United States District Court,
C.D. California.

DIODEM, LLC,
Plaintiff.
v.
LUMENIS, INC., et al,
Defendants.

No. CV 03-2142 GAF (RCx)

Aug. 17, 2004.

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Court-Filed Expert Resumes

MEMORANDUM AND ORDER REGARDING *MARKMAN* CLAIM CONSTRUCTION

GARY ALLEN FEESS**, District Judge.**

I.

INTRODUCTION

This case involves the alleged infringement of United States Patents Nos. 5,267,856, 5,304, 167, 5,422,899, and 6,122,300, the rights to which are assigned to Plaintiff Diodem. The patents protect laser technology and methods for using laser technology to perform surgery. Plaintiff brings this suit against four defendants-Biolase, HoyaConBio ("Hoya"), Lumenis, and OpusDent FN1-alleging patent infringement. The case is currently at the first phase of the infringement analysis claim construction. The parties dispute the proper construction of 21 terms used in the four patents-in-suit.

II.

BACKGROUND

Each of the four patents-in-suit involve laser technology primarily for use in medical procedures. The term "laser," an acronym for Light Amplification by Stimulated Emission of Radiation, refers to a device that creates a powerful beam of light with a uniform wavelength (as opposed to sunlight, which can have a variety of wavelengths). The basic laser consists of an optical cavity that has mirrors on both ends and is filled with a lasable material such as crystal, glass, liquid, gas, or dye. The application of a stimulus (such as light or an electrical discharge) excites the lasable material to a higher energy level. Photons of light are generated during the transition back to the material's normal energy state. The mirrors at the ends of the optical cavity serve to reflect the photons back and forth, which amplifies the laser beam. The patents at issue in this case purportedly describe and cover improved methods for using lasers in a variety of surgical procedures, particularly in the field of dentistry.

A. U.S. PATENT NO. 5.267.856 **(" *THE*** '856 PATENT ") FN2

The '856 patent protects a "method of ablating or cutting a selected area of a material with a laser, wherein a substance such as water-which absorbs laser radiation-is applied to the area in an amount to allow the substance to be absorbed into pores, cracks and other holes in the substance but without pooling on the surface of the material." (Dovel Decl., Exh. A at [57]). The "invention relates to laser surgery and to cutting of dental and other hard tissue and non-cellular material." (Id. col.1:6-8).

1. The Prior Art

The '856 patent discloses prior art related to the use of lasers to perform dental surgery. Although using lasers to perform dental surgery was reported as early as 1964, lasers were not generally used clinically because heat from the laser caused damage to surrounding tissue. However, more recent prior art discloses methods for performing such surgery that reduces damage. For example, one method uses an yttrium-aluminum-garnet ("YAG") laser "to eradicate tooth decay without significantly heating the tooth and thus without damage to the nerve." (Id., col.1:21-26). Another method uses a YAG laser to remove lesions and stains from teeth. (Id., col 1:30-34).

The prior art discloses that an erbium YAG ("Er: YAG") laser can be used to perform laser surgery. The Er: YAG laser is strongly absorbed by water; therefore, when water is present in the target tissue it absorbs the radiant energy, heats to boiling, and produces water vapor. The water vapor builds up pressure at the surgical site, resulting in a microexplosion that ablates a small portion of the tissue. The radiation can be transmitted through optical fibers and its pulsed nature allows for cooling between pulses. (Id., col.1:40-59).

The prior art also discloses that water is used in both conventional and laser surgery as a coolant for the tooth. One method uses a Neodymium: YAG laser where water is sprayed on the tooth after a pulse, followed by the drying of the tooth prior to the next laser pulse. The prior art stresses the importance of keeping the tooth dry during the application of the laser, particularly for lasers (like Er: YAG lasers) that absorb water, in order to minimize heating of and damage to the tooth. (Id., col .2:14-26).

2. Description of the Invention

Unlike the prior art described above, the '856 patent teaches that the controlled addition of water prior to and during laser surgery actually increases the efficiency of the laser and reduces the residual damage. (Id., col.2:27-35). However, the amount of water or other absorbent substance used should be kept to the minimum amount that will keep the selected area moist. (Id., col .3:1-3). This is because too much

absorption of the energy by the selected liquid will render the laser ineffective. (Id., col.4:22-28). The invention requires both a source of laser irradiation and a source of liquid. (Id., col.4:63-66).

The method is preferably used on materials that have a fibrous or granular structure with pores, interstices, micro-cracks, channels or other types of small openings that allows the absorbent substance to infiltrate the material. (Id., col.3:49-54). However, the invention also covers use where the material has sites where the absorbing liquid may be chemically held by being combined with chemical components of the material and/or by being present in the form of water of crystallization. (Id., col.3:54-58). The absorbent substance is applied to the surface of the material immediately before or during laser irradiation. (Id., col.3:66-68). The absorbent substance is preferably applied as a mist, although the invention also covers application via a directed jet with the excess being driven off by a puff of moistened air, or by any other method that keeps the surface pores hydrated, but does not leave any standing water on the surface of the material. (Id., col.4:16-42). It is important that the absorbent substance does not form a barrier to penetration of the laser into the material surface. (Id., col.4:8-12).

The preferred embodiment of the invention is an Er: YAG laser because it emits a wavelength that is at or near the absorption peak for water (as well as ethyl alcohol and various glycols). (Id., col.3:27-32). The invention also covers the use of other lasers provided that the liquid substance used absorbs at the wavelength of the particular laser. (Id., col.3:32-34). The laser beam may be transmitted from a laser generator known in the art and may be focused by any means known in the art. (Id., col. 4:41-45). In addition, the power level and duration of exposure to the radiation may be adjusted by means known in the art. (Id., col.4:50-54).

B. U.S. PATENT NO. 5,304,167 (" ***THE %*** 2C167 PATENT ") FN3

The '167 patent protects a "medical system for transmitting and delivering to a tissue site multiwavelength therapeutic radiant energy along a common optical pathway." (Dovel Decl., Exh. B at [57]).

1. The Prior Art

Different wavelengths of electromagnetic energy offer different advantages in their application to specific medical procedures. Under prior art laser systems, if the surgical procedure required the use of different wavelengths of amplified light to accomplish different objectives, the physician would need to deliver the laser energy to the worksite via different pathways. For example, if the surgery required both precise cutting of tissue and coagulation, as with a tonsillectomy, the physician would use independent laser sources and deliver the energy along two or more optical paths. (Id., col.1:22-38).

2. Description of the Invention

Unlike the prior art described above, the '167 patent is directed toward a medical system that transmits therapeutic radiant energy from multiple sources as well as means defining a common optical path for delivering the energy to the tissue site. (Id., col.1:54-58). The optical path may be a catheter, one or more optical fibers, a hollow waveguide, an articulated arm, or a combination of optical fibers and a hollow waveguide or an articulated arm. (Id., col.1:58-63). Also, the articulated arm might include a hollow waveguide, reflective optics or transmission optics. (Id., col.1:63-65).

The therapeutic energy sources are lasers with varying wavelengths, depending on the desired application (i.e.cutting, ablating, coagulating, anastomosing). (Id., col.1:66-68). The laser energy may be delivered to

the tissue site separately, simultaneously or alternatively. (Id., col.1:68-2:2). A visible aiming beam may also be delivered along the same optical path to direct the energy to the desired tissue site. (Id., col.2:2-4).

In a preferred form, the system includes a hand-held flexible catheter and, near the second end of the catheter, a means for focusing the energy delivered to the second end. (Id., col.2:53-57). Focusing is achieved via a low optical loss high heat capacity contact tip, piano convex lens, or spherical lens. (Id., col.2:57-63).

C. U.S. PATENT NO. 5 ***.422.899*** **(" *THE %*** 2C899 PATENT **")** FN4

The '899 patent describes an "optically pumped mid-infrared solid-state laser with high pulse repetition rate" for use in laser surgery. (Dovel Decl., Exh. C at [57]). The laser provides an increased rate of tissue cutting without necessitating an increase in the pulse energy. (*Id.*).

1. The Prior Art

Current medical practice uses laser energy to perform a variety of surgical operations including cutting, ablating and cauterizing tissue, as well as coagulating blood. (*Id.,* col.1:12-15). Yttrium aluminum garnet ("YAG") is a host crystal whose dopant-derived lasers emit primarily in the infrared region and are widely used for surgical applications. (*Id.,* col.1:16-18). When used for tissue surgery, the lasers typically operate in a pulsed mode and the rate of cutting is commonly controlled by adjusting the optical energy of the pulses. (*Id.,* col.1:21-24).

However, a possible side-effect of increasing the pulse energy is micro-fracturing of the hard tissue and excessive heating of healthy soft tissue. (*Id.,* col.1:25-28). Another problem with pulsing the laser at higher repetition rates is that the lasing rod may overheat, resulting in instability and possibly decreasing cutting efficiency. (*Id.,* col.1:28-31).

2. Description of the Invention

Unlike the prior art described above, the '899 patent is directed toward a laser system that increases cutting efficacy without the detrimental effects associated with high pulse energies. (*Id.,* col.1:32-34). Rather than adjusting the energy, the patent teaches that a circuit should be used to energize a pump source to produce pulsed optical pump energy at a pulse repetition rate greater than 10 pulses per second, preferably greater than 20 pulses per second. (*Id.,* col.1:37-46). The laser light has a wavelength between 1.7 and 4.0 (mu)m and the pump energy has a rise and fall time that is sufficiently short to avoid thermal lensing induced instability of the laser pulses. (*Id.,* col.1:46-51).

A preferred embodiment of the invention includes a solid-state mid-infrared laser (such as an Er: YAG operating at over 10 pulses per second), a xenon flashlamp as the pump source, and a reflective ellipsoidal pump cavity (as opposed to an optically diffusive pump cavity). (*Id.,* col.1:52-59, 2:15-23). The pump circuit may be an LC-type pulse-forming network, preferably using a simmer supply. (*Id.,* col.1:59-66).

D. U.S. PATENT NO. 6 ***.122.300*** **(" *THE %*** 2C300 PATENT **")** FN5

The '300 patent describes an "optically pumped mid-infrared solid-state laser with high pulse repetition rate" for use in laser surgery. (Dovel Decl., Exh. D at [57]). The laser provides an increased rate of tissue cutting without necessitating an increase in the pulse energy. (*Id.*). The primary difference between the '300

patent and the '899 patent is that the ' 300 patent protects a laser system wherein the laser material is doped with Erbium. (Diodem's Opening Brief at 24).

