L'EFFETTO DOPPLER

(C) DOPPLER 1803-1853)

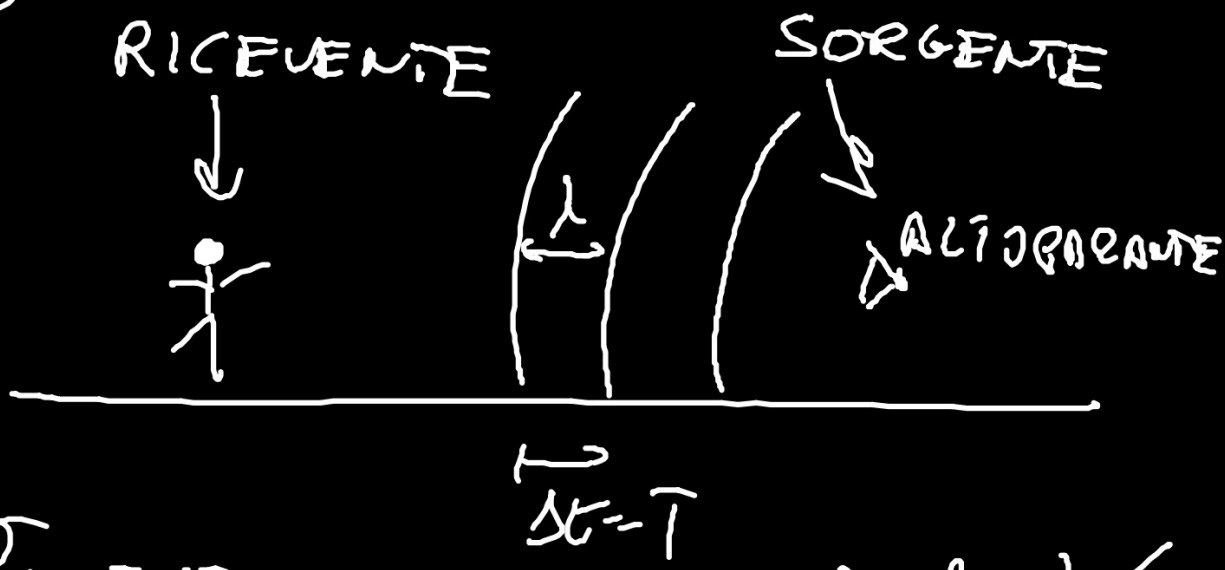
EFF. DOPPLER

=

VARIAZIONE DELLA FREQUENZA DI UNA ONDA IN RELAZIONE AL MOTO DELLA SORGENTE E/O DEL RICEVENTE.

ONDE SONORE

A)

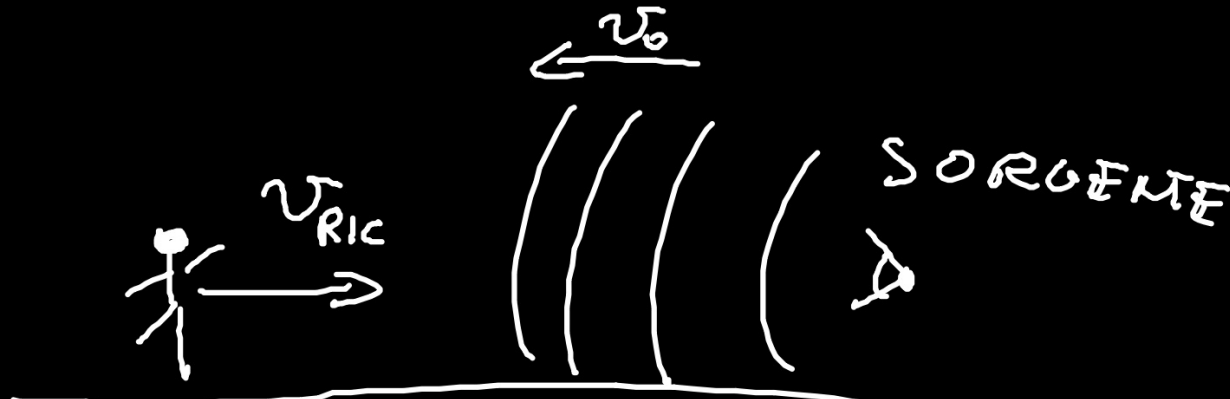


$v_{RIC} = 0$

$v_{SOR} = 0$

$\lambda \cdot f = \lambda / T = v$

B) $v_{RIC} \neq 0 \qquad v_{SOR} = 0$



$$v' = v_{RIC} + v_0 = \lambda \cdot f'$$

$$v_{RIC} + v_0 = \lambda \cdot f'$$

$$v_0 = \lambda \cdot f_0$$

$$\lambda = \frac{v_0}{f_0}$$

$$v_{RIC} + v_0 = \frac{v_0}{f_0} f'$$

$$f' = f_0 \cdot \frac{v_{RIC} + v_0}{v_0}$$

$v_{RIC} > 0 \Rightarrow$ RIC IN AVVICINAM.

