



HURSLEY
EMC
SERVICES

EMC TEST REPORT

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BSMI Lab ID: SL2-IN-E-3008
KC Lab ID: EU0184

FCC Part 15C Certification Report

for the

Avonwood Developments Ltd

Eureka-ID Discovery Reader

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Approval Signatory

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1.0 DECLARATION

1.1 FCC Part 15C Statement and Industry Canada (IC) Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with parts 15.109 and 15.209 of the CFR 47:2013 FCC rules in accordance with ANSI C63.4:2003. The EUT operates at a frequency of 125 kHz and complies with part 15C emission requirements.

1.2 Related Submittal(s) Grants

This is an application for certification of an Avonwood Eureka-ID Discovery Reader (transmitting at 125 kHz and receiving at 902.4 MHz), described in this report.

The sections of FCC Part 15 that apply to the EUT are:

15.209 General requirements

15.109 applied to the EUT in receive mode.

Note: The EUT in receiver mode complies with part 15B of the FCC rules for unintentional radiators.

1.3 EUT Manufacturer

Trade name:	Avonwood Developments Ltd
Company name:	Avonwood Developments Ltd
Company address:	Knoll Technology Centre Stapehill Road Hampreston Wimborne Dorset BH21 7ND United Kingdom
Manufacturing address:	As above.
Company representative:	Mr David Stanley-Boden Tel: +44 (0) 1202 868000

2.0 EUT DESCRIPTION

2.1 Identity

EUT:	Eureka-ID Discovery Reader
Sample build:	Production
Serial number:	001

2.2 Product Operation

The EUT is an active transponder reader for monitoring or controlling access through sites or monitoring assets on or between sites. Two open or closed contacts are provided to operate third party devices such as barriers or alarms. The EUT operates from a 24V DC power input, in this case provided by a Stontronics AC/DC Adapter.

2.3 Support Equipment

SUPPORTING EQUIPMENT	PART/MODEL NUMBER	SERIAL NUMBER
Stontronics AC Adapter	CGSW-2402500	001

2.4 Exerciser Program

Not applicable.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Office	Hursley EMC Services Ltd Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire
EMI Measurement Site	Hursley EMC Services Ltd Hursley Park, Winchester; FCC Registered UK Designation number: UK0006 Industry Canada Registration number: 7104A
Test Dates	3 rd to the 7 th October 2014
HEMCS References:	14R438

3.2 General Operating Conditions

Testing was performed according to the procedures in ANSI C63.4:2003. Final radiated testing was performed at a EUT to antenna distance of three metres.

Instrumentation, including receiver and spectrum analyser bandwidth, comply with the requirements of ANSI C63.2:1996.

3.3 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated & Conducted	20 degrees Celsius	52% relative	991 millibars

3.4 Radiated Emissions

Initial Scan

A radiated profile scan was taken at a three metre distance on eight azimuths of the system under test in both vertical and horizontal polarities of the antenna in a semi-anechoic chamber. Instrumentation used in the chamber as below:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
008	1	HP	8568B	2517A01791	Spectrum analyser	Internal
026	1	Chase	CBL6140	1036	Antenna X-wing (chamber)	Internal
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	06/06/2015
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	04/07/2015
073	3	Schwarzbeck	BBHA9120B	237	Horn antenna (1-10GHz)	03/07/2016
132	1	HP	8447D	2944A07094	Pre-amplifier (30-1000MHz)	Internal

The data obtained from the profile scan was used as a guide for the final measurements.

