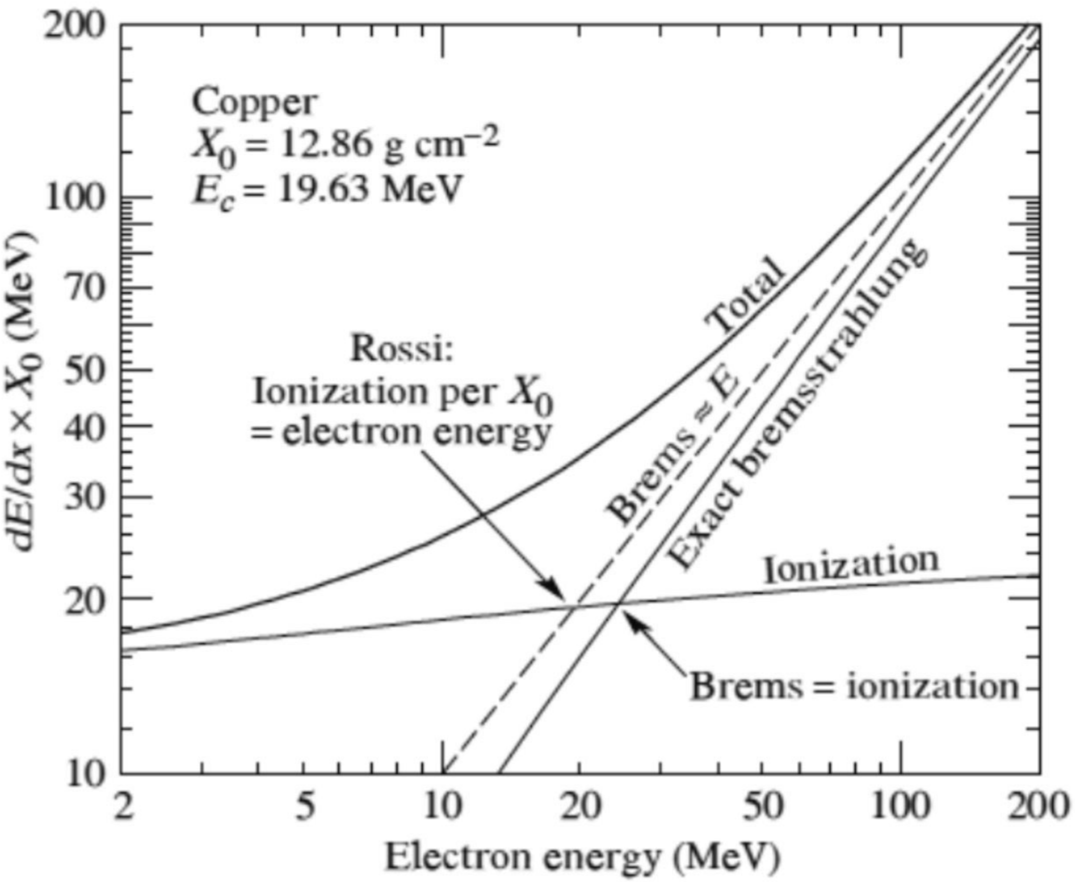
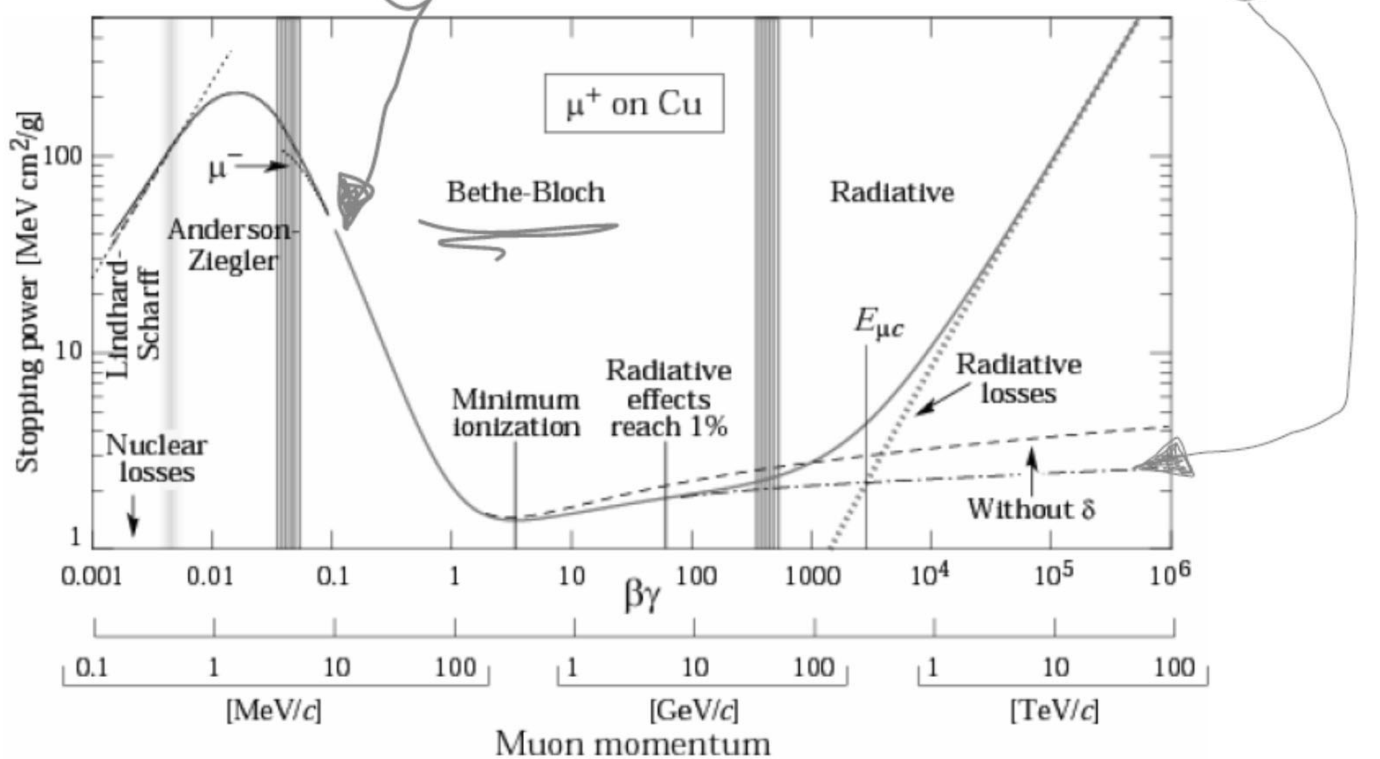
RADIAZIONE DI FRENAMENTO



