Symposium The Physics of Energy-Recovering LINACs (SYER)

gemeinsam veranstaltet von
dem Arbeitskreis Beschleunigerphysik (AKBP) und
dem Fachverband Physik der Hadronen und Kerne (HK)

Andreas Jankowiak
Helmholtz-Zentrum Berlin
Albert-Einstein-Str. 15
12489 Berlin
andreas.jankowiak@helmholtz-berlin.de

Harald Merkel
Universität Mainz
Johann-Joachim-Becher-Weg 45
55099 Mainz
merkel@kph.uni-mainz.de

Norbert Pietralla
TU Darmstadt
Schlossgartenstraße 9
64289 Darmstadt
pietralla@ikp.tu-darmstadt.de

Übersicht der Hauptvorträge und Fachsitzungen

(Hörsaal S1/05 122)

Hauptvorträge

SYER 1.1	Mi	9:00– 9:45	S1/05 122	**What Is An Energy Recovery Linac, and Why There Might Be One In Your Future*** — •Geoffrey Krafft
SYER 1.2	Mi	9:45–10:30	S1/05 122	**An FFAG-ERL at Cornell University for eRHIC Prototyping and Bright-Beam Applications** — •Georg Hoffstaetter
SYER 2.1	Mi	11:00–11:30	S1/05 122	**Physics opportunities at ERLs** — •Jan Bernauer
SYER 2.2	Mi	11:30–12:00	S1/05 122	**MESA - an ERL project for particle physics experiments*** — •Florian Hug
SYER 2.3	Mi	12:00–12:30	S1/05 122	**Development of a high brightness, high current SRF photo-electron source for ERL applications** — •Axel Neumann for the bERLinPro Team and Collaborators

Fachsitzungen

SYER 1.1–1.2	Mi	9:00–10:30	S1/05 122	**The Physics of Energy-Recovering LINACs I**
SYER 2.1–2.3	Mi	11:00–12:30	S1/05 122	**The Physics of Energy-Recovering LINACs II**

SYER 1: The Physics of Energy-Recovering LINACs I

Zeit: Mittwoch 9:00–10:30 Raum: S1/05 122

Hauptvortrag SYER 1.1 Mi 9:00 S1/05 122
What Is An Energy Recovery Linac, and Why There Might Be One In Your Future* — •Geoffrey Krafft — Jefferson Laboratory, Newport News, VA, USA — Old Dominion University, Norfolk, VA, USA

Applying beam energy recovery allows a class of novel accelerators to be built with performance characteristics beyond that possible in ring accelerators or non-recirculated linear accelerators. Although the idea was published 50 years ago, and was explored and developed as a result of "Star Wars" strategic defense programs in the 1980s and 1990s, renewed interest in energy recovery linacs (ERLs) has flowered as a result of continuous development and improvement of superconducting beam acceleration systems. Many applications to electron accelerators where the very best beam quality is required at high average current have been and are being explored. Examples include advanced X-ray sources, electron sources for electron ion colliders, internal target experiments and applications, lithography, and other topics. Examples highlighting new performance possibilities and the present perception on the limits of ERLs will be given. *Authored by Jefferson Science Associates, LLC under U.S. DOE Contract No. DE-AC05-06OR23177. The U.S. Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce this manuscript for U.S. Government purposes.

Hauptvortrag SYER 1.2 Mi 9:45 S1/05 122
An FFAG-ERL at Cornell University for eRHIC Prototyping and Bright-Beam Applications — •Georg Hoffstaetter — Cornell University, Ithaca / NY

Cornell University has prototyped technology essential for any high-brightness electron ERL. This includes a DC gun and an SRF injector Linac with world-record current and normalized brightness in a bunch train, a high-current CW cryomodule for 70MeV energy gain, a high-power beam stop, and several diagnostics tools for high-current and high-brightness beams, e.g. slid measurements for 6-D phase-space densities, a fast wire scanner for beam profiles, and beam loos diagnostics. All these are now available to equip a one-cryomodule ERL, and laboratory space has been cleared out and is radiation shielded to install this ERL at Cornell.

BNL has designed a multi-turn ERL for eRHIC, where beam is transported more than 20 times around the RHIC tunnel. The number of transport lines is minimized by using two non-scaling (NS) FFAG arcs.

A collaboration between BNL and Cornell has been formed to investigate the new NS-FFAG optics and the multi-turn eRHIC ERL design by building a 4-turn, one-cryomodule ERL at Cornell. It has a NS-FFAG return loop built with permanent magnets and is meant to accelerate 40mA beam to 250MeV.

SYER 2: The Physics of Energy-Recovering LINACs II

Zeit: Mittwoch 11:00–12:30 Raum: S1/05 122

Hauptvortrag SYER 2.1 Mi 11:00 S1/05 122
Physics opportunities at ERLs — •Jan Bernauer — Massachusetts Institute of Technology, Cambridge, MA, USA

The advent of energy recovering linacs opens up a new area in the luminosity / target density plane, allowing for unique experiments both on the intensity and on the precision frontier. In the talk, I will give an overview of experiments already funded or proposed. In the second part, ideas for future experiments will be discussed.

Hauptvortrag SYER 2.2 Mi 11:30 S1/05 122
MESA - an ERL project for particle physics experiments* — •Florian Hug — Institut für Kernphysik, Universität Mainz

The Mainz Energy-recovering Superconducting Accelerator (MESA) will be constructed at the Institut für Kernphysik of the Johannes Gutenberg University of Mainz. The accelerator is a low energy continuous wave (CW) recirculating electron linac for particle physics experiments. MESA will be operated in two different modes serving mainly two experiments: the first is the external beam (EB) mode, where the beam is dumped after being used with the external fixed target experiment P2, whose goal is the measurement of the weak mixing angle with highest accuracy. The required beam current for P2 is 150 μA with polarized electrons at 155 MeV. In the second operation mode MESA will be run as an energy recovery linac (ERL). In an ERL the energy of the electrons is recovered after their experimental use by decelerating them in the superconducting acceleration cavities. The experiment served in this mode is a (pseudo) internal fixed target experiment named MAGIX. It demands an unpolarized beam of 1 mA at 105 MeV. In a later construction stage of MESA the achievable beam current in ERL-mode shall be upgraded to 10 mA. Within this talk an overview of the MESA project will be given highlighting the challenges of operation with high density internal gas targets and the (*new*) physics applications.

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Hauptvortrag SYER 2.3 Mi 12:00 S1/05 122
Development of a high brightness, high current SRF photoelectron source for ERL applications — •Axel Neumann for the bERLinPro Team and Collaborators — Helmholtz-Zentrum Berlin, 12489 Berlin, Germany

Energy recovery linacs (ERL) offer the potential to combine major beam properties of the two main domains of particle accelerators: The low emittance of linear accelerators and the high average beam current of storage rings, while also allowing to compress to short bunches below the ps regime. This makes among other applications ERLs an ideal candidate for future light sources. The beam properties of the ERL are given by the performance of the injection section and hence of the beam source. Helmholtz-Zentrum Berlin is currently designing and building a high average current all superconducting CW driven ERL as a prototype to demonstrate low normalized beam emittance of 1 mm*mrad at 100mA and short pulses of about 2 ps. In this contribution we will discuss the development of this class of a high brightness, high current SRF photo-electron source and present recent commissioning results. Also, alternative approaches at other laboratories will be shortly reviewed.