New Technologies

Quantum Fingerprint Detection of IED's and Explosives

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Executive Summary

- Most of combat deaths in Iraq and Afghanistan are due to IEDs, roadside bombs and suicide car bombs.
  - Over 3000 combat deaths in Iraq.
  - Over 240 combat deaths in Afghanistan.
- QF™ Technology would have prevented a large percentage of those deaths.
- Need ~$3,000,000 in funding and 24 months to reach full production and start saving lives.

Reference: DOD Personnel and Military Casualty Statistics, Defense Manpower Data Center, Casualty Summary by Reason, Oct. 7, 2001 – Aug. 18, 2007, available at http://siadapp.dmdc.osd.mil/personnel/CASUALTY/gwot_reason.pdf

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Executive Summary

- **Key Features**
  - **#1: Much higher sensitivity than other methods.**
  - **#2: Detection versatility.**
  - **#3: Simultaneous detection of multiple agents.**
  - **#4: Highly rugged and lower cost.**
  - **#5: Real-time operation in the field.**
- **Key Benefits**
  - **Much enhanced safety for military personnel and civilians.**
  - **Save time, money and LIVES!**

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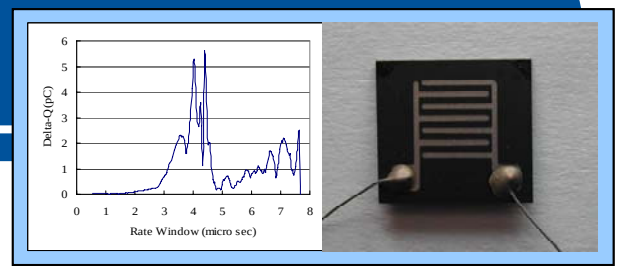
Overview



- Working principle of QF™ detection.
- Why is QF™ detection of IED's so promising?
  - Ultra sensitive detection of explosives via QF™.
  - Simultaneous detection of multiple explosives.
  - Increased safety of military personnel due to increased standoff.
- Applications of the QF™ detector in the field.
- Analysis of costs vs. benefits.

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The Promise: IED Detection via QF

QF™ detection is:

- Ultra-sensitive (ppb/ppt).
- Versatile in the kinds of compounds that can be detected.
- Based on robust, solid-state hardware.

Benefits: QF™ has great potential to:

- Increase the detection standoff from cm to meters.
- Detect military explosives, alternative explosive compounds and even chem/bio agents.
- Function reliably in the field.
- Provide these benefits at low cost.

Breakthrough in **increasing safety** for military personnel and civilians.

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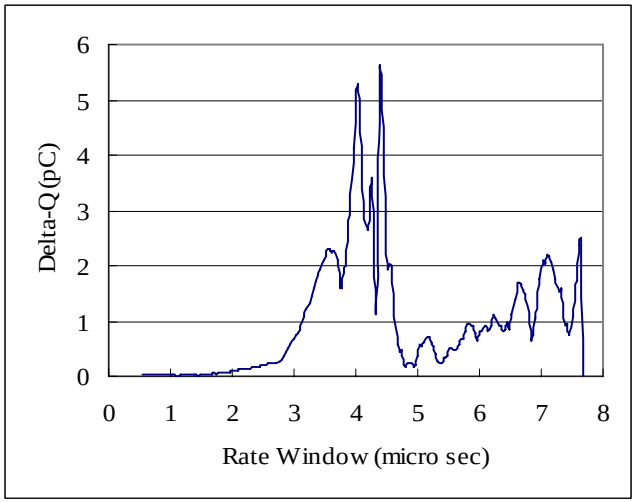
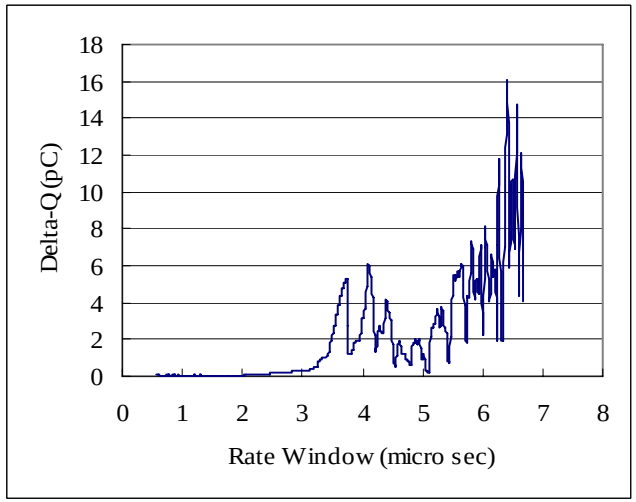
Quantum Fingerprint™ Data



Preliminary QF™ spectrum of **TNT** obtained using a polycrystalline diamond film sensor substrate.



Preliminary QF™ spectrum of **Crystal Methamphetamine** obtained using a polycrystalline diamond film sensor substrate.

The maxima in the QF™ spectra correspond to the various trap energies.

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QF™ Prototype Design

Two parallel efforts:

- The Nuclear Science and Engineering Institute (NSEI) in Missouri designed and built a QF™ prototype (being tested now).
- NxGEN Electronics is designing and will build the commercial QF™ detector.
  - Packaging of the sensor chip is key.
  - Rugged, miniaturized design of the entire detector system.
  - We are working on the design now.

Summary

- QF™ Technology has a high potential to be the breakthrough the military has been looking for in IED and explosives detection.
  - Much enhanced detection standoffs.
  - Detection versatility and potential for discriminating many different species.
  - Ruggedness, small, lightweight system.
  - Low cost.
- Project is tackled in parallel via laboratory and more field-oriented experiments and measurements.
- This approach will accelerate the development of this promising sensor system.