Polarized Protons and the Booster

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Background:

injected beam - from the Linac at 200 MeV kinetic energy. $G\gamma = (1.793)*(1.213) = 2.175$
extracted beam – at 1.5 GeV kinetic, $\gamma = 2.6$, $G\gamma = 4.66$

depolarizing resonances considered:

imperfections:

$G\gamma = 3$
$G\gamma = 4$

intrinsic:

$G\gamma = \nu_v$

There is not a polarimeter in the Booster. The relevant polarization measurements are made in the AGS.

Status:

The **imperfections** at n=3 and n=4 are explored and corrected by varying the phase and amplitude of the relevant vertical correction magnetic harmonic field. The resonances can be made strong enough to flip the sign of the polarization measured in the AGS. These two resonances are corrected (rather than flipped). The required corrections are a small fraction of the correction magnet capabilities. Periodically during the run checks are made that the applied magnetic harmonics are still active.

The **intrinsic** is far enough above the extraction energy to cause no harm to the beam polarization. The vertical betatron tune is set to about 4.9, putting the resonance well above extraction energy ($G\gamma = 4.66$). This assertion was tested experimentally during the previous (Sep, 2000) RHIC run (when the polarization measured early in the AGS acceleration cycle was anomalously low) by reducing the vertical tune until an effect was seen on the polarization measured in the AGS. There was a wide margin before any effect was seen, and a significant effect was seen given adequate reduction.