
Obtaining e-MERLIN Data For Use With NRAO Legacy Projects

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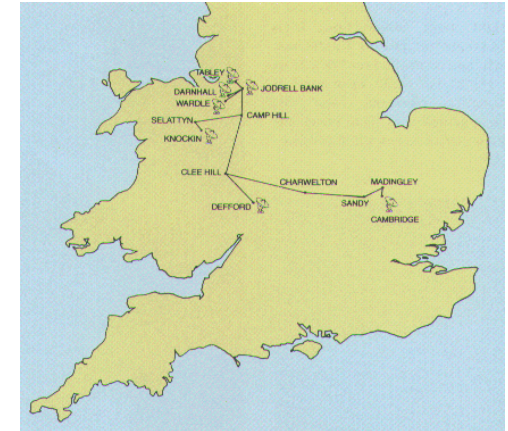
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Outline

- *e*-MERLIN overview and status report
- VLA + MERLIN combination deep field studies
- *e*-MERLIN enhanced key projects

Introduction

- Original MERLIN
 - Motivated by high resolution at cm wavelengths; real time
 - 50 – 150 mas resolution
 - 7x resolution of VLA: can resolve
 - Novae; Circumstellar OH shells; YSOs
 - SNR in nearby starburst galaxies
 - Star-forming galaxies in Deep Fields
 - Jets in young radio galaxies
 - Key technical advances
 - Affordable data links with 30 MHz b/w
 - Radio link clock distribution (few ps)
 - Sensitivity limited by link bandwidth
 - Sparse spatial frequency coverage



e-MERLIN Upgrade

- Tightly focussed on sensitivity upgrade using optical fibre links
 - 2 GHz bandwidth in each polarization
 - New C-band (4-8 GHz) receiver suite
 - Modest improvement in $T_{\text{sys}} \sim 30\text{K}$
 - Upgrade L-band (1.3-1.7 GHz)
 - Deployable lens for 3 E-systems (VLA-type) dishes
→ frequency flexibility
 - Upgrade K-band (22-24 GHz)
 - New LNAs for receivers
 - Retain radio link initially for LO distribution
 - Develop implementation over fibre – reduce cost
 - New correlator
 - Wide field (<0.5 MHz channel width at full bandwidth)
 - Spectral line (<0.5 kHz channels in multiple sub-bands)
 - Low cost
 - Share development (eg ALMA/EVLA/e-MERLIN DTS)
 - Retain & reuse (eg synthesisers, LO link)

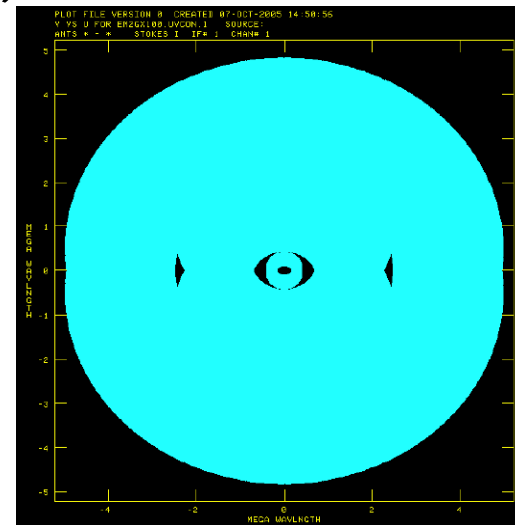
Capabilities

C-band (4-8 GHz)

- 2 x 2 GHz (L & R) or 4 GHz (L or R) bandwidth
- 25 x sensitivity $\sim 2 \mu\text{Jy}/\text{beam}$ or 65K in 12hrs
- 40 mas resolution
- Sub-mas ICRF astrometry (GPS network)
- Almost complete aperture coverage via MFS
- 4-5 arcminute diameter field of view (Lovell)

