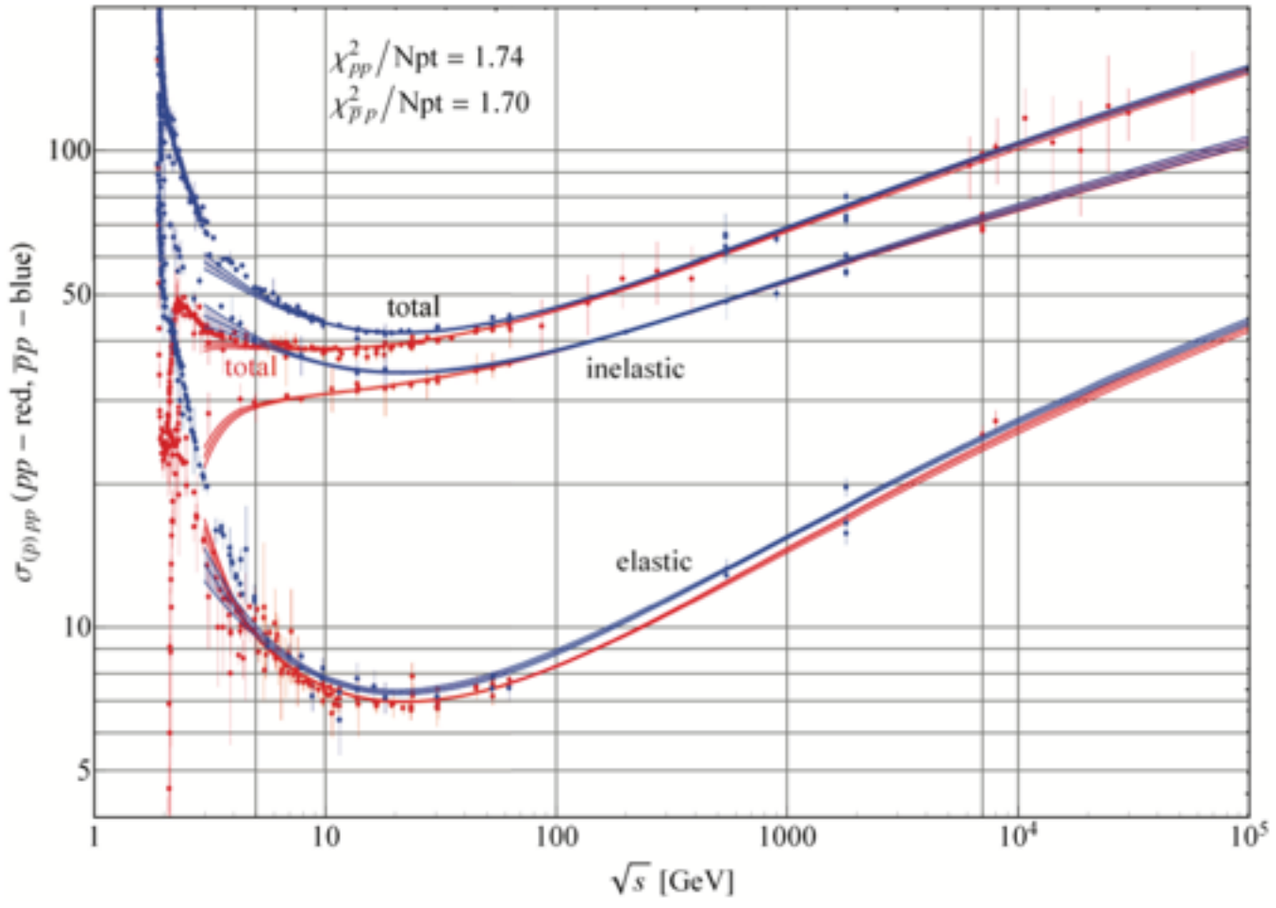
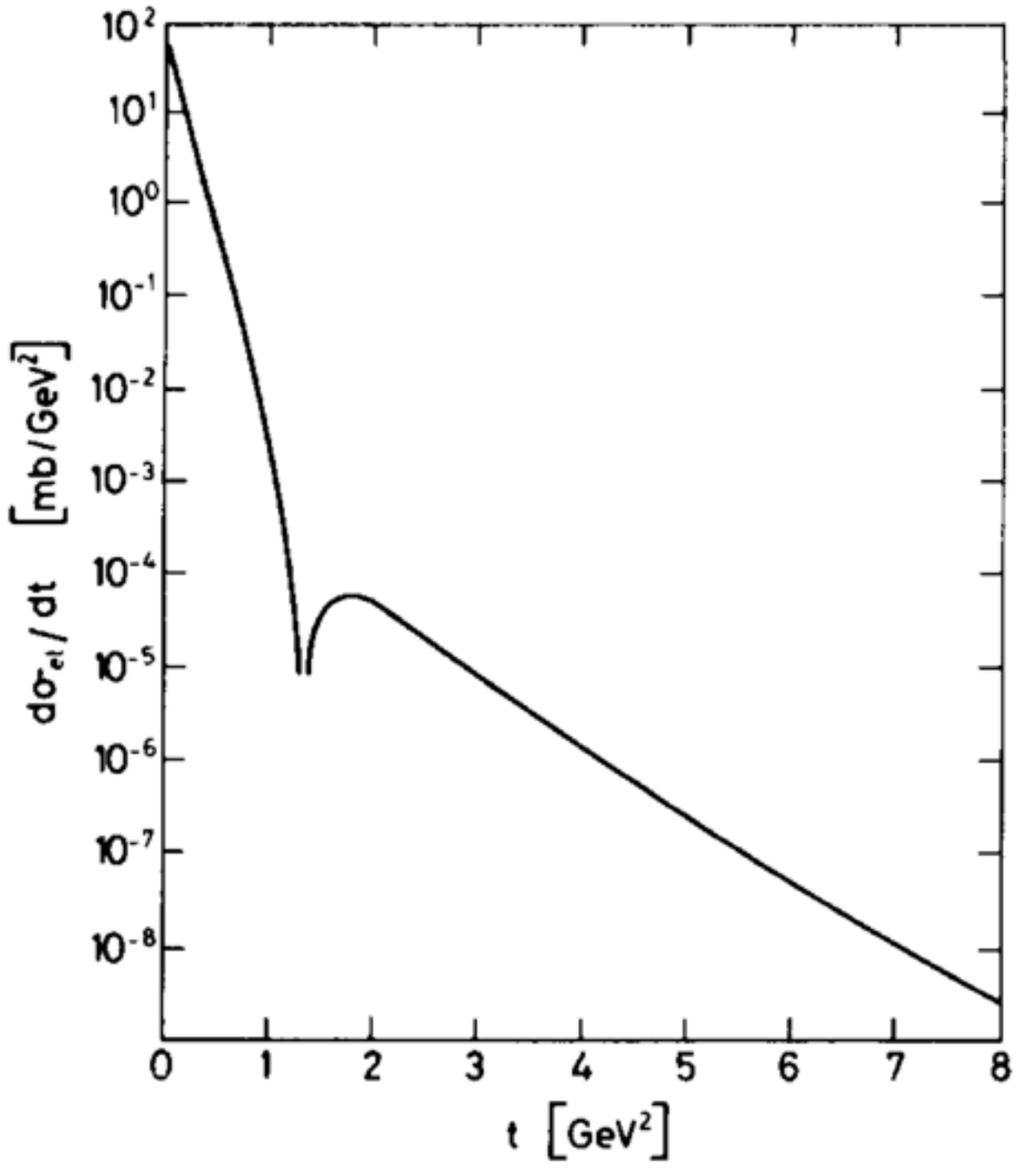
p-p elastic scattering & local polarimetry

