ERL sub-Panel Kick-Off Meeting

July 14, 2021

Andrew Hutton

Why Are We Here?

- The European Lab Director's Group (LDG) established a Panel to evaluate ERLs, as one of five technologies to be studied
  - The other four are high field magnets, SRF, plasma acceleration and muon colliders
- While the Panel was collecting information, an ERL concept was put forward to build the ILC as an energy recovery twin collider, termed ERLC, with the prospect of a large increase of the e^+e^- instantaneous luminosity as compared to the ILC
- This caused the formation, in agreement with the LDG, of a sub-Panel to evaluate the prospects (primarily luminosity), involved R&D, and the schedule and cost consequences for the ERLC
- The concept to configure the FCC-ee as a high luminosity circular energy recovery collider, called CERC, should also be evaluated with the same criteria
- The sub-Panel should document its findings in an Appendix to the ERL baseline paper, which will be published in early fall 2021

Who Are We?

- The sub-Panel Members:
  - Chris Adolphsen (SLAC)
  - Reinhard Brinkmann (DESY)
  - Oliver Brüning (CERN)
  - Andrew Hutton (Jefferson Lab) - Chairman
  - Sergei Nagaitsev (Fermilab)
  - Max Klein (Liverpool)
  - Peter Williams (STFC)
  - Akira Yamamoto (KEK)
  - Kaoru Yokoya (KEK)
  - Frank Zimmermann (CERN)

Charter

- Goal: Evaluate two new concepts for high energy e^+e^- Colliders:
  - V. Litvinenko, T. Roser, M. Chamizo-Llatas, https://doi.org/10.1016/j.physletb.2020.135394
  - V. Telnov, https://arxiv.org/pdf/2105.11015.pdf
- The sub-Panel should evaluate the technical and financial implications of the two concepts compared to the FCC-ee and ILC projects
- What are the technical advances, specifically in luminosity?
  - Luminosity is the driver for the User interest, but polarization, reliability and energy upgrade potential are also important
- What are the technical obstacles requiring R&D?
  - These are the problem areas
- What would be time early for implementation?
  - Important question for ILC, less so for FCC-ee
- What is the rough cost implication (to about 10%)?
  - Cost effectiveness and absolute cost are both important

Charter - Continued

Deliverable:

- A short report (~20 pages) detailing the conclusions of the evaluation, which should be agreed and supported by the entire sub-Panel and published as an Appendix to the full Panel report.

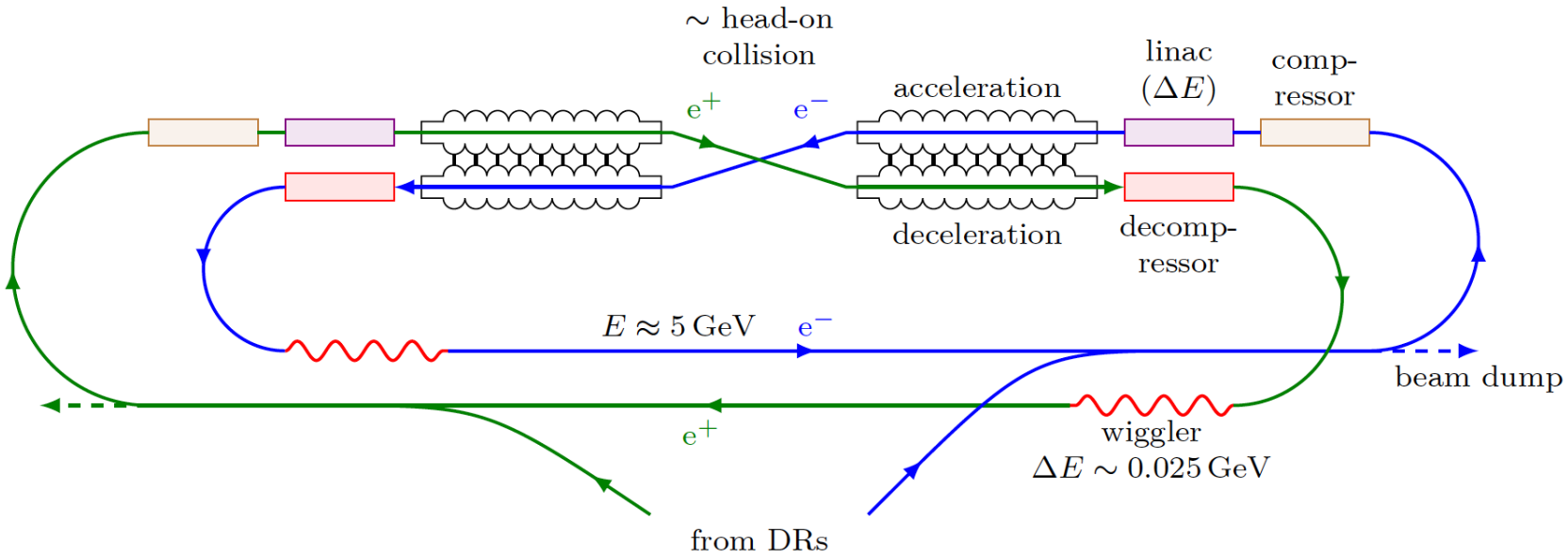
Methodology:

- We had a short kick-off meeting mid-June, with initial discussion of the two projects
- There will be one 90 minute meeting on each concept: 1 hour for a presentation, 30 minutes for questions
- If needed, this will be followed by a second meeting of 1 hour; 30 minutes Q&A with the proponents and 30 minutes with just the panel

- I will collate the opinions and we will end with a meeting to finalize our conclusions

Energy Recovery Linear Collider Concept: ERLC proposal

Valery Telnov



- ERLC consists of two parallel superconducting linacs connected to each other with RF-couplers, so that the fields are equal at any time
  - One line is for acceleration, the other for deceleration.
- Damping is provided by wigglers (no damping rings) at the “return” energy about E~5 GeV
- The energy loss per turn δE/E~1/100
- Damping is needed to reduce the energy spread arising from collision of beams