CONICYT
COMISIÓN NACIONAL DE INVESTIGACIÓN
CIENTÍFICA Y TECNOLÓGICA

Resultados Concurso Apex 2008-B

• Lista 1 Propuestas seleccionadas

Propuesta: 2008B-010

Investigador Principal: Leonardo Bronfman

Universidad: Universidad de Chile

Título: ATLASGAL - The APEX Telescope Large Area Survey of the Galaxy

Resumen: We propose to use APEX/LABOCA to map the inner Galactic Plane at 870 μm to achieve the first Galaxywide continuum survey at submillimeter wavelength. Dust continuum emission in the (sub)millimeter range is the best tracer of the earliest phases of (high-mass) star formation since it is directly probing the cold material from which the stars form. Only a large unbiased survey can provide the statistical base to study the scarce and short-lived protostars and protoclusters in the Galaxy. LABOCA can image more than 500 deg2 down to 50 mJy rms with only 400 hrs of observing time. Cross-correlation with already available galactic surveys such as GLIMPSE, MIPSGAL, VLA-NVSS, and with similar surveys planned with Herschel and NANTEN2, will considerably help to answer a wide range of questions including: (1) What are the properties of the cold phase of massive star-formation? (2) What is the evolutionary sequence for high-mass stars? (3) How important is triggering to form new generations of high-mass stars? (4) What are the earliest phases of the richest clusters of the Galaxy? ATLASGAL will act as a true pathfinder for ALMA by providing large samples of high-mass protostars and protoclusters.

Tiempo asignado: 15 horas

Propuesta: 2008B- 009

Investigador Principal: Paulo Cortes

Universidad: Pontificia Universidad Católica de Chile

Título: Cosmological Nucleosynthesis: The Lithium Problem.

Resumen: A measure of the primordial lithium abundance provides significant observational constraints on current models of big-bang nucleosynthesis (BBN), including the confrontation between BBN models and the observed cosmic microwave background anisotropy measurements, and dark matter particle physics in the early universe.
Current optical measurements of halo star lithium abundances are subject to significant systematic uncertainties. APEX, however, allows observations of sub-millimeter LiH rotational transitions, providing an important alternative approach to the lithium problem. Because, the lowest LiH rotational transition, ($^{o} = 0, J = 1 - 0$) at 443 GHz is heavily

absorbed in the atmosphere, it has only been searched for in redshifted extragalactic absorption (Combes & Wiklind 1998), difficulting a clear detection. However, the new APEX-T2 receiver allows a search for the ($^{o} = 0, J = 3-2$) transition near 1.3 THz in the local ISM directly. We propose here, to search for this LiH transition in its both isotopomers toward high-density molecular clouds in Orion. If detected, this will provide an important estimate of galactic LiH abundance, and help to answer one of the important cosmological questions regarding primordial nucleosynthesis.

Tiempo asignado: 18 horas
Propuesta: 2008B- 020

Investigador Principal: Rodrigo Parra

Universidad: Pontificia Universidad Católica de Chile

Título: Hydrogen Masers in _-Carinae.

Resumen: Hydrogen is the simplest and most abundant atom in the universe and also the first known atomic astrophysical maser. So far, only the peculiar star MCW349 is known to host confirmed hydrogen maser sources. The well studied and enigmatic object _ Carinae is suspected to also host hydrogen masers but the available line data available is to sparse to be decisive. In order to confirm or reject the existence of such masers we propose hetherodine observations of a series of _ and _ hydrogen recombination lines towards _ Car. The signature of departure from LTE can be obtained from the _/_ intensity line ratios. The discovery of a new hydrogen maser source is of uttermost importance in the study of the detailed physics of the maser phenomenon and can moreover provide with a high resolution probe (both in space an velocity) of the very core of the extraordinary source _ Car.

Tiempo asignado: 3,5 horas

Propuesta: 2008B-017

Investigador Principal: Gaspar Galaz

Universidad: Pontificia Universidad Católica de Chile

Título: Molecular gas and dust in nearby low surface brightness galaxies

Resumen: Low surface brightness galaxies (LSBs) dominate the galaxy number density in the universe. Their internal dynamics is driven by large amounts of dark matter, implying that knowing their origin, properties and evolution is fundamental. Even though many properties have been elucidated during the last ten years, there are still many pending issues like the dust and gas physical and chemical characteristics in the interstellar medium (ISM) of these objects. Are these conditions preventing LSBs from forming stars or allowing only low star formation rates? In this regard, we propose to use APEX-1 to detect the 12CO(2−1) molecular transition at 230 GHz in two LSBs, to be correlated with the 12CO(3−2) already detected with APEX-2, as well as to map their dust distribution using LABOCA. The sample of galaxies is from Galaz et al. (2008). In order to carry out this program, we need a total of 12 hours. This time is divided into 6 hours for 12CO(2−1) detections with APEX-1, to achieve an rms noise of 3 mK with a resolution of 5 km/s, and 6 hours for LABOCA under the condition of 10 mJy rms noise.

Tiempo asignado: 12 horas

Propuesta: 2008B- 003

Investigador Principal: Ovidiu Vaduvescu

Universidad: Universidad Católica del Norte

Título: Massive Star Forming Galaxies in the COSMOS Field

Resumen: We request 14 hours plus overhead of LABOCA time to image a 25×25 arcmin2 part of the Cosmic Evolution Survey (COSMOS) field as part of a concerted effort of the Chilean, ESO and MPG APEX partners to image the inner 1 deg2 of the COSMOS field to a sensitivity level of 3 mJy. The submillimeter measurements are crucial to supplement and use the unprescedented COSMOS multiwavelength dataset. We expect the complete survey to double (»75) the number of known submillimeter galaxies above 10 mJy, and this in a large single field that allows to connect their spatial and redshift distribution to the cosmic large-scale structure (LSS). We will study the properties of the galaxies, such as as morphology, star formation, nuclear activity and age, in relation to their LSS environment. The observations requested here will be used to characterise the spectral energy distribution of the 26 high significance MAMBO sources in the subfield to derive accurate photometric redshifts and in particular resolve the temperature-dust emissivity degeneracy. We will also be able to perform a cross-correlation with our 2 mm APEX-Sunyaev-Zel'dovich cluster survey (APEX-SZ) data to assess the contribution of submm galaxies to the SZ signal.

Tiempo asignado: 26 horas

Propuesta: 2008B-014

Investigador Principal: Neil Nagar

Universidad: Universidad de Concepción

Título: The dense gas component in ULIRGs and an improved [CII] diagnostic for High-z ALMA detections

Resumen: The [CII] 158μm line is predominantly emitted by PDRs (photo-dominated regions) exposed to UV radiation and is thus a direct estimator of star formation rate (SFR). This line accounts for 0.1–1% of the bolometric luminosity in local starbursts, and its study is as important as CO in the era of ALMA. However, 80% of Ultraluminous Infrared Galaxies (ULIRGs) and all high-z quasars studied have suppressed [CII]/FIR ratios. These suppressed sources are either rich in dust-bounded PDRs, which contribute to the FIR but not to [CII], or have PDRs with different densities an UV irradiance factors. ULIRGs are now known to have a high temperature and density component, detectable in e.g. CO J:5-4 but not in CO J:1-0, which cools predom- inantly by high CO transitions and [CII]. Here we propose for CO J:2-1, J:3-2 and HCN J:3-2 observations of ULIRGs with both 'normal' and low [CII]/FIR ratios which have previous CO J:1-0 detections. With these data, and future high transition CO observations with APEX, we will attempt to discriminate the physical state, SFR, cooling, and merger status of the starburst, leading to a better interpretation for thousands of high-z sources with future [CII] and CO detections with ALMA

Tiempo asignado: 16 horas

• Lista 2 Propuestas en espera

Propuesta: 2008B-012

Investigador Principal: Diego Mardones

Universidad: Universidad de Chile

Título: The evolution of star-forming cores

Resumen: Protostars form as a consequence of the gravitational contraction of dense gas in cores, this dense gas serves as the primary mass reservoir of a forming star. The inward and outward motions of the circumstellar material have an impact on the final mass of the star; thus, it is essential to study the infall and outflow of material in cores in order to fully understand the star formation process. Here we propose the first of a set of observations aimed at conducting a survey of cores at different evolutionary stages in order to study the evolution of the dense gas infall and outflow motions, their effect on the core, and the mass-assembling process. We will observe different molecular emission lines which trace the core column density, the dense outflow, and the infall motions. We will also use publicly available multi-wavelength continuum data and radiative transfer models to characterize the observed cores. The combination of the kinematical information from the APEX spectral observations and the information from the continuum data will allow us to conduct an unprecedented study of the evolution of cores in low-mass star forming regions.

Tiempo asignado: 20 horas

Propuesta: 2008B- 013

Investigador Principal: Paulo Cortes

Universidad: Pontificia Universidad Católica de Chile

Título: Constraining the magnetic field 3D morphology in the massive star forming regions: G30.79 FIR 10 and G34.4

Resumen: Here, we are proposing to map H13CN($J = 4 ! 3$) and ($J = 3 ! 2$) towards the dust maxima at G30.79 FIR 10 and G34.4 with the APEX telescope. By using ion-to-neutral molecular line width ratio measurements, its has been shown that the orientation of the magnetic field, respect to the line of sight, can be determined. We will combine this new technique with our previous results from polarized emission to attempt constrain the three-dimensional morphology of the field toward these sources. This program is a continuation of a proposal, for the 2008A period, which has already been awarded time by the Chilean APEX TAC. Here, we will complete the observing campaign by adding the, likely optically thin, neutral molecule H13CN in ($J = 4 ! 3$) and ($J = 2 ! 2$) rotational transitions. We request a total time of 4.6 hrs to carry out this proposal.

Tiempo asignado: 4,6 horas

Propuesta: 2008B- 001

Investigador Principal: María Teresa Ruiz

Universidad: Universidad de Chile

Título: Exploring VLM stars and BD disks in Lambda Orionis SFR

Resumen: We have selected a small area belonging to the dark cloud Barnard 30, 1-3 Myr, within the Lambda Orionis Star Forming Region. A sample of very low mass star and brown dwarf candidates with masses in the range 0.5-0.05$M_\odot$ are located in this area, and have been classified as Class I or Class II objects using IRAC/Spitzer and excess at 24 microns (from MIPS/Spitzer). Because the disks are likely optically thick at 24 µm, the main goal of this proposal is to detect the disk flux at 870µm in order to get a reliable estimate of their mass. Our detection limit is 5 mJy, enough for this purpose based on our Spectral Energy Distribution estimations. We propose LABOCA 870µm observations in order to: i) build complete SEDs from the optical to 870µm, ii) derive disk masses and relate them with the proposed formation mechanisms, iii) search for evidences of truncated disks, and iv) study the dependence of these properties with stellar or substellar mass.

Tiempo asignado: 15 horas

Propuesta: 2008B- 005

Investigador Principal: Ovidiu Vaduvescu

Universidad: Universidad Católica del Norte

Título: Dust Properties in Nearby Galaxies: The SINGS Sample

Resumen: We propose to observe with LABOCA seven galaxies from the SINGSs sample in order to image their cold dust properties (T, emissivity, dust-to-gas ratio) when compared with high-quality Spitzer and other imaging data, and applying a novel, multi-component physical dust model to the infrared spectral energy distributions. Submillimeter observations are crucial to constrain the cold dust component and thereby the total dust mass in these systems. LABOCA well matches the Spitzer spatial resolution, allowing for the first time an analysis of the spatial variation of the dust properties in galaxies, and how this varies over the wide range of galaxy types and morphologies this sample provides. LABOCA is the first wide field camera that can properly image the extended dust emission of nearby galaxies, and SINGS is the sample with the best complementary IR, optical, and radio data. It is our aim to determine (1) dust temperature and mass surface density, (2) dust mass fraction in PAHs and its scaling with metallicity, (3) dust-to-gas ratio, and (4) the heating source of the dust. The data will allow a comparison with the star formation processes in the different regions of the galaxies.

Tiempo asignado: 30 horas

Propuesta: 2008B- 0015

Investigador Principal: Juan Cortes

Universidad: Universidad de Chile

Título: Warm Molecular Gas and Dust in Interacting Galaxies: A key project

Resumen: We are proposing to conclude our key project using the APEX heterodyne and bolometric capabilities, for a long term study of galaxy-galaxy interactions. This key project has started by mapping a selected sample of interacting galaxies, which are at different stages of the galaxy-galaxy interaction process. We request strip-scan observations along the major, minor axis, and interaction regions of the galaxies with APEX-SHFI in order to map the CO(J = 3 ! 2) line, as well as, to map the dust emission at 870 _m with APEX-LABOCA for all the sample galaxies. These observations will allow us to locate where active star formation activity is actually occurring, to determine how this is related to the galaxy-galaxy interaction process at their different stages, to compare the extension CO(J = 3 ! 2) with the cold dust emission, and to study the physical properties of the dust along the galaxy interaction sequence. Finally, these observations will be a pathfinder in the selection of interesting targets for continuing this long term project with ALMA.

Tiempo asignado: 33 horas

Propuesta: 2008B- 018

Investigador Principal: Monica Rubio

Universidad: Universidad de Chile

Título: Study of the Cold Molecular Gas in the Small Magellanic Cloud with LABOCA

Resumen: The Small Magellanic Cloud (SMC) is a unique galaxy to study the molecular gas content and molecular clouds characteristics in a low metallicity (10% solar) star forming environment resembling the early steps of galaxy formation at high redshift. The SMC has been extensively observed in CO low J rotational lines but due to the low metallicity most of the molecular gas mass could be in moderate extinction H2 gas where CO is photo-dissociated. Observations of the sub-mm dust emission with the LABOCA allowed us to map a 20’x20’ SW region in the SMC bar, offering a far better alternative to trace dense gas in the SMC independently of the gas chemistry, density and temperature. We propose to extend this succesful observing program to the SMC NE and Wing, including the most luminous star forming region N66. The LABOCA observations will be combined to the 160 mµ Spitzer images to determine the dust temperature and obtain dust column density maps with sufficient resolution (10 pc) to resolve individual GMCs. The maps will also probe extended emission from a collection of smaller clouds. Comparison with CO and planned CI and CII observations with Atacama telescopes and Herschel will yield important constraints on the physical structure of the dense gas.

Tiempo asignado: 23 horas
