InterLab®

# Final Report on

# JLT 1213

**Report Reference:** MDE_SVEP_0802_01

**Date:** November 03, 2008

**Test Laboratory:**

DAT-P-192/99-01

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Borsigstr. 11
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Germany



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# 1 Administrative Data

## 1.1 Project Data

| | |
|---|---|
| *Project Responsible:* | Holger Leutfeld |
| *Date Of Test Report:* | 2008/11/03 |
| *Date of first test:* | 2008/06/28 |
| *Date of last test:* | 2008/06/28 |

## 1.2 Applicant Data

*Company Name:* Svep Design Center AB

| | |
|---|---|
| *Street:* | St. Lars väg 42A |
| *City:* | 22270 Lund |
| *Country:* | Sweden |

*Contact Person:* Mr. Mikael Bergqvist

| | |
|---|---|
| *Phone:* | +46 (0)46 19 27 02 |
| *Fax:* | +46 (0)46 12 84 30 |
| *Mobile:* | +46 (0)708 742 002 |
| *E-Mail:* | vis@svep.se |

## 1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

### 7 layers DE

| | |
|---|---|
| *Company Name :* | 7 layers AG |
| *Street :* | Borsigstrasse 11 |
| *City :* | 40880 Ratingen |
| *Country :* | Germany |
| *Contact Person :* | Mr. Michael Albert |
| *Phone :* | +49 2102 749 201 |
| *Fax :* | +49 2102 749 444 |
| *E Mail :* | michael.albert@7Layers.de |

### Laboratory Details

| *Lab ID* | *Identification* | *Responsible* | *Accreditation Info* |
|---|---|---|---|
| Lab 1 | Radiated Emissions | Mr. Robert Machulec<br>Mr. Andreas Petz | DAR-Registration no. DAT-P-192/99-01 |

## 1.4 Signature of the Testing Responsible

7 layers AG, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

Dr. Michael Küppers
responsible for tests performed in: Lab 1

## 1.5 Signature of the Accreditation Responsible


Accreditation scope responsible person
responsible for Lab 1

# 2 Test Object Data

## 2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

**OUT: JLT 1213**

| | |
|---|---|
| *Product Category:* | Others |

## 2.2 Detailed Description of OUT Samples

**Sample : A01**

| | |
|---|---|
| *OUT Identifier* | JLT 1213 |
| *Sample Description* | |

## 2.3 OUT Features

**Features for OUT: JLT 1213**

| *Designation* | *Description* | *Allowed Values* | *Supported Value(s)* |
|---|---|---|---|
| **Features for scope: FCC_v1** | | | |
| BT | EUT supports Bluetooth data rate of 1 Mbps with GFSK modulation in the band 2400 MHz - 2483.5 MHz | | |
| DC | EUT is powered by DC | | |
| EDR2 | EUT supports Bluetooth using data rate of 2 Mbps with PI/4 DQPSK modulation in the band 2400 MHz - 2483.5 MHz | | |
| Iant | permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment | | |
| PantC | permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment | | |
| Wb | EUT supports WLAN in mode b in the band 2400 MHz - 2483.5 MHz | | |
| Wg | EUT supports WLAN in mode g in the band 2400 MHz - 2483.5 MHz | | |

## 2.4 Auxiliary Equipment

| *AE No.* | *Type Designation* | *Serial No.* | *HW Status* | *SW Status* | *Description* |
|---|---|---|---|---|---|
| AE key | Cherry ML 4100 USB | | | | Keyboard |
| AE Adap. | External USB to Serial Adapter | | | | USB to Serial Adapter |
| AE Floppy | IBM External USB Floppy Drive | 3018297 | | | Floppy Disk |
| AE Mouse | Logitech USB Mouse | | | | USB Mouse |

## 2.5 Operating Mode(s)

| *Ref.-No.* | *Description* |
|---|---|
| WL2437 | WLAN on 2437 MHz turbo mode |

