



# ***Baltic Particle therapy center initiative: recent activities and closest events***

On behalf of the  
CERN Baltic group's "*Advanced Particle therapy center for the Baltic States*" working group

prof. **Toms Torims** and **Kristaps Paļskis**



# *Fast recap*

**April 12<sup>th</sup>, 2022**

“Advanced Particle Therapy center for the Baltic States” working group established within the CERN Baltic group (CBG)

**End of 2021**

CBG discussion with NIMMS collaboration on facility options

**February 2022**

NIMMS Helium synchrotron working group establishment with involvement of researchers from the CBG

**Spring 2022**

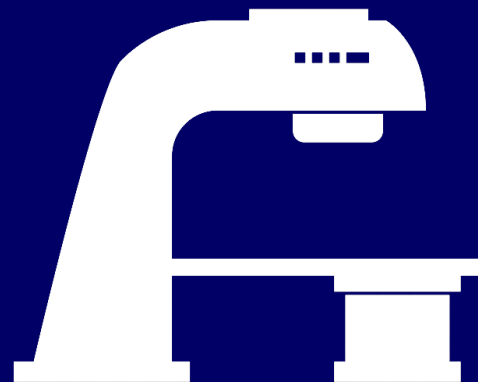
Development of a dedicated conceptual design report



# *Fast recap*

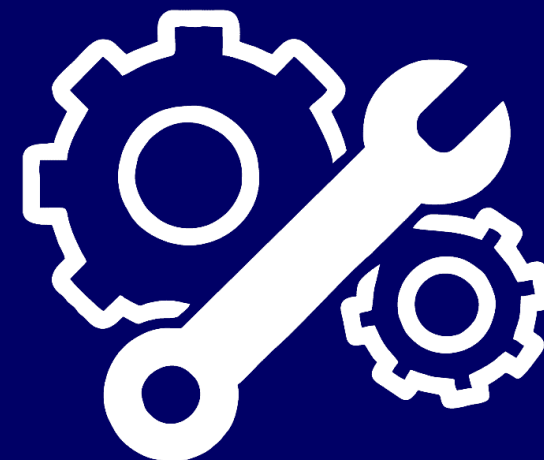


**Research  
institution**



**Clinical cancer  
treatment  
facility**

Particle therapy and  
nuclear medicine



**Industry  
involvement  
infrastructure**



# Fast recap

End of 2022 : Bilateral meetings with relevant medical associations, universities and political stakeholders



therapeutic technology association in Latvia and Lithuania

Crucial!



# Recent activities: medical community

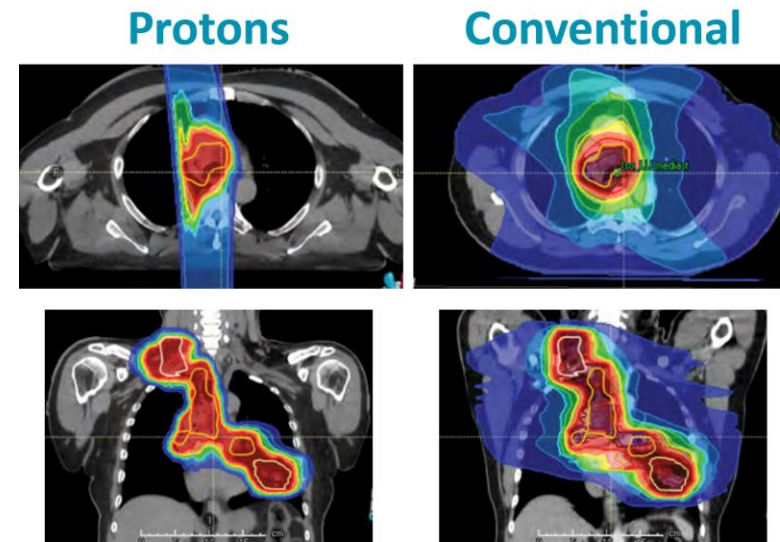
**27<sup>th</sup> of January, 2023**

Invitation to give a talk in Lithuanian Radiation Therapy association conference “Innovations in lung and breast cancer treatment and their integration into everyday life”

