Exercise 1

A 300 μm-thick silicon detector is perpendicularly traversed by 30 GeV electrons. The induced charge signal is read by a charge preamplifier that is affected by an electronic noise of 750 electrons (standard deviation).

1) Show that the radiation loss does not contribute significantly to the signal.
2) Compute the maximal kinetic energy that can be transfered to an electron.
3) Is this max transfer possible ?
4) Find an estimate of the maximal electron energy that can be deposited in this detector.
5) What is the right stopping power formula to be used then ?
6) Compute the average energy deposited in this detector.
7) Compute the most probable signal.
8) What is the S/N ratio
9) conclusion