pc

Apparent Brightness ~ $F = \frac{L}{4\pi d^2}$ ← luminosity [W]

[W/m²] flux density, intensity

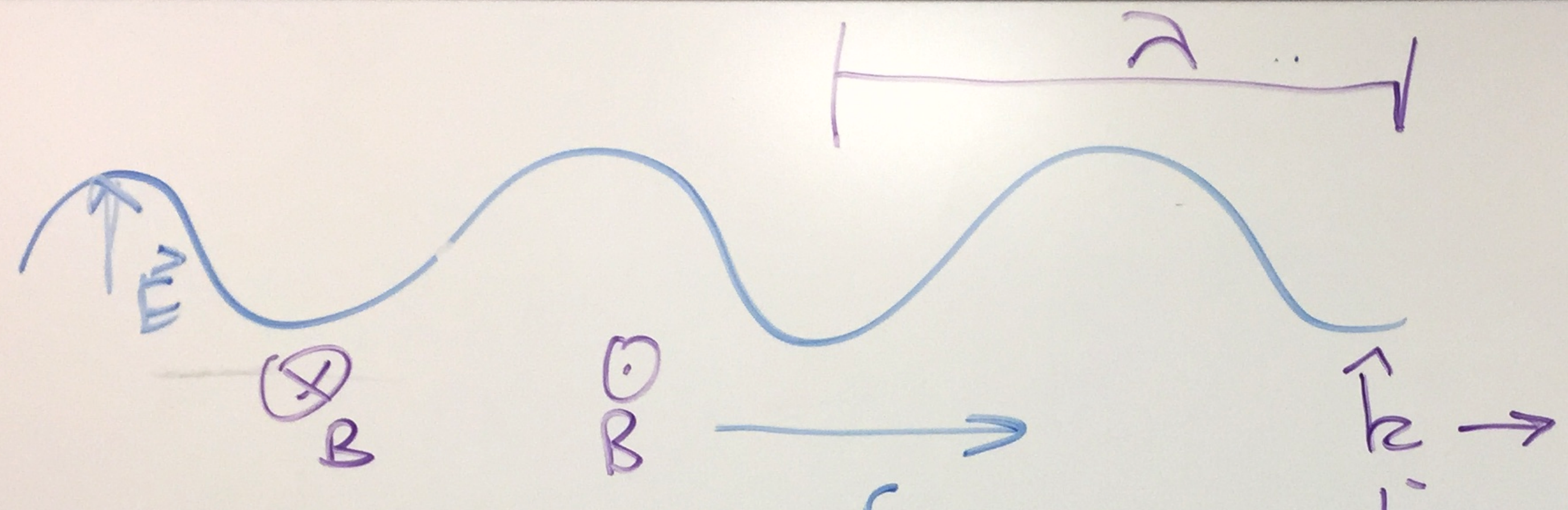
$m = -2.5 \cdot \lg F/F_0$

$\Rightarrow m_{\odot} = -26.83$ $\quad F_{\odot}^{Earth} = 1365 \frac{W}{m^2}$ (⊙ = sun)

$M_{\odot} = 4.7$

$M = -2.5 \lg L/L_0$

IF: $d = 10\,pc$ THEN $M = m$



$\vec{E}(\vec{r},t) = \vec{E}_0 \cdot \cos(\vec{k}\cdot\vec{r} - \omega t)$

$\vec{E}_0$ ← amplitude, polarization

$\vec{k} = \frac{2\pi}{\lambda}\hat{k}$ $\quad \omega = 2\pi f = \frac{2\pi}{T}$ ← period

