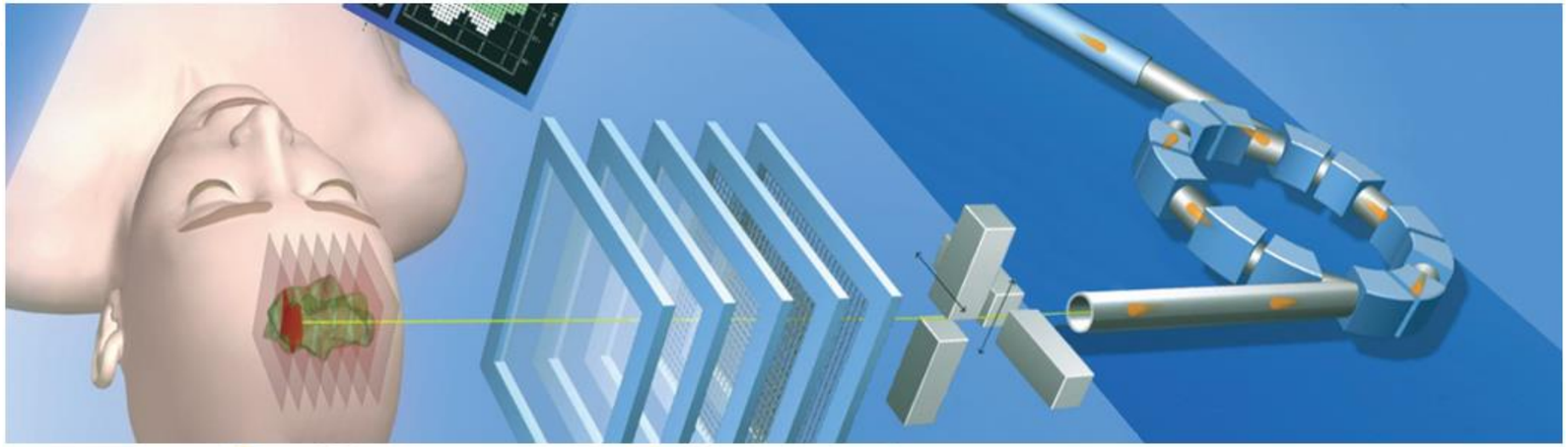
მასტერკლასი ნაწილაკების თერაპიაში

24 მარტი 2023



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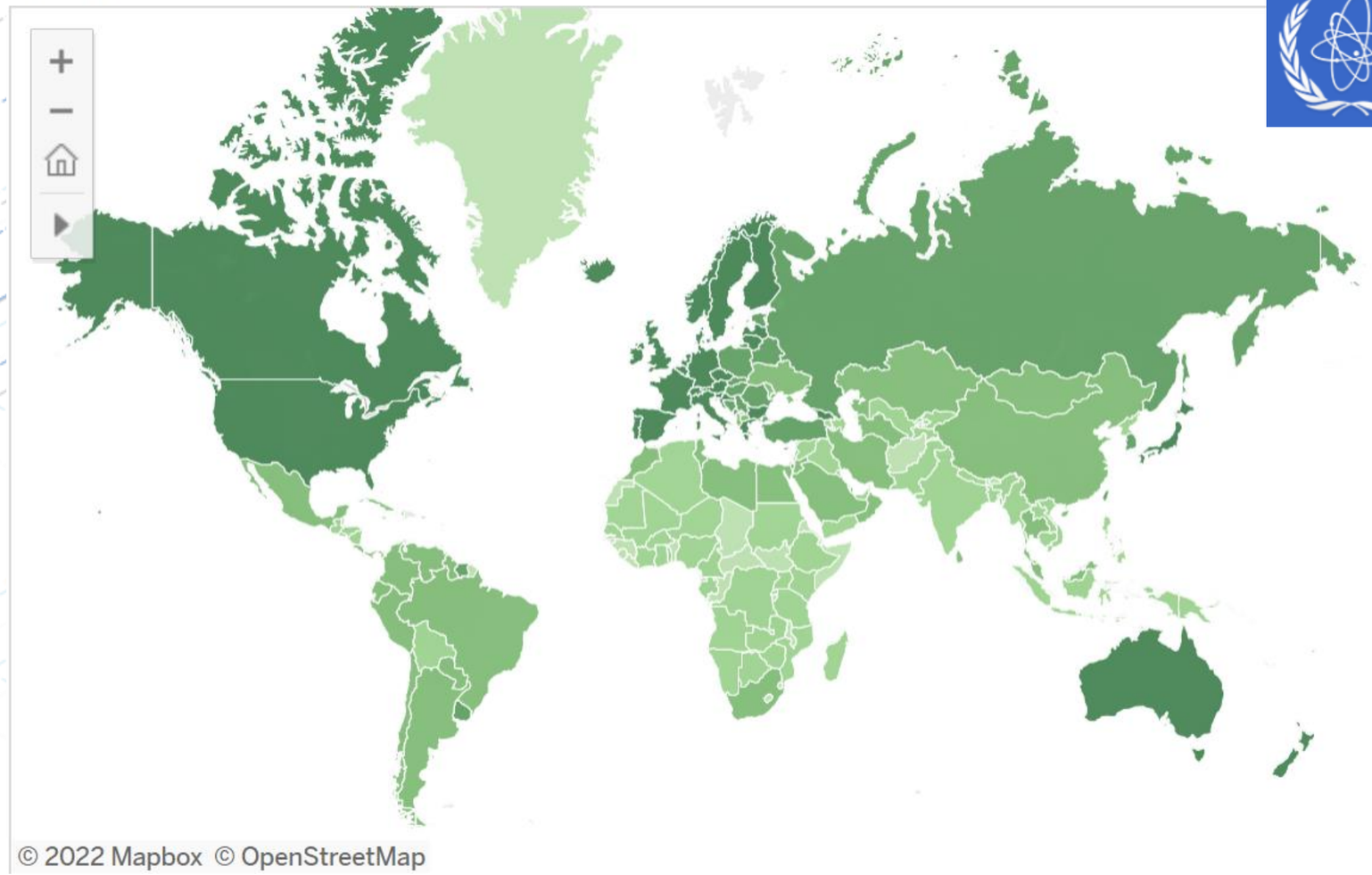
Radiotherapy Machines per Million People

(Updated on : 11/11/2022 9:31:12 AM)



IAEA | DIRAC Directory of RAdiotherapy Centres

Country:	**Georgia**
Population:	**3,757,980**
Cancer cases:	**12,751**
Income group:	**Upper middle income (UM)**
Machines per 1 mill.:	**5 and more**
Radioteletherapy centers:	**8**
MV Therapy:	**19**
Light Ion Therapy:	**0**

- 5 and more
- between 3 and 5
- between 1 and 3
- less than 1
- no reported machines

