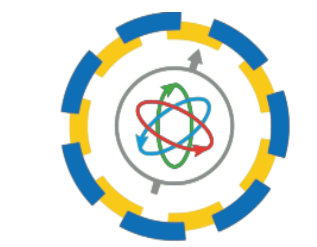




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# Towards molecular in-vivo cancer imaging by means of positronium and the J-PET tomograph

Authors: P. Moskal, M. Bała, Z. Bura, J. Chhokar, M. Dadgar, K. Dulski, K. Farbaniec, A. Gajos, B. Jasińska, H. Karimi, E. Kubicz, G. Korcyl, K. Rakoczy, S. Sharma, E. Stępień for the J-PET collaboration

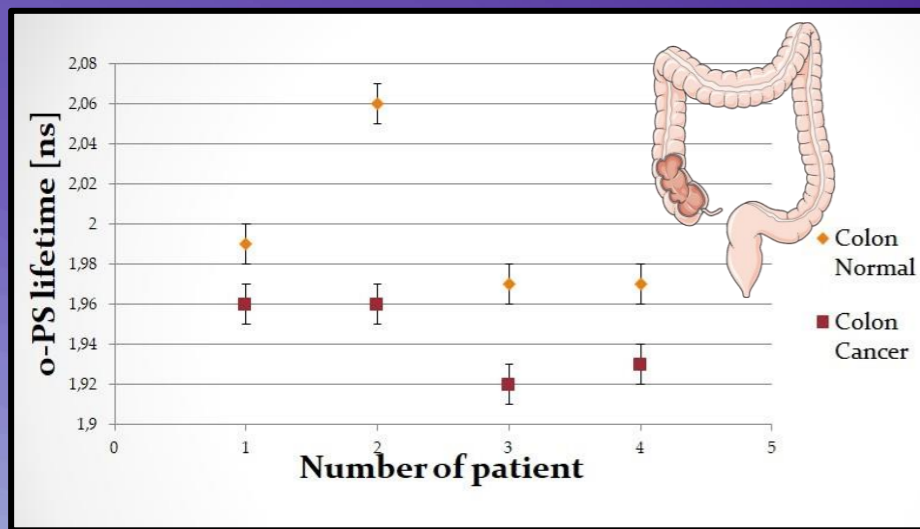


J-PET

J-PET is the first PET scanner built from plastic scintillators. The developed technology enables construction of total body scanners which are : **cost-effective, modular, reconfigurable, light and portable**

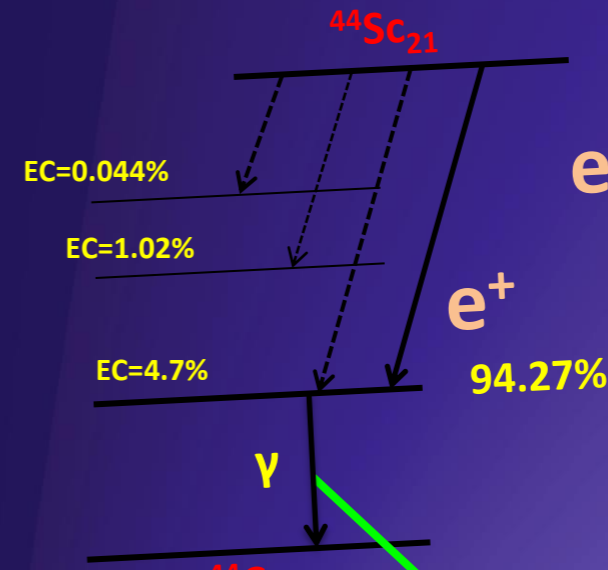
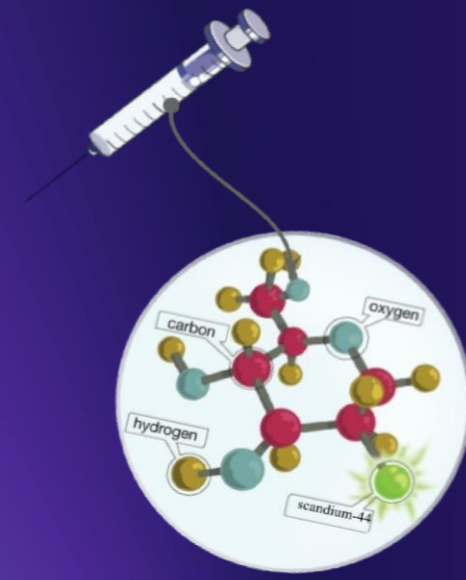
## Step 6. Conclusion

- Combining metabolic and positronium images the doctor recognizes a position of possible cancer tissues, and has access to the **positronium properties** which are correlated with the grade and stage of cancer.
- The graph presents lifetimes of positronium in normal and cancer colon tissues.



