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EMI TEST REPORT
for
CERTIFICATION to
FCC PART 15.101 & RSS-210

FCC ID: **LXP-VIM236**
Industry Canada ID: **2298A-VIM236**

Test Sample: Porsche Base Station (Receiver)
Model: VIM236
Tested for: Robert Bosch Australia

Report Number: M050852_Cert_Rx

Issue Date: 9th October 2005

NATA Accredited Laboratory Number:
5292

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Report Number: **M050852_Cert_Rx**

Test Sample: Porsche Base Station (Receiver)
Model: VIM236
Manufacturer: Robert Bosch (Australia) Pty Ltd

FCC ID: LXP-VIM236
Industry Canada ID: 2298A-VIM236
Equipment Type: Unintentional Radiator

Tested for: Robert Bosch (Australia) Pty Ltd
Address: Cnr Centre & McNaughton Roads,
Clayton VIC 3168, Australia
Phone: +613 9541 5045
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Responsible Party: Dino Rischitelli

Test Standards: FCC Part 15, Subpart B Section 101

ANSI C63.4 – 2003
OET Bulletin No. 65

RSS-210 Issue 6 - Low Power Licence-exempt RadioCommunication Devices. Clause 7: Receiver Tests and Certification.

Test Dates: 31st August and 1st September 2005

Test Officer: **Jorge Lara**

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*

Authorised Signatory: **Chris Zombolas**
Technical Director
EMC Technologies Pty Ltd

EMI TEST REPORT FOR CERTIFICATION
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1.0 INTRODUCTION

This report details the results of EMI tests and measurements performed on the Porsche Base Station (Receiver), Model VIM236.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart B:	Rules for unintentional radiators (particularly section 15.101)
Section 15.107:	Conducted Emission Limits
Section 15.109:	Radiated Emission Limits

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart B - Section 15.101: Equipment Authorization of unintentional radiators.

The test sample also complied with the Industry Canada RSS-210 issue 6 (Low Power Licence-exempt Radiocommunication Devices (All Frequency Bands)) clause 7: Receiver Tests and Certification.

The Receiver has been previously certified by Robert Bosch Australia under the FCC ID: LXP-VIM236. The intention of this application is to re-certify the Porsche Base Station (Receiver), Model VIM236 as a **Class II Permissive Change.** A Low Noise Amplifier (LNA) was added to the front end of an original Receiver. Refer to Appendix H – Manufacturer's Statement.

The "Porsche Body Computer System" comprises the Remote Key (Transmitter), the Base Station (Receiver) and the Electronic Ignition Switch (Immobiliser). The Remote Key (Transmitter) and the Electronic Ignition Switch (Immobiliser) were certified by Robert Bosch Australia under the FCC ID: LXP-VIM244 and FCC ID: LXP-VIM234 respectively

1.1 Summary of Results

FCC Part 15, Subpart B Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.107	7.4	Conducted Emissions	**Not Applicable**
15.109	7.3	Radiated Emissions	**Complies**

The measurement procedure used was in accordance with ANSI C63.4-2003 and OET Bulletin No. 65. The instrumentation conformed to the requirements of ANSI C63.2-1996.

1.2 Modifications by EMC Technologies

No modifications were required.

2.0 GENERAL INFORMATION
(Information supplied by the Client)

2.1 Product Details
Test Sample: Porsche Base Station (Receiver)
Model: VIM236
FCC ID: LXP-VIM236
Industry Canada ID: 2298A-VIM236
Equipment Type: Unintentional Radiator

2.2 Test Sample Operational Description
The Base Station (Basic Version) is the main component of the Porsche Body Computer System. The Base Station derives its power supply from the vehicle battery.

Porsche Body Computer System comprises of the Base Station in conjunction with the following sub-systems:

- A "Remote Key" device (Electronic Key)
- An EZS (Electronic Ignition Switch)
- An ESCL (Electronic Steering Column Lock)

The Base Station is a Micro-controller based ECU which is responsible for the following functions:

- Remote Keyless Entry (Block 2) - Locking / unlocking the vehicle doors using a "RF Remote Key" device (Electronic Key) which will be carried on the user.
- Engine Immobilisation (Block 6) - Communicates with the EZS (Electronic Ignition Switch) to check if a valid transponder is detected in the key placed in the lock barrel.
- Control of Ignition and Crank Relays - Provides drivers used to activate the relays that are used to control Ignition and Motor Cranking.
- Interface to the Electronic Steering Lock Module (ESCL) (Block 5) - Provides power and communicates with an Electronic Steering Lock Module which is used to lock the steering column.

Refer to Appendix C – Test Sample Block Diagram

2.3 Test sample configuration
The EUT was setup with a simulator and an optical/electrical to simulate the receiver in its normal operating mode.

Refer to Appendix B - Test Setup Photographs.

2.4 Test Sample Block Diagram
Refer to Appendix C – Test Sample Block Diagram

2.5 Test Procedure
Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2003. Radiated emissions tests were performed at a distance of 3 and 10 metres from the EUT. OET Bulletin 65 dated June 2001 was used for reference.

2.6 Test Facility
2.6.1 General
Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated at Lerderderg Gorge, near the township of Bacchus Marsh in Victoria, Australia.