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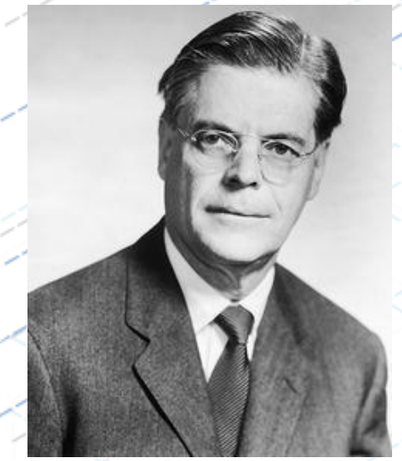
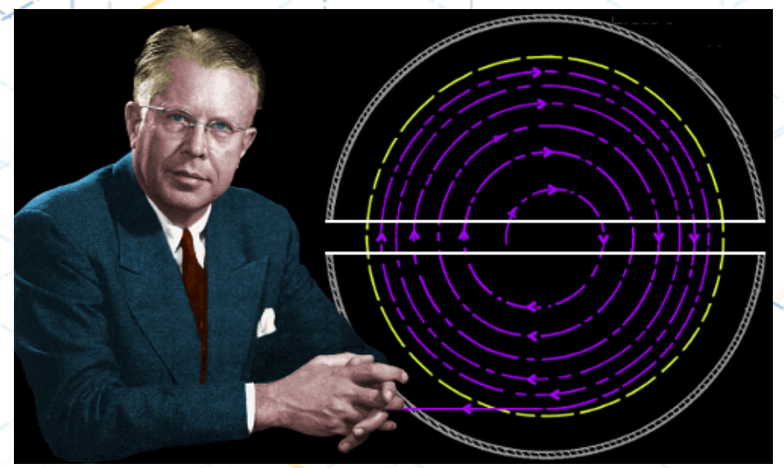
Radiological Use of Fast Protons



Robert R. Wilson
(1914-2000)



Ernest Lawrence (1901-1958)
The inventor of a cyclotron.
Nobel prize in physics 1939

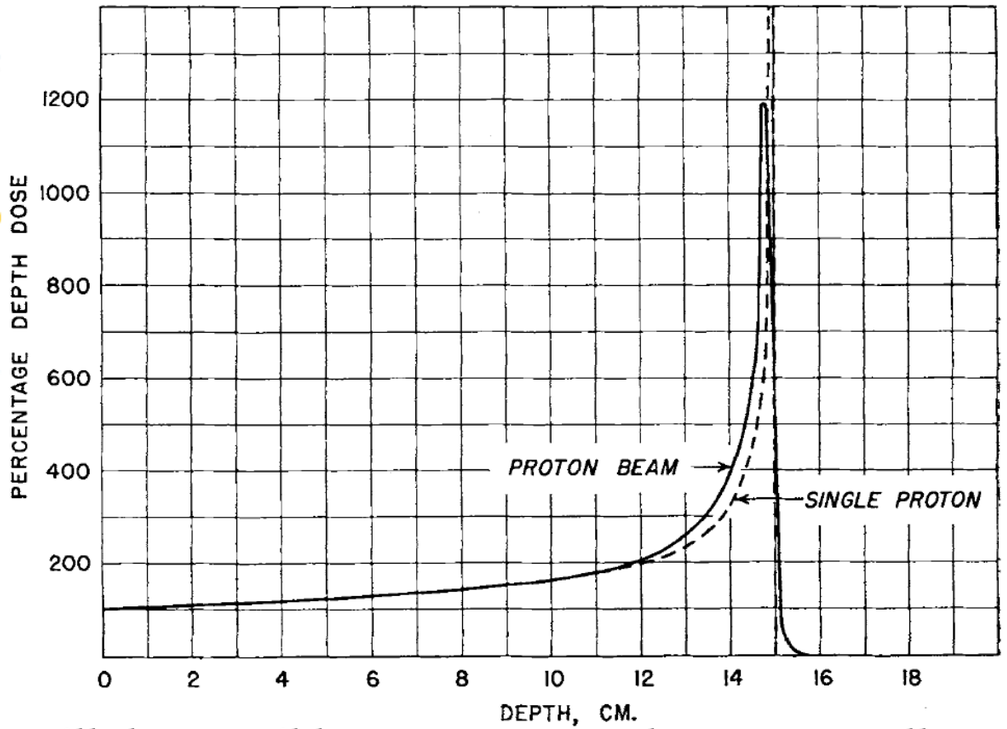
Radiology 47 (1946), 487

Radiological Use of Fast Protons

ROBERT R. WILSON

Research Laboratory of Physics, Harvard University

Cambridge, Massachusetts



"It will be possible to treat a volume as small as 1 cc anywhere in the Body and to give that volume several times the dose of any other neighboring tissue. The exact behavior of protons of the energy considered here will became known only when such protons are available for experiment."

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PT in Hospital: Loma Linda University Medical Center (LLIMC)

1990: The first hospital-based proton facility in the world: Loma Linda University Medical Center (LLUMC)

1988: the ground was broken for the treatment facility

1989: the accelerator was commissioned at Fermilab

1990: the entire system was commissioned in the summer

1990: the first patient was treated in October

The LLUMC proton accelerator: a small synchrotron, with proton beams of 70-250 MeV energy, and i

Accelerators for the particle therapy

Two types of particle accelerators are used in the particle therapy: cyclotron and synchrotron

Cyclotron (IBA C230) in CCB(Poland)

Advantages: compact design, cost

Disadvantages: fixed particle type (proton), energy
Energy variation bt degrader

Synchrotron in CNAO (Italy), Developed at CERN
PIMMS (proton-ion medical machine study) project

