# **PROCEEDINGS OF SPIE**

# Ground-based and Airborne Instrumentation for Astronomy IX

Christopher J. Evans Julia J. Bryant Kentaro Motohara Editors

17–22 July 2022 Montréal, Québec, Canada

Sponsored and Published by SPIE

Volume 12184 Part One of Three Parts

Proceedings of SPIE 0277-786X, V. 12184

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 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 *Ground-based and Airborne Instrumentation for Astronomy IX*, edited by Christopher J. Evans, Julia J. Bryant, Kentaro Motohara, Proc. of SPIE 12184, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510653498 ISBN: 9781510653504 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org Copyright © 2022 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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



**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE 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

xvii Conference Committee

# Part One

### MAJOR OBSERVATORIES I

12184 02	Instrumentation at the Subaru Telescope [12184-1]
12184 03	Ten years of the ESO paranal instrumentation programme [12184-2]
12184 05	Innovations and advances in instrumentation at the W. M. Keck Observatory, vol. II [12184-4]
12184 06	Current and future instrumentation at Gemini Observatory [12184-5]

# MAJOR OBSERVATORIES II

- 12184 07 Laboratory performance and commissioning status of the SALT NIR integral field spectrograph [12184-6]
- 12184 09 MAVIS: imager and spectrograph [12184-8]
- 12184 0A CUBES: the Cassegrain U-band Efficient Spectrograph [12184-9]

# MAJOR OBSERVATORIES III

12184 OC	FRIDA: diffraction-limited imaging and integral-field spectroscopy for the GTC [12184-12]
12184 OE	Detailed performance of the preliminary optical design of the Gemini multi-object infrared integral-field spectrograph [12184-14]
12184 OF	A near-IR imager for the Gemini InfraRed Multi-Object Spectrograph (GIRMOS) [12184-15]

# MAJOR OBSERVATORIES IV

12184 OH	EIFIS: a modular extreme integral field spectrograph for the 10.4m GTC [12184-17]
----------	---

12184 01 Design of SCALES: a 2-5 micron coronagraphic integral field spectrograph for Keck Observatory [12184-18]

#### WIDE-FIELD IMAGERS

12184 OJ	Rubin Observatory Commissioning Camera: summit integration [12184-19]
12184 OL	The HR image slicer for GNIRS at Gemini North: optical design and performance [12184-11]
12184 OM	Commissioning, on sky performance and first operations of JPCam, a 1.2 Gpixel camera for the wide-field 2.6m Javalambre Survey Telescope [12184-22]
12184 ON	Conceptual design of the Keck Wide Field Imager (KWFI) [12184-23]

# TIME DOMAIN/MULTI-MESSENGER INSTRUMENTATION

- 12184 00 Progress on the SOXS transients chaser for the ESO-NTT [12184-24]
- 12184 OR Concept and deisgn of a next-generation optical sensor for IceCube-Gen2 [12184-27]
- 12184 0S The mosaic CMOS wide field camera for transneptunian automatic occultation survey [12184-28]

#### **AIRBORNE & SOLAR INSTRUMENTATION**

12184 0T Enhancing the accuracy of solar polarimetry by coalescing slow and fast modulation: method description and first performance tests [12184-29]
12184 0U The upgraded GREGOR infrared spectrograph [12184-30]
12184 0V The EXoplanet Climate Infrared TElescope (EXCITE) [12184-31]

# MOS I

12184 OX	The DESI instrument [12184-33]
12184 OY	TAIPAN starbugs: commissioning and the start of science observations [12184-34]
12184 10	Prime Focus Spectrograph (PFS) for the Subaru Telescope: its start of the last development phase [12184-36]

