Activity calibration of I-125 seeds for prostate brachytherapy
prostate cancer

Most commonly occurring cancer in males today

Western countries:
About 20% of cancer-related death.

Asian countries:
3〜5%  ＜recently: a marked increase＞

Percentage incidence of cancer in males  (reference: ProstateLine.com)
Choice of treatment - Prostate cancer

- Hormonal therapy (testosterone inhibitor, testis excision)
- Surgery (prostate excision)
- Chemotherapy (anticancer agent)
- Radiation therapy
  * External radiotherapy
  * I-125 prostate brachytherapy

→ Excellent prognoses to men
* Low probability of long-term side effects
* Does not affect the patient's lifestyle
Radioactive seed for prostate brachytherapy

weight: 9.39mg, activity: 11~15MBq/seed

The cartridge which loads the seed

(reference: Japan Megefigeccs Co. onco seed manual)
Prostate

Bladder

Cartridge (5~15 seeds loaded)

Applicator (seed implantation tool)

Supersonic wave probe

Implanted seed

Seed implantation

Radiograph after the operation

(reference: Japan Medi-physics Co. manual)
Necessity of activity calibration for I-125 seeds

- Nominal accuracy = ±7% to 10%
- Some reported ~ Dead seed, Loose seed, Mis-calibrated seed
- AAPM TG40 recommendation of "ideally 100% seeds" to "at least 10% seeds" should be calibrated in each institution before implantation.
Activity calibration of I-125 seeds

* Well-type ionization chamber
- Expensive
  - required: Multiple measurement
  - Processing of re-sterilization

* Survey meters
  
  <Nal scintillation survey meter for I-125, GM survey meter>
  - required: Securing of measurement place
    - Multiple measurement
    - Processing of re-sterilization

• Both methods are impractical to calibrate the cartridge.
New calibration method

Automatic measurement system

To calibrate simultaneously all seeds in the cartridge in a sterile environment.