

Resultados Concurso Apex 2011-A

Propuesta: 2011A-15

Investigador Principal: Gustavo Orellana

Universidad: Universidad de Concepción

Título: ZSPARC: the Z-Spec/APEX Redshift Campaign for H-ATLAS

Resumen: We have uncovered a population of uniquely bright, FIR-selected galaxies in H-ATLAS, the widest extragalactic *Herschel* survey. Helped by gravitational amplification we can study the galaxies that dominate the cosmological FIR background and the star-formation-rate density at $z \sim 2$. We propose to observe selected lensed SMGs with $S_{350\mu\text{m}} > 150\text{mJy}$ at $1.5 < z < 2.5$, the major epoch of galaxy/AGN activity, and Z-Spec's sweet spot. We will obtain redshifts and derive CO SLEDs with Z-Spec. We shall determine gas properties via the CO ladder, and explore the influence of AGN, while relatively immune to uncertainties in the lensing models. With Z-Spec redshifts in hand, we can use ALMA and EVLA (ultimately *JWST* and E-ELT) to map their internal structures on sub-kpc scales, testing the FIR/radio correlation, Larson's laws and the Schmidt-Kennicutt relation, all on the scale of individual GMCs within the galaxies. The sub-project proposed here, led by Chileans, and to be published as Orellana et al., is composed by three targets that will complement the H-ATLAS campaign. The program proposed here will lead to a long term APEX/ALMA collaboration between UdeC and the H-ATLAS team members.

Tiempo asignado: 24 horas

Propuesta: 2011A-5

Investigador Principal: Michel Curé

Universidad: Universidad de Valparaíso

Título: Circumstellar disk perturbation during the periastron passage of α Sco

Resumen: An intensive multi-instrument observing campaign and theoretical modeling are prepared to monitor the 2011 periastron passage in the extreme eccentric binary α Sco, containing the primary Be star surrounded by a circumstellar disk. An expected strong secondary/disk and secondary/primary interaction during the secondary's passage through the disk offers a unique opportunity to test the viscous disc model and to determine physical parameters of the disk, including the viscosity parameter α . The requested LABOCA and SABOCA observations, together with proposed CARMA observations at 1 and 3mm will provide the unique information about the outer disk and set important constraints for the modelling.

Tiempo asignado: 3,1 horas

Propuesta: 2011A-12

Investigador Principal: L. Infante

Universidad: Pontificia Universidad Católica de Chile

Título: LASCAR: the LABOCA/ACT Survey of Clusters at All Redshifts

Resumen: We propose to continue our ESO/MPG/OSO/Chile survey to obtain LABOCA 870 μm maps of 15 of the most massive galaxy clusters in a 455 square degree southern strip surveyed by the Atacama Cosmology Telescope (ACT). Our targets were identified by their 148 GHz Sunyaev-Zel'dovich Effect (SZE) decrements, which provide a redshift-independent mass selection, and confirmed with optical imaging. The LABOCA maps will exploit the clusters' gravitational lensing for the detection of background submillimeter galaxies over a range in cluster-centric radius, thereby furnishing good candidates for followup with ALMA and placing valuable constraints on how severely individual galaxies may undermine the cosmological conclusions of ACT and other SZE surveys. Digging deeper, we will also use our maps to measure the clusters' SZE increments, and the 870 μm flux densities of sources (or stacks of sources) selected at other wavelengths. We ask to map one cluster through Chilean APEX Observing time in semester 2011A.

Tiempo asignado: 25 horas

Propuesta: 2011A-11

Investigador Principal: María Teresa Ruiz

Universidad: Universidad de Chile

Título: Barnard 30: a proto-brown dwarfs nursery?

