



Transportation
Security
Administration

January 26, 2012

Mr. Donald Barker
Federal Security Director
Transportation Security Administration
Port Columbus International Airport (CMH)

Dear Mr. Barker:

The TSA Office of Occupational Safety, Health, and Environment (OSHE) is sponsoring an independent radiation protection survey project of general-use backscatter x-ray advanced imaging technology (AIT) systems and cabinet x-ray systems through an interagency agreement with the U.S. Army Public Health Command (USAPHC). This survey project is not to be confused with the radiation surveys performed during preventive maintenance checks. The annual equipment inspections are conducted by certified equipment maintenance personnel under specific testing conditions, whereas the survey project is conducted by USAPHC personnel under normal operating conditions; e.g., baggage flow-through or passenger screening with TSOs in attendance.

As part of the survey project, a radiation protection survey of selected general-use backscatter x-ray AIT and cabinet x-ray systems used at TSA CMH was conducted on September 12-13, 2011, by a team of certified health physicists from USAPHC's Health Physics Program, Army Institute of Public Health. The purpose of the survey was to ensure that the general-use backscatter x-ray AIT systems comply with the requirements of ANSI/HPS N43.17-2009, and that the cabinet x-ray systems comply with the Food and Drug Administration's Performance Standards for Ionizing Radiation Emitting Products (21 CFR 1020.40), and to identify any health hazards associated with the use of either of these x-ray systems.

General-use Backscatter X-ray AIT Systems

The findings for the surveyed AIT systems are described on pages 1 and 2 of the attached report and in applicable survey worksheets (Enclosure 1 of attached report), and are summarized as follows:

A total of five general-use backscatter x-ray AIT systems were tested and found to be in compliance with the radiation dose limits specified in ANSI/HPS N43.17-2009. There is no health hazard associated with the use of these general-use backscatter x-ray AIT systems provided the appropriate operating procedures are followed. In addition, the general-use backscatter x-ray AIT systems were in compliance with other (non-emission) requirements of the standard.

Several administrative items were noted by the survey officers during the AIT surveys, specifically misalignment of the master and slave units and excessive noise at the end of travel in one AIT system, and "loud idle sounds" and loud noises during travel in another AIT system. It was recommended to have the maintenance service provider check the misalignment and cause of the sounds during the provider's next scheduled visit. See items (a) and (b) in the bottom half of page 2.

Cabinet X-ray Systems

The findings for the surveyed cabinet x-ray systems are described on pages 2 and 3 of the attached report and in the survey worksheets (Enclosure 2 of the attached report), and are summarized as follows:

A total of nine cabinet x-ray systems were tested and found to be in compliance with the emissions limit specified in Title 21, CFR, Subchapter J. There is no health hazard associated with the use of these cabinet x-ray systems provided the appropriate operating procedures are followed.

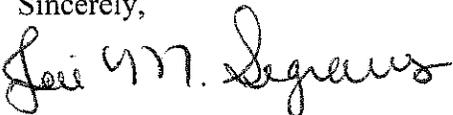
The cabinet x-ray systems complied with other (non-emission) requirements of Title 21, CFR, Subchapter J, with the exception of the absence of a user's manual for one system and the absence of a required warning label on another system. Please see the details in (a) and (b) in the top half of page 2.

In addition, the cabinet x-ray systems have several administrative items as noted in paragraphs (c) through (e) on the bottom half of page 2, mostly concerning the absence of or incorrect service provider survey labels and non-functional "x-ray on" lights.

Your early attention to correcting the identified noncompliant findings and administrative items is requested. Please contact the TSA Service Response Center at 1-800-820-8535 for assistance, and advise me of progress via email by February 27, 2012, or when the corrections are completed, whichever is sooner.

If you have questions or comments about the report's contents, please direct them to me at

Sincerely,



Jill M. Segraves, CSP
Director
Office of Occupational Safety, Health, and Environment

cc: Mr. Peter Marcello, TSA CMH AFSD-Screening / Designated Occupational Safety and Health Officer
Ms. Christine Halfacre, Chief of Staff, Office of Security Technology

Enclosure: TSA CMH Radiation Protection Survey Report, dated 20 December 2011



DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

Health Physics Program

20 DEC 2011

Ms. Jill Segraves
Transportation Security Administration
TSA-170SHE
601 South 12th Street
Arlington, Virginia 22202

Dear Ms. Segraves:

This letter is in reference to the Memorandum of Agreement between the U.S. Army Medical Command and the Transportation Security Administration (TSA), signed September 10, 2008; electronic mail message, subject: CMH Radiation Safety Surveys, 30 August 2011; American National Standards Institute/Health Physics Society (ANSI/HPS) N43.17-2009; and Title 21, Code of Federal Regulations (CFR), Subchapter J.

A radiation protection survey was performed on September 12-13, 2011, at Port Columbus International Airport (CMH), Columbus, OH, Project Number 26-MF-0F0P-11. The survey was performed to:

- a. Evaluate the advanced imaging technology (AIT) x-ray systems to ensure compliance with the requirements of ANSI/HPS N43.17-2009.
- b. Evaluate a cabinet x-ray system to ensure compliance with the requirements of Title 21, CFR, Subchapter J.
- c. Identify any health hazards associated with the use of these x-ray systems.
- d. Provide recommendations to assist in correcting any areas of regulatory noncompliance or health hazards.

The survey was performed by [REDACTED] Certified Health Physicist (CHP), Health Physics Program (HPP), Army Institute of Public Health (AIPH); and, [REDACTED] CHP, Consolidated Safety Services. A total of five AIT x-ray systems were evaluated for compliance with the requirements of ANSI/HPS N43.17-2009 and nine cabinet x-ray systems were evaluated for compliance with the requirements of Title 21, CFR, Subchapter J. The survey results for the AIT systems are provided in Enclosure 1 and the survey results for the cabinet systems are provided in Enclosure 2.

All AIT x-ray systems were found to be in compliance with the radiation dose limits specified in ANSI/HPS N43.17-2009. The cabinet x-ray systems tested were found to be in compliance with the emissions limit specified in Title 21, CFR, Subchapter J.

There is no health hazard associated with the use of these systems provided appropriate operating procedures are followed.

All AIT systems surveyed were found to be in compliance with the other requirements of ANSI/HPS N43.17-2009. The cabinet x-ray systems surveyed were found to be in compliance with the other requirements of Title 21, CFR, Section 1020.40, with the following exceptions:

a. Invision CTX-2500, Serial No. M175, Curbside – South: A User's Manual was not available at the time of the survey.

b. Smiths Detection 6040i, Serial No. 20877, C Checkpoint, Lane 2: The warning label "Caution: X-Rays Produced When Energized" was not present at the control panel.

In addition, the survey officers noted the following administrative items during the surveys:

a. Rapiscan Secure 1000 SP, Serial No. S50952005, Checkpoint A: The master and slave units were slightly misaligned. Also, the master and slave units made loud noises at the end of travel. The misalignment and the cause of the mechanical sounds should be checked by the maintenance service provider during their next visit.

b. Rapiscan Secure 1000 SP, Serial No. S50952002 Checkpoint C: The master unit made unusually loud idle noises and also made loud noises during travel. The cause of the mechanical sounds should be checked by the maintenance service provider during their next visit.

c. The service providers survey dates posted on the following systems were greater than one year ago: Invision CTX-5500 DS, Serial No. C666, CTX #2; Invision CTX-5500 DS, Serial No. C354, CTX #3; Invision CTX-5500 DS, Serial No. C355, CTX #4; Invision CTX-5500 DS, Serial No. C219, CTX #5; and Invision CTX-2500, Serial No. M175, Curbside South. According to the service technician, surveys had been performed after July 1, 2011, however, the survey labels are back-ordered and therefore have not been posted on the systems.

d. Invision CTX-5500 DS, Serial No. C219, CTX #5: The "x-ray on" light near the entrance port opposite from the operator's console side was not working.

e. Smiths Detection 6040i, Serial No. 20877, C Checkpoint, Lane 2: A service provider survey date was not posted on the system and both "x-ray on" lights on the passenger's side were not working.

