

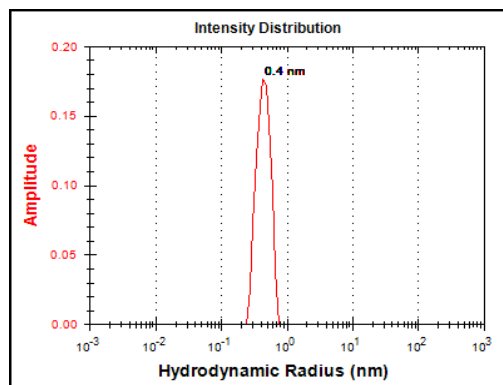
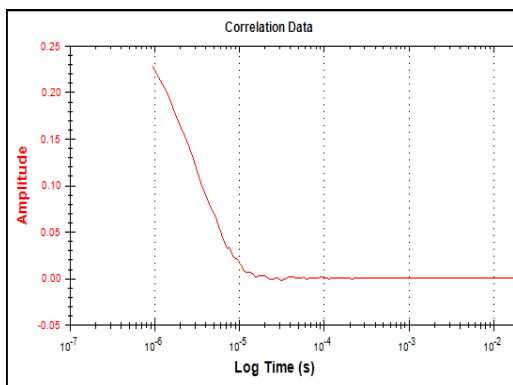
Measuring the Sub-Nanometer Range with the pUNk

Background: Caffeine is a bitter tasting substance with well-known physiological properties, which stimulate the mind and body in numerous ways. Having a molecular weight of 194.2 g/mol, it is a very small molecule, which readily dissolves in water. The characteristics of caffeine make it suitable to demonstrate the power of the pUNk dynamic light scattering system from Avid Nano, to detect molecules or particles of less than 1nm in size.

Sample Preparation: A solution of 1.4% w/v caffeine (Sigma Aldrich C0750) in water was prepared and filtered through a 0.02 μ m filter into a square quartz glass cuvette.

Measurement: The prepared cuvette was placed into the temperature controlled sample holder of the pUNk, and allowed to stabilize at 20°C for 10 min. A single acquisition, averaged over 300s was made.

Results: The light scattering signal from the dissolved caffeine is sufficient to produce a good quality correlogram with an intercept >0.2 and highly reproducible data with low polydispersity.



Cumulants Average

Parameter	Value
Mean Radius (nm)	0.48
Pd Index	0.053
SD (nm)	0.11
Intensity	51984

The mean radius was consistently reported at about 0.48nm and molecular weight estimate around 400Da indicating concentration dependent self-association into dimers, a known characteristic of caffeine in aqueous solutions.

Summary: The pUNk DLS system is easily capable of discerning molecules or particles of less than 1nm in diameter, even at low concentrations.