Resumen: We have selected an area belonging to the dark cloud Barnard 30, of 1-3 Myr, within the Lambda Orionis Star Forming Region. A sample of very low mass star and brown dwarf (BD) candidates with masses in the range $0.5-0.05M_{\odot}$ are located in this area, and have been classified as Class I or Class II objects using IRAC/Spitzer and excess at 24 μm (from MIPS/Spitzer). We mapped recently the region with LABOCA at 870 μm and we detected a group of very low-mass cold dust structures. The southern part of this region (the part closer to the O star λ Ori) shows a group of submillimeter sources associated with the coldest Spitzer sources (at 70 and 24 μm), suggesting they are very young. In addition, there are several very low-mass submillimeter detections with no MIPS/IRAC counterparts, which are excellent candidates to pre-protobd cores. We propose to map this region with SABOCA (at 350 μm) in order to complete the SED and confirm the pre-protobd and protobd nature of these excellent candidates, as well as characterize their surrounding dust envelopes. This proposal could impact in the different scenarios concerning the formation of brown dwarfs. This is a resubmission of a last period accepted proposal (we follow TAC recommendations).

Tiempo asignado: 12 horas

Propuesta: 2011A-9

Investigador Principal: Simon Casassus

Universidad: Universidad de Chile

Título: Study of HCO⁺ emission properties in protoplanetary disks

Resumen: We propose observations in HCO⁺(4-3) in a set of protoplanetary disks that show CO or/and submm continuum emission. We aim to complement the classical CO studies on gas emission in protoplanetary disks (usually affected by optically thick emission and from abundance changes) using HCO⁺, the more abundant molecular ion in disks. Our main goals are to study the dependence of the HCO⁺ emission with the CO, dust, and disks properties, constrain the ionization fraction of the disks, and provide good candidates for future interferometric studies. We expect to triplicate the number of known HCO⁺ disk emitters and provide excellent candidates for next ALMA Early Science.

Tiempo asignado: 20 horas

Propuesta: 2011A-24

Investigador Principal: C. Vlahakis

Universidad: Universidad de Chile

Título: A submillimetre excess in star-forming dwarf galaxies in the Virgo cluster – emission from very cold dust?

Resumen: Star-forming dwarf galaxies recently detected in the Herschel Virgo Cluster Survey are found to have an excess of emission at 500 μ m. We propose to observe the two submillimetre-brightest star-forming dwarf galaxies at 870 μ m using the LABOCA instrument on the APEX telescope, in order to determine whether excess emission is also seen in the longer wavelength part of the submillimetre spectral energy distribution. These LABOCA observations are vital for determining whether the excess submillimetre emission is consistent with emission from very cold dust ($T < 10$ K) or due an alternative mechanism, and will thus shed important light on the dust content of star-forming dwarf galaxies in a dense cluster environment.

Tiempo asignado: 26,8 horas

Propuesta: 2011A-19

Investigador Principal: Nadia Lo

Universidad: Universidad de Chile

Título: Probing high mass protostellar disk candidates in preparation for ALMA

Resumen: There are only a handful of cases, based on indirect evidence, of high mass protostellar disks, partly due to their short life time and instrumentation limits (e.g. spatial resolution). We propose molecular lines observations with APEX-1 and APEX-2 of five high mass star forming cores with possible kinematic signatures of rotating disk. Our aim is to search for enhanced abundance of certain molecular species based on the prediction from chemical models of disks by Nyugen et al. (2002). Having reliable molecular tracers of disk is important as they not just serve as 'pointers' to disk, but also provide kinematic and chemical informations in the ALMA era. If these molecular species are enhanced, as

expected, they will provide reliable candidates to spatially resolve a disk surrounding a high mass star with the ALMA telescope for the first time.

Tiempo asignado: 24 horas

Propuesta: 2011A-7

Investigador Principal: Simon Casassus

Universidad: Universidad de Chile,

Título: Search for CI in protoplanetary disks.

Resumen: Models of the structure and chemistry of protoplanetary disks indicate they have a layered structure, with ionised gas at the surface, an atomic neutral layer and deeper down, mostly molecular gas. The molecular gas is most easily detected with CO, and is well-studied in many disks. However, the physical and chemical state of the upper disk layers have not been observed. Our recent Herschel observations show that ionised carbon from the outer layer (the fine structure line at 157 μ m) is surprisingly not detected - even in the brighter disks. We are evaluating what this means for the models. We propose deep searches for the neutral atomic carbon content using APEX, to further determine the location of C in the surface layers. CI is most easily detected through the 3P1 -3 P0 line at 492GHz - accessible only in good atmospheric conditions. We have a very tentative detection of TW Hya from the JCMT, and wish to confirm this. We will also observe 2 of the brightest isolated protoplanetary disks which may also show this line.

