

**CALIBRATION CERTIFICATE** issued by an Accredited Calibration Laboratory

Upstate Medical Physics  
1290 Blossom Drive  
14564 VICTOR, NY  
United States

Product:	Xi
Model:	R/F
Serial Number:	183689

**R/F Arrival Check:**

Date: 01-15-15

**R/F Calibration Certificate:**

Date: 01-21-15

**Calibration Equipment List**

*Your instrument has passed several strict tests and has been approved for delivery.  
Enclosed you will find detailed documents for your instrument.*



This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this certificate have been determined within the scope of accreditation unless stated otherwise in this certificate.

This certificate may not be reproduced other than in full, except with the prior written approval of Unfors RaySafe.

# Arrival Check

Xi R/F

Date of Arrival Check:	01-15-15	Product:	Xi
Serial Number:	183689	Model:	R/F

## Measurement Details, As Found:

### kVp

Total Filtration = 2.5 mm Al

R/F Low				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. kVp	Xi kV	Tolerance *) 3,1%
50	32	50,41	50,37	-0,1%
70	16	70,43	69,91	-0,7%
100	8	100,4	100,5	0,1%
150	5	150,2	150,8	0,4%

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. kVp	Xi kVp	Tolerance *) 3,1%
50	51	50,41	50,11	-0,6%
70	26	70,43	70,44	0,0%
100	10	100,4	100,4	0,0%
150	5	150,2	150,1	-0,1%

### Dose

Total Filtration = 2.5 mm Al

R/F Low				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. Dose μGy	Xi Dose μGy	Tolerance *) 6,6%
50	32	320,4	320,0	-0,1%
70	16	210,3	212,1	0,9%
100	8	205,3	208,2	1,4%
150	5	337,9	337,2	-0,2%

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. Dose μGy	Xi Dose μGy	Tolerance *) 6,6%
50	51	5647	5705	1,0%
70	26	2911	2964	1,8%
100	10	2582	2632	1,9%
150	5	4612	4616	0,1%

### Time (Non-Accredited)

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set ms	Ref. Time ms	Xi Time ms	Tolerance *) 0,5%
70	320	320,2	320,9	0,2%

\*) The tolerance is calculated as the manufacture specification plus the expanded uncertainty. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , which for a normal distribution provides a level of confidence of approximately 95%. (EA-4/02 (Expression of the Uncertainty of Measurement in Calibration) and ISO/IEC Guide 98-3:2008 (Guide to the Expression of Uncertainty in Measurement)). For further details regarding the arrival check tolerances, please refer to enclosed "Information on Assessment of Compliance with Specification".

# Certificate of Calibration

## Xi R/F

Date of Calibration:	01-21-15	Product:	Xi
Serial Number:	183689	Model:	R/F

### Measurement Details, As Left:

#### kVp

Total Filtration = 2.5 mm Al

R/F Low				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. kVp	Xi kV	Deviation
50	32	50,24	50,26	0,0%
70	16	70,25	70,80	0,8%
100	8	100,3	100,2	-0,1%
150	5	150,1	151,1	0,7%
Active Compensation Total Filtration = 2.5 + 10 mm Al				
100	16	100,3	100,1	-0,1%

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. kVp	Xi kVp	Deviation
50	51	50,24	50,14	-0,2%
70	26	70,25	70,18	-0,1%
100	10	100,3	99,96	-0,3%
150	5	150,1	149,9	-0,1%
Active Compensation Total Filtration = 2.5 + 10 mm Al				
100	16	100,3	99,52	-0,7%

#### Dose

Total Filtration = 2.5 mm Al

R/F Low				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. Dose $\mu$ Gy	Xi Dose $\mu$ Gy	Deviation
50	32	365,5	361,0	-1,2%
70	16	228,9	231,5	1,1%
100	8	220,1	222,4	1,1%
150	5	302,7	299,3	-1,1%
Active Compensation Total Filtration = 2.5 mm Al + 26 mm Al				
80	64	142,5	143,6	0,8%

