

To:

Doc. Ing. Václav Čuba, PhD
Dean of the Faculty of nuclear science and physical engineering
Czech Technical University Prague

Subject: Referee report on PhD thesis by Martin Albrecht

Amsterdam, October 24th, 2023

Dear Dr. Čuba and members of the examination board,

It is my pleasure to provide a positive assessment of the PhD thesis submitted by Martin Albrecht, entitled "Laser-generated short-wavelength coherent sources and their applications". In this thesis, Mr. Albrecht discusses the development of advanced diagnostic tools for the characterization of state-of-the-art extreme-ultraviolet (EUV) light sources. He presents measurements on the spatial and temporal coherence of soft-X-ray lasers (SXRLs), where in both cases he developed novel methodology to perform such measurements. Furthermore, he presents experimental results on two different implementations of lensless diffractive imaging, namely coherent diffractive imaging (CDI) and multi-wavelength ptychography, using a high-harmonic generation (HHG) source. Lensless imaging is an advanced application of coherent EUV sources that is experimentally very demanding, requiring careful setup design and sample fabrication, as well as a high stability and flux of the HHG source. Mr. Albrecht achieves successful reconstructions using both methods, which is a significant achievement and certainly at the state-of-the-art for the field.

The thesis contains a clear overview of the relevant theory, a detailed description of the various EUV sources and experiments, and a good amount of detail on the methods. From this thesis, I conclude that Mr. Albrecht has a good overview of the project, and that he has demonstrated significant expertise and skill in fulfilling such a wide range of complex experiments. Both SXRL and HHG sources are advanced and complex devices, and their operation and use in experiments is challenging. The lensless imaging projects in addition require iterative phase retrieval algorithms that are likewise advanced from a data analysis perspective. To successfully complete a project with such a variety of demanding tasks shows that Mr. Albrecht is at a stage where he can complete his PhD. I evaluate this thesis as being high quality, and I would certainly recommend that he presents and defends his thesis work to obtain the PhD degree.

Yours sincerely,

Dr. Stefan Witte,

Group leader and department head of Metrology at ARCNL
Associate professor, Department of Physics and Astronomy, Vrije Universiteit Amsterdam

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