An additional survey measurement was performed to simulate missing flaps from the exit curtains of Invision CTX-5500 DS, Serial No. C219, CTX #5. Three exit curtain flaps were taped-up to simulate the missing flaps and then the survey measurement repeated. A photograph of the set-up is Enclosure 4 and the results of the additional survey measurement are provided on page 6 of Enclosure 2. Although the simulated missing flaps measurement was higher than the measurement with all curtain flaps in place, the results are still well below the cabinet x-ray emissions limit specified in Title 21, CFR, Subchapter J.

Based on dosimetry and field measurements around the Secure 1000 SP and cabinet x-ray systems, it is estimated that Transportation Security Officers will receive a radiation dose of less than 10 millirem per year. For comparison, the occupational limit under Occupational Safety and Health Administration regulations is 1,250 millirem per quarter (5,000 millirem per year). The goal of the TSA radiation safety program is to keep all exposure less than 100 millirem per year.

The survey officers discussed the survey results with Mr. Scott Lorenzo, Acting Federal Security Director (FSD); Mr. Peter Marcello, Assistant FSD for Screening; and nine other TSA CMH staff on September 14, 2011. A copy of the survey notes is provided in Enclosure 3.

For more information concerning the survey, please contact the AIPH, HPP,
at [REDACTED]

Sincerely,

[REDACTED]

Portfolio Director
Occupational Health Sciences

Enclosures

Survey Results for Five AIT X-Ray Systems

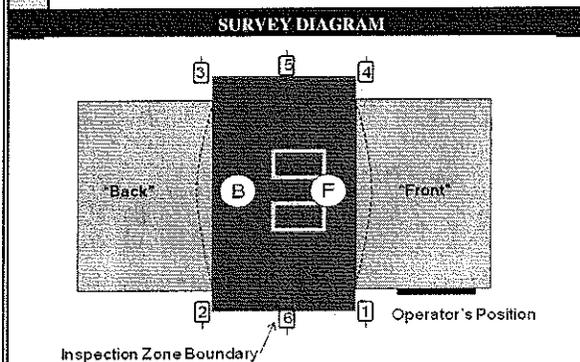
Survey Worksheet - AIT X-Ray Systems

Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	A Checkpoint		
Survey Date	12 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	Secure 1000SP	SS0952005	Dec 2009
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40155	*	Service Provider Survey Date	29 Jun 2011		

VISUAL INSPECTION			
Y	N	Requirement	Requirement
X		Key activated control with key capture? (ANSI N43.17-2009, paragraph 7.2.1.c)	At least one lighted scan in progress indicator visible from the inspection zone? (ANSI N43.17-2009, paragraph 7.2.1.b)
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (ANSI N43.17-2009, paragraph 7.2.2.d)	X-ray emission terminates after a preset time or exposure? (ANSI N43.17-2009, paragraph 7.2.2.e)
X		Technique factors preset for each mode of operation? (ANSI N43.17-2009, paragraph 7.2.2.b)	Operators have a clear view of the scanning area? (ANSI N43.17-2009, paragraph 7.2.1.f)
X		Means to initiate emission of radiation other than an interlock or main power control? (ANSI N43.17-2009, paragraph 7.2.1.d)	Tool or key required to open or remove access panels? (ANSI N43.17-2009, paragraph 7.2.1.i)
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	User provided with required information? (ANSI N43.17-2009, paragraph 7.5)
X		Scan in progress indicator visible for any location from which a scan can be initiated? (ANSI N43.17-2009, paragraph 7.2.1.a)	NT=not tested; NA=not applicable.



SCANNING MEASUREMENTS

Scanning below action levels? Yes No
(If no, explain in comments)

Inspection zone boundary scanned with Instrument #3.

SCATTERED RADIATION (Optional)

Location	Scan 1	Scan 2	Scan 3	Average
1	0.00 μR	μR	μR	0.00 μR
2	0.07 μR	μR	μR	0.07 μR
3	0.00 μR	μR	μR	0.00 μR
4	0.07 μR	μR	μR	0.07 μR
5	0.07 μR	6	0.00 μR	

DOSE PER SCREENING

Trial	Exposure (X)	
	"Front" Side	"Back" Side
a	5.48 μR	5.61 μR
b	5.60 μR	5.61 μR
c	5.54 μR	5.61 μR
d	5.54 μR	5.54 μR
e	5.61 μR	5.63 μR
AVG	5.55 μR	5.60 μR

Reference Effective Dose per Screening (max 25 μrem):
1.7 μrem
or
0.017 μSv

Energy Correction Factor: 1.25

RESULT PASS

BEAM QUALITY

mm Al	Exposure (X)	
	"Front" Side	"Back" Side
0	1.64 μR	1.97 μR
0	1.57 μR	1.98 μR
1	0.82 μR	1.02 μR
1	0.82 μR	1.02 μR
1.5	0.68 μR	0.89 μR
1.5	0.61 μR	0.82 μR

HVL "Front" Side: 1.0 mm Al
HVL "Back" Side: 1.1 mm Al
Conversion Factor: 0.120
Min. Filtration¹: 1.0 mm Al

¹ An HVL of 1 mm Al corresponds to a filtration of 1 mm Al for this system.

RESULT PASS

Measurements made with Instruments #1 & #2 Measurements made with Instruments #4 & #5

COMMENTS AND RECOMMENDATIONS

Slight Master ("Front") - Slave ("Back") misalignment.
Master ("Front") and Slave ("Back") units make loud noise at end of travel.

Additional Instruments Used:

	Manufacturer	Model	Serial No.	Cal. Due
Instrument #4	Radcal	9010	90-3290	17 Mar 2012
Instrument #5	Radcal	10X5-1800	10302	17 Mar 2012

* Response checked before and after the survey.

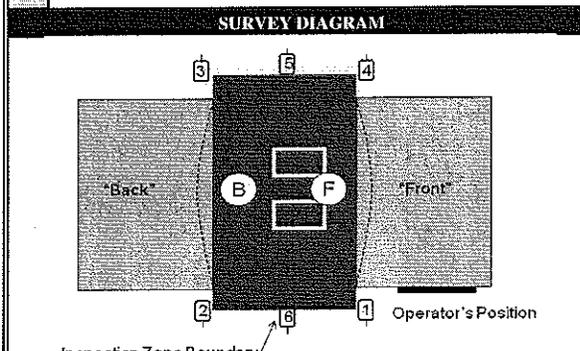
Survey Worksheet - AIT X-Ray Systems

Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	B Checkpoint, AIT #1		
Survey Date	12 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[Redacted]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	Secure 1000SP	S50952003	Dec 2009
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40155	*	Service Provider Survey Date		2 Jun 2011	

VISUAL INSPECTION				
Y	N	Requirement	Requirement	
X		Key activated control with key capture? (ANSI N43.17-2009, paragraph 7.2.1.c)	X	At least one lighted scan in progress indicator visible from the inspection zone? (ANSI N43.17-2009, paragraph 7.2.1.b)
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (ANSI N43.17-2009, paragraph 7.2.2.d)	X	X-ray emission terminates after a preset time or exposure? (ANSI N43.17-2009, paragraph 7.2.2.e)
X		Technique factors preset for each mode of operation? (ANSI N43.17-2009, paragraph 7.2.2.b)	X	Operators have a clear view of the scanning area? (ANSI N43.17-2009, paragraph 7.2.1.f)
X		Means to initiate emission of radiation other than an interlock or main power control? (ANSI N43.17-2009, paragraph 7.2.1.d)	X	Tool or key required to open or remove access panels? (ANSI N43.17-2009, paragraph 7.2.1.i)
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	X	User provided with required information? (ANSI N43.17-2009, paragraph 7.5)
X		Scan in progress indicator visible for any location from which a scan can be initiated? (ANSI N43.17-2009, paragraph 7.2.1.a)	NT=not tested; NA=not applicable.	



