**TEST REPORT 04001855**
**2004-01-20**

EQUIPMENT UNDER TEST:

| | |
|---|---|
| Trade Name: | **Marquardt Keyless Go FBS- C6** |
| Model: | **EZS (**Electrical ignition start switch**)** |
| Serial No: | none Prototype |
| Equipment Category: | **Inductive system / Transceiver** |
| Manufacturer: | **Marquardt GmbH** |
| Address: | Schloßstrasse 16<br>D-78604 Rietheim-Weilheim<br>Germany |
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| RELEVANT STANDARD: | 47 CFR Part 15C - Intentional Radiators |
| EQUIPMENT UNDER TEST: | |

**TEST REPORT PREPARED BY:**

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TEST PERSONNEL: SIGNATURE OF THE COMPANY OFFICIAL:

Ralf Trepper — Manfried Dudde

**CONTENTS**

# 1 GENERAL INFORMATION

## 1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.209 of the Code of Federal Regulations title 47.

## 1.2 Limits and Reservations

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report. This test report shall not be reproduced except in full without the written permission of m.dudde hochfrequenz-technik.

## 1.3 Test Location

| | |
|---|---|
| Company Name: | m.dudde high frequency technology |
| 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 |
| | accepted in the letter dated Registration Number .699717 |
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## 1.4 Manufacturer

| | |
|---|---|
| Company Name: | Marquardt GmbH |
| Street: | Schloßstrasse 16 |
| City: | D-78604 Rietheim-Weilheim |
| Country: | Germany |

Name for contact purposes: Reinhardt Neumann

| | |
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## 1.5 Dates

| | |
|---|---|
| Date of receipt of EUT: | 2003 December 20 |
| Test date: | 2003-December-20 to 23 |

# 2 PRODUCT DESCRIPTION

## 2.1 Equipment Under Test (EUT)

| | |
|---|---|
| Device: | **Inductive system / Transceiver** |
| Trade Name: | **Keyless Go FBS-C6 EZS** |
| Model: | **EZS (**Electrical ignition start switch**)** |
| Serial Number: | none (Prototype) |
| FCC ID: | **IYZ3330** |
| Power: | 12V DC |
| Transmit Frequency: | 125kHz / 315MHz |
| Type of modulation: | N0N / F1D |
| Interface: | none |
| Variants: | |
| Highest frequency generated or used in the device: | µC: 8.0MHz / Transceiver: 12.73193MHz |

## 2.2 EUT Peripherals

The EUT was tested in a typical system consisting of:

### 2.2.1 DC Power supply (power supply for EUT)

Type:
Manufacturer: Rhode&Schwarz
Serial Number:

### 2.2.2 Notebook Computer *none*

Type:
Manufacturer:
Serial Number:

Highest frequency generated or used in the device:

### 2.2.3 AC Adapter *none*

Type:
Manufacturer
Serial Number:

## 2.3 Mode of Operation During Testing

The **Keyless Go FBS-C6 EZS** was tested in a typical fashion. The Rhode&Schwarz DC Power supply was connected to the DC input port of the **Keyless Go FBS-C6 EZS** special connector. During preliminary emission tests the **Keyless Go FBS-C6 EZS** was operated in continuous TRANSMITTING and READING mode for worst case emission mode investigation. Therefore, final qualification testing was completed with **Keyless Go FBS-C6 EZS** operated in the both continuous modes. All tests performed with applicant typical voltage (12 Volts DC).

## 2.4 Modifications Required for Compliance

None.

# 3 TEST RESULTS SUMMARY

**Summary of Test Results**

| Requirement | CFR Section | Report Section | Test Result |
|---|---|---|---|
| Antenna Requirement | 15.203 | 4 | Pass |
| Radiated Emissions | 15.209, 15.109 | 5 | Pass |
| Radiated Spurious Emissions | 15.205(b), 15.209 | 6 | Pass |
| Conducted Emissions | 15.207 | 7 | * |
| Periodic Operation Characteristics | 15.231 (a) | 8 | Pass |
| Field Strength Limits (Fundamental) | 15.231 (b) | 6 | Pass |
| 20 dB Bandwidth | 15.231 (c) | 9 | Pass |

* Not required, the EUT is battery powered.

