LASER IN PEDIATRIC DENTISTRY

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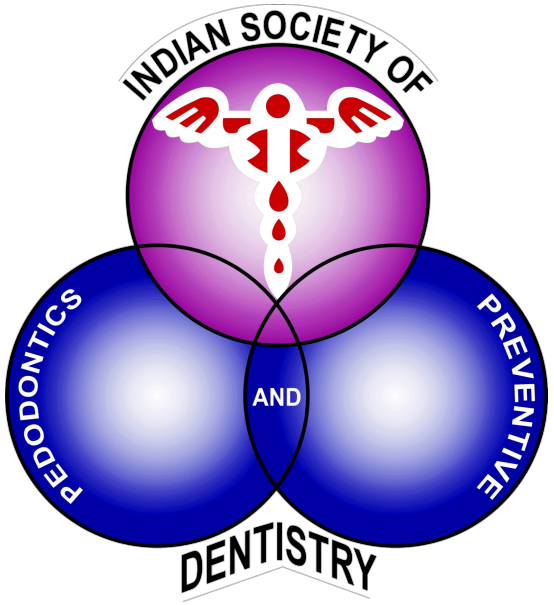

Previous papers – Final year MDS

Laser

- 1. Lasers in dentistry (essay que; Manipal 2013, RGUHS 2012, short notes; Manipal 2018, RGUHS 2015,2017)
- 2. Soft tissue lasers in Ped dentist (short note- RGUHS 2016)
- 3. Laser fluorescence in detection of caries (short note, Manipal 2016)

Electrocautery

- None to my knowledge

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General Concepts for answering a Short Note

How much to write in a short note

Depends on the proportion of marks allotted. For e.g

- A 3 hours paper with Max. Marks -80
- Short note – 10 marks then you need to spend 1/8th time or about 22 minutes. It means about 3 pages of your copy.
- In case it is 5 marks then spend 10-11 minutes or 1½ pages
- If 2 marks then spend 4-5 minutes and write half page

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How much to cover

Normally the paper setters must ask you precise and pointed information so you answer that only even if it is half a page. For e.g. 'Role of salivary albumin in caries protection'.

If pointed information is not asked then you need to decide to write only brief overview. For e.g. 'ECC' – we know you can write an essay on this. However, you will choose to write the meaning/ definition and importance of it

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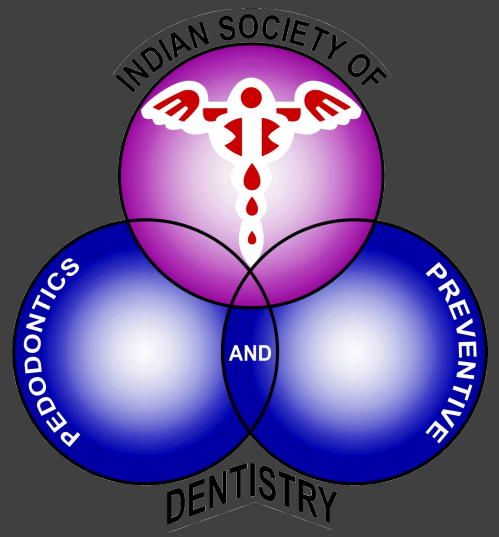
Action verbs for assessment



Cognitive Domain Levels					
----------Increasing Complexity---------->					
Remember	Understand	Apply	Analyze	Evaluate	Create
Retrieve relevant knowledge from long-term memory	Construct meaning from instructional messages, including oral, written, and graphic communication	Carry out or use a procedure in a given situation	Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose	Make judgments based on criteria and standards	Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure

The table above outlines the six levels in the cognitive domain and action-verbs that can be used to write learning outcomes as well as assess them

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Learning objectives

- INTRODUCTION TO ELECTROCAUTERY
- HOW IS LASER GENERATED
- PROPERTIES OF LASER
- CLASSIFICATION OF LASERS
- PARTS OF THE MACHINE
- USES OF LASERS
- LASER SAFETY

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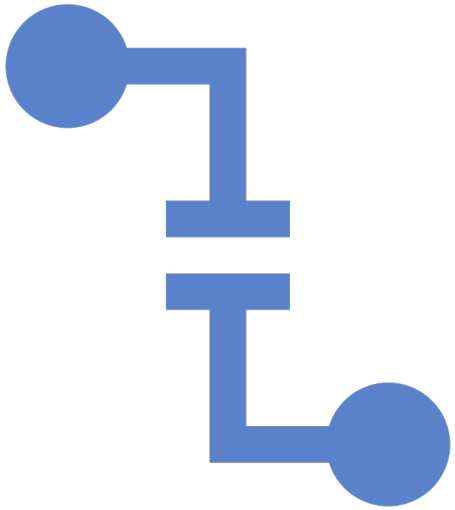
Electrocautery

- Electrocautery is a controlled precise application of electrical current to the soft tissue site for cutting/ coagulation using carefully designed electrodes.
- Depending upon the amount of current and resistance of tissue, heat generation can cause coagulation at lower temperatures.
- At higher temperatures, there is sudden dehydration of tissues resulting in incision.
- Before Lasers, it was popular for pulpotomy before year 2000.



