

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                   |                                                                                                                                     |                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Prüfbericht - Nr.:</b><br>Test Report No.                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>14013162 001</b>                                                                                                                                                                                                               | <b>Seite 1 von 12</b><br>Page 1 of 12                                                                                               |                                                                                                                                                      |
| <b>Auftraggeber:</b><br>Applicant                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Nokia Corporation</b><br><b>Joensuunkatu 7E</b><br><b>86 Salo</b><br><b>Finland</b>                                                                                                                                            |                                                                                                                                     |                                                                                                                                                      |
| <b>Gegenstand der Prüfung:</b><br>Test item                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Bluetooth Headset</b>                                                                                                                                                                                                          |                                                                                                                                     |                                                                                                                                                      |
| <b>Bezeichnung:</b><br>Identification                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>BH-501 (HS-71W)</b>                                                                                                                                                                                                            | <b>Serien-Nr.:</b><br>Serial No.                                                                                                    | <b>Engineering sample</b>                                                                                                                            |
| <b>Wareneingangs-Nr.:</b><br>Receipt No.                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>060420016</b>                                                                                                                                                                                                                  | <b>Eingangsdatum:</b><br>Date of receipt                                                                                            | <b>20.04.2006</b>                                                                                                                                    |
| <b>Prüfört:</b><br>Testing location                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>TÜV Rheinland Hong Kong Ltd.</b><br>Room 8, 25th Floor, Skyline Tower, 39 Wang Kwong Road, Kowloon Bay<br>Kowloon, Hong Kong<br><b>Hong Kong Productivity Council</b><br>HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong |                                                                                                                                     |                                                                                                                                                      |
| <b>Prüfgrundlage:</b><br>Test specification                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>FCC Part 15 Subpart C</b><br><b>ANSI C63.4-2003</b><br><b>CISPR 22:1997</b>                                                                                                                                                    |                                                                                                                                     |                                                                                                                                                      |
| <b>Prüfergebnis:</b><br>Test Result                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.</b><br>The above mentioned product was tested and <b>passed</b> .                                                                 |                                                                                                                                     |                                                                                                                                                      |
| <b>geprüft / tested by:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                   | <b>kontrolliert / reviewed by:</b>                                                                                                  |                                                                                                                                                      |
| 26.05.2006                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sharon Li                                                                                                                                                                                                                         | 26.05.2006                                                                                                                          | Thomas Berns                                                                                                                                         |
| <b>Datum</b><br>Date                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Name</b><br>Name                                                                                                                                                                                                               | <b>Datum</b><br>Date                                                                                                                | <b>Name</b><br>Name                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <br><b>Unterschrift</b><br>Signature                                                                                                           |                                                                                                                                     | <br><b>Unterschrift</b><br>Signature                            |
| <b>Sonstiges:</b><br>Other Aspects                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                   | <b>FCCID: PYAHS-71W</b>                                                                                                             |                                                                                                                                                      |
| <b>Abkürzungen:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         | OK, Pass, P<br>Fail, F<br>N/A<br>NT                                                                                                                                                                                               | <b>= entspricht Prüfgrundlage</b><br><b>= entspricht nicht Prüfgrundlage</b><br><b>= nicht anwendbar</b><br><b>= nicht getestet</b> | <b>Abbreviations:</b><br>OK, Pass, P<br>Fail, F<br>N/A<br>NT<br><b>= passed</b><br><b>= failed</b><br><b>= not applicable</b><br><b>= not tested</b> |
| <b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicate in extracts. This test report does not entitle to carry any safety mark on this or similar products. |                                                                                                                                                                                                                                   |                                                                                                                                     |                                                                                                                                                      |

## Table of Content

|                                                            | Page            |
|------------------------------------------------------------|-----------------|
| <b>Cover Page .....</b>                                    | <b>1</b>        |
| <b>Table of Content .....</b>                              | <b>2</b>        |
| <b>Product information.....</b>                            | <b>3</b>        |
| Manufacturers declarations .....                           | 3               |
| Product function and intended use.....                     | 3               |
| Submitted documents .....                                  | 3               |
| <b>List of Test and Measurement Instruments.....</b>       | <b>4</b>        |
| <b>Result FCC Part 15 – Subpart C .....</b>                | <b>5</b>        |
| Subclause 15.203 – Antenna Information.....                | Pass..... 5     |
| Subclause 15.204 – Antenna Information.....                | Pass..... 5     |
| Subclause 15.207 – Disturbance Voltage on AC Mains .....   | N.A..... 5      |
| Subclause 15.247 (a) – Carrier Frequency Separation.....   | Pass..... 5     |
| Subclause 15.247 (a) – Time of Occupancy (Dwell Time)..... | Pass..... 6     |
| Subclause 15.247 (a) – 20 dB Bandwidth .....               | Pass..... 7     |
| Subclause 15.247 (a) – Hopping Sequence .....              | Pass..... 7     |
| Subclause 15.247 (a) – Equal Hopping Frequency Use .....   | Pass..... 8     |
| Subclause 15.247 (a) – Receiver Input Bandwidth .....      | Pass..... 9     |
| Subclause 15.247 (a) – Receiver Hopping Capability.....    | Pass..... 9     |
| Subclause 15.247 (b) – Peak Output Power .....             | Pass..... 9     |
| Subclause 15.247 (b) – Band edge compliance .....          | Pass..... 10    |
| Subclause 15.247 (c) – Spurious Conducted Emissions .....  | Pass..... 10    |
| Subclause 15.247 (c) – Spurious Radiated Emissions.....    | Pass..... 11    |
| <b>Appendix 1 – Test protocols .....</b>                   | <b>14 pages</b> |
| <b>Appendix 2 – Test setup .....</b>                       | <b>2 pages</b>  |
| <b>Appendix 3 – Photo documentation .....</b>              | <b>7 pages</b>  |
| <b>Appendix 4 – Product documentation .....</b>            | <b>28 pages</b> |

## Product information

### Manufacturers declarations

|                                         | Transceiver                                                                             |
|-----------------------------------------|-----------------------------------------------------------------------------------------|
| Operating frequency range               | 2402 - 2480 MHz                                                                         |
| Type of modulation                      | FHSS modulation                                                                         |
| Number of channels                      | 79                                                                                      |
| Channel separation                      | 1 MHz                                                                                   |
| Type of antenna                         | Integral Antenna                                                                        |
| Antenna gain (dBi)                      | 0                                                                                       |
| Power level                             | fix                                                                                     |
| Type of equipment                       | stand alone, plug-in radio device                                                       |
| Connection to public utility power line | No                                                                                      |
| Nominal voltage                         | V <sub>nom</sub> : 3.9 V                                                                |
| Independent Operation Modes             | Page scan<br>Inquiry scan<br>Connection state - ACL Link<br>Connection state - SCO Link |

### Product function and intended use

The test item is a Bluetooth Headphone based on the Bluetooth technology.

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, 79 RF channels spaced 1 MHz apart are defined.

The channel is represented by a pseudo-random hopping sequence through the 79 channels. The channel is divided into time slots, with a nominal slot length of 625 µs, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s. The symbol rate on the channel is 1 Ms/s.

### Submitted documents

Circuit Diagram  
Block Diagram  
Bill of material  
User manual

## List of Test and Measurement Instruments

|                                     | Kind of Equipment               | Manufacturer      | Type                | S/N          |
|-------------------------------------|---------------------------------|-------------------|---------------------|--------------|
| <input type="checkbox"/>            | Test Receiver                   | Rohde & Schwarz   | ESH-3               | 890173/033   |
| <input type="checkbox"/>            | L/I/S/N                         | Rohde & Schwarz   | ESH 3-Z5            | 849876/026   |
| <input type="checkbox"/>            | Oscilloscope                    | HP                | 54713B              | US34510455   |
| <input type="checkbox"/>            | Test Receiver                   | Rohde & Schwarz   | ESVP                | 882402/033   |
| <input type="checkbox"/>            | Absorbing Clamp                 | Rohde & Schwarz   | MDS-21              | 979 3/4      |
| <input type="checkbox"/>            | Test Receiver                   | Rohde & Schwarz   | ESVS30              | 842807/009   |
| <input type="checkbox"/>            | Biconical Antenna               | Rohde & Schwarz   | HK116               | 841489/015   |
| <input type="checkbox"/>            | Log.-Periodic Antenna           | Rohde & Schwarz   | HL223               | 841516/017   |
| <input type="checkbox"/>            | Universal Power Analyzer        | Voltech           | PM3000A             | 9915         |
| <input type="checkbox"/>            | Reference Impedance Network     | Voltech           | IEC 555<br>Standard | 9946         |
| <input type="checkbox"/>            | AC Power Source                 | California Instr. | 4500L               | HK51895      |
| <input type="checkbox"/>            | Trip-Loop Antenna               | Chase             | LLA6142             | 1019         |
| <input type="checkbox"/>            | Double Ridge Horn Antenna       | EMCO              | 3115                | 9002-3351    |
| <input checked="" type="checkbox"/> | Double Ridge Horn Antenna       | EMCO              | 3115                | 9002-3347    |
| <input type="checkbox"/>            | RF Comms Test Set               | HP                | 8920B               | US36492628   |
| <input type="checkbox"/>            | Spectrum Analyser + Tracking G. | HP                | 8596E               | 3639A00758   |
| <input type="checkbox"/>            | Signal Generator                | Rohde & Schwarz   | SMY 01              | 844146/024   |
| <input type="checkbox"/>            | Signal Generator                | Rohde & Schwarz   | SMY 01              | 844146/023   |
| <input type="checkbox"/>            | BiLog Antenna                   | EMCO              | 3143                | 9607-1287    |
| <input type="checkbox"/>            | Isotropic Field Probe           | Holladay          | HI-4422             | 90956        |
| <input type="checkbox"/>            | Power Amplifier                 | Kalmus            | 757-LC              | 7620-1       |
| <input type="checkbox"/>            | Power Amplifier                 | Kalmus            | 122-FC              | 7620-2       |
| <input type="checkbox"/>            | Coupling Clamp                  | Schaffner         | CDN 126             | 312          |
| <input type="checkbox"/>            | Couple Device Network           | Fischer           | CDN-M2              | 9604         |
| <input checked="" type="checkbox"/> | Spectrum Analyzer               | Rohde & Schwarz   | FSP30               | 1093.4495K30 |
| <input type="checkbox"/>            | Temperature Chamber             | Binder            | MK 240              | 9020-0028    |
| <input type="checkbox"/>            | EFT,ESD,SURGE, DIPS tester      | Schaffner         | Best 96             | IN3796-011   |
| <input type="checkbox"/>            | Surge Generator                 | Schaffner         | NSG650              | 280          |
| <input checked="" type="checkbox"/> | Active Loop Antenna             | EMCO              | 6502                | 9107-2651    |

