HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI 2005–2010

RC-Specific Evaluation of BNCTMI – Medical Physics: BNCT & Medical Imaging

Seppo Saari & Antti Moilanen (Eds.)

Evaluation Panel: Natural Sciences

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI 2005–2010

RC-Specific Evaluation of BNCTMI – Medical Physics: BNCT & Medical Imaging

Seppo Saari & Antti Moilanen (Eds.)

University of Helsinki
Administrative Publications 80/68
Evaluations

2012

Publisher:
University of Helsinki

Editors:
Seppo Saari & Antti Moilanen

Title:
International Evaluation of Research and Doctoral Training at the University of Helsinki 2005–2010 : RC-Specific Evaluation of BNCTMI – Medical Physics: BNCT & Medical Imaging

Type of publication:
Evaluations

Summary:
Researcher Community (RC) was a new concept of the participating unit in the evaluation. Participation in the evaluation was voluntary and the RCs had to choose one of the five characteristic categories to participate.
Evaluation of the Researcher Community was based on the answers to the evaluation questions. In addition a list of publications and other activities were provided by the TUHAT system. The CWTS/Leiden University conducted analyses for 80 RCs and the Helsinki University Library for 66 RCs.
Panellists, 49 and two special experts in five panels evaluated all the evaluation material as a whole and discussed the feedback for RC-specific reports in the panel meetings in Helsinki. The main part of this report is consisted of the feedback which is published as such in the report.
Chapters in the report:
1. Background for the evaluation
2. Evaluation feedback for the Researcher Community
3. List of publications
4. List of activities
5. Bibliometric analyses
The level of the RCs' success can be concluded from the written feedback together with the numeric evaluation of four evaluation questions and the category fitness. More conclusions of the success can be drawn based on the University-level report.

RC-specific information:

Main scientific field of research:
Natural Sciences

Participation category:
2. Research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through

RC's responsible person:
Savolainen, Sauli

RC-specific keywords:
Medical radiation physics, medical physics, molecular imaging, BNCT, medical engineering, nuclear medicine, MRI, MRS, dosimetry, computational physics

Keywords:
Research Evaluation, Meta-evaluation, Doctoral Training, Bibliometric Analyses, Researcher Community

Series title and number:
University of Helsinki, Administrative Publications 80/68, Evaluations

ISSN:
1795-5513 (Online)

ISBN:
978-952-10-7488-2 (PDF)

Total number of pages:
66

Language:
English

Additional information:
Cover graphics: Päivi Talonpoika-Ukkonen
Enquiries: seppo.o.saari@helsinki.fi

Internet address:
http://www.helsinki.fi/julkaisut/aineisto/rc_evaluation2012/hallinnon_julkaisuja_80_68_2012.pdf

Contents

Foreword

The evaluation of research and doctoral training is being carried out in the years 2010–2012 and will end in 2012. The steering group appointed by the Rector in January 2010 set the conditions for participating in the evaluation and prepared the Terms of Reference to present the evaluation procedure and criteria. The publications and other scientific activities included in the evaluation covered the years 2005–2010.

The participating unit in the evaluation was defined as a Researcher Community (RC). To obtain a critical mass with university-level impact, the number of members was set to range from 20 to 120. The RCs were required to contain researchers in all stages of their research career, from doctoral students to principal investigators (PIs). All in all, 136 Researcher Communities participated in this voluntary evaluation, 5857 persons in total, of whom 1131 were principal investigators. PIs were allowed to participate in two communities in certain cases, and 72 of them used this opportunity and participated in two RCs.

This evaluation enabled researchers to define RCs from the "bottom up" and across disciplines. The aim of the evaluation was not to assess individual performance but a community with shared aims and researcher-training activities. The RCs were able to choose among five different categories that characterised the status and main aims of their research. The steering group considered the process of applying to participate in the evaluation to be important, which lead to the establishment of these categories. In addition, providing a service for the RCs to enable them to benchmark their research at the global level was a main goal of the evaluation.

The data for the evaluation consisted of the RCs' answers to evaluation questions on supplied e-forms and a compilation extracted from the TUHAT – Research Information System (RIS) on 12 April 2011. The compilation covered scientific and other publications as well as certain areas of scientific activities. During the process, the RCs were asked to check the list of publications and other scientific activities and make corrections if needed. These TUHAT compilations are public and available on the evaluation project sites of each RC in the TUHAT-RIS.

In addition to the e-form and TUHAT compilation, University of Leiden (CWTS) carried out bibliometric analyses from the articles included in the Web of Science (WoS). This was done on University and RC levels. In cases where the publication forums of the RC were clearly not represented by the WoS data, the Library of the University of Helsinki conducted a separate analysis of the publications. This was done for 66 RCs representing the humanities and social sciences.

The evaluation office also carried out an enquiry targeted to the supervisors and PhD candidates about the organisation of doctoral studies at the University of Helsinki. This and other documents describing the University and the Finnish higher education system were provided to the panellists.

The panel feedback for each RC is unique and presented as an entity. The first collective evaluation reports available for the whole panel were prepared in July–August 2011. The reports were accessible to all panel members via the electronic evaluation platform in August. Scoring from 1 to 5 was used to complement written feedback in association with evaluation questions 1–4 (scientific focus and quality, doctoral training, societal impact, cooperation) and in addition to the category evaluating the fitness for participation in the evaluation. Panellists used the international level as a point of comparison in the evaluation. Scoring was not expected to go along with a preset deviation.

Each of the draft reports were discussed and dealt with by the panel in meetings in Helsinki (from 11 September to 13 September or from 18 September to 20 September 2011). In these meetings the panels also examined the deviations among the scores and finalised the draft reports together.

The current RC-specific report deals shortly with the background of the evaluation and the terms of participation. The main evaluation feedback is provided in the evaluation report, organised according to the evaluation questions. The original material provided by the RCs for the panellists has been attached to these documents.

On behalf of the evaluation steering group and office, I sincerely wish to thank you warmly for your participation in this evaluation. The effort you made in submitting the data to TUHAT-RIS is gratefully acknowledged by the University. We wish that you find this panel feedback useful in many ways. The bibliometric profiles may open a new view on your publication forums and provide a perspective for discussion on your choice of forums. We especially hope that this evaluation report will help you in setting the future goals of your research.

Johanna Björkroth
Vice-Rector
Chair of the Steering Group of the Evaluation

Steering Group of the evaluation

Steering group, nominated by the Rector of the University, was responsible for the planning of the evaluation and its implementation having altogether 22 meetings between February 2010 and March 2012.

Chair

Vice-Rector, professor **Johanna Björkroth**

Vice-Chair

Professor **Marja Airaksinen**

Chief Information Specialist, Dr **Maria Forsman**
Professor **Arto Mustajoki**
University Lecturer, Dr **Kirsi Pyhältö**
Director of Strategic Planning and Development, Dr **Ossi Tuomi**
Doctoral candidate, MSocSc **Jussi Vauhkonen**

Panel members

CHAIR
Professor Jan-Otto Carlsson
Materials science in chemistry and physics, nanotechnology, inorganic chemistry
Uppsala University, Sweden

VICE-CHAIR
Professor Jan van Leeuwen
Computer science, information technology
University of Utrecht, the Netherlands

Professor Caitlin Buck
Probability and statistics, archeology, palaeoenvironmental science
University of Sheffield, Great Britain

Professor David Colton
Mathematics, inverse problems of acoustic and electromagnetic scattering
University of Delaware, USA

Professor Jean-Pierre Eckmann
Mathematics, dynamical systems, mathematical physics
University of Geneva, Switzerland

Professor Ritske Huismans
Geosciences, geodynamics
University of Bergen, Norway

Professor Jukka Jurvelin
Medical physics and engineering
University of Eastern Finland

Professor Lea Kauppi
Environmental sciences, water research
The Finnish Environment Institute, Finland

Professor Riitta Keiski
Chemical engineering, heterogeneous catalysis, environmental technology, mass and heat transfer processes
University of Oulu, Finland

Professor Mats Larsson
Experimental molecular physics, chemical dynamics, molecular spectroscopy, astrobiology
Stockholm University, Sweden

Professor Holger Stark
Medicinal, organic and pharmaceutical chemistry, pharmacology
Johann Wolfgang Goethe Universität, Germany

The panel, independently, evaluated all the submitted material and was responsible for the feedback of the RC-specific reports. The panel members were asked to confirm whether they had any conflict of interests with the RCs. If this was the case, the panel members disqualified themselves in discussion and report writing.

Added expertise to the evaluation was contributed by the members from the other panels.

Experts from the Other Panels

Professor Barbara Koch, from the Panel of Biological, Agricultural and Veterinary Sciences
Professor Peter York, from the Panel of Medicine, Biomedicine and Health Sciences

EVALUATION OFFICE

Dr Seppo Saari, **Doc.**, Senior Adviser in Evaluation, was responsible for the entire evaluation, its planning and implementation and acted as an Editor-in-chief of the reports.

Dr Eeva Sievi, **Doc.,** Adviser, was responsible for the registration and evaluation material compilations for the panellists. She worked in the evaluation office from August 2010 to July 2011.

MSocSc Paula Ranne, Planning Officer, was responsible for organising the panel meetings and all the other practical issues like agreements and fees and editing a part the RC-specific reports. She worked in the evaluation office from March 2011 to January 2012.

Mr Antti Moilanen, Project Secretary, was responsible for editing the reports. He worked in the evaluation office from January 2012 to April 2012.

TUHAT OFFICE

Provision of the publication and other scientific activity data

Mrs Aija Kaitera, Project Manager of TUHAT-RIS served the project ex officio providing the evaluation project with the updated information from TUHAT-RIS. The TUHAT office assisted in mapping the publications with CWTS/University of Leiden.

MA Liisa Ekebom, Assisting Officer, served in TUHAT-RIS updating the publications for the evaluation. She also assisted the UH/Library analyses.

BA Liisa Jäppinen, Assisting Officer, served in TUHAT-RIS updating the publications for the evaluation.

HELSINKI UNIVERSITY LIBRARY

Provision of the publication analyses

Dr Maria Forsman, Chief Information Specialist in the Helsinki University Library, managed with her 10 colleagues the bibliometric analyses in humanities, social sciences and in other fields of sciences where CWTS analyses were not applicable.

Acronyms and abbreviations applied in the report

External competitive funding

AF – Academy of Finland
TEKES - Finnish Funding Agency for Technology and Innovation
EU - European Union
ERC - European Research Council
International and national foundations
FP7/6 etc. /Framework Programmes/Funding of European Commission

Evaluation marks

Outstanding (5)
Excellent (4)
Very Good (3)
Good (2)
Sufficient (1)

Abbreviations of Bibliometric Indicators

P - Number of publications
TCS – Total number of citations
MCS - Number of citations per publication, excluding self-citations
PNC - Percentage of uncited publications
MNCS - Field-normalized number of citations per publication
MNJS - Field-normalized average journal impact
THCP10 - Field-normalized proportion highly cited publications (top 10%)
INT_COV - Internal coverage, the average amount of references covered by the WoS
WoS – Thomson Reuters Web of Science Databases

Participation category

Category 1. The research of the participating community represents the international cutting edge in its field.
Category 2. The research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through.
Category 3. The research of the participating community is distinct from mainstream research, and the special features of the research tradition in the field must be considered in the evaluation.
Category 4. The research of the participating community represents an innovative opening.
Category 5. The research of the participating community has a highly significant societal impact.

Research focus areas of the University of Helsinki

Focus area 1: The basic structure, materials and natural resources of the physical world
Focus area 2: The basic structure of life
Focus area 3: The changing environment – clean water
Focus area 4: The thinking and learning human being
Focus area 5: Welfare and safety
Focus area 6: Clinical research
Focus area 7: Precise reasoning
Focus area 8: Language and culture
Focus area 9: Social justice
Focus area 10: Globalisation and social change

1 Introduction to the Evaluation

1.1 RC-specific evaluation reports

The participants in the evaluation of research and doctoral training were Researcher Communities (hereafter referred to as the RC). The RC refers to the group of researchers who registered together in the evaluation of their research and doctoral training. Preconditions in forming RCs were stated in the Guidelines for the Participating Researcher Communities. The RCs defined themselves whether their compositions should be considered well-established or new.

It is essential to emphasise that the evaluation combines both meta-evaluation[1] and traditional research assessment exercise and its focus is both on the research outcomes and procedures associated with research and doctoral training. The approach to the evaluation is enhancement-led where self-evaluation constituted the main information. The answers to the evaluation questions formed together with the information of publications and other scientific activities an entity that was to be reviewed as a whole.

The present evaluation recognizes and justifies the diversity of research practices and publication traditions. Traditional Research Assessment Exercises do not necessarily value high quality research with low volumes or research distinct from mainstream research. It is challenging to expose the diversity of research to fair comparison. To understand the essence of different research practices and to do justice to their diversity was one of the main challenges of the present evaluation method. Understanding the divergent starting points of the RCs demanded sensitivity from the evaluators.

1.2 Aims and objectives in the evaluation

The aims of the evaluation are as follows:

- to improve the level of research and doctoral training at the University of Helsinki and to raise their international profile in accordance with the University's strategic policies. The improvement of doctoral training should be compared to the University's policy.[2]
- to enhance the research conducted at the University by taking into account the diversity, originality, multidisciplinary nature, success and field-specificity,
- to recognize the conditions and prerequisites under which excellent, original and high-impact research is carried out,
- to offer the academic community the opportunity to receive topical and versatile international peer feedback,
- to better recognize the University's research potential.
- to exploit the University's TUHAT research information system to enable transparency of publishing activities and in the production of reliable, comparable data.

1.3 Evaluation method

The evaluation can be considered as an enhancement-led evaluation. Instead of ranking, the main aim is to provide useful information for the enhancement of research and doctoral training of the participating RCs. The comparison should take into account each field of science and acknowledge their special character.

[1] The panellists did not read research reports or abstracts but instead, they evaluated answers to the evaluation questions, tables and compilations of publications, other scientific activities, bibliometrics or comparable analyses.

[2] Policies on doctoral degrees and other postgraduate degrees at the University of Helsinki.

The comparison produced information about the present status and factors that have lead to success. Also challenges in the operations and outcomes were recognized.

The evaluation approach has been designed to recognize better the significance and specific nature of researcher communities and research areas in the multidisciplinary top-level university. Furthermore, one of the aims of the evaluation is to bring to light those evaluation aspects that differ from the prevalent ones. Thus the views of various fields of research can be described and research arising from various starting points understood better. The doctoral training is integrated into the evaluation as a natural component related to research. Operational processes of doctoral training are being examined in the evaluation.

Five stages of the evaluation method were:

1. Registration – Stage 1
2. Self-evaluation – Stage 2
3. TUHAT[3] compilations on publications and other scientific activities[4]
4. External evaluation
5. Public reporting

1.4 Implementation of the external evaluation

Five Evaluation Panels

Five evaluation panels consisted of independent, renowned and highly respected experts. The main domains of the panels are:

1. biological, agricultural and veterinary sciences
2. medicine, biomedicine and health sciences
3. natural sciences
4. humanities
5. social sciences

The University invited 10 renowned scientists to act as chairs or vice-chairs of the five panels based on the suggestions of faculties and independent institutes. Besides leading the work of the panel, an additional role of the chairs was to discuss with other panel chairs in order to adopt a broadly similar approach. The panel chairs and vice-chairs had a pre-meeting on 27 May 2011 in Amsterdam.

The panel compositions were nominated by the Rector of the University 27 April 2011. The participating RCs suggested the panel members. The total number of panel members was 50. The reason for a smaller number of panellists as compared to the previous evaluations was the character of the evaluation as a meta-evaluation. The panellists did not read research reports or abstracts but instead, they evaluated answers to the evaluation questions, tables and compilations of publications, other scientific activities, bibliometrics and comparable analyses.

The panel meetings were held in Helsinki:

- On 11–13 September 2011: (1) biological, agricultural and veterinary sciences, (2) medicine, biomedicine and health sciences and (3) natural sciences.
- On 18–20 September 2011: (4) humanities and (5) social sciences.

[3] TUHAT (acronym) of Research Information System (RIS) of the University of Helsinki

[4] Supervision of thesis, prizes and awards, editorial work and peer reviews, participation in committees, boards and networks and public appearances.

1.5 Evaluation material

The main material in the evaluation was the RCs' self-evaluations that were qualitative in character and allowed the RCs to choose what was important to mention or emphasise and what was left unmentioned.

The present evaluation is exceptional at least in the Finnish context because it is based on both the evaluation documentation (self-evaluation questions, publications and other scientific activities) and the bibliometric reports. All documents were delivered to the panellists for examination.

Traditional bibliometrics can be reasonably done mainly in medicine, biosciences and natural sciences when using the Web of Science database, for example. Bibliometrics, provided by CWTS/The Centre for Science and Technology Studies, University of Leiden, cover only the publications that include WoS identification in the TUHAT-RIS.

Traditional bibliometrics are seldom relevant in humanities and social sciences because the international comparable databases do not store every type of high quality research publications, such as books and monographs and scientific journals in other languages than English. The Helsinki University Library has done analysis to the RCs, if their publications were not well represented in the Web of Science databases (RCs should have at least 50 publications and internal coverage of publications more than 40%) – it meant 58 RCs. The bibliometric material for the evaluation panels was available in June 2011. The RC-specific bibliometric reports are attached at the end of each report.

The panels were provided with the evaluation material and all other necessary background information, such as the basic information about the University of Helsinki and the Finnish higher education system.

Evaluation material

1. Registration documents of the RCs for the background information
2. Self evaluation material – answers to the evaluation questions
3. Publications and other scientific activities based on the TUHAT RIS:
   - 3.1. statistics of publications
   - 3.2. list of publications
   - 3.3. statistics of other scientific activities
   - 3.4. list of other scientific activities
4. Bibliometrics and comparable analyses:
   - 4.1. Analyses of publications based on the verification of TUHAT-RIS publications with the Web of Science publications (CWTS/University of Leiden)
   - 4.2. Publication statistics analysed by the Helsinki University Library - mainly for humanities and social sciences
5. University level survey on doctoral training (August 2011)
6. University level analysis on publications 2005–2010 (August 2011) provided by CWTS/University of Leiden

Background material

University of Helsinki
- Basic information about the University of the Helsinki
- The structure of doctoral training at the University of Helsinki
- Previous evaluations of research at the University of Helsinki – links to the reports: 1998 and 2005

The Finnish Universities/Research Institutes
- Finnish University system
- Evaluation of the Finnish National Innovation System
- The State and Quality of Scientific Research in Finland. Publication of the Academy of Finland 9/09.

The evaluation panels were provided also with other relevant material on request before the meetings in Helsinki.

1.6 Evaluation questions and material

The participating RCs answered the following evaluation questions which are presented according to the evaluation form. In addition, TUHAT RIS was used to provide the **additional material** as explained. For giving the feedback to the RCs, the panellists received the evaluation feedback form constructed in line with the evaluation questions:

1. Focus and quality of the RC's research

- Description of
  - the RC's research focus.
  - the quality of the RC's research (incl. key research questions and results)
  - the scientific significance of the RC's research in the research field(s)
- Identification of the ways to strengthen the focus and improve the quality of the RC's research

The additional material: TUHAT compilation of the RC's publications, analysis of the RC's publications data (provided by University of Leiden and the Helsinki University Library)
A written feedback from the aspects of: scientific quality, scientific significance, societal impact, innovativeness

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

2. Practises and quality of doctoral training

- Organising of the doctoral training in the RC. Description of the RC's principles for:
  - recruitment and selection of doctoral candidates
  - supervision of doctoral candidates
  - collaboration with faculties, departments/institutes, and potential graduate schools/doctoral programmes
  - good practises and quality assurance in doctoral training
  - assuring of good career perspectives for the doctoral candidates/fresh doctorates
- Identification of the RC's strengths and challenges related to the practises and quality of doctoral training, and the actions planned for their development.

