

**Activity Report of Commission J**  
**February 2013 to July 2013**

July 16, 2013

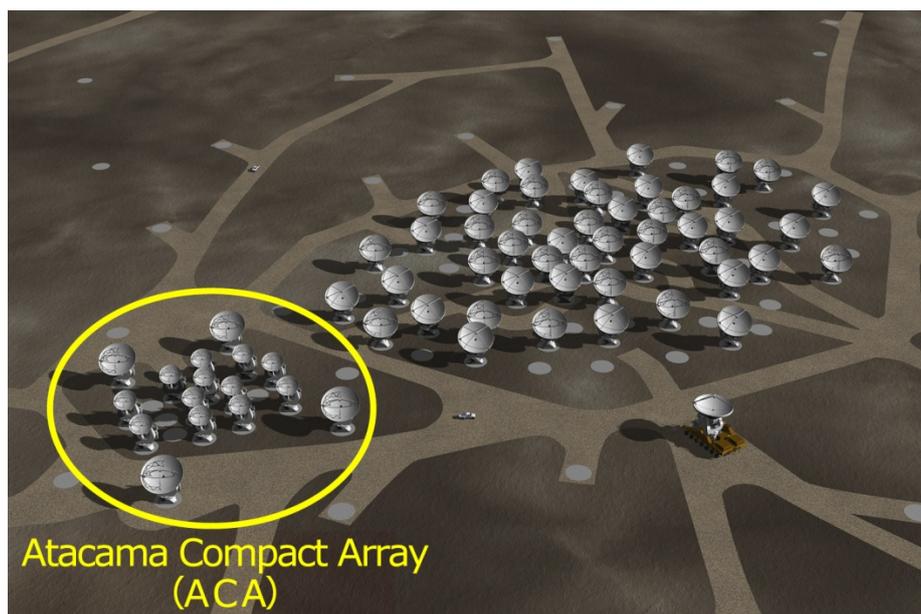
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**ALMA project**

- Final ACA Antenna Delivered with the new name "Morita Array" (May 07, 2013)

The twelfth 7-m antenna developed by Japan was delivered to the high site in Chajnantor on April 29, 2013. Now all the 16 antennas of the Atacama Compact Array (ACA) are installed at the Array Operations Site at the altitude of 5,000 m and awaiting to unveil secrets of the universe.

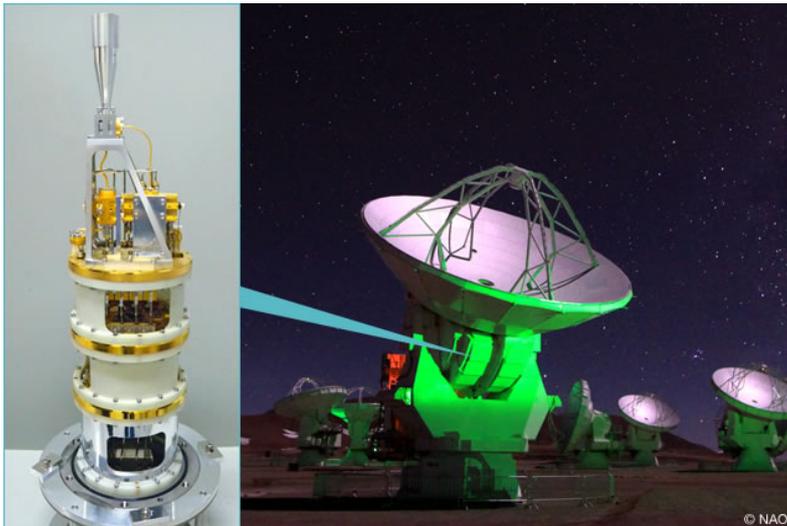
ALMA, the Atacama Large Millimeter/submillimeter Array, is an international partnership of East Asia, Europe and North America in cooperation with the Republic of Chile, to build a giant radio telescope by connecting 66 high precision antennas. In this global venture, Japan is responsible for the development of 16 antennas (four 12-m antennas and twelve 7-m antennas), ultra-cooled radio receivers for three frequency bands which are installed in all the 66 antennas, and high-speed computer, or the correlator, to combine the signals collected by Japanese 16 antennas. The Atacama Compact Array, a major deliverable from Japan to the ALMA project, consists of the 16 antennas and receivers installed therein and the ACA correlator. The ACA is able to correct the radio waves emanated from celestial objects with a large angular size, such as molecular clouds and nearby galaxies, and make ALMA's radio image fidelity higher.



