

PROCEEDINGS OF SPIE

# ***Ground-based and Airborne Instrumentation for Astronomy VII***

**Christopher J. Evans**  
**Luc Simard**  
**Hideki Takami**  
*Editors*

**10–14 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 10702**  
Part One of Five Parts

Proceedings of SPIE 0277-786X, V. 10702

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

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 [SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 *Ground-based and Airborne Instrumentation for Astronomy VII*, edited by Christopher J. Evans, Luc Simard, Hideki Takami, Proceedings of SPIE Vol. 10702 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

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

ISBN: 9781510619579  
ISBN: 9781510619586 (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](http://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](http://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 Vm7 i ffUb '5ggc WjUHŷ gž bWzi bXYf`jW'bgŷ žca 'GD-9.

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

**SPIE. DIGITAL  
LIBRARY**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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

xix *Authors*  
xxxix *Conference Committee*

## Part One

### SESSION 1 OBSERVATORY OVERVIEWS

---

- 10702 04 The ESO Paranal Instrumentation Programme [10702-3]  
10702 05 Current status of the facility instruments at the Large Binocular Telescope Observatory [10702-4]  
10702 07 Innovations and advances in instrumentation at the W. M. Keck Observatory [10702-6]

### SESSION 2 NEW AND UPGRADED FACILITY INSTRUMENTS FOR LARGE OBSERVATORIES I

---

- 10702 09 ERIS: revitalising an adaptive optics instrument for the VLT [10702-8]  
10702 0B Commissioning of the adaptive optics supported LUCI instruments at the Large Binocular Telescope: results [10702-10]  
10702 0C ALES: overview and upgrades [10702-11]  
10702 0D NEAR: new earths in the Alpha Cen Region (bringing VISIR as a "visiting instrument" to ESO-VLT-UT4) [10702-12]

### SESSION 3 NEW AND UPGRADED FACILITY INSTRUMENTS FOR LARGE OBSERVATORIES II

---

- 10702 0F SOXS: a wide band spectrograph to follow up transients [10702-14]  
10702 0H KRAKENS: a superconducting MKID integral field spectrograph concept for the Keck I telescope [10702-16]  
10702 0I SCORPIO: the Gemini facility instrument for LSST follow-up [10702-427]

---

**SESSION 4**    **TIME-DOMAIN ASTRONOMY**

---

10702 0J    **The Tomo-e Gozen wide field CMOS camera for the Kiso Schmidt telescope (Invited Paper)**  
[10702-18]

10702 0L    **First light with HiPERCAM on the GTC** [10702-20]

---

**SESSION 5**    **NOVEL APPROACHES**

---

10702 0N    **Window to the universe for less money: 10 years of PAIX from Antarctica** [10702-23]

10702 0O    **Optical system design of the AST3-NIR camera** [10702-24]

10702 0P    **PRAXIS: an OH suppression optimised near infrared spectrograph** [10702-25]

10702 0Q    **IGRINS at the Discovery Channel Telescope and Gemini South** [10702-26]

10702 0R    **Overview, design, and flight results from SuperBIT: a high-resolution, wide-field, visible-to-near-UV balloon-borne astronomical telescope** [10702-27]

---

**SESSION 6**    **HIGH-CONTRAST IMAGING**

---

10702 0U    **Installation and commissioning of the LINC-NIRVANA near-infrared MCAO imager on LBT**  
[10702-30]

---

**SESSION 7**    **HIGH-RESOLUTION SPECTROGRAPHS I**

---

10702 0W    **CARMENES: high-resolution spectra and precise radial velocities in the red and infrared (Invited Paper)** [10702-32]

10702 0Y    **Veloce Rosso: Australia's new precision radial velocity spectrograph** [10702-34]

10702 0Z    **GIARPS: commissioning and first scientific results** [10702-35]

---

**SESSION 8**    **HIGH-RESOLUTION SPECTROGRAPHS II**

---

10702 11    **The infrared Doppler (IRD) instrument for the Subaru telescope: instrument description and commissioning results (Invited Paper)** [10702-37]

10702 12    **Want a PEPSI? Performance status of the recently commissioned high-resolution spectrograph and polarimeter for the 2x8.4m Large Binocular Telescope** [10702-38]

