT 40626, AC-4 DUT 40627, HS-23 DUT 40651 |
| **Operation Voltage [V] / [Hz]** | 115 / 60 |
| **Result** | PASSED |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 20 / 48 / 103.7 |
| **Date of measurements** | 4.5.2006 |
| **Measured by** | Jari Jantunen |

## 7.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-GEN as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U\ [dB\mu V] = U_{RX} + A_{TOT}$$

Where $U_{RX}$ is receiver reading and $A_{TOT}$ is total correction factor including cable and pulse limiter attenuations.

CISPR 22 Class B limits

| Frequency range [MHz] | Quasi peak limit [dBµV] | Average limit [dBµV] |
|---|---|---|
| 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |



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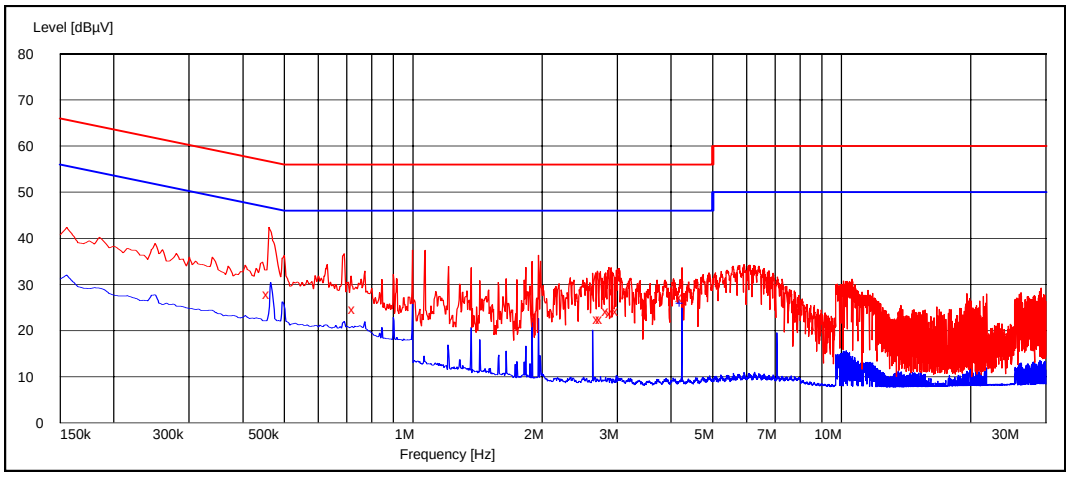
## 7.2. Bluetooth Test results

### 7.2.1 GFSK modulation, PRBS packet type

Channel 40 / 2442 MHz




Quasi peak (RBW: 9 kHz)

| Frequency [MHz] | U [dBµV] | Line | Result |
|---|---|---|---|
| 0.460000 | 27.80 | L1 | PASSED |
| 0.730000 | 24.60 | L1 | PASSED |
| 2.725000 | 22.40 | L1 | PASSED |
| 2.760000 | 22.50 | L1 | PASSED |
| 2.855000 | 24.20 | L1 | PASSED |
| 2.915000 | 23.80 | L1 | PASSED |
| 3.005000 | 24.30 | L1 | PASSED |
| 4.240000 | 27.20 | L1 | PASSED |

Average (RBW: 9 kHz)

| Frequency [MHz] | U [dBµV] | Line | Result |
|---|---|---|---|
| 4.240000 | 25.90 | N | PASSED |



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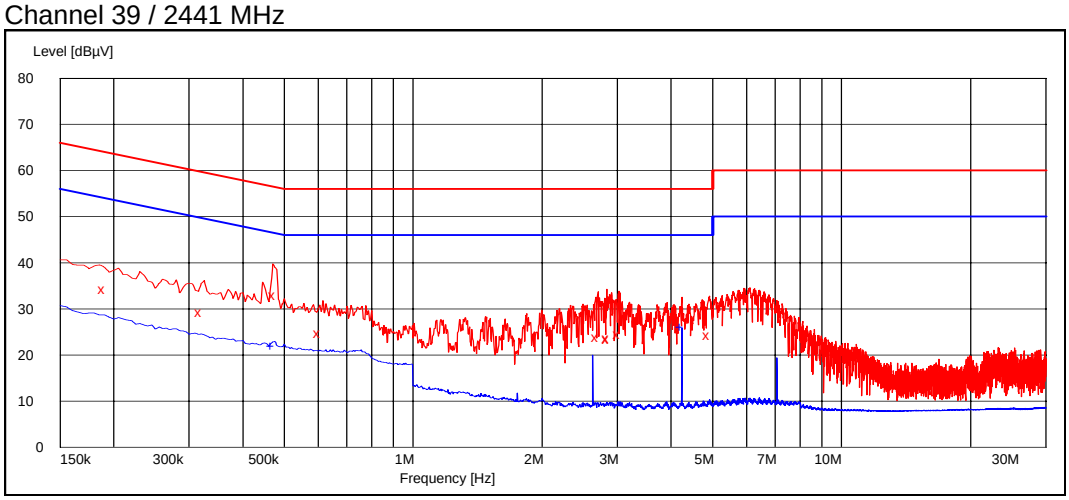
### 7.2.2 8DPSK modulation, PRBS packet type

