AbstractID: 3463 Title: Improved calibration method of EDR films for IMRT-QA

Purpose: Due to film processing variation and the optical density not being linear with the dose, a full calibration has to be obtained for every IMRT-QA with film. We are proposing the application of a linearization method and the use of a single dose calibration EDR film for relative and absolute dose measurement in IMRT-QA.

Method and Materials: The linearization method was studied for the EDR films using 6, 10 and 15 MV photon beams. The films were developed in a Konica film processor, then scanned with a Vidar VXR-16 scanner and analyzed using RIT-114 version 4.1. A standard 30-point calibration curve was obtained with the 6 MV beam. Using the method developed in a previous paper, a curve fitting was obtained for a sigmoid expression modulated by a 3rd degree polynomial: ApparentDose = $b(1+a_1x+a_2x^2+a_3x^3)$ [log(m)-log(m-x)]; where x is the net optical density, m is the net saturation density, b, a_1, a_2 and a_3 are parameters of the model.

Results: A value of 1870.1945 was obtained for b that is a parameter related to the dose unit. The net saturation density was 3.5587 for our system. The parameters a_1, a_2 and a_3 are, respectively, -0.4551, 0.1167, -0.0134. For every IMRT-QA a spreadsheet is used to obtain a 70 point calibration curve for RIT, using only one exposed film developed together with the composed and enface films, obtaining <5% uncertainty.

Conclusion: Some softwares are available to make film dosimetry in IMRT QA less cumbersome, however daily calibration still remains a time consuming procedure. Absolute dosimetry requires a full calibration every time film is used. The linearization method presented here is being used in our department for isodose comparison and for absolute measurement at calculation point. The overall time is reduced while obtaining uncertainty comparable to the existing methods.