

- Home Work : I1. Introduction

Answer the following questions.

- Q.I1.1 Rutherford discovered nucleus in 1911 by observing scattering of alpha particle with Gold-foil. Please explain why this result shows the existence of nucleus in gold atom? What is the essence of the Rutherford experiment?
- Q.I1.2 Why can not we reach higher energy with any DC (static field) accelerator?
- Q.I1.3 What is the practical and fundamental limits of proton cyclotron energy?
- Q.I1.4 LHC is constructed in LEP tunnel (27km circumference) and the designed CME is 14 TeV. As the upgrade, let us consider 28 TeV CME (double) with the same tunnel. Is it possible? If so, what is the critical issue?
- Q.I1.5 LHC (proton collider) and ILC ($e^+ e^-$ collider) are complementary from a scientific point of view. Please explain the reasons.
- Q.I1.6 Dark-matter is a massive object which we can not see. How do we know the existence of the dark matter? What is the evidence?

- Home Work : I2. ILC

Answer the following questions.

Q.I2.1 ILC is an $e^+ e^-$ collider with variable CME from 240 GeV to 1 TeV. What kind of physics process can be studied in this energy region?

Q.I2.2 How do we get the polarized electrons?

Q.I2.3 Electron beam is generated as photo-electron, but positron is generated by $e^+ e^-$ pair-creation. Why do we employ different methods?

Q.I2.4 The beam is focused down to 6nm in vertical and 470 nm in horizontal direction. To achieve a higher luminosity, it is better to focused down in both direction. Please explain why we employ this asymmetric beam for ILC design.

Q.I2.5 One of the most important measurement in ILC is Higgs coupling. What kind of relation between the coupling and mass is expected?

Q.I2.6 Let us consider another option. An $e^+ e^-$ collider (500GeV CME) is constructed in LEP tunnel. What is the ratio of the radiation power by this facility and LEP2 (209GeV CME)?