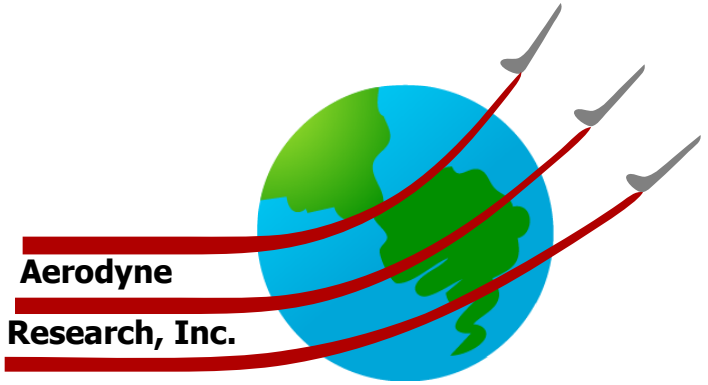


# PM2.5 Lens

14th Annual AMS Users Meeting

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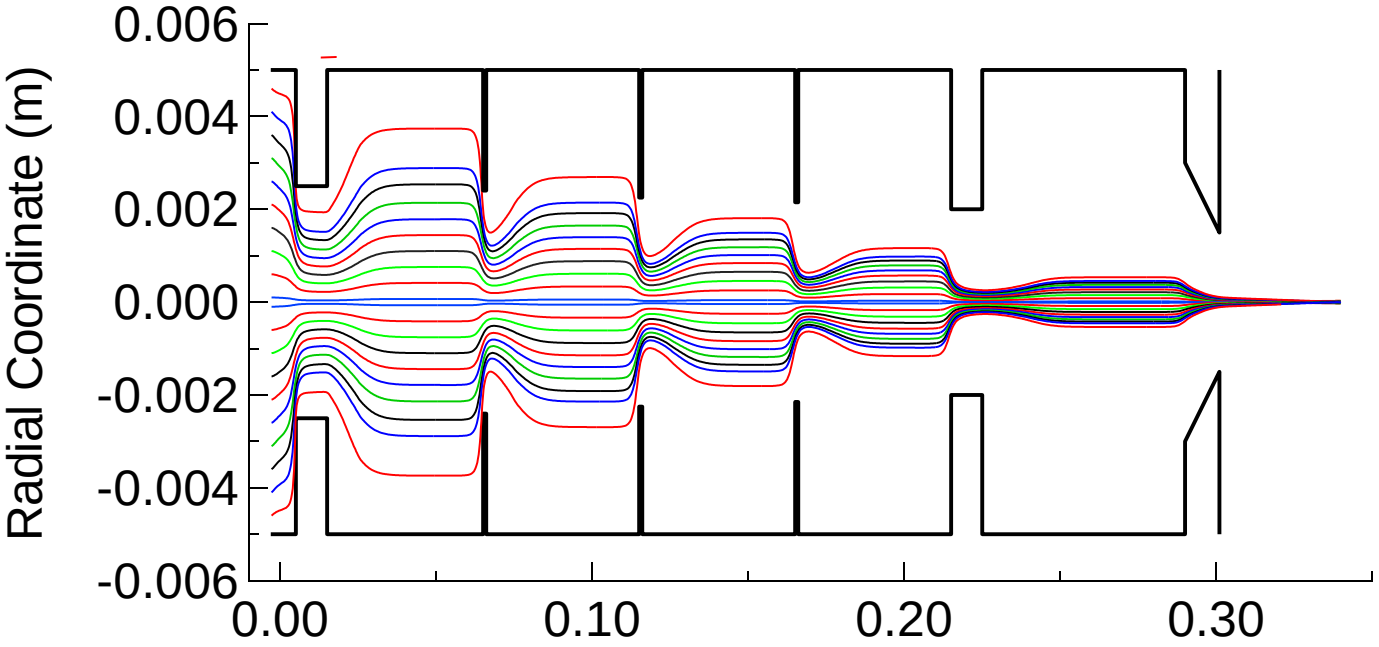
# Particle Focusing in the Lens

Aerodyne Research, Inc.

