Implementation of a portable PET scanner for proton therapy beam quality assessment

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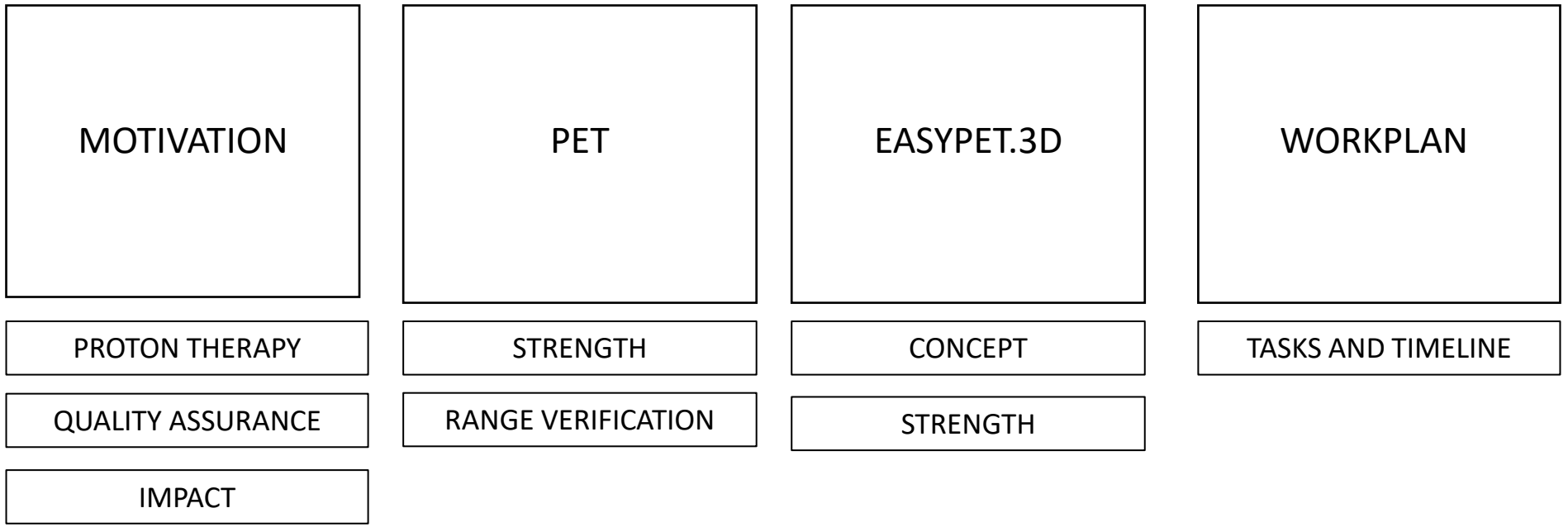

MOTIVATION
PET
EASYPET.3D
WORKPLAN
PROTON THERAPY
QUALITY ASSURANCE
IMPACT
STRENGTH
RANGE VERIFICATION
CONCEPT
STRENGTH
TASKS AND TIMELINE

