Secondo Workshop sull'Astronomia millimetrica e submillimetrica in Italia

INAF-Istituto di RadioAstronomia
Italian ALMA Regional Center

Centro congressi Area della Ricerca
Bologna, 2-3 Aprile 2012

PRESENTAZIONE

L'ALMA Regional Centre italiano, ospitato dall'INAF-Istituto di Radioastronomia, organizza il "Secondo Workshop sull'Astronomia millimetrica e submillimetrica in Italia" presso l'Area della Ricerca del CNR a Bologna, il 2-3 Aprile 2012.
Partendo dalle basi poste durante la prima edizione svoltasi nel 1998 a Firenze, il workshop intende fornire un'occasione di incontro per i ricercatori che lavorano attivamente o hanno interesse a lavorare nel campo dell'astronomia millimetrica e submillimetrica in Italia nell'era di ALMA.
L'incontro vuole essere un'occasione di dibattito e di confronto per la comunita' coinvolta o interessata in questo campo di ricerca, alla luce dei piu' recenti risultati raggiunti, dei diversi nuovi strumenti operanti in questa banda (con particolare attenzione ad ALMA e ai progetti ad esso collegati, ma non solo) e del ruolo fin qui svolto dall'Italia. Lo scopo e' quello di tracciare un quadro esauriente dell'attivita' passata e presente, e di individuare idee concrete per progetti futuri.
Il meeting si articolera' in sessioni dedicate a ciascuna delle grandi tematiche della ricerca astronomica millimetrica e submillimetrica, dal vicino sistema solare all'universo remoto, includendo la cosmologia e la ricerca chimica in ambito astronomico. Sara' lasciato ampio spazio alla discussione sul ruolo dell'astronomia millimetrica in Italia, e sul contributo che l'ALMA Regional Center puo' portare alla comunita'.

Scientific Organizing Committee:
Jan Brand
Marcella Massardi
Isabella Prandoni

Local Organizing Committee:
Francesco Bedosti
Jeremie Boissier
Viviana Casasola
Arturo Mignano
Rosita Paladino
Alessandra Rossetti

PROGRAMMA

02 Aprile 2012

Chair: Feretti
09:00 - 09:10 FERETTI (INAF-IRA): Benvenuto

ALMA: organizzazione, status e sviluppi futuri
09:10 - 09:30 TESTI (ESO/INAF-OAA): ALMA e ARC europeo
09:30 - 09:50 BRAND (INAF-IRA ARC): The Italian ARC
09:50 - 10:10 VILLA (INAF-IASFBo): Due proposte sperimentali a partecipazione Italiana per l' "Advanced Study for Upgrades of ALMA"

Astrochimica - Sistema solare - Planetologia
Chair: Brand
10:10 - 10:40 TESTI (ESO/INAF-OAA): Protoplanetary disks
10:40 - 11:00 BOISSIER (ESO/INAF-IRA ARC): Recent observations of comets in interferometry at mm wavelengths
11:00 - 11:30 *Coffee break*
11:30 - 11:50 TRIGILIO (INAF-OACT): Studio dei flare solari con ALMA
11:50 - 12:20 PALUMBO (INAF-OACT): The role of cosmic rays in the formation of interstellar and circumstellar molecules

Scienze Galattiche
Chair: Testi
12:20 - 12:50 CESARONI (INAF-OAA): Il ruolo dei dischi nella formazione delle stelle O-B
12:50 - 13:10 FONTANI (INAF-OAA): Probing the earliest phases of high-mass star formation through observations of N2D+

13:10 - 14:30 *Pranzo*

PROGRAMMA

Chair: Cesaroni

14:30 - 15:00 CODELLA (INAF-OAA): From the Alps to Andes: protostellar jets as observed at submm-wavelengths

15:00 - 15:20 GIANNINI (INAF-OAR): Joint ALMA and BLAST-Pol constraints on protostellar infall morphologies and cloud magnetic fields

15:20 - 15:40 NISINI (INAF-OAR): Probing water in proto-stellar systems: Herschel-WISH and ALMA perspectives

15:40 - 16:00 GIANNETTI (UniBO/INAF-IRA): Molecular gas under the influence of massive stars: The case of G353.2+0.9

16:00 - 16:30 *Coffee break*

Chair: Palumbo

16:30 - 17:00 MOLINARI (INAF-IFSI): Herschel Galactic imaging surveys as the key tools for millimeter astronomy in the next decade.

17:00 - 17:20 OLMI (INAF-OAA): On the shape of the mass-function of dense cores in the Hi-GAL fields: frequentist vs. Bayesian approach

17:20 - 17:40 CERRIGONE (INTA-CSIS, Madrid): ALMA and the late stages of stellar evolution

17:40 - 18:00 AGLIOZZO (UniCT/INAF-OACT): LBV nebulae in the Large Magellanic Cloud: exploring the dust content in the ALMA era.

20:00 *CENA SOCIALE*

PROGRAMMA

03 Aprile 2012

Universo Locale
Chair: De Zotti
09:00 - 09:30 BURIGANA (INAF-IASFBo): Astrophysical foregrounds from the Planck mission: lessons for the ALMA era
09:30 - 10:00 HUNT (INAF-OAA): The ALMA view of the cool dust in an extreme low-metallicity starburst
10:00 - 10:20 PALADINO (UniBO/INAF-IRA ARC): Magnetic fields and cosmic rays effects on star formation processes
10:20 - 10:40 CORBELLI (INAF-OAA): Dust and molecules in Virgo cluster galaxies
10:40 - 11:00 COSTAGLIOLA (Onsala Space Observatory): Compact Obscured Nuclei

11:00 - 11:30 *Coffee break*

Chair: Massardi-Prandoni
11:30 - 11:50 BIGNAMI
11:50 - 13:00 **Discussione generale**

13:00 - 14:20 *Pranzo*

Chair: Hunt

14:20 - 14:40 CASASOLA (INAF-IRA ARC): Feeding and feedback in nearby AGN and radio MOHEGs

14:40 - 15:00 GIROLETTI (INAF-IRA): The connection between millimeter and gamma-ray emission in AGNs

High-redshift/cosmologia

15:00 - 15:30 MAIOLINO (Cavendish Lab, Cambridge): Ricerca e c aratterizzazione di galassie ad alto redshift tramite osservazioni (sub-)millimetriche

15:30 - 15:50 TRONCOSO (INAF-OAR): Chemical evolution and gas flows in star forming galaxies up to redshift 3

15:50 - 16:10 MIGNANO (INAF-IRA ARC): A μ variation in the MW?

