



# e-MERLIN : a pathfinder for the SKA

(a summary of the e-MERLIN talk given at the Berkeley SKA meeting)

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11/7/01



# e-MERLIN

[www.merlin.ac.uk/e-merlin](http://www.merlin.ac.uk/e-merlin)

- Fibre connect
- 2 GHz/p
- Data rate
- Sensitivity (system)
- Correlation
  - e-MERLIN ~10 as VLBI
  - Output
  - Hundreds of high science
- Complete



Jodrell Bank



Pickmere



Darnhall



Knockin

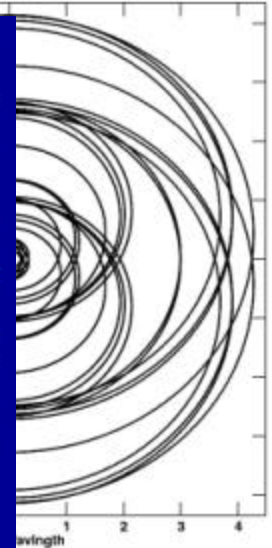


Defford

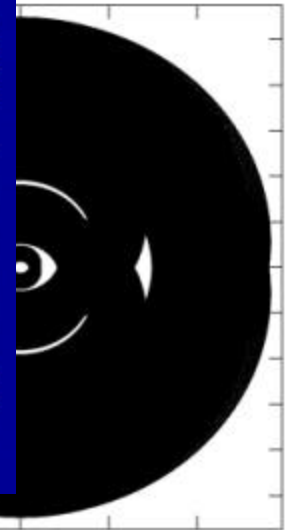


Cambridge

Plot file version 1 created 17-OCT-2000 19:10:04  
V vs U for MERLIN.UVCON.1 Source:  
Ants \*.\* Stokes I IF# 1 Chan# 1



09:51:05  
ce:



Bar

UH

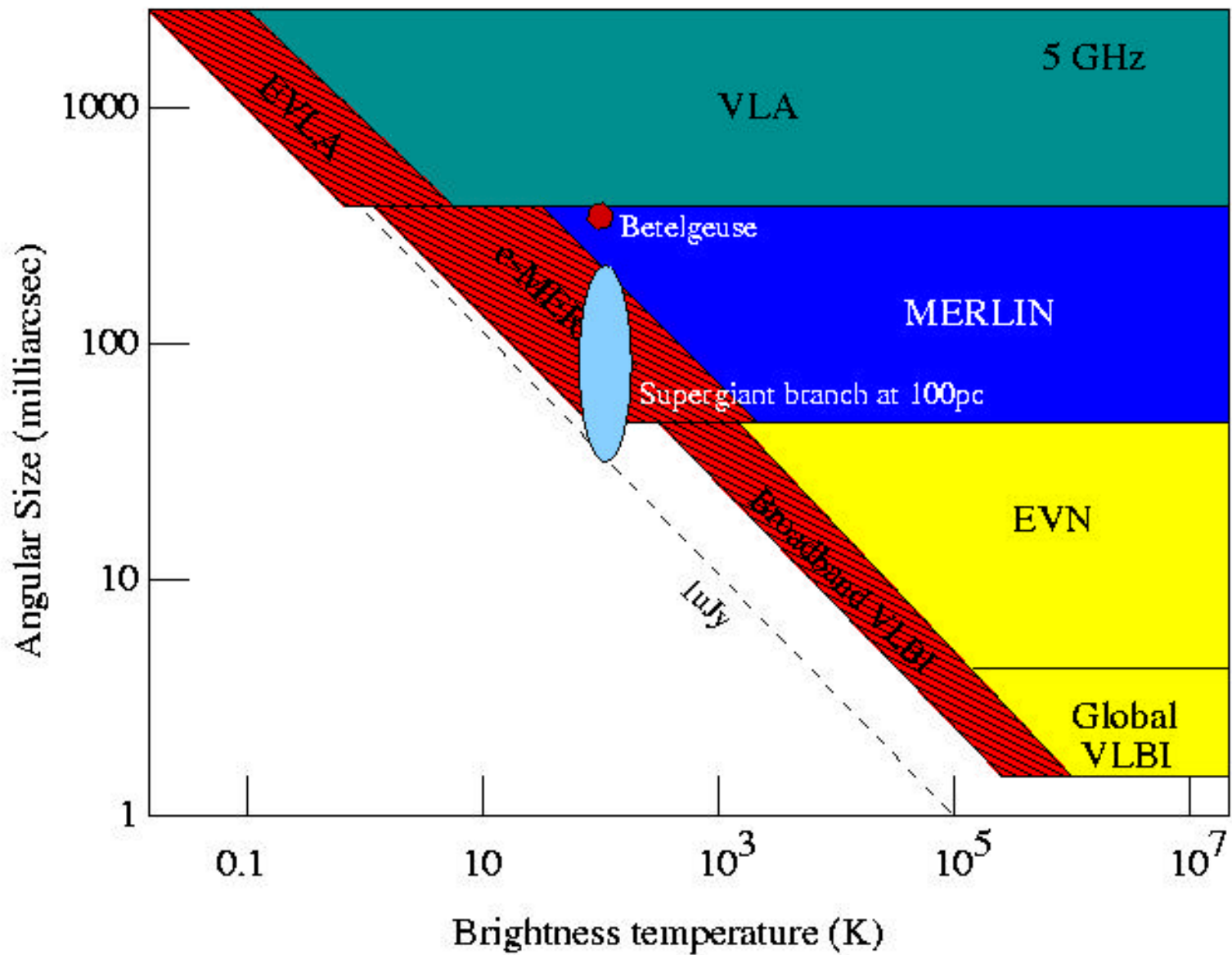
L

C

X

U

K



