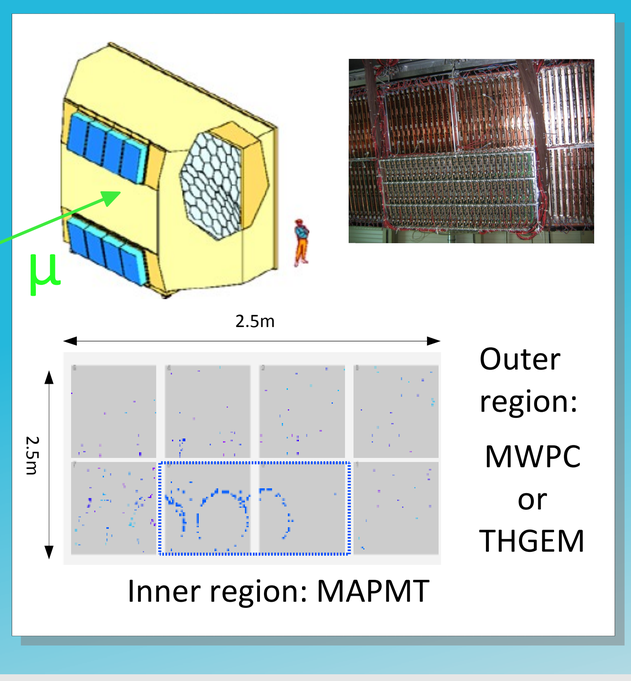
THGEM-BASED PHOTON DETECTOR FOR CHERENKOV IMAGING APPLICATIONS

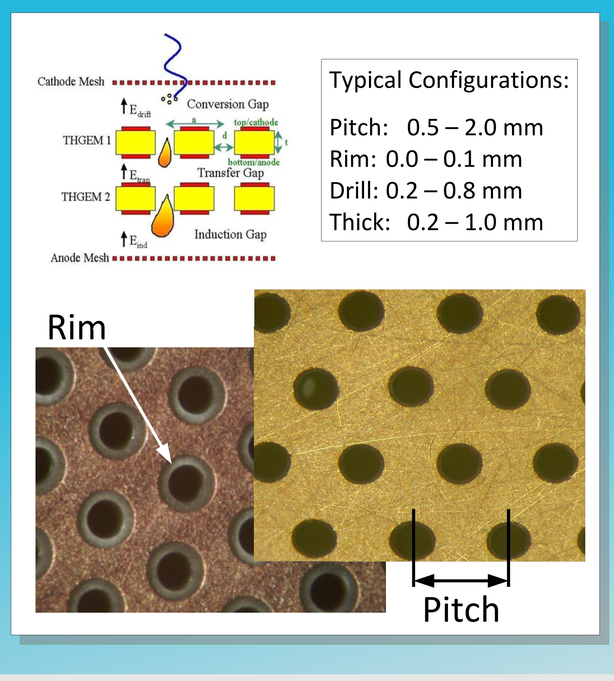
On behalf of an
Alessandria-CERN-Freiburg-Liberec-Prague-Torino-Trieste Collaboration

