Future VLB

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VLBI System

A good instrument for collaboration

HOW TO FORM A VLBI NETWORK
1. TO COMBINE NETWORKS

KVN [3 (+1)] + VERA [4]

2. TO INVITE TELESCOPES

M. China: Shanghai, Urumqi, Delinha
Korea: Taeduk, Seoul
Japan: Nobeyama, Kashima, Yamaguchi, Taiwan:
Australia: ATCA

Japan & Korea To Link

NEWS OF THE WEEK

the masers form and what drives them

very old stars

such nairings between neutron stars and ordinary stars. Still, he won't disregard the fas-cinating possibility that PSR J1740-5340 is a cosmic newborn. "It may or may not be knowable," he says. "But they've done very good detective work so far just to find it." -PORTET INION

RADIO ASTE Japan and Korea

To Link Networks

TOKYO-Japan and Korea are teaming up to create an Asian network of radio telescopes that will match the capabilities of existing arrays in the United States and Europe. Last month scientists from both countries announced their first joint observations using two antennas, the forerunner of what they hope will be a string of 10 dishes operating

in unison by 2005. The observations mark a scientific coming of age for Korea in very long baseline interferometry (VLBI), which combines signals from two or more radio antennas into an image equivalent to what would be captured by a single antenna spread over the entire area. "This is really a big step forward for Ko-

rean astronomy," says Se-Hyung Cho, direc-tor of the Taeduk Radio Astronomy Obser-vatory, one of two telescopes making the ini-tial observations. "We hope this leads to throughout the Milky Way. In doing so, it will also plot the movement of the galaxy's spiraling arms. The \$16 million Korean VLBI Network, to be completed in 2005, more opportunities for our community to make in ortant contributions. In VLBI, the wider the spacing of the of the larger array.

The Korean and Japanese observatories antennas, the better the resolution. The United States currently operates the 10-station U.S. Very Long Baseline Array that stretches nearly 13,000 kilometers will also give a boost to the Asia-Pacific Telescope, an informal framework for cooperation among radio observatories throughout the Pacific Rim. "It makes a lot of sense to build in collaborations among from Hawaii to the Virgin Islands and the 18-station European VLBI Network covers an even larger region. regional neighbors as early as possible." The Asian array, although smaller, is exsays David Jauncey, a radio astronomer a

nected to be ideal for investigating silicon monoxide masers, sources of coherent radiation produced when energy from an expanding star excites silicon monoxide molecules within Vew radio antenna T Existing radio antener Asian Array. Japan and Korea will link up new and existing to one instrument for of

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a surrounding dust cloud. These excited the Australia Telescope National Facility, molecules release powerful radio waves, Canberra, one of 21 observatories in 10 just as excited molecules within a lager recountries that belong to the consort lease coherent light waves. Silicon monos -DENNIS NORMILE ide masers are believed to eject mass from With reporting by Mark Russell in Secu

But widely spaced arrays are too power-ICAL RESEARCH ful to image the entire maser, which are in Tritium Lab to Close our galaxy and thus, relatively close. Katsunori Shibata, a radio astronomer at Japan's

After Loss of NIH Funds National Astronomical Observatory, Mitaka, compares it to training a very powerful tele-scope on a distant house and seeing only a BERKELEY, CALIFORNIA-Long a target of local activists, a government-funded tritium labeling facility here is shutting down next month. Federal officials say the 19-year-old section of wall instead of an outline of the entire building. "The 1000 kilometers sepa-rating Taeduk and Nobeyama is ideal for obfacility has outlived its usefulness, but sup porters see it as a victim of political pressure founded on scientific ignorance. serving these masers," explains his colleague, Hideyuki Kobayashi. Scientists hope that the observations will shed light on how The National Tritium Labeling Facility

(NTLF) at Lawrence Berkeley National Laboratory develops reagents for biomedi-The larger network will incorporate a new array of four, 20-meter antennas scatcal researchers to label molecules with tritered throughout Japan, as well as three. tium, a radioactive hydrogen isotope used to trace the movements, activities, and binding 20-meter diameter radio antennas being built in Korea (see map). On its own, the \$58 million Japanese array, called VERA sites of existing and potential drugs. Local officials have twice passed a resolution urg-ing the government to shut it down for fear (VLBI Exploration of Radio Astrometry) and expected to come online next year, will try to pinpoint the location of masers that its emissions of tritium gas and tritiated water pose a health hazard and local Representative Barbara Lee (D-CA) has raised the issue with officials at the National Institutes of Health (NIH) But NIH officials env the facility is safe and that fiscal and scien-tific shortcomings, not politics, led to its dehopes to study active galactic nuclei and r-forming regions as well as being part cision to end funding "I did not consider the NTLF among our

highest priorities in view of ... resources needed for genomics," says Judith Vaitukaitis, director of NIH's National Cen ter for Research Resources (NCRR), which has supported the facility since its inception. "It was never mentioned during our work-shops to set priorities for biomedical tech-nology." The NTLF also had become "too much of a service facility for industry," she adds. Figures show that it has provided a total subsidy to users of \$97,000 over the last 2 years. Michael Marron, NCRR's director of biomedical technology, says that the pri-mary reasons for closure were low publica-tion rates, inadequate service to NIH grantees, and failure to fill a safety position Supporters of the center question that ex-planation and accuse NIH of caving in to outside pressure. They cite a 1999 NIH re view laced with effusive praise that gave the center an exceptional score and say that the subsidy is a small part of a \$1-million-ayear budget. "It's an extraordinary example of a bunch of extremely ill-informed and antiscience people destroying a precious scien tific lab," says Elmer Grossman, a professor emeritus at the University of California, San Francisco, and chair of Berkeley's Commu nity Environmental Advisory Commission.

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- 10-dish network
- mm VLBI succeeded \bullet
- Good for maser and low frequency mapping
- Appreciate more telescopes!

Good baselines for masers



Maser components shown by total flux (red line) are resolved out in correlated flux (blue line). They are resolved more by longer baselines

mm VLBI

East-West baseline(s)

 SiO (J = 2-1), and (J = 3-2) maser lines at 86, and 129 GHz
 Methanol at 107 GHz

Compact dense array

- Also good for AGN jets
 - Short and Middle baselines are good for extended emission
 - Dense array will produce high quality images of extended structure
 - Polarimetry desirable



Within the red circle, we will have a dense array.

Extended structure

By Junor



- With VLA, extended structures are revealed
- Ahead of VLBI jets, extended structure to connect VLA jets are expected at lower frequencies

System R & D

- Phase referencing/compensation techniques
 - Water vapor monitoring system at 22 GHz
- Real time system
 - Wider bandwidth by optical fiber link
- To get higher sensitivity to see thermal emission

System R & D (cont.)

- Compatibility issue of recording system

 Japan:
 K4, VSOP, VERA
 USA:
 Mk III, Mk IV, Mk V
 Canada:
 S2, S3
- Correlator

- Asian correlation center is needed

Scientific objectives

- S/X (2.3/8.3 GHz) imaging of extended structure
 - Thermal emission visible?
- mm VLBI maser emissions of SiO, methanol, etc.

Summary

- KVN and VERA (+ some telescopes) produce a compact, dense VLBI network
 - Good for extended structures at 2/8 GHz bands
- mm VLBI is feasible for SiO and methanol masers with NRO 45-m and TRAO 14-m (and Delinha 14-m)