

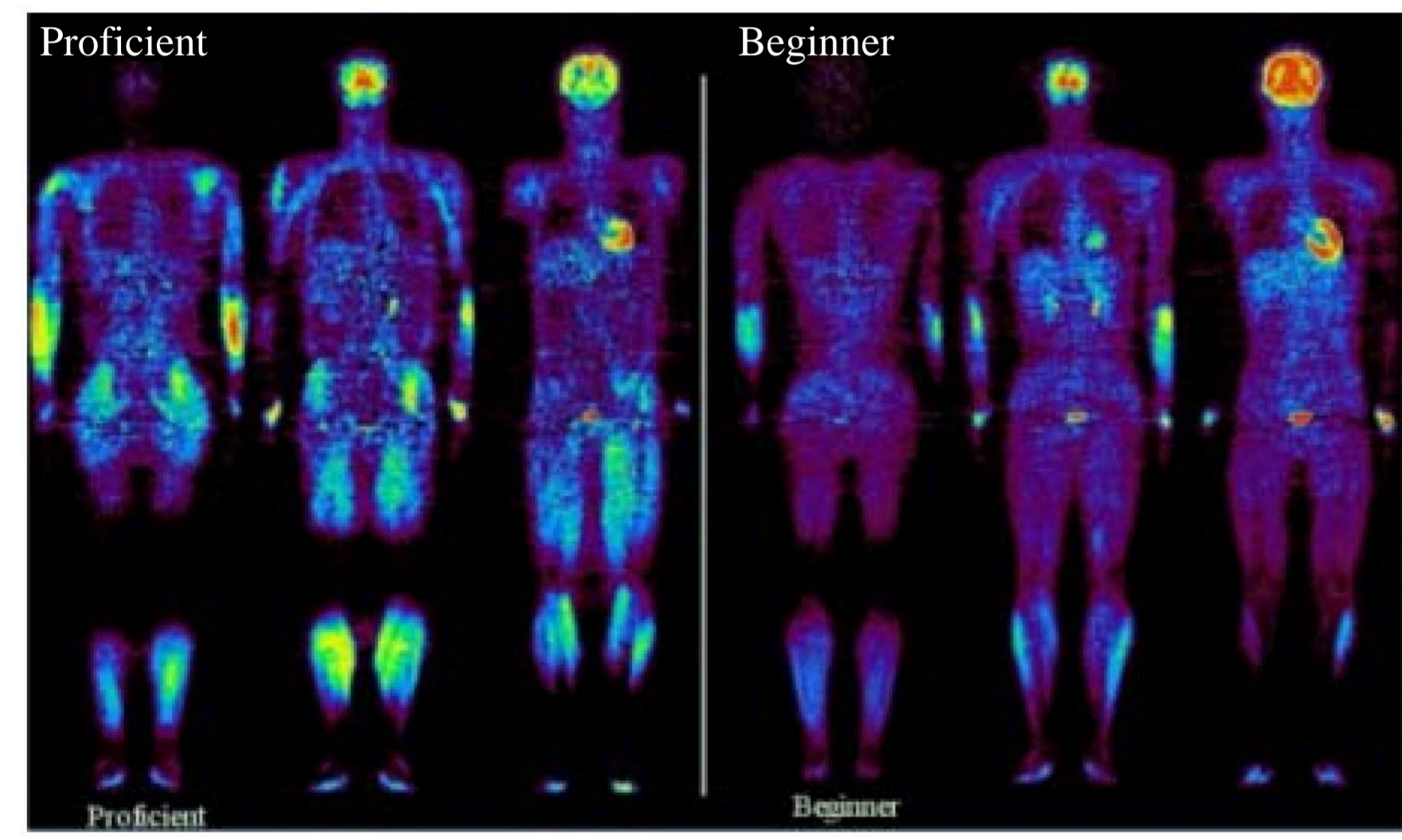
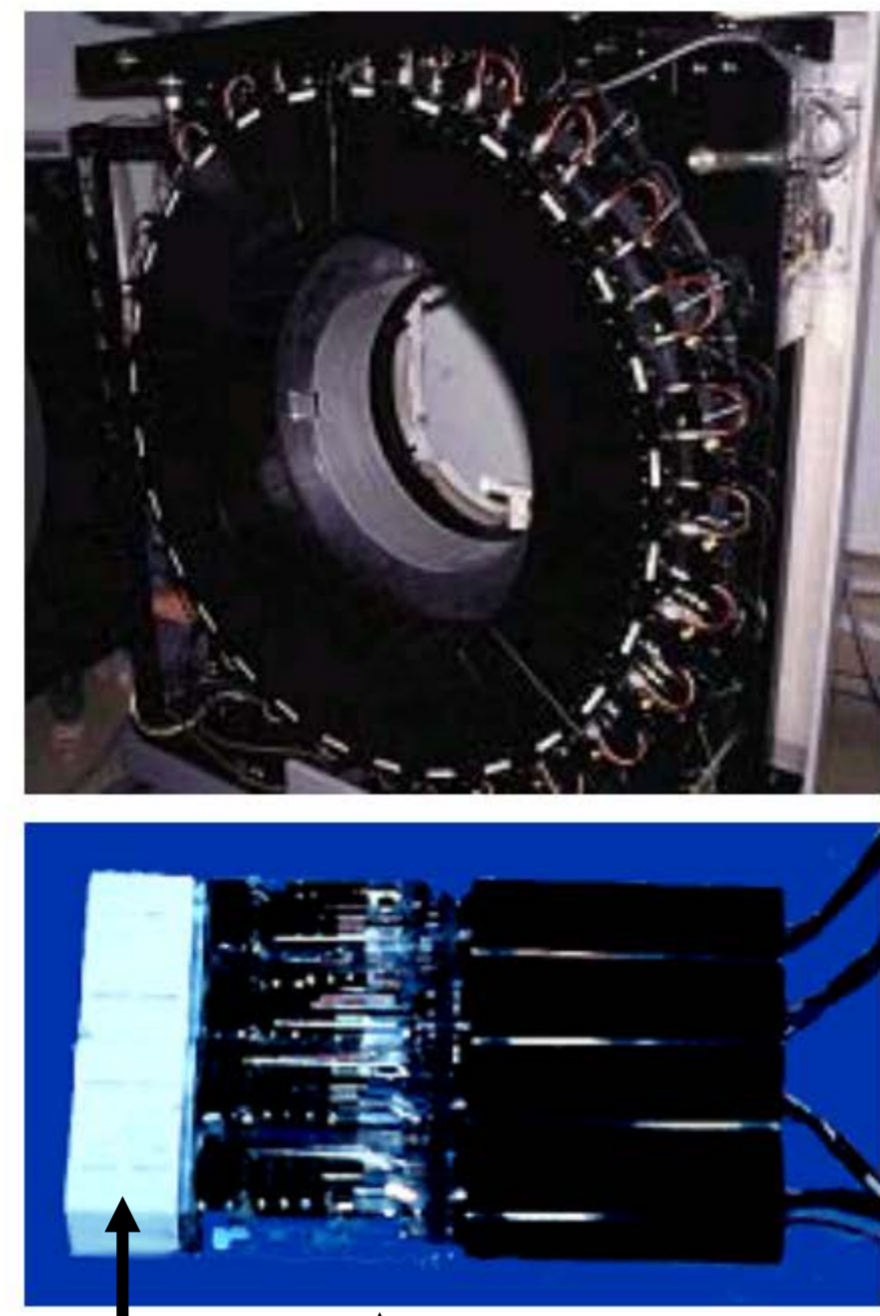
Development of High-Performance PET (Positron Emission Tomography) Scanner

