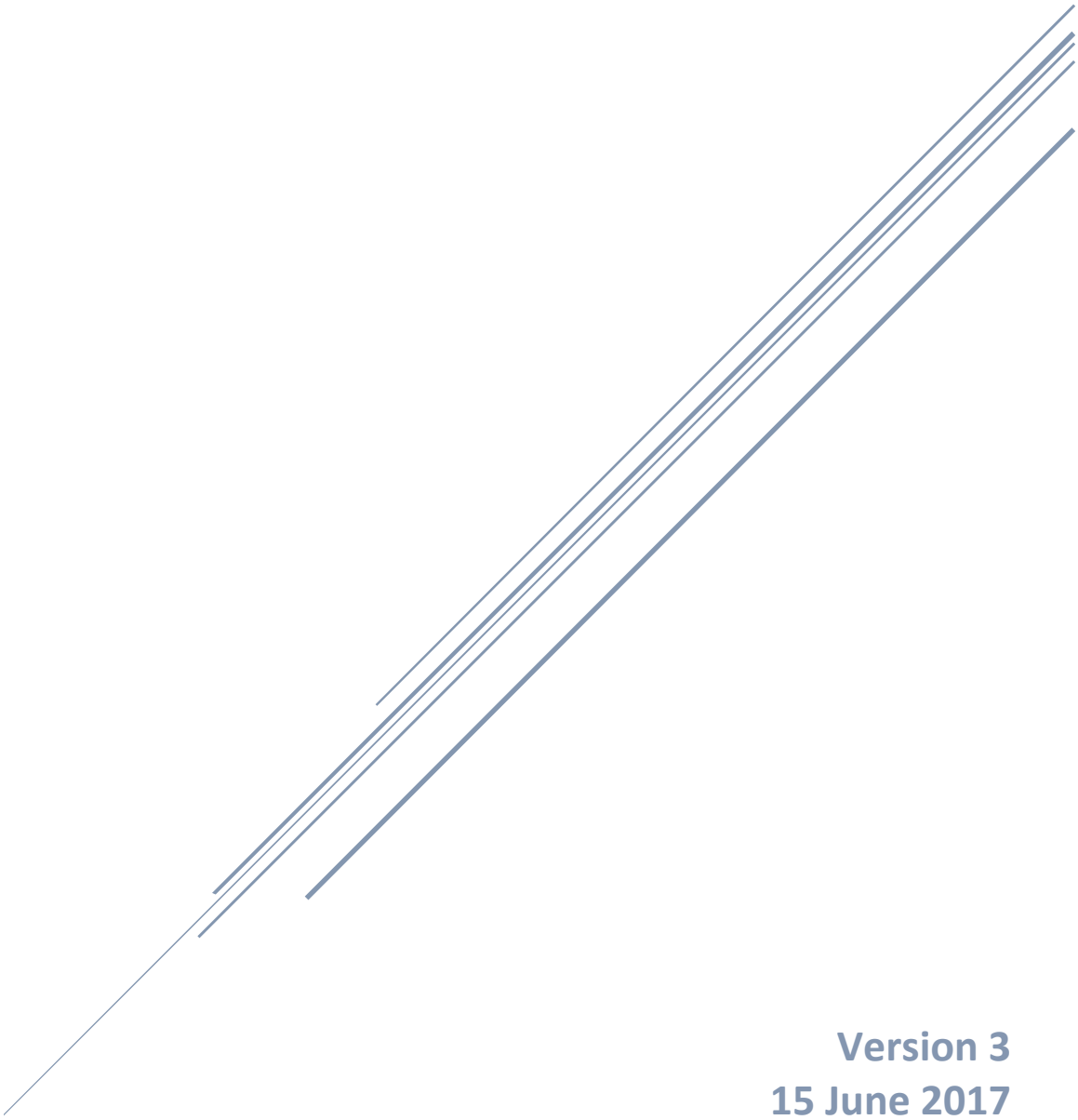
LBTO 2017 USERS' MEETING

Abstracts of Contributions



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333P/2007 VA85 (PANSTARRS): the first transient retrograde Near-Earth Object (NEO) observed at LBT

Author(s): E. Dotto, E. Mazzotta Epifani, O. Hainaut, M. Micheli, R. Carini, M. Faccini, S. Ieva, E. Perozzi

Type of contribution: Poster

Abstract

We present observations of the first transient retrograde near-Earth object (NEO) 333P/2007 VA85 (PANSTARRS), showing an intense and sustained comet-like activity. The observations were obtained in the framework of the EC Horizon 2020 NEOShield-2 (2015-2017) project.

We analysed visible images of the NEO taken at the LBT telescope in the V and R filters, in order to investigate the morphology and the colours of the coma. The object's coma displayed a complex morphology: two thin structures in the antisolar direction, corresponding to dust grains released in different time-ranges, and a broad, smooth and not collimated sunward fan, suggesting a small, gently active area on the nucleus surface. The coma has an unusual blue colour, getting even bluer when moving away from the nucleus toward the outer coma regions, possibly associated to one or more outburst(s) in water production.

A chemical abundance analysis of the ancient planet-host star Kepler-444

Author(s): C. E. Mack III, K. G. Strassmeier, I. Ilyin, F. Spada, and S. Schuler

Type of contribution: Poster

Abstract

We obtained a very high resolution and high S/N spectrum of the K0V multi-planet host Kepler-444. With a spectral resolution of up to R=250,000, a continuous wavelength coverage from 423 nm to 912 nm, and S/N ratio in the continuum of between 150â€“550:1 (blue to red), this spectrum enables us to determine abundances and isotope ratios with a precision at the 1% level.

A LUCI user experience

Author(s): Contursi A.

Type of contribution: Oral

Abstract

I will give my feedback as a LUCI (seeing limited, monocular and binocular) user. I will concentrate on the MOS preparation software, the new OT tool and on the experience at the telescope.

A New Generation of LBT User Software

Author(s): Michelle L. Edwards, Doug Summers, Joseph Astier, Igor Suarez Sola, Christian Veillet, Jennifer Power, Andrew Cardwell, Shane Walsh

Type of contribution: Oral

Abstract

With its unique twin 8.4m mirror design, yielding the collecting area of an 11.8m telescope, the Large Binocular Telescope Observatory (LBTO) has a window of opportunity to exploit its singular potential as the first of the ELTs. Prompted by the urgency to maximize scientific output during this favorable interval, LBTO developed a strategic plan to build a suite of user tools to optimize every stage of observing -- from proposal creation and script preparation to observation scheduling. In this talk, we outline the adaptation of existing programs that led to the successful staged rollout of two new pieces of software, the LBTO Phase I Tool (PIT) and the LBTO Observing Tool (OT). We also review the next steps in our path to efficient observing: the completion of a Binocular Planner and the creation of the Night Scheduling Tool (NST).

A virtual coronagraphic test bench for SHARK-NIR, the second-generation high contrast imager for the Large Binocular Telescope

Author(s): Daniele Vassallo, Jacopo Farinato, Davide Greggio, Elena Carolo et al.

Type of contribution: Poster

Abstract

We present a simulator conceived for the conceptual study of an AO-fed high-contrast coronagraphic imager. The simulator implements physical optics: a complex disturbance (the electric field) is Fresnel-propagated through any user-defined optical train, in an end-to-end fashion.

The effect of atmospheric residual aberrations and their evolution with time can be reproduced by introducing in input a temporal sequence of phase screens: synthetic images are then generated by co-adding instantaneous PSFs. This allows studying with high accuracy the impact of AO correction on image quality for different integration times and observing conditions.

In addition, by conveniently detailing the optical model, the user can easily implement any coronagraphic set-up and introduce optical aberrations at any position. Furthermore, generating multiple images can allow exploring detection limits after a differential post-processing algorithm is applied (e.g. Angular Differential Imaging).

The simulator has been developed in the framework of the design of SHARK-NIR, the second-generation high contrast imager selected for the Large Binocular Telescope. In this article, we also report some of the results of the trade-off study that led to the selection of the currently foreseen coronagraphs.

