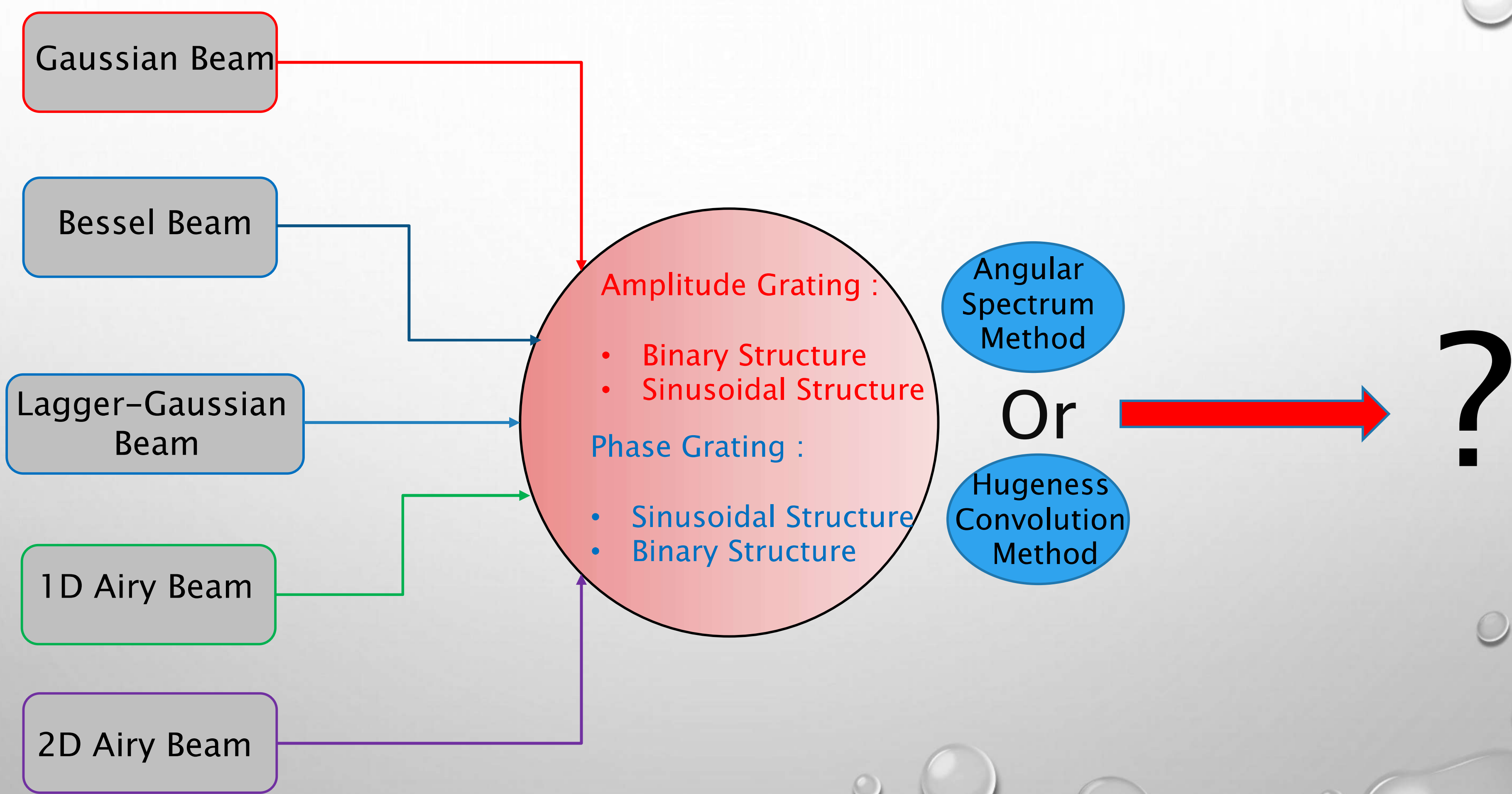

Gaussian Beam
Bessel Beam
Lagger-Gaussian Beam
1D Airy Beam
2D Airy Beam
Amplitude Grating :
• Binary Structure
• Sinusoidal Structure
Phase Grating :
• Sinusoidal Structure
• Binary Structure
Angular Spectrum Method
Or
Hugeness Convolution Method
?

