Purpose:To develop a novel DNA dosimeter for accurate dose measurements in a broad spectrum of therapeutics beams including contaminated x-ray fields.

Methods:Monte Carlo simulations were used to evaluate the DNA dosimeter for surface dose detection. The dose deposited to the detector while on the surface of a cylindrical tissue phantom was compared to the dose deposited to the first 1 mm of skin along the beam's central axis for electrons and photons with energies100 keV to 20 MeV. These results were combined with a theoretical derivation of the dosimeter's response to a broad spectrum of electron-photon fields and compared to experimental results.

Results:Results from the Monte Carlo simulations and theoretical derivation concluded that the DNA detector is capable of measuring skin doses with a 4.2% relative uncertainty. The experimental uncertainty in absorbed dose measurements was found to be 9%. The DNA dosimeter showed a linear signal response with dose in the range of 10 cGy to 10 Gy and the responses were statistically equal in cobalt 60 and 6 MV beams.

Conclusions:The DNA dosimeter is theoretically capable of accurate absorbed dose measurements in therapeutic beam including skin dose measurements from contaminated x-ray beams. Further experimental testing is required to determine if the dosimeter is independent of energy in a broad energy range of electron and photon fields and lower the experimental uncertainty.

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