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# DELTA Test Report

TEST Reg. no. 19

## EMC and radio parameter test of Patient Simulator SimMan 3G

## Performed for Laerdal Medical AS

DANAK-1910405 Rev. B
Project no.: A505816-3


20 February 2009

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| | |
|---|---|
| Title | EMC and radio parameter test of Patient Simulator SimMan 3G |
| Test object | SimMan 3G |
| Report no. | DANAK-1910405 Rev. B |
| Project no. | A505816-3 |
| Test period | 07 November to 08 January 2009 |
| Client | Laerdal Medical AS<br>Tanke Svilandsgt. 30<br>Postbox 377<br>4001 Stavanger<br>Norway<br><br>Tel.: +47 51 51 17 00 |
| Contact person | Ove Mæstad<br>E-mail: Ove Maestad@laerdal.com |
| Manufacturer | Laerdal Medical AS |
| Specifications | FCC CFR 47 Part 15, Subpart C |
| Results | The test object was found to be in compliance with the specifications |
| Test personnel | Henrik Egeberg Nielsen<br>Claus Rømer Andersen |
| Date | 20 February 2009 |

Responsible

Claus Rømer Andersen
Team Manager, Wireless
DELTA

This report is a revision of the original test report A505816-3 dated 05 February 2009. The revision has been made due to the following correction:

"Resusci" has been deleted from the title on page 1 and page 2.

Evaluation result in Section 4.1 has been corrected.

Antenna distance and explanation for limit extrapolations has been added and the limit has been corrected in section 4.3.

Antenna distance has been corrected in section 4.4.

Antenna distance and detector type has been corrected and explanation for limit extrapolation and comment regarding 2.4 GHz emission has been added to section 4.5.

A measurement of 2.4 GHz emission with WLAN module deactivated was added to section 4.5.

A new measurement with shown limit, explanation for limit extrapolation has been added to section 4.8.

Antenna distance and explanation for limit extrapolation has been added and the limit corrected in section 4.10.

A measurement of frequency stability in 10ºC steps has been added in section 4.11.

The instrument list in section 6 was updated.

Table of contents Page

# 1. Summary of tests

| Tests | Test method | Rule section | Results |
|---|---|---|---|
| Antenna requirement | Inspection | 15.203 | Passed |
| Measurement of radio frequency voltage on mains | ANSI C63.4:2003 | 15.207 | Passed |
| Measurement of radio frequency magnetic field | ANSI C63.4:2003 | 15.209 | Passed |
| Occupied bandwidth | ANSI C63.4:2003 | 15.215 | Passed |
| Measurement of radio frequency magnetic field, fundamental | ANSI C63.4:2003 | 15.225(a), (b), (c) and (d) | Passed |
| Frequency tolerance | ANSI C63.4:2003 | 15.225(e) | Passed |

The given result is based on a shared risk principle with respect to the measurement uncertainty.

**Conclusion**

The test object mentioned in this report meets the requirements of the standard stated below.

- FCC CFR 47 Part 15, Subpart C.

The test results relate only to the object tested.

# 2. Test object and auxiliary equipment

## 2.1 Test object

**Test object 2.1.1**

| | |
|---|---|
| Name of test object | SimMan 3G |
| Model / type | 212-00050 |
| Part no. | - |
| Serial no. | Prototype 32 |
| FCC ID | QHQ-212-00001 |
| Manufacturer | Laerdal Medical AS |
| Supply voltage | 24 VDC |
| Software version | - |
| Cycle time | - |
| Comments | - |

**Test object 2.1.2**

| | |
|---|---|
| Name of test object | Power Supply |
| Model / type | AML 150PS24 |
| Part no. | - |
| Serial no. | 112192 |
| FCC ID | - |
| Manufacturer | XP Power |
| Supply voltage | 110-240 VAC |
| Software version | - |
| Cycle time | - |
| Comments | - |

## 2.2 Auxiliary equipment

### Auxiliary equipment 2.2.1

| | |
|---|---|
| Name of auxiliary equipment | Dell laptop |
| Model / type | Latitude D620/PP18L |
| Part no. | - |
| Serial no. | RF621 A01 |
| FCC ID | - |
| Manufacturer | Dell Inc. |
| Supply voltage | 230 VAC |
| Comments | - |

# 3. General test conditions

## 3.1 Test setup during test

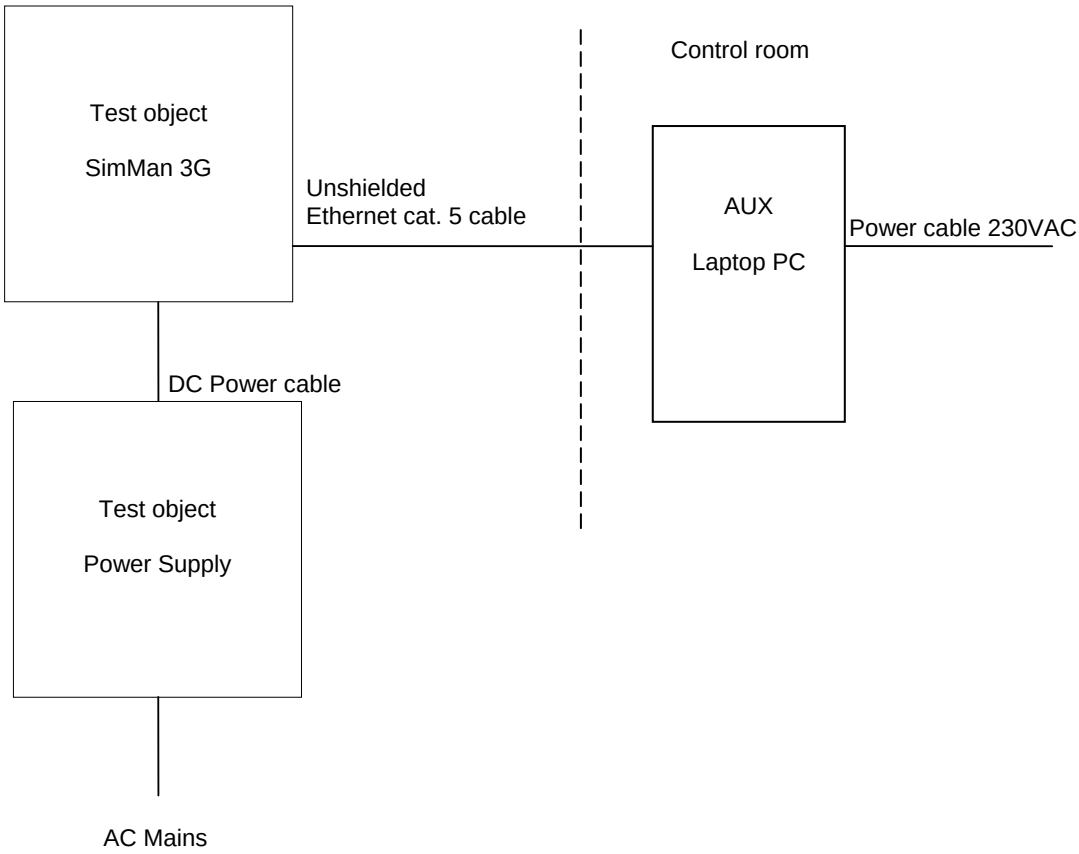



Figure 3.1.1 Block diagram of test objects with cables and auxiliary equipment.

The RFid system is made from an off-the shelf RFid module working at 13.56 MHz. The antenna system is an in-house design with 5 different antennas and antenna switching electronics.

The antennas are divided in 2 groups with 1 antenna in the jaw, to read tags attached to equipment entered into the mouth, and 4 antennas in the lower arm to read tags attached to syringes.

Each antenna has its own tuning circuitry. The antennas in the arm are positioned so that they have different placement and orientations. This is to create a reading area as large as possible and to cover the fact that the orientation of the tags is unknown.

The antennas are selected in a round robin sequence. Each antenna is active for approximately 34 ms. The antenna is powered off 25 ms before and 25 ms after antenna switching. Thus, every antenna is selected approximately 2.4 times per second.

The SimMan 3G test object contains a 2.4 GHz WLAN dongle with modular approval (FCC ID: JCK-GN-W31N-RH). This module was continuously transmitting discover beacons during test.

## 3.2 Modifications before test

- A ferrite was installed on the antenna output coaxial cable from the antenna select board. Manufacturer: Multicomp, Part no.: LF35B.

# 4. Test results

## 4.1 Antenna requirement

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | X-1 |
| Type. | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 08 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | CRA |
| Specification | FCC CFR 47 15.203 | | |

| | | |
|---|---|---|
| Test method | Visual inspection | |

Evaluation criteria:
Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:
(a) Antenna must be permanently attached to the unit.
(b) Antenna must use a unique type of connector to attach to the EUT.
(c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Evaluation result:
The four antennas in the arm of the test object are soldered to the RF output, which is in compliance with evaluation criteria (a) above.
The antenna in the jaw of the test object uses a reverse polarity SMA connector, which is in compliance with evaluation criteria (b) above.

| | |
|---|---|
| Evaluation result | The test object meets evaluation criterion (b). |
| Comments | None. |
| Compliant | Yes. |

## 4.2 Measurement of radio frequency voltage on mains

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | CE-1 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 7 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.207 | Frequency | 0.15-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Artificial mains network: 50 Ω, 50 µH | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak and average | Bandwidth | 10 kHz |
| Test equipm. | EMI room Hørsholm 29461 29516 29916 29861 | Uncertainty | 2 dB |

The test object operates at 13.56 MHz and has detachable antennas.

According to KDB 174176 the following procedure can be used to determine compliance with 15.207:
(1) Perform the AC line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band.
(2) Retest with a dummy load to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band.

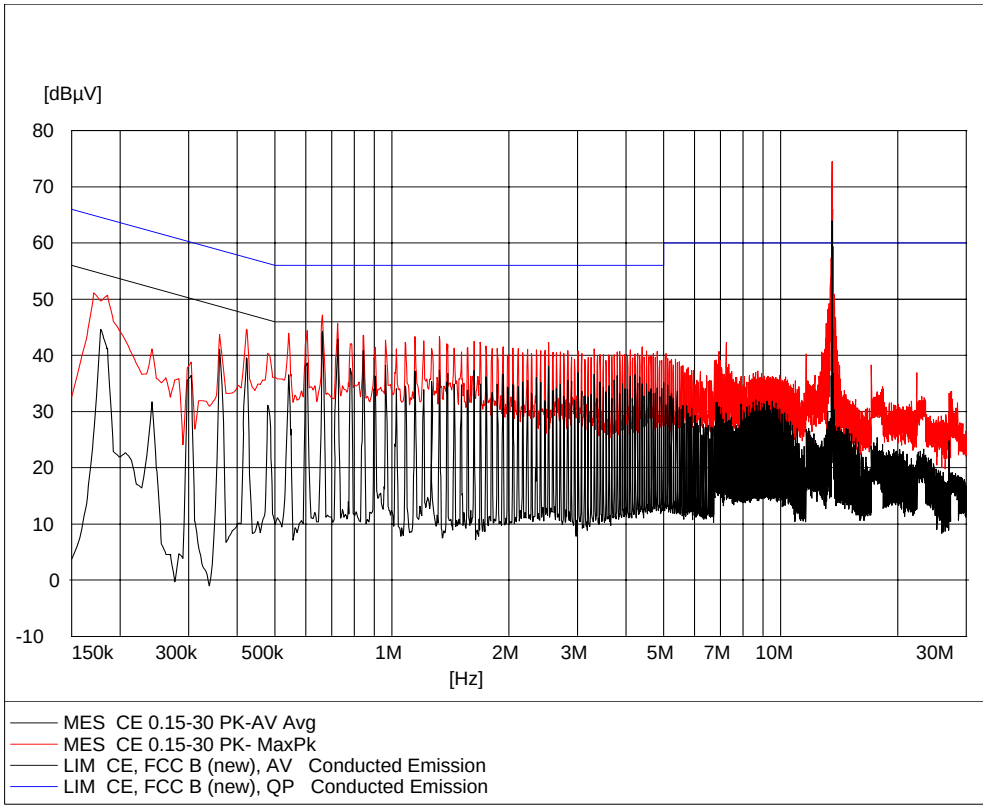
The results of (1) are reported in test record sheets CE-2 and CE-3. The measured voltages were below the limit, except at the fundamental frequency (13.56 MHz).

The results of (2) are reported in test record sheets CE-4 and CE-5. The measured voltages were below the limit at all frequencies.

| | |
|---|---|
| Test result | The measured voltages were below the limit, except at the fundamental frequency (13.56 MHz).<br>When the antennas were replaced with a 50 Ω dummy load the measured voltage were below the limit. |
| Comments | Measured with normal antennas installed.<br>Mains voltage: 120 VAC. |
| Compliant | Yes. |

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | CE-2 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 7 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.207 | Frequency | 0.15-30 MHz |

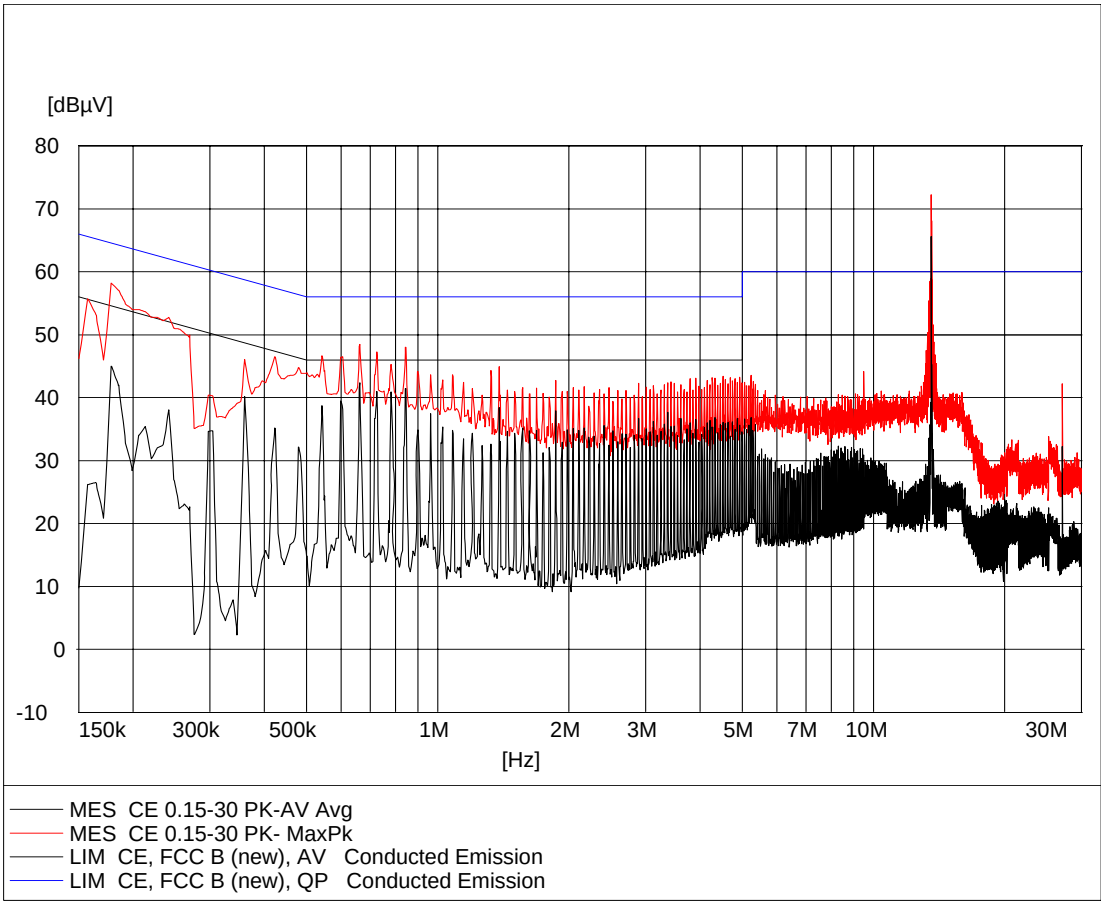
| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Artificial mains network: 50 Ω, 50 µH | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak and average | Bandwidth | 10 kHz |
| Test equipm. | EMI room Hørsholm 29461 29516 29916 29861 | Uncertainty | 2 dB |




| | |
|---|---|
| Line under test | Line. |
| Test result | The measured voltages were below the limit, except at the fundamental frequency (13.56 MHz). |
| Comments | Applied modulation: Normal tag.<br>Measured with normal antennas installed.<br>Mains voltage: 120 VAC. |

