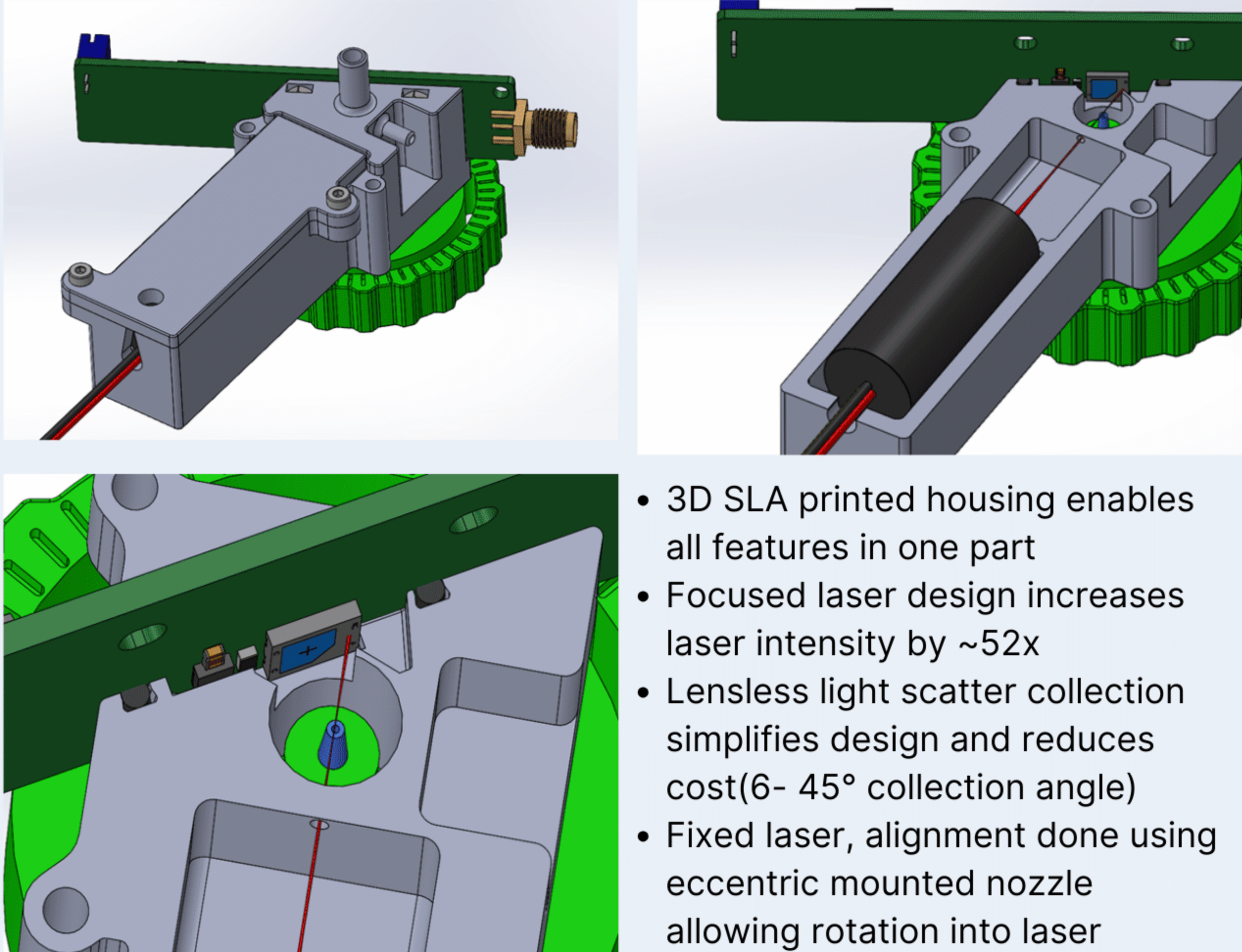


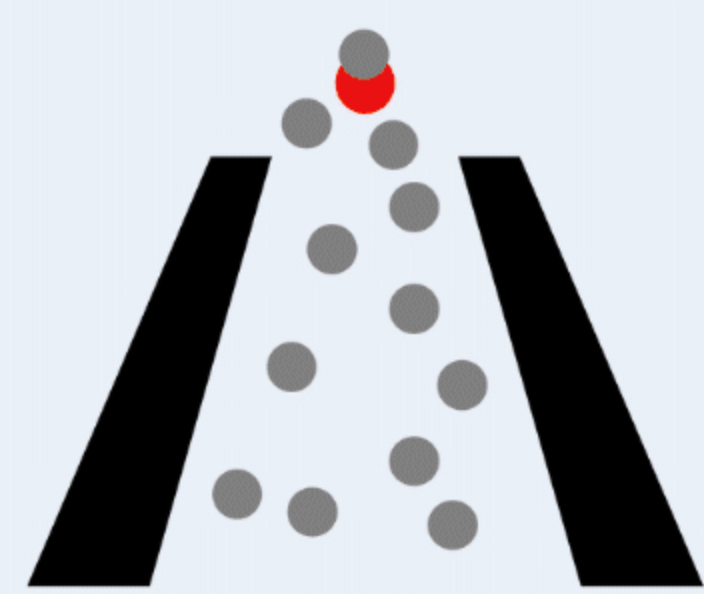
Development of an **open source**, **low-cost**, condensation particle counter

Optics Design



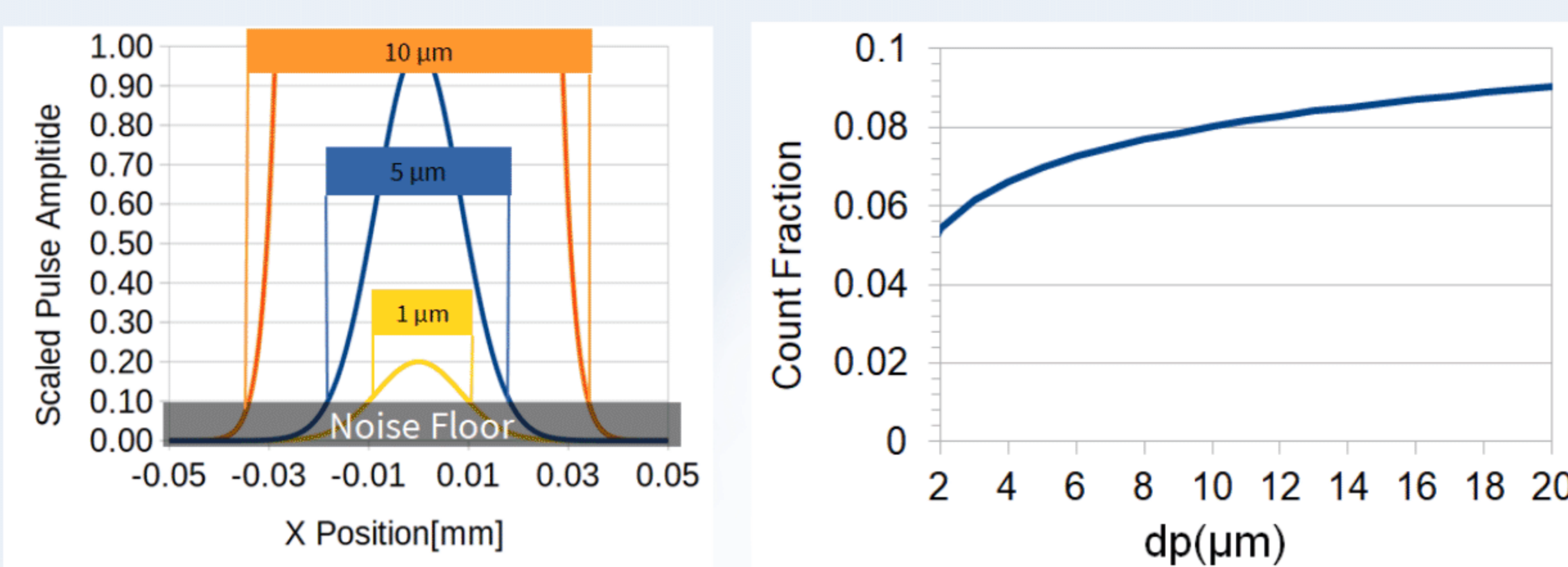
- 3D SLA printed housing enables all features in one part
- Focused laser design increases laser intensity by ~52x
- Lensless light scatter collection simplifies design and reduces cost (6- 45° collection angle)
- Fixed laser, alignment done using eccentric mounted nozzle allowing rotation into laser