Application: COMPASS Ring Imaging Cherenkov Detector



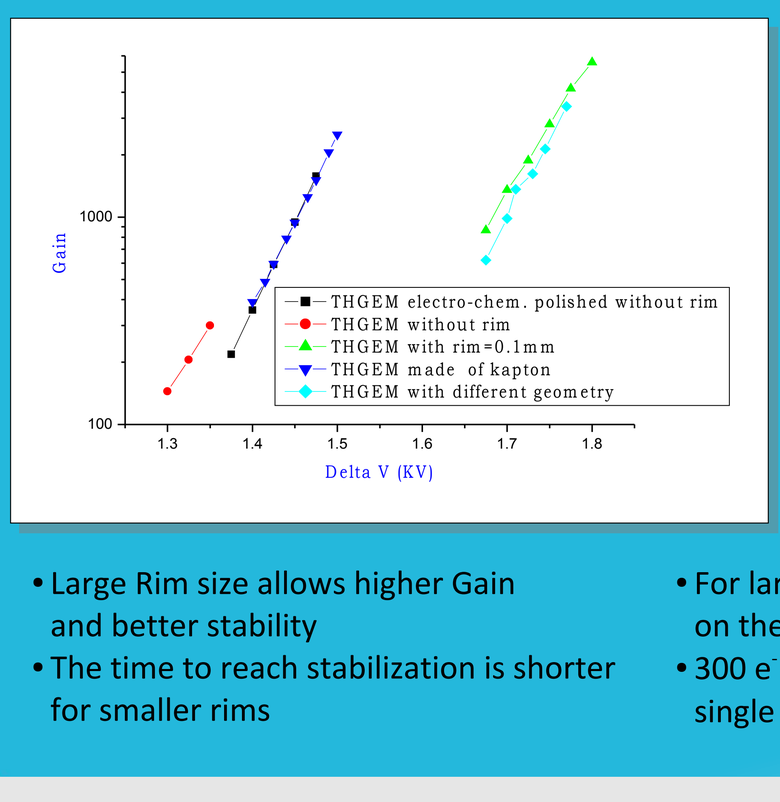
- Now: -Combined readout with MAPMT and CsI MWPC
- MAPMT: -High resolution in near beam region
- MWPC: -Moderate Gain: ~10^4
  -Long recovery time after discharge ~1d
- Future : -Readout with MAPMT & THGEM to reach higher gain and stability for large surface of 5 m^2

THGEM: Functionality, Design and Techniques

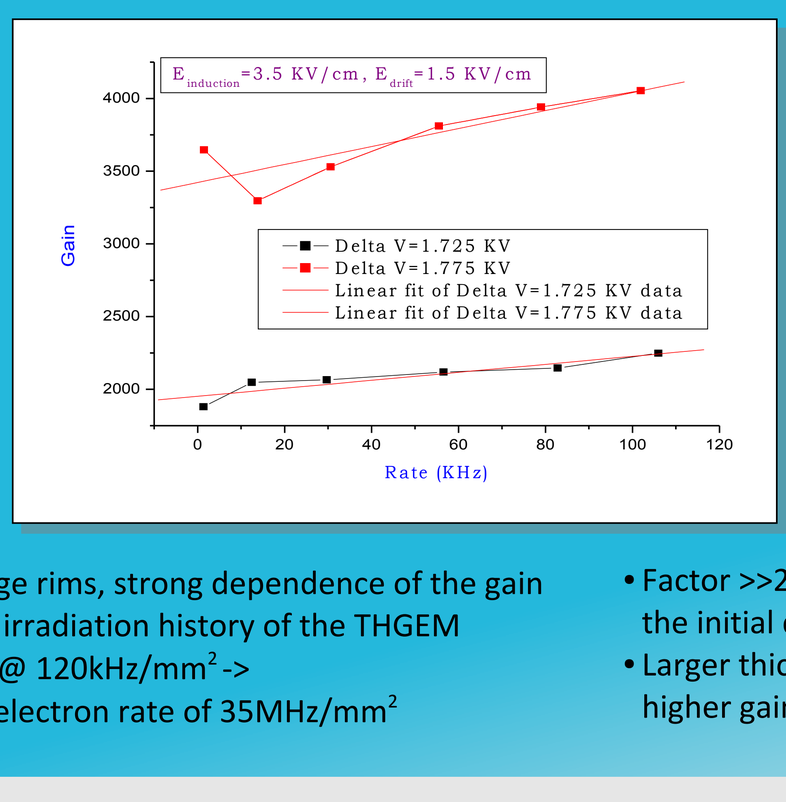


- Robust design for large surfaces
- Production: Standard PCB techniques
- 30 Different configurations in pitch, rim, hole diameter and PCB thickness tested
- Setup THGEM with up to four layers to increase gain

