# Highlights from the Recent IAEA Conference on Accelerators for Research and Sustainable Development


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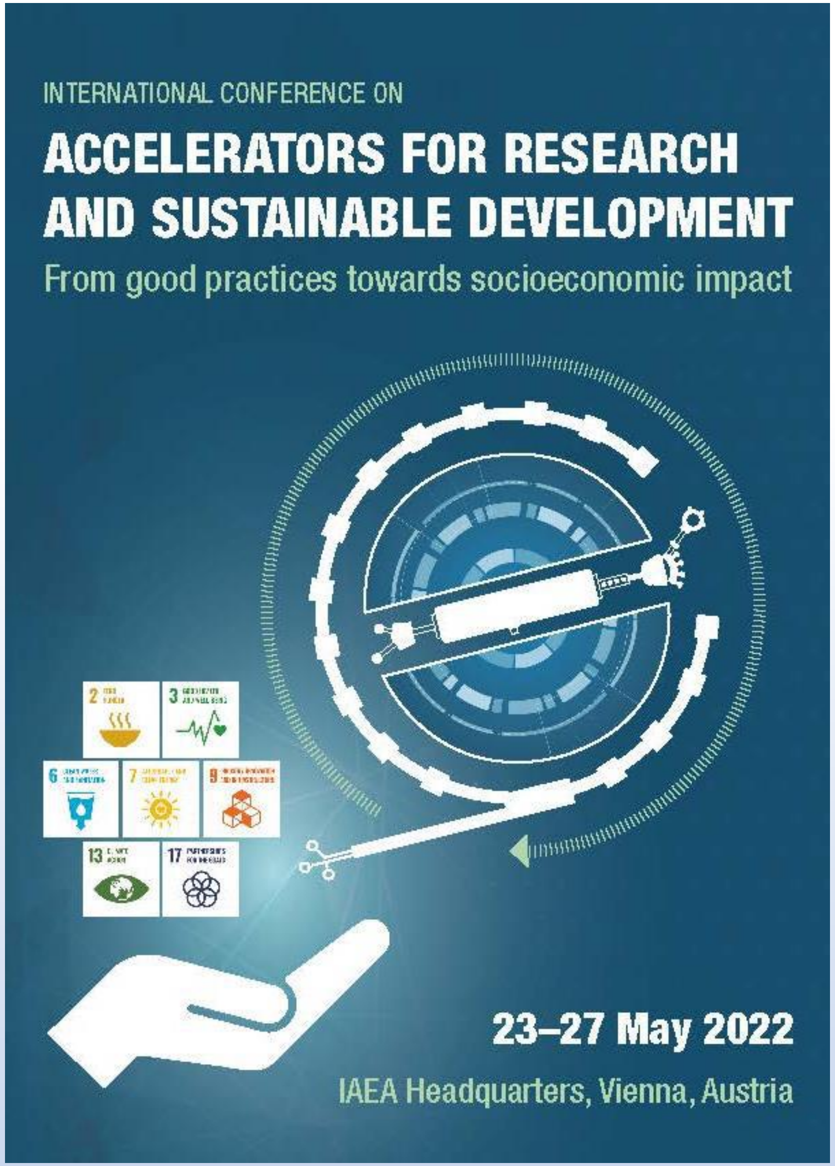
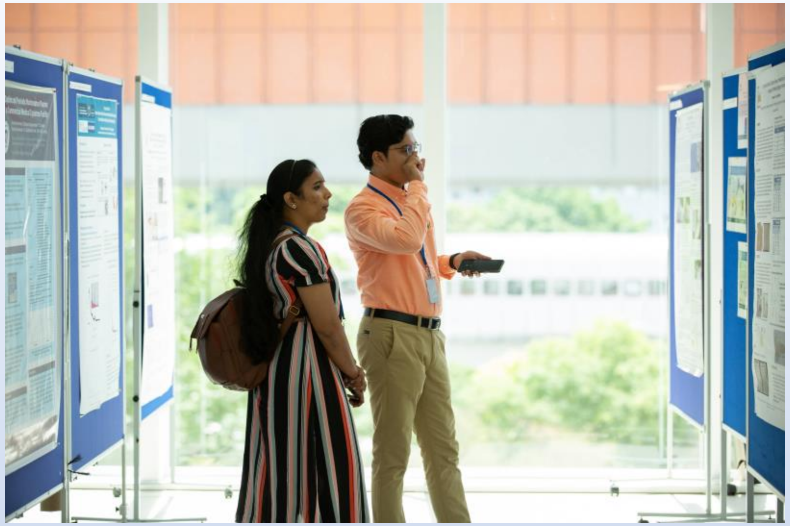


