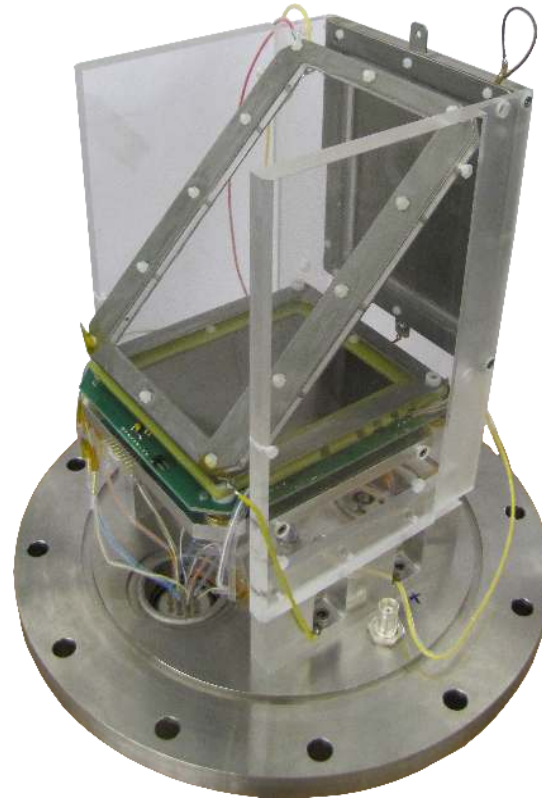
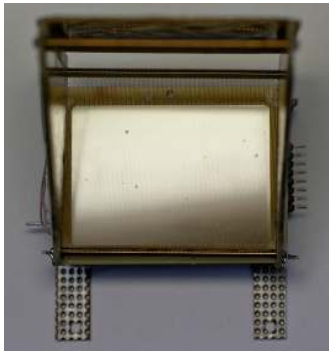


# MCP development for the Slowed Down Beams



40x60mm<sup>2</sup>

100x80mm<sup>2</sup>

Ø=150mm

02/28/2017

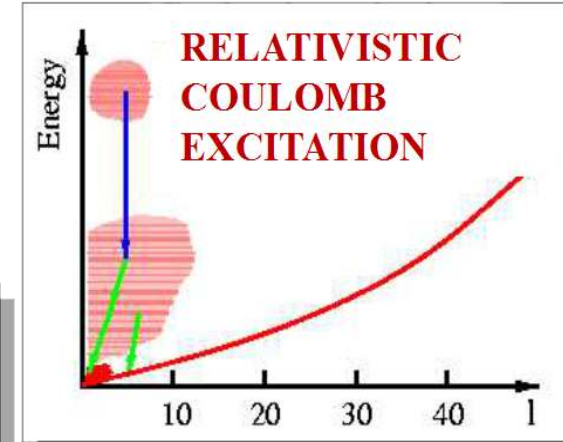
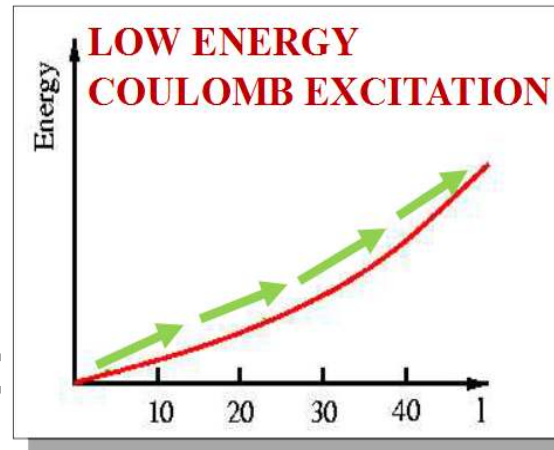
Mario Cappellazzo  
IKP Cologne

# Agenda

- Slowed Down Beam experiments
- MCP based detectors
- Developments and results
- Conclusion and outlook