## Result FCC Part 15 – Subpart C

| Subclause 15.203 – Antenna Information |                                                                                             | Pass |
|----------------------------------------|---------------------------------------------------------------------------------------------|------|
| Requirement:                           | No antenna other than that furnished by the responsible party shall be used with the device |      |
| Result:                                | Permanent attached antenna                                                                  |      |
| Verdict:                               | Pass                                                                                        |      |

| Subclause 15.204 – Antenna Information |                                                                                                                                             | Pass |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------|
| Requirement:                           | Provide information for every antenna proposed for the use with the EUT                                                                     |      |
| Result:                                | a) Antenna type: Permanent attached antenna<br>b) Manufacturer and model no: N.A.<br>c) Gain with reference to an isotropic radiator: 0 dBi |      |
| Verdict:                               | Pass                                                                                                                                        |      |

| Subclause 15.207 – Disturbance Voltage on AC Mains               |  | N.A. |
|------------------------------------------------------------------|--|------|
| The device is not functioning (no RF radiations) during charging |  |      |

| Subclause 15.247 (a) – Carrier Frequency Separation                                                                                                                                                                                                                                                                                  |                                                                                                                                                                              | Pass |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Requirement:                                                                                                                                                                                                                                                                                                                         | Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. |      |
| Test Specification : FCC Part 15 Subpart A – Subclause 15.31<br>Mode of operation : Tx mode (hopping on), DH1 packet<br>Port of testing : Temporary antenna port<br>Detector : Peak<br>RBW/VBW : 100 kHz / 300 kHz<br>Supply voltage : 3.9 VDC from DC power supply<br>Temperature : 23°C<br>Humidity : 50%<br>Op. mode : Hopping on |                                                                                                                                                                              |      |
| Result:                                                                                                                                                                                                                                                                                                                              | The centre frequencies of the hopping channels are separated by more than the 20dB bandwidth. For test results plots refer to Appendix 1, page 2.                            |      |
| Verdict:                                                                                                                                                                                                                                                                                                                             | Pass                                                                                                                                                                         |      |

| Subclause 15.247 (a) – Time of Occupancy (Dwell Time)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Pass |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Requirement:</b> Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.                                                                                                                                                                                                                                                                                                                                                         |      |
| Test Specification : FCC Part 15 Subpart A – Subclause 15.31<br>Mode of operation : Tx mode (hopping on), DH5 packet<br>Port of testing : Temporary antenna port<br>Detector : Peak<br>RBW/VBW : 1 MHz / 3 MHz<br>Supply voltage : 3.9VDC from DC power supply<br>Temperature : 23°C<br>Humidity : 50%<br>Op. mode : Hopping on                                                                                                                                                                                                                                                                                                                              |      |
| <b>Result:</b> The screenshot in Appendix 1 page 4 shows the occurrence of a channel in a 31.6 s time period. In normal hopping mode Bluetooth is using 79 hopping channels only. The frequency was used 64 times. The dwell time for the longest supported packet type is about 3 ms. As a result the average time of occupancy will not be greater than 400 ms.<br><br>i.e. Time period calculation:<br>$0.4 \times 79 = 31.6\text{s}$<br><br>Limit calculation:<br>$64 \times 2.936 \times 10^{-3} = 187.9 \times 10^{-3}$<br>$\leq 400 \times 10^{-3} \text{ s}$<br><br>For test protocols please refer to Appendix 1, page 3-4.<br><b>Verdict:</b> Pass |      |

**Subclause 15.247 (a) – 20 dB Bandwidth****Pass**

Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

Test Specification : FCC Part 15 Subpart A – Subclause 15.31  
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH5 packet  
 Port of testing : Temporary antenna port  
 Detector : Peak  
 RBW/VBW : 30 kHz / 100 kHz  
 Supply voltage : 3.9VDC from DC power supply  
 Temperature : 23°C  
 Humidity : 50%  
 Op. mode : TX mode, DH5 with PRBS9 payload

**Results**

For test protocols refer to Appendix 1, page 5-6

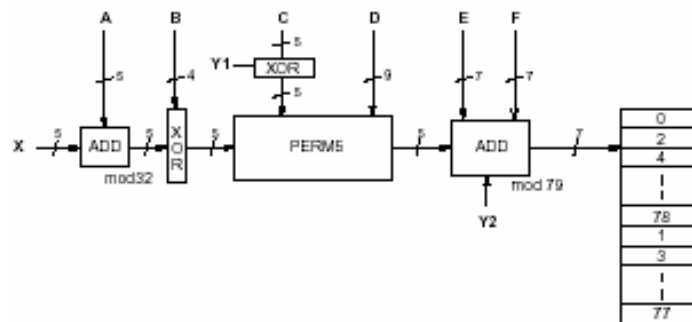
| Frequency (MHz) | 20 dB left (MHz) | 20 dB right (MHz) | 20dB bandwidth (MHz) |
|-----------------|------------------|-------------------|----------------------|
| 2402            | 0.460            | 0.416             | 0.876                |
| 2441            | 0.464            | 0.460             | 0.924                |
| 2480            | 0.468            | 0.472             | 0.940                |

**Subclause 15.247 (a) – Hopping Sequence****Pass**

Requirement: The hopping sequence is generated and provided with an example.

**Hopping sequence**

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



**Example data:**

Hop sequence {k} for CONNECTION STATE:

CLK start: 0x0000010

ULAP: 0x00000000

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

```

0x0000010: 08 66 | 10 70 | 12 19 | 14 23 | 16 01 | 18 05 | 20 33 | 22 37 |
0x0000030: 24 03 | 26 07 | 28 35 | 30 39 | 32 72 | 34 76 | 36 25 | 38 29 |
0x0000050: 40 74 | 42 78 | 44 27 | 46 31 | 48 09 | 50 13 | 52 41 | 54 45 |
0x0000070: 56 11 | 58 15 | 60 43 | 62 47 | 32 17 | 36 19 | 34 49 | 38 51 |
0x0000090: 40 21 | 44 23 | 42 53 | 46 55 | 48 33 | 52 35 | 50 65 | 54 67 |
0x00000b0: 56 37 | 60 39 | 58 69 | 62 71 | 64 25 | 68 27 | 66 57 | 70 59 |
0x00000d0: 72 29 | 76 31 | 74 61 | 78 63 | 01 41 | 05 43 | 03 73 | 07 75 |
0x00000f0: 09 45 | 13 47 | 11 77 | 15 00 | 64 49 | 66 53 | 68 02 | 70 06 |
0x0000110: 01 51 | 03 55 | 05 04 | 07 08 | 72 57 | 74 61 | 76 10 | 78 14 |
0x0000130: 09 59 | 11 63 | 13 12 | 15 16 | 17 65 | 19 69 | 21 18 | 23 22 |
0x0000150: 33 67 | 35 71 | 37 20 | 39 24 | 25 73 | 27 77 | 29 26 | 31 30 |
0x0000170: 41 75 | 43 00 | 45 28 | 47 32 | 17 02 | 21 04 | 19 34 | 23 36 |
0x0000190: 33 06 | 37 08 | 35 38 | 39 40 | 25 10 | 29 12 | 27 42 | 31 44 |
0x00001b0: 41 14 | 45 16 | 43 46 | 47 48 | 49 18 | 53 20 | 51 50 | 55 52 |
0x00001d0: 65 22 | 69 24 | 67 54 | 71 56 | 57 26 | 61 28 | 59 58 | 63 60 |
0x00001f0: 73 30 | 77 32 | 75 62 | 00 64 | 49 34 | 51 42 | 57 66 | 59 74 |
0x0000210: 53 36 | 55 44 | 61 68 | 63 76 | 65 50 | 67 58 | 73 03 | 75 11 |
0x0000230: 69 52 | 71 60 | 77 05 | 00 13 | 02 38 | 04 46 | 10 70 | 12 78 |
0x0000250: 06 40 | 08 48 | 14 72 | 16 01 | 18 54 | 20 62 | 26 07 | 28 15 |
0x0000270: 22 56 | 24 64 | 30 09 | 32 17 | 02 66 | 06 74 | 10 19 | 14 27 |
0x0000290: 04 70 | 08 78 | 12 23 | 16 31 | 18 03 | 22 11 | 26 35 | 30 43 |
0x00002b0: 20 07 | 24 15 | 28 39 | 32 47 | 34 68 | 38 76 | 42 21 | 46 29 |
0x00002d0: 36 72 | 40 01 | 44 25 | 48 33 | 50 05 | 54 13 | 58 37 | 62 45 |
0x00002f0: 52 09 | 56 17 | 60 41 | 64 49 | 34 19 | 36 35 | 50 51 | 52 67 |
0x0000310: 38 21 | 40 37 | 54 53 | 56 69 | 42 27 | 44 43 | 58 59 | 60 75 |
0x0000330: 46 29 | 48 45 | 62 61 | 64 77 | 66 23 | 68 39 | 03 55 | 05 71 |
0x0000350: 70 25 | 72 41 | 07 57 | 09 73 | 74 31 | 76 47 | 11 63 | 13 00 |
0x0000370: 78 33 | 01 49 | 15 65 | 17 02 | 66 51 | 70 67 | 03 04 | 07 20 |
0x0000390: 68 55 | 72 71 | 05 08 | 09 24 | 74 59 | 78 75 | 11 12 | 15 28 |
0x00003b0: 76 63 | 01 00 | 13 16 | 17 32 | 19 53 | 23 69 | 35 06 | 39 22 |
0x00003d0: 21 57 | 25 73 | 37 10 | 41 26 | 27 61 | 31 77 | 43 14 | 47 30 |
0x00003f0: 29 65 | 33 02 | 45 18 | 49 34 | 19 04 | 21 08 | 23 20 | 25 24 |

```

**Subclause 15.247 (a) – Equal Hopping Frequency Use****Pass**

Requirement: Each of the transmitter's hopping channels is used equally on average.

