

Sound and Light Speed Limits

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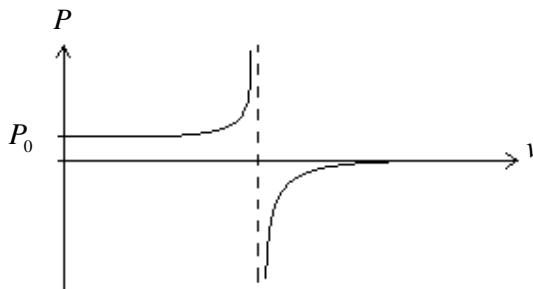
Mathematically it's impossible to overcome the sound and the light barrier.
The argument for the impossibility of overcoming light speed is the same used for sound and we know that mach 2 is possible.

For sound, pressure Doppler formula:

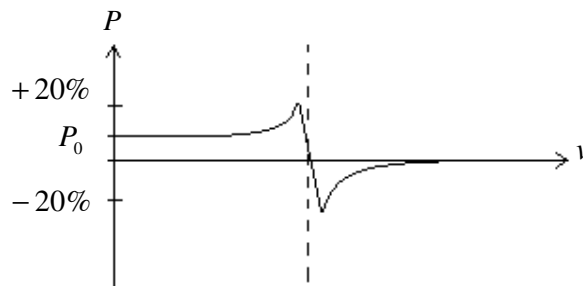
$$P = P_0 \frac{V}{V - v}$$

P – pressure; V – sound speed; P0 – normal pressure; v – airplane speed.

Mathematical graphic:



Real graphic:

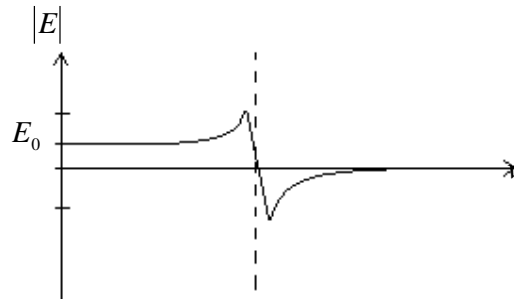


What happens for light must also happens for light.

Temperature: $T^4 = T_0^4 \frac{c}{c - v}$

Radiation pressure: $P = P_0 \frac{c}{c-v}$

Rest energy: $E = \frac{E_0}{\sqrt{1-v^2/c^2}}$



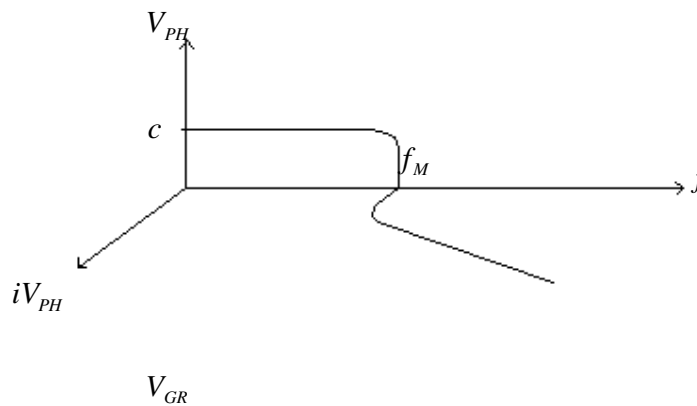
Overcome the light barrier is easier than overcome the sound one.

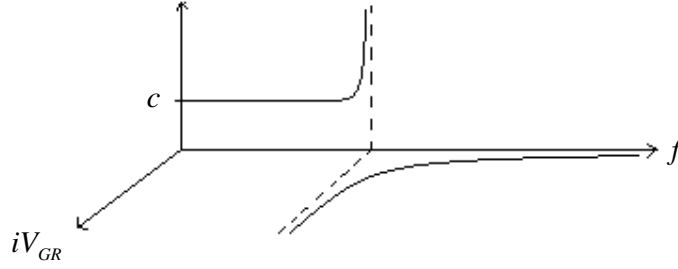
Group and phase speeds

$$V_{PH} \cdot V_{GR} = c^2 \quad \text{and} \quad V_{PH} = w = \sqrt{c^2 - kf^2} = \frac{x}{t}$$

$$V_{GR} = \frac{dx}{dt} \quad \text{and} \quad c^2 t^2 - x^2 = k$$

$$\frac{x}{t} \frac{dx}{dt} = c^2$$





The group speed or the true speed of transmission of information can be infinite.

Group speed of gravity

$$M \cdot w^2 = h \cdot f_M = \frac{h \cdot c}{\sqrt{k}} \quad \Leftrightarrow \quad w = \sqrt{\frac{h \cdot c}{\sqrt{k} M}}$$

$$V_{GR} = \frac{c^2}{w} \quad \Leftrightarrow \quad V_{GR} = c^2 \sqrt{\frac{\sqrt{k}}{h \cdot c}} \sqrt{M}$$

$$V_{GR} = 9 \times 10^{20} \sqrt{M}$$

M – mass of the body

The speed of the transmission of the gravity is variable with the mass of the body and it is faster than light speed.

Imaginary frequencies

There are also imaginary frequencies.

$$\left\{ \begin{array}{l} x = c \frac{x_0 + vt_0}{\sqrt{c^2 - v^2}} \\ f = cf_0 \frac{\sqrt{c^2 - v^2}}{c^2 + vw_0} \end{array} \right. \quad \text{and} \quad v \geq c$$

$$\left\{ \begin{array}{l} x = -ic \frac{x_0 + vt_0}{\sqrt{v^2 - c^2}} \\ f = icf_0 \frac{\sqrt{v^2 - c^2}}{c^2 + vw_0} \end{array} \right.$$

$$v \rightarrow \infty \quad \Leftrightarrow \quad \begin{cases} x = -ict_0 \\ f = ic/x_0 \end{cases}$$

Speed: $w = \sqrt{c^2 + kf^2}$