

Test Report

Electromagnetic Compatibility

Test Report - Nr.: 08KFE009210-C-01

Date: 2008-11-13

Type:	Digital Manometer Service Junior Wireless SCJNP-XXX-1-RC	PC Adapter Wireless SCSW-KIT-JN
Description:	Digital Manometer and PC Adapter	
Serialnumber:	27009	1124

Manufacturer:	Parker Hannifin GmbH & Co. KG Am Metallwerk 9 DE- 33659 Bielefeld
Customer:	AS Electronics GmbH
Address (Customer):	Kantstr. 10 DE-72663 Grossbettlingen Germany

Test Laboratory:	Intertek Deutschland GmbH, Innovapark 20, D- 87600 Kaufbeuren
FCC registration number:	90714
Compiled by:	M. Virkki Project Engineer
Approved by:	R. Dressler Project Engineer

This test report consists of 20 pages. All measurement results exclusively refer to the equipment, which was tested.
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1. General description

1.1. Product description

The ServiceJunior digital pressure gauge measures and displays pressures and corresponding MIN and MAX readings. The accuracy (tolerance) is given by $\pm 0,5\%$ related to Full scale. (FS).

Running with a scanning rate of 10 msec (100 readings per second) pressure peaks are captured. The MIN/MAX memory will be permanent updated.

The ServiceJunior *wireless* operates with a bidirectional wireless interface. The operating range is specified to 50 mtr. In some applications you will have disturbances based on existing interferences.

Transmitting data's from the ServiceJunior to the PC data lost will be avoid by sending cryptic data codes.

The ServiceJunior *wireless* operates battery powered. Send and transmit datas to the PC/Notebook or receive parameters will consume energy. If the battery capacity will be consumed totally, no data memory content will be lost.

The data memory content operates independent from given battery capacity.

1.2. Related submittal(s) Grants

This is an application for the certification of the Digital Manometer and PC Adapter using the electrical identical RF- Modules.

1.3. Test Methodology

- ☒ The test setup and test in the frequency range of 150 kHz to 30 MHz (Conducted Emission) was done according to: **CISPR 22: 2006 and ANSI C63.4: 2003**
- ☒ The test setup and test in the frequency range of 30 MHz to 25 GHz was done according to: **ANSI C63.4: 2003** American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz and **CFR 47, Part 15.249**.

The test results detailed in this report apply only to the Digital Manometer SCJNP-XXX-1-RC and the PC Adapter SCSW-KIT-JN with the test setup described.

Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.

The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

1.4. Test Facility

The test site was the semi-anechoic chamber Intertek Germany (PM KF 1150). The measurement distance EUT – Antenna was $d = 3$ m and in the frequency range of 18 GHz to 25 GHz a measurement distance EUT – Antenna of $d = 0.3$ m was additionally used to find emissions easier.

1.5. List of exhibits

Following exhibits are delivered as separate pdf files. The name of each file corresponds to the description of the exhibit with the extension **.pdf**

EXHIBIT 1	Block Diagram
EXHIBIT 2	Confidentiality Request
EXHIBIT 3	External Photos
EXHIBIT 4	ID Label / Location Info
EXHIBIT 5	Internal Photos
EXHIBIT 6	Parts List / Tune Up Info
EXHIBIT 7	Schematics
EXHIBIT 8	Test Setup Photos
EXHIBIT 9	Users Manual

2. **Measurements And Test Specifications**

Emission - Requirements according to

- ☐ FCC, Part 15, Class A, verification
- ☒ FCC, Part 15, Class B, DoC
- ☐ FCC, Part 15, Class B, certification
- ☒ FCC, Part 15, intentional radiator, certification

3. Description Of EUT

3.1. Configuration / Operating Conditions

☒ table-top EUT

☐ floor-standing EUT

The device is pressure measuring unit (battery operated) with TX and RX. The operation frequency is 2,414 GHz. Data measured by the unit are transmitted the central unit (PC Adapter) connected to the PC (storage and evaluation of measured values).

Supply voltage of EUT is 3 V (2 x cell AA).

Radio part of both units are identical. Operating frequency is fixed to one channel.

