Occupational Radiation Protection in Nuclear Medicine

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Contents

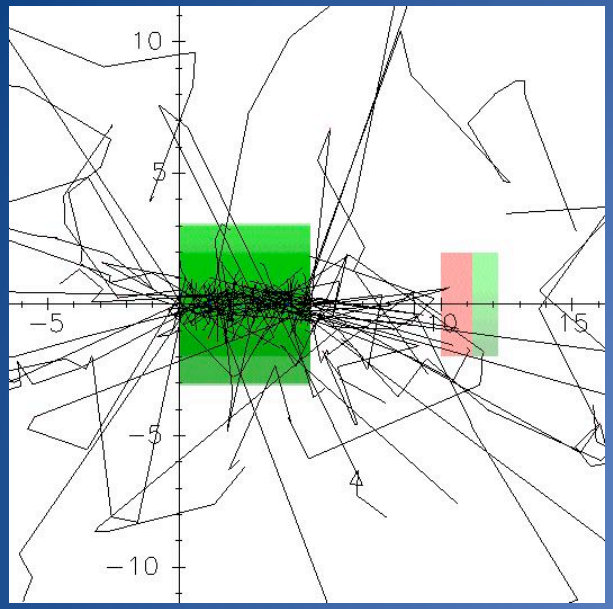
- How to promote ALARA?
  - Trade off structure
- Key topics for WG to discuss

Should we risk it?

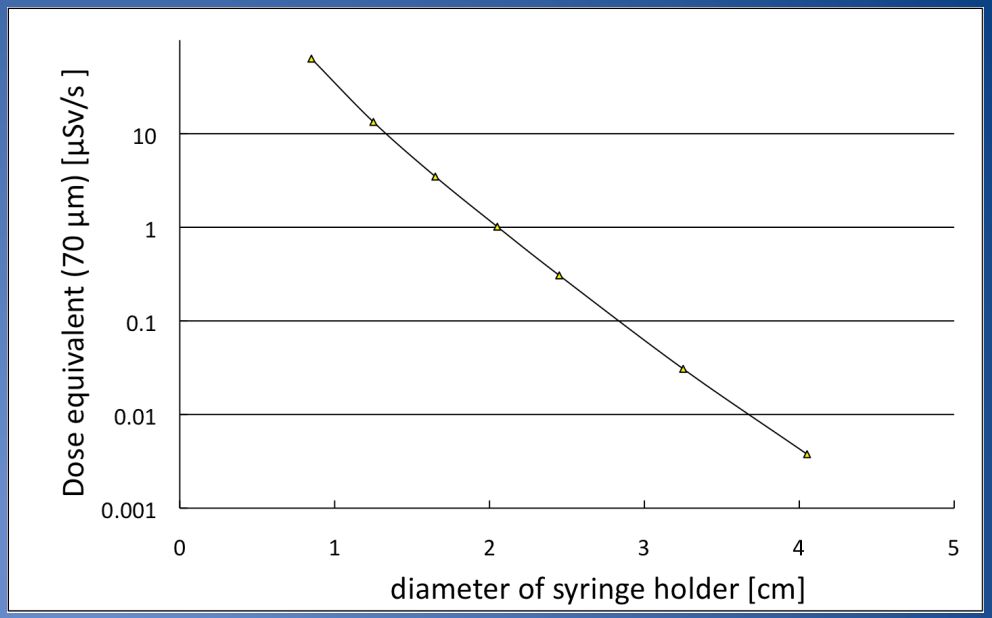
- RI iv shot by one female physician in a hospital
  - Should several nurses be allocated instead of one?
- Care for released patients after administration of RI at outside of controlled area
  - I-131 ablation therapy (1.1GBq)
- Cleaning workers in hospitals
  - who enters a controlled area only occasionally and may receive exposure…

RI: Radioisotope, Radiopharmaceutical

Radiation dose to medical workers (F-18, PET)