The additional material: TUHAT compilation of the RC's other scientific activities/supervision of doctoral dissertations
A written feedback from the aspects of: processes and good practices related to leadership and management

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

3. The societal impact of research and doctoral training

- Description on how the RC interacts with and contributes to the society (collaboration with public, private and/or 3rd sector).
- Identification of the ways to strengthen the societal impact of the RC's research and doctoral training.

The additional material: TUHAT compilation of the RC's other scientific activities.
A written feedback from the aspects of: societal impact, national and international collaboration, innovativeness

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

4. International and national (incl. intersectoral) research collaboration and researcher mobility

- Description of
  - the RC's research collaborations and joint doctoral training activities
  - how the RC has promoted researcher mobility
- Identification of the RC's strengths and challenges related to research collaboration and researcher mobility, and the actions planned for their development.

A written feedback from the aspects of: scientific quality, national and international collaboration

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

5. Operational conditions

- Description of the operational conditions in the RC's research environment (e.g. research infrastructure, balance between research and teaching duties).
- Identification of the RC's strengths and challenges related to operational conditions, and the actions planned for their development.

A written feedback from the aspects of: processes and good practices related to leadership and management

- Strengths
- Areas of development
- Other remarks
- Recommendations

6. Leadership and management in the researcher community

- Description of
  - the execution and processes of leadership in the RC
  - how the management-related responsibilities and roles are distributed in the RC
  - how the leadership- and management-related processes support
    - high quality research
    - collaboration between principal investigators and other researchers in the RC
    the RC's research focus
    - strengthening of the RC's know-how
- Identification of the RC's strengths and challenges related to leadership and management, and the actions planned for developing the processes

7. External competitive funding of the RC

- The RCs were asked to provide information of such external competitive funding, where:
  - the funding decisions have been made during 1.1.2005-31.12.2010, and
  - the administrator of the funding is/has been the University of Helsinki
- On the e-form the RCs were asked to provide:

  1) The relevant funding source(s) from a given list (Academy of Finland/Research Council, TEKES/The Finnish Funding Agency for Technology and Innovation , EU, ERC, foundations, other national funding organisations, other international funding organisations), and

  2)The total sum of funding which the organisation in question had decided to allocate to the RCs members during 1.1.2005–31.12.2010.

Competitive funding reported in the text is also to be considered when evaluating this point.
A written feedback from the aspects of: scientific quality, scientific significance, societal impact, innovativeness, future significance

- Strengths
- Areas of development
- Other remarks
- Recommendations

8. The RC's strategic action plan for 2011–2013

- RC's description of their future perspectives in relation to research and doctoral training.

A written feedback from the aspects of: scientific quality, scientific significance, societal Impact, processes and good practices related to leadership and management, national and international collaboration, innovativeness, future significance

- Strengths
- Areas of development

- Other remarks
- Recommendations

9. Evaluation of the category of the RC in the context of entity of the evaluation material (1-8)

The RC's fitness to the chosen participation category
A written feedback evaluating the RC's fitness to the chosen participation category
- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

10. Short description of how the RC members contributed the compilation of the stage 2 material
Comments on the compilation of evaluation material

11. How the UH's focus areas are presented in the RC's research?
Comments if applicable

12. RC-specific main recommendations based on the previous questions 1–11

13. RC-specific conclusions

1.7 Evaluation criteria

The panellists were expected to give evaluative and analytical feedback to each evaluation question according to their aspects in order to describe and justify the quality of the submitted material. In addition, the evaluation feedback was asked to be pointed out the level of the performance according to the following classifications:

- outstanding (5)
- excellent (4)
- very good (3)
- good (2)
- sufficient (1)

Evaluation according to the criteria was to be made with thorough consideration of the entire evaluation material of the RC in question. Finally, in questions 1-4 and 9, the panellists were expected to classify their written feedback into one of the provided levels (the levels included respective descriptions, 'criteria'). Some panels used decimals in marks. The descriptive level was interpreted according to the integers and not rounding up the decimals by the editors.

Description of criteria levels

Question 1 – FOCUS AND QUALITY OF THE RC'S RESEARCH

Classification: Criteria (level of procedures and results)

Outstanding quality of procedures and results (5)

Outstandingly strong research, also from international perspective. Attracts great international interest with a wide impact, including publications in leading journals and/or monographs published by leading international publishing houses. The research has world leading qualities. The research focus, key research questions scientific significance, societal impact and innovativeness are of outstanding quality.

In cases where the research is of a national character and, in the judgement of the evaluators, should remain so, the concepts of "international attention" or "international impact" etc. in the grading criteria above may be replaced by "international comparability".

Operations and procedures are of outstanding quality, transparent and shared in the community. The improvement of research and other efforts are documented and operations and practices are in alignment with the documentation. The ambition to develop the community together is of outstanding quality.

Excellent quality of procedures and results (4)

Research of excellent quality. Typically published with great impact, also internationally. Without doubt, the research has a leading position in its field in Finland.

Operations and procedures are of excellent quality, transparent and shared in the community. The improvement of research and other efforts are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of excellent quality.

Very good quality of procedures and results (3)

The research is of such very good quality that it attracts wide national and international attention.

Operations and procedures are of very good quality, transparent and shared in the community. The improvement of research and other efforts are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of very good quality.

Good quality of procedures and results (2)

Good research attracting mainly national attention but possessing international potential, extraordinarily high relevance may motivate good research.

Operations and procedures are of good quality, shared occasionally in the community. The improvement of research and other efforts are occasionally documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of good quality.

Sufficient quality of procedures and results (1)

In some cases the research is insufficient and reports do not gain wide circulation or do not have national or international attention. Research activities should be revised.

Operations and procedures are of sufficient quality, shared occasionally in the community. The improvement of research and other efforts are occasionally documented and operations and practices are to some extent in alignment with the documentation. The ambition to develop the community together is of sufficient quality.

Question 2 – DOCTORAL TRAINING
Question 3 – SOCIETAL IMPACT
Question 4 – COLLABORATION

Classification: Criteria (level of procedures and results)

Outstanding quality of procedures and results (5)

Procedures are of outstanding quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are documented and operations and practices are in alignment with the documentation. The ambition to develop the community together is of outstanding quality. The procedures and results are regularly evaluated and the feedback has an effect on the planning.

Excellent quality of procedures and results (4)

Procedures are of excellent quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of excellent quality. The procedures and outcomes are evaluated and the feedback has an effect on the planning.

Very good quality of procedures and results (3)

Procedures are of very good quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and

management are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of very good quality.

Good quality of procedures and results (2)

Procedures are of good quality, shared occasionally in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of good quality.

Sufficient quality of procedures and results (1)

Procedures are of sufficient quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are occasionally documented and operations and practices are to some extent in alignment with the documentation. The ambition to develop the community together is of sufficient quality.

Question 9 – CATEGORY

Participation category – fitness for the category chosen

The choice and justification for the chosen category below should be reflected in the RC's responses to the evaluation questions 1–8.

1. *The research of the participating community represents the international cutting edge in its field.*
2. *The research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through.*
3. *The research of the participating community is distinct from mainstream research, and the special features of the research tradition in the field must be considered in the evaluation.* The research is of high quality and has great significance and impact in its field. However, the generally used research evaluation methods do not necessarily shed sufficient light on the merits of the research.
4. *The research of the participating community represents an innovative opening*. A new opening can be an innovative combination of research fields, or it can be proven to have a special social, national or international demand or other significance. Even if the researcher community in its present composition has yet to obtain proof of international success, its members can produce convincing evidence of the high level of their previous research.
5. *The research of the participating community has a highly significant societal impact.* The participating researcher community is able to justify the high social significance of its research. The research may relate to national legislation, media visibility or participation in social debate, or other activities promoting social development and human welfare. In addition to having societal impact, the research must be of a high standard.

An example of outstanding fitness for category choice (5) [5]

The RC's representation and argumentation for the chosen category were convincing. The RC recognized its real capacity and apparent outcomes in a wider context to the research communities. The specific character of the RC was well-recognized and well stated in the responses. The RC fitted optimally for the category.

- Outstanding (5)
- Excellent (4)
- Very good (3)
- Good (2)
- Sufficient (1)

The above-mentioned definition of outstanding was only an example in order to assist the panellists in the positioning of the classification. There was no exact definition for the category fitness.

[5] The panels discussed the category fitness and made the final conclusions of the interpretation of it.

1.8 Timetable of the evaluation

The main timetable of the evaluation:

1.	Registration	November 2010
2.	Submission of self-evaluation materials	January–February 2011
3.	External peer review	May–September 2011
4.	Published reports	March–April 2012
	- University level public report	
	- RC specific reports	

The entire evaluation was implemented during the university's strategy period 2010–2012. The preliminary results were available for the planning of the following strategy period in late autumn 2011. The evaluation reports will be published in March/April 2012. More detailed time schedule is published in the University report.

1.9 Evaluation feedback – consensus of the entire panel

The panellists evaluated all the RC-specific material before the meetings in Helsinki and mailed the draft reports to the evaluation office. The latest interim versions were on-line available to all the panellists on the Wiki-sites. In September 2011, in Helsinki the panels discussed the material, revised the first draft reports and decided the final numeric evaluation. After the meetings in Helsinki, the panels continued working and finalised the reports before the end of November 2011. The final RC-specific reports are the consensus of the entire panel.

The evaluation reports were written by the panels independently. During the editing process, the evaluation office requested some clarifications from the panels when necessary. The tone and style in the reports were not harmonized in the editing process. All the reports follow the original texts written by the panels as far as it was possible.

The original evaluation material of the RCs, provided for the panellists is attached at the end of the report. It is essential to notice that the exported lists of publications and other scientific activities depend how the data was stored in the TUHAT-RIS by the RCs.

2 Evaluation feedback

2.1 Focus and quality of the RC's research

- *Description of*
  - *the RC's research focus*
  - *the quality of the RC's research (incl. key research questions and results)*
  - *the scientific significance of the RC's research in the research field(s)*
- *Identification of the ways to strengthen the focus and improve the quality of the RC's research*

ASPECTS: Scientific quality, scientific significance, societal impact, innovativeness

The BNCTMI is a medical physics RC with 3 PIs, 9 senior researchers, 6 postdoctoral researchers, 13 PhD students and 2 undergraduate students. The RC members come from the UH (Physics, Chemistry, Center of drug research), Helsinki University Hospital (Medical imaging center, HUSLAB, Oncology), VTT, STUK and private sector. The hospital subgroup is one of the strongest in Finland in the fields of medical physics research and research training. The main focus of the RC is the development of boron neutron capture therapy (BNCT) for cancer treatment, involving multidisciplinary collaboration between medical physicists, chemists, engineers and physicians. Also, development of imaging modalities, radiation dosimetry and modelling is active, especially to support the BNCT development. Today, the BNCT treatment research in Helsinki is the longest ongoing BNCT research in the Western Countries. As found from Web-of-Science Helsinki lists 21 papers under topic BNCT since 2005, being 9th in number globally (University of Kyoto, 1st, 78 papers).

Basic element in the RC activity is training of hospital physicists (HPs). All of the RC institutes have the permission to contribute to very demanding 4 year practical training of Finnish hospital physicists. As the profession of a hospital physicist in Finland also includes conduction of a PhD or Phil. Lic. degree, much of the RC research and research training is conducted as a part of hospital physicist training. In fact, this also means that not many of the PhD students work full day for their thesis. And topics of theses may be from diverse fields of medical physics. As reported, many of the seniors act as hospital physicists and conduct and supervise research parallel to their hospital duties. Against this background the scientific outcome is good, with minor external funding that is in use for research.

The papers by RC indicate different focus fields for the subgroups, not very much intra-RC research papers between subgroups are published. The subgroups with some highly respected leaders seem to be quite independent.

Strength

The BNCTMI is a multidiscplinary consortium including aspects of basic, applied and clinical science. The RC exhibits the infrastructure and expertise to develop novel medical technology for medical problems with critical importance. The RC institutes build up modern facilities and instrumentation that can under effective and professional management create environment for highly successful research and doctoral training.

Areas of development

As the research and doctoral training is closely linked to professional training of hospital physicists, this creates the basis for scientific research and doctoral training. However, it cannot make the RC the leader of their research field. With this strategy the present level of research quality may be the maximum the RC can realistically reach. To strive for research excellence, both in quantitative and qualitative terms, much improved external research funding with full-time researchers at all levels of research are needed. International collaboration and funding for the BNCTMI research is still much lacking, the research is based too much on internal hospital support and minor national funding.

Other remarks

From the research point of view, the scientific training for Phil. Lic. degrees is not optimal and does not support the aims for high quality research. In this issue, the strategy should be considered.

Numeric evaluation: 3 (Very good)

2.2 Practises and quality of doctoral training

- *Organising of the doctoral training in the RC. Description of the RC's principles for:*
  - *recruitment and selection of doctoral candidates*
  - *supervision of doctoral candidates*
  - *collaboration with faculties, departments/institutes, and potential graduate schools/doctoral programmes*
  - *good practises and quality assurance in doctoral training*
  - *assuring of good career perspectives for the doctoral candidates/fresh doctorates*
- *Identification of the RC's strengths and challenges related to the practises and quality of doctoral training, and the actions planned for their development.*
- *Additional material: TUHAT compilation of the RC's other scientific activities/supervision of doctoral dissertations*

ASPECTS: Processes and good practices related to leadership and management

The RC has an excellent track record in training of HPs. Majority of the PhD students get their scientific training parallel to their professional training for a HP degree. This is a challenging situation, especially from point of view of top-level research. Due to the well recognized and appreciated profession of HPs, the RC is able to recruit talented young candidates and guide them also to research. Along the professional specialization there will probably be a constant flow of new PhD degrees, however, the number of PhD students is limited as the students can only occasionally conduct full time research. Their research activity is limited by the formal (clinical) duties in hospitals. The seniors in RC can be competent for effective supervision, however, their formal duties may compromise effective, regular and deep interaction with the students. Due to fact that HP specialization includes, as a minimum, the Phil Lic. degree, many of students may only conduct this degree and then leave for another hospital. This is not beneficial for science. The doctoral training follows good practices of HU, and the head of the RC represents a remarkable supervisor in the field of medical physics.

Strengths

The RC comprises the diverse expertise for supervision, and strong multidiscplinary collaboration is possible also in doctoral training. Very good infrastructure, combining modern clinical instrumentation of the hospital with special facilities of HU, VTT and STUK is available. For some thesis works, data from clinical examinations and therapies in hospital can probably support the effective progress of the PhD study. With the resources in use doctoral training has been successful.

Areas of development

The RC should improve external funding to hire full-time PhD students, also internationally. The graduate school positions could also help. The challenge seems to be the lack of highly motivated research oriented senior physicists. Some full time seniors with strong scientific background are needed to strengthen the RC research and doctoral training.

Other remarks

It remains open what are the regular practices of PhD training and supervision. How they can be linked to normal practices the students and supervisors have in their institutes, especially in hospital. The daily/weekly/monthly practices for supervision and progress monitoring should be established.

Numeric evaluation: 3 (Very good)

2.3 The societal impact of research and doctoral training

- *Description on how the RC interacts with and contributes to the society (collaboration with public, private and/or 3rd sector).*
- *Identification of the ways to strengthen the societal impact of the RC's research and doctoral training.*
- *Additional material: TUHAT compilation of the RC's other scientific activities.*

ASPECTS: Societal impact, national and international collaboration, innovativeness

Strengths

The scientific field of RC is of high importance, with extensive possibilities for advancements in medicine in the future. The RC has a network in science and industry. The RC actively trains licensed hospital physicists with the PhD degree. After training they occupy hospitals around Finland and implement their knowhow and expertise to the best of Finnish health care system. More and more frequently, they also move to private sector, mostly to existing or new companies in the medical field.

Areas of development

Even the BNCTMI has obtained some good visibility in Finland, the PR activities could still be improved. For example, new funding when obtained should gain publicity.

Other remarks

The RC can actively contribute to the arise of new generation of research intensive hospital physicists in Finland.

Numeric evaluation: 4 (Excellent)

2.4 International and national (incl. intersectoral) research collaboration and researcher mobility

- *Description of*
  - *the RC's research collaborations and joint doctoral training activities*
  - *how the RC has promoted researcher mobility*
- *Identification of the RC's strengths and challenges related to research collaboration and researcher mobility, and the actions planned for their development.*

ASPECTS: Scientific quality, national and international collaboration

Strengths

The scientific research and doctoral training of RC has obviously a strong recognition and integration in the hospital. It is also well appreciated in Finland.

Areas of development

Active international collaboration in the RC research and research training is not so obvious or frequent. Active collaboration with international partners may be challenging in PhD training and necessitates more flexibility e.g. in international visits to other significant research centers in the field. This will be easier with full time PhD-students. International activity should be natural in all RC research.

Numeric evaluation 3 (Very good)

2.5 Operational conditions

- *Description of the operational conditions in the RC's research environment (e.g. research infrastructure, balance between research and teaching duties).*

- *Identification of the RC's strengths and challenges related to operational conditions, and the actions planned for their development.*

ASPECTS: Processes and good practices related to leadership and management

Strengths

The RC merges the operational strengths of several organizations with unique facilities and expertise in Finland. This creates excellent infrastructure for research and research training. The head of the RC shares a position in both university and hospital. This gives him an excellent position for strategic development of RC. The modern technology around supports when aiming to research excellence.

Areas of development

To combine research and research training with physicist duties in hospital is challenging, and the time devoted to research will be highly limited. Therefore, by improving the external funding full time junior and senior researchers should be hired to RC. Also in hospital the RC should have researchers with no clinical duties.

Other remarks

The responsibilities of the RC head are obviously extensive.

2.6 Leadership and management in the researcher community

- *Description of*
  - *the execution and processes of leadership in the RC*
  - *how the management-related responsibilities and roles are distributed in the RC*
  - *how the leadership- and management-related processes support*
    - *high quality research*
    - *collaboration between principal investigators and other researchers in the RC*
    - *the RC's research focus*
    - *strengthening of the RC's know-how*
- *Identification of the RC's strengths and challenges related to leadership and management, and the actions planned for developing the processes*

ASPECTS: Processes and good practices related to leadership and management

Strengths

In this RC, the management group is composed of PIs. The group informs RC partners about the research status and planning as well as other relevant issues. The management group has regular meetings. Each subgroup of the RC has a person in charge. A careful plan for leadership and management of the multidisciplinary RC, including several participating organizations, is presented.

Areas of development

The active collaboration and change of information within the RC should be stimulated anyways possible. It remains open if the management practices have already been implemented and in use. If not that should happen with no delays. The leadership and management of RC between several institutes is challenging. A strong leadership is needed.

2.7 External competitive funding of the RC

• The RCs were asked to provide information of such external competitive funding, where:
  • the funding decisions have been made during 1.1.2005–31.12.2010, and
  • the administrator of the funding is/has been the University of Helsinki
• On the e-form the RCs were asked to provide:

1) The relevant funding source(s) from a given list (Academy of Finland/Research Council, TEKES/The Finnish Funding Agency for Technology and Innovation, EU, ERC, foundations, other national funding organisations, other international funding organizations), and
2) The total sum of funding which the organisation in question had decided to allocate to the RCs members during 1.1.2005–31.12.2010.

Competitive funding reported in the text is also to be considered when evaluating this point.
ASPECTS: Scientific quality, scientific significance, societal impact, innovativeness and future significance

Strengths

Obviously, major funding for the RC comes from the EVO, special funding devoted for major Finnish hospitals. This indicates strong support and commitment from the hospital.

