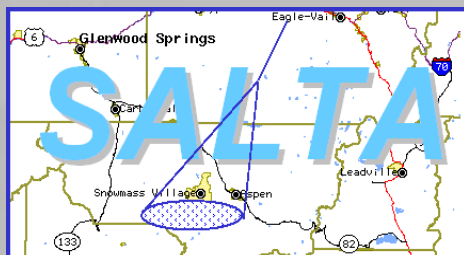


CORSIKA below the knee

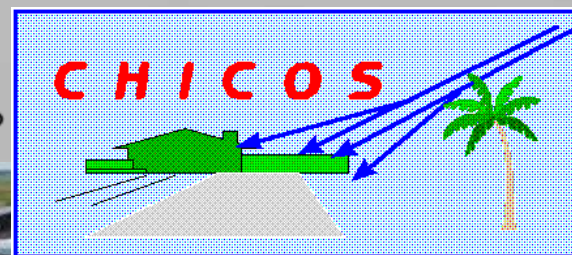
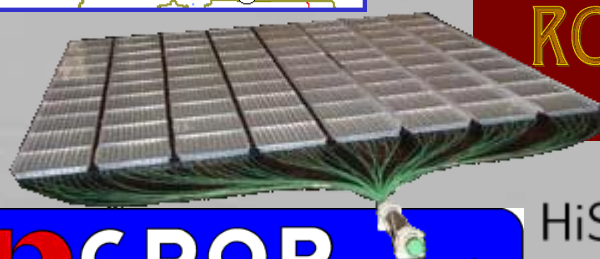
Tadeusz Wibig

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University of Lodz
ul. Pomorska 149/153, 90-236 Łódź, Poland

CORSIKA Below the Knee



the
ROLAND MAZE
project

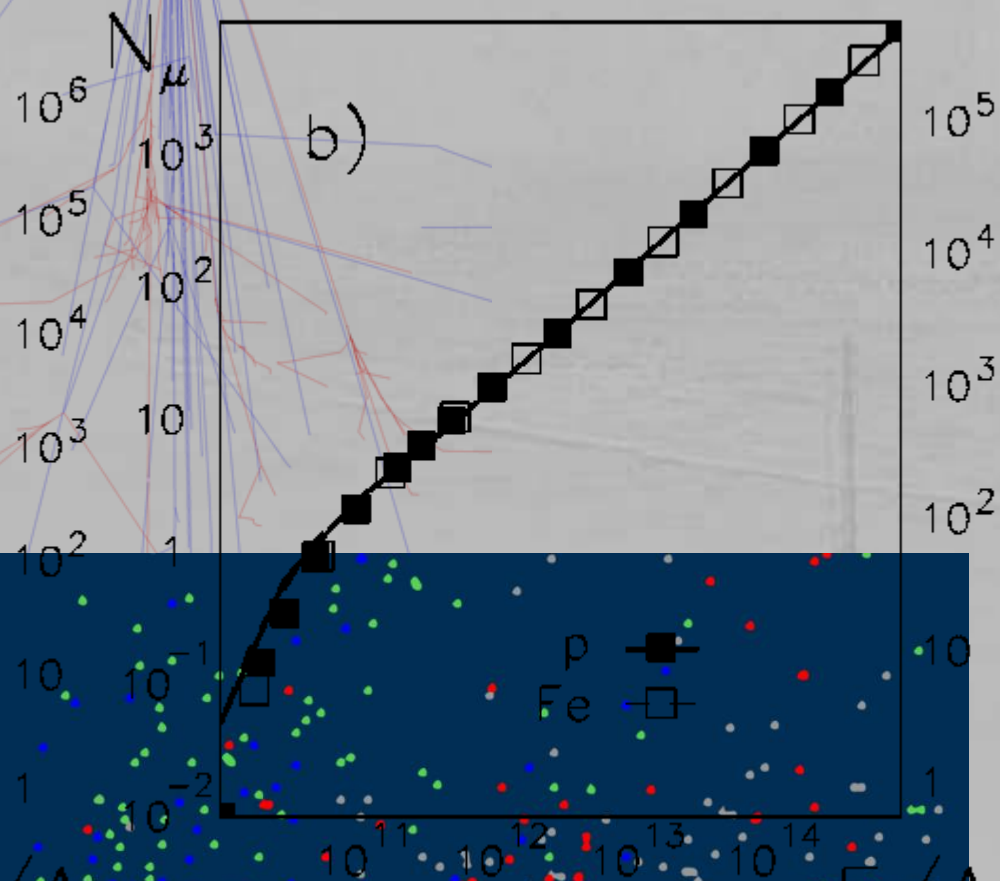
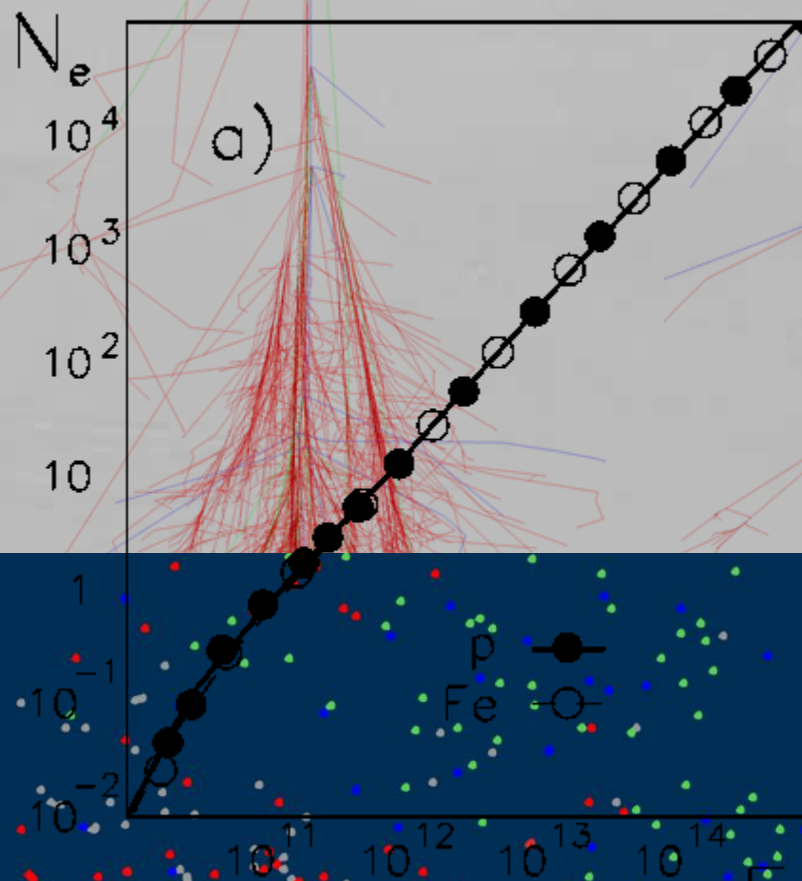


