An Airport-Passenger-Screening System based on Emitted IR and Thermal Radiation

This paper discusses health issues related to passenger-screening-full-body scan (backscatter-X-ray scan), currently implemented at selected airports in Europe and North America, and proposed a safer system. In the full-body scan, X-rays penetrate through clothes and Compton scattered to produce an unclethed image (which could be stored, although stated not to be stored during test runs) of the person being screened. Modern-image-processing systems can display this image as negative (looking like a body pattern) or positive (depicting the actual shape of face and body). In this process, it sets off millions of electrons on or near the skin. The scientific concerns arise from the fact that Compton scattering of X-rays (ionizing radiation) generates a very large number of scattered electrons. They could disturb fluid-electrolyte balance of the body. Backscatter-X-rays, not only, expose passengers, but also, security guards, who have to stand exposed for a whole shift of passengers. Depending on the geometry of the source producing them, they may fall off as inverse square (spherical symmetry) or inverse (cylindrical symmetry). These X-rays are stated to be of low intensity and medium energy (the cross section of Compton scattering is maximum at medium energy). The nature of damage depends on the energy of the photons interacting with the surface. The extent of damage depends on the energy and intensity of the alpha radiation. The optical density of the skin region (for high energy) is high enough to prevent X-rays (concealed anywhere on the body surface) demand that private body parts of the image not be blurred using filters, because that would defeat the very purpose of scanning. For this very reason, there is no provision of shielding of giveaways in the back-scatter-X-ray-screening system, which is a standard safety requirement in the clinical-X-ray procedures. Further, at some stage, the authorities managing the system would like to store the images for follow-up, investigation and evaluation of any security lapses discovered at a later stage as well as for research purposes. Hence, the statement that the images are destroyed after processing seems not to be compatible with standard security and surveillance procedures. Presently, data are not available on false positives. However, it seems that these would be as almost as for security gates (or even more), because many things, which are harmless, may look like potential threat on screen (a pen may be mistaken as a pen pistol; an implant or an artificial body-part may prompt the screener to conduct an intrusive search). It has been pointed out that application of talcum powder on the skin may, also, produce false positives. As regards missed cases, the system would not be able to detect material, which has the same reflective properties as human skin, as well as objects hidden under thick clothes. Demetrius Klitou* observes “Objects with a high atomic number (high Z materials), such as metallic weapons, absorb X-rays while X-rays are relatively transparent, for example, nitrogen and carbon, which have a low atomic number (low-Z materials), scatter X-rays.” Hence, there is an indication of blackout for intermediate-Z materials. In order to test the effectiveness of full-body X-ray-backscatter-screening system, a simulated-plastic explosive (a baggy with powder substance) and a syringe were strapped to the body of a person, and had him go through the scanner. The scanner showed nothing except the needle and the unclethed figure of that person. The airplane employee performing the blind screening missed both. On another occasion, a very light or very small grain of blackhead (which i...