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Soft Tissue Lasers

for Pediatric Dentistry

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Laser

L-Light

A -Amplification by

S -Stimulated

E -Emission of

R -Radiation

is a form of electromagnetic energy in which photons are generated from a medium by stimulating the medium from external energy source.

1917 – Albert Einstein
1964 – Theodore Maiman

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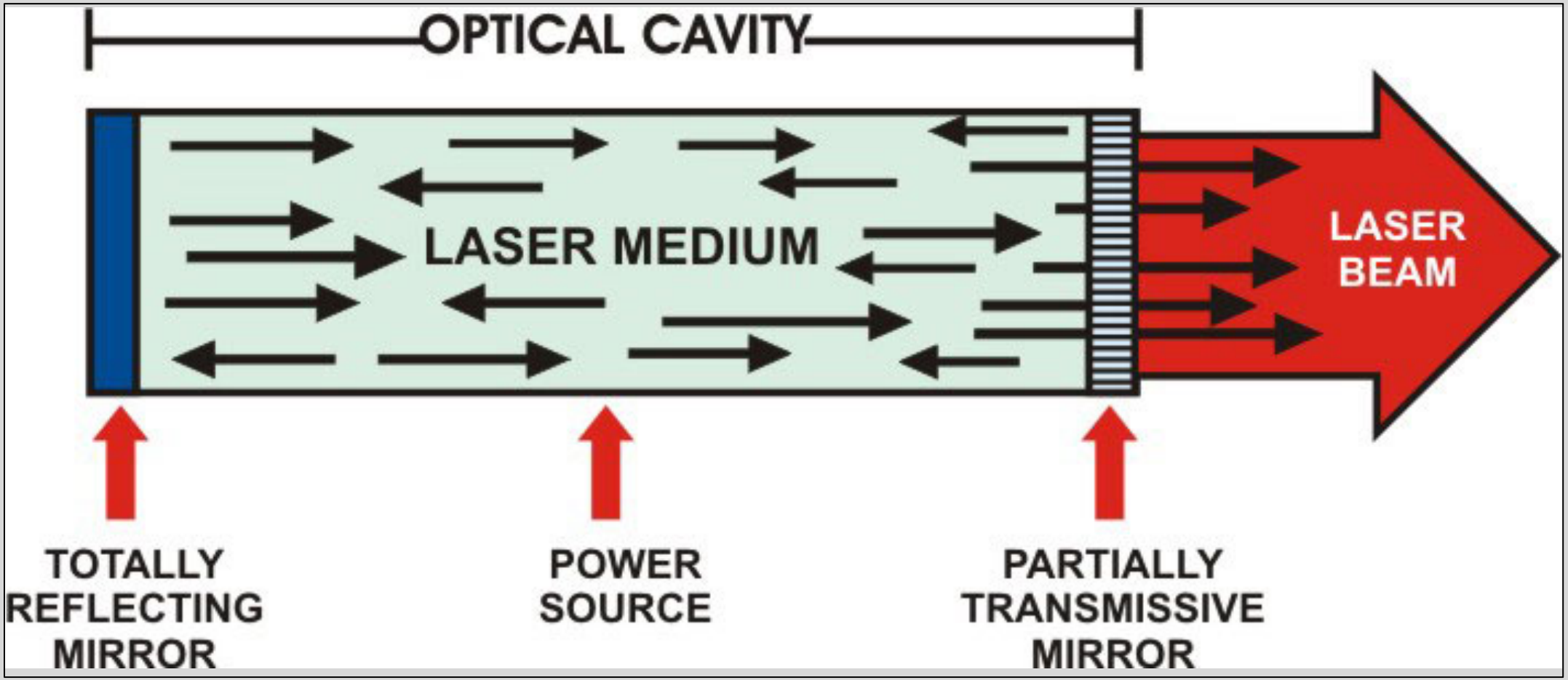
Generation of Lasers



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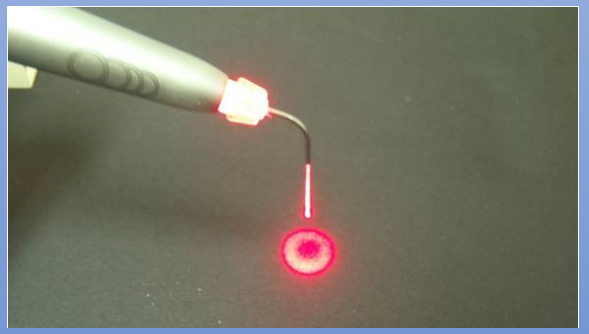