	MOS II
12184 12	MOONS – Multi Object spectroscopy for the VLT: overview and instrument integration update [12184-38]
12184 13	VIRUS2: a next generation replicated integral field spectrograph with wide field and broad wavelength coverage [12184-39]
12184 14	4MOST: the 4-metre multi-object spectroscopic telescope project in the assembly, integration, and test phase [12184-40]
12184 15	The Magellan infrared multi-object spectrograph project: 2022 update [12184-41]
12184 17	MANIFEST@GMT science overview: a multi-interface, multi-mode instrument science and simulations [12184-70]
	MOS III
12184 19	What could KIDSpec, a new MKID spectrograph, do on the ELT? [12184-329]
12184 1A	A high resolution multi-object spectrograph for the VLT: pre-concept design [12184-44]
12184 1B	MSE: Instrumentation for a massively multiplexed spectroscopic survey facility [12184-45]
12184 1C	Multi-object spectroscopic capability at the Canada France Hawaii Telescope: the MSE pathfinder [12184-46]
	HIGH-RESOLUTION SPECTROGRAPHS I
12184 1D	Final integration of the Gemini High-Resolution Optical SpecTrograph (GHOST) spectrograph [12184-48]
12184 1E	Science commissioning and first results from the next generation Gemini High Resolution Optical Spectrograph (GHOST) [12184-47]
12184 1F	CRIRES <sup>+</sup> on sky: high spectral resolution at infrared wavelength enabling better science at the ESO VLT [12184-49]
12184 1G	MAROON-X: the first two years of EPRVs from Gemini North [12184-50]
12184 1H	First light of NIRPS, the near-infrared adaptive-optics assisted high resolution spectrograph for the ESO 3.6m [12184-51]

#### **HIGH-RESOLUTION SPECTROGRAPHS II**

- 12184 11 On-sky demonstration at Palomar Observatory of the near-IR, high-resolution VIPA spectrometer [12184-52]
- 12184 1J **20 GHz astronomical laser frequency comb with super-broadband spectral coverage** [12184-53]
- 12184 1K Astrophotonic solutions for spectral cross-correlation techniques [12184-54]

#### **HIGH-RESOLUTION SPECTROGRAPHS III**

- 12184 10 System integration of the Potsdam Arrayed Waveguide Spectrograph (PAWS) [12184-58]
- 12184 1P The final design of the iLocater spectrograph: an optimized architecture for diffraction-limited EPRV instruments [12184-59]
- 12184 1Q RISTRETTO: high-resolution spectroscopy at the diffraction limit of the VLT [12184-60]
- 12184 1R Fiber-fed high-resolution infrared spectroscopy at the diffraction limit with Keck-HISPEC and TMT-MODHIS: status update [12184-61]

#### HIGH-SPATIAL RESOLUTION INSTRUMENTS

- 12184 15 Upgrading the high contrast imaging facility SPHERE: science drivers and instrument choices [12184-62]
- 12184 11 GPI 2.0: upgrade status of the Gemini Planet Imager [12184-63]
- 12184 10 MIRAC-5: a ground-based mid-IR instrument with the potential to detect ammonia in gas giants [12184-64]
- 12184 1W Phase II of the Keck Planet Imager and characterizer: system-level laboratory characterization and preliminary on-sky commissioning [12184-66]

#### ELT INSTRUMENTATION I

- 12184 1Y Science instrumentation progress at the Giant Magellan Telescope [12184-68]
- 12184 20 HARMONI at ELT: overview of the capabilities and expected performance of the ELT's AO assisted integral field spectrograph [12184-71]
- 12184 21 Status update on the development of METIS, the mid-infrared ELT imager and spectrograph [12184-72]

#### **ELT INSTRUMENTATION II**

- 12184 23 Design and development of WFOS, the Wide-Field Optical Spectrograph for the Thirty Meter Telescope [12184-74]
- 12184 24 ANDES, the high resolution spectrograph for the ELT: science case, baseline design and path to construction [12184-75]
- 12184 26 The Planetary Systems Imager for TMT: overview and status [12184-77]

