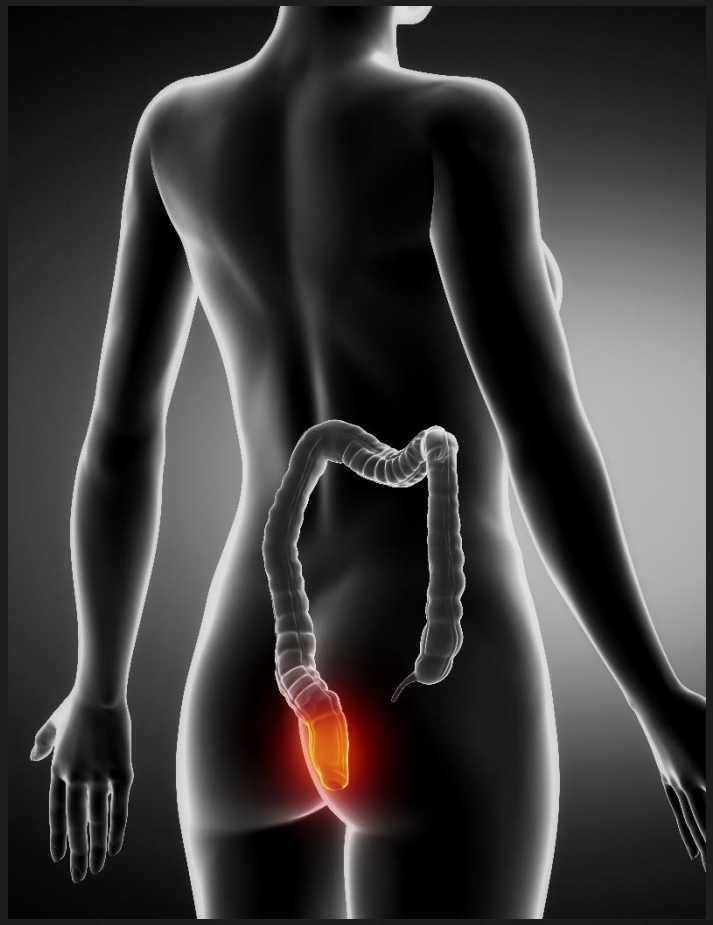


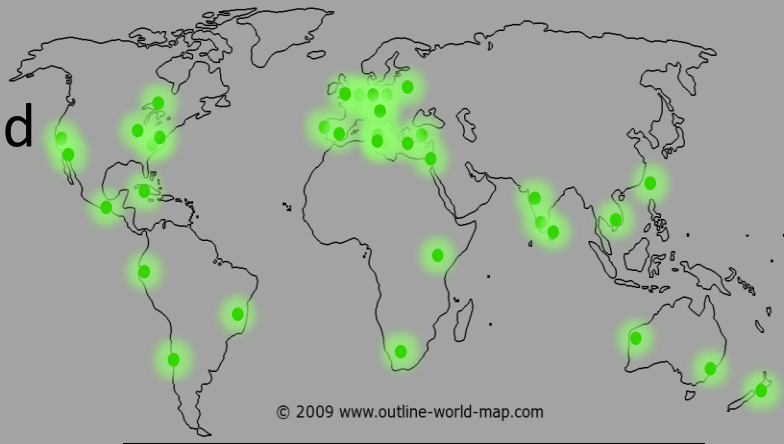
Proctology – Basic Laser Theory

Gil Shapira, CEO neoLaser – July 2016

neoLaser - The Company

neoLaser designs and manufactures top quality laser devices for the medical field

- Private company
- Headquarters and R&D in Israel, founded in 2012
- Team has over 50 years of combined experience in surgical lasers
- 2013-2014, 2014-2015 CAGR 150%
- Key areas of activity – EVLA, Proctology, Spine, ENT
- GMP Compliant, CE marked, FDA Cleared