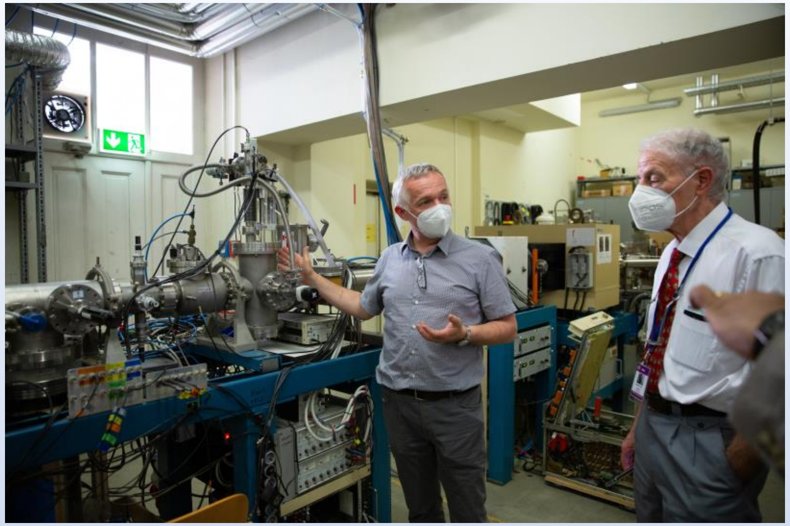
# Purpose and Objective

- Not only scientific results and innovative applications of accelerator-based research, but also success stories and case studies to address the following SDGs:
    - **Zero hunger**
    - **Good health and wellbeing**
    - **Clean water and sanitation**
    - **Affordable and clean energy**
    - **Industry, innovation, and infrastructure**
    - **Climate action**
    - **Partnership for the goals**


# Overview

- Almost 200 participants in person and 300 virtual attendees from 72 IAEA member states
- Six plenary sessions featuring 16 key-note invited talks
- Sixteen parallel sessions, where as many as 80 contributed talks presented
- Four side events and two technical tours
- Over 70 posters (in person and virtual)
- Awards the best oral and poster presentations by young researchers

