

ERL11

Working Group 4 Charge – Instrumentation & Controls

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Working Group 4 will address technical issues for instrumentation and diagnostics that are designed to measure the electron beam properties required for initial machine set up, safe operation, and to diagnose anomalous behavior. In addition we will cover synchronization of the electron beam with accelerator RF, external lasers, and experimental equipment.

The main topics to be addressed are:

- Procedures for commissioning & operations
- Transverse orbit measurements and beam profiles
- Longitudinal beam instrumentation for energy spread and time profiles
- Beam-based machine diagnosis and feedback systems
- Synchronization & timing systems for operations & users
- Controls topics for system experts, and operations
- Passive and active machine protection system

These topics can be subdivided into specifics that each proposed diagnostic method should address, including:

Operation phase:

- Early commissioning and re-commissioning (start-up from scratch)
- Performance evaluation of the machine (dedicated machine studies)
- Full machine performance runs (nominal or user operation)

Beam modes (ERL specific):

- Low, medium and high currents ($I < 0.01\text{mA}, <1\text{mA}, 1\dots1000\text{mA}$)
- Low, medium and high charge ($Q < 10\text{pC}, <100\text{pC}, 0.1\dots10\text{ nC}$)
- Low, medium or high bunch rep. rate ($f \sim \text{kHz}, \sim\text{MHz}, \sim\text{GHz}$)
- Small, medium or large nominal emittance ($\epsilon < 1\mu\text{m}, < 10\mu\text{m}, 10\text{ }\mu\text{m}$)
- Short, medium or large bunch length ($s < 100\mu\text{m}, <1\text{mm}, \sim 1\dots10\text{ mm}$)

Location:

- Drive laser beam line(s)
- Injector
- Acceleration linac
- Arcs, up- and downstream of bunch compressors
- Insertion device
- Experiments
- Beam dump area

There is a range of measurements to be performed in each of the five major topics. Attendees should present work toward diagnostics that perform one or several of these measurements. Each method proposed should address the measurement resolution, the dynamic range and limitations of the system due to physical, technical or noise reasons. Does the method discriminate between the accelerating and decelerating beams?