III.

ANALYSIS

A. THE LEGAL STANDARD FOR CLAIM CONSTRUCTION

To assess a claim of patent infringement the Court must first determine the proper construction of the asserted claims and then compare the properly construed claim to the allegedly infringing method or device. *See* Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1581-82 (Fed.Cir.1996). In Markman v. Westview Instruments, Inc., 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996), the Supreme Court held that claim construction is a question of law that "is exclusively within the province of the court." Id. at 372. After the decision in *Markman,* courts commonly hold "a claim interpretation hearing, or *Markman* hearing, to facilitate the claim interpretation process." McNulty v. Taser Int'l Inc., 217 F.Supp.2d 1058, 1061 (C.D.Cal.2002). Accordingly, the parties have submitted claim construction charts and *Markman* briefs in support of their interpretation of the disputed claim language.

"It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, *i.e.,* the patent itself, including the claims, the specification and, if in evidence, the prosecution history." Vitronics, 90 F.3d at 1582 (citing Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed.Cir.1995)). The intrinsic evidence is "the most significant source of the legally operative meaning of disputed claim language." *Id.*

Within the category of "intrinsic evidence," the claim construction analysis begins by looking to the words of the claims themselves to determine the scope of the invention. *Id.* Where the claim language is clear on its face, the Court's "consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified." Interactive Gift Exp., Inc. v. CompuServe Inc., 256 F.3d 1323, 1331 (Fed.Cir.2001). Because it is axiomatic that a patentee may be his own lexicographer, the Court must review the specification to determine if the patentee "used any terms in a manner inconsistent with their ordinary meaning." Vitronics, 90 F.3d at 1582. In addition, "[c]laims may not be construed one way in order to obtain their allowance and in a different way against accused infringers." Southwall Techs., Inc. v. Cardinal IG Co., 54 F.3d 1570, 1576 (Fed.Cir.1995). Thus, if the prosecution history is in evidence, it should be reviewed to determine if the patentee relinquished a potential claim construction to either overcome or distinguish a prior art reference. *See* Interactive Gift, 256 F.3d at 1331.

The words used in the claim language "bear a 'heavy presumption' that they mean what they say and have the ordinary meaning that would be attributed to those words by persons skilled in the relevant art." Texas Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1202 (Fed.Cir.2002). The Court may refer to extrinsic evidence, such as dictionaries, treatises, and even expert testimony to "inform the court's task of ascertaining the meaning of the claim terms to one of ordinary skill in the art at the time of invention." Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings, 370 F.3d 1354, 2004 WL 1243734, (Fed.Cir.2004). In fact, "it is entirely appropriate, perhaps even preferable, for a court to consult trustworthy extrinsic evidence to ensure that the claim construction it is tending to from the patent file is not inconsistent with clearly expressed, plainly apposite, and widely held understandings in the pertinent technical field." Pitney Bowes, Inc. v. Hewlett-

Packard Co., 182 F.3d 1298, 1309 (Fed.Cir.1999). While using extrinsic evidence as a reference is permissible, it is improper to rely upon a dictionary or expert definition to "contradict any definition found in or ascertained by a reading of the patent documents." Vitronics, 90 F.3d at 1584 n. 6; Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1332 (Fed.Cir.2003).

After fully analyzing the intrinsic evidence, if the Court finds that the public record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper." Vitronics, 90 F.3d at 1583. Only when ambiguities exist may the Court turn to extrinsic evidence to actually construe the claim language. Id. at 1585. Furthermore, even in the rare instances where extrinsic evidence is necessary for claim construction, the Court should turn first to treatises or prior art references because expert opinion testimony should only be relied upon as a last resort. *Id*.

B. STIPULATED CLAIM TERMS

The Court has reviewed the stipulated definitions provided in the parties' amended joint statement of *Markman* issues. None of the definitions appear to be inappropriate, thus the Court adopts the following stipulated constructions:

Claim Language	**Asserted Claim Containing Language**	**Jointly Proposed Construction**
"chemically held in the material at the surface"	'856 patent claims 1	"combined with chemical components of the material, including as in a loose chemical combination, and/or by being present in the form of water of crystallization"
"applied as a mist"	'856 patent claims 3 & 7	"applied as fine droplets of liquid, including from a spray"
"optically transparent member"	'167 patent claims 1, 6, 8	"a component through which light can be passed or that is permeable to light"
"pump light"	'899 patent claims 1, 6 '300 patent claims 1, 6, 14, 17	"light energy that is used to excite, or transfer energy to the lasing medium during the process of optical pumping"
"resonant cavity"	'899 patent claims 1, 8 '300 patent claims 1, 8, 17	"a volume that has an optical axis defined by highly reflective surfaces that allows the resonance of light along the axis between the reflective surfaces"
"fluidic coolant"	'899 patent claim 9 '300 patent claim 9	"a flowing substance used to cool"
"controller"	'300 patent claim 14	"a device for regulating or adjusting a circuit"
"rise and fall times"	'899 patent claim 1 '300 patent claims 1 & 17	"the time during which the instantaneous pump power is between 10% and 90% of the peak instantaneous power for the leading and training edge of the pulse, respectively"

"pores"	'856 patent claims 1	"openings (pores, interstices, micro-cracks, channels or other types of generally very small openings between the hard components of the material) in the materials and the mean (including sites where the absorbing liquid may be chemically held) of the absorbing substance being chemically held"
"surface pores"	'856 patent claims 1	"pores at or near the surface of a material"

C. CONSTRUCTION OF THE DISPUTED CLAIM TERMS

1. The '856 Patent

The '856 patent consists of eight claims. Plaintiff asserts that Defendant Biolase is infringing claims 1, 7, and 8. Plaintiff asserts that Hoya and Lumenis are infringing all eight claims. The proper construction of the emphasized language below is disputed by at least one Defendant.

1. A method of ablating a selected area of a material with a laser, said material having a surface and surface pores in the selected area, said method comprising:

(a) adding a selected liquid to the selected area in a manner and amount so that the selected liquid enters the surface pores or is chemically held in the material at the surface in the selected area but ***does not remain pooled on the material surface;***

(b) irradiating the selected area while the selected liquid is ***present in the pores*** using pulses of a laser ***having radiation which is absorbed by the selected liquid;*** and

(c) repeating steps (a) and (b) until the ablation is terminated with step

(a) being performed immediately prior to or during each laser pulse.

3. A method of ablating a selected area according to claim 2, wherein the water is applied as a mist.

4. A method of ablating a selected area according to claim 2, wherein the water is ***applied as a directed jet of water*** and any ***pooled water*** in the selected area is driven off by ***blowing moistened air*** at the selected area.

6. A method of ablating a selected area of a material with a laser, said method comprising:

(a) adding a selected liquid to the selected area in a manner and amount so that the selected liquid is ***spread in a thin layer on the surface*** in the selected area, but *does not remain pooled on the surface:* and

(b) irradiating the selected area while the selected liquid is present on the surface using pulses of a laser *having radiation which is absorbed by the selected liquid,* wherein the selected liquid is water and the laser is an erbium: YAG laser.

7. A method of ablating a selected area of a material with a laser, said method comprising:

(a) adding a selected liquid to the selected area in a manner and amount so that the selected liquid is *spread*

in a thin layer on the surface in the selected area but *does not remain pooled on the surface:* and

(b) irradiating the selected area while the selected liquid is present on the surface using pulses of a laser *having radiation which is absorbed bv the selected liquid,* wherein the liquid is water which is applied as a mist.

8. A method of ablating a selected area of a material with a laser, said method comprising:

(a) adding a selected liquid to the selected area in a manner and amount so that the selected liquid is *spread in a thin laver on the surface* in the selected area but *does not remain pooled on the surface:* and

(b) irradiating the selected area while the selected liquid is present on the surface using pulses of a laser *having radiation which is absorbed bv the selected liquid,* wherein the liquid is water which is *applied as a directed jet* and any *pooled water* in the selected area is driven off by *blowing moistened air* at the selected area.

a. " does not remain pooled on the material surface " and " pooled water "

Diodem	Biolase & Lumenis	Hoya
"does not form a puddle or accumulation of standing liquid on the surface of the cutting site"	"an amount of the selected liquid where the laser radiation cannot penetrate to act effectively on the material surface"	indefinite or "without leaving any standing liquid" or "no more than a thin film of liquid"

The parties agree that the plain and ordinary meaning of the term "pooled" is to form "an accumulation of standing liquid; a puddle ." (Dovel Decl., Exh. E at 1364). Diodem contends that because this term is not otherwise defined in the specification and the term does not carry any specialized technical meaning to one of ordinary skill in the art, the Court should adopt the plain and ordinary meaning. (Diodem's Opp. at 4).

Lumenis and Biolase both contend that adoption of the dictionary definition of "pooled" is improper because Diodem acted as its own lexicographer and defined the term "pooled" to have a meaning different than its plain and ordinary meaning. For support, Defendants cite to the '856 specification, which provides that:

It is important that water not be pooled on the surface of the selected site because laser radiation is absorbed and does not penetrate such a pool, cannot act effectively on the substance to be cut, and results in undesirable heating.

(Dovel Decl., Exh. A col. 4:22-26).

The above-cited language from the specification does not purport to give a unique definition to the term "pooled." Rather, the specification provides an explanation as to why a pool must be avoided. In fact, the specification supports the common definition of "pooled" by stating that the invention covers various methods of hydrating the pores, including application of liquid via a mist, a directed jet of water, or any other method "which will allow the surface pores to be hydrated ... without leaving any ***standing water*** on the surface." (Id. col.4:28-42) (emphasis added). Further, the patentee notes that "[i]t is particularly important to keep the tooth moist with the minimum amount of added water or other absorbent substance." (Id. col.3:1-3).

While it is true that the size of a given "pool" may vary, there is no type of pool that does not constitute standing liquid, which the patent clearly states must be avoided. On the other hand, the definition of "pooled" proposed by Biolase and Lumenis allows for varying amounts of standing liquid depending upon certain variables, including the type of liquid used and the amount of laser energy applied. (Biolase Suppl. Brief at 2-3). However, the patent does not teach such variations; rather, it states that all standing liquid must be avoided.'

