

Joint Research Activities – General Overview

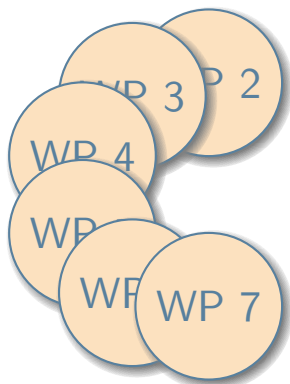
Richard Pötter and Thomas Schreiner

ULICE – Annual Workshop

September 15, 2012



Six work-packages in JRA – Structure



Clinical research infrastructure

Biologically based expert system for individualised patient allocation

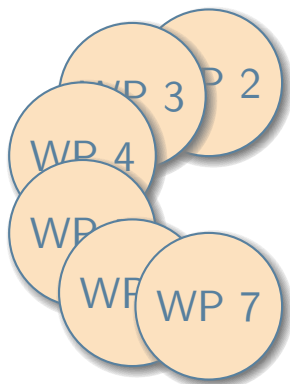
Ion therapy for intra-fractional moving targets

Adaptive treatment planning for ion radiotherapy

Carbon ion gantry

Common database and grid infrastructures for improving and catalysing access to RI for the broad European community

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Six work-packages in JRA – Coordinators

WP 2: Clinical research infrastructure

WP 3: Biologically based expert system for individualised patient allocation

WP 4: Ion therapy for intra-fractional moving targets

WP 5: Adaptive treatment planning for ion radiotherapy

WP 6: Carbon ion gantry

WP 7: Common database and grid infrastructures for improving and catalysing access to RI for the broad European community

Coordinators:

Ulrike Mock, Jacques Balosso

Subgroup coordinators:

2.1: André Wambersie, Jacques Balosso

2.2: Ramona Mayer, Pascal Pommier

2.3: Richard Pötter, Michael Baumann

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Coordinators:

Michael Baumann, Wolfgang Enghardt

Subgroup coordinators:

3.1: Michael Baumann

3.2: Vincent Grégoire

3.3: Wolfgang Enghardt

3.4: Benjamin Ribba

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Coordinators:

Dietmar Georg, Christoph Bert

Subgroup coordinators:

4.1: David Sarrut

4.2: Guido Baroni

4.3: Flavio Marchetto

4.4: Christoph Bert

4.5: Dietmar Georg

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Coordinator:

Michael Krämer

Subgroup coordinators:

5.1: Michael Krämer

5.2: Oliver Jäkel

5.3: Bleddyn Jones

5.4: Dietmar Georg

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Coordinator:

Marco Pullia

Subgroups:

6.1: Functional specifications

6.2: Conceptual design

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Coordinators:

Bleddyn Jones, Steve Harris

Subgroups:

7.1: Infrastructure

7.2: Semantics

7.3: Services

7.4: Treatments

JRA deliverables – already finished

1/4

M 3 – November 2009 – WP 7

- 7.1 Federated security infrastructure; metadata services for recording terminology; model generation components for the creation of data capture interfaces ✓

M 6 – February 2010 – WP 7

- 7.2 Selection, development and curation of metadata elements and models for the capture of inter-operable presentation, treatment and outcome data for large hadron-therapy ✓

M 9 – May 2010 – WP 6

- 6.1 A report describing the optimised functional specifications ✓

M 18 – February 2011 – WP 2

- 2.1 Harmonisation of concepts and terms for volume and dose parameters in photon, proton and carbon-ion therapy ✓
- 2.2 Review of the existing protocol structure in large clinical research organisations (national and international) as collected by WP 10 ✓
- 2.3 Description of tasks with a proposal for potential structures for clinical research in ULICE ✓

JRA deliverables – already finished

2/4

M 18 – February 2011 – WP 3

- | | | |
|------------------|--|---|
| 3.1 | List of radiobiological relevant parameters determining tumour control dependent on the beam quality | ✓ |
| 3.2 [†] | Report of different methods available for measurement of radiobiological relevant parameters in patients | ✓ |
| 3.3 [†] | Report on data of the radiobiological effects of different beams on tumours | ✓ |
| 3.4 | Structure of the software modules | ✓ |
| 3.5 | Provision of exemplary molecular imaging data sets to WP 5 | ✓ |

[†] the two deliverables 3.2 and 3.3 have been combined into one report

M 18 – February 2011 – WP 4

- | | | |
|-----|--|---|
| 4.1 | 4D deformation model for generation of reference data | ✓ |
| 4.2 | Prototype of optical tracking system based on external markers and surface detection | ✓ |
| 4.3 | Lateral compensation strategy based on motion monitoring signal | ✓ |
| 4.4 | Rescanning component of UKL-HD treatment control system | ✓ |

M 18 – February 2011 – WP 5

- | | | |
|-----|--|---|
| 5.1 | Recommendations for organ depending optimised fixation systems | ✓ |
| 5.2 | Results of robustness test with respect to inter-fraction variations | ✓ |

M 24 – August 2011 – WP 2

- 2.4 Joint dosimetry protocol structure enabling inter-comparison between centres, including modern dosimetric and microdosimetric approaches (e. g. selection of stopping powers) ☒

M 24 – August 2011 – WP 3

- 3.6 Test version of software modules available ☐
- 3.7 Report on the methodology and the clinical goals of implementation of the radiobiology-driven software prototype ☒

