TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Dynex Semiconductors Ltd
DA5823 Transceiver

To: FCC Part 15 Subpart C
(Intentional Radiators)
Section 15.245

Test Report Serial No:
RFI/MPTB1/RP43607JD01A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By:**  **pp**
Tested By: 	**Release Version No:** **PDF01**
Issue Date: 22 August 2002	**Test Date: 04 July 2002**

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields. Furthermore, the date of creation must match the issue date stated above.

This report may be copied in full.

The results in this report apply only to the sample(s) tested.

This page has been left intentionally blank.

Test Of: Dynex Semiconductors Ltd
DA5823 Transceiver
To: FCC Part 15 Subpart C (Intentional Radiators)
Section 15.245

Table of Contents

1. Client Information

Company Name:	Dynex Semiconductor Ltd
Address:	Doddington Road Lincoln Lincolnshire LN6 3LF
Contact Name:	Mr G Dobson

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Dynex Semiconductor
Model Name or Number:	DA5823
Unique Type Identification:	032
Serial Number:	DA5823-032-022612-00190
Country of Manufacture:	United Kingdom
FCC ID Number:	MAYDA5823
Date of Receipt:	04 July 2002

2.2. Description Of EUT

The equipment under test is a Dynex Semiconductor Movement Sensor, it is a volumetric microwave Doppler radar sensor that operates at 2.45 GHz in the ISM band. The unit is intended for security/alarm applications such as the protection of the interior of a vehicle against any unauthorised entry or other domestic security alarm systems. The DA5823 is an OEM product and is designed for automotive applications.

The device consists of an autodyne radar, based on a ceramic resonator stabilised transistor oscillator and balanced mixer, coupled to a patch antenna. The Doppler output from the mixer is fed to a microcontroller for signal processing, where an alarm output is generated when unusual movement has been detected. An alarm condition is signalled by the output of a single logic bit of approximately 1 second duration.

The microcontroller also controls duty cycling of the RF power and the setting of the analogue gain of the unit. The sensors analogue gain is determined by Dynex Semiconductor although the sensors' detection range can be varied electronically for different applications so long as the control unit supports the programming protocol.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from the Model Name or Unique Type Identification number stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement:	DC Supply of 12 Volts
Intended Operating Environment:	Vehicle Interior
Weight:	0.06 kg
Dimensions:	82.1 x 71.8 x 18.6 mm
Interface Ports:	5 Pin Socket incorporating +12v, Ground and programming pins.

2.5. Support Equipment

No support equipment was used to exercise the EUT during testing.

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 15: 2001 Subpart C (Intentional Radiators) Section 15.245
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Digital Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complies with the requirements of the specification to achieve the relevant approval.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1996)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1998)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1 (1999)
Title: Specification for radio disturbance and immunity measuring apparatus and methods. Part 1. Radio disturbance and immunity measuring apparatus.

3.3. Definition Of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations From The Test Specification

None

5. Operation Of The EUT During Testing

5.1. Operating Conditions

The EUT was tested in normal operating conditions.

5.2. Operating Modes

The EUT was operated in its normal duplex-operating mode.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Connected to an external 12v DC supply.

6. Summary Of Test Results

6.1. Radiated Emissions

Range Of Measurements	Specification Reference	Compliancy Status
Electric Field Strength, Fundamental Emission	Section 15.245 of C.F.R. 47	Complied
Electric Field Strength of Spurious Emissions, 30 MHz to 1000 MHz	Section 15.245 of C.F.R. 47	Complied
Electric Field Strength of Spurious Emissions, 1000 MHz to 26500 MHz	Section 15.245 of C.F.R. 47	Complied
Electric Field Strength, Band Edges	Section 15.245 of C.F.R. 47	Complied

6.2. Location Of Tests

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd., Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ.

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only. Details of the test methods and procedures can be found in Appendix 2 of this report.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 8 for details of measurement uncertainties.

7.2. Radiated Emissions

7.2.1. Electric Field Strength Measurements: Fundamental Emission

7.2.1.1. The client has stated that the transmitter frequency for the EUT was 2.45 GHz.

7.2.1.2. The following table lists the measurement of the fundamental emission in the worse case antenna polarisation, using an average detector function (results incorporate antenna factors and cable losses):

Frequency (GHz)	Ant. Pol.	Av. Level (dBμV/m)	Av. Limit (dBμV/m)	Margin (dB)	Result
2.447	Vert.	46.7	114	66.8	Complied

7.2.2. Electric Field Strength Measurements (1000 to 26500 MHz)

7.2.2.1. The client has stated that the highest clock frequency for the EUT was 2450 MHz. Therefore tests were performed up to 26500 MHz.

7.2.2.2. Radiated spurious emission limits shown in section 15.245 (b) state that spurious emissions shall not exceed a level of 50dB below the fundamental carrier limit, or the limit specified in section 15.209, whichever is the higher limit. If the frequency of the spurious emission is located in one of the Restricted Bands of operation stated in section 15.205, then the level of emissions shall not exceed the limit specified in section 15.209.

