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Particle Accelerators for Radiotherapy. Present Status and Future

Wieslaw Maciszewski,[1] Waldemar Scharf[2]

1. *The Andrzej Soltan Institute for Nuclear Studies, PL 05-400 Swierk (Poland)*
2. *Warsaw University of Technology, Institute of Radioelectronics, Nowowiejska Street 15/19, PL 00-665 Warsaw (Poland)*

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Abstract

The paper describes the development of the application of particle accelerators in the treatment of cancer diseases over the past fifty years. Special emphasis is put on the routine application of conventional electron accelerators delivering electron and photon beams. This is the largest group of devices for radiotherapy (over 7,500 machines operating worldwide). The number of patients reaches 5 million per year. The medical electron linacs have recently undergone considerable modifications of construction, in particular the systems of radiation field shaping. Contemporary accelerators for radiotherapy are equipped with dynamic multi-leaf collimators (MLC) which, in conjunction with IMRT (Intensity Modulation Radiation Therapy) technique and special system of therapy planning, assure considerably higher precision, effectiveness and quality of treatment.

KEYWORDS: Particle accelerators, Medical accelerators, Radiotherapy, Multi-energy accelerators.

A comparison of Monte Carlo and TG60 algorithm calculation in the dosimetry of $^{90}Sr/^{90}Y$ seed source trains for intravascular brachytherapy

Federica Saiani,[1] Marco Galelli,[2] Piero Feroldi[2]

1. *Scuola di Specializzazione in Fisica Sanitaria, Università degli Studi di Milano, Milano (Italy)*
2. *Servizio di Fisica Sanitaria, Spedali Civili di Brescia, Brescia (Italy)*

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Abstract

In this work the EGSnrc Monte Carlo code was used to calculate the parameters of the AAPM TG60 report formalism for the dosimetry of a beta source used in intravascular brachytherapy. A $^{90}Sr/^{90}Y$ seed source was considered in order to obtain the TG60 parameters, which were then applied to a clinical 12-seed source train. The present calculation was compared with calculations reported by other authors. Our calculated radial dose function for $^{90}Sr/^{90}Y$ single seed source is consistent with those of published works for intermediate radial distances. The dose uniformity in the axial direction was studied both for the single seed source and for the seed source train. For the latter source train a comparison was made between the dose obtained respectively from Monte Carlo simulations and that obtained from TG60 calculations based on dose parameters and functions derived from the Monte Carlo calculation of the single seed source.

KEYWORDS: Monte Carlo, Dosimetry, Intravascular brachytherapy.

Classification of aorta insufficiency and stenosis using MLP neural network and Neuro-fuzzy system

Fırat Hardalaç,[1] Necaattin Barışçı,[2] Uçman Ergün[2]

1. *Department of Biomedical, Faculty of Medicine, Gazi University, Ankara (Turkey)*
2. *Department of Electronic and Computer Education, Faculty of Technical Education, Gazi University, Ankara (Turkey)*

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Abstract

Cardiac Doppler signals recorded from aorta valve of 120 patients were transferred to a personal computer by using a 16 bit sound card. Spectral analyses of aorta valve Doppler signals were performed for determining the Multi Layer Perceptron (MLP) neural network and Neuro-fuzzy system inputs. In order to do a good interpretation and rapid diagnosis, AR parameters of aorta valve Doppler signals classified using MLP neural network and Neuro-fuzzy system. Our findings demonstrated that 90% correct classification rate was obtained from MLP neural network, and 88.33% correct classification rate was obtained from Neuro-fuzzy system. Since we had limited number of patient, there is no significant performance difference observed between the two methods.

KEYWORDS: Multi Layer Perceptron (MLP), Neuro-Fuzzy Classification (NEFCLASS), Cardiac Doppler, Autoregressive (AR) spectral analysis.