10702 15      **SPIRou @CFHT: full in-lab and on-sky performances** [10702-41]

---

**SESSION 9      MOS/IFS I**

---

10702 16      **MEGARA, the R=6000-20000 IFU and MOS of GTC (Invited Paper)** [10702-42]

10702 17      **First scientific observations with MEGARA at GTC** [10702-43]

10702 18      **The wide integral field infrared spectrograph: commissioning results and on-sky performance**  
[10702-44]

---

**SESSION 10      MOS/IFS II**

---

10702 1B      **Construction progress of WEAVE: the next generation wide-field spectroscopy facility for the William Herschel Telescope** [10702-47]

10702 1C      **Prime Focus Spectrograph (PFS) for the Subaru telescope: ongoing integration and future plans**  
[10702-48]

---

**SESSION 11      MOS/IFS III**

---

10702 1F      **Overview of the Dark Energy Spectroscopic Instrument** [10702-51]

10702 1G      **Rising MOONS: an update on the VLT's next multi-object spectrograph as it begins to grow**  
[10702-52]

10702 1H      **Hector: a modular integral field spectrograph instrument for the Anglo-Australian Telescope**  
[10702-53]

10702 1I      **The LAMOST middle resolution spectrograph** [10702-54]

10702 1J      **Gemini infrared multi-object spectrograph: instrument overview** [10702-55]

---

**SESSION 12      MOS/IFS IV**

---

10702 1K      **VIRUS: status and performance of the massively replicated fiber integral field spectrograph for the upgraded Hobby-Eberly Telescope** [10702-56]

10702 1L      **Maunakea Spectroscopic Explorer (MSE): instrumentation suite** [10702-57]

10702 1M      **Sphinx: a massively multiplexed fiber positioner for MSE** [10702-58]

- 10702 1N **On-sky performance evaluation of RITMOS, a micromirror-based multi-object spectrometer** [10702-59]
- 10702 1O **The opto-mechanical design of SAMOS: a DMD-based spectrograph for the SOAR telescope** [10702-60]

---

**SESSION 13 INSTRUMENTATION FOR THE ELTS I**

---

- 10702 1P **Instrumentation for ESO's Extremely Large Telescope** [10702-61]
- 10702 1R **The GMT-consortium large earth finder (G-CLEF): an optical echelle spectrograph for the Giant Magellan Telescope (GMT)** [10702-63]
- 10702 1S **The MICADO first light imager for the ELT: overview, operation, simulation** [10702-64]

---

**SESSION 14 INSTRUMENTATION FOR THE ELTS II**

---

- 10702 1U **Status of the mid-IR ELT imager and spectrograph (METIS)** [10702-66]
- 10702 1V **Design evolution of the Giant Magellan Telescope Integral Field Spectrograph, GMTIFS** [10702-67]
- 10702 1W **The ELT-MOS (MOSAIC): towards the construction phase** [10702-68]
- 10702 1X **GMACS: a wide-field, moderate-resolution spectrograph for the Giant Magellan Telescope** [10702-69]
- 10702 1Y **ELT-HIRES, the high resolution spectrograph for the ELT: results from the Phase A study** [10702-70]

---

**SESSION 15 INSTRUMENTATION FOR THE ELTS III**

---

- 10702 1Z **Arrayed wide-angle camera system for the Extremely Large Telescopes** [10702-71]

## **Part Two**

---

**POSTER SESSION: NEW AND UPGRADED FACILITY INSTRUMENTS FOR LARGE OBSERVATORIES**

---

- 10702 23 **First results using a new near-infrared 1% narrow-band filter in the GTC 10.4m telescope to detect galaxies at the dawn of the universe** [10702-75]
- 10702 24 **Optical design of imaging and spectrograph for 4m telescope in China** [10702-76]

