

Accelerator Physics short option

Problem set 9.

Nicolas Delerue

Trinity 2010

1 Course questions

Would you be able to answer the following questions? (answers in the lecture)

- Give the name of 3 devices that allow beam size measurements and describe how they work.
- Make a quick comparison of Faraday cup and Beam current monitor.
- What can be measured by using synchrotron radiation?

2 Faraday cup depth

A 1 GeV electron beam is sent of a Faraday cup made of Copper.

What should be the thickness of the cup be to ensure that all electrons are contained?

Hint: how many radiation length are needed to slow the electrons to their critical energy.

3 Image from the LHC

The image shown in figure 1 has been used to prove that the beam had travel around the LHC during the first injection attempt in September 2008. Explain what kind of diagnostic was used to produce this image.

Can you explain the features seen in the middle of each side of the image?

4 Beam total energy

What is the total energy contained in a beam of 10^{10} electrons (express the result in Joules) accelerated to an energy of 1.6 GeV.

How much water can you boil with this amount of energy?

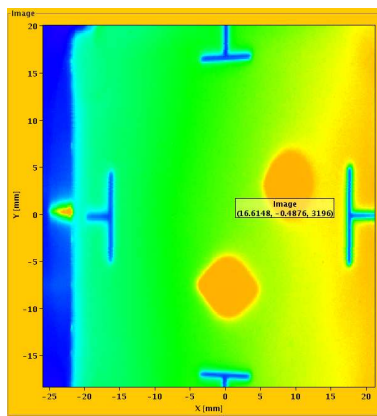


Figure 1: First turn in the LHC.