

Endoscopic TOFPET

(Time of Flight Positron Emission Tomography)

& Ultrasound



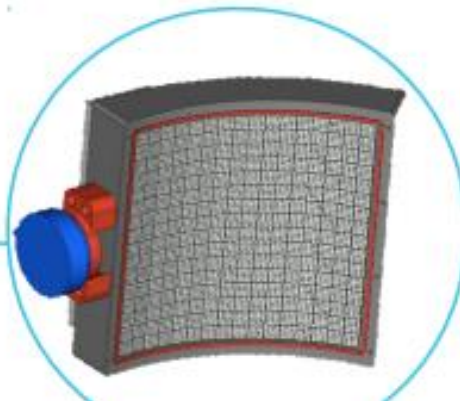
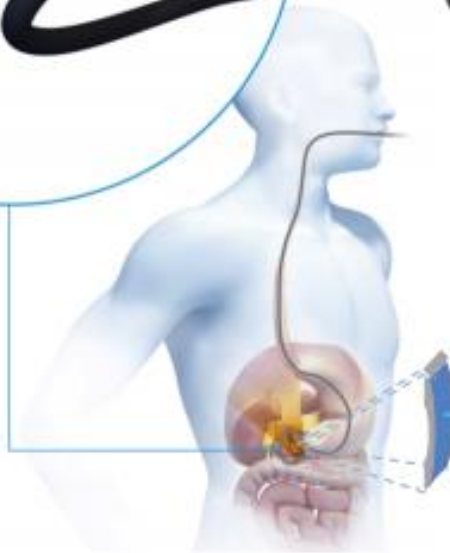
INNA GERTSENSHTEYN
MARCH 24, 2014

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Head of Project: Etienne Auffray

Overall Projects and Goals



- Scintillating Crystals (WP2)
- Ultra-fast Photodetection (WP3)
- Highly Integrated Electronics (WP4)
- System Integration (WP 5)
- Image Reconstruction (WP 5)
- Clinical Development (WP 6)



Focus



Pancreatic Cancer

- 5-year survival rate: 6%
- 4th leading cause for cancer-related death in Western countries
- No reliable method for early detection (yet)
- Standard procedures: Ultrasound and CT scans
 - Lack metabolic information

Prostate Cancer

- 6th leading cause for cancer-related death amongst male population worldwide
- Good prognosis if cancer confined to prostate and treated aggressively
- Standard procedures: Ultrasound and MRI
 - Lack metabolic information

