

PART COUNTING AND SIZE MONITORING

PROPHESÉE EVENT-BASED VISION:

Real-time Particle Counting and Size Distribution Monitoring with lower complexity and system costs than traditional high-speed cameras.

>1,000 Objects/sec
Sizing + Counting Throughput

>10 meters/sec
Linear Speed

99.5%
Accuracy @1,000 obj/sec

Real Time
Processing

Ultra-Low
Datarate

Advanced LED
No need for complex, expensive lighting

Particle Counting and Size Monitoring is crucial for quality control and process optimization. Accurate particle size analysis ensures product consistency, optimizes manufacturing processes, and helps ensure regulatory requirements are met.

Prophesee's event-based solution monitors particles at high speeds in real-time. It allows manufacturers to make quick, informed decisions without needing complex hardware or high-power lighting.



PROPHESÉE
META-VISION TECHNOLOGIES

HIGH-SPEED IMAGING VS. EVENT-BASED VISION SENSING

High-speed imaging captures detailed images of particles in motion. It provides data on particle behavior, size, shape, and interactions.

However, high-speed imaging has drawbacks. It generates **very high data rates, making storage and processing challenging.** Real-time analysis **requires significant resources and investment.**

Lighting requirements are another challenge. High-speed imaging needs high-power illumination to capture clear images. Maintaining stable lighting over time is technically demanding.

Lastly installation, tuning and maintenance are significantly simplified with Prophesee's event-based Metavision® technology.

Prophesee's Metavision uses an event-based approach to overcome these issues. It relies on a **patented sensor design** allowing **continuous pixel-by-pixel sensing.** Intelligent pixels activate only when detecting changes. This breakthrough **shutter-free design both reduces data rates and increase sensing speed significantly.**

Without an image shutter, there's also **no motion blur** and Metavision® sensors detect relative changes in illumination and adapt to various light levels, providing a **dynamic range of over 120dB.**



Figure 1: High-speed seed counting



PARTICLE COUNT AND SIZE MEASUREMENT

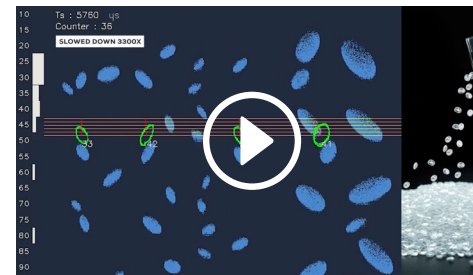
Metavision technology is used in industries like food, construction, pharmaceuticals, and agriculture. It monitors grain, flour, sand, powders, and more.

The Metavision PSM algorithm **counts particles, measures sizes, estimates shapes, and tracks trajectories.** Real-time data aids process monitoring,

distribution analysis, and quality control. Particles move through the Metavision system’s field of view. The best results use homogeneous backlighting, but no high-power lighting is needed. The region of interest (ROI) can be limited to reduce data rates even further.

Metavision achieves particle throughputs of **1,000 particles**

per second with 99% counting accuracy and +/- 4% size accuracy.



This video shows plastic

bullets **analyzed at 8-10m/s.** The system collects data on size, shape, position, motion trajectory, and total count:

- Particle size (in px or mm)
- Histogram of size distribution (in px or mm)
- Particle shape (contour)
- Particle position
- Particle motion trajectory
- Total number of particles

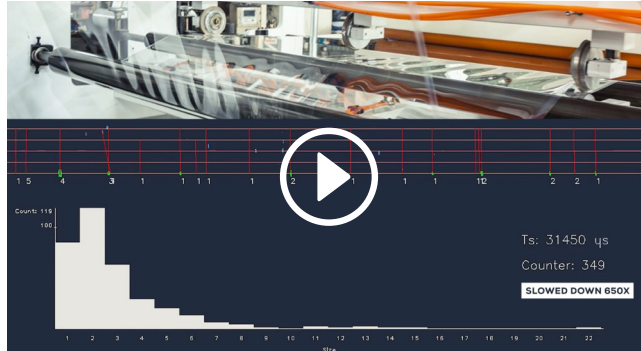
Use cases: Prophesee’s Metavision technology excels in particle counting, sizing, and contamination detection.

High-Speed / Line-Scan Cameras	PROPHESSEE Metavision®
Expensive hardware or complex high-power light source setup	Cost Effective Hardware - Native High Dynamic Range
Computing power required	Simple algorithm running on the edge
Image analysis time consuming	Real-time results
Short exposure period to minimize blurring	No exposure 'period' = no blurring
Crosstalk (MTF) Low-light temporal/spatial noise is amplified	Noise immunity from relative contrast difference = good detection at low light
Requires high external illumination to compensate for SNR and minimal exposure	Reduced external illumination for same (or better) speed/temp resolution
Entire frames output with high data redundancy	Events only output with no data redundancy = sparse data through entire processing chain
Fast readout mechanisms = high power consumption and thermal management	Asynchronous low latency, per pixel readout
Micro-lens to external optic CRA mismatch causes signal loss in image corners and increased pixel crosstalk (MTF)	Tolerant to CRA differences between sensor and external lens
\$\$\$\$	\$\$

SURFACE CONTAMINATION DETECTION

Metavision is also used for high-speed web inspection. It detects **defects like holes, spots, inclusions, contaminants and scratches on moving surfaces in real-time.**

For non-textured surfaces, it detects defects as small as a few pixels with 25% contrast difference. The control area can be backlit, frontlit, or lit at an angle. ROI minimization helps reduce data rates.



A video shows Metavision checking packing

film for defects. It collects data on size, shape, position, motion trajectory, and total count of defects:

- Defect size (In px or mm)
- Histogram of size distribution (in px or mm)
- Defect shape
- Defect position
- Defect motion trajectory
- Total number of defects

IMPLEMENTING PROPHESIE PARTICLE SIZE MONITORING



Implementing Prophesie PSM is straightforward. Start with our code samples to see the system's capabilities. Our SDK offers customizable modules and command line interface tuning for parameters like:

- Processing rate: time between processing iterations
- Accumulation time: duration of event-buffers processed at each iteration
- Number of processing lines and their positions
- Direction of particle motion
- Minimum width of a cluster and minimum number of clusters in a particle used for noise filtering
- Minimum distance to merge clusters in particles
- Minimum similarity score for particle matching
- Learning rate setting the importance ratio between the previous and new particle positions

CONCLUSION

Event-based processing reduces complexity and cost while delivering real-time analysis compared to traditional high-speed imaging for particle size monitoring and counting. Lower data volumes enable **real-time processing on lower-cost platforms, without the need for expensive GPUs or cloud processing.**

The event-based, shutter-free Metavision sensor **keeps data volumes low, offers a high dynamic range, and eliminates motion blur.** High-powered illumination is typically unnecessary. Prophesee's algorithm delivers reliable results from a few sensor lines, adaptable across industries and applications.

SCAN TO LEARN MORE



<https://bit.ly/4g6U4AD>