Tiempo asignado: 12 horas

Propuesta: 2011A-2

Investigador Principal: Guido Garay

Universidad: Universidad de Chile

Título: A survey to search for Hot Molecular Cores toward southern star-forming regions.

Resumen: Despite recent advances in the characterization of the early stages of massive star-forming regions, many questions remain still open. In particular, questions regarding the earliest phase known to date in the formation of a massive star: the hot molecular core (HMC) — characterized by high temperatures (> 100 K) and a rich chemistry. Must all the (massive) protostars undergo the HMC stage? Are the HMCs specifically associated with a dominant star formation phenomena (infall, outflow, maser, ionized gas)? Which is the lifetime of HMCs? Current surveys of dense gas tracers, toward large samples of massive young stellar objects, have not followed a good strategy to search for HMCs, because they focused on low-energy molecular lines. We propose to carry out a 257 GHz survey, to probe the presence of HMCs towards a large sample (85) of massive young stellar objects. By observing a reliable hot core tracer (a high-frequency CH₃CN transition tracing gas temperatures >70 K) we aim: 1) to detect and classify HMCs, and estimate their lifetimes; 2) to determine the relation between HMCs with infall, outflow and ionized, as traced by other data already available in the current surveys.

Tiempo asignado: 40 horas

Propuesta: 2011A-20

Investigador Principal: Monica Rubio

Universidad: Universidad de Chile

Título: Submillimeter studies of cold gas and dust in the Magellanic Clouds.

Resumen: The Magellanic Clouds provide unique laboratories to study gas, dust, and star formation in low metallicity environments, resembling the early phases of galaxy formation in the universe. The SMC and LMC have been extensively observed in CO line emission, but due to their low metallicities most of the molecular gas is likely to be in moderate extinction regions where CO is faint and mostly photo-dissociated. Dust emission is potentially a better molecular tracer, because of its independence from the photo-chemistry and density structure. Thus it allows for a more complete census of the dense, star forming gas distribution, and its relation to star formation activity. We propose to extend our successful LABOCA imaging program to the SMC N region, LMC south ridge regions and a second CO peak in the Magellanic Bridge. These observations will be combined with Spitzer (SAGE) and Herschel (HERITAGE) data to determine dust temperature and surface density, yielding images of giant molecular clouds at 10 pc resolution and probing dust properties in a range of environments. Comparison with CO and planned CI and CII observations with Atacama telescopes and Herschel will yield crucial constraints on the physical state of the dense gas clouds.

Tiempo asignado: 50 horas

Propuesta: 2011A-17

Investigador Principal: Simon Casassus

Universidad: Universidad de Chile

Título: Warm gas kinematics in the HD 142527 protoplanetary disk.

Resumen: The late pre-main sequence evolution of circumstellar gas is cornerstone to giant planet formation. However, only a few gas-rich systems are known. HD 142527 is particularly interesting because a substellar companion has carved out a gap within 10 AU. As HD 142527 is gas rich, the possibility exists that the putative giant planet is still accreting gas, i.e. that it is still a protoplanet. With CHAMP+ we have detected HD 142527 in CO(6-5). This is one of two or three disks with strong tell-tales of planet formation that also have a warm gas detection. However our preliminary CHAMP+ detection was acquired in marginal weather conditions, and is not deep enough to trace kinematics. We propose to followup with CHAMP+ and obtain high-quality CO(6-5), $^{13}\text{CO}(6-5)$, and CO(7-6) spectra to sample the warm-molecular-gas reservoir. These data will bring important observational information for the production of a disk model in HD 142527 that accounts for all the available constraints.

