SPEED DEPENDENT BROADENING OF THE OXYGEN FINE STRUCTURE LINES

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The fine structure oxygen lines near 60 GHz are well known to be important spectroscopic object from both fundamental and practical points of view. It is the first and almost the only object in the mm/submm range for demonstrating and studying the collisional line mixing effect at atmospheric conditions. The lines are widely used for retrieving vertical pressure and/or temperature profiles from remote sensing data obtained by ground based, airborne and satellite instruments. Thus, the parameters of the oxygen lines should be known with high enough accuracy for accurate modeling of the mm/submm oxygen absorption in the wide pressure range.

In our recent work, the effect of speed dependence (SD) of collisional relaxation was investigated for the first time for the 118-GHz oxygen line. In this report we present results of the experimental study of the rotational dependence of the speed-dependent collisional broadening of the oxygen fine structure lines. Spectra were recorded using a spectrometer with radio-acoustic detection of absorption (RAD spectrometer) with the signal-to-noise ratio of a few thousands. Line shape analysis performed using the quadratic speed-dependent Voigt profile allowed accurate determination of the line shape parameters and their rotational dependence.

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