Areas of development

The RC lists a total external funding of less than 0.5 million euros for 2005-2011. The external funding, including international funding, is small for a RC of this size. This is critical and should be improved.

Other remarks

It is not clear whether the limited external funding is due to passivity or failures in funding applications.

2.8 The RC's strategic action plan for 2011–2013

• RC's description of their future perspectives in relation to research and doctoral training.
ASPECTS: Scientific quality, scientific significance, societal Impact, processes and good practices related to leadership and management, national and international collaboration, innovativeness, future significance

The strategic action plan of the RC provides a general description of development of BNCTMI technologies. It gives some hints for developments but does not detail the lines of research for future. Information on the future goals of the subgroups, intergroup collaboration as well as the main aims of the RC would have been useful, especially as the plan is for next two years. Where is/what is the status of RC in 2013?

2.9 Evaluation of the category of the RC in the context of entity of the evaluation material (1-8)

The RC's fitness to the chosen participation category.

This RC sets it in the category 2. *Research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through.*

Indeed, the RC has potential to be one of the leading groups in its research field within medical physics. However, when thinking the cutting edge research, including a broad range of technologies from different fields of medical physics makes the research challenging and sounds much like general development of the medical physics in hospital. Description the role of some organizations, e.g. STUK, is a general listing of their future activities.

The RC needs one strategic plan, involving all institutes of RC research. This could establish an "umbrella" for all research lines and activities, and could be supplemented with more detailed research plans when applying actively external funding.

Numeric evaluation: 5 (Outstanding)

2.10 Short description of how the RC members contributed the compilation of the stage 2 material

All the members of RC have been involved in the documentation either by contributing to this document or to the TUHAT database. The evaluation material documentation has been created under supervision of PIs and senior researchers of institutes behind the RC. In harmonizing the document PIs and coordinators have had few meetings. To the evaluator, many sections show frequently overlapping material.

2.11 How the UH's focus areas are presented in the RC's research

HU has defined "health and welfare" to be one focus area for the period 2010-2012. Even this RC indicates no national centre of excellences in their activity, the research field fits well in the above mentioned focus area.

2.12 RC-specific main recommendations

A strong strategic action plan for BNCTMI is necessary. The RC could introduce itself as a strong multi-institute consortium with basic-applied-clinical science continuum.

The RC should define and focus their "spear head" projects. Based on the ambitious strategy and successful past research, they can significantly improve their long-term funding and expand their international activity.

Most importantly, improved external funding is needed to hire full-time students and to increase national/international collaboration.

The PhD students should join relevant doctoral schools (programs).

Sabbatical periods should be made possible for supervisors and part-time PhD students to enable fulltime research.

International experts working in the RC can strengthen its status.

Finally, the RC should have a plan to strive for a centre of excellence status.

2.13 RC-specific conclusions

This RC may be exceptional as they strongly link their research and doctoral training to professional training of hospital physicists (HPs). This link is important and they have coupled these activities well. However, to improve research outcomes, extra man power independent of professional training is needed. Then, the RC has potential to be one of the leading groups in its research field within medical physics. For true research excellence in RC, a more focused research profile should be developed. As responsibility for a broader range of research activities among different fields of medical physics may be required in hospital, those activities may be developed outside the RC.

2.14 Preliminary findings in the Panel-specific feedback

The BNCTMI is a large scale collaboration between different organizations. Further, it establishes a continuum from basic science to clinical science. How different organizations, e.g. university and university hospital, can effectively support this kind of research continuum. For example, are joined positions (e.g., 50% researcher (PhD student) in university and 50% assistant physicist in hospital) realistic?

It would be appealing to think that the M.Sc students of medical physics in HU could practice as amanuensis for short periods during their M.Sc studies in Helsinki university hospital (i.e. similarly as

medical students). This way they would receive some practical aspect to hospital physics, probably supporting their theoretical studies as well as entering to scientific research later.

2.15 Preliminary findings in the University-level evaluation

When the research, to be successful, is based on concept of active collaboration between HU and other research organizations, such as VTT and STUK in BNCTMI, the commitment of each organization may be needed by formal project agreements. In those, the role and responsibility of each participating organization is carefully defined.

3 Appendices

A. Original evaluation material
    a. Registration material – Stage 1
    b. Answers to evaluation questions – Stage 2
    c. List of publications
    d. List of other scientific activities
B. Bibliometric analyses
    a. Analysis provided by CWTS/University of Leiden
    b. Analysis provided by Helsinki University Library (66 RCs)

International evaluation of research and doctoral training
at the University of Helsinki 2005-2010

RC-SPECIFIC MATERIAL FOR THE PEER REVIEW

NAME OF THE RESEARCHER COMMUNITY:
Medical Physics: BNCT & Medical Imaging (BNCTMI)

LEADER OF THE RESEARCHER COMMUNITY:
Professor Sauli Savolainen, Department of Physics, Faculty of Science

RC-SPECIFIC MATERIAL FOR THE PEER REVIEW:

- Material submitted by the RC at stages 1 and 2 of the evaluation
  - STAGE 1 material: RC's registration form (incl. list of RC participants in an excel table)
  - STAGE 2 material: RC's answers to evaluation questions
- TUHAT compilations of the RC members' publications 1.1.2005-31.12.2010
- TUHAT compilations of the RC members' other scientific activities 1.1.2005-31.12.2010
- Web of Science(WoS)-based bibliometrics of the RC's publications data 1.1.2005-31.12.2010 (analysis carried out by CWTS, Leiden University)

  NB! Since Web of Science(WoS)-based bibliometrics does not provide representative results for most RCs representing humanities, social sciences and computer sciences, the publications of these RCs will be analyzed by the UH Library (results available by the end of June, 2011)

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI

RC-SPECIFIC STAGE 1 MATERIAL (registration form)

1 RESPONSIBLE PERSON

Name: Savolainen, Sauli

E-mail:

Phone: +358-40-8321016

Affiliation: Dept. of Physics

Street address: Haartmanink 4

2 DESCRIPTION OF THE PARTICIPATING RESEARCHER COMMUNITY (RC)

Name of the participating RC (max. 30 characters): Medical Physics: BNCT & Medical Imaging

Acronym for the participating RC (max. 10 characters): BNCTMI

Description of the operational basis in 2005-2010 (eg. research collaboration, joint doctoral training activities) on which the RC was formed (MAX. 2200 characters with spaces): The Boron neutron capture therapy (BNCT) research is conducted by dedicated researchers (RC) consisting of physicists, chemists, engineers and physicians from the University of Helsinki (UH) [Department of Physics, Department of Chemistry, Faculty of Sciences and Centre of Drug Research (CDR), Faculty of Pharmacy], Helsinki University Central Hospital (HUCH) [HUS Helsinki Medical Imaging Center, HUSLAB and Department of Oncology], VTT Technical Research Centre of Finland, STUK - Radiation and Nuclear Safety Authority, Radiation Metrology Laboratory and also from private health care sector.

BNCT is highly challenging and multidisciplinary therapy against cancer. The outcome depends on the complex spatio-temporal distribution of boron and neutron interactions in the tumour. Quantitative imaging of the boron carrier molecules with various modalities (e.g. SPECT/CT, PET/CT, MRI and MRS) is essential for accurate treatment planning, extending from macrodosimetry to cell level microdosimetry. There are various preclinical and clinical problems motivating further research i.e. dosimetric calculations, in vivo dosimetry and imaging, reconstruction and study of new molecular carriers, which the RC have expertise needed for resolving the issues.

The RC consists of three PI researchers, 9 senior, and 6 postdoctoral researchers, 13 PhD–students and two undergraduate students.

FiR1 reactor operated by VTT, has been converted into a full-scale BNCT facility. Finnish BNCT Consortium has been established to develop BNCT into a viable cancer treatment by HUCH and VTT. The CDR hosts a nanoSPECT/CT instrument, which enables quantitative, real-time ultra-high resolution 3D morphological imaging and tracking of radiolabeled substances in rodents. The computational materials science group at the Department of Physics at UH develops cell cluster models, micro and macro-level dosimetry. Laboratory of Organic Chemistry at the UH, has modern equipment for organic synthesis, sample purification and molecular structure characterization. Research at STUK and Radiation Metrology Laboratory is focused on the detection, dosimetry and safe medical use of radiation.

RC-SPECIFIC STAGE 1 MATERIAL (registration form)

3 SCIENTIFIC FIELDS OF THE RC

Main scientific field of the RC's research: natural sciences

RC's scientific subfield 1: Physics, Applied

RC's scientific subfield 2: Radiology, Nuclear Medicine and Medical Imagi

RC's scientific subfield 3: Physics, Mathematical

RC's scientific subfield 4: Engineering, Biomedical

Other, if not in the list: Medical Physics

4 RC'S PARTICIPATION CATEGORY

Participation category: 2. Research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through

Justification for the selected participation category (MAX. 2200 characters with spaces): The established RC has a great potential to be a vital group in the field of medical physics both in research and doctoral training. It has access to the top Finnish sites in medical physics research and is a balanced combination of experienced and post doctoral scientists and enthusiastic graduate students pursuing a doctoral degree. The RC is a multifunctional base for future development of medical physics research in Finland and with potential to become an important player worldwide. The quality of the six sub groups is already recognized on either national or international level in doctoral training and research. The number of papers published by the RC in 2005-2010 is ~200 with approx. six M.Sc., PhD or Hospital Physicist degrees achieved per year. Helsinki University Central Hospital is the leading university hospital in Finland with a vital role in medical physics research. HUCH has 6 senior researchers, 3 post-docs and 13 PhD students in the RC. The Division of Materials Physics at the Dept of Physics concentrates on computational materials science and medical physics with over 15 years of experience in simulations in micro and macro dosimetric applications. RC has one PI and 2 PhD students from this division. The laboratory of Organic Chemistry offers a full range of organic analytical techniques and is in major role when new possible drugs for TRT, especially for BNCT are studied. They strengthen the RC with a PI. The CDR hosts a new generation nanoSPECT/CT, the only one in public institutes or universities in Scandinavia. The role of CDR increases as it has just got the authorized rights to train hospital physicists.
The BNCT project with the FiR 1 reactor at VTT has already been recognized as a leading class research group where break-through results have already been made. A senior and a post doctoral researcher strengthen the role of doctoral training in the RC. STUK has actively participated in the 6th and the 7th framework research programmes of the EC. STUK's research network involves over 100 national and international partners. A senior and a post doctoral researcher are part of the RC where their role in dosimetry is fundamental

5 DESCRIPTION OF THE RC'S RESEARCH AND DOCTORAL TRAINING

Public description of the RC's research and doctoral training (MAX. 2200 characters with spaces): Medical Physics in the RC is engaged in academic research, teaching, and multi-professional supervision and support

of clinical specialists involved with areas of physics, radiation and tech-nology. Important aspect of medical physics is its close connection with vast field of medical technology and emerging clinical solutions for diagnostic and therapeutic modalities. As such, RCs functions are founded on multidisciplinary science. Medical Physics is defined as a branch of applied physics encompassing concepts, principles and methodology of physical sciences to medicine in clinics. Primarily, Medical Physics seeks to develop efficient and safe diagnosis and treatment methods for human diseases.

In Finland, medical physics experts with successful completion of the accredited specialized training may obtain the licensed professional title of a Medical Physicist. Medical Physicist is a necessary expert in medical usage of radiation as required by legislation in the statute of the medical usage of radiation (423/2000). The accredited specialized training of Medical Physicist is defined in the statute of the University degree system (464/1998) and the modification for the statute of the examinations pertaining to the humanities and the natural sciences (834/2000). Medical Physicist training has inherent linkage to scientific research as the training includes Ph.D. or Lic.Phil. curriculum degrees.

The RC conducts research in the various disciplines of medical physics, e.g. reactor physics, mixed beam neutron and photon dosimetry; computational beam models, dosimetry and treat-ment simulations; specialized applications of magnetic resonance imaging and spectroscopy; biokinetic modelling and estimation; development of new carriers for therapy, morphological tracking of radiolabelled substances and computational cell cluster modelling. The high level of the doctoral program is assured by the RCs national and international collaboration covering several institutes, its wide scientific area and by the access to top level research facilities.

Significance of the RC's research and doctoral training for the University of Helsinki (MAX. 2200 characters with spaces): The PIs and senior researchers in RC have supervised nine PhD theses, five Phil. Lic. theses and 18 M. Sc. theses between the years 2005 and 2010. The number of graduated medical physicist during this time is 18. There are currently 13 PhD students in the RC. In the RC, altogether 22 PhD students have either achieved their doctoral degrees or have a plan to complete their thesis in the next 3-4 years. Each doctoral theses have a supervisor appointed by the Faculty of Sciences, Department of Physics. Furthermore, all of the RC partner institutes involved in doctoral training are also authorized for medical physicists training. The continuous and steady flow of academic graduates in different degrees clearly indicates the extensiveness and reproducive potential of the RC in the long run. The track record is evident.

The RC benefit the Helsinki University Central Hospital (HUCH) by developing novel and improving methods for medical diagnosis and treatment. Additionally, the medical physicist specialized training ensures competent experts in the field of medical physics for HUCH. Collaboration between University of Helsinki (UH) [Dept. of Physics, Dept. of Chemistry, Faculty of Sciences and Centre for Drug Research (CDR), Faculty of Pharmacy], HUCH [HUS Helsinki Imaging Center, HUSLAB and Dept. of Oncology], VTT Technical Research Centre of Finland, STUK - Radiation and Nuclear Safety Authority and Radiation Metrology Laboratory provide a wide range of expertise, warranting multidisciplinary research with highest quality. The Finnish BNCT project has also gained societal vantage point to address the significance of versatile collaboration in natural sciences and medicine, to overcome some of the most common, yet fatal pathologies of the present Western world. As such, the RC and BNCT project has already caught recurrent visibility in national media, thus yielding positive publicity for the university.

Keywords: Medical radiation physics, medical physics, molecular imaging, BNCT, medical engineering, nuclear medicine, MRI, MRS, dosimetry, computational physics

6 QUALITY OF RC'S RESEARCH AND DOCTORAL TRAINING

Justified estimate of the quality of the RC's research and doctoral training at national and international level during 2005-2010 (MAX. 2200 characters with spaces): The quality of RCs research and doctoral training can be objectively judged according to key figures of graduated persons and level of academic degrees, research papers and corresponding results, and the coverage of them related to RCs field of interest.

The Impact factor of the peer-reviewed papers produced by the RC has a range from 0.7 (Radiat Prot Dosim) to 4.6 (Int J Radiat Oncol Biol Phys). The medical physics publications of the RC has frequently been published in "Medical Physics" or "Physics in Medicine and Biology" journals which both have an Impact factor of about 3. The total number of articles is close to 200.

The PIs and senior researchers in RC have supervised nine PhD theses, five Phil. Lic. theses and 18 M. Sc. theses between the years 2005 and 2010. The number of graduated medical physicist during this time is 18. There are currently 13 PhD students in the RC. In the RC, altogether 22 PhD students have either achieved their doctoral degrees or have a plan to complete their thesis in the next 3-4 years. Each doctoral theses have a supervisor appointed by the Faculty of Sciences, Department of Physics. Furthermore, all of the RC partner institutes involved in doctoral training are also authorized for medical physicists training.

The peer-reviewed papers and related publications span several fields of science, including theoretical and computational physics, applied and medical physics, organic-/biochemistry and pharmacology, physical chemistry and laboratory science, nuclear medicine and medical imaging, radiation dosimetry and radiation biology, biokinetics and patient positioning, neurology and oncology, pathology and clinical efficacy. Roughly 30% of the publications include co-authors from international affiliates, demonstrating collaboration across borders. The published research areas cover entirely the RCs scientific domain, stimulating further areas to study.

Comments on how the RC's scientific productivity and doctoral training should be evaluated (MAX. 2200 characters with spaces): The quality of RCs research and doctoral training will be judged according to key figures of graduated persons and level of academic degrees, research papers and corre-sponding results, and the coverage of them related to RCs field of interest. The follow-ing evaluation criteria is proposed.

Methods of assessing the RC's scientific productivity:

- average Impact factor and number of publications per RCs senior member. Notably, the two main Journals in the filed of question are Medical Physics and Physics in Medi-cine and Biology, which impact factors are approx. 3.

- sum of Impact factors and total number of publications during the evaluation period 2005-2010

- list of journals where the publications appear

Remark: when interpreting the results, it should be notified that most senior members are mainly involved in their office tasks and thus research is not their primary duty.

Methods of assessing the doctoral training:

- number of completed PhD degrees during the evaluation period 2005-2010

- coverage of the thesis topics with respect to the RC fields of interest and localization within each sub-speciality i.e. medical physics

- number of current doctoral candidates who has at least one peer-reviewed publication

- number of papers including an international affiliate as a co-author (indication of inter-national collaboration)

Publishing strategy of the RC:

All doctoral candidates in RC have a written plan for the doctoral thesis. The supervi-sors appointed by the Faculty of Sciences in RC are responsible to support and track the candidates' scientific approach. As each of theses will consist of 4-6 peer-reviewed publications, there is a potential of over 50 papers to be published during next five ears. The RC partner organizations are motivated to participate in the medical physicists training which includes the doctoral supervision. Nine of the senior researchers in RC are medical physicists, and rests of the seniors are working in the field very close to medical physics applications. Publishing strategy of the RC focuses on the new and emerging fields of research which are also essential to the RCs scientific profile (desc. earlier in the e-form)

LIST OF RC MEMBERS

NAME OF THE RESEARCHER COMMUNITY:			Medical Physics: BNCT & Medical Imaging		
RC-LEADER			S. Savolainen		
CATEGORY			2		
	Last name	First name	PI-status (TUHAT, 29.11.2010)	Title of research and teaching personnel	Affiliation
1	Heikkinen	Sami	x	PI, Senior researcher	Laboratory of Organic Chemistry
2	Kuronen	Antti	x	PI, Senior researcher	Dept of Physics
3	Savolainen	Sauli	x	PI, Professor	Dept of Physics
4	Auterinen	Iiro		Research Coordinator	VTT Technical Research Centre of Finland
5	Bergström	Kim		Research Coordinator	Centre for Drug Research, Faculty of Pharmacy
6	Kortesniemi	Mika		Research Coordinator	HUS Helsinki Medical Imaging Center, HUCH
7	Kosunen	Antti		Research Coordinator	Radiation and Nuclear Safety Authority-STUK
8	Nikkinen	Päivi		Research Coordinator	HUSLAB, HUCH
9	Perkiö	Jussi		Research Coordinator	Suomen Terveystalo Oy
10	Salli	Eero		Senior Researcher	HUS Helsinki Medical Imaging Center, HUCH
11	Seppälä	Tiina		Senior Researcher	Dept of Oncology, HUCH
12	Sipilä	Outi		Research Coordinator	HUS Helsinki Medical Imaging center, HUCH
13	Komssi	Soile		Postdoctoral Researcher	Suomen Terveystalo Oy
14	Kotiluoto	Petri		Postdoctoral Researcher	VTT Technical Research Centre of Finland
15	Timonen	Marjut		Postdoctoral Researcher	HUS Helsinki Medical Imaging Center, HUCH
16	Toroi	Paula		Postdoctoral Researcher	Radiation and Nuclear Safety Authority-STUK
17	Uusi-Simola	Jouni		Postdoctoral Researcher	HUS Helsinki Medical Imaging Center, HUCH
18	Lönnroth	Nadja		Postdoctoral Researcher	HUS Helsinki Medical Imaging Center, HUCH
19	Hippeläinen	Eero		Doctoral candidate	Dept of Physics
20	Ihalainen	Toni		Doctoral candidate	Dept of Physics
21	Kaasalainen	Touko		Doctoral candidate	Dept of Physics
22	Koivunoro	Hanna		Doctoral candidate	Dept of Physics
23	Kuusela	Linda		Doctoral candidate	Dept of Physics
24	Käser (Schenkel)	Yvonne		Doctoral candidate	Dept of Physics
25	Lampinen	Anniina		Doctoral candidate	Dept of Physics
26	Mannila	Vilma		Doctoral candidate	Dept of Physics
27	Merimaa	Katja		Doctoral candidate	Dept of Physics
28	Pitkonen	Miia		Doctoral candidate	Dept of Physics
29	Turunen	Sampsa		Doctoral candidate	Dept of Physics
30	Vitikainen	Anne-Mari		Doctoral candidate	Dept of Physics
31	Välimäki	Petteri		Doctoral candidate	Dept of Physics
32	Nyrhinen	Mikko		resident physicist	Dept of Physics
33	Paasonen	Timo		resident physicist	Dept of Physics

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI

RC-SPECIFIC STAGE 2 MATERIAL

BACKGROUND INFORMATION

Name of the RC's responsible person: Savolainen, Sauli

E-mail of the RC's responsible person:

Name and acronym of the participating RC: Medical Physics:BNCT and Medical Imaging, BNCTMI

The RC's research represents the following key focus area of UH: -- Select --

Comments for selecting/not selecting the key focus area: Clinical research DOES not include the research done in the field of Medical Physics. Helsinki University Central Hospital has invested considerably in acquiring technologies and related expertise. All the modern methodology is now made available in clinical environment, which all have been tested in small research projects within multiple specialties, including oncology, radiology, paediatrics, children's and adult's neurology, as well as neurosurgery. The next step in this development is to study their genuine role in clinical workup using prospective clinical patient series, and therewith to also truly establish their availability as lege artis routine clinical repertoire. While the clinical specialties and questions are apparently diverse, it is notable that they all are crucially dependent on how a few, common technical challenges in diagnostics and BNCT can be solved. Therefore, the core of the RC's plan is heavily technical, all the motivation and yield of this work lies in its direct benefit to clinical science and patient therapy or diagnostics.

