SMA Newsletter

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FROM THE DIRECTOR

Dear SMA Newsletter readers,

The month of June was an exciting time for the SMA, first with the SMA: First Decade of Discovery Conference, followed immediately by the SMA Advisory Committee Meeting. I take this opportunity to thank all involved for making both events enjoyable and successful.

For some time now, the SMA digital group has been working on adding additional correlator capacity with a new correlator, called SWARM, based on the ROACH-2 platform developed by the CASPER collaboration. We have hoped to offer additional bandwidth on a shared risk basis for some time, and I am happy to report that we will offer an additional 2 GHz of bandwidth alongside the 4 GHz bandwidth afforded by the original SMA ASIC correlator this fall. With the SMA's double sideband receivers, this will result in a total processed bandwidth of 12 GHz: 8 GHz from the ASIC correlator, and 4 GHz from SWARM. This will provide increased sensitivity for continuum observations, and additional, though not spectrally contiguous, bandwidth for spectral line observations. Specifically, the ASIC correlator will cover the IF range of 4 – 6 GHz and 9 – 11 GHz, and SWARM will cover 8 – 9 GHz and 11 – 12 GHz. An updated version of the SMA passband visualization tool has been developed and is available to help prepare observing proposals and observations.

Assuming the initial observations with SWARM proceed as planned, we expect to offer even more bandwidth in the following semester.

Ray Blundell

SMA OBSERVATIONS OF SPATIALLY RESOLVED CONTINUUM AND [CII] EMISSION FROM A STRONGLY LENSED INTERACTING SYSTEM AT Z=5.24

A synopsis of Rawle, T.D. et al 2014, ApJ 783:59, by Mark Gurwell

Observation of atomic and molecular line emission from galaxies is an important diagnostic tool, providing insight into processes such as star formation, active galactic nuclei (AGN) fueling, and the state of the interstellar medium (ISM). The line emission is dictated by local conditions such as density, temperature, and abundance, and if resolved spectrally, dynamics. These conditions change with time, and observations of galaxies at high redshift can provide information on the evolution of molecular material in the universe. However, galaxies at high redshift appear relatively small and faint; their line emission (and even continua) are difficult to detect and resolve. A useful technique to overcome these challenges is observation of lensed objects, which benefit from magnification via an intermediate massive object. The magnification both increases the observed flux density along with the linear size of the lensed object, albeit with a distorting lens. Nonetheless, observations using sensitive interferometers such as the SMA (and now ALMA) allow for detection and resolution of star-forming galaxies at high redshift in the millimeter and submillimeter bands.

SMG HLSJ091828.6+514223 (HLS0918 hereafter) was discovered in widefield Herschel/SPIRE observations of the region around the massive cluster A773 obtained for the Herschel Lensing Survey (Egami et al 2010) program. HLS0918 is an unusually bright "500 μm peaker" source in the Herschel/SPIRE data. The source was initially described using spatially integrated observations of mm/submm spectral lines and continuum in Combes et al (2012).

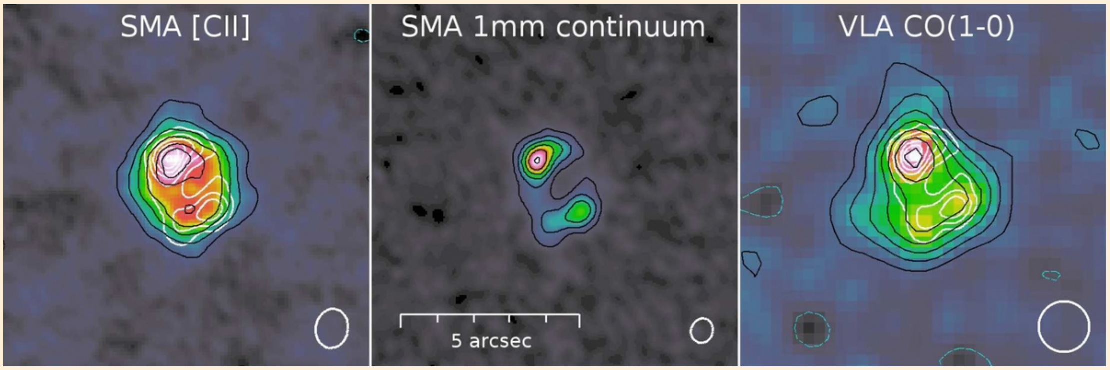

Figure 1: Imaging of HLS0918 covering a 10"x10" field centered on the lensed source. (left) Map of redshifted [CII] integrated line emission observed with the SMA (color scale and dark contours). (center) 1mm observed frame continuum emission morphology (also reproduced as white contours in left and right panels) showing resolved structure indicative of lensed. (right) complementary map of redshifted CO(1-0) integrated line emission observed with the VLA. (from Fig. 1 of Rawle et al 2014)

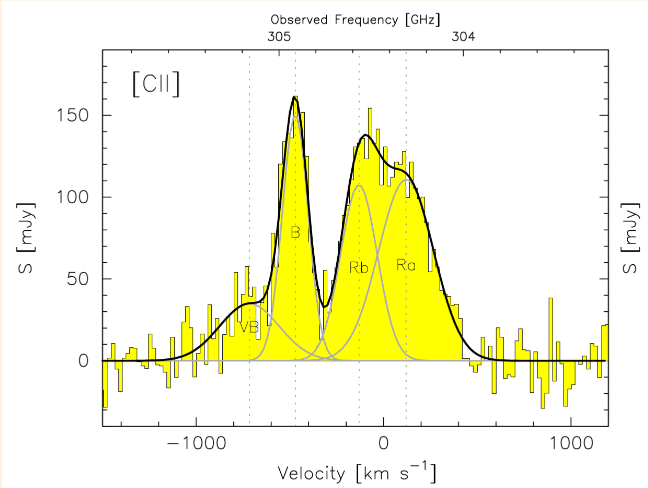

Figure 2: Continuum-subtracted and spatially integrated[CII] line profile (rest frequency 1900 GHz, shown at the observed redshifted frequency. The best, fully simultaneous fit by four Gaussian-profile components are overlaid: two red (Ra and Rb; +120 ± 30 and −130 ± 20 km s−1, respectively), a blue (B; −470 ± 10 km s−1), and a "very blue" (VB; −720 ± 40 km s−1). All velocities are relative to the center of the broad [CII] peak at redshift z = 5.2430. (from Fig. 3 of Rawle et al 2014).

At the position of the mm/submm emission lies an intermediate redshift galaxy (z=0.63) which dominates the optical imaging. Combes et al (2012) used the peak of the observed $^{12}CO(6-5)$ line to derive a redshift for the lensed source at z=5.2429, and estimated the total magnification of μ~11. Two kinematic components were identified from the CO, [NII], [CI] and water lines detected. In this new paper, Rawle et al present new, spatially resolved imaging of [CII], obtained with the SMA, and $^{12}CO(1-0)$, from the JVLA, originating from HLS0918. The resolved observations are used to characterize the gas properties and morphology of the system in detail, including a new model for the combined lensing effects of the intermediate redshift galaxy along with the cluster A773.

Observations using the SMA were obtained in 2011 December (compact), 2012 February (extended) and 2012 April (very extended), with the array tuned to the redshifted [CII] line, with an observation frequency near 304.5 GHz in the USB, while the LSB sampled a line free continuum region of the spectrum. The combined uv data resulted in a synthesized resolution of 1.33″x1.10″ FWHM for the spectral data; the 1mm continuum data, with higher SNR, were imaged with more uniform weighting emphasizing the longer baselines, resulting in a synthesized resolution of 0.69″x0.60″. Both the continuum map and the spectrally integrated [CII] line emission above the continuum are shown in Fig. 1, left and center panels. The integrated continuum flux density at 1mm is 103±9 mJy.

The spatially integrated complex spectrum of [CII] is shown in Fig. 2, which clearly shows intensity and kinematic structure. Using the [CII] line to provide an initial component model, Rawle et al use all the lines from Combes et al (2012) and the two new lines to obtain a global best simultaneous component fit, shown as overlays in Fig. 2 for [CII]. Four components are characterized: Ra: V = +120 ± 30 km s−1 , ΔVFHWM = 350 ± 50 km s−1 , Rb: − 130

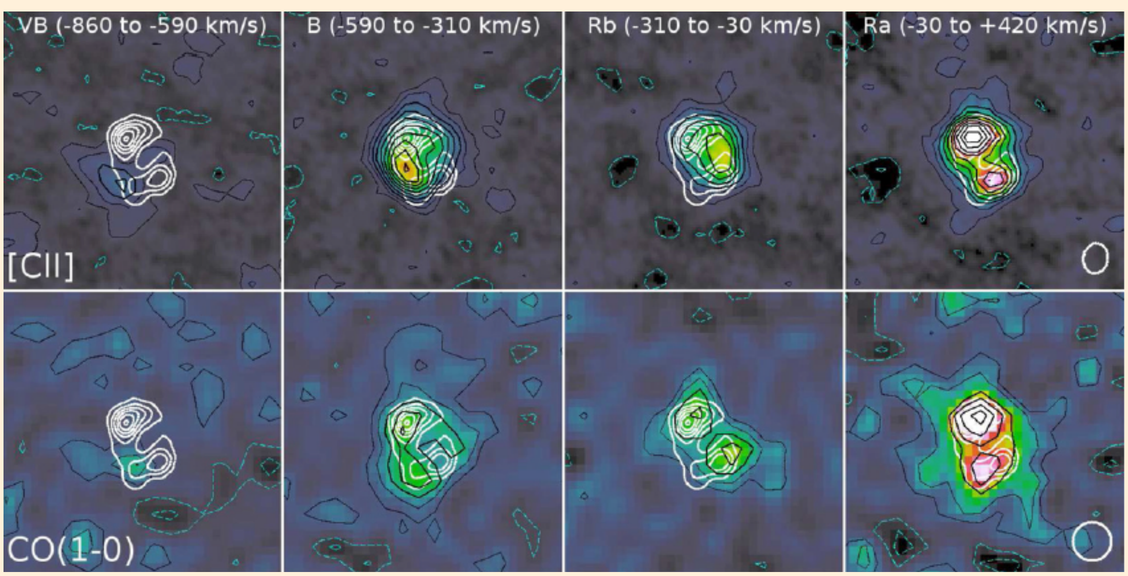

Figure 3: Spatially resolved imaging of the four identified components from HLS0918, for [CII] (top row) and $^{12}CO(1-0)$ (bottom row). The SMA 1mm continuum data is shown as white contours, while the integrated line emission is shown in the color map with dark contours. Both lines show that the emission from the components is spatially distinct. (from Fig. 4 of Rawle et al 2014)

± 20, 230 ± 30 km s−1 , B: − 470 ± 10, 160 ± 10 km s−1 , and VB: − 720 ± 40, 370 ± 170 km s−1 . The SMA [CII] and JVLA CO(1-0) data, decomposed into spectrally integrated bins covering the four identified components, are shown in Fig. 3. Concentrating first on the high S/N [CII] data (upper row), the spectral components are clearly located in distinct locations on the sky. Ra corresponds to the bright north and south peaks visible in the 1 mm continuum map. The Rb and B appear as two arcs, to the west and east, respectively, with the latter aligned to the bridge identified in the continuum map. Division of the broad "red" spectral peak into Ra and Rb components is essential to extract the western bridge. The faint VB spectral component appears as a faint source to the southeast of the continuum flux. The $^{12}CO(1–0)$ data have a lower S/N and a poorer spatial resolution than [CII]. Despite these limitations, there are many similarities to the [CII] maps.