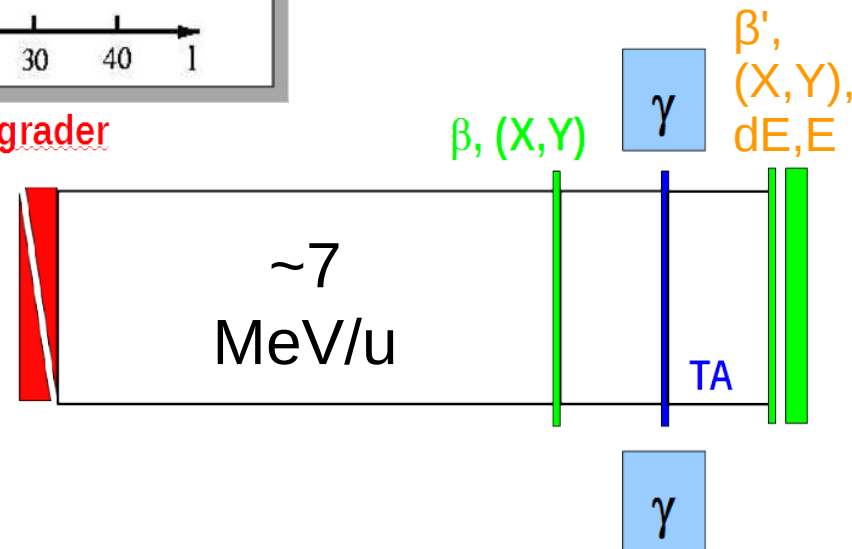
# Slowed Down Beams

- Complementary nuclear structure measurements of decelerated radioactive ions
- Energy and angular straggeling
- Reaction type:
  - interaction velocity
- thin/thick (active) target
- Doppler correction needs:
  - interaction point
  - velocity after reaction