1 FOCUS AND QUALITY OF RC'S RESEARCH (MAX. 8800 CHARACTERS WITH SPACES)

- **Description of the RC's research focus, the quality of the RC's research (incl. key research questions and results) and the scientific significance of the RC's research for the research field(s).**

  Research is focused in the development of novel methods and applications for medical imaging (in vitro, pre-clinical and clinical) and therapy (BNCT, boron neutron capture therapy). The ongoing research projects are: BNCT, dosimetry in diagnostics and treatments, ionizing and non-ionizing medical imaging applications, mathematical modelling of physiological systems in clinical studies and quality assurance in medical imaging.

  BNCT is the most complex therapeutic modality. The outcome depends on the concentrations of boron and neutrons delivered to the tumour. Quantitative imaging of the molecule carriers with different modalities e.g. SPECT/CT, PET/CT, MRI and MRS, is essential for accurate treatment planning. When the carrier's distribution is known, macro and micro-level dosimetric calculations can be carried out. Preclinical and clinical problems exists i.e. dosimetric calculations, in vivo dosimetry and imaging, reconstruction and study of new molecular carriers. The RC has expertise needed for resolving the mentioned issues.

  The first clinically important results on BNCT treated patients has been just published, which motivates to develop the BNCT and the imaging tools to improve the accuracy of treatment planning and to detect early and late effects of BNCT. In Finland BNCT trials were initialized with applying epithermal neutron beam in malignant brain cancer patients in 1999. Before initializing the clinical trials, the epithermal neutron beam was reconstructed, radiobiological studies were carried out, the patient position system was developed and the procedures for primary beam dosimetry, treatment planning and boron concentration evaluation were established. A new deterministic three-dimensional neutral and charged particle transport code, MultiTrans, has been developed for BNCT. The tumour 10-B concentration is primarily estimated using blood samples and an inductively coupled plasma-atomic emission spectrometer. The results of the histological findings indicated high variation in both mean blood-to-

tumour boron concentration ratios as well as in the blood-to-tumour concentration ratio inside particular tumours. BPA distribution in patients has been studied by means of PET and MRS imaging.

Realistic 3D cell cluster models and dosimeter software are required for the cellular and sub-cellular dosimetry. State-of-the-art 3D microscope technology is used to generate the data necessary for the models. In larger scale, dosimetry of radionuclide therapies is studied using clinical imaging and numerical methods. Internal dosimetry calculations have been approached using Monte Carlo simulations based on PENELOPE simulation package, which is currently compared with conventional dose evaluation methods like the MIRD based OLINDA program. During 2010 one licentiate thesis was published about internal emitter dosimetry using Monte Carlo simulations.

When using ionizing imaging modalities, radiation safety is an important aspect. Paediatric patients have a higher probability for late radiation effects, because longer life expectancy and higher radiation sensitivity of the developing organs. In CT and paediatric radiography different dosimetric protocols have been compared and optimised. Large variations in radiation exposure in paediatric skull, sinus, chest were observed. For paediatric radiography, methods for setting diagnostic reference levels in chest examinations were provided. Peripheral cone beam computed tomography and multislice computed tomography (MSCT) research and development projects have been initiated including refinement of dosimetric and image quality assessment methods, resulting in a MSCT journal article. MSCT optimization and protocol harmonization has been focused on paediatric examinations. Additionally, research concerning average glandular dose determination and related issues of scattered radiation in digital mammography has been conducted for a prospective publication.

In Magnetic Resonance Imaging the emphasis has been on developing quality assurance, clinical imaging and quantisation methods. Utilizing 1H MRS and MRSI for in vivo BPA-F detection in patients at 1.5 or 3.0 T has been studied recently. Aromatic proton signals in the tumour spectrum were detected on the BNCT treatment day indicating that, in favourable cases, it is possible to detect BPA and use it for patient selection in BNCT. When assessing the response to BNCT, the changes observed in diffusion imaging indices were overlapping and inconclusive, problems arising from swelling of the brain and miss-alignment of tumour tissue. Technology-based deficiencies in image quality are relatively common even in routine clinical MRI. It is therefore necessary to have accurate and practical quality control tools available for MRI, including fMRI, simultaneous EEG-fMRI, diffusion imaging, MRS and cardiac MRI.

Navigated transcranial magnetic stimulation (nTMS) –mapping is done preoperatively to determine cortical areas responsible for motor control in patients with epilepsy and brain tumours. Data fusion of images and signals from different modalities, e.g. anatomical MRI, fMRI, CT, SPECT, EEG, MEG and TMS, is important in presurgical evaluation of epilepsy patients and is performed by the image processing group. Segmentation, processing images of intracranial electrodes, voxel based morphometry and development and maintenance of the in-house developed software is also in the interest of this group.

Within the past decade, HUCH has invested considerably in setting up and in testing with pilot-level studies on several frontier methodologies at the intersection between radiology, oncology, paediatrics, physics, and neuroscientific fields of medicine. Presently, all these techniques are at the edge of becoming truly established and approved as part of everyday healthcare in HUCH. We have good access to all necessary modalities, software and computing capacity.

BNCT research is conducted by dedicated researchers consisting of physicists, chemists, engineers and physicians from the University of Helsinki (UH) [Department of Physics, Department of Chemistry and Centre for Drug Research (CDR)], Helsinki University Central Hospital (HUCH) [HUS Helsinki Imaging Center, HUSLAB and Department of Oncology], VTT Technical Research Centre of Finland, STUK - Radiation and Nuclear Safety Authority, Radiation Metrology Laboratory and a few consulting hospital physicists from private health care companies.

FiR1 reactor operated by VTT has been converted into a full-scale BNCT facility. The Finnish BNCT consortium has been established to develop BNCT into a viable cancer treatment by HUCH and VTT. The CDR hosts a new generation nanoSPECT/CT instrument, the only one in public institutes or universities in Scandinavia. This enables quantitative, in vivo, real-time, ultra-high resolution, 3D morphological imaging and tracking of radiolabel substances in rodents and rabbits. The computational materials science group at the Department of Physics develops cell cluster models on micro and macro-level dosimetry. The laboratory of organic chemistry at the Department of Chemistry, has modern equipment for organic synthesis, sample purification and molecular structure characterization. Research at STUK and Radiation Metrology Laboratory is focused on detection, dosimetry and safe medical use of radiation. STUK is a national standards laboratory for ionizing radiation and has high quality calibration.

- **Ways to strengthen the focus and improve the quality of the RC's research.**

A critical issue is the need for permanent qualified senior medical physicists. We expect this to develop during the next few years as new hospital physicists graduate, resulting in better supervision of junior physicists.

Combining the existing knowledge in the RC and enhancing communication between the members of the RC will ensure that the individual researchers can get benefit of the research group and the fields within it. The exchange of ideas with medics should be strengthened in the future.

In medical imaging the importance of quantitative and statistical analysis of medical images and related image computing is quickly increasing. At the same time, the advanced image computing methods have become increasingly complicated. RC needs specialists who have strong knowledge in advanced medical image modelling, estimation and computing methods and in implementation. Combination of the expertise by image computing specialists, physicists and other researchers of RC will form a good basis for high quality research.

2 PRACTISES AND QUALITY OF DOCTORAL TRAINING (MAX. 8800 CHARACTERS WITH SPACES)

- How is doctoral training organised in the RC? Description of the RC's principles for recruitment and selection of doctoral candidates, supervision of doctoral candidates, collaboration with faculties, departments/institutes, and potential graduate schools/doctoral programmes, good practises and quality assurance in doctoral training, and assuring good career perspectives for the doctoral candidates/fresh doctorates.

STUDIES IN MEDICAL PHYSICS AT THE UNIVERSITY OF HELSINKI (Appendix 1, Fig. 3)

A) Specialization including a licentiate degree: A higher university degree (MSc) in physics is required as basic education. Specialized studies: 1) 60 credits from theoretical education related to medical physics, 2) Theoretical education in the form of lectures takes place at the Faculty of Science, according to the guidelines given in the faculties' curriculum and the medical physics study guide. A hospital physicist national advisory board coordinates the education and is responsible for the uniformity of the content of the hospital physics study guide. 3) Practical training in medical physics (4 years). The practical training takes usually place at the university hospital under the supervision of the diagnostics and therapy units chief physicists. 4) Radiation safety examination, 5) Medical physicist examination, and 6) Licentiate in medical physics

B) Specialization including Doctoral degree in medical physics: The organization of the studies is the same as described in part A. The national board gives proof of the completion of the required specialized studies, after which the Faculty of Science gives the certification of achieving the degree in medical physics.

RC-SPECIFIC STAGE 2 MATERIAL

C) Licentiate or doctoral degree from any other physical discipline than medical physics: The education is the same as mentioned in A, except for: momentum 1 is replaced by specially adapted additional education and momentum 5 is not required. The post-graduate studies are approved by a professor of the Department of Physics in collaboration with the chief physicist responsible for the practical training. Thus it is ensured that the studies are related to medical physics. The national board can, if needed, give a statement about the post-graduate studies concerning medical physics.

All the organisations behind the RC have the authorized rights to give practical training for upcoming hospital physicists under supervision of local senior hospital physicists. Chief physicists of HUCH and the professor in Medical Physics are responsible for the coordination of training. Senior physicists participate in giving lectures in their respective field of expertise and are in charge of the practical training in their respective fields. Students can choose medical physics related courses already in their master degree studies and masters thesis can be written within this field. The few positions as doctoral students in medical physics are very popular and the amount of applicants is tenfold. In the selection is preferred students with previous medical physics background (studies or practical experience). Candidates with other funding start also in the doctoral training program. In their selection the candidates own interest in the field, their motivation and previous studies are taken into account.

Each doctoral candidate has a supervisor in the field of their thesis work, to receive prompt and up to date information. The supervisor can be from HUCH, UH, STUK, VTT or other accepted instance. During the practical training in the various fields of medical physics, several of the senior physicists function as supervisors for the doctoral candidates. In each field there are guidelines that describe the focus of that practical training to ensure thorough knowledge. Hospital physicist is a profession where knowledge across traditional faculty borders is required. This is also built-in in the course repertoire, courses are organized by physics, chemistry computer science departments at the faculty of science and at the medical faculty and also at the university of technology (Aalto University). There are also nation wide special courses whereto doctoral candidates from all the universities, that provide hospital physicist training, participate.

The post-graduate studies are approved by a professor of the Department of Physical Science in collaboration with the chief physicist responsible for the practical training. Thus it is ensured that the studies are related to medical physics. The national board has to approve the studies included in the hospital physics degree and can, if required, give a statement about the post-graduate studies concerning medical physics. The national board gives proof of the completion of the required specialized studies, after which the Faculty of Science awards the certification of achieving the degree in medical physics. The licentiate certificate includes a certification of completing the degree in medical physics.

All the doctoral candidates are encouraged to participate to international and national conferences and present their research work to the broad scientific community. Doctoral thesis's are mainly written as plurals containing articles written to scientific journals and reviewed by peers. This ensures that the subjects are relevant and the quality of research is on internationally accepted level.

At the moment there is very good career possibilities for graduating hospital physicists. Already in the capital area, in the public sector there are many unfilled vacancies and the same is true throughout the country. This situation will continue both due to the rather high age of physicists in positions (more vacancies will open due to retirement) and due to the fact that medical treatments are becoming increasingly complicated requiring physicist and technical knowledge which implies that more physicist need to be employed in the future. The private sector has also a demand of hospital physicist.

- RC's strengths and challenges related to the practises and quality of doctoral training, and the actions planned for their development.

  Due to the good career perspectives among hospital physicists we have a high amount of highly motivated candidates applying to the doctoral program as either doctoral or licentiate degree is required for that. Persons that have first acquired the licentiate degree typically continue to pursue the doctoral degree later in their career. The broad scientific knowledge within the RC gives the doctoral candidates a wide variety of fields to specialize in and gives the opportunity to learn and do research across traditional borders. The challenge is to arrange the mandatory practical training such that all doctoral candidates get an equal chance to spend practice time in the different units, as the units' resources vary considerably. When the vacant hospital physicist positions are filled with qualified applicants in the future, the resources for supervision of practical training will be better.

3 SOCIETAL IMPACT OF RESEARCH AND DOCTORAL TRAINING (MAX. 4400 CHARACTERS WITH SPACES)

- Description of how the RC interacts with and contributes to the society (collaboration with public, private and/or 3rd sector).

  With the support of the existing RC, over 200 patients have been treated with BNCT.

  In the RC, on average 5 to 6 academic degrees has been accomplished between the years 2005 and 2010 as shown in Appendix 1. The chart includes M.Sc., PhD and hospital physicist's degrees. UH/HUCH together with its partners, identified in RC's documentation, forms the largest community in Finland, which is responsible for hospital physicists training. The hospital physicists graduated during this time period have been employed by both the private and the public sector.

  RC consists of research groups both in public and private sector. It gives the students a possibility to get familiar with different kind of research environments during their training and enhances future collaboration between public and private sector.

  All together, the RC has invested considerably in acquiring technologies and related expertise. The new acquired technology has been tested with single experiments, as well as in small research projects within multiple specialities, including radiology, clinical neurophysiology, paediatrics, children's and adult's neurology, as well as neurosurgery. This has been followed by exploring their genuine role in clinical workup using prospective clinical patient series, and therewith to also truly establish their availability as routine clinical repertoire. While the core of RC's research is technical, all the motivation and yield of this work lies in its direct benefit to clinical science and patient diagnostics.

  The awaited return of this investment in terms of patient care can be remarkably high. For instance, more accurate structure-functional brain mapping prior to neurosurgery may lead to dramatic differences in both financial and humane burden of post-operative neurocognitive sequalae. Likewise, more accurate neurological prognosis of ill neonates may significantly guide their costly therapeutic protocols, with manifold savings compared to the sought funding. The advances in dosimetry and protocol optimization of modalities using ionizing radiation in diagnostics and treatment, result in better knowledge of radiation exposure and ways to decrease it. The knowledge gained is shared in publications, educational events, international meetings and national recommendations of the radiation safety authority.

  Finally, all these techniques together do undoubtedly comprise a repertoire that is necessary not only for their own right, but also as an HUS infrastructure that is currently required for the highest level of clinical science in participating clinical specialities. Hence, this research project will strongly support both the national and international competitiveness of HUCH in conducting translational and application based medical research.

- Ways to strengthen the societal impact of the RC's research and doctoral training.

  At the moment there is a lack of hospital physicist, especially, in the HUCH area. The RC consists of institutes, which all have the authorized rights to give practical training for coming hospital physicists. Each institute in RC has a responsible trainer nominated by the qualification board of national hospital physicists. UH and HUCH are responsible for coordinating the education, so that potential hospital physicists can achieve the needed practical training in four years. The responsibility of academic training and education is at the Department of Physics at UH.

  Research on imaging modalities in HUCH often has a direct impact on clinical imaging practices offering effective implementation of new imaging methods, enhanced image quality and minimizing the risks e.g. from ionizing radiation.

4 INTERNATIONAL AND NATIONAL (INCL. INTERSECTORAL) RESEARCH COLLABORATION AND RESEARCHER MOBILITY (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the RC's research collaborations and joint doctoral training activities and how the RC has promoted researcher mobility.

  Each partner in RC has a specific role in doctoral training of Medical Physicist. Depending on the institutes research interest, different kind of expertise is required in preclinical and clinical support for diagnostics and treatments. Students in doctoral training are circulated so that they can get their minimum required practical training in the five categories (Oncology, radiology, nuclear medicine, clinical neurophysiology and clinical physiology) in four years.

  The research collaborations and interests are:

  - Collaboration with IAEA (International Atomic Energy Agency) in expert missions, fellowships and training (Africa, Asia, Europe and within institution in Finland) since 2006.
  - Collaboration within Nordic countries for quality assurance in CT.
  - Evaluation and optimization of limited cone beam computed tomography for dental and cranial applications in clinical radiology.
  - Patient dosimetry and optimization in multi-slice computed tomography (MSCT).
  - Dosimetry and optimization in mammography.
  - Radiological image quality determination methods and applications.
  - New applications of occupational radiation dosimetry and radiation protection in radiology.
  - Dosimetry and optimization in paediatric radiology.
  - Collaboration with radiation safety authority (STUK); national recommendations in quality assurance, imaging criteria and optimization in various modalities in clinical radiology.
  - Academic supervision and review in clinical radiology.
  - Lectures and teaching in clinical radiology and radiation protection (physicists, medical doctors, nursing staff).
  - Management of research projects in clinical radiology physics and applications.
  - Dosimetry, biokinetic modelling and patient positioning systems in boron neutron capture therapy (BNCT).

Additionally, in image analysis on-going research collaboration exists with the following parties: Medical Imaging Centre of Southwest Finland, Turku University Hospital, Department of Psychiatry (HUCH,) HUS Helsinki Medical Imaging Center, HUCH (radiologists), Paediatric Neurology at the Department of Gynaecology and Paediatrics, (HUCH), Pain Clinic at the Department of Anaesthesia and Intensive Care Medicine (HUCH).

During the doctoral training period the students have to get practical training in all five fields and they have the chance to be at a favoured training place for a longer time. Candidates can use up to one year of the four mandatory practical training years in a non-hospital unit. After graduation the researchers usually get a permanent position either in public or in private sector and then they are not keen to leave. However, medical physicists are requested frequently as speakers for national educational events and meetings, where information and new ideas can be exchanged.

- RC's strengths and challenges related to research collaboration and researcher mobility, and the actions planned for their development.

