SOCIEDAD ESPAÑOLA DE ASTRONOMÍA
XIII REUNIÓN CIENTÍFICA / XIII SCIENTIFIC MEETING
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SEA

Libro de resúmenes
Abstract book

Instrumentación y supercomputación /
Instrumentation and supercomputation
Sesiones IS1 – IS4 / Sessions IS1 - IS4

Instrumentación y supercomputación / Instrumentation and supercomputation (IS1)
Lunes 16 de julio / Monday 16 July

15:30	**Tjarda Boekholt** Accurate and precise N-body simulations (invitada/invited)
16:00	**Antoni Ramos Buades** Calibration of Black Hole Binary Numerical Relativity simulations
16:15	**Sergio Soria Nieto** Big data framework for Gaia archive
16.30	**Javier Castañeda** Gaia source list evolution: GDR2 and beyond
16:45	**Ferran Torra Clotet** Proper motion and other challenges in cross-matching Gaia observations
17:00	**Josep Manel Carrasco Martínez** Astrophysical information combining JPLUS and Gaia surveys
17:15	**PÓSTERES**

Accurate and precise N-body simulations

Tjarda Boekholt, Simon Portegies Zwart (charla invitada/invited talk)

Numerical solutions to Newton's equations of motion for chaotic self gravitating systems of more than 2 bodies are often regarded to be irreversible. This is due to the exponential growth of errors introduced by the integration scheme and the numerical round-off in the least significant figure. This secular growth of error is sometimes attributed to the increase in entropy of the system even though Newton's equations of motion are strictly time reversible. We demonstrate that when numerical errors are reduced to below the physical perturbation and its exponential growth during integration the microscopic reversibility is retrieved. Time reversibility itself is not a guarantee for a definitive solution to the chaotic N-body problem. However, time reversible algorithms may be used to find initial conditions for which perturbed trajectories converge rather than diverge. The ability to calculate such a converging pair of solutions is a striking illustration which shows that it is possible to compute a definitive solution to a highly unstable problem. This works as follows: If you (i) use a code which is capable of producing a definitive solution (and which will therefore handle converging pairs of solutions correctly), (ii) use it to study the statistical result of some other problem, and then (iii) find that some other code produces a solution S with statistical properties which are indistinguishable from those of the definitive solution, then solution S may be deemed veracious.

Calibration of Black Hole Binary Numerical Relativity simulations

Antoni Ramos Buades, Geraint Pratten, Héctor Estellés Estrella,
Cecilio García Quirós, Rafel Jaume Amengual, Sascha Husa

This talk gives an overview and status report of the efforts at the UIB group to explore the astrophysically plausible parameter space of coalescing black hole systems with the methods of numerical relativity, that is by solving the Einstein equations as a system of partial differential equations, using finite difference mesh refinement techniques. A brief discussion will be given of how the results are used in gravitational wave data analysis, new results on controlling the amount of eccentricity in the initial data will be presented, and the setup and scaling on the MareNostrum 4 machine will be described.

Big data framework for Gaia archive

Sergio Soria Nieto, Luis M. Sarro, Xavier Luri, Daniel Tapiador, Francesc Julbe, on behalf of Gaia-DPAC CU9-WP973

The Coordination Unit 9 (CU9) of Gaia Data Processing and Analysis Consortium (DPAC) has the responsibility to design and grant access to the Gaia archive. One of the work packages inside CU9 has been developing the Gaia Data Analytics Framework (GDAF), a Data Mining environment mainly based on Hadoop and Apache Spark, integrating and collecting data mining tools needed to fully exploit huge datasets like the recent releases of Gaia. During the last two years new features and algorithms have been included in this framework in order to facilitate user data handling, increase the number of algorithms for large data processing, as well as to improve the user interaction with the platform. GDAF should be fully operational for the third Gaia Data Release, for that reason, simple use cases have been developed and tested during first phases of the project but, in some cases, more ambitious tasks have been evaluated as well. Some of those case are: analysis of large simulations of of Gaia data, estimation of the IMF (Initial Mass Function) and Star Formation Rate (SFR) and object clustering using algorithms like DBSCAN or K-Means.

