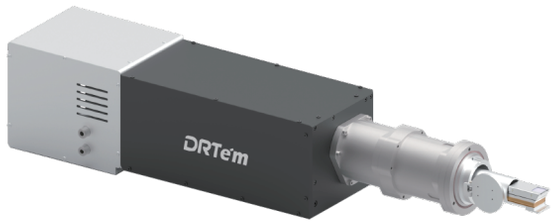
DRTEM Technology Pte. Ltd.

Huangshan 1C-S Camera

Advanced 4D-STEM Detector for SEM

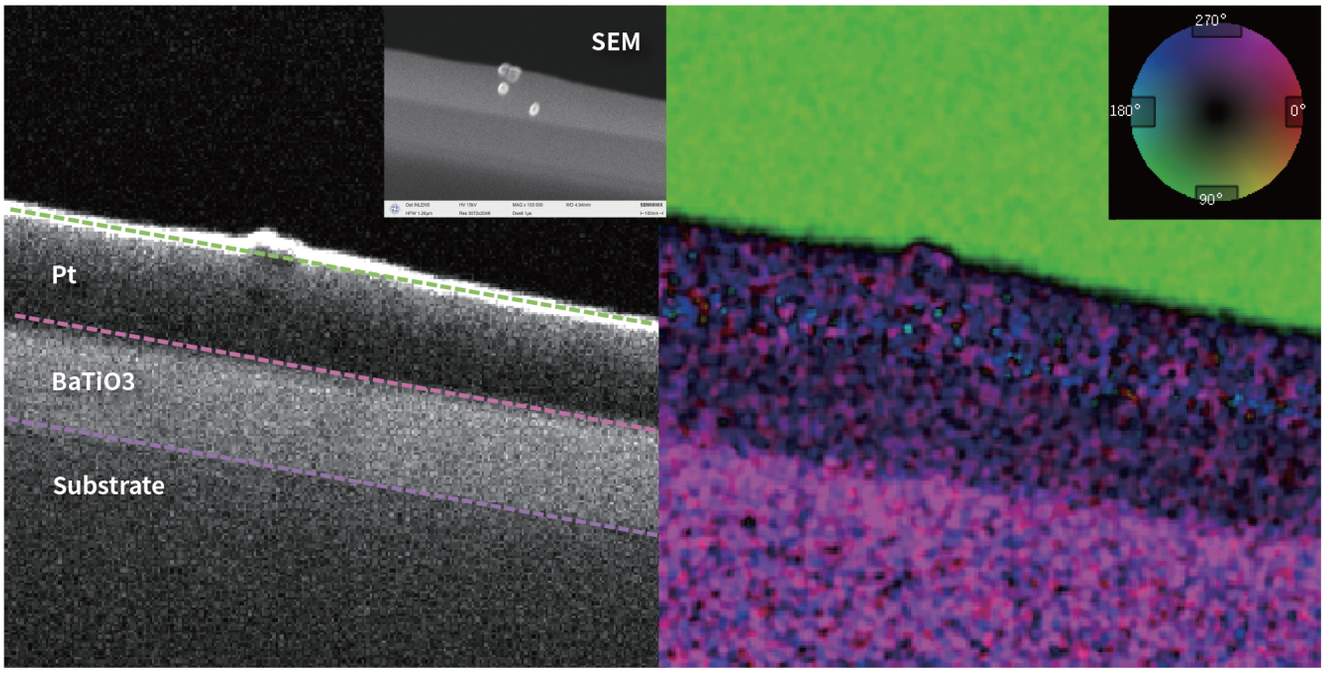


The Huangshan Series Direct Electron Detector, based on the **Timepix3** ASIC, is optimized for Scanning Electron Microscopy (SEM) platforms, enabling advanced microstructural characterization at low acceleration voltages. Unlike traditional frame-based detectors, the Huangshan camera utilizes a cutting-edge **event-driven** architecture. It features zero readout noise and a superior time resolution of 1.56 ns, precisely recording the coordinates and time-stamps of individual electron impacts while significantly reducing data redundancy.

