# THE RADIANCE 330® PROTON THERAPY SYSTEM





# **OUR TECHNOLOGY, YOUR FUTURE**

At ProTom, we are working to transform cancer treatment by expanding the accessibility of proton therapy and developing proton tomography.

The Radiance 330<sup>®</sup> Proton Therapy System was designed to address challenges and break down barriers. Leveraging innovation, expertise, and passion, we are raising the bar for proton therapy technology.

### **WHY PROTONS?**

Proton therapy is an advanced form of radiation treatment that uses protons to treat cancer. Proton therapy has been shown to be effective in treating tumors near or in vital organs, including the brain, head & neck, spinal cord, breast, and lung. The precise delivery of protons results in less radiation to normal tissue around these sensitive sites, including the elimination of an exit dose, while increasing the treatment dose to the targeted site.

Proton therapy is also beneficial for the treatment of pediatric tumors since it can reduce the risk of side-effects, such as developmental delays and decreased bone and soft tissue growth, while improving long-term health outcomes by reducing the chance of secondary cancers later in life.

The key distinctive quality of protons is the Bragg Peak – a physical property of charged-particle beams causing the vast majority of proton energy to be delivered over a short and precisely-defined interval, confining the high dose to the tumor target while sparing normal tissue and other critical structures in close proximity. Since the radiation dose given through protons is very precise, with the exposure to surrounding healthy areas limited (less toxicity), patients experience fewer harmful side effects and are able to tolerate treatment much better. Due to proton therapy's ability to arrest tumor progression while limiting exposure to critical structures, this treatment offers new hope for patients who are not able to get surgery and conventional radiation therapy and for patients with recurrent disease who have received previous radiation treatment.



Traditional radiation treatment has a relatively high entrance dose and exit dose. Proton therapy has a lower entrance dose and no exit dose.



Comparison of Proton Beam Scanning (PBS) vs. Intensity Modulated Radiation Therapy (IMRT). Both PBS (left) and IMRT (right) plans use 5 transverse fields and satisfy the prescription dose objective of 59.5 Gy (RBE), with the proton plan achieving a significant reduction in normal tissue dose. (Courtesy: Mass General Hospital)

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### INTRODUCING RADIANCE 330<sup>®</sup> PROTON THERAPY SYSTEM

ProTom International's Radiance 330<sup>®</sup> Proton Therapy System is a compact, modular and economically viable proton therapy system, allowing health care providers to develop single or multiple-room capability within or adjacent to an existing radiation oncology department.

The Radiance 330<sup>®</sup>'s modular designed treatment system includes advanced pencil beam scanning technology and a compact synchrotron particle accelerator, which delivers a clinical treatment energy range from 70 MeV to 250 MeV with a capacity of up to 330 MeV for future deployment of proton imaging.



# **SYNCHROTRON**

The Radiance 330<sup>®</sup> has the smallest synchrotron footprint in the market. Synchrotrons have low secondary neutrons and scatter radiation, which lowers the risk of unnecessary and unwanted radiation to the patient and facility.

The Radiance 330<sup>®</sup> synchrotron design allows for dynamic modulation of proton beam energy and intensity in three dimensions utilizing Radiance 330<sup>®</sup>'s Fidelity Beam<sup>™</sup> Scanning System. This allows precise positioning of the beam and deposition of dose through the use of computer-controlled scanning magnets. This ability to adjust intensity and energy in real-time, when combined with the system's active scanning delivery capabilities, enables the system to deliver three-dimensional, intensity-modulated proton therapy (IMPT). This enhanced level of dosimetric precision (and reduction in dose to normal tissue) allows clinicians to deliver higher doses to target volumes, increasing the probability for tumor control; this also enables clinicians to target smaller and/or difficult-to-reach tumors near sensitive organs.

Because synchrotron technology produces the energy required, no degrading of the beam is required to alter energy. Therefore, the synchrotron is the more energy efficient choice of the two particle accelerators. Add to that the cost savings of decreased shielding and an easier installation, and the synchrotron becomes the top choice for proton therapy facilities.

# **PENCIL BEAM SCANNING**

The Radiance 330  $^{\mbox{\tiny (B)}}$  delivers the most advanced form of proton therapy treatment with the precision of pencil beam scanning.

Pencil beam scanning delivers superior dose sculpting and higher beam efficiencies than other methods of proton beam delivery. This reduces unwanted side effects, improves long-term outcomes for patients, and improves the patient's quality of life.

