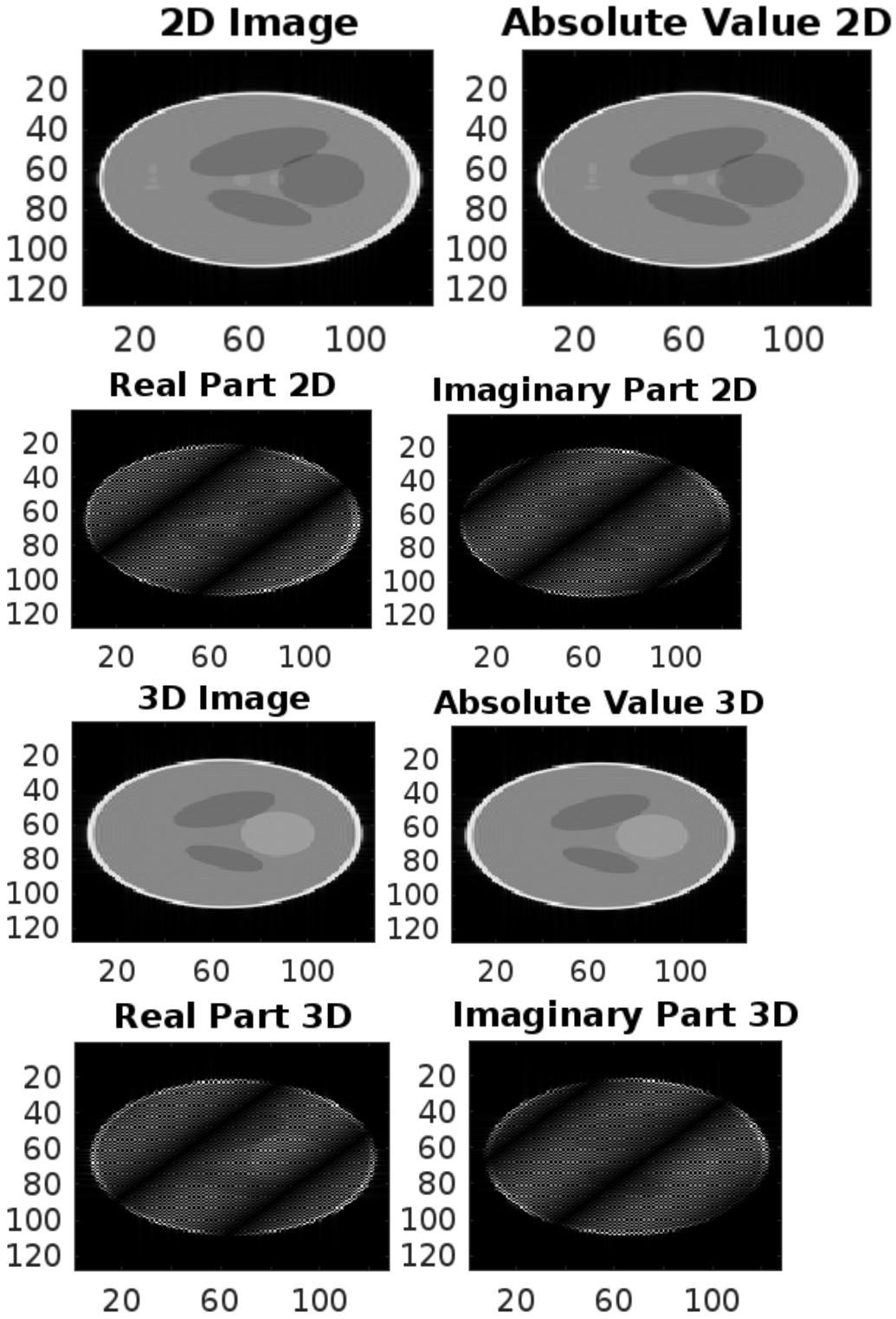
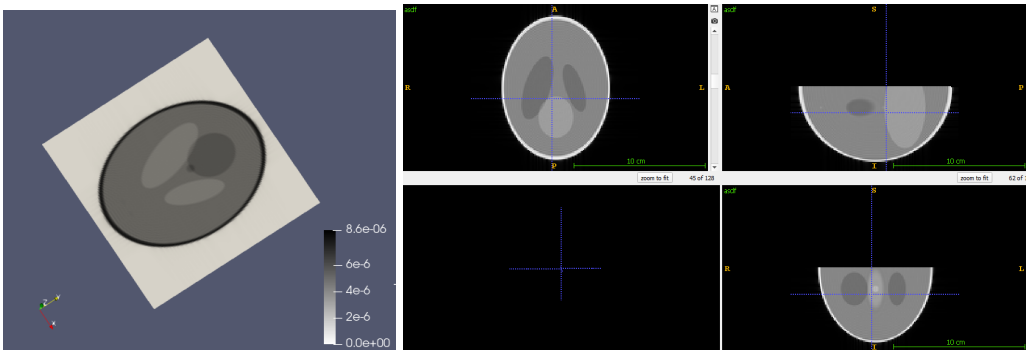
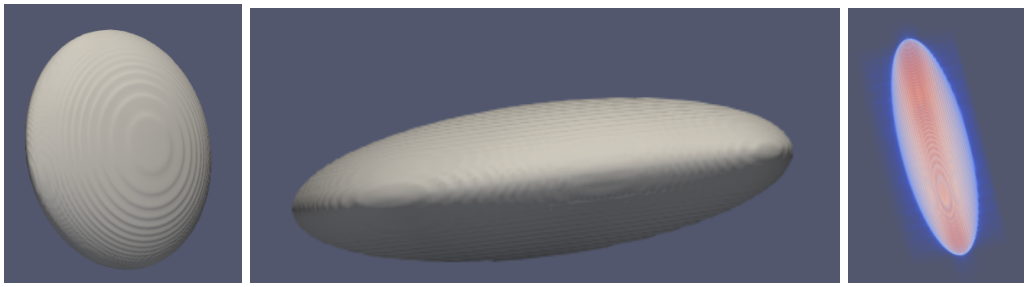
Alisa Zhang Assignment 3.2