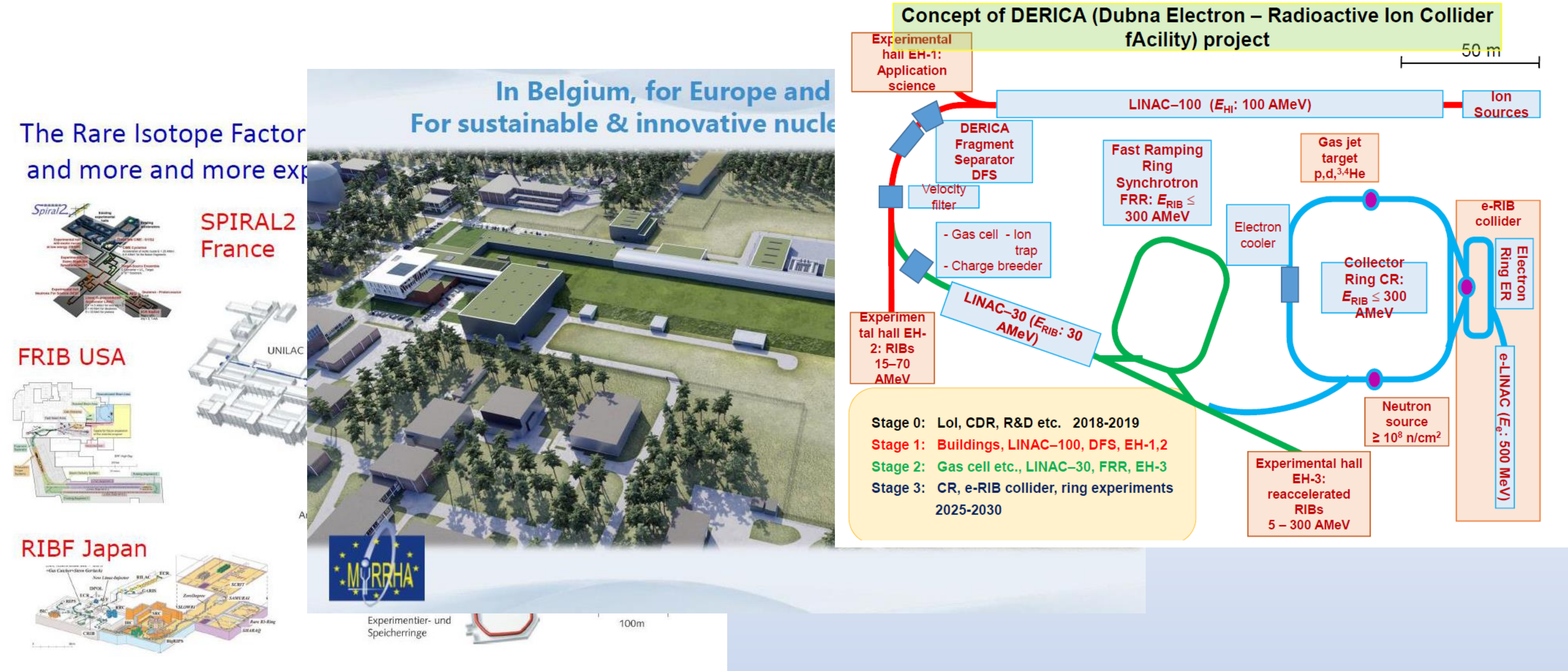




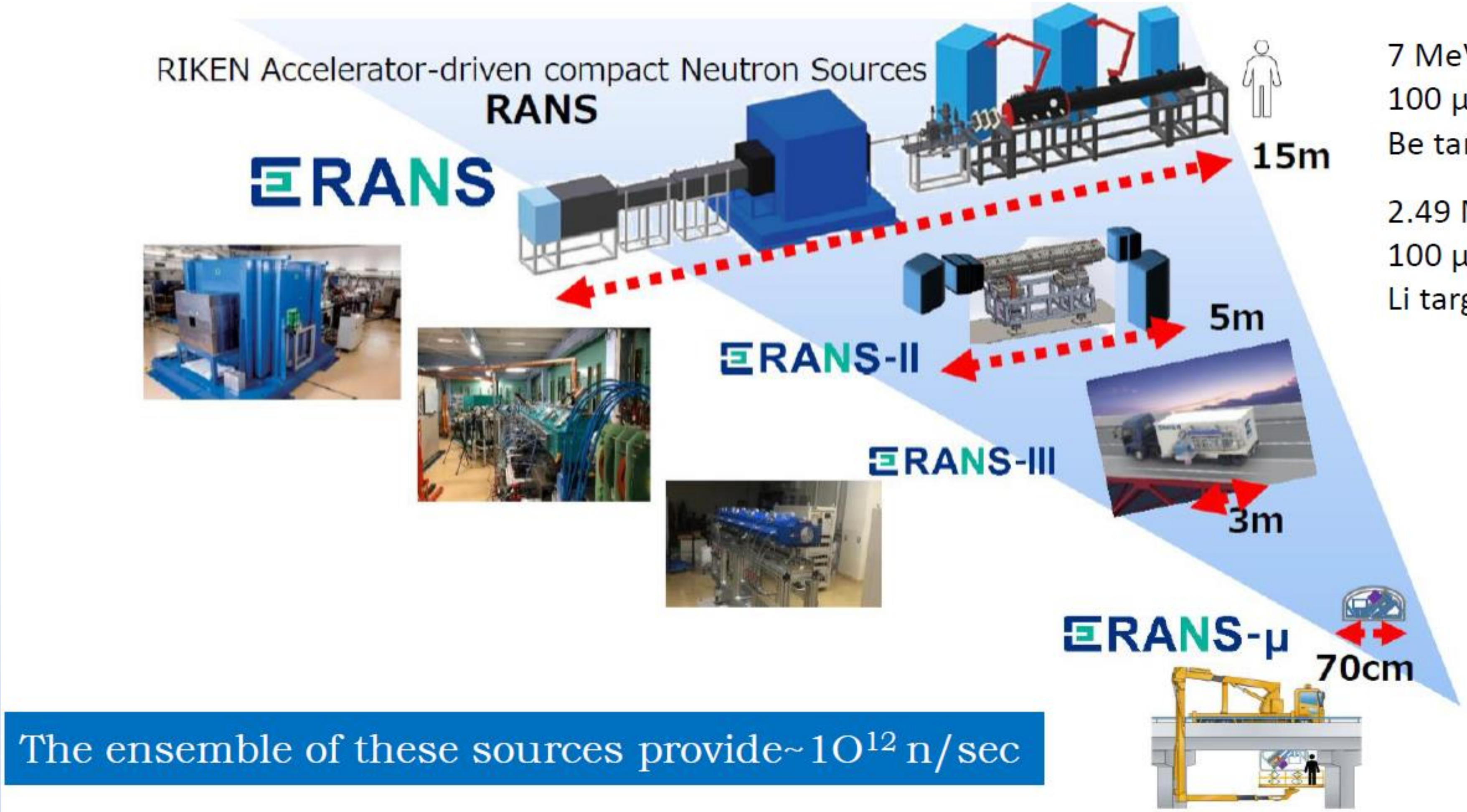
https://www.iaea.org/events/accconf22

https://www.iaea.org/newscenter/news/iaea-accelerator-conference-kicks-off-with-sustainable-development-focus