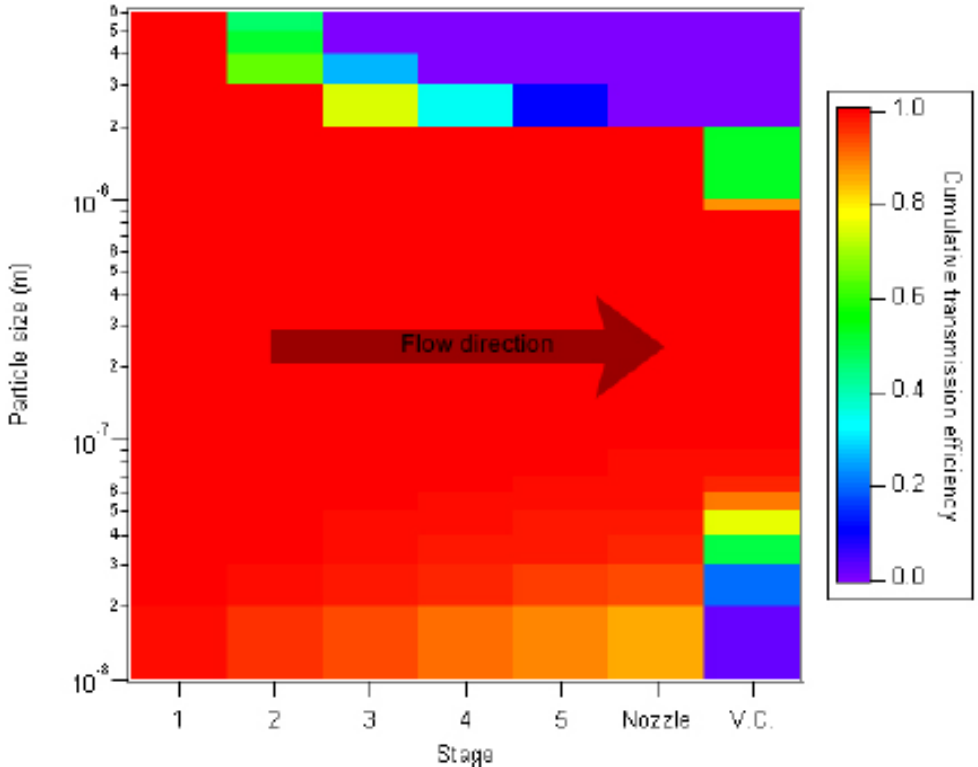



1.3 Torr inlet

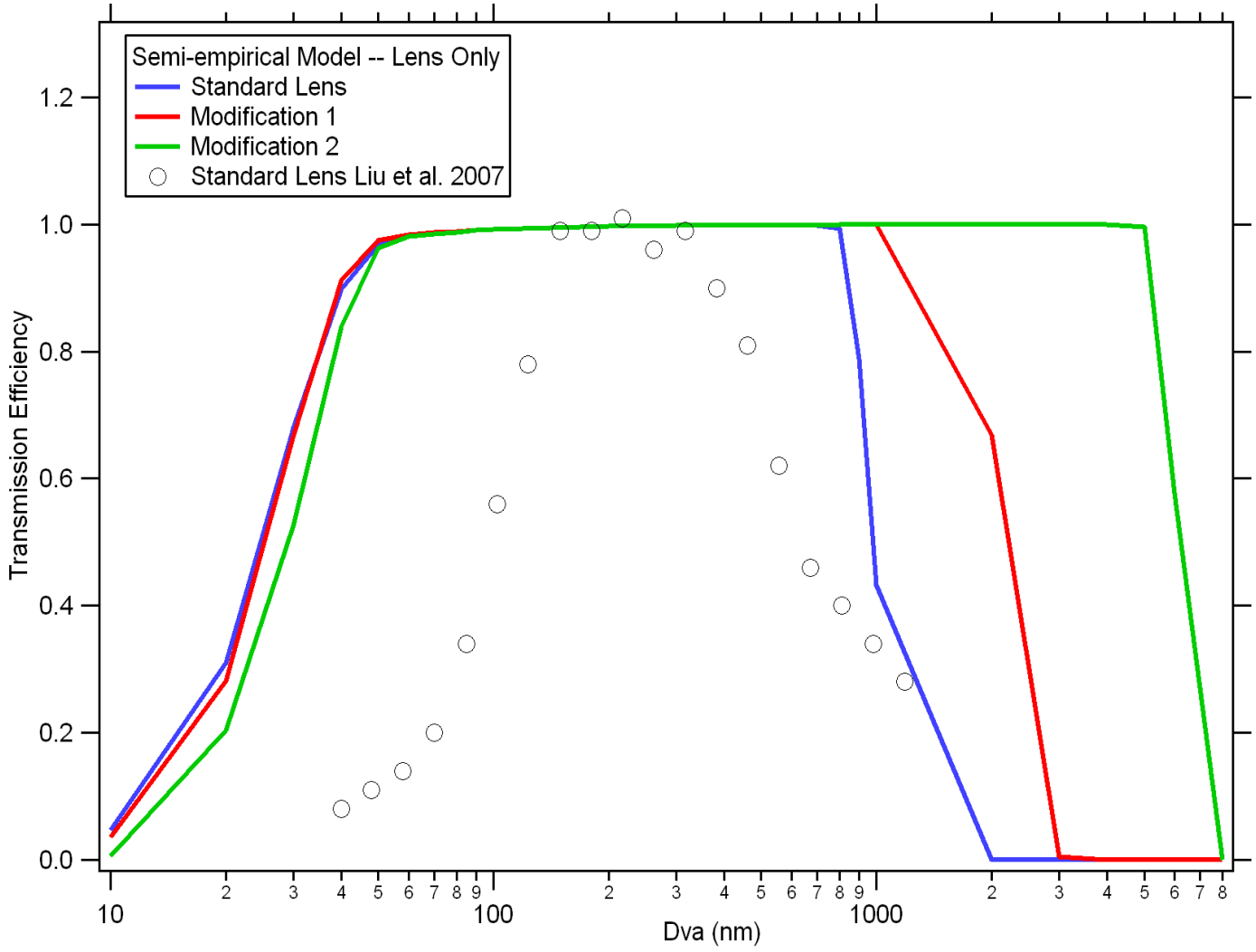
$10^{-3}$ torr exit

