Physics of Superluminal Communication and Estakhr Relativistic Omega Factor

AHMAD REZA ESTAKHR, Researcher — Superluminal communication is a process by which one might send information at FTL (Faster Than Light). I try to developed this idea in detail and with mathematical rigor. The velocity of particle (information) is represented by the group velocity \( v_g \). If \( v_g \geq c \) then

\[ \gamma = \frac{1}{\sqrt{1 - \frac{v_g^2}{c^2}}} = -i\Omega \]

that which means \( \gamma \) (Lorentz factor) is an imaginary number (at \( v_g \geq c \)), that can be written as a real number multiplied by imaginary unit \( i \), which is defined by its property \( i^2 = -1 \). and this is

\[ \Omega = \frac{1}{\sqrt{1 - \frac{v_g^2}{c^2}}} \]

Estakhr Omega factor.

then kinetic energy of FTL particle is Complex number

\[ k = E - E_o = -E_o(i\Omega + 1) \]

we still use Lorentz Symmetry, \( \gamma^2 - \gamma^2 \beta^2 = 1 \) which means faster than light is particle-like,

\[ i^2\Omega^2 - i^2\Omega^2 \beta^2 = \Omega^2 \beta^2 - \Omega^2 = 1 \]

The phase velocity can be found from

\[ v_{ph} = \frac{c^2}{v_g} \]

this shows that the phase velocity of FTL particle is less than the speed of light \( v_{ph} = \frac{c^2}{v_g \geq c} \leq c \) which means that speed of material particles can exceed \( c \) but finally, the product of the group and phase velocities is equal to \( c^2 \), in general:

if \( v_g \leq c \) then \( v_{ph} \geq c \), if \( v_g \geq c \) then \( v_{ph} \leq c \), if \( v_g = c \) then \( v_{ph} = c \) i.e., \( v_g v_{ph} = c^2 \).

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