Focused Laser Concept

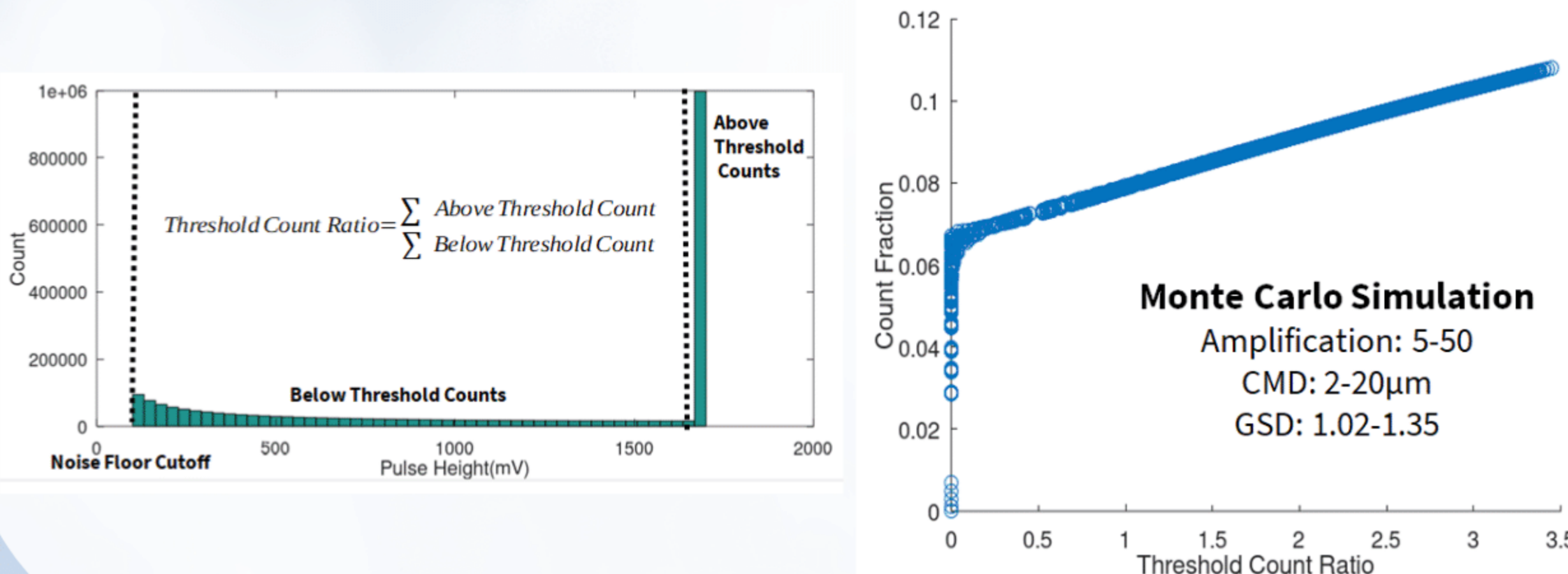


- Design results in particle size dependent counting fraction
- Distribution of pulse height contains information to correct for size
- System clips pulses greater than 1800mV, but Threshold Count Ratio method introduced as viable correction

