Scintillator calibration for the AMS prototype test at CERN (October 2003)

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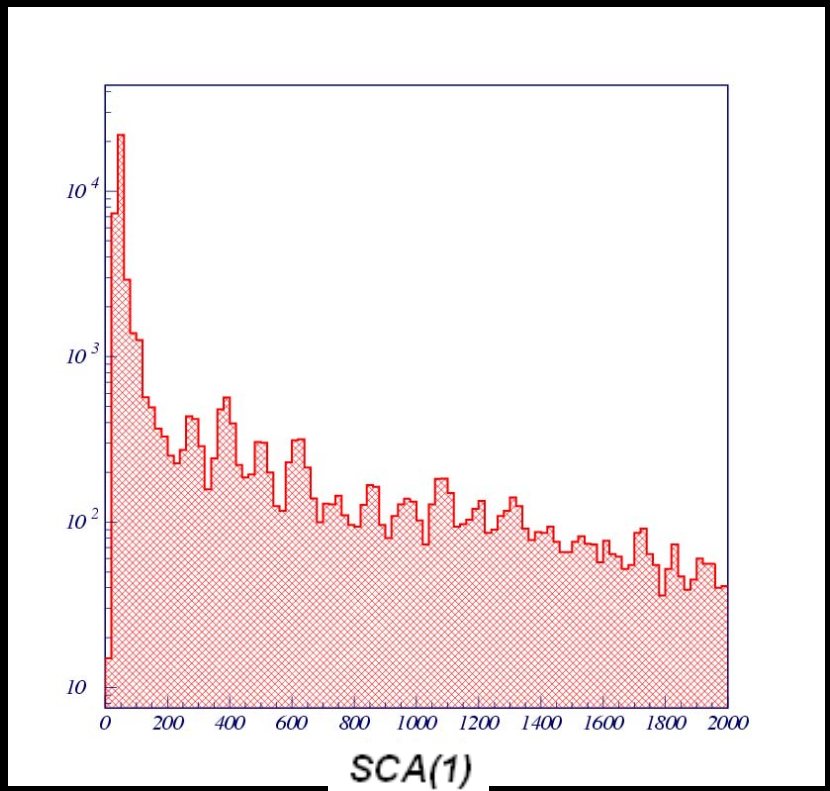
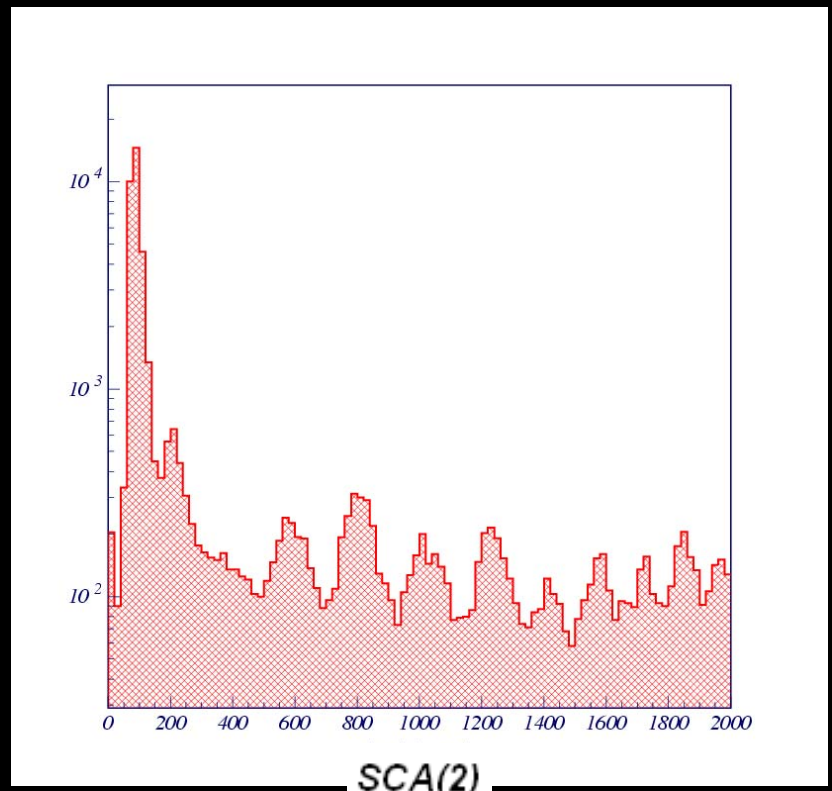
Starting data

- Data: spectra for ADC readings of scintillator anodes
- Several peaks visible for both scintillators