CORSIKA (COsmic Ray SIMulations for KAScade)

proton 100 GeV

iron 100 GeV

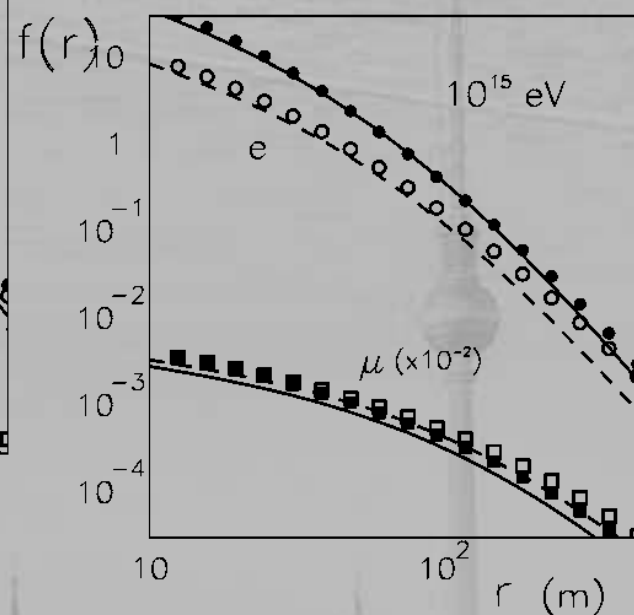
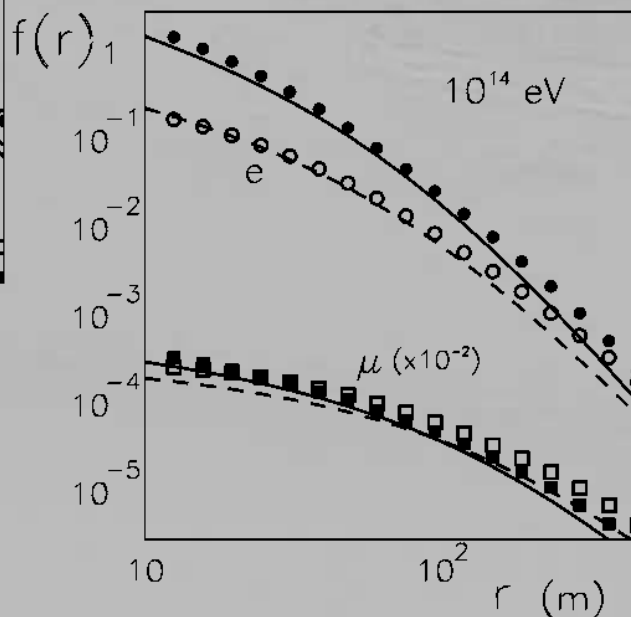
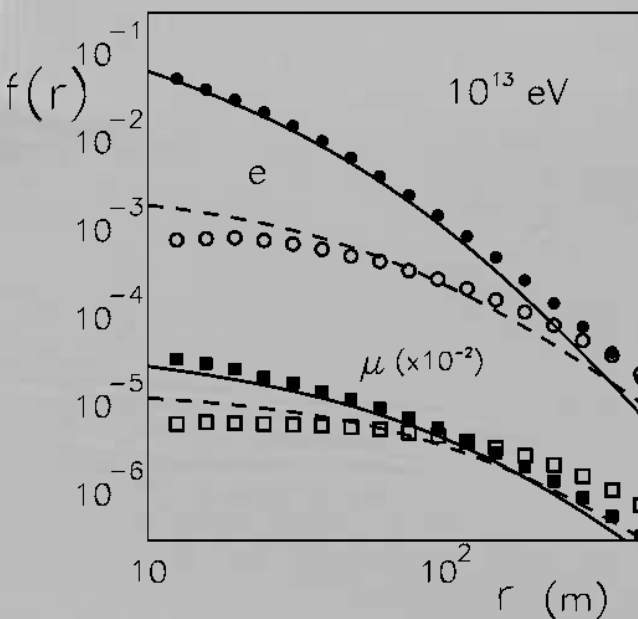
$$N_{e,\mu}(\text{iron}, E) = 56 \times N_{e,\mu}(\text{proton}, E/56)$$



CORSIKA

TeV

$$\rho_{e/\mu}(r) = \frac{N_{e/\mu}}{2\pi r_0^2} \frac{\Gamma(4.5 - s)}{\Gamma(s) \Gamma(4.5 - 2s)} \left(\frac{r}{r_0}\right)^{s-2} \left(1 + \frac{r}{r_0}\right)^{s-4.5}$$