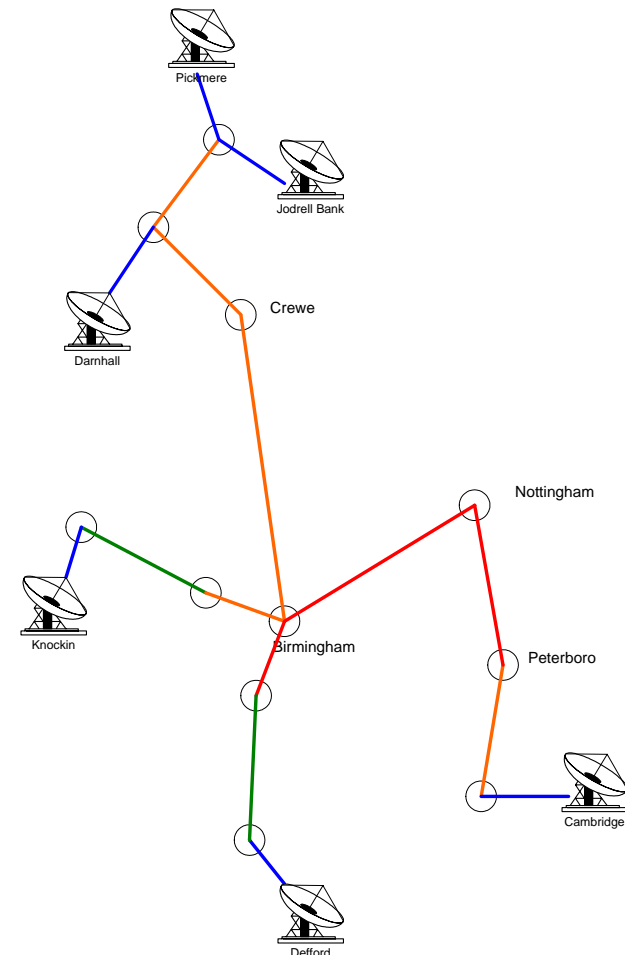
Continuum sensitivity (12 hrs) in other bands:

L-Band (1.3-1.8 GHz) $\sim 5 \mu\text{Jy}/\text{beam}$
K-Band (22-24 GHz) $\sim 11 \mu\text{Jy}/\text{beam}$



Data Transmission Network Solution

- Requirement: 30 Gb/s sustained data rate from each telescope
- Private fibre network to connect remote telescopes in rural locations
- Have installed & tested 90km new fibre alongside minor roads to connect to...
- Dark fibre trunks provided mainly by Global Crossing (UK)
- Use e-MERLIN/EVLA/ALMA data transmission system
- Amplifiers/Regeneration at Peterborough, Nottingham, Birmingham, Crewe, designed and installed by JBO

