

# Update on the Si-Strip Tests

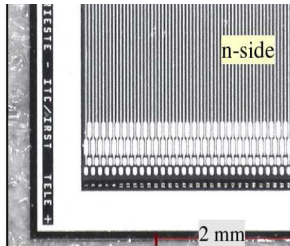
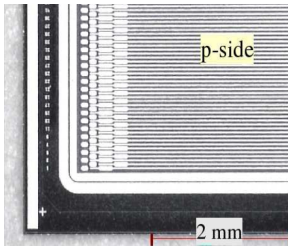
Hans-Georg Zaunick

HISKP  
Universität Bonn

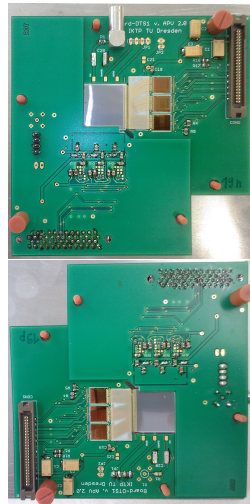
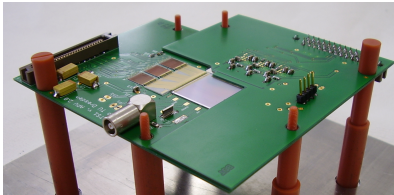
PANDA collaboration meeting, Torino, June 15, 2008

## Prototype Sensors

- Strip Telescope Sensors delivered by ITC/irst (Trento)
- area  $2 \times 2 \text{ cm}^2$ , thickness  $320 \mu\text{m}$
- $50 \mu\text{m}$  pitch, double sided,  $90^\circ$  stereo angle
- AC-coupled, punch-through biased
- non radiation hard

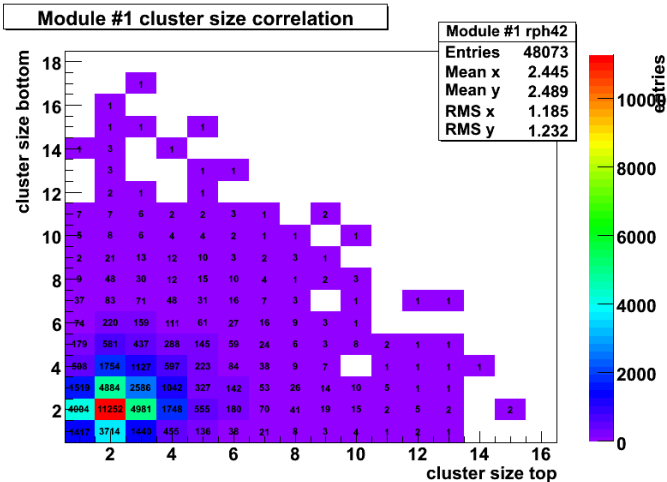


- second double sided fully equipped prototype module delivered in may ⇒ works fine
- study of charge correlation, charge collection efficiency, 2d-clustering etc. ⇒ in progress



# Cluster Size Correlation

cosmics



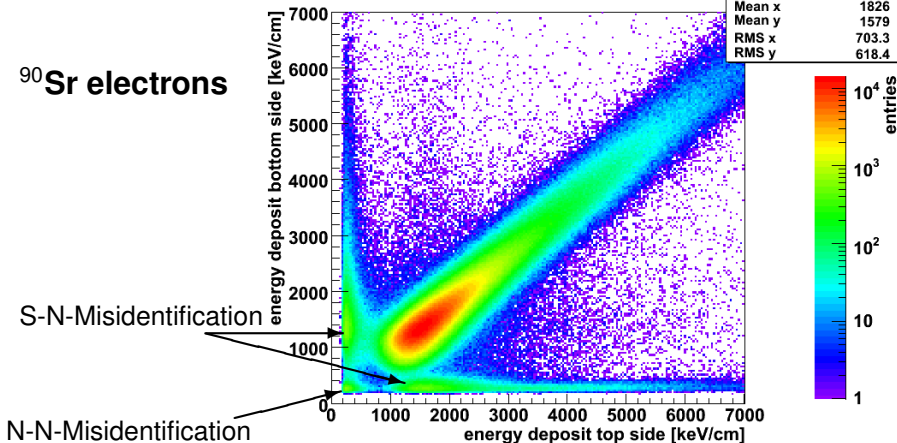


# Charge Correlation

Module #24 energy loss correlation

Module #24 vsEloss41	
Entries	4992845
Mean x	1826
Mean y	1579
RMS x	703.3
RMS y	618.4