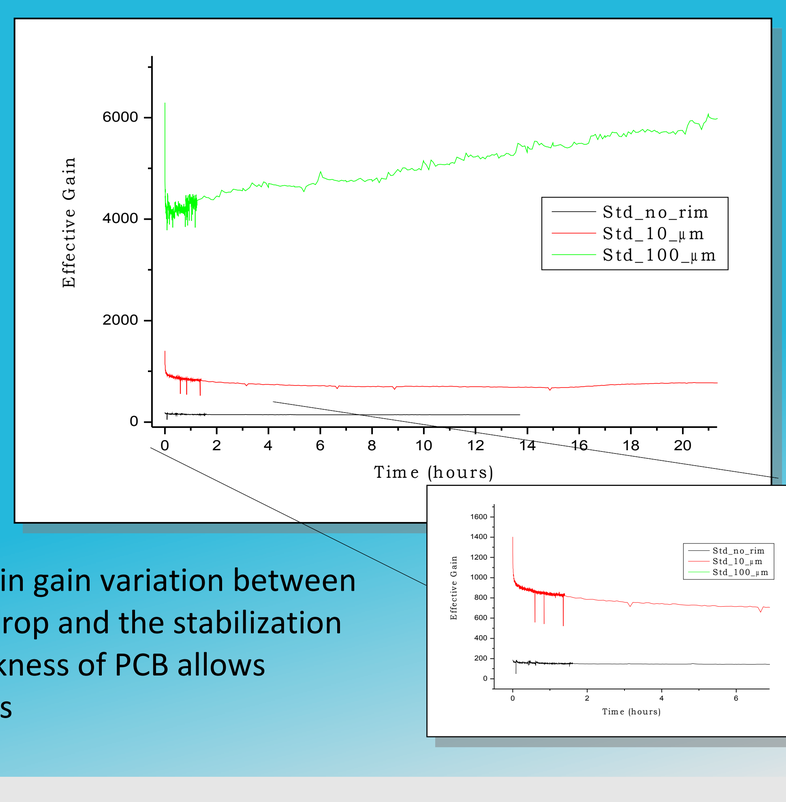
Characterisation: Gain, Rate Capability, Long Term Stability



- Large Rim size allows higher Gain and better stability
- The time to reach stabilization is shorter for smaller rims

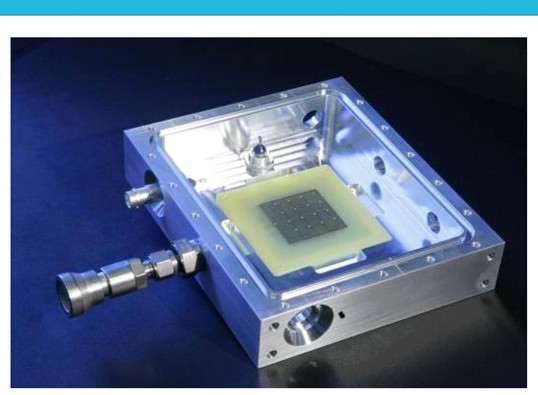


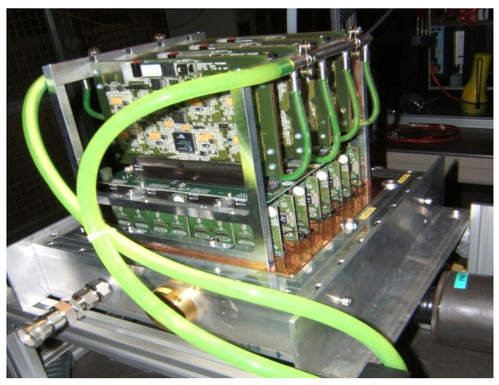
- For large rims, strong dependence of the gain on the irradiation history of the THGEM
- 300 e^- @ 120kHz/mm^2 -> single electron rate of 35MHz/mm^2



