# AbstractID: 7753 Title: Radiation Safety of Pregnant Patients During Radiation Treatment: A Detailed Modeling of the Accelerator, Patient Anatomy, and Non-target Doses

**Purpose:** The cancer incidence rate in pregnant women is increasing, due to both the new trend for delaying pregnancy into late reproductive ages and early detection of common cancers associated with pregnancy. When radiation treatment is chosen, the safety concern for the mother and fetus must be fully addressed. However, previous studies of fetal dose, such as those reported by AAPM TG-36, had been limited to homogenous water phantoms and surface measurements that are not quantitative. This paper presents our effort to develop medical accelerators and ICRP standard reference pregnant patient models for Monte Carlo calculations of non-target doses during radiation treatments.

**Method and Materials:** The Monte Carlo program MCNPX was used to develop a complete model of a Varian Clinac 2100C. Peripheral dose profiles in a water phantom were investigated for the following square fields defined by the jaws: 5 cm x 5 cm, 10 cm x 10 cm, and 20 cm x 20 cm. Anatomically-realistic pregnant patient and fetal models at different stages of gestation representing ICRP reference female patients were developed using latest anatomical modeling technologies.

**Results:** The peripheral dose characteristics as a function of distance from the field edge for 5 cm x 5 cm, 10 cm x 10 cm, and 20 cm x 20 cm field sizes at several depths are consistent with previous studies. The change in peripheral dose as a function of depth is small for each field size. The peripheral dose increases as field size increases.

**Conclusion:** Calculations of organ doses to a pregnant patient and fetus have been demonstrated. Such data will help better assess the risks to the mother and fetus from radiation treatment procedures. The tools we have developed can be adopted for routine use to optimize the treatment planning for pregnant patients.