Small-Field Dosimetry

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Challenges in Small Field MV Photon Dosimetry

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Small Field Dosimetry
Relative dosimetry: detector choice and corrections

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Modelling of small fields in Treatment Planning Systems

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Treatment Fields

Magna-Fields

- 200x200 cm²

Traditional Fields

- 40x40 cm²
- 4x4 cm²

Advance Therapy Fields

- SRS/SRT
- Gamma Knife
- Cyber-Knife
- Tomotherapy
- IMRT

Small Field

- 4x4 cm²
- 0.3x0.3 cm²
What is a Small Field?

- Lack of charged particle
  - Dependent on the range of secondary electrons
  - Photon energy
- Collimator setting that obstructs the source size
- Detector size comparable to the field size

[ Detail discussion by Maria in this talk ]
CPE & Electron Range

- CPE, Charged Particle Equilibrium
- Electron range = $d_{\text{max}}$ in forward direction
- Electron range in lateral direction
  - Nearly energy independent
  - Nearly equal to penumbra (8-10 mm)
- Field size needed for CPE
  - Lateral range
  - 16-20 mm

[ Detail discussion by Anders on treatment planning in this talk ]
Definition of Small Fields

An elegant presentation of this issue by Anders in this talk

Dosimeters & Associated Problems

- **Ion Chambers**
  - Diameter, volume, and window thickness
  - W/e, S/ρ, μen/ρ
  - Perturbation

- **Films**
  - Silver bromide films
    - high Z, sensitivity, thickness
  - GAFchromic polymer films
    - Sensitivity, thickness, polymerization at low energy

- **TLD/OSL (sensitivity at low energy, F center)**
  - Size 10-15 μm, difficulty of handling

- **Fricke Dosimeter (G value)**
  - (Size and dose)

- **MOSFET (thickness, dose rate, burnout, life, cost)**

- **Monte Carlo (benchmarking, expertise, reliability)**

[ Detail discussion by Otto in this talk ]
Field Size Limit for Accurate Dose Measurements with Available Detectors

Das et al, TG-106, Med Phys, 35, 4186, 2008
Thanks