**28<sup>th</sup> of February, 2023**

Invitation to give talk in the periodic meeting of Latvian Therapeutic Radiology Association

**Clinical perspective:**  
Lung cancer



Consensus Statement on Proton Therapy in Early-Stage and Locally Advanced Non-Small Cell Lung Cancer

“Innovations in lung and breast cancer treatment and their integration into everyday life”, January 26<sup>th</sup> 2022

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# Recent activities: political stakeholders

9<sup>th</sup> of March, 2023

Invitation to take part and give a talk on the initiative as part of the Latvian Ministry of Science and Education organized **Enhanced Dialogue on Latvian R&I System** with European Commission representatives on Research institution project initiatives



## Concept of an innovative particle therapy center in the Baltic States: *current status report*

On behalf of the  
CERN Baltic group's "Advanced Particle therapy center for the Baltic States" working group

**Kristaps Paļskis** (Riga Technical University, CERN)



# Recent activities: scientifically

April of 2023

NIMMS collaboration has developed a scientific publication on the helium synchrotron technology updates for the 14<sup>th</sup> International Particle Accelerator Conference (IPAC2023)

## **“CONCEPTUAL DESIGN OF A COMPACT SYNCHROTRON-BASED FACILITY FOR CANCER THERAPY AND BIOMEDICAL RESEARCH WITH HELIUM AND PROTON BEAMS”**

The publication has a dedicated chapter on the possible development in the Baltic States, outlining cancer and radiotherapy equipment statistics etc.:

### **A FACILITY FOR THE BALTIC STATES**

## Conceptual design of a compact synchrotron-based facility for cancer therapy and biomedical research with helium and proton beams

M. Vretenar,<sup>1</sup> M.E. Angoletta,<sup>1</sup> J. Borburgh,<sup>1</sup> L. Bottura,<sup>1</sup> R. Taylor,<sup>1</sup> G. Tranquille,<sup>1</sup> E. Benedetto,<sup>2</sup> T. Torims,<sup>3</sup> K. Palškis,<sup>3</sup> M. Sapinski,<sup>4</sup> D. Adliene,<sup>5</sup> E. Korobeinikova,<sup>7</sup> M. Kalniņa,<sup>5</sup> E. Gershkevitch<sup>8</sup>

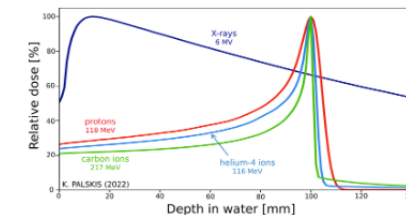


### Helium Ions for Cancer Therapy

Helium radiotherapy trialed since 1975 at LBL, USA.

- Sharper Bragg peak compared to protons
- Reduced fragmentation compared to carbon ions
- Increased RBE and reduced OER to protons
- Reduced neutron risk compared to carbon ions

- Compromise of dose conformity & biological effectiveness.
- High potential for helium ion FLASH therapy treatments.



### Accelerator Design

#### Ion Source

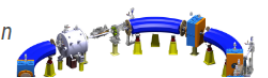
- Two ECR ion sources: >2 mA for protons and <sup>4</sup>He<sup>2+</sup>.
- Delivering  $8 \times 10^{10}$  ions from synchrotron (2 Gy/l).

#### LINAC Injector (352 MHz)

- RFQ up to 2 MeV/u.
- Three DTL tanks:
  - 5 MeV/u Helium for synchrotron injection.
  - 7 MeV/u Helium for At-211 isotope production.
  - 10 MeV protons for synchrotron injection.