3.2. Peripheral Devices Used For Testing

Device	Manufacturer	Type	SN	FCC ID
Notebook	HP	Compaq nc 6320	C NU6483GYJ	QDS-BRCM1018
AC Adapter	HP	PPP009L	6Y34378801	-/-

3.3. Major Subassemblies Or Internal Peripherals

Device	Manufacturer	Type	SN	FCC ID
none				

3.4. Supply- And Interconnecting Cables

Line	Length	shielded	non shielded	Shield on GND / PE
USB- cable	1,4 m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	PE
DC- cable to Notebook	1,8 m	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-

4. Test Results - Overview

Emission	required	passed	passed with modification	not passed
Conducted Emission 150 kHz - 30 MHz	Class B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Receiver Radiated Emission 30 MHz – 18 GHz	FCC 15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transmitter Radiated Emission 30 MHz - 25 GHz	FCC 15.249	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Field strength of fundamental	FCC 15.249	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20 dB bandwidth	FCC 15.215	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Measurement results detailed

5.1. Conducted Emission 150 kHz - 30 MHz

Normative references

Limits equivalent:	CISPR 22
Methods of Measurement equivalent:	ANSI C63.4

Test requirement

Class	B
Frequency range	150kHz - 30 MHz

Place of measurement

- ☒ Shielded cabin Siemens Matsushita CER Nr. C62128-A501-A945-1-0006
☐ Horizontal, vertical plane of reference

Conducted Emissions

Measurement device	Manufacturer	Type	SN	Asset No.	Last Calibr.	Inter-val
<input checked="" type="checkbox"/> Receiver 9 kHz-30MHz	Rohde & Schwarz	ESHS10	837356/012	PM KF 0134	08-02	2
<input checked="" type="checkbox"/> V-Artificial mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	838576/016	PM KF 0141	07-03	2

Test Procedure

The test was carried out automatically by the test receiver.
The EUT is a table-top EUT and was standing on a wooden table with the dimensions 2,0 m x 0,8 m x 0,8 m (Length x Width x Height).

Test result:

Test requirements ☒ **passed** ☐ **passed with modification** ☐ **not passed**

Comment

The conducted emissions between 150 kHz and 30 MHz are under the limits for Class B devices. These data represents worst case emissions.

Measurement diagram is given in the attachment. Photodocumentation is found in the exhibits.

5.2. Radiated Emission 30 MHz – 25 GHz

5.2.1. Field strength calculation

The field strength is calculated by adding the reading on the measuring receiver to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when the specified limit is related to average detector and measurements are made with peak detector).

A sample of calculation is included below :

$$E = RR + AF + CF - AG + PD + AV$$

Where

E	field strength in dB μ V/m
RR	receiver reading including preamplifier in dB μ V
CF	cable attenuation factor in dB
AF	antenna factor in dB/m
AG	amplifier gain in dB
PD	pulse desensitization in dB
AV	average factor in dB

Example : Assume that measured values and factors are as follows :

RR	= 60 dB μ V
CF	= 1.2 dB
AF	= 12.6 dB/m
AG	= 20 dB
PD	= 0 dB
AV	= -10 dB

$$\text{Then } E = 60 + 1.2 + 12.6 - 20 + 0 - 10 = 43.8 \text{ dB}\mu\text{V/m}$$

The radiated emission tables which follow the graphical presentation of results were created by the EMC 32 software by Rohde-Schwarz. The data of field strength include the components given above with the exception of PD and AV.

5.2.2. Normative references

Limits equivalent:	FCC, Part 15.249
Methods of Measurement equivalent:	ANSI C63.4

Test requirement

Distance Antenna – EUT	3 m for $f < 18$ GHz; 0.3 m for $f > 18$ GHz
Frequency range	30 MHz - 25 GHz

Place of measurement

- ☒ Semi anechoic chamber Intertek Germany PM KF 1150.
☐ Open Area Test Site

Measurement devices

Measurement device	Type	Manufacturer	SN	Asset No.	Last Calibr. at ion	Interval
<input checked="" type="checkbox"/> Test receiver, 20Hz-26GHz	ESIB26	Rohde & Schwarz	100150	PM KF 0948	07-03	2
<input checked="" type="checkbox"/> Antenna, 30-3000 MHz	HL562	Rohde & Schwarz	100354	PM KF 1123	07-03	2
<input checked="" type="checkbox"/> Horn antenna, 1 GHz-18 GHz	Rohde & Schwarz	HF 906	100331	PM KF 1047	07-09	2
<input checked="" type="checkbox"/> Horn antenna preamp. 1 GHz-18GHz	Bonn	BLMA0118-BT	76609	PM KF 1047	07-09	2
<input checked="" type="checkbox"/> Horn antenna, 14 GHz-40 GHz	Schwarzbeck	BBHA 9170	BBHA91703 61	PM KF 1204	07-10	2