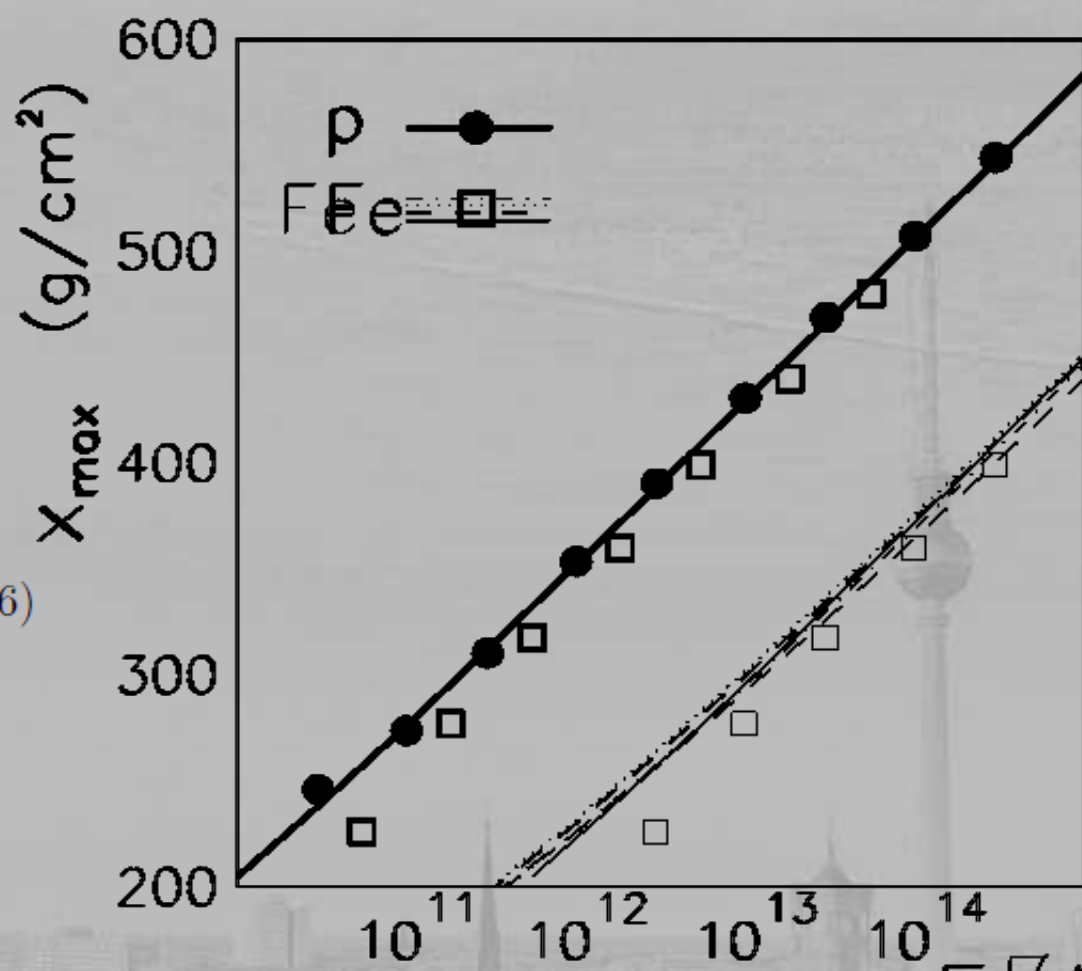


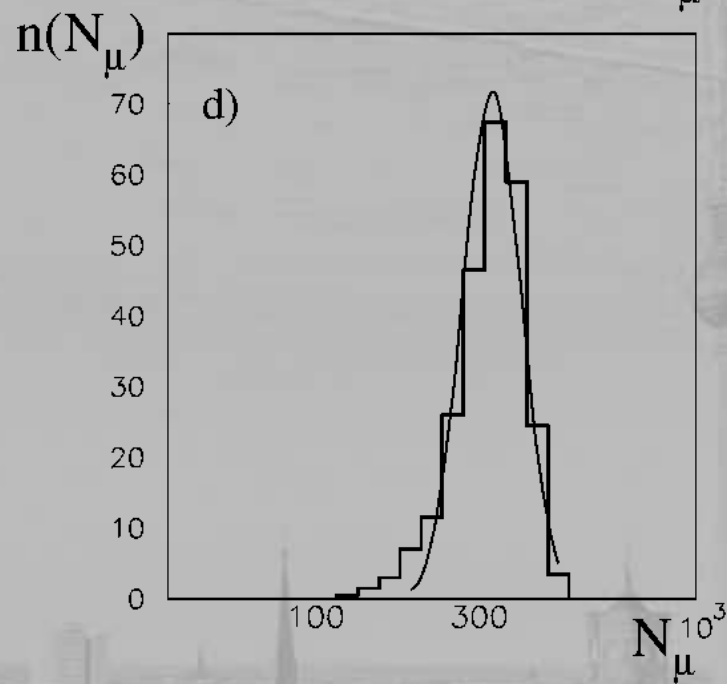
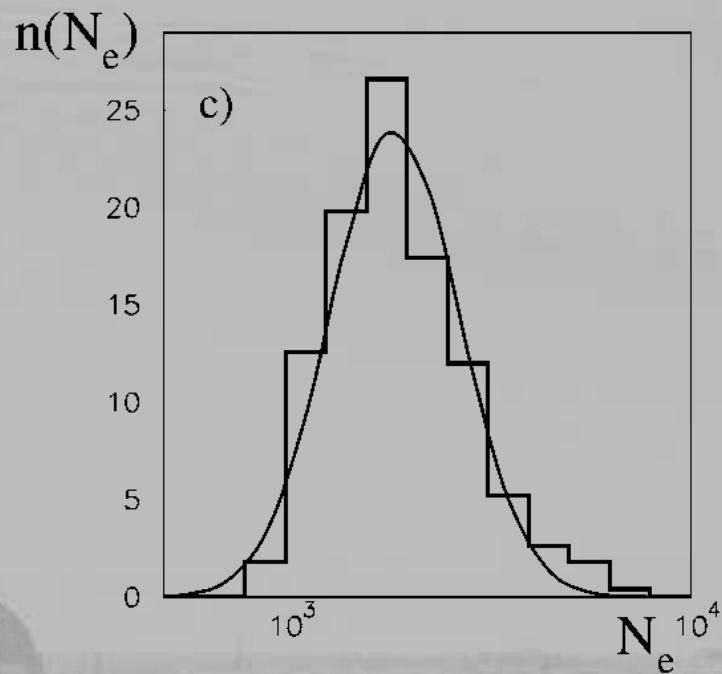
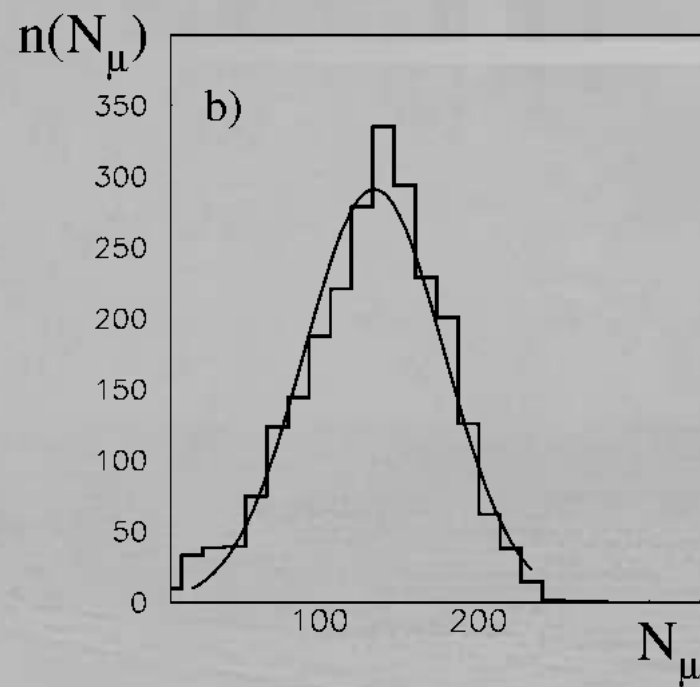
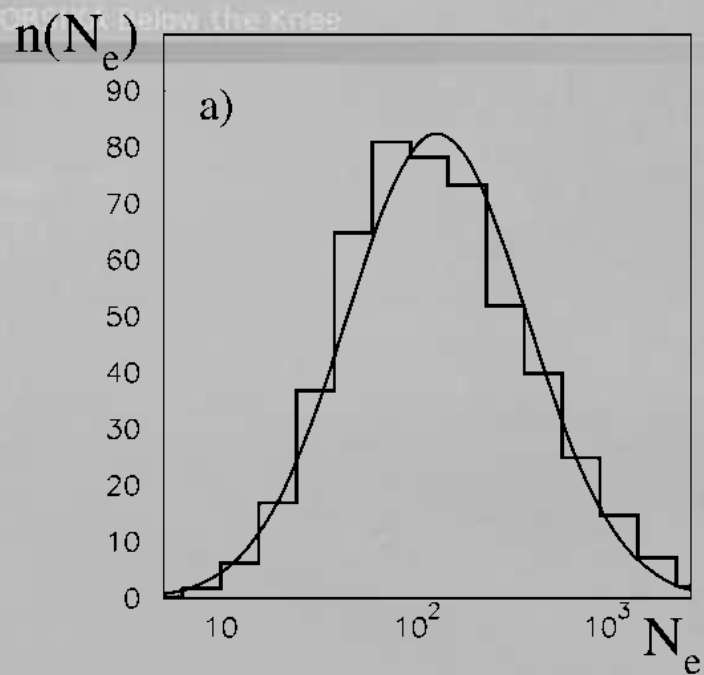
$$N(x) = N_{\max} \left(\frac{x - x_0}{x_{\max} - x_0} \right)^{\left(\frac{x_{\max} - x_0}{\lambda} \right)} \exp \left(- \frac{x - x_{\max}}{\lambda} \right)$$

$$N_{\max} = \frac{1}{2} \frac{\langle n \rangle}{3} \langle K_{\text{inel}} \rangle \frac{E}{\epsilon_c}$$

