MERLINnews
MERLIN/VLBI
National Facility

Newsletter

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1. Call for Proposals

The **deadline** for the receipt of proposals for Semester 05A (February 2005 - June 2005) on MERLIN is **September 15th, 2004**. All details are in the MERLIN web area, specifically;
http://www.merlin.ac.uk/propsub/call

L-Band: 1.35GHz to 1.43GHz & 1.57GHz to 1.73GHz

- The Lovell telescope will be available at L-Band for a period during Semester 05
- Observations at C-Band and K-Band will be available during Semester 05B. Applications for observations in these frequency bands will be passed forward to the next Semester.

The system parameters for observation of a continuum source in **good weather conditions** are;

	L-Band	C-Band	K-Band
Maximum angular resolution (mas)	~ 150	~ 40	~ 8
RMS for 12 hr. on source (μJy/beam)	~ 60/30	~ 50/20	~ 400
Maximum bandwidth/polarization (MHz)	~ 15	~ 15	~ 15

The use of the recently resurfaced Lovell telescope at L-Band and C-Band reduces the 12 hour RMS noise level to ~30 and ~20 μJy/beam respectively. The maximum rate at which the observing frequency can be switched within an observing band will be approximately once every five minutes for multi-frequency synthesis (MFS) observations. MFS is possible within each C-Band range (eg 4.5GHz-5.2GHz), but not possible between 4.5/5.2GHz and 6/7GHz. For spectral line work throughout the Semester, users are referred to Table 4.4 of the MERLIN User Guide Version 3 which is now available online. The maximum number of frequency channels per baseline to be divided between the 4 polarizations for bandwidths of 16 MHz, 8 MHz and 4 MHz are 64, 128 and 256, respectively. The number of frequency channels per baseline to be divided between the 4 polarizations will be 512 for bandwidths of 2 MHz or less. The minimum total bandwidth is 250 kHz.

There will be MERLIN+EVN observations at L-Band during February / March 2005. Applications to go to the EVN PC http://www.evlbi.org/

Proposal forms, information on MERLIN Key Programmes, and further information can be obtained via;
www: http://www.merlin.ac.uk
ftp: ftp.jb.man.ac.uk, directory: /pub/merlin/proposals
email: merlin@jb.man.ac.uk

2. Director's Report

I am glad to report that there has been significant progress on *e*-MERLIN since the last MERLIN Newsletter. Simon Garrington's Project Manager's report below discusses the details but, as an outline, I can confirm that the contracts for procuring the fibre-optic network were signed with Fujitsu and Global Crossing at the end of March and work began on laying the fibre on 14 June. Since then the project has progressed at an impressive pace and we expect the fibre network to be in place next year.

In parallel with the fibre work there has been major progress in other areas: the L-band lenses have been installed at Knockin and Darnhall; a new drive system is being installed on the MkII; the development of the new C-band systems is on-track, with delivery of three new broad-band capable systems by the end of October in time for the new observing season. In addition, the Pickmere telescope has been painted as have parts of the Lovell Telescope (LT). Repairs to some cracks in the LT wheel girder are happening as I write this and a second iteration of the surface setting procedure will happen at the same time. So, our engineering staff have had an exhausting summer and are, I am sure, looking forward as much as the astronomers to the resumption of observing.

However, observing did not stop over the summer; the telescopes at Cambridge and Defford have only undergone routine maintenance during this period and so we were able to respond to a request for observations of a new supernova with single baseline monitoring for a period of several weeks. This has provided a useful record of the flux variations and has provided an absolute position. Further information is contained below.