SCANNING MEASUREMENTS		
Scanning below action levels?	Yes	No
	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(If no, explain in comments)		

Inspection zone boundary scanned with Instrument #3.

SCATTERED RADIATION (Optional)						
Location	Scan 1	Scan 2	Scan 3	Average		
1	0.00 μR		μR	μR	0.00	μR
2	0.00 μR		μR	μR	0.00	μR
3	0.00 μR		μR	μR	0.00	μR
4	0.00 μR		μR	μR	0.00	μR
5	0.00 μR	6	0.00 μR			

Measurements made with Instruments #1 & #2

DOSE PER SCREENING			
	Exposure (X)		Reference Effective Dose per Screening (max 25 μrem): <input type="text" value="1.7"/> μrem or <input type="text" value="0.017"/> μSv
Trial	"Front" Side	"Back" Side	
a	5.68 μR	5.62 μR	
b	5.81 μR	5.61 μR	
c	5.75 μR	5.61 μR	
d	5.68 μR	5.68 μR	
e	5.68 μR	5.68 μR	
AVG	5.72 μR	5.64 μR	
Energy Correction Factor		<input type="text" value="1.25"/>	
RESULT <input type="text" value="PASS"/>			

BEAM QUALITY			
	Exposure (X)		HVL "Front" Side <input type="text" value="1.0"/> mm Al HVL "Back" Side <input type="text" value="1.1"/> mm Al Conversion Factor <input type="text" value="0.117"/> Min. Filtration ¹ <input type="text" value="1.0"/> mm Al
mm Al	"Front" Side	"Back" Side	
0	1.91 μR	2.06 μR	
0	1.85 μR	2.05 μR	
1	0.96 μR	1.03 μR	
1	0.96 μR	1.09 μR	
1.5	0.75 μR	0.82 μR	
1.5	0.75 μR	0.82 μR	
RESULT <input type="text" value="PASS"/>			

Measurements made with Instruments #4 & #5

COMMENTS AND RECOMMENDATIONS

Additional Instruments Used:

	Manufacturer	Model	Serial No.	Cal. Due
Instrument #4	Radcal	9010	90-3290	17 Mar 2012
Instrument #5	Radcal	10X5-1800	10302	17 Mar 2012

* Response checked before and after the survey.

Survey Worksheet - AIT X-Ray Systems

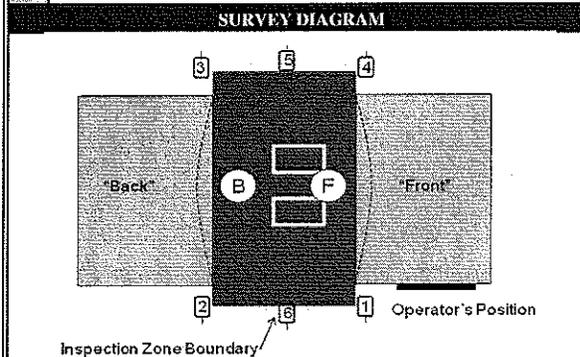
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0FOP-11			Location	B Checkpoint, AIT #2		
Survey Date	12 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[Redacted]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	Secure 1000SP	S50952001	Dec 2009
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40155	*	Service Provider Survey Date	31 May 2011		

VISUAL INSPECTION			
Y	N	Requirement	Requirement
X		Key activated control with key capture? (ANSI N43.17-2009, paragraph 7.2.1.c)	At least one lighted scan in progress indicator visible from the inspection zone? (ANSI N43.17-2009, paragraph 7.2.1.b)
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (ANSI N43.17-2009, paragraph 7.2.2.d)	X-ray emission terminates after a preset time or exposure? (ANSI N43.17-2009, paragraph 7.2.2.e)
X		Technique factors preset for each mode of operation? (ANSI N43.17-2009, paragraph 7.2.2.b)	Operators have a clear view of the scanning area? (ANSI N43.17-2009, paragraph 7.2.1.f)
X		Means to initiate emission of radiation other than an interlock or main power control? (ANSI N43.17-2009, paragraph 7.2.1.d)	Tool or key required to open or remove access panels? (ANSI N43.17-2009, paragraph 7.2.1.i)
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	User provided with required information? (ANSI N43.17-2009, paragraph 7.5)
X		Scan in progress indicator visible for any location from which a scan can be initiated? (ANSI N43.17-2009, paragraph 7.2.1.a)	

NT=not tested; NA=not applicable.



SCANNING MEASUREMENTS

Scanning below action levels? Yes No
(If no, explain in comments)

Inspection zone boundary scanned with Instrument #3.

SCATTERED RADIATION (Optional)

Location	Scan 1	Scan 2	Scan 3	Average
1	0.00 μR			0.00 μR
2	0.00 μR			0.00 μR
3	0.00 μR			0.00 μR
4	0.00 μR			0.00 μR
5	0.00 μR	6	0.00 μR	

DOSE PER SCREENING

Trial	Exposure (X)	
	"Front" Side	"Back" Side
a	5.93 μR	5.60 μR
b	5.94 μR	5.67 μR
c	6.00 μR	5.60 μR
d	5.93 μR	5.67 μR
e	6.00 μR	5.61 μR
AVG	5.96 μR	5.63 μR

Reference Effective Dose per Screening (max 25 μrem):
2.0 μrem
or
0.020 μSv

Energy Correction Factor: 1.25

RESULT **PASS**

BEAM QUALITY

mm Al	Exposure (X)	
	"Front" Side	"Back" Side
0	1.51 μR	2.06 μR
0	1.51 μR	2.13 μR
1	0.75 μR	1.18 μR
1	0.82 μR	1.18 μR
1.5	0.62 μR	0.96 μR
1.5	0.62 μR	0.88 μR

HVL "Front" Side: 1.1 mm Al
HVL "Back" Side: 1.2 mm Al
Conversion Factor: 0.136
Min. Filtration¹: 1.0 mm Al

¹ An HVL of 1 mm Al corresponds to a filtration of 1 mm Al for this system.

RESULT **PASS**

Measurements made with Instruments #1 & #2 Measurements made with Instruments #4 & #5

COMMENTS AND RECOMMENDATIONS

Additional Instruments Used:

	Manufacturer	Model	Serial No.	Cal. Due
Instrument #4	Radcal	9010	90-3290	17 Mar 2012
Instrument #5	Radcal	10X5-1800	10302	17 Mar 2012

* Response checked before and after the survey.

Survey Worksheet - AIT X-Ray Systems

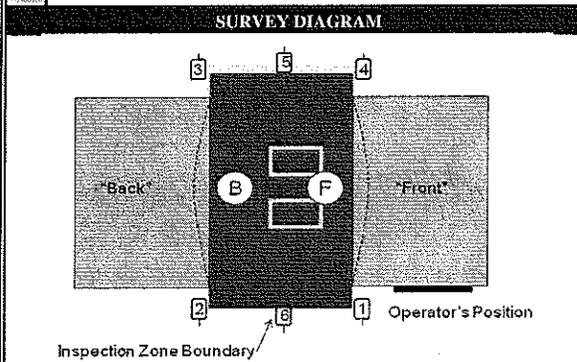
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0FOP-11			Location	B Checkpoint, AIT #3		
Survey Date	12 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	Secure 1000SP	S50952004	Dec 2009
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40155	*	Service Provider Survey Date	16 May 2011		

VISUAL INSPECTION				
Y	N	Requirement	Y N	Requirement
X		Key activated control with key capture? (ANSI N43.17-2009, paragraph 7.2.1.c)	X	At least one lighted scan in progress indicator visible from the inspection zone? (ANSI N43.17-2009, paragraph 7.2.1.b)
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (ANSI N43.17-2009, paragraph 7.2.2.d)	X	X-ray emission terminates after a preset time or exposure? (ANSI N43.17-2009, paragraph 7.2.2.e)
X		Technique factors preset for each mode of operation? (ANSI N43.17-2009, paragraph 7.2.2.b)	X	Operators have a clear view of the scanning area? (ANSI N43.17-2009, paragraph 7.2.1.f)
X		Means to initiate emission of radiation other than an interlock or main power control? (ANSI N43.17-2009, paragraph 7.2.1.d)	X	Tool or key required to open or remove access panels? (ANSI N43.17-2009, paragraph 7.2.1.i)
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	X	User provided with required information? (ANSI N43.17-2009, paragraph 7.5)
X		Scan in progress indicator visible for any location from which a scan can be initiated? (ANSI N43.17-2009, paragraph 7.2.1.a)		

NT=not tested; NA=not applicable.



