Single Particle Issues

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Workshop charge:

- Guided by the Snowmass '96 parameter sets **explore and develop innovative concepts that will result in significant cost reductions**.

- Coordinate parameter sets, infrastructure requirements for the various options, and designs with the other working groups.

- **Explore** the viability of the various parameters sets implied by **the major magnet options**.

From the Port Jeff magnet workshop:

- **A particularly important goal of the workshop is to identify high-payoff topics for vlhc (magnet) R&D**.

A RARE CHANCE TO BE RADICAL!

- It is easy for the Magnet Working Group to be radical: (transmission line magnets, HTS, 4 hole common coil, ...). Not so easy in AP.

- **Eschew the tendency to "polish"!**

The the first spade work is ? 10 to 25 ? years away. Only two vlhc workshops have been held so far.

- Thus, the enabling technologies will undoubtedly evolve to our advantage (but how much?)

- Especially, it is premature to "find an optimal solution for the vlhc design."

- Most of all, **avoid (unnecessary) conflict between high and low field designs**. Now is not the time for a "design competition".

Almost all single particle issues are important to both low and high field vlhcs ...

HOW SMALL IS THE HOLE?

The $6.4 billion question.

• Transmission line magnet designs quote small apertures. Flat coil HTS magnets can be small. (But why be constrained by "perceived reality"?)

From a purely AP perspective, how small can the beam pipe aperture be?

• (This is also a multi-particle issue).

• Assume systematic field errors dominate randoms. Or apply scaling laws for randoms. Or ...

• How far can one relax field quality?

• Does synchrotron radiation at high field lessen the field quality requirements at injection?

• Does the emittance matter (with "very large" γ's)? If so, what is the optimum emittance (*natural* emittance, if high field)?

<u>OPTICS</u>

ARCS

- What is the optimum 1/2 cell length?

- Dispersion supressors? Lattice modules?

CORRECTORS

- Sparse corrector schemes? Phase trombones? Local (non)linear correction?

- Tuning 2-in-1 magnets? Combined Function magnets?

INTERACTION REGIONS

- Doublet/triplet interaction region optics?

- Crossing angles and dispersion control?

- Small bore iron Q1?

FORMAL EXPERIMENTS

RHIC is commissioning as a superconducting collider, Tevatron is recommissioning.

What formal beam dynamics experiments might be proposed, "in the LHC era"?

TIME DEPENDENT EFFECTS

- Some say that little beam will accelerate in the LHC without beam based feedback (on closed orbit, tunes, chromaticities).

- Does this "large" issue become "very large" in the vlhc?

FUNDAMENTAL NONLINEAR DYNAMICS

- Experimental techniques, simulation power, and theoretical understanding have advanced since the experiments "in the SSC era".

- What *fundamental* nonlinear dynamics investigations can be successfully defended in front of a BNL or FNAL Program Advisory Committee?

- Use AC Dipoles? AC Quadrupoles?

BEAM-BEAM EXPERIMENTS

- What might *fundamental* beam-beam investigations be, which go beyond "routine" machine studies to enhance operational performance?

- True or False: RHIC is more amenable to controlled beam-beam experiments, with separate vacuum chambers, and no antiprotons.

Where are the protagonists?