# Large Scale Accelerator Facilities



# Compact Neutron Sources




7 MeV protons
100 μA
Be target

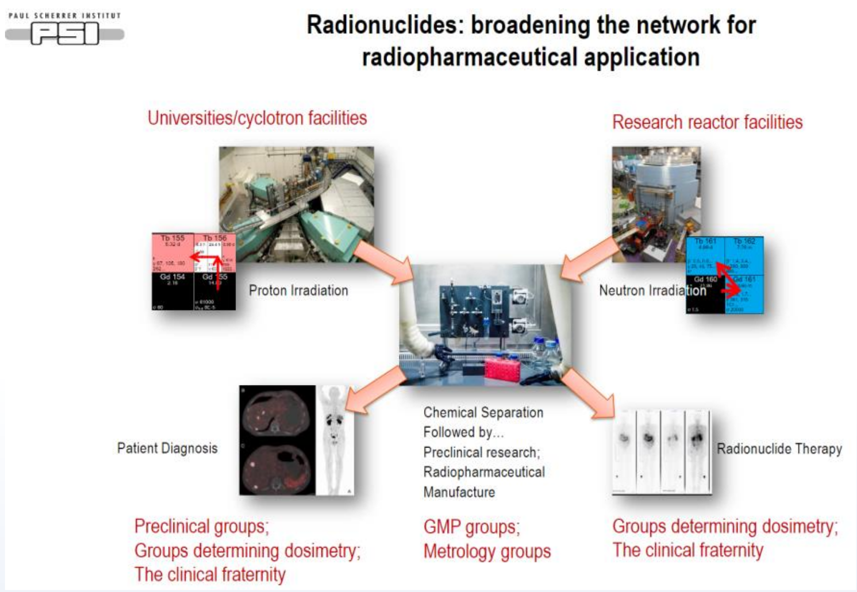
2.49 MeV protons
100 μA
Li target

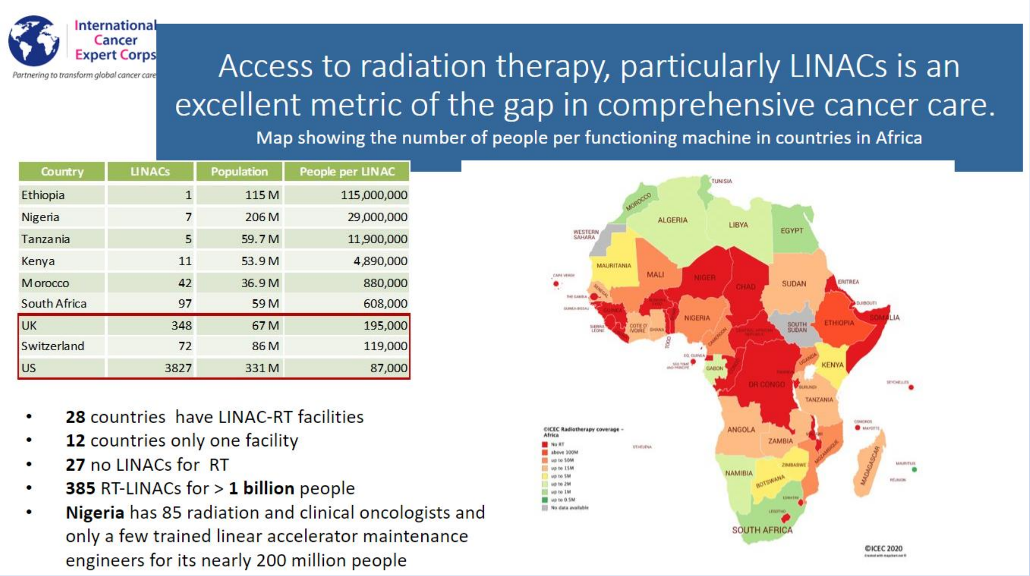
In operation

Under development

# Accelerators for Medical Applications

- Radioisotope production with accelerators
  - Production of radioisotopes with high energy proton linacs
  - Production of radioisotopes with PET cyclotrons
  - Production of novel/exotic isotopes using isotope separation online
- Radiotherapy with electron linacs and proton centers
- Accelerator-produced neutrons for boron neutron capture therapy (BNCT)

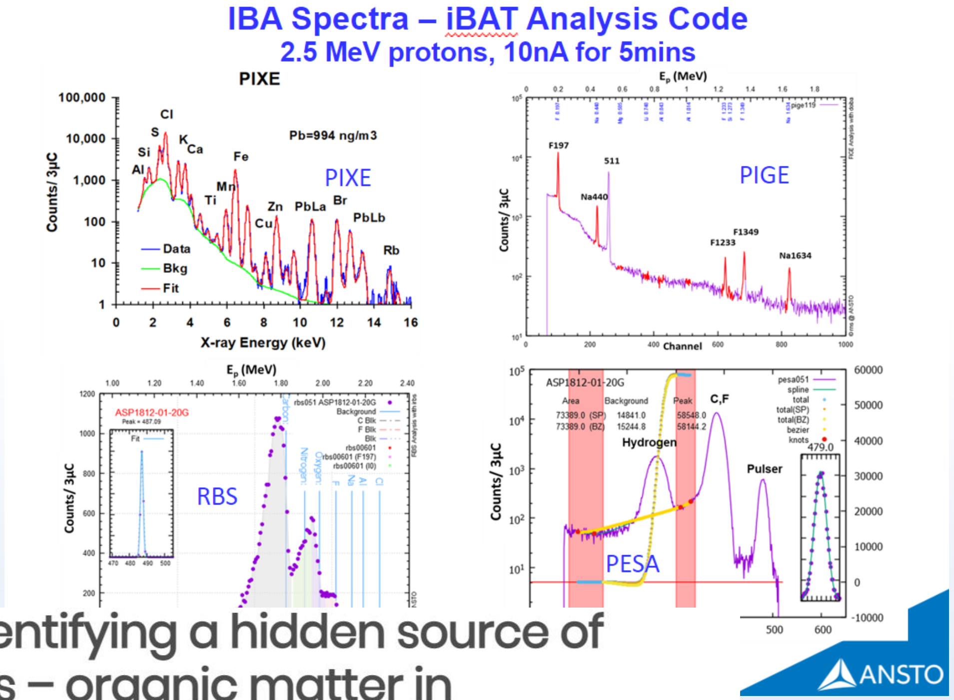



| Country | LINACs | Population | People per LINAC |