Final Measurements

The system under test was then measured at three metres in the Open Area Test site (OATS) using a receiver. The data obtained from the chamber profile-scan was used to guide the test engineer. Above 30 MHz, each emission from the transmitter was maximised by revolving the system on the turntable and moving the antennae in height and azimuth. Below 30 MHz the loop antenna was set at a height of 1m, the EUT was measured with the antenna in the vertical and horizontal polarity and each emission was maximised by revolving the system on the turntable. The worst-case data is presented in this report. Test instrumentation used was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	06/06/2015
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	04/07/2015
073	3	Schwarzbeck	BBHA9120B	237	Horn antenna (1-10GHz)	03/07/2016
109	3	Schwarzbeck	VULB 9163	9163-321	Trilog antenna (OATS)	19/10/2015
215	1	Sucoflex	106		Cable SMA (18GHz)	30/09/2014
242	3	Rohde & Schwarz	HFH2-Z2	881056/4	Loop antenna (9kHz-30MHz)	31/05/2015
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	06/06/2015

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using HEMCS procedures

3.5 Conducted Emissions

Test Configuration

A filtered 110V/60Hz supply was fed to the system under test, via a 50Ω/50μH Line Impedance Stabilisation Network (LISN). The LISN was directly bonded to a conductive ground plane.

Test Measurement

The worst-case emissions were identified on both the neutral and phase(s) with a spectrum analyser set to scan from 0.15 MHz to 30 MHz.

The worst-case peaks were then identified and measured using an RF receiver using a quasi-peak detector and compared to the frequency range and limits of CISPR 22 as specified by ANSI C63.4-2003. Quasi-peak values that exceeded the average limit were then re-measured using the average signal detector.

The worst-case results are presented in this report.

Test instrumentation used in the conducted test was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
004	1	Rohde & Schwarz	ESH-3	893607/002	Test receiver (9kHz-30MHz)	10/01/2015
010	1	HP	8568B	2601A02322	Spectrum analyser	Internal
189	1	Rohde & Schwarz	ESH3-Z2	-	Pulse limiter N type	09/07/2015
265	1	Rohde & Schwarz	ESH3-Z5	861189/003	Mains LISN / AMN	09/04/2015

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.

4.0 TEST DATA

4.1 Power Line Conducted Emissions

A search was made of the frequency spectrum between 0.15 MHz to 30 MHz and the measurements reported here are the highest emissions relative to the CISPR 22 Class B limits. Emissions that meet the average limit on a quasi-peak measurement are deemed to meet both the average and quasi-peak specification.

MAINS – LINE

Frequency (MHz)	Quasi-peak value (dB μ V)		Average value (dB μ V)		Status
	Measured	Limit	Measured	Limit	
0.170	55.60	64.98	22.50	54.98	Pass
0.250	50.80	61.74	27.50	51.74	Pass
0.373	47.00	58.43	23.00	48.43	Pass
0.625	40.50	56.00	24.40	46.00	Pass
1.310	34.50	56.00	21.90	46.00	Pass
2.000	35.80	56.00	24.10	46.00	Pass
4.623	36.90	56.00	25.40	46.00	Pass
12.705	39.74	60.00	27.94	50.00	Pass

MAINS – NEUTRAL

Frequency (MHz)	Quasi-peak value (dB μ V)		Average value (dB μ V)		Status
	Measured	Limit	Measured	Limit	
0.167	55.80	65.11	22.50	55.11	Pass
0.220	45.50	62.84	20.00	52.84	Pass
0.248	50.50	61.82	27.10	51.82	Pass
0.375	47.70	58.40	23.20	48.40	Pass
0.553	39.10	56.00	22.90	46.00	Pass
0.624	40.50	56.00	23.90	46.00	Pass
11.461	41.48	60.00	28.78	50.00	Pass
19.368	38.48	60.00	26.78	50.00	Pass

Uncertainty of measurement: ± 3.22 dB μ V for a 95% confidence level.

Measurements made according to the FCC rules and Hursley EMC Services test procedure CON-02.

TEST ENGINEER: Ross Goodenough

5.0 TEST DATA

5.1 FCC – Radiated Emissions (Transmitting 125 kHz Receiving 902.4 MHz)

A search was made of the frequency spectrum from 9 kHz to 10 GHz and the measurements reported are the highest emissions relative to the ‘FCC CFR 47 Section 15.209 Limits & RSS Gen Section 7.2.5 Limits’ at a measuring distance of three metres. Below 30 MHz the results have been extrapolated from measurements made at a distance of three and ten metres to the limit distance set at 300m or 30m.

