AMSTERDAM SCIENTIFIC INSTRUMENTS

Phoebe

Single-photon detector for quantum science

Phoebe is the most advanced event-based single-photon camera, combining nanosecond timing, noise-free detection, and efficient data acquisition for quantum and time-resolved experiments.

Technology

Phoebe is an event-based single-photon camera that captures the position, arrival time, and intensity of every detected photon. Combining nanosecond timing, single-photon sensitivity, and efficient zero-suppressed acquisition, it enables advanced quantum optics, photon correlation, and time-resolved measurements while dramatically reducing data volumes. With precision timing down to 260*ps* and powerful event-based processing, Phoebe transforms individual photon events into actionable scientific insight.

General Features

- Event-driven (data-based) readout — no frame acquisition
- Simultaneous ToA (timing) and ToT (energy) per photon
- Down to ~195 *ps* time bin resolution
- High-speed interface for sustained data streaming

Specifications

Parameter	Timepix3		Timepix4
Pixel Matrix	256x256	512x512	512x448
Bandwidth (Mhits/s)	80	320	1200
Active Area (mm²)	14 x 14	28 x 28	30 x 24
Pixel Pitch (µm²)	55	55	55
Time Resolution	~ 1.56 ns		~ 195 ps
TDC	~ 260 ps	~ 5 ps	~ 260 ps
Event Packet Size	48-bit		64-bit
Energy Measurement	Time over Threshold		
Readout Mode	Data Driven		
Sensor Options	Silicon		

Applications

*** Quantum optics**
High-speed diffraction pattern acquisition for strain, orientation, phase, and electric field mapping.

*** Single-photon / Low light imaging**
Event-based acquisition of sharp diffraction disks at high dynamic range.

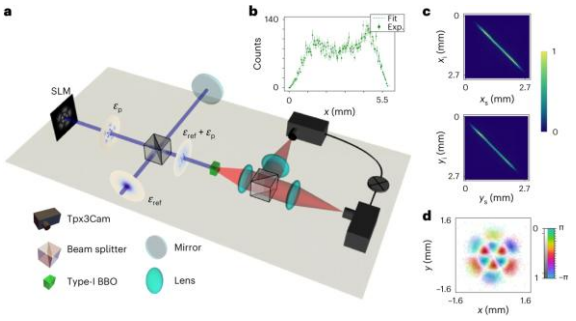
*** Time-resolved measurements, continuous granular processes**
Sparse electron counting enables studies of 2D materials, soft matter, and hybrid perovskites.

*** Photon correlation studies (SPDC, g2, etc.)**
Real-time monitoring during heating, biasing, mechanical deformation, or environmental TEM experiments.

*** Trapped ion & atom state & micromotion direct detection**
Time-stamping of individual electron packets for pump–probe experiments with nanosecond temporal precision.

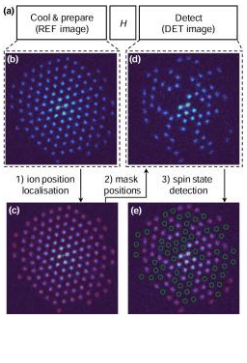
Photon pair interferometry

Zia et al., Nat. Photonics, 17, 1009–1016 (2023)



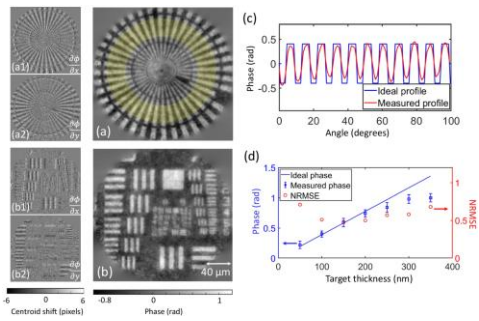
Single-shot ion spin-state detection

Wolf et al., Phys. Rev. Appl., 21, 054067 (2024)



Quantitative Phase Imaging

Zhang et al., Nat. Comm., 17, 3108 (2026).



quantum@amscins.com

hello@amscins.com