EMU: The Evolutionary Map of the Universe

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***Who is who*:**
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What is EMU?

Evolutionary Map of the Universe (EMU) is a radio sky survey project using the new Australian SKA Pathfinder telescope to make a deep, wide-field radio continuum survey at 1 GHz (288 MHz bandwidth). The survey will cover the entire southern sky extending up to at least +30 deg in declination.

It is expected EMU will detect and catalogue ~70 million radio sources with angular resolution of 10–15 arcsec down to noise levels of <20 μJy/beam. The survey will deliver images and sophisticated value added catalogues, which will include multiwave-length identifications, redshifts, and radio source classification.

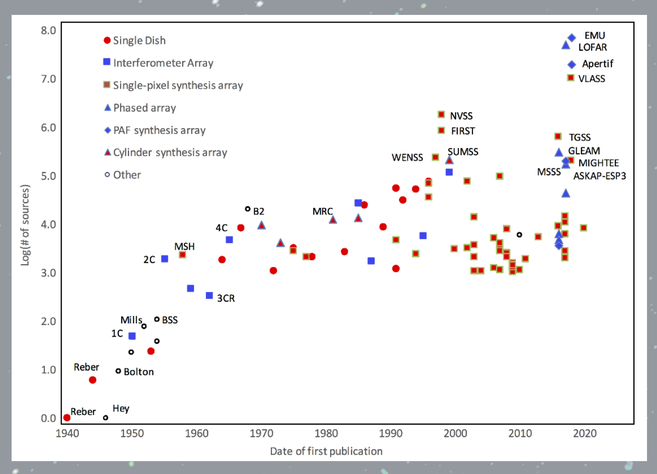


Figure 1:
Number of extragalactic radio sources discovered by surveys as a function of time (Norris, 2017). EMU will detect some 70 million sources.

Australian SKA Pathfinder (ASKAP)

ASKAP is a 36 antenna radio interferometer located in the remote Murchison Radio-astronomy Observatory in Western Australia, 800km NE of Perth. ASKAP dishes are equipped in state-of-the-art receivers, Phase Array Feeds (PAFs), that allow for instantaneous 30 sq.deg field of view at 1.4 GHz thanks to each PAF forming up to 36 instantaneous and independent beams. This capability, and the collecting area of 4,000 sq deg, make ASKAP particularly suited to delivering large-scale surveys.

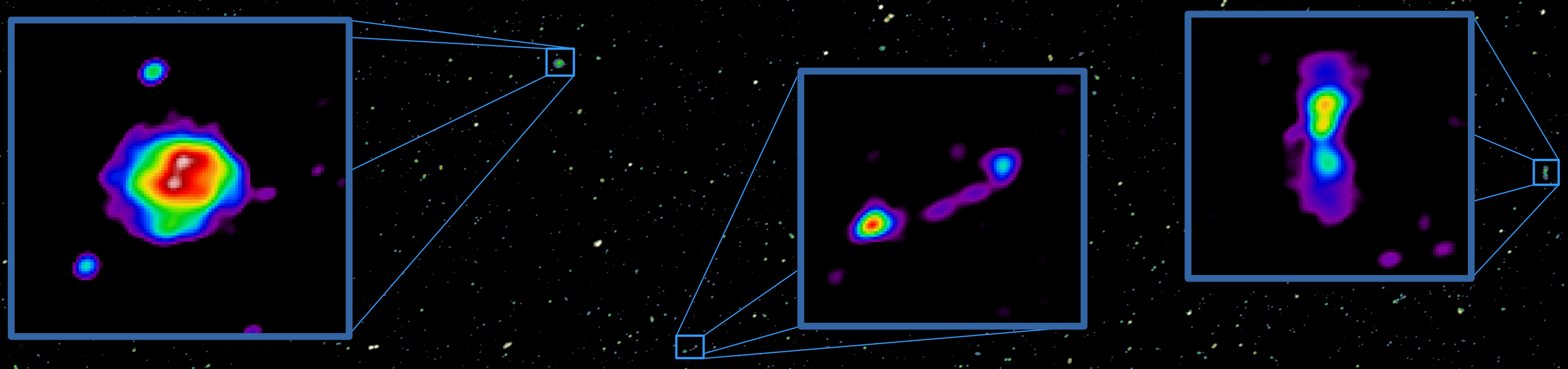
ASKAP, with its non-movable 12m antennas, has a maximum baseline of 6km, and observes at frequencies from 700 MHz to 1.8 GHz with an instantaneous bandwidth of 300 MHz.

