



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

10 JAN 2011

Health Physics Program

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 US Army Medical Command and the Transportation Security Administration, signed September 10, 2008; electronic mail message, subject: 2400.2.1 CVG Radiation Safety Surveys, May 3, 2010; Title 21, Code of Federal Regulations (CFR), Subchapter J; and American National Standards Institute/Health Physics Society (ANSI/HPS) N43.17-2009, Radiation Safety for Personnel Security Screening Systems Using X-Ray or Gamma Radiation.

Radiation protection surveys were performed on 9-10 June 2010 and 2-3 November 2010 at Cincinnati/Northern Kentucky International Airport (CVG), Hebron, Kentucky, Project No. 26-MF-CVG-11. The surveys were performed to:

- a. evaluate all advanced image technology (AIT) x-ray systems and selected cabinet x-ray systems to ensure compliance with the requirements of Title 21, CFR, Subchapter J.
- b. identify any health hazards associated with the use of these x-ray systems.
- c. provide recommendations to assist in correcting any areas of regulatory noncompliance or health hazards.

The surveys were performed by [REDACTED] Certified Health Physicist (CHP), Health Physics Program (HPP), Army Institute of Public Health (AIPH), [REDACTED] CHP, HPP, AIPH and [REDACTED] Research Analyst, HPP, AIPH.

Our procedures for surveying AIT x-ray systems were modified for the 2-3 November 2010 survey. This modification was made to improve and standardize the half-value layer measurement. An accurate half-value layer is needed to determine the reference effective dose per ANSI/HPS N43.17-2009.

A total of 14 cabinet x-ray systems were evaluated for compliance with the requirements of Title 21, CFR, Subchapter J, and nine AIT x-ray systems were evaluated for compliance with the requirements of ANSI/HPS N43.17-2009, a voluntary national consensus standard. The survey results for each cabinet x-ray system and AIT X-ray system are provided in Enclosures 1 and 2, respectively.

The following systems were surveyed.

Model	Serial No.	Location
AIT (Personnel) Screening Systems		
Rapiscan Secure 1000SP	S51005005	Terminal 2, AIT A
Rapiscan Secure 1000SP	S51003013	Terminal 3, AIT A
Rapiscan Secure 1000SP	S50949003	Terminal 3, AIT B
Rapiscan Secure 1000SP	S51003014	Terminal 3, AIT C
Rapiscan Secure 1000SP	S51003015	Terminal 3, AIT D
Rapiscan Secure 1000SP	S51005001	Terminal 3, AIT E
Rapiscan Secure 1000SP	S51005002	FIS, AIT A
Rapiscan Secure 1000SP	S51005003	FIS, AIT B
Rapiscan Secure 1000SP	S51005004	FIS, AIT C
Cabinet Screening Systems		
InVision CTX 5500	C460	Terminal 2, Baggage East
L3 Communication 3DX6000	6317	Terminal 2, Baggage West
InVision CTX 5500	C612	Terminal 3, T Drive
Smiths Detection 6040aTiX	78502	Terminal 2, Checkpoint, Lane 2
Smiths Detection 6040aTiX	78926	Terminal 3, Checkpoint, Lane 3
Smiths Detection 6040aTiX	78656	Terminal 3, Checkpoint, Lane 4
Heimann Systems HS-6040i	23404	Terminal 3, Checkpoint, Lane 5
Heimann Systems HS-7555i	23331	Terminal 3, Checkpoint, Lane 6
Heimann Systems HS-7555i	40274	Terminal 3, Checkpoint, Lane 7
Heimann Systems HS-7555i	20756	Terminal 3, Checkpoint, Lane 8
Heimann Systems HS-6040i	23406	Terminal 3, Checkpoint, Lane 9
Heimann Systems HS-6040i	40184	Terminal 3, Checkpoint, Lane 10
Heimann Systems HS-7555i	20750	FIS, Checkpoint, Lane 3
Heimann Systems HS-7555i	20751	FIS, Checkpoint, Lane 4

All cabinet x-ray systems tested were found to be in compliance with the emissions limit specified in Title 21, CFR, Subchapter J. All AIT x-ray systems tested were found to be in compliance with the radiation dose limits specified in ANSI/HPS N43.17-2009. There are no health hazards associated with the use of these systems provided appropriate operating procedures are followed.

All systems were found to be in compliance with the other requirements of Title 21, CFR, Subchapter J or ANSI/HPS N43.17-2009, as applicable, with the following exceptions:

a. All Rapiscan Secure 1000 SP systems: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

b. Smith Detection 6040aTiX, serial number (SN) 78926, Terminal 3, Checkpoint, Lane 3: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

c. Smith Detection 6040aTiX, SN 78656, Terminal 3, Checkpoint, Lane 4: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

d. Heimann Systems HS-6040i, SN 23404, Terminal 3, Checkpoint, Lane 5: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

e. Heimann Systems HS-7555i, SN 23331, Terminal 3, Checkpoint, Lane 6: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

f. Heimann Systems HS-7555i, SN 40274, Terminal 3, Checkpoint, Lane 7: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

g. Heimann Systems HS-7555i, SN 20756, Terminal 3, Checkpoint, Lane 8: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

h. Heimann Systems HS-6040i, SN 23406, Terminal 3, Checkpoint, Lane 9: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

i. Heimann Systems HS-7555i, SN 20750, FIS, Checkpoint, Lane 3: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

j. Heimann Systems HS-7555i, SN 20751, FIS, Checkpoint, Lane 4: The control panel warning label “Caution: X-Rays Produced When Energized” was missing.

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

a. Rapiscan Secure 1000SP, SN S51003013, Terminal 3, AIT “A”: The maintenance service provider’s survey date was not posted on system.

b. Rapiscan Secure 1000SP, SN S51003014, Terminal 3, AIT “C”: The maintenance service provider’s survey date was not posted on system.

c. Rapiscan Secure 1000SP, SN S51003015, Terminal 3, AIT “D”: The maintenance service provider’s survey date was not posted on system.

d. Rapiscan Secure 1000SP, SN S51005001, Terminal 3, AIT “E”: The maintenance service provider’s survey date was not posted on system.

e. Invision CTX 5500, SN C460, Terminal 2, Baggage East: The maintenance service provider’s survey date was not posted on system.

f. InVision CTX 5500, C612, Terminal 3, T Drive: The "x-ray on" light was inoperable at entrance port opposite from the operator's table. The maintenance service provider's survey date was not posted on the system.

g. Heimann Systems HS-6040i, SN 23404, Terminal 3, Checkpoint, Lane 5: The "x-ray on" light was inoperable at the entrance port on passenger's side.

h. Heimann Systems HS-7555i, SN 20756, Terminal 3, Checkpoint, Lane 8: The "x-ray on" light was inoperable at the entrance port on passenger's side.

The survey officers discussed the survey results with Mr. Paul Wisniewski, CVG Federal Security Director; Ms. Deb Kern, CVG Assistant Federal Security Director for Operations; Mr. Thomas Bechtol, CVG Assistant Federal Security Director for Screening; Mr. James R. Aasen, Jr, CVG Deputy Assistant Federal Security Director for Screening; Mr. Dylan James, CVG Transportation Security Manager; and Ms. Janet Lang, CVG Supervisory Transportation Security Officer (STSO) on June 11, 2010. A copy of the June 2010 survey notes is provided in Enclosure 3. The November 2010 survey results were discussed with STSO Janet Lang on November 3, 2010.