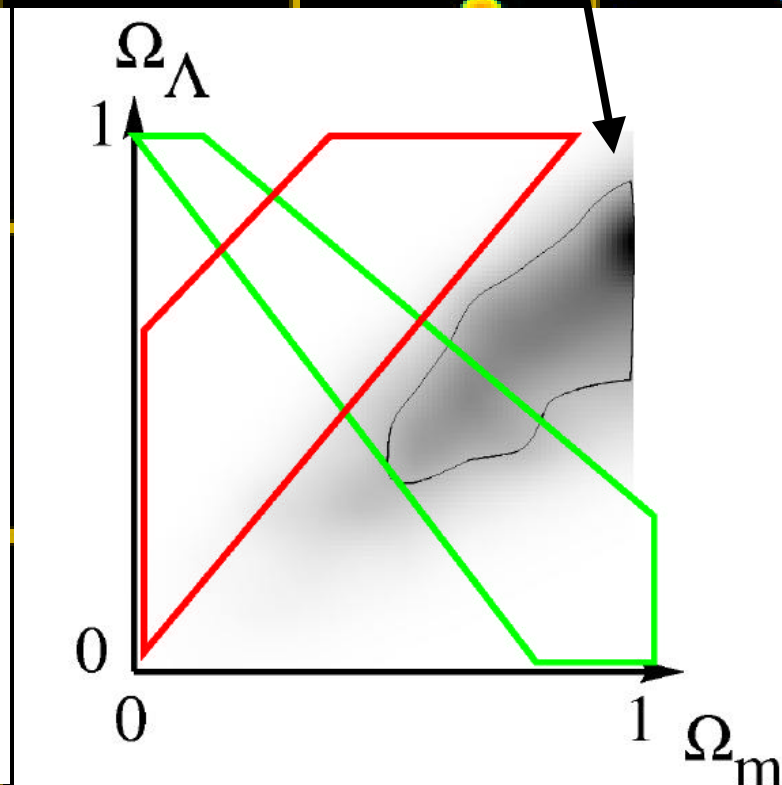
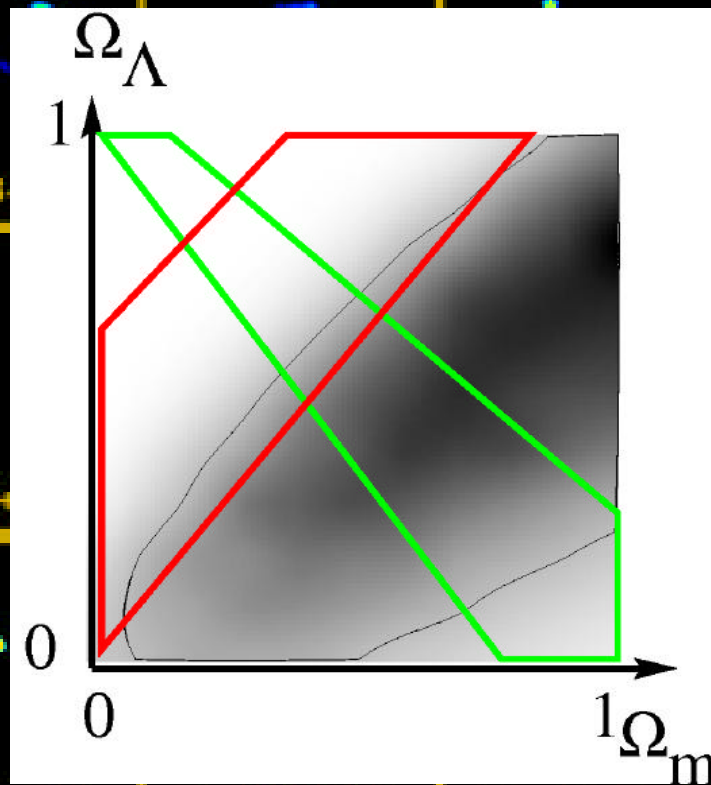
# e-MERLIN Science

