DRAFT: Task A (Information for simulations) of ILC Simulation

Acc. Physics Group

The first table is based on the meeting on Aug. 7 and 21, 2007

Description of each task is based on http://www.slac.stanford.edu/~quarkpt/EDRPlan quarkpt 16-May-2007 and modified by K.Kubo

List A: Information for simulations	Contact
Lattice design	Mark Woodley (SLAC), Allex Valishev (FNAL)
Alignment model	*K. Kubo (KEK)
Ground motion and vibration model	*P. Lebrun (FNAL) Dirk Kruecker (DESY)
RF (BC, ML) error model	*D. Schulte (CERN)
Magnet error model	*James Jones (ASTeC)
BPM performance mode Cold and Warm	(Glen White (SLAC))
BSM(Beam size monitor) performance model	*G. Blair (RHUL)
Cavity wakefield	Igor Zagorodnov (DESY) Karl Bane (SLAC) Roger Jones
Collimator wakefield	Roger Barlow (Manchester), Igor Zagorodnov (DESY), Karl Bane (SLAC)
Other impedance	Karl Bane, Gennady Stupakov (SLAC)
Stray electromagnetic fields	*N. Solyak (FNAL)
Feedback/forward model	→ List B

Tasks of “Information for simulations”

- Contact person is responsible to
  - Organize each task, if necessary.
  - Communicate with experts
  - Gather relevant information
  - Make documentation(s).
  - If suitable, make a set of data file(s) which can be used in simulation studies.
- Contact person is not necessarily an expert in each task (probably not, in most cases). But he/she should know what information are needed for simulations.
- Time schedule
  - First set of out put by the GDE meeting in October
  - Can be tentative. Further update will be necessary, but we need models for simulation studies. (There may be exceptions)

Lattice Design

Goals of the Project

The goal is to make a complete and self-consistent optics design from the DR exits to beam dumps, for both e+ and e-. This should include the undulator section for e+ source. The design should define beam diagnostics and correction sections.

Deliverables

Complete set of lattice files of LET (from the DR exits to beam dumps) in an agreed standard format (or formats).

Note:

The format will probably be MAD format, with expanded list of components, without any macros.

Since the lattice designs of RTML and BDS have been developed by their Area Group in RDR phase. and the ML lattice design has been also developed by different groups around the word, main effort of this task will be matching between areas.

It is not clear which group will be responsible to this task primarily.

Alignment model

Goals of the Project

The goal of the project is to develop and document a model of the initial survey and alignment which is suitable for incorporation into ILC simulations. The model should incorporate the following issues:

- Errors in the initial construction of the tunnel, with a particular emphasis on the long-wavelength misalignments in the tunnel trajectory.
- Uncorrelated and correlated alignment errors due to the process of mechanical survey and alignment of components, including correlations between multiple beamlines in the same tunnel (caused, for example, by systematic errors in the survey network).

Deliverables

One or more technical notes which document the content and design of the model.

This should includes formula which give misalignment of every relevant beam line component.

Ground motion and vibration model

- **Goals of the Project**

  The goal of the project is to develop and document models of ground motion and vibration which are suitable for incorporation into ILC simulations. The models should incorporate the following physics:

- Expected ground motion at typical "reference" sites, including long-term, long-baseline correlated motions (ATL and/or tunnel settling)
- Technical noise
- Component vibrations, in particular quadrupole and other multipole magnets
- Detector and IR noise, incorporating any anticipated correction methods which are not beam-based (geophone or interferometer, for example).
- The models should represent the best compromise possible between strict accuracy and computational efficiency.

  Deliverables

  One or more technical notes which document the content and design of the models, along with results of "test" simulations which can be used to validate the inclusion of the models into simulation programs. It is preferred that a coded-up implementation of the model be made available as well as a technical note describing how to code up such a model. The coded-up versions should include documentation describing how to put them to use.

RF (BC, ML) error model

- **Goals of the Project**

  The goal is to develop and document a model of the field errors of RF cavities which is suitable for incorporation into ILC simulations. The model should incorporate the following issues:

- Phase and amplitude errors (at the RF source as well as cavity-by-cavity)

- The model should include static errors, errors which develop over long periods of time (drift), errors which occur over the interval from one bunch train to another (jitter), and errors which develop in the course of a single bunch train.

  Deliverables

  One or more technical notes which document the content and design of the model.

Magnet error model

- **Goals of the Project**

  The goal is to develop and document a model of the field errors of magnets which is suitable for incorporation into ILC simulations. The model should incorporate the following issues:

- Magnet strength errors
- Magnet harmonic content

- The model should include static errors, errors which develop over long periods of time (drift), errors which occur over the interval from one bunch train to another (jitter), and errors which develop in the course of a single bunch train.

  Deliverables

  One or more technical notes which document the content and design of the model.

BPM performance model
Cold and Warm

- **Goals of the Project**

  The goal is to develop and document a model of the errors of BPM which is suitable for incorporation into ILC simulations. The model should incorporate the following issues:

- Resolution,
- Offset, and scale factor errors, include static errors, errors which develop over long periods of time (drift).
- Dynamic range.
- Dependence on intensity and number of bunches.

  Deliverables

  One or more technical notes which document the content and design of the model.

BSM(Beam size monitor) performance model

- **Goals of the Project**

  The goal is to develop and document a model of the errors and performance of beam size monitors which is suitable for incorporation into ILC simulations.

Deliverables

One or more technical notes which document the content and design of the model.

Cavity Wakefield

Goals of the Study

There are two sets of goals for this study: goals related to the baseline design, with the TESLA technology cavity and the 9-8Q-9 standard RF unit, and studies of alternate cavity shapes which may produce higher gradients (typically at the expense of stronger wakefields).

Baseline Cavity Study Goals

Produce a complete set of LRWFs for a standard RF unit, as described above, including misalignments, cavity fabriaction errors, all couplers and loads in the system, and which is consistent with field measurements of LRWFs and the known procedures of the cavity and cryomodule fabrication process. Verify that the current set of short-range wakefields used for ILC simulations is adequate, alternately propose a new set which is adequate.

Alternate Cavity Study Goals

Produce sets of short- and long-range wakefields for the high gradient cavity models (re-entrant, low-loss, ICHIRO) which are consistent with field measurements and known procedures of fabrication. Determine the wakefields in the case of alternate coupler designs.

Deliverables

The deliverables are as follows:

- A technical note describing the results of the baseline cavity studies.
- A technical note describing the results of the alternate cavity studies.
- For both baseline and alternate cavities, a set of publicly-available data files which can be used in simulation studies, representing the short- and long-range wakefields of the baseline and alternate cavity designs.

Collimator wakefield

Goals of the Study

Produce a complete set of wakefiled (wakefunction) of collimators.

Deliverables

- A technical note describing the results of the study.
- A set of publicly-available data files which can be used in simulation studies.

Other impedance

Goals of the Study

Check wakefiled(impedance) of beam line components other than RF cavities and collimators. And produce a complete set of wakefiled (wakefunction) of relevant components. Probably following components:

- Cavity BPM
- Beam pipe in BDS
- Beam pipe in undulator section

Deliverables

- A technical note describing the results of the study.
- A set of publicly-available data files which can be used in simulation studies.