7.2.2.3. The following table lists frequencies at which emissions were measured using an Average and Peak detector function.

Average Levels

Frequency (GHz)	Antenna Polarity (H/V)	Average Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
4.894	Vert.	18.1	22.9	1.2	42.2	54.0	11.8	Complied
7.342	Vert.	14.4	25.4	1.5	41.3	54.0	12.7	Complied
9.789	Vert.	5.3	28.7	1.7	35.7	54.0	18.3	Complied
12.237	Vert.	2.9	31.4	2.2	36.5	54.0	17.5	Complied
14.684	Vert.	5.0	31.4	2.2	38.6	54.0	15.4	Complied
17.132	Vert.	3.3	34.3	2.7	40.3	54.0	13.7	Complied

Peak Levels

Frequency (GHz)	Antenna Polarity (H/V)	Peak Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
4.894	Vert.	35.0	22.9	1.2	59.1	74.0	14.9	Complied
7.342	Vert.	31.4	25.4	1.5	58.3	74.0	15.7	Complied
9.789	Vert.	20.6	28.7	1.7	51.0	74.0	23.0	Complied
12.237	Vert.	18.3	31.4	2.2	51.9	74.0	22.1	Complied
14.684	Vert.	17.6	31.4	2.2	51.2	74.0	22.8	Complied
17.132	Vert.	15.7	34.3	2.7	52.7	74.0	21.3	Complied

7.2.3. Electric Field Strength Measurements: (Emissions at Band Edges):

7.2.3.1.The EUT and spectrum analyser was configured as for radiated emission measurements

7.2.3.2. The following table lists the field strength at the emissions at the band edges for the device under test.

Average Levels

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.435	Vert.	15.3	19.7	0.8	35.8	54.0	18.2	Complied
2.465	Vert.	16.2	19.7	0.8	36.7	54.0	17.3	Complied

Peak Levels

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.435	Vert.	27.1	19.7	0.8	47.6	74.0	26.4	Complied
2.465	Vert.	27.6	19.7	0.8	48.1	74.0	25.9	Complied

8. Measurement Uncertainty

8.1. No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

8.2. The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

8.3. The uncertainty of the result may need to be taken into account when interpreting the measurement results.

8.4. The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	**Range**	**Confidence Level**	**Calculated Uncertainty**
Radiated Emissions at 3.0 metres	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Emissions at 3.0 metres	1 GHz to 26.5 GHz	95%	+/- 5.1 dB

8.5. The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Maker	Type No.	Serial No.
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A1037	Chase Bilog Antenna	Chase EMC Ltd	CBL6112B	2413
A197	Site 2 Controller SC144	Unknown	SC144	150720
A201	WG 20 Horn Antenna	Flann Microwave Ltd	20240-20	266
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A256	WG 18 Microwave Horn	Flann Microwave	18240-20	400
A276	OATS Positioning Controller	Rohde & Schwarz	HCC	
C160	Cables	Rosenberger	UFA210A-1-1181-70x70	None
C228	Cable	Unknown	Not stated	Not stated
C341	Cable	Andrews	None	None
C362	Cable	Rosenberger	UFA210A-1-1181-70x70	1925
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020
M191	Thermo-Hygro	RS Components	RS212-124	M191-212-124

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Measurement Methods

A2.1. Radiated Emissions

A2.1.1. Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.1.2. Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.1.3. The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using a measuring receivers with a Quasi-Peak detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

A2.1.4. For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

A2.1.5. All measurements on the open area test site were performed using broadband antennas.

A2.1.6. On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

A2.1.7. The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	100 kHz	120 kHz	1 MHz
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

