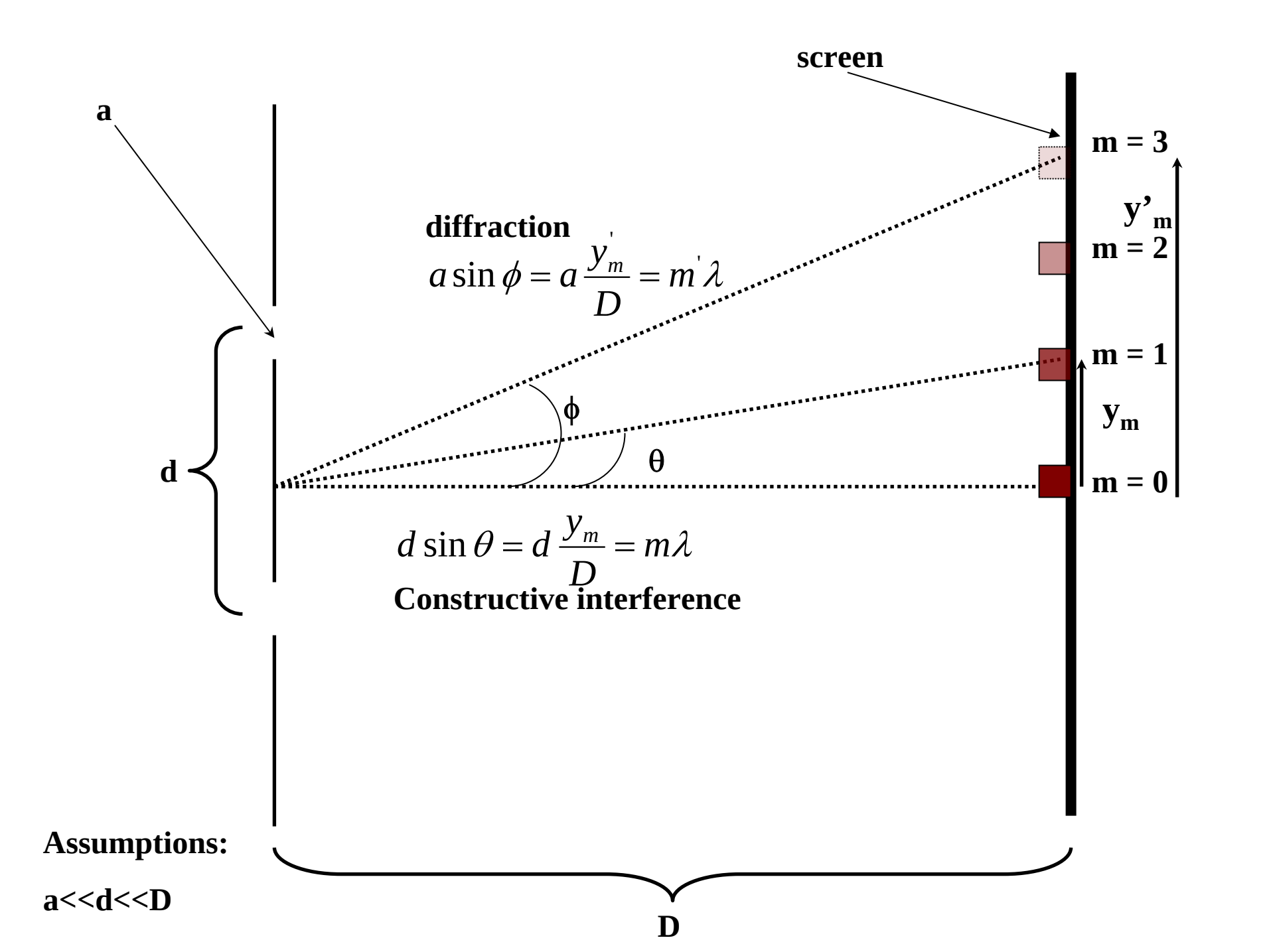
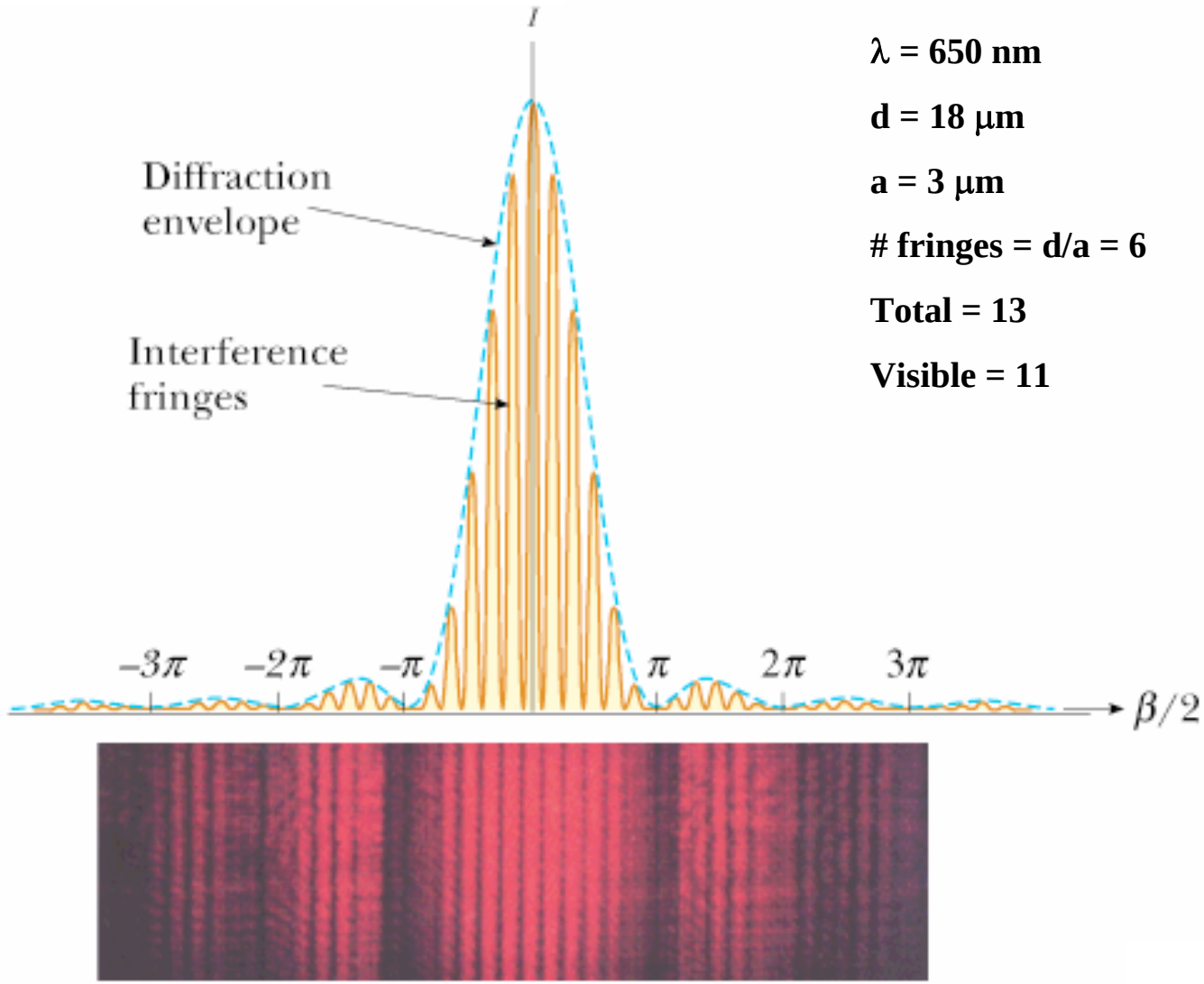