- 10702 25 **First version of the fiber injection unit for the Keck Planet Imager and Characterizer [10702-77]**
- 10702 26 **Development status of the simultaneous two-color near-infrared multi-object spectrograph SWIMS for the TAO 6.5m telescope [10702-78]**
- 10702 27 **Optical design of the SOXS spectrograph for ESO NTT [10702-79]**
- 10702 28 **The NIR spectrograph for the new SOXS instrument at the NTT [10702-80]**
- 10702 29 **The WIYN one degree imager in 2018: an extended 30-detector focal plane [10702-81]**
- 10702 2A **Characterising the stability of the SPRAT autonomous imaging spectrograph [10702-82]**
- 10702 2B **Photometric error in mid-infrared observations at the TAO site caused by short-term variation of atmospheric water vapor [10702-83]**
- 10702 2C **Acceptance testing for LSST camera raft tower modules [10702-84]**
- 10702 2E **Revisiting the science case for near-UV spectroscopy with the VLT [10702-86]**
- 10702 2F **New wavefront-sensing guiders for SOAR [10702-87]**
- 10702 2G **Conversion of a classical coudé room at the CFHT into a clean room [10702-89]**
- 10702 2H **Laboratory performance evaluation of the mid-infrared camera and spectrograph MIMIZUKU for the TAO 6.5-m telescope [10702-90]**
- 10702 2I **Commissioning tests of an Integral Field Unit (IFU) at GREGOR solar telescope [10702-91]**
- 10702 2J **The VIS detector system of SOXS [10702-92]**
- 10702 2K **Design and results for the SAAO wide-field nasmyth camera [10702-93]**
- 10702 2L **The preliminary design of the next generation Palomar spectrograph for 200-inch Hale telescope [10702-94]**
- 10702 2M **The acquisition camera system for SOXS at NTT [10702-95]**
- 10702 2N **Performance of the reflective optics of MIMIZUKU at cryogenic temperature [10702-96]**
- 10702 2O **A near infrared integral field spectrograph for the Southern African Large Telescope (SALT) [10702-97]**
- 10702 2P **Variation of the sky background in near-infrared spectroscopy using X-Shooter and KMOS at the VLT [10702-98]**

- 10702 2Q **MEAD: data reduction pipeline for ALES integral field spectrograph and LBTI thermal infrared calibration unit** [10702-99]
- 10702 2R **Spectral and polarimetric facilities for ground support of the WSO-UV Space mission** [10702-100]
- 10702 2S **FIES fiber injection upgrade** [10702-101]
- 10702 2T **Hamamatsu CCD upgrade for the Gemini multi-object spectrographs GMOS-S and GMOS-N: results from the 2017 GMOS-N upgrade and project completion summary** [10702-102]
- 10702 2U **Upgrade and characterization of the OSIRIS imager detector** [10702-103]
- 10702 2V **Adding a second spectral channel to the SOFIA FPI+ science instrument** [10702-104]
- 10702 2X **The LUCI@LBT twins: instrument flexure control** [10702-106]
- 10702 2Y **Thermal-infrared adaptive optics imaging- and spectro-polarimetry with the Infrared Camera and Spectrograph (IRCS) for the Subaru Telescope** [10702-107]
- 10702 2Z **MITs: the multi-imaging transient spectrograph for SOXS** [10702-108]
- 10702 30 **Development of cryogenic mechanisms for the VLT/ERIS instrument** [10702-109]
- 10702 31 **The mechanical design of SOXS for the NTT** [10702-110]
- 10702 32 **GeMS/GSAOI: towards regular astrometric distortion correction** [10702-111]
- 10702 33 **Wide-field acousto-optical imaging spectral polarimeter: design and commissioning** [10702-112]
- 10702 34 **A unique infrared spectropolarimetric unit for CRIRES+** [10702-113]
- 10702 36 **Bringing high-spectral resolution to VLT/SPHERE with a fiber coupling to VLT/CRIRES+** [10702-115]
- 10702 37 **The ASTRI camera for the Cherenkov Telescope Array** [10702-116]
- 10702 39 **Full system test and early preliminary acceptance Europe results for CRIRES+** [10702-118]
- 10702 3A **Development of TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems** [10702-119]
- 10702 3C **A Near Infrared Integral Field spectrograph (NIR) for the Southern African Large Telescope (SALT): mechanical design** [10702-121]
- 10702 3D **The assembly integration and test activities for the new SOXS instrument at NTT** [10702-122]



