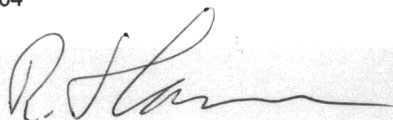


## BT Transmitter Compliance Test Report for RH-28

|                                                         |                                                                                                                                                                                                                                                           |                                   |                                                                                                               |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Test Report no.:</b>                                 | DTX11612-EN                                                                                                                                                                                                                                               | <b>Date of Report:</b>            | 07/19/2004                                                                                                    |
| <b>Number of pages:</b>                                 | 42                                                                                                                                                                                                                                                        | <b>Customer's Contact person:</b> | Per Crety                                                                                                     |
|                                                         |                                                                                                                                                                                                                                                           | <b>Responsible Test engineer:</b> | Ruben Hansen                                                                                                  |
| <b>Testing laboratory:</b>                              | TCC Copenhagen<br>Frederikskaj<br>1790 COPENHAGEN V<br>DENMARK<br>Tel. +45 33 292929<br>Fax. +45 33 292934                                                                                                                                                | <b>Client:</b>                    | Nokia Corporation<br>Frederikskaj<br>1790 COPENHAGEN V<br>DENMARK<br>Tel. +45 33 292929<br>Fax. +45 33 292934 |
| <b>Tested devices/ accessories:</b>                     | <b>Phone; RH-28 and Battery; BL- 5C</b>                                                                                                                                                                                                                   |                                   |                                                                                                               |
| <b>Supplement reports:</b>                              |                                                                                                                                                                                                                                                           |                                   |                                                                                                               |
| <b>Testing has been carried out in accordance with:</b> | The tests listed in this report have been done to demonstrate compliance with the applicable requirements in FCC rules Part 15.247 and IC standard RSS-210                                                                                                |                                   |                                                                                                               |
| <b>Documentation:</b>                                   | 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 Copenhagen. |                                   |                                                                                                               |
| <b>Test Results:</b>                                    | <b>The EUT complies with the requirements in respect of all parameters subject to the test.</b><br>The test results relate only to devices specified in this document                                                                                     |                                   |                                                                                                               |
| <b>Date and signature(s) for the contents:</b>          | 07/26/2004                                                                                                                                                                                                                                                |                                   |                                                                                                               |



**Ruben Hansen**  
Team Leader

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|                                       |           |
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## Summary of test RESULTS

| Rule part in CFR 47     | Section in RSS-210 |                                      | Result |
|-------------------------|--------------------|--------------------------------------|--------|
| 15.247, a1              | 6.2.2 (o), a1      | Carrier frequency separation         | PASS   |
| 15.247, a1ii            | 6.2.2 (o), a3      | Number of hopping frequencies        | PASS   |
| 15.247, a1ii, 15.247, f | 6.2.2 (o), a3      | Time of occupancy                    | PASS   |
| 15.247, a               | 6.2.2 (o), a1      | 20dB bandwidth                       | PASS   |
| 15.247, b1              | 6.2.2 (o), a3      | Peak output power                    | PASS   |
| 15.247, c               | 6.2.2 (o), e1      | Band-edge compliance of RF emissions | PASS   |
| 15.207                  | 6.6                | AC powerline conducted emissions     | -      |
| 15.247, c               | 6.2.2 (o), e1      | Spurious RF conducted emissions      | PASS   |
| 15.247, c               | 6.2.2 (o), e1      | Spurious radiated emissions          | PASS   |

PASS Pass

FAIL Fail

X Measured, but there is no applicable performance criteria

- Not done

## 1. EUT Information

| Product  | Type    | SN                            | HW       | MV | SW   | DUT    |
|----------|---------|-------------------------------|----------|----|------|--------|
| Phone    | RH-28   | KKH595021                     | TR_01-2B |    | 4.28 | 234280 |
| Phone    | RH-28   | KKH595027                     | TR_01-2B |    | 4.28 | 234282 |
| Battery  | BL-5C   | 067039880257336331            |          |    |      | 233002 |
| MMC card | DTS-128 | MC1DU128NAVA-OMBNO Y8F270G349 |          |    |      | 233747 |

### 1.1. EUT description

The EUT is a triple band ( 850MHz/1800MHz/1900MHz) E-GPRS (EDGE) GSM cellular phone with Bluetooth functionality.

The EUT was not modified during the tests.

## 2. EUT TEST SETUP

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

The EUT was equipped with an external antenna connector for conductive measurements.

The Bluetooth simulator was used to control the following:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns

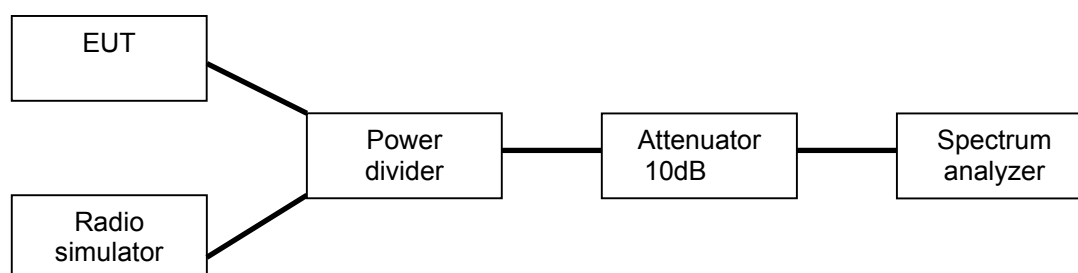
In tests, where absolute level reporting were required, the results were corrected with all applicable factors as detailed in the result section of each measurement.

### 3. Carrier Frequency Separation

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.2 °C / 58.5 RH%                   |
| Date of measurement          | 16-07-2004                           |
|                              | §15.247 (a) (1)                      |
|                              | 6.2.2 (o), a1                        |
|                              | Jesper Nielsen                       |

#### 3.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



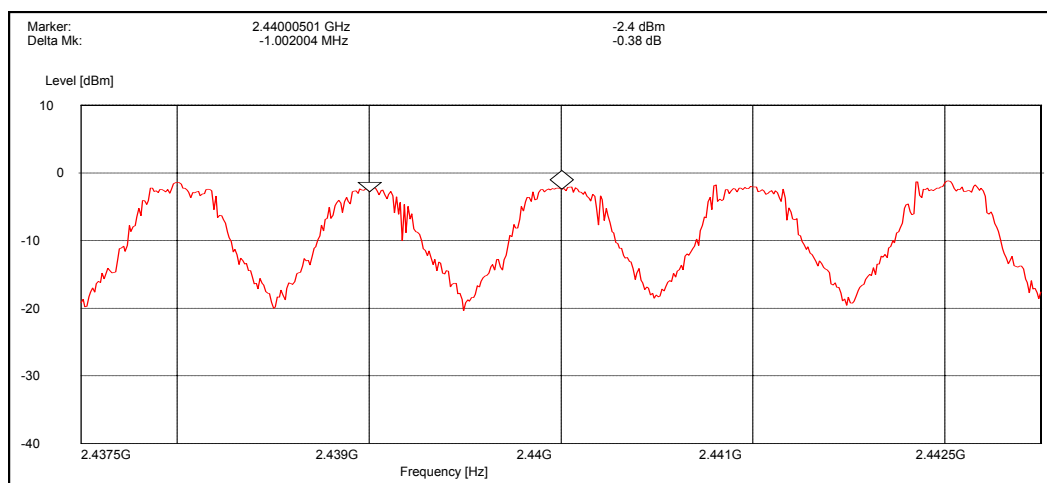
#### 3.1.1 Measuring Equipment Set-up

|                        |                                                  |
|------------------------|--------------------------------------------------|
| <b>Frequency Range</b> | 2437.5 MHz – 2442.5 MHz (Center Freq.= 2440 MHz) |
| <b>Sweep Mode</b>      | Continuously, Max hold                           |
| <b>Sweep time</b>      | Coupled                                          |
| <b>Res.BW / VBW</b>    | 100 kHz / 100 kHz                                |
| <b>Detector</b>        | Peak                                             |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external                  |
| <b>Ref. Level</b>      | 0 dBm                                            |

### 3.1.2 EUT Operational Mode

|                                |                                          |
|--------------------------------|------------------------------------------|
| <b>Transmission Parameters</b> | Connection, Static PRBS, DH5 packet type |
| <b>Bluetooth channel</b>       | Hopping (US / Eur scheme)                |
| <b>EUT Tx power level</b>      | Nominal                                  |

### 3.1.3 Graph



### 3.1.4 Test Results

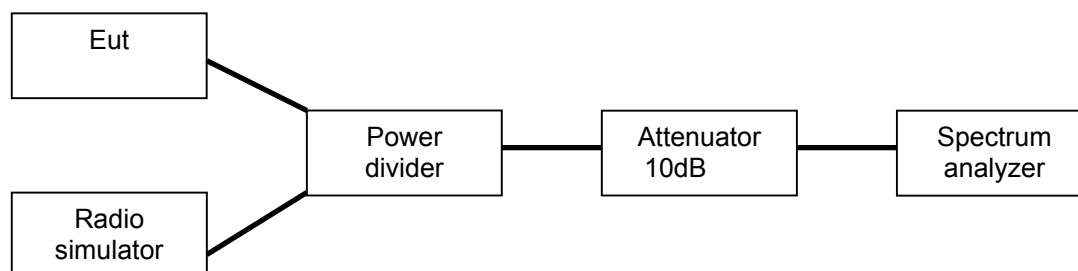
| Limit [MHz]             | Measured [MHz] | Result |
|-------------------------|----------------|--------|
| $\geq 0.025$ or 20dB BW | 1.002          | Passed |

## 4. Number of Hopping Frequencies

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.2 °C / 58.5 RH%                   |
|                              | 16-07-2004                           |
|                              | §15.247 (a) (2)                      |
|                              | 6.2.2 (o), a3                        |
|                              | Jesper Nielsen                       |

### 4.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



#### 4.1.1 Measuring Equipment Set-up

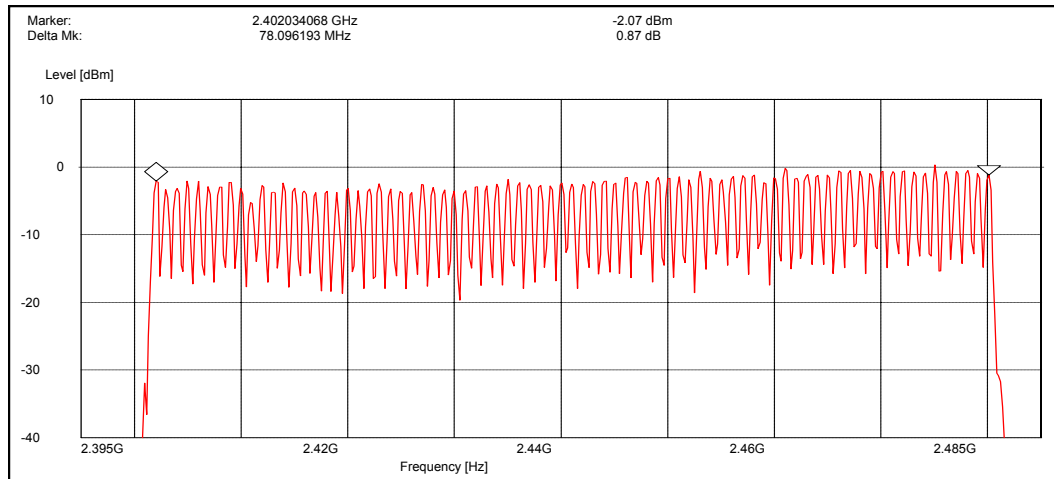
|                        |                                 |
|------------------------|---------------------------------|
| <b>Frequency Range</b> | 2395 MHz – 2485 MHz             |
| <b>Sweep Mode</b>      | Continuously, Max hold          |
| <b>Sweep time</b>      | Coupled                         |
| <b>Res.BW / VBW</b>    | 100 kHz / 100 kHz               |
| <b>Detector</b>        | Peak                            |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external |
| <b>Ref. Level</b>      | 0 dBm                           |