To calculate the extrapolation factor (see FCC Part 15.31 or RSS Gen 4.11) measurements were made at three metres and ten metres from the EUT. The extrapolation factor (x) was then calculated as follows:

$$x = \frac{E_1 - E_2}{20 \text{Log} (d_2 / d_1)}$$

Where (E) is the receiver reading at the distance (d) from the EUT. The extrapolation factor (x) is then used to calculate the extrapolated result at the limit distance.

Between 110 and 490 kHz measurements were made using an average detector with a 200 Hz bandwidth.

RESULTS - 9 kHz to 490 kHz

kHz	Measured amplitude (E ₁)	Measured amplitude (E ₂)	Extrapolation Factor (x)	Calculated amplitude @ 300m		Specified limit @ 300m	
	dBµV/m @ 3m (d ₁)	dBµV/m @ 10m (d ₂)		dBµV/m	µV/m	dBµV/m	µV/m
125*	100.7	70.0	2.92	-16.1	0.157	25.66	19.2
250	70.0	41.2	2.75	-40.0	0.01	19.65	9.6

*Transmitting frequency

For example:

The limit at 125 kHz is calculated from FCC 15.209 RSS Gen Table 6 as $\frac{2400}{125} = 19.2\mu\text{V/m}$.

The extrapolation factor is calculated as $\frac{100.7 - 70.0}{20 \text{Log} (10/3)} = 2.92$

The calculated amplitude is $100.7 - (20 \times 2.92 \times \text{Log} (300 / 3)) = -16.1 \text{ dB}\mu\text{V/m}$

30 MHz to 10 GHz

A search was made of the frequency spectrum from 30 MHz to 10 GHz and the measurements reported are the highest emissions relative to the 'FCC CFR 47 Section 15.209 Limits' at a measuring distance of three metres.

Testing was performed with the EUT powered on transmitting at 125kHz. Below 1 GHz a quasi-peak detector was used (bandwidth 120 kHz), above 1 GHz a peak and average detector was used (bandwidth 1 MHz). The worst-case results from all tests are presented here.

RESULTS - 30 MHz to 1000 MHz

Frequency MHz	Receiver amplitude dB μ V	Antenna factor dB	Cable loss dB	Actual quasi-peak value @ 3m dB μ V/m	Specified limit @ 3m dB μ V/m
30.540	26.8	10.8	0.7	38.3 #	40.0
44.076	15.3	13.4	0.8	29.5	40.0
311.987	9.4	13.2	2.5	25.1	40.0
415.996	10.9	16.1	3.0	30.0	43.5
625.022	14.5	19.2	3.9	37.6	43.5
875.030	8.1	21.8	4.9	34.8	46.0

Uncertainty of measurements: ± 4.2 dB μ V for a 95% confidence level.

The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the EUT tested complies with the specification limit.

Radiated emissions (continued)**RESULTS - 1.0 GHz to 10.0 GHz**

Frequency GHz	Receiver amplitude dB μ V	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual average value @ 3m dB μ V/m	Specified average limit @ 3m dB μ V/m
5.410	48.0	29.5	4.8	37.9	44.4	54.0

Frequency GHz	Receiver amplitude dB μ V	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual peak value @ 3m dB μ V/m	Specified limit @ 3m dB μ V/m
5.410	50.7	29.5	4.8	37.9	47.1	74.0

Procedure: In accordance with ANSI C63.4:2003

Measurements below 1.0 GHz performed with a quasi-peak detector. Measurements above 1.0 GHz performed with an average and peak detector.