- 10702 3E **NIHTS: the near-infrared high throughput spectrograph for the Discovery Channel Telescope** [10702-123]
- 10702 3F **On-sky operations with the ALES integral field spectrograph** [10702-124]
- 10702 3G **Final design and construction of the ERIS calibration unit** [10702-125]
- 10702 3H **MegaCam FAST: reducing data acquisition time on the Canada-France-Hawaii Telescope's wide-field optical imager** [10702-126]
- 10702 3J **WIRC+Pol: low-resolution near-infrared spectropolarimeter** [10702-128]
- 10702 3K **The new NESSI: refurbishment of an NIR MOS for characterizing exoplanets using the Hale telescope** [10702-129]
- 10702 3L **Design of ALES: a broad wavelength integral field unit for LBTI/LMIRcam** [10702-130]
- 10702 3N **Developing an infrared APD array camera for near-infrared wavefront sensing** [10702-132]
- 10702 3R **Gemini instrument upgrade program** [10702-136]
- 10702 3T **The common path of SOXS (Son of X-Shooter)** [10702-138]
- 10702 3V **Near-infrared adaptive optics imaging- and spectro-polarimetry with the infrared camera and spectrograph of the Subaru Telescope** [10702-140]
- 10702 3W **Observing modes for the new SCORPIO imager and spectrograph at Gemini South** [10702-141]

---

**POSTER SESSION: HIGH-CONTRAST IMAGING**

- 10702 3Y **Cryogenic characterization of the grating vector APP coronagraph for the upcoming ERIS instrument at the VLT** [10702-143]
- 10702 40 **Moving the Gemini planet imager to Gemini North: expectations and challenges** [10702-145]
- 10702 42 **High-contrast imaging of tight resolved binaries with two vector vortex coronagraphs in cascade with the Palomar SDC instrument** [10702-147]
- 10702 43 **Design, specification, and manufacturing of a PIAACMC for the SPEED testbed** [10702-148]
- 10702 44 **Upgrading the Gemini planet imager: GPI 2.0** [10702-149]
- 10702 45 **New inverse method for circumstellar environments reconstruction in polarimetry with the ESO/VLT-SPHERE IRDIS instrument** [10702-150]

## Part Three

- 10702 4G **High contrast imaging for the enhanced resolution imager and spectrometer (ERIS)** [10702-151]
- 10702 4H **A precursor mission to high contrast imaging balloon system** [10702-153]
- 10702 4C **The AIV concept of SHARK-NIR, a new coronagraph for the Large Binocular Telescope**  
[10702-157]
- 10702 4E **High-contrast spectroscopy testbed for Segmented Telescopes: instrument overview and development progress** [10702-159]
- 10702 4F **SHARK-VIS the LBT high contrast imager at visible wavelengths** [10702-160]

---

### POSTER SESSION: TIME-DOMAIN AND NOVEL APPROACHES

---

- 10702 4G **Enhanced exoplanet biosignature detection from an interferometer addition to low resolution spectrographs** [10702-161]
- 10702 4H **Design of a next generation synoptic solar observing network: solar physics research integrated network group (SPRING)** [10702-162]
- 10702 4I **Design and development of Mt. Abu faint object spectrograph and camera-pathfinder (MFOSC-P) for PRL 1.2m Mt. Abu telescope, India** [10702-163]
- 10702 4J **LSST craft raft integration support equipment: design, assembly, and test status** [10702-164]
- 10702 4K **Aligning the ZTF science focal plane using stellar images** [10702-165]
- 10702 4M **Acousto-optic spectrometer for speckle imaging** [10702-167]
- 10702 4O **The rigid and thermally stable all-ceramic LSST camera: focal plane from design to assembly**  
[10702-169]
- 10702 4P **Fast automatic spectrograph for transient (FAST)** [10702-170]
- 10702 4Q **Optical design of the Liverpool Telescope Multicolour OPTimised Optical Polarimeter (MOPTOP)**  
[10702-172]
- 10702 4R **Chimera: a high-speed three-color photometer for space surveillance and astronomy**  
[10702-173]
- 10702 4T **Connectivity and functional verification for the LSST science raft towers** [10702-175]
- 10702 4U **Spectroscopic measurements of asteroids allow mitigation of differential color refraction effects on ground-based astrometry and orbit prediction accuracy** [10702-176]

