Towards a in-field, multi-spectral, low dose, compact x ray system, Mark Derzon, Sandia National Laboratories

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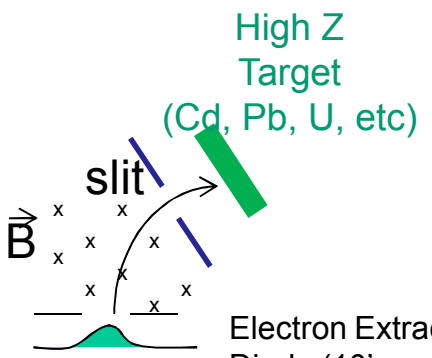
Objective: Simulate Components of a System for Ultra Compact in-field, Low-Dose Multi-spectral X ray Imaging Capability

Description: Short pulses of high energy electrons can be made with very high efficiency in pulse power diodes. New technologies may have embedded magnetic field structures to select energy bands and modify x ray spectra. A new class of high z sensors are being developed for SNM detection. Together these could produce a valuable multienergy compact x ray system for field based medicine.



Low Voltage (100-300 keV, high current density (kA/cm^2), pulsed electron diode in extractor geometry, magnetic field transport region, slit and 'thin' high Z target

Electron Extractor/source Diode (10's ns pulse)

Benefit: Multienergy compact x ray system for field based medicine.. Estimated CAT scanner-like performance with 2-10x reduction in dose, 2-5 kg system weight, few seconds for installation and operation .

What is needed?
The next step is to build a team and model system performance to determine if larger effort would be useful.

Challenges: Efficiency for nearly mono-energetic inner shell 50-120keV lines. Fabrication of MEMs diodes and electron transport regions. Fabrication and function of atomic number tuned x ray sensors.

Maturity: TRL1.

Major Goals:
2011: Seedling effort. A joint team of multidisciplinary efforts will estimate system performance assuming the components can be built and team will design proof-of-principal development plan for each component.

Funding: 1 yr period of performance.
Year 1: Fy11-$200k Seedling

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Proposed Team: Proposed: Tim Pointon, SNL – electron diode development, Joe McFarlane-Prism Scientific, x-ray modeling, Jeff Fessler, Umich, Modeling of Medical Imaging Systems, Mark Derzon, MEMS and System Integration.

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