- Cosmology – gravitational lenses, JVAS/CLASS, constraints on cosmological parameters, e.g  $\Omega_m$  and  $\Omega_\Lambda$

Current constraints: Red from supernovae

e-MERLIN constraints

Green from Boomerang, JVAS/CLASS as contours



B1422+231

B1555+375

B1600+434

B1608+656

B1933+503

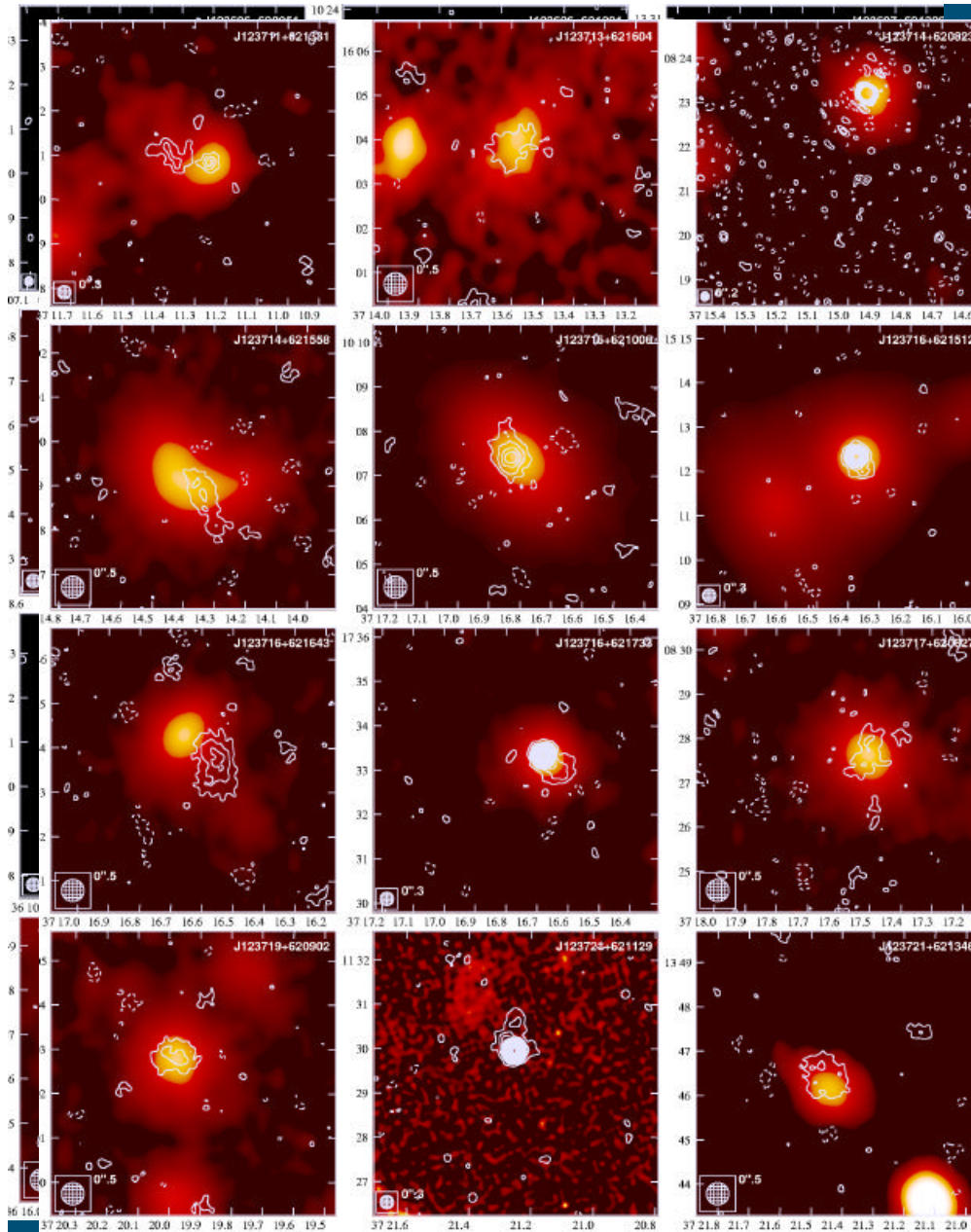
B1938+666

B0128

B1127

74

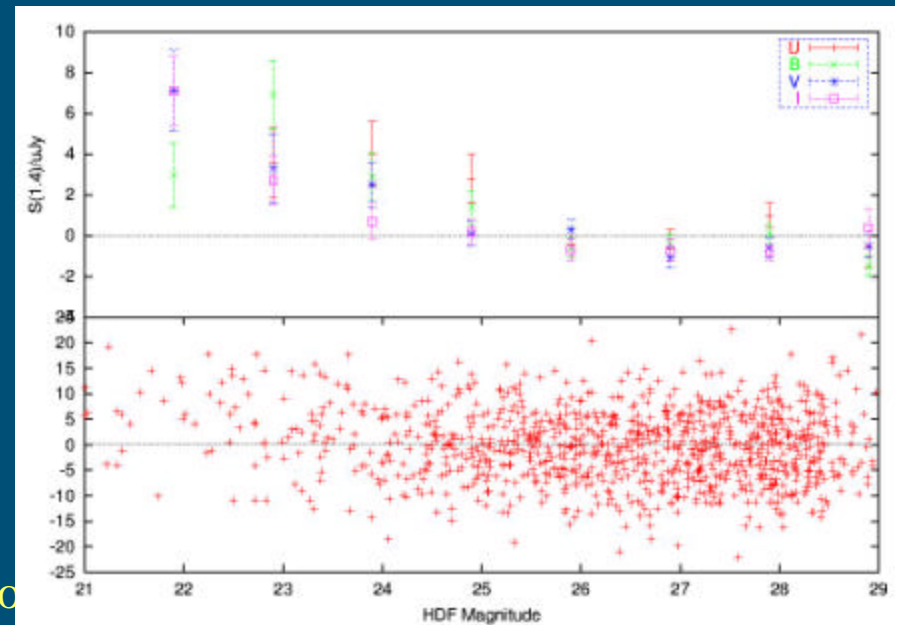
51



- Galaxy Formation & Evolution: nature of submm galaxies, starbursts, X-ray background.
- 100's of sources in primary beam.

Statistical detection of  $< 10\mu\text{Jy}$  sources in HDF.