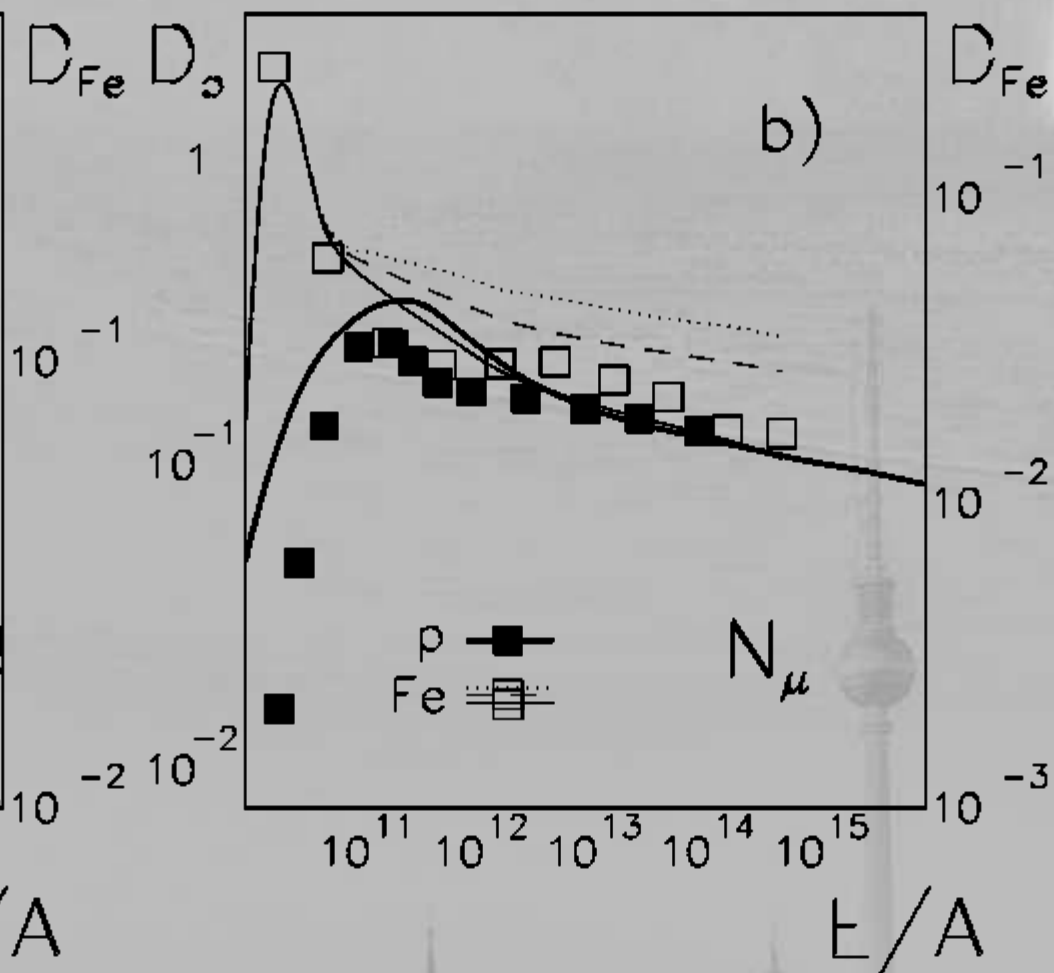
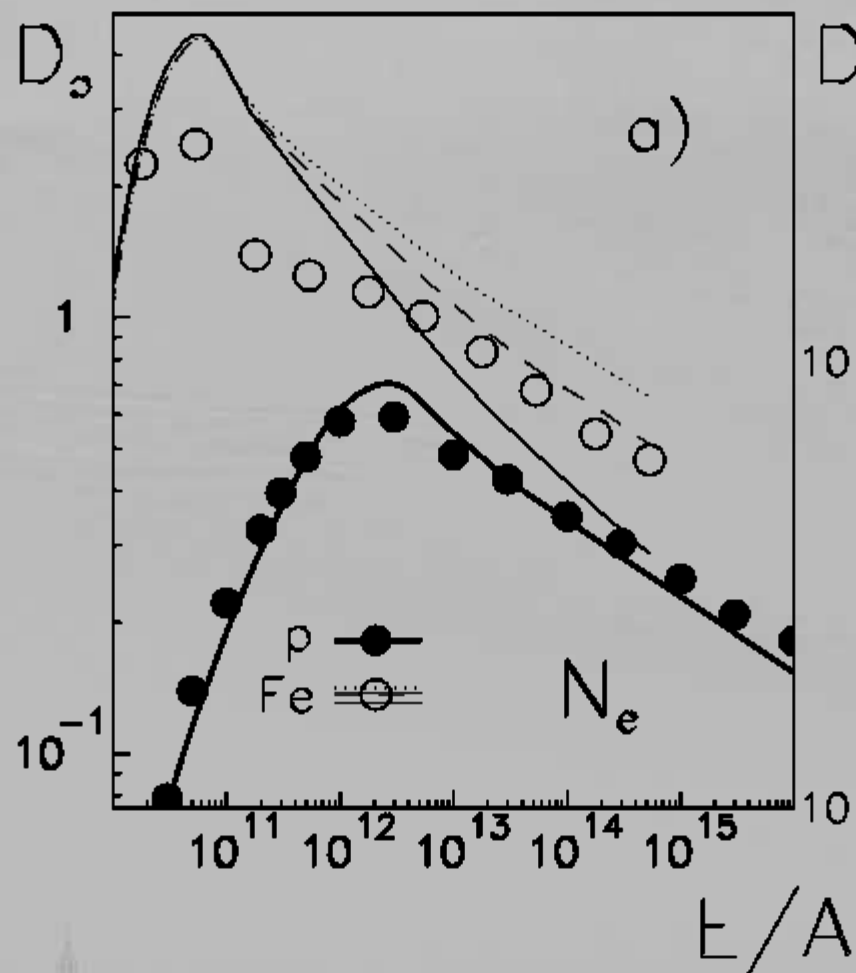
$$F_A(\{x_i\}) = \prod_{j=1}^A \frac{1}{\lambda_p} \exp(-x_j/\lambda_p)$$