N.B. RIC E' IN AVVICINAM.

$v_{RIC} > 0$

$\downarrow$

$v_{RIC} + v_0 > v_0$

$f' > f_0$ LA FREQ. AUMENTA

SE $v_{RIC} < 0$

RIC. E' IN ALLONTANAM.

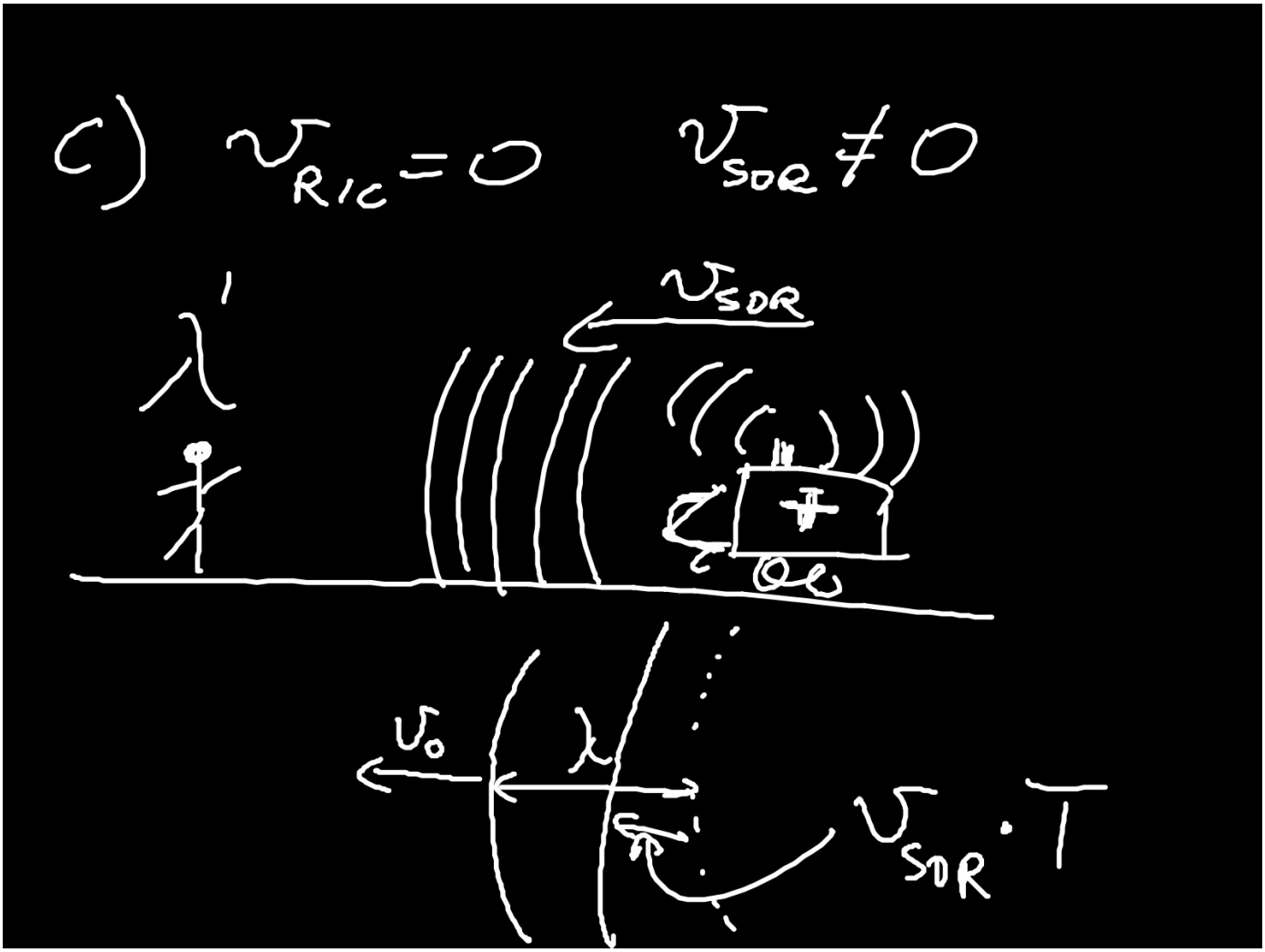
$\downarrow$

$V_{RIC} + V_0 < V_0$

$\downarrow$

$f' < f_0$ LA FREQ. E' PIU' BASSA

c) $v_{R/C} = 0 \qquad v_{SOR} \neq 0$



$$\lambda' = \lambda - v_{sob} \cdot T$$

$$T = \frac{1}{f_0} \qquad \lambda = \frac{v_0}{f_0}$$

$$\lambda' = \frac{v_0}{f'}$$

$$\lambda' = \frac{v_0}{\nu'}$$

$$\nu' = \frac{v_0}{\lambda'} = \frac{v_0}{\lambda - v_{SOR} \cdot T}$$

$$\nu' = \frac{\nu_0}{\lambda - \nu_{зов} \cdot \frac{1}{\nu_0}}$$

$$= \frac{\nu_0}{\frac{\nu_0}{\nu_0} - \nu_{зов} \frac{1}{\nu_0}}$$

$$f' = \frac{v_0}{\frac{1}{f_0}\left(v_0 - v_{SOR}\right)}$$

$$f' = f_0 \cdot \frac{v_0}{v_0 - v_{SOR}}$$