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4 1992 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report. The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

Test Personnel: Ralf Trepper
Issuance Date: 2004 Jan 20

*** Not required, the EUT is directly connected to a car battery .**

# 4 ANTENNA REQUIREMENT

Test Requirement: FCC CFR47, Part 15C

## 4.1 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.

## 4.2 Result

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**
Serial No: none (Prototype)

***Inductive system:*** The antenna of the inductive radio application is part of the casing.
***Transceiver*** *:* The antenna of the transceiver will be firmly connected. It is mounted into the vehicle and placed on the rear window.(see in addition to this Annex No. 5)
The EUT meets the requirements of this section.

# 5 RADIATED EMISSIONS

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

## 5.1 Regulation

Section 15.31 (e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

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) lf the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(4) lf the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1)-(a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this Section, whichever is the higher frequency range of investigation. (b) For unintentional radiators: (1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3), for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

| Highest frequency generated or used in the device or on which the device operates or tunes (MHz) | Upper frequency of measurement (MHz) |
|---|---|
| Below 1.705 | 30 |
| 1.705 -108 | 1000 |
| 108-500 | 2000 |
| 500-1000 | 5000 |
| Above 1000 | 5th harmonic of the highest frequency or 40 GHz, whichever is lower |

Section 15.35 Measurement detector functions and bandwidths. The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part: (a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance

with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.
(b) On any frequency of frequencies above 1000 MHz, the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules in this part, e.g., see § 15.255. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. Measurement of AC power line conducted emissions are performed using a CISPR quasipeak detector, even for devices for which average radiated emission measurements are specified.
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

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.

Section 15.109 Radiated emission limits. (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency (MHz) | Field Strength (microvolts/meter) |
|---|---|
| 30-88 | 100 |
| 88-216 | 150 |
| 216-960 | 200 |
| Above 960 | 500 |

## 5.2 Radiated Emissions Test, 9 kHz to 30 MHz (Magnetic Field Test)

### 5.2.1 Test Equipment

| Type | Manufacturer/ | Dudde Device No. | Last Calibration | Next Calibration |
|---|---|---|---|---|
| Receiver | Anritzu Spectrum Analyzer | MT74457 | 03/2002 | 03/2005 |
| (9 kHz –30 MHz) Receiver | MS 2601 (2) Rohde & Schwarz | 882902/007 | 01/2002 | 01/2005 |
| (9 kHz –30 MHz) Loop Antenna | ESH2 (22) Schwarzbeck | | | |
| | FMZB 1516 | | | |

### 5.2.2 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Emissions from the unit are maximized by adjusting the orientation of the receive loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. Refer to the photographs' section.

The EUT was tested in a typical fashion. The test distance was reduced to 3 m and 10 m, respectively. according to section 15.31 (f) (2). The initial step in collecting radiated data is a peak scan of the measurement range with an EMI test receiver. The significant peaks within a margin of 25 dB to the limit are then measured with quasi-peak and AV detector, respectively. Worst case radiated emissions are listed under chapter: test results.

| **Radiated Emissions Test Characteristics (magnetic field test)** | |
|---|---|
| Frequency range | 9 kHz - 30 MHz |
| Test distance | 3 m; 10 m* |
| Test instrumentation resolution bandwidth | 200 Hz (9 kHz - 150 kHz) |
| | 9 kHz (150 kHz - 30 MHz) |
| Test instrumentation detector | QP / AV, Peak |
| Receive antenna height | 1 m |
| Receive antenna orientation | 0-360° |