Derivation of the absolute luminosity, along with other source-plane characteristics such as the true morphology, requires a well-constrained model of the magnification and distortion due to lensing. For HLS0918, the lens model has to combine the effect of both A773 (z = 0. 22) and the foreground galaxy at z = 0. 63. Using the SMA [CII] data, Rawle et al use a lensing model (to be described in a future paper) to estimate the source plane structure. It is determined that the bright regions to the north and south are images of the same source with a joint magnification μ_{Ra} = 9.4; The total ("flux-weighted") magnification of the full source HLS0918 is μ_{total} = 8. 9 ± 1. 9. In the final analysis, the four components are shown to originate from a source-place region separated by _ 4 kpc, with the three reddest crossing the caustic (double images).

This comprehensive view of the gas properties and morphology of a system at z = 5.2 shows the power of gravitational lensing in revealing star formation and galaxy evolution in the early universe. This paper also offers a preview of the type of analysis that will become possible for a large number of high-redshift galaxies once ALMA progresses to full science operations.

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DETERMINING THE MASS ACCRETION RATE ONTO THE SUPERMASSIVE BLACK HOLE IN M 87

Keiichi Asada, Cheng-Yu Kuo, Ramprasad Rao, Masanori Nakamura and Patrick Koch

Active Galactic Nuclei (AGNs) are some of the most powerful (~ 10^{35}-10^{41} W) objects in the universe. It is widely believed that this spectacular phenomenon can be attributed to the release of gravitational energy from matter that is accreting onto a super massive (10^{6}-10^{10} $M_{\odot}$) black hole (SMBH). Therefore, the mass accretion rate onto SMBHs is one of the fundamental parameters that can be used to investigate AGNs. However, observational understanding of the mass accretion process is very limited, as there has been no direct imaging of the accretion flow thus far.

Low Luminosity Active Galactic Nuclei (LLAGNs) are an AGN subclass with sub-Eddington luminosity. Their low luminosity is thought to be caused by an optically thin and geometrically thick accretion flow with a very low accretion rate and a very low radiative efficiency. This is in contrast with the standard disk, which is optically thick with a geometrically thin disk such as in quasars. This type of accretion flow is called *"radiatively inefficient accretion flow"* (RIAF), and has several submodels: *advection dominated accretion flow* (ADAF: e.g., Narayan & Fabian 2011), *adiabatic inflow-outflow solution* (ADIOS; e.g., Blandford & Begelman 1999) and *convection-dominated accretion flow* (CDAF; e.g., Igumenshchev & Abramowicz 1999). RIAFs are very hot (the ion temperature becomes virial and the electron temperature approaches 10^{9}-10^{11} K around the SMBHs).

Faraday Rotation Measure (RM) observations of the continuum emission at mm/sub-mm wavelengths are one of the most powerful tools which can be used to derive the mass accretion rate of such hot accretion flows (Quataert & Gruzinov 2000). In Figure 1, we show a schematic picture of such an accretion flow. The Submillimeter Array (SMA) and other interferometer arrays operating at mm/sub-mm wavelengths have been used to probe the hot accretion flow associated with our galactic center, Sgr A* (Marrone et al. 2006). While this method has been successfully used towards Sgr A*, it has only been tested in a very limited number of other LLAGNs.

Following this successful project to study Sgr A*, we conducted SMA observations to derive the mass accretion rate onto the SMBH of M 87

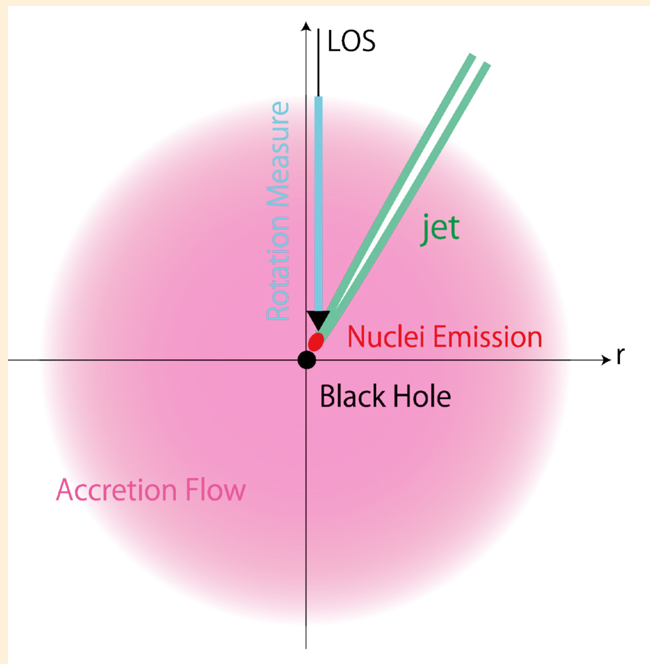

Figure 1: A schematic picture of accretion flow and its relationship to RM observations. The hot accretion flow is expected to exist in the region surrounding the SMBH and innermost jet emission (nuclei emission). Since RM is product of integration along the line of sight, the column density is derived through the RM with respect to the innermost jet emission.

(Kuo et al. 2014). This object, which is located at the center of the Virgo cluster, is one of the nearest (16.7 Mpc) low luminosity and jetted AGNs with an extremely large central SMBH of 6.6 x 10^{9} $M_{\odot}$ (Gebhardt et al. 2011). These observations were conducted using the SMA polarimetry system in the 230 GHz band with the bandwidth doubler system.

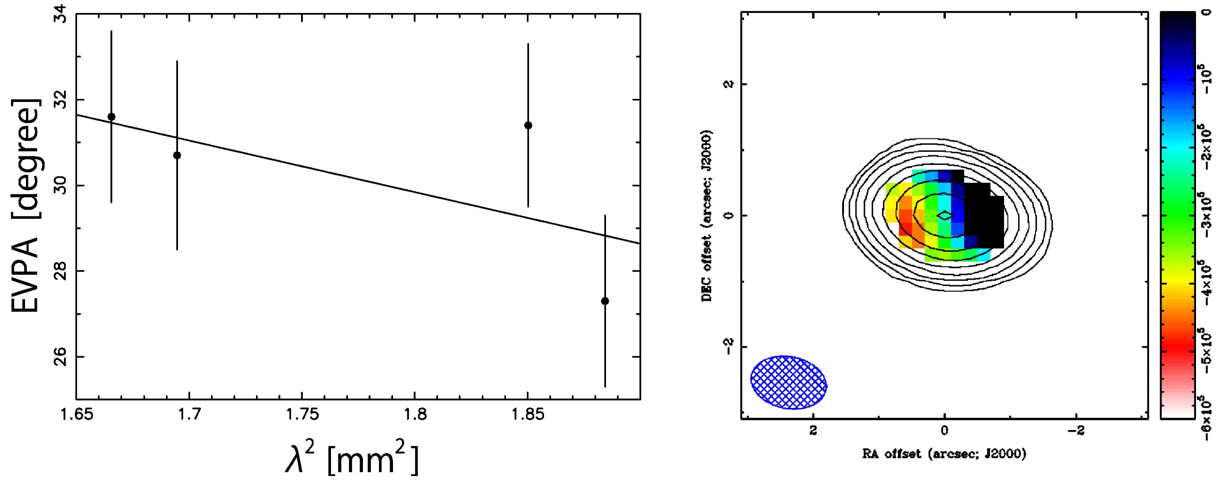

Figure 2 Left: RM fit at the center of the M87 core based on the polarization position angles measured at four different frequencies. The best-fit RM is $-(2.1 \pm 1.8) \times 10^5$ rad m^{-2}. The error bars are derived from the 1σ image uncertainty of the *Q* and *U* maps.

Right: RM image of M87 (color scale) superposed on the total intensity (contours).

In Figure 2, we show the observed polarization position angles as a function of the square of wavelength. The RM that was derived was - $(2.1 \pm 1.8) \times 10^5$ rad m^{-2} ; due to the low sensitivity, we determine the RM to be in the range between -7.5×10^5 and 3.3×10^5 rad m^{-2} with a 3 sigma confidence level. By assuming that the density profile of the accretion flow follows a power law distribution ($n \sim r^{-\beta}$) and that the magnetic field is well ordered, radial, and of equipartition strength (Marrone et al. 2007), the observed range of RM gives an upper limit of the mass accretion rate to be 9.2×10^{-4} $M_\odot$ yr^{-1} in the vicinity (~ 21 Schwarzschild radius: r_s) of the SMBH.

X-ray observations independently estimated the mass accretion rate at a distance of ~10^5 r_s, which corresponds to the size of the sphere of influence of the SMBH (Di Matteo et al. 2003). This accretion rate was 0.1 $M_\odot$ yr^{-1}. Our estimated mass accretion rate is at least two orders of magnitude smaller than that estimated by X-ray observations. As mentioned earlier, determination of the mass accretion rate provides an effective way to constrain the accretion flow models. The ADAF model requires the mass accretion rate to be of comparable value all the way from the outer part of accretion flow to the event horizon of the BH, while the ADIOS and the CDAF models require a substantial decrease of the accretion rate towards the inner region. Our new results indicate significant suppression of the mass accretion rate in the inner region of the accretion flow; it rules out the possibility of classical ADAF, and prefers either the ADIOS or CDAF models.