Trajectory of radiation; thickness of syringe shield:12.5mm

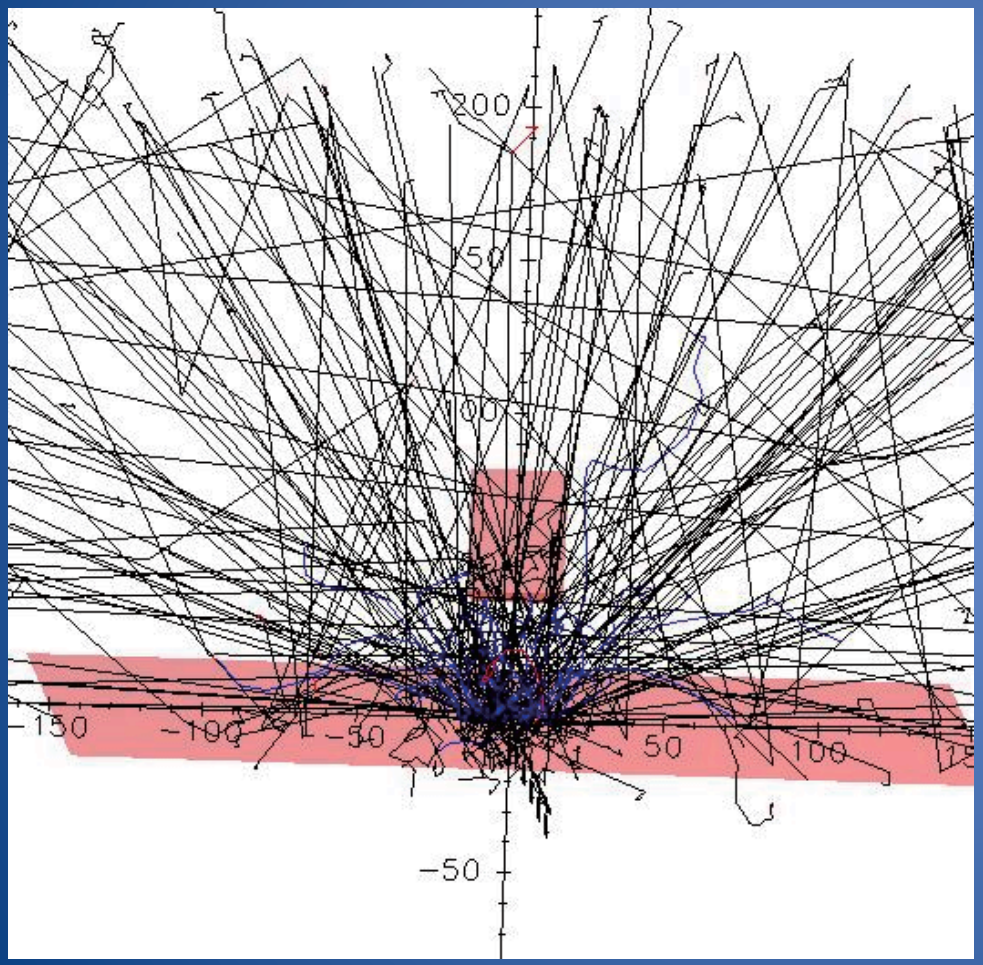


Dose rate at the surface of syringe shield
F-18: 185MBq

Dose to hand during 3 month;260MBq, 10person/d, 30s/person

Thickness of syringe shield	Palm	Back of hands
5.5mm	230	43
8.5mm	85	17
2.3cm	12	0.4