* Section 15.31 (f) (2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

### 5.2.3 Calculation of Field Strength Limits

Calculation: microvolts/meter to dBµV/m

| Frequency | Field Strength Limit according to Section 15.209 | | Measurement distance |
|---|---|---|---|
| (MHz) | (µV/m) | (dBµV/m) | (meters) |
| 0.009-0.490 | 266.7-4.9 | 48.5-13.8 | 300 |
| 0.490-1.705 | 49.0-14.1 | 33.8-23.0 | 30 |
| 1.705-30.0 | 30 | 29.5 | 30 |

### 5.2.4 Field Strength Calculation

No special calculation for obtaining the field strength in dBµV/m is necessary, because the EMI receiver and the active loop antenna operate as a system, where the reading gives directly the field strength result (dBµV/m). The gain, antenna factors and cable losses are already taken into consideration.

For 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 lineardistance for field strength measurements). The basic equation with a sample calculation is as follows:

**FS** = **RA** + **DF**
where
**FS** = Field Strength in dBµV/m
**RA** = Receiver Amplitude in dBµV/m
**DF** = Distance Extrapolation Factor in dB,

where DF = 20 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance

Assume the tests performed at a reduced Test Distance of 3 m instead of the Specified Distance of 30 m giving a Distance Extrapolation Factor of DF = 20 log(3m/30m) = -40 dB.
Assuming a receiver amplitude of 40.7 dBµV/m is obtained. The distance factor of -40 dB are added, giving a field strength of 0.7 dBµV/m. The 0.7 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 40.7 - 40 = 0.7 [dBµV/m]

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

### 5.2.5 Test Results

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**
Serial No: none (Prototype)

| PRODUCT EMISSIONS DATA 9 kHz - 30 MHz | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No | Emission Frequency [MHz] | Receiver Mode and BandWidth [KHz] | Test Distance [mI | Receiver Reading RA [dBµV/m] | Distance Extrapola-tion Factor DF [dB] | Result = Corrected Reading FS [dBµV/m] | Spec Limit @ Distance [dBµV/m] @ [m] | Margin [dB] | Remarks |
| *1* | *0.125* | *PK/0.2kHz*<br>*AV/0.2kHz* | *10*<br>*10* | *90.63*<br>*81.35* | *-59.1*<br>*-59.1* | *31.53*<br>*21.85* | *Pk45.6- @ 300*<br>*AV25.6 @ 300* | *PK: 14.07*<br>*AV: 3.75* | |
| *2* | *0.250* | *AV/0.2kHz* | *10* | *< 4.0* | *-59.1* | *-55.1* | *AV20.2 @ 300* | *75.3* | *[1] |
| *3* | *0.375* | *AV/0.2kHz* | *10* | *< 4.0* | *-59.1* | *-55.1* | *AV16.7 @ 300* | *71.8* | *[1] |
| *4* | *0.500* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV34.2 @ 30* | *49.3* | *[1] |
| *5* | *0.6250* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV32.5 @ 30* | *47.6* | *[1] |
| *6* | *0.7502* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV30.6 @ 30* | *45.7* | *[1] |
| *7* | *0.875* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV29.3 @ 30* | *44.4* | *[1] |
| *8* | *1.000* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV28.2 @ 30* | *43.3* | *[1] |
| *9* | *1.125* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV27.2 @ 30* | *42.3* | *[1] |
| *10* | *1.250* | *AV/9.0kHz* | *10* | *< 4.0* | *-19.1* | *-15.1* | *AV26.2 @ 30* | *41.3* | *[1] |

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 EUT meets the requirements of this section.**