A. Guskov
DLNP, JINR

p-p elastic scattering





$$\sigma_{el} \approx 7 \div 8 \; mb$$

$$\frac{d\sigma_{el}}{dt} = Ae^{-Bt} \qquad t \approx p^2\theta^2$$

$$B \approx 12 \; GeV^{-2}$$

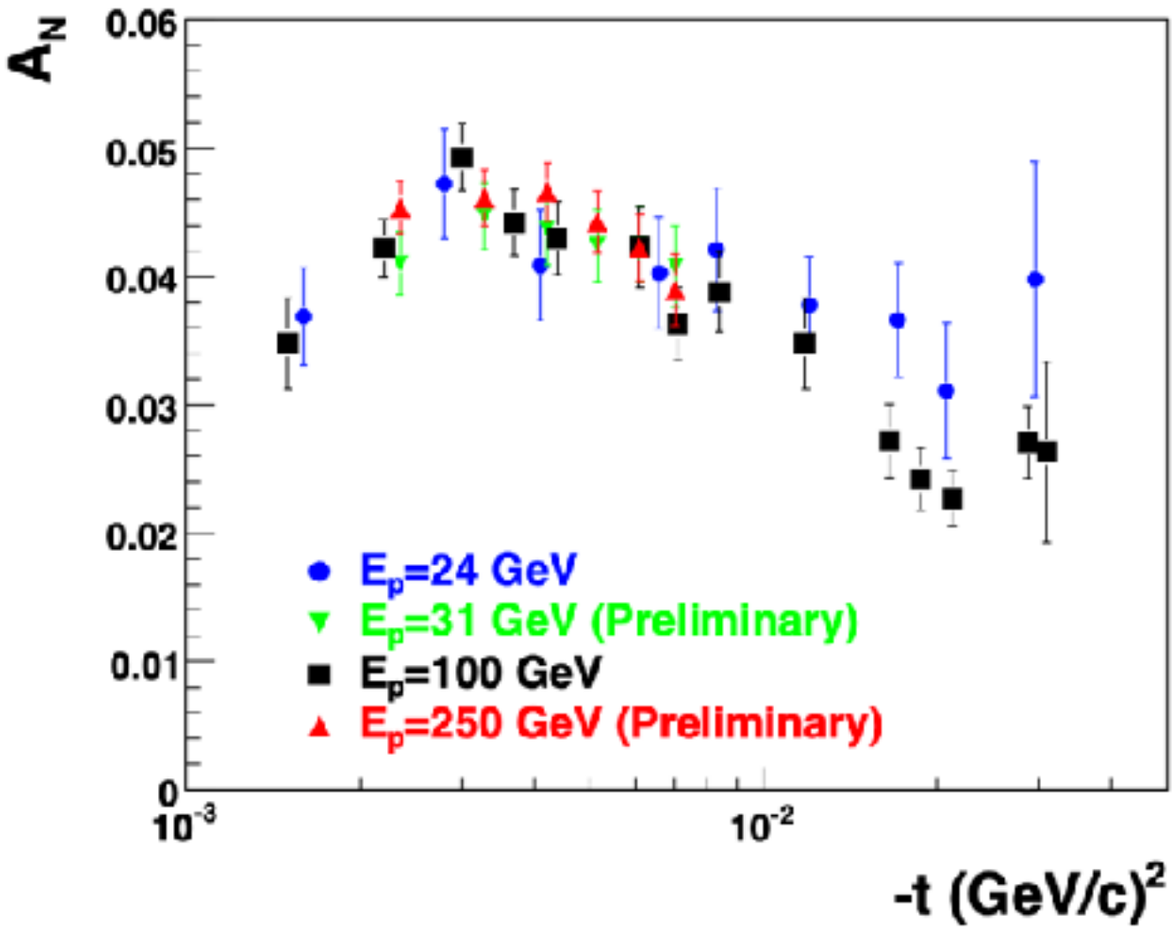
Single spin asymmetry in p-p elastic scattering

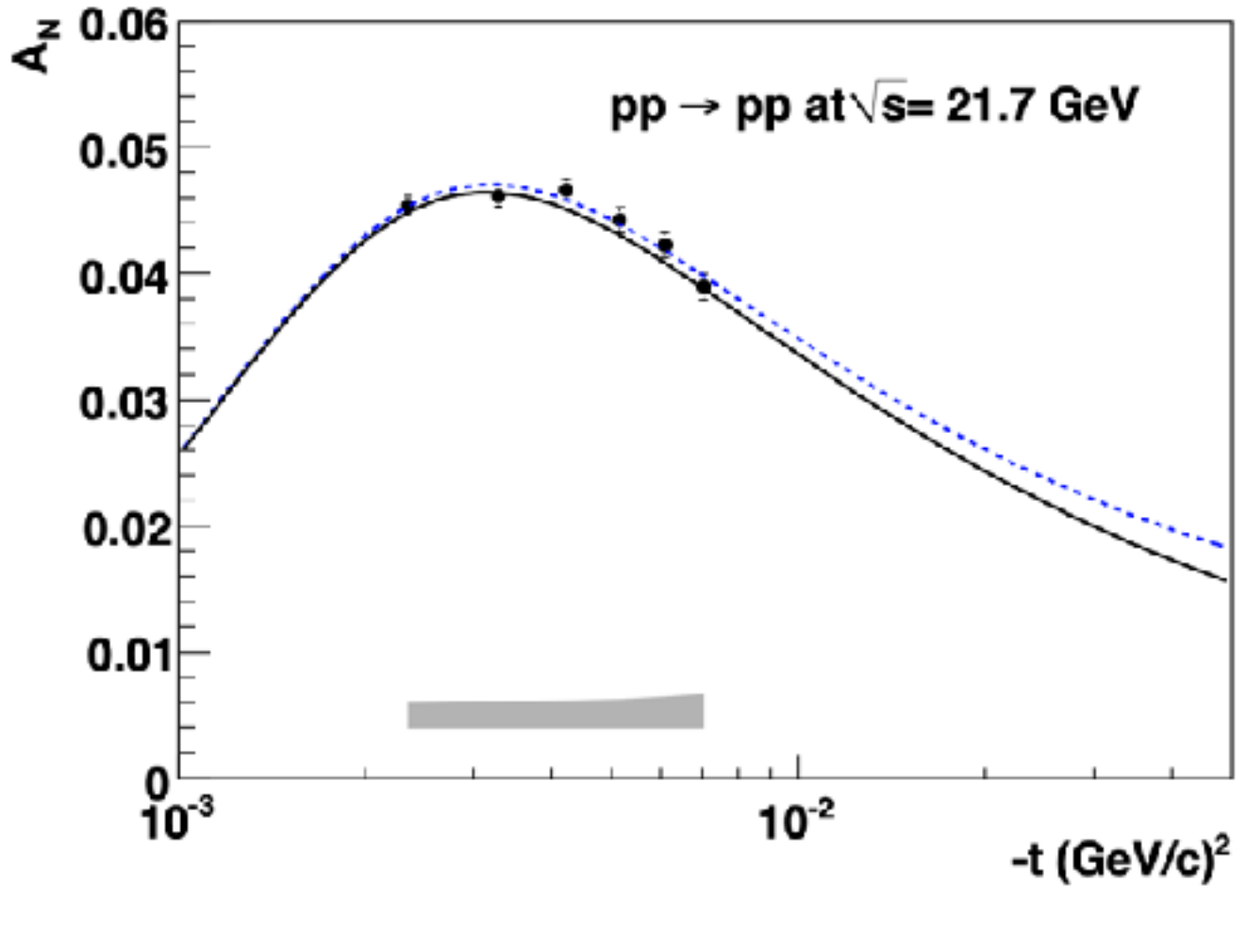
$$A_N = \frac{\sigma^{\uparrow} - \sigma^{\downarrow}}{\sigma^{\uparrow} + \sigma^{\downarrow}}$$