The above sites have been fully described in a report submitted to the FCC office, and accepted in a letter dated June 14, 2002, **FCC Registration Number 90560**.
EMC Technologies open area test site (OATS) has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS-212, Issue 1 (Provisional). **Industry Canada File Number IC 4161.**

2.6.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

"FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E)."

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of emissions, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Laboratory (NML) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A^2LA).

2.7 Units of Measurements (Radiated Emissions)

Measurements are reported in units of dB relative to one microvolt per metre (dBμV/m).

2.8 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Laboratory (NML). All equipment calibration is traceable to Australia national standards at the National Measurements Laboratory. The reference antenna calibration was performed by NML and the working antennas (biconical, log-periodic and horn) were calibrated by the NATA approved procedures. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in Appendix A.

2.9 Ambients at OATS

The Open Area Test Site (OATS) is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.

3.0 CONDUCTED EMISSION MEASUREMENTS

Not applicable, EUT is battery powered.

4.0 RADIATED EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15 Subpart B.

Radiated emission measurements were performed to the limits as per section 15.109. The measurements were made at the open area test site at a distance of 3 meters (above 1 GHz) and 10 metres (below 1 GHz).

The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the PC Controller through the IEEE.488 Interface Bus Card Adaptor. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. A calibrated Biconical antenna was used for measurements between 30 MHz to 232 MHz and a calibrated Logperiodic antenna used for measurements between 230 MHz to 1000 MHz. Calibrated EMCO 3115 Horn antenna was used for measurements between 1 GHz to 2 GHz.

The measurement of emissions between 30 - 1000 MHz was measured with the resolution bandwidth of 120 kHz and the video bandwidth of 300 kHz.

The measurement of emissions above 1000 MHz was made using an average detector with a bandwidth of 1.0 MHz.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. Each significant peak was then investigated and maximised with the Quasi-Peak detector. The measurement data for each frequency range was automatically corrected by the software for cable losses, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisations.

4.2 Plotting of Measurement Data for Radiated Emissions

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges over the range 30-1000 MHz. The accumulated EMI (EUT ON) was plotted as the Red trace while the Ambient signals (AMBIENT) were plotted as Green trace. The worst case radiated EMI *peak* measurements as recorded using the Max-Hold data are presented as the upper or **RED** trace while the respective ambient signals are presented as the lower or **GREEN** trace. Occasionally, an intermittent ambient arose during the EUT ON measurement (RED trace) and could not be captured when the Ambient trace was being stored. The ambient peaks of significant amplitude with respect to the limit are tagged with the "**#**" symbol while EMI peaks are identified with a numeral. Ambient peaks that were present during the EUT ON measurement (RED trace) and not captured during the AMBIENT measurement were also tagged with the "#" symbol.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. For radiated EMI, each numbered peak is listed as a frequency, peak field strength, quasi-peak field strength and the margin relative to the limit in dB. A negative margin is the deviation of the recorded value below the limit.

At times, the quasi peak level may appear to be higher than the peak level. This happens because the individual peak is further maximised with the QP detector, after the peak trace is recorded. This will be apparent when the peaks list at the foot of the graphs shows the quasi peak level.

4.3 Calculation of Peak and Average Field Strength

The peak field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

E = V + AF - G + L

Where:

E	=	Radiated Peak Field Strength in dBμV/m.
V	=	EMI Receiver Voltage in dBμV. (measured value)
AF	=	Antenna Factor in dB(m^{-1}). (stored as a data array)
G	=	Preamplifier Gain in dB. (stored as a data array)
L	=	Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

- **Example Peak Field Strength Calculation**

Assuming a receiver reading of 34.0 dBμV is obtained at 90 MHz, the Antenna Factor at that frequency is 9.2 dB. The cable loss is 1.9 dB while the preamplifier gain is 20 dB. The resulting Field Strength is therefore as follows:

34.0 + 9.2 + 1.9 - 20 = 25.1 dBμV/m

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 MHz to 1000 MHz) ± 3.7 dB
  (1000 MHz to 18,000 MHz) ± 4.1 dB

4.4 Results - 30 to 2000 MHz

The worst case radiated emission occurred at 135.4 MHz and complied with the FCC class B limits by a margin of 12.4 dB. Refer to Appendix G, graphs 1 to 4.

5.0 COMPLIANCE STATEMENT

The Porsche Base Station (Receiver), Model VIM236 tested on behalf of Robert Bosch (Australia) Pty Ltd, **complies** with the requirements of 47 CFR, Part 15 Subpart B - Rules for Radio Frequency Devices (unintentional radiators), Section 15.101 – Equipment Authorization of unintentional radiators

The test sample also complies with the Industry Canada RSS-210 issue 6 - Low Power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment, clause 7: Receiver Tests and Certification.

Results were as follows:

FCC Part 15, Subpart B Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.107	7.4	Conducted Emissions	**Not Applicable**
15.109	7.3	Radiated Emissions	**Complies**

TEST REPORT APPENDICES

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS

APPENDIX B: TEST SAMPLE PHOTOGRAPHS

APPENDIX C: TEST SAMPLE BLOCK DIAGRAM

APPENDIX D: TEST SAMPLE SCHEMATIC

APPENDIX E: TEST SAMPLE PCB LAYOUT

APPENDIX F: FCC ID LABELLING

APPENDIX G: GRAPHS of EMI MEASUREMENTS

APPENDIX H: MANUFACTURER'S STATEMENT