$$x_{\max}(\text{iron}, E) = x_{\max}(\text{proton}, E/56)$$



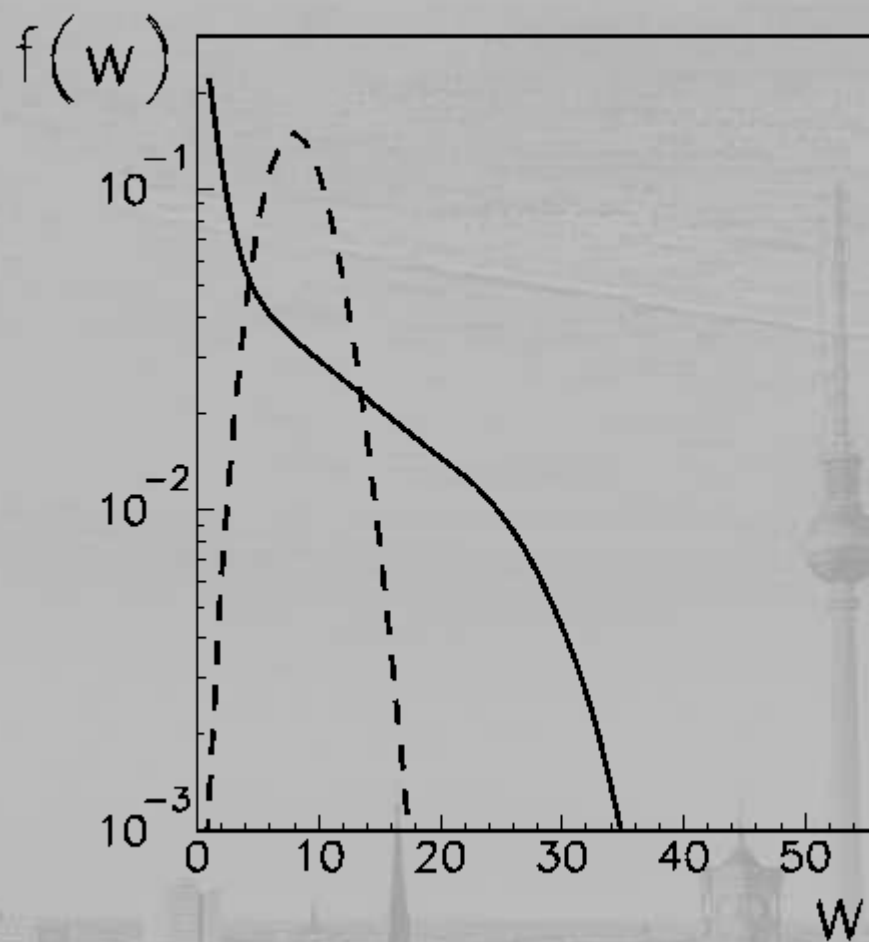


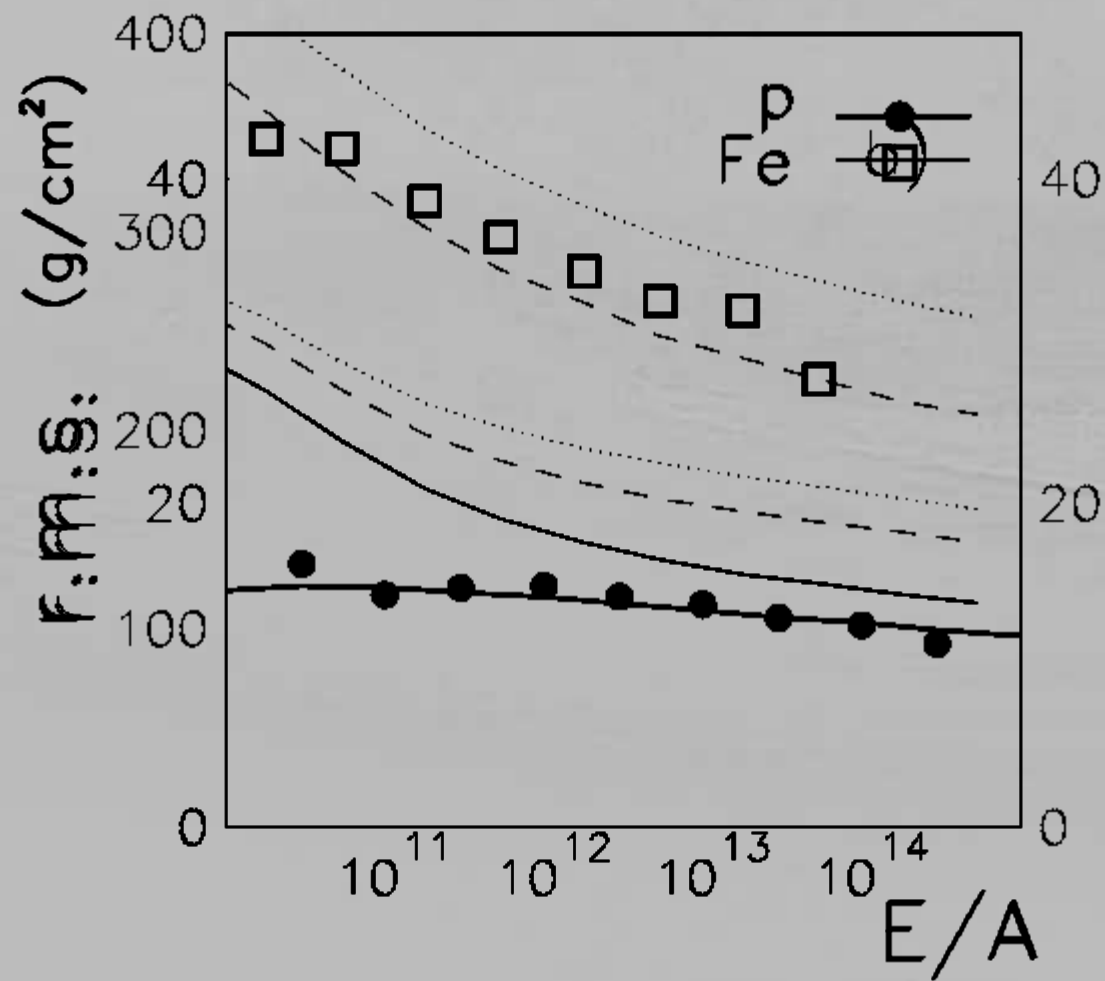
$$D_{e,\mu}(\text{iron}, E) = \frac{1}{\sqrt{56}} D_{e,\mu}(\text{proton}, E/56)$$

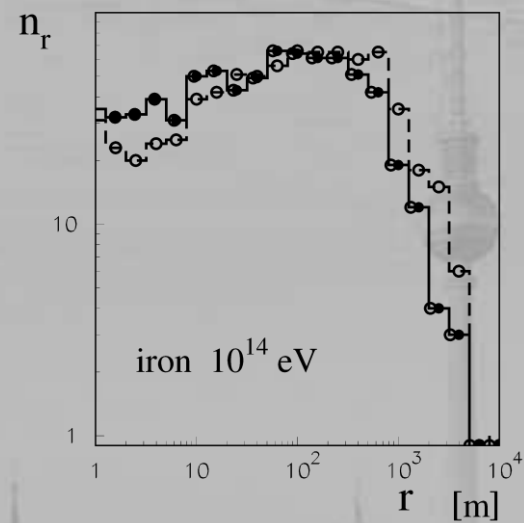
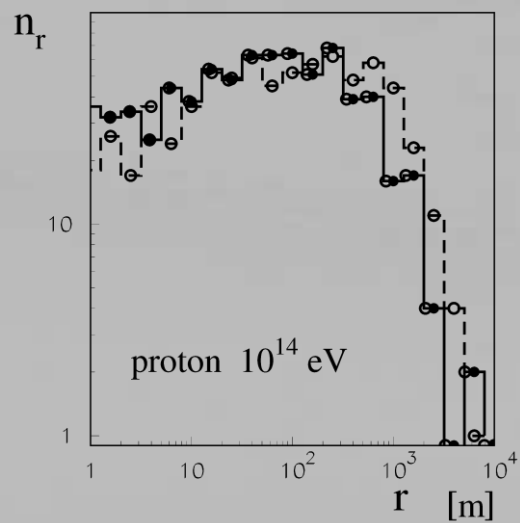
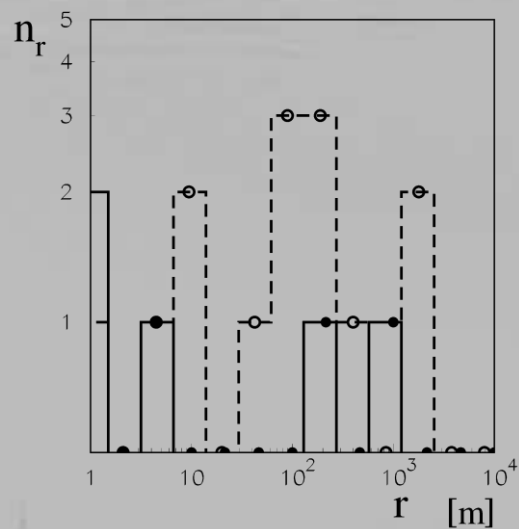
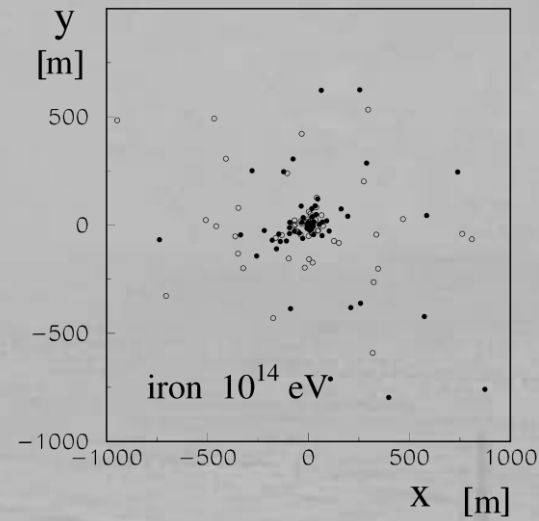
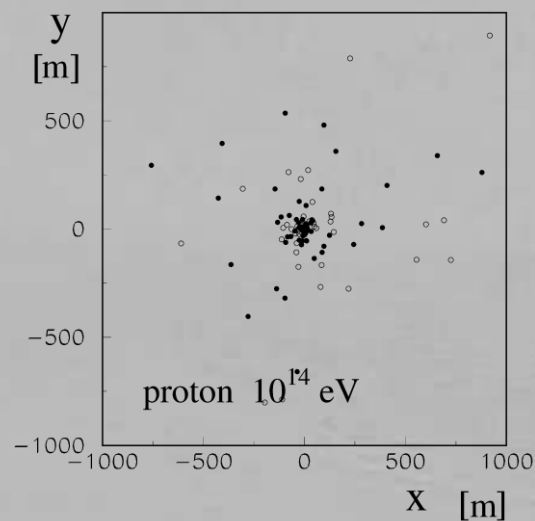
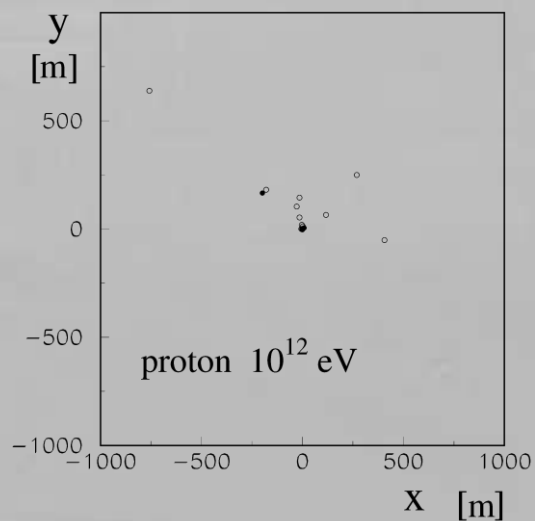