Test Personnel: Ralf Trepper
Test Date: 2003 Dec 20

## 5.3 Radiated Emissions Test, 30 MHz to 2 GHz

### 5.3.1 Test Equiprnent

| Type | Manufacturer/ Model No. | Dudde Device No. | Last Calibration | Next Calibration |
|---|---|---|---|---|
| Receiver<br><br>(30MHz - 1GHz) | Hewlett Packard Spectrum Analyzer (171)<br>8593 E | 3528U00990 | 02/2002 | 02/2004 |
| Pre-Amplifiere<br>(30MHz - 1GHz | Hewlett Packard<br>8447 E (166a) | 1726°00705 | 04/2002 | 04/2006 |
| Antenna<br>(30 MHz - 1 GHz)<br>Receiver | Chase (Bilog)<br>CBL 611A<br>Hewlett Packard | 1517<br><br>3528U00990 | 04/2002<br><br>02/2002 | 04/2008<br><br>02/2004 |
| (1 GHz - 26.5<br><br>GHz) | Spectrum Analyzer (171)<br>8593 E | | | |
| Antenna | Schwarzbeck | | | |
| (1 GHz - 2 GHz) | BBHA 9120 – A/236 | | | |

### 5.3.2 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable *[Remark.- Not applicable]*. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.
Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the tumtable. Manipulating the system cables also maximizes EUT emissions. Refer to the photographs' section. The initial step in collecting radiated data is a peak scan of the measurement range with an EMI test receiver under closer distances as given in the rule. The significant peaks are then measured with the appropriate detectors (QP, AV and PK).

Worst case radiated emissions are listed under chapter: test results.

| **Radiated Emissions Test Characteristics** | |
|---|---|
| Frequency range | 30 MHz - 2,000 MHz |
| Test distance | 3 m* |
| Test instrumentation resolution bandwidth | 120 kHz (30 MHz - 1,000 MHz) |
| | 1 MHz (1,000 MHz - 4,000 MHz) |
| Test instrumentation detector | QP (30 MHz - 1,000 MHz) |
| | AV (1,000 MHz - 2,000 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 nearfield 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-Iinear-distance-squared for power density measurements).

### 5.3.3 Calculation of Field Strength Limits

Calculation: microvolts/meter to dBµV/m

| Frequency | Field Strength Limit acc. to section 15.209 and 15.109 (non-class A digital devices) | | Measurement distance |
|---|---|---|---|
| (MHz) | (microvolts/meter) | (dBµV/m) | (meters) |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| 960-2,000 | 500 | 54 | 3 |

### 5.3.4 Calculation of Average Correction Factor

The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules. The relationship between average and peak mode reading has been confirmed by direct measurement using the receivers average and peak detectors. All emission measurements performed using the test receiver's average detector and the max. hold facility; i.e. the average value measured directly without the necessity of additional correction factor.

### 5.3.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

**FS** = **RA**+ **AF**+**CF**

where

**FS** = Field Strength in dBpV/m
**RA** = Receiver Amplitude in dBµV
**AF** = Antenna Factor in dB(1/m)
**CF** = Cable Attenuation Factor in dB

*Assume a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dBµV/m. The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.*

*FS = 23.5 + 7.4 + 1.1 = 32 [dBµV/m]*

*Level in pV/m = Common Antilogarithm (32/20) = 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 lineardistance for field strength measurements). The basic equation with a sample calculation is as follows:

**FS**=**RA**+ **AF**+**CF**+**DF**
where

**FS** = Field Strength in dBµV/m
**RA** = Receiver Amplitude in dBµV
**AF** = Antenna Factor in dB(1/m)
**CF** = Cable Attenuation Factor in dB
**DF** = Distance Extrapolation Factor in dB,
where DF = 20 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance

Assume the tests performed at a reduced Test Distance of 1,5 m instead of the Specified Distance of 3 m giving a Distance Extrapolation Factor of DF = 20 log(1,5m/3m) = -6 dB.
Assuming a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(l/m), the Cable Factor of 1.1 dB and the Distance Factor of -6 dB are added, giving a field strength of 26 dBµV/m. The 26 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 23.5 + 7.4 + 1.1 - 6 = 26 [dBµV/m]

Level in µV/m = Common Antilogarithm (26/20) = 20

### 5.3.6 Test Results

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**
Serial No: none (Prototype)

