Journée d'Etude de la SFT

Mesures des propriétés thermiques de solides dans des conditions extrêmes

Paris, 17 décembre 2009

Problématique liée à la mesure des hautes températures par voie optique en présence du rayonnement parasite Application aux matériaux chauffés par rayonnement solaire concentré

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PROBLEMATIQUE GENERALE A LA PYROMETRIE OPTIQUE

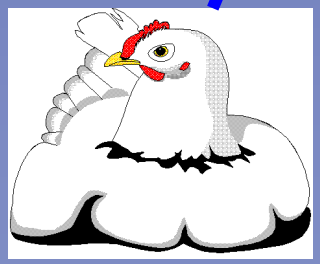
Emission

Réflexion

Transmission

$$S(\lambda,T) = K\,[(1-P)\,[\varepsilon'(\lambda,T)\,L^{\circ}(\lambda,T) + \Sigma_i\,\rho^{i,'}L^{i}(\lambda) + \Sigma_j\,\tau^{j,'}\,L^{j}(\lambda)]]$$

?



EXPRESSION DE LA REFLEXION PARASITE

Cp = 1

Cp = 14 000

PRINCIPALES TECHNIQUES 'Blind Solar' Pyrométrie

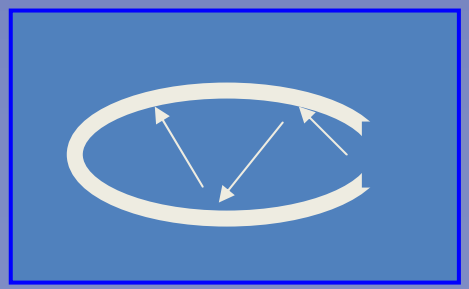
$$G_p \tau_a(\lambda) R^2(\lambda) C_p(\lambda) Ls(\lambda) \Omega_s \int_{\Omega_p} \rho^{\theta,o}(T,\lambda,\theta) \cos(\theta) d\Omega_p$$