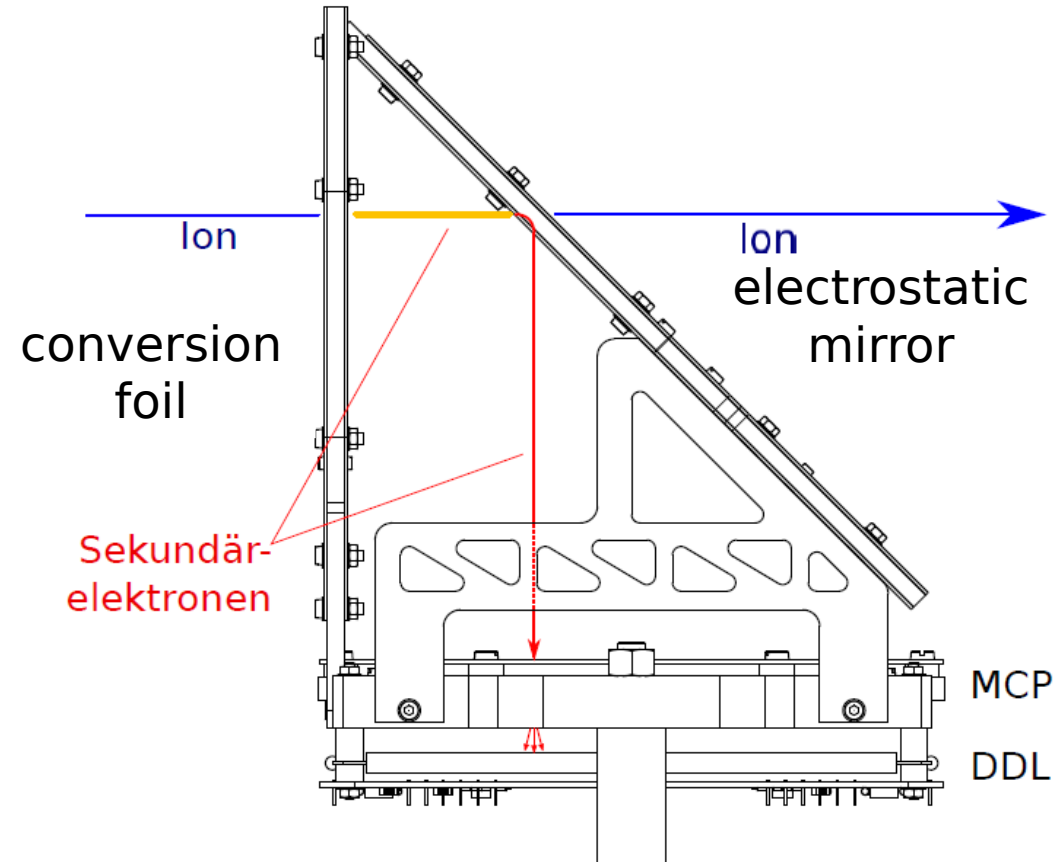
Degradar

$^{58}\text{Ni}$   
 $\xrightarrow{\sim 250 \text{ MeV/u}}$

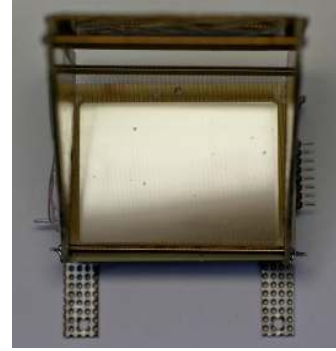


# MCP based detectors

- general concept:
  - ions produce secondary electrons in conversion foil
    - Au+Mylar
    - C ( $\sim 40\mu\text{g}/\text{cm}^2$ )
    - nano materials in development
  - electrostatic point to point imaging of SE
  - MCP and DDL for readout
- compact design
- full geometric size of MCP usable



# Small size MCPs

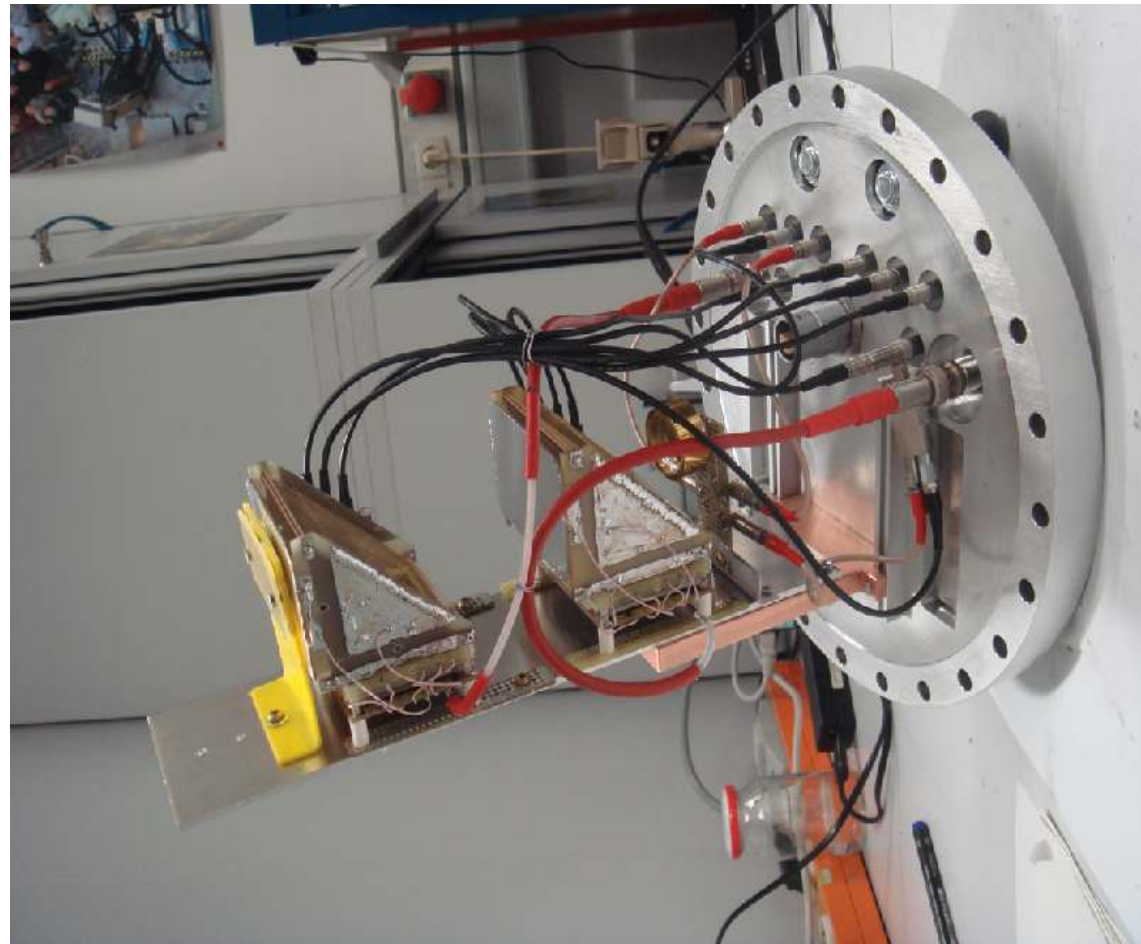


- size 40x60mm<sup>2</sup>
- 1.5μm Mylar foil
- $\Delta T(\text{FWHM}) \sim \mathbf{140 \text{ ps}}$   
 $\Delta X_{\alpha}(\text{FWHM}) \sim 3 \text{ mm}$   
 $\Delta X_{\text{fr}}(\text{FWHM}) \sim 1.5 \text{ mm}$

