FCC ID: IYZFBSB802 Date of issue: 2007-05-21

Deutscher Akkreditierungs Rat DAR

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
Marquardt GmbH
FBSB802 ID-Geber Keyless Go

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

m. dudde hochfrequenz-technik
Rottland 5a
D-51429 Bergisch Gladbach
Tel.: +49 2207-9689-0
Fax: +49 2207 9689-20
e-mail: manfred.dudde@t-online.de
http://www.dudde.com

Manufacturer's details	
Manufacturer	Marquardt GmbH
Manufacturer's grantee code	**IYZ**
Manufacturer's address	Schloßstrasse 16
	D-78604 Rietheim Weilheim
	Germany
	Phone : +49 7424 99 1960
	Fax : +49 7424 99 2419
	E- Mail: andreas.gaebler@marquardt.de
Relevant standard used	47 CFR Part 15C - Intentional Radiators
	ANSI C63.4-1992

Test report prepared by	
Technical engineer	Ralf Trepper
	m.dudde hochfrequenz-technik (laboratory)
	Rottland 5a
	51429 Bergisch Gladbach
	Germany
	Phone: +49 2207 96890
	Fax: +49 2207 968920
	E-mail: m.duddelabor@dudde.com

Equipment **U**nder **T**est **(EUT)**	
Equipment category	Transmitter
Trade name	Marquardt
Type designation	FBSB802 ID-Geber Basis
Serial no.	Batch number: 6203
Variants	none

0 Test result

CFR Section	Report Chapter	Requirements Headline	Test result OK		
15.203	10.1	Antenna requirement	**pass**	~~**fail**~~	~~**n.a.**~~
15.231(b)	10.2	Field strength limits (fundamental)	**pass**	~~**fail**~~	~~**n.a.**~~
15.205(b) 15.209	10.2	Radiated spurious emissions	**pass**	~~**fail**~~	~~**n.a.**~~
15.231(a)	10.3	Periodic operation characteristics	**pass**	~~**fail**~~	~~**n.a.**~~
15.231 (c)	10.4	20 dB bandwidth	**pass**	~~**fail**~~	~~**n.a.**~~
15.201 (a) 15.209	10.5	Equipment authorization requirement	**pass**	~~**fail**~~	~~**n.a.**~~

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

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

Signature
(Manager) .....
Manfried Dudde

List of contents Page

0 Test result 3
1 Test laboratory 6
2 Introduction 6
3 Product 7
4 Test schedule 7
5 Product and measurement documentation 8
6 Observations and comments 8
7 Summary 8
8 Conclusions 9
9 Operation description 10
10.1 Antenna requirement 11
10.1.1 Regulation 11
10.1.2 Result 11
10.2 Radiated emissions 12
10.2.1 Regulation 12
10.2.2 Test equipment 13
10.2.2.1 Test procedures 13
10.2.3 Calculation of field strength limits 14
10.2.4 Calculation of average correction factor 14
10.2.5 Calculation of the field strengths 14
10.2.6 Results 15
10.3 Periodic operation characteristics 18
10.3.1 Periodic operation 18
10.3.1.1 Regulation 18
10.3.1.2 Result 18
10.3.2 Manually operated transmitter deactivation 18
10.3.2.1 Regulation 18
10.3.2.2 Result 18
10.3.3 Automatically operated transmitter deactivation 18
10.3.3.1 Regulation 18
10.3.3.2 Result 18
10.3.4 Prohibition of periodic transmission 19
10.3.4.1 Regulation 19
10.3.4.2 Result 19
10.3.5 Continuous transmission during an alarm condition 19
10.3.5.1 Regulation 19
10.3.5.2 Result 19
10.4 Bandwidth 20
10.4.1 Regulation 20
10.4.2 Calculation of the 20 dB bandwidth limit 20
10.4.3 Test equipment 20
10.4.4 Test procedure 20
10.4.5 Test result 21
10.5 Radiated emission 22
10.5.1 Regulation 22
10.5.2 Test equipment 23
10.5.3 Test procedures 24
10.5.4 Calculation of field strength Section 15.209 below 30 MHz 25
10.5.5 Calculation of field strength Section 15.209 above 30 MHz 25
10.5.6 Calculation of the field strength 26

