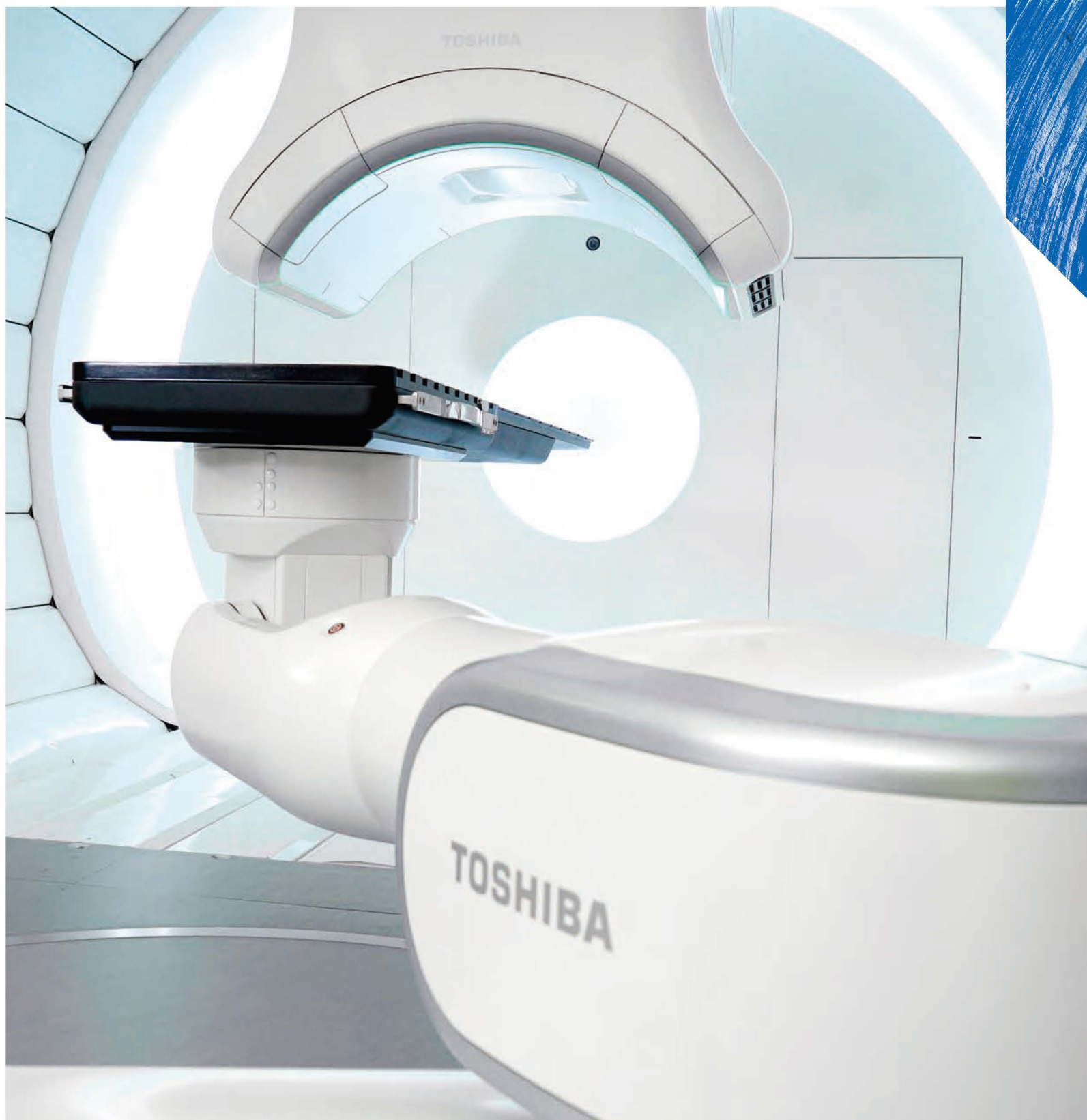


**TOSHIBA**

# Heavy Ion Therapy System





# Therapy system

## Why heavy ion ?

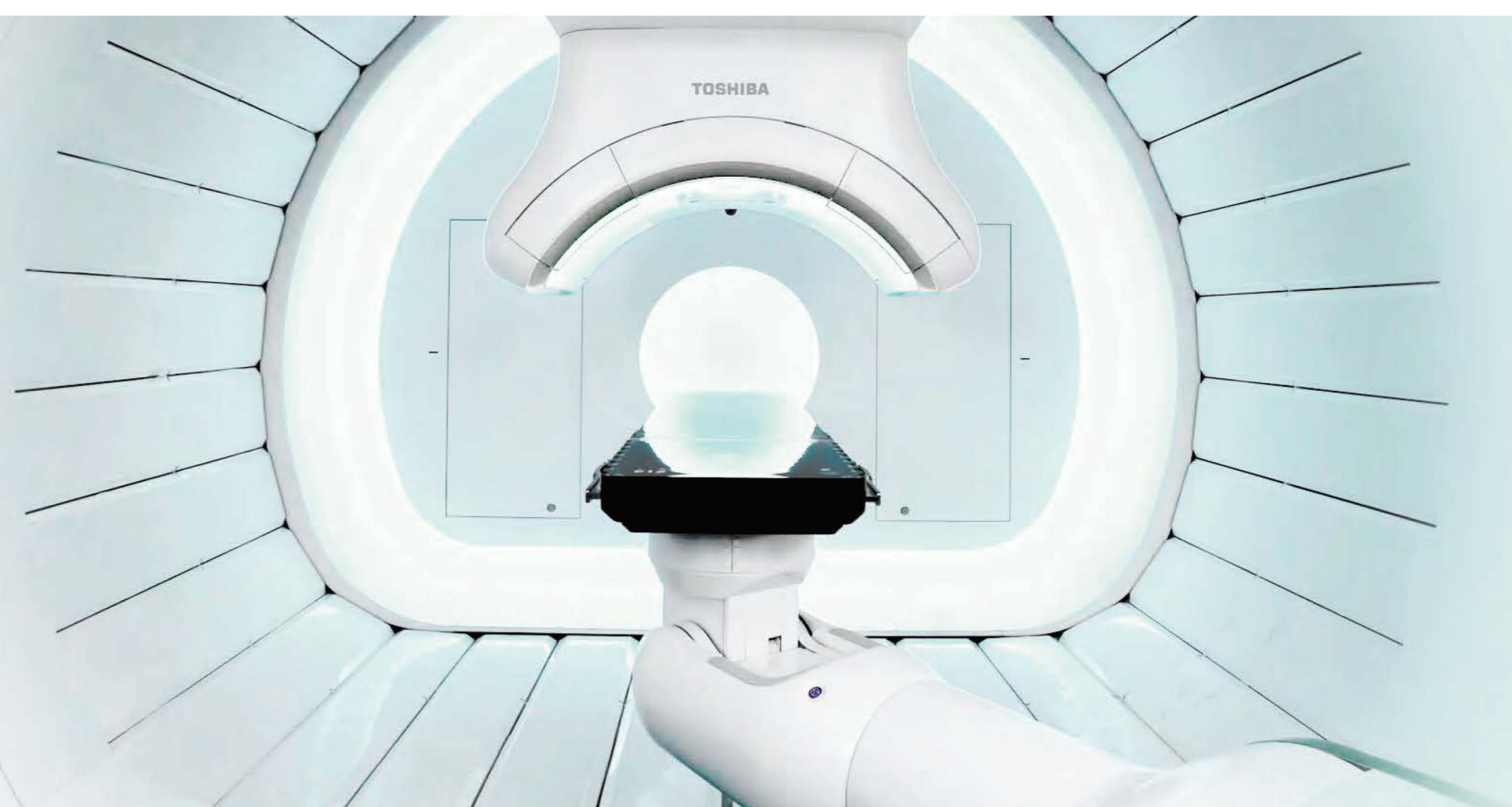
Dose concentration on cancer cells  
High relative biological effectiveness (RBE)  
Abundant clinical experiences in Japan

## Why gantry ?

Flexibility and efficiency for multiple irradiation angles  
Accurate imaging and treatment without deformation  
Alleviation of patient's physical and mental burden

