WP12 - Societal Applications

Task 12.1 - A Strategy for Implementing Novel Societal Applications of Accelerators

Rob Edgecock on behalf of Task 12.1

Objectives

- Study some new and important societal applications of accelerators with the aim of developing roadmaps for their innovation: novel forms of radiotherapy for cancer treatment, reduction of environmental pollution, new imaging techniques, improved methods for radioisotope production.
- Develop a strategy to deliver these roadmaps.
- Study the barriers which discourage the use of accelerators in industry.

Sub-Tasks

- Sub-task 1. Coordination and Communication
  (Rob Edgecock - HUD)
- Sub-task 2. Novel forms of radiotherapy
  (Angeles Faus-Golfe - CNRS)
- Sub-task 3. Environmental applications of electron beams
  (Toms Torims – RTU
  Andrzej Chmielewski - INCT)
- Sub-task 4. Accelerator imaging
  (Graeme Burt - ULANCS)
- Sub-task 5. Accelerator production of radioisotopes for imaging and therapy
  (Conchi Oliver - CIEMAT)
- Sub-task 6. Barriers to accelerator adoption by industry
  (Andrzej Chmielewski – INCT
  Andrea Sagatova – STU)

Task12.1.2: Novel Forms of Radiotherapy

CHALLENGES IN RADIOTHERAPY

New RT approaches

RT treatment of some radio resistant tumours, paediatric cancers and tumours close to or delicate structure (i.e. spinal cord) is currently limited

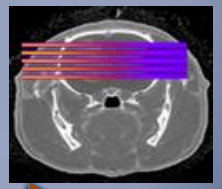
One of the main challenges is to find approaches to increase the normal tissue resistance

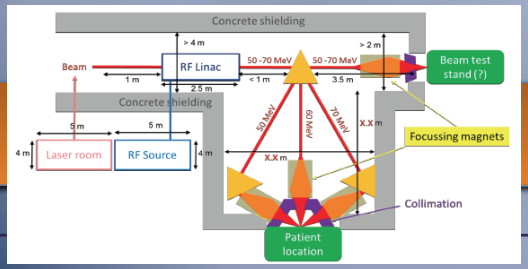
Standard RT is restricted to the few temporal and spatial schemes, dose rates, broad field sizes: mainly photons, 2 Gy/session, 1 session/day, 5 days/week, dose rates ~ 2 Gy/min, field sizes > cm², homogeneous dose distributions

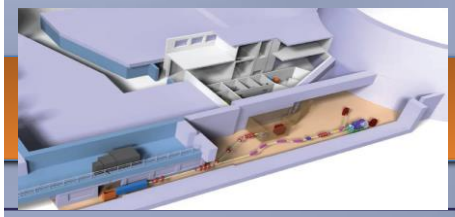
Possible strategies to spare normal tissue

Different particle types: Very High Energy Electrons (VHEE)

