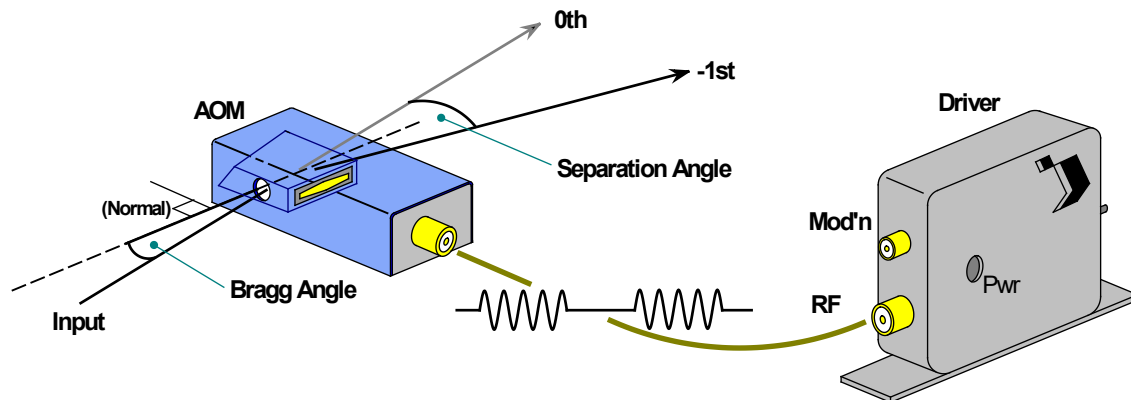


## Basic AO Modulator Equations



Input Bragg angle

$$\theta_{Bragg} = \frac{\lambda \cdot fc}{2 \cdot V}$$

Separation angle

$$\theta_{sep} = \frac{\lambda \cdot fc}{V}$$

Optical rise time

$$\tau_r = 0.65 \cdot \frac{d}{V}$$

Modulation bandwidth

$$BW_{mod} = 0.35 / \tau_r$$

Optimum RF drive power

$$P_{sat} = \frac{k \cdot \lambda^2 \cdot H}{2 \cdot L \cdot M_2}$$

Diffraction Efficiency

$$DE = \frac{I_{1st}}{I_{0th}}$$

Insertion Loss

$$IL = 1 - \frac{I_{0th}}{I_{Laser}}$$

Key:

$\lambda$  = wavelength  
 $d$  =  $1/e^2$  beam diameter

$f$  = RF frequency  
 $fc$  = centre frequency  
 $\Delta f$  = RF bandwidth

$V$  = acoustic velocity  
 TeO2 (L): 4.2mm/us  
 TeO2 (S): 0.62- 0.65 mm/us  
 PbMoO4: 3.63mm/us  
 Quartz: 5.7mm/us  
 Ge: 5.5mm/us

$L$  = interaction (electrode) length  
 $H$  = active aperture (electrode) height  
 $M_2$  = AO Figure of Merit  
 $k$  = transducer conversion loss

$I_{1st}$  = diffracted laser power  
 $I_{0th}$  = zero order (no RF) laser power  
 $I_{Laser}$  = input laser power