

PROCEEDINGS OF SPIE

Modeling, Systems Engineering, and Project Management for Astronomy VIII

George Z. Angeli
Philippe Dierickx
Editors

10–12 June 2018
Austin, Texas, United States

Sponsored by
SPIE

Cosponsored by
4D Technology (United States) • Andor Technology, Ltd. (United Kingdom) • Astronomical Consultants & Equipment, Inc. (United States) • Giant Magellan Telescope (Chile) • GPixel, Inc. (China) • Harris Corporation (United States) • Materion Corporation (United States) • Optimax Systems, Inc. (United States) • Princeton Infrared Technologies (United States) • Symétrie (France) • Teledyne Technologies, Inc. (United States) • Thirty Meter Telescope (United States)

Cooperating Organizations
European Space Organisation • National Radio Astronomy Observatory (United States) • Science & Technology Facilities Council (United Kingdom) • Canadian Astronomical Society (Canada) • Canadian Space Association ASC (Canada) • Royal Astronomical Society (United Kingdom) • Association of Universities for Research in Astronomy (United States) • American Astronomical Society (United States) • Australian Astronomical Observatory (Australia) • European Astronomical Society (Switzerland)

Published by
SPIE

Volume 10705

Proceedings of SPIE 0277-786X, V. 10705

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Modeling, Systems Engineering, and Project Management for Astronomy VIII
edited by George Z. Angeli, Philippe Dierickx, Proc. of SPIE Vol. 10705
1070501 · © 2018 SPIE · CCC code: 0277-786X/18/\$18

Proc. of SPIE Vol. 10705 1070501-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Modeling, Systems Engineering, and Project Management for Astronomy VIII*, edited by George Z. Angeli, Philippe Dierickx, Proceedings of SPIE Vol. 10705 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510619630
ISBN: 9781510619647 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2018, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/18/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL
LIBRARY**

SPIEDigitalLibrary.org

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

Contents

ix *Authors*
xiii *Conference Committee*

SESSION 1 SYSTEM PERFORMANCE MODELING I

- 10705 02 **GMT aerothermal modeling validation through site measurements [10705-2]**
- 10705 03 **Dome seeing sensitivity analysis for LSST [10705-3]**
- 10705 04 **On the precision of aero-thermal simulations for TMT: revisited [10705-4]**
- 10705 05 **Giant Magellan Telescope site and enclosure computational fluid dynamics modeling and analysis [10705-1]**

SESSION 2 PROJECT MANAGEMENT I

- 10705 06 **Understanding the risk of unattended nighttime operations at W. M. Keck Observatory [10705-7]**
- 10705 07 **A novel approach to the development of the HARMONI integral field spectrograph using structured systems thinking [10705-6]**
- 10705 08 **Risk management system at Gemini Observatory [10705-8]**
- 10705 09 **How to talk so your engineer will listen, how to listen so your scientist will talk: the human side of astronomical instrument development [10705-5]**

SESSION 3 ASSEMBLY, INTEGRATION, AND TEST

- 10705 0A **Delivery and integration of MEGARA at GTC: the process of going from laboratory to the telescope [10705-13]**
- 10705 0C **ESO ELT system requirements verification [10705-12]**
- 10705 0D **Integration and verification testing of the LSST camera [10705-10]**
- 10705 0E **LSST camera-integration and test subsystem: planning and status [10705-11]**

10705 OF **Precise alignment method for MAORY** [10705-14]

SESSION 4 SYSTEMS ENGINEERING

10705 OH **Maunakea spectroscopic explorer (MSE): implementing systems engineering methodology for the development of a new facility** [10705-19]

10705 OI **Systems engineering for the Giant Magellan Telescope** [10705-17]

10705 OJ **Cherenkov Telescope Array (CTA): challenges in systems engineering and project management (Invited Paper)** [10705-15]

10705 OK **A comparison of systems engineering challenges and practices between space and ground based astronomical projects (Invited Paper)** [10705-16]