Tiempo asignado: 9 horas

Propuesta: 2011A-21

Investigador Principal: G. A. Romero

Universidad: Universidad de Chile

Título: Looking deeply inside the molecular fingerprints related to the star formation activity in G025.95+0.1255

Resumen: Bearing on mind that the environs of HII regions are excellent places to look for triggered massive-star formation, we would like to observe three BOLOCAM sources which are seen projected onto a molecular cloud associated with a diffuse HII region located at $(l, b) = (250.945, +00.125)$. As expected, the three BOLOCAM sources positionally coincide with ^{13}CO molecular clumps. The goal of this project is to characterize the dense clumps where star formation is taking place and to analyze the presence of molecular outflows. To perform this study we propose to focus on small areas centered at the position of each BOLOCAM source, in the molecular transitions $^{12}\text{CO}(3-2)$, $^{13}\text{CO}(3-2)$, $\text{HCO}^+(4-3)$, and $\text{CS}(7-6)$. The analysis of these data would allow us to investigate the physical conditions where the YSO candidates are embedded and to better understand the mechanism involved in the formation of massive stars.

Tiempo asignado: 23,6 horas

Propuesta: 2011A-18

Investigador Principal: Nadia Lo

Universidad: Universidad de Chile

Título: The Extremes of Massive Star Formation: The Giant Core G331.5-0.1

Resumen: We request SABOCA observations of the dust cores in the most massive, extended star forming condensation in the southern Galactic plane, G331.5-0.1. The 350 μm observations will allow us to provide tight constraints on the spectral energy distribution of the cores, giving accurate dust temperatures and masses, while the high resolution of SABOCA will allow us to determine the degree of fragmentation in the dust cores. We also request observations of the 3–2 transitions of the molecules HCO^+ , N_2H^+ and C_2H with the APEX-1 and 2 receivers. These transitions will provide constraints on the evolutionary states and ages of the dust cores, allowing us to answer questions such as: Are the cores at the same evolutionary stage, or is there sequential triggering along the core? The molecular line observations, together with physical parameters, such as temperature, derived from the continuum emission will be used to constrain 3D molecular line radiative transfer models for the source. The results will potentially be able to differentiate between the competitive accretion and core accretion models for massive star formation, in this unique region.

Tiempo asignado: 24 horas

Propuesta: 2011A-22

Investigador Principal: C. Lopez

Universidad: Pontificia Universidad Católica de Chile

Título: Ring-like structures and gas compression produced by massive star formation

Resumen: Several ring-like structures observed in the interstellar medium are associated to the process of massive star formation, produced by or forming high mass stars. We propose to observe 2_2_5 in the sky using LABOCA, covering two such regions, G345.5+1.0 and G345.5+2.5, part of the same GMC. They have molecular structures formed possibly by ram pressures produced by HII regions and/or supernova explosions. In G345.5+1.5, there is a gas-dust ring observed in 1.2mm continuum emission and 13CO(3-2) line, with 10 pc in diameter and $5 \times 10^3 M_{\odot}$ in mass. This ring is expanding with a velocity of 1.5 km/s, with a needed energy of 10^{47} erg to be created, and a time of 3×10^6 yr. In G345.5+2.5 we find the microquasar GRO J1655-40 and the open cluster NGC 6242, which are embedded in a HI cavity of 1.5_1.5 in diameter, with molecular material along the south-eastern internal border of the HI cavity. A supernova explosion in NGC 624 is the proposed way to form GRO J1655-40, and produce the HI cavity. These new observations with LABOCA will allow us to calculate physical properties and spectral energy distributions of the dust in this complex region.

Tiempo asignado: 8 horas

Propuesta: 2011A-4

Investigador Principal: Michel Curé

Universidad: Universidad de Valparaíso

Título: Formation, truncation, and dissipation of decretion disks around B-type stars

Resumen: The proposed Apex observations will continue our study of outer circumstellar disks around rapidly rotating Be stars. This study will focus on the structure of their outer regions, and their interaction with binary companions and/or the stellar wind. Recent VLTI observations of those systems have allowed us to investigate the inner parts of Be star disks with unprecedented details, but the outer parts of the disk are still poorly studied. We propose to measure the spectral energy distribution of six selected nearby Be stars using Laboca and Saboca. At those wavelengths, most of the flux originates from optically thick bremsstrahlung from the disk; therefore, the sub-mm/mm spectral region provides the means to study the otherwise inaccessible outer disk. When combined with our dynamic disk models and planned Carma observations (at 1 and 3 mm), such data will allow us to test several hypotheses that have been put forward to explain the disk formation and dissipation.

