SPECS™

in cooperation with

SURFACE CONCEPT

2D-Delayline Detector

Product Information

Specifications

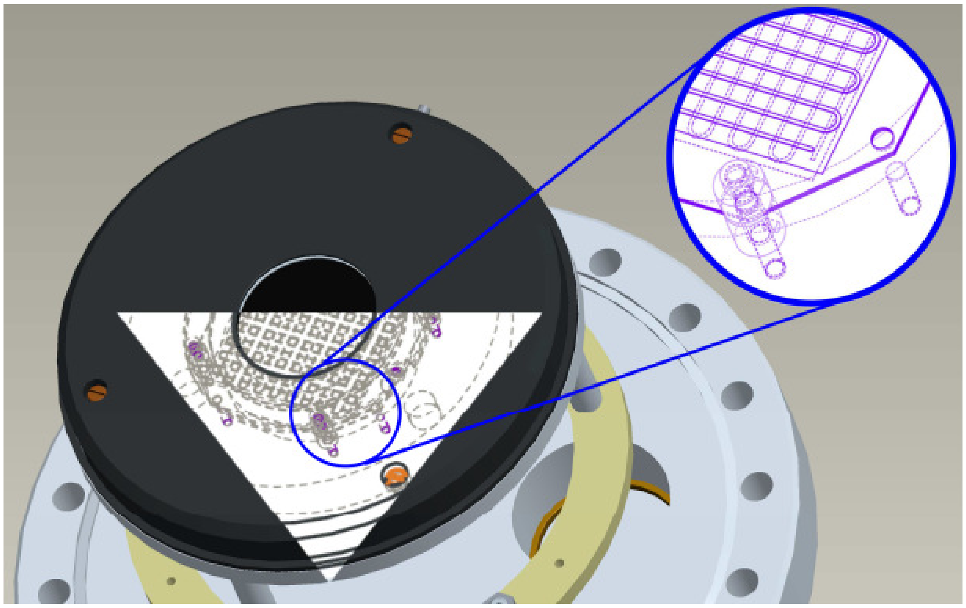
- **2D detector** with Ø 40 mm MCP's and 20 x 40 mm^2 active area.
- **Lateral detector resolution** of about 100 micrometers.
- Guaranteed **time resolution in 2D mode** of 240 ps, typically 190 ps in production series.
- **Maximum permanent random count** rates of 3 MHz

Features

- Extremely low dark count rate
- Real single event counting
- Highly linear counting response
- 1 MHz count rate in 2D and 2D/time resolved mode
- Retrofitable on site, without modifications of the analyzer
- High Voltage versions up to 20 kV isolation available

Introduction

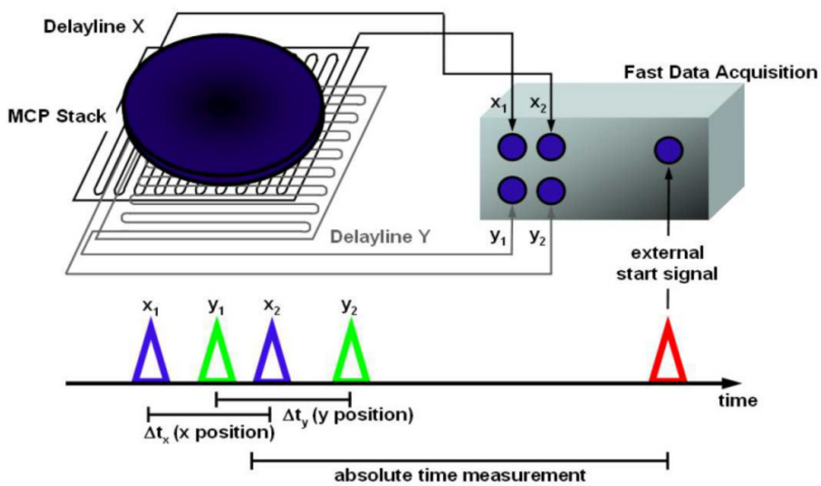
SPECS is now offering a 2D delay-line detector system that can be mounted on PHOIBOS 100, 150, and 225 hemisperical analysers as well as on the THEMIS 600 and 1000 time-of-flight spectrometers.
A delay line detector (DLD) is a position (x, y) and time (t) sensitive microchannel plate area detector for imaging of single counted particles with or without temporal resolution in the pico-second range. The (x, y, t) histograms are gathered over very many excitation cycles of the particle generating process as the system is a single counting device. Particle images can be collected from continuous running processes with randomly incoming particle sequences without time correlation as well. The dead time of these single counting devices are as small as 10 ns – 20 ns, which enables even live imaging with highest sensitivity, collecting high count rates of randomly incoming particles in the millions counts per second range, as well as imaging with a very high dynamic range of 10^6. Unlike for other picosecond imagers, delay line detectors collect all incoming particle hits continuously without any gate window duty cycles, thus (besides the device dead time limits) all hits are collected even when they represent random time positions within the excitation cycle time period. The delay-line method is based on measuring the time differences of signals.