The current RM accuracy is limited both by the low signal-to-noise ratio and inadequate frequency separation. Therefore, in the future, it is important to have higher sensitivity observations with significantly longer lever arm in the frequency space for a more reliable RM detection. Recently, a new capability of using wider separation between the two 2 GHz sub-bands with the bandwidth doubler system has been available for SMA observations. By using this setup, we have started follow-up observations in order to derive a tighter constraint on the mass accretion rate onto the M 87 SMBH. Furthermore, future mm/submm VLBI polarimetry including SMA and Greenland Telescope will reveal the spatial distribution of the RM. This will enable us to investigate the radial profile of the accretion flow together with the shadow of the SMBH and the structure of the magnetic field at the launching region of the relativistic jet.

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SUBMILLIMETER INTERFEROMETRY OF THE LUMINOUS INFRARED GALAXY NGC 4418: A HIDDEN HOT NUCLEUS WITH AN INFLOW AND AN OUTFLOW

Kazushi Sakamoto

The luminous nucleus of the spiral galaxy NGC 4418 is among the most obscured in the local universe. The luminosity source behind the »50 mag of visual extinction has been suspected to be an AGN for nearly three decades (Roche et al. 1986) but conventional diagnostics do not work with such a heavy obscuration. As the obscuring dust is a good emitter of submillimeter continuum, we observed the nucleus with the SMA to use the new submillimeter diagnostic previously applied to Arp 220 in Sakamoto et al. (2008); see also the Aug. 2008 issue of SMA Newsletter. Namely, we aimed at measuring the bolometric luminosity L_{bol} and luminosity to mass ratio L_{bol}/M_{dyn} to characterize the nucleus.

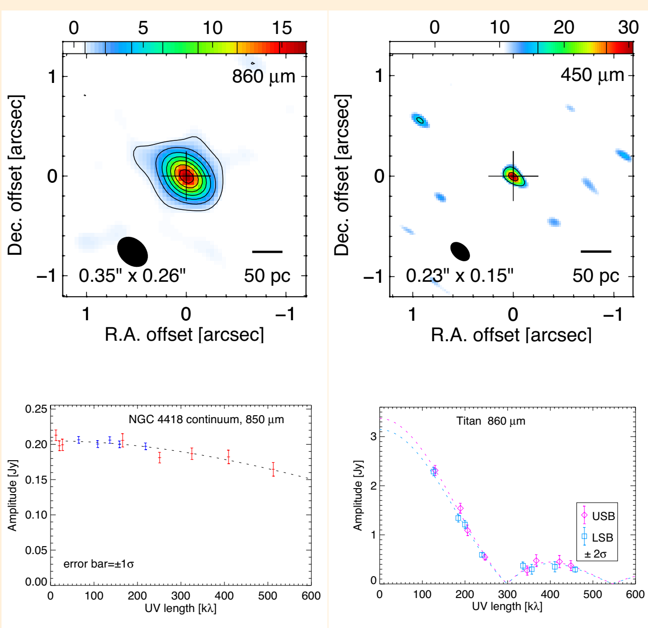

Figure 1 Top: 860 and 450 µm continuum emission of the nucleus of NGC 4418. The nucleus is detected at 5.8 σ at 450 µm. **Bottom:** Baseline– amplitude plots for the 860 µm continuum of NGC 4418 and a test source, Titan.

Our 850 and 450 µm images of the nucleus are in the upper panels of Fig. 1. The 850 µm continuum is partially resolved. We obtained the source size of ~20 pc (0″.1) and (peak) brightness temperature of 120–210 K from the visibility fitting (Fig. 1, lower-left). The 20 pc core has thus a bolometric luminosity of about $10^{11} L_{\odot}$. We also obtained its luminosity-to-mass ratio of ~500 $L_{\odot}/M_{\odot}$ by supplementing the dynamical mass we estimated from our simultaneous molecular line observations.

This *L/M* in the central 20 pc of NGC 4418 is so high that it can be only explained with an AGN or a starburst younger than about 10 Myr (see Fig. 2, left). Interestingly, the *L/M* for the central 20 pc of NGC 4418 is comparable to the one we previously measured for the central 50–80 pc of the western nucleus of Arp 220. A high *L/M* like this in a dusty environment is expected to cause an ISM outflow through radiation pressure on dust. In Arp 220, we found through P-Cygni profiles (i.e., blueshifted absorption) of molecular lines an outflow on both of the two merger nuclei (Sakamoto et al. 2009). In NGC 4418, however, redshifted absorption and hence inflow has been found through Herschel observations of molecular lines by González-Alfonso12. Although we did not see an outflow in our SMA data, we found (almost by chance when looking at public optical images from the Sloan Digital Sky Survey) a clear kpc scale outflow cone in dust reddening (Fig. 2, right). The nucleus of NGC 4418 thus has both an inflow and an

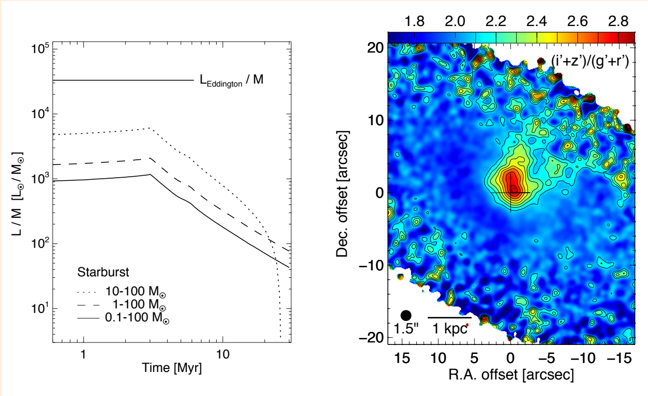

Figure 2 Left: Luminosity-to-mass ratio for starburst as a function of age as well as *L/M* at the Eddington limit. **Right:** Optical color index image of NGC 4418 showing a kpc-scale dust outflow cone along a semi-minor axis.

outflow. These dynamic features imply that the nucleus is rapidly evolving.

There have been more recent developments on NGC 4418. Costagliola et al. (2013) reported SMA 1.3 mm imaging of the nucleus at ~0″.4 resolution. Among their interesting observations are detection of vibrationally excited HNC and HC_3N lines at vibrational temperatures of about 300 K. This is consistent with the SMA detection of vibrationally excited HCN with $T_{vib} \approx 230$ K (Sakamoto et al. 2010). These lines suggest the presence of warm molecular gas and strong IR radiation in the nucleus. Moreover, Varenius et al. (2014) resolved the 5 GHz emission of the nucleus at the resolution of ~15 mas using EVN and MERLIN and found clumps that they infer to be super star clusters and possibly an AGN. Interestingly the group extent of their most prominent peaks is about 0″.1 and comparable to our SMA 860 μm size. It is plausible that we are seeing the same luminous core at the nucleus.

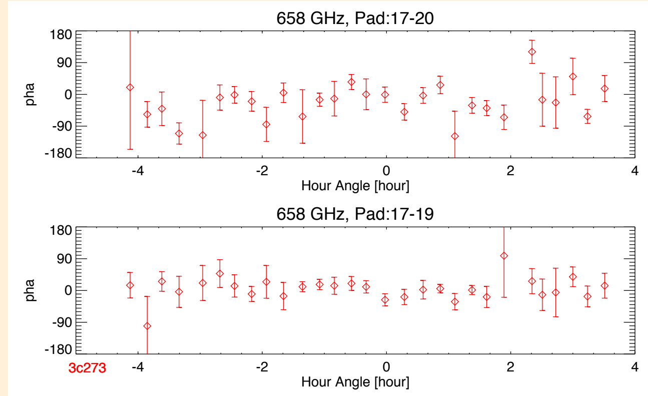

Figure 3: SMA fringes at 455 μm (658 GHz) toward 3C273 (~4 Jy) on Mar. 3, 2010. The projected baseline length varied between 420–460 m in the upper panel and 140–230 m in the lower. The bandwidth is 1 GHz and each point is from nine 20 sec integrations. Bandpass and gain calibrations have been applied with 1.5 hr smoothing in the latter.

There were two technical achievements in our SMA observations. First, we could measure a size of 0″.1 at 850 μm. We verified our size measurement capability by observing a distant quasar and Titan. We found the quasar to be a point source, as it should be, and we could measure the known subarcsec size of Titan (~0″.8) with an accuracy of 3% or 20 mas (Fig. 1, lower-right). Secondly, we could use the SMA in its largest configuration (VEX config.) at 660 GHz. The fringes of our gain calibrator 3C273 are shown in Fig. 3. The 450 μm image in Fig. 1 must be among the highest resolution images made with the SMA alone.

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MOST IN-DEPTH VIEW OF THE INITIAL STAGES OF MASSIVE CLUSTERED STAR FORMATION

Ke Wang (ESO) and Qizhou Zhang (CfA)

Massive stars drive the evolution of galaxies, but how they come into existence is still a fundamental open question. Particularly critical and still poorly understood is the very early stage of evolution, i.e., initial conditions in molecular clouds leading to the onset of massive star formation.

We have carried out a series of studies on infrared dark clouds (IRDCs) aiming to characterize the early stages of evolution (Zhang et al. 2009; Zhang & Wang 2011; Wang et al. 2011, 2012ab, 2013, 2014). Seen as shadows against the Galactic IR background, IRDCs are extremely cold and dense molecular clouds that represent the early stages of massive star formation. Our dedicated observing campaign is carefully designed to resolve the initial fragmentation of dense IRDC clumps (using SMA dust continuum) and at the same time to measure the gas temperature and turbulence (using VLA NH_3 lines) at a matching resolution. This coordinated effort allows us to infer the nature of the fragmentation and to constrain theoretical models.

Highlighted here is a prime example of IRDCs catalogued as G11.11-0.12, also known as the "Snake Nebula" (Wang et al. 2014). This giant molecular cloud sketches a striking dark semi-sinuous feature in the mid-IR sky, and transitions to emission at far-IR wavelength (Figure 1). The S-shaped Snake measures 30 pc in the sky at a distance of 3.6 kpc. Approximately 10^4 $M_\odot$ of dense gas is inferred for the entire cloud based on the *Herschel* dust emission. Seen at higher resolution, the cloud is highly structured: it comprises of several clumps of ~1 pc in size and 18 protostellar cores of ~0.1 pc in size. The cores are identified as point sources from deep *Herschel* images (Henning et al. 2010). However, detailed structures beyond the core scale, the key to understand the early fragmentation that directly initiates subsequent clustered star formation, are only accessible by deep interferometric imaging. With the SMA and VLA, we peered into the two most massive (~10^3 $M_\odot$) and low-luminosity (10^2-10^3 $L_\odot$) clumps within the Snake nebula, designated as P1 and P6.

