ADVANCED RADIO ASTRONOMY IN EUROPE

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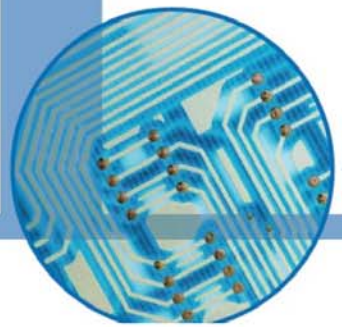


FP7 RadioNet and CCAT:
13 September 2006 Cardiff

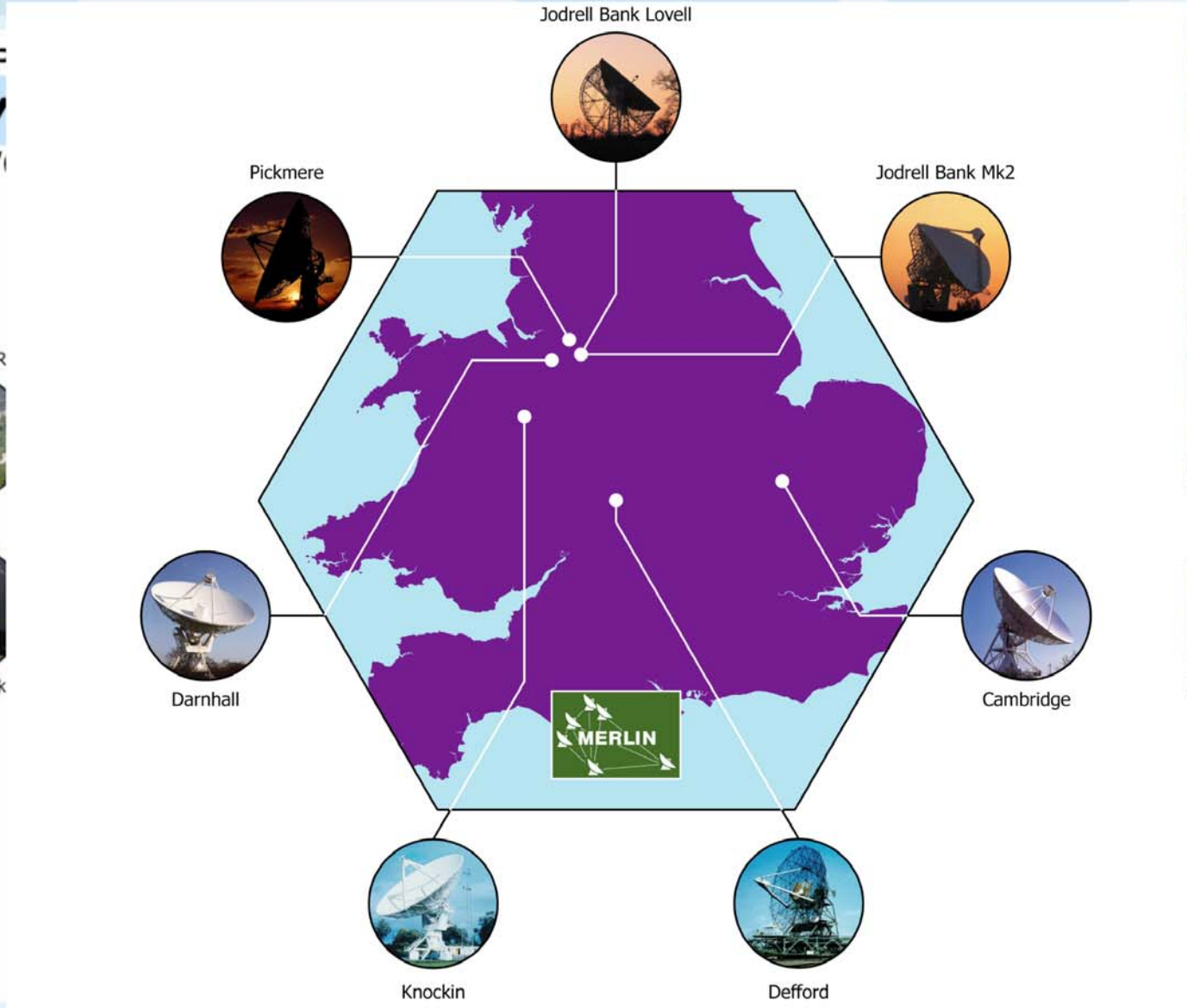
European Radio Astronomy

European Radio Astronomy

European Radio Astronomy

EUROPEAN VLBI NETWORK

European Radio Astronomy



The near future

- Yebes 40m (commissioning) 2006
- SCUBA-2 2006/7
- LOFAR 2006/7
- e-MERLIN 2008
- Sardinia 64m 2008
- ALMA 2009+
- e-EVN 2009

- In addition, EVLA will be coming on-line
- …. and the SKA + its pathfinders KAT and MIRA

RadioNet Partners & Mission

- RadioNet has 24 partners: most of the major radio astronomy facilities and laboratories involved in technology development.
- Grew out of 25 years of cooperation in the European VLBI Network.
- Coordinated by Univ. of Manchester, UK
- Remit is to support the European radio astronomy community and to enhance the European radio astronomy facilities
- RadioNet was awarded €12.4M by the EC
- Is becoming a major factor in our plans for planning the future of European radio astronomy.

Scope of FP6 RadioNet

- Trans-National Access (TNA)
  - Effelsberg, EVN, IRAM (PdB & PV), JCMT, MERLIN, OSO-20m, WSRT
- Joint Research Activities (JRA)
  - ALBUS: algorithm and software for interferometry
  - AMSTAR: developing new mm/submm devices and instrumentation
  - PHAROS: developing 5 GHz prototype FPA
- Networking Activities (NA)
  - science, engineering, (software), ALMA, spectrum management; planning for the future