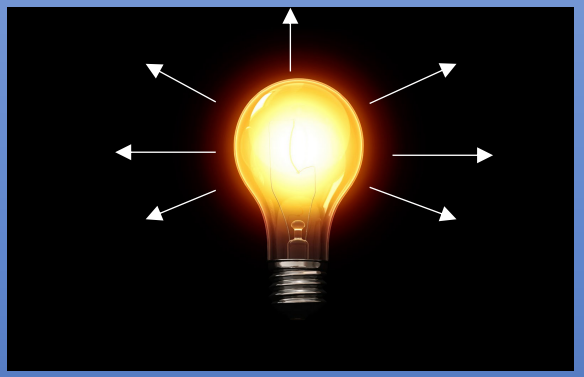

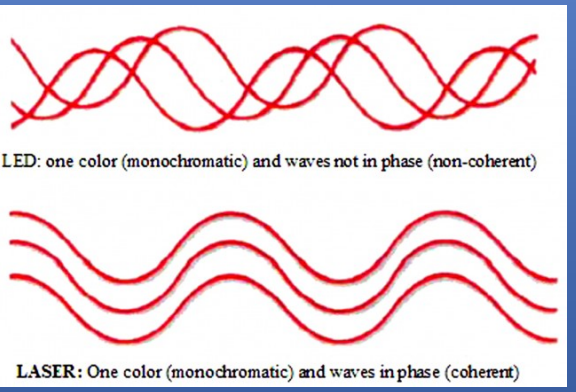

Laser Characteristics

Monochromatism

- One specific color

Collimation (highly directional)

- - Beam having specific spatial boundaries.

Coherency

- - wavelengths in one phase with identical amplitude & identical frequency.

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Classification of Laser

Based on active medium

- Solid state : Nd:YAG; Diode laser
- Liquid state (Dye): Rhodamine 6G; toludine blue
- Gas state: He; He-Ne; Co2; Argon; Er:YAG
- Excimer lasers: Chlorine + Fluorine gas mixed with inert gases (Ar,Kr,Xe)
- Semiconductor lasers: (diode): In-Ga As P; GaAl As

Based on mode of action

- Contact mode : Nd:YAG; He:YAG
- Non contact mode: CO2

Based on application

- Soft tissue laser: Ar, Diode, CO2
- Hard tissue laser: Er:YAG; Nd YAG

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Laser unit

Parts of laser unit

- The laser generator and the display controls

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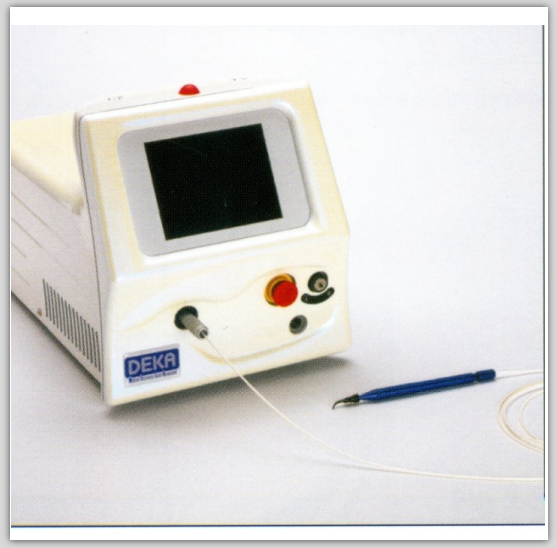
Handpiece



Foot control

Cork for activation

Parts of the Unit

- Hand piece
- Foot control
- Activation media
- Protective eyewear

For patient

For clinician

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Foot control (locked)

Foot control (open)