Adaptive Optics Capabilities at the Large Binocular Telescope Observatory

Author(s): Julian Christou

Type of contribution: Oral

Abstract

We present an overview of the current and future adaptive optics systems at the LBTO along with the current and planned science instruments they feed. All the AO systems make use of the two 672 actuator adaptive secondary mirrors. They are (1) FLAO (NGS/SCAO) feeding the LUCI NIR imagers/spectrographs; (2) LBTI/AO (NGS/SCAO) feeding the NIR/MIR imagers and LBTI beam combiner; (3) the ARGOS LGS GLAO system feeding LUCIs; and (4) LINC-NIRVANA - an NGS/MCAO imager and interferometer system. AO performance of the current systems is presented along with proposed performances for the newer systems taking into account the future instrumentation.

ALTA Center: an operational system for the forecast of the optical turbulence and atmospheric parameters to support the LBTO queue mode

Author(s): Elena Masciadri, Alessio Turchi, Luca Fini

Type of contribution: Oral

Abstract

ALTA (Advanced LBTO Turbulence and Atmosphere) Center is an automatic and operational system conceived to forecast optical turbulence and atmospheric parameters relevant for the LBTO observations particularly those supported by adaptive optics and interferometry. It will support observing at LBTO by forecasting all the parameters related to the whole forthcoming night with a high temporal frequency and delivering them early in the afternoon. Even if this is a long term scientific programme the system is already running nightly to predict atmospheric conditions above Mt. Graham and for many of these parameters the model has been already validated (see Turchi contribution). In this contribution we will present the main features of the project, how it works, how to use the system, the different applications that such a system can have in improving the observing efficiency at LBTO and the on-going model validation for the optical turbulence (CN2 profiles, seeing, theta0 and tau0).

ALTA project â€“ Atmospheric model validation

Author(s): Turchi A., Masciadri E., Fini L.

Type of contribution: Oral

Abstract

In this contribution we present the results of an extended validation study performed in the context of the ALTA project. The aim of ALTA project is to implement an automated system for the forecasts of atmospheric parameters (Meso-Nh code) and optical turbulence (Astro-Meso-NH code) for the observing operation of the LBT. The final goal of such an operational tool is to provide predictions with high time frequency for an optimized planning of the telescope operation (dome thermalization, wind-dependent dome orientation, observation planning based on predicted seeing, adaptive optics optimization, etc...). In the present study we show results, recently published, obtained by comparing atmospheric parameters (wind speed, wind direction, temperature, relative humidity) forecasted by the numerical model (Meso-NH) close to the ground with measurements taken by the observatory instrumentations on a large sample of 144 nights uniformly distributed between 2014 and 2015. The excellent performances shown by the model are to be considered the state of the art of the reliability of atmospheric forecasts at LBT. We also show an ongoing study on the validation of the water content forecast over the whole vertical profile, that will be useful for infrared astronomy (LBTI). The results of the study presented here allows the telescope operator to have a quantitative measure of the reliability of the forecasts of each atmospheric parameter.

AO with LBTI

Author(s): Eckhart Spalding

Type of contribution: Poster

Abstract

LBTI's science programs almost always require AO. Here we provide an overview of the experience from a current user's perspective, highlighting the benefits, features, and observing strategy implications of using the LBT's world-class AO system.

Characterizing Gas-giant Exoplanets in the Thermal-Infrared with LBTI+ALES

Author(s): Jordan Stone, Phil Hinz, Andy Skemer, Travis Barman, Chick Woodward

Type of contribution: Oral

Abstract

In order to understand the physical processes at work in the atmospheres of gas-giant exoplanets spectroscopic observations are essential. Integral field spectrographs (IFS) facilitate spectroscopy of directly imaged planets because their data-cubes can be analyzed using the techniques of high-contrast imaging to separate planet light from starlight. Furthermore, integral field spectrographs make planet detection easier than standard imagers because static stellar speckles are easily distinguishable from astrophysical objects. Most known directly imaged exoplanets have had their near-infrared (1 to 2.5 microns) spectra measured with integral field spectrographs. But interpreting the data is complicated due to degeneracies between effective temperature, surface gravity, and dis-equilibrium chemistry. These degeneracies can be broken with the addition of thermal-infrared observations, which measure the peak of cool planet SEDs and probe the fundamental transitions of methane and carbon monoxide. The recently commissioned Arizona Lenslets for Exoplanet Spectroscopy (ALES) is the world's only thermal-infrared integral field spectrograph. Thermal infrared imaging with ALES is facilitated by the world-class LBT-adaptive optics system that uses deformable secondary mirrors to minimize warm background. I have led the commissioning and pipeline development for ALES and I will discuss the instrument and present our initial results.

Chemical abundances of PNe and H II regions in the irregular galaxy NGC 4449 from LBT MODS data

Author(s): F. Annibali, M. Tosi, D. Romano, A. Buzzoni, F. Cusano, M. Fumana, A. Marchetti, M. Mignoli, A. Pasquali, A. Aloisi

Type of contribution: Oral

Abstract

I will present our recent study, based on deep LBT/MODS spectra, of planetary nebula (PN) and H II region chemical abundances in the starburst irregular galaxy NGC 4449, at a distance of ~4 Mpc from us. This is the first case of PNe studied in a starburst irregular outside the Local Group. The comparison between the PN and HII region chemical abundances provides important clues on the chemical enrichment history of NGC 4449. Also, our data clearly show the presence of a well-defined negative oxygen abundance gradient for both HII regions and PNe, at odds with previous studies claiming the absence of metallicity gradients in dwarf irregular galaxies.

Circumstellar Disks and LBTI+ALES

Author(s): Eckhart Spalding

Type of contribution: Poster

Abstract

LBTI's unique integral field spectrograph ALES is sensitive to a wide water ice absorption feature in the thermal infrared. Here we overview some of our (proposed) future possibilities for using ALES to help constrain models of protoplanetary and debris disks.

Commissioning MCAO with LINC-NIRVANA

Author(s): Tom Herbst, Carmelo Arcidiacono, Maria Bergomi, Thomas Bertram, JÃ¼rgen Berwein, Peter Bizenberger, Florian Briegel, Rosalie McGurk, Kalyan Radhakrishnan, Roberto Ragazzoni, Valentina Viotto

Type of contribution: Oral

Abstract

LINC-NIRVANA (LN) is a high-resolution infrared imager that employs Multi-Conjugate Adaptive Optics (MCAO) using natural guide stars. The instrument will deliver a diffraction-limited field of view that is two arcminutes across, although the current science camera field is considerably smaller. LN was installed on LBT in September 2016 and achieved "First Technical Light" two months later. The first formal commissioning runs took place in March and June, 2017. In this presentation, we report on commissioning progress toward our goal of full MCAO later this calendar year. We also hope to spark thinking within the LBT community about wider field upgrades and eventually, interferometric beam combination.

Constraining the contribution of faint AGN to the ionizing background at z~4 with LBT

Author(s): Grazian A., Giallongo E., Cristiani S., et al.

Type of contribution: Oral

Abstract

Finding the sources responsible of the HI reionization is one of the most pressing issues in observational cosmology. At present, the dentification of the source population which ends up the Dark Ages and illuminates the Cosmic Dawn is still an open issue. Very bright QSOs (M1450<-27) at z>4 are able to ionize their surrounding medium, but they are too few to provide the required UV background.

Star-forming galaxies are more numerous but their escape fraction of ionizing photons is below few percent, still insufficient to keep the niverse ionized, as shown by deep LBC/LBT UV imaging in the CANDELS fields. A significant contribution by faint AGN could solve the problem, since their space density at high-z seems higher than previously thought. Recently, we have measured an HI ionizing escape fraction >50% in 4 faint (L>0.5L*) AGN at 3.5<z<4.2 with deep MODS/LBT spectroscopy. Complementing these data with UV/optical spectra from FORS2 and Magellan, we have an indication that the faint AGN population can contribute substantially to the ionizing background at z~4. It is an important step in order to understand whether AGN at high-z are the potential drivers of the reionization process.

Constraints when Observing with the LBT

Author(s): D. Thompson

Type of contribution: Oral

Abstract

We discuss at the conceptual level THE constraint (co-pointing) when observing with the Large Binocular Telescope, as well as the advantages and disadvantages of pairing various combinations of the facility instruments (LBC, LUCI and MODS) in full binocular mode observing.