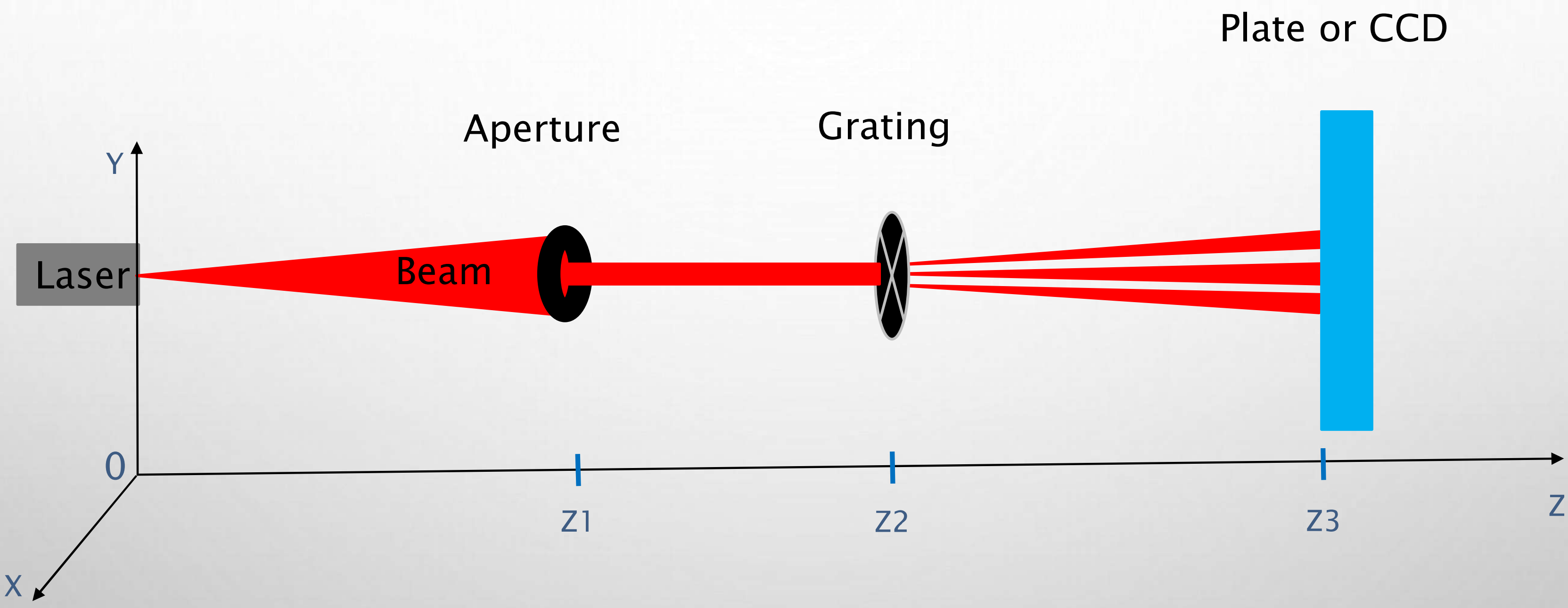


Plate or CCD
Aperture
Grating
Y
Laser
Beam
0
Z1
Z2
Z3
Z
X

Angular Spectrum Method (ACM)

We convert the initial wave mantle into a large number of flat waves.
(Of course, with different directions to give us the same initial wave again. Of course, we get a Fourier transform.)

The next step is to propagate them one by one and finally we collect all the flat waves again (inverse Fourier transform) and this is the final propagated wave.

We used the Angular Spectrum Method to propagate these waves.

The Angular Spectrum method is used for short distances(such as Fresnel diffraction which is used for short distances.)

Hugeness Convolution Method (HCM)

We look at the initial wave mantle as a large number of fountain points.

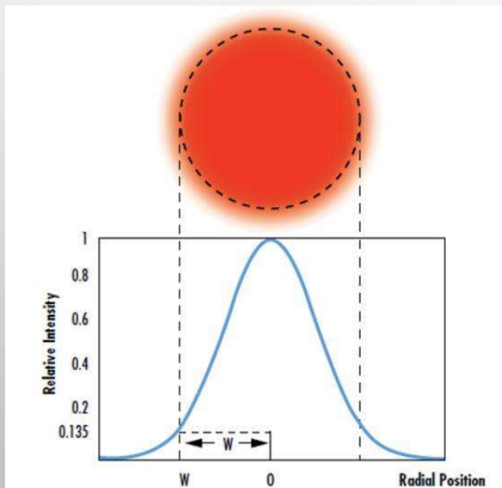
(These fountains have different directions and act in a way like a spherical wave with a different amplitude that is increasing. We use Fourier and inverse Fourier transform.)