#### 4.1.2 EUT Operational Mode

|                                |                                          |
|--------------------------------|------------------------------------------|
| <b>Transmission Parameters</b> | Connection, Static PRBS, DH5 packet type |
| <b>Bluetooth channel</b>       | Hopping (US / Eur scheme)                |
| <b>EUT Tx power level</b>      | Nominal                                  |



### 4.1.3 Graph



### 4.1.4 Test Results

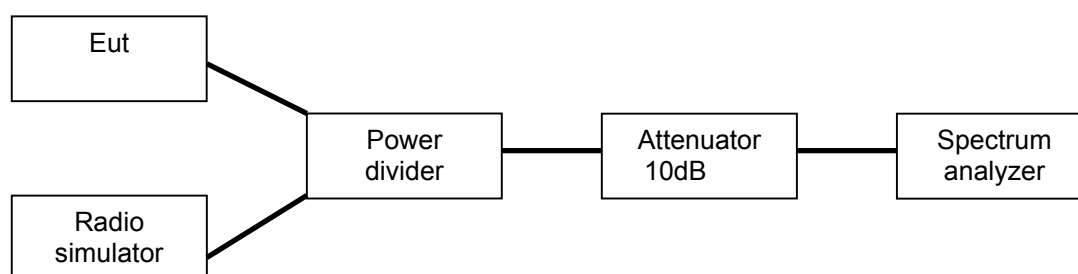
| Required number | Actual Number | Result |
|-----------------|---------------|--------|
| ≥ 75            | 79            | Passed |

## 5. Time of occupancy

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.0 °C / 58.0 RH%                   |
|                              | 17-07-2004                           |
|                              | §15.247 (a) (3)                      |
|                              | 6.2.2 (o), a3                        |
|                              | Jesper Nielsen                       |

### 5.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



### 5.2. Page mode

#### 5.2.1 EUT Operational Mode

|                           |                           |
|---------------------------|---------------------------|
| <b>EUT operation mode</b> | Page                      |
| <b>Bluetooth channel</b>  | Hopping (US / Eur scheme) |
| <b>EUT Tx power level</b> | Nominal                   |

#### 5.2.2 Limits and results

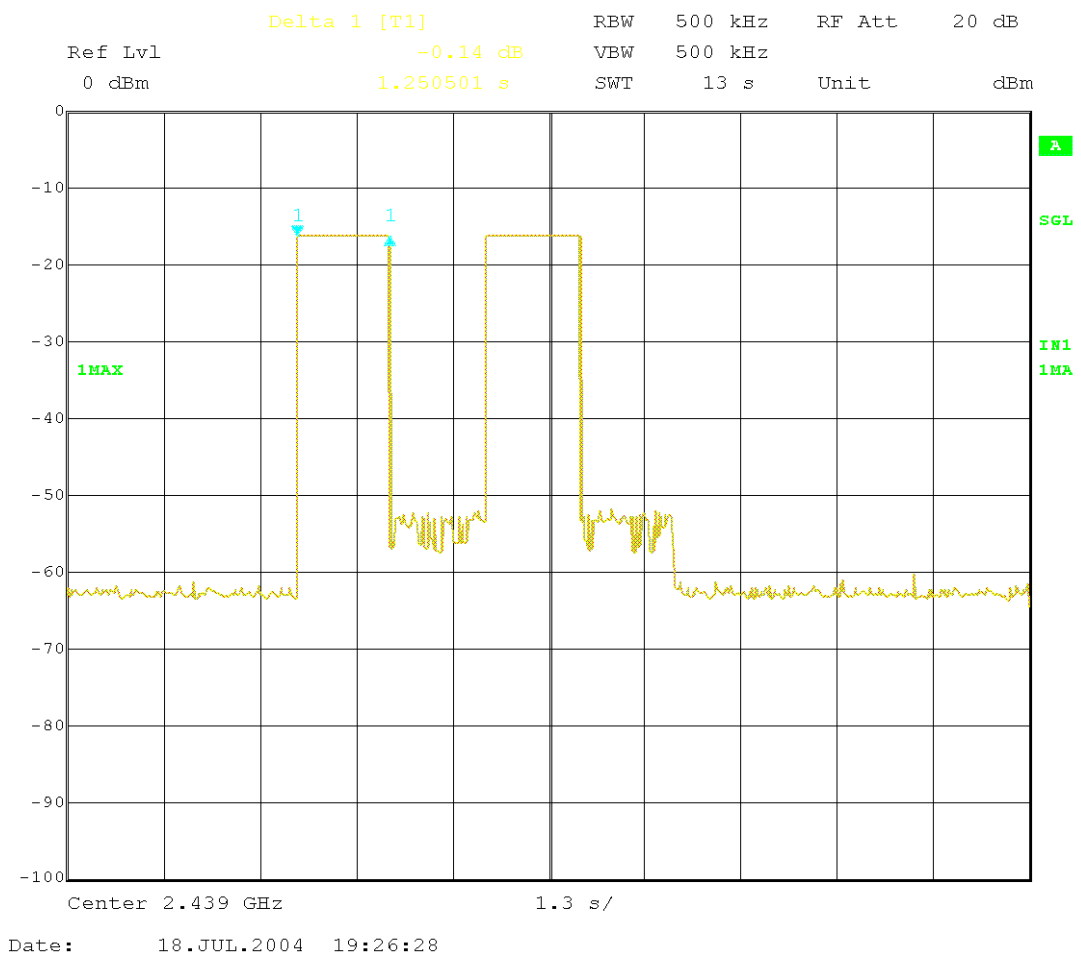
| Limit (s) | Measured value (s) |
|-----------|--------------------|
| ≤ 0.4     | 0.03811            |

The complete paging cycle took 2.527 s, during which the transmitter operated at every 10.02 ms. The duration of one transmission was 151.102 µs.  $(2.527 \text{ s} / 0.01002 \text{ s}) * 0.151102 \text{ ms} = 38.11 \text{ ms}$

### 5.2.3 Complete paging cycle

|                 |                                 |
|-----------------|---------------------------------|
| Frequency Range | 2439 MHz, zero span             |
| Sweep Mode      | Single sweep                    |
| Sweep time      | 13 sec                          |
| Res.BW / VBW    | 500 kHz / 500 kHz               |
| Detector        | Peak                            |
| Attenuation     | 20 dB internal / 10 dB external |
| Ref. Level      | 0 dBm                           |

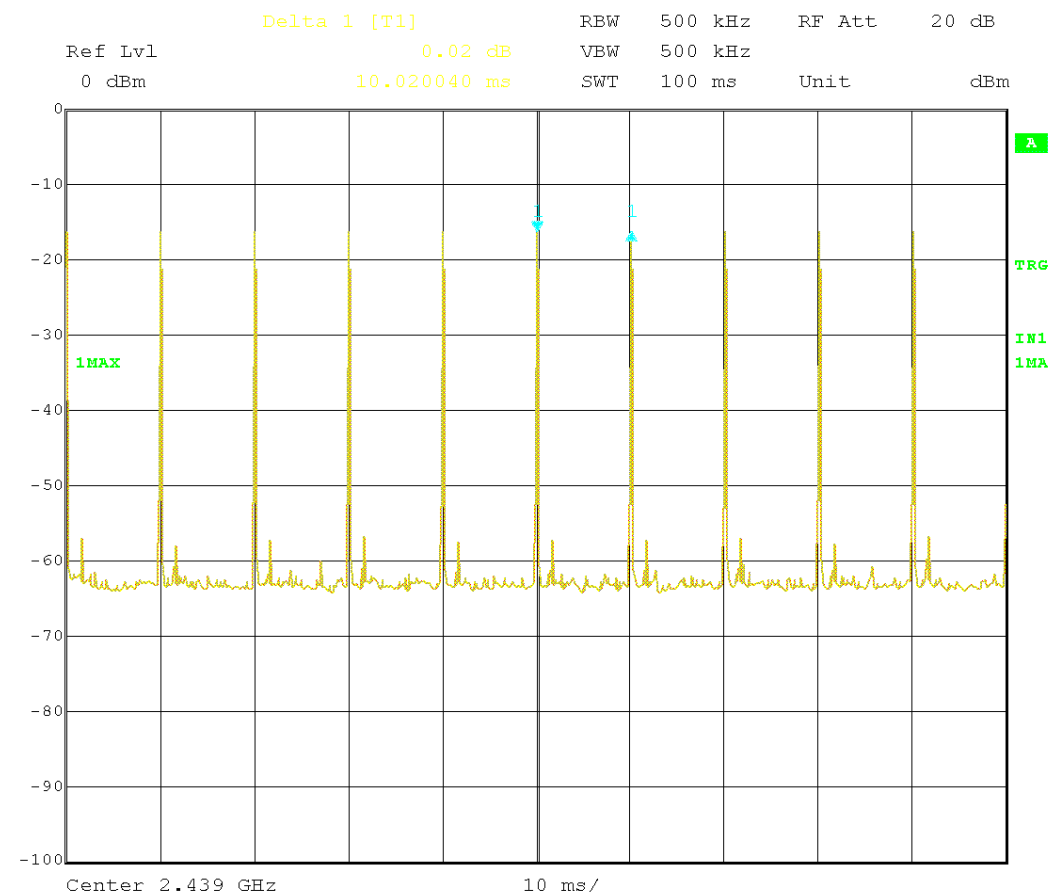
#### 5.2.3.1 Graph



## 5.2.4 Paging repetition frequency

|                 |                                 |
|-----------------|---------------------------------|
| Frequency Range | 2439 MHz, zero span             |
| Sweep Mode      | Single sweep                    |
| Sweep time      | 100 msec                        |
| Res.BW / VBW    | 500 kHz / 500 kHz               |
| Detector        | Peak                            |
| Attenuation     | 20 dB internal / 10 dB external |
| Ref. Level      | 0 dBm                           |

