



### D63 The Invisible Sentry: The Use of Radiation Imaging for Border Control

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After attending this presentation, attendees will understand security measurements with X-rays; technique, possibilities, and risks.

Security at airports, international borders, and government buildings are of general concern. Although measurements imposed may have consequences for individuals and society; they are little known. Techniques using ionizing radiation are explained. They are used with and without consent of the persons concerned. There is a conflict between the necessity of security on one hand, and the protection of privacy on the other. This presentation will impact the forensic community and/or humanity by informing the forensic community about new technical developments, their possibilities, problems, and risks.

At international borders and at internal control points, governmental control agencies are using x-ray and gamma rays to inspect and control not only persons, but also goods and the systems that transport them. Radiation systems employed range from conventional industrial x-rays through accelerators with 5 to 10 MeV energy through gamma ray units using sealed sources of cesium 137 or cobalt 60. Transmission (fluoroscopic) images and analysis of forward and backward radiation scatter are used. Transparency or fluoroscopy images show the object in question in superimposition upon its container and other contents. Computed tomography used for luggage inspection produces a digital image without superimposition. The identification of chemical components is possible by means of analysis of scatter radiation. The addition of a color palette by computer manipulation aids in identification of specific substances.

Explosives, transported in luggage or other carriers, can only be identified indirectly or suspected on transmission images. Double imaging or scatter systems, particularly if color can be added, can provide direct identification. Illegal transport of protected species can be detected by similar methods. Narcotics can be detected by radiologic inspection of luggage, where even a visual inspection might fail.

Sophisticated integrated systems for examining vehicles and their contents have been developed. Moving as well as stationary vehicles can be examined. Imaging systems for large vehicles and their contents have been developed elsewhere. Even China is producing a fluoroscopic system with a fixed detector and a movable source.

There are special restrictions and uses in some locations. In Germany exposure of food by x-rays or gamma rays is not allowed. The unit in the Port of Hamburg is operated so as to prevent the direct radiation exposure of people. Pamphlets and Internet information available from some manufacturers suggest they do not bother to prevent direct radiation exposure of human beings, such as truck drivers or passengers. Furthermore, the exposure of the equipment operator often is not discussed. New operators of the detection devices look for density where there should be voids, motion where there should be stillness, symmetry where there should be symmetry, and ominous silhouettes, particularly of weapons.

The body packer or mule smugglers carry drugs across borders in specially constructed packages to be carried hidden inside the body in the rectum, vagina or alimentary canal. The rectum and vagina are too easily accessible for search and discovery by manual means, so the alimentary canal has become the favored internal receptacle. The early drug packages were fairly primitive, using one or more layers of latex in the form of condoms, the finger of surgical gloves, or even toy balloons. Almost inevitably air was trapped between the layers of the latex, and these telltale crescentic shadows were easily detected by routine radiography or fluoroscopy. Those early packages were also susceptible to rupture or leakage with sometimes fatal results.

Smuggling of contraband materials on the body rather than inside has required a pat-down strip search, or body search. The recent development of backscatter imaging provides an excellent method of hands-off body search for external contraband. This system is capable of detecting metals (inorganic) materials such as wires of a bomb, gun, blades, etc., and can also detect plastic (organic) materials such as explosives and drugs. The radiation dose is low, comparable to a few minutes flight at 30,000 ft. in a commercial aircraft. In the United States individuals are given a choice of simply standing in front of the imaging device fully clothed, or undergoing a pat-down (in either case conducted by a member of the same sex). The suspect must consent to the search by radiation. It is said never to be used in secret in the United States. In other countries, there are reports that similar devices are used on unsuspecting travellers.

#### **X-Ray in Airport Security, Detection of Explosives, X-Ray Exposure**