Calibration Data from Cosmic Ray Tests

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Overview:

- Motivation for second teststand
- Introduction of mobile cosmic teststand
- Trigger quality
- Additional investigations
- First results from LMU test facility

Why another Cosmic Teststand?

- All produced chambers are tested at LMU
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- All produced chambers are tested at LMU
  ($\rightarrow$ previous talk of Felix)
- First 40 chambers were tested without the final electronics

$\Rightarrow$ Test these chambers again with final electronics attached before shipping to CERN

Need for a second teststand,
since LMU is fully booked!

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- Important calibration constants for every channel:
  - t_0 (since trigger is good enough!)
  - Pulseheight (important input parameter for r(t) calibration in presence of cavern background)

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- Important calibration constants for every channel:
  - t_0 (since trigger is good enough!)
  - Pulseheight (important input parameter for r(t) calibration in presence of cavern background)
- To be useful, need knowledge of dependence on:
  - Temperature, gas pressure
  - ADC integration time
  - HV
  - Readout distance

Chamber Storage

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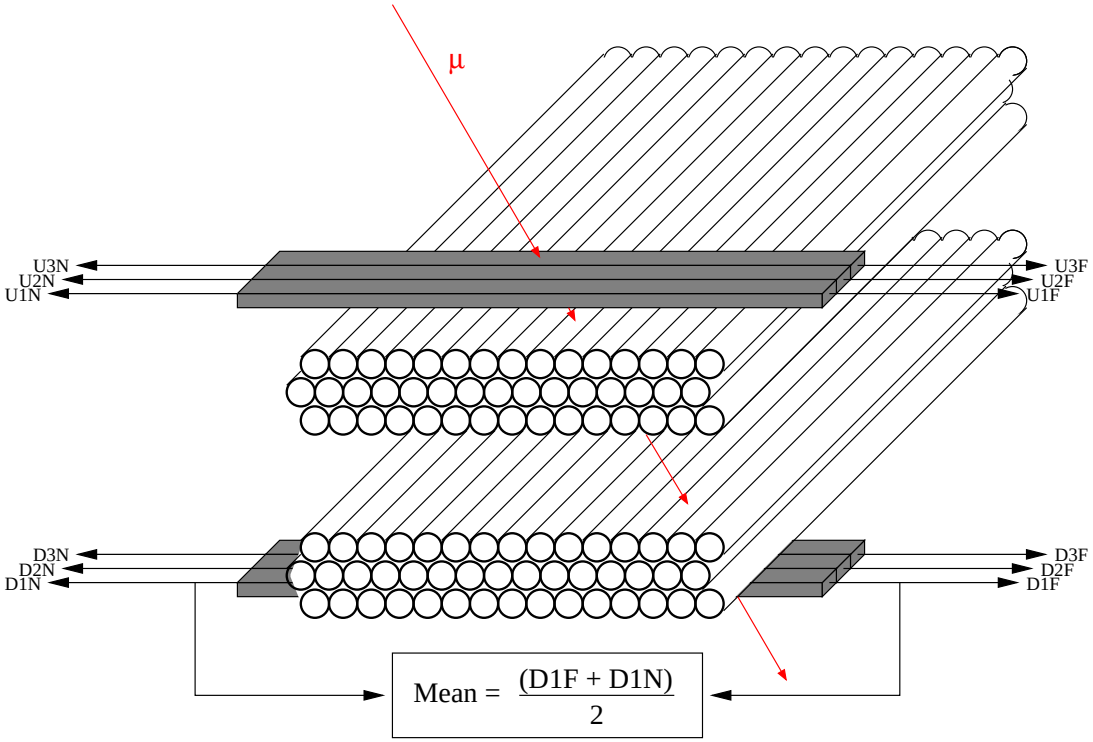
The Mobile Cosmic Teststand - Really Mobile

