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Microwave shielding of ultracold dipolar molecules[1]

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Ultracold dipolar molecules are excellent candidates for engineering quantum applications and controlled chemistry [1]. Therefore a lot of effort is devoted nowadays to produce ground state ultracold molecules in high densities as well as to understand their properties [2]. One of a main goal is to create a quantum degenerate gas of dipolar molecules such as a Bose-Einstein condensate [3] or a degenerate Fermi gas [4]. This is for now a major missing step for ultracold molecules. Unfortunatelly, when the molecules start to collide, whether thay are chemically reactive or not, a lot of molecules are lost in the process. Hoping for a long-lived quantum degenerate gas is then compromised unless to shield the molecules from collisional losses. This can be achieved by using a static electric field [5] but also by using microwaves [6]. I will show preliminary results for ultracold collisions of NaRb + NaRb in a microwave field and I will present how one can suppress the collisional losses of molecules as a function of the detuning, intensity and polarization of the field. This might be a necessary requirement for successful evaporative cooling to take place and for reaching quantum degeneracy. [1] L. Carr et al., New J. Phys. 11, 055049 (2009) ; J. L. Bohn et al., Science 357, 1002 (2017) [2] G. Qumner, P. Julienne, Chem. Rev. 112, 4949 (2012) [3] E. Cornell, C. Wieman, Rev. Mod. Phys.74, 875 (2002); W. Ketterle, Rev. Mod. Phys. 74, 1131 (2002) [4] B. DeMarco, D. Jin, Science 285, 1703 (1999) [5] M.L. Gonzlez-Martnez, J. L. Bohn, G. Qumner, Phys. Rev. A 96, 032718 (2017) [6] A. Micheli et al., Phys. Rev. A 76, 043604 (2007)

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