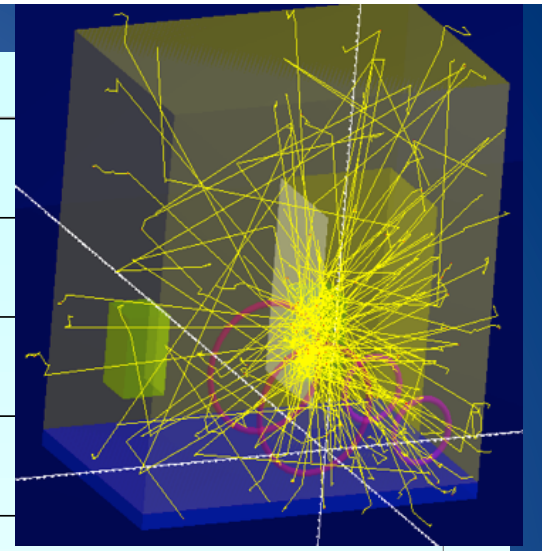
Radiation dose to Cleaning workers

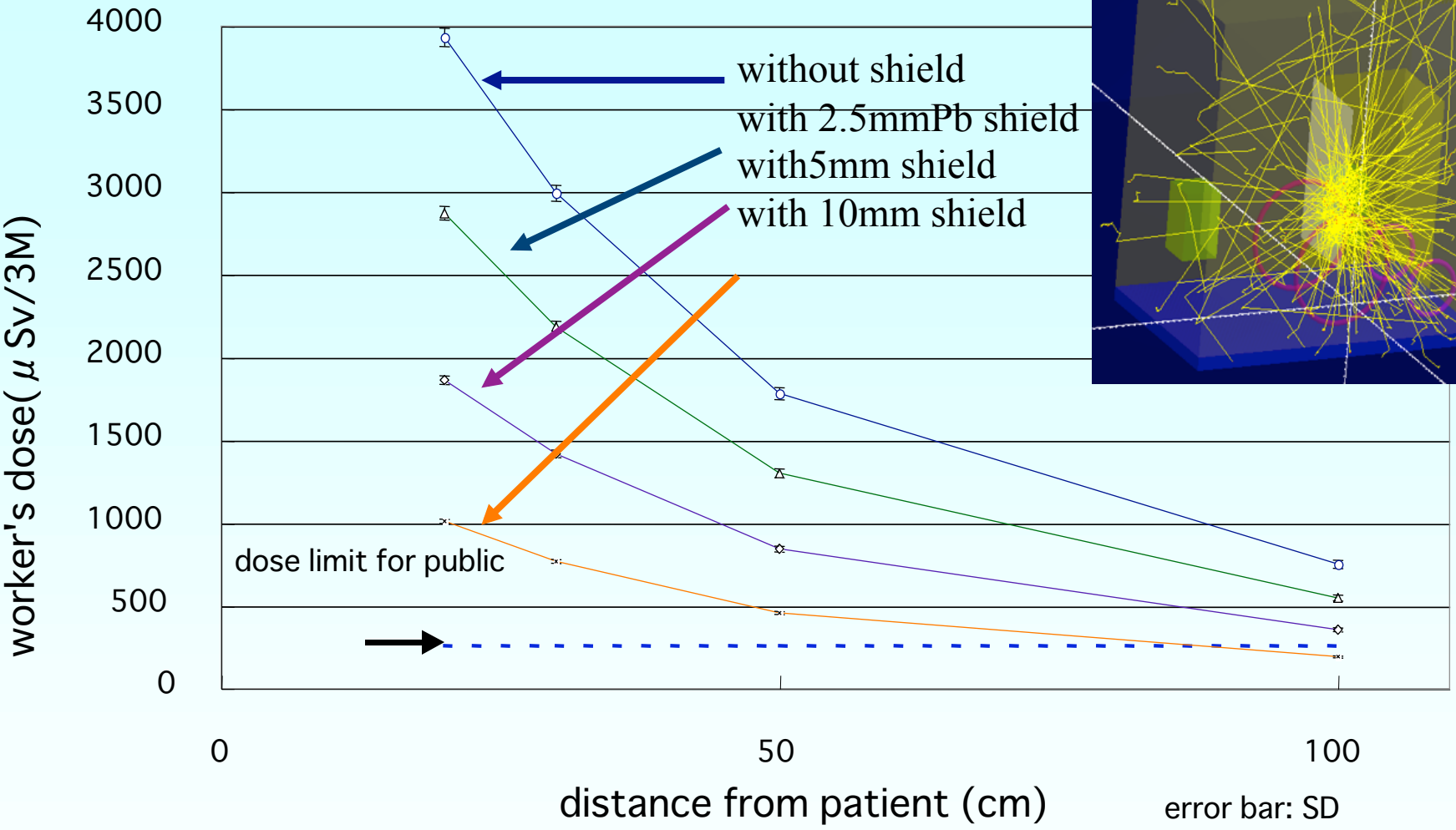


The trajectory of radiation for 100 decays of F-18 on floor

Radioactivity at the time of administration: 260MBq, The ratio of contamination to toilet floor: 5% for 5 patients/week