**PRODUCT EMISSIONS DATA 30 MHz - 1000 MHz**

| No | Emission Frequency [MHz] | Receiver Mode and Bandwidth [kHz] | Test Distance [m] | Receiver Reading RA [dBµV] | Correction Factor AF+CF [dB(1/m)] | Distance Extrapola-tion Factor DF [dB] | Result = Corr ected Reading FS [dBµV/m] | Spec Limit [dBµV/m] | Antenna Polari-zation | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | QP, 120 | 3 | < 6.5 | -2.9 | 0 | 3.6 | 40.0 | V, H/V, H | 33.4 | *[1] |
| 2 | 88 | QP, 120 | 3 | < 6.5 | -11.2 | 0 | -4.7 | 40.0 | V, H/V, H | 44.7 | *[1] |
| 3 | 216 | QP, 120 | 3 | < 6.5 | -9.2 | 0 | -2.7 | 43.5 | V, H/V, H | 46.2 | *[1] |
| 4 | 960 | QP, 120 | 3 | < 6.5 | 12.6 | 0 | 19.1 | 54.0 | V, H/V, H | 34.9 | *[1] |
| | **No emissions detected*[1]** | | | | | | | | | | |

**PRODUCT EMISSIONS DATA 1000 MHz - 2000 MHz**

| No | Emission Frequency [MHz] | Receiver Mode and Bandwidth [kHz) | Test Distance [m] | Receiver Reading RA [dBµV] | Correction Factor AF+CF [dB(1/ma)] | Distance Extrapola-tion Factor DF [dB] | Result = Correded Reading FS [dBµV/m] | Spec Limit [dBµV/m] | Antenna Polari-zation | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1000 | AV,1000 | 3 | < 10 | 29.6 | 0 | 39.6 | 54.0 | V, H/V, H | 14.4 | *[2] |
| 2 | 1500 | AV,1000 | 3 | < 10 | 28.4 | 0 | 38.4 | 54.0 | V, H/V, H | 15.6 | *[2] |
| 3 | 2000 | AV,1000 | 3 | < 10 | 28.8 | 0 | 38.8 | 54.0 | V, H/V, H | 15.2 | *[2] |
| | **No emissions detected*[2]** | | | | | | | | | | |

Remark: *[1] Noise level of the measuring instrument ≤ 6.5dBµV @ 3m distance (30 – 1000 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 10 dBµV @ 3m distance (1000 – 2000 MHz)
Remark: *[2] Peak Limit according to Section 15.35 (b).

The EUT meets the requirements of this section.

Test Personnel: Ralf Trepper
Test Date: 2003 Dec 20

# 6 RADIATED SPURIOUS EMISSIONS

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

## 6.1 Regulation

15.231 (b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|---|---|---|
| 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. lf 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 ) lf the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

## 6.2 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 | 2002/02 | 2004/02 |
| Pre Amplifier (100kHz - 1.3GHz) | Hewlett Packard 8447 E (166a) | 1726A00705 | 2002/04 | 2006/04 |
| Bilog Antenna | CHASE | 1517 | 2002/04 | 2008/04 |
| (30- 1000 MHz) | CBL611A (167) | | | |
| Hornantenna (0,86-8,5 GHz) | Schwarzbeck BBHA 9120 A (284) | 236 | 1998/01 | 2008/01 |

## 6.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal tumtable *[Remark: Not applicable]*. The EUT is connected to its associated peripherals with any excess I/0 cabling bundled to approximately 1 meter *[Remark: Not applicable]*.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions *[Remark.Not applicable]*. *All* tests performed with the EUT placed in two polarizations on the nonconductive table: horizontal and vertical. Refer to the photographs'section.

| **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 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

## 6.4 Calculation of Field Strength Limits

Fundamental field strength limits for the band 260 - 470 MHz: µV/m at 3 meters = 41.6667(F[MHz]) - 7083.3333 = 41.6667* 315 - 7083.3333 = 6,041.68 6,041.68 µV/m corresponds with 75.6 dBµV/m. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level, i.e. 55.6 dBµV/m.

