

sarrp
By **xstrahl**



CAUTION

THIS EQUIPMENT
PRODUCES
RADIATION WHEN
ENERGIZED



**SARRP – MULTI-MODALITY
IMAGE GUIDED
MICRO IRRADIATOR**

Move your research into a new dimension



THE SARRP IRRADIATION PLATFORM HAS BEEN DESIGNED TO ALLOW TARGETED IRRADIATION STUDIES ON SMALL ANIMALS

As Oncology research moves towards clinically relevant experiments the use of radiation also needs to match this trend.

Whether your research requires you to target Xenografts, orthotopic tumors, or micro metastases, the SARRP is a flexible irradiation partner, designed to enable your experiments, from the simple to the complex.

A revolutionary advancement from a standard X-Ray irradiator, SARRP allows users to deliver radiation from multiple angles resulting in a much more conformal dose to the target tissue. With fixed and variable collimation, SARRP retires lead blocks and fixed beam irradiators with enhanced targeting and less normal tissue toxicity.

The SARRP system mimics advanced radiosurgery with a couch and gantry that both rotate, thus delivering radiation from any angle, and in multiple planes.

A limitation of fixed X-Ray irradiators is the dose fall off through the specimen. The rotating X-Ray tube means specimens can be irradiated from multiple angles, therefore eliminating this dose irregularity, concentrating dose to the target area.

Advanced image guided pre-clinical radiosurgery is facilitated by the Muriplan software. Muriplan not only controls the beam delivery, but is also a full pre-clinical treatment planning system, featuring many functions you would expect to see on a clinical system.

Trigger an Immune Response

SARRP is a great partner for immunology research. Targeting just the orthotopic tumour under image guidance and precise delivery allows the user to trigger an immune response with an intact lymph system and save normal tissue. Opening up the exciting area of immune-radiation research.

There are a variety of accessories that allow the SARRP to further target specific organs, tumours, or Xenographs and minimise dose to non-targeted tissues.

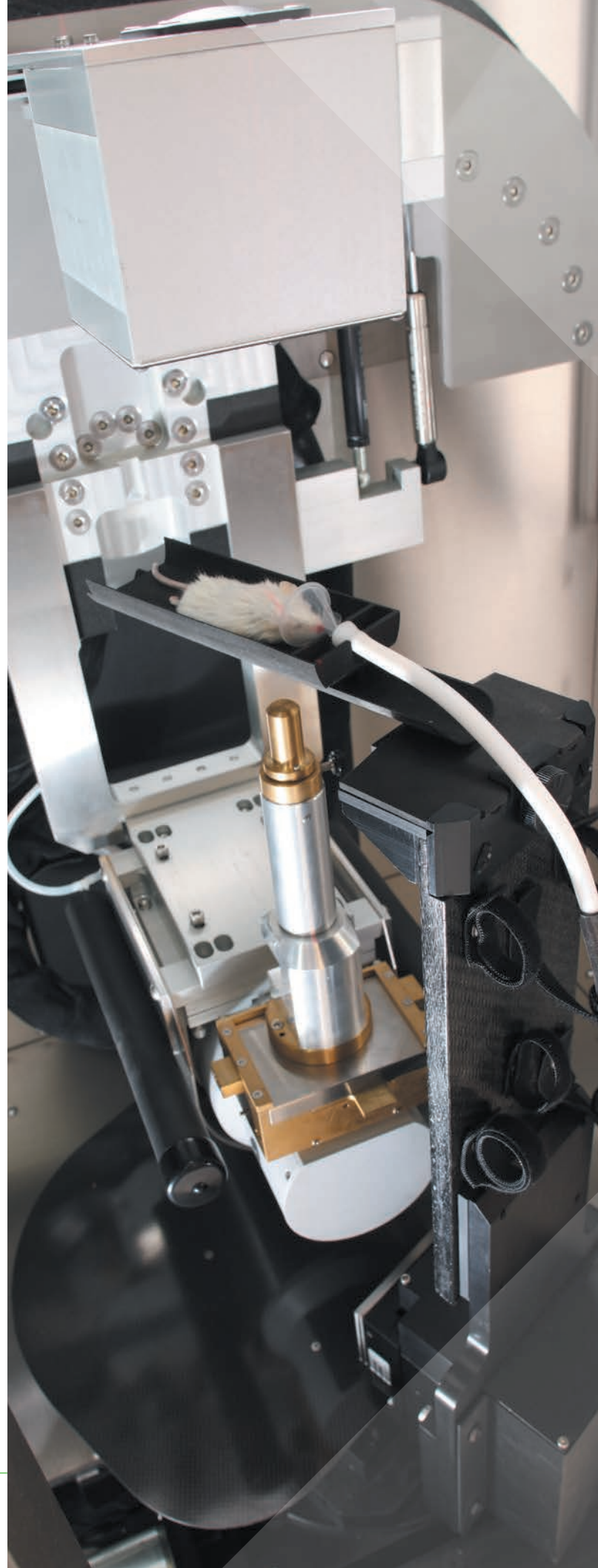
The portal imaging camera provides a fluoroscopic X-Ray image of the specimen or so called "beams eye view". This allows the user to guide their radiation beam to the correct target, which is visible on the 2D X-Ray. As a comparison, this SARRP set up and delivery is equivalent to clinical practice where cone beam CT is not available. AP and Lateral Portal images can be obtained to verify the target is in the correct position. The X,Y,Z stages allow the user to accurately position the animal.

