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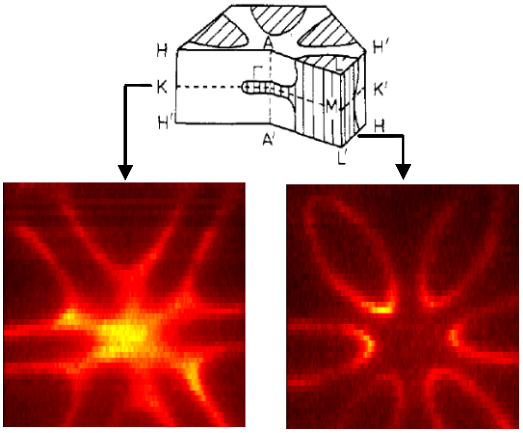
SOFT-X-RAY ARPES VIEW OF THREE-DIMENSIONAL ELECTRONIC STRUCTURE

ARPES experiments in the soft-X-ray energy range bring advantages of free-electron final states, simplified matrix elements and increasing photoelectron escape depth λ. The latter, along with enhancement of the bulk sensitivity, improves intrinsic resolution in surface-perpendicular momentum $\Delta k_z = \lambda^{-1}$. This enables investigations of electronic structure under reliable control of the three-dimensional (3D) momentum **k**.

The soft-X-ray ARPES facility at SLS has come into operation in early 2011. The ARPES endstation is installed at the ADRESS beamline operating in a photon energy range from 300 to 1600 eV (V.N. Strocov *et al*, J. Synchrotron Rad. **17** (2010) 631). High photon flux topping up 10^{13} photons/s/0.01%BW at 1 keV has allowed us to break through the notorious problem of small valence band crossection in the soft-X-ray range. Operation around a photon energy of 900 eV with a combined energy resolution of 110 meV delivers spectra of publication quality within 5 min, and of 60 meV within 30 min.



Apart of a technical overview, I will demonstrate a variety of experimental results achieved with the new soft-X-ray ARPES instrument. They include determination of 3D Fermi surface (FS) of VSe_2 (figure) with its warping in the out-of-plane momentum giving rise to 3D charge density waves, exciton mediated CDWs in $TiSe_2$, alternating shapes of the FS in three-dimensional HTSC pnictides, hybridization between *sp*- and *f*-states in heavy-fermion systems, three-dmensional FS of strongly correlated $NiS_{2-x}Se_{x,}$ FS of buried layers in $LaNiO_3/LaAlO_3$ hererostructures, etc. These unfolding results demonstrate an immense potential of soft-X-ray ARPES to deliver a clear view of 3D electronic structure.