Precision measurement of the beam polarisation for the P2 experiment

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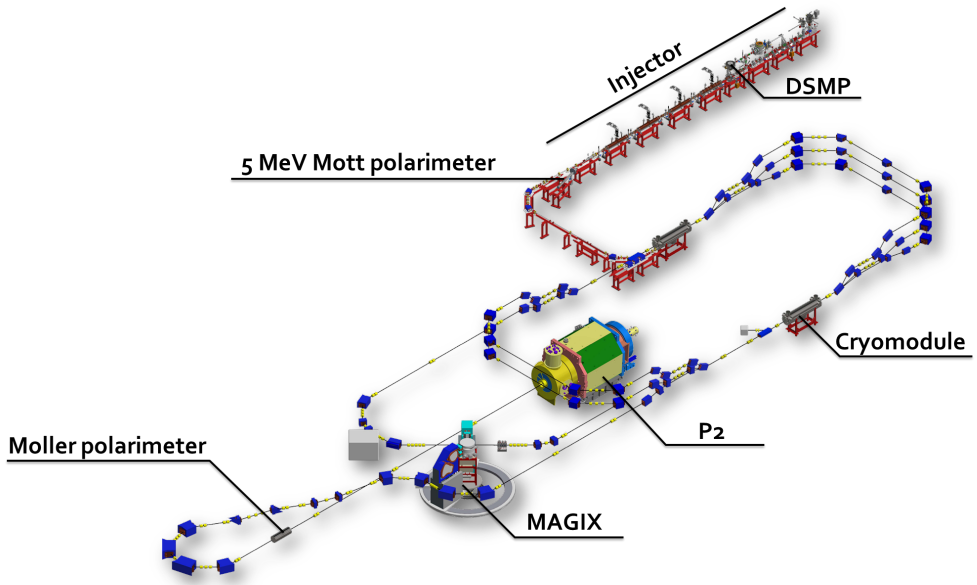
Introduction and motivation

P2 experiment:

- Polarised beam P $>$ 85 % @ 155 MeV, 150 µA
- Weinberg angle ($\sin^2\theta_W$)$\rightarrow$ 0.15 %, $\approx$11 000 h
- Requires $\frac{\Delta P}{P} \leq 1\,\%$
- Past observations indicate varying beam polarisation over the run period
- Polarimeters chain to track beam polarization



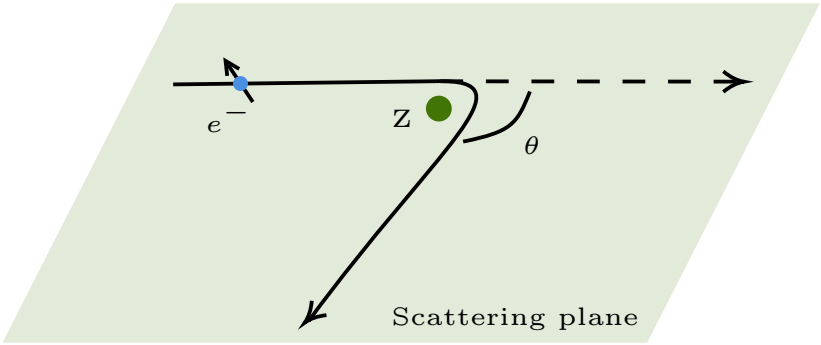
Mott polarimetry

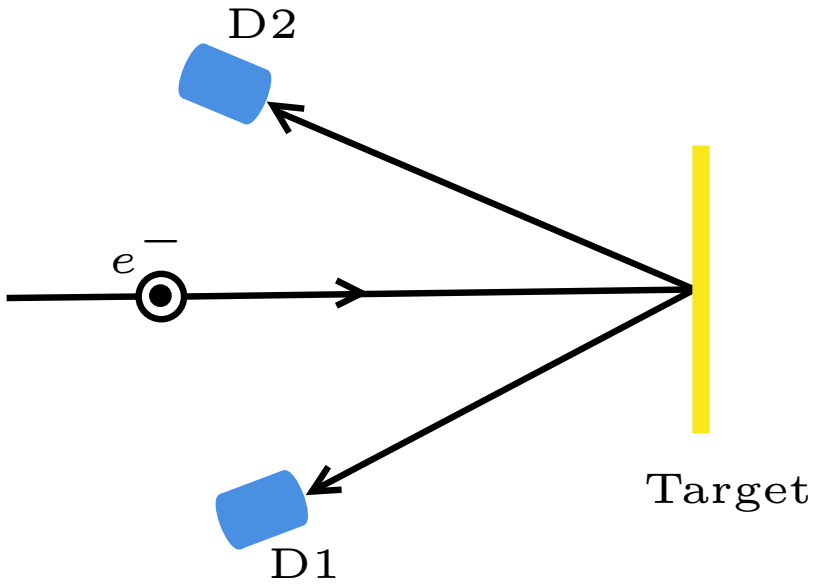
Mott cross section

$$\sigma(\theta, \phi) = I(\theta)[1 + S(\theta)\vec{P} \cdot \hat{n}]$$

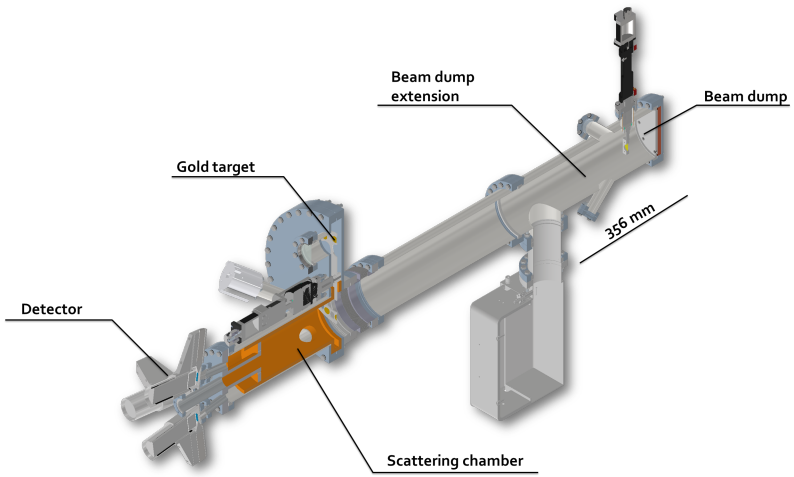
$S(\theta)$ = Sherman function/analysing power
$I(\theta)$ = unpolarised cross-section
$\hat{n}$ = unit vector perpendicular to the scattering plane

- Asymmetric elastic scattering of spin polarised electrons in coulomb field
- Experimental situation: A = P.S, A = Asymmetry, P = degree of beam polarisation, S = Sherman function





5 MeV Mott polarimeter set-up



- Design was done based on understanding developed via computer simulation and existing work.
- YAG screens to reproduce beam position
- Capacity for 20 simultaneous targets
- Detectors to handle higher event rate
- Target temperature investigation system

Status of the 5 MeV**:**
Vacuum chamber in fabrication; detectors and associated electronics development in progress.
Pilot test will be done at MAMI next year.