## 2.6 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

| *Setup No.* | *List of OUT samples* | | *List of auxiliary equipment* | |
|---|---|---|---|---|
| | *Sample No.* | *Sample Description* | *AE No.* | *AE Description* |
| **FCC15B (Setup for computer peripheral setup (radiated))** | | | | |
| | *Sample:* A01 | | AE key | Keyboard |
| | | | AE Adap. | USB to Serial Adapter |
| | | | AE Floppy | Floppy Disk |
| | | | AE Mouse | USB Mouse |

# 3 Results

## 3.1 General

**Documentation of tested devices:** Available at the test laboratory.

**Interpretation of the test results:** The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

## 3.2 List of the Applicable Body

(Body for Scope: FCC_v1)

| *Designation* | *Description* |
|---|---|
| FCC47CFRChIPART15bRADIO FREQUENCY DEVICES | Subpart B - Unintentional Radiators |

## 3.3 List of Test Specification

| | |
|---|---|
| *Test Specification:* | **FCC part 2 and 15** |
| *Date / Version* | 2007/10/01 Version: 10-1-07 Edition |
| *Title:* | PART 2 - GENERAL RULES AND REGULATIONS<br>PART 15 - RADIO FREQUENCY DEVICES |

## 3.4 Summary

| *Test Case Identifier / Name*<br>*Test (condition)* | *Result* | *Date of Test* | *Lab Ref.* | *Setup* |
|---|---|---|---|---|
| **15b.2 Spurious Radiated Emissions §15.109** | | | | |
| 15b.2 Spurious Radiated Emissions | Passed<br>operating mode: WL2437 | 2008/06/28 | Lab 1 | FCC15B |

## 3.5 Detailed Results

### 3.5.1 15b.2 Spurious Radiated Emissions §15.109

**Test: 15b.2 Spurious Radiated Emissions**

| | |
|---|---|
| *Result:* | Passed |
| *Setup No.:* | FCC15B |
| *Date of Test:* | 2008/06/28 1:38 |
| *Body:* | FCC47CFRChIPART15bRADIO FREQUENCY DEVICES |
| *Test Specification:* | FCC part 2 and 15 |

*Test Equipment Environmental Conditions*

| | |
|---|---|
| *Temperature:* | 27°C |
| *Air Pressure:* | 1019hPa |
| *Rel. Humidity:* | 33% |

**Detailed Results:**

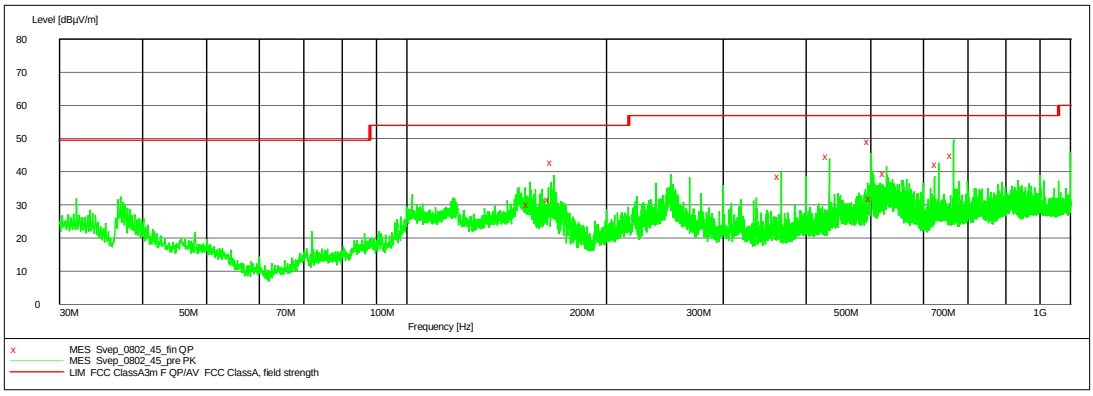
***EMI RADIATED TEST***

***Diagram No.: 2.01***

```
EUT:                 JLT 121X (DI000a01)
Manufacturer:        JLT mobile Computers
Operating Condition: TX on 2437 MHz; WLAN on 2437 MHz turbo mode
Test Site:           7 layers, Ratingen
Operator:            Doe/Gal
Test Specification:  FCC part 15 b Class A
Comment:             Horizontal EUT position
Start of Test:       28.06.2008 / 00:45:56
```