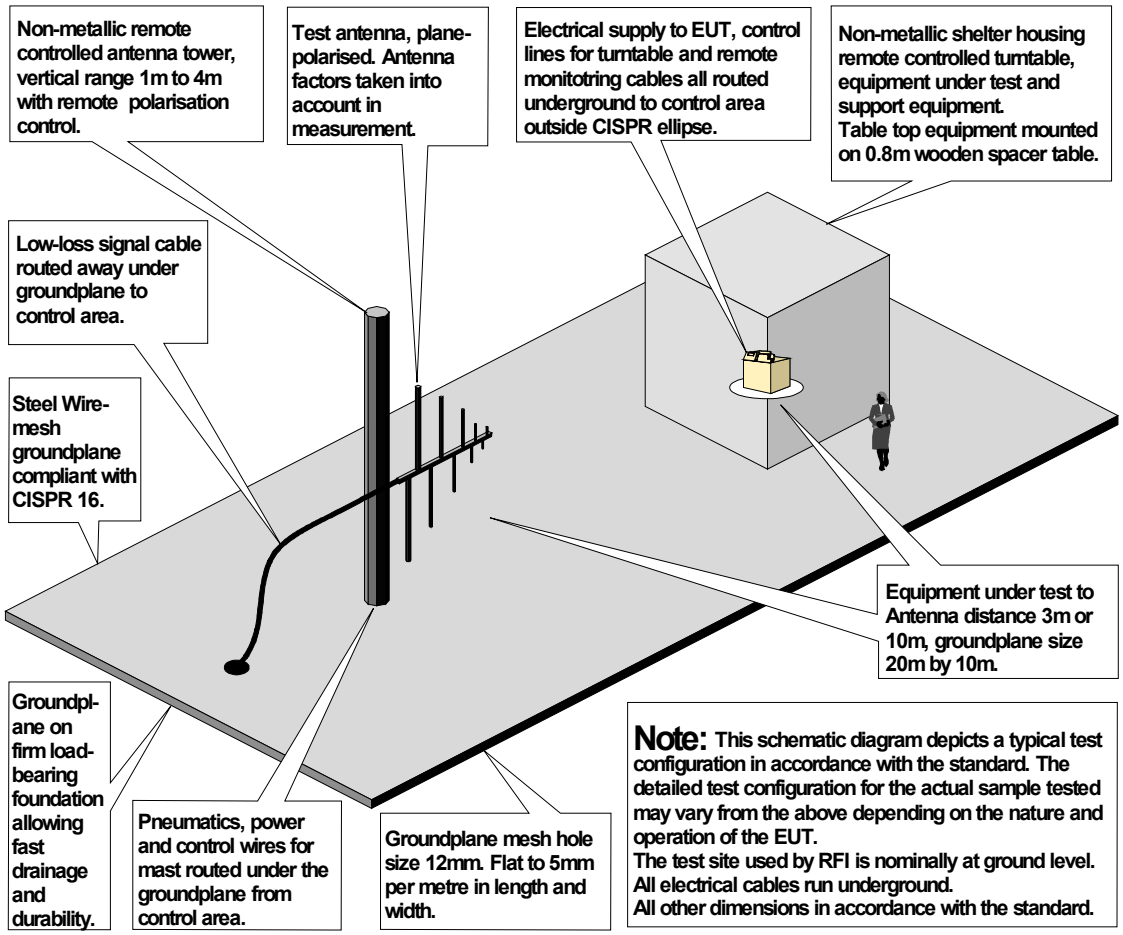
Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

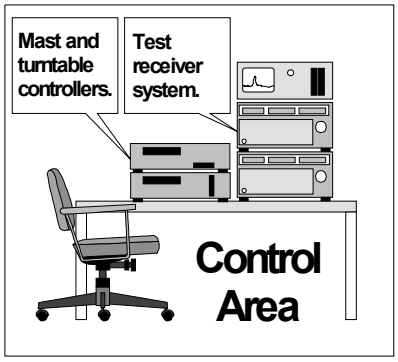
Drawing Reference Number	Title
DRG\43607JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\43607JD01\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test

Test Of: **Dynex Semiconductors Ltd**
DA5823 Transceiver
To: **FCC Part 15 Subpart C (Intentional Radiators)**
Section 15.245

DRG\43607JD01\EMIRAD



Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse

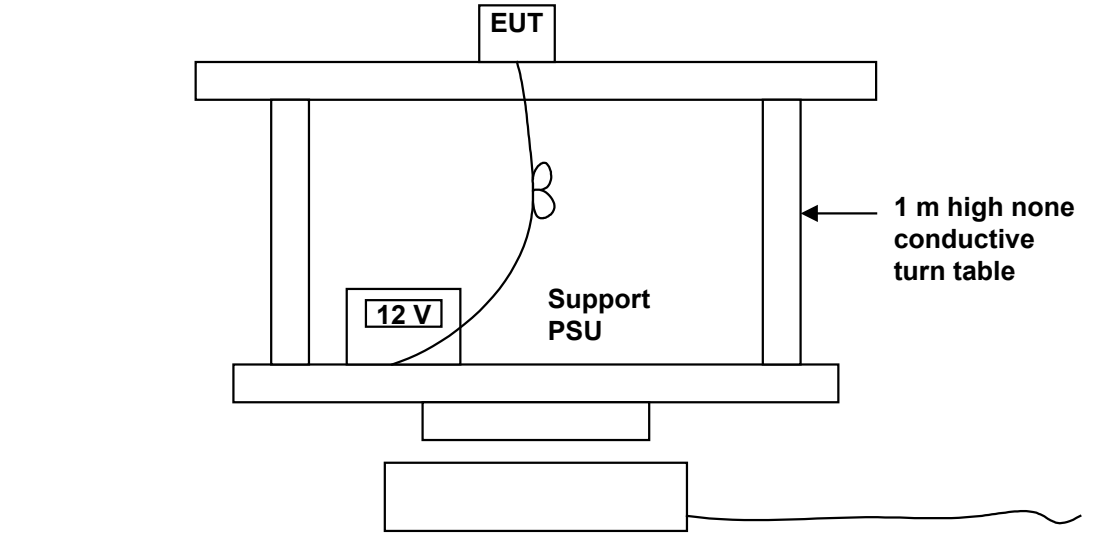


Test Of: Dynex Semiconductors Ltd
DA5823 Transceiver

To: FCC Part 15 Subpart C (Intentional Radiators)
Section 15.245

DRG\43607JD01\001

Configuration of EUT and Local Support Equipment



Configuration of Remote Support Equipment

This page has been left intentionally blank.