



# BACKGROUNDED MEMBRANE IMAGING

High contrast particle  
imaging for visible and  
subvisible analysis

## Backgrounded membrane imaging (BMI)

*Fast, accurate and fully automated subvisible particle analysis for 96 samples in under 2 hours.*

The Horizon® instrument's primary analytical technique is Backgrounded Membrane Imaging (BMI). BMI has its roots in membrane microscopy, the tedious USP 788 subvisible particle lot release method by which samples are filtered through a membrane and captured particles are manually counted using a microscope.

BMI reinvents membrane imaging with modern robotics, image processing, and novel optics in a 96-well filter plate format that works just like a plate reader.



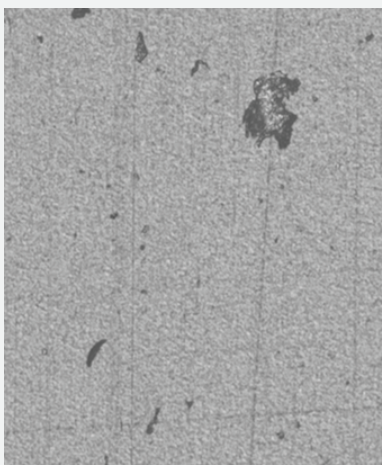
Proprietary 96-well filter plate laid out to demonstrate a complex multi-condition experiment

## Backgrounded images: the heart of BMI

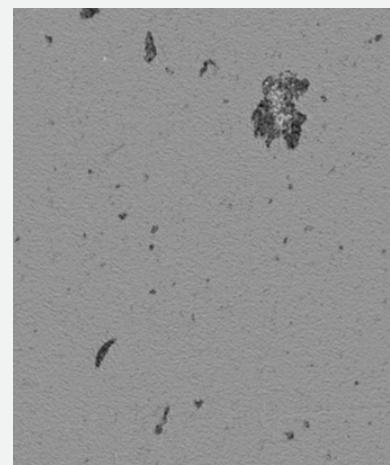
BMI uses sophisticated image-processing techniques to analyze images and acquire particle data. The key is to first take a background image of the membrane. After samples are filtered through and particles are captured, the same membrane is re-imaged, this time with particles on the surface. The background image is precisely aligned with the sample image and then subtracted on a pixel-by-pixel basis so that the background texture is eliminated and particles are revealed. Contrast is 10x greater than measurements done in liquid, sizes are calibrated with an electron microscope, and analysis is fully automated.



Background image



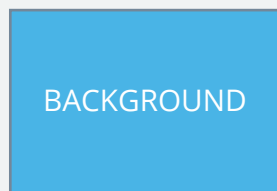
Sample image



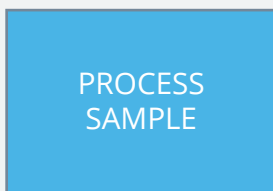
Resulting BMI image

## How it works

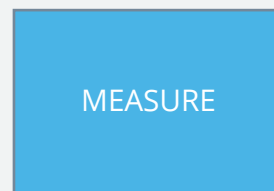
Three easy steps will get you a 96-sample screen in under 2 hours.



Load a filter plate and select BACKGROUND



Pipette samples into individual wells of the filter plate and vacuum through the membrane

