RADIATION PROPERTIES

FOR BLACKBODIES

$$E_b(T) = \sigma T^4$$

$$\doteq \frac{[\quad]}{[\quad]}$$

[   ], [   ] EMISSIVE P...

ALL [   ]   ALL [   ]

A REAL BODY EMITS LESS

$$E(T) = \epsilon E_b = \epsilon \sigma T^4$$

-OR-

$$\epsilon \equiv \frac{E(T)}{E_b(T)}$$

[   ]

(,   )

@ A PARTICULAR WAVELENGTH, PER UNIT WAVELENGTH

$$\epsilon_\lambda \equiv \frac{E_\lambda(T)}{E_{b,\lambda}(T)}$$

[   ]

IF A SURFACE IS

________, ITS PROPERTIES ARE INDEPENDENT of

________, ITS PROPERTIES ARE INDEPENDENT of

CAN ALSO DEFINE

ϵ_θ :

$\epsilon_{\lambda,\theta}$:

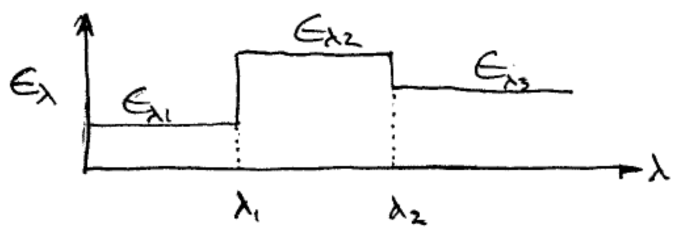
FOR A NON-GRAY SURFACE

$$E = \quad E_{b,\lambda} \quad = \quad \sigma T^4$$

SO

$$\epsilon(T) = \frac{\int_0^\infty \epsilon_\lambda E_{b,\lambda} \, d\lambda}{\sigma T^4}$$

FOR ϵ_λ THAT VARIES IN A STEP-LIKE FASHION; i.e.



$$\epsilon = \frac{\int_0^{\lambda_1} \epsilon_{\lambda_1} E_{b,\lambda} \, d\lambda}{\sigma T^4} + \epsilon_{\lambda_2} \frac{\int_{\lambda_1}^{\lambda_2} E_{b,\lambda} \, d\lambda}{\sigma T^4} + \dots$$

THUS

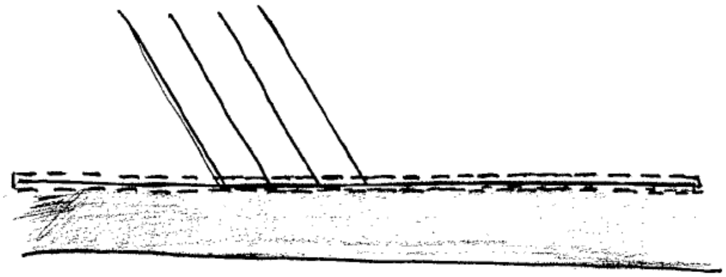
$$\boxed{\epsilon = \epsilon_{\lambda,1} \qquad + \quad \epsilon_{\lambda,2} \qquad + \dots}$$

¡LIST THE ASSUMPTIONS!

NOTES: Radiation properties

OTHER PROPERTIES

INCIDENT RADIATION ( )



$\alpha = \frac{\qquad}{\text{INCIDENT}} = \text{———}$ *

$\rho = \frac{\qquad}{\text{INCIDENT}} = \text{———}$ *

$\tau = \frac{\qquad}{\text{INCIDENT}} = \text{———}$ *

CONS. of ENERGY ON THIS SURFACE REQUIRES

$G + G + G = G$

-OR-

(,)

IF A SURFACE IS ______

$\tau = 0 \Rightarrow$

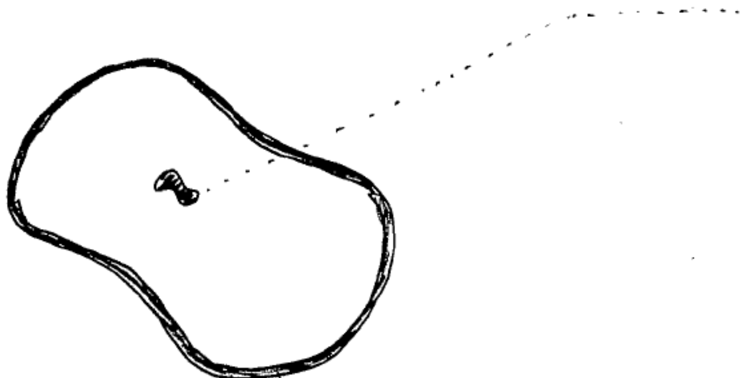
* NOTE THAT THESE PROPS. NOT ONLY DEPEND ON THE SURFACE, BUT ALSO THE SOURCE of THE IRRADIATION!!

IF SOURCE of G IS A BLACKBODY & α VARIES STEPWISE

$$\alpha = \alpha_{\lambda_1} \frac{\int_0^{\lambda_1} E_\lambda \, d\lambda}{\sigma T_{source}^4} + \alpha_{\lambda_2} \frac{\int_{\lambda_1}^{\lambda_2} E_\lambda \, d\lambda}{\sigma T_{source}^4} + \ldots$$

$$= \alpha_{\lambda_1} \qquad\qquad + $$

KIRCHOF 'S LAW



CONS. of ENERGY

$$\frac{dE_{sys}}{dt} =$$

LARGE, ISOTHERMAL ENCLOSURE @

(∴)

[ ] *

WARNING! IF $T_{source} >> T$

OR

$T_{source} << T$

$\neq$!!

* FOR RESTRICTIONS ON $\alpha_{\lambda,\theta} = \epsilon_{\lambda,\theta}$