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | CE-3 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 7 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.207 | Frequency | 0.15-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Artificial mains network: 50 Ω, 50 µH | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak and average | Bandwidth | 10 kHz |
| Test equipm. | EMI room Hørsholm 29461 29516 29916 29861 | Uncertainty | 2 dB |



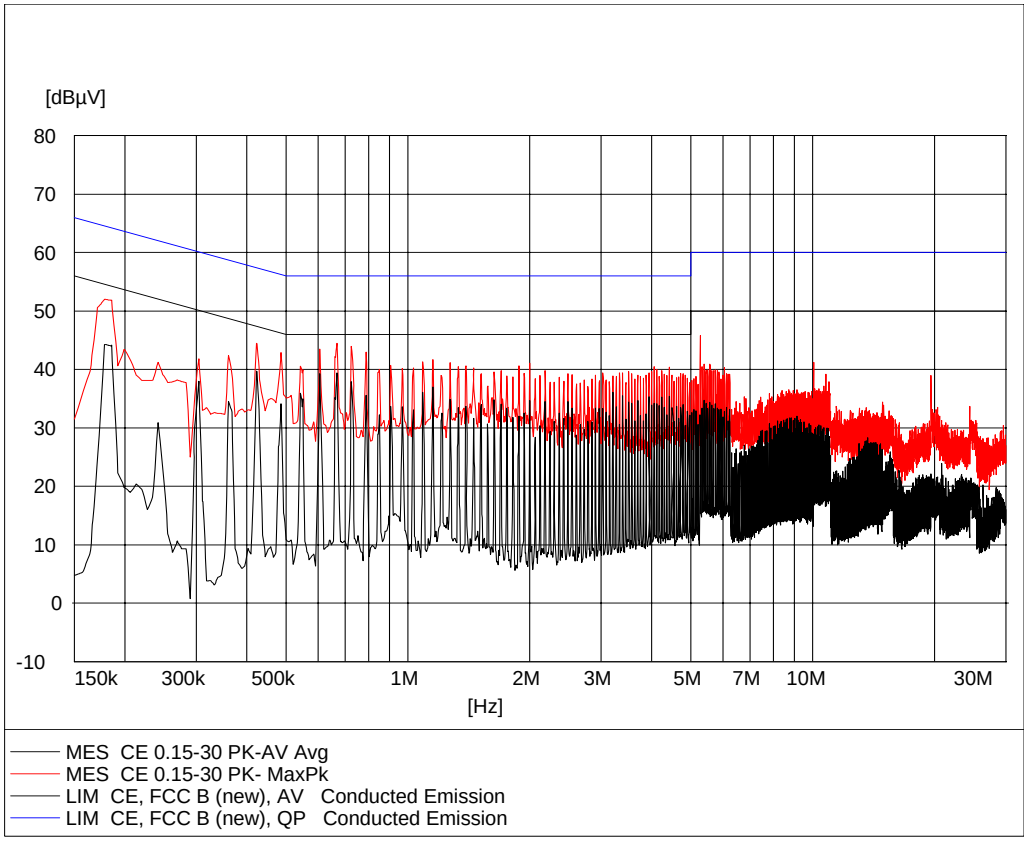

Line under test: Neutral.

Test result: The measured voltages were below the limit, except at the fundamental frequency (13.56 MHz).

Comments: Applied modulation: Normal tag.
Measured with normal antennas installed.
Mains voltage: 120 VAC.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | CE-3 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 7 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.207 | Frequency | 0.15-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Artificial mains network: 50 Ω, 50 µH | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak and average | Bandwidth | 10 kHz |
| Test equipm. | EMI room Hørsholm 29461 29516 29916 29861 | Uncertainty | 2 dB |



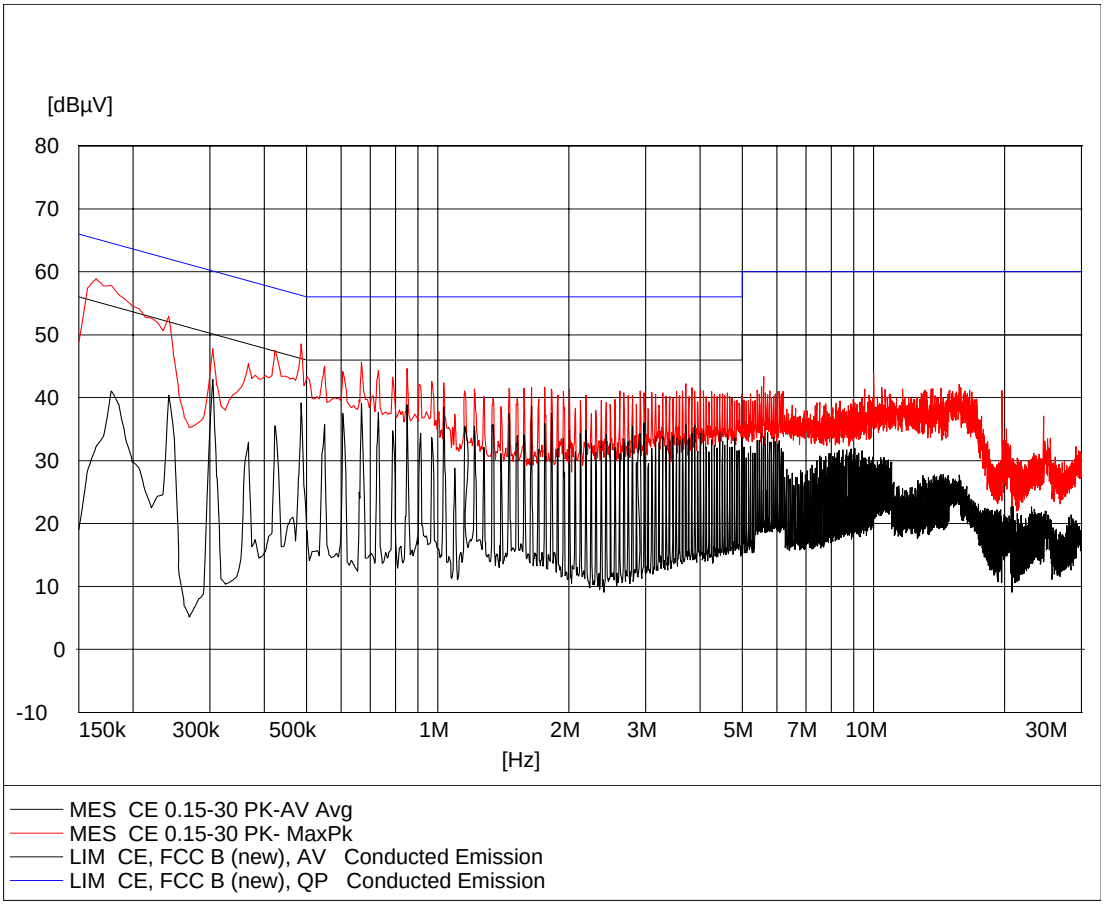

Line under test — Line.

Test result — The measured voltages were below the limit.

Comments — Applied modulation: None.
Measured with normal antennas replaced by 50 Ω dummy load.
Mains voltage: 120 VAC.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | CE-4 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 7 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.207 | Frequency | 0.15-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Artificial mains network: 50 Ω, 50 µH | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak and average | Bandwidth | 10 kHz |
| Test equipm. | EMI room Hørsholm 29461 29516 29916 29861 | Uncertainty | 2 dB |




Line under test — Neutral.

Test result — The measured voltages were below the limit.

Comments — Applied modulation: None.
Measured with normal antennas replaced by 50 Ω dummy load.
Mains voltage: 120 VAC.

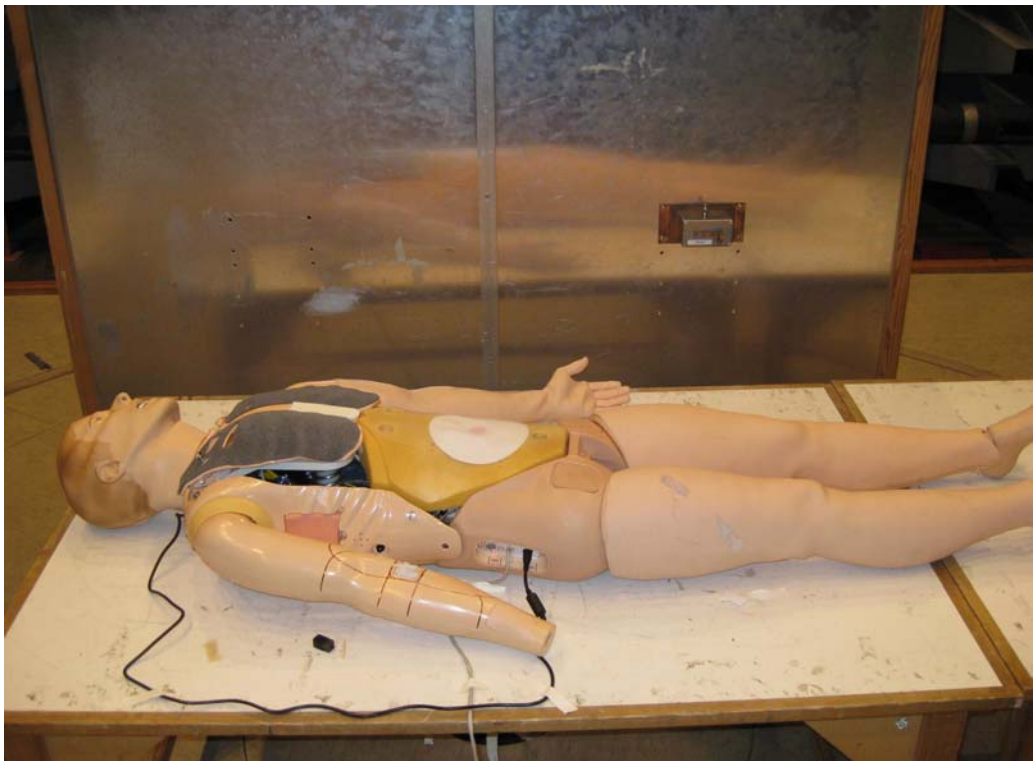


Photo 4.2.1 Test setup regarding measurement of radio frequency voltage on mains.

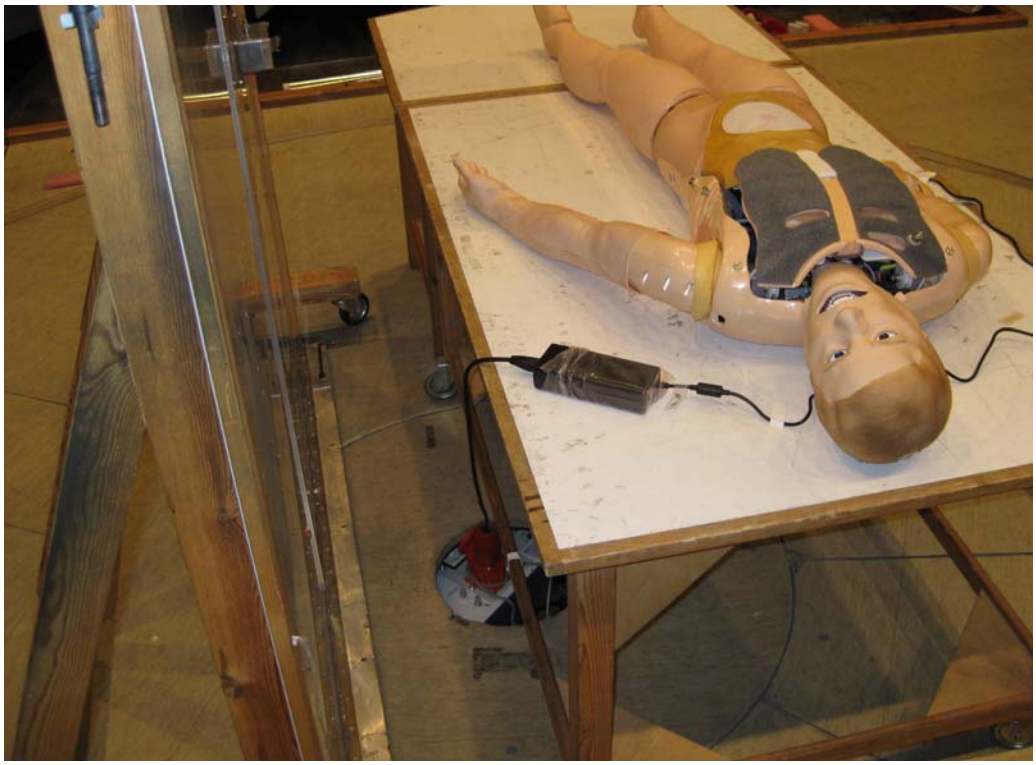
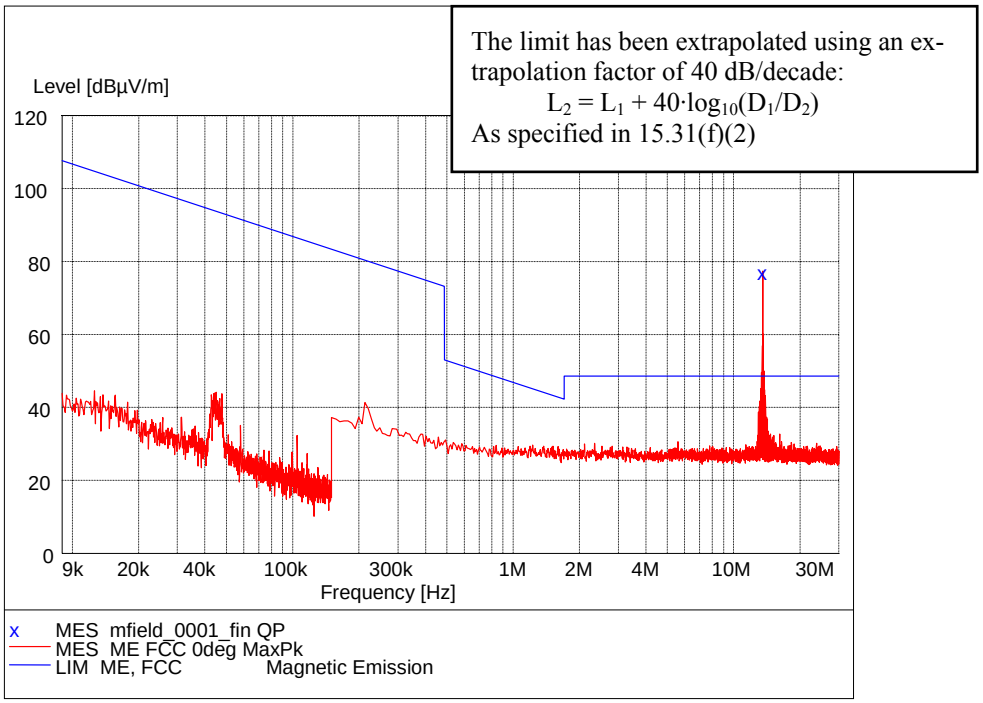


Photo 4.2.2 Test setup regarding measurement of radio frequency voltage on mains.