Curved slit spectroscopic observations of gravitational arc-like structures

Author(s): Perna, Cresci, Mannucci, Curti

Type of contribution: Oral

Abstract

Gravitationally lensed systems allow a detailed view of galaxies at high redshift. High spatial and spectral resolution measurements of arc-like structures can offer unique constraints on metallicity gradients and gas kinematics. We have undertaken during the Large Binocular Telescope commissioning time a spectroscopic campaign with the ARGOS ground-layer AO system to target arc-like structures associated with galaxies at z ~ 1.3-2.7. We used â€˜curvedâ€™ slits in MOS configuration to follow extended arched structures and study the Halpha+[NII] and Hbeta+[OIII] systems in H and K bands. Iâ€™ll present preliminary results showing complex clumpy and filamentary structures in ionised gas.

Deep Field Observations with the LBC: New and Old

Author(s): Teresa A Ashcraft

Type of contribution: Oral

Abstract

As part of an ongoing collaboration of several LBT member partners, many of the most well-known extragalactic deep fields were observed with the LBC. In the GOODS-N field, over 30 hours of U-band imaging was acquired, which enabled us to examine trade-off between depth and resolution using the 315 images. We generated multiple image mosaics, starting with the best atmospheric seeing images (FWHM < 0.8"), which constitute 10% of the total data set. For subsequent mosaics, we added in data with larger seeing values until the final, deepest mosaic included all images with FWHM < 1.8". From the mosaics, we made object catalogs to compare the optimal-resolution, yet shallower image to the lower-resolution but deeper image. We find, for the 220 brightest galaxies in the field, only marginal differences in total-flux between the optimal-resolution and optimal-depth light-profiles. This helps constrain how much flux can be missed from galaxy outskirts, which is important for studies of the Extragalactic Background Light.

Finally, we will summarize first results from our LBC observations of a new deep field, the JWST North Ecliptic Pole (NEP) Survey field. It is located within JWST's northern Continuous Viewing Zone, and will have NIRcam/NIRISS observations taken during JWST GTO time. We have Ugrz LBC images of this field and its surrounding to m_AB ~ 26 mag.

Deep imaging and spectroscopy of dwarf galaxies in Virgo: a probe on Dark Matter cosmology and stellar evolution

Author(s): Giallongo

Type of contribution: Oral

Abstract

Deep imaging and spectroscopy have been obtained in a region of the Virgo Cluster. Despite the limited area of 0.17deg2 the depth of the image obtained by LBC in the r band (2sigma surface brightness mu_r=28.6 mag/arcsec^2) allowed the detection of 27 dwarf LSB galaxies classified as Virgo members on the basis of a reliable morphological criterion. Accurate 2D profile fitting has been performed to derive the morphological parameters assuming Sersic profiles. Their number density provides significant lower limits on the non baryonic particles mass in a cosmology scenario driven by Warm Dark Matter. We have also performed deep spectroscopy with MODS of 5 LSB dwarfs with central SB of about mu_ro=24.5. The simultaneous observations of UV and red spectra allowed the investigation of both UV metal and red Balmer absorption lines. The UV window resulted crucial to probe the evolution of the stellar population in these very low mass galaxies.

We present an updated analysis of the cosmological implications on the Dark matter scenarios and constraints on the star formation histories of these low mass systems in the Virgo cluster.

Exoplanet spectroscopy with LBC, MODS and PEPSI: Silicate aerosols in the atmosphere of the hot Jupiter HAT-P-32b

Author(s): M. Mallonn, E. Keles, K.G. Strassmeier

Type of contribution: Poster

Abstract

We use the three optical instruments LBC, MODS & PEPSI at the Large Binocular Telescope (LBT) to measure the transmission spectra of extrasolar planets. Independent LBC and MODS transit measurements of the hot Jupiter HAT-P-32b provide evidence for a scattering signature of aerosols in the planetary spectrum. Potential condensate species of these aerosols are silicates like forsterite or enstatite. PEPSI will be able to resolve the spectral absorption above the haze or cloud layer of, e.g., sodium in much higher spectral resolution. Our group did first PEPSI transit observation for the hot Jupiter XO-2b.

EXORCISM at LBT: a characterization of EXor young eruptive variables using optical and near-IR spectra

Author(s): S. Antoniucci, T. Giannini, D. Lorenzetti, A.A. Arkharov, A. Di Paola, A. Giunta, A. Harutunyan, V. Larionov, G. Li Causi, C. Manara, U. Munari, B. Nisini, R. Speziali, F. Strafella, V. Testa, F. Vitali

Type of contribution: Oral

Abstract

EXors are pre-main sequence eruptive variables that show outbursts (delta mag ~ 3-4 at optical wavelengths) of short duration (months) superposed to longer (years) quiescence periods, usually associated with phases of enhanced accretion from the circumstellar disk. Many questions about EXors are still open: are they an intermediate stage between the FUors and T Tauri Stars? What is the mechanism that triggers and regulates the accretion outbursts? This uncertain picture stems not only from the small number of classified EXors (around two dozens), but especially from the lack of a wide-band spectroscopic database of information for these sources.

During the last observing periods we have been successfully using MODS and LUCI in the framework of our program EXORCISM (EXOR optiCal-Infrared Systematic Monitoring) with the aim of building a complete and homogeneous database of optical-to-nearIR spectra of most of the known EXors (16 objects so far) in their quiescent phase. The wide spectral coverage of the MODS and LUCI data allows us to use multiple tracers to characterize the objects in quiescence, and in particular to measure their mass accretion rate. On this basis, we will present for the first time an analysis of the derived properties for a statistically significant sample of EXors.

The collected quiescence spectra will be a fundamental reference for any future spectra obtained during the outburst events, as they allow to properly quantify all the variations induced by the accretion events. This is the kind of analysis we were able to perform on V1118 Ori, an EXor that has recently shown an outburst after a 10 yr quiescence period. We will show the results from the comparison of quiescence and outburst spectra of this source, discussing the indications we can derive on the physics of the outburst.

Extragalactic nuclei with ARGOS

Author(s): Georgiev et al.

Type of contribution: Oral

Abstract

It is unclear how central massive black holes got in the dense nuclear region of their host galaxies (in situ formation or migration). To disentangle their various formation paths we need to know how they interact with their host galaxies and the dense nuclear star clusters, which crucially relies on high spatial and spectral resolution. Thanks to ARGOS unparalleled high (0.25") spatial resolution over 4'x 4' field of view we can efficiently study the small (subparsec) and large (kpc) scale structure and dynamics of nuclear star clusters and their host galaxies. I will present imaging and spectroscopic data of Nearby extragalactic nuclei taken during several ARGOS commissioning runs and what have we learned so far from the observations of few galactic nuclei.

First Doppler images with PEPSI

Author(s): S. JÃ¤rvinen, T. Carroll, K. G. Strassmeier, I. Ilyin

Type of contribution: Poster

Abstract

We present the first Doppler images based on ultra-high resolution (R=220,000) spectra obtained with the Potsdam Echelle Polarimetric and Spectroscopic Instrument (PEPSI) at the Large Binocular Telescope (LBT) and the Vatican Advanced Technology Telescope (VATT). The selected targets are the young solar twin EK Dra, the hot-Jupiter host tau Boo, and the close double-lined active binary HR 5110. All these targets have rather small projected rotational velocities on the stellar equator and the earlier attempts to map them have been limited by the surface resolution via the Doppler effect. With PEPSI we can have 25-30 resolution elements across the stellar disk and are able to detect more subtle surface variations than ever before.

First spectra with the Potsdam Echelle Polarimetric and Spectroscopic Instrument

Author(s): K. G. Strassmeier, I. Ilyin, M. Weber, A. JÃ¤rvinen, S. JÃ¤rvinen, A. Mott, M. Steffen, C. Mack III, D. Sablowski, A. Liermann, M. Mallonn, T. Carroll, & J. Storm

Type of contribution: Poster

Abstract

We have just put into operation the optical high-resolution echelle spectrograph PEPSI (Strassmeier et al. 2015, AN 336, 324) at the effective 11.8m Large Binocular Telescope (LBT). PEPSI provides a spectral resolution of up to 250,000 for the wavelength range 383-912nm and can alternatively be fed by the nearby 1.8m Vatican Advanced Technology Telescope (VATT) of the Vatican Observatory or by a robotic Solar Disk Integration (SDI) telescope. In this poster we present a selection of commissioning spectra that shall allow a first assessment of the data quality. Remaining issues are the fixed-pattern noise of the two 10k CCDs, the lowered throughput in the blue, and electric interference issues with one of the AGw guiding CCDs.