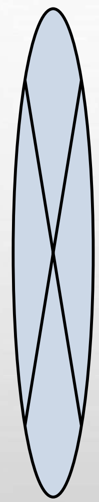
The next step is to connect the distribution of the amplitude of the initial field with the impact response of the point springs (which are the spherical waves) by The Hugence Convolution method .

The Hugence Convolution method is used for long distances(such as Fraunhofer diffraction which is used for long distances.)

Gaussian Beam

$$U = \exp(-(\frac{r}{wg})^2)$$





ASM

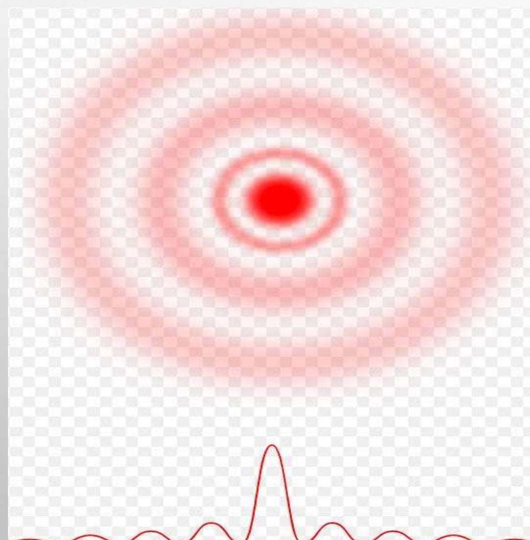
HCM

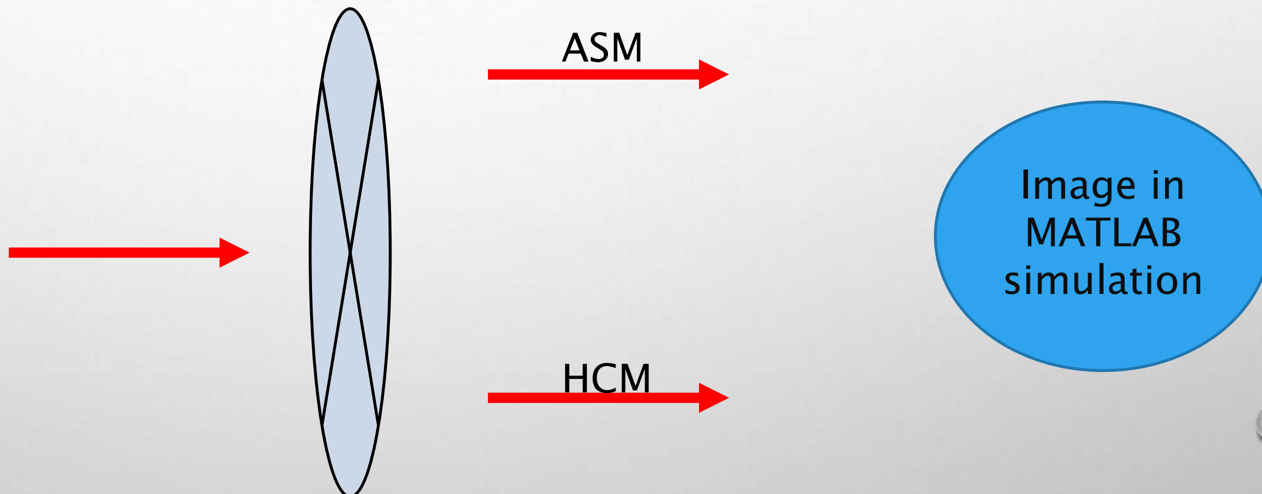
Image in MATLAB simulation

r : is the radial distance from the center axis of the beam
wg : is the radius at which the field amplitudes

Bessel Beam

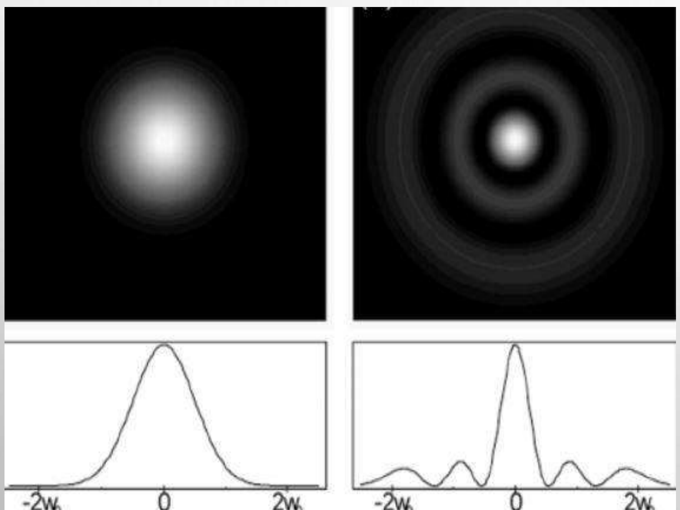
$$U = \mathrm{j}\left(\left(\frac{r}{wg1}\right)\right)\exp(-(\frac{r}{wg2})^2)$$