## 4.3 Measurement of radio frequency electromagnetic field, 0.009-30 MHz

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-1 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 0.009-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Loop antenna pos X. Antenna distance 10 m. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 200 Hz / 9 kHz |
| Test equipm. | EMI room Hørsholm 29916 29861 20332 | Uncertainty | 4 dB |



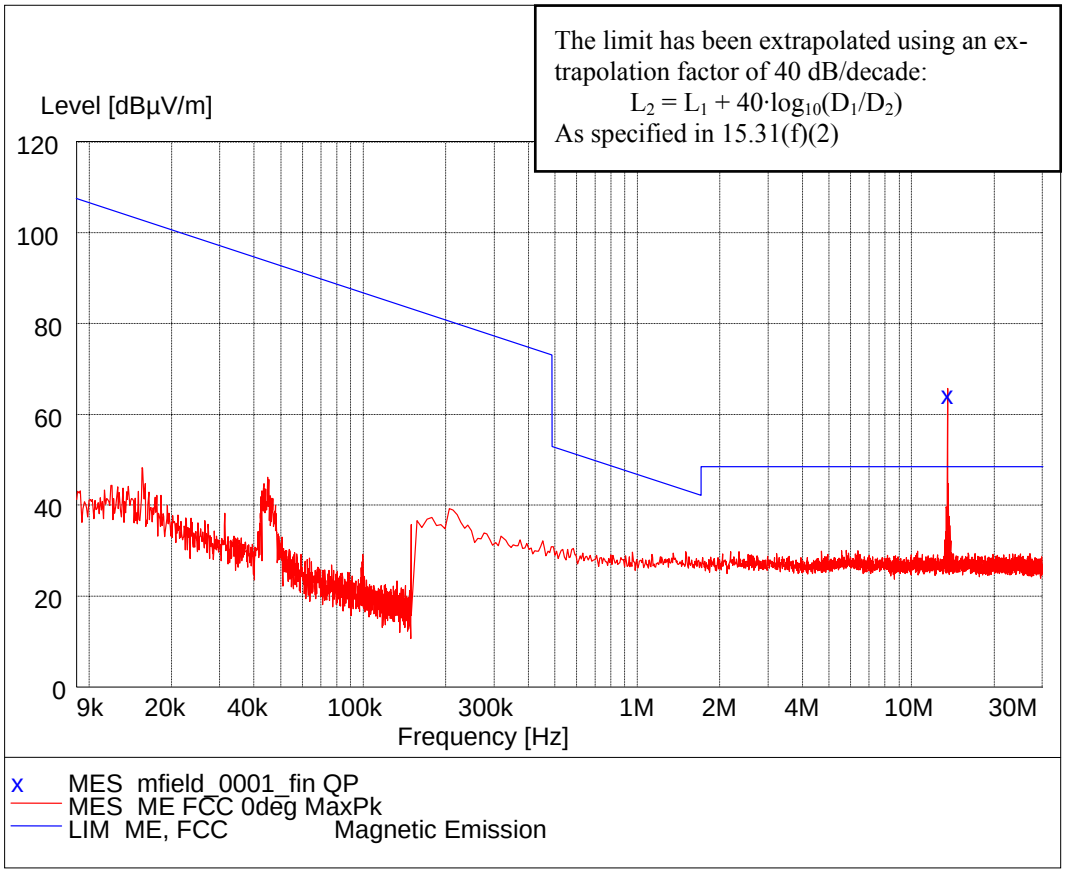

Test result: The measured field strengths arebelow the limit.

Compliant: Yes.

Comments: Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-2 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 0.009-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Loop antenna pos Y. Antenna distance 10 m. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 200 Hz / 9 kHz |
| Test equipm. | EMI room Hørsholm 29916 29861 29332 | Uncertainty | 4 dB |



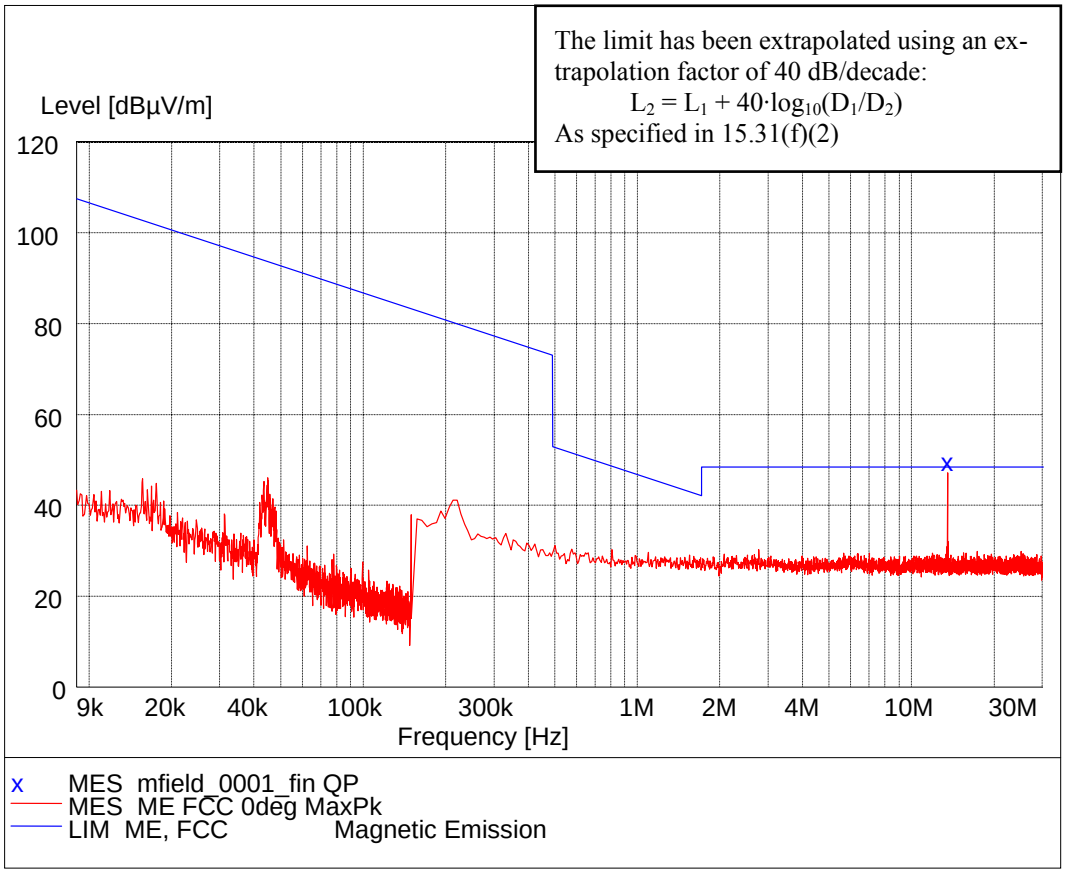

Test result — The measured field strengths arebelow the limit.

Compliant — Yes.

Comments — Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-3 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 0.009-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Loop antenna pos Z. Antenna distance 10 m. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 200 Hz / 9 kHz |
| Test equipm. | EMI room Hørsholm 29916 29861 29332 | Uncertainty | 4 dB |




Test result — The measured field strengths are below the limit

Compliant — Yes

Comments — Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth.

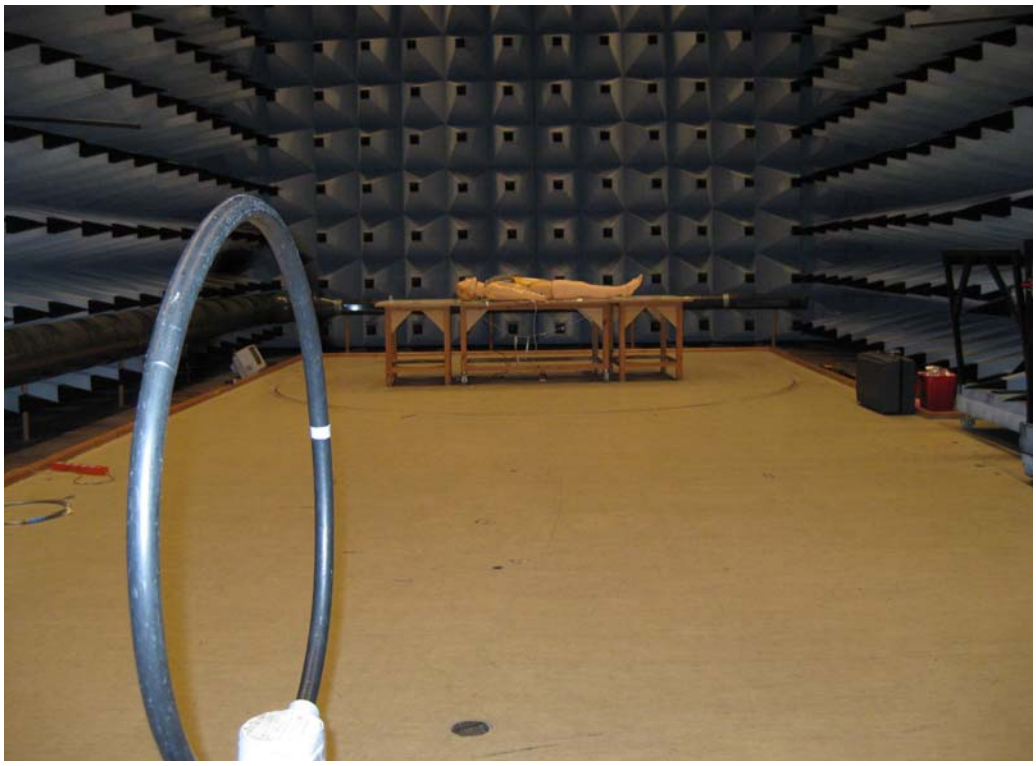


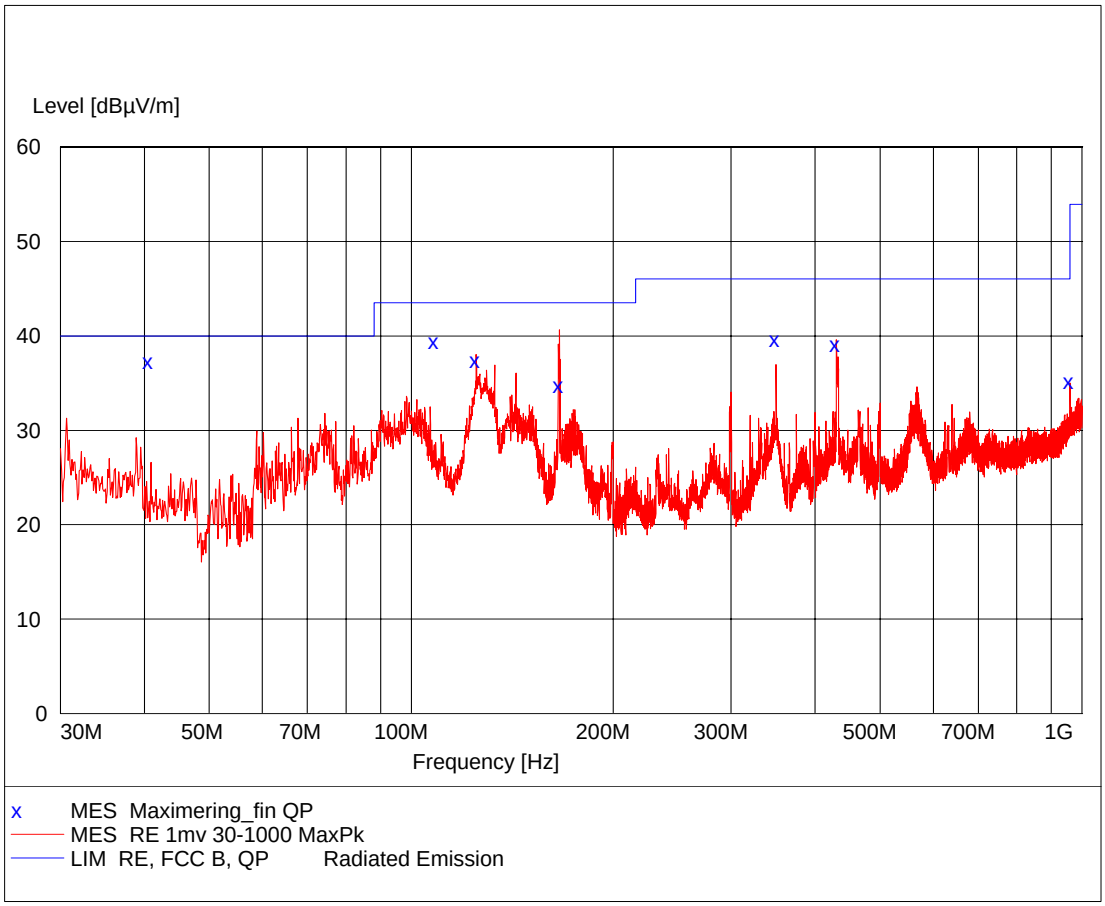
Photo 4.3.1 Test setup regarding measurement of radio frequency electromagnetic field.

