

PROGRAMME

Dose Modelling and Verification for External Beam Radiotherapy

14-18 March 2010, Seville, Spain

Teaching staff: Maria Mania Aspradakis (MA), Switzerland
 Anders Ahnesjö (AA), Sweden
 Günther Hartmann (GH), Germany
 Nuria Jornet I Sala (NJ), Spain
 Tommy Knöös (TK), Sweden - Course director
 Brendan McClean (BMcC), Ireland - Course director
 Jörgen Olofsson (JO), Sweden

Guest lecturer: Francisco Sanchez-Doblado (FSD), Spain

Course co-ordinator: Dominique Weyers (DW), Belgium

SUNDAY 14 MARCH

Chair: Tommy Knöös

10.00 - 10.30	1. Introduction to the course - Setting the scene - Accuracy requirements in RT	TK
2. The radiation transport and energy deposition, formalism and definitions, absorbed dose, calibration etc		
10.30 - 11.15	2a. Basic quantities, concepts and theorem	BMcC
11.15 - 12.00	2b. Basic experimental quantities	MA
12.00 - 12.30	<i>Coffee</i>	
12.30 - 13.15	2c. Reference dosimetry	GH
13.15 - 14.00	GUEST LECTURE - MC as powerful tool for IMRT absolute dose verification	FSD
14.00 - 15.00	<i>Lunch</i>	
<u>Chair: Brendan McClean</u>		
15.00 - 15.45	2d. Characterisation of patients for dose calculations	BMcC
15.45 - 16.45	2e. Introduction to Monte Carlo modelling	MA
16.45 - 17.00	<i>Coffee</i>	
3. Modelling of photon beams		
17.00 - 18.00	3a. Linac treatment head design for photon beams	JO

MONDAY 15 MARCH

Chair: Günther Hartmann

10.00 - 10.45	3b. Introduction to photon beam modelling and dose per MU formalisms	MA
10.45 - 11.30	3c. Multi-source models and data commissioning for treatment planning	AA
11.30 - 12.00	3d. Broad beam correction-based dose modelling	MA
12.00 - 12.30	<i>Coffee</i>	
12.30 - 13.15	3e. Pencil kernel models for photon dose calculations	JO
13.15 - 14.00	3f. Point kernel models for dose modelling in the patient	AA
14.00 - 15.00	<i>Lunch</i>	
<u>Chair: Maria Mania Aspridakis</u>		
4. Photon dose modelling based on factor models and independent dose calculations		
15.00 - 15.45	4a. Introduction to independent MU calculations as a verification tool	NJ
15.45 - 16.45	4b. ESTRO factor formalism - Concepts and implementation 4c. Monitor Unit calculation for electron beams	BMcC NJ
16.45 - 17.00	<i>Coffee</i>	
5. Modelling of "small" beams		
17.00 - 18.00	5a. Small photon fields - Dosimetry	GH

TUESDAY 16 MARCH

Chair: Jorgen Olofsson

10.00 - 10.45	5b. Small photon fields - Modelling, dose calculation and IMRT issues	AA
6. Modelling electron beams		
10.45 - 11.15	6a. Linac treatment head design for electron beams	NJ
11.15 - 12.00	6b. Beam characterisation and dose modelling for electron beams	AA
12.00 - 12.30	<i>Coffee</i>	
12.30 - 13.00	7. Uncertainties	GH
13.00 - 14.00	8. Dose modelling discussion	AA
14.00 - 15.00	<i>Lunch</i>	
15.00 - 16.00	Practicals I	
16.00 - 16.45	<i>Coffee</i>	
16.45 - 17.45	Practicals II	

WEDNESDAY 17 MARCH

Chair: Anders Ahnesjö

9. Dose verification		
10.00 - 10.45	9a. Point detectors (1D)	JO
10.45 - 12.15	9b. Dose verification - 2D/3D detectors and methods	NJ
12.15 - 12.45	<i>Coffee</i>	
12.45 - 13.15	9c. Methods for comparison	TK
13.15 - 14.00	9d. The ESTRO project on dose verification for advanced treatment techniques	JO
14.00 - 15.00	<i>Lunch</i>	
15.00 - 16.00	Practicals III	
16.00 - 16.45	<i>Coffee</i>	
16.45 - 17.45	Practicals IV	

