ONGOING PARTNERSHIP BETWEEN SCIENTA OMICRON GMBH AND FOCUS GMBH

Highlights from the new NanoESCA MARIS system

In light of FOCUS GmbH's recent announcement of joining the Lab14 group, we want to assure our mutual customers that the collaborative relationship between Scienta Omicron GmbH and FOCUS GmbH remains unchanged. We are committed to continuing our close partnership, and no changes are anticipated to our relationship as a result of FOCUS GmbH's restructuring in ownership.

Scienta Omicron GmbH and FOCUS GmbH have a longstanding history of close collaboration, delivering cutting-edge instruments for research in surface science and nanotechnology. A notable outcome of the tight partnership between the two companies is the development of the NanoESCA product, a state-of-the-art PEEM (Photoemission Electron Microscopy) instrument, combining high lateral and momentum resolution with excellent spectroscopy performance.

NanoESCA MARIS

With its ability to perform both **M**omentum **a**nd **R**eal Space **I**maging **S**pectroscopy, the latest version of the instrument is called NanoESCA **MARIS**. Here, the lens system is completely modified in order to achieve a much improved angular / momentum resolution of 0.005 $Å^{-1}$ (as compared to its predecessor reaching a resolution of 0.015 $Å^{-1}$), while keeping the same excellent lateral resolution in real space of < 35 nm. The performance in momentum space is presented in Figure 1, displaying the band structure of a Au (111) single crystal measured at the Fermi level (Figures 1a and 1b). The Rashba split surface state is nicely resolved and fitted by two Lorentzian peaks (Figure 1c). The result shows that the inherent broadening of the spectral bands is considerably larger than the Gaussian broadening caused by the instrumental resolution.

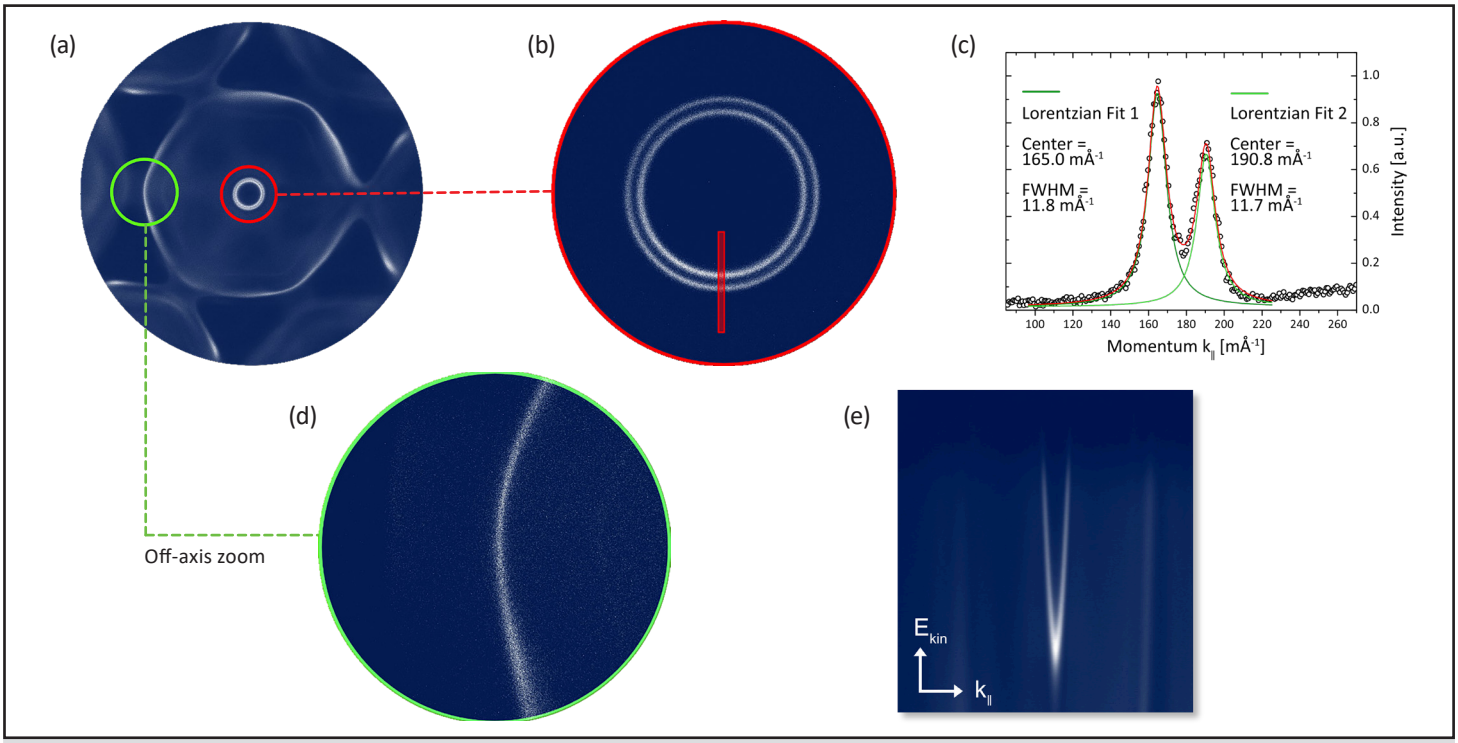

Figure 1: (a) Momentum Space Image of a Au (111) single crystal taken at the Fermi level, showing (a) more than one Brillouin zone and (b) a zoom onto the Rashba split surface state. (c) Line profile taken along the red line in (b) fitted with two Lorentzian peak functions. (d) Off-axis zoom onto the momentum space area enclosed by the green circle in panel (a). (e) Surface state of Au (111) measured with the Energy Dispersion Mode. All data are collected at a sample temperature of 45 K.