- 10702 4V **Wavelength calibration of a tunable spatial heterodyne spectrometer** [10702-177]
- 10702 4X **Full Stokes polarimetry using dual-frequency liquid crystals** [10702-179]
- 10702 4Y **N SIE: a fiber-fed near-infrared spectrograph for TIGRE telescope** [10702-180]
- 10702 4Z **High-precision and high-accuracy polarimetry of exoplanets** [10702-181]
- 10702 50 **Extreme precision photometry from the ground with beam-shaping diffusers for K2, TESS, and beyond** [10702-182]
- 10702 53 **The RHEA single-mode spectrograph** [10702-185]
- 10702 54 **Prototype of S4EI (spectral sampling with slicer for stellar and extragalactical instrumentation): a new generation 3D Spectro-imager** [10702-186]
- 10702 57 **BTFI2: a simple, light, and compact Fabry-Perot instrument for the SOAR telescope** [10702-189]
- 10702 58 **LSST camera bench for optical testing: design, assembly, and preliminary testing** [10702-190]
- 10702 5D **Image guider subsystem analysis for the GHAPS project** [10702-196]
- 10702 5G **The Exoplanet Climate Infrared Telescope (EXCITE)** [10702-199]
- 10702 5H **Panoramic optical and near-infrared SETI instrument: prototype design and testing** [10702-200]
- 10702 5I **Panoramic optical and near-infrared SETI instrument: overall specifications and science program** [10702-201]
- 10702 5J **Development of the single-mode fiber integral field unit for the RHEA Spectrograph** [10702-202]
- 10702 5K **Evryscopes North and South: hardware to science** [10702-203]
- 10702 5L **Panoramic optical and near-infrared SETI instrument: optical and structural design concepts** [10702-204]
- 10702 5M **Conceptual optical designs for an eight channel imager/polarimeter** [10702-205]
- 10702 5O **GravityCam: higher resolution visible wide-field imaging** [10702-207]
- 10702 5P **BATMAN @ TNG: instrument integration and performance** [10702-208]
- 10702 5Q **SIFAP2: a new versatile configuration at the TNG for the MPPC based photometer** [10702-209]

POSTER SESSION: HIGH-RESOLUTION SPECTROGRAPHS

---

- 10702 5R **SPIRou at CFHT: fiber links and pupil slicer** [10702-210]
- 10702 5S **Commissioning the SALT High Resolution Spectrograph's iodine cell** [10702-211]
- 10702 5T **Developing an ultra-stable single mode fiber spectrograph for adaptive optics assisted observation in the infrared** [10702-212]
- 10702 5U **Very high-sensitive NIR high-resolution spectrograph WINERED: on-going observations at NTT** [10702-213]
- 10702 5V **Design and manufacturing of a precision cryogenic actuator** [10702-214]
- 10702 5X **Keck Planet Finder: preliminary design** [10702-216]
- 10702 5Y **Experimental test of a 40 cm-long R=100 000 spectrometer for exoplanet characterisation** [10702-217]
- 10702 60 **Performance tests of Subaru/IRD for very precise and stable infrared radial velocity observations** [10702-219]
- 10702 62 **SPIRou @CFHT: integration and performance of the cryogenic near infra-red spectrograph unit** [10702-221]
- 10702 65 **Test results and operating configuration of the calibration unit for the near-infrared spectropolarimeter SPIRou** [10702-224]
- 10702 66 **Introducing GOFIO: a DRS for the GIANO-B near-infrared spectrograph** [10702-225]
- 10702 67 **The NEID precision radial velocity spectrometer: port adapter overview, requirements, and test plan** [10702-226]
- 10702 68 **On-sky results with the fast guiding system on the SPIRou spectropolarimeter at CFHT** [10702-227]
- 10702 69 **GHOST optical fiber system** [10702-228]
- 10702 6A **Development of a stabilized Fabry-Perot based wavelength calibrator for precision Doppler spectroscopy** [10702-229]
- 10702 6B **Analysis of the polarimetric performance of the HARPS3 Cassegrain adaptor unit** [10702-230]
- 10702 6C **NRES: the network of robotic echelle spectrographs** [10702-231]
- 10702 6D **MAROON-X: a radial velocity spectrograph for the Gemini Observatory** [10702-232]

