IV Meeting of AGN research in Spain

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Abstracts book

Advances in instrumentation

A. Alonso-Herrero: *"News about ESO's future instrumentation program"*

In this talk I will summarize briefly ESO's future instrumentation plans for the 2016-2020 period and beyond. I will emphasize those instruments that will be more useful to advance our knowledge of active galactic nuclei.

R. Rizzo: *"Space VLBI with RadioAstron, a world-class instrumentation to dissect AGN structure"*

The RadioAstron project is one of the most ambitious and challenging radio astronomical international endeavours ever undertaken. It is a space-VLBI mission consistent on an Earth-orbiting 10-m radio telescope, which co-observes with a bunch of the largest and most sensitive ground-based radio telescopes worldwide. Given that the orbit of the space radio telescope is very eccentric (from 10 to 350 thousands km), it is possible to cover a wide range of spatial frequencies, and at the same time to reach ultimate angular resolutions, up to 8 micro arcsec. This unprecedented angular resolution allow astronomers to go deep into the structures of the observed sources. This is especially relevant in the cases of AGNs, where we can resolve structures up to lineal scales around 1 pc. In fact, most of the observing time was devoted to AGN studies during all the periods. In this talk, a brief description of the capabilities and policy of use of RadioAstron is presented, together with a short description of the most relevant results attained in some AGN projects.

A. Labiano: *"News on the JWST – Status and the use for AGN observations"*

The James Webb Space Telescope (JWST) carries four instruments that will observe in the 0.6 to 28 micron range with imagers, coronagraphs, slit, slit-less and integral field spectrographs. With half of the main Science Themes of the JWST directly related to AGN, we should expect a high demand for AGN observations. In this presentation I will overview the current status of the mission, the different observing modes of JWST, its Science Programs and policies for the first Cycles, the proposal preparation tools and timelines, as well as the development status of analysis tools, data pipelines, etc.

F. Carrera: *"Athena, the ESA observatory to study AGN in the Hot and Energetic Universe"*

Athena (Advanced Telescope for High ENergy Astrophysics) is the X-ray observatory mission selected by ESA to address the Hot and Energetic Universe theme, due for launch in 2028. All classes of astrophysical objects, where high-energy phenomena take place, can be studied with Athena but, in the context of this conference, Athena will study how accretion into supermassive black holes happened across cosmic time and how it influenced galaxies and clusters through feedback processes. The Athena mission concept is that of a single large-aperture grazing-incidence X-ray telescope, utilising a novel technology (Si pore optics) developed in Europe, with 12m focal length and 5 arcsec HEW angular resolution. The focal plane contains two instruments. One is the Wide Field Imager (WFI) providing sensitive wide field of view imaging and low resolution spectroscopy, as well as bright source observation capability. The other one is the X-ray Integral Field Unit (X-IFU) delivering spatially resolved high-resolution X-ray spectroscopy over a limited field of view. Synergies with other facilities (ALMA, E-ELT, SKA etc) are being identified and developed. Spain has an important role in Athena, with a significant contribution to the X-IFU instrument, including the dewar for the detector cooling system, the algorithms for the on-board pulse detection software, and a leading scientific contribution. Spain also leads the Athena Community Office, set up to help optimising the participation of the more than 800 scientists which are helping to shape up the mission through its working groups.

I. Perez Fournón: *"SPICA, Unviling the cold obscured universe"*

A joint European-Japanese project has been recently proposed to ESA to implement the SPace Infrared telescope for Cosmology and Astrophysics, SPICA. SPICA, is an infrared space observatory with a large, actively cooled telescope and instrumentation designed to achieve background limited performance, aimed for launch and operations at the end of the next decade. With a 2.5-meter primary mirror cooled to below 8K and with a new generation of ultra-sensitive detector arrays, SPICA will offer the community a unique astronomical facility covering the rich 12 - 230

μm spectral range, and capable of making deep and wide surveys to unprecedented depths in spectroscopy. I will present the main features of SPICA and the role it will have in understanding AGN over all cosmic epochs.

