HEALTH PHYSICS SOCIETY

"Specialists in Radiation Safety"

Edward F. Maher, ScD, CHP
President
42 Tuttle Drive
Acton, MA 01720-2830
Phone: (978) 929-9133 x111
Fax: (978) 929-9134
email: edward.f.maher@verizon.net

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The Honorable Joseph I. Lieberman
Committee on Homeland Security and Governmental Affairs
340 Dirksen Senate Office Building
Washington, DC 20510

Dear Senator Lieberman:

I am writing to offer the expertise of the Health Physics Society (HPS) on an issue of current public concern and of interest to you and your staff regarding one aspect of airport security measures being employed by the Transportation Security Administration. The HPS has taken the position that intentionally exposing people to low levels of ionizing radiation for security screening is justified if certain criteria are met. In addition, we have developed a Frequently Asked Questions (FAQ) Web page and a brief presentation that provides information regarding the airport personnel scanning systems now being used by the TSA. I think this information may be of use to you, your staff, and the public in understanding the radiation exposure concerns associated with the use of these new "whole body scanners."

The HPS is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. I have enclosed for your information a copy of our position on the justified use of radiation for security screening "Use of Ioninzing Radiation For Security Screening Individuals," which is also available at http://hps.org/documents/securityscreening_ps017-1.pdf. Our position that the use of radiation emitting scanners is justified is dependent on the use of these scanners meeting certain criteria. Specifically, we require; (1) the scanners meet the dose requirements of a national consensus standard issued by the American National Standards Institue "ANSI N43.17-2009, Radiation Safety for Personnel Security Screening Systems Using X-Rays or Gamma Radiation," (2) there be a net benefit from their use, and (3) subjects be informed of the radiation exposure.

In regards to the dose delivered by the scanners currently in use by TSA, manufacturers documents indicate they not only meet the requirements of ANSI N43.17-2009 but they actually deliver about one-half of the ANSI requirements.

Regarding the net benefit from the scanner's use, the necessity and benefit for security purposes is not in the HPS area of expertise, however, the HPS can speak to the risk from the scanners and it is so low, if even existent, that only a marginal increase in security would provide a net benefit from their use.

In regards to the public, being informed of the radiation exposure, it seems apparent the general public is already aware that the scanners involve radiation exposure. However, we are concerned that some of the public may be misled about the low level of radiation involved due to statements and concerns raised in the media by various stakeholders. To that end, we have developed some public information documents that we hope will be useful in educating the public on this innocuous use of radiation for beneficial use.

I have attached for your information a copy of our FAQ Web site page, which is available at http://hps.org/publicinformation/ate/faqs/backscatterfaq.html, and a presentation that summarizes the operation and radiation exposure from these scanners, which is available at
http://hps.org/documents/WholeBodyScanners.pdf
The FAQ information addresses, for example, the reason pregnant women and parents do not need to be concerned about exposures to their fetus or children from going through a scanner, the concern of frequent flyers, like pilots, about the cumulative effect of frequent use by explaining that it would take more than 1000 scannings per year to reach the safe levels of exposure established by the ANSI standard, and it puts in perspective that the dose to a person from the scanner is approximately equivalent to the dose received from about one and one-half minute of flying.

The HPS can not speak to other aspects that raise public concerns about security measures used by the TSA, such as privacy issues. However, I hope this information is useful in dispelling any concern you or your staff may have about the radiation exposure that results from the use of the "whole body scanners."

Pleae do not hesitate to contact me if you or your staff would like further information on this or any other radiation safety issue.

Sincerely,

Edward F. Maher, ScD, CHP

Enclosures

USE OF IONIZING RADIATION FOR SECURITY SCREENING INDIVIDUALS

PS017-1

POSITION STATEMENT OF THE HEALTH PHYSICS SOCIETY*

HEALTH PHYSICS SOCIETY

Adopted: February 2003
Revised: December 2009

Contact: Richard J. Burk, Jr.
Executive Secretary
Health Physics Society
Telephone: 703-790-1745
Fax: 703-790-2672
Email: HPS@BurkInc.com
http://www.hps.org

The Health Physics Society believes that intentionally exposing people to low levels of ionizing radiation for security screening is justified if certain criteria are met. The key considerations are the net benefit to society and keeping individual doses as low as reasonably achievable (ALARA) while achieving the desired objective. Appropriate organizations should develop criteria for determining when the social benefits of public screening outweigh the risks associated with ionizing radiation exposure. The criteria should represent the consensus of professional, consumer-advocacy, labor, and business organizations; academic institutions; government agencies; and the general public.