Gaia source list evolution: GDR2 and beyond

Javier Castañeda, F. Torra Clotet, M. Clotet, J.J. González-Vidal, C. Fabricius

The working catalogue of sources in Gaia evolves as new observational data is received from the spacecraft and it enters the iterative processing loop. The precision and accuracy of source parameters will improve with the addition of the new measurements but at the same time a change in source character and source identification can always occur as observations are added and linked to the already known sources.

The source list is expected to stabilize in future Gaia data releases, specially once the spacecraft stops its operations, but some evolution of a substantial fraction of sources will take place up to the final data release (e.g., a stable source can turn into a variable from one data release to the next).

In this talk, we describe the main causes that lead to the Gaia Data Release identification and major parameters updates, the nature of the updates and the best approach that the user can take to match the data of the current and subsequent data releases.

Proper motion and other challenges in cross-matching Gaia observations

Ferran Torra Clotet, Marcial Clotet, Juan José González-Vidal,
Claus Fabricius, Javier Castañeda

The cross-matching in Gaia is a sophisticated process that provides a consistent match between observations and sources in the working catalogue for subsequent data reduction process. We consider a generalized algorithm based on clustering analysis that can take into account proper motions and possibly more complex source models as well.

In this talk, we describe the improvements and the identification on new proper motions sources thanks to this generalization for subsequent data releases.

Astrophysical information combining JPLUS and Gaia surveys

Josep Manel Carrasco Martínez, Carme Jordi

J-PLUS Early Data Release (EDR, September 2017) provided early data in 12 filters collected from December 2016 to February 2017 by the JAST/T80 telescope. Some of the current J-PLUS passbands were firstly proposed by the authors of this work as baseline for Gaia mission and were optimised to extract the astrophysical information of the stars in our Galaxy.

Now that Gaia has released its second set of data (GDR2, April 2018), with magnitudes, parallaxes and colours for more than one billion sources, we combine both surveys in order to extract information for the stellar content in common. The combination of these two catalogues is very useful, as JPLUS expands the Gaia wavelength range to the ultraviolet, providing for example very useful information to break degeneracies between temperature and interstellar reddening of the stars.

On the other side, Gaia astrometric (parallaxes and proper motions in particular) and photometric information can be used as reference for J-PLUS as they are very precise and complete, improving the characterisation of the observed sources.

This work starts this combination of both surveys, analysing the possible synergies between both projects and providing photometric transformations between these photometric systems. We also comment on the classification and parametrisation tools that could be established using some colour-colour diagrams with passbands from the two surveys, starting its application with already published data to get the temperatures, surface gravities and global metallicities of the stars.

Instrumentación y supercomputación / Instrumentation and supercomputation (IS2)
Martes 17 de julio / Tuesday 17 July

9:00	**Francisco Garzón** First results of EMIR (invitada/invited)
9:30	**Antonio Cabrera-Lavers** 10 years of GTC - GTC Science Operations Status
9:45	**Víctor J. Sánchez Béjar** The GTC Adaptive Optics system: the high spatial resolution Adaptive Optics facility at GTC
10:00	**Enrique Solano Márquez** The Gran Telescopio Canarias Archive
10:15	**Jesús Aceituno Castro** Calar Alto observatory, present and future projects
10:30	**Gilles Bergong** Recent scientific results and future instruments at the Calar Alto Observatory
10:45	**Carsten Kramer** The IRAM 30m Telescope

First results of EMIR

Francisco Garzón and the EMIR team(charla invitada/invited talk)

We report the results on the EMIR (Espectrógrafo Multiobjeto Infra-Rojo) performances after two semesters of scientific operations at the Gran Telescopio Canarias (GTC). EMIR is one of the first common user instruments for the GTC, the 10 meter telescope operating at the Roque de los Muchachos Observatory (La Palma, Canary Islands, Spain). EMIR have been built by a Consortium of Spanish and French institutes led by the Instituto de Astrofísica de Canarias. EMIR is primarily designed to operated as a MOS in the K band, but offers a wide range of observing modes, including imaging and spectroscopy, both long slit and multi-object, in the wavelength range 0.9 to 2.5 microns. The development and fabrication of EMIR is funded by GRANTECAN and the Plan Nacional de Astronomía y Astrofísica (National Plan for Astronomy and Astrophysics, Spain).