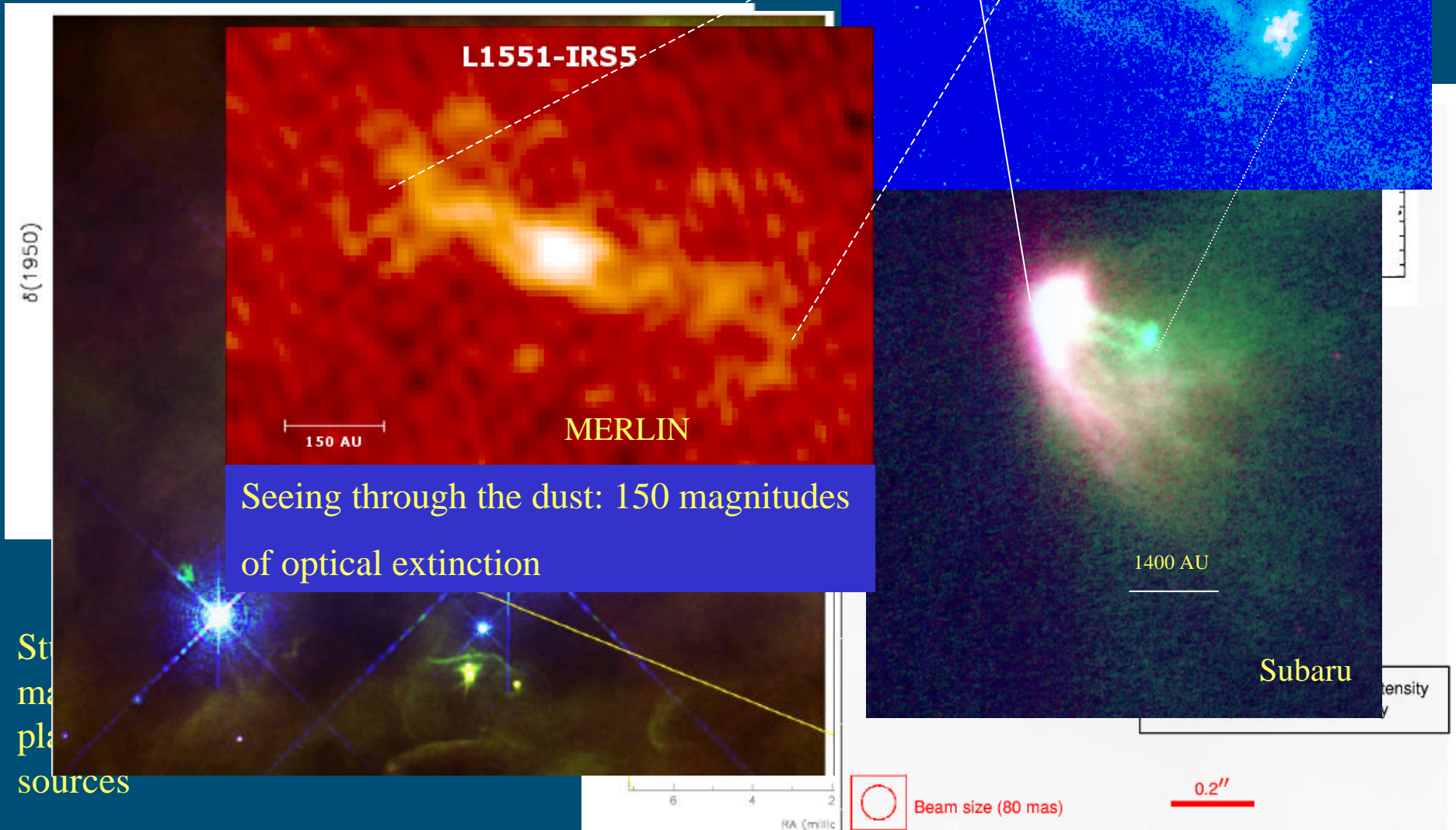
Excess radio emission clearly seen for  $I < 26$ , implying majority of galaxies at this level detectable by e-MERLIN



HDF: contours are MERLIN+VLA 1.4 GHz emission

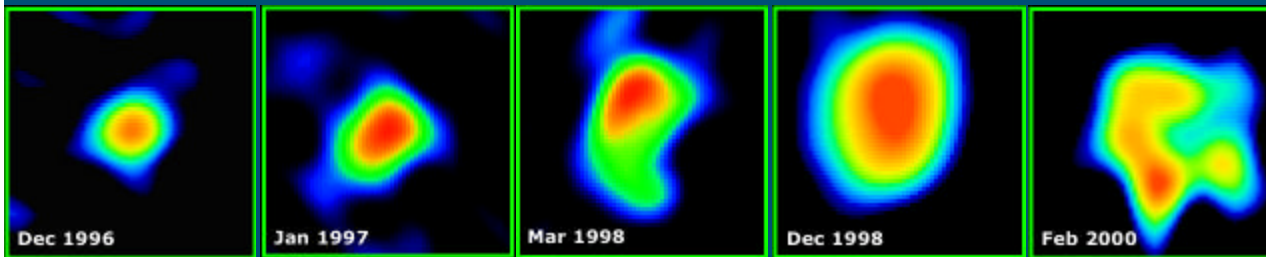
# e-MERLIN Science

- Star-formation:
  - Imaging thermal jets and outflows in YSOs
  - Maser emission in star-formation regions



