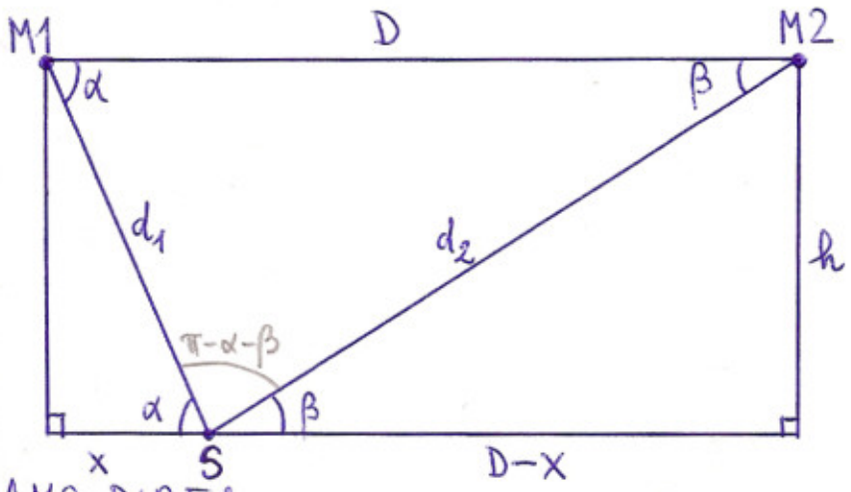

NOTI
h
D
Δ

COSA POSSIAMO DIRE:

Pitagora: $x^2+h^2=d_1^2$

$(D-x)^2+h^2=d_2^2$

differenza di cammino

$d_1-d_2=c\cdot\tau_i=\Delta \Rightarrow d_1=d_2+\Delta$

(c: velocità del suono; τ_i: ritardo)

$c=20{,}1\sqrt{T}$ $T(K)$

triangoli rettangoli:

$h=d_1\sin\alpha$

$h=d_2\sin\beta$

$x=d_1\cos\alpha$

$D-x=d_2\cos\beta$

Carnot: $D^2=d_1^2+d_2^2-2d_1d_2\cos(\pi-\alpha-\beta)=d_1^2+d_2^2+2d_1d_2\cos(\alpha+\beta)$

VOGLIAMO ESPRIMERE x IN FUNZIONE DI h, D, Δ

$$\begin{cases} x^2+h^2=d_2^2+\Delta^2+2\Delta d_2 \quad (1) \\ D^2+x^2-2Dx+h^2=d_2^2 \end{cases} \rightarrow D^2-2Dx+\Delta^2+2\Delta d_2=0$$

$$x=\frac{D^2+\Delta^2+2\Delta d_2}{2D}$$

Sostituisco x in (1):

$$D^4+\Delta^4+4\Delta^2d_2^2+2D^2\Delta^2+4D^2\Delta d_2+4\Delta^3d_2+4D^2h^2=4D^2d_2^2+4D^2\Delta^2+8D^2\Delta d_2$$

$$4(\Delta^2-D^2)d_2^2+4(\Delta^3-D^2\Delta)d_2+D^4+\Delta^4+4D^2h^2-2D^2\Delta^2=0$$

$$d_2=\frac{-2(\Delta^3-D^2\Delta)\pm\sqrt{4(\Delta^3-D^2\Delta)^2-4(\Delta^2-D^2)(D^4+\Delta^4+4D^2h^2-2D^2\Delta^2)}}{4(\Delta^2-D^2)}$$

Nella radice $4\Delta^6+4D^4\Delta^2-8\Delta^4D^2-4\Delta^2D^4-4\Delta^6-16\Delta^2D^2h^2+8D^2\Delta^4$

$+4D^6+4D^2\Delta^4+16D^4h^2-8D^4\Delta^2=$

$=16h^2D^2(D^2-\Delta^2)+4D^2\underbrace{(D^4-2D^2\Delta^2+\Delta^4)}_{(D^2-\Delta^2)^2}=$

$$= 4D^2(D^2-\Delta^2)\cdot\left[4h^2+D^2-\Delta^2\right]$$

$$d_2 = \frac{-2\Delta\cdot(\Delta^2-D^2) \pm 2D\sqrt{(D^2-\Delta^2)\left[4h^2+D^2-\Delta^2\right]}}{4(\Delta^2-D^2)} =$$

$$= -\frac{\Delta}{2} \pm \frac{D}{2}\sqrt{\frac{4h^2+D^2-\Delta^2}{D^2-\Delta^2}} \qquad \text{scelgo } + \text{ (altrimenti } d_2<0)$$

Dunque $$d_2 = -\frac{\Delta}{2} + \frac{D}{2}\sqrt{\frac{4h^2+D^2-\Delta^2}{D^2-\Delta^2}}$$

$$X = \frac{D^2+\Delta^2+2\Delta d_2}{2D}$$