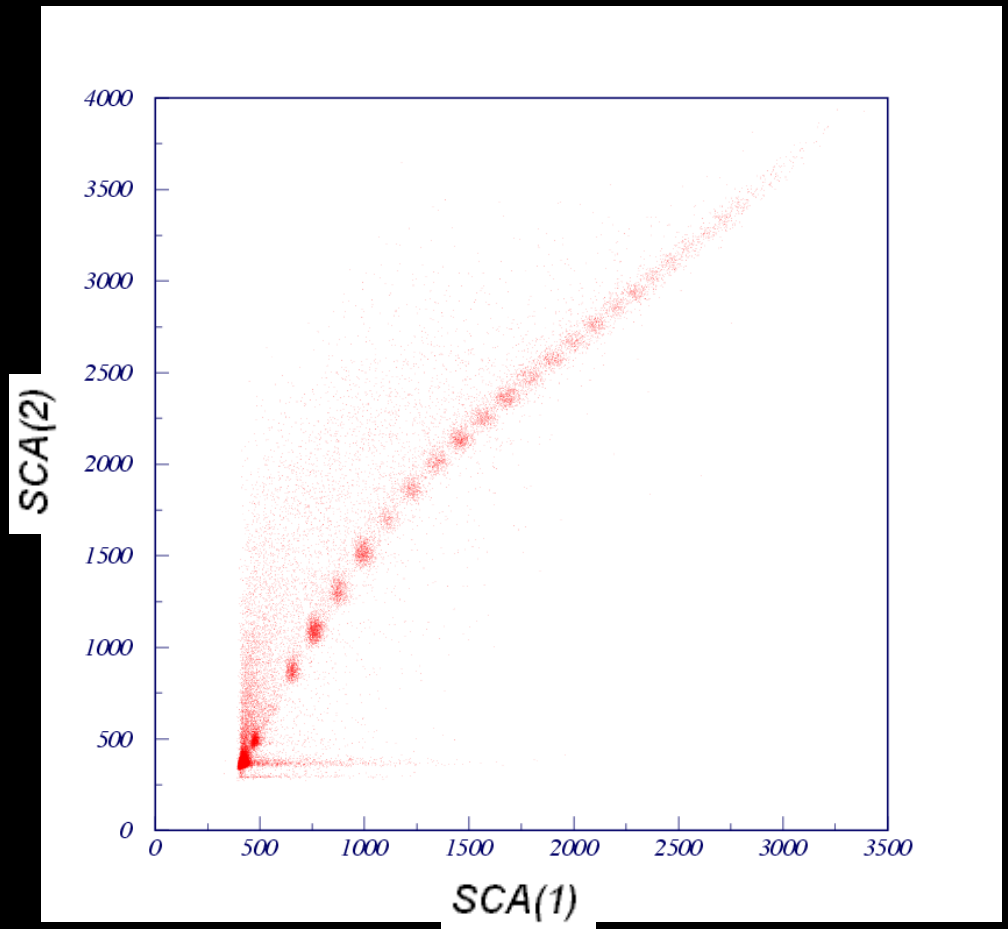




run 510

Starting data

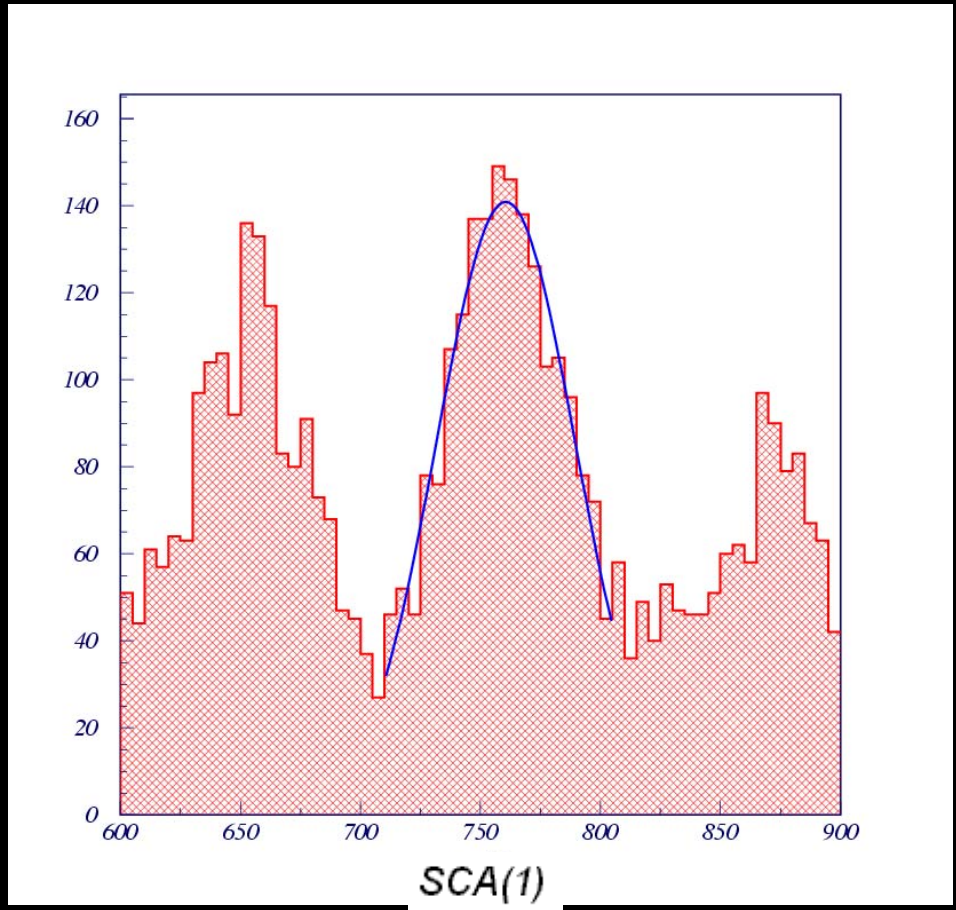
- Good correlation (but not quite linear) between scintillators
- Visible charge separation up to Z ~ 20



Data for run 510 (anode readings)

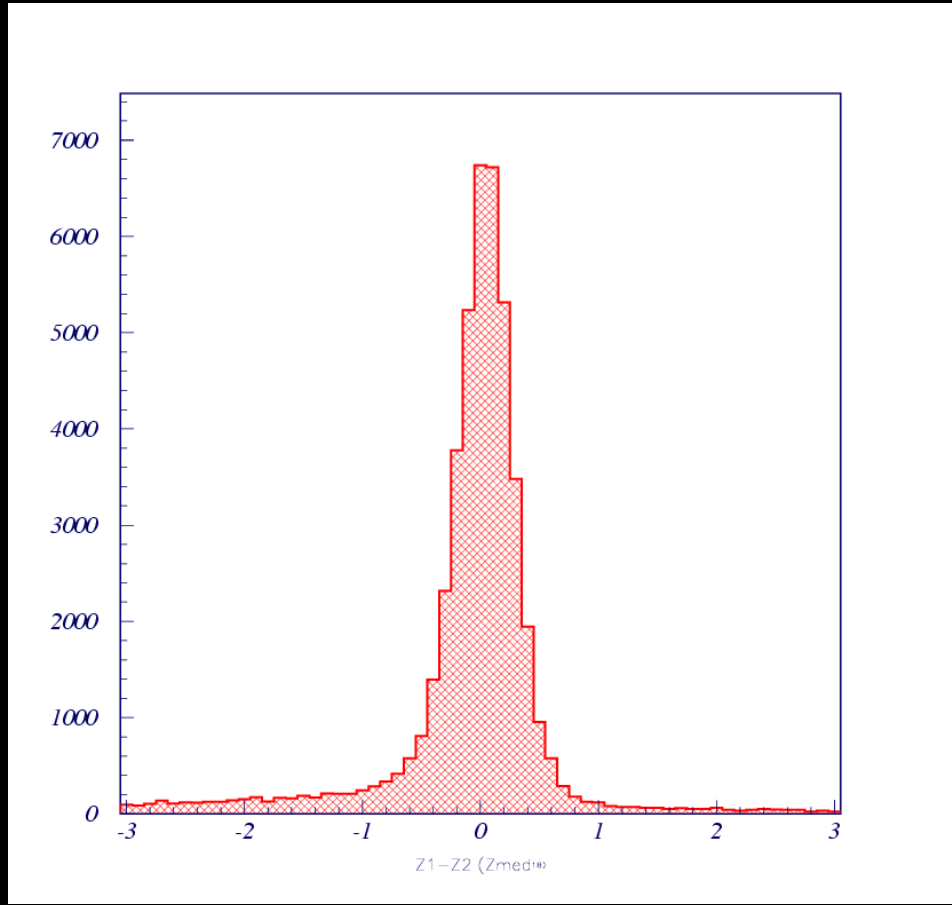
Charge determination for low Z

- Fits performed on 1-D distribution peaks for SCA(1) & SCA(2)
- Peak coordinates used for calibration up to Z ~ 18 (limit depends on run and scintillator)
- Reconstructed charge Z_{rec} is given by the average of Z_1 & Z_2