10702 6E **VELOCE's novel IFU-fitted fibre feed** [10702-233]

## Part Four

10702 6F **A optical fiber double scrambler and mechanical agitator system for the Keck planet finder spectrograph** [10702-234]

10702 6G **PARAS-2 precision radial velocimeter: optical and mechanical design of a fiber-fed high resolution spectrograph under vacuum and temperature control** [10702-235]

10702 6H **Final design and assembly of the GHOST Cassegrain unit** [10702-236]

10702 6I **A high resolution echelle spectrograph for exoplanet searches with small aperture telescopes** [10702-237]

10702 6J **Veloce environmental control system** [10702-238]

10702 6K **Hanle echelle spectrograph: design and performance** [10702-239]

10702 6L **GANS: a nighttime spectrograph for the GREGOR solar telescope** [10702-240]

10702 6M **The NEID precision radial velocity spectrometer: fast, first-order wavefront correction** [10702-241]

10702 6N **A Fabry Perot based instrument for biomarkers detection** [10702-242]

10702 6P **A fibre scrambling unit for the laser frequency comb of ESPRESSO** [10702-244]

10702 6W **ESPRESSO VCS: Vacuum and cryogenic Controller System (VCS) for a spectrograph** [10702-251]

10702 6Y **Keck Planet Finder: Zerodur optical bench mechanical design** [10702-253]

10702 71 **The NEID precision radial velocity spectrometer: optical design of the port adapter and ADC** [10702-257]

10702 72 **Rubidium traced etalon wavelength calibrators: towards deployment at observatories** [10702-258]

10702 73 **Pierced mirrors in ultrastable spectrographs** [10702-259]

10702 74 **GIANO, the high resolution IR spectrograph of the TNG: geometry of the echellogram and strategies for the 2D reduction of the spectra** [10702-260]

10702 75 **Estimation of asymmetries in point spread function for the echelle spectrograph operating at Vainu Bappu Telescope for high precision radial velocity studies** [10702-261]

10702 76 **Two Fabry-Pérots and two calibration units for CARMENES** [10702-262]

---

**POSTER SESSION: MOS/IFS**

---

- 10702 77 **The improvement of LAMOST fiber view camera metrology system fiber position recognition algorithm** [10702-263]
- 10702 78 **Quality assurance and safety conformity for the 4-metre Multi-Object Spectroscopic Telescope (4MOST) project** [10702-264]
- 10702 79 **AESOP: the 4MOST fiber positioner** [10702-265]
- 10702 7A **DOTIFS: spectrograph optical and opto-mechanical design** [10702-266]
- 10702 7B **4MOST: status of the high resolution spectrograph** [10702-267]
- 10702 7D **A predictive optical sky background model for DESI** [10702-269]
- 10702 7E **Gemini IRMOS: conceptual optical design of a multi-object adaptive optics-fed infrared integral-field spectrograph for the Gemini telescope** [10702-270]
- 10702 7F **Stability study of the multi-object photogrammetric platform for optical fiber units** [10702-271]
- 10702 7G **The DESI spectrograph system and production** [10702-272]
- 10702 7H **Metrology camera system of prime focus spectrograph for Subaru telescope** [10702-273]
- 10702 7I **Automated testing of optical fibres: towards the design of the Maunakea Spectroscopic Explorer Fibre Transmission System** [10702-274]
- 10702 7K **Integration and testing of the DESI multi-object spectrograph: performance tests and results for the first unit out of ten** [10702-276]
- 10702 7L **Design and production of DESI slit assemblies** [10702-277]
- 10702 7N **Design and production of the DESI fibre cables** [10702-279]
- 10702 7O **The DESI fiber system** [10702-280]
- 10702 7P **Design, production, and performance of the DESI front end fiber system** [10702-281]
- 10702 7Q **Slit device assembly of Prime Focus Spectrograph for Subaru telescope** [10702-282]
- 10702 7R **FRD characterization in large-scale for FOCCoS of Prime Focus Spectrograph for Subaru telescope** [10702-283]