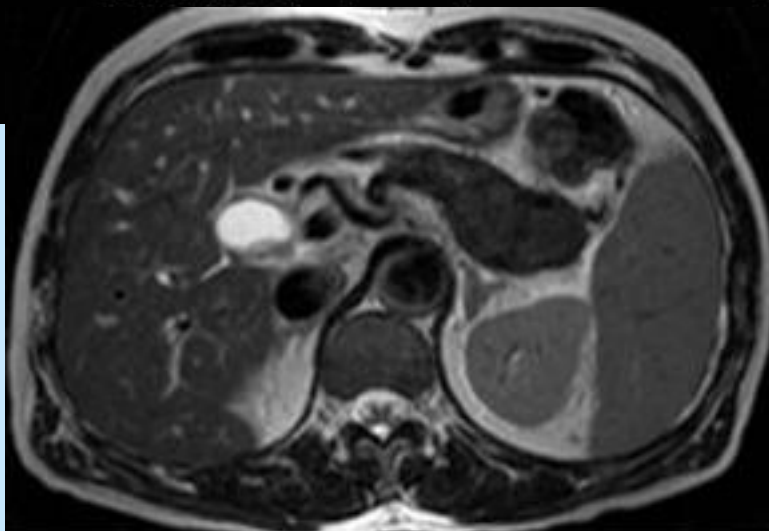
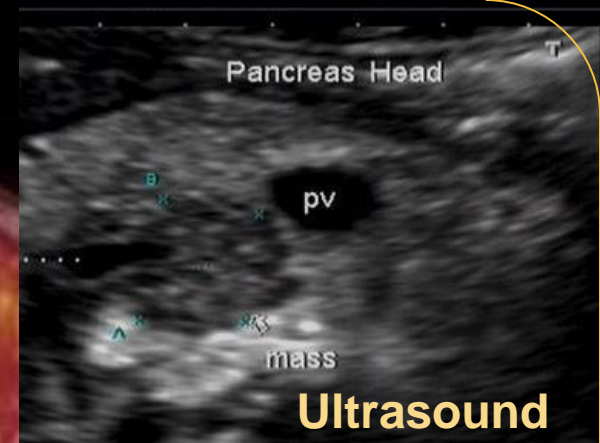
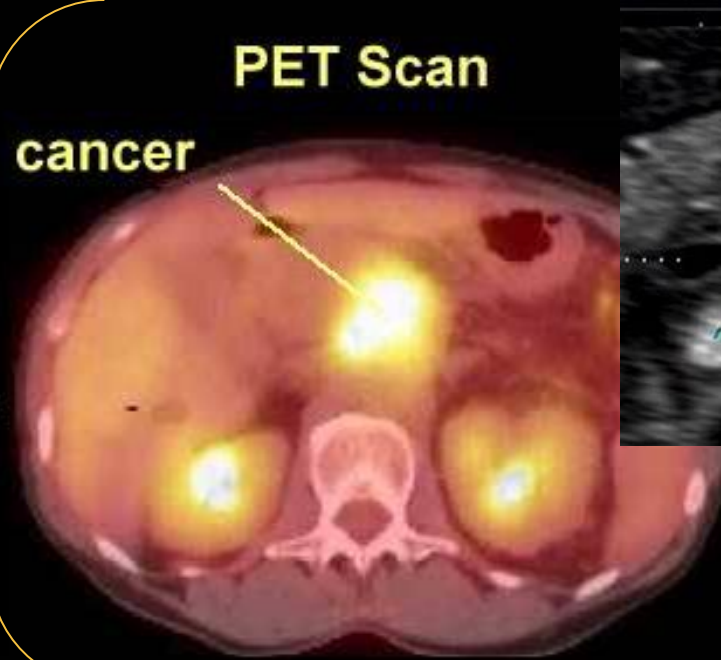
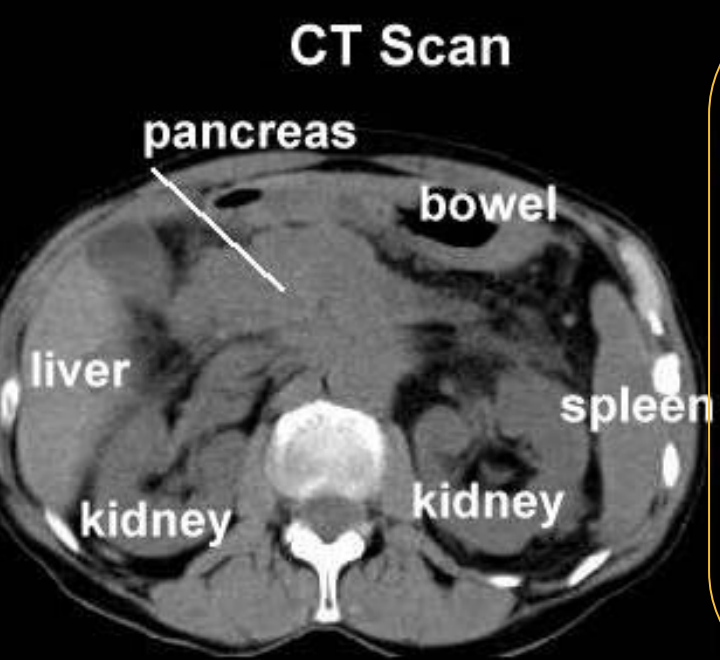


