Portable Atmospheric Electron Beam to Remotely Deactivate Electronic Devices (e-Zapper)

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LONG-TERM GOALS

The long-term goal of this research is to use an electon beam for standoff, non-intrusive disruption of electronic safe-arm fuzing (ESAF). It is anticipated that this technique will be effective against ESAFs contained in ordnance items as well as improvised explosive devices (IEDs) that employ electronic fuzing.

OBJECTIVES

The first objective of this effort is to do proof of principal experiments to demonstrate the ability of an electron beam to render safe an ESAF. If the electron beam is found to be effective the second objective will be to develop and demonstrate a laboratory prototype.

APPROACH

This effort is divided into three phases. During the first phase technology that will allow the electron to be fired into the atmosphere will be explored and initial proof of principle experiments will be conducted to determine the ability of an electron beam to render safe an ESAF. In addition to these initial experiments planning will be started for the prototype construction. The second phase will focus on building a laboratory prototype system and performing some initial tests of the prototype. The third and final phase will be to extensively evaluate the prototype's performance and test the prototype against a variety of ESAF targets.

WORK COMPLETED

This effort was a new start in FY05. During FY05 a test site was established in Newark,OH and approval for experimental operation was obtained from Ohio's Department of Radiation Safety. Some initial safety assesments were performed using a 12 MeV electron beam. The beam was found to present no radiation hazzard at distances of greter than one meter, Figure 1

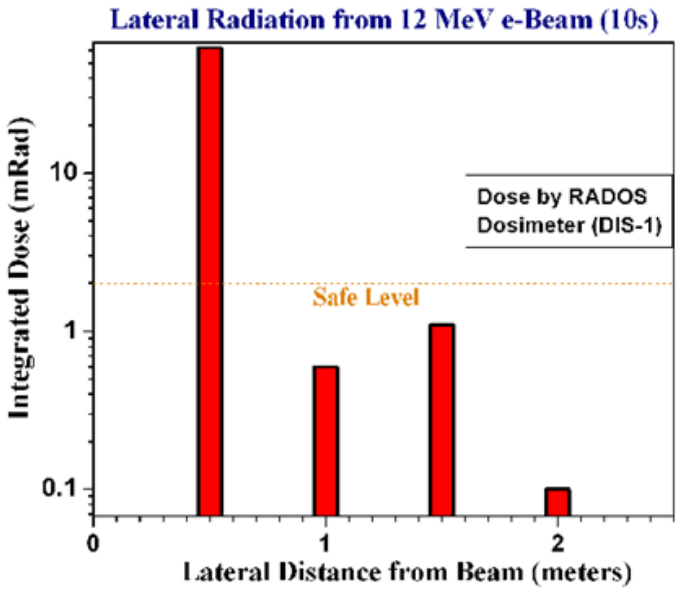

Figure 1. Lateral Radiation from a 12 MeV e-beam

Additionally measurements were made of the dispersion of the beam in the air. Dispersion was found to be related to the inverse square of distance, Figure 2.

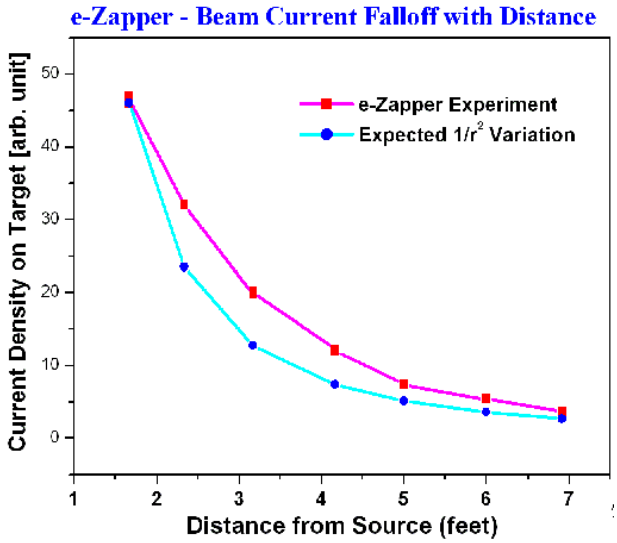

Figure 2. e-zapper Beam Current Falloff with Distance

As a proof of principle experiment, a group of electronic targets listed below were exposed to the electron beam for less than five seconds, see configuration at Figure 3. All targets were found to be nonfunctioning after exposure to the beam.

