Quantum Diamond Technologies

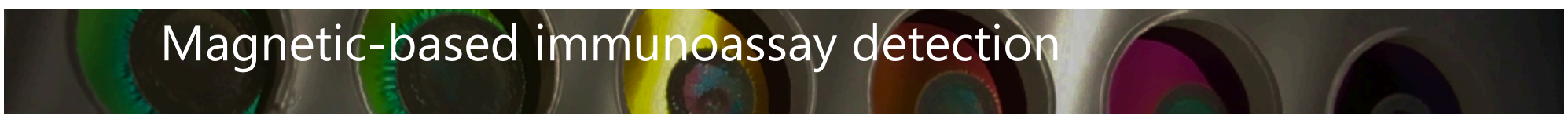
Exciting advances in quantum technology are beginning to emerge after years of significant academic and corporate research. Powered by the fundamental principles of quantum mechanics, these unique systems provide new capabilities that enable revolutionary approaches to computation, communication, sensing and beyond.

Quantum Diamond Technologies Incorporated (QDTI) was started to exploit quantum systems intelligently engineered into diamond crystal – called nitrogen vacancy (NV) centers – based on world-leading research at Harvard University. QDTI is using the NV center technology to build a quantum sensor capability with the potential to disrupt the biomarker detection and medical diagnostics fields.

QDTI imaging technology

NV centers are tiny defects in the diamond crystal whose electronic states probe their local environment with very high sensitivity and resolution. To make the imaging platform, QDTI embeds billions of these NV centers just below the surface of a synthetic diamond ‘chip’. The quantum sensor-infused chip can then rapidly image magnetic fields from objects as small as a few 10s of nanometers. The NV imager acts like a magnetic microscope – making detailed images of magnetic fields instead of light – with unrivaled sensitivity and throughput.

While the QDTI imaging technology can be used to detect magnetic fields generated from a wide array of objects, the current QDTI product development focus has been to leverage the imager to create a novel, ultrasensitive biomaterial detection and diagnostics capability.



Blood and other biofluids have minimal magnetic background signal. So an assay that utilizes a magnetic detection approach (versus optical detection approach) should provide ultrasensitive measurement capabilities coupled with minimal washing or sample preparation. That is what the QDTI detection platform can deliver.
First, QDTI leverages decades of immunoassay tool development (e.g., target specific tags, or antibodies) yet replaces the optical labels with novel magnetic labels that generate special, tiny magnetic fields.
Second, the NV-center powered imaging platform is able to detect these novel magnetic tags rapidly, discretely and in a manner compatible with biological samples.
The end result is an ultrasensitive detection platform that requires minimal sample processing and substantially reduced technician time.

Why QDTI?

Detecting biomolecules, such as proteins or nucleic acids, present at low concentrations within blood or other biofluids represents a significant technical challenge. Yet, recent biomedical and clinical research reveals that being able to quantify these low abundance biomolecules is becoming increasingly important to patient care, drug discovery and development efforts, and basic science investigation. Proteins themselves are tiny. So in order to detect these biomolecules, tags (e.g., antibodies) that bind to a protein target of interest in a highly specific and high affinity manner are used to make tag-protein complexes. These tags are also attached

to labels that allow for optical signal based detection of the protein-tag complexes. The presence of a certain protein, for example, can be quantified by measuring the optical signal strength resulting from a sample that has been treated with target specific tags. Unfortunately, biofluids such as blood, where clinicians would like to measure for certain proteins, are inherently “noisy” for optical measurements due to the presence of intrinsically auto-fluorescent contaminants. As a result, optical based detection technologies need to be washed repeatedly (e.g., sample processing) in order to remove background and to enrich for protein-tag complexes before a true optical based signal can be observed.

Ultra simple sample preparation —

The QDTI magnetic based assay requires minimal sample processing before the sample is measured. Many existing systems have many steps that require technician time before the test can be run.

Minimal sample input +

Ultrasensitive detection of low-concentration biomarkers +

Reducing diagnostics costs +

Flexibility in biomarker targets +

Meet the Team

CORE TEAM

John Pena

Chief Executive Officer

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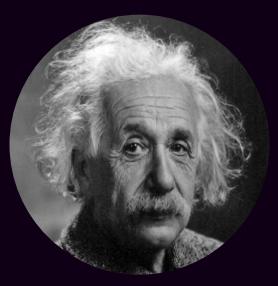

Seabron Adamson

Chief Financial Officer

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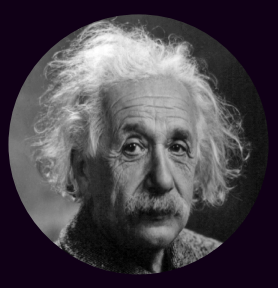

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September 2017

NIST awards a Phase II grant to support QDTI's development of NV imaging

November 2017

NSF awards QDTI a grant to support rapid sample transfer for quantum magnetic sensors

July 2018

The MassVentures START program awards QDTI $100k

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