Synchrotron radiation circular dichroism and oriented CD spectroscopy of membrane-active proteins and peptides

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Theme: Instrumentation (SRCD Advancement, New Techniques)

Abstract:
Synchrotron radiation circular dichroism (SRCD) is a rapidly growing technique for structure analysis of proteins, carbohydrates and other biomaterials [1]. CD12 is a high flux beamline for steady-state and time-resolved SRCD measurements, which has been installed at the ANKA synchrotron in 2010 and covers the VUV to near-UV spectral range. Originally, this beamline had been conceived and designed by the Centre for Protein and Membrane Structure and Dynamics (CPMSD), a consortium of U.K. structural biologists. It was constructed at the SRS synchrotron facility of the Daresbury Laboratory and was open for users since 2003. Following the closure of SRS in August 2008, the relatively new beamline was transferred to ANKA and will be operated by the IBG-2 to continue its working life. Dedicated to structural biology research of chiral biomacromolecules, CD12 will become active again in 2011 for the community. It will exceed conventional laboratory instruments in terms of photon flux and extend the accessible spectral range into the VUV, thus improving the signal-to-noise ratio and accelerate data collection.
Our effort of re-building and commissioning CD12 at ANKA will be discussed, and details on the main beamline components (front-end, primary mirror, monochromator) and the CD experimental set-up will be given. Examples for future applications of the beamline, e.g., for secondary structure and orientational analysis of membrane-active peptides (e.g. with antimicrobial and cell-penetrating functions) as well as for integral membrane proteins (PDGFβ-receptor, TatA translocase) will be presented. A special focus lies on the new method of synchrotron-based oriented circular dichroism (OCD) in

macroscopically aligned membrane samples [2,3]. As a complementary method to OCD, oriented solid-state NMR structure analysis of biomembranes has been well established at the institute and can provide quasi-atomic resolution on the molecules of interest, provided that they are selectively labeled with NMR-active isotopes.

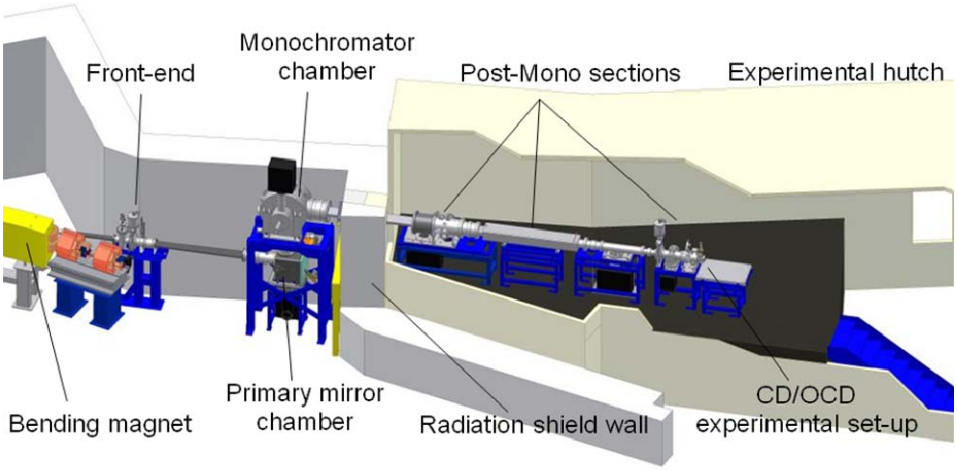

Fig. 1: Modified set-up of CD12 at ANKA

References

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