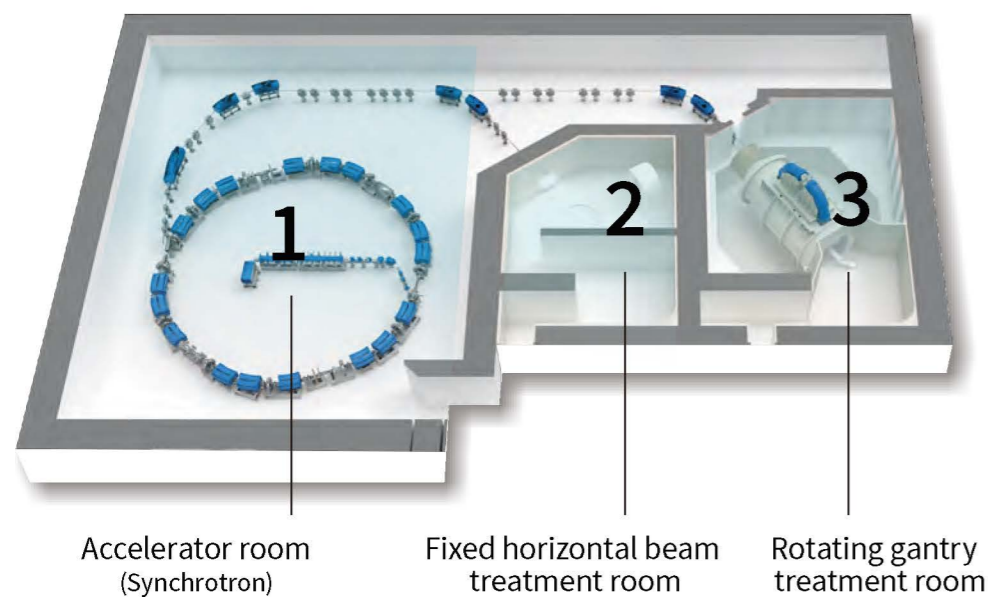
## Why Toshiba ?

Expertise in accelerator and superconducting technologies  
Long term collaboration with NIRS/QST  
Realization of precision medicine from prevention to treatment prognosis



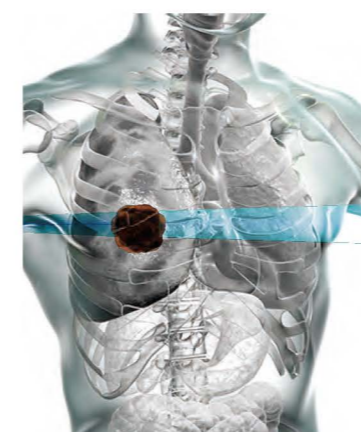
## Heavy ion therapy system

Based on the proven and exclusive technologies developed in collaboration with NIRS/QST, Toshiba provides both compact rotating gantry treatment and fixed beam treatment rooms. A fundamental layout of our heavy ion therapy system measures 40m x 60m. The layout can be customized according to a customer's requirements.

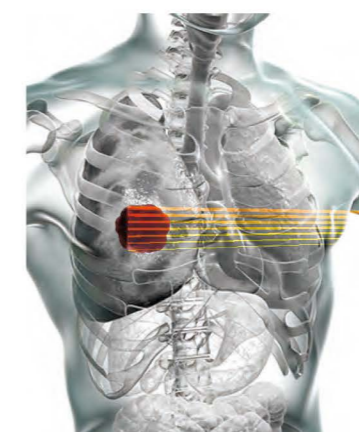


## Heavy ion compared with photon and proton

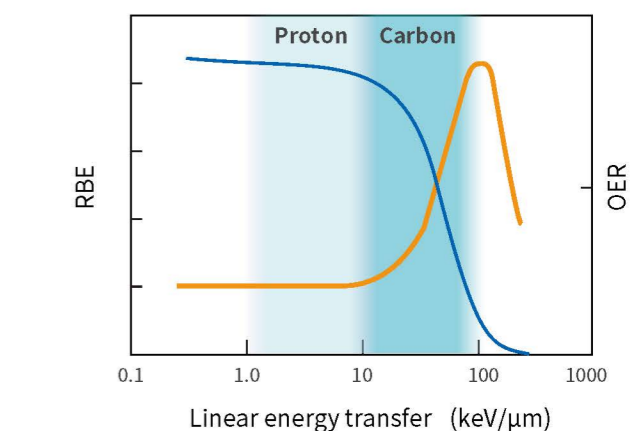
Heavy ion therapy provides an excellent dose distribution for a tumor volume because of the physical properties of the charged particles; meaning the sharp Bragg peak and small scattering angle, which reduce side effects for normal tissue and adjacent organs. Further, the linear energy transfer (LET) for heavy ion beams is known to exhibit large relative biological effectiveness (RBE) at the tumor position. These properties realize precision radiotherapy that is unique and unparalleled to the conventional radiotherapy.



