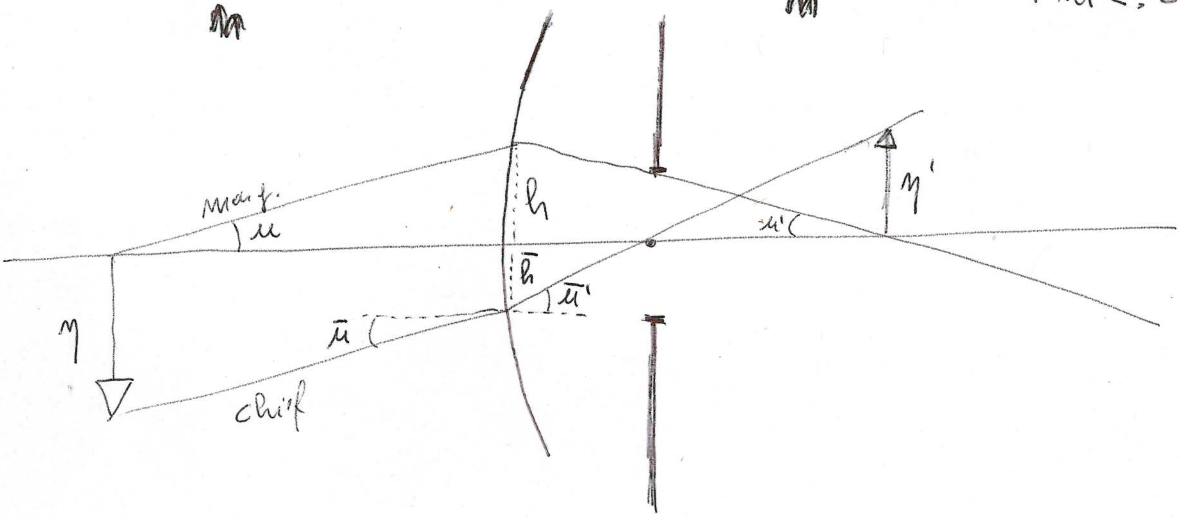
fig 2.4



∀ surface

$$\begin{cases} n'u' = nu - hc(n'-n) & \langle 2.16 \rangle \text{ per il marginal ray} \\ n'\bar{u}' = n\bar{u} - \bar{h}c(n'-n) & \text{per il chief ray} \end{cases}$$

$$\begin{cases} \dfrac{n'\cdot u' - nu}{-h} = \cancel{-h}c(n'-n) \\ \dfrac{n'\bar{u}' - n\bar{u}}{-\bar{h}} = \cancel{-\bar{h}}c(n'-n) \end{cases}$$

$$\frac{n'\cdot u' - nu}{+h} = \frac{n'\bar{u}' - n\bar{u}}{+\bar{h}}$$

angolo solido della radiazione che incide sull'area A in un mezzo n

$$nA\Omega = \text{costante}$$

$$(n'\cdot u' - nu)\,\bar{h} = (n'\bar{u}' - n\bar{u})\,h$$

$$(nu - n'\cdot u')\,\bar{h} = (n\bar{u} - n'\bar{u}')\,h$$

$$n(u\cdot\bar{h} - \bar{u}h) = n'(u'\bar{h} - \bar{u}'\cdot h) = \mathcal{H} \quad @ \text{ refraction} \quad \langle 2.24 \rangle$$

(analogo a Greivy

$$\boxed{Z} \quad n(u\bar{y} - \bar{u}y) = n'(u'\bar{y} - \bar{u}'y) \quad (5.11\,z)$$

)

$\forall$ spazio

$$\langle 2.19\rangle \begin{cases} h_{i+1} = h_i + u_i' \cdot d_i & \text{marginal} \\ \bar{h}_{i+1} = \bar{h}_i + \bar{u}_i' \cdot d_i & \text{chief} \end{cases}$$

$$\frac{h_{i+1} - h_i}{u_i'} = d_i = \frac{\bar{h}_{i+1} - \bar{h}_i}{\bar{u}_i'}$$

$$\left(h_i - h_{i+1}\right)\bar{u}_i' = \left(\bar{h}_i - \bar{h}_{i+1}\right)u_i'$$

$$n\left(u_i' \cdot \bar{h}_i - \bar{u}_i' h_i\right) = \left(u_i' \bar{h}_{i+1} - \bar{u}_i' h_{i+1}\right) n \equiv \mathcal{H}$$

cvd

marginal ray @ OBJECT = 0 !!

