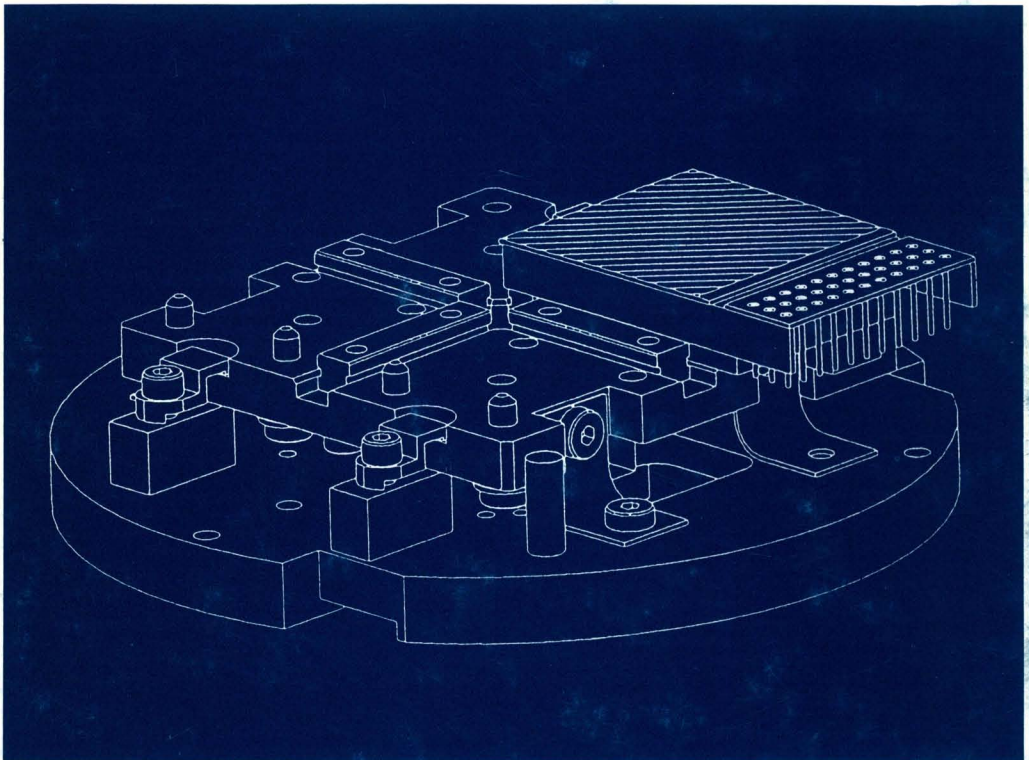


INTERNATIONAL ASTRONOMICAL UNION

SYMPOSIUM No. 167

NEW DEVELOPMENTS IN ARRAY TECHNOLOGY AND APPLICATIONS

Edited by A. G. DAVIS PHILIP, KENNETH A. JANES
and ARTHUR R. UPGREN



INTERNATIONAL ASTRONOMICAL UNION

KLUWER ACADEMIC PUBLISHERS

NEW DEVELOPMENTS IN ARRAY TECHNOLOGY AND APPLICATIONS

INTERNATIONAL ASTRONOMICAL UNION
UNION ASTRONOMIQUE INTERNATIONALE

NEW DEVELOPMENTS IN ARRAY TECHNOLOGY AND APPLICATIONS

PROCEEDINGS OF THE 167TH SYMPOSIUM OF THE
INTERNATIONAL ASTRONOMICAL UNION,
HELD IN THE HAGUE, THE NETHERLANDS, AUGUST 23–27, 1994

EDITED BY

A. G. DAVIS PHILIP

Union College and the Institute for Space Observations

KENNETH A. JANES

Boston University

and

ARTHUR R. UPGREN

Van Vleck Observatory, Wesleyan University



KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON



A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 0-7923-3639-9

*Published on behalf of
the International Astronomical Union
by
Kluwer Academic Publishers, P.O. Box 17, 3300 AA Dordrecht, The Netherlands.*

*Kluwer Academic Publishers incorporates
the publishing programmes of
D. Reidel, Martinus Nijhoff, Dr W. Junk and MTP Press.*

