Maximum Permissible Exposure (MPE) Levels Heading

It is useful to carry out the calculation for each laser system in order to show the factor by which the MPE is exceeded. All laser users should then be made aware of the results to emphasise the hazard associated with the laser system they are using.

Two examples of MPE calculations are given, the first for a Excimer Laser (intrabeam), the second for a Dye Laser (intrabeam) For further assistance in carrying out MPE calculations, please refer to your academic supervisor, School Laser Supervisor or the Safety Office.

Excimer Laser (intrabeam)

Details: Pulse Train Intra-Beam Calculations.

Input Parameters:

- Laser Beam Wavelength........ 308 nm.
- Total Exposure Time............... 1 s.
- Laser Beam Energy............... 450 mJ.
- Beam Major Axis............... 25 mm.
- Beam Minor Axis............... 20 mm.
- Major Axis Divergence........... 1 mr.
- Minor Axis Divergence........... 1 mr.
- Distance to Target............... 1 m.
- Pulse Repetition Frequency.... 10 Hz. P
- Pulse Duration.................... 22 ns.
- Beam Profile Type............... Elliptical.

Calculation Results:

- Single Pulse M.P.E...... 68.2 J/m2.
- ** Pulse Train M.P.E....... 38.4 J/m2. -> Most limiting MPE.
- Average M.P.E............... 39.8 J/m2.
- Limiting Aperture........... 1 mm.
- Accessible Emission........ 1.05 kJ/m2.
- Ocular M.P.E. Excess... 27
- 50mm. M.P.E. Excess... 15000
- N.O.H.D..................... 99.9 m.
- Average Irradiance......... 10.5 kW/m2.
- Peak Irradiance........... 47.7 GW/m2.
- Average Power Output.... 4.5 W.
- Spot Major Axis....... 26 mm.
- Spot Minor Axis........ 21 mm.
- Exposure Train........... 10 Pulses.
- The trial Class of this product is 4.
- This Situation is Extremely Dangerous!
- Direct Ocular Exposure must not be permitted!
- Safety Eyewear for a single exposure will need to have a minimum Optical Density of: 1.5 for a "Yellow" limit.
- 1.8 for a "Green" limit.

Dye Laser (intrabeam)
Details: Pulse Train Intra-Beam Calculations.

Input Parameters:

- Laser Beam Wavelength........ 260 nm.
- Total Exposure Time............. 5 s.
- Laser Beam Energy............. 1 mJ.
- Beam Major Axis............... 25 mm.
- Beam Minor Axis............... 20 mm.
- Major Axis Divergence......... 1 mr.
- Minor Axis Divergence......... 1 mr.
- Distance to Target............. 1 m.
- Pulse Repetition Frequency... 10 Hz.
- Pulse Duration................... 20 ns.
- Beam Profile Type.............. Elliptical.

Calculation Results:

- Single Pulse M.P.E...... 30 J/m2.
- Pulse Train M.P.E........ 11.3 J/m2.
- ** Average M.P.E............. 600 mJ/m2. -> Most limiting MPE.
- Limiting Aperture......... 1 mm.
- Accessible Emission..... 2.33 J/m2.
- Ocular M.P.E. Excess.. 3.9
- 50mm. M.P.E. Excess.. 2100
- N.O.H.D..................... 23.7 m.
- Average Irradiance...... 23.3 W/m2.
- Peak Irradiance......... 117 MW/m2.
- Average Power Output.... 10 mW.
- Spot Major Axis....... 26 mm.
- Spot Minor Axis....... 21 mm.
- Exposure Train.......... 50 Pulses.
- The trial Class of this product is 4.
- This Situation is Dangerous!
- Direct Ocular Exposure must not be permitted!
- Safety Eyewear for a single exposure will need to have a minimum Optical Density of: 0.7 for a "Yellow" limit.
- 1 for a "Green" limit.