FCC ID: UF9IPS149 Date of issue: 2007-01-02

DAT-P-225/96-02

Test Report
acc. to the relevant standard
47 CFR Part 15 C – Intentional Radiators
Measurement Procedure:
ANSI C63.4 - 1992
relating to
G. Lufft Mess- und Regeltechnik GmbH
2.4 GHz-Radar-Sensor IPS-149

Measurement of Radio- Noise Emissions
from Low- Voltage Electrical and Electronic Equipment
Technical characteristics and test methods for radio equipment
in the frequency range 9 kHz to 40 GHz

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FCC ID: UF9IPS149 Date of issue: 2007-01-02

Manufacturer's details	
Manufacturer	G. Lufft Mess- und Regeltechnik GmbH
Manufacturer's grantee code	UF9
Manufacturer's address	G. Lufft Mess- und Regeltechnik GmbH
	Gutenbergstr. 20
	D-70736 Fellbach
	Germany
	Phone: +49 (0) 711 51822 0
	Fax: +49 (0) 711 51822 41
	47 CFR Part 15C - Intentional Radiators
Relevant standard used	ANSI C63.4-1992
	G. Lufft Mess- und Regeltechnik GmbH

Test Report prepared by	
Technical engineer	Ralf Trepper
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Equipment **U**nder **T**est **(EUT)**	
Equipment category	Field disturbance sensor
Trade name	Lufft
Type designation	2.4 GHz Radar Sensor IPS-149
Serial no.	---
Variants	IRS-20 / IRS-21 (Variants in which the 2.4GHz Radar Sensor IPS-149 will be built in)

0 Test result

CFR Section	Report Chapter	Requirements Headline	Test result OK		
15.203	10.1	Antenna requirement	**pass**	~~**fail**~~	~~**n.a.**~~
15.249(a)	10.2	Field strength limits (fundamental)	**pass**	~~**fail**~~	~~**n.a.**~~
15.249(d) 15.209	10.2	Radiated spurious emissions	**pass**	~~**fail**~~	~~**n.a.**~~
15.215(c)	10.3	20 dB bandwidth	**pass**	~~**fail**~~	~~**n.a.**~~

Test requirements kept	**yes**	~~**no**~~

Signature
(Technical engineer) .....
Ralf Trepper

Signature
(Manager) .....
Manfried Dudde

FCC ID: UF9IPS149 Date of issue: 2007-01-02

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1 Test laboratory

Company name	: m.dudde hochfrequenz-technik
Street	: Rottland 5a
City	: 51429 Bergisch Gladbach
Country	: Germany
Laboratory	: FCC Registration Number: 699717 This site has been fully described in a report submitted to the FCC, and renewed with letter dated July 12, 2005, Registration Number 699717.
Phone	: +49-2207-9689-0
Fax	: +49-2207-9689-20
E-Mail	: manfred.dudde@t-online.de
Web	: http://www.dudde.com

2 Introduction

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of m. dudde hochfrequenz - technik.

This report contains the result of tests performed by m. dudde hochfrequenz - technik for the purpose of a type approval. The order for carrying out these tests has been placed by:

Manufacturer

Company name	: G. Lufft Mess- und Regeltechnik GmbH
Address	: Gutenbergstr. 20
Postcode	: 70736
City/town	: Fellbach
Country	: Germany
Telephone	: +49 (0) 711 51822 67
Fax	: +49 (0) 711 51822 41
Date of order	: 2006-06-20
References	: Mr. Axel Schmitz-Hübsch
E-mail	: Axel.Schmitz-Huebsch@lufft.de

3 Product

Samples of the following apparatus were submitted for testing:

Type of equipment	: field disturbance sensor
Trademark	: lufft
Type designation	: 2.4 GHz Radar Sensor IPS-149
Hardware version	: 2.4 GHz Radar Sensor IPS-149
Serial number	: ---
Software release	: ---
Power used	: 5.0 V DC
Frequency range	: 2.4000 GHz ... 2.4835 GHz
Frequency used	: 2.435 GHz to 2.475 GHz
Generated or used frequencies	: 2.435 GHz to 2.475 GHz
FCC ID	**: UF9IPS149**

