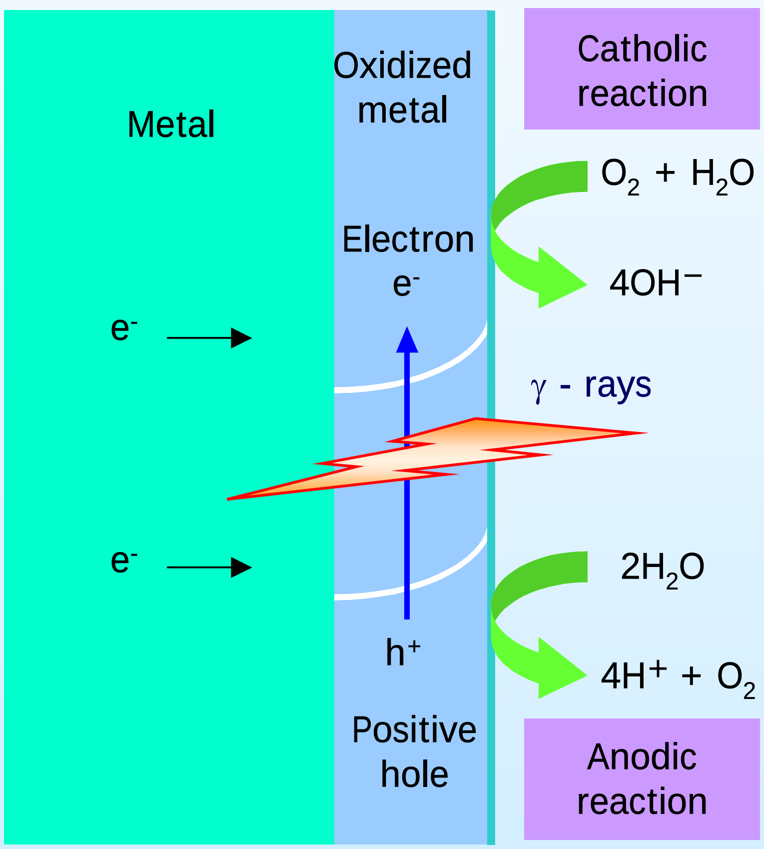
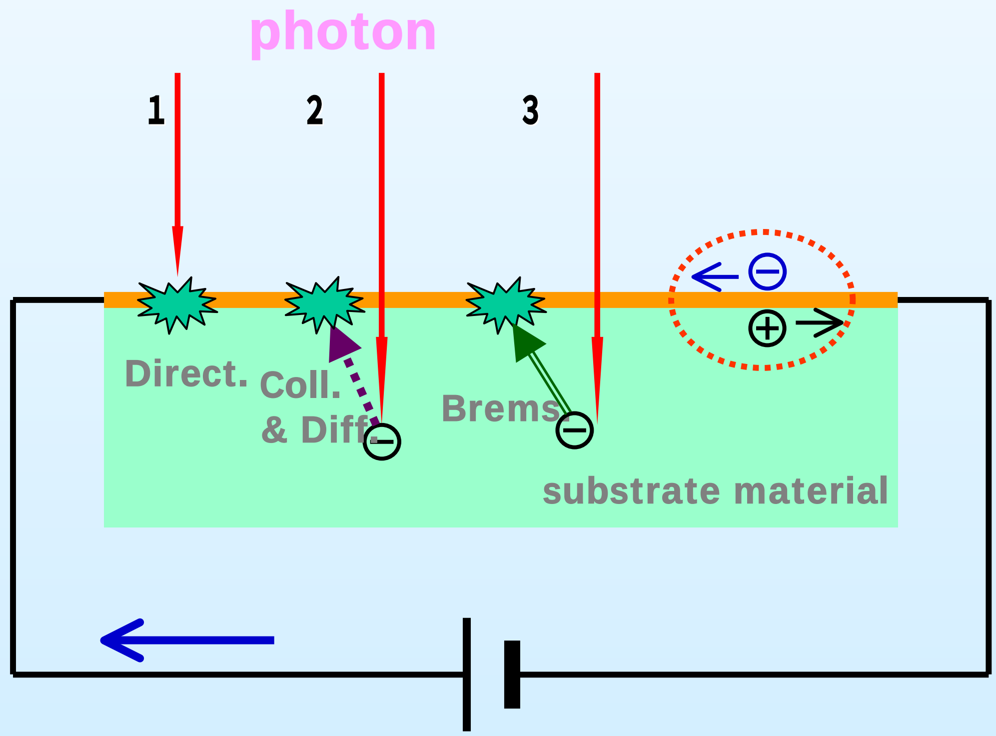
4) Radiation detection