Advantages: protons and heavy ions (He, C), Energy variation

Disadvantages: cost, complex device larger space

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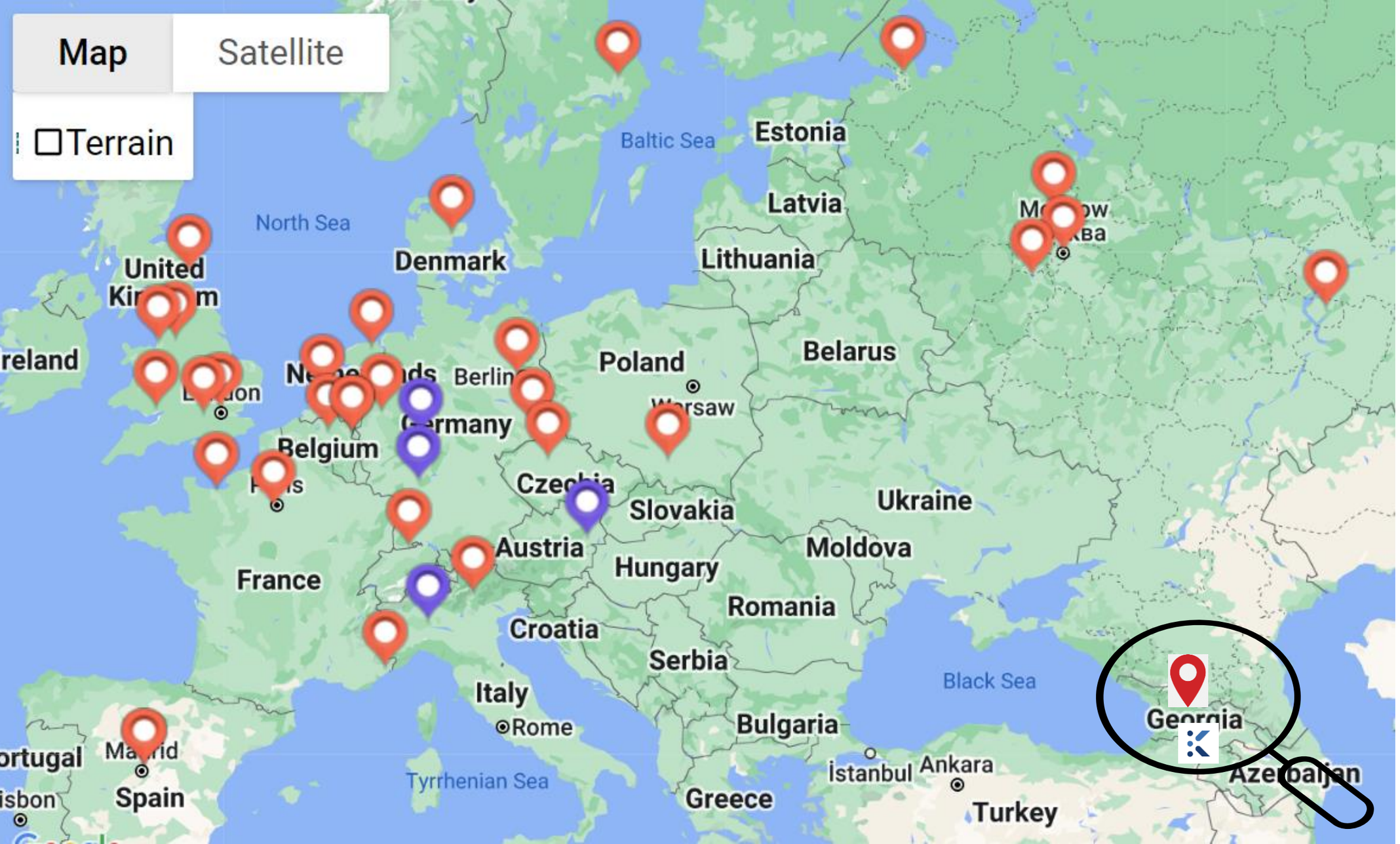


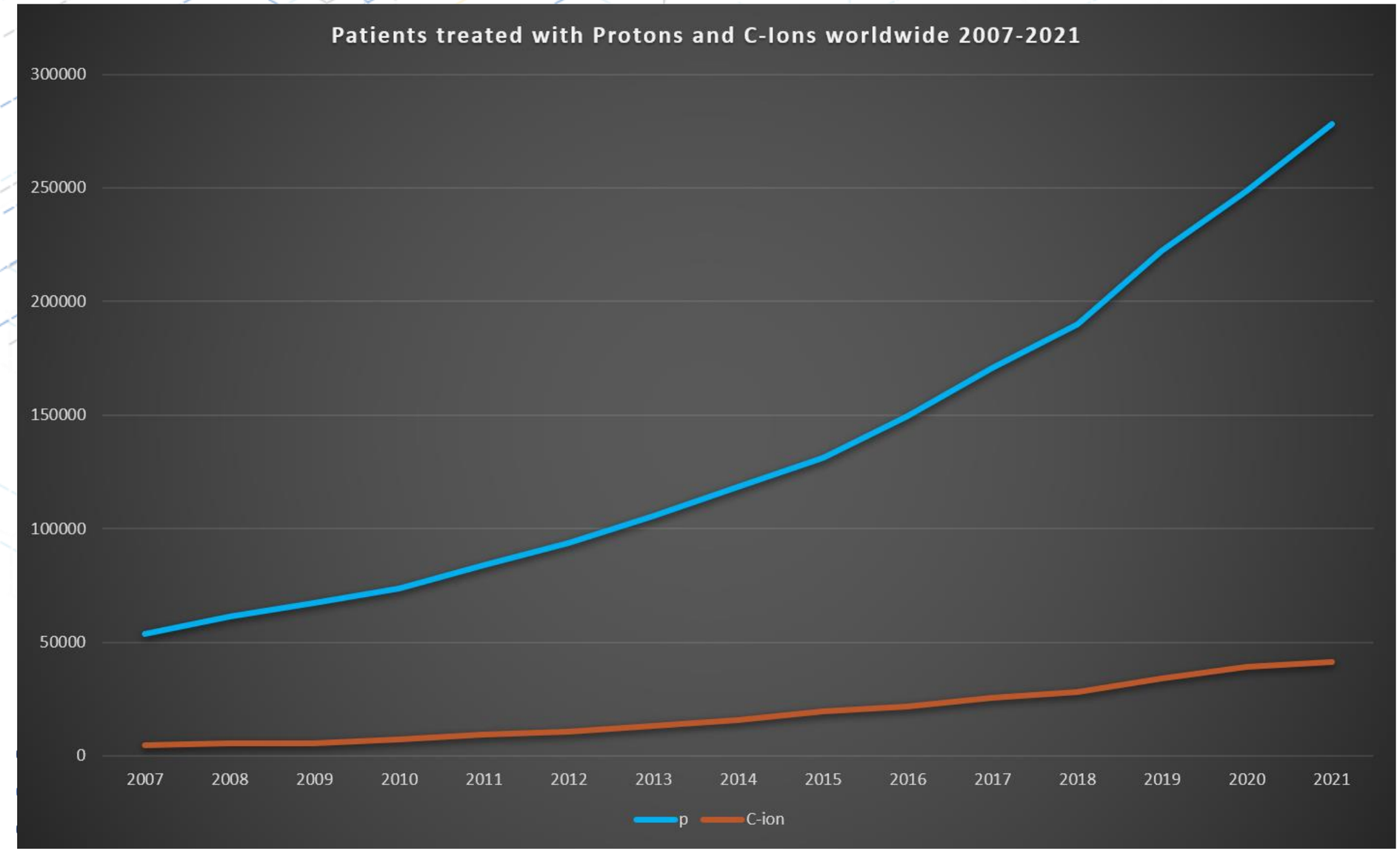
ptcog.ch

Hadron therapy in Europe.

