# Table of Contents

**FOREWORD**  
**LIST OF PARTICIPANTS**  
**THE NERD GALLERY**  
**MAPS AND MASTER PLAN**  

---

**Ian S. Mclean**

A Golden Era for Astronomy - The Advent of CCDs and Infrared Arrays  

---

**SECTION I: DETECTOR MANUFACTURERS**

Ken J. Ando, Peter J. Love, Nancy A. Lum, David J. Gulbransen, Alan W. Hoffman, Elizabeth Corrales, Robert E. Mills, Mark E. Murray

Overview of Astronomy Arrays at Raytheon Infrared Operations (RIO)  

Giovanni Bonanno, Massimiliano Belluso, Antonio Calì, Alessandro. Carbone, Rosario Cosentino, Angelo Modica, Salvo Scuderi, Cristina Timpanaro, Michela Uslenghi

A New Photon Counting Detector: Intensified CMOS-APS  

Giovanni Bonanno, Rosario Cosentino, Massimiliano Belluso, Salvo Scuderi, Cinzia Di Franco, Pier Giorgio Fallica, Delfo Sanfilippo, Emilio Sciacca, Salvatore Lombardo

Preliminary test measurements of the SPAD array  

Morley M. Blouke, Denis L. Heidtmann, J. Eriksen and Archibald Barter

Preliminary Characterization of Two High-Speed, Back-Illuminated CCD Image Sensors  

Barry E. Burke, James A. Gregory, Andrew H. Loomis, Steven D. Calawa, Paul M. Nitishin, Thomas A. Lind, Michael J. Cooper, Douglas J. Young, Peter W. O'Brien, Bernard B. Kosicki, Gerald A. Luppino, and John L. Tonry

Broadband (200-1000 nm) Back-Illuminated CCD Imagers  

Albert M. Fowler, K. Michael Merrill, William Ball, Arne Henden, Fred Vrba, Craig McCreigh

Orion: A 1-5 Micron Focal Plane for the 21st Century  

James D. Garnett, Majid Zandian, Roger E. DeWames, Michael Carmody, John G. Pasko, Mark Farris, Craig A. Cabelli, Donald E. Cooper, G. Hildebrandt, J. Chow, John T. Montroy, Jose Arias, Jagmohan Bajaj, and Kadri Vural, and Donald N.B. Hall

Performance of 5 Micron, Molecular Beam Epitaxy HgCdTe Sensor Chip Assemblies (SCAs) for the NGST Mission and Ground-based Astronomy
Don Groom
Cosmic rays and other nonsense in astronomical CCD images 81

Steve Holland
An Overview of CCD Development at Lawrence Berkeley National Laboratory 95

James Janesick, Ferry Gunawan, Taner Dosluoglu, John Tower, Niel McCaffrey
Scientific CMOS Pixels 103

Paul R Jorden, Peter Pool, Simon M. Tulloch
Secrets of E2V Technologies CCDS (ex Marconi CCDs) 115

Lester J. Kozlowski
Progress in Ultra-low Noise Hybrid and Monolithic FPAs for Visible and Infrared 123

J. Rainer Kramm, Horst Uwe Keller, Reinhard Müller, Dietmar Germerott and Georg Tomasz
A Marconi CCD42-40 with Anti-Blooming - Experiences with the OSIRIS CCDs for the ROSETTA Mission 131

Michael Lesser
Very Large Format Back Illuminated CCDs 137

David Lumb, Alan Owens, Anthony Peacock, Marcos Bavdaz, Christian Erd
Compound Semiconductor Detectors, Development activities at ESA 145

David Lumb, Peter Verhoeve, Roland den Hertog, Anthony Peacock, Didier Martin, Nicola Rando
Optical Photon-Counting STJ Activities at ESA 149

Vyshnavi Suntharalingam, Barry E. Burke, and Michael J. Cooper
Silicon-on-Insulator-Based Single-Chip Image Sensors - Low-Voltage Scientific Imaging 155

Pavel Vu
Large Format and Scientific Detectors at Fairchild Imaging 163

HgCdTe Detectors for the Hubble space telescope wide field camera 3 IR Channel 175

Guy F.W. Woodhouse, Nicholas R. Waltham, Marcus J. French, Mark L. Prydderch, Quentin R. Morrissey, Renato Turchetta, Andy J. Marshall, James M. King
CMOS Active Pixel Sensor developments at the Rutherford Appleton Laboratory 183
SECTION II: OBSERVATORY STATUS/PLANS