10.5.7 Calculation of Average Correction Factor..... 26
11 Additional information to this test report..... 29

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	: Marquardt GmbH
Address	: Schloßstrasse 16
Postcode	: D-78604
City/town	: Rietheim-Weilheim
Country	: Germany
Telephone	: +49 7424 99 1960
Telefax	: +49 7442 99 2419
E-Mail	: andreas.gaebler@marquardt.de
Date of order	: 2007-03-22
References	: Mr. Andreas Gäbler

3 Product

Samples of the following apparatus were submitted for testing:

Type of equipment	: Transmitter
Trademark	: Marquardt
Type designation	: **FBSB802 ID-Geber Keyless Go**
Hardware version	: **FBSB802 ID-Geber Keyless Go**
Serial number	: Batch number:6203
Software release	: 0047
Power used	: 3.00 VDC
Frequency used	: 315.00 MHz
Generated or used frequencies	: 32.768 kHz / 13.5672 MHz / 315.00 MHz
ITU emission class	: 97K0 F1D
FCC ID	**: IYZFBSB802**

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:

- 2007-03-22

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

- 2007-05-02 - 2007-05-04

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	2007-05-18	Annex No. 1
Internal photographs of the **E**quipment **U**nder **T**est	2007-05-18	Annex No. 2
Occupied bandwidth plot	2007-05-04	Annex No. 3
FCC ID label sample	2007-02-28	Annex No. 4
User Manual	2006-12-15	Annex No. 5
Test setup photos	2007-05-04	Annex No. 6
Block diagram	2007-03-28	Annex No. 7
Schematics	2006-12-18	Annex No. 8
Technical description	2007-03-28	Annex No. 9
Periodic operation characteristic	2007-05-04	Annex No. 10

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 **30.**

Tester:

Date : 2007-05-21

Name : Ralf Trepper

Signature :

Technical responsibility for area of testing:

Date : 2007-05-21

Name : Manfried Dudde

Signature :

9 Operation description

9.1 EUT details

See Annex no. 5 (User Manual)

9.2 EUT configuration

The ***Transmitter FBSB802 ID-Geber Keyless Go*** operated in the continuous transmitting mode after pressing a bottom.
To press the close or open bottom: the transmitter operated in CW mode
To press the tailgate bottom: the transmitter operated in modulation mode

9.3 EUT measurement description

The ***Transmitter FBSB802 ID-Geber Keyless Go*** was tested in a typical fashion. During preliminary emission tests the ***Transmitter FBSB802 ID-Geber Keyless Go*** was operated in the continuous transmitting mode for worst case emission mode investigation. Therefore, the final qualification testing was completed with ***Transmitter FBSB802 ID-Geber Keyless Go*** operated in continuous modes.
All tests were performed with the applicant's typical voltage: 3.0 V DC
In order to establish the maximum radiation, firstly, there have been viewed all orthogonal adjustments of the test samples, secondly the test ample have been rotated at all adjustments around the own axis between 0° and 360°, and thirdly, the antenna polarization between horizontal and vertical had been varied.

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. 29

10.2 Radiated emissions

10.2.1 Regulation

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

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)	Field strength of spurious emissions (µV/m)
40.66 - 40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750	125 to 375
174-260	3,750	375
260-470	3,750 to 12,500	375 to 1,250
Above 470	12,500	1,250

** Linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, µV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, µV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

(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 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.

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
Bilog antenna	CHASE	1517	2003/09	2009/09
(30- 1000 MHz)	CBL611A (167)			
Horn antenna (0,86-8,5 GHz)	Schwarzbeck BBHA 9120 A (284)	236	1998/01	2008/01

10.2.2.1 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 3m. 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	30 MHz - 4,000 MHz
Test distance	3 m*
Test instrumentation resolution bandwidth	120 kHz (30 MHz - 1,000 MHz)
	1 MHz (1000 MHz - 4,000 MHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/horizontal

*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 limits

For example: Transmitter working on 315 MHz
Limit for average measurements → 41.6667*(315 MHz) – 7083.3333 = 6041.677µV/m = 75.6dBµV/m @3m
Limit for peak measurements → Limit for average measurements + 20dB = 95.6dBµV/m @3m

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 strengths

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 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).