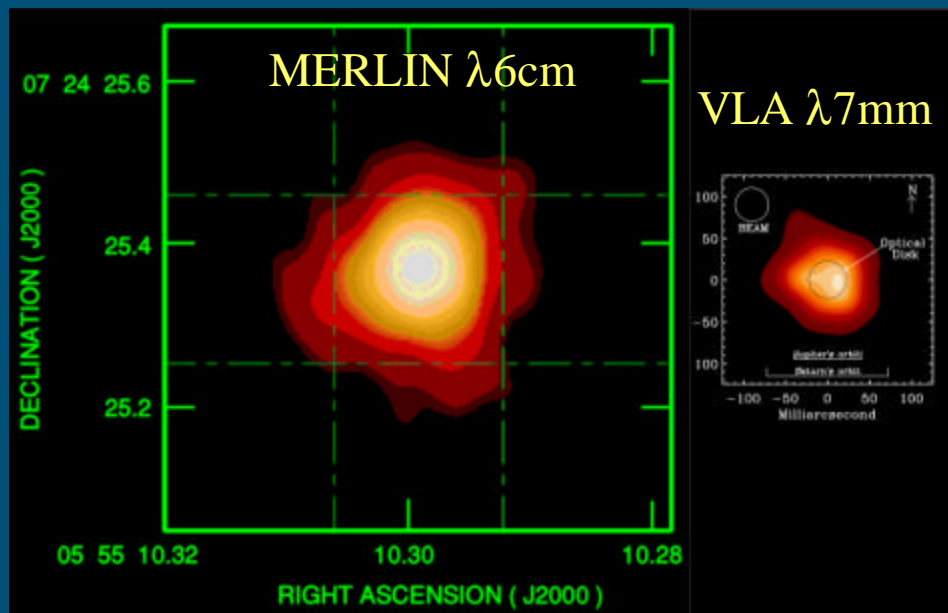
# e-MERLIN Science

- Main sequence and evolved stars – novae, stellar coronae, planetary nebula, surfaces of supergiants/giants

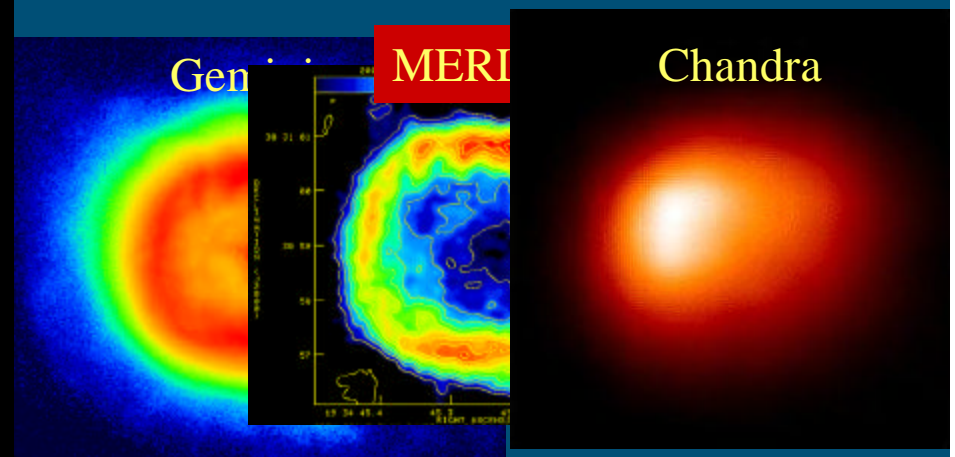


Nova V723 Cas

## Imaging stellar surfaces



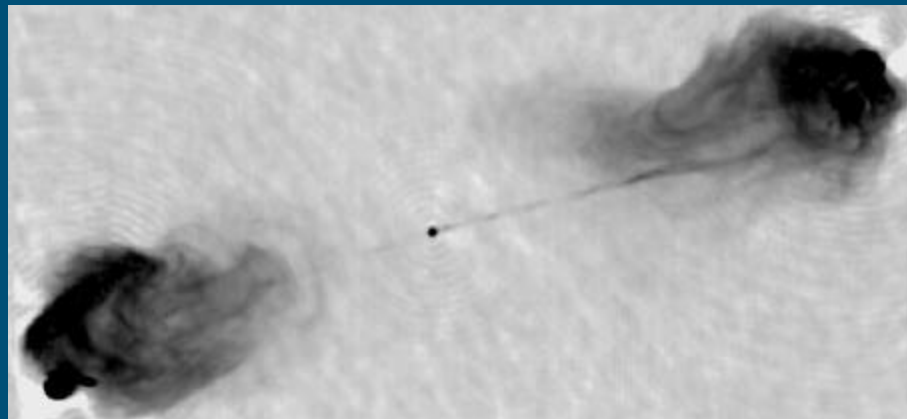
## Planetary Nebulae



BD +30° 3639

## e-MERLIN Science

- Extreme environment astrophysics –
  - micro-quasars,
  - relativistic jets in AGN,
  - pulsar proper motions,
  - GRBs .....