Occultation chromatique

$\tau_a(\lambda) = 0$ ou $\tau_f(\lambda) = 0$

Occultation temporaire

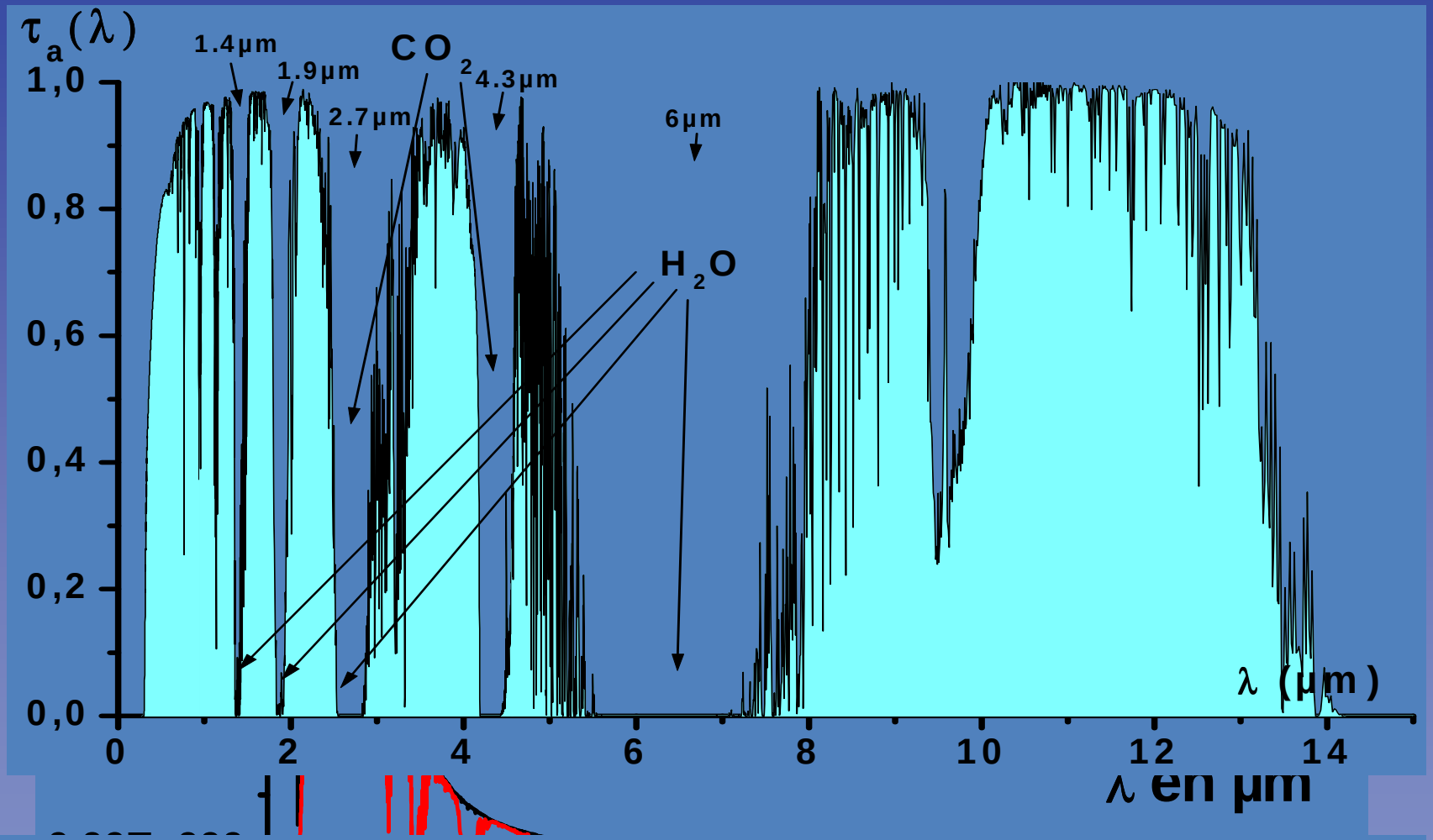
$L_s(t) = 0$



Conditions 'Corps noir'