The Mobile Cosmic Teststand - Principle

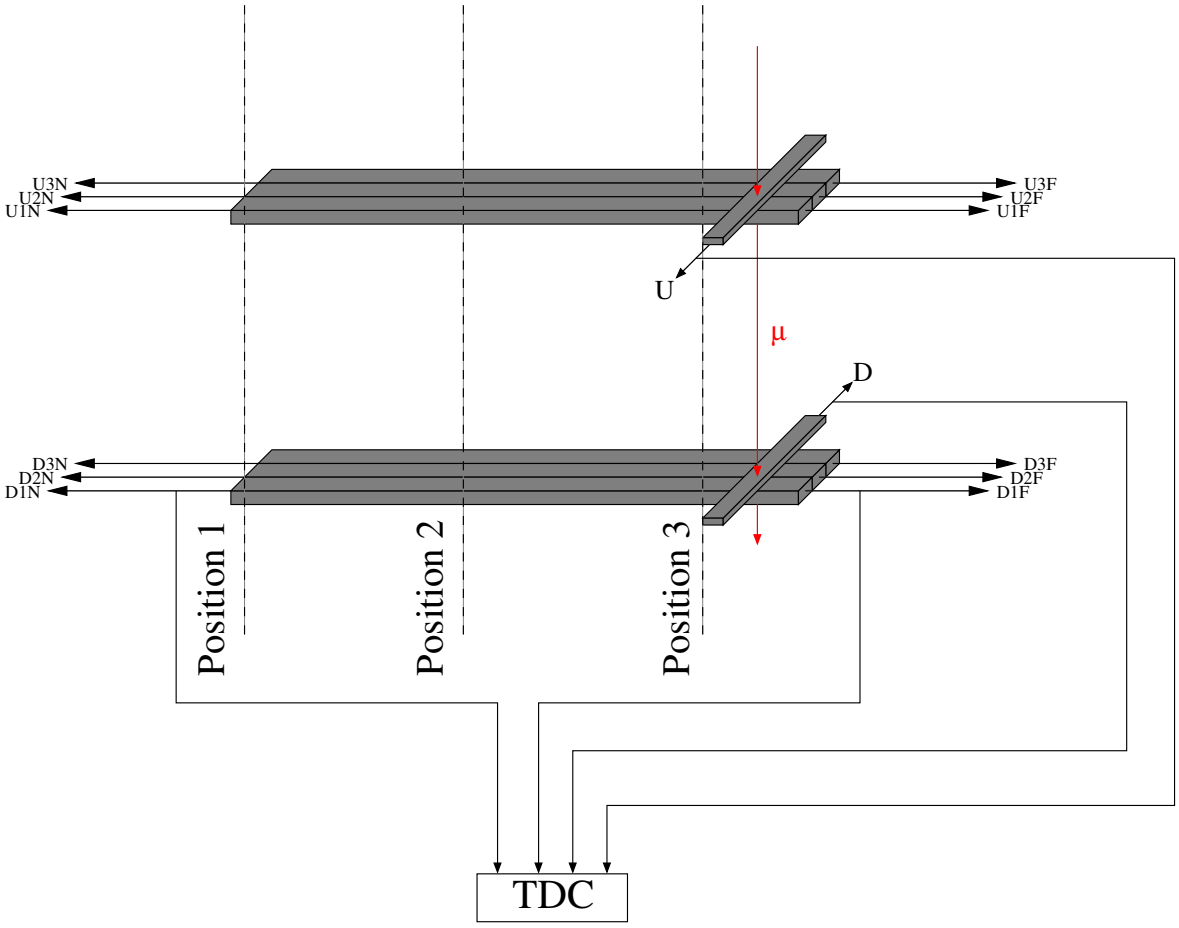


Expected trigger rate: 36 Hz

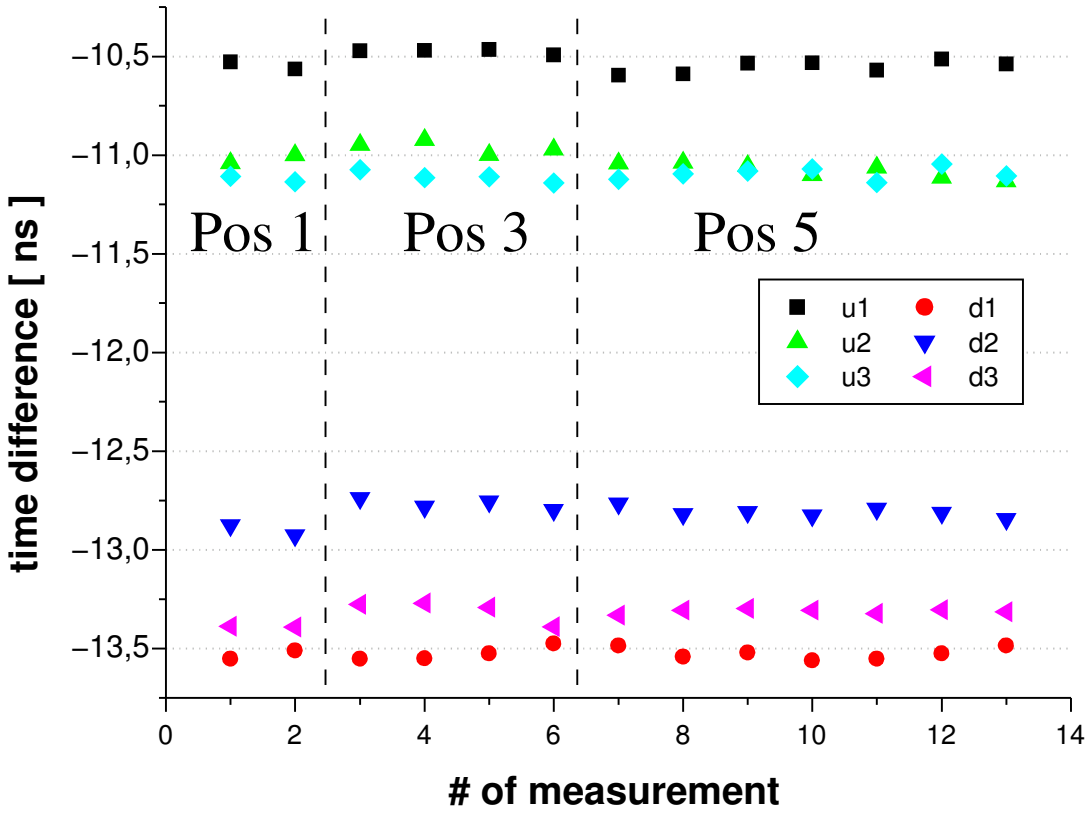
$\Rightarrow$ 40,000 hits per tube and day

