AbstractID: 3352 Title: A Integrated Approach to Improve Accuracy of Film Dosimetry in TPS Verification

Purpose: To eliminate negative impacts in film measurement system, which adopt commercially availabe scanner as digitizer, and diminish film's inherent over-response to low energy scatter photons, an integrated approach is proposed to improve total accuracy of film dosimetry

Method and Materials: The system is composed of EDR2 radiographic film, polystyrene phantom, auto-processor and ArtixScan 2020 Scanner.A wavelet packet filtering method combining with mid-value filtering is employed to eliminate interference-pattern artifacts, grains drift and high frequency noise, which usually produced by laser scanner based on CCD in film digitizing process and have random characters. In order to reconstruct the original OD image, point-spread function (PSF) is used to deconvolve transmission gray data. Besides calibrating for OD-Dose translation, the approach also integrates a nonlinearity correction method to scanner with Kodak step wedge film to correct the nonlinearity and inconsistency of the detectors' response to film's gray. To reduce film's inherent loverresponse to low energy, a set of coefficients of EDR2 film for Co-60 γ rays in polystyrene phantom is calculated through MC simulation and used to correct film dose in TPS's verification for rotating gamma system. The results from 0.015 cm^3 PTW ion chamber is obtained and used to be the reference.

Results: Trial validation experiment shows this approach has better linearity, higher sensitivity of OD-Dose response, and excellent agreement (SSD <5% in 21 test points) with those from ionization chamber at corresponding planes in phantom.

Conclusion: This approach has a potential capability in clinicl to eliminate artifacts and noises in film digitizing process, and then significantly improve total accuracy of film dosimetry. To remove its over-response, the key is to acquire the appropriate correction coefficient for various buildups through experiment or MC simulation, both needing collaboration with other research groups interested.