RHIC Spin Flipper Status

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RHIC Spin Collaboration Meeting
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RHIC Spin Flipper Status

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- RHIC Spin flipper
  - a dipole magnet with horizontally oriented oscillating magnetic field.
  - maximum magnetic field:
    100 Gauss-m, spin resonance strength:
  - oscillating frequency: 37.5 kHz
  - time for getting a full spin flip: 2seconds
  - capable of independantly achieve spin flipping in each ring.

- project status
  - Magnet:
    - DC magnetic field measurement:
      - transfer function:
        106.8 Gauss-m/kAmp
      - multipole components: < 1%
      - integral field angle: 6 mrad
    - AC magnetic field measurement:
      - 2nd & 3rd harmonic distortion: -60 dB
    - ready for installation.
    - Location : IP4

- project status
  - Electric system:
    - magnet inductance:
      - 104.96 μH @ 37.5 kHz
      - 26.362 μH @ 64.0 kHz
    - Q factor:
      - 320 @ 37.5 kHz
      - 309 @ 64.0 kHz
    - 6 kwatt power supply testing done
    - cap-bank assembly done
    - vertical testing

- project status
  - Control system:
    - Front end computer installed
    - PA remote control PLC in progress.
    - Programing the Lecroy scope for digitizing magnet current readback done.
    - Application ready for integrated testing.

- schedule
  - magnet installation:
    - estimated time for installation: 2 -3 shifts
    - between Oct. 1 and Oct. 15
  - system review:
    - before Oct. 15
  - system testing:
    - second week of Oct.
  - Power supply and cap-bank installation:
    - estimated time for installation: 1-2 shifts
    - after Oct. 15

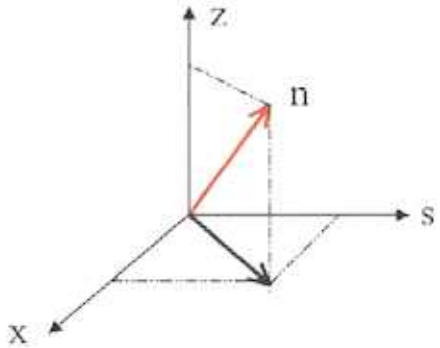
- commission the RHIC spin flipper
  - at injection
    - with both snakes
    - move the spin tune away from half integer by tunning the two snakes' axis slightly away from being perpendicular.
    - Slowly ramp the spin flipper frequency across the spin tune and measure the beam polarization after the frequency ramping.
  - At storage:
    - with both snakes
    - with one snake

- application of the RHIC spin flipper
  - flip the spin direction for reducing the systematic error.
  - measure the spin tune:
    - slowly move the spin flipper frequency towards the spin tune and then let the induced spin resonance be on top of the spin tune.
    - measure the beam polarization
    - the spin tune=

• in the frame which rotates at the same frequency as the spin flipper's frequency, the stable spin direction is

$$\hat{n} = \frac{\delta}{\lambda}\vec{e}_z + \frac{\varepsilon_1}{\lambda}\vec{e}_x + \frac{\varepsilon_2}{\lambda}\vec{e}_s$$

$$\lambda = \sqrt{\delta^2 + \varepsilon_1^2 + \varepsilon_2^2} \qquad \delta = \gamma_m - \gamma_s$$



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