

Startup Contest Application

International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication

Please submit only one application per venture.

Type over/remove grey text from the completed application. Do NOT delete black text.

1. Venture Name. *POC Blood Biomarker*

2. Team Leader and Primary Contact Information.

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3. Additional Team Members.

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4. Describe the business opportunity.

Our point-of-care (POC) diagnostic module helps cardiologists who want to reduce 60% of unnecessary emergency room (ER) or clinical visits. Limited by current lab-based troponin testing protocol, patients with chest pains must visit either ER or facilities to confirm his/her heart condition. By providing a remote diagnosis platform, cardiologists can reduce 60% of unnecessary ER and outpatient visits. Furthermore, the POC platform can accelerate the urgent visit decisions within 15 minutes and prevent severe heart diseases.

5. Describe your technological solution.

The nanoengineering-enabled rapid POC diagnostics are intended to provide warning of changing level of Troponin I biomarker to improve optimal treatment. Figure 1 demonstrates the overall schematic of the POC module. The module is based on the team's innovative on-chip colorimetric biosensing technology, which strategically combines (a) light interactions with plasmonic gold nanoparticles (AuNPs) aggregating upon antigen/antibody binding (b) manufacturing of ultralow-noise nanometer-thick two-dimensional photodetector channels. Since this is a platform technology, we anticipate a broad set of secondary markets based on the settings where it is used as well as the disease indication/biomarkers it can detect. For example, screening various virus species for future epidemics at a port of entry (air, land, sea), drive-thru test center, hospital clinic, dental office, concert hall, military aircraft/ship, etc. where

timely screening and quarantining virus carriers is extremely critical to prevent the aggressive disease transmission.

6. Who is your competition and what are your product differentiators?

While most POC-authorized products use ELISA colorimetric detection, our technology uses nanoengineering-based optoelectronics. Our technology demonstrates 10-fold higher sensitivity compared to commercial ELISA assays. Furthermore, single assay cost of the currently available ELISA is \$400 – 500. Owing to the optoelectronic system characteristics, our platform can be priced below \$100. Furthermore, we anticipate a reusable assay platform composed of primary machine and disposable AuNPs-based chips. It can further reduce the cost of single assay and enable regular health monitoring.

7. Describe the Market Opportunity. [Optional Section]

United States High-Sensitivity Troponin Market size was valued at USD 557.05 Million in 2020 (Fig. 2) and is projected to reach USD 1190 Million by 2028, growing at a compound annual growth rate (CAGR) of 10.04% from 2021 to 2028. According to the American Heart Association around 2,300 Americans die of cardiovascular disease each day. The high sensitivity Troponin helps in monitoring the prognosis of certain condition with greater accuracy and providing the most effective treatment to the patients Therefore, with the growing concerns regarding cardiovascular disorders, the market is expected to grow over the forecast period. Furthermore, since our POC module is a platform technology, our goal is to expand our module into a broad set of secondary markets based on the settings where the disease indication/biomarkers can be detected by the module. Total POC testing market size was valued at USD 23 Billion in 2020. And the POC market is projected to reach USD 43.5 Billion by 2026 with CAGR of 11.9%.

8. Describe the Team. [Optional Section]

Under the National Science Foundation (NSF) CBET RAPID program, the University of Michigan team has developed a smartphone-connected handheld point-of-care (POC) diagnostic module for detecting viral infections, cancer biomarkers, sepsis biomarkers, metabolites, and proinflammatory proteins. The team has developed an alpha prototype of the portable biosensor module and proved the concept of the technology with scientific data. Through the I-Corps program, we have completed 100+ customer discovery interviews to identify applications with the strongest need and aligned the prototype for the user setting and demonstrate strategically advantageous assay metrics (sensitivity, selectivity, accuracy, rapidness, portability, user friendliness, cost, etc.).

9. Describe any traction. [Optional Section]

Our research group has worked on various biomarker detection and proved the outstanding capabilities using nanoengineering-based platforms. We have recently published three papers including cytokine, D-lactate enzyme, CitH3 sepsis biomarkers detection. In addition, our team successfully completed NSF national I-CORP program after accomplishing 100+ customer discovery interviews and developed a robust business model canvas. (Fig. 3) Now, we are developing the beta prototyping by integrating optoelectronic components and nanofabricated devices into single printed circuit board (PCB).

Figures and Additional Information

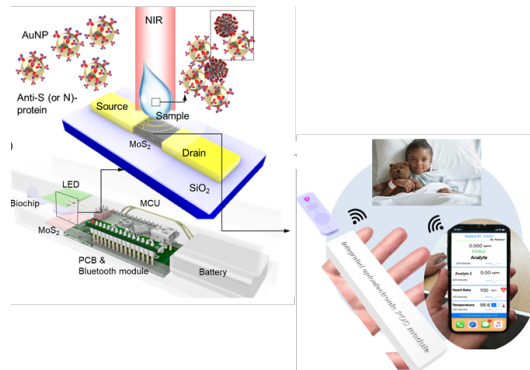


Figure 1: Schematic diagram of our POC module

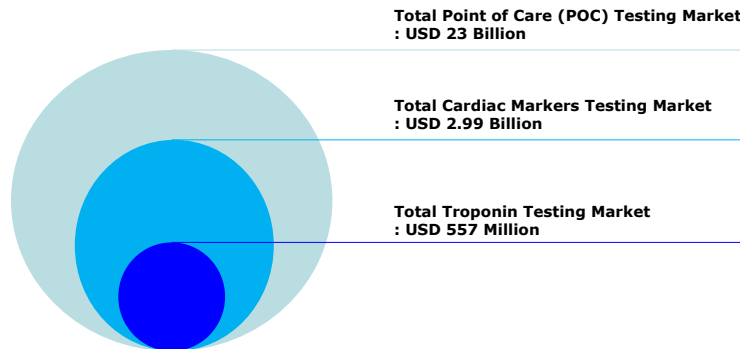


Figure 2: The POC testing, cardiac biomarkers, and troponin testing market size.

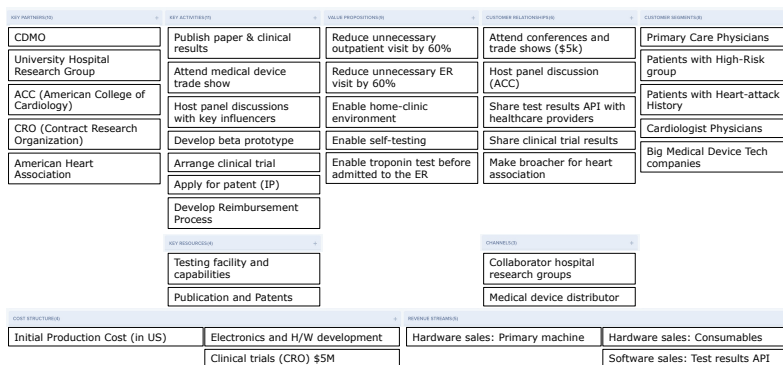


Figure 3: Business Model Canvas.