Maximal analysing power A_N is at

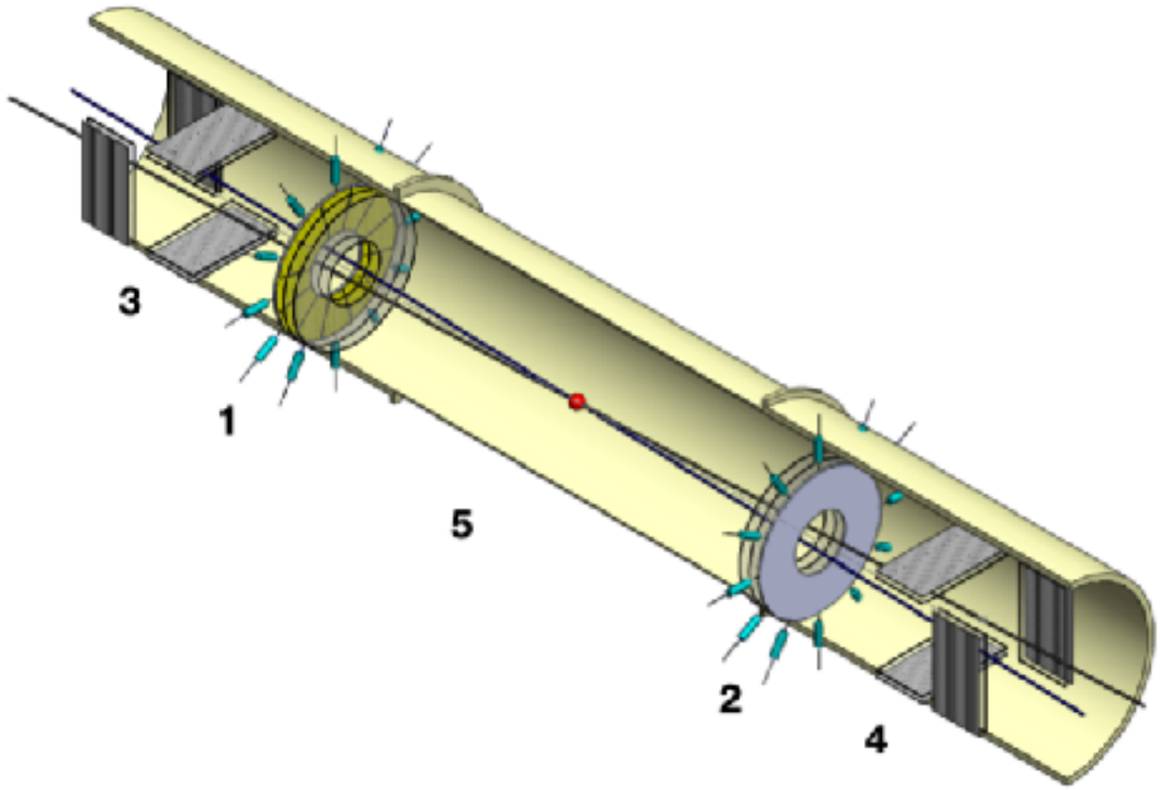
$$t = 3 \times 10^{-3}\ GeV^2$$

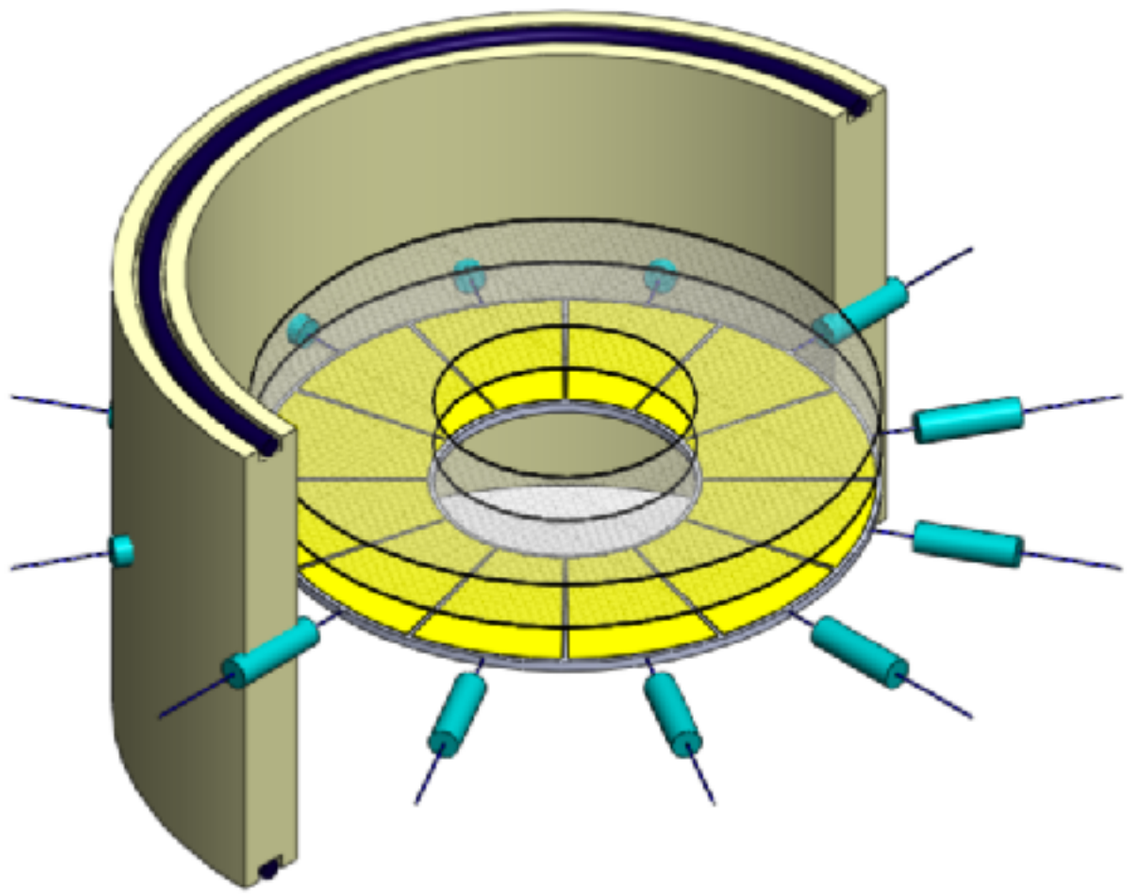
For $\sqrt{s} = 27\ GeV$ it corresponds to θ=0.004