Effective dose: 1.3mSv/y
Skin dose : 30 mGy/y

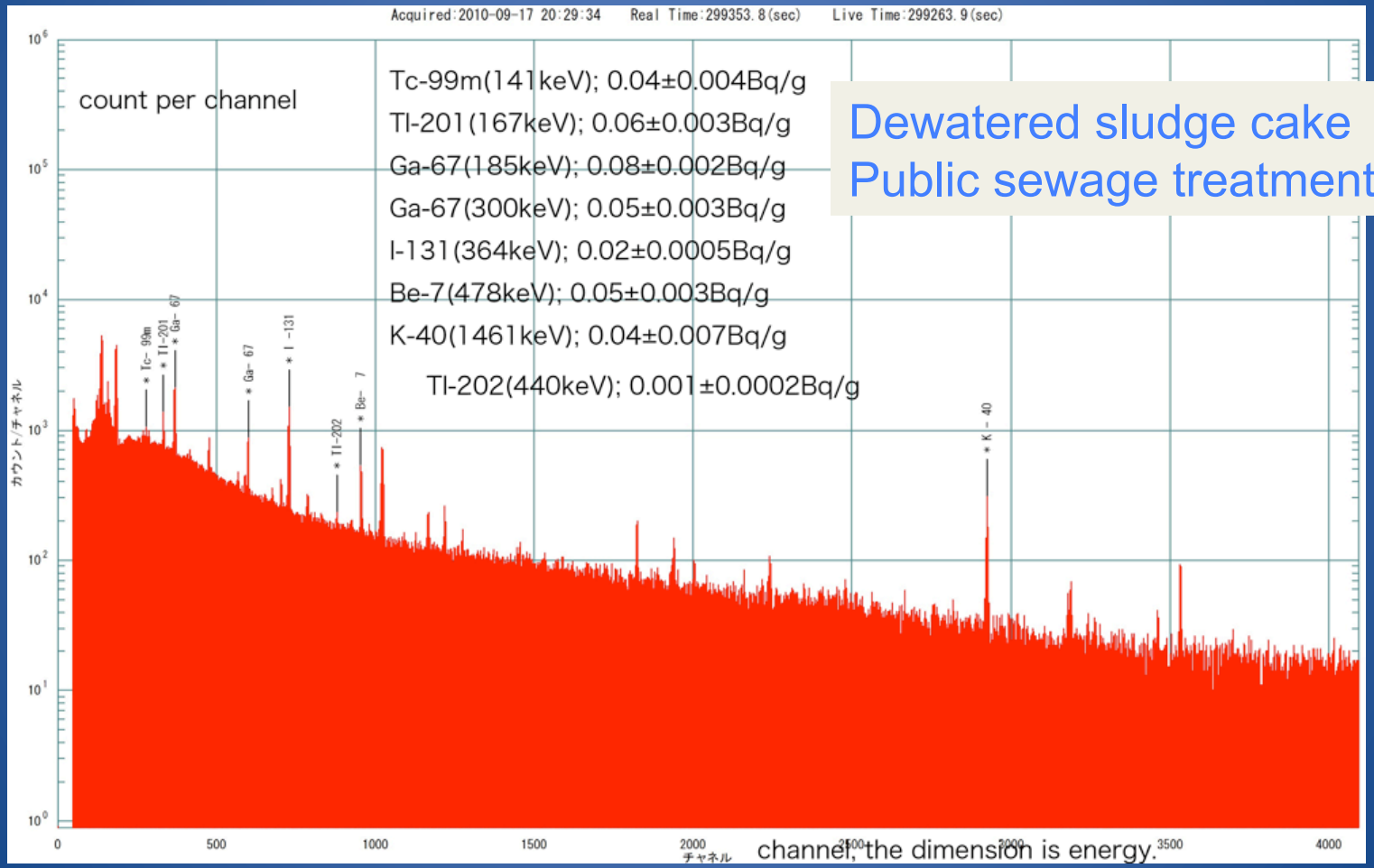




Radiation doses to healthcare workers caring for nonambulatory FDG-PET patients.
Radioactivity: 400MBq/patient, 20 patients/hospital/day, Time to care: 5 minutes/patient, examination days: 26days/3months