AGNs in surveys

N. Loiseau: *"X-ray characterization of the nuclear activity in a sample of IR bright pairs of galaxies"*

As infrared observations have revealed, most of the ultra luminous IR sources are associated with interacting galaxies. AGN activity also appears to be more frequent in major mergers. The search of AGN in pairs of galaxies is not only important for the study of the origin of AGN activity (secular or merger induced) but is also relevant to the quest for super massive binary black holes (SMBBH), possibly triggering gravitational waves. We are analysing the X-ray emission in a well defined sample of major mergers in order to determine which parameters of the interaction are instrumental for the triggering of nuclear activity in one or both of the pair members: the mass of the galaxies, their separation and relative velocities, their morphological type, or the stage of the merging process. The sample is a subset of the nearby (z<0.05) close pairs of similar size galaxies of Arp-Madore for which Sekiguchi and Wolsencroft (1992) obtained optical and IR spectra.

J. A. Fernández Ontiveros: *"Far-IR Line Spectra of AGN from Herschel/PACS: The Complete Database"*

We present a coherent database of spectroscopic observations of far-IR fine-structure lines from the Herschel/PACS archive for a sample of 170 local AGN, plus a comparison sample of 20 starburst galaxies and 43 dwarf galaxies. Published Spitzer/IRS and Herschel/SPIRE line fluxes are also included to extend our database to the full 10 to 600 micron spectral range. The observations are compared to a set of Cloudy photoionisation models to estimate the above physical quantities through the different diagnostic diagrams. We confirm the presence of a stratification of gas density in the emission regions of the galaxies, which increases with the ionisation potential of the emission lines. The new [OIV]25.9um/[OIII]88um vs [NeIII]15.6um/[NeII]12.8um diagram is proposed as the best diagnostic to separate: 1) AGN activity from any kind of star formation; and 2) low-metallicity dwarf galaxies from starburst galaxies. Current stellar atmosphere models fail to reproduce the observed [OIV]25.9um/[OIII]88um ratios, which are much higher when compared to the predicted values. Finally, the ([NeIII]15.6um + [NeII]12.8um)/([SIV]10.5um + [SIII]18.7um) ratio is proposed as a promising metallicity tracer to be used in obscured objects, where optical lines fail to accurately measure the metallicity. The diagnostic power of mid- to far-infrared spectroscopy shown here for local galaxies will be of crucial importance to study galaxy evolution during the dust-obscured phase at the peak of the star formation and black-hole accretion activity (1 < z < 4). This study will be adressed by future deep spectroscopic surveys with SPICA, in cooperation with present and forthcoming facilities such as JWST and ALMA.

A. M. Pérez García: *"An OSIRIS/GTC survey of the AGN population of the intermediate redshift cluster ZwCl 0024.0+1652"*

We have performed a deep Halpha/[NII] survey of emission-line galaxies (ELG) in the intermediate-redshift cluster ZwCl 0024.0+1652 (z=0.395) using the red tunable filter of the OSIRIS instrument at GTC. Our final catalog comprises 174 robust cluster members, likely the largest sample of ELG in a cluster at intermediate redshift. Our observing technique allowed us to separate AGN from star-forming (SF) galaxies. On the one hand, we were able to detect and separate broad-line AGN (BLAGN). For narrow-line AGN (NLAGN), we used the standard diagnostic EWalphaN2 from Cid-Fernandes et al. (2010) to separate AGN from SF galaxies using the F([NII])/F(Halpha) ratio. We find that the count ratio BLAGN/NLAGN is approximately 0.64 (similar to the ratio Seyfert1/Seyfert2 in the local universe) and that (BLAGN+NLAGN)/ELG ~ 0.37. We have studied the evolution of the fraction of ELG vs. cluster-centric distance and local density, finding an increase of the activity in the intermediate density environment, close to the virial radius. This could suggest a trigger of activity induced by the interaction of galaxies with the intra-cluster medium (ICM). For the first time, we have been able to perform the study separately for SF galaxies and AGN.

M. Ramón Pérez: *"Selection and analysis of Active Galactic Nuclei in OTELO survey"*

OTELO (Osiris Tunable Emission Line Object survey) has become the deepest emission-line survey to date using the Tunable Filters of the OSIRIS instrument at the GTC, which allow to obtain 2D low-resolution spectroscopy of all the objects in the field. More than 10k objects have been detected up to 3 sigma in the resulting deep image, with limiting flux of 1.8x10-20 erg/s/cm²/angstrom (mAB=27.18). A first multiwavelength catalogue of all the objects has been built using public archive data from X-Rays to Infrared. The emission-line objects have then been selected and their photometric redshifts derived. The confirmed emitters account for about 10% of the total number of objects, although another 20% of candidates is still awaiting confirmation. The next step has been to discriminate between Star-Forming Galaxies and AGN.

