

## Appendix A

### Fluence, Sweep Velocity, and Dwell Time Calculations

During an 80-second exposure per hemisphere, the surface “sweep” is repeated a predetermined number of times, or in this example, 5 times. For a single sweep, the average arc length scanned per hemisphere is approximately 22mm. The velocity ( $v$ ) is equal to the arc length divided by 16 seconds (80 seconds divided by 5 sweeps), or 1.25mm/sec. The dwell time is 0.51 sec per 700- $\mu$ m segment.

#### Calculation Example:

Average Power = 2.0W,

Duty cycle = 0.313,

(The pulses of light is “on” 31.3% of the time ( 0.5ms); ”off” for 1.1ms)

Exposure duration = 80 seconds/hemisphere,

Number of “sweeps” per 80 second exposure duration = 5,

Laser spot size at treatment site = 700 $\mu$ m, and

Approximate arc length at 3.8mm posterior to the limbal margin = 22mm.

With these values, the fluence per 700- $\mu$ m segment may be calculated and remains constant throughout the treatment. (See calculation below)

#### Definitions:

“*Sweep velocity*” is equal to the arc length divided by exposure time for a single sweep.

“*Dwell time*” is the equivalent stationary pulse duration during which equal energy is deposited per unit area per unit time as scanned delivery. For example, with a 700- $\mu$ m spot diameter and arc length of 22mm the dwell time =  $0.7\text{mm}/22\text{mm} \times$

16sec (time per sweep )= 0.51sec. A single pulse of 0.51 sec would deliver the same energy as a moving source that required 0.51sec to cover the same area.

“Area” for a 700- $\mu\text{m}$  spot diameter  $\sim 0.0038\text{cm}^2$ .

With the dwell time calculation, the fluence may be determined as follows:

$$\begin{aligned}\text{Fluence} &= \text{Power} \times \text{duty cycle} \times \text{dwell time}/\text{Area} \\ &= 2.0\text{W} \times 0.313 \times 0.51\text{sec} / .0038\text{cm}^2 = 84 \text{ J/cm}^2.\end{aligned}$$

Ranges of parameter sets and calculated values which demonstrate how the dose is affected by the average power level, the exposure duration per hemisphere, the arc length, and the number of sweeps are shown in **Table 1**.

Figure A1 (Appendix)