The Society's principal recommendations about the practice of security screening individuals by the use of ionizing radiation are:

1. The practice should be limited to those applications that result in an overall net benefit to society.

2. When the practice is used to screen members of the general public, screening systems and their use should conform to the requirements of ANSI/HPS N43.17.[1] This Standard limits the reference effective dose[2] delivered to the subject to 0.25 microsieverts (25 microrem) per screening. Additionally, a screening facility should not expose any individual to more than 250 microsieverts (25 millirem) reference effective dose in a year.

3. Subjects should be informed of the radiation exposure.

Footnotes

[1]American National Standards Institute (ANSI) Standard N43.17-2009, "Radiation Safety for Personnel Security Screening Systems Using X-Rays or Gamma Radiation," August 2009.

[2]Reference effective dose is a quantity based on measurable parameters of the scanning device; see ANSI N43.17-2009 for details.

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*The Health Physics Society is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the Department of Defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.

Safety for Security Screening Using Devices That Expose Individuals to Ionizing Radiation

Q What are these devices? Does this include the general walk-through magnetic screeners?

A What this FAQ refers to are the devices often seen in airports or courthouses that expose people to ionizing radiation (x rays) when a person walks through them. These x-ray-emitting devices are more commonly called "backscatter screeners," although they have been called "people scanners" and "security screeners."

We won't be talking about the magnetic screening units or another type of device called a millimeter wave unit—those use nonionizing forms of radiation.

Q To how much radiation am I being exposed? Is this something I need to be concerned about as a frequent flier (I fly twice a month)?

A There is an American National Standards Institute/Health Physics Society (ANSI/HPS) consensus standard (listed in the reference information at the end of this document) stating that people-scanning devices should expose an individual to no more than 0.25 microsievert per screening (one screening procedure generally consists of two scans). The two primary companies who sell people screeners say that their devices expose people to half that amount of radiation.

For perspective, 0.25 microsievert is also received by flying about a minute and a half (cosmic radiation during commercial flight exposes fliers to about 10 microsievert per hour). It is also received by living for 40 minutes (natural background radiation exposes people to about 0.35 microsievert per hour).

Frequent fliers will be exposed to more radiation because they will go through the people scanners more often, plus they will be receiving more cosmic radiation while they are flying. The consensus standard took into account extra scans for frequent fliers and put a recommended limitation on the total radiation dose from this activity. That limit is 250 microsieverts per year, which would be 1,000 scans per year if the scanner is operating at the per scan limit.

Q Is it safe to take my children through this device? What if I am pregnant?

A The American National Standards Institute/Health Physics Society (ANSI/HPS) consensus standard took into account the varying sensitivity of different groups of people who might be scanned. The authors first looked at a number of reports and published studies on the health effects of radiation. They then chose the 0.25 microsievert dose level to ensure that children and pregnant individuals can be safely scanned with these devices. The x-ray scanner uses a very low-energy and low-intensity radiation, so that an embryo/fetus is not exposed to any radiation that could possibly increase the developmental risks of radiation to the embryo.

Q Who decided that it is okay to use radiation on so many people?

A The final decision was made by the Department of Homeland Security (DHS). This was made, however, only after experts gave their input on the safety of the devices. DHS needed to weigh the potential risk of exposing people to ionizing radiation versus the overall societal benefit of detecting terrorist threats. Because the amount of radiation someone receives from being screened is so low, the benefit was determined to far outweigh the risk (if any).

Q What about concerns that people have raised regarding the skin dose from these devices? Some have said that the skin dose must be high if most of the x rays only come in contact with the skin.