10.2.6 Results

TRANSMITTER SPURIOUS RADIATION (Section 15.231(b))										
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	Antenna height **cm**
315.030	120, *QPK*	**82.7**	3	**-7.5***[5]	0	**75.2**	75.6	**0.4**	V / V	150
630.060	120, *QPK*	**47.5**	3	**-1.9***[5]	0	**45.6**	55.6	**10.0**	V / V	160
945.090	120, *QPK*	**39.1**	3	**+1.2***[5]	0	**40.3**	55.6	**15.3**	V / V	130
1260.120	*1000, AV*	**37.7**	3	**+1.3***[6]	0	**39.0**	55.6	**16.6**	V / V	120
1575.150	*1000, AV*	**36.5**	3	**+2.8***[6]	0	**39.3**	55.6	**16.3**	V / V	180
1890.180	*1000, AV*	**44.3**	3	**+3.8***[6]	0	**48.1**	55.6	**7.5**	V / V	100
2205.210	*1000, AV*	**41.5**	3	**+7.8***[6]	0	**49.3**	55.6	**6.3**	V / V	140
2520.240	*1000, AV*	**36.7**	3	**+7.9***[6]	0	**44.6**	55.6	**11.0**	V / V	120
2835.270	*1000, AV*	**35.6**	3	**+9.6***[6]	0	**45.2**	55.6	**10.4**	V / V	100
3150.300	*1000, AV*	**32.9**	3	**+11.3***[6]	0	**44.4**	55.6	**11.2**	V / V	200
3465.330	*1000, AV*	**27.1**	3	**+13.7***[6]	0	**40.8**	55.6	**14.8**	V / V	200
			3							
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**	

n.a [x] See page no. 29

TRANSMITTER SPURIOUS RADIATION (Section 15.231(b))										
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	Antenna height **cm**
315.030	120, *QPK*	**76.6**	3	**-7.5***[5]	0	**69.1**	75.6	**6.5**	V / H	200
630.060	120, *QPK*	**41.0**	3	**-1.9***[5]	0	**39.1**	55.6	**16.5**	V / H	110
945.090	120, *QPK*	**31.7**	3	**+1.2***[5]	0	**32.9**	55.6	**22.7**	V / H	120
1260.120	*1000, AV*	**30.3**	3	**+1.3***[6]	0	**31.6**	55.6	**24.0**	V / H	140
1575.150	*1000, AV*	**32.3**	3	**+2.8***[6]	0	**35.1**	55.6	**20.5**	V / H	140
1890.180	*1000, AV*	**35.2**	3	**+3.8***[6]	0	**39.0**	55.6	**16.6**	V / H	200
2205.210	*1000, AV*	**33.1**	3	**+7.8***[6]	0	**40.9**	55.6	**14.7**	V / H	170
2520.240	*1000, AV*	**28.6**	3	**+7.9***[6]	0	**36.5**	55.6	**19.1**	V / H	200
2835.270	*1000, AV*	**36.2**	3	**+9.6***[6]	0	**45.8**	55.6	**9.8**	V / H	100
3150.300	*1000, AV*	**25.8**	3	**+11.3***[6]	0	**37.1**	55.6	**18.5**	V / H	150
3465.330	*1000, AV*	**27.8**	3	**+13.7***[6]	0	**41.5**	55.6	**14.1**	V / H	100
			3							
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**	

n.a [x] See page no. 29

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	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. 29

10.3 Periodic operation characteristics

10.3.1 Periodic operation

10.3.1.1 Regulation

15.231 (a) The provisions of this Section are restricted to periodic operation within the band 40.66 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system.

10.3.1.2 Result

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

Further test results are attached	~~yes~~	no	

10.3.2 Manually operated transmitter deactivation

10.3.2.1 Regulation

15.231 (a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released

10.3.2.2 Result

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

Further test results are attached	**yes**	~~no~~	Annex no: 10

10.3.3 Automatically operated transmitter deactivation

10.3.3.1 Regulation

15.231 (a2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

10.3.3.2 Result

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

Further test results are attached	**yes**	~~no~~	Annex no: 10

10.3.4 Prohibition of periodic transmission

10.3.4.1 Regulation

15.231 (a3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

10.3.4.2 Result

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

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

10.3.5 Continuous transmission during an alarm condition

10.3.5.1 Regulation

15.231 (a4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

10.3.5.2 Result

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

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

10.4 Bandwidth

10.4.1 Regulation

15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the centre 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 centre frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

10.4.2 Calculation of the 20 dB bandwidth limit

The 20 dB bandwidth limit = 0.0025 * 315 MHz = 0.7875 MHz = 787.5 kHz

10.4.3 Test equipment

Type	Manufacturer/ Model no.	Serial no.	Last calibration	Next calibration
Receiver (30MHz - 1GHz)	Hewlett Packard Spectrum Analyzer (171) 8593 E	3528U00990	05/2006	05/2008
Test fixture	Dudde			

10.4.4 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.

