

**TEST REPORT No.: 03001541**

**Date : 2003.02.14**

**EQUIPMENT UNDER TEST:**

|                     |                                                                        |
|---------------------|------------------------------------------------------------------------|
| Trade Name:         | <b>Marquardt Keyless Go</b>                                            |
| Model:              | Key Typ 3312 - Vector                                                  |
| Serial No:          | none Prototype                                                         |
| Equipment Category: | Transceiver                                                            |
| Manufacturer:       | <b>Marquardt GmbH</b>                                                  |
| Address:            | Schloßstrasse 16<br>D-78604 Rietheim-Weilheim<br>Germany               |
| Phone:              | +49 (0)7424 / 99-1975                                                  |
| Fax:                | +49 (0)7424 / 99-2541                                                  |
| E-mail:             | <a href="mailto:Uwe.Schwalm@marquardt.de">Uwe.Schwalm@marquardt.de</a> |
| RELEVANT STANDARD:  | 47 CFR Part 15C - Intentional Radiators                                |
| USED:               | ANSI C63.4-1992                                                        |

**TEST REPORT PREPARED**

**BY:**

Ralf Trepper  
m.dudde hochfrequenz-technik  
Rottland 5a  
D-51429 Bergisch Gladbach  
Germany  
Phone: +49 2207 96890  
Fax : +49 2207 968920  
E-mail: [manfred.dudde@t-online.de](mailto:manfred.dudde@t-online.de)

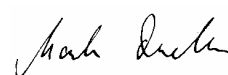
**TEST PERSONNEL:**

Ralf Trepper



**SIGNATURE OF THE COMPANY OFFICIAL:**

Manfried Dudde



## CONTENTS

|           |                                                                 |           |
|-----------|-----------------------------------------------------------------|-----------|
| <b>1</b>  | <b>GENERAL INFORMATION .....</b>                                | <b>4</b>  |
| 1.1       | Purpose .....                                                   | 4         |
| 1.2       | Limits and Reservations .....                                   | 4         |
| 1.3       | Test Location .....                                             | 4         |
| 1.4       | Manufacturer .....                                              | 4         |
| 1.5       | Dates .....                                                     | 4         |
| <b>2</b>  | <b>PRODUCT DESCRIPTION .....</b>                                | <b>5</b>  |
| 2.1       | Equipment Under Test (EUT) .....                                | 5         |
| 2.2       | EUT Peripherals .....                                           | 5         |
| 2.4       | Modifications Required for Compliance .....                     | 5         |
| <b>4</b>  | <b>ANTENNA REQUIREMENT .....</b>                                | <b>7</b>  |
| 4.1       | Regulation .....                                                | 7         |
| 4.2       | Result .....                                                    | 7         |
| <b>5</b>  | <b>RADIATED EMISSIONS .....</b>                                 | <b>8</b>  |
| 5.1       | Regulation .....                                                | 8         |
| 5.2       | Test Equipment .....                                            | 9         |
| 5.3       | Test Procedures .....                                           | 9         |
| 5.4       | Calculation of Field Strength Limits .....                      | 10        |
| 5.5       | Calculation of Average Correction Factor .....                  | 10        |
| 5.6       | Field Strength Calculation .....                                | 10        |
| 5.7       | Test Results .....                                              | 11        |
| 5.7.1     | Model Keyless Go Typ 3312 - Vector .....                        | 11        |
| <b>6</b>  | <b>CONDUCTED EMISSIONS TESTS .....</b>                          | <b>13</b> |
| 6.1       | Regulation .....                                                | 13        |
| 6.2       | Test Equipment .....                                            | 13        |
| 6.3       | Test Procedures .....                                           | 13        |
| 6.4       | Test Results .....                                              | 13        |
| <b>7</b>  | <b>PERIODIC OPERATION CHARACTERISTICS .....</b>                 | <b>14</b> |
| 7.1       | Periodic Operation .....                                        | 14        |
| 7.1.1     | Regulation .....                                                | 14        |
| 7.1.2     | Result .....                                                    | 14        |
| 7.2       | Manually Operated Transmitter Deactivation .....                | 14        |
| 7.2.1     | Regulation .....                                                | 14        |
| 7.2.2     | Result .....                                                    | 14        |
| 7.3       | Automatically Operated Transmitter Deactivation .....           | 15        |
| 7.3.1     | Regulation .....                                                | 15        |
| 7.3.2     | Result .....                                                    | 15        |
| 7.4       | Prohibition of Periodic Transmission .....                      | 15        |
| 7.4.1     | Regulation .....                                                | 15        |
| 7.4.2     | Result .....                                                    | 15        |
| 7.5       | Continuous Transmission During an Alarm Condition .....         | 15        |
| 7.5.1     | Regulation .....                                                | 15        |
| 7.5.2     | Result .....                                                    | 15        |
| 8.1       | Regulation .....                                                | 16        |
| 8.2       | Calculation of 20 dB Bandwidth Limit .....                      | 16        |
| 8.3       | Test Equipment .....                                            | 16        |
| 8.4       | Test Procedure .....                                            | 16        |
| 8.5       | Test Result .....                                               | 16        |
| 8.5.1     | Model : Keyless Go Typ 3312 - Vector .....                      | 16        |
| <b>9</b>  | <b>PHOTOGRAPHS OF THE TEST SETUP .....</b>                      | <b>18</b> |
| 9.1       | Radiated Emissions Tests .....                                  | 18        |
| 9.1.2     | Photograph: EUT in vertical polarization on the turntable ..... | 18        |
| 9.2       | Conducted Emission Tests .....                                  | 19        |
| <b>10</b> | <b>MISCELLANEOUS COMMENTS AND NOTES .....</b>                   | <b>20</b> |

