



WaveGuide

*Next Generation Mobile Analytical Instruments
Palm Nuclear Magnetic Resonance System (PNMR)*

*University Research & Entrepreneurship Symposium
April 1, 2010*

Dr. Marcus Semones



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WaveGuide Corporation

WaveGuide is an early stage mobile analytical instrument company building a suite of next generation handheld (i) infrared and (ii) nuclear magnetic resonance spectrometers for portable use in multiple untapped markets.

WaveGuide's business model:

- Acquire exclusive worldwide licensing for existing handheld infrared spectrometer technologies for placement into large unrealized markets (to be licensed from defense company already earning \$MM revenues from its existing products);*
- Acquire exclusive worldwide licensing for disruptive nuclear magnetic resonance spectrometer technologies to commercialize next generation handheld instruments (to be licensed from Harvard's OTD).*



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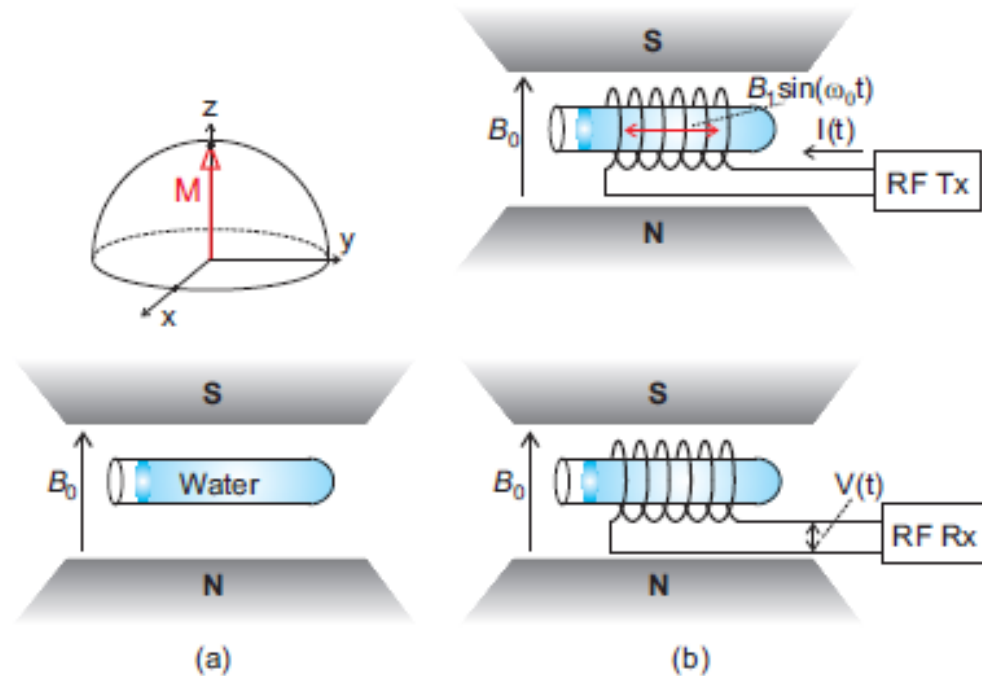
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Nuclear Magnetic Resonance (NMR) Overview

NMR is a phenomenon which occurs when the nuclei of certain atoms are immersed in a static magnetic field and then exposed to a second oscillating magnetic field.

Basic components of a NMR System:

- **Magnet (largest component)**
- **Sample coil**
- **RF transceiver**



a) water in a magnetic field B_0

b) excitation (top) and reception (bottom) phase in NMR



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Nuclear Magnetic Resonance (NMR) Overview

**State of the art NMR Relaxometer
(bulky stationary bench top unit)**

Basic components of a NMR System:

- **Magnet (largest component 120kg)**
- **Sample coil**
- **RF transceiver (requires ~100 mg's of sample)**
- **Cost ~\$140K**



