*EX Optics Working Group

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EVERYTHING HERE IS STILL EXPLORATORY AND NOT EVEN PRELIMINARY

Overview and Strategy

- APEX has unique optics requirements
 - FOM is driven by *scattering angle* resolution rather than momentum resolution
 - Septum needed to go from 6° to 12.5°
- Requires careful examination of HRS tune to optimize
- John LeRose is gone so we have to think through much of this ourselves
- Have produced 2nd order transport matrices for ideal case as starting test ground
- Confirmation in existing ray tracing required for final result





- Using idealized representation of HRS first and second order elements can be calculated
- Excellent primer for framework
- http://cds.cern.ch/record/283218/files/SLAC-75.pdf
- http://github.com/seamusriordan/hrstrans

Standard Tune Comparison



- Framework does a reasonably good job of recreating first order elements
- $\bullet\,$ Acceptance $\sim\,6$ msr using simple aperture cuts

APEX Tune

 APEX test run ran with special tune which nominally reproduces standard tune optics and acceptance but with pure (y|φ) coupling



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APEX Tune

 APEX test run ran with special tune which nominally reproduces standard tune optics and acceptance but with pure (y|φ) coupling



APEX Tune - Simple Optimization Attempt



- Using first order code allows for rapid calculation of acceptance and matrix elements
- A fitter is used which
 - Preserve acceptance for target length (as seen at $6^\circ)$
 - Produce first order reconstruction matrix by inverting transport
 - Minimize reconstruction elements of $\phi_{\rm tg}$ with VDC spatial/angular resolutions
- Immediately drove (y|ytg) coupling to zero and increased (y|\u03c6)
- About the same acceptance but serious losses in momentum and vertex resolution (> factors 2?)

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Summary and Work To Do

- Looks like we have some room for improvement for APEX
- Need to check acceptances and APEX geometry would also help to get databases for APEX run
- John LeRose's files were recovered and are available I have access to SNAKE and the files used for standard tune, PREX, etc
- Need to include our new septum, produce full polynomial transport, verify acceptance and reconstruction
- I believe this is a project which we can handle on our own and this is at a point where a grad students could get involved