5.2.3. Emission Test results

Test requirements

☒ passed

☐ passed with
modification

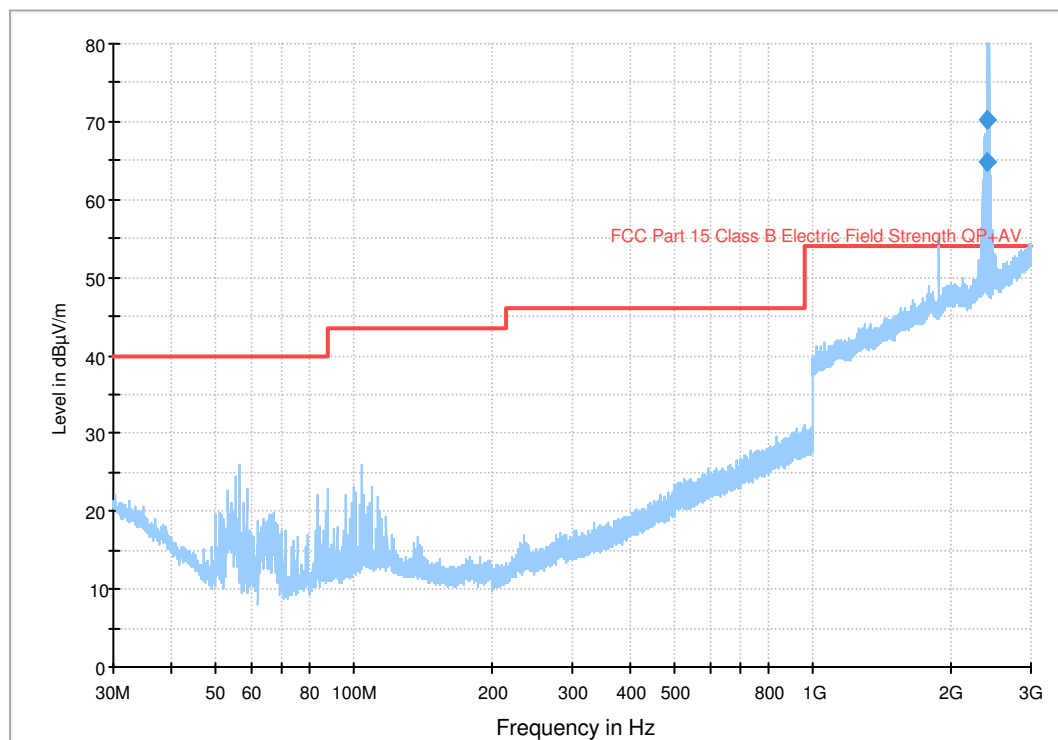
☐ not passed

Comment:

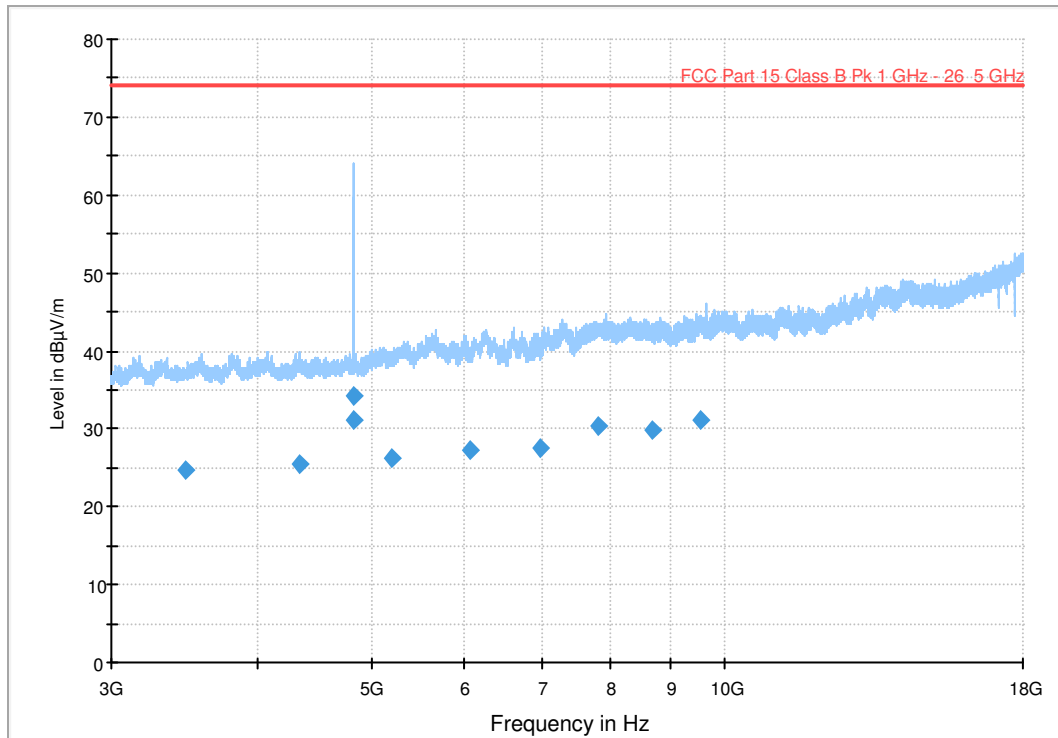
The radiated emissions between 30 MHz and 25 GHz are under the limit
specified in FCC 15.249.

In the following diagrams the transmitter frequency at 2.4148 GHz is visible.

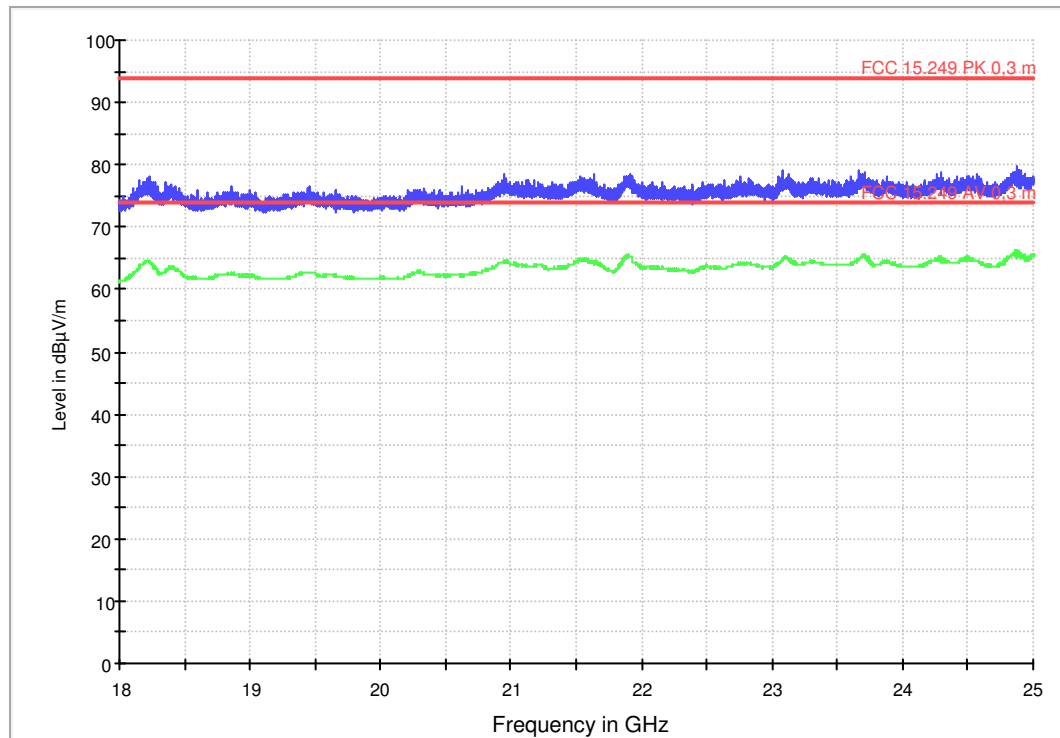
5.2.3.1. Transmitter Radiated Emission 30 MHz – 3 GHz



5.2.3.2. Transmitter Radiated Emission 3 GHz – 18 GHz



5.2.3.3. Transmitter Radiated Emission 18 GHz – 25 GHz



5.2.3.4. Transmitter Radiated Emission : Table 30 MHz – 25 GHz

Measurements based on a measurement time of 1000 ms unless otherwise noted.
Limits are valid for measuring distance d = 3m unless otherwise noted.