Lumenis argues that its proposed definition of the claim avoids indefiniteness. (Lumenis Opp. at 6). According to Lumenis, under Diodem's definition "one of ordinary skill in the art would not be able to determine how much liquid must be added in order to infringe the claims." (Id.). In fact, the opposite appears to be the case. With Diodem's definition, one of ordinary skill reading the patent is advised that the invention covers any method of combining a source of liquid and a laser, provided that the method does not result in any standing liquid on the surface. (Dovel Decl., Exh. A col. 4:28-42). But under the definition of "pooling" proffered by Defendants, the meaning of "pooling" varies. Thus, someone trying to apply the method of the patent would have to engage in trial and error to determine, for a given combination of liquid and laser energy, what amount, if any, of standing liquid does not lead to (1) inability to penetrate, (2) inability to effectively ablate, and/or (3) undesirable heating. However, under Diodem's definition the answer is simple because the user is to avoid any amount of standing water.

The first canon of claim construction is that "[i]f there is a discernable plain and ordinary meaning of the claim language, then this meaning usually defines the scope of the claims unless the patentee has explicitly disclaimed or clearly disavowed this meaning in the specification or prosecution history." Housey Pharms., Inc. v. Astrazeneca UK Ltd., 366 F.3d 1348, 1352 (Fed.Cir.2004) (citing Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed.Cir.2004)). Defendants have not established that departure from the plain and ordinary meaning of the word "pooled" is required in this case. The declaration of Biolase's expert does not establish that the word "pooled" has a special, technical meaning to one of ordinary skill in the art. Rather, the declaration merely supports that if someone uses a laser in combination with standing liquid-against the teaching of the patent-then the amount of standing liquid that will not lead to undesirable results will vary. (Biolase Suppl. Brief, Bridges Decl. para. 30).

For the reasons set forth above, the Court construes the phrase "does not remain pooled on the material surface" to mean "does not form a puddle or accumulation of standing liquid on the surface of the cutting site" and the phrase "pooled water" to mean "a puddle or accumulation of standing liquid."

b. " present in the pores "

Diodem	Biolase	Lumenis & Hoya
"enters the surface pores and/or is chemically held in the material at the surface of the selected cutting site"	"sitting in an interstice or held in a site chemically"	"infiltrated into the pores of the selected cutting site"

The parties agree that the patentee was his own lexicographer and defined "pores" to be either very small openings between the hard components of the materials or the mean of the absorbing substance being chemically held at a site. (Amended Joint Statement at 2-3). The specification supports this definition. (Dovel Decl., Exh. A col. 3:51-61). The parties disagree, however, as to what it means for liquid to be "present in the pores." The disagreement is one of form over substance.

Diodem disagrees with Lumenis and Hoya's definition because it only encompasses one of the two meanings of the definition of pores. However, because the parties have agreed upon the proper construction of the term "pores," Lumenis and Hoya's definition, which uses the term pores, is necessarily the equivalent of saying "infiltrated into the very small openings between the hard components of the materials or being chemically held at the site."

Diodem's definition improperly includes the terms "enters" and "surface" and ignores the term "present." In fact, the definition is not a definition at all but is the language of the preceding step in the method where the invention teaches that you must add liquid so that it "enters the surface pores or is chemically held at the surface." (Dovel Decl., Exh. A col. 6:40-43). After that step has been completed, the laser operates " ***while*** the selected liquid is ***present*** in the pores." (*Id*. col.6:45-46) (emphasis added). Clearly, it is not sufficient for the liquid to merely enter the surface pores or be chemically held at the surface at some prior point in time. Rather, the liquid must have infiltrated the pores so that when the laser is applied the liquid is still in the small openings or is still being held chemically. (*Id*. col. 3:6-11; col. 4:10-12). Such a conclusion follows from the plain and ordinary meaning of "present" in this context, which is "existing or occurring in a place, thing, combination, or the like: *Carbon is present in many minerals*." RANDOM HOUSE WEBSTER'S COLLEGE DICTIONARY (2d ed.1997) at 1029.

Although further construction would appear to be unnecessary given the agreed upon definition of "pores," for the sake of clarity, the Court construes "while liquid is present in the pores" to mean "while liquid is existing in the very small openings between the hard components of the material or while the liquid is currently being chemically held at a site."

c. " having radiation which is absorbed by the selected liquid "

Diodem	all Defendants
"emitting radiation within the range of wavelengths for which the absorption coefficient is 50% or more of the peak absorption coefficient for the selected liquid"	"the radiation is at least partially taken up by the selected liquid"

Defendants all argue that "absorbed" should be given its plain and ordinary meaning of "the retention of one medium (or a part of it) by another medium, through which the first one attempts to pass." (Lumenis Opp. at 8, quoting THE ILLUSTRATED DICTIONARY OF ELECTRONICS (7th ed.1997) at 4). Defendants argue that the plain claim language controls because it is clear and the terms are not otherwise defined in the specification.

Diodem's proposed construction clearly goes beyond the language of the claim itself, which merely states that the radiation is "absorbed" by the liquid, but does not specify how much of the radiation is absorbed. Diodem contends that, when read in light of the specification, "absorbed" actually means "highly absorbed," (Diodem's Suppl. Brief at 5), which in turn is "typically defined" as having a wavelength at which the absorption coefficient is 50% or more of the peak absorption coefficient of the liquid. (Diodem Opening Brief at 4-5 & May 9th Stafsudd Decl. para. 8). Diodem contends that Defendants' definition would render the claim language meaningless because all wavelengths of radiation will be "at least partially" absorbed to some degree. (Diodem's Suppl. Brief at 6 & May 24th Stafsudd Decl. para. 7).

Diodem also relies on the specification, wherein the various preferred embodiments point to more specific

combinations of liquid and lasers. For example, the patentee states that "[p]referably, the laser used emits **a** wavelength which is ***substantially absorbed*** by water." (Dovel Decl., Exh. A col. 3:26-27) (emphasis added). The specification goes on to give an example, stating that "[a] preferred laser for use in the invention is an Er: YAG laser because it emits in or near the 3 urn region ***absorption peak*** for water." (*Id*. col.3:27-30) (emphasis added). In fact, this particular preferred embodiment is specifically claimed in claim 2. (*Id*., col.6:52-54). The specification goes on to provide that:

Other liquids which can be used with an Er:YAG laser include ethyl alcohol and various glycols. Thus, as used herein the terms "water" and "moisture" and related terms include any substance which absorbs at the wavelength of the particular laser. Radiation absorbent substances to use with an Er:YAG laser, preferably have an OH group with ***high absorption*** in the 3 urn region of the spectrum.

(*Id*. col.3:30-48) (emphasis added). Finally, the specification provides that "[t]he location and amount of liquid in the pores of the material must also give the material a ***high absorption coefficient*** at each laser exposure." *Id*. col. 4:12-15 (emphasis added).

Lumenis argues that Diodem is impermissibly attempting to read limitations from the specification into the claim language. In addition, Lumenis contends that Diodem impermissibly relies upon extrinsic evidence in the form of expert testimony to adopt a specific percentage that appears nowhere in the specification. (Lumenis Opp. at 9).

Biolase begins by arguing that the patentee's use of modifiers such as "high" or "substantially" or "peak," in the preferred embodiments shows that the patentee clearly understood that a distinction exists between the various levels of absorption. However, in the claim language, the patentee explicitly chose to use just the general term, "absorbed" without any qualifier as to the degree of absorption. Next, Biolase presents its own expert testimony to the effect that Diodem's expert has dramatically oversimplified the situation and that Dr. Stafsudd's definition fails to account for Beer's Law. (Biolase Suppl. Brief, Bridges Decl. para.para. 11-26). Dr. Bridges states that the same substance combined with the same laser will result in differing degrees of absorption depending upon the thickness (path length) of the substance through which the radiation passes (*id*. para.para. 11-13) as well as how the substance is affected by the radiation that passes through it (*id*. para.para. 21-26). Biolase's position is that Diodem's definition only accounts for wavelength, which is not the only factor in determining! absorption and thus is insufficient to define the term "absorbed."

In addition, Dr. Bridges states that, under Diodem's definition, the preferred embodiment of an Er:YAG laser combined with water would not fall within the invention. Stafsudd states that the peak absorption coefficient for water is 13,000 cm^{-1}, (May 24th Stafsudd Decl. para. 8), however, Dr. Bridges presents more recently dated evidence that the actual highest peak is nearly 1,000,000 cm^{-1}111111, (Biolase Suppl. Brief, Bridges Decl. para. 15). Accordingly, 50% of this peak is 500,000 cm^{-1}, but the coefficient corresponding to an Er:YAG laser is only 12,000 cm^{-1}. (*Id*. para. 16). Biolase also argues that Diodem's definition does not take into account the fact that there are several additional peaks recognized by those skilled in the art in the absorption curve of water. (*Id*. para. 17). Thus, the proposed definition is also insufficient because it erroneously presumes only a single "peak."

Biolase's final contention is that Diodem did not propose its 50% absorption construction until after Biolase provided a prior art reference that it alleges completely anticipates claims 1, 7, and 8 of the '856 patent Of course, a patentee cannot avoid invalidity by redefining the claimed invention. *See* In re Paulsen, 30 F.3d

1475, 1480 (Fed.Cir.1994). But because all radiation is "at least partially absorbed" by passing through another medium, the plain meaning of absorption, which covers ***any*** amount of absorption no matter how small, is meaningless. Therefore, the meaning of the term "absorbed," as it is used in the claim, is neither clear nor unambiguous.

Because the Court has determined that the claim language is ambiguous, the next step is to review the patent specification and prosecution history. None of the parties cite to the prosecution history, although Diodem, as discussed above, relies heavily on the patent specification to support its proposed definition. There is no question that the preferred embodiments require "substantial" or "high" absorption. However, use "of the term 'preferably' makes clear that the language describes a preferred embodiment, not the invention as a whole." Cordis Corp. v. Medtronic Ave. Inc., 339 F.3d 1352, 1357 (Fed.Cir.2003). Moreover, "claims are not to be interpreted by adding limitations appearing only in the specification." Electro Med. Sys., S.A. v.Cooper Life Scis., 34 F.3d 1048, 1054 (Fed.Cir.1994).