In the past delaylines were made of coils of thin wire wound around a base plate. Today, delaylines are based on a serpentine anode techhnology with improved high voltage decoupling. This technology leads, for example, to improved lateral resolution and linearity.

Standard Delayline Position Encoding

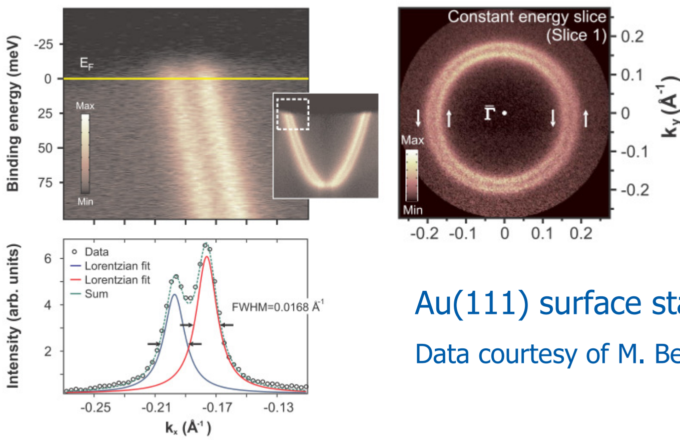
The detector consists of a chevron multi channel plate array for pulse amplification and an in-vacuum readout unit consisting of crossed delaylines. The position of a charge pulse is encoded by the signal arrival time differences at opposite ends of the delayline. Each delayline is connected to a constant fraction discriminator for pulse shaping and a time to digital converter for arrival time measurements. The signals are fed into the PC and the SpecsLab data acquisition software. For the user, the detector appears as a 2D detector.



Applications

- Typical applications are:
- Fermi surface mapping
- Band mapping
- Photoelectron diffraction measurements
- XPS, UPS, ESCA and AES
- Stroboscopic experiments in 2D/time resolved mode

Application Data



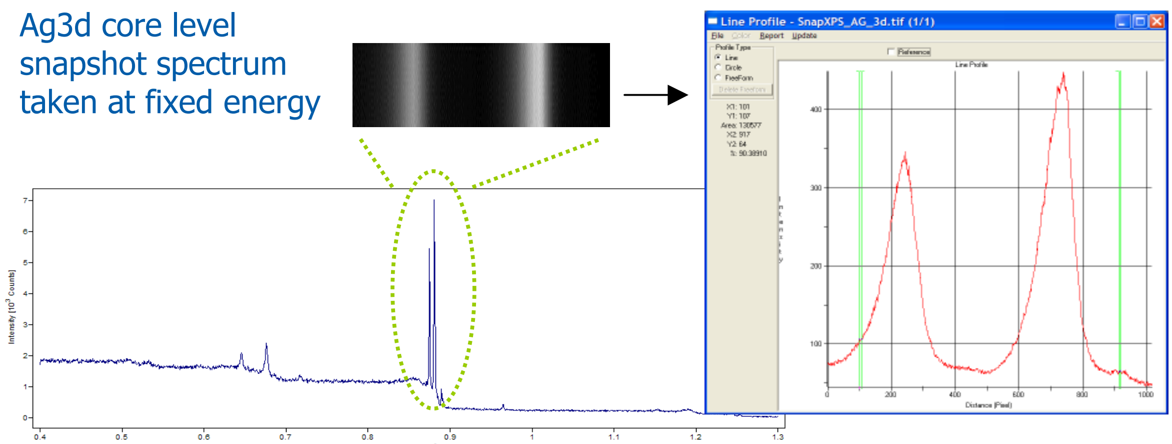
Band mapping with THEMIS 1000

Au(111) surface state

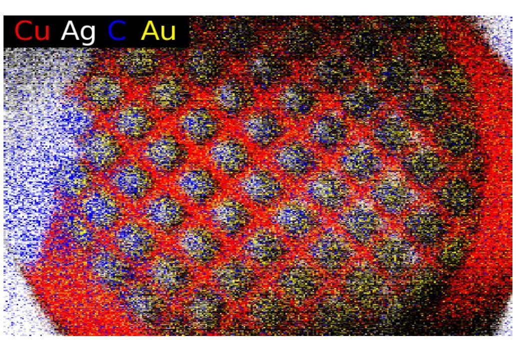
Data courtesy of M. Berndsen and O. Tjernberg, KTH, Stockholm

Snapshot data acquisition with PHOIBOS 150 2D-DLD

Ag3d core level snapshot spectrum taken at fixed energy



Slab Imaging with PHOIBOS 150 2D-DLD



False-color image of the lateral distribution of Cu, Ag, Au, and C.

Sample: Au fine mesh (25µm width) on Cu mesh (247 µm width); glued on Ag with Ag containing glue

High Resolution Image for one element takes 26 min

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