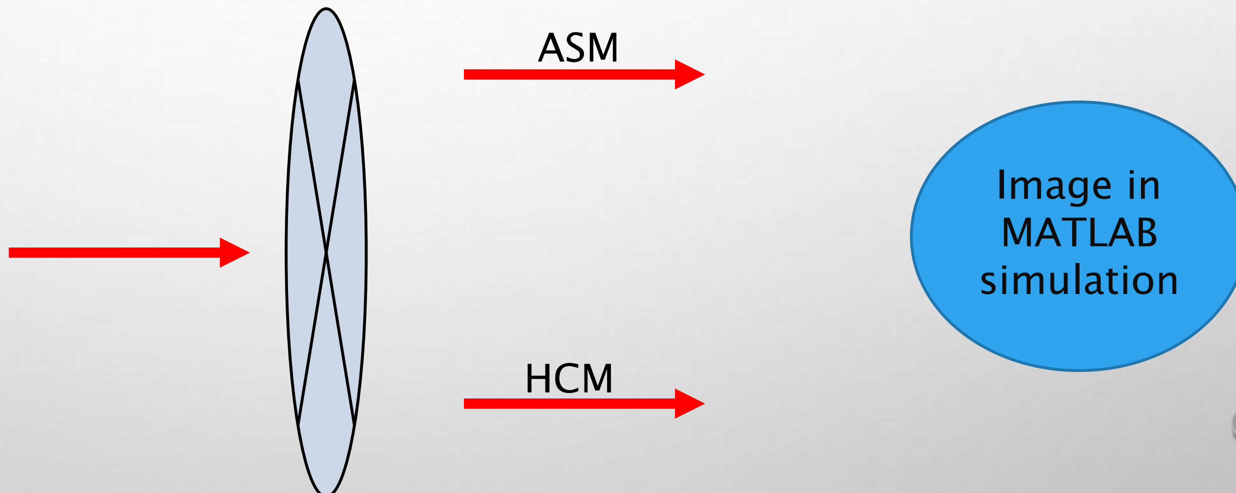




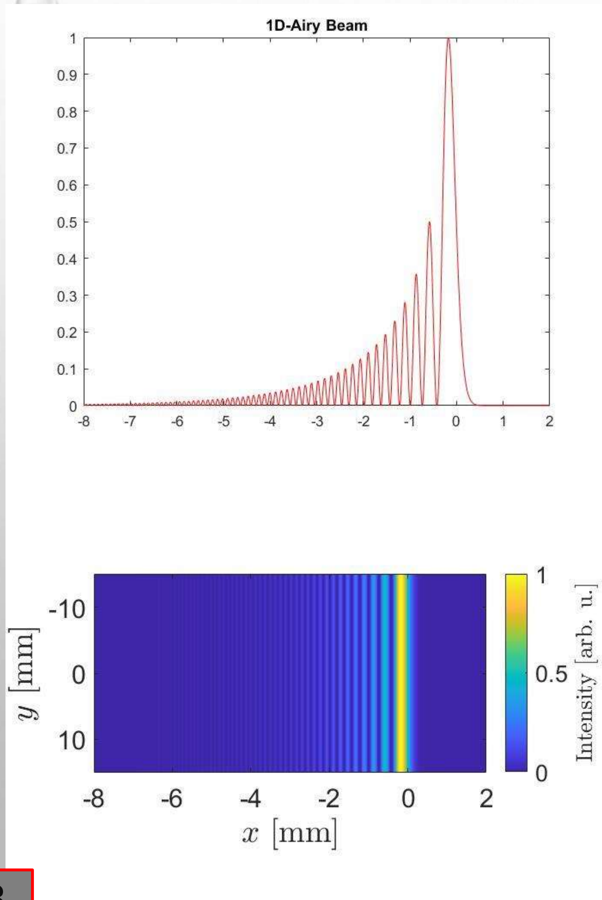
r : is the radial distance from the center axis of the beam
Wg1,Wg2: is the radius at which the field amplitudes