Channel 39 / 2441 MHz




Quasi peak (RBW: 9 kHz)

| Frequency [MHz] | U [dBµV] | Line | Result |
|---|---|---|---|
| 0.190000 | 34.20 | N | PASSED |
| 0.320000 | 29.40 | L1 | PASSED |
| 0.475000 | 32.90 | L1 | PASSED |
| 0.605000 | 24.80 | N | PASSED |
| 2.695000 | 23.90 | L1 | PASSED |
| 2.855000 | 23.60 | L1 | PASSED |
| 2.860000 | 23.50 | L1 | PASSED |
| 3.030000 | 24.50 | L1 | PASSED |
| 3.035000 | 24.50 | L1 | PASSED |
| 4.905000 | 24.40 | L1 | PASSED |

Average (RBW: 9 kHz)

| Frequency [MHz] | U [dBµV] | Line | Result |
|---|---|---|---|
| 0.470000 | 21.90 | L1 | PASSED |
| 4.240000 | 26.00 | L1 | PASSED |



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# 8. 20 dB bandwidth

**(FCC §15.247(a)(1), RSS-210 A8.1 (1))**

| | |
|---|---|
| **EUT with DUT number** | RM-170: DUT 40650 |
| **Accessories with DUT numbers** | BL-5C: DUT 40625 |
| **Operation Voltage [V] / [Hz]** | - |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21/44/102.5-104.0 |
| **Date of measurements** | 25.4.2006, 2.5.2006, 5.5.2006 |
| **Measured by** | Jan-Erik Lilja |

## 8.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for 20 dB bandwidth measurements

| Limit [MHz] |
|---|
| N/A |

## 8.2. Bluetooth Test results

### 8.2.1 GFSK modulation, PRBS packet type

| Channel / $f_C$ [MHz] | 20 dB bandwidth [kHz] | Result |
|---|---|---|
| 0 / 2402 | 961.538 | Passed |
| 40 / 2442 | 977.564 | Passed |
| 78 / 2480 | 935.897 | Passed |



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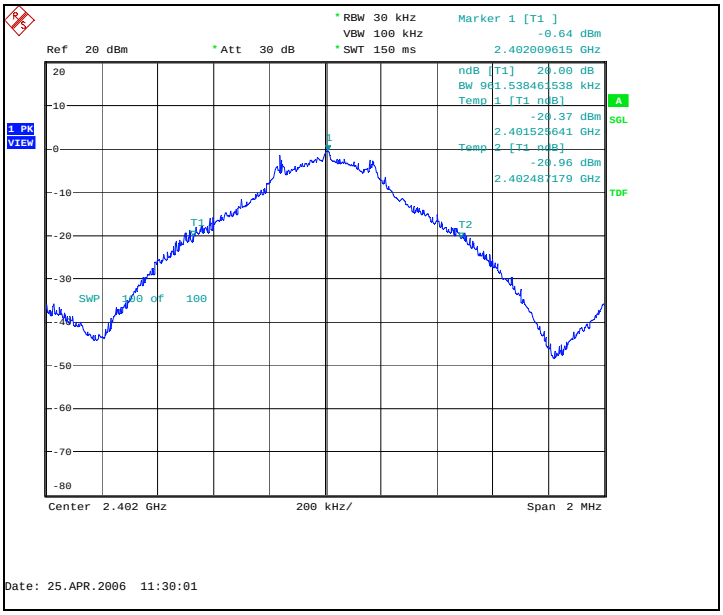
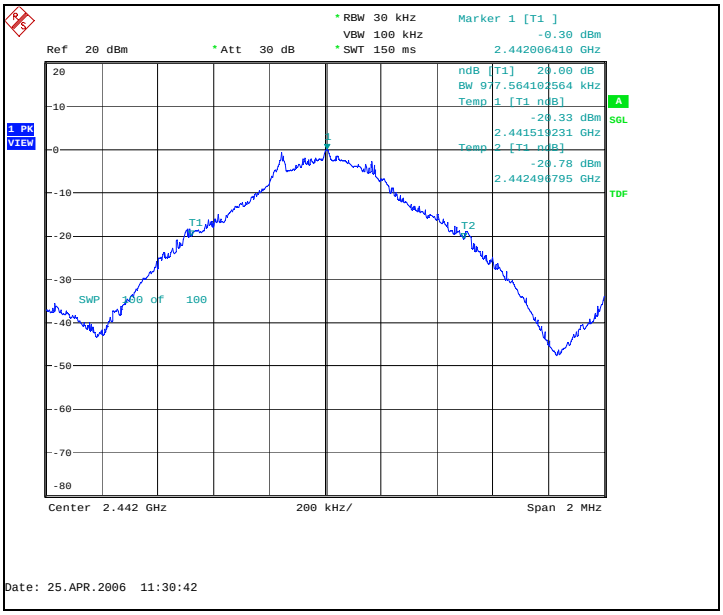
Channel 0 / 2402 MHz