FOOT CONTROL WITH SAFETY PEDAL

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PREPARATION

Eyes to be sealed

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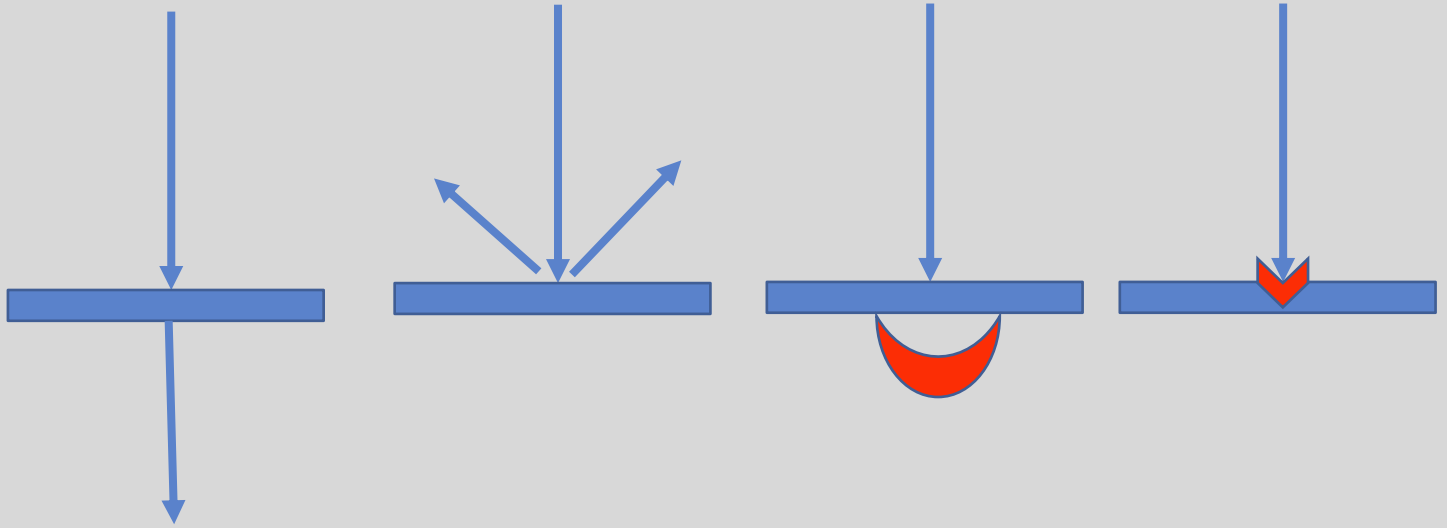
LASER TISSUE INTERACTION

- Transmission
- Reflection
- Dissipation
- Absorption



◦ Diagnostics. Healing/ stimulation Cutting

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Target tissue temperature change and effect

Tissue temperature (° C)	Observed effect
37-50	Hyperthermia, stimulation
60-70	Coagulation, protein denaturation
70-80	Melting of tissue
100-150	Ablation – water vaporization
200 and above	Dehydration and burning of hydroxyapatite crystals

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D.J. Coluzzi . Fundamentals of dental lasers: science and instruments. Dent Clin N Am 48 (2004) 751–770

Properties of Soft tissue Laser for clinical use

- Highly **absorbed by pigmented tissue** and are deeply penetrating
- Relatively poorly absorbed by tooth structure so that soft tissue procedures can be **safely performed in close proximity to enamel dentin and cementum.**
- Interfere with sodium pump mechanism, change cell membrane permeability & alter the endings of sensory nerves & **block depolarization of c & a fibers of nerves temporarily**

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Controls of functions in a Laser Machine

The clinician controls the tissue reaction by controlling the following factors:

- Applied power (power density)
- Total energy delivered over a given surface area (fluence)
- Rate and duration of the exposure (pulse repetition rate and pulse duration)
- Mode of delivery

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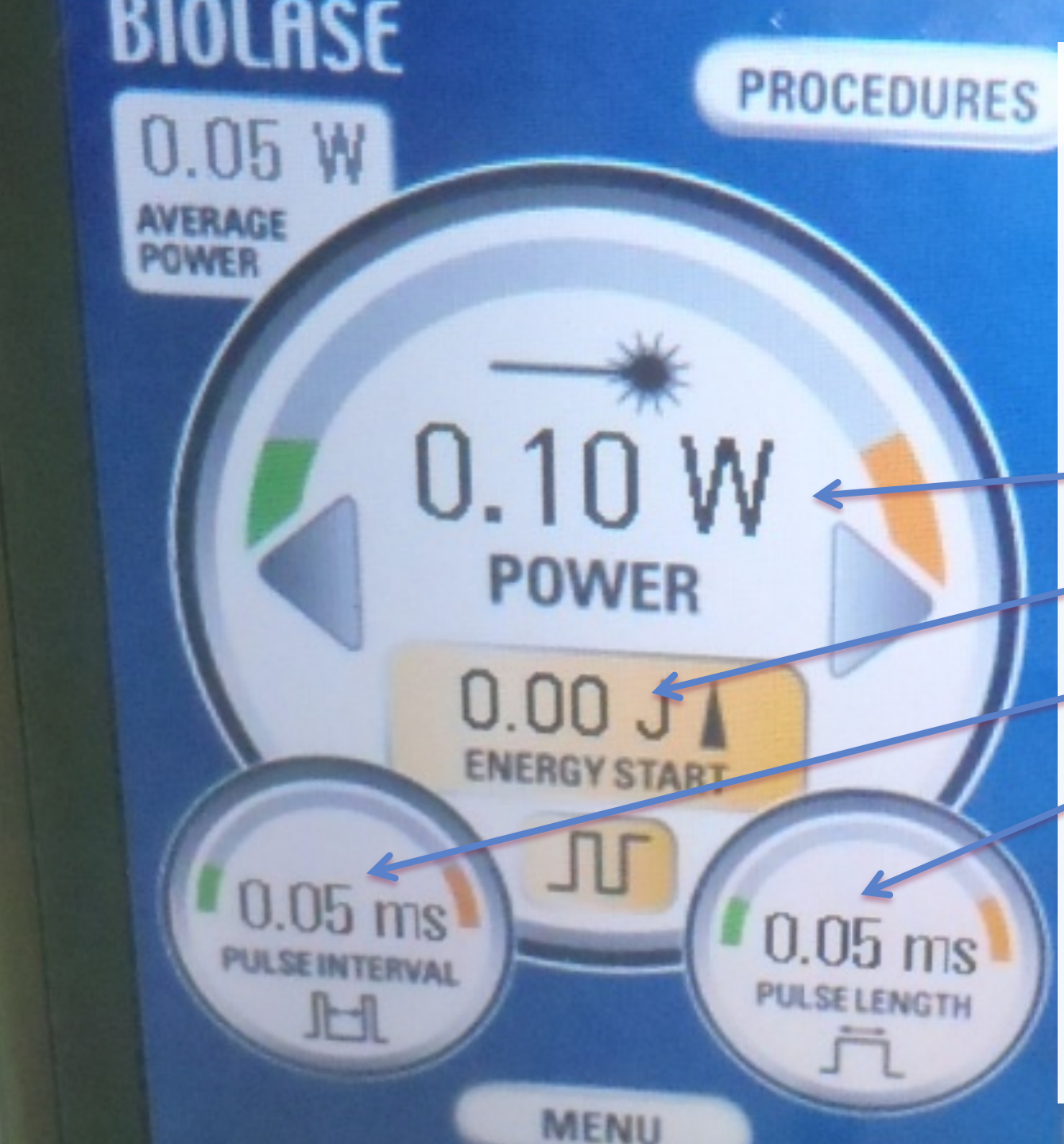

