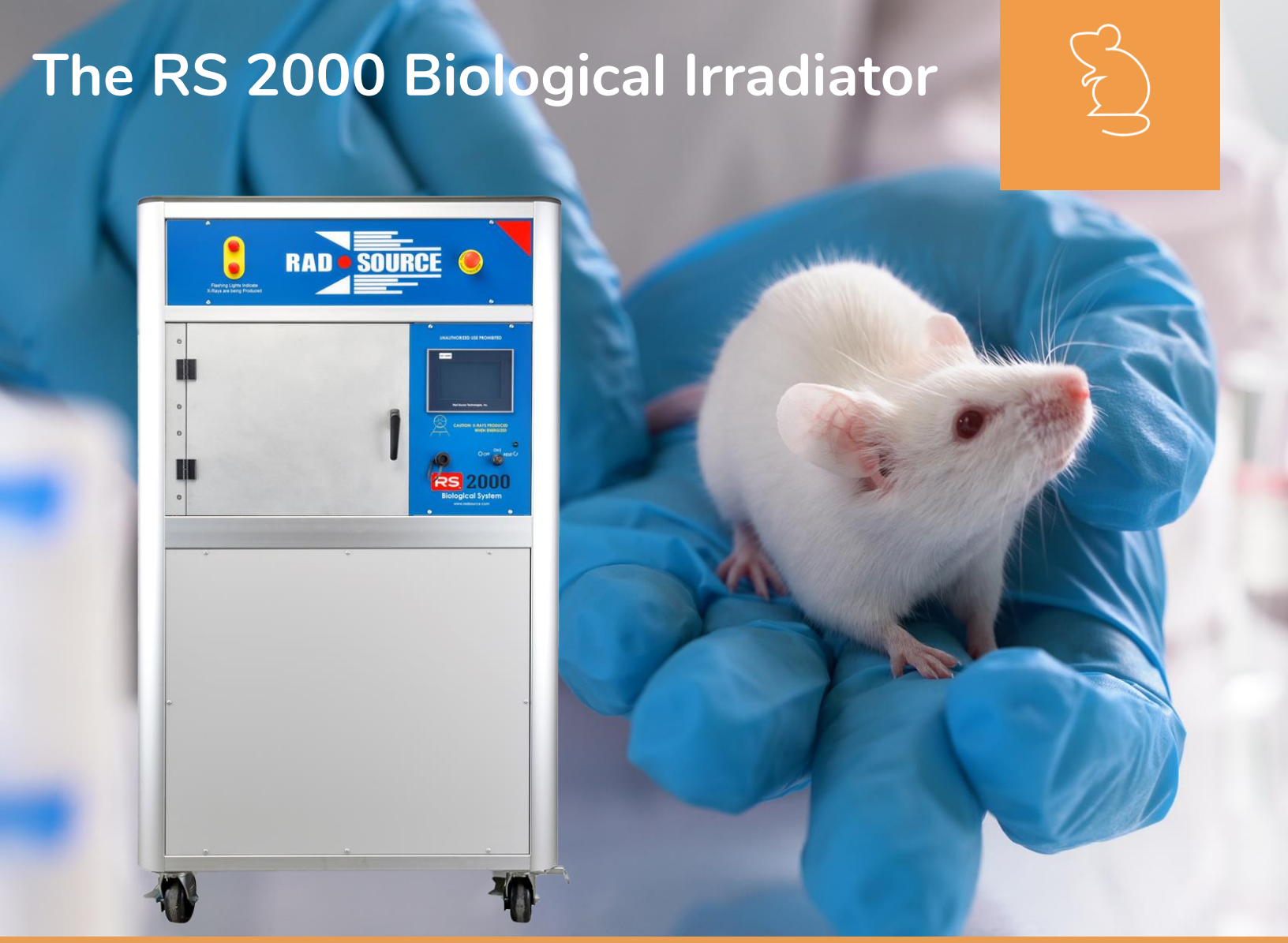
# The RS 2000 Biological Irradiator




## Dose Uniformity of 95% or Greater

## The Industry Standard for Whole Body Small Animal Irradiation

animal

### X-Ray Designed for Life Science™

Rad Source irradiators are designed for life science and provide scientists with the research tools and flexibility for many advantageous configurations for optimal and consistent dose uniformity and dose rates.

### RADPlus™ Research Solutions

Patented RADPlus Research tools are engineered to reduce animal stress while ensuring beam uniformity of 95% or higher and will not cause skin burns to the animal. Animals stay in their cages, which also reduces cross-contamination.

### Unmatched Service and Support Footprint

With more than 1000 irradiator installs in renowned hospitals, universities, pharma, government and life science institutions world-wide, Rad Source is a proven and reliable x-ray manufacturer with unmatched services.