SCANNING MEASUREMENTS

Scanning below action levels? Yes No

(If no, explain in comments)

SCATTERED RADIATION (Optional)

Location	Scan 1	Scan 2	Scan 3	Average
1	0.00 μR	μR	μR	0.00 μR
2	0.00 μR	μR	μR	0.00 μR
3	0.00 μR	μR	μR	0.00 μR
4	0.07 μR	μR	μR	0.07 μR
5	0.00 μR	6	0.00 μR	

DOSE PER SCREENING

Trial	Exposure (X)	
	"Front" Side	"Back" Side
a	6.14 μR	5.95 μR
b	6.00 μR	5.95 μR
c	6.01 μR	5.95 μR
d	5.95 μR	5.88 μR
e	6.07 μR	5.42 μR
AVG	6.03 μR	5.83 μR

Reference Effective Dose per Screening (max 25 μrem):

1.9 μrem
or
0.019 μSv

Energy Correction Factor: 1.25

RESULT PASS

BEAM QUALITY

mm Al	Exposure (X)	
	"Front" Side	"Back" Side
0	1.84 μR	2.05 μR
0	1.91 μR	2.05 μR
1	0.95 μR	1.10 μR
1	0.96 μR	1.10 μR
1.5	0.68 μR	0.88 μR
1.5	0.68 μR	0.88 μR

HVL "Front" Side: 1.0 mm Al

HVL "Back" Side: 1.2 mm Al

Conversion Factor: 0.127

Min. Filtration¹: 1.0 mm Al

¹ An HVL of 1 mm Al corresponds to a filtration of 1 mm Al for this system.

RESULT PASS

COMMENTS AND RECOMMENDATIONS

Additional Instruments Used:

	Manufacturer	Model	Serial No.	Cal. Due
Instrument #4	Radcal	9010	90-3290	17 Mar 2012
Instrument #5	Radcal	10X5-1800	10302	17 Mar 2012

* Response checked before and after the survey.

Survey Worksheet - AIT X-Ray Systems

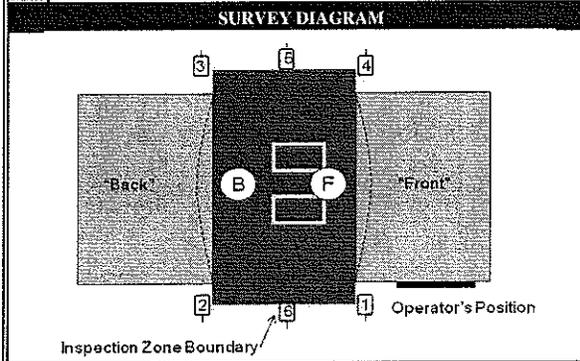
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	C Checkpoint		
Survey Date	12 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	Secure 1000SP	S50952002	Dec 2009
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40155	*	Service Provider Survey Date	2 Jun 2011		

VISUAL INSPECTION			
Y	N	Requirement	Requirement
X		Key activated control with key capture? (ANSI N43.17-2009, paragraph 7.2.1.c)	At least one lighted scan in progress indicator visible from the inspection zone? (ANSI N43.17-2009, paragraph 7.2.1.b)
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (ANSI N43.17-2009, paragraph 7.2.2.d)	X-ray emission terminates after a preset time or exposure? (ANSI N43.17-2009, paragraph 7.2.2.e)
X		Technique factors preset for each mode of operation? (ANSI N43.17-2009, paragraph 7.2.2.b)	Operators have a clear view of the scanning area? (ANSI N43.17-2009, paragraph 7.2.1.f)
X		Means to initiate emission of radiation other than an interlock or main power control? (ANSI N43.17-2009, paragraph 7.2.1.d)	Tool or key required to open or remove access panels? (ANSI N43.17-2009, paragraph 7.2.1.i)
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	User provided with required information? (ANSI N43.17-2009, paragraph 7.5)
X		Scan in progress indicator visible for any location from which a scan can be initiated? (ANSI N43.17-2009, paragraph 7.2.1.a)	

NT=not tested; NA=not applicable.



SCANNING MEASUREMENTS

Scanning below action levels? Yes No
(If no, explain in comments)

Inspection zone boundary scanned with Instrument #3.

SCATTERED RADIATION (Optional)

Location	Scan 1	Scan 2	Scan 3	Average
1	0.07 μR			0.07 μR
2	0.07 μR			0.07 μR
3	0.00 μR			0.00 μR
4	0.07 μR			0.07 μR
5	0.00 μR	6	0.00 μR	

DOSE PER SCREENING

Trial	Exposure (X)	
	"Front" Side	"Back" Side
a	5.59 μR	5.39 μR
b	5.60 μR	5.39 μR
c	5.53 μR	5.33 μR
d	5.66 μR	5.39 μR
e	5.60 μR	5.39 μR
AVG	5.60 μR	5.38 μR

Reference Effective Dose per Screening (max 25 μrem):
1.6 μrem
or
0.016 μSv

Energy Correction Factor: 1.25

RESULT **PASS**

BEAM QUALITY

mm Al	Exposure (X)	
	"Front" Side	"Back" Side
0	1.56 μR	1.43 μR
0	1.64 μR	1.43 μR
1	0.82 μR	0.75 μR
1	0.82 μR	0.68 μR
1.5	0.68 μR	0.55 μR
1.5	0.61 μR	0.55 μR

HVL "Front" Side: 1.1 mm Al
HVL "Back" Side: 1.0 mm Al
Conversion Factor: 0.116
Min. Filtration¹: 1.0 mm Al

¹ An HVL of 1 mm Al corresponds to a filtration of 1 mm Al for this system.

RESULT **PASS**

COMMENTS AND RECOMMENDATIONS

Slave ("Back") unit door unlocked at time of survey. Key obtained and door locked.
Master ("Front") unit made loud idle noises and loud noises during travel.

Additional Instruments Used:

	Manufacturer	Model	Serial No.	Cal. Due
Instrument #4	Radcal	9010	90-3290	17 Mar 2012
Instrument #5	Radcal	10X5-1800	10302	17 Mar 2012

* Response checked before and after the survey.

Survey Results for Nine Cabinet X-Ray Systems

Encl 2

Survey Worksheet - Cabinet X-Ray Systems

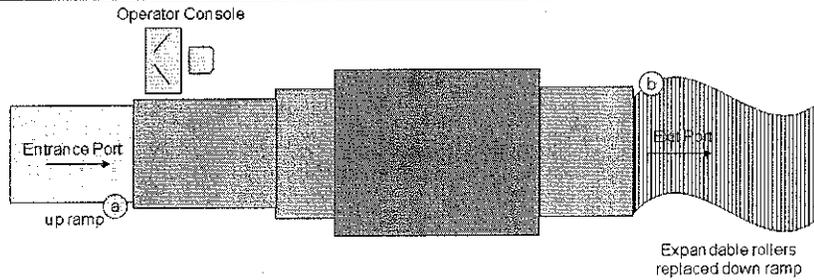
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA		SURVEY LOCATION	
Project No.	26-MF-0F0P-11	Location	CTX #1
Survey Date	13 Sep 2011	Organization	Port Columbus International Airport
Surveyor(s)		Street Address	4600 International Gateway
		City/Installation	Columbus State OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Invision	CTX-5500 DS	C353	Jun. 2002
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input checked="" type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	Sep. 2010		

VISUAL INSPECTION	
Y/N	Requirement
X	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))
X	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))
X	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))
X	One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))
X	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))
NA	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))
X	Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
X	Leaded drapes in good condition?
X	Interlocks not bypassed?
X	Current User's Manual available? (21 CFR 1020.40(c)(9))
X	Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
NT=not tested; NA=not applicable.	