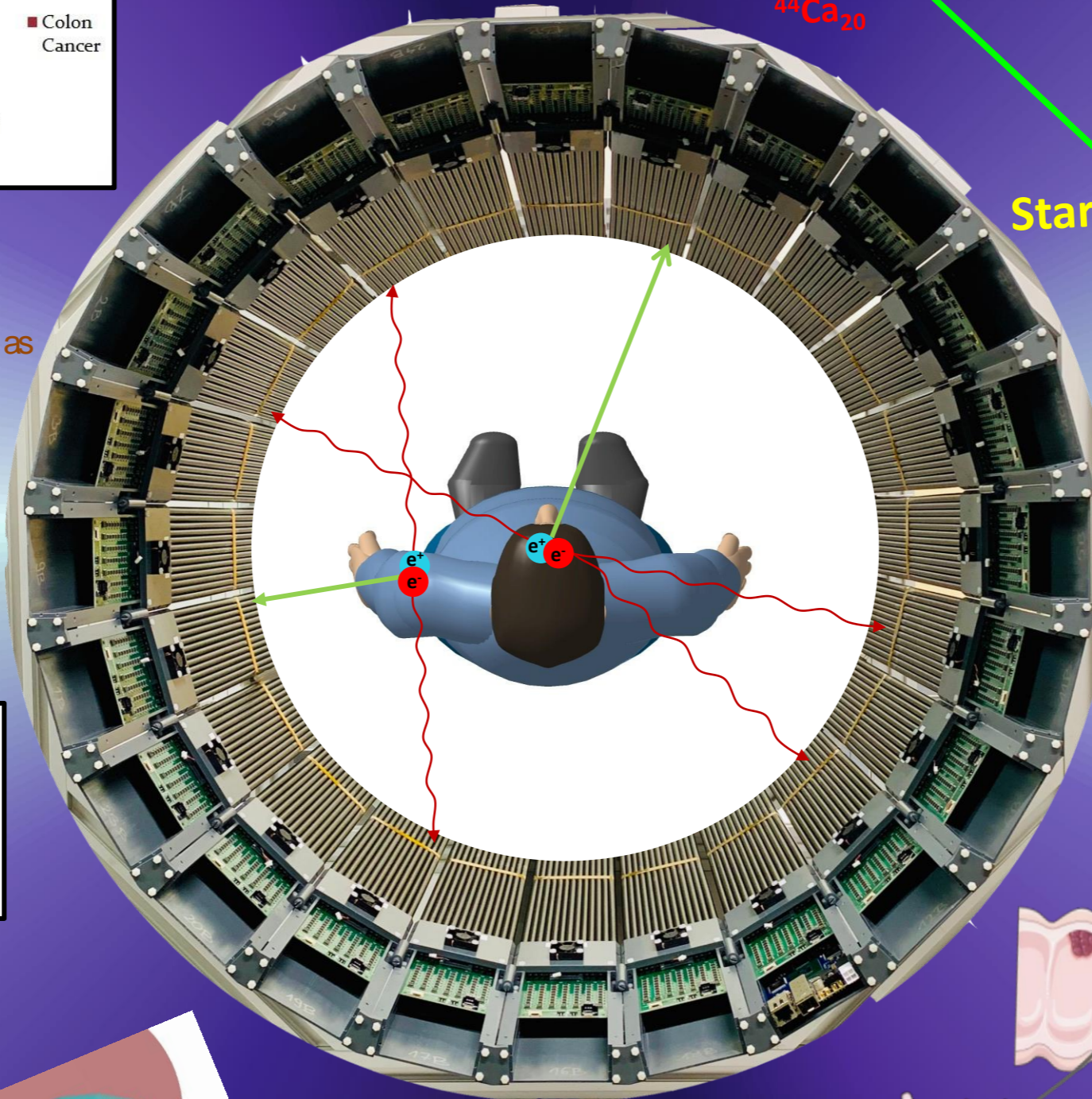
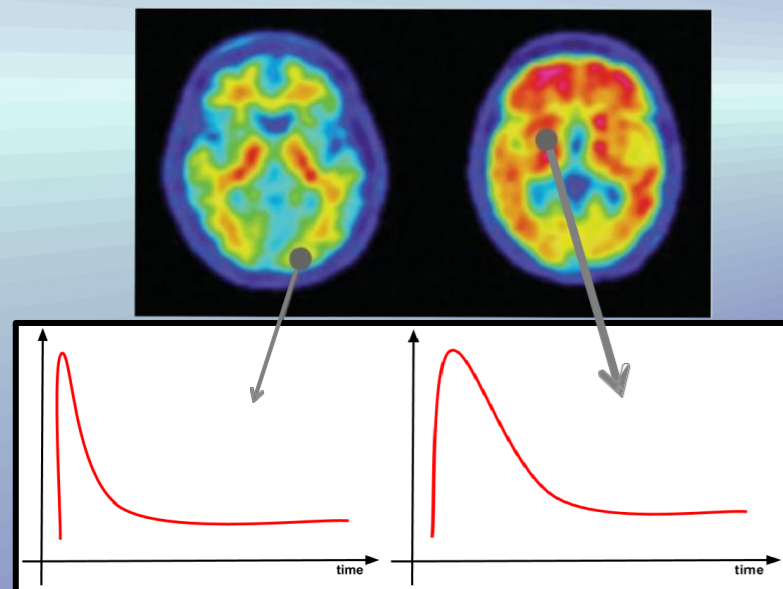
## Step 1. Injection