Energy density: $\frac{\varepsilon_0}{2}|\vec{E}_0|^2$

Flux density: $F = \frac{\varepsilon_0}{2}|\vec{E}_0|^2 \cdot c$

$\mathcal{L} = 4\pi R^2 F_{surface}$

constant phase

$\frac{2\pi}{\lambda}\cdot\vec{r}\cdot\hat{k} = 2\pi f \cdot t$

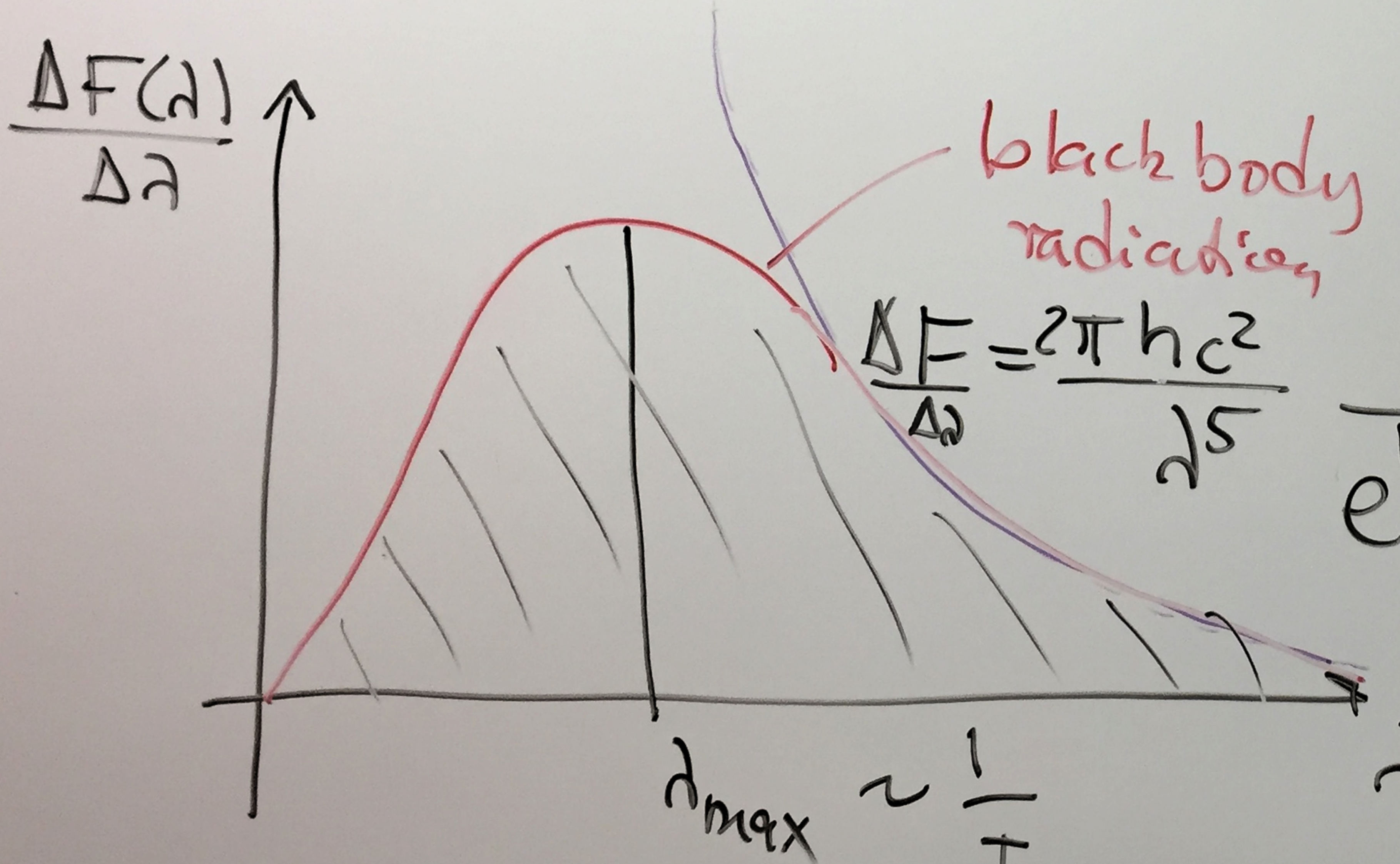
$c = \frac{\Delta\vec{r}\cdot\hat{k}}{\Delta t} = f \cdot \lambda = \frac{\omega}{|\vec{k}|}$

c: phase velocity; f: frequency; λ: wavelength; ω = angular frequency; |k|: wave number

$\frac{\Delta F}{\Delta\lambda}(\lambda)(T) \sim \frac{1}{\lambda^3}$

$\lambda = \infty$ .... very small

Ultraviolet catastrophe



$\frac{\Delta F}{\Delta\lambda} = \frac{2\pi h c^2}{\lambda^5}\frac{1}{e^{hc/\lambda kT} - 1}$

$\lambda_{max} \sim \frac{1}{T}$

total $F = \int \frac{\Delta F}{\Delta\lambda} d\lambda = \sigma \cdot T^4$

Max Planck:

Energy of E.M. radiation is Quantized

multiples of $\frac{hc}{\lambda} = h \cdot f$ (h: Planck's constant)

package = PHOTON