Channel 40 / 2442 MHz



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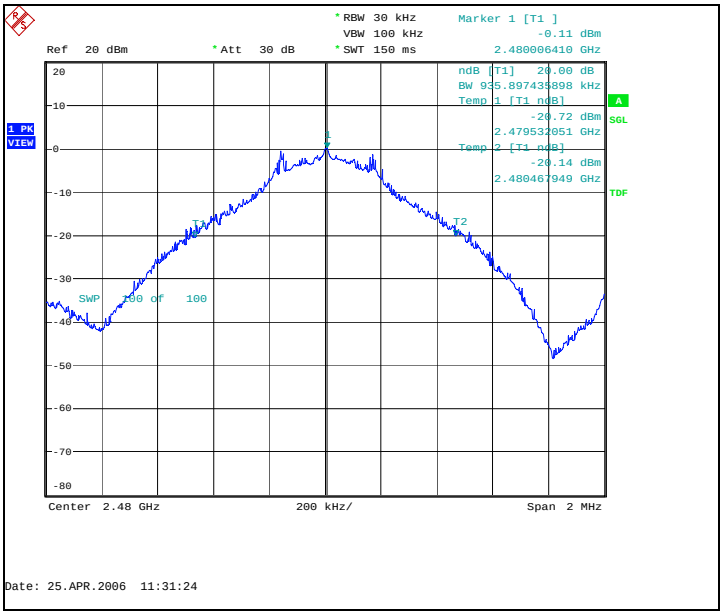
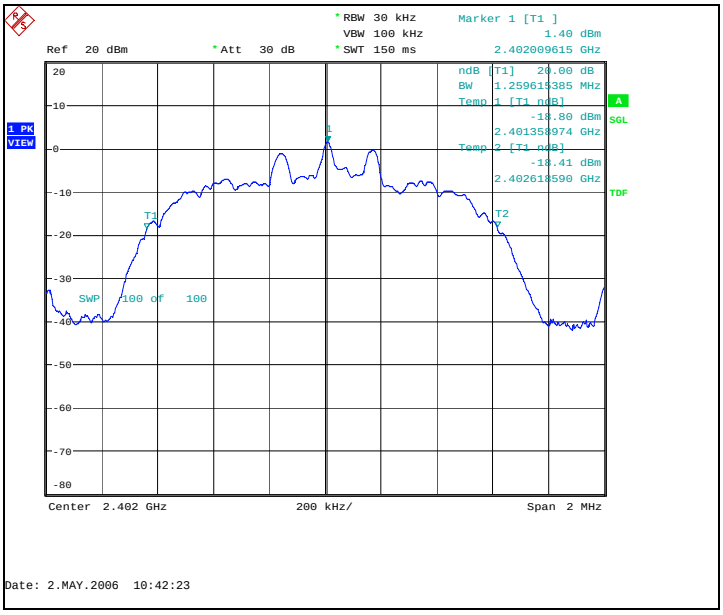
Channel 78 / 2480 MHz




## 8.2.2 8DPSK modulation, PRBS packet type

| Channel / $f_C$ [MHz] | 20 dB bandwidth [kHz] | Result |
|---|---|---|
| 0 / 2402 | 1259.615 | Passed |
| 39 / 2441 | 1259.615 | Passed |
| 78 / 2480 | 1259.615 | Passed |