Preliminary dosimetry data using Landauer Optically Stimulated Luminescence dosimeters has been collected at CVG with area monitors mounted inside the inspection zones of AIT x-ray systems. The preliminary data indicates doses well below the public dose limit and is further discussed in Enclosure 4.

For more information concerning the surveys or the preliminary dosimetry data, please contact the AIPH, Health Physics Program, at [REDACTED].

Sincerely,

[REDACTED]

CIH
Portfolio Director
Occupational Health Sciences

Enclosures

Survey Results for 14 Cabinet X-Ray Systems

Survey Worksheet - Cabinet X-Ray Systems

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

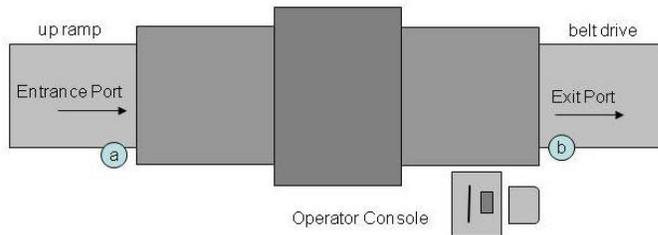
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 2, Baggage West		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Location	Model	Serial No.	Manuf. Date	
Instrument #1	Radcal	9010	90-3291	20 May 2011	L3 Communications	3DX6000	6317	Nov. 2002	
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Peabody, MA		
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input type="checkbox"/>	EDS:	In-line <input type="checkbox"/>	Stand-Alone <input checked="" type="checkbox"/>
Instrument #4	WB Johnson	TVX-2000	40174	†resp cked	Manufacturer Survey Date		8 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<input 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		mR	Location	Exposure	Time	Exposure in 1 hr		RESULT
2		mR	a	1.42 μR	5.0 min	0.017 mR	PASS	
3		mR	b**	3.38 μR	5.0 min	0.041 mR	PASS	
4		mR	c	μR	5.0 min	mR		
5		mR	d	μR	5.0 min	mR		
			e	μR	5.0 min	mR		

X_{avg} mR

CV

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
Exposure outside cabinet measured with instrument #1/#2 combination.
**Probe was bumped during exposure outside cabinet measurement at location "b".
†resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

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

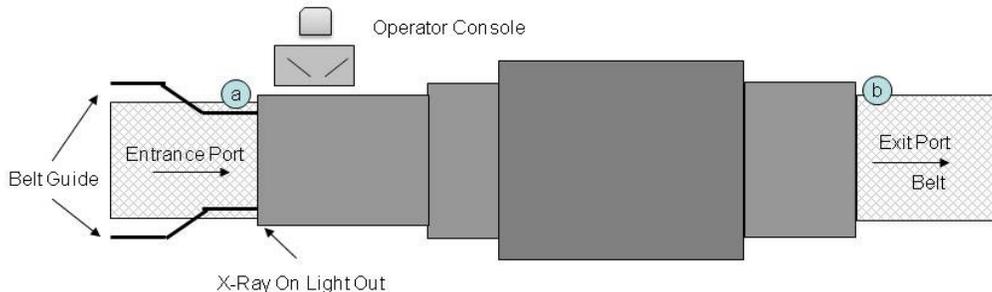
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, Baggage T-Drive		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[Redacted]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date	
Instrument #1	Radcal	9010	90-3291	20 May 2011	InVision	CTX-5500DS	C612	Dec. 2002	
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint	EDS:	In-line <input type="checkbox"/> Stand-Alone <input checked="" type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40174	†resp cked	Manufacturer Survey Date	none found			

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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<input 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		mR	Location	Exposure	Time	Exposure in 1 hr		RESULT
2		mR	a	0.00 μR	5.0 min	0.000	mR	PASS
3		mR	b	0.20 μR	5.0 min	0.002	mR	PASS
4		mR	c		5.0 min		mR	
5		mR	d		5.0 min		mR	
			e		5.0 min		mR	

X_{avg} [] mR

CV []

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
Exposure outside cabinet measured with instrument #1/#2 combination.
X-ray on light not working as indicated in the diagram.
†resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

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

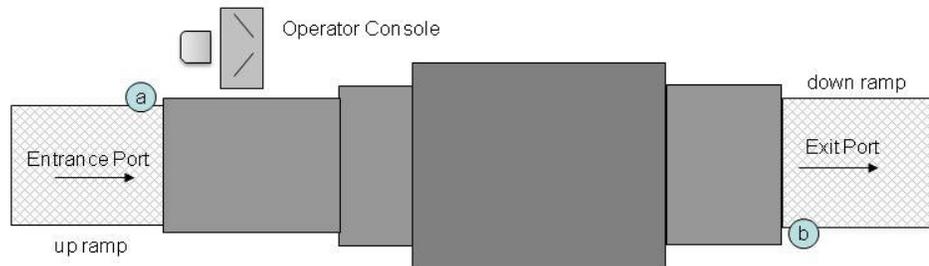
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 2, Baggage East		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[Redacted]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	InVision	CTX-5500	C460	Sep. 2002
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Newark, CA
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input checked="" type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40174	†resp cked	Manufacturer Survey Date	none found		

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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<input 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		mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2		mR	a	2.09 μR	5.0 min	0.025 mR	PASS
3		mR	b	3.32 μR	5.0 min	0.040 mR	PASS
4		mR	c	μR	5.0 min	mR	
5		mR	d	μR	5.0 min	mR	
			e	μR	5.0 min	mR	

X_{avg} mR

CV

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
 Exposure outside cabinet measured with instrument #1/#2 combination.
 †resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

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

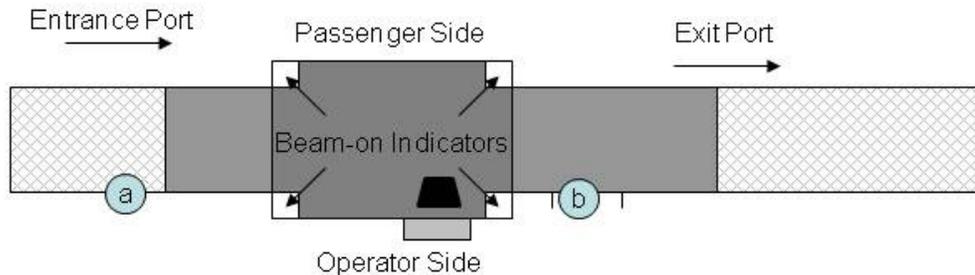
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	FIS, Checkpoint Lane 3		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date	
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-7555i	20750	Mar. 2001	
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Wiesbaden, GE		
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS:	In-line <input type="checkbox"/>	Stand-Alone <input type="checkbox"/>
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date		28 May 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<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.