Flame: a data reduction pipeline for LUCI

Author(s): Sirio Belli

Type of contribution: Oral

Abstract

I will present Flame, a flexible pipeline specifically developed for the reduction of LUCI spectroscopic data. The flexibility is due to a modular design, which allows for specific changes and customizations. The pipeline outputs science-grade 2D spectra, which are sky-subtracted and rectified. By running only the first few modules, users can also obtain a quick, approximate reduction, which is useful while observing to check the data quality and monitor the weather conditions.

From clear skies to publication: observing strategies and LBT productivity.

Author(s): Christian Veillet

Type of contribution: Oral

Abstract

We will present an overview of LBT-based refereed publications and their evolution over the years (instruments, LBT partners, citations...) as well as statistics on weather and seeing.

This talk will serve as an introduction to a reflection on the importance to assess the feasibility of programs proposed on the telescope and the likelihood of their success when scheduling constraints (classical or mini-queue scheduling) and environment (weather/seeing) are taken into account.

Hierarchical formation at the smallest galaxy scales

Author(s): F. Annibali, F. Cusano, M. Bellazzini, M. Tosi, C. Nipoti, L. Ciotti, D. Paris, M. Cignoni, E. Sacchi

Type of contribution: Oral

Abstract

I will present our discovery, based on LBT/LBC deep imaging, of a stellar stream and substructures associated to the very metal poor star-forming dwarf galaxy DDO 68, located in a Void at ~13 Mpc from us. DDO 68 is very light (only 10^8 Msun in stars), yet it shows evidence for the accretion of at least two smaller satellites. DDO 68 is one of the very few cases where the hierarchical formation process is caught in action at such small galactic scales. Following this successful "pilot" study, we proposed and were approved a 2-year strategic program with LBT/LBC, named SSH (the Smallest Scales of Hierarchy Survey) to search for stellar streams around a sample of ~50 nearby star-forming dwarf galaxies. I will describe the SSH Survey and will present some preliminary results based on the observations completed so far.

High angular resolution observations at the LBTI

Author(s): Steve Ertel, Phil Hinz, Jordan Stone, Al Conrad, Eckhart Spalding, Amali Vaz

Type of contribution: Oral

Abstract

The Large Binocular Telescope Interferometer is the LBT's leading instrument for both observations at high angular resolution and at mid-infrared wavelengths. The instrument was designed for high accuracy mid-infrared interferometric observations to perform the NASA funded HOSTS survey for habitable zone dust around nearby main sequence stars. Despite this very specific purpose, it is a versatile instrument for both interferometric and classical adaptive optics assisted high angular resolution and high sensitivity observations covering the H to N atmospheric bands. The LBTI is now in its fourth year of routine operations. In semester 2016B a queue mode was implemented making observations more efficient and robust against weather and technical loss. We will present an overview of the modes and capabilities of the LBTI, describe and report on the queue mode, and present selected science highlights.

Imaging Planet Formation Inside the Diffraction Limit with LBT

Author(s): Steph Sallum, Josh Eisner, Phil Hinz

Type of contribution: Oral

Abstract

Understanding the details of planet formation requires direct images of forming planets themselves. Transition disks - protoplanetary disks with dust clearings that may be shaped by young planets - are promising targets for these studies. While protoplanets have relatively low contrast compared to mature planets in the infrared, the distances to the nearest star forming regions necessitate novel imaging techniques for their detection. I will discuss recent LBT non-redundant masking (NRM) results for the LkCa15 transition disk. Here, single-aperture datasets may be explained by multiple forming planets in the disk clearing. Future observations with the dual-aperture LBTI will provide triple the single-aperture resolution, dramatically increasing the phase space for exoplanet detection. I will present new NRM results from this mode, with similar resolution to that expected for next generation facilities like GMT.

Latest results with LBTI's Vortex coronagraph: real-time tip/tilt sensing, new data reduction algorithms, and YSO observations

Author(s): Defrere, D.

Type of contribution: Oral

Abstract

Vortex coronagraphs are among the most promising solutions to perform high contrast imaging at small angular separations from bright stars. They enhance the dynamic range at very small inner working angle (down to the diffraction limit of the telescope) and provide a clear 360 degree discovery space for high-contrast direct imaging of exoplanets. In 2013, we installed and commissioned an L-band coronagraph in LBTI/LMIRCam and obtained outstanding images of the four planets around HR8799 during the first hours on sky. In this presentation, we will present the results of the latest data reduction performed with the VIP software that is developed at the University of LiÃ¨ge and that features state-of-the-art image processing algorithms inherited from the field of background subtraction in computer vision (including machine learning algorithms and low rank modeling algorithms). We will also present the results obtained with the second L- and M-band coronagraph that was recently installed in LMIRCam to enable binocular Vortex observations. During the first observations (October 2016), we tested and validated a new real-time post-coronagraphic tip-tilt sensing technique (called QACITS) to quickly align each beam on the center of their respective Vortex coronagraph and obtained observations of a young star showing disk features near the resolution limit of each aperture. Finally, we will present some exciting prospects for the Vortex coronagraph that will be installed on VISIR and ELT/METIS.

LBT archive: past and future.. not only save the bit.

Author(s): R. Smareglia; C. Knapic

Type of contribution: Oral

Abstract

Status and prospective of the LBT archive will be explain.

Data Archive shouldn't be a simple "save the bit" repository, but an instrument able to improve the scientific following up, as reported in several report from the biggest astronomical organizations.

Evolution of the IA2 infrastructure, which manage LBT archive, with experience in the Cloud environment will be reported and suggested for the evolution of LBT archive.

LBT Observations of the Most Massive Protoclusters in the Early Universe

Author(s): Xiaohui Fan, Zheng Cai

Type of contribution: Oral

Abstract

I will present LBT observations of the most massive galaxy protoclusters and associated Ly alpha nebulae in the early universe at z=2-3. These systems were selected by locating high opacity Ly alpha forest absorption systems along quasar sightlines in the SDSS quasar absorption database. At comoving sizes of ~30Mpc and galaxy overdensity of ~10, they represent the most active galaxy assembly regions in the early universe, and are excellent laboratories for large scale structure formation and IGM/galaxy interaction. I will discuss our efforts in using LBC, MODS and LUCI to characterize the properties of galaxies in these protoclusters, and in using ARGOS to obtain deep, high resolution images of some of the largest Ly alpha nebulae yet discovered at high redshift associated with these systems.

LBT Science at the University of Virginia

Author(s): Mark Whittle, Nitya Kallivayalil, Trinh Thuan, Nick Troup, Mike Skrutskie

Type of contribution: Oral

Abstract

I will summarize a number of research projects that UVa has been pursuing using the LBT. These include (a) measuring proper motions of faint halo objects to constrain our halo's mass distribution; (b) measure the Lyman Continuum leakage from low-z dwarf starburst galaxies to help understand how their high-z counterparts could re-ionize the Universe; (c) use the lowest metallicity dwarf starburst galaxies to measure the primordial He abundance, and so place constraints on Big Bang nucleosynthesis; (d) identify jet-driven feedback in deeply embedded AGN with compact young radio sources; (e) identify exoplanets responsible for in-spiraling hot Jupiters; (f) studying vulcanism on Io.

LUCI1/2 AO commissioning: status and prospects

Author(s): J. Heidt, R. Gredel, A. Pramskiy, W. Seifert, D. Thompson

Type of contribution: Oral

Abstract

Since the semester 2017A, LUCI1 is offered for

AO imaging. In the meantime, commissioning of the AO imaging mode of LUCI2 is ongoing. The entire adventure will hopefully be concluded by the commissioning of the AO spectroscopic mode of LUCI2 during the week following the Users Meeting.

In this contribution, a status report of the LUCI1/2 AO commissioning will be given. In particular, the novel concept of the "Active Flexure Compensation" to correct for the flexure of the instruments which is a requirement for AO narrow-band imaging and AO spectroscopy will be discussed. Some guidelines on how to prepare and execute successfully AO observations at the LBT will also be emphasized and some first results be presented.

