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Title: Towards high resolution IPES in the VUV range

Abstract

Since its concept was introduced and its feasibility was demonstrated, the conceptual interest of Angle-Resolved Inverse Photoemission (ARIPES) has not declined. Unfortunately, for decades technical challenges have kept ARIPES in a niche. At the same time direct photoemission, ARPES, has become a popular and unmissable technique for the determination of the electronic structure of solids. ARPES spectra are commonly measured with energy resolution better than 10 meV, a figure still unachieved in ARIPES, which explains the different popularity of the two complementary techniques.

Is it possible to design today an ARIPES instrument that better exploits the technological progress undergone over the years by detectors and optical elements for VUV radiation, and by monochromatized electron-beam sources?

I present some ideas guiding the realization of an ARIPES apparatus working in the 20–100 eV energy range. Aiming at a combined instrumental bandwidth smaller than 50 meV, it is based on a high-luminosity grating spectrometer and a 2D position-sensitive semiconductor detector. The design strategy follows the spectrometer optimization algorithm developed by Prof. Ghiringhelli, which I will use to illustrate the successive optimization steps of the optical layout and of its key components, in particular the diffraction grating and the collecting mirror.