Application and Performance Test Report for MLI 200 KrF

The MLase excimer laser MLI-KrF-200 has been tested for 4 weeks. Here, several studies have been made. The main attention was on:

- spatial coherence,
- power stability,
- beam stability (position) and the
- gas lifetime.

The laser has been operated at a stabilized power [energy] of 4mJ and a frequency of 150Hz.

**Coherence:**
With this laser a series of Fiber Bragg Gratings were fabricated. For this a periodic interference pattern is written into the core of a glass fiber which reflects one wavelength.

The spatial coherence can be estimated by observing the growth process of the grating. The growth process of the grating is the ratio of lateral offset to the transmission attenuation change (increase).

**Result:** The spatial coherence length is between 350 and 450 µm. This is sufficient for the production of Fiber Bragg Gratings.
Power stability:
Depending on the desired filter type the exposure process takes 5 to 15 minutes. The grid is written by a scanning process. A power fluctuation during the exposure will result in a drift of the average refractive index when comparing the right end of the grating to the left end. This results in an asymmetric distortion of the filter function. Even at an exposure time of 15 minutes no asymmetry of the filter function to the center line could be detected down to -35 dB.

Result: The power fluctuation of this laser is well below 1%.

Beam stability:
For the beam stability test above scanning process was repeated but this time there was a cylindrical lens included. This lens creates a focal line (F = 100mm). The fiber was placed near the focus (4 mm toward the laser). Also here a symmetrical grating could be written immediately after the powering the laser. After 4h of working with the laser (ratio standby to ‘laser on’: about 4:1) the room ambient temperature change was about +5°C. Even then identical symmetric gratings could be re-produced.

Result for beam stability: At no time the position of the fiber had to be corrected.

[Efficiency and] Gas lifetime:
The laser has arrived pre-filled with standard operating gas (KrF).

With the old laser [not MLase] the following process parameters were used for writing a certain FBG: exp.: 10 min, 7 mJ, 150 Hz. With the new laser [MLase] the resulting grating were far too strong. Therefore the pulse energy had to be reduced to 4 mJ to achieve comparable results. Apparently the percentage of incoherent radiation is significantly lower with the MLIase laser.

The old system [not MLase] required a gas exchange after 30-40 exposure processes.

With the MLI-KrF-200 about 200 exposures could be performed and still the pulse energy could easily stabilize to 10 mJ at 150 Hz.

Result: The dynamic gas life of the MLase laser is 8 – 10 times better than with the old system.