

Health assessment of radiography systems using the photon transfer curve

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In this paper, we present a method for assessing the health of radiography systems. The main components involved in the system are the X-ray source and detector or camera. Typically, when a system needs troubleshooting, the user needs to evaluate each component separately. In some cases, this may be difficult or impossible without known-good components on hand. This technique helps the user gather insight into whether the X-ray source or detector is showing signs of degradation. The technique can also show if the degradation in the detector is caused by the scintillator or the internal electronics. It is based on an existing methodology called the Photon Transfer Curve (PTC) that is commonly used for measuring the performance of image sensors. Performance of the individual components affect the PTC differently and we can monitor the changes in the PTC over time. To measure and plot the PTC, we present a general method the user can follow at set intervals to gather multiple PTC plots and track any changes. For validation, we then present data collected from an X-ray line scan detector that uses time-delayed integration (TDI). The data set includes data from test setups using simulated degradation and real component degradation. We explain how each degradation source impacts the PTC and how the user can correlate the data to the system performance.