Search for Charged Particle Electric Dipole Moments (EDMs)

Generic Idea
1. Apply electric field $\vec{E}$ to particle in storage ring
2. Due to EDM $\vec{d}$, spin rotates out of horizontal plane
3. Measure vertical polarisation build up $\Rightarrow$ EDM $\vec{d}$

Key Requirements:
- Study systematic effects
- Maximize horizontal polarisation lifetime $(\rightarrow \sim 1000 \text{ s})$

EDDA Polarimeter

Development of new Ultra Precise Beam Position Monitors (BPMs)

One major source of systematic effects
Radial $\vec{B}$ field mimics EDM if:
$$\mu B_r \approx d E_r \text{ with } d = 10^{-29} \text{ e-cm and } E_r = 10 \text{ MV/m}$$
$$B_r = \frac{dE_r}{\mu} = \frac{10^{-22} \text{ eV}}{3.1 \cdot 10^{-8} \text{ eV}/\text{T}} \approx 3 \cdot 10^{-17} \text{ T}$$

Solution
Two counter rotating beams
1. Separation of beams sensitive to $B_r$
2. Compensate separation with BPMs

One possible BPM system based on SQUIDs*
Place SQUIDs near beam and measure magnetic field
$\Rightarrow$ Calculate position from magnetic field distribution

First noise measurements with one pickup coil
COSY signal
revolution frequency
750 kHz

* Superconducting Quantum Interference Device