Protons

Protons / Carbon-ions

Patients Treated with the Particle Therapy



Kutaisi International University

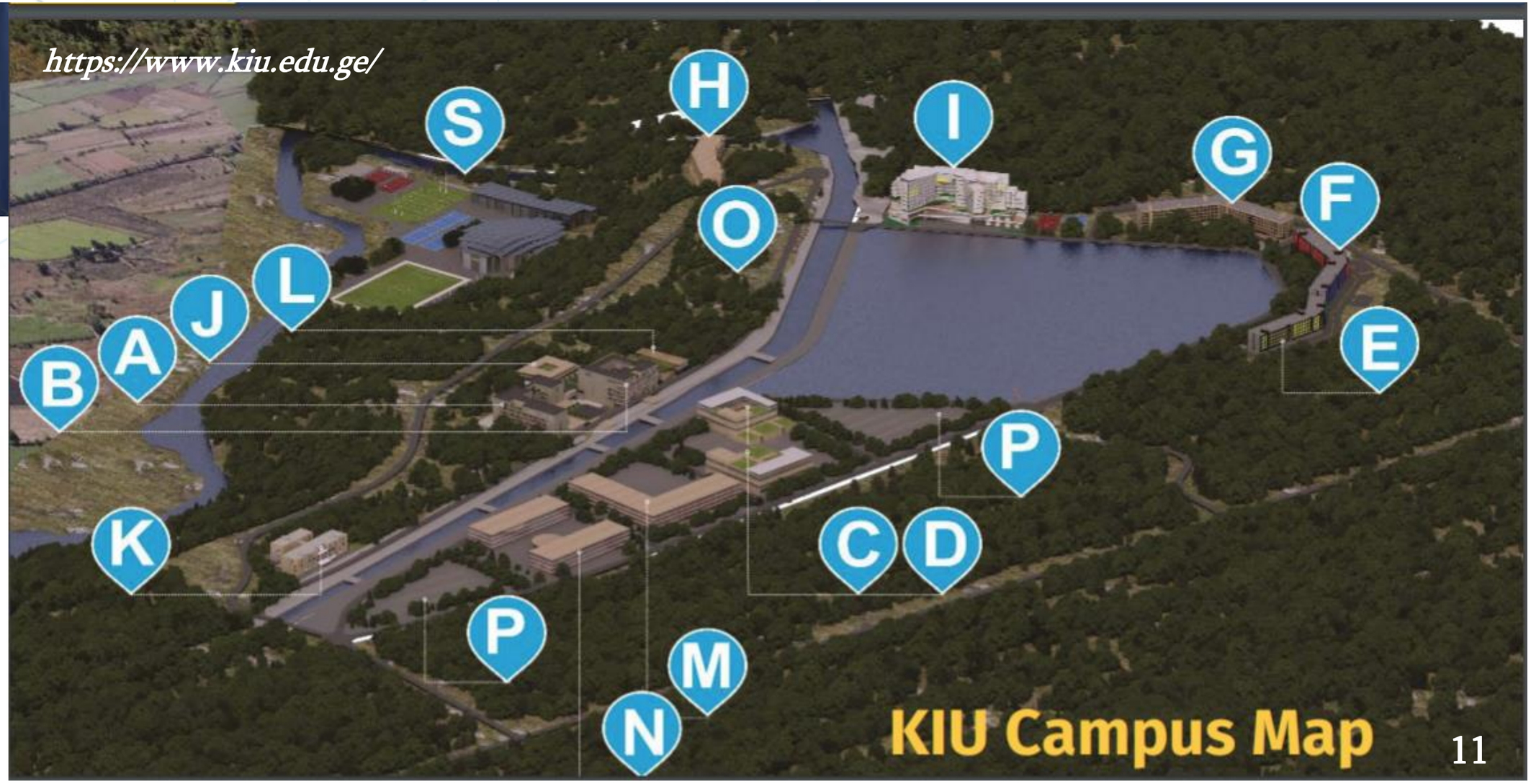
Mr. Bidzina Ivanishvili

ფონდი ქართუ

Investment in the Kutaisi International University

1 000 000 000 €

ქუთაისის საერთაშორისო უნივერსიტეტი



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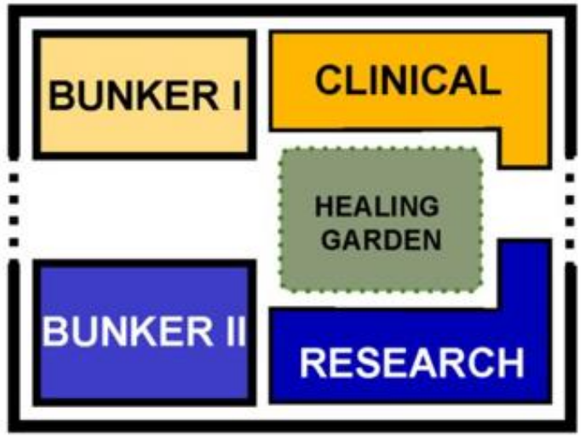
Hadron Therapy Center at KIU



Design of KIU Hadron Therapy Center:

IDOM

www.idom.com

Hadron Therapy Center at KIU

KIU Hadron Therapy Center drawings from IDOM

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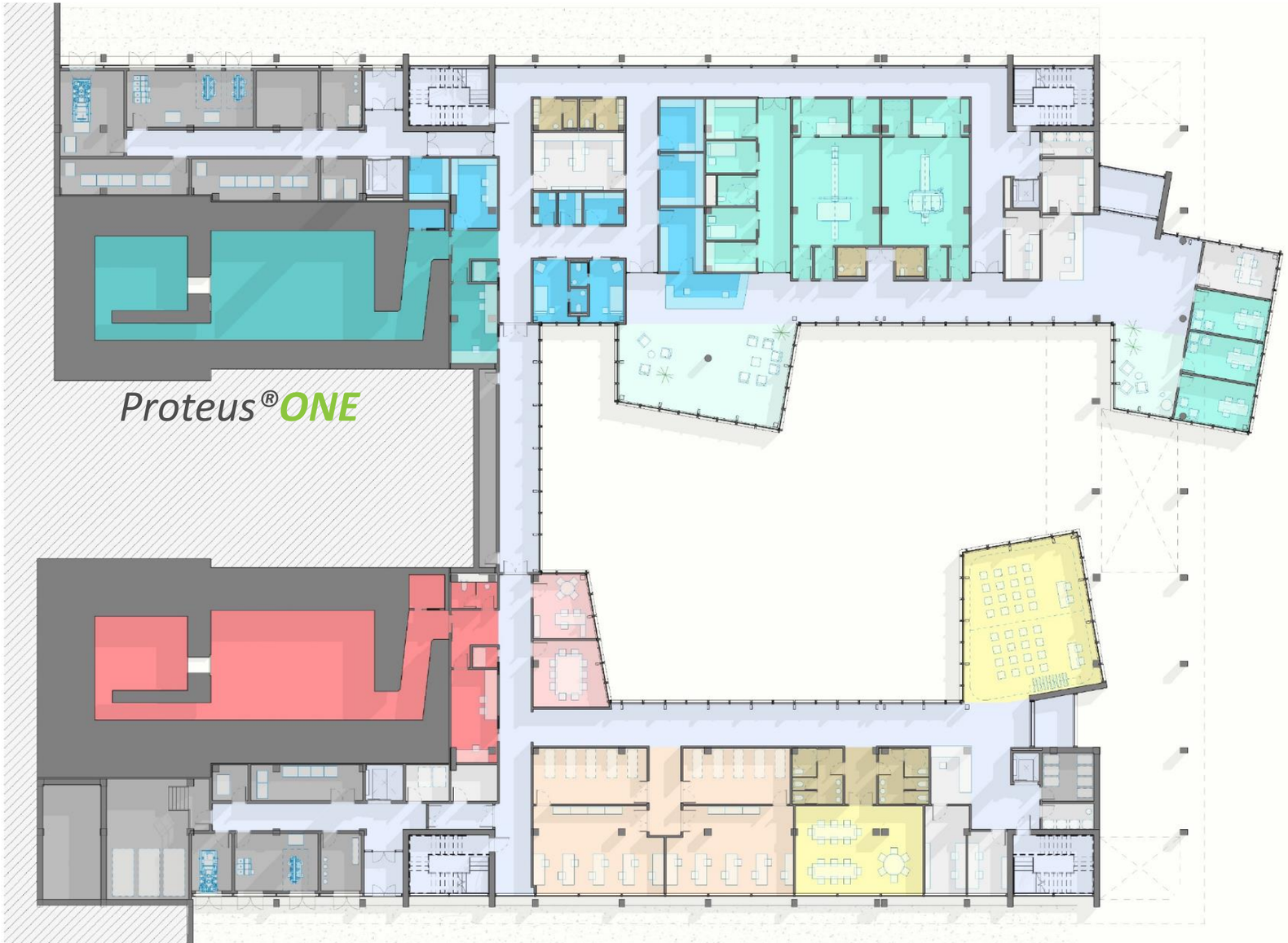
Hadron Therapy Center at KIU



