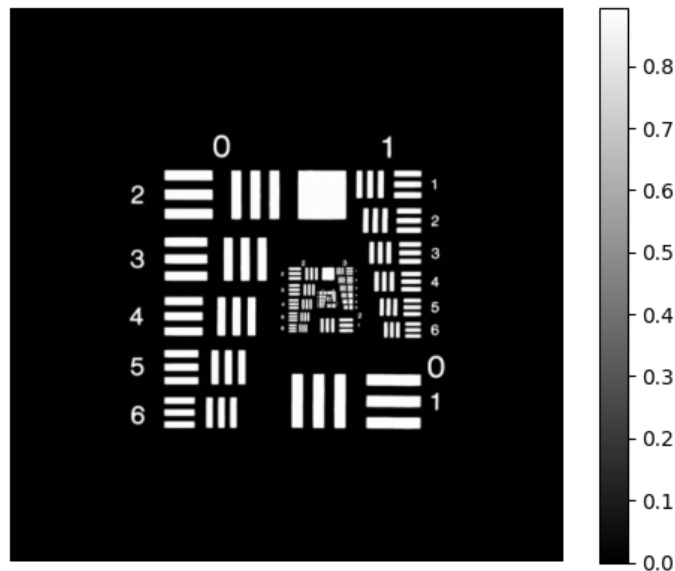


In-class exercise: Evanescent waves

1. Visit <https://www.graticulesoptics.com/products/optical-resolution-charts/usaf-test-charts/ps75p-usaf-positive-test-chart-group-21-group-93>

Download the USAF resolution chart, make it a normalized grayscale numpy array, down-sample it to 350,350 and zero-pad it to have 512,512 array. Make sure the features of the resolution chart have values of 1 and the background is zero. The final image should look like the following:



2. Use a non-paraxial BPM code to propagate a field that is generated by illuminating the processed USAF resolution chart for the following three scenarios:
 - a. All the features are larger than the wavelength.
 - b. All the features are sub-wavelength.
 - c. A hybrid case where smaller features are sub-wavelength and larger features are above the wavelength scale.

Choose a propagation distance of 4λ (four times the wavelength) to ensure that the evanescent (non-propagating) components decay before reaching the output plane.

Optional: Back-propagate the output fields obtained and check if you can re-construct the resolution chart for all the above cases. What is your observation?