SESSION 5 PROJECT MANAGEMENT II

10705 OL **The technology development programme at ESO: challenges for industry** [10705-22]

10705 OM **Deriving generic telescope use cases for the Cherenkov Telescope Array** [10705-59]

SESSION 6 MODELING AS A DRIVER OF OBSERVATORY DESIGN I: JOINT SESSION WITH CONFERENCES 10700 AND 10705

10705 OP **Monitoring LSST system performance during construction** [10705-25]

10705 OQ **Integrated modeling under uncertainty for the James Webb Space Telescope** [10705-24]

SESSION 7 MODELING AS A DRIVER OF OBSERVATORY DESIGN II: JOINT SESSION WITH CONFERENCES 10700 AND 10705

10705 OR **Computational fluid dynamics modeling of GMT** [10705-28]

10705 OT **Optical performance prediction of the Thirty Meter Telescope after initial alignment using optical modeling** [10705-27]

SESSION 8 MODEL BASED SYSTEMS ENGINEERING

10705 OU **V&V planning and execution in an integrated model-based engineering environment using MagicDraw, Syndeia, and Jira** [10705-30]

- 10705 0V **Verifying Interfaces and generating interface control documents for the alignment and phasing subsystem of the Thirty Meter Telescope from a system model in SysML** [10705-29]
- 10705 0W **The OpenSE Cookbook: a practical, recipe based collection of patterns, procedures, and best practices for executable systems engineering for the Thirty Meter Telescope** [10705-31]
- 10705 0X **The multi-object spectroscopy (MOS) observations automatized production line** [10705-33]

SESSION 9 SYSTEM PERFORMANCE MODELING II

- 10705 0Z **Control modeling of the fast-steering secondary mirror for GMT** [10705-37]
- 10705 12 **Performance analysis tools and results for GMT primary mirror segment active support system** [10705-35]
- 10705 13 **ELT dome and telescope: performance analysis overview** [10705-38]

SESSION 10 SYSTEM PERFORMANCE MODELING III

- 10705 14 **ELT -HIRES, the high resolution spectrograph for the ELT, end-to-end simulator: design approach and results** [10705-43]
- 10705 15 **STOP modeling in support of a 1-meter aperture balloon based telescope** [10705-42]
- 10705 16 **Validating the phase diversity approach for sensing NCPA in SHARK-NIR, the second-generation high-contrast imager for the Large Binocular Telescope** [10705-40]

POSTER SESSION

- 10705 1A **Systems engineering applied to ELT instrumentation: the GMACS case** [10705-46]
- 10705 1B **Integrating project management and systems engineering to transition to remote operations** [10705-47]
- 10705 1D **Non-blind deconvolution of the residual tip-tilt error of the Sunrise Solar Observatory** [10705-49]
- 10705 1E **Radial velocity accuracy prediction of the GREGOR at night spectrograph based on simulated spectra** [10705-50]
- 10705 1F **The integration and verification of the power and mechanism control unit of the VIS instrument for the Euclid space mission** [10705-52]
- 10705 1G **Flexure compensation simulation tool for TMT-WFOS Spectrograph** [10705-53]

