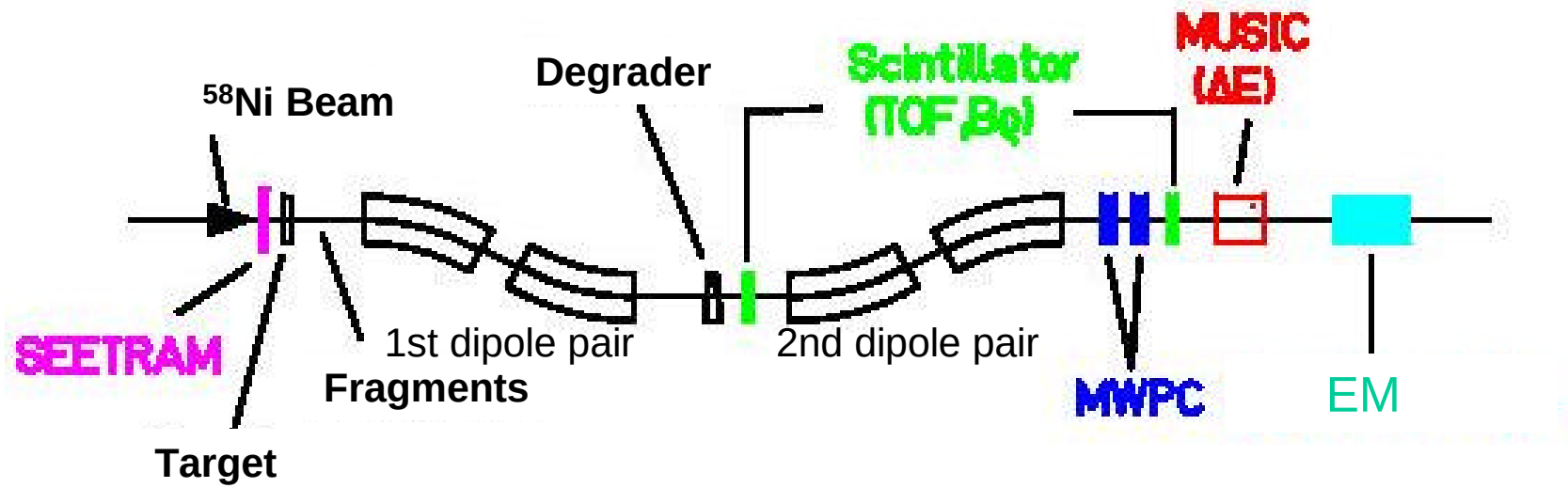
GSI experiment (November 14-24,2003)



FRS: FRagment Separator at GSI Darmstadt, Germany
One single beam: ^{58}Ni, with energy varying between .1 and 1.7 GeV/nucleon.
All fragments lighter than Ni are produced in the target, sorted out by the spectrometer (magnetic rigidity) and identified (Z,A,E) thanks to the detection system.

Plan: different energies and EM angles, all elements (2<Z<26)
dedicated runs with specific ions: C, Si, Fe (use of "degrader")