4 Test schedule

The tests were carried out in accordance with the specifications detailed in chapter 7 “Summary“ of this report at:

- m. dudde hochfrequenz - technik, D-51429 Bergisch Gladbach

The test sample was received on:

- 2006-06-20

The tests were carried out in the following period of time:

- 2006-12-13 - 2006-12-14

5 Product and measurement documentation

For issuing this report the following product documentation was used and the following annexes were created:

Description	Date	Identifications
External photographs of the **E**quipment **U**nder **T**est (EUT)	2006-10-20	Annex no. 1
Internal photographs of the **E**quipment **U**nder **T**est (EUT)	2006-10-20	Annex no. 2
Occupied bandwidth plot	2006-10-20	Annex no. 3
FCC ID label sample	2006-10-20	Annex no. 4
User Manual	2006-10-20	Annex no. 5
Test setup photos	2006-10-20	Annex no. 6
Block diagram	2006-10-20	Annex no. 7
Schematics	2006-10-20	Annex no. 8
Technical description	2006-10-20	Annex no. 9

The above mentioned documentation will be filed at m. dudde hochfrequenz - technik for a period of 10 years following the issue of this report.

6 Observations and comments

7 Summary

The product is intended for the use in the following areas of application:

Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the frequency range of 9 kHz to 40 GHz

The samples were tested according to the following specification:

47 CFR Part 15 – Intentional Radiators, ANSI C63.4 - 1992

8 Conclusions

Samples of the apparatus were found to **CONFORM WITH** the specifications stated in chapter 7 "Summary" of this report.

In the opinion of m. dudde hochfrequenz - technik, the samples satisfied all applicable requirements relating to the network interface types specified in chapter 7 "Summary".

The results of the type tests as stated in this report are exclusively applicable to the product item as identified in this report. m. dudde hochfrequenz - technik does not accept any responsibility for the results stated in this report, with respect to the properties of product items not involved in these tests.

This report consists of a main module, modules with test results and annexes listed in chapter 5:
“Product documentation”. All pages have been numbered consecutively and bear the m. dudde hochfrequenz - technik logo, the report number and sub numbers.
The total number of pages in this report is **23.**

Tester:

Date : 2007-01-02

Name : Ralf Trepper

Signature : 

Technical responsibility for area of testing:

Date : 2007-01-02

Name : Manfried Dudde

Signature : 

9 Operation description

9.1 EUT details

see User Manual in Annex No. 5

9.2 EUT configuration

Operation:	:	As soon as the equipment is powered up, TX start operating
Purpose of operation	:	see User Manual in Annex No. 5

9.3 EUT measurement description

As soon as the EUT connected to the power supply it starts, after a short delay, to operate in continuous mode. The maximum radiation will be achieved, if the EUT is adjusted as described by the manufacturer in the manual. The inclination of the test sample will be brought into a prescribed angle to the aerial antenna.

10.1 Antenna requirement

10.1.1 Regulation

15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

10.1.2 Result

The equipment meets the requirements	**yes**	~~**no**~~	~~**n.a.**~~

Further test results are attached	~~**yes**~~	**no**	page no:

n.a [x] See page no. 22

10.2 Radiated emissions

10.2.1 Regulation

Test requirement: FCC CFR47, Part 15C Section 15.249, Test procedure: ANSI C63.4:1992

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)	Field strength of spurious emissions (µV/m)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24.0-24.25 GHz	250	2500

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

Section 15.33 Frequency range of radiated measurements: (a) Unless otherwise noted in the specific rule section under which the equipment operates for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph: (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

FCC ID: UF9IPS149 Date of issue: 2007-01-02

Test requirement: FCC CFR47, Part 15C Section 15.209, Test procedure: ANSI C63.4:1992

