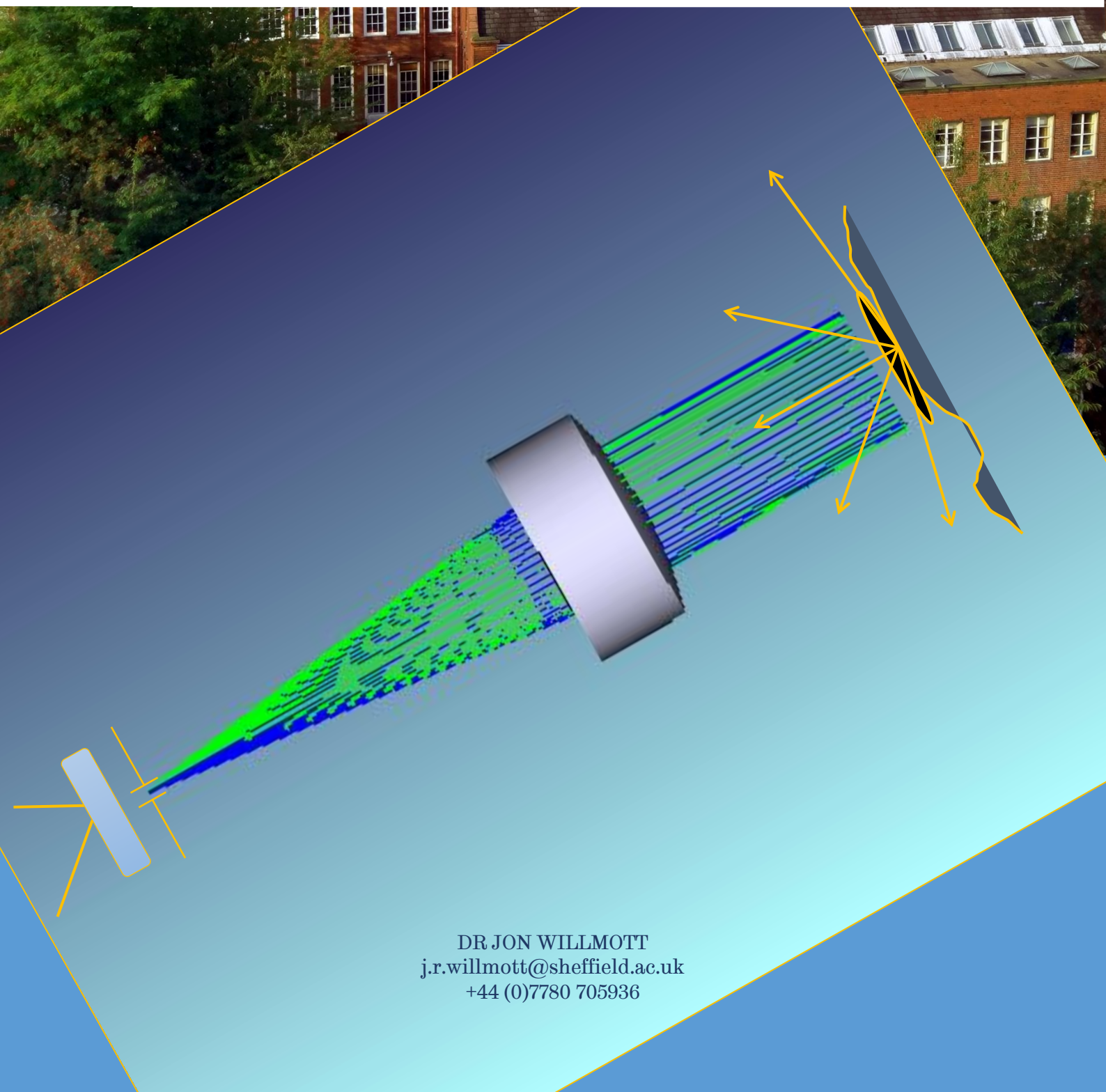
The University Of Sheffield.