#### Compact Synchrotron

Triangular ring, 33m:



### Implementation in the Baltic States

- The Baltic States are without a particle therapy centre. Support is growing in the region to construct such a facility.
- Incidence rate of 630 cases per 100 000 inhabitants: 34% receiving radiotherapy.
- 28 radiotherapy LINACs in region: **Sufficiently developed to move towards particle therapy.**
- Plans for head and neck tumours, sarcomas, complex localisations & paediatric cancers.
- Above treatment, provides **opportunities in accelerator technology, medical physics and (pre-)clinical research.**



Courtesy of: Taylor R. (CERN)



# Recent activities: cancer statistics

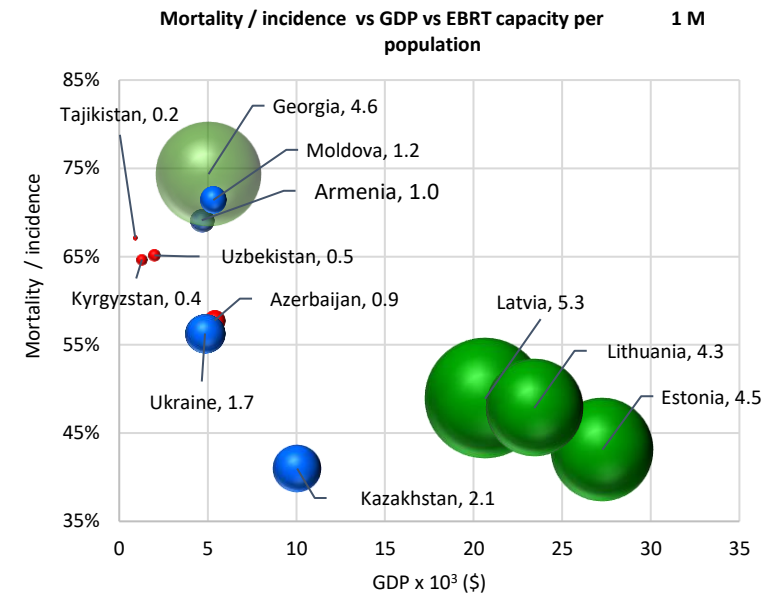
## March - April of 2023

Last year Estonia, Latvia and Lithuania took part in the *Access to Radiotherapy Technologies Study in the Baltics, Eastern Europe, Central Asia, and the Caucasus*.

We have received the data analysis: **our first joint statistical data**, that could be used further for patient number estimates

Data are to be published in a scientific journal

**Survey for additional data collection has been developed together with Manjit Dosanjh** (*particle therapy specific data, Baltic country case study*)



**ACCESS**  
RADIOTHERAPY  
TECHNOLOGIES



**CERN Baltic Group**  
“Advanced Particle Therapy center  
for the Baltic States” working group

in collaboration with



**ACCESS**  
RADIOTHERAPY  
TECHNOLOGIES

### QUESTIONNAIRE CANCER DATA FOR THE BALTIC REGION

Name	
Contact/e-mail	
Institution	
Country	

This questionnaire has been prepared together with the experts from last year's *Access to Radiotherapy Technologies Study (ART)* in the Baltics, Eastern Europe, Central Asia and the Caucasus. The goals of this questionnaire:

- to focus on the case in the Baltic States and extend the data further for better understanding of cancer incidence and treatment within our region;
- to achieve **first estimate of the number of patients, who could potentially benefit from the particle therapy** that would be accessible through the proposed facility.



# Planned events: *Main event*

**25<sup>th</sup> of May, 2023**

Workshop

## **“Particle therapy - future for the Baltic States? State-of-play, synergies and challenges”**

*Conceptually:* Representatives and experts from involved professional associations from the Baltic States to discuss and find solution for 5 of the main identified “problem-areas”. Non-Baltic clinical and technical experts to take part as well.