To do that, we have used diagnostic and color-color diagrams, such as the ones in Cid-Fernandes et al. (2010) or Donley et al. (2012), as well as the complementary information in X-Rays and MIR. In this talk, we present the latest results obtained from the analysis of the population of Active Galactic Nuclei found in OTELO field of view, with special emphasis on the low-luminosity ones.

M. Povic: *"Star formation and AGN activity in the most luminous LINERs in the local universe"*

We will present the properties of 42 objects in the group of the most luminous, highest star formation rate LINERs at z= 0.04 - 0.11. We obtained long-slit spectroscopy of the nuclear regions for all sources, and FIR data (Herschel and IRAS) for 13 of them. We measureed emission line intensities, extinction, stellar populations, stellar masses, ages, AGN luminosities, and star-formation rates. We found considerable differences from other low-redshift LINERs, in terms of extinction, and general similarity to star forming galaxies. We confirmed the existence of such luminous LINERs in the local universe, after being previously detected at z □0.3 by Tommasin et al. (2012). We found that most of these sources have LAGN □ LSF suggesting co-evolution of black hole and stellar mass. In addition, we saw that among local LINERs being on the main-sequence of SF galaxies is related to their AGN luminosity.

Seyferts and QSOs

C. Ramos Almeida: *"Unveiling the hidden BLR of Seyfert 2 galaxies"*

The origin of the unification model for AGN was the detection of broad hydrogen recombination lines in the optical polarized spectrum of the Seyfert 2 galaxy (Sy2) NGC 1068. Since then, a search for the hidden broad-line region (HBLR) of nearby Sy2s started, but polarized broad lines have only been detected in ~30-40% of the nearby Sy2s observed to date. Here we present new VLT/FORS2 optical spectropolarimetry of a sample of 15 Sy2s, including Compton-thin and Compton-thick sources. The sample includes six galaxies without previously published spectropolarimetry, some of them normally treated as non-hidden BLR (NHBLR) objects in the literature, and four Sy2s classified as NHBLR based on previous data. We report >4sigma detections of a HBLR in 11 of these galaxies (73% of the sample). Our results confirm that at least some NHBLRs were misclassified, bringing previous publications reporting differences between HBLR and NHBLR objects into question. We detect broad Ha and Hb components in polarized light for 9 targets, and just broad Ha for the other two. We do not find any correlation between the properties of the polarized spectra and the column densities measured from the X-rays or torus inclination, but a larger sample is required to confirm this.

R. Luque: *"The black hole feeding and feedback connection in the nucleus of NGC 1386"*

In this work, we present integral field spectroscopy observations in the near-infrared (NIR) acquired for the low-luminosity AGN NGC 1386 with SINFONI at the Very Large Telescope. This galaxy is one of the best targets in the nearby Universe to investigate the feeding and feedback connection with a spatial resolution of 8 pc. We have characterized the kinematics and morphology of three different phases of the interstellar medium: the warm molecular gas, traced by several H2 emission lines in the NIR K-band; the low excitation gas, traced by Brackett gamma; and the highly excited coronal gas, traced by [Si VI] and [Ca VIII] lines. The SINFONI data has been also compared with a multiwavelength dataset collected for NGC 1386 covering the radio, infrared, optical and X-ray spectral ranges; allowing us to infer the excitation mechanisms behind the emission line spectrum in the NIR.

J. Nadolny: *"Type1 AGN – dust and ionized gas around the nuclei"*

In this work we want to determine if type 1 AGN are indeed unobscured. To reach the goal we make use of optical HST and IR VLT (K-band) images. This combination provides the accurate positions of the nuclei (IR peaks) down to 10 mas. Moreover, we are able to construct dust extinction maps as IR-optical color images. These provide the morphology of the dusty absorber. Using narrow HST filters we also create Hα and O[iii] ionized gas maps. The dust (which is present in all of the examined objects) is in some cases able to obscure the nucleus, either partially or totally, which is supported by the finding of a shift between the IR and optical peaks. We conclude that the dusty torus is not the only cause of the obscuration. Therefore, we discuss if the torus is indeed necessary to explain the type 1 and 2 dichotomy.