***SCAN TABLE: "FCC part 15 b Class A"***

```
  Short Description:            FCC part 15 b
  Start      Stop       Step       Detector  Meas.    IF      Transducer
  Frequency  Frequency  Width                Time     Bandw.
  30.0 MHz   1.0 GHz    60.0 kHz   MaxPeak   1.0 ms   120 kHz HL562
```




***MEASUREMENT RESULT: "Svep_0802_47_fin QP"***

```
28.06.2008  01:49
   Frequency     Level  Transd   Limit  Margin  Height  Azimuth  Polarisation
         MHz    dBµV/m      dB  dBµV/m      dB      cm      deg

  153.300000     30.10     8.3    54.0    23.9   249.0   160.00  HORIZONTAL
  164.940000     31.80     8.1    54.0    22.2   256.0   292.00  HORIZONTAL
  166.680000     42.90     8.1    54.0    11.1   250.0   176.00  HORIZONTAL
  366.660000     38.50    14.2    56.5    18.4   118.0   218.00  HORIZONTAL
  433.260000     44.70    15.8    56.5    12.2   113.0   209.00  HORIZONTAL
  499.920000     49.20    17.3    56.5     7.7   100.0    94.00  HORIZONTAL
  503.280000     31.90    17.4    56.5    25.0   101.0    96.00  HORIZONTAL
  528.120000     39.50    17.8    56.5    17.4   100.0   224.00  HORIZONTAL
  633.300000     42.20    19.6    56.5    14.7   101.0    81.00  HORIZONTAL
  666.600000     44.90    20.0    56.5    12.0   184.0    92.00  HORIZONTAL
```

# 4 Annex

## 4.1 Additional Information for OUT Description

front view

back view

## 4.2 Additional Information for Report


setup for radiated tests

Test Description

_____

Spurious radiated emissions

_____

Standard FCC Part 15, 10-1-07
Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description

Measurement below 1 GHz:
The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.
The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.
The radiated emissions measurements were made in a typical installation configuration.
The measurement procedure is implemented into the EMI test software ES-K1 from R&S.
Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)
Intention of this step is, to determine the radiated EMI-profile of the EUT.
Settings for step 1:
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180° to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.
Step 2:
A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.
Settings for step 2:
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180° to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):
- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:
- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by +/- 22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: –22.5° to + 22.5 ° around the determined value

- Height variation range: -0.25m to + 0.25m around the determined value
Step 4: Final measurement (with QP detector)
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s
Measurement above 1 GHz:
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.
Detector: Peak, Average (simultaneously)
RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

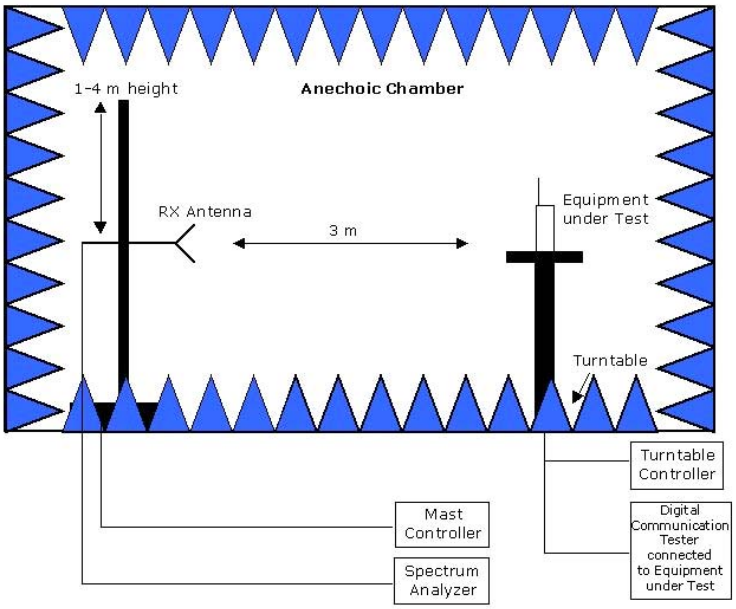
FCC Part 15, Subpart B, §15.109, Radiated Emission Limits
Frequency Range (MHz): Class A Limit (dBµV/m)