*Sold and distributed in the U.S.A. and Canada
by Kluwer Academic Publishers,
101 Philip Drive, Norwell, MA 02061, U.S.A.*

*In all other countries, sold and distributed
by Kluwer Academic Publishers Group,
P.O. Box 322, 3300 AH Dordrecht, The Netherlands.*

Printed on acid-free paper

*All Rights Reserved
©1995 International Astronomical Union*

*No part of the material protected by this copyright notice may be reproduced or utilized
in any form or by any means, electronic or mechanical including photocopying,
recording or by any information storage and retrieval system, without written permission
from the publisher.*

Printed in the Netherlands

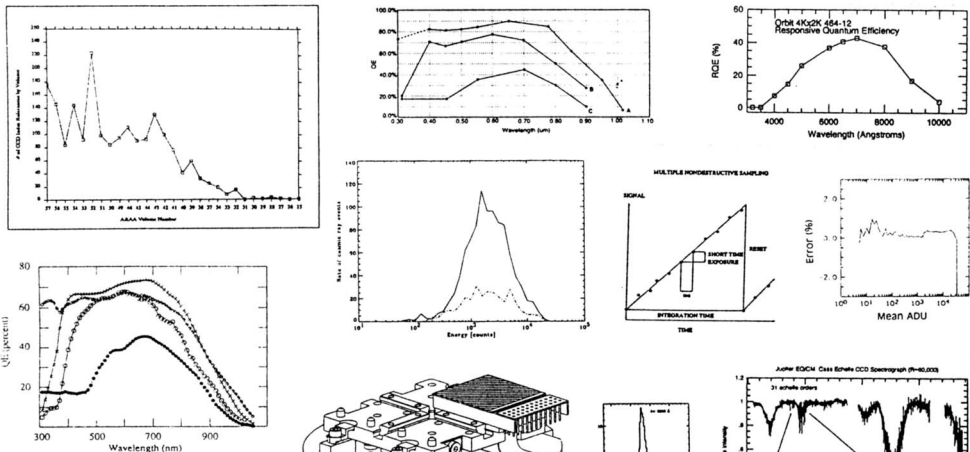


Fig. 1. Sensitiver curves for selected CCDs.

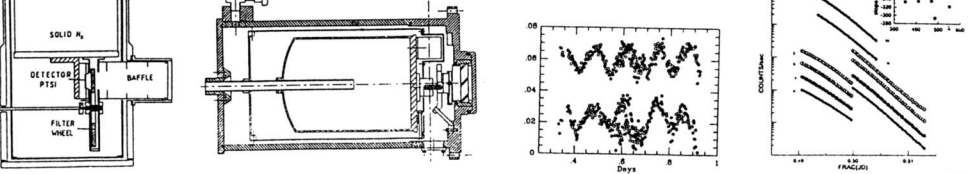
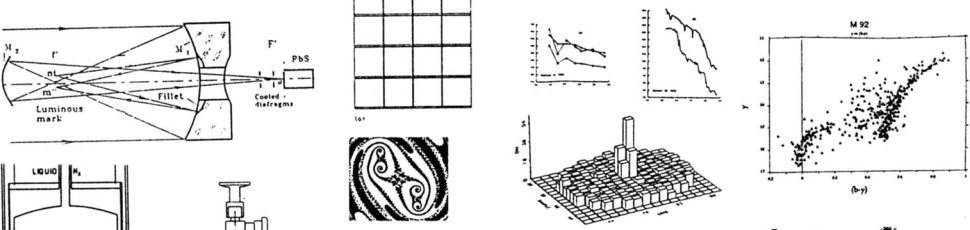
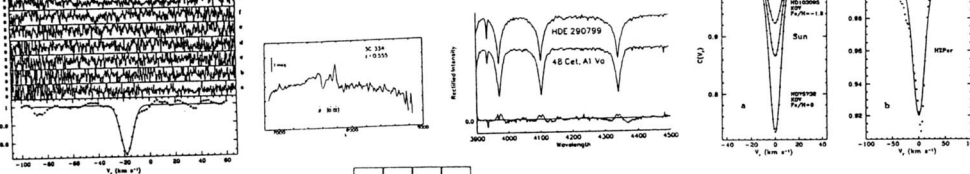
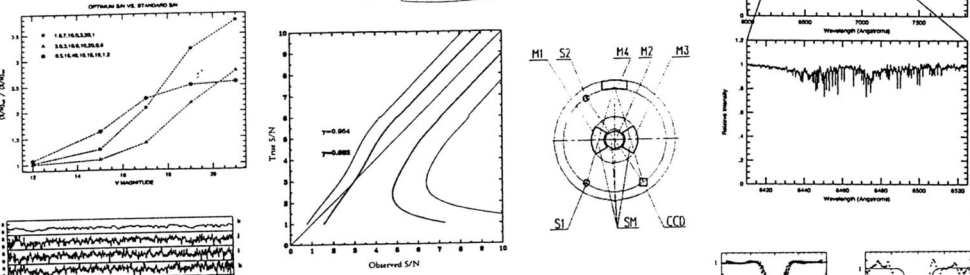