Room Legend

- BUNKER I
- BUNKER II
- CIRCULATION
- COMMON AREAS
- DIAGNOSIS
- LABORATORIES
- MEP
- OFFICES
- PATIENT PREPARATION
- SUPPORT
- TOILET
- WAITING

Subcategory	Area
CLINICAL	
BUNKER I	178.95 m²
CIRCULATION	496.63 m²
DIAGNOSIS	245.80 m²
MEP	152.38 m²
PATIENT PREPARATION	115.34 m²
SUPPORT	86.87 m²
TOILET	21.37 m²
WAITING	105.17 m²
	1402.51 m²
EXTERIOR	
GARDEN	871.87 m²
	871.87 m²
RESEARCH	
BUNKER II	195.22 m²
CIRCULATION	314.16 m²
COMMON AREAS	151.70 m²
LABORATORIES	179.24 m²
MEP	174.64 m²
OFFICES	41.60 m²
SUPPORT	63.30 m²
TOILET	36.05 m²
	1155.90 m²
	3430.28 m²

Hadron Therapy Center Groundbreaking

Groundbreaking ceremony at KIU: July 12, 2022

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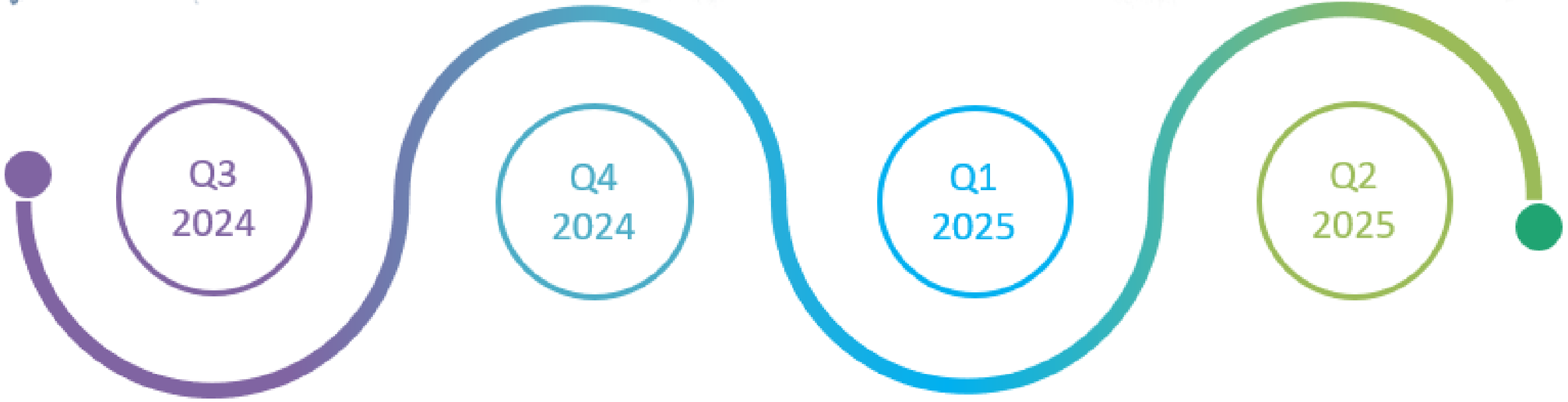
KIU HTC Roadmap



Construction

Construction process will be finished by Q3, 2024

Permissions

The operation and radiation safety permissions will be acquired from the national authorities

T & C

Testing and commissioning will be finished by Q1. 2025

First Patient

Fist patient will be received by Q2, 2025

IBA S2C2 (Super-Conducting Synchro-Cyclotron)

Maximum Energy:	230/250 MeV
Yoke/pole radius:	1.25 m/0.50 m
Weight:	50 tons
Mag. field central/extraction:	5.7 T/5.0 T
Initial cooldown:	12 days
Beam pulse rate/length:	1000 Hz/7 μsec
RF system frequency:	93-63 MHz
Voltage:	10 kV

Power: 60 kW

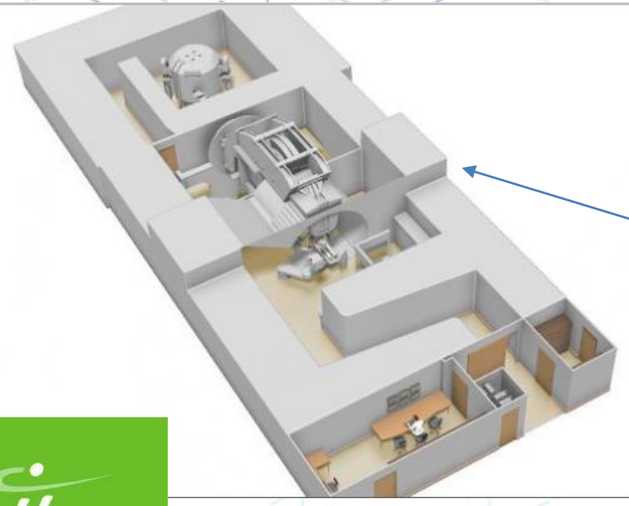
ქრონიკა 5

პირველი ციკლოტრონები საქართველოს დროშით

17:28

წარმატებული ტესტირების შემდეგ ციკლოტრონები ქუთაისის საერთაშორისო უნივერსიტეტის ადრონული თერაპიის ცენტრში განთავსდება