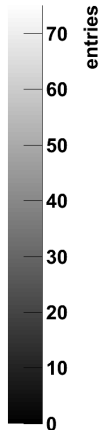
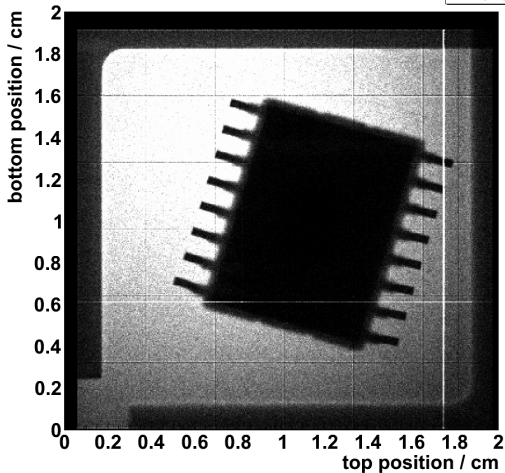
$^{90}\text{Sr}$  electrons



# 2d hitmap

Module #24

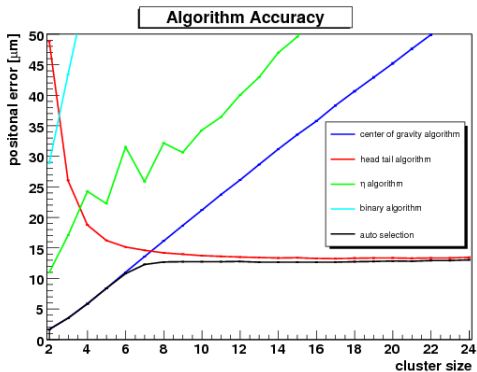
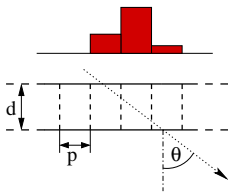
Module #24 rph1	
Entries	4992845



# Clustering - Comparison of Algorithms

## Algorithm Error

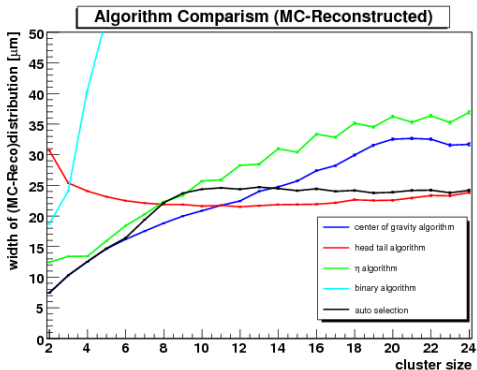
- a priori errors for:
  - 1 COG
  - 2  $\eta$ -Algorithm
  - 3 analog-head-tail
  - 4 binary algorithm



## Simulation - electrons 25...30MeV

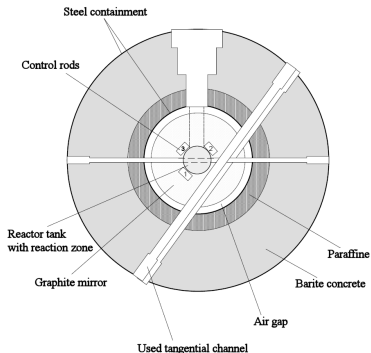
### Resolution

- MC-Reconstructed Position on Sensor
- best algorithm chosen by smallest (a priori-) error for given cluster size



