Pion polarimetry issues.

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- **Some conclusions coming from background simulations.**

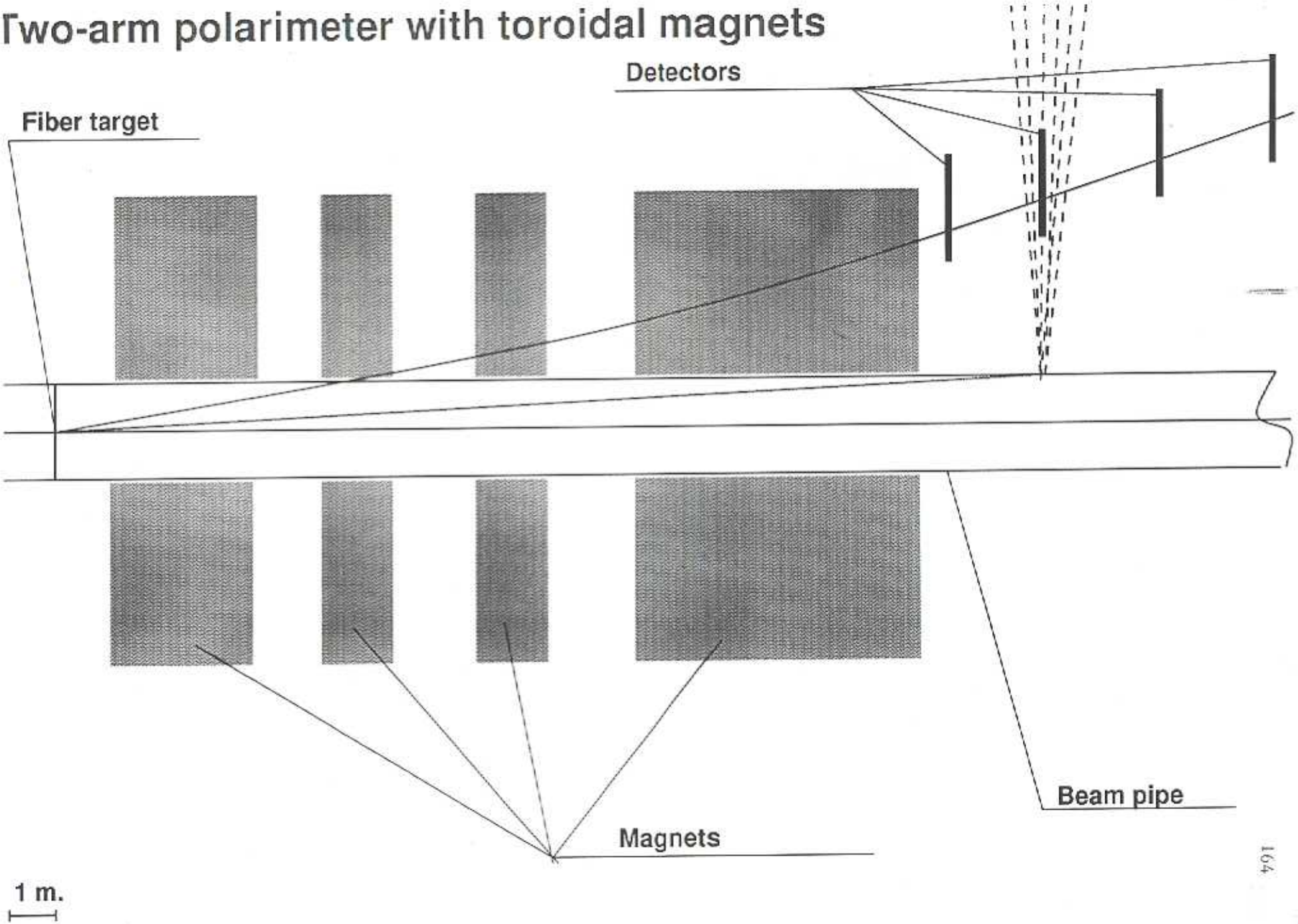
  A simulation of detector acceptance and backgrounds was performed for two-armed polarimeter based on toroidal magnets. Our results could be interesting for understanding of current polarimeter design also.

  ◊ Inclusive pion polarimeter can work up to the highest intensities of RHIC: P=250 GeV/c, bunch filling $2 \cdot 10^{11}$ protons and 120 bunches per ring.