N.B. SE SORGI SI AVVICINA:

$v_{sor} > 0$

$v_0 - v_{sor} < v_0$

$\downarrow$

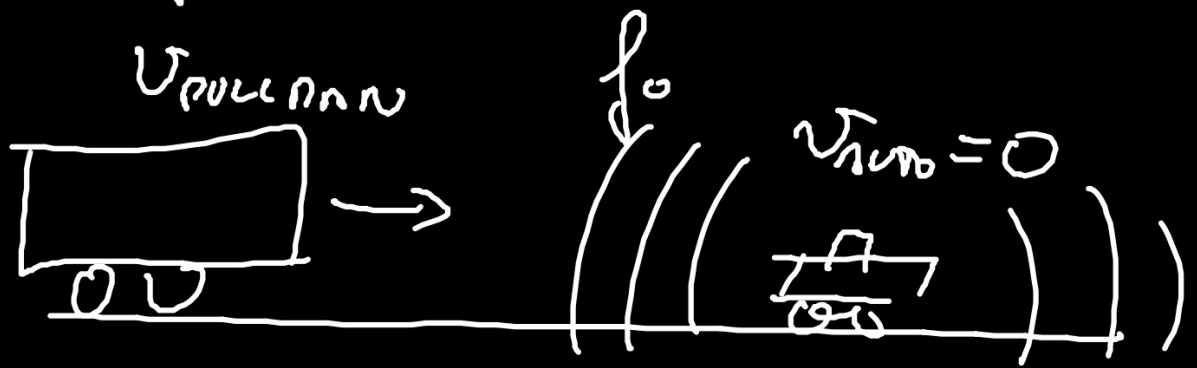
$f' > f_0$ LA FREQ. E' PIU' ALTA.

D) $v_{RIC} \neq 0 \quad v_{SOR} \neq 0$

$$f' = f_0 \frac{v_0 + v_{RIC}}{v_0 - v_{SOR}}$$

Es.: $v_s = 340\ m/s$

$f_0 = 50\ Hz$



$v_{PULLMAN} = 21\ m/s$

$$f' = f_0 \frac{v_{RIC} + v_0}{v_0}$$

$$= 50\,Hz \cdot \frac{21\,m/s + 340\,m/s}{340\,m/s}$$

$$= 53.03\,Hz \qquad 1.061\overline{7}$$

Es.:

$f_0 = 1100\ Hz \quad v_{SOR} = 0$

$f' = 1300\ Hz$

$v_{RIL} = ?$

$$f' = f_0 \frac{v_{RL} + v_0}{v_0}$$

$$v_0 = 340\ m/s$$

$$\frac{f'}{f_0} = \frac{v_{RL}}{v_0} + 1$$

$$v_{R1} = v_0 \cdot \left(\frac{f'}{f_0} - 1 \right)$$

$$v_{R1} = 340 \frac{m}{s} \cdot \left(\frac{1300\,Hz}{1100\,Hz} - 1 \right)$$

$$\approx 61.82\ m/s$$