http://rcwww.kek.jp/egsconf/proceedings/3iwoegs.pdf

Waste management



MEDIWASTE

http://ec.europa.eu/energy/nuclear/events/doc/2010_02_04_med_medical_installations.pdf

Tradeoff

- Public health ethics issues
  - A young female nurse vs an old physician
  - Early release or long stay at controlled area
  - Utilitarianism vs Liberalism vs Communitarianism
- Who is a stakeholder?
  - Cleaning workers?
  - Workers at sewerage plant?
  - How to Satisfy workers?

Key topics for WG to discuss

Monitoring of PET facility PET/CT installations

Area monitor
γ and neutron

Recovery room

Hot Lab.

High dose rate monitor

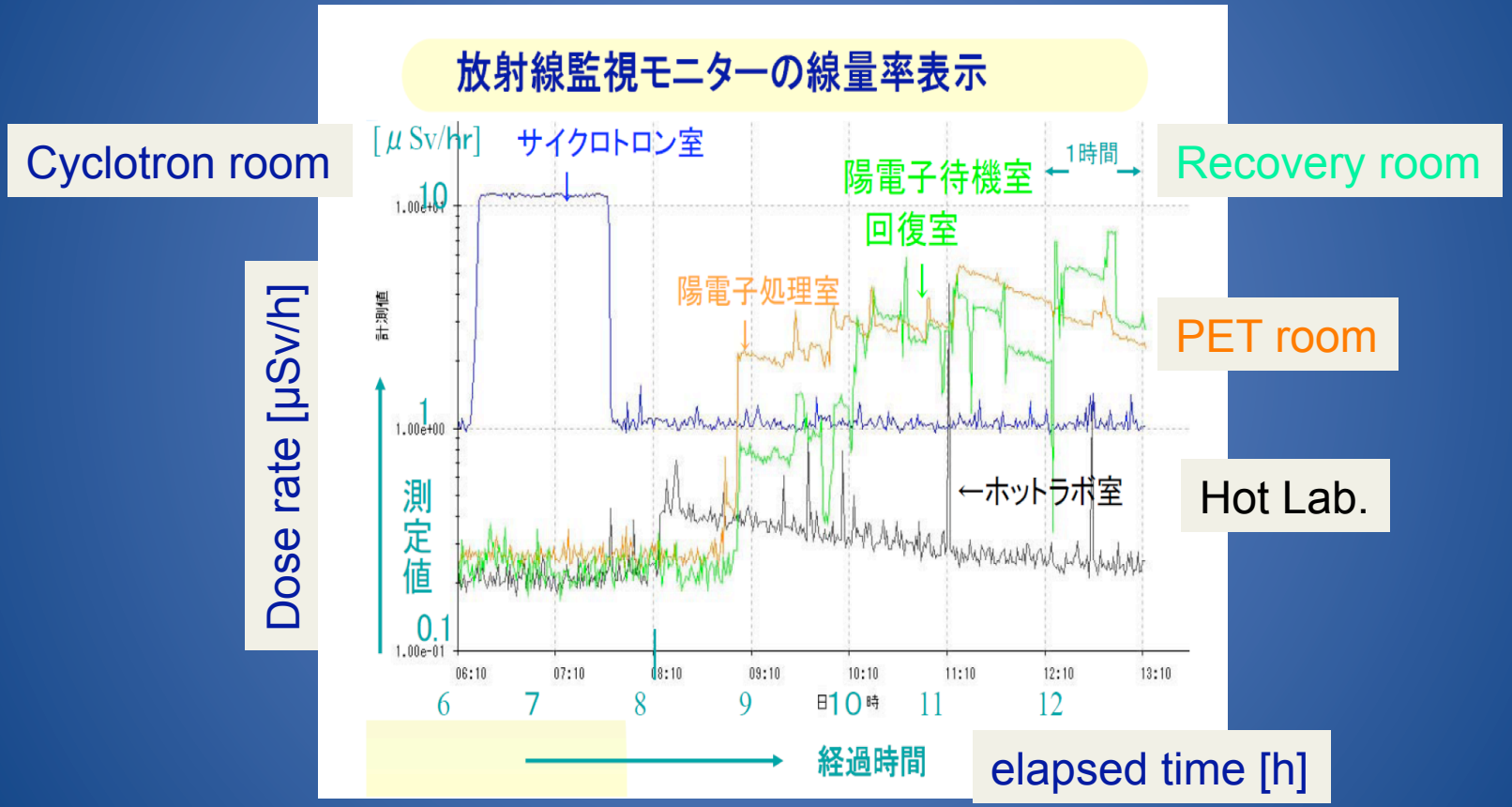
direct-view monitor

Cyclotron room

PET room

By courtesy of Shinichi Kanaya (Tokyo Women's Medical University Hospital)

Monitoring of PET facility
PET/CT installations



By courtesy of Shinichi Kanaya (Tokyo Women's Medical University Hospital)
http://www.mext.go.jp/b_menu/shingi/housha/003/shiryo/__icsFiles/afieldfile/2009/05/08/20060703_02c.pdf

Exposure to a patient form the other patient (Mr. Choi)

- Patient exposure or public exposure?
  - Not offset-able exposure
- Dose limit for public would be adaptable
  - Then think about ALARA…
- Similar setting
  - Exposure to a patient from contaminated wall
  - Exposure to a patient from activated air