$$\frac{dE}{dx} = Kz^2 \frac{Z}{A} \frac{1}{\beta^2} \left[\frac{1}{2} \ln \frac{2m_e c^2 \beta^2 \gamma^2 T_{\max}}{I^2} - \beta^2 - \frac{\delta}{2} \right]$$



Stopping power (≡⟨dE/dx⟩) for positive muons in copper as a function of $\beta\gamma = p/Mc$ over nine orders of magnitude in momentum (12 orders of magnitude in kinetic energy). Solid curves indicate the total stopping power.

the number of photons becomes, after angular integration,

$$\frac{dN}{d\lambda}=\frac{2\pi\alpha}{\lambda^2}L\sin^2\theta_c \qquad (5.7)$$

The number of photons emitted in the wavelength interval from λ_1 to λ_2 is then

$$N=2\pi\alpha L\int_{\lambda_2}^{\lambda_1}\sin^2\theta_c/\lambda^2\,d\lambda \qquad (5.8)$$

For a counter equipped with a photocathode sensitive in the visible region, $\lambda_1=400$ nm and $\lambda_2=700$ nm, such that we have

$$\frac{N}{L}=490\sin^2\theta_c \quad \text{photons/cm}$$

If the sensitivity is expanded into the ultraviolet region, the yield of photons can be increased by a factor of two to three. One way of achieving this goal

Fig. 5.6. Cherenkov angle θ_c as a function of the reduced particle velocity $\beta=v/c$ for a series of refractive indices n.

