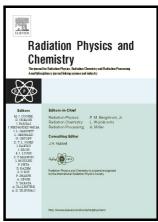
Author's Accepted Manuscript

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

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www.elsevier.com/locate/radphyschem

PII: S0969-806X(17)30092-0

DOI: https://doi.org/10.1016/j.radphyschem.2017.10.001

Reference: RPC7660

To appear in: Radiation Physics and Chemistry

Received date: 24 January 2017 Revised date: 30 August 2017 Accepted date: 1 October 2017

Cite this article as: Laleh Rafat-Motavalli, Hashem Miri-Hakimabad and Elie Hoseinian-Azghadi, Hybrid pregnant reference phantom series based on adult female ICRP reference phantom, *Radiation Physics and Chemistry*, https://doi.org/10.1016/j.radphyschem.2017.10.001

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ACCEPTED MANUSCRIPT

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

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