$$\epsilon_{\alpha} \sim 85 \%$$

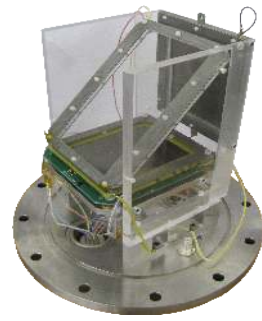
$$\epsilon_{\text{fr}} \sim 100\%$$

P.Boutachkov, GSI



Design: N.A. Kondratjev

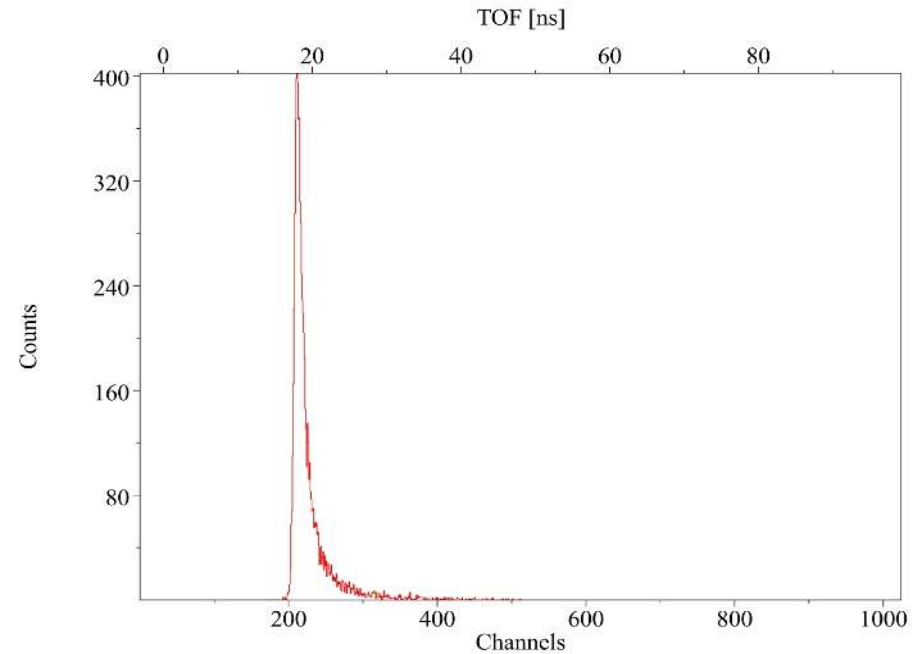
# Medium size MCPs



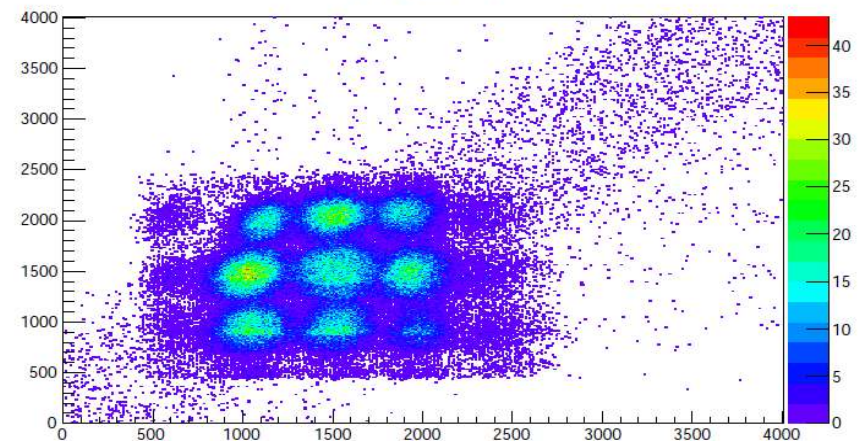
- size 100x80mm<sup>2</sup>
- C foil with  $\sim 40\mu\text{g}/\text{cm}^2$
- $\Delta T(\text{FWHM}) \sim 700 \text{ ps}$   
 $\Delta X_{\alpha}(\text{FWHM}) \sim 10 \text{ mm}$