- 10705 1J **Initial on-site measurements at potential observatory sites within the United Arab Emirates** [10705-56]
- 10705 1K **Analysis of mode excitation on different geometries of optical fibres for astronomical spectroscopy** [10705-57]
- 10705 1M **Giant Magellan Telescope enclosure thermal modeling and simulation** [10705-60]
- 10705 1N **Ground layer studies for the alternate TMT site** [10705-61]
- 10705 1O **Modeling and budgeting fiber injection efficiency for the Maunakea Spectroscopic Explorer (MSE)** [10705-62]
- 10705 1R **End-to-end simulations for COLIBRI, ground follow-up telescope for the SVOM mission** [10705-65]
- 10705 1S **Organization, management and risk analysis of the MAORY project** [10705-66]
- 10705 1U **Physical modeling of echelle spectrographs: the CARMENES case study** [10705-68]
- 10705 1V **Product assurance for instrumental projects in research laboratory: galaxies, étoiles, physique, instrumentation (GEPI)** [10705-69]
- 10705 20 **Project management and status update for DAG (Eastern Anatolia Observatory) the 4-meter VIS/IR optical telescope** [10705-74]
- 10705 22 **Maximising the sensitivity of next generation multi-object spectroscopy: system budget development and design optimizations for the Maunakea Spectroscopic Explorer** [10705-76]
- 10705 23 **Modeling of structural cables** [10705-77]
- 10705 24 **The 4MOST numerical instrument model: TOAD** [10705-78]
- 10705 25 **Factory acceptance testing and model refinement for the Daniel K. Inouye Solar Telescope air knife assembly** [10705-79]
- 10705 26 **WFIRST coronagraph technology requirements: status update and systems engineering approach** [10705-81]
- 10705 28 **Recent advances in stray light modeling for large telescope/observatory systems** [10705-83]
- 10705 29 **Maunakea Spectroscopic Explorer (MSE): the prime focus subsystems: requirements and interfaces** [10705-84]
- 10705 2A **Key aspects in designing for electromagnetic compatibility for astronomical instrumentation** [10705-85]
- 10705 2C **Coordination in building an observatory: a case study of Eastern Anatolian Observatory (DAG)** [10705-88]

10705 2E **ELT Telescope: control system dynamic simulations** [10705-90]

10705 2F **At the dawn of a systems engineering process** [10705-91]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Abicca, Renata, 1S
Ageron, M., 1R
Ambert, P., 1R
Andersen, Torben, 23
Ángeles, F., 1R
Angeli, George Z., 02, 03, 0I, 0R, 1J
Ansorge, Wolfgang, 0J
Antilogus, P., 0D
Arcidiacono, C., 0F
Arrillaga, Xabier, 0A
Ashby, Dave, 12
Atteia, J. L., 1R
Bajaj, Manas, 0U
Barrau, A., 0D
Baruffolo, A., 16
Basa, S., 1R
Bauer, F., 1U
Baumann, B., 0D
Bellazzini, Michele, 1S
Bellido-Tirado, Olga, 24
Bergomi, M., 16
Bernier, Robert, 0Z
Bernstein, Rebecca, 0I
Berthé, M., 1F
Biancat-Marchet, F., 0C
Bigelow, Bruce, 05, 0R
Blanc, P. E., 1R
Blin, Alexandre, 29
Bogart, J. R., 0D
Bond, Tim, 0D, 0E
Bongiovanni, Angel Manuel, 0X
Booth, John A., 09
Borgland, A. W., 0D
Bortoletto, D., 1A
Bouchez, Antonin, 02, 0I
Boulade, O., 1R
Bovill, Rob, 0U
Bowdish, Boyd, 0E
Boy, J., 1R
Brack, Gary, 0V
Bragante, Enrico, 2E
Bressan, Riccardo, 13, 2E
Brooks, Thomas, 15
Brower, Eric, 0W
Burgett, William, 05, 0R
Bushahab, A., 1J
Cabrera-Lavers, Antonio, 0X
Cadena, E., 1R
Cahoy, Kerri L., 26
Cara, C., 1F
Carlton, Ashley K, 26
Carolo, E., 16
Carrasco Licea, Esperanza, 0A
Carrera, Ignacio, 0A
Casali, Mark M., 0L
Castillo Morales, África, 0A
Cataldo, Giuseppe, 0Q
Catanzaro, Brian, 15
Cedazo, Raquel, 0A
Chanumolu, A., 1U
Chemla, Fanny, 1V
Chiang, J., 0D
Chiquito, Hugo, 0Z
Cho, Myung K., 0Z
Cilieggi, Paolo, 0F, 1S
Clarke, Fraser, 07
Claver, Charles (Chuck), 03, 0P, 0U
Close, Madeline, 1V
Coker, Deniz, 2F
Colavita, Mark, 0T
Combet, C., 0D
Comoretto, Gabriele, 0U
Conan, Rodolphe, 0I, 12
Cook, E., 1A
Cordier, B., 1R
Corre, D., 1R
Cortecchia, Fausto, 0F, 1S
Crause, Lisa A., 09
Crawford, Amanda G., 0W
Cuevas Cardona, S., 1R
Curto, Andres, 0A
Dalton, Gavin, 1V
Daniel, Scott, 0P
Dargaud, G., 0D
Das, Kaushik, 02, 0R, 1M
Dazzi, F., 0M
De Frondat Laadim, Fatima, 1V
Dekens, Frank, 0V
De Lorenzi, Simone, 2E
De Pascale, M., 16
DePoy, D. L., 1A
Digel, Seth, 0D, 0E
Di Marcantonio, P., 14
Diolaiti, Emiliano, 0F, 1S
Divakar, Devika, 1G
Di Varano, I., 14
Doherty, P., 0D
Dohlen, Kjetil, 1V