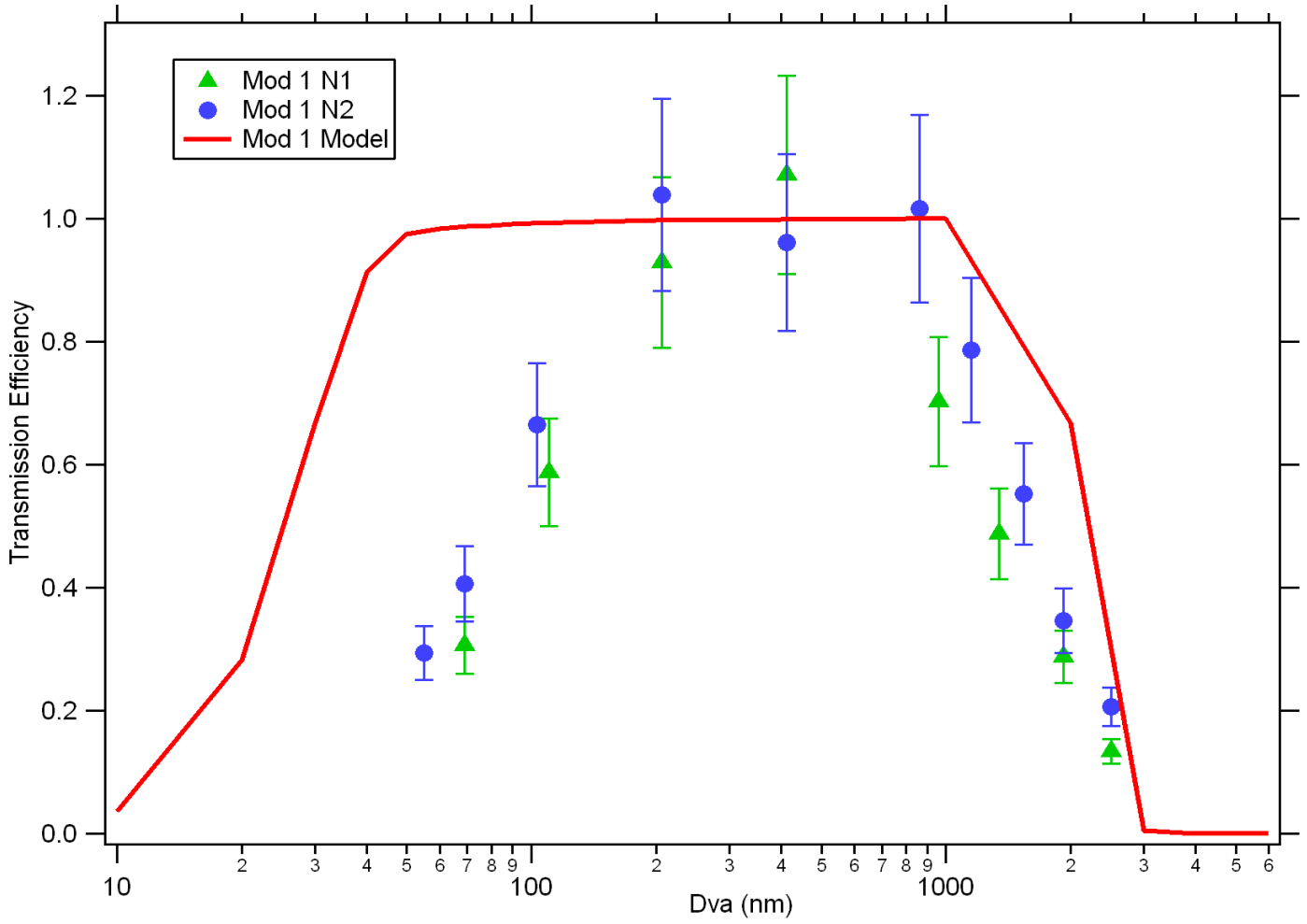
- **Computational Fluid Dynamics (Fluent)**
  - **Calculate particle trajectories for different lens and inlet configurations**
  - **Calculate fraction that impact vaporizer (transmission efficiency)**