$$\epsilon_{\alpha} \sim 70 \%$$

$$\epsilon_{\text{fr}} \sim 100\%$$



MCP2 X vs. Y M.Pfeiffer, IKP Cologne



# Large size MCP

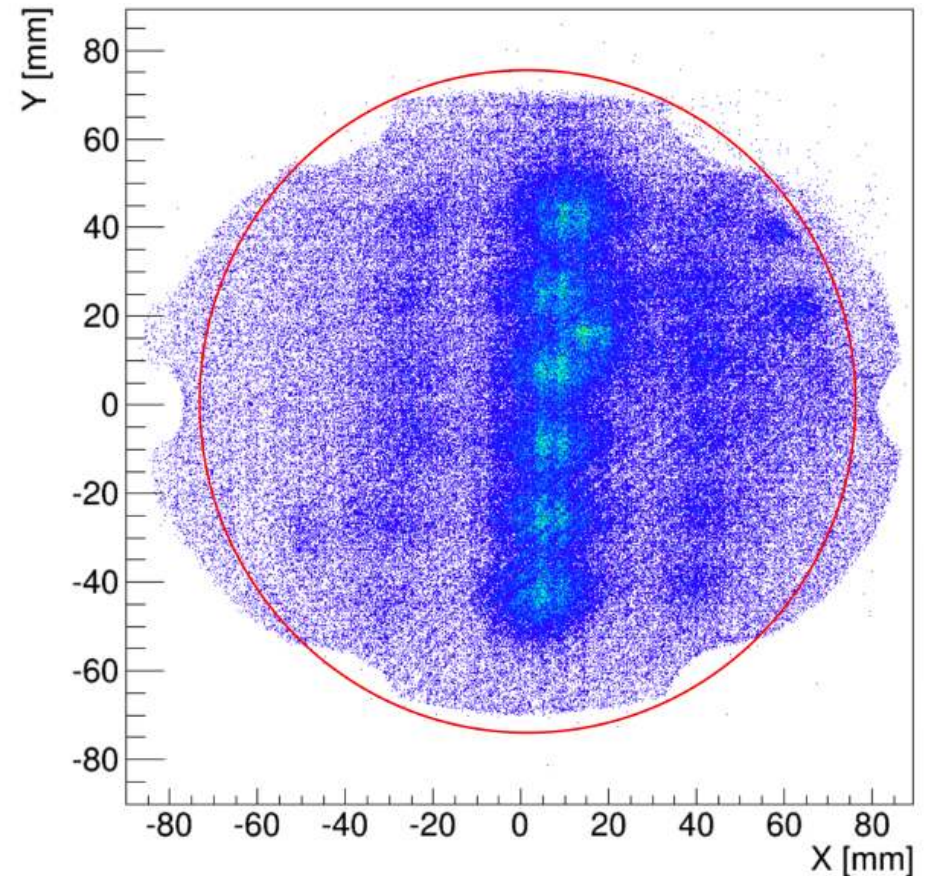
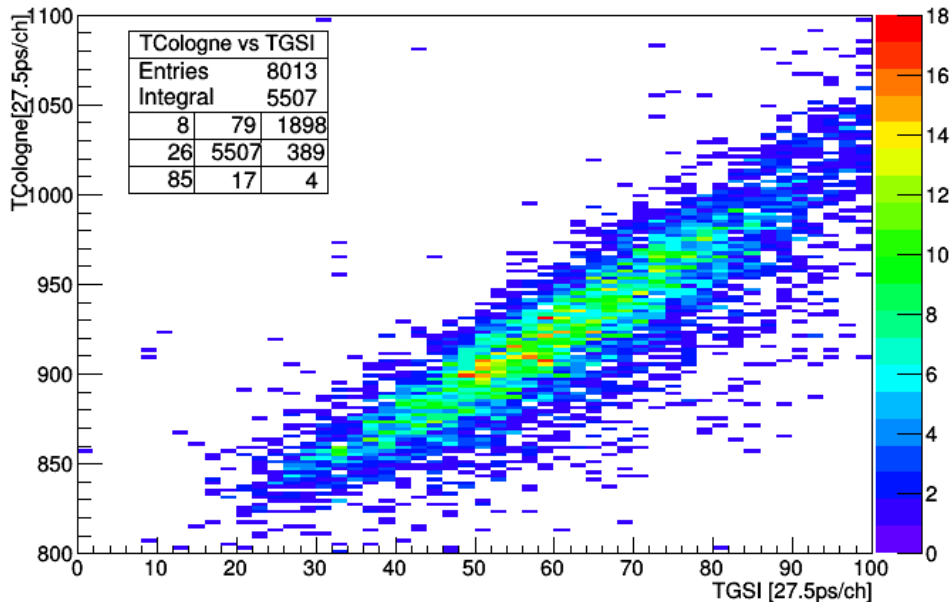