M 24 – August 2011 – WP 4

- 4.5 Motion model demonstrating internal-external correlation ☒
- 4.6 Strategies demonstrating the integration of optical tracking with in-room 2D, 3D, 4D imaging and 4D dose delivery ☒
- 4.7[‡] Lateral and longitudinal compensation based on monitoring signal ☐
- 4.8 Overview and comparison of existing workflow concepts for 4D radiotherapy ☒

[‡] deliverable 4.7 scheduled for M 24, August 2011, has been shifted to M 36, August 2012

JRA deliverables – already finished

4/4

M 24 – August 2011 – WP 5 ⇒ M 28 – December 2011		
5.3 [†]	TRiP version including spatially variable radio-sensitivity (hypoxia)	✓
5.4 [†]	Protocol for replanning steps due to temporal variation on radio-sensitivity	✓
5.5	TPS version for a common photon-ion treatment plan including several facilities	✓
5.6 [†]	Table of pre-conditions eligible for multi-ion treatment	✓
5.7	TRiP version for a biologically optimised multi-ion treatment plan	✓
5.8	Table of alpha/beta values depending on initial sensitivity and fractionation scheme	✓

[†] *the three deliverables 5.3, 5.4, and 5.6 have been combined into one report with the new title “TRiP version including hypoxia”*

M 30 – February 2012 – WP 6 ⇒ M 34 – June 2012		
6.2 [‡]	Conceptual design of the gantry explaining the choices made	✓

[‡] *deliverable 6.2 scheduled for M 30, February 2012, has been shifted to M 34, June 2012*

JRA deliverables falling due M 36 – August 2012

WP 2 – 1 is currently missing		
2.5	Harmonisation and recommendations for prescribing and reporting absorbed doses and dose-volume histogrammes based on 3D and 4D concepts	✓
2.6	Implementation, testing and evaluation of the structure with typical "cases" for research and development	□
2.7	Document on joint outcome assessment: disease control, recurrence assessment, morbidity assessment, quality of life	✓
2.8	Designing a standard operation procedure taking into account concepts and terms as defined in WP 2.1	✓

WP 3 – 5 old ones are currently missing – restructure of WP 3 and corresponding deliverables		
3.8	Report on the importance weighting of radiobiological parameters for tumour response	□
3.9	Report on validity and suitability of methods of measurement of radiobiological parameters in patients	□
3.10	Provision of refined exemplary molecular imaging data sets on different clinically relevant situations of tumour radio-sensitivity	□
3.11	Fully evaluated test version of software modules	□
3.12	Catalogue of protocol designs that could test the software prototype	□

JRA deliverables falling due M 36 – August 2012

WP 4

- | | | |
|------|--|---|
| 4.9 | 4D deformation model with adaptation to daily data | ✓ |
| 4.10 | Combined internal/external motion monitoring | ✓ |

WP 5

- | | | |
|-----|--|---|
| 5.9 | Protocol to decide in case of inter-fraction motion: replanning or follow inter-fraction organ motion control? | ✓ |
|-----|--|---|

WP 6 – draft version is currently available

- | | | |
|-----|--|---|
| 6.3 | Final design of the gantry describing the device, the design strategy and the performances achieved. It includes the papers published, the preliminary design of those magnets, power supplies, mechanical structure aspects that are considered to be more critical | □ |
|-----|--|---|

WP 7 – 2 are currently missing

- | | | |
|-----|--|---|
| 7.3 | Prototypical services for the capture, cleaning, anonymisation and federation of case history data | □ |
| 7.4 | Prototypical services that allow a clinician to locate case histories, to view summary information, and to request detailed information in support of treatment planning | □ |



Upcoming JRA deliverables – end of project

WP 2 – M 48 – August 2013

- 2.9 Integrated concept of 3D/4D absorbed dose and variations in biological effects with RBE, fractionation, overall time
- 2.10 Adaptation of the so far existing protocols (that will be provided by WP 10) within the facilities (UKL-HD, CNAO, UNIMAR) according to the needs as defined in this SOP for clinical trial design for hadron-therapy in cooperation with WP 11
- 2.11 Adaptation of the tasks and the structure according to the test phase to design and to implement the final set of tasks and structure as agreed upon

WP 3 – M 48 – August 2013

- 3.13 Report of harmonised protocols for measurement of radiobiological parameters in patients
- 3.14 Report on recommendation on implementation of the expert system prototype
- 3.15 Report on areas where data is lacking and recommendation for prioritisation of future research project
- 3.16 Prototype of software modules including the radiobiological data basis and importance weighting

WP 4 – M 48 – August 2013

- 4.11 Guideline document on QA and workflow aspects (incl. radiation protection) for 4D ion beam therapy
- 4.12 Rescanning prototype validation

WP 5 – M 37 – September 2012

- 5.10 Representative treatment plans and recommendations for different fractionation schemes

WP 7 – M 48 – August 2013

- 7.5 Infrastructure update: finalised version of grid and services infrastructure, together with semantic data and terminology services, complete with report upon continued development, feedback, and adoption
- 7.6 Tools update: finalised version of tool support for treatment plan comparison, image management, and clinical data acquisition and standardisation, complete with report upon development and adoption

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