$\Rightarrow$ 24 h enough for t_0-measurement

Test of Homogeneity

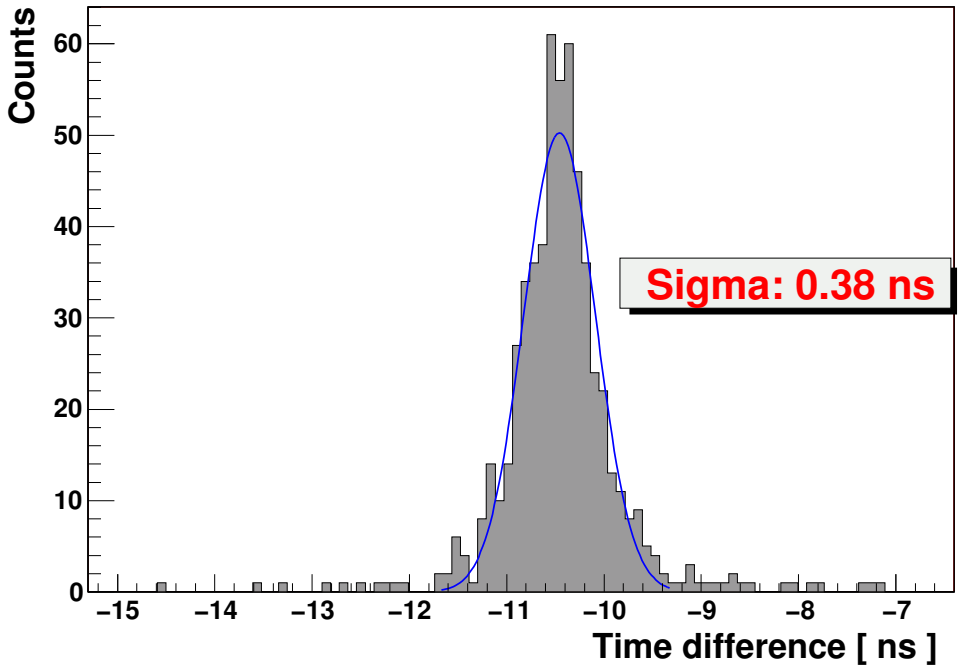


Independence of Trigger on Position



Variation with track position: $\leqq$ 0.1 ns

Trigger Time Resolution



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