10.4.5 Test result

The measured 20 dB bandwidth is: .....**97.0 kHz**

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

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

10.5 Radiated emission

(Measurement of the active transponder of the EUT)

10.5.1 Regulation

Test Requirement: FCC CFR47, Part 15B Test Procedure: ANSI C63.4:1992

15.201(a) Intentional radiators operated as carrier current systems, devices operated under the provisions of §§ 15.211, 15.213 and 15.221, and devices operating below 490 kHz in which all emissions are at least 40 dB below the limits in Section 15.209 shall be verified pursuant to the procedures in Subpart J of Part 2 of this Chapter prior to marketing.

Test Requirement: FCC CFR47, Part 15C 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 (microvolts/meter)**	**Measurement distance (meters)**
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. lf 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.

10.5.2 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	2006/03	2008/03
Pre-amplifier (100kHz - 1.3GHz)	Hewlett Packard 8447 E (166a)	1726A00705	2006/03	2008/03
Magnetic antenna (9.0-30 MHz)	Schwarzbeck FMZB 1516 (23)	---	2004/04	2008/04
Bilog antenna (30-1000 MHz)	CHASE CBL611A (167)	1517	2004/04	2008/04
Horn antenna (0.86-8.5 GHz)	Schwarzbeck BBHA 9120 A (284)	236	1998/01	2008/01

10.5.3 Test procedures

The EUT and this peripheral (when additional equipment exist) are placed on a turn table which is 0.8 m 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 3m. To find the maximum emission, the polarization of the receiving antenna is 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	30 MHz - 4,000 MHz
Test distance	10m, 3 m*
Test instrumentation resolution bandwidth	9 kHz (20 kHz – 30 MHz)
	120 kHz (30 MHz - 1,000 MHz)
	1 MHz (1000 MHz - 12,000 MHz)
Receive antenna height	1 m (20 kHz – 30 MHz)
Receive antenna polarization	0° - 90° (20 kHz – 30 MHz)
Receive antenna scan height	1 m - 4 m (30 MHz - 12,000 MHz)
Receive antenna polarization	vertical/horizontal (30 MHz - 12,000 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 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

10.5.4 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 an 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 an 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

10.5.5 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 an Pre-amplifier)

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

10.5.6 Calculation of the field strength

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of an Pre-amplifier)

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

10.5.7 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*Iog (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, there for the correction factor is 20*Iog(50/100) = -6 dB. The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules.

TRANSPONDER SPURIOUS RADIATION BELOW 30 MHz (Section 15.109)									
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	*QPK/0.2kHz*	*< 4.0*	*10*	20.2	*-59.1*	-34.90	*26.0 @ 300*	80.90	V, H/0-360°
0.5000	*QPK/0.2kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*33.6 @ 30*	49.4	V, H/0-360°
1.5000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*24.1 @ 30*	39.9	V, H/0-360°
3.0000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*29.5 @ 30*	45.3	V, H/0-360°
5.0000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*29.5 @ 30*	45.3	V, H/0-360°
8.0000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*29.5 @ 30*	45.3	V, H/0-360°
10.0000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*29.5 @ 30*	45.3	V, H/0-360°
20.0000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*29.5 @ 30*	45.3	V, H/0-360°
30.0000	*QPK/9kHz*	*< 4.0*	*3*	20.2	*-40.0*	-15.8	*29.5 @ 30*	45.3	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. 29

TRANSPONDER SPURIOUS RADIATION ABOVE 30 MHz (Section 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, QPK	≤ 3.5	1	-2.6	9.5	0	-8.6	40.00	48.6	H,V/H,V	100-400
88.0000	100, QPK	≤ 3.5	1	-10.8	9.5	0	-16.8	40.00	56.8	H,V/H,V	100-400
216.0000	100, QPK	≤ 3.5	1	-10.3	9.5	0	-16.3	43.50	59.8	H,V/H,V	100-400
960.0000	100, QPK	≤ 3.5	1	8.5	9.5	0	2.5	43.50	41.0	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 ≤ 4.5 dBµV @ 3m distance (1,000 – 2,000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 10 dBµV @ 3m distance (2,000 – 5,500 MHz)
Remark: *[4] noise floor noise level of the measuring instrument ≤ 14 dBµV @ 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 4.0 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. 29

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