We have developed high performance (next-generation) PET scanners.

PET is a functional imaging modality using the coincident detection of a pair of positron annihilation gamma rays.

PET provides biochemical information about a living body by using positron-emitter-labeled pharmaceuticals.

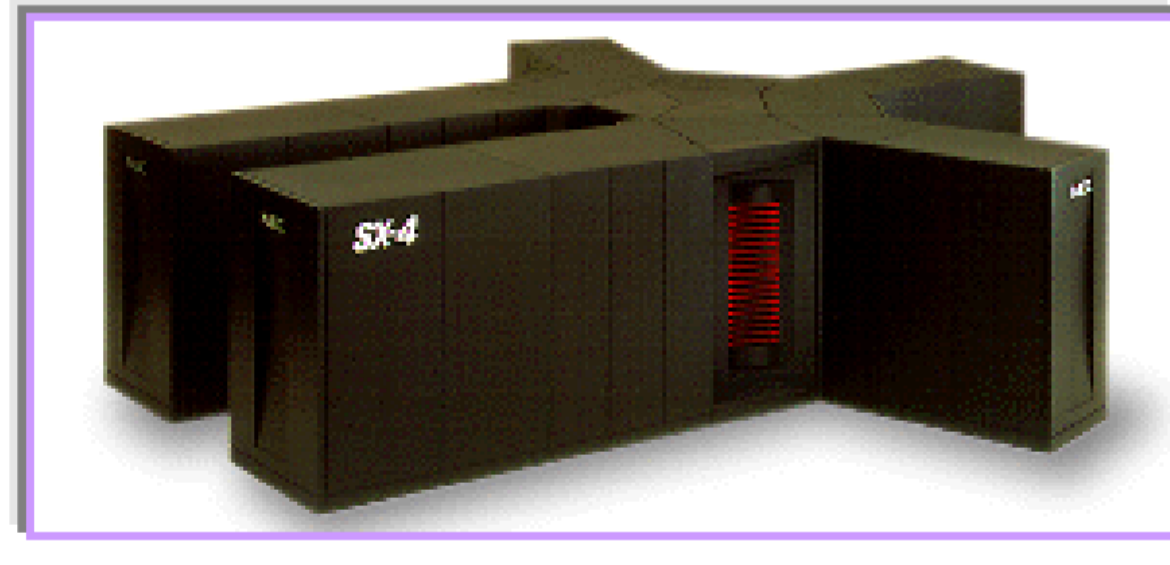
Whole body PET



¹⁸F₂ uptake increased in the skeletal muscles of leg, forearm and hands in the proficient golfer.



FastNetwork
FDDI
(100Mbps/sec)



