R&D Plans
WBS 2.1.1: Lattice Design

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Outline

- Objectives
- Priority Justification
- Tasks
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- Principal Investigators
- Status

Objectives

- This work package includes 5 objectives
  - WBS 2.1.1.1 Lattice Design for Baseline e^+ Ring
  - WBS 2.1.1.2 Lattice Design for Baseline e^- Ring
  - WBS 2.1.1.3 Lattice Design for Alternative e^+ Ring
  - WBS 2.1.1.4 Lattice Design for Alternative e^- Ring
  - WBS 2.1.1.5 Lattice Design for Injection/Extraction Lines
- Compare with alternative lattice designs to ensure choosing technically- and cost-optimized solution
  - ideally, we carry only a single alternative design
    - examine other lattices to evaluate certain specific features
      - e.g., techniques for momentum compaction adjustment
    - may need to consider alternative insertions in a given lattice
      - e.g., bypass lines for injection or extraction

Priority Justification

- Lattice design designated Very High Priority by S3 task force
- Performance of DR complex and specifications for most hardware components depend on lattice choice
  - important to ensure robust and cost-effective design
- Must "freeze" lattice design in a timely way to permit detailed engineering of ring components for EDR
  - otherwise, we design everything multiple times

Tasks (1)

- DR workshop at Frascati (ILCDR07, March 2007) served to examine present state of lattice design
- List of required tasks generated there includes:
  - incorporate RDR RF configuration √
  - define and implement required circumference adjustability √
  - evaluate momentum compaction factor adjustability √
  - evaluate need for phase trombone sections √
  - incorporate lumped injection and extraction kickers √
    - if practical
  - implement separate injection and extraction sections √
    - needed for central DR complex

Tasks (2)

- locate abort dump and abort line optics
- specify required hardware
  - ring magnets, incl. wigglers
  - dipole and skew quadrupole corrector locations for LET studies
    - also higher multipoles if needed
  - bpm locations and tolerances
  - beam-stay-clear requirements
  - alignment tolerances
  - vibration tolerances
- demonstrate adequate dynamic aperture using realistic error tolerances
  - alignment, strength errors, multipole content
- define lattice nomenclature for all ring elements

- Some tasks must coordinate with other WPs

Deliverables

- Main deliverable for both objectives is a cost-effective lattice having the features and performance outlined on the previous slides
  - tacit assumption for now is that both EDR and PDR have identical lattices
    - EDR lattice could possibly be a bit more "relaxed" than PDR
      - less wiggler, reduced dynamic aperture
    - not clear that this is cost effective, however
      - probably cheaper in most cases to use identical designs rather than "almost identical" designs
  - deliverables should be **completed by the end of 2008** to give adequate time for finalizing engineering designs and costs for EDR

Resources

- Resources include effort and some travel funds
  - no M&S is needed (aside from perhaps some minor software or software license purchases)

Staff Effort (FTE)

S3 WBS	2007	2008	2009	2010
2.2.1.1	1.5	1.5	0.75	0.5
2.1.1.2	0.5	0.5	0.25	0.25
2.1.1.3-5	1.0	1.0	0.5	0.25

Travel (US $k)

S3 WBS	2007	2008	2009	2010
2.2.1.1	15	15	7.5	5
2.1.1.2	5	5	2.5	2.5
2.1.1.3-5	10	10	5	2.

Principal Investigators

- ANL
  - Louis Emery, Aimin Xiao
- Cockcroft Institute
  - James Jones, Andy Wolski
- Cornell
  - Rich Helms, Mark Palmer, Dave Rubin
- IHEP
  - Jie Gao, Yi-peng Sun
- LBNL
  - Gregg Penn, Ina Reichel, Weishi Wan, Mike Zisman
- SLAC
  - Yunhai Cai

Status

- RDR baseline lattice (TME) was developed at ANL
  - had somewhat marginal dynamic aperture
    - more work needed to improve this
      - working point adjustment helps
      - may require increasing periodicity of lattice...with or without more access shafts (OCS8, already done but not evaluated)
- Alternative FODO lattice being studied at IHEP
  - fewer magnets ⇒ may be less expensive
  - dynamic aperture appears adequate
- Most tasks (slides 5, 6) remain to be carried out for alternative lattice
  - and compared on an equal footing