Government and Military Research News

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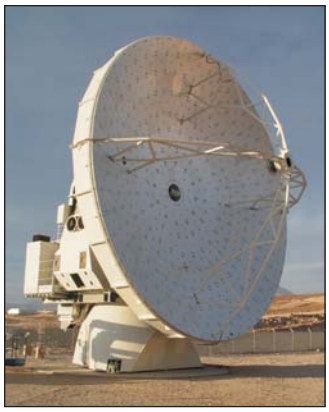
First North American Antenna for Joint ALMA Observatory

Astronomers celebrated the formal acceptance of the first North American antenna by the Joint ALMA Observatory. ALMA, the Atacama Large Millimeter/submillimeter Array, is a growing armada of short-wavelength radio telescopes whose combined power will enable astronomers to probe phenomena and regions that are beyond the reach of visible-light telescopes, with unprecedented sharpness. The observatory is being assembled high in the Chilean Andes by a global partnership.



The 12-meter-diameter antenna (photo at left) recently delivered is the first of twenty-five being provided by North America's ALMA partners, whose efforts are led by the National Radio Astronomy Observatory (NRAO) and supported by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada and the National Science Council of Taiwan. The antenna was manufactured by General Dynamics SATCOM Technologies.

When completed early next decade, ALMA will have a total of sixty-six antennas (with the option of further expansion) provided by partners in North America, Europe, and East Asia. The first European antennas, produced under the auspices of the European Organization for Astronomical Research in the Southern Hemisphere (ESO) are scheduled to begin arriving early this year.

When complete, ALMA will offer unprecedented sensitivity and resolution. The 12-meter antennas will have reconfigurable baselines ranging from 15 m to 16 km. Resolutions as fine as 0.005 arcseconds will be achieved at the shortest wavelengths. ALMA's antennas have surfaces accurate to less than the thickness of a human hair, and can be pointed precisely enough to pick out a golf ball at a distance of 15 km.

DARPA Issues Request for Information for an Electric Field Detector

Small electric fields are produced by a wide variety of sources over a wide range of frequencies. Sensing these fields over large frequency ranges is very challenging. The Defense Advanced Research Projects Agency's (DARPA) Microsystems Technology Office (MTO) is requesting information on novel research ideas and approaches to detect small electric fields over large frequency ranges using a compact detector. No funding has currently been allocated to this effort; it is only a request for information at this time.

DARPA/MTO is interested in electric field detection systems that have both high sensitivity and large frequency response in a small form factor. In order to focus onto technical approaches with the greatest potential, a preliminary set of system metrics have been formulated. These metrics are:

Sensitivity: 0.1 μV/m per $Hz^{1/2}$
Bandwidth: 1000 Hz
Frequency range: 0.5 to 10^9 GHz
Sensor size: 1 mm^2

Instructions for preparing a submission for this Request for Information (DARPA-SN-09-12) are available on the DARPA web site: www.darpa.mil/MTO.

U.S. Naval Observatory to Improve Time Measurement for GPS and Data Networks

The ultra-precise timing technology that enables NAVSTAR Global Positioning Systems and high-speed Internet communication soon may resolve the measure of time to 100 trillionths of a second, according to the U.S. Naval Observatory, the world's authority in time-keeping and celestial observation.

To meet the demands of technology and the needs of society, researchers at the U.S. Naval Observatory continue to develop more precise time-keeping systems than provided by current atomic clock technology. By 2010, they hope to release an operational version of their newest clock, known as a "fountain clock," which uses laser beams to induce oscillations of the rubidium atom. This rubidium fountain clock will pro-

vide a measure of time accurate to 100 trillionths of a second, about 10 to 100 times more precise than the current master clock.

The U.S. Naval Observatory, one of about 50 scientific laboratories concerned with time-keeping, maintains one-third of the operational atomic clocks currently deployed around the world.

In addition to its role in defining and maintaining universal time, the Naval Observatory also acts as a reference point for navigation and communications technologies that affect people's everyday lives. For instance, its ultra-precise time-keeping systems enable computer networks to rapidly and accurately transmit information, and the constellation of satellites used in GPS relies on the master clock to calculate locations on the Earth's surface.

Department of Energy Announces Expansion of its Entrepreneur in Residence Program

In late 2008, U.S. Department of Energy (DOE) Secretary Samuel W. Bodman announced a competitive solicitation for five venture capital firms to participate in the expansion of DOE's Entrepreneur in Residence (EIR) program, that aims to accelerate deployment and commercialization of advanced clean energy technologies from DOE's National Laboratories.

