

PROSPECTS FOR PRECISION MEASUREMENTS ON AMMONIA MOLECULES IN A FOUNTAIN

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The recent demonstration of cooling and manipulation techniques for molecules offers new possibilities for precision measurements in molecules. At the LCVU, we are constructing a molecular fountain based on a Stark decelerated molecular beam. In this fountain, ammonia molecules are decelerated, cooled, and subsequently launched upwards some 10-50 cm before falling back under gravity, thereby passing a microwave cavity or laser beam twice – as they fly up and as they fall back down. In this way, it will be possible to measure the inversion transition in $^{15}\text{NH}_3$ around 22.6 GHz with a fractional accuracy better than 10^{-12} ^a. Besides serving as a proof-of-principle, these measurements may be used as a test of the time-variation of fundamental constants using the sensitivity of the tunneling motion to a change of the proton-electron mass ratio. We present first experimental results of the molecular beam decelerator and focusing lenses.

^aHendrick L. Bethlem, Masatoshi Kajita, Boris Sartakov, Gerard Meijer, and Wim Ubachs, to appear in *Eur. Phys. J. Special Topics*.