

# RADIO TEST REPORT

**No. 409677R1**

## EQUIPMENT UNDER TEST

Equipment: Conference unit  
Type / model: Konftel 60W  
Manufacturer: Konftel Technology AB  
Tested by request of: Konftel Technology AB

## SUMMARY

The equipment complies with the requirements of the following standards:

FCC, Part 15, Subpart B (2003) and Subpart C (2003);  
RSS-210, Issue 5 (November 2001)

Industry Canada listed test facility No. IC 3481



Date of issue: October 7, 2004

Tested by:

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Approved by:

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**1. CLIENT INFORMATION**

The EUT has been tested by request of

Company: Konftel Technology AB  
Box 268  
SE-901 06 Umeå  
Sweden  
Name of contact: Mr. Tommy Edlund

**2. EQUIPMENT UNDER TEST (EUT)****2.1 Identification of the EUT according to the manufacturer/client declaration**

Equipment: Conference unit  
Type/Model: Konftel 60W  
Brand name: Konftel  
Serial number: -  
FCC ID Number: -  
Manufacturer: Konftel Technology AB  
Rating/Supplying voltage: 13,5 V DC (11,5 ... 15,0 V DC)  
Rating RF output power: Power class 2  
Antenna gain: 0 dBi  
External antenna connector: NO  
Operating temperature range: 0 to +40 °C  
Frequency range: 2400 – 2483,5 MHz  
Number of channels: 79  
Modulation characteristics: GFSK  
Stand by mode supported: Yes

**2.2 Additional hardware information about the EUT**

The EUT consists of the following unit:

|                 |                  |
|-----------------|------------------|
| Unit            | Type and version |
| Conference unit | Konftel 60W      |



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**2.3 Additional software information about the EUT**

During the tests the EUT supported the following software:

| Software      | Version | Comment                        |
|---------------|---------|--------------------------------|
| Test software | 1.0     | Bluetooth test mode activation |

**2.4 Peripheral equipment**

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

| Equipment                     | Manufacturer / Type   | Serial number                  |
|-------------------------------|---|--------------------------------|
| AC adapter                    | DPX481821 Input: 120 V, 60 Hz, 16 W; -<br>Output: 12 V DC, 700 mA.<br>Class 2 Transformer |                                |
| Bluetooth starter kit         | Ericsson AB / ROK 101 008/21 P3G  | 106002538 8001001<br>01W06 S61 |
| Laptop PC (SW: EBDK v2.0.1.5) | IBM ThinkPad / 2645450  | 55223TF                        |

**2.5 Modifications during the test**

Modifications made by the client in order to suppress spurious emissions at the frequencies 30 - 1000 MHz are described below:

- Shielding box above the DSP, according to drawing P:\809\W\PCB\B\BOX.CDO.
- Shielding plate on secondary side of the PCB, it covers the same area as the shielding box and extends towards X105 to give ground connection for the 47 pF capacitors.
- All 100 nF decoupling capacitors for +3,3V, except C398, changed to 10 nF.
- Additional decoupling for +3,3V.

10 nF in the following positions:  
 Lower left corner of R103 - nearby pin of shielding can;  
 Across D104;  
 Right end of R302 - nearby pin of shielding can;  
 Right end of C402 - nearby pin of shielding can;  
 68 µF 6,3 V tantalum capacitor on secondary side, between the vias near upper side of D101.

- 47 pF between all signal conductors of X105 (pin 1 - pin 6) and shielding plate.
- R201 and R202 changed to ferrite coils about 1 µH, for example Philips 4312 020 36700 / Ferroxcube WBC2,5/A-4B1 (green), Elfa 58-317-06.
- The ribbon cables to microphone board and keyboard must be routed well away from the CPU board. The keyboard cable should be routed outside of the support in the bottom case used for the display board of the KT200, and the cable to the microphone board is to be routed above one of the loudspeaker cables to be secured against falling down on the CPU board.

No other modifications have been made during the tests.

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### 3. TEST SPECIFICATIONS

#### 3.1 Standards

FCC 47 CFR part 15 (2003) Subpart B – Unintentional radiators  
FCC 47 CFR part 15 (2003) Subpart C – Intentional Radiators; §15.247 Operation within the bands 902-928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz.

Measurements methods according to ANSI C63.4-2003

RSS-210, Issue 5 (November 2001): Low Power Licence-Exempt Radiocommunication Devices.