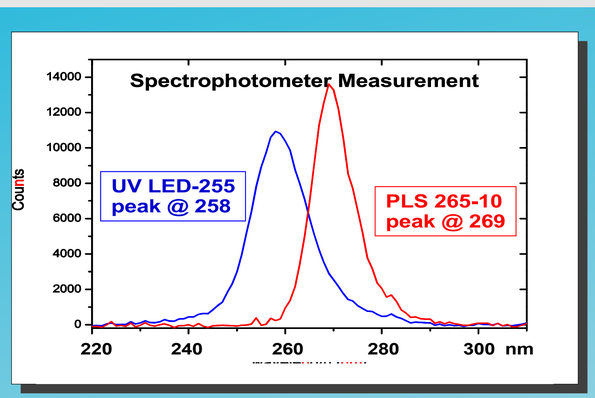
- Factor >>2 in gain variation between the initial drop and the stabilization
- Larger thickness of PCB allows higher gains

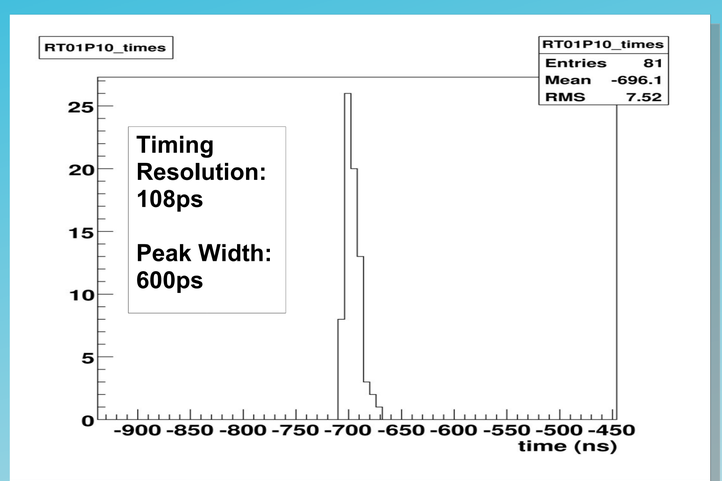
Single Photon Detection and First Electronic Readout

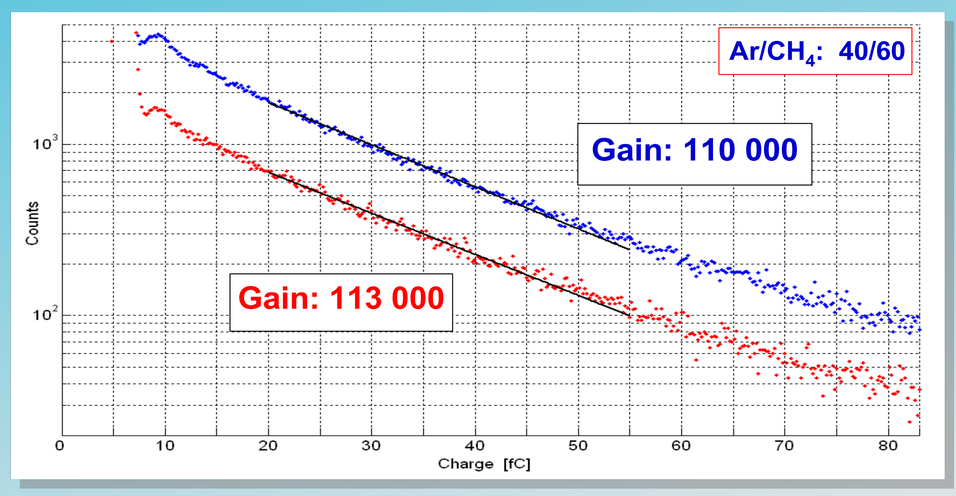




- Test facility in COMPASS area
- 4 Layer CsI coated THGEM detector Different gas mixture setups
- Measurements with ^{55}Fe source and pulsed UV Light source: 600ps pulses @ up to 40MHz
- Electronic readout of chamber:
  -MAD4 CMOS amplifier chip
  -108ps F1 TDC on Dreisam Board
  -COMPASS data acquisition
- Timing resolution of THGEM <1ns







bmb+f - Förderschwerpunkt
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