Today X-ray absorption fine structure (XAFS) spectroscopy is an established analytical method and used routinely by a large user community working in various fields of science to gain information about the structure around the absorbing element in their samples. The evolution of synchrotron storage rings over the past decades has made experiments possible that were impossible some years ago. Today the first 4th generation storage rings are in operation and many more will follow in the next years. The trend to ever smaller e-beam emittance and the resulting higher brilliance and beam coherence is a challenge for classical XAFS spectroscopy. It is therefore mandatory to evaluate the options to continue to provide routine XAFS analytics to the broad user community which is using this indefensible analytical tool for their research in socioeconomically important fields like catalysis and energy storage.

The ideal source for classical XAFS spectroscopy emits a broad spectrum without spatial or intensity fluctuations over the scan range of a typical extended X-ray absorption fine structure (EXAFS) spectroscopy scan. Today, at PETRA III P65 uses a short undulator as source. However, this requires a synchronized scanning of undulator gap and monochromator and makes fast continuous scans with second or sub-second time resolution impossible [1]. The planned beamline at PETRA IV will make use of the radiation emitted by a 3 pole wiggler. The main components will be the 3 pole wiggler, a horizontally and vertically collimating mirror, the double crystal monochromator (Si 111 and 311) and a focusing mirror that will focus the beam on the sample position. A schematic overview of the beamline is shown in figure 1.

The concept of the beamline foresees the implementation of highly automated and remotely controlled modes of operation for all kinds of applications including in-situ/operando experiments. This will increase the throughput tremendously and allow for easy and safe remotely controlled mail-in experiments thus making the beamline highly attractive for industrial applications and new user groups without previous experience with experiments at synchrotrons. Outreach and output of XAFS spectroscopy as a standard analytical tool will without doubt be greatly increased by lowering the access bar for industrial users and less experienced user groups from academia.

Figure 1. Schematic representation of the new XAFS beamline. Graph generated using the ray tracing code xrt [2]. 3 pole wiggler, collimating mirror, Si111 double crystal monochromator, toroidal focusing mirror, sample