Hadron Therapy Center of the Kutaisi International University



iba Proteus®ONE

Ground Floor

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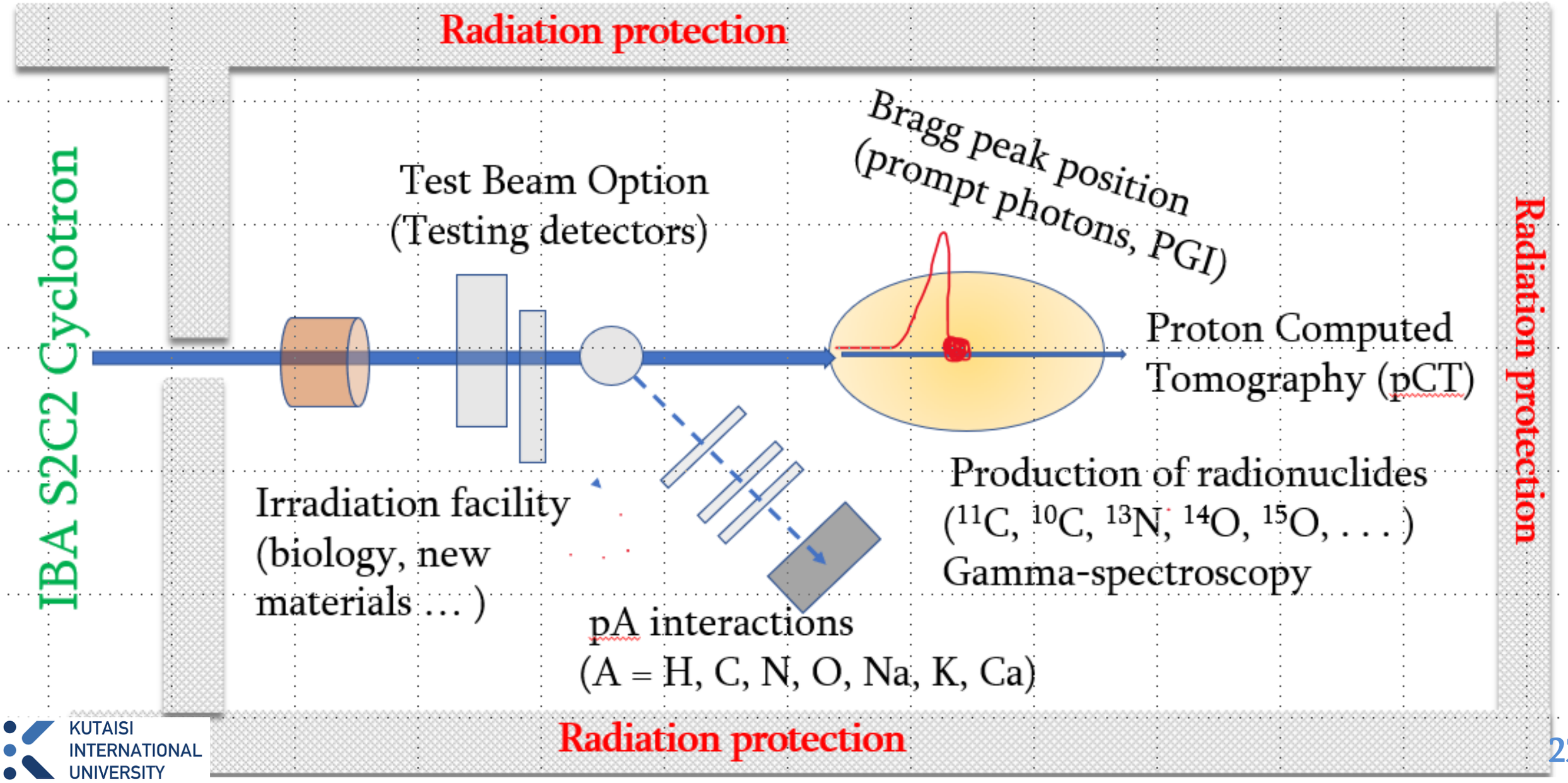

Radiation protection
IBA S2C2 Cyclotron
Test Beam Option
(Testing detectors)
Bragg peak position
(prompt photons, PGI)
Proton Computed
Tomography (pCT)
Irradiation facility
(biology, new
materials …)
pA interactions
(A = H, C, N, O, Na, K, Ca)
Production of radionuclides
(^{11}C, ^{10}C, ^{13}N, ^{14}O, ^{15}O, . . .)
Gamma-spectroscopy
Radiation protection
Radiation protection