Measuring Chemical Abundances in Nearby Spirals with CHAOS

Author(s): Richard Pogge, Evan Skillman, Kevin Croxall, Danielle Berg, John Moustakas, Malinda Baer

Type of contribution: Oral

Abstract

The elemental abundances of the interstellar medium in galaxies can be determined through analyzing the emission-line spectra of HII regions. However, after decades of observations, the present-day measurements of these abundances have unacceptably high uncertainties. In this talk I will present results from the CHemical

Abundances Of Spirals (CHAOS) project, which is using MODS on the LBT to obtain high signal-to-noise UV to near IR spectra of nearly 500 HII region spectra in 9 spiral galaxies drawn from the SINGS sample. We measure at least one of the classic temperature-sensitive auroral lines (O++, S++, and N+) in more than half of the HII regions in our sample, and two or more in many of these, permitting us to use multiple emission-line diagnostics to determine the physical conditions in the HII regions, and derive absolute and relative chemical abundances with uncertainties less than 0.2 dex. These large samples HII regions allow us to explore azimuthal trends and the observed scatter about the radial gradients, and refine the empirical abundance calibration in nearby massive galaxies which will help better estimate abundances in more distant massive galaxies.

PEPSI data acquisition and image processing

Author(s): I. Ilyin

Type of contribution: Poster

Abstract

The Spectroscopic Data Systems (SDS4PEPSI) is a generic C++ software package based on a numerical template library and graphical toolkits. It is designed and implemented as the control system for various distributed units of the PEPSI spectrograph and polarimeter, as well as for comprehensive echelle image processing and analysis of the resulting spectra.

PEPSI deep spectrum library

Author(s): Strassmeier, K.G., Ilyin, I., Weber, M. et al.

Type of contribution: Poster

Abstract

We provide a homogeneous library of high-resolution, high-S/N spectra for 48 bright AFGKM stars, some of them approaching the quality of solar-flux spectra. Our sample includes the northern Gaia benchmark stars, some solar analogs, and some other bright Morgan-Keenan (M-K) spectral standards. With an average spectral resolution of R=220,000 (1.36 km/s), a continuous wavelength coverage from 383nm to 912nm, and S/N ratios between 100:1 for the faintest stars in the extreme blue and 4000:1 for the brightest stars in the red, these spectra are made public for further data mining and analysis.

Pisces II and Pegasus III: twin sisters or only good friends?

Author(s): Alessia Garofalo, Maria Tantalo, Felice Cusano, Gisella Clementini

Type of contribution: Oral

Abstract

Stimulated by the mounting discovery of ultra-faint dwarf galaxies (UFDs), we proposed and obtained LBC@LBT time-serie observations of 2 UFDs: Pisces II and Pegasus III, Milky Way satellites, recently revealed by the Sloan Digital Sky Survey. Due to their close location in the sky and similar heliocentric distances it has been proposed that these galaxies are physically connected. We investigated this hypothesis through the variable stars identification and stellar populations. I will present our results aimed to a) better constrain the distance estimates to the UFDs using the RR Lyrae stars and b) explore the stellar populations and spatial distribution of Pisces II and Pegasus III, combining their deepest color-magnitude diagrams currently available and the properties of the RR Lyrae stars.

Precision photometry redward of K-band with a â€˜wall-eyedâ€™ pointing mode

Author(s): Eckhart Spalding, Phil Hinz, Andy Skemer, John Hill, Vanessa Bailey, Amali Vaz

Type of contribution: Oral

Abstract

The atmospheric background is bright and highly time-variable in the thermal infrared (>K-band). Detectors sensitive to these wavelengths tend to have very small plate scales partly to avoid rapid saturation of the pixels. This forces observations to be restricted to tiny fields-of-view, which makes it difficult to perform precision photometry by simultaneously observing a science and comparison star. We have demonstrated the feasibility of pointing the LBTâ€™s two telescopes apart by up to ~2â€™ for sustained periods of time so as to acquire a science target with one aperture, and a comparison star with the other. This allows partial decorrelation of atmospheric effects from the science target. Further removal of atmospheric effects is possible with a simple systematics model involving wind movement relative to the aperture baseline. We use this technique to extract the signal of a transit of an exoplanet in front of its host star in Ls-band with a precision that is comparable to that obtainable at visible wavelengths.

Preparing for PEPSI polarimetry

Author(s): I. Ilyin, A. JÃ¤rvinen, K. G. Strassmeier, M. Weber, M. Woche, F. Dionies

Type of contribution: Poster

Abstract

Both polarimetry units for PEPSI are on the mountain and are being prepared for commissioning at the symmetric straight-through Gregorian foci in September 2017. We give a status report and an overview of the instrument capabilities.

Science cases for SHARK-NIR at LBT

Author(s): Valentina D'Orazi, Francesca Bacciotti, Angela Bongiorno, Guido Agapito, Simone Antoniucci, Carlo Baffa, Andrea Baruffolo, Serena Benatti, Maria Bergomi, Federico Biondi, Mariangela Bonavita, Mickael Bonnefoy, Luca Borsato, Enzo Brocato, Pietro Bruno, Enr

Type of contribution: Oral

Abstract

SHARK-NIR is a new facility that combining extreme adaptive optics with coronagraphy, dual-band imaging, and long-slit coronagraphic spectroscopy will be operating at LBT by the end of 2018. The instrument has been purposely designed to achieve outstanding performances in the framework of high-contrast imaging (and spectroscopy); in particular we will take advantage of the AO system upgrade (SOUL) that will allow to achieve a significant gain in terms of target magnitudes (thus, distances). We will be pushing our limit to previously unexplored regimes.

In this contribution, I will present the science cases we aim at investigating with SHARK-NIR. We want to address several fundamental, but as yet unanswered, topics that cover a very broad context ranging from the exoplanet detection and characterisation, to the study of the jets and circumstellar disks around young stars, up to distant AGN and QSO. Crucially, the science questions we propose to answer provide us with the utmost synergy of SHARK-NIR with the existing and forthcoming instrumentation at LBT, resulting in a very powerful tool that is not currently available for other facilities in the world.

Science with SHARK-VIS

Author(s): S. Antoniucci, V. Testa, G. Agapito, F. Bacciotti, C. Baffa, A. Baruffolo, S. Benatti, M. Bergomi, F. Biondi, M. Bonavita, A. Bongiorno, M. Bonnefoy, L. Borsato, E. Brocato, P. Bruno, E. Cappellaro, L. Carbonaro, A. Carlotti, E. Carolo, G. Chauvin, R. Cla

Type of contribution: Oral

Abstract

SHARK-VIS is the visual channel (400-1000 nm) of SHARK, the upcoming extreme-AO instrument for the LBT optimized for high-contrast observations. The instrument will provide quasi-diffraction limited images with an angular resolution down to 15 mas and with frame rates up to 1kHz.

These unique features make SHARK-VIS the perfect instrument to investigate with unprecedented accuracy several scientific cases at the front line of the astrophysical research, such as identification of accreting planets in star-forming regions, morphology of jets and disks in young stars, study of close binary systems, and characterization of minor bodies of the Solar System.

A review of the expected contributions of SHARK-VIS for these scientific cases will be provided, placing particular emphasis on the synergy with the SHARK-NIR channel and LMIRCAM and on further improvements expected from the implementation of the SOUL AO upgrade.

SHARK-NIR, the NIR coronagraphic camera for LBT, moving toward construction

Author(s): Jacopo Farinato, Guido Agapito, Simone Antoniucci, Francesca Bacciotti, Carlo Baffa, Andrea Baruffolo, Serena Benatti, Maria Bergomi, Federico Biondi, Mariangela Bonavita, Angela Bongiorno, Mickael Bonnefoy, Luca Borsato, Enzo Brocato, Pietro Bruno, Enric

Type of contribution: Oral

Abstract

SHARK-NIR, together with SHARK-VIS and LMIRCam, will give to LBT unique coronagraphic imaging capabilities in term of wavelength coverage. In fact, a variety of outstanding science cases, ranging from exo-planets search and characterization to morphological studies of the inner parts of jets and disks will be possible to be exploited using the three instruments at the same time, by collecting scientific data in three different wavelengths going from the Visible (0.5-1.0 microns with SHARK-VIS) to the Near Infra Red (0.96-1.7 micron with SHARK-NIR) till reaching the Mid Infra Red (2-3.5 micron with LMIRCam). Furthermore, with the upgrade of the LBT AO system (SOUL) the increased performance in the faint end magnitude regime will allow to exploit a science niche not achievable from other competitors, allowing to study fainter targets and enabling even extra-galactic science, such as AGN and QSO characterization. SHARK-NIR recently successfully passed the final design review, and it has been endorsed to proceed to the construction phase. We present here the final design of the instrument and the current status of the project.

