
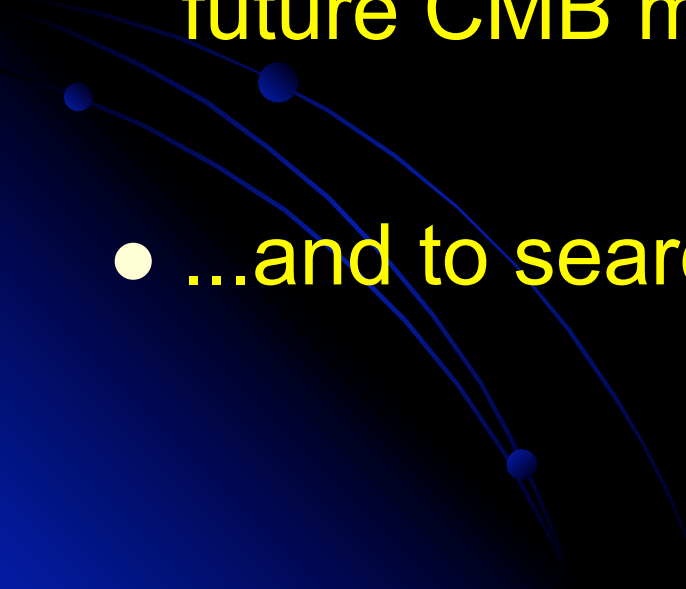


Active Galaxies at High Radio Frequencies

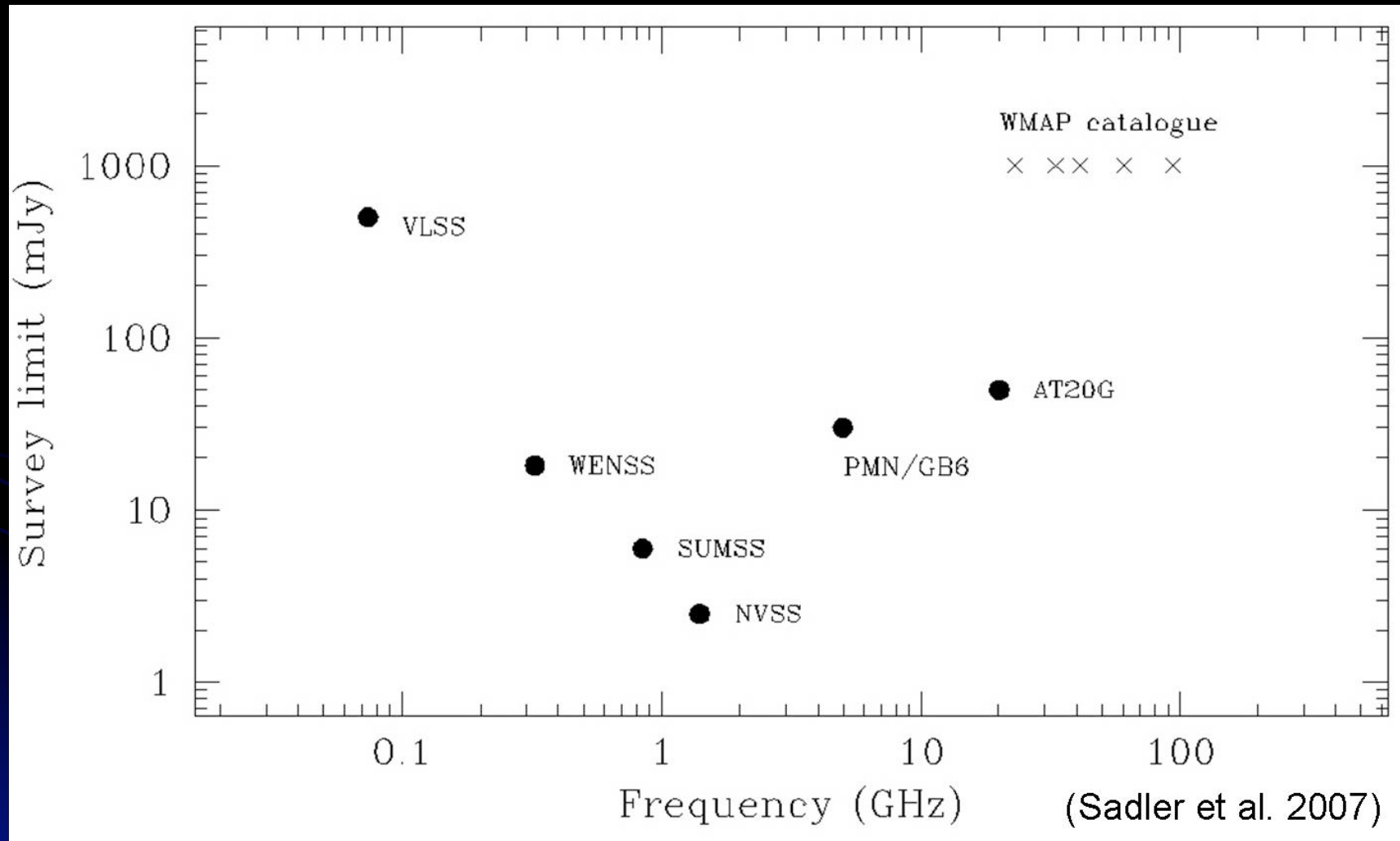
Elizabeth Mahony (USYD), Elaine Sadler (USYD),
Ron Ekers (ATNF), Ilana Feain (ATNF) and the
AT20G team