Transmitter spurious emission

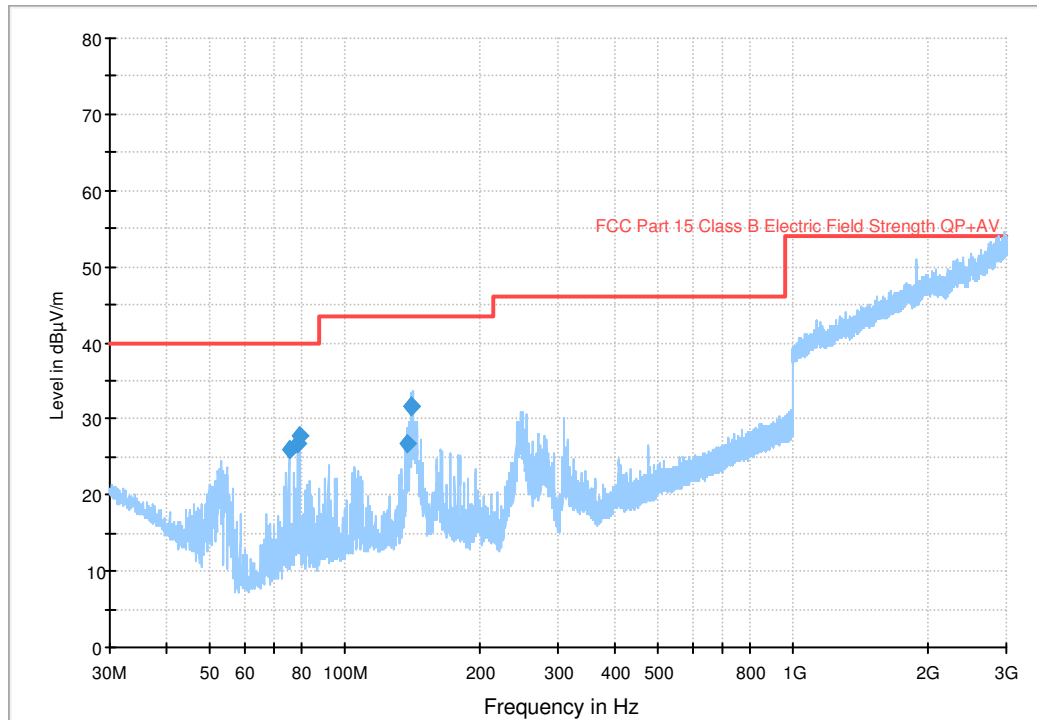
Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3468.90000	24.6	150.00	1000.000	100.0	V	3.0	-12.5	49.4	74.0
4345.40000	25.6	150.00	1000.000	180.0	H	23.0	-11.8	48.4	74.0
4828.90000	31.2	150.00	1000.000	100.0	H	3.0	-11.3	42.8	74.0
4830.90000	34.2	150.00	1000.000	140.0	H	3.0	-11.3	39.8	74.0
5213.90000	26.3	150.00	1000.000	140.0	H	39.0	-10.6	47.7	74.0
6078.40000	27.2	150.00	1000.000	134.0	H	45.0	-9.0	46.8	74.0
6954.50000	27.5	150.00	1000.000	118.0	H	-34.0	-7.5	46.5	74.0
7822.20000	30.2	150.00	1000.000	180.0	H	45.0	-6.2	43.8	74.0
8683.10000	29.9	150.00	1000.000	100.0	V	26.0	-5.9	44.1	74.0
9554.00000	31.2	150.00	1000.000	180.0	V	3.0	-4.5	42.8	74.0

