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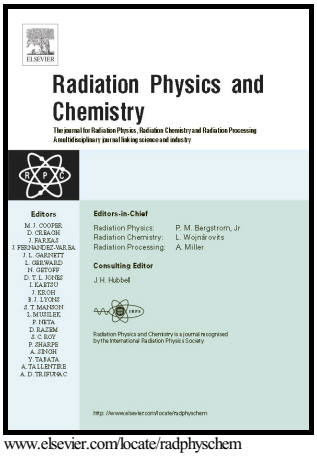

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Hybrid pregnant reference phantom series based on adult female ICRP reference phantom

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Short title: Hybrid pregnant reference phantoms

Abstract: This paper presents boundary representation (BREP) models of pregnant female and her fetus at the end of each trimester. The International Commission on Radiological Protection (ICRP) female reference voxel phantom was used as a base template in development process of the pregnant hybrid phantom series. The differences in shape and location of the displaced maternal organs caused by enlarging uterus were also taken into account. The CT and MR images of fetus specimens and pregnant patients of various ages were used to replace the maternal abdominal pelvic organs of template phantom and insert the fetus inside the gravid uterus. Each fetal model contains 21 different organs and tissues. The skeletal model of the fetus also includes age-dependent cartilaginous and ossified skeletal components. The replaced maternal organ models were converted to NURBS surfaces and then modified to conform to reference values of ICRP Publication 89. The particular feature of current series compared to the previously developed pregnant phantoms is being constructed upon the basis of ICRP reference phantom. The maternal replaced organ models are NURBS surfaces. With this great potential, they might have the feasibility of being converted to high quality polygon mesh phantoms.

Keywords: hybrid phantom, pregnant woman, fetus