

CASS
Industries
Limited

EMC TEST REPORT

for

LED VEHICLE MESSAGE BOARD

to

EC DIRECTIVE 89/336/EEC

BS EN 61000-6-3 :2001
EMISSIONS STANDARD
RESIDENTIAL, COMMERCIAL AND LIGHT INDUSTRY

BS EN 61000-6-1 :2001
IMMUNITY STANDARD
RESIDENTIAL, COMMERCIAL AND LIGHT INDUSTRY

CASS INDUSTRIES REPORT NO. CI02709
TEST DATE : 23rd January 2006

Prepared for:

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INDEX

Introduction

Emissions Test - Radiated Field

Immunity Test - Radiated Field

Immunity Test - Electrostatic Discharge

TESTS WERE CARRIED OUT IN THE ORDER LISTED ABOVE

Result of Testing

Calibration

INTRODUCTION

The LED VEHICLE MESSAGE BOARD was tested to assess conformity to the EMC Directive 89/336/EEC.

The unit tested was a battery powered LED display module used as a display message system for vehicles.

Several messages can be selected via a remote infrared handset.

The Equipment Under Test (EUT) was tested as a system comprising the LED display module and the remote handset.

Emissions were recorded with the unit (display unit and handset) operating in the various display modes.

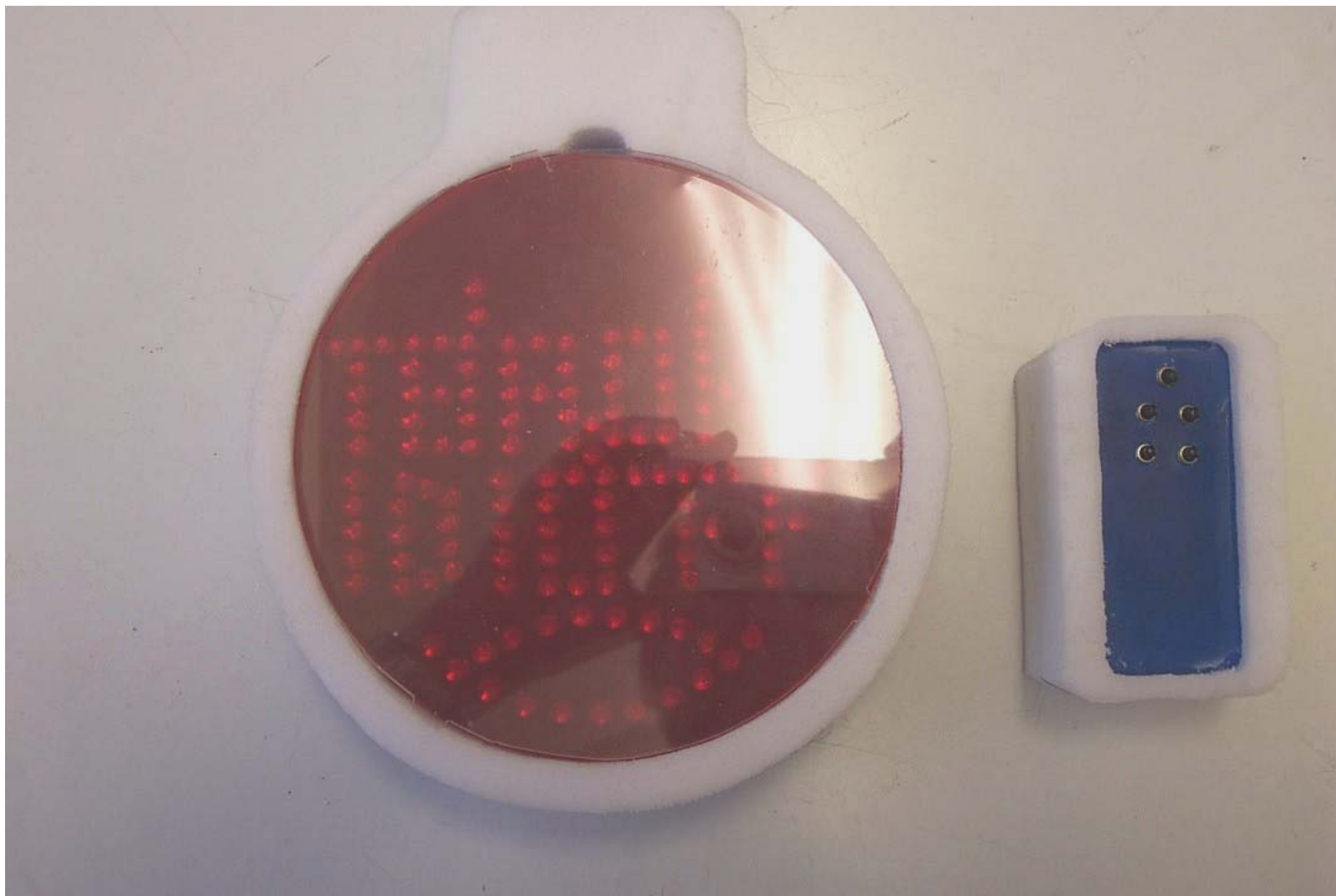
Immunity testing was carried out with the unit operating with one of the display modes being continually activated via the infrared handset.