|           |                             |           |
|-----------|-----------------------------|-----------|
| <b>11</b> | <b>LIST OF ANNEXES.....</b> | <b>21</b> |
|-----------|-----------------------------|-----------|

## **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 15.231 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.

Phone: +49-2207-9689-0  
Fax: +49-2207-9689-20  
Mail: manfred.dudde@t-online.de  
Web: <http://www.dudde.com>

### **1.4 Manufacturer**

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

Name for contact purposes: Uwe Schwalm

Phone: +49 (0)7424 / 99-1975  
Fax: +49 (0)7424 / 99-2541  
Mail: [Uwe.Schwalm@marquardt.de](mailto:Uwe.Schwalm@marquardt.de)

### **1.5 Dates**

Date of receipt of EUT: 2003 January 21  
Test date: 2003 February 10 - 14

## **2 PRODUCT DESCRIPTION**

### **2.1 Equipment Under Test (EUT)**

Device: **Transceiver**  
Trade Name: **Keyless Go**  
Model: **Typ 3312 - Vector**  
Serial Number: none (Prototype)  
FCC ID: **IYZ VECTOR**  
Power: 6V DC  
Transmit Frequency: 315 MHz  
Type of modulation: FSK  
Interface: none  
Variants:  
Highest frequency generated or used in the device: Quarz 1 43.691 kHz / Quarz 2 3.998MHz

### **2.2 EUT Peripherals**

The EUT were tested as stand-alone device.

### **2.3 Mode of Operation During Testing**

The transmitter were tested in a typical fashion. During preliminary emission tests all 4 transmitter codes activated by the 4 different buttons ("Lock", "Release", "Tailgate remote release" and "Panic") were investigated for worst case emission mode. Pressing the "Lock" button was found to be the worst case emission mode. Therefore, final qualification testing was completed with transmitters activated with the "Lock" button.

### **2.4 Modifications Required for Compliance**

None.

## **3 TEST RESULTS SUMMARY**

Summary of Test Results Transmitter

| <b>Requirement</b>                  | <b>CFR Section</b> | <b>Report Section</b> | <b>Test Result</b> |
|-------------------------------------|--------------------|-----------------------|--------------------|
| Antenna Requirement                 | 15.203             | 4                     | Pass               |
| Radiated Spurious Emissions         | 15.209, 15.205(b)  | 5                     | Pass               |
| Conducted Emissions                 | 15.207             | 6                     | *                  |
| Periodic Operation Characteristics  | 15.231 (a)         | 7                     | Pass               |
| Field Strength Limits (Fundamental) | 15.231 (b)         | 5                     | 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: 2003 February 14

## **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: Remote Control (RF) for Car Locking / Unlocking

Transmitter Model: **Keyless Go Typ 3312 - Vector**

Antenna is a trace on the PCB.

**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

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,  $\mu\text{V/m}$  at 3 meters =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  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 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.

## 5.2 Test Equipment

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

## 5.3 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 turntable [Remark: Not applicable]. The EUT is connected to its associated peripherals with any excess I/O 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.

| <b>Radiated Emissions Test Characteristics</b> |                              |
|------------------------------------------------|------------------------------|
| 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).