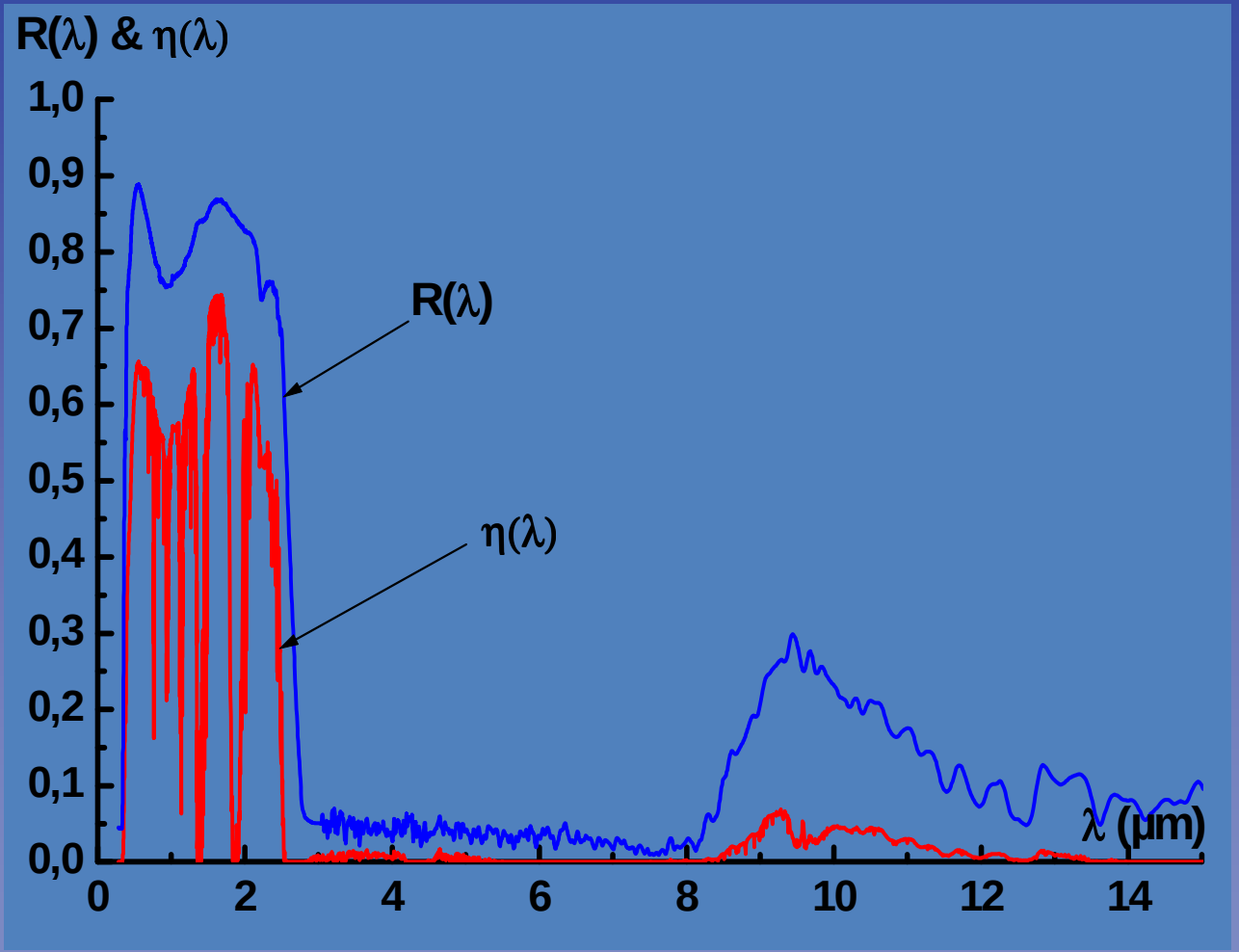
$\rho = 0$

PROPRIETES SPECTRALES DU RAYONNEMENT SOLAIRE



Absorption spectrale atmosphérique

FACTEUR DE PERFORMANCE SOLAIRE D'UNE "CSP"



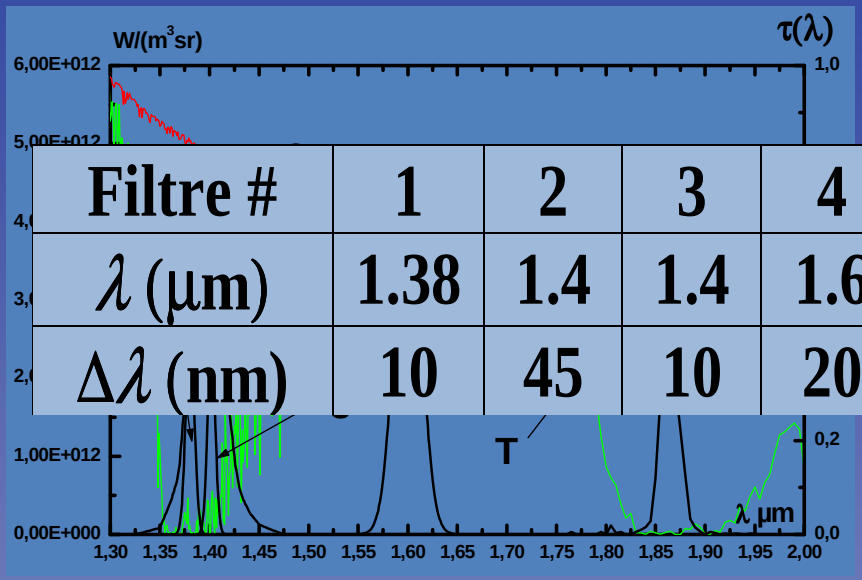
$$\eta(\lambda) = \tau_a(\lambda)\, R^2(\lambda)$$