Pharmaceutical labelled with radioisotope for example scandium ( $^{44}\text{Sc}$ ), is injected to the patient body. Radioisotopes are attached to biological carrier molecules.



## Step 5. Medical Information

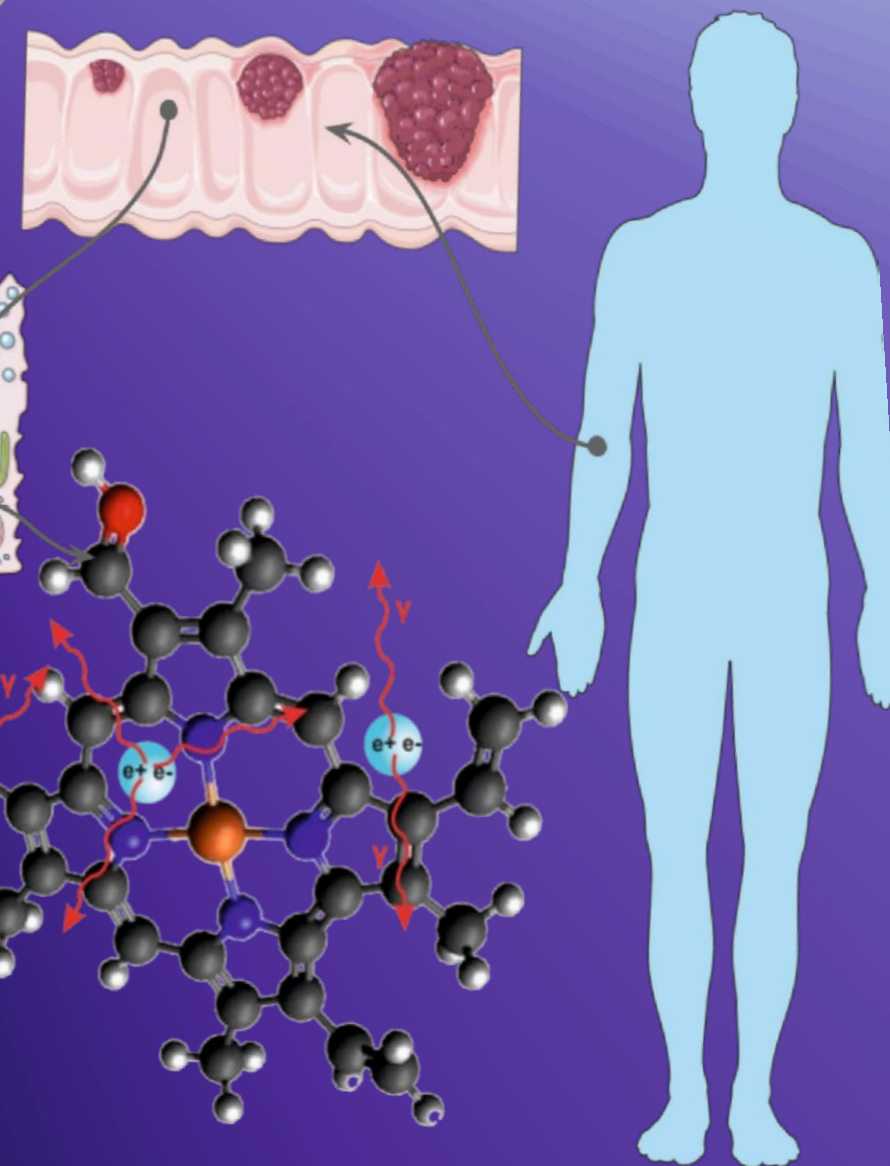
J-PET tomograph delivers metabolic image as well as an image of positronium properties in the body.