*Hosted at CERN*

### **Questions for today:**

- Representation of Estonia
- As we have key-people on site – are we OK to announce hybrid for others interested?

Cancer statistics in the Baltic States region

Clinical indications for proton therapy

Technology readiness level of the  
accelerator

Synergies with the nuclear medicine field

Educational pathways for personnel



# Planned events: educational aspects

**28<sup>th</sup> of June, 2023**

As part of the annual HITRI<sup>plus</sup> project meeting in Riga, a dedicated workshop will be held:

**“Clinics and research: considerations to create a novel particle therapy center”**

*Conceptually:* Educational lectures by the leading experts from European ion therapy centers (CNAO, HIT, MedAustron) on clinical indications, medical physics, scientific research and practical

**We welcome your participation by registering here:**

<https://indico.cern.ch/event/1256528/>

**Session I**  
**Clinical aspects and rationales of particle therapy**

**Session II**  
**Medical physics and quality assurance in particle therapy**

**Session III**  
**Helium ion therapy. Heavy ion therapy research**

**Session IV**  
**Practical experience of setting up a treatment center**

<https://www.hitriplus.eu/>





# Other planned activities: . . .

**3<sup>rd</sup> of June, 2023**

Invitation for a lecture on particle therapy technology developments at the project initiative in ISRS course Sigulda, Latvia:

**ISRS Educational Course “SRS/SRT in Management of Metastatic Brain Tumors, Genitourinary, Gynecological, and Abdominal Cancers; Medical Physics for Radiosurgery.”**

**12<sup>th</sup> to 14<sup>th</sup> of June, 2023**

Oral presentation in the “**19<sup>th</sup> Nordic-Baltic Conference on Biomedical Engineering and Medical Physics**” conference

**Finalizing the speaker for this conference!**



# Work on the visual identity of the initiative



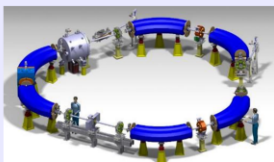
## Project initiative "Advanced Particle Therapy center for the Baltic states"

### Main goal of the initiative

Development of large scale medical particle accelerator complex and associated infrastructure in the Baltic States based on technologies developed in collaboration with **Next Ion Medical Machine Study (CERN)**. Activities would stand on "three main pillars" – clinical cancer treatment center with proton and ion therapy, multi-disciplinary research institution with broad array of involved scientific fields and a point of industry collaboration and involvement – both in constructional delivery of the facility and future R&D activities.

### Involved organizations

- CERN Baltic group (CBG)
- CBG associated scientific institutions
- Baltic medical communities
- in radiation therapy, nuclear medicine and radiology



- Next Ion Medical Machine Study (NIMMS) collaboration

Baltic States scientific institutions as partners in the NIMMS collaboration - developed technologies can be used as "toolbox" for the development of a unique facility

#### Research institution

- Dedicated beam-line for research
- Technology provides broad research spectrum:
  - clinical radiation oncology
  - medical, nuclear and particle physics
  - accelerator physics and technologies
  - radiation biology
  - material science
- Possible future research with heavier
- Facility to attract researchers from all Baltic States and beyond

#### Clinical treatment center

- Provide clinicians with particle therapy as another, novel cancer treatment tool
- Proven benefits in complicated localizations and recurrent tumors.
- Technology would provide:
  - established proton therapy
  - clinically researched helium ion therapy
  - novel delivery such as FLASH
- Linear accelerator based radioisotope production for modern nuclear medicine - diagnostics and theranostics

#### Industry involvement infrastructure

- Delivery of the complex:
  - increase the capacity in accelerator technologies in the Baltic States - novel and
  - emerging field for the region develop industry "know-how"
- Infrastructure would provide long-term possibilities of future R&D activities
- Future development of medical technologies, addressing the needs of particle therapy community globally.



Involvement of professionals for development of the visual identity of the initiative and promotional material preparation



**Thank you for  
your attention !**