#### **POSTER SESSION: AIRBORNE & SOLAR INSTRUMENTATION**

- 12184 27 Optical alignment and performance evaluation of the Sunrise Chromospheric Infrared spectroPolarimeter (SCIP) for SUNRISE III [12184-78]
- 12184 28 Supporting Parker Solar Probe mission with Goode Solar Telescope at Big Bear Solar Observatory [12184-79]
- 12184 29 Design and testing of a low-resolution NIR spectrograph for the EXoplanet Climate Infrared TElescope [12184-80]
- 12184 2A IBIS 2.0: optical layout and polarimetric unit of the Interferometric Bldimensional Spectrometer 2.0 [12184-81]
- 12184 2B Sunrise chromospheric Infrared spectroPolarimeter (SCIP) for SUNRISE III: thermal-vacuum test of the SCIP optical unit [12184-82]
- 12184 2F End-to-end tests of the TuMag instrument for the SUNRISE III mission [12184-87]
- 12184 2G **TuMag for SUNRISE III mission: development of the optical unit of an imaging** spectropolarimeter [12184-88]
- 12184 2H Daniel K. Inouye Solar Telescope's heat stop [12184-89]
- 12184 21 The design and development status of the cryogenic receiver for the EXoplanet Climate Infrared TELescope (EXCITE) [12184-90]

#### POSTER SESSION: ELT INSTRUMENTATION

- 12184 2J HARMONI at ELT: opto-mechanics of the IFS pre-optics at CDR [12184-91]
- 12184 2K The final design of the cryostat for ELT/METIS [12184-92]

12184 2L	HARMONI at ELT: mechanisms of the pre-optics at CDR [	12184-93]
----------	---	-----------

- 12184 20 Global to local FEA validation for complex geometries: submodeling technique applied to mechanical structures for ELT class of instrumentation [12184-96]
- 12184 2P Finite element modeling technique: trade-off between two different FE models of a mechanical selector for astronomical instrumentation [12184-97]
- 12184 2Q GMTNIRS: preliminary optical mount design for cryogenic spectrograph [12184-98]
- 12184 2R Preliminary design of GMTNIRS cryostat and optical bench [12184-99]

# Part Two

12184 2T	HARMONI – the Extremely Large Telescope first light integral field spectrograph: pre-optics: stray light analysis [12184-102]
12184 2W	The MICADO atmospheric dispersion corrector: optomechanical design, expected performance, and calibration techniques [12184-105]
12184 2X	Mechanical design overview for the main structure of MAORY/MORFEO [12184-106]
12184 2Y	The MICADO first light imager for the ELT: relay optics opto-mechanical final design [12184-107]
12184 2Z	MOSAIC on the ELT: optomechanical design of the NIR spectrograph [12184-108]
12184 30	Mechanical and electronic design of the MORFEO (formerly known as MAORY) calibration unit selector [12184-109]
12184 31	General overview of MORFEO (formerly known as MAORY) instrument control hardware design [12184-110]
12184 32	Trade-off between different PLC based architectures of instrument control hardware for ESO ELT class of instrumentation [12184-111]
12184 33	Analysis of the requirements and their impact on the design of electronic cabinets for the current generation of ESO ELT instruments [12184-112]
12184 34	The MICADO main selection mechanism: final design [12184-114]
12184 35	The MICADO first light imager for the ELT: a comprehensive tolerance analysis for the relay optics [12184-115]
12184 36	Preliminary design of GMTNIRS electronics [12184-116]
12184 39	ANDES, the high resolution spectrometer for the ELT: the UBV spectrograph module [12184-119]
12184 3A	The METIS warm support structure final design [12184-120]