SHARK-VIS: project stauts of the high resolution imager at visible band for LBT

Author(s): Fernando Pedichini, Guido Agapito, Simone Antoniucci, Francesca Bacciotti, Andrea Baruffolo, Serena Benatti, Maria Bergomi, Mariangela Bonavita, Angela Bongiorno, Runa Briguglio, Enrico Cappellaro, Luca Carbonaro, Elena Carolo, Riccardo Claudi, Laird Cl

Type of contribution: Oral

Abstract

SHARK-VIS will provide LBT with unique high-contrast and high-resolution imaging capabilities in the visible bands. Such performance, possible thanks to several technical solutions aimed to optimize the PSF stability and through the use of a high-frame-rate low-noise camera, will allow the observers to investigate several unexplored science topics, also by taking advantage of the simultaneous use of SHARK-NIR and LMIRCAM, which provide continuous wavelength coverage from 0.4 to 3.5 micron. Furthermore, the upgrade of the LBTI AO system (SOUL) will allow us to enhance even more the contrast, thus increasing the number of potential targets with fainter magnitudes. Instrument details, basic performances and the project status will be presented.

Solar system morphology at a finer scale thanks to a 23m telescope

Author(s): Al Conrad

Type of contribution: Oral

Abstract

With Fizeau imaging of Jupiterâ€™s volcanic moon Io with LBTI, at the resolution available with the 23-meter aperture (Conrad, et al, AJ (2016); de Kleer et al, Nature (2017)), we have seen the beginning of investigations in our solar system enabled by that mode. Both of these are presented in more detail at this meeting. Here we look at what future solar system science might be possible with a 23m telescope. Other than Io, do any other targets, observable in this mode, reside in our solar neighborhood? We look at the subset of small bodies, such as MBA, NEA, KBO, or comets, which might be observed in this mode. In addition, we will show what might be possible looking at the full disk of Jupiter at 23m resolution. In this talk we primarily look at the 23m phased imaging results that will be possible with LBTI, however, we will also look at what might be possible with the greater sky coverage that could be realized with LINC-NIRVANA, should that instrument be upgraded to interferometry following its coming MCAO commissioning phase. Finally, we will present a status update of our plans to include simultaneous LBTI/JWST observations of Io in an upcoming JWST/ESR proposal. A combined, contemporaneous LBTI/JWST has the potential to provide the best of both worlds, diffraction limit with a 23m aperture and the PSF stability unique to space-based observatories.

This presentation compliments our companion abstract, "Solar system spectroscopy at fainter limits thanks to a 12m telescope"

Solar system spectroscopy at fainter limits thanks to a 12m telescope

Author(s): Al Conrad, Olga Kuhn, Barry Rothberg, Vishnu Reddy, Dave Thompson, Christian Veillet

Type of contribution: Oral

Abstract

Given the wide breadth of objects inhabiting our Solar System, it is often the case that the unique requirements of some planetary science cases are not met. In particular, reflectance spectra of faint airless bodies, requires low resolution (R = ~ 100) over a wide spectral range (0.4 to 2.5 microns) [Reddy et al, 2015]. Although well-funded agencies (e.g., NASA and ESA) are actively pursuing scientific studies of these objects, they still face significant limitations, specifically, a deficit of aperture. Here, we present recent observations using the MODS prism mode (R = ~300) in the visible of two interesting small bodies: â€œthe mini-Phaethonâ€ UD 2005 and Earthâ€™s most recently discovered quasi-satellite, 2016 HO3. For the former we also present our attempts to use simultaneous color photometry with LUCI (i.e. MODS+LUCI binocular observations). We discuss the first attempts to use this mixed mode and the short-comings near-IR color photometry. At 1-2.5 micron, we propose a simple upgrade to LUCI that could provide a spectroscopic mode covering the full 1-2.5 micron wavelength range (rather than broad-band imaging). Using MODS+LUCI in heterogeneous binocular (or "mixed") mode has the potential to provide a unique capability at LBT that currently cannot be replicated elsewhere.

This presentation compliments our companion abstract, "Solar system morphology at a finer scale thanks to a 23m telescope."

SOUL project status

Author(s): E. Pinna, S. Esposito, P. Hinz, T. Mazzoni, F. Rossi, A. Puglisi, G. Agapito, R. Briguglio, M. Bonaglia, L. Carbonaro, M. Xompero, P. Grani, A. Riccardi, M. Montoya, O. Durney, A. Vaz

Type of contribution: Poster

Abstract

Currently, there are 4 SCAO systems operating at LBT, all composed by an Adaptive Secondary Mirror (672 actuators) and a Pyramid Wavefront Sensor (30x30 sub-apertures). Two of these SCAO systems feed the interferometric focal stations of LBTI, while the remaining two provide the correction for the two LUCI spectro-imagers. Replacing the current wavefront sensor camera with an Electron Multiplied CCD, we will provide: a faster read out and framerate (2kHz instead of 1kHz) at lower noise (< 1e- instead of ~ 10e-) for better rejection of disturbances, and a higher spatial sampling (40 instead of 30 sub-apertures on the pupil diameter) for an improved reduction of aliasing error.

We will report here the project status together with the updated estimation of the main system performances. In brief, the project passed the Design Review in 2016 and completed the AIT phase for the first 2 systems in spring 2017. The integration and commissioning of the first system is forseen in 2018.

We updated the numerical simulation using the measured obtained during the laboratory test on the new devices. The new results confirm the gain around 1.5-2 magnitudes at all wavelengths in almost all the range of reference star brightness (7.5 < mR < 18). This improvement will open the SCAO correction to a wider number of scientific cases from high contrast imaging in the visible to extragalactic source in the NIR.

Status and performance of ARGOS

Author(s): Sebastian Rabien

Type of contribution: Oral

Abstract

We will report on the status and performance of ARGOS, LBTs laser guide star facility. Now coming online for scientific observations, we will show first results on sky from ARGOS & LUCI observations: shrinking the PSF size for imaging and increasing the flux in the slit for spectroscopy gives a unique gain for infrared observations at LBT. We will discuss the performance, the operation and the users outlook for the coming year.

Studies of Classical Novae with the Large Binocular Telescope

Author(s): R. M. Wagner (LBTO), C. E. Woodward (Minnesota), S. Starrfield (ASU), I. Ilyin and K. G. Strassmeier (AIP)

Type of contribution: Oral

Abstract

We are performing a long-term study of the evolution of classical nova outbursts and other low luminosity transients using the instruments and capabilities of the Large Binocular Telescope. In a major investigation over the past 2 years, we have obtained regular systematic optical spectroscopy of the gamma-ray classical nova V5668 Sgr 2015 with PEPSI covering all or part of the 384-907 nm spectral region at a resolution of up to 270,000 (1 km/s). Our spectra obtained early in the outburst show dramatic variations in the multi-component P Cygni-type line profiles. Subsequently, V5668 Sgr was observed to form dust in the ejecta. Our recent observations show that it has now evolved into the nebular phase and these spectra provide significant constants on the dynamics, structure, and abundances of the outflowing ejecta. Following the recent identification of spectral lines arising from Be II and perhaps Li I in other classical novae, we provide constraints on the presence of Li I in our spectra of V5668 Sgr. In addition, we have studied several other galactic and extragalactic classical nova events with the LBT using MODS. In the Milky Way, these include V1324 Sco 2012, the first gamma-ray emitting classical nova with a precursor optical light curve event, V339 Del 2013, another bright gamma-ray emitting classical nova, and V5593 Sgr 2012, a classical nova with strong (>Halpha) [Fe X] and [Fe XI] emission lines in the nebular phase. Extragalactic classical novae studied by us using MODS include M33N 2015-12a, where spectra obtained late in the outburst (SDSS r = 22 mag) identified it as the second ONeMg classical nova discovered outside the Galaxy. We also used MODS to obtain deep imaging of the extreme recurrent nova M31N 2008-12a late in its most recent outburst (2016). Future investigations will include utilizing LUCI-AO and interferometry with LBTI to directly image nova shells early in their outbursts.

