Hall C Expert Howto

Experiment: HKS

Splitter Magnet

Liguang Tang and Lulin Yuan

April 6, 2005

Abstract

This Howto outlines the purpose of the Splitter magnet and its operation and monitor.

1 Purpose

The Splitter magnet will handle beam electrons, scattered electrons and positively charged kaons at the same time. It separates the scattered electrons and kaons at small forward angles to much larger separation angles before entering the Enge and HKS spectrometers, respectively. Therefore, it contributes to the overall optics for both the Enge and HKS spectrometers. It will also bend the electron beam about 8.15 degrees and reorient aiming back to Hall C dump by later two dipoles, DZ and EZ magnets.

Although using such a common Splitter magnet reduces kinematics flexibility, it greatly optimizes the usage of large high precision spectrometers at large physical angles to detect extremely forward scattered particles with opposite charges under very limited space.

2 Control and setting of the Splitter magnet

Since this magnet will effect the exit beam trajectory toward the beam dump, this magnet can only be operated by MCC.

The nominal field setting for the Splitter is 1.546 Tesla. The corresponding power supply current setpoint is 842.83 A. The Splitter field is monitored by a fixed Hall probe glued to the wall of target vacuum chamber. Between the field range of 1.4 Tesla and 1.65 Tesla, the Splitter B (in Tesla)-I (in Ampere) curve can be expressed as a 6-order polynomial:

$$B = 2.33427E-18 \times I^6 - 6.12490E-15 \times I^5 + 5.66717E-12 \times I^4 - 2.56364E-9 \times I^3 \\ + 5.76159E-7 \times I^2 + 1.87247E-3 \times I + 1.89685E-3$$

Before setting the splitter, the magnet must be degaussed. The degauss procedure is ramping up and down the magnet in two full cycles: 0A-1000A-0A-1000A-0A, THe ramping speed is 100A/min with 2 minute staying time at each minimum and maximum current. After that, the ramping up speed to the desired field value is 25A/min.

To set the magnet

1. Beam must be off during setting or any field change (even it may be small).
2. Call MCC to request on and setting up the Splitter magnet.
3. MCC will confirm the setting value in terms of current.
4. MCC will set the magnet following the specified ramping procedure.
5. MCC will call back to confirm the field reading by hall probe monitored by Hall C.
6. Small current correction (directly increase or decrease) can be done if the. field is not set to the desired value within an accuracy of 10^{-4}.

3 Monitoring the Splitter field

The field of Splitter magnet must stable through out the entire experiment. Thus, the hall probe reading is under constant monitoring as well as writing the value to each data run. If the value of the field tends to drift over an accuracy of 10^{-4} or ± 1.5 Gauss, current correction should be requested to MCC following the Control and setting procedure.