Photon therapy



Heavy ion therapy



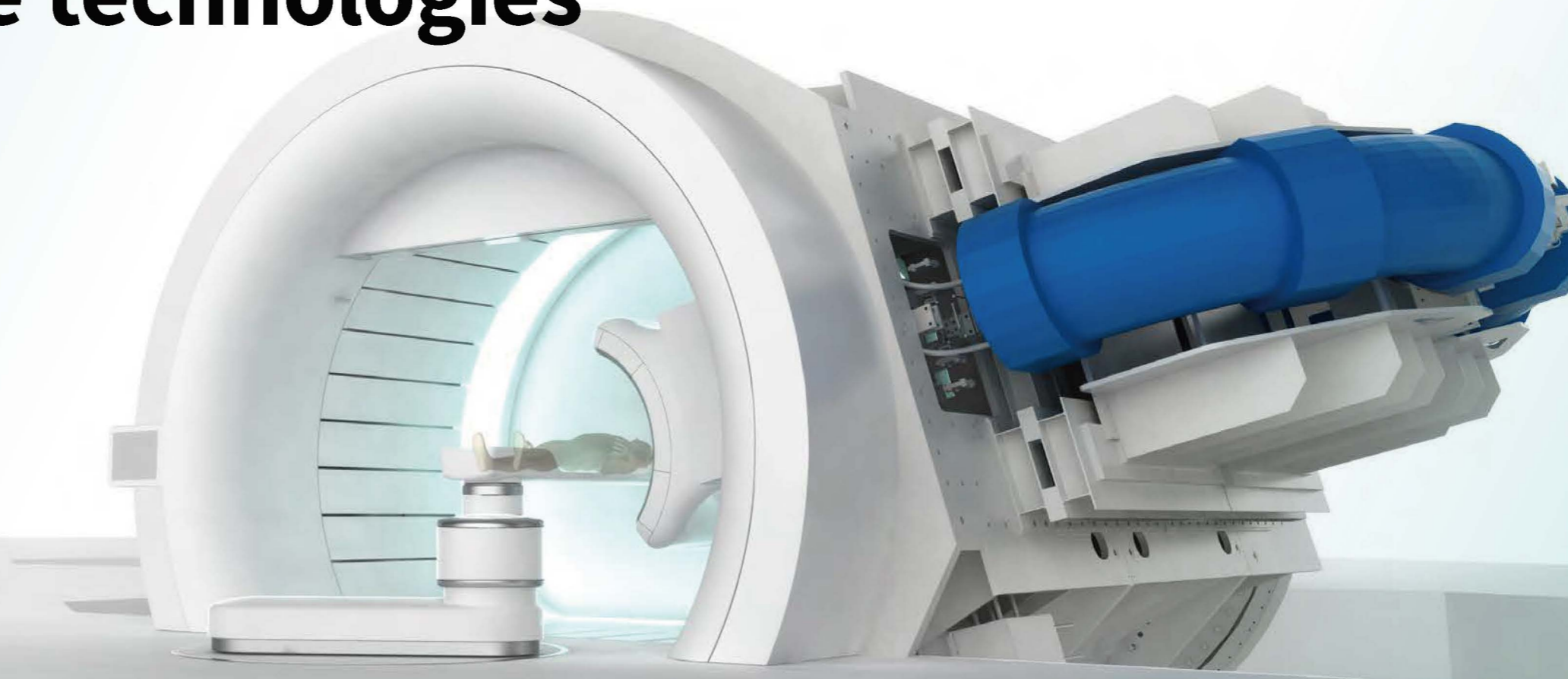
— Relative biological effectiveness — Oxygen enhancement ratio