Sensor Systems Research Group

Department of Electronic and Electrical Engineering



DR JON WILLMOTT
j.r.willmott@sheffield.ac.uk
+44 (0)7780 705936

Emissivity Measurement Capabilities

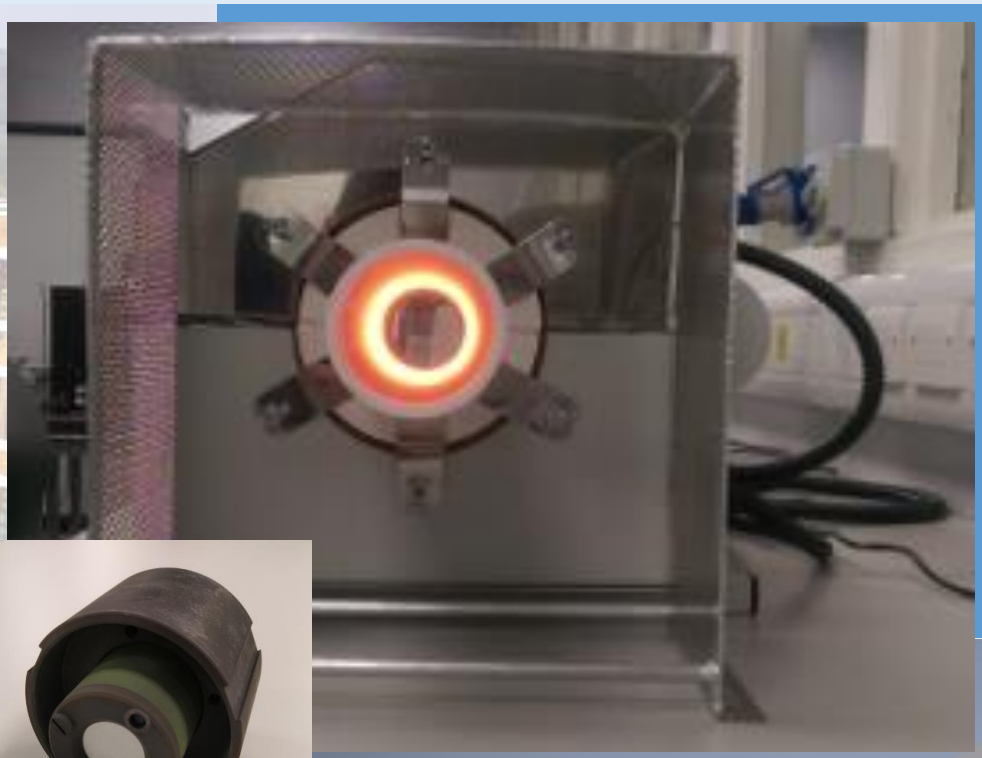
There is a parameter needed for every infrared temperature measurement: emissivity. This is the 'efficiency' with which an object radiates heat. Blackbodies emit with an emissivity = 1.0. We have spent many years studying, measuring and compensating for emissivity.

$$\varepsilon = \frac{S_{body}(\lambda,T)}{S_{blackbody}(\lambda,T)}$$

j.r.willmott@sheffield.ac.uk
+44 (0)7780 705936

Measuring Emissivity

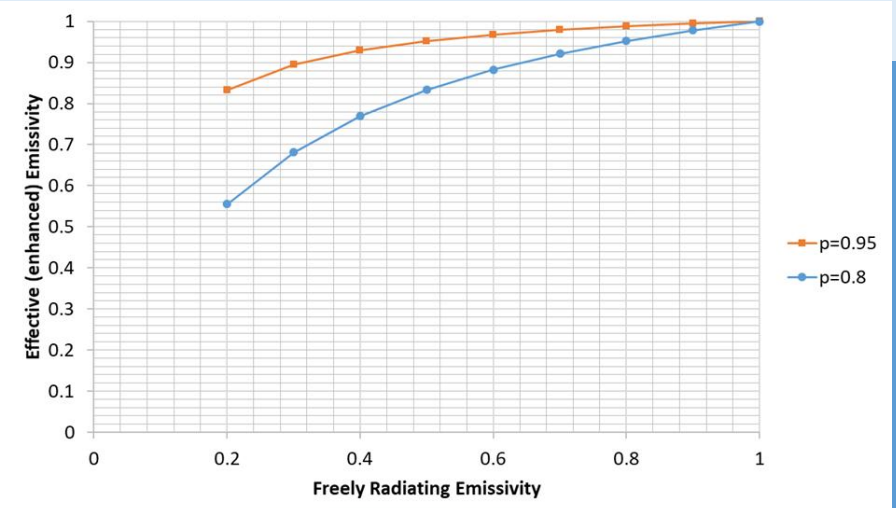
Our preferred method of measuring emissivity records samples radiating freely, with simultaneous measurements from a blackbody reference. These precise measurements are within a controlled environment and in thermal equilibrium.