Dolon, F., 1R
 Dornic, D., 1R
 Douglas, Ewan S., 26
 Doumayrou, E., 1F
 Dribusch, Christoph, 0Z
 Dubbeldam, Marc, 1V
 Dubois, R., 0D
 Dubreuil, D., 1R
 Dumas, Christophe, 1N
 Ederoclite, Alessandro, 0X
 Edgar, Mick, 0H
 Edwards, Ryan, 15
 Egan, Mark, 12
 Egner, Sebastian, 0C, 0K
 Ek, Garrett, 1M
 El Hadi, Kacem, 1V
 Ellis, Scott, 28
 Elrod, Leigh, 15
 Els, S., 1J
 Eraud, L., 0D
 Esposito, Simone, 0F, 1S
 Faes, D. M., 1A
 Farah, A. S., 1R
 Farinato, J., 16
 Feautrier, P., 0F, 1S
 Figueroa, L., 1R
 Fitzsimons, Ewan, 1V
 Flagey, Nicolas, 0H, 1O, 22
 Floriot, J., 1R
 Focke, W. B., 0D
 Fontignie, J., 1F
 Frey, Steffen, 24
 Froning, C., 1A
 Frotin, Mickael, 1V
 Fucik, Jason, 1G
 Fuentes-Fernández, J., 1R
 Fusco, T., 16
 Fűbling, M., 0M
 Gajadhar, Sarah, 06, 1B
 Gallais, P., 1R
 Gallego, Jesús, 0A
 Garcés, Leonardo, 2A
 García, Oscar, 0A
 García-Vargas, Marísa-Luisa Luisa, 0A
 Gardner, Paul, 0Z
 Genoni, M., 14
 Ghedin, Leonardo, 13
 Gil de Paz, Armando, 0A
 Gillingham, Peter, 0H
 Gilmore, K., 0D
 Giordano, Christophe, 14
 Giro, Enrico, 1S
 Glanzman, T., 0D
 Goetschy, A., 1F
 Gomes, Ivan, 0W
 Gómez Velarde, Gabriel, 0X
 González Escalera, Víctor, 0X
 Gonzalez, Eider, 0A
 Gonzalez, O. A., 14
 González-Herrera, J.C., 0C
 Goodrich, Robert, 02
 Gorius, Nicolas, 15
 Greggio, D., 0F, 16
 Groark, Frank, 0Z
 Gucsav, B. Bulent, 2F
 Guinouard, Isabelle, 1V
 Hall, Pat, 22
 Hammer, François, 1V
 Han, Jeong-Yeol, 0Z
 Hascall, Diane, 0D, 0E
 Hascall, P., 0D
 Haupt, J., 0D
 Haynes, Dionne M., 24
 Hechenblaikner, Gerald, 0K
 Hernandez, Eloy, 1K
 Herrmann, S., 0D
 Hervef, G., 1F
 Hervieu, Calum, 0H, 1O
 Herzig, Sebastian J. I., 0V, 0W
 Hill, Alexis, 0H, 1O, 22, 29
 Hinton, J. A., 0M
 Hoffmann, Monica, 15
 Horville, David, 29
 Huke, P., 14
 Iglesias-Páramo, Jorge, 0A
 Ilyin, Ilya, 1E
 Irarrazaval, Benjamin, 0I
 Ivezić, Željko, 0P
 Jagourel, Pascal, 1V
 Janssen, Annemieke, 1V
 Järvinen, Arto, 1E
 Jenness, Tim, 0U
 Jeong, Ueejeong, 0Z
 Ji, T.-G., 1A
 Jiménez-Bailón, E., 1R
 Johann, Ulrich, 0K
 Johnson, A. S., 0D
 Johnson, Will, 15
 Jolissaint, L., 20
 Jones, D., 1A
 Jones, Lynne, 0P
 Jordan, Carolyn, 06
 Jun, Youra, 0Z
 Juramy, C., 0D
 Karban, Robert, 0V, 0W
 Kasdin, N. Jeremy, 26
 Kasim, Kawthar, 1M
 Kelly, H. M., 0D
 Kelz, Andreas, 1K, 1V
 Keskin, Onur, 20, 2C
 Khodadoust, Abdollah, 05, 1M
 Kim, Chang-Hee, 0Z
 Kim, Ho-Sang, 0Z
 Kim, Sanghyuk, 0Z
 Kim, Yunjong, 0Z
 Klotz, A., 1R
 Korhonen, H., 14
 Ladd, John, 05
 Landoni, M., 14
 Langarica Lebre, R., 1R