As shown in Figure 2, the high-resolution, high-sensitivity SMA continuum images at 1.3 and 0.88 mm resolve two levels of fragmentation in both P1 and P6: the clump (~1 pc in size) fragments into 6 dense cores (~0.1 pc), some of which further fragment into even smaller condensations (~0.01 pc). While the clump fragmentation is consistent with the gravitational collapse of a gaseous cylinder, the masses of the dust cores and condensations are

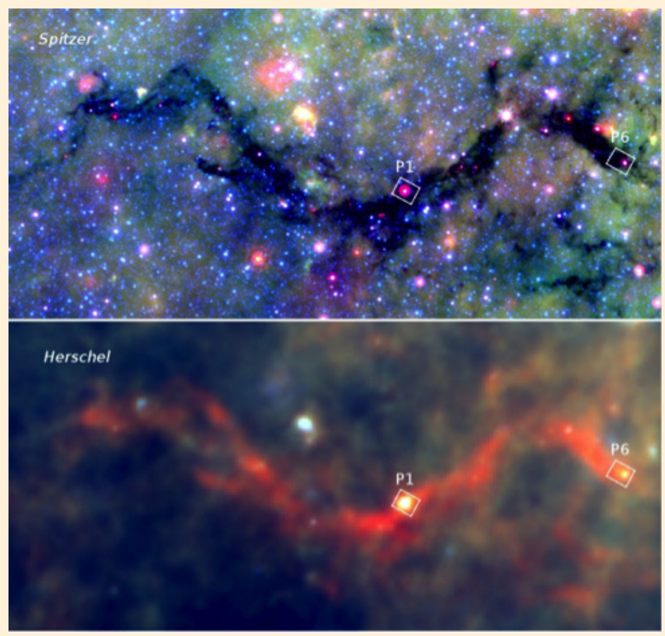

Figure 1: Panoramic view of the Snake nebula (IRDC G11.11-0.12). The upper panel shows a Spitzer composite view at mid-infrared wavelengths (red/green/blue = 24/8/4.5 micron), outlining the dark features; the lower panel shows a *Herschel* composite image at far-infrared wavelengths (red/green/blue = 350/160/70 micron), highlighting the emission from cold dust. The match between the absorption and emission between the mid-IR and far-IR views indicates that the dust is cold (~15 K). Two white boxes label regions we zoom-in with SMA deep imaging (see Fig. 2).

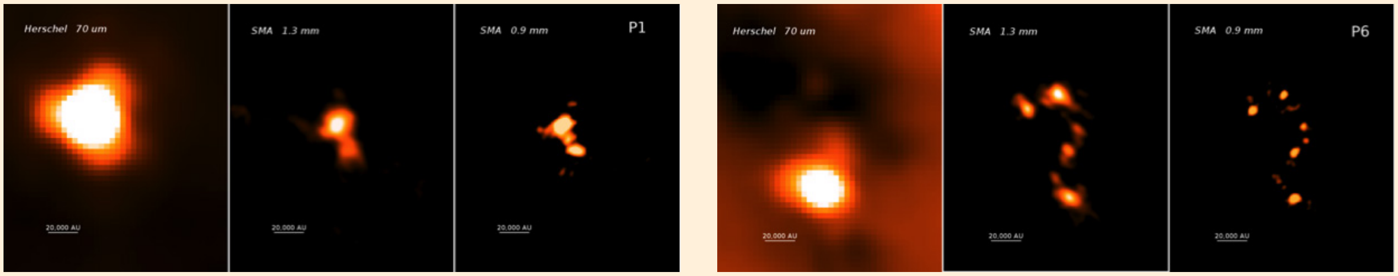

Figure 2: Comparison of deep images obtained from Herschel and SMA at different angular resolutions. SMA images resolved small "star formation seeds" invisible even in these deep Herschel images (taken as part of the EPoS key program, Henning et al. 2010). In P6, the seeds distribute in a question-mark shape which reflects the original morphology of the parent clump from which the seeds arise.

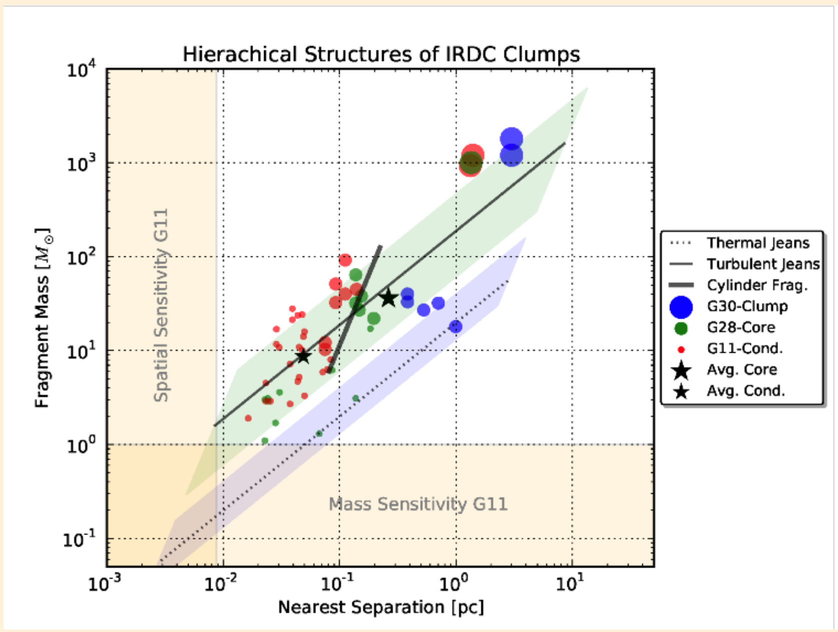

Figure 3: Structural analysis: fragment mass versus projected separation to the nearest fellow fragment. Circles filled with various sizes denote clump, core, and condensation. Sources are color coded as G11.11 red, G28.34 green, and G30.88 blue. Predictions of various fragmentation scenarios are shown by lines and blue/green shaded areas. This figure shows that the fragmentation of clump-cores and core-condensations are dominated by turbulence over thermal pressure.

much greater than the respective thermal Jeans masses (see Figure 3). This is similar to what was found in IRDCs G28.34+0.06 (Zhang et al. 2009; Wang et al. 2011,2012a) and G30.88+0.13 (Zhang & Wang 2011), suggesting that turbulence supported fragmentation is common in the initial stages of massive star formation.

A total of 23 condensations sized ~0.01 pc with masses ranging from 5 to 25 $M_\odot$ are resolved in P1 and P6. These are the smallest "seeds" of star formation; each will form one or a multiple system of stars. Some of the seeds are clearly forming stars -- as indicated by protostellar outflows, shocked NH_3 gas, and masers -- while others appear to be still quiescent. For instance, the discovery of an East-West outflow in P1-SMA1 provides critical support to a long hypothesized North-South disk surrounding the central protostar. Furthermore, millimeter spectra of the condensations differentiate them from each other in terms of variations in evolutionary stages. Seeds associated with star formation are chemically active, with spectral line emission similar to hot molecular cores but at a lower gas temperature of <30 K; quiescent seeds have very little detectable lines, some only show ^{12}CO. The observed snapshots of physical and chemical properties can be placed along an apparent evolutionary sequence, which is subject to further tests by chemical modeling.

For the first time, enrichment of ortho-NH_3 is found to increase along protostellar outflows downstream. We find ortho/para-NH_3 abundance ratios of 1.1 ± 0.4, 2.0 ± 0.4, and 3.0 ± 0.7 associated with all three identified outflows in clump P6, at locations of 0.03, 0.15, and 0.3 pc to protostars, respectively. This suggests that the NH_3 molecules have been released to gas phase from dust grains by outflow shocks, and that the ortho-NH_3 is preferentially desorbed than para-NH_3 because the former requires less energy for desorption than the latter, due to the energy difference in the lowest ortho and para states.

Because of the large mass reservoir in the cloud, P1 and P6 will become star clusters that contain massive stars, once the mass accretion is complete. By then, the Snake nebula will dissolve and shine as a chain of several star clusters.

Our combined SMA and VLA observations of IRDCs present the most in-depth view so far of the early stages of massive star formation prior to the hot core phase. We find that the early phase is characterized by hierarchical fragmentation at multiple levels that leads to structures at multiple spatial scales, ranging from ~1 pc down to ~0.01 pc, where turbulence dominates the fragmentation at all scales probed. These results are yet to be fully implemented by theoretical models. The observations of P1 and P6 have been published in Wang et al. (2014). Multi-scale fragmentation and gas kinematics of the entire Snake nebula will be addressed by our upcoming ALMA observations.