- 10702 7S     **MSE FITS: the ultimate multi-fiber optic transmission system** [10702-284]
- 10702 7T     **Permanent optical fiber cable for Prime Focus Spectrograph and Subaru telescope “Cable B”**  
[10702-285]
- 10702 7U     **DOTIFS: fore-optics and calibration unit design** [10702-286]
- 10702 7V     **Calibration system for the 4MOST multi object fiber-fed spectrographs** [10702-287]
- 10702 7W     **Mauna Kea Spectroscopic Explorer (MSE): a preliminary design of multi-object high resolution spectrograph** [10702-289]
- 10702 7X     **First lab results of the WEAVE fibre positioner system** [10702-290]
- 10702 7Y     **As-built new Mayall telescope top end for the DESI project** [10702-291]
- 10702 7Z     **Performance of the first production-ready actuators for the 4MOST-AESOP fiber positioner**  
[10702-292]
- 10702 80     **The commissioning instrument for the dark energy spectroscopic instrument** [10702-293]
- 10702 81     **VIRUS: comparison of lab characterization with on-sky performance for multiple spectrograph units** [10702-294]
- 10702 82     **Structural error simulation analysis of LAMOST fiber units** [10702-295]
- 10702 86     **4MOST metrology system error analysis** [10702-299]
- 10702 87     **4MOST low resolution spectrograph final design** [10702-300]
- 10702 88     **SUBARU prime focus spectrograph integration and performance at LAM** [10702-301]
- 10702 89     **4MOST fibre feed: performance and final design** [10702-302]
- 10702 8A     **Deployment and handling of the VIRUS fiber integral field units** [10702-303]
- 10702 8B     **Maunakea spectroscopic explorer low moderate resolution spectrograph conceptual design**  
[10702-304]

## **Part Five**

- 10702 8E     **VIRUS-2 for the Harlan J. Smith telescope of the McDonald Observatory** [10702-307]
- 10702 8I     **Optical design of the highly cost optimized new Hector Spectrograph** [10702-312]

- 10702 8J      **Research on the key technology of the fiber positioning closed-loop control system based on four-quadrant detector** [10702-313]
- 10702 8K      **Priority coordination of fiber positioners in multi-objects spectrographs** [10702-314]

---

**POSTER SESSION: INSTRUMENTATION FOR ELTS**

---

- 10702 8M      **Image slicer module for Wide Field Optical Spectrograph (WFOS)** [10702-315]
- 10702 8N      **Opto-mechanical design of a High Contrast Module (HCM) for HARMONI** [10702-316]
- 10702 8O      **ELT-HIRES the high resolution instrument for the ELT: optical design and instrument architecture** [10702-317]
- 10702 8P      **The warm calibration unit of METIS: optical design and principle of operation** [10702-318]
- 10702 8Q      **ELT-HIRES the High Resolution Spectrograph for the ELT: the IFU-SCAO module** [10702-319]
- 10702 8R      **Simulating surveys for ELT-MOSAIC: status of the MOSAIC science case after phase A** [10702-320]
- 10702 8S      **ELT-HIRES the high resolution spectrograph for the ELT: fiber link** [10702-321]
- 10702 8T      **The MICADO first light imager for ELT: derotator design status and prototype results** [10702-322]
- 10702 8U      **The MICADO first light imager for the ELT: preliminary design of the MICADO Calibration Assembly** [10702-323]
- 10702 8W      **The MICADO first light imager for ELT: cold optics instrument** [10702-325]
- 10702 8X      **Detailed design of the G-CLEF flexure control camera subsystem** [10702-326]
- 10702 8Y      **The MICADO Main Selection Mechanism (MSM): an operational mode selector for the MICADO instrument** [10702-327]
- 10702 8Z      **MICADO instrument control approach in context of ESO ELT standards** [10702-328]
- 10702 90      **The MICADO first light imager for ELT: its astrometric performance** [10702-329]
- 10702 91      **The calibration unit of the mid-infrared E-ELT instrument METIS** [10702-330]
- 10702 92      **The MICADO first light imager for ELT: from hexapod to octopod instrument support structure** [10702-331]



