

# TREATMENT GUIDELINES

## Subthreshold MicroPulse™ Laser Treatment Diabetic Macular Edema (DME)

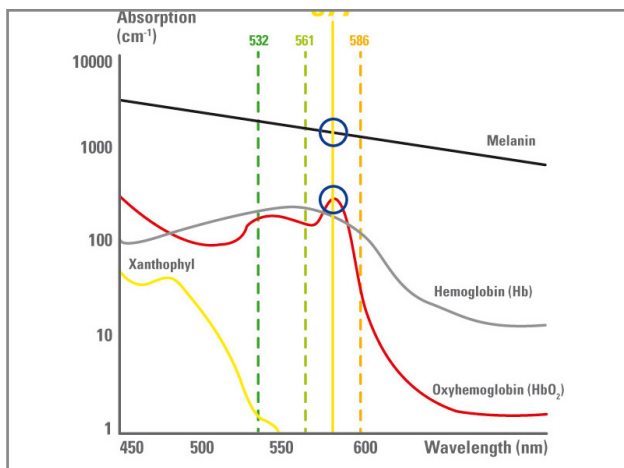
VICTOR CHONG, MD - Oxford Eye Hospital, Oxford University Hospitals – Oxford, UK  
QUAN DONG NGUYEN, MD - The Nebraska Medical Center – Omaha, USA

**S**ubthreshold MicroPulse laser treatment (STMPL) is a method of delivering laser energy to the retina, producing a bio-stimulation effect to reduce diabetic macular edema, while minimizing permanent thermal damage to the retinal tissue. The concept involves delivery of a “train” of laser pulses, each pulse separated by sufficient time to allow heat dissipation and reduce permanent damage to the retina. Unlike conventional macular laser treatment, there is no visible scarring on clinical examination, OCT or angiogram.

### WAVELENGTH: 577 nm (YELLOW)

577nm (yellow) has been identified as the ideal wavelength for RPE stimulation since it is well absorbed by melanin and oxyhemoglobin.

Targeted absorption in the RPE, plus the ability of yellow light to penetrate poor media with less scatter, means that less total energy is required compared to 532nm (green) and less thermal impact on non-RPE retinal layers.



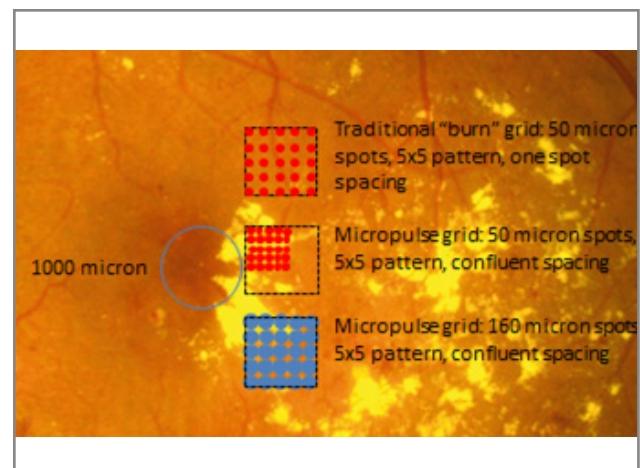
## SETTINGS

### SPOT SIZE

**160μ, CONFLUENT**

Since there is no intended thermal injury using STMPL, confluent treatment (i.e. no gaps between treatment spots) is used to increase the treatment area, ensuring therapeutic delivery to all of the targeted tissue (this is known as “dense” treatment). The larger spot size (160μ) offsets those used in traditional ETDRS laser grid therapy which are typically 50μ-100μ, spaced one or more spot diameters apart. The spot spacing in traditional grid therapy allows for lateral damage which spreads from the initial thermal injury. Since STMPL has no thermal effect, the spacing of spots is not needed.

**However, more spots are often required even with this compensation.**

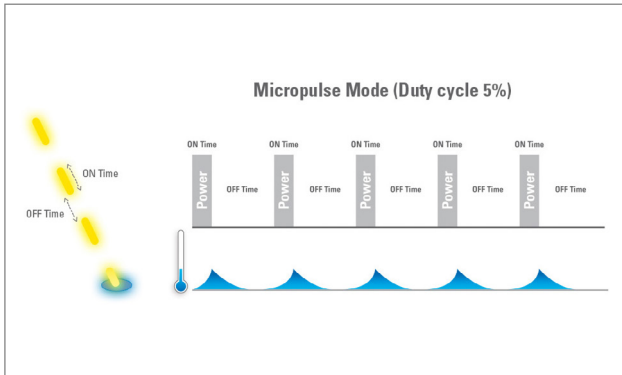


## DUTY CYCLE

### 5%

The concept of duty cycle allows the spaced delivery of MicroPulse of energy to minimize thermal damage.

A 5% duty cycle means that each MicroPulse of energy has a laser ON time of 0.1ms followed by a laser OFF time of 1.9ms. One laser "shot" contains a train of these MicroPulses. Recent clinical experience has led to this newer, low duty cycle of 5% as it is safer but equally effective.



## EXPOSURE TIME

### 200 ms

Exposure Time refers to the shot duration of each MicroPulse envelope.

In MicroPulse mode with a 5% duty cycle, there are 100 MicroPulses ON / OFF cycles of 2ms within the 200ms exposure time.

