

## Challenges and solutions for MX at beamline P11 on PETRA III

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Beamline P11 at PETRA III in Hamburg is a dedicated macromolecular crystallography beamline in operation since 2013 [1-2]. During the lifetime of the beamline, structural biology has made great advances, especially in the field of cryo-EM and structure predictions with Alphafold, and also faced challenges, such as the pandemic. The changes in the surroundings have impacted P11 beamline in various ways, one example being the transfer of experiments from onsite to almost solely remote access.

Beamline P11 has responded to the changing MX landscape in several ways, such as engaging into the MXCuBE/ISPyB collaborations and making both of these systems available in user operations. This collaboration has aided the development of unattended data collections, where machine learning based optical auto centering has already been implemented. We have also built in a sample logistics chain together with our campus partner.

To further advance our MX beamline, we plan to upgrade the diffractometer and sample changer during 2026-2027, to increase the reliability of the instrument, add more experimental possibilities and also to improve the throughput. The upgrade of the MX endstation is done in advance to the source upgrade of PETRA IV, where the successor of P11 is one of the intended phase I beamlines and it will also remain in its current location.

Also relating to PETRA IV developments, P11 among 4 other beamlines is piloting a new access model since 2024, aiming to provide better responsiveness in terms of shorter time from proposal submission to beamtime and lowered threshold for cross-disciplinary work and fully or partially outsourced projects. Simultaneously we look to simplify the application process.

[1] Burkhardt, A., Pakendorf, T., Reime, B., Meyer, J., Fischer, P. Stübe, N., Panneerselvam, S., Lorbeer, O., Stachnik, K., Warmer, M., Rödig, P., Göries, D., Meents, A. Status of the crystallography beamlines at PETRA III (2016) *Eur. Phys. J. Plus* **131**, 56

[2] Oberthür, D., Hakanpää, J., Chatziefthymiou, S., Pompidor, G., Bean, R., Chapman, H.N. & Weckert, E. (2025). *J. Synchrotron Rad.* **32**, <https://doi.org/10.1107/S1600577525000669>.