# Proven & exclusive technologies

Toshiba has successfully downsized our rotating gantry structure to be comparable with proton gantries by applying cutting-edge superconducting magnet and scanning system technologies. A rotating gantry treatment room provides a customer with several benefits for advanced treatments:

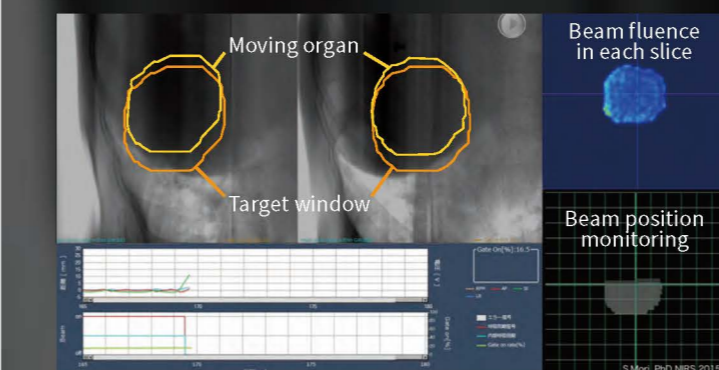
- Reduce patient physical & mental burden
- Shorten positioning time
- Accurate irradiation (w/o deformation)



## Patient positioning

Fundamentally, automated 2D/3D patient positioning using a set of oblique X-ray imaging system is provided. In addition, 3D/3D patient positioning by in-room CT or CBCT is an option.

- Positioning calculation within 10 sec.
- Automatic control with a robotic couch
- Human friendly



## Respiratory-gated irradiation

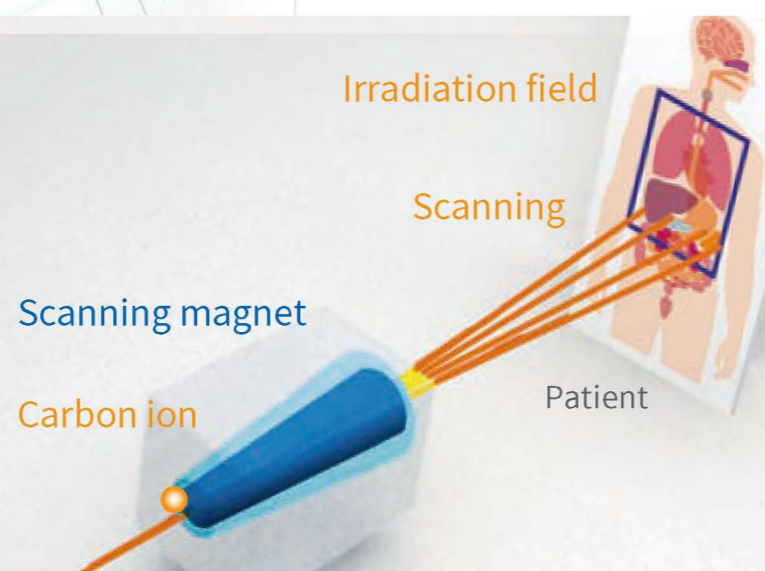
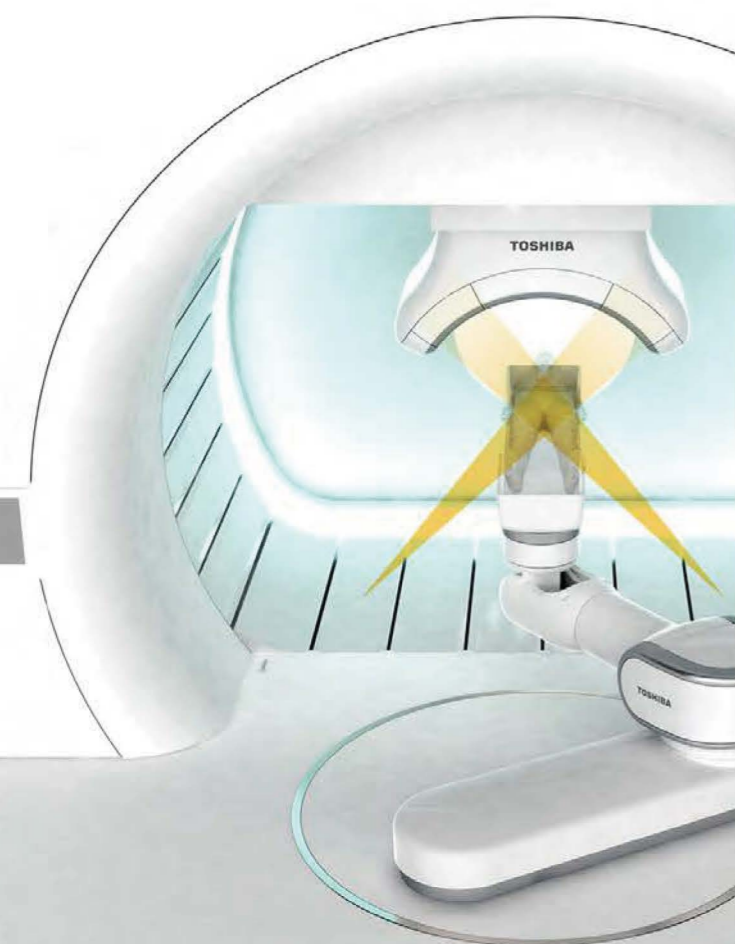
Respiratory-gated irradiation technology, combined with real time target tracking by fluoroscopic imaging, realizes fast and accurate irradiation to moving organs.