Dietrich Baade
ESO's Optical detector systems in the VLT operations era 197
James W. Beletic, Paola Amico, Randall Campbell and Robert Goodrich
The Detector Systems of the Keck Observatory - UV to 25 microns 205
Gert Finger, Reinhold J. Dorn, Hamid Mehrgan, Manfred Meyer, Alan F.M.
Moorwood, and Joerg Stegmeier
IR Detector Developments at ESO 219
Jason Griesbach
Controller Developments – at the Anglo-Australian Observatory 225
Derek Ives, Nagaraja Bezawada, Maureen Ellis
Detector Work at the UKATC - The optical to the sub-millimetre 231
Ralf Kohley, Marcos Suárez, Juan Manuel Martín, Greg Burley, Lluis Cavaller and
Rafael Vilela
CCD camera systems for the GTC 239
Ricardo Schmidt
Detectors at CTIO: Present Status and Future Plans 247
Roger Smith
Strange Happenings in the Dungeons - A new detector group at Caltech 255
Barry Starr
NOAO Observatory plans 261
Barry M. Starr, Nicholas Buchholz, Gustavo Rahmer, Jerry Penegor, Ricardo
Schmidt, Michael Warner, K. Michael Merrill, Charles F. Claver, Y. Ho, Kaviraj
Chopra, Eduardo Mondaca, Chirag Shroff, D. Shroff
MONSOON Image Acquisition System 269

SECTION III: INSTRUMENTATION

Keith H. Burr ell, Punit Gohil, Richard J. Groebner, David H. Kaplan, John I.
Robinson, Daniel M. Thomas, and David G. Nilson
Improved CCD Detectors for High Speed, Charge Exchange Spectroscopy
Studies on the D III-D Tokamak 279
Cyril Cavadore, Claudio Cumani, Francis Franzia and Enrico Marchetti
CCD wavefront sensing system for the ESO Multi-Conjugate Adaptive Optics
Demonstrator (MAD) 283
Jean-Charles Cuillandre
CFHT's SkyProbe: true atmospheric attenuation measurement in the telescope
field 287
Jean-Charles Cuillandre, James Beletic, Reinhold Dorn, James Beletic, Gerard
Luppino, Sidik Isani, Nicolas Gorceix, Olivier Lai, Thomas Craven-Bartle, Barry
Burke, François Ménard
CFHT's FlyEyes: assessing on-sky performance of the new MIT/LL CCID35
CCD curvature wavefront sensor 299
Sebastian Deiries, Olaf Iwert, Cyril Cavadore, Christof Geimer, Evi Hummel

Ultra-clean CCD Cryostats —

CCD contamination can be kept under control

M. Bonner Denton, Andrew K. Knight, Stephen C. Denson, Roger P. Sperline, Erick T. Young, James H. Barnes, Gary M. Heiftje, Mahadeva Sinha, Mark Wadsworth, David W. Koppenaal, Charles J. Barinaga, Christopher A. Gresham

The Impact of Astronomy Technologies on Chemical Analysis

Reinhold J. Dorn, Barry E. Burke, James W. Beletic

A CCD based curvature wavefront sensor for adaptive optics in astronomy

Philippe Feautrier, Reinhold J. Dorn, Gerard Rousset, Cyril Cavadore, Julien Charton, Claudio Cumani, Norbert Hubin, Pierre Kern, Jean-Louis Lizon, Pascal Puget, Didier Rabaud, Patrick Rabou, Eric Stadler, Thierry Fusco, Yves Magnard

Performance and results of the NAOS visible wavefront sensor

Jean-Luc Gach, Olivier Hernandez, Jacques Boulesteix, Claude Carignan

Fabry Perot Observations using a new GaAs Photon Counting System

Mario Gai, Leonardo Corcione, Giuseppe Massone

Near IR fringe tracking for VLTI: the FINITO detection system

Enrique Joven, José V. Gigante and Francis Beigbeder

OSIRIS Detectors - First tests and Control System

Fernando Pedichini and Roberto Speziali

The Optimized Cryostat for the LBC Camera

Klaus Reif, Günter Klink, Phillip Müller and Henning Poschmann

The OmegaCam Shutter - A low acceleration, impact-free device for large CCD mosaics