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		mR	Location	Exposure	Time	Exposure in 1 hr		RESULT
2		mR	a	0.75 μR	5.0 min	0.009 mR		PASS
3		mR	b**	1.63 μR	5.0 min	0.020 mR		PASS
4		mR	c	μR	5.0 min	mR		
5		mR	d	μR	5.0 min	mR		
			e	μR	5.0 min	mR		

X_{avg} mR

CV

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
Exposure outside cabinet measured with instrument #1/#2 combination.
**Probe was bumped during exposure outside cabinet measurement at location "b".
†resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

Health Physics Program
 U.S. Army Public Health Command (Provisional)
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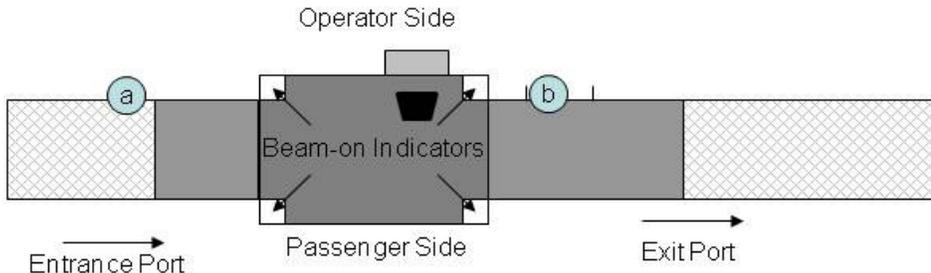
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	FIS, Checkpoint Lane 4		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[Redacted]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-7555i	20751	Mar. 2001
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Wiesbaden, GE	
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date		25 May 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<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.

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	[] mR	$X_{avg} \quad \text{mR}$ $CV \quad \text{mR}$ <p style="text-align: center;">Coefficient of Variation (CV): $CV = (1/X_{avg})(\sum(X_i - X_{avg})^2/(n-1))^{1/2}$</p>	Location	Exposure	Time	Exposure in 1 hr	RESULT
2	[] mR		a	0.27 μR	5.0 min	0.003 mR	PASS
3	[] mR		b	1.50 μR	5.0 min	0.018 mR	PASS
4	[] mR		c	[] μR	5.0 min	[] mR	[]
5	[] mR		d	[] μR	5.0 min	[] mR	[]
		e	[] μR	5.0 min	[] mR	[]	

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
 Exposure outside cabinet measured with instrument #1/#2 combination.
 †resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

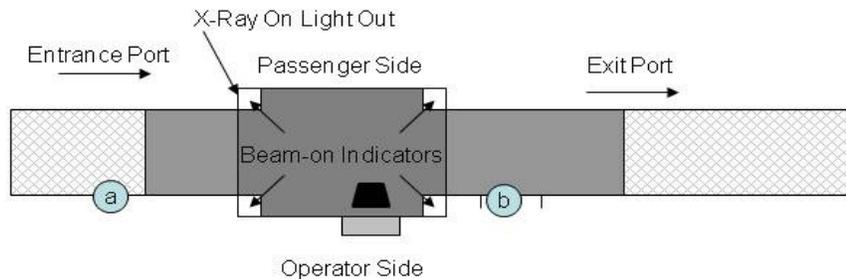
Health Physics Program
U.S. Army Public Health Command (Provisional)
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, Checkpoint Lane 8		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[Redacted]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-7555i	20756	Mar. 2001
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Wiesbaden, GE	
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date		13 May 2010	

VISUAL INSPECTION			
Y	N	Requirement	Y N
<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"/>
<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"/>
<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 type="checkbox"/> <input type="checkbox"/>
<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 type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key Activated Control present? (21 CFR 1020.31(j))	<input type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))	<input type="checkbox"/> <input type="checkbox"/>
			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		mR	Location	Exposure	Time	Exposure in 1 hr		RESULT
2		mR	a	1.29 μR	5.0 min	0.015 mR		PASS
3		mR	b	2.58 μR	5.0 min	0.031 mR		PASS
4		mR	c	μR	5.0 min	mR		
5		mR	d	μR	5.0 min	mR		
			e	μR	5.0 min	mR		

X _{avg}		mR
CV		

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
 Exposure outside cabinet measured with instrument #1/#2 combination.
 X-ray on light not working as indicated in the diagram.
 †resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

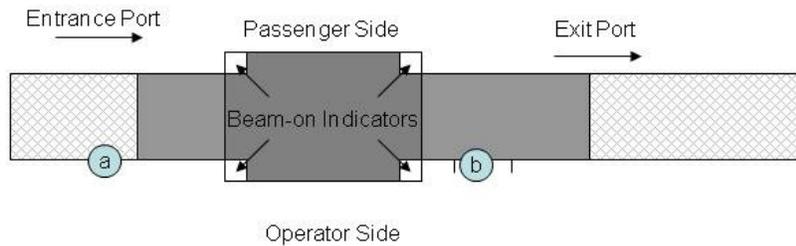
Health Physics Program
U.S. Army Public Health Command (Provisional)
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, Checkpoint Lane 6		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-7555i	23331	Feb. 2002
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Wiesbaden, GE	
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date		13 May 2010	

VISUAL INSPECTION			
Y	N	Requirement	Y N
<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"/>
<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"/>
<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 type="checkbox"/> <input type="checkbox"/>
<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 type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key Activated Control present? (21 CFR 1020.31(j))	<input type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Means to require operator presence at control panel? (21 CFR 1020.40(c)(10))	<input type="checkbox"/> <input type="checkbox"/>
			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}	CV	mR	Ambient Background		0.00 μR		
1		mR				Location	Exposure	Time	Exposure in 1 hr	RESULT
2		mR				a	0.21 μR	5.0 min	0.003 mR	PASS
3		mR				b	0.62 μR	5.0 min	0.007 mR	PASS
4		mR				c	μR	5.0 min	mR	
5		mR				d	μR	5.0 min	mR	
						e	μR	5.0 min	mR	

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
Exposure outside cabinet measured with instrument #1/#2 combination.
†resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

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

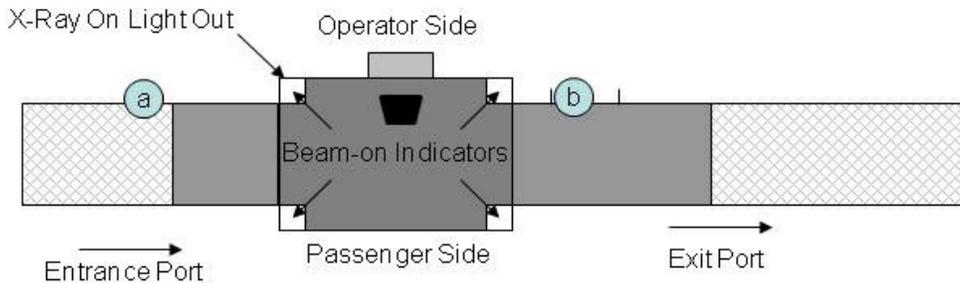
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, Checkpoint Lane 5		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-6040i	23404	Mar. 2002
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Wiesbaden, GE
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	14 May 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<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.