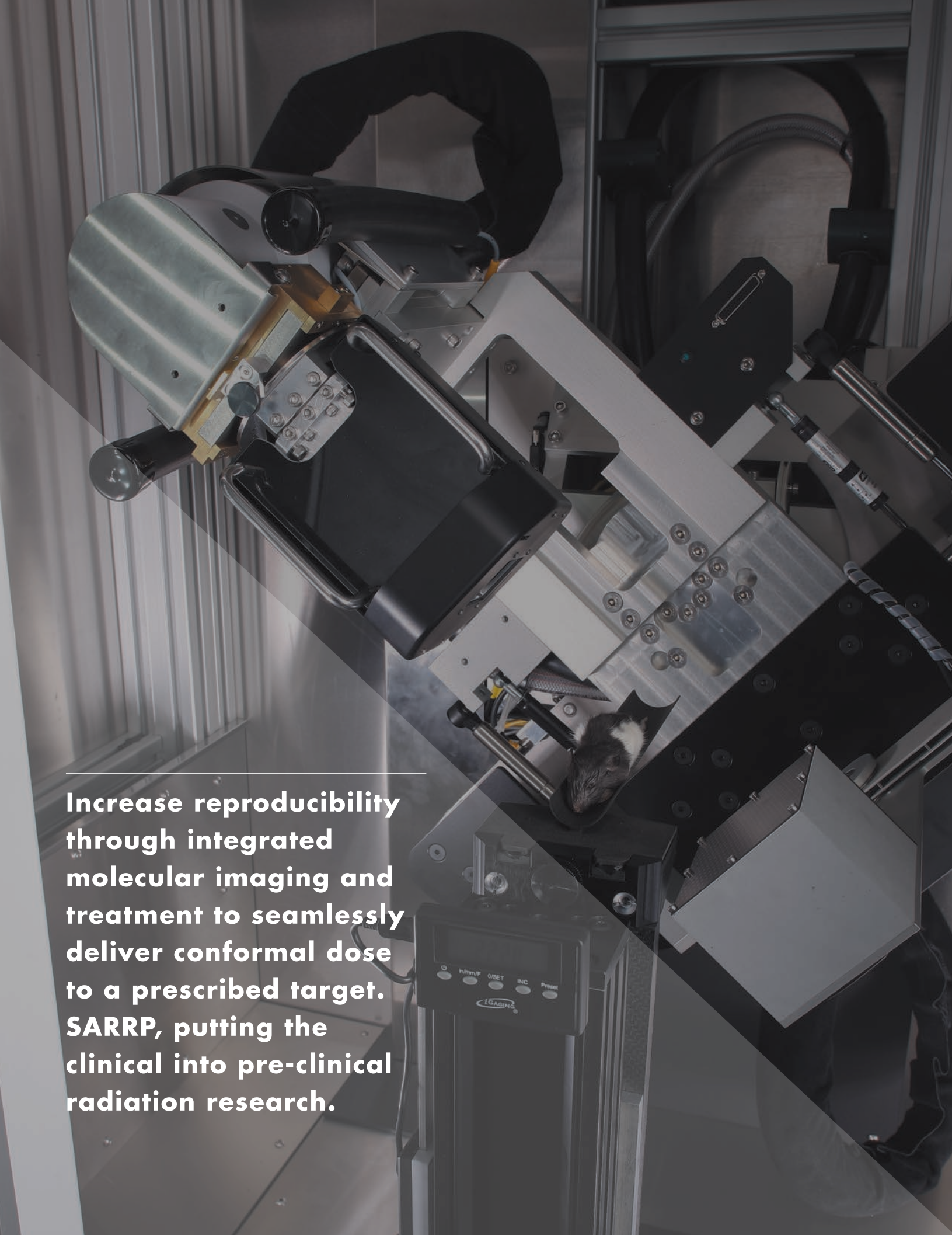
In Vitro

SARRP is able to greatly improve accuracy and reproducibility of In Vitro experiments, making it an all round versatile system. Cell irradiation is often affected by the flask and liquid potentially causing inaccuracy in the dose distribution. SARRP's rotating X-Ray tube gives the option of irradiating from underneath a flask, guaranteeing a uniform dose, as the cells settle to the bottom.