The patent specification does include a definition of what the inventor meant by the term "absorbed." Specifically, the specification envisions the use of "liquids or radiation absorbent substances having other ***absorption peaks*** which may be used in the method of the invention with other lasers emitting in or near the ***corresponding absorption region*** for these substances." (Dovel Decl., Exh. A col. 3:43-48). Therefore, the Court concludes that while the term "absorbed" should not be given its plain and ordinary meaning, the construction should be limited to the factors discussed in the patent-wavelength and the absorption region of the liquid. As a final point, the Court declines to take the additional step requested by Diodem and further define "in or near" to be 50% because such a percentage is not at all supported by the patent. *See* Cordis, 339 F.3d at 1362 ("Because there is no clear and unmistakable disclaimer of any variation in thickness of 0.001 inch or more, the district court erred in imposing that numerical restriction on the 'substantially uniform thickness' limitation.").

For the reasons set forth above, the Court construes the phrase "having radiation which is absorbed by the selected liquid" to mean "having radiation emitting in an absorption region of the liquid substance." FN6

d. " applied as a directed jet "

Diodem	Biolase & Hoya	Lumenis
"applied by aiming a high velocity fluid stream forced under pressure out of a small diameter opening or nozzle"	"a stream of water exiting from a nozzle in a particular direction"	"to lay or put on as a forceful stream of fluid discharged from a narrow opening or nozzle in a particular direction"

The parties agree that the Court should adopt the plain and ordinary meaning of the words "directed" and "jet" in order to construct the phrase "directed jet," but they disagree about the exact dictionary definitions that the Court should adopt. The specification merely used the term "directed jet" without any additional explication, so the Court is left with choosing among the substantially similar dictionary definitions proffered by the parties. The Court finds it reasonable to adopt Diodem's construction. It appears that the only reason Diodem's current proposed construction is slightly different from the original construction is that Diodem chose to rely on a single dictionary (American Heritage) rather than the multiple dictionaries it used in its initial claim construction chart. Also, Diodem is the only party that attached a copy of the relevant dictionary pages that support its proposed definition and Diodem's construction exactly tracks its dictionary definitions, while Biolase combines more than one definition to reach its construction. (Diodem's

Opening Brief, Dovel Decl., Exh. E at 512 ("direct") and 939 ("jet")).

For the reasons set forth above, the Court construes the phrase "applied as a directed jet" to mean "applied by aiming a high velocity fluid stream forced under pressure out of a small diameter opening or nozzle."

e. " blowing moistened air "

Diodem & Lumenis	Biolase & Hoya
"combination of air and water vapor"	"a directed jet of water and a separate source of air"

All the parties agree that moistened air is a combination of air and water vapor. However, Biolase and Hoya argue that in the context of the patent, the moist air must come from a separate source than the directed jet of water. Neither Biolase nor Hoya provide any support, either in the claim language or the specification, for their construction. Biolase argues that two sources are required "because the 'directed jet' is how the liquid/water gets put 'on the surface' and it is the 'moistened air' that is 'blowing ... at the selected area' that is used to remove the liquid/water, which is the plain and ordinary meaning of 'driven off.' " (Biolase Opening Brief at 9).

The Court finds that neither the claim language nor the patent specification includes a limitation or even a suggestion that the moistened air must come from a different source than the directed jet of water. Biolase failed to adequately support why the Court should ignore the clear and unambiguous claim language in favor of adding in a limitation that can be found nowhere in the specification. Under the Court's reading of the claim language, if someone were to use a single nozzle to emit a directed jet of water, immediately followed by a puff of moistened air, perhaps by using a switch or a button, the clear claim language would obviously cover such an embodiment of the invention.

For the reasons set forth above, the Court construes the phrase "blowing moistened air" to mean "blowing a combination of air and water vapor."

f. " spread in a thin layer on the surface in the selected area "

Diodem	Biolase	Lumenis	Hoya
"adding a selected liquid to the cutting site in a manner and amount such that the liquid does not prevent the laser radiation from acting effectively on the cutting surface"	"a layer that does not prevent the laser radiation from penetrating the layers and acting effectively on the substance to be cut"	indefinite	indefinite or "narrow layer"

Lumenis argues that "thin layer" is indefinite and cannot be defined. However, this argument is based in large part on the fact that Lumenis's proposed definition for "pooled water," (which the Court did not adopt, *supra*) is virtually identical to Diodem's definition of "thin layer." By referencing to its definition of pooled water, Lumenis argues that Diodem's definition of thin layer is "mere surplusage." (Lumenis Opp. at 7). Diodem and Biolase's current proposed construction of "thin layer" are nearly identical, in fact, Diodem changed its proposed construction in light of Biolase's. (Diodem's Suppl. Brief at 7-8).

Unlike the term "pooled water," which is amenable to a plain and ordinary construction, "thin layer" is inherently a relative term. All the parties agree that a relative term like "thin" must be defined with reference

to the technology and the context of the patent. (Biolase Opening Brief at 6; Suppl. Brief at 12 and Diodem Suppl. Brief at 8; Opp. at 14). Biolase and Diodem agree that, in light of the technology and patent specification, a thin layer is one that does not prevent the laser from acting effectively. Lumenis disagrees, stating that the specification does not enlighten one of ordinary skill in the art when something is "thin" as opposed to "thick." (Lumenis Opp. at 7). Thus, Lumenis contends that "thin layer" is undefinable and, therefore, indefinite.

"The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification." Miles Lab. v. Shandon, Inc., 997 F.2d 870, 875 (Fed.Cir.1993). The Federal Circuit has made clear that a claim is not rendered indefinite "merely because it poses a difficult issue of claim construction." Exxon Research & Eng'q Co. v.United States, 265 F.3d 1371, 1375 (Fed.Cir.2001). Rather, the court in *Exxon* recognized that claims have been held indefinite only where the claim is "insolubly ambiguous, and no narrowing construction can properly be adopted." *Id*.

The patent teaches two primary methods of hydrating the area to be cut. Claims 1-5 envision the water being applied so that it infiltrates **into** the pores and does not leave any standing water on the surface. Claims 6-8 do not require infiltration, but rather provide for the liquid being "spread in a thin layer on the surface in the selected area but does not remain pooled on the surface." (Dovel Decl. Exh. A col. 6:65-68). Thus, looking only to the plain language of the claims, a "thin layer" is somewhere in between no liquid on the surface at all and standing liquid.

The next question is whether the specification gives the reader enough information to reasonably determine what constitutes "thin." *See* Exxon, 265 F.3d at 1381 ("[T]he fact that 'some claim language may not be precise ... does not automatically render a claim invalid. When a word of degree is used the district court must determine whether the patent's specification provides some standard for measuring that degree.' ") (quoting Seattle Box Co. v. Indus. Crating & Packaging, Inc., 731 F.2d 818, 826 (Fed.Cir.1984). When dealing with relative terms, it is permissible to define the scope through reference to the result sought. *Id*. (finding that "substantial absence of slug flow" was not indefinite because the "patent specification teaches that slug flow should be avoided because it may interfere with reactor operations" and that the scope of the claim "therefore can be determined with reference to whether reactor efficiency is materially affected").

Here, the specification makes clear that the primary teaching of the invention is "the surprising discovery that controlled addition of water, rather than drying of the surface, prior to and/or during laser surgery, so that no more than a thin film of water is present during surgery, results in a significant increase in laser efficiency and less residual damage than with the prior laser surgery methods for hard materials." (Dovel Decl., Exh. A col. 2:28-35). Thus, combining the claim language with the teaching of the specification, a "thin layer" is a layer of liquid in such an amount that the efficacy of the laser is actually enhanced and certainly not diminished. In addition, the "thin layer" explicitly does not cover the presence of standing water on the surface because that leads to inability of the laser to penetrate, reduction in laser efficacy, and undesirable heating. (*Id*. col.4:22-26).

While it is true that this definition will require some degree of experimentation to determine the ideal amount of liquid in combination with a specific laser, this alone does not lead to the conclusion that the claim language is indefinite. *See Exxon,* 265 F.3d 1379 ("Provided that the claims are enabled, and no undue experimentation is required, the fact that some experimentation may be necessary to determine the scope of the claims does not render the claims indefinite."). Dr. Stafsudd states that "one skilled in the art could easily determine, through minimal experimentation, how thin the layer of liquid should be in order to achieve the

ablation enhancement described in the specification." (May 24th Stafsudd Decl. para. 4).

Thus, if the layer of liquid does not rise to the level of standing liquid and the efficacy of the laser is enhanced-or at least not diminished-by the liquid, the layer is a "thin layer." This conclusion comports with Diodem's definition. Because radiation that fails to "penetrate the layers" necessarily will not act "effectively on the surface," Biolase's definition is slightly redundant. Thus, the Court concludes that Diodem's proposed definition, which tracks the purpose of the invention, adequately states that a thin layer is one that does not prevent the laser from acting effectively.

For the reasons set forth above, the Court construes the phrase "spread in a thin layer on the surface in the selected area" to mean "adding a selected liquid to the cutting site in a manner and amount such that the liquid does not prevent the laser radiation from acting effectively on the cutting surface."

2. The '167 Patent

The '167 patent consists of fifteen claims. Plaintiff asserts that Defendant Biolase is infringing claims 1, 6, and 8. Plaintiff asserts that Hoya and Lumenis/OpusDent are infringing claims 6, 8, and 14. Biolase also seeks construction of unasserted claims 7, 9, and 10, which it contends are invalid. (Biolase Invalidity Chart at 3). The proper construction of the emphasized language below is disputed by at least one Defendant.

1. A surgical method, comprising:

generating a ***first beam of pulsed electromagnetic energy having a first wavelength*** of ***approximately three microns;***

generating a ***second beam of electromagnetic energy having a second wavelength*** in the visible portion of the optical spectrum;

coupling the electromagnetic energy of the first and second wavelengths to a ***fluoride optical fiber*** such that said first and second wavelengths are simultaneously transmitted through said fiber;

directing energy from a distal end of the *fluoride optical fiber* into an optically transparent member comprised of material different than said optical fiber;

using said optically transparent member to focus the first beam of energy; and

placing said optically transparent member into contact with tissue and using the energy at the first wavelength to perform surgery on the tissue.