#### FIDELITY BEAM SCANNING

The Radiance 330<sup>®</sup> is equipped with ProTom's Fidelity Beam<sup>™</sup> Scanning System, which uses matrix spot scanning. This type of scanning accurately "paints" a tumor with the prescribed dose using beam energy variations to control penetration depth and magnetic steering to guide lateral dose deposition.



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Fidelity Beam™ Scanning provides precise, high-speed matrix spot scanning.

The ProTom logo image at the top is an example of how a scanned proton beam can be "painted" to accurately target tumors.

#### **CLINICAL EFFICIENCY**

The Radiance 330<sup>®</sup> is designed to treat patients with high clinical efficiency. Approximately 20 to 25 patients per eight hour shift may be treated in each treatment room, with the average treatment time of 20 minutes. Proton centers with the Radiance 330<sup>®</sup> have treated many different cancers, including head & neck, brain, spine, pelvis and abdomen. The youngest patient to receive Radiance 330<sup>®</sup> treatment was only 16 months old.

# **COMPACT PROTON THERAPY TECHNOLOGY DESIGNED FOR YOU.**

The Radiance 330<sup>®</sup> has the smallest synchrotron footprint in the market.

The small footprint combined with a modular design allows for the Radiance 330<sup>®</sup> to be installed in purpose-built or existing facilities. This design architecture also allows for future upgrades of individual components.

Radiance 330<sup>®</sup> supports single, multi-room and expandable configurations. The beam transport system can be installed in multiple configurations to guide the proton beam from the synchrotron to the treatment rooms, and it is expandable to as many as three treatment rooms.

#### $ProTom\ International\ |\ Radiance\ 330^{\circledast}$



Compact Single Gantry Solution The most compact single room configuration.



Compact Two Gantry Solution Radiance 330<sup>®</sup> supports single, multi-room and expandable configurations.



**Compact Three Gantry Solution** Radiance 330® is expandable to as many as three treatment rooms. Fixed-beam treatment rooms are available.

We have designed the Radiance 330<sup>®</sup> to be compact and customizable. This allows installation of the Radiance 330<sup>®</sup> in locations other systems cannot be installed.

### DELIVERY, CONSTRUCTION, AND INSTALLATION TRANSFORMED.

The lightweight, compact, modular design of the Radiance 330<sup>®</sup> eliminates the need for heavy equipment in the delivery, construction, and installation phases. This, along with the ability to install the Radiance 330<sup>®</sup> above-grade or within existing space, significantly reduces costs.

Developing proton therapy capability with the Radiance 330<sup>®</sup> represents an economically viable project, dramatically simplifying construction and installation. The patented and proven design of the compact synchrotron allows for accelerator interior vault space of approximately 20' x 30' and requires 30 - 50% less radiation shielding than most other systems on the market today. The lighter-weight, compact technology makes installation easier and simpler, even in the most space-constrained environment. The largest equipment component requires no hatch, special crane, transport, or reinforced roadways and is easily moved-in through typical freight or staff entrances. A simpler project with lower construction and equipment costs is easier to implement, translating to faster time-to-market and faster time to patients-in-need.

The Radiance 330<sup>®</sup> runs more efficiently, generates less heat, and consumes far less electricity than most other proton therapy systems, translating to enormous savings on lifetime operational costs. Furthermore, the system's smaller scale makes it possible to add proton therapy as an extension to an existing cancer treatment program/center, saving on the cost of land and avoiding the expense of duplicating facilities, ancillary equipment, and personnel.



Easier and simpler installation – the largest piece of the Radiance 330<sup>®</sup> system requires no hatch, special crane or transport, or reinforced roadway.



The compact and lightweight synchrotron accelerator is easily moved into place and assembled on-site in a matter of weeks.



ProTom team members slide a large piece of the system into the elevator shaft.

# **ENERGY EFFICIENT TECHNOLOGY**

A third-party analysis found the Radiance 330<sup>®</sup> consumes half as much electricity as competitors' cyclotron systems. The Radiance 330<sup>®</sup> runs more efficiently and generates less heat and electricity as other proton beam therapy systems - translating to enormous savings on long-term operational costs.

#### THE RADIANCE 330® CONSUMES LESS POWER THAN COMPETITORS BASED ON 3RD-PARTY ANALYSIS\*

	Synchrotron	A Cyclotron	B Cyclotron
Normal Power Proton Therapy Equipment	630 kVA	1,200 kVA	1,800 kVA
Standby Power	250 kW	580 kW	350 kW
Uninterruptible Power Supply System	100 kVA	80 kVA	225 kVA
Cooling Load Proton Therapy Equipment (Water Side)	100 Tons	300 Tons	320 Tons
Air in Proton Therapy Equipment	5,000 CFM	10,000 CFM	10,000 CFM

\* Analysis conducted by Bard, Rao + Athanas Consulting Engineers, PC. Data collected from 3-room facilities.