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		mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2		mR	a	0.68 μR	5.0 min	0.008 mR	PASS
3		mR	b	0.62 μR	5.0 min	0.007 mR	PASS
4		mR	c	μR	5.0 min	mR	
5		mR	d	μR	5.0 min	mR	
			e	μR	5.0 min	mR	

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
Exposure outside cabinet measured with instrument #1/#2 combination.
X-ray on light not working as indicated in the diagram.
†resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

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

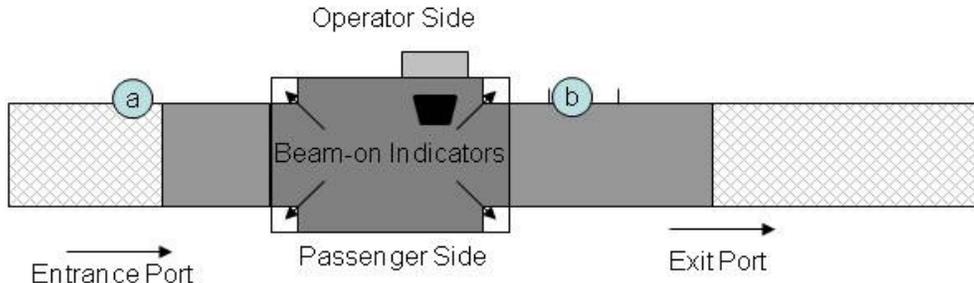
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, Checkpoint Lane 9		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-6040i	23406	Mar. 2002
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Wiesbaden, GE	
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date		13 May 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<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.

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		mR	Location	Exposure	Time	Exposure in 1 hr		RESULT
2		mR	a	1.16 μR	5.0 min	0.014	mR	PASS
3		mR	b	1.16 μR	5.0 min	0.014	mR	PASS
4		mR	c		5.0 min		mR	
5		mR	d		5.0 min		mR	
			e		5.0 min		mR	

X_{avg} mR

CV 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 measurements not performed.
Exposure outside cabinet measured with instrument #1/#2 combination.
†resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

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

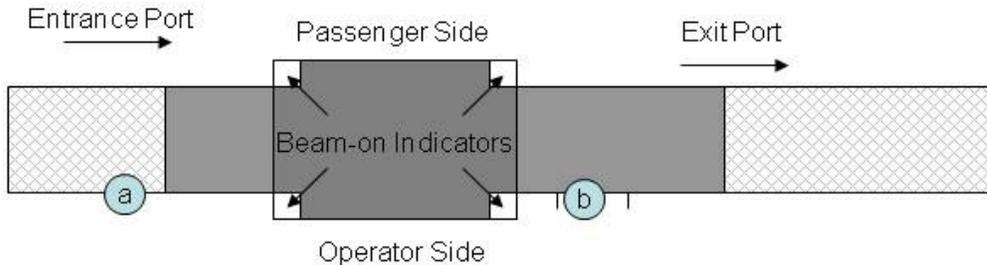
SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, Checkpoint Lane 10		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Heimann Systems	HS-6040i	40184	**
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture	Wiesbaden, GE
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/> Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	13 May 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<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.

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		mR	Location	Exposure	Time	Exposure in 1 hr		RESULT
2		mR	a	1.16 μR	5.0 min	0.014	mR	PASS
3		mR	b	1.98 μR	5.0 min	0.024	mR	PASS
4		mR	c		5.0 min		mR	
5		mR	d		5.0 min		mR	
			e		5.0 min		mR	

X_{avg} mR

CV

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
 Exposure outside cabinet measured with instrument #1/#2 combination.
 ** Inadvertantly forgot to record date of manufacture.
 †resp cked = instrument was response checked before survey.

Survey Worksheet - Cabinet X-Ray Systems

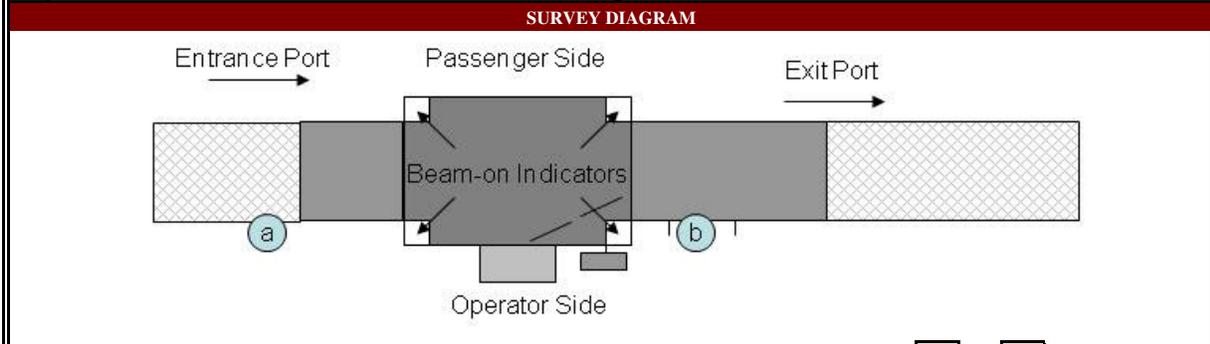
Health Physics Program
 U.S. Army Public Health Command (Provisional)
 Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 2, Checkpoint Lane 2		
Survey Date	9,10 Jun 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[Redacted]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date	
Instrument #1	Radcal	9010	90-3291	20 May 2011	Smiths Detection	6040aTiX	78502	Jun. 2008	
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Place of Manufacture Wiesbaden, GE		
Instrument #3	Radcal	10X5-180	18836	29 Jan 2011	Type	Checkpoint <input checked="" type="checkbox"/>	EDS: In-line <input type="checkbox"/>	Stand-Alone <input type="checkbox"/>	
Instrument #4	WB Johnson	TVX-2000	40174	†resp cked	Manufacturer Survey Date		25 May 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? (21 CFR 1020.40(c)(6)(iv))	<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 1020.31(j))	<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		mR	Location	Exposure	Time	Exposure in 1 hr	RESULT
2		mR	a	1.65 μR	5.0 min	0.020 mR	PASS
3		mR	b**	2.06 μR	5.0 min	0.025 mR	PASS
4		mR	c	μR	5.0 min	mR	
5		mR	d	μR	5.0 min	mR	
			e	μR	5.0 min	mR	

X_{avg} mR

CV

Coefficient of Variation (CV):

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

COMMENTS AND RECOMMENDATIONS

*Dose to baggage measurements not performed.
 Exposure outside cabinet measured with instrument #1/#2 combination.
 **Probe was bumped during exposure outside cabinet measurement at location "b".
 †resp cked = instrument was response checked before survey.

Survey Results for Nine AIT X-Ray Systems

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 2, AIT "A" Alpha		
Survey Date	3 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51005005	Feb. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	25 May 2010		

VISUAL INSPECTION				
Y	N	Requirement	Y N	Requirement
X		Key activated control with key capture? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X	X-ray emission terminates after a present time or exposure? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.e)
	X	Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X	Operators have a clear view of the scanning area? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
 "Back" Side measurements made at location "B".
 Individual scan measurements (µR) at locations:

1:	0.07, 0.00, 0.00
2:	0.00, 0.00, 0.00
3:	0.00, 0.07, 0.00
4:	0.00, 0.00, 0.00

Inspection Zone Boundary

Accessible exterior surfaces of system scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING				BEAM QUALITY					
		Exposure (X)		Reference Effective Dose per Screening (max 25 µrem):		Exposure (X)			
Trial	"Front" Side	"Back" Side	µR	µR	mm Al	"Front" Side	"Back" Side	µR	µR
1	6.19	7.80	µR	µR	0	1.88	3.00	µR	µR
2	6.37	7.86	µR	µR	0	1.88	2.99	µR	µR
3	6.32	7.86	µR	µR	1	0.94	1.62	µR	µR
4	6.45	7.86	µR	µR	1	0.94	1.68	µR	µR
5	6.44	7.85	µR	µR	1.5	0.67	1.25	µR	µR
AVG	6.35	7.85	µR	µR	1.5	0.74	1.28	µR	µR
Energy Correction Factor	1.25								

