Characterization of the Dosimetry System in Terms of $H_p(3)$ for Eye Lens Dose Assessment

2nd Cycle Integrated Project In Engineering Physics

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Radiological Protection Principles

Justification of practices

Use of ionizing radiation must produce net-benefit for an individual or society

Optimization of protection

Exposure and number of exposed individuals must be as low as reasonably achievable (ALARA)

Dose limitation

Dose limits for planned exposure situations to prevent deterministic effects and reduce the risk of stochastic effects

Dose Limits

Type of limit		Occupational exposure	Public exposure
Effective dose		20 mSv/yr	1 mSv/yr
Equivalent dose	Eye lens	20 mSv/yr	15 mSv/yr
	Skin	500 mSv/yr	50 mSv/yr
	Hands and feet	500 mSv/yr	50 mSv/yr

Exposure situations:

- Planned exposure
- Existing exposure
- Emergency exposure

Exposure categories:

- Occupational exposure (A and B)
- Public exposure
- Medical exposure

LiF:Mg,Cu,P (TLD-100H) Detectors

Figure 1: LiF:Mg, Cu, P (TLD-100H) detectors placed inside cards.

Advantages of LiF compounds:

- Tissue equivalence
- Large operational range of doses
- Dose-rate independent behavior
- Reusability

LiF:Mg,Cu,P (TLD-100H) is specifically chosen for its higher sensitivity, lower detection limits, and negligible fading

Characterization Tests for Dosimeter Performance

- Linearity
- Energy dependence - from N30 X-rays to ^{60}Co
- Angular dependence– normal incidence, ±20º, ±40º, and ±60º
- Reproducibility
- Measurement uncertainty

Dosimeters are inserted into a holder to assess $H_p(3)$ and placed on the surface of the head phantom (Perspex cylinder with 20 cm diameter and 30 cm height filed with water)

Figure 2: Harshaw 6600E TLD readers used to analyze LiF:Mg,Cu,P detectors and measuring $H_p(3)$.

Conclusions

Relevance of eye lens monitoring

Increased radiosensitivity

TLDs

Multiple advantages

Radiation protection

Dose limits and protection principles

Characterization tests

Assessment of dosimeter performance