Equal hopping frequency use

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

| Subclause 15.247 (a) – Receiver Input Bandwidth                                                                                                                                        |                                                                                                                                    | Pass |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------|
| Requirement:                                                                                                                                                                           | The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal. |      |
| Receiver input bandwidth                                                                                                                                                               |                                                                                                                                    |      |
| The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing. |                                                                                                                                    |      |

| Subclause 15.247 (a) – Receiver Hopping Capability                                                  |                                                                                                               | Pass |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------|
| Requirement:                                                                                        | The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals. |      |
| Receiver hopping Capability                                                                         |                                                                                                               |      |
| The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard. |                                                                                                               |      |

| Subclause 15.247 (b) – Peak Output Power                                                                                                                                                                                                                                                                                                                            |                                 |                        |                    | Pass          |         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------|--------------------|---------------|---------|
| Test Specification : FCC Part 15 Subpart A – Subclause 15.31<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet<br>Port of testing : Temporary antenna port<br>Detector : Peak<br>RBW/VBW : 1 MHz / 3 MHz<br>Supply voltage : 3.9VDC from DC power supply<br>Temperature : 23°C<br>Humidity : 50%<br>Op. mode : TX mode, DH1 with PRBS9 payload |                                 |                        |                    |               |         |
| Requirement: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt. For all other frequency hopping systems in the 2400 – 2483.5 MHz band: 0.125 Watts.                                                                                   |                                 |                        |                    |               |         |
| <b>Result</b><br>All three transmit frequency modes comply with the maximum peak output power limit.<br>For test protocols please refer to Appendix 1, page 7-8.                                                                                                                                                                                                    |                                 |                        |                    |               |         |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                     | Maximum peak output power (dBm) | Cable attenuation (dB) | Output power (dBm) | Limit (W/dBm) | Verdict |
| 2402                                                                                                                                                                                                                                                                                                                                                                | -2.67                           | 3.52                   | 0.85               | 1 / 30.0      | Pass    |
| 2441                                                                                                                                                                                                                                                                                                                                                                | -2.82                           | 3.65                   | 0.83               | 1 / 30.0      | Pass    |
| 2480                                                                                                                                                                                                                                                                                                                                                                | -3.40                           | 3.60                   | 0.20               | 1 / 30.0      | Pass    |

| <b>Subclause 15.247 (b) – Band edge compliance</b>                                                                                                                                                                                                                                                                                                                                                                                 |  | <b>Pass</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------|
| Test Specification : FCC Part 15 Subpart A – Subclause 15.31<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet<br>Port of testing : Temporary antenna port<br>Detector : Peak<br>RBW/VBW : 300 kHz / 1 MHz<br>Supply voltage : 3.9VDC from DC power supply<br>Temperature : 23°C<br>Humidity : 50%<br>Op. mode : TX mode, DH1 with PRBS9 payload                                                              |  |             |
| <b>Requirement:</b> In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |  |             |
| <b>Result</b><br>There is no peak found outside any 100 kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(c).<br>For test protocols refer to Appendix 1, page 9-10.                                                                                                                                               |  |             |

| Subclause 15.247 (c) – Spurious Conducted Emissions                                                                                                                                                                                                                                                                                                                                                                         |                          |                      | Pass                  |            |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|-----------------------|------------|---------|
| Test Specification : FCC Part 15 Subpart A – Subclause 15.31<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet<br>Port of testing : Temporary antenna port<br>Detector : Peak<br>RBW/VBW : 100 kHz / 300 kHz<br>Supply voltage : 3.9VDC from DC power supply<br>Temperature : 23 °C<br>Humidity : 50 %<br>Op. mode : TX mode, DH1 with PRBS9 payload                                                   |                          |                      |                       |            |         |
| Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |                          |                      |                       |            |         |
| Result<br><br>There is no peak found outside any 100kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(c).<br><br>For test protocols refer to Appendix 1, page 11-15.                                                                                                                                       |                          |                      |                       |            |         |
| Operating frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                   | Spurious frequency (MHz) | Spurious Level (dBm) | Reference value (dBm) | Delta (dB) | Verdict |

|      |          |        |       |        |      |
|------|----------|--------|-------|--------|------|
| 2402 | 4795.660 | -41.52 | -2.63 | -38.89 | Pass |
| 2441 | 4875.420 | -38.41 | -2.46 | -35.95 | Pass |
| 2441 | 5174.520 | -50.13 | -2.46 | -47.67 | Pass |
| 2480 | 4955.180 | -39.64 | -2.68 | -36.96 | Pass |

| Subclause 15.247 (c) – Spurious Radiated Emissions                                                                                                                                                                                                                                                                                                                                                                          |              |                         | Pass |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------|------|
| Test Specification : ANSI C63.4 - 2003<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet<br>Port of testing : Enclosure<br>Detector : Peak<br>RBW/VBW : 100 kHz / 300 kHz for $f < 1$ GHz<br>1 MHz / 3 MHz for $f > 1$ GHz<br>Supply voltage : internal batteries has been activated<br>Temperature : 23°C<br>Humidity : 50%                                                                           |              |                         |      |
| Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |              |                         |      |
| <b>Result</b><br>All three transmit frequency modes comply with the field strength within the restricted bands.<br>There is no peak found under 30MHz.                                                                                                                                                                                                                                                                      |              |                         |      |
| Tx frequency 2402MHz                                                                                                                                                                                                                                                                                                                                                                                                        |              | Vertical Polarization   |      |
| Freq MHz                                                                                                                                                                                                                                                                                                                                                                                                                    | Level dBuV/m | Limit/ Detector dBuV/m  |      |
| No peak found                                                                                                                                                                                                                                                                                                                                                                                                               | -            | 43.5 / QP               |      |
| 1602.060                                                                                                                                                                                                                                                                                                                                                                                                                    | 46.29        | 74.0 / P                |      |
| 1602.060                                                                                                                                                                                                                                                                                                                                                                                                                    | 45.70        | 54.0 / A                |      |
| 4803.960                                                                                                                                                                                                                                                                                                                                                                                                                    | 48.58        | 74.0 / P                |      |
| 4803.960                                                                                                                                                                                                                                                                                                                                                                                                                    | 46.18        | 54.0 / A                |      |
| Tx frequency 2402MHz                                                                                                                                                                                                                                                                                                                                                                                                        |              | Horizontal Polarization |      |
| Freq MHz                                                                                                                                                                                                                                                                                                                                                                                                                    | Level dBuV/m | Limit/ Detector dBuV/m  |      |
| No peak found                                                                                                                                                                                                                                                                                                                                                                                                               | -            | 43.5 / QP               |      |
| 1602.020                                                                                                                                                                                                                                                                                                                                                                                                                    | 49.31        | 74.0 / P                |      |
| 1602.020                                                                                                                                                                                                                                                                                                                                                                                                                    | 48.87        | 54.0 / A                |      |
| 4803.820                                                                                                                                                                                                                                                                                                                                                                                                                    | 50.02        | 74.0 / P                |      |
| 4803.820                                                                                                                                                                                                                                                                                                                                                                                                                    | 48.69        | 54.0 / A                |      |