1. The plots below show how taking specified slice of the 3D phantom is equivalent to the 2D given image. Additionally, taking the absolute value preserves all the image data, while the real and imaginary portions present an incomplete, but complementary (with each other) depiction of the phantom.

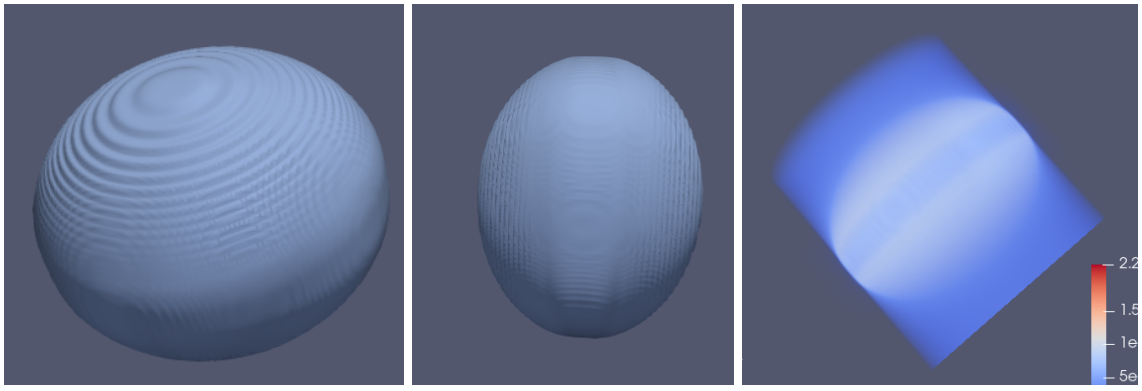


1b. 