The AT20G Survey

- Provides high frequency flux calibrators for the next generation of radio surveys
 - Important for active galaxy evolution and future CMB missions such as PLANCK
 - ...and to search for black hole mergers
- 

The AT20G Survey



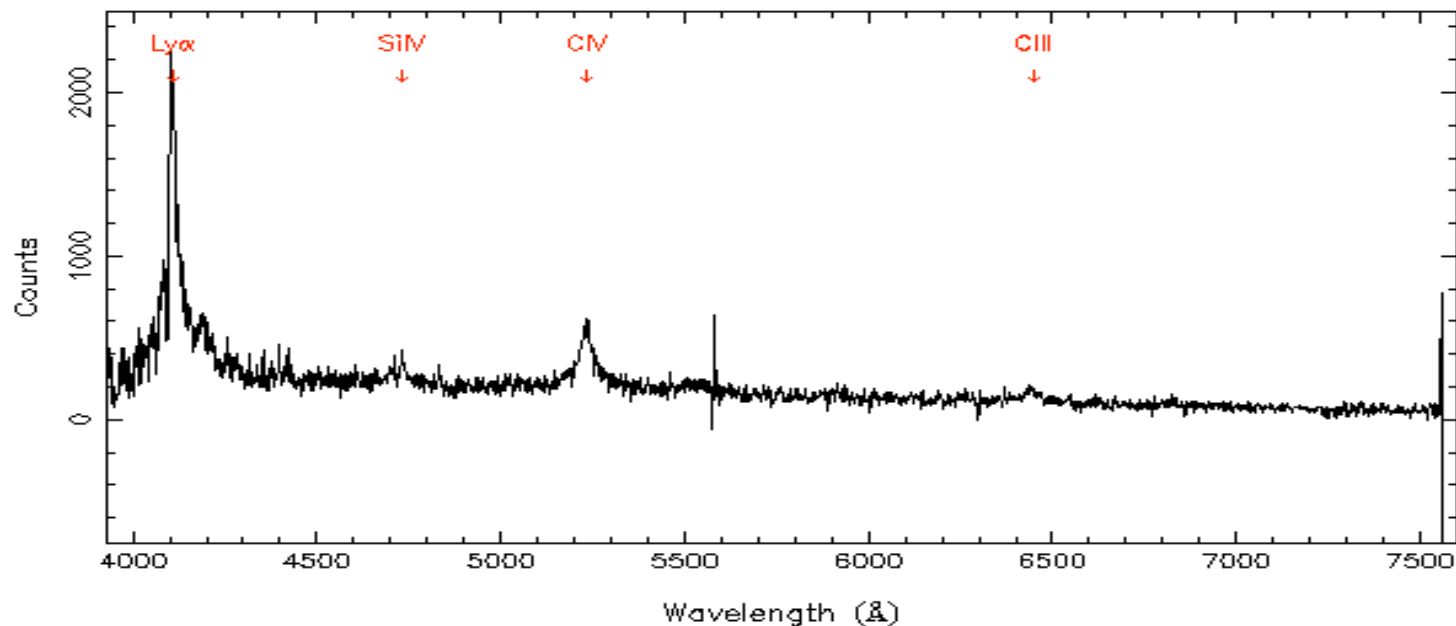
The AT20G Sample

- 5450 sources from $0^\circ \leq \delta \leq -90^\circ$, excluding galactic plane $|b| < 1.5^\circ$
- Flux limited at 40mJy, complete to 60mJy