12184 3B	Optimising IFU design for the Planetary Camera and Spectrograph (ELT-PCS): experimental overview and initial characterization [12184-121]
12184 3D	The Infrared Imaging Spectrograph (IRIS) for TMT: low wavefront error and highly reflective mirror [12184-123]
12184 3F	The MICADO first light imager for the ELT: final design of primary instrument support, access and supply subsystems [12184-125]
12184 3H	The opto-mechanical design of the GMT-Consortium Large Earth Finder (G-CLEF) spectrograph adapted for the Magellan Telescope [12184-128]
12184 31	GMTNIRS optical system design [12184-129]
12184 3K	METIS: final design of the imager sub-system [12184-131]
12184 3L	Optical design, analysis, and performances of the infrared and visible channels of the warm calibration unit in METIS/ELT [12184-132]
12184 3M	Warm calibration unit of the mid-infrared ELT instrument METIS: overview and current status towards FDR [12184-133]
12184 3P	ANDES, the high resolution spectrometer for the ELT: fiber link and observing modes [12184-136]

#### POSTER SESSION: HIGH SPATIAL-RESOLUTION INSTRUMENTS

- 12184 3R Structural analyses of the MAORY/MORFEO main support structure at global level for preliminary design review [12184-138]
- 12184 35 MAVIS: preliminary design overview of the AOM control electronics [12184-139]
- 12184 3U ELVIS: the exoplanets at LBT with a visible IFS for SHARK-VIS [12184-141]
- 12184 3V SHARK-NIR on its way to LBT [12184-142]
- 12184 3W The segmented pupil experiment for exoplanet detection: 6. from early design to first lights [12184-144]
- 12184 3X The polarization aberrations of the Gemini Telescope as seen by the Gemini Planet Imager [12184-145]
- 12184 3Y The segmented pupil experiment for exoplanet detection: 5. system control and software infrastructure [12184-146]
- 12184 40 Design of the near infrared camera DIRAC for East Anatolia Observatory [12184-149]
- 12184 41 MAVIS: preliminary mechanical design overview of the adaptive optics module [12184-150]

- 12184 42 On-sky performance and results of the recently upgraded ALES integral field spectrograph [12184-151]
- 12184 43 GPI 2.0: performance of upgrades to the Gemini Planet Imager CAL and IFS [12184-152]
- 12184 44 MAVIS: an optical design for the image slicer and spectrograph [12184-153]
- 12184 45 Weighing exo-atmospheres: a novel mid-resolution spectral mode for SCALES [12184-154]
- 12184 46 The Planetary Systems Imager for TMT: driving science cases and top level requirements [12184-155]
- 12184 48 GPI 2.0: baseline testing of the Gemini Planet Imager before the upgrade [12184-157]
- 12184 49 Spectroastrometry with photonic lanterns [12184-158]
- 12184 4A SCALES on Keck: optical design [12184-159]
- 12184 4B GPI 2.0: characterizing self-luminous exoplanets through low-resolution infrared spectroscopy [12184-160]
- 12184 4C AIV of FRIDA optics: from optical manufacturing to system cryogenic qualification [12184-161]
- 12184 4E A visible-light Lyot coronagraph for SCExAO/VAMPIRES [12184-163]
- 12184 4F MedRes: a new MEDium RESolution integral field spectrograph for SPHERE [12184-164]

#### POSTER SESSION: HIGH-RESOLUTION SPECTROGRAPHS

- 12184 4H NIRPS front-end: design, performance, and lessons learned [12184-167]
- 12184 41 Modal noise mitigation in few-mode fibers [12184-168]
- 12184 4J The Large Fiber Array Spectroscopic Telescope: fiber feed and spectrometer conceptual design [12184-171]
- 12184 4K A fiber injection unit for the Keck Planet Finder: opto-mechanical design [12184-172]
- 12184 4M NIRPS the Near Infra-Red Planet Searcher: design, integration, and tests of the atmospheric dispersion corrector [12184-174]
- 12184 4N The NEID port adapter: on-sky performance [12184-175]
- 12184 40 The NEID port adapter at WIYN: on-sky fast guiding performance [12184-176]