Table of Contents

Preface	xv
Section I - Review Papers	
INTRODUCTION	
A. G. Davis Philip	3
ARRAY DETECTORS AND INSTRUMENTS FOR THE ESO VLT	
Sandro D'Odorico	9
DESIGN AND FABRICATION OF LARGE CCDs FOR THE KECK OBSERVATORY DEIMOS SPECTROGRAPH	
R. J. Stover, W. E. Brown, D. K. Gilmore and M. Wei	19
SCIENTIFIC CCD PROSPECTS FOR 1994 AND BEYOND	
Paul R. Jordan and A. P. Oates	27
NEW DEVELOPMENTS IN CCD TECHNOLOGY FOR THE UV-EUV SPECTRAL RANGE	
Giovanni Bonanno	39
CCD CONTROLLERS	
Robert W. Leach	49
CCDs IN ACTIVE ACQUISITION SYSTEMS	
A. Blecha	57
CCD DEVELOPMENT ACTIVITIES AT ESO	
O. Iwert	67
INFRARED ARRAY DETECTORS: PERFORMANCE AND PROSPECTS	
Ian S. McLean	69

THE LICK OBSERVATORY TWO MICRON CAMERA		
	K. Gilmore, D. Rank and P. Temi	79
INFRARED ARRAYS AT THE EUROPEAN SOUTHERN OBSERVATORY		
	G. Finger, G. Nicolini, P. Biereichel, M. Meyer and A. F. M. Moorwood	81
THE IMPACT OF INFRARED ARRAY TECHNOLOGY ON ASTRONOMY		
	Giovanni G. Fazio	93
MONOLITHIC Si BOLOMETER ARRAYS: DETECTORS FOR FAR INFRARED AND SUBMILLIMETER DETECTION		
	Harvey Moseley	95
OBSERVATIONAL CONCERNS AND TECHNIQUES FOR HIGH- BACKGROUND MID-INFRARED (5 - 20 micron) ARRAY IMAGING		
	Daniel Y. Gezari	97
AN INFRARED CAMERA BASED ON A LARGE PtSi ARRAY		
	I. S. Glass, K. Sekiguchi and Y. Nakada	109
PtSi IR ARRAY IN MOSAIC CONFIGURATION		
	Munetaka Ueno, Fumiaki Tsumuraya and Yoshihiro Chikada	117
CCD PHOTOMETRY - PRESENT AND FUTURE		
	Alistair R. Walker	123
CCD PHOTOMETRY: SOME BASIC CONCERNS		
	C. Sterken	131
CHOOSING FILTERS TO MAKE CCD PHOTOMETRY TRANS- FORMABLE TO OTHER DETECTORS		
	Andrew T. Young	145

