

Eighth International Workshop on Laser Ranging Instrumentation

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Eighth International Workshop on Laser Ranging Instrumentation

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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.



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Chairman

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**8TH INTERNATIONAL WORKSHOP ON LASER
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MAY 18 - 22, 1992**

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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 MOBILAS-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

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

The Formation of On-Site Normal Points, G. Appleby, Royal Greenwich Obs.

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)

Performance of the Upgraded Orroral Laser Ranging System, J. McK. Luck, Orroral Geodetic Obs.

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

Turbulence Effects on the Geodynamic Laser Ranging System, J.H. Churnside

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