PET scanner

supercomputer

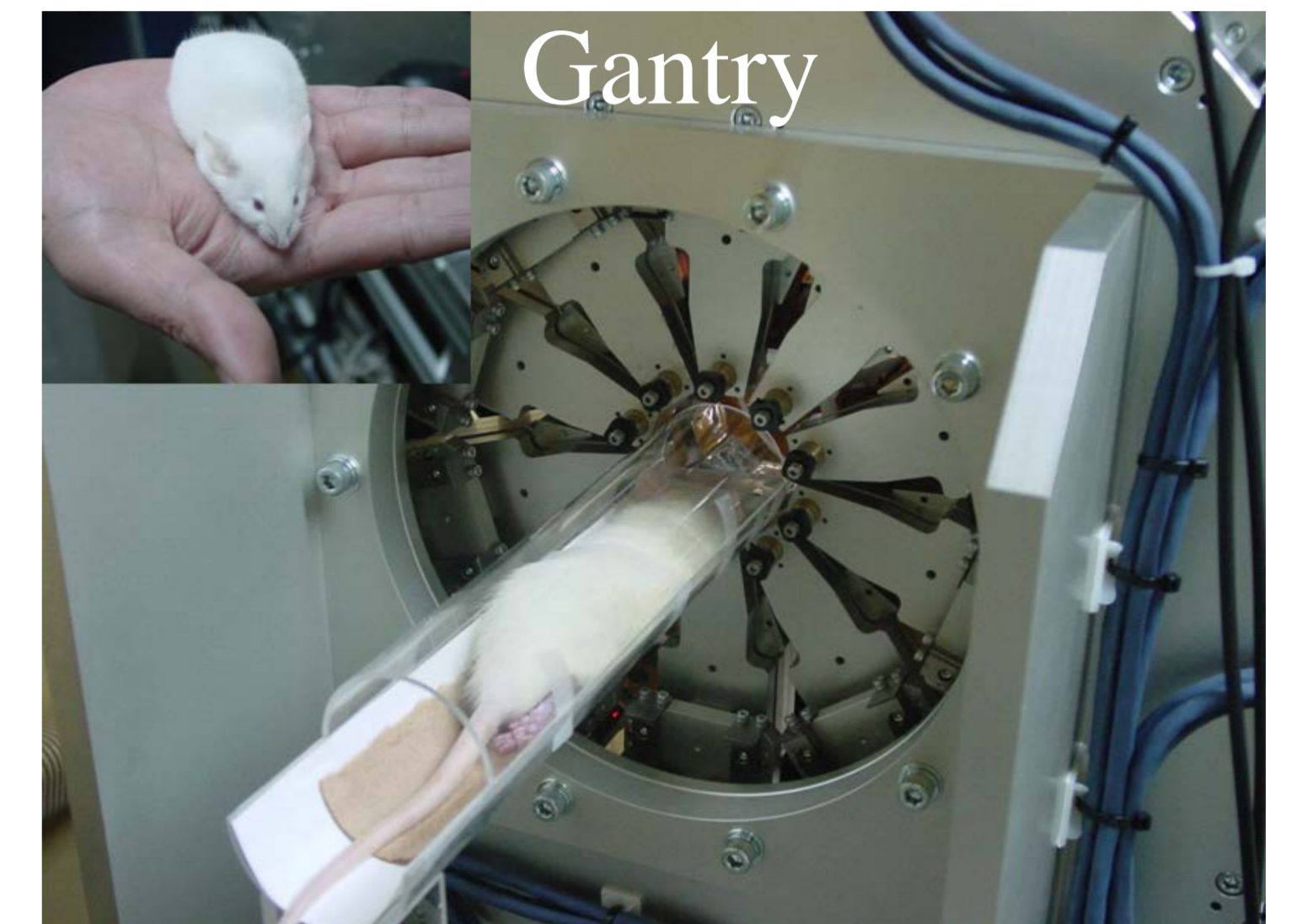
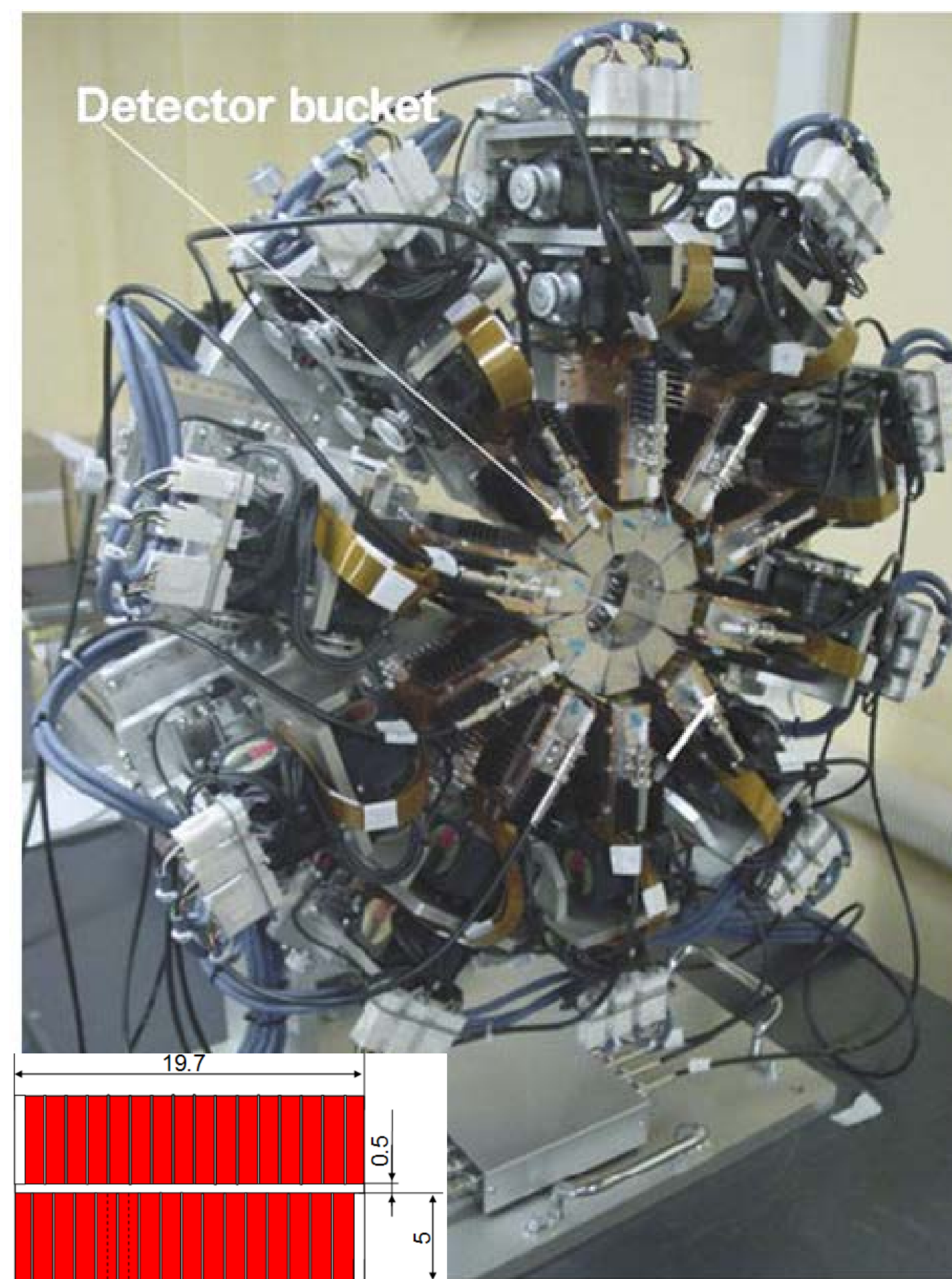
The first achievement of clinical whole body PET

