Preparation for the Time Reversal Invariance experiment at COSY (TRIC)

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\textbf{Trick behind TRIC: T reversal via spin-flip!}

\begin{equation}
\frac{N_I}{N_{II}} \sim \frac{N_I - N_{II}}{N_I + N_{II}}
\end{equation}

\textbf{Comparison of slopes for states I and II}

\textbf{Possible Systematic Uncertainties}

\begin{equation}
\delta_{\text{syst}} = 10^{-5} \times (\Delta_{\text{time}} + \Delta_{\text{target}} + \Delta_{\text{OSY}}) + 5 \times 10^{-2} \times (S_{\text{temp}} + S_{\text{homo}}) \leq 10^{-7}
\end{equation}

\textbf{Conclusions:}

- TRIC is a genuine T-symmetry test in $p\bar{d}$ scattering.
- COSY can provide a polarised beam for TRIC.
- Tensor polarised D target and polarimeter are available for TRIC.
- Beam current measurement system with resolution sufficient for TRIC has been constructed.
- First measurements of $A_{T\gamma}$ are in agreement with expected value.

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\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure.png}
\caption{Diagram illustrating the experimental setup and data acquisition process for the TRIC experiment.}
\end{figure}

\textbf{Beam Parameters:}

- Energy: 135 MeV
- Intensity after stacking: $1.7 \times 10^{12}$ (120 s)
- Proton polarisation: 64%
- Polarisation life time: $>10000$ s
- Beam life time: 10000 s

\textbf{Beam is ready for TRIC}

\textbf{Polarised D Target & Polarimeter}

- Low-\(\beta\) section
- ABS
- BRP
- Target is ready for TRIC

\textbf{Beam Current Measurement}

- Data from one night (1/08/2016)
- $A_{T\gamma}$ Measurements @ COSY

\textbf{Lifetime measurement at 135 MeV}

- $\tau \approx 10000$ s
- $\tau \approx 8000$ s

\textbf{Beam is ready for TRIC}

\textbf{Parametrizing BSM physics}

Considering only flavour-conserving CPT tests (u,d,s quarks)

\begin{equation}
L = L^\text{SM} + \alpha_{\text{TVPV}} L_{\text{TVPV}} + \alpha_{\text{TVPC}} L_{\text{TVPC}}
\end{equation}

$O(1)$ $O(\alpha_{\text{W}})$

$\alpha_{\text{TVPV}}$ $\alpha_{\text{TVPC}}$

EDM

TRIC

EDM

TRIC

EDM

TRIC

Conclusions:

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