The handset was activated remotely by a pneumatic switching system.

Performance criteria for the tests were set as being;

Criterion A – No change in the selected display mode permitted.

Criterion B – No permanent change in the selected display mode permitted.



CI02709

EMISSIONS TEST - RADIATED

EQUIPMENT USED

G - CELL

ROHDE & SCHWARZ FSU SIGNAL ANALYSER

PENTAGRAM PTS 7100A EMC PRESELECTOR

SCHAFFNER COMPLIANCE 3 SOFTWARE

METHOD of MEASUREMENT

As per EN 55022.

The Equipment Under Test (EUT) was checked for radiated emissions over a frequency range of 30 - 1000 MHz with the Analyser set for a resolution bandwidth of 120kHz.

The limits used (calibrated for a 10 metre OATS) being

30dB(μ V/m) for 30 - 230MHz

37dB(μ V/m) for 230 - 1000MHz

The frequency range was scanned over 4 ranges, giving an overall scan time of 90 seconds and the level of the emissions recorded using the SCHAFFNER COMPLIANCE 3 software.

A "Blank" was first run, with the EUT in the cell but with no power applied.

The EUT was tested operating in the display mode.

Emissions were recorded for both the vertical and horizontal orientations of the EUT with respect to the axis of the cell.

TEST RESULTS

Graphs are included for;

Graph 1 - The EUT in the cell but with no power applied, any emissions recorded being due to background noise within the cell.