Photomultiplier Tube (PMT)
BGO Scintillator

Ultra-high resolution PET scanner I

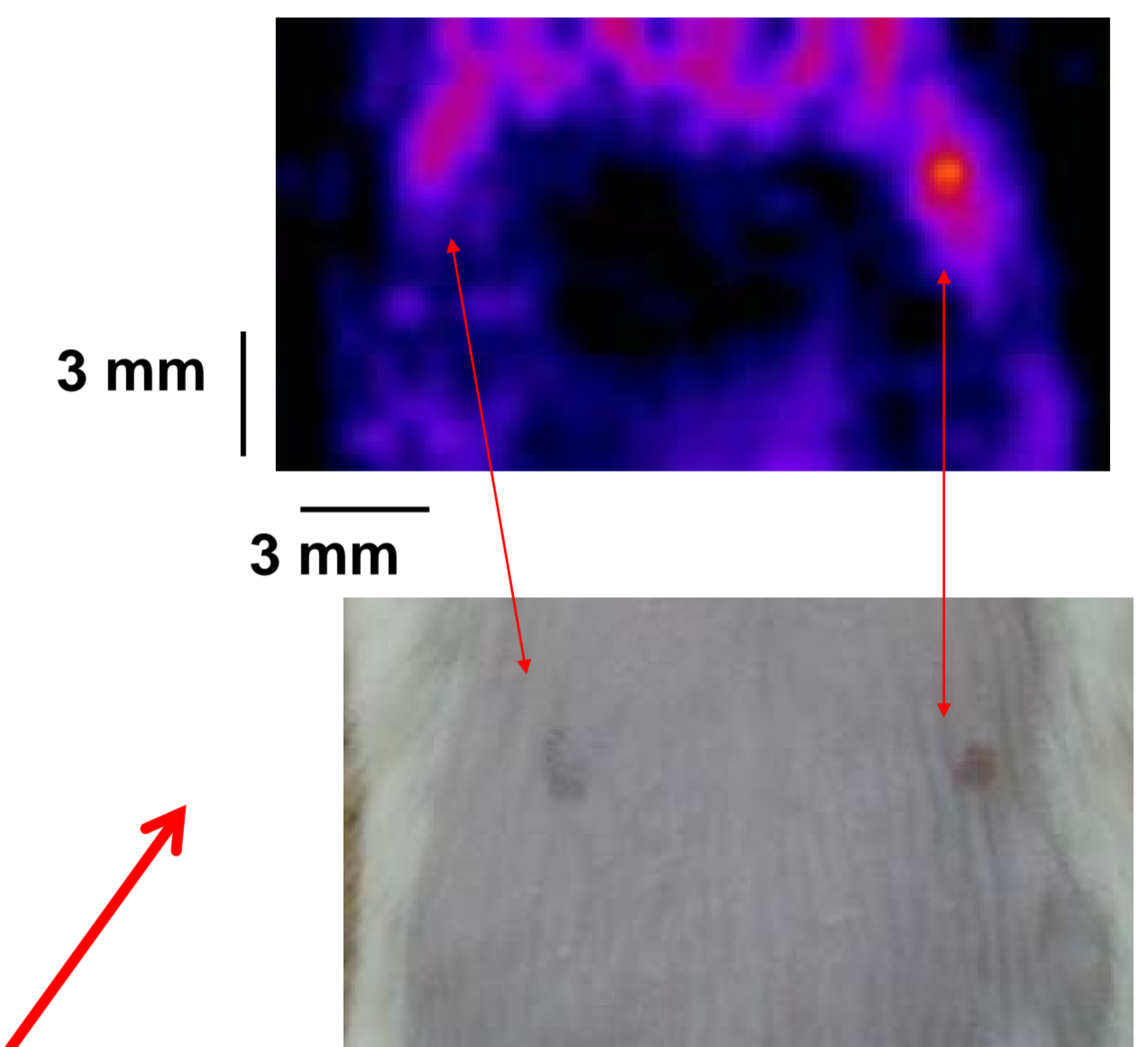
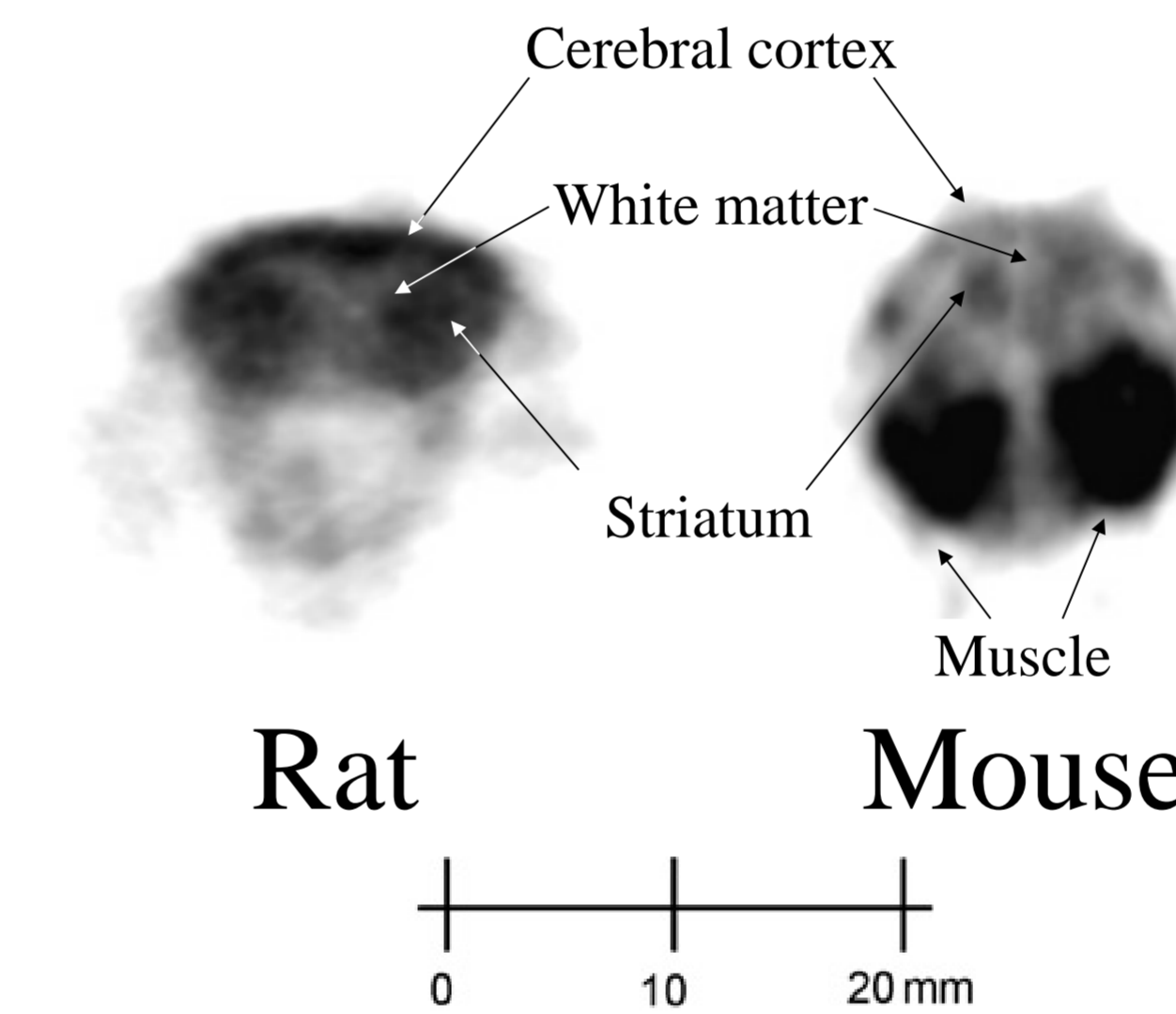
For small animal