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. Dose $\mu$ Gy	Xi Dose $\mu$ Gy	Deviation
50	51	5968	5925	-0,7%
70	26	3081	3110	0,9%
100	10	2280	2307	1,2%
150	5	3989	3970	-0,5%
Active Compensation Total Filtration = 2.5 + 26 mm Al				
80	102	994,3	997,4	0,3%

#### HVL

(Non-Accredited)

Total Filtration = 2.5 mm Al

R/F Low				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. HVL mm Al	Xi HVL mm Al	Deviation
70	16	2,61	2,55	-2,4%

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set mAs	Ref. HVL mm Al	Xi HVL mm Al	Deviation
70	26	2,61	2,62	0,1%

#### Time

(Non-Accredited)

Total Filtration = 2.5 mm Al

R/F High				
Generator Settings		Measurements		
Set kVp	Set ms	Ref. Time ms	Xi Time ms	Deviation
70	320	320,3	320,8	0,2%

#### RF Low Specification:

kV/kVp for <0.5mm Cu  $\pm$  2%, for >0.5mm Cu  $\pm$  3%, Dose  $\pm$  5%,  
HVL  $\pm$  10% or  $\pm$  0.2 mm Al, Time  $\pm$  0.5% or  $\pm$  0.2 ms,  
Total Filtration  $\pm$  10% or 0.2mm Al

#### RF High Specification:

kV/kVp for <0.5mm Cu  $\pm$  2%, for >0.5mm Cu  $\pm$  3%, Dose  $\pm$  5%,  
HVL  $\pm$  10% or  $\pm$  0.2 mm Al, Time  $\pm$  0.5% or  $\pm$  0.2 ms,  
Total Filtration  $\pm$  10% or 0.2mm Al

For further specification details, please refer to your Xi Manual.

## Calibration Equipment

Date of Calibration(s):	01-21-15	Product:	Xi
Serial Number:	183689	Model:	R/F

The listed equipment below were used as main references for the calibration

	R/F Arrival Check	R/F Calibration		
GENERATOR	CPI Indico 100	CPI INDICO 100		
WAVEFORM TYPE	HF	HF		
ANODE/FILTER	W / 2.5 mm Al	W / 2.5 mm Al		
FIELD SIZE	10 x10 cm	10 x 10 cm		
FDD	R/F Low: 200/100 cm R/F High: 50 cm	R/F Low: 200/100 cm R/F High: 50 cm		

	R/F Arrival Check	Calibration Date	R/F Calibration	Calibration Date				
REFERENCE SYSTEM <b>DOSE</b>	Unfors Xi S/N: 183952	2014-11-22	Unfors Xi S/N: 183949	2014-10-14				
REFERENCE SYSTEM <b>kV</b>	CPI Indico 100 S/N: AM13295D10  Varian A196 S/N: 93085-S4	09-10-14	CPI Indico 100 S/N: AM14818G11  Varian A196 S/N: 28582-N2	03-12-14				
REFERENCE SYSTEM <b>TIME</b>	Unfors Xi S/N: 183952	2014-09-11	Unfors Xi S/N: 183949	2014-03-12				

The expanded uncertainties for the presented deviations are:

R/F: kVp: 1,1%      Dose: 1,6% (without added filtration), 1,5% (with added filtration)  
Mammo: kVp: 0,8%      Dose: 2,4 % (< 1 mm added Al-filtration), 3,0% (> 1 mm added Al-filtration)

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , which for a normal distribution provides a level of confidence of approximately 95%. (EA-4/02 (Expression of the Uncertainty of Measurement in Calibration) and ISO/IEC Guide 98-3:2008, Guide to the Expression of Uncertainty in Measurement (GUM))

All reference systems are calibrated once a year. kV systems are calibrated by the Swedish National Testing and Research Institute and are traceable to PTB. All dose systems are calibrated by PTB and are traceable to NIST on available beam qualities. NIST does not currently have traceable dose standards for the W/Rh, Mo/Rh (2 mmAl), Rh/Al and Mo/Al beam qualities. Unfors RaySafe certifies the W/Rh, Mo/Rh, Rh/Al, Rh/Rh and Mo/Al (if applicable) beam quality measurements, made with this Xi, to be accurate within its published specifications.

Xi is calibrated according to FDA MQSA requirements.