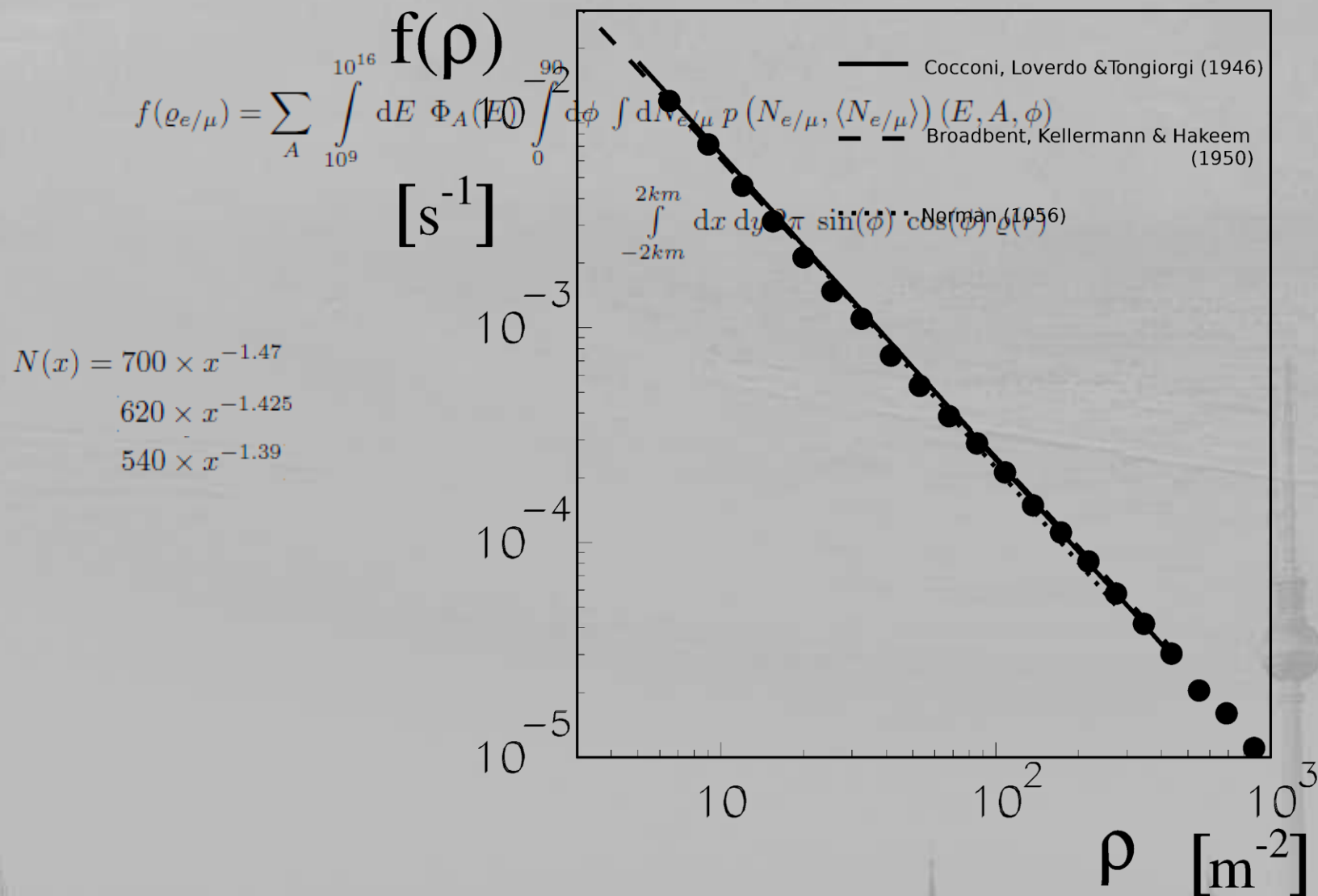
$$\langle w_A \rangle = A \frac{\sigma_{p-\text{air}}}{\sigma_{A-\text{air}}} = A \frac{\lambda_{A-\text{air}}}{\lambda_{p-\text{air}}}$$

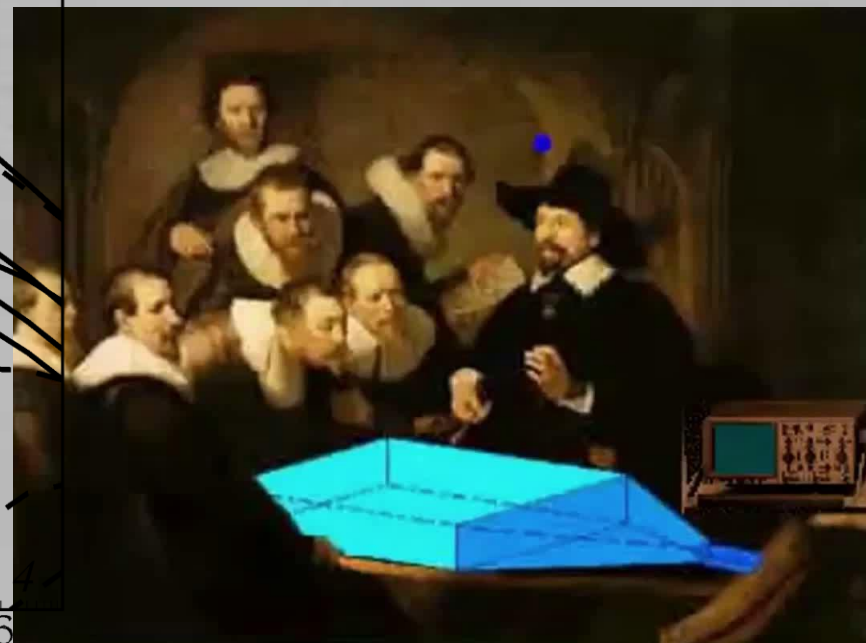
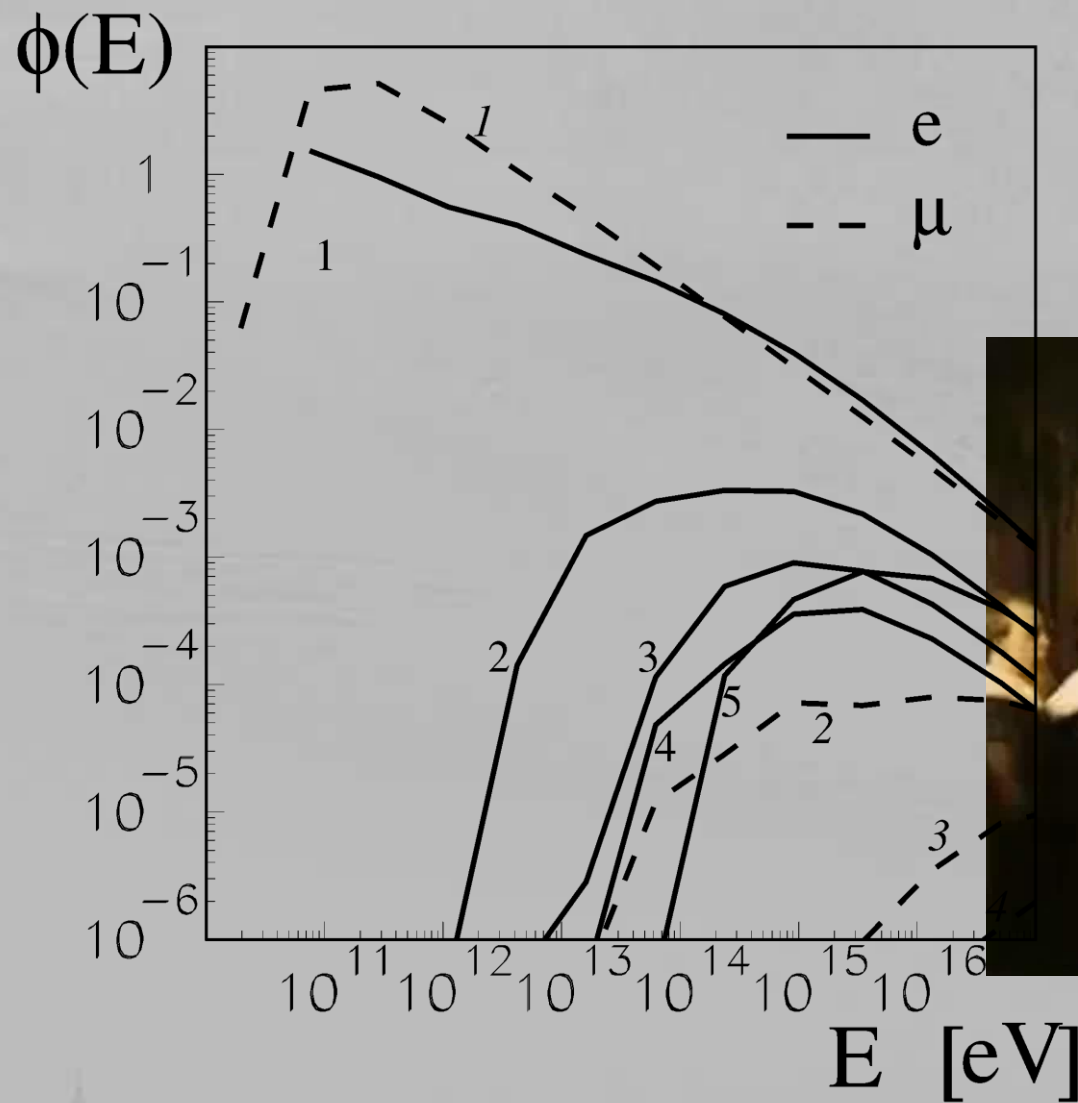
$$F_A \left(\left\{ \overbrace{x_0, x_0, \dots, x_0}^{w \text{ times}}, x_{w+1}, x_{w+2}, \dots, x_A \right\} \right) = \frac{1}{\lambda_{Fe}^w} \exp \left(- \frac{w x_0}{\lambda_{Fe}} \right) \prod_{j=1}^{A-w} \frac{1}{\lambda_p} \exp \left(- \frac{(x_j - x_0)}{\lambda_p} \right) \Big|_{x_j > x_0}$$

