Eighth International Workshop on Laser Ranging Instrumentation

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Eighth International Workshop on Laser Ranging Instrumentation

Compiled and Edited by
John J. Degnan
Goddard Space Flight Center
Greenbelt, Maryland

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Goddard Space Flight Center
Greenbelt, Maryland 20771
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Page No.</th>
<th>Title</th>
<th>Authors/Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>vii</td>
<td>Foreward</td>
<td></td>
</tr>
<tr>
<td>viii</td>
<td>List of Participants</td>
<td></td>
</tr>
<tr>
<td>xv</td>
<td>Workshop Agenda</td>
<td></td>
</tr>
<tr>
<td>1-1</td>
<td>Scientific Applications and Measurements Requirements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laser Tracking for Vertical Control</td>
<td>P. Dunn et al., Hughes STX</td>
</tr>
<tr>
<td></td>
<td>Laser Ranging Network Performance and Routine Orbit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Determination at D-PAF</td>
<td>F.-H. Massman et al., DGFI</td>
</tr>
<tr>
<td>1-19</td>
<td>Laser Ranging Application to Time Transfer Using Geodetic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Satellite and to Other Japanese Space Programs</td>
<td>H. Kunimori et al., CRL</td>
</tr>
<tr>
<td>1-34</td>
<td>Applications of SLR</td>
<td>B. E. Schutz, Center for Space Research, University of Texas</td>
</tr>
<tr>
<td>2-1</td>
<td>Timely Issues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Satellite Signatures in SLR Observations</td>
<td>G.M. Appleby, Royal Greenwich Obs.</td>
</tr>
<tr>
<td></td>
<td>Work at Graz on Satellite Signatures</td>
<td>G. Kirchner, SLR Graz</td>
</tr>
<tr>
<td>2-15</td>
<td>The Precision of Today’s Satellite Laser Ranging Systems</td>
<td>P.J. Dunn et al., Hughes STX</td>
</tr>
<tr>
<td>2-23</td>
<td>SLR Data Screening; Location of Peak of Data Distribution</td>
<td>A.T. Sinclair, Royal Greenwich Observatory</td>
</tr>
<tr>
<td>2-34</td>
<td>Adaptive Median Filtering for Preprocessing of Time Series Measurements</td>
<td>M. Paunonen, Finnish Geodetic Institute</td>
</tr>
<tr>
<td>2-44</td>
<td>SATCOP Mission Planning Software Package</td>
<td>S. Bucey, BFEC</td>
</tr>
<tr>
<td>3-1</td>
<td>Laser Technology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nd:YLF Laser for Airborne/Spaceborne Laser Ranging</td>
<td>J.L. Dallas et al., NASA/GSFC</td>
</tr>
<tr>
<td></td>
<td>Alternative Wavelengths for Laser Ranging</td>
<td>K. Hamal, Czech Technical Univ.</td>
</tr>
<tr>
<td>3-7</td>
<td>New Methods of Generation of Ultrashort Laser Pulses for Ranging</td>
<td>H. Jelinkova et al., Czech Technical University</td>
</tr>
<tr>
<td>3-9</td>
<td>Simultaneously Compression of the Passively Mode-Locked Pulsedwidth and Pulse Train</td>
<td>Yang Xiangchun et al., Shanghai Institute of Optics and Fine Mechanics</td>
</tr>
<tr>
<td>3-15</td>
<td>An Improved Light Source for Laser Ranging</td>
<td>K. Hamal et al, Czech Technical University</td>
</tr>
<tr>
<td>3-19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Epoch and Event Timing

Preliminary Results from the Portable Standard Satellite Laser Ranging
Intercomparison with MOBLAS-7, M. Seldon et al., BFEC .......................... 4-1

Detector Technology

Performance Optimization of Detector Electronics for Millimeter Laser Ranging,
S. Cova et al., Politecnico di Milano ...................................................... 5-1
Tracking Capabilities of SPADs for Laser Ranging, F. Zappa et al.,
Politecnico di Milano ............................................................................... 5-19
How to Squeeze High Quantum Efficiency and High Time Resolution out of a SPAD,
A. Lacaita et al., Politecnico di Milano .................................................... 5-25
The Solid State Detector Technology for Picosecond Laser Ranging, I. Prochazka,
Czech Technical University ..................................................................... 5-31
Streak Camera Based SLR Receiver for Two Color Atmospheric Measurements,
T. Varghese et al., BFEC ................................................................. 5-36
The First Satellite Laser Echoes Recorded on the Streak Camera, K. Hamal et al.,
Czech Technical University ..................................................................... 5-47

Calibration Techniques/Targets

Experience and Results of the 1991 MTLRS#1 USSR Campaign, P. Sperber et al.,
IfAG ........................................................................................................... 6-1
ETALON-1, -2 Center of Mass Correction and Array Reflectivity, N.T. Mironov
et al., Main Astron. Obs. of the Academy of Sciences ............................... 6-9
Test Results from LAGEOS-2 Optical Characterization Using Pulsed Lasers,
T. Varghese et al., BFEC ........................................................................... 6-33
Analysis of TOPEX Laser Retroreflector Array Characteristics, T. Varghese, BFEC
Historical MOBLAS System Characterization, V. Husson, BFEC ............... 6-47

Multiwavelength Ranging/Streak Cameras

Optimum Wavelengths for Two Color Ranging, J. Degnan, NASA/GSFC .......... 7-1
Two Color Satellite Laser Ranging Upgrades at Goddard’s 1.2m Telescope Facility,
T. Zagwodzki et al., NASA/GSFC .......................................................... 7-15
Measuring Atmospheric Dispersion with WLRS in Multiple Wavelength Mode,
U. Schreiber et al., Fundamentalstation Wettzell ..................................... 7-28
Millimeter Accuracy Satellites for Two Color Ranging, J. Degnan, NASA/GSFC 7-36
Two Wavelength Satellite Laser Ranging Using SPAD, I. Prochazka et al., Czech
Technical University ................................................................................ 7-52
New Perspectives for High Accuracy SLR with Second Generation Geodesic Satellites,
G. Lund, AEROSPATIALE ........................................................................ 7-56