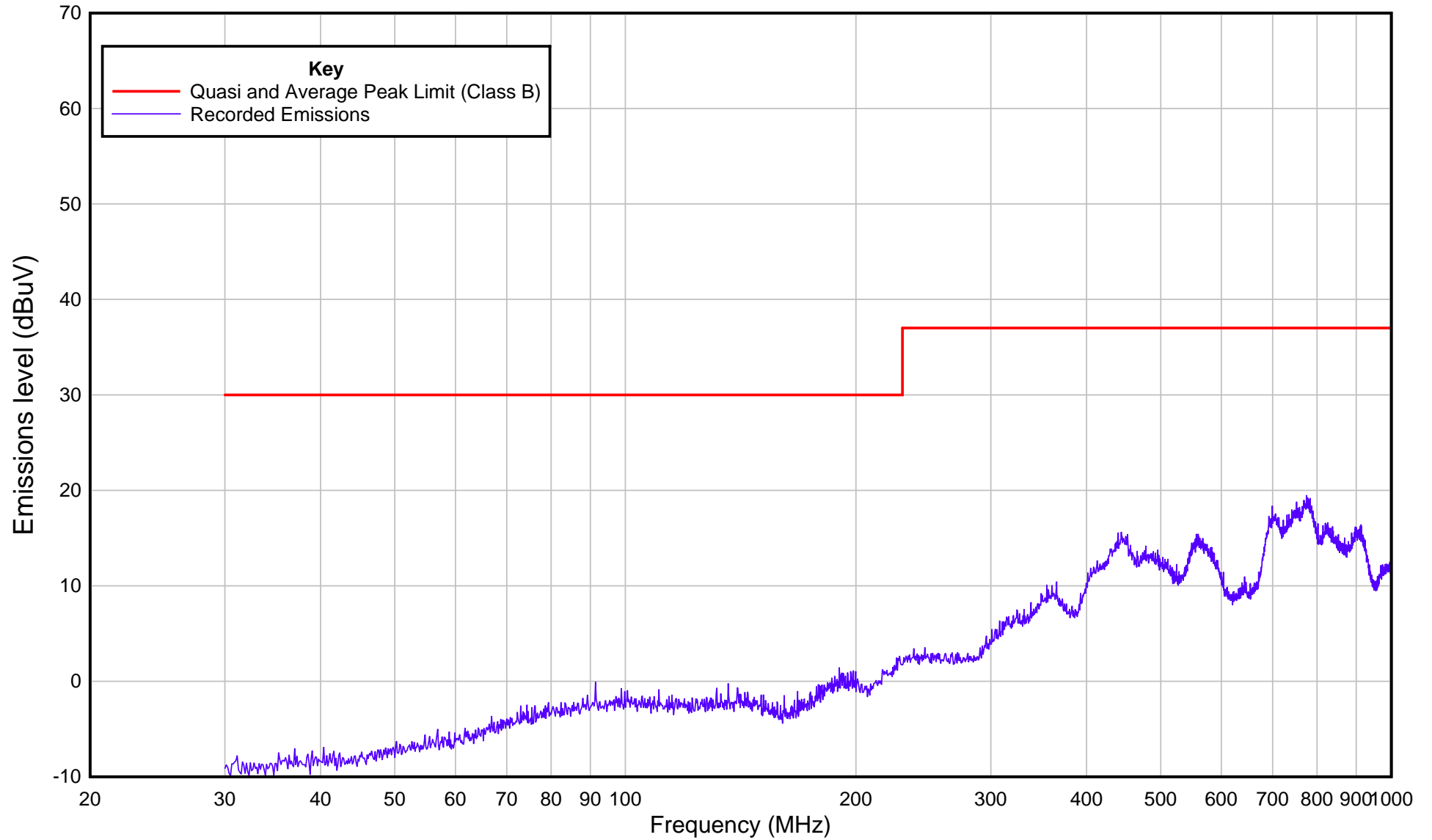
Graph 2 - The EUT in the cell, powered on and working in the 'display mode' a comparison with Graph 1 giving the emissions due to the EUT.

All emissions recorded were within the limits set by the Standard.

