

Homework 5: CT

- 1: The first generation of CT had a single x-ray source collimated to produce a “pencil” beam that moved on a linear path across the patient, as the detector moved in parallel behind the subject. This process acquired a line integral. The entire assembly was rotated and subsequent line integrals acquired in a time consuming arduous process. Describe the improvements made on this process for each of the subsequent generations of CT scanner. How did each of these changes affect scan time and signal to noise?
2. What strategy do CT makers employ to minimize the bandwidth of x-rays used in CT scanners? (hint: this was mentioned in the Dr. Furman’s lecture)
3. CT slide 19 describes the line integral. Detector intensity is a function of I_0 , an integral from 0 to d , μ , s , E -bar, and ds . What are each of these terms, and how would they contribute to detector intensity.
4. From slide 21, what are g , l , θ , and $f(x(s), y(s))$ and ds ? (hint, the image graphs g along l as a function of θ) Describe each variable.
5. From slide 41, describe each term in the integral (including $f(x,y)$). What do they stand for, why are they needed in computing $f(x,y)$? Don’t skip describing the necessity for magnitude of curly rho after the $W(\text{curly rho})$ term.