Tiempo asignado: 10 horas

Propuesta: 2011A-23

Investigador Principal: Nadia Lo

Universidad: Universidad de Chile

Título: Probing the possibility of triggered star formation

Resumen: Whether star formation are triggered is one of the major topics in star formation, to investigate the possibility of triggered star formation we propose molecular line and continuum observations of RCW 36 with SABOCA, APEX-1 and APEX-2. RCW 36 consists of a deeply embedded star cluster, ultra compact Hii region and cold dust clumps, star formation in different stages coexist in a small region. We have already developed models to simulate the molecular emissions in RCW 36, however to get better constraints on the physical environments (e.g. mass, temperature), high J transitions of molecular line and high spatial resolution of dust continuum are required.

Tiempo asignado: 25,8 horas

Propuesta: 2011A-16

Investigador Principal: G. A. Romero

Universidad: Universidad de Chile

Título: Identifying molecular and dust associated with Sh2-54 using APEX facilities

Resumen: Sh2-54 is an HII region characterized by a complex filamentary structure. The *Spitzer*-IRAC observations at 8.0 μm evidence the presence of several photo-dissociation regions (PDRs), indicating the existence of molecular gas surrounding the HII region. Given the low resolution molecular images available today and the lack of surveyed far-IR data in this region, we would like to observe the cold dust emission at 0.8 mm using the LABOCA bolometer array, and the molecular emission in both, 12CO(2-1) and 13CO(2-1) lines, with the APEX-1 SHFI instrument. These observations would allow us to analyze and characterize the molecular gas and dust components related to Sh2-54. In this way, the physical parameters, such as, excitation temperature, opacity, densities, and masses could be derived. In addition, this analysis would allow us to identify dense molecular clumps possibly associated with the catalogued young stellar object (YSO) candidates in the area. This project is part of a more extensive research leads to improve the knowledge of star formation activity in the environment of HII regions.

Tiempo asignado: 22,4 horas

Propuesta: 2011A-10

Investigador Principal: Guida Garay

Universidad: Universidad de Chile

Título: Characterizing the chemical and kinematical properties of PDRs toward young massive stars.

Resumen: The ultra compact HII region G213.880–11.837 is a prototype photodissociated region (PDR), the closest (1 kpc) from which high angular resolution radio recombination lines have been imaged. We propose here to undertake multi-line observations towards this PDR which will allow us to study its chemical and kinematical properties and to understand the evolution of expanding HII regions into the molecular

clouds. A further goal of these APEX observations is to find new molecular PDR tracers that can be used in future survey programs to study PDRs toward UCHII regions with ALMA.

Tiempo asignado: 12 horas

Propuesta: 2011A-14

Investigador Principal: Guillermo Gunthardt

Universidad: Universidad de La Serena

Título: Submillimetre Mapping of the Narrow Line Seyfert 1 Galaxy NGC 4748.

Resumen: We propose to obtain LABOCA mapping the Narrow-Line Seyfert 1 (NLSy1) galaxy NGC 4748 in order to detect nuclear and extended submillimeter emission. This is the first step towards the submillimeter study of a new type of active galactic nuclei (AGN). The target is part of an optical spectroscopic study on the dynamics of AGN and was selected based on its optical/radio flux ratio. NGC 4748 is also part of a subsample of NLSy1s with large emission in 6 cm, which are suspected to harbour nuclear jets as a consequence of their activity, which is a rare phenomenon since it is widely supposed that NLSy1 are radio quiet AGN. Our goal is to detect submm fluxes originating in the nuclear source as well as possible extended emission due to radio lobes, thus helping to discern the existence of a new subtype of AGN, i.e., moderately radio-loud NLSy1. The proposed sub-mm mapping will contribute to a better understanding of the physics involved in these objects.

Tiempo asignado: 3,8 horas