EMU Science

Our backyard: Located in the southern hemisphere, ASKAP and EMU are perfectly suited to observing the Galactic Centre and the Galactic Plane in continuum radio emission, cataloguing stars of the Milky Way in various stages of their evolution.

Galaxies: EMU will detect typical star-forming galaxies up to redshift z=1, powerful star-bursts to higher redshifts, and the AGN population to the edge of the Universe. The survey will reveal the cosmic star formation rate density, fill in our gap in knowledge on the nature of radio-quiet AGN, and help us understand the link between AGN and star formation evolution.

The largest scales: EMU is expected to detect diffuse radio emission from clusters of galaxies and the cosmic web, which will also aid in tracing the large-scale structure formation. The scale and depth of the survey will allow us to study cosmology and precisely measure cosmological parameters.



EMU Pilot Survey

EMU observed its pilot survey for a total of 100 hrs (10 fields x 10 hrs each) on 15 Jul – 02 Aug 2019, to test the observing mode planned for the full survey. The EMU pilot survey maps 270 sq. deg of the sky (~1% of the full survey area) in the Dark Energy Survey area, with an angular resolution of 10–15 arcsec and image noise of ~25 μJy/beam, cataloguing ~200,000 radio sources at 994 MHz. Processing and data validation are in progress, and are available to all EMU team members.

The background image of this poster shows data from the Pilot Survey.

EMU is an open collaboration of over 300 scientists from 20 countries.
If you would like to join us, contact the EMU Management Team.

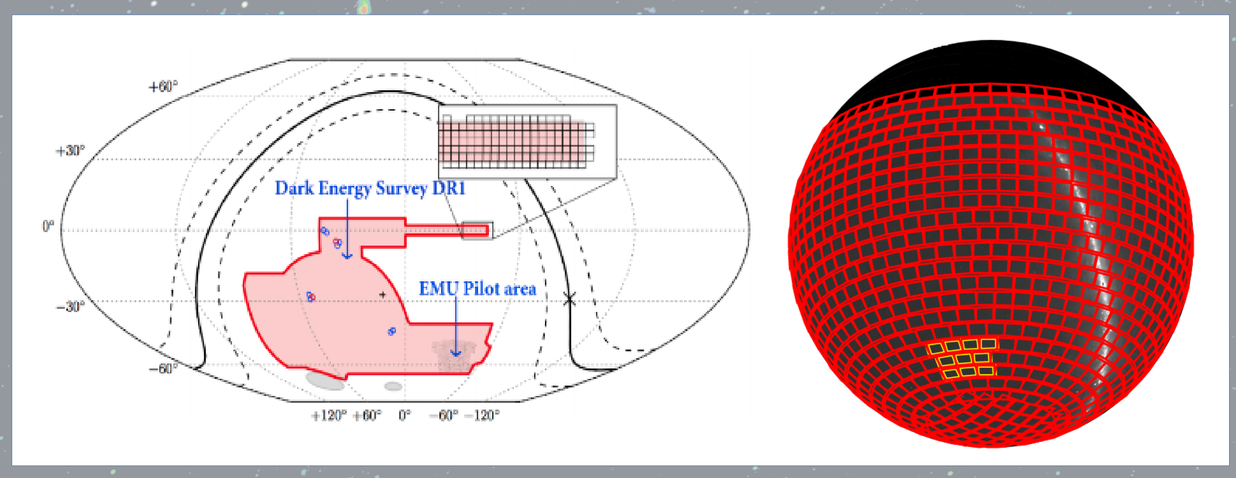


Figure 2: Location of the EMU Pilot fields as compared to the DES DR1 sky region (left), and the full EMU survey (right). EMU will cover the sky in 'tiles' (right panel: tiles of full EMU survey in red, and of pilot survey in yellow). Credits: R.P. Norris, J. Marvil.

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