Photo 4.3.2 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.4 Measurement of radio frequency electromagnetic field, 30-1000 MHz

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-4 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 30-1000 MHz |

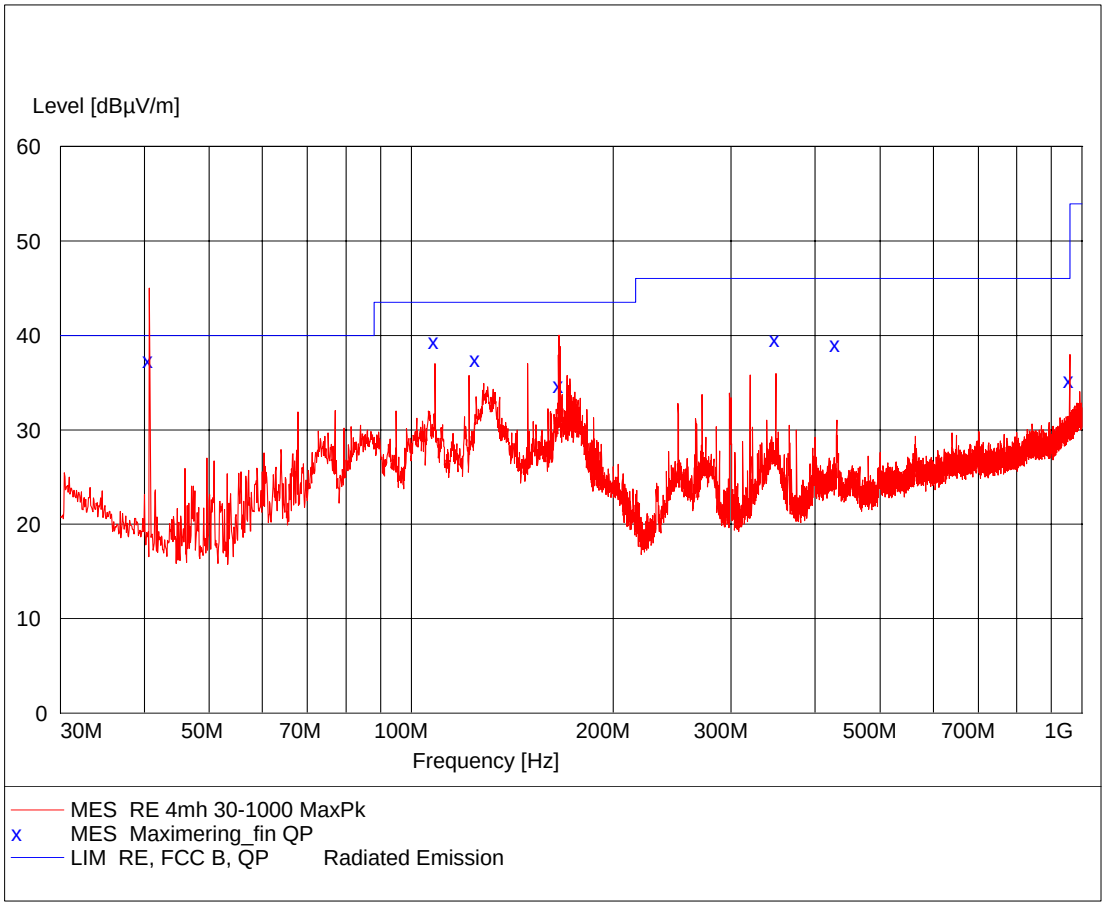
| | | | |
|---|---|---|---|
| Test method | ANSI C63.4:2003 | Temperature | 21 °C |
| Characteristics | Pre-scan, Antenna at 3 m, 1 m height, vert. pol. | Humidity | 35 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29916 29861 29797 | Uncertainty | 4 dB |




Comments Applied modulation: Normal tag.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-5 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 30-1000 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Pre-scan, Antenna at 3 m, 4 m height, hor. pol. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29916 29861 29797 | Uncertainty | 4 dB |




Comments Applied modulation: Normal tag.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-3 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 12 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 30-1000 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Peak search ant. at 3 m, height: 1-4 m, v/h pol. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Quasi peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29916 29861 29797 | Uncertainty | 4 dB |

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Height cm | Azimuth deg | Polarisation |
|---|---|---|---|---|---|---|---|
| 40.680000 | 37.30 | 14.6 | 40.0 | 2.7 | 396.0 | 359.00 | HORIZONTAL |
| 108.480000 | 39.40 | 13.3 | 43.5 | 4.1 | 311.0 | 164.00 | HORIZONTAL |
| 125.000000 | 37.40 | 13.9 | 43.5 | 6.1 | 101.0 | 173.00 | VERTICAL |
| 166.350000 | 34.70 | 12.4 | 43.5 | 8.8 | 101.0 | 319.00 | VERTICAL |
| 350.000000 | 39.60 | 17.6 | 46.0 | 6.4 | 104.0 | 289.00 | HORIZONTAL |
| 430.700000 | 39.10 | 19.4 | 46.0 | 6.9 | 101.0 | 116.00 | VERTICAL |
| 959.990000 | 35.20 | 27.7 | 46.0 | 10.8 | 281.0 | 1.00 | HORIZONTAL |

Test result — The measured field strengths are below the limit

Compliant — Yes

Comments — Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

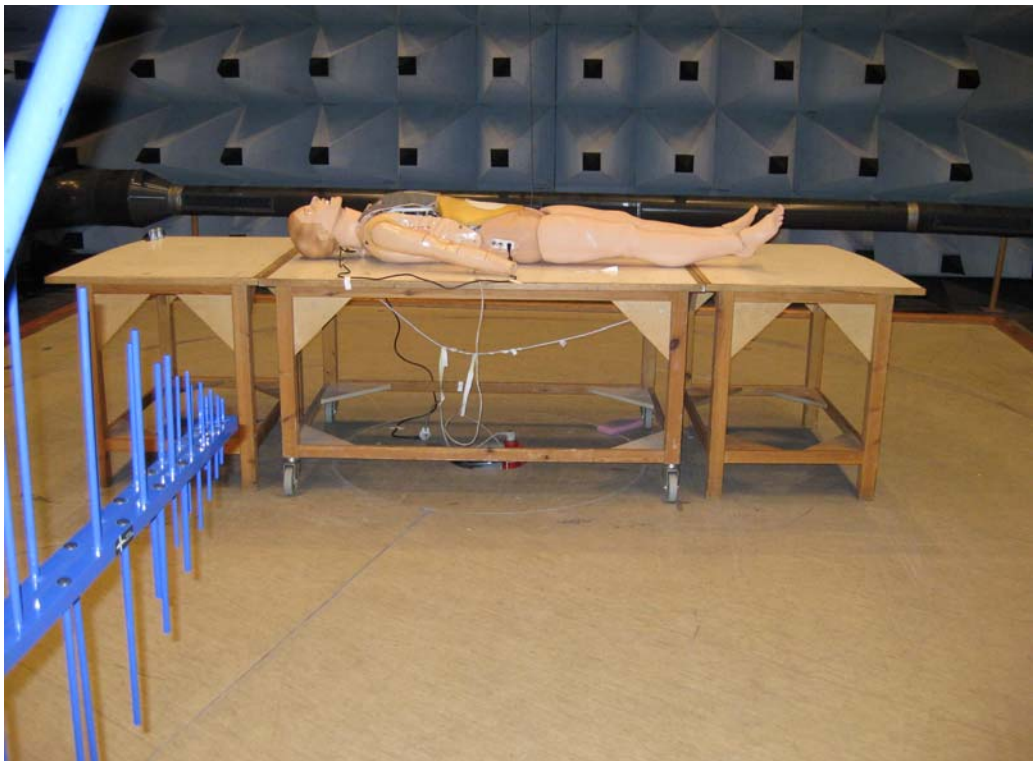


Photo 4.4.1 Test setup regarding measurement of radio frequency electromagnetic field.

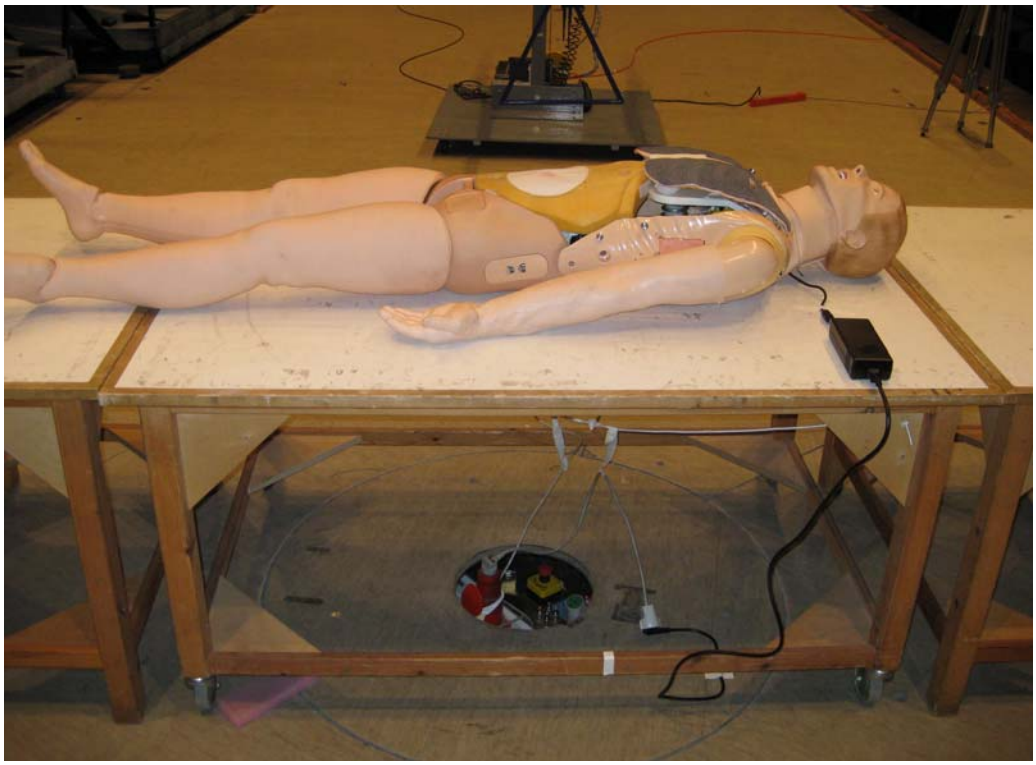
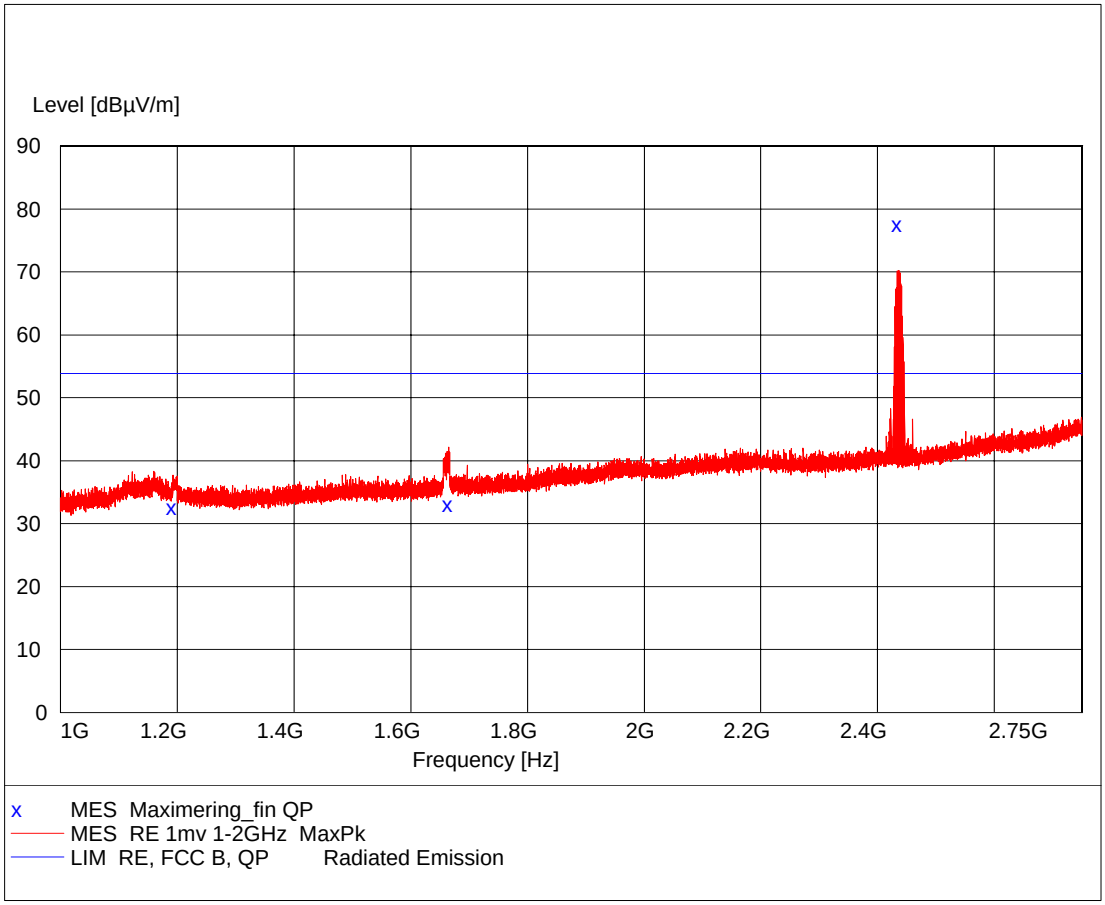


Photo 4.4.2 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.5 Measurement of radio frequency electromagnetic field, 1000-2750 MHz

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-6 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 1-2.75 GHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Pre-scan, Antenna at 3 m, 1 m height, vert. pol. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29916 29861 29876 | Uncertainty | 4 dB |