SURVEY DIAGRAM



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE†			EXPOSURE OUTSIDE CABINET						
Trial	Exposure (X _i)		X _{avg}		Ambient Background		0.00 μR		
1	13.71 mR		14.4	mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	13.66 mR		CV	0.0818	a	0.07 μR	5.0 min	0.001 mR	PASS
3	15.72 mR		Coefficient of Variation (CV): CV = (1/X _{avg})(Σ(X _i - X _{avg}) ² /(n-1)) ^{1/2}		b	1.00 μR	5.0 min	0.012 mR	PASS
4	mR				c	μR	min	mR	
5	mR				d	μR	min	mR	
					e	μR	min	mR	

†Only three measurements performed due to bag ejection speed.

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#3 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.

* Response checked before and after the survey.

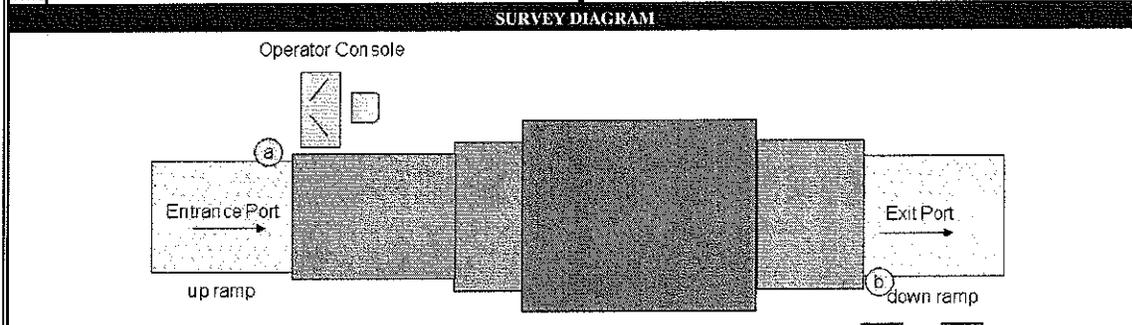
Survey Worksheet - Cabinet X-Ray Systems

Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	CTX #2		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[Redacted]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Invision	CTX-5500 DS	C666	Feb. 2003
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/>	Stand-Alone <input checked="" type="checkbox"/>
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	28 Jun 2010†		

VISUAL INSPECTION				
Y	N	Requirement	Y N	Requirement
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))	<input checked="" type="checkbox"/>	Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(iii))	<input checked="" type="checkbox"/>	Leaded drapes in good condition?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))	<input checked="" type="checkbox"/>	Interlocks not bypassed?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))	<input checked="" type="checkbox"/>	Current User's Manual available? (21 CFR 1020.40(c)(9))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))	<input checked="" type="checkbox"/>	Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))	NT=not tested; NA=not applicable.	



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE†				EXPOSURE OUTSIDE CABINET				
Trial	Exposure (X _i)			Ambient Background	0.00 μR			
1	13.02 mR	X _{avg}	14.1 mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	13.38 mR	CV	0.1162	a	2.07 μR	5.0 min	0.025 mR	PASS
3	16.03 mR	Coefficient of Variation (CV): CV = (1/X _{avg})(Σ(X _i - X _{avg}) ² /(n-1)) ^{1/2}		b	2.40 μR	5.0 min	0.029 mR	PASS
4	mR			c	μR	min	mR	
5	mR			d	μR	min	mR	
				e	μR	min	mR	

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#3 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.
‡Per Morpho service technician - maintenance had been performed after 1-Jul-2011; however, labels are on back-order.

* Response checked before and after the survey.

Survey Worksheet - Cabinet X-Ray Systems

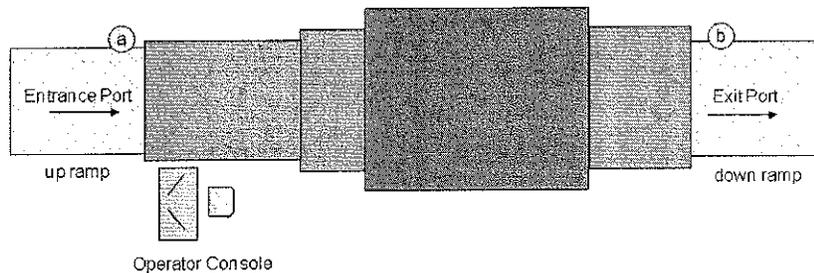
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	CTX #3		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	State	OH	ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Invision	CTX-5500 DS	C354	Jun. 2002
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/>	Stand-Alone <input checked="" type="checkbox"/>
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	21 Jun 2010†		

Y		N		Requirement	Y		N		Requirement
<input checked="" type="checkbox"/>				Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))	<input checked="" type="checkbox"/>				Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
<input checked="" type="checkbox"/>				Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))	<input checked="" type="checkbox"/>				Leaded drapes in good condition?
<input checked="" type="checkbox"/>				Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))	<input checked="" type="checkbox"/>				Interlocks not bypassed?
<input checked="" type="checkbox"/>				One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))	<input checked="" type="checkbox"/>				Current User's Manual available? (21 CFR 1020.40(c)(9))
<input checked="" type="checkbox"/>				Key Activated Control present? (21 CFR 1020.40(c)(6)(i))	‡				Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
<input type="checkbox"/>				Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))					NT=not tested; NA=not applicable.

SURVEY DIAGRAM



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE				EXPOSURE OUTSIDE CABINET				
Trial	Exposure (X _i)			Ambient Background 0.00 μR				
1	10.82 mR	X _{avg}	12.1 mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	14.91 mR	CV	0.2042	a	2.13 μR	5.0 min	0.026 mR	PASS
3	14.70 mR	Coefficient of Variation (CV): CV = (1/X _{avg})(Σ(X _i - X _{avg}) ² /(n-1)) ^{1/2}		b	0.53 μR	5.0 min	0.006 mR	PASS
4	10.10 mR			c	μR	min	mR	
5	10.05 mR			d	μR	min	mR	
				e	μR	min	mR	

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#3 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.
‡Per Morpho service technician - maintenance had been performed after 1-Jul-2011; however, labels are on back-order.

* Response checked before and after the survey.

Survey Worksheet - Cabinet X-Ray Systems

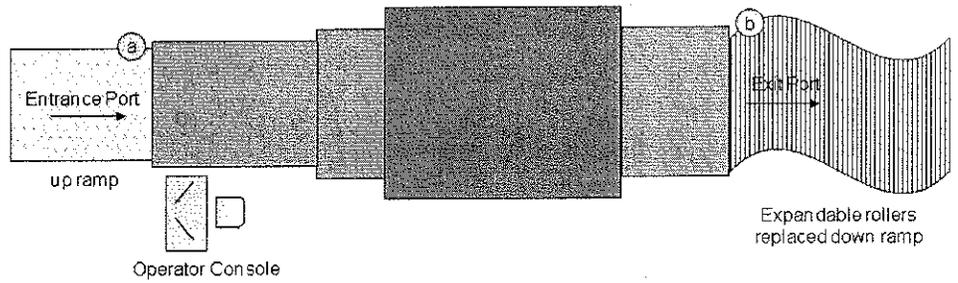
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	CTX #4		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Invision	CTX-5500 DS	C355	Jun. 2002
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input checked="" type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	28 Jun 2010†		

VISUAL INSPECTION	
Y/N	Requirement
X	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))
X	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))
X	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))
X	One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))
X	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))
NA	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))
Y/N	Requirement
X	Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
X	Leaded drapes in good condition?
X	Interlocks not bypassed?
X	Current User's Manual available? (21 CFR 1020.40(c)(9))
‡	Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
NT=not tested; NA=not applicable.	