- Diametre 150mm
- C-Foil with  $\sim 40\mu\text{g}/\text{cm}^2$

$\Delta T(\text{FWHM}) \sim \mathbf{1178 \text{ ps}}$

$\Delta X_{\alpha}(\text{FWHM}) \sim 13 \text{ mm}$

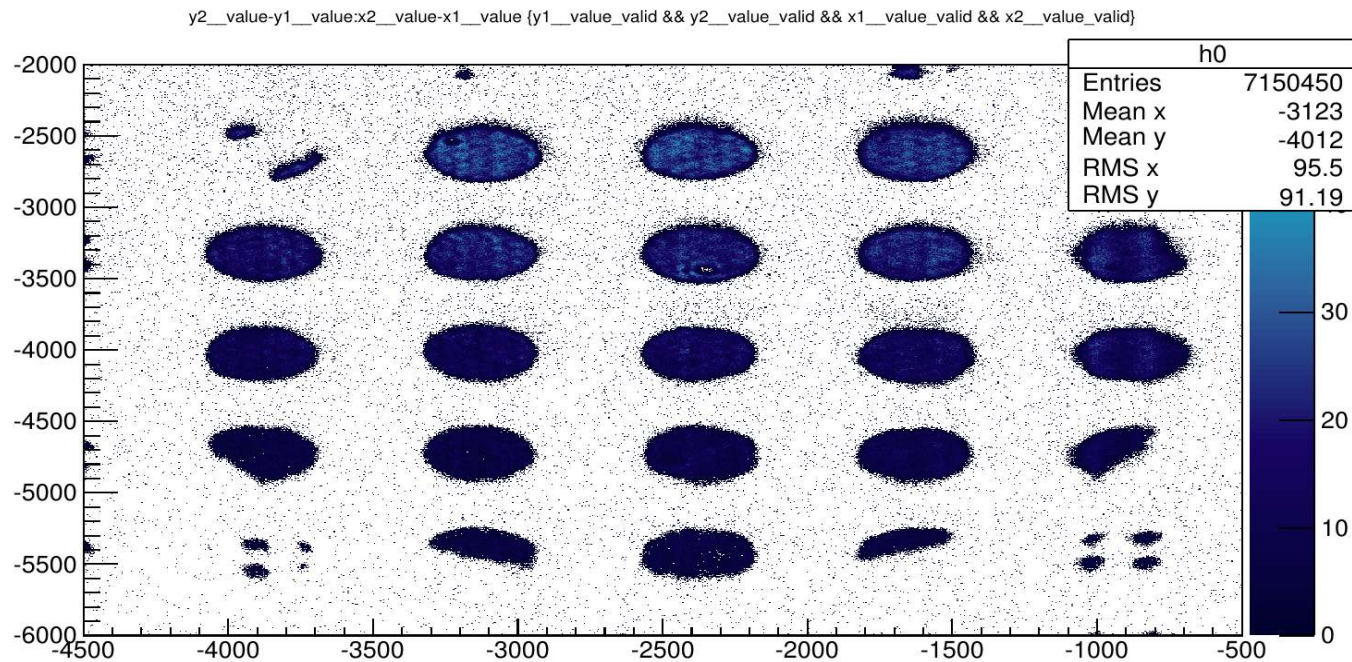
TColgne vs TGSi



- scanned detector vertically and horizontally with collimated alpha source
- applied calibration shows stretching in x-direction (red circle=MCP size)

