# Scaling the ultra-fast LANL proton radiography system to medical energies.

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**Abstract**

A proton radiography system applied at a proton therapy treatment center could be utilized to provide instantaneous, beam's-eye-view feedback of patient anatomy, as well as a proton-based estimation of a patient's water equivalent thickness (WET). I will describe a magnetic lens-based flash radiography system as it is implemented at the Los Alamos National Laboratory (LANL) 800-MeV proton radiography center, in order to provide an estimation of the water equivalent thickness of an anatomic hand phantom. The mechanisms of focus and deterministic transmission will be described. A transmission radiograph is converted to a water-equivalent thickness by backwards calculating the transmission equations using known constants for water. Methods for scaling this system down from 800-MeV to a more standard 250-MeV system, for the purposes of estimating WET using this technique with clinically-relevant energies, will also be described. The ability to calculate a patient's WET using proton radiography allows for the acquisition of a proton-CT that could be used for treatment planning, as well as an instantaneous feedback on WET from the beam's-eye-view perspective that could enable real-time adaptive proton therapies.

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