

Test Report
Electromagnetic Compatibility

Test Report - Nr.: 07KFE008728-USB-01

Date: 2008-06-03

Type:	USB105
REF:	590086
Description:	RF-Module for USB interfaces
Serial number:	0012420000000114

Manufacturer:	Biocomfort Diagnostics GmbH & Co. KG
Customer:	Biocomfort Diagnostics GmbH & Co. KG
Address (Customer):	Bernhaeuser Strasse 17 DE-73765 Neuhausen a.d.F. Germany

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This test report consists of 16 pages. All measurement results exclusively refer to the equipment, which was tested.
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Table of Contents

1. General description.....	3
1.1. Product description	3
1.2. Related submittal(s) Grants.....	3
1.3. Test Methodology.....	4
1.4. Test Facility	4
1.5. List of exhibits	4
2. Measurements And Test Specifications.....	5
3. Description Of EUT	6
3.1. Configuration / Operating Conditions	6
3.2. Peripheral Devices Used For Testing.....	6
3.3. Major Subassemblies Or Internal Peripherals.....	7
3.4. Supply- And Interconnecting Cables	7
4. Test Results - Overview.....	8
5. Measurement results detailed.....	9
5.1. Radiated Emission 30 MHz – 25 GHz.....	9
5.3.1. <i>Field strength calculation.....</i>	9
5.3.2. <i>Normative references</i>	10
5.3.3. <i>Emission Test results</i>	11

1. General description

1.1. Product description

The RF-Module USB105 is plugged into an USB interface of a PC or notebook and is part of the following system:

Excerpt of the manufacturers product description:

The high-performance measuring devices automatically transmits your values by radio to your PC. Every time you open the Health Manager software on your PC the values are amalgamated, put in a medically based, sensible context, and interpreted.

Blood pressure, which indicates a healthy cardiovascular system, blood sugar, the early warning system for health problems, HRV, the absolute parameter for assessing the heart's adaptability to stress and relaxation, body weight and fat as indicators of fitness and diet – these values are easily and quickly measured using Biocomfort's high-quality devices.

The technology used is 2.4 GHz IEEE 802.15.4 / Zigbee.

The operating frequency is 2.425 GHz. The USB105 and the measuring devices are working as transceivers.

Antenna type : Internal, Integral

Duty cycle : the duty cycle was 100 ms (this is the shortest periodic transmission interval).

The USB105 was connected to a notebook.

1.2. Related submittal(s) Grants

This is an application for the certification of the RF-Module USB105.

1.3. Test Methodology

- The test setup and test in the frequency range of 30 MHz to 1 GHz was done according to: **CISPR 22: 1998 + Corrigendum: 2003 + A1: 2000 + A2: 2003 and ANSI C63.4: 2003**
- The test setup and test in the frequency range of 1 GHz 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 RF-Module CFC105 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 $d = 1$ 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 USB-Module is powered by the USB interface of a notebook.

The blood pressure measuring device, the blood sugar measuring device and the scale for body weight and fat were switched on and placed on the same table to transmit in a duty cycle of 100 ms.

The equipment under test (EUT) is placed on wooden table 0,8 m above ground plane.

The measurements in the frequency range of 30 MHz – 3 GHz were performed with the bilog antenna HL 562. At all interference frequencies the height of the antenna is scanned in the range 1 m to 4 m with horizontal and vertical polarization and the turntable is rotated in the range 0° to 360° to obtain the highest field strength.

The measurements in the frequency range of 3 GHz – 18 GHz were performed with the horn aerial HF 906 with a pre-amp. At all interference frequencies the height of the antenna is scanned in the range 1 m to 4 m with horizontal and vertical polarization and the turntable is rotated in the range 0° to 360° to obtain the highest field strength.

For frequencies above 18 GHz the measurement was performed at a distance of d = 3 m with the horn aerial BBHA 9170. The measured values were below the noise level. Therefore the measurement was performed at a closer distance of d = 1 m. The measured values were still below the noise level.

