PERLE: An ERL facility at Orsay

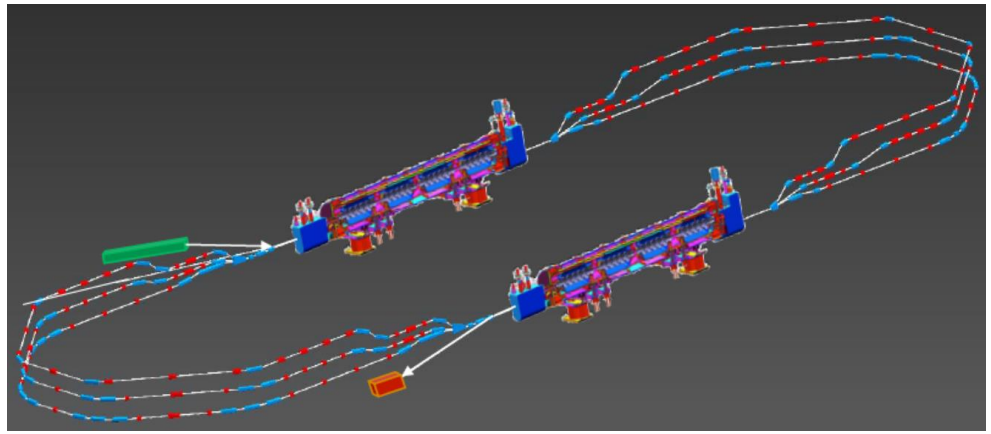
ICHEP2020

30/07/20

Ben Hounsell on behalf of the PERLE collaboration

What is PERLE and what are its applications?

- PERLE is a proposed ERL that would be the first 10 MW Energy Recovery Linac facility. It is being designed by an International Collaboration for construction at IJClab in Orsay
- ERLs are a type of particle accelerator in which the beam is decelerated after use recovering the beam's energy back into the RF cavities.
- The function of PERLE is threefold:
  - As a test facility for high power multiturn ERL operation.
  - As a facility preparing for the LHeC.
  - Use in experiments in photonuclear physics, electron scattering from radioactive ions beams and ep scattering.
- The PERLE collaboration is composed of: University of Liverpool, IJCLab, STFC Daresbury, BINP, Jlab , Cornell University and CERN

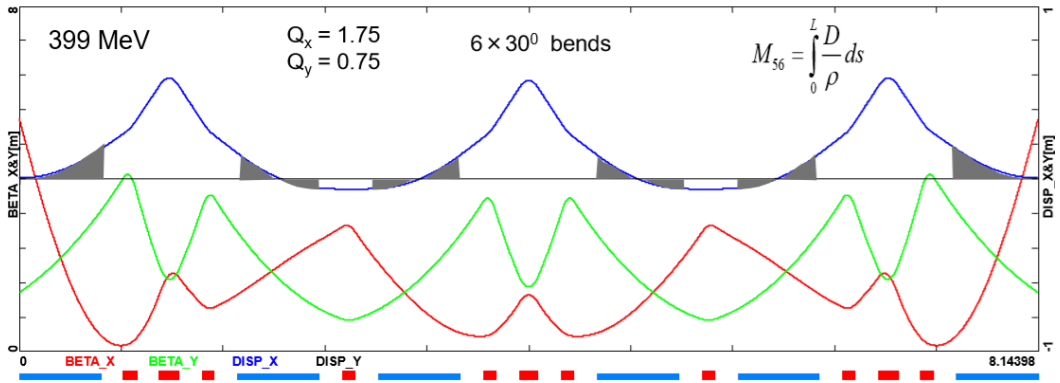


PERLE Parameters	
Maximum energy	500 MeV
RF Frequency	802 MHz
Number of turns	3
Bunch charge	500 pC
Current	20 mA
RMS bunch length	3 mm
Emittance	< 6 π·mm·mrad

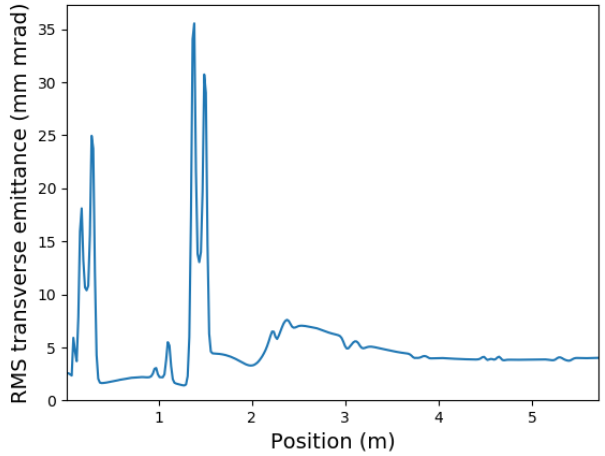
Parameters selected on the basis of the LHeC

Current status of PERLE development

- Progress is currently being made in several areas:
  - Lattice: Work is currently being done towards new 6 dipole baseline arcs
  - Injector: The injector meets the specification at the booster exit. The merger is currently being worked on.
  - Magnets: Preliminary designs for the magnets have been done. The new lattice will require new magnet designs.
  - Cryomodule & HOM damping: The HOM damping requirements of the main linac cryomodule are currently being investigated. If the HOM requirements permit it an SPL cryomodule will be repurposed for PERLE.



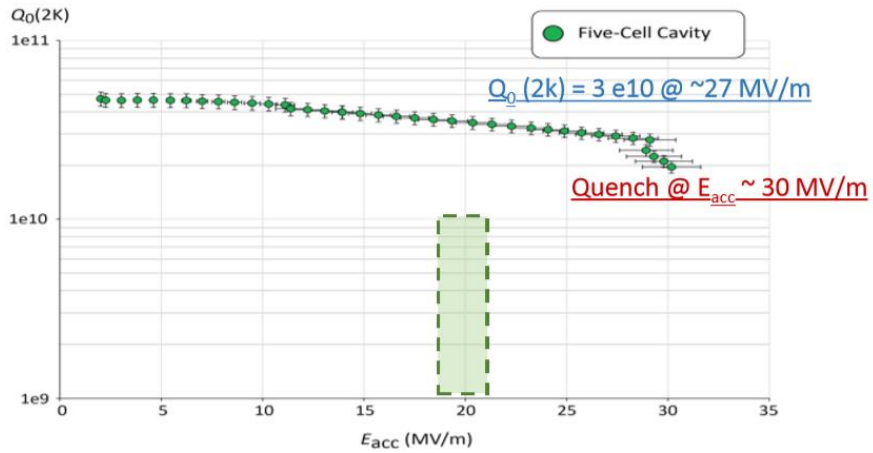
New lattice arc optics



Emittance in the PERLE injector

Status and progress

- A CDR has been completed for the previous 1 GeV version of PERLE in 2017.
- Progress is being made in several areas towards the 500 MeV PERLE@Orsay design.
- Detailed breakdowns of timelines and divisions of work between collaboration member institutions are being laid out.
- Initial step: Prototypes, hardware choices and TDR by 2022.



Results for the first 802 MHz SRF cavity