QUALITY AND REGULATORY

ISO 13485 GMP CE FDA CLEARED

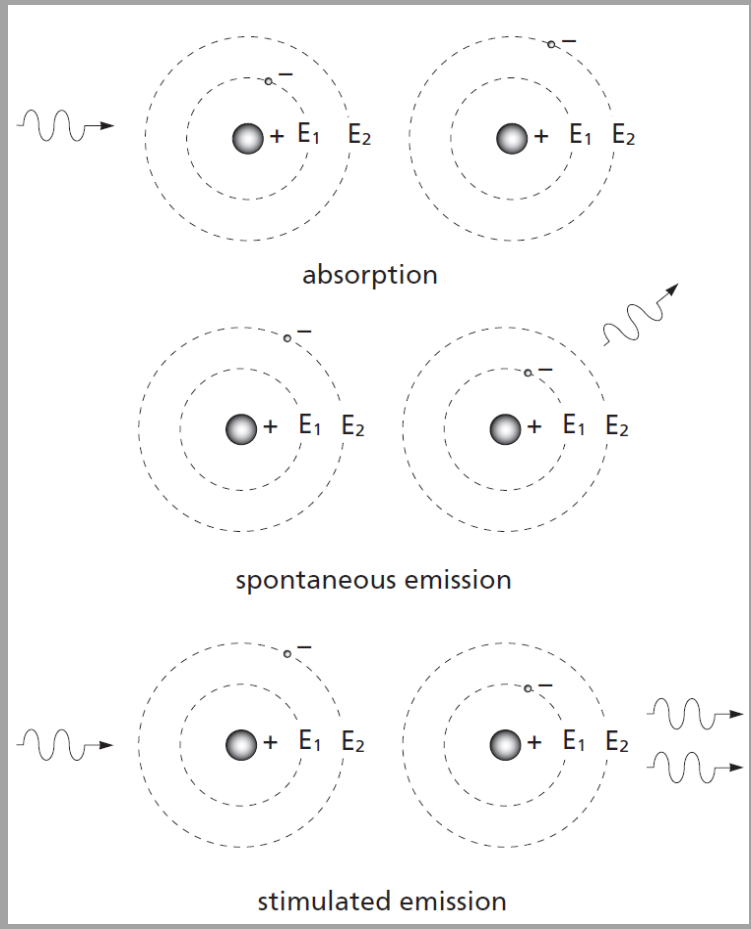
The neoV

- High power unit
  - 810nm 28W / 25W
  - 980nm 28W / 25W
  - 1064nm 24W / 20W
  - 1470nm 12W / 10W
- Unique cooling technology
- Small footprint, unique design
- Intuitive User Interface
- Power stability
- Reliability

LASER – What is it?

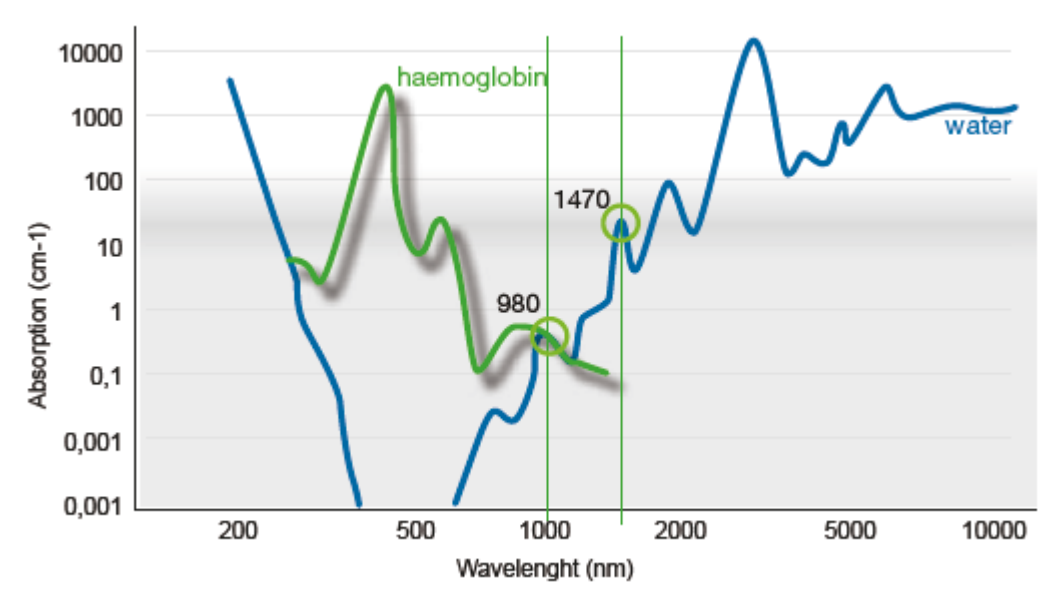
- LASER = **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation

- Coherent light = one color
- Depends on material used
- One color = **predictable tissue interaction**



Laser Theory – Impact of Wavelength

- Absorption of energy
  - Water
  - Hemoglobin
  - Melatonin
- Near and mid infrared energy
- Interaction
  - Absorption
  - Vaporization
  - Collateral damage