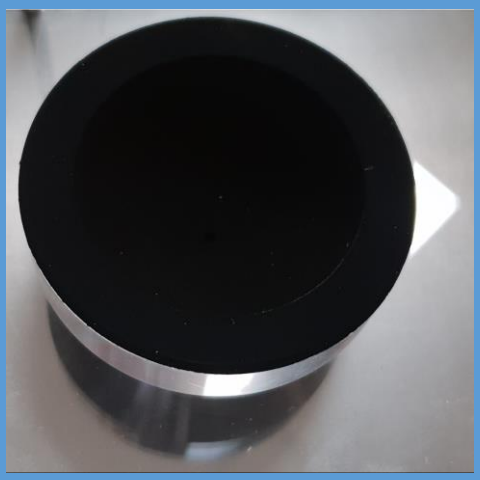
j.r.willmott@sheffield.ac.uk
+44 (0)7780 705936

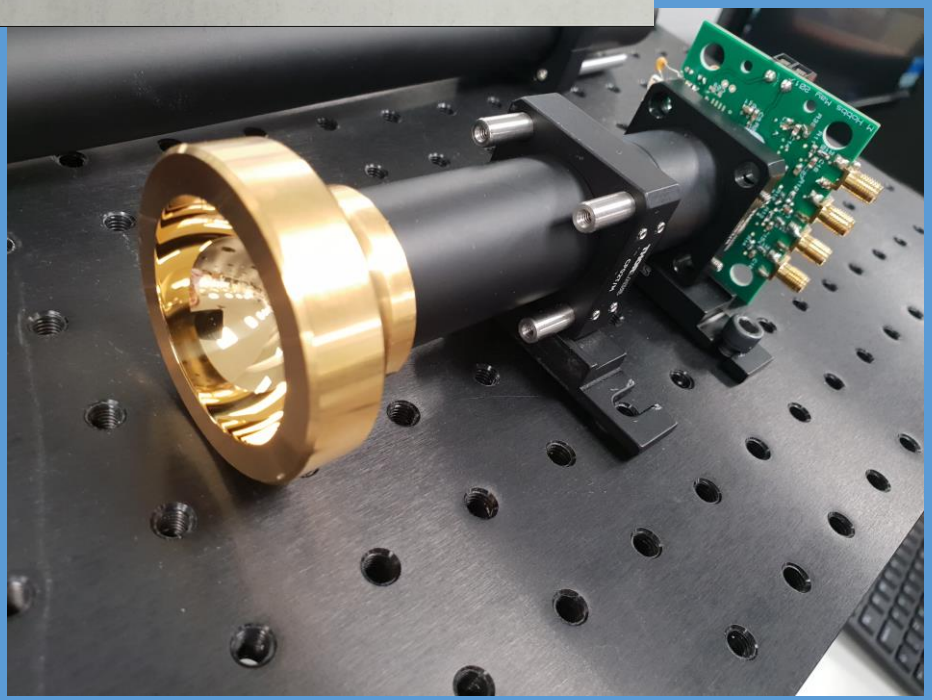
Gold Cup Infrared Thermometer

Gold cup thermometers measure the surface temperature of an object and enhance its emissivity to almost that of a blackbody. We design gold cup thermometers and also Vantablack cups that shield background radiation and are useful as references for gold cups.