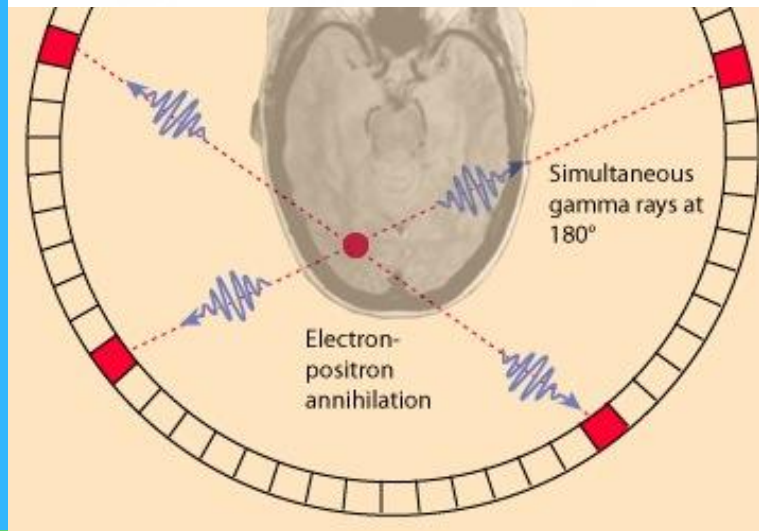
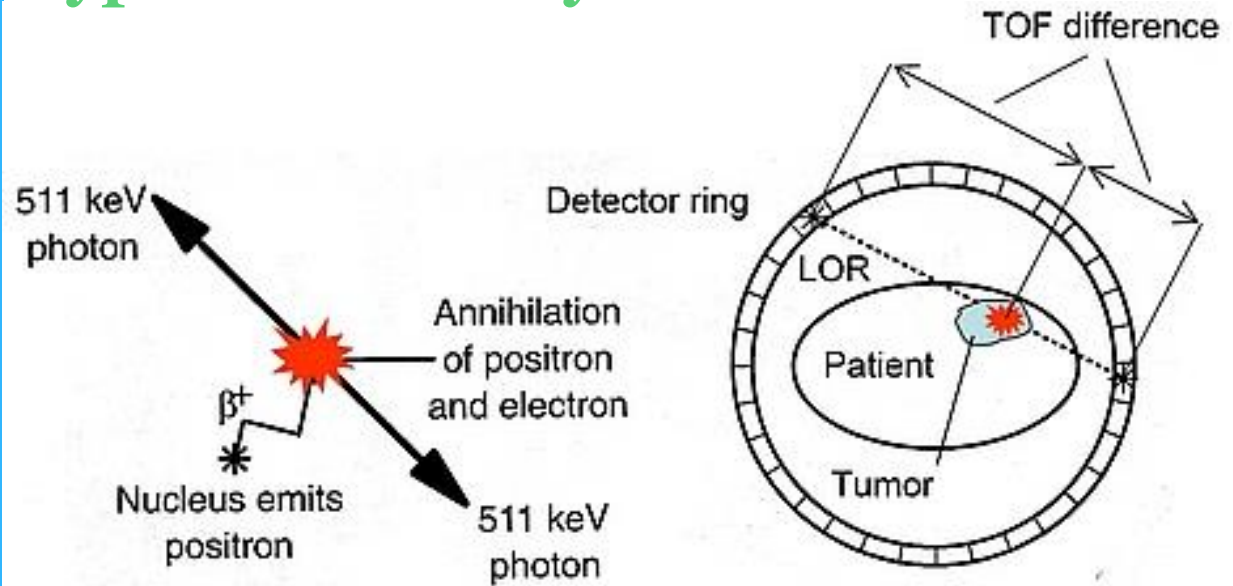
Figure 2. MRI abdomen (T2 weighted image) demonstrating diffuse pancreatic enlargement with low-T2 signal rim around the tail.

Figure 3. CT abdomen with contrast demonstrating diffuse pancreatic enlargement with hypoattenuation. Multiple wedge-shaped low attenuation lesions are present in the bilateral renal cortices.