Controls – Applied power, total energy

- Power setting
- Total energy in Joules
- Pulse interval
- Pulse length

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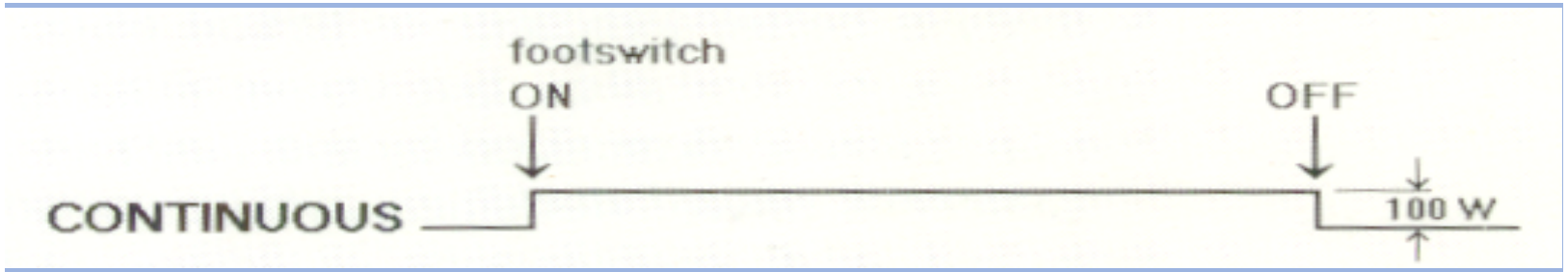
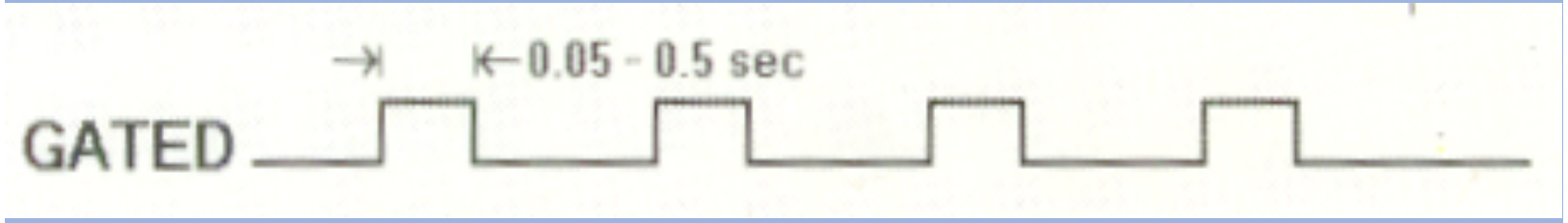
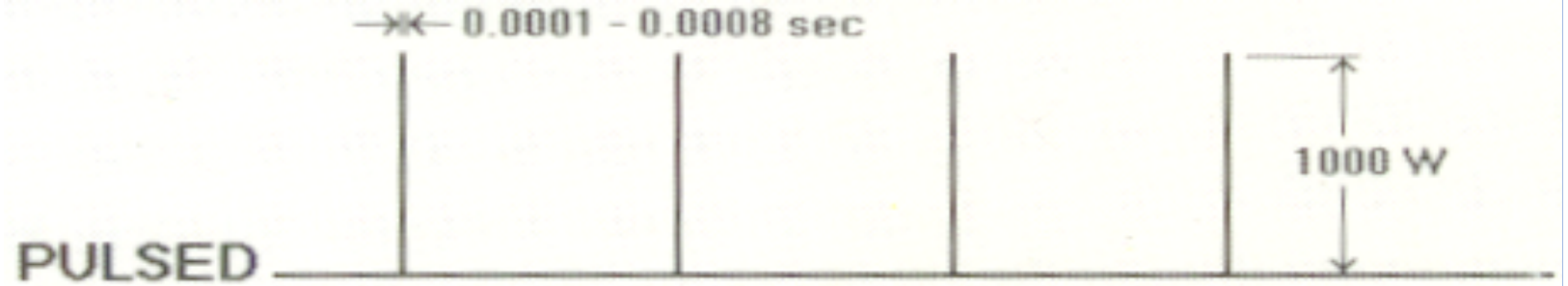