J. Garcia Gonzalez: *"A statistical investigation of clumpy torus model predictions in the mid-infrared"*

The dusty torus is the key ingredient of the unification scheme of AGN. It is known that clumpy dust configurations are more realistic than homogeneous ones and reproduce better the observations. Nevertheless, it is important to improve the physical hypotheses of current clumpy torus. To do so, we compare Hönig & Kishimoto (2010) clumpy torus models with a more physically motivated version of the same models. We investigate the mid-infrared spectral index and the strength of the silicate feature as they provide information about the radial distribution of the clouds and the number of clouds in the torus, respectively. We also compiled mid-infrared spectra for 55 Seyfert galaxies obtained with instruments

on 8-10 m telescopes (CanariCam, VISIR, T-ReCS, Michelle). Before we compare the data with the clumpy torus model predictions, we use the spectral decomposition tool deblendIRS to separate the star-formation component from the emission of the dusty torus. The main goal of this work is to constrain some of the parameters of the Hönig & Kishimoto models from the statistical point of view using the mid-IR AGN spectral indices and silicate feature strengths measured for our sample of Seyfert galaxies.

I. Garcia Bernete: *"The nuclear and extended mir-infrared emission of Seyfert galaxies"*

We present subarcsecond resolution mid-infrared (MIR) images obtained with 8-10 m-class ground-based telescopes of a complete volume-limited (DL<40 pc) sample of 24 Seyfert galaxies selected rom the Swift/BAT nine month Catalog. We use those MIR images to study the nuclear and circumnuclear emission of the galaxies. Using different methods to classify the MIR morphologies on scales of ~200 pc, we found that the majority of the galaxies (75-79%) are extended or possibly extended and 21-25 % are point-like. In general, we find that the galaxies with point-like MIR morphologies are face-on or moderately inclined (b/a~0.4-1.0), and we do not find significant differences between the morphologies of Sy1 and Sy2. This extended emission is weak and compact and it represents ~30% of the total MIR emission of the galaxies in the sample. We obtain nuclear and circumnuclear MIR fluxes to investigate their correlation with different AGN and star formation indicators. We find that the nuclear MIR emission (inner ~70 pc) is strongly correlated with the X-ray emission (the harder the X-rays the better the correlation) and with the [O IV] lambda 25.89 micron emission line. We find the same results, although with more scatter, for the circumnuclear MIR emission. This indicates that AGN ionization is the dominant source of excitation of the nuclear and circumnuclear MIR emission.

N. López Gonzaga: *"Mid-infrared interferometry: Disks and outflows"*

The dusty "torus" plays a mayor role in the unified theory of AGNs. But due to its compact size, the torus is typically unresolved with current infrared single-aperture telescopes. Instead, infrared interferometry has demonstrated to be a powerful tool in the study of the torus. This technique allowed us to resolve the circum-nuclear dust distribution for several nearby AGNs and achieved constraints on some further two dozen sources. In NGC1068, we were able to dissect the dusty region into two distinct components. A compact disk probably connected to the maser disk and a extended component. The extended component, also present in Circinus and NGC3783, seems to be consistent with polar emission. After inspecting a sample of 23 objects, we found that the major axis of the elongated emission is always closer to the polar axis. Optically thin dust in the polar region, perhaps driven by a disk wind, could solve the scale height problem of the torus.

S. Garcia Burillo: *"ALMA resolves the torus of NGC 1068"*

We used the Atacama Large Millimeter Array (ALMA) to map the emission of the CO(6–5) molecular line and the 432 μm continuum emission from the 300 pc sized circumnuclear disk (CND) of the nearby Seyfert 2 galaxy NGC 1068 with a spatial resolution of ~4 pc. These observations spatially resolve the CND and, for the first time, image the dust emission, the molecular gas distribution, and the kinematics from a 7–10 pc diameter disk that represents the submillimeter counterpart of the putative torus of NGC 1068. We fitted the nuclear spectral energy distribution of the torus using ALMA and near- and mid-infrared (NIR/MIR) data with CLUMPY torus models. The mass and radius of the best-fit solution for the torus are both consistent with the values derived from the ALMA data alone: Mgas-torus=(1+/- 0.3) × 10^5 Msun and R-torus = 3.5 ± 0.5 pc. The dynamics of the molecular gas in the torus show strong non-circular motions and enhanced turbulence superposed on a surprisingly slow rotation pattern of the disk. By contrast with the nearly edge-on orientation of the H2O megamaser disk, we found evidence suggesting that the molecular torus is less inclined (i = 34–66 degs) at larger radii. The lopsided morphology and complex kinematics of the torus could be the signature of the Papaloizou–Pringle instability, long predicted to likely drive the dynamical evolution of active galactic nuclei tori.