# Large size MCP

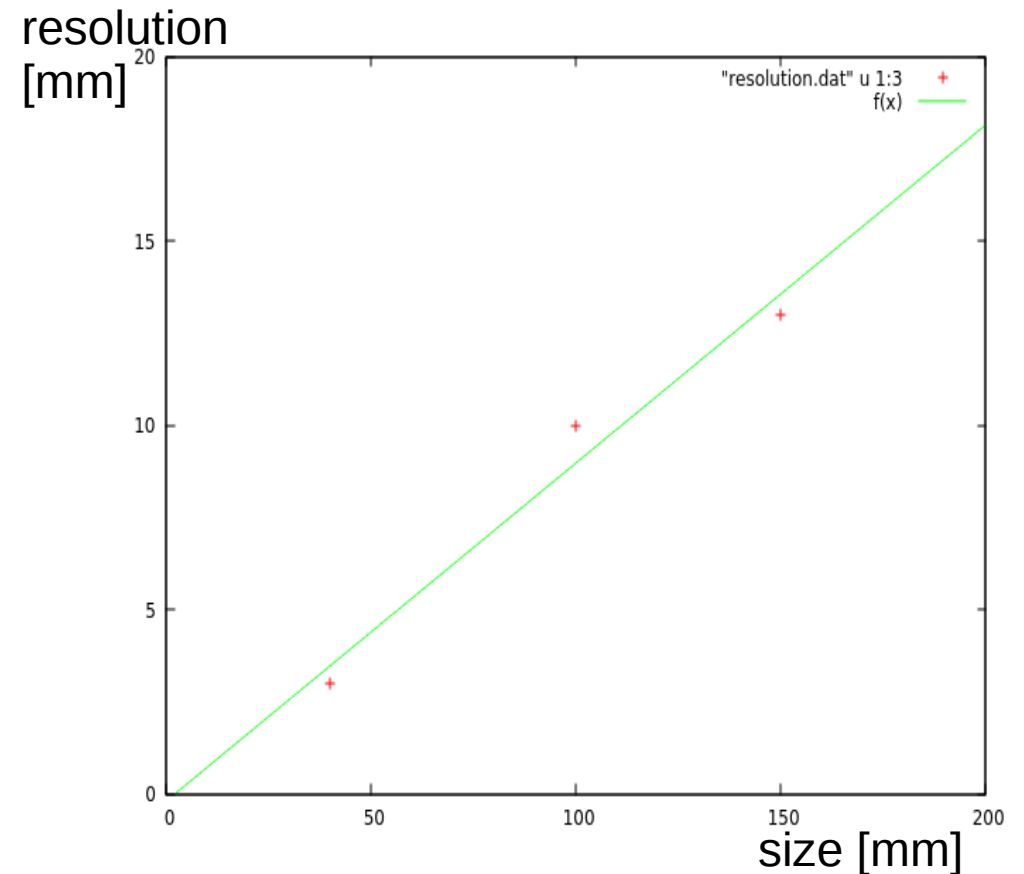
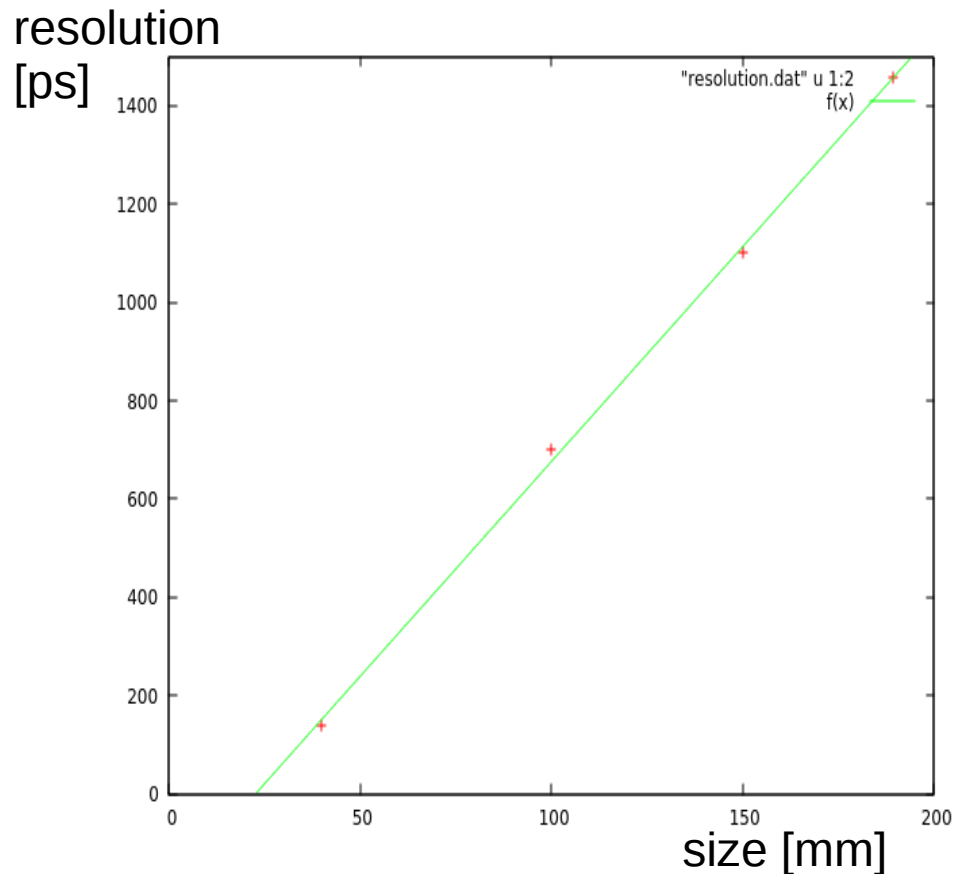
- testing the dector head with direct alpha irradiation
- resolution  $< 1\text{mm}$





