

**EXECUTIVE SUMMARY [NON-CONFIDENTIAL, NON-TECHNICAL ABSTRACT FOR PUBLIC INFORMATION OR PROGRAM PROMOTION]:** State in layman's terms the application's broad, long-term objectives and specific aims, making reference to the potential public benefits of the project relevant to California. Do not include proprietary or confidential information. This may be distributed before the funding decision has been finalized.

A three-dimensional (3D) manipulation of molecules and charged particles at a micron and sub-micron level (from several microns down to 0.1  $\mu\text{m}$ ) will form the basis for enabling practical technology for a high-volume miniaturized molecular diagnostics device that (i) helps to determine the genetic causes of diseases, (ii) isolates, separates and detects disease causing organisms, and (iii) allows controlled, uniform and reproducible nano-fabrication of devices. The major drawback in current miniaturized cell and pathogen detection systems in oncology and infectious diseases is the large threshold for detection (often a million cells/ml) and the large wash waste. A relevant example is the case of bacterial infections where the concentration of pathogens is about 100 cells/ml. With the proposed 3-dimensional high-volume and high-efficiency diagnostic device, the sample volume is increased to as much as 1 ml. With the expected high-efficiency of collection in the range of 90-100%, the pathogen capture rate is high enabling detection thresholds as low as 1 part in a million.