A. Hernán Caballero: *"Understanding the restframe NIR spectrum of luminous quasars"*

The rest-frame near infrared (NIR) is a key spectral range for understanding the physics of AGN, but progress has been hindered by the difficulty in defining the NIR spectrum of the accretion disk and removing contamination from stellar emission in the host galaxy. In this talk I will present the analysis of a sample of 85 luminous (L3μm>10^45.5 erg/s) quasars with rest-frame NIR spectroscopy from AKARI and Spitzer/IRS. Their high luminosity allows a direct determination of the NIR shape of the quasar spectrum clean from host galaxy emission. We find that the entire UV-to-MIR SED can be accurately reproduced with a semi-empirical disk+dust model that uses a single template for the accretion disk and two blackbody components (hot and warm) for the dust. The observed diversity in individual SEDs can be accounted for by varying levels of extinction affecting the disk component and differences in the relative luminosities of the disk and dust components. We present a new quasar template [0.1-10μm] as well as separate templates for the disk and dust components, and conclude that previous templates based on less luminous quasars suffer from contamination by stellar emission in the host galaxy, which accounts for up to ~30% of the flux at 1μm. We also perform the first ever measurement of the Paschen_α emission in a large sample of luminous quasars and find that the Paschen_α to optical continuum luminosity ratio is boosted in our sample compared to less

luminous quasars.

M. L. Martínez Aldama: *"Spectroscopic Analysis of High Luminous Quasars"*

We present two lines of our recent research on high luminosity quasars. Our analysis is based on the 4 Dimensional Eigenvector 1 (4DE1) formalism, which distinguish and unify type 1 quasar diversity. We focus on: (1) Our recent results from the analysis of CIV1549 line profiles for a sample of radio-quiet extreme luminosity quasars (log L = 47-48.5) for which we also had previous IR observations covering the Hbeta region that allow us to estimate black hole mass, Eddington ratio and accurate source rest frame, an invaluable input for CIV studies. We find high CIV blueshifts, interpreted as signatures of strong outflow, in most sources. Quasars radiating close to the Eddington limit show blueshifts as large as -6000 km/s. We find evidence for a strong correlation between CIV blueshift amplitude and Eddington ratio, with a weaker trend with source luminosity. (2) First results from the spectroscopic analysis of a sample of 50 type I highly accreting quasars (L/LEdd ~ 1) at redshift 2-4. They were observed with the OSIRIS spectrograph at the GTC. Kinematical and physical properties of the broad line region are derived by fitting the profiles of strong UV emission lines. The importance of highly accreting quasars goes beyond the understanding of the details of their physics as their high Eddington ratio make them candidates to be standard candles for cosmological probes.

S. Mateos: *"Quasars cannot clear out the torus"*

Providing a complete census of the obscured Active Galactic Nuclei (AGN) is crucial to fully understand the cosmological growth of supermassive black holes (SMBH). Nevertheless, the contribution of obscured accretion to the total AGN radiative output remains uncertain. In this talk I will show that, as predicted by ``receding torus'' models, the enormous radiative power in the most luminous AGN can change the geometry of the material located in the vicinity of the SMBH that is obscuring the AGN central engine. Nevertheless, the effect is too weak to explain the apparent scarcity of luminous obscured AGN reported by many studies in the literature. Furthermore, the contribution from optically obscured AGN to the total population has a weak, if at all, dependence on AGN luminosity. Our results have profound impact for studies of AGN demographics since we find that, at z<1 more than 60% of powerful highly obscured AGN still evade our census.

Blazars

J. Becerra Gonzalez: *"What do we learn from the most extreme AGNs?"*

Only around 60 AGNs have been detected so far at Very High Energy (VHE, E>100 GeV) gamma rays, most of them being blazars. Among them only five Flat Spectrum Radio Quasars (FSRQs) have been observed in the VHE band, all of them detected by the MAGIC telescopes. Despite the difficulty of their detection, FSRQs offer a unique physics scenario to test the AGN structure thanks to their intrinsic gamma-ray absorption within their Broad Line Region (BLR). Gamma-ray blazars are one of the most powerful accelerators of the Universe, and besides the study of their intrinsic properties, blazars can be used as cosmic lighthouses to probe the cosmic backgrounds as the extragalactic background light (EBL). We will present an overview of the study of VHE FSRQs in a multi-wavelength context as well as the VHE blazar role on cosmological studies. The results will be presented in light of the future Cherenkov Telescope Array (CTA) which northern observatory will be based in La Palma.