- ~80% also have near simultaneous measurements at 5 and 8 GHz (all sources south of -15°)

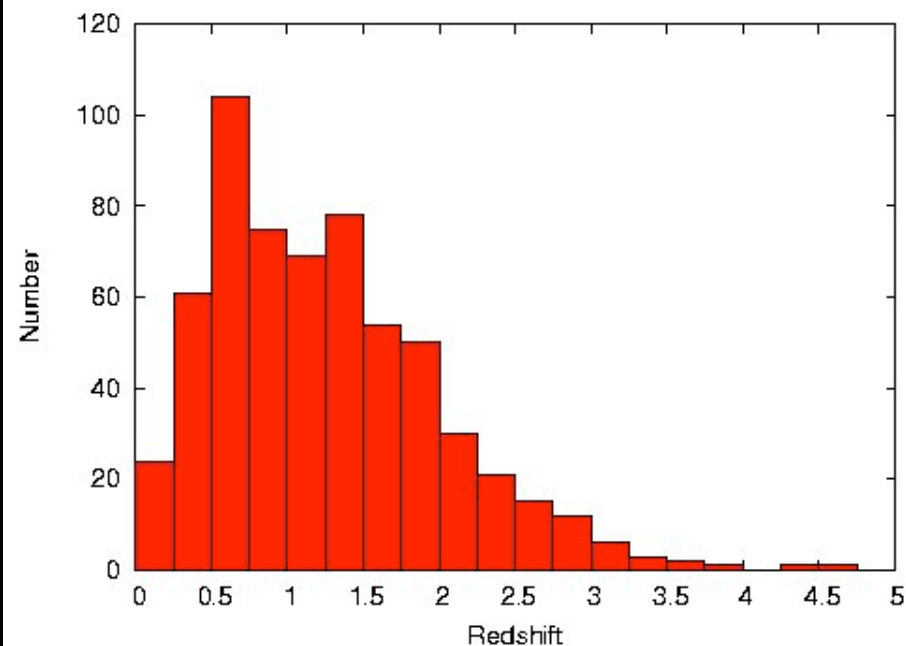
Optical Identifications

- Crossmatched the entire survey with the SuperCOSMOS database, complete to $B=22$
- 4016 (74%) sources with optical counterparts, majority (71%) are candidate QSOs
- Searched the 6dFGS and NED for redshift information
- 19% of sources have redshifts