In Vivo

The real benefit of a SARRP system is seen with small animal research. Pre-clinical radiation studies face the same challenges as clinical radiotherapy. Fractionated dose delivery requires the patient to be set up in the same position for every visit. The use of CT imaging to ensure patients are in the correct position was pioneered by the same people who invented the SARRP. This clinically accepted methodology is now available for small animals. The SARRP CT imaging can be completed in 1 min, meaning the user can quickly verify the animal is in the correct position. Fast image registration algorithms in the Muriplan software, fuse the planned CT with the daily CT and automatically reposition the animal at the planned target.





Increase reproducibility through integrated molecular imaging and treatment to seamlessly deliver conformal dose to a prescribed target. SARRP, putting the clinical into pre-clinical radiation research.

Beam Collimation

SARRP is available with a range of fixed collimators; manual or motorized variable collimators. The variable collimators allows the user to simply adjust the X-Ray field to irradiate only the target and minimise dose to other tissue. With a beam size from 1 mm x 1 mm to 40 mm x 80 mm the system is capable of targeting whole organs, Xenographs or specific orthotropic tumours. Throughput is accelerated by using the built in X-Ray Field light to align the target.

Utilising the variable collimator's dynamic jaws SARRP can be used to create specific dose shapes, like annuli. It can also deliver IMRT (Intensity Modulated Radiation Therapy) and SMRT (Spatially Modulated Radiation Therapy).

Fixed collimators from 0.5mm up and above give a quick and efficient beam size, with minimal scatter.

The use of collimators and multiple beam arrangements has led to much higher fractionated doses being delivered. Several groups have proved that clinical dose regimes of up to 60Gy can be delivered over a 7 week period compared to conventional lead cut-out based experiments.

Gating and animal Monitoring

Moving SARRP on to mimic adaptive radiotherapy. Xstrahl has designed a gating system which will only deliver dose at the defined point of the breathing cycle, minimising normal tissue damage as a result of breathing motion. The gating system uses a unique quiet shutter mechanism and the gated dose is measured by a transmission ion chamber. Therefore the treatment can be set as a prescribed dose. The respiratory signal, temperature and heart rate of the animal are all monitored.

Dose Planning

A fast and simple dose calculator based on depth in tissue is a standard feature on SARRP. The depth can be measured on the lateral portal image. The treatment time will be calculated based on the measured depth.

Muriglo

The new Xstrahl MuriGlo is an advanced in vivo optical imaging system with bioluminescence imaging (BLI), bioluminescence tomography (BLT) and trans illumination fluorescence imaging (TFI) capabilities. The system uses the photon emission data acquired from three rotating mirrors, and a state-of-the-art 3D reconstruction engine, which uses the anatomic and optical priors derived by diffuse optical tomography (DOT) and cone-beam CT (CBCT) data. The results are uniform, highly sensitive data points throughout the subject, providing reproducible and accurate optical quantitation. The versatility of the system provides the user an unprecedented range of imaging wavelengths (i.e. 450nm-800nm). MuriGlo is designed to be used on board the SARRP image guided irradiator for accurate targeting of tumors and metastases.

Applications

- **Immunology**
Deliver targeted dose, avoiding Lymph nodes to stimulate an immune response
- **Normal Tissue Injury**
- **Preclinical Tumor Studies**
Xenograft & Orthotropic models
Targeted tumour irradiation
- **Preclinical Drug Efficacy & Toxicity Studies**
Radio sensitizers
Mitigators / Protectors
- **Immuno-Oncology**
Adjuvant treatment
- **Stem Cell Therapy**
Total Body Irradiation or Partial Body Irradiation with bone marrow sparing
- **Genomics**
Tumour heterogeneity
- **Neurology**
Examine neurogenesis
Brain inflammation / injury
- **Osteoporosis**
Examine bone density and injury