Georgian-German ScienceBRIDGE
CONNECTING PEOPLE AND KNOWLEDGE

RWTH AACHEN UNIVERSITY

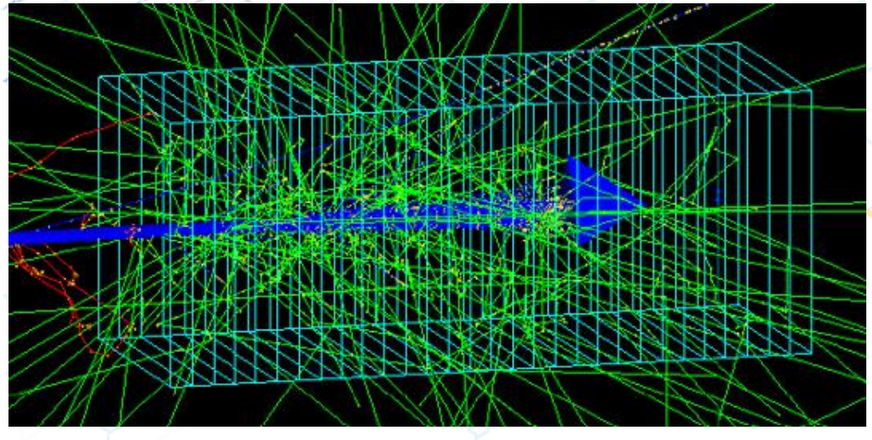
Knowledge Transfer

KUTAISI INTERNATIONAL UNIVERSITY

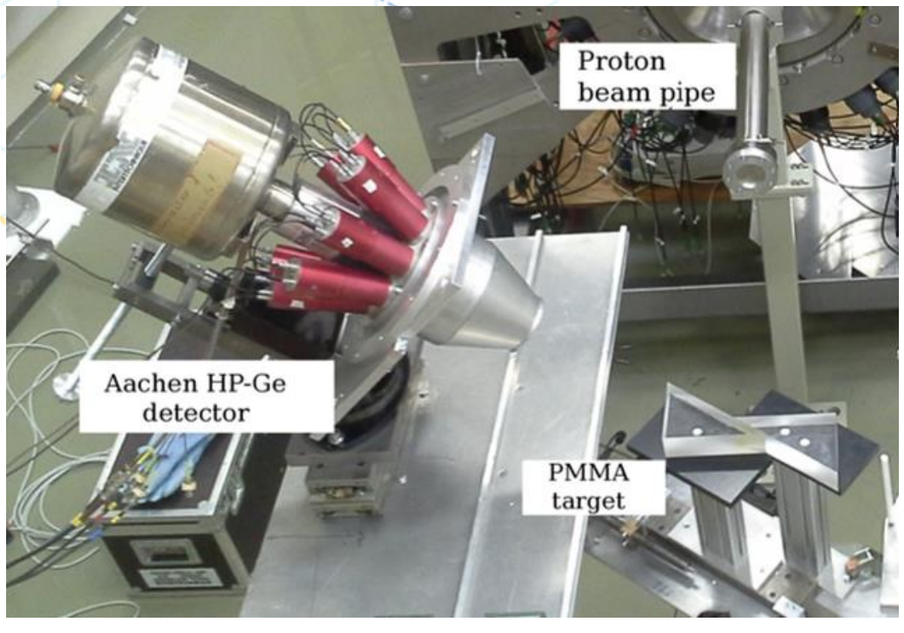
GEANT4
A SIMULATION TOOLKIT

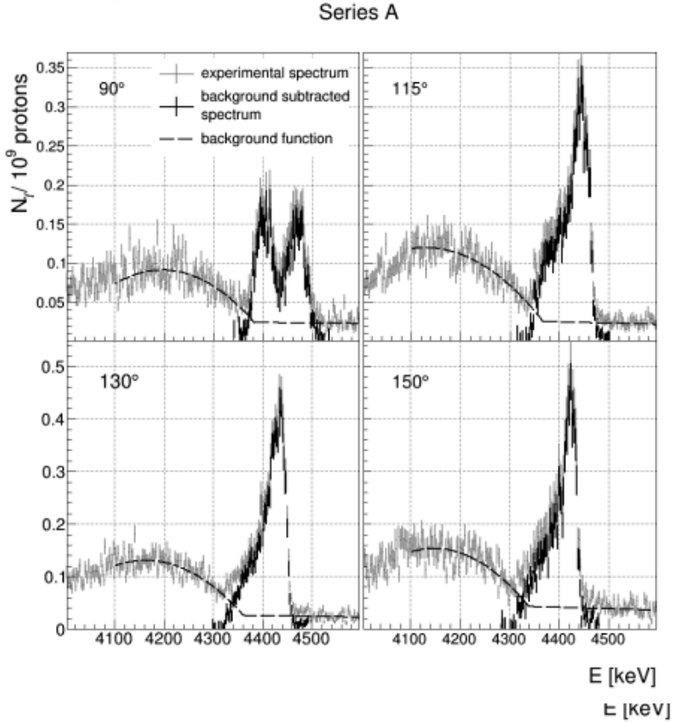
Simulations for proton therapy

Prompt photons for treatment monitoring; dose calculations

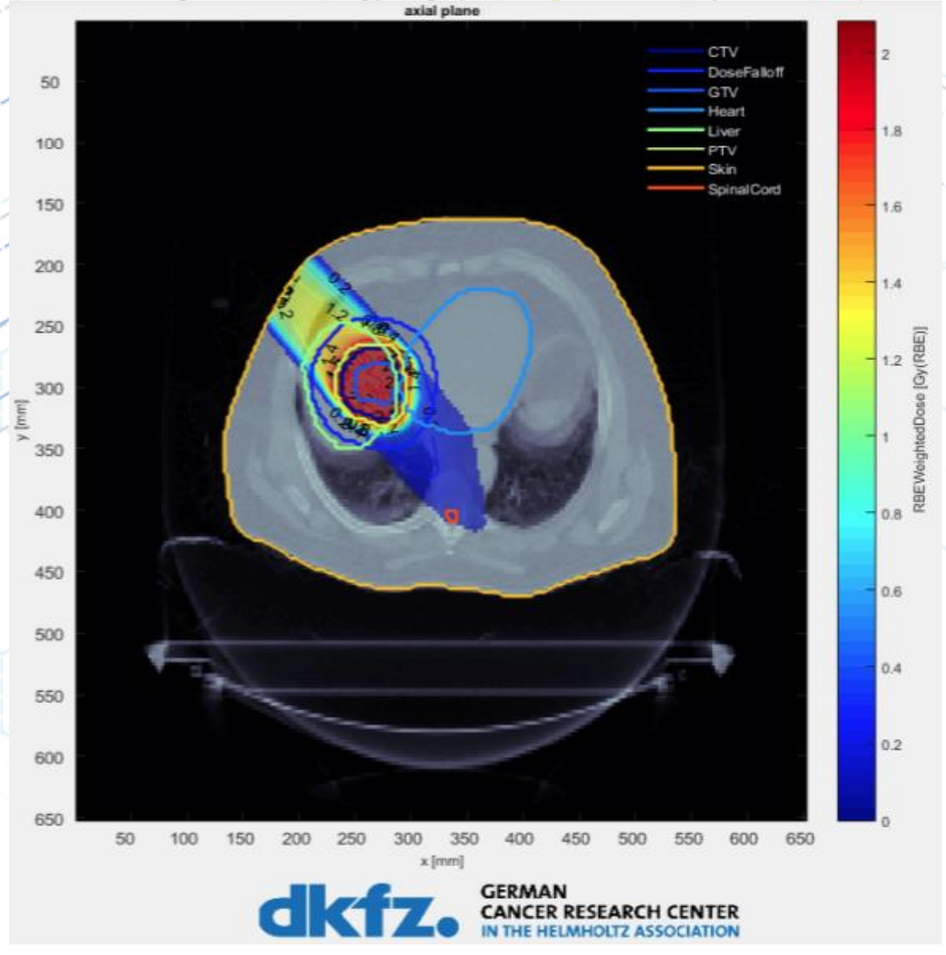


$$^{12}C(p,p'\gamma)C^{12}$$

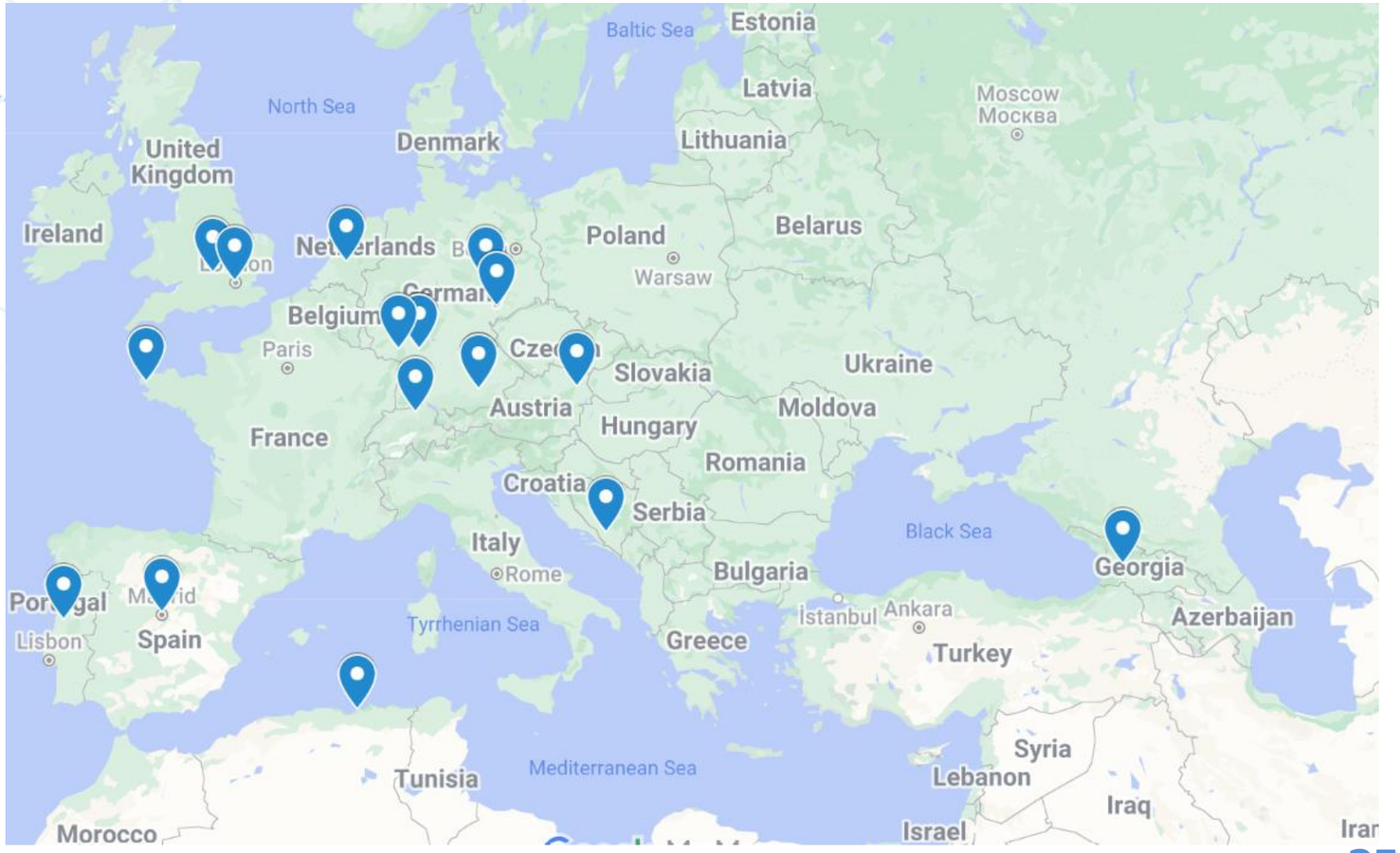




matRad



Open source software for radiation treatment planning for photon, proton, and carbon ion therapy.
Developed **for educational and research** purposes.
Entirely written in MATLAB.



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Other European Projects

Advanced Particle (Cancer) Therapy Center in the Baltic States, in close cooperation with CERN and relevant stakeholders (August 2021)

Particle therapy options are still under review.

- Riga Technical University
- University of Tartu
- Vilnius University
- University of Latvia
- National Institute of Chemical Physics and Biophysics
- Kaunas University of Technology
- Riga Stradinš University