Until now there have been some difficulties to get positions for practical training for students. The RC will help the situation by giving new challenging positions for PhD –students in the projects ongoing in the institutes behind the RC. There is a lack of funding for researcher mobility, which has to be resolved. Both the high workload with daily clinical duties and the lack of resources required for scientist exchange, inhibit mobility.

5 OPERATIONAL CONDITIONS (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the operational conditions in the RC's research environment (e.g. research infrastructure, balance between research and teaching duties).

HUCH is the leading university hospital in Finland with a vital role in medical physics research. HUCH has access to most of the necessary human imaging modalities, software and computing capacity. HUCH has 6 senior researchers, 3 post-docs and 13 PhD students in the RC. In general, these researchers also have daily clinical duties, part of it is the time necessary for preparing and conducting teaching. Teaching includes lectures for both students and hospital personnel. Teaching and all kinds of communication is encouraged.

The FiR1 reactor operated by VTT, has been converted into a full-scale BNCT facility. The Finnish BNCT Consortium has been established to develop BNCT into a viable cancer treatment by HUCH and VTT. Presently the BNCT treatment research in Helsinki is the longest ongoing BNCT research in the Western Countries and thus provides a unique possibility for researchers.

The Division of Materials Physics at the Dept of Physics concentrates on computational materials science and medical physics with over 15 years of experience in simulations in micro and macro dosimetric applications. The computational materials science group develops cell cluster models, micro and macro-level dosimetry. RC has one PI and 2 PhD students from this division.

Laboratory of Organic Chemistry at the UH, has modern equipment for organic synthesis, sample purification and molecular structure characterization. It offers a full range of organic analytical techniques and is in major role when new possible drugs for TRT, especially for BNCT are studied. They strengthen the RC with a PI.

The Real-Time Imaging Unit (RTI) at CDR in Faculty of Pharmacy provides multi-modality imaging and image analysis for small animals. The RTI combines state-of-the-art instrumentation and radiotracer services to assist investigators with a wide range of imaging based experimental approaches. It hosts a nanoSPECT/CT instrument, which enables quantitative, real-time ultra-high resolution 3D morphological

imaging and tracking of radiolabeled substances in rodents. It is one of a kind in Scandinavia. The role of CDR increases as it has just got the authorized rights to train hospital physicists.

STUK and Radiation Metrology Laboratory is focused on the detection, dosimetry and safe medical use of radiation. STUK is a national standards laboratory for ionizing radiation and has high quality calibration facilities, which offers a possibility to perform accurate studies on different types of dosimeters.

- RC's strengths and challenges related to operational conditions, and the actions planned for their development.

  The established RC has a great potential to be a vital group in the field of medical physics in research and doctoral training, and playing an important role internationally. It has access to the top Finnish sites in medical physics research and is a balanced combination of experienced and post doctoral scientists and enthusiastic graduate students pursuing a doctoral degree. The number of papers published by the RC in 2005-2010 is ~200 with approx. six M.Sc., PhD or Hospital Physicist degrees achieved per year.

  The collaboration with the BioMag laboratory at HUCH should be reinforced compared to the current situation, because they possess knowledge and technology which could enable new cutting edge clinical applications.

  The most challenging issue is the impact of pressure and workload from the routine clinical work on the time resources available for conducting research. With a higher amount of external funding more weight could be placed on research and/or by requiring more vacancies for physicists.

6 LEADERSHIP AND MANAGEMENT IN THE RESEARCHER COMMUNITY (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the execution and processes of leadership in the RC, how the management-related responsibilities and roles are distributed in the RC and how the leadership- and management-related processes support high quality research, collaboration between principal investigators and other researchers in the RC, the RC's research focus and strengthening of the RC's know-how.

  - the execution and processes of leadership in the RC.

  A management group (project steering committee) is composed of senior researchers. The senior researchers contribute to the research alongside their main duties. The project communication strategy aims at keeping the partners fully informed about the research planning and status, and all other issues which are important to the partners in order to obtain reasonable transparency and to increase synergy of the cooperation. The project steering committee includes five senior researchers and one PI form HUCH, one senior form VTT and STUK, UH is represented by three PI researchers in the committee. Private sector, which includes three companies, has one coordinating senior researcher in the committee (Appendix 1). The Management group will have meetings in the regular basis.

  - how the management-related responsibilities and roles are distributed in the RC.

  The project management structure: Each subgroup of the RC has a person in charge. This group of leaders acts as an administrative board; principally monitoring the progress by checking both the research and progress reports, solving unforeseen difficulties, and reacting to unforeseen results either by making minor modifications to the details or some subsequent milestones and deliverables or by making major modifications to the work contents in collaboration with the coordinator and PIs.

  - how the leadership- and management-related processes support

- high quality research

Each leader of subgroups in the RC represents his/her own sector's nationally or internationally recognized status in the Medical Physics field in question. The leadership of the RC forms a supporting example for teaching and researching. Thus graduate student has the best possible support in their doctoral training. Each of the seniors has a long experience both in theoretical and practical work in the field of Medical Physics.

- collaboration between principal investigators and other researchers in the RC

The PI's function as supervisors, project leaders and as contacts between fields of expertise. PI's are often in charge of the research financing i.e. funding applications and ideas for new funding possibilities. They further ensure that individual researchers have equal opportunity to present their work and attend at conferences etc.

- the RC's research focus

The management teams' main function is to support all aspects of research within the RC. The individual researchers have the freedom to find their own research interest and path in the field. The management team only ensures that the topics are close enough to the main field and the reality. It can also bring up ideas from other subgroups.

- strengthening of the RC's know-how

The management team is in prime position to see the full picture of the multidisciplinary research performed in the RC. From their regular meetings they bring back that viewpoint to the researchers of the RC. They have the chance to bind together the research performed in the subgroups and to enhance the cross-knowledge and promote collaboration.

- RC's strengths and challenges related to leadership and management, and the actions planned for developing the processes.

The RC's university departments are divided on several campuses, so mainly the management group has to keep the information flowing and enhance the communication between the groups. The management team needs to have, and is planned to have, often enough meetings to keep the group together. On the other hand as the research field within the RC is so vast, the individual group leaders will have high level of independence as they are the best experts in their field. This requires experienced group leaders and PI's that understand issues out of their own scope. Especially in the beginning high amount of communication will promote the forthcoming co-operation and mutual understanding.

The challenge is to acquire highly motivated research oriented senior physicists for doctor trainee supervision. There have been some deficiencies in routine research supervision of the doctoral candidates. On the doctoral candidate side, demand for good quality routine research supervision hasn't been forceful enough.

7 EXTERNAL COMPETITIVE FUNDING OF THE RC

- Listing of the RCs external competitive funding, where:
  - the funding decisions have been made during 1.1.2005-31.12.2010, and
  - the administrator of the funding is/has been the University of Helsinki

- Academy of Finland (AF) - total amount of funding (in euros) AF has decided to allocate to the RC members during 1.1.2005-31.12.2010: 117884

- Finnish Funding Agency for Technology and Innovation (TEKES) - total amount of funding (in euros) TEKES has decided to allocate to the RC members during 1.1.2005-31.12.2010:

- European Union (EU) - total amount of funding (in euros) EU has decided to allocate to the RC members during 1.1.2005-31.12.2010: 80000

- European Research Council (ERC) - total amount of funding (in euros) ERC has decided to allocate to the RC members during 1.1.2005-31.12.2010:

- International and national foundations – names of international and national foundations which have decided to allocate funding to the RC members during 1.1.2005-31.12.2010, and the amount of their funding (in euros).
  - names of the foundations:
  - total amount of funding (in euros) from the above-mentioned foundations:

- Other international funding - names of other international funding organizations which have decided to allocate funding to the RC members during 1.1.2005-31.12.2010, and the amount of their funding (in euros).
  - names of the funding organizations:
  - total amount of funding (in euros) from the above-mentioned funding organizations:

- Other national funding (incl. EVO funding and Ministry of Education and Culture funded doctoral programme positions) - names of other national funding organizations which have decided to allocate funding to the RC members during 1.1.2005-31.12.2010, and the amount of their funding (in euros).
  - names of the funding organizations: EVO
  - Suomen kulttuurirahasto
  - total amount of funding (in euros) from the above-mentioned funding organizations: 283924

8 RC'S STRATEGIC ACTION PLAN FOR 2011–2013 (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the RC's future perspectives in respect to research and doctoral training.

  HUCH has invested considerably in acquiring technologies and related expertise. All the modern methodology is now made available in clinical environment, in theory. Next is to study their genuine role in clinical workup using prospective clinical patient series, and therewith to also truly establish their availability as routine clinical repertoire. While the clinical specialities and questions are apparently diverse, it is notable that they all are crucially dependent on how a few, common technical issues can be solved. Therefore, the core of the work is heavily technical, all the motivation and yield of this work lies in its direct benefit to clinical science: patient treatments and diagnostics. The awaited return of this investment in terms of patient care can be remarkably high. All the techniques together do undoubtedly comprise a repertoire that is necessary, not only for their own right, but also as an HUCH infrastructure that is required for the highest level of clinical science in the participating clinical specialities. Hence, the RC will strongly support both the national and international competitiveness of HUCH in conducting application near medical research.

  Imaging has been recognized as an extremely valuable tool in drug development, which facilitates go/no-go decisions in preclinical studies and thus can reduce the development costs. According to the

RC-SPECIFIC STAGE 2 MATERIAL

Food and Drug Administration influential 'white paper', the current preclinical methods of pharmacology and toxicology (in silico, in vitro and in vivo) predict poorly the clinical safety and efficacy of new drugs. SPECT/CT is an established imaging method in drug development. The CDR hosted SPECT/CT has high spatial resolution and sensitivity that allow proper imaging of rodents, even at the sub-organ level imaging in small animals. SPECT imaging is recognized as a non-invasive in vivo method, which may diminish the number of laboratory animals used in drug research.

Conventional MRI is insufficient in detection of subtle changes, which is essential when studying changes due to tumours and radiation. To evaluate the suitability of MRSI for BNCT patient selection, it is necessary to perform MRS immediately after the end of BPA-F infusion for a larger patient group. Functional Diffusion Maps is a promising biomarker to predict early response to therapy and should be studied. Preoperative planning of epilepsy patients is advanced with research in nTMS-mappings, simultaneous EEG-fMRI and advanced image visualization. The ERP-project is currently part of a nationwide Salwe-project, in which the multidisciplinary co-operation will bring more effort on the development of the methodology also in the future.

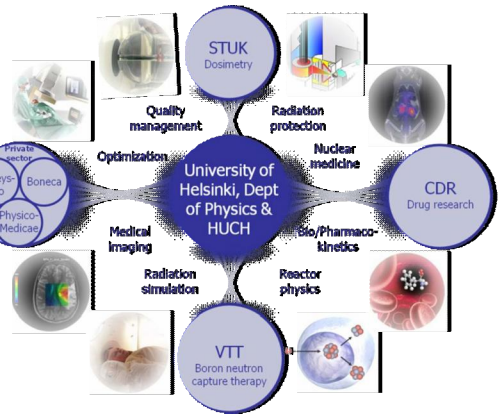
STUK with HUCH focuses research on development of quality assurance for technologies, examination and treatment methods – including dosimetry of small fields in modern external photon and electron radiotherapy modalities, individual patient dosimetry for nuclear medicine, optimization of high exposure x-ray imaging (CT, interventional/cardiology), dosimetry techniques and patient doses in diagnostic/interventional x-ray exposures of children, and justification/optimization of radiation use in health screening programs. Active participation and collaboration in EU funded and in IAEA research projects is continued.

According to the developed 2D surrogate dosimetry model the averaged Monte Carlo dose calculations on 2D tissue sections containing both morphology and activity data present an accurate equivalent to calculations in 3D. In 2D BNCT microdosimetry the cell morphology and the boron distribution can be revealed by autoradiographs of the randomly selected BNCT radiated tissue slices. The results of the 2D surrogate models seem promising, but the verification is still in progress.

The RC is a multifunctional base for future development of medical physics research in Finland and has the potential to become an important player worldwide. The quality of the sub groups is already recognized on either national or international level in doctoral training and research. To ensure the state-of-art research in the future the institutes behind the RC should invest in modern technology such as MR/PET. All the institutes in RC have the authorized rights to give practical training for the upcoming hospital physicist at least one year.

9 SHORT DESCRIPTION OF HOW THE RC MEMBERS HAVE CONTRIBUTED TO THE COMPILATION OF THE STAGE 2 MATERIALS (MAX. 1100 CHARACTERS WITH SPACES).

All the members of RC have been involved in the documentation either by contributing to this document or to the TUHAT database. The information in the database has been created by each member of RC individually and independently. This document has been created under supervision of PIs and senior researchers of institutes behind the RC (App. 1). Participants of RC working at the UH have described their main research interests, activities and publications as instructed by the UH's administration. The description of the project BNCTMI has been created by the PIs together with the senior researchers of RC. Participants outside of UH have contributed for data collecting by producing parts of text in this document. Parts of their scientific contribution have been added to the App. 2. Most of their scientific papers (2005-2010) have been written together with the UH's researchers, so majority of the scientific work can be found in the database. In harmonizing the document PIs and coordinators have had few meetings. In the future the steering committee will have meetings on regular basis.



ure 1. The RC is a multifunctional base for future development medical physics research and doctoral training in Finland and th potential to become an important player worldwide. It is a anced combination of experienced and post doctoral scientists d enthusiastic graduate students pursuing a doctoral degree, th access to the top Finnish sites in medical physics research

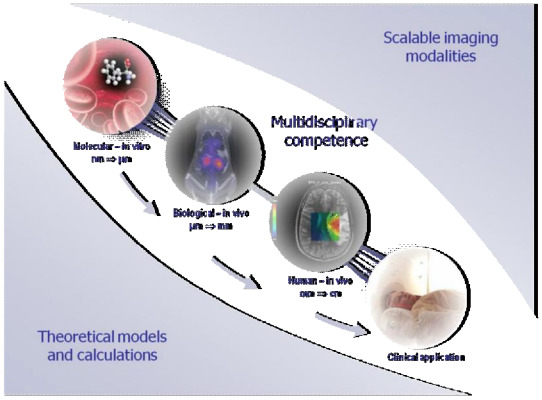


Figure 2. The functional basis of each institute in RC. To induce communication between different disciplines of medical physics, new division philosophy is introduced. Each institute of RC represents different scales of the phenomena dealing with: Molecular and cell level research as well as large scale pre clinical and clinical research.

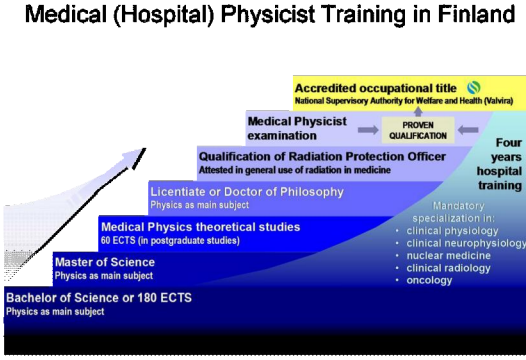


Figure 3. Medical Physics in RC is engaged in academic research, teaching and clinical physics support services. Medical Physics is a branch of applied physics encompassing concepts, principles and methodology of physical sciences to medicine in clinics. Primarily, Medical Physics seeks to develop efficient and safe diagnosis and treatment methods for human. In Finland most medical physicists have the licensed profession of a Hospital Physicist. Department of Physics started an education program for Hospital Physicists in 1995.

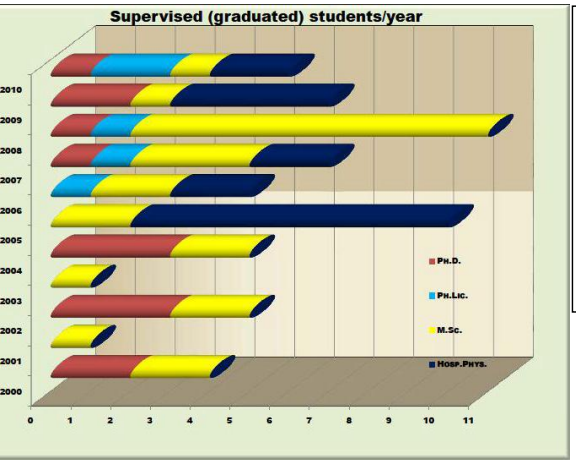


Figure 4. The quality of RC's research and doctoral training can be objectively judged according to key figures of graduated persons and level of academic degrees, research papers and corresponding results, and the coverage of them related to RC's field of interest.

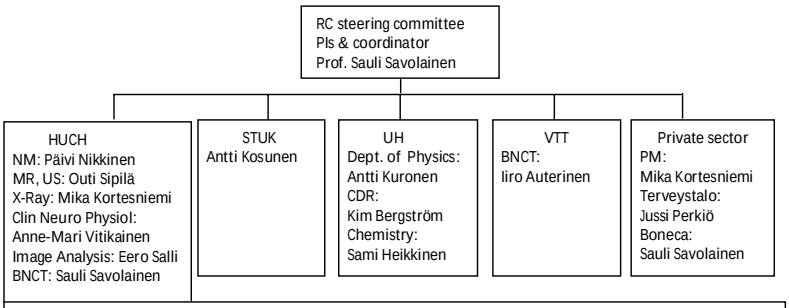


Figure 5. The management group is composed of senior researchers (PI). The project communication strategy aims at keeping the partners fully informed about the research status, the planning and all other issues which are important to the partners in order to obtain reasonable transparency and to increase synergy of the cooperation.

Terveystalo/Soile Komssi

- Kähkönen S, Komssi S, Wilenius J, Ilmoniemi RJ. Prefrontal TMS produces intensity-dependent EEG effects. NeuroImage 24 (2005):955-960.
- Kähkönen S, Komssi S, Wilenius J, Ilmoniemi RJ. Prefrontal TMS produces smaller EEG responses than motor-cortex TMS: implications for rTMS treatment in depression. Psychopharmacology 81 (2005):16-20.
- Huttunen J, Komssi S, Lauronen L. Spatial dynamics of population activities at S1 after median and ulnar nerve stimulation: an MEG study. NeuroImage 32 (2006):1024-1031.
- Komssi S, Savolainen P, Heiskala J, Kähkönen S. Excitation threshold of the motor cortex estimated with TMS–EEG. NeuroReport 18 (2007):13-16.
- Litvak V, Komssi S, Scherg M, Hoechstetter K, Classen J, Zaaroor M, Pratt H, Kähkönen S. Artifact correction and source analysis of early electroencephalographic responses evoked by transcranial magnetic stimulation over primary motor cortex. NeuroImage 37 (2007): 56-70.