Issue: Synchronisation of two data streams

Goals of the GSI experiment

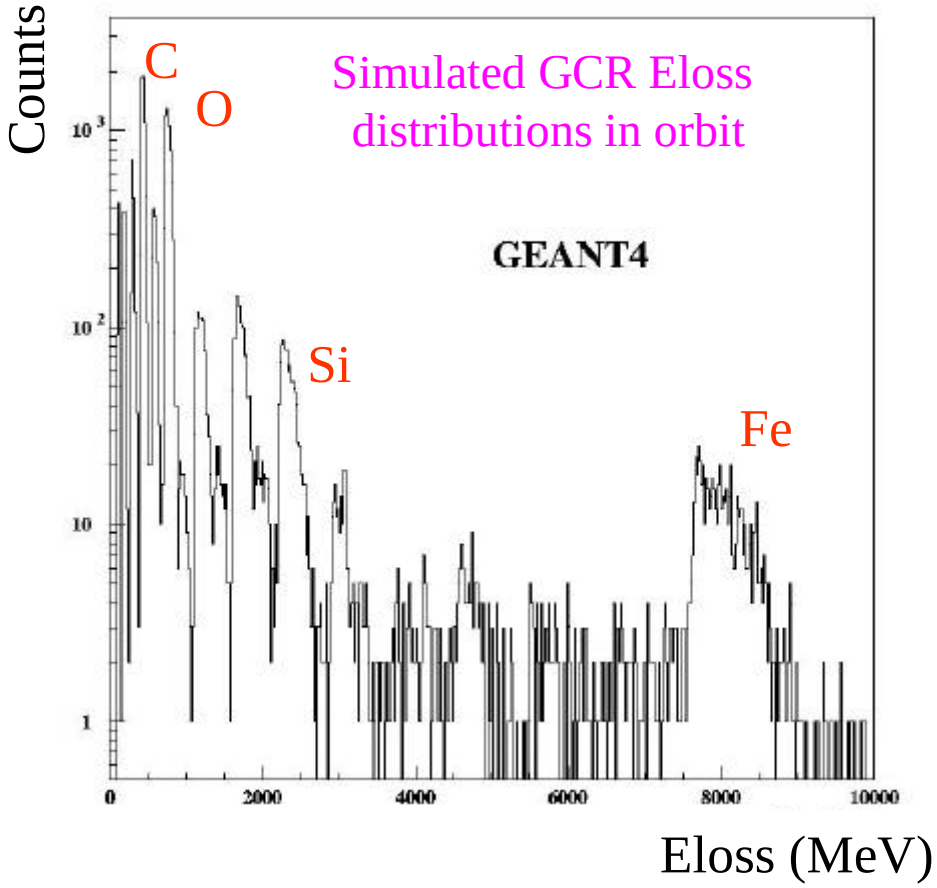
Goals:

- Determination of dL/dE as a function of (E,Z)

- Test of the algorithms for rejection of reaction events: heavy ions + lighter ions (alphas…)

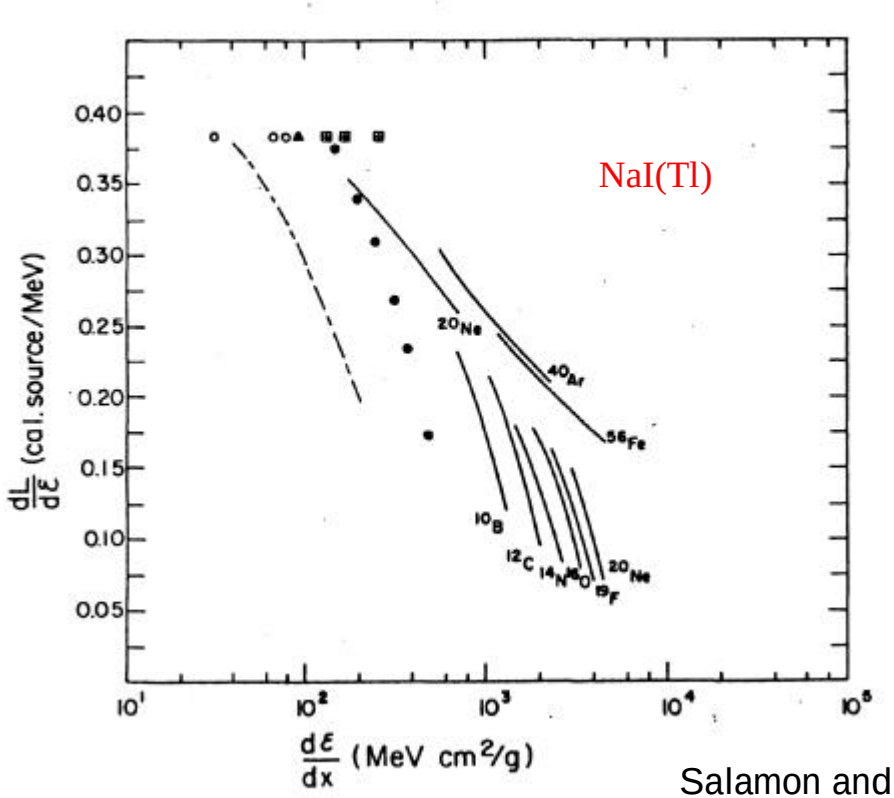
Side benefit:

