MALT Survey meeting / Masers at 7 and 3mm

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04th June 2009

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Which masers are there?

- Silicon monoxide (SiO) masers
  - Mostly seen in late type stars
  - Very few are known in massive star-forming regions
  - Two 7mm maser transitions (near 42.9 and 43.1 GHz)
  - One 3mm maser transition (near 86.2 GHz)
  - Thermal lines of SiO and isotopologues - study of shocks
- Class I methanol (CH_3OH) masers
  - Regions of star formation (possibly low-mass ones as well)
  - Shock excited (outflows?)
  - 36 and 44 GHz (can't be observed simultaneously)
  - 84 and 95 GHz + rare/weak at 104.3 GHz
  - Thermal methanol series near 96.7 GHz - rotational diagrams
- Class II methanol (CH_3OH) masers
  - Regions of high mass star formation only
  - Excited by infrared, nearest vicinity of protostars, follow 6.7 GHz
  - 107, 108 GHz + rare/weak 85/86 GHz and 37/38 GHz
  - Exotic torsionally excited maser near 44.9 GHz

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Science

- Silicon monoxide (SiO) masers
  - Probably too weak to detect a reasonable number of new masers in a wide area survey
- Class I methanol (CH_3OH) masers
  - Untargeted surveys are needed
  - Most sources known at present found near 6.7 GHz masers (class II)
  - Evolutionary stages unclear
  - Associations with outflows, expanding Hii regions …
  - Better job can be done at 7mm (44 and 36 GHz transitions)
  - Need good positions, good sensitivity, good spectral resolution
- Class II methanol (CH_3OH) masers
  - MMB follow-up is a more efficient way
  - Observations at 37, 107 and 108 GHz could make sense
  - Other transitions will not give many (if any) new detections

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Mopra vs. ATCA

- ATCA (hybrid arrays) is usually better for maser work
  - Much more sensitive
  - Accurate positions straight away, uv-coverage is not a big deal
  - Can distinguish masers from possible thermal lines
  - Spectral resolution is better
  - Easier to get accurate calibration (not the most important, though)
- Mopra has very limited advantages
  - Easier to process the data
  - Velocity coverage may still be more superior even when 16 zooms are available with CABB

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Summary

- The best of survey-type maser science at 7mm and 3mm:

  surveys of class I methanol masers

  - I'd prefer to search for 44 GHz masers and/or 36 GHz with ATCA (in fact, we're planning a follow-up of the 6.7 GHz MMB detections at 44 GHz with ATCA)
  - At 3mm, it is worth to include 95 or 84 GHz transitions, although they are usually weaker than their 7mm counterparts.
- ATCA is superior than Mopra for maser work

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Thank you

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