# LINESHAPE MODEL ANALYSIS FOR MEASUREMENTS IN THE MICROWAVE REGION

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We present lineshape studies performed in the millimeter range on CO and $N_2O$ in collision with various perturbing gases ($N_2$, $O_2$, $CO_2$, $H_2$, rare gases). Beside the goal of providing accurate spectroscopic parameters allowing for fine analysis of atmospheric spectra, reported measurements have given a clear evidence of line narrowing processes, that is of a failure of the Voigt profile. These experimental observations have allowed tackling studies on the physical origin of frequently reported line narrowings.

Up to a recent time and from a pure numerical point of view, it was generally recognized that Galatry and Speed Dependent Voigt profiles lead to an equal quality in the fitting of experimental lineshapes. As a consequence, it was not possible to distinguish between the two possible origins of narrowing effects: velocity/speed changing collisions (Dicke or diffusion process) or speed dependence of relaxation rates.

From our observations, it is observed that the optical diffusion parameter involved in the Galatry profile may have a strongly nonlinear pressure dependence, in agreement with similar observations reported on infrared HCN lines[a].

As a general conclusion, it seems possible to claim that, except for the case of very light collision partners (He and $H_2$), narrowing effects originate mainly from the speed dependence of relaxation rates that have to be modeled by a Speed Dependent Voigt profile.

[a] J.-F. D'Eu, B. Lemoine, F. Rohart, *J. Mol. Spectrosc.* in press (2002).