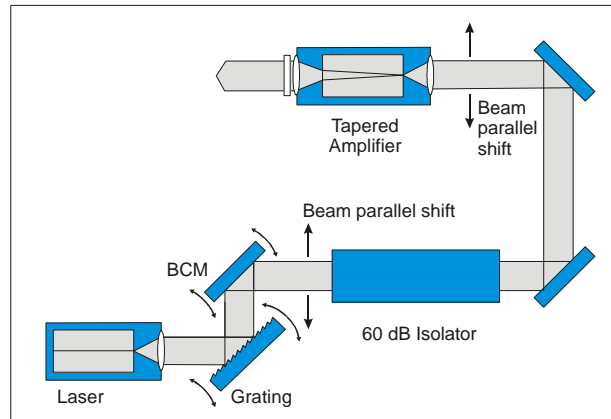


Amplified Laser Systems vs. Single Stage Lasers, a comparison

Amplified Diode Laser system:

Power values of 500mW .. 1000mW. Available wavelength range from 760nm up to 1080nm.



An Amplified Diode Laser System consists of a Master Laser and an Amplification Stage. Typical Master Lasers are external cavity diode lasers. Typical Amplification Stages consist of a Tapered Diode Laser Amplifier. The light output of the Master Laser system passes a 60dB isolator for protection purposes and is coupled into a Tapered Diode Laser Amplifier. With this tapered amplifier, the output power of the master laser is amplified from typically 30mW up to typically 500mW. Higher output versions are available. There are several drawbacks of such a laser system.

1. The laser beam of the master laser is coupled out via the zeroth order of the grating of the master laser. With tuning of the wavelength, the beam shows a beam walk caused by the angle change of the grating. This angle change is compensated by a beam correction mirror (BCM). The BCM changes the variation of the beam angle into parallel shift of the laser beam. Typical values are in the range of $5\mu\text{m}$. This beam shift of $5\mu\text{m}$ results in a shift of the focusing point at the coupling facet of the tapered amplifier. Tapered amplifiers are sensitive to their coupling conditions. A slight change of the input beam may cause the oscillation of higher transversal modes within the taper structure. It is known in literature that tapered laser structures oscillate in their fundamental mode at low power conditions and they oscillate in higher transversal modes at high power conditions. This effect drastically reduces the beam quality of the high power laser beam. At moderate power levels such as 300mW a M^2 below 2 is realistic. For higher power levels of 500mW or above, M^2 values can increase to 4 or higher. This drastically reduces the coupling efficiency to single mode fibers.
2. In case the master laser system shows a high linewidth, this value is directly transferred to the amplified laser beam.
3. Tapered amplifiers are tapered diode laser structures with an excellent antireflection coating on both laser facets. Due to the low reflectivity, there is a high amount of amplified spontaneous emission included within the emitted laser beam.
4. Due to the large number of required components, Tapered amplifier systems are very expensive.

Document: <http://data.sacher-laser.com/techdocs/TATiger.pdf>
 Note: Specification are subject to change without further notice

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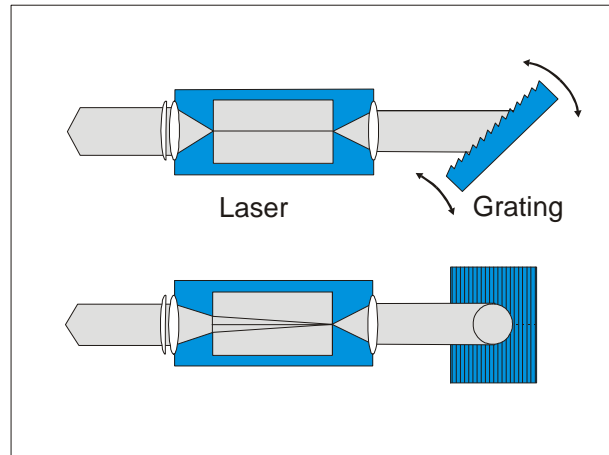
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Single Stage Laser Systems:

Power values of 300mW .. 1000mW, available wavelength range from 760nm up to 1080nm



A Single Stage Laser System consists of a tapered diode laser with an external cavity in Littrow configuration. It is very similar to conventional Littrow diode laser systems. The output power of such a laser system is only determined by the laser chip itself. Power values up to 1000mW are available.

1. Since the laser beam is emitted via the rear facet of the laser chip, there is no risk of beam walk or comparable effects. The beam quality is only determined by the external cavity. Therefore, high optical output power is available without losing optical quality of the beam. M^2 values below 2 at power levels in the range of 500mW .. 1000mW are available at several wavelengths. Therefore, an excellent coupling efficiency into single mode fibers of more than 50% is realistic.
2. There is no need to use the cavity grating as output coupler. Therefore, the high quality of the laser cavity can be realized. This, together with a low noise laser driver, results in very low values for the linewidth of the laser system.
3. Since the tapered diode laser is used as a tapered laser, there is no need for a ultra low reflectivity of the emission facet of the laser system. This causes a significant reduction of the amplified spontaneous emission level of this laser system in comparison to amplified laser systems.
4. No expensive components like isolators, internal mirror, etc. are required, since this is a single stage laser system.

Summary: A single stage laser system as the Sacher Lasertechnik TEC-300 Tiger series offers a large number of advantages in comparison to amplified laser systems.

The TEC-300 TIGER series got recently approved for various applications. The excellent quality of the Sacher Lasertechnik laser driver results in a perfect suitability for various applications. First results have been presented at the Tunable Diode Laser in Spectroscopy Conference in Zermatt, 2003, c/f <http://data.sacher-laser.com/publications/TDLS2003.pdf>.

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