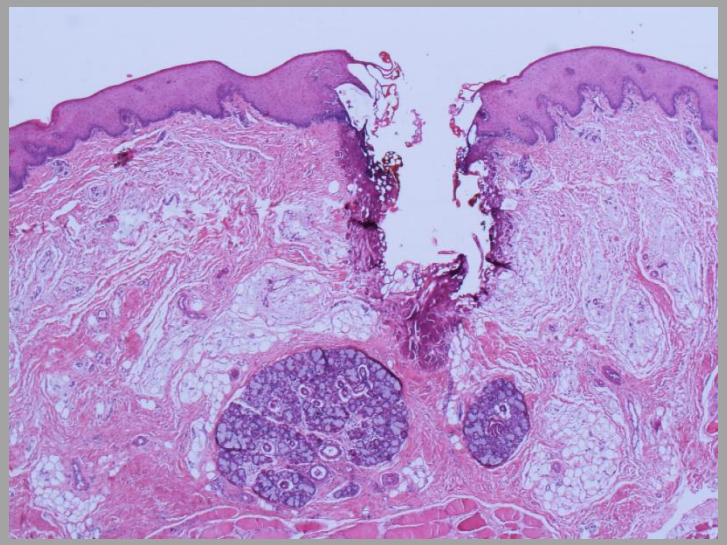


Temperature Effect	
Temperature	Effect
>40°C	Enzyme induction, membrane disaggregation, edema
45°-65°C	Tissue damage, reversible or irreversible, dependent on irradiation time
>65°C	Coagulation
>100°C	Dehydration
>150°C	Carbonization
>300°C	Vaporization, ablation (removal of tissue)
Some 1000°C	Ionisation, immediate burn (shock wave formation)