Motivation

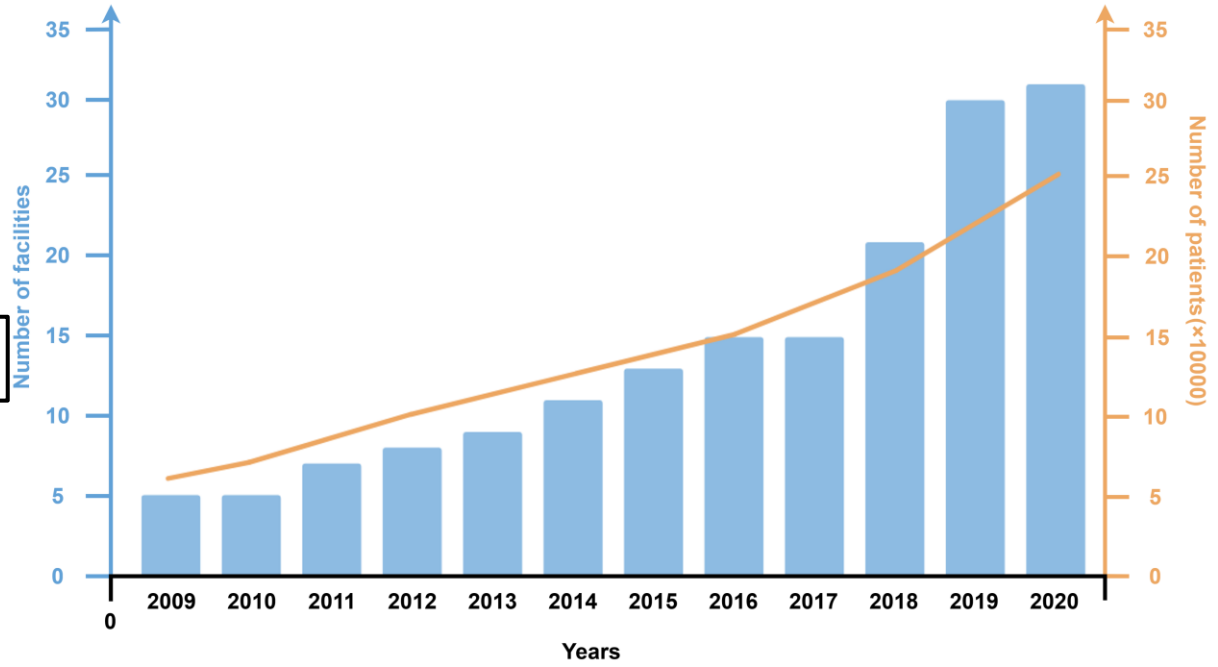
Proton Therapy adoption worldwide has been growing.

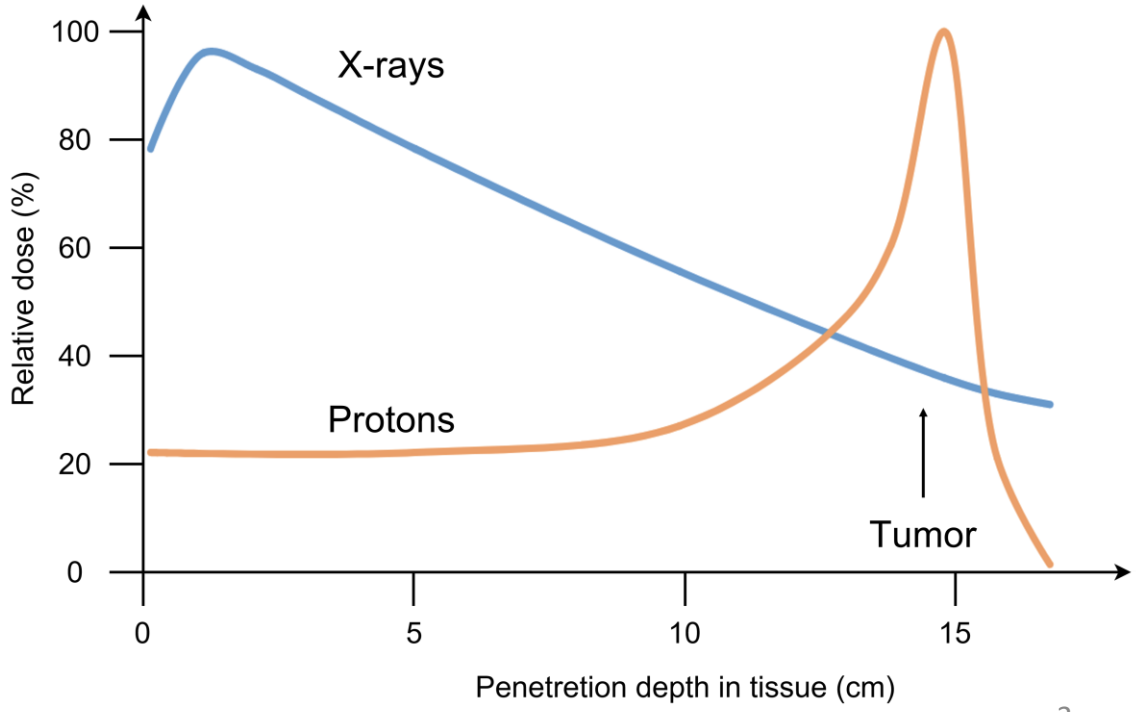
Why?