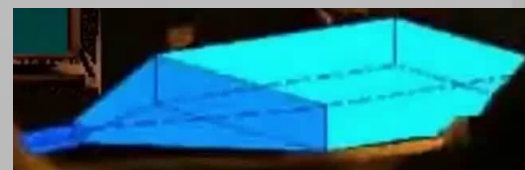
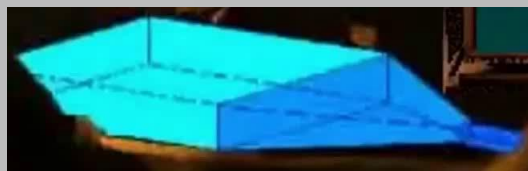
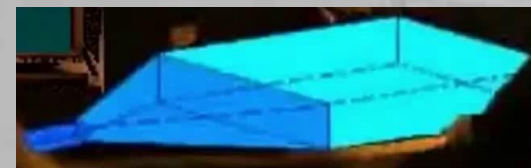
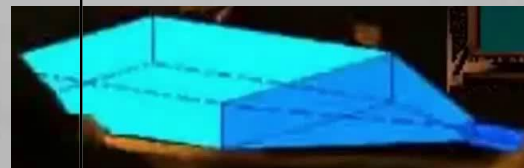
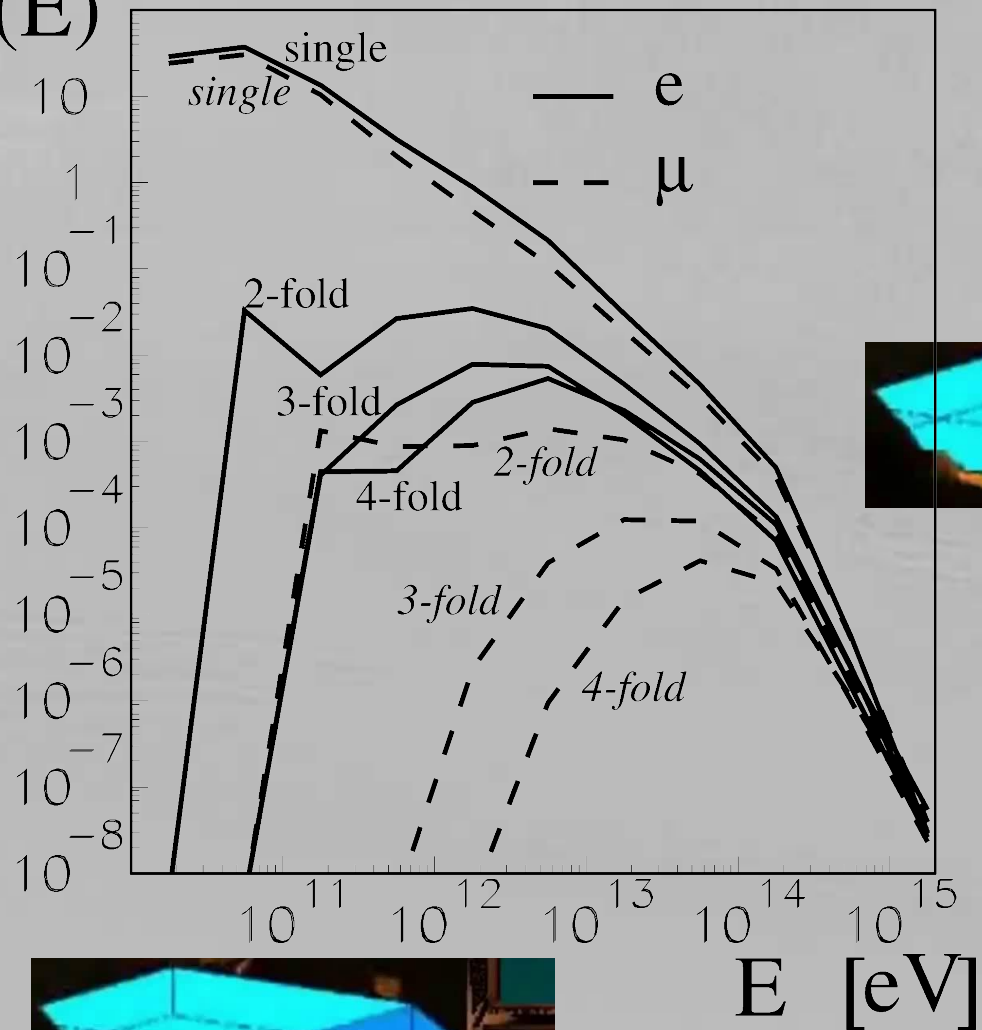


