## Tarea 10 Física del Electrón

1. Demuestre que, usando la transformacion de Lorentz, que la ecuación de onda para una onda Electro-Magnetica es invariante.
2. An airplane travels at a constant speed $v$ for a distance of 3000 km as measured by a stationary observer. The pilot measures the flight time to be $\Delta t$ and the stationary observer measures the flight time to be $\Delta t^{\prime}$. (a) Which time interval is longer? (b) If $\left|\Delta t-\Delta t^{\prime}\right|=4 \mathrm{~ns}$, determine the speed of the airplane.
3. In the laboratory frame a particle with the speed $v=0.99 c$ travels a distance of 1 mm before spontaneously decaying. What is the proper lifetime of the particle?
4. (a) The muon $\left(\mu^{ \pm}\right)$has a proper lifetime of $2.2 \mu \mathrm{~s}$. If a $\mu$ has a speed of $0.99 c$, what is the average distance that it travels before decaying? (b) The charged pion ( $\pi^{ \pm}$) has a proper lifetime of 26 ns . If a $\pi$ has a speed of $0.99 c$, what is the average distance that it travels before decaying?
5. Determina la masa de un protón con la energía máxima del LHC.
6. Determina $\gamma$ para un coche de la Fórmula 1 al final de una recta.
7. Read Measurement of the neutrino velocity with the OPERA detector in the CNGS beam. arXiv:1109.4897v1 [hep-ex]. Discuss the implications of the result reported in this paper would be correct. Also discuss where the measurement could be wrong.