Radiated Emissions

EM02709 Graph 1

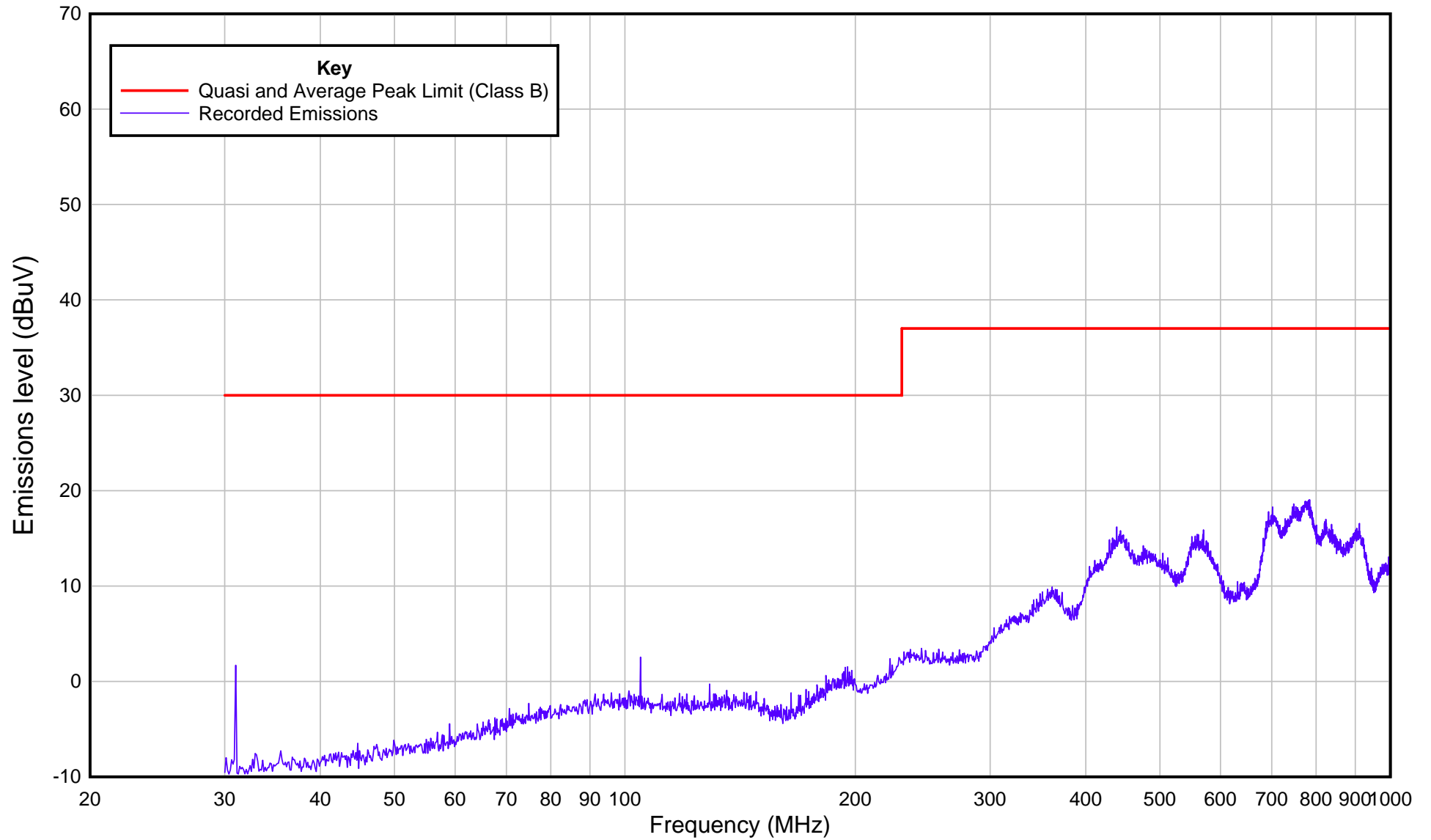
Background Scan

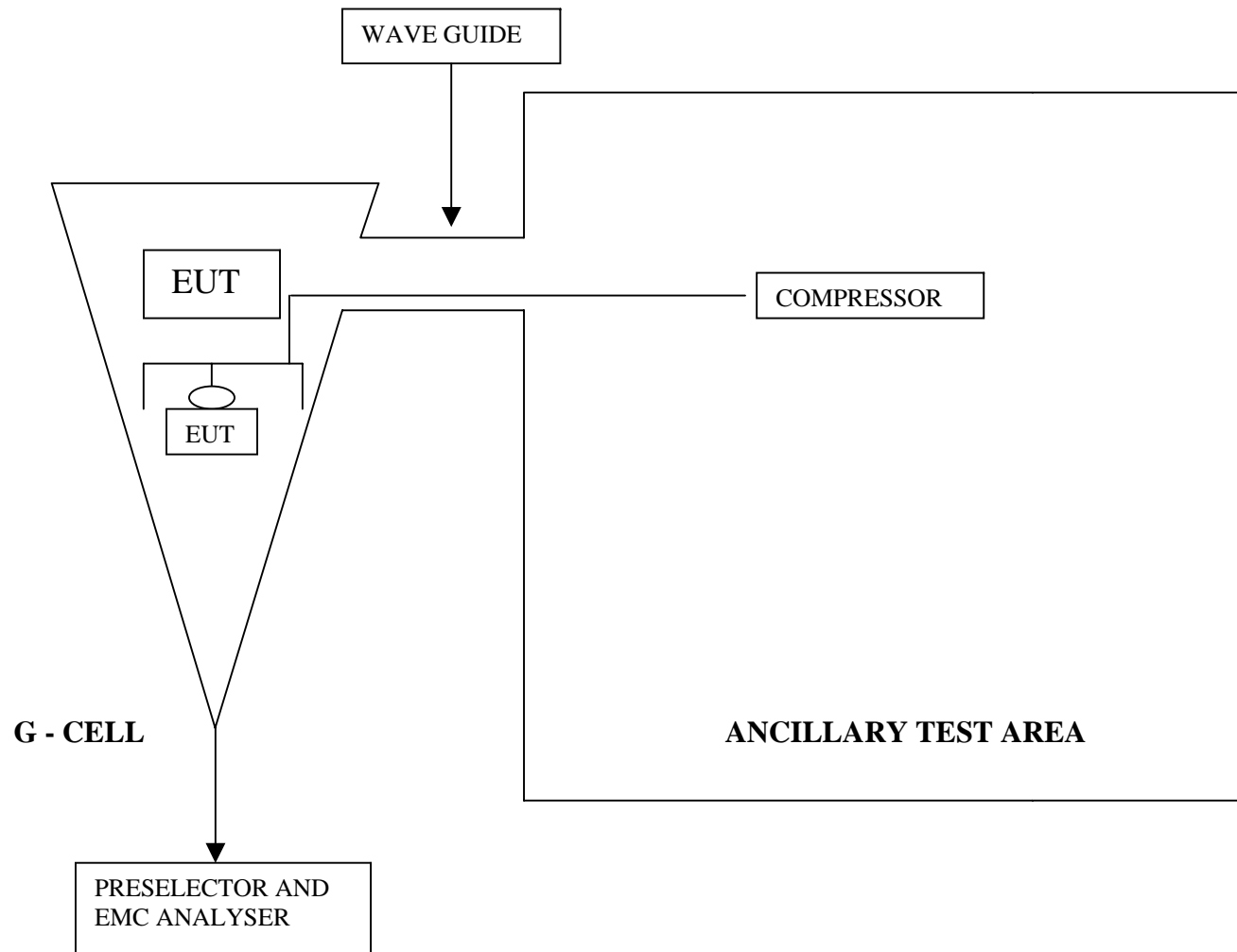


Radiated Emissions

EM02709 Graph 2

Operating Mode





RADIATED EMISSIONS TEST SET-UP

IMMUNITY TEST - ENCLOSURE (RADIATED)

EQUIPMENT USED

G - CELL

ROHDE & SCHWARZ SM300 SIGNAL GENERATOR 9kHz - 3GHz

AMPLIFIER RESEARCH 10W 1000A

WANDEL & GOLTERMANN EMR-20 FIELD PROBE

PIERCE EMCYCLE SOFTWARE

TEST METHOD

As per EN 61000-4-3.

A Criterion A response was set for the test.

The Equipment Under Test (EUT) was subjected to a field strength of at least 3V/m for a frequency range of 80MHz - 1000MHz, the frequency change being logarithmic, $\Delta f = 0.5\%$, with a dwell time of 3 seconds amplitude modulation of 80% (1kHz).

The test specifications were as per Table 4 EN61000-6-1.

The EUT was tested operating in the display mode.