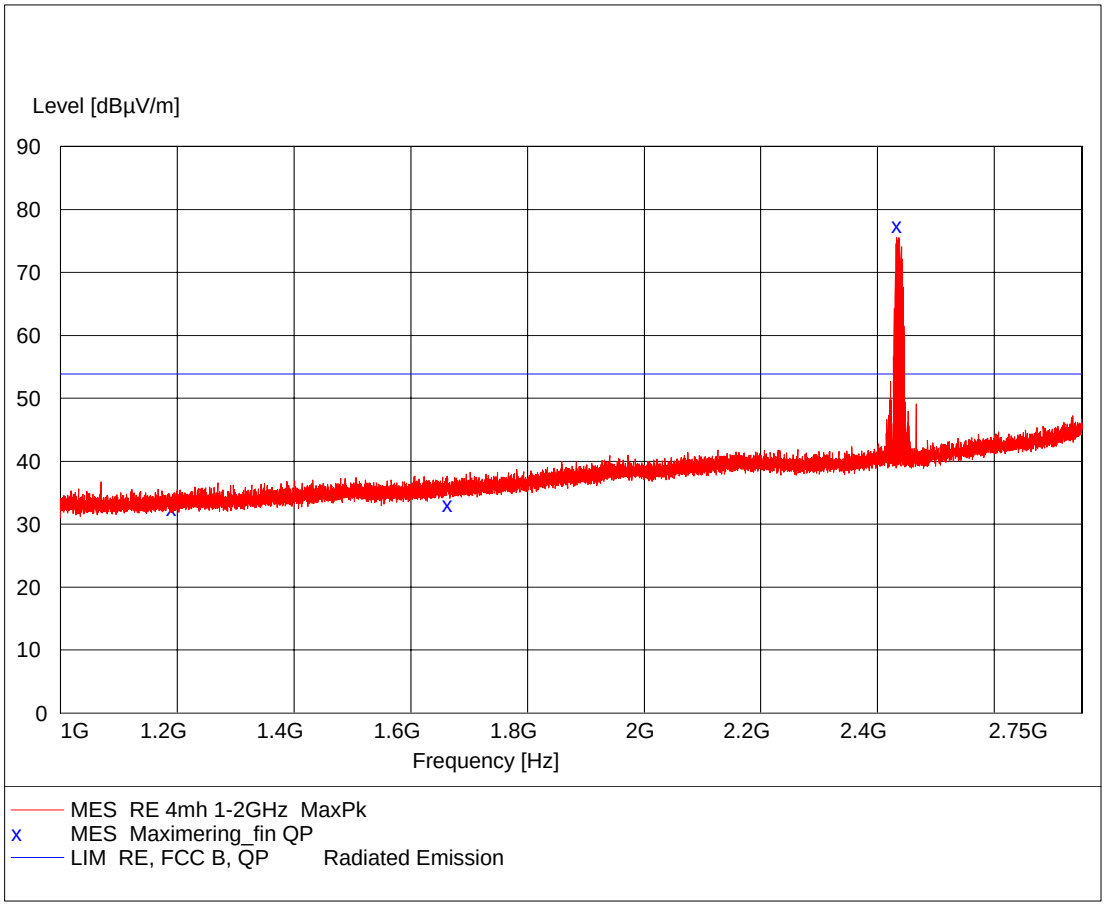



Comments

Applied modulation: Normal tag.
The 2435 MHz emission is coming from the WLAN module which was active during test.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-7 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 1-2.75 GHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Pre-scan, Antenna at 3 m, 4 m height, hor. pol. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29916 29861 29876 | Uncertainty | 4 dB |




Comments

Applied modulation: Normal tag.
The 2435 MHz emission is coming from the WLAN module which was active during test.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-8 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 1-2.75 GHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Peak search ant. at 3 m, height: 1-4 m, v/h pol. | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29916 29861 29876 | Uncertainty | 4 dB |

| Frequency | Level | Transd | Limit | Margin | Height | Azimuth | Polarisation |
|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | dB | dBµV/m | dB | cm | deg | |
| 1192.500000 | 32.50 | 29.7 | 53.9 | 21.4 | 110.0 | 1.00 | Vertical |
| 1665.400000 | 33.10 | 32.2 | 53.9 | 20.8 | 111.0 | 1.00 | Vertical |
| 2435.000000 | 77.50 | 35.8 | 124.0 | 46.5 | 145.0 | 336.0 | Vertical |

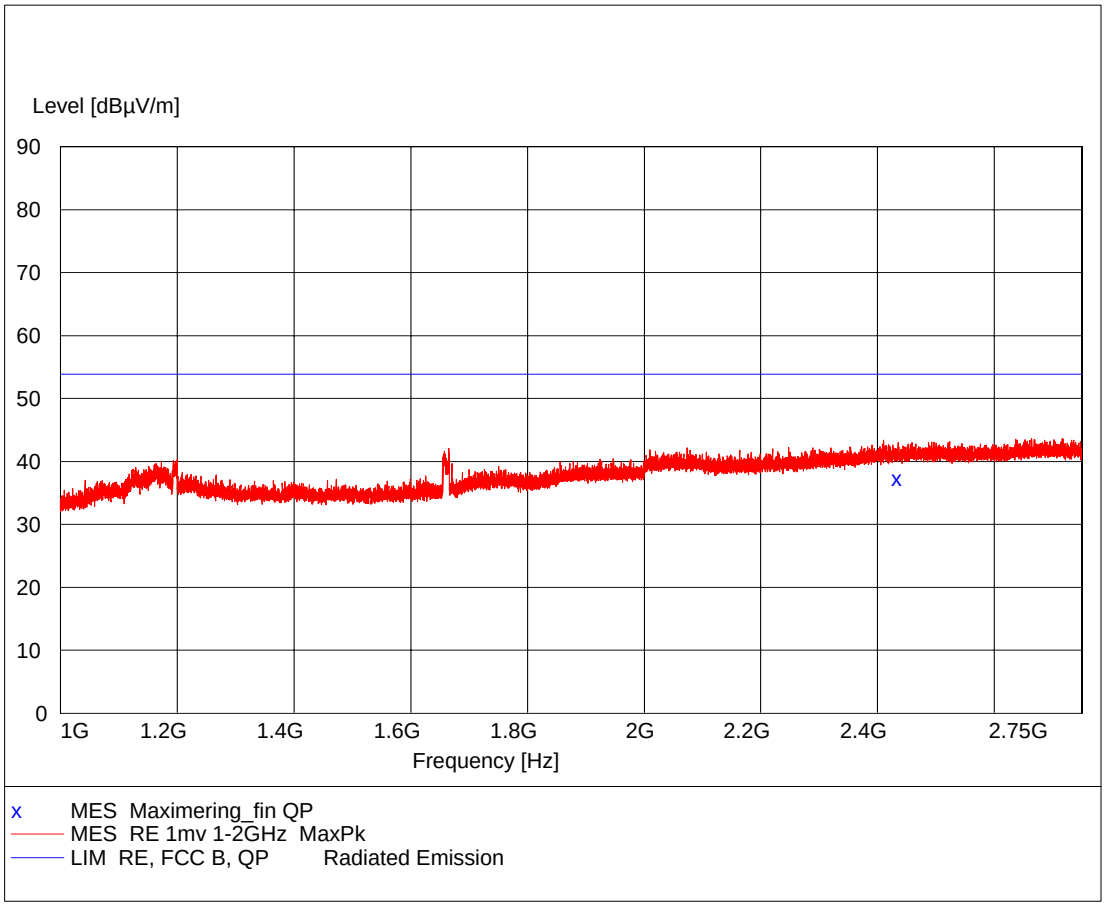
Test result — The measured field strengths are below the limit.

Compliant — Yes.

Comments — Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
The 2435 MHz emission is coming from the WLAN module which was active during test.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-9 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Feb. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 1-2.75 GHz |

| | | | |
|---|---|---|---|
| Test method | ANSI C63.4:2003 | Temperature | 24 °C |
| Characteristics | Pre-scan, Antenna at 3 m, 1 m height, vert. pol. | Humidity | 17 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29861 29876 49555 | Uncertainty | 4 dB |

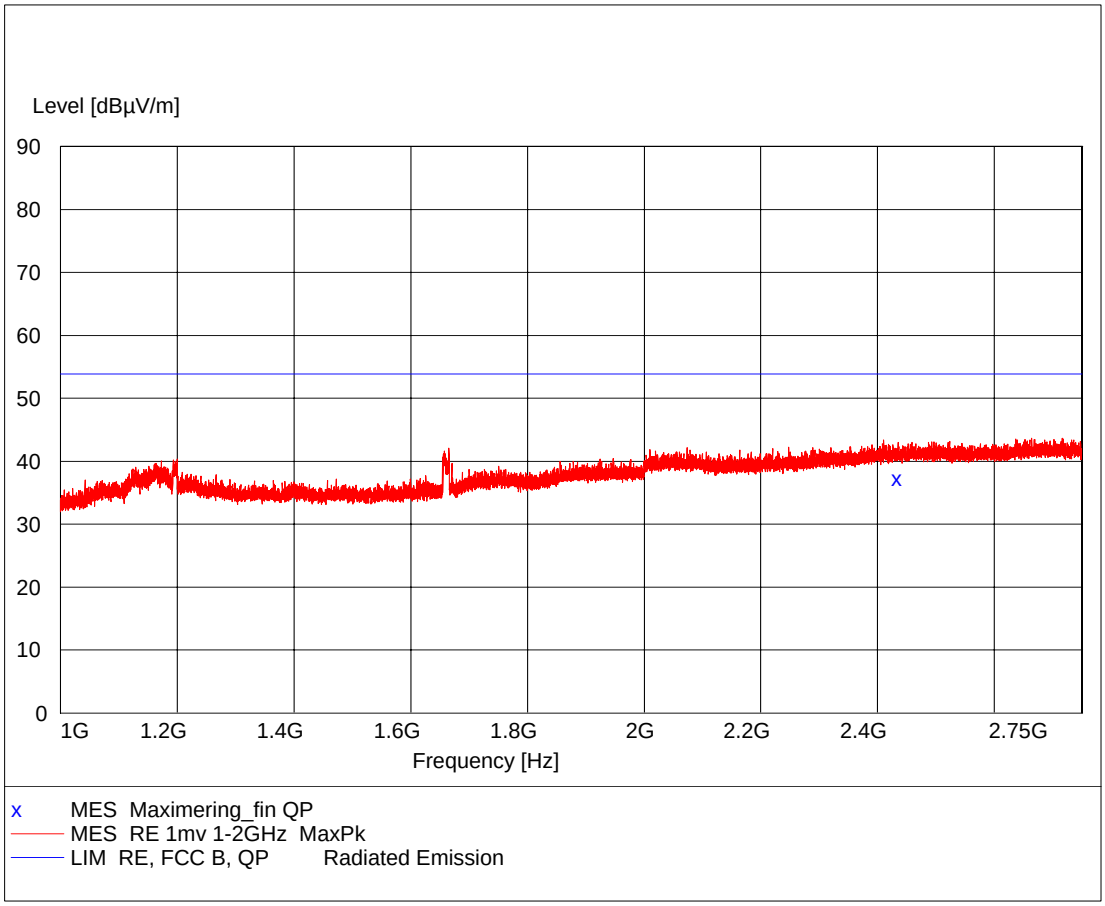



Comments

Applied modulation: Normal tag.
The WLAN module was deactivated during test.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-10 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Feb. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 1-2.75 GHz |

| | | | |
|---|---|---|---|
| Test method | ANSI C63.4:2003 | Temperature | 24 °C |
| Characteristics | Pre-scan, Antenna at 3 m, 4 m height, hor. pol. | Humidity | 17 % RH |
| Detector | Peak | Bandwidth | 120 kHz |
| Test equipm. | EMI room Hørsholm 29461 29861 29876 49555 | Uncertainty | 4 dB |




Comments

Applied modulation: Normal tag.
The WLAN module was deactivated during test.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-11 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Feb. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 1-2.75 GHz |

| | | | |
|---|---|---|---|
| Test method | ANSI C63.4:2003 | Temperature | 24 °C |
| Characteristics | Peak search ant. at 3 m, height: 1-4 m, v/h pol. | Humidity | 17 % RH |
| Detector | Peak | Bandwidth | 1 MHz |
| Test equipm. | EMI room Hørsholm 29461 29861 29876 49555 | Uncertainty | 4 dB |

| Frequency | Level | Transd | Limit | Margin | Height | Azimuth | Polarisation |
|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | dB | dBµV/m | dB | cm | deg | |
| 2435 | 37.30 | 35.1 | 53.9 | 16.6 | 101 | 82 | Horizontal |

Test result — The measured field strengths are below the limit.

Compliant — Yes.

Comments — Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.
The WLAN module was deactivated during test.

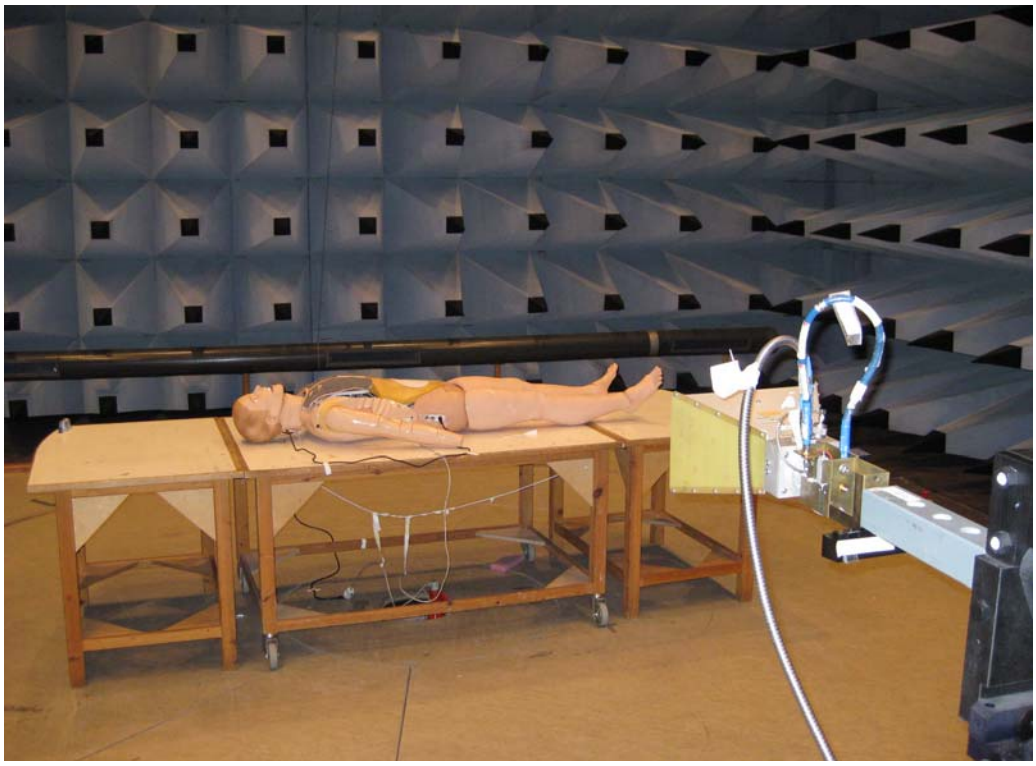


Photo 4.5.1 Test setup regarding measurement of radio frequency electromagnetic field.

