Contribution ID: **14** Type: **not specified**

CONCEPTUAL DESIGN OF ADVANCED PARTICLE THERAPY CENTER IN THE BALTIC STATES

OBJECTIVE
In the field of radiation oncology, particle therapy is promising to be more efficient cancer treatment modality due to favourable physical and biological properties over conventional gamma radiation therapy. In clinic, particle therapy has already shown benefits in treatment of paediatric oncological malignancies, brain and head and neck region tumors and other localizations in vicinity of critical vital organs. Moreover, particle therapy has shown the clinical possibility of treatment for tumors that are otherwise radioresistant to conventional radiation therapy, such as gliomas and sarcomas. The Baltic States is one of the only regions in Europe without a dedicated infrastructure for the highly beneficial particle therapy treatment.
With the active work of CERN Baltic Group in close collaboration with CERN scientists from Next Ion Medical Machine Study (NIMMS) collaboration, a conceptual design proposal has been made on Advanced Particle Therapy facility in the Baltic States. The aim of this work is to report on the progress made and current status of the conceptual design of the proposed facility, outlining key clinical and physics rationales of particle therapy, clinical treatment improvements, novel research pathways and industrial sector involvement possibilities.

METHODS
This conceptual design report covers the overall technical concept of the proposed facility and focuses on the three main functions of it: clinical treatment center, novel research facility and a dedicated infrastructure for involvement and development of relevant industry sectors. The technical concept for the proposed facility is based on a design in development at CERN by the researchers of the NIMMS collaboration –the helium synchrotron. The design of helium synchrotron is a novel and „first - ever"medical treatment synchrotron made specifically for acceleration of helium ions. A dedicated section in the paper gives the main technical details regarding the proposed accelerator complex.
From the clinical perspective, the physical properties and associated biological effects of helium ions are explored in comparison with the clinically used proton and carbon ion beams. Applicability of helium ion therapy is given from the treatment perspective, identifying oncological malignancies benefiting the most from the novel treatment.
The technical design of the proposed accelerator complex includes dedicated section of the injection linear accelerator for production of medical use radioisotopes. Thus, possibilities of exotic radioisotope production are given and potential benefits and applications in the nuclear medicine field have also been identified.
The proposed facility provides infrastructure for novel research possibilities in the fields of radiation oncology, medical physics, nuclear medicine, radiation chemistry and nuclear physics, radiobiology, accelerator physics and engineering and others. Possible research directions have been identified, delivering world class research in the corresponding fields. Pathways of relevant industrial sector involvement in construction of the facility have been identified and future perspectives of research and development of technology innovations are proposed, adressing the needs of the international particle therapy community.

Primary authors: PALSKIS, Kristaps (Riga Technical University (LV)); VRETENAR, Maurizio (CERN); COLLABORATION, NIMMS; TORIMS, Toms (Riga Technical University (LV))

Presenters: PALSKIS, Kristaps (Riga Technical University (LV)); TORIMS, Toms (Riga Technical University (LV))