SLR Data Analysis/Model Errors

State-of-the-Art Satellite Laser Range Modeling for Geodetic and Oceanographic
Applications, S.M. Klosko et al., Hughes STX ......................................... 8-1
Geometric Analysis of Satellite Laser Ranging Data, B. Conklin et al., BFEC ....... 8-15
Improvement of SLR Accuracy, A Possible New Step, M. Kasser, ESGT ........... 8-23
Operational Software Developments

On the Accuracy of ERS-1 Orbit Predictions, R. Koenig et al., DGFI ........................................ 9-1
Compensation for the Distortion in Satellite Laser Range Predictions Due to Varying
Pulse Travel Times, M. Paunonen, Finnish Geodetic Institute ..................................................... 9-9
Timebias Corrections to Predictions, R. Wood et al., Satellite Laser Ranger Group,
Hermon Sioux Castle .................................................................................................................. 9-13
Formation of On-Site Normal Points, G.M. Appleby et al., Royal Greenwich Obs. .................. 9-19
Poisson Filtering of Laser Ranging Data, R.L. Ricklefs et al., McDonald Obs. ......................... 9-26
Computer Networking at SLR Stations, A. Novotny, Czech Technical Univ. .......................... 9-33
Upgrading NASA/DOSE Laser Ranging System Control Computers, R.L. Ricklefs
et al., McDonald Observatory ..................................................................................................... 9-43
HP Upgrade Operational Streamlining, D. Edge et al., BFEC .................................................... 9-49
Application of the Robust Estimate in SLR Data Preprocessing, T. Detong et al.,
Shanghai Observatory .................................................................................................................. 9-57

Lunar Laser Ranging

A Computer-Controlled x-y Offset Guiding Stage for the MLRS, P.J. Shelus et al.,
McDonald Observatory .................................................................................................................. 10-1
Lunar Laser Ranging Data Processing in a Unix/X Windows Environment,
R.L. Ricklefs et al., McDonald Observatory .............................................................................. 10-6
LLR-Activities in Wettzell, U. Schreiber et al., Fundamentalstation Wettzell .......................... 10-14

Fixed Station Upgrades/Developments

Matera Laser Ranging Observatory (MLRO); An Overview, T. Varghese et al.,
BFEC ............................................................................................................................................... 11-1
Performance of the Upgraded Orroral Laser Ranging System, J. Mck. Luck,
Orroral Geodetic Observatory ......................................................................................................... 11-6
SUB-CM Ranging and Other Improvements in Graz, G. Kirchner et al., SLR Graz ............. 11-31
Upgrading of the Borowiec Laser Station, S. Schillak et al., Space Research
Center of Polish Academy of Sciences .............................................................................................. 11-37
Development of Shanghai Satellite Laser Ranging Station, F.M. Yang et al.,
Shanghai Observatory .................................................................................................................... 11-44
Status-Report on WLRS, R. Dassing et al., IfAG ....................................................................... 11-51
Ground Based Laser Ranging for Satellite Location, G.C. Gilbreath et al., Naval
Research Laboratory ..................................................................................................................... 11-54
New Progress of Ranging Technology at Wuhan Satellite Laser Ranging Station,
Xia Zhizhong et al., Institute of Seismology .............................................................................. 11-60

Mobile System Upgrades/Developments

TLRS-3 System Upgrades, R. Eichinger et al., BFEC .................................................................... 12-1
Results of the MTLRS-1 Upgrade, P. Sperber et al., IfAG .......................................................... 12-17
The new MTLRS#1 Receiving System, P. Sperber et al., IfAG .................................................. 12-26
The new MTLRS Transmitting System, P. Sperber et al., IfAG .................................................. 12-33
Transputer Based Control System for MTLRS, E. Vermaat et al., Kootwijk
Observatory for Satellite Geodesy ............................................................................................ 12-40
Airborne and Spaceborne Systems

Airborne 2 Color Ranging Experiment, P.S. Millar et al., NASA/GSFC ............ 13-1
GLRS 2-Colour Retroreflector Target Design and Predicted Performance, G. Lund, AEROSPATIALE .................................................. 13-17
Development of the Mars Observer Laser Altimeter (MOLA), B.L. Johnson Jr. et al., NASA/GSFC ............................................. 13-49
Bench Checkout Equipment for Spaceborne Laser Altimeter Systems, J.C. Smith et al., NASA/GSFC ........................................ 13-52
Mars Laser Altimeter Based on a Single Photon Ranging Technique, I. Prochazka et al., Czech Technical University ..................... 13-74
Multi-Beam Laser Altimeter, J.L. Bufton, NASA/GSFC ............................ 13-78

Poster Presentations

Satellite Laser Station Helwan Status 1992, M. Cech et al., Czech Technical University .................................................. 14-1
Optical Attenuation Mechanism Upgrades, MOBLAS and TLRS Systems, R. Eichinger et al., BFEC ........................................... 14-2
The Third Generation SLR Station Potsdam No. 7836, H. Fischer et al., GeoForschungsZentrum Potsdam ........................................... 14-14
Performance Comparison of High Speed Microchannel Plate Photomultiplier Tubes, T. Varghese et al., BFEC ................................. 14-20
Station Report on the Goddard Space Flight Center (GSFC) 1.2 Meter Telescope Facility, J.F. McGarry et al., NASA/GSFC ..................... 14-29

