Spectradyne®
Particle Analysis

Extracellular Vesicle (EV) Measurements with Spectradyne's nCS1

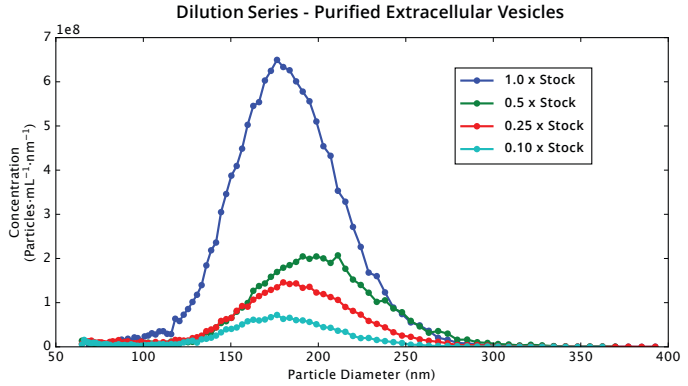
A Modern Implementation of Proven Technology

Spectradyne's nCS1™ instrument (Fig.1) accurately measures the concentration and size of EVs using Microfluidic Resistive Pulse Sensing (MRPS, a.k.a. the *Coulter Principle*), a proven technique that is considered the gold standard for whole blood measurements. The RPS technique has been updated using Spectradyne's patented nanoparticle analyzer (NPA) technology. The heart of the technology is the microfluidic cartridge (Fig.1), which allows the electrical detection of EVs as they pass one by one through a nanoconstriction.

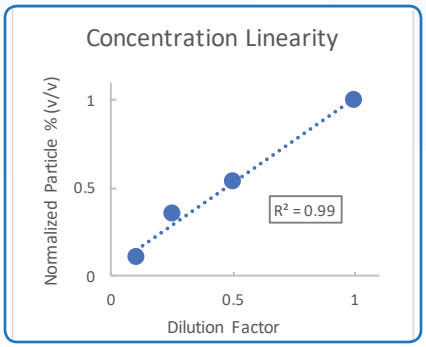
The nCS1 Difference for EV Characterization:

- **Accurate concentration & size**
- **Fast & easy to use**
- **Only 3µL sample required**
- **Truly orthogonal to optical techniques**
- **Any polydispersity!**

Highest concentration accuracy with EVs:



Single-particle electrical measurements of EVs yield higher concentration accuracy as shown by the dilution series above (R^2 = 0.99).



Spectradyne nCS1 and Microfluidic Cartridges

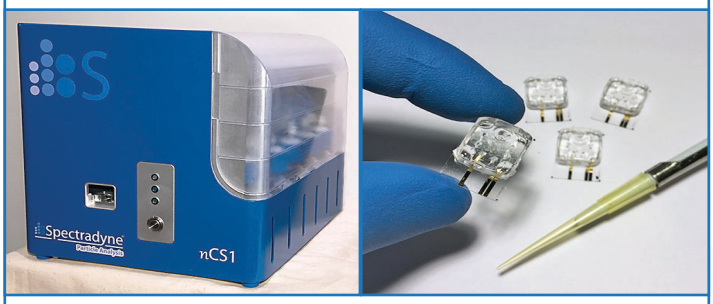
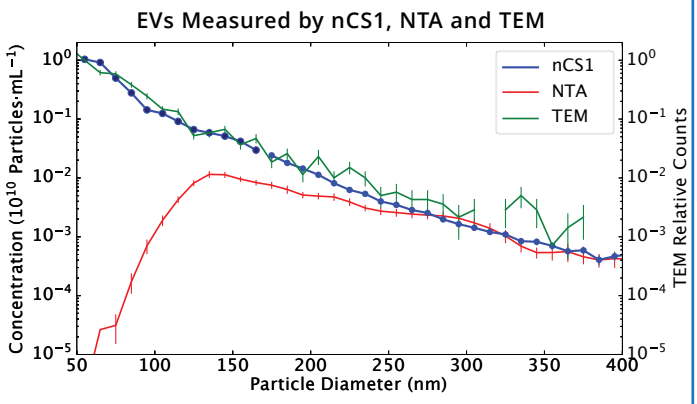


Figure 1: The Spectradyne nCS1 occupies a small bench top footprint, approximately 1.5 sq ft (left). Only 3 µL of analyte is required for analysis using a disposable microfluidic cartridge (right), which prevents contamination between measurements and eliminates cleaning requirements.