- Test of the EM's response to real, high-energy events (comparison with detectors fitted with good electronics)

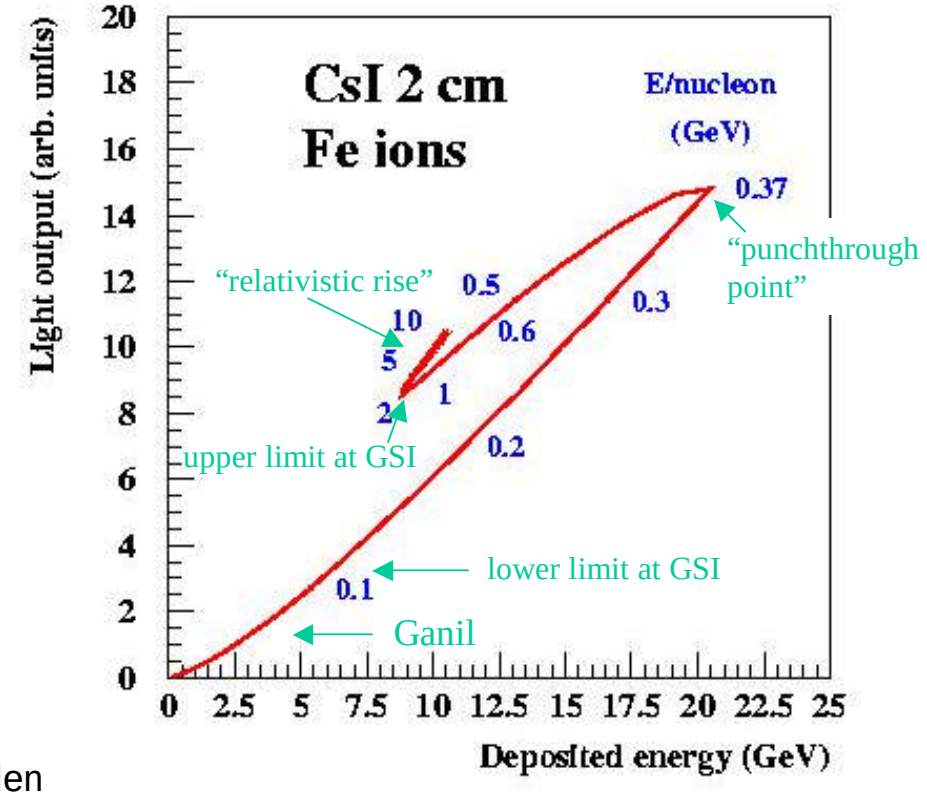


Quenching Effects: dL/dE

Birk's formula: $L(E) \propto E/(1+k_B\, dE/dx)$
High energy:
for a given dE/dx, E is higher for greater Z ? more ??electrons ? less quenching
exemple of functional:
$L(E) \propto E\,(1- X \ln(1+X^{-1})+ bAZ^2 \ln((1+X)/(X+cA/E)))$ with $X=a\, AZ^2/E$