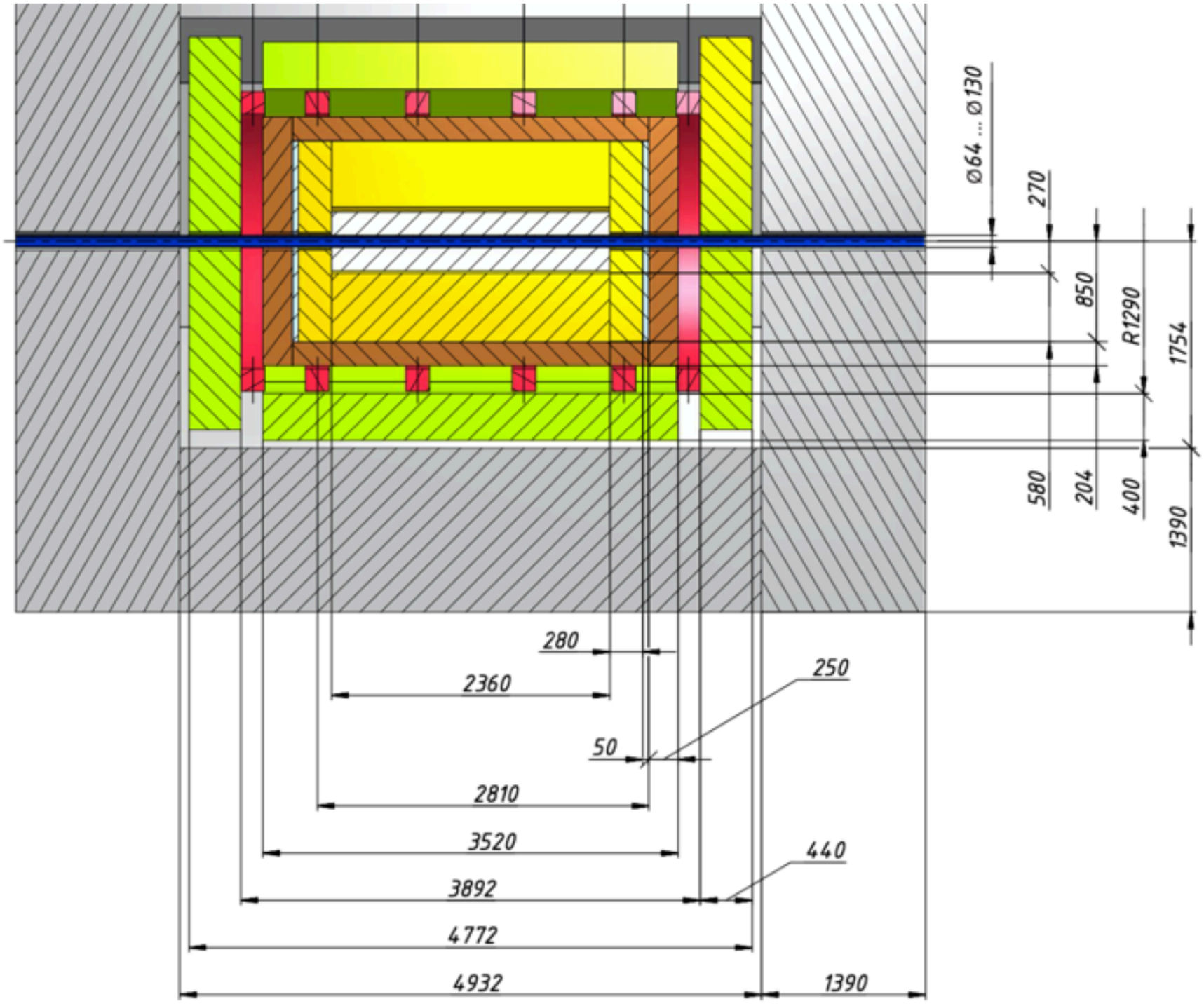
Micro-Chanel Plates at SPD





In my simulation I used R_{in} = 25 mm and R_{out}=60 mm,
12 sectors

SPD layout

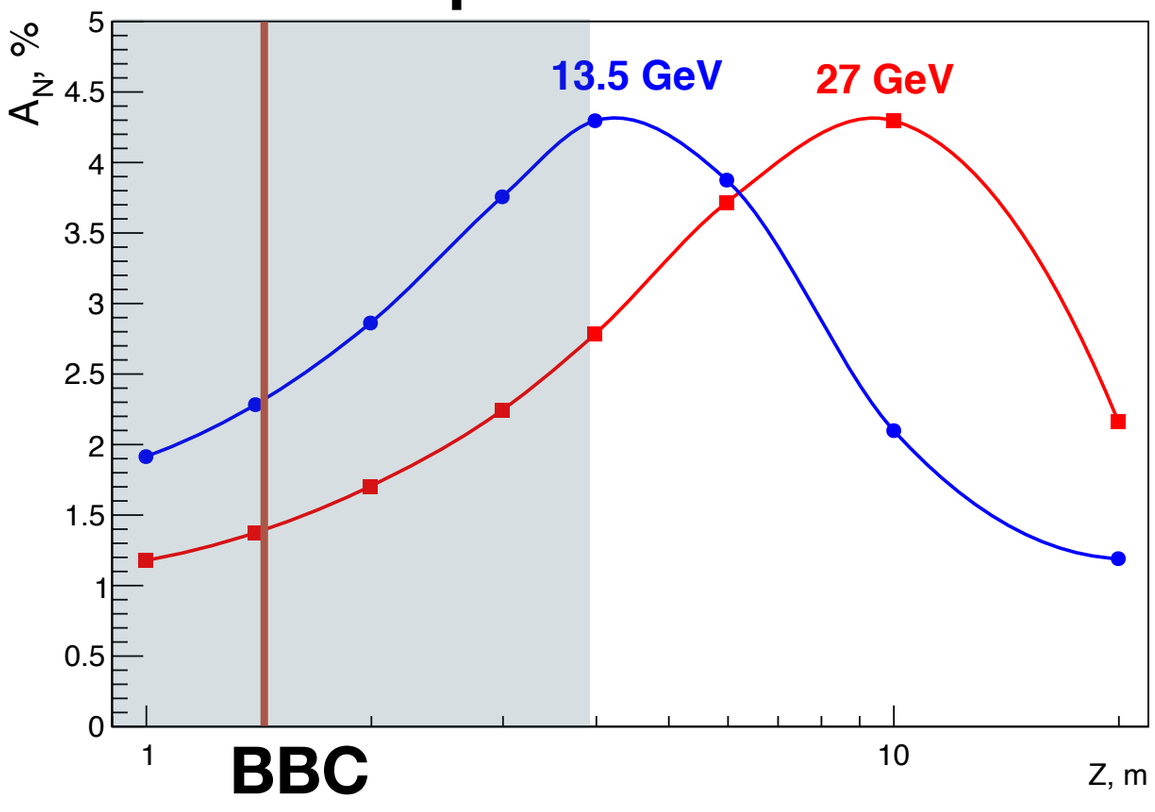

Ø64 ... Ø130
270
850
R1290
1754
580
204
400