$$\varepsilon_{\text{eff}} = \frac{\varepsilon}{1-\rho_g(1-\varepsilon)} = 1 - \frac{(1-\rho_g)(1-\varepsilon)}{1-\rho_g(1-\varepsilon)},$$





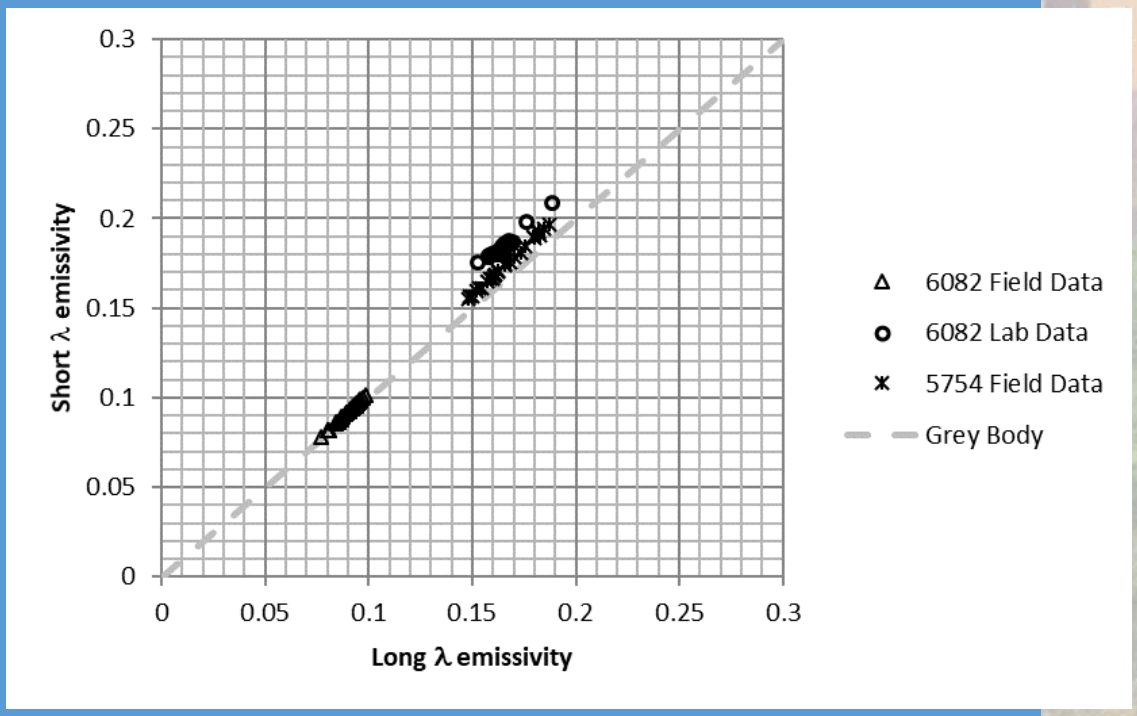
j.r.willmott@sheffield.ac.uk
+44 (0)7780 705936

Emissivity Algorithms

Making careful measurements of emissivity allows us to use Wien's law and calculate emissivity compensation algorithms.