### 5.2.4.1 Graph

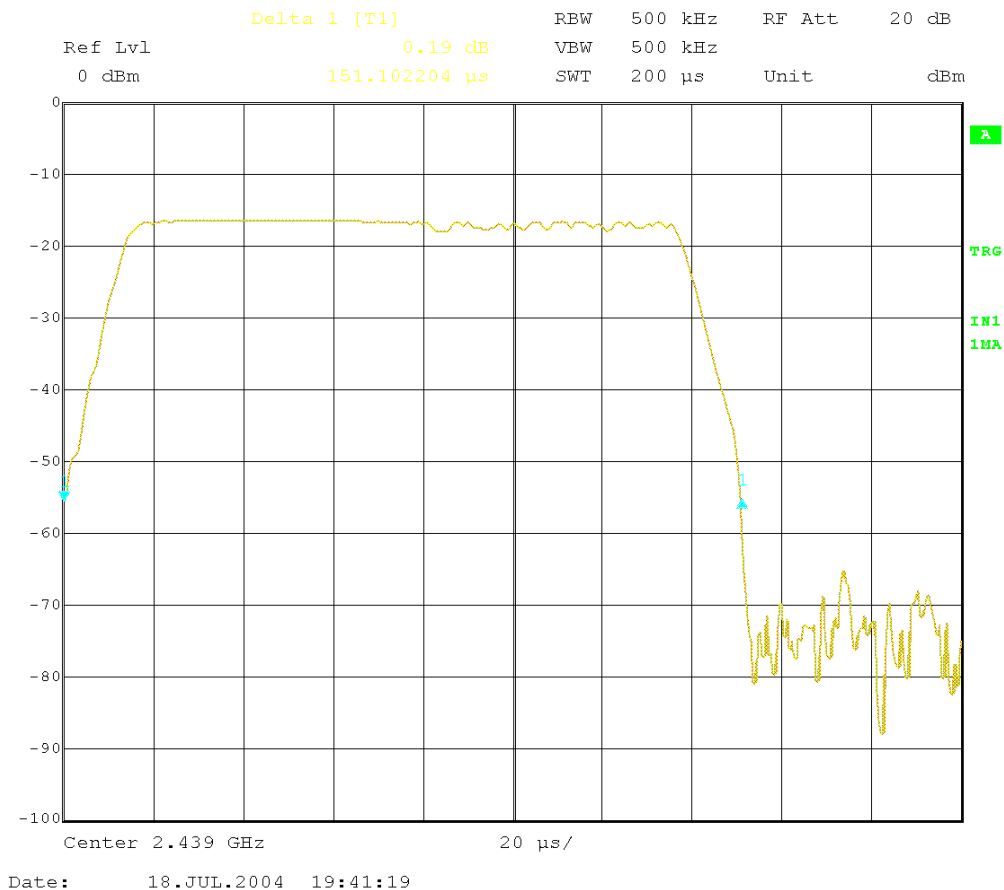


Date: 18.JUL.2004 19:32:25

## 5.2.5 Duration of one transmission

|                 |                                 |
|-----------------|---------------------------------|
| Frequency Range | 2440 MHz, zero span             |
| Sweep Mode      | Single sweep                    |
| Sweep time      | 200 usec                        |
| Res.BW / VBW    | 500 kHz / 500 kHz               |
| Detector        | Peak                            |
| Attenuation     | 20 dB internal / 10 dB external |
| Ref. Level      | 0 dBm                           |

### 5.2.5.1 Graph



## 5.3. Enquiry mode

### 5.3.1 EUT Operational Mode

|                           |                           |
|---------------------------|---------------------------|
| <b>EUT operation mode</b> | Enquiry                   |
| <b>Bluetooth channel</b>  | Hopping (US / Eur scheme) |
| <b>EUT Tx power level</b> | Nominal                   |

### 5.3.2 Limits and results

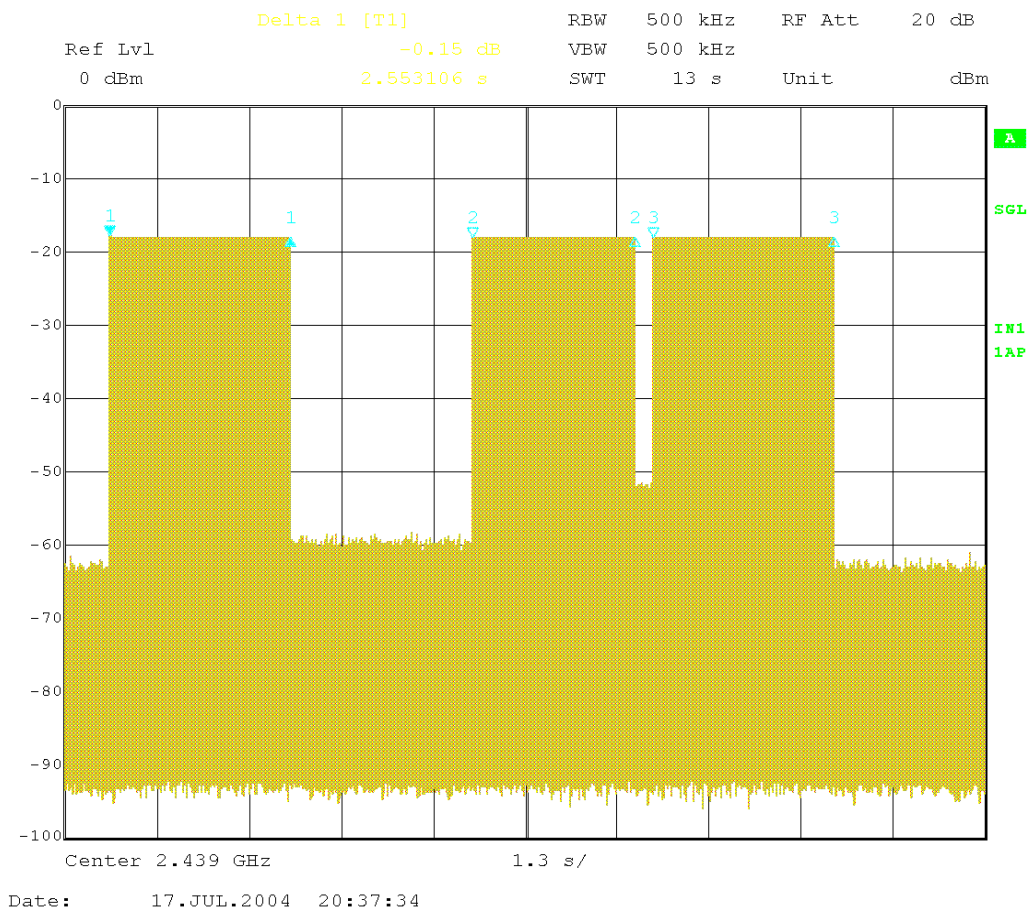
| <b>Limit (s)</b> | <b>Measured value (s)</b> |
|------------------|---------------------------|
| $\leq 0.4$       | 0.10005                   |

The complete enquiry cycle took 7.40 s, during which the transmitter operated at every 10.02 ms. The duration of one transmission was 135.471  $\mu$ s.  $(7.4 \text{ s} / 0.01002 \text{ s}) * 0.135471 \text{ ms} = 100.05 \text{ ms}$

### 5.3.3 Complete enquiry cycle

|                        |                                 |
|------------------------|---------------------------------|
| <b>Frequency Range</b> | 2439 MHz, zero span             |
| <b>Sweep Mode</b>      | Single sweep                    |
| <b>Sweep time</b>      | 13 sec                          |
| <b>Res.BW / VBW</b>    | 500 kHz / 500 kHz               |
| <b>Detector</b>        | Peak                            |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external |
| <b>Ref. Level</b>      | 0 dBm                           |

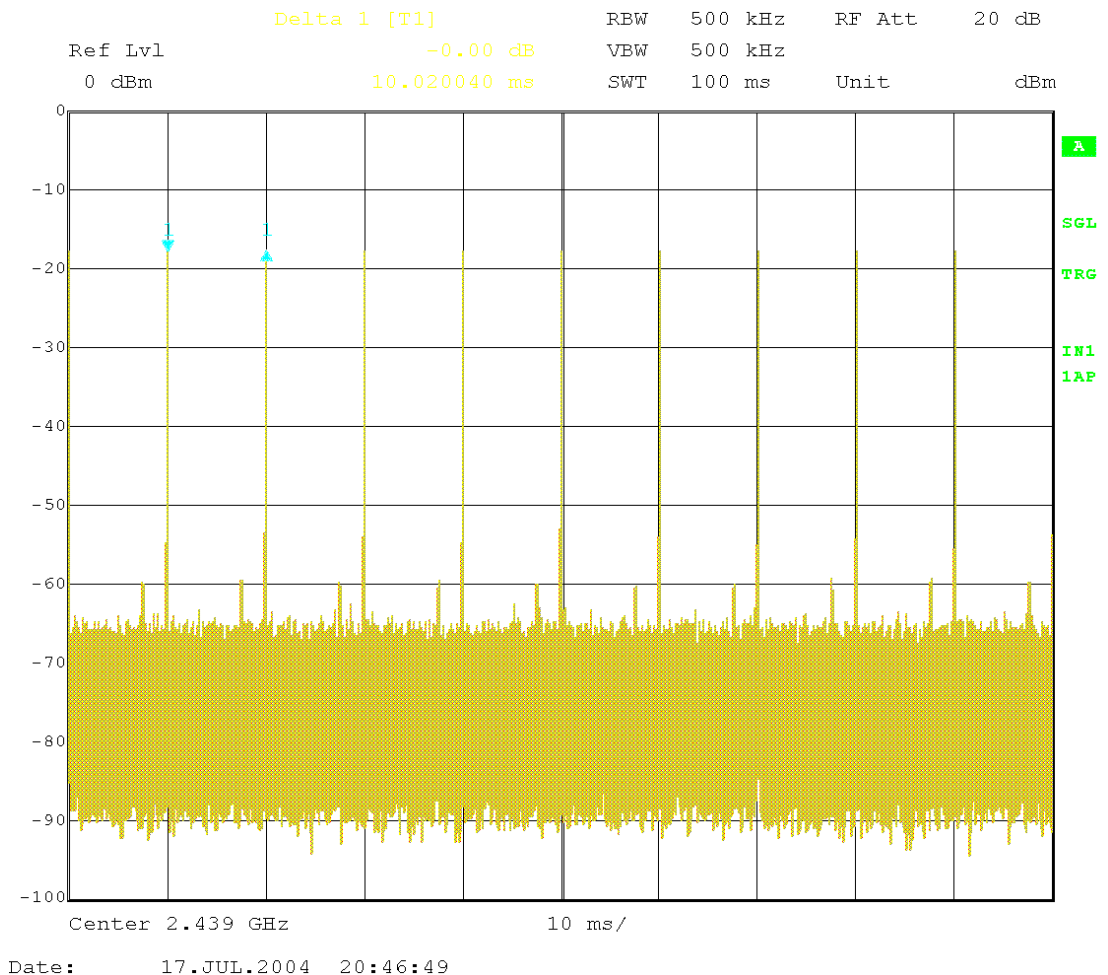
### 5.3.3.1 Graph



### 5.3.4 Repetition frequency

|                 |                                 |
|-----------------|---------------------------------|
| Frequency Range | 2439 MHz, zero span             |
| Sweep Mode      | Single sweep                    |
| Sweep time      | 100 msec                        |
| Res.BW / VBW    | 500 kHz / 500 kHz               |
| Detector        | Peak                            |
| Attenuation     | 20 dB internal / 10 dB external |
| Ref. Level      | 0 dBm                           |

