

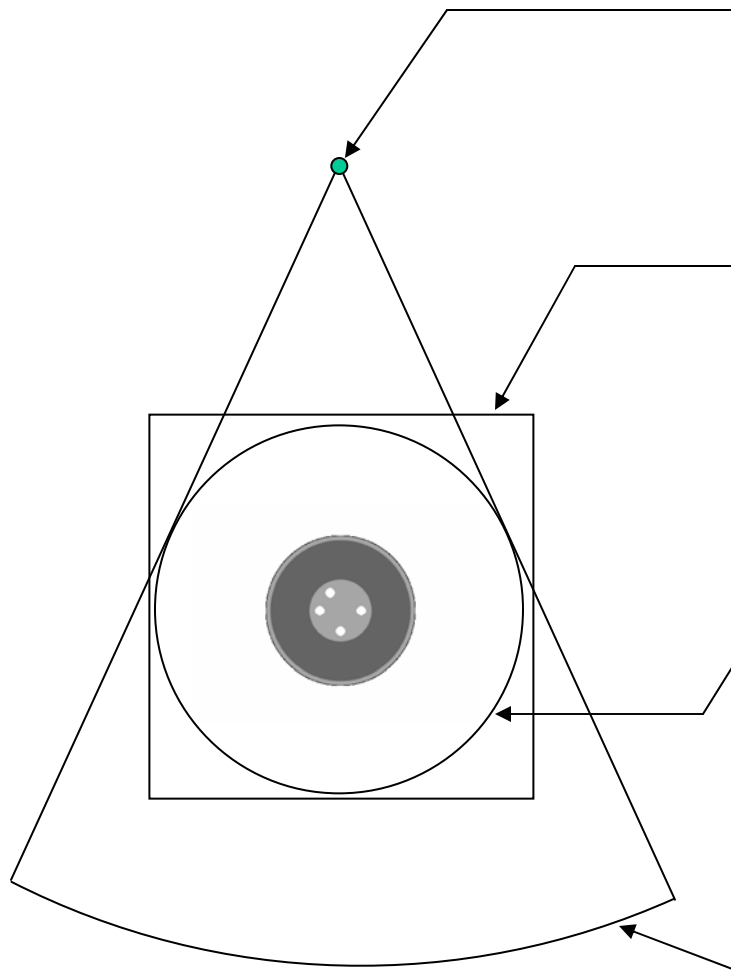
Hypothesis: The **streaky images** produced by the alternating minimization algorithm **are not fixed points**.
Instead, we are merely prematurely stopping the iterations of a slowly converging algorithm.

To test this hypothesis we need to speed up the calculations.

First attempt to speed up the computations:

Mini CT. The sampling on the image and data remains the same, but the field of view is made smaller.

Regular-Sized CT



Time per Iteration: ~40 sec

X-ray Source
1056 Gantry Positions

Image:

512-by-512 pixels
1mm by 1mm

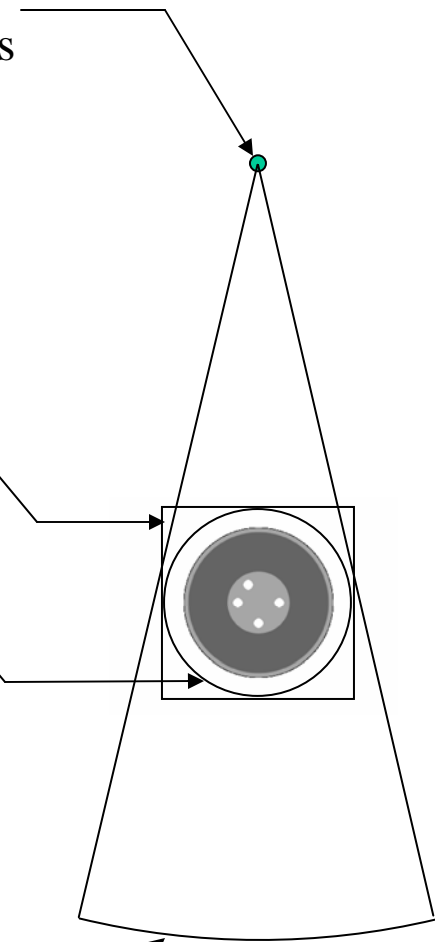
256-by-256 pixels
1mm by 1mm

Reconstructed
Field of View

768 Detectors
4.0625' of arc each

384 Detectors
4.0625' of arc each

Mini CT

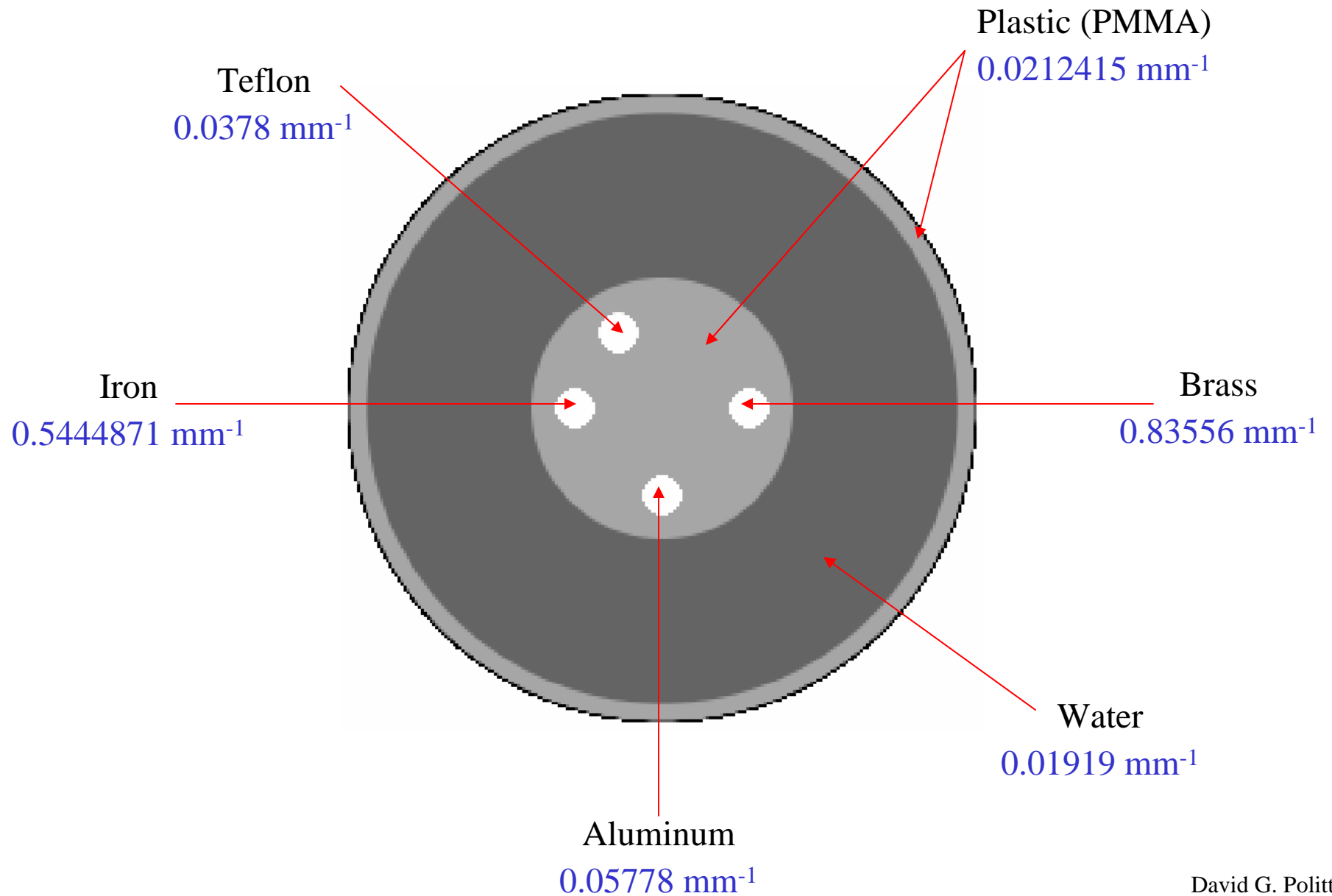


Time per Iteration: ~7 sec

Second attempt to speed up the computations:

Ordered Subsets. The subset specification file 022_subsets_a.sub, with 22 ordered subsets, was used.

Fritz Phantom Used in the Numerical Experiments



Experimental Conditions

1. Data were constructed by computing the discrete forward projection of the phantom image, negating, and then exponentiating.
2. No noise.
3. No scatter.
4. No beam hardening (75 keV assumed).
5. The initial image was set to the attenuation coefficient of water (0.01919 mm^{-1}).
6. No regularization.
7. $Z(x)$ is the function that makes the bound

$$\sum_{x \in X} h(y | x) \frac{1}{Z(x)} \leq 1 \quad \text{nearly an equality } \forall y \in Y.$$

The movies show successive iterations of the alternating minimization algorithm.

Iterations 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 50000.

Note: The grayscale axis is linear between 0.016 mm^{-1} and 0.024 mm^{-1} for all images.