“Fine Structure Imaging PET Scanner (Fine PET)”



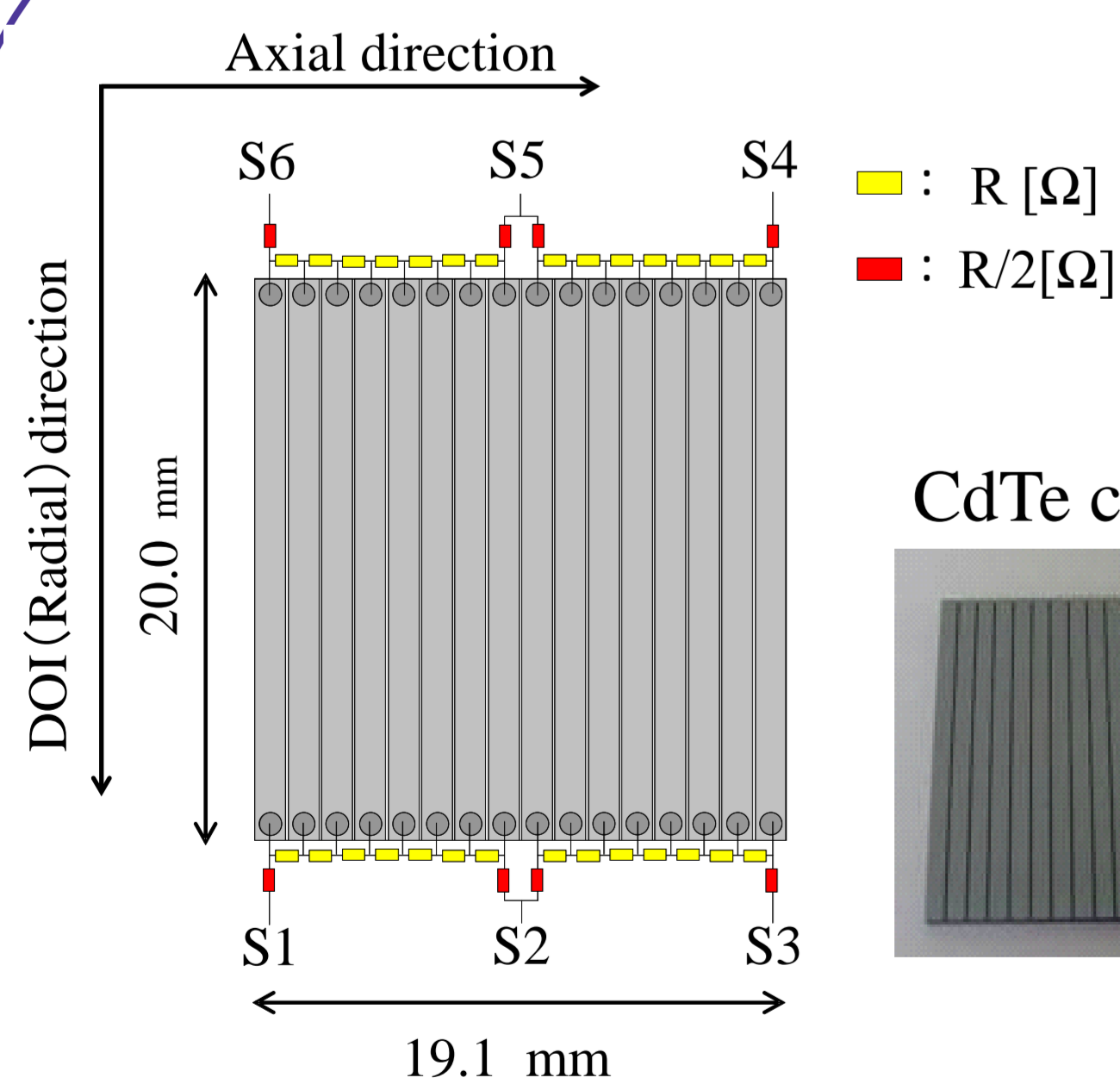
Detector material: CdTe (Cadmium Telluride)
 Number of detector elements: 5120
 Gantry diameter: 60mm
 Axial FOV: 26mm

¹⁸F-images of small cancer

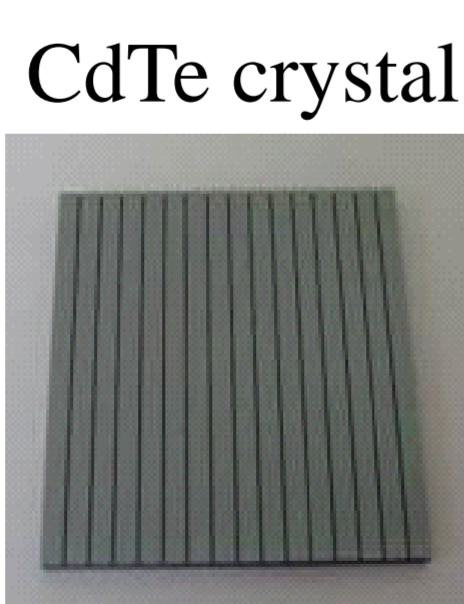


The first achievement of FDG imaging of small cancer less than 1 mm

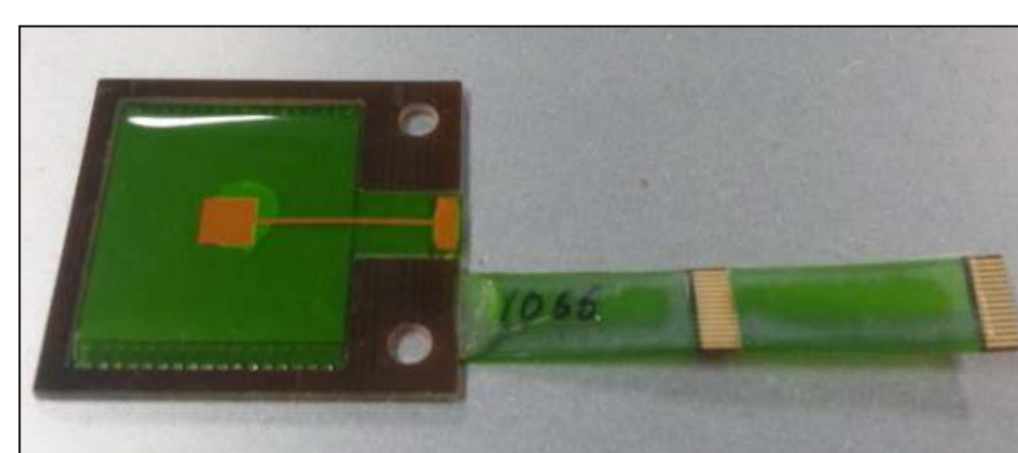
2D position sensitive detector



Detector material: CdTe
 Crystal Size: 20 × 19.2 × 1.0 [mm]
 Strip number: 16 (1.2 [mm] pitch)
 Indium deposition: 500[Å]



Two dimensional position sensitive detector (2D-PSD)