The full MERLIN will be back in operation in a few weeks, in time for the autumn EVN session. It will be available at C-band, with significant new capabilities as advertised previously and then, in January 2005 the array will switch to L-band. The call for proposals advertised a week or so ago, and repeated in this Newsletter, is soliciting proposals for the L-band session

On the VLBI front we have continued cooperating with our European colleagues in developing the technical capabilities of the EVN and in further *e*-vlbi tests. On 28 April, the LT along with WSRT and Onsala observed the gravitational lens JVAS BO218+357 and produced the first real-time VLBI image from data sent directly from a telescope into the EVN JIVE correlator (http://www.evlbi.org/evlbi/te017/te017.html). As we go to press, several *e*-VLBI tests are being performed with the inclusion of Arecibo, ahead of a first *e*-VLBI EVN science demonstration this month.

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3. *e*-MERLIN Update

Contracts for the optical fibre connections, which are the key to the *e*-MERLIN project, were finally signed in March and construction of the first link from the Pickmere telescope to Jodrell Bank Observatory began in June. The *e*-MERLIN fibre network consists of about 600 km of dark fibre route, largely leased from the Global Crossing UK network, running alongside railway lines, and about 80 km of new fibre installed along
minor roads to connect each of the MERLIN telescopes to the trunk fibre. The new fibre installation is being done by Fujitsu Telecommunications UK using a combination of conventional trenching, mole-ploughing and directional drilling (see pictures). The construction work on the 14km Pickmere to Jodrell Bank link has just been completed and the fibre cable will be installed and tested in the next few weeks. Much of the digging on the 21km route from the Knockin telescope has also been completed and work will soon start on the 30km routes from the Cambridge telescope

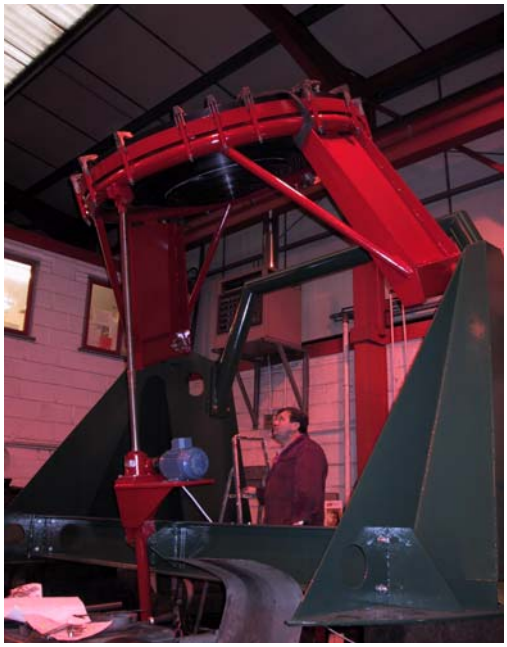

Figure 1: One of the L-band lenses and drive sy stems now installed on E-systems antennas

Figure 2: The horizontal directional drilling machine in action near the Pickmere telescope. This machine installs the cable duct at a typical depth of 1-2m in lengths of up to 100m. The depth and direction of the drill head is sensed and controlled remotely. This technique has allowed installation of the cable duct across farmland, underneath major roads and underneath driveways with minimal disruption.

Figure 3: The optical fibre cable (stored on the reel) is 'blown in' to the duct (at right) using high pressure compressed air. This technique minimizes the risk of damage to the cable, both from snagging and by distributing the tension over the length of the cable

to the East Cost main line. The whole network should be complete by Summer 2005. The first new C-Band receiver and its new cryostat have been completed and the receiver is being tested on the Pickmere telescope. The second and third receivers are being prepared for Knockin and Darnhall for their first use in November for 6.7 GHz EVN+MERLIN observations of methanol masers. The massive L-band lenses and their drive systems have now been installed on all three E-systems telescopes. The first of the L-band horns will be tested in conjunction with the lens in the next few weeks.

S.T. Garrington (stg@jb.man.ac.uk)

4.Topical News and Recent Science

Radio Supernovae monitoring in nearby starburst galaxies.