### 5.3.4.1 Graph

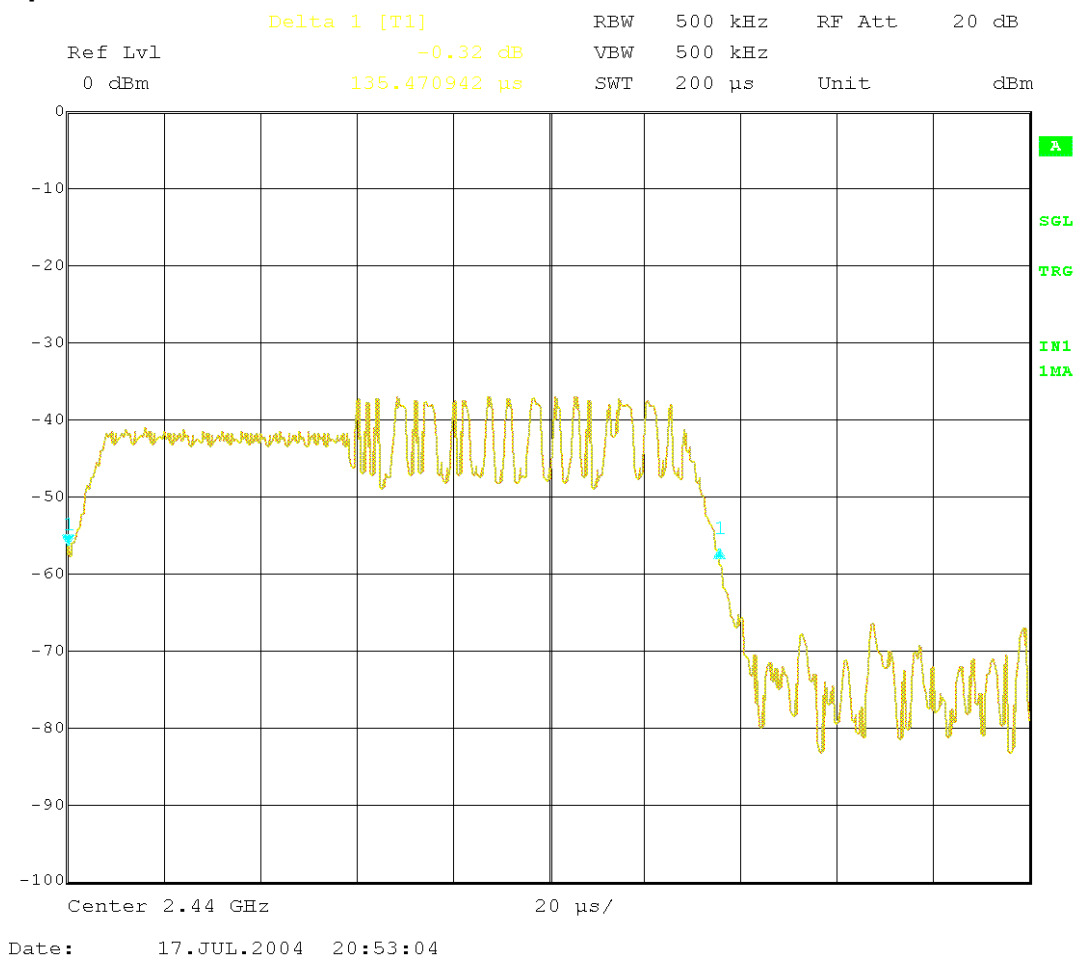


### 5.3.5 Duration of one transmission

|                 |                                 |
|-----------------|---------------------------------|
| Frequency Range | 2440 MHz, zero span             |
| Sweep Mode      | Single sweep                    |
| Sweep time      | 200 usec                        |
| Res.BW / VBW    | 500 kHz / 500 kHz               |
| Detector        | Peak                            |
| Attenuation     | 20 dB internal / 10 dB external |
| Ref. Level      | 0 dBm                           |



### 5.3.5.1 Graph



## 5.4. Connection mode

### 5.4.1 EUT Operational Mode

|                    |                                           |
|--------------------|-------------------------------------------|
| EUT operation mode | Connetction, Static PRBS, DH5 packet type |
| Bluetooth channel  | Hopping (US / Eur scheme)                 |
| EUT Tx power level | Nominal                                   |

#### 5.4.2 Limits and results

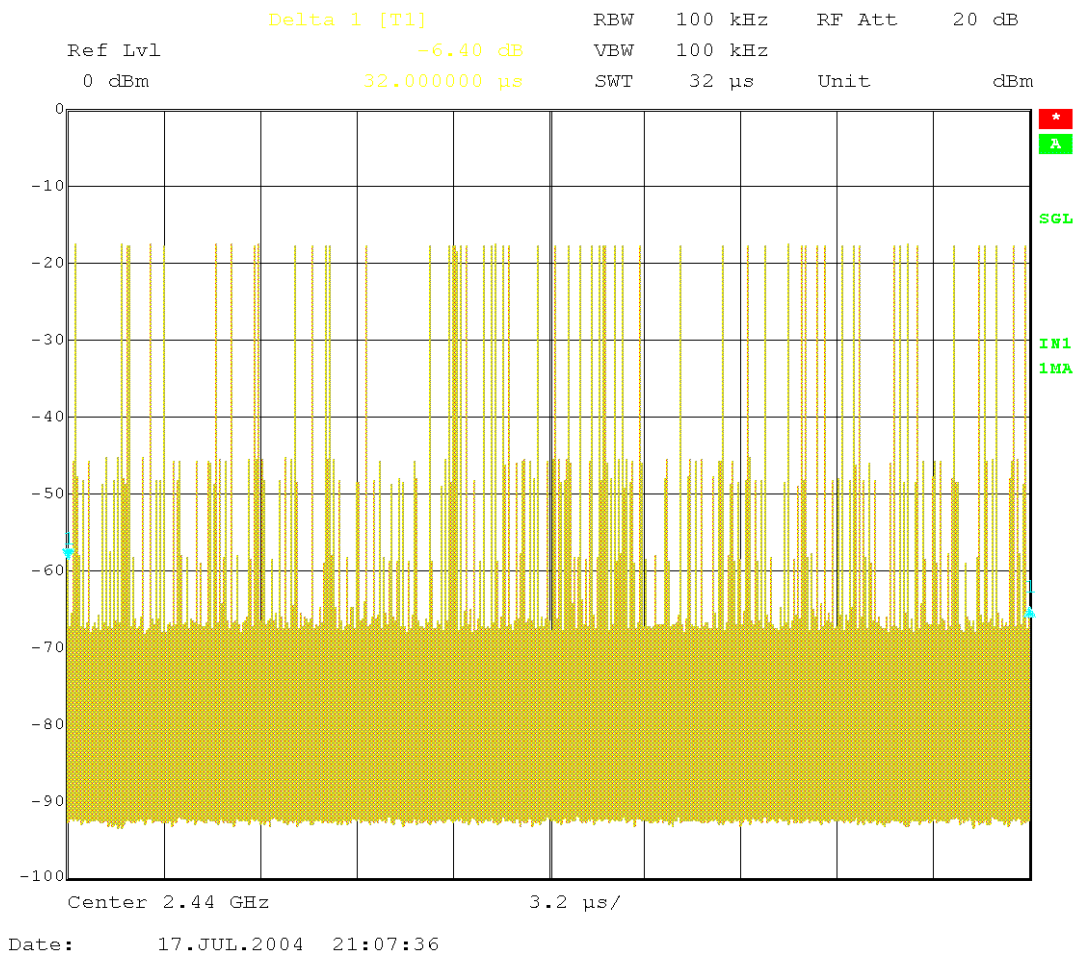
| Limit (s)  | Measured value (s) |
|------------|--------------------|
| $\leq 0.4$ | 0.17676            |

During the measurement time of 32 s, a total of 60 transmissions occurred. The duration of one transmission was 2.946 ms. The total duration was  $76 * 2.957 = 176.76$  ms.

#### 5.4.3 Number of transmissions

|                        |                                 |
|------------------------|---------------------------------|
| <b>Frequency Range</b> | 2440 MHz, zero span             |
| <b>Sweep Mode</b>      | Single sweep                    |
| <b>Sweep time</b>      | 32 sec                          |
| <b>Res.BW / VBW</b>    | 100 kHz / 100 kHz               |
| <b>Detector</b>        | Peak                            |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external |
| <b>Ref. Level</b>      | 0 dBm                           |

### 5.4.3.1 Graph

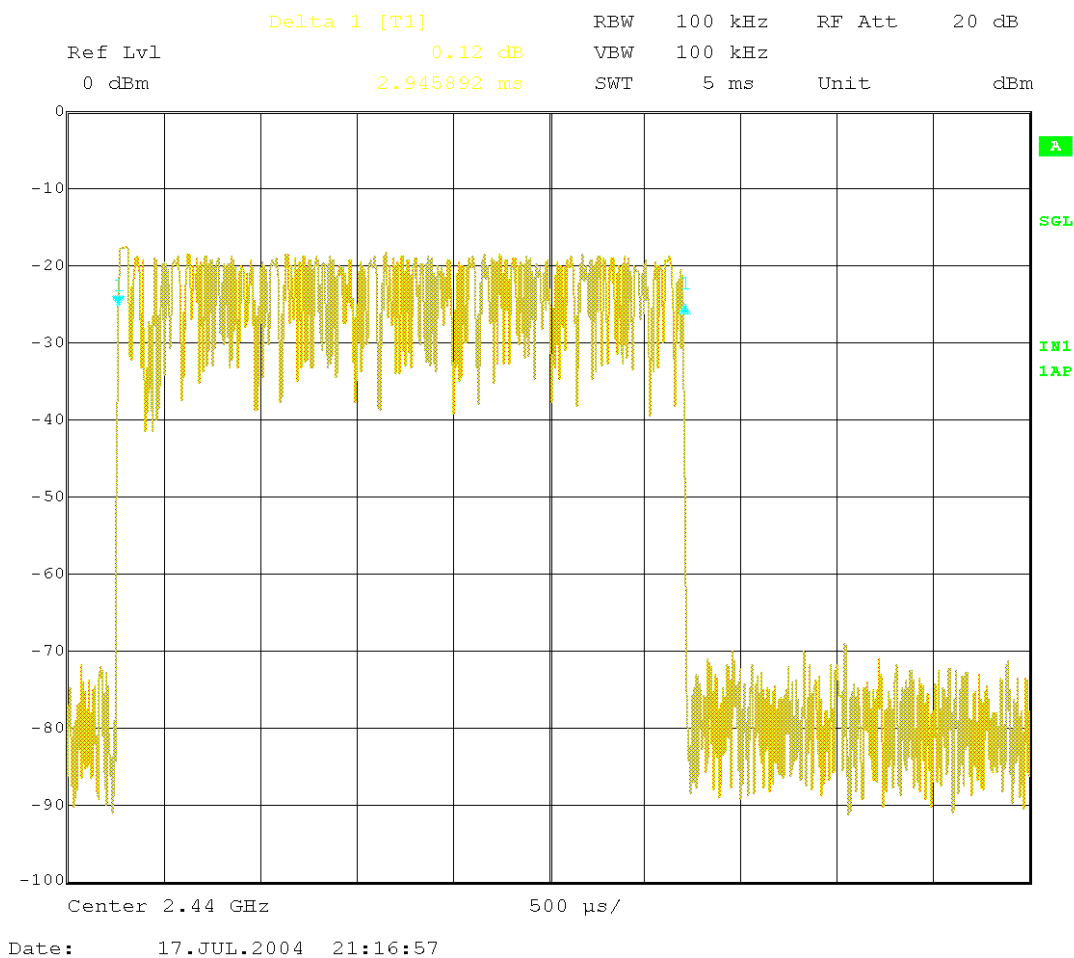


### 5.4.4 Duration of one transmission

|                 |                                 |
|-----------------|---------------------------------|
| Frequency Range | 2440 MHz, zero span             |
| Sweep Mode      | Single sweep                    |
| Sweep time      | 5 msec                          |
| Res.BW / VBW    | 100 kHz / 100 kHz               |
| Detector        | Peak                            |
| Attenuation     | 20 dB internal / 10 dB external |

|            |       |
|------------|-------|
| Ref. Level | 0 dBm |
|------------|-------|

#### 5.4.4.1 Graph

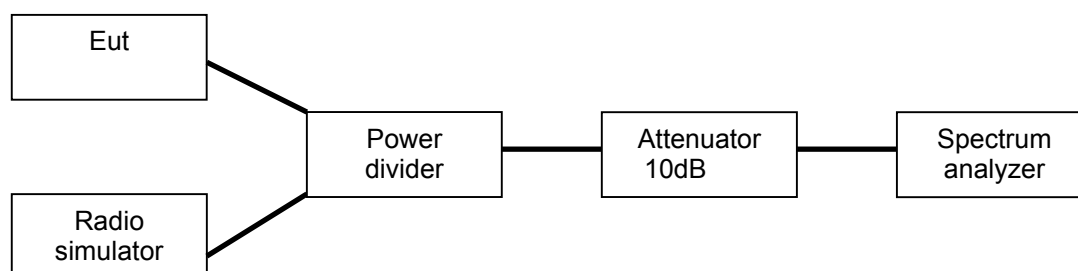


#### 6. 20dB Bandwidth

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.2 °C / 58.5 RH%                   |
| Date of measurement          | 16-07-2004                           |
| FCC rule part                | §15.247 (a) (1)                      |
| RSS-210 section              | 6.2.2 (o), a3                        |
| Measured by                  | Jesper Nielsen                       |