SS acknowledges partial support from NSF and NASA grants to ASU.â€‹ CEW acknowledges support from NASA.â€‹

Tests of Convective Zone Radial Differential Rotation in Intermediate Mass Core Helium Burning Stars with PEPSI

Author(s): J. Tayar, M. H. Pinsonneault, I. Ilyin, K. Strassmeier (Presenter)

Type of contribution: Poster

Abstract

Intermediate mass stars (M ~ 2.0 - 3.0 Msun) provide important tests of the role of rotation in the structure and evolution of stars because they live in an important transitional regime. Like massive stars, they rotate rapidly on the main sequence and have convective cores. However, they evolve to become secondary red clump stars, where their structure and internal rotation can be measured with the tools of red giant asteroseismology developed for lower mass stars. Recent studies of these stars have indicated that they are rotating much more slowly than would have been expected given their main sequence rotation rates and a soar calibrated rate of angular momentum loss. Once explanation put forth for this measured discrepancy is radial differential rotation. Seismic measurements of the core and bulk envelope rotation rates have indicated that the cores of these stars rotate about twice as fast as the envelopes on average. However, the small moment of inertia of the core means that this is insufficient to account for the slow surface rotation. We therefore search for radial differential rotation in the convective envelopes of these stars by comparing the seismic bulk envelope rotation rates with the surface v sin(i)s measured using spectra from the PEPSI spectrograph on the LBT. We present our preliminary results, which suggest that the amount of convection zone differential rotation is likely to be insufficient to explain the slow rotation rates of these stars, and that some enhanced angular momentum loss on the giant branch will be required.

The environment of the luminous quasar PDS456

Author(s): Olga Kuhn, Barry Rothberg (LBTO)

Type of contribution: Poster

Abstract

The low-redshift, bright quasar, PDS456 (z=0.184, V~14) is one of the most powerful and intriguing quasars in the local Universe. PDS 456 is both an ultraluminous infrared galaxy (ULIRG) and a QSO, making it one of the nearest transition objects. X-ray observations reveal powerful, ultrafast outflows, and far infrared and radio observations place it at the upper extreme in star formation efficiency. Ground-based near-IR imaging shows three K-band sources less than 3â€² away, at projected distances less than 9 kpc from the nucleus.

Here, we present rest-frame optical spectra from MODS which confirm the relation of these sources to the quasar and reveal a narrow emission line region, also at the quasar redshift, at the same position angle as one of the K-band sources but at a projected distance of ~20 kpc. Narrow-band imaging observations at redshifted H-alpha were made in an attempt to determine the morphology of the H-alpha emission and relate it to the broadband images from the LBC and MODS. Work on near-IR LUCI spectroscopy and imaging data is in progress. The MODS spectra of the K-band sources are consistent with those of old stellar populations. We speculate on the relationship between these, the narrow emission line region and the quasar.

The Giga-Monsters of Yore: The Relationship between QSOs and Intermediate Redshift ULIRGs

Author(s): Barry Rothberg, Jacqueline Fischer, Nor Pirzkal, Myriam Rodrigues

Type of contribution: Oral

Abstract

Theoretical models and observations in the local Universe indicate there is a clear progression from merger-induced star-formation (SF) to QSO activity via Ultraluminous Infrared Galaxies (ULIRGs). Not all mergers are ULIRGs, but all local ULIRGs are mergers, and likely the progenitors of QSO host galaxies. At earlier epochs, this relationship is less well accepted. Here, we focus on the critical redshift range of 0.4 < z < 1.0, where the star-formation rates, gas fractions, and masses of galaxies are believed to be significantly higher than in the local universe (i.e. due to "Downsizing"). ULIRGs at these redshifts begin to dominate the SF activity at are responsible for up to 70% of the co-moving IR density. But are ULIRGs at these epochs mergers and the progenitors of QSO host galaxies? While galaxies at at z > 0.4 are not the same as those in the local Universe, we use rest-frame UV/optical spectra obtained with MODS on the LBT and HST imaging to apply the same techniques used for local ULIRGS: measuring dynamical and BH masses; directly probing gas-metallicities outflows; and probing the properties of stellar populations, to a sample of "classically" selected ULIRGs (based on integrated 12, 25, 60 and 100Î¼m fluxes) at 0.4 < z < 1.0. Our results indicate that these intermediate redshift ULIRGs are dynamically similar but more powerful than their local counterparts, and show clear of evidence of hosting powerful AGNs with supermassive black holes.

The Hunt for Observable Signatures of Terrestrial planetary Systems (HOSTS): an LBTI Key project

Author(s): Steve Ertel, Denis Defrere, Jordan Stone, Amali Vaz

Type of contribution: Oral

Abstract

Emission from zodiacal dust disks in other planetary systems, is both a signpost of rocky material in, or near, the habitable zone, as well as a noise source for future exoplanet imaging missions. Over the last observing season, the HOSTS survey has gathered uniquely sensitive data on dust emission (or upper limits) for a statistically meaningful sample of nearby stars. This sample is allowing the HOSTS team to provide useful constraints on the luminosity distribution of dust in the habitable zone of nearby stars. By combining results with dust detection at other wavelengths, it also provides improved insight into dust formation and removal mechanisms, as well as filling in our picture of the architecture of planetary systems. Initial results for the first full year of routine observing will be presented.

The iLocater Spectrograph

Author(s): Justin R. Crepp

Type of contribution: Oral

Abstract

iLocater is a cross-dispersed, echelle spectrograph being developed for the Large Binocular Telescope (LBT) at the University of Notre Dame. Designed to use both primary mirrors of the LBT and their respective adaptive optics systems, iLocater will provide high-spatial resolution imaging (41 mas at 0.95 Î¼m) and high resolution spectroscopy (R = 150, 000 - 240, 000) simultaneously for on-axis sources in natural guide star mode across the YJ-bands. This unique combination cannot be found at other observatories and will permit novel studies of stellar and substellar objects in the solar neighborhood including extrasolar planets. In this talk I will present iLocater's science cases, recent on-sky results for coupling starlight into single mode fibers, and an update on the overall instrument development program.

The LBT italian data reduction pipeline

Author(s): Alida Marchetti

Type of contribution: Oral

Abstract

The italian spectroscopic data observed at LBT (both optical with Mods 1-2 and near-IR with Luci 1-2) are reduced by the Italian data reduction

center in Milan. The reduction is performed through a semi-automatic pipeline (Pandora.Vipgi) through which we automatically organize observed data by P.I., target and observing night.

The Pandora.Vipgi software accomplishes the following reduction steps for each single data exposure: bias subtraction (or dark subtraction), cosmics and pixel-to-pixel correction, tracing of the spectra, wavelength calibration, sky subtraction.

Single 2D spectra are then extracted, corrected by the distortions and rebinned linearly in wavelenght.

Final 2D spectra are obtained combining single 2D spectra according to their offsets.

The spectra are then extracted through a Horne extraction, and flux calibrated through a spectro-photometric standard (or telluric for IR spectra).

The final products of the pipeline, that are provided to the P.I.s, are 1D and 2D spectra, bias-subtracted, flat fielded, cosmic cleaned and background subtracted spectra, and 1D flux-calibrated spectra (also 2D of needed).