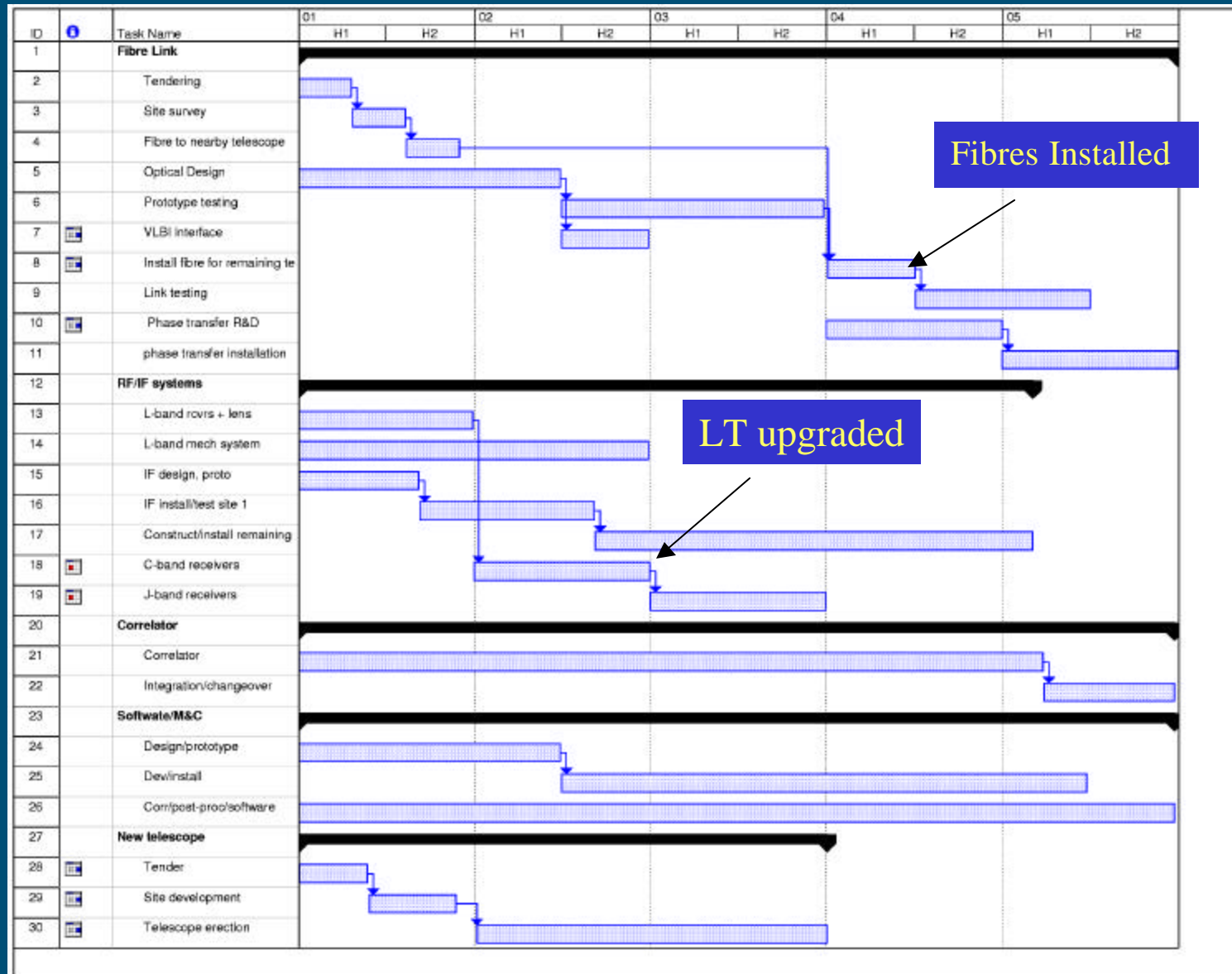


e-MERLIN will provide detailed images of Cygnus A-like objects at 10 times the distance currently possible.

