A STUDY OF METHANOL MASERS AT 36 AND 44 GHz AND 48 GHz THERMAL EMISSION AROUND THEM.

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ABSTRACT

An extensive search for new methanol sources were made. Three new masers in the 7_0-6_1A^+ transition and twenty-four new thermal sources in the 1_0-0_0A^+ transition were detected. Our results support the idea that high- velocity flows may increase the abundance of methanol and that methanol masers arise in methanol-rich sources.

1. INTRODUCTION

A search for 7_0-6_1A^+ methanol maser emission and 1_0-0_0A^+ thermal emission at 44 and 48 GHz was made with 14-meter radio telescope of Centro Astronomico de Yebes near Guadalajara in Spain. The masers were searched toward cold IRAS sources - young, highly embedded in dust envelopes stellar objects. To look for a relation between maser and thermal methanol emission, we observed the majority of these and some additional sources in the 1_0-0_0A^+ transition at 48 GHz.

We detected three new masers toward cold luminous IRAS sources. These masers were also observed in the 4_{-1}-3_0E (36 GHz) transition with the 22-meter radio telescope of Radio Astronomical Station of Astro Space Center in Pushino near Moscow. Toward two of them 36 GHz masers were found. We detected also 24 new thermal sources and determined, where possible, methanol abundance.

2. NOTES ON INDIVIDUAL SOURCES

GGD 27. A strong narrow maser line was observed in the 7_0-6_1A^+ transition toward IRAS 18162-2048 (GGD 27 IRS2). The five-point mapping showed that the source is unresolved with 2' beam and approximately 20" offset to the north-east from IRS2. At 36 GHz we also detected a narrow line, approximately at the same radial velocity as 44 GHz line. 48 GHz emission was not found.

L 379. A strong asymmetrical line was detected in the 7_0-6_1A^+ transition toward cold source IRAS 18265-1517 (L 379 IRS3). The lack of symmetry and the different shape of the lines toward different directions suggest a presence of several components. The observed profiles can be explained by assuming that two components are present: "narrow" and "broad" components with the parameters given in the Table 1.

In the 4_{-1}-3_0E transition toward IRAS 18265-1517 a double - peaked line with a narrow (ΔV = 1 km s^{-1}), probably, maser feature at 20.4 km s^{-1} and a broader component (ΔV = 1.9 km s^{-1}) was observed. In the 1_0-0_0A^+ transition thermal emission toward IRAS 18265-1517 was detected.

IC 1396N. A narrow (ΔV = 0.6 km s^{-1}) maser line was detected in the 7_0-6_1A^+ transition at -0.5 km s^{-1} toward cold source IRAS 21391+5802 in the bright-rimmed globule IC 1396N. 36 and 48 GHz emission was not found.

Table 1. Parameters of Newly Detected Masers.

Source Name	R.A. 1950 Dec. 1950	Transition	T_A K	V_{LSR} km s^{-1}	ΔV(FWHM) km s^{-1}	S_ν Jy
GGD 27	$18^h16^m13^s.8$	7_0-6_1A^+	1.50	13.5	0.8	135
	-20°48'31"	4_{-1}-3_0E	0.43	14.0	<1	17
L 379	18 26 32.9	7_0-6_1 A^+	0.70	18.0	1.1	63
	-15 17 51		0.50	19.0	3.3	45
		4_{-1}-3_0E	0.88	18.0	1.9	36
			0.96	20.4	1.2	38
IC 1396N	21 39 10.3	7_0-6_1 A^+	0.14	-0.5	0.6	15
	58 02 29	4_{-1}-3_0E	<0.15			<6