A detailed description of the simulation can be found in the Interferometer Simulation section of the Final Report found in the **Documentation** folder. A visual of the final code flow is found in the **Flow Diagram** folder. When learning the code, use the flow diagram in tandem with the code.

To run the latest version of the code, download the files in the Final Version folder. Keep **gratingLib** files in its folder. This is a library containing the classes and functions that build the grating. **2gratingdiffraction\_final.py** is the script where you will change the initial parameters.

We suggested downloaded Anaconda Navigator, as it makes the installation of packages very easy. We used the Spyder IDE that comes with Anaconda. We used Python 3.6.

You will need the following packages to run the simulation as is:

numpy

cudatoolkit

numba → cuda, vectorize, jit

sys

math

cmath

time

matplotlib → pyplot, ticker

The final version runs a 2-grating simulation. Halfway down the script, there is a section to change the parameters:

#Define initial parameters ##########################################################################  
screen\_distance = 5e7 #nm  
screen\_length = 1e7  
second\_grating\_distance = 5e7 #nm  
wavelength = .56 #nm  
U\_0 = 1 #?  
wavenumber = 2 \* np.pi / wavelength  
numOfSlits = 200 # number of slits in each grating  
numOfPointSources = 100 # number of point sources in each slit  
numObsPoints = 1000 # number of observing points on the screen  
spacingType = 'uniform'  
slitLength = 50 #nm  
newSimulation = False  
runNum = 1 #Used to dynamically name files. Change every time you run a simulation. Otherwise it will write  
 # over old data

##########################################################################  
# Observing screen size  
#center of screen will automatically be at 0.5e7 nm  
# Change this based on size of gratings  
screenStart = 0e7  
screenEnd = 1e7

This simulation will gratings that are 5 cm apart with an observing screen 5 cm after the second grating. The code assumes that the gratings are 1 cm in height, and then the slits are filled in starting at the center of the grating. This means that the simulated grating’s height depends on the amount of slits thats are placed in the grating. The “1 cm tall” grating only gives a reference point for you to build the gratings. The grating will always be centered at y=0.5 cm. Keep that in mind when deciding the start and end of the observing screen, as it is also centered at y=0.5 cm.

Below the initial parameters, the gratings and the initial source are built. The comments explain how to change the source type between plane and spherical. The simulation can easily be adjusted to a single grating or more than two gratings. When propagating between two gratings, make sure to make the receiving positions of that propagation the point source positions in the second grating.

The final version script creates a plot with the important parameters on the plot as well as outputting data files from each propagation.

The code can also be found on our github repository: <https://github.com/haiimjoee/HF-Simulation>

We suggest using github as your way to make changes to the code, as it saves previous versions if mistakes are made.

If you have any questions, feel free to e-mail us at:

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(as of Dec. 2017 we will have graduated, but should be available to help answer questions with the code)