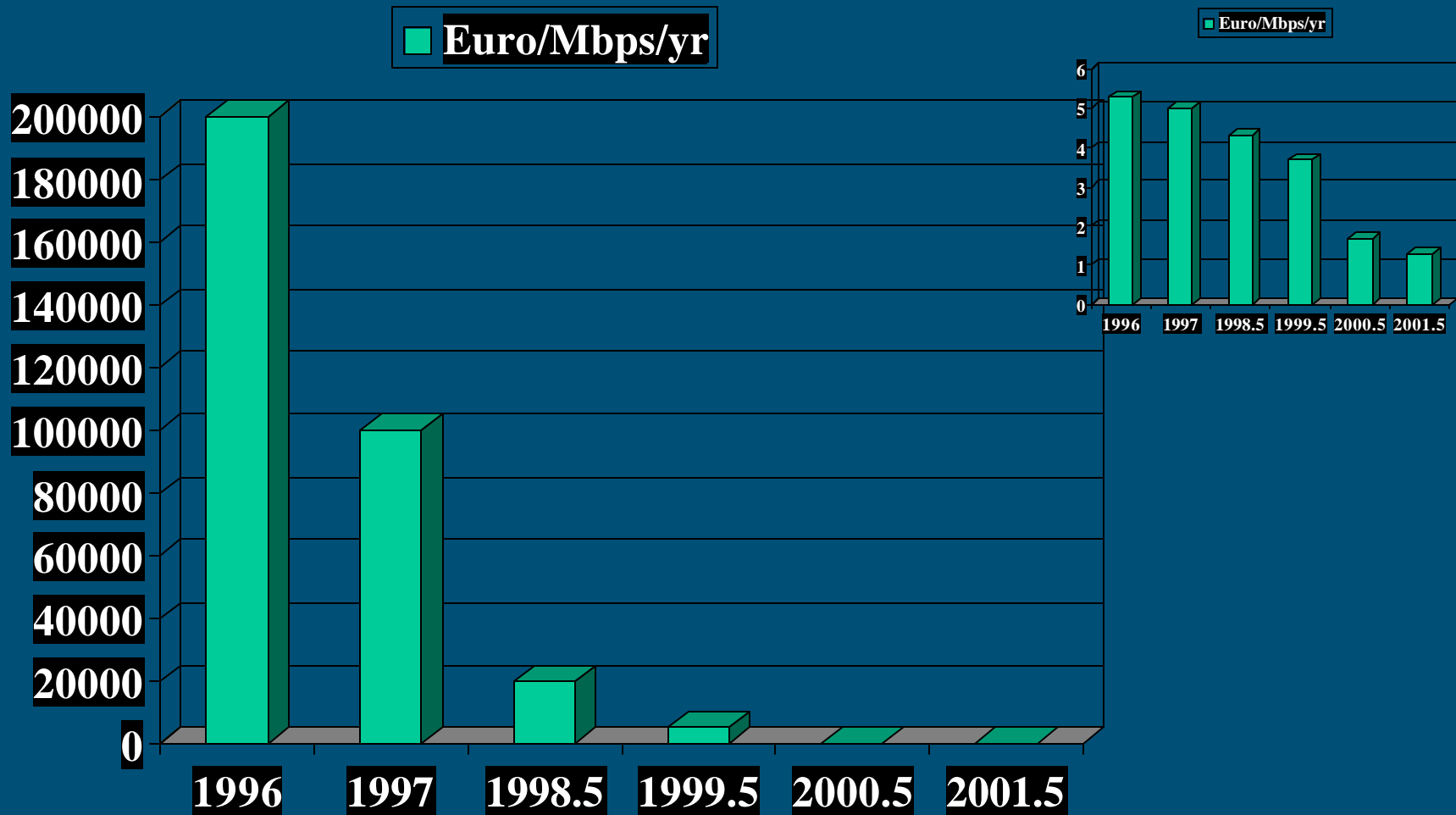


# e-MERLIN: straw-man timetable (now out of date)


5 year timeline



# Cost of leasing dark fibre



## e-MERLIN status

- Re-scoped project:
    - deferred 12-18 GHz system
    - adopted ALMA data transmission system => 1.5 GHz bandwidth (i.e. 12.5% hit in sensitivity)
    - Cost now £7.0M
  - March, 2001 --- highly rated by Astronomy Committee  
But no capital cost available from PPARC.
  - May 2001, final resolution of capital cost:
    - NWDA: £2.5M
    - SRIF: UMan £2.0M, UMIST £0.25M, UCam £0.25M
    - Savings on MERLIN Ops: £1.3M
    - U Manchester willing to underwrite remainder: £0.7M
- 
- £7.0M

## e-MERLIN status

- Current status:
  - Negotiations underway with PPARC on future operating costs
  - September, cost and risk assessment
  - Early 2002 start project build phase.

## From e-MERLIN to SKA

- Develop digital, fibre etc technologies essential for SKA
- Learn how to operate fibre-based system with SKA-like baselines and in hostile RFI environment
- Maintain British astronomical expertise in cm-wave interferometry
- e-MERLIN will have  $\mu\text{Jy}$  sensitivity at  $< 0.1$  arcsec resolution
  - demonstration of range of science possible with SKA