#### 3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

#### 3.3 Test set-up

Measurement set-ups for the test of conducted disturbance voltage in the frequency range 0,15-30 MHz and out-of-band spurious emissions test are described in corresponding sections. During other tests the EUT was connected to the spectrum analyser by cable.

#### 3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature: 19 – 21 °C  
Relative humidity: 39 – 56 %



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**4. TEST SUMMARY**

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

| FCC reference | Test                                     | Result | Note |
|---------------|--|--------|------|
| 15.247(b)     | Peak output power                        | Pass   |      |
| 15.247(a)     | 20 dB Bandwidth                          | Pass   |      |
| 15.247(a)     | Carrier frequency separation             | Pass   |      |
| 15.247(a)     | Number of hopping frequencies (channels) | Pass   |      |
| 15.247(a)     | Time of occupancy (dwell time)           | Pass   |      |
| 15.247(c)     | Band edge compliance                     | Pass   |      |
| 15.247        | Out of band spurious emissions, radiated | Pass   |      |
| 15B           | Out of band spurious emissions, radiated | Pass   |      |
| 15B           | Conducted emission at AC port            | Pass   |      |



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**5. PEAK OUTPUT POWER****5.1 Test protocol**

Date of test: September 20, 2004

EUT mode of operation: TX, hopping on one channel.

Spectrum analyser settings:

Span: 10 MHz  
RBW: 3 MHz  
VBW: 3 MHz  
Sweep time: 5 ms  
Detector: Peak  
Trace: Max Hold

| Channel<br>(MHz) | Peak Output<br>Power<br>(dBm) | Limit value<br>(dBm) |
|------------------|-------------------------------|----------------------|
| 2402             | 3.6                           | < 30                 |
| 2441             | 3.4                           |                      |
| 2480             | 3.5                           |                      |

Measurement results are corrected for attenuation in the set-up configuration and antenna gain declared by the manufacturer.

Example calculation:

$$\text{Peak output power [dBm]} = \text{Analyser reading [dBm]} + \text{cable loss [dB]} + \text{EUT antenna gain [dBi]}$$
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**6. 20 dB BANDWIDTH****6.1 Test protocol**

Date of test: September 20, 2004

EUT mode of operation: TX, hopping on one channel.

Spectrum analyser settings:

Span: 1,5 MHz

RBW: 30 kHz

VBW: 30 kHz

Sweep time: 5 ms

Detector: Peak

Trace: Max Hold

| Channel (MHz) | 20 dB Bandwidth (kHz) | Limit value (kHz) |
|---------------|-----------------------|-------------------|
| 2402          | 872                   |                   |
| 2441          | 872                   | < 1000            |
| 2480          | 878                   |                   |



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**7. CARRIER FREQUENCY SEPARATION**

**7.1 Test protocol**

Date of test: September 20, 2004

EUT mode of operation: TX and hopping on.

Spectrum analyser settings:

Span: 4 MHz  
 RBW: 100 kHz  
 VBW: 100 kHz  
 Sweep time: Auto  
 Detector: Peak  
 Trace: Max Hold

| Channel<br>(MHz) | Carrier frequency<br>separation<br>from the next channel |                      | Limit value<br>(kHz) |
|------------------|--|----------------------|----------------------|
|                  | To the right<br>(kHz)                                    | To the left<br>(kHz) |                      |
| 2402             | 994  | -                    | > 872                |
| 2441             | 1018   | 986                  | > 872                |
| 2480             | -  | 1010                 | > 878                |

Limit = Result from the 20 dB Bandwidth measurements



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**8. NUMBER OF HOPPING CHANNELS**

**8.1 Test protocol**

Date of test: September 20, 2004

EUT mode of operation: TX and hopping on.

Spectrum analyser settings:

Start frequency: 2400 MHz

Stop frequency: 2484 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

| Number of hopping channels | Limit value |
|----------------------------|-------------|
| 79                         | > 75        |



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**9. TIME OF OCCUPANCY (DWELL TIME)**

**9.1 Test protocol**

Date of test: September 20, 2004

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

*Determination of transmitting time T*

Span: 0 Hz  
 RBW: 1 MHz  
 VBW: 1 MHz  
 Sweep time: 4 ms  
 Single sweep  
 Detector: Peak  
 Trace: Clear/Write  
 Trigger: Video

*Determination of the number of times n the channel is active during the sweep time of 10 s*