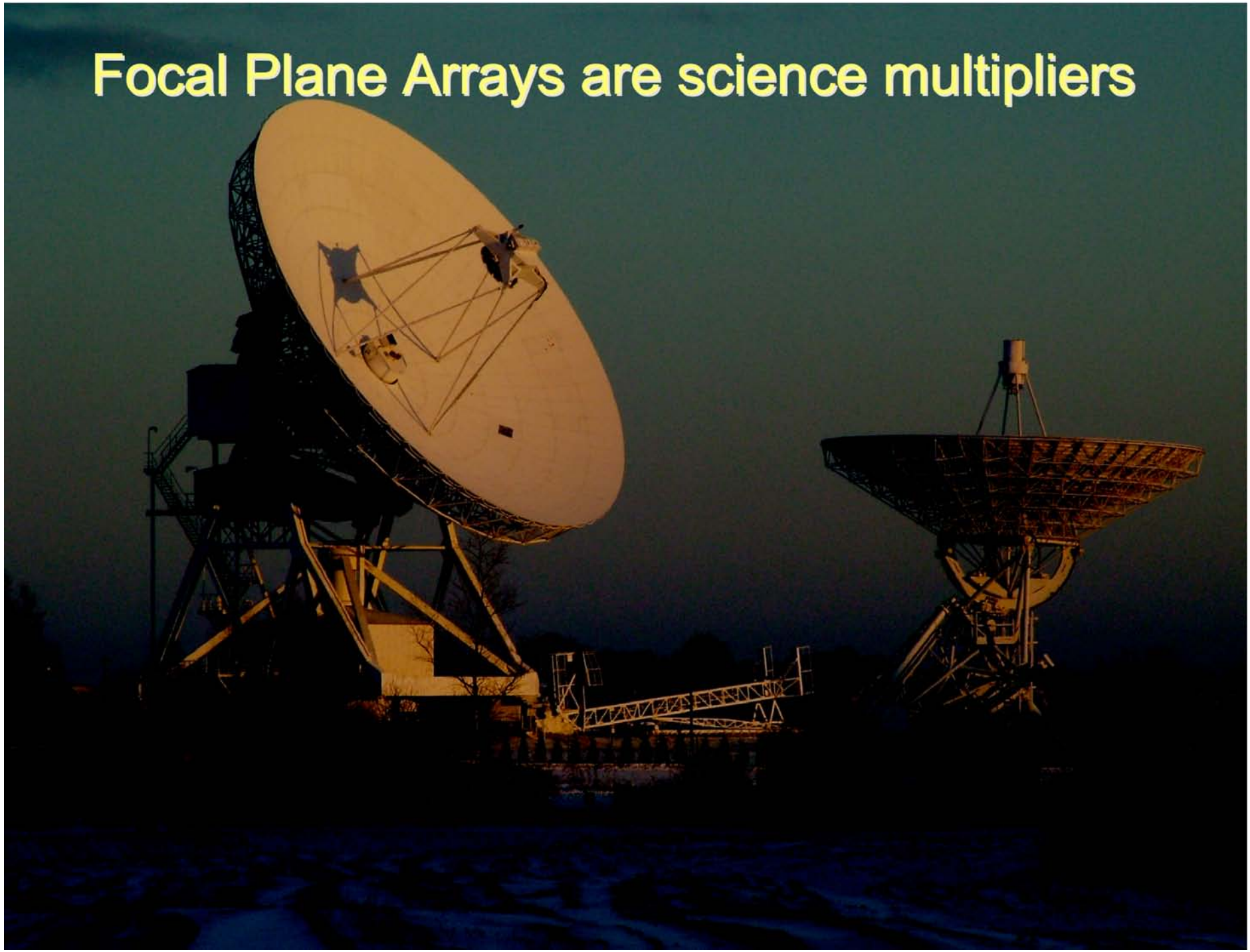
FP7 Planning

- Meeting in Volterra in April 2006 to plan FP7 RadioNet
- Expected size:
  - Build a proposal aiming at ~ €20-25M, dependent on advice from DG-Research.
  - Will have TNAs, Networks and JRAs
  - FP7 will run for 6/7 years – maybe too long for an I3
- Principles:
  - The strategy must be science-driven.
  - Exploite new and strategic instruments owned and operated by Europe, e.g. e-MERLIN, e-EVN, PdB, upgraded single-dishes, LOFAR, ALMA and SKA
  - Enunciate clear goal for the inclusion of a particular R&D area