THURSDAY 18 MARCH

Chair: Nuria Jornet I Sala

10.00 - 11.00	10. What a physicist should look at in a treatment planning system	TK
11.00 - 12.00	11. Dose calculation for proton and ion beams	GH
12.00 - 12.15	<i>Coffee</i>	
12.15 - 13.00	12. How good can it get?	TK
13.00 - 13.30	13. Discussions - Closing - Thanks	TK & BMcC

Practical exercises:

- A) Monitor calculation for electrons - I (NJ)
- B) Monitor calculation for photons - II simple geometry (open beams) (BMcC)
- C) Monitor calculation for photons - III complicated geometry (wedge and/or blocks, MLC) (JO)
- D) Virtual calibration (GH+TK)

LITERATURE

Suggested reading prior to the course (of relevant sections in the following books)

- Attix, F. A. (1986). Introduction to Radiological Physics and Radiation Dosimetry, 0-471-01146-0, John Wiley & Sons, Inc.
- IAEA (2000). Absorbed dose determination in external beam radiotherapy: An international code of practice for dosimetry based on standards of absorbed dose to water. TRS, 398, <http://www-naweb.iaea.org/nahu/dmrp/codeofpractice.shtm> and worksheets at <http://www-naweb.iaea.org/nahu/dmrp/trs398.zip>
- Radiation Oncology Physics: A Handbook for Teachers and Students, ed E. B. Podgorsak, IAEA 2005, ISBN 92-0-107304-6, <http://www-naweb.iaea.org/nahu/dmrp/syllabus.shtm> and <http://www-naweb.iaea.org/nahu/dmrp/slides.shtm>
- Modern Technology of Radiation Oncology, Volume 1, ed: J Van Dyk, 1999, ISBN: 9780944838228
- The Physics of Radiation Therapy, F. M. Kahn, 2003, Lippincott Williams & Wilkins, ISBN 0-7817-3065-1
- Physics of Radiotherapy X-Rays from Linear Accelerators, Metcalfe P., Kron T., Hoban P., Medical Physics Publishing, 2007, ISBN: 9781930524361
- Handbook of Radiotherapy Physics, Theory and Practice, ed: P. Mayles, A. Nahum, J-C. Rosenwald, 2007, Taylor & Francis, ISBN 0-7503-0860-5
- Ahnesjö and Aspradakis (1999), Dose calculations for external photon beams in radiotherapy, Physics in Medicine and Biology 44, R99-155
- AAPM, Ed. (2004). AAPM TG85: Tissue inhomogeneity corrections for megavoltage photon beams, Madison, Medical Physics Publishing, 1-888340-47-9; <http://www.aapm.org/pubs/reports/>
- Schlegel and Mahr (eds): 3D Conformal Radiation Therapy, A Multimedia Introduction to Methods and Techniques. Springer Verlag Berlin, Heidelberg New York (2001)
- ESTRO Booklet 3: Dutreix, A., Bjärngård, B. E., Bridier, A., Mijnheer, B., Shaw, J. E. and Svensson, H. (1997). Monitor Unit Calculation For High Energy Photon Beams. Physics for Clinical Radiotherapy, Garant Publishers, N. V.; <http://www.estro-education.org/publications/Documents/Booklet3.htm>
- ESTRO Booklet 6: Mijnheer, B., Bridier, A, Garibaldi, C, Torzsok, K, Venselaar, J (2001). Monitor Unit Calculation For High Energy Photon Beams - Practical Examples, ESTRO ISBN 90-80453204; http://www.estro-education.org/publications/Documents/booklet6_Physics.pdf
- ESTRO Booklet 7: Mijnheer, B., Olszewska, A., Fiorino, C., Hartmann, G. H., Knöös, T., Rosenwald, J. C. and Welleweerd, H. (2004). Quality assurance of treatment planning systems practical examples for non-imrt photon beams Physics for Clinical Radiotherapy, 90-804532-7. http://www.estro-education.org/publications/Documents/booklet7_Physics.pdf
- ESTRO booklet 9: Mijnheer, B and Georg D (editors), (2008) Guidelines for the verification of IMRT, ESTRO ISBN 90-804532-9; http://www.estro-education.org/publications/Documents/booklet9_Physics.pdf