EMIR was shipped to the GTC on May 2016 for its integration at the Nasmyth platform. From June till November 2016 several commissioning periods were conducted. Then a short Science Verification phase was launched on which EMIR was offered to the community to test its capabilities on sky in image and long-slit observing modes. In March 2017, EMIR was included in the call for observing time in semester 17B and started routine scientific operations at the GTC from July 2017. In November 2017, EMIR was lifted off the Nasmyth platform for the first maintenance period and resume operations at the end of February 2018. MOS commissioning will take place, in at least two periods, starting at the beginning of March 18. MOS mode will be offered to the community as soon as it becomes ready for operation.

This contribution summarises the results and performances of the EMIR operation at the GTC since the very beginning.

10 years of GTC - GTC Science Operations Status

Antonio Cabrera-Lavers

GTC celebró 10 años de su primera luz en Julio de 2017 y mucho ha cambiado desde entonces. En la presente contribucion se describe el estado actual del telescopio, de su operación científica, así como de su instrumentación, con la vista en la próxima llamada para la definición de la futura generación de instrumentos en la era de los Large Telescopes (a partir de 2025).

The GTC Adaptive Optics system: the high spatial resolution Adaptive Optics facility at GTC

Víctor J. Sánchez Béjar, M. Reyes García-Talavera, J. Patrón, E.Hernández, R.L. López, R. Simoes, J., Marco de la Rosa, I. Montilla, M. Núñez Cagigal, M. Puga Antolín, L.F. Rodríguez-Ramos, J. Rosich, J. Sánchez-Capuchino, O. Tubío, J.A. Acosta-Pulido, A. Prieto, A.M. Watson, M.R. Zapatero Osorio

The GTC Adaptive Optics (GTCAO) system is the general Adaptive Optics facility that will provide diffraction limited images in the near-infrared to the GTC telescope. At Day 1 it will consist of a single deformable mirror with 21x21 actuators, conjugated to the telescope pupil and a Shack-Hartmann wave-front sensor with 20x20 sub-apertures using a Natural Guide Star (NGS) as a reference source. The GTCAO system is expected to provide a strehl ratio of 0.65 in the K-band with a bright NGS, and it will be later upgraded to a Sodium Laser Guide Star (LGS) to significantly increase the sky coverage.

In this talk, we will review the current status of the integration of the different subsystems of GTCAO in the IAC laboratory, the results of the tests carried out to comply with the requirements, the planned schedule until the arrival to the telescope, and the development of the LGS system at the IAC, which is currently in the Preliminary Design phase. We will also summarize some of the scientific cases that can be carried out with the GTCAO LGS system and the FRIDA instrument.

The Gran Telescopio Canarias Archive

Enrique Solano Márquez, José Manuel Alacid

The Gran Telescopio Canarias (GTC) archive is operational since November 2011. The archive, developed and maintained at Centro de Astrobiología (CSIC-INTA) in the framework of the Spanish Virtual Observatory project, provides access to both raw and science ready data and has been designed in compliance with the standards defined by the International Virtual Observatory Alliance (IVOA) to guarantee a high level of data accessibility and handling.

In this presentation I will describe the main capabilities the GTC archive offers to the community, in terms of functionalities and data collections, to carry out an efficient scientific exploitation of GTC data.

Calar Alto observatory, present and future projects

Jesús Aceituno Castro

The observatory of Calar Alto has been managed by Max Planck society and CSIC since 1984, but this situation will change by the end of 2018. This talk will describe the current status of the observatory and how the center will address the future beyond 2019.