Session Summaries ............................................. 15-1
Scientific Applications and Measurements Requirements ........................... 15-2
Timely Issues .................................................. 15-5
Laser Technology ........................................... 15-6
Epoch and Event Timing ....................................... 15-7
Detector Technology ........................................ 15-8
Calibration Techniques/Targets ................................... 15-9
Multiwavelength Ranging/Streak Cameras ....................................... 15-10
SLR Data Analysis/Model Errors .................................. 15-11
Operational Software Developments ....................................... 15-12
Lunar Laser Ranging ......................................... 15-13
Fixed Station Upgrades/Developments ................................... 15-14
Mobile System Upgrades/Developments .................................... 15-15

Conference Summary/Resolutions ......................................... 16-1

Business Meeting/Next Workshop ........................................ 17-1
FOREWORD

At long last, the Proceedings of the Eighth International Workshop are "ready" for publication. As Chairman, I tried very hard to obtain 100 percent of the presentations in printed form so that they could be distributed in these proceedings. In spite of the fact that the original submission deadline of 1 August 1992 was extended twice into early 1993 and numerous personal contacts were made, there are still several fine papers missing. Nevertheless, this volume contains the vast majority of the presentations, and I felt I could not delay publication any longer. Besides, I desperately wanted to avoid the embarrassment of distributing these proceedings at the 1994 workshop in Australia. Thank you to all who contributed.

One does not take on the job of chairing a major international meeting without a lot of help, and I wish to take this opportunity to thank a number of people who made the Annapolis meeting a success.

A special thank you goes to Miriam Baltuck and Joe Engeln at NASA Headquarters who provided funding support for the meeting. Not only did this contribute substantially to the overall success of the workshop, but it permitted greater participation from many of our foreign colleagues.

I also wish to express my thanks to Karel Hamal of the Technical University of Prague, who kindly offered his laboratory as a meeting site for the Program Committee in January 1992, and to Ivan Prochazka for serving as unofficial recording secretary during our deliberations. Thanks also to Program Committee members Christian Veillet and Ben Greene for taking time from their busy schedules and coming to Prague to help plan the workshop.

I am grateful also for the support of the session chairmen who were responsible for soliciting papers and for organizing and summarizing the material presented in their sessions. These include Bob Schutz, Andrew Sinclair, Helena Jelinkova, Ben Greene, Tom Varghese, Jean Gaignebet, Karel Hamal, Ron Kolenkiewicz, Georg Kirchner, Christian Veillet, Erik Vermaat, Jim Abshire, Mike Pearlman, Carroll Alley, and Richard Eanes (for standing in on occasion).

Thanks also to Sarah Wager and Deborah Williams of Westover Consultants for their assistance in selecting the site for the meeting, helping with hotel and travel arrangements for the meeting, and general coordinating activities.

Last, but certainly not least, I want to thank my secretary, Mrs. Diana Elben, for her wonderful support during the entire effort - from mailing the initial circulars, through supporting the meeting itself (in countless ways), through the preparation of the proceedings for publication through their final distribution. I couldn't have done it without her.

John J. Degnan
Chairman
Eighth International Workshop on Laser Ranging Instrumentation
LIST OF PARTICIPANTS

James Abshire
NASA/Goddard Space Flight Cntr.
Code 924
Greenbelt, MD 20771
USA
Phone: 301-286-2611
Robert Afzal
NASA/Goddard Space Flight Cntr.
Code 924
Greenbelt, MD 20771
USA
Fahad Al-Hussain
428-2 Ridge Road
Greenbelt, MD 20770
USA
Phone: 301-474-4787
Carroll Alley
Department of Physics
University of Maryland
College Park, MD 20742
USA
Phone: 301-405-6098
Fax: 301-699-9195
G.M. Appleby
Royal Greenwich Observatory
Madingley Road
Cambridge, CB30EZ
ENGLAND
Phone: 44-223-37437
Fax: 44-223-374700
Miriam Baltuck
NASA Headquarters
Code SEP-05
Washington, D.C. 20541
Aldo Banni
Via Ospedale 72
Cagliari, 09124
ITALY
Phone: 39-70-72-5246
Wiard Beek
Kootwijck Observatory
P.O. Box 581
Apeldoorn, 7300 AN
NETHERLANDS
Phone: 31-5769-8212
Fax: 31-5769-1344
Tammy Bertram
NASA/Goddard Space Flight Cntr.
Code 726.1
Greenbelt, MD 20771
USA
Phone: 301-286-8119
Fax: 301-286-2429
Giuseppe Bianco
Centro di Geodesia Spaziale
P.O. Box 11
Matera, 75100
ITALY
Phone: 39-835-377209
Fax: 39-835-339005
John Bosworth
NASA/Goddard Space Flight Cntr.
Code 901
Greenbelt, MD 20771
USA
Phone: 301-286-7052
Fax: 301-286-4943
Steven Bucey
BFEC
10210 Greenbelt Rd/Suite 700
Seabrook, MD 20706
USA
Phone: 301-794-3510
Fax: 301-794-3524
J.L. Button
NASA/Goddard Space Flight Cntr.
Code 920
Greenbelt, MD 20771
USA
Phone: 301-286-8591
Fax: 301-286-9200
Alberto Cenci
via Tiburtina,
Rome, 965
ITALY
Phone: 39-640693861
Fax: 39-640693638
Jean Eugene Chabaudie
Ave. Copernic
Grasse, 06130
FRANCE
Phone: 33-93-365869
Fax: 33-93-368963
Jack Cheek
4400 Forbes Boulevard
Lanham, MD 20782
USA
Phone: 301-286-4076
Fax: 301-286-1620
Jim Churnside
NOAA - Wave Propagation
R/E/WP1, 325 Broadway
Boulder, CO 80303
USA
Phone: 303-497-6744
Fax: 303-497-6978
Brion Conklin
BFEC
10210 Greenbelt Rd/Suite 700
Seabrook, MD 20706
USA
Phone: 301-794-3510
Fax: 301-794-3524
Sergio Cova
p.z.a. Leonardo da Vinci 32
Politecnico di Milano
Milano, 20133
ITALY
Phone: 39-2-23996103
Fax: 39-2-2367604
William Crawford  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3495  
Fax: 301-794-3524  