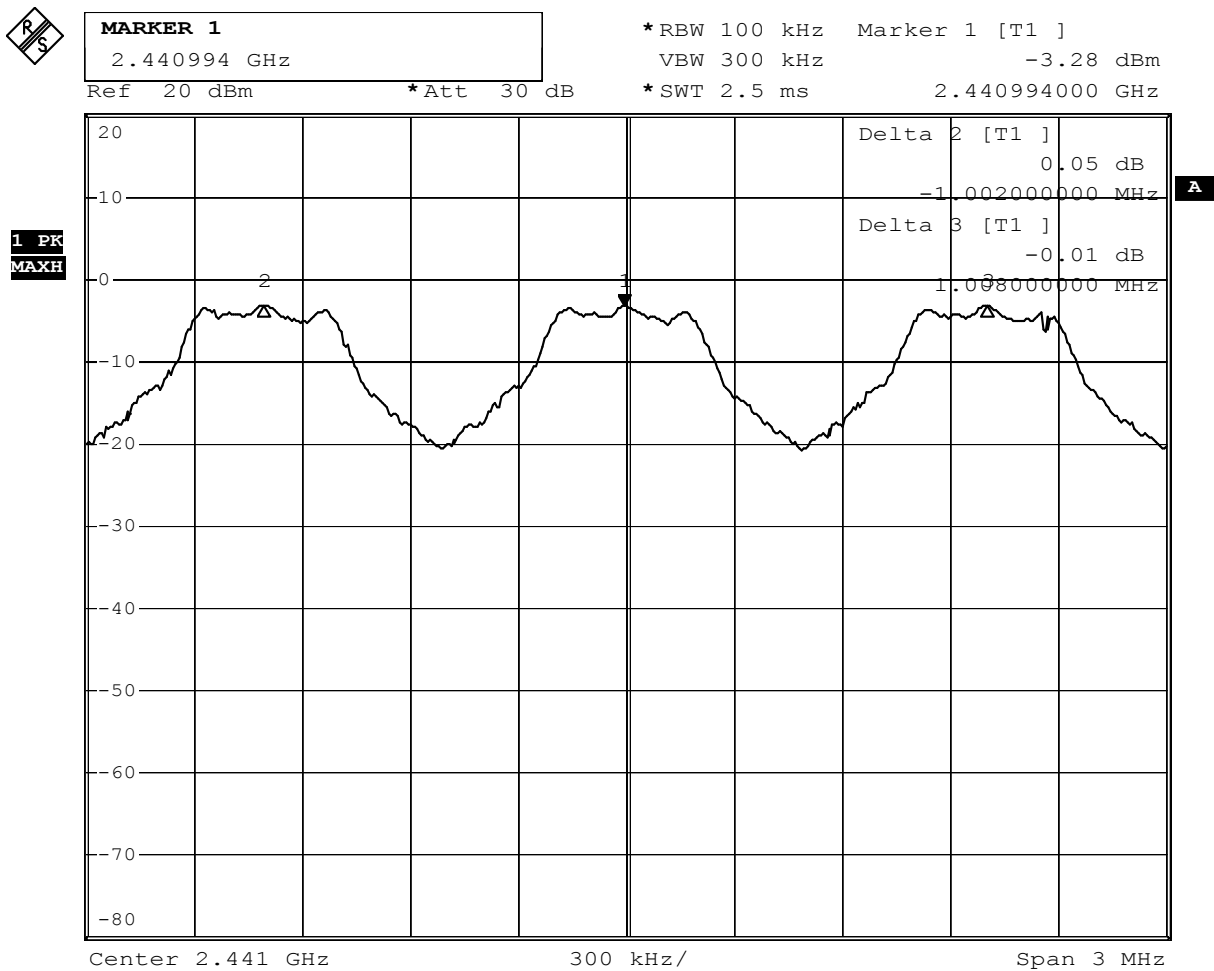
| Tx frequency 2441MHz Vertical Polarization   |              |                        |
|----------------------------------------------|--------------|------------------------|
| Freq MHz                                     | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found                                | -            | 43.5 / QP              |
| 1627.980                                     | 43.17        | 74.0 / P               |
| 1627.960                                     | 41.88        | 54.0 / A               |
| Tx frequency 2441MHz Horizontal Polarization |              |                        |
| Freq MHz                                     | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found                                | -            | 43.5 / QP              |
| No peak found                                | -            | 74.0 / P               |
| No peak found                                | -            | 54.0 / A               |
| Tx frequency 2480MHz Vertical Polarization   |              |                        |
| Freq MHz                                     | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found                                | -            | 43.5 / QP              |
| 1602.000                                     | 46.72        | 74.0 / P               |
| 1602.000                                     | 45.89        | 54.0 / A               |
| 4803.900                                     | 50.61        | 74.0 / P               |
| 4803.900                                     | 47.68        | 54.0 / A               |
| Tx frequency 2480MHz Horizontal Polarization |              |                        |
| Freq MHz                                     | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found                                | -            | 43.5 / QP              |
| 1602.020                                     | 45.47        | 74.0 / P               |
| 1602.020                                     | 44.21        | 54.0 / A               |
| 4803.820                                     | 47.14        | 74.0 / P               |
| 4803.980                                     | 43.17        | 54.0 / A               |

# **Appendix 1**

## **Test results**

# Carrier Frequency Separation

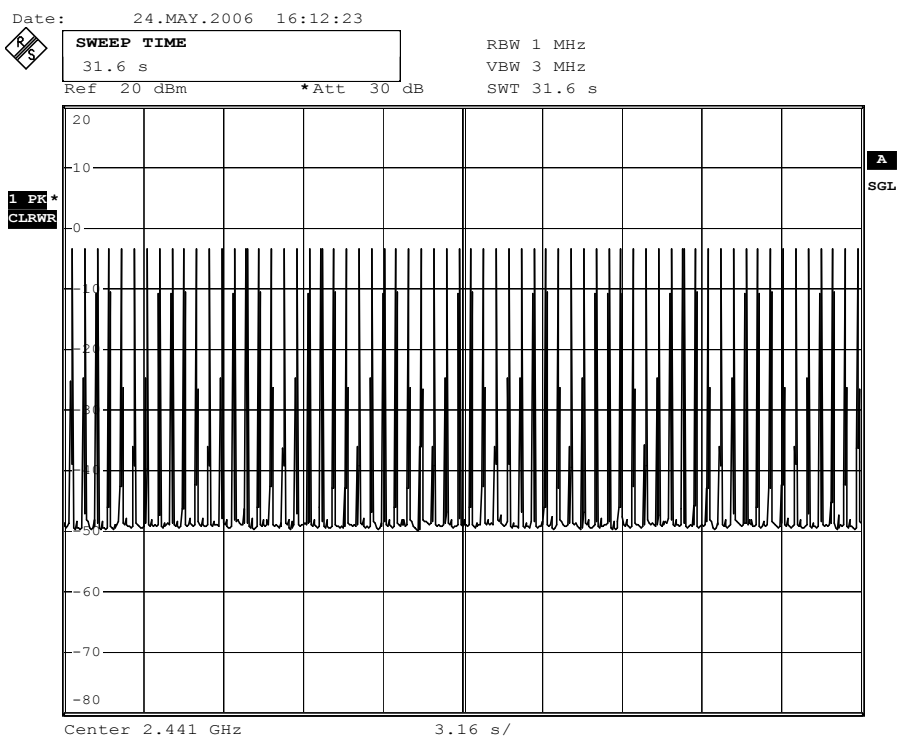
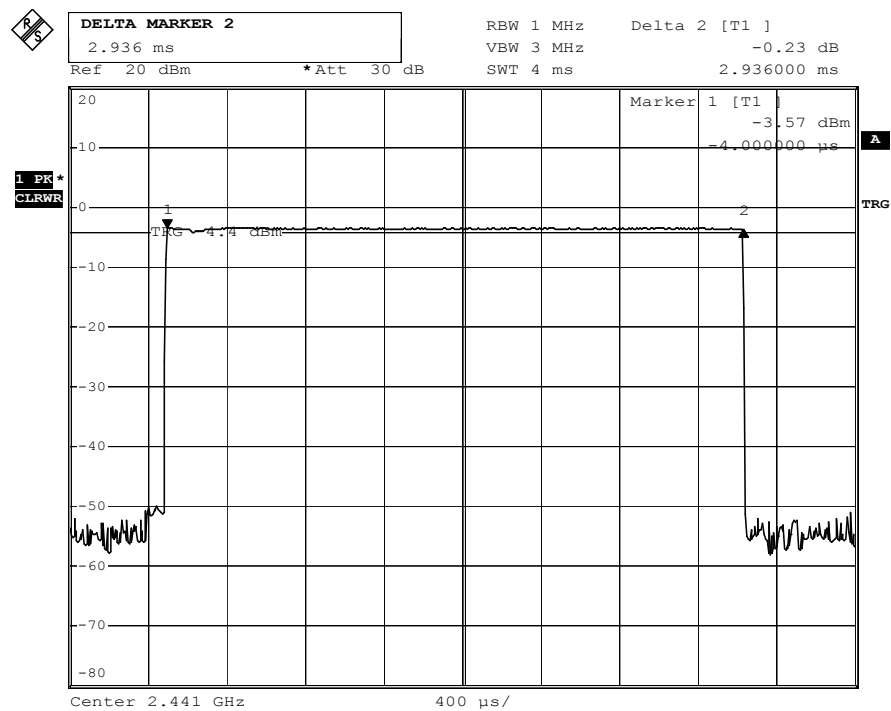
Test by: Sharon Li



Date:            24.MAY.2006    16:08:59

## Dwell Time

Test by: Sharon Li



Date: 24.MAY.2006 16:13:36

## 20dB Bandwidth

Test by: Sharon Li

Tx frequency: 2402MHz

**FREQUENCY LINE 2**

2.402412 GHz

Ref 20 dBm

\*Att 30 dB

\*RBW 30 kHz

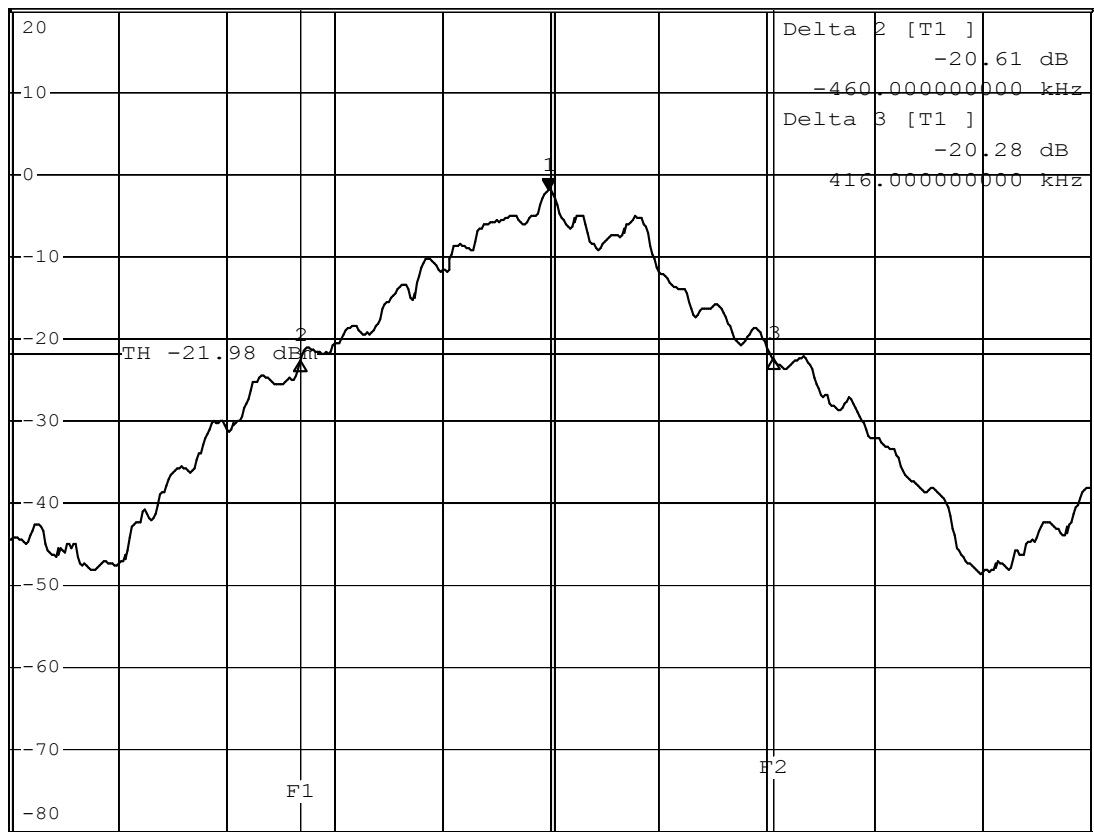
Marker 1 [T1 ]

