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Vrije Universiteit Brussel, Belgium

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Faculty of Physics  
"Babes Bolyai" University, Cluj-Napoca, Romania



Joint PhD VUB & UBB  
2017-2018

INVITATION to the Public defence of

**Nicoleta Manuela BURGHELEA**

To obtain the academic degree of

**'DOCTOR IN MEDICAL SCIENCES'**  
**'DOCTOR IN PHYSICS'**

**Dynamic Wave Arc: implementing a theoretical concept  
to clinical routine.**

**Thursday 12 October 2017**

Auditorium **Vanden Driessche**, 17:00

Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

How to reach the campus Jette:

<http://www.vub.ac.be/english/infoabout/campuses>

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## Summary of the dissertation

The art of cancer treatment is in finding the right balance between tumor cure and injury to normal tissues. In the last 20 years there has been a huge technological leap forward in the technical aspects of radiotherapy. One of the ways of increasing the radiotherapeutic success is by optimization the treatment delivery technique.

The goal of this thesis was to focus on a novel noncoplanar rotational delivery technique specifically developed around the Vero SBRT system under the name Dynamic Wave Arc (DWA). The translation process of DWA from a theoretical concept to routine practice in the Radiotherapy Department of the UZ Brussel is described.

In the first step, the geometric accuracy was determined applying an independent, in-house developed method based on on-board X-ray fluoroscopy rotating along with the DWA delivery, using a phantom with predefined 3D spherical marker geometry. Secondly, a benchmark against the current clinical approaches for various anatomical tumor regions determined the patients for which DWA would further add a value. The clinical commissioning and validation process followed, and the first assessment of DWA workflow in clinical conditions was presented.

Wave Arc took shape as the first noncoplanar rotational IMRT technique clinically in use, allowing additional flexibility in dose shaping while preserving dosimetric robust delivery. These features make it possible to create patient-individualized treatment plans, and provide more convenient therapy due to a shorter length of the treatment session. Lastly, TIN the thesis was discussed our preliminary clinical experience with DWA, and highlights several avenues for further improvements.

## Curriculum Vitae

Manuela Burghilea was born on November 29nd 1986 in Ramnicu Valcea, Romania. She studied Medical Physics at the Faculty of Physics of the "Babes Bolyai" University in Cluj-Napoca, Romania. After graduation, she worked in the Radiation Oncology Department of Oncology Institute "Prof. Dr. Ion Chiricuța" as medical physicist in training. In 2011 she joined for 3 months the Radiotherapy Physics group at the UZ Brussel. Her research project was to determine the feasibility of using the Vero system for cranial radiosurgery treatments. In the following 4 years, she continued working on the Vero project as postgraduate student for BrainLAB, Munich, Germany. Under a research collaboration agreement with UZ Brussel, she developed and implemented a novel radiation delivery technique in the radiotherapy department.