Intercalibration for higher Z

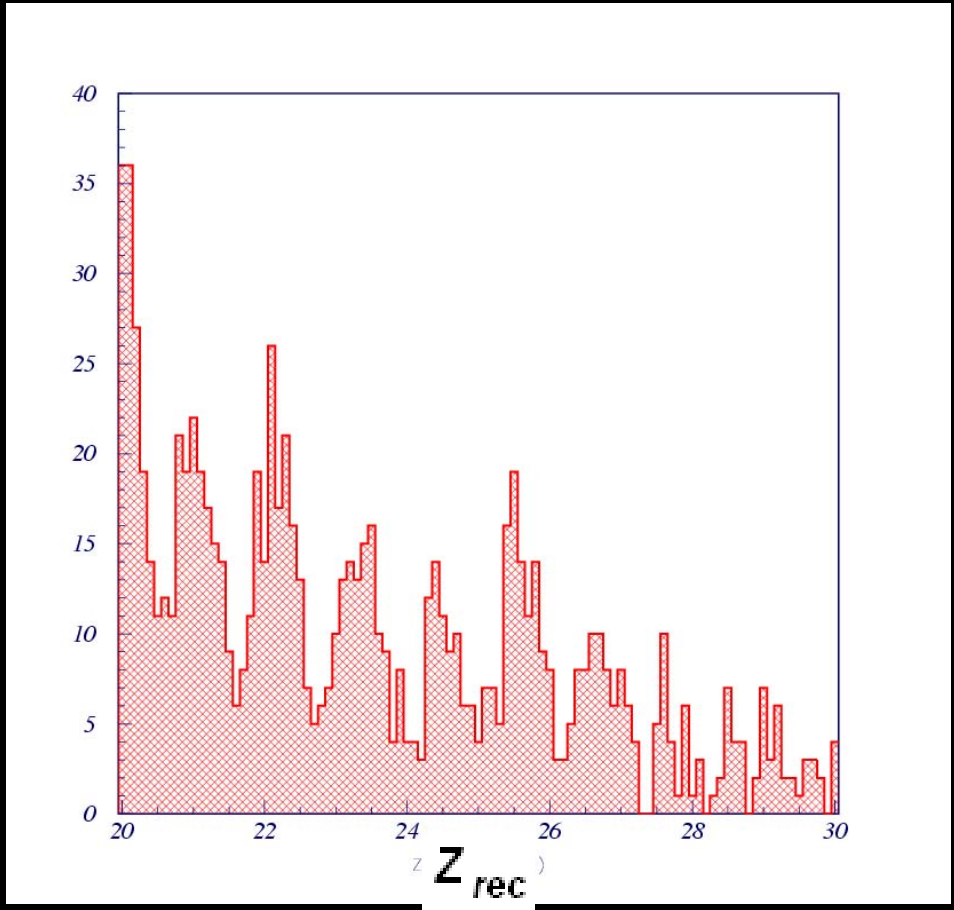
- For higher Z there are no visible peaks in the 1-D distributions
- Linear extrapolation of calibration functions used as starting point for extension
- Distribution for ΔZ ($\equiv Z_1 - Z_2$) used for cross calibration: function for Z_2 is changed so that ΔZ peaks at zero in all regions of Z



ΔZ distribution for $Z_{rec} < 18$
run 510

Absolute calibration for higher Z

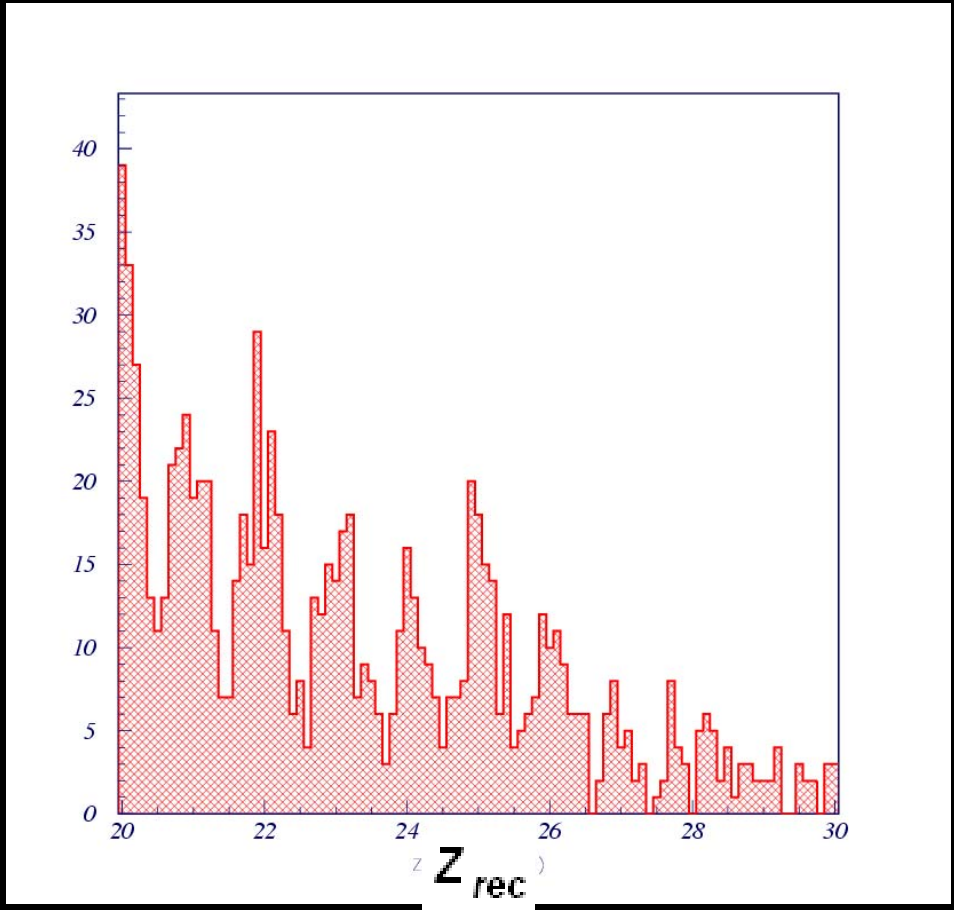
- Further peaks are now visible in Z_{rec} spectrum
- These peaks move away from integer values as Z increases
- Peak positions are used to correct values on calibration functions