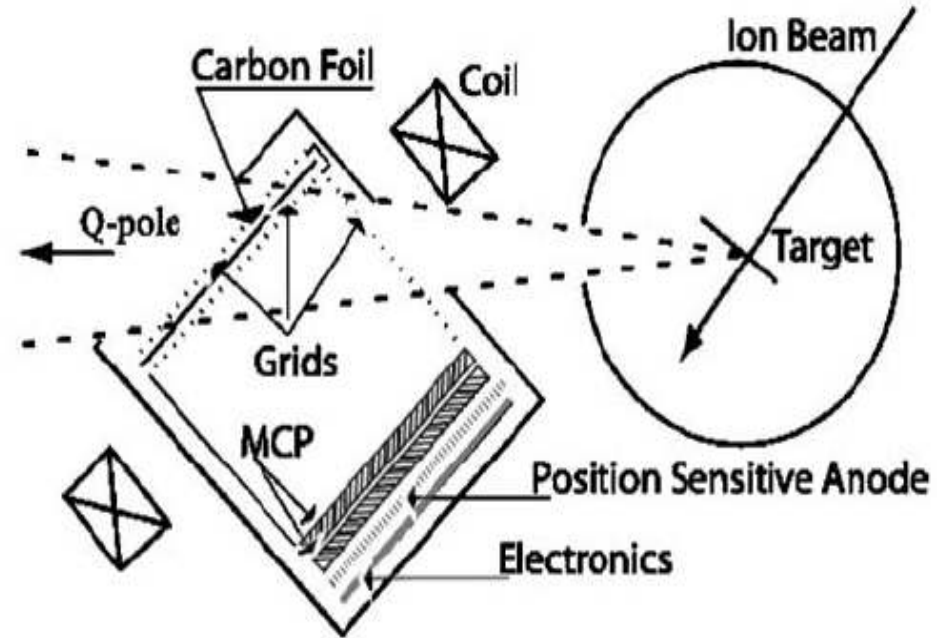
# Conclusion

- MCP detectors with electrostatic mirror seems not to fulfil the requirements



# Outlook

- PRISMA-Start detector:
  - MCP size 80x100mm<sup>2</sup>
  - no electrostatic deflection
  - magnetic field for limitation of broadening of SE trajectories
  - 400 ps and 1mm resolution
- magnetic field properties reported to be of minor importance for performance
- we will perform tests with magnetic fields and our large size MCP



*G. Montagnoli et al. / Nuclear Instruments and Methods in Physics Research A 547 (2005) 455–463*