Recent scientific results and future instruments at the Calar Alto Observatory

Gilles Bergond

On behalf of the CAHA Astronomy Dept., I will first review the most appealing scientific results, published as press releases on the observatory home page (www.caha.es), from recent publications (partially) based on data taken with the main Calar Alto telescopes (1.23, 2.2 and 3.5-m), with a peculiar emphasis on the completed and ongoing surveys at the observatory, like CALIFA and CARMENES GTO.

On the instrumental side, current and future developments will be presented, like the soon to come first light of the refurbished CAFE high-resolution spectrograph, or the PANIC monolithic near-infrared, wide-field camera.

With the arrival of a new partner for the observatory in 2019, innovative instrumental and science projects are also expected, to ensure the leadership of Calar Alto among optical observatories on the European mainland.

The IRAM 30-m Telescope

Carsten Kramer

The IRAM 30m telescope is operated in the 70 to 375 Ghz range. Together with NOEMA, it provides a powerful means to study the millimeter universe at resolutions between 35" and less than 1".

We will briefly describe the evolution of the 30m telescope over the past 30 years, to then highlight a couple of current science topics showing the strengths and potential of this observatory. We will go from deep line surveys of nearby evolved stars to maps of high density tracing molecules in nearby galaxies, to redshift searches in distant galaxies.

And, we will go from recent mapping projects of the thermal dust emission of Galactic molecular clouds to high resolution maps of the Sunyaev Zel'dovich effect in galaxy clusters, and to VLBI observations at 1mm wavelength. On the way, we will present the current suite of instruments, to continue with an outlook on multi-beam heterodyne receivers and possible upgrades of the telescope.

Instrumentación y supercomputación / Instrumentation and supercomputation (IS3)
Miércoles 18 de julio / Wednesday 18 July

15:30	**Josе Antonio Font** Numerical relativity simulations of binary neutron star mergers (invitada/invited)
16:00	**Daniele Vigano** Turbulent MHD and binary mergers
16.15	**Ricard Casas Rodríguez** Aportación a distintos instrumentos para Cosmología observacional
16:30	**Eva Verdugo** El archivo final de la misión Herschel
16:45	**Jose Sabater** New developments for radio-astronomy data intensive infrastructures. From innovative calibration techniques to artificial intelligence.
17:00	**Pablo Marcos-Arenal** Release of the WSO-UV Software tools to attend the call for the Core Scientific Program
17:15	**Héctor Vázquez Ramió** Status of the Commissioning of the Pathfinder camera at JST/T250 at the Observatorio Astrofísico de Javalambre

Numerical relativity simulations of binary neutron star mergers

José Antonio Font Roda

On August 17, 2017, the Advanced LIGO and Advanced Virgo detectors observed the first gravitational-wave (GW) signal produced by a binary neutron-star (BNS) merger, GW170817. Through the unprecedented coordinated action of LIGO, Virgo and some 70 astronomical facilities, this landmark detection provided key evidence to address open issues in relativistic astrophysics. BNS mergers are a prime example of astrophysical systems where numerical simulations are fundamental to understand their dynamics.

While the inspiral phase can be accurately described by post-Newtonian approximations, the merger and post-merger phases can only be studied with non-linear numerical simulations in full general relativity. These simulations started at the beginning of the 21st century and have steadily incorporated increasing complexity in the input physics and mathematics. The current simulation frontier accounts for microphysical equations of state (EOS), ideal MHD, approximate radiative transport of neutrinos, and nuclear reaction networks, along with state-of-the-art formulations for the gravitational field equations, improved numerical methods, and suitable approaches for gravitational-wave extraction.

The simulations have shown that BNS mergers lead to either prompt or delayed black hole formation, depending primarily on the masses of the individual stars and on the EOS. Delayed collapse involves a post-merger horizonless object, a hypermassive neutron star, whose evolution originates the emission of significant amounts of GWs at distinct frequencies of a few kHz, the appearance of combination frequencies, and the convective excitation of inertial modes. The study of such high-frequency GW features in the late-time GW spectrum of BNS mergers will be a sensitive probe of neutron star physics and strongly motivates the science case for third-generation detectors.