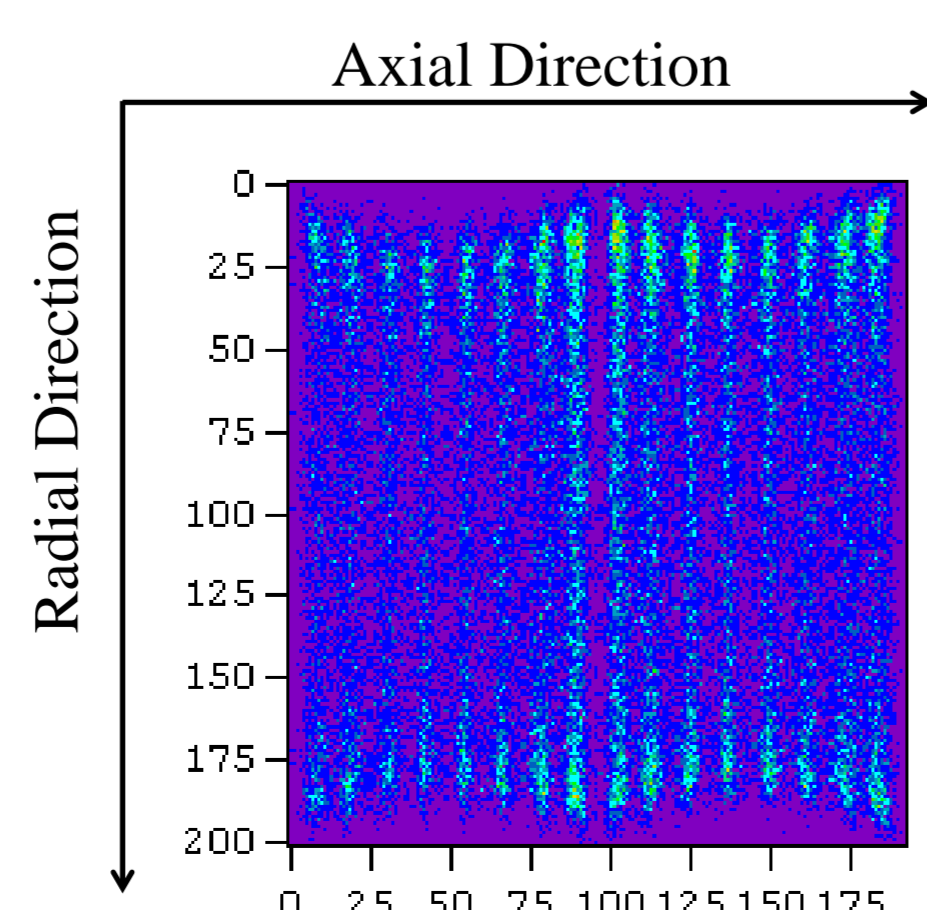
Interaction position of gamma rays are calculated using equation of position calculation from pulse heights of (S1, S2, S3, S4, S5, S6).

Position Calculation

Equation of Position Calculation

If (S1+S6 > S3+S4):
 $x = 0.5 \times (S2+S5) / (S1+S2+S5+S6)$
 $y = (S1+S2) / (S1+S2+S5+S6)$
 If (S1+S6 < S3+S4):
 $x = 0.5 \times (S3+S4) / (S2+S3+S4+S5) + 0.5$
 $y = (S2+S3) / (S2+S3+S4+S5)$
 If (S1+S6 = S3+S4):
 $x = 0.5, y = S2 / (S2+S5)$

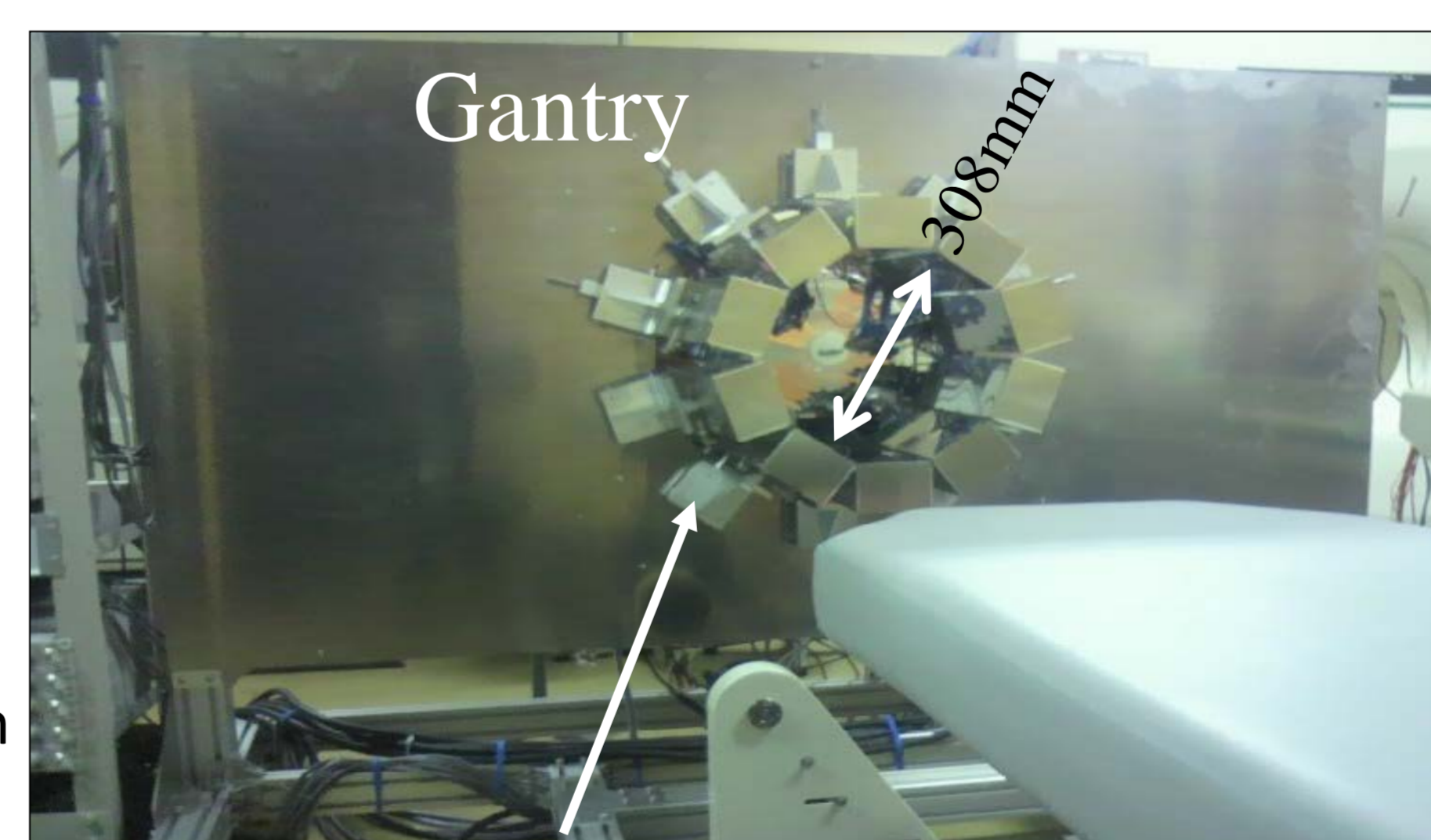
Positions Distribution by ²²Na Entire Irradiation



