SIMULASI RESPONS *OPTICALLY STIMULATED LUMINESCENCE DOSIMETER* (OSLD) PADA MAMOGRAFI MENGGUNAKAN PROGRAM MONTE CARLO N-PARTICLE (MCNP)

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INTISARI

OSLD berpotensi sebagai dosimeter yang lebih unggul dalam mamografi karena memiliki sensitivitas yang tinggi, stabilitas termal unggul, dapat digunakan kembali, dan biaya yang murah dibanding dosimeter lainnya. Pada penelitian ini dilakukan simulasi respons OSLD dengan MCNP untuk mempersiapkan supaya OSLD dapat bekerja optimum dalam dosimetri mamografi.

OSLD yang dimodelkan merupakan nanoDot OSL Landauer Inc. dan sistem mamografi yang ditulis dalam kode MCNP. *Phantom* berupa PMMA dengan ketebalan 4,5 cm. Simulasi dilakukan menggunakan tegangan tabung 32 kVp pada 100 mAs yang mencakup *breast depth dose*, distribusi spasial, *angular dependence,* serta *average glandular dose* (AGD) yang diukur pada tegangan 25, 28, dan 32 kVp.

Hasil menunjukkan dosis yang diterima OSLD sebesar 12,6925 ± 0,0222 mGy di permukaan *phantom* dan berkurang seiring bertambahnya kedalaman *phantom* dengan R^2=0,9973. Dosis relatif yang diterima dosimeter tengah terhadap posisi lateral lainnya sebesar 0,9740 ± 0,0021. Dosis maksimum diterima pada posisi sudut 0° sebesar 13,2684 ± 0,0254 mGy dan minimum pada sudut 90°. AGD pada tegangan 25, 28, dan 32 kVp secara berurutan sebesar 1,1815 ± 0,0226 mGy, 1,8458 ± 0,0305 mGy, dan 2,9144 ± 0,0226 mGy. Perhitungan numerik dengan MCNP dapat menentukan penggunaan OSLD untuk dosimetri mamografi dengan memperhatikan penempatan dosimeter, ketebalan *phantom*, tegangan, dan arus yang digunakan.

Kata kunci: Mamografi, *Optically Stimulated Luminescence Dosimeter* (OSLD), Monte Carlo, Respons OSLD

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RESPONSE SIMULATION OF OPTICALLY STIMULATED LUMINESCENCE DOSIMETER (OSLD) IN MAMMOGRAPHY USING MONTE CARLO N-PARTICLE (MCNP) PROGRAM

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ABSTRACT

OSLD has the potential to be a superior dosimeter in mammography because it has high sensitivity, superior thermal stability, reusability, and low cost of use compared to other dosimeters. Therefore, in this study, OSLD response simulation was carried out based on numerical calculation using MCNP to prepare for optimizing OSLD in mamographic dosimetry usage.

The modeled OSLD is OSL nanoDot Landauer Inc. and a mammography system written in MCNP code. Phantom is a PMMA with a thickness of 4.5 cm. The simulation was carried out using a tube voltage of 32 kVp at 100 mAs which included breast depth dose, spatial distribution, angle dependence, and average glandular dose (AGD) which was measured using 25, 28, and 32 kVp.

The simulation results show that the dose received by OSLD was 12.6925 ± 0.0222 mGy in the surface of PMMA phantom and decreased with increasing phantom depth with R^2=0.9973. The relative dose received by the center dosimeter to other lateral positions was 0.9740 ± 0.0021 times. The maximum dose was received at 0° angle which is 13.2684 ± 0.0254 mGy and minimum in 90° angle. AGD measured at 25, 28, and 32 kVp were 1.1815 ± 0.0226 mGy, 1.8458 ± 0.0305 mGy, and 2.9144 ± 0.0226 mGy, respectively. The numerical calculation by using MCNP can determined the use of OSLD for mammographic dosimetry by considering the placement of the dosimeter, the thickness of the phantom, as well as the tube voltage and current used.

Keywords: Mammography, Optically Stimulated Luminescence Dosimeter (OSLD), Monte Carlo, OSLD Response

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