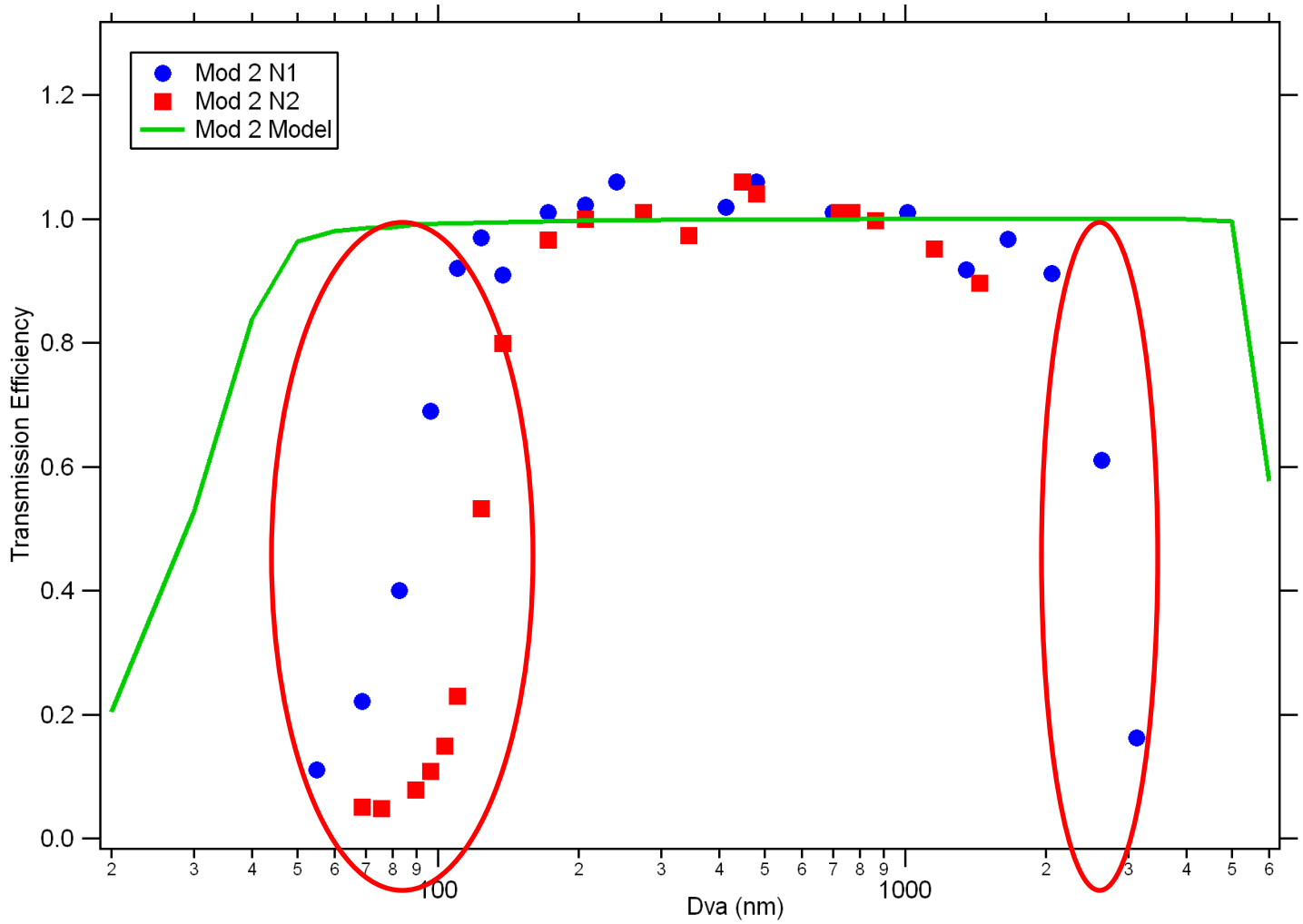
- Computational fluid dynamics modeling of high pressure lens and inlet
  - → semi-analytical model
  - → new design for standard lens.