## 6.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



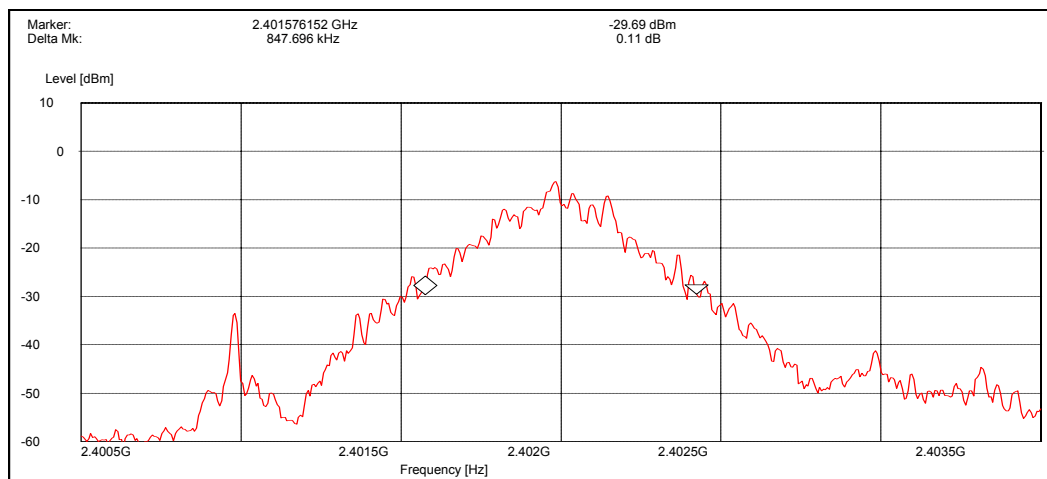
### 6.1.1 Measuring Equipment Set-up

|                        |                                                                           |
|------------------------|---------------------------------------------------------------------------|
| <b>Frequency Range</b> | 2400.5 MHz – 2403.5 MHz, 2438.5 MHz – 2441.5 MHz, 2478.5 MHz - 2481.5 MHz |
| <b>Sweep Mode</b>      | Continuously, Max hold                                                    |
| <b>Sweep time</b>      | Coupled                                                                   |
| <b>Res.BW / VBW</b>    | 10 kHz / 10 kHz                                                           |
| <b>Detector</b>        | Peak                                                                      |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external                                           |
| <b>Ref. Level</b>      | 0 dBm                                                                     |

### 6.1.2 EUT Operational Mode

|                                |                                          |
|--------------------------------|------------------------------------------|
| <b>Transmission Parameters</b> | Connection, Static PRBS, DH5 packet type |
| <b>Bluetooth channel</b>       | Single freq.                             |
| <b>EUT Tx power level</b>      | Nominal                                  |

### 6.1.3 Graph – Channel 0 (2402 MHz)

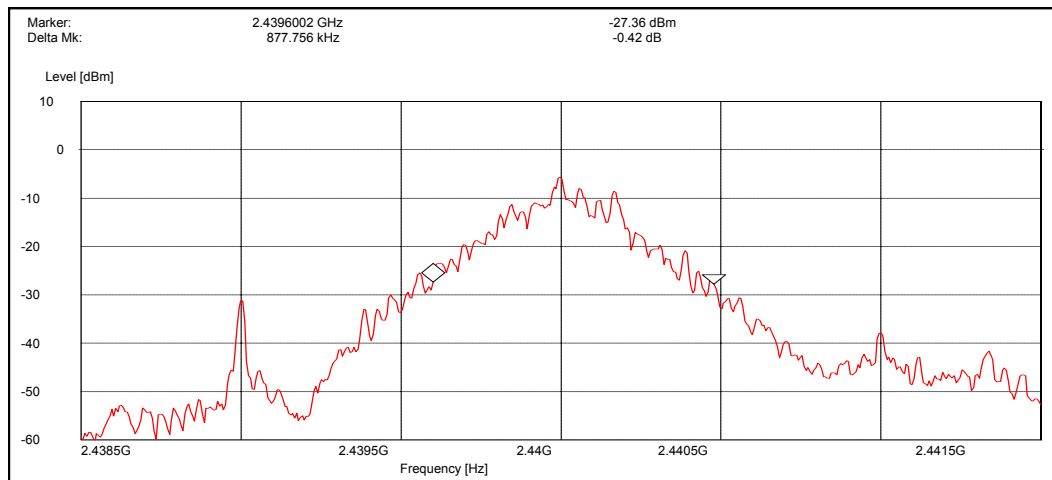


Frequency peak = -6.30 dBm

### 6.1.4 Test Result – Channel 0

| Limit [MHz] | Measured Value [MHz] | Result |
|-------------|----------------------|--------|
| ≥ 1.0       | 0.8477               | Passed |

### 6.1.5 Graph – Channel 38 (2440 MHz)

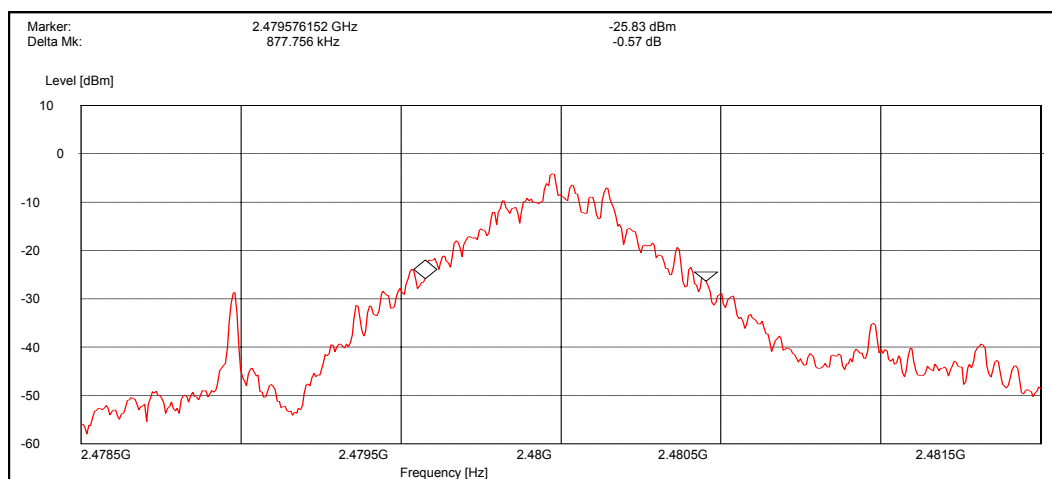


Frequency peak = -5.66

### 6.1.6 Test Result – Channel 38

| Limit [MHz] | Measured Value [MHz] | Result |
|-------------|----------------------|--------|
| $\geq 1.0$  | 0.8778               | Passed |

### 6.1.7 Graph – Channel 78 (2480 MHz)



Frequency peak = -4.14

---

### 6.1.8 Test Result – Channel 78

| Limit [MHz] | Measured Value [MHz] | Result |
|-------------|----------------------|--------|
| ≥ 1.0       | 0.8778               | Passed |

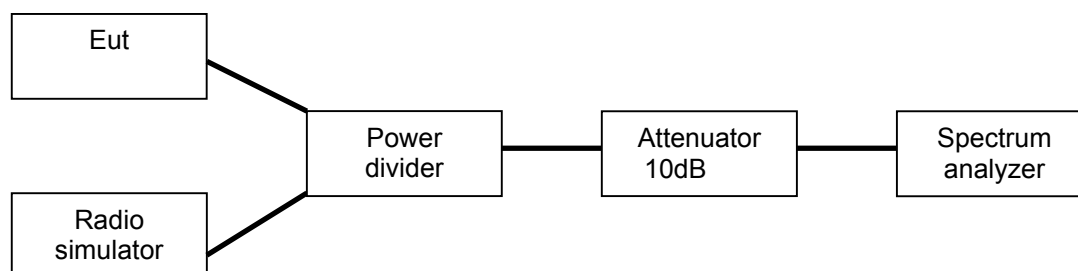


## 7. Peak Output Power

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.2 °C / 58.5 RH%                   |
|                              | 16-07-2004                           |
|                              | §15.247 (b) (1)                      |
|                              | 6.2.2 (o), a3                        |
|                              | Jesper Nielsen                       |

### 7.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



#### 7.1.1 Measuring Equipment Set-up

|                        |                                                                           |
|------------------------|---------------------------------------------------------------------------|
| <b>Frequency Range</b> | 2400.5 MHz – 2403.5 MHz, 2438.5 MHz – 2441.5 MHz, 2478.5 MHz - 2481.5 MHz |
| <b>Sweep Mode</b>      | Continuously, Max hold                                                    |
| <b>Sweep time</b>      | 50 ms                                                                     |
| <b>Res.BW / VBW</b>    | 1 MHz / 1 MHz                                                             |
| <b>Detector</b>        | Peak                                                                      |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external                                           |
| <b>Ref. Level</b>      | 0 dBm                                                                     |

### 7.1.2 EUT Operational Mode

|                                |                                          |
|--------------------------------|------------------------------------------|
| <b>Transmission Parameters</b> | Connection, Static PRBS, DH5 packet type |
| <b>Bluetooth channel</b>       | Single freq.                             |
| <b>EUT Tx power level</b>      | Nominal                                  |

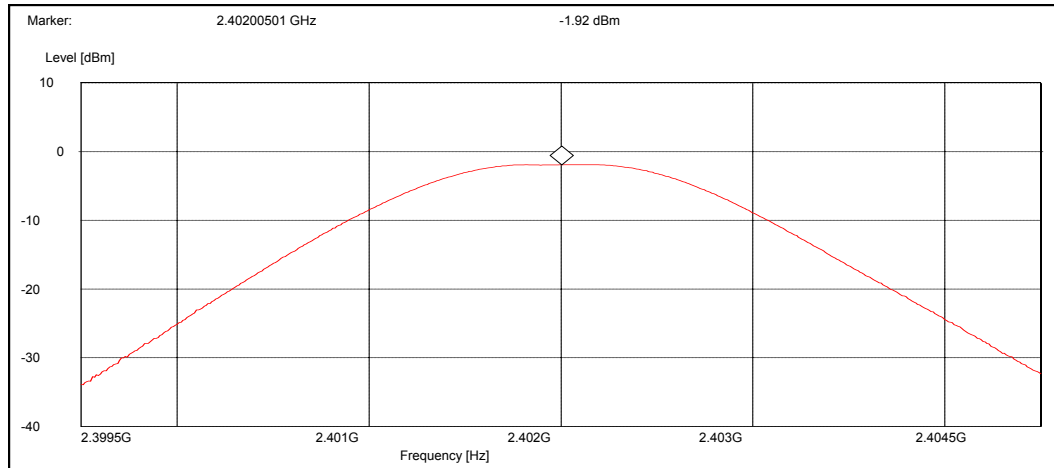
### 7.1.3 Limits and results

| EUT Channel | Limit (W) | Test result (W) | Result |
|-------------|-----------|-----------------|--------|
| 0           | ≤ 1       | 0.0006427       | Passed |
| 38          |           | 0.0007345       | Passed |
| 78          |           | 0.0010375       | Passed |

The measured power values were corrected with the attenuation of the cables, attenuator and power divider using the formula:

$$P[W] = \frac{10^{(P_{Meas}[dBm] + L_{Cables}[dB] + L_{Attenuator}[dB] + L_{Divider}[dB]) / 10}}{1000}$$