## Step 2. Molecular structure

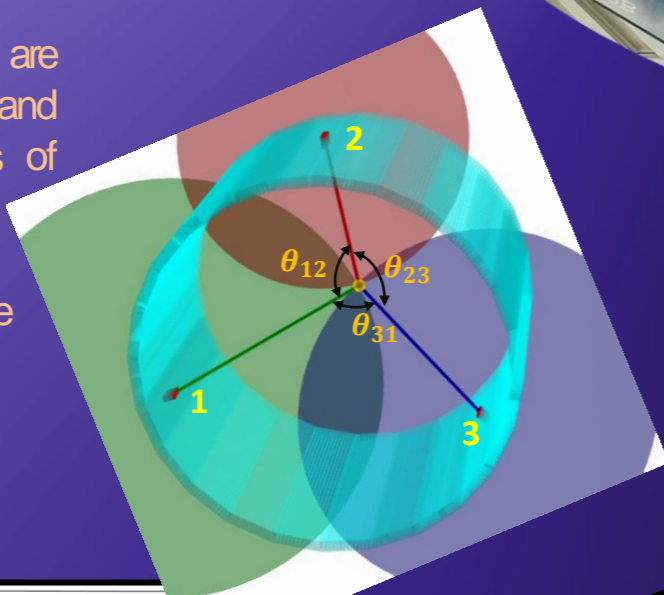
Positrons emitted from radionuclide are annihilating with electrons in the body. Annihilation of positron and electron results mostly in two or three photons.

In the body, in about 35% cases, this process proceeds via production of positronium atom.



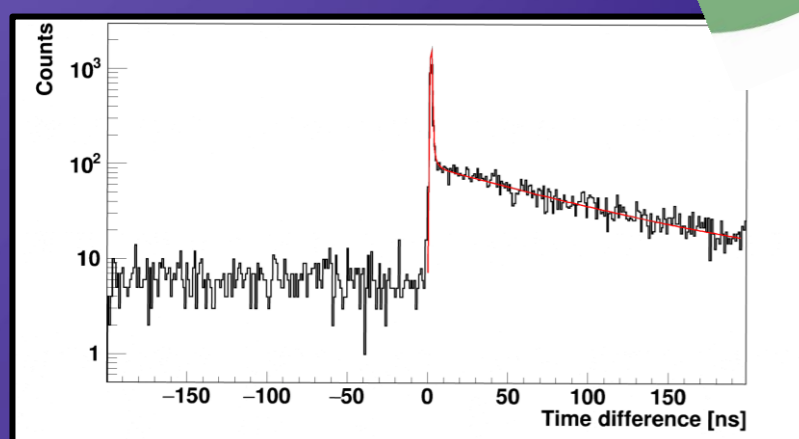
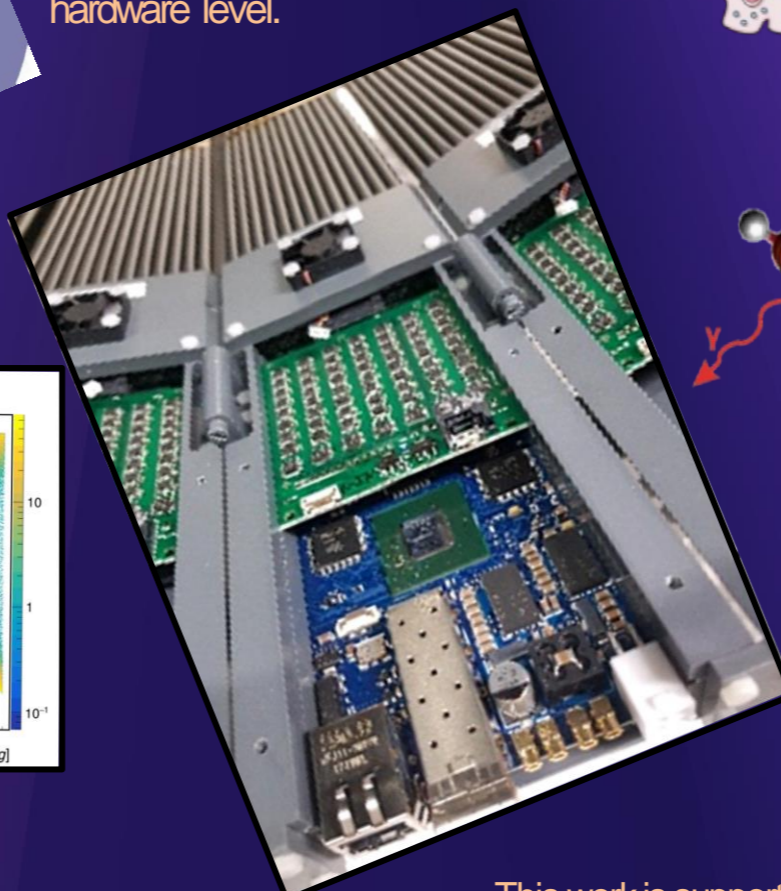
## Step 4. Data Acquisition

- Data from the J-PET scanner are collected in triggerless mode, and then are analysed by means of dedicated compute programs.
- The elaborated procedures enable determination of positronium properties in the patient body.



## Step 3. Electronics

Readout system of the J-PET scanner enables true real-time imaging on the hardware level.



## References:

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