More often than not, spectral features away from the center of the Brillouin zone are of interest in ARPES experiments. As such, the new NanoESCA MARIS system allows to zoom onto any point in momentum space and collect band structural data around a desired k-point with high-resolution. The off-axis zooming capability is presented in Figure 1d.

In particular instances, there may be the need for a direct measurement of the Energy Dispersion Image. A new mode in the lens system – called the Energy Dispersion Mode – enables the projection of an energy vs. momentum cut directly onto the detector as shown in Figure 1e.

Low Temperature NanoESCA manipulator with Hexapod sample stage

For ultimate experimental resolution, it is always desired to cool down the sample. With the newly designed open cycle LHe cooled NanoESCA manipulator, we guarantee a sample temperature of < 10 K. The manipulator also hosts a 6-axis hexapod sample stage, enabling a proper in-situ alignment of the sample with respect to the optical axis of the microscope. The specifications of the low temperature hexapod sample stage are given in Figure 2.

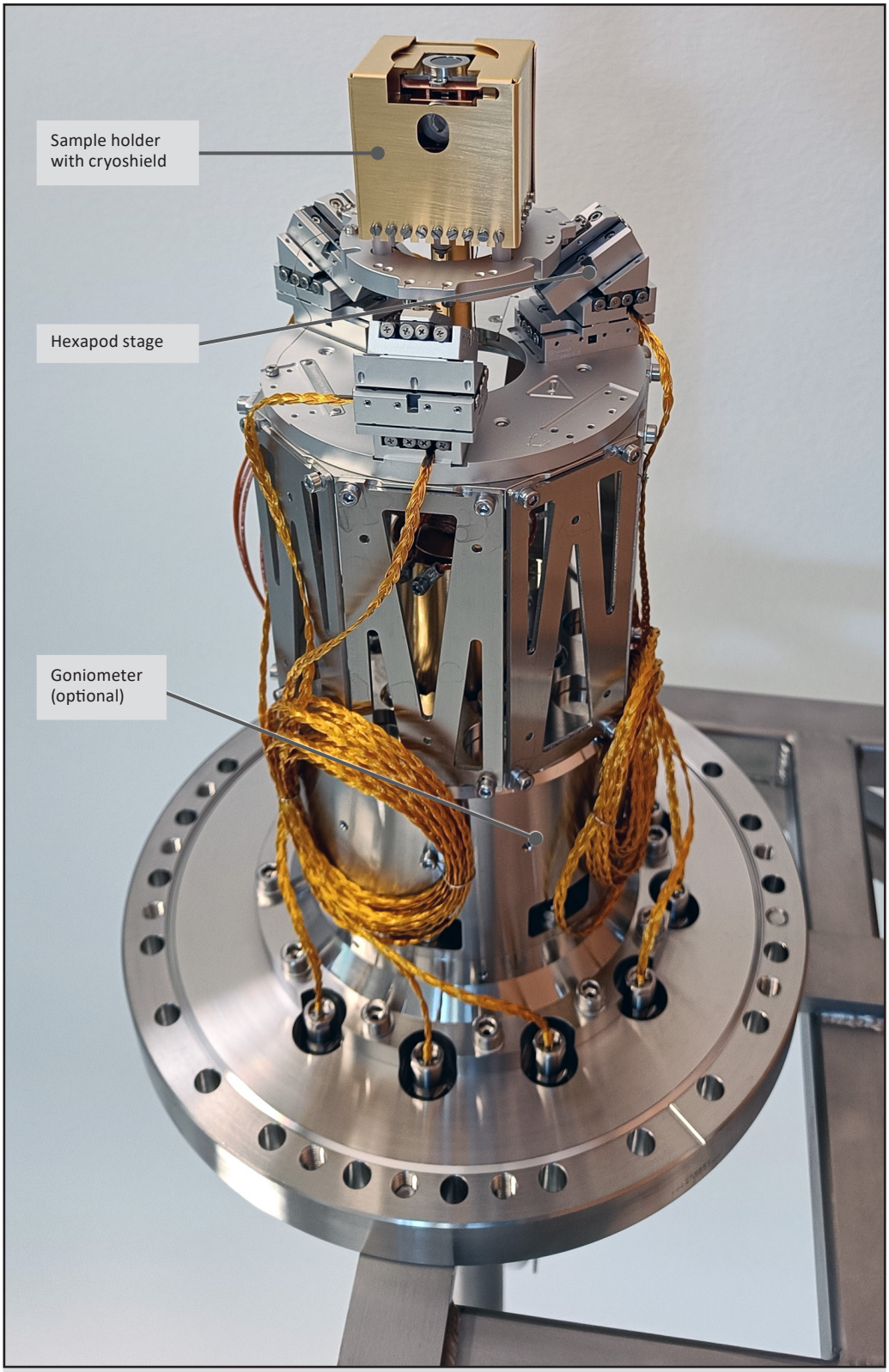

Figure 2: Low Temperature NanoESCA manipulator with hexapod sample stage.

- Temperature range < 10 K to 400 K
- x and y motion ±5 mm
- z motion > 5 mm
- tilt along x and y directions > ± 5°
- azimuthal rotation ± 10° (upgradeable to ± 60° with the addition of a goniometer)
- 4 electrical contacts to the sample (optional)