- 12184 4P MARVEL: optical design for the spectrograph [12184-177]
- 12184 4Q SPIP at TBL, the faithfull companion of the SPIRou spectropolarimeter at CFHT : integration, tests, and performances [12184-178]
- 12184 45 Gemini High-Resolution Optical Spectrograph (GHOST) instrument shipping reflections [12184-180]
- 12184 4T RISTRETTO: seven spaxel single mode spectrograph design [12184-181]
- 12184 40 A near-infrared Fabry-Pérot for Fourier-transform spectrograph calibration [12184-182]
- 12184 4V Development of a laser frequency comb and precision radial velocity pipeline for SALT's HRS [12184-183]
- 12184 4W The absorbing cells for the NIR spectrograph GIANO-B@TNG [12184-184]
- 12184 4X The iLocater cryostat and thermal control system: enabling extremely precise radial velocity measurements for diffraction-limited spectrographs [12184-185]
- 12184 4Y On-sky performance and lessons learned from the phase I KPIC fiber injection unit [12184-186]
- 12184 50 Echelle simulation for the High-resolution Infrared Spectrograph for Exoplanet Characterization (HISPEC) at Keck [12184-188]
- 12184 51 NIRPS fiber-link design, performances and modal noise mitigation performances tested on sky [12184-189]
- 12184 53 Mechanical design and integration of the Gemini High-Resolution Optical Spectrograph (GHOST) lens barrels assemblies. [12184-191]
- 12184 54 NIRPS back-end: design and performance [12184-192]
- 12184 56 Measuring the near-IR airglow continuum with stray light reduced spectrograph [12184-195]
- 12184 58 **Tunable fibre Bragg grating arrays for spectral cross-correlation** [12184-197]
- 12184 59 HighSpec: a novel high-resolution narrow band-pass spectrograph [12184-198]
- 12184 5A Pupil slicer at high throughput for the EXtreme Precision Spectrograph (EXPRES) at the Lowell Discovery Telescope [12184-200]
- 12184 58 Designs of Mt. Abu faint object spectrograph and camera echelle polarimeter (M-FOSC-EP) and its prototype: spectro-polarimeters for PRL 1.2m and 2.5m Mt. Abu Telescopes, India [12184-201]

#### POSTER SESSION: MAJOR OBSERVATORIES

12184 5E	GIRMOS: preliminary design of the calibration system [12184-202]
12184 5F	SITELLE, CFHT's visible-band, wide-field imaging Fourier transform spectrometer: from the Milky Way to clusters of galaxies [12184-204]
12184 5G	Revamping of VLT-FORS control electronics with PLC systems: the final design. [12184-205]
12184 5H	A UV double pass spectrograph for monitoring stellar activity for the Keck Planet finder [12184-206]
12184 51	Laboratory test of the VIS detector system of SOXS for the ESO-NTT Telescope [12184-207]
12184 5J	Development status of TAO/MIMIZUKU: performance test of the near-infrared channel [12184-208]
12184 5K	GIRMOS image slicer: preliminary optical design [12184-209]
12184 5M	First on-sky results of ERIS at VLT [12184-211]
12184 50	Concept for calibration of OSIRIS with a Fabry-Pérot etalon [12184-213]
12184 5P	IFUM: integral field units for Magellan [12184-214]
12184 5R	Ground-based support of the planned WSO-UV mission [12184-216]
12184 5S	The BlueMUSE calibration unit: phase-A studies [12184-217]
Part Three	
12184 5T	SDSS-V local volume mapper objective optics [12184-218]

- 12184 5V Slit mask integral field units for the Southern African Large Telescope [12184-220]
- 12184 5X CRIRES+: characterisation and preparation during the pandemic [12184-223]
- 12184 5Y Liger at Keck Observatory: image detector and IFS pick-off mirror assembly [12184-224]
- 12184 57 Throughput modeling of the Planet as Exoplanet Analog Spectrograph (PEAS) [12184-225]
- 12184 60 Characterizing the line spread function in integral field spectrographs from ground-based telescopes [12184-226]