Continuous laser generation with foot switch on and off for whole duration



By opening and closing of a mechanical shutter in front of the beam path of a continuous wave emission.



Large peak energies of laser light are emitted for an extremely short time span, usually in micro-seconds, followed by a relatively long time in which the laser is off.

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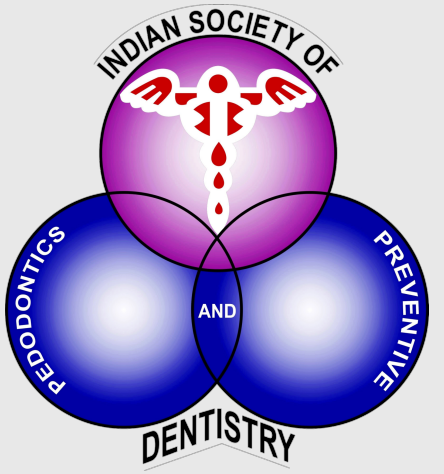
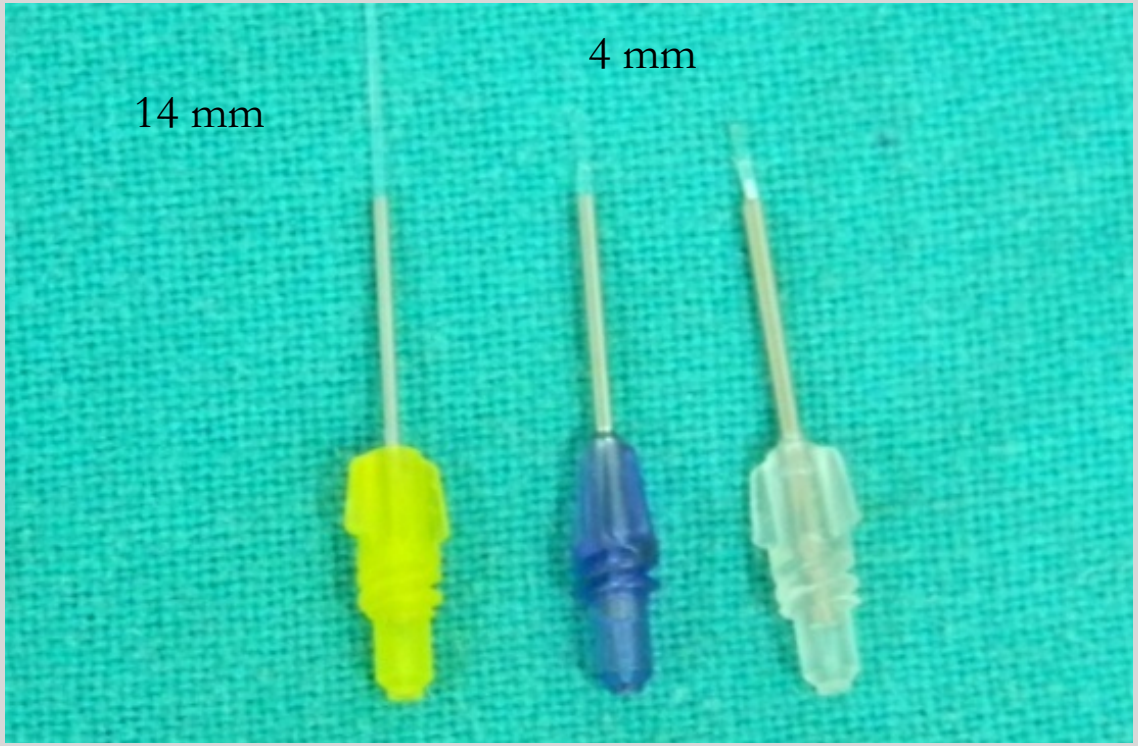
Pulse modes

Based on pulse, mode of use and applied power same laser tip can be used for several functions.

