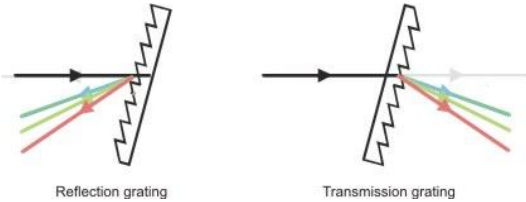


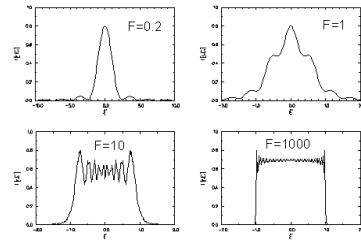
PHY385-H1F Introductory Optics

Class 21 – Outline: 10.2

- Single-slit: Fraunhofer vs Fresnel
- Double slit when the slits have finite width
- N slits: Diffraction Gratings

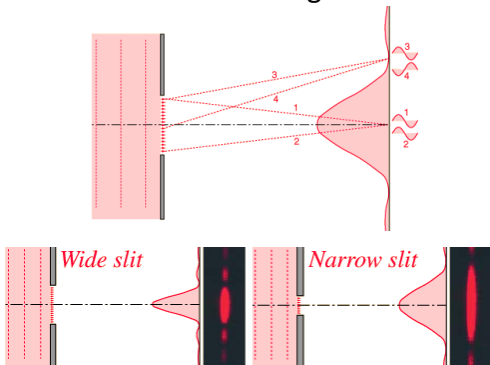


Single slit diffraction



$$F = \frac{a^2}{L\lambda}$$

Fraunhofer Single Slit



- Course evaluations for Arts & Science students in Fall courses are now open! Please complete your evals – your feedback matters only if you provide it!
- Arts & Science Time frame: November 23<sup>rd</sup>–December 7<sup>th</sup>
- See: [uoft.me/courseevaluations](http://uoft.me/courseevaluations) for more information.



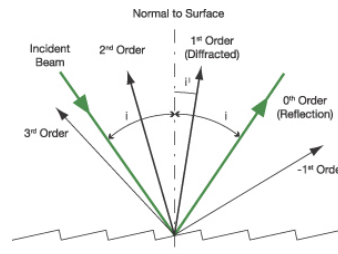
How are those online course evaluations going?

1. I received the email, logged on, and evaluated some or all of my fall courses online (including PHY385!)
2. I received the email about course evaluations, but I haven't done them yet.
3. I have **not** received the email about course evaluations sent out on Nov.23.
4. I haven't checked my utoronto.ca email since last Friday Nov.23, so I really don't know if I've received that email or not.

Diffraction Gratings

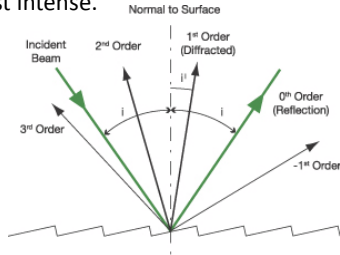
- Reflection gratings obey a similar equation as transmission gratings:

$$m\lambda = a(\sin\theta_m - \sin\theta_i)$$



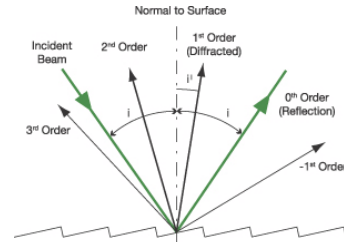
## Diffraction Gratings

- The  $m = 0$  order corresponds to regular reflection:  $\theta_m = \theta_r$ : No dispersion.
- Other orders are dispersed: rainbows. Usually the first order lines ( $m = 1$  or  $m = -1$ ) are the most intense.



## Diffraction Gratings

- The grating below is “blazed”, meaning its surface is a reflective saw-tooth shape. Blazing can increase the efficiency for a particular order.
- It appears to be blazed for 1<sup>st</sup> order



## Echelle Gratings

- An echelle grating is blazed for extremely high order. The purpose is to increase dispersion, which is proportional to  $m$ .
- In practice, adjacent orders always overlap, so a second “cross-grating” must be used to separate the orders on the detector.