Bruker minispec mq series



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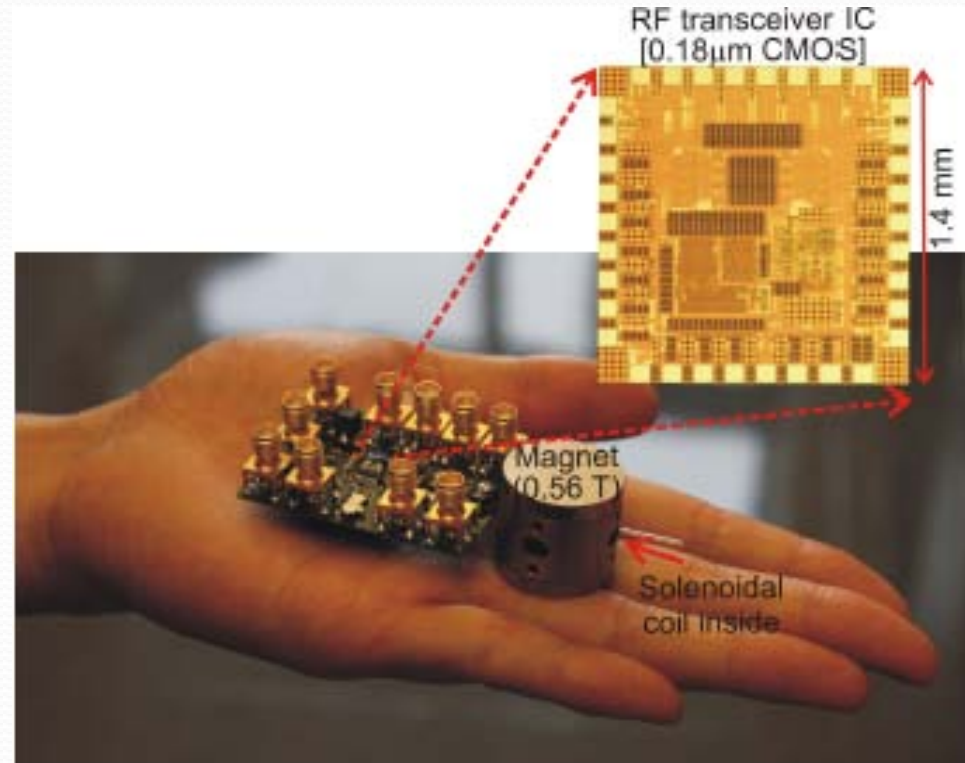
Silicon NMR Radio-Frequency Biomolecular Sensor

Components of the PNMR (0.1 kg) System:

- Magnet 0.56 T (ping pong ball size)
- Sample coil
- RF transceiver IC (0.18 μ m CMOS)

Advantages of PNMR System:

- 1200 x lighter at (0.1kg)
- 1200 x smaller footprint
- 150 x more spin-mass sensitive
- 1400 x production cost reduction



Palm NMR system (0.1 kg)

Highly sensitive RF transceiver was designed to compensate for the small magnet's weakened signal

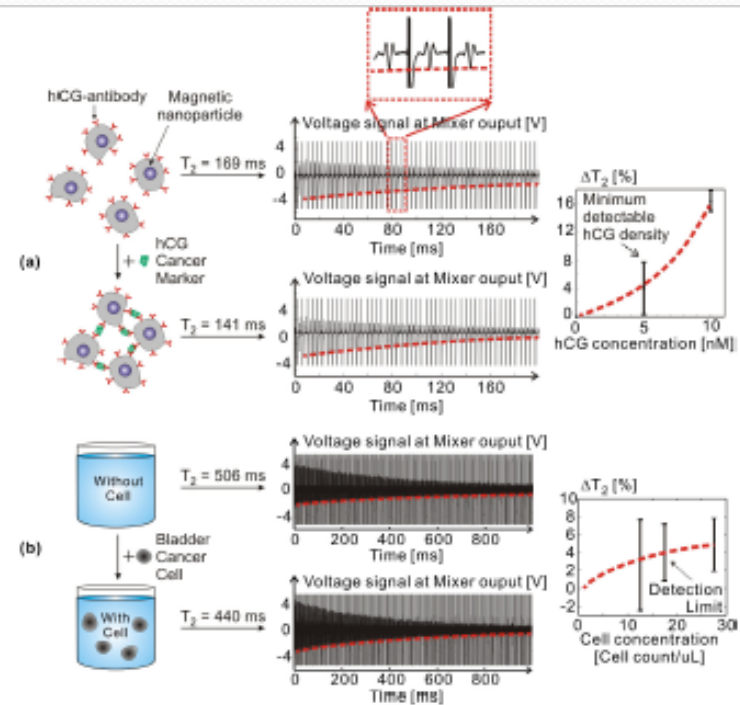
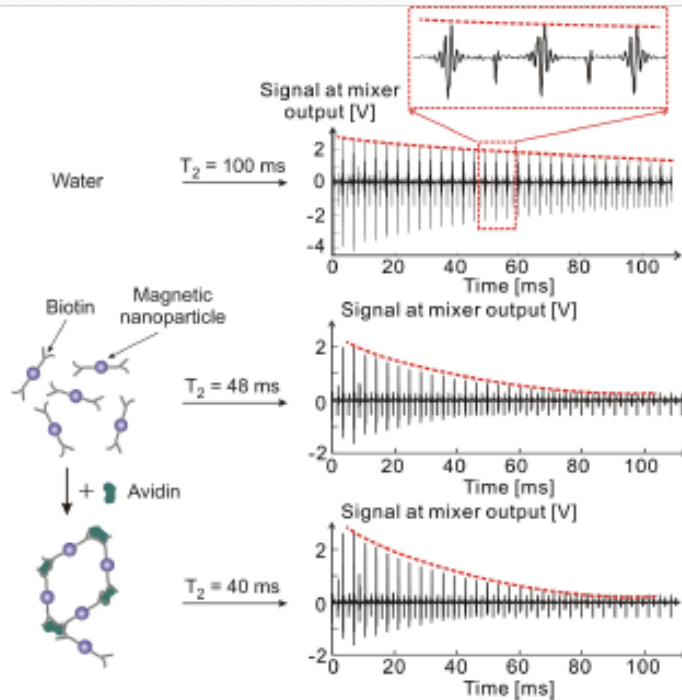