Particle Size Dependent Fractional Counting



Threshold Count Correction Method



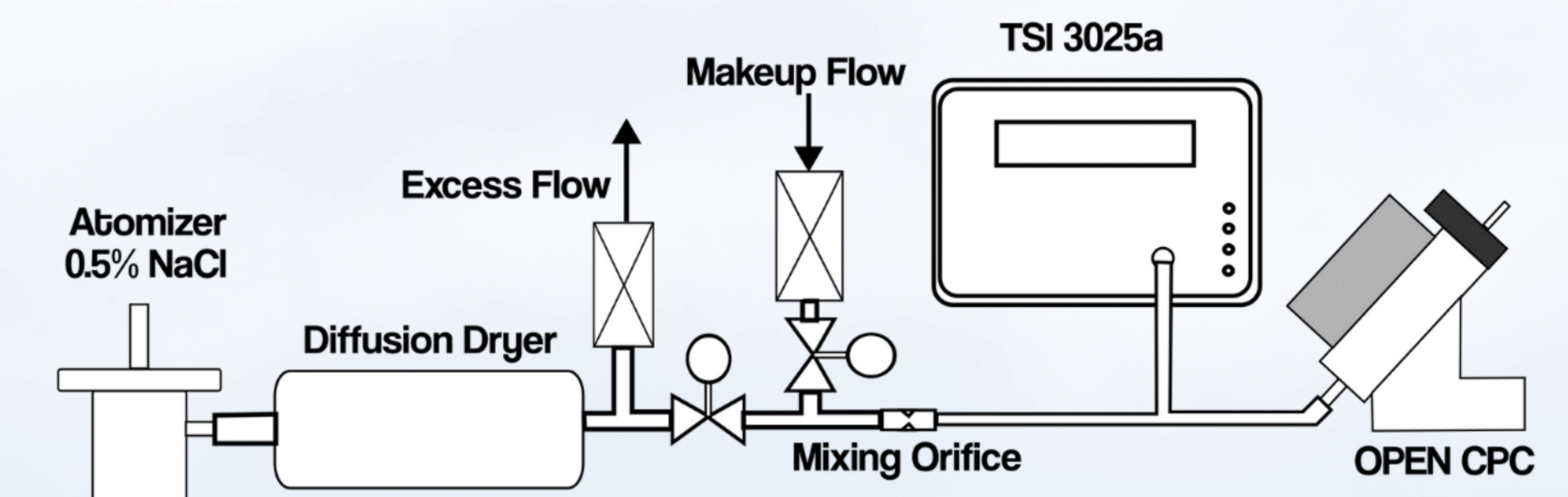
Key Points

- Capable of up to 100,000 #/cm³ with 15% total error relative to a TSI 3025a
- Focused laser & lensless forward scattered collection simplifies optics design and reduces cost
- Requires particle size correction, but Threshold Count Method introduced and evaluated
- Current BOM cost of \$415 at Qty 5

Future Work

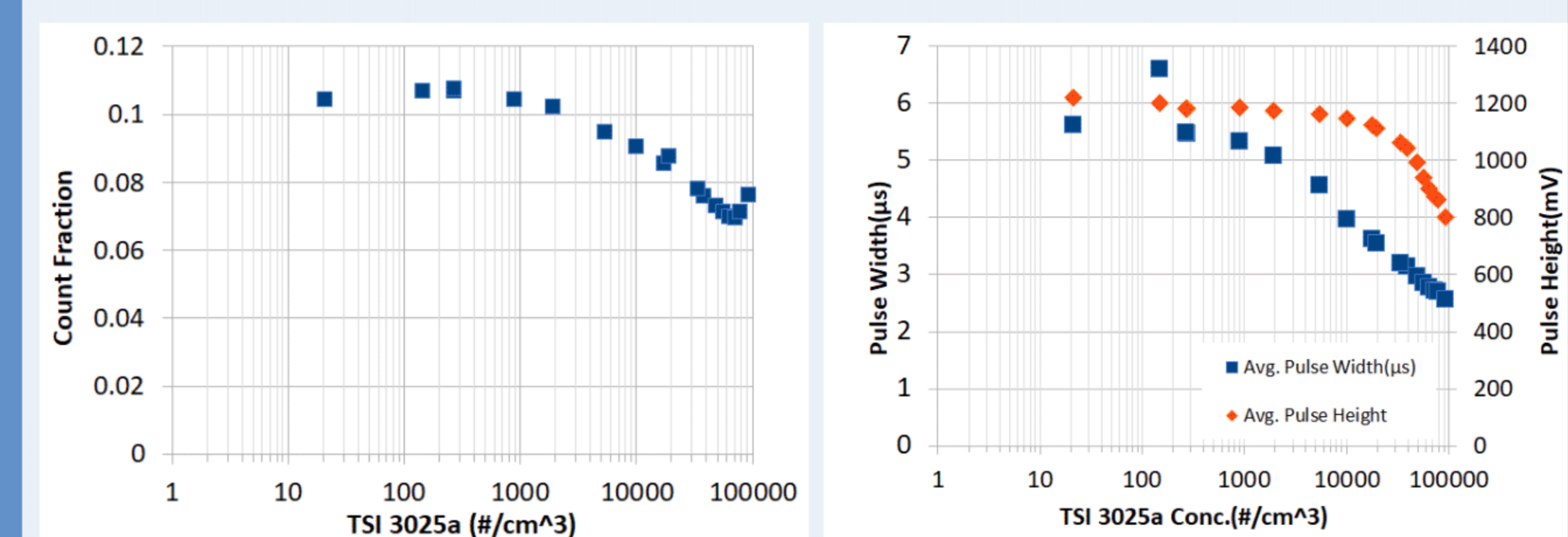
- Alpha release on GitLab soon!
- Cut-point, long-term stability & device-to-device variability