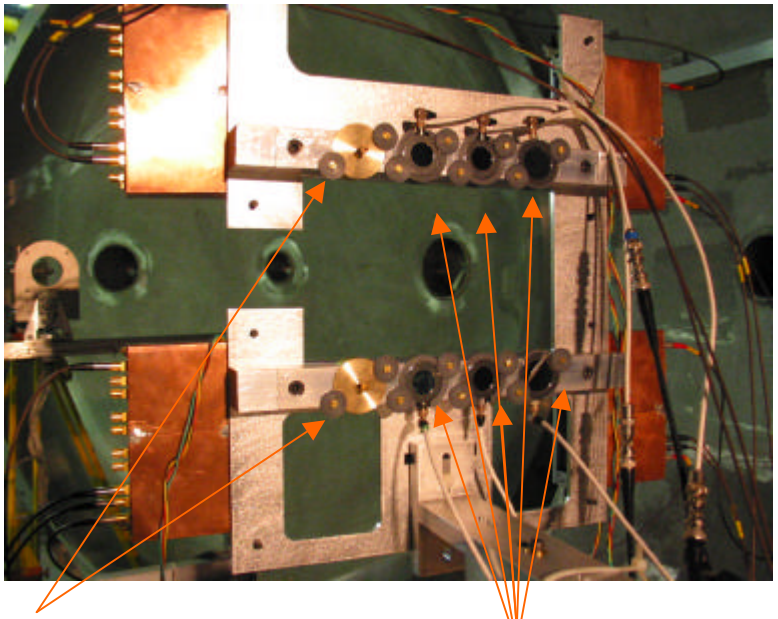


Salamon and Ahlen

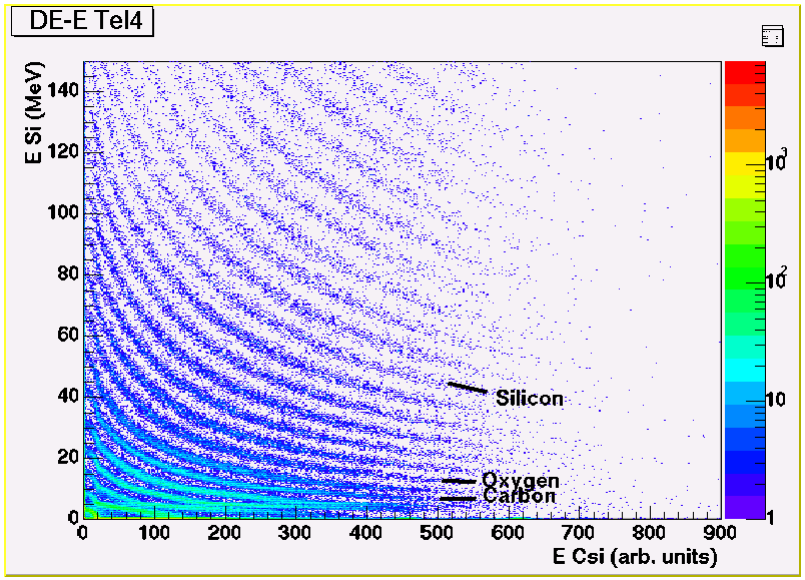


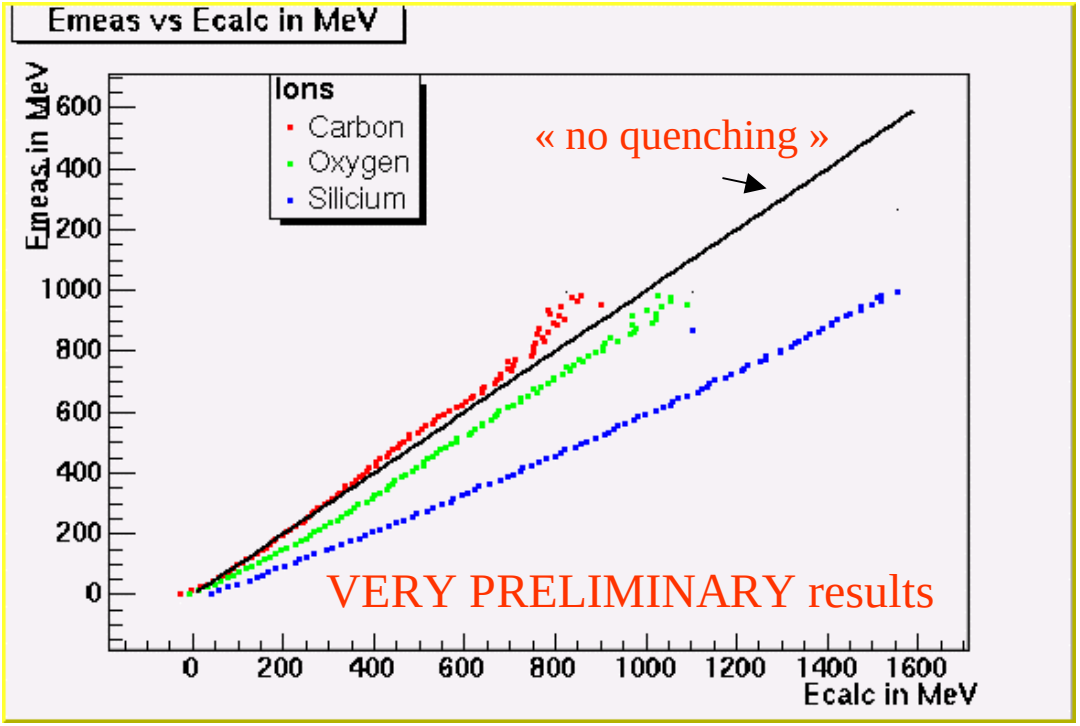
GANIL experiment (Easter 2003)

