High Resolution Infrared Imaging

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Declaration

The research described in this dissertation was carried out between October 1991 and October 1995 under the supervision of Dr. Craig Mackay at the Institute of Astronomy and Cavendish Laboratory, Cambridge. The work described here is the author's own and no part of it has been submitted for any degree or qualification at any other university.

This thesis does not contain more than 60,0000 words.

Acknowledgements - Official

The major credit for the work in this thesis must go to my supervisor Craig Mackay for suggesting the project, agreeing to buy the NICMOS device and generally knowing which way round a transistor should go.

The highlight of any COAST project is the COAST team. I would like to thank John^2, Chris, Donald, Pete, Graham, Roger and Craig, for the Friday afternoon sun bathing sessions in John's office where I learnt a great deal of physics, very little of which was to do with COAST.

Acknowledgements - Unofficial

Since this is the only part of the thesis that anyone is ever going to read I should point out that this volume contains no useful information, except for the cartoons. The extremely useful lists detailing which wire is connected to which plug, are in the COAST technical manual. The software is in the very large volume accompanying the technical manual, I would appreciate someone reading this as it involved quite a lot of work.

And now the list of people I didn't forget to include:

Since I am the last student of my year to submit, I can whinge about all the people who left me out of their acknowledgements. But I would like to say thanks to Geraint, Peter, Karl, Kate, Julia, and Amanda.

In the Institute I would especially like to thank Margaret, a constant source of useful gossip and even more useful grants.

The radio astronomy coffee breaks where I spent approximately 1000 hours and without which this thesis could probably have been finished on time. In particular, the contribution of Richard Saunders to the atmosphere of the group cannot be underestimated.

A big thank you to Julie for the commas.

Finally, I wrote this thesis in a Windows word processor and I was the first person I know to do so.
I now realise why everyone else used TeX.

Outline

Chapter one examines why high spatial resolution images are important and how to obtain them. The historical and technical background to interferometry is described.

Chapter two explains the physics and technology of infrared detectors It also describes the difference in operation of visible and infrared systems in a way which would be useful for astronomers familiar with visible CCD systems.

Chapter three is the detailed design, construction and operation of the NICMOS device and the camera produced for COAST. It also contains the results of the studies into the NICMOS device performance.

Chapter four explains the COAST infrared system and the modifications to the existing visible telescopes. The performance of COAST in the infrared is examined along with a discussion of its efficiency and a prediction of the limiting magnitude

Chapter five describes the collection and processing of COAST data and the results of the limited astronomical measurements made with the instrument in the infrared.

Chapter six is a conclusion of the work described here and contains some suggestions for future directions of COAST.

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