Don Cresswell  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3493  
Fax: 301-794-3524  

Henry A. Crooks  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3500  
Fax: 301-794-3524  

E. Cuot  
Avenue Nicolas Copemic  
Grasse 06130, FRANCE  
Phone: 33-93-126270  
Fax: 33-93-092615  

Joseph Dallas  
NASA/Goddard Space Flight Cntr.  
Code 726.1  
Greenbelt, MD 20771  
USA  
Phone: 301-286-6041  
Fax: 301-286-6041  

Reiner Dassing  
Fundamental Station Wetzell  
Koetzting, 8493  
GERMANY  
Phone: 49-9941-603112  
Fax: 49-9941-603222  

Winfield M. Decker  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3474  
Fax: 301-794-3524  

John J. Degnan  
NASA/Goddard Space Flight Cntr.  
Code 901  
Greenbelt, MD 20771  
USA  
Phone: 301-286-8470  
Fax: 301-286-4943  

Domenico Del Rosso  
Centro Spaziale Di Matera  
ITALY  
Phone: 39-835-334951  
Fax: 39-835-3771  

Howard Donovan  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3524  
Fax: 301-794-3524  

Peter Dunn  
Hughes STX  
4400 Forbes Blvd.  
Lanham, MD 20905  
Phone: 301-796-5036  
Fax: 301-306-1010  

Richard Eanes  
Cntr. for Space Research  
University of Texas - Austin  
Austin, TX 78712-1085  
USA  
Phone: 512-471-5573  
Fax: 512-471-3570  

David R. Edge  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3474  
Fax: 301-794-3524  

Richard Eichinger  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3508  
Fax: 301-794-3524  

John J. Degnan  
NASA/Goddard Space Flight Cntr.  
Code 901  
Greenbelt, MD 20771  
USA  
Phone: 301-286-8470  
Fax: 301-286-4943  

Kenneth S. Emenheiser  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3495  
Fax: 301-794-3524  

Joe Engeln  
NASA Headquarters  
Code SEP-05  
Washington, D.C. 20541  
Phone: 202-453-1725  
Fax: 202-755-2552  

Dominique Feraudy  
CERGA  
Ave. Copemic  
Grasse, F06130 FRANCE  
Phone: 33-93-365849  
Fax: 33-93-092613  

Thomas Fischetti  
2609 Village Lane  
Silver Spring, MD 20906  
USA  
Phone: 301-871-2425  
Fax: 301-871-0269  

J.C. Gaignebet  
GRGS/CERGA/OCA  
Av Copemic  
Grasse, F06130 FRANCE  
Phone: 33-93-365899  
Fax: 33-93-368963  

Virgil F. Gardner  
NASA/Goddard Space Flight Cntr.  
Code 901  
Greenbelt, MD 20771  
USA  
Phone: 301-286-8437  
Fax: 301-286-4943  

Luciano Garramone  
Centro Spaziale Di Matera  
ITALY  
Phone: 39-835-334951  
Fax: 39-835-3771
Danny Krebs
NASA/Goddard Space Flight Cntr.
Code 726.1
Greenbelt, MD 20771
USA
Phone: 301-286-7714

Hiroo Kunimori
4-2-1 Nukui-Kita-Machi Koganei
Tokyo, 184
JAPAN
Phone: 81-423-27-7560
Fax: 81-423-21-9899

Maurice Laplanche
CERGA/OCA
Ave. Copernic
Grasse, F06130
FRANCE
Phone: 33-93-426270
Fax: 33-93-092613

Dr. Kasimir Lapushka
Riga SLR Station
University of Riga
Riga
LATVIA

John Luck
AUSLIG, P.O. Box 2
Belconnen, ACT 2616
AUSTRALIA
Phone: 61-6-2357285
Fax: 61-6-2575883

Glenn Lund
Aerospatiale CA/TO/I
100 Blvd, du Midi
06322 Cannes La Bocca
FRANCE
Phone: 33-9292-7856
Fax: 33-9292-7190

Jan McGarry
NASA/Goddard Space Flight Cntr.
Code 901
Greenbelt, MD 20771
USA
Phone: 301-286-5020
Fax: 301-286-4943

Michael Maberry
Institute for Astronomy
P.O. Box 209
Kula, HI 96790
USA
Phone: 808-878-1215
Fax: 808-878-2862

Paul Malitson
BFEC
10210 Greenbelt Rd/Suite 700
Seabrook, MD 20706
USA
Phone: 301-794-3505
Fax: 301-794-3524

Jean Francois Mangin
CERGA/OCA
Ave. Copernic
Grasse, F06130
FRANCE
Phone: 33-93-365849
Fax: 33-93-092613

Franz-Heinrich Massmann
Pfarrangerweg 4
Petershalisen, D-8037
GERMANY
Phone: 49-8137-5965
Fax: 49-8153-28-1207

Timothy May
Electro Optic Systems Pty. Ltd.
55A Monaro Street
Queanbeyan, NSW 2820
AUSTRALIA
Phone: 61-6-2992470
Fax: 61-6-2992477

