# UV EFFECTS IN TOOTH ENAMEL AND THEIR POSSIBLE APPLICATION IN EPR DOSIMETRY WITH FRONT TEETH

**Sholom Sergey**[1], Desrosiers Marc[2], Chumak Vadim[1], Luckyanov Nicolas[3], Simon Steven[3] and Bouville André[3]

[1] Laboratory of External Exposure Dosimetry, Research Center for Radiation Medicine, Melnikova str., 53, Kiev, Ukraine, sholom@leed1.kiev.ua, chumak@leed1.kiev.ua
[2] Ionizing Radiation Division, National Institute of Standards and Technology, Gaithersburg, MD, USA, marc.desrosiers@nist.gov
[3] Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Bethesda, MD, USA, luckyann@mail.nih.gov, ssimon@mail.nih.gov, bouvilla@mail.nih.gov

The EPR signal in tooth enamel, produced by the ultraviolet (UV) component of solar radiation, restricts using front teeth in retrospective estimation of external gamma-ray doses. The problem stems from the high degree of similarity of the spectral characteristics of the UV signals and the gamma-induced signals, the latter being of interest in field of retrospective dosimetry for ionizing radiation. There are, however, some distinctions between the signals from UV and gamma radiation and these can potentially be used to distinguish the two sources of radiation. In particular, according to Sholom et al. (1998), the shape of EPR signals in spectra of UV and gamma-exposed samples is slightly different. Also, there are differences of the anisotropy properties of EPR signals in tooth enamel plates exposed to different kinds of radiation (Vorona et al. (2007). It is also known that gamma and UV radiations have different depths of penetration in tooth enamel material.

The main purpose of the present study was to investigate UV effects in samples of tooth enamel prepared in two different ways: (i) powdered grains of certain sizes, and (ii) plate-shaped cutouts of certain thickness. The samples were exposed to UV using a calibrated source of UV light radiation that closely simulates the solar spectrum and is used by the NIST to study the effects of sunlight on coatings and materials for the construction industry.

Our study on UV effects included determination of:

- A dose-response curve for UV exposed samples,
- Differences of spectra EPR for gamma and UV exposed samples,
- Anisotropy properties of tooth enamel plates exposed to gamma and UV beams,
- Peculiarities of saturation curves for UV exposed samples,
- Dose profiles in tooth enamel plates exposed to different kinds of radiation.

The primary outcome of our studies was development of a proposal for an improved technique of retrospective dosimetry using EPR and front teeth that accounts for UV exposure. This technique was tested using front teeth collected from a few inhabitants of region around the Semipalatinsk Nuclear Test Site (Kazakhstan) in order to estimate their accidental doses resulting from exposure to fallout from nuclear weapons tests. Preliminary findings will be presented.

References:

1. Sholom S., Haskell E., Hayes R., Chumak V., Kenner G. Radiat. Meas. 1998. 29, p. 113.
2. Vorona I.P., Baran N.P., Ishchenko S.S., Rudko V.V. Appl. Radiat. Isot. 2007. 65, p. 553.