#### Less shielding and less power are needed, more clean beam delivered.

#### **CLEAN BEAM**

The Radiance 330® produces far fewer neutrons than cyclotron-based treatment.

The physical characteristics of a synchrotron ensure that protons lost during production are only low energy protons, either during injection or after the beam has been decelerated. The lower energy protons are less able to produce induced secondary radiation activity. This means patients, staff, ancillary equipment and the building are exposed to fewer neutrons, less shielding is required, and no equipment cool-off period is needed before entering the vault for routine maintenance.

#### SUPERIOR, INTEGRATED IMAGING.

It's designed to interface with in-room imaging solutions, such as computed tomography or cone-beam computed tomography. It's also equipped with orthogonal imaging, including image-registration software, which generates a six degree of freedom patient-alignment correction vector.

In addition to supporting ProTom's own 2D X-Ray solution, the Radiance 330<sup>®</sup> has the ability to adapt to a number of off-the-shelf imaging products.



3D / 3D shown for this test case

#### ABLE TO TREAT ANY TUMOR SITE CAPABLE OF PROTON IMAGING.

The Radiance 330<sup>®</sup> is capable of the high proton energies needed for proton imaging of all areas of the body. The 330 MeV proton beam allows proton radiography and tomography of up to 56 g/cm<sup>2</sup> water equivalent thickness. With clinical treatment energy range of 70 MeV to 250 MeV and the ability to accelerate protons up to 330 MeV, the Radiance 330<sup>®</sup> is capable of treating and imaging with the same beam.



Radiance 330<sup>®</sup> is the **ONLY** proton therapy system that is capable of proton imaging any anatomical location in a patient.

# **INTUITIVE DESIGN**

The design of the Radiance 330<sup>®</sup> features an intuitive and user-friendly interface. Experienced users of a variety of proton beam therapy systems were consulted in the design of the control system. That empirical information was used to integrate workflow guidance into the operator controls, enabling radiation therapists to spend less time interacting with the equipment and more time focusing on the patient.

The ProTom-designed screens have uncluttered, organized display panels, with integrated touch-screen technology employed inside and outside the treatment room. Outside the treatment room, the Treatment Control System screen provides the radiation therapist with a single-screen view of all required patient information including plan information, treatment fields, room coordinates, digitally reconstructed radiographs, beam status, and a "beam-on" dose monitor.

Inside the treatment room the control touch-screen provides a unique workflow-driven view. This user interface functions not only as a control and status display for the equipment, but also as a workflow guide for the radiation therapist. As the different function "buttons" on the touch-screen are selected, the therapist is guided through the workflow of treating a patient, including imaging and robotic-patient positioning with six degrees of freedom. Customizable, pre-programmed movements for both imaging and treatment workflows are available. Additionally, multiple programmed destination sequences can be saved for clinical use, for physics quality assurance checks, and for preventive maintenance routines.

# PROTOM — DEDICATED TO A SINGLE MISSION.

Our mission is to increase the availability and affordability of clinically advanced proton beam therapy technology for physicians and the patients for whom they care. We believe that our proprietary technology will significantly lower the capital and operating costs of proton centers and accelerate the adoption of this clinically-advanced treatment technology in the fight against cancer. Developing and delivering clinically sophisticated proton therapy technology is not only what we do, it is all we do.

Our core medical device operations are headquartered in the USA — from which all of our domestic and select international manufacturing, development, service, and proton therapy projects are currently managed and operated.

Our team has the singular focus, commitment, and credentials to perform its work intelligently, efficiently, and cost effectively.

#### **SERVICE AND MAINTAINANCE**

The Radiance 330<sup>®</sup> installations are maintained by ProTom Service Engineers. ProTom supplies on-site maintenance personnel to monitor the system while in clinical use, and perform preventative maintenance during non-clinical work hours. The number of Service Engineers assigned to a site is dependent upon the number of treatment rooms installed and the number of clinical operation hours.



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The Radiance 330<sup>®</sup> Proton Therapy System has been designed, developed and built to meet the specifications in this brochure. The Radiance 330<sup>®</sup> is an FDA cleared medical device (510K Number – K134052). Design adjustments required for any particular installation may necessitate an abbreviated or special clearance application.

Only available for sale in certain countries or regions. Indications of use and product features may also vary by country or region. Please contact ProTom for more details.

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