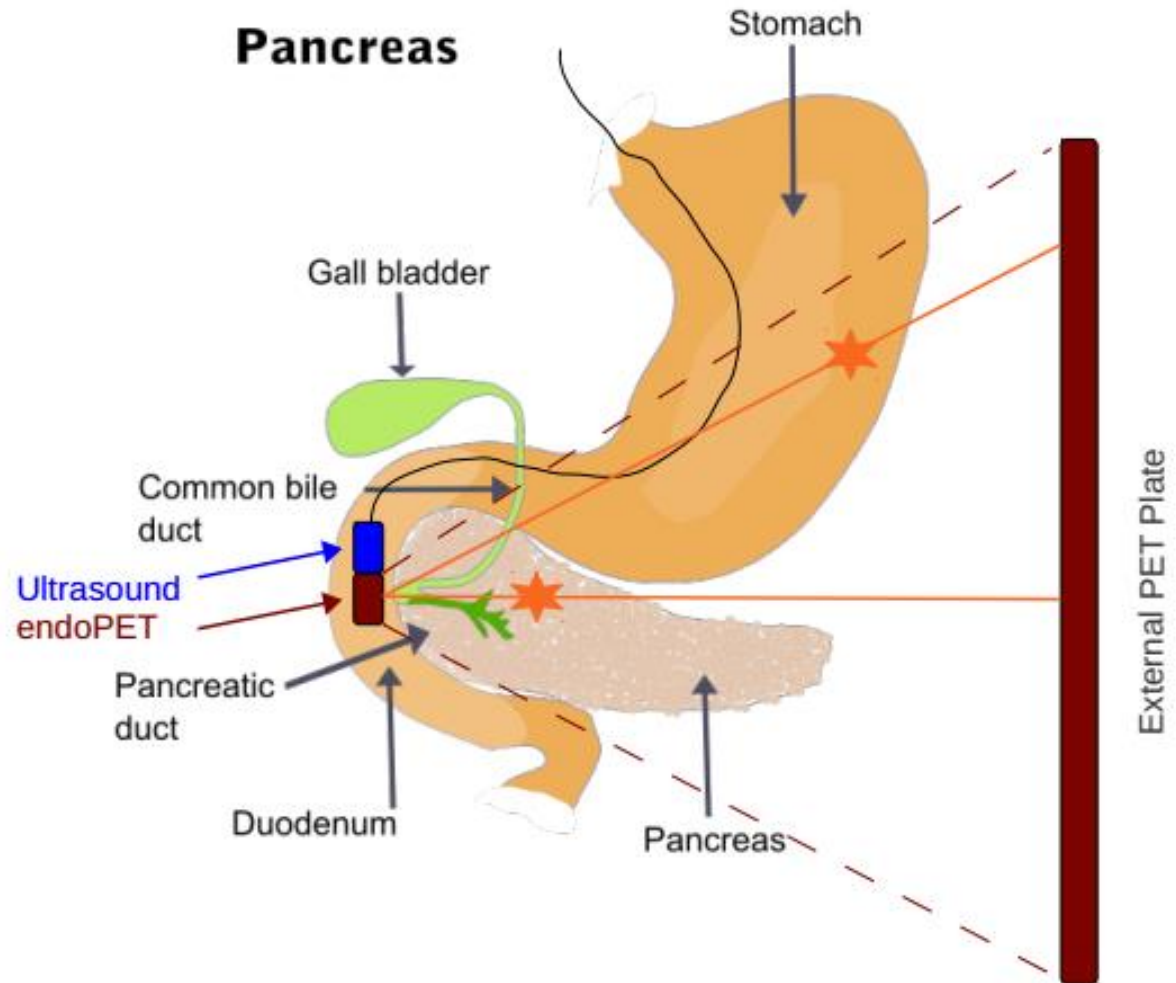
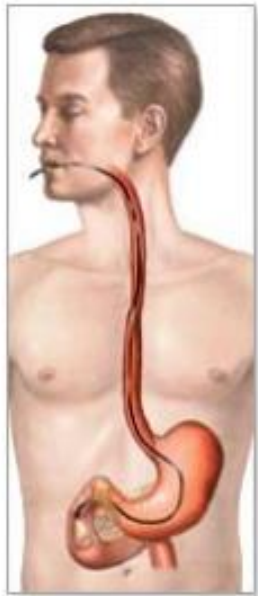
- Fluorodeoxyglucose (FDG) injected into body
- FDG is basically radioactive glucose
- Cancerous cells process glucose differently to normal cells
- FDG releases positrons, which break down and release gamma waves
- PET scanner detects gammas
- Images from scan highlight how FDG is broken down in body, giving insight into tumors' metabolism