6. A surgical method, comprising:

generating a *first beam of pulsed electromagnetic energy* having a first wavelength of *approximately three microns:*

generating a *second beam of electromagnetic energy* having a second wavelength in the visible portion of the optical spectrum;

coupling the electromagnetic energy of the first and second wavelengths to ***an optical fiber comprised of a compound that includes a metal*** such that said first and second wavelengths are simultaneously transmitted through said fiber;

directing energy from a distal end of the optical fiber into an optically transparent member comprised of material different than said optical fiber;

using said optically transparent member to focus the first beam of energy; and directing energy of said first wavelength from said optically transparent member against tissue to perform surgery on the tissue.

8. The method of claim 6, wherein the step of *using said optically transparent member to focus* comprises passing the first beam of energy through the optically transparent member and concentrating energy of said first wavelength at a ***location proximal to an energy exit surface*** of said transparent member.

14. The method of claim 6, wherein the first wavelength is ***about 2.9 microns.***

a. " first beam of pulsed electromagnetic energy having a first wavelength " and " second beam of electromagnetic energy having a second wavelength "

Diodem & Lumenis	Biolase	Hoya
"electromagnetic radiation or waves emitted in the form of a concentrated stream in regular beats or in a series of intermittent occurrences having a first wavelength" and "electromagnetic radiation or waves emitted in the form of a concentrated stream having a second wavelength"	the second beam must be "therapeutic"	"originating a concentrated, unidirectional flow of therapeutic electromagnetic waves having a single, specified wavelength"

Both Biolase and Hoya insist that both "beams" must be therapeutic (*i.e.* for the purpose of cutting, ablating, coagulating, or anastomosing). Hoya also argues that both "beams" must be construed as being single wavelength, *i.e.* ***laser,*** energy.

i. the " therapeutic " issue

The claim language clearly supports Diodem's construction that the second beam is not necessarily a therapeutic beam. In claim 1, the "second beam" has a wavelength in the visible portion of the spectrum. Although therapeutic energy can be in the visible spectrum, the preferred embodiment is that the therapeutic energy is infrared and the aiming beam, of course, is visible. (Id. col.5:37-42). In addition the language of claim 1 limits the use of the first beam "to perform surgery on the tissue." (*Id.* 14 col. 7:44-45). The purpose of the second beam is never so limited. More significantly, claims 2 and 11, which are both dependent claims, explicitly provide that the second beam is "an aiming beam produced by a continuous wave helium neon laser." (*Id.* col. 7:46-48; col. 8:45-48).

Moreover, beginning with claim 4, the patentee expressly claims a multiple therapeutic beam system wherein the first beam and the third beam have wavelengths described in the patent specification as having therapeutic uses, but the second beam continues to be limited to a wavelength in the visible spectrum. (*Id.* col.7:50-8:4). The remaining claims all describe the use of three beams, but the second beam is always limited to a beam in the visible spectrum and its use is never limited to being therapeutic. The final claim, 15, goes even further, limiting the use of the first beam ***and*** the third beam to the therapeutic uses of cutting

and coagulating, respectively, but again the second beam is not so limited. (*Id*. col.8:57-10:6). Under Biolase and Hoya's construction, which seeks to require the second beam to always be "therapeutic," dependent claims 2 and 11 would not even fall within the scope of the invention.

Because the claim language is clear and unambiguous on its face, the Court's "consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified." Interactive Gift Exp., Inc. v. CompuServe Inc., 256 F.3d 1323, 1331 (Fed.Cir.2001). Biolase is correct that the specification primarily describes the invention as involving multiple therapeutic lasers. For example, Figure 1 displays a picture of the invention with two therapeutic lasers and an n th therapeutic laser, but it also depicts an aiming beam. (Dovel Decl., Exh. B). Many times in the specification the patentee indicates that "the invention relates to the transmission of therapeutic radiant energy from two or more energy sources." (*Id*. col. 1:12-15; *see also id*. col. 1:45-47; col. 1:55-56; col. 2:31-33; col. 2:40-41; col. 3:43-45; col. 5:34-35; col. 5:46-50). However, the specification also makes multiple references to the use of an "aiming beam." (*Id*. Fig 1.; col. 2:2-4; col. 3:43-44; col. 5:39-42; col. 6:53-57; col. 7:10-11). Because beams one and three are therapeutic beams, if the second beam is not an "aiming beam" then the patent would not claim an aiming beam at all.

While it is clear that the patentee envisions the primary utility of his invention as being the simultaneous transmission of multiple wavelengths of therapeutic energy, the Court does not find that the specification clearly disavows use of the invention to simultaneously transmit one wavelength for performing surgery and another wavelength for aiming. Particularly considering that the specification often refers to the use of an aiming beam. Although the preferred embodiments use at least two therapeutic lasers (preferably one for cutting/ablating and one for coagulating/anastomosing) *and* a visible aiming beam, the claim language clearly covers an invention combining just one therapeutic laser and one aiming beam. It is improper to go beyond the plain claim language and read in limitations from the specification under these circumstances. *See* Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 908 (Fed.Cir.2004) (refusing to construe a claim as requiring a "pressure jacket" because even though "all the embodiments described in the common specification of the '669 and '261 patents include a pressure jacket, the written description does not contain a clear disavowal of embodiments lacking a pressure jacket).

This is not a case where, viewing the claim language in the abstract, it might be construed as covering a non-therapeutic second beam, but more strongly suggests a limitation of a therapeutic second beam. Rather, the opposite is true because Defendants' proposed construction would necessarily invalidate claims 2 and 11, which explicitly claim the second beam as an aiming beam, not a therapeutic beam. Although Defendants insist that the second beam must always be therapeutic, the express claim language never describes the second beam as being therapeutic, but does describe the first and third beam as therapeutic and the second beam as a visible aiming beam.

Both Defendants also point to statements made during the prosecution history where the patentee described the invention as covering multiple therapeutic lasers.FN7 However, none of the statements disavowed the use of one therapeutic beam combined with one aiming beam, which is the exact invention claimed by claim 2, or the use of a first therapeutic beam, a second aiming beam, and a third therapeutic beam, which is the exact invention claimed by claim 11.

Defendants primarily rely on statements relating to an earlier, related patent (the '494 patent) wherein the patentee expressly *claimed* the second beam as a therapeutic, coagulating beam; such a limitation is *not* included in the '167 patent. (Id. Exh. K at 80). In fact, the PTO continually rejected the initial versions of

the '494 patent even though the patentee had explicitly claimed the second beam as always being therapeutic. From reviewing the prosecution history of the '494 patent, the issue was not whether the second beam was therapeutic or aiming, but rather whether the entire concept of transmitting multiple lasers through a *single* optical fiber was obvious under various references. (Biolase Suppl. Hankin Decl. Exh. B at 14-16; Exh. D at 26; Exh. F at 38-39). In the comments to the final amendment of the '494 application, the patentee argued vigorously that the invention was not obvious under the prior art because those references taught "free space" transmission and not "optical fiber delivery." (Id. Exh. G. at 43). Biolase provides no citing reference to support its contention that the limitation of two therapeutic beams "was made as a basis for patentability to overcome a prior rejection by the patent examiner." (Biolase Suppl. Brief at 2). In any case, the prosecution history of a related patent, such as the '494 patent, is only relevant to the extent that the two patents contain the same limitation *and* the prosecution history at issue concerns that limitation. *See* Medtronic, Inc. v. Advanced Cardiovascular Sys., 248 F.3d 1303, 1315 (Fed.Cir.2001).

The only direct history of the serial number that led to issuance of the '167 patent reveals that as of July 1992, the patentee expressly limited the second beam to being a visible beam and did not include a limitation (as in the '494 patent) that the second beam be used for coagulating. (Id. Exh. H at 50). The patentee described the method as involving pulsed infrared and visible radiation. (Id. at 53). The patentee argued that the key distinguishing feature of the invention is the "concept of transmitting multiple wavelengths over a single fiber." (Id. at 54). Such a statement is not inconsistent with having one therapeutic wavelength and one visible aiming beam, or even ten therapeutic beams with the second beam being an aiming beam.

The examiner noted the change between the '494 and the '167 patent, commenting that the "basic method is disclosed by Stack et al except for the use of a visible aiming beam." (Id. Exh. I at 57). However, the examiner found the use of the aiming beam to be obvious under other references. (Id.) The examiner stated that three claims would be allowable if they were "rewritten in independent form including all the limitations of the base claim and any intervening claims." (Id.). Neither the base claim nor the intervening claims referred to by the examiner required the second beam to be therapeutic. Accordingly, in the last amendment that Defendants presented to the Court (February 1993) the patentee re-wrote those three claims, resulting in the current patent language. (Id. Exh. J. at 60, 63).

In short, the examiner's objections and the patentee's responses and amendments, all of which eventually lead to the issuance of the '167 patent did not necessarily disavow use of the second beam for aiming. Rather, the patentee primarily argued that the difference between his invention and the prior art was that his system allowed multiple wavelengths to travel down the same optical path to accomplish different purposes.

Biolase's argument is clearly an attempt to limit the claim language to the preferred embodiment. Given the clear and unambiguous claim language and the fact that the patentee never clearly disavowed the use of a single therapeutic beam combined with an aiming beam, reading in an extraneous limitation is not appropriate, especially considering that the result would be to read claims 2 and 11 out of the patent altogether. Accordingly, the "second beam" phraseology need not be limited to a therapeutic beam

ii. the " laser " issue

In addition, Hoya contends that the term "beam" as used throughout the patent must be limited to a beam of a single, specific wavelength. Diodem's position appears to be that "the term beam is not restricted to visible light or laser radiation" and that the electromagnetic energy can come from a variety of sources including

"lamps, light emitting diodes, lasers, etc." (May 9th Stafsudd Decl. para. 9). Diodem does not directly respond to Hoya's contention that the wavelength must be "a single, specific wavelength" or, in other words, that the beam must be a laser. Diodem's only comment on this point is that the specification uses the term beam "to refer to a visible aiming beam and a laser beam." (Id. at 8). Hoya responds that there is no support in the specification "that any generated beam, including the aiming beam, is anything other than a single wavelength laser energy source ." (Hoya Suppl. Brief at 4).

That the intended energy source is a laser is supported by all parts of the patent. The title is "multiwavelength medical ***laser*** method" and the abstract describes a " ***laser*** catheter suitable for engaging multiple sources of ***laser*** energy and transmitting multiwavelength therapeutic ***laser*** energy." (Diodem Opening Brief, Dovel Decl., Exh. B) (emphasis added). The specification similarly only refers to lasers and even states that the "therapeutic energy sources are lasers." (Id. col.1:66-68). However, nowhere does the specification state that the aiming beam is a laser, even though the specification often states that the therapeutic beam is a laser. (Id. Fig 1; col. 1:66-2:4; col. 3:43-45; col. 5:36-42; col. 6:53-55; col. 7:10-11).