Lange, Travis, 0D, 0E
 Larrieu, Marie, 1V
 Le Borgne, J. F., 1R
 Lee, Chanhee, 0Z
 Lee, H.-I., 1A
 Lee, Sunggho, 0Z
 Lee, Vincent, 0E
 Lee, W. H., 1R
 Lee, Wongi, 0Z
 Lefort, Bertrand, 0A
 Le Van Suu, A., 1R
 Lewis, Ian, 1V
 Liang, Ming, 0Z
 Li Causi, Gianluca, 14
 Lombini, Matteo, 0F, 1S
 Lopez, Margaux, 0D, 0E
 Lortholary, M., 1F
 Macintosh, Bruce, 26
 Magrin, D., 0F
 Maldonado, Manuel, 0A
 Marafatto, L., 16
 Marchiori, Gianpietro, 13, 2E
 Marconi, A., 14
 Marcos, M., 1R
 Marcuzzi, Enrico, 13, 2E
 Maree, J., 1J
 Marquart, Thomas, 14
 Marshall, J. L., 1A
 Marshall, Stuart, 0D, 0E
 Martínez Delgado, Ismael, 0A
 Marton, M., 0D
 Mason, E., 14
 Mathon, R., 1R
 McConnachie, Alan W., 0H, 1O, 22
 McQuillen, Isaac, 25
 Meessen, C., 1R
 Melle, S., 1F
 Mian, Stefano, 13
 Michaels, Scott B., 0V
 Middleton, Kevin, 1V
 Migliore, M., 0D
 Mignot, Shan, 0H, 1O, 22, 29
 Mitchell, A., 0M
 Moon, Bong-Kon, 0Z
 Moon, Il-Kwon, 0Z
 Morris, Tim, 1V
 Munoz, John, 0E
 Murowinski, Richard, 0H
 Navarro, Ramon, 1V
 Neal, H., 0D
 Newbry, Scott, 0D, 0E
 Nissly, Carl, 0T
 Nogué, Jordi Cepa, 0X
 Nomerotski, A., 0D
 Nordby, Martin, 0D, 0E
 Núñez Castain, Agustín, 0X
 Ochoa, J. L., 1R
 O'Connor, Brian, 15
 O'Connor, P., 0D
 Oliva, E., 14
 Oliveira, C. M., 1A
 O'Mullane, Wil, 0U
 Orduna, T., 1F
 Oser, Matt, 05
 Owner-Petersen, Mette, 23
 Oya, I., 0M
 Paganini, Lucas, 15
 Pak, S., 1A
 Pallier, E., 1R
 Papovich, C., 1A
 Pariani, G., 14
 Park, Byeong-Gon, 0Z
 Park, Chan, 0Z
 Parr-Burman, Phil, 1V
 Pascual, Sergio, 0A
 Patti, M., 0F
 Perbet, E., 0D
 Pérez-Calpena, Ana, 0A
 Peterson, John, 0P
 Pfisterer, Richard N., 28
 Phelps, LeEllen, 25
 Piette, Marie, 0W
 Pinto, M. Tala, 1U
 Platzer, J., 1R
 Poczulp, Gary, 0Z
 Pompea, Stephen M., 28
 Pragt, Johan, 1V
 Prochaska, T., 1A
 Puech, Mathieu, 1V
 Quirós, F., 1R
 Quirrenbach, A., 1U
 Racine, Evan, 15
 Radaelli, E., 0F
 Radovan, Matthew, 1G
 Ragazzoni, Roberto, 0F, 1S
 Rampini, Francesco, 13, 2E
 Ranka, Trupti, 12
 Rasmussen, Andy, 0D, 0E
 Reffert, S., 1U
 Reil, Kevin, 0D, 0E
 Renaud, D., 1F
 Reuter, Michael, 0U
 Ribeiro, R. A., 1A
 Ricol, J.-S., 0D
 Riva, M., 0F, 14
 Roberts, Austin, 0U
 Roberts, Scott, 04, 0T, 1N
 Rodrigues, Myriam, 07, 1V
 Rogers, John, 0T
 Ronayette, S., 1R
 Roodman, Aaron, 0D, 0E
 Rosenberg, E., 0D
 Rosenthal, Wylie, 02
 Roth, Martin M., 1K
 Rousset, Gerard, 1V
 Rumore, M., 0D
 Russo, S., 0D
 Ryu, Jieun, 0Z
 Şahmali, A. Erkan, 2C
 Sánchez, Ainhoa, 0A