Z_{rec} spectrum before correction
run 510

Calibration completed

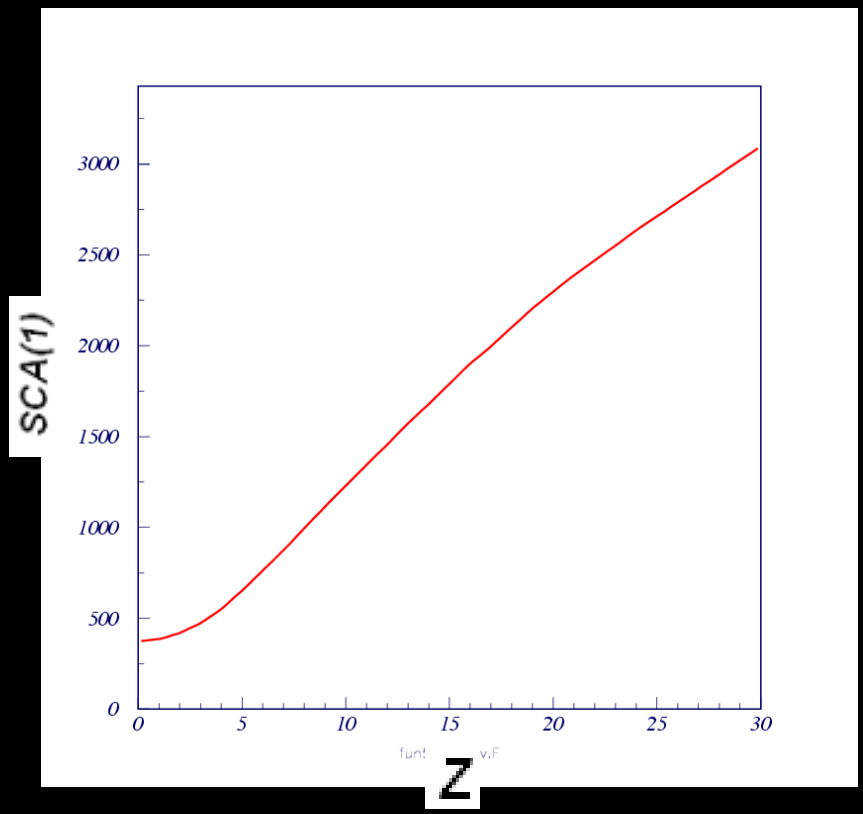
- Peaks have been moved to the correct integer values
- Z_{rec} spectrum shows visible peaks up to high Z (Z = 27 for run 510)

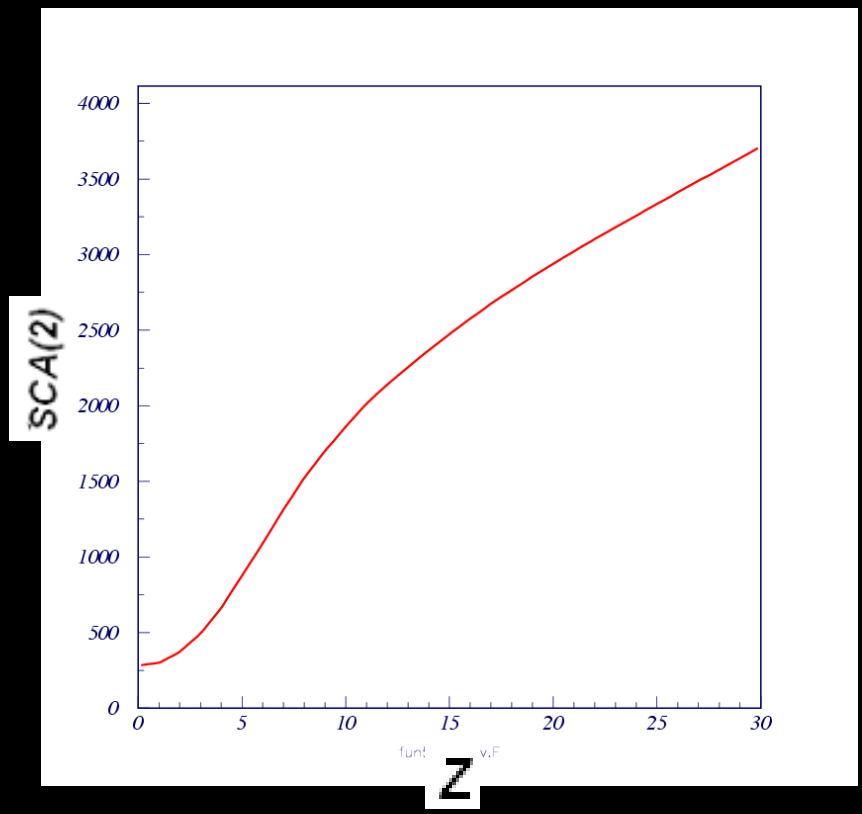


Z_{rec} spectrum after correction
run 510

Calibration results

- Final calibration functions for SCA(1) and SCA(2):