TRANSVERSE MAGNIFICATION (2.5.1)

angolo solido

$$H \equiv n(u\eta - \bar{u}h) = n(u\eta - \bar{u}\cdot\emptyset) = nu\eta = n \cdot A \cdot \Omega$$

marginal ray @ IMAGE = 0!!

$$H \equiv n'(u'\eta' - \bar{u}' \cdot 0) = n'u'\eta' = n' \cdot A' \cdot \Omega'$$

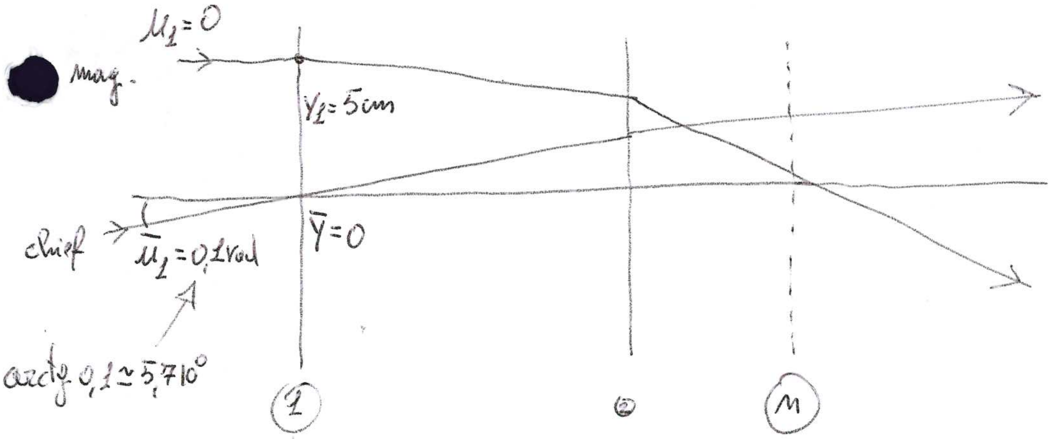
$= \Delta$

$$n \cdot u \cdot \frac{\cancel{\eta}}{\cancel{\eta}} = n' \cdot u' \cdot \frac{\eta'}{\eta} \qquad \text{if} \quad m = \frac{\eta'}{\eta} \quad \text{(Transverse mag.)}$$

$$\boxed{\frac{\eta'}{\eta} = m = \frac{n \cdot u}{n' \cdot u'}} \quad \langle 2.33\rangle$$

3

Lagrange Invariance ZEMAX
Geary 5.6



<fig 1>
Telescopio galileiano

$$\begin{cases} \text{mag.} & n'u' = nu - y\varphi \\ \text{chief} & n'\bar{u}' = n\bar{u} - \bar{y}\varphi \end{cases} \quad \cancel{\text{chief mag}} \quad \Rightarrow \begin{cases} \dfrac{n'u' - nu}{y} = -\varphi \\ \dfrac{n'\bar{u}' - n\bar{u}}{\bar{y}} = -\varphi \end{cases} \Rightarrow$$

$$\frac{nu - n'u'}{y} = \frac{n\bar{u} - n'\bar{u}'}{\bar{y}} \Rightarrow \frac{n'\bar{u}'}{\bar{y}} - \frac{n'u'}{y} = \frac{n\bar{u}}{\bar{y}} - \frac{nu}{y} \Rightarrow$$

$$\Rightarrow n'\left(\frac{\bar{u}'}{\bar{y}} - \frac{u'}{y}\right)\cdot\bar{y}y = n\left(\frac{\bar{u}}{\bar{y}} - \frac{nu}{y}\right)\cdot\bar{y}y \Rightarrow n'\left(\bar{u}'y - u'\bar{y}\right) = \underbrace{n\left(\bar{u}y - u\bar{y}\right)}_{\mathcal{H}}$$

In <fig 1> su sup. 1

$$\mathcal{H} = n\left(\bar{u}y - u\bar{y}\right) = 1\cdot\left(0,1\text{ rad}\cdot 5\text{cm} - 0\cdot 0\right) = 0,5\text{ cm}$$

