Cs in a cryogenic matrix: towards a measurement of the electron electric dipole moment

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To explain the open questions in the fundaments of physics, new theories that reach beyond the standard model of particle physics are needed. A great number of these indirectly predict electric dipole moments (EDM) of fundamental particles in ranges that are just within reach for modern atomic and molecular physics experiments. While measurements in atomic and molecular beams, and more recently in ion traps, provided the most successful null measurements of the electron EDM over the past decades, only quite recently did the method of matrix isolation spectroscopy arise. It has the potential advantage of performing spectroscopy on unprecedented numbers of atoms/molecules at once. To perform such a measurement in the future, it is however necessary to first understand how the trapping of atoms inside the cryogenic matrix looks like in detail.

In this contribution, I would like to present what we learned so far through experiments and simulations of cesium trapped in an inert argon matrix and which future steps we are planning to take toward a measurement of the electron EDM and other beyond standard model effects.