g1122057-253234 2004/05/14 z_helio= 2.37828 z= 2.37850 qual= 4

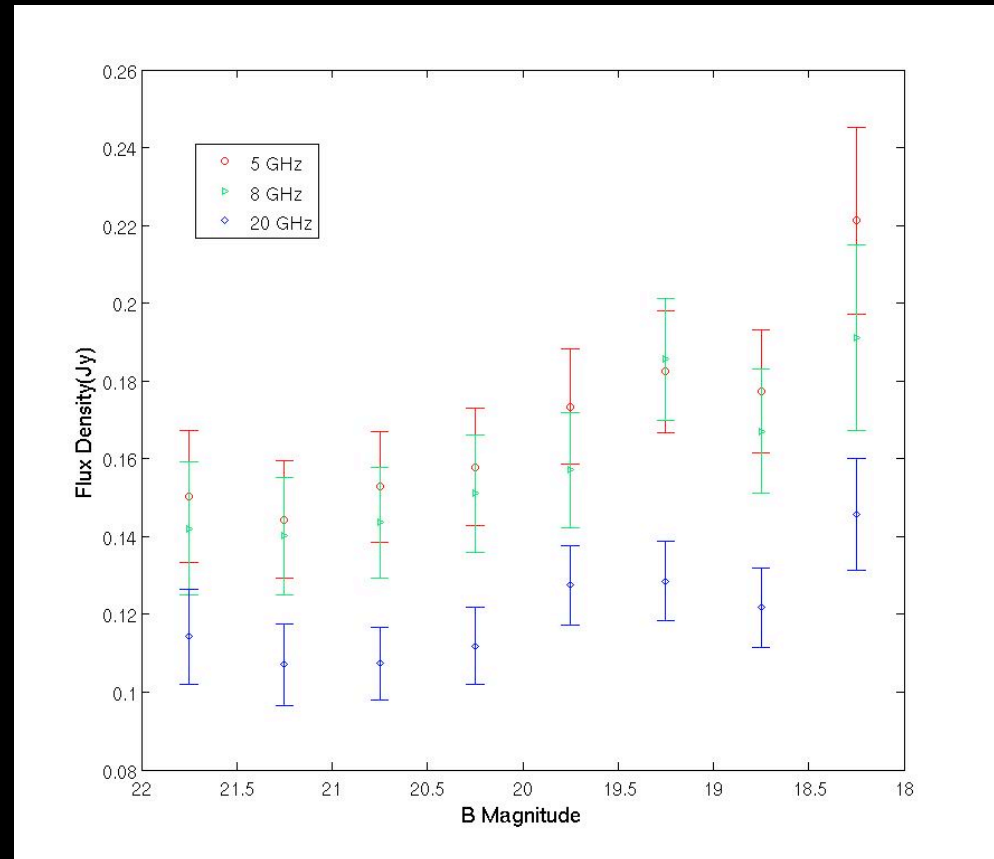


- Median redshift is $z=1.12$
- Highest redshift at $z=4.63$



AT20G QSOs

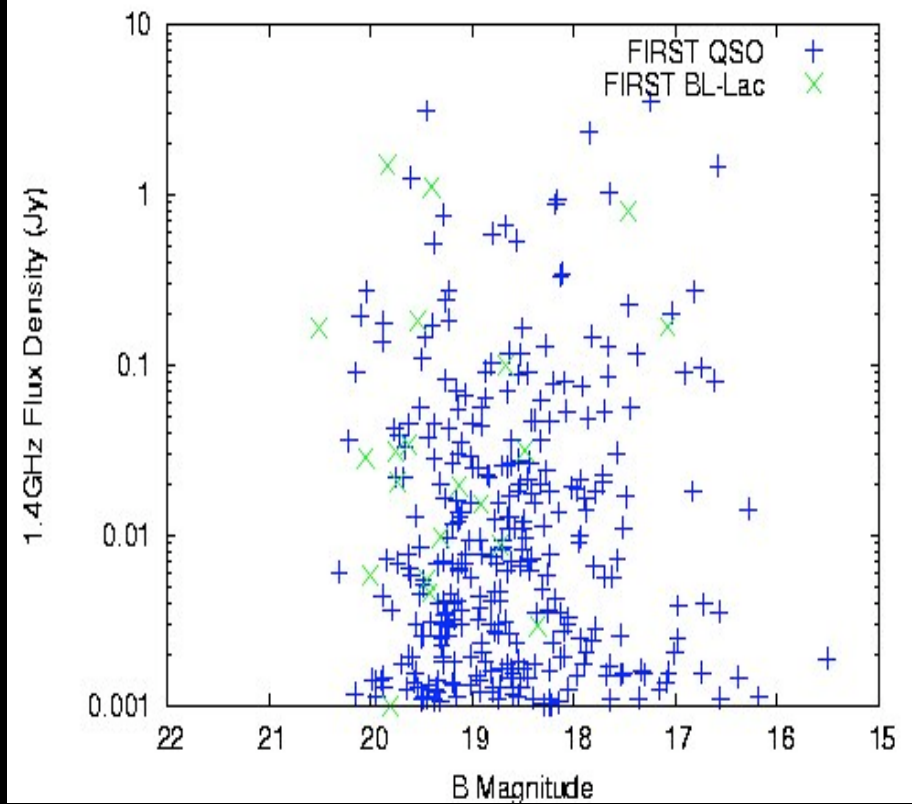
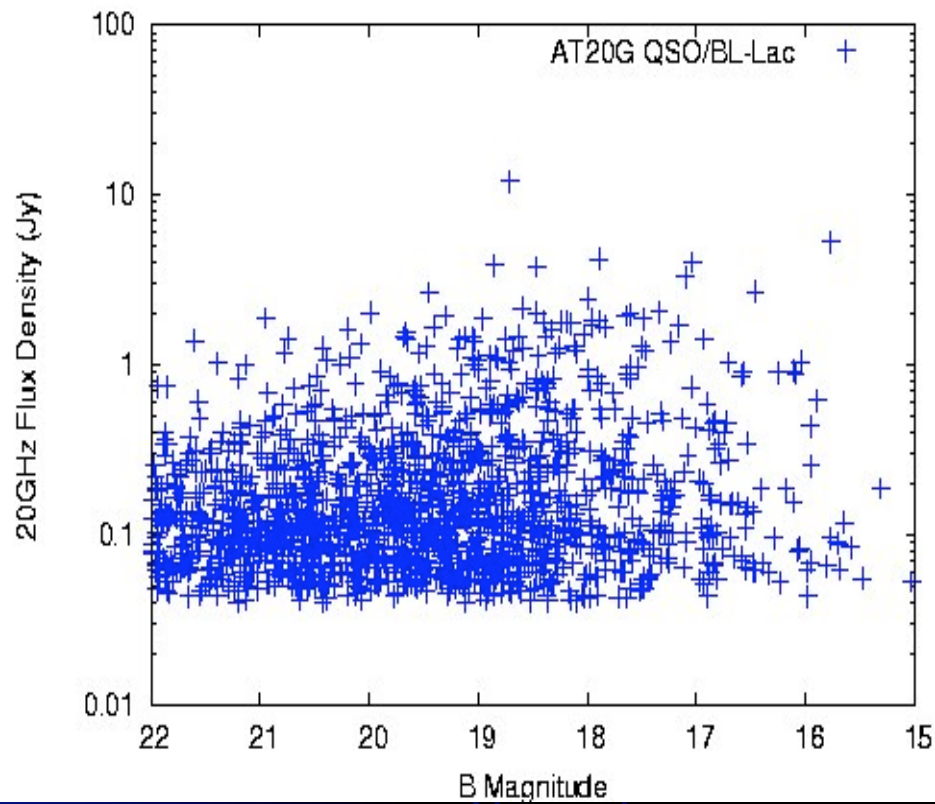
- A correlation between optical luminosity and radio luminosity for QSOs selected at 20GHz
- Significant at 99% confidence level
- Only observed for AT20G QSOs, not for Galaxies



AT20G QSOs

- Owen & Mufson (1977) found a similar correlation for a small sample of QSOs observed at 90GHz
- Correlation not observed in QSO samples selected at 1.4GHz i.e. the FIRST Bright QSO sample (Becker et al. 2001).
- Suggests a link between the radiation mechanisms in the optical and radio regimes