Reference Effective Dose per Screening (max 25 µrem):

2.55 µrem

or

0.0255 µSv

RESULT PASS

HVL "Front" Side 1.0 mm Al

HVL "Back" Side 1.2 mm Al

Conversion Factor 0.130

‡Minimum Filtration 1.0 mm Al

RESULT PASS

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
 All exposure measurements made with instrument #1/#2 combination.
 ‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, AIT "A" Alpha		
Survey Date	3 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51003013	Jan. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	none found		

VISUAL INSPECTION			
Y	N	Requirement	Y N
X		Key activated control with key capture? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.1.c)	X
			X
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X
			X
X		Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X
			X
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
			X
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	X
			X
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.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
"Back" Side measurements made at location "B".

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY					
Trial	Exposure (X)				Reference Effective Dose per Screening (max 25 µrem):	mm Al	Exposure (X)			
	"Front" Side	"Back" Side					"Front" Side	"Back" Side		
1	6.23 µR	5.94 µR			0	1.15 µR	1.08 µR			
2	6.16 µR	6.01 µR			0	1.14 µR	1.08 µR			
3	6.22 µR	6.02 µR			1	0.61 µR	0.61 µR			
4	6.29 µR	5.95 µR			1	0.61 µR	0.61 µR			
5	6.23 µR	5.95 µR			1.5	0.47 µR	0.47 µR			
AVG	6.23 µR	5.97 µR			1.5	0.47 µR	0.47 µR			
Energy Correction Factor	1.25									

2.11 µrem
 or
 0.0211 µSv
RESULT PASS

HVL "Front" Side 1.1 mm Al
 HVL "Back" Side 1.2 mm Al
 Conversion Factor 0.136
 ‡Minimum Filtration 1.0 mm Al
RESULT PASS

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
 All exposure measurements made with instrument #1/#2 combination.
 ‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, AIT B "Bravo"		
Survey Date	3 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S50949003	Dec. 2009
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	23 Mar 2010		

VISUAL INSPECTION					
Y	N	Requirement	Y	N	Requirement
X		Key activated control with key capture? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X		X-ray emission terminates after a present time or exposure? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.e)
X		Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X		Operators have a clear view of the scanning area? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
 "Back" Side measurements made at location "B".
 *Individual scan measurements (µR) at locations:

1:	0.00, 0.00, 0.00, 0.07, 0.00
2:	0.07, 0.07, 0.14, 0.00, 0.07, 0.07
3:	0.00, 0.07, 0.00, 0.07, 0.00
4:	0.07, 0.14, 0.14, 0.07, 0.07

Inspection Zone Boundary

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY					
		Exposure (X)			Reference Effective Dose per Screening (max 25 µrem):			Exposure (X)		
Trial	"Front" Side	"Back" Side		mm Al		"Front" Side	"Back" Side		HVL "Front" Side	HVL "Back" Side
1	5.52 µR	5.57 µR		1.88 µrem or 0.0188 µSv	0	0.81 µR	1.34 µR		1.23 mm Al	1.00 mm Al
2	5.58 µR	5.57 µR			0	0.81 µR	1.34 µR		Conversion Factor	0.135
3	5.58 µR	5.57 µR			1	0.54 µR	0.67 µR		‡Minimum Filtration	1.0 mm Al
4	5.50 µR	5.51 µR			1	0.40 µR	0.67 µR		RESULT PASS	
5	5.51 µR	5.57 µR			1.5	0.34 µR	0.47 µR			
AVG	5.54 µR	5.56 µR		1.5	0.34 µR	0.47 µR				
Energy Correction Factor	1.25									

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
 All exposure measurements made with instrument #1/#2 combination.
 *Individual scan measurements at locations 1-4 were made on 9-10 Jun 2010.
 ‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, AIT C "Charlie"		
Survey Date	2 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51003014	Jan. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	none found		

VISUAL INSPECTION			
Y	N	Requirement	Y N
X		Key activated control with key capture? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.1.c)	X
			X
	X	"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X
			X
X		Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X
			X
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
			X
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	X
			X
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.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
 "Back" Side measurements made at location "B".
 *Individual scan measurements (µR) at locations:

1:	0.07, 0.07, 0.07, 0.07, 0.13
2:	0.13, 0.07, 0.07, 0.07, 0.07
3:	0.07, 0.07, 0.00, 0.07, 0.07
4:	0.00, 0.00, 0.00, 0.00, 0.00

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY									
Trial	Exposure (X)				Reference Effective Dose per Screening (max 25 µrem):	mm Al	Exposure (X)				HVL "Front" Side	HVL "Back" Side	Conversion Factor	‡Minimum Filtration
	"Front" Side	"Back" Side	µR	µR			"Front" Side	"Back" Side	µR	µR				
1	5.72	5.45	µR	µR	1.79	0	1.07	1.00	µR	µR	1.0	1.1	0.126	1.0
2	5.65	5.46	µR	µR	or	0	1.07	1.00	µR	µR				
3	5.65	5.45	µR	µR	0.0179	1	0.54	0.54	µR	µR				
4	5.58	5.46	µR	µR	RESULT	1	0.54	0.54	µR	µR				
5	5.65	5.39	µR	µR	PASS	1.5	0.44	0.44	µR	µR				
AVG	5.65	5.44	µR	µR		1.5	0.47	0.40	µR	µR				
Energy Correction Factor	1.25													

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
 All exposure measurements made with instrument #1/#2 combination.
 *Individual scan measurements at locations 1-4 were made on 9-10 Jun 2010.
 ‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

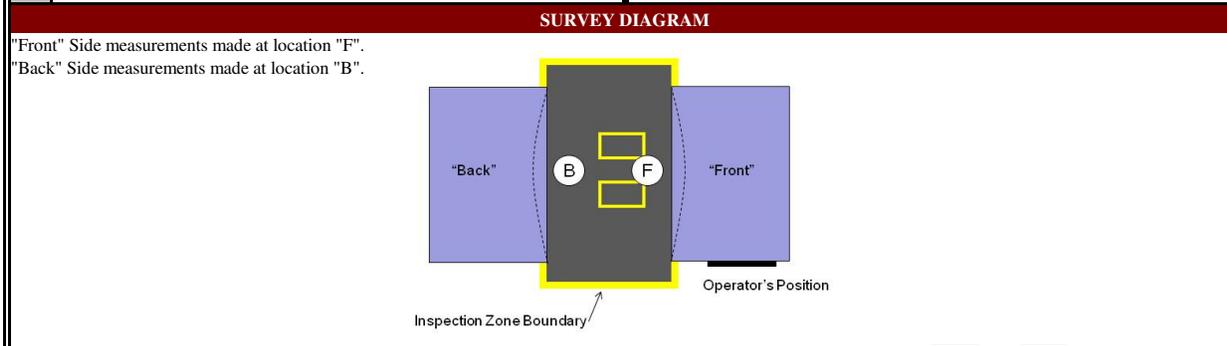
Health Physics Program
U.S. Army Public Health Command (Provisional)
Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, AIT D "Delta"		
Survey Date	3 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY
					ZIP	41048	

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51003015	Jan. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	none found		

VISUAL INSPECTION			
Y	N	Requirement	Y N
X		Key activated control with key capture? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.1.c)	X
			X
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X
			X
X		Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X
			X
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
			X
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	X
			X
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.



Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY								
Trial	Exposure (X)				Reference Effective Dose per Screening (max 25 µrem):	mm Al	Exposure (X)						
	"Front" Side		"Back" Side				"Front" Side	"Back" Side					
1	6.63	µR	6.75	µR	1.91	0	1.04	µR	1.19	µR	HVL "Front" Side	1.0	mm Al
2	6.63	µR	6.69	µR	or	0	1.07	µR	1.19	µR	HVL "Back" Side	1.0	mm Al
3	6.57	µR	6.69	µR	0.0191	1	0.53	µR	0.60	µR	Conversion Factor	0.113	
4	6.65	µR	6.69	µR	RESULT	1	0.53	µR	0.60	µR	‡Minimum Filtration	1.0	mm Al
5	6.57	µR	6.83	µR	PASS	1.5	0.47	µR	0.46	µR	RESULT	PASS	
AVG	6.61	µR	6.73	µR		1.5	0.47	µR	0.46	µR			
Energy Correction Factor	1.25												

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
All exposure measurements made with instrument #1/#2 combination.
‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	Terminal 3, AIT E "Echo"		
Survey Date	2 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY
					ZIP	41048	

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51005001	Feb. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	none found		

VISUAL INSPECTION			
Y	N	Requirement	Y
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Key activated control with key capture? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.1.c)	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Means to initiate emission of radiation other than an interlock or main power control? (ANSI N43.17-2009, paragraph 7.2.1.d)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Scan in progress indicator visible for any location from which a scan can be initiated? (ANSI N43.17-2009, paragraph 7.2.1.a)	<input type="checkbox"/>
			NT=not tested; NA=not applicable.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
"Back" Side measurements made at location "B".

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY					
		Exposure (X)			Reference Effective Dose per Screening (max 25 µrem):			Exposure (X)		
Trial	"Front" Side	"Back" Side		mm Al		"Front" Side	"Back" Side		HVL "Front" Side	
1	5.93 µR	6.14 µR		1.95 µrem or 0.0195 µSv RESULT PASS	0	1.05 µR	1.04 µR		HVL "Back" Side	
2	5.94 µR	6.15 µR			0	1.05 µR	1.04 µR		Conversion Factor	
3	5.87 µR	6.15 µR			1	0.59 µR	0.59 µR		‡Minimum Filtration	
4	5.94 µR	6.15 µR			1	0.59 µR	0.59 µR		RESULT PASS	
5	6.02 µR	6.15 µR			1.5	0.40 µR	0.39 µR			
AVG	5.94 µR	6.15 µR			1.5	0.40 µR	0.39 µR			
Energy Correction Factor	1.25									

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
 All exposure measurements made with instrument #1/#2 combination.
 ‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	FIS, AIT A "Alpha"		
Survey Date	2 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[Redacted] P			Street Address	2939 Terminal Drive		
	[Redacted]			City/Installation	Hebron	State	KY
				ZIP	41048		

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51005002	Feb. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	24 May 2010		

VISUAL INSPECTION				
Y	N	Requirement	Requirement	
X		Key activated control with key capture? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X	X-ray emission terminates after a present time or exposure? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.e)
	X	Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X	Operators have a clear view of the scanning area? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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.	

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
"Back" Side measurements made at location "B".

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY								
Trial	Exposure (X)				Reference Effective Dose per Screening (max 25 µrem):	mm Al	Exposure (X)						
	"Front" Side		"Back" Side				"Front" Side	"Back" Side					
1	6.44	µR	6.24	µR	2.09	0	0.94	µR	0.91	µR	HVL "Front" Side	1.1	mm Al
2	6.51	µR	6.37	µR	or	0	0.94	µR	0.87	µR	HVL "Back" Side	1.2	mm Al
3	6.57	µR	6.37	µR	0.0209	1	0.47	µR	0.47	µR	Conversion Factor	0.128	
4	6.57	µR	6.44	µR	RESULT	1	0.54	µR	0.54	µR	‡Minimum Filtration	1.0	mm Al
5	6.58	µR	6.37	µR	PASS	1.5	0.34	µR	0.34	µR	RESULT	PASS	
AVG	6.53	µR	6.36	µR		1.5	0.34	µR	0.34	µR			
Energy Correction Factor	1.25												

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
All exposure measurements made with instrument #1/#2 combination.
‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	FIS, AIT B "Bravo"		
Survey Date	2 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY

INSTRUMENTS USED				SYSTEM INFORMATION				
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51005003	Feb. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	26 May 2010		

VISUAL INSPECTION					
Y	N	Requirement	Y	N	Requirement
X		Key activated control with key capture? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X		X-ray emission terminates after a present time or exposure? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.e)
	X	Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X		Operators have a clear view of the scanning area? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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? (21 CFR 1020.31(j); 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.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
 "Back" Side measurements made at location "B".
 *Individual scan measurements (µR) at locations:

1:	0.00, 0.00, 0.00
2:	0.00, 0.00, 0.00
3:	0.00, 0.00, 0.00
4:	0.00, 0.00, 0.00

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING				BEAM QUALITY						
Trial	Exposure (X)		Reference Effective Dose per Screening (max 25 µrem):	mm Al	Exposure (X)		HVL "Front" Side	HVL "Back" Side	Conversion Factor	‡Minimum Filtration
	"Front" Side	"Back" Side			"Front" Side	"Back" Side				
1	5.50 µR	5.16 µR	1.70 µrem or 0.017 µSv RESULT PASS	0	1.27 µR	1.18 µR	1.1 mm Al	1.0 mm Al	RESULT PASS	
2	5.50 µR	5.23 µR		0	1.27 µR	1.21 µR	1.024			
3	5.50 µR	5.23 µR		1	0.67 µR	0.60 µR	1.0 mm Al			
4	5.50 µR	5.24 µR		1	0.67 µR	0.60 µR				
5	5.50 µR	5.23 µR		1.5	0.54 µR	0.47 µR				
AVG	5.50 µR	5.22 µR	1.5	0.54 µR	0.47 µR					
Energy Correction Factor	1.25									

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
 All exposure measurements made with instrument #1/#2 combination.
 *Individual scan measurements at locations 1-4 were made on 9-10 Jun 2010.
 ‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Worksheet - AIT X-Ray Systems

Health Physics Program

U.S. Army Public Health Command (Provisional)

Aberdeen Proving Ground, Maryland 21010-5403

SURVEY DATA				SURVEY LOCATION			
Project No.	26-MF-TSAX-CVG-10			Location	FIS, AIT C "Charlie"		
Survey Date	2 Nov 2010			Organization	Cincinnati/Northern Kentucky International Airport		
Surveyor(s)	[REDACTED]			Street Address	2939 Terminal Drive		
				City/Installation	Hebron	State	KY
					ZIP	41048	

INSTRUMENTS USED					SYSTEM INFORMATION			
	Manufacturer	Model	Serial No.	Cal. Due	Manufacturer	Model	Serial No.	Manuf. Date
Instrument #1	Radcal	9010	90-3291	20 May 2011	Rapiscan	Secure 1000SP	S51005004	Feb. 2010
Instrument #2	Radcal	10X5-1800	10302	29 Jan 2011	Certified	NA	Place of Manufacture	Torrance, CA
Instrument #3	WB Johnson	TVX-2000	40036	†resp cked	Manufacturer Survey Date	25 May 2010		

VISUAL INSPECTION			
Y	N	Requirement	Y N
X		Key activated control with key capture? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.1.c)	X
			X
X		"Caution: X-Rays Produced When Energized" label present at control to initiate scan? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.d)	X
			X
X		Technique factors preset for each mode of operation? (21 CFR 1020.31(j); ANSI N43.17-2009, paragraph 7.2.2.b)	X
			X
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
			X
X		Means to terminate emission of radiation other than an interlock? (ANSI N43.17-2009, paragraph 7.2.1.e)	X
			X
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.