VTT/Petri Kotiluoto

- Korpiola, Kari, Järvinen, Joonas, Penttilä, Karri, Kotiluoto, Petri. 2010. Modeling of Incineration of Spent Ion Exchange Resins of Boiling Water and Pressurized Water Nuclear Reactors:ANS. Nuclear Technology, Vol. 172, Nr. 2, Pp. 230-236 http://www.new.ans.org/pubs/journals/nt/a_10908
- Kotiluoto, Petri, Wasastjerna, Frej, Kekki, Tommi, Sipilä, Heikki, Banzuzi, Kukka, Kinnunen, Petri, Heikinheimo, Liisa. 2009. Emission and transmission tomography systems to be developed for the future needs of Jules Horowitz material testing reactor. Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, Vol. 607, Nr. 1, Pp. 61 – 63. doi:10.1016/j.nima.2009.03.113
- Fischer, Ulrich, Pereslavtsev, Pavel, Kotiluoto, Petri, Wasastjerna, Frej. 2007. Nuclear performance analyses for HCPB test blanket modules in ITER. Fusion Engineering and Design, Vol. 82, Nr. 15 - 24, Pp. 2140 – 2146. doi:10.1016/j.fusengdes.2006.12.013
- Kotiluoto, Petri, Pyyry, Joakim, Helminen, Hannu. 2007. MultiTrans SP3 code in coupled photon-electron transport problems. Radiation Physics and Chemistry, Vol. 76, Nr. 1, Pp. 9 – 14. doi:10.1016/j.radphyschem.2006.04.004
- Kotiluoto, Petri. 2006. Verification of MultiTrans Calculations by the VENUS-3 Benchmark Experiment. Journal of ASTM International (JAI), Vol. 3, Nr. 3 doi:10.1520/JAI13433

STUK/Paula Toroi (née Pöyry)

- Hakanen A, Kosunen A, Pöyry P, Tapiovaara M. Determination of conversion factors from air kerma to operational dose equivalent quantities for low energy x-ray spectra. Radiation Protection Dosimetry 2006; 125(1-4): 198-204.
- Zanca F, Jacobs J, Pöyry P, Van Ongeval C, Carton, AC, Deprez T, Marchal G, Bosmans H. Development and implementation of a user friendly and automated environment for creation of databases of digital mammograms with simulated microcalcifications. In book: Jiang Y, Eckstein MP. (Eds.). Image perception, observer performance, and technology assessment. Proceedings of SPIE (The International Society for Optical Engineering) Medical Imaging; 2006.
- Pöyry P, Zanca F, Bosmans H. Experimental investigation of the necessity for extra flat field corrections in quality control of digital mammography. International Workshop on Digital Mammography, 18-21 June 2006, Manchester, England. In Astley S. et al. (eds.). IWDM 2006, LNCS 4046. Berlin Heidelberg: Springer-Verlag; 2006: 475-481.
- Zanca F, Van Ongeval C, Jacobs J, Pöyry P, Marchal G, Bosmans H. Evaluation of the global effect of anatomical background on microcalcifications detection. In book: Jiang Y, Sahiner B (eds.). Medical Imaging 2007: Image perception, observer performance and technology assessment. Pro-ceedings of SPIE, 2007; 6515.
- Toroi P, Zanca F, Young KC, van Ongeval C, Marchal G, Bosmans H. Experimental investigation on the choice of the tungsten/rhodium anode/filter combination for an amorphous selenium-based digital mammography system. European Radiology 2007; 17 (9): 2368-2375.
- Toroi P, Komppa T, Kosunen A. A tandem calibration method for kerma–area product meters. Phys. Med. Biol. 53; 2008: 4941-4958
- Toroi P, Komppa T, Kosunen A, Tapiovaara M. Effects of radiation quality on the calibration of kerma-area product meters in x-ray beams. Phys. Med. Biol. 53; 2008: 5207–5221.
- Toroi P and Kosunen A. The energy dependence of the response of a patient dose calibrator. Phys. Med. Biol. 54; 2009: N151-N156.
- Toroi P, Nieminen M T, Tenkanen-Rautakoski P and Varjonen M. Determining air kerma from pixel values in digital mammography. Phys. Med. Biol. 2009; 54: 3865-3879.
- Toroi P. Patient exposure monitoring and radiation qualities in two-dimensional digital x-ray imaging. STUK-A 239. Helsinki: Radiation and Nuclear Safety Authority 2009.

STUK/Antti Kosunen

- Siiskonen T, Tapiovaara M, Kosunen A, Lehtinen M, Vartainen E. Monte Carlo simulations of occupational radiation doses in interventional radiology. The British Journal of Radiology 2007; 80: 460-468.
- O'Connor U, Dowling A, Larkin A, Sheahan N, Gray L, Gallagher A, O'Reilly G, Kosunen A, Zdesar U, Malone JF. Development of training syllabi for radiation protection and quality assurance of dual-energy x-ray absorptiometry (DXA) systems. Radiation Protection Dosimetry 2008.
- Vano E, Järvinen H, Kosunen A, Bly R, Malone J, Dowling A, Larkin A, Padovani R, Bosmans H, Dragusin O, Jaschke W, Torbica P, Back C, Schreiner A, Bokou C, Kottou S, Tsapaki V, Jankowski J, Papierz S, Domienik J, Werduch A, Nikodemova D, Salat D, Kepler K, Bor MD, Vassileva J, Borisova R, Pellet S, Corbett RH. Patient dose in interventional radiology: A European survey. Radiation Protection Dosimetry 2008; 129 (1-3): 39-45.
- Malisan MR, Padovani R, Faulkner K, Malone JF, Vano, Jankowski J, Kosunen A. Proposal for patient database on cardiac interventional exposures for epidemiological studies. Radiation Protection Dosimetry 2008.
- Siiskonen T, Tapiovaara M, Kosunen A, Lehtinen M, Vartiainen E. Occupational radiation doses in interventional radiology: simulations. Radiation Protection Dosimetry 2008; 129: 36-38.
- Smans K, Vaño E, Sanchez R, Schultz FW, Zoetelief J, Kiljunen T, Maccia C, Järvinen H, Bly R, Kosunen A, Faulkner K, Bosmans H. Results of a european survey on patient doses in paediatric radiology. Radiation Protection Dosimetry 2008; 129 (1-3): 204-210.
- Hakanen A, Siiskonen T, Pöllänen R, Kosunen A, Turunen A, Belyakov O. Design, spectrum measurements and simulations for a 238Pu α-particle irradiator for bystander effect and genomic instability experiments. Applied Radiation and Isotopes 2006; 64: 864-867.
- Kosunen A, Komppa T, Toivonen M. Evaluation of methods to estimate the patient dose in interventional radiology. Radiation Protection Dosimetry 2005; 117 (1-3): 178-184.

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI

RC-SPECIFIC TUHAT COMPILATIONS OF PUBLICATIONS DATA 2005-2010

BNCTMI/Savolainen

1 Analysis of publications

- Associated person is one of Sami Heikkinen , Antti Kuronen , Sauli Savolainen , Kim Bergström , Mika Kortesniemi , Päivi Nikkinen , Jussi Perkiö, Eero Salli , Tiina Seppälä, Outi Sipilä , Soile Komssi, Marjut Timonen , , Jouni Uusi-Simola , Nadja Lönnroth, Eero Tapio Hippeläinen , Toni Ihalainen , Touko Tuomas Kaasalainen , Hanna Koivunoro , Linda Kuusela , Anniina Lampinen , Vilma Mannila , Katja Merimaa , Miia Pitkonen , Sampsa Turunen , Anne-Mari Vitikainen , Petteri Välimäki , Mikko Nyrhinen ,

	Publication year						
Publication type	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total Count 2005 - 2010**
A1 Refereed journal article	9	6	16	12	20	16	79
A2 Review in scientific journal	1						1
A3 Contribution to book/other compilations (refereed)		2					2
A4 Article in conference publication (refereed)	2	8		2	3	5	20
B1 Unrefereed journal article				1			1
B2 Contribution to book/other compilations (non-refereed)		1					1
B3 Unrefereed article in conference proceedings		1		1	1	2	5
D1 Article in professional journal	3	1				1	5
D2 Article in professional hand or guide book or in a professional data system, or text book material		1					1
D3 Article in professional conference proceedings	1		1		2	5	9
D5 Text book or professional handbook or guidebook or dictionary	1			4			5
H1 Patents		1					1

2 Listing of publications

A1 Refereed journal article

2005

Alftan, SV, Sutton, AP, Kuronen, A, Kaski, K **2005**, 'Stability and crystallization of amorphous clusters in crystalline Si', **Journal of Physics: Condensed Matter**, vol 17, no. 13, pp. 4263-4270.

Binns, PJ, Riley, KJ, Harling, OK, Kiger, WSI, Munck af Rosenschöld, PM, Giusti, V, Capala, J, Sköld, K, Auterinen, I, Seren, T, Kotiluoto, P, Uusi-Simola, J, Marek, M, Viererbl, L, Spurny, F **2005**, 'An international dosimetry exchange for boron neutron capture therapy: Part I: absorbed dose measurements', **Medical Physics**, vol 32, no. 12, pp. 3729-3736.

Eerola, J, Tienari, PJ, Kaakkola, S, Nikkinen, P, Launes, J **2005**, 'How useful is [123I]beta-CIT SPECT in clinical practice?', **Journal of Neurology, Neurosurgery and Psychiatry**, vol 76, no. 9, pp. 1211-1216.

Haapala, J, Lönnroth, N, Stoessel, A **2005**, 'A numerical study of open water formation in sea ice', **Journal of Geophysical Research : Oceans**, vol 110, pp. C09011.

Koskela, H, Kilpeläinen, I, Heikkinen, S **2005**, 'Some aspects of quantitative 2D NMR', **Journal of Magnetic Resonance**, vol 174, no. 2, pp. 237-244.

Lundbom, JJ, Vuori, K, Gaily, E, Granström, M, Blomstedt, GC, Häkkinen, A, Heikkinen, S, Lundbom, N **2005**, 'Metabolite phantom correction of the nonuniform volume-selection profiles in MR spectroscopic imaging: application to temporal lobe epilepsy', **American Journal of Neuroradiology**, vol 2005, no. 26, pp. 1072-1077.

Numminen, K, Sipilä, O, Mäkisalo, H **2005**, 'Preoperative hepatic 3D models: virtual liver resection using three-dimensional imaging technique', **European Journal of Radiology**, vol 56, pp. 179-84.

Perkiö, J, Soinne, L, Østergaard, L, Helenius, J, Kangasmäki, A, Martinkauppi, S, Salonen, O, Savolainen, S, Kaste, M, Tatlisumak, T, Aronen, HJ **2005**, 'Abnormal intravoxel cerebral blood flow heterogeneity in human ischemic stroke determined by dynamic susceptibility contrast magnetic resonance imaging', **Stroke**, vol 36, no. 1, pp. 44-49.

Timonen, M, Kankaanranta, L, Lundbom, N, Collan, J, Kangasmäki, A, Kortesniemi, M, Häkkinen, A, Lönngren, A, Karjalainen, S, Rasilainen, M, Leinonen, J, Huitti, T, Jääskeläinen, J, Kouri, M, Savolainen, S, Heikkinen, S **2005**, '^{1}H MRS studies in the Finnish boron neutron capture therapy project: Detection of 10B-carrier, L-p-boronophenylalanine-fructose', **European Journal of Radiology**, vol 56, no. 2, pp. 154-159.

2006

Fagerlund, A, Heikkinen, S, Autti-Ramo, I, Korkman, M, Timonen, M, Kuusi, T, Riley, EP, Lundbom, N **2006**, 'Brain metabolic alterations in adolescents and young adults with fetal alcohol spectrum disorders', **Alcoholism: Clinical and Experimental Research**, vol 30, no. 12, pp. 2097-2104.

Flux, G, Bardies, M, Monsieurs, M, Savolainen, S, Strand, S, Lassmann, M **2006**, 'The impact of PET and SPECT on dosimetry for targeted radionuclide therapy', **Zeitschrift für medizinische Physik**, vol 16, no. 1, pp. 47-59.

Kortesniemi, M, Kiljunen, T, Kangasmäki, A **2006**, 'Radiation exposure in body computed tomography examinations of trauma patients', **Physics in Medicine and Biology**, vol 51, no. 12, pp. 3269-3282.

Korvenoja, A, Kirveskari, E, Aronen, HJ, Avikainen, S, Brander, A, Huttunen, J, Ilmoniemi, R, Jääskeläinen, J, Kovala, T, Mäkelä, JPT, Salli, E, Seppä, M **2006**, 'Sensorimotor cortex localization: comparison of magnetoencephalography, functional MR imaging, and intraoperative cortical mapping', **Radiology**, vol 241, no. 1, pp. 213-222.

Tillikainen, L, Salli, E, Korvenoja, A, Aronen, H **2006**, 'A cluster mass permutation test with contextual enhancement for fMRI activation detection', **NeuroImage**, vol 32, no. 2, pp. 654-664.

Urrila, A, Hakkarainen, A, Heikkinen, S, Huhdankoski, O, Kuusi, T, Stenberg, D, Häkkinen, A, Porkka-Heiskanen, T, Lundbom, N **2006**, 'Preliminary findings of proton magnetic resonance spectroscopy in occipital cortex during sleep deprivation', **Psychiatry Research: Neuroimaging**, vol 147, no. 1, pp. 41-46.

2007

Flux, G, Bardies, M, Chiesa, C, Monsieurs, M, Savolainen, S, Strand, S, Lassmann, M **2007**, 'Clinical radionuclide therapy dosimetry: The quest for the "holy Gray"', **European Journal of Nuclear Medicine and Molecular Imaging**, vol 34, no. 10, pp. 1699-1700.

Järvi, TT, Kuronen, A, Meinander, K, Nordlund, K **2007**, 'Contact epitaxy by deposition of Cu, Ag, Pt, and Ni nanoclusters on (100) surfaces: Size limits and mechanisms', **Physical Review B, Condensed Matter and Materials Physics**, vol 75, no. 11, pp. 115422.

Järvi, TT, Kuronen, A, Nordlund, K, Albe, K **2007**, 'Structural modification of a multiply twinned nanoparticle by ion irradiation: a molecular dynamics study', **Journal of Applied Physics**, vol 2007, pp. 124304.

BNCTMI/Savolainen

Kankaanranta, L, Seppälä, T, Koivunoro, H, Saarilahti, K, Atula, T, Collan, J, Salli, E, Kortesniemi, M, Uusi-Simola, J, Mäkitie, A, Seppänen, M, Minn, H, Kotiluoto, P, Auterinen, I, Savolainen, S, Kouri, M, Joensuu, H **2007**, 'Boron neutron capture therapy in the treatment of locally recurred head and neck cancer', **International Journal of Radiation: Oncology - Biology - Physics**, vol 69, no. 2, pp. 475-482.

Kavakka, JS, Heikkinen, S, Kilpeläinen, I, Mattila, M, Lipsanen, H, Helaja, J **2007**, 'Noncovalent attachment of pyro-pheophorbide a to a carbon nanotube', **Chemical Communications**, no. 6, pp. 519-521.

Kesälä, E, Kuronen, A, Nordlund, K **2007**, 'Molecular dynamics simulation of pressure dependence of cluster growth in inert gas condensation', **Physical Review B, Condensed Matter and Materials Physics**, vol 2007, no. 17, pp. 174121.

Kiljunen, T, Järvinen, H, Savolainen, S **2007**, 'Diagnostic reference levels for thorax X-ray examinations of paediatric patients', **British Journal of Radiology**, vol 80, no. 954, pp. 452-459.

Kilpeläinen, I, Xie, H, King, A, Granstrom, M, Heikkinen, S, Argyropoulos, DS **2007**, 'Dissolution of wood in ionic liquids', **Journal of Agricultural and Food Chemistry**, vol 55, pp. 9142-9148.

Koskela, H, Heikkinen, O, Kilpeläinen, I, Heikkinen, S **2007**, 'Rapid and accurate processing method for amide proton exchange rate measurement in proteins', **Journal of Biomolecular NMR**, vol 37, pp. 313-320.

Lilienkampf, A, Heikkinen, S, Mutikainen, I, Wähälä, K **2007**, 'Synthesis of isomeric enamine derivatives of fused cykloalkeno thieno[2,3-d]pyrimidin-4(3H)-ones: Stereoelectronic effect on the regioselectivity', **Synthesis (Stuttgart)** , vol 2007, no. 17, pp. 2699-2705.

Mäntynen, V, Vitikainen, A, Koskinen, R, Mäkijärvi, M, Toivonen, L, Montonen, J **2007**, 'Magnetocardiography is sensitive to differences in inter-atrial conduction in patients with paroxysmal lone atrial fibrillation', **International congress series**, vol 1300, pp. 508-511.

Patriarca, M, Kuronen, A, Robles, M, Kaski, K **2007**, 'Three-dimensional interactive molecular dynamics program for the study of defect dynamics in crystals', **Computer Physics Communications**, vol 176, no. 1, pp. 38-47.

Peltonen, LI, Aarnisalo, AA, Kortesniemi, MK, Suomalainen, A, Jero, J, Robinson, S **2007**, 'Limited cone-beam computed tomography imaging of the middle ear: a comparison with multislice helical computed tomography', **Acta Radiologica**, vol 48, no. 2, pp. 207-212.

Piirilä, P, Välimäki, P, Turunen, A, Seikkula, T, Sovijärvi, ARA **2007**, 'Keuhkojen diffuusiokapasiteetin viitearvojen soveltaminen ei-suomalaisilla maahanmuuttajilla', **Suomen lääkärilehti** , vol 62, no. 46, pp. 4305-4309.

Piirilä, P, Seikkula, T, Välimäki, P **2007**, 'Differences between Finnish and European reference values for pulmonary diffusing capacity', **International Journal of Circumpolar Health**, vol 66, no. 5, pp. 449-457.

Uusi-Simola, J, Heikkinen, S, Kotiluoto, P, Seren, T, Seppälä, T, Auterinen, I, Savolainen, S **2007**, 'MAGIC polymer gel for dosimetric verification in boron neutron capture therapy', **Journal of applied clinical medical physics**, vol 8, no. 2, pp. 114-123.

2008

Heikkilä, O, Lundbom, N, Timonen, M, Groop, P, Heikkinen, S, Mäkimattila, S **2008**, 'Risk for metabolic syndrome predisposes to alterations in the thalamic metabolism', **Metabolic Brain Disease**, vol 23, no. 3, pp. 315-324.

Hippeläinen, E, Nikkinen, P, Ihalainen, T, Uusi-Simola, J, Savolainen, S **2008**, 'Personal radiation doses in PET/CT facility: measurements vs. calculations', **Radiation Protection Dosimetry**, vol 132, no. 1, pp. 57-63.

Holmström, E, Kuronen, A, Nordlund, K **2008**, 'Threshold defect production in silicon determined by density functional theory molecular dynamics simulations', **Physical Review B, Condensed Matter and Materials Physics**, vol 78, no. 4, pp. 045202.

Järvi, TT, Pakarinen, JA, Kuronen, A, Nordlund, K **2008**, 'Enhanced sputtering from nanoparticles and thin films: Size effects', **Europhysics Letters**, vol 82, pp. 26002.

Järvi, T, Kuronen, A, Hakala, MO, Nordlund, K, van Duin, A, Goddard, III, WA, Jacob, T **2008**, 'Development of a reaxFF description for gold', **European Physical Journal B. Condensed Matter and Complex Systems**, vol 66 (2008), pp. 75-79.

Kairemo, K, Erba, P, Bergström, K, Pauwels, KJ **2008**, 'Nanoparticles in cancer', **Current Radiopharmaceuticals**, vol 1, no. 1, pp. 30-36.

Kavakka, JS, Heikkinen, S, Helaja, J **2008**, 'Zn pyropheophorbide a: a ß-face selective nicotine receptor', **European Journal of Organic Chemistry**, pp. 4932-4937.

Kortesniemi, M, Schenkel, Y, Salli, E **2008**, 'Automatic image quality quantification and mapping with an edge-preserving mask-filtering algorithm', **Acta Radiologica**, vol 49, no. 1, pp. 45-55.

Linko, S, Revitzer, H, Zilliacus, R, Kortesniemi, M, Kouri, M, Savolainen, S **2008**, 'Boron detection from blood samples by ICP-AES and ICP-MS during boron neutron capture therapy', **Scandinavian Journal of Clinical & Laboratory Investigation**, vol 68, no. 8, pp. 696-702.

Riley, KJ, Binns, PJ, Harling, OK, Albritton, JR, Kiger, WS, Seppälä, T, Savolainen, S **2008**, 'An international dosimetry exchange for BNCT part II: computational dosimetry normalizations', **Medical Physics**, vol 35, no. 12, pp. 5419-5425.