SURVEY DIAGRAM



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE			EXPOSURE OUTSIDE CABINET							
Trial	Exposure (X _i)		X _{avg}	8.8	mR	Ambient Background 0.00 μR				
1	14.93	mR	CV	0.4758		Location	Exposure	Time	Exposure in 1 hr	RESULT
2	5.059	mR	Coefficient of Variation (CV): CV = (1/X _{avg}) * Σ(X _i - X _{avg}) ² / (n-1) ^{1/2}			a	4.01 μR	5.0 min	0.048 mR	PASS
3	10.87	mR				b	2.67 μR	5.0 min	0.032 mR	PASS
4	4.977	mR				c	μR	min	mR	
5	8.337	mR				d	μR	min	mR	
						e	μR	min	mR	

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#3 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.
‡Per Morpho service technician - maintenance had been performed after 1-Jul-2011; however, labels are on back-order.

* Response checked before and after the survey.

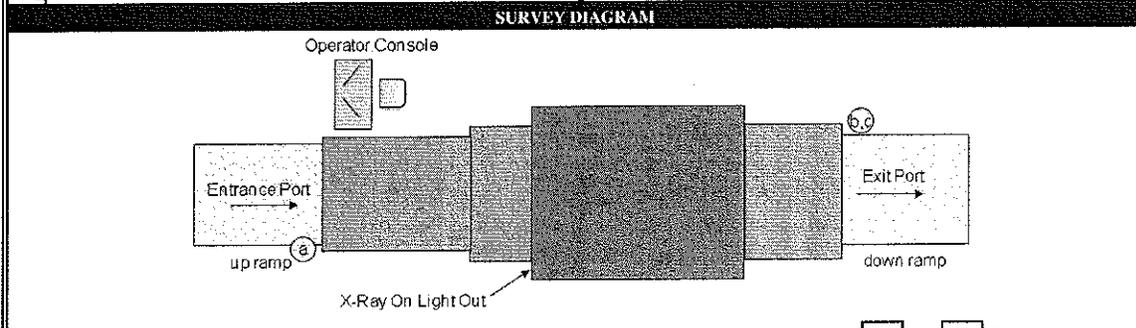
Survey Worksheet - Cabinet X-Ray Systems

Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	CTX #5		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Invision	CTX-5500 DS	C219	Apr. 1998
Instrument #2	Radcal	10X5-1806	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input checked="" type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	28 Jun 2010†		

VISUAL INSPECTION			
Y	N	Requirement	Requirement
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))	<input checked="" type="checkbox"/> Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))	<input checked="" type="checkbox"/> Leaded drapes in good condition?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))	<input checked="" type="checkbox"/> Interlocks not bypassed?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	One "x-ray on" indicator visible from each port and access panel? Light not working as indicated in diagram. (21 CFR 1020.40(c)(6)(iv))	<input checked="" type="checkbox"/> Current User's Manual available? (21 CFR 1020.40(c)(9))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))	<input checked="" type="checkbox"/> Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))	NT=not tested; NA=not applicable.



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE				EXPOSURE OUTSIDE CABINET				
Trial	Exposure (X _i)			Ambient Background 0.00 μR				
1	31.08 mR		X _{avg} 25.4 mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	31.20 mR		CV 0.2206	a	0.00 μR	5.0 min	0.000 mR	PASS
3	23.90 mR			b	0.60 μR	5.0 min	0.007 mR	PASS
4	22.44 mR			c	1.20 μR	5.0 min	0.014 mR	PASS
5	18.42 mR			d	μR	min	mR	
				e	μR	min	mR	

Coefficient of Variation (CV):
 $CV = (1/X_{avg}) * (\sum(X_i - X_{avg})^2 / (n-1))^{1/2}$

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#3 combination.
 Exposure outside cabinet measured with instrument #1/#2 combination.
 Additional measurement at location c simulated missing flap - three flaps were taped up.
 ‡Per Morpho service technician - maintenance had been performed after 1-Jul-2011; however, labels are on back-order.

* Response checked before and after the survey.

Survey Worksheet - Cabinet X-Ray Systems

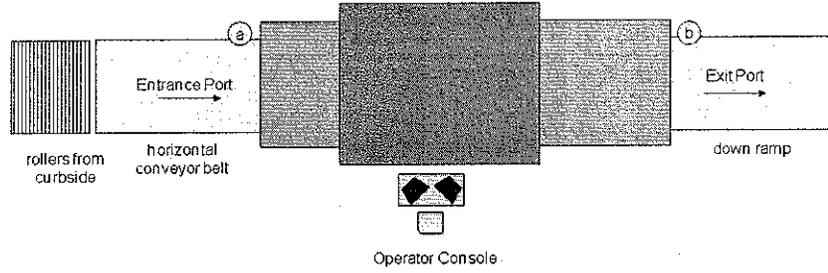
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	Curbside - South		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Invision	CTX-2500	M175	Apr. 2002
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input checked="" type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	22 Jun 2010†		

VISUAL INSPECTION				
Y	N	Requirement	Y N	Requirement
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))	<input checked="" type="checkbox"/>	Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(iii))	<input checked="" type="checkbox"/>	Leaded drapes in good condition?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))	<input checked="" type="checkbox"/>	Interlocks not bypassed?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))	<input checked="" type="checkbox"/>	Current User's Manual available? (21 CFR 1020.40(c)(9))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))	<input checked="" type="checkbox"/>	Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))		NT=not tested; NA=not applicable.

SURVEY DIAGRAM



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE			EXPOSURE OUTSIDE CABINET							
Trial	Exposure (X _i)		Ambient Background 0.00 μR							
1	23.45	mR	X _{avg}	20.3	mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	20.86	mR	CV	0.2625		a	0.00 μR	5.0 min	0.000 mR	PASS
3	11.78	mR	Coefficient of Variation (CV): $CV = (1/X_{avg})(\sum(X_i - X_{avg})^2/(n-1))^{1/2}$			b	1.14 μR	5.0 min	0.014 mR	PASS
4	19.51	mR				c	μR	min	mR	
5	25.76	mR				d	μR	min	mR	
						e	μR	min	mR	

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#3 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.
‡Per Morpho service technician - maintenance had been performed after 1-Jul-2011; however, labels are on back-order.

* Response checked before and after the survey.

Survey Worksheet - Cabinet X-Ray Systems

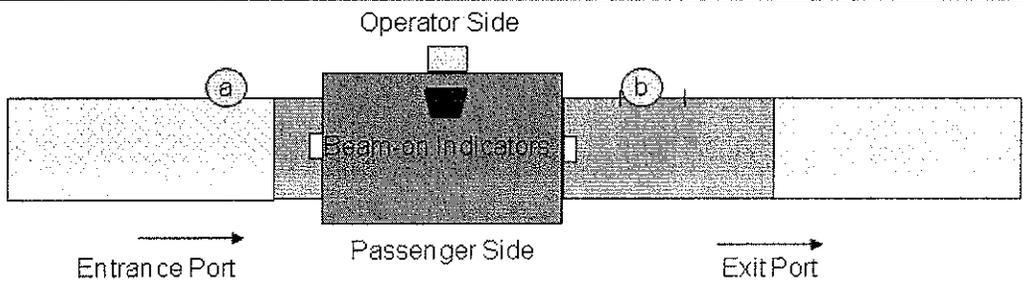
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0FOP-11			Location	A Checkpoint, Lane 1		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
	[REDACTED]			City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	522B	7014502	worn off
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes	No	Place of Manufacture
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint	X	EDS: In-line
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	24 Aug 2011		

VISUAL INSPECTION			
Y/N	Requirement	Y/N	Requirement
X	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))	X	Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
X	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))	X	Leaded drapes in good condition?
X	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))	X	Interlocks not bypassed?
X	One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))	X	Current User's Manual available? (21 CFR 1020.40(c)(9))
X	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))	X	Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
X	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))		NT=not tested; NA=not applicable.