Hoya's justification for interpreting "beam" to be a laser is based on the accompanying claim language "having a first wavelength ... a second wavelength ... a third wavelength." Hoya argues that this use is clearly singular and does not cover any given beam having multiple or varying wavelengths. The Court tentatively adopted Hoya's construction that the claim language and the specification both envision a beam with a single wavelength rather than a wavelength that varies. During oral argument, Diodem did not object to a construction limiting the beam phrases to having a single wavelength.

For the reasons set forth above, the Court construes the phrase "a first beam of pulsed electromagnetic energy having a first wavelength" to mean "electromagnetic radiation or waves emitted in the form of a concentrated stream in regular beats or in a series of intermittent occurrences having a first single wavelength." The Court construes the phrase "a second beam of electromagnetic energy having a second wavelength" to mean "electromagnetic radiation or waves having a second single wavelength."

b. " approximately three microns " and " about 2.9 microns "

Diodem	Biolase	Lumenis	Hoya
"between 2.5 and 3.5 microns" and "between 2.85 and 2.95 microns"	"between 2.89 microns and 3.11 microns" and "between 2.89 microns to 2.91 microns	"between 2.9 microns and 3.1 microns" and "between 2.85 microns and 2.95 microns"	" between 2.89 microns and 3.11 microns" and "between 2.85 microns and 2.95 microns"

Diodem asserts that under the rule of significant numbers, a quantity expressed as a whole integer (*i.e.* 3)-versus as a decimal (*i.e.* 3.0 or 3.00)-includes numbers 0.5 above and below the integer. Thus, "approximately 3 microns" means between 2.5 and 3.5 microns. Likewise, a quantity expressed as a two digit decimal (*i.e.* 2.9) includes numbers .05 above and below. Thus, "about 2.9 microns" means between 2.85 and 2.95 microns. (Diodem Opening Brief at 9-10; May 9th Stafsudd Decl. para. 10 & May 24th Stafsudd Decl. para. 10).

Biolase argues that Diodem's construction violates the doctrine of claim differentiation, which requires that "approximately 3" and "about 2.9" be "patently different from one another." (Biolase Opening Brief at 10). Biolase argues that because these two limitations must be different in scope and because "one cannot be more precise with a derivative number than with the foundational number ... there is no basis for dividing the

'three' into units less than or more than one tenth of one." (Id.).

The Court does not see a claim differentiation issue with Diodem's construction-clearly the range 2.5 to 3.5 is broader than and fully encompasses the range of 2.85 to 2.95. Moreover, unlike Diodem, Biolase provides no support for the allegedly "standard principle of mathematics" that requires approximately 3 to equal 2.89 to 3.11.(Id.). The remaining Defendants, also without support, propose a construction of 2.9 to 3.1.

Because the claim language does not provide a clear answer, the Court must review the remaining intrinsic evidence. Diodem argues that the specification supports its definition. One preferred embodiment is a range of wavelengths from about 2.7 to about 3.3 microns. (Dovel Decl., Exh. B col. 2:7-9). The full range of this preferred embodiment would not be covered by Defendants' construction. However, Diodem's argument is undermined by the fact that the specification also states that another preferred embodiment is about 5.5 microns to about 12.0 microns, which is not covered by any construction of the claim language. (Id. col.2:8-9). The specification also specifically calls out the use of a Carbon Dioxide laser with about a 10.6 micron wavelength or a Holmium laser with about a 2.1 micron wavelength, neither of which would be covered by the claim language. (Id. col. 2:13-14; 2:14-16).

Biolase argues that the prosecution history requires a narrower construction. As to the construction of the "3 microns" limitation, which appears almost identically in both the '494 and the '167 patent, the prosecution history of the '494 patent is relevant. *See* Elkay Mfg. Co. v. Ebco Mfg. Co., 192 F.3d 973, 980 (Fed.Cir.1999) ("When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation."). During oral argument, Diodem stated that "on the order" of and "approximately" have dissimilar definitions; therefore, the prosecution history of the '494 patent is not relevant. However, when pressed, Diodem's counsel could not offer a satisfactory definition of "on the order of," beyond his assertion that it refers to orders of magnitude. In any case, Diodem's argument that "on the order of 3 microns" and "approximately 3 microns" are not "the same limitation" is strained. Diodem does not argue that "approximately" has any specific meaning, rather, Diodem's claim construction argument is based wholly upon the patentee's use of "3 microns" rather than 3.0 or 3.00 microns and the significance of the use of a whole integer under the rule of significant figures-this portion of the limitation appears exactly in the '494 patent.

Although the parties all refer to the issue as being one of prosecution history ***estoppel,*** the issue must be evaluated under the related "doctrine of prosecution disclaimer." *See* Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1323 (2003); *see also* Alpex Computer Corp. v. Nintendo Co. Ltd., 102 F.3d 1214, 1220 (Fed.Cir.1996) ("Prosecution history is relevant not only for purposes of prosecution history estoppel but also for construing the meaning and scope of the claims."). Under the doctrine of prosecution disclaimer, the Court must review the prosecution history to determine "if the alleged disavowing actions or statements made during prosecution [are] both clear and unmistakable." Omega Eng'g, 334 F.3d at 1326.

During the prosecution of the related '494 patent, the patentee originally attempted to claim each of the wavelengths and wavelength ranges discussed in the specification. (Biolase Suppl. Brief, Hankin Decl. Exh. A at 6). The patent examiner rejected the claims as being obvious under Sugiyama, Stack, and Sinofsky. The examiner also stated that "[p]articular wavelengths and lasers would have been obvious to achieve desired effects in light of the teaching of Sinofsky." (Id. Exh. B at 15). It appears that the examiner's comment as to the wavelengths was not dispositive to the rejection, but was intended to inform the patentee that the invention was obvious and the claiming of very specific wavelengths did not save the language because the

wavelengths selected were also obvious.

In the next amendment, the patentee changed tactics and merely attempted to claim "about 2.7 microns to about 3.3 microns" (for cutting) and "about 0.3 to about 2.0 microns" (for coagulating). (Id. Exh. C at 17; Exh. E at 28). The patentee's primary arguments for issuance were that his invention was "the first to employ a multiple wavelength delivery system to deliver the precise energies at the required dosimetries." (Exh. C at 22; Exh. E at 35). The only reference to wavelengths was that the 2.7 to 3.3 micron range was not obvious under Sinofsky, which disclosed a 1.4 to 2.2 micron range. (Exh. C at 23). As to both sets of amendments, the examiner responded with the exact same rejection, stating that "the basic concept of applying multiple sources of laser radiation in a single system is disclosed by Sugiyama et al. the various sources and wavelength claimed by applicant to achieve the desired effects are well known in the art as disclosed by various references." (Id. Exh. D at 26; Exh. F at 38). In the end, the patentee's final amendment modified the language to make clear that the claimed invention described multiple wavelengths of laser energy being generated from multiple sources, but being delivered down the same optical fiber. (Id. Exh. G at 40-41). As for wavelengths, the patentee merely claimed "on the order of 3 microns" instead of 2.7 to 3.3 microns and "on the order of 1 micron" instead of 0.3 to 2.0 microns. (Exh. G at 40).

Biolase interprets all of the above as a clear disavowal of a wavelength range broader than 2.89 to 3.11. The Court initially agreed with Biolase's interpretation of the prosecution history. However, Biolase has not persuaded the Court that the examiner's issue with the wavelengths was one of breadth; rather, the examiner merely stated that the range of 2.7 to 3.3 was obvious. This statement does not imply that 2.5 to 3.5 is obvious or that 2.89 to 3.11 is not obvious. The patentee's only comment on the change was the statement that "to further distinguish the claimed invention from any perceived suggestions in the prior art, Applicant has amended Claim 67 to define the cutting wavelength as being on the order of 3 microns, and the coagulating wavelength as being on the order of 1 micron." (Id. at 48). The amended claim 67 indicates that "on the order of 3 microns" replaced the previous language "in the range of about 2.7 to 3.3 microns." (Id. at 40).

The Court concludes that the above prosecution history is not a clear and unmistakable disavowal of Diodem's proposed definition of "2.5 to 3.5 microns." The decision to replace 2.7 to 3.3 microns with "on the order of 3 microns" is ambiguous because it is not clear why the decision was made, *i.e.,* was it to narrow, as Defendants propose or to broaden as Diodem proposes? The prior prosecution history is similarly ambiguous because the examiner failed to clearly explain what his precise problem was with the previous wavelength language. Thus, the Court finds that the patentee did not clearly disavow the proposed range of 2.5 to 3.5 wavelengths.

In short, Defendants have failed to adequately support their contention that the plain and ordinary meaning of "approximately 3 microns" is "2.9 to 3.1 microns" or more narrowly, "2.89 to 3.11 microns" as Biolase proposes. In addition, Defendants have also failed to provide adequate support for their contention that the patentee clearly disavowed a construction of "approximately 3 microns" that would cover a range from 2.5 to 3.5 microns.

For the reasons set forth above, the Court construes the phrase "approximately 3 microns" to mean "2.5 to 3.5 microns" and the phrase "about 2.9: microns" to mean "2.85 to 2.95 microns."

c. " fluoride optical fiber "

Diodem	Biolase	Lumenis	Hoya
"a slender, threadlike object, containing more than trace amounts of fluoride, for transmitting electromagnetic radiation"	"a nonoxide optical fiber wherein a metal fluoride is the glass former and the fiber is primarily composed of fluoride compounds, such as a zirconium fluoride fiber"	"a solid (i.e. not hollow) core, optical fiber that uses a fluoride based fiber, such as zirconium fluoride fiber or a heavy metal fluoride"	"an optical fiber that primarily is based on fluoride compounds, such as a zirconium fluoride fiber or a heavy metal fluoride"

The first issue presented by this term is the amount of fluoride necessary for the claimed "fluoride optical fiber." The second issue, which is only argued by Lumenis, is whether the optical fiber must be a solid core fiber rather than a hollow waveguide.

i. the " optical fiber " issue

As an initial matter, the parties disagree as to whether "optical fiber" needs to be construed. Diodem proposes using the dictionary definition of "fiber," which is a "slender, threadlike object." (Diodem Opening Brief at 11). Diodem then states that in the art, an "optical" fiber is one for transmitting electromagnetic radiation. (Id.; May 9th Stafsudd Decl. para. 12). Lumenis contends that resort to a standard dictionary is inappropriate to define a technical term such as "optical fiber." Lumenis contends that an "optical fiber" is "a glass or plastic medium through which light is propagated." (Lumenis Opp. Brief at 10 (citing the Illustrated Dictionary of Electronics (7th ed.1997) at 489)). Diodem argues that this definition is too narrow because not all technical dictionaries require the medium to be glass or plastic and the specification specifically describes the use of materials that are not glass or plastic, such as sapphire or halide crystal. (Dovel Decl., Exh. B col. 2:24-26).