1390
280
2360
250
50
2810
3520
440
3892
4772
4932
1390

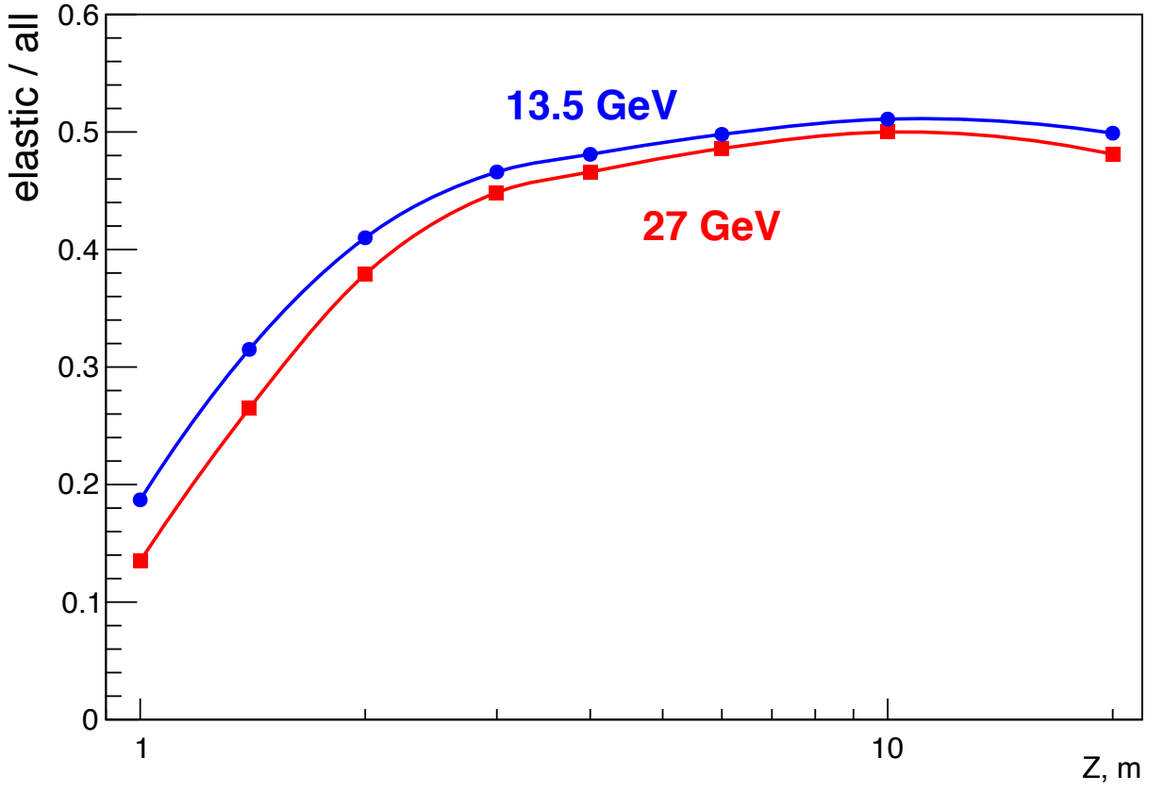
p-p elastic scattering & a single MCP

- protons from elastic scattering
- charged particles from inelastic interactions
- beam halo (unknown)