## 6.5 Calculation of Average Correction Factor

The average correction factor is computed by analyzing the "worst case" on time in any 100 msec time period and using the formula: Corrections Factor (c113) + 20*Iog (worst case on time/100 msec) Analysis of the remote transmitter worst case on time in any 100 msec time period is an on time of 50 msec, therefor 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. *The relationship between average and peak mode reading has been confirmed also by direct measurement using the receiver's average and peak detectors. All emission measurements performed using the test receiver's average detector and the max. hold facility; i. e. the average value measured directly without the necessity of additional correction factor.*

## 6.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

FS=RA+ AF+CF where FS Field Strength in dBµV/m RA Receiver Amplitude in dBµV AF Antenna Factor in dB(1/m) CF Cable Attenuation Factor in dB

Assume a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dBµV/m. The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 23.5 + 7.4 + 1.1 = 32 [dBµV/m]

Level in µV/m = Common Antilogarithm (32/20) = 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 lineardistance for field strength measurements). The basic equation with a sample calculation is as follows:

**FS=RA+AF+CF+DF** or **FS=RA+AF+CF+DF-PA {(100kHz – 1,000MHz)(PA amplify Factor = 22dB)}**
where

**FS** Field Strength in dBµV/m
**RA** Receiver Amplitude in dBµV **AF** Antenna Factor in dB(1/m) **CF** Cable Attenuation Factor in dB **DF** Distance Extrapolation Factor in dB **PA** Linear Pre Amplifier amplify Factor in dB, where DF = 20 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance

Assume the tests performed at a reduced Test Distance of 1,5 m instead of the Specified Distance of 3 m giving a Distance Extrapolation Factor of DF = 20 log(1,5m/3m) = -6 dB. Assuming a receiver reading of 23.5 dBµV is obtained. The Antenna Factor of 7.4 dB(1/m), the Cable Factor of 1.1 dB and the Distance Factor of -6 dB are added, giving a field strength of 26 dBµV/m. The 26 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

FS = 23.5 + 7.4 + 1.1 - 6 = 26 [dBµV/m]

Level in µV/m = Common Antilogarithm (26/20) = 20

## 6.7 Test Results

### 6.7.1 Model EZS

| PRODUCT EMISSIONS PEAK DATA 15.231 BANDS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Emission Frequency [MHz] | Receiver Mode and Bandwidth [kHz] | Test Distance [m] | Receiver Reading RA [dBµV] | Correction Factor AF+CF (-PA*[4]) [dB(1/m)] | Distance Extrapola-tion Factor DF [dB] | Result = Corrected Reading FS [dBµV/m] | Spec Limit [dBµV/m] | Antenna Height [m] | Polarization Eut/Ant | Margin [dB] |
| 1 | 315.0010 | 120, *QPK* | 3 | 77.45 | -5.00 | 0 | 72.45 | 75.6 | 150 | V / V | 3.15 |
| | | 120, *AV* | 3 | 73.12 | -5.00 | 0 | 68.12 | 75.6 | 150 | V / H | 7.48 |
| 2 | 630.0020 | 120, *QPK* | 3 | 25.93 | +3.50 | 0 | 29.43 | 55.6 | 140 | V / H | 26.17 |
| | | 120, *AV* | 3 | 19.60 | +3.50 | 0 | 23.10 | 55.6 | 140 | V / H | 32.50 |
| 3 | 945.0030 | 120, *QPK* | 3 | < 6.5 | +8.50 | 0 | 15.00 | 55.6 | 160 | V / H | 40.60 |
| | | 120, *AV* | 3 | < 6.5 | +8.50 | 0 | 15.00 | 55.6 | 160 | V / H | 40.60 |
| 4 | 1,260.0040 | *1000, AV* | 3 | < 10 | +24.35 | 0 | 34.35*[2] | 55.6 | 100-400 | H, V/H, V | 21.25 |
| 5 | 1,575.0050 | *1000, AV* | 3 | < 10 | +25.63 | 0 | 35.63*[2] | 55.6 | 100-400 | H, V/H, V | 19.97 |
| 6 | 1,890.0060 | *1000, AV* | 3 | < 10 | +26.57 | 0 | 36.57*[2] | 55.6 | 100-400 | H, V/H, V | 19.03 |
| 7 | 2,205.0070 | *1000, AV* | 3 | < 17 | +27.27 | 0 | 44.27*[3] | 54.0 | 100-400 | H, V/H, V | 9.73 |
| 8 | 2,520.0080 | *1000, AV* | 3 | < 17 | +27.82 | 0 | 44.82*[3] | 55.6 | 100-400 | H, V/H, V | 10.78 |
| 9 | 2,835.0090 | *1000, AV* | 3 | < 17 | +28.07 | 0 | 45.07*[3] | 54.0 | 100-400 | H, V/H, V | 8.93 |
| 10 | 3,150.0100 | *1000, AV* | 3 | < 17 | +28.59 | 0 | 45.59*[3] | 55.6 | 100-400 | H, V/H, V | 10.01 |
| 11 | 3,465.0110 | *1000, AV* | 3 | < 17 | +29.41 | 0 | 46.41*[3] | 55.6 | 100-400 | H, V/H, V | 9.19 |