Unfors RaySafe calibration method: "Calibration method for kV meters ACCR-0454" and/or "Calibration method for Air Kerma ACCR-0453".

### Calibration Condition:

Ambient Temperature: 59-86°F  
Relative Humidity: <80%

Tested by: Sean Stockbridge

Approved by:

  
Jay Desrochers  
Logistics Coordinator

### UNFORS RaySafe Inc.

86 South Street, Suite A, Hopkinton, MA 01748  
Phone: (508) 435-5600. FAX: (508) 435-5665  
customerservice.us@raysafe.com. www.RaySafe.com

Certificate No.: 190566-01212015

## Certificate of Calibration

Upstate Medical Physics  
1290 Blossom Drive  
VICTOR, NY 14564  
United States

Product:	Xi
Model:	Light
Serial Number:	190566

**Light Arrival Check:** Date: 01-21-15

**Light Calibration Certificate:** Date: 01-21-15

**Calibration Equipment List**

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# Arrival Check

## Xi Light Detector

Date of Arrival Check:	01-21-15	Product:	Xi
Serial Number:	190566	Model:	Light

### Measurement Details, As Found:

#### Luminance

Measurements		
Ref. Value (cd/m <sup>2</sup> )	Xi value (cd/m <sup>2</sup> )	Tolerance *)
5,031	4,974	-1,1%
998,0	974,1	-2,4%

#### Illuminance

Measurements		
Ref. Value (lux)	Xi value (lux)	Tolerance *)
199,2	196,9	-1,1%

Luminance measured with Xi setting at Luminance CRT

\*) The tolerance is calculated as the manufacture specification plus the expanded uncertainty. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , which for a normal distribution provides a level of confidence of approximately 95%. (EA-4/02 (Expression of the Uncertainty of Measurement in Calibration) and ISO/IEC Guide 98-3:2008 (Guide to the Expression of Uncertainty in Measurement)).  
For further details regarding the arrival check tolerances, please refer to enclosed "Information on Assessment of Compliance with Specification".

# Certificate of Calibration

## Xi Light Detector

Date of Calibration:	01-21-15	Product:	Xi
Serial Number:	190566	Model:	Light

### Measurement Details, As Left:

#### Luminance

Measurements		
Ref. Value (cd/m <sup>2</sup> )	Xi value (cd/m <sup>2</sup> )	Deviation
5,001	5,040	0,8%
1000	1006	0,6%
2997	3008	0,4%

#### Illuminance

Measurements		
Ref. Value (lux)	Xi value (lux)	Deviation
198,7	197,3	-0,7%

Luminance measured with Xi setting at Luminance CRT

RaySafe Xi Light Specification:  
Luminance  $\pm 3\%$  and Illuminance  $\pm 3\%$

For further specification details, please refer to your RaySafe Xi Light Manual.

# Calibration Equipment

<b>Date of Calibration:</b>	01-21-15	<b>Product:</b>	Xi
<b>Serial Number:</b>	190566	<b>Model:</b>	Light

The listed equipment below were used as main references for the calibration

Reference System	Calibration Date
<p>OL 462 Controller, S/N: 07407138</p> <p>OL 462-8U Integrating Sphere Calibration Standard, S/N: 07202011</p> <p>Opal Diffuser, S/N: 07202011-A</p>	02-06-14

The expanded uncertainties for the presented deviations are:

Luminance: 1.5%

Illuminance: 1.2%

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , which for a normal distribution provides a level of confidence of approximately 95%. (EA-4/02 (Expression of the Uncertainty of Measurement in Calibration) and ISO/IEC Guide 98-3:2008 (Guide to the Expression of Uncertainty in Measurement))

The reference instruments are traceable to NIST providing traceability to international standards

## Calibration Condition:

Ambient Temperature: 59-86°F

Relative Humidity: <80%

Tested by: Doyle Spencer

Approved by:

  
Jay Desrochers  
Logistics Coordinator

Unfors RaySafe Inc.

86 South Street, Suite A

Hopkinton, MA 01748

Phone: (508) 435-5600

FAX: (508) 435-5665

service@unfors.com. www.unfors.com