Pamela Millar
NASA/Goddard Space Flight Cntr.
Code 924
Greenbelt, MD 20771
USA
Phone: 301-286-3793
Fax: 301-286-2717

Joseph Miller
1130 Freeland Road
Freeland, MD 21053
Phone: 410-357-5818

Grant Moule
Electro Optic Systems Pty. Ltd.
55A Monaro Street
Queanbeyan, NSW
AUSTRALIA
Phone: 61-6-2992470
Fax: 61-6-2992477

Alan Murdoch
BFEC
10210 Greenbelt Rd/Suite 700
Seabrook, MD 20706
USA
Phone: 301-794-3497
Fax: 301-794-3524

Reinhart Neubert
Telegrafenberg A 17
Potsdam, 0-1561
GERMANY
Phone: 37-331-0325
Fax: 37-332-2824

Carey Noll
NASA/Goddard Space Flight Cntr.
Code 935
Greenbelt, MD 20771
USA
Phone: 301-286-9283
Fax: 301-286-4952

Antonin Novotny
Technical University of Prague
Brehova 7
115 19 Prague 1
CZECHOSLOVAKIA
Phone: 42-2-84-8840
Fax: 42-2-84-8840

Jacek Offierski
P.O. Box 581
7300 An Apeldoorn
Netherlands
Phone: 31-5769-8211
Fax: 31-5769-1344

Thomas Oldham
BFEC
10210 Greenbelt Rd/Suite 700
Seabrook, MD 20706
USA
Phone: 301-794-3499
Fax: 301-794-3524
Klaus Otten  
P.O. Box 581  
7300 An Apelldoorn  
NETHERLANDS  
Phone: 31-5769-8211  
Fax: 31-5769-1344

Linda Pacini  
NASA/Goddard Space Flight Cntr.  
Code 726  
Greenbelt, MD 20771  
USA  
Phone: 301-286-4685

Jocelyn Paris  
CERGA  
Avenue Nicolas Copernic  
Grasse, 06130  
FRANCE  
Phone: 33-93-126270  
Fax: 33-93-092615

Kamoun Paul  
Le Rocazur, Rue Cntr.so  
Nice, 06100  
FRANCE  
Phone: 33-92-92-7517  
Fax: 33-92-92-7620

Matti Paunonen  
Ilmalankatu 1A  
Helsinki, 00240  
FINLAND  
Phone: 353-0-264994  
Fax: 353-0-264995

Michael R. Pearlman  
SAO  
60 Garden Street  
Cambridge, MA 02138  
USA  
Phone: 617-495-7481  
Fax: 617-495-7105

Peter Pendlebury  
MOBLAS-5 Tracking Station  
P.O. Box 137  
Dongara, 6525  
AUSTRALIA  
Phone: 61-99-291011  
Fax: 61-99-291060

Francis Pierron  
OCA/CERGA  
Ave N. Copernic  
Grasse, F06130  
FRANCE  
Phone: 33-93-365849  
Fax: 33-93-092613

James Pirozzoli  
Naval Research Laboratory  
4555 Overlook Ave.  
Washington, D.C. 20375-5000  
USA  
Phone: 202-767-2828  
Fax: 202-767-1317

E. Pop  
Sidlerstr. 5  
Bern, 3012  
PEOPLE’S REP. OF CHINA  
Phone: 4131658591  
Fax: 4131653869

Ivan Prochazka  
Technical University of Prague  
Brehova 7  
115 19 Prague 1  
CZECHOSLOVAKIA  
Phone: 42-2-84-8840  
Fax: 42-2-84-8840

U.K. Rao  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3478  
Fax: 301-794-3524

Randall Ricklefs  
McDonald Observatory  
University of Texas  
Austin, TX 78712-1083  
USA  
Phone: 512-471-1342  
Fax: 512-471-6016

Giancarlo Ripamonti  
p.z.a. Leonardo da Vinci 32  
Politecnico di Milano  
Milano, 20133  
ITALY  
Phone: 39-2-23996103

Gary D. Robinson  
BFEC%CDLSLR, Suite 750  
10210 Greenbelt Road  
Seabrook, MD 20706  
USA  
Phone: 301-794-3467  
Fax: 301-794-3524

Norris J. Roessler  
5844 Five Oaks Pkwy  
St. Louis, MO 63128  
Phone: 314-233-0421  
Fax: 314-232-3393

Stanislaw Schillak  
Astronomical Latitude Observ.  
Borowiec 91  
Kornik, 62-035  
POLAND  
Phone: 48-61-170187  
Fax: 48-61-170219

Ulrich Schreiber  
Fundamental Station Wettzell  
Kotzing, Munich, 8493  
GERMANY  
Phone: 49-9941603113  
Fax: 49-9941-60322

Bob E. Schutz  
Cntr. for Space Research  
University of Texas  
Austin, TX 78712  
USA  
Phone: 512-471-4267  
Fax: 512-471-3570

Bernard Seery  
NASA/Goddard Space Flight Cntr.  
Code 726  
Greenbelt, MD 20771  
USA  
Phone: 301-286-8943

Paul J. Seery  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3494  
Fax: 301-794-3524
Michael Selden  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3499  
Fax: 301-794-3524  

Mark Selker  
NASA/Goddard Space Flight Cntr.  
Code 726.1  
Greenbelt, MD 20771  
USA  
Phone: 301-286-1013  

Victor Shargorodsky  
Science Research Institute for  
Precision Device Engineering  
53, Aviamotornaya Street  
Moscow, 111024  
RUSSIA  
Phone: 7-95-273-47-19  
Fax: 7-95-273-19-37  

Peter Shelus  
University of Texas at Austin  
Austin, TX  78712  
USA  
Phone: 512-471-3339  
Fax: 512-471-6016  