Channel 0 / 2402 MHz









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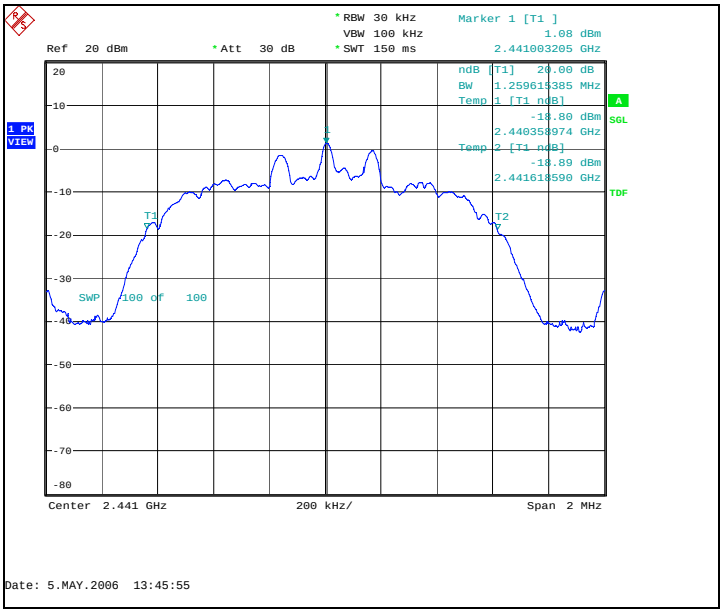
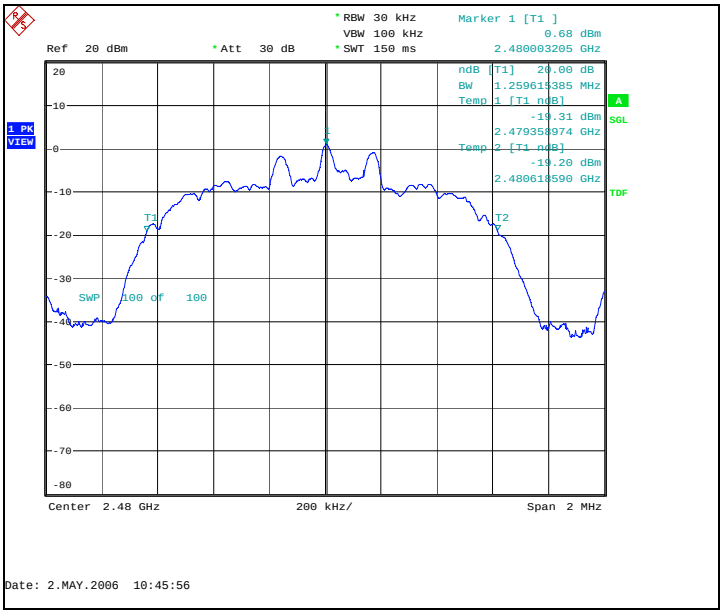
Channel 39 / 2441 MHz




Channel 78 / 2480 MHz









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# 9. Carrier frequency separation

**(FCC §15.247(a)(1), RSS-210 A8.1 (2))**

| | |
|---|---|
| **EUT with DUT number** | RM-170: DUT 40650 |
| **Accessories with DUT numbers** | BL-5C: DUT 40625 |
| **Operation Voltage [V] / [Hz]** | - |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21/44/102.5 |
| **Date of measurements** | 25.4.2006, 2.5.2006 |
| **Measured by** | Jan-Erik Lilja |

## 9.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for carrier frequency separation measurements

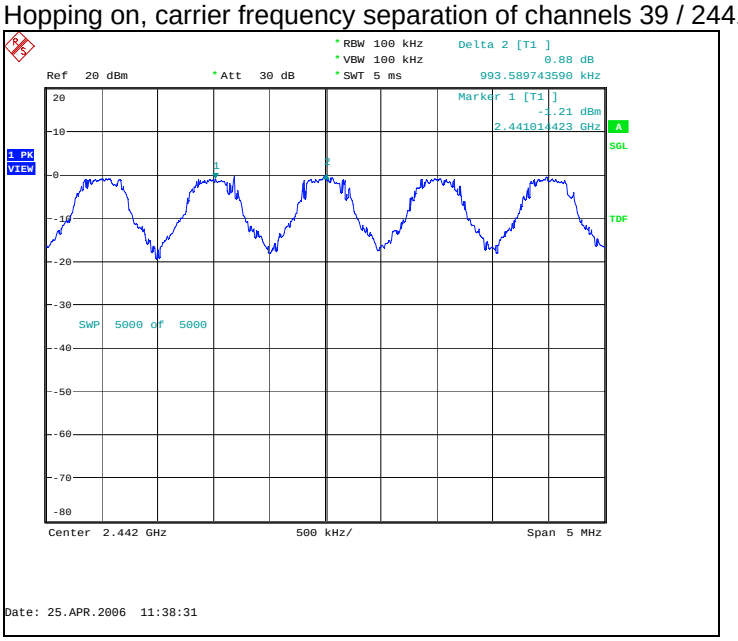
| Limit [MHz] |
|---|
| ≥ 0.025 or 2/3 of the 20 dB bandwidth |

