

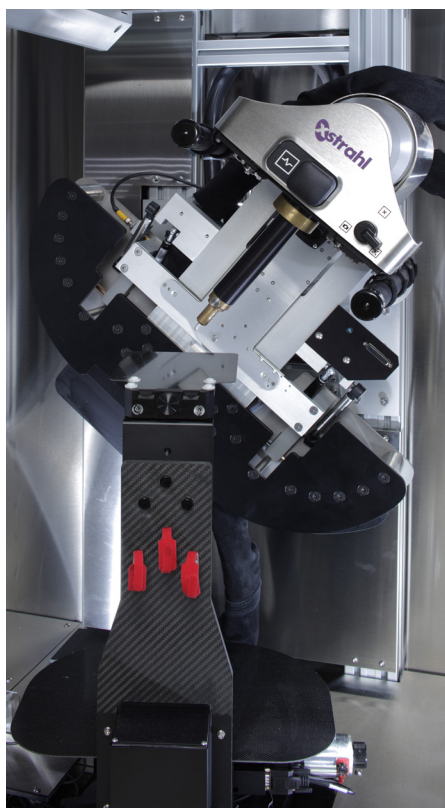
The background of the slide is a composite image. The top half shows a close-up of a Strahl X-ray machine's head, which is white and blue, with the 'xstrahl' logo visible. The bottom half shows a histological slide with a pink and purple stained tissue sample. The entire image is overlaid with a semi-transparent blue filter.

SARRP: SMALL ANIMAL RADIATION RESEARCH PLATFORM

Advancing
clinically relevant
radiation research



SARRP **transforms** the way researchers conduct radiation research by **delivering highly conformal radiation** to preclinical models. Created by expert physicists and engineers at John's Hopkins University and installed in nearly 130 research facilities worldwide, SARRP brings the same precision, accuracy, and reproducibility found in radiation therapy to translational research.



SARRP's key advantage is that it drives research forward with truly unmatched technology that unlocks your research potential. The combination of high-resolution CT imaging, dynamic couch and gantry movements to support both simple and complex arc therapy, intuitive treatment planning software, and expert customer support sets SARRP above other research systems.

Xstrahl leads technology innovation to support radiation therapy research, and SARRP is the first choice for researchers who want to truly replicate clinical radiation therapy. SARRP's ability to support advanced pre-clinical research is backed up by thousands of peer-reviewed papers have been published featuring pre-clinical research carried out using SARRP.

SARRP PUTS THE CLINICAL INTO PRECLINICAL RESEARCH:

1. Flexible immobilization systems facilitate reproducible set-up and radiation delivery for fractionated studies.
2. Onboard CT imaging – the only system with both axial and pancake geometry so you can identify your radiation targets and avoid organs at risk
3. Integrated treatment planning with dual calculation algorithm, including Monte Carlo, and image fusion capabilities
4. 4π delivery with dynamic beam shaping to deliver simple and complex treatments
5. Supports stereotactic radiosurgery with fixed collimators
6. Supports IMRT and SABR with variable collimators
7. SARRP gantry and specimen stage with a unique calibration can both rotate 360° for complex multi-isocenter or non-coplanar techniques.
8. A preclinical dosimetry protocol provides traceability of delivered dose to a national standard for research protocol validation.

SEE IT, PLAN IT, TREAT IT, VALIDATE IT

RESEARCH APPLICATIONS: SARRP SUPPORTS THE FULL BREADTH OF RADIATION THERAPY RESEARCH TECHNIQUES.

In Vivo Image-Guided Radiation Therapy

SARRP is a versatile and multi-functional radiation platform, with technical advantages that are superior for small animal studies. Recent, high-profile studies have detailed SARRP's ability to be used for very complex radiation therapy techniques, coupled with fractionated regimes, that haven't ever been demonstrated before. SARRP supports advanced single or multi-animal studies with a CT field of view that allows you to image up to five animals with multiple isocenters depending on their targets. In a recent publication in the International Journal of Radiation Oncology Biology Physics, one research site reported how the SARRP equipped with a motorized variable collimator was essential in researching image-guided cranio spinal irradiation.

To further expedite workflow, SARRP CT imaging can be completed in less than 50 seconds, providing extremely fast target localization and treatment positioning, exposure delivery including the portal image, beam's eye view confirmation.



“SARRP has become central to our translational pipeline in radiation biology and comes with extremely good support and maintenance to take the stress out of running large pre-clinical experiments.”

— Leeds Institute of Cancer and Pathology,
Leeds University, United Kingdom

Particle Therapy

As proton therapy moves into routine clinical use, there is an increased need to understand and validate the biological responses seen with particle therapy. **SARRP Beamline** is specifically designed for pre-clinical particle research, enabling image-guided experiments with your particle beamlines. Leading research programs at the University of Washington, the University of Pennsylvania, KVI & GSI have already demonstrated that **SARRP Beamline** is the ultimate adaptable platform for in vivo proton studies.