RBW: 100 kHz  
 VBW: 100 kHz  
 Sweep time: 10 s

| Test parameters                                       | Channel (MHz) |        |        | Limit value (s) |
|---|---------------|--------|--------|-----------------|
|   | 2402          | 2441   | 2480   |                 |
| T (µs)  | 1434.9        | 1434.9 | 1434.9 | -               |
| n   | 30            | 35     | 35     | -               |
| Dwell time (s) = $T \cdot 10^{-6} \cdot 3,16 \cdot n$ | 0.14          | 0.16   | 0.16   | < 0,4           |



**10. BAND EDGE COMPLIANCE**

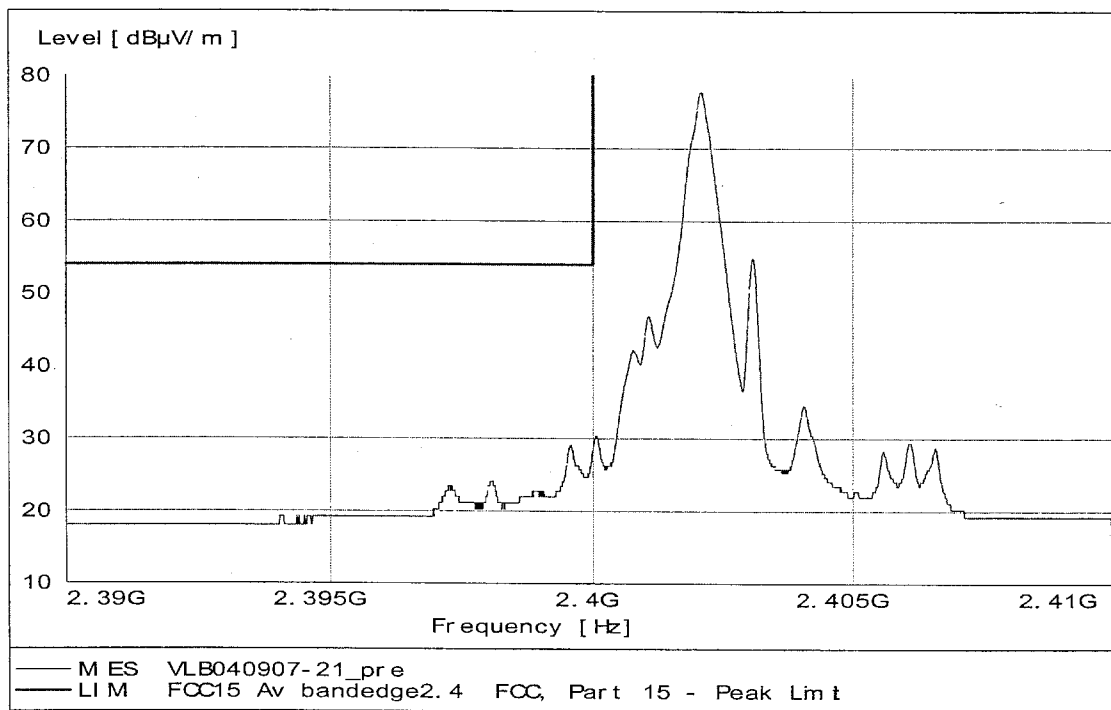
**10.1 Test protocol**

Date of test: September 7, 2004

EUT mode of operation: TX and hopping on one channel.

| Parameter settings     | Compliance at 2400 MHz | Compliance at 2483,5 MHz |
|------------------------|------------------------|--------------------------|
| Start frequency (MHz): | 2390                   | 2472                     |
| Stop frequency (MHz):  | 2410                   | 2492                     |
| RBW (kHz):             | 100                    | 100                      |
| VBW (kHz):             | 10                     | 10                       |
| Sweep time (ms):       | 5                      | 5                        |
| Detector:              | Average                | Average                  |
| Trace:                 | Max Hold               | Max Hold                 |