| Frequency Range (MHz) | Class A Limit (dBµV/m) / @ 3m ! |
|---|---|
| 30 – 88 | 49.5 |
| 88 – 216 | 54.0 |
| 216 – 960 | 56.9 |
| above 960 | 60.0 |

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....
Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings




Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

Test Equipment

*EUT Digital Signalling System*

| Equipment | Type | Serial No. | Manufacturer | Last Cal | Next cal |
|---|---|---|---|---|---|
| Digital Radio Communication Tester | CMD 55 | 831050/020 | Rohde & Schwarz | 01.12.05 | 01.12.08 |
| Signalling Unit for Bluetooth | PTW60 | 100004 | Rohde & Schwarz | - | - |
| Universal Radio Communication Tester | CMU200 | 102366 | Rohde & Schwarz | 22.09.07 | 22.09.09 |
| Universal Radio Communication Tester | CMU200 | 837983/052 | Rohde & Schwarz | 22.09.07 | 22.09.09 |
| Signalling Unit for Bluetooth | CBT | 100302 | Rohde & Schwarz | 22.09.06 | N/A – only used for signalling |

*EMI Test System*

| Equipment | Type | Serial No. | Manufacturer | Last Cal | Next cal |
|---|---|---|---|---|---|
| Comparison Noise Emitter | CNE III | 99/016 | York | - | - |
| EMI Analyzer | ESI 26 | 830482/004 | Rohde & Schwarz | 06.12.07 | 06.12.09 |
| Signal Generator | SMR 20 | 846834/008 | Rohde & Schwarz | 05.12.07 | 05.12.09 |
| AC Power Source | 6404 | 64040000B04 | Croma ATE INC. | 01.06.08 | 01.06.11 |

*EMI Radiated Auxiliary Equipment*

| Equipment | Type | Serial No. | Manufacturer | Last Cal | Next cal |
|---|---|---|---|---|---|
| Antenna mast 4m | MA 240 | 240/492 | HD GmbH H. Deisel | - | - |
| Biconical dipole | VUBA 9117 | 9117108 | Schwarzbeck | 02.07.03 | 02.10.08 |
| Broadband Amplifier 18MHz-26GHz | JS4-18002600-32 | 849785 | Miteq | 06.02.08 | 06.10.08 |
| Broadband Amplifier 30MHz-18GHz | JS4-00101800-35 | 896037 | Miteq | 06.02.08 | 06.10.08 |
| Broadband Amplifier 45MHz-27GHz | JS4-00102600-42 | 619368 | Miteq | 06.02.08 | 06.10.08 |
| Cable "ESI to EMI Antenna" | EcoFlex10 | W18.01-2 W38.01-2 | Kabel Kusch | 06.02.08 | 06.10.08 |
| Cable "ESI to Horn Antenna" | UFB311A UFB293C | W18.02-2 W38.02-2 | Rosenberger-Microcoax | 06.02.08 | 06.10.08 |
| Double-ridged horn | HF 906 | 357357/002 | Rohde & Schwarz | 12.05.06 | 12.10.08 |
| Double-ridged horn | HF 906 | 357357/001 | Rohde & Schwarz | 20.01.04 | N/A – spare antenna |
| High Pass Filter | 5HC3500/12750-1.2-KK | 200035008 | Trilithic | 06.02.08 | 06.10.08 |
| High Pass Filter | 5HC2700/12750-1.5-KK | 9942012 | Trilithic | 06.02.08 | 06.10.08 |
| High Pass Filter | 4HC1600/12750-1.5-KK | 9942011 | Trilithic | 06.02.08 | 06.10.08 |
| Log.-per. Antenna | HL 562 Ultralog | 830547/003 | Rohde & Schwarz | 17.05.06 | 17.05.09 |
| Loop Antenna | HFH2-Z2 | 829324/006 | Rohde & Schwarz | 19.08.02 | N/A – only used for pre-testing |
| Pyramidal Horn Antenna 26.5 GHz | Model 3160-09 | 9910-1184 | EMCO | 06.02.08 | 06.10.08 |

