CLIC

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Why?

• LHC probes high energies (7+7 TeV)
  – Proton-proton collisions
  – Many participating quarks and gluons
  – Events are very complex and difficult to analyze

• CLIC probes parton energies (1.5+1.5 TeV)
  – Electron-positron collisions
  – Point-like particles
  – Reasonably well-defined initial-state energies
  – Precision measurements that are easier to interpret
Partikeldagarna 081016

V. Ziemann, CLIC

CLIC overall layout
3 TeV

Drive Beam Generation Complex

Main Beam Generation Complex

Main & Drive Beam generation complexes not to scale

326 klystrons
33 MW, 139 µs

Drive beam accelerator
2.37 GeV, 1.0 GHz

1 km

delay loop

CR1
CR2
CR1
CR2

BDS
2.75 km

BDS
2.75 km

Combiner rings
Circumferences
Delay loop 80.3 m
CR1 160.6 m
CR2 481.8 m

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2.37 GeV, 1.0 GHz

1 km

delay loop

IP1

Booster linac
9 GeV, 2 GHz

Decelerator, 24 sectors of 868 m

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Booster linac
9 GeV, 2 GHz

Decelerator, 24 sectors of 868 m

From JP Delahaye CLIC08

Main Beam Generation Complex

Main & Drive Beam generation complexes not to scale
CLIC Overview

- Main beam
- Particles sources
- Damping rings
- RTML
- Main linac
- Beam-delivery system
- Interaction point
- Post-collision line

- Drive beam
- Particle sources
- Linac (low E, high I)
- Delay loop and combiner rings
- Long beamline
- Decelerators with power extraction structures
Many critical issues

- DB: Beam interleaving in delay loop and combiner rings to get right time structure and high beam current
- DB: Drive beam stability in decelerator
- MB: Reaching high energies, reliably and economically!
- MB: High luminosity: Making small spots with nm size, alignment and jitter tolerances
- MB: Beam quality preservation in linac
- MB: Post-collision line
- DB+MB: Two-beam acceleration scheme

→ Test-facility CTF3 at CERN
Beam-quality and Post-collision

- Peder Eliasson's (CERN-UU) thesis
  - Beam alignment and correction algorithms for Linacs
- FP6-EuroTeV project on the conceptual design of the multi-TeV post-collision line (A. Ferrari, VZ)
  - Safely dispose 14 MW beam power when in collision (large energy spread) or not (small beam on dump)
Two-beam Test-stand in CTF3

TBTS crew:
Tord Ekelöf
Magnus Johnson
Roger Ruber
Volker Ziemann

Construction supported by the Swedish Research Council and the Knut and Alice Wallenberg Foundation
TBTS, the real thing

Installation of beam line is complete, first beam arrived at the dump screen on Sept 3, PETS tests imminent.

Pics from R. Ruber, G. Riddone
Summary and Future

• Wide program around the accelerator physics issues of CLIC
  – Beam-quality and post-collision √
  – Mostly focused on the two-beam test-stand
  – Beam based diagnostics of RF-breakdown (lic MJ)

• Will participate in FP7 EuCARD project
  – TBTS upgrade and breakdown test inside SEM

• Started collaboration on Nordic scale
  – UU, U-Oslo, U-Helsinki → NorduCLIC

• Doctoral student position available, now!