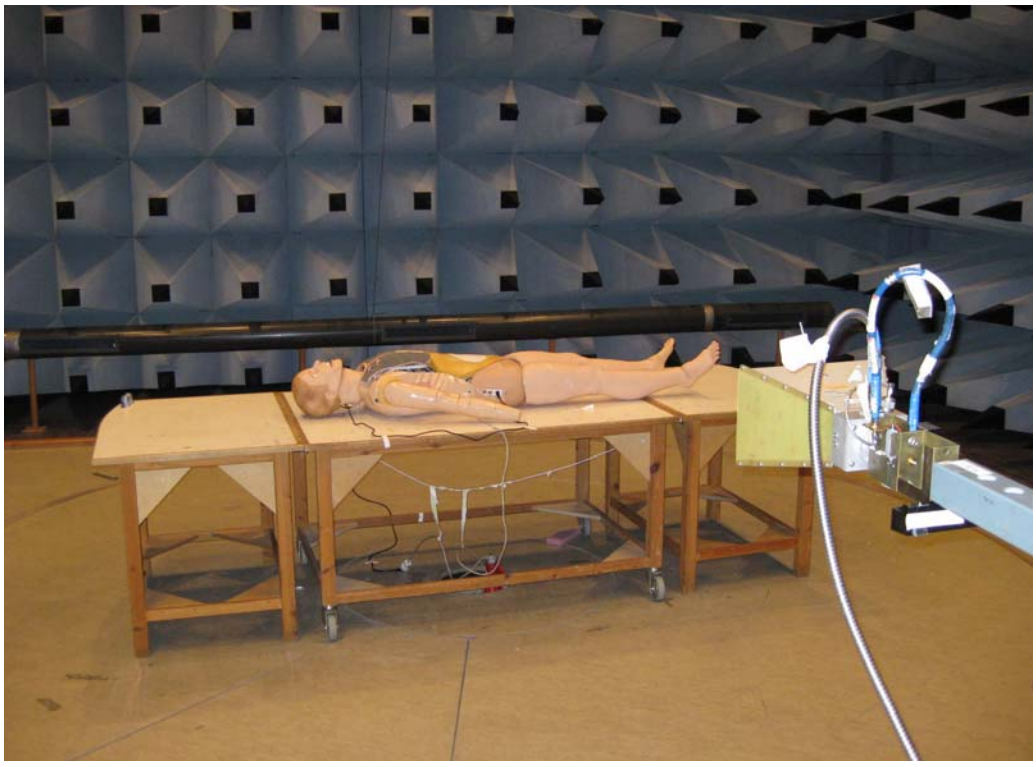
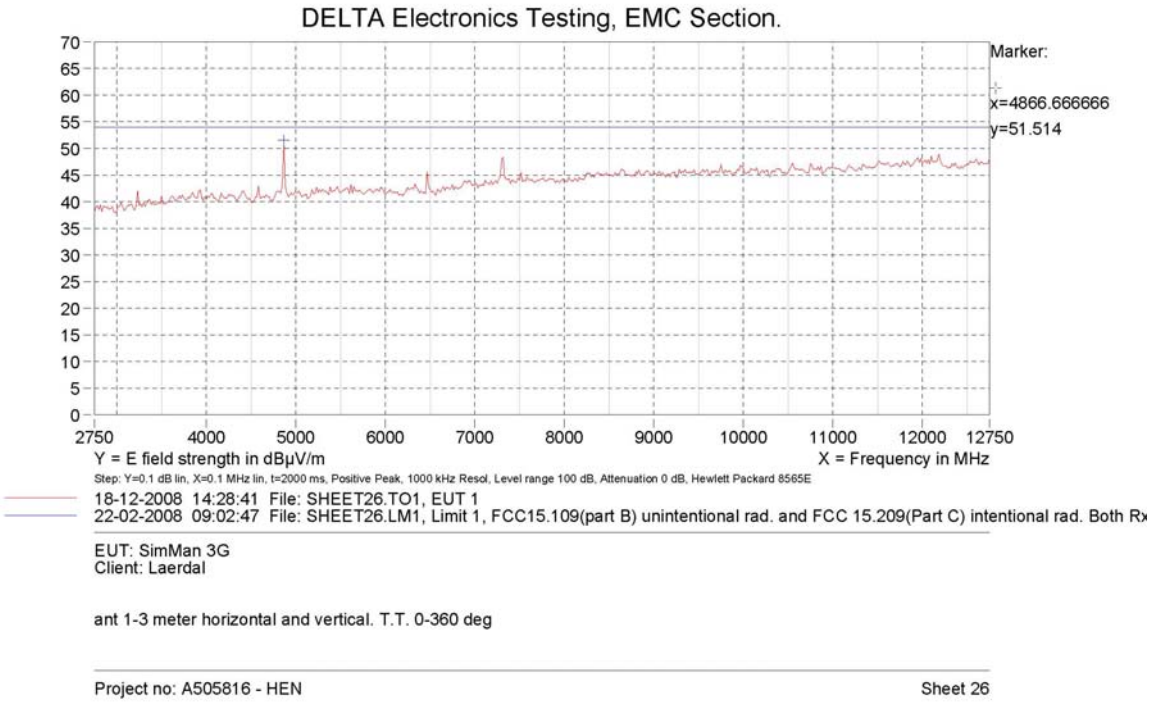


Photo 4.5.2 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.6 Measurement of radio frequency electromagnetic field, 2.75-12.75 GHz

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-9 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 2.75-12.75 GHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Complete search, Antenna distance 3 m | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 1 MHz |
| Test equipm. | EMI room Hørsholm 49086 49555 29876 49097 49037 | Uncertainty | 4 dB |




Comments

Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

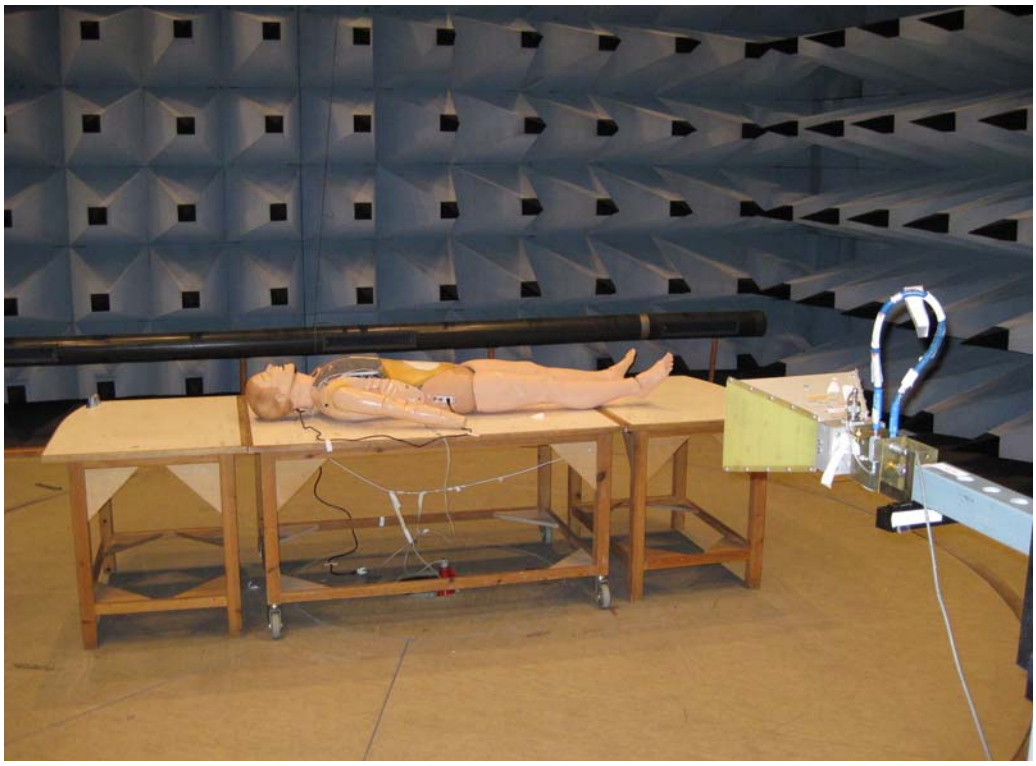
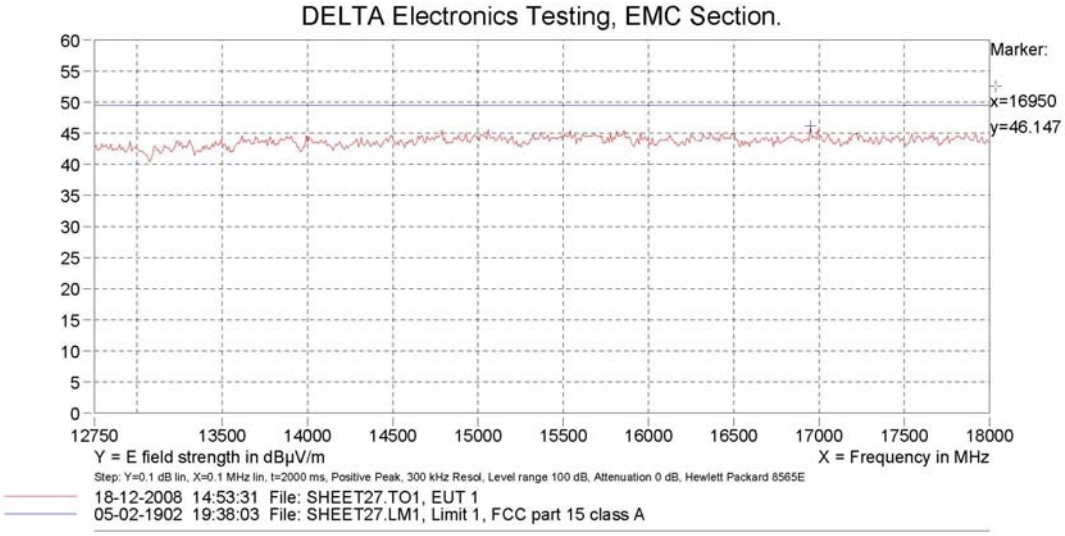


Photo 4.6.1 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.7 Measurement of radio frequency electromagnetic field, 12.75-18 GHz

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-40 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18 Dec. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 12.75-18 GHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Complete search, Antenna distance 3 m | Temperature<br>Humidity | 21 °C<br>35 % RH |
| Detector | Peak | Bandwidth | 1 MHz |
| Test equipm. | EMI room Hørsholm 49085 49555 29837 29448 | Uncertainty | 4 dB |




Comments

Applied modulation: Normal tag.
Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

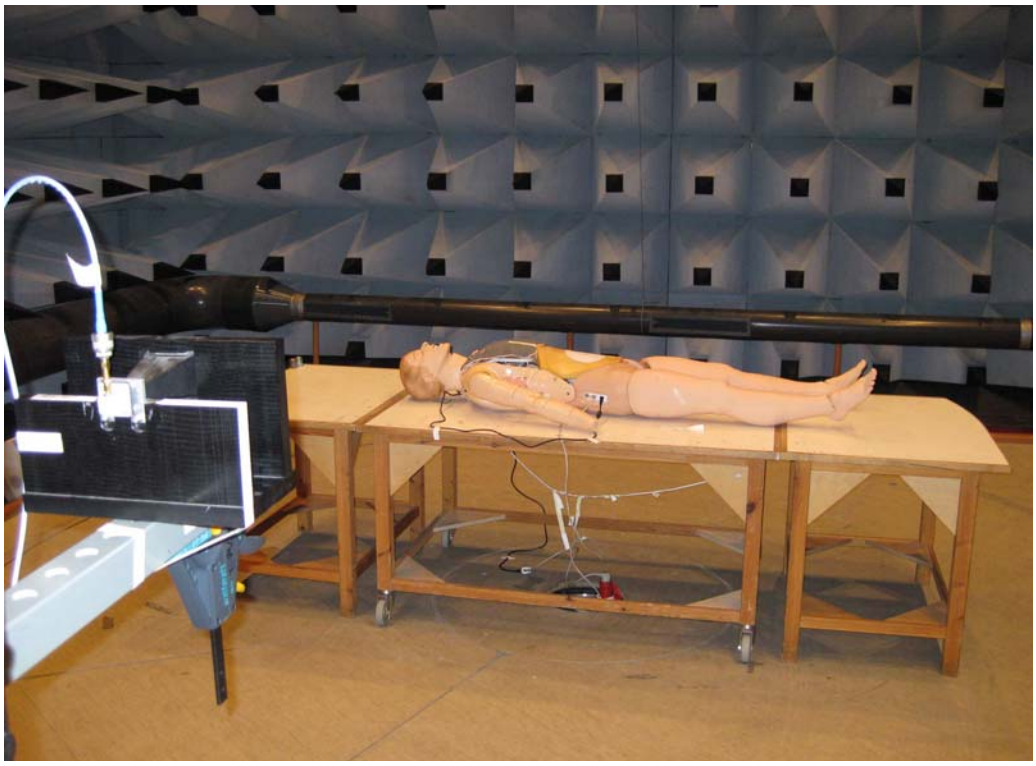
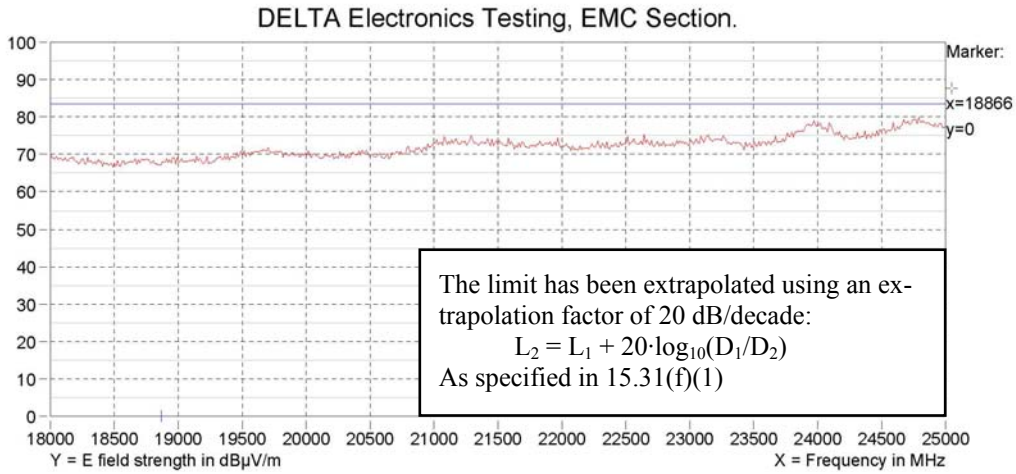


Photo 4.7.1 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.8 Measurement of radio frequency electromagnetic field, 18-25 GHz

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-51 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 20 Feb. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.209 | Frequency | 18-25 GHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Complete search, Antenna distance 0.1 m | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak | Bandwidth | 10 kHz |
| Test equipm. | EMI room Hørsholm 49329 49321 49592 | Uncertainty | 4 dB |




Comments

Applied modulation: Normal tag.
Final maximal measurements by variation of antenna azimuth, antenna height, and antenna polarisation. Performed by moving the antenna manually.

It was necessary to reduce the bandwidth to 10 kHz to get the noisefloor below the limit. The emissions from the test object are not visible above the noisefloor.

