



# FisMat 2015



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# BOOK OF ABSTRACT

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When also radiobiological data are plotted as a function of the mean ionization-cluster size  $M_1$ , the result is a clear relation between radiobiological cross sections and some of the cumulative distributions  $F_k$ . The correspondence between radiobiological cross sections and experimental nanodosimetric data for protons and carbon ions will be presented.

#### #510 - The impact of self-oxidation on the dosimetric performance of ferrous-sulfate/xyleneol-orange gels

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Since their introduction in the 1980's, most of the research on ferrous-sulfate gel dosimeters has aimed at minimizing the ferric ion diffusion phenomena that blur the 3D distribution of the signal. However, equally important are the spontaneous oxidation effects, which alter the sensitivity of the gels over time. In some gels, this effect is very pronounced and must be accounted for even when production, calibration and use of the gels are separated by just a few days. In other cases, the effect is much milder, but should still be properly accounted for when gels are used over a long period a time, such as in the proposed monitoring of adaptive radiotherapy treatments. Our work examined and modeled the spontaneous oxidation processes occurring in ferrous-sulfate/xyleneol-orange gels for 3D dosimetry. The model accounts for the time interval between production of the gels and their use, as well as for the fractionation schemes adopted for the irradiations. Based on a single kinetic constant and on the initial amounts of Fe<sup>2+</sup> and Fe<sup>3+</sup>, our model predicts as a function of time the amount of Fe<sup>3+</sup> present in the gels and coordinated with xyleneol-orange.

#### #511 - Use of alanine EPR dosimeters for discriminating neutron and photon components in the thermal column of Pavia Triga reactor

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The optimization of the procedures of Neutron Capture Therapy (NCT) for cancer treatments involves research for beam characterization. One major issue for this therapy is the reliable dosimetric determination of the various (neutronic and photonic) components of the employed beam. In particular, the precise and accurate measurements of the gamma photon component is fundamental for evaluating the risks to healthy tissues hit by the mixed field.

Among solid state dosimeters the alanine detectors read by Electron Paramagnetic Resonance (EPR) technique present several advantages such as: tissue equivalence for photon and electron beams, linearity of its dose-response over a wide range, high stability of radiation induced free radicals, no destructive read-out procedure, no sample treatment before EPR signal measurement and low cost of the dosimeters.

These features associated with the possibility of recognizing the various components of a mixed radiation fields makes alanine a good candidate for dosimetry in neutron-gamma fields.

In this work we determine the gamma component of the mixed radiation field in thermal column of the Triga Reactor of University of Pavia (which is used for experimental activities on NCT) by means of alanine EPR dosimeters.

Commercial alanine dosimeters produced by Synergy Health (Germany) were exposed in three positions in the thermal column; the irradiations were performed inside graphite holders to avoid use of hydrogenous phantoms for minimizing the gamma contribution due to the plastic holders. EPR measurements were carried out through Bruker ECS106 spectrometer equipped with a TE<sub>102</sub> rectangular cavity. In order to isolate the gamma components of the mixed field two kinds of irradiations were carried out inside a lithium carbonate box (wherein the thermal neutron component is heavily reduced) and outside of it.

MCNP Monte Carlo simulations of the irradiation set-up were carried out, calculating the contributions of the various components present in the mixed field (thermal and fast neutron and gamma).

The experimental values are compared with the computations of the Monte Carlo simulations and the results are discussed on the basis of the mixed field features and on the response of alanine dosimeters to high and low LET radiations.

#### #512 - Alanine EPR pellets for dosimetry of clinical proton and carbon ion beams

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