"The Department has established the Entrepreneur-in-Residence Program to leverage private sector expertise in ways that will move proven technologies developed at DOE's National Laboratories down the capital development pipeline and, ultimately, to the marketplace," Secretary Bodman said. The additional EIR program solicitation today will ultimately place five more venture capital entrepreneurs in these DOE world class National Laboratories:

Argonne National Laboratory
Brookhaven National Laboratory
Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
Pacific Northwest National Laboratory

While at the laboratory, the entrepreneurs will also recommend policy and business practice modifications to the National Laboratories to further refine their scientific approaches to moving technologies into the private sector.

DOE has facilitated and encouraged a broad range of collaborative activities to allow the public and private sectors to benefit from the research done by DOE's national laboratories' research. These activities include cooperative research and development agreements, financial assistance awards through lab partnerships, and work for others opportunities.

Johns Hopkins Applied Physics Laboratory (APL) staff test the Mini-RF radar instrument hardware. ***Photo Credit: Johns Hopkins University Applied Physics Laboratory (APL)***

NASA Mini-RF Radar Instruments Help Map the Moon

The Mini-RF project will fly two radar instruments to the moon to map the lunar poles, search for water ice, and to demonstrate future NASA communication technologies. The first instrument, launched on the Indian Space Research Organisation's (ISRO's) Chandrayaan-1 spacecraft, will map both polar regions. The second instrument will fly on NASA's Lunar Reconnaissance Orbiter (LRO) and will perform targeted radar observations and communications demonstrations.

Chandrayaan-1's two-year mission is India's first to the moon. It consists of a lunar orbiter that will map the moon from a 100-kilometer circular polar orbit. It carries 11 instruments, including Mini-SAR. The Chandrayaan-1 orbiter was launched October 22, 2008 from the Satish Dhawan Space Centre, Sriharikota, India, and is in a polar lunar orbit at 100 km. Radar image resolution is 150 meters.

The Lunar Reconnaissance Orbiter was built at Goddard Space Flight Center in Maryland. It is carrying seven instruments and will map the moon for one year from a 50-kilometer circular polar orbit. Launch is scheduled for April 2009 from the Kennedy Space Center, Florida. It will enter a polar lunar orbit at a height of 50 km. Radar images will be obtained at resolutions of 150 meters and 30 meters.

Mini-RF has been designed, built and tested for NASA by a team that spans the entire United States. Entities playing a major role include the Naval Air Warfare Center, Johns Hopkins Applied Physics Laboratory, Sandia National Laboratories, Raytheon and Northrop Grumman. Numerous smaller companies also played an important role.

National Science Foundation Requests $7B Budget

The National Science Foundation's (NSF) proposed $7.0 billion budget reflects several national science and technology priorities, idenitfied as:

Investment in the sciences—Investments in science and technology foster economic growth and create high-tech, high-wage jobs. The budget doubles funding for basic research over 10 years, beginning with $3 billion for NSF in the American Recovery and Reinvestment Act of 2009 and a 2010 budget with increased funding of $950 million over FY 2008.

Supporting researchers at the beginning of their careers—The budget provides substantial increases for NSF's prestigious Graduate Research Fellowship and Faculty Early Career Development programs.

Strengthening the education of technicians in high-technology fields—The budget increases support for the Advanced Technological Education program, which focuses on two-year colleges and supports partnerships between academic institutions and employers to promote improvement in the education of science and engineering technicians.

Encouraging promising high-risk research—The budget increases support for exploratory and high-risk research proposals that could fundamentally alter our understanding of nature, revolutionize fields of science and lead to radically new technologies.

Making climate change research and education a priority—The budget supports research to improve our ability to predict future environmental conditions and to develop strategies for responding to global environmental change.

More details on the NSF budget, including requested allocations for specific programs and initiatives, will be made available in April when the full FY 2010 President's Budget is released.

Sandia Encourages Use of its Facilities

Sandia National Laboratories is adopting two new Department of Energy (DOE) model agreements that will simplify and expand the way universities and industry use the Labs facilities. DOE recently finalized the agreement forms and is encouraging all of its laboratories across the country to begin using them.

Sandia, like many of the DOE laboratories, has user facilities that are made available to universities and industry to conduct research and work with Sandia researchers. In the past, the agreements were individualized across the DOE laboratories. This new method will standardize forms so that all agreements are alike, presenting a common DOE face to industry. Sandia's Center for Integrated Nanotechnologies (CINT) is the first designated science user facility to implement the new agreements.