AT20G QSOs



Future Work

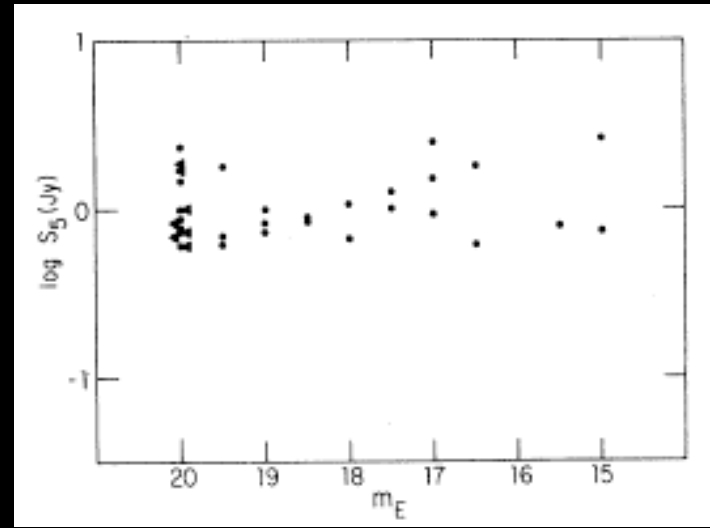
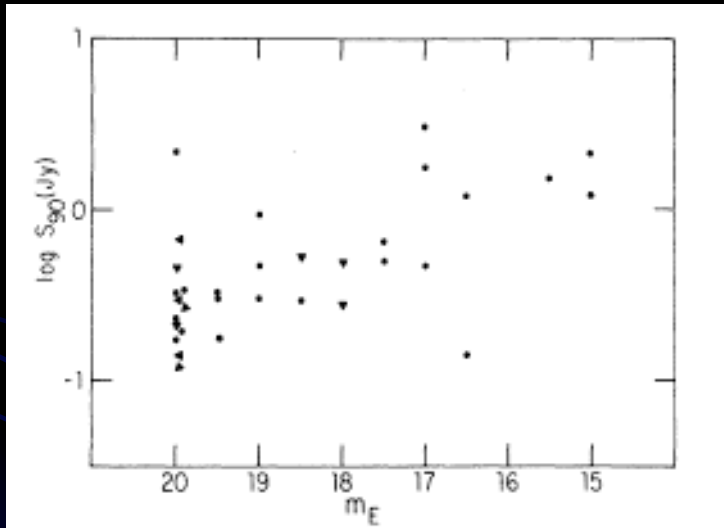
- Investigate the properties of radio-loud QSOs selected at high-frequency, and compare them with QSOs selected at lower radio frequencies, in X-rays and optically.
- Test whether the radio-optical correlation in AT20G QSOs might be due to relativistic beaming effects, using measurements of the line/continuum ratio from optical spectra.
- Observe a larger sample of QSOs at 20GHz and measure their radio spectral-energy distributions.
- Could also carry out eVLBI observations of the most luminous AT20G QSOs to test beaming models and determine radio-source morphology.

Searching for Black Hole Mergers

- By selecting at high frequencies the sample becomes dominated by QSOs
- QSOs are ideal in searching for merging black holes since they are bright over a wide range of redshifts
- eVLBI imaging of these sources would reveal any binary black holes
- Optical spectra would also be informative – sources with double peaked emission lines could be evidence of a binary black hole system