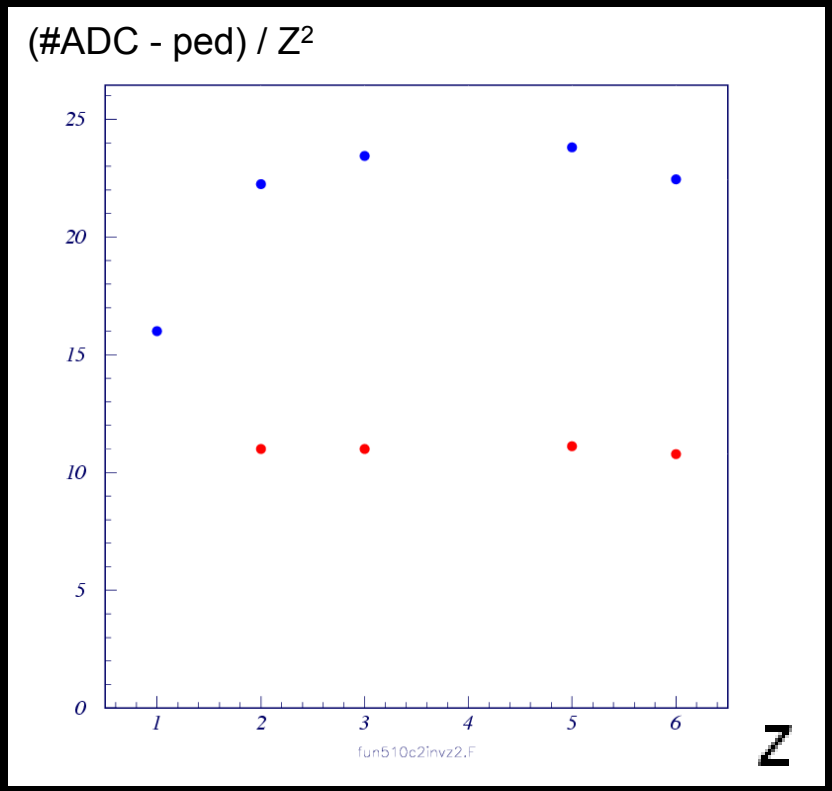




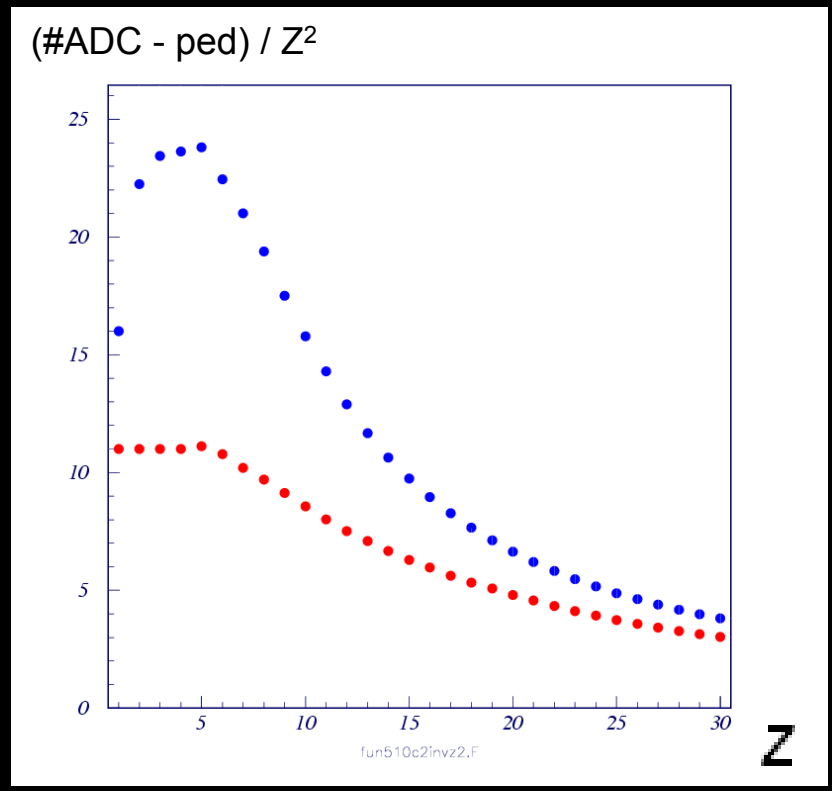
run 510

Calibration results

- Good agreement with Z^2 law for $Z \leq 6$, does not hold for higher values of Z: saturation observed