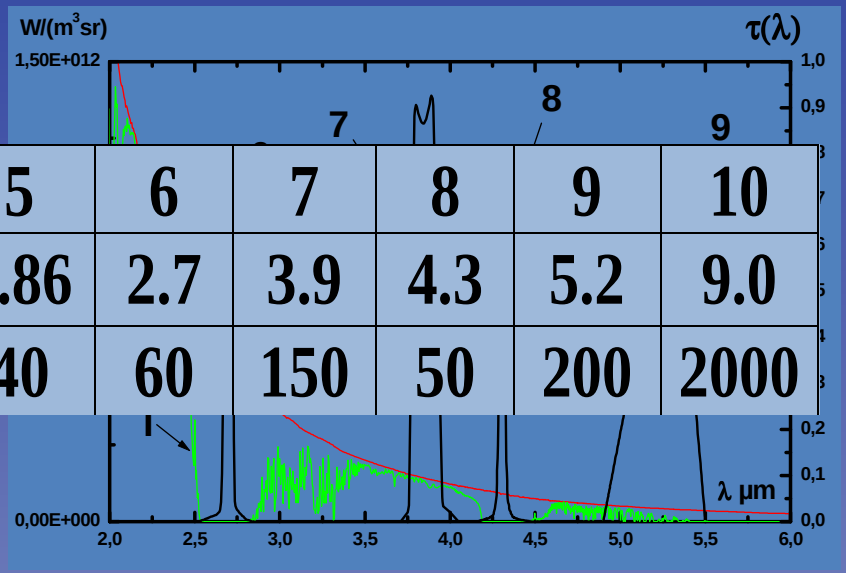
Pour la pyrométrie optique

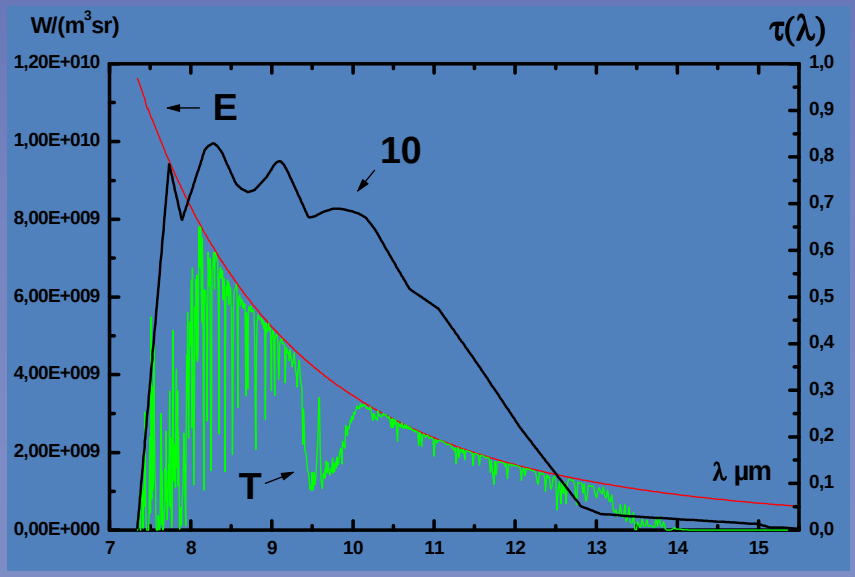
$\eta(\lambda) \Rightarrow 0$

BANDES SPECTRALES EXPLOREES