Sánchez-Blanco Mancera, Ernesto, 0A
 Sauvage, J.-F., 16
 Saxton, O., 0D
 Schmid, Christian, 0K
 Schmidt, L., 1A
 Schnetler, Hermine, 07
 Schwartz, Dave, 12
 Sebag, Jacques, 0U
 Selvy, Brian M., 03, 0P, 0U
 Seo, Byoung-Joon, 0T
 Serio, Andrew, 0U
 Silva, David Y., 2A
 Sitarski, Breann, 02, 0I
 Snyder, Adam, 0D, 0E
 Souza, A., 1A
 Sriram, S., 1G
 Stadler, Eric, 1S
 Stechele, Walter, 1D
 Stoia, Mike, 1M
 Stomski, Paul, 06, 1B
 Strassmeier, Klaus G., 1E
 Streicher, Ole, 24
 Surya, Arun, 1G
 Szeto, Kei, 0H, 1O, 22, 29
 Tabel, Stefan, 1D
 Tait, Isabelle E., 08
 Takacs, P., 0D
 Taylor, K., 1A
 Tether, S., 0D
 Thirupathi, Sivarani, 1G
 Thomas, Sandrine, 0U
 Thompson, Hugh, 04, 1N
 Tosti, G., 0M
 Tourrette, T., 1F
 Trancho, Gelys, 0W
 Treis, Johannes, 1D
 Troy, Mitchell, 0T, 0V
 Turnbull, Margaret, 26
 Turpin, D., 1R
 Turri, M., 0D
 Utsumi, Yousouke, 0D, 0E
 Valentin, H., 1R
 Van Klaveren, Brian, 0U
 Vassallo, D., 16
 Vaz Cedillo, Jacinto Javier, 0X
 Verdet, Antonio, 0A
 Vergani, S. D., 1R
 Vescovi, C., 0D
 Viotto, V., 16
 Vogiatzis, Konstantinos, 02, 03, 04, 0R, 1M, 1N
 Walls, Brian, 0I
 Watson, A. M., 1R
 Weber, Michael, 1E
 Wild, Wolfgang, 0J
 Winkler, Roland, 24
 Winters, S., 0D
 Woche, Manfred, 1E
 Wolfe, J., 0D
 Woodruff, Robert, 15
 Xin, Bo, 03, 0P
 Xompero, M., 14
 Yang, Yanbin, 1V
 Yeşilyaprak, Cahit, 20, 2C, 2F
 Yoachim, Peter, 0P
 Young, Eliot, 15
 Zamparelli, Michele, 0W
 Zechmeister, M., 1U
 Zwemer, Dirk, 0U