\*VBW 100 kHz

-1.98 dBm

SWT 2.5 ms

2.401996000 GHz

**1 PK**  
**MAXH**

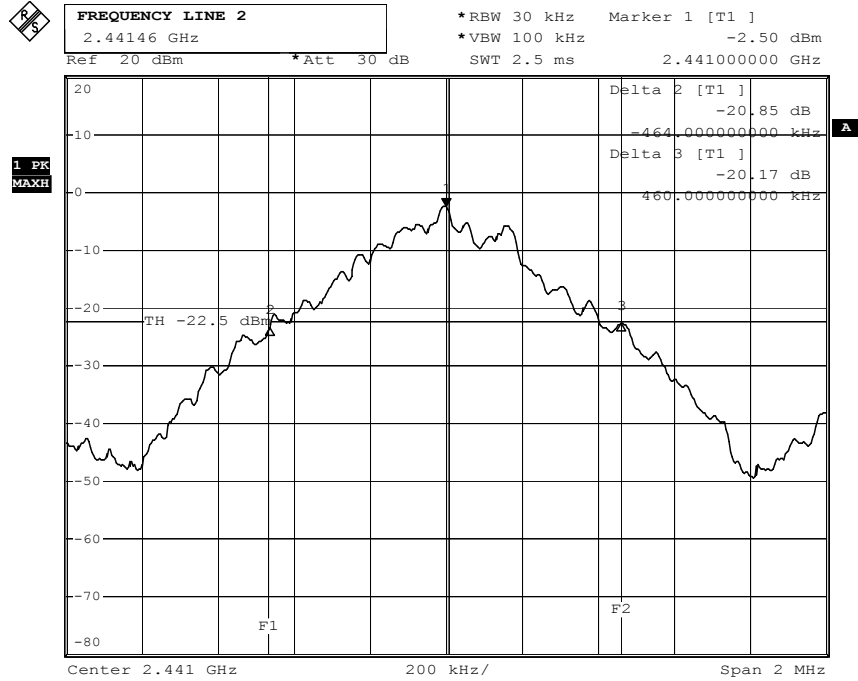
Center 2.402 GHz

200 kHz/

Span 2 MHz

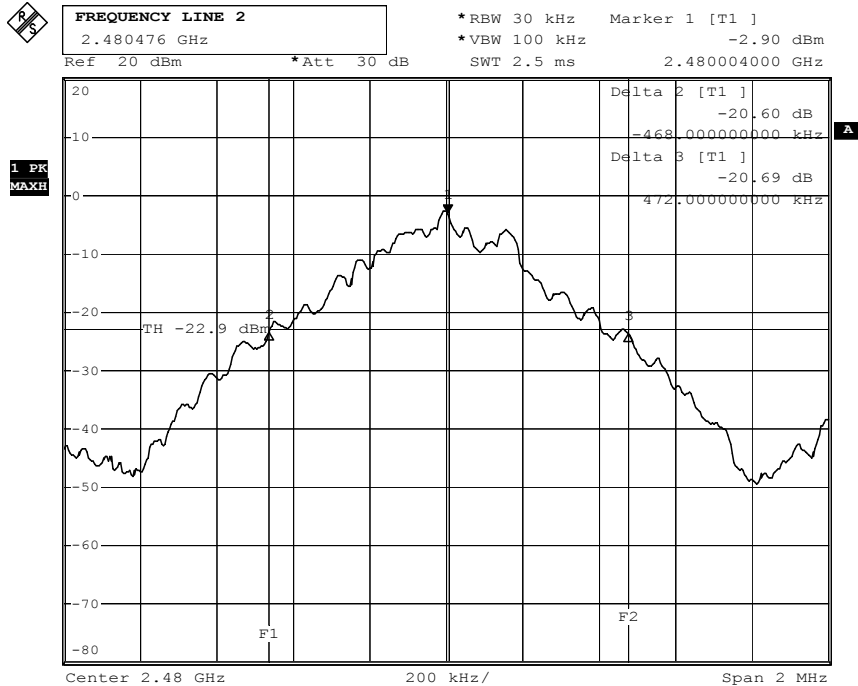
Date: 24.MAY.2006 16:19:02

Tx frequency: 2441MHz



Date: 24.MAY.2006 16:20:49

Tx frequency: 2480MHz



Date: 24.MAY.2006 16:22:40

## Peak Output Power

Test by: Sharon Li

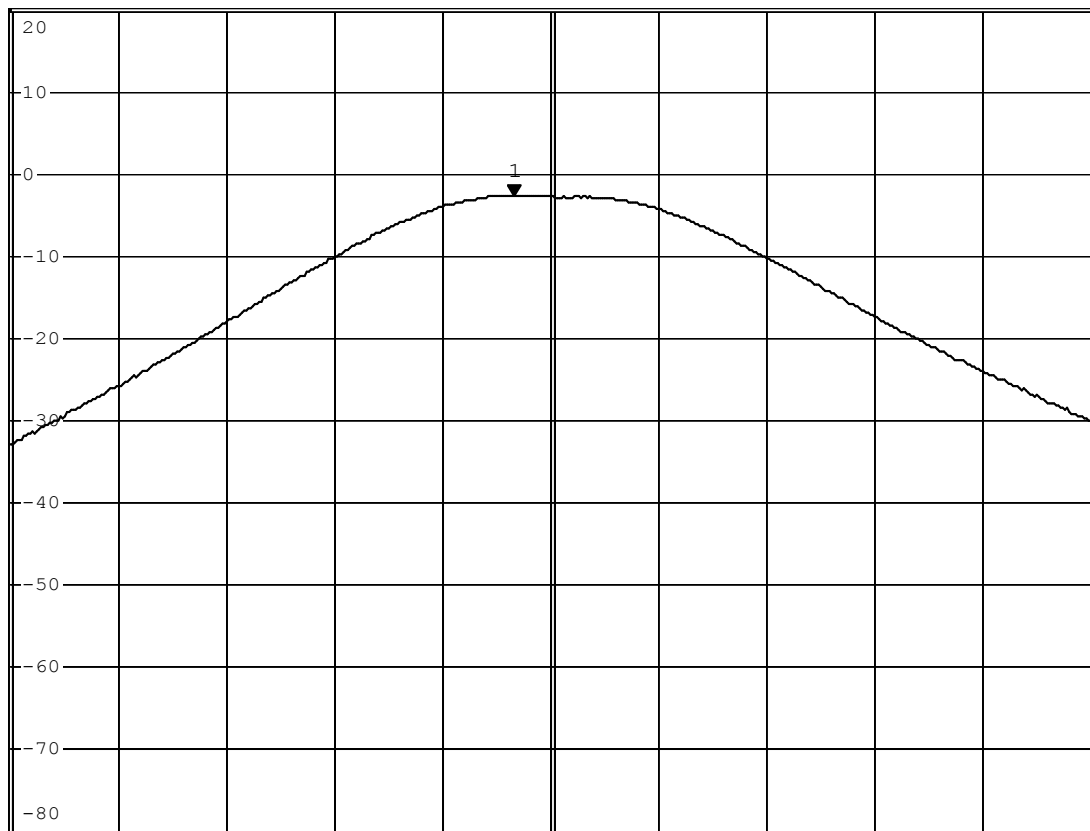
Tx frequency: 2402MHz



**MARKER 1**  
2.40183 GHz  
Ref 20 dBm \*Att 30 dB

\*RBW 1 MHz Marker 1 [T1 ]  