Turbulent MHD and binary mergers

Daniele Vigano, Carlos Palenzuela, Carles Bona

The dynamics of binary neutron star mergers gives rise to a number of MHD instabilities, including the Kelvin Helmholtz and the magneto-rotational ones, that can lead to growth and non trivial configurations of the magnetic field. These features, in turn, can have observable imprints on the EM signals of both kilonovae and jets. The modeling of these processes will help to interpret the expected forthcoming events gravitational waves detected by LIGO and VIRGO and associated to neutron star mergers, similar to GW170817. The main challenge is that solving the smallest scales of such physical mechanisms in a realistic merger simulation is currently impossible due to the very high computational cost. Thus, one has to model the effects and the feedback of the unresolved scales.

Here we present the numerical techniques and some preliminary results of turbulent MHD simulations in this direction. They include some sub-grid modeling of unresolved scales, inspired by large eddy simulations techniques usually employed in engineering simulations and solar physics, but much less explored in the context of GRMHD simulations. Our simulations have been obtained with Simflowny, a publicly available versatile platform that automatically generates codes for computational adaptive mesh refinement infrastructures reaching high-scalability, like SAMRAI. Simflowny includes the possibility of implementing different high-resolution shock capturing methods and has a variety of applications, including the efficient evolution of the GRMHD equations.

Aportación a distintos instrumentos para Cosmología observacional

Ricard Casas Rodríguez

Nuestro equipo del ICE (ICE, CSIC) y IEEC colabora con otros centros españoles (IFAE, PIC, CIEMAT, IFT) e internacionales para la construcción de diferentes instrumentos de tierra y espaciales con el fin de llevar a cabo programas de investigación en el campo de la Cosmología Observacional. DECam fue el primero de ellos, le siguió PAUCam, en pleno funcionamiento desde 2015. Euclid y DESI están en pleno apogeo.

La comunicación pondrá al día sobre el estado de funcionamiento de PAUCam en el telescopio William Herschel del Observatorio del Roque de los Muchachos, así como de la contribución de nuestro equipo en el proyecto espacial Euclid, con el diseño y construcción de la rueda de filtros, y también en DESI, con el desarrollo de las unidades de Guiado, Foco y Alineado (GFA).

El archivo final de la misión Herschel

Eva Verdugo

En esta charla presentaré la version final del archivo de datos de la mision Herschel. Mostraré todas las posibilidades de la nueva "interface" para usuarios y los diferentes tipos de datos que constituyen el legado de la misión Herschel.

New developments for radio-astronomy data intensive infrastructures. From innovative calibration techniques to artificial intelligence

José Sabater, the LOFAR surveys collaboration and the AMIGA team

New data intensive infrastructures for science, like the upcoming Square Kilometre Array (SKA), present a huge challenge due to the amount of data produced and the need to develop innovative workflows for the data calibration.

In this talk I will focus on some of the innovative techniques and solutions developed using LOFAR, one of the SKA pathfinders, that will be of general use in future infrastructures. First, I will present the new facet calibration techniques that allow to account for the direction-dependent effect of the ionosphere at low frequencies. Later, I will show how to leverage existing and new high throughput infrastructures like the GRID and cloud to run the new data intensive calibration pipelines. Both commercial clouds like Amazon Web Services and institutional clouds like the EGI federated cloud were tested, compared and used in production. Finally, I will show how the application of artificial intelligence allows us to classify sources and overcome the limitations of human visual inspection and heuristic techniques. I will present practical examples of classification of large samples of radio sources using self-organising maps and deep convolutional neural networks.

Release of the WSO-UV Software tools to attend the call for the Core Scientific Program

Pablo Marcos-Arenal, Ana Inés Gómez de Castro, Juan Carlos Vallejo Chavarino

In October 2018 there will be a fist call for for the Core Scientific Program to the WSO-UV observatory. In order to attend the needs of the appliers to that call, we present a set of tools including a simulator for the instrumentation of the mission (WSO Simulator) and an Exposure Time Calculator.