SURVEY DIAGRAM

"Front" Side measurements made at location "F".
"Back" Side measurements made at location "B".

Inspection Zone Boundary Operator's Position

Accessible exterior surfaces of cabinet scanned with Instrument #3. All scanning results below action levels? Yes No (If no, explain below)

DOSE PER SCREENING					BEAM QUALITY						
Trial	Exposure (X)				Reference Effective Dose per Screening (max 25 µrem):	mm Al	Exposure (X)				HVL "Front" Side
	"Front" Side	"Back" Side					"Front" Side	"Back" Side			
1	5.50	5.78			1.77	0	0.80	1.61		1.1	
2	5.43	5.76			or	0	0.80	1.61		1.1	
3	5.57	5.76			0.0177	1	0.40	0.84		0.123	
4	5.49	5.77			µSv	1	0.47	0.87		1.0	
5	5.63	5.76			RESULT	1.5	0.27	0.60		PASS	
AVG	5.52	5.77			PASS	1.5	0.34	0.60			
Energy Correction Factor	1.25										

COMMENTS AND RECOMMENDATIONS

†resp cked = instrument was response checked before survey.
All exposure measurements made with instrument #1/#2 combination.
‡For this system 1 mm Al filtration is approximately equal to 1 mm Al HVL.

Survey Notes Provided on June 11, 2010

Exit Briefing Notes

1. Project Information.

- a. Radiation Protection Survey No. 26-MF-TSAX-CVG-10
- b. Survey dates: 9-11 June 2010
- c. Cincinnati / Northern Kentucky International (CVG), Hebron, KY
- d. Survey Officer(s): [REDACTED] CHP and [REDACTED], CHP

2. Background Information.

- a. TSA Headquarters Contact: Jill Segraves, Director, Occupational Safety, Health, and Environment (OSHE), [REDACTED]
- b. Airport Contact: Bill Lewis, Customer Support and Quality Improvement Manager, Phone: [REDACTED]
- c. Individuals assisting the survey team:

Name	Title/Position
Janet Lang	STSO, Safety Action Team Member
Frank Sedarat	TSO
Valentina Irons	TSO
Thomas J. Headley	TSO
Mark Turner	LTSO

d. Cabinet x-ray systems surveyed:

Model	Serial No.	Location
Rapiscan Secure 1000SP	S51005005	Terminal 2, AIT A
Rapiscan Secure 1000SP	S50949003	Terminal 3, AIT B
Rapiscan Secure 1000SP	S51003014	Terminal 3, AIT C
Rapiscan Secure 1000SP	S51003015	Terminal 3, AIT D
Rapiscan Secure 1000SP	S51005001	Terminal 3, AIT E
Rapiscan Secure 1000SP	S51005002	FIS, AIT A
Rapiscan Secure 1000SP	S51005003	FIS, AIT B
Rapiscan Secure 1000SP	S51005004	FIS, AIT C
InVision CTX 5500	C460	Terminal 2, Baggage East
L3 Communication 3DX6000	6317	Terminal 2, Baggage West
InVision CTX 5500	C612	Terminal 3, T Drive

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Model	Serial No.	Location
Smiths Detection 6040aTiX	78502	Terminal 2, Checkpoint, Lane 2
Smiths Detection 6040aTiX	78926	Terminal 3, Checkpoint, Lane 3
Smiths Detection 6040aTiX	78656	Terminal 3, Checkpoint, Lane 4
Heimann Systems HS-6040i	23404	Terminal 3, Checkpoint, Lane 5
Heimann Systems HS-7555i	23331	Terminal 3, Checkpoint, Lane 6
Heimann Systems HS-7555i	40274	Terminal 3, Checkpoint, Lane 7
Heimann Systems HS-7555i	20756	Terminal 3, Checkpoint, Lane 8
Heimann Systems HS-6040i	23406	Terminal 3, Checkpoint, Lane 9
Heimann Systems HS-6040i	40184	Terminal 3, Checkpoint, Lane 10
Heimann Systems HS-7555i	20750	FIS, Checkpoint, Lane 3
Heimann Systems HS-7555i	20751	FIS, Checkpoint, Lane 4

3. Findings and Recommendations.

a. X-Ray Personnel Screening Systems.

(1) All x-ray personnel screening systems 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 were found to be in compliance with the other requirements of ANSI/HPS N43.17-2009, with the following exception - the warning label "Caution: X-Rays Produced when Energized" was not present at the location where scans can be initiated for all Rapiscan Secure 1000SP systems.

b. Cabinet X-Ray Systems.

(1) All systems were found to be in compliance with the radiation emission limits of Title 21, Code of Federal Regulations, Section 1020.40.

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c. All systems were found to be in compliance with the other requirements of Title 21, Code of Federal Regulations, Section 1020.40, with the following exceptions:

(1) Smith Detection 6040aTiX, SN 78926, Terminal 3, Checkpoint, Lane 3: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(2) Smith Detection 6040aTiX, SN 78656, Terminal 3, Checkpoint, Lane 4: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(3) Heimann Systems HS-6040i, SN 23404, Terminal 3, Checkpoint, Lane 5: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(4) Heimann Systems HS-7555i, SN 23331, Terminal 3, Checkpoint, Lane 6: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(5) Heimann Systems HS-7555i, SN 40274, Terminal 3, Checkpoint, Lane 7: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(6) Heimann Systems HS-7555i, SN 20756, Terminal 3, Checkpoint, Lane 8: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(7) Heimann Systems HS-6040i, SN 23406, Terminal 3, Checkpoint, Lane 9: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(8) Heimann Systems HS-7555i, SN 20750, FIS, Checkpoint, Lane 3: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

(9) Heimann Systems HS-7555i, SN 20751, FIS, Checkpoint, Lane 4: Control panel warning label "Caution: X-Rays Produced when Energized" was not present.

d. The following items were also noted during the surveys:

(1) Invision CTX 5500, SN C460, Terminal 2, Baggage East: Maintenance service provider survey date not posted on system.

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(2) InVision CTX 5500, C612, Terminal 3, T Drive: "X-ray on" light inoperable at entrance port opposite from the operator's table. Maintenance service provider survey date not posted on system.

