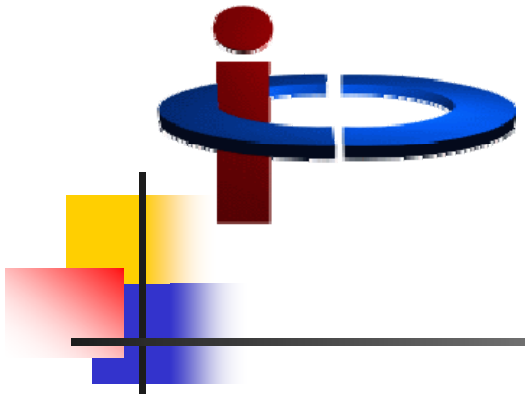

THE UNIVERSITY
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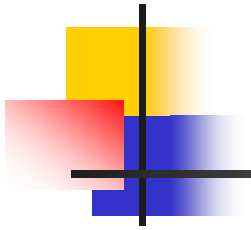
Intentional depolarisation of positron beam?

L.I. Malysheva



What is already available “on shelf”

Radio-frequency (RF) methods for spin manipulation in Storage Rings using of RF dipoles or Solenoids :

a) resonance depolarisation (Routinely used for Beam Energy Calibration)

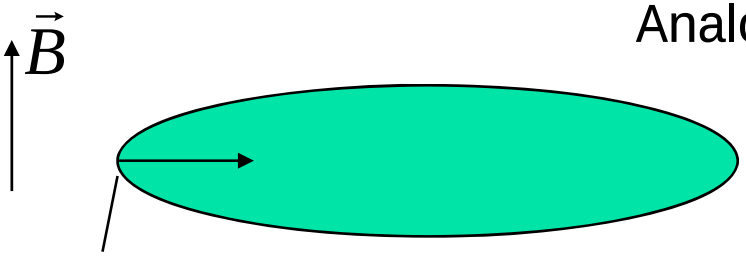
b) Spin-flipping technique: Stable and fast (0.2 sec COSY data for proton flipping)

These methods applicable for hadrons and leptons (for high energy Synchrotron radiation effects on spin are coming to the picture)

The ring must be in a storage rings regime i.e. the energy of the ring is fixed.

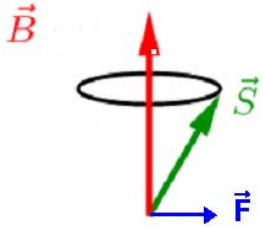
Then If we introduce RF dipole in DR could we expect a depolarisation during the time that beam stays in DR?

Flipping (or depolarising) mechanism



RF transverse field

Analogous to NMR



If $\nu \approx k_0 \pm Q_{RF}$ and SRM expected

Froissart –Stora formula $\frac{S_f}{S_i} = 2e^{-\frac{\pi|\varepsilon|^2}{2\alpha}} - 1$ where

α is the rate of resonance crossing $\frac{d\,Q_{RF}}{d\,t}$

ε is "resonance strength". It can be calculated as $\varepsilon = \frac{(1+a\gamma)}{4\pi}\int \frac{B_{ocs}\,dl}{B\rho}$

Substituting some DR parameters

- E=5 GeV
- Damping time= 22 msec
- Time beam stays in DR =5 d.t.
- 1100 turns~ 1 d.t.
- Then
- Using Froissart-Stora formula I can get an estimate of required ε and RF dipole integrated field
- The numbers I obtained are at a first look quite reasonable

$$f_{rev} = 44kHz$$

$$\alpha = \frac{dQ_{ocs}}{d\theta} = \frac{0.1}{5000 * 2\pi}$$

THUS a more detailed investigation required!