- Uniform dose irradiation by rescanning
- Fluoroscopic tracking with/without fiducial markers
- External tracking options

## Scanning

High-speed/Accurate 3D scanning technology contributes to the high-precision irradiation to complex shaped tumors without using collimators and patient

- Wide field size such as 40cm×30cm
- High dose rate
- Variable energy operation up to 600-level



Better together ➤



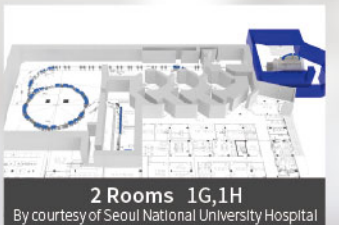
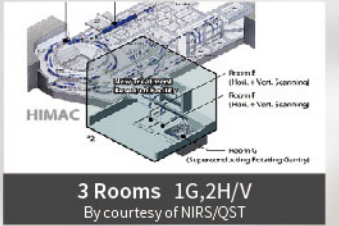
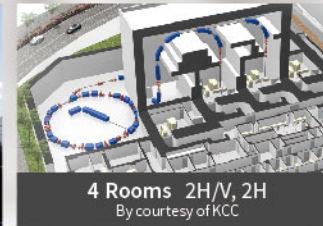
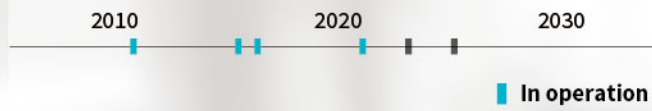
# Better together

Toshiba commits to pursuing the best heavy ion therapy with our clinical partners.

Toshiba has developed the most advanced heavy ion therapy system, with cutting-edge technologies, in collaboration with National Institute of Radiological Sciences in Japan. Toshiba is now stepping forward internationally with our advanced technologies to realize the best care for each and every patient.



## Legacy to future



## Customer feedback

“There are currently 13 heavy ion therapy facilities in operation globally, with more preparing to start in the next few years. Toshiba's systems are one step advanced in technology among them.”

“Toshiba has been arduously developing advanced heavy ion technologies in collaboration with NIRS/QST. The most valuable achievement is the compact superconducting rotating gantry.”

“Scanning beam is indispensable for heavy ion therapy today. Toshiba has made it possible for us to treat patients with very large cancerous tumors.”

## Future collaboration with customer

Upgrade of facility function  
Additional installation with minimal interruption



## Collaboration possibility

- In-room CT / CBCT
- Multi-ion beam
- Adaptive radiotherapy
- More compact system





**Committed to People,  
Committed to the Future.**

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<https://www.toshiba-energy.com/en/heavy-ion/index.htm>

This brochure includes the issues which are not yet approved under the pharmaceutical affairs laws.  
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