In autumn 2003 a 5 year program was initiated to monitor the radio emission from 10 nearby (<15Mpc) starburst galaxies every four months using a combination of MERLIN and the VLA. The aims of this project are to detect new radio SNe within these galaxies and to further monitor the flux evolution of existing remnants. Radio observations have the significant advantage of being able to penetrate the dust and gas enshrouded centres of star-forming galaxies which are not accessible to optical observers because of obscuration. Some interesting results have already been found:

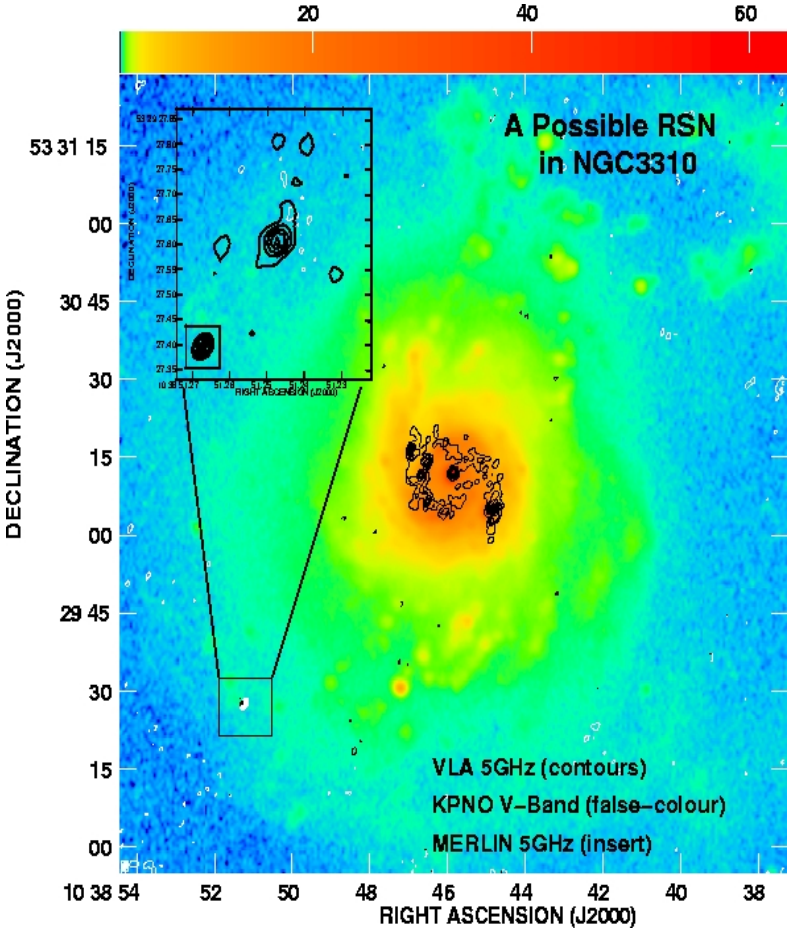

Figure 4: MERLIN and VLA 5GHz radio images contoured and overlaid on a KPNO V-Band image shown in false-colour

NGC3310: The first observing session was conducted at the VLA in November 2003. Although initially no new supernovae sources were noted, inspection of the outer part of NGC3310 did reveal the presence of a compact radio source ~4kpc from the central starburst region. From a subsequent investigation of this source using both MERLIN and VLA archival data, and observations using a subset of MERLIN at 5GHz it was concluded that this source is most likely a previously un-catalogued radio supernova which exploded in the early 1990s.

SN2004dj: NGC2403 is a nearby galaxy within the M81/82 group and, although not formally part of our observing program, it has harbored two optical supernovae in the last 50 years (SN1954J & SN2002KG, 16 and 19 mag respectively). On 31st July 2004 a third was discovered: SN2004dj. At 11.2 mag, it is the brightest optical supernova in over a decade. During the summer of 2004 the VLA has been in D-configuration and was unable to unambiguously separate radio emission due to SN2004dj from the extended emission of the host galaxy. Consequently a request was received from van Dyke for MERLIN monitoring. Unfortunately SN2004dj appeared just as many of the MERLIN telescopes were undergoing engineering upgrades. However observations using a sub-set of MERLIN antennas successfully detected SN2004dj at

