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GeGI (Germanium Gamma Imager) Performance: Maritime Interdiction Operation

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Disclaimer

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GeGI (Germanium Gamma Imager) Performance:
Maritime Interdiction Operation

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Exercise: Maritime Interdiction Operation

Date: August 13-14, 2014

Location: Point Alameda, Alameda California

Summary of Results

The Gamma Ray Imager (GeGI) was demonstrated during the Maritime Interdiction Operation at Point Alameda, the site of the former Naval Air Station, in Alameda, CA. During this exercise GeGI was used to localize sources within an abandoned building and a cargo ship, the Admiral Callaghan. Key points from this exercise include:

- Demonstrated portable, high-resolution gamma-ray imager
- Demonstrated viability of gamma-ray imaging for interdiction scenarios
- Operated in field environment w/out power for full work day
- Localized various radioactive sources throughout a cargo ship and in buildings

Summary of System Performance

GeGI is a portable gamma-ray imager weighing less than 30lbs. It was easily transported between the various measurement locations by car and could be hand carried onto the cargo vessel. With the hot-swappable external batteries (each weighing 1.8lbs) the instrument was operated throughout the day without the need of AC power.

Figure 1 The Germanium Gamma-Ray Imager (GeGI) with attached PC for instrument control and data storage. The 180° panoramic camera provides an optical photograph to overlap on the Compton and Pinhole images.

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Measurement 1: Source Localization within a Building

GeGI was fielded for two days at an abandoned building in Point Alameda. The configuration of GeGI with laptop and batteries is shown in Figure 2. A ^{137}Cs and ^{60}Co source were placed in within a room of the building and GeGI was used to locate the sources. On the first day the ^{137}Cs was localized from within the room (see Figure 3) and from an adjacent room (Figure 4), for each case the time to localize the source required less than 10 seconds and 5.6 minutes, respectively. On the second day additional measurements (shown in Figure 6) were conducted with both ^{60}Co and ^{137}Cs. In all cases GeGI successfully localized the sources of radiation.

Figure 2 GeGI setup in a room of the abandoned building. GeGI was successfully able to localize sources within the room and from an adjacent room.

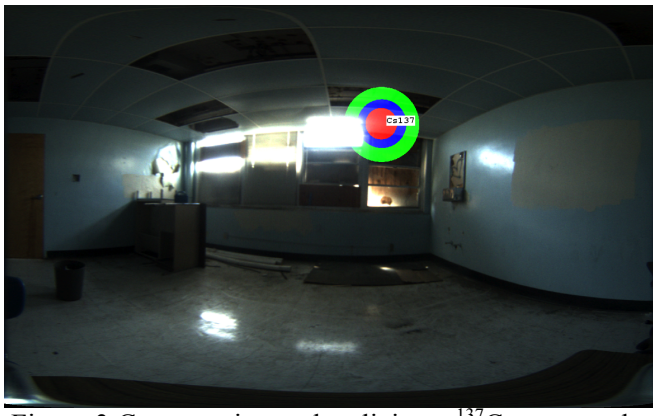

Figure 3 Compton image localizing a ^{137}Cs source placed in the ceiling. With GeGI located in the same room the source was localized within 10 seconds.

Figure 4 A Compton image of the same ^{137}Cs source shown in Figure 3, located in an adjacent room. The additional attenuation of the walls increased the time to localization from 10 seconds (GeGI within the room), to 5.6 minutes.

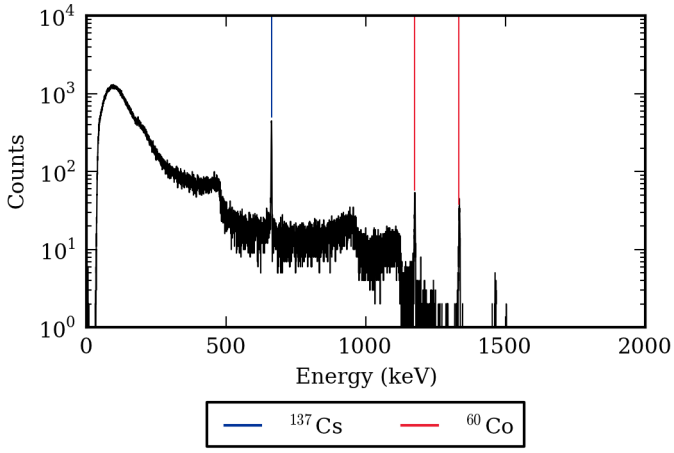

Figure 5 The spectrum taken for 15mins of the ^{60}Co and ^{137}Cs sources shown in Figure 6.