AUTOMATED CCD SCANNING FOR NEAR EARTH ASTEROIDS	
Robert Jedicke	157
CCD TIME SERIES PHOTOMETRY OF ASTRONOMICAL SOURCES	
Steve B. Howell	167
HIGH PRECISION STELLAR PHOTOMETRY WITH CCDs. I.	
A. J. Penny	173
HIGH PRECISION STELLAR PHOTOMETRY WITH CCDs. II.	
Michael S. Bessell	175
PRECISION DIFFERENTIAL CCD PHOTOMETRY	
L. A. Balona	187
ARRAY POLARIMETRY AND OPTICAL-DIFFERENCING PHOTOMETRY	
J. Tinbergen	197
COSMIC RAY EVENTS AND NATURAL RADIOACTIVITY IN CCD CRYOSTATS	
Ralph Florentin-Nielsen, Michael J. Andersen and Sven P. Nielsen	207
MOCAM: A 4k X 4k CCD MOSAIC FOR THE CANADA-FRANCE- HAWAII TELESCOPE PRIME FOCUS	
J. C. Cuillandre, Y. Melliers, R. Murowinski, D. Crampton, G. Luppino and R. Arsenault	213
ECHELLE SPECTROSCOPY WITH A CCD AT LOW SIGNAL-TO- NOISE RATIO	
Didier Queloz	221
NICMOS3 DETECTOR FOR SPECTROSCOPY	
L. Vanzi, A. Marconi and S. Gennari	231
SPECTRAL CLASSIFICATION WITH ARRAY DETECTORS	
C. J. Corbally	241

SPECTROSCOPIC OBSERVATIONS OF SOLAR SYSTEM OBJECTS:
PUSHING THE LIMITS

Anita L. Cochran 251

“VA-ET-VENT” (“BACK-AND-FORTH”) CCD SPECTROSCOPY:
A NEW WAY TO INCREASE THE LIMITING MAGNITUDE OF
VERY LARGE TELESCOPES

G. Soucail, J. C. Cuillandre, J. P. Picat
and B. Fort 263

SOME PROBLEMS OF WIDE-FIELD ASTROMETRY WITH A SHORT-
FOCUS CCD ASTROGRAPH

I. S. Guseva 275

A DUAL CCD MOSAIC CAMERA SYSTEM SEARCHING FOR
MASSIVE COMPACT HALO OBJECTS (MACHOs)

Kem H. Cook 285

MULTI-FIBER SPECTROSCOPY WITH WIDE-FIELD TELESCOPES

F. G. Watson 287

PERFORMANCE OF A 2048 x 2048 PIXEL THREE-SIDE-
BUTTABLE CCD DESIGNED FOR LARGE FOCAL PLANES
IN ASTRONOMY

J. A. Cortiula 295

CCD MOSAIC DEVELOPMENT FOR LARGE OPTICAL TELESCOPES

G. A. Luppino, M. R. Meizer and
S. Miyazaki 297

HIGHLIGHTS OF IAU SYMPOSIUM No. 167

Sandro D’Odorico 309

Section II - Poster Papers

THE TRANSPUTER BASED CCD CONTROLLER AT ESO	
Roland Reiss	317
DETECTOR CONTROLLERS FOR THE GALILEO TELESCOPE: A PROGRESS REPORT	
G. Bonanno, P. Bruno, R. Consentino, F. Bortoletto, M. D'Alessandro, D. Fantinel, A. Balesstra and P. Marcucci	319
THE RUTHERFORD-SAAO CCD CONTROLLERS AND THEIR APPLICATIONS	
I. S. Glass, D. B. Carter, G. F. Woodhouse, N. A. Waltham and G. M. Newton	321
CCD IMAGERS WITH ENHANCED UV SENSITIVITY FOR INDUSTRIAL AND SCIENTIFIC APPLICATIONS	
G. I. Vishnevsky, M. G. Vydrevich, L. Yu. Lazovsky, V. G. Kossov and S. S. Tataushchikov	323
THE LARGE-FIELD BRIGHT-STAR HIGH-PRECISION CCD PHOTOMETER OF BAO	
Shiyang Jiang	325
EFFECTS OF SHUTTER TIMING ON CCD PHOTOMETRY	
D. Galadi-Enriquez, C. Jordi and E. Trullols	327
ASTRONOMICAL APPLICATIONS OF CCDs IN HUNGARY: THE FIRST STEPS AND FUTURE PLANS	
G. Szécsényi-Nagy	329
A SIMPLE CCD-SYSTEM FOR SECONDARY ALIGNMENT OF THE SPECTRUM-UV SPACE TELESCOPE	
V. Didkovsky, N. V. Steshenko, P. I. Borzyak and A. I. Dolgushin	331