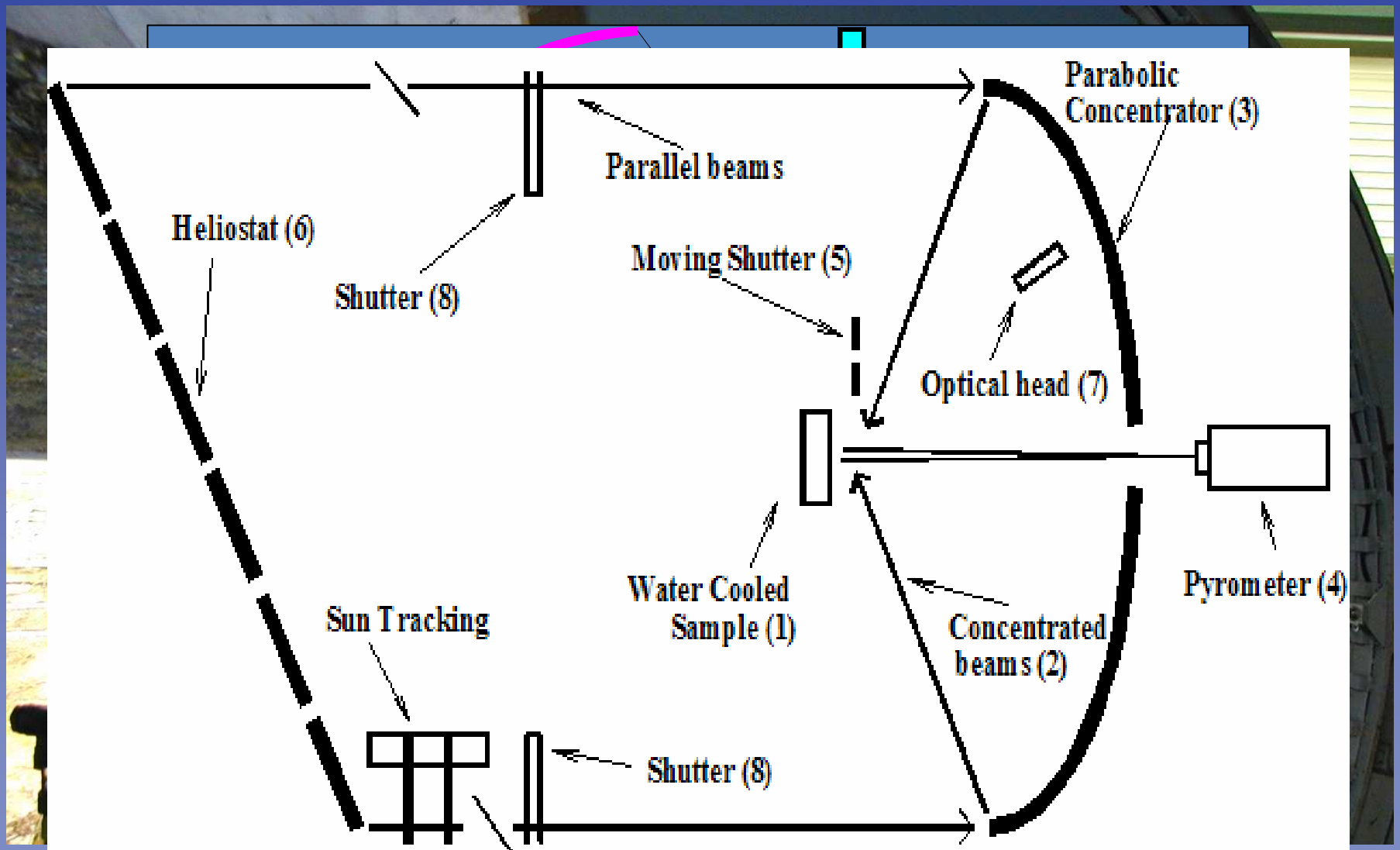
Filtre #	1	2	3	4	5	6	7	8	9	10
λ (µm)	1.38	1.4	1.4	1.6	1.86	2.7	3.9	4.3	5.2	9.0
$\Delta\lambda$ (nm)	10	45	10	20	40	60	150	50	200	2000



