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# Proton therapy

This page is dedicated to the capability of Geant4 in the proton therapy field.

## Applications

- Applications developed at MGH:
  - ◆ Beam delivery developments and quality assurance
  - ◆ Dose calculation for treatment planning
  - ◆ Neutron doses and the risk of secondary cancer
- Applications developed at LNS:
  - ◆ Hadrontherapy: a Geant4 example for proton and ion therapy
  - ◆ Physics validation for 62 MeV protons

## Talks

- Effect of material composition on proton depth dose distribution [↗](#), S.-W. Wu, October 2008
- Development of a Monte Carlo simulation for the proton therapy in National Cancer Center, Korea [↗](#), J. Shin, October 2008
- Clinical validation of a proton ocular treatment planning system with Geant4 Monte Carlo toolkit and measurements, G.A.P.Cirrone & F.Di Rosa, March 2007
- Hadrontherapy Geant4 application: how Monte Carlo helps Hadrontherapy G.A.P.Cirrone, March 2007
- How well do we know the range of a proton beam in the patient? [↗](#), T. Bortfeld, May 2007
- Roadmap to clinical use of proton Monte Carlo [↗](#), H. Paganetti, October 2006

## Publications

- **Clinical implementation of full Monte Carlo dose calculation in proton beam therapy**, H. Paganetti *et al.*, Phys. Med. Biol. 53 (2008) 4825-4853
- **Sensitivity of different dose scoring methods on organ specific neutron doses calculation in proton therapy**, C. Zacharathou Jarlskog and H.Paganetti, Phys. Med. Biol. 53 (2008) 4523-4532
- **Physics settings for using the Geant4 toolkit in proton therapy**, C. Zacharathou Jarlskog and H.Paganetti, IEEETransaction on Nuclear Science, 55 (2008) 1018-1025
- **Assessment of organ specific neutron equivalent doses in proton therapy using computational whole-body age-dependent voxel phantoms**, C. Zacharathou Jarlskog *et al.*, Phys. Med. Biol. 53 (2008) 693-717
- **Monte Carlo calculations of absolute dosimetry to determine output factors for proton therapy fields**, H.Paganetti, Phys. Med. Biol. 51 (2006) 2801-2812
- **Implementation of a new Monte Carlo - Geant4 simulation tool for the development of a proton therapy beam line**, G. A. P. Cirrone *et al.*, IEEE Trans. Nucl. Sci. 52 (2005) 262-265
- **The role of nonelastic reactions in absorbed dose distributions from therapeutic proton beams in different medium**, A.J.Wroet *et al.*, Medical Physic, 32 (2005) 37
- **4D Monte Carlo simulation of proton beam scanning: Modelling of variation in time and space to study the interplay between scanning pattern and time-dependent patient geometry**, H.Paganetti *et al.*, Phys. Med. Biol. 50 (2005) 983-990
- **Simulation of patient organ doses and effective doses originating from secondary neutrons in proton beam treatment**, H.Jiang *et al.*, Phys. Med. Biol. 50 (2005) 4337-4354
- **Four-dimensional Monte Carlo simulation of time dependent geometries**, H.Paganetti, Phys. Med. Biol. 49 (2004) N75-N81
- **Accurate Monte Carlo simulations for nozzle design, commissioning, and quality assurance in proton radiation therapy**, H.Paganetti *et al.*, Med. Phys. 31 (2004) 2107-2118

- **A Monte Carlo dose calculation algorithm for proton therapy**, M.Fippel, M.Soukup, *Med.Phys.* 31, (2004) 2263
- **Adaption of Geant4 to Monte Carlo dose calculations based on CT data**, H. Jiang *et al.*, 31 (2004) 2811-2818
- **Monte Carlo simulations with time-dependent geometries to investigate organ motions**, H.Paganetti *et al.*, *Int, Journ. Rad. Onc. Biol. Phys.* 60 (2004) 942-950
- **Test of Geant3 and Geant4 nuclear models for 160 MeV protons stopping in CH2**, H.Paganetti *et al.*, *Med. Phys.* 30 (2003) 1926-1931
- **Monte Carlo calculation in support of the commissioning of the Northeast Proton Therapy Center**, J.Flanz and H.Paganetti, *Australasian Physical & Engineering Science in Medicine* 26 (2003) 156-161
- **Nuclear interaction in proton therapy: dose and relative biological effect distributions originating from primary and secondary particles**, H. Paganetti, *Phys. Med. Biol.* 47 (2002) 747-764
- **Radiobiological significance of beam line dependent proton energy distribution in a spread out Bragg peak**, H. Paganetti *et al.*, *Med. Phys.* 27 (2000) 1119-1126
- **Nuclear interactions of 160 MeV protons stopping in copper: a test of Monte Carlo nuclear models**, B. Gottschalk, *Med. Phys.* 26 (1999) 2597-2601
- **Calculation of the patial variation of relative biological effectiveness in a therapeutic proton field for eye treatment**, H. Paganetti *et al.*, *Phys. Med. Biol.* 43 (1998) 2147-2157
- **Monte Carlo method to study the proton fluence for treatment planning**, H. Paganetti *et al.*, *Med. Phys.* 25 (1998) 2370-2375

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-- GiuseppeCirrone - 13 Jun 2009

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