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EMI TEST REPORT
for
CERTIFICATION
of
TRANSCEIVER
to
FCC PART 15.249

Manufacturer: CHK Wireless Technologies Australia Pty Ltd
Test Sample: Conductor Mounted Sensor
Model: LT40-CMS-916
Serial No: 01045016

FCC ID: P3D LT40-CMS-916

Date: 7 January 2002

EMI TEST REPORT FOR CERTIFICATION
Of
TRANSCEIVER
To
FCC Part 15.249

CERTIFICATION OF COMPLIANCE WITH FCC PART 15 REGULATIONS

EMC Technologies Report No. T11129A

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EMI TEST REPORT FOR CERTIFICATION OF FCC PART 15.249 TRANSCEIVER

Report No.	:	T11129A
Tested For	:	CHK Wireless Technologies Australia Pty Ltd
Phone	:	+61 2 9874 3899
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Responsible Party	:	Peter Wyatt
Manufacturer	:	CHK Wireless Technologies Australia Pty Ltd 31 Hope St Ermington NSW 2115 Australia
Test Sample	:	Conductor Mounted Sensor
Model	:	LT40-CMS-916
Serial Number	:	01045016
FCC ID	:	P3D LT40-CMS-916
Equipment Type	:	Intentional Radiator, Low Power Transceiver
Test Standards	:	FCC Part 15 Section 249 Intentional Radiators ANSI C63.4-1992 OET Bulletin No.63, October 1993
Test Date/s	:	27th November 2001, 28th November 2001
Test Officer/s	:	Sebastian Beier, Bruce Holdsworth

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.*

Les Dickenson
Sydney Manager
EMC Technologies Pty Ltd.

EMI TEST REPORT FOR CERTIFICATION to FCC PART 15.249 on the LT40-CMS-916 Conductor Mounted Sensor

1. INTRODUCTION

This report details the results of EMI test and measurements performed on the conductor mounted sensor, Model: LT40-CMS-916, in accordance with the Federal Communications Commission (FCC) regulations as detailed in Title 47 CFR, FCC Part 15 Rules for intentional radiators. The test sample was found to comply with the requirements for fundamental frequencies and spurious emissions of section 15.249.

1.1 Summary of Test Results

Transmitter Fundamental Frequency: 916.28MHz, Complied with a margin of 2.4dB.*

Transmitter Spurious and Harmonics: Complies with a margin of greater than 9.0dB.

Receiver Spurious: Complies with a margin of greater than 10dB.

* This result falls within the laboratory's measurement uncertainty.

The measurement procedure used was in accordance with ANSI C63.4 1992 and OET Bulletin No. 63. The instrumentation conformed to the requirements of ANSI C63.2-1987.

1.2 Modifications

No modifications were required to ensure compliance with this standard.

2. GENERAL INFORMATION

2.1 Product Specifications

The Equipment Under Test (EUT) was identified as follows:

Manufacturer	:	CHK Engineering Australia Pty Ltd
Test Sample	:	Conductor Mounted Sensor
Model	:	LT40-CMS-916
Serial No	:	01045016
FCC ID	:	P3D LT40-CMS-916
Power Supply	:	2V rechargeable sealed lead acid battery
Centre Frequency	:	916.48MHz
Transmit Power	:	-5dBm (maximum), -6dBm (nominal)
Modulation	:	FM
Baud Rate	:	19200 bits per second (Manchester encoded data)
Antenna Type	:	¼ wave monopole antenna. *1
Antenna Gain	:	2dBi
Enclosure	:	Diecast aluminium

1 – Note, the antenna is not permanently attached. The antenna is attached to the device via an SMA connector. The antenna is only to be installed by professionals as the device is a pole conductor transmitter used by utility companies. Refer to Appendix F–Antenna Specifications and Appendix G-Users manual.

2.2 Product Description

The LT40 Conductor Mounted Sensors are mounted on each phase of a high voltage overhead conductor and they directly measure current and voltage. Any abnormalities (events) sensed are time-stamped and recorded. Each LT40 CMS can also be configured to calculate and store time-averaged load current. The event and load information can then be transmitted via local radio to the pole-attached collator (LT40PAC), which analyses the related phases as a system.

2.3 EUT Operating Conditions

Each LT40CMS communicates using local low-power RF communication. This communication system is half duplex 916.48 MHz FSK and allows data to be written to and read from any device without uninstalling or physical contact. In order to reduce battery power consumption of LT40s, the internal RF Transceivers are powered OFF for the majority of time. The receiver typically polls for only 50 ms every second. This polling interval may also be altered under user control for specific applications, but will be reset whenever the unit is reset.

2.4 EUT Configurations

During testing of the transmitter, the LT40CMS was set up to transmit continuously. During testing of the receiver, the LT40CMS was set up to receive continuously. A new fully charged battery was used during testing.