## 9.2. Bluetooth Test results

### 9.2.1 GFSK modulation, PRBS packet type

| Carrier frequency separation [kHz] | Result |
|---|---|
| 993.59 | Passed |

Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



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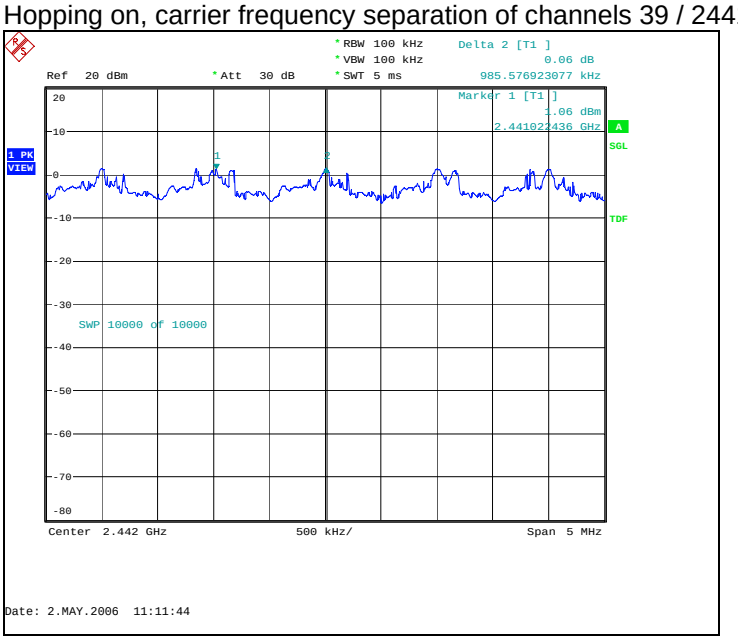
### 9.2.2 8DPSK modulation, PRBS packet type

| Carrier frequency separation [kHz] | Result |
|---|---|
| 985.577 | Passed |

Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz









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# 10. Number of hopping frequencies

**(FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))**

| | |
|---|---|
| **EUT with DUT number** | RM-170: DUT 40650 |
| **Accessories with DUT numbers** | BL-5C: DUT 40625 |
| **Operation Voltage [V] / [Hz]** | - |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21/44/102.5 |
| **Date of measurements** | 25.4.2006, 2.5.2006 |
| **Measured by** | Jan-Erik Lilja |