SURVEY DIAGRAM



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE				EXPOSURE OUTSIDE CABINET				
Trial	Exposure (X _i)			Ambient Background 0.00 μR				
1	0.1691 mR	X _{avg}	0.17 mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	0.1730 mR	CV	0.0146	a	0.44 μR	5.0 min	0.005 mR	PASS
3	0.1684 mR	Coefficient of Variation (CV): CV = (1/X _{avg})(Σ(X _i - X _{avg}) ² /(n-1)) ^{1/2}		b	0.34 μR	5.0 min	0.004 mR	PASS
4	mR			c	μR	min	mR	
5	mR			d	μR	min	mR	
†Only three measurements performed due to survey time constraints.				e	μR	min	mR	

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#2 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.

* Response checked before and after the survey.

Survey Worksheet - Cabinet X-Ray Systems

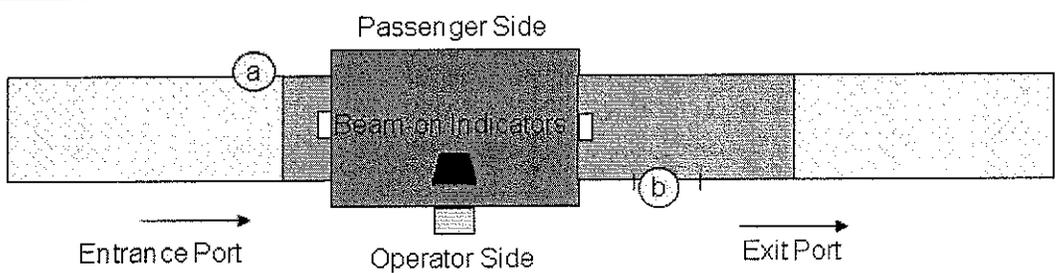
Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0F0P-11			Location	B Checkpoint, Lane 4		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[Redacted]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Rapiscan	520B	7075009	Dec. 2007
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Torrance, CA
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	13 Sep 2010		

VISUAL INSPECTION		Requirement	
Y	N	Y	N
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))		Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))	
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))		Leaded drapes in good condition?	
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))		Interlocks not bypassed?	
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
One "x-ray on" indicator visible from each port and access panel? (21 CFR 1020.40(c)(6)(iv))		Current User's Manual available? (21 CFR 1020.40(c)(9))	
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Key Activated Control present? (21 CFR 1020.40(c)(6)(i))		Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))	
<input checked="" type="checkbox"/>			
Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))		NT=not tested; NA=not applicable.	

SURVEY DIAGRAM



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE				EXPOSURE OUTSIDE CABINET				
Trial	Exposure (X _i)			Ambient Background 0.00 μR				
1	0.2833	mR		Location	Exposure	Time	Exposure in 1 hr	RESULT
2	0.2843	mR		a	7.21 μR	5.0 min	0.087 mR	PASS
3	0.2860	mR		b	3.08 μR	5.0 min	0.037 mR	PASS
4		mR		c	μR	min	mR	
5		mR		d	μR	min	mR	
		mR		e	μR	min	mR	

X_{avg} 0.28 mR
CV 0.0048
Coefficient of Variation (CV):
CV = (1/X_{avg})(Σ(X_i - X_{avg})²/(n-1))^{1/2}
*Only three measurements performed due to survey time constraints.

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#2 combination.
Exposure outside cabinet measured with instrument #1/#2 combination. Empty bins run through system for measurements.

* Response checked before and after the survey.

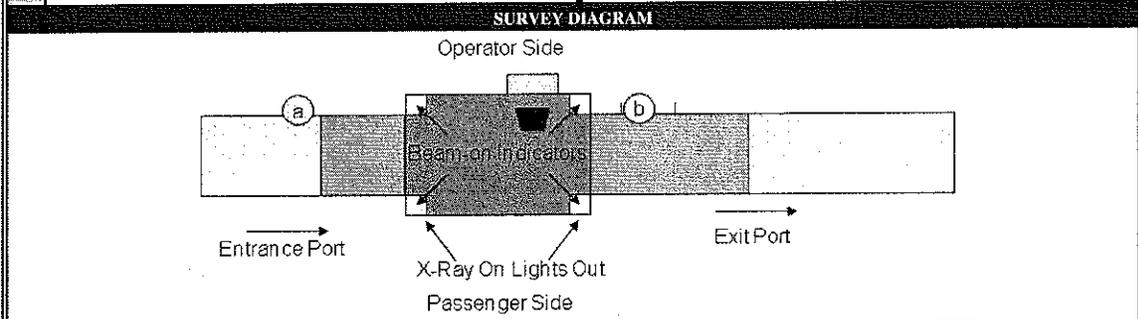
Survey Worksheet - Cabinet X-Ray Systems

Health Physics Program
U.S. Army Public Health Command
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-0FOP-11			Location	C Checkpoint, Lane 2		
Survey Date	13 Sep 2011			Organization	Port Columbus International Airport		
Surveyor(s)	[REDACTED]			Street Address	4600 International Gateway		
				City/Installation	Columbus	State	OH ZIP 43219

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	28 Jul 2012	Smiths Detection	6040i	20877	Apr. 2001
Instrument #2	Radcal	10X5-1800	10299	28 Jul 2012	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Wiesbaden, GE
Instrument #3	Radcal	10X5-180	18793	28 Jul 2012	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40155	*	Manufacturer Survey Date	none found†		

Y N		Requirement	Y N		Requirement
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: X-Rays Produced When Energized" present at control panel? (21 CFR 1020.40(c)(8)(i))	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Means to initiate and terminate x-ray generation? (21 CFR 1020.40(c)(6)(ii); 1020.40(c)(10)(i) or (ii))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Warning label "Caution: Do Not Insert Any Part of the Body When System Is Energized - X-Ray Hazard" present at each port? (21 CFR 1020.40(c)(8)(ii))	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Leaded drapes in good condition? Some wear on both entrance and exit curtains.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Two independent "x-ray on" indicators visible from control panel? (21 CFR 1020.40(c)(6)(iii))	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Interlocks not bypassed?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	One "x-ray on" indicator visible from each port and access panel? Two lights not working as indicated in diagram. (21 CFR 1020.40(c)(6)(iv))	NT	<input type="checkbox"/>	Current User's Manual available? (21 CFR 1020.40(c)(9))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key Activated Control present? (21 CFR 1020.40(c)(6)(i))	‡	<input type="checkbox"/>	Maintenance performed according to recommended schedule? (21 CFR 1020.40(c)(9))
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))	NT=not tested; NA=not applicable.		



Accessible exterior surfaces of cabinet scanned with Instrument #4. All scanning results below action levels? Yes No (If no, explain below)

DOSE TO BAGGAGE				EXPOSURE OUTSIDE CABINET				
Trial	Exposure (X _i)			Ambient Background 0.00 μR				
1	0.1129 mR	$X_{avg} = 0.11 \text{ mR}$ $CV = 0.011$		Location	Exposure	Time	Exposure in 1 hr	RESULT
2	0.1152 mR		a	2.75 μR	5.0 min	0.033 mR	PASS	
3	0.1132 mR		b	1.94 μR	5.0 min	0.023 mR	PASS	
4	mR		c	μR	min	mR		
5	mR		d	μR	min	mR		
			e	μR	min	mR		

Coefficient of Variation (CV):
 $CV = (1/X_{avg})(\sum(X_i - X_{avg})^2/(n-1))^{1/2}$

† Only three measurements performed due to survey time constraints.

COMMENTS AND RECOMMENDATIONS

Dose to baggage measured with instrument #1/#2 combination.
Exposure outside cabinet measured with instrument #1/#2 combination.
‡ Unable to be determined at the time of the survey because a label was not present on the system.

* Response checked before and after the survey.

Survey Notes Provided on 14 September 2011

Encl 3

Exit Briefing Notes

1. Project Information.

- a. Radiation Protection Survey No. 26-MF-0F0P-11
- b. Survey dates: 12-13 September 2011
- c. Port Columbus International Airport (CMH), Columbus, OH
- d. Survey Officer(s): [REDACTED] CHP, U.S. Army Public Health Command (USAPHC); and [REDACTED] CHP, Consolidated Safety Services (CSS).

