

## Comparative Evaluation of EBT3 Film Dosimetry Using Flat Bad Scanner, Densitometer and Spectrophotometer Methods and Its Applications in Radiotherapy

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**Abstract :** Over the past few decades, film dosimetry has become a tool which is used in various radiotherapy modalities, either for clinical quality assurance (QA) or dose verification. The response of the film to irradiation is usually expressed in optical density (OD) or net optical density (netOD). While the film's response to radiation is not linear, then the use of film as a dosimeter must go through a calibration process. This study aimed to compare the function of the calibration curve of various measurement methods with various densitometer, using a flat bad scanner, point densitometer and spectrophotometer. For every response function, a radichromic film calibration curve is generated from each method by performing accuracy, precision and sensitivity analysis. netOD is obtained by measuring changes in the optical density (OD) of the film before irradiation and after irradiation when using a film scanner if it uses ImageJ to extract the pixel value of the film on the red channel of three channels (RGB), calculate the change in OD before and after irradiation when using a point densitometer, and calculate changes in absorbance before and after irradiation when using a spectrophotometer. the results showed that the three calibration methods gave readings with a netOD precision of doses below 3% for the uncertainty value of  $1\sigma$  (one sigma). while the sensitivity of all three methods has the same trend in responding to film readings against radiation, it has a different magnitude of sensitivity. while the accuracy of the three methods provides readings below 3% for doses above 100 cGy and 200 cGy, but for doses below 100 cGy found above 3% when using point densitometers and spectrophotometers. when all three methods are used for clinical implementation, the results of the study show accuracy and precision below 2% for the use of scanners and spectrophotometers and above 3% for precision and accuracy when using point densitometers.

**Keywords :** Callibration Methods, Film Dosimetry EBT3, Flat Bad Scanner, Densitomete, Spectrophotometer

**Conference Title :** ICHMS 2020 : International Conference on Health and Medical Science

**Conference Location :** Bali, Indonesia

**Conference Dates :** January 13-14, 2020