- 12184 61 Hydra21: modernizing a robotic multi-object spectrograph in partnership with an industrial automation firm [12184-227]
- 12184 62 On-sky performance of the SDSS-V wide field corrector [12184-228]
- 12184 63 Henrietta: a low-resolution, high-precision exoatmosphere spectrograph for Las Campanas Observatory [12184-229]
- 12184 64 Liger at Keck Observatory: design of imager optical assembly and spectrograph re-imaging optics [12184-230]
- 12184 65 Optical design of MAAT: an IFU for the GTC OSIRIS spectrograph [12184-231]
- 12184 68 The SCORPIO instrument: status update and path forward [12184-234]
- 12184 6A The Crescent Nebula and its hundreds of line-of sight stars as seen with the imaging FTS SITELLE [12184-237]
- 12184 6B NGC 925 with SITELLE: HII region analysis [12184-238]
- 12184 6C Discovery of planetary nebulae in NGC 4214 using SITELLE [12184-239]
- 12184 6F Error analysis of a Stokes imaging polarimeter based on liquid crystal variable retarders [12184-242]
- 12184 6G VLT MAVIS: optical designs of the reflective IFU and transmissive spectrograph [12184-325]
- 12184 6H The Gemini-south high-resolution optical spectrograph (GHOST) data reduction system [12184-327]

#### POSTER SESSION: MOS

- 12184 61 Optimisation of the WEAVE target assignment algorithm [12184-244]
- 12184 6J Calibration at elevation of the WEAVE fibre positioner [12184-245]
- 12184 6K Development of the FOBOS focal plane positioner [12184-246]
- 12184 6L Mix and match as you go: integration/test of the first beam switch module production that splits wavelengths, scrambles beams, and switches fibers for the VIRUS2 instrument [12184-247]
- 12184 6M Overall performance of AESOP: the 4MOST fibre positioner [12184-248]
- 12184 6N AESOP, the 4MOST fibre positioner: engineering principles [12184-249]
- 12184 60 4MOST: MAIT of the high-resolution-spectrograph [12184-250]

12184 6P MOONS – multi object spectroscopy for the VLT: integration and tests of the field corrector and the rotating front end [12184-251] 12184 6R Prime focus spectrograph (PFS) for the Subaru Telescope: the prime focus instrument [12184-253] 12184 6T 4MOST low resolution spectrograph alignment [12184-255] 12184 6U Validating the local volume mapper acquisition and guiding hardware [12184-256] 12184 6V The assembly and alignment of the 4MOST wide field corrector [12184-257] 12184 6W Optical performance and results from the alignment and testing of the cameras for the MOONS spectrograph. [12184-258] 12184 6Y Fabrication, integration, and alignment of the VIRUS2 instrument [12184-260] 12184 70 Prime Focus Spectrograph (PFS) for the Subaru Telescope: 2D modeling of the point spread function [12184-262] 12184 72 Subaru Night-Sky Spectrograph (SuNSS): fiber cable construction [12184-264] 12184 73 4MOST calibration system: design, assembly, and testing [12184-265] 12184 74 Prime Focus Spectrograqph (PFS): fiber optical cable and connector system (FOCCoS) intergration [12184-266] 12184 75 Spector: integration and performance of the multi-object spectrograph for the Anglo-Australian Telescope [12184-267] 12184 78 Fiber optic throughput performance evaluation in multi-fiber termination connectors [12184-271] 12184 79 4MOST low resolution spectrograph performances [12184-272] 12184 7A MOONS – multi-object spectroscopy for the VLT: spectrograph performance [12184-273] 12184 7C VIRUS2: IFU and mechanical interfaces to the 2.7 m Harlan J. Smith Telescope [12184-275] 12184 7D Design and fabrication of a silicon based micro fiber holder for DOTIFS Integral field unit and associated IFU tests [12184-276] 12184 7E Overview and operation of the DESI focal plane [12184-277] 12184 7H External upgrades to improve the RV precision of the APOGEE Spectrographs [12184-282] 12184 7J SDSS-V focal plane system high-precision metrology [12184-285]