(3) Heimann Systems HS-6040i, SN 23404, Terminal 3, Checkpoint, Lane 5: "X-ray on" light inoperable at entrance port on passenger side.

(4) Heimann Systems HS-7555i, SN 20756, Terminal 3, Checkpoint, Lane 8: "X-ray on" light inoperable at entrance port on passenger side.

4. Discussion.

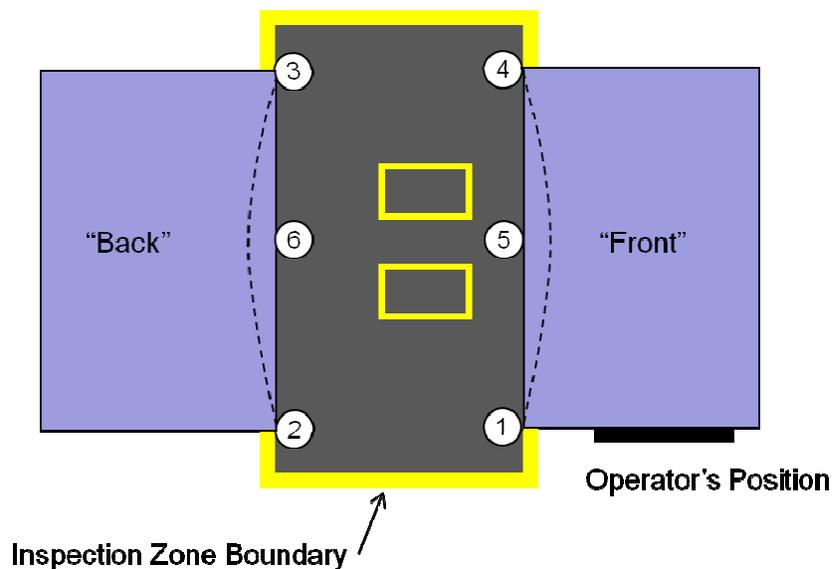
a. Based on measurements at the inspection zone boundary it is estimated that an individual would need to be present at the inspection zone boundary for 1,000,000 screenings in one year to reach the public dose limit. Assuming 600 screening are accomplished each hour, then a TSO would need to be at the inspection zone boundary for 1666 hours of the work year to reach the public dose limit.

b. Longer term measurements using area dosimeters on Terminal 2, AIT A and Terminal 3, AIT B are underway and will be used to refine the above estimates. The area dosimeters will be collected in approximately one month. The measurement data from the area dosimeters along with the number of screenings on each of the two monitored systems over this time period will be used to refine the estimates.

Preliminary AIT Dosimetry Data

CVG AIT Preliminary Dosimetry Results

Landauer Optically Stimulated Luminescence (OSL) dosimeters were deployed at CVG on Rapiscan Secure 1000SP systems from 10 June 2010 to 8 July 2010; however, the control (background) subtracted results have not been received from Landauer (although the control dosimeters were identified to Landauer about the time the dosimeters were returned). A second set of Landauer OSL dosimeters was deployed on Rapiscan Secure 1000SP systems at CVG from 8 July 2010 to 15 September 2010. The results of these dosimeters, with an appropriate control (background) subtracted, have been received from Landauer. Two systems were monitored – each with six OSL dosimeters. The locations of the six dosimeters are shown (numbers 1 through 6) in the diagram below. Dosimeters at locations 1-4 were mounted on the metal “wings” of the system approximately 1 meter from the floor. Dosimeters at locations 5 and 6 were mounted on the metal frames at the top of the system. All dosimeters were placed in a plastic bag before mounting on the system (facing the radiation source). The bag was attached to the system with tape and a custody seal to prevent tampering. Neither the tape nor the custody seal covered the face of the dosimeter.



The numbers of screenings performed while the dosimeters were mounted on the two systems were recorded. From 8 July 2010 to 15 September 2010 one of the monitored systems had performed a total of 49,905 screenings (Terminal 3, AIT “B”), the other only 6,329 (Terminal 3, AIT “C”) system had been down intermittently).

Landauer reports three doses, in millirem (mrem), for each dosimeter:

- 1) Whole body or Deep Dose Equivalent (DDE)
- 2) Lens of the eye or Lens Dose Equivalent (LDE)
- 3) Skin or Shallow Dose Equivalent (SDE)

Dose equivalents below the minimum measurable quantity are reported as “M” in the Landauer reports. Landauer’s minimum measurable quantity is 1 mrem. The OSL dosimeter results for the two systems are provided in the table below.

System Location#	DDE (mrem)	LDE (mrem)	SDE (mrem)
Terminal 3, AIT “B” #1	17	17	14
Terminal 3, AIT “B” #2	10	10	16
Terminal 3, AIT “B” #3	9	24	44
Terminal 3, AIT “B” #4	13	18	26
Terminal 3, AIT “B” #5	18	38	67
Terminal 3, AIT “B” #6	16	40	66
Terminal 3, AIT “C” #1	M	1	4
Terminal 3, AIT “C” #2	M	M	M
Terminal 3, AIT “C” #3	M	1	5
Terminal 3, AIT “C” #4	M	M	1
Terminal 3, AIT “C” #5	M	1	3
Terminal 3, AIT “C” #6	M	M	M

For the Terminal 3, AIT “B” system with 49,905 screenings, the DDE inside the inspection zone at the 4 edges of the metal “wings” (locations 1 through 4) ranged from 9 to 17 mrem. Assuming a screening is accomplished in 6 seconds, then to reach an annual 100 mrem DDE would require an individual to be standing inside the inspection zone at the wing edge from 489 hours ($49,905 \text{ screenings} / 17 \text{ mrem} * 100 \text{ mrem yr}^{-1} * 6 \text{ sec screening}^{-1} / 3600 \text{ sec hr}^{-1}$) to 924 hours ($49,905 \text{ screenings} / 9 \text{ mrem} * 100 \text{ mrem yr}^{-1} * 6 \text{ sec screening}^{-1} / 3600 \text{ sec hr}^{-1}$) in a year. The LDEs range from 1 to 2.6 times the DDE and the SDEs range from less than 1 to 4.1 times the DDE.

The DDE at the edge of the metal “wings” ranges from 0.00018 mrem to 0.00034 mrem per screening. Measurements of the exposure per screening were made just outside the metal “wings” at the inspection zone boundary approximately 1 meter from the floor. These measurements were made on several of the systems when individuals were being screening. (See survey sheets in Enclosure 2.) The per-screening exposure measurements range from 0.0 microrentgen (μR) per screening to 0.14 μR (or 0.00014 milliroentgen, mR) per screening. The per screening exposure measurements just outside the metal “wings” are lower than the OSL dosimeter measurements at locations 1 through 4 (assuming 1 mR is approximately equal to 1 mrem). These results are consistent because the field per screening exposure measurements are further from the source and should be lower than the “wing” OSL measurements.

These CVG preliminary dosimetry results were collected to determine the number of screenings that would be required to evaluate doses due to scattered radiation outside the inspection zone (potential doses to TSOs). An OSL dosimeter study to further document the scattered radiation outside the inspection zone is expected to be performed in the first quarter of 2011 at the Transportation Systems Integration Facility at Ronald Reagan Washington National Airport. Any effects on the dose measurements

due to mounting the OSL dosimeters in plastic bags will also be evaluated as part of the study.