Precise beam (Bragg peak)

↓

More integral dose to the tumor and less to the normal tissues





Motivation

LACK EFFECTIVE SOLUTIONS/TOOLS FOR BEAM QUALITY ASSURANCE

HIGHLY CHALLENGING

Provide a fast and high-quality image

Portable and economical solution

Capable of being integrated smoothly into clinical environment

- *In vivo* dosimetry
- MRI
- Prompt Gamma detectors
- PET

SOLUTION:
Benchtop **portable** and **high-performance** PET prototype (based on **EasyPET.3D** system) for 3D quality assessment of the beam delivery.

PET

Protons through nuclear reactions creates positron-emitting isotopes (e.g., ^{11}C, ^{13}N, ^{15}O)

↓ decay

Positron annihilate with electrons

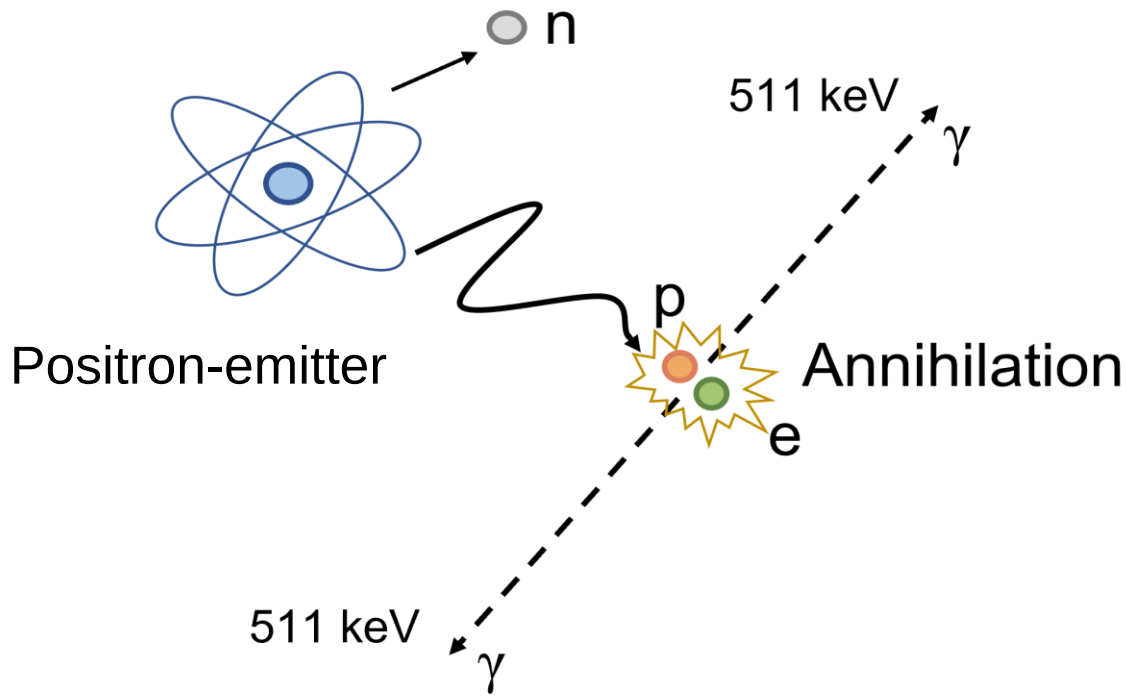
↓ emit

511 keV gamma rays

Detected by a PET scanner

→

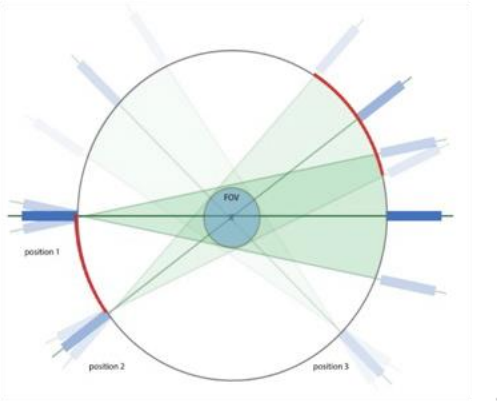
Can give an insight about the planned and delivered treatment.



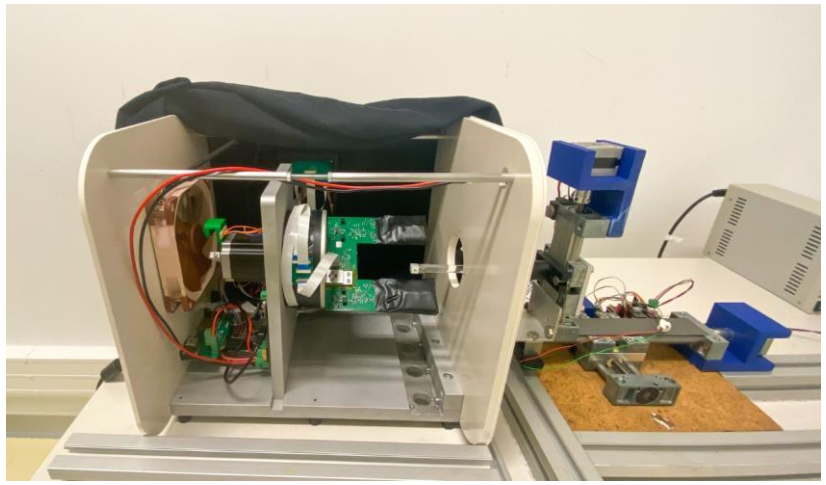
EasyPET.3D System

Patented Technology

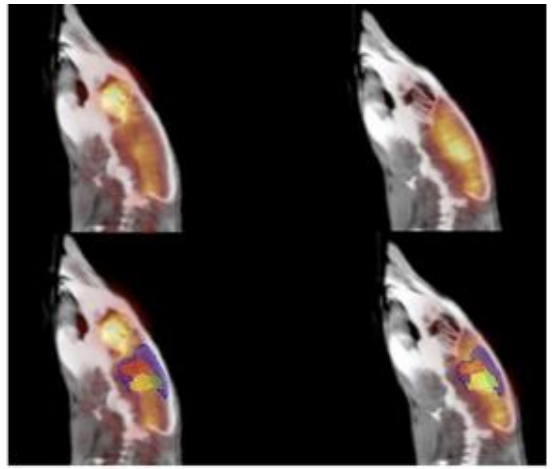
PCT/IB2016/051487

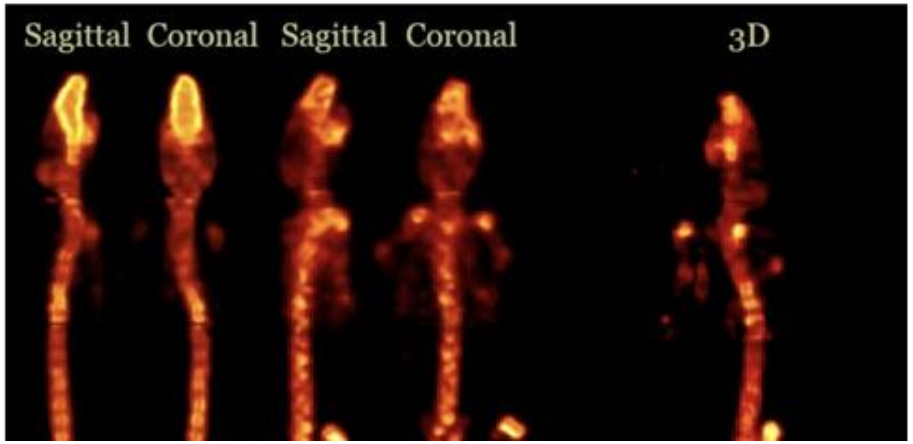


Less components → Less complexity → **Cost-effective high-resolution PET scanner solution**