Measurement of reference EVs:

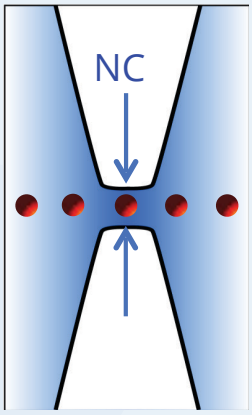


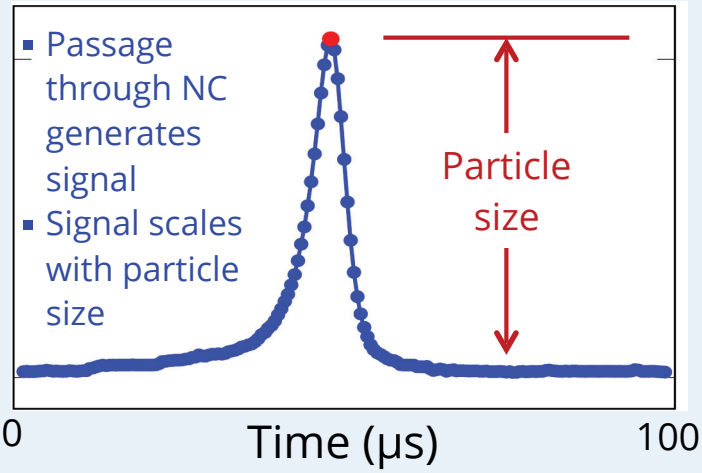
In the example above, vesicles isolated from urine were accurately quantified by the nCS1 and results agreed with the gold standard, Cryo-TEM.

While optical methods, such as NTA, have been used in the past, the result above clearly shows how NTA fails to accurately count particles below about 150 nm diameter in EV samples and dramatically underreports EV concentration—often by multiple orders of magnitude. This is due to the 6th order dependence of scattering signal to particle size - the larger particles scatter so much that the smaller particles are no longer detected. Optical techniques suffer from this sample-dependent Limit of Detection (LOD).

How it Works:

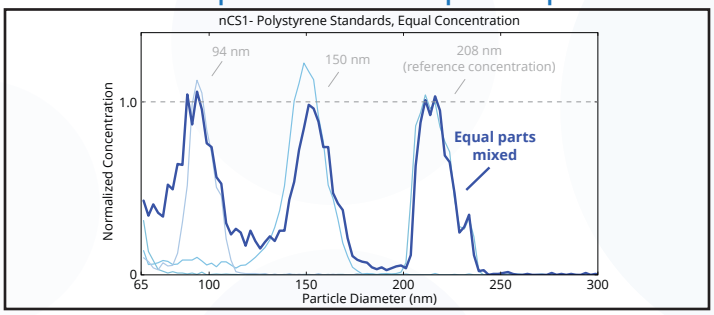
- Nanoscale constriction (NC)
- Electrical detection
- **Individual particles**





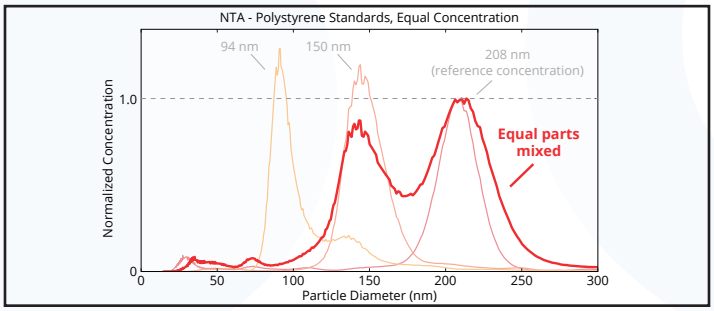
How Microfluidic Resistive Pulse Sensing (MRPS) works: Particles in fluid pass through a nanoscale constriction (NC) as shown on left side. A voltage is applied continuously across the two sides of the NC. As particles pass through the NC, the output signal changes in proportion to the volume of the particle. Particles are measured individually, with no dependence on particle material.

nCS1: No dependence on sample composition



3 different bead sizes mixed measured identically to each bead size by itself.

NTA: sample-dependent Limit of Detection (LOD)



NTA shows a sample-dependent LOD when the same 3 bead sizes are mixed

See what you've been missing!

Contact Spectradyne today and ask for a complimentary sample analysis:
Spectradyne LLC, 23875 Madison St., Suite A, Torrance, CA 90505
(424) 271-9262 www.nanoparticleanalyzer.com

Spectradyne nCS1 Specifications	
Technology	Microfluidic Resistive Pulse Sensing (MRPS)
Acceptable particle types	All materials (e.g. transparent/opaque, conducting/insulating, etc.)
Particle Size Range	50nm to 10,000nm
Sizing/Concentration Precision	Sizing < ±3%, Concentration < ±10% (particles/ml)
Measurable Concentration Range	10^4 to 10^{12} particles/ml (sample dependent)
Sample Size Required	3 µL
Maximum Particle Detection Rate	≈ 10,000 particles/sec (sample dependent)
Instrument Control Interface	USB to Windows computer
Data Analysis Software	Proprietary signal extraction method, real-time signal display, real-time concentration display, multiple filtering methods, multi-dimensional data display, PDF report export
Physical Characteristics	13" W x 15" L (33 cm W x 38 cm L)
Electrical	Standard 120/220V, 50/60 Hz AC