  - Ensure that we educate and train the next generation of astronomers and engineers:
  - Think strategically and on European-scale, not nationally

Summary of 20 April Meeting

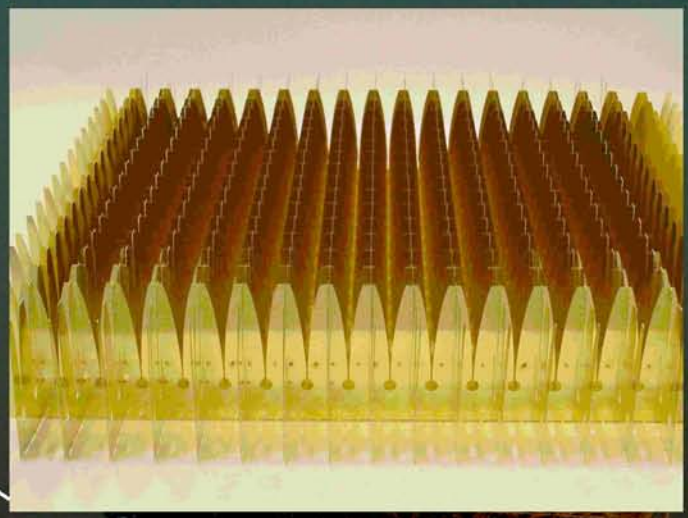
- JRAs – 4/5 major areas have emerged
- FPAs :
  - develop next generation of phased and horn arrays,
  - move from (generally) conceptual and R&D phase to deployment of large-scale arrays for astronomy, from GHz – THz
  - Clearly enhances existing facilities but also very relevant for the future.