## POWER SELECTION

### (TITRATED TO INDIVIDUAL PATIENT) @ 50% OF THRESHOLD (JUST VISIBLE ENDPOINT)

Power selection is customized to the thermal threshold of each individual patient. Using the suggested parameters (160 $\mu$  spot size, 5% duty cycle), a single spot is used to determine the patient's thermal threshold by starting at low power and gradually increasing until a just visible burn endpoint (barely visible threshold burn) is observed in a normal area of retina near the edematous area.

Once the thermal threshold is determined for a given retina, reduce the power to 50% of this threshold power for STMPL treatment.

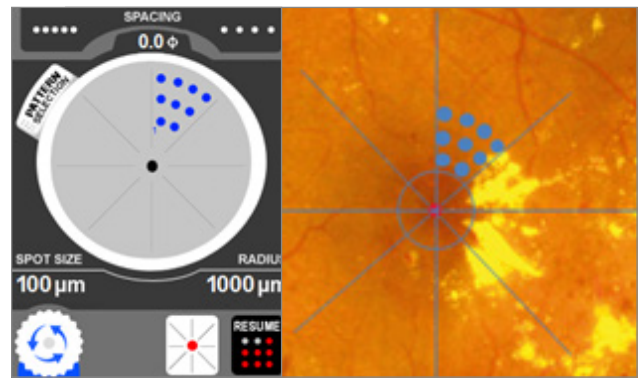
There is no visible reaction is seen during treatment and there is no need to change power with different degrees of edema.

## TREATMENT ALIGNMENT

### PATTERN SCAN ALIGNMENT

#### MACULAR GRID

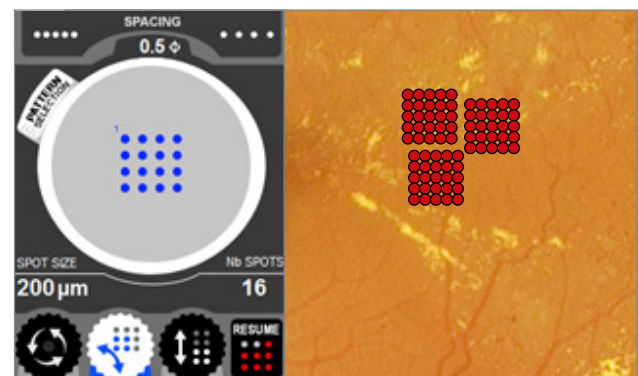
Since the laser spots are not visible, this pattern can help in the application and placement of the subthreshold spots. Using the aiming beam, the fovea can be referenced for positioning the grid pattern. As one grid sector is completed, the information is recorded on the settings screen display and the pattern can be positioned in the next sector. The treatment pattern and location can be previewed with the aiming beam prior to treating the sector.



### PATTERN SCAN ALIGNMENT

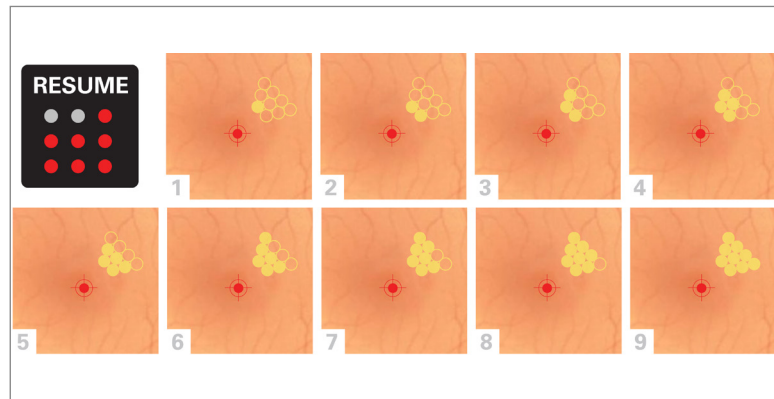
#### SQUARES

When the macular grid cannot be used (treatment areas out of the macular grid pattern) or there is a large area of treatment Square patterns can be used instead. Remember that each laser spot is 200ms, so it takes about 6 seconds to complete 25 spots on a 5 x 5 grid. So patient might move during treatment.



## RESUME FUNCTION

The Resume function allows for interruption and resumption of the selected pattern. Shots can be fired one at a time or the entire pattern can be fired, with the opportunity to stop if there is excessive eye movement. As treatment is invisible, the surgeon needs to remember where the last laser spot is located on the retina. If the patient moves, the surgeon can realign the last laser spot to the redefined location and continue to finish the treatment pattern.



## TREATMENT PARAMETERS/PROCESS SUMMARY

### STEP 1

#### TITRATE POWER USING MONOSPOT & MICROPULSE

- Spot Size: **160 $\mu$**
- Exposure Time: **0.2s (200ms)**
- Duty Cycle : **5%**

Increase of the power level (step by step) until reaching a just visible endpoint (barely visible threshold burn).

### STEP 2

#### MULTISPOT & MICROPULSE TREATMENT SETTINGS

- Resume function activation
- Spot Size: **160 $\mu$**
- Spacing: **0**
- Exposure Time: **0.2s (200ms)**
- Duty Cycle : **5%**
- Use **50%** of the power level reached during the titrate step for treatment.

Treatment is based on OCT thickness map, treat the entire area of edema.

*NB: The most common cause of treatment failure is under treatment.*

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