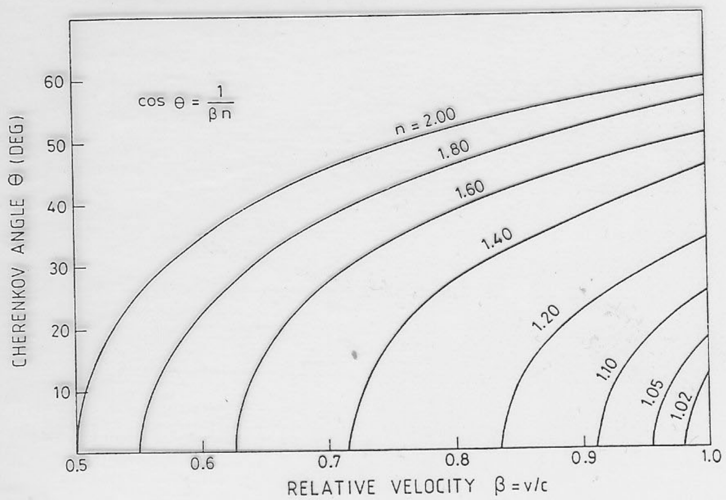


Table 6.2. *Compilation of Cherenkov radiators [1, 34, 35, 122]. The index of refraction for gases is for 0 °C and 1 atm (STP). Solid sodium is transparent for wavelengths below 2000 Å [447, 448]*

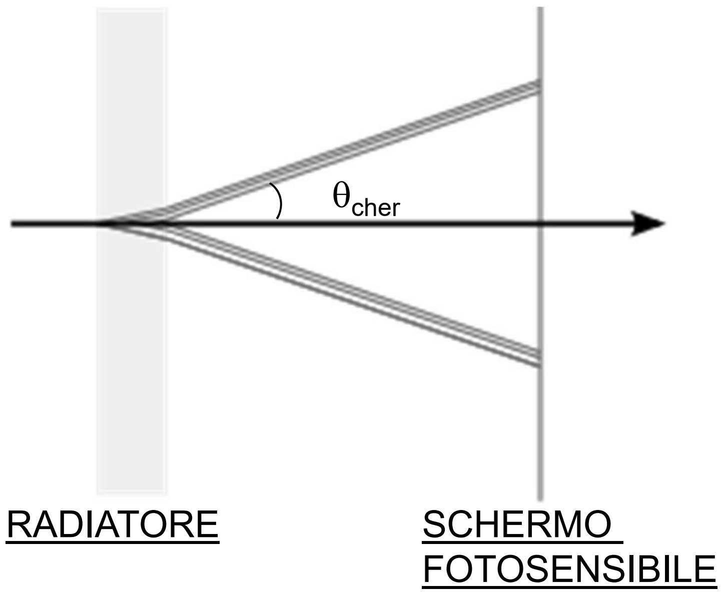
material	$n-1$	β-threshold	γ-threshold
solid sodium	3.22	0.24	1.029
lead sulfite	2.91	0.26	1.034
diamond	1.42	0.41	1.10
zinc sulfide (ZnS(Ag))	1.37	0.42	1.10
silver chloride	1.07	0.48	1.14
flint glass (SFS1)	0.92	0.52	1.17
lead fluoride	0.80	0.55	1.20
Clerici solution	0.69	0.59	1.24
lead glass	0.67	0.60	1.25
thallium formate solution	0.59	0.63	1.29
scintillator	0.58	0.63	1.29
Plexiglas (lucite)	0.48	0.66	1.33
boron silicate glass (Pyrex)	0.47	0.68	1.36
water	0.33	0.75	1.52
silica aerogel	0.025 - 0.075	0.93 - 0.976	4.5 - 2.7
pentane (STP)	$1.7 \cdot 10^{-3}$	0.9983	17.2
CO_2 (STP)	$4.3 \cdot 10^{-4}$	0.9996	34.1
air (STP)	$2.93 \cdot 10^{-4}$	0.9997	41.2
H_2 (STP)	$1.4 \cdot 10^{-4}$	0.99986	59.8
He (STP)	$3.3 \cdot 10^{-5}$	0.99997	123

supposed to be precisely at threshold and does not radiate. Under these circumstances one has:

$$\beta_2 = \frac{1}{n} \tag{6.26}$$

or

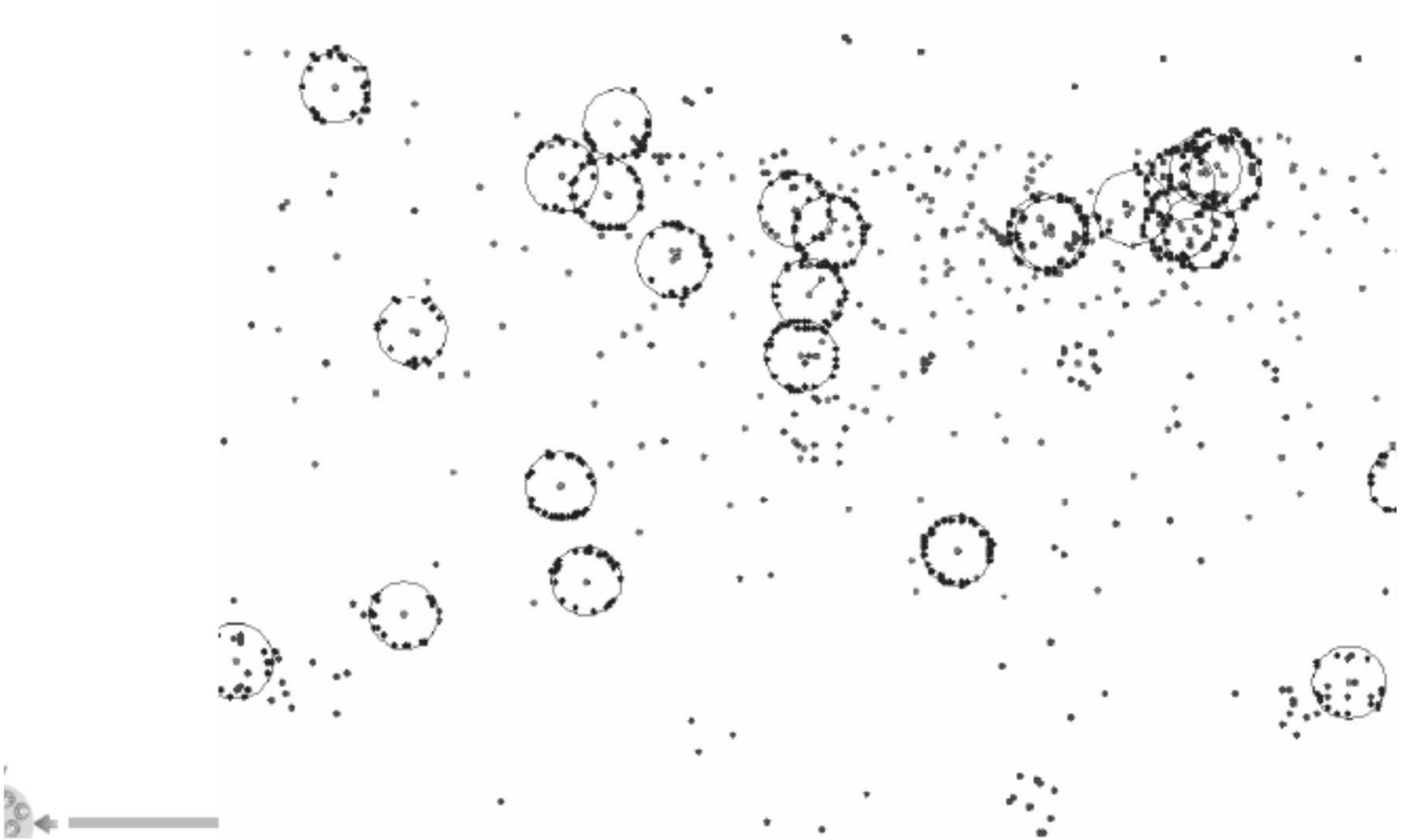
$$\gamma_2 = \frac{1}{\sqrt{1-\frac{1}{n^2}}} \,. \tag{6.27}$$


θ_{cher}
RADIATORE
SCHERMO
FOTOSENSIBILE

Development of a RICH detector for electron identification in CBM (FAIR/GSI)

UrQMD simulation of central Au+Au collisions, 25 AGeV

event display of inner fraction of RICH detector:



Ice cube
Pictorial event

Selecting events coming from ‘below’
(using the earth as a filter/shield)