Martin Roth, Thomas Fechner, Dieter Wolter, Andreas Kelz, Thomas Beckner

Ultra-deep Optical Spectroscopy with PMAS — using the Nod-and-Shuffle Technique

Roger Smith, David Walker and Hugo E. Schwarz

The Tololo All Sky Camera – TASCA

John Tonry, Barry Burke, Gerald Luppino, Nicholas Kaiser

The Orthogonal Parallel Imaging Transfer Camera

John Tonry, Gerald A Luppino, Nicholas Kaise', Barry Burke, George H. Jacoby

Giga-pixels and Sky Surveys


The Hubble Space Telescope Wide Field Camera 3 Instrument Charge-Coupled Device Detectors – CTE Performance and Mitigation

Guy F.W. Woodhouse, Nicholas R. Waltham, James M. King, Gary R. Burton, Duncan L. Drummond, Andy J. Marshall, John A. Rainnie, Marcus J. French

Camera and detector development in the Space Science and Technology Department of the Rutherford Appleton Laboratory
Zhaowang Zhao and Binxun Ye
Compact CCD Camera 413

SECTION IV: ELECTRONICS 417

Paul D. Berry, Rene Doyon, Philippe Vallee, Daniel Nadeau
The design and testing of a cryogenic pre-amplifier for the Rockwell Hawaii and Hawaii II Detector Arrays 419

Giovanni Bonanno, Roario Cosentino, Massimiliano Belluso, Pietro Bruno, Fabio Bortoletto, Maurizio D'Alessandro, Daniela Fantinel, Enrico Giro, Leonardo Corcione, Alessandro Carbone, Gioacchino Evola
The new generation CCD controller: first results 423

Marco Bonati, Michael Ashe
ISPI's software- an infrared application of the ArcVIEW system. 427

Greg Burley, Ian Thompson, Charlie Hull
Compact CCD guider camera for Magellan 431

Gert Finger, Reinhold J. Dorn, Alan W. Hoffman, Hamid Mehrgan, Manfred Meyer, Alan F.M. Moorwood and Joerg Stegmeier
Readout techniques for drift and low frequency noise rejection in infrared arrays 435

Michael Lesser and Madhuvanesh Parthasarathy
AzCam: A Windows-based CCD/CMOS/Client/Server Data Acquisition System 445

Javier Reyes-Moreno, Christoph Geimer, Andrea Balestra, Nicolas Haddad
Upgrade of ESO's FIERA CCD Controller and PULPO subsystem 449

Martin Riopel, René Doyon, Daniel Nadeau and Christian Marois
An Optimized Data Acquisition System Without Reset Anomaly for the HAWAII and HAWAII-2 Arrays 453

Marcos Suárez, Ralf Kohley, Greg Burley, Luís Cavaller, Rafael Vilela, Albert Tomás
GTC Acquisition Cameras and Wavefront Sensors 459

Mingzhi Wei and Richard Stover
A New CCD Controller at UCO/Lick Observatory 463

Guy F.W. Woodhouse, Nicholas R. Waltham, Marcus J. French, Lawrence L. Jones
The Use of ASIC Technology in the Development of Compact, Low-Power CCD Cameras 467

SECTION V: DETECTOR TESTING AND CHARACTERIZATION 479

Randall D. Campbell
Characterization of the Si:As Blocked Impurity Band (BIB) Detector in Keck's Long Wavelength Spectrometer, LWS 481
Mario Gai, Deborah Busonero
On the Implementation and Calibrations of the Focal Plane for GAIA 565

Yann Hello, Jérôme Parisot, Sébastien Barde, Tristan Buey, Bertrand Le Ruyet, Alain Sémery, Didier Tiphène
Behaviour of a Raytheon IRFPA (438x270) under high energy protons 573

David Lumb
Radiation damage effects in XMM-Newton Epic MOS CCDs 577

Robert Philbrick, John Geary, Edward Dunham, David Koch
95 Million Pixel Focal Plane for Use On The Kepler Discovery Mission 581

SECTION VIII: SUB-ELECTRON NOISE FOCAL PLANE ARRAYS 591

Alastair Basden, Craig Mackay, Chris Haniff
L3CCDs: Fast Photon Counting for Optical Interferometry - Statistics of Photon Counting 593

Alastair Basden, Craig Mackay, Bob Tubbs
L3CCDs: Low Readout Noise CCDs in Astronomy – Lucky Exposure Technique 599

Jean-Luc Gach, David Darson, Christian Guillaume, Michel Goillandeau, Olivier Boissin, Jacques Boulesteix, Cyril Cavadore
Zero noise CCD - a new readout technique 603

Jean-Luc Gach Christian Guillaume, Cyril Cavadore, Olivier Boissin
First results of an L3CCD in photon counting mode 611

GLOSSARY OF ACRONYMS 615

THE NERD BOAT 625