Andrew T. Sinclair  
Royal Greenwich Observatory  
Madingley Road  
Cambridge, CB30EZ  
ENGLAND  
Phone: 44-223-374741  
Fax: 44-223-374700  

David E. Smith  
NASA/Goddard Space Flight Cntr.  
Code 920  
Greenbelt, MD 20771  
USA  
Phone: 301-286-8671  
Fax: 301-286-9200  

Jay Smith  
NASA/Goddard Space Flight Cntr.  
Code 924  
Greenbelt, MD 20771  
USA  
Phone: 301-286-8525  

Peter Sperber  
Fundamental Station Wettzell  
Koetzting, 8493  
GERMANY  
Phone: 49-9941-603205  
Fax: 49-9961-603222  

Charles A. Steggerda  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3489  
Fax: 301-794-3524  

Mark Torrence  
STX  
4400 Forbes Boulevard  
Lanham, MD 20706  
USA  
Phone: 301-794-5213  
Fax: 301-794-1010  

J. Utzinger  
Sidlerstr. 5  
Berm, 3012  
PEOPLE’S REP. OF CHINA  
Phone: 4131658591  
Fax: 4131653869  

M.R. van der Kraan  
P.O. Box 155  
2600 AD Delft,  
NETHERLANDS  
Phone: 31-15-692269  
Fax: 31-15-692111  

Carolus Vanes  
P.O. Box 581  
7300 An Apeldoorn  
NETHERLANDS  
Phone: 31-5769-8211  
Fax: 31-5769-1344  

Christian Veillet  
CERGA  
Ave. Copernic  
Grasse, F06130  
FRANCE  
Phone: 33-93-365869  
Fax: 33-93-368963  

Erik Vermaat  
Kootwijk Observatory  
P.O. Box 581  
7300 An Apeldoorn  
NETHERLANDS  
Phone: 31-5769-8211  
Fax: 31-5769-1344  

Huib Visser  
P.O. Box 155  
2600 AD Delft,  
NETHERLANDS  
Phone: 31-15-692160  
Fax: 31-15-692111  

Thomas Varghese  
BFEC  
10210 Greenbelt Rd/Suite 700  
Seabrook, MD 20706  
USA  
Phone: 301-794-3492  
Fax: 301-794-3524  

Scott Wetzel  
NASA/Goddard Space Flight Cntr.  
Code 924  
Seabrook, MD 20771  
USA  
Phone: 301-794-3498  
Fax: 301-794-3524  

Roger Wood  
Satellite Laser Ranging Group  
Herstmonceux Castle  
Hailsham, East Sussex BN271RP  
ENGLAND  
Phone: 44-323-833888  
Fax: 44-223-374700  

Yao Xing-jia  
Changchun,  
PEOPLE’S REP. OF CHINA  
Phone: 0431-42859  

Fu-Min Yang  
Shanghai Observatory  
80 Nan Dan Road  
Shanghai, 200030  
PEOPLE’S REP. OF CHINA  
Phone: 86-21-4386191  
Fax: 86-21-4384618  

xiii
Wenwei Ye
Wuhan SLR Station
Xiao Hongshan 430071
PEOPLE’S REP. OF CHINA

Lu Yu-Lin
Changchun,
PEOPLE’S REP. OF CHINA
Phone: 0431-42859

Xia Zhizhong
Wuhan SLR Station
Xiao Hongshan 430071
PEOPLE’S REP. OF CHINA
Phone: 86-027-81342
Fax: 86-027-712989

Thomas Zagwodzki
NASA/Goddard Space Flight Cntr.
Code 715
Greenbelt, MD 20771
USA
Phone: 301-286-5199

Ronald Zane
University of Hawaii
P.O. Box 209
Kula, HI 96790
USA
Phone: 808-878-1215
Fax: 808-878-2862

Barbara Zukowski
STX
4400 Forbes Boulevard
Lanham, MD 20706
USA
Phone: 301-286-2779
Fax: 301-286-2929
WORKSHOP AGENDA

EIGHTH INTERNATIONAL WORKSHOP
ON
LASER RANGING INSTRUMENTATION

Sunday Evening, May 17

6:00-10:00pm  Registration/Orientation (Governor Calvert Inn)

8:00-10:00pm  Session Chairman Meeting (Calvert Chamber, Governor Calvert House)

Monday Morning, May 18

8:30-10:00am  Registration (Joint Senate Hearing Room Lobby)

10:00-11:30am Welcome/Orientation - John Degnan

Welcome/Introductions - J. Degnan, Program Chairman

Welcoming Address - M. Baltuck, Head, Geodynamics Branch, NASA Headquarters

Welcoming Address - J. Bosworth, Manager, NASA Crustal Dynamics Project

Orientation - John Degnan

Last Minute Agenda

Poster Papers

Submission Schedule for Proceedings - August 1, 1992

Conference Rooms/Splinter Meetings

Facilities (A-V equipment, xerox, etc.)