*EMI Conducted Auxiliary Equipment*

| Equipment | Type | Serial No. | Manufacturer | Last Cal | Next cal |
|---|---|---|---|---|---|
| Cable "LISN to ESI" | RG214 | W18.03+W48.03 | Huber+Suhner | 06.02.08 | 06.10.08 |
| Two-Line V-Network | ESH 3-Z5 | 828304/029 | Rohde & Schwarz | 01.11.05 | 01.11.08 |
| Two-Line V-Network | ESH 3-Z5 | 829996/002 | Rohde & Schwarz | - | - |

*Auxiliary Test Equipment – calibration not applicable; spare equipment*

| Equipment | Type | Serial No. | Manufacturer | Last Cal | Next cal |
|---|---|---|---|---|---|
| Broadband Resist. Power Divider N | 1506A / 93459 | LM390 | Weinschel | - | - |
| Broadband Resist. Power Divider SMA | 1515 / 93459 | LN673 | Weinschel | - | - |
| Digital Multimeter 01 | Voltcraft M-3860M | IJ096055 | Conrad | - | - |
| Digital Multimeter 02 | Voltcraft M-3860M | IJ095955 | Conrad | - | - |
| Digital Oscilloscope | TDS 784C | B021311 | Tektronix | - | - |
| Fibre optic link Satellite | FO RS232 Link | 181-018 | Pontis | - | - |
| Fibre optic link Transceiver | FO RS232 Link | 182-018 | Pontis | - | - |
| I/Q Modulation Generator | AMIQ-B1 | 832085/018 | Rohde & Schwarz | - | - |
| Notch Filter ultra stable | WRCA800 /960-6E | 24 | Wainwright | - | - |
| Spectrum Analyzer 9 kHz to 3 GHz | FSP3 | 838164/004 | Rohde & Schwarz | 25.11.05 | 25.11.08 |
| Temperature Chamber | VT 4002 | 58566002150010 | Vötsch | - | - |
| Temperature Chamber | KWP 120/70 | 59226012190010 | Weiss | - | - |
| ThermoHygro Datalogger 03 | Opus10 THI (8152.00) | 7482 | Lufft Mess- und Regeltechnik GmbH | - | - |

*Anechoic Chamber – calibration not applicable*

| Equipment | Type | Serial No. | Manufacturer | Last Cal | Next cal |
|---|---|---|---|---|---|
| Air Compressor (pneumatic) | | | Atlas Copco | - | - |
| Controller | CO 2000 | CO2000/328/12470406/L | Innco innovative constructions GmbH | - | - |
| EMC Camera | CE-CAM/1 | | CE-SYS | - | - |
| EMC Camera for observation of EUT | CCD-400E | 0005033 | Mitsubishi | - | - |
| Filter ISDN | B84312-C110-E1 | | Siemens & Matsushita | - | - |
| Filter telephone systems / modem | B84312-C40-B1 | | Siemens & Matsushita | - | - |
| Filter Universal 1A | B84312-C30-H3 | | Siemens & Matsushita | - | - |
| Fully/Semi AE Chamber | 10.58x6.38x6 | | Frankonia | - | - |
| Turntable | DS 420S | 420/573/99 | HD GmbH, H.Deisel | - | - |
| Valve Control Unit (pneum.) | VE 615P | 615/348/99 | HD GmbH, H.Deisel | - | - |

# 5 Index