5.2.3.5. Transmitter Field strength of fundamental

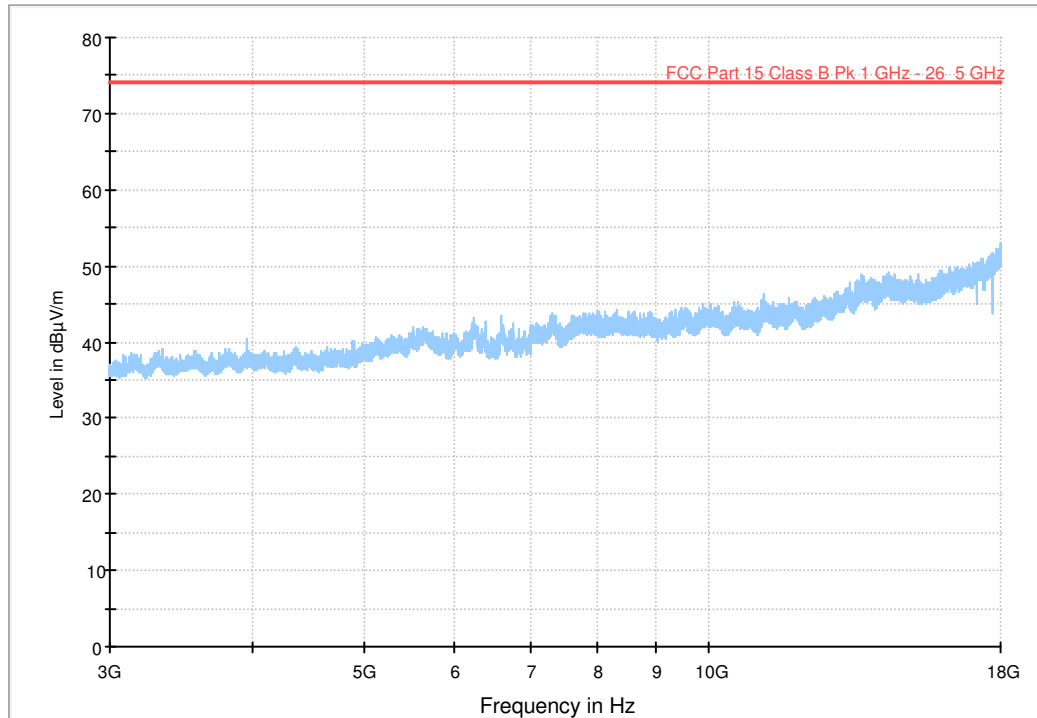
Field strength of fundamental

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
2414.80000	109.6	89.7	30.00	1000.000	195.0	V	10.0	35.1	