1) ZEMAX lesson1_lagrange_afocal.zmx

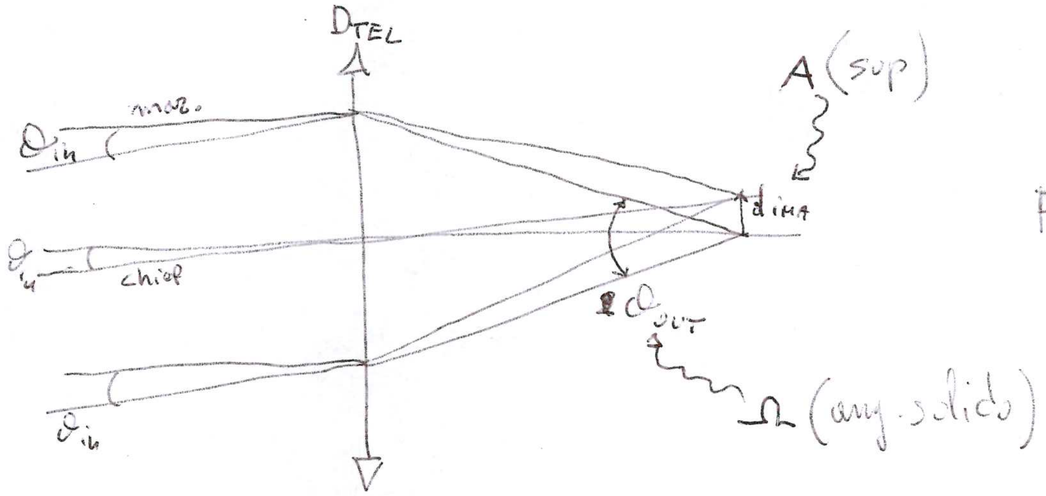
$$\begin{cases} \alpha = \dfrac{1}{10}\text{ rad} = 5,729^\circ \\ \varnothing_{lente} = 100\text{ mm} \end{cases} \qquad LINV = \overset{\bar{u}_1}{\overbrace{tg\alpha}} \cdot \overset{y_1}{\overbrace{\frac{\varnothing_{lente}}{2}}} = 5,06$$

B) ZEMAX LBT_TW.ZMX

$$\begin{cases} Pup.IN = 8221{,}87\ mm \Rightarrow y = \dfrac{Pup_{IN}}{2} \\ \alpha = 0.001^\circ \end{cases}$$

$$\mathcal{H} = tg\,\alpha \cdot \frac{Pup.IN}{2} = 0{,}0717\ mm$$

$$D_{TEL} \cdot \vartheta_{in} = d_{IMA} \cdot \vartheta_{OUT}$$



Flusso / $m^2 \cdot sr \cdot s$ = Kost.

$A\,\Omega$ = Kostante

$$\mathcal{H} = n(\bar{u}y - u\bar{y})$$

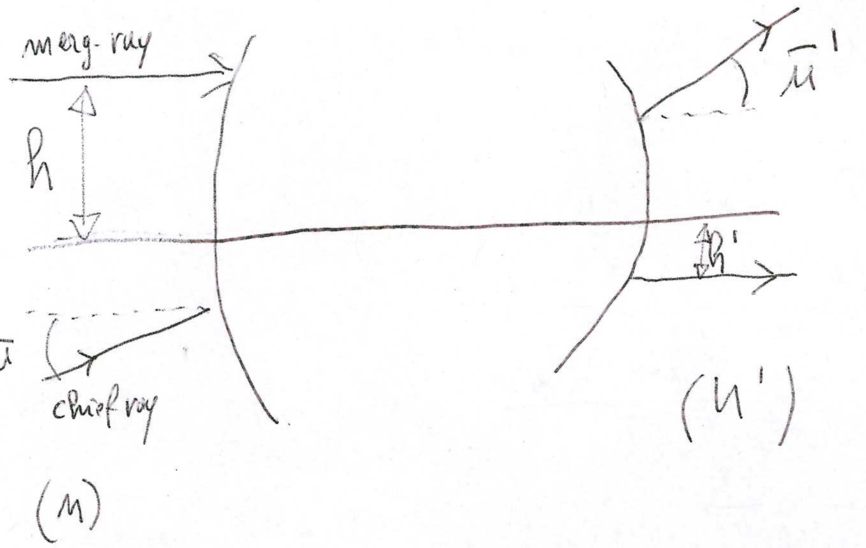
@ TEL. Sup
$$\begin{cases} \bar{u} = \vartheta_{in} & \text{(ang chief ray)} \\ y = D_T/2 & \text{(alt. mar. ray)} \\ u = \vartheta_{in} & \text{(ang mar. ray)} \\ \bar{y} = 0 & \text{(alt. chief ray)} \end{cases}$$

$$H = \vartheta_{in} \cdot \frac{D_T}{2} - 0 \cdot 0$$

@ IMM
$$\begin{cases} \bar{u} = \vartheta_{OUT}/2 \\ y = 0 \\ u = \vartheta_{OUT}/2 \\ \bar{y} = d_{IMA} \end{cases}$$

$$H = \frac{\vartheta_{OUT}}{2} \cdot \cancel{0} - \frac{\vartheta_{OUT}}{2} \cdot d_{IMA}$$

$$\boxed{\vartheta_{in} \cdot D_{TEL} = \vartheta_{OUT} \cdot d_{IMA}}$$



se afocale : $\begin{cases} u=0 \\ u'=0 \end{cases} \Rightarrow H = -n\bar{u}\,h = -n'\bar{u}'\,h'$

θ_{mag} = angular magn. $= \dfrac{\bar{u}'}{\bar{u}} = \dfrac{n \cdot h}{n'\,h'} \overset{aria}{=} \dfrac{h}{h'}$