The Court agrees with Lumenis that it is inappropriate to break up a technical term with an identified meaning in the art such as "optical fiber" and define part of the term through reference to a standard dictionary. *See* Transclean Corp. v. Bridgewood Servs., 290 F.3d 1364, 1375 (Fed.Cir.2002) (stating that "to the extent there is a difference between the common and technical meanings of the terms," when the patent uses the term in a technical context, "a technical dictionary is therefore a better source to inform the meaning of the term to a skilled artisan"). However, Diodem is also correct that some technical dictionaries generically refer to the use of transparent materials that are capable of transmitting light. (Diodem Opp. Brief, Exh. I at 21). This definition comports with the statements of Diodem's expert, Dr. Stafsudd, that optical fibers can also be made of materials with a crystalline structure. (May 24th Stafsudd Decl. para. 11)

Moreover, limiting the definition of "optical fiber" to glass and plastic would exclude fibers composed of sapphire or halide crystal, which are explicitly included in the patent specification. (Dovel Decl., Exh. B col. 2:24-26). Thus, the Court construes "optical fiber" to mean "a filament of material capable of transmitting light."

ii. the fluoride issue

The next issue concerns the amount of fluoride. Diodem argues generally that when a claim limitation requires an element, that element is "essential" but other elements may be added and still form a construct within the scope of the claim. Thus, Diodem states that a "fluoride optical fiber" merely contains "more than trace amounts of fluoride." (Diodem Opening Brief at 11). Diodem's only support for this contention is

citation to patent cases construing the meaning of the term of art "comprising," even though this claim does not use the term "comprising."

Diodem's argument would be reasonable, except that Biolase argues that in the art, a "fluoride fiber" has a specialized meaning that goes beyond "trace amounts of fluoride." Accordingly to Biolase's expert, Dr. Harrington, one skilled in the art would understand that "fluoride fibers have always been known to comprise two or more compounds containing fluorine bonded metals." (Biolase Suppl. Brief, Harrington Decl. para. 7). In addition, Dr. Harrington asserts that there is a distinct difference between "fluoride fibers" and "oxide fibers." Thus, a fluoride fiber does not contain any oxide compounds. (*Id.*). To support this construction, Biolase attaches a patent related to "oxide fibers" that clearly distinguishes such fibers from "fluoride fibers" in the art of laser medical surgery. (*Id.,* Exh. B at 31-32).

Thus, it appears that the patentee used a very specific term in the art "fluoride fiber" and that Diodem is now trying to expand the scope of the invention to cover any fiber that contains more than a trace amount of fluoride, presumably even an oxide-based fiber that may contain a trace amount of fluoride. The patentee did not clearly redefine the term "fluoride fiber" to include all types of fibers that contain more than a trace amount of fluoride. The mere fact that the specification mentions fibers that do not fall into the category of "fluoride optical fibers" is not dispositive because claims 6 and 15 are not limited to "fluoride optical fibers." Therefore, the other materials in the specification could have been included as possible fibers to use in those claims and their inclusion in the specification does not rise to the level of the patentee disavowing the common meaning in the art of "fluoride optical fiber."

Thus, the Court adopts Biolase's construction that a fluoride fiber is a "nonoxide" fiber. During oral argument, Diodem did not object to this construction. However, the Court finds that Biolase did not adequately support its contention that the term be further limited to require a "metal fluoride glass former."

iii. the hollow issue

Lumenis is the only Defendant that discusses the "hollow" issue and it devotes the bulk of its briefing to this single term. Lumenis primarily bases its argument that "optical fiber" means a solid (non-hollow) fiber on language in the specification that distinguishes between "optical fibers" and "hollow waveguides," suggesting that they are two different things. Lumenis also argues that the optical fiber must have a solid, rather than a hollow core. Diodem responds that a "waveguide" is a broad term that encompasses an "optical fiber." Diodem supports this construction by citation to two technical dictionaries that define "waveguide" as a means for channeling electromagnetic energy. (Diodem Suppl. Brief at 12; Exhs. K & M).

Diodem's citation to the dictionary is not terribly helpful because while a generic "waveguide" may well encompass optical fibers as well as other means of transmitting light, it is not clear that in the art a " ***hollow*** waveguide" may encompass an "optical fiber." The only direct support in the patent for Diodem's broad construction is the summary of the invention wherein the patentee states that "the common optical path" for delivering the radiation "may be a catheter, one or more optical fibers, a hollow waveguide, *or* an articulated arm," which suggests that the invention could be used without any fiber whatsoever.FN8 (Dovel Decl., Exh. B col. 1:57-60). It is notable that this broad definition is not of "optical fiber," which is the claim language to be construed, but rather of "common optical path." FN9 Moreover, by repeatedly referring to optical fibers and hollow waveguides separately, the patentee clearly distinguished between the two. (*See also* col. 1:60-65, 2:44-47, 4:48-54, 5:11-13, and 5:19-25). Although the patentee at one point defined "optical fiber" to include both solid and hollow core fibers, in the very next sentence the patentee

stated that "the fiber could be used in conjunction with a hollow flexible waveguide or articulated arm." (Id. col.4:53-55). That the patentee did not intend the term optical fiber to be synonymous with hollow waveguide is also clear from the description of one of the preferred embodiments describing the use of "the fiber being disposed inside the arm or waveguide." (*Id*. col.5:19-23). If hollow waveguides and optical fibers are one and the same, this construction makes no sense. In short, the specification clearly distinguishes between optical fibers and hollow waveguides.

Again, the prosecution history of the related '494 patent is significant. The '494 patent, as issued, includes the same language, figures, and preferred embodiments as relevant to the optical fiber/hollow waveguide distinction. (Biolase Suppl. Brief, Hankin Decl., Exh. K col. 1:57-64; col. 2:43-47; col. 3:28-29; col. 4:48-57; col. 5:19-23). Moreover, the claim language in the '494 patent used the exact term "optical fiber." (Id. at col. 7:33-36). In the initial applications the patentee attempted to generally claim a "common optical path" and then tried to claim each form of "optical path" separately, and in combination, which supports that an optical fiber is not synonymous with a hollow waveguide. (Id. Exh. A at 5).

In the subsequent amendments, the patentee dropped the hollow waveguide and articulated arm claims and instead replaced the "common optical path" variably with a "metal halide optical fiber," a "silica based optical fiber," and a "zirconium fluoride optical fiber." (Id. Exh. C at 17, 19-20). In the next amendment, the patentee chose to proceed with just a "metal halide optical fiber." (Id. Exh. E at 29). In the comments, the patentee argued that the prior art references did not disclose transmitting multiple wavelengths over optical fibers. The patentee stressed that until his invention, no one had solved "the problem of coordinating desired tissue reactions within the limitations of optical fiber transmissions." (Id. at 34) (emphasis added). In the next amendment, the patentee again claimed a metal halide fiber, and again argued, even more vigorously that it was well known that multiple wavelengths could not be "transmitted through a single optical fiber" and that the prior art utilized " *free space* beams in implicit recognition of the problems with fiber transmission." (Id. Exh. G at 43) (emphasis in original). In the comments to the final amendment of the '494 application, the patentee argued vigorously that the invention was not obvious under the prior art because those references taught "free space" transmission and not "optical fiber delivery." (Id. Exh. G. at 43).

Lumenis provides deposition testimony from Diodem's expert, Dr. Stafsudd, stating that a hollow core fiber is merely a subset of the class of hollow waveguides, which he distinguished from dielectic core (*i.e*. solid core) waveguides. (Lumenis Suppl. Brief, Hanagan Decl. Exh. A at 15). Dr. Stafsudd stated that the only distinction is that a hollow core fiber has a smaller diameter than a hollow waveguide. (Id.). However, he clearly stated that the transmission of radiation through both hollow core fibers and hollow waveguides is in the free space (*i.e*. air), (Id. at 15-16). Significantly, Dr. Stafsudd admitted that he did not review the prosecution history before giving his opinion that the generic term "optical fiber" as used in the patent encompasses hollow waveguides and hollow and solid core fibers. (Id. at 14). Lumenis uses the above '494 prosecution history, combined with Dr. Stafsudd's testimony to argue that not only does the invention not claim hollow waveguides, but it also cannot claim hollow core optical fibers either.

During oral argument, Diodem responded that the inventor's comments as to "free space" transmission were designed to distinguish prior art articulated arms (specifically the Jako reference), not hollow waveguides. According to Diodem, the primary distinctions between "fiber" and "nonfiber" delivery systems is flexibility and diameter, *i.e*. "fiber" systems are flexible and have a relatively small diameter. However, Diodem failed to provide support for this statement, which is contradicted by the testimony of its own expert.

As discussed above, because the same limitation "optical fiber" appears in both patents, the patentee's act of abandoning the hollow waveguide "optical fibers" and free space transmissions requires the Court to construe "optical fiber" as *not* including free space transmission paths such as hollow waveguides. The specification fully supports this distinction. Moreover, because a hollow core fiber *is* a form of hollow waveguide and it uses free space transmission, an optical fiber must also be construed to cover only solid core fibers. This is true even though the specification states that the optical fiber can either be solid or hollow. (Dovel Decl., Exh. B col. 4:49-53). This is because "[c]laims may not be construed one way in order to obtain their allowance and in a different way against accused infringers." Southwall Techs., Inc. v. Cardinal IG Co., 54 F.3d 1570, 1576 (Fed.Cir.1995).