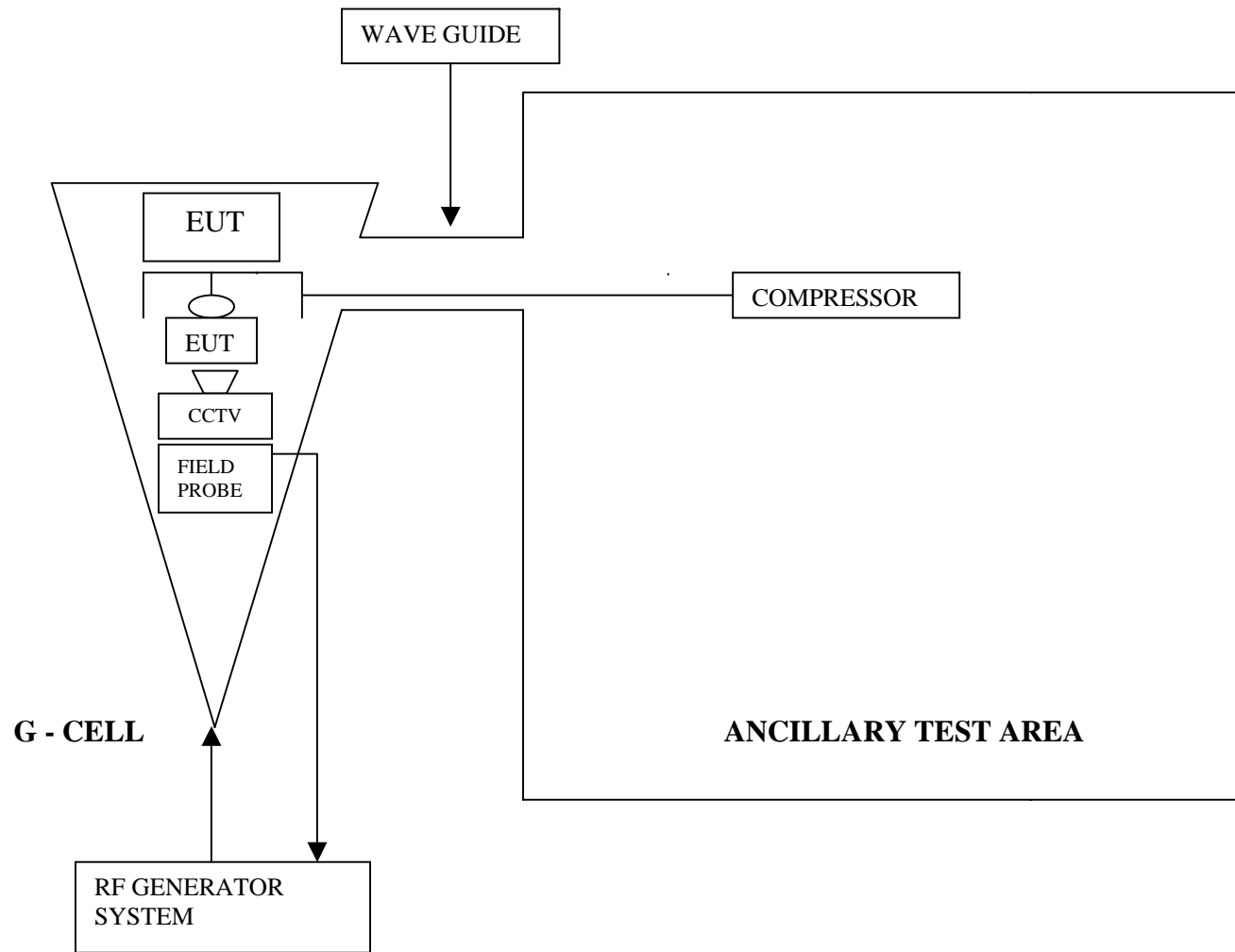
The operation of the EUT was monitored continuously, via the LED display (using a CCTV camera system) to ensure that there was no change in the display mode due to the applied radio frequency (RF) fields.

Testing was carried out twice, with the EUT in the axis of the cell and at 45° to the vertical and horizontal axis of the cell.

TEST RESULTS

At no time while testing was carried out was any change of the set display mode observed.

The EUT was tested to be operating correctly after completion of the tests.



RADIATED RF IMMUNITY TEST SET-UP

IMMUNITY TEST - ELECTROSTATIC DISCHARGE

EQUIPMENT USED

SCHAFFNER NSG432 DISCHARGE SIMULATOR

TEST METHOD

As per BS EN 61000-4-2.

A Criterion B response was set for the test.

The Equipment Under Test (EUT) was placed on an insulated sheet on a stainless steel Horizontal Coupling Plane (HCP), 800mm above a reference ground plane and 100mm away from a Vertical Coupling Plane (VCP) and subjected to discharges of $\pm 4\text{kV}$.

