MO 17: Precision

Time: Thursday 10:30–11:15 Location: MO-H6

MO 17.1 Thu 10:30 MO-H6

Spin precession with BaF for EDM searches — •Virginia Marshall[1,2], Parul Aggarwal[1,2], Hendrick L. Bethlem[1,3], Alexander Boeschoten[1,2], Anastasia Borschevsky[1,2], Malika Denis[1,2], Pi Haase[1,2], Steven Hoekstra[1,2], Joost van Hofslot[1,2], Klaus Jungmann[1,2], Thomas B. Meijknecht[1,2], Maarten C. Mooij[2,3], Rob G.E. Timmermans[1,2], Anno Touwen[1,2], Wim Ubachs[3], Lorenz Willmann[1,2], and Yanning Yin[1,2] — [1]Netherlands, Groningen, RUG — [2]Netherlands, Amsterdam, Nikhef — [3]Netherlands, Amsterdam, VU

*e*EDM sensitive searches form a probe into the Standard Model of particle physics and its extensions. A BaF supersonic beam with a velocity of around 600 m/s, moving in a controlled 10 kV/cm electric field and nT magnetic field, forms an experimental setup for *e*EDM sensitive searches. The *e*EDM search employs the $X^2\Sigma^+\nu = 0, N = 0$ ground state of BaF, which is controlled solely by interactions with laser fields in order to execute a spin precession measurement in well known E- and B-fields. Our particular interest is on the dependence of the signal on the laser parameters such as intensity, polarization and frequency detuning. With this we aim to complete a first measurement step in the coming year at a sensitivity level $10^{-28}\,e$cm.

MO 17.2 Thu 10:45 MO-H6

eEDM sensitive searches with BaF molecules — •Thomas B. Meijknecht[1,2], Parul Aggarwal[1,2], Hendrick L. Bethlem[1,3], Alexander Boeschoten[1,2], Anastasia Borschevsky[1,2], Malika Denis[1,2], Pi Haase[1,2], Steven Hoekstra[1,2], Joost van Hofslot[1,2], Klaus Jungmann[1,2], Virginia Marshall[1,2], Maarten C. Mooij[2,3], Rob G.E. Timmermans[1,2], Anno Touwen[1,2], Wim Ubachs[3], Lorenz Willmann[1,2], and Yanning Yin[1,2] — [1]Netherlands, Groningen, RUG — [2]Netherlands, Amsterdam, Nikhef — [3]Netherlands, Amsterdam, VU

eEDM sensitive searches form a probe into the Standard Model of particle physics and its extensions. A BaF supersonic beam with a velocity of around 600 m/s, moving in a controlled 10 kV/cm electric field and nT magnetic field, forms an experimental setup for eEDM sensitive searches. The emphasis lies on characterizing and controlling the electric and magnetic fields. Not only of interest are these fields themselves, but in particular (the use of) the sensitivity of the BaF quantum system in such fields. This provides multiple handles on statistical and systematic effects, critical in EDM searches. With this we aim to complete a first measurement step with the supersonic BaF beam in the coming year at a sensitivity level 10^{-28}ecm.

MO 17.3 Thu 11:00 MO-H6

Electrostatic lens for ThO molecules in the ACME III electron EDM search — •Xing Wu[1,2], Daniel Ang[2], David DeMille[1], John Doyle[1], Gerald Gabrielse[3], Zhen Han[1], Bingjie Hao[3], Ayami Hiramoto[4], Peiran Hu[1], Daniel Lascar[3], Zack Lasner[2], Siyuan Liu[3], Takahiko Masuda[4], and Cole Meisenhelder[2] — [1]The University of Chicago — [2]Harvard University — [3]Northwestern Unviersity — [4]Okayama University

Measurements of the electron electric dipole moment (eEDM) using atoms and molecules shed light on T-symmetry violating new physics beyond the Standard Model. The best upper limit on the eEDM was recently set by the ACME collaboration: $|d_e| < 1.1 \times 10^{-29}$e·cm, using a cold beam of thorium monoxide (ThO) molecules. This result significantly constrains $\mathcal{T}$-violating new physics in the $1 \sim 10$ TeV range and above. The next generation of ACME aims to improve the sensitivity to d_e by another order of magnitude. A molecular lens is used to focus, into the EDM measurement region, beams of ThO molecules that have been prepared in the highly polarizable Q state. Our lens system requires several new features: 1) a new, spatially compact rotational cooling scheme which we demonstrated to work with efficiency near its theoretical limit; 2) a STIRAP process to transfer molecules into and out of the Q state, demonstrated with 80% total efficiency; and 3) an electrostatic hexapole lens operated at ±23kV, demonstrated to enhance molecular signal by 16 times relative to an unfocused molecular beam.