

AbstractID: 8825 Title: Investigation of optical artifacts in a complex light-scattering gel phantom for optical CT polymer gel dosimetry

INTRODUCTION: A test phantom of complex shape was developed to simulate artefacts in dosimetric polymer gels (e.g. PAGAT [1]) when read using cone beam optical CT. Here we report the results of modelling of experimental data using this phantom.

MATERIALS & METHODS: Using a method reported earlier [2], opacity change in an exposed dosimetric gel was simulated by adding known concentrations of Dettol™ to gelatin. Different doses were simulated with gelatin of different opacity (optical density, OD).

The phantom was contained in a cylindrical PETE vessel (9.5 cm diameter, 13 cm high). It consisted of an outer mantle of pure gelatin ("zero dose") surrounding a central, vertical hollow finger. The hollow finger was constructed of 10 transverse layers 15 mm thick of increasing OD, the uppermost layer having the lowest OD. The cavity through the finger centre was filled with a pith of pure "zero dose" gelatin. Inclusion of this central pith simulates a treatment where a high dose region surrounds a low dose region.

The phantom was scanned with a Vista Optical CT Scanner (Modus Medical Devices Inc.). Horizontal profiles of OD versus position through each of the 10 layers were obtained from the reconstruction (resolution; 0.25 mm per voxel).

RESULTS & DISCUSSION: Consistent with earlier work [1], higher OD slices exhibited dishing artefacts - inner regions within the slice exhibiting an apparent reduction in OD, similar to dishing artefacts in X-ray CT. More interestingly, the central "zero dose" pith exhibited spurious increases in OD. These effects are modelled by taking into account the back-reflection of scattered light.

REFERENCES:

¹ A.J. Venning, B. Hill, S. Brindha, C. Baldock, *Phys. Med. Biol.*, **50** (2005): 3875-3888

² S. Bosi, P. Naseri, A. Puran, J. Davies, C. Baldock, *Phys. Med. Biol.*, **52** (2007): 2893-2903