

Contribution ID: 105

Type: **Poster**

Capturing ion-solid interactions on sub ps timescales

Monday, September 22, 2025 5:15 PM (10 minutes)

Ion impacts trigger atomic-scale processes in solids on ultrafast timescales, yet direct experimental access to these dynamics has been limited by the lack of short, monoenergetic ion pulses. To address these challenges, we developed a novel ion source based on strong-field photoionization of a cooled gas jet. In combination with a compact buncher system, we are able of generating monoenergetic keV ion pulses with durations of only a few picoseconds. In a proof-of-principle experiment on a free-standing graphene membrane, we performed the first ion-based pump-probe measurement in the keV regime with picosecond resolution, directly probing hot electron emission following ion impact. Computer simulations indicate that ion pulses in the sub-picosecond regime are possible, highlighting the need for further instrumental improvements.

To advance this capability, we will enhance the time resolution by modifying the gas composition and re-designing the ionization chamber. We approach this challenge by a more compact and modular chamber design, improving stability and reproducibility, mitigating the sensitivity of the setup. Its modularity also increases versatility for integrating various detection technologies without affecting the remaining configuration, thus paving the way toward resolving ion-solid interaction dynamics on even shorter timescales.

Author: STOLZ, Simone (Universität Duisburg-Essen)**Co-authors:** Dr BREUER, Lars (Universität Duisburg-Essen); JUNKER, Nele (Universität Duisburg-Essen); Dr KALKHOFF, Lukas (Universität Duisburg-Essen); MEYER, Ann-Sophie (Universität Duisburg-Essen); Prof. SCHLEBERGER, Marika (Universität Duisburg-Essen); Prof. SOKOLOWSKI-TINTEN, Klaus (Universität Duisburg-Essen)**Presenter:** STOLZ, Simone (Universität Duisburg-Essen)**Session Classification:** Posters**Track Classification:** Annual Workshop on Ion and Particle Beams (Ionenstrahl Workshop)