5.2.3.6. Receiver Radiated Emission 30 MHz – 3 GHz



5.2.3.7. Receiver Radiated Emission 3 GHz – 18 GHz

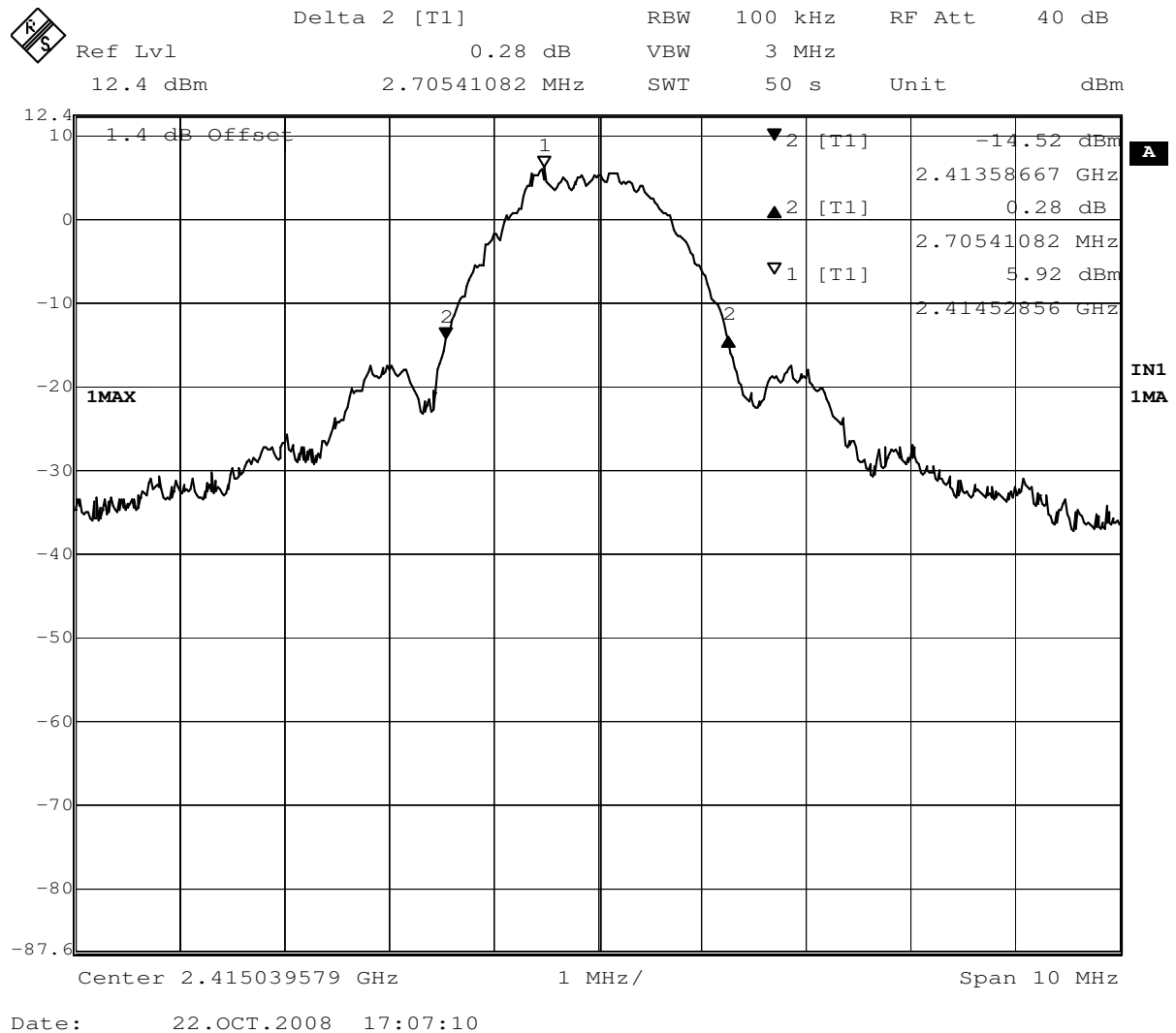


Receiver spurious emission table

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas, Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr, (dB)	Margin (dB)	Limit (dBμV/m)
75,340000	25,9	1000,00	120,000	119,0	V	30,0	8,4	14,1	40,0
78,500000	26,7	1000,00	120,000	154,0	V	-4,0	9,0	13,3	40,0
79,540000	27,7	1000,00	120,000	152,0	V	11,0	9,0	12,3	40,0
137,700000	26,8	1000,00	120,000	252,0	H	0,0	9,8	16,7	43,5
140,660000	31,6	1000,00	120,000	235,0	H	173,0	9,7	11,9	43,5
141,660000	31,6	1000,00	120,000	270,0	H	-5,0	9,6	11,9	43,5

5.2.4. 20 dB bandwidth

The 20 dB bandwidth was measured using 100 kHz resolution bandwidth and maximum hold function of spectrum analyzer. 20 dB bandwidth was defined by measuring the maximum level on the measured channel and by placing markers on 20 dB below the peak value on trace line. Due to the removable antenna, the measurement was done conducted.