*CE marked



## The RS 2000 Biological Irradiator

### X-Ray Designed for Life Science

Rad Source biological irradiators are designed for cancer and immunology research applications such as myeloablation, cell arrestment and more. Researchers need cost effective and flexible irradiation solutions for many applications that require high dose uniformity and dose rates.

The RS 2000 was developed in 1999 as a Cesium-137 replacement device for the research irradiation of small animals, cells, tissue and more. The RS 2000 uses a form of filtration specifically designed for small animal irradiation, mA combinations plus patented RADPlus Research Solutions that prevent skin burns at a higher kV.

**RADPlus Solutions - Engineered for Life Science™**

- Engineered to optimize dose rate and dose uniformity.
- Proprietary material developed for animal comfort and safety.
- Superior dose uniformity reduces stress on the animals and allows them to comfortably move in their cage during treatment.
- Animals can be irradiated in their own personal cages, which reduces potential for cross-contamination.

**Multi-level Chamber Exposure System with Guides**

- 6 -level exposure chamber with manually adjustable shelf provides flexibility in the height placement of the specimen.
- Components need to be placed within the ring that corresponds to the shelf number in order to receive optimal and uniform dosing.

**Instrument Portability**

- Mounted on sturdy castor wheels for flexible placement and improved workflow efficiency.

**Direct Replacement for Nuclear Source Irradiators**

- The beam quality within the system is considered by the FDA to be equivalent to Cesium-137 gamma irradiators for the irradiation of blood and blood products.

**No Radioactive Source – No Ongoing Regulatory Hassles**

- No Nuclear Regulatory Commission (NRC) License required.
- No nuclear disposal requirements.
- No additional security requirements.
- No additional safety equipment for laboratory staff.
- Meets Fed. Reg. 21 CFR 1020.40. safety requirements.

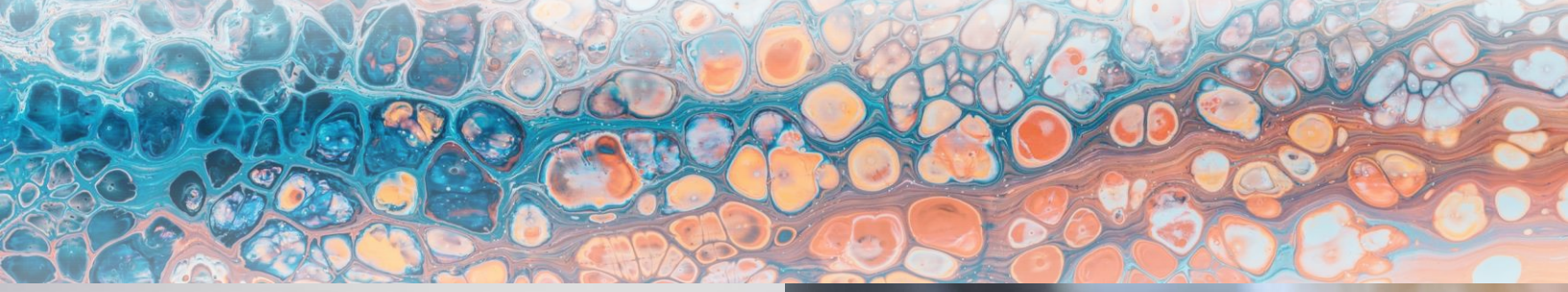
*Disclaimer: Regulations subject to change.*
*Check with local radiation safety experts to confirm requirements.*

## Rad Source in Action

Our patented x-ray irradiation technology is validated and widely used to configure the immune systems of laboratory animals so they can be used in cancer and immunology research. Cancer and immunology researchers often use laboratory animals with a modified immune system as a preliminary way to study the behavior of human cancer cells, and the potential for success of new cancer therapies. Researchers also use lab animals to study the effects of stem cells and bone marrow transplantation, and immune system function in response to disease before they are tested in humans.

To prepare these laboratory animals for human-simulated experiments, their original immune system needs to be either weakened or completely destroyed and then reconstructed with human immune cells.

This is achieved through the application of ionizing radiation, and our patented x-ray irradiation technology is the gold-standard for this application.








## RADPlus+ Rectangle

### Sensitive Stress-Free Treatment Solutions

- Ensures optimal and consistent dosing of the animal(s) being irradiated on the cage floor.
- Allows for convenient dosing of small animals – users are not required to sedate or trap mice in a particular spot due to optimal flatness across the mouse cage.
- Animals stay in their cages, minimizing risk of cross-contamination.
- Functions as a placeholder for standard Innovive disposable cages.