16:10 - 16:40 *Coffee break*

Chair: Maiolino

16:40 - 17:10 DE ZOTTI (INAF-OAPD): Synergies between Herschel and ALMA for the study of the high redshift universe

17:10 - 17:30 NEGRELLO (INAF-OAPD): Gravitational lensing and ALMA: a perfect synergy for studying dust-oscured star-forming galaxies at redshift 2 and beyond.

17:30 - 17:50 RODIGHIERO (UniPD): In and out the main sequence of Star Forming galaxies at z~2, as revealed by Herschel

17:50 - 18:10 BRUSA (MPE, Monaco): Placing AGN in the merger sequence with ALMA

Benvenuto
Luigina Feretti
INAF – Istituto di Radioastronomia

Leonardo Testi
ESO/INAF-OAA
ALMA e l'ARC europeo

I will briefly present the ALMA construction status, including plans and timeline for phasing in scientific capabilities (especially for Early Science Cycle 1) towards completion of the baseline project and full science operation. I will briefly summarize the ALMA Operations model in practice, focusing again on Cycle 0 and Cycle 1 and the European ALMA Regional Centre structure.
I will also briefly mention the long term upgrade plans for ALMA.

Jan Brand
INAF-IRA Italian ARC
The Italian ARC

The Italian node of the European ALMA Regional Centre (ARC) network is presented. An overview is given of its tasks and activities. The Italian ARC is hosted by the Istituto di Radioastronomia in Bologna. The node currently employs 2 staff members, 5 post docs (including an ESO/ALMA-Cofund fellow), experts in mm-astronomy and/or interferometry, and one system manager. All dedicate more than 50 per cent of their time to support ALMA users. Offered support consists in running ALMA tools for proposal preparation and submission, tracking of accepted ALMA projects, data reduction with CASA, ALMA archive mining, and handling of large datasets. This is mostly done via face-to-face visits or helpdesk tickets.
The Italian ARC is also developing new CASA tasks, it investigates new techniques of data reduction and handling (also testing the use of GRID technology), and organizes seminars, tutorials and workshops to train the Italian community that operates in the (sub-)mm band, and stimulate scientific discussion and collaborations.
The Italian ARC researchers are involved in several (sub-)mm scientific projects covering different topics (from solar system, galactic and local-Universe studies to high-redshift galaxies and cosmology), and offer general scientific support on their specific area of expertise.
At the host institute, the ARC node occupies an open-plan office where it can simultaneously accommodate two (or more) visitors for face-to-face support and visits. Visitors are provided with desktop computers (or laptop sockets), directly connected to a dedicated computer server, to access the data and run the CASA reduction software.
The ARC node is connected to the outside world through a high-speed optical fiber network, allowing fast data transfer (10 Gbit/sec). The node exploits 54 Tb of disk space, one 12-blade cluster (96x2.1-GHz cores and 8Gb RAM) and an additional 1-blade unit (4x2.8-GHz cores and 16Gb RAM), dedicated to its activities. ALMA and CASA users can access the ARC node cluster facilities for a period of one month after their their face-to-face visit. On request, access can be extended to longer periods.

Fabrizio Villa
INAF-IASF Bologna

Due proposte sperimentali a partecipazione Italiana per l' “Advanced Study for Upgrades of ALMA”

Verranno illustrate due proposte sperimentali a partecipazione italiana presentate ed accettate nell'ambito della call per l'Advanced Study for Upgrades of ALMA. La prima, guidata dall'univerista' di Manchester, dal titolo "A Study and Development Programme for ALMA Band 2 and a Combined Band 2 and 3 Receiver System" che ha lo scopo di sviluppare la banda 2 e di studiare la possibilita' di unificare la banda 2 con la banda 3. La seconda guidata dall'IASF-Bologna dal titolo 'MI-ALMA: Multi-Imaging for ALMA", non essendo prioritaria per ALMA, ha lo scopo di mettere a disposizione di ALMA le conoscenze sperimentali sviluppate per la cosmologia sperimentale.

Leonardo Testi
ESO/INAF-OAA
Protoplanetary disks (invited talk)

Circumstellar disks appear in the early phases of formation of stars and play a key role in the assembly of the final mass of the central star and in the possible formation of a planetary system around it. I will discuss the key observations at (sub-)mm wavelengths that allow us to constraint the properties and evolution of disks around young stellar objects, mostly focusing on the solids (dust and pebbles) in disk. The evolution of the solids is directly related to the initial stages of planets formation as grains are expected to grow to large pebbles and form planetesimals and rocky cores of planets. I will discuss the current observational evidence for grain evolution in disks, the difficulties and success of theoretical models to explain observations and the latest ideas on grain populations segregation in disks. I will discuss future observational tests, in particular with ALMA Early Science and beyond, that will allow us to impose tighter constraints on models of solids evolution in disks. Time permitting, I will also briefly discuss some of the key disk properties that are probed by the molecular gas emission.

Jeremie Boissier
ESO/INAF-IRA Italian ARC
Recent observations of comets in interferometry at mm wavelengths

This contribution will be an overview of recent studies of comets based on interferometric observations at mm wavelengths. Such observations allow detailed analysis of cometary nuclei and atmospheres (dust and gas). These studies give an insight into what will be the cometary science with ALMA.

Corrado Trigilio
INAF-Osservatorio Astrofisico di Catania
Studio dei flare solari con ALMA

I flare solari sono dei fenomeni altamente energetici (∼ 10^27 – 10^32 erg) che si verificano improvvisamente nell'atmosfera solare in siti caratterizzati da configurazioni magnetiche particolarmente complesse. La comprensione di questi fenomeni è stata notevolmente migliorata negli ultimi anni, grazie ad osservazioni multi-banda ad alta risoluzione spaziale, effettuate sia da Terra che dallo spazio. Tuttavia, vi sono ancora alcuni aspetti che non sono stati del tutto compresi, quali ad esempio i processi di accelerazione delle particelle e i meccanismi di rilascio di energia nella bassa atmosfera. In questo studio viene presentato un modello per la simulazione dell'emissione di giro-sincrotrone durante l'evoluzione dei flares solari, sviluppato assumendo un singolo evento di accelerazione che avviene alla sommità di un loop magnetico, nel probabile sito di riconnessione magnetica, e che causa l'arrivo di particelle relativistiche fino alla fotosfera. Sono discusse le applicazioni del modello a flares precedentemente osservati ed i miglioramenti che l'alta risoluzione spaziale e temporale di ALMA possono fornire in questo campo.

Maria Elisabetta Palumbo
INAF - Osservatorio Astrofisico di Catania
The role of cosmic rays in the formation of interstellar and circumstellar molecules (invited talk)

More than 160 molecular species have been detected in space. Molecules are observed in the atmosphere or on the solid surface of Solar System objects, in comets, in interstellar and circumstellar regions. In dense molecular clouds molecules are expected to form after gas-phase reactions or on the surface of dust grains after grain-surface reactions and/or after energetic processing (i.e. ion irradiation and UV photolysis) of icy grain mantles. Most of our knowledge on the formation processes of molecules in space is based on laboratory experiments. The Laboratorio di Astrofisica Sperimentale at INAF-OACt is involved in the study of the formation of molecules after energetic processing of icy mantle analogues. Here I will present some recent experimental results and will discuss their relevance to understand the formation processes of molecules in interstellar and circumstellar regions.

Riccardo Cesaroni
INAF - Osservatorio Astrofisico di Arcetri
Il ruolo dei dischi nella formazione delle stelle O-B (invited talk)

La formazione delle stelle di tipo spettrale OB pone dei problemi di natura sostanzialmente diversa rispetto alle stelle di tipo solare. La ragione principale e` che la grande pressione di radiazione dovrebbe impedire l'accrescimento della materia sulla protostella, limitandone quindi la massa al di sotto di circa 8 masse solari. Modelli recenti indicano che questo paradosso puo` essere risolto se l'accrescimento avviene mediante un disco circumstellare. Tuttavia, a differenza delle stelle di tipo solare, solo per poche (proto)stelle di tipo B e nessuna di tipo O esiste al momento evidenza di strutture circumstellari rotanti che possano essere interpretate come dischi di accrescimento. Sebbene non si possa escludere che le stelle di grande massa si formino mediante un diverso meccanismo, e` probabile che la mancata rivelazione di tali dischi sia da imputare alla limitata sensibilita` e risoluzione degli interferometri (sub)mm attualmente operanti. Con l'avvento di ALMA sara` possibile dirimere la questione. Nella nostre osservazioni di ciclo 0 ci proponiamo quindi di dimostrare l'esistenza di dischi kepleriani attorno a due (proto)stelle di tipo B, mentre quando ALMA sara` completato spingeremo la ricerca attorno alle (proto)stelle di tipo O. Nella presentazione saranno illustrati i risultati delle nostre precedenti ricerche di dischi attorno a stelle di alta massa e verra` illustrato il progetto ALMA attualmente in corso e i possibili sviluppi futuri.

Francesco Fontani
INAF - Osservatorio Astrofisico di Arcetri

Probing the earliest phases of high-mass star formation through observations of N2D+

To probe the initial conditions of the high-mass star formation process and put constraints on competing theories one needs to know physics, dynamics and chemistry of massive cores in very early evolutionary stages. These properties can be determined through observations of deuterated molecules. In fact, chemical models predict that deuterated species are excellent tracers of cold, dark cores, where most other molecules are not usable because depleted from the gas phase. I will present IRAM-30m and brand new ALMA cycle-0 observations of the N2D+ molecule, a species eminently suitable to trace cold and dense gas, in a sample of massive cores supposed to harbour different stages of the massive star formation process. These observations demonstrate that: 1- the deuterated fraction N2D+/N2H+ can be used as evolutionary tracer in the massive star formation process, and 2- the most promising massive starless cores are close to virial equilibrium conditions, as determined from targeted high-angular resolution ALMA N2D+ observations.

Claudio Codella
INAF - Osservatorio Astrofisico di Arcetri
From the Alps to Andes: protostellar jets as observed at submm-wavelengths (invited talk)

The launching process of jets from young accreting stars remains one of the most enigmatic and intriguing phenomena in astrophysics. One fundamental problem to which jets are believed to provide a solution is the removal of excess angular momentum, allowing accretion onto the central core. However, the precise launch region of the jet (star, inner disk edge at < 0.1 AU, outer disk at > 1 AU) remains unknown, despite its potential crucial consequences for stellar braking, or planet migration in disks. So far, most investigations of the jet origin have been made in atomic microjets from optically visible T Tauri stars, thanks to the high angular resolution available in the optical range. Recently, the advent of sub-arcsecond resolution at submm-arrays has opened a new window by allowin studies of the jet base in much younger (Class 0) protostars, where molecular emission dominates. SiO and CO are key tracers in this context, sampling the primary jet launched close to the protostar, where even the IR emission is heavily obscured. We discuss in this contribution constraints on the origin of mass-loss from low-mass protostars brought by recent observations, obtained using the recent extended PdBI configuration as well as in the framework of Herschel Key Program. The results expected from the forthcoming Early Science ALMA observations will be also discussed: we will be able to constrain the CO opacity, the SiO abundance, and the jet mass-flux rate. These results will be confronted with updated predictions for SiO in C-shocks and dust-free winds, to elucidate the SiO formation process and possibly constrain the jet launch radius.

Teresa Giannini
INAF - Osservatorio Astronomico di Roma
Joint ALMA and BLAST-Pol constraints on protostellar infall morphologies and cloud magnetic fields

Based on Herschel observations between 70 um and 500 um, we realized a photometric survey of the molecular cloud Vela-C, one of the nearest star forming regions of low-to-high mass in the Galactic plane. Out from a catalogue of about 8000 entries, we identified a sample of 288 sources in different evolutionary stages (clumps, cores, young stellar objects), which represents a well suited sample for ALMA observations. In particular, a sub-region of Vela-C was recently observed with BLAST-Pol at 250 um. From the comparative analysis between ALMA images and polarization maps we will able to study the correlation between cores morphology and direction of the local magnetic field. This will allow us to evaluate the role of the magnetic field in the framework of the gravitational collapse.

Brunella Nisini
INAF - Osservatorio Astronomico di Roma

Probing water in proto-stellar systems: Herschel-WISH and ALMA perspectives

Water is a key molecule for determining the physical and chemical structure of star-forming regions because of its large abundance variations and its sensitivity to the local excitation conditions. 'Water In Star-forming regions with Herschel' (WISH) is a key program on the Herschel Space Observatory designed to observe, with the HIFI and PACS instruments, a variety of lines of H2O, H218O and chemically related species in a large sample of young sources spanning different luminosities and evolutionary stages. The so far obtained results have shown that the bulk of H2O emission in the youngest objects is localized in shocked regions associated with the matter flows from the proto-stars. The H2O profiles, as observed in the large beam of the HIFI instrument, are however very complex, indicating the presence of different dynamical components, not traced by other molecules usually observed from ground. In this contribution, I will illustrate these results and I will discuss possible follow-up ALMA observations to disentangle the origin and characteristics of the different H2O emitting regions.

Andrea Giannetti
Universita' di Bologna/INAF-IRA
Molecular gas under the influence of massive stars: The case of G353.2+0.9

G353.2+0.9 is an HII region whose main ionization front is seen nearly edge-on. This is the ideal configuration to study the zone of interaction between molecular gas and energetic radiation and winds delivered by the numerous massive stars in the nearby cluster Pismis 24. I will discuss the physical properties of the gas in the PDR and its fragmentation along the ionization front, derived from low-angular resolution (~20"-50"), single-dish observations. During an upcoming run at the EVLA we will observe NH3 in this region at high-angular resolution (~2"), to investigate the spatial distribution of the gas and derive its temperature. The next step will be ALMA, which offers the possibility to observe several molecules simultaneously, thus allowing to study their stratification in the PDR as a function of distance from the ionizing stars.

Sergio Molinari
INAF – IFSI Roma
Herschel Galactic imaging surveys as the key tools for millimeter astronomy in the next decade. (invited talk)

The photometric imaging surveys of the Milky Way that the Herschel satellite is presently carrying out in the far infrared with unprecedented sensitivity and spatial resolution, are unlocking a new level of understanding on the formation of clouds, clusters and stars on a global Galactic scale. I will illustrate the most recent results form these surveys and outline their impact for the millimeter and submillimeter astronomy in the next decade with ALMA and other planned facilities.

Luca Olmi
INAF - Osservatorio Astrofisico di Arcetri
On the shape of the mass-function of dense cores in the Hi-GAL fields: frequentist vs. Bayesian approach

The relationship between mass distributions of dense cores in star forming regions (also known as the core mass function, or CMF) and the stellar initial mass function (IMF) contains information regarding how observed samples of cores evolve into stars. The observational similarity between the CMF and the IMF has already been discussed in countless papers. The qualitative similarity between the CMF and the IMF offers support for the widely accepted idea that stars form from dense cores. Observed CMFs are typically characterized by one or more powerlaws, or sometimes by lognormal distributions. Distinguishing between these two forms is important for our understanding of how dense molecular cores produce the full spectrum of stellar masses. However, discriminating between these two forms is complicated by the difficulty in measuring the CMF over large dynamic ranges and the fact that lognormal and powerlaw forms can look quite similar over limited mass ranges. The source catalogs extracted from the Hi-GAL SDP fields, containing thousands of sources, now offer the possibility to apply Bayesian inference techniques and compare the results with standard frequentist analysis.

Luciano Cerrigone
Centro de Astrobiologia, INTA-CSIC, Madrid
ALMA and the late stages of stellar evolution

The late evolutionary stages of intermediate-mass stars are characterized by strong instabilities, whose signpost is the formation of Circumstellar Envelopes (CSE). The importance of focusing on these stages resides in the fact that stars going through these phases contribute with their stellar ejecta to the chemical enrichment of the ISM and are important sources of UV radiation and kinetic energy. In this contribution, I will show, through a few case studies, how ALMA can contribute to improve our know ledge of the neutral and ionized components of these ejecta. The high angular resolution and sensitivity of ALMA will allow us to map in great detail the emitting components coexisting in the CSEs, providing strong constraints on the mass-loss and shaping processes that lead to the formation of the beautiful but still largely unexplained shapes of Planetary Nebulae.

Claudia Agliozzo
Università di Catania/INAF-OACT
LBV nebulae in the Large Magellanic Cloud: exploring the dust content in the ALMA era.

Late stages of stellar evolution are often characterized by massive mass-loss. Signpost of these events is the formation of circumstellar envelopes (CSEs), whose physical properties make ideal sites for molecules and dust formation. Despite the importance of AGB stars and RGS as primordial dust producers, when the low mass stars did not have time to evolve off the main sequence (Dwek et al. 2005, ApJ, 635, 784-794), very few studies on dust and molecules formation and processing in CSE near hot, massive stars have been conducted. Recently Smith and Owocki (2006, ApJ, 645, L45) have suggested that Luminous Blue Variable (LBV) extreme mass-loss occur only via eruptive episodes, driven by metallicity independent mechanisms other than the usually adopted line driven stellar wind. If this is the case, LBV stars would have a paramount importance in the evolution of early universe massive stars. In this context it is therefore of great interest to study LBVs in different environments, in particular at different metallicities, to assess if the LBV phase depends on the metallicity and if the observational characteristics of LBV at low metallicity are the same as those at higher metallicity. LBVs are quite rare in our Galaxy but few members have been identified also in the Large Magellanic Cloud (LMC). Because of its lower metallicity, the LMC appears as an ideal laboratory to test the metallicity independence of this phenomenon. Moreover, very recently Matsura et al. (2009, MNRAS,396, 918), on the basis of mid-IR observations, estimated the global gas and dust input from AGB stars and SNe in the LMC. They pointed out a missing dust-mass problem as observed in high-z galaxies, implying the necessity to have an extra dust source. Among possible alternatives they considered a contribution from LBVs despite the total lack of information on the LBV mass-loss in the LMC. In order to widen our understanding of the LBV phenomenon in all these contexts, we have started a study of LBV nebulae in the LMC. We present the first radio observations, obtained at ATCA, of 4 known objects in the LMC, and through the comparison between our high resolution radio images and the HST Hα ones, we provide an estimate of the intrinsic extinction and derive the likely dust morphology. These results can be used to plan focused ALMA observations designed to obtain detailed maps of the dust component.

Carlo Burigana
INAF-IASF Bologna
Astrophysical foregrounds from the Planck mission: lessons for the ALMA era (invited talk)

In Winter 2011 and 2012 the Planck Collaboration released a set of early and intermediate papers dedicated to astrophysical emissions from our Galaxy, extragalactic sources, cluster of galaxies, cosmic infrared background together with the Early Release Compact Source Catalog, the first scientific product from the project available to scientific community. I present a review of the main Planck results, focussing on those aspects more relevant for ALMA and future projects of millimetre astrophysics.

Leslie Hunt
INAF - Osservatorio Astrofisico di Arcetri
The ALMA view of the cool dust in an extreme low-metallicity starburst
(invited talk)

The starburst in SBS 0335-052E, one of the most metal-poor starbursts in the local universe, occurs in extreme conditions; 6 Super Star Clusters (SSCs) have formed in a relatively pristine interstellar medium (ISM) (12+logO/H=7.2). ALMA's superb sensitivity and spatial resolution can for the first time probe the cool dust in this tiny galaxy, and help understand how metal enrichment and dust production proceed in early stages of galaxy formation. Our analysis of the spectral energy distribution (SED) of this SBS 0335-052E suggests that the dust mass and dust-to-gas ratio (DGR) is highly uncertain; compared with the HI mass, the dust-to-gas ratios (DGRs) range from 3e-7 to 2e-5, much lower than predicted by a linear extrapolation of the DGR variation with metallicity. However, the SED fits are unconstrained, because there have been no detections of cool dust so far. We are likely missing a large fraction of dust mass traced by the cool dust which ALMA can now measure. Most of the star-formation activity occurs in the two brightest SSCs, which host almost 10000 O stars in a compact region unresolved by the HST. With ALMA, we can assess the effects of feedback of the massive stars on the dust morphology and the clumping scale of the cool dust in an extreme unenriched ISM. Ultimately, our proposed observations will a new window on the transition from metal-free star formation in the early universe to the chemically evolved massive galaxies typical of the current epoch.

Rosita Paladino
Universita' di Bologna/INAF-IRA Italian ARC
Magnetic fields and cosmic rays effects on star formation processes

Star formation processes involve in different ways all the different interstellar medium components, particularly puzzling is their connection with cosmic ray particles and magnetic fields. The correlations observed in galaxies between radio continuum emission and different star formation tracers, are interpreted as a manifestation of this link. Most of the models proposed so far to explain these correlations consider global properties, while the correlations have been proved to hold also on local scales in different galaxies.
Spatially resolved observations are crucial in providing constraints to the models addressing these local properties. I present the possibility to study the magnetic fields and cosmic rays effects on star formation, by comparing low frequencies (<1 GHz) observations with star formation tracers (such as molecular emissions observed with ALMA). These studies will be nicely complemented by mm polarization observations, providing information about the giant molecular clouds magnetic properties.

Edvige Corbelli
INAF - Osservatorio Astrofisico di Arcetri
Dust and molecules in Virgo cluster galaxies

We present our latest results on the combined Herschel(HeViCS)-IRAM Virgo Cluster survey. The CO flux correlates tightly with far-infrared fluxes, implying that molecules in galaxies are more closely related to cold dust rather than to hot dust heated by star formation. Our results highlight quantitatively also the disturbances of the cluster environment on the dust, HI, and molecular phases of the ISM in late type galaxies.

Francesco Costagliola
Onsala Space Observatory, Sweden
Compact Obscured Nuclei

The central regions of luminous infrared galaxies (LIRGs) are deeply obscured by large columns of dust and gas and precluded from direct investigation at optical and IR wavelengths. Observations in the mm/submm can penetrate deeper in the obscuring material and provide unique information about the nuclear environment of LIRGs. In the most compact, obscured galactic nuclei (CON), star formation happens at extreme pressures and densities, resembling the conditions found in early star-forming galaxies. Here I will describe mm/submm studies of CON, focusing on how molecular lines can be used as diagnostics of the circumnuclear gas. I will briefly report highlights from my research, which include single dish and interferometric observations of CON, in particular I will discuss their peculiar molecular chemistry, dynamics and excitation. A new method for determining the temperature of the IR field via vibrationally excited molecular transitions will be also proposed. I will also discuss how the unprecedented capabilities of the ALMA array can be used to study compact obscured nuclei, briefly describing our Cycle0 spectral line survey in the prototypical CON of NGC4418.

Viviana Casasola
INAF-IRA Italian ARC
Feeding and feedback in nearby AGN and radio MOHEGs

It is now observationally well established that the supermassive black holes (SMBHs) reside in nuclei of all galaxies. Both high redshift quasars and local Seyfert nuclei are fueled by accretion of material onto the SMBH. The relationship of the black hole growth with galaxy formation and evolution is still far from being completely understood. With the NUclei of GAlaxies (NUGA) program (IRAM PdBI & 30m), we have studied the molecular gas distribution in nearby active galactic nuclei (AGN) and derived clues to their fueling. However, IRAM observations have insufficient resolution to probe the gas within 100 pc of the AGN. Thanks to our successful ALMA-Cycle 0 proposals, we now have the opportunity to resolve the gas within about 20 pc for nearby southern galaxies. These observations will constrain specific feedback mechanisms, since we are searching for molecular outflows and to determine their origin, i.e. from star formation or AGN. I will also show very recent results I have obtained with the Nobeyama 45m telescope on the search of cold molecular gas in radio MOHEGs (Molecular Hydrogen Emission Galaxies). The CO detection found in some objects of this new class of radio galaxies (e.g., Cygnus A and 3C 436) is bringing new insight into fueling and/or feedback in AGN and it will lead us to obtain higher-resolution mm-interferometer observations.

Marcello Giroletti
INAF-Istituto di Radioastronomia
The connection between millimeter and gamma-ray emission in AGNs

Gamma-ray emission from AGNs is expected to originate on very compact regions, as shown by the very short variability timescales observed at MeV, GeV, and TeV energies. Centimeter wavelengths radio emission is typically dominated by steep spectrum synchrotron radiation from more extended regions, while the most compact features are self absorbed. Therefore, radio observations in the millimeter wavelength regime are ideal to investigate the connection between radio and gamma-ray emission in blazars. I will review some possible perspectives for combined ALMA and Fermi observations, and briefly discuss how VLBI with ALMA could also reveal fundamental details about the properties of the black hole proximity, where relativistic jets are formed.

Roberto Maiolino
Cavendish Laboratory – University of Cambridge
Ricerca e caratterizzazione di galassie ad alto redshift tramite osservazioni (sub-)millimetriche (invited talk)

Presentero' alcuni recenti risultati sulla ricerca e caratterizzazione di galassie ad alto redshift ottenuti tramite osservazoni profonde con diversi osservatori millimetrici e submillimetrici (se gia' disponibili entro la data dello workshop, presentero' anche alcuni risultati preliminari ottenuti con ALMA). In particolare, presentero' i risultati di campagne osservative finalizzate alla ricerca di galassie ad alto redshift (z>4) tramite osservazioni profonde. Mostrero' inoltre i risultati di alcune osservazioni che hanno consentito di risolvere la distribuzione della formazione stellare, del mezzo interstellare e della cinematica in galassie distanti, anche prossime all'epoca di re-ionizzazione. Infine mostrero' alcune simulazioni di survey profonde finalizzate alla ricerca di galassie ad alto redshfit e alla determinazione del loro contenuto di gas molecolare, che saranno possibili una volta che ALMA sara' completata.

Paulina Troncoso
INAF- Osservatorio Astronomico di Roma
Chemical evolution and gas flows in star forming galaxies up to redshift 3.

We investigate the chemical properties of 34 star forming galaxies at z~3.4. These galaxies are part of two ESO major programs "AMAZE" and "LSD", which aim is to constrain the chemical evolution at high redshift by using the Integral Field Unit(IFU) of SINFONI. The metallicity gradients has been measured for the galaxies with higher S/N (about a third of the complete sample). The metallicity maps shows a correlation between the peak of the star formation and the part with the lowest metallicity of the galaxy, it suggest the presence of infals of pristine gas that boost the star formation but also dilute the metals (see Cresci et al. 2010, Troncoso et al. 2012). 30% of the sample show a flat metallicity gradient, while the other 70% show an internal part metal poorer than the galaxy outer parts. The decrease of the metallicity could be ascribed to an increase of pristine gas inflow (see Mannucci et al. 2009) or by a major effect given by galaxy merging. According to the dynamical classification of Gnerucci et al. 2011, 60% of these galaxies are ordered rotating disks. In these rotationally supported disk, mergers can not be addressed as the responsible of the infals of metal poor gas. Therefore, these galaxies can be suggested as an observational probe of the cold gas accretion. By inverting the Schmidt-Kennicutt law it was possible to estimate the gas content expected to be observe. Nowdays, by exploiting the capabilities of ALMA we can look forward to study the gas content and dynamics of these flows, which are a key piece to understand the galaxy formation at such early epochs.

Arturo Mignano
INAF-IRA Italian ARC
A μ variation in the MW?

The Standard Model of particle physics is a very successful theory and its predictions have been tested to high precision in laboratories around the world. A variation in the proton-to-electron mass ratio, μ, would manifest as shifts in the transition energies of molecules. By comparing laboratory transition energies with the values registered in spectra of astronomical objects, possible variations can be probed over our entire observable Universe and through most of its history.
A variation in μ can be tested through precise measurements of the relative radial velocities of narrow molecular lines observed in the cold interstellar molecular cores (Flambaum and Kozlov,2007). Recently, Levshakov et al. (2008,2009), Molaro et al. (2009) suggests a relative change of μ of about $\Delta\mu/\mu \sim 2 \times 10^{-8}$, possibly connected with the two extremely different environments terrestrial and interstellar. I will review last results and new ideas in the ALMA era.

03 Aprile 2012 - High-redshift/cosmologia

Gianfranco De Zotti
INAF - Osservatorio Astronomico di Padova
Synergies between Herschel and ALMA for the study of the high redshift universe (invited talk)

I will briefly review recent results on the early evolution of galaxies and AGN obtained thanks to Herschel surveys and will discuss synergies with ALMA. In particular, Herschel surveys proved to be extremely efficient in finding strongly gravitationally lensed high-z galaxies, some of which have very high amplifications. However observations with the ALMA sensitivity and resolution are necessary to assess the nature of candidate lensed galaxies through the detection of multiple images. The increase in angular size and brightness due to lensing, coupled with the ALMA capabilities will allow us to study in detail the intrinsic properties of high-redshift dusty star-forming galaxies, determining the spatial distribution of star-formation regions which is informative on the processes driving the galaxy evolution. The highest amplifications that can be achieved for point sources with small impact parameters will make possible to probe the obscured accretion phase of high-z AGNs and its relationship with the evolution of the host galaxy. Measurements of the image separation will allow us to estimate the Einstein radius and the total (dark+luminous) mass of the lens galaxy out to and above z=1, as the sub-mm-selection method picks up lenses at much higher redshifts than optical or radio selections. On the other hand, since strongly gravitationally lensed galaxies are rare, the Herschel surveys are crucial to select candidates for ALMA follow-up. ALMA will assess the effects of confusion (flux boosting) affecting Herschel surveys, thus improving the determination of Herschel source counts, and can directly extend them to much fainter flux density limits, resolving most of the extragalactic sub-mm background.

03 Aprile 2012 - High-redshift/cosmologia

Mattia Negrello
INAF - Osservatorio Astronomico di Padova
Gravitational lensing and ALMA: a perfect synergy for studying dust-oscured star-forming galaxies at redshift 2 and beyond.

Wide-area sub-mm imaging surveys with the Herschel Space Observatory have recently unveiled a population of sub-mm bright, strongly lensed galaxies. These galaxies are ultra-luminous infrared galaxies, representative of the star-forming population that dominates the far-infrared background at z~2. As they are severely obscured by dust their emission at optical to near-IR wavelengths is low (A_v>~5) and usually dominated by that of the foreground elliptical galaxy acting as the lens. Therefore interferometric observations at sub-mm/mm wavelengths, where these sources are bright and the contamination from the lens is negligible, are the best suited to characterize the lensed morphology, thus taking fully advantage of the increase in spatial resolution offered by gravitational lensing to study these distant galaxies. I will show some examples of lensing events discovered so far by Herschel for which follow-up observations with HST/WFC3/IR and the SMA have been obtained. I will discuss the limitations of HST observations and the advantage offered by follow-up observations with ALMA in modeling and studying these systems.

03 Aprile 2012 - High-redshift/cosmologia

Giulia Rodighiero
Universita' di Padova

In and out the main sequence of Star Forming galaxies at z~2, as revealed by Herschel

Two main modes of star formation are know to control the growth of galaxies: a relatively steady one in disk-like galaxies, defining a tight star formation rate (SFR)-stellar mass sequence, and a starburst mode in outliers to such a sequence which is generally interpreted as driven by merging. Such starburst galaxies are rare but have much higher SFRs, and it is of interest to establish the relative importance of these two modes. PACS/Herschel observations over the whole COSMOS and GOODS-South fields, in conjunction with previous optical/near-IR data, have allowed us to accurately quantify for the first time the relative contribution of the two modes to the global SFR density in the redshift interval $1.5<z<2.5$, i.e., at the cosmic peak of the star formation activity. The logarithmic distributions of galaxy SFRs at fixed stellar mass are well described by Gaussians, with starburst galaxies representing only a relatively minor deviation that becomes apparent for SFRs more than 4 times higher than on the main sequence. Such starburst galaxies represent only 2% of mass-selected star forming galaxies and account for only 10% of the cosmic SFR density at z~2. We conclude that merger-driven starbursts play a relatively minor role for the formation of stars in galaxies, whereas they may represent a critical phase towards the quenching of star formation and morphological transformation in galaxies.

03 Aprile 2012 - High-redshift/cosmologia

Marcella Brusa
MPE Garching bei Muenchen
Placing AGN in the merger sequence with ALMA

I present the case for an ALMA program of observations of a large sample of AGN extracted from ongoing large area and deep X-ray surveys, to map the gas content in the systems as a function of AGN luminosity, obscuration, host stellar mass and redshift in a systematic way as never done in the past. The scenario I want to test is whether luminous AGN at z = 1–3 live in cold-gas-rich galaxies, similarly to starburst galaxies with inactive nuclei, or whether AGN feedback was already effective in diminishing the cold gas mass in the host galaxies, and if there is a link with the system obscuration. Finding a smaller fm than that observed in starburst galaxies at the same redshifts would suggest that AGN feedback was already effective in diminishing the cold gas mass in the host galaxies, and therefore they can be placed in a later stage in the merging sequence.

Francesca Zuccarello
Università di Catania
Moving Magnetic Features around sunspots: a possible target for ALMA

Moving Magnetic Features (MMFs) are small-size magnetic elements that are seen to stream-out from solar sunspots. Although several observations suggest that MMFs are closely related to the existence and presence of penumbral filaments, there are some very few observations that report MMFs streaming from pores. We show that the characteristics of some MMFs observed around some naked spots (i.e., sunspots without a visible penumbra) agree with those reported in the literature for MMFs which stream out from spots with penumbrae. We believe that these studies and their implications on the comprehension of the process of diffusion of the magnetic field in the solar atmosphere could go a step forward if high resolution observations of the above mentioned features will be carried out with ALMA.

Michele Pestalozzi
INAF - IAPS
Herschel places methanol masers into context

Methanol masers are known to be among the most reliable tracers of high-mass stars in early stages of evolution. A number of searches across the Galaxy has yielded to date a complete census of those masers in two thirds of the Milky Way, providing a catalogue of some 800 sources to be studied in depth. In

particular, it is important to characterise the physical properties of the objects hosting methanol masers, and this is today possible using Herschel data. I will present early results in the characterisation of methanol maser hosts using Herschel data from the Hi-GAL project, an Open Time Key Project to survey the inner Galactic plane at 5 wavelengths between 70 and 500 microns. The exceptional spatial resolution and waveband coverage of the instruments on board of the Herschel Space Observatory give a unique opportunity to definitely assign physical properties to the maser hosts and draw conclusions on their nature and lifetime as well as compare maser hosts with objects showing no maser emission.

POSTERS

StefanoPezzuto
INAF - IFSI
Two very young objects in the Perseus star forming region observed with Herschel: an ideal target for ALMA observations.

As part of the Gould Belt survey, the Perseus star forming region has been observed with Herschel PACS and SPIRE instruments. In this presentation I show two interesting objects found in this field: from their SED the physical properties of the dusty envelopes have been derived: these sources present many features that suggest that are in a very early stage of their formation, being indeed two new candidates to be first hydrostatic cores (FHC). These two objects are close each other, about 20", and the Herschel spatial resolution is enough to separate them up to 250 mu. At 1.1 mm there are only Bolocam observations with a beam of 31" which makes it impossible to separate the two sources. ALMA observations can measure the millimetric flux of both sources and allow to derive the precise mass of the envelopes, as well as to clearly identify the evolutionary stage of these two sources that could be then the first firmly identified FHC.

Ciro Pappalardo
INAF - Osservatorio Astrofisico di Arcetri
Gas to dust ratio in Virgo spiral galaxies

Spiral galaxies are physical systems whose evolution is set by a complex and still not really understood interchange between gas, stars, and dust. Today many

galaxies are found in clusters, in which the stellar and gas distribution can be drastically modified through environmental effects. One of the best laboratory to investigate galaxy properties in cluster environment is Virgo, because it is a young, close 17 Mpc, and still dynamically active cluster of galaxies. In this talk I present CO emission lines observations for 7 of these galaxies, obtained at the IRAM-30m telescope. We investigate the balance between different gas phases in spiral discs and their relation with the dust component as a function of the environment.

POSTERS

Isabella Prandoni
INAF-Istituto di Radioastronomia
The Role of Molecular Gas in Radio Galaxies

It has recently been proposed that the jets of low-luminosity radio galaxies (RGs) are powered by direct accretion of the hot phase of the IGM onto the central black hole. Cold gas remains a plausible alternative fuel supply, however. The most compelling evidence that cold gas plays a role in fuelling RGs is that dust is detected more commonly and/or in larger quantities in (elliptical) RGs compared to radio-quiet elliptical galaxies. However, the role of cold gas in fueling radio jets remains an open question, as indeed ALMA is the only instrument capable of imaging the molecular component on scales relevant to the accretion process. The aim of this project is to build a well defined and complete volume-limited sample of Southern galaxies, to be imaged in the near future with ALMA. Here we present the results obtained so far from our CO(2-1) APEX detection experiment of Southern RGs, and illustrate the complementary IFU spectroscopy program, aimed at studying the interplay between the various components (cold and hot gas, stars) in the core of the RGs.

R. Gilli, C. Vignali, A. Comastri, M. Rovilos, F. Vito
Universita' di Bologna
High-redshift obscured black holes in the Chandra Deep Field South

We present prospects for ALMA observations of high-redshift AGN in the Chandra Deep Field South. The deepest X-ray observations available in this field are uncovering a population of faint accreting black holes which are likely to be both at high-redshift, obscured by significant columns of dust and gas, and whose

host galaxies are experiencing a vigorous burst of dusty star formation. These objects are very faint, often invisible, even in the deepest optical and near-IR observations with HST ACS and WFC3 (HUDF, GOODS, CANDELS), while they are relatively bright at wavelenghts above 3 micron. Based on the extrapolations of mid- to far-IR data available from the deep Spitzer and Herschel programs, the SED of these objects is expected to peak in the wavelength range covered by ALMA. We show that ALMA continuum observations will allow a reconstruction of their SED peak and, in turn of their star formation rate. In the most extreme cases, follow-ups with ALMA to detect molecular or atomic emission lines appears the only way to estimate the redshift of these objects.

POSTERS

Marcella Massardi
INAF-IRA Italian ARC
Simulating high-redshift Universe with CASA for ALMA-Cycle 1

In this poster I'll show a set of simulations for the ALMA-Cycle 1 for high-redshift starburst galaxies, galaxy clusters and lensed galaxies. The simulation have been performed by using the ALMA Observing Support Tool and the CASA tasks sim_observe and sim_analyze.

Carlotta Gruppioni
INAF- Osservatorio Astronomico di Bologna
The Herschel PEP+HerMES Luminosity Function: Probing evolution of FIR/sub-mm galaxies up to z~4

Here we present the first derivation of the Herschel Luminosity Function of galaxies and AGNs up to unprecedented high redshifts (z~4), obtained by exploiting the deep and extended far-IR data-set (at 70, 100 and 160 um) of the PACS Evolutionary Probe Survey (PEP), combined with that of the Herschel Multi-tiered Extragalactic Survey (HerMES, at 250, 350 and 500 um). PEP and HerMES are the Herschel guaranteed time key programme surveys of the extragalactic sky aimed to study the restframe far-IR emission of galaxies up to high redshifts. We detect very strong luminosity evolution for the total IR LF of the PACS selected sources, combined with a density decrease at all redshifts (milder at $z<1$, more pronounced at $z>1$). In agreement with previous findings, the IR luminosity density increases steeply to $z\sim1$, then flattens between $z=1$ and $z=2$, to decrease at $2<z<4$. However, the evolution of the "global" LF comes from the combination of the different evolutionary paths of the different IR

populations. Our large and deep statistical sample of far-IR/sub-mm galaxies is the only one allowing us to separately study the different evolutionary behaviours of the single IR populations contributing to the IR luminosity density of the Universe.

POSTERS

Barbara Lo Faro
Universita di Padova

Physical modeling of a faint galaxy sample with FIR and submm data by Herschel and deep IR spectroscopy by Spitzer: the complex physics of dusty star-forming galaxies at high redshift

We report on the first systematic effort of physical modeling of high-redshift (U)LIRGs, as a first attempt to achieve a deeper understanding of these sources. Our current study concentrates on a small sample of 31 high-z Ultraluminous and Luminous infrared Galaxies ((U)LIRGs) with the currently richest suite of photometric and spectroscopic data, combining deep Herschel imaging in 6 bands between 70 and 500 μm with ultra-deep IRS spectra from Spitzer, available for the first time at redshift $z \sim 2$. These data have been analysed with a state-of-art chemo-spectro-photometric model (GRASIL) including a self-consistent treatment of dust absorption and reprocessing based on a full radiative transfer solution. This combination not only allows precise estimates of the main physical parameters, like stellar mass and star-formation rate, but it also allows putting significant constraints on their SF history. Our study illustrates the complexity of the phenomenon of active star-formation at high-z, due mainly to dust extinction and reprocessing and the modeling of their SFHs. This sample will make the ideal reference for ALMA high-resolution observations.

Lucia Marchetti
Universita' di Padova

The evolution of the FIR/SMM Luminosity Function based on the Herschel/HerMES cosmological survey

The Herschel Multi-tiered Extragalactic Survey (HerMES) charts the obscured star formation and its evolution in galaxies throughout cosmic history. HerMES maps the sky using two instruments, Herschel-SPIRE (at 250, 350 and 500 micron) and Herschel-PACS (at 100 and 160 micron), in a nested set of fields closely coordinated with the PACS Evolutionary Probe (PEP) survey that brings unprecedented depth and breadth to galaxy evolution studies. Besides HerMES fields are some of the best studied sky areas, making maximum use of ancillary surveys from radio to X-ray wavelengths.
The HerMES survey detects tens of thousand galaxies allowing us to measure the total infrared emission of galaxies, study the evolution of the luminosity function, measure their clustering properties, and probe populations of galaxies below the confusion limit through lensing and statistical techniques. In my talk, after a brief introduction on the goals of the Herschel/HerMES observations, I will discuss the statistical properties of the SPIRE detected sources from a multi-wavelength point of view, focusing on the evolution of the far-infrared/sub-millimetre luminosity functions in the SPIRE & PACS channels and on the contribution to the star formation rate density by different classes of star-forming sources. Starting from the data I will discuss the properties of cosmological evolution of the sub-millimetric sources and compare them to those detected by mm ground-based observatories and attempt to frame them into modellistic evolutionary schemes outlining then the opportunities for follow-up investigations with ALMA.

POSTERS

Simona Gallerani
Scuola Normale Superiore di Pisa
Resolved [CII] emission in a lensed quasar at z=4.4

We present one of the first resolved maps of the [CII] 158 μm line, a powerful tracer of the star forming inter-stellar medium, at high redshift. We use the new IRAM PdBI receivers at 350 GHz to map this line in BRI 0952-0115, the host galaxy of a lensed quasar at z=4.4, previously found to be very bright in [CII] emission. The [CII] emission is clearly resolved and our data allow us to resolve two [CII] lensed images associated with the optical quasar images. We find that the star formation, as traced by [CII], is distributed over a region of about 1 kpc in size near the quasar nucleus, and we infer a star formation surface density of about 200 Msun/yr/kpc^2, similar to what is observed in local ULIRGs. We also reveal another [CII] component, located at about 10 kpc from the quasar. This component is extended over about 12 kpc. We suggest that this component is a companion disk galaxy, in the process of merging with the quasar host, whose rotation field is distorted by the interaction with the quasar host, and where star formation, although intense, is more diffuse. These observations suggest that galaxy merging at high-z can enhance star formation at the same time in the form of more compact regions, in the vicinity of the accreting black hole, and in more extended star forming galaxies.

Claudio Maccone
INAF-IASF Milano
SETI millimetrico e sub-millimetrico con ALMA

Il SETI (Search for Extraterrestrial Intelligence) finora e` stato solo condotto sugli 1-10 GHz e nell'ottico. Ma speculazioni sono state fatte, in particolare da Kardashev, sulla possibilita` di fare un SETI sulla riga del positronio a 204 GHz (1.477 mm) o su altre righe nel millimetrico e sub-millimetrico. In questo lavoro si cerca di capire meglio quali tipi di osservazioni SETI si potrebbero fare con ALMA.

POSTERS

Lucia Sabbatini
Università Roma Tre
COCHISE: first light del telescopio millimetrico italiano a Dome C (Antartide)

COCHISE (Cosmological Observations at Concordia with Highsensitivity Instrument for Source Extraction) è un telescopio millimetrico di 2.6 m di diametro, in grado di operare tra 200 μm e 3 mm di lunghezza d'onda, situato sull'alto plateau antartico presso la stazione italo-francese di Dome C. Dopo le fasi di installazione e calibrazione, il telescopio COCHISE è ora perfettamente funzionante, e le osservazioni preliminari hanno soddisfatto in pieno le aspettative. Questo risultato incoraggia la prosecuzione delle attività, con la realizzazione di osservazioni astrofisiche e cosmologiche. Nel corso dell'estate australe 2010-2011 è stata effettuata la first light: questo risultato importante segna l'inizio delle osservazioni millimetriche a Dome C. Oltre all'interesse scientifico, COCHISE riveste anche un ruolo importante per gli aspetti tecnologici, essendo il telescopio più grande attualmente installato a Dome C. Vengono qui descritte le caratteristiche principali dello strumento, le osservazioni di calibrazione su pianeti, le misure di site testing.

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