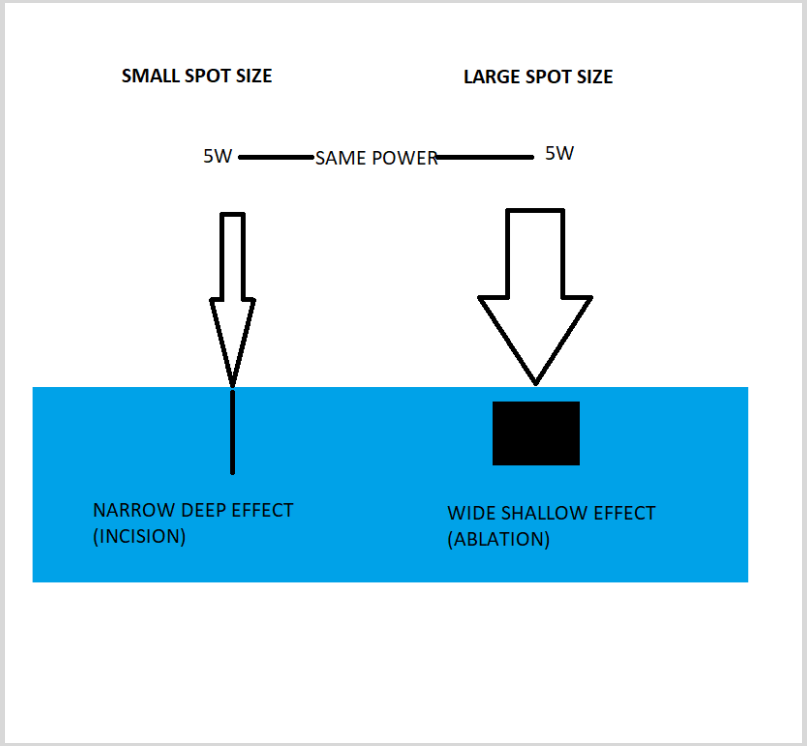


Laser fiber diameter and length



200 300 400

Micron diameter



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Settings for different procedures

Procedure	Power	Pulse interval	Pulse length
Pulp capping	0.5 W	0.5 ms	0.5 ms
Pulpotomy	2 W	0.5 ms	0.5 ms
Gingivectomy	1.0 W	0.20 ms	0.05 ms
Excision	0.9 W	0.5 ms	0.5 ms
Frenectomy	1.0 W	1.0 ms	1.0 ms
Pocket disinfection	0.8 W	1.0 ms	1.0 ms
Curettage	0.8 W	0.5 ms	0.5 ms

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Uses of Lasers in Dentistry

Diagnosis

- Detection of pulp vitality - Doppler flowmetry
- Laser fluorescence- Detection of caries, bacteria and dysplastic changes in the diagnosis of cancer

Hard Tissue applications

- Caries removal and cavity preparation
- Re-contouring of bone (crown lengthening)
- Endodontics (root canal preparation, sterilization and Apicectomy
- Laser etching/Bleaching/ Caries resistance

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Soft tissue applications

Bacterial decontamination
Coagulation / Hemostasis

- Frenectomy
- Natal and Neonatal teeth extraction
- Operculotomy
- Treatment of aphthous ulcers and Oral lesions
- Mucocele excision
- Soft tissue curettage and peri-apical surgery
- Gingivectomy / retraction for impressions
- Implant exposure
- Biopsy incision and excision