Remark: *[1] noise floor noise level of the measuring instrument ≤ 6.5dBµV @ 3m distance (30 – 1,000 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 10 dBµV @ 3m distance (1,000 – 2,000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 17 dBµV @ 3m distance (2,000 – 5,500 MHz)
Remark: *[4] for using an Pre Amplifier in the range between 100kHz and 1,000MHz

| PRODUCT EMISSIONS PEAK DATA 15.205 BANDS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Emission Frequency [MHz] | Receiver Mode and Bandwidth [kHz] | Test Distance [m] | Receiver Reading RA [dBµV] | Correction Factor AF+CF (-PA*[4]) [dB(1/m)] | Distance Extrapola-tion Factor DF [dB] | Result = Con-ected Reading FS [dBµV/m] | Spec Limit [dBµV/m] | Antenna Height [cm] | Polarization Eut/Ant | Margin [dB] |
| 1 | 30 | QP, 120 | 3 | < 6.5 | -3.45 | 0 | 3.05*[1] | 40.0 | 100-400 | V, H/V, H | 36.95 |
| 2 | 88 | QP, 120 | 3 | < 6.5 | -12.86 | 0 | -6.36*[1] | 40.0 | 100-400 | V, H/V, H | 46.36 |
| 3 | 216 | QP, 120 | 3 | < 6.5 | -12.71 | 0 | -6.21*[1] | 43.5 | 100-400 | V, H/V, H | 49.71 |
| 4 | 960 | QP, 120 | 3 | < 6.5 | +2.70 | 0 | 9.70*[1] | 46.0 | 100-400 | V, H/V, H | 55.70 |
| 5 | 1000 | AV, 1000 | 3 | < 10 | +2.93 | 0 | 12.93*[2] | 54.0 | 100-400 | V, H/V, H | 33.61 |
| 6 | 1500 | AV, 1000 | 3 | < 10 | +25.40 | 0 | 35.40*[2] | 54.0 | 100-400 | V, H/V, H | 18.60 |
| 7 | 2000 | AV, 1000 | 3 | < 10 | +26,90 | 0 | 36.90*[2] | 54.0 | 100-400 | V, H/V, H | 17.10 |
| **In this band no emissions detected** | | | | | | | | | | | |

Remark: *[1] noise floor noise level of the measuring instrument ≤ 6.5dBµV @ 3m distance (30 – 1000 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 10 dBµV @ 3m distance (1000 – 2000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 17 dBµV @ 3m distance (2000 – 5500 MHz)
Remark: *[4] for using an Pre Amplifier in the range between 100kHz and 1,000MHz

**The EUT meets the requirements of this section.**

Test Personnel: Ralf Trepper
Issuance Date: 2003 Dec 22

# 7 CONDUCTED EMISSIONS TESTS

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

## 7.1 Regulation

Section 15.207 (a) For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line

and ground at the power terminals.