The LEECH Survey to Directly Image Exoplanets with LBTI

Author(s): Jordan Stone, Phil Hinz, Andy Skemer, the LEECH collaboration

Type of contribution: Oral

Abstract

I will discuss the LBTI Exozodi Exoplanet Common Hunt (LEECH) survey for wide-orbit extra solar giant planets. The LEECH survey observed >100 stars using the twin LBT deformable secondary adaptive optics systems and is unique among direct imaging surveys because it was conducted in the thermal infrared (3.7 microns), where relatively cool planets emit the majority of their flux. Early near-infrared (1 to 2.5 micron) surveys for directly imaged exoplanets produced many non-detections, showing that hot bright planets at wide-separations are rare. However, cooler planets (Teff < 1000 K) including relatively low-mass planets, planets formed via core-accretion, and older planets, all have the peak of their spectral energy distributions at >3 microns. By observing at 3.7 microns LEECH is more sensitive to these cool planets. Thus LEECH will put meaningful constraints on planet frequency independent of formation scenario and can target older and more nearby stars. LEECH finished its primary observing phase in January of 2017 and I have led the data reduction effort. I will summarize the survey strategy and science case, and I will provide initial survey results and analysis.

The nebula around P Cygni with LBT/LUCI-AO

Author(s): K. Weis, A. Becker, D.J. Bomans, J. Heidt et al.

Type of contribution: Poster

Abstract

The Luminous Blue Variable star P Cygni is, next to Eta Carinae, the only other known giant-eruption LBV in our galaxy. LBVs are evolved massive stars with variable brightness which is caused by changes of the spectrum/radius.

Being at least temporarily close to the Eddington limit LBVs are unstable andsome, like P Cygni in 1600, can undergo an eruption that is nearly as energetic as a SN. Strong stellar winds in that phase and/or giant eruptions lead to the formation of small (1-2pc) circumstellar nebulae. The nebulaaround P Cygni has two physically distinct regions, a larger structure about 0.5 pc from the star and a really close one only 0.1 pc away. With the very bright central star studies of smaller nebulosity are hard and not very much is known about the morphology and kinematics. On the other hand the bright central star offers favorable conditions for AO and being one of the two closest eruption LBVs, observations of P Cygni probes small scales not accessible before. We observed P Cygni during LUCI-AO commissioning (October 2016) in [FeII] and Br-gamma lines. The pixel size in this setup is 0.015"/px and the achieved effective resolution is about 0.05". With four different pointings around thecentral star, we omitted the bright stellar light to gain a higher contrast for the faint nebula. This adapts an idea previously used with LBT/PISCES (Arcidiacono et al. 2014) Adding high-spectral resolution longslit data and archival HST data to the LBT AO images, we are able to gain new insight aboutcharacteristics (structure, densities, velocity field) and therefore origin ofthe inner nebula - for instance address the question if both the outer and inner nebula were created simultaneously or was there an eruption we might have missed.

The processing system for the reduction of the INAF LBT imaging data.

Author(s): Diego Paris, Adriano Fontana, Stefano Gallozzi, Vincenzo Testa

Type of contribution: Oral

Abstract

We present our processing system for the reduction of optical/NIR imaging data from single and multi-chip LBT cameras, such as LBC and LUCI.

The whole INAF LBT imaging data processing has been supported by our system that uses a standalone data reduction pipeline to get the processed data from the raw data as they come from LBT.

We will focus on the methods we have developed and the results we have obtained over the last decade.

The SECCO survey: hunting extremely dark galaxies

Author(s): M. Bellazzini, G. Beccari, L. Magrini, G. Battaglia, G. Cresci, F. Fraternali, R. Ibata, N. Martin, V. Testa, M. Correnti

Type of contribution: Poster

Abstract

The SECCO survey is aimed at obtaining deep wide field imaging of Ultra Compact High Velocity HI Clouds that have been recently discovered and proposed as the gaseous components of faint dwarf galaxies in the Local Group and its surroundings. While the absence of stars in these clouds is not sufficient to exclude that they are associated with a Dark Matter halo (i.e. they may be dwarf galaxies that were unable to form stars), the presence of a stellar counterpart would confirm the galaxian nature of these objects. Our survey, largely performed at LBT, have provided robust constraint on the Surface Brightness of any possible stellar counterpart of 25 UCHVC and led to the discovery of an extremely dark stellar system: SECCO1.

The Sun with PEPSI

Author(s): Strassmeier, K.G., Ilyin, I.,

Type of contribution: Poster

Abstract

We show the full optical spectrum of the disk-integrated Sun from 382nm to 913nm. The average spectral resolution over all wavelengths is 250,000 (+/-30,000) and the peak S/N ratio is 8,000:1 in the red. The spectrum can be downloaded as a pdf from the PEPSI home page at https://pepsi.aip.de/

The VATT-PEPSI connection

Author(s): K. G. Strassmeier, P. Gabor, I. Ilyin, C. Corbally, A. JÃ¤rvinen, S. JÃ¤rvinen, D. Sablowski, M. Weber et al.

Type of contribution: Poster

Abstract

PEPSI is coupled to the 1.8m VATT by a 450m underground fiber connection. It provides currently two high-resolution observing modes with R=200,000+ for a total of 40 nights per year for the VATT/LBT community. We present and compare spectra in this mode and lay out the upcoming VATT-PEPSI-TESS Northern Ecliptic Pole survey.

Unevolved emission line galaxies with the LBT: from local galaxies to high-z

Author(s): D.J. Bomans, M. Langener, A. Enders

Type of contribution: Oral

Abstract

The last years have seen several claims for high redshift (z~6) emission lines galaxies with emission lines ratios requiring extremely hard ionization sources and therefore hinting at very massive, very low metallicity stars.

To study this idea in more details we set out to search local galaxies, moderate redshift galaxies, and galaxies near the peak of the universe' star formation epoch with similar properties. These will serve as proxies for these very high redshift, unevolved emission line galaxies.

Here we report on our results based on LBT observations using LBC (broad and narrow band imaging) and MODS (long-slit and MOS spectroscopy), targeting local dwarf galaxies with nebular He II and e.g. [Ar IV] emission, and extremely blue intermediate redshift dwarfs.

We started to critically analyze the nature of the ionization mechanism, the metallicities, and the evolutionary state. In this presentation we also will discuss their usefulness as local proxies for high redshift "young galaxies", in view of several objects in our samples, which seem indeed to fit this status based on our current data.

Unraveling the Properties of Intermediate Redshift Proxies for Proto-Galaxies with the LBT

Author(s): M. Langener, D.J. Bomans, A. Enders, A. Becker, R.-J. Dettmar

Type of contribution: Poster

Abstract

We can easily study today's mature local galaxies and their satellites. Their building blocks, the first dwarf galaxies, appear to be absent in today's universe. At high redshifts there are plenty, but mostly hidden from our view due to their faintness.

At intermediate redshifts, proxies for those first galaxies may be found in chemically underevolved or even pristine regions. We are hunting for them. For this, we select these galaxies by their emission lines and their very blue continuum color.

We have used the LBT LBC to acquire deep narrowband and deep U imaging and target the SXDF and AEGIS fields. Combining our LBT data with data from NUV to 8 microns we compose a 15 filter catalog for SED fitting. We use the SED fitting code EAZY for redshift determination and FAST to derive masses and star-formation rates.

The use of the F972N20 narrowband filter in combination with 14 broad-band filters results in robust redshifts for our emission line/narrowband excess objects. Furthermore, we are using MODS MOS follow-up spectroscopy and started to derive oxygen abundances. Our goal with even deeper spectroscopy is the analysis of the hard continuum in these low-mass, low-metallicity systems, especially its origin.

Here we present our preliminary results such as redshifts, masses, star-formation rates and metallicities for the selected extreme, low-mass sample.

Want a PEPSI ?

Author(s): K.G.Strassmeier and the PEPSI team

Type of contribution: Oral

Abstract

PEPSI is the bench-mounted fiber-fed and stabilized Potsdam Echelle Polarimetric and Spectroscopic Instrument for the LBT. It covers the entire optical wavelength range from 383 to 912 nm in three exposures at resolutions of either R=43,000, 120,000 or 250,000. As of fall 2017, the R=120,000 mode can also be used with two dual-beam Stokes IQUV polarimeters and as such provides another unique capability besides the ultra-high resolution mode. The 43,000-mode with its 12-pix sampling is our â€œbad seeingâ€ or â€œfaint-objectâ€ mode but has not been fully commissioned yet. A robotic solar-disk-integration telescope feeds light to PEPSI also during day time and a 450-m fiber feed from the VATT uses PEPSI when LBT is busy otherwise. I will show first spectra and lay out some of the science programs already ongoing.