screen
a
m = 3
y'm
m = 2
diffraction
$a \sin\phi = a\frac{y'_m}{D} = m'\lambda$
m = 1
ϕ
ym
θ
d
m = 0
$d \sin\theta = d\frac{y_m}{D} = m\lambda$
Constructive interference
Assumptions:
a<<d<<D
D



λ = 650 nm

d = 18 μm

a = 3 μm

 # fringes = d/a = 6

Total = 13

Visible = 11

Example:

Suppose that a double slit pattern observed on a screen *4 m* away from a pair of slits separated by *0.05 mm*. What is the wavelength of light used if the 1st bright maximum is *4.6 cm* from the central maximum?

If the slit width $a = 0.01\ mm$, at what angle, ϕ, will the 1st order diffraction minimum lie?

What distance from the center interference maximum does the 1st diffraction minimum occur?

How many total fringes are in the diffraction envelope?

How many fringes are visible in the diffraction envelope?

Example: Interference and Diffraction

Suppose that a double slit pattern is produced under water (n_{water} = *1.33*) observed on a screen *4 m* away from a pair of slits separated by *0.05 mm*. What is the spacing between interference fringes if the laser has a wavelength of *623.8 nm*?

If the slit width *a = 0.01 mm*, at what angle, ϕ, will the 1st order diffraction minimum lie?

What distance from the center interference maximum does the 1st diffraction minimum occur and what is the width of the diffraction envelope?

How many total fringes are in the diffraction envelope?

How many fringes are visible in the diffraction envelope?