Peak data for small Z



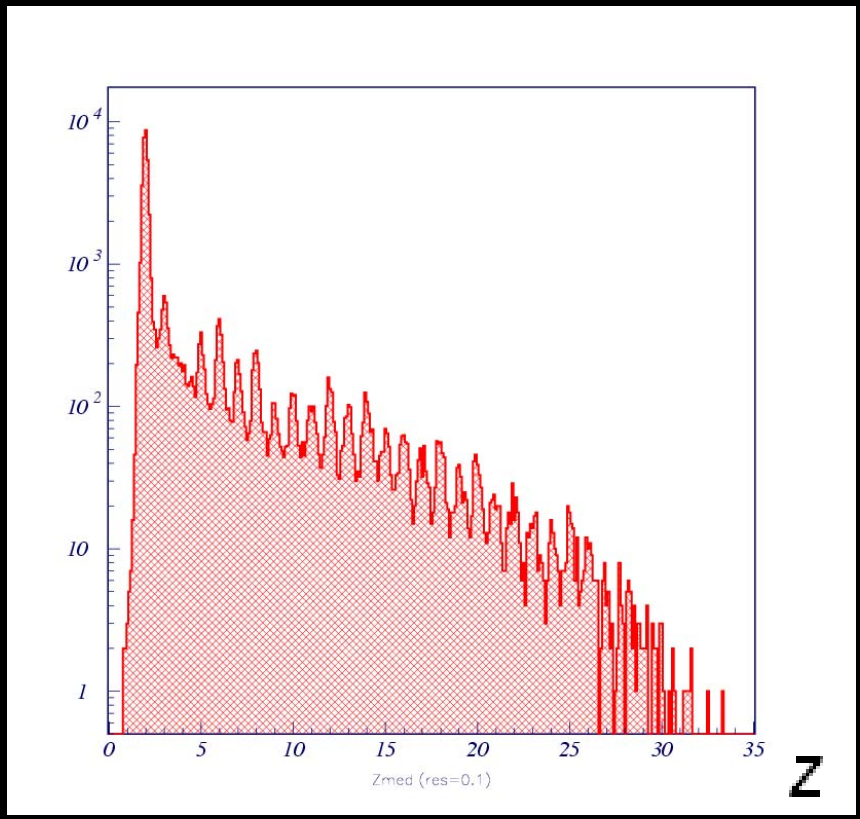
Final calibration

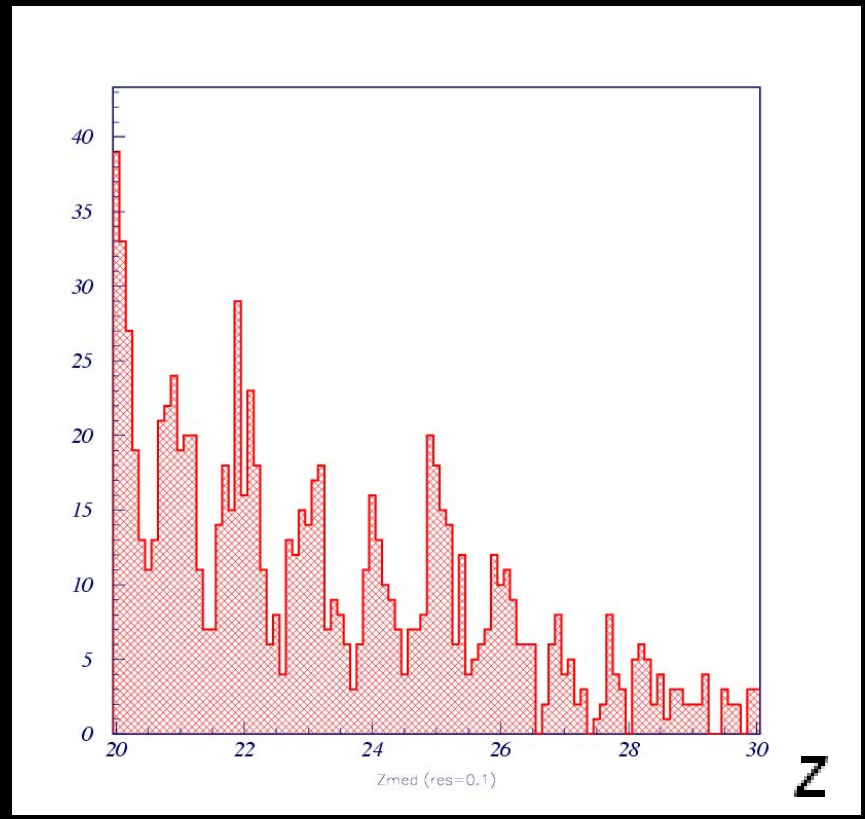
run 510

● SCA(1) ● SCA(2)

Calibration results

- Full spectrum for Z_{rec} (all events), with peaks up to Z = 27

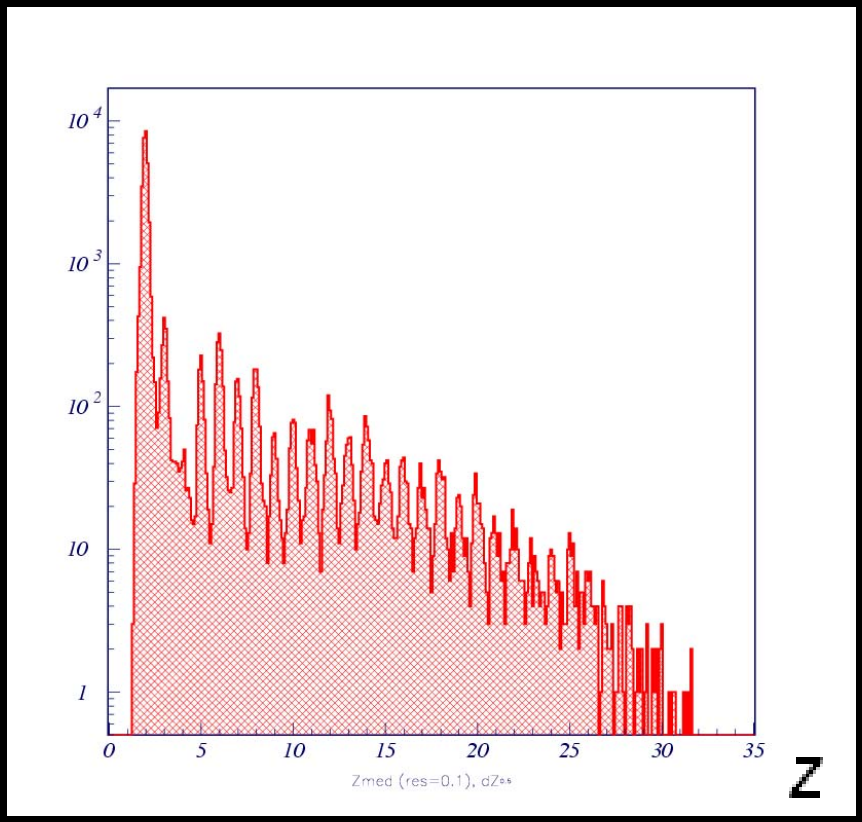


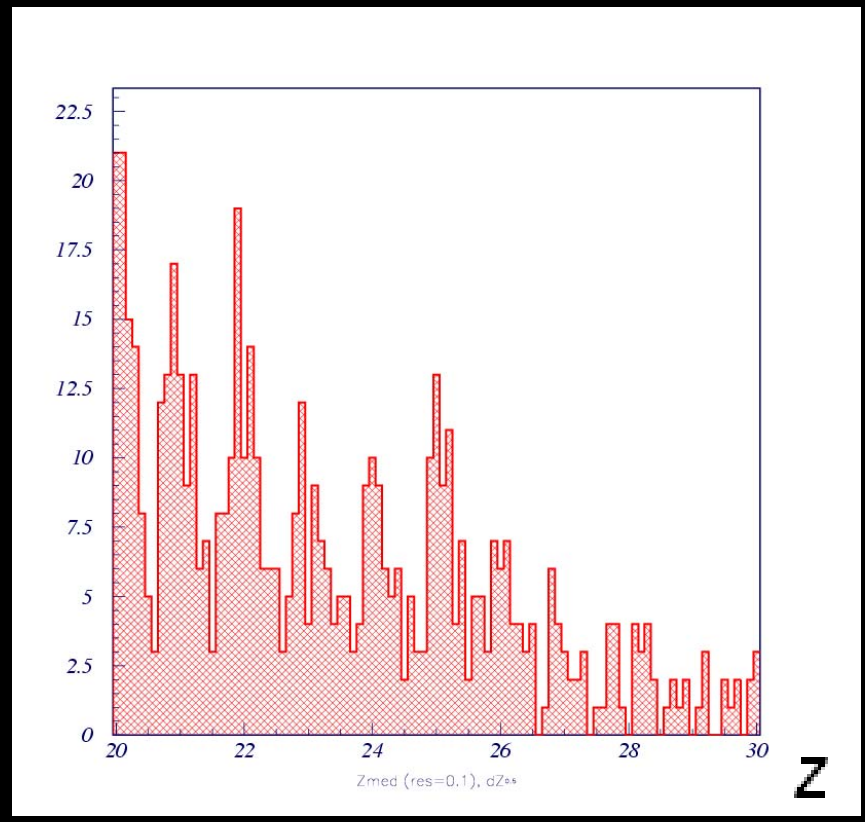


run 510

Calibration results

- Spectrum after quality cut (Z_1 & Z_2 compatible, i. e., $|\Delta Z| < 0.5$): 78% of events kept, improved peak definition for intermediate values of Z_{rec}