Immunotherapy

SARRP supports immunotherapy research in several ways. Preclinical validation is key, and SARRP opens up this exciting research area. SARRP plays a vital role in helping researchers establish which patients will and will not benefit from immunotherapy – ranging from the abscopal effects to the mechanisms underlying the role of immune checkpoint inhibitors and monoclonal antibodies.

Whole Body Irradiation

Many research protocols require Chimera models, and SARRP can be used to create these models with a whole-body irradiation technique. Multiple animals can be treated at 35cm FSD on a flat bed, or an entire pie cage could be treated at 80cm FSD. Xstrahl can provide a custom beam hardening and flattening filter for optimal homogeneity. SARRP provides quick and easy whole-body irradiation using the field light on the MVC to improve workflow efficiency.

In Vitro

SARRP also support in vitro irradiation protocols. The in vitro irradiation protocol is often affected by the flask and culture media used, irradiating from above and below will optimize the dose homogeneity across the volume or flask. SARRP makes this workflow significantly more accurate and reproducible.

SARRP ADVANTAGES

1 - Dynamic Delivery

SARRP is a versatile radiation research solution, supporting a full range of clinically relevant techniques including rotational arc therapy, IRMT, gated treatments and stereotactic radiosurgery.

2 - Organ Motion

SARRP's gating system overcomes organ and target motion, which is a significant pre-clinical and clinical challenge.

3 - Advanced Imaging

SARRP integrates a variety of imaging modalities, including micro focus CT and bioluminescence, with image fusion tools to clearly identify the target and organs at risk.



TREATMENT PLANNING

Unlike other pre-clinical research systems, SARRP includes fully integrated software that guides you through a step-by-step process from conducting the CT to treatment delivery in an easy and seamless fashion. It has been designed to truly replicate modern radiation therapy techniques by allowing investigators or researchers to view the 3D reconstructed CT, register/fuse other images such as MR and PET/CT, contour the target, identify an isocenter and treatment plan, evaluate the DVH and deliver simple or dynamic techniques with single or multiple isocenters.

The software supports Monte Carlo calculations in addition to superposition-convolution, making it the only pre-clinical planning system that allows researchers to select which algorithm they use. Whereas superposition-convolution is fast and very useful for high throughput calculations, the Monte Carlo dose engine algorithm enables even greater precision. It brings the best of each algorithm to pre-clinical research.

SARRP's integrated treatment planning enables easy co-registration with other imaging modalities, such as SPECT, BLT, and MRI through DICOM or non DICOM format imports.

Workflow is key in pre-clinical research so the SARRP software includes templated treatment plan tools that enables fast, accurate and reproducible results. These are essential considerations for complex, high volume pre-clinical projects.

SARRP is fully compatible with other TPS planning software such as SmART-XPS and microRaystation which opens further options and tools for treatment.

SARRP ACCESSORIES

- Bioluminescent Imaging Modality
- MicroCT Imager
- 4D Gating system
- Vertical beds
- Heated beds
- Motorized variable collimators

BEAM COLLIMATION

SARRP is available with a range of fixed or motorized variable collimators. The motorized collimator enables dynamic field shapes to be delivered, mimicking conformal treatment techniques such as IMRT. With a beam size of 2 mm x 2 mm minimum to 35 mm x 75 mm maximum, the system can target whole organs, Xenographs or specific orthotropic tumors. Throughput is accelerated by using the built-in X-ray field light for visual confirmation of field coverage.

“SARRP has really made a significant impact in our lab, the ability to accurately target small volumes with image guidance hasn't been possible before and we are now constantly evolving our approaches to leverage the technology to its maximum potential. Clearly our ability to deliver clinically relevant radiotherapy treatments in preclinical models has taken a major step forward.”

— Center of Cancer Research and Cell Biology, Queen's University, Belfast, United Kingdom

“Future advances in the technology of small animal microirradiator imaging and treatment planning, including the ability not only to define an isocenter but also to contour tumor volumes accurately using onboard imaging, will result in further improvements. The future of clinically relevant preclinical irradiation studies has never looked brighter.”

— Perelman School of Medicine, University of Pennsylvania, United States

COMMISSIONING & SITE SURVEY

Everyone at Xstrahl strives to make your research goals a reality and we support you all along the way. Xstrahl specialists work closely with your in-house team to provide the most accurate and traceable dosimetry for research. To ensure seamless integration, a qualified Xstrahl engineer will conduct a site survey prior to delivery and installation to establish the service and delivery requirements. Typically we will commission your system at our factory prior to shipment and then verify the measurements at installation.