Strbian, D, Durukan, A, Pitkonen, M, Marinkovic, I, Tatlisumak, E, Pedrono, E, Abo-Ramadan, U, Tatlisumak, T **2008**, 'The blood-brain barrier is continuously open for several weeks following transient focal cerebral ischemia', **Neuroscience**, vol 153, no. 1, pp. 175-181.

BNCTMI/Savolainen

Suomalainen, A, Vehmas, T, Kortesniemi, M, Robinson, S, Peltola, J **2008**, 'Accuracy of linear measurements using dental cone beam and conventional multislice computed tomography', **Dentomaxillofacial Radiology**, vol 37, no. 1, pp. 10-17.

2009

Abo-Ramadan, U, Durukan, A, Pitkonen, M, Marinkovic, I, Tatlisumak, E, Pedrono, E, Soinne, L, Strbian, D, Tatlisumak, T **2009**, 'Post-ischemic leakiness of the blood-brain barrier: a quantitative and systematic assessment by Patlak plots', **Experimental Neurology**, vol 219, pp. 328-333.

Durukan, A, Marinkovic, I, Strbian, D, Pitkonen, M, Pedrono, E, Soinne, L, Abo-Ramadan, U, Tatlisumak, T **2009**, 'Post-ischemic blood-brain barrier leakage in rats: one-week follow-up by MRI', **Brain Research : international multidisciplinary journal devoted to fundamental research in the brain sciences**, vol 1280, pp. 158-165.

Granström, M, Olszewska, A, Mäkelä, V, Heikkinen, S, Kilpeläinen, I **2009**, 'A new protection group strategy for cellulose in an ionic liquid: simultaneous protection of two sites to yield 2,6-di-O-substituted mono-p-methoxytrityl cellulose', **Tetrahedron Letters**, vol 50, pp. 1744-1747.

Heikkila, O, Lundbom, N, Timonen, M, Groop, P-, Heikkinen, S, Mäkimattila, S **2009**, 'Hyperglycaemia is associated with changes in the regional concentrations of glucose and myo-inositol within the brain', **Diabetologia**, vol 52, no. 3, pp. 534-540.

Heikkinen, OK, Ruskamo, S, Konarev, PV, Svegun, DI, Iivanainen, T, Heikkinen, SM, Permi, P, Koskela, H, Kilpeläinen, I, Ylänne, J **2009**, 'Atomic structures of two novel immunoglobulin-like domain pairs in the actin cross-linking protein filamin', **Journal of Biological Chemistry**, vol 284, no. 37, pp. 25450-25458.

Heikkinen, O, Seppala, R, Tossavainen, H, Heikkinen, S, Koskela, H, Permi, P, Kilpeläinen, I **2009**, 'Solution structure of the parvulin-type PPIase domain of staphylococcus aureus PrsA-implications for the catalytic mechanism of parvulins', **BMC Structural Biology**, vol 9, pp. art. 17.

Jarvi, TT, Kuronen, A, Nordlund, K, Albe, K **2009**, 'Damage production in nanoparticles under light ion irradiation', **Physical Review B, Condensed Matter and Materials Physics**, vol 80, pp. 132101.

Järvi, TT, Pohl, D, Albe, K, Rellinghaus, B, Schultz, L, Fassbender, J, Kuronen, A, Nordlund, K **2009**, 'From multiply twinned to fcc nanoparticles via irradiation-induced transient amorphization', **Europhysics Letters**, vol 85, pp. 26001.

Järvi, TT, Kuronen, A, Nordlund, K, Albe, K **2009**, 'Low energy cluster deposition of nanoalloys', **Journal of Applied Physics**, vol 106, pp. 063516.

Kavakka, JS, Kilpeläinen, I, Heikkinen, S **2009**, 'General Chromatographic NMR Method in Liquid State for Synthetic Chemistry: Polyvinylpyrrolidone Assisted DOSY Experiments', **Organic Letters**, vol 11, no. 6, pp. 1349-1352.

Kavakka, JS, Heikkinen, S, Kilpeläinen, I, Tkachenko, NV, Helaja, J **2009**, 'Zn pyro-pheophorbide a-fulleronicotine dyad; supramolecular self assembled donor-acceptor system for photoinduced charge separation', **Chemical Communications**, vol 2009, no. 7, pp. 758-760.

Kiljunen, T, Tietäväinen, A, Parviainen, T, Viitala, A, Kortesniemi, M **2009**, 'Organ doses and effective doses in pediatric radiography: patient-dose survey in Finland', **Acta Radiologica**, vol 50, no. 1, pp. 114-124.

King, AWT, Kilpeläinen, I, Heikkinen, S, Järvi, P, Argyropoulos, D **2009**, 'Hydrophobic interactions determining functionalized lignocellulose solubility in dialkylimidazolium chlorides, as probed by ^{31}P NMR', **Biomacromolecules**, vol 10, no. 2, pp. 458-463.

Korpela, MP, Paetau, A, Löfberg, MI, Timonen, MH, Lamminen, AE, Kiuru-Enari, SMK **2009**, 'A novel mutation of the GAA gene in a Finnish late-onset Pompe disease patient: clinical phenotype and follow-up with enzyme replacement therapy', **Muscle & Nerve**, vol 40, no. 1, pp. 143-148.

Lundbom, J, Heikkinen, S, Fielding, B, Hakkarainen, A, Taskinen, M, Lundbom, N **2009**, 'PRESS echo time behavior of triglyceride resonances at 1.5 T: detecting -3 fatty acids in adipose tissue in vivo', **Journal of Magnetic Resonance**, vol 201, no. 1, pp. 39-47.

Pauwels, E, Bergström, K, Mariani, G, Kairemo, K **2009**, 'Microdosing, Imaging Biomarkers and SPECT: A Multi-Sided Tripod to Accelerate Drug Development', **Current Pharmaceutical Design**, vol 15, no. 9, pp. 928-934.

Peltonen, L, Aarnisalo, A, Käser, Y, Kortesniemi, M, Robinson, S, Suomalainen, A, Jero, J **2009**, 'Cone-beam computed tomography: a new method for imaging of the temporal bone', **Acta Radiologica**, vol 50, no. 5, pp. 543-548.

Suomalainen, A, Kiljunen, T, Käser, Y, Peltola, J, Kortesniemi, M **2009**, 'Dosimetry and image quality of four dental cone beam computed tomography scanners compared with multislice computed tomography scanners', **Dentomaxillofacial Radiology**, vol 38, no. 6, pp. 367-378.

Timonen, M, Kankaanranta, L, Lundbom, N, Kortesniemi, M, Seppälä, T, Kouri, M, Savolainen, S, Heikkinen, S **2009**, 'Acquisition-weighted MRSI for detection and quantification of BNCT 10B-carrier L-p-boronophenylalanine-fructose complex, a phantom study', **Journal of Radiation Research**, vol 50, no. 5, pp. 435-440.

Vitikainen, A, Lioumis, P, Paetau, R, Salli, E, Komssi, S, Metsähonkala, L, Paetau, A, Kic□ić, D, Blomstedt, G, Valanne, L, Mäkelä, JPT, Gaily, E **2009**, 'Combined use of non-invasive techniques for improved functional localization for a selected group of epilepsy surgery candidates', **NeuroImage**, vol 45, no. 2, pp. 342-348.

2010

BNCTMI/Savolainen

Ahlgren, T, Heinola, K, Juslin, N, Kuronen, A **2010**, 'Bond-order potential for point and extended defect simulations in tungsten', **Journal of Applied Physics**, vol 107, no. 3, pp. 033516.

Durisi, E, Koivunoro, H, Visca , L, Borla , O, Zanini , A **2010**, 'Comparison of different MC techniques to evaluate BNCT dose profiles in phantom exposed tovarious neutron fields.', **Radiation Protection Dosimetry**, vol 138, no. 3, pp. 213-22.

Heikkila, O, Lundbom, N, Timonen, M, Groop, P, Heikkinen, S, Mäkimattila, S **2010**, 'Evidence for abnormal glucose uptake or metabolism in thalamus during acute hyperglycaemia in type 1 diabetes-a H-1 MRS study', **Metabolic Brain Disease**, vol 25, no. 2, pp. 227-234.

Heikkilä, O, Mäkimattila, S, Timonen, M, Groop, P, Heikkinen, S, Lundbom, N **2010**, 'Cerebellar Glucose During Fasting and Acute Hyperglycemia in Nondiabetic Men and in Men with Type 1 Diabetes', **Cerebellum**, vol 9, no. 3, pp. 336-344.

Holmström, E, Nordlund, K, Kuronen, A **2010**, 'Threshold defect production in germanium determined by density functional theory molecular dynamics simulations', **Physica Scripta**, vol 81, no. 3, pp. 035601.

Hummel, M, Leppikallio, M, Heikkinen, S, Niemelä, K, Sixta, H **2010**, 'Acidity and Lactonization of Xylonic Acid: A Nuclear Magnetic Resonance Study', **Journal of Carbohydrate Chemistry**, vol 29, no. 8 & 9, pp. 416-428.

Kavakka, J, Heikkinen, S, Kilpeläinen, I, Wähälä, K, Parviainen, V **2010**, 'Enhanced chromatographic NMR with polyethyleneglycol: A novel resolving agent for diffusion ordered spectroscopy', **Magnetic Resonance in Chemistry**, vol 48, no. 10, pp. 777-781.

King, AWT, Jalomäki, JA, Granström, M, Argyropoulos, D, Heikkinen, S, Kilpeläinen, I **2010**, 'A new method for rapid degree of substitution and purity determination of chloroform-soluble cellulose esters, using ^{31}P NMR', **Analytical Methods**, vol 2, pp. 1499-1505.

Koivula, T, Laine, J, Lipponen, T, Perhola, O, Kämäräinen, E, Bergström, K, Solin, O **2010**, 'Assessment of labelled products with different radioanalytical methods: study on 18F-fluorination reaction of 4-[18F]fluoro-N-[2-[1-(2-methoxyphenyl)-1-piperazinyl]ethyl-N-2-pyridinyl-benzamide (p-[18F]MPPF)', **Journal of Radioanalytical and Nuclear Chemistry**, vol 286, no. 3, pp. 841.

Koivunoro, H, Seppälä, T, Uusi-Simola, J, Merimaa, K, Kotiluoto, P, Seren, T, Kortesniemi, M, Auterinen, I, Savolainen, S **2010**, 'Validation of dose planning calculations for boron neutron capture therapy using cylindrical and anthropomorphic phantoms', **Physics in Medicine and Biology**, vol 55, no. 12, pp. 3515–3533.

Koskela, H, Heikkila, O, Kilpelainen, I, Heikkinen, S **2010**, 'Quantitative two-dimensional HSQC experiment for high magnetic field NMR spectrometers', **Journal of Magnetic Resonance**, vol 202, pp. 24-33.

Merimaa, K, Järvinen, H, Kortesniemi, M, Karppinen, J **2010**, 'A direct method for air kerma-length product measurement in CT for verification of dose display calibrations', **Radiation Protection Dosimetry**, vol 140, no. 3, pp. 274-280.

Mäkelä, A, Kilpeläinen, I, Heikkinen, S **2010**, 'Quantitative 13C NMR Spectroscopy using refocused constant-time INEPT, Q-INEPT-CT', **Journal of Magnetic Resonance**, vol 204, no. 1, pp. 124-130.

Pakarinen, S, Vitikainen, A, Corbucci, G, Toivonen, L **2010**, 'Morphological analysis of sinus and retrograde atrial waves detected through a permanent pacemaker atrial lead', **Journal of Interventional Cardiac Electrophysiology**, vol 29, no. 3, pp. 191-198.

Palmu, K, Wikstrom, S, Hippelainen, E, Boylan, G, Hellstrom-Westas, L, Vanhatalo, S **2010**, 'Detection of 'EEG bursts' in the early preterm EEG: Visual vs. automated detection', **Clinical Neurophysiology**, vol 121, no. 7, pp. 1015-1022.

Saukkonen, T, Heikkinen, S, Hakkarainen, A, Häkkinen, A, van Leemput, K, Lipsanen-Nyman, M, Lundbom, N **2010**, 'Association of intramyocellular, intraperitoneal and liver fat with glucose tolerance in severely obese adolescents', **European Journal of Endocrinology**, vol 163, no. 3, pp. 413-419.

A2 Review in scientific journal

2005

Robinson, S, Suomalainen, A, Kortesniemi, M **2005**, 'Micro-CT', **European Journal of Radiology**, vol 56, no. 2, pp. 185-191.

A3 Contribution to book/other compilations (refereed)

2006

Salmi, T, Eskola, H, Välimäki, P **2006**, 'Neurofysiologian laitetekniikka', **Kliininen neurofysiologia, Duodecim, Helsinki**, pp. 757-772.

Vitikainen, A, Kähkönen, S **2006**, 'Transkraniaalinen magneettistimulaatio', **Mieli ja aivot. kognitiivinen neurotiede., Kognitiivisen neurotieteen tutkimuskeskus, Turun yliopisto, Turku**, pp. 130-136.

A4 Article in conference publication (refereed)

2005

BNCTMI/Savolainen

Neuvonen, T, Salli, E **2005**, 'Characterizing diffusion tensor imaging data with directional entropy', in **Proceedings of the 2005 IEEE 27th Annual International Conference of the Engineering in Medicine and Biology Society, 2005 : IEEE-EMBS 2005**, pp. 5798-801.

Timonen, M, Savolainen, S, Heikkinen, S **2005**, 'BPA quantification and detection in phantoms using three dimensional 1-H magnetic resonance spectroscopic imaging', in **Proceedings of the International Federation for Medical and Biological Engineering**, pp. 211-212 **IFMBE Proceedings, vol. 9**.

2006

Bardies, M, Flux, G, Lassmann, M, Monsieurs, M, Savolainen, S, Strand, S **2006**, 'Quantitative imaging for clinical dosimetry', in **3rd International Conference on Imaging Technologies in Biomedical Sciences - Innovation in Nuclear and Radiological Imaging: from Basic Research to Clinical Application** , pp. 467-471.

Karila, J, Seppälä, T, Seren, T, Nieminen, K, Kankaanranta, L, Auterinen, I, Savolainen, S **2006**, 'Dose verification of BNCT head and neck patients with TLD', in **Advances in neutron capture therapy 2006: Proceedings of ICNCT-12**, pp. 429-432.

Koivunoro, H, Kotiluoto, P, Auterinen, I, Uusi-Simola, J, Kosunen, A, Savolainen, S **2006**, 'Simulation study of the photon quality correction factors of ionization chambers for FiR 1 epithermal neutron beam', in **Advances in neutron capture therapy 2006: Proceedings of ICNCT-12**, pp. 470-473.

Kotiluoto, P, Auterinen, I, Savolainen, S **2006**, 'Effective whole body dose in epithermal neutron irradiation at the FiR 1BNCT facility', in **Advances in neutron capture therapy 2006: Proceedings of ICNCT-12.**, pp. 549-552.

Morozov, B, Auterinen, I, Kotiluoto, P, Kortesniemi, M **2006**, 'The 3D Tomographic Image Reconstruction Software for Prompt-Gamma Measurement of the Boron Neutron Capture Therapy', in **Advances in Neutron Capture Therapy 2006: Proceedings of the 12th International Congress on Neutron Capture Therapy**, pp. 409-412.

Riley, K, Binns, P, Harling, O, Kiger, W, Seppälä, T, Savolainen, S, Moss, R, Marek, M, Rezaei, A **2006**, 'The International Dosimetry Exchange for BNCT: A Basis for Pooling and Collectively Analyzing Clinical Results', in **Advances in neutron capture therapy : Proceedings of ICNCT-1**, pp. 393-396.

Salli, E, Seppälä, T, Koivunoro, H, Kankaanranta, L, Asikainen, S, Savolainen, S **2006**, 'Co-registration of the BNCT treatment planning images for clinical practice', in **Advances in neutron capture therapy 2006**, pp. 64-66.

Uusi-Simola, J, Seppälä, T, Kotiluoto, P, Seren, T, Nieminen, K, Kortesniemi, M, Auterinen, I, Savolainen, S **2006**, 'Dosimetric study of varying aperture-surface distance at the Finnish BNCT facility', in **Advances in neutron capture therapy 2006**, pp. 539-542.

2008

Heikkilä, O, Lundbom, N, Timonen, M, Groop, P, Heikkinen, S, Mäkimattila, S **2008**, 'Decreased glucose transport into the thalamus in type 1 diabetes', in **Abstract Book 2008**, pp. S283-S283.

Ristolainen, H, Kuronen, A, Nordlund, K, Fujikane, M, Nowak, R **2008**, 'Studies of the Elastic Properties of Amorphous SiO2 Nanoballs by Molecular Dynamics Simulations', in **Symposium EE: Nano- and Microscale Materials: Mechanical Properties and Behavior under Extreme Environments**.

2009

Holmström, EK, Kuronen, A, Krasheninnikov, A, Nordlund, K **2009**, 'Quantum and Classical Molecular Dynamics Studies of the Threshold Displacement Energy in Si Bulk and Nanowire', in **Ion Beams and Nano-Engineering**, pp. 111-122 **MRS symposium proceedings, vol. 1181**.

Koivunoro, H, Kumada, H, Seppälä, T, Kotiluoto, P, Auterinen, I, Kankaanranta, L, Savolainen, S **2009**, 'Comparative study of dose calculations with SERA and JCDS treatment planning systems', in **13th International Congress on Neutron Capture Therapy BNCT: a new option against cancer** , pp. S126 - S129.

Kuusela, L, Sipilä, O, Lundbom, N, Kankaanranta, L, Savolainen, S **2009**, 'Diffusion tensor imaging using rigid co-reagistration in assessing the effect of boron neutron capture therapy on brain tissue', in **Computer assisted radiology and surgery: proceedings of the 23rd International Congress and Exhibition**, pp. 314.

2010

Kankaanranta, L, Saarilahti, K, Koivunoro, H, Seppälä, T, Kotiluoto, P, Auterinen, I, Savolainen, S, Joensuu, H **2010**, 'Boron Neutron Capture Therapy (BNCT) in the Treatment of Recurred, Irradiated and Inoperable Meningioma', in **New Challenges in NEUTRON CAPTURE THERAPY 2010 : Proceedings of 14th International Congress on Neutron Capture Therapy** , pp. 539.

Koivunoro, H, Kumada, H, Seppälä, T, Seren, T, Kotiluoto, P, Auterinen, I, Savolainen, S **2010**, 'Evaluation of SERA and JCDS Dose Determination Methods and Comparison to Reaction Rate Measurements in Phantom', in **New Challenges in Neutron Capture Therapy 2010** , pp. 250-252.

Koivunoro, H, Seren, T, Hyvönen, H, Kotiluoto, P, Iivonen, P, Auterinen, I, Kankaanranta, L, Pakarinen, S, Tenhunen, M, Savolainen, S **2010**, 'Epithermal Neutron Beam Interference with Cardiac Pacemakers', in **New Challenges in Neutron Capture Therapy 2010 : Proceedings of 14th International Congress on Neutron Capture Therapy** , pp. 269-71.

BNCTMI/Savolainen

Koivunoro, H, Hyvönen, H, Uusi-Simola, J, Jokelainen, I, Kosunen, A, Kortesniemi, M, Seppälä, T, Auterinen, I, Savolainen, S **2010**, 'Effect of the Calibration in Water and the Build-up Cap on the Mg(Ar) Ionization Chamber Measurements', in **New Challenges in Neutron Capture Therapy 2010**, pp. 185-187.

Tolvanen, A, Krasheninnikov, A, Kuronen, A, Nordlund, K **2010**, *Effect of iron nanoparticle geometry on the energetics of carbon interstitials*, , Physica Status Solidi. C: Current Topics in Solid State Physics 7 WILEY-VCH VERLAG GMBH & CO. KGAA.