73 MeV/nucleon ^{78}Kr+Au, Pb targets



2 CsI bars (hidden) 6 Si detectors





E estimated from Si Energy loss

E in CsI deduced from Eloss in Si
(loss in wrapping foil taken into account)

Effect of shaping time (0.5 –2 –6 ?s) also investigated

Nuclear reactions: rejection

Will be tested with GSI data: 1.7 GeV Fe will « punch » through the whole calorimeter at normal incidence.

Rejection algorithms based on:

- E_i/E_{i+1} ratios, significantly different from 1 (thresh: TBD) for reactions charge-changing (« stripping ») reactions: Z ? Z-1: ? E/E ? 1/Z = 4% for Fe
- presence of energy in neighboring crystals

Numbers of identified reactions can be confronted with expected (= real!) values from empirical cross sections

Simulations: JQMD, INC in GEANT4, Fluka?

CERN-SPS experiment in 2003 (August 7-13)

Goals:

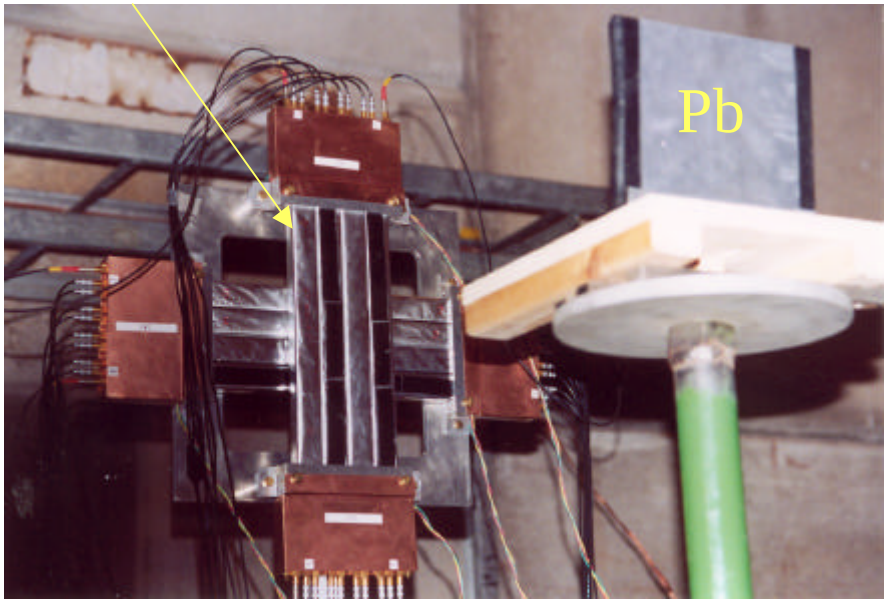
- precise measurement of longitudinal shower profile (~20 X_0)
- test of energy-reconstruction methods
- investigation of crack effects (2 detector subsets)
- investigation of the impact of direct energy deposit within photodiodes on position determination
- determination of nuclear-reaction patterns (pion-induced reactions)
- verification of CsI time constants