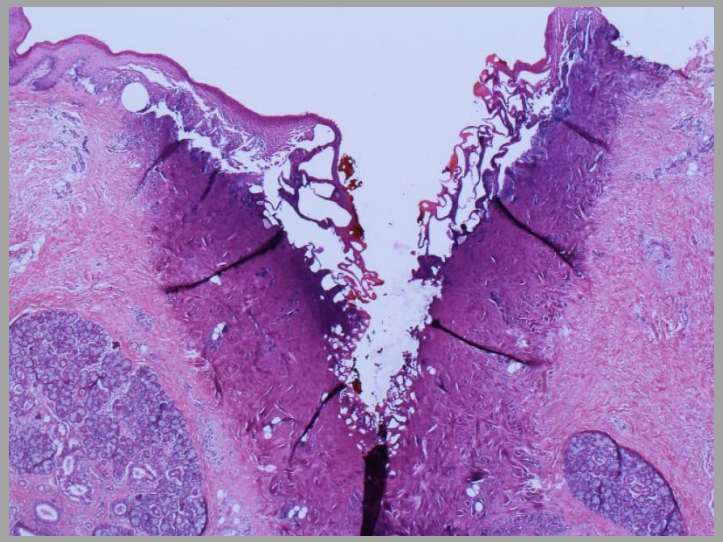
Example of Tissue Interaction

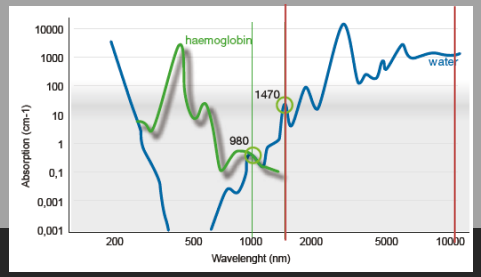
Histology on Soft Tissue

CO2 Laser



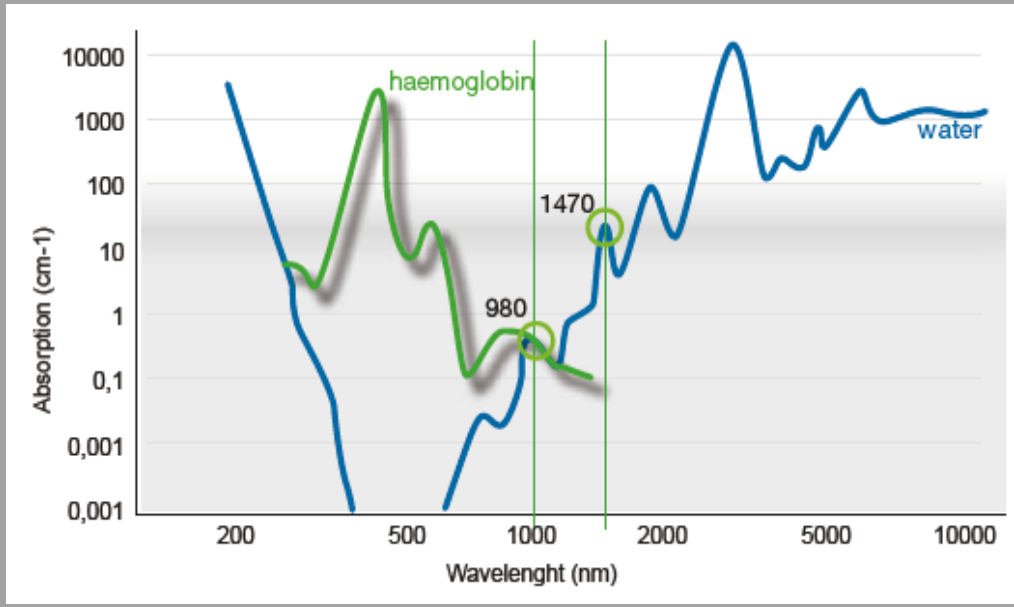
1470 Laser



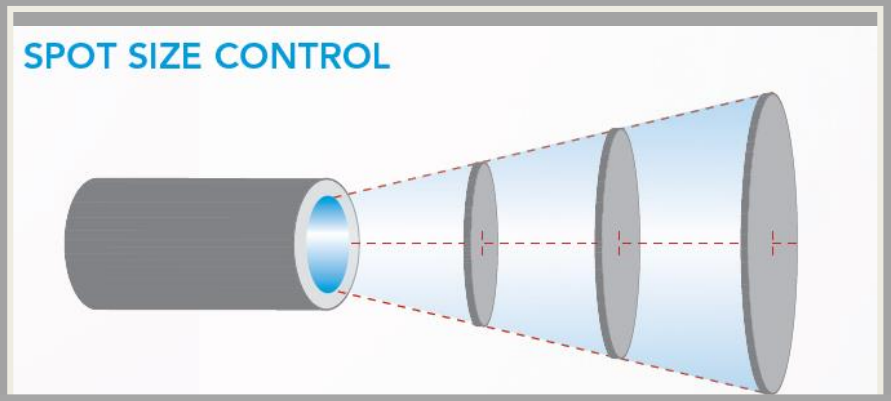


The 1470nm Advantage

- Local peak absorption in water
- Heat is localized
- Thermal damage of 2-3mm
- Good coagulation properties
- A good balance of precision vs coagulation