Section 15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (µV/m)	Measurement distance (µV/m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.
(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

10.2.2 Test equipment

Type	Manufacturer/ Model no.	Serial no.	Last calibration	Next calibration
Receiver (9 kHz –26.5 GHz)	Hewlett Packard Spectrum Analyzer 8593E (171)	3528U00990	2006/05	2008/05
Pre-amplifier (100kHz - 1.3GHz)	Hewlett Packard 8447 E (166a)	1726A00705	2006/03	2008/03
Loop antenna (0.009 - 30 MHz)	Schwarzbeck			
Bilog antenna (30 - 1000 MHz)	CHASE CBL611A (167)	1517	2003/09	2009/09
Horn antenna (0,86-8,5 GHz)	Schwarzbeck BBHA 9120 A (284)	236	1998/01	2008/01

10.2.2 Test procedures

The EUT and this peripheral (when additional equipment exists) are placed on a turn table which is 0.8m above the ground. The turn table would be allowed to rotate 360 degrees to determine the position of the maximum emission level. The test distance between the EUT and the receiving antenna are 3 m. To find the maximum emission, the polarization of the receiving antenna are changed in horizontal and vertical polarization, the position of the EUT was changed in different orthogonal determinations.
ANSI C63.4: 1992 Section 8 “Radiated Emissions Testing”

Radiated emissions test characteristics	
Frequency range	0.009 MHz - 10,000 MHz
Test distance	3 m*(for frequencies above 30 MHz)
Test instrumentation resolution bandwidth	9 kHz (0.009 – 30MHz)
	120 kHz (30 MHz - 1,000 MHz)
	1 MHz (1000 MHz - 10,000 MHz)
Receive antenna scan height	1 m (0.009 MHz - 30 MHz)
	1 m - 4 m (30 MHz - 10,000 MHz)
Receive antenna polarization / orientation	0 – 360°
	Vertical / horizontal (30 MHz - 1,000 MHz)

* According to Section 15.31 (f)(1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

10.2.3 Calculation of field strength Section 15.209 below 30 MHz

The receiver reading gives not directly the field strength result in (dBµV/m). The antenna factors of the loop antenna and cable losses must be added to find the correct result.

For frequencies below 30 MHz and for a test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f) (2) the field strength is calculated by adding additionally an extrapolation factor of 40 dB/decade (inverse linear distance for field strength measurements).

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor

Corrected Level = Receiver Level + Correction Factor – Pre-amplifier (with the use of a pre-amplifier)

Receiver Level : Receiver reading without correction factors
Correction Factor : Loop antenna factor + cable loss

FS = 40.7 - 40 = 0.7 [dBµV/m]

Level in µV/m Common Antilogarithm (0.7/20) = 1.1

10.2.3 Calculation of field strength Section 15.209 above 30 MHz

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of a pre-amplifier)

Corrected Level = Receiver Level + Correction Factor – Pre-amplifier (with the use of a pre-amplifier)

Receiver Level : Receiver reading without correction factors
Correction Factor : Antenna factor + cable loss

For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f) (1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements).

10.2.4 Calculation of average correction factor

The average correction factor is computed by analyzing the "worst case" on time in any 100msec time period and using the formula: Corrections Factor + 20*log (worst case on time/100msec) Analysis of the remote transmitter worst case on time in any 100msec time period is an on time of 50msec, therefore the correction factor is 20*log (50/100) = - 6 dB. The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules.

10.2.5 Calculation of the field strength Section 15.249

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of a pre-amplifier)

Corrected Level = Receiver Level + Correction Factor – Pre-amplifier (with the use of a pre-amplifier)

Receiver Level : Receiver reading without correction factors
Correction Factor : Antenna factor + cable loss

For example:

The receiver reading is 32.7 dBµV. The antenna factor for the measured frequency is +2.5 dB (1/m) and the cable factor for the measured frequency is 0.71 dB, giving a field strength of 35.91dBµV/m.
The 35.91dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/m = Common Antilogarithm (35.91/20) = 39.8

For a test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f) (1), the field strength is calculated by adding additionally an extrapolation factor of 20dB/decade (inverse linear distance for field strength measurements).