N. Castro Segura: *"A new statistical approach to the optical spectral variability in a sample of Gamma-Bright Blazars"*

We present a statistical study based on optical spectroscopic observations of a list of gamma-ray bright blazars. We have used the observations obtained as part of the ground-based observational support program to the Fermi mission conducted at Steward Observatory (Univ. of Arizona). Spectra of about 35 targets have been obtained with an almost weekly cadence. We retrieved observations from the end of 2008 to beginning of 2016, i.e. about 7.5 years. We have obtained synthetic photometry and produced colour-magnitude diagrams which show different trends associated to the object classes: generally BL-Lacs tend to become bluer when brighter, FSRQs redder when brighter, although several objects exhibit different trends depending on the brightness. We have also applied a pattern recognition algorithm to obtain the minimum number of physical components which can explain the variability of the optical spectrum. We have used NMF (Non-Negative Matrix Factorization) instead of PCA (Principal Component Analysis) to avoid un-realistic negative components. For most targets we found that two meta-components are enough to explain the observed spectral variability. The spectral shape of these components will be presented and their association to plausible physical emission mechanisms (synchrotron, accretion disk, inverse-Compton, stellar population, etc) will be discussed. The relative contribution of each component is also studied in relation to colour changes and variability observed in other frequency ranges.

M. I. Carnerero: *"Investigating the puzzling synchrotron behaviour of Mkn 421"*

We present the preliminary results of a huge observing effort spent on the BL Lac object Mkn 421 by the Whole Earth Blazar Telescope (WEBT; http://www.oato.inaf.it/blazars/webt/). The multiwavelength analysis covers the period 2007-2015, including the 2012-2013 outburst detected at optical and X-ray frequencies. The WEBT continuous monitoring was performed with 35 optical and near-infrared telescopes, collecting more than 6000 data points, while UV and X-ray data were acquired by the Swift satellite during 709 pointings at the source. Optical polarimetry was provided by the Calar Alto, Liverpool, Steward, and St. Petersburg observatories. We investigate the synchrotron emission from the Mkn 421 jet with the main goal of understanding the different behaviour of the optical and X-ray radiations, which are expected to come from the same emission mechanism. Moreover, we study the relationship between the flux and polarization variability, focussing on episodes characterized by wide rotations of the electric vector polarization angle.

GTC instrumentation

F. Garzon Lopez: *"EMIR, commissioning results and plans for scientific exploitation"*

In this contribution, the EMIR instrument will be briefly described making emphasis on its capabilities as a common user instrument for the GTC. Then, I will report on the EMIR performances measured on the first commissioning periods of the instrument at the GTC, during this summer. Finally, a summary of the observing modes as they will be offered to the user astronomer will be given, together with the expected outcome from the online data reduction pipeline. 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 is being built by a Consortium of Spanish and French institutes led by the Instituto de Astrofísica de Canarias (IAC). EMIR is primarily designed to be operated as a MOS in the K band, but offers a wide range of observing modes, including imaging and spectroscopy, both long slit and multiobject, in the wavelength range 0.9 to 2.5 μm. 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).

A. Prieto: *"Pioneering high-angular resolution at GTC: FRIDA"*

FRIDA imager and integral-field spectrograph will provide the GTC community with the first diffraction-limited angular resolutions of a 10 m telescope: 25-40 mas in the 1-2.5 um range. These angular resolutions are a factor 15 improvement with respect to those of current and/or planned instruments for GTC, factor 1.5 superior to that of JWST. In this talk I will develop on science paths for FRIDA, with natural and laser guide star that illustrate the potential and unique capabilities of GTCAO+FRIDA till the arrival of the ELTs.

A. Gil de Paz: *"MEGARA – A new spectrograph for GTC"*

MEGARA is the new optical spectrograph of GTC. Once installed at GTC (spring of 2017) it will offer Integral-Field and Multi-object spectroscopic capabilities in the entire optical window (370-970nm) with resolutions in the range R=6000-20000. In this talk I will summarize the main characteristics of the instrument with special emphasis to its potential applications to the study of the nuclear regions of galaxies both locally (the IFU covers 12.5x11.3 arcsec^2 with spaxels of 0.62 arcsec) and at high-redshift (92x Fiber-MOS robotic positioners equipped with 7-fiber mini-IFUs).

