APEX Status and Plan

Phil's Meeting, March 20, 2012

M. Bai

Polarization Performance Challenges

- **Polarization Transmission Efficiency**
  - To achieve 100% polarization transmission efficiency between 100 GeV and 255 GeV
  - Identify where we loose
    - One study
  - Deep understanding of depolarizing mechanism, benchmarking spin tracking code
    - One study

- **Polarization lifetime at store**
  - Optimize snake setting including its orbital angle, parasitic/MD
  - Minimize vertical angle between rotators, parasitic/MD
  - Understand the effect of beam-beam on polarization lifetime
    - One study
  - Benchmark stable spin direction calculation
    - One study

Polarization Performance Challenges

- ## Polarimetry, polarimetry!
  - Fast and Reliable
  - It is very critical for all polarization related beam studies
  - So far, one dedicated beam study proposal

- ## Develop new working point for pp operation
  - Current working point has issues on emittance growth due to excitation of pi mode, which gets closer to 2/3 resonance.
  - Putting one ring working point above 0.7 showed bad polarization lifetime at store, which is yet not well understood and is on the APEX list
  - In preparation to the success of Elens, we need to find a new working point(s) which can accommodate not only as much as beam-beam tune shift, but also post no adverse impact on beam polarization

List of Polarization Related Beam Studies

- Impact of orbit harmonic correction
  - **PI:** V. Ranjbar
  - **Goal:** To determine impact of various harmonic orbit distortions on Polarization in RHIC. Understand if polarization can be improved via targeted harmonic correction to reduce associated spin imperfection resonance strength and to understand the impact of different harmonics on polarization.

  - **Beam time request:** 6 RHIC ramp to systematically scan the effect of orbital harmonic 29 at spin resonance 393+Qy, 411-Qy on polarization. Can be parasitic to physics data taking.

  - **Impact on Physics:** Can result in significant polarization losses during acceleration. Can also cause failed ramps if the request change in orbit exceeds the control of the orbit feedback.

List of Polarization Related Beam Studies

APEX

- Polarization loss crossing 411-Qy resonance in RHIC

  - **PI:** V. Ranjbar

  - **Goal:** To Understand Polarization loss due to crossing the 411-Qy and 393+Qy resonance during the RHIC ramp

  - **Beam time request:** This requires having two special acceleration and decceleration ramp, one goes to Ggamma=370.26 and another one goes to Ggamma=416.26. Polarization will be measured at injection as well as each store energy.

  - **Impact on Physics:** None

List of Polarization Related Beam Studies

- Evaluate polarization lifetime at store with different working point
  - **PI:** M. Bai, Y. Luo, S. White
  - **Goal:** to understand why polarization lifetime is much worse with tunes above 0.7. To have split tune for collision can be very beneficial for Elens. So, it is important to know how polarization behaves with this configuration

  - **Beam time request:** This study requires 2~3 regular stores, during which both detectors can continue take data.

  - **Impact on Physics**: Can have much lower average store polarization. Luminosity lifet

List of Polarization Related Beam Studies

APEX

- Measured polarization profile at Ggamma=462.5
  - **PI:** V. Ranjbar, M. Bai
  - **Goal:** Measure Polarization Profile at Ggamma=462.5. Verify the spin tracking res

  - **Beam time request:** This study needs to store beam at Ggamma=462.5 without rotators for ~4-5 hours. Polarization profile as well as average polarization will be monitored by CNI as well as Jet polarimeter.

  - **Impact on Physics**: since this is at different energy, experiments may not be interested in taking data.

List of Polarization Related Beam Studies

- Polarimeter performance with special targets
  - **PI:** H. Huang
  - **Goal:** To study the effect of target orientation on polarization measurement with different target (regular, high twist, wide 5mm target). To quantify the effect of the target orientation

  - **Beam time request:** requires two hours of dedicated beam time

  - **Impact on Physics**: none

List of Polarization Related Beam Studies

- Near-working point development
  - **Goal:**
    - To evaluate the polarization transmission efficiency
    - To check the feasibility of swing the working point to 0.98 and above for collsion

  - **Condition:**
    - Lattice: no beta-squeeze
    - Ramping tune: 0.92, 0.93
    - Ramp: all four feedbacks+10Hz feedback
  - **Beam time request:** requires 12-16 dedicated beam hours

  - **Impact on Physics**: none

Tentative APEX Schedules for Polarization

session	Duration	Polarization development related studies
March 21	8am – 8pm	Spin flipper, impact of orbit harmonic study: test all the tools including software at injection (parasitic to others)
March 28	8pm – 8am	Polarimeter, Polarization lifetime with split tune(8 hour store), impact of orbit correction
April 4	8am – 8pm	Polarization loss crossing 411-nu(requires up-down ramp)
April 11	8pm – 8am	Polarization profile at Ggamma=462.5
April 18	8am – 8pm	New working point development

APEX Schedule March 21, 2012

APEX

V dispersioncorrection, weighted algorithm
C. Liu, Luo, Minty

Longitudinal match w.o. GammaT
C. Montag

Spin flipper
M. Bai, P. Oddo, …

ORM data taking
Tasha, Jorg, …

Beam Beam: pi mode suppression
Luo, White

Off momentum beta beat measurement/correction
White, Luo, Bai

Triplet bpm BBA
Joane, Jordan

IP transfer matrix
Tepikian, Ptitsyn

Back2Physics

| 8am | 10am | 12pm | 3pm | 5pm | 7pm | 8pm |