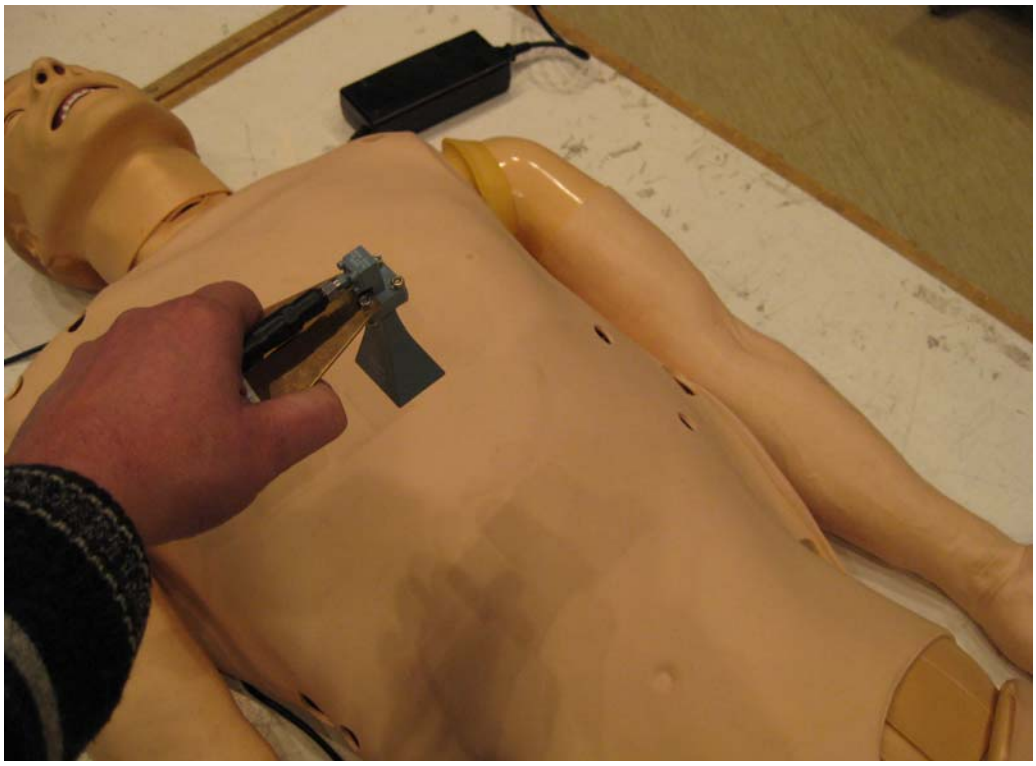


Photo 4.8.1 Test setup regarding measurement of radio frequency electromagnetic field.

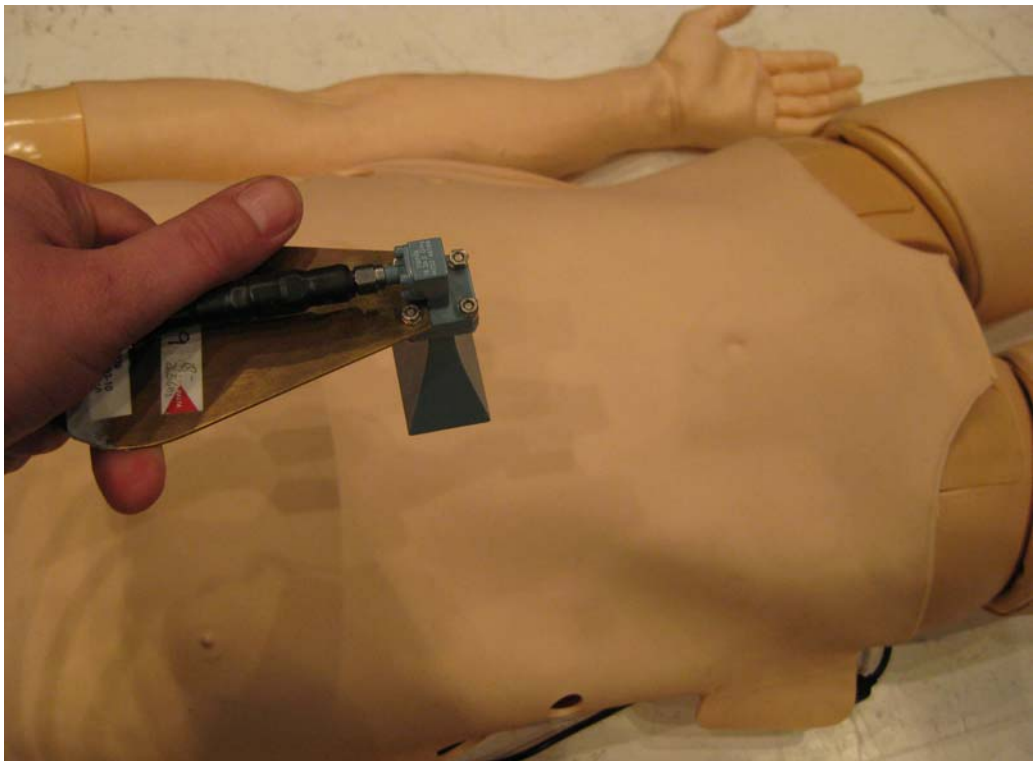
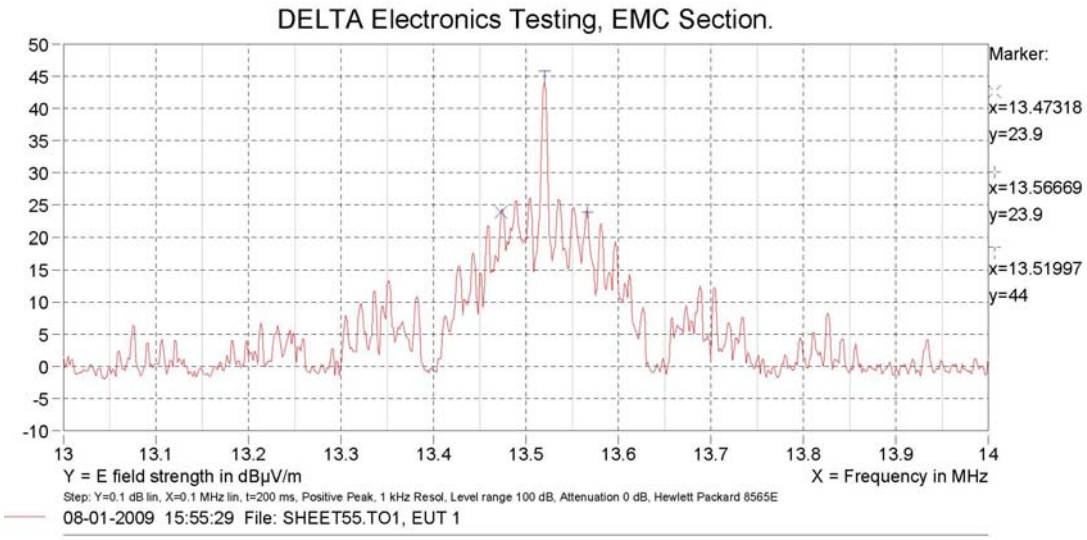


Photo 4.8.2 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.9 Occupied bandwidth

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | BW-2 |
| Type. | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 08 Jan. 2009 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.215 | RBW | 1 kHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>20 dB BW | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Test equipm. | EMI room Hørsholm 29916 29861 20332 | | |




Test result — Applied modulation: Normal tag.
The measured 20 dB bandwidth is 93.51 kHz.

Comments — None.

Compliant — Yes.

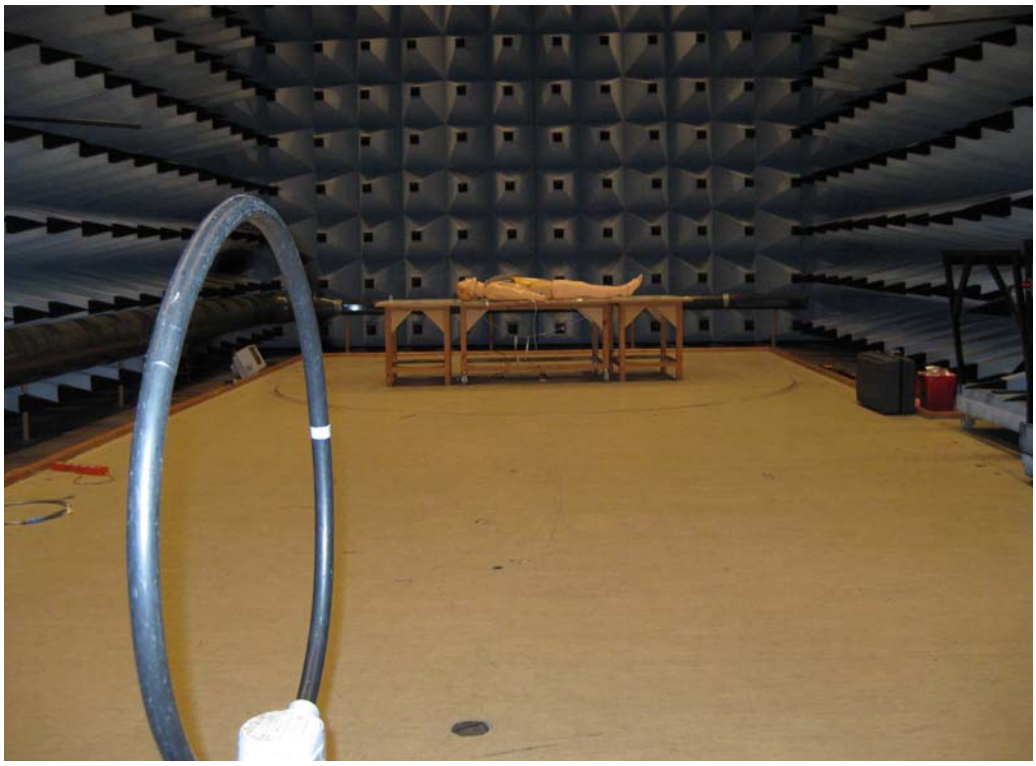
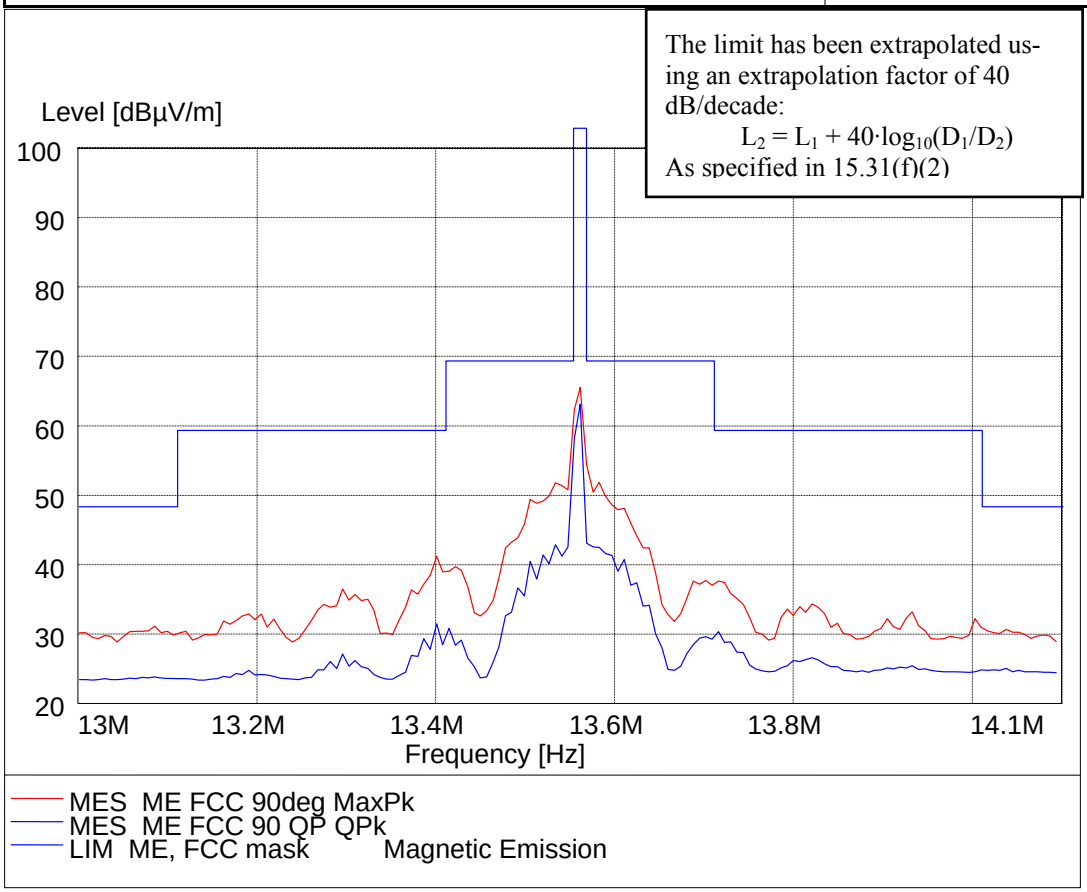


Photo 4.9.1 Test setup regarding measurement occupied bandwidth.

## 4.10 Measurement of radio frequency electromagnetic field, fundamental

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | RE-6 |
| Type | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 08 Jan. 2008 |
| Client | Laerdal Medical AS | Initials | HEN |
| Specification | FCC CFR 47 15.225(a), (b), (c) and (d) | Frequency | 0.009-30 MHz |

| | | | |
|---|---|---|---|
| Test method<br>Characteristics | ANSI C63.4:2003<br>Loop antenna pos Y, Turntable at 279 deg. Antenna dist. 10 m. | Temperature<br>Humidity | 23 °C<br>20 % RH |
| Detector | Peak and quasi peak | Bandwidth | 9 kHz |
| Test equipm. | EMI room Hørsholm 29916 29861 20332 | Uncertainty | 4 dB |




Test result: The measured field strengths are below the limit.

Compliant: Yes.

Comments: Applied modulation: Normal tag.
Final maximal measurements at max. turntable position and antenna orientation.