- Tallinn University of Technology
- Vytautas Magnus University

ENLIGHT

Other European Projects: SEEIIST

The South East European International Institute for Sustainable Technologies (www.seeiist.eu)

- Proposed in late 2016 by Prof. Herwig Schopper a former Director General of CERN
- 2017, March : received first official political support by the Government of Montenegro.

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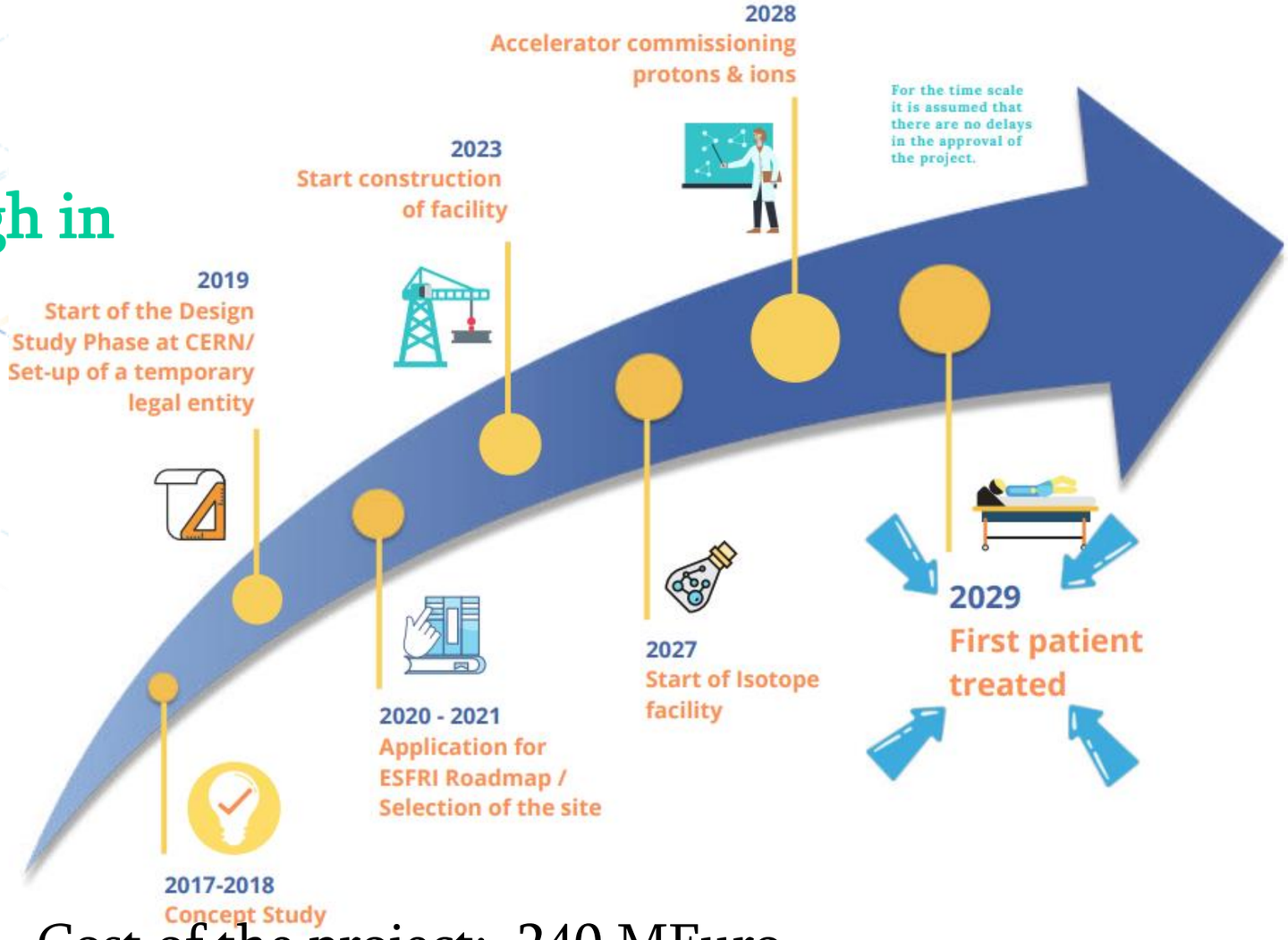
The Mission of SEEIIST

Combating cancer
Science for Society
Breakthrough in Technology

The **SEEIIST region** with a total population of about 40 million has no facility for PT.



Cost of the project: 240 MEuro

Kutaisi International University Hadron Therapy Group

Alexander Tevzadze

Vakhtang Tsagareli

Mariam Abiladze

Vasil Beruashvili

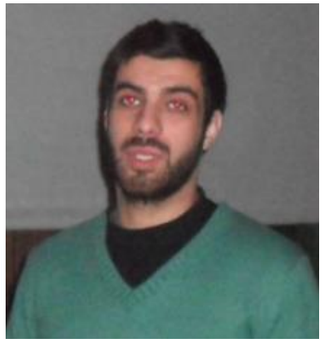
Shalva Bilanishvili

Ioseb Giorgobiani

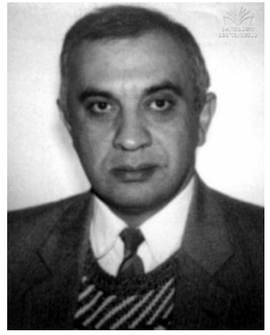
Abesalom Iashvili

Levan Ivanisgvili

Levan Kankadze



Akali Lomia



Tengiz Mdzinarishvili

Mariam Osepashvili

Revaz Shanidze

Nikoloz Totogashvili

Edisher Tskhadaze

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