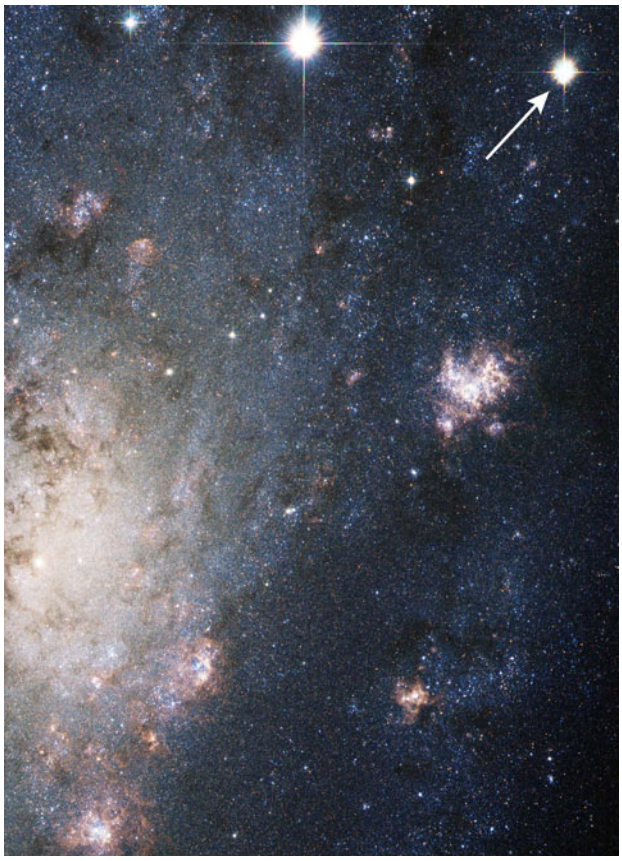

Figure 5: NASA Hubble Space Telescope image of the supernova SN2004DJ (arrowed) in the outskirts of the nearby galaxy NGC2403
Credit: AV Filippenko, P Challis

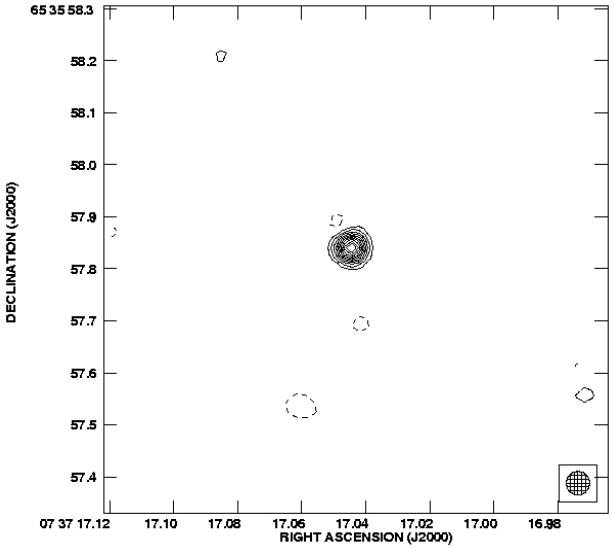

Figure 6: MERLIN 5GHz image of SN2004dj made from several days of observations. Contour intervals linearly spaced with a separation of 250µJy/beam.

4994MHz with a measured a flux density of 1.5+/-0.15mJy, and produced the most accurate position so far recorded for this source (see IAUC 8399). Our continued monitoring has resulted in a well sampled early radio light curve for this type-IIP supernovae. The observations were carefully phase-referenced using three independent calibrators with a resulting positional accuracy of better than 0".050. This is within 0".4 of the optical position reported by Itagaki on IAUC 8377 and agrees with the X-ray position reported by Pooley & Lewin, but is 3".8 from the cluster Sandage 96 which several authors have suggested as a possible progenitor.

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