**160 kV Irradiator**

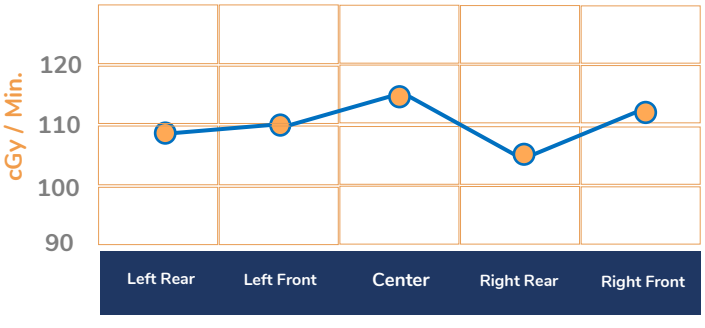
- Min DR: 1.0 Gy
- Flatness: 95%

**225 kV Irradiator**

- Min DR: 1.4 Gy/min
- Flatness: 95%




**ENGINEERED FOR ANIMAL COMFORT**




Note: *The Rectangle is designed to be used on the floor of the chamber for optimal performance.*

**ENGINEERED FOR ANIMAL COMFORT**

## RADPlus+ Research Tools

Patented RadPlus material aids in uniform dosing which ensures optimal and consistent dosing of the specimen being irradiated as compared to dosing in the absence of the RADPlus tool.

RADPlus Research Solutions provide up to 97% flatness and a range of 1.05 – 2.5 Gy/min dose rate.

The RADPlus Research Tool collection has been engineered to be compatible with the RS 2000 Biological Irradiator and consists of:

- RADPlus™ Vial Holder
- RADPlus™ Well-Plate Holder
- RADPlus™ Petri Dish Holder
- RADPlus™ Rectangle
- RADPlus™ Round





RS# 1402272

# RADPlus+ Petri Dish Holder

**Increases dose rate and uniformity with petri dishes.**

Holds (3) standard petri dish sizes and up to (14) smaller sized petri dishes.

- 100 x 15mm
- 60 x 15mm
- 35 x 10mm

| Solution | Dose Rate (Gy/min) | Flatness |
|---|---|---|
| 160 kV | 1.05 | 95% |
| 225 kV | 2.00 | 95% |

*Note: Must be placed at the center of the floor of the chamber with the assistance of the spacer provided for the Round and/or Rectangle.*

# RADPlus+ Well Plate Holder

**Increases dose rate and uniformity with well plates.**

- Compatible with standard size 24 and 96 well plates
- Provides flexibility in dose rate; can be used on all 3 shelf levels
- Manually adjustable aluminum plate: 3-level positions

| 160 kV | Dose Rate (Gy/min) | Flatness |
|---|---|---|
| Shelf 3 | 2.2 | 85% |
| Shelf 2 | 1.7 | 90% |
| Shelf 1 | 1.3 | 95% |

| 225 kV | Dose Rate (Gy/min) | Flatness |
|---|---|---|
| Shelf 3 | 2.5 | 85% |
| Shelf 2 | 1.9 | 90% |
| Shelf 1 | 1.5 | 95% |


RS#1402273



RS# 1402270

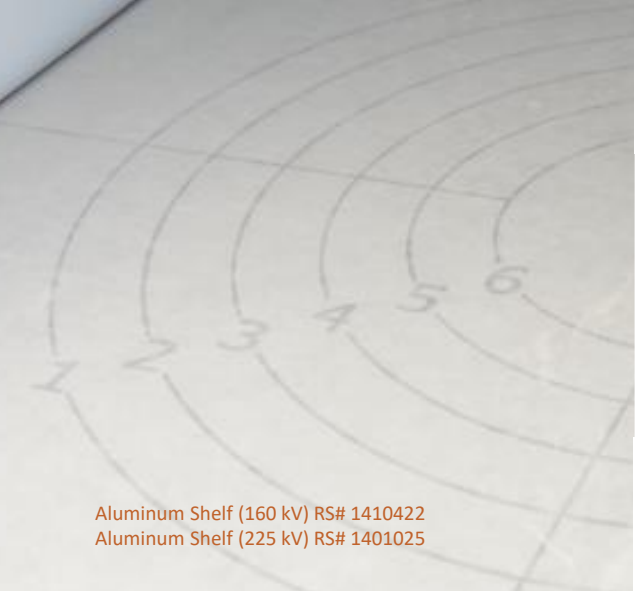
# RADPlus+ Vial Holder

**Engineered design provides optimal and uniform vial dosing.**

- Compatible with vials, sizes 2 mL - 50 mL
- Vial holding inclination angle serves to better position the target in the radiation field for optimal dosing.

| 160 kV Irradiator | 225 kV Irradiator |
|---|---|
| • Dose Rate: 1.1 Gy/min<br>• Flatness: 97% | • Dose Rate: 2.2 Gy/min<br>• Flatness: 97% |

