VLA OBSERVING APPLICATION

A

rcvd:

DEADLINES: 1st of Feb., June., Oct. for next configuration following review
INSTRUCTIONS: Each numbered item must have an entry or N/A
E-MAIL TO: propsoc@nrao.edu (different for some Rapid Response Science)
OR MAIL TO: Director NRAO, 520 Edgemont Rd., Charlottesville, VA 22903-2475

(1) Date Prepared: November 24, 2004

(2) Title of Proposal: Line Ratios of cm and sub-mm H_2O masers in Orion-KL- Physical Conditions in Star Formation Outflows

(3) AUTHORS (Add * for new location)	INSTITUTION	E-mail	G/U	Students Only: For Thesis?	Students Only: Ph.D. Year
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(4) Related VLA previous proposal number(s):

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(7) Scientific Category: ○ solar system ⊗ galactic ○ extragalactic ○ other:
Rapid Response Science: ○ Known Transient ⊗ Exploratory ○ Target of Opportunity

(8) Configurations (one per column) (A+Pt, A, B, C, D, BnA, CnB, DnC, Any)	A, BnA				
(9) Wavelength(s) (400, 90, 20, 6, 3.5, 2, 1.3, 0.7 cm)	1.3				
(10) Time requested (hours)	1				

(11) Type of observation: ○ continuum ⊗ spectroscopy ○ multichannel continuum ○ polarimetry ○ solar
(check all that apply) ○ pulsar ○ high-time resolution ○ Pie Town link ○ other:

(12) Suitable for dynamic scheduling? ⊗ Suitable ○ Unsuitable

(13) ABSTRACT (do not write outside this space)

H_2O masers are widespread among star forming regions. Despite much study, the physical conditions in the underlying gas are poorly constrained; the emission can arise over a three order of magnitude range in density and half an order range in temperature. The chief problem is that only one transition (22 GHz) has been mapped with high resolution. Orion-KL is a desirable target for mapping other transitions (e.g., it is nearby and well studied), but these are affected by very low atmospheric transmission. During unusually dry weather at Mauna Kea on 2004 November 17/18, we succeeded in obtaining strong fringes on the 325 GHz line with the SMA. The cross-power spectrum is complex, with indications of distributed angular structure, as seen at 22 GHz. We propose an exploratory snapshot at 22 GHz, so that we can estimate 22/325 GHz intensity ratios for individual centers of maser activity and obtain new constraints for excitation models.

NRAO use only
(08/03)

(14) Observer present for observations? ○ Yes ⊗ No   Data analysis at? ⊗ Home ○ AOC or CV (2 weeks notice)

(15) Help required: ⊗ None ○ Consultation ○ Friend (extensive help)

(16) Spectroscopy only	line 1	line 2	line 3	line 4
Transition (HI, OH, etc.)	H_2O			
Rest Frequency (MHz)	22235.08			
Velocity (km/s)	10			
Observing frequency (MHz)	22234			
Correlator mode	1A			
IF bandwidth(s) (MHz)	3.125			
Hanning smoothing (y/n)	y			
Number of channels per IF	128			
Frequency Resolution (kHz/channel)	24.4			
Rms noise (mJy/bm, nat. weight., 1 hr)	~ 5	(@ 10^3Jy SEFD)		
Rms noise (K, nat. weight., 1 hr)	N/A			

(17) Number of sources:	**1**

(If more than 10 please attach list. If more than 30 give only selection criteria and LST range(s).)

(18) NAME	Coordinates 1950 ○ 2000 ⊗ RA Dec. hh mm $\pm$ xx.x°	Conf.	λ (cm)	Corr. mode	Band-width per IF (MHz)	Total Flux (Jy)*	LAS	Required rms (mJy/bm)	Required dynamic range	Time request (hr)
Orion-KL	05 35, -05.4	A	1.3	1A	3.125	4000 peak†	N/A	~ 10	> 1000	1

*For spectral line, this should be the total flux at the peak of the line

Notes to the table (if any): †The emission comprises knots of up to ~ 4000 Jy (c.2002) distributed chiefly over ~ 40 km s^{-1} (~ 3 MHz). Each spectral channel will contain multiple knots. In 1^h we anticipate achieving adequate dynamic range to detect $1 - 10$ Jy knots in spectral channels dominated by kJy features. In other channels we will reach the thermal noise limit.

(19) Restrictions to elevation (other than hardware limits) or HA range (give reason):

(20) Preferred range of dates for scheduling (give reason):
Masers vary on time scales on the order of a month. We prefer observing as soon as possible to limit the effects of source variability on our estimation of intensity ratios.

(21) Dates which are not acceptable:

(22) Special hardware, software, or operating requirements:

(23) Please attach a self-contained Scientific Justification **not in excess of 1000 words.** (Preprints or reprints will be ignored.)

Please include the full addresses (postal and e-mail) for first-time users or for those that have moved (if not contact author).

When your proposal is scheduled, the contents of the cover sheets become public information (Any supporting pages are for refereeing only).

v4.2 8/03