TEST ENGINEER: Ross Goodenough

5.2 FCC – Radiated Emissions (Receive Mode)

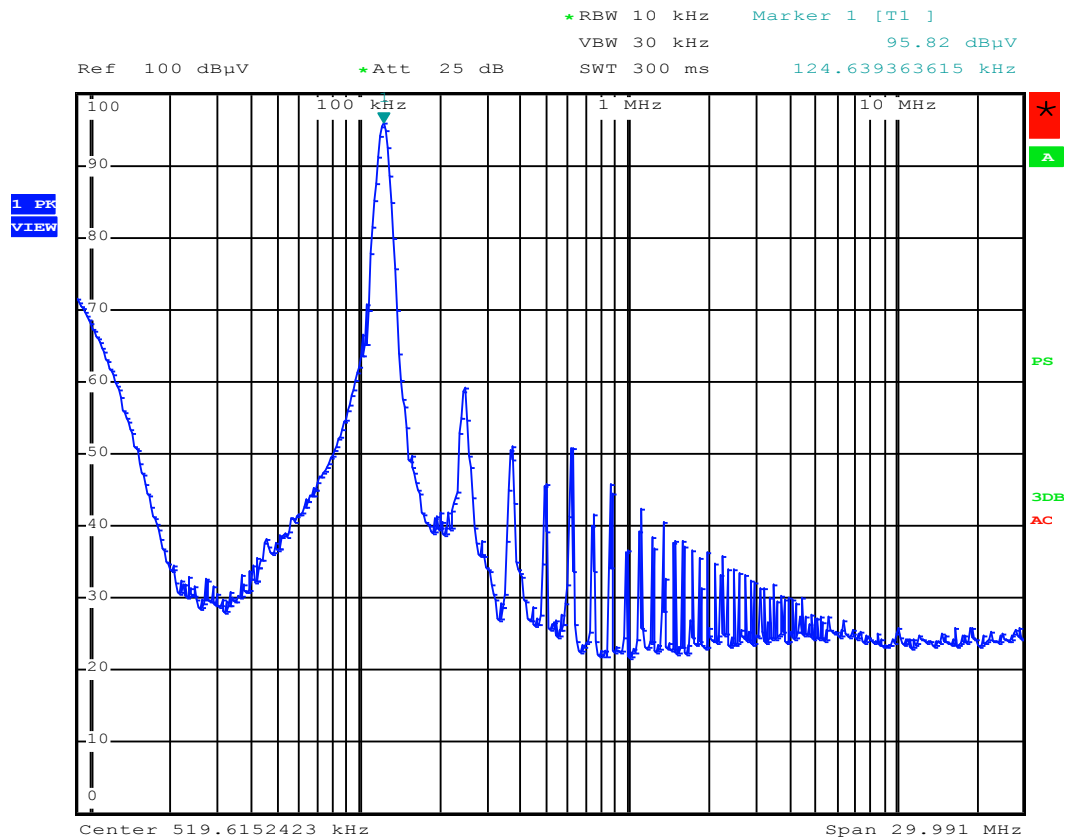
Not applicable, as unit is always transmitting at 125 kHz and receiving at 902.4 MHz.

Procedure: In accordance with ANSI C63.4:2003

Measurements below 1000 MHz performed with a quasi-peak detector. Measurements above 1000 MHz performed with an average and peak detector.

