



Contribution ID: 163 Contribution code: TUAO3

Type: **Contributed Oral**

## Demonstration of Enhanced FEL Performance with Optical Klystron and Helical Undulators

*Tuesday, 23 August 2022 09:45 (25 minutes)*

This contribution presents the experimental demonstration of improved performance of an X-ray free-electron-laser (FEL) using the optical klystron mechanism and helical undulator configuration in comparison to a standard planar undulator without optical klystron. The demonstration has been carried out at Athos, the soft X-ray beamline of SwissFEL. Athos has variable-polarization undulators and small magnetic chicanes placed between every two undulator modules to fully exploit the optical klystron. It is shown that, for wavelengths between 1 and 3 nm, the required length to achieve FEL saturation is reduced by about a factor of two when using both the optical klystron and helical undulators, with each effect accounting for about half of the improvements. Moreover, it is shown that a helical undulator configuration provides a 20% or higher saturation power than planar undulators. This work represents an important step towards more compact and high-power FELs, rendering this key technology more efficient, affordable, and accessible to the scientific community.

### I have read and accept the Privacy Policy Statement

Yes

**Primary authors:** KITTEL, Christoph (Paul Scherrer Institut); CALVI, Marco (Paul Scherrer Institut); PRAT, Eduard (Paul Scherrer Institut); Dr WANG, Guanglei (Paul Scherrer Institut); Dr SAMMUT, Nicholas (University of Malta)

**Presenters:** KITTEL, Christoph (Paul Scherrer Institut); CALVI, Marco (Paul Scherrer Institut); PRAT, Eduard (Paul Scherrer Institut); Dr WANG, Guanglei (Paul Scherrer Institut); Dr SAMMUT, Nicholas (University of Malta)

**Session Classification:** SASE FELs

**Track Classification:** SASE FEL