Equations for determining composite physical properties from part-properties in SR

(James MC)

Energy:

$$(1) \qquad E_{system} = \sum_{i=1}^{N} E_i$$

Momentum:

$$(2) \qquad p_{system} = \sum_{i=1}^{N} p_i$$

Mass (for system composed of particles 1 & 2):

$$(3) \qquad m_{system} = \left[\left(\sqrt{m_1^2 + \frac{p_1^2}{c^2}} + \sqrt{m_2^2 + \frac{p_2^2}{c^2}} \right)^2 - \left(\frac{p_1 + p_2}{c^2} \right)^2 \right]^{1/2}$$

Mass (generalization of the last equation):

$$(4) \qquad m_{system} = \left[\left(\sum_{i=1}^{n} \frac{E_i}{c^2} \right)^2 - \left(\sum_{i=1}^{n} \frac{p_i}{c} \right)^2 \right]^{1/2}$$