DA2FAGRSTEP2S

Diffraction on an step grating with width d, center to center distance of steps a, height H, two wavelength λ1 and λ2 for 0th and first order, distance from grating to screen X and coordinate on screen Y.

All distances and wavelength in mm, number of lines N .Normal incidence.
All parameters are globally defined above the graph.
D(θ) is the diffraction factor, I(θ) is the interference factor, normalized to 1.
II(θ) is the interference factor of the gratings with respect to the two planes.
P(A) is the product of Interference and diffraction factors.
The intensity of the zeroth order and of the first orders change depending on the heigth H.
If H is a multiple of λ, all light is in the zero order, if H is a multiple of λ/2, all light is in the first order.

$$\theta := -.7001, -.6999 .. .7$$

$$D1(\theta) := \left[\frac{\sin\left(\pi \cdot \frac{d}{\lambda 1} \cdot \sin(\theta)\right)}{\left(\pi \cdot \frac{d}{\lambda 1} \cdot \sin(\theta)\right)} \right]^2 \quad I1(\theta) := \left(\frac{\sin\left(\pi \cdot \frac{a}{\lambda 1} \cdot \sin(\theta) \cdot N\right)}{N \cdot \sin\left(\pi \cdot \frac{a}{\lambda 1} \cdot \sin(\theta)\right)} \right)^2 \quad II1(\theta) := \cos\left[\left[\frac{\pi}{\lambda 1} \cdot (d \cdot \sin(\theta) + H)\right]\right]^2$$

$$D2(\theta) := \left[\frac{\sin\left(\pi \cdot \frac{d}{\lambda 2} \cdot \sin(\theta)\right)}{\left(\pi \cdot \frac{d}{\lambda 2} \cdot \sin(\theta)\right)} \right]^2 \quad I2(\theta) := \left(\frac{\sin\left(\pi \cdot \frac{a}{\lambda 2} \cdot \sin(\theta) \cdot N\right)}{N \cdot \sin\left(\pi \cdot \frac{a}{\lambda 2} \cdot \sin(\theta)\right)} \right)^2 \quad II2(\theta) := \cos\left[\left[\frac{\pi}{\lambda 2} \cdot (d \cdot \sin(\theta) + H)\right]\right]^2$$

$$D1(\theta) := \left[\frac{\sin\left(\pi \cdot \frac{d}{\lambda 1} \cdot \sin(\theta)\right)}{\left(\pi \cdot \frac{d}{\lambda 1} \cdot \sin(\theta)\right)} \right]^2 \quad I1(\theta) := \left(\frac{\sin\left(\pi \cdot \frac{a}{\lambda 1} \cdot \sin(\theta) \cdot N\right)}{N \cdot \sin\left(\pi \cdot \frac{a}{\lambda 1} \cdot \sin(\theta)\right)} \right)^2 \quad II3(\theta) := \cos\left[\left[\frac{\pi}{\lambda 1} \cdot (d \cdot \sin(\theta) + H)\right]\right]^2$$

$$D2(\theta) := \left[\frac{\sin\left(\pi \cdot \frac{d}{\lambda 2} \cdot \sin(\theta)\right)}{\left(\pi \cdot \frac{d}{\lambda 2} \cdot \sin(\theta)\right)} \right]^2 \quad I2(\theta) := \left(\frac{\sin\left(\pi \cdot \frac{a}{\lambda 2} \cdot \sin(\theta) \cdot N\right)}{N \cdot \sin\left(\pi \cdot \frac{a}{\lambda 2} \cdot \sin(\theta)\right)} \right)^2 \quad II4(\theta) := \cos\left[\left[\frac{\pi}{\lambda 2} \cdot (d \cdot \sin(\theta) + H)\right]\right]^2$$

$$P1(\theta) := D1(\theta) \cdot I1(\theta) \cdot II1(\theta) \qquad P3(\theta) := D1(\theta) \cdot I1(\theta) \cdot II3(\theta)$$

$$P2(\theta) := D2(\theta) \cdot I2(\theta) \cdot II2(\theta) \qquad P4(\theta) := D2(\theta) \cdot I2(\theta) \cdot II4(\theta)$$

$d \equiv .001$ $a \equiv .002$ $N \equiv 6$ $\lambda 2 \equiv .0005$ $\lambda 1 \equiv .0007$ $n1 \equiv 1$ $n2 \equiv .5$

$H1 \equiv n1 \cdot \lambda 1$ $H3 \equiv n2 \cdot \lambda 1$

$H2 \equiv n1 \cdot \lambda 2$ $H4 \equiv n2 \cdot \lambda 2$

$H \equiv .00035$