10.2.6 Result

TRANSMITTER SPURIOUS RADIATION (Section 15.249 (a), (d))											
f (GHz)	Bandwidth (kHz) Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	AV Correction factor **dB**	Level corrected **dBµV/m**	Limit **dBµV/m**	Margin **dB**	Polaris. EUT / antenna	Antenna height **cm**
2.4350	1000, PK	**74.4**	3	11.1*[6]	0	0	**85.5**	94	**8.5**	V,0° / V	165
4.8700	1000, PK	**34.0**	3	9.9*[6]	0	0	**43.9**	54	**10.1**	V,0° / V	141
7.3050	1000, AV	< 14	3	15.9*[6]	0	0	29.9	54	24.1	H,V/H,V	100-400
9.7400	1000, AV	< 14	3	17.6*[6]	0	0	31.6	54	22.4	H,V/H,V	100-400
12.1750	1000, AV	< 14	3	21.2*[6]	0	0	35.2	54	18.8	H,V/H,V	100-400
14.6100	1000, AV	< 14	3	22.6*[6]	0	0	36.6	54	17.4	H,V/H,V	100-400
17.0450	1000, AV	< 18	1	23.2*[6]	-19.1	0	22.1	54	31.9	H,V/H,V	100-400
19.4800	1000, AV	< 18	1	43.5	-19.1	0	42.4	54	11.6	H,V/H,V	100-400
21.9150	1000, AV	< 18	1	43.4	-19.1	0	42.3	54	11.7	H,V/H,V	100-400
24.3500	1000, AV	< 18	1	44.9	-19.1	0	43.8	54	10.2	H,V/H,V	100-400
26.7850	1000, AV	< 18	1	45.7	-19.1	0	44.6	54	9.4	H,V/H,V	100-400
Measurement uncertainty		4 dB									

Bandwidth = the measuring receiver bandwidth

Remark: *[1] noise floor noise level of the measuring instrument ≤ 3.5dBµV @ 3m distance (30 – 1,000 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 4.5dBµV @ 3m distance (1,000 – 2,000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 10dBµV @ 3m distance (2,000 – 5,500 MHz)
Remark: *[4] noise floor noise level of the measuring instrument ≤ 14dBµV @ 3m distance (5,500 – 14,500 MHz)
Remark: *[5] for using a pre-amplifier in the range between 100 kHz and 1,000 MHz
Remark: *[6] for using a pre-amplifier in the range between 1.0 GHz and 18.0 GHz

The equipment meets the requirements	**yes**	~~**no**~~	~~**n.a.**~~

Further test results are attached	~~yes~~	**no**	page no:

n.a [x] See page no. 22

TRANSMITTER SPURIOUS RADIATION (Section 15.249 (a), (d))											
f (GHz)	Bandwidth (kHz) Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	AV Correction factor **dB**	Level corrected **dBµV/m**	Limit **dBµV/m**	Margin **dB**	Polaris. EUT / antenna	Antenna height **cm**
2.4650	1000, PK	**73.4**	3	11.1*[6]	0	0	**84.5**	94	**9.5**	V,0° / V	170
4.9300	1000, PK	**36.6**	3	9.9*[6]	0	0	**46.5**	54	**7.5**	V,0° / V	145
7.3950	1000, AV	< 14	3	15.9*[6]	0	0	29.9	54	24.1	H,V/H,V	100-400
9.8600	1000, AV	< 14	3	17.6*[6]	0	0	31.6	54	22.4	H,V/H,V	100-400
12.3250	1000, AV	< 14	3	21.2*[6]	0	0	35.2	54	18.8	H,V/H,V	100-400
14.7900	1000, AV	< 14	3	22.6*[6]	0	0	36.6	54	17.4	H,V/H,V	100-400
17.2550	1000, AV	< 18	1	23.2*[6]	-19.1	0	22.1	54	31.9	H,V/H,V	100-400
19.7200	1000, AV	< 18	1	43.5	-19.1	0	42.4	54	11.6	H,V/H,V	100-400
22.1850	1000, AV	< 18	1	43.4	-19.1	0	42.3	54	11.7	H,V/H,V	100-400
24.6500	1000, AV	< 18	1	44.9	-19.1	0	43.8	54	10.2	H,V/H,V	100-400
27.1150	1000, AV	< 18	1	45.7	-19.1	0	44.6	54	9.4	H,V/H,V	100-400
Measurement uncertainty		4 dB									