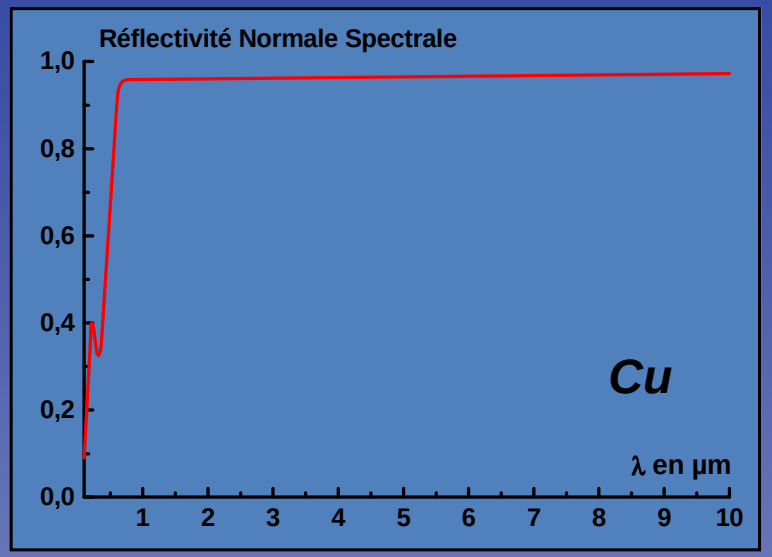


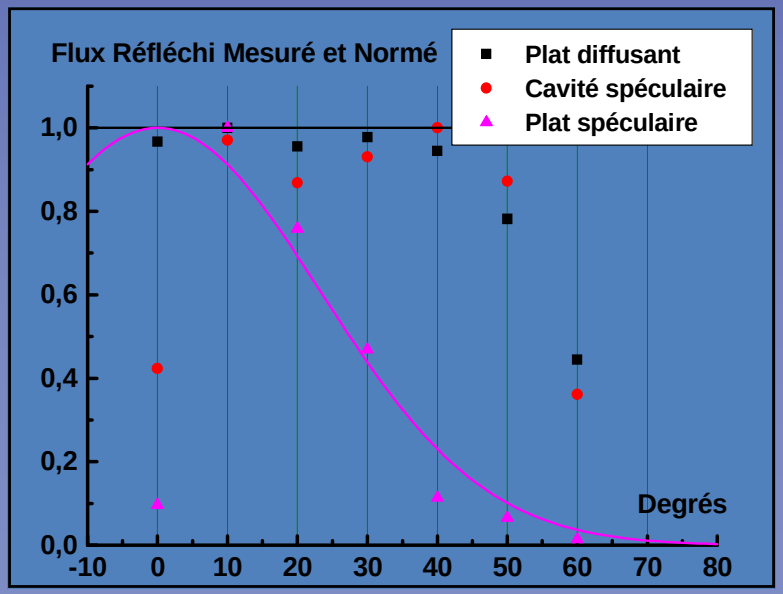


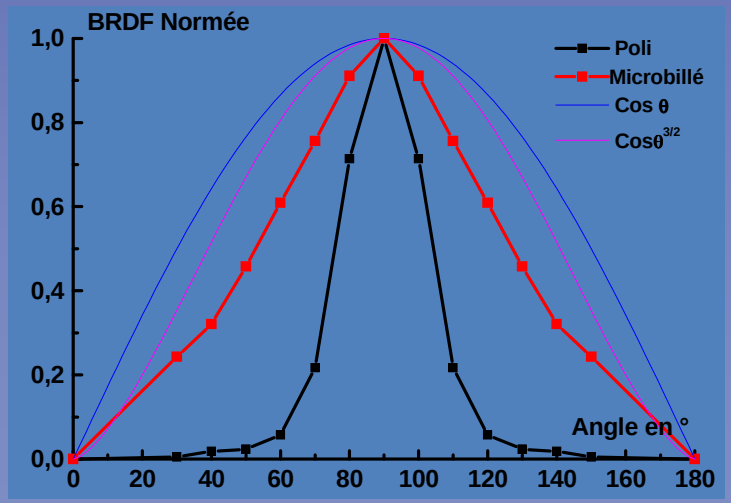
LES MOYENS D'ESSAIS



CARACTERISATION DE LA CIBLE





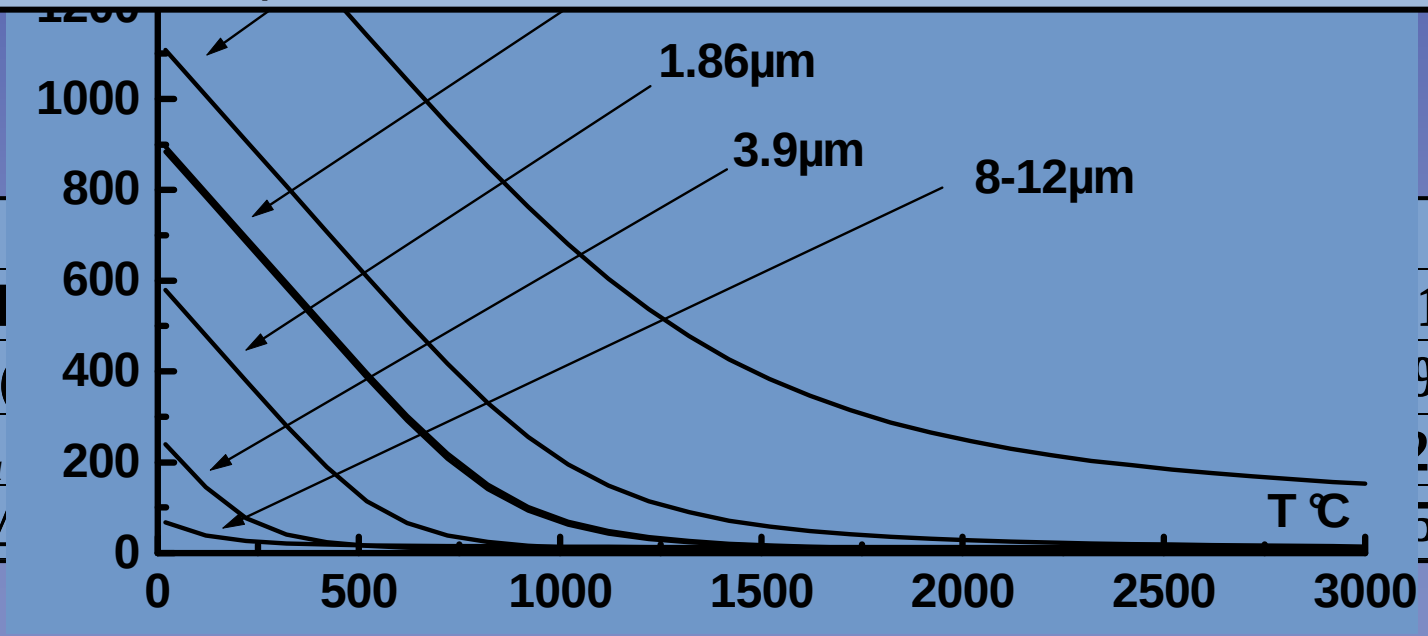


RESULTATS THEORIQUES ET EXPERIMENTAUX

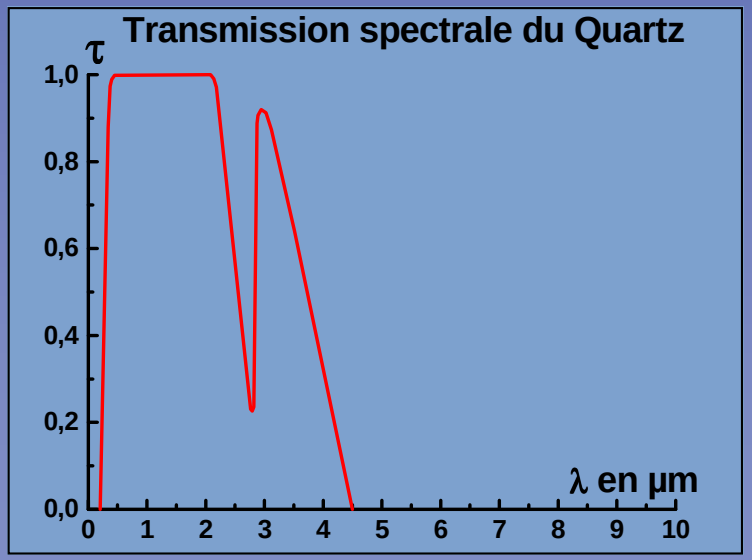
Théoriques

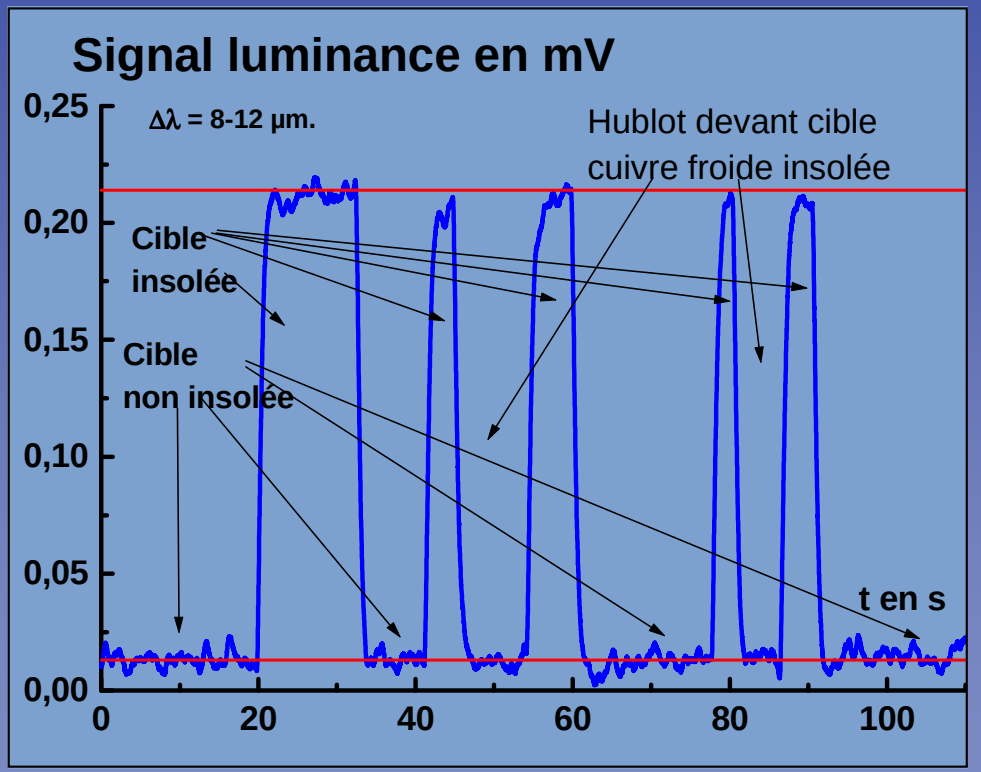
Filtre #	1	2	3	4	5	6	7	8	9	10
λ (µm)	1.38	1.4	1.4	1.6	1.86	2.7	3.9	4.3	5.2	9.0
$\Delta\lambda$ (nm)	10	45	10	20	40	60	150	50	200	2000
$\tau_r(\Delta\lambda)$ (%)	2	8	5	96	2	0	89	0	22	67

τ_r= *Filtre + Atmosphère*

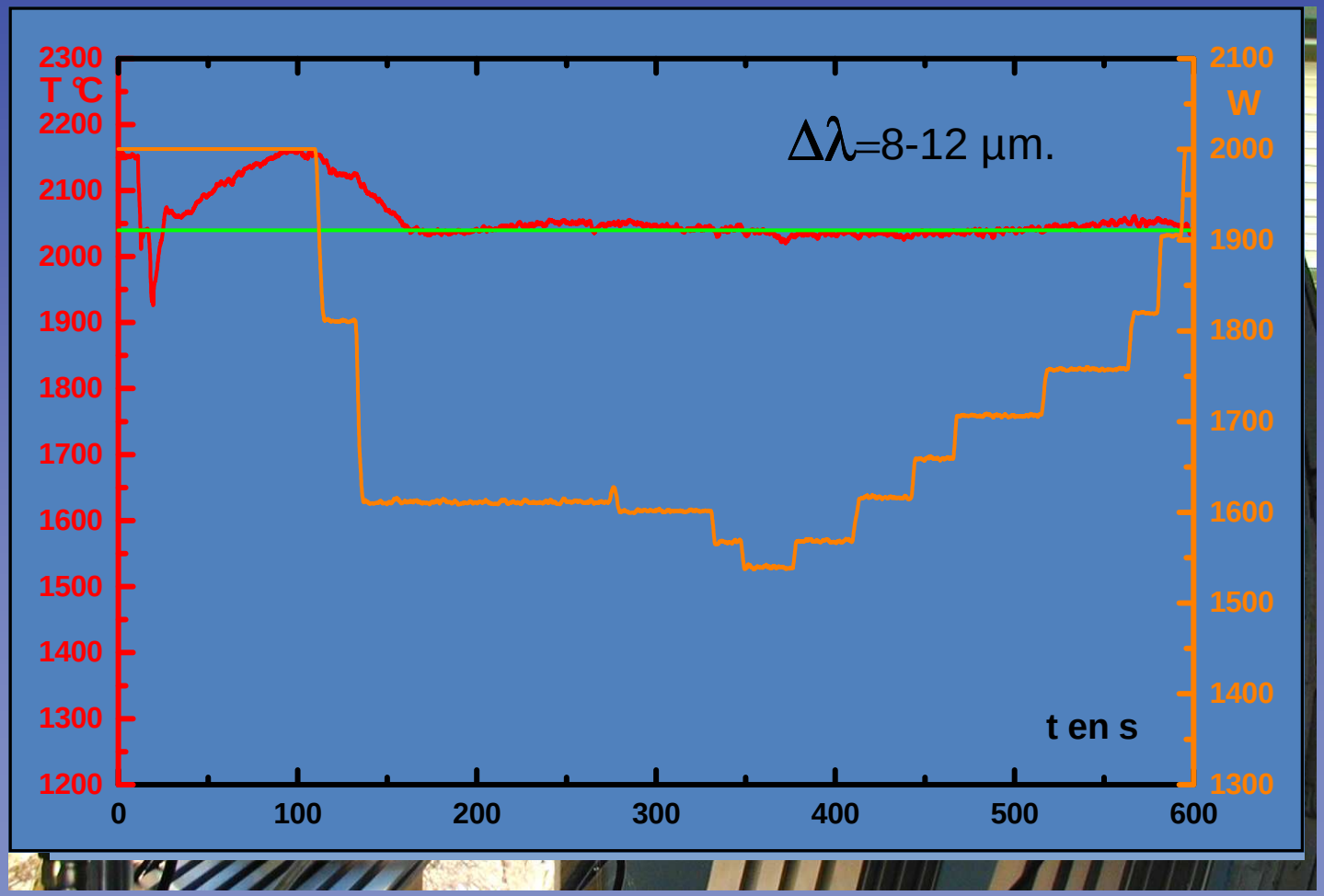


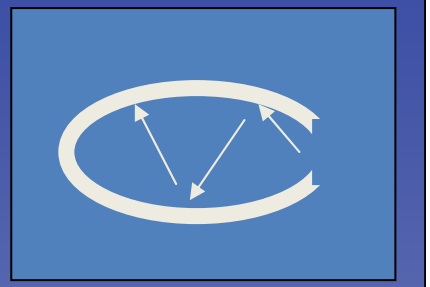
UTILISATION D'UN FILTRE





APPLICATION AU PALIERS DE CONGELATION H.T. A DUREE CONTROLEE





PERSPECTIVES

Programme Européen I3 "SFERA"

Problématique de la mesure de température des récepteurs solaires

Définition d'un axe de recherche

SOLAR BLIND PYROREFLECTOMETRIE : 2.7 et 5 µm.

D. Hernandez, G. Olalde, C. Gueymard
Analysis and experimental results of Solar-Blind temperature measurements in solar Furnaces
Journal of Solar Energy Engineering Fev. 2004, Vol. 126

Merci de votre attention