3.2. Peripheral Devices Used For Testing

Device	Manufacturer	Type	SN	FCC ID
Notebook	DELL	PP01X, Latitude C800	B34Q70J	-/-
AC Adapter	DELL	AA20031	CN-09364U-16291-17A-061E	-/-
Blood pressure measuring device	Biocomfort	gluco-comfort, BGM105	0206440120	-/-
Blood sugar measuring device	Biocomfort	tenso-comfort, BPM105	0206440120	-/-
Scale	Biocomfort	scaleo-comfort, BSC105	0407210123	-/-

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 extension cable	1,0 m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	GND
DC- Cable to the notebook	1,8 m	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
AC- Cable to the external power supply	1,8 m	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

4. Test Results - Overview

Emission	required	passed	passed with modification	not passed
30 MHz - 25 GHz	FCC 15.249	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Measurement results detailed

5.1. Radiated Emission 30 MHz – 25 GHz

Data was measured for worst case configuration which resulted in highest emission levels. A sample calculation, configuration photographs and data tables of emissions are included.

The detector used was QP in the frequency range of 30 MHz – 1000 MHz. In the frequency range of 1 GHz – 25 GHz PK and AV were used.

The measurement time was 150 ms per step.

5.3.1. 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

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

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.

5.3.2. 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; 1 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.ation	Inter-val
<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

5.3.3. Emission Test results

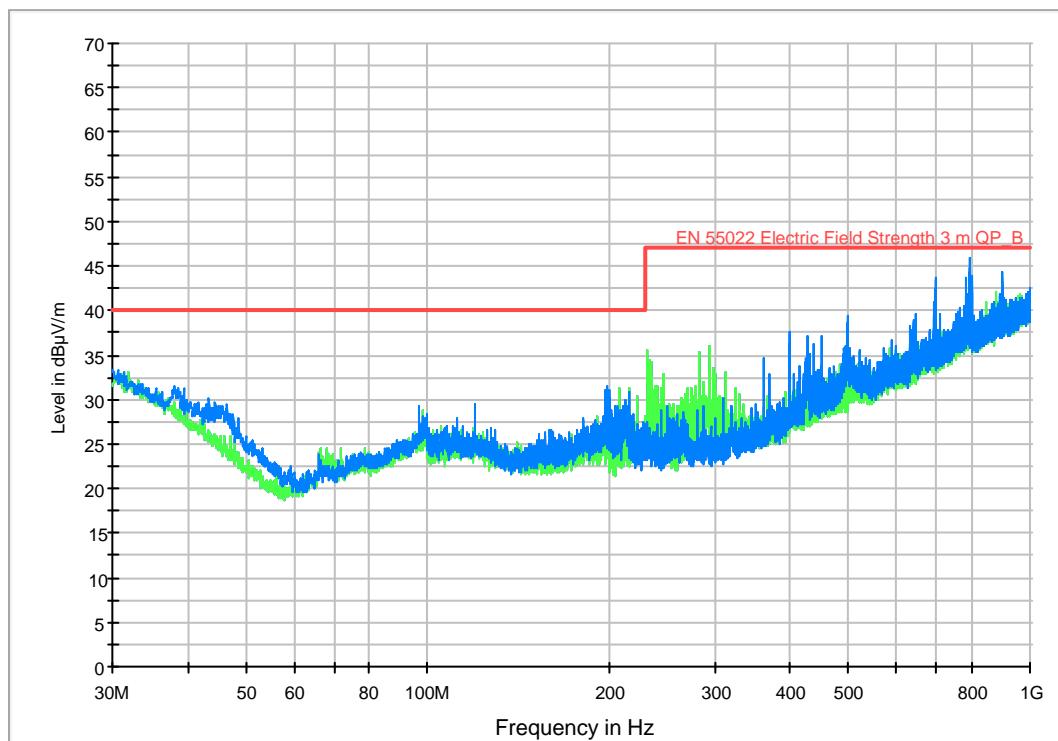
Test requirements **passed** **passed with modification** **not passed**

Comment:

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

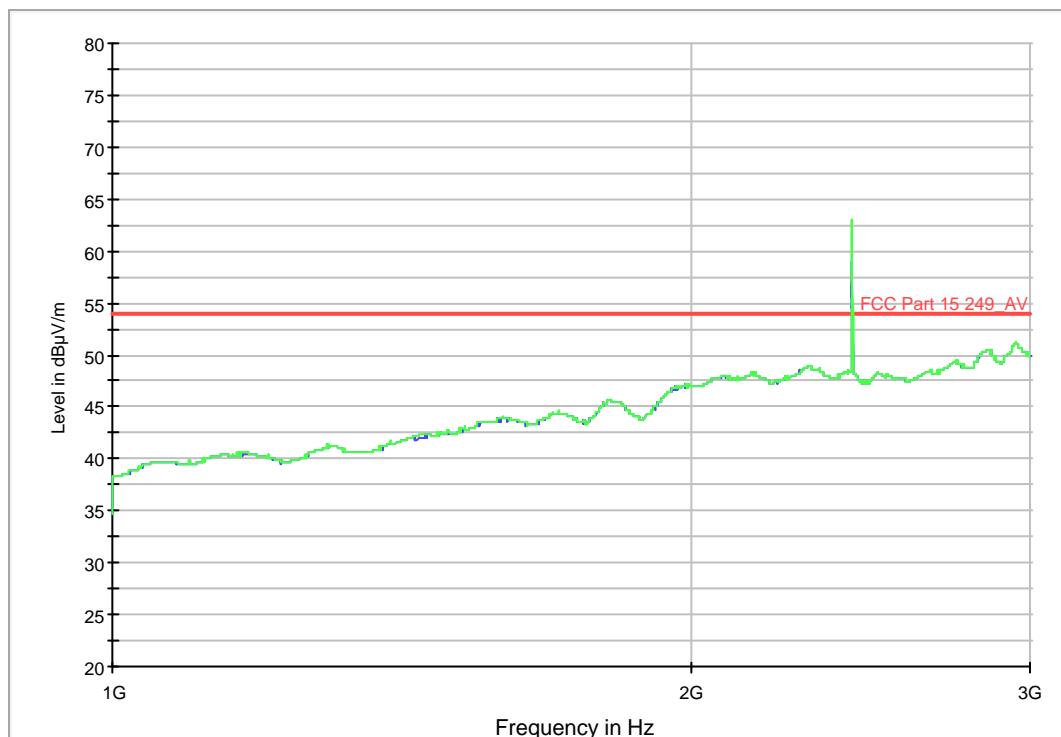
In the following diagrams the transmitter frequency at 2.425 GHz is visible.