Conference Committee

Symposium Chairs

Allison A. Barto, Ball Aerospace & Technologies Corporation
(United States)

Suzanne K. Ramsay, European Southern Observatory (Germany)

Symposium Co-chairs

Satoru Iguchi, National Astronomical Observatory of Japan (Japan)

Alison B. Peck, Gemini Observatory (United States)

Conference Chairs

George Z. Angeli, GMTO Corporation (United States)

Philippe Dierickx, European Southern Observatory (Germany)

Conference Program Committee

Roberto Biasi, Microgate S.r.l. (Italy)

Sebastian G. Els, Gulf Solutions (United Arab Emirates)

James L. Fanson, GMTO Corporation (United States)

Robert Karban, Jet Propulsion Laboratory (United States)

Gary E. Mosier, NASA Goddard Space Flight Center (United States)

Richard M. Prestage, National Radio Astronomy Observatory
(United States)

Scott Roberts, Thirty Meter Telescope Observatory Corporation
(Canada)

Masao Saito, National Astronomical Observatory of Japan (Japan)

Hermine Schnetler, UK Astronomy Technology Center (United
Kingdom)

Masahiro Sugimoto, National Astronomical Observatory of Japan
(Japan)

Albert Tomàs, NTE-SENER S.A. (Spain)

Mitchell Troy, Jet Propulsion Laboratory (United States)

Session Chairs

1 System Performance Modeling I

George Z. Angeli, GMTO Corporation (United States)

Sebastian G. Els, Gulf Solutions (United Arab Emirates)

- 2 Project Management I
Richard M. Prestage, National Radio Astronomy Observatory
(United States)
George Z. Angeli, GMTO Corporation (United States)
- 3 Assembly, Integration, and Test
Masao Saito, National Astronomical Observatory of Japan (Japan)
- 4 Systems Engineering
Robert Karban, Jet Propulsion Laboratory (United States)
Hermine Schnetler, UK Astronomy Technology Center
(United Kingdom)
- 5 Project Management II
James L. Fanson, GMTO Corporation (United States)
Albert Tomàs, SENER Ingeniería y Sistemas S.A. (Spain)
- 6 Modeling as a Driver of Observatory Design I: Joint Session with
Conferences 10700 and 10705
Jeffrey R. Kuhn, Institute for Astronomy (United States)
Amir Sadjadpour, Thirty Meter Telescope (United States)
Mitchell Troy, Jet Propulsion Laboratory (United States)
George Z. Angeli, GMTO Corporation (United States)
- 7 Modeling as a Driver of Observatory Design II: Joint Session with
Conferences 10700 and 10705
Yongtian Zhu, Nanjing Institute of Astronomical Optics & Technology
(China)
Victor L. Krabbendam, LSST (United States)
Roberto Biasi, Microgate S.r.l. (Italy)
- 8 Model Based Systems Engineering
Hermine Schnetler, UK Astronomy Technology Center (United
Kingdom)
Philippe Dierickx, European Southern Observatory (Germany)
- 9 System Performance Modeling II
Mitchell Troy, Jet Propulsion Laboratory (United States)
- 10 System Performance Modeling III
George Z. Angeli, GMTO Corporation (United States)
Scott C. Roberts, Thirty Meter Telescope (United States)