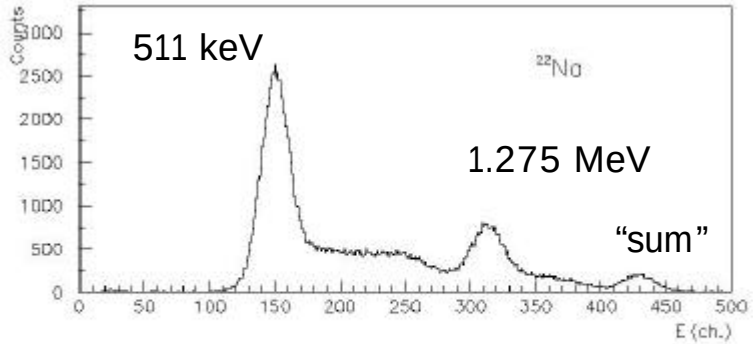
Beams (H6a line) : electrons 6 GeV<E<150 GeV
pions+muons

Setup: « Cal »: at least 32 crystals (50 proposed by Sweden)
trigger: 2cm x 2cm plastic scintillator
position: Si strips (?)

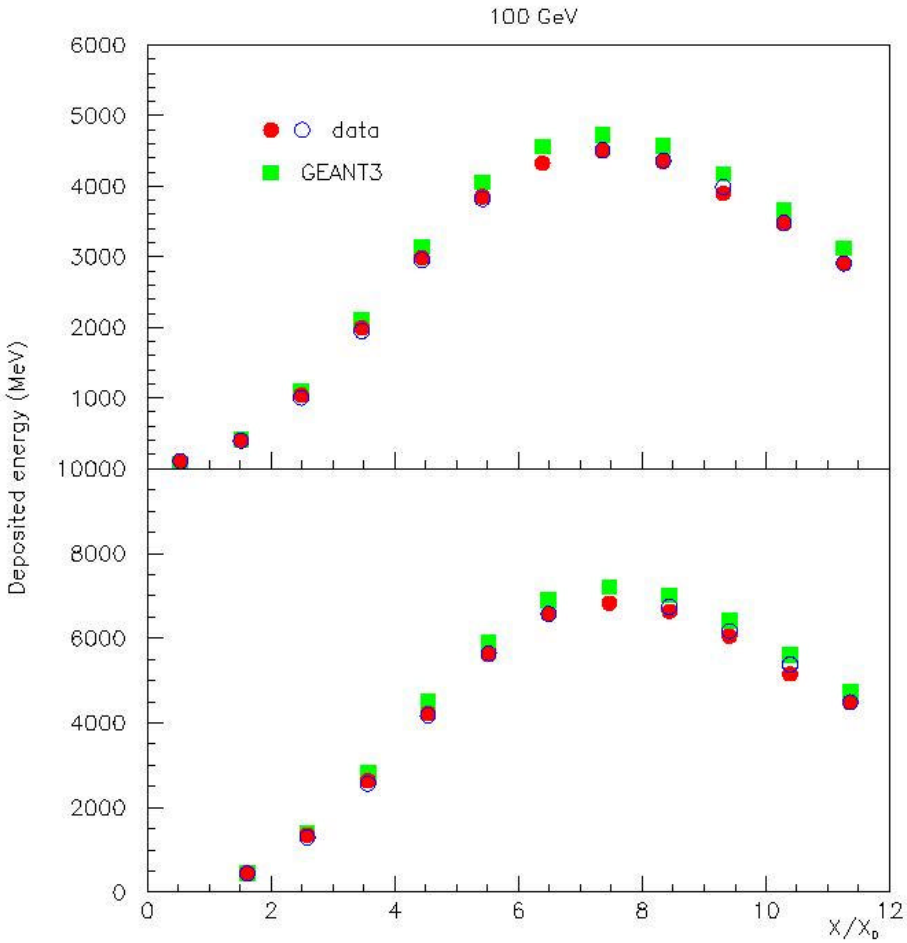
CERN-SPS experiment in 2002

detector (2x4 CsI crystals)





Good electronics



Longitudinal shower profile (calibration with muons…)

Transverse "shower profile" at 200 GeV