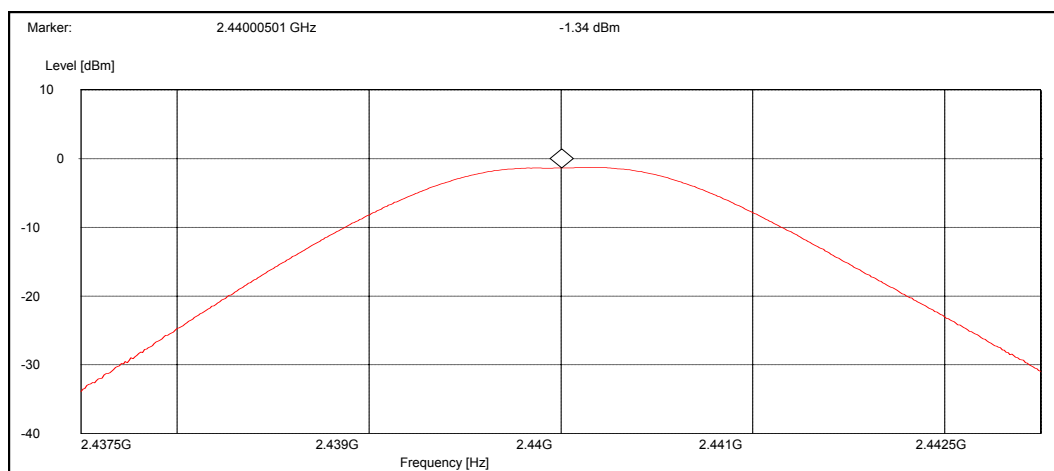
#### 7.1.4 Graph – Channel 0 (2402 MHz)



#### 7.1.5 Test Result – Channel 0

| EUT channel | Raw Signal [dBm] | Signal Path Loss [dB] | Peak Output Pwr [dBm] | Peak Output Pwr [W] |
|-------------|------------------|-----------------------|-----------------------|---------------------|
| 0           | -18.49           | 16.57                 | -1.92                 | 0.0006427           |

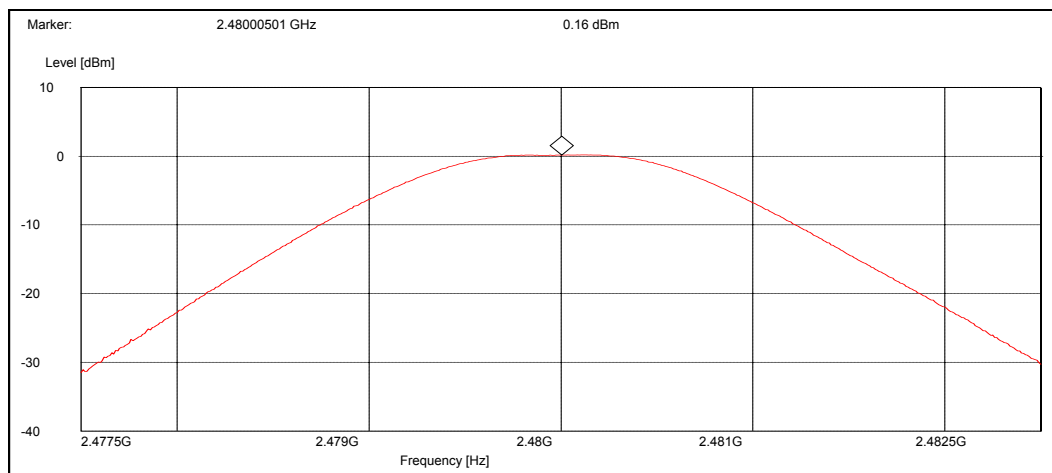
#### 7.1.6 Graph – Channel 38 (2440 MHz)



### 7.1.7 Test Result – Channel 38

| EUT channel | Raw Signal [dBm] | Signal Path Loss [dB] | Peak Output Pwr [dBm] | Peak Output Pwr [W] |
|-------------|------------------|-----------------------|-----------------------|---------------------|
| 38          | -17.94           | 16.60                 | -1.34                 | 0.0007345           |

### 7.1.8 Graph – Channel 78 (2480 MHz)



### 7.1.9 Test Result – Channel 78

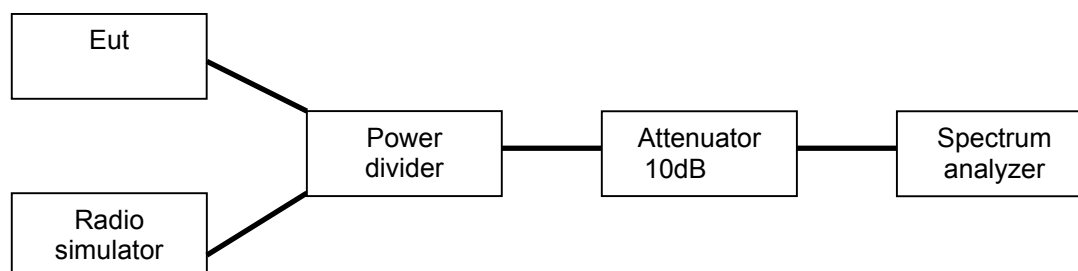
| EUT channel | Raw Signal [dBm] | Signal Path Loss [dB] | Peak Output Pwr [dBm] | Peak Output Pwr [W] |
|-------------|------------------|-----------------------|-----------------------|---------------------|
| 78          | -17.91           | 18.07                 | 0.16                  | 0.0010375           |

## 8. Band Edge Compliance

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.2 °C / 58.5 RH%                   |
|                              | 16-07-2004                           |
|                              | §15.247 (c) (1)                      |
|                              | 6.2.2 (o), e1                        |
|                              | Jesper Nielsen                       |

### 8.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



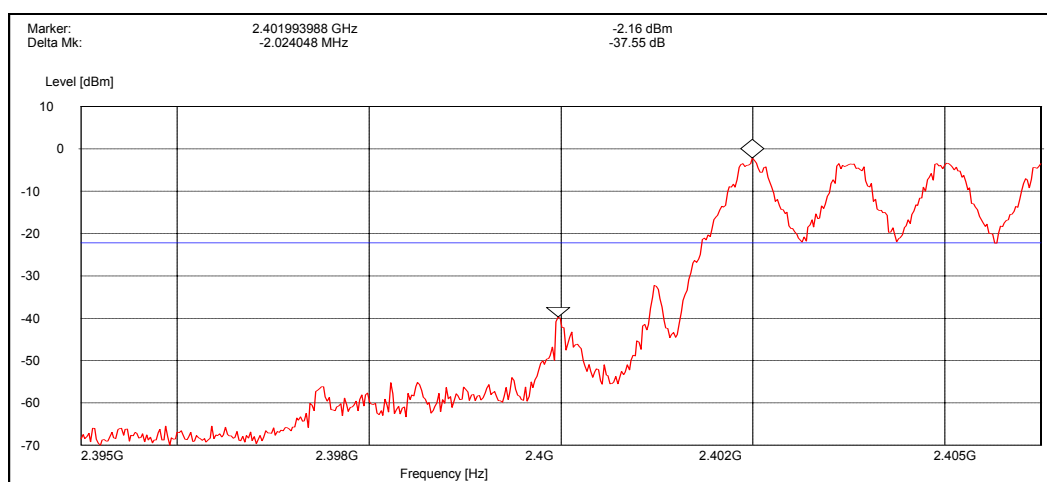
#### 8.1.1 Measuring Equipment Set-up

|                        |                                                 |
|------------------------|-------------------------------------------------|
| <b>Frequency Range</b> | 2395 MHz – 2405 MHz and 2478.5 MHz – 2488.5 MHz |
| <b>Sweep Mode</b>      | Continuously, Max hold                          |
| <b>Sweep time</b>      | Coupled                                         |
| <b>Res.BW / VBW</b>    | 100 kHz / 100 kHz                               |
| <b>Detector</b>        | Peak                                            |
| <b>Attenuation</b>     | 20 dB internal / 10 dB external                 |
| <b>Ref. Level</b>      | 0 dBm                                           |

## 8.1.2 EUT Operational Mode

|                                |                                          |
|--------------------------------|------------------------------------------|
| <b>Transmission Parameters</b> | Connection, Static PRBS, DH5 packet type |
| <b>Bluetooth channel</b>       | Single freq. & Hopping                   |
| <b>EUT Tx power level</b>      | Nominal                                  |

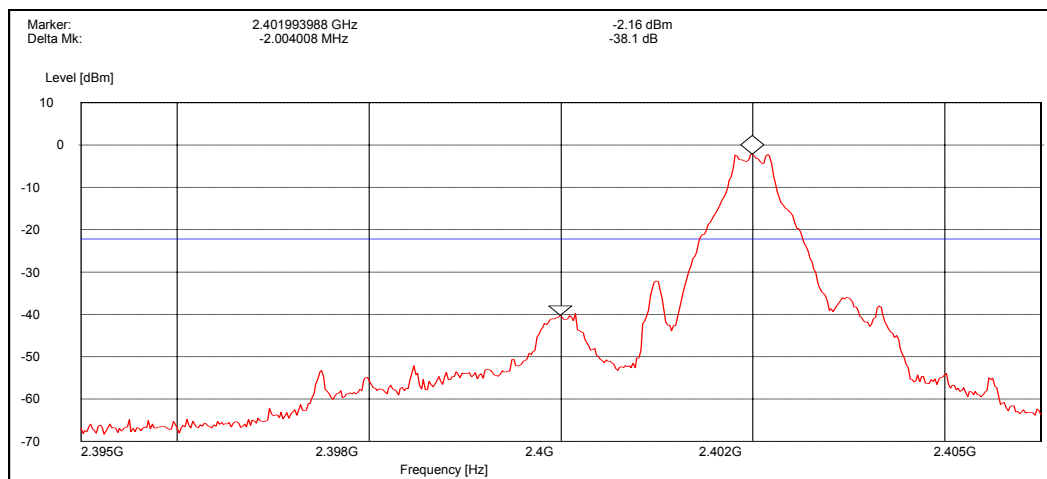
## 8.1.3 Graph – Hopping Mode / Low Band Edge



## 8.1.4 Test Result – Hopping Mode / Low Band Edge

| EUT channel | Signal peak [dBm] | Limit (Signal Peak – 20 dB) [dBm] | Max. level below 2400 MHz [dBm] | Status |
|-------------|-------------------|-----------------------------------|---------------------------------|--------|
| 0           | -2.16             | -22.16                            | -39.71                          | Passed |

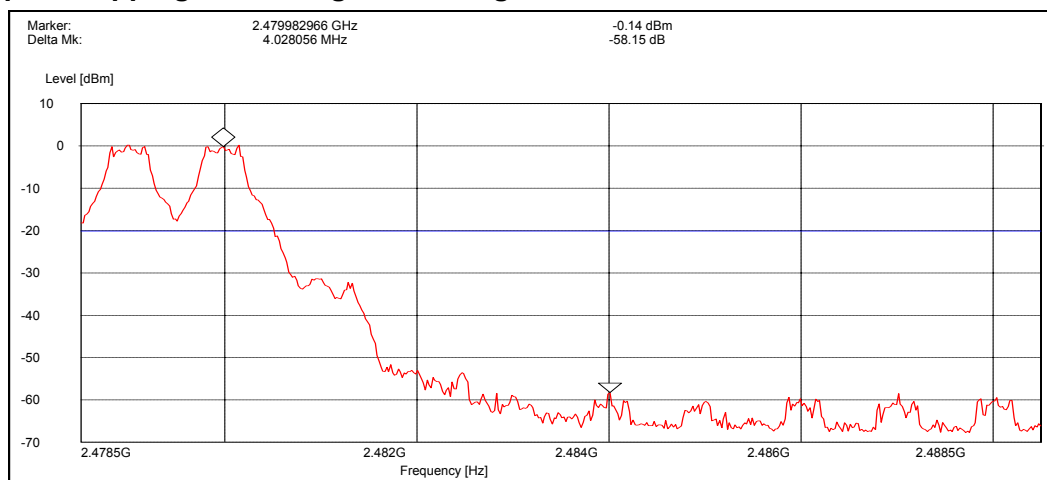
### 8.1.5 Graph – Single Channel (Ch 0) / Low Band Edge



