General Physics Seminar
Rijnhuizen Seminar Room

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Trapping cold polar molecules

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Static electric and magnetic fields have been used to deflect and focus neutral atoms and molecules since the 1940's. Time-varying electric fields can be used to change the longitudinal velocity of polar molecules. Molecules possessing an electric dipole moment will gain Stark-energy upon entering an electric field when in an appropriate quantum state. This gain in Stark-energy ('potential' energy) is compensated by a loss in kinetic energy. If the electric field is greatly reduced before the molecule has left the electric field the molecule will not fully regain the lost kinetic energy. This process may be repeated by letting the molecules pass through multiple pulsed electric fields. Molecules can thus be slowed and eventually brought to a standstill.

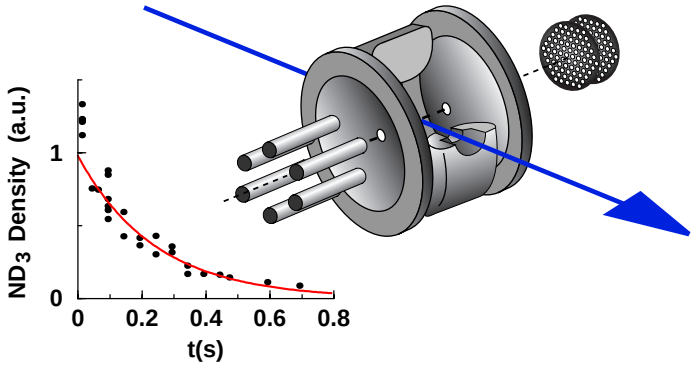

Figure 1: *Schematic representation of the electrostatic trap together with the measured ND_3 density as a function of time which has elapsed since loading of the trap.*

Using this method we have produced a slow beam of ND_3 molecules and subsequently loaded these molecules into an electrostatic trap. This method allows one to study polar molecules at ultralow temperatures.