|---|---|---|---|
| Ethiopia | 1 | 115 M | 115,000,000 |
| Nigeria | 7 | 206 M | 29,000,000 |
| Tanzania | 5 | 59.7 M | 11,900,000 |
| Kenya | 11 | 53.9 M | 4,890,000 |
| Morocco | 42 | 36.9 M | 880,000 |
| South Africa | 97 | 59 M | 608,000 |
| UK | 348 | 67 M | 195,000 |
| Switzerland | 72 | 86 M | 119,000 |
| US | 3827 | 331 M | 87,000 |

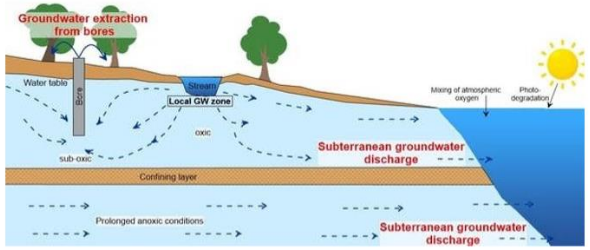
# Accelerators for Environment

- Environmental samples characterization with ion accelerators (more than 30 elements from H to U)
- Identifying hidden sources of greenhouse gases – dissolved organic matter in groundwater
- Radiation treatment of biohazards and organic pollutants in waste waters, sludge, and flue gases