Section 15.207 (d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which-do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or

battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the

conducted limits.

## 7.2 Test Equipment

Not applicable.

## 7.3 Test Procedures

Not applicable.

## 7.4 Test Results

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**

The EUT is battery powered only. Therefore - according to Section 15.207

**(d) - conducted emissions measurements to demonstrate compliance with the conducted limits are not required.**

# 8 PERIODIC OPERATION CHARACTERISTICS

Test Requirement: FCC CFR47, Part 15C

## 8.1 Periodic Operation

### 8.1.1 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.

### 8.1.2 Result

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**

**The EUT meets the requirements of this section.**

## 8.2 Manually Operated Transmitter Deactivation

### 8.2.1 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.

### 8.2.2 Result

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**

Transmitter ceases immediately after being released.

**The EUT meets the requirements of this section.**

## 8.3 Automatically Operated Transmitter Deactivation

### 8.3.1 Regulation

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

### 8.3.2 Result

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**

Transmitter ceases immediately after activation.

**The EUT meets the requirements of this section.**

## 8.4 Prohibition of Periodic Transmission

### 8.4.1 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.

### 8.4.2 Result

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**

The Transceiver of the EUT does not employ periodic transmission.

## 8.5 Continuous Transmission During an Alarm Condition

7.5.1 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.

### 8.5.2 Result

Device: **Inductive system / Transceiver**
Trade Name: **Keyless Go FBS-C6 EZS**
Model: **EZS**

This section is not applicable to the EUT.

# 9 BANDWIDTH

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992 Section 13.1.7

## 9.1 Regulation

15.231 (c) 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.

## 9.2 Calculation of 20 dB Bandwidth Limit

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

## 9.3 Test Equipment

| Type | Manufacturer/ Model No. | Serial No. | Last Calibration | Next Calibration |
|---|---|---|---|---|
| Receiver | Hewlett Packard Spectrum Analyzer (171) | 3528U00990 | 02/2002 | 02/2004 |
| (30MHz - 1GHz) | 8593 E | | | |
| Pre-Amplifiere | Hewlett Packard | | | |
| (30MHz - 1GHz | 8447 E (166a) | 1726°00705 | 04/2002 | 04/2006 |
| Antenna | Chase (Bilog) | 1517 | 04/2002 | 04/2008 |
| (30 MHz - 1 GHz) | CBL 611A | | | |
| Receiver (1 GHz - 26.5 GHz) | Hewlett Packard Spectrum Analyzer (171) 8593 E | 3528U00990 | 02/2002 | 02/2004 |
| Antenna | Schwarzbeck | | | |

## 9.4 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.

## 9.5 Test Result

### 9.5.1 Model : EZS

Bandwidth setting of the analyzer: ..... 30 kHz [3 dB] corresponds with 46 kHz [6 dB]

The measured 20 dB bandwidth is: ..... **52.0 kHz**

**The EUT meets the requirements of this section.**

Test Personnel: Ralf Trepper
Issuance Date: 2003 Dec 23

## 10 MISCELLANEOUS COMMENTS AND NOTES

**EZS is a combination of two different radio applications: one being an inductive system (transponder base station operating on 125 KHz) and the other a "Short Range Device"– transceiver operating on 315 MHz.**

## 11 LIST OF ANNEXES

The following Exhibits are separated annexes to this test report.

| Annex No. | Exhibit | Pages |
|---|---|---|
| 1 | External Photographs of the Equipment Under Test | 2 |
| 2 | Internal Photographs of the Equipment Under Test | 2 |
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