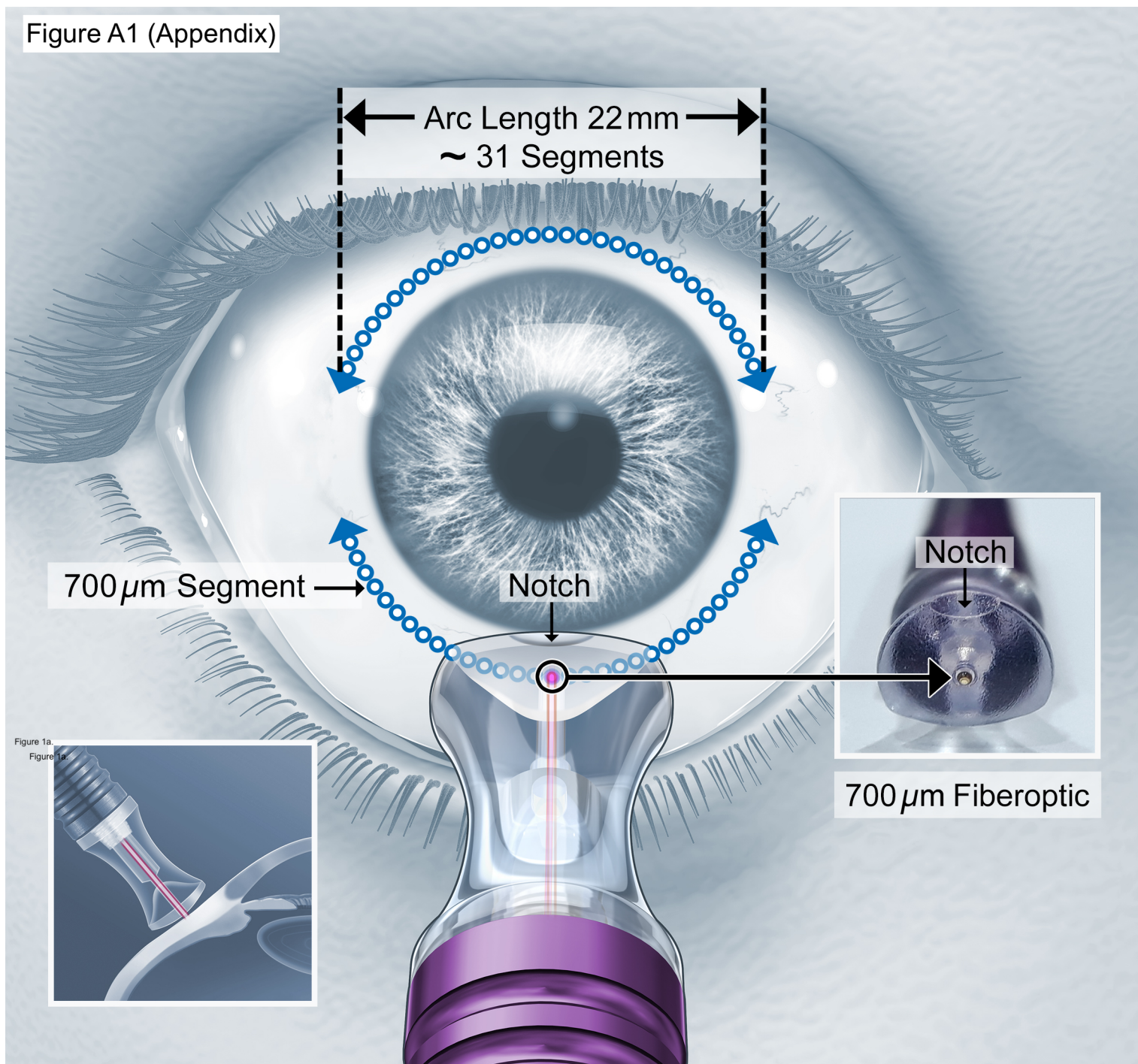
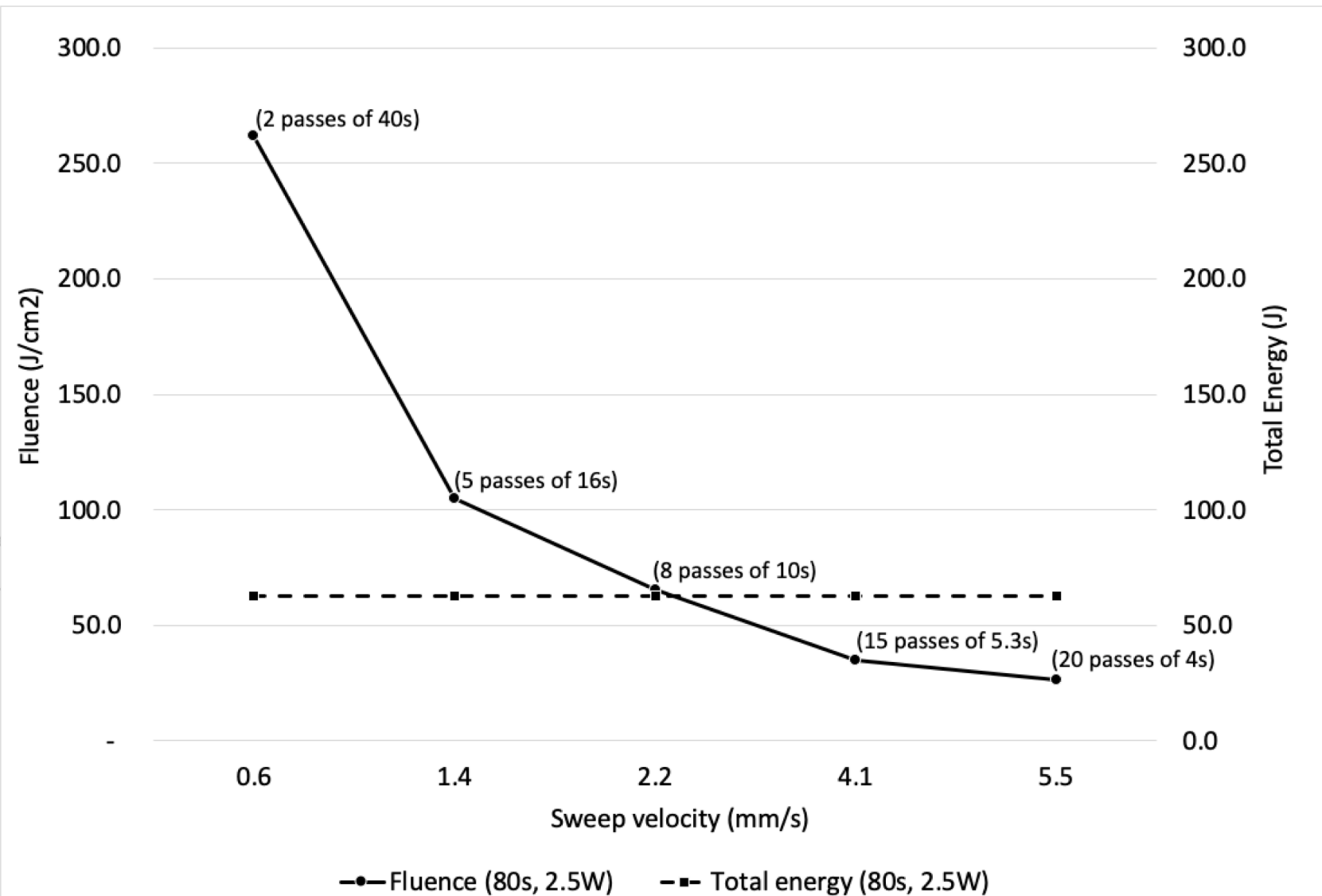


Figure A2 (Appendix)



## Legends

Figure A1. Position of the MicroPulse P3 handpiece and demonstration of energy deposited per segment treated for a single sweep. For a 700- $\mu\text{m}$  spot, there are 31.3 segments per 22mm arc length. The tip of the handpiece is placed at the limbal margin; the fiber optic is located 3.8mm posterior to the limbus and corresponds to the pars plana region of the eye.

Figure A2. Example of fluence ( $\text{J}/\text{cm}^2$ ) and total energy (J) against sweep velocity ( $\text{mm}/\text{s}$ ). Solid line: fluence with different sweep velocities. Dotted line: total energy with different sweep velocities.