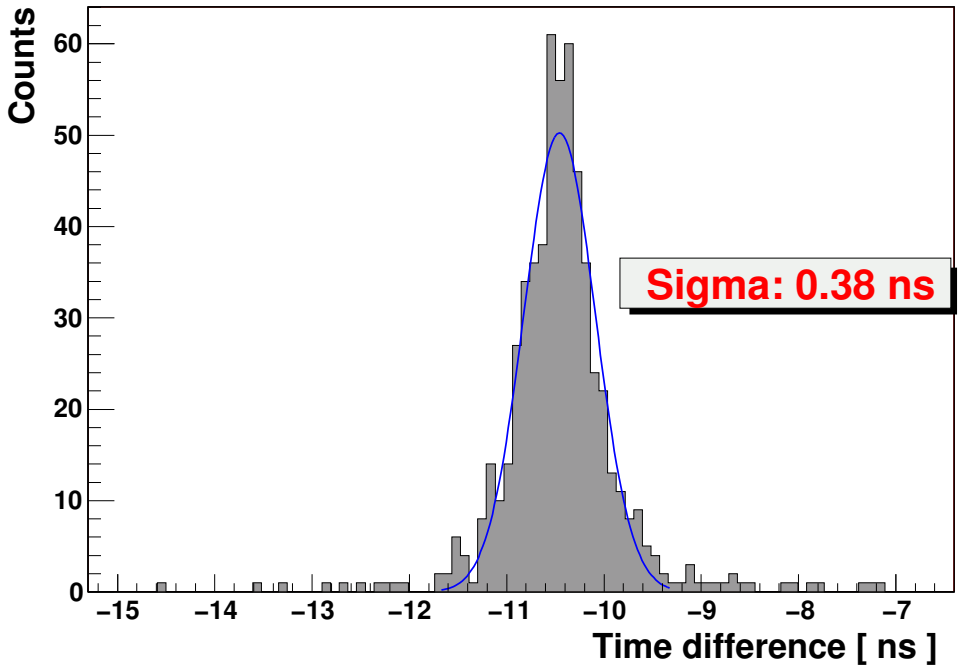

⇒ Homogeneity and time resolution good enough to trigger events AND to measure t_0 offsets

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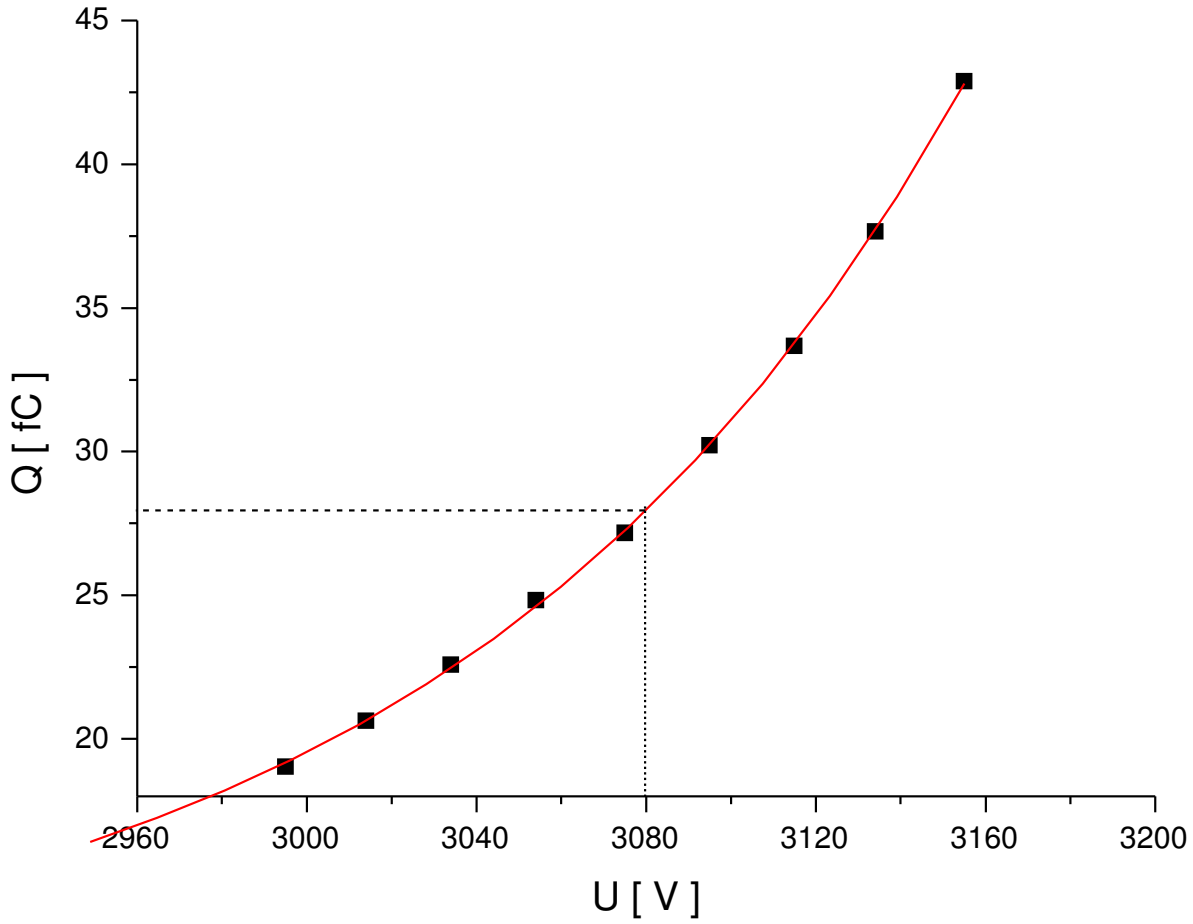
First measurements taken at LMU

