

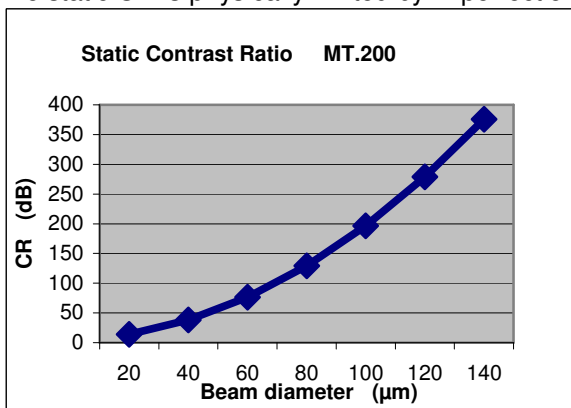
Contrast ratio of the AOM (static and dynamic)

The incident laser beam properties have a significant impact upon modulator performances (temporal response and extinction ratio). The static contrast ratio measures the ability of the modulator to separate the different diffraction orders (especially 0 and 1st orders). As a consequence, the lower carrier frequencies and highly focused beams will be a physical limitation of the static extinction ratio. The Gaussian profile (TEM00) gives the best performances and will be considered in the following part. The far field 1st order beam (propagating at angle $+\theta_B$) is typically separated from the 0 order ($-\theta_B$) with a beam block which is placed such that angles up to 0 are stopped (angles higher than $+2\theta_B$ can also be stopped to suppress higher orders scattering light).

TEM00 static contrast ratio can be written as :

$$CR = \int_0^{2\theta_B} I(\theta) d\theta \quad / \quad \int_{-\infty}^{+\infty} I(\theta) d\theta$$

The static CR is physically limited by imperfection of the crystal and scattered light.



The dynamic contrast ratio is the reduction of the CR due to the finite response time of the AOM. This leads to a reduction of the contrast ratio of ON light intensity to OFF light intensity in dynamic operation. The dynamic contrast ratio is directly related to the modulation bandwidth of the modulator.

Extinction ratio of the driver

When the driver is OFF (Amplitude control is set to min RF power), there is still a small portion of RF power out of the driver which will create inside the AOM diffraction efficiency at low level, reducing optical static extinction ratio of the AOM.

Extinction Ratio (ER) of the driver is the ratio between maximum output RF (PRFmax) power and minimum RF power (PRFmin) when control is set to 0.

$$ER = PRF_{max} / PRF_{min} \quad ER(dB) = 10 \text{ Log} (PRF_{max} / PRF_{min})$$

NOTE: Optical Extinction ratio of the AOM is always lower than the driver's one.

Standard ER of the driver is 45 dB. AA offers as an option drivers with >60dB extinction ratio in order to improve optical extinction ratio of the AOM.

Example: AOM with 33 dB Extinction ratio (1/2000), Input laser power 5 Watts

When AM control of the driver is set to minimum, then $5W/2000 = 2.5mW$ are still present in the first order of the AOM.