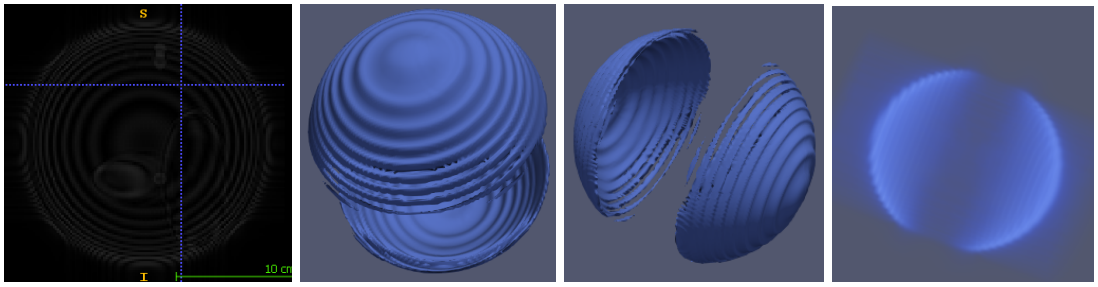
2. First k-space cropped: A flattened sphere with a faint halo that isn't symmetrical, where the extra half is mostly blank with one, small white ellipse inside. Aliasing occurs here because cropping the k-space results in the object being bigger than the field of view. The sphere is squished because the cropping is just of a middle column of the k-space, instead of a perfect half like the second example.



Second k-space cropped: This sphere has a much more apparent halo than the first one due a decreased resolution. Aliasing also occurs here because cropping the k-space results in the object being greater than the field of view, but since the cropping goes exactly to end/2, the phantom's shape is copied exactly.

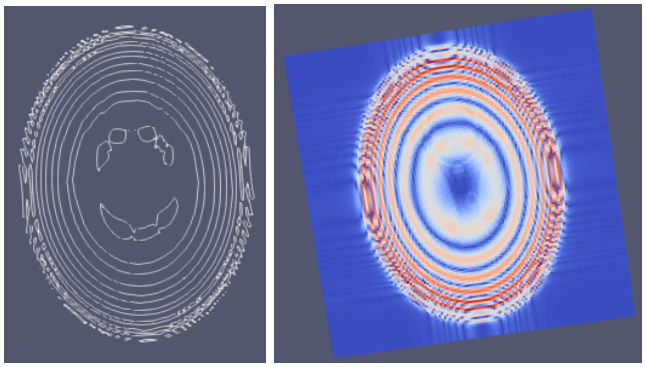


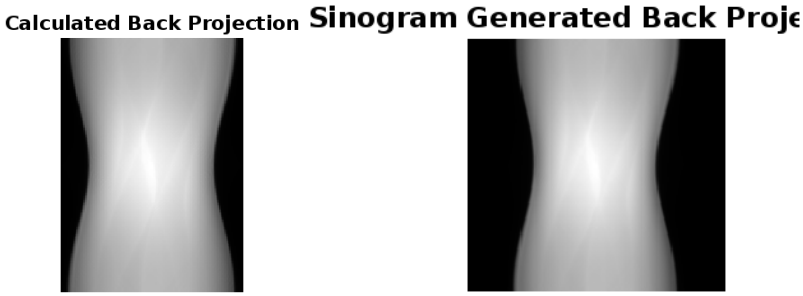
Third k-space cropped: Increased voxel sizing results in a better signal to noise ratio, but it also results in a reduced resolution. Additionally, it preserved high frequencies much better and essentially eliminated any low frequencies (see especially the ITK snap slice for ellipse outlines). Aliasing also occurs here since the phantom half is copied again.



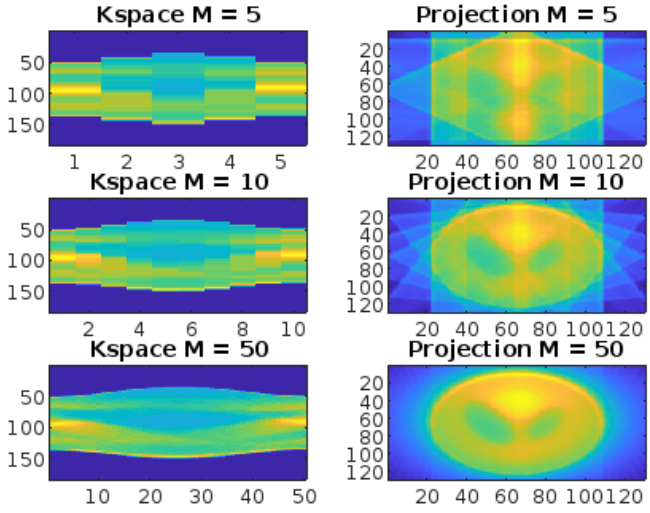
Fourth k-space cropped: Taking one slice with a normal vector Z of the k-space results in a 2D image that reflects parts of the image where the frequency corresponds to the 53rd slice. Most of the image data is lost since we essentially made a 3D signal into a 2D one.