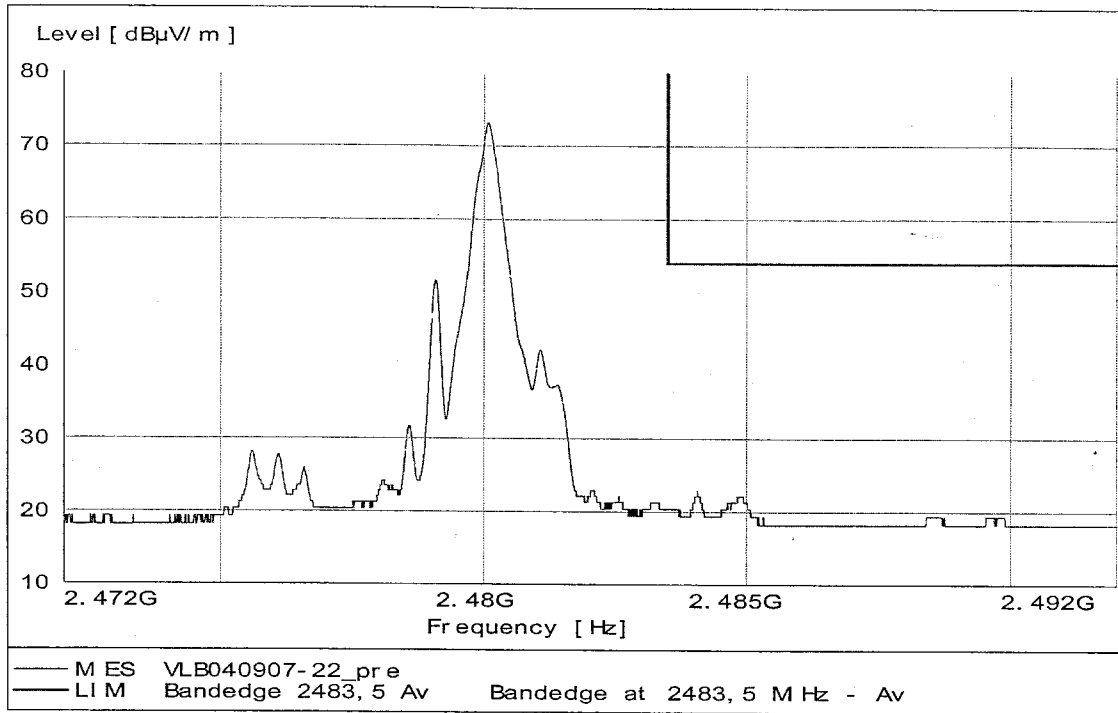
Band edge compliance at 2400 MHz



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Band edge compliance at 2483,5 MHz



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**11. RADIATED SPURIOUS EMISSIONS**

**11.1 Operating environment**

Temperature: 19 - 21 °C (10 - 40 °C)  
 Relative Humidity: 39 - 56 % (10 - 90 %)

**11.2 Measurement uncertainty**

Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4,6 dB  
 Radiated disturbance electric field intensity, 1000 – 18000 MHz: ± 6,0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.  
 The measurement uncertainty is given with a confidence of 95%.

**11.3 Test equipment**

| Equipment  | Manufacturer    | Type               | SEMKO No. |
|--|-----------------|--------------------|-----------|
| <i>Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)</i>        |                 |                    | 30300     |
| Software:  | Rohde & Schwarz | ES-K1, V1.60       |           |
| Measurement receiver:  | Rohde & Schwarz | ESAI               | 2973/2974 |
| Antenna amplifier:   | SEMKO           |                    | 7992/7993 |
| Antenna, bilog:  | Chase           | CBL6111A           | 8578      |
| <i>Test site: Bluetooth anechoic shielded chamber, 3,7 x 7,0 x 2,4 m (W x L x H)</i> |                 |                    | 12285     |
| Software:  | Rohde & Schwarz | ES-K1, V1.70       |           |
| Signal analyser:   | Rohde & Schwarz | FSIQ 40            | 40023     |
| Preamplifier:  | MITEQ           | AFS6/AFS44         | 12335     |
| <b>Antennas:</b>   |                 |                    |           |
| Double Ridge Guide Horn:   | EMCO            | 3115               | 4936      |
| Horn antenna:  | EMCO            | 3160-08            | 30099     |
| Horn antenna:  | EMCO            | 3160-09            | 30101     |
| High pass filter   | K&L             | 4410-X4500/18000-0 | 5133      |
| Attenuator 6 dB  | HP              | 8491A              | 7980      |
| Transformer  | Tufvassons      | AFM-1500           | 30317     |