## 5.4 Calculation of Field Strength Limits

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

## 5.5 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) +  $20 \cdot \log(\text{worst case on time}/100 \text{ msec})$  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  $20 \cdot \log(50/100) = -6 \text{ dB}$ . 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.*

## 5.6 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 dB $\mu\text{V/m}$  RA Receiver Amplitude in dB $\mu\text{V}$  AF Antenna Factor in dB(1/m) CF Cable Attenuation Factor in dB

Assume a receiver reading of 23.5 dB $\mu\text{V}$  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 dB $\mu\text{V/m}$ . The 32 dB $\mu\text{V/m}$  value can be mathematically converted to its corresponding level in  $\mu\text{V/m}$ .

$$FS = 23.5 + 7.4 + 1.1 = 32 \text{ [dB}\mu\text{V/m]}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm}(32/20) = 39.8$$

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 dB $\mu\text{V/m}$

RA Receiver Amplitude in dB $\mu\text{V}$  AF Antenna Factor in dB(1/m) CF Cable Attenuation Factor in dB DF Distance Extrapolation Factor in dB, where  $DF = 20 \log(D_{\text{test}}/D_{\text{spec}})$  where  $D_{\text{test}}$  = Test Distance and  $D_{\text{spec}}$  = 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  $DF = 20 \log(1,5\text{m}/3\text{m}) = -6 \text{ dB}$ . Assuming a receiver reading of 23.5 dB $\mu$ V 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 dB $\mu$ V/m. The 26 dB $\mu$ V/m value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$FS = 23.5 + 7.4 + 1.1 - 6 = 26 \text{ [dB}\mu\text{V/m]}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } (26/20) = 20$$

## 5.7 Test Results

### 5.7.1 Model Keyless Go Typ 3312 - Vector

| PRODUCT EMISSIONS PEAK DATA 15.231 BANDS |                    |                             |               |                     |                         |                                  |                               |                |                |                      |        |
|------------------------------------------|--------------------|-----------------------------|---------------|---------------------|-------------------------|----------------------------------|-------------------------------|----------------|----------------|----------------------|--------|
| No                                       | Emission Frequency | Receiver Mode and Bandwidth | Test Distance | Receiver Reading RA | Correction Factor AF+CF | Distance Extrapolation Factor DF | Result = Corrected Reading FS | Spec Limit     | Antenna Height | Polarization Eut/Ant | Margin |
|                                          | [MHz]              | [kHz]                       | [m]           | [dB $\mu$ V]        | [dB(1/m)]               | [dB]                             | [dB $\mu$ V/m]                | [dB $\mu$ V/m] | [m]            |                      | [dB]   |
| 1                                        | 314.9784           | 120, QPK                    | 3             | 50.89               | +16                     | 0                                | 66.89                         | 75.6           | 180            | H/V                  | 7.71   |
|                                          |                    | 120, AV                     | 3             | 48.75               | +16                     | 0                                | 64.75                         | 75.6           | 180            | H/V                  | 9.85   |
| 2                                        | 634.9568           | 120, QPK                    | 3             | 25.27               | +2                      | 0                                | 27.27                         | 55.6           | 200            | H/V                  | 28.33  |
|                                          |                    | 120, AV                     | 3             | 24.79               | +2                      | 0                                | 26.79                         | 55.6           | 200            | H/V                  | 28.81  |
| 3                                        | 949.9352           | 120, QPK                    | 3             | 20.08               | +6                      | 0                                | 26.08                         | 55.6           | 380            | H/V                  | 29.52  |
|                                          |                    | 120, AV                     | 3             | 19.67               | +6                      | 0                                | 25.67                         | 55.6           | 380            | H/V                  | 29.93  |
| 4                                        | 1264.9136          | 1000, AV                    | 3             | < 10                | +28.5                   | 0                                | 38.5 <sup>*2</sup>            | 55.6           | 100-400        | H, V/H, V            | 17.10  |
| 5                                        | 1579.8920          | 1000, AV                    | 3             | < 10                | +28.6                   | 0                                | 38.6 <sup>*2</sup>            | 55.6           | 100-400        | H, V/H, V            | 17.00  |
| 6                                        | 1894.8704          | 1000, AV                    | 3             | < 10                | +29.0                   | 0                                | 39.0 <sup>*2</sup>            | 55.6           | 100-400        | H, V/H, V            | 16.60  |
| 7                                        | 2209.8488          | 1000, AV                    | 3             | < 17                | +29.3                   | 0                                | 46.3 <sup>*3</sup>            | 54.0           | 100-400        | H, V/H, V            | 7.70   |
| 8                                        | 2524.8272          | 1000, AV                    | 3             | < 17                | +30.6                   | 0                                | 47.6 <sup>*3</sup>            | 55.6           | 100-400        | H, V/H, V            | 8.00   |
| 9                                        | 2839.8056          | 1000, AV                    | 3             | < 17                | +31.4                   | 0                                | 48.4 <sup>*3</sup>            | 54.0           | 100-400        | H, V/H, V            | 5.60   |
| 10                                       | 3154.7840          | 1000, AV                    | 3             | < 17                | +31.6                   | 0                                | 48.6 <sup>*3</sup>            | 55.6           | 100-400        | H, V/H, V            | 7.00   |
| 11                                       | 3469.7624          | 1000, AV                    | 3             | < 17                | +32.5                   | 0                                | 49.5 <sup>*3</sup>            | 55.6           | 100-400        | H, V/H, V            | 6.10   |

