Summary of the MDI & CFS sessions

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MDI & CFS Sessions – Overview

Monday morning:
MDI: MDI/BDS/CFS
- Helium-Experiment at HERA
- ILC main beam dump issues
- FLUKA simulation of the ILC main beam dump

CFS
- CFS staging discussion
- CLIC CFS study
- CFS utility study
- Recent geology survey at Kitakami

Tuesday morning:
MDI
- Report from KEK Mini-Workshop
- Update on Anti-DID studies
- Polarisation/Polarimetry
- CLIC QD0 stabilisation progress
- CLIC background studies
1) ILC Main Beam Dump
   a) Issues
   b) Simulations
   c) Possible alternatives
2) Backgrounds
   a) CLIC Background Simulations
   b) ILC Muon Shielding
3) Update on Anti-DID studies
4) Helium-Experiment at HERA
5) KEK Mini-Workshops
6) ILC surface sites & geological survey
ILC Beam Dump Issues

Beam dump design issues:
- Beam window durability
- Tritium handling
- Recombination of Hydrogen
- Remote window replacement
- Safety

Strong efforts at KEK:
- Revisit previous studies
- New simulations of the energy deposition and temperature
- Evaluation of the possibility of other beam dump designs

Yu Morikawa (KEK)
Fluka simulation of the ILC main beam dump

Anne Schuetz (DESY)

Energy deposition of a 500 GeV beam peaks at $10^9$ GeV/cm$^3$ per bunch inside the water dump.

Implementation of 2 water dump designs (by B. Smith, 2006-2007) in Fluka

Tritium flux inside the dump ranges around $10^5$/cm$^3$ Tritium atoms per bunch.
Due to large energy deposition, **instantaneous dose equivalent** reaches up to 100 Sv per bunch. The dose rate after 1 month of beam time and 1 year of cooling time still of the order of 0.1 mSv/s in the dump surrounding.

**Future studies:**
- Effect of material composition on residual nuclei, especially Tritium
- Simulating the neutrons reaching back to the detectors
FLUKA simulation of the ILC main beam dump
Anne Schuetz (DESY)

Also alternative options, like a gaseous or solid beam dump, need to be studied.

Quick simulation of a gaseous beam dump filled with Nitrogen shows:

- Energy deposition restricted to the copper tank
- Dose rate after 1 month of cooling time negligible outside the tank
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Ongoing studies of the major backgrounds at **380 GeV and 3 TeV**

- Incoherent pair background and $\gamma\gamma \rightarrow$ hadrons the only significant source of direct background
- At 3 TeV, pairs and trident $e^+e^-$ may cause energy deposition in the forward region of the detector

**Synchrotron radiation at the IP:**

- For the simulation, only photons from the FF-system were extrapolated to the IP
- No synchrotron radiation hits any detector part
Muons from the ILC Beam Delivery System
Anne Schuetz (DESY)

Discussion about the **necessity of a magnetized wall to shield muons** that are emitted in the BDS and boosted towards the detectors.

**Comparison of SiD detector occupancy of muons with and without the wall:**

- **Magnetized wall is preferable** in order to keep the occupancy as low as possible
- Wall serves as tertiary containment device

→ **No wall means no access to the detector garage!**
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Update on Anti-DID Studies

- Anti-DID field will reduce background from beamstrahlung pairs
- Implementation of such an anti-DID coil is challenging
- New designs needed since L* change

Two new promising options:
- Dipole coils integrated into solenoid modules (B. Parker):
  Good behaviour despite thermal stress, bending forces, quenches
- Independent dipole coils (Y. Makida et al. and Toshiba/Hitachi):
  Straight forward production of flat coils that are bent in shape
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Helium-Experiment in the HERA Tunnel
Klaus Sinram (DESY)

- Experiment in 1988 to assess danger of Helium burst inside the tunnel
- 1000 l Helium was released into the tunnel
- At a height of 1.6 m, drop in the Oxygen and temperature levels for only 10 s
- Helium separates from air at tunnel ceiling, and is extracted due to the tunnel air flow

Danger considered to be small except for direct proximity to Helium burst location

Expensive stationary system for monitoring $O_2$ not necessary at HERA
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Report from KEK Mini-Workshop on CFS and Infrastructure for Detectors  
Karsten Buesser (DESY)

- 05/16/2017: Fourth workshop of the successful series funded by E-JADE
- Topics: Solenoid/Anti-DiD engineering, backgrounds, infrastructure at IP & main campus, detector engineering, Staging

Impact of staging on the detectors:

- Discussion of schedules:
  Will a staged machine be ready earlier?
  Can the detector assembly schedules be matched?
- Will the detectors also be staged?

Next workshop: September 28, 2017!
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ILC Utility Design Study for the Kitakami-site

Hitoshi Hayano (KEK)

3D model of the Collision Point surface site:
- Total area 7.85 ha
- Each zone is separable
Recent Geological Survey at Kitakami
Tomoyuki Sanuki (Tohoku U./KEK)

Geological survey of the Kitakami site:
- Large areas already assessed, especially around the IP area
- The more “blue”, the better

X-ray fluorescence analysis:
- No heavy metals
- Debris from digging can therefore easily be dumped somewhere else
- Granite is “standard”, “normal” and “typical”!
  ➤ All very positive!
The talks in the MDI & CFS sessions were all great!

Thanks to the speakers for their very nice contributions, and special thanks to the MDI & CFS session conveners.

For more information, please refer to the slides of the single talks uploaded on the Indico agenda for the sessions:

http://agenda.linearcollider.org/event/7507/sessions/4456/#20170626

http://agenda.linearcollider.org/event/7507/sessions/4460/#20170626
Backup
The cascade trident process:

- Only relevant for large $E_{\text{CM}}$
- The trident process is mediated by a virtual photon
- No accurate single cross section available in literature
- Conversion into pair assumes that the photon is unpolarized