Local Phone Number for Workshop Participants

GGAO Tour/Cruise

Restaurants/Local Attractions
Monday Afternoon, May 18

1:00-3:30pm

Scientific Applications & Measurements Requirements - Bob Schutz

Applications of SLR, B. E. Schutz, Center for Space Research, Univ. of Texas

SLR Tracking of Lageos and Etalon: Past Results and Future Trends, Richard J. Eanes, et al., Center for Space Research, Univ. of Texas

Applications of SLR to Gravity Field Modeling and Sea Surface Topography Determination, D. E. Smith et al., NASA/GSFC

Laser Tracking for Vertical Control, P. Dunn et al., Hughes STX

ESA’s Intentions for Laser Tracking of Future European Earth Observation Satellites, Dr. Paci, ESA

ERS-1: Laser Ranging Network Performance and Routine Orbit Determination at the D-PAF, Ch. Reigber et al., DGFI

LASSO Experiments, Christian Veillet, OCA/CERGA

Laser Ranging Application to Time Transfer Using Geodetic Satellite and Other Japanese Space Programs, Hiroo Kunimori et al., CRL

Laser Ranging Support for TV Time Transfer, John McK. Luck, Orroral Geodetic Observatory

4:00-6:00pm

Timely Issues - Andrew Sinclair

Satellite Signatures in SLR Data, G. M. Appleby et al., Royal Greenwich Observatory

Work at Graz on Satellite Signatures, G. Kirschner, Observatory Lustbuhel

SLR Data Quality Control, P. Dunn et al., Hughes STX

SLR Data Screening for Normal Points, A. T. Sinclair, Royal Greenwich Observatory

Adaptive Median Filtering for Preprocessing of Time Series Measurements, M. Paunonen, Finnish Geodetic Institute

SATCOP Mission Planning Software Package, S. Bucey, BFEC
Tuesday Morning, May 19

8:30-10:30am  Laser Technology - Helena Jelinkova

Nd:YLF Laser for Airborne/Spaceborne Laser Ranging, J. L. Dallas et al., NASA/GSFC

Picosecond Laser Transmitter, J. Ferrario, QUANTA Systems

Alternative Wavelengths for Laser Ranging, K. Hamal, Faculty of Nuc. Sci. and Physical Engineering

Laser for Two Color Laser Ranging, J. Gaignebet, OCA/CERGA

New Methods of Generation of Ultrashort Laser Pulses for Ranging, H. Jelinkova, Faculty of Nuc. Sci. and Physical Engineering

Multi-Pulse Ranging to the Moon and Meteosat3 at OCA LLR Station, C. Veillet, OCA/CERGA

Recent Analyses and Laser Oscillator Breadboard Test Results for the Geoscience Laser Ranging System (GLRS), J. Gaignebet et al., OCA/CERGA

Simultaneous Compression of Passive Mode-locked Pulsewidth and Pulse Train, Yang Fu Min, Shanghai Observatory

11:00am-12:00pm  Epoch and Event Timing - Ben Greene

Results of Accurate Timing Tests at Graz, G. Kirchner, Observatory Lustbuhel

Streak Camera Timing Resolution, J. Gaignebet, OCA/CERGA

Preliminary Results from the Portable Standard Satellite Laser Ranging Intercomparison with MOBLAS-7, M. Seldon et al., BFEC
Tuesday Afternoon, May 19

1:30-3:30pm  Detector Technology - Thomas Varghese

*Performance Optimization of Detector Electronics for Millimeter Ranging*, S. Cova et al., Politecnico di Milano (Invited Talk)

*Tracking Capabilities of SPADs for Laser Ranging*, F. Zappa et al., Politecnico di Milano

*How to Squeeze High Quantum Efficiency and High Temporal Resolution out of a SPAD*, A. Lacaita et al., Politecnico di Milano

*Solid State Detector Technology for Picosecond Laser Ranging*, I. Prochazka, Faculty of Nuc. Sci. and Physical Engineering

*Streak Camera Based SLR Receive System for High Accuracy Multiwavelength Atmospheric Differential Delay Measurements*, T. K. Varghese et al., BFEC

*Temporal Analysis of Picosecond Laser Pulses Reflected from Satellites*, K. Hamal, Faculty of Nuc. Sci. and Physical Engineering

4:00-6:00pm  Calibration Techniques/Targets - Jean Gaignebet

*Experiences and Results of the MLTRS#1 USSR Collocation Campaign 1991*, P. Sperber et al., IfAG

*ETALON 1, 2 Center of Mass Correction and Array Reflectivity*, Nikolai Mironov et al., Main Astron. Obs. of the Ukrainian Acad. of Science (presented by B. Schutz)

*Test Results from LAGEOS-2 Optical Characterization Using Pulsed Lasers*, T. Varghese et al., BFEC

*Historical System Characterization of the NASA SLR Network of the NASA SLR Network Using Collocation and Special Analysis Techniques*, V. Husson, BFEC

*New Target Concept Based on Fizeau Effect*, V. Shargorodsky

6:30pm  Buses leave for GGAO tour

7:00-10:00pm  Barbecue/tour of the Goddard Geophysical and Astronomical Observatory (GGAO)

10:30pm  Buses return to hotel
Wednesday Morning, May 20

8:30-10:30am  Multiwavelength Ranging/Streak Cameras - Karel Hamal

Two Color Laser Ranging: Potential and New Developments, J. Gaignebet, OCA/CERGA

Optimum Wavelengths for Two Color Ranging, J. Degnan, NASA/GSFC

Two Color Satellite Laser Ranging Upgrades at Goddard's 1.2m Telescope Facility, T. Zagwodzki et al., NASA/GSFC

Two Color Ranging at Wettzell, U. Schreiber, WLRS

Two Wavelengths Satellite Laser Ranging Using SPAD, I. Prochazka et al., Faculty of Nuc. Sci. and Physical Engineering

Millimeter Accuracy Satellites for Two Color Ranging, J. Degnan, NASA/GSFC

Low Pulse Spread Laser Retroreflector Array, I. Prochazka et al., Faculty of Nuc. Sci. and Physical Engineering

New Possibilities for High Precision 2 Color Ranging to Geodesic Satellites, G. Lund