Remark: <sup>\*1</sup> noise floor noise level of the measuring instrument  $\leq 6.5\text{dB}\mu\text{V}$  @ 3m distance (30 – 1000 MHz)

Remark: <sup>\*2</sup> noise floor noise level of the measuring instrument  $\leq 10\text{dB}\mu\text{V}$  @ 3m distance (1000 – 2000 MHz)

Remark: <sup>\*3</sup> noise floor noise level of the measuring instrument  $\leq 17\text{dB}\mu\text{V}$  @ 3m distance (2000 – 5500 MHz)

| PRODUCT EMISSIONS PEAK DATA 15.205 BANDS |                    |                             |               |                     |                         |                                  |                               |            |                |                      |        |
|------------------------------------------|--------------------|-----------------------------|---------------|---------------------|-------------------------|----------------------------------|-------------------------------|------------|----------------|----------------------|--------|
| No                                       | Emission Frequency | Receiver Mode and Bandwidth | Test Distance | Receiver Reading RA | Correction Factor AF+CF | Distance Extrapolation Factor DF | Result = Connected Reading FS | Spec Limit | Antenna Height | Polarization Eut/Ant | Margin |
|                                          | [MHz]              | [kHz]                       | [m]           | [dBμV]              | [dB(1/m)]               | [dB]                             | [dBμV/m]                      | [dBμV/m]   | [cm]           |                      | [dB]   |
| 1                                        | 30                 | QP, 120                     | 3             | < 6.5               | -2.9                    | 0                                | 3.6* <sup>1</sup>             | 40.0       | 100-400        | V, H/V, H            | 33.4   |
| 2                                        | 88                 | QP, 120                     | 3             | < 6.5               | -11.2                   | 0                                | -4.7* <sup>1</sup>            | 40.0       | 100-400        | V, H/V, H            | 44.7   |
| 3                                        | 216                | QP, 120                     | 3             | < 6.5               | -9.2                    | 0                                | -2.7* <sup>1</sup>            | 43.5       | 100-400        | V, H/V, H            | 46.2   |
| 4                                        | 960                | QP, 120                     | 3             | < 6.5               | 12.6                    | 0                                | 19.1* <sup>1</sup>            | 46.0       | 100-400        | V, H/V, H            | 26.9   |
| 5                                        | 1000               | AV, 1000                    | 3             | < 10                | 29.6                    | 0                                | 39.6* <sup>2</sup>            | 54.0       | 100-400        | V, H/V, H            | 14.4   |
| 6                                        | 1500               | AV, 1000                    | 3             | < 10                | 28.4                    | 0                                | 38.4* <sup>2</sup>            | 54.0       | 100-400        | V, H/V, H            | 15.6   |
| 7                                        | 2000               | AV, 1000                    | 3             | < 10                | 28.8                    | 0                                | 38.8* <sup>2</sup>            | 54.0       | 100-400        | V, H/V, H            | 15.2   |
| In this band no emissions detected       |                    |                             |               |                     |                         |                                  |                               |            |                |                      |        |

Remark: \*<sup>1</sup> noise floor noise level of the measuring instrument  $\leq 6.5\text{dB}\mu\text{V}$  @ 3m distance (30 – 1000 MHz)

Remark: \*<sup>2</sup> noise floor noise level of the measuring instrument  $\leq 10\text{ dB}\mu\text{V}$  @ 3m distance (1000 – 2000 MHz)

Remark: \*<sup>3</sup> noise floor noise level of the measuring instrument  $\leq 17\text{ dB}\mu\text{V}$  @ 3m distance (2000 – 5500 MHz)

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

Test Personnel: Ralf Trepper

Issuance Date: 2003 February 14

## **6 CONDUCTED EMISSIONS TESTS**

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992

### **6.1 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.

### **6.2 Test Equipment**

Not applicable.