### 8.1.6 Test Result – Single Channel (Ch 0) / Low Band Edge

| EUT channel | Signal peak [dBm] | Limit (Signal Peak – 20 dB) [dBm] | Max. level below 2400 MHz [dBm] | Status |
|-------------|-------------------|-----------------------------------|---------------------------------|--------|
| 0           | -2.16             | -22.16                            | -40.26                          | Passed |

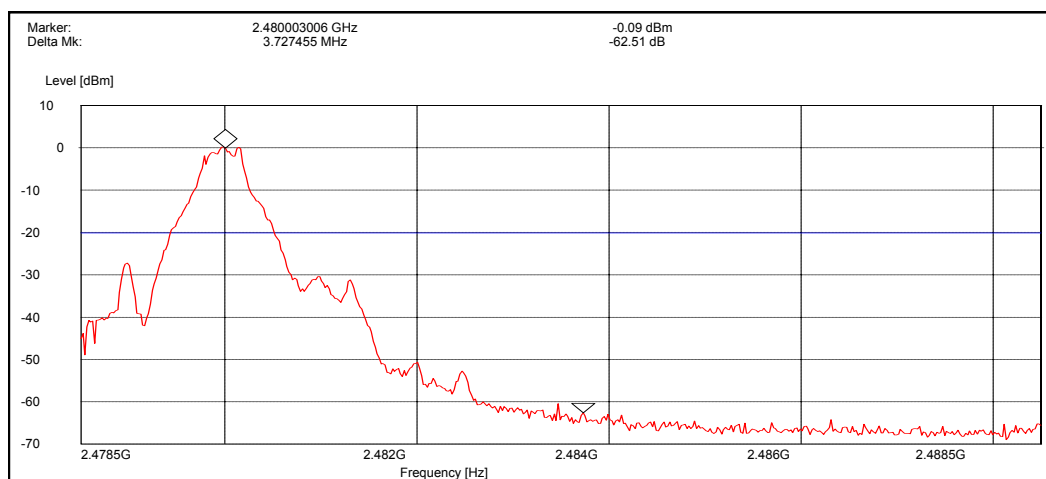
### 8.1.7 Graph – Hopping Mode / High Band Edge



### 8.1.8 Test Result – Hopping Mode / High Band Edge

| EUT channel | Signal peak [dBm] | Limit (Signal Peak – 20 dB) [dBm] | Max. level above 2483.5 MHz [dBm] | Status |
|-------------|-------------------|-----------------------------------|-----------------------------------|--------|
| 79          | -0.14             | -20.14                            | -58.01                            | Passed |

### 8.1.9 Graph – Single Channel (Ch 78) / High Band Edge



### 8.1.10 Test Result – Single Channel (Ch 78) / High Band Edge

| EUT channel | Signal peak [dBm] | Limit (Signal Peak – 20 dB) [dBm] | Max. level above 2483.5 MHz [dBm] | Status |
|-------------|-------------------|-----------------------------------|-----------------------------------|--------|
| 79          | -0.09             | -20.09                            | -62.42                            | Passed |

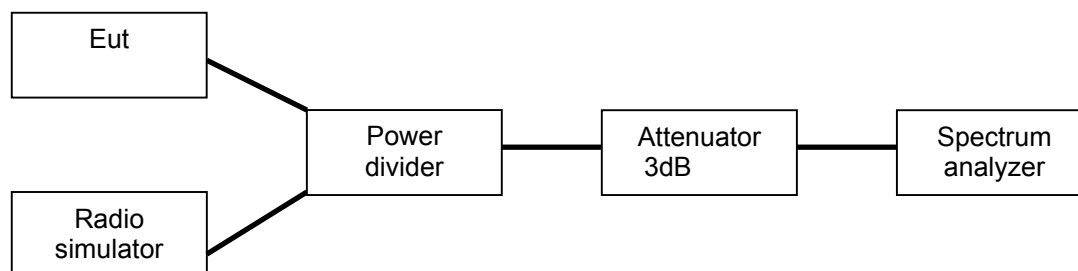


## 9. Spurious RF Conducted Emission

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234280                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 21.2 °C / 58.5 RH%                   |
|                              | 16-07-2004                           |
|                              | §15.247 (c) (2)                      |
|                              | 6.2.2 (o), e1                        |
|                              | Jesper Nielsen                       |

### 9.1. Test setup

The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



#### 9.1.1 Measuring Equipment Set-up

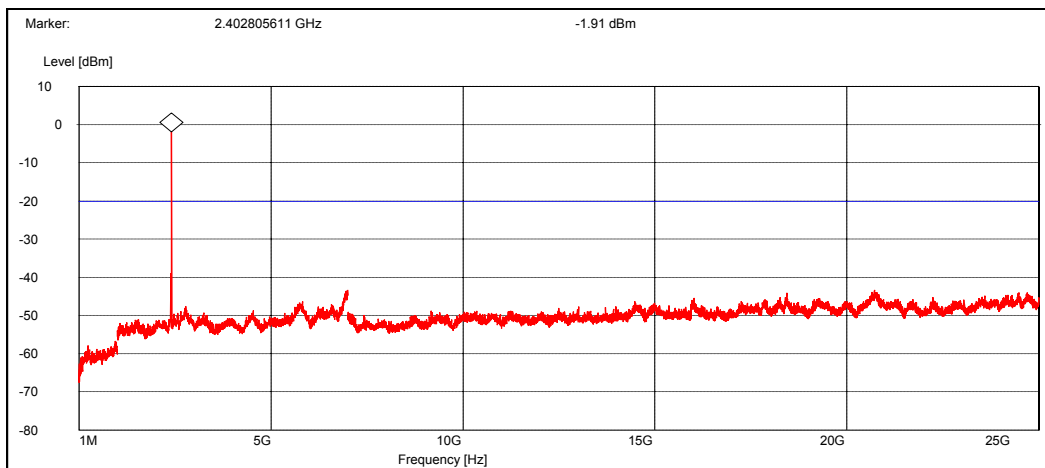
|                        |                                |
|------------------------|--------------------------------|
| <b>Frequency Range</b> | 1 MHz – 25000 MHz              |
| <b>Sweep Mode</b>      | Continuously, Max hold         |
| <b>Sweep time</b>      | Coupled                        |
| <b>Res.BW / VBW</b>    | 100 kHz / 100 kHz              |
| <b>Detector</b>        | Peak                           |
| <b>Attenuation</b>     | 20 dB internal / 3 dB external |
| <b>Ref. Level</b>      | 0 dBm                          |

#### 9.1.2 EUT Operational Mode

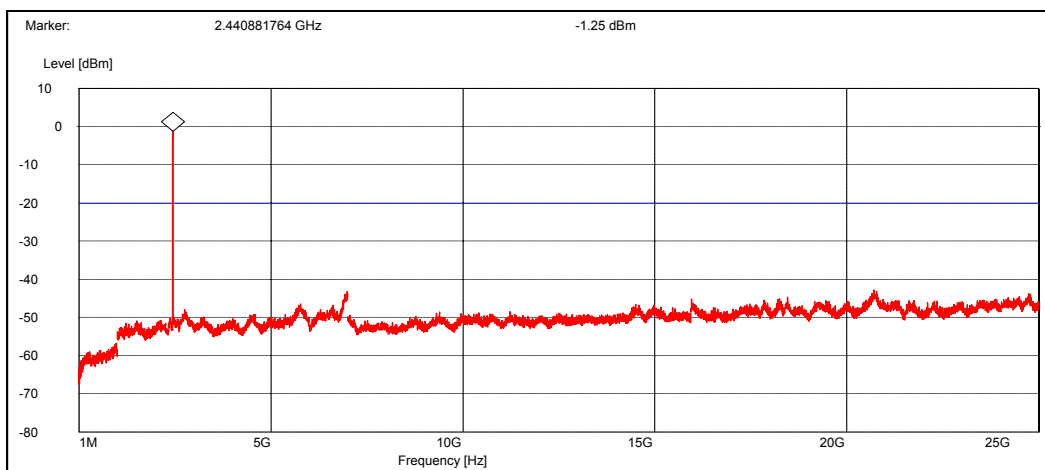
|                                |                                          |
|--------------------------------|------------------------------------------|
| <b>Transmission Parameters</b> | Connection, Static PRBS, DH5 packet type |
|--------------------------------|------------------------------------------|

|                           |                        |
|---------------------------|------------------------|
| <b>Bluetooth channel</b>  | Single freq. & Hopping |
| <b>EUT Tx power level</b> | Nominal                |

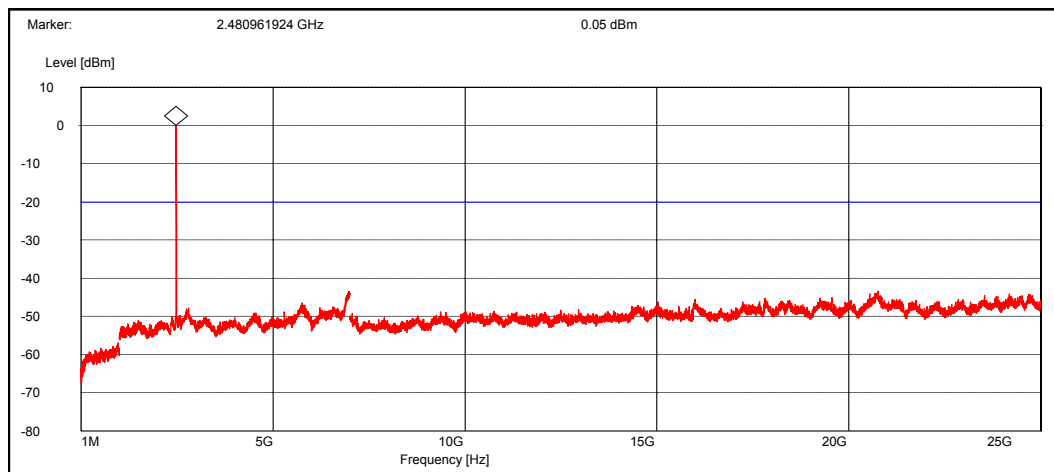
### 9.1.3 Graph – Channel 0 (2402 MHz)



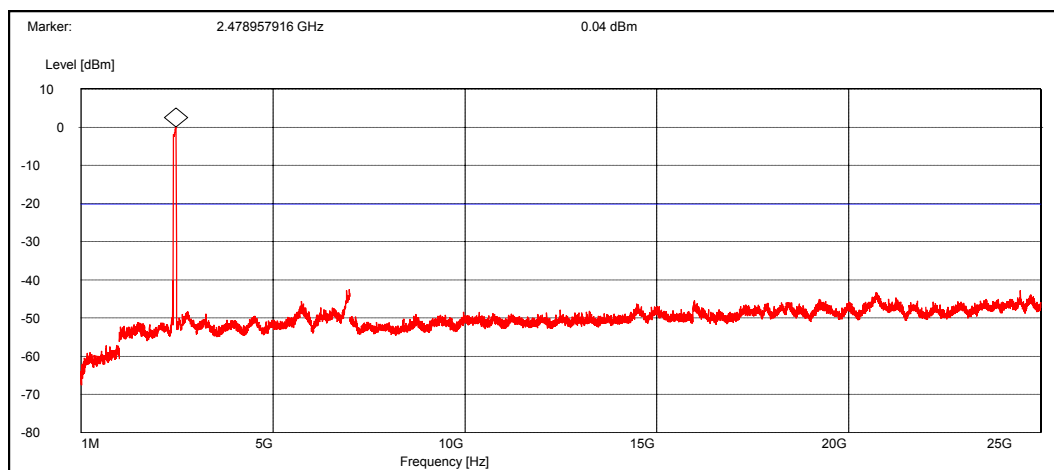
### 9.1.4 Graph – Channel 38 (2440 MHz)



