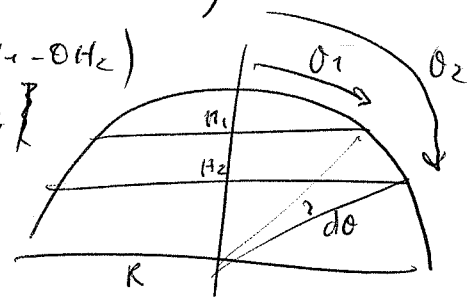
11) $d\Omega = 2\pi \sin\theta \, d\theta$

12) $S_{\theta_1}^{\theta_2} = 2\pi R \left| -\cos\theta \right|_{\theta_1}^{\theta_2} = 2\pi R \left(\cos\theta_1 - \cos\theta_2 \right)$

$= 2\pi R \left(OH_1 - OH_2 \right)$

$= 2\pi R \, H_1H_2$



13) $d^2U = \dfrac{\cos\alpha_1 \cos\alpha_2 \, dS_1 \, dS_2}{R^2}$

Etendue géom : d^2U : proportionelle à la surface apparente de l'élément de surface considéré (source dS ou récepteur dS') et à l'angle solide déterminé par l'autre élément de surface. unité : $m^2 sr$

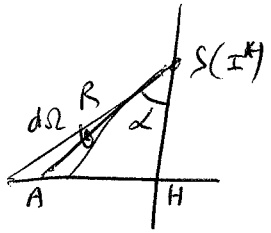
$d^2U = \dfrac{\cos\theta \, dS \, \cos\theta' dS'}{R^2} = d\Omega' \cos\theta' \, dS' = d\Omega \cos\theta \, dS$

$d^2\Phi = L \, d^2U$

14) $M = \pi L$: 1) orth
2) C.N.
3) Lambert

21) E_A^* ? $E_{A(S)}^* = \dfrac{d\Phi}{dS'} = \dfrac{I \, d\Omega}{dS'} = \dfrac{I \dfrac{dS' \cos\alpha}{R^2}}{dS'}$ ~~$\sin\alpha = \frac{R}{R}$~~

$\sin\alpha = \dfrac{AH}{R} = \dfrac{I \cos\alpha}{R^2} = \dfrac{I \cos\alpha}{\dfrac{AH^2}{\sin^2\alpha}}$



$\rightarrow E_A^*(S) = \dfrac{I^*}{AH^2} \sin^2\alpha \cos\alpha$

$$E_A^*(S') = \frac{I^*}{AH'^2} \sin^2\beta \cos\beta \qquad \text{id.}$$

$$\rightarrow \boxed{E_{A\,total}^* = \frac{I^*}{AH^2} \sin^2\alpha \cos\alpha + \frac{I^*}{AH'^2} \sin^2\beta \cos\beta}$$

$$AH + AH' = a$$

22) $$E_C^* = \frac{4I^*}{a} \sin^2\alpha \cos\alpha + \frac{4I^*}{a} \sin^2\beta \cos\beta$$

car $AH = AH' = \frac{a}{2}$

et $\alpha = \beta \rightarrow$ $$\boxed{E_C^* = \frac{8I^*}{a^2} \sin^2\alpha \cos\alpha}$$

23) $\alpha = 45° \rightarrow \cos\alpha = \frac{\sqrt{2}}{2} \qquad \sin\alpha = \frac{\sqrt{2}}{2}$

$$\sin^2\alpha \cos\alpha = \frac{2}{4} \cdot \frac{\sqrt{2}}{2} = \frac{2\sqrt{2}}{8}$$

$$\rightarrow \boxed{E_C^*(\alpha = 45°) = \frac{2\sqrt{2}}{a^2} I^*}$$

24) $$\frac{dE_C^*}{d\alpha} = 0 \rightarrow = \frac{8I^*}{a^2}\left[(2\sin\alpha\cos\alpha)\cos\alpha - \sin^2\alpha \sin\alpha\right]$$

$$= \frac{8I^*}{a^2}\left(2\sin\alpha\cos^2\alpha - \sin^3\alpha\right)$$

$$\rightarrow \quad 2\cos^2\alpha - \sin^2\alpha = 0$$

$$\rightarrow \quad \tan\alpha = \sqrt{2} \rightarrow \boxed{\alpha = 54,73°}$$

25) $$\frac{CH}{SH} = \sqrt{2} \rightarrow SH = \frac{a}{2\sqrt{2}}$$

3) Corps gris.