## 10.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for number of hopping frequencies measurements

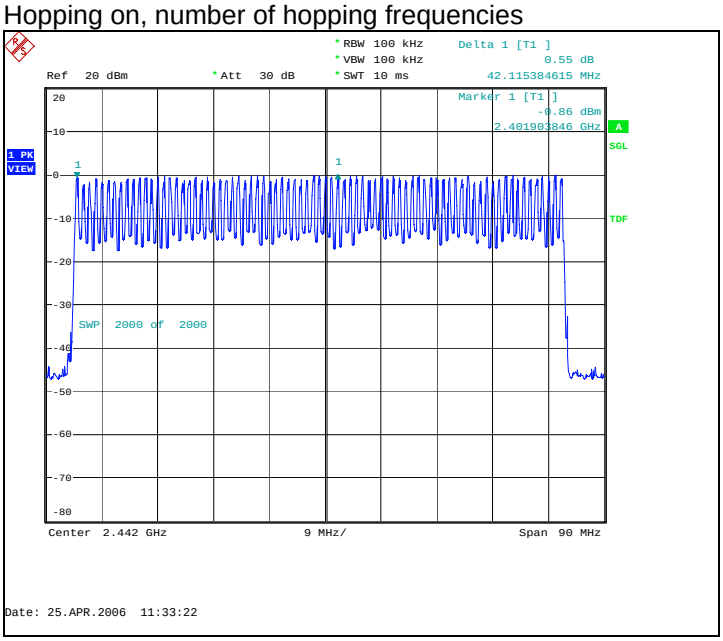
| Limit [number] |
|---|
| ≥ 15 |

## 10.2. Bluetooth Test results

### 10.2.1 GFSK modulation, PRBS packet type

| Measured number of hopping frequencies | Result |
|---|---|
| 79 | Passed |

Hopping on, number of hopping frequencies









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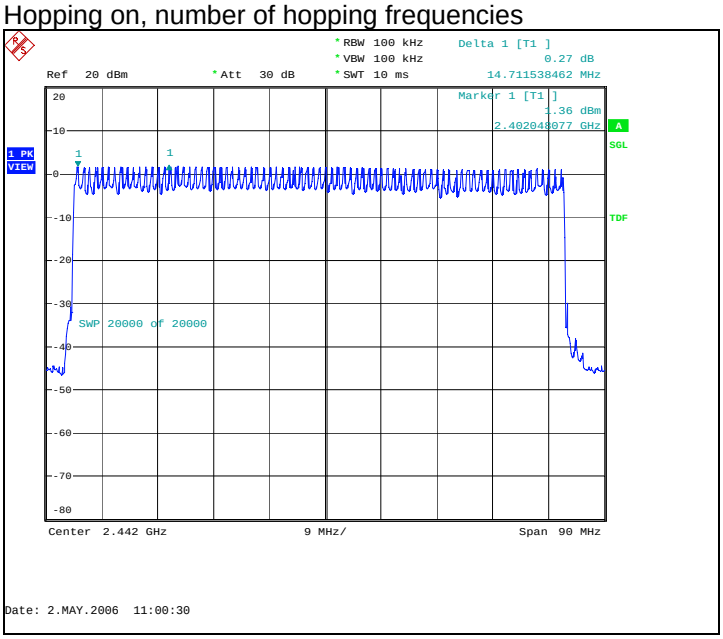
## 10.2.2 8DPSK modulation, PRBS packet type

| Measured number of hopping frequencies | Result |
|---|---|
| 79 | Passed |

Hopping on, number of hopping frequencies









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# 11. Time of occupancy

**(FCC §15.247(a)(1)(iii), RSS-210 A8.1 (4))**

| | |
|---|---|
| **EUT with DUT number** | RM-170: DUT 40650 |
| **Accessories with DUT numbers** | BL-5C: DUT 40625 |
| **Operation Voltage [V] / [Hz]** | - |
| **Result** | Passed |
| **Remarks** | - |
| **Temp [°C] / Humidity [%RH] / Air Pressure [kPa]** | 21/44/102.5 |
| **Date of measurements** | 25.4.2006, 2.5.2006 |
| **Measured by** | Jan-Erik Lilja |

## 11.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The total time of occupancy is get by multiplying the measured number of transmissions occurred during 31.6 second period with the duration of one transmission.

Limits for time of occupancy measurements

| Limit [s] |
|---|
| ≤ 0.4 |

## 11.2. Bluetooth test results

### 11.2.1 GFSK modulation, PRBS packet type

| Measured number of transmissions | Duration of one transmission [µs] | Time of occupancy [s] | Result |
|---|---|---|---|
| 71 | 2961.538 | 0.210269 | Passed |