On SEM platforms, the Huangshan camera takes advantage of a wide field of view (from nanometers to millimeters) and large scattering-angle coverage to capture a complete 2D diffraction pattern at every scanning pixel, unlocking rich information within reciprocal space. Even under low-beam-damage conditions at 30 kV, it achieves high-fidelity mapping of strain, electric fields, and crystallographic orientation for large-area thin film samples. Integrated with a high-speed data processing workstation, the Huangshan camera seamlessly merges the high spatial resolution of 4D-STEM with the macroscopic control of SEM. This synergy provides outstanding detection sensitivity and experimental efficiency for your cutting-edge electron microscopy research.

Advantages

- **Turnkey Solution**
  Full system includes camera, acquisition PC, optional reconstruction workstation, application support, and training
- **High Spatial Resolution**
  Large single-chip 256 × 256 array – scalable for larger imaging fields
- **1.56 ns Time Resolution**
  Event-driven continuous data acquisition with equivalent frame rates above 1,000,000 fps for 4D-STEM applications
- **Ultrafast Data Acquisition**
  Ultralow dwell time (200–1000 ns) with MHz-level synchronization control for ultrafast 4D-STEM imaging
- **High SNR for Low-Dose Imaging**
  Ideal for delicate experiments with beam sensitive samples using minimal electron dose
- **Radiation Resistant**
  Robust performance for electron detection from 5–30 kV
- **Flexible Integration**
  Retractable design. The probe supports motorized retraction with a travel range of 0–220 mm
- **Event-Driven & Wide Dynamic Range**
  Records only real electron events with zero readout noise, perfect for single-electron detection



Huangshan 1C-S — 4D-STEM Imaging and COM Analysis of BaTiO3 Sample
Accelerating Voltage : 15 kV Magnification: 100,000x Camera Length: 130 mm

Powerful and Flexible Software Support

- **Proprietary GS4D Image Acquisition Software**
  Unlock full control and visualization for advanced electron microscopy workflows
- **Frame Mode Visualization**
  - Real-time viewing of each captured frame
  - Continuous multi-frame acquisition for dynamic processes
- **STEM Mode Capabilities**
  Real-time visualization of convergent beam electron diffraction (CBED) patterns. Select any region within the CBED pattern for live virtual imaging, supporting integrated real-time modes such as iDPC and iCoM
- **Flexible Data Format Support**
  Save data in open formats such as .h5 and .npy, with seamless compatibility for post-processing workflows
- **Customizable STEM Beam Scanning**
  Precisely control scan coil trajectories with user-defined scan paths, including spiral, zigzag, and ROI-focused scanning modes for diverse imaging needs
- **ROI Selection Made Easy**
  Select scan areas directly using the mouse
  Combined with virtual imaging for precise ROI control through the scanning engine

Applications

- **Nanocrystalline Orientation Mapping**
  Achieve high-precision mapping of grain orientations and phase distributions over large areas by analyzing point-by-point diffraction patterns
- **High-Precision Strain Analysis**
  Quantify local strain fields in semiconductors and metallic materials with high accuracy by capturing subtle shifts in diffraction spots
- **Multimodal Virtual Imaging**
  Reconstruct various imaging modes, such as bright-field, dark-field, and differential phase contrast (DPC), from a single scan
- **Quantitative Electric/Magnetic Field Visualization**
  Map internal electric and magnetic fields quantitatively by analyzing the center-of-mass (COM) shift of the electron beam

Specifications

Parameter	Specification
Sensor	Timepix3
Pixel size	55μm × 55μm
Pixel Matrix	256 × 256
Readout Modes	Frame or Event
Minimal Dwell Time	0.2μs
TOA (Time-of-Arrival) Precision	1.56 ns
Data Acquisition	5.12Gb
Maximum Readout Rate	40M hits/sec/chip
Acquisition PC	High performance PC for acquisition, and optional GPU workstation for ptychography reconstruction
Software	GS4D software package with LiberTEM and py4D-STEM support