- All positions measured simultaneously
- Constant temperature ($\Delta T < 0.5°\mathrm{C}$)
- Our readout still at BB5

Dependence of Charge on HV



nominal conditions:
$19.5°\mathrm{C}$
$\mathrm{Ar/CO_2}$:93/7
3 bar
Gate: 15.8 ns

fitted function:

$$Q = 8.7 + 20.2 \cdot e^{\frac{(U-3080)}{123}}$$

Remark

Pulseheights at 3080 V:

LMU	27 fC
X5 (2003)	34 fC

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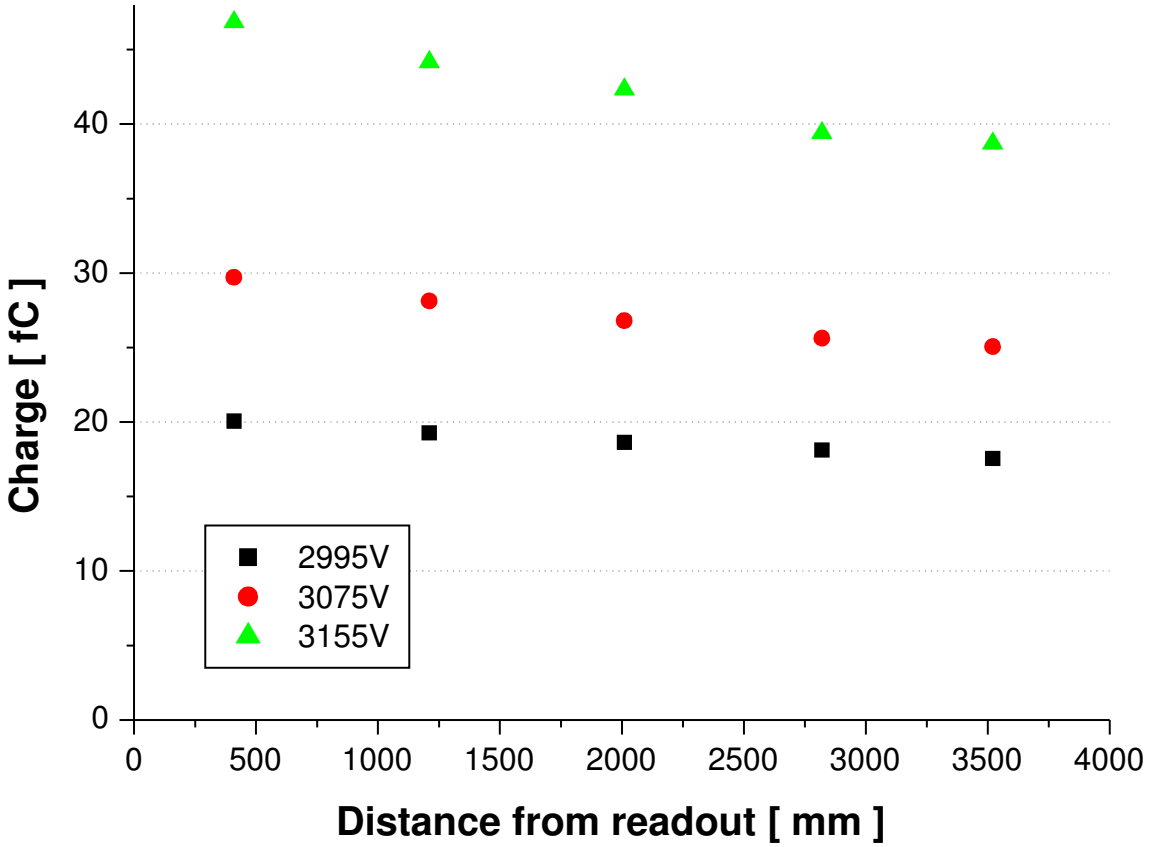
Pulseheights at 3080 V:

LMU	27 fC	2.5 GeV
X5 (2003)	34 fC	90 GeV

Charge ratio = ratio of primary ionisations predicted by the Bethe-Bloch formula!

Energy measurement in principle possible, although not really precise.

Dependence of Pulseheight on Readout Distance



Still to understand: Why different slopes?

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- Mobile cosmic teststand to test 40 chambers with final electronics
- As byproduct calibration parameters of each channel:
  - Relative t_0-offset
  - Pulseheight
- Increase of pulseheight with HV
- Decrease of pulseheight with increasing readout distance