Bandwidth = the measuring receiver bandwidth

Remark: *[1] noise floor noise level of the measuring instrument ≤ 3.5dBµV @ 3m distance (30 – 1,000 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 4.5dBµV @ 3m distance (1,000 – 2,000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 10dBµV @ 3m distance (2,000 – 5,500 MHz)
Remark: *[4] noise floor noise level of the measuring instrument ≤ 14dBµV @ 3m distance (5,500 – 14,500 MHz)
Remark: *[5] for using a pre-amplifier in the range between 100 kHz and 1,000 MHz
Remark: *[6] for using a pre-amplifier in the range between 1.0 GHz and 18.0 GHz

The equipment meets the requirements	**yes**	~~**no**~~	~~**n.a.**~~

Further test results are attached	~~yes~~	**no**	page no:

n.a [x] See page no. 22

TRANSMITTER SPURIOUS RADIATION BELOW 30 MHz (Section 15.205, 15.209)									
f (MHz)	Bandwidth (kHz) Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	Level corrected **dBµV/m**	Limit **dBµV/m**	Margin **dBµV/m**	Polarisation EUT / antenna orientation
0.1200	*PK/0.2kHz*	*< 4.0*	*10*	20.2	*-59.1*	-34.90	*Pk46.0- @ 300*	80.90	V, H/0-360°
	AV/0.2kHz	*< 4.0*	*10*	20.2	*-59.1*	-34.90	*AV26.0 @ 300*	80.90	V, H/0-360°
0.5000	*AV/0.2kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV33.6 @ 30*	28.5	V, H/0-360°
1.5000	*AV/0.2kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV24.1 @ 30*	19.00	V, H/0-360°
3.0000	*AV/9.0kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV29.5 @ 30*	24.4	V, H/0-360°
5.0000	*AV/9.0kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV29.5 @ 30*	24.4	V, H/0-360°
8.0000	*AV/9.0kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV29.5 @ 30*	24.4	V, H/0-360°
10.0000	*AV/9.0kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV29.5 @ 30*	24.4	V, H/0-360°
20.0000	*AV/9.0kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV29.5 @ 30*	24.4	V, H/0-360°
30.0000	*AV/9.0kHz*	*< 4.0*	*10*	20.2	*-19.1*	5.10	*AV29.5 @ 30*	24.4	V, H/0-360°
No emissions detected									
Measurement uncertainty	4 dB								

Remark: *[1] Noise level of the measuring instrument ≤ 4.0dBµV @ 10m distance (0.009 MHz –30 MHz)
Remark: * Peak Limit according to Section 15.35 (b).

The equipment meets the requirements	**yes**	~~**no**~~	~~**n.a.**~~

Further test results are attached	~~yes~~	**no**	page no:

n.a [x] See page no. 22

TRANSMITTER SPURIOUS RADIATION ABOVE 30 MHz (Section 15.205, 15.209)											
f (MHz)	Bandwidth (kHz) Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	AV Correction factor **dB**	Level corrected **dBµV/m**	Limit **dBµV/m**	Margin **dBµV/m**	Polaris. EUT / antenna	Antenna height **cm**
30.0000	100, AV	≤ 3.5	3	-2.60*[5]	0	0	0.90	40.00	39.10	H,V/H,V	100-400
88.0000	100, AV	≤ 3.5	3	-10.80*[5]	0	0	-7.30	40.00	47.30	H,V/H,V	100-400
216.0000	100, AV	≤ 3.5	3	-10.30*[5]	0	0	-6.80	43.50	50.30	H,V/H,V	100-400
960.0000	100, AV	≤ 3.5	3	8.50*[5]	0	0	12.00	43.50	31.50	H,V/H,V	100-400
1700.0000	1000, AV	≤ 4.5	3	3.80*[6]	0	0	8.30	54.00	45.70	H,V/H,V	100-400
2250.0000	1000, AV	≤ 10	3	8.00*[6]	0	0	18.00	54.00	36.00	H,V/H,V	100-400
4000.0000	1000, AV	≤ 10	3	8.40*[6]	0	0	18.40	54.00	35.60	H,V/H,V	100-400
5000.0000	1000, AV	≤ 10	3	9.10*[6]	0	0	19.40	54.00	34.60	H,V/H,V	100-400
7500.0000	1000, AV	≤ 14	3	12.9*[6]0	0	0	26.90	54.00	27.10	H,V/H,V	100-400
8300.0000	1000, AV	≤ 14	3	14.80*[6]	0	0	28.80	54.00	25.20	H,V/H,V	100-400
9400.0000	1000, AV	≤ 14	3	16.00*[6]	0	0	30.00	54.00	24.00	H,V/H,V	100-400
11000.0000	1000, AV	≤ 14	3	18.25*[6]	0	0	32.25	54.00	21.75	H,V/H,V	100-400
Measurement uncertainty		4 dB									

Bandwidth = the measuring receiver bandwidth

Remark: *[1] noise floor noise level of the measuring instrument ≤ 3.5dBµV @ 3m distance (30 – 1,000 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 4.5dBµV @ 3m distance (1,000 – 2,000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 10dBµV @ 3m distance (2,000 – 5,500 MHz)
Remark: *[4] noise floor noise level of the measuring instrument ≤ 14dBµV @ 3m distance (5,500 – 14,500 MHz)
Remark: *[5] for using a pre-amplifier in the range between 100 kHz and 1,000 MHz
Remark: *[6] for using a pre-amplifier in the range between 1.0 GHz and 18.0 GHz

The equipment meets the requirements	**yes**	~~**no**~~	~~**n.a.**~~

Further test results are attached	~~yes~~	**no**	page no:

n.a [x] See page no. 22

10.3 Bandwidth

10.3.1 Regulation

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

10.3.2 Calculation of the 20 dB bandwidth limit

The 20 dB bandwidth limit = 0.05 * 2.4 GHz = 120 MHz

10.3.3 Test equipment

Type	Manufacturer/ Model no.	Serial no.	Last calibration	Next calibration
Receiver (30MHz - 1GHz)	Hewlett Packard Spectrum Analyzer 8593 E (171)	3528U00990	2006/05	2008/05
Test fixture for relative measurement	Dudde	---	---	---
Power supply	Hewlett Packard (DC Power Supply) 6034L (226)		2006/05	2008/05

10.3.4 Test procedure

ANSI C63.4-1992 Section 13.1.7 Occupied Bandwidth Measurements. The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce worst-case (i.e., the widest) bandwidth. In order to measure the modulated signal properly, a resolution bandwidth that is small compared to the bandwidth required by the procuring or regulatory agency shall be used on the measuring instrument. However, the 6 dB resolution bandwidth of the measuring instrument shall be set to a value greater than 5% of the bandwidth requirements.

10.3.5 Test result

The measured 20 dB bandwidth is: .....**180.0 KHz**

The equipment meets the requirements	**yes**	~~**no**~~	~~**n.a.**~~

Further test results are attached	**yes**	~~**no**~~	Annex no: 3

11 Additional information to this test report

Remarks

n.a.[1] Not applicable, because the antenna is part of the PCB

n.a.[2] Not applicable, because the EUT is directly battery powered

End of test report