

Title: World's first portable dual energy X-ray detector for the screening and monitoring of COVID-19 pneumonia

Abstract: Dual-energy (DE) radiography is a technique that can remove specific anatomical noise from a radiograph and generate tissue-subtracted images. Typically, a trio of images is presented comprised of a standard digital radiography (DR) image, a soft-tissue image where the bone tissue has been removed, and a bone image where the soft tissue is not present. Dual energy X-ray images have been demonstrated clinically over 20 years to provide significantly better detection of pulmonary diseases (including pneumonia, pneumothorax, lung nodules, and tuberculosis) compared to traditional digital X-ray. However, current dual-energy X-ray approaches use two sequential, spectrally different X-ray exposures that cause motion artifact streaks in the image and also demand a fixed bulky system with a special X-ray source and a well-defined source to detector geometry. In this research, we will describe the decade long ideation, development and commercialization of a portable, single-shot, dual-energy large area flat-panel X-ray detector that achieves dual energy images, excellent dose efficiency with zero motion artifact. This detector, called Reveal, is US FDA cleared and is being used for the detection of pneumonia (including COVID-19) and lung cancer in multiple hospitals across Canada. The Reveal detector is universally compatible with all X-ray systems (CR, DR, fixed, mobile) enabling a significant performance improvement in the 500,000 global X-ray install base. Like color photographic film replaced black and white film, Reveal is initiating a global transition from black and white X-ray to dual energy or color X-ray to usher in a new era of higher sensitivity, point-of-care X-ray diagnostics for better patient outcomes and more efficient healthcare.