Algorithm Thermometer

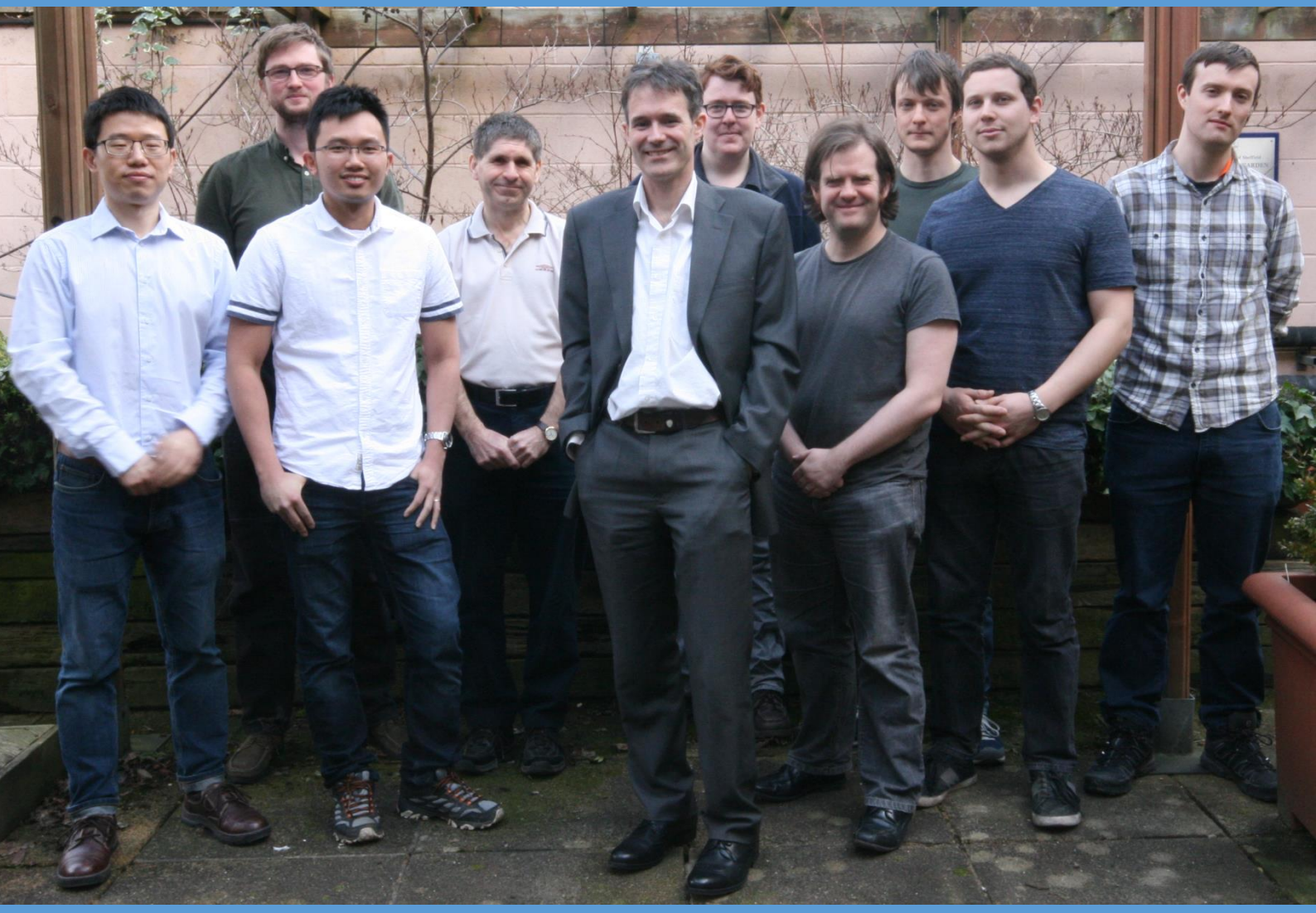
$$\ln(\varepsilon_{\lambda_1}) = b.\ln(\varepsilon_{\lambda_2}) + \ln a \Rightarrow S = \varepsilon\lambda^{-5}e^{\frac{-c2}{\lambda T t}} \Rightarrow \frac{1}{T} = A\left(\frac{1}{T_2}\right) + (1-A)\left(\frac{1}{T_1}\right) + B$$



j.r.willmott@sheffield.ac.uk
+44 (0)7780 705936

MEET THE TEAM

From left to right: Todd Zhu, Leigh Stanger, Cheong, Andy Heeley, Jon Willmott, Matt Davies, Matthew Hobbs, Nick Boone, Matt Grainger, Tom Rockett.



j.r.willmott@sheffield.ac.uk
+44 (0)7780 705936

Department of Electronic and Electrical Engineering

The University of Sheffield

Portobello Centre

Pitt Street

Sheffield

S1 4ET

tel: +44 114 222 5436