

Measurement of proton and deuteron electric dipole moments using the prototype electric dipole moment ring (PTR)

Wednesday, July 14, 2021 4:15 PM (15 minutes)

Any measurably large elementary particle electric dipole moment (EDM) would constitute physics beyond the standard model. Based on frozen spin polarized beam control technology developed at the COSY laboratory in Juelich, Germany, a conceptual design is presented for a storage ring (PTR) capable of measuring proton (p) and deuteron (d) EDMs. Superimposed electric and magnetic bending make it possible to freeze the spins of simultaneously counter circulating polarized beams. This permits the monotonic accumulation of “out-of-plane” (meaning “out of the horizontal ring plane”) precession of the polarization direction of one of the two beams, as caused by the bend fields acting on its particle EDMs, thereby supporting the EDM determination. Bunch accumulation and polarization preparation would be accomplished using an “arcs-only bunch accumulator” reconfiguration of COSY, now side-by-side with PTR in the existing COSY beam hall. Using doubly frozen (p,p), (p,d), and (d,d) proton and deuteron pairings, the EDMs and their differences can be obtained with unprecedented precision. The required spin control technology has already been demonstrated using deuterons in COSY. Existing polarized beam sources, injection, extraction, electron cooling and other existing beam-handling apparatus would be re-deployed. Newly to be constructed would be the PTR ring described in a recent CPEDM report, “Storage ring to search for EDMs of charged particles”.

Are you are a member of the APS Division of Particles and Fields?

Yes

Primary author: Prof. TALMAN, Richard (Laboratory for Elementary-Particle Physics, Cornell)

Presenter: Prof. TALMAN, Richard (Laboratory for Elementary-Particle Physics, Cornell)

Session Classification: Beyond Standard Model

Track Classification: Beyond Standard Model Physics