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Applications NMR Radio-Frequency Biomolecular Sensors



- Concentration sensitivity (fmol) is comparable to conventional ELISA sensors (pmol)
- Rapid assay time (~10 min)
- Perform measurements on unprocessed biological samples: saliva and blood



Markets for Handheld NMR Radio-Frequency Sensor

- **The global point of care (POC) testing market was estimated to be worth US\$11.3 billion in 2007 and is growing at 11% a year.**
- **POC testing accounts for approximately 34% of the US\$33.6 billion global in-vitro diagnostic testing market.**
- **Target markets include: (1) hospitals; (2) clinics; (3) physician's offices (viruses, bacteria, etc.); (4) military/defense (bio-warfare agents); and (5) law enforcement and security agencies (illicit drug detection).**



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Markets for Handheld NMR Radio-Frequency Sensor

- **Target large analytical instrument/diagnostic companies for use with existing magnetic nanoparticle reagents.**
- **Target emerging markets for infectious disease point of care (POC) testing through partnerships with established global market players.**
- **Partner with large defense contractors and security firms for entry into military/defense market space (bio-warfare agents, anthrax etc).**
- **Develop or license novel magnetic nanoparticle reagents for use with PNMR system.**



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Competition

- **Currently there are no handheld NMR biosensors on the market.**
- **Concateno plc and Royal Philips Electronics, are about to launch (in the UK) a larger handheld illicit drug detection proto-type based on Philips' 'Magnotech' technology (confirming market need and market opportunity).**
- **T2 Biosystems has also developed a diagnostic proto-type, NanoDx System, which consists of a small, portable instrument and a disposable cartridge that is pre-loaded with nanoparticle reagents used to detect and analyze the presence of biomarkers.**



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Funding Requirements

WaveGuide is seeking a bridge financing round of \$300K to \$500K with a follow-on Series A financing of \$3M to \$5M in equity financing to license, develop, manufacture market and commercialize the PNMR, build the organization and fuel rapid growth.



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WaveGuide Management

- **Dr. Brent M. Segal** - Co-Founder/Chairman. Dr. Segal is currently the Chief Technologist at Lockheed Martin Nanosystems following the acquisition of the government unit of Nantero in August 2008. Dr. Segal is a Co-Founder and was part-time Chief Operating Officer of Nantero. He is a General Partner at Atomic Venture Partners, an early stage venture capital fund, based in Waltham, MA. Dr. Segal was educated at Harvard University and Reed College.
- **Dr. Marcus Semones** - Co-Founder/Interim CEO. Dr. Semones was a Senior Investigator Medicinal Chemist Drug Discovery Oncology at GlaxoSmithKline since 1998. He is co-author of over 40 patents and publications. Dr. Semones was educated at Harvard University and Emory University.
- **Gregg S. Hershenson** - Co-Founder/VP Business Development. Mr. Hershenson is a Founding General Partner at JMM Partners and Atomic Venture Partners where he focuses on investments that leverage “game-changing” technology for rapid growth. He is an experienced entrepreneur and respected investor in life sciences, nanotechnology and entertainment/media.



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Principle Investigators Of Technologies (Harvard University)

- **Dr. Donhee Ham** (S'99–M'02) is John L. Loeb Associate Professor of the Natural Sciences and Associate Professor of Electrical Engineering at Harvard University, Cambridge, MA, where he is with the School of Engineering and Applied Sciences (Programs: Electrical Engineering and Applied Physics). Ham was recognized by MIT Technology Review as among the world's top 35 young innovators in 2008 (TR35), for his group's work on CMOS RF bio-molecular sensor using nuclear spin resonance to pursue early disease detection and low-cost medicine.
- **Nan Sun** (S'06) is currently working toward a Ph. D. degree in electrical engineering at Harvard University, Cambridge, MA. Nan has developed several CMOS RF bio-molecular sensors utilizing nuclear magnetic resonance to pursue early disease detection and low-cost medicine. These systems can be used not only for low-cost medical diagnostics, but also for oil detection and quantum computing on silicon.



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The logo for WaveGuide features the word "WaveGuide" in a blue serif font. A blue wave-like line arches over the "Wave" and under the "Guide".

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