ON THE DEVELOPMENT OF THE "PITZ-ROBOT" FOR USE AT THE FLASH*lab*@PITZ EXPERIMENTAL AREA

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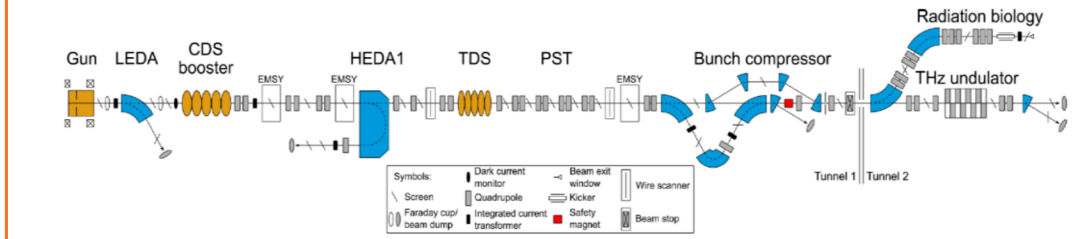
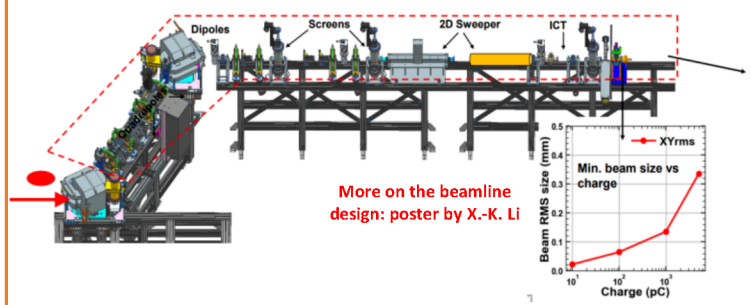
FLASH*lab*@PITZ beamline upgrade

More on radiation biology: poster by S. A. Gohari

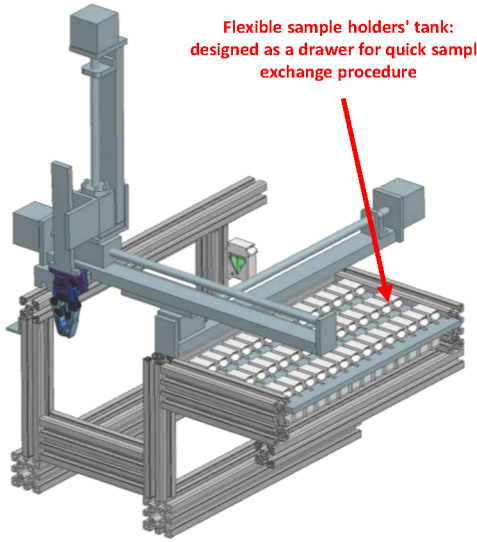




PITZ Robot
Photo Injector Test Facility
Zeuthen

- The **PITZ** accelerator (22 MeV, electrons) at DESY-Zeuthen is perfectly suited for FLASH-RT research, studies on a new **cancer treatment technique,** due to its **wide parameter range** available.
- Number of RF pulses, number of micropulses, micropulse charge, RF repetition rate and beam size can be adjusted
- Dose rates down **from 0.02 Gy/s up to 10^{14} Gy/s** are possible.
- Search for best parameters is ongoing
- Full FLASHlab@PITZ beamline was designed and is **currently under installation.**
- **The PITZ-Robot**, a tailored copy of the C-Robot for PITZ needs, is part of the **upgrade package**.

PITZ-Robot overview



- The **PITZ-Robot** is a version of the **CLEAR-Robot** (C-Robot[1]), tailored for PITZ beam parameters and experimental needs. Its ongoing development takes place after **commissioning of the C-Robot in the startup beamline** at PITZ[2], applying the **lessons leaned** with the experience.
- Its main goal is the optimization of beam position alignment and dose delivery.
- Consists mainly of:
  - 3 linear motors
  - 1 grabber
  - Storage area; and
  - Irradiation area

It is ARDUINO coded, and MATLAB controlled. MATLAB GUI has been adapted. A custom-designed 3D-printed holder with a YAG screen and a 45° mirror serves as a beam tracker. Real-time feedback is provided by a camera attached to the grabber. Possibility of using this device as online dosimetry tool is under investigation.

[1] P. Korysko et al. "The CLEAR user facility: a review of the experimental methods and future plans" in Proc. IPAC'23, Venice, Italy, May 2023.
[2] D. Villani et al. Commissioning of the C-Robot at the FLASHLAB@PITZ experimental area. Physica Medica, 2024 10.1016/j.ejmp.2024.104183

Outlook

- The PITZ-Robot is part of the upgrade package of the FLASH*lab*@PITZ, becoming the **main tool for sample manipulation** during irradiations.
- Hardware mounting is ongoing → **commissioning together with upgraded beamline**;
- Future applications of the PITZ-Robot also include studies on **luminescence and dosimetry R&D**.

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