The WSO-UV space observatory, to be launched in 2023, will provide with slitless, long-slit and echelle spectroscopy with the WSO-UV Spectrographs (WUVS) and high resolution images and low resolution spectra with the Field Camera Unit (FCU).

The Core Scientific Program of the WSO-UV observatory will include the key scientific research projects driving the development of the mission. In order to guarantee that possible preparatory observations are carried out on due time before launch, the first call to the core program will be open 4 years before the launch. We developed a set of tools to support the astronomers attending this call, mainly the WSO Simulator and the Exposure Time Calculator.

The WSO Simulator provides with the scientific data outcome of each of the channels of WUVS and FCU. WUVS includes two high resolution echelle spectrographs to observe point sources in far UV (VUVES, working in the range 115-175 nm, R∼50,000) and near UV (UVES, working in the range 175-310 nm, R∼50,000) and the Long-Slit Spectrograph (R∼1,000; range 115-310 nm). FCU includes a far UV channel (115-176 nm) based on CsI MCP detector with a CMOS readout and a near UV channel (115-1,000 nm) with a cooled CCD. The WSO Simulator allows to evaluate the instrumental performance of the instruments in terms of noise source response, data quality, and number of counts detected for different types of configurations and observing.

Status of the Commissioning of the Pathfinder camera at JST/T250 at the Observatorio Astrofísico de Javalambre

Héctor Vázquez Ramió

The Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is an unprecedented photometric sky survey of 8500 deg2 visible from the Observatorio Astrofísico de Javalambre (OAJ) in 59 colors, using a set of broad, intermediate and narrow band filters. J-PAS is intended to map not only the positions of hundreds of millions of galaxies in the sky, but their individual distances to us as well, providing the first complete 3D map of the Universe. In addition to that, many other astrophysical science cases (from Solar System minor bodies to Cosmology) will benefit from the fact of having a low-resolution spectrum for every pixel on the J-PAS observed sky area. The survey will be conducted by the JST/T250 with JPCam, which is currently under the engineering tests stage in a clean room lab.

Meanwhile, the Pathfinder camera, mounting a single 9.2k x 9.2k CCD is installed at the telescope for commissioning. From there it offers a pixel scale of 0.227arcsec/pixel and covers the central region, 0.33 squared degrees, of the whole JST/T250 field of view (FoV). For comparison, JPCam mounts 14 CCDs of similar size. Its filter wheel is ready to host the J-PAS filters already available for use on sky. This permits the initial operation of the telescope, the testing of the whole equipment, the identification of both expected and unexpected issues, and allows the fine-tunning of the image reduction process. This commissioning will enable a smoother transition when the time JPCam is going to be installed arrives.

The up-to-date Pathfinder commissioning status at JST/T250 will be presented, describing the different challenges that are being confronted at different levels: engineering-, operational-, data processing- and scientific-wise.

Instrumentación y supercomputación /Instrumentation and supercomputation (IS4)
Viernes 20 de julio / Friday 20 July

9:00	**Héctor Linares Arroyo** First Night Sky Modelling of Montsec protected area and its light pollution sources
9:15	**Jaime Zamorano** Monitorización del brillo de cielo nocturno en España
9:30	**Sergio Velasco** AOLI's lessons: a story of success
9:45	**Antonio Carlos López Jiménez** De IMaX a SOPHI y viceversa
10:00	**Javier Piqueras López** CAB contribution ELT-HARMONI: update after the PDR
10:15	**Alex Oscoz** Space developments at IACTEC
10:30	**Tomas Belenguer** Micróptica para la exploración planetaria: nuevos retos en la instrumentación espacial
10:45	**José Luis Gálvez** A wide field monitor (WFM) based on the LOFT ESA (M3) proposal for the new-generation X-ray missionss eXTP (China) and STROBE-X (NASA)

First Night Sky Modelling of Montsec protected area and its light pollution sources

Héctor Linares Arroyo, E. Masana, S.J. Ribas, M. García-Gil, F. Figueras, M. Aubé

We have established the first night sky modelling of Montsec area (north-east of Spain), an astronomical protected area labelled as Reference Point in Catalonia and certified as Starlight Reserve. To do so we have used an artificial sky brightness model (ILLUMINA), developed by the group of Aube et al. (2005).