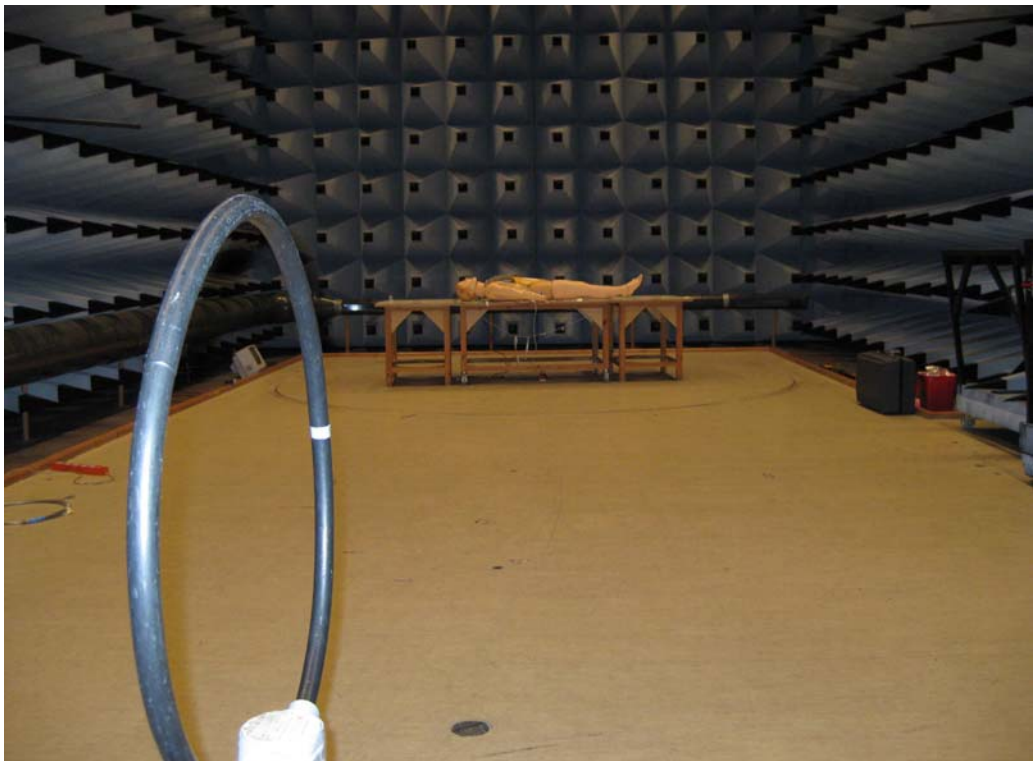


Photo 4.10.1 Test setup regarding measurement of radio frequency electromagnetic field.

## 4.11 Frequency tolerance

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | PROF-3 |
| Type. | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 07 Nov. 2008 |
| Client | Laerdal Medical AS | Initials | CRA |
| Specification | FCC CFR 47 15.225(e) | | |

| | |
|---|---|
| Test method | ANSI C63.4:2003 |
| Characteristics | Temp. Category: -20 ºC to +50 ºC. Test voltage: 12.58 to 17.02 VDC |
| Test equipm. | 49555 29623 49015 EVFGT-27 Uncertainty: $1 \cdot 10^{-7}$ |

During test the battery was removed, and the test object was supplied from an external DC power supply.
DC supply variation specification according to Laerdal Medical AS:

| | | |
|---|---|---|
| Nominal | : | 14.80 VDC |
| Minimum | : | 12.58 VDC |
| Maximum | : | 17.02 VDC. |

The test was performed at combination of variation of temperature and supply voltage.

| Temperature | Voltage | Carrier frequency |
|---|---|---|
| +22 ºC | 14.80 VDC | 13.560288462 MHz (ref. freq.) |
| -20 ºC | 12.58 VDC | 13.560705128 MHz |
| | 14.80 VDC | 13.560769231 MHz (high freq.) |
| | 17.02 VDC | 13.560769231 MHz (high freq.) |
| +50ºC | 12.58 VDC | 13.560064103 MHz (low freq.) |
| | 14.08 VDC | 13.560096154 MHz |
| | 17.02 VDC | 13.560064103 MHz (low freq.) |

| | Measured | Meas. tol. | Limit | Comment |
|---|---|---|---|---|
| Lowest op. freq.: | 13.560096154 MHz | -0.0017 % | -0.01 % | Ok |
| Highest op. freq.: | 13.560769231 MHz | +0.0035 % | +0.01 % | Ok |

Spectrum Analyzer Settings:

| RBW | VBW | SPAN | DET | CF | Trace |
|---|---|---|---|---|---|
| 300 Hz | 3 kHz | 20 kHz | Max Pk | 13.56 MHz | Max Hold |

Test result: The measured range of operating frequencies is within the limit.

Comments: Applied modulation: Normal tag.
The peak of the unmodulated carrier was used as reference.

Compliant: Yes.

| | | | |
|---|---|---|---|
| Test object | SimMan 3G | Sheet | PROF-4 |
| Type. | SimMan 3G | Project no. | A505816-3 |
| Serial no. | Prototype 32 | Date | 18-20 Feb. 2009 |
| Client | Laerdal Medical AS | Initials | CRA |
| Specification | FCC CFR 47 15.225(e) | | |

| | |
|---|---|
| Test method | ANSI C63.4:2003 |
| Characteristics | Temp. Category: -20 ºC to +50 ºC. Test voltage: 14.8 VDC |
| Test equipm. | 29934 49067 43089 EVFGT-26 Uncertainty: $1 \cdot 10^{-7}$ |

During test the battery was removed, and the test object was supplied from its own power supply (test object 2.1.2). Mains voltage: 230 VAC.
The test was performed at in 10 ºC steps.

| Temperature | Voltage | Carrier frequency |
|---|---|---|
| +50 ºC | 14.80 VDC | 13.559938 MHz (low freq.) |
| +40 ºC | 14.80 VDC | 13.560063 MHz |
| +30 ºC | 14.80 VDC | 13.559950 MHz |
| +20 ºC | 14.80 VDC | 13.560288 MHz (ref. freq.) |
| +10ºC | 14.80 VDC | 13.560068 MHz |
| 0ºC | 14.80 VDC | 13.560150 MHz |
| -10 ºC | 14.80 VDC | 13.560238 MHz |
| -20 ºC | 14.80 VDC | 13.560769 MHz (max freq.) |

| | Measured | Meas. tol. | Limit | Comment |
|---|---|---|---|---|
| Lowest op. freq.: | 13.559938 MHz | -0.0026 % | -0.01 % | Ok |
| Highest op. freq.: | 13.560769 MHz | +0.0035 % | +0.01 % | Ok |

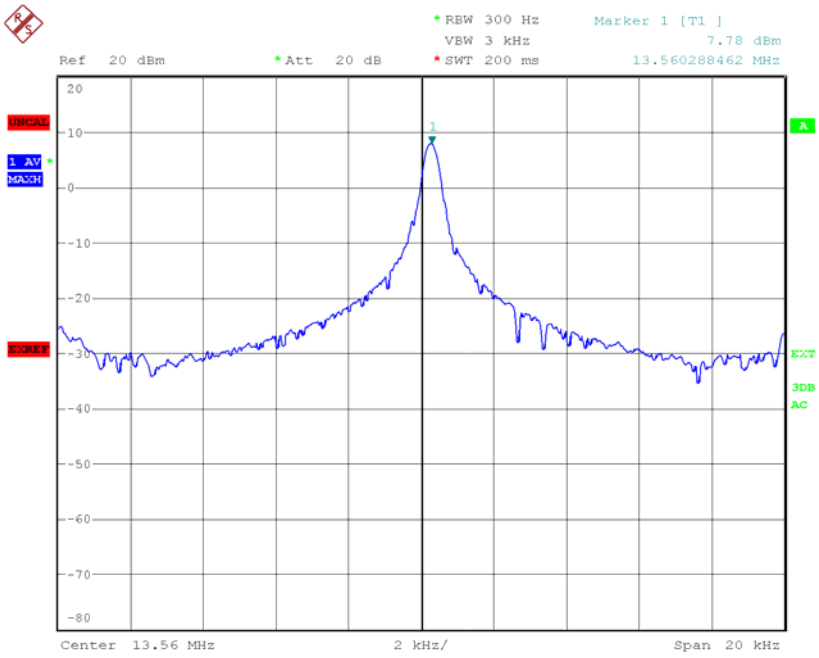
Spectrum Analyzer Settings:

| RBW | VBW | SPAN | DET | CF | Trace |
|---|---|---|---|---|---|
| 300 Hz | 3 kHz | 5 kHz | Max Pk | 13.56 MHz | Max Hold |

Test result: The measured range of operating frequencies is within the limit.

Comments: Applied modulation: Normal tag.
The peak of the unmodulated carrier was used as reference.
The temperature of the chamber was allowed to stabilize for a period of 2 hours at each temperature step.

Compliant: Yes.




Date: 6.NOV.2008 19:39:04


Photo 4.11.1 Test setup regarding measurement of frequency tolerance.

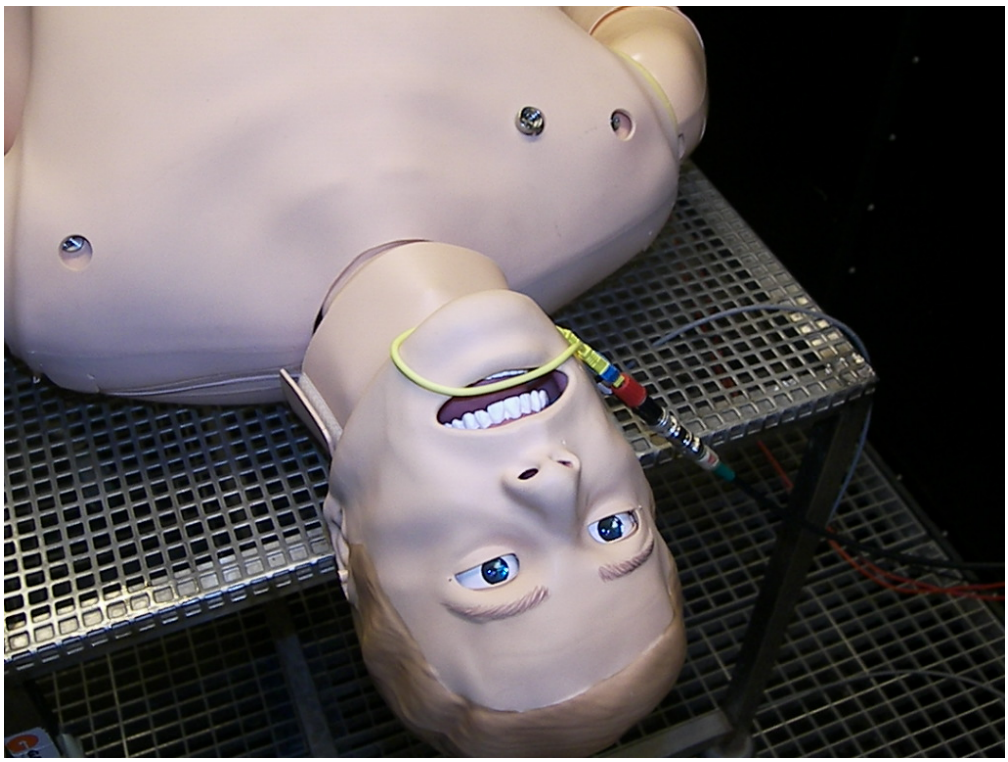


Photo 4.11.2 Test setup regarding measurement of frequency tolerance. Small loop antenna.

# 5. National registrations and accreditations

## 5.1 FCC Registrations

**Organization:** Federal Communications Commission, USA

**Registration Number:** 90529

**Facilities:**
OATS Hørsholm (EMC-0)
EMC room 2 Hørsholm (EMC-2)
EMC room 3 Hørsholm (EMC-3)
EMC room 4 Hørsholm (EMC-4)
EMI room Hørsholm (EMC-5)

## 5.2 VCCI Registrations

**Organization:** Voluntary Control Council for Interference by Information Technology, Japan

**Member Number:** 910

**Facilities:**

| | |
|---|---|
| OATS Hørsholm (EMC-0): | R-691 |
| EMC room 2 Hørsholm (EMC-2): | C-707 and T-246 |
| EMC room 3 Hørsholm (EMC-3): | C-2532 and T-247 |
| EMC room 4 Hørsholm (EMC-4): | C-2533 and T-248 |
| EMI room Hørsholm (EMC-5): | R-1180, C-706 and T-249 |

## 5.3 IC Registrations

**Organization:** Industry Canada, Certification and Engineering Bureau

**Registration Number:** IC4187-5

**Facilities:** EMI room Hørsholm (EMC-5)

## 5.4 DANAK Accreditation

**Organization:** Danish Accreditation and Metrology Fund - DANAK, see www.danak.dk and www.ilac.org

**Registration Number:** 19C

DANAK is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement). The MRA includes the Australian NATA and Canadian SCC.

CISPR 22 is equivalent to AS/NZS CISPR 22, and therefore this report can be used for applying the **Australian C-Tick mark** for IT equipment, when this test has been passed.

CISPR 22:2002 is equivalent to ICES-003:2004, and therefore this report can be used for approval in Canada for IT equipment, when this test has been passed.

# 6. List of instruments

| NO. | DESCRIPTION | MANUFACTURER | TYPE NO. |
|---|---|---|---|
| 29332 | ACTIVE LOOP ANTENNA | ROHDE & SCHWARZ | HFH-Z2 |
| 29461 | ARTIFICIAL MAINS NETWORK | ROHDE & SCHWARZ | ESH2-Z5 |
| 29516 | IMPULSE VOLTAGE LIMITER | ROHDE & SCHWARZ | ESH3/Z2 |
| 29623 | DIGITAL MULTIMETER, ROOM 5 (EMI) | FLUKE | 77 |
| 29797 | BILOG ANTENNA, 30-2000 MHz | CHASE ELECTRICS LTD | CBL 6111A |
| 29837 | BROADBAND POWER AMPLI-FIER, 8-18 GHz, 1 W | MITEQ | AMF-9B-080180-30P |
| 29861 | EMI-SOFTWARE Ver. 1.60 | ROHDE & SCHWARZ | ES-K1, PART: 1026.6790.02 |
| 29876 | RIDGED GUIDE HORN ANTENNA, 1-12.75 (18) GHz | EMCO | 3115 |
| 29916 | AUTOMATIC TEST RECEIVER, 9 kHz-2.75 GHz | ROHDE & SCHWARZ | ESCS 30 1102.4500.30 |
| 29934 | RF SPECTRUM ANALYSER, 9 kHz-2.9 GHz w. TRACK-GEN. | HEWLETT-PACKARD | 8594EM |
| 49015 | DC POWER SUPPLY | HEWLETT-PACKARD | 6274B |
| 49067 | CABLE#48, 10 m, 50 Ohm COAX CABLE, N(angle)-N(straight) | SUHNER | RG 214/U |
| 49085 | REMI EMISSION SOFTWARE PACKAGE v. 2.133, ROOM 1 | NeWeTec | REMI |
| 49086 | REMI EMISSION SOFTWARE PACKAGE v. 2.133, ROOM 5 | NeWeTec | REMI |
| 49097 | MICROWAVE HP FILTER 2.75-12.75 GHz, MAX. 2 W | MICRO-TRONICS | HPM13106 |
| 49321 | SPECTRUM ANALYZER, 50GHz with option 006 | HEWLETT-PACKARD | 8565E |
| 49329 | STANDARD GAIN HORN, 18-26.5GHz | NARDA | 638 |
| 49555 | SPECTRUM ANALYZER / MEAS-UREMENT RECEIVER | ROHDE & SCHWARZ | ESU26 |
| 29332 | ACTIVE LOOP ANTENNA | ROHDE & SCHWARZ | HFH-Z2 |
| 29461 | ARTIFICIAL MAINS NETWORK | ROHDE & SCHWARZ | ESH2-Z5 |
| 29516 | IMPULSE VOLTAGE LIMITER | ROHDE & SCHWARZ | ESH3/Z2 |