Karlsruhe Institute of Technology

Experimental tests in KARA booster in favor of cSTART

MT-ARD-ST3 meeting 2021

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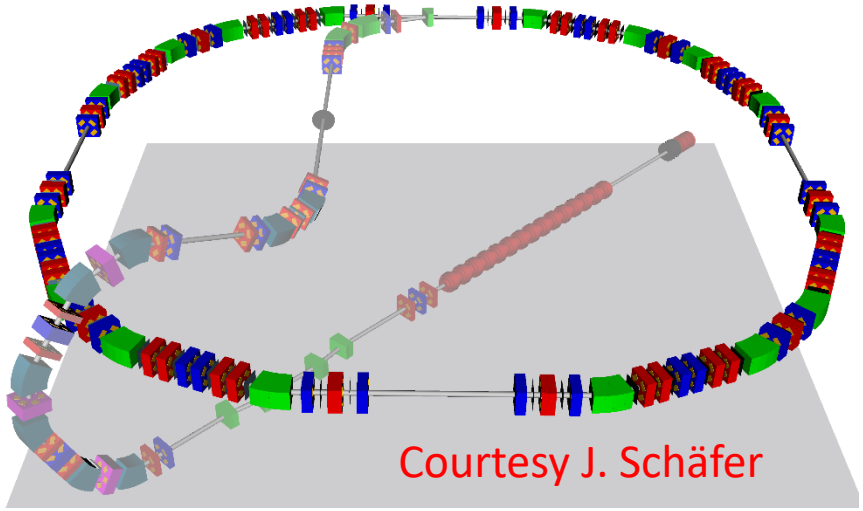
cSTART project

Overview talk of M. Schwarz
Speed talk of A. Papash



A. Papash et al., IPAC21, MOPAB035

Machine	cSTART ring	Booster ring
Single bunch	Yes	Yes
Beam energy (MeV)	50	53
Repetition rate (MHz)	6.8	11.36

Table 1: similarities between the cSTART ring and the KARA booster

- Few challenges in designing an electron beam diagnostics system given the:
  - Limited space in the arc sections
  - High repetition rates
  - Ultra-short bunches and low bunch charge
- Possibility of conducting few tests on existing beam diagnostics at KARA booster given few similarities, see Table. 1

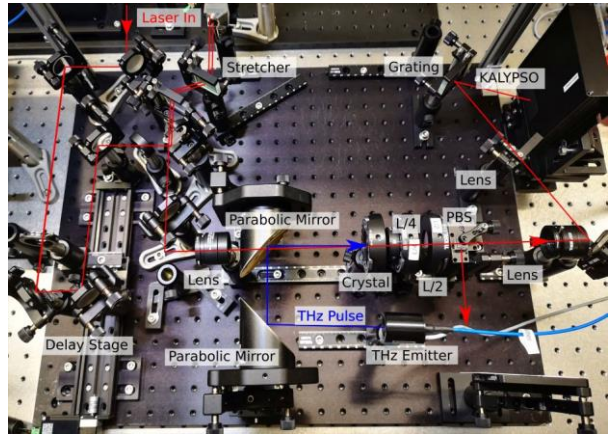
Beam diagnostics at KARA booster

- Existing diagnostics in the booster which are of interest for cSTART:
  - Striplines (beam position, tune and bunch charge measurements)
  - Optical windows for synchrotron light diagnostics (Intra-beam scattering IBS lifetime measurements)
  - Beam loss system based on scintillators with readout units
- Further plans for cSTART:
  - Possibility of using Electro-Optical far-field setups for longitudinal profile measurements

Libera BPM readout units,
Courtesy H. Hoteit

Synchrotron light port,
Courtesy J. Steinmann

Beam loss system,
Courtesy E. Blomley



Far field EO setup,
Courtesy C. Widmann

Status of preparations - I

- Single bunch operation at the booster is implemented and commissioning will start in October
- Tests of the new Libera SPARK units are planned as soon as the cabling is finalised
  - Spare units will be used to readout the signals from the stripline during single bunch operations
- IBS is limiting the lifetime in low energy electron rings
  - Study of the enhancement of the horizontal bunch size at 53 MeV on a turn-by-turn basis
  - Preparation of an optical setup to guide the SR light into a camera/KALYPSO (speed talk of M. Patil, Faraday cup award 2021)

Status of preparations - II

- Four Beam loss detectors based on scintillator + PMT are installed in the booster connected to a Libera BLM readout unit
  - Calibration with radioactive source
  - Tests with single bunch operation

- A promising method for longitudinal profile measurements:
  - EO far-field setup is under construction and test in the Infra-red (IR) beamline at KARA (speed talk of M. Patil, Faraday cup award 2021)
  - Plan of constructing a similar system in the VLD hutch (very preliminary, under discussion and investigation)

Summary

- Challenges of designing a compact diagnostics system at cSTART have been addressed
- KARA booster will be a test-ring where different beam diagnostics options could be tested
- Plans and preparations for testing were mentioned and briefly discussed

Thank you for your attention