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Pulp Procedures

- Dentin Desensitization
- Pulp Capping
- Pulpotomy
- Root canal Disinfection

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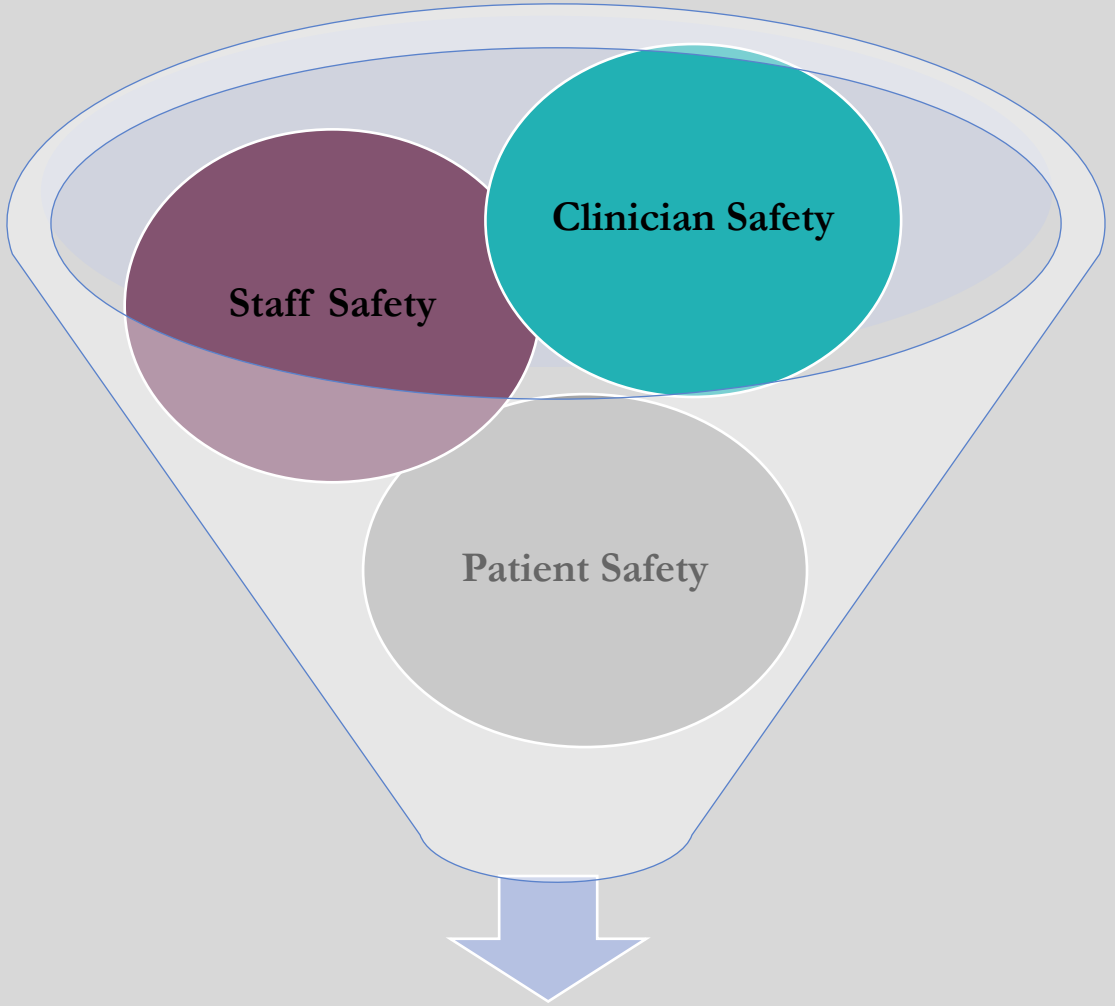
Effect of Lasers on Soft Tissue

- Ability to cut, coagulate, ablate or vaporise target tissue
- Sealing of small blood vessels
- Sealing of small lymphatic vessels
- Sterilising of tissue
- Decreased post-operative tissue shrinkage

LASER SAFETY



CLINICIAN'S RESPONSIBILITY

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Laser Hazards

1. Ocular Hazards
2. Tissue Damage
3. Respiratory /Environmental Hazards
4. Combustion Hazards (Fire and Explosion)
5. Electrical Hazards (Shock)

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Laser Hazard Signs

- All dental Lasers are included under **Class IIIb and Class IV** of IEC classification
- Display of Laser Hazard sign outside all rooms is mandatory.

AERB, 2018

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PANIC BUTTON *must be identified for each laser.*

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Advantages of lasers

- Dry operating field by sealing the blood vessels
- Reduce operative time
- Minimize post operative swelling by sealing lymphatic vessels
- Able to vaporize, coagulate or cut tissue depending on power setting and mode of delivery.
- Reduce pain to 90% of the time (due to sealing of nerve fibers)

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Advantages of lasers(contd.)

- Reduce chance of mechanical trauma
- Minimal scarring
- Reduce microbial counts (HIV, HBV risks)
- High rate of patient acceptance
- Reduced stress and fatigue

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Advantages for Child patient

- No scalpel/blade
- Painless
- No blood
- Rapid healing
- Infants can be operated
- Child finds the whole setup “fun”

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Your outline in short note on Laser

- Laser definition, generation
- Properties of Laser light
- Parts of Laser unit
- Indications
- Advantages
- Safety

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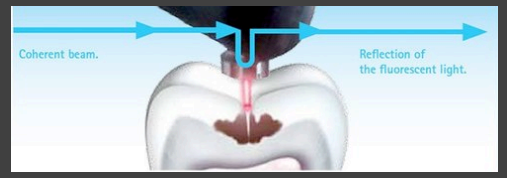

LASER FLUORESCENCE IN CARIES DETECTION

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Suggested readings

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- *D.J. Coluzzi . Fundamentals of dental lasers: scienceand instruments. Dent Clin N Am 48 (2004) 751–770*
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THANK YOU

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