Owen & Mufson 1977



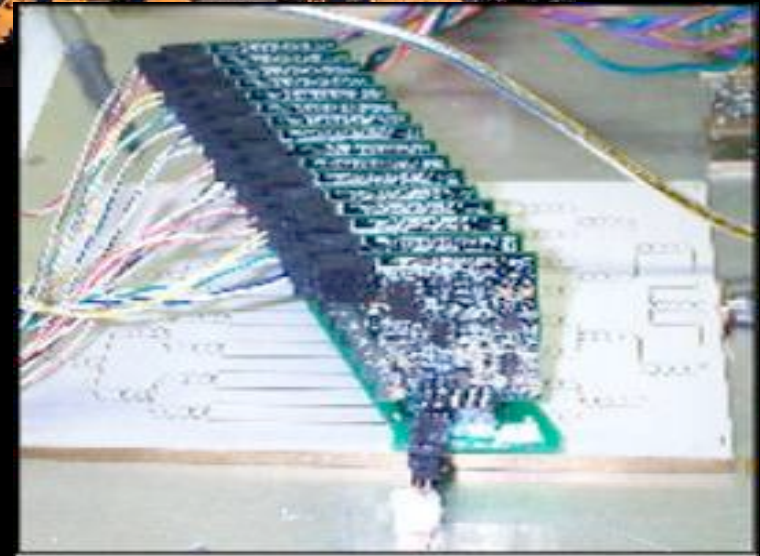
The AT20G Recipe

Ingredients:

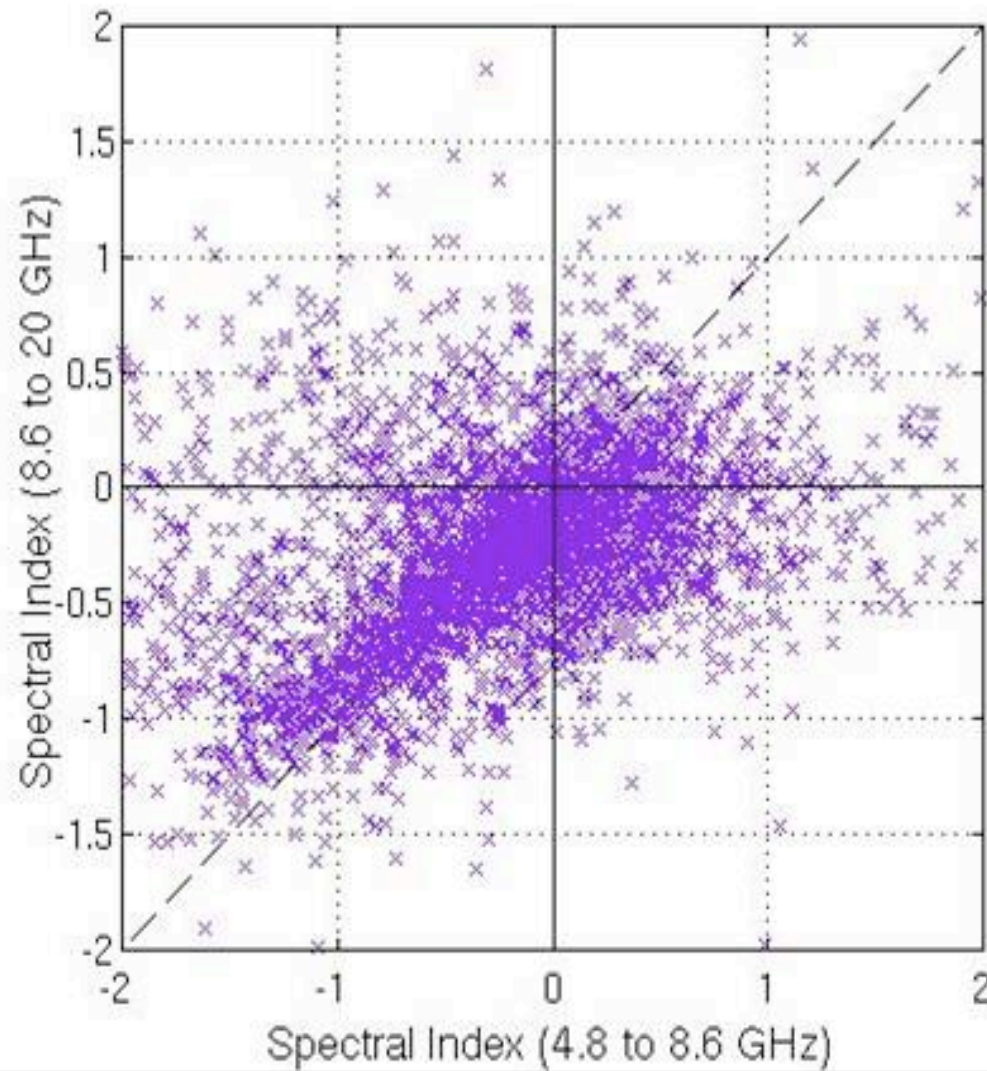
- 5 ATCA dishes
- 1 Wideband correlator

Method:

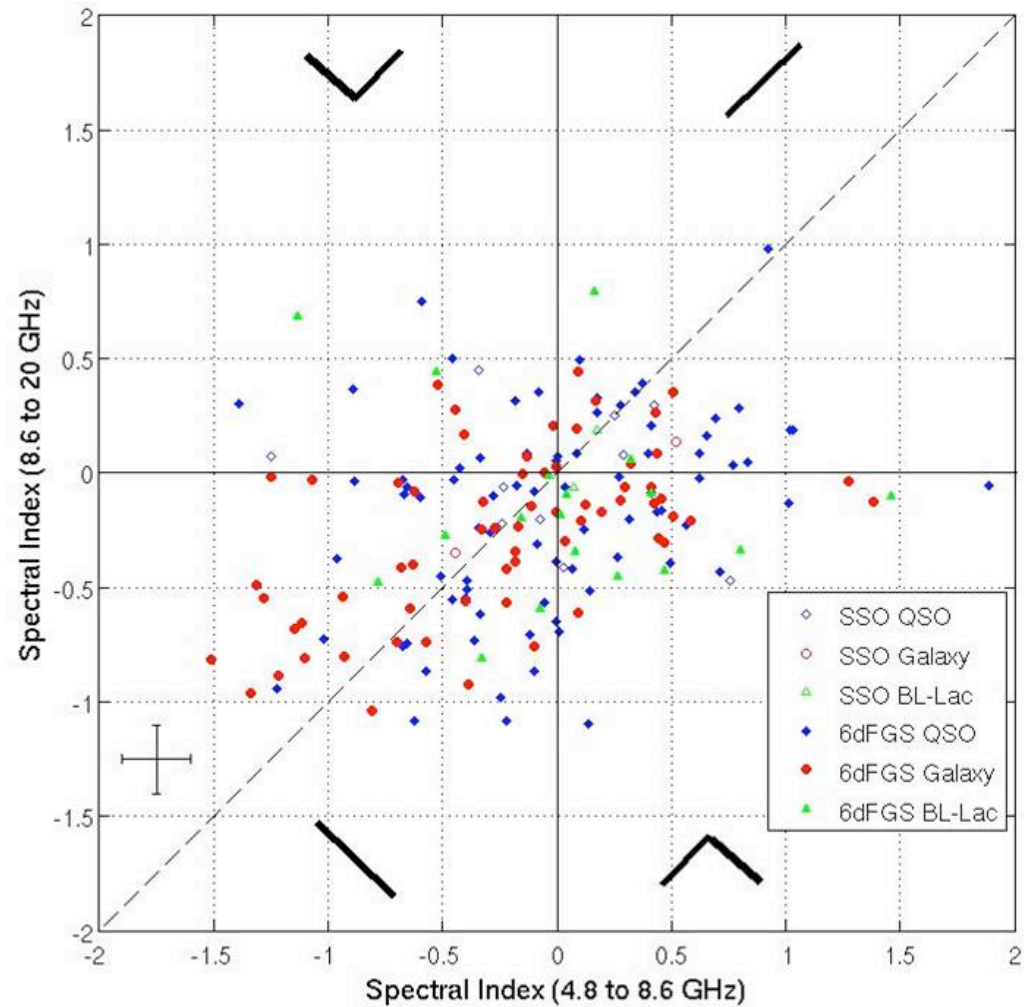
- Scan the sky at 20GHz down to flux limit of 40mJy
- Then observe candidate sources individually
- Observe confirmed detections at 5 & 8 GHz as well



Radio colour-colour plot



Radio colour-colour plot



6dF selection