THE MODERNIZATION OF THE PULKOVO PHOTOGRAPHIC
(PHOTOELECTRIC) VERTICAL CIRCLE BY A CCD ARRAY

G. A. Goncharov, B. K. Bagildinsky, E. V. Kornilov,
D. D. Polojentsev, K. V. Rumyantsev and V. D. Shkotov 333

A NEW OCULAR MICROMETER FOR THE MAHIS

T. R. Kirian, V. S. Korepanov and V. M. Grozdilov 335

PbS AND CCD ARRAY AUTOCOLLIMATION MICROMETERS
FOR THE INFRARED MERIDIAN CIRCLE

V. N. Yershov 337

THE NOAO CCD CONTROLLER - ARCON

Alistair R. Walker 339

INTENSIFIED ELECTRON-BOMBARDED CCD IMAGES FOR
INDUSTRIAL AND SCIENTIFIC APPLICATIONS

I. Dalinenko, G. Vishnevsky, V. Kossov, L. Lasovsky,
G. Kuzmin and A. Malyarov 341

THE CCDs AT ESO: A SYSTEMATIC TESTING PROGRAM

T. M. C. Abbott 343

DEVELOPMENT OF A 7000 x 4000 PIXEL MOSAIC CCD CAMERA

Nobunari Kashikawa, Masafumi Yagi, Naoki Yasuda,
Sadanori Okamura, Kazuhiro Shimasaku, Mamoru
Doi and Maki Sekiguchi 345

THE FEASIBILITY OF A CCD FOR AN ASTROMETRIC REFRACTOR

A. R. Uppgren, Alice Morales, Jose Herrero, J. W.
Griese, III, J. M. Vincent and John T. Lee 347

STELLAR POSITIONS FROM CCD IMAGES

A. R. Uppgren, C. Abad and J. Stock 349

ON THE ACCURACY OF CCD AND PHOTOGRAPHIC OBSERVATIONS OF ASTEROIDS AND THEIR CURRENT ORBIT DETERMINATIONS	
O. P. Bykov	351
ON THE PROBLEM OF STANDARD FIELDS FOR CCD ASTROMETRY	
I. S. Guseva	353
COMBINED VISUAL AND NEAR-IR DIGITAL PHOTOMETRY: THE VERY YOUNG CLUSTER WESTERLUND 2	
M. D. Guarnieri, M. Gai, G. Massone, M. G. Lattanzi, U. Munari and A. Moneti	355
A DUAL CCD MOSAIC CAMERA SYSTEM SEARCHING FOR MASSIVE-COMPACT HALO OBJECTS (MACHOs)	
Kem H. Cook	357
JHK PHOTOMETRY OF EXTRAGALACTIC SOURCES USING AN INFRARED ARRAY CAMERA	
I. S. McLean, T. Liu and H. Tepliz	359
PRECISION CCD PHOTOMETRY OF THE HORIZONTAL BRANCH	
A. G. Davis Philip	361
CCD PHOTOMETRY OF THE M 67 CLUSTER IN THE VILNIUS PHOTOMETRIC SYSTEM	
R. Boyle, V. Straižys, F. Vrba, F. Smriglio and A. Dasgupta	363
ESTIMATION OF THE ERRORS INVOLVED IN THE INTENSITY MEASUREMENT OF LOW S/N RATIO EMISSION LINES	
Claudia Rola and Didier Pelat	365
EEV AND ELECTRON CORP. VIRTUAL PHASE CCDs IN THE NEAR IR REGION, He λ 10830 Å	
A. G. Shcherbakov, Z. A. Shcherbakova, I. Ilyin and I. Tuuominen	367

STELLAR PHOTOMETRY WITH A PERFECT CCD	
Bjarne Thomsen and Frank Grundahl Jensen	369
APPLICATIONS OF A REALISTIC MODEL FOR CCD IMAGING	
Steve B. Howell and William J. Merline	371
3D: THE NEW NEAR-INFRARED FIELD IMAGING SPECTROMETER	
L. E. Tacconi-Garman, L. Weitzel, M. Cameron, S. Drapatz, R. Genzel, A. Krabbe, H. Kroker and N. Thatte	373
TECHNICAL CCD SYSTEMS FOR THE ESO VERY LARGE TELESCOPE	
J. Erich	375
POSTER DISCUSSIONS	377
INDEX	381
NAME INDEX	383
OBJECT INDEX	388
SUBJECT INDEX	390