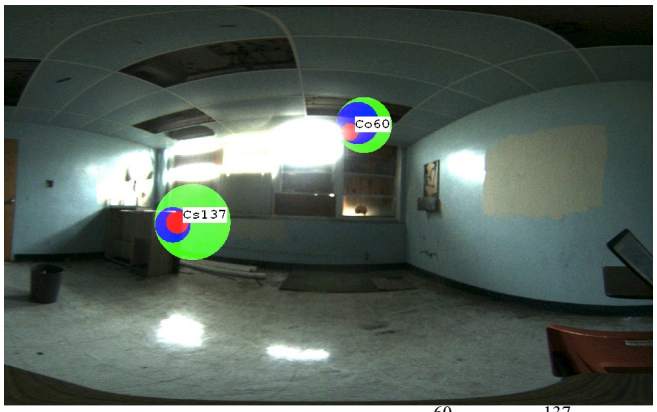

Figure 6 The Compton image of the ^{60}Co and ^{137}Cs sources located within the ceiling and a desk, respectively.

Measurement 2: Source Localization within a Cargo Ship, Admiral Callaghan

GeGI was also used to locate sources within a cargo ship, the Admiral Callaghan. A ^{60}Co, ^{137}Cs, and uranium source were placed in several storage bins and on the floor. GeGI located the ^{60}Co and ^{137}Cs source within 138 and 80 seconds, respectively. The uranium source was located using the 610 keV gamma ray within 60 seconds.

Figure 7 GeGI was used to localize three sources within the Admiral Callaghan cargo ship. The uranium source is located in the blue container, center. The ^{60}Co and ^{137}Cs source were placed in storage bins approximately 30ft from the detector.

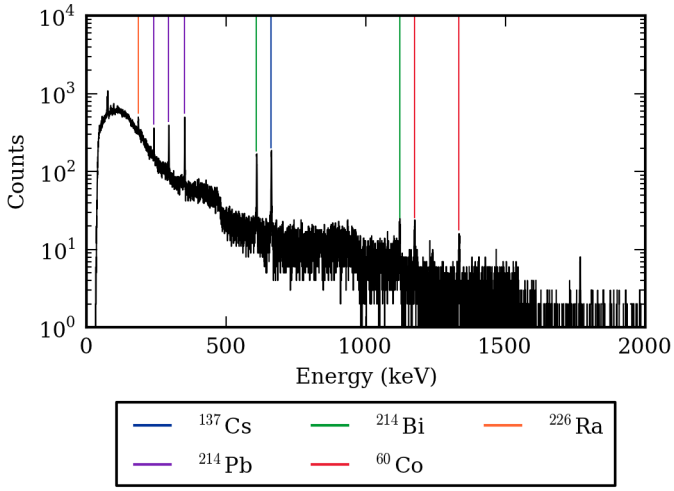

Figure 8 The spectrum taken for 35mins of the ^{60}Co, ^{137}Cs and uranium source shown in Figure 7. The ^{214}Bi, ^{226}Ra, and ^{214}Pb are decay products of the ^{238}U decay chain.

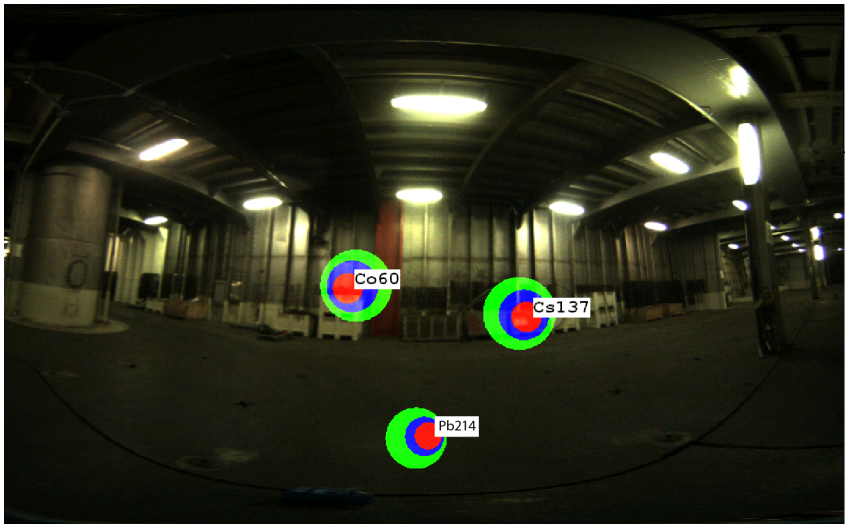

Figure 9 Compton image of the three sources taken within the cargo ship.