Galactic Structure and feedback

J. Knapen: *"The role of bars in AGN fueling in disk galaxies over the last seven billion years"*

Stellar bars can lead to gas inflow toward the center of a galaxy and stimulate nuclear star formation. However, there is no compelling evidence on whether they also feed a central supermassive black hole: by measuring the fractions of barred active and inactive galaxies, previous studies have yielded conflicting results. We present empirical constraints on the influence of stellar bars on the fueling of active galactic nuclei (AGNs) out to z = 0.84 using a sample of X-ray-selected AGNs and imaging from Spitzer for nearby galaxies and from HST for galaxies at higher redshifts. We find no significant correlation between any of the bar strength indicators and the degree of nuclear activity, irrespective of galaxy luminosity, stellar mass, Hubble type, or bulge size. Strong bars do not favor brighter or more efficient nuclear activity, implying that at least for the low-luminosity regime, supermassive black hole fueling is not closely connected to large-scale features. We also find that the fraction of barred active galaxies displays a similar behavior as that of inactive spirals, declining with redshift from 71% at z ~ 0.3, to 35% at z ~ 0.8.

At the high-redshift end, we find that roughly 60% of active disk galaxies are unbarred. We speculate this to be related with the known dynamical state of disks at higher redshifts—more gas-rich and prone to instabilities than local spirals—which could also lead to gas inflows without the need of bars.

B. Dullo: *"Bar-driven AGN fuelling in SO galaxies with complex central structures"*

Nuclear stellar bars, rings and/or spirals in disk galaxies are thought to stimulate the inward funnelling of disk materials, fuelling the AGN. However, how such small-scale structures and the central AGN activities are actually related still remains uncertain. Therefore, we performed a detailed analysis of the structures and isophotal properties for three barred S0 galaxies NGC 2681, NGC 3945 and NGC 4371 having small-scale stellar bars, rings and a point source. Building on this and using our imaging of the narrow lines (Hβ, [O III], Hα, [N II], and [S II]) to measure the pertaining emission fluxes, we constructed the standard BPT diagnostic diagrams. Our results favor bar-related AGN fuelling and nuclear gas ionisation. However, we argue that the bar-driven scenario alone cannot account for the formation of these three S0s.

S. Cazzoli: *"Negative and positive outflow-feedback in nearby (U)LIRGs"*

The starburst-AGN coexistence in local (U)LIRGs makes these galaxies excellent laboratories for the study of stellar and AGN outflows and feedback. Outflows regulate star formation and AGN activity, redistributing gas, dust and metals over large scales in the interstellar and intergalactic media (negative feedback) being also considered to be able to undergo vigorous star formation (positive feedback). In this contribution, I will present results from a search for outflows in a sample of 38 local (U)LIRG systems (Cazzoli et al. 2016) observed with VIMOS/VLT integral field unit. Then, for two galaxies of the sample I will detail the outflow properties and discuss the observational evidence for negative and positive outflow-feedback.

J. J. Urbano Mayorgas: *"Preliminary results from structural properties of the host galaxies of luminous type 2 active galactic nuclei at z~0.3"*

The nuclear activity in galaxies has become a topic of major importance in studies of galaxy formation and evolution. By characterizing the nature of the galaxies hosting the most powerful active galactic nuclei (AGN) we aim at understanding in more depth the role nuclear activity plays in the life cycle of all massive galaxies. For this, we have studied the morphological and structural properties of the host galaxies associated with 58 luminous type 2 AGN (high luminosity Seyfert 2 and obscured QSO2). Our study is based on high spatial resolution optical HST images. We focus on topics such as the galaxy types and structure, the incidence of merger/interactions features and possible correlations with AGN power proxies. In this talk we will present the methodology and preliminary results. We will put them in context of related works on type 1 and type 2 AGN.

M. Villar: *"Ionized outflows in luminous type 2 AGNs at z<0.6: no evidence for significant impact on the host galaxies"*

The quest for powerful outflows induced by nuclear activity in galaxies is a long-distance race: outflows so destructive that may influence the evolution of an entire galaxy in a significant way. If such outflows exist, they might provide the answer to some relevant cosmological questions: why are the supermassive black hole masses correlated with some properties of the galactic bulges? how do we explain the luminosity function of galaxies? how do galaxies migrate from the blue cloud to the red sequence as time goes by? Although outflows in active galaxies (AGN) are very common, the degree to which they can cause an impact on its host galaxy is a matter of hot debate. Our recent work adds up to the controversy. I shall present our study of the ionized outflows in a sample of 18 luminous AGN at $0.3 < z < 0.6$ based on VLT-FORS2 spectroscopy.