These contact discharges being between the high voltage probe and the coupling planes as close as possible to the EUT and to accessible conductive points on the EUT. $\pm 8\text{kV}$ air discharges were carried out to insulating surfaces on the EUT.

10 discharges were made at each test point.

The EUT was tested operating in the display mode.

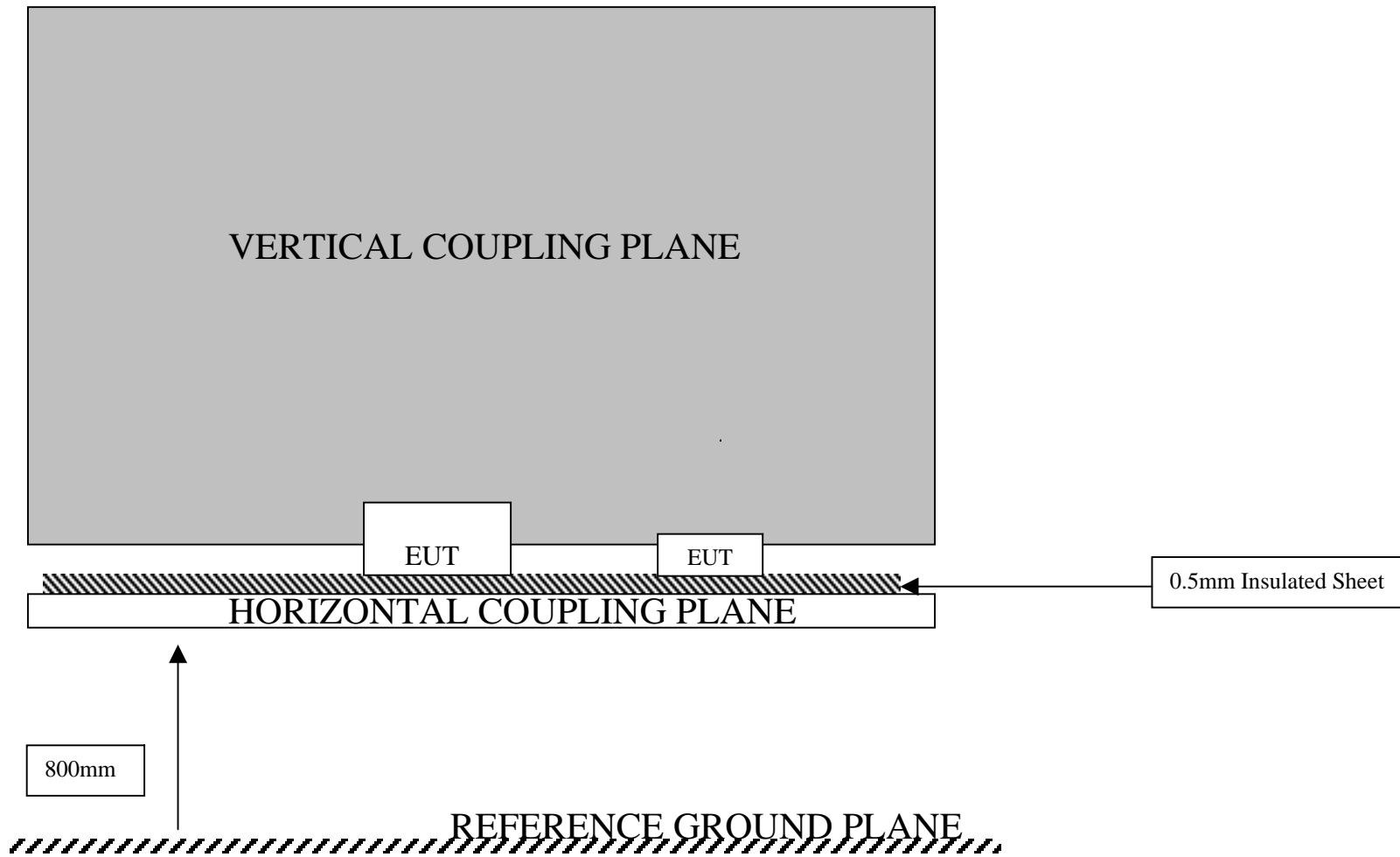
The operation of the EUT was monitored continuously, via the LED display, to ensure that there was no change in the display mode due to the applied disturbances.

