

4th Summer School in Medical Physics: Radiobiology and Radiobiological Modeling for Radiotherapy

PROGRAM

Target group

- BSc, MSc, PhD & MD students with a background in Physics, Medical Physics, Radiation Therapy
BSc students should be at the end of their studies.
- Young Postdocs (with a PhD Degree awarded after Sep. 01st 2021)
- Further requirements:
 - Good mathematical background
 - Knowledge in Radiotherapy Physics

Certificate and ECTS Points

Once successfully completed, participants will get a certificate of attendance including supplement with 4 ECTS points, issued by the German Cancer Research Center and our partners.

Online Phase: 05. – 25.09.2022

1. Recordings (1 Rec. = 45 min.)

Recording	Main Topic	Talk	Speaker
Rec. 1	Introduction	Overview on medical physics research in HD – contributing institutes	Oliver Jäkel
Rec. 2	Biological Background and Introduction to Modelling	The biological basis of radiotherapy	Ina Kurth
Rec. 3		DNA-damage and molecular consequences as origin of the radiation response	Ramon Lopez Perez
Rec. 4		Cancer stem cells and tumor heterogeneity and their role in radioresistance	Ina Kurth
Rec. 5 & 6		Introduction to radiobiological models (part 1 & 2)	Christian Karger
Rec. 7	Dose-volume effects	Data-driven approaches for radiotherapy response modeling	Hubert Gabrys

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2. Online Sessions on Zoom during Online Phase

Date	Time (CEST)	Main Topic	Talk	Speaker
Tue. 06.09.22	15.30 – 16.00		Mandatory Online-ID-Check	Anna & Marcel
	16.00 – 16.30		Online: Welcome, Introduction and expectations	Simone Barthold-Beß, Marcel Schäfer, Anna Moshanina
	16.30 – 18.00	Biological Background	Introduction to radiobiology	Rob Coppes
Fri. 16.09.22	16.00 – 16.45	Dose-volume effects	Predicting normal tissue complications: relevant clinical applications	Claudio Fiorino
	16.45 – 17.00		Break	
	17.00 – 17.45		Issues in modelling normal tissue complications prediction in the current IGRT/ART era	Claudio Fiorino
	17.45 – 18.00		Wrap-Up & Questions	
Mon. 19.09.22	16.00 – 16.45	Dose-volume effects	Modeling for stratification of patients to treatment modalities	Peter van Luijk
	16.45 – 17.00		Break	
	17.00 – 17.45		Interactions of organ systems in response to irradiation	Peter van Luijk
	17.45 – 18.00		Wrap-Up & Questions	
Tue. 20.09.22	16.00 – 16.45	Summary and Outlook	Questions and Answers about: Applications of the linear-quadratic model	Christian Karger
	16.45 – 17.00		Break	
	17.00 – 17.45		General questions	Christian Karger
	17.45 – 18.00		Wrap-Up & Questions & Outlook attendance phase	

Duration of 1st mandatory Online Test (Multiple Choice) about all topics taught during the Online Phase: 16. – 25.09.2022

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Attendance Phase/Live-Online-Phase

Place: Marsilius-Kolleg, Building INF 130.1 or online on Zoom

Mon. 26.09.22	Time (CEST)	Main Topic	Talk	Speaker
	13.00 – 13:30	Networking	OPTIONAL: Welcome Coffee	
	13.30 – 14.00	Welcome	Welcome by Course Leaders and Team	Christian Karger & Orga-Team
	14.00 – 14.30		Welcome by Heidelberg University & Studying in Heidelberg	Ulrike Riedling (International Office, Heidelberg University)
	14.30 – 15.00		Coffee Break	
	15.00 – 15.45	High-LET radiation	Introduction to Low and High LET Particle Radiation	Brita Sørensen
	15.45 – 16.30		RBE models for heavier ions	Michael Scholz
	16.30 – 16.45		Coffee Break	
	16.45 – 17.30	High-LET radiation	Do we need a variable RBE-model for protons?	Harald Paganetti
	17.30	Networking	Get Together	

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Place: Marsilius-Kolleg, Building INF 130.1 or online on Zoom

Tue. 27.09.22	Time (CEST)	Main Topic	Talk	Speaker
	9.00 – 9.30	Networking	OPTIONAL: Welcome Coffee	
	9.30 – 10.15	High-LET radiation	Inverse treatment planning with radiobiological models	Niklas Wahl
	10.15 – 11.00		Investigating the proton-RBE in patients	Emanuel Bahn
	11.00 – 11.30		Coffee Break	
	11.30 – 12.15	High-LET radiation	Temporal lobe reactions after proton and carbon ion radiotherapy: comparison of RBE-weighted tolerance doses	Clarissa Gillmann
	12.15 – 12.30		Wrap-up & Questions	
	12.30 – 13.30		Lunch Break	
	13.30 – 14.15	High-LET radiation	Validating RBE-models in animals	Christian Karger
	14.15 – 15.00		Clinical application of RBE-models	Christian Karger
	15.00 – 15.30		Coffee Break	
	15.30 – 16.15		Discussion Round with experts (Pro/Contra of different models, Clinical application, uncertainties and clinical handling of uncertainties etc.? (Participants will be allowed to hand-in questions) Moderator: Christian Karger	Emanuel Bahn, Semi Harrabi, Christian Karger, Harald Paganetti
	16.15 – 16.30		Wrap-up & Questions	Christian Karger
	16.30 – 17.30	Networking	OPTIONAL: Guided Tour on the Campus Neuenheimer Feld	HIT or MR-Linac or Clinic

