

# Spectradyne's Nanoparticle Analyzer Technology

## A Modern Implementation of Proven Technology

Spectradyne's nCS1™ instrument (Fig.1) characterizes nanoparticles 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 nanoparticles as they pass one by one through a nanoconstriction.

### The nCS1 Difference:

- No dependence on particle material type
- High-resolution size distribution
- Sizing range: 50nm to 10µm diameter
- Arbitrary polydispersity
- Total sample analysis in minutes.
- Disposable microfluidic cartridges
- Only 3µL sample required
- Truly orthogonal to light-based techniques

## Spectradyne nCS1 and Microfluidic Cartridges



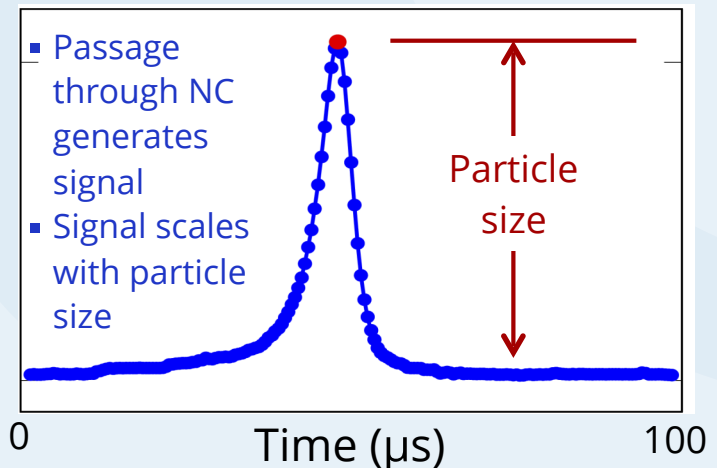
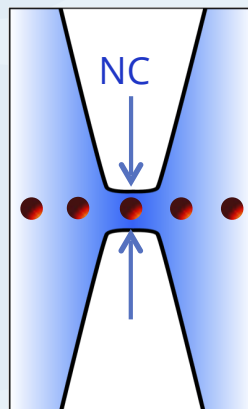
Figure 1: The Spectradyne nCS1 occupies a small bench top footprint, approximately 1.5 sq ft (left). Only 3 µL of analyte is required for analysis using a disposable microfluidic cartridge (right), which prevents contamination between measurements and eliminates cleaning requirements.

## Spectradyne nCS1 Applications

- Biologics: protein aggregates, viruses, etc.
- Extracellular Vesicles (EVs), liposomes
- Nanomedicines
- Biomarkers in serum, etc.
- General nanoparticles: gold/silver, silicon-derived, metal-oxide nanoparticles, etc.

## How it Works:

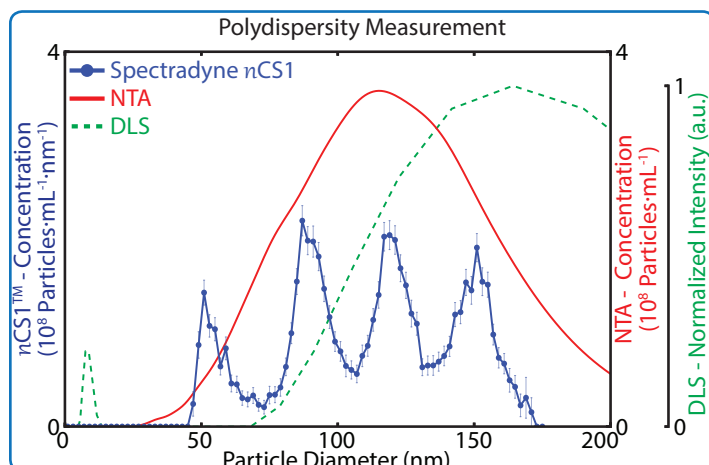
- Nanoscale constriction (NC)
- Electrical detection
- **Individual particles**



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.

## Example nCS1 Applications

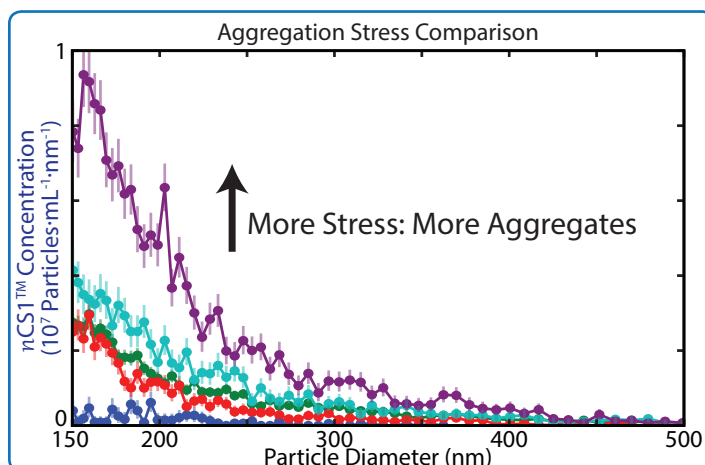
### Measurement of polydisperse samples:



In the graph above, results are shown for an equal parts mixture of polystyrene beads having NIST-certified mean diameters of 52, 94, 122 and 150nm measured with the nCS1, and also by an independent laboratory using DLS and nanotracking analysis (NTA).

Only the nCS1 has high enough resolution to clearly resolve the four components of the mixture, and properly return concentrations for each within the manufacturers specification.

### Measurement of submicron protein aggregates:



In the example shown above, protein aggregates in a proprietary protein formulation were accurately quantified by the nCS1. Five samples were provided: one unstressed sample and four samples subjected to increasing levels of stress (10, 20, 30 and 60 minutes of stress). The sample was run "as-is": no dilution or additives were required.

The nCS1 was able to clearly show increased aggregation with increased stress. Protein aggregates are difficult to measure by NTA or DLS, since they rely on optical contrast, which is very low in this type of sample.

### 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](http://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 <sup>5</sup> to 10 <sup>12</sup> 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