3.

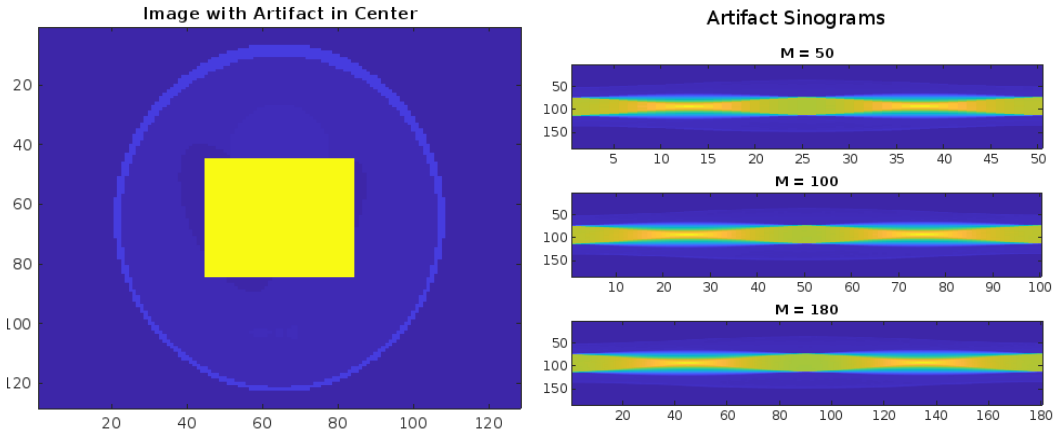


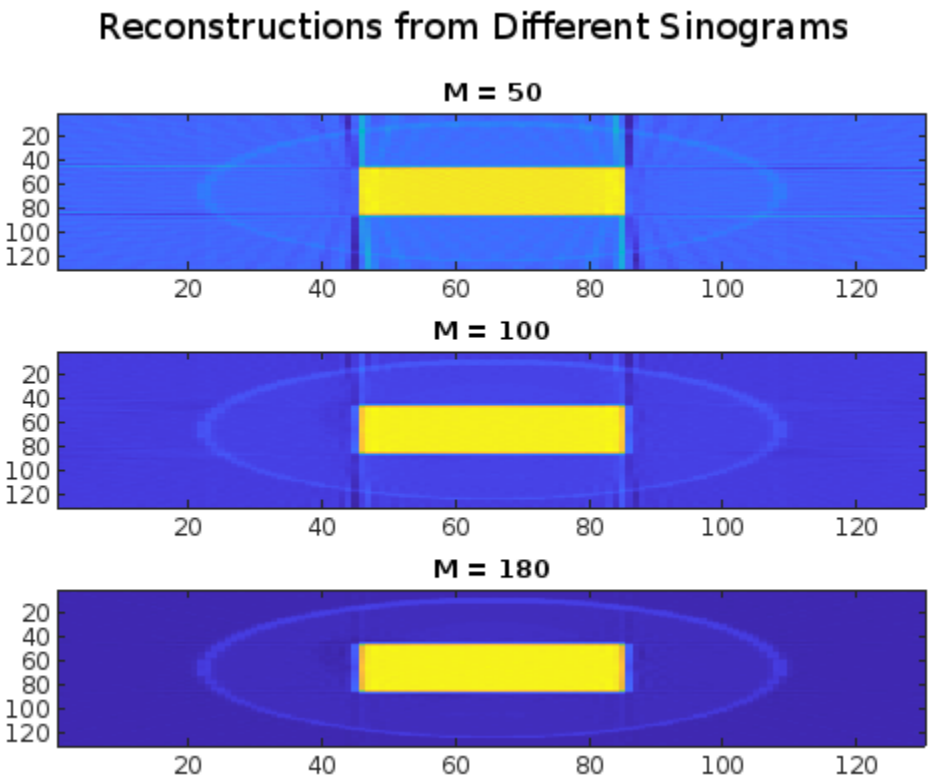


4.



5.





The more projections performed, the darker the rest of the image, as the bright artifact bleeds less into the surrounding areas and is more accurately restrictedto where it was in the original image.