Typical Full-Body PET Scan



TOF = Time of Flight
LOR = Line of Response

Endoscopic PET probe



Close-up of probe



First prototype: prostate endoscope

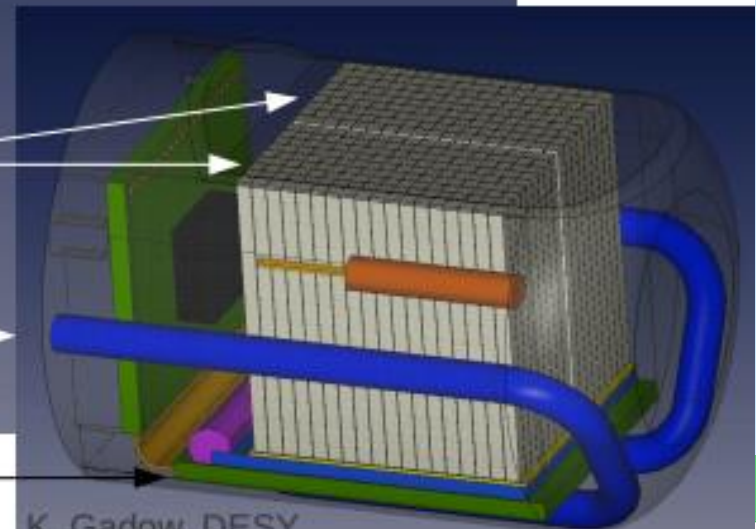
Hitachi EUP-U533
Ultrasound

PET clamped
on endoscope
without
alterations of
endoscope

2 matrices of
9x18 crystals

Water cooling

SPAD PCB

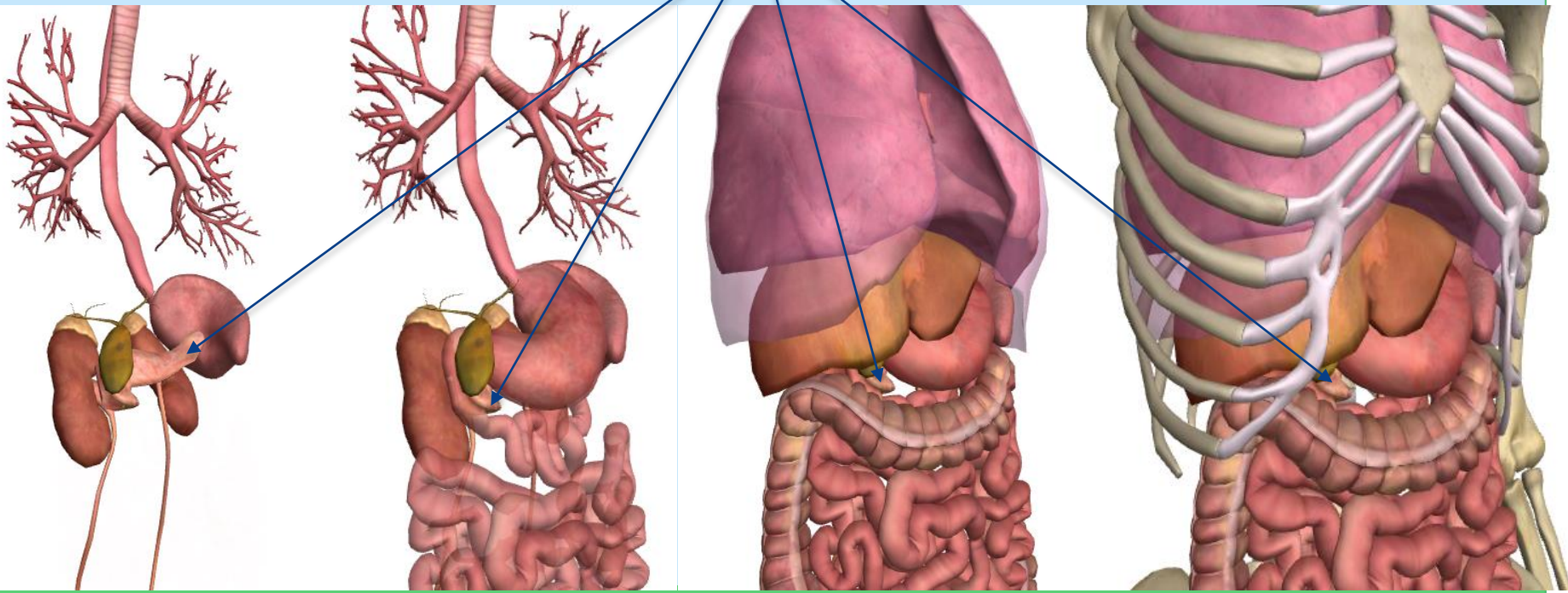


K. Gadov, DESY

What I Do



- Currently working on simulation of phantom pancreas and surrounding organs/bones
(just in case, here is the pancreas)