Targets Exposed to the Electron Beam

- Walkie-Talkies
- Wireless Door Bell
- Car Alarm
- RC Car
- IR detector

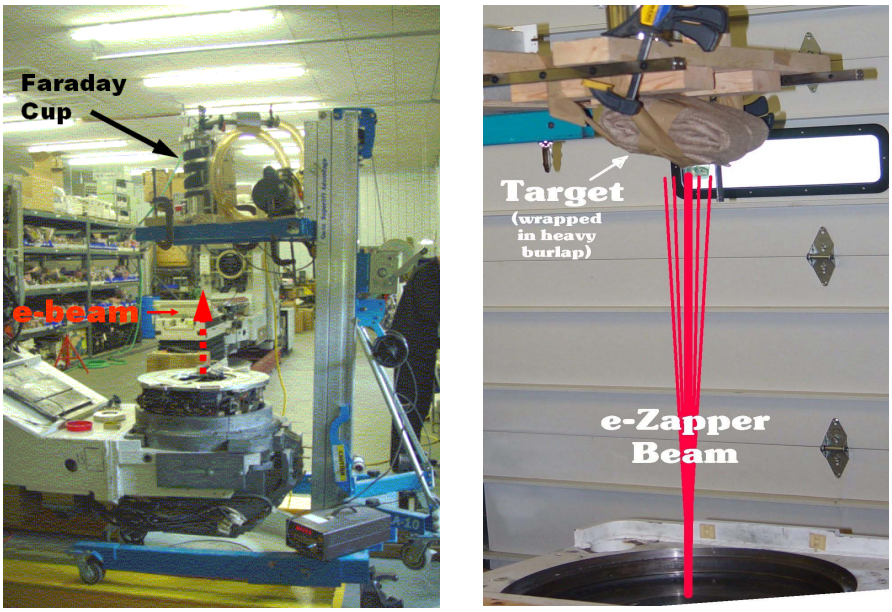

Figure 3. Experimental e-Zapper Configuration

RESULTS

The most significant result this year was the demonstration of an electron beams ability to render inoperable the electronics listed in Table 1. The ability of the 12 MeV electron beam to impact the performance of these electronics suggests that the more powerful electron beam planed for the prototype will be able to perform its anticipated mission. Additionally radiation measurements made during the e-Zapper experiments showed no significant radiation (<<2 mRem/hr) at one meter away from the beam.

IMPACT

The initial testing of the e-Zapper showed success in all benchmarks. The technology chosen for the e-Zapper is capable of deactivating electronics at a distance with very low doses of beam. The next step

is to engineer a full-strength e-Zapper based on this technology, and to evaluate its characteristics. If this level of success is sustained this effort may provide an additional tool for use by Explosive Ordnance Disposal (EOD) Technicians.

TRANSITIONS

The effort will provide input to an anlaysis of alternatives in FY07.

RELATED PROJECTS

The e-zapper project is closely related to two other projects currently taking place at the Naval Explosives Ordnance Disposal Technology Division. The first of these is the ESAF Standoff Detection effort. The goal of this effort is to develop technologies that enable EOD technicians to determine the status of an ESAF from a safe distance. The second related project is the ESAF standoff disruption effort. The goal of this effort is to evaluate the use of electrostatic discharge as well as a variety of electro-magnetic pulses for their effectiveness at rendering safe ESAFs.

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Radiation Generated by e-Zapper

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