Device Performance

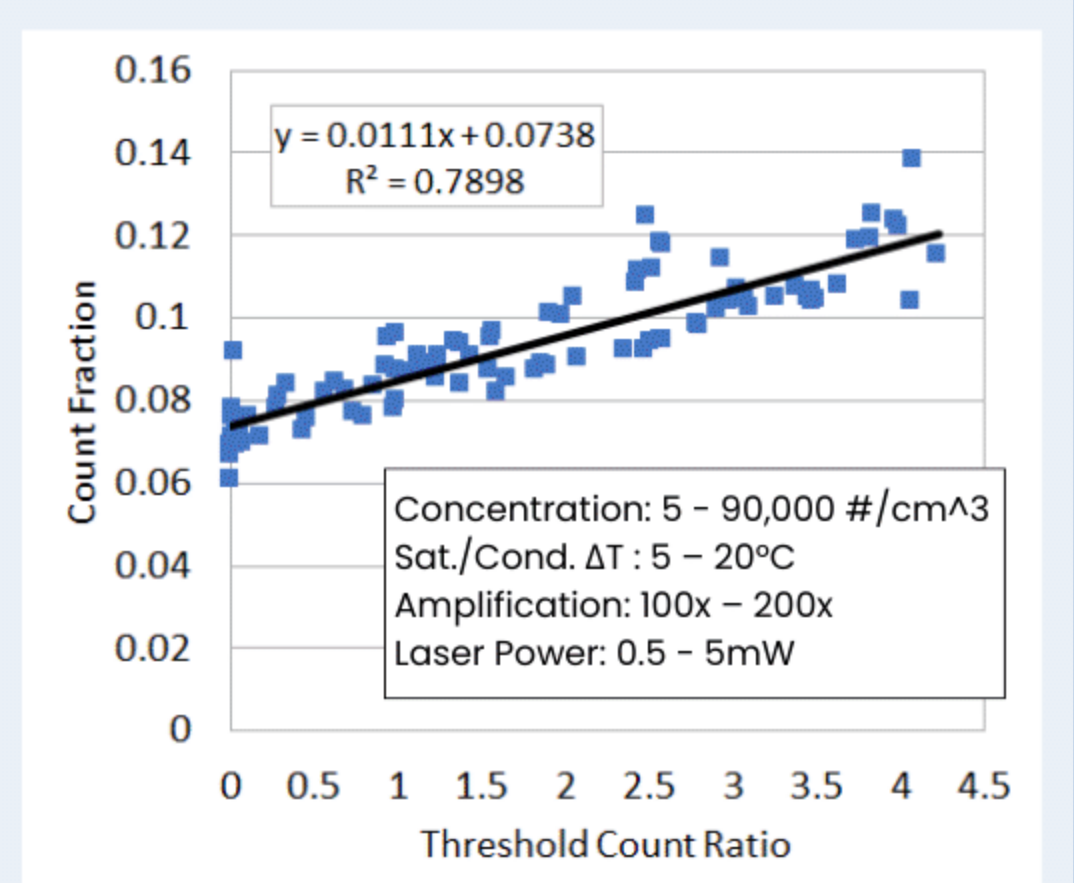


- Test Aerosol -0.5% NaCl Solution in Distilled Water
- CMD: 115 nm, GSD: 2.1