## $^{14}C$ a key tool in identifying a hidden source of greenhouse gases – organic matter in groundwater

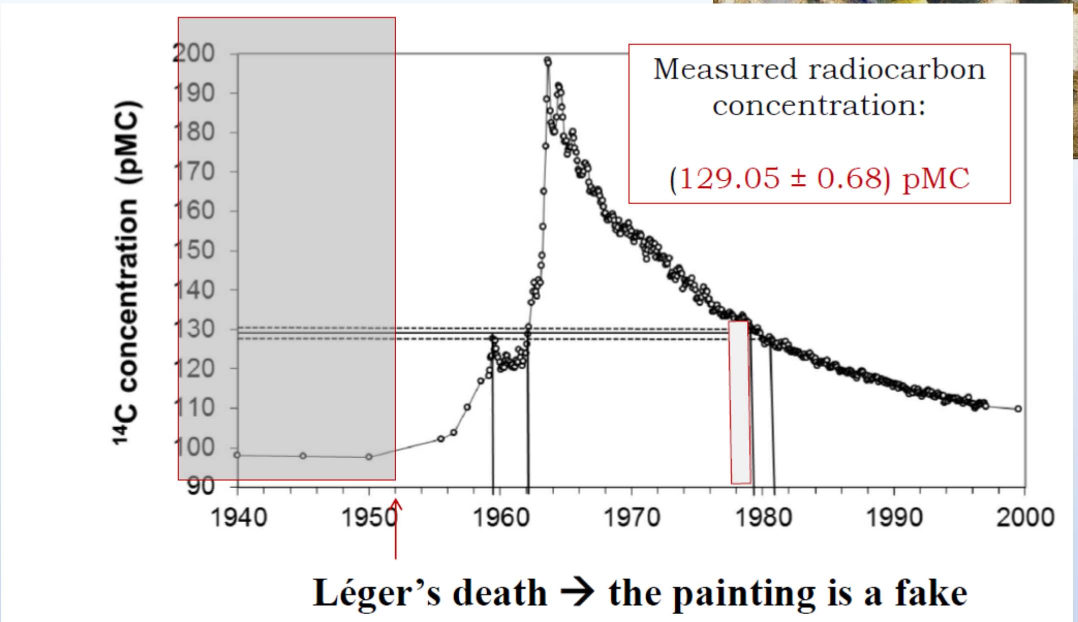
- When groundwater – especially from deep down – is pumped to the surface, it brings with it dissolved organic matter preserved from long ago.
- Once sunlight and oxygen hit this matter, it can easily turn into carbon dioxide.




- That means groundwater is likely to be yet another source of planet-heating greenhouse gases (GHG) -> is not included in our carbon budgets.

# Accelerators for Cultural Heritage

- Ion beam Analysis (IBA) allows preserve cultural heritage objects as well as detect art forgeries
- PIXE techniques can determine original compositions of different alloys - for example to reveal the past of Apoxyomenos statue
- Accelerator Mass Spectroscopy (AMS) can distinguish original pieces from fake ones - for example Leger's painting