2D-PSD can identify interaction position with about 1mm's position resolution.

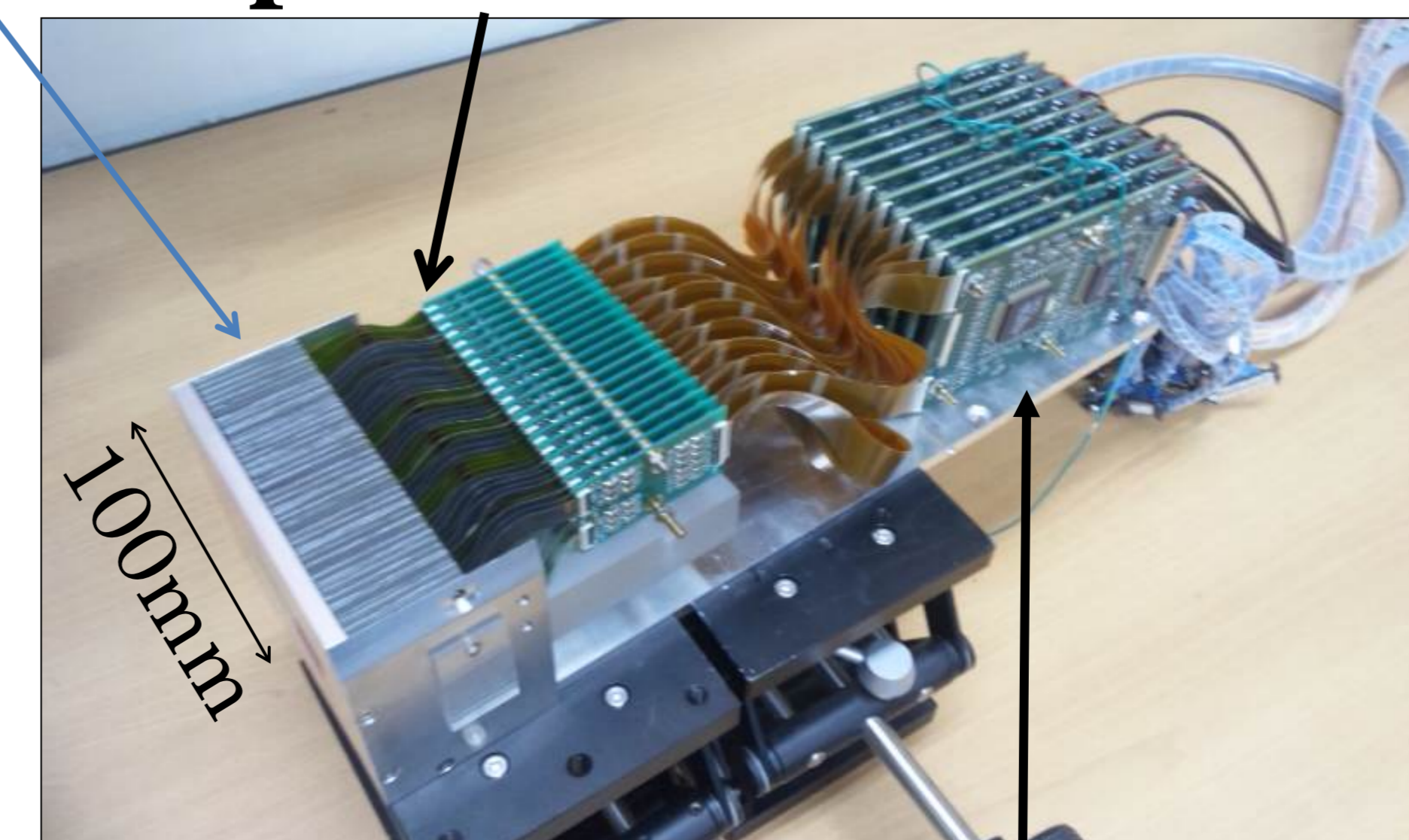
Ultra-high resolution PET scanner II

For human brain



Stacking 2D position sensitive detectors

3D position sensitive detector



Amplifier and Signal processing circuit