RISA radiation detector

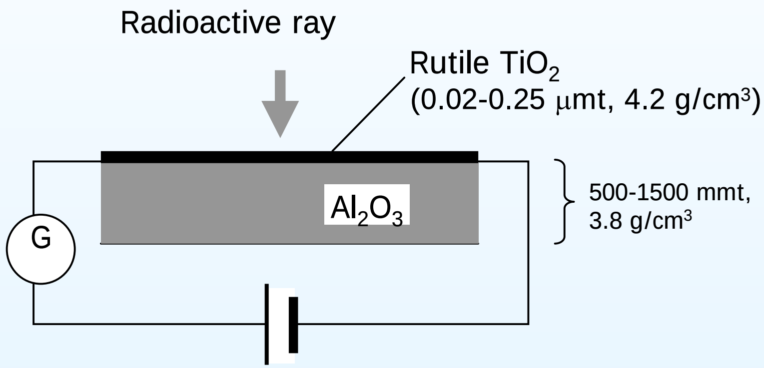


Fig. 4 RISA radiation detector

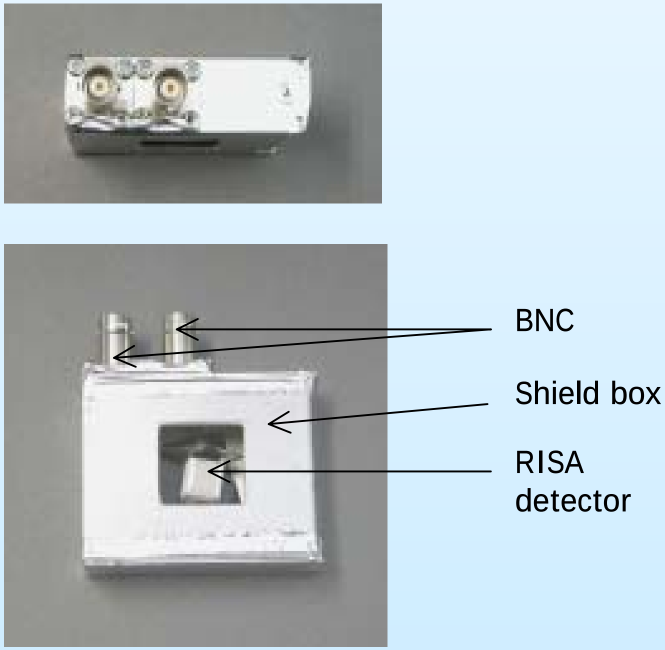


Fig. 5 RISA detector in shield box

Radiation : TiO_2 surface backed by an Al_2O_3 layer.

Aluminum shield box to reduce noise in the signal.

Feasibility study to check the electric reaction of RISA, and to develop the RISA detector for applications in the fields of medicine, engineering, and physics, such as γ-, β-, and X-ray measurements.

Takano, et al.,
J. Nuclear Science and Technology, (2004)

T.U.M.S.A.T.
Power and Energy Lab.