T. Muñoz Darias: *"Why AGN people should care about stellar-mass black holes?"*

X-ray observations performed by several missions during the last few decades have provided a rich data base on X-ray binaries harbouring stellar-mass black holes. A strong coupling between the properties of the accretion flow and ejection processes (jets/winds) has been found to be a fundamental characteristic of these objects; a property which is probably shared by super-massive black holes in active galactic nuclei. I will review the state-of-the-art of the field focussing on some previous attempts to encompass AGN and stellar-mass black holes observables under a common "accretion states" scheme.

Star Formation in AGNs

H. Dannerbauer: *"An Excess of Dusty Starbursts at z=2.2"*

A prominent feature of colour-magnitude diagrams of (local) clusters is the often so-called red sequence. These red-sequence galaxies are dominating the core of galaxy clusters and their members are massive, passive-evolving, early-type galaxies. The red-sequence is found in clusters up to z=1.5 and its tightness proposes that they are formed in a short time scale beyond z=2. When and how these progenitors of the red-sequence are formed in clusters is one of the most hotly debated topics in extragalactic astronomy. Scenarios for their ancestors include in situ formation or accretion/falling into the cluster potential. Distant dusty starbursts with short time scales of building up the bulk of their stellar mass are promising candidates for being the ancestors of red-sequence galaxies. Searching for massive, dusty starbursts thus offers a great opportunity to trace galaxy overdensities and therefore the cosmic web in the distant universe. With APEX-LABOCA we have uncovered an excess of these dusty, massive galaxies in the protocluster field of the radio galaxy MRC1138-262. Based on an exquisite multi-wavelength database, including Herschel/Spitzer infrared observations and VLA 1.4 GHz radio, we show that a large fraction of these starbursts are physically associated with the protocluster at z=2.16. Based on this initial discovery, we have conducted extensive observing campaigns with the radio interferometers ATCA and ALMA on these sources. I will present our observations of the molecular gas reservoir of several cluster members enabling us to investigate the environmental dependency of the amount of cold molecular gas and star formation efficiency. Based on our observations and the literature, I will discuss scaling relations and compare the molecular gas properties of (proto)cluster and field galaxies. Finally, I will match our results of this starburst overdensity with theoretical predictions and discuss the potential of revealing (proto)clusters of massive, dusty starbursts via submillimeter surveys.

N. P. Plaza: *"The role of different galactic nuclei iin the global star formation history"*

We have studied the effects of different galactic nuclei on the global star formation history (SFH) of the host galaxy, using a sample of 339 objects from the CALIFA survey over a wide range of masses and morphologies. Both the classification of the galactic nucleus and the reconstruction of the SFH are based on the optical spectra. With this analysis we were able to determine the differences in the SFH associated to galaxy mass and morphological type, but we have found no strong correlation with nuclear activity. More generally, the reconstructed SFH display a variety of behaviours, but we did not find evidence for a rapid quenching of the star formation activity in any of our targets.

P. Mínguez Ledo: *"El balance energetico en el entorno de agujeros negros supermasivos"*

Existe un consenso generalizado en la existencia de un agujero negro supermasivo (SMBH) en el centro de cualquier galaxia. La activación de este agujero negro da lugar a los objetos más energéticos del Universo, los llamados núcleos activos de galaxias o AGN. El objetivo de este trabajo es determinar el balance energético de estos "monstruos" energéticos. Para alcanzar esta meta analizaremos y compararemos diversas fuentes de emisión térmica y "no" térmica en el centro de la galaxia N1097. Se utilizarán principalmente la emisión en Hα, Pα, ubicado en el NIR está mucho menos afectado de extinción al no encontrarse líneas de N[II]; y el compuesto HCN, conocido por ser un buen "gas tracer". Todas estas fuentes han sido descubiertas en las observaciones realizadas con ALMA y VLT. Además, gracias a los datos aportados por los mapas generados por estas fuentes, hemos obtenido resultados muy interesantes en cuanto a la determinación de las principales propiedades, tanto para el gas ionizado como el gas neutro del AGN.

G. Rodríguez-Coira: *"The Kennicutt-Schmidt law at parsec scales"*

We present parsec scales observations in molecular-H2 and Halpha gas of the well known star forming ring in the nearby galaxy NGC 1097. The star forming ring is resolved in hundreds of young star clusters. For most of them, the Halpha emission and dust extinction and molecular H2 emission has been derived. Using these measurements, the Kennicutt-Schmidt trend is for the first time evaluated down to the smallest scale of coeval star formation, a cluster. The method and results will be presented.