- 10702 93 **Assembly, integration, test, and verification scenarios for the ELT MOSAIC instrument** [10702-332]
- 10702 94 **The MICADO first light imager for ELT: control concept for the derotator** [10702-333]
- 10702 95 **USM Test Cryostat for the MICADO project: first steps in stabilizing and testing the cryostat** [10702-334]
- 10702 96 **ELT HARMONI: image slicer preliminary design** [10702-335]
- 10702 97 **Design and lab-test result of APol, a polarimeter for the Atacama sub-millimeter telescope experiment** [10702-336]
- 10702 98 **The estimation of the instrumental polarization and crosstalk at the focus of the mid-infrared imaging system for the Thirty Meter Telescope** [10702-337]
- 10702 9A **The infrared imaging spectrograph (IRIS) for TMT: design of image slicer** [10702-339]
- 10702 9B **The optical design for the Giant Magellan Telescope Multi-object Astronomical and Cosmological Spectrograph (GMACS)** [10702-340]
- 10702 9E **Test and control of new-generation optical fiber positioning units of LAMOST based on ZigBee network** [10702-343]
- 10702 9F **Trade-offs in the visible spectrograph of the ELT instrument MOSAIC** [10702-344]
- 10702 9H **HARMONI pre-optics design at PDR** [10702-346]
- 10702 9I **ELT-HIRES the high resolution spectrograph for the ELT: application of E2E + ETC for instrument characterisation, from efficiency to accuracy in radial velocity measurements** [10702-347]
- 10702 9K **The optical design of the G-CLEF Spectrograph: the first light instrument for the GMT** [10702-349]
- 10702 9L **ELT -HIRS the High Resolution Spectrograph for the ELT: Fabry-Pérots for use as calibration sources** [10702-350]
- 10702 9M **The HARMONI/ELT spectrographs** [10702-351]
- 10702 9N **System analysis and expected performance of a high-contrast module for HARMONI** [10702-352]
- 10702 9O **End to end optical design and wavefront error simulation of METIS** [10702-353]
- 10702 9P **MOSAIC optical relay module: optical design, performance, and flexure analysis** [10702-354]
- 10702 9T **ELT-HIRES, the High Resolution Spectrograph for the ELT: the design of the Front End** [10702-358]
- 10702 9U **The opto-mechanical design of the GMT-Consortium Large Earth Finder (G-CLEF)** [10702-359]

- 10702 9X **Overview of the opto-mechanical design of the 2-5 micron arm of the Thirty Meter Telescope planetary systems imager [10702-363]**
- 10702 9Y **The optomechanical design of the Giant Magellan telescope multi-object astronomical and cosmological spectrograph (GMACS) [10702-364]**
- 10702 9Z **Electronics prototypes for the Giant Magellan telescope multi-object astronomical and cosmological spectrograph (GMACS) [10702-365]**
- 10702 A0 **The key science drivers for MICH1: a thermal-infrared instrument for the TMT [10702-366]**
- 10702 A1 **The infrared imaging spectrograph (IRIS) for TMT: electronics-cable architecture [10702-367]**
- 10702 A2 **Precision thermal control of the GMT-Consortium Large Earth Finder (G-CLEF) [10702-368]**
- 10702 A3 **A review of high contrast imaging modes for METIS [10702-369]**
- 10702 A4 **MOSAIC: the ELT multi-object spectrograph [10702-370]**
- 10702 A5 **The planetary systems imager: 2-5 micron channel [10702-371]**
- 10702 A6 **Wide-field multi-object spectroscopy with MANIFEST [10702-372]**
- 10702 A7 **The InfraRed Imaging Spectrograph (IRIS) for TMT: photometric precision and ghost analysis [10702-373]**
- 10702 A8 **The infrared imaging spectrograph (IRIS) for TMT: status report for IRIS imager [10702-374]**
- 10702 A9 **Building the HARMONI engineering model [10702-375]**
- 10702 AD **UV camera conceptual designs for TMT Fiber WFOS [10702-379]**