B1 Unrefereed journal article

2008

Kairemo, K, Bergström, K **2008**, 'The role of radiopharmaceuticals in drug discovery', **Current Radiopharmaceuticals**, vol 1, no. 1, pp. 1.

B2 Contribution to book/other compilations (non-refereed)

2006

Kuronen, A, Patriarca, M **2006**, 'Atomistic modeling of strain effects in heterostructures', **Handbook of Theroretical and Computational Nanotechnology. Atomistic Simulations - Algorithms and Methods.**, vol. 2**, American Scientific Publishers**.

B3 Unrefereed article in conference proceedings

2006

Muhonen, J, Lipponen, T, Bergström, K **2006**, *Ion trap mass spectrometry in the qualitative analysis of [18F] MPPF*, , European Journal of Nuclear Medicine and Molecular Imaging 33 SPRINGER.

2008

King, AWT, Kilpeläinen, I, Järvi, PK, Olszewska, A, Heikkinen, S, Argyropoulos, D **2008**, 'Quantitative 31P NMR Analysis of Lignin Functionalities in Wood, Based On Ionic Liquid Pre-Treatment', in **10th European Workshop on Lignocellulosics and Pulp (Proceedings)**, pp. 32-35.

2009

King, AWT, Jalomäki, JA, Järvi, PK, Granström, M, Heikkinen, S, Kilpeläinen, I **2009**, 'Rapid DS and Purity Determination of Organically Soluble Esters of Cellulose using 31P NMR', in **2nd Nordic Wood Biorefinery Conference (Proceedings)**, pp. 225-231.

2010

King, AWT, Parviainen, A, Heikkinen, S, Kilpeläinen, I **2010**, 'The basis for chemical interaction of ionic liquids with lignocellulosic material', in **11th European Workshop on Lignocellulosics and Pulp (Proceedings)**, pp. 247-250.

Nyrhinen, M, Sipilä, O **2010**, 'T2* maps to assess tissue iron concentration', in **Proceedings of the XLIV Annual Conference of the Finnish Physical Society**, pp. 90.

D1 Article in professional journal

2005

Auterinen, I, Kankaanranta, L, Savolainen, S **2005**, 'Boorineutronisädehoidosta vaihtoehtoinen syövän hoitomuoto?', **ATS Ydintekniikka**, vol 34, no. 2, pp. 10-12.

Kortesniemi, M **2005**, 'TT-kuvausten putkivirran automaattinen modulointi säteilyn käytön optimoinnin työkaluna', **Radiografia.**, vol 2005, no. 2, pp. 10-13.

Kortesniemi, M **2005**, 'Digitaalinen röntgenkuvaus ja säteilyannokset', **Oriola-uutiset : Oriolan henkilöstölehti**, vol 2005, no. 12, pp. 4-5.

2006

Kortesniemi, M **2006**, 'Vismuttisuojat TT-tutkimuksissa', **Radiografia.**, vol 2006, no. 1, pp. 10-12.

2010

Savolainen, S, Kortesniemi, M, Lönnroth, N **2010**, 'Suomen boori-neutronisädehoitojen (BNCT) menestystarina – kulman takana?', **Arkhimedes**, no. 6, pp. 38-41.

BNCTMI/Savolainen

D2 Article in professional hand or guide book or in a professional data system, or text book material

2006

Kortesniemi, M **2006**, 'TT-laitteiden historiaa', **Radiologia Suomessa. historiikki vuoteen 2005 ., WSOY**, pp. 50-52.

D3 Article in professional conference proceedings

2005

Kortesniemi, M **2005**, 'Digitaalikuvauksen fysiikka', in **Sädeturvapäivät 2005**, pp. 23-27.

2007

Kortesniemi, M **2007**, 'Digitaalista menetelmää käyttävän röntgentutkimusyksikön laadunvarmistusohjelma', in **Sädeturvapäivät 2007**.

2009

Kaasalainen, TT **2009**, *Optimointi uusilla monileikelaitteilla,*.

Kortesniemi, M **2009**, 'TT-tekniikan kehityksen suuntaviivat', in **Sädeturvapäivät 2009**, pp. 39-41.

2010

Jauhiainen, M, Blomqvist, P, Kilpeläinen, T, Malaska, P, Vinnurva-Jussila, T, Virsula, S, Sipilä, O **2010**, *Reproducibility of phantom-based quality assurance measurements in ultrasound imaging,*.

Kaasalainen, TT **2010**, *Kartiokeilatietokonetomografialaitteiden laadunvarmistus,*.

Kaasalainen, TT **2010**, *Potilasannokset hammastutkimuksissa,*.

Kortesniemi, M **2010**, 'Monileiketietokonetomografia MSK radiologiassa', in **Sädeturvapäivät 2010**, pp. 105-107.

Mannila, V, Sipilä, O **2010**, *B-mode ultrasound quality assurance: Phantom measurements,*.

D5 Text book or professional handbook or guidebook or dictionary

2005

STUK-työryhmä **2005**, *Lasten röntgentutkimusohjeisto,* **STUK TIEDOTTAA, no. 2005/1**, vol. 2005**, Säteilyturvakeskus**.

2008

STUK-työryhmä **2008**, *Terveydenhuollon röntgenlaitteiden laadunvarmistusopas,* **STUK TIEDOTTAA, no. 2008/2**, vol. 2008**, Säteilyturvakeskus**.

STUK-työryhmä **2008**, *Lasten röntgentutkimuskriteerit,* **STUK TIEDOTTAA, no. 2008/1**, vol. 2008**, Säteilyturvakeskus**.

SRY:n ja Rh-liiton asiantuntijatyöryhmä **2008**, *Mammografian kuvausopas,* **Radiological Society of Finland and Society of Radiographers in Finland**.

Savolainen, S, Kortesniemi, M, Sipilä, O, Nikkinen, P, Perkiö, J, Tenhunen, M **2008**, *Opinto-ohjeet sairaalafyysikoksi aikoville,* **Report Series in Physics, no. HU-P-A83, University of Helsinki, Department of Physics**.

H1 Patents

2006

Kortesniemi, M Aug. 15 2006, *Lääketieteellisen tutkimus- ja käsittelypöydän jatkesovitelma,* FI-117235-B.

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI

RC-SPECIFIC TUHAT COMPILATIONS OF OTHER SCIENTIFIC ACTIVITIES 2005-2010

BNCTMI/Savolainen

1 Analysis of activities 2005-2010

- Associated person is one of Sami Heikkinen , Antti Kuronen , Sauli Savolainen , Kim Bergström , Mika Kortesniemi , Päivi Nikkinen , Jussi Perkiö, Eero Salli , Tiina Seppälä, Outi Sipilä , Soile Komssi, Marjut Timonen , , Jouni Uusi-Simola , Nadja Lönnroth, Eero Tapio Hippeläinen , Toni Ihalainen , Touko Tuomas Kaasalainen , Hanna Koivunoro , Linda Kuusela , Anniina Lampinen , Vilma Mannila , Katja Merimaa , Miia Pitkonen , Sampsa Turunen , Anne-Mari Vitikainen , Petteri Välimäki , Mikko Nyrhinen ,

Activity type	Count
Supervisor or co-supervisor of doctoral thesis	14
Prizes and awards	3
Editor of research journal	1
Peer review of manuscripts	6
Membership or other role in review committee	1
Membership or other role in research network	6
Membership or other role in national/international committee, council, board	17
Membership or other role in public Finnish or international organization	6
Membership or other role of body in private company/organisation	2
Other tasks of an expert in private sector	1

2 Listing of activities 2005-2010

Supervisor or co-supervisor of doctoral thesis

Sauli Savolainen ,

Supersior of PhD thesis, Sauli Savolainen, 2001 → ..., Finland

Supervisor of PhD theis, Sauli Savolainen, 2001 → ..., Finland

Supervision of PhD thesis, Sauli Savolainen, 2007, Finland

Supervision of PhD thesis, Sauli Savolainen, 2008, Finland

Supervision of PhD thesis, Sauli Savolainen, 2009, Finland

Supervison of phD thesis, Sauli Savolainen, 2009, Finland

Supervision of PhD thesis, Sauli Savolainen, 2010, Finland

Kim Bergström ,

Supervisor of PhD thesis in progress, Mirkka Sarparanta, Kim Bergström, 2007 → ...

Supervisor of PhD thesis in progress, Teija Koivula, Kim Bergström, 2007 → ...

Outi Sipilä ,

Doctoral Thesis supervision, Outi Sipilä, 2007 → ...

Doctoral Thesis supervision, Outi Sipilä, 2007 → ...

Doctoral Thesis supervision, Outi Sipilä, 2008 → ...

Doctoral Thesis supervision, Outi Sipilä, 2008 → ...

Linda Kuusela ,

Samanaikaisen EEG–fMRI-tutkimuksen potilasturvallisuus, Linda Kuusela, 01.02.2008 → 30.03.2008, Finland

Prizes and awards

Sauli Savolainen ,

Carl Wegelius award, Sauli Savolainen, 05.11.2009, Finland

Touko Tuomas Kaasalainen ,

Fysiikan päivät 2008 - Paras esitys (lääketieteellinen fysiikka), Touko Tuomas Kaasalainen, 27.03.2008

Miia Pitkonen ,

Young Investigator Award (YIA), Miia Pitkonen, 11.01.2010, Japan

Editor of research journal

Sauli Savolainen ,

Cancer Biotherapy & Radiopharmaceuticals, Sauli Savolainen, 01.01.2006 → 31.12.2006, United States

Peer review of manuscripts

Kim Bergström ,

Referee in 8 peer reviewed Journals, Kim Bergström, 1998 → ...

Mika Kortesniemi ,

Referee - Acta Radiologica, Mika Kortesniemi, 2007 → ...

Eero Salli ,

Reviewer in IEEE Transactions on Medical Imaging, Eero Salli, 2010

Outi Sipilä ,

Acta Radiologica, Outi Sipilä, 2009 → ...

Hanna Koivunoro ,

Applied Radiation and Isotopes, Hanna Koivunoro, 2010 → 2011

Progress in Nuclear Science and Technology, Hanna Koivunoro, 12.2010 → ...

Membership or other role in review committee

Kim Bergström ,

Reviewer of NorFA:s (Nordic Academy of Advanged Study) guest professor, Kim Bergström, 2003 → ...

Membership or other role in research network

Mika Kortesniemi ,

Member of International Society of Neutron Capture Therapy (ISNCT), Mika Kortesniemi, 1998 → ...

Member of Finnish Physical Society, Mika Kortesniemi, 2002 → ...

Member of Radiological Society of Finland (SRY), Mika Kortesniemi, 2002 → ...

Member of European Federation of Organisations in Medical Physics (EFOMP), Mika Kortesniemi, 2003 → ...

Eero Salli ,

Member of Radiological Society of Finland (SRY), Eero Salli, 2000 → ...

Anne-Mari Vitikainen ,

Member of Radiological Society of Finland (SRY), Anne-Mari Vitikainen, 01.03.2006 → ..., Finland

Membership or other role in national/international committee, council, board

Sauli Savolainen ,

EANM dosimetry committee, Sauli Savolainen, 01.01.2001 → 01.10.2007, Austria

EANM Dosimetry committee, Sauli Savolainen, 01.01.2006 → 31.12.2006, Austria

The national qualification board of hospital physicists, Sauli Savolainen, 01.01.2006 → 31.12.2006, Finland

EANM Dosimetry committee, Sauli Savolainen, 01.01.2007 → 31.12.2007, Austria

Finnish National Advisor for EANM Dosimetry Committee, Sauli Savolainen, 01.01.2007 → 31.12.2007

The national qualification board of hospital physicists, Sauli Savolainen, 01.01.2007 → 31.12.2007, Finland

EANM Dosimetry Comittee, Sauli Savolainen, 01.01.2008 → 2011, Austria

Kim Bergström ,

National Advisor in Radiopharmacy, European Association of Nuclear Medicine, Kim Bergström, 2006 → ...

Member of Editorial Board of the Current Radiopharmaceuticals –journal, Kim Bergström, 2007 → ...

Supervisor member of Drug Discovery Graduate School (DDGS), Turku, Finland, Kim Bergström, 2007 → ...

Mika Kortesniemi ,

Vice-Chairman of the Board, Mika Kortesniemi, 2006 → 2009

Chairman of the Board, Mika Kortesniemi, 2007 → 2009, Finland

Chairman of the Board, Mika Kortesniemi, 2010 → ...

Marjut Timonen , ,

Suomen fyysikkoseuran lääketieteellisen fysiikan jaoston hallituksen jäsen, Marjut Timonen, 2006 → 2007, Finland

Toni Ihalainen ,

Member, Nordic Association for Clinical Physics, Radiological Physics Committee, Toni Ihalainen, 01.01.2010 → ...

Vice president, Finnish Association of Hospital Physicists, Toni Ihalainen, 01.01.2010 → 31.12.2010

Touko Tuomas Kaasalainen ,

BNCTMI/Savolainen

Suomen fyysikkoseuran lääketieteellisen fysiikan jaoston hallituksen jäsen, Touko Tuomas Kaasalainen, 2008 → 2010, Finland

Membership or other role in public Finnish or international organization

Sauli Savolainen ,

The qualification board of national hospital physicists, Sauli Savolainen, 01.01.2004 → 31.12.2007, Finland

The qualification board of national hospital physicists, Sauli Savolainen, 01.01.2008 → 2011, Finland

Kim Bergström ,

Management Committee Member to COST Action B12, Kim Bergström, 1999 → 2005

National Coordinator for radiopharmacy teaching program, INSTN, France, Kim Bergström, 1999 → 2005

Outi Sipilä ,

Member of The qualification board of Finnish medical physicists, Outi Sipilä, 2004 → 2007

Jouni Uusi-Simola ,

Finnish Association of Hospital Physicists, Jouni Uusi-Simola, 2010 → ..., Finland

Membership or other role of body in private company/organisation

Kim Bergström ,

Board Member, Imanext Ltd, Kim Bergström, 2006 → 2010

Mika Kortesniemi ,

Board member, Mika Kortesniemi, 2004 → ...

Other tasks of an expert in private sector

Kim Bergström ,

Senior Advisor in life-science sector, Replicon Group, Kim Bergström, 2006 → ...

INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING
AT THE UNIVERSITY OF HELSINKI

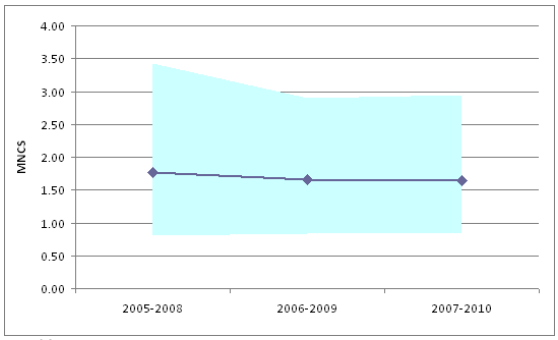
Web of Science(WoS)-based bibliometrics of the RC's publications data 1.1.2005-31.12.2010
by CWTS, Leiden University, the Netherlands

Research Group: Savolainen S

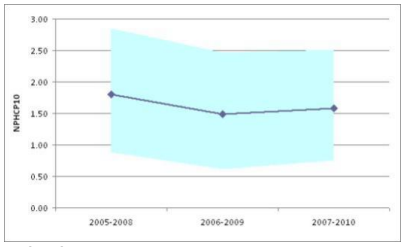
Basic statistics

Number of publications (P)	75
Number of citations (TCS)	370
Number of citations per publication (MCS)	4.98
Percentage of uncited publications	31%
Field-normalized number of citations per publication (MNCS)	1.47
Field-normalized average journal impact (MNJS)	1.00
Field-normalized proportion highly cited publications (top 10%)	1.43
Internal coverage	.79

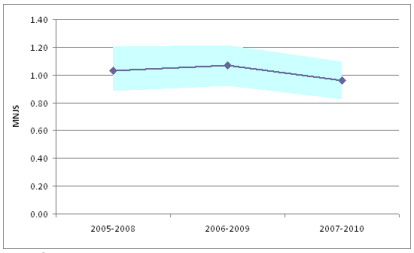
Trend analyses



MNCS

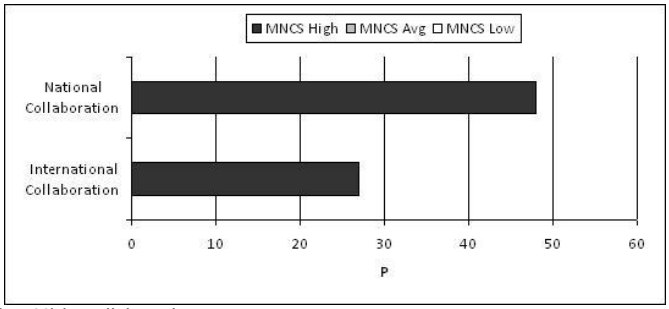


THCP10



MNJS

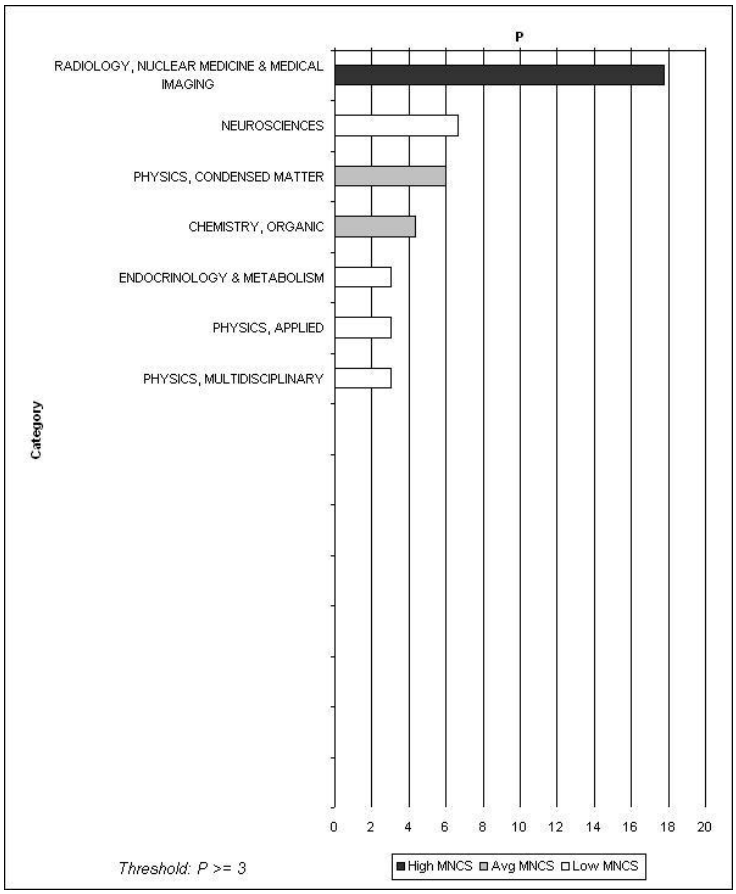
Collaboration



Performance (MNCS) by collaboration type

Web of Science(WoS)-based bibliometrics of the RC's publications data 1.1.2005-31.12.2010
by CWTS, Leiden University, the Netherlands

Research profile



University of Helsinki
Administrative Publications 80/68
Evaluations

ISBN 978-952-10-7488-2 (PDF)
ISSN 1795-5513 (Online)

Internet address:
http://www.helsinki.fi/julkaisut/aineisto/rc_evaluation2012/hallinnon_julkaisuja_80_68_2012.pdf

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI