CERN Baltic Group

Proposal for

Feasibility Study

of

Advanced Particle Therapy Centre for the Baltics

Implementation plan

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Executive summary

Overview

The *Advanced Particle Therapy Centre for the Baltics* (APTCB) is an initiative established in 2022 by CERN Baltic Group (CBG). **The main goal of the initiative is to develop a modern large-scale scientific research infrastructure**, often referred to as Big Science Centre, **and clinical treatment centre in the Baltic States** by integrating CERN NIMMS designed *HeLICS* particle accelerator technology. Proposed infrastructure would foster multidisciplinary research, contribute to the breakthrough innovation development, cross-sectoral economic growth, and strengthen regional integration of Baltic States into the European Research Area.

At this stage, a **dedicated, scientifically and factually driven Feasibility Study is necessary to consider any future developments of the initiative and envision such a facility**. The main goal of the Feasibility Study would be to investigate the feasibility of implementation of the proposed facility and possible scenarios.

This document presents the overall concept of the envisioned centre, rationale of its development, with the focus on the proposed design of the planned Feasibility Study.

Strategic Relevance. Alignment with EU priorities

The APTCB would serve as a catalyst for deep-tech commercialization, industrial collaboration and the emergence of local high-tech ecosystems in the Baltic States.

It aligns closely with EU strategic priorities in healthcare innovation, cancer treatment, and medical artificial intelligence, contributing to the reduction of regional disparities in research and development capacity.

Addressing a Critical Regional Gap

The absence of such a multi-disciplinary large-scale infrastructure in the Baltic States places the region at a significant disadvantage compared to Western Europe. A dedicated particle accelerator research facility would bridge gap in scientific research, technological and healthcare domains. It would expand the access to advanced cancer therapies and enhance participation of regional scientific groups in EU-funded research and innovation programmes.

Clinical Potential

The European Commission's Mission on Cancer (2023) underscores the urgency of reducing inequalities in cancer care across Member States. The APTCB could play a transformative role by offering advanced cancer treatment modalities including:

- clinically established proton therapy;
- emerging *cutting-edge* helium ion therapy;
- production of innovative radioisotopes for nuclear medicine.

APTCB would also contribute to research necessary for clinical translation of other novel approaches such as *FLASH* therapy.

These technologies mark a new era in high-precision oncology, improving therapeutic outcomes, minimizing side effects, and elevating the standard of care. Their implementation would also foster innovation in medical technologies and high-impact clinical and fundamental research.

Multidisciplinary Research

Equally central to the APTCB's mission is the promotion of world-class research beyond clinical research. The facility would form a solid base for high technology-driven research programmes in medical physics, high-energy physics, nuclear physics, material sciences, radiochemistry, accelerator physics and technologies and several other related fields. It would attract international expertise, drive competence development in early-stage researchers and encourage collaboration with high-tech industries and open science communities, contributing to the creation of a Baltic innovation ecosystem.

Economic Impact

Big Science Centres have demonstrated their potential to deliver long-term socio-economic returns. The APTCB could provide the following benefits:

- **boost innovation ecosystems** and **enhance the capacity of national economies** to generate, adopt, and commercialize advanced technologies;
- provide environment for high-skilled workforce development, including upskilling and improved career prospects for early-stage researchers, engineers, and professionals in various fields;
- deliver wide-ranging societal benefits, such as public access to cutting-edge cancer treatment therapies, cultural engagement, and technological spillovers;
- create public value through Big Science infrastructure, enabling economies of scale in knowledge generation and incentivizing innovation and product development across industries.

Stakeholder Support

The initiative has progressed through the dedicated efforts of two Working Groups within CBG and has secured strong backing from stakeholders across the medical, scientific, and policy sectors in the Baltic States.

Framework of the Feasibility Study

A **dedicated, scientifically and factually driven Feasibility Study is essential to assess the viability and implementation scenarios of the proposed APTCB facility**. Outcome of it **- a comprehensive Feasibility Study Report - will support informed decision-making on continuation of the initiative.**

Feasibility Study is to be led by Baltic scientific institutions in close collaboration with CERN. Feasibility study will also involve both local and international stakeholders through the Stakeholder Advisory Board. To ensure communication with international experts, Scientific Advisory Board will also be formed by renowned experts in relevant domains of APTCB initiative. The technical design for full-scale implementation will be based on CERN NIMMS HeLICS technology, while alternative approaches will be investigated.

Feasibility Study will be structured in 3 core Working Groups focusing investigations on crucial domains of the facility:

- clinical needs and regional epidemiology assessment;
- technological aspects and implementation of it;
- economics and innovation.

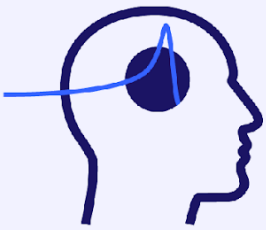
Each Working Group will address scientific, clinical, and innovation aspects of the respective domain. Additionally, transversal tasks will cover legal frameworks, risk analysis, coordination, education planning, and alternative implementation approaches, combing inputs from 3 Working Groups.

The study would be also benchmarked against leading European centres such as CNAO, MedAustron, and HIT, to ensure optimized technology investment, cost-effective operations, and sustainable business models.

The duration of the Feasibility Study is planned to be two years, while earlier termination is possible upon finishing investigations.

ADVANCED PARTICLE THERAPY CENTER FOR THE BALTIC STATES

SCIENTIFIC RESEARCH INSTITUTION



CLINICAL TREATMENT CENTER

INDUSTRY INVOLVEMENT INFRASTRUCTURE

To envision the facilty and consider any future developments - scientifically and factually driven

FEASIBILITY STUDY

- **Main goal:** investigate the feasibility and possible scenarios of facility's implementation
- **Expected duration:** 2 years

CLINICAL AND EPIDEMIOLOGY

- Research programme in clinical sciences
- Relevant medical statistics in the region
- Eligibility criteria for proton therapy
- Patient referral, connections with PT community

Researchers or PhD students from each of the Baltic countries

TECHNOLOGY AND IMPLEMENTATION

- Research programme in natural and technical sciences
- Technical requirements of the facility
- Integration study and future upgradability
- Basis of cost estimates for accelerator and facility

Researchers or PhD students from each of the Baltic countries

ECONOMICS AND INNOVATION

- Research on long term funding, business engagement
- Organizational structure and governance model
- Full cost estimation and economic benefit analysis
- Evaluation of revenue streams

Researchers or PhD students from each of the Baltic countries

TRANSVERSAL TASKS

- Alternative solutions for the facility
- Aspects on regulatory and legal approvals
- Risk analysis and evaluation
- Information flow between pillars for cost estimates
- Education and training necessities

FEASIBILITY STUDY IS TO BE DONE WITHIN THE FRAMEWORK OF CERN BALTIC GROUP:
performed by scientific institutions in the Baltic States,
informing and including local and international stakeholders and having international experts as consultants
STRONG COLLABORATION WITH CERN ENSURED THROUGHOUT THE FEASIBILITY STUDY