A The American National Standards Institute/Health Physics Society (ANSI/HPS) consensus standard addresses this issue. The American National Standards Institute/Health Physics Society (ANSI/HPS) consensus standard addresses this issue. The 0.25 microsievert limit is an overall whole-body effective dose. To calculate that dose, measurements of the entrance exposure at the skin was taken first. The standard indicates that the associated skin absorbed dose is even less than the overall whole-body effective dose.http://hps.org/publicinformation/ate/faqs/backscatterfaq.html

Q What about concerns people have raised about the possible radiation dose to organs that sit just under the skin—like the thyroid? Or what about the eyes?

A Some organs do get a radiation dose—a higher dose if they are close to the skin and a lower dose if they are deeper inside the body. They won't, however, get a dose higher than the skin dose because the x rays all come in contact with the skin while only a few penetrate deeper into the body. As a result of that, even the organs that are close to the skin surface receive less than 0.087 microgray. This is a dose that is considered to have negligible risk for harmful effects.

Q Aren't all radiation doses cumulative—doesn't all this radiation add up?

A It isn't as simple as saying we can add up all of the radiation to which we've been exposed in our lifetime to determine what the effect might be. When radiation interacts with a cell in the body, several things can occur:

- The cell might have some minor damage that is repaired.
- The cell might have some minor damage that remains inactive until another agent interacts with the cell again.
- The cell might have damage that causes it to become cancerous.
- The cell may simply stop functioning.
- The cell may die.

So, radiation doses aren't necessarily cumulative.

Q Who measured these doses, anyway? How do they really know that is the dose to a person?

A The radiation measurements from these devices were performed by some independent researchers along with the manufacturers. The American National Standards Institute/Health Physics Society (ANSI/HPS) standard indicates how these measurements are to be performed, with what types of measuring instruments, and from the resulting data, how the dose is to be determined.

References and additional information:

The consensus standard referenced in this document: ANSI/HPS N43.17-2009 Radiation Safety for Personnel Security Screening Systems Using X-Ray or Gamma Radiation

The Food and Drug Administration Web site on this topic: http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/SecuritySystems/ucm227201.htm

The Health Physics Society position statement on this topic: Use of Ionizing Radiation for Security Screening Individuals (2009)

A reference standard created by an interagency committee to assist federal agencies in setting guidance on these devices: Guidance for Security Screening of Humans Utilizing Ionizing Radiation (GSSHUIR)

A couple of items from the National Council on Radiation Protection and Measurements:

- NCRP Commentary No. 16 - Screening of Humans for Security Purposes Using Ionizing Radiation Scanning Systems (2003)
- NCRP press release about the commentary: http://www.ncrponline.org/Press_Rel/Commentaries/Comm_16_Press_Release.pdf