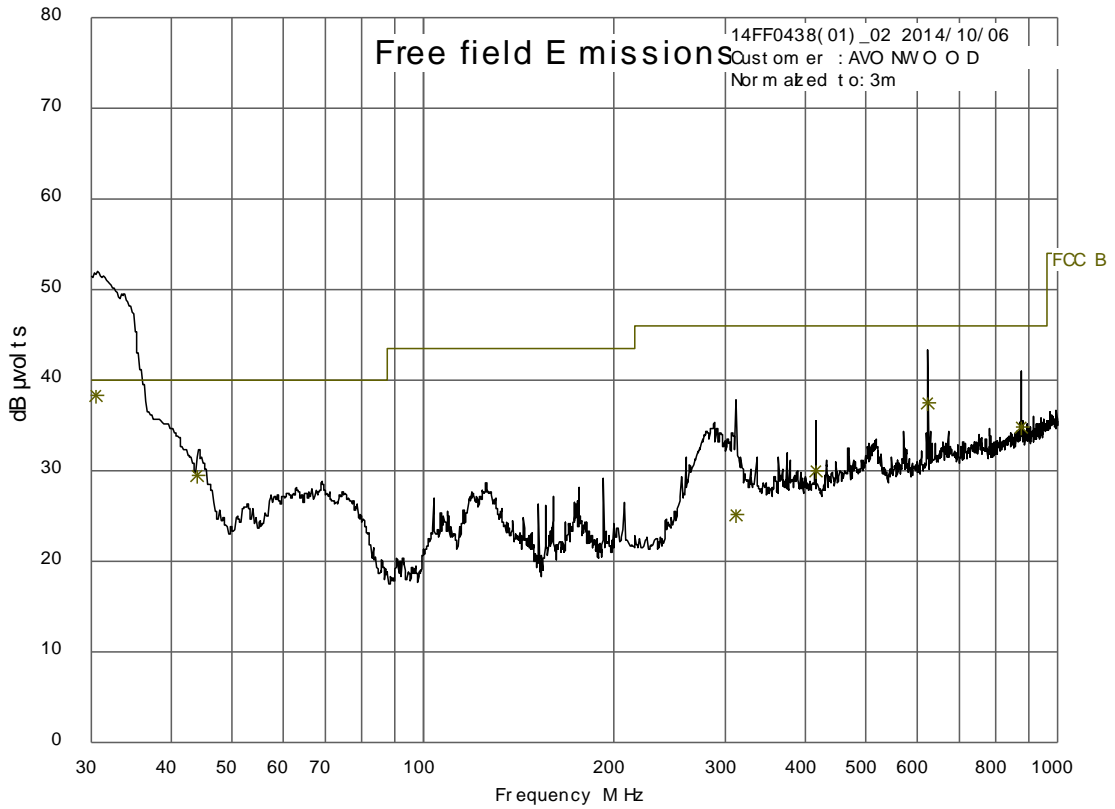
6.0 TEST PLOTS

6.1 Radiated Emission Plot, 9 kHz to 30 MHz



Date: 6.OCT.2014 12:11:46

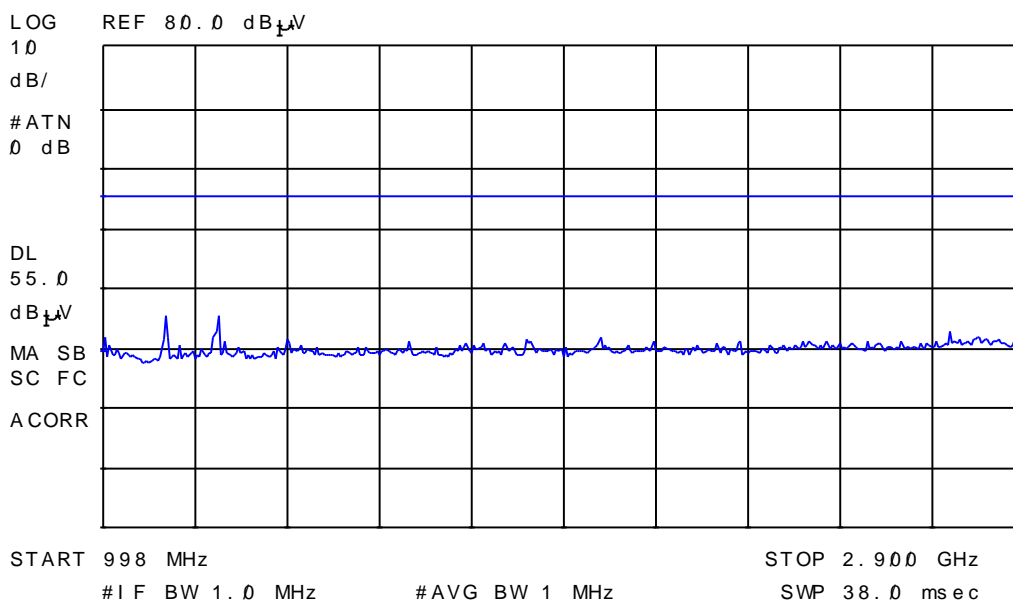
6.2 Radiated Emission Plot, 30 to 1000 MHz