### 9.1.5 Graph – Channel 88 (2480 MHz)



### 9.1.6 Graph – Hopping Mode



### 9.1.7 Test Results

| EUT channel | Highest spurious peak [dBm] | Limit [dBm] | Status |
|-------------|-----------------------------|-------------|--------|
| 0           | -43.32                      | -20         | Passed |
| 38          | -42.74                      | -20         | Passed |
| 78          | -43.37                      | -20         | Passed |
| Hopping     | -42.54                      | -20         | Passed |

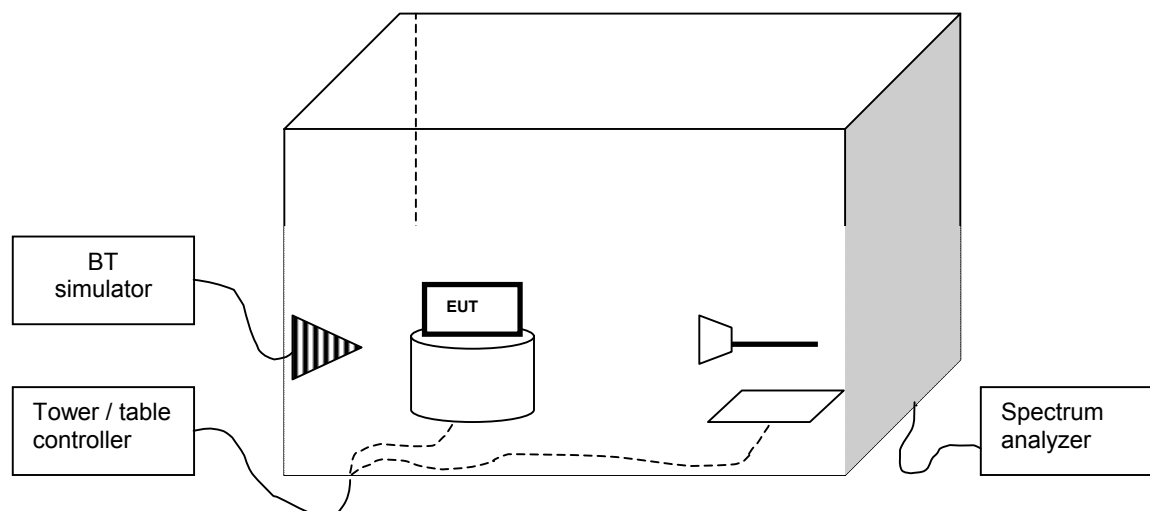
## 10. Spurious radiated emissions

|                              |                                      |
|------------------------------|--------------------------------------|
| EUT                          | RH-28 dut#234282                     |
| Accessories                  | BL-5C dut#233002, DTS-128 dut#233747 |
| Temp, Humidity, Air Pressure | 22.5 °C / 51.5 RH%                   |
| Date of measurement          | 19-07-2004                           |
| FCC rule part                | §15.247 (c) (1)                      |
| RSS-210 section              | 6.2.2 (o), e1                        |
| Measured by                  | Jesper Nielsen                       |

### 10.1. Test setup

The EUT was set on a non-conductive turn table in a semi anechoic chamber. In the corner of the chamber there was a communication antenna, which was connected to the BT simulator located outside the chamber. The radiated power from the EUT was measured with an antenna fixed to a antenna tower. The tower and turn table were remotely controlled to turn the EUT and change the antenna polarization. The measured signal was routed from the measuring antenna to the spectrum analyzer. The Bluetooth simulator was used to the same as in conducted measurements.

In tests, where absolute level reporting were required, the results were corrected with all applicable factors as detailed in the result section of each measurement.



### 10.2. Measurement method

a) The spectrum analyzer with peak detector was used to find all the emissions generated by the EUT.

- b) All suspicious frequencies with emission levels were recorded.
- c) For each frequency detected in (b), the emissions were maximized by moving the turn table and measuring antenna and manipulating the EUT.
- d) The maximized emissions were measured and reported.

### 10.3. EUT operation mode

|                       |                                             |
|-----------------------|---------------------------------------------|
| EUT operation mode    | BT Connection, Static PRBS, DH5 packet type |
| EUT channel           | 0, 38 and 78                                |
| EUT TX power level    | Nominal                                     |
| EUT operation voltage | Battery                                     |

#### 10.4. Limits, 3m measuring distance

| Frequency band (MHz) | Limit (μV/m) | Limit (dBμV/m) | Detector |
|----------------------|--------------|----------------|----------|
| 30 – 88              | 100          | 40             | QP       |
| 88 -216              | 150          | 43.5           | QP       |
| 216 - 960            | 200          | 46             | QP       |
| 960 - 1000           | 500          | 54.0           | QP       |
| 1000 - 25000         | 500          | 54.0           | Av       |
| 1000 - 25000         | 5000         | 74.0           | Pk       |

As default, all emissions were compared against the general limits. If any emission exceeded that limit, it was further checked, if it was outside the restricted band thus complying with the -20dBc requirement.

#### 10.5. Results

The results were corrected with the cable and filter losses, preamplifier gain, antenna factor and measurement distance.

The measurement results were obtained as described below.

$$E[uV / m] = U_{RX} + A_{CABLE} + AF - G_{PREAMP} - C_{DISTANCE}$$

Where

$U_{RX}$  receiver reading

$A_{CABLE}$  Attenuation of the cable

$AF$  Antenna factor

$G_{PREAMP}$  Gain of the preamplifier

$C_{DISTANCE}$  Conversion factor from 3m to 1.6 m measurement distance

$PK$  1MHz/ 3MHz RBW/VBW

$AV$  1MHz/10Hz RBW/VBW

Measuring Distance 1.6 meter

Table 1 Emission levels, TX on channel 0

| Freq.<br>[MHz] | U <sub>RX</sub><br>dBuV | Pol. | Det. | A <sub>CABLE</sub> (dB) | G <sub>PREAMP</sub><br>(dB) | AF (dB) | Limit<br>[dBuV/m] | C <sub>DISTANCE</sub> | Result<br>[dBuV/m] |
|----------------|-------------------------|------|------|-------------------------|-----------------------------|---------|-------------------|-----------------------|--------------------|
| 4804           | 36.89                   | V    | PK   | 6.50                    | 29.26                       | 35.5    | 74                | 5.46                  | 47.17              |
| 4804           | 24.78                   | V    | AV   | 6.50                    | 29.26                       | 35.5    | 54                | 5.46                  | 32.06              |
| 7206           | 38.41                   | V    | PK   | 7.29                    | 29.58                       | 39.0    | 74                | 5.46                  | 49.66              |
| 7206           | 24.47                   | V    | AV   | 7.29                    | 29.58                       | 39.0    | 54                | 5.46                  | 35.72              |

Table 2 Emission levels, TX on channel 38

| Freq.<br>[MHz] | U <sub>RX</sub><br>dBuV | Pol. | Det. | A <sub>CABLE</sub> (dB) | G <sub>PREAMP</sub><br>(dB) | AF (dB) | Limit<br>[dBuV/m] | C <sub>DISTANCE</sub> | Result<br>[dBuV/m] |
|----------------|-------------------------|------|------|-------------------------|-----------------------------|---------|-------------------|-----------------------|--------------------|
| 4880           | 40.09                   | V    | PK   | 6.58                    | 29.51                       | 35.2    | 74                | 5.46                  | 46.90              |
| 4880           | 24.91                   | V    | AV   | 6.58                    | 29.51                       | 35.2    | 54                | 5.46                  | 31.72              |
| 7320           | 39.26                   | V    | PK   | 7.37                    | 29.48                       | 39.2    | 74                | 5.46                  | 50.89              |
| 7320           | 24.60                   | V    | AV   | 7.37                    | 29.48                       | 39.2    | 54                | 5.46                  | 36.23              |

Table 3 Emission levels, TX on channel 78

| Freq.<br>[MHz] | U <sub>RX</sub><br>dBuV | Pol. | Det. | A <sub>CABLE</sub> (dB) | G <sub>PREAMP</sub><br>(dB) | AF (dB) | Limit<br>[dBuV/m] | C <sub>DISTANCE</sub> | Result<br>[dBuV/m] |
|----------------|-------------------------|------|------|-------------------------|-----------------------------|---------|-------------------|-----------------------|--------------------|
| 4960           | 39.17                   | V    | PK   | 6.62                    | 29.39                       | 35.5    | 74                | 5.46                  | 46.44              |
| 4960           | 24.77                   | V    | AV   | 6.62                    | 29.39                       | 35.5    | 54                | 5.46                  | 32.04              |
| 7440           | 38.25                   | V    | PK   | 7.39                    | 29.26                       | 40.0    | 74                | 5.46                  | 50.92              |
| 7440           | 24.03                   | V    | AV   | 7.39                    | 29.26                       | 40.0    | 54                | 5.46                  | 36.70              |



## 11. Test equipment

Each test equipment is calibrated once a year, except antennas which are calibrated every second year.

### 11.1. Conducted and radiated measurements

| Equipment # | Equipment                      | Type       | Serial #     | Manufacturer     |
|-------------|--------------------------------|------------|--------------|------------------|
| 13799       | Signal Generator               | SMP 02     | 1035.5005.02 | Rohde & Schwarz  |
| 18861       | Spectrum Analyzer 20Hz-26.6GHz | ESI        | 1088.7490.26 | Rohde&Schwarz    |
| 18416       | BS Simulator                   | CMU-200    | 1100.0008.02 | Rohde & Schwartz |
| -           | RF Attenuator                  | 6603.19.AA |              | Suhner           |
| -           | RF Attenuator                  | MOD 768-10 |              | Narda            |
| 19087       | Power Divider                  | 11636B     | 52228        | Agilent          |

### 11.2. Radiated measurements

| Equipment # | Equipment                                    | Type               | Serial #     | Manufacturer     |
|-------------|----------------------------------------------|--------------------|--------------|------------------|
| 18774       | 3m Semi-anechoic Chamber                     | RSFD-F/A-100       | 2425         | ETS-Lindgren     |
| 18861       | Spectrum Analyzer 20Hz-26.6GHz               | ESI                | 1088.7490.26 | Rohde&Schwarz    |
| 18416       | BS Simulator                                 | CMU-200            | 1100.0008.02 | Rohde & Schwartz |
| 18792       | Turntable and Antenna Contoller              | MDC-2090           | 1606         | ETS-EMCO         |
|             | EUT fixture Controller                       | G-1000 DXC         | 3D240011     | Yaesu            |
|             | RF Preamplifier 3GHz-26.5GHz (Metal Chassis) | JS4-01002600-36-5P | 681866       | Miteq/NMP Cph    |
| 16878       | Dual Log Periodic Antenna 1-26.5 GHz         | HL025              |              | Rohde&Schwarz    |
| 14507       | Broad Band MW Antenna                        | BBHA 9120 LFA      | 103          | Schwarzbeck      |
| 14508       | Broad Band MW Antenna                        | BBHA 9120 LFA      | 104          | Schwarzbeck      |
| 19151       | High Pass Filter >3GHz                       | WHK3.0/18G-10SS    | 121          | Wainwright       |

## Test setup photographs

### 11.3. Conducted RF measurements