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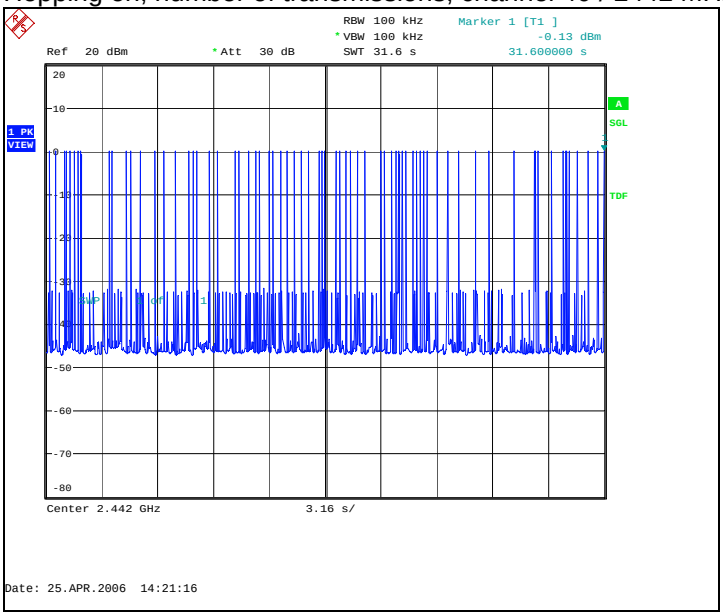
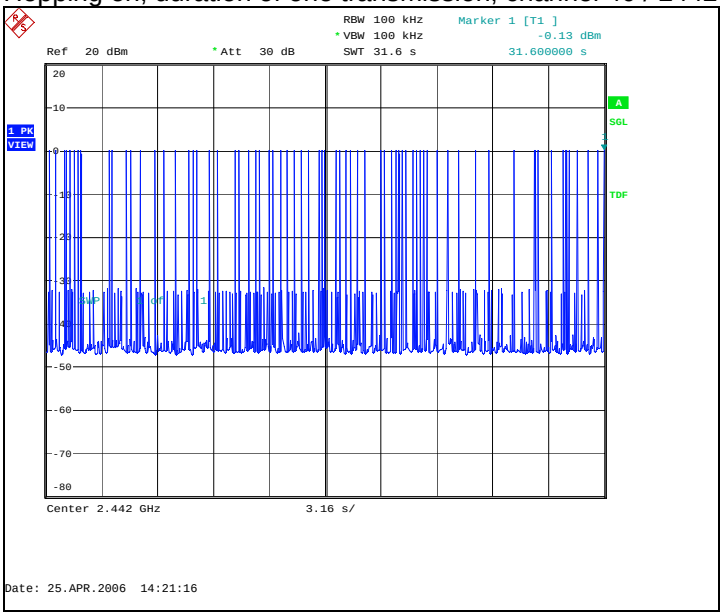
Hopping on, number of transmissions, channel 40 / 2442 MHz




Hopping on, duration of one transmission, channel 40 / 2442 MHz




### 11.2.2 8DPSK modulation, PRBS packet type

| Measured number of transmissions | Duration of one transmission [µs] | Time of occupancy [s] | Result |
|---|---|---|---|
| 108 | 2980.769 | 0.321923 | Passed |



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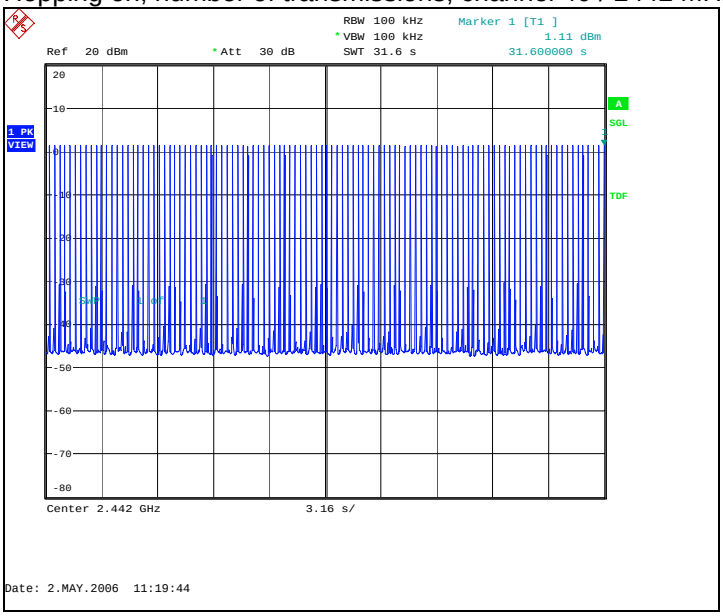
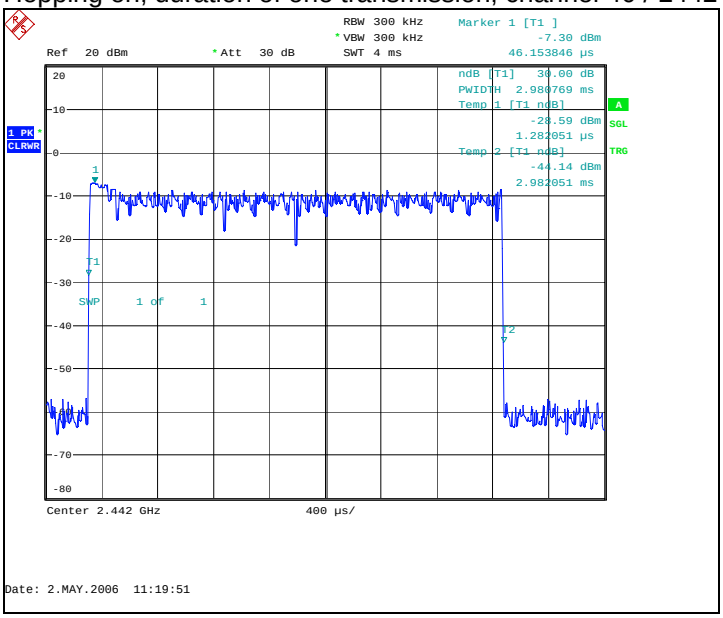
Hopping on, number of transmissions, channel 40 / 2442 MHz