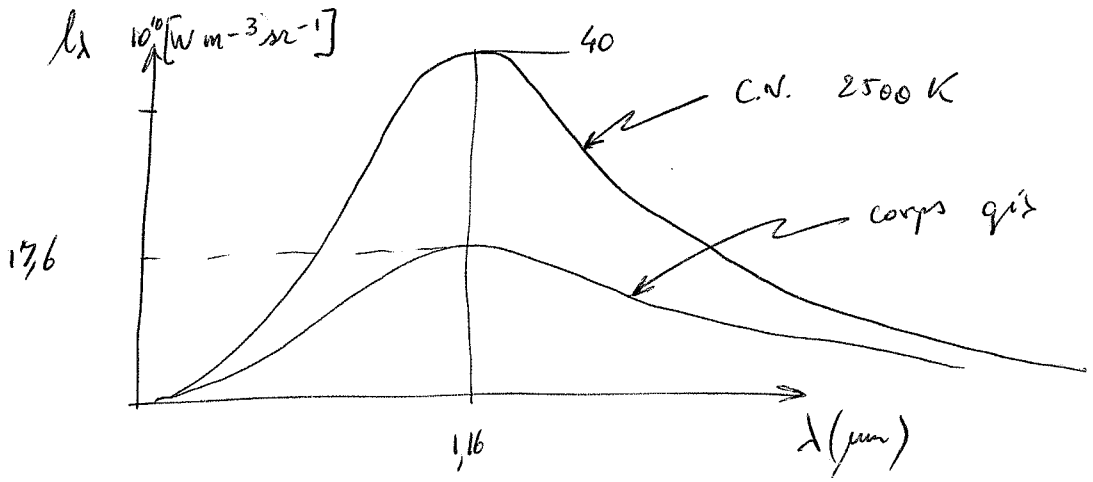
pour un corps qcq, $\alpha_\lambda(T) = \dfrac{l_\lambda(T)}{L_\lambda(T)}$

corps noir, $\alpha_\lambda(T) = \alpha(T) = \alpha = 1 \quad \forall \lambda, T$

corps gris $\alpha_\lambda(T) = \alpha(T) = \alpha < 1 \quad \forall \lambda, T$ considérés

ici $\alpha = 0,44$

$\rightarrow l_\lambda(T) = 0,44\ L_{\lambda,T}$



coordonnés du sommet : $\lambda_m T = 2,897 \cdot 10^{-3}$ m.K

$T = 2500$ K $\rightarrow \lambda_m = 1,16$ μm

$l_{\lambda,m} = \underbrace{40 \cdot 10^{10}}_{\hookrightarrow L_{\lambda,m}}$ W m^{-3} sr^{-1} $\cdot \underbrace{0,44}_{\alpha} = 17,6\ 10^{10}$ W/m^3/sr

41) $r = n^2 \dfrac{\varepsilon_0 h^2}{\pi m Z e^2}$

l'é retour en 1s : $n = 1 \rightarrow r_1 = \dfrac{\varepsilon_0 h^2}{\pi m \cdot 2 e^2} = 1,825\ 10^{-11}$ m

42) $E_n = \dfrac{-1}{n^2} \dfrac{m e^4 Z^2}{8 \varepsilon_0^2 h^2} \rightarrow E_1 = -\dfrac{1}{1} \cdot \dfrac{m e^4 2^2}{8 \varepsilon_0^2 h^2} = -1,83\ 10^{-15}$ J $= -11,453$ eV

$E_2 = -\dfrac{1}{4} \dfrac{m e^4 2^2}{8 \varepsilon_0^2 h^2} = -0,92\ 10^{-15}$ J $= -2,863$ eV

43) $E_2 - E_1 = \dfrac{hc}{\lambda} \rightarrow \lambda = \dfrac{hc}{E_2 - E_1} = 2,18$ Å

1,41

1,45

44) Bien sûr ce résultat n'est pas compatible avec 43). ~~D'abord~~ Le cuivre métallique n'est pas ionisé, aussi toute les interactions é-é modifient les états énergétiques et donc les λ émission.

51) $K_\lambda = \frac{\Phi_\lambda^*}{\Phi_\lambda}$ $\qquad K_M = \frac{\Phi^*_{555nm}}{\Phi_{555nm}} = 683\ W^{-1}lm$

$V_\lambda = \frac{K_\lambda}{K_M}$ $\rightarrow$ $K_\lambda = K_M \cdot V_\lambda \Rightarrow$

$\rightarrow$ $K_{\lambda 460} = K_M \cdot V_{\lambda 460} = 683 \cdot 0,06 = 40,98\ lm/$

52) $K = K_M \frac{\int V_\lambda \Phi_\lambda d\lambda}{\int \Phi_\lambda d\lambda}$ or Φ_λ = cte de tt l'intervalle

$K = K_M \frac{\int V_\lambda d\lambda}{\int d\lambda}$

53) $K = K_M \frac{\sum V_\lambda \Delta\lambda}{\sum \Delta\lambda}$ or $\Delta\lambda$ = cte

$K = K_M \frac{\Delta\lambda \sum V_\lambda}{\sum \Delta\lambda}$

$\sum V_\lambda = 8,49$

$\Delta\lambda = 10\ nm$

$\sum \Delta\lambda = \lambda_2 - \lambda_1 = 220\ nm$