6.3 Radiated Emissions Plot, 0.998 to 2.9 GHz

09:40:27 OCT 06, 2014
170

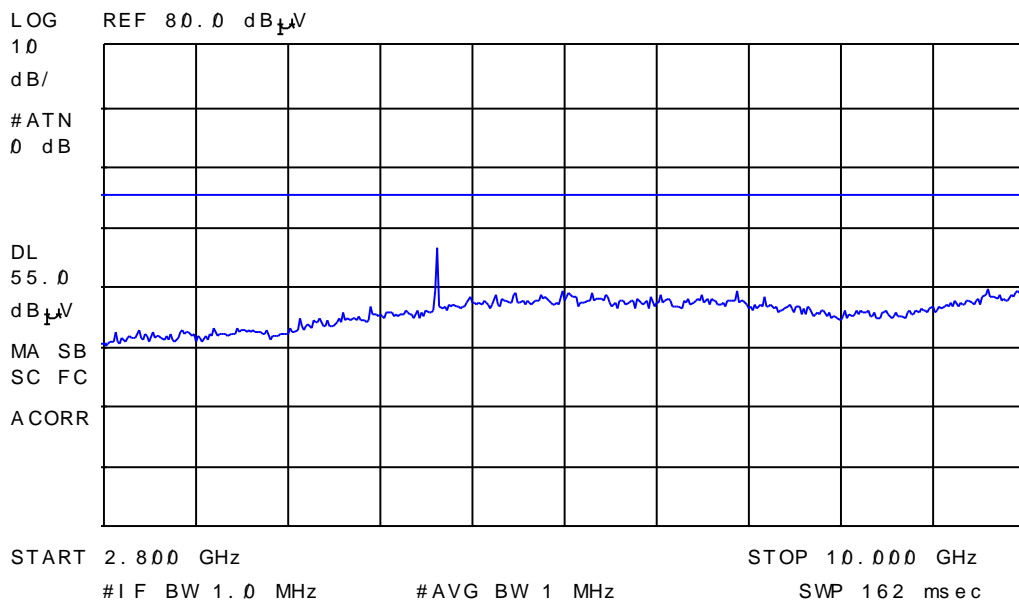
ACTV DET: PEAK
MEAS DET: PEAK QP AVG



6.4 Radiated Emissions Plot, 2.8 to 10.0 GHz

09:43:31 OCT 06, 2014

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



7.0 RADIATED EMISSIONS PLOTS – RECEIVE MODE

Not applicable, as unit is always transmitting at 125 kHz and receiving at 902.4 MHz.

8.0 FCC DETAILS

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

February 13, 2006

Hursley EMC Services Ltd.
Unit 16
Brickfield Lane
Chandlers Ford - Hampshire, SO53 4DB
United Kingdom
Attention: R P St John James

Re: Accreditation of Hursley EMC Services Ltd.
Designation Number: UK0006

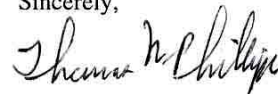
Dear Sir or Madam:

We have been notified by Department of Trade and Industry (DTI) that Hursley EMC Services Ltd. has been accredited as a Conformity Assessment Body (CAB).

At this time your organization is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,



Thomas Phillips
Electronics Engineer