Physics 457 Notes

Particle Physics & Cosmology at University of Michigan

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Lecture 1. (`Jan 5th`) *First Day*

eV is energy required to move 1 e^- through 1 V
We can set $c, \hbar, k_B = 1$ A result of that is being able to describe all quantities in terms of energies or inverse energies.

Lecture 2. (`Jan 7th`) *Second Day*

eV are a thng
Natural units are thing

Dimension	SI	Planck	Natural
Energy	1.602×10^{-10} J	1 GeV	1 GeV
Mass	1.783×10^{-27} kg	1 GeV/c^2	1 GeV
Momentum	5.33×10^{-19} kg*m/s	1 GeV/c	1 GeV
Distance	1.973×10^{-16} m	$\hbar$c GeV	1 GeV^{-1}
Time	5.33×10^{-19} kg*m/s	1 GeV/c	1 GeV^{-1}

Table 1: Units

Proper time is Δt_0 with the clock at rest in that frame
Time dilation is $\Delta t = \gamma \Delta t_0$ in the frame
Proper length is Δx_0 with the clock at rest in that frame
Length Contraction is $\Delta x = \Delta x_0 / \gamma$ in the frame

Lecture 3. (`Jan 12th`) *Finishing Special Relativity*

Invariant vs constant and how they are different.
Different relationships for beta and gamma
Lorentz transform in matrix form as boost.