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- Wang K. et al., 2013, Protostars and Planets VI, #1S025, 25
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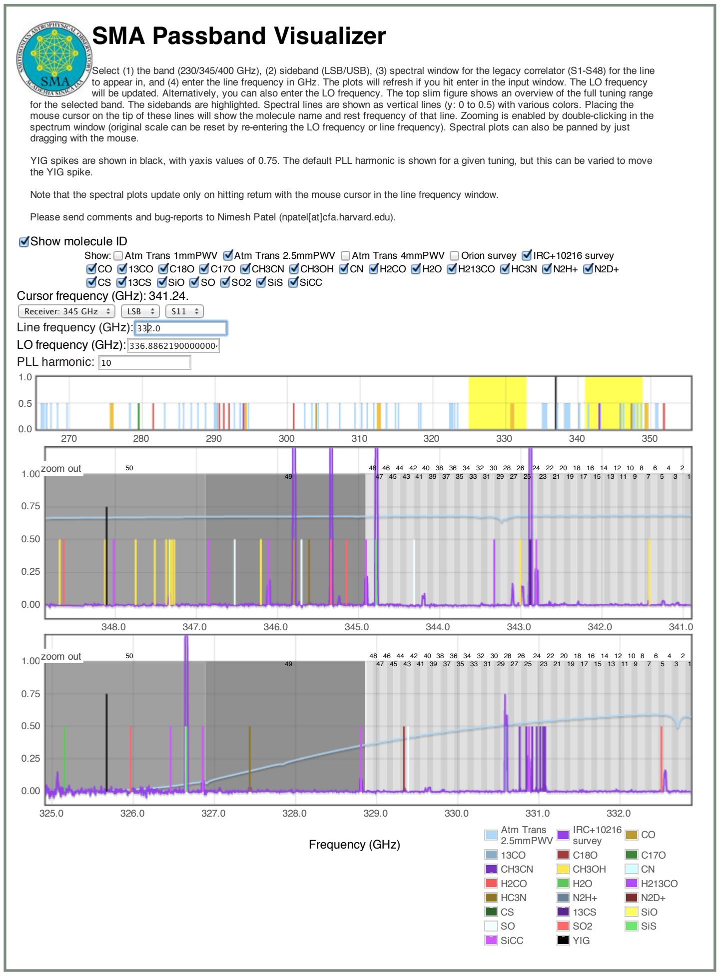
SMA PASSBAND VISUALIZER FOR THE NEW WIDEBAND CORRELATOR

Nimesh Patel

The SMA Wideband Astronomical Roach2 Machine (SWARM) correlator is currently being implemented and is expected to be fully operational during this observing semester (2014A). The Passband Visualizer tool on the SMA Observer Center website, was written by Chris Schaab and maintained by Ryan Howie. This tool needed improvements to the user interface, enhanced clarity in graphical and textual elements, and expansion of spectral range to include the extra 4 GHz of bandwidth for SWARM. We have created a new passband visualizer with significantly enhanced usability, a more comprehensive database of molecular lines, and additional 4 GHz of bandwidth for SWARM. The correlator configuration for SWARM portion of the bandwidth is not required since the spectral resolution is fixed at the highest resolution of 122 KHz per channel in the new chunks S49 and S50. And the correlator configuration for the ASIC correlator remains the same as before, so the previous tool can be used for specifying/checking the assignment of number of channels in various spectral chunks in S1 to S48.

The new passband visualizer is available under Tools on the Observer Center (http://sma1.sma.hawaii.edu/smaPassbandViewer/smaPassbandVis.html). Frequencies of the molecular lines were obtained from the ALMA Spectroscopy Group's Splatalogue website, and JSON format database entries were created for display on the webpage using Jquery and Flot packages. Atmospheric transmission curves can be overlaid on the spectral coverage displays for 1, 2.5 and 4 mm of precipitable water vapor levels. These curves are obtained from Scott Paine's latest version of his Atmospheric Model code (see SMA technical memo number 152, "The am Atmospheric Model", 3 March 2014). As before, the Orion line survey can be plotted. The SMA IRC+10216 line survey data in 345 and 400 GHz bands can also be overlaid. Plots of spectral coverage can be zoomed and scrolled with an overview display showing the full tuning range. Spurs caused by the YIG frequency for a given LO frequency and PLL harmonic, are shown in both the sidebands as black lines. These spurs can be relocated by changing the PLL harmonic value to place them away from spectral windows including lines of interest.



We hope this new version of the SMA Passband Visualizer will be helpful in planning the tuning setup for observations using SWARM as well as the legacy ASIC correlator..

INTERFEROMETRIC POINTING CAN NOW BE FASTER

Ken Young (CfA)

The ipoint command, which determines pointing offsets for the antennas by observing a strong unresolved or weakly resolved source, can now run faster. By default, ipoint takes data at five positions: on-source and offset by 1/2 primary beam in +-Az and +-El. The new faster mode takes data on only three positions, each 1/2 beam from the nominal pointing, and located at the vertices of an equilateral triangle. The new faster mode (selected with the -3 option on the ipoint command) takes only 60% of the time required by the default mode. The new mode derives pointing corrections which are consistent with the default mode, as long as the required corrections are less then 1/2 of the primary beam width. This new mode should be helpful for PIs who request frequent pointing updates during their science tracks.

NEW OPTIONS FOR SMA DATA REDUCTION

Eric Keto and Ken Young (CfA)

The SMA has a new data reduction website:

http://www.cfa.harvard.edu/sma/smaData/

The new site presents two cookbook-style tutorials, which emphasize illustrative plots and detailed discussion of SMA data reduction.

The two new sites are:

1. "Eric Keto's MIR Website", which presents a streamlined version of the standard MIR calibration. (Standard MIR is discussed at https://www.cfa.harvard.edu/~cqi/mircook.html.)

   Both MIR versions have their situations of optimal use.

2. "SMA CASA Website", which presents both calibration and imaging of raw SMA data.

   CASA is an alternative to MIR and/or Miriad processing.

Several example tracks, including a very old data set, are calibrated and/or imaged to completion.

We intend to add additional tutorials to this website and welcome feedback from the user community. Please send suggestions or comments to **smaCAL@cfa.harvard.edu**.

POSTDOCTORAL OPPORTUNITIES AT THE SMA

Applications are now being accepted for SMA Postdoctoral Fellowships starting Summer/Fall 2015. These positions are aimed chiefly at research in submillimeter astronomy, and successful candidates will participate either in observations with the SMA, research in their interpretation, or instrument development.

While the SMA fellowships are intended primarily for research associated with the SMA, being located at the Center for Astrophysics, fellows have unique opportunities to develop collaborations within the wider CfA community and enjoy extraordinary freedom in structuring their own research activities.

Applicants must have a recent PhD in astronomy or a related field. Experience in millimeter or submillimeter astronomy, radio interferometry, radio frequency instrumentation, or research in processes in the interstellar medium is desirable.

The SMA is a collaboration between the Smithsonian Astrophysical Observatory and the Academia Sinica Institute of Astronomy and Astrophysics in Taipei, Taiwan. The Smithsonian Astrophysical Observatory is an Equal Opportunity/Affirmative Action Employer where all qualified applicants receive equal consideration without regard to race, color, creed, national origin or gender.

Application information and instructions can be found at http://www.cfa.harvard.edu/opportunities/fellowships/sma/

Questions can be directed to smapostdoc@cfa.harvard.edu

Online applications are due **October 1, 2014**.

SMA: FIRST DECADE OF DISCOVERY

On June 9 and 10, 2014, the SMA hosted The Submillimeter Array: First Decade of Discovery. Over 100 people attended this scientific conference, held at the Marriott Courtyard Boston Cambridge, which showcased the scientific results from and instrumentation advances of the SMA since the official science dedication in November 2003. Presentations also discussed proposed and future studies using the SMA and the continuing importance of the SMA in the age of ALMA.

After an informal opening reception Sunday night, the conference officially kicked off Monday morning with remarks by former SMA director Jim Moran and SAO director Charles Alcock. Monday sessions highlighted the areas of protoplanetary disks, nearby galaxies, high redshift galaxies, solar system astronomy, evolved stars, and studies of the galactic center, while Tuesday shifted focus to star formation, time-domain astronomy, Event Horizon Telescope/Very Long Baseline Interferometry, and discussions about the future of the SMA. Forty posters were displayed throughout the meeting, with over half of the presenters participating in the Poster Blast on Monday. On Monday night, attendees were invited to the conference banquet, where Irwin Shapiro gave the keynote address followed by additional remarks from Ray Blundell, Ben Bosma, Fred Lo, Jim Moran and Antony Schinckel.

Poster and oral presentations will be archived online at the conference website:

http://www.cfa.harvard.edu/sma/events/smaConf/

The photo of conference attendees can be found at:

http://www.cfa.harvard.edu/sma/SMApics/sma10groupPhoto9June2014.jpg

The slide show of historical photos is available through the conference site:

http://www.cfa.harvard.edu/sma/events/smaConf/SMASlideShow.m4v

For those having playback errors, another version is also available:

http://www.cfa.harvard.edu/sma/events/smaConf/SMASlideShow.swf

Thank you and congratulations to both the Local Organizing Committee and Scientific Organizing Committee on an informative and successful conference.

SPECIAL MENTION: LES SHIRKEY IS AWARDED SMITHSONIAN INSTITUTION 2014 SAFETY PERSON OF THE YEAR AWARD

Les is the lead mechanical technician at the Mauna Kea Summit and works full time maintaining heavy equipment. Les takes it upon himself to ensure safety barriers are around hazardous equipment, ensures appropriate lockout/tagout procedures are followed, provides icy weather driver training and is a medical first responder.

We congratulate Les on his good work!

CALL FOR SMA SCIENCE OBSERVING PROPOSALS

The joint CfA-ASIAA SMA Time Allocation Committee (TAC) solicits proposals for observations for the period 16 November 2014 - 15 May 2015 (2014B semester). The deadline for submitting proposals is 7 August 2014. For more information please see link below.

http://sma1.sma.hawaii.edu/proposing.html

The deadline for the following semester (16 May 2015 - 15 Nov 2015) is expected to be on 12 February 2015.

PROPOSAL STATISTICS 2014A (16 MAY 2014 - 15 NOV 2014)

The SMA received a total of 101 proposals requesting observing time in the 2014A semester. The proposals received by the joint SAO and ASIAA Time Allocation Committee are divided among science categories as follows:

Category	Proposals
high mass (OB) star formation, cores	30
low/intermediate mass star formation, cores	21
submm/hi-z galaxies	12
protoplanetary, transition, debris disks	11
local galaxies, starbursts, AGN	10
evolved stars, AGB, PPN	9
galactic center	3
other	3
GRB, SN, high energy	2

TRACK ALLOCATIONS BY WEATHER REQUIREMENT (ALL PARTNERS):

PWV[1]	SAO+ASIAA	UH[2]
< 4.0mm	10A + 28B	0
< 2.5mm	20A + 28B	6
< 1.0mm	3A + 3B	0
Total	**33A + 59B**	**6**

(1) Precipitable water vapor required for the observations.

(2) UH does not list As and Bs.

TOP-RANKED SAO AND ASIAA PROPOSALS - 2014A SEMESTER

The following is the listing of all SAO and ASIAA proposals with at least a partial A ranking with the names and affiliations of the principal investigators.

EVOLVED STARS, AGB, PPN

Wouter Vlemmings, Chalmers University of Technology
The magnetic field of binary evolved stars

GALACTIC CENTER

Dan Marrone, University of Arizona
Probing the G2 Gas Cloud Disruption by Sagittarius A with SMA and CARMA Polarimetry*

James Moran, CfA
G2 Impact - Short Time-Scale Monitoring

HIGH MASS (OB) STAR FORMATION, CORES

Karin Öberg, Harvard University
A complete, spatially resolved survey of complex molecules in MYSO ice sources

Keping Qiu, School of Astronomy and Space Science, Nanjing University
A Toroidal Magnetic Field in the Brightest YSO Radio Jet in our Galaxy? (copied from 2012B-S020)

Keping Qiu, School of Astronomy and Space Science, Nanjing University
A twin jet powered by a massive protobinary in IRAS 16547-4247?

