

International Linear Collider Workshop (LCWS08 and ILC08)

Simulations Group Summary

K. Kubo, D. Schulte, N. Solyak for
the beam dynamics working group

Specifications

- Specifications for imperfections and instrumentation need to be reviewed
 - Not enough resources to complete, review, update numbers (e.g. for BDS studies)
 - Need to re-establish capabilities of the team
- Some specifications are demanding
 - BPM scale error is critical (2%)
 - Quadrupole field accuracy ($1e-4$)
- Review of some models is necessary
 - E.g. in main linac for BPM mounted to quadrupole
 - Survey/Pre-alignment model
- Summary of tolerances
 - In particular where not yet calculated
- Will distribute CLIC template and definitions for specifications

ILC-CLIC Studies

- Survey/pre-alignment is very important topic
 - No clear responsible group on ILC side, no resources left
 - For CLIC alignment experts simulate the expected misalignments of the survey reference line
 - Used as input for beam dynamics studies
- Temperature stability is an issue
 - Tight tolerances are expensive
 - Better understand origin of tolerances/mitigation strategy
 - Make model of second feedback layer
 - In long run expect some progress on CLIC side that could be useful to ILC
- Stray fields
 - Can be a problem in ILC and CLIC long transfer line
 - Very interesting presentation on measurement results by Dmitri Sergatskov (FNAL)
 - FNAL will collect measurement data
 - Model/needs for simulations to be defined

ILC-CLIC Studies

- Benchmarking of simulations on CLIC main linac
 - Larger leverage of imperfections than for ILC
 - Dirk and Kiyoshi volunteered to implement lattice and look at tolerances
- RTML design
 - Some feedback is expected from the CLIC design considerations
 - Vacuum specification in long return line is dominated by fast beam-ion instability
 - Giovanni Rumolo (CERN) will simulate beam line using new code
 - Performance/tolerances for single stage ILC compressor should be looked at
 - Currently CLIC side is not ready to do it, will change
- Luminosity spectrum reconstruction can have impact on collider performance
 - Problem for ILC and CLIC
 - Try to address it together with MDI and physics

ILC-CLIC Studies

- Intra-pulse IP feedback is vital for ILC (and CLIC)
- J. Resta Lopez: ILC and CLIC Luminosity Performance with Intra-Train Feedback
- Orbit feedback studies mainly performed by Javier Resta Lopez at Oxford
 - Try to connect to slow feedback studies expected to come at CERN

ILC-CLIC Collaboration

- AML standard
 - DESY will continue promoting AML (N. Walker and Dirk Kruecker)
 - Support from David Sagan
 - Should try it out on one system
 - BDS but maybe also damping ring
 - A. Wolski and David made first test during workshop
 - Had tested it for CLIC
 - Main focus on agreement on coding rules
 - Proposal expected in January next year
- Progress on codes only discussed for CHEF (Francois Ostiguy)
 - Slowed by lack of resources
 - Still development and benchmarking continues
- Not clear that a common workshop would have enough critical mass

Possible contribution from Beam Dynamics Group for Minimum Machine

- Studies related to the new Low P parameter
 - ML: making z-E correlation, gradient and phase tolerances
 - We can do, if necessary.
 - BDS: Tolerances should be looked.
 - How to see who can do.
- Studies related to single stage bunch compressor
 - Tolerances in BC itself: ongoing
 - Effect to ML (initial momentum spread): ongoing
- Some beam dynamics consideration for beam line geometry change.
 - Shorter BDS
 - RTML: verify there is no new significant emittance source.

No specific studies, no work assignment so far.

Do we have enough manpower?

- Extension of list is likely

Studies

- Simplified survey model presented by K. Kubo
 - Should help to translate beam dynamics into survey requirements
 - LICAS group has given relevant parameters
 - Appear to have little emittance growth due to variation of survey line
- Alignment simulations for the main linac by John Dale
 - Simulate conventional alignment
 - Performance seem not acceptable (90% below 180nm)
 - Simplified model does need some improvements

Coupler Kicks in RTML and ML

- Calculation of RF kicks presented by Vyacheslav Yakovlev (FNAL)
 - Understanding seems to be very mature
 - differences from simulations will be investigated
- Wake field smaller than previously assumed
- Impact of kicks on bunch compressors and main linac by Andrea Latina (FNAL)
 - New configuration to cure wakefield kicks introduces large impact of RF kicks
 - Alternate solution leads to acceptable growth (0.8nm)
 - For bunch compressor old solution is best (0.8+3.3nm)
 - Single stage compressor performs better (1.5nm)
- Impact of kicks in main linac by Dirk Krücker (DESY)
 - Coupler wakefield effect is small
 - Modification of coupler position to reduce wakefield effect increase RF kick
 - Old solution is better than new

RTML

- Update of study status by Nicolai Solyak
 - Significant impact of lack of resources
 - Extraction line design
 - Re-evaluation of vacuum system
 - Time varying stray fields
 - Study of single stage compressor for minimum machine
 - Some loss in flexibility
 - Two options are being studied
- Single stage compressor by Andrea Latina
 - Good performance for nominal beam
 - Significant growth for jittering beam
- Progress of bunch compressor (Eun-San Kim)
 - Small horizontal emittance growth due to radiation (0.6 μ m)
 - Emittance growth with imperfections is small
 - But cavity tilts need to be integrated

RTML

- Extraction line design by Sergei Seletskiy
 - Three extraction lines (5GeV, 5GeV, 15GeV) have been designed
 - First two can accept full beam power, last 1/3
 - Specifications of elements including dumps have been given
 - Single stage compressor will be studied in the future
- Stray field measurements by Dmitri Sergatskov
 - In the A0 hall at Fermilab with klystrons
 - Very important component at 60Hz
 - 5Hz helps but some detailed questions
 - Stability of 60Hz power line frequency
 - Remaining amplitude because of bunch train length (~2%)
 - Space extension of complex compared to wavelength
 - More data needed and will be collected