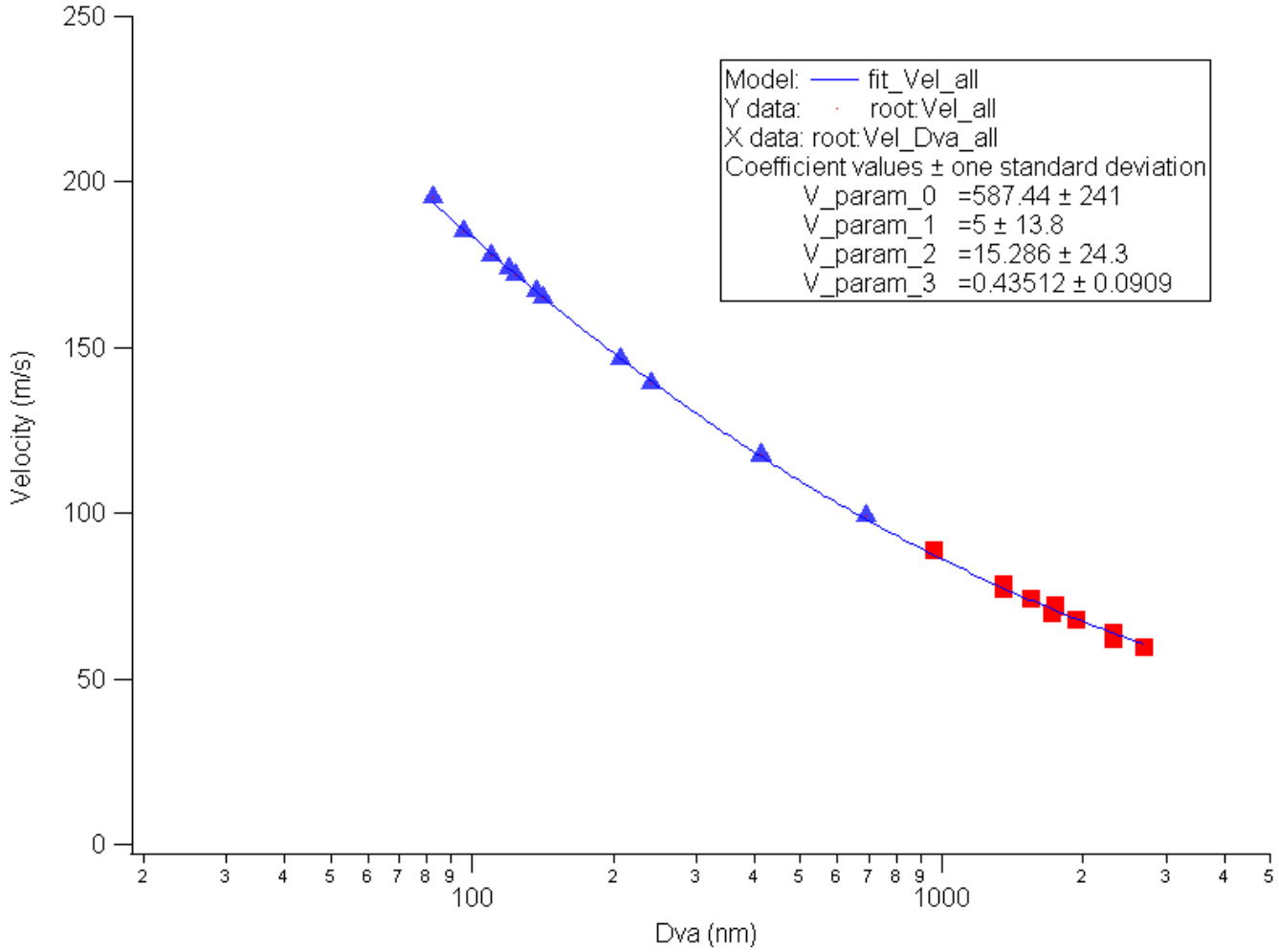

Larger particles lost at 2nd and 3rd aperture.


Semi-empirical Model -- Lens Only
Standard Lens
Modification 1
Modification 2
Standard Lens Liu et al. 2007
Transmission Efficiency
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10
100
1000
Dva (nm)