2.5 Test Procedure

Radiated Emissions measurements were performed in accordance with the procedures of ANSI C63.4-1992. Radiated emissions tests were were performed at an EUT distance of 3 metres. OET Bulletin 63 dated October 1993 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 in Upper Colo NSW, Australia.
Conducted emission measurements were performed in EMC Technologies shielded test chamber measuring 7.25m X 4.83m X 2.45m.

The FCC Registration number is 90561, dated 1st December 1999.

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).
CISPR 22, CISPR 11, CISPR 13, CISPR 14, CISPR 15, CISPR 12, MIL-STD-285 and MIL-STD 461/2.

NATA is the Australian national laboratory accreditation agency operating 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 NVLAP and A2LA.

2.7 Units of Measurements

2.7.1 Conducted Emissions

Conducted emissions measurements are not applicable as the unit is powered by batteries with the batteries being charged via a solar cell attached to the EUT.

2.7.2 Radiated Emissions

Measurements are reported in units of dB relative to one microvolt per metre (dBμV/m) at a distance of 3 metres from the EUT.

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 Hewlett-Packard Australia Limited. All equipment calibration is traceable to Australian national standards at the National Measurements Laboratory (NML). The reference antenna calibration was performed by NML and the working antennas (biconical and log-periodic) calibrated by the direct comparison method. The complete list of test equipment used for the measurements, including calibration dates and traceability, is contained in Appendix A of this report.

2.9 Ambients at OATS

The OATS site 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.

3. TEST CONFIGURATION

The Eut was tested in transmit only and receive only modes. Refer to Appendix B for photographs of the tested system.

4. CONDUCTED EMISSION MEASUREMENTS

Conducted EMI Tests were not applicable as the transmitter is battery powered.

5. RADIATED EMISSION MEASUREMENTS – 30MHz to 10GHz

5.1 Test Procedure

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 and 3 of this report. The Spectrum Analyser (EMI Receiver configuration) was operated under software control via the Portable PC Controller through the IEEE.488 Interface Bus Card Adaptor. The 30 MHz to 10 GHz 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. The EUT was slowly rotated with the Peak Detector set to Max-Hold. Each significant peak was then investigated and maximized by rotating the EUT and scanning the height of the measurement antenna between 1 and 4 metres. For measurements between 30MHz and 1GHz, measurements of each of the peaks was made with the Quasi-Peak detector. For measurements above 1GHz, the Average Detector was used. 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 polarity.

5.2 Plotting of Measurement Data for Radiated Emissions

5.2.1 Quasi Peak Plots in the Range 30-1000MHz

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 worst case radiated EMI *peak* measurements (as recorded using the Max-Hold data) are presented as a **RED** trace, the ambient peaks of significant amplitude with respect to the limit are tagged with the "**#**" symbol while EMI peaks are identified with a numeral.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. Peaks that were greater than 20 dB below the limit were not measured. For each numbered peak the frequency, peak field strength, Quasi-peak field strength, and the margin relative to the limit in dB is listed. A negative margin is the level below the limit.

5.2.2 Average Plots in the Range 1GHz to 10GHz

The stored measurement data was combined to form a single graph which comprised of all the frequency sub-ranges over the range 1GHz to 10GHz. The radiated EMI *average* measurements are presented as a **RED** trace.

The highest recorded EMI signals are shown on the Peaks List on the bottom right side of the graph. Peaks that were greater than 10 dB below the limit were not measured. For each numbered peak the frequency, average field strength and the margin relative to the limit in dB is listed. A negative margin is the level below the limit.

5.3 Calculation of Field Strength

The 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 Field Strength in dBµV/m.
- **V** = EMI Receiver Voltage in dBµV. (measured value)
- **AF** = Antenna Factor in dB/m (stored as a data array)
- **G** = Preamplifier Gain in dB. (stored as a data array)
- **L** = Cable insertion loss in dB. (stored as a data array)

5.4 Radiated EMI Results

5.4.1 30-1000MHz Results

Frequency (MHz)	Polarisation	Quasi Peak (dBμV/m)	Limit @ 3m (dBμV/m)	ΔLimit (dB)
916.48	Vertical	91.6	94	-2.4
902.10	Vertical	37.0	46	-9.0

All measured frequencies were at least 2.4dB below the 15.249 limit.

The measurement uncertainty for radiated emissions is ±4.6 dB.

Appendix C, Graphs 1 to 5.

5.4.2 1GHz – 10GHz Results

All measured frequencies were greater than 10dB below the 15.249 limit.

The measurement uncertainty for radiated emissions is ±4.6 dB.

See Appendix C, Graphs 6 and 7.

5.5 Results of Radiated Emission Measurement

The EUT complied with the limits of FCC Rule Part 15.249.

6. CONCLUSION

The LT40-CMS-916, tested on behalf of CHK Engineering Australia Pty Ltd, complied with the radiated and conducted EMI requirements of the FCC Part 15.249 Rule for intentional radiators.

Transmitter Fundamental:	Complied with a worst case margin of 2.4dB.
Transmitter Spurious and Harmonics :	Complied with a margin of greater than 9.0dB.
Receiver Spurious :	Complied with a margin of greater than 10dB.