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Place: Marsilius-Kolleg, Building INF 130.1 or online on Zoom

Wed. 28.09.22	Time (CEST)	Main Topic	Talk	Speaker
	9.00 – 9.30	Networking	OPTIONAL: Welcome Coffee	
	9.30 – 10.15	Hypoxia and the impact of Oxygen	The effect of hypoxia in radiation response	Joao Seco
	10.15 – 11.00		Radiation response of hypoxic tumors	Christin Glowa
	11.00 – 11.30		Coffee Break	
	11.30 – 12.15	Hypoxia and the impact of Oxygen	Hypoxia imaging: <ul style="list-style-type: none"> • Overview • Possibilities and limitations 	Ina Kurth
	12.15 – 12.30		Wrap-up & Questions	
	12.30 – 13.30		Lunch Break	
	13.30 – 14.15	Hypoxia and the impact of Oxygen	Models for dose painting to improve treatment of hypoxic tumors	Daniela Thorwarth
	14.15 – 15.00		Journal Club part 1: Papers are introduced by students in groups <ul style="list-style-type: none"> • Paper 1: LET painting • Paper 2: tbd • Paper 3: tbd 	Oliver Jäkel & Christian Karger & Daniela Thorwarth
	15.00 – 15.30		Coffee Break	
	15.30 – 16.15		Journal Club part 2	Oliver Jäkel & Christian Karger
	16.15 – 16.30		Wrap-up & Questions	
	16.30 – 17.30	Networking	OPTIONAL: Guided Tour to REZ Building of DKFZ	

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Place: DKFZ Lecture Hall or online on Zoom

Thu. 29.09.22	Time (CEST)	Main Topic	Topic	Speaker
	9.00 – 9.30	Networking	OPTIONAL: Welcome Coffee	
	9.30 – 10.15	Devices	Small animal imaging devices in preclinical research	Ina Kurth
	10.15 – 11.00		Small animal irradiation devices in preclinical research	Patrick Granton
	11.00 – 11.30		Coffee Break	
	11.30 – 12.15	Devices	How can small animal imaging and irradiation devices improve modeling for radiotherapy?	Patrick Granton
	12.15 – 12.30		Wrap-up & Questions	
	12.30 – 13.30		Lunch Break	
	13.30 – 14.15	Special Techniques	Evidence on FLASH radiotherapy and potential for clinical application	Joao Seco
	14.15 – 15.00		Mini beam Radiotherapy	Yolanda Prezado
	15.00 – 15.30		Coffee Break	
	15.30 – 16.15	Special Techniques	Pro & Contra Debate: FLASH Moderation: Christian Karger	Pro: Joao Seco Contra: Oliver Jäkel
	16.15 – 16.30		Wrap-up & closing	Oliver Jäkel
	18.00	Networking	OPTIONAL Dinner	

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Place: DKFZ, K1/K2 and online on Zoom

Fri. 30.09.22	Time (CEST)	Main Topic	Talk	Speaker
	9.00 – 9.30	Networking	Welcome Coffee	
	9.30 – 10.15	Clinical	General clinical requirements/decision-making basis for RBE model	Semi Harrabi
	10.15 – 11.00		Is RBE weighted dose optimization the optimal way to meet clinical needs in CIRT? (tbd.)	Piero Fossati
	11.00 – 11.30		Coffee Break	
	11.30 – 12.45	round table discussion	<p>Meet the Expert: 4 experts with different topics; rotation after 15 min.</p> <ul style="list-style-type: none"> • Semi Harrabi: clinical radiobiology • Oliver Jäkel: biological models for particle therapy • Joao Seco: radiobiological models • Ina Kurth: molecular radiobiology, hypoxia, small animal treatment <p>While 3 experts are on three tables, one expert is online on Zoom with online participants. After 15 minutes, the next expert is online; thus, all experts are online once.</p>	Semi Harrabi, Oliver Jäkel, Joao Seco, Ina Kurth
	12.45 – 13.00		Wrap-up & Conclusion of the summer school	Oliver Jäkel & Christian Karger

Duration of 2nd mandatory Online Test (Multiple Choice) about topics taught during Attendance Phase/Live-Online-Phase: 30.09. – 05.10.2022

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