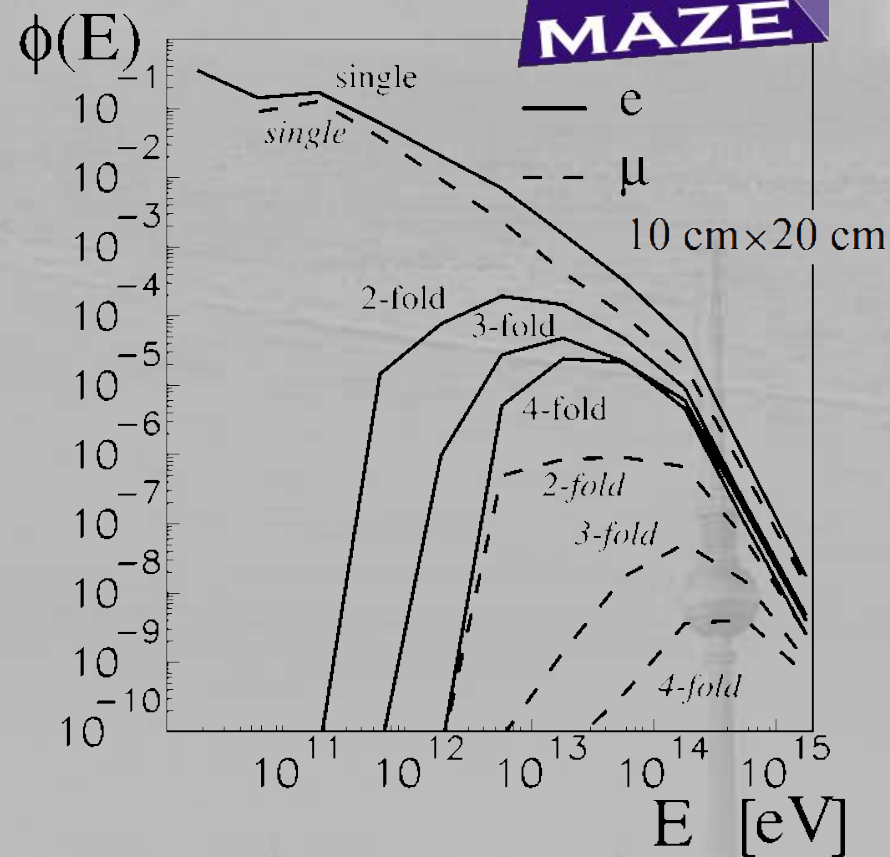
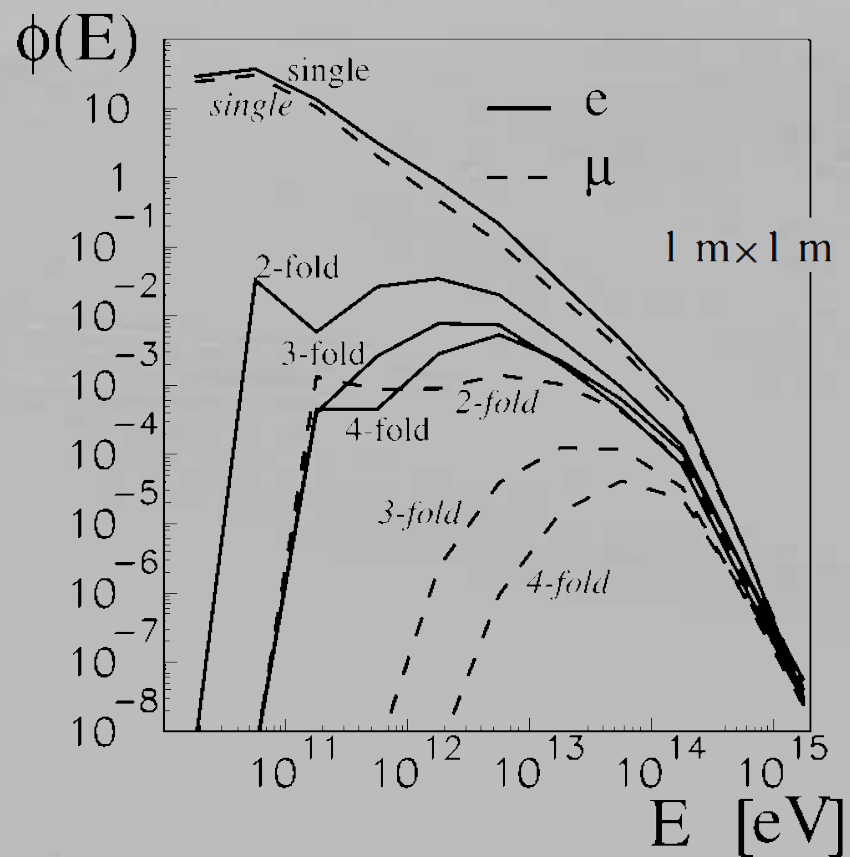








$\phi(E)$ 



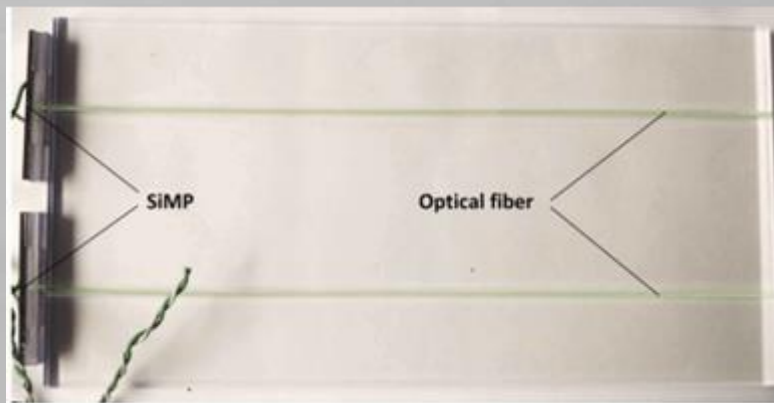
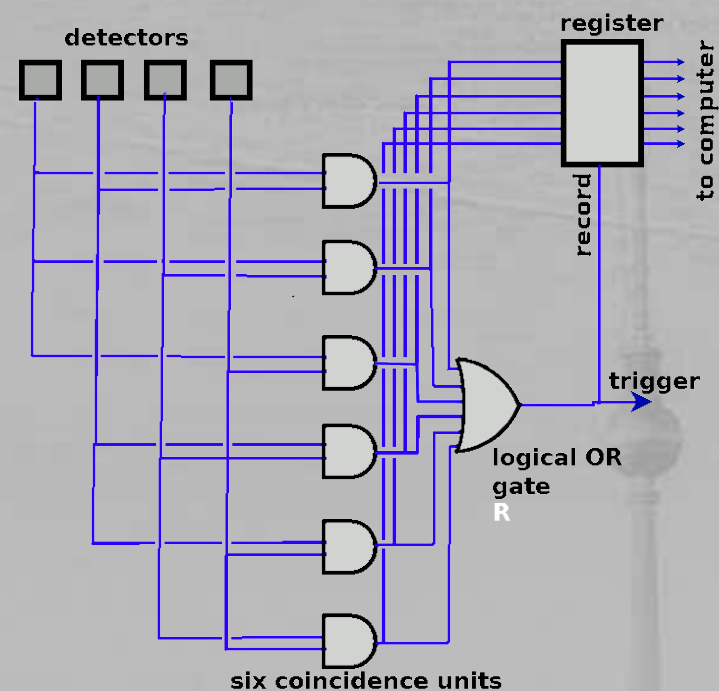


Table 1. Rates (s^{-1}) of single detector registration as well as 2-fold, 3-fold, and 4-fold coincidences for stations of four detectors of 1 m^2 and 0.02 m^2 each. Results for muons alone are presented in the last two columns.

coincidence	charged		muons only	
	1 m^2	0.02 m^2	1 m^2	0.02 m^2
single	433	2.0	331	1.3
2-fold	5.6×10^{-1}	2.5×10^{-3}	2.7×10^{-2}	1.5×10^{-5}
3-fold	1.1×10^{-1}	5.2×10^{-4}	1.6×10^{-3}	4.3×10^{-7}
4-fold	6.0×10^{-2}	2.9×10^{-4}	4.1×10^{-4}	4.4×10^{-8}



The
E N D