SARRP CONSORTIUM

When you select a SARRP system, you will also be able to join the SARRP consortium user group, which includes top researchers from around the world. The SARRP consortium meets annually to discuss research projects and find new collaborations. Xstrahl also provides in-house experts to assist with research questions and facilitate communication, and invests each year to support innovative research projects. Xstrahl also routinely connects SARRP researchers to one another to advance additional research interests and grant writing.

COMPREHENSIVE WARRANTY & ONGOING SUPPORT

All SARRP systems include a comprehensive warranty and service package that covers all parts, labor and travel, including biannual service visits for ongoing training, education and support. Xstrahl has a dedicated engineering team throughout the United States and Europe with an extensive network of distributors who can also provide trained engineers. Ongoing phone and email support is available anytime to help further maximize performance of the system. Customers worldwide routinely comment about the outstanding quality of Xstrahl's entire support team.



“The irradiation devices developed by Xstrahl for radiobiological research, both in vitro and in vivo, certainly are of outstanding quality in this field of research... SARRP helps us to make our research more reliable and more clinically relevant. From my point of view, the customer service provided by Xstrahl is close to perfect.” — Ludwig Maximilian University of Munich, Munich, Germany

SARRP FEATURES

STANDARD FEATURES

The standard components of the system include:

- 225 kV Dual-Focus X-Ray Tube, for CBCT and Treatment delivery on a Rotating Gantry
- Integrated Lead Shielding
- X-Ray Generator and Cooling System
- SARRP X-Ray Control System, consisting of MP1 and the Safety Interlock Circuit
- A Robotic Specimen Stage with x,y,z and theta rotation
- 6 standard collimators and a standard Accessories Kit, including a range specimen beds for in-vitro and in-vivo use.
- Filters and Standard Accessories Kit, including a set of Specimen heated Immobilization Beds
- Specimen Camera and Isocenter Alignment Lasers
- SARRP User Interface, consisting of:
 - MuriSuite (Control Software) and Voxl (CBCT reconstruction)
 - SarrpPDC (Point Dose Calculator)
- MuriPlan Treatment Planning Software with Superposition Convolution
- High Resolution Imaging Panel
- Electronic Portal Imaging Device

OPTIONAL FEATURES

The optional components of the system include:

- MuriGlo Bioluminescence Targeting System
- MuriPlan Treatment Planning Software with Monte Carlo
- SmART-XPS Treatment Planning Software
- Connectivity to third-party planning systems
- Motorized Variable Collimator
- Optional Additional Collimators
- Physics and Quality Assurance (QA) Kits
- Gating System (SARRP 4D)
- Optional Immobilization beds
- Thoraesus (Hardening) Filter
- Flattening Filter

SPECIFICATIONS

CABINET SIZE AND WEIGHT

Overall Dimensions: 2060 mm H x 1480 mm W x 1040mm D

Weight: 2590 kg (excluding generator and cooling system)

X-RAY TUBE

Type: Dual focal spot, metal ceramic, fixed anode, unipolar water-cooled

Maximum Voltage: 225kV (or Voltage Range 20 to 225kV)

Maximum Current: 2.8mA (Fine);13.0mA (Broad)

Power: 640W (Fine); 3000W (Broad)

Focal Spot Size (EN12543): 1.0 mm (Fine); 5.5 mm (Broad)

Inherent Filtration: 0.8mm \pm 0.1mm Be (Beryllium)

HT GENERATOR & COOLING SYSTEM

Maximum Power: 4000W/4kW

kV Range: 5 to 225kV

kV Accuracy: \pm 1% of demand value

kV Reproducibility: Better than \pm 0.01kV

mA Range: 0.0mA to 30.0mA (auto power restricted)

mA Accuracy: \pm 0.5% of demand value

mA Reproducibility: Better than 2 μ A

Cooling System: Water-to-water /water-to-air

IMAGING PANEL & FLUOROSCOPIC CAMERA

Imaging Panel Pixel Area: 19.5 cm x 24.4 cm

Imaging Panel Pixel Matrix: 1536 x 1920 (1x1)

Imaging Panel Pixel Pitch: 127 μ m²

Imaging Panel Field of View at Isocenter: 10.5 cm x 10.5 cm x 13.8 cm

Imaging Panel Pixel Size at Isocenter: 72 μ m

Fluoroscopic Camera Resolution: 1920px x 1080px

Fluoroscopic Camera Pixel Size: 2.2 μ m²

About Xstrahl

Xstrahl is a medical technology company that designs clinical and research systems to help eradicate cancer. For more than 20 years, Xstrahl has been shaping the development of superficial and orthovoltage therapies for cancer treatment and advancing preclinical research. Xstrahl systems are in operation at more than 700 treatment and research facilities worldwide.

Xstrahl.com