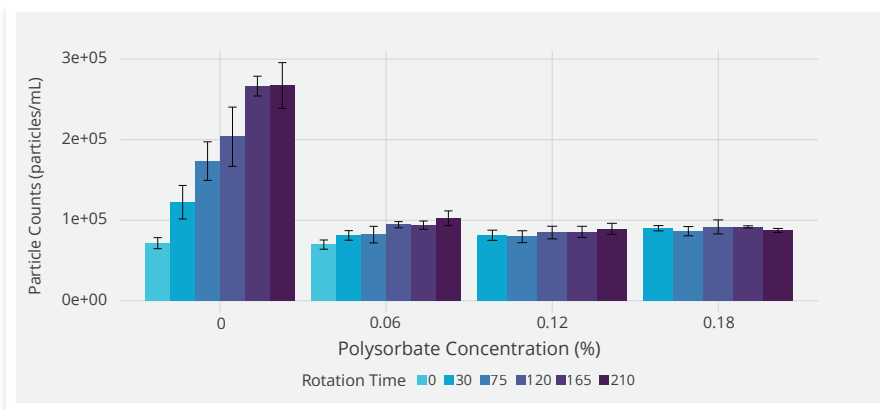


Re-load the filter plate and select MEASURE

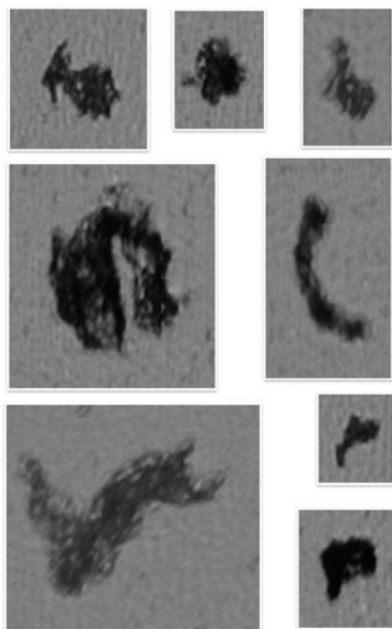
## Resulting data

BMI produces data comparable to other subvisible systems, plus high-level process insights with the Horizon® system's analysis suite.

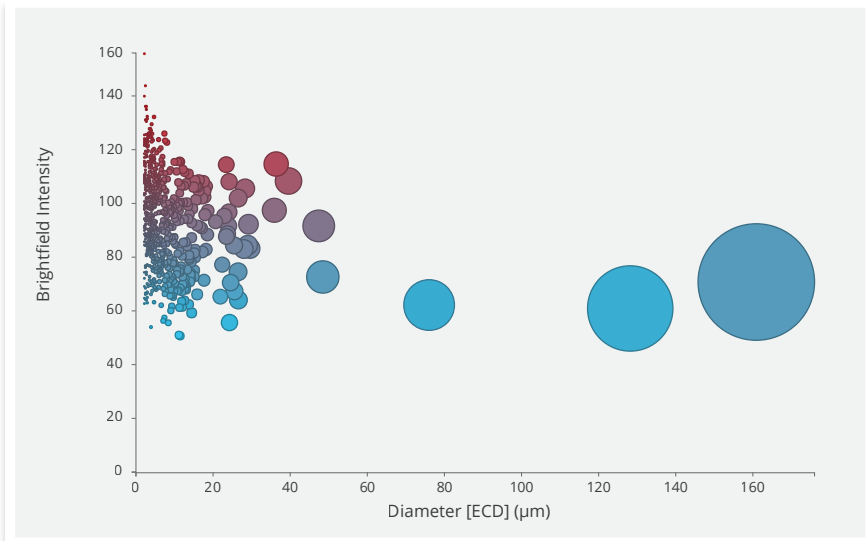
A complex multi-condition IgG aggregation with differing polysorbate concentrations, run in under 2 hours



Single particle images for every particle



Interactive scatter plots of individual wells allow you to visualize your data by multiple particle characteristics



## Key advantages of BMI

	BMI	Light obscuration	Flow imaging
Low volume requirements	✓ Requires 25 $\mu$ L, 20x less than competition	✗ Requires 5 mL	✗ Requires 500 $\mu$ L
Highly reproducible	✓ CVs of polydisperse samples under 6%	✗ Highly variable on polydisperse samples	✗ Highly variable on polydisperse samples
Consumable	✓ ZERO particle carryover, ZERO cross-contamination, ZERO washing	✗ Multiple components that require washing	✗ Expensive flow cell that requires washing
High refractive index contrast	✓ Dry-based measurement = Analyze small and dim particles with higher fidelity	✗ Low-contrast, liquid-based measurement	✗ Low-contrast, liquid-based measurement
Fluidics-free	✓ ZERO purge volume, ZERO leaking, ZERO clogging	✗ Fluidics-based	✗ Fluidics-based
No confounding Particles	✓ Air bubbles are not measured	✗ Air bubbles counted as particles	✗ Air bubbles counted as particles
Instrument compatibility	✓ Particles are captured on a membrane where they can be analyzed later with other instruments	✗ Sample ends up in waste, no additional analysis possible	✗ Sample ends up in waste, no additional analysis possible