TEST RESULTS

NUMBER	VOLTAGE	POSITION	RESULT
1	+4kV Contact	HCP, close to and symmetrically about the EUT	PASS
2	-4kV Contact	HCP, close to and symmetrically about the EUT	PASS
3	+4kV Contact	VCP, centre of one vertical edge	PASS
4	-4kV Contact	VCP, centre of one vertical edge	PASS
9	+8kV Air	Insulated enclosure of EUT	PASS
10	-8kV Air	Insulated enclosure of EUT	PASS

At no time while testing was carried out was any change of the set display mode observed.

The EUT was tested to be operating correctly upon completion of the tests.



ELECTROSTATIC DISCHARGE SET-UP

RESULT OF TESTING

The LED VEHICLE MESSAGE BOARD has met the performance criteria set by;

BS EN 61000-6-3
for
Generated Emissions Radiated

BS EN 61000-6-1
for
Immunity to Radiated Electromagnetic Fields
Immunity to Electrostatic Discharge

REPORT APPROVED BY:

A handwritten signature in black ink, appearing to read 'S. M. Austin', with a stylized flourish at the end.

17th February 2006

S. M. Austin
for
CASS Industries Limited

COMMENTS:

1. All emissions recorded were “worst case” for orientation.
2. All testing included the infra red hand set.

EQUIPMENT CALIBRATION

MANUFACTURER	EQUIPMENT	SERIAL #	CALIBRATED	DUE
AGILENT (HEWLETT PACKARD)	8648A Synthesised Signal Generator	3416U00106	24/08/04	24/08/06
AGILENT (HEWLETT PACKARD)	11947A Transient Limiter	3107A01467	14/09/05	14/09/06
AVO	RM215 Breakdown Leakage and Ionisation Tester	339	20/04/04	20/04/05
CASS INDUSTRIES	G - CELL - Amplitude Calibration		06/12/05	18/12/06
CASS INDUSTRIES	ICON RF current probe	010	25/04/04	25/04/06
EMCO	Line Impedance Stabilisation Network 38/10/2	9507-1090	14/09/05	14/09/06
KIKUSUI	TOS8650 Voltage Withstand Tester	1040061	22/09/05	22/09/06
LAPLACE INSTRUMENTS	Emissions Reference Source	1190	06/10/05	06/10/07
LAPLACE INSTRUMENTS	AC2000 Harmonics & Flicker Analyser	1349739	02/12/02	02/12/04
MECMESIN	Compact gauge 200N	99SER0166-02	19/02/05	19/01/06
MEGGER	PAT 2/2 Portable Appliance Tester	1007 0495	22/09/05	22/09/06
PENTAGRAM	PTS 7100A-Preselector	MA 4401	14/09/05	14/09/06
PHILLIPS	PM 2521 Bench Multimeter	DY 01 2937	04/02/05	04/02/06
ROHDE & SCHWARZ	SM300 Signal Generator	10057	18/12/04	18/12/06
ROHDE & SCHWARZ	FSU3 Spectrum Analyser	100022	19/10/05	19/10/06
SCHAFFNER	NSG 432 ESD Simulator	1310	26/09/05	26/09/06
SCHAFFNER	PNW2050 Surge plug-in	200430-543LU	26/09/05	26/09/06
SCHAFFNER	PNW2003 PQT Voltage Dip Generator	200209-019SC	26/09/05	26/09/06
SCHAFFNER	PNW2225 FTB plug-in	200448-528LU	26/09/05	26/09/06
TEKTRONIX	TDS 360 Oscilloscope	B010180	20/09/05	20/09/06
THURLBY THANDAR	TG215 Function Generator	150700	20/09/05	20/09/06
WANDEL & GOLTERMAN	EMR-20 Field Probe	L-0093	02/09/04	02/09/06
WEST	2300 Digital Thermometer	NSN	22/09/05	22/09/06