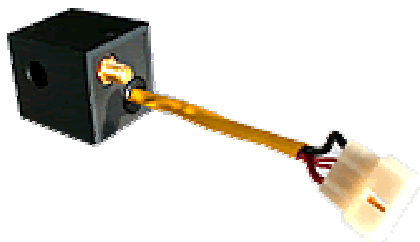


## Intra-Cavity Mode Lockers



The Gooch & Housego Acousto-Optic standing wave Mode Lockers can obtain near theoretical mode locked laser pulse widths. The exceptional performance is due to the design and manufacture of the high Q acoustic resonator with very low spurious modes. The Mode Lockers can be used for the Nd:YAG, Nd:YLF, Ti:Sapphire and Argon Ion lasers. The Acousto-Optic Mode Lockers are manufactured from high quality fused quartz with durable hard AR coatings. Brewster window models and other materials are available. The design permits the most efficient coupling of RF energy into acoustic energy.

A laser is mode locked when the longitudinal cavity modes of the laser are forced to maintain a fixed phase relationship with each other. This occurs by modulating the cavity losses at a frequency equal to the frequency difference between adjacent longitudinal modes. These modes are separated by a frequency  $f$ :

$$f = C/2L$$

C-Speed of Light

L-Cavity Length

The Mode Locker, when driven, sets up acoustic standing waves which modulates the cavity losses corresponding to a frequency of  $C/2L$ , (twice the acoustic drive frequency), the Mode Locker acts as a shutter that opens and closes during each round trip transit time of the laser light. The Gooch & Housego Mode Locker driver utilizes a crystal oscillator with extremely low phase noise as the driving source. The Mode Locker driver temperature tunes the Mode Locker Crystal to the frequency of the Driver's crystal oscillator. A front panel meter provides relative forward and reflected RF power reading, with a minimum reflected power indicating that the crystal is at resonance. All Gooch & Housego Mode Locker and driver are designed to the frequency that matches the customer's laser cavity length. It is necessary to adjust the laser cavity mode spacing frequency (cavity length) to be equal to twice the acoustic frequency to achieve mode locking.

In order to have stable mode locking of a laser, temperature control of the laser's environment as well as temperature control the mode locker modulator's crystal is necessary as any change in cavity length will result in unstable mode locking. Stable mode locking of a laser also requires a very clean cavity. Any dust or contaminate inside the laser cavity will influence the laser modes.

Stable mode locking also requires balancing the energy pumped into the laser media and the energy removed during the transit of a mode locked laser pulse through the media. If excess energy is input to the media, spontaneous lasing may cause the mode locked pulses to be unstable. If insufficient energy is input to the media, the energy in the upper state may be depleted also resulting in unstable mode locked pulses. Lasing is a quantum process, therefore, critical adjustment of the laser's input power is necessary to produce stable mode locking.



光技術をサポートする

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