Dynamically Collimated Proton Therapy

- Beam of protons to irradiate cancerous tissue
- Majority of energy released in target but scatters laterally
- Energy-specific collimation confines dose closer to target
  - increases healthy tissue sparing

References:

3. A. Moignier, RED, 95(1), 2016
5. A. Moignier, Int. J. Particle Therapy 2(4), 2016
Secondary Radiation during Proton Therapy

• Primary Radiation
  • Planned, intended treatment

• Secondary Radiation
  • Non-intentional radiation

• Secondary Neutrons
  • From nuclear reactions\(^1\)
  • From patient and collimator\(^1\)
  • High cell death potential\(^2\)

\(^1\) A. Andujar, Phys. Med. Bio., 2009
\(^2\) Nat. Research Council, BEIR VII Report, 2006
Evaluating Dose Distributions

- Mathematically model radiation transport\(^1\)
  - DCS and Patient
  - Primary Proton Beam
  - Secondary Neutrons

- Quantify Risks vs Benefit
  - 2% - 4% increased risk of cancer development from secondary radiation
    - Half of risk estimated for brass apertures\(^2\)
  - 25% reduction of cancer development from primary beam\(^3\)

---

1. T. Goorley, MCNP6, 2009
2. H. M. Islam, Radiation Measurements, 96, 2017
3. A. Moignier, RED, 95(1), 2016