Electrical reaction γ-ray detection

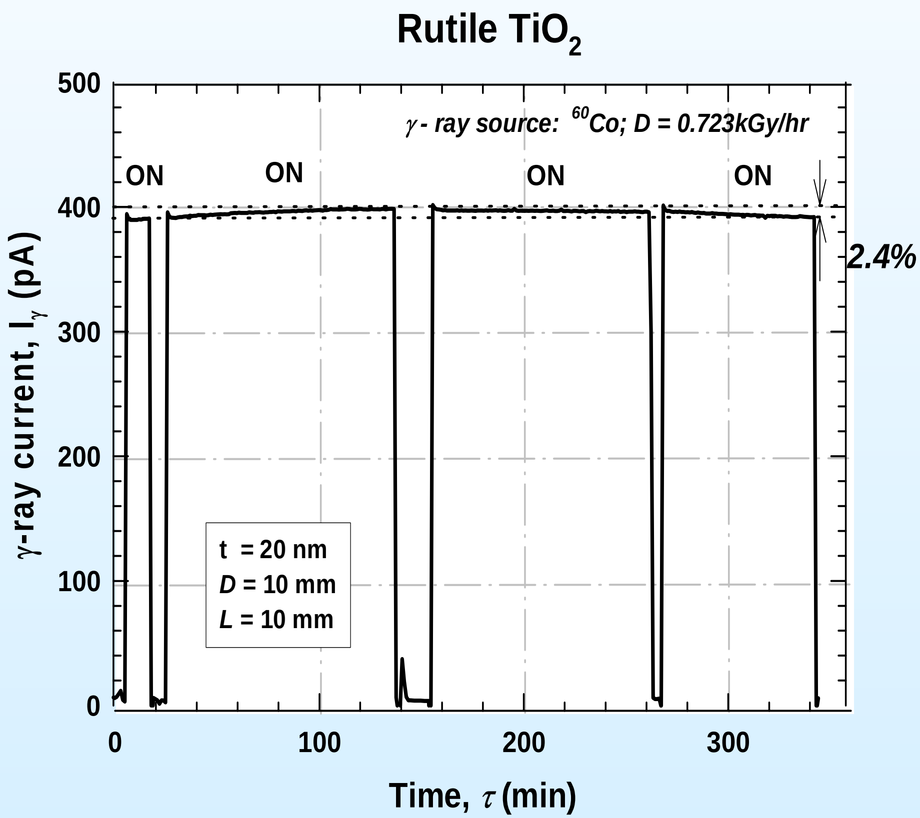


Fig. 8 Responsiveness of the sensor

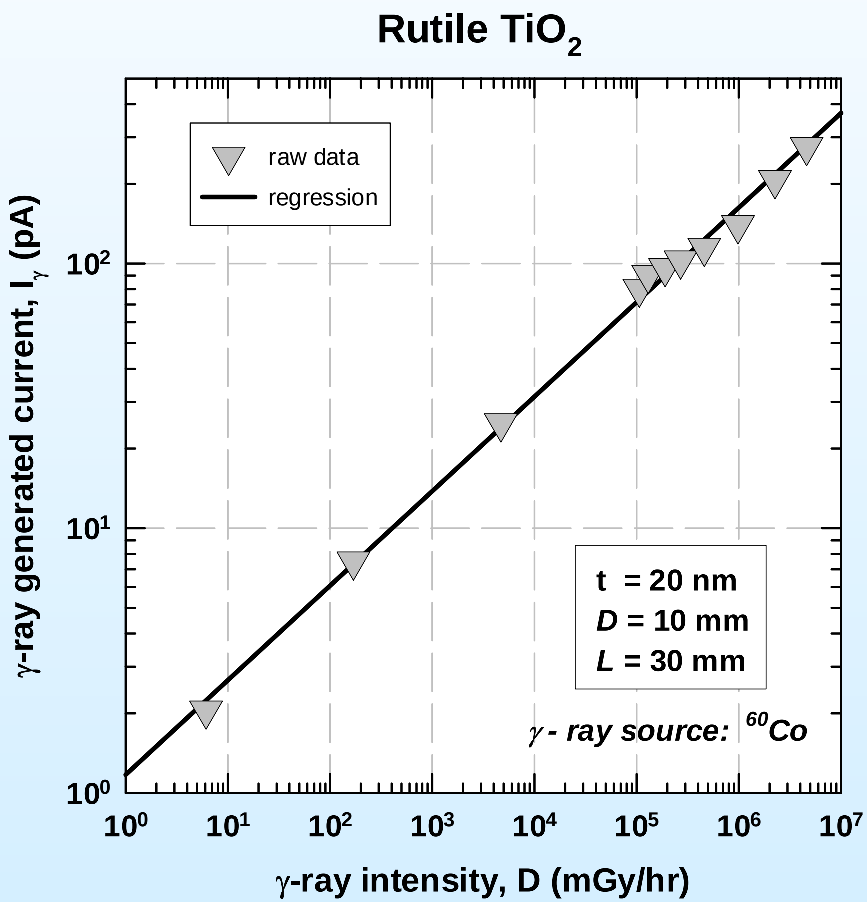


Fig. 7 Measurement range

Electric reaction caused by β- and X-ray radiation

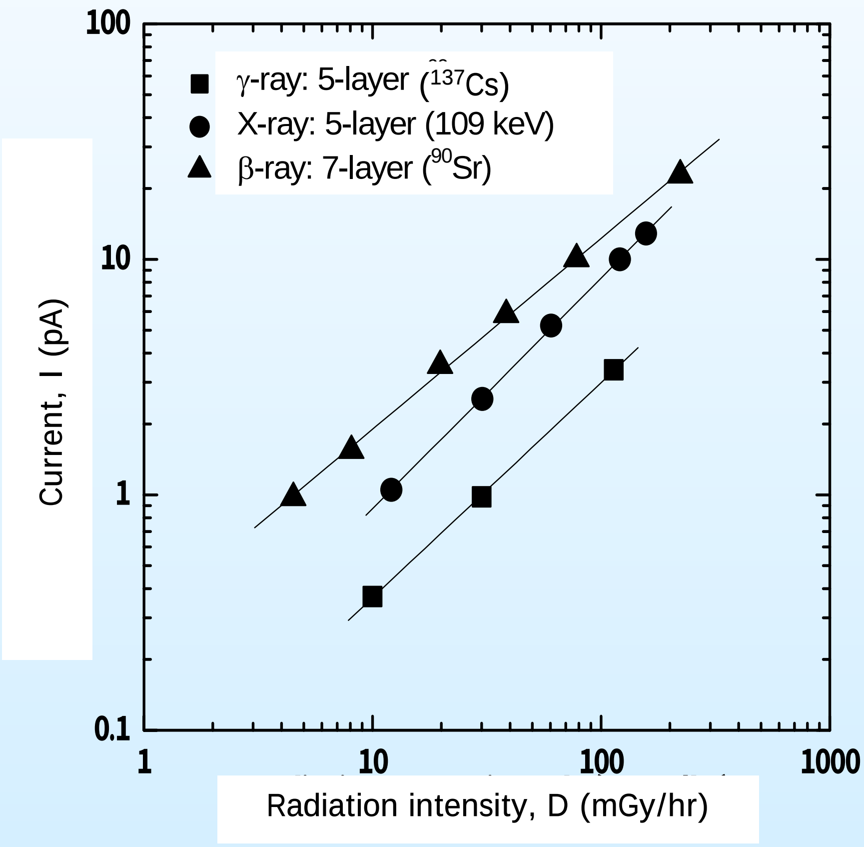


Fig. 10 Current signals for γ-, X-, and β-ray measurements

Facilities for radioactive irradiation at the Japan Nuclear Cycle Development Institute.

Uncertainty of the reference dose rate 10%.

100 V impressed and monitored.

Sensitivities of the detector are β-ray > X-ray > γ-ray.

Collisional interaction ratios of the rays, β-ray > X-ray > γ-ray.

The collisional interaction of the β-rays differs from those of the X- and γ-rays in the backing plate.