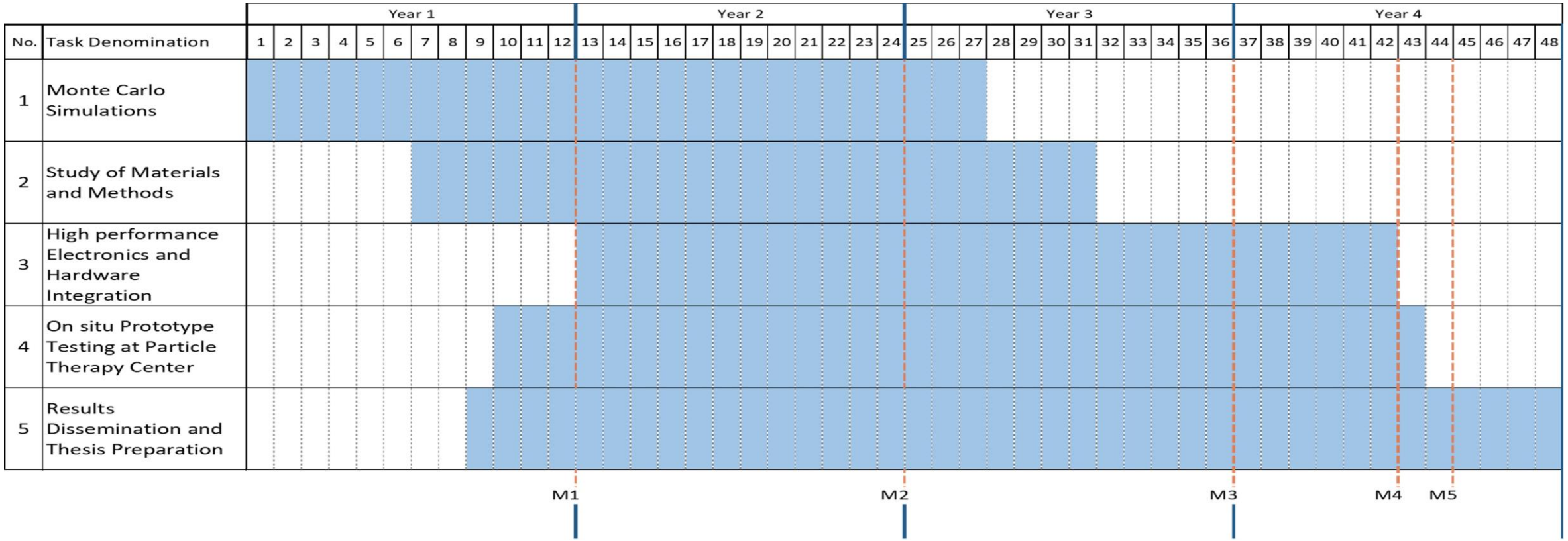


Real-time high quality *in-vivo* images of mice





Workplan



M1: Simulation framework ready, evaluation of the first results using figures of merit.
M2: Identification of limitations of current technology and future upgrades.
M3: Evaluation of new hardware solutions in laboratory and integration in a prototype.
M4: Final prototype.
M5: Final prototype evaluation in real context at PSI Proton Therapy Center.

Conclusion

The purpose of the present project is to **study the feasibility** of using the cost-effective **EasyPET** technology and phantoms for **quality assurance** of proton beam delivery.

Scanning method produces **high-quality image**

Portability and cost-effectiveness

Less prone to high flux saturation

Acknowledgements

- Research Grant PRT/BD/153499/2021 – ProtoTera.

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Thank you for your attention!

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