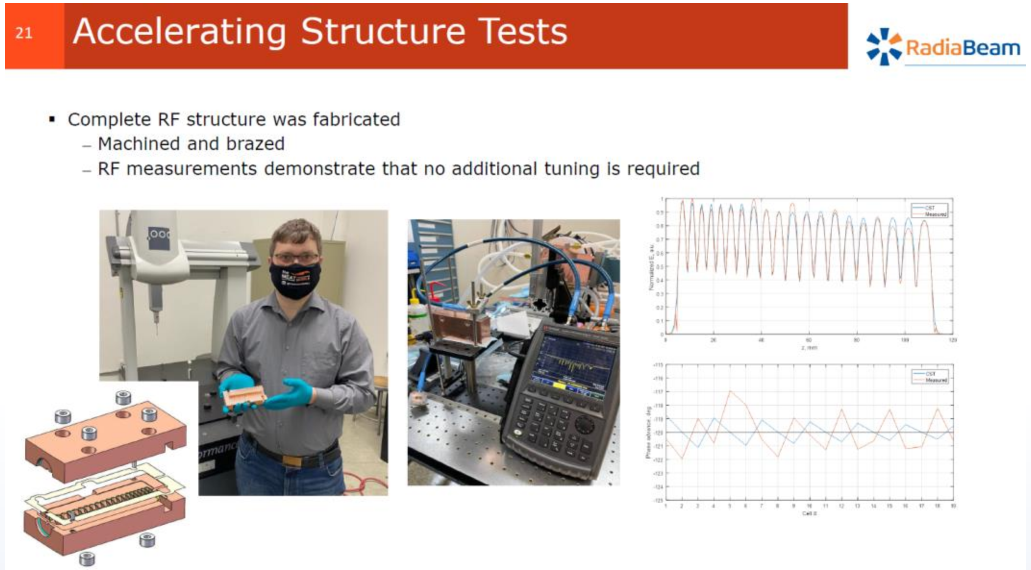


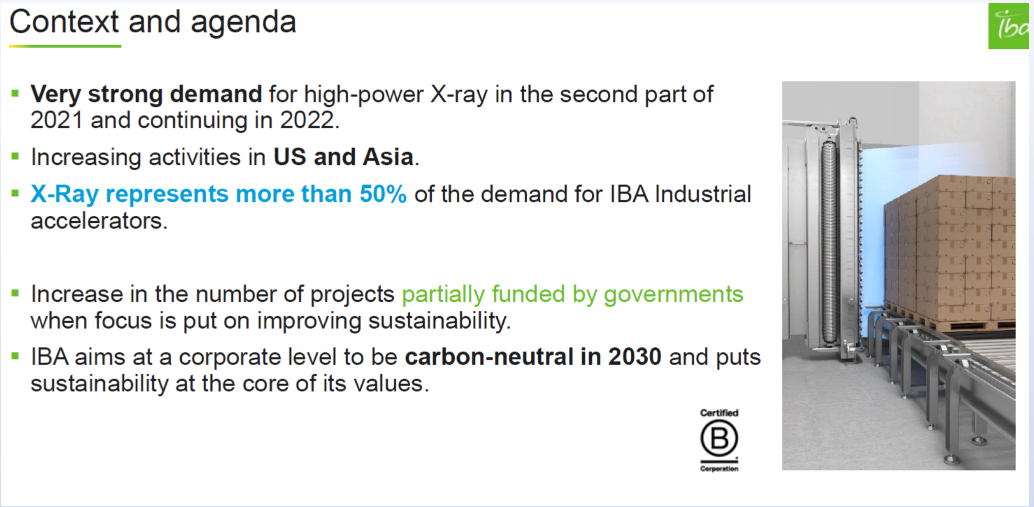
# Regulatory Aspects

- New uses of accelerators and new accelerator-based facilities can be a challenge to the regulatory bodies, who have to deal with new technologies, for which no specific requirements may exist in the national legal and regulatory framework.
- Regulatory bodies have to quickly adjust and find solutions
  - to authorize and inspect the facilities and activities
  - to review and assess complex safety cases, including shielding and ventilation systems
  - to optimize authorization and inspection process, for example by establishing a new categorization for the different accelerators
- Regulatory bodies face challenges to adjust their National Regulatory framework for this widely and very evolving technology in terms of requirements, training and regulatory processes.

# Side Events

- The IAEA Collaborating Centres and their role in applying and promoting nuclear techniques for a host of societal applications and training in nuclear science
- Promotion of Self-Reliance and Sustainability of National Nuclear Institutions
- The position, role, and achievements of women in accelerator-based science
- **Recent developments on accelerator-based sources of radiation for industrial purposes**
  - **Neutron sources (Jerome Schwindling, CEA, France)**
  - **Electron sources (Anne-Laure Lamure, RadiaBeam, USA)**
  - **X-ray sources (Arnaud Pierard, IBA, Belgium)**



# Conclusions

- Other topics not mentioned in this overview:
  - Accelerators for material science
  - Nuclear data
  - Food and agriculture
  - Education
  - Cost efficiency and improving public acceptance
- IAEA support:
  - Collaborating Centers, Coordinated Research Projects and Technical Cooperation Projects, Training opportunities, Publications and Databases, etc
- New ion beam facility in Siebersdofr?
- Next conference in 2025?