2. Background Information.

- a. TSA Headquarters Contact: Jill Seagraves, Director, Occupational Safety, Health, and Environment (OSHE), phone: [REDACTED] e-mail: [REDACTED]
- b. Airport Contacts: Peter Marcello, CMH Assistant Federal Security Director for Screening, Phone: [REDACTED], email: [REDACTED] and Betty Powers, CMH Program Analyst, Phone: [REDACTED], email: [REDACTED]
- c. Individuals assisting the survey team:

Name	Title/Position
[REDACTED]	Director, TSA OSHE
[REDACTED]	OSHE/CSS
[REDACTED]	CMH Transportation Security Officer (TSO)
[REDACTED]	CMH Supervisory TSO

d. Systems surveyed

(1) X-Ray Personnel Screening Systems:

Model	Serial No.	Location
Rapiscan Secure 1000 SP	S50952005	A Checkpoint
Rapiscan Secure 1000 SP	S50952003	B Checkpoint, AIT #1
Rapiscan Secure 1000 SP	S50952001	B Checkpoint, AIT #2
Rapiscan Secure 1000 SP	S50952004	B Checkpoint, AIT #3
Rapiscan Secure 1000 SP	S50952002	C Checkpoint

(2) Cabinet X-Ray Systems:

Model	Serial No.	Location
Invision CTX-5500DS	C353	CTX #1
Invision CTX-5500DS	C666	CTX #2
Invision CTX-5500DS	C354	CTX #3
Invision CTX-5500DS	C355	CTX #4
Invision CTX-5500DS	C219	CTX #5
Invision CTX-2500	M175	Curbside South
Rapiscan 522B	7014502	A Checkpoint, Lane 1
Rapiscan 520B	7075009	B Checkpoint, Lane 4
Smiths Detection 6040i	20877	C Checkpoint, Lane 2

3. Findings and Recommendations.

a. X-Ray Personnel Screening Systems:

(1) All x-ray personnel screening systems surveyed were found to be in compliance with the radiation dose limits of American National Standards Institute/Health Physics Society (ANSI/HPS) Standard N43.17-2009, Radiation Safety for Personnel Security Screening Systems Using X-Ray or Gamma Radiation.

(2) All systems surveyed were found to be in compliance with the other requirements of ANSI/HPS N43.17-2009.

(3) The following items were also noted during the surveys:

(a) Rapiscan Secure 1000 SP, Serial No. S50952005, Checkpoint A: The master and slave units were slightly misaligned. Also, the master and slave units made loud noises at the end of travel. Request service provider to check during next visit.

(b) Rapiscan Secure 1000 SP, Serial No. S50952002 Checkpoint C: The master unit made unusually loud idle noises and also made loud noises during travel. Request service provider to check during next visit.

b. Cabinet X-ray Systems

(1) The cabinet x-ray systems surveyed were found to be in compliance with the radiation emission limits of Title 21, Code of Federal Regulations, Section 1020.40.

MCHB-TS-OHP

Exit Briefing Notes, CMH, Columbus, OH, 12-13 September 2011

(2) The systems surveyed were found to be in compliance with the other requirements of Title 21, Code of Federal Regulations, Section 1020.40, with the following exceptions:

(a) Invision CTX-2500, Serial No. M175, Curbside - South: A CTX-2500 User's Manual was not available at the time of the survey.

(b) Smiths Detection 6040i, Serial No. 20877, C Checkpoint, Lane 2: The warning label "Caution: X-Rays Produced When Energized" was not present at the control panel.

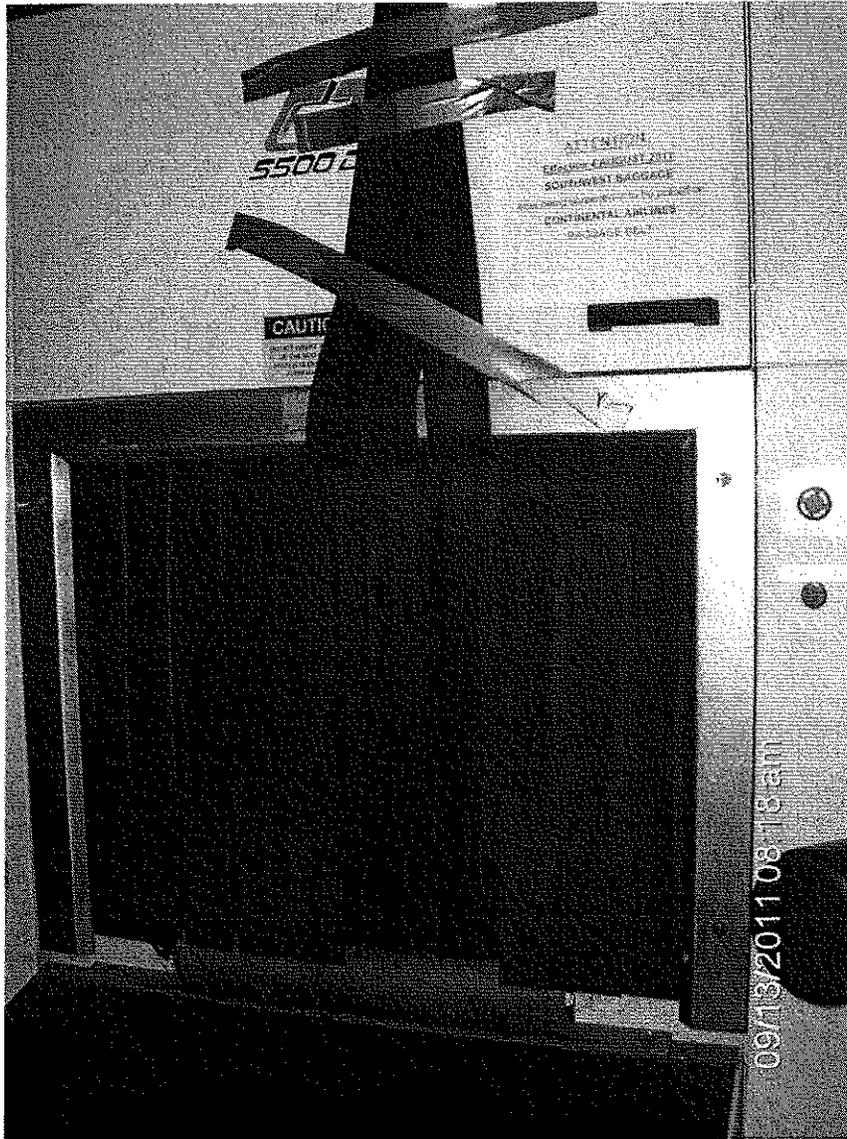
(3) The following items were also noted during the surveys:

(a) The service providers survey dates posted on the following systems were greater than one year ago: Invision CTX-5500 DS, Serial No. C666, CTX #2; Invision CTX-5500 DS, Serial No. C354, CTX #3; Invision CTX-5500 DS, Serial No. C355, CTX #4; Invision CTX-5500 DS, Serial No. C219, CTX #5; and Invision CTX-2500, Serial No. M175, Curbside South. According to the Morpho Detection service technician, surveys had been performed after 1-Jul-2011; however, the survey labels are back-ordered and therefore, have not been posted on the systems.

(b) Invision CTX-5500 DS, Serial No. C219, CTX #5: The "x-ray on" light near the entrance port opposite from the operator's console side was not working.

(c) Smiths Detection 6040i, Serial No. 20877, C Checkpoint, Lane 2: A service provider survey date was not posted on the system and both "x-ray on" lights on the passenger's side were not working.

c. Based on dosimetry and field measurements around the Secure 1000 SP and cabinet x-ray systems, it is estimated that TSOs will receive a radiation dose of less than 10 millirem per year. For comparison, the occupational limit under Occupational Safety and Health Administration regulations is 1,250 millirem per quarter (5,000 millirem per year) and the goal of the TSA radiation safety program is to keep all exposures less than 100 millirem per year.



Photograph of Simulated Missing Flaps Survey Measurement