*Note: Only to be used on the floor of the chamber. Use the rings on the Aluminum shelf to position the Vial Holder exactly in the center of the field.*



Aluminum Shelf (160 kV) RS# 1410422
Aluminum Shelf (225 kV) RS# 1401025

# Aluminum Shelf

**Manual dose rating guides by location built into chamber**

- Functions as a placeholder for the RADPlus Well Plate Holder (can be placed on shelf levels 1, 2 or 3), and positioning tool for the RADPlus Vial Holder. Components can also be placed directly on the aluminum shelf.
- Allows more flexibility in dose rate choices as components such as petri dishes and well plates can be placed directly on all (6) six shelves.
- Components need to be placed within the circular guiding ring that corresponds to the shelf number in order to receive optimal and uniform dosing.
- Flatness within each ring of its corresponding shelf is 80% or higher.
- Lower shelf levels correspond to larger rings leaving space for more components; the higher the shelf, the higher the dose rate.

## Aluminum Shelf Dose Rates by Shelf Level

| Plates and Rings | | 160 kV | 225 kV |
|---|---|---|---|
| Ring Size (dia. in.) | Chamber Plate Level | Dose Rate (Gy/Min @ Center) | Dose Rate (Gy/Min @ Center) |
| 4.38 | 6 | 8.5 | 11.5 |
| 6.31 | 5 | 4.5 | 6.5 |
| 8.13 | 4 | 2.8 | 4.1 |
| 9.86 | 3 | 2.0 | 2.8 |
| 11.68 | 2 | 1.4 | 2.0 |
| 13.50 | 1 | 1.1 | 1.5 |

## RADPlus Round

**Increases dose rate and optimizes uniformity with small animal cages**

- Circular cages are designed to keep mouse in place using the pie wedge design.
- A perfect placeholder for round animal cages allowing for optimal and uniform dosing of small animals.
- Allows for convenient dosing of small animals –users do not have to sedate or trap mice in a particular spot due to optimal flatness across the mouse cage.
- Compatible with Braintree Rad Disk Mouse Holder (8 pie and 12 pie wedges).

| 160 kV Irradiator | 225 kV Irradiator |
|---|---|
| • Min DR: 1.3 Gy/min<br>• Flatness: 95% | • Min DR: 1.7 Gy/min<br>• Flatness: 95% |




RS#1420221

*Note: The Round is designed to be used on the floor of the chamber for optimal performance. Spacer provided can be used to position the tool in the center of the aluminum shelf.*

## RS 2000 160 kV




## RS 2000 225 kV




## TECHNICAL SPECIFICATIONS

| Instrument | Power | Dimensions | Weight | Electrical Requirements |
|---|---|---|---|---|
| RS 2000 - 160kV | 4000W | ▪ 43” W x 35” D x 72" H<br>▪ 109.2 cm x 88.9 cm x 182.9 cm | ▪ 1450 lbs.<br>▪ 657.7 kg | ▪ Power: 208/240VAC, 1-phase, 50/60Hz, 30A, True Earth Ground<br>▪ Instrument Wiring: 10 AWG L1, L2/N |
| RS 2000 - 225kV | 4000W | ▪ 43” x 33” x 71"<br>▪ 108.4 cm x 83.2 cm x 181.2 cm | ▪ 2500 lbs.<br>▪ 1134.0 kg | ▪ Power: 208/240VAC, 1-phase, 50/60Hz, 30A, True Earth Ground<br>▪ Instrument Wiring: 10 AWG L1, L2/N |

## Reference Definitions

### BEAM FLATNESS

$$Flatness = 100 \times \frac{\overline{D}_{min}}{D_{max}}$$

### DOSE UNIFORMITY RATIO

Dose Uniformity Ratio or DUR is defined as the ratio of maximum to minimum absorbed dose within the irradiation container.

**NOTE:**
Aluminum plate dose rates mentioned in this brochure are for the center of the plate (therefore higher), whereas dose rates specified for the other RADPlus are the minimum dose rates across the RadPlus material.



## X-Ray Designed for Life Science™

SCAN ME

Rad Source is a global leader in developing x-ray solutions for life science. Our mission is to develop innovative x-ray technologies that enable our customers to improve the world through life science research and life saving innovation. Whether our customers are doing cell or cancer research, solving life's most challenging issues or preventing the spread of infectious diseases, we are here to support them. Our global network of employees and partners deliver an unrivaled combination of the world's most innovative x-ray-based life science solutions and a highly trained and responsive global service and support footprint.

**Note: For more details on RADPlus Research Tools, please refer to the product sheets on the RS 2000 Series webpage**

RAD SOURCE | POWERED BY QUASTAR