Charged-particle transport through models of human trabecular spongiosa

Jacob A. Gersh, M.S.
Department of Physics
East Carolina University
Geometric Modeling of Spongiosa
Comparison of Internal Dimensions
Path-Length Distribution through Marrow
Path-Length Distribution through Bone

![Graph showing normalized frequency vs. path length with error bars for Gersh et al. 2007 and Shah et al. 2005]
Path-Length Distribution through Bone

![Graph showing normalized frequency vs. path length for bone with error bars. Two curves are present: one for Gersh et al. 2007 and another for Shah et al. 2005.](image)

- **Normalized Frequency (µm⁻¹)**
  - Y-axis range: 0.000 to 0.004
- **Path Length (µm)**
  - X-axis range: 0 to 1400
- Legend:
  - Blue line: Gersh et al. 2007
  - Red dashed line: Shah et al. 2005
Comparison of Absorbed Fractions:
Electron Emission
Absorbed Fraction = \frac{\text{Energy Absorbed by a Target}}{\text{Energy Emitted by a Source}}
PENELOPE

PENetration and Energy LOss of Positrons and Electrons

Beta particles and photons
1 keV – 1 GeV
Condensed-history transport for beta transport.
Event-by-event transport for photon transport
Quadric-based geometry
279 Materials
Target = LV Marrow
Target = LV Endosteum
Target = LV Bone
Comparison of Absorbed Fractions:
Alpha Emission
PENELOPE

Beta particles and photons
1 keV – 1 GeV
Condensed-history transport
for beta transport.
Event-by-event transport for photon transport
Quadric-based geometry
279 Materials
**PENELOPE**

- Beta particles and photons
- 1 keV – 1 GeV
- Condensed-history transport for beta transport.
- Event-by-event transport for photon transport
- Quadric-based geometry
- 279 Materials

**PARTRAC**

- Protons, alpha particles, heavy ions
- 1 keV – 1 GeV
- Event-by-event transport
- Slab geometry
- Density-scalable liquid water
Initial Parameters

Hybrid MC Code
Hybrid MC Code

Initial Parameters

PARTRAC
Hybrid MC Code

PARTRAC

Secondary e⁻ Depositions
$E_0 < 1000\ eV$

Deposition Scoring

Primary Depositions
Hybrid MC Code

PARTRAC

Secondary e\textsuperscript{-} Depositions
\(E_0 < 1000\)

Primary Depositions

Deposition Scoring
Hybrid MC Code

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Secondary $e^-$
$E_o > 1$ keV

PENELOPE

Deposition Scoring
Hybrid MC Code

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PENELOPE

e^{-} deps

Deposition Scoring
Target = LV Marrow
Target = LV Endosteum
Target = LV Bone
Mission Accomplished?


Thank You