11:00am-12:00pm  SLR Data Analysis/Model Errors - Ronald Kolenkiewicz

State of the Art SLR Data Analysis at GSFC, S. Klosko, Hughes STX

SLR Modelling Errors, R. Eanes, Center for Space Research, Univ. of Texas

Geometric Analysis of Satellite Laser Ranging Data, J. Degnan et al., NASA/GSFC

Improvement of SLR Accuracy: A Possible New Step, M. Kasser, ESGT

xix
Wednesday Afternoon, May 20

1:30-4:00pm  
**Operational Software Developments** - Georg Kirchner  

*On the Accuracy of ERS-1 Orbit Predictions*, R. Koenig et al., DGFI  

*Compensation for the Distortion in Satellite Laser Range Predictions Due to Varying Pulse Travel Times*, M. Paunonen, Finnish Geodetic Institute  

*Timebias Corrections to Predictions*, Roger Wood, Satellite Laser Ranger, Herstmonceux  


*Poisson Filtering of Laser Ranging Data*, Randall L. Ricklefs et al., McDonald Obs., Univ. of Texas  

*Computer Networking at SLR Stations*, Antonin Novotny, Czech Technical Univ.  

*Upgrading NASA/DOSE Laser Ranging System Control Computers*, R.L. Ricklefs et al., McDonald Obs., University of Texas  

*HP Upgrade Operational Streamlining*, D. Edge et al., BFEC  

*Application of the Robust Estimate in SLR Data Preprocessing*, T. Detong, Shanghai Observatory

4:30-6:00pm  
**Lunar Laser Ranging** - Christian Veillet  

*A Computer-Controlled X-Y Offset Guiding Stage for the MLRS*, P.J. Shelus et al., McDonald Obs., University of Texas  

*Lunar Laser Ranging Data Processing in a Unix/X Windows Environment*, R.L. Ricklefs et al., McDonald Obs., University of Texas  

*LLR Activities in Wettzell*, U. Schreiber et al., Wettzell Laser Ranging Station  

*Multi-Wavelength Ranging to the Moon and METEOSAT 3 at OCA LLR*, J.F. Mangin, OCA/CERGA  

*Orroral LLR Activities*, J. McK. Luck, Orroral Geodetic Obs.
Wednesday Evening, May 20

7:30-10:30pm  WEGENER/CSTG Splinter Meetings

Thursday Morning, May 21

8:30-10:30am  Fixed Station Upgrades/Developments - John Degnan

- Design Principles of Fully Automated Ranging Systems, B. Greene et al., EOS Systems Inc.
- Status of the Matera Laser Ranging Observatory, G. Bianco et al., ASI/CGS (presented by T. Varghese)
- Sub-CM Ranging and Other Improvements in Graz, G. Kirchner et al., Laser Station Graz
- Upgrading of the Borowiec Laser Station, S. Schillak et al., Space Research Center of Polish Academy of Sciences
- New Progress in the Work of the Yunnan Laser Ranging Station, Feng Hesheng, Yunnan Observatory
- Development of Shanghai SLR Station, Yang Fu Min, Shanghai Observatory
- WLRS Status Report, R. Dassing and U. Schreiber, WLRS
- NRL SLR Activities, C. Gilbreath, NRL
- Status of Tokyo Station, Hiroo Kunimori, CRL

11:00am-12:00pm  Mobile System Upgrades/Developments - Erik Vermaat

- TLRS-3 System Upgrades, R. Eichinger, BFEC
- Results of the MTLRS-1 Upgrade, P. Sperber et al., IfAG
- A Transputer Based Control System for MTLRS, E. Vermaat et al., Delft Univ. of Technology
- Presentation of the Highly Mobile French SLR Station, F. Pierron et al., ESGT
Thursday Afternoon, May 21

1:30-4:00pm  Airborne and Spaceborne Systems - James Abshire

- Airborne Laser/GPS Mapping of the Greenland Ice Sheet, W. B. Krabill et al., NASA/GSFC
- Airborne 2 Color Ranging Experiment, P.S. Millar et al., NASA/GSFC
- GLRS Phase B Extension Studies, K. Anderson, GE/ASD
- GLRS-R 2 Color Retroreflector Target Design and Predicted Performance, G. Lund
- Development of the Mars Observer Laser Altimeter, B.L. Johnson et al., NASA/GSFC
- Bench Checkout Equipment for Spaceborne Laser Altimeter Systems, J. C. Smith
- Single Photon Ranging Systems for Mars Altimetry and Atmospheric Studies, I. Prochazka et al., Faculty of Nuc. Sci. and Physical Engineering
- Small Spacecraft Laser Altimeter Instrument Concepts for Topography Measurement from Low Earth Orbit, J.L. Bufton, NASA/GSFC
- Satellite to Satellite Laser Ranging System for Lunar Gravity Measurements, J. Abshire et al., NASA/GSFC

4:00-6:00pm  Operational Software Splinter Meeting/Joint Hearing Room
LASSO Splinter Meeting/Arundel Room/Maryland Inn
Poster Session/Governor Calvert Inn/Calvert Chamber

6:15pm  Boarding time for Conference Dinner Cruise (Annapolis Harbor)

6:30-9:30pm  Conference Dinner Cruise

9:30pm  Return to Annapolis Harbor

Friday Morning, May 22

8:30-10:00am  Conference Summary/Resolutions - Michael Pearlman

10:30am-12:00pm  Business Meeting/Next Workshop - Carroll Alley

12:00pm  Adjourn
POSTER PRESENTATIONS

Satellite Laser Station Helwan, NRIAG, Helwan, Egypt, and Czech Tech. Univ., Prague, Czechoslovakia

1.2 Meter Telescope Facility, Goddard Space Flight Center, Greenbelt, Md., T. W. Zagwodzki et al., NASA/GSFC

Ranging Data Quality Improvement from High Speed Detection Using 6m Core Microchannel Plate Photomultiplier Tube, T. Varghese et al., BFEC

The Optical Attenuation Mechanism, R. Eichinger, BFEC