Focal Plane Arrays are science multipliers



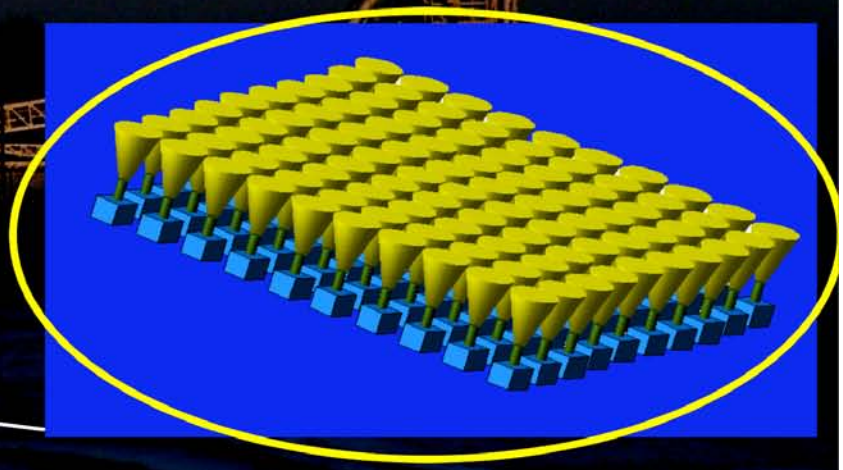
Focal Plane Arrays are science multipliers

Low-frequency (1.4-5 GHz) beam-forming arrays to maximise the potential of the EVN



- Mid-frequency (30-120 GHz) horn arrays to maximise the potential of large single dishes in Europe (e.g. Yebes, Effelsberg, SRT etc)

- High frequency (100-1000 GHz) horn arrays to maximise the potential of high-altitude single dishes in the era of ALMA



Continuation of AMSTAR

- AMSTAR+ : Very Large Format FPAs at mm/submm wavelengths and State of the Art Methodologies at THz frequencies
  - **a) Wideband SIS mixers with integrated HEMT** amplifiers.
  - **b) Compact 2SB and SSB SIS mixers**.
  - **c) Extension of this work to the THz domain** with HEBs and SIS mixers.
  - **d) Local oscillators** for large focal plane mm/submm array receivers and for THz frequencies.
  - e) Development of **cryogenic 3-mm MMIC amplifiers** in collaboration with a European foundry.
  - f) Development of **new detector technologies** for broadband continuum and spectral line signal observations.
  - g) Construction of scaled **prototype of a very large millimeter-wave heterodyne FPA.**

Other possible JRAs

- Algorithm development, especially for interferometry, has been under-resourced for > decade.
- One major software JRA:
  - Continuation of ALBUS, ParselTongue
  - Radio interferometry algorithm development in modern environment; software/algorithms for FPAs
  - Distributed/parallel computing for large datasets
- Digital systems:
  - CORFU – next generation correlator development
  - Next generation pulsar timing equipment
  - VLBI backends
  - Clock distribution for SKA : relevant now, e-MERLIN, e-EVN

Networks

- Science workshop activity:
  - Coordinates workshops in different areas : general science themes, mm/submm-related themes (separate in FP6); pulsar meetings; panchromatic workshops supporting SKA science case.

- Activity running schools & maybe science personnel exchanges:
  - m/dm/cm/mm/submm interferometry schools
  - Single-dish schools
  - YERAC
  - Solar physics schools
  - Spectrum management Schools
  - Training in best engineering practice

Other possible Networks

- Geonet – link geodesy to European astronomy activities
- LOFAR across Europe: planning, RFI, long-baseline calibration strategies…
- SKA non-astronomy applications
- QASP for E. European antennas
- Space VLBI – preparation for VSOP-2. Will now happen, so important we organise ourselves.
- ESKAC
- Policy / Industrial links

TNAs

Strong case for major existing facilities (but all should be re-examined)

- Several major new instruments coming on-line soon and in FP7 period – LOFAR, Yebes, SRT
- Other large facilities : NRT, GMVA
- Smaller, more focused facilities : INAF 32ms, APEX (Swedish time), Nancay radioheliograph, AMI/VSA

Timeline

- Will be relative to issuance of Call for Proposals and date of proposal submission (T_o).
- Believe T_o will be ~Dec 2007, i.e. 2nd call within FP7
- Timeline:
  - Set deadline of 15Feb07 for receipt of more developed ideas
  - June07 months : institute peer review process for TNAs
  - July07 months : 2nd & final FP7 planning meeting, emerge with final list of projects; decide on new membership
  - Oct07 months : fully developed project proposals to be received, small team start development of overall proposal
  - 15Nov07 month : Board approves FP7 proposal
  - 1Dec07 – submit