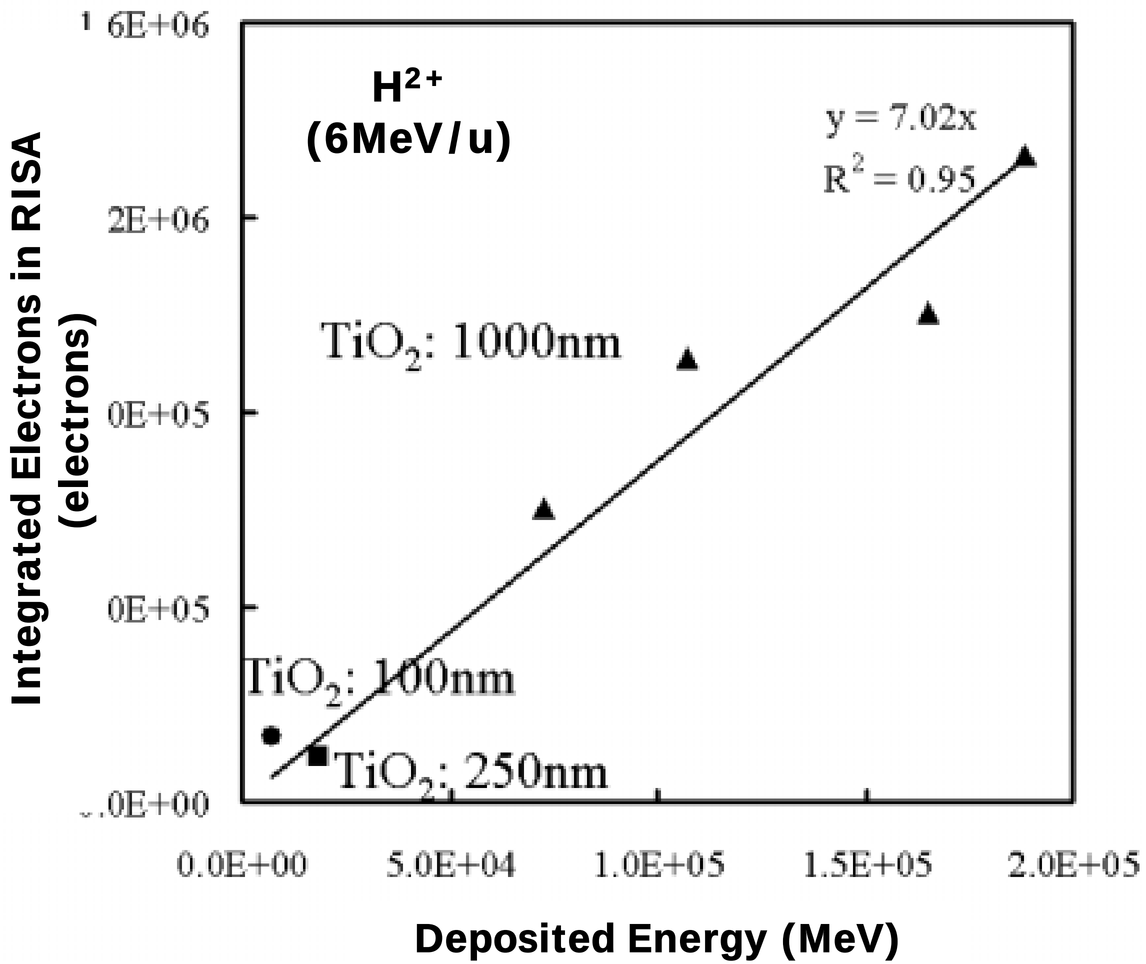
Heavy Ion measurement

Beam loss monitor
Conventional detector: Unstable, Short life

NIRS (National Institute of Radiological Sciences) Japan

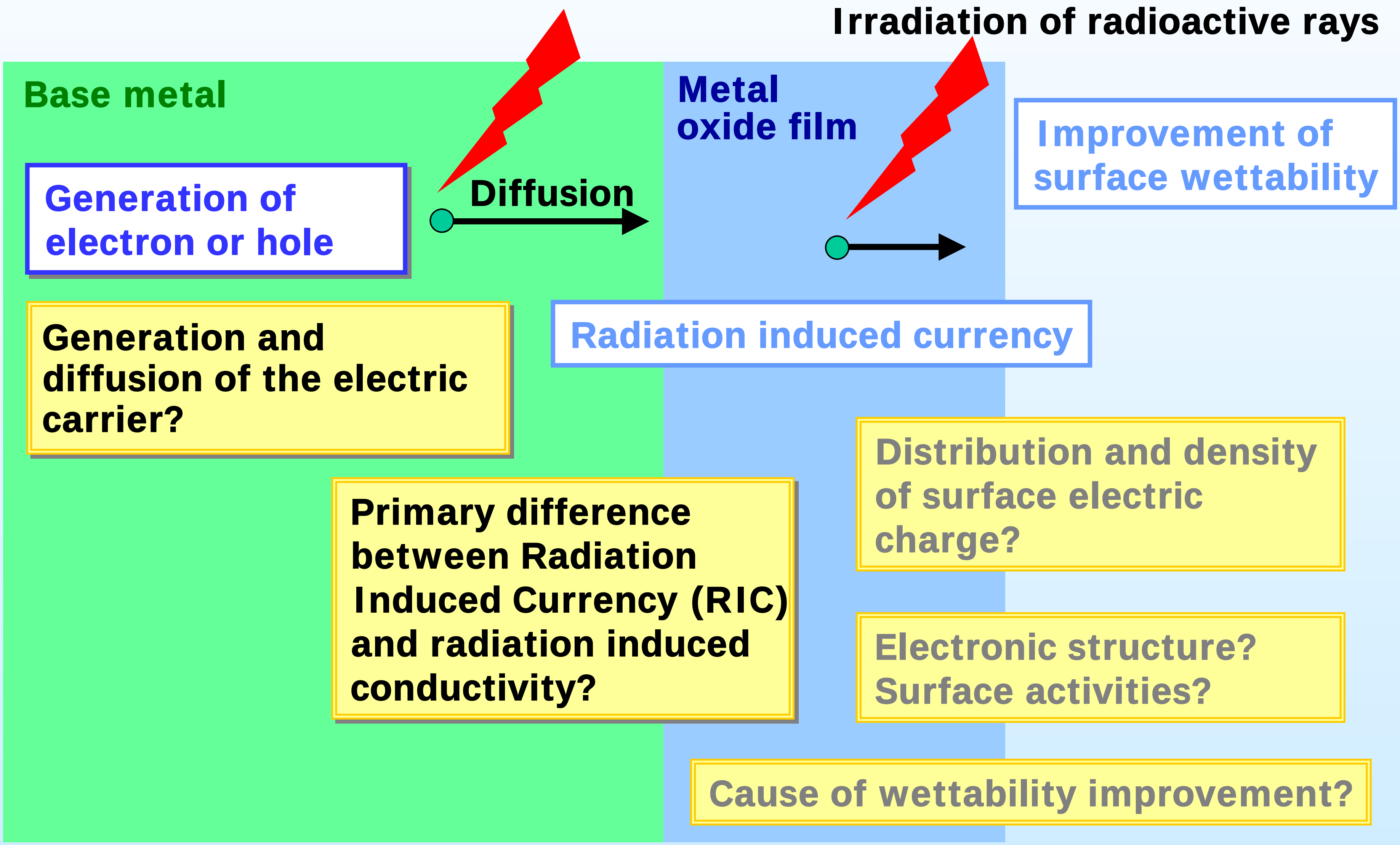
HIMAC (Heavy Ion Medical Accelerator in Chiba) (2004-2005)

for 6 MeV/u He and C-ion



Rise time of the output signals from the RISA detector is fast and the amplitude of output signals is in proportion to an energy deposited in the RISA Film.