Pau Frau, Observatorio Astronomico Nacional (OAN) - Centro de Astrobiologia (CSIC-INTA)
Assessing the role of magnetic fields in a filament with super-Jeans fragmention

Qizhou Zhang, CfA
H30 alpha & H26 alpha recombination masers in MWC349A

Vivien Huei-Ru Chen, National Tsing Hua University
Are Dense Clumps in M17 SWex Nurturing O Stars?

LOW/INTERMEDIATE MASS STAR FORMATION, CORES

Hsi-Wei Yen, ASIAA
Linking velocity and magnetic-B field analyses from disks to associated clouds

PROTOPLANETARY, TRANSITION, DEBRIS DISKS

Meredith Hughes, Wesleyan University
HD 166191: Giant Debris Impact or Late-Stage Transition Disk?

Sean Andrews, CfA
A Size--Luminosity Scaling for Protoplanetary Dust Disks

SUBMM/HI-Z GALAXIES

Nicole Nesvadba, Institut d'Astrophysique Spatiale Orsay (France)
Probing intense star-formation in the brightest gravitationally lensed high-z galaxies discovered with Planck

Wei-Hao Wang, ASIAA
SMA Identification of Strongly Amplified SCUBA-2 Sources

ALL SAO PROPOSALS - 2013B SEMESTER

The following is the listing of all SAO proposals observed in the 2013B semester (16 November 2013 – 15 May 2014)

Mohaddesseh Azimlu, CfA
Extremly High Velocity Outflow in Small Star Forming Association

Andrew Baker, Rutgers University
SMA mapping of ACT dusty star-forming galaxies

Cara Battersby, CfA
The Role of Feedback on Core Fragmentation

Maite Beltran, Osservatorio Astrofisico di Arcetri
A new laboratory for the earliest phases of high-mass star formation

Sandrine Bottinelli, Institut de Recherche en Astrophysique et Planétologie
Presence of a jet or a cavity in the low-mass protostar IRAS16293-2422

Xi Chen, Shanghai Astronomical Observatory
Massive star formation: accreting from the companion

Laura Chomiuk, Michigan State University
Exploring the Millimeter Behavior of Novae

Christopher Faesi, Harvard University
Molecular Cloud-Scale Star Formation in NGC 300

Andres Guzman Fernandez, CfA
Fragmentation of prestellar high-mass clumps through different evolutionary stages in the Snake

Michael Hecht, MIT Haystack Observatory
Mapping HDO/HH18O on Mars as a marker of atmospheric processes and climate history

Soh Ikarashi, University of Tokyo
Searching more [CII] emitters in a [CII] emitter group discovered by AzTEC/ASTE and SMA at z=5.7

Izaskun Jiménez-Serra, ESO
Unveiling the population of deeply embedded low-mass protostars in the Monoceros R2 star cluster

Cheng-Yu Kuo, ASIAA
Exploring the Mass Accretion Flow in M87 through time variability of Polarized Emissions and Rotation Measure

Chin-Fei Lee, ASIAA
Mapping the B-fields in Protostellar Jets

Katherine Lee, UIUC
Hub-Filament Structure and Star Formation in OMC-1

Hau-Yu Baobab Liu, ASIAA
A Millimeter Survey to Characterize the Environment and the Mass-loss of Accretion Outburst YSOs

Tie Liu, Peking University
Search for infall signature in the high-mass protostellar cluster AFGL 5142

Xing Lu, CfA
Gas Kinematics in Filamentary Infrared Dark Clouds

A-Ran Lyo, Korea Astronomy and Space Science Institute
Collimated CO bipolar jets of massive YSO with ~190 km/s

Meredith MacGregor, Harvard University
Constraining the Structure and Eccentricity of Debris Disks

Dan Marrone, University of Arizona
Capitalizing on the G2 Cloud Impact: Understanding Sgr A Accretion with SMA and CARMA*

Anaëlle Maury, CfA
On the role of magnetic braking to solve the angular momentum problem in low-mass star formation

James Moran, CfA
*Monitoring the Disintegration of G2 by SgrA**

Sebastien Muller, Onsala Space Observatory
Monitoring the submm variability at the jet base of the blazar PKS1830-211 with 1% accuracy

Nicole Nesvadba, Institut d'Astrophysique Spatiale Orsay (France)
SMA dust interferometry of the brightest gravitational lenses on the sub-mm sky

Karin Öberg, Harvard University
Spatially resolved survey of complex molecules in MYSO ice sources

Karin Öberg, Harvard University
Resolving the origins of low-mass protostellar complex organics

Charlie Qi, CfA
The Primary Volatile Composition of a Dynamically New Comet - C/2012 S1 (ISON)

Keping Qiu, School of Astronomy and Space Science, Nanjing University
Characterizing warm and dense molecular gas around a shell-like compact HII region

Ya-Wen Tang, ASIAA
Resolving molecular outflows, streamers and circumbinary disk in a young binary system

Arthur Cheng-Hung Tsai, National Tsing Hua University
Resolving Extreme High Velocity Components of the Highly Collimated NGC 2023 MM1 Outflows

Viviana Guzman Veloso, CfA
Constraining the H2CO ortho-to-para ratio in protoplanetary disks

Wei-Hao Wang, ASIAA
Precise Identification of SCUBA-2 Sources in the Chandra Deep Field-North

Yuan Wang, University of Geneva
Investigating the sequential star formation in S235 complex

Yoshimasa Watanabe, The University of Tokyo, Department of Physics
Imaging the Molecular Distributions in the Spiral Arm of M51

Sarah Willis, Iowa State University / CfA
Exposing an embedded massive young cluster in NGC 6334 (copied from 2013A-S025)

Hsi-Wei Yen, ASIAA
Revealing Accretion Flow toward the Keplerian Disk around a Low-mass Protostar L1489 IRS

Lingzhen Zeng, CfA
Probe the magnetic field in a low-mass disk-jet protostellar system

RECENT PUBLICATIONS

Title: A Non-thermal Study of the Brightest Cluster Galaxy NGC 1275 - The Gamma-Radio Connection Over Four Decades
Authors: Dutson, K. L.; Edge, A. C.; Hinton, J. A.; Hogan, M. T.; Gurwell, M. A.; Alston, W. N.
Publication: *eprint arXiv:1405.3647*
Publication Date: 05/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1405.3647

Title: Interferometric Follow-Up of WISE Hyper-Luminous Hot, Dust-Obscured Galaxies
Authors: Wu, Jingwen; Bussmann, R. Shane; Tsai, Chao-Wei; Petric, Andreea; Blain, Andrew; Eisenhardt, Peter R. M.; Bridge, Carrie R.; Benford, Dominic J.; Stern, Daniel; Assef, Roberto J.; Gelino, Christopher R.; Moustakas, Leonidas; Wright, Edward L.
Publication: *eprint arXiv:1405.1147*
Publication Date: 05/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1405.1147

Title: Grain growth in the envelopes and disks of Class I protostars
Authors: Miotello, A.; Testi, L.; Lodato, G.; Ricci, L.; Rosotti, G.; Brooks, K.; Maury, A.; Natta, A.
Publication: *eprint arXiv:1405.0821*
Publication Date: 05/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1405.0821

Title: Subarcsecond Imaging of the NGC 6334 I(N) Protocluster: Two Dozen Compact Sources and a Massive Disk Candidate
Authors: Hunter, T. R.; Brogan, C. L.; Cyganowski, C. J.; Young, K. H.
Publication: *The Astrophysical Journal, Volume 788, Issue 2, article id. 187, 22 pp. (2014). (ApJ Homepage)*
Publication Date: 06/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1405.0496

Title: A spider-like outflow in Barnard 5 - IRS 1: the transition from a collimated jet to a wide-angle outflow?
Authors: Zapata, Luis A.; Arce, Héctor G.; Brassfield, Erin; Palau, Aina; Patel, Nimesh; Pineda, Jaime E.
Publication: *Monthly Notices of the Royal Astronomical Society, Volume 441, Issue 4, p.3696-3702 (MNRAS Homepage)*
Publication Date: 07/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1404.6147

Title: The dynamics and star-forming potential of the massive Galactic centre cloud G0.253+0.016
Authors: Johnston, K. G.; Beuther, H.; Linz, H.; Schmiedeke, A.; Ragan, S. E.; Henning, Th.
Publication: *eprint arXiv:1404.1372*
Publication Date: 04/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1404.1372