Some TSA reports on the scanners: http://www.tsa.gov/research/reading/index.shtm

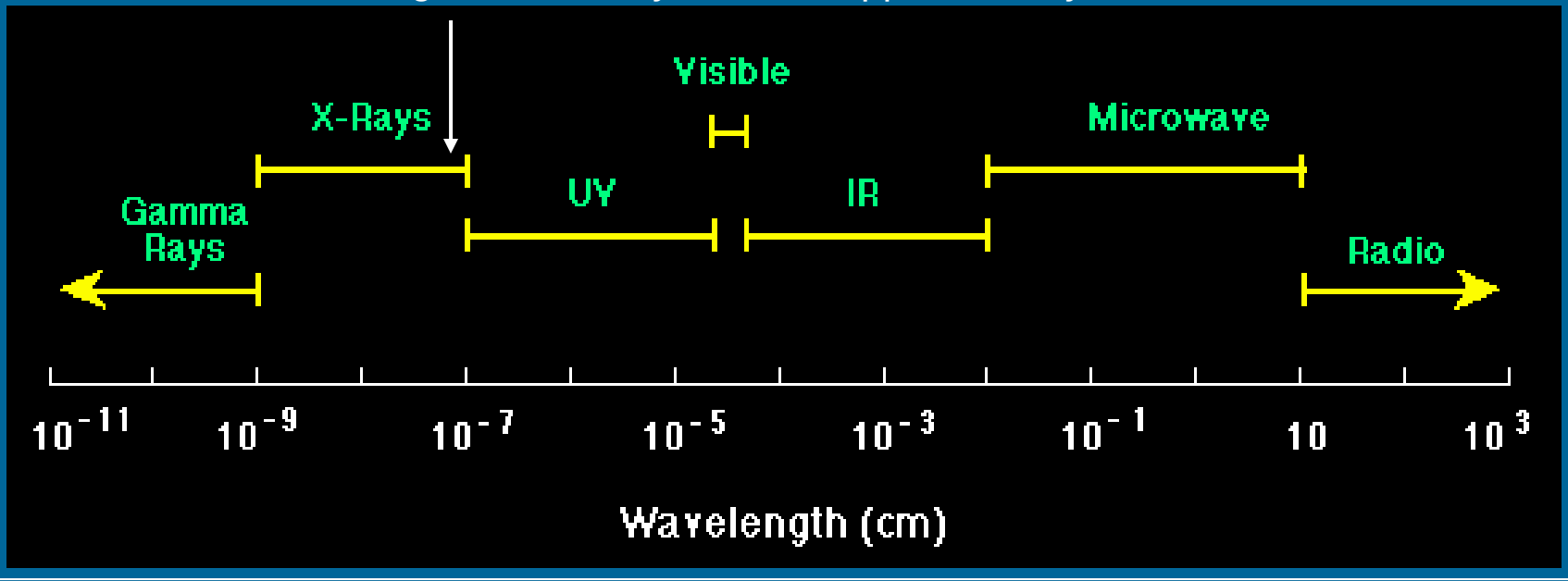
A Health Physics Society slide presentation: "X-Ray Security Screening of People"

X-Ray Security Screening of People

What Are These Devices?

Backscatter x-ray scanners use low-energy x rays to look for items hidden under clothing.

The wavelength of the x rays used is approximately here.



Backscatter X Ray

- Backscatter x rays are low-energy x rays that are scattered or reflected from the skin, creating an image that can "see through" clothing.
- For comparison, medical x rays are higher-energy x rays that penetrate into and through the body to create an image of organs within.

Backscatter X Ray

- Maximally, the x-ray energy is 50 kV; the dose estimates are based on assuming all of the x rays produced are 50 kV – a very conservative assumption.
- Since a few of the backscatter x rays penetrate the body, there is some energy deposited, giving individuals a small radiation dose – this dose is expressed in millirem or microrem.

Radiation Dose Units

- A millirem or mrem is a unit of effective whole-body radiation dose.
- A microrem or μrem is also a unit of effective whole-body radiation dose and is 1/1,000th of a millirem

