A SEGMENTED QUARTZ-FIBER LEAD CALORIMETER


Lab. for High Energy Physics, University of Bern
Sidlerstrasse 5, CH-3012 Bern, Switzerland

K. ELSENER

CERN, SL Division, CH-1211 Geneva 23, Switzerland

PH. GORODETZKY

College de France, Paris, France

a now at CERN, PPE Division, CH-1211 Geneva 23, Switzerland
TOPICS:

- The project
- Results from tests with prototypes
- The final calorimeter ...
- ... and its performance
A Čerenkov calo for NA52

Aim:
Study Pb+Pb collisions at 158 A·GeV/c
i.e. Centrality and energy flow information
to correlate with particle production

How:
e-m calo (γ from π⁰)
Segmentation
Small b ⇒ more participants and more \( p_t \)

Why Čerenkov?
Radiation hardness (quartz fibers)
Speed (good time resolution, less pile-up)
Time resolution

Obtained time resolutions:

\[
\sigma_{test-mod1} = (110 \pm 7) \text{ ps}
\]

\[
\sigma_{test-mod2} = (78 \pm 10) \text{ ps}
\]
Side view

19 layers:

4 mm lead plates

430 μm quartz fibers

Abs: Fiber = 12.8 : 1

Length = 18 X₀
Calorimeter response

\( \frac{E_{\text{Measured}} - E_{\text{Beam}}}{E_{\text{Beam}}} \) in %

95% cont.

\( E_{\text{Beam}} \) in GeV
Showerwidth at 100 GeV

Gauss fit:

\[ \sigma = (1.7 \pm 0.4) \text{ mm} \quad (\sim R_{68\%}) \]
The NA52 Experiment
First look at energy spectra

200 000 Pb+Pb collisions

$p = 158 \text{ A GeV/c}$
Conclusion

- shield the outer edge (fiber outgoing)
- response is linear up to 100 GeV
- energy resolution:
  \[ \frac{\sigma_E}{E} = \frac{(57.0 \pm 3.3)\%}{\sqrt{E/\text{GeV}}} \oplus (3.6 \pm 0.6)\% \]
- narrow visible showerwidth:
  \[ \sigma = (1.7 \pm 0.4) \text{ mm} \ (\sim R_{68\%}) \]
- we can get centrality information from $E_T$

Future

- relative calibration for flow studies
- take data in 1998
- do Pb+Pb physics