Many already available ground based data obtained at Montsec and other areas of Catalonia (Ribas et al., 2015, 2016) - including both, photometric and spectroscopic data has been used to fit and evaluate the parameters of the model.

In this first attempt only Lleida, the biggest city in the area and the most affecting one, has been considered. A detailed comparison between different light source inventory scenarios is shown in order to measure the effects that different kind of lamps can produce, in particular Lleida's previous to a lighting system update in 2014 and afterwards. This information will be used to plan for future updates and improvements of the lighting systems in the area.

Monitorización del brillo de cielo nocturno en España

Jaime Zamorano, Carlos Tapia, Sergio Pascual, Alejandro Sánchez de Miguel, Jesús Gallego, Lucía García

La monitorización del brillo de cielo nocturno es uno de los instrumentos para el análisis de la evolución de la contaminación lumínica. Se presenta la red de estaciones de monitorización de brillo de cielo nocturno de la Red Española de Estudios sobre Contaminación Lumínica REECL y algunos de sus resultados. Se describe el fotómetro TESS desarrollado dentro del proyecto STARS4ALL que permite establecer estaciones más simples y la incipiente red mudial de fotómetros.

AOLI's lessons: a story of success

Sergio Velasco, A. Oscoz, R. López, R. Rebolo, C. Colodro

The Adaptive Optics Lucky Imager (AOLI) instrument has been the first Spanish AO instrument to close the loop on sky, being able to provide with high resolution wavefront-corrected images not only as a sole instrument but also as an AO feeder to other instruments as the Fabry-Perot GHaFas. However, achieving this success has not been a smooth path and has required to fight against some stopping problems and also to provide solutions with new ideas. On this talk we present the lessons learned during the development of the instrument and the know-how acquired.

De IMaX a SOPHI y viceversa

Antonio Carlos López Jiménez, J.C. del Toro Iniesta, M. Balaguer Jimenez, M. Herranz de la Revilla, J.P. Cobos Carrascosa, D. Álvarez García, B. Aparicio del Moral, F. Girela Rejón, P. Labrousse, the IMaX+ team and the E-Unit SOPHI team

Se pretende dar una perspectiva de la evolución del desarrollo de la electrónica para los magnetómetros solares IMaX (imaging Magnetograph eXperiment) , SO-PHI (Solar Orbiter Polarimetric and Helioseismic Imager) e IMaX+. La experiencia y conocimientos adquiridos en el primer diseño para IMaX a bordo de sendos vuelos estratósfericos de la misión SUNRISE I y II permitió un segundo paso en el desarrollo instrumental para el estudio del magnetismo solar. Así, se ha diseñado y construido una unidad de electrónica para el instrumento SO-PHI a bordo de la misión espacial europea Solar Orbiter, que actualmente se haya en fase de integración en las instalaciones de Airbus en Stevenage (UK). Este instrumento y su electrónica han sido un importante reto, ya que las restrictivas condiciones de los instrumentos espaciales han supuesto la introducción de sistemas de procesamiento masivo de datos a bordo del satélite. Un ancho de banda muy pequeño para el volumen de datos brutos obtenido ha derivado en la necesidad de introducir unos dispositivos con lógica programable en los que se han implementado costosas labores de cálculo con tiempos y consumos de ejecución realmente pequeños. Por último se presentará la evolución hacia una nueva generación de IMaX, el IMaX+, que se encuentra en fase de diseño conceptual muy avanzado y que volará en una nueva misión del telescopio solar SUNRISE III.

CAB contribution ELT-HARMONI: update after the PDR

Javier Piqueras López, Santiago Arribas, Alejandro Crespo

HARMONI is the optical and near-IR integral field spectrograph (IFS) selected as a first-light instrument for the Extremely Large Telescope (ELT). The Centro de Astrobiología (CAB INTA/CSIC) and the Instituto de Astrofísica de Canarias (IAC) form part of the international consortium aimed at developing this instrument.

