Hall C Reference

A Brief Description of the Hall C Beamline

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Abstract

Fundamental Hall C beamline optics, configuration and the major functions is described.

1 Conceptual Beamline Optics

1.1 Separation Section

Hall C beamline starts from the Lambertson magnet (match point) after the recombiner section. Usually, one places the original source there. The Lambertson dipole and the following 1 meter BN dipole plus three quads (3C01,02, and 03) between them form the first 3.2 degree separation from the straight orbit. An achromatic imaging (R16 = R26 = 0) is obtained at the end of this section.

1.2 The First Match SectionSecond Section

The next four quads (3C04, 05, 06, and 07) transport the beam achromatically and give a double waist in front of Hall C 34.3 degree arc.

1.3 Arc Section

The arc section consists of 8 3 meter dipole magnets and 8 qudas. It provides $34.3°$ bending angle and an achromatic imaging. Like the general achromat, at the mid-point 3C12, beam has a double waist and large dispersion about 4 cm/%. At the end of the arc, the beam is recombined achromatically at 3C17.

1.4 The second match section

After Hall C arc, the final three quads (3C18, 19, and 20A)provide adequate focusing property on either Hall C target or G_0 target. The beam size adjustment is done by varying them.

1.5 Chicane

Two Chicane dipole magnets (B_E and B_Z) are located downstream the second match section. The function of chicane is to generate additional bending power in vertical plane to compensate the beam vertical offset caused by 3 tesla Hermholtz coils suround polarized target.

2 Major Function of Hall C Beamline

2.1 Optics Decoupling

There are three double focusing locations along Hall C beamline. At each double focusing point, the beam forgets its former behavior, therefore, the beam optics tune at each section is decoubled with the previous. Any local disturpancy cannot be transfered to the next section. This is the major requirement of optics tune in order to provide high reliability and reproducibility.

2.2 Achromat

During experiments, users want not only to have a well-focused beam on the target, but also to have the beam spot size and the incident angle are independent to beam momentum change, is defined as a term "double achromatic focusing", i.e. R16 = R26 = 0. This function is executed mainly by Hall C 34.3° arc achromat.

2.3 Compatible optics for Moeller and beam energy measurement

Some users want to have continuous beam transportation when the Moeller polarimeter is on. The 3 tesla Helmholtz coils give axial field only. It doesn't effect the global beamline optics. The two Moeller quads have certain few percent effect on the downstream optics. With fine adjustment of 3C18, 19, and 20A, the effect can be reduced and a set of compromising tuning parameters can be found.

A new energy measurement optics will be verified in 2003 by CASA. The idea is to use the first half of achromat (dispersive section) to determine the absolute beam energy and to use the second half achromat recombining beam achromatically. If this is doable, the Hall C beamline transporation optics will be greatly simplified by applying only optics model. The impact of such modification is to make beam energy measurement on-line, no optics alternation is necessary.