Internal exposure
country report from Malaysia

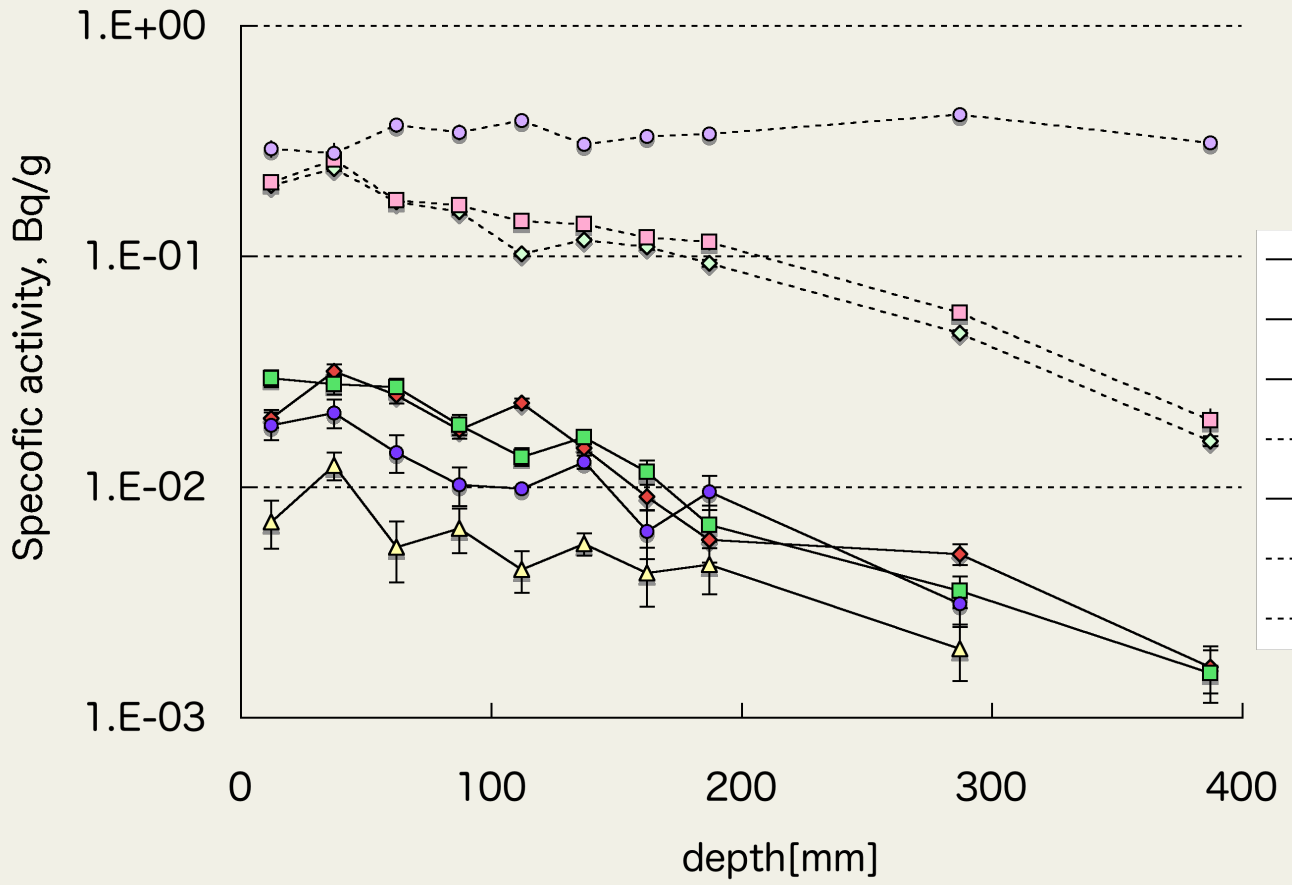
- Maximum uptake amount of a nurse
  - 4.8kBq
    - NaI to Methylated iodine
      - Difficult to remove by mask
      - higher dose coefficient
  - Committed effective dose for one year work: less than 5mSv
    - G. H. Jeong, K J. Lim, J. K. Lee, T. J. Park and W. K. Cho. Thyroids Monitoring of Workers in Nuclear Medicine at Korean Hospitals. AOCRP-3
- External dose rate for 500MBq: 0.03mSv/h at 1m
- IAEA Safety Reports Series No.63

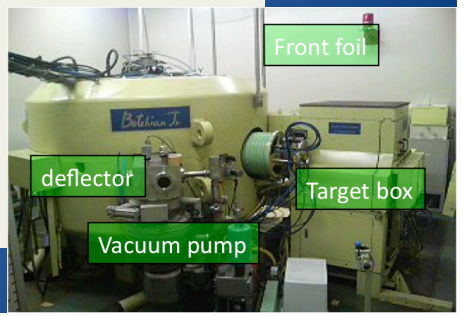
Occupational radiation protection in newer techniques

- Sr-89, Y-90, Radioiodine I-131 therapy
  - Diaper
  - Transfer to a different hospital
  - Blood sampling, Urine collection
  - Shielding of β ray, Shielding of urine collection bag
  - Surgical operation, postmortem examination
  - Cremation

Transport and waste issues

Decommission cyclotron





Accident?

Exhaust of radioactive gas that exceeds concentration limit

3 cases were press released by MEXT on Nov. 2007, Dec. 2007, Feb. 2008

This image is not able to be shown here because of copyright.

Radioprotection at a radioactive pharmaceutical company

By courtesy of Nihon Medi-Physics Co.,Ltd

Overexposure?

- Monitoring service company notifies the data to the hospital
  - This data is not approved record
- Hospital assesses the data with monitoring service company
  - Measuring the energy of irradiated radiation
  - Irradiated angular
  - Work record of the worker
- Hospital reports the fact of over exposure to the regulatory body
- Regulatory body starts the RCA with scientific community
- Confidential reporting system might be helpful

Summary

- Appropriate risk assessment should be promoted
- Risk communication
  - Stakeholder involvement in each hospital should be promoted
  - Why some interventional cardiologists do not want to wear dosimeters?
    - Because of harassment from RSO…?
    - Lack of awareness, or other possible reasons…