RISØ

Software and algorithms for online medical dosimetry with luminescence detectors

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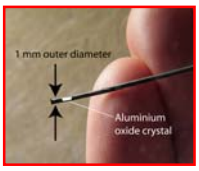


Brachy project with:

Søren Kynde Nielsen
Kari Tanderup
Jakob Lindegaard

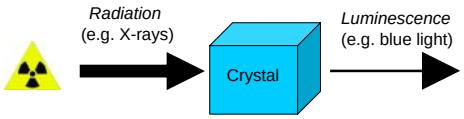
Århus University Hospital

Outline:
1. Luminescence signals
2. System (including software)
3. Treatment terminology
4. In vivo online measurements

Nordic Society for Radiation Protection
26 -30 May 2008 Ålesund, Norway

May 27, 2008 15:20 – 15:40

Luminescence dosimetry using Al_2O_3:C crystals



1. **Spontaneous luminescence**

Radioluminescence (**RL**) — "Prompt signal" ~ dose rate

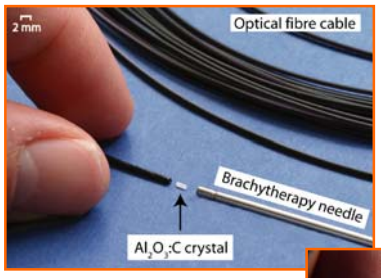
2. **Stimulated luminescene**

Thermoluminescence (**TL**)

Optically stimulated luminescence (**OSL**)

Delayed signal ~ dose (passive dosimetry)

The benefit of RL/OSL ...



Key features:

All optical (remote readout)
Small size
Suitable for in vivo use

High precision
High sensitivity

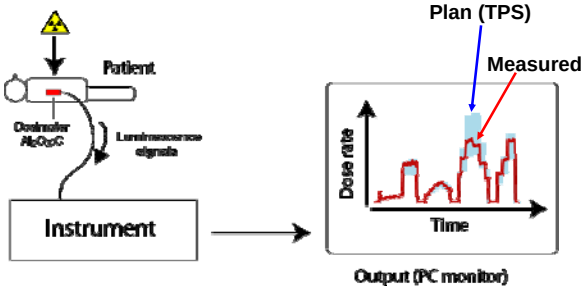
Improved dose verification for brachytherapy

Århus University Hospital & Risø
Danish Medical Research Council

Lighttight probe w. crystal

Vision – Improved safety in brachytherapy

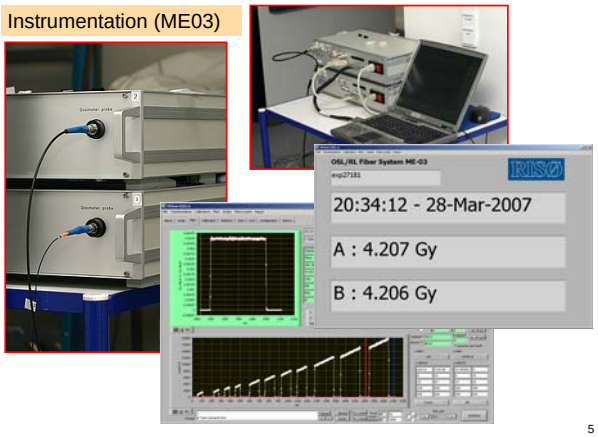
Århus & Risø



Dose verification

Direct online comparison of time-resolved in vivo point measurements and the treatment plan dose predictions for those positions

Instrumentation (ME03)

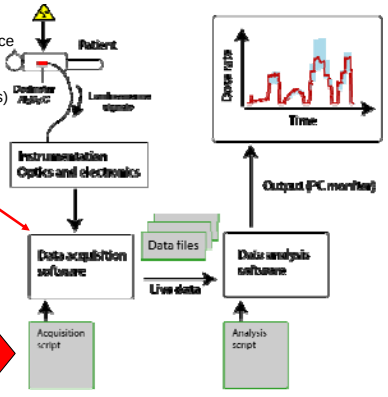


System software

Acquisition hardware interface
Realiability
Standardization
Flexibility (different protocols)
Documentation

How?

Tailored hardware-near software with text scripts




```
# Jobfile exp12004
# Standard job for…
# Created: May 27
# Modified: May 27

set save on
set append on
set scans 1000
set rate 10
set DIO 2 off
…
```

Programmed in Labview (National Instruments)

Online clinical measurements

Århus University Hospital & Risø

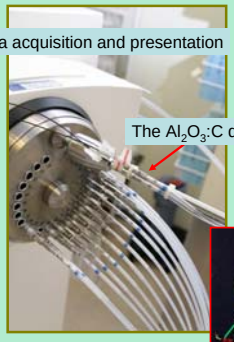
Two Risø ME03 luminescence readers

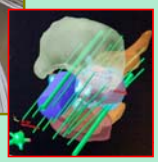
Data acquisition and presentation

RL during each pulse

OSL in between pulses

The Al_2O_3:C dosimeter probes





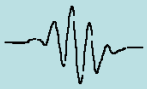
Brachytherapy with **Ir-192** gamma source (~1 Ci)

Medical dosimetry at Risø 2008

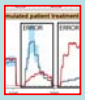
Now part of the Technical University of Denmark (DTU)

Gated IMRT – time resolved dosim.

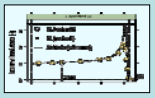
Reference dosimetry – EPR alanine



Brachy dosimetry system



Proton & HCP dosimetry



Close collaboration with the University hospitals in Malmø, Århus and Copenhagen (Rigshospitalet and Herlev)

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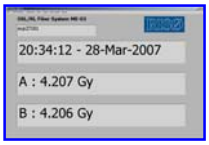

Conclusions

1. Single windows application with text scripts (job files) for different protocols
2. Online medical dosimetry example: Improved safety for brachytherapy with Århus Univ. Hospital
3. Time resolved measurements contain much information (good for point measurements)

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