

Syllabus

Course	International Training Course for Medical physicist_1-month	Total hrs	57.00
Purpose	Acquire fundamental and advanced knowledge of heavy-ion and carbon-ion radiotherapy, including the clinical background and workflow of CIRT, HIMAC and facility operations, accelerator and irradiation systems, dosimetry and QA/QC, treatment planning, commissioning, patient QA, respiratory and motion management, radiation biology and protection, clinical indications and assessment, operational reliability, audit/intercomparison activities, and current research developments in particle therapy.		
Objectives	1. Understand the background, current status, clinical indications, standard treatments, outcomes, and overall workflow of carbon-ion radiotherapy, including HIMAC and facility operations. 2. Understand particle therapy accelerator technologies and irradiation systems, including ion sources, linear accelerators, synchrotrons, superconducting magnets, gantry systems, and major equipment characteristics. 3. Explain the basic physical principles of particle beams and carbon-ion dosimetry, including particle-matter interactions, ionization chamber dosimetry, reference and relative dosimetry, dose and LET measurement, and uncertainty management. 4. Understand treatment planning workflows and physics for carbon-ion therapy, including imaging, CT-to-SPR conversion, dose calculation algorithms, margin and robustness handling, implant handling, multi-ion therapy, and clinical treatment planning demonstrations. 5. Understand commissioning, patient-specific QA, periodic QA/QC, setup and immobilization, respiratory and motion management, and practical measures required for safe and reliable clinical operation. 6. Understand radiation biology, biological effects and models, radiation protection, and clinical assessment as the basis for safe and effective carbon-ion radiotherapy. 7. Understand operational reliability monitoring, third-party audit/intercomparison activities, and recent research developments in particle therapy.		
Lecture #	Contents		
B-1	[Basic] Introduction to Heavy Ion Therapy	Lecture and video	
B-2	[Basic] Overview of HIMAC	Lecture	
B-3	[Basic] Particle Therapy Accelerators	Lecture	
B-4	[Basic] Irradiation System Equipment	Lecture	
B-5	[Basic] Interaction of Particle Beams with Matter	Lecture	
B-6	[Basic] Dosimetry 1 (Theory)	Lecture	
B-7	[Basic] Dosimetry 2 (Measurement System)	Lecture	
B-8	[Basic] Carbon-Ion Treatment Planning	Lecture	
B-9	[Basic] Carbon-Ion Treatment Planning Demonstration	Observation	
B-10	[Basic] Commissioning	Lecture	
B-11	[Basic] QA (Quality Assurance)	Lecture	
B-12	[Basic] Biological Effects of Carbon-Ion Beams	Lecture	
B-13	[Basic] Motion Management	Lecture	
B-14	[Basic] Facility Tour	Tour	
A-1-1	[Advanced] Ion Source	Lecture	
A-1-2	[Advanced] Linear Accelerator	Lecture	
A-1-3	[Advanced] Synchrotron	Lecture	
A-1-4	[Advanced] Superconducting Magnets, Gantry, Quantum Scalpel	Lecture	
A-2-1	[Advanced] Commissioning 2	Lecture	
A-2-2	[Advanced] Patient QA	Lecture	
A-2-3	[Advanced] Multi-ion	Lecture	
A-2-4	[Advanced] Advanced Dosimetry	Lecture	
A-3-1	[Advanced] CT to SPR Conversion	Lecture	
A-3-2	[Advanced] Dose Calculation Algorithms	Lecture	
A-4-1	[Advanced] Treatment Planning - Head & Neck	Demonstration	

A-4-2	[Advanced] Treatment Planning - Lung	Demonstration
A-4-3	[Advanced] Treatment Planning - Liver	Demonstration
A-4-4	[Advanced] Treatment Planning - Pancreas	Demonstration
A-4-5	[Advanced] Treatment Planning - Prostate	Demonstration
A-4-6	[Advanced] Treatment Planning - Bone & Soft Tissue	Demonstration
A-4-7a, b	[Advanced] Treatment Planning - Gynecology/Breast/Eye/Lower Gastrointestinal	Demonstration
A-5	[Advanced] Radiation Protection in Carbon-ion Radiotherapy	Lecture
A-6	[Advanced] Patient Setup (Immobilization)	Lecture
A-7	[Advanced] Respiratory Management (External Gating)	Lecture
A-8	[Advanced] Respiratory Management (Internal Gating)	Lecture
A-9	[Advanced] Biology in Carbon-ion Radiotherapy	Lecture
A-10	[Advanced] Operation Experience	Lecture
A-11	[Advanced] Audit and Intercomparison	Lecture
A-12	[Advanced] Advanced Research of Particle Therapy	Lecture
C-1	[Clinical] Introduction to Carbon Ion Radiotherapy	Lecture & video
C-2	[Clinical] Head and Neck Cancer	Lecture
C-3	[Clinical] Dental interventions	Lecture
C-4	[Clinical] Ocular melanoma	Lecture
C-5	[Clinical] Esophageal Cancer	Lecture
C-6	[Clinical] Lung cancer	Lecture
C-7	[Clinical] Hepatobiliary cancer	Lecture
C-8	[Clinical] Pancreatic cancer	Lecture
C-9	[Clinical] Urological cancer	Lecture
C-10	[Clinical] Gynecologic tumors	Lecture
C-11	[Clinical] Breast cancer	Lecture
C-12	[Clinical] Locally recurrent colorectal cancer	Lecture
C-13	[Clinical] Sarcoma	Lecture
C-14	[Clinical] Diagnostic Imaging	Lecture
C-15	[Clinical] Physics-0: facility tour	Observation
C-16	[Clinical] Physics-1	Lecture
C-17	[Clinical] Radiation Biology	Lecture
	Conclusion	
Remarks	1. Participants must follow the instructions below. ①Participants are strictly prohibited from performing any clinical procedures,or other medical interventions. ②Clinical observation is allowed only when the patient has given consent. 2. Participants can attend activities as follows: • Treatment planning • QA observation 3. The training content will be implemented in a way that ensures the trainingobjectives can be achieved.	