12184 7K	SDSS-V robotic focal plane system: overview of coordinate systems and transforms	[12184-286]
----------	--	-------------

- 121847L Performance of the near-infrared camera for the Subaru Prime Focus Spectrograph [12184-287]
- 1218470 Mauna Kea Spectrographic Explorer (MSE): a new optical design for the multi-object highresolution spectrograph [12184-290]
- 12184 7P Hector spectrograph (spector): mechanical engineering overview [12184-291]
- 121847Q Modeling the performance of the Hadamard transform spectral imaging technique with SAMOS: a ground-based MEMS spectrograph [12184-292]

#### POSTER SESSION: TIME DOMAIN / MULTI-MESSENGER INSTRUMENTATION

- 12184 7R NINJA: an LTAO assisted optical and near-infrared spectrograph of Subaru Telescope [12184-293]
- 12184 7T Galway Liverpool Imaging Polarimeter GLIP: design and prototype status [12184-295]
- 12184 7U SiFAP4XP: time domain polarimetry with silicon photometers at the TNG [12184-296]
- 12184 7V SCALA update: deci-percent laboratory spectro-radiometric NIST calibration transfer to new flux reference sensors [12184-297]
- 12184 7W Design of the DDRAGO wide-field imager for the COLIBRÍ Telescope [12184-298]
- 12184 7X SPECTRE: a 0.4-4.2-micron IFU Spectrograph for the NASA Infrared Telescope facility [12184-300]
- 121847Y Progress on the development of FAST: the fully automatic spectrograph for the robotic telescope PROMPT-7 [12184-301]
- 12184 7Z Progress on the SOXS NIR spectrograph AIT [12184-302]
- 12184 80 The internal alignment and validation of a powered ADC for SOXS [12184-303]
- 12184 81 SOXS mechanical integration and verification in Italy [12184-304]
- 12184 82 From assembly to the complete integration and verification of the SOXS common path [12184-305]
- 12184 83 The integration and alignment phase for the acquisition and guiding system of SOXS [12184-306]
- 12184 84 SOXS AIT: a paradigm for system engineering of a medium class telescope instrument [12184-307]

12184 85	ArgusSpec: rapid, autonomous spectroscopic follow-up of bright transients [12184-308]
12184 86	The Exoplanet Transmission Spectroscopy Imager (ETSI), a new instrument for rapid characterization of exoplanet atmospheres [12184-309]
12184 87	RIMAS: testing, and categorization of grism spectral performance [12184-310]
12184 88	Structural design techniques applied in DDRAGO/CAGIRE instruments for the COLIBRÍ Telescope [12184-311]
12184 89	The control system of the DDRAGO imager of COLIBRÍ, a ground follow-up telescope of the SVOM mission [12184-312]
12184 8A	Performance of the NUTTelA-TAO instrument system after two years of operation [12184-313]
12184 8B	Panoramic SETI: program update and high-energy astrophysics applications [12184-314]

#### POSTER SESSION: WIDE-FIELD IMAGERS

- 12184 8C MOSAIC on the ELT: development of a camera prototype for the near-infrared spectrograph unit [12184-101]
- 12184 8D Commissioning 'Opihi: a wide-angle finderscope for the NASA Infrared Telescope Facility [12184-315]
- 12184 8E Integration/test of dual unit arrayed wide-angle camera system and its evaluation in the context of Extremely Large Telescopes [12184-316]
- 12184 8F Development of an infrared all-sky camera system for cloud monitoring [12184-317]
- 121848G Low-resolution spectroscopy mode for CASTLE Telescope with a composite grism [12184-318]