#### 11.4 Measurement set-up

##### Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

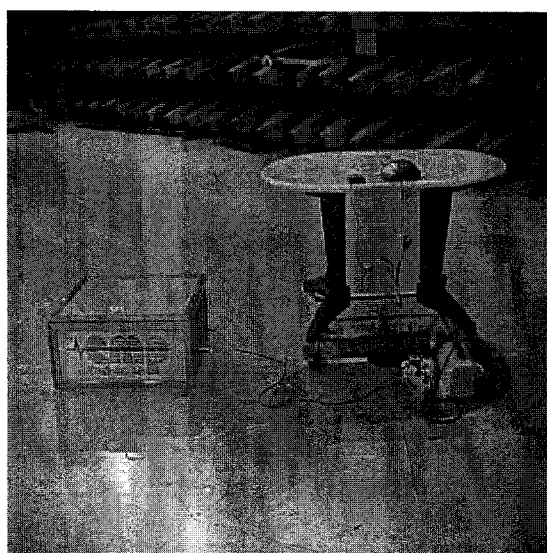
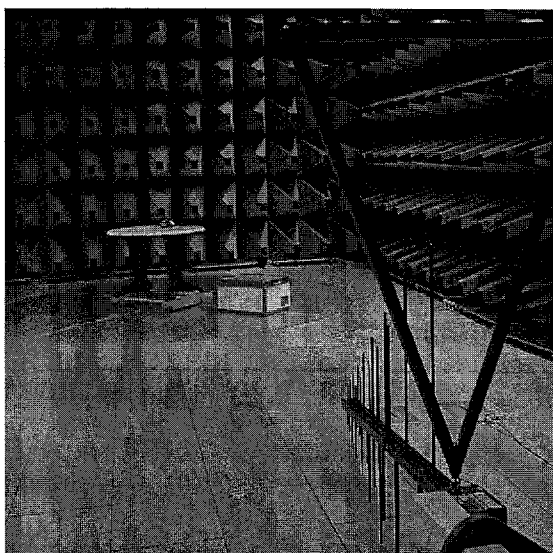
The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 10 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out.

The EUT was supplied with 120 V AC (50 Hz) during the test.

Test set-up photos:



##### Test site: Bluetooth anechoic shielded chamber (1 – 26 GHz)

In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the spectrum analyser in max-hold and with the antenna placed 1,4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out.

The EUT was supplied by 120 V AC (50 Hz) during the test.



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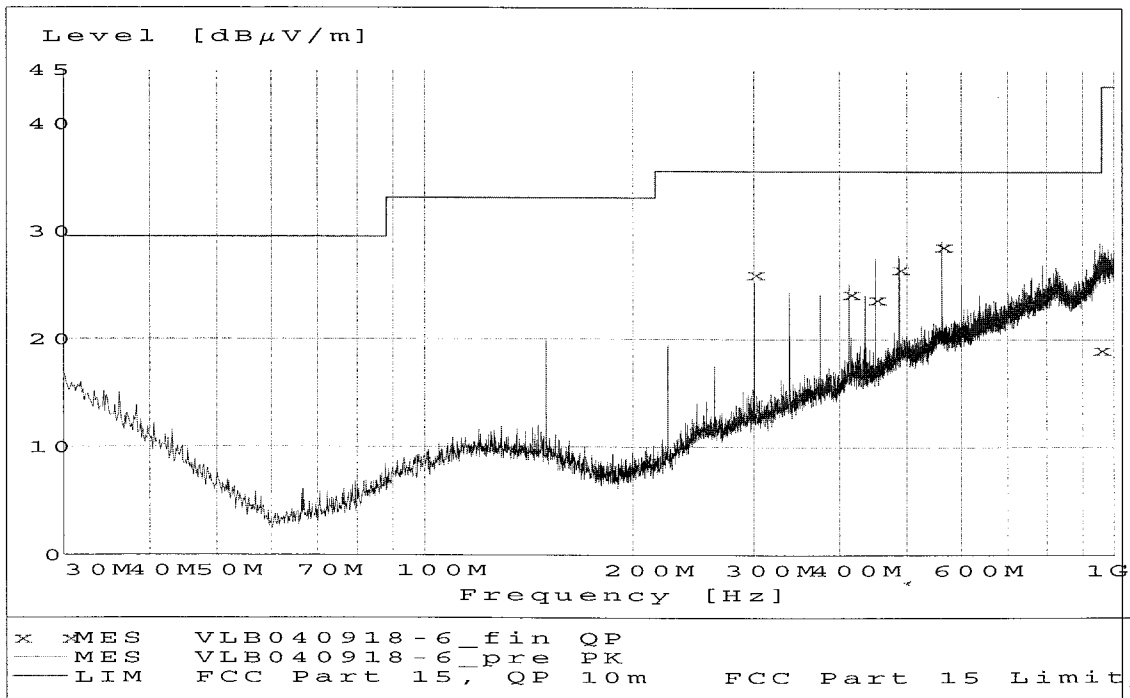
Test set-up photo:



**11.5 Test protocol**

Semi-anechoic shielded chamber

Date of test: September 18, 2004



30 – 1000 MHz, max peak at a distance of 10 m on the lower TX channel

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