# BETA & ASKAP-12

- BETA: first six ASKAP dishes, with version 1 of phased-array feed
  - commissioning ongoing; operational from late 2012?
  - maximum baseline 900 metres, resolution ~ 80″ at 1 GHz
  - sensitivity: ~0.3 mJy/beam over 300 MHz in 1 hour (for $T_{sys}$ = 50 K at v < 1.2 GHz)
- ASKAP-12: BETA plus six more dishes with version 2 of phased-array feed
  - feeds installed in March 2013; fully operational from late 2013?
  - maximum baseline TBD; 3-km baselines give resolution of ~ 20″ at 1 GHz
  - sensitivity: ~0.15 mJy/beam over 300 MHz in 1 hour

# Science with ASKAP-12

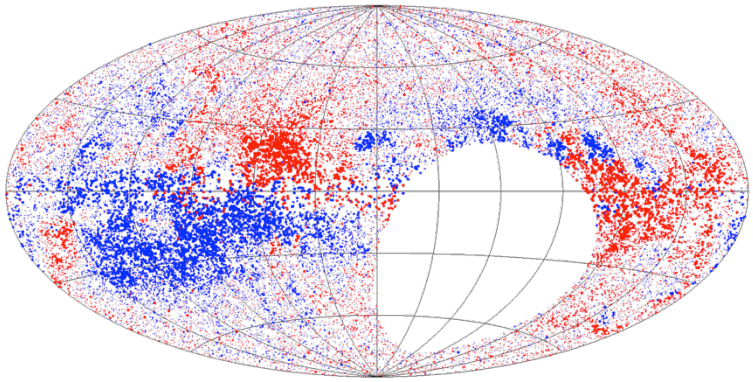
*Strong consensus view that EMU & POSSUM*
*should partner closely on science with ASKAP-12*

› Value to the survey teams
- ASKAP design study (early science, implementation of software pipelines)
- unique 700-1200 MHz frequency window
- potential for significant, dedicated time allocation (counters surv. speed comparison)
- wide-field science capabilities ~12-18 months from now
- opportunity to help demonstrate first scientifically-capable PAF system
- science outcomes on time scale of a 3-year postdoc position

› Proposed survey: 2π sr to σ = 80 μJy, 800-1100 MHz (8 weeks of observing)
- POSSUM: RM synthesis for 200,000 sources, plus diffuse emission
- EMU: 4 million sources, ~10% with continuous SEDs
- VAST, CRAFT: commensal surveys; FLASH: ~10 detections of extreme absorbers

# POSSUM-12: "The RM Sky"

Taylor et al. (2009)



- NVSS: 37,000 polarised sources,
  RMs from two frequency channels

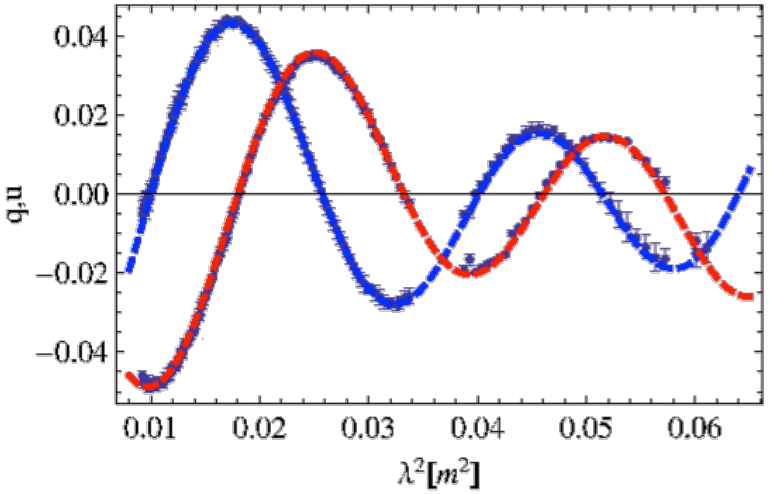
- POSSUM-12: ~400,000 polarised sources

  - 200,000 sources with full RM spectra from 300 frequency channels

  → evolution of magnetic field with time to high redshift

  - diffuse polarised emission over whole sky, to be combined with single dish

  → relics, haloes, cosmic web;
  strong synergy with MWA GEG science




O'Sullivan et al. (2011)

# EMU-12: "The Colours of the Radio Sky"

- SUMSS: 200,000 sources above 6 mJy
- FIRST: 890,000 sources above 1 mJy
- NVSS: 1.8 million sources above 2.3 mJy

*No contemporaneous information on spectral index*

- EMU-12: ~4 million sources above 0.4 mJy
  - spectral index to $\Delta\alpha = \pm 0.1$ for ~1.5 million sources

    (cf. Kimball & Ivezić 2008: 64,000 two-point spectra, 12,000 3-point spectra)
  - spectral curvature to 1% for brightest ~150,000 sources
  - USS & GPS sources; radio/FIR correlation; clustering; cosmology?
  - combine with SkyMapper & TAIPAN for redshifts?
  - combine with full EMU for (non-contemporaneous) octave-coverage of SED

# Options & Issues

- What baseline distribution is optimal for POSSUM-12?
  - synergy with EMU: can do science with long baselines
  - diffuse emission, lack of confusion: can do science with short baselines

- Is a POSSUM-12 deep field of interest?
  - Total intensity images confused after ~ 6 hours
  - JVLA can map 30 deg$^2$ to 50-μJy sensitivity in ~60 hours

- Repeat survey at higher frequencies (or replace with higher frequencies)
  - GASKAP-12
  - further broaden ν and $\lambda^2$ coverage for EMU & POSSUM
  - deeper spectral line studies over smaller areas for WALLABY & DINGO

- Sufficiently compelling science?
- Is ASKAP-12 an appropriate instrument for a survey (cf. AperTIF, JVLA)
- Does it leave us with enough resources to commission & design full ASKAP surveys?
- Is there enough computing time and disk space available at Pawsey to do this?