1,000 μrem = 1 mrem

Radiation Dose

0.005 mrem[1] = 1 Backscatter Scan

1 mrem/year = Negligible Individual Dose Limit

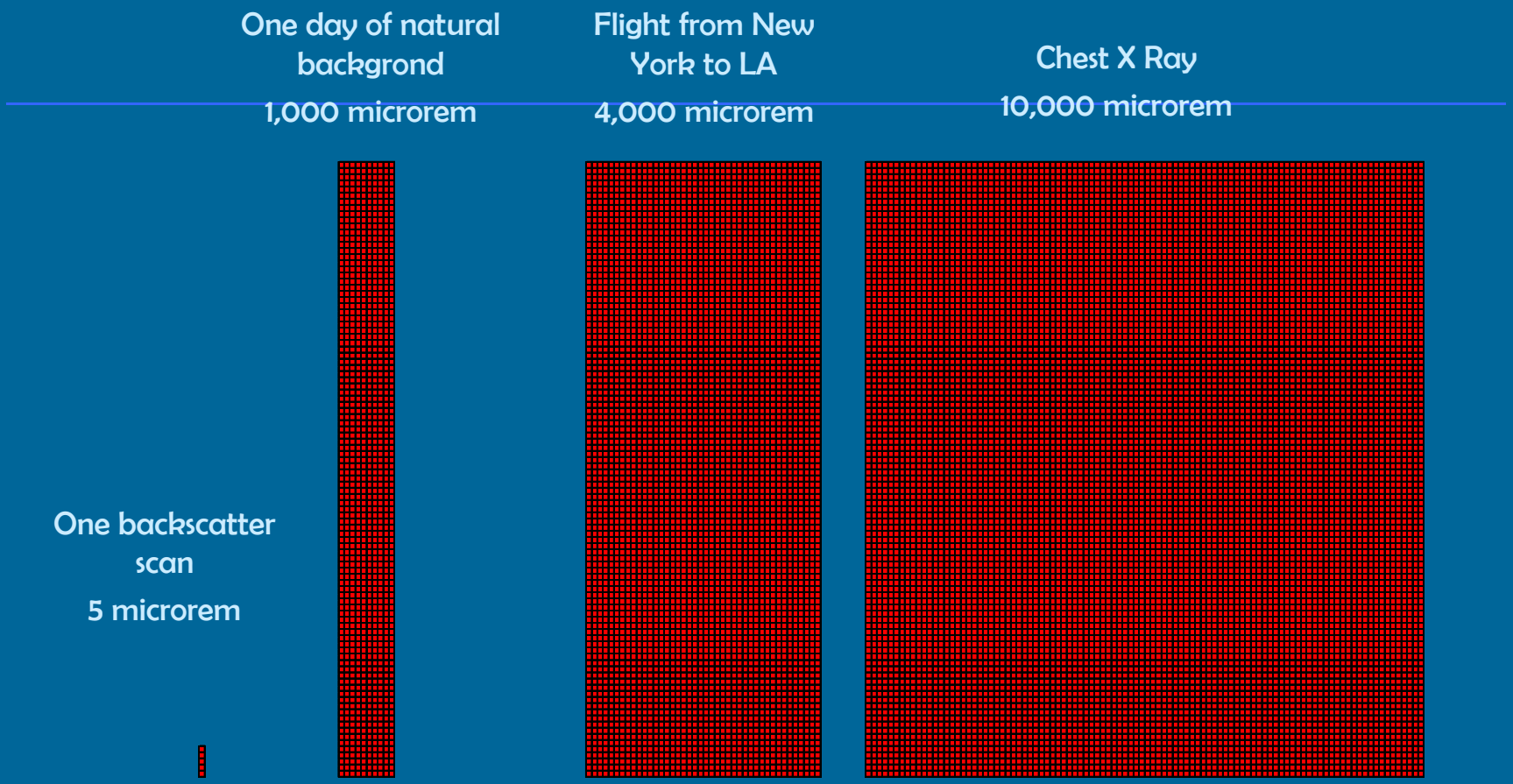
100 mrem/year = Annual Limit to Public

300 mrem/year = Annual Background Radiation

(includes no medical or human-made sources)

[1]According to manufacturers

Radiation Dose Comparisons



Each tiny box represents 1 microrem

Radiation Dose

- The National Council on Radiation Protection and Measurements (NCRP) defines a Negligible Individual Dose as 1 mrem/yr.[1]
  - 200 scans per year = negligible dose
- 60,000 scans per year = annual natural background radiation dose
  - Over 160 scans per day, 365 days per year

[1]Report 116

Worth the Benefits?

- "General use systems, like those deployed in airports across the country, are considered safe to use and can be used without regard to the number or type of individuals scanned or the number of individual scans per year."

Interagency Steering Committee on Radiation Standards (ISCORS)[1]

[1]ISCORS is comprised of eight federal agencies, three federal observer agencies and two state observer agencies who facilitate consensus on acceptable levels of radiation risk to the public and workers and promote consistent risk approaches in setting and implementing standards for protection from ionizing radiation.

Worth the Benefits?

- "The Health Physics Society believes that exposing people to low levels of ionizing radiation is justified if certain criteria[1] are met."

Health Physics Society Position Statement PS017-1 available at http://hps.org/documents/securityscreening_ps017-1.pdf

[1]The "criteria" is less than 25 microrem per screening.

An FAQ is available at http://hps.org/publicinformation/ate/faqs/backscatterfaq.html to answer additional questions you might have regarding these security screening devices.

The Health Physics Society would like to thank Gordon Tannahill for developing this program and to the HPS Homeland Security members for their review of the content.