# HIGH RESOLUTION FOURIER TRANSFORM SPECTROSCOPY OF THE C-O STRETCH STATE OF METHANOL-$D_1$ AND ASSIGNMENTS OF OPTICALLY PUMPED FAR-INFRARED LASER LINES

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In this work, Doppler limited Fourier transform infrared (FTIR) spectrum corresponding to the a-type C-O stretch band of methanol-$D_1$ ($CH_2DOH$) has been recorded using a Brueker spectrometer at the Justus-Liebig Universitiaet in Germany at a resolution of 0.002 cm-1. The spectrum shows very complicated fine structure due to strong torsion-vibration-rotation interactions in the molecule. Despite the difficulties assignments were possible for up to $K_p$ values of 6 for the $o_1$ and $e_1$ species. As an immediate application of the IR assignments it was found that two of the $CO_2$ laser lines viz. 10R(34) and 9P(26) are in exact coincidence with two absorption transitions corresponding to the $o_1$ C-O stretch state and could successfully provide the assignments for the quantum states for five optically pumped far infrared (FIR) laser lines. The assignments have been confirmed by means of loop closure technique involving accurately measured transitions. For the 9P(12) $CO_2$ pump line four optically pumped FIR laser lines have been assigned from analytical considerations. Further comments will be made on the intensity of the C-O stretch transitions for various torsional symmetries.