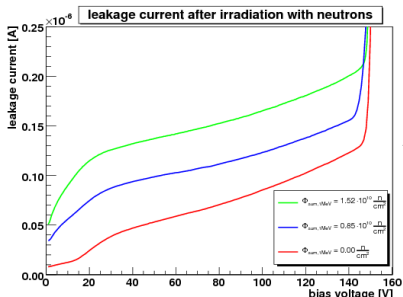


## Low Power Educational Reactor AKR-2 (TU Dresden)

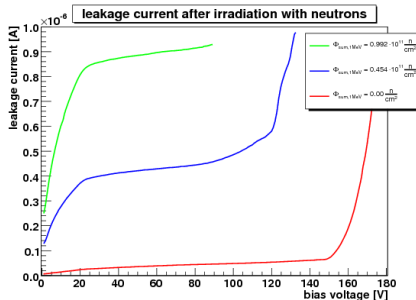


## Neutron Irradiation

- done in two stages
- I-V-behaviour determined ex situ
- fast (AmBe-Source) and broadband neutrons (Reactor)
- 1MeV neutron equivalent flux calculated from known spectra



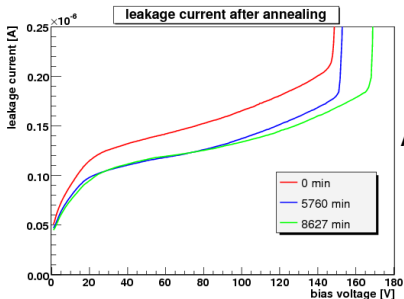
AmBe Source



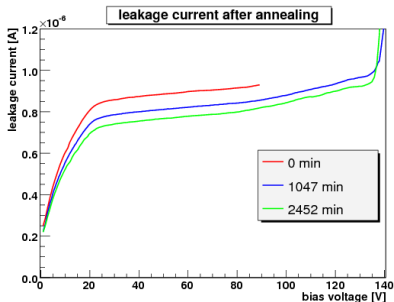
Reactor

## Annealing

- decrease of overall leakage with time
- recovery of Zener-breakdown
- critical depletion shows no significant shift
- leakage current reached pre-irradiation level after 1 month

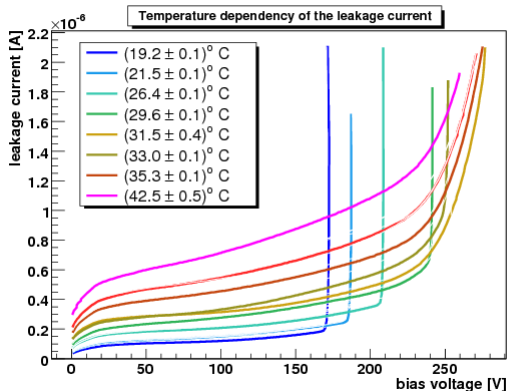


AmBe Source



Reactor

# Temperature Behaviour

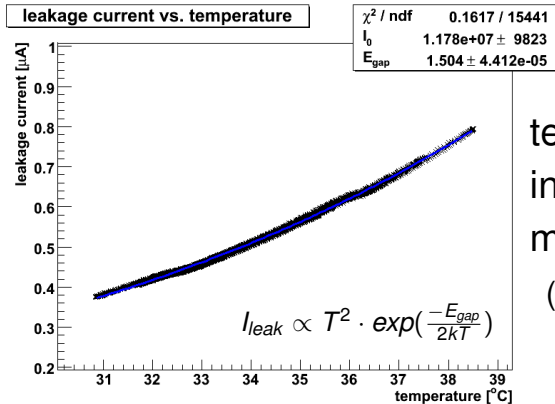


- I-V-curves recorded at different environment temperatures (no active heating/cooling), equilibrium state
- strong dependence of Zener breakdown from temperature



# Temperature Behaviour

- during all measurements temperature and leakage current have been tracked
- environmental temp. variations span  $\approx 10\text{K}$   $\implies$  look at correlation  $I_{leak} \leftrightarrow T$



temperature variation  
in a 5 week cosmic  
measurement

( $V_{\text{bias}} = 60\text{V}$ )

# Conclusion

- double sided readout is working and its evaluation in progress
- implemented algorithm benchmark for clustering
- started studying behaviour of sensors wrt temperature and irradiation

- tracking station to study "real life" track resolution and multiple scattering in compound material samples (for MVD-Mec)
- fix specifications for PANDA-targeted Prototype Sensors
- design of FE-Prototype PCB on thin film material (polyimide substrate)