\*VBW 3 MHz -2.67 dBm  
SWT 2.5 ms 2.401830000 GHz

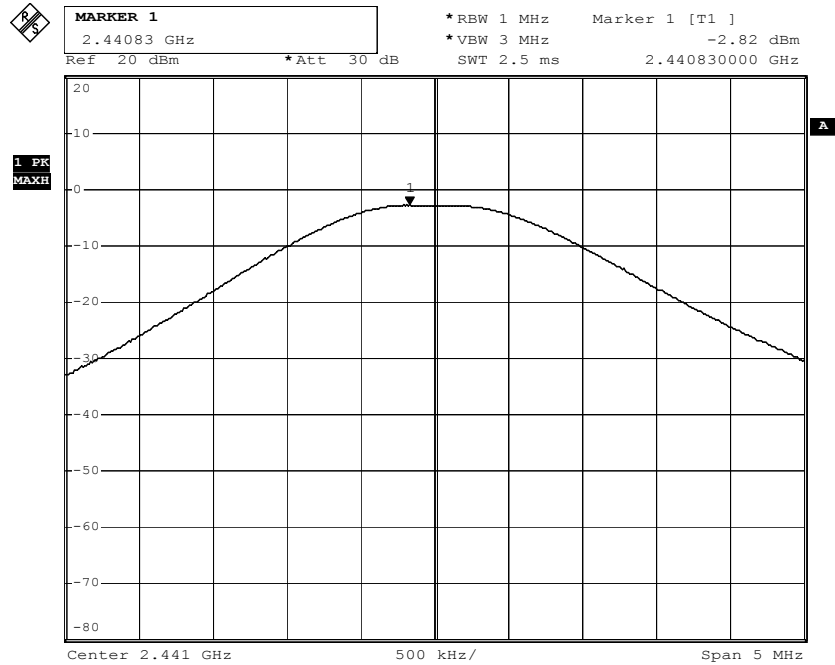
1 PK  
MAXH



Center 2.402 GHz 500 kHz/ Span 5 MHz

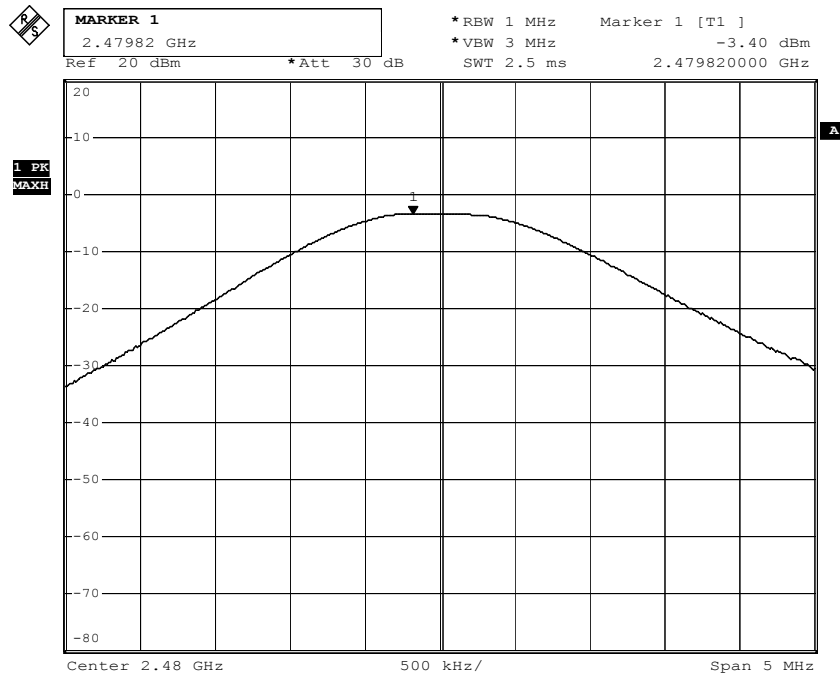
Date: 24.MAY.2006 16:25:08

Tx frequency: 2441MHz



Date: 24.MAY.2006 16:27:16

Tx frequency: 2480MHz



Date: 24.MAY.2006 16:28:12

## Band Edge Compliance

Test by: Sharon Li

Tx frequency: 2402MHz

**CENTER FREQUENCY**

2.394 GHz

Ref 20 dBm

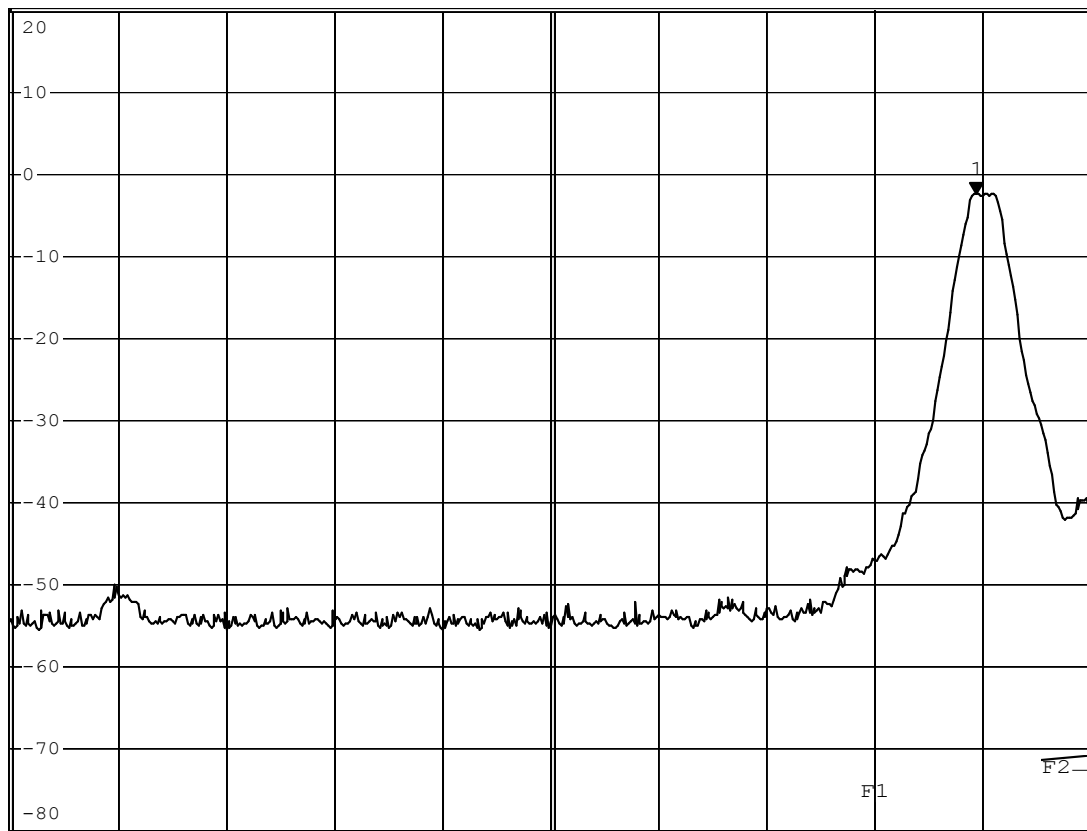
\*Att 30 dB

\*RBW 300 kHz Marker 1 [T1 ]

