Abstract title: Response of alanine dosimeters to low energy X-rays and small fields.

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L-α-alanine Electron Paramagnetic Resonance (EPR) dosimetry is a convenient method for quality assurance (QA) measurements in radiotherapy due to its excellent properties (robustness, nearly water equivalent, nondestructive read-out, low signal fading rate). It has been used for more than 20 years as a transfer dosimetry system mostly for high-energy photon beams where the energy response is very well documented. The rapid development of small animal treatment with kilovolt X-ray sources led us to investigate the use of EPR dosimetry in this field.

The aim of this project is to determine the response of the alanine-EPR dosimetry system in low energy X-rays and small fields (down to the mm range). We will use cylindrical pellets with height 2.8 mm and a diameter of 5 mm (Harwell Dosimeters LTD, Oxfordshire, UK). The dose delivered to the alanine in small fields will be determined using Gafchromic® EBT3 films (Covington, Kentucky, USA) with triple channel dosimetry. The irradiations will be performed on a small animal radiation research platform (SARRP) (Johns Hopkins University School of Medicine, Baltimore, USA), which has an X-ray source with energies varying between 50 kVp and 225 kVp. The alanine detectors will be placed in a small cubic slab phantom (6 x 6 x 10 $cm^3$) at different depth in combination with EBT3 films. EBT3 films have been shown by several authors to have a very small energy dependence. They will be calibrated against an ionization chamber at different energies to confirm it. The slabs will consist of water equivalent material RW3. To compare the tissue equivalent property of the solid phantom, a custom-made water tank (10 x 10 x 10 $cm^3$) will be used where EBT3 film can be placed vertically to measure the depth dose curves. This depth dose will be compared to a depth dose curve measured in the solid phantom.

The procedure we plan to use for the measurements combining alanine pellets and films has already been used in fields of 5x5 $cm^2$ to 1x1 $cm^2$ in a PMMA slab phantom for MV beams to assess the response of alanine for small fields. During these experiments, we could show that alanine over responds for fields smaller than 2 x 2 $cm^2$.

Alanine-EMR dosimetry is a very accurate tool for QA for MV beams in fields larger than 2x2$cm^2$. However to become a possible dosimeter for quality assurance in small animal radiotherapy, the response should be accurately characterized for low energy photons and for much smaller field sizes. As the pellets have a diameter of 5 mm, the effect of inhomogeneous irradiation of the pellet with beams smaller than the physical dimension of the detector will be investigated.

**Preference:** oral / ~~poster~~ [delete as appropriate]