We describe here the current status of HARMONI after the Preliminary Design Review (PDR) held in ESO by the end of 2017. In particular, we will focus on the main CAB responsibilities, which include the calibration module (CM) and the low-order wavefront sensing sub-system (LOWFS), as well as the calibration plan of the instrument. We will also comment briefly on some science cases, which will illustrate the great potential of this instrument.

Space developments at IACTEC

Alejandro Oscoz, S. Velasco, L. Suárez, R.L. López, C. Colodro-Conde, P. Redondo, A.Y. Rivera, S. Sordo

IACTEC is a technological and business collaboration space set up by the Instituto de Astrofísica de Canarias (IAC) to promote collaboration between the public and private sectors by boosting the creation of quality employment and the generation of high added-value technological products with a high commercialization potential, both nationally and internationally. On the growing sector of innovation related to the useful payload of micro- and nanosatellites, our initial focus is on observations of the Earth. On this talk we are presenting the promising developments that we are bringing to the nano and microsatellites imaging, from the design of cameras based on the knowledge-base acquired at the IAC on detectors and optics, to the start of a new product on this kind of satellites, the superresoluton techniques, a high added value product.

Micróptica para la exploración planetaria: nuevos retos en la instrumentación espacial

Tomás Belenguer, Raquel López Heredero, Javier Gómez Elvira, Lola Sabau

Los recientes avances en sistemas de microfluidica han permitido incluir complejas técnicas de análisis biológico y químico en pequeñas dimensiones físicas, lo que se ha venido en llamar lab-on-a-chip. Son sistemas miniaturizados que deben incorporar sofisticadas técnicas ópticas muy diversas para el análisis de sustancias orgánicas que permitan la detección e identificación de microorganismos y compuestos bioquímicos mediante el análisis in situ de residuos sólidos presentes en suelos, hielos o fluidos de muestras líquidas compatibles con la vida.

Para ello, la espectrometría Raman, la espectroscopia de fluorescencia, los sensores de fibra óptica o la microscopia interferometrica son técnicas muy apropiadas para este tipo de estudios pero que deben ser concebidas de una manera muy compacta y versátil para que puedan ser empleadas en las futuras misiones de exploración planetaria. INTA está desarrollando en este sentido novedosos sistemas ópticos que permitan su inclusión como detectores activos en la nueva gama de instrumentación óptica para la exploración planetaria de altas prestaciones y reducido tamaño.

A wide field monitor (WFM) based on the LOFT ESA (M3) proposal for the new-generation X-ray missionss eXTP (China) and STROBE-X (NASA)

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We present the recent development of a Wide Field Monitor (WFM) in the X-ray range from 2 to 50 keV, with about 4 sr field of view capability. Such instrument based on European technology meets the challenge to be part of future X-ray spectral timing missions currently under study such as the Chinese enhanced X-ray Timing and Polarimetry (eXTP) and the NASA Probe Mission concept for X-ray Timimg and Spectroscopy Spectroscopic STROBE-X. The WFM design is inherited from the Large Observatory For x-ray Timing (LOFT) mission concept which was proposed and selected by ESA in 2011 as an M3 mission candidate.

The WFM is a set of coded mask cameras with solid state-class energy resolution, thanks to the use of Silicon Drift Detectors (SDDs). Since SDDs provide accurate event position measurements in one direction and only coarse positional information along the other direction, pairs of two orthogonal cameras are used to obtain precise 2D source positions. The useful effective field of view of one camera pair is about 28ºx28º(90ºx90º at zero response). A set of 3 or 4 camera pairs can be implemented to provide fully sky coverage. The working principle of the WFM is the classical sky encoding by coded masks, that has been widely used in space borne instruments (e.g. INTEGRAL, RXTE/ASM, Swift/BAT). The coded mask imaging is the most effective technique to observe simultaneously steradian-wide sky regions with arc min angular resolution.