\*VBW 1 MHz -2.37 dBm

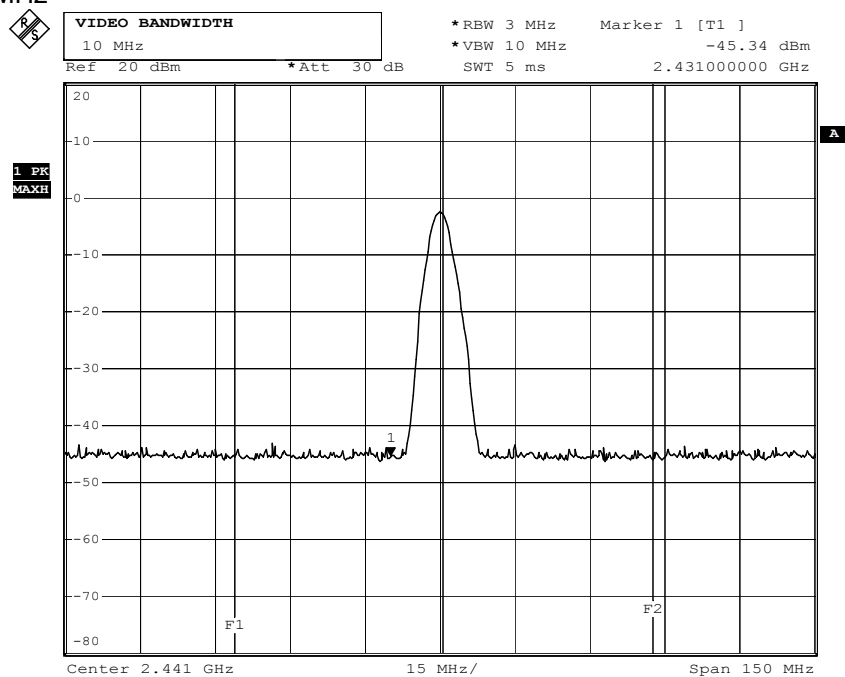
SWT 2.5 ms

2.401880000 GHz

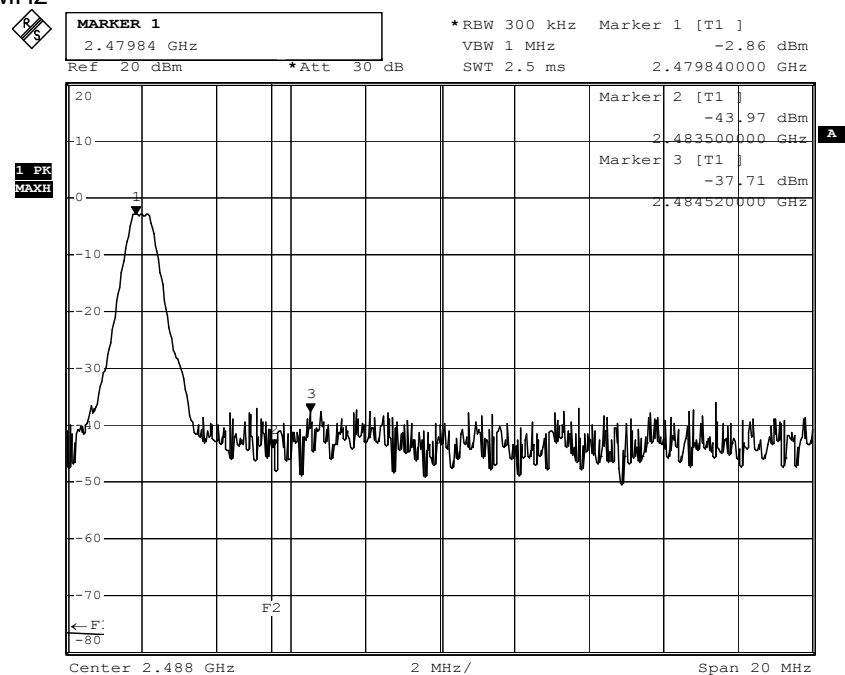
**1 PK  
MAXH**

Date: 24.MAY.2006 16:30:27

Tx frequency: 2441MHz



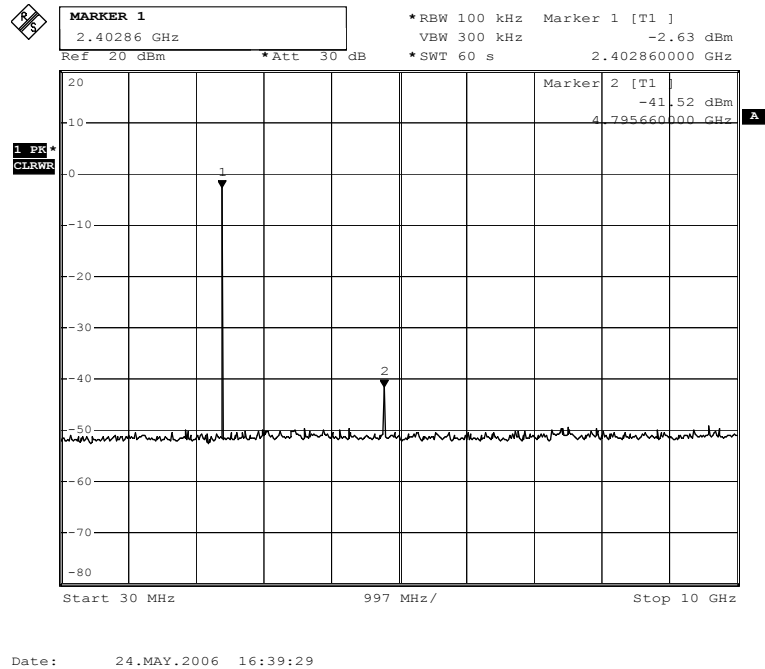
Tx frequency: 2480MHz



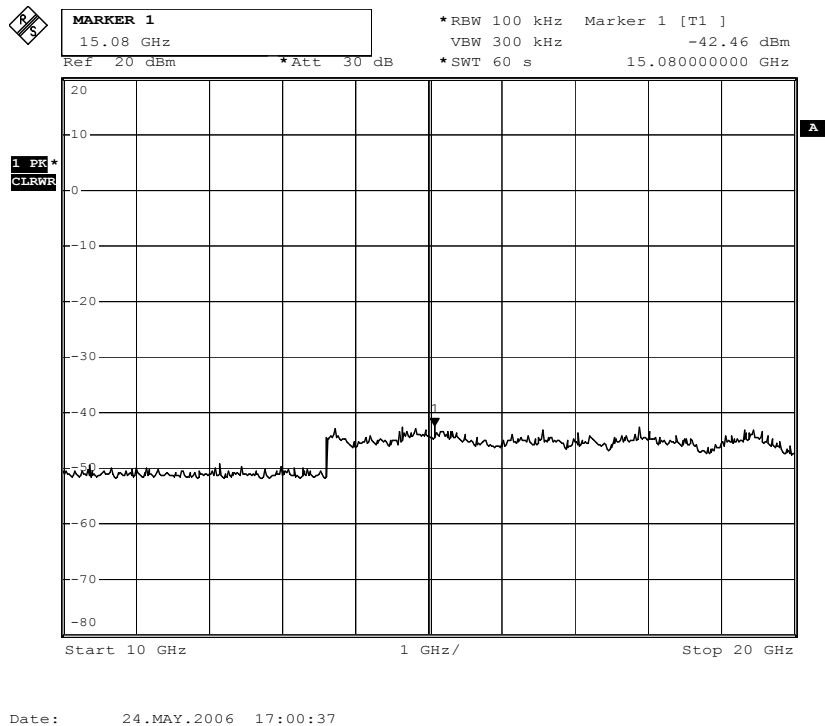
## Spurious Emissions - Conducted

Test by: Sharon Li

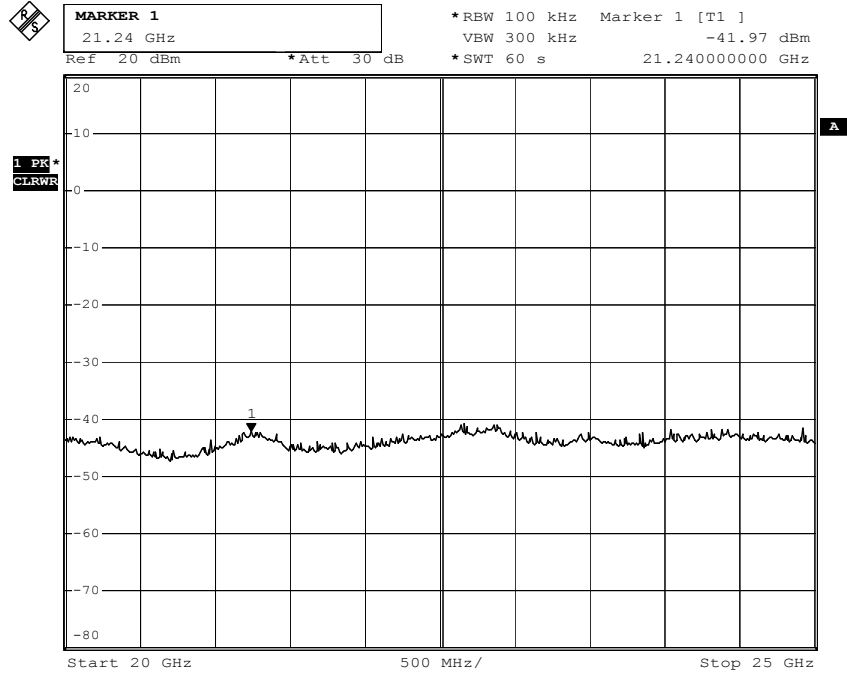
Tx frequency: 2402MHz



Tx frequency: 2402MHz

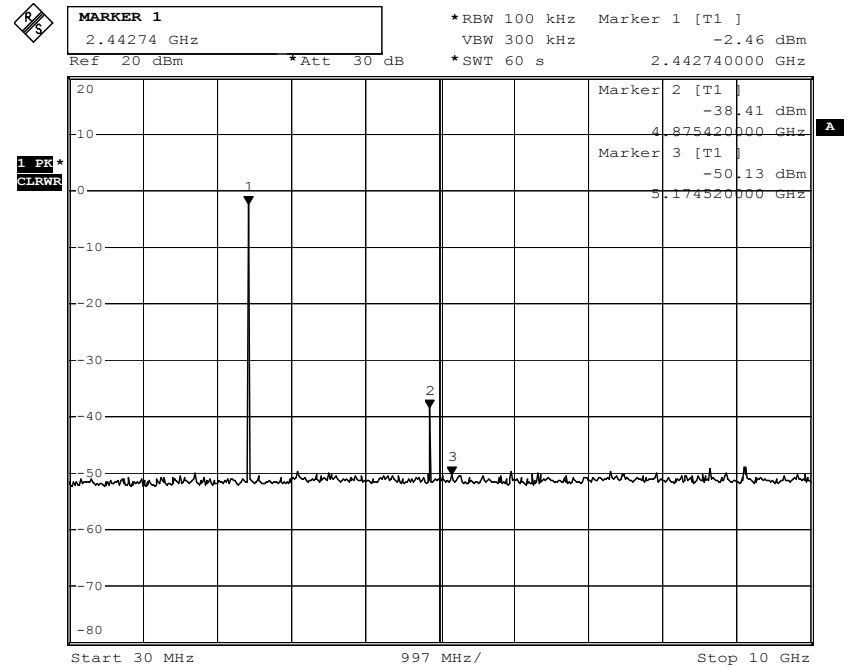


Tx frequency: 2402MHz



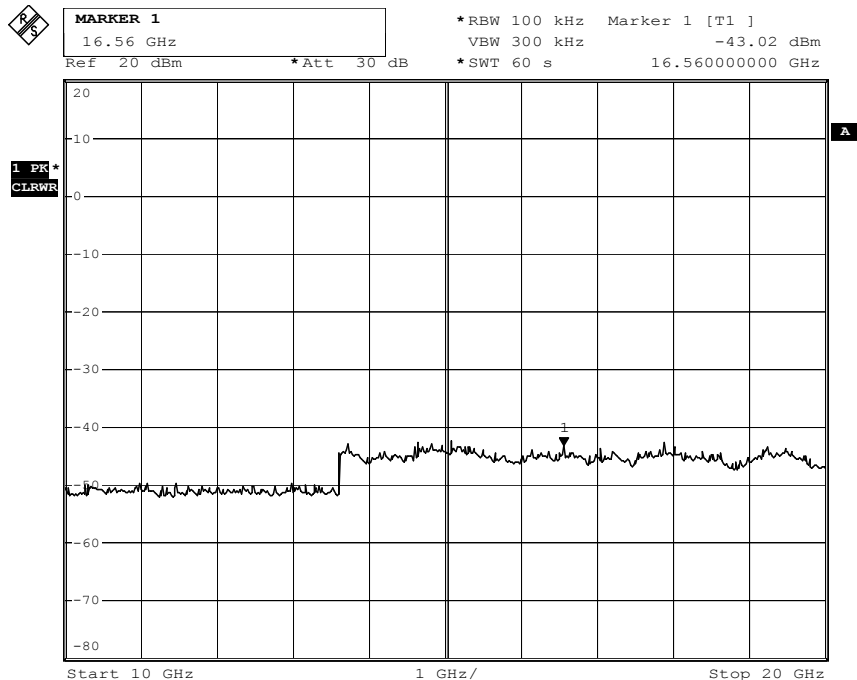
Date: 24.MAY.2006 17:04:51

Tx frequency: 2441MHz