Hopping on, duration of one transmission, channel 40 / 2442 MHz









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# 12. Test Equipment

## 12.1. Conducted measurements

| Eq. No | Equipment | Type | Manufacturer | Used in |
|---|---|---|---|---|
| TM37610 | Spectrum analyzer | FSU | R&S | 15C,22/24 |
| TM37678 | Radio communication tester | CMU-200 | R&S | 15C,22/24 |
| | Attenuator 10 dB | 6251.17.A | Huber+Suhner AG | 15C,22/24 |
| TM22901 | Step attenuator 110dB | 8496A | Agilent | 15C,22/24 |
| TM37499 | Power splitter | 11667A | Agilent | 15C,22/24 |
| | Temperature chamber | VT4002 | Vötsch | 15C,22/24 |
| TM38112 | DC power supply | 6632A | Agilent | 15C,22/24 |
| TM38111 | Multimeter | 34401A | Agilent | 15C,22/24 |
| TM38845 | EMI receiver | ESI 40 | R&S | 15B,15C |
| TM37773 | Radio communication tester | CMU-200 | R&S | 15B,15C |
| TM38631 | Signal generator | 83640L | Agilent | 15B,15C |
| TM38114 | DC power supply | 6632A | Agilent | 15B,15C |
| TM22835 | Multimeter | 87 | Fluke | 15B,15C |
| TM30600 | Pulse Limiter | ESH3-Z2 | R&S | 15B,15C |
| TM26490 | LISN 50 µH | ESH3-Z5/ | R&S | 15B,15C |
| TM30636 | LISN 50 µH | L2-16/ | PMM | 15B,15C |

## 12.2. Radiated measurements

| Eq. No | Equipment | Type | Manufacturer | Used in |
|---|---|---|---|---|
| TM30599 | 3m semi-anechoic chamber | | TDK | 15B,15C, 22/24 |
| TM38845 | EMI receiver | ESI 40 | R&S | 15B,15C, 22/24 |
| TM37498 | Preamplifier | AMF-5D-020180-26-10P | MITEQ | 15B,15C, 22/24 |
| TM37523 | Preamplifier | AMF-4D-10M-3G-25-20P | MITEQ | 15B,15C, 22/24 |
| TM37516 | Biconilog antenna | HL562 | R&S | 15B,15C, 22/24 |
| TM26496 | Double ridged waveguide antenna | 3115 | EMCO | 15B,15C, 22/24 |
| TM39158 | Horn antenna | 3116 | EMCO | 15B,15C, 22/24 |
| TM26492 | Reference dipole set | UHAP/VHAP | Schwarzbeck | 15B,15C, 22/24 |
| TM37501 | Dipole antenna | 3125-870 | EMCO | 22/24 |
| TM37502 | Dipole antenna | 3125-1880 | EMCO | 22/24 |
| TM37773 | Radio communication tester | CMU-200 | R&S | 15B,15C, 22/24 |
| TM38631 | Signal generator | 83640L | Agilent | 15B,15C, 22/24 |
| TM38066 | High pass filter | 4HC3000/18000-3-KK | Trilithic | 15B,15C, 22/24 |
| | High pass filter | WHK2010-10SS | Trilithic | 15B,15C, 22/24 |
| | Low pass filter | WLK1750-10SS | Trilithic | 15B,15C, 22/24 |
| TM26511 | Tunable notch filter | WRCA870 | Wainwright | 22/24 |
| TM38215 | Tunable notch filter | WRCD1850/1910-0.2/40 | Wainwright | 22/24 |
| TM38214 | Band reject filter | WRCT 2402/2480-2400/2483.5-30 | Wainwright | 15C |
| TM30642 | Turntable controller | HD-100 | Deisel | 15B,15C, 22/24 |
| TM26500 | Turntable | DS412 | Deisel | 15B,15C, 22/24 |
| TM38842 | Antenna mast controller | 2090 | EMCO | 15B,15C, 22/24 |
| TM38843 | Antenna mast | 2075 | EMCO | 15B,15C, 22/24 |
| TM38114 | DC power supply | 6632A | Agilent | 15B,15C, 22/24 |
| TM22835 | Multimeter | 87 | Fluke | 15B,15C, 22/24 |



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