  ◊ Main source of parasitic particles comes from fast particles produced on the target, which go the most way in the beam pipe and then produce a shower on its wall. Due to the fact that detectors are too near to the tube this can not be cured by shielding.

  ◊ Acceptance is enough to ensure small measurement times, but the problem could come from emittance blowup at low energies, especially at small bunch filling. So we should not drop the acceptance without serious reasons.

Two-arm polarimeter with toroidal magnets



- Absolute calibration of inclusive pion polarimeter with polarized jet target.

We can go on now with relative inclusive pion polarimeter and, if then a strong demand for precise absolute value arise, obtain it for old measurements also.

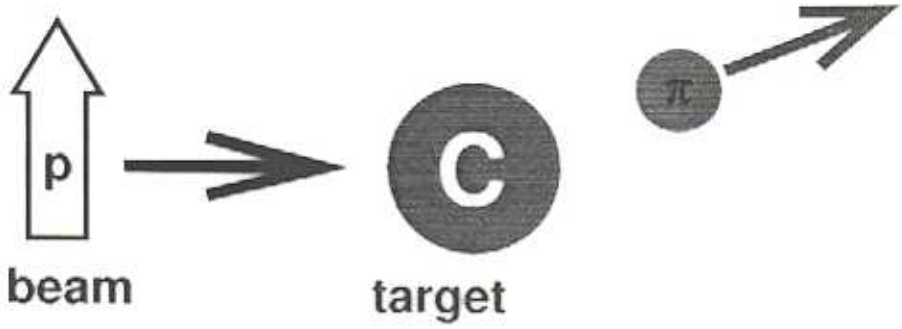
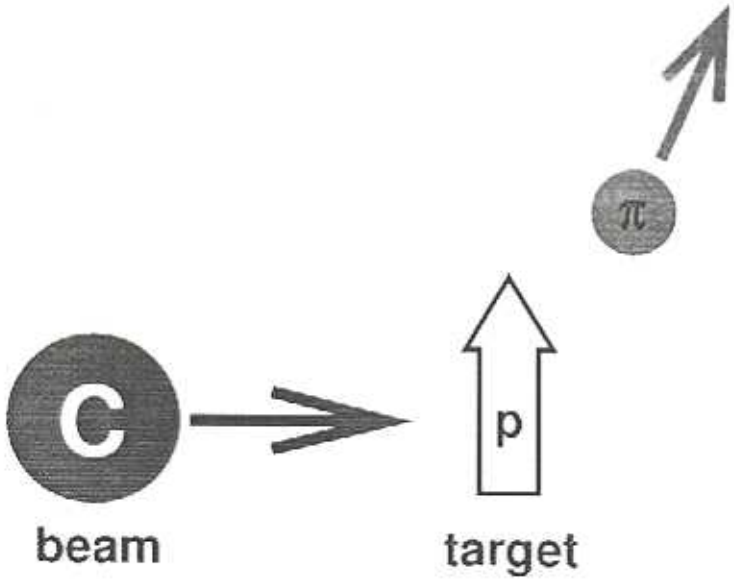
To have the same geometry for polarized target as for polarized beam we need:

$$p^{A}_{beam}/A = p^{p}_{beam};$$
$$p'_{t} = p_{t};$$
$$p'_{\parallel} \approx \frac{x_f}{2m_p}\left(m_p^2 - \frac{p_t^2 + m_\pi^2}{x_f^2}\right)$$

- Direction and momentum of pions does not depend on the beam momentum, so the two-arm setup covering angles θ_{lab}=45-78° and φ=0±10°, 180±10° and momentum range near 1 GeV will suit for all beam energies.
- The estimated time of gathering of 10^4 pions corresponding to "polarized beam" x_f=0.5±0.1 and p_t=0.8±0.1 GeV/c is 30 min. at 25 GeV and several seconds at 250 GeV on a polarized jet target with thickness 10^{13} atoms/cm^2.
- This method also votes for using hydrogen jet target in polarimeter because carbon can not be accelerated at RHIC to 250 GeV/nucleon, which we need to make calibration at 250 GeV.

Conclusion: Inclusive pion polarimeter is quite reasonable choice for polarimetry at RHIC.

Beam polarization measurement



Analysing power measurement