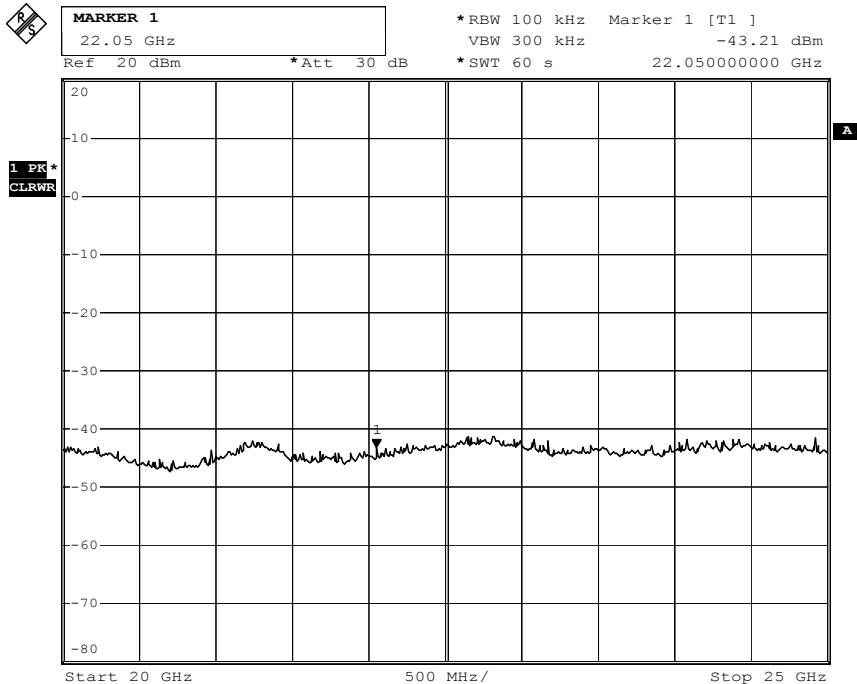
Date: 24.MAY.2006 17:07:38

Tx frequency: 2441MHz



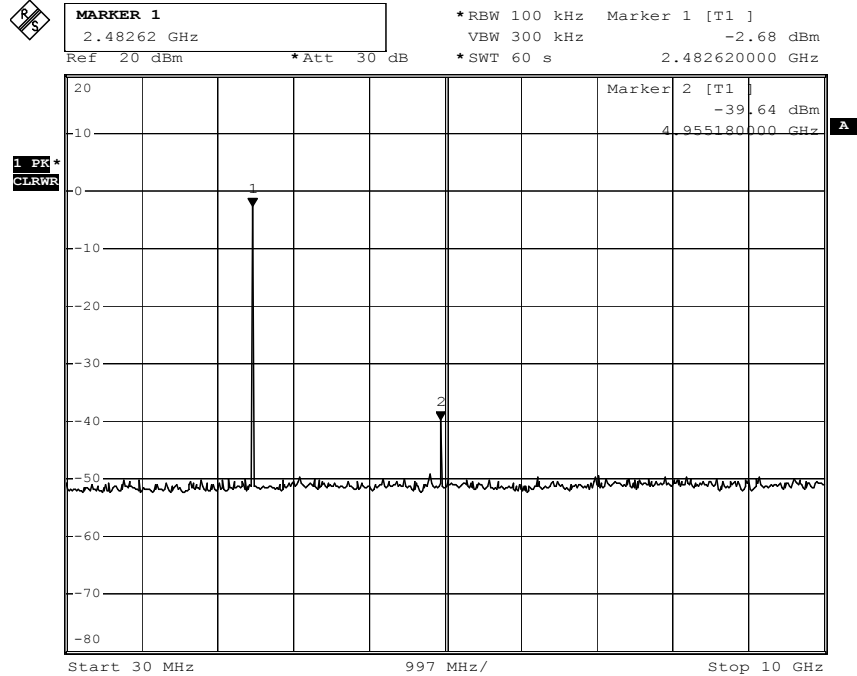
Date: 24.MAY.2006 17:01:02

Tx frequency: 2441MHz



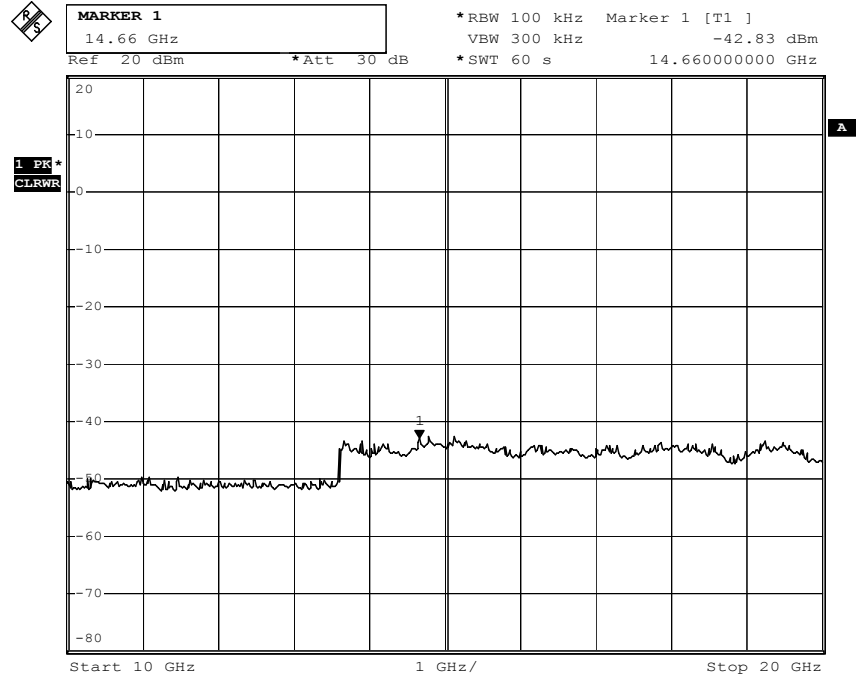
Date: 24.MAY.2006 17:04:31

Tx frequency: 2480MHz



Date: 24.MAY.2006 17:10:48

Tx frequency: 2480MHz



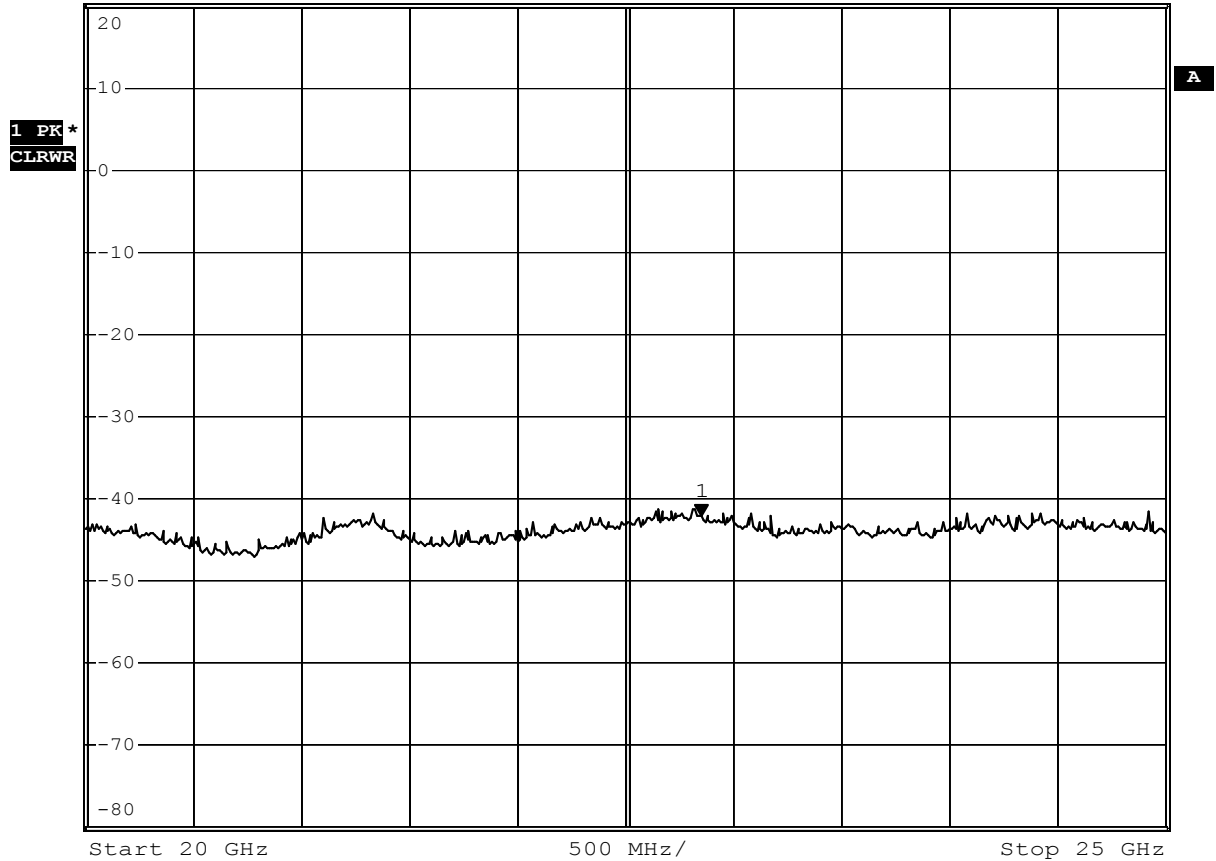
Date: 24.MAY.2006 17:01:38

Tx frequency: 2480MHz



**MARKER 1**  
22.85 GHz  
Ref 20 dBm \*Att 30 dB

\*RBW 100 kHz Marker 1 [T1 ]  
VBW 300 kHz -42.12 dBm  
\*SWT 60 s 22.850000000 GHz



Date: 24.MAY.2006 17:04:04