5.3.3.1 Radiated Emission 30 MHz – 1 GHz

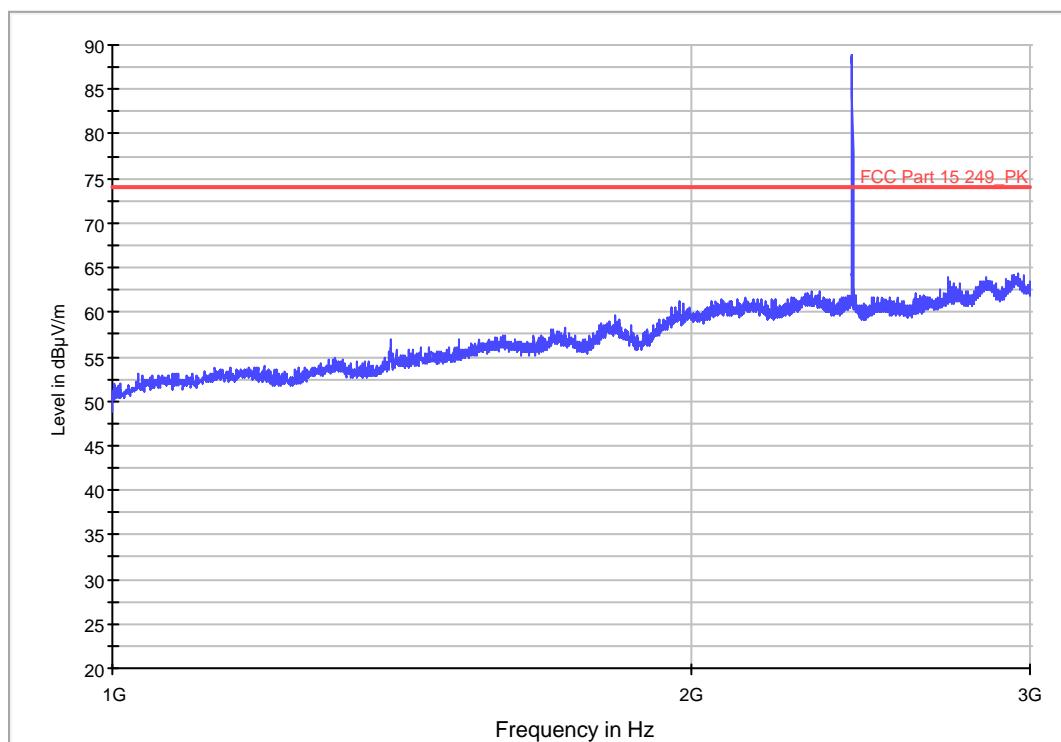


EMI-Scan_MaxPeak -1G

5.3.3.2 Radiated Emission 1 GHz – 3 GHz

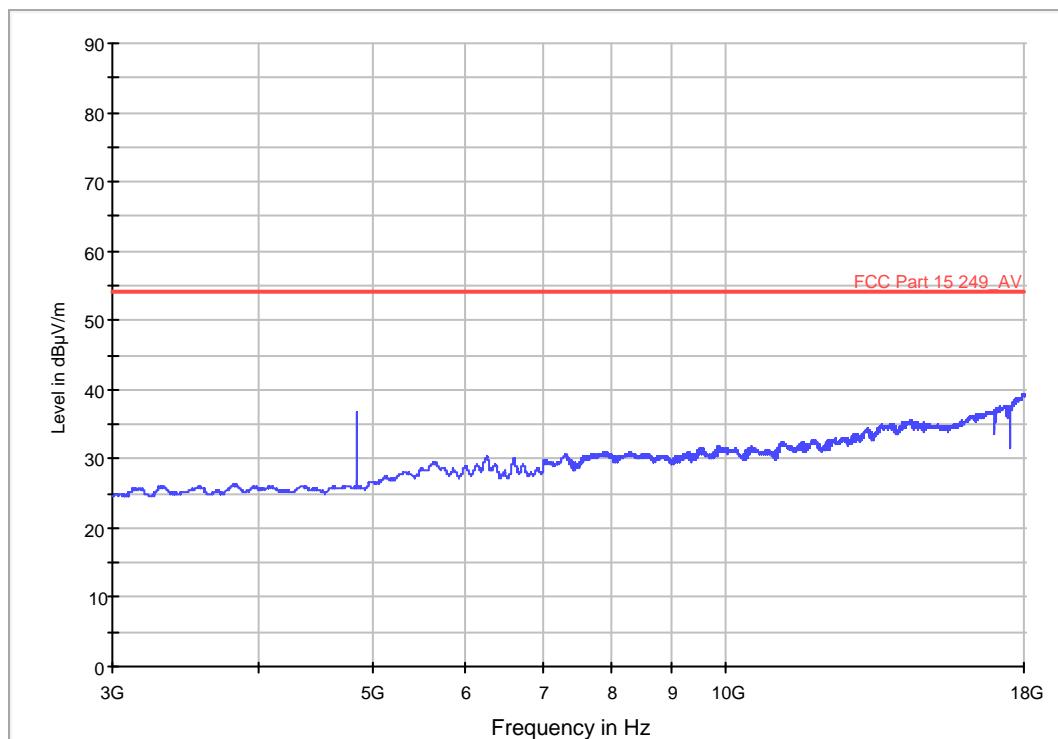


EMI-Scan_Average 1-3G

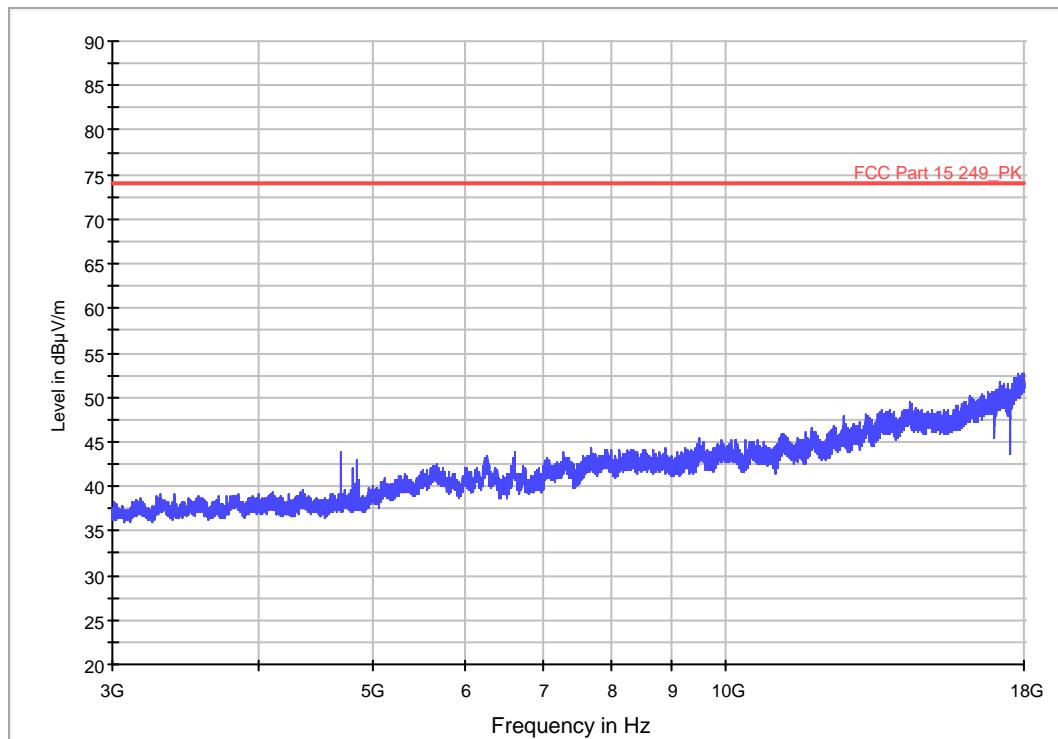


EMI-Scan_MaxPeak 1-3G

5.3.3.3 Radiated Emission 3 GHz – 18 GHz

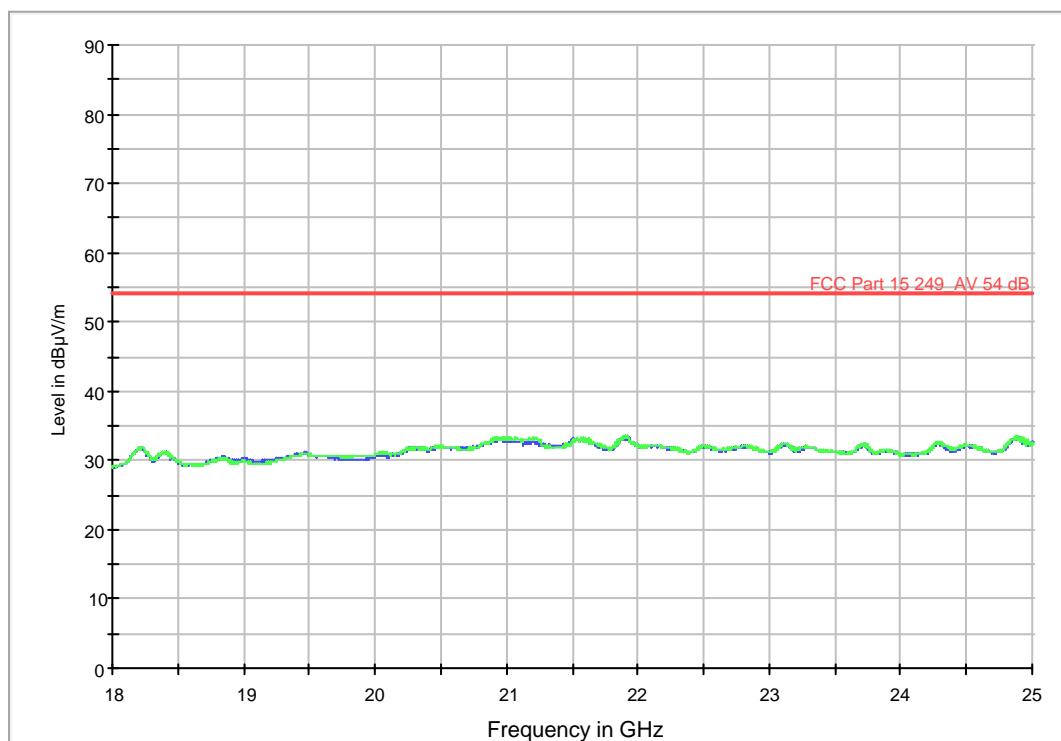


3_18G Scan_HF906_PreAmp AV

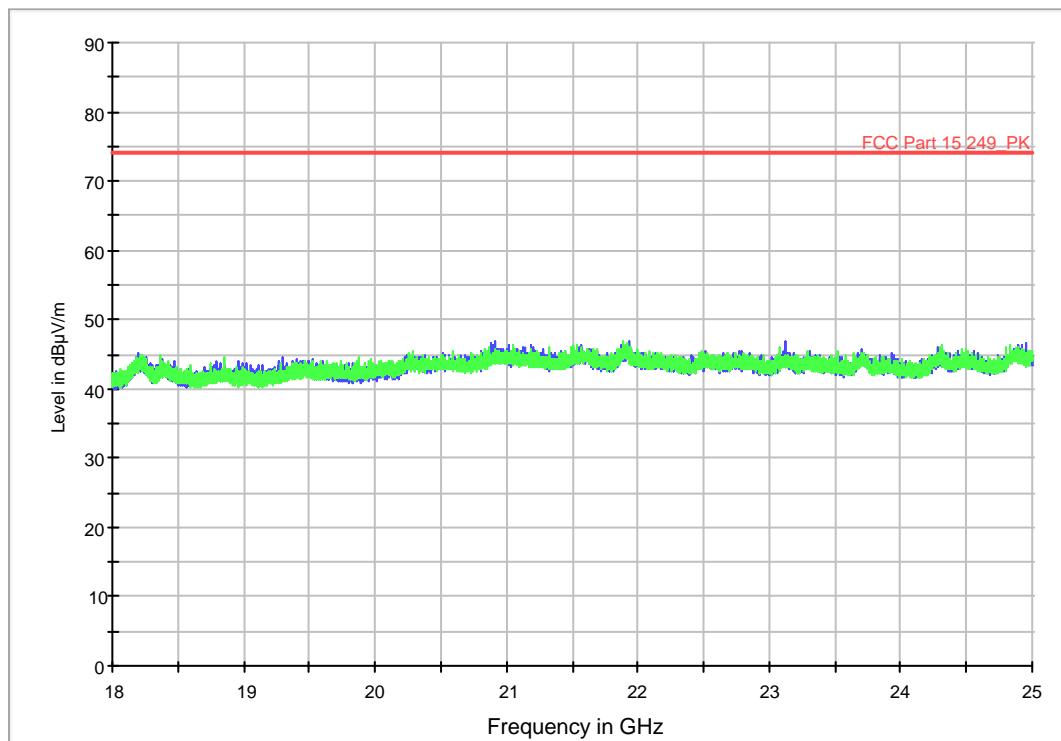


3_18G Scan_HF906_PreAmp PK

5.3.3.4 Radiated Emission 18 GHz – 25 GHz