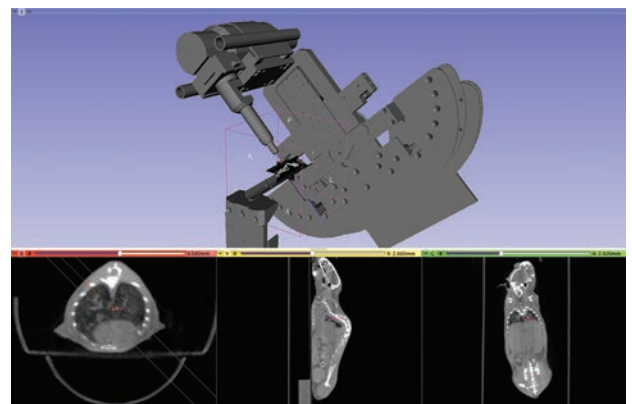
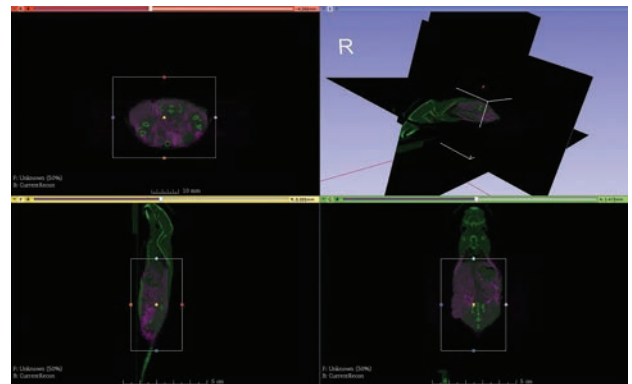
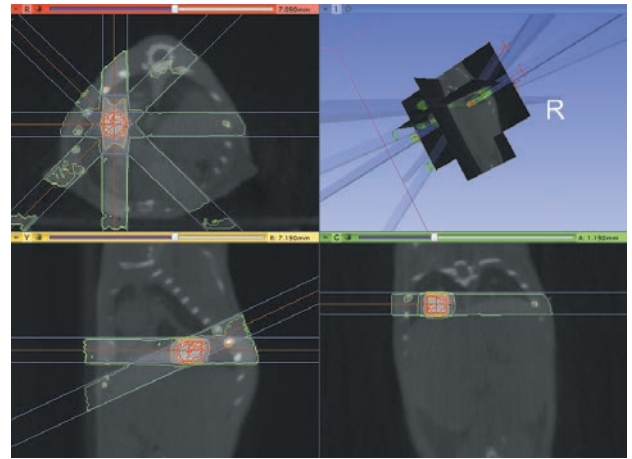
Muriplan is a complete image registration and dose planning system dedicated to pre-clinical research. Xstrahl has taken the key elements of a full clinical planning system to make a simple pre-clinical system capable of operating at the speed, resolution, and simplicity, required for research.

Muriplan guides the user through the treatment process of CT imaging, image registration, dose planning, validation and delivery. The software is fully integrated with the SARRP controlling the X-Ray delivery, imaging and robotics. Muriplan eliminates the guesswork in pre-clinical irradiation studies by calculating the dose distribution, before you start treatment. The user can evaluate the isodose lines and Dose Volume Histogram for the contoured structures.

The Superposition – Convolution dose calculation is done on the GPU resulting in a ~4sec/ beam calculation time. This high speed calculation allows the user to carry deliver the plan while the mouse is set up. Once a plan has been determined, it can be saved and applied to other animals, in this case the user can make small adjustments to the Isocenter and beam angles as appropriate.

The beam plan is then executed by Muriplan, the X-Rays are delivered for the appropriate time, correct collimator and gantry position set.

Complex Arc treatments with multiple beams can also be planned and delivered using Muriplan.





THE XSTRAHL TEAM

Xstrahl employs a team of individuals to support our SARRP users. The machine can be commissioned by in house physicists. User training is done by clinically trained staff who have both dosimetry and radiotherapy backgrounds. Therefore Xstrahl staff can support and assist you in getting going with your experiments.

- Xstrahl has mechanical software and electronic designers all of whom strive to make your research goals a reality.
- The SARRP consortium meets twice per year and allows all the users to gather and discuss their research and find new collaborations. These meetings are timed around large conferences, and also uses the latest online technology to allow geographical boundaries to be eliminated.
- SARRP forum – As requested by the consortium www.xstrahl.com has recently implemented an online discussion forum for users to exchange ideas.
www.xstrahl.com/life-sciences/community
- Xstrahl engineers are based out of Atlanta(USA), London(UK) and Essen(D) as well as trained engineers through the distributor network.
- Engineers can be on site or login remotely to solve any issues in a very short time.
- In-house experts are always available to assist with your research questions.
- Xstrahl has collaborations with many universities throughout the world and have a budget each year to support innovative research projects.

SARRP Research Platform Advantages

- > Radiosurgical dose delivery with 0.2mm accuracy
- > Unrestricted non-coplanar radiation delivery
- > Large imaging panel 20cm x 25cm
- > High resolution imaging 63 μ m at Isocenter
- > Fast CT reconstruction and dose calculation (~4sec /beam)
- > Fully integrated imaging, registration and dose planning software
- > Dynamic variable collimator 1 mm x 1mm to 40mm x 80mm
- > Dose monitoring system
- > Gating system
- > Portal imaging
- > Optical tomographic imaging



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