20dB bandwidth measurement result table

EUT Frequency MHz	Limit MHz	Measured value MHz
2413,59	-	2,705

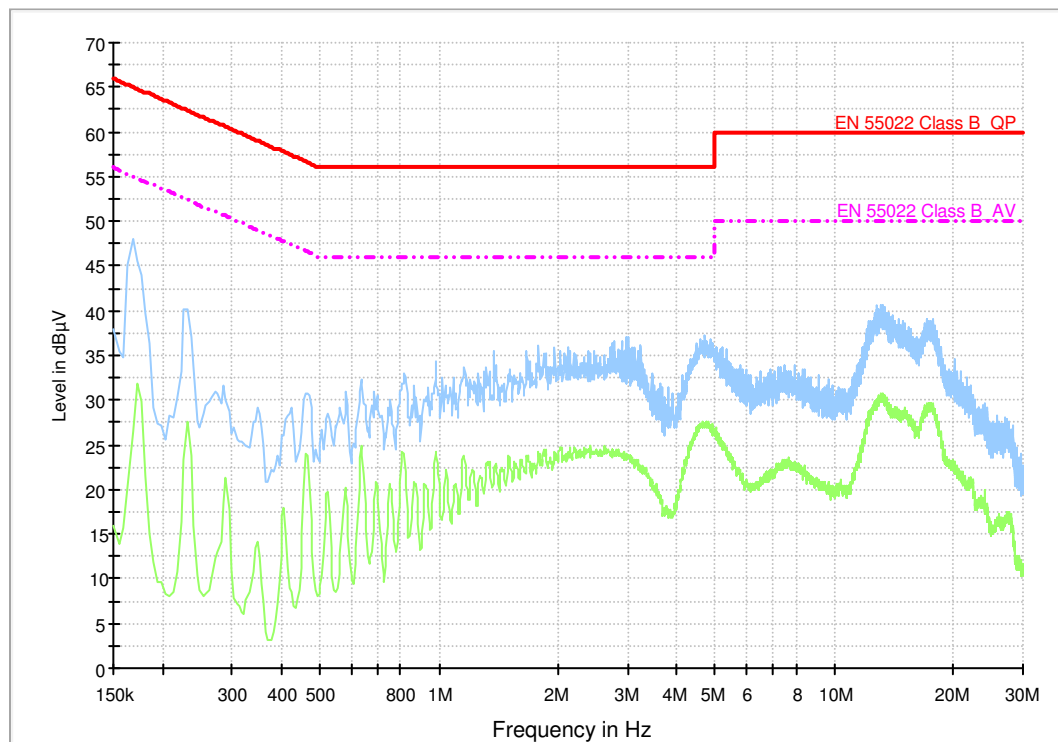
6. Attachment

6.1. Diagrams Conducted Emissions

Test Information

EUT Name:	PC-Adapter via USB connected to the notebook
Serial Number:	1124
Test Description:	CISPR 22
Operating Conditions:	120 V/ 60 Hz
Operator Name:	R. Dressler
Comment:	N-Line and P-Line merged

Voltage with 2-Line-LISN_EN55022 Class B



7. Product Labelling

FCC Part 15 Declaration of Conformity (DoC)
Approval Procedures - FCC CFR 47 §2.1071 - §2.1077

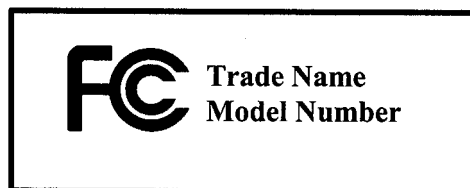
Restrictions

- Test labs must be accredited to ISO/IEC Guide 25 or ISO 17025
- Responsible party signing DoC must have US address.

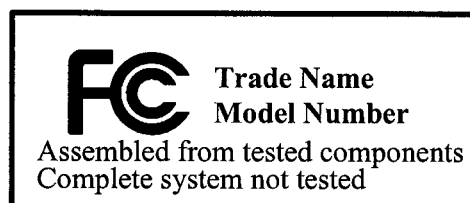
Requirements

- Test reports must be detailed and include signature of responsible party.
- Product and compliance files must be retained by Responsible Party for 2 years after product is discontinued.

FCC Labels for Declarations of Conformity



Label above: for personal computers, peripherals and modular components (CPU boards, power supplies) which have been tested and approved in accordance with the DoC procedures.



Label above: for personal computers assembled from certified components, or from components tested and approved by Declaration of Conformity, where the assembled product has not been tested.

Sample Declaration of Conformity for FCC Part 15:

Declaration of Conformity

Product name/model number:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party

Name:

Address:

Telephone:

When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (b) (1) of this section on it, such as for a CPU board or a plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instruction manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in § 2.925(d) of this chapter. „Permanently affixed“ means that the label is etched, engraved, stamped, silkscreened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or a permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

Note in the user manual:

NOTE: This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC rules. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Information to user:

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.