The concept of Power Density

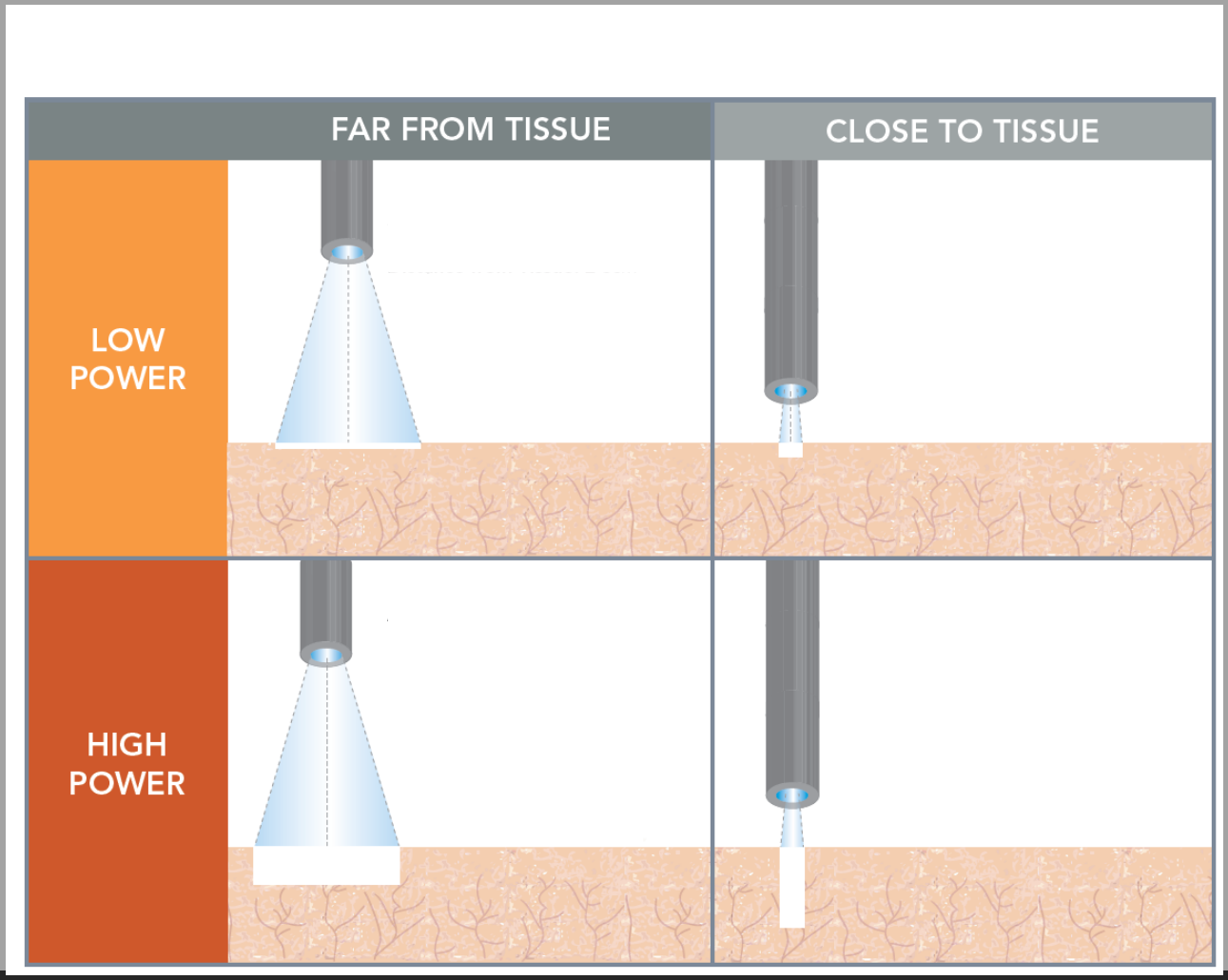


$$\text{Power Density} = \frac{\text{Power}}{\text{Spot size (area)}}$$

- Bare fibers – light diverges on output
- Large distance – low power density
- Small distance – high power density

Power Density = Force of applying a mechanical scalpel

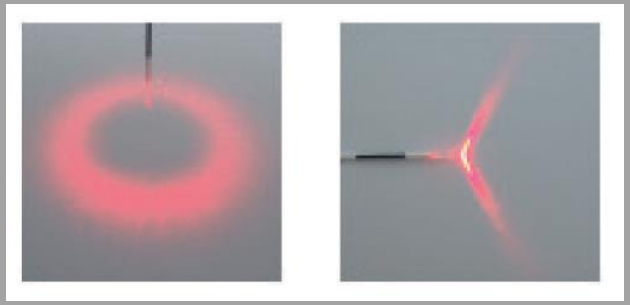
Power Density Impact Bare Fibers



Control of Emission – Special Fibers

- Reduce power density
  - Avoid cutting
  - Put power over large area
  - Match emission to anatomy
- Radial emission – FISTULA probe
- Wide emission – HEMORRHOID probe

CORONA 360 Fistula Probe



CORONA 360 Hemorrhoid Probe

Dosage – Key Points

ENERGY (Joules) =
POWER (Watts) X TIME (Sec)

- Dosage will impact safety and efficacy of treatment
- High enough to be effective, low enough to be safe
- Optical equivalent of “Work = Force X Time”, typically expressed in Joules
- Sweet zone dictated by job to be done and neighboring structures
- Literature provides guidance per procedure type
- Always record total Energy (in Joules) to each patient, will give you your own database over time

Dosage – How to Control, Examples

- Method#1 – Single Pulse
  - Example, 8W Pulse On of 3sec. Every press of pedal used for coagulating certain section of hemorrhoid after aiming
- Method#2 – Repeat Pulse
  - Example, 10W Pulse On of 8sec, Pulse Off 100msec. Continuous press of pedal while pulling back fistula fiber, giving exactly 80J per cm of fistula tract
- Method#3 – CW
  - Example, 10W CW while using for fistula tract with haptic feedback. Only for very experienced users. Least amount of control
- Always – keep Joule counter to monitor total dosage applied

Summary – Laser as the Right Surgical Tool

- The **right wavelength** for the job
- The **right fiber** – how energy is transferred to the body
  - Cutting/ablation/coagulation?
  - Match anatomy
  - Optimal power density to target tissue
- The **right dosage** (power and time)
  - Enough but not too much
  - Use setting that gives your technique the best control
  - Monitor total energy delivered

Thank you

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