

Transition Radiation – Basics

“Transition radiation is omitted whenever a charged particle crosses an interface between two media with different dielectric functions.” — L. Durand, *Phys. Rev. D* 11, 89 (1975)

$$\left(\frac{dW}{d\omega}\right)_{interface} = \frac{\alpha}{\pi} \left(\frac{\xi_1^2 + \xi_2^2 + 2\gamma^{-2}}{\xi_1^2 - \xi_2^2} \ln \frac{\gamma^{-2} + \xi_1^2}{\gamma^{-2} + \xi_2^2} - 2 \right)$$

TR frequency spectrum without absorption

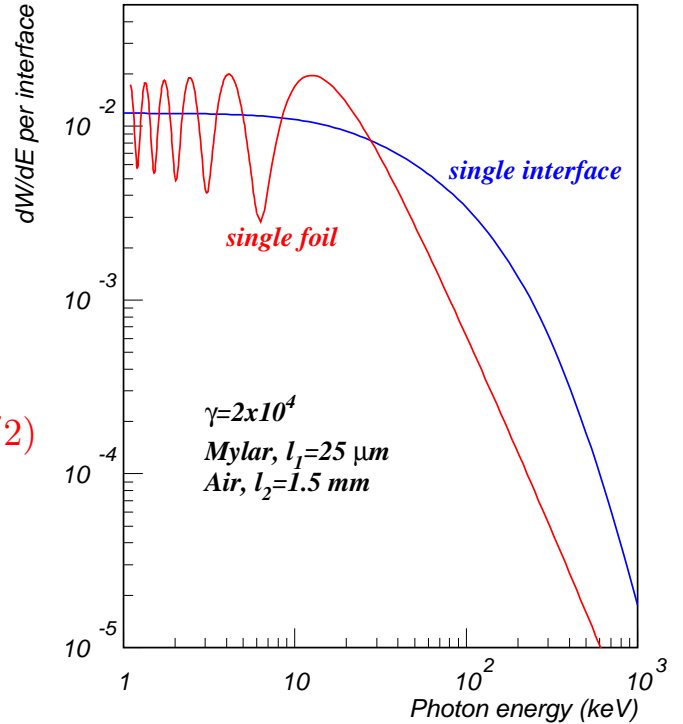
for : $\gamma \gg 1$; $\xi_1^2, \xi_2^2 \ll 1$; $\theta \ll 1$ ($\theta \sim 1/\gamma$)

$$\xi^2 = \omega_P^2 / \omega^2 = 1 - \epsilon(\omega)$$

ω_P = plasma frequency

$$\omega_P^{CH_2} = 20\text{eV} ; \omega_P^{Air} = 0.7\text{ eV}$$

$$\left(\frac{d^2W}{d\omega d\Omega}\right)_{foil} = \left(\frac{d^2W}{d\omega d\Omega}\right)_{interface} \times 4 \sin^2(\phi_1/2)$$



Ginzburg & Frank, 1946; Garibian, 1958

Average number of produced photons

