Muons Will Be Used to Protect You from Terrorist Attacks

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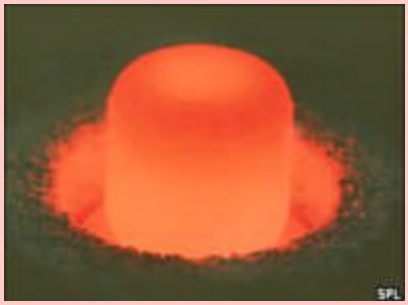
Nuclear terrorism is the greatest threat facing the United States today, according to last fall's campaign debates of both President Bush and Senator John Kerry. Yet despite the worries over this massive threat, less than 5 percent of the cargo entering the United States is examined for it -- largely because the U.S. government lacks a capable and reliable means of carrying out such a task. But a solution may now have been discovered.

Scientists at Los Alamos National Laboratory are testing technology that uses muons to detect potential nuclear materials in vehicles or ship containers. What are muons? Muons are tiny charged particles that occur naturally in the atmosphere. They are able to penetrate virtually all substances; they are deflected to varying degrees by denser materials such as lead and aluminum. With an average energy of three billion electron volts, most muons can penetrate about 1.8m of lead.

And while scientists had been studying the possibility of using muon cosmic rays for screening purposes, the project did not gain full swing until the Sept. 11 terror attacks occurred. Principal funding was received in October 2003 -- two years following the attacks.



Muons are formed when cosmic rays heading toward Earth interact with atmospheric gases and produce electrically charged subatomic particles. These particles (or muons) have a mass 207 times that of an electron. They strike Earth at the rate of 10,000 per square meter every minute, moving through most materials, scattering when they come in contact with high-density materials.

By utilizing these tiny charged particles, the scientists at Los Alamos National Laboratory have developed a muon cosmic ray screening device that can accurately detect smuggled nuclear weapons and materials in any vehicle or container.

How Does the Muon Cosmic Ray Screening Device Work?

The essential parts of the device consists of two sets of parallel tubular sensor constructed so:

- Trucks and other vehicles can drive through
- Sensors would fit over ship containers

By placing detectors above and below a vehicle, scientists are able to monitor muon interaction with different materials in the vehicle's cargo. The denser a material is, the more muons will scatter when they make contact. Using the scatter data, a computer creates an image of the different materials in the vehicle. This way, instead of relying on the interpretation of images on a screen, operators only need to consult the device's readings.

The new device is large enough to scan a 50-foot trailer truck or a 20-foot-long ship container. It would cost about $1 million each and could be used for screening vehicles at border crossings or ship cargo at major ports.

According to one scientist, the muon cosmic ray screening device is basically a data analysis system that measures the exact amount of deflection caused by the rays bouncing off different materials and identifies them according to the degree of deflection.

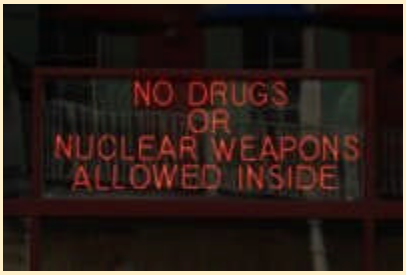
Questions have been raised, however, concerning the speed of the device and whether or not it is fast enough to allow prompt screening of large numbers of vehicles or cargo containers. Currently, the system takes 30 to 60 seconds to complete an examination of a vehicle or object; however, scientists foresee reducing that time to a mere 20 seconds, making it possible for use with a large volume of motor traffic or cargo.

Muons vs. X-Rays

Scientists agree X-rays (and gamma ray) detectors that are currently being used at U.S. borders are inefficient for detecting nuclear materials shielded with lead and steel.

The bottom line is that the muon cosmic ray screening device is superior to X-ray devices -- such as those used at airports -- which require the generation and focusing of radiation beams that can penetrate luggage or metal packaging material but not highly dense lead and similar shielding.

Moreover, any X-ray systems large and powerful enough for motor vehicles and ships' containers would not only generate a poor success rate, but would also pose a significant health hazard. In fact, on scientist commented, "If you had illegal migrants inside a container you would kill them [with X-rays]."



The new system has proven to be accurate within a 3 percent margin for error, and scientists believe they can improve that. Better software techniques are being developed to allow rapid 3-dimensional images of the volumes being screened. Scientists can consistently detect a small cube of uranium--about 4 inches on a side--within a large metal container full of sheep.