



Project initiative “Advanced Particle Therapy center for the Baltic states”

On behalf of the
CERN Baltic group’s “Advanced Particle therapy center for the Baltic States” working group

Prof. Toms Torims (*Riga Technical University, CERN*)



CERN Baltic group

Group of 13 Baltic universities and research institutions formed to coordinate joint activities with CERN and to strengthen the high-energy physics and accelerator technology communities

NIMMS collaboration

Next Ion Medical Machine Study - a CERN based collaboration for development of novel, next generation particle therapy technologies



The “ why ? ” : Clinical perspective

In 2018 – 4.23 million new registered cancer cases in Europe

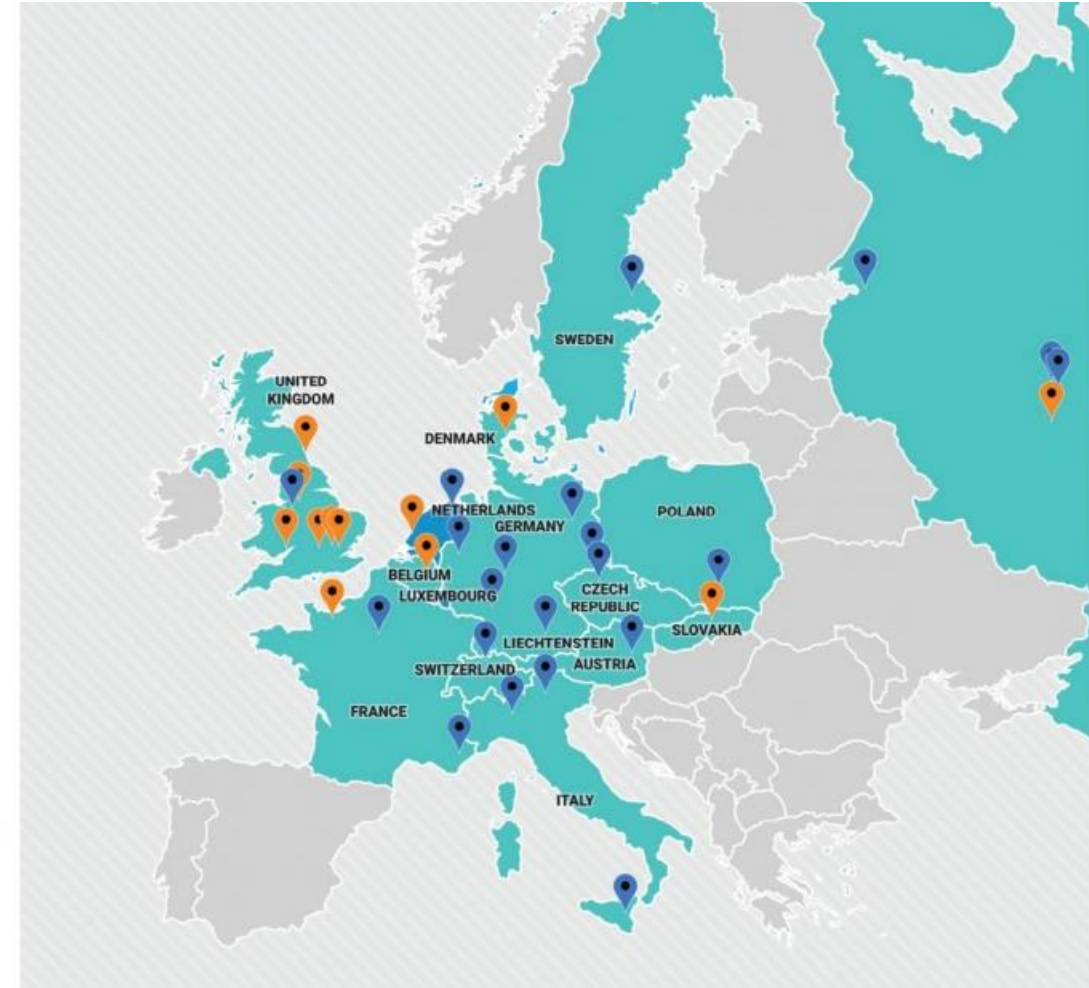
By 2040 – estimated 5.2 million new registered cases

More than 50% of cancer patients require radiation therapy **BUT**

1 in 4 patients do not receive the treatment

One of the main causes – **lack of technology**

For specific cancer types – particle therapy is the ONLY optimal treatment modality



Particle therapy centre geography in Europe, ENLIGHT 2018



The “ why ? ” : Scientific research

The Baltic States are lacking a joint, large-scale multi-disciplinary scientific research infrastructure

Joint particle accelerator based research infrastructure would foster sustainable collaboration with the CERN



Road to the initiative

April 12th, 2022

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

End of 2021

CBG discussion with NIMMS collaboration on facility options

February 2022

NIMMS Helium synchrotron working group established with participation of researchers from the CBG

Spring 2022

Development of a dedicated conceptual design report



Possible routes for the initiative

Development of a novel ion therapy system

A circular particle accelerator in development by NIMMS collaboration

- Acceleration of protons and helium ions to treatment energies
- Higher energy protons for ion radiography purposes
- Possibility for heavy ion acceleration (carbon, oxygen) for biophysics research
- Possibility of ultra-fast dose rate delivery (*FLASH*)
- Possibility of parallel production of therapeutic and diagnostic radioisotopes

On initial design: M. Vretenar, E. Benedetto, M. Sapinski, M. E. Angoletta, G. Bisoffi, J. Borburgh, L. Bottura, K. Pałskis, R. Taylor, G. Tranquille: *A Compact Synchrotron for Advanced Cancer Therapy with Helium and Proton Beams*

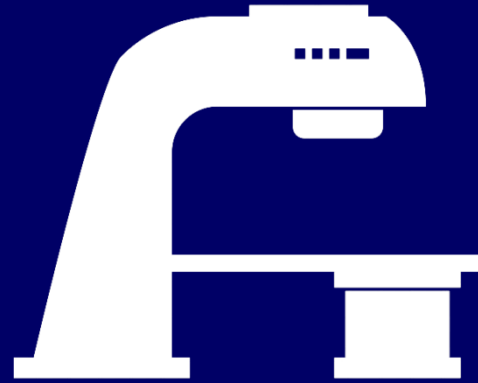
HELIUM SYNCHROTRON



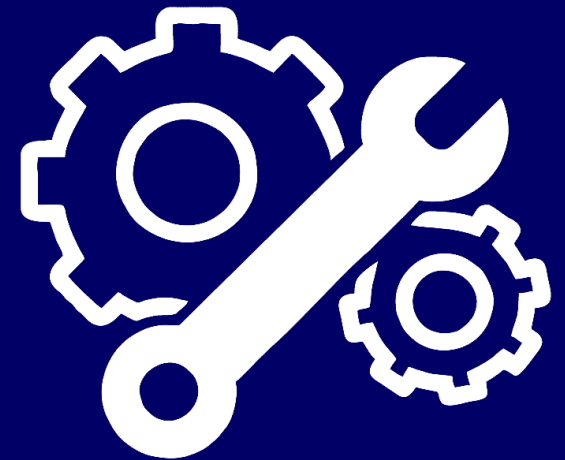
Overall concept



**Research
institution**



**Clinical cancer
treatment facility**
Particle therapy and
nuclear medicine



**Industry
involvement
infrastructure**



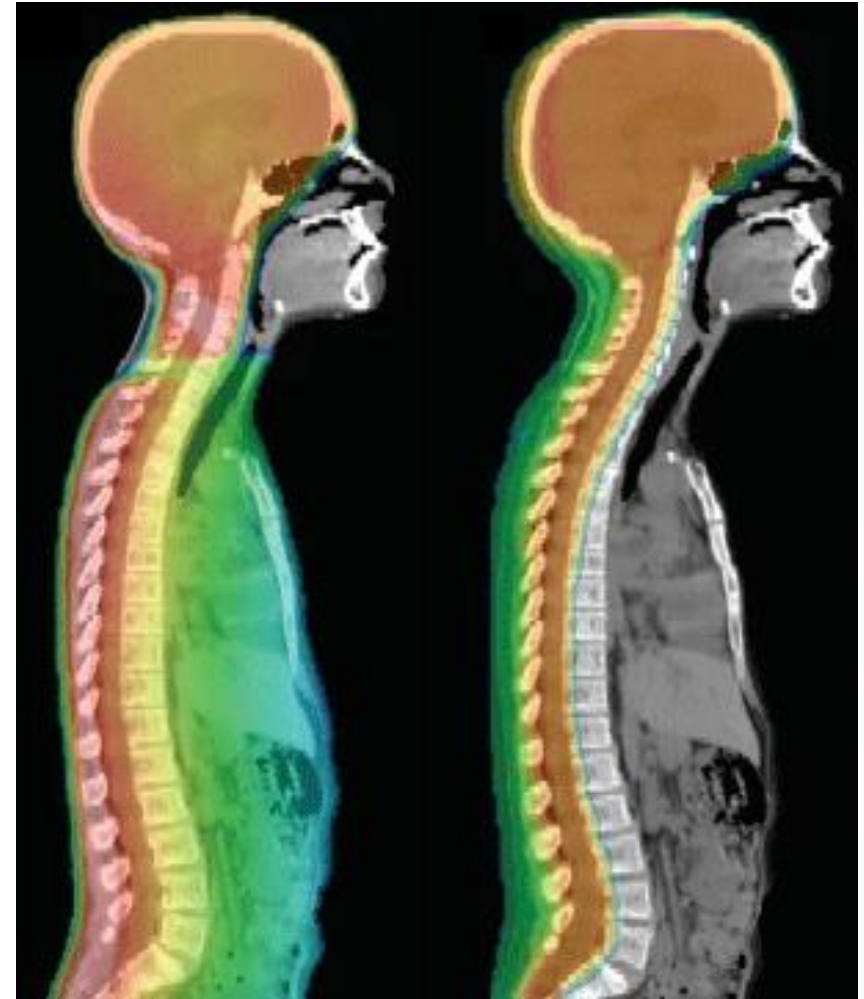
Overall concept



Clinical cancer treatment facility

- Helium synchrotron technology
- **Clinical use of proton therapy**
- **Research and future clinical translation of helium ion therapy**
- Technology could offer novel pathways in **nuclear medicine – diagnostics and theranostics**

Treatment of complex tumors, recurrent cancers and pediatrics



Source: Rowe LS, Krauze AV, Ning H, Camphausen KA, Kaushal A. Optimizing the Benefit of CNS Radiation Therapy in the Pediatric Population-PART 2: Novel Methods of Radiation Delivery. *Oncology (Williston Park)*. 2017 Mar 15;31(3):224-6, 228.



Overall concept



Research institution

Clinically necessary research

Clinical radiation oncology – pre-clinical and clinical research, radiobiology, medical physics, dosimetry . . .

Material science, nuclear physics, radiation chemistry, particle physics, accelerator physics and technologies . . .

Embedded research fields



Industry involvement infrastructure

Involvement in construction

Involvement of local Baltic industrial companies in technical delivery of the accelerator complex **expanding the “know-how”**

Addressing the needs of particle therapy community globally – development of novel delivery techniques and equipment, particle detectors . . .

Future technology developments



Project in close partnership with the CERN NIMMS collaboration

- Strong future involvement of researchers from the Baltic States within the collaboration
- Expanding the knowledge and expertise in medical particle accelerators

Partners involved in technology development can create their own, unique facility !

**Success of the *predecessor* PIMMS -
CNAO and MedAustron**



Current status of the project

Scientific communities

- NIMMS collaboration partners
- Baltic scientific community within the CBG
- TIARA Collaboration Council

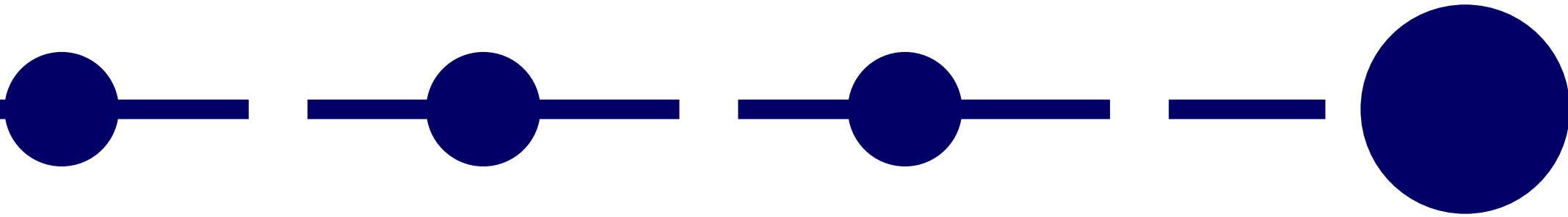
Political stakeholders

- Baltic Assembly – letters to Baltic prime ministers
- Baltic States ambassadors within EU COREPER I
- Innovation and investment agencies

Involvement and support of medical community is crucial !



Current status of the project



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



therapeutic technology associations within Latvia and Lithuania

Current status of the project

Baltic cancer statistics

Do we have enough patients?

Training and experience from other centers

Involvement of nuclear medicine

Clinical evidence of proton therapy

Radioisotope production

Cancer types eligible

Lack of specialists

How developed is the technology?

TRL of helium synchrotron



Current status of the project

25th of May: Workshop “Particle therapy - future for the Baltic States? State-of-play, synergies and challenges” at CERN

Cancer statistics and indication profile in the Baltic States. Status of radiotherapy technologies in the Baltic States.

Clinical indications for proton and particle therapy. Existing clinical evidence and on-going clinical trials.

The technology of helium synchrotron: technology readiness level and research needed.

Current status of nuclear medicine in the Baltic States. Trends and research pathways going into the future.

Educational necessities and possible solution pathways for clinical and technical personnel training.

Medical communities – generally supportive and a lot of current state considerations are done.

Generally practical approach – more and more investigations on certain aspects are necessary, **calling for an official feasibility study in the near future.**



Report – is being finalized now



Intermediate goals – working on this now

1. **To bring together high-level professionals**, experts and stakeholders from the Baltic States, nominated by the corresponding professional associations **to discuss and work on ideas** for development of key aspects of the initiative.
2. **To provide fact-based and scientifically driven reasoning** for each of the key aspects of the initiative based on the afore mentioned stakeholder opinion.
3. **To build** multi-disciplinary **synergies** between the different fields and specialties involved in cancer treatment and three Baltic States at large.
4. **To reach a joint consensus and vision** of future development of the “Advanced Particle Therapy Center in the Baltic States” initiative based on the conclusions reached within the workshop.

Discuss the future and work needed for the particle therapy center initiative and build on collaboration



Fallout

Session	Moderator	Speaker / reporter
Cancer statistics and indication profile in the Baltic States. Status of radiotherapy technologies in the Baltic States.	Dace Bogorada-Saukuma	<i>Jointly</i> Erika Korobeinikova, Kristaps Palskis, Manjit Dosanjh
Clinical indications for proton and particle therapy. Existing clinical evidence and on-going clinical trials.	Erika Korobeinikova	Anna Maria Camarda (CNAO)
The technology of helium synchrotron: technology readiness level and research needed.	Taylor Rebecca Toms Torims	Maurizio Vretenar Elena Benedetto
Current status of nuclear medicine in the Baltic States. Trends and research pathways going into the future.	Diana Adlienē	Maija Radziņa (<i>remotely</i>) Edgars Mamis
Educational necessities and possible solution pathways for clinical and technical personnel training.	Andrejs Ērglis	<i>Jointly</i> Manjit Dosanjh, Erika Korobeinikova, Kristaps Palskis



Some pertinent questions, just before sleep

- Where we are going?
- Why we are doing this?
- What are the next steps?
- How we gona achieve this?
- When it will be ready/
- Where it will be built?
- Who will pay for that?
- Are we ambitious enough?



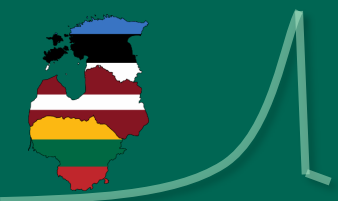
“Destination will change during the progress of the project / building this machine”





Overall feeling: supportive





This is Baltic Project -> 3B

- Research infrastructure
- BA support
- CERN developed NIMMS technology
- 3B has modern linacs and we are not building adream in the desert
- Even basic cancers are eligible, even is they are not in basic indication
- All paediatric cancers are eligible
- Evidence is increasing
- Evidence -> prevalence
- Level of knowledge in 3B re PT is rudimental
- We have no idea how many patients we will have, but we can use other countries modelling approach
- No side effects
- **Quality of live** improving
- No major R&D is needed, it is technically feasible
- He always allows also for PT
- Isotops – shall be no overlap with other facilities in 3B, yet clear regional need is there
- Why we need this?
- Multidisciplinary, Interdisciplinarity, team-science approach
- CERN, CNAO -> experience, know-how, technology
- 100 specialists in 3B
- training, education, opportunities for young researchers
- **Motivation – new leaders are needed**
- There are several previous projects and collaborations from which 3B can benefit



Do we have a "case"?

With the data from the ART study of **13045 patients** receiving radiotherapy, what we can estimate:

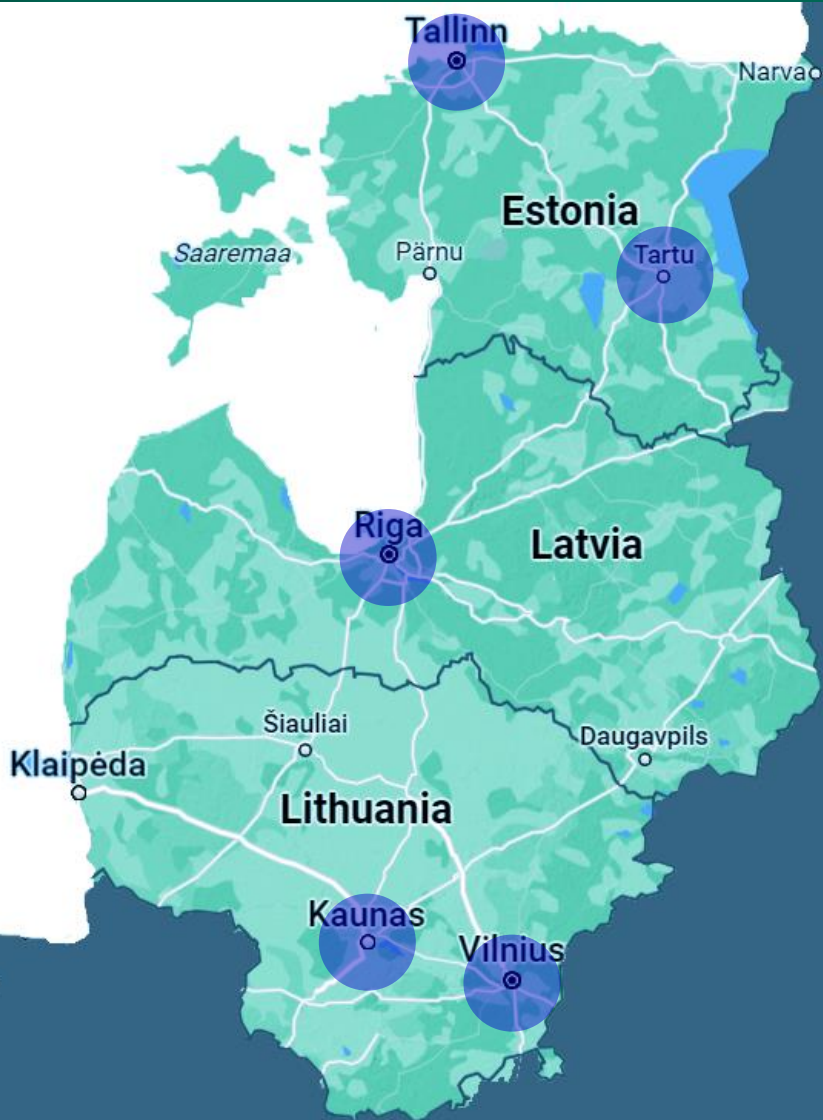
- **Conservative at 4.3 % - 560 patients**
- **Optimistic 15 % - 2000 patients**
- So, around 2000 human lives (not considering recidivous)
- One live = 1M EUR
- i.e. 20 00 000 000 EUR
- Not even speaking about children



Site selection – to put patient
first -> where it will work
best?



On site selection criteria



- Clear and undivided support to the initiative from the national medical communities involved in radiation therapy
- Strong and continuous political support: parliament, relevant ministries and governmental agencies
- **Sustained stakeholder engagement in the project initiative**
- **The main site shall be integral part of the major oncology hospital. Physical proximity and access to the existing infrastructure is critical**
- Proximity to the international airport – *max 50 km distance*
- Accessibility to patients from all 3 Baltic States (*and beyond*) – accessible from *RailBaltica* and its inter connections, major roads
- Hosting facilities for the patients, families
- EC support for the chosen site



Why we are bringing this up here today?

One of the key development areas indicated always in our discussions:

Training and education

Clinical aspects and rationales of particle therapy

Medical physics and quality assurance in particle therapy

Helium ion therapy. Heavy ion therapy research

Practical experience of setting up a treatment center

Introduction to the key aspects and considerations for particle therapy for our Baltic clinical and research communities

Learning from the European ion therapy center experts !



Name? *Baltic (Way) Light to Beat the Cancer?*

 [blbcagency.com](https://www.blbcagency.com)
<https://www.blbcagency.com>

Bright Lights Big City

Bright Lights Big City is a Paris-based music booking & management boutique. The principles of the agency are based on a tightly-knit team, which represents ...

 [Bair Lake Bible Camp](https://www.blbc.com)
<https://www.blbc.com>

Bair Lake Bible Camp- Christian Camps & Retreat in Michigan ...

Bair Lake Bible Camp. We know many people are feeling disconnected and isolated in these uncertain times. That's why we provide a refuge from the ...

[Summer Camps](#) · [Middle School](#) · [Our Staff](#) · [Pricing](#)

 [ScienceDirect](https://www.sciencedirect.com)
<https://www.sciencedirect.com> > [medicine-and-dentistry](#)

Basal Like Breast Cancer - an overview


Clinically, **BLBC** is hormone independent, characterized by brief disease-free survival, a high proliferative index, and poor histologic grade, and requires ...

 [SLBC Chhattisgarh](http://slbcchhattisgarh.com)
<http://slbcchhattisgarh.com> > [aboutus_blocklevel](#)

Block Level Bankers' Committee (BLBC)

BLBC is an Inter Institutional Forum at Block Level aimed at achieving coordination between credit institutions on one hand and field level development ...

Members: All the banks operating in the block... Chairman: Lead District Manager

 [Black Lake Bible Camp](https://blbcolympia.com)
<https://blbcolympia.com>

Black Lake Bible Camp

Black Lake Bible Camp. Christian Camping and retreat center. on the shores of Black lake in Olympia, Washington. Join our Summer staff team!





Final words . . .

- Visionary and long-term goals for the region from medical perspective, but even more – scientific research perspective
- Exciting opportunity and unifying project between the 3 States
- Flagship project for collaboration between CERN and the Baltic States
- Preventing *brain-drain* of professionals, researchers and young scientists in the corresponding fields
- Goes *hand in hand* with the development strategies of the Baltic States and overall European Union priorities

A unique opportunity for large-scale scientific and clinical infrastructure development in the Baltic States – **not to be missed!**



**Thank you and wishing a
great time in Palanga!**