Title: Multifrequency Studies of the Peculiar Quasar 4C +21.35 during the 2010 Flaring Activity
Authors: Ackermann, M.; Ajello, M.; Allafort, A.; Antolini, E.; Barbiellini, G.; Bastieri, D.; Bellazzini, R.; Bissaldi, E.; Bonamente, E.; Bregeon, J.; Brigida, M.; Bruel, P.; Buehler, R.; Buson, S.; Caliandro, G. A.; Cameron, R. A.; Caraveo, P. A.; Cavazzuti, E.; Cecchi, C.; Chaves, R. C. G.; Chekhtman, A.; Chiang, J.; Chiaro, G.; Ciprini, S.; Claus, R.; Cohen-Tanugi, J.; Conrad, J.; Cutini, S.; D'Ammando, F.; de Palma, F.; Dermer, C. D.; Silva, E. do Couto e.; Donato, D.; Drell, P. S.; Favuzzi, C.; Finke, J.; Focke, W. B.; Franckowiak, A.; Fukazawa, Y.; Fusco, P.; Gargano, F.; Gasparrini, D.; Gehrels, N.; Giglietto, N.; Giordano, F.; Giroletti, M.; Godfrey, G.; Grenier, I. A.; Guiriec, S.; Hayashida, M.; Hewitt, J. W.; Horan, D.; Hughes, R. E.; Iafrate, G.; Johnson, A. S.; Knödlseder, J.; Kuss, M.; Lande, J.; Larsson, S.; Latronico, L.; Longo, F.; Loparco, F.; Lovellette, M. N.; Lubrano, P.; Mayer, M.; Mazziotta, M. N.; McEnery, J. E.; Michelson, P. F.; Mizuno, T.; Monzani, M. E.; Morselli, A.; Moskalenko, I. V.; Murgia, S.; Nemmen, R.; Nuss, E.; Ohsugi, T.; Orienti, M.; Orlando, E.; Perkins, J. S.; Pesce-Rollins, M.; Piron, F.; Pivato, G.; Porter, T. A.; Rainò, S.; Razzano, M.; Reimer, A.; Reimer, O.; Sanchez, D. A.; Schulz, A.; Sgrò, C.; Siskind, E. J.; Spandre, G.; Spinelli, P.; Stawarz, Ł.; Takahashi, H.; Takahashi, T.; Thayer, J. G.; Thayer, J. B.; Thompson, D. J.; Tinivella, M.; Torres, D. F.; Tosti, G.; Troja, E.; Usher, T. L.; Vandenbroucke, J.; Vasileiou, V.; Vianello, G.; Vitale, V.; Werner, M.; Winer, B. L.; Wood, D. L.; Wood, K. S.; the Fermi Large Area Telescope Collaboration; Aleksić, J.; Ansoldi, S.; Antonelli, L. A.; Antoranz, P.; Babic, A.; Bangale, P.; Barres de Almeida, U.; Barrio, J. A.; Becerra González, J.; Bednarek, W.; Berger, K.; Bernardini, E.; Biland, A.; Blanch, O.; Bock, R. K.; Bonnefoy, S.; Bonnoli, G.; Borracci, F.; Bretz, T.; Carmona, E.; Carosi, A.; Carreto Fidalgo, D.; Colin, P.; Colombo, E.; Contreras, J. L.; Cortina, J.; Covino, S.; Da Vela, P.; Dazzi, F.; De Angelis, A.; De Caneva, G.; De Lotto, B.; Delgado Mendez, C.; Doert, M.; Domínguez, A.; Dominis Prester, D.; Dorner, D.; Doro, M.; Einecke, S.; Eisenacher, D.; Elsaesser, D.; Farina, E.; Ferenc, D.; Fonseca, M. V.; Font, L.; Frantzen, K.; Fruck, C.; García López, R. J.; Garczarczyk, M.; Garrido Terrats, D.; Gaug, M.; Giavitto, G.; Godinović, N.; González Muñoz, A.; Gozzini, S. R.; Hadasch, D.; Herrero, A.; Hildebrand, D.; Hose, J.; Hrupec, D.; Idec, W.; Kadenius, V.; Kellermann, H.; Knoetig, M. L.; Kodani, K.; Konno, Y.; Krause, J.; Kubo, H.; Kushida, J.; La Barbera, A.; Lelas, D.; Lewandowska, N.; Lindfors, E.; Lombardi, S.; López, M.; López-Coto, R.; López-Oramas, A.; Lorenz, E.; Lozano, I.; Makariev, M.; Mallot, K.; Maneva, G.; Mankuzhiyil, N.; Mannheim, K.; Maraschi, L.; Marcote, B.; Mariotti, M.; Martínez, M.; Mazin, D.; Menzel, U.; Meucci, M.; Miranda, J. M.; Mirzoyan, R.; Moralejo, A.; Munar-Adrover, P.; Nakajima, D.; Niedzwiecki, A.; Nishijima, K.; Nilsson, K.; Nowak, N.; Orito, R.; Overkemping, A.; Paiano, S.; Palatiello, M.; Paneque, D.; Paoletti, R.; Paredes, J. M.; Paredes-Fortuny, X.; Partini, S.; Persic, M.; Prada, F.; Prada Moroni, P. G.; Prandini, E.; Preziuso, S.; Puljak, I.; Reinthal, R.; Rhode, W.; Ribó, M.; Rico, J.; Rodriguez Garcia, J.; Rügamer, S.; Saggion, A.; Saito, T.; Saito, K.; Salvati, M.; Satalecka, K.; Scalzotto, V.; Scapin, V.; Schultz, C.; Schweizer, T.; Shore, S. N.; Sillanpää, A.; Sitarek, J.; Snidaric, I.; Sobczynska, D.; Spanier, F.; Stamatescu, V.; Stamerra, A.; Steinbring, T.; Storz, J.; Sun, S.; Surić, T.; Takalo, L.; Takami, H.; Tavecchio, F.; Temnikov, P.; Terzić, T.; Tescaro, D.; Teshima, M.; Thaele, J.; Tibolla, O.; Toyama, T.; Treves, A.; Vogler, P.; Wagner, R. M.; Zandanel, F.; Zanin, R.; the MAGIC Collaboration; Aller, M. F.; Angelakis, E.; Blinov, D. A.; Djorgovski, S. G.; Drake, A. J.; Efimova, N. V.; Gurwell, M. A.; Homan, D. C.; Jordan, B.; Kopatskaya, E. N.; Kovalev, Y. Y.; Kurtanidze, O. M.; Lähteenmäki, A.; Larionov, V. M.; Lister, M. L.; Nieppola, E.; Nikolashvili, M. G.; Ros, E.; Savolainen, T.; Sigua, L. A.; Tornikoski, M.
Publication: The Astrophysical Journal, Volume 786, Issue 2, article id. 157, 17 pp. (2014). (ApJ Homepage)
Publication Date: 05/2014
Abstract: http://adsabs.harvard.edu/abs/2014ApJ...786..157A

Title: A Luminous Infrared Merger with Two Bipolar Molecular Outflows: ALMA and SMA Observations of NGC 3256
Authors: Sakamoto, Kazushi; Aalto, Susanne; Combes, Francoise; Evans, Aaron; Peck, Alison
Publication: *eprint arXiv:1403.7117*
Publication Date: 03/2014
Abstract: http://adsabs.harvard.edu/abs/arXiv:1403.7117

Title: ALMA Observations of the Orion Proplyds
Authors: Mann, Rita K.; Di Francesco, James; Johnstone, Doug; Andrews, Sean M.; Williams, Jonathan P.; Bally, John; Ricci, Luca; Hughes, A. Meredith; Matthews, Brenda C.
Publication: *The Astrophysical Journal, Volume 784, Issue 1, article id. 82, 8 pp. (2014). (ApJ Homepage)*
Publication Date: 03/2014
Abstract: http://adsabs.harvard.edu/abs/2014ApJ...784...82M

Title: Submillimeter Array observations of the proto brown dwarf candidate SSTB213 J041757
Authors: Phan-Bao, N.; Lee, C.-F.; Ho, P. T. P.; Martín, E. L.
Publication: *Astronomy & Astrophysics, Volume 564, id.A32, 7 pp. (A&A Homepage)*
Publication Date: 04/2014
Abstract: http://adsabs.harvard.edu/abs/2014arXiv1403.1926P

Title: Measuring Mass Accretion Rate onto the Supermassive Black Hole in M87 Using Faraday Rotation Measure with the Submillimeter Array
Authors: Kuo, C. Y.; Asada, K.; Rao, R.; Nakamura, M.; Algaba, J. C.; Liu, H. B.; Inoue, M.; Koch, P. M.; Ho, P. T. P.; Matsushita, S.; Pu, H.-Y.; Akiyama, K.; Nishioka, H.; Pradel, N.
Publication: *The Astrophysical Journal Letters, Volume 783, Issue 2, article id. L33, 5 pp. (2014). (ApJL Homepage)*
Publication Date: 03/2014
Abstract: http://adsabs.harvard.edu/abs/2014ApJ...783L..33K

Title: A subarcsecond study of the hot molecular core in G023.01-00.41
Authors: Sanna, A.; Cesaroni, R.; Moscadelli, L.; Zhang, Q.; Menten, K. M.; Molinari, S.; Caratti o Garatti, A.; De Buizer, J. M.
Publication: *Astronomy & Astrophysics, Volume 565, id.A34, 17 pp. (A&A Homepage)*
Publication Date: 05/2014
Abstract: http://adsabs.harvard.edu/abs/2014arXiv1402.3518S

Title: SMA Millimeter Observations of Hot Molecular Cores
Authors: Hernández-Hernández, Vicente; Zapata, Luis; Kurtz, Stan; Garay, Guido
Publication: *The Astrophysical Journal, Volume 786, Issue 1, article id. 38, 17 pp. (2014). (ApJ Homepage)*
Publication Date: 05/2014
Abstract: http://adsabs.harvard.edu/abs/2014arXiv1402.2682H