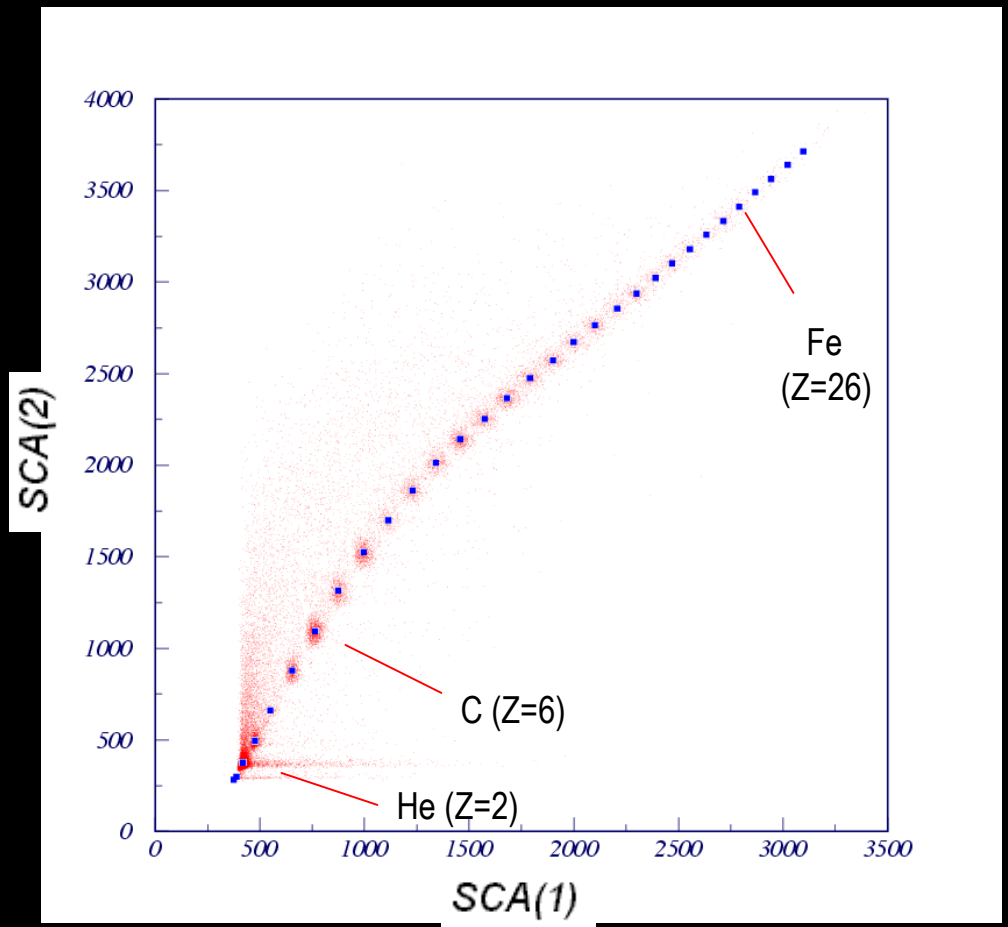




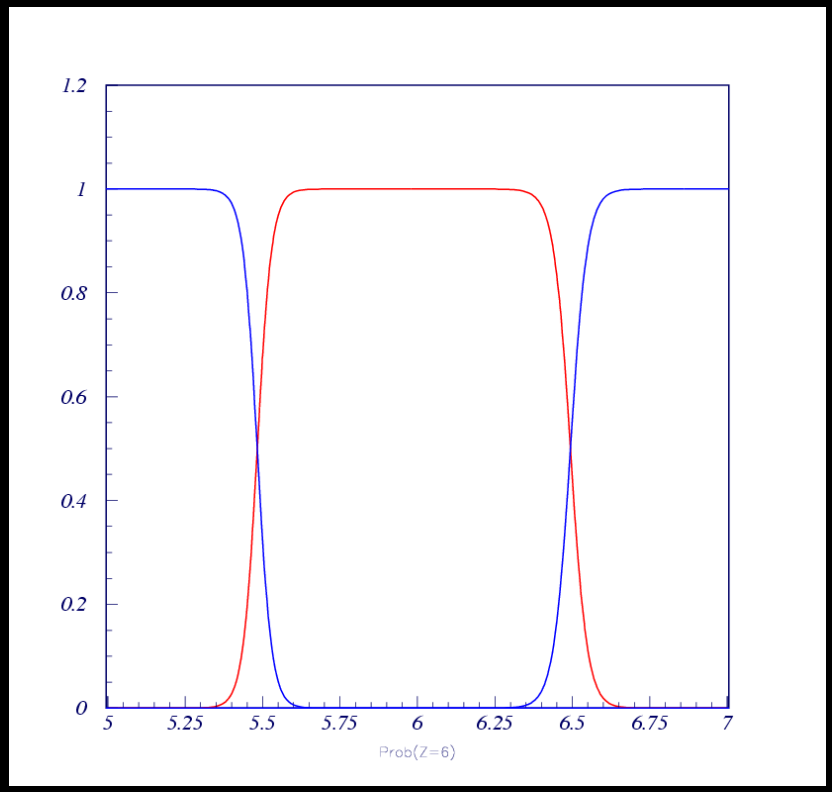
run 510

Calibration results

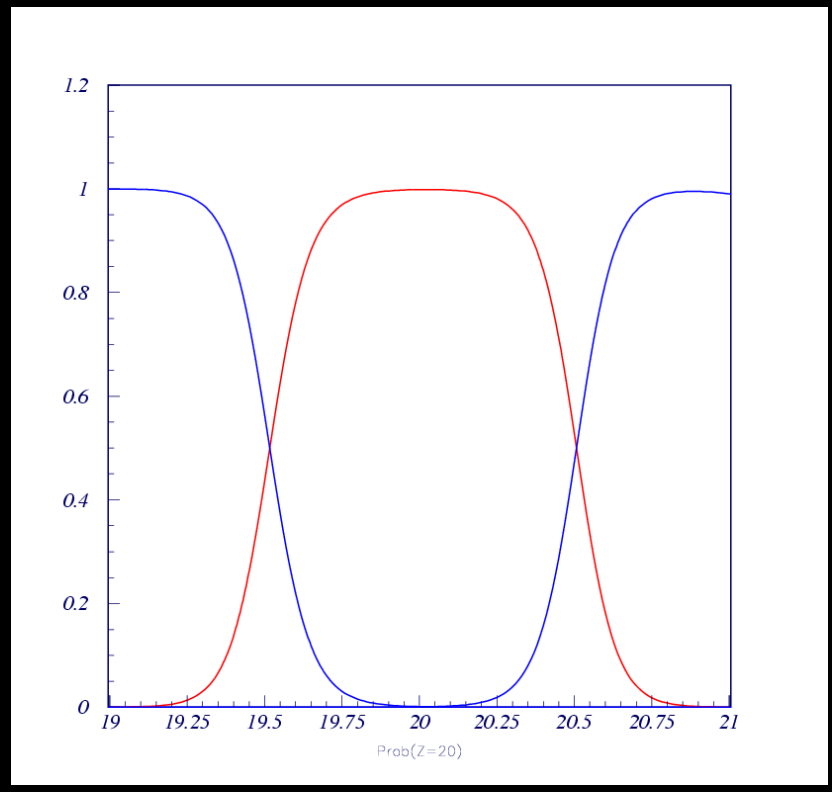
- Very good agreement between calibration values and original data
  - Reference points for calibration



Quality of charge separation



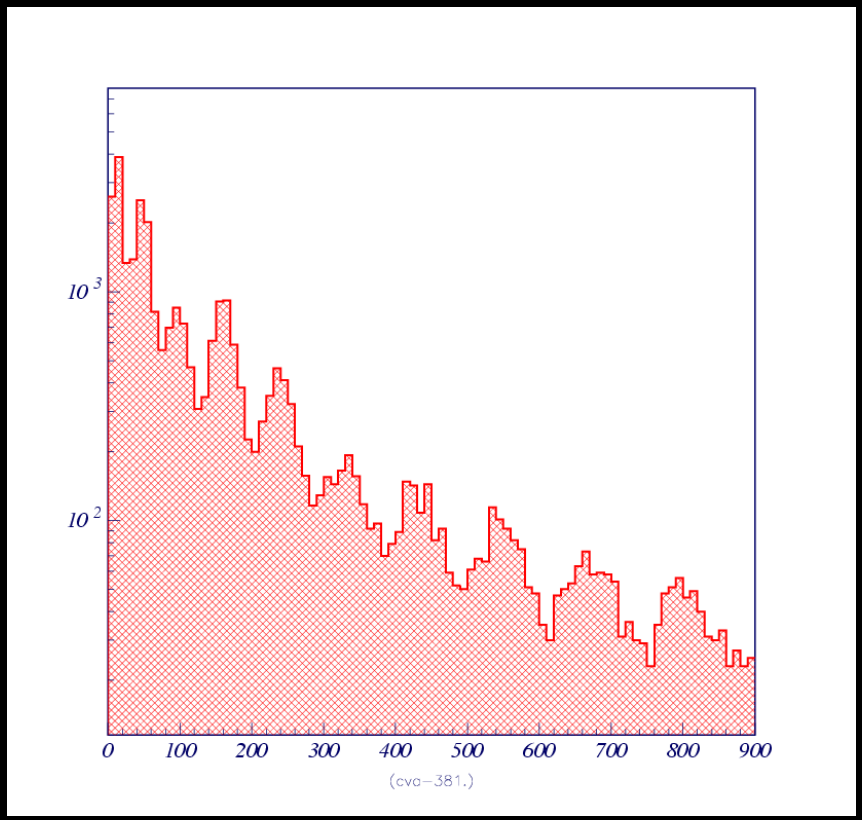
Carbon (Z = 6)



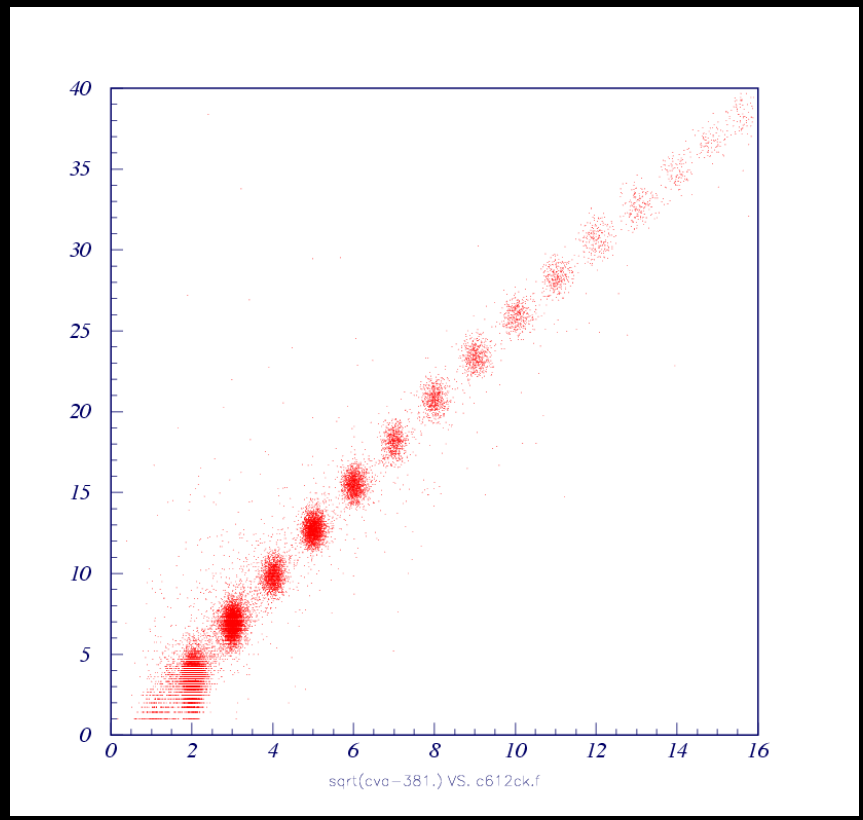
Calcium (Z = 20)

Correlation with Cherenkov counter

- Good correlation (Z^2 law) observed between CVA and Z_{rec}



CVA - ped



Z_{rec} vs. $(CVA - ped)^{1/2}$

run 612

Conclusions

- Three runs were analyzed (510, 538 and 612)
- Both scintillator measurements were used to determine a unique charge, Z_{rec}
- Charge separation is visible up to high values of Z
- Very good correlation observed between scintillator charge and Cherenkov counter data
- Other runs will be analyzed in the future