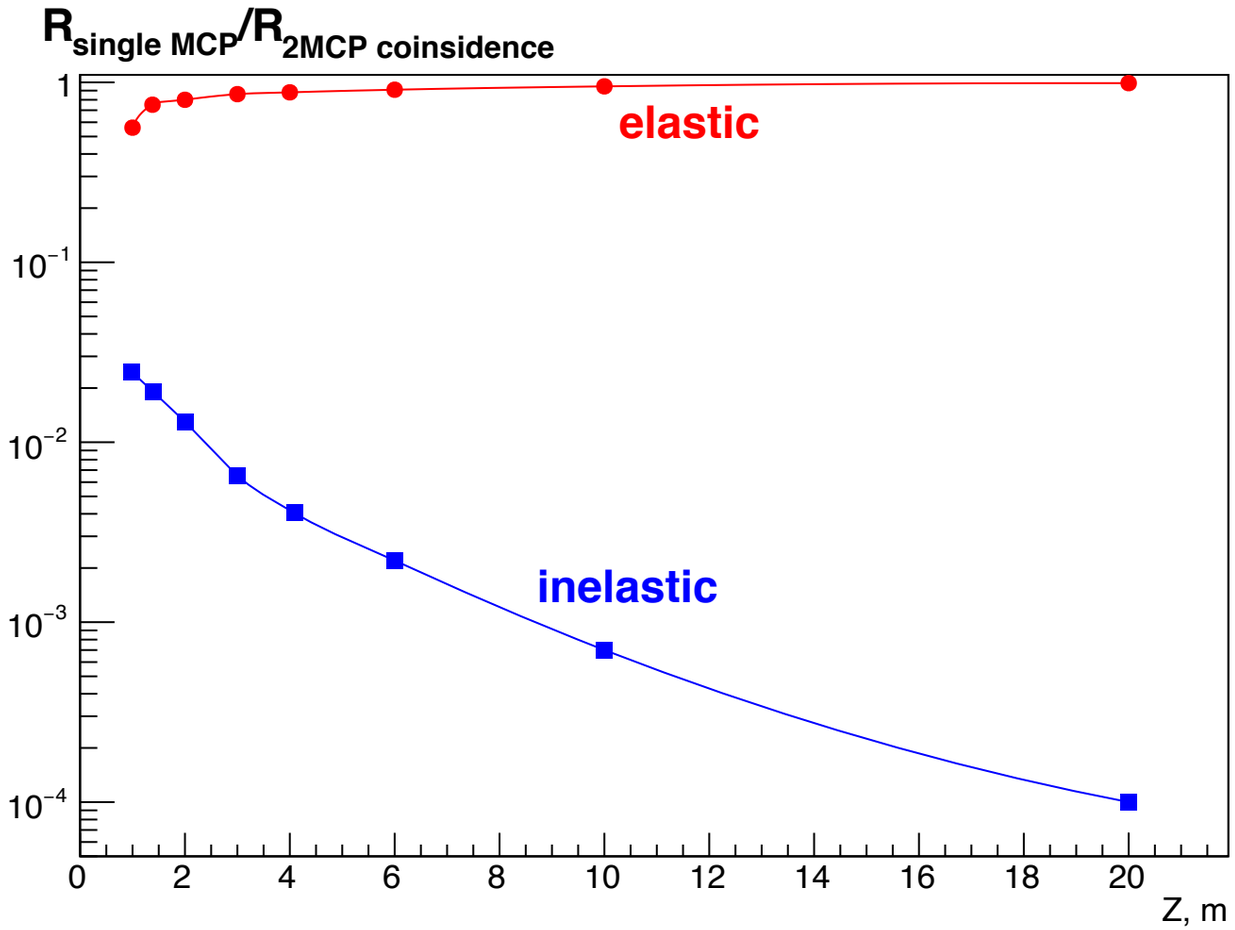
$$\sqrt{s} = 13.5\ GeV$$

z_{MCP}=1.4 m	x,y,z=0	σ_{xy}=3 mm, σ_z=±30 cm
$\langle A_N \rangle$	0.038	0.0378
elastic/all	0.449	0.446



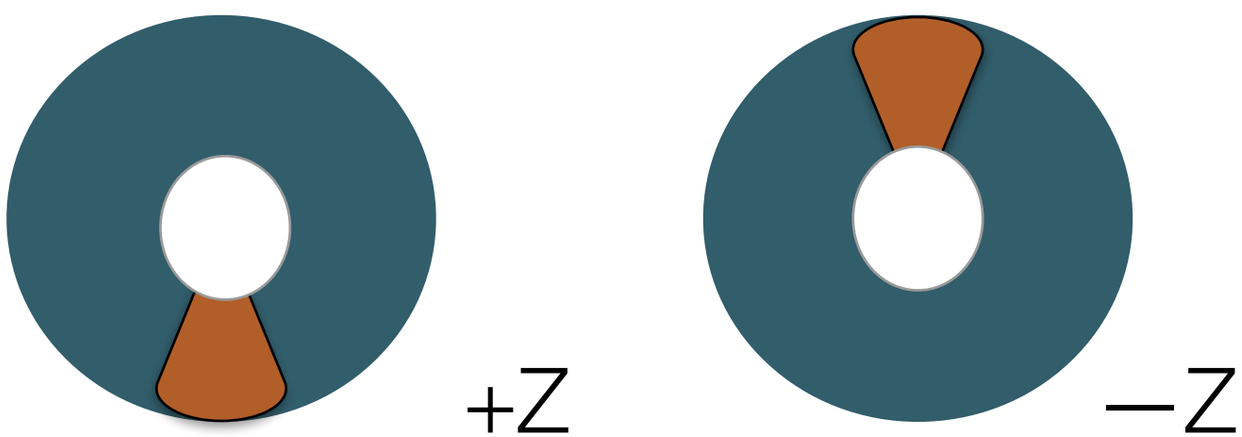


p-p elastic scattering & coincidence of two MCPs



$Z = 3\ m,\ \sqrt{s} = 27\ GeV, L = 10^{32}\ cm^{-2}s^{-1}$

kHz	
Single MCP rate	350
Coincidence rate: elastic	185
Coincidence rate: inelastic	1.5



Conclusion

- MCPs could be really nice instrument for local polarimetry.
- To maximize analyzing power it would be reasonable to install MCPs as far as reasonably possible from the IP.