Title: High-resolution Submillimeter and Near-infrared Studies of the Transition Disk around Sz 91
Authors: Tsukagoshi, Takashi; Momose, Munetake; Hashimoto, Jun; Kudo, Tomoyuki; Andrews, Sean; Saito, Masao; Kitamura, Yoshimi; Ohashi, Nagayoshi; Wilner, David; Kawabe, Ryohei; Abe, Lyu; Akiyama, Eiji; Brandner, Wolfgang; Brandt, Timothy D.; Carson, Joseph; Currie, Thayne; Egner, Sebastian E.; Goto, Miwa; Grady, Carol; Guyon, Olivier; Hayano, Yutaka; Hayashi, Masahiko; Hayashi, Saeko; Henning, Thomas; Hodapp, Klaus W.; Ishii, Miki; Iye, Masanori; Janson, Markus; Kandori, Ryo; Knapp, Gillian R.; Kusakabe, Nobuhiko; Kuzuhara, Masayuki; Kwon, Jungmi; McElwain, Mike; Matsuo, Taro; Mayama, Satoshi; Miyama, Shoken; Morino, Jun-ichi; Moro-Martín, Amaya; Nishimura, Tetsuro; Pyo, Tae-Soo; Serabyn, Eugene; Suenaga, Takuya; Suto, Hiroshi; Suzuki, Ryuji; Takahashi, Yasuhiro; Takami, Hideki; Takami, Michihiro; Takato, Naruhisa; Terada, Hiroshi; Thalmann, Christian; Tomono, Daigo; Turner, Edwin L.; Usuda, Tomonori; Watanabe, Makoto; Wisniewski, John P.; Yamada, Toru; Tamura, Motohide
Publication: *The Astrophysical Journal, Volume 783, Issue 2, article id. 90, 10 pp. (2014). (ApJ Homepage)*
Publication Date: 03/2014
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Title: HerMES: Spectral Energy Distributions of Submillimeter Galaxies at z > 4
Authors: Huang, J.-S.; Rigopoulou, D.; Magdis, G.; Rowan-Robinson, M.; Dai, Y.; Bock, J. J.; Burgarella, D.; Chapman, S.; Clements, D. L.; Cooray, A.; Farrah, D.; Glenn, J.; Oliver, S.; Smith, A. J.; Wang, L.; Page, M.; Riechers, D.; Roseboom, I.; Symeonidis, M.; Fazio, G. G.; Yun, M.; Webb, T. M. A.; Efstathiou, A.
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Title: MAGIC gamma-ray and multifrequency observations of flat spectrum radio quasar PKS 1510-089 in early 2012
Authors: MAGIC Collaboration; Aleksić, J.; Ansoldi, S.; Antonelli, L. A.; Antoranz, P.; Babic, A.; Bangale, P.; Barres de Almeida, U.; Barrio, J. A.; Becerra González, J.; Bednarek, W.; Bernardini, E.; Biland, A.; Blanch, O.; Bonnefoy, S.; Bonnoli, G.; Borracci, F.; Bretz, T.; Carmona, E.; Carosi, A.; Carreto-Fidalgo, D.; Colin, P.; Colombo, E.; Contreras, J. L.; Cortina, J.; Covino, S.; Da Vela, P.; Dazzi, F.; De Angelis, A.; De Caneva, G.; De Lotto, B.; Delgado Mendez, C.; Doert, M.; Domínguez, A.; Dominis Prester, D.; Dorner, D.; Doro, M.; Einecke, S.; Eisenacher, D.; Elsaesser, D.; Farina, E.; Ferenc, D.; Fonseca, M. V.; Font, L.; Frantzen, K.; Fruck, C.; García López, R. J.; Garczarczyk, M.; Garrido Terrats, D.; Gaug, M.; Godinović, N.; González Muñoz, A.; Gozzini, S. R.; Hadasch, D.; Hayashida, M.; Herrera, J.; Herrero, A.; Hildebrand, D.; Hose, J.; Hrupec, D.; Idec, W.; Kadenius, V.; Kellermann, H.; Kodani, K.; Konno, Y.; Krause, J.; Kubo, H.; Kushida, J.; La Barbera, A.; Lelas, D.; Lewandowska, N.; Lindfors, E.; Lombardi, S.; López, M.; López-Coto, R.; López-Oramas, A.; Lorenz, E.; Lozano, I.; Makariev, M.; Mallot, K.; Maneva, G.; Mankuzhiyil, N.; Mannheim, K.; Maraschi, L.; Marcote, B.; Mariotti, M.; Martínez, M.; Mazin, D.; Menzel, U.; Meucci, M.; Miranda, J. M.; Mirzoyan, R.; Moralejo, A.; Munar-Adrover, P.; Nakajima, D.; Niedzwiecki, A.; Nilsson, K.; Nishijima, K.; Noda, K.; Nowak, N.; Orito, R.; Overkemping, A.; Paiano, S.; Palatiello, M.; Paneque, D.; Paoletti, R.; Paredes, J. M.; Paredes-Fortuny, X.; Partini, S.; Persic, M.; Prada, F.; Prada Moroni, P. G.; Prandini, E.; Preziuso, S.; Puljak, I.; Reinthal, R.; Rhode, W.; Ribó, M.; Rico, J.; Rodriguez Garcia, J.; Rügamer, S.; Saggion, A.; Saito, T.; Saito, K.; Satalecka, K.; Scalzotto, V.; Scapin, V.; Schultz, C.; Schweizer, T.; Shore, S. N.; Sillanpää, A.; Sitarek, J.; Snidaric, I.; Sobczynska, D.; Spanier, F.; Stamatescu, V.; Stamerra, A.; Steinbring, T.; Storz, J.; Strzys, M.; Sun, S.; Surić, T.; Takalo, L.; Takami, H.; Tavecchio, F.; Temnikov, P.; Terzić, T.; Tescaro, D.; Teshima, M.; Thaele, J.; Tibolla, O.; Torres, D. F.; Toyama, T.; Treves, A.; Uellenbeck, M.; Vogler, P.; Wagner, R. M.; Zandanel, F.; Zanin, R.; Lucarelli, F.; Pittori, C.; Vercellone, S.; Verrecchia, F.; Buson, S.; D'Ammando, F.; Stawarz, L.; Giroletti, M.; Orienti, M.; Mundell, C.; Steele, I.; Zarpudin, B.; Raiteri, C. M.; Villata, M.; Sandrinelli, A.; Lähteenäki, A.; Tammi, J.; Tornikoski, M.; Hovatta, T.; Readhead, A. C. S.; Max-Moerbeck, W.; Richards, J. L.; Jorstad, S.; Marscher, A.; Gurwell, M. A.; Larionov, V. M.; Blinov, D. A.; Konstantinova, T. S.; Kopatskaya, E. N.; Larionova, L. V.; Larionova, E. G.; Morozova, D. A.; Troitsky, I. S.; Mokrushina, A. A.; Pavlova, Yu. V.; Chen, W. P.; Lin, H. C.; Panwar, N.; Agudo, I.; Casadio, C.; Gómez, J. L.; Molina, S. N.; Kurtanidze, O. M.; Nikolashvili, M. G.; Kurtanidze, S. O.; Chigladze, R. A.; Acosta-Pulido, J. A.; Carnerero, M. I.; Manilla-Robles, A.; Ovcharov, E.; Bozhilov, V.; Metodieva, I.; Aller, M. F.; Aller, H. D.; Fuhrmann, L.; Angelakis, E.; Nestoras, I.; Krichbaum, T. P.; Zensus, J. A.; Ungerechts, H.; Sievers, A.; Riquelme, D.
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Title: Submillimeter Array and Very Large Array Observations in the Hypercompact H II Region G35.58-0.03
Authors: Zhang, Chuan-Peng; Wang, Jun-Jie; Xu, Jin-Long; Wyrowski, Friedrich; Menten, Karl M.
Publication: *The Astrophysical Journal, Volume 784, Issue 2, article id. 107, 15 pp. (2014). (ApJ Homepage)*
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Title: Hierarchical fragmentation and differential star formation in the Galactic `Snake': infrared dark cloud G11.11-0.12
Authors: Wang, Ke; Zhang, Qizhou; Testi, Leonardo; Tak, Floris van der; Wu, Yuefang; Zhang, Huawei; Pillai, Thushara; Wyrowski, Friedrich; Carey, Sean; Ragan, Sarah E.; Henning, Thomas
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Title: Is There a Maximum Star Formation Rate in High-redshift Galaxies?
Authors: Barger, A. J.; Cowie, L. L.; Chen, C.-C.; Owen, F. N.; Wang, W.-H.; Casey, C. M.; Lee, N.; Sanders, D. B.; Williams, J. P.
Publication: *The Astrophysical Journal, Volume 784, Issue 1, article id. 9, 22 pp. (2014). (ApJ Homepage)*
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Title: SMA Submillimeter Observations of HL Tau: Revealing a Compact Molecular Outflow
Authors: Lumbreras, Alba M.; Zapata, Luis A.
Publication: *The Astronomical Journal, Volume 147, Issue 4, article id. 72, 4 pp. (2014). (AJ Homepage)*
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Title: Serendipitous ALMA detection of a distant CO-emitting galaxy with a buried active galactic nucleus beyond the nearby merging galaxies VV114
Authors: Tamura, Yoichi; Saito, Toshiki; Tsuru, Takeshi G.; Uchida, Hiroyuki; Iono, Daisuke; Yun, Min S.; Espada, Daniel; Kawabe, Ryohei
Publication: *eprint arXiv:1401.0003*
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Title: The accretion-ejection coupling in the black hole candidate X-ray binary MAXI J1836-194
Authors: Russell, T. D.; Soria, R.; Miller-Jones, J. C. A.; Curran, P. A.; Markoff, S.; Russell, D. M.; Sivakoff, G. R.
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Publication Date: 04/2014
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Title: Hot Core, Outflows, and Magnetic Fields in W43-MM1 (G30.79 FIR 10)
Authors: Sridharan, T. K.; Rao, R.; Qiu, K.; Cortes, P.; Li, H.; Pillai, T.; Patel, N. A.; Zhang, Q.
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Title: Submillimetre polarization and magnetic field properties in the envelopes of protoplanetary nebulae CRL 618 and OH 231.8+4.2
Authors: Sabin, L.; Zhang, Q.; Zijlstra, A. A.; Patel, N. A.; Vázquez, R.; Zauderer, B. A.; Contreras, M. E.; Guillén, P. F.
Publication: *Monthly Notices of the Royal Astronomical Society, Volume 438, Issue 2, p.1794-1804 (MNRAS Homepage)*
Publication Date: 02/2014
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Title: Herschel-ATLAS: deep HST/WFC3 imaging of strongly lensed submillimeter galaxies
Authors: Negrello, M.; Hopwood, R.; Dye, S.; da Cunha, E.; Serjeant, S.; Fleuren, S.; Bussmann, R. S.; Cooray, A.; Dannerbauer, H.; Gonzalez-Nuevo, J.; Lapi, A.; Omont, A.; Amber, S.; Auld, R.; Baes, M.; Buttiglione, S.; Cava, A.; Danese, L.; Dariush, A.; De Zotti, G.; Dunne, L.; Eales, S.; Fritz, J.; Ibar, E.; Ivison, R.; Kim, S.; Maddox, S.; Michalowski, M. J.; Pascale, E.; Pohlen, M.; Rigby, E.; Rowlands, K.; Smith, D. J. B.; Sutherland, W.; Temi, P.; Wardlow, J.
Publication: *eprint arXiv:1311.5898*
Publication Date: 11/2013
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Title: The State of the Warm and Cold Gas in the Extreme Starburst at the Core of the Phoenix Galaxy Cluster (SPT-CLJ2344-4243)
Authors: McDonald, Michael; Swinbank, Mark; Edge, Alastair C.; Wilner, David J.; Veilleux, Sylvain; Benson, Bradford A.; Hogan, Michael T.; Marrone, Daniel P.; McNamara, Brian R.; Wei, Lisa H.; Bayliss, Matthew B.; Bautz, Marshall W.
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The Submillimeter Array (SMA) is a pioneering radio-interferometer dedicated to a broad range of astronomical studies including finding protostellar disks and outflows; evolved stars; the Galactic Center and AGN; normal and luminous galaxies; and the solar system. Located on Mauna Kea, Hawaii, the SMA is a collaboration between the Smithsonian Astrophysical Observatory and the Academia Sinica Institute of Astronomy and Astrophysics.

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