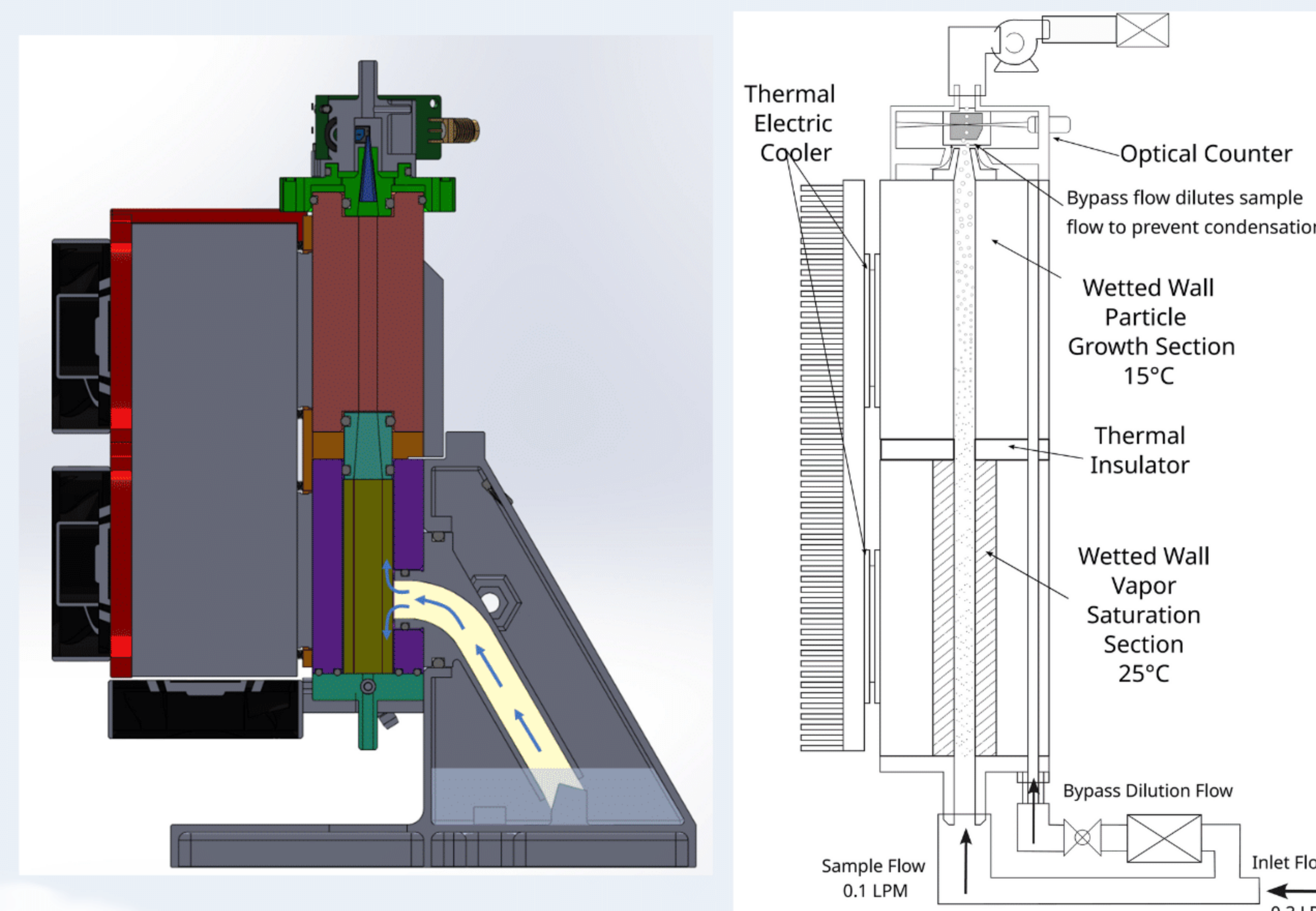
Raw Count



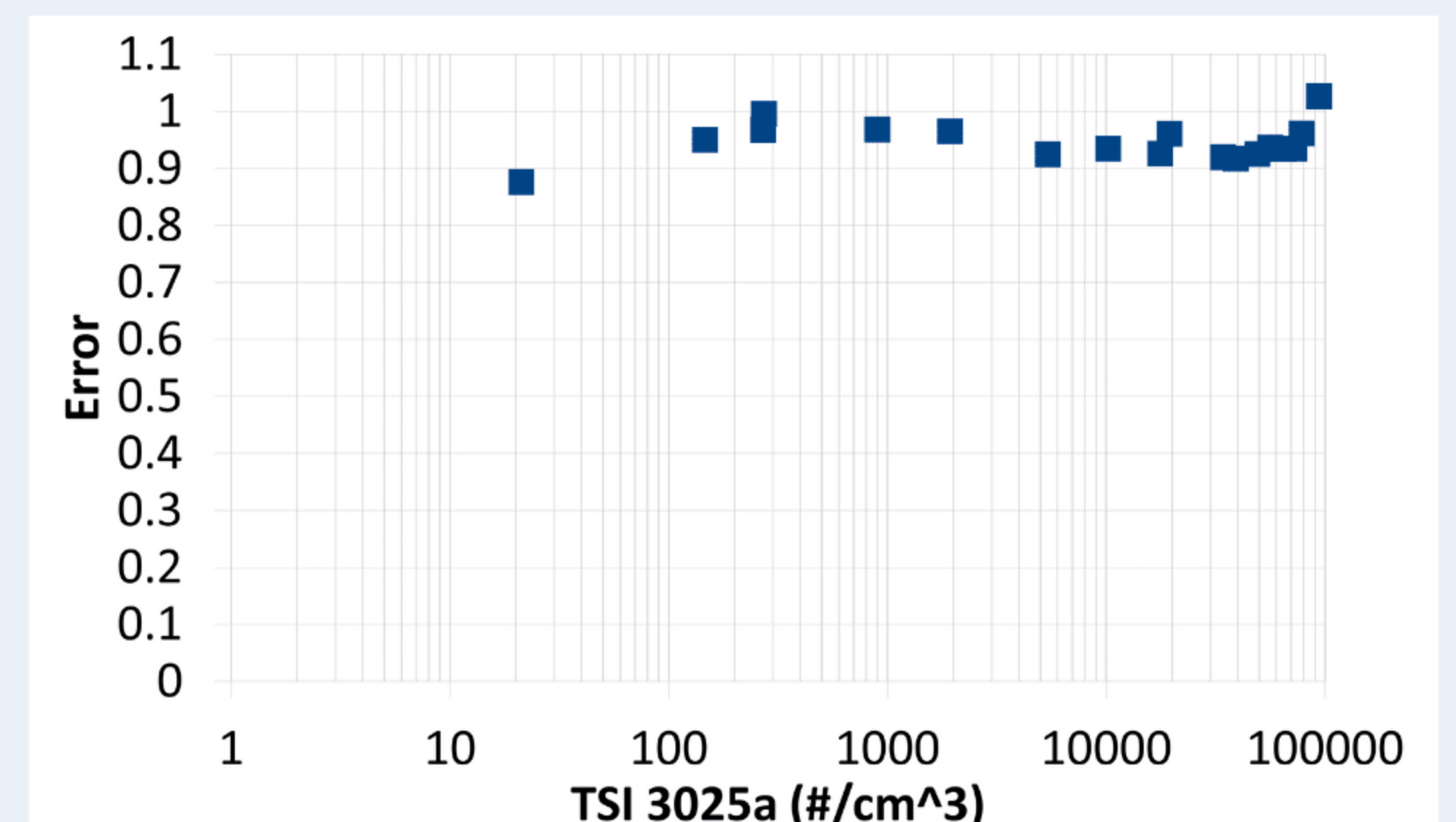
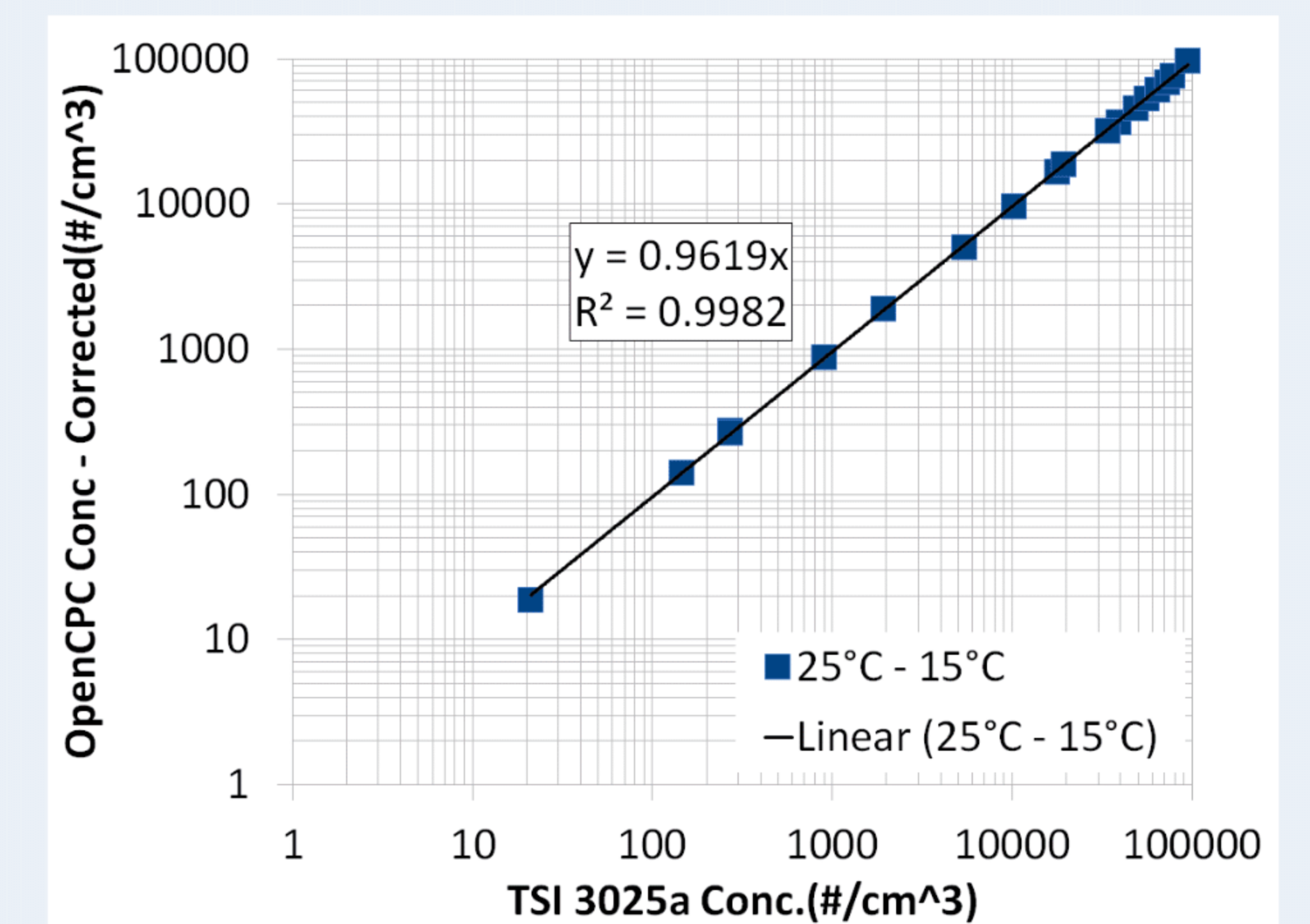
- Concentration has large impact on final grown particle size and count fraction
- Empirically determined Threshold Count Ratio for optics measured and used to correct count data



Simplified Liquid Handling & Gas Flow



Threshold Count Ratio Corrected



Aaron M. Collins, OpenAeros LLC

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