Contribution ID: **806** Type: **Contributed talk**

The Munich Compact Light Source –Lessons Learned at and Ongoing Upgrade of a Laboratory-Scale Synchrotron Facility with a User-Centered Operation Scheme

Tuesday 27 August 2024 13:15 (15 minutes)

The possibility to generate low-divergence, high-flux, energy-tunable X-ray beams with a narrow energy bandwidth has long been limited to synchrotron radiation sources based on storage rings with hundreds of meters in circumference. In recent years, there has thus been a growing interest in inverse Compton scattering X-ray sources, as they also allow to generate such X-ray beams of high brilliance, yet with a machine footprint compatible with standard research laboratory settings. The Munich Compact Light Source (MuCLS) is a laboratory-scale synchrotron facility at the Technical University of Munich (TUM), which consists of a commercial inverse Compton X-ray source (Lyncean Technologies Inc., formerly of Fremont, USA) and a beamline with two endstations designed and constructed by TUM scientists [1,2].
In many other inverse Compton source projects (see, e.g., [2] and [3] for a list), the development of the source itself and its characterization, i.e., accelerator and laser physics, are major parts of the respective research programs. In contrast, they play only a minor role at the MuCLS where the research program has been explicitly focusing on applications of the X-ray beam in user experiments since the source's installation in 2015. These applications are centered around, but not limited to, biomedical X-ray imaging [1].

In the first part of the contribution, the emphasis will be put on the lessons learned in more than nine years of user-centered operation. This will include some aspects of operating the inverse Compton source of the MuCLS day-to-day and efforts made to simplify this task. In addition, we will take a look at how an inverse Compton facility can meet the typical requirements and expectations users have concerning, e.g., source properties, source availability or access, also considering what they are used to from other X-ray sources. Furthermore, we will present some practical considerations for experiments, in particular for experiments in vivo.
In the second part of the contribution, the ongoing upgrade of the facility will be discussed. It will replace the two separate X-ray shielding enclosures along the single beamline [1] by a large shielded experimental area, resulting in a very high flexibility for future experiments.

References

[1] B. Günther et al., Journal of Synchrotron Radiation 27, 1395 (2020).
[2] E. Eggl et al., Journal of Synchrotron Radiation 23, 1137 (2016).
[3] K. E. Deitrick et al., Physical Review Accelerators and Beams 21, 080703 (2018).

I plan to submit also conference proceedings

No

Primary author: DIEROLF, Martin (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany)

Co-authors: Dr GÜNTHER, Benedikt (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany); MELCHER, Johannes (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany); Mr BRANTL, Johannes (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany); Dr GLEICH, Bernhard (2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany); Dr ACHTERHOLD, Klaus (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany); PFEIFFER, Franz (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany; 3) TUM Institute for Advanced Study, Technical University of Munich, Germany; 4) Department of Diagnostic and Interventional Radiology, TUM School of Medicine, Technical University of Munich, Germany)

Presenter: DIEROLF, Martin (1) Chair of Biomedical Physics, Department of Physics, TUM School of Natural Sciences, Technical University of Munich, Germany; 2) Munich Institute of Biomedical Engineering, Technical University of Munich, Germany)

Session Classification: Mikrosymposium MS 11/1: SR facilites: Updates and New Facilities

Track Classification: 11. Synchrotron radiation facilities: Facility updates and new facilities