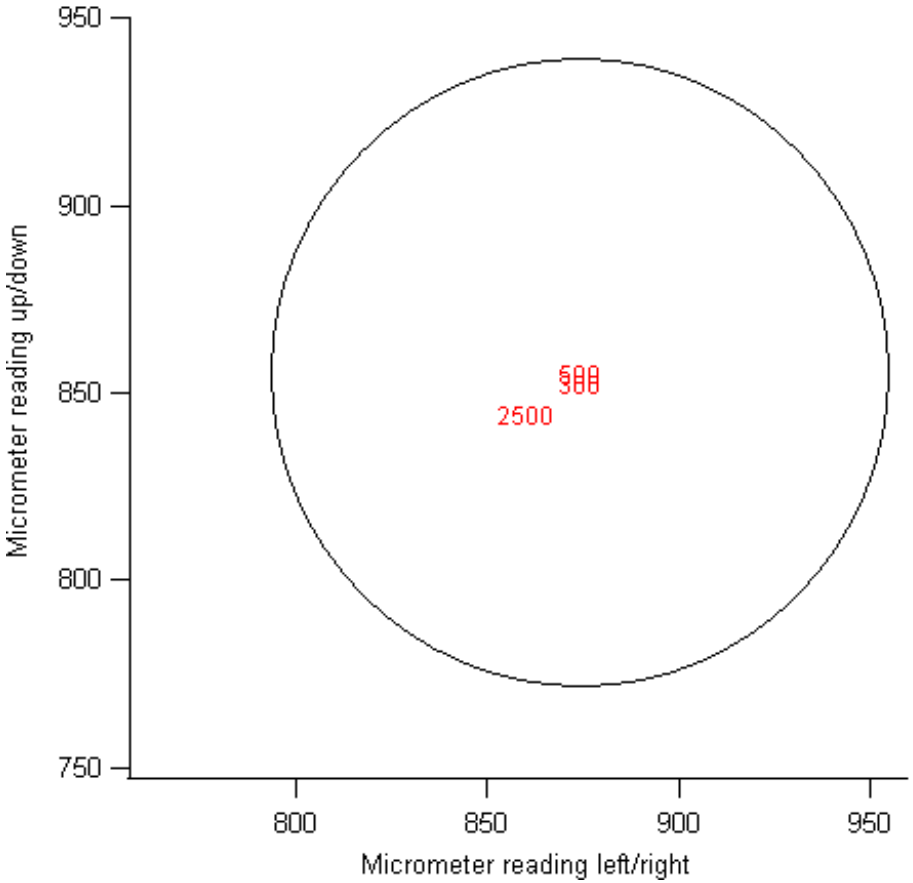

Mod 1 N1
Mod 1 N2
Mod 1 Model
Transmission Efficiency
1.2
1.0
0.8
0.6
0.4
0.2
0.0
10
100
1000
Dva (nm)

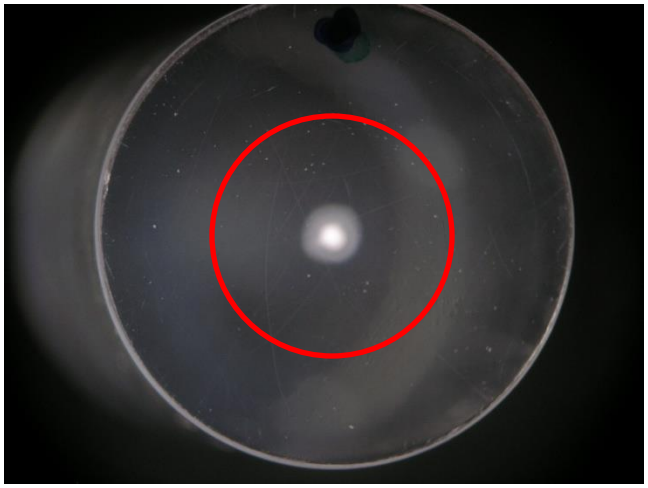

Mod 2 N1
Mod 2 N2
Mod 2 Model
Transmission Efficiency
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2 3 4 5 6 7 8 9 100 2 3 4 5 6 7 8 9 1000 2 3 4 5 6
Dva (nm)

PM 2.5!

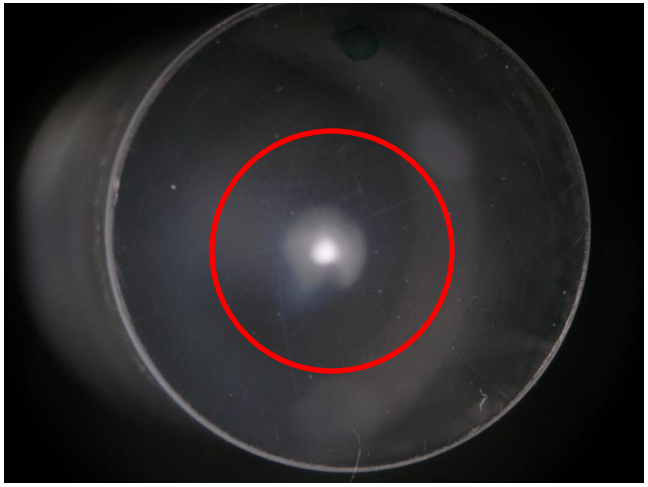



Particle velocities are higher than standard lens, but b
velocity curve does not flatten at large sizes the way the HP lens does.



Mod 2 N1



Mod 2 N2

Lens alignment -- different size particles (300 nm to 2.5 micron) focus in roughly the same place.

Next:

- Improve machining – better small particle transmission, better alignment.
- Test transmission efficiency in ACSM (shorter chamber) and TOF-ACSM (different pumping).