Preliminary phantom prostate
created on GAMOS 5.0.0
(to be used in future simulations)

Detector
Plate

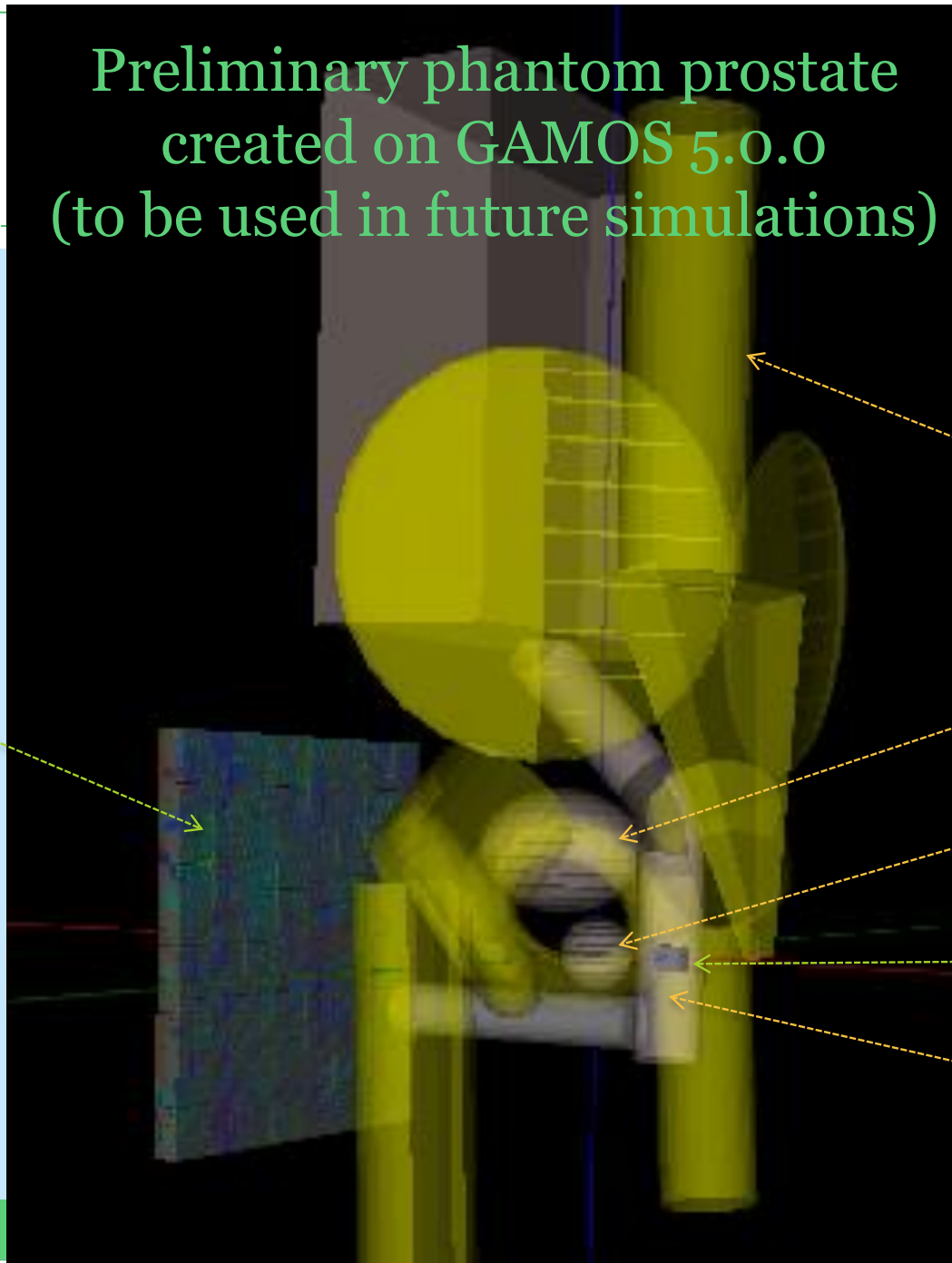
Spine

Bladder

Prostate

PET

Colon



What I Do



- Testing physical and scintillation properties of various crystals

