SCINTILLATING ARRAY FOR REAL TIME HIGH-RESOLUTION ION THERAPY RESOLUTION ION THERAPY DOSIMETRY: INITIAL DESIGN AND SIMULATIONS

Speaker: Duarte Guerreiro, LIP/FCUL Supervisors: Jorge Sampaio, Luis Peralta IDPASC SCHOOL 20/21 September, 2021

The need for a good microdosimeter

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RADIOBIOLOGY

- Radiobiology is used to study how cells and organs react to being irradiated.
- This information is important to plan radiotherapy sessions.



Figure 1. Radiobiology study scheme.

RADIOBIOLOGY – CELL SURVIVAL CURVES



Figure 4. Cell survival rate for each dose. Comparisson between High-LET and Low-LET. The cell survival against dose is graphically represented by plotting the surviving dose S(D) on a log scale against the dose D.

RADIOBIOLOGY – RBE



Figure 4. Cell survival rate for each dose. Comparisson between High-LET and Low-LET. Relative biological effectiveness (RBE) compares the dose of test radiation to the dose of standard radiation to produce the same biological effect.

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RADIOBIOLOGY – RBE



Figure 4. Cell survival rate for each dose. Comparisson between High-LET and Low-LET.

- RBE is complex. It depends on: LET, dose, dose rate.
- It is known that it is possible to have different RBE for particles witht the same LET depending on the track structure.
- To study the biological effects it is importan to have a dose distribution map at a micrometric scale

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The Project

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THE PROJECT

- The aim is to develop a detector with real time dose measurement, good spatial resolution and tissue equivalence.
- The possibility of placing a cell culture directly on top of the optical fibres is being explored.
- This seeks to reduce the errors introduced by the cell culture plates.



Figure 5. Scheme describing the project. The skin cell model is placed directly on top of the optical fibres.



Figure6. Cell culture plates.

THE PROJECT

t became necessary to design the detector as an irradiation
box.

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• This irradiation box includes the sensitive area and the PMT. Includes enough space to receive the cell cultures.



Figure7. Inside of the detector. The volume that receives the optical fibres is shown (the figure shows a cross-section of the detector).