### **6.3 Test Procedures**

Not applicable.

### **6.4 Test Results**

Device: Remote Control (RF) for Car Locking / Unlocking Transmitter Model: **Keyless Go Typ 3312 - Vector**

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.**

## **7 PERIODIC OPERATION CHARACTERISTICS**

Test Requirement: FCC CFR47, Part 15C

### **7.1 Periodic Operation**

#### **7.1.1 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.

#### **7.1.2 Result**

Device: Remote Control (RF) for Car Locking / Unlocking

Transmitter Model: **Keyless Go Typ 3312 - Vector**

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

### **7.2 Manually Operated Transmitter Deactivation**

#### **7.2.1 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.

#### **7.2.2 Result**

Device: Remote Control (RF) for Car Locking / Unlocking

**Transmitter Model: Keyless Go Typ 3312 - Vector**

Transmitter ceases immediately after being released.

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

## **7.3 Automatically Operated Transmitter Deactivation**

### **7.3.1 Regulation**

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

### **7.3.2 Result**

Device: Remote Control (RF) for Car Locking / Unlocking

Transmitter Model: **Keyless Go Typ 3312 - Vector**

The EUT does not have automatic transmission.

## **7.4 Prohibition of Periodic Transmission**

### **7.4.1 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.

### **7.4.2 Result**

Device: Remote Control (RF) for Car Locking / Unlocking

Transmitter Model: **Keyless Go Typ 3312 - Vector**

The EUT does not employ periodic transmission.

## **7.5 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.

### **7.5.2 Result**

Device: Remote Control (RF) for Car Locking / Unlocking

Transmitter Model: **Keyless Go Typ 3312 - Vector**

This section is not applicable to the EUT.

## 8 BANDWIDTH

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992 Section 13.1.7

### 8.1 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.

### 8.2 Calculation of 20 dB Bandwidth Limit

The 20 dB bandwidth limit =  $0.0025 * 315 \text{ MHz} = 0.7875 \text{ MHz} = 787.5 \text{ kHz}$

### 8.3 Test Equipment

| Type                              | Manufacturer/<br>Model No.                    | Serial No. | Last Calibration | Next Calibration |
|-----------------------------------|-----------------------------------------------|------------|------------------|------------------|
| Receiver                          | Hewlett Packard<br>Spectrum Analyzer<br>(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<br>(1 GHz - 26.5<br>GHz) | Hewlett Packard<br>Spectrum Analyzer<br>(171) | 3528U00990 | 02/2002          | 02/2004          |
| Antenna                           | 8593 E<br>Schwarzbeck                         |            |                  |                  |

### 8.4 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.( ... )

### 8.5 Test Result

#### 8.5.1 Model : Keyless Go Typ 3312 - Vector

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

The measured 20 dB bandwidth is: ..... **68.0 kHz**

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

Test Personnel: Ralf Trepper

Issuance Date: 2003 February 14

## **9 PHOTOGRAPHS OF THE TEST SETUP**

### **9.1 Radiated Emissions Tests**

#### **9.1.2 Photograph: EUT in vertical polarization on the turntable**



## **9.2 Conducted Emission Tests**

**not applicable**

## **10 MISCELLANEOUS COMMENTS AND NOTES**

**The radio key KEYLESS GO type 3312 Vector is technically identical with the radio key KEYLESS GO type 3312.**

**The difference lies only in the layout and in the modification of some few components.**

## 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     |
| 3         | Occupied Bandwidth Plot                          | 1     |
| 4         | FCC ID Label Sample                              | 2     |
| 5         | Technical Description /Operational Description   | 14    |
| 6         | Test Setup Foto                                  | 1     |
| 7         | Block Diagram                                    | 1     |
| 8         | Schematics                                       | 2     |
|           |                                                  |       |