5) RISA mechanism



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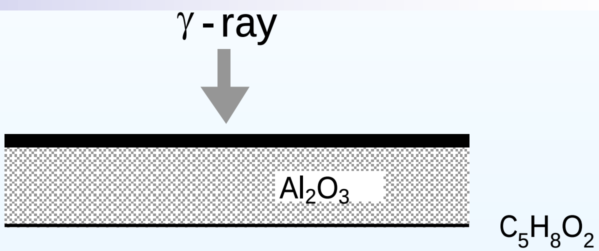
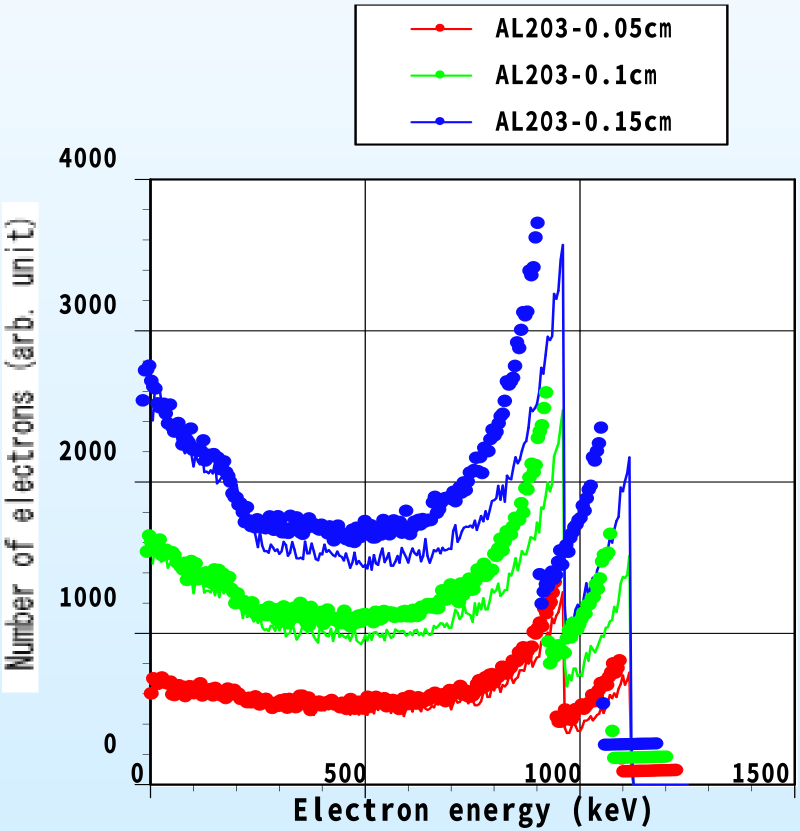
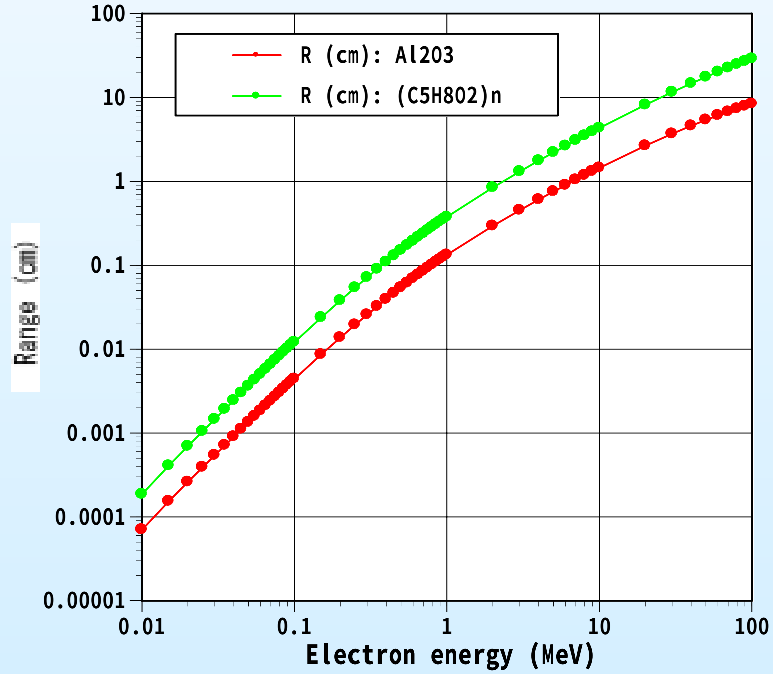
Power and Energy Lab.

Monte Carlo simulation





Energy distribution of electrons generated by photon processes



Range of electrons in $(C_5H_8O_2)_n$ and Al_2O_3

Electric behavior in RISA process

- Estimations were made for:
  1) probabilities of the photon processes causing carrier generation
  2) number of the generated electron from the energy deposition
  3) flow rate of electrons from the substrate to TiO_2 layer.

- It was suggested that:
  1) Compton scattering in the substrate layer is dominant
  2) majority carrier for conduction is "electron"
  3) electron flow from the substrate to TiO_2 layer by diffusion has a significant contribution for yielding the conduction carrier.