14_26G Scan_BBHA 9170 w Amplifier_AV



14_26G Scan_BBHA 9170 w Amplifier_PK

5.3.3.5 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.

Frequency (MHz)	Average (dB μ V/m)	Peak (dB μ V/m)	Quasi Peak (dB μ V/m) d = 3 m	Antenna height (meter)	Polarisation	Turn-table (degree)	Margin (dB)	Limit (dB μ V/m)	BW (kHz)
196.60	-	-	33.0	2.50	v	0	7.0	40	120
199.40	-	-	28.9	1.00	v	0	11.1	40	120
232.24	-	-	41.2	1.30	h	90	5.8	47	120
293.96	-	-	25.6	1.00	h	110	21.4	47	120
697.52	-	-	33.2	1.00	v	0	13.8	47	120
796.16	-	-	34.3	1.00	v	0	12.7	47	120
2425.00	64.4	-	-	1.00	v	0	29.6	94	1000
2425.00	63.5	-	-	1.40	h	150	30.5	94	1000
4846.00	36.7	-	-	1.00	v	0	17.3	54	1000
4846.00	39.7	-	-	1.13	h	30	14.3	54	1000
2425.00	-	92.2	-	1.45	v	210	21.8	114	1000
2425.00	-	90.1	-	1.30	h	220	23.9	114	1000
4700.50	-	44.1	-	1.00	h	0	29.9	74	1000
4700.50	-	42.4	-	1.00	v	180	31.6	74	1000
4809.00	-	41.4	-	1.00	v	0	32.6	74	1000
4809.00	-	41.8	-	1.00	h	0	32.2	74	1000
4846.00	-	44.5	-	1.40	h	0	29.5	74	1000
4846.00	-	43.5	-	1.00	v	0	30.5	74	1000