Microdosimetry at LIP

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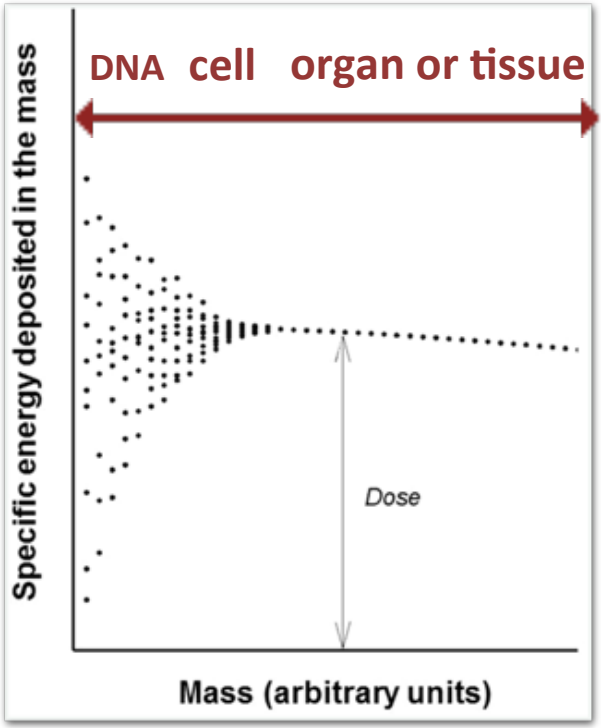
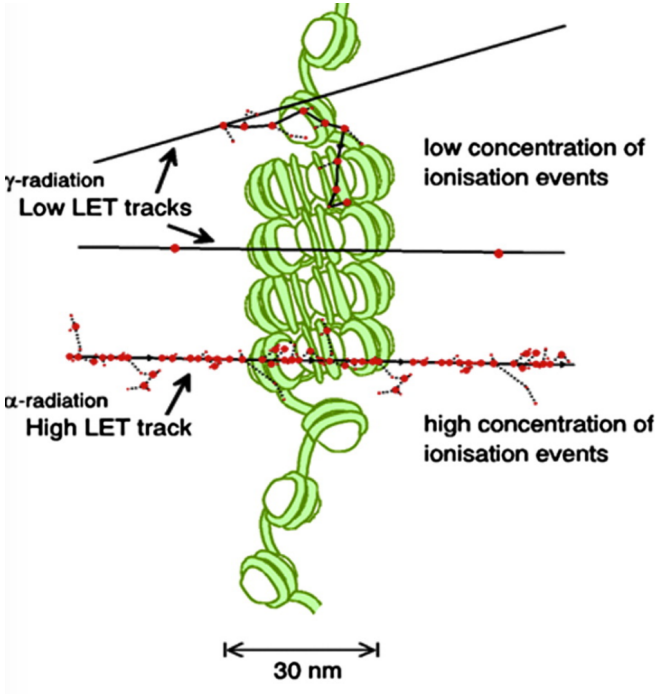
Microdosimetry of high-LET radiation

Measuring doses at the cell scale and below to relate the **relative biological effectiveness (RBE)** with dosimetric quantities:

- Effectiveness in hadron therapy
- Radiation risk assessment for air-flight crews

and human space missions





At µm scales and below dosimetric quantities become stochastic

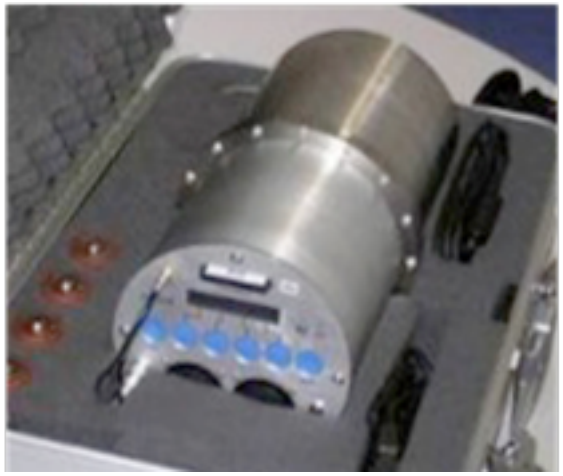
Microdosimeters of high-LET radiation

Measuring doses at the (sub)cell scale requires detectors that **ideally** have:

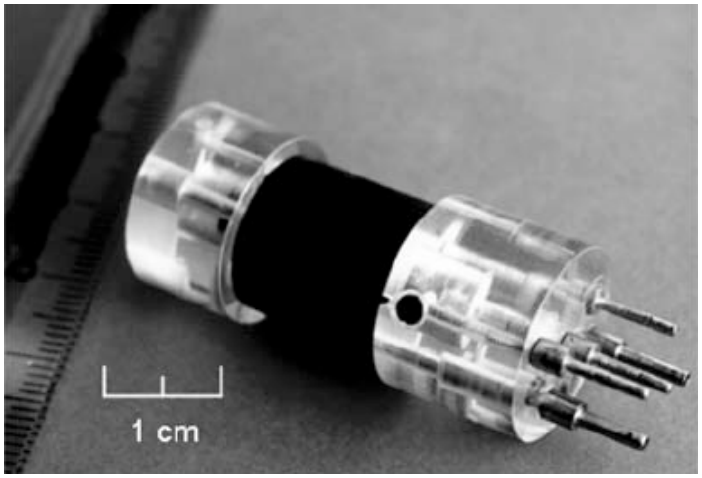
- Excellent spatial resolution (µm)
- Well-defined sensitive SV (we need to know the mean chord length)
- Minimal wall effects (similar scattering properties in the walls and SV);
- Tissue-equivalence in the walls and SV
- Operate at low potentials
- Compact
- Low cost

Tissue-equivalent proportional counters (TEPC)

- Tissue-equivalent gas (methane/propane based)
- Tissue-equivalent (A-150) plastic walls;
- Pressure adjusted to mimic the energy loss at the cell scale;
- Too large to model an array of cells
- Well-known technology



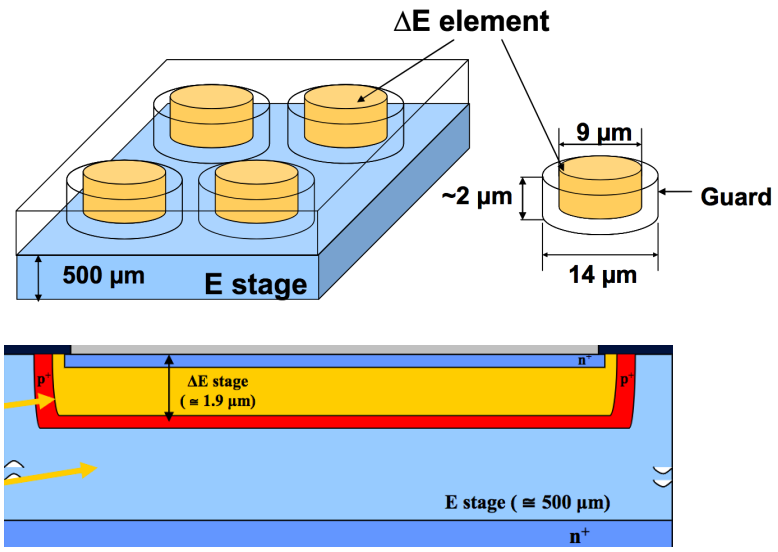
“HAWK” TEPC (NASA)



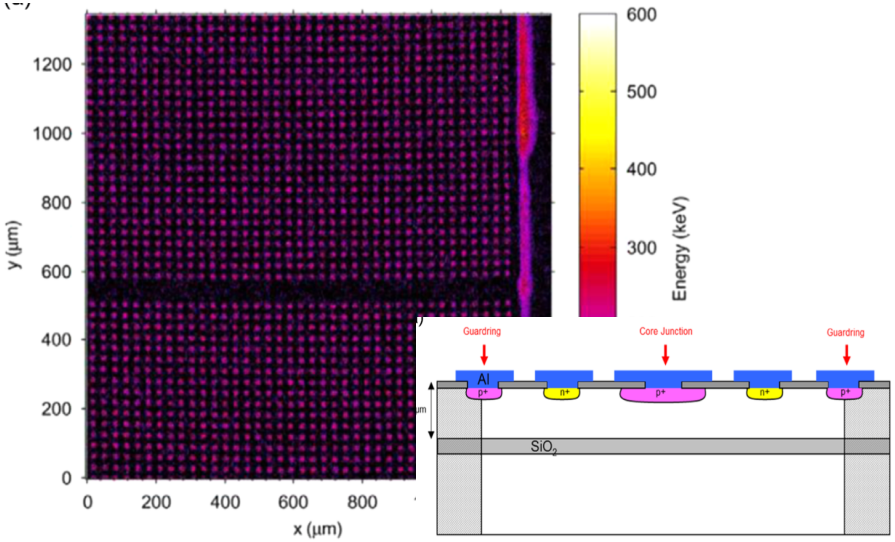
Sei TEPC (Seibersdorf lab.)

Si based microdosimeters

- SV built at µm scales. Can model a matrices of cells
- Low operation voltages
- Bad tissue-equivalence
- Efficiency limitations due to drift currents
- New technology (requires microelectronic design and manufacturing)



Segmented Si-telescope (INFN/ARDENT)



n-SOI microdosimeter (Australia)

A microdosimeter project at LIP

Development of a microdosimeter at LIP opens opportunities to R&D in

- **Instruments and methods for biomedical applications**
- **Space Radiation Environment and Effects**

Regarding

- LIP´s scientific strategy for the upcoming proton therapy unit
- Portugal Space 2030 strategy
- International collaborations (BIOMAT/FAIR/GSI experiments, EURADOS network)
- Transfer of technology to industry

Who wants to build a microdosimeter?