- Latest scientific topic:

#### Successful ALMA First Radio Imaging with Band 4 Receiver (June 27, 2013)

ALMA telescope successfully captured its first radio image with Band 4 receiver developed by Japan in an ALMA test observation conducted in January 2013. The target object was IRAS16293-2422, a protostar (baby star) in the constellation of Ophiuchus. The telescope received radio emission from carbon sulfide (CS) molecules surrounding the star and imaged their distribution.



Band 4 Receiver (54 cm high) developed by Japan and ALMA Telescope. The receiver is set in the cabin part of the antenna.

### Activities of meetings

- **From Planets to Distant Galaxies: SPICA's New Window on the Cool Universe**

Date : 18-21 June, 2013

Venue: The University of Tokyo, Japan

URL: <http://www.ir.isas.jaxa.jp/SPICA/spica2013/>

Aims and Scope: The first international conference on the science of SPICA (Space Infrared Telescope for Cosmology and Astrophysics) mission will be held on 18-21 June, 2013. The conference is open to interested scientists from around the world.

The primary aims of the conference are to introduce the scientific capabilities of the SPICA mission to the international community, and to foster interactions in the IR community on how to optimally utilise this new facility to further explore the physical processes in formation and evolution of planets, stars and galaxies.

- **International Conference on Cosmic Microwave Background**

Date: 10-14 June 2013

Place: Okinawa Institute of Science and Technology Graduate University (OIST)

Overview:

Detection of primordial gravitational waves would be one of the most significant scientific discoveries of all time. Such a detection would be a direct evidence for inflation and shed light on fundamental physics such as quantum gravity behind inflation. The accurate measurement of CMB polarization is the best way to discover the primordial gravitational waves. It is thus one of the greatest challenges in experimental cosmology in the next decade. Thanks to remarkable technological development in recent years, the detection is not a mere dream anymore but becoming factual. The primary objective of the conference is to exchange ideas on how to reach the precision at the level of  $r=0.001$  or even better, where  $r$  is the tensor-to-scalar ratio. Another important goal of the conference is to evaluate scientific values of such a measurement, where relations to other observations such as CMB temperature anisotropies are also important. To these ends, the conference will have talks from all the CMB projects in operation, in preparation or in planning.

- **ALMA Workshop 2012: EA ALMA Development Workshop 2013**

Date: July 8 - 9, 2013

Place: National Astronomical Observatory of Japan, Mitaka, Large Seminar Room

Website: [http://alma-intweb.mtk.nao.ac.jp/~diono/meetings/EA\\_Development\\_Meeting/Welcome.html](http://alma-intweb.mtk.nao.ac.jp/~diono/meetings/EA_Development_Meeting/Welcome.html)

Aims: The Atacama Large Millimeter/submillimeter Array (ALMA) is already producing a growing number of impressive and scientifically compelling results during its first year of operation as the most powerful mm/submm interferometer in the world. In order to maintain ALMA as the state-of-the-art facility over the course of its projected life of 30+ years, continuing technical upgrades and development of new capabilities are essential. The scope of this meeting is to present the status of ongoing future development studies/projects in the East Asian region which will be the main development focus for the next 5 - 10 years, and to discuss the technical requirements and the potential science achievable with a larger scale development which are envisioned in the next 10 - 20 years.

The anticipated new science capabilities are, for example,

-- Installation of multi-beam receivers for sensitive and large field mapping observations

-- Development of ultra-wide bandwidth receiver for multi-line observations

Other innovative ideas are also welcome and encouraged.

- **Workshop on the Galactic Center**

Date: June 3, 2013

Place: Nagoya University

Aims: The Galactic Center is one of the most complex region in our galaxy. Intensive observations at various wavelengths have been made to date, and unified interpretations throughout the results of all wavelengths have been expected. The aim of this workshop is as follows: theoreticians and observers at various wavelengths come together in order to exchange the latest results and interpretations, especially focusing on the strong magnetic field, molecular clouds around the massive black hole, and simulations.

- **Technical Development Center Symposium for the International VLBI Service 2013**

Date: June 6, 2013

Place: NICT Kashima

Aims: NICT is a member of IVS (International VLBI Service for Geodesy and Astrometry) and has contributed to the development of VLBI technologies. A specification called VLBI2010 provide the next generation specification of VLBI observation. In some countries, new telescopes satisfying the specification are under construction, and technical developments for VLBI2010 are being made in parallel. In this symposium together with researcher and company, we will discuss on the recent development for VLBI2010 and related engineering.

- **Workshop on the chemistry in the extra galaxies**

Date: June 12, 2013

Place: Tokyo University

Aims: Astrochemistry is one of the important fields of astrophysics which revealed not only the chemical process in the interstellar field but also the physical evolution of astronomical objects. The aim of this workshop is to exchange the latest results of the astrochemistry and discuss on the future observation focusing on the ALMA era.