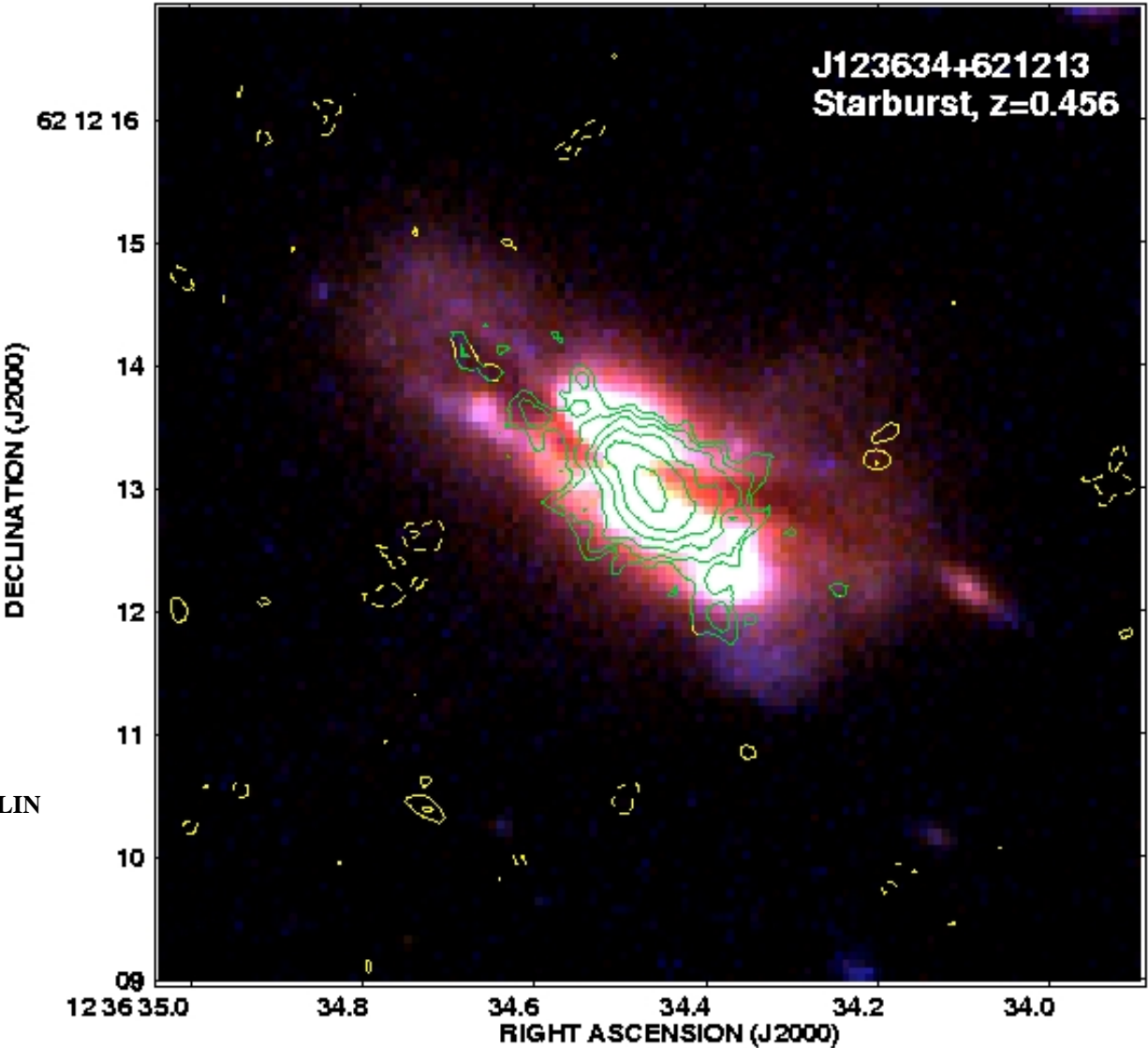


e-MERLIN Status

- C-band feeds, receivers in service
- L-band lenses in service
- Fibre network in and tested
- Data transmission equipment OK in lab, being tested on real connections now
- IF prototype now under test
- Samplers & regeneration equipment for longest links still under development
- Ready for prototype correlator - first fringes 2007
- Fully operational 2009

VLA+MERLIN Deep Fields

- Highest resolution (equivalent to the VLA)
- With the best angular resolution available with the VLA
- Deep fields



MERLIN has
resolution of the VLA

high resolution and
depth, making it
ideal for forming
images in great
detail. For
studies of
nearby galaxies
)
ideal

Contours: VLA+MERLIN
CI=10 μ Jy/bm (0.3")
Image: HST ACS



e-MERLIN Enhanced Key Projects

- Up to ~30% of e-MERLIN time available for such projects in first 3 years of full e-MERLIN operations (from end 08, or mid 09?)
- 2006-07 formation of consortia to bid openly for e-MERLIN time
- Expect call for projects to be issued this autumn
- Decisions on projects and establishment of consortia by early 07
- Consortia expected to provide some additional resources (subsequently to be made available to the community)
– *cf Arecibo ALFA consortia*
- Data to be made available in public domain in a VO-compatible form after a reasonable proprietary period (2 year TBD)
- Planning still at early stage – few details yet finalised
- Would it be useful for MERLIN/MBL National Facility and NRAO to investigate a mechanism for joint proposals in this specific area?
- Announcements on ‘merlin announce’ and VLBV exploders
- The Enhanced Key Projects are derived from and effectively replace the initial ‘MERLIN Legacies’ initiative

END