Lagger-Gaussian Beam





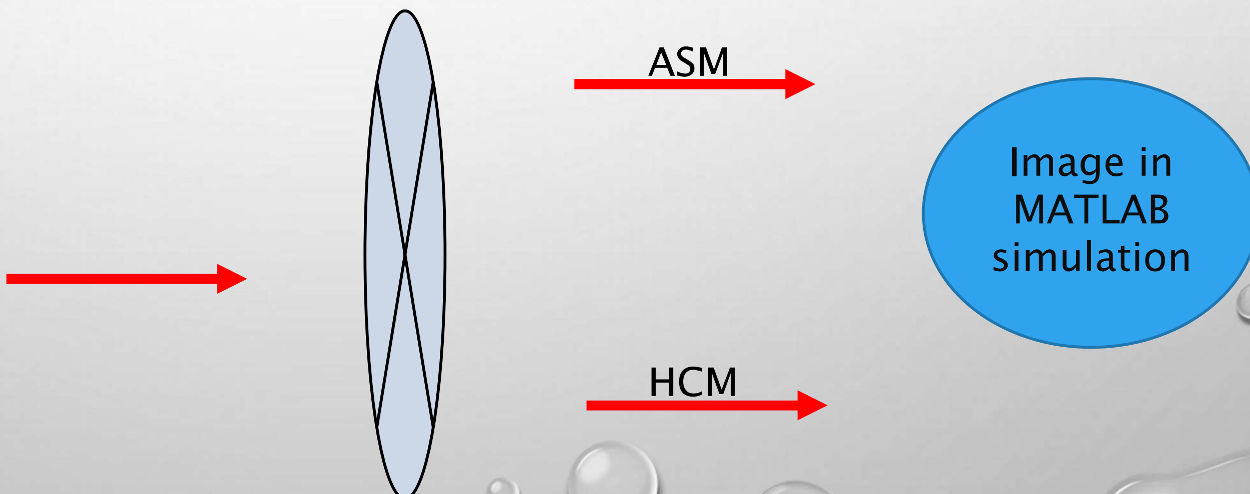
1D Airy Beam



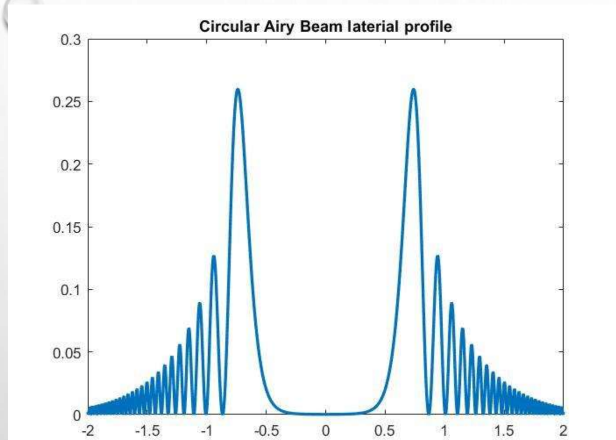
$$A = \left(Airy\left(\frac{x}{s}\right)\right) esp(ax)$$

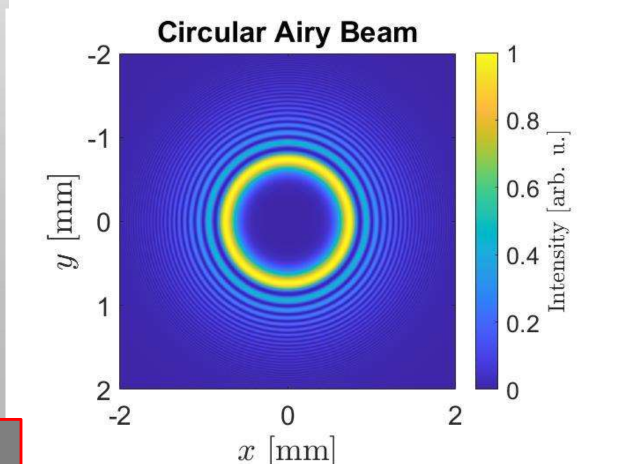
$$U = AA^{*}$$

a : truncation
s : width of main ring (mm)



2D Airy Beam





$$A = \left(Airy\left(\frac{r_0 - r}{s}\right)\right) esp\left(\frac{r_0 - r}{s}\right)$$

$$U = AA^*$$

a : truncation
r0 : main ring (mm)
s : width of main ring (mm)