Different dose delivery methods: Grid Mini-beam or FLASH RT





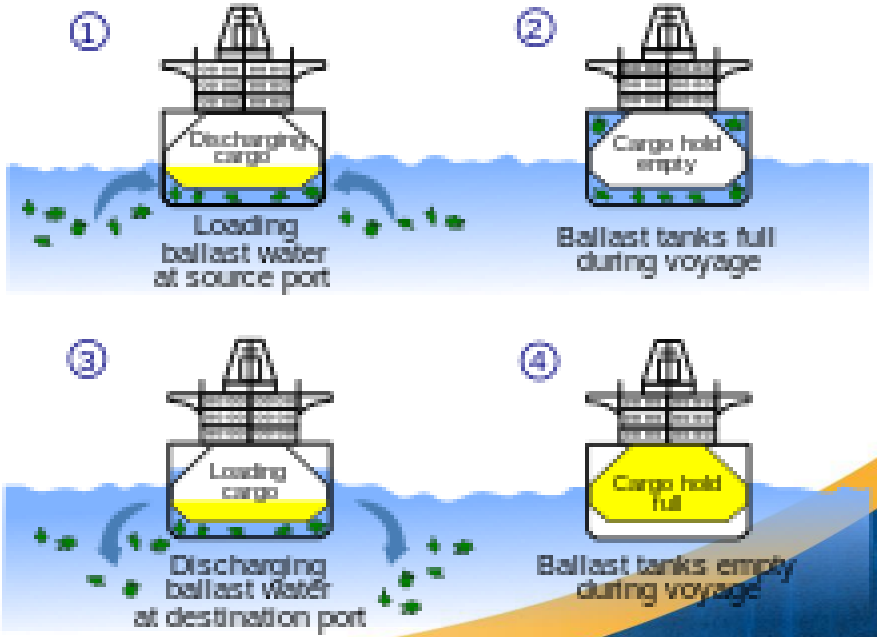


Task12.1.2: Novel Forms of Radiotherapy

- Study novel forms of RT that could bring substantial improvements
- Examples:
  - Mini-beams with electrons and protons
  - Flash with electrons and protons
  - More cost-effective therapy with ions
  - Boron Neutron Capture Therapy
  - Etc
- Accelerator technology to deliver these

Task12.1.3: Environmental Applications of EB

- Many possibilities
- Wastewater and sewage sludge treatment:
  - Improved bio-gas and fertiliser
  - Removal of PPCPs, POPs, microplastics
  - Suppression of AMR growth
- Marine diesel engine exhaust gases treatment
- Ship ballast water
- Leather tanning
- Etc

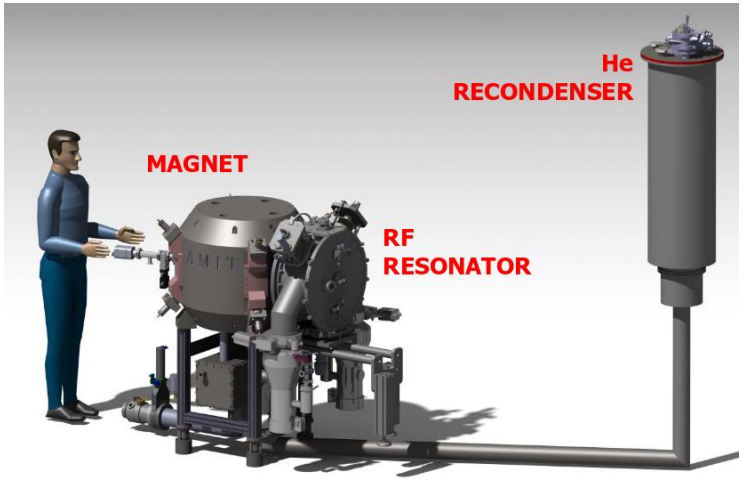


Task12.1.4: Accelerator imaging

- Innovative uses of accelerators for imaging
- Focus on security and medical uses
- Examples:
  - X-ray cargo scanning and non-destructive testing
  - neutron sources for non-destructive testing
  - proton radiography
  - X-ray imaging of dense targets
  - Compact Compton sources

Task12.1.5: Radioisotope Production

- Investigate isotopes with potential, but with limited availability due to current accelerator technology
- Study new technology
- Examples:
  - Compact circular accelerators
  - Compact linacs
  - Laser-plasma
  - Etc
- Study their practical implementation



Task12.1.6: Barriers for Industry

- Introducing accelerators in new areas can be difficult
- This task will study some of the barriers
- Examples:
  - The R word
  - Perception of cost and complexity
  - Lack of knowledge and experience
  - Risks
  - Etc
- Find ways of addressing the concerns
- Use recent converts as examples

Deliverable and Milestones

D12.1	Strategy for Implementing Novel Societal Applications of Accelerators	HUD	R	M28
MS57	Projects identification for development funding	12.1	M10	Abstract of proposals
MS58	Completion of strategy documents for each application area	12.1	M40	Report