Thus, the Court concludes that "optical fiber" is limited to a solid core fiber and does not include hollow waveguides or hollow fibers. Therefore, "fluoride optical fiber" means "a solid core, non-oxide filament of material comprised of a fluoride compound that is capable of transmitting light."

d. " *optical fiber comprised of a compound that includes a metal* "

Diodem	Biolase	Lumenis	Hoya
"a slender, threadlike object, containing more than trace amounts of metallic ion and that is used for transmitting electromagnetic radiation"	the metal must be an elemental metal, not a metal oxide	"an optical fiber, as opposed to a hollow waveguide where the optical fiber includes a metal compound, such as a heavy metal fluoride, or a metal halide"	"an optical fiber that is a metal based fiber, such as a heavy metal fluoride fiber, including a zirconium based fiber"

This issue is very similar to what was discussed in terms of the "fluoride optical fiber." That discussion applies here, except to the extent that the claim adds a limitation requiring metal, and removes the limitation requiring fluoride. Biolase continues to argue that the "optical fiber" cannot include an oxide. However, this particular claim language does not require a "fluoride" optical fiber, it just states "optical fiber comprised of a compound that includes a metal." (Dovel Decl., Exh. B col. 8:14-16). The entire basis for Biolase's "non-oxide" requirement was the "fluoride" limitation. In its supplemental brief, Biolase merely states that "metal and metal oxides are listed separately in the specification and consequently cannot be the same thing." (Biolase Suppl. Brief at 11). Then Biolase cites to the part of the specification stating that the optical fiber may be chalcogenide, sapphire, heavy metal fluoride, halide crystal, silica or non-oxide glasses. However, Biolase did not enlighten the Court as to which materials fall into the "metal" category and which are "metal oxides" and, more importantly, why the claim language must be construed to cover one and not the other.

During oral argument, counsel for Biolase argued that the optical fiber that includes a metal cannot be construed to cover "metal oxides" because an oxide is distinct from the metal itself. Biolase contends that the fiber must be limited to a fiber containing an elemental metal. Diodem responds that there is no justification for imposing such a limitation. In fact, Diodem argues that because sapphire-one of the possible fibers included in the specification-is aluminum ***oxide,*** the definition supports the broader construction of metal that includes both elemental metals and metal oxide.

Even though Biolase submitted two lengthy claim construction briefs and appeared at oral argument, it utterly failed to provide any support for its construction. Even assuming that a metal oxide is distinct from an elemental metal, Biolase does not adequately explain why, in the context of the optical fiber described in the patent, the reference to metal must be limited to an elemental metal. Because the "optical fiber" in the

claim language is not limited to a fluoride fiber, Biolase's argument that a fluoride fiber cannot contain an oxide is unavailing.

Accordingly, the Court finds that it is inappropriate to limit the claim to require an elemental metal. The Court therefore construes "optical fiber comprised of a compound that includes a metal" to mean "a solid core filament of material containing more than trace amounts of metallic ion that is capable of transmitting light."

e. " using said optically transparent member to focus "

Diodem	Biolase & Hoya	Lumenis
"cause the beam to converge or concentrate"	"cause the first beam of energy to converge on a focal point"	"cause the first beam of energy to be concentrated"

The dispute here is between Biolase and Diodem (Hoya does not actually make any arguments in support of its construction). In short, Biolase contends that, in the context of this patent, "to focus" means that the beam must come to a focal ***point***-it is not enough that the energy merely concentrates. Biolase strongly relies on the prosecution history of the '167 patent to support its construction. However, as discussed below, the prosecution history actually supports Diodem's construction.

The examiner rejected the initial version of the following claim language as not being supported by the specification:

"wherein said optically transparent member has a spherical surface" [claim 63] ... "placing said optically transparent member into contact with tissue and using the energy at the first wavelength to perform surgery on the tissue" [claim 60]

"focusing the first beam to a point proximal to a location of contact between said tissue and optically transparent member" [claim 66] ... "placing said optically transparent member into contact with tissue and using the energy at the first wavelength to perform surgery on the tissue" [claim 60]

(Biolase Opening Brief, Hankin Dec l., Exh. B 56-57, 61). Specifically, the examiner notes that the "spherical surface" tip, which corresponds to figure 4 "does not contact the tissue and focussing [sic] is not effected proximal to the point of tissue contact." (Id. at 61).FN10

The issue the examiner had with claim 66 was that figure 4 was the only embodiment that "focused to a point" and did so at a point *past* the tip (*i.e.* a point proximal to a location of contact *between* the tissue and the tip) as required by claim 66. The problem, though, was that this configuration did not correspond with the limitation of claim 60 (upon which 66 was dependent) which stated that the tip was to be *in contact* with the tissue. Likewise, although claim 63 did not require focusing, it required a spherical tip (again figure 4) but the beams from figure 4 do not converge until a point well beyond the tip and, as stated above, this embodiment is inconsistent with the requirement that the tip be in contact with the tissue.FN11 In short, there was no embodiment disclosed that did all of the things claimed in dependent claims 63 and 66.

In response, the patentee amended what later became claims 6, 7, and 8 as follows:

"using said optically transparent member to focus the first beam of energy" [claim 6] ... "wherein the step of using said optically transparent member to focus comprises passing the first beam of energy through a spherical surface on said optically transparent member" [claim 7] ... "and directing energy from said optically transparent member against tissue." [claim 6]

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"using said optically transparent member to focus the first beam of energy" [claim 6] ... "wherein the step of using said optically transparent member to focus comprises passing the first beam of energy through the optically transparent member and concentrating energy of said first wavelength at a location proximal to an energy exit surface" [claim 8] ... "and directing energy from said optically transparent member against tissue." [claim 6]

(Id. at 67).

The patentee stated that these amendments were in direct response to the prior rejection. (Id. at 70). The patentee solved the problem with old claim 63 (now claim 7) by changing the base claim 60 (now claim 6) to no longer require the tip to touch the tissue, thus, figure 4 with its spherical tip became an acceptable embodiment for the amended dependent claim 7. As for claim 66 (now claim 8), the patentee ***removed*** the limitations requiring focusing to "a point" and tip contact with the tissue. The patentee directed the examiner to look at figure 3 and the corresponding description in the specification. Figure 3 shows a concentrated beam coming out of the tip, which would work in claim 8, which requires the beam to be concentrated "at a location proximal to the energy exit surface" (i.e. a configuration where the tip would not necessarily touch the tissue, but be near it).

Biolase argues that the above prosecution history reveals that "focusing" requires focusing down to a point. Biolase argues this by referencing to the examiner's problem with original claims 63 and 66 and figure 4. Its logic is that if mere "concentration" without reaching a focal point was sufficient to accomplish "focusing" then the original version of the claims would have been acceptable and would not have required amendment to the claim language. Biolase's argument is that the examiner made clear that "focusing," requires a high level of convergence/concentration, specifically to a point, focal point, or line. The statements of Biolase's expert, Dr. Smith, are not terribly helpful because he does not discuss the meaning of the term "focusing" to one of skill in the art. Rather, he merely reiterates Biolase's interpretation of the prosecution history.FN12

The Court does not find that the examiner intended his comments to become a limitation on the term "focusing." The examiner's issue was not so much that all focusing meant focusing to a point, but rather that the patentee's initial claim 66 *specifically* required focusing to point outside the tip *and* required the tip to the touch the surface, limitations that were mutually exclusive and unsupported by the specification. Because claim 63 did not even require focusing at all, the examiner's problem with that claim does not shed any light on what it means to "focus." Biolase is taking the examiner's comments out of context when it argues that the examiner required that focusing meant focusing to a point.

Most significantly, Biolase completely ignores the fact that the language that the examiner objected to ***required*** "focusing the first beam to a point" at a location beyond the exit surface. To gain approval, the patentee ***removed*** this language, but Biolase is now trying to rewrite the language to bring back in this limitation. To put it another way, the usual situation with the prosecution history is that the patentee is

seeking a construction that attempts to re-claim that which it abandoned in order to achieve issuance. Here, Biolase is the party attempting to "re-claim" abandoned language and such an attempt is clearly improper.

The plain language of claim 8, particularly after contrasting it to the initial language of claim 66, does not require direct tip contact and does not require focusing to "point." In fact, the language actually states that the energy does *not* come to point because the focusing step is defined as "concentrating," replacing the former use of "point." In fact, it seems likely that this would occur if one used the tip in figure 3 with claim 8 (as suggested by the patentee). Because claim 8 does not touch the tip to the tissue, even though the energy may come to a "point" in the tip, it would then leave the tip and start to spread back out and would no longer be a "point," but instead would be a concentration that weakens the farther away the tip is from the tissue. Likewise if you used figure 7, which has the energy coming to a "line" in the tip, if you did not touch the tip to the surface, the "line" would start to spread out.

Therefore, contrary to Biolase's assertion that every embodiment requires focusing to a point, the patent does support constructions where focusing requires the energy to be concentrated, but not necessarily to a point or line. Thus, because there is at least one embodiment described in the specification that satisfies claim 8 (figure 3), the patentee was not required to draw out all other possible embodiments in order to satisfy 35 U.S.C. s. 112, which was the examiner's reason for rejecting the initial language. If Biolase's construction is adopted, the Court would be reading in a limitation that the patentee purposefully excluded in response to the concerns of the examiner.

Considering the difference in language between the initial and the amended versions of the claims at issue, the only current significance of the examiner's comments is to clarify that for claims that require the tip to touch the tissue (claim 1 and dependents, claim 4 and dependents), whatever level of "focusing" occurs, if any, must take place within the tip, *i.e.* like in figures 3, 7, and 8. For claims that require focusing and do not require contact (claim 6 and dependents), the examiner's comments do not apply and clearly figures 3, 4, 7, & 8 support such claim language. Likewise, the examiner's comments were not directed to claims that do not require focusing or contact (claim 15) because any of the tips, including 4, 5, & 6 are supported by the specification.

Although Biolase's argument is facially persuasive, a careful reading of the prosecution history-taking particular care to compare the exact language in the initial patent and with the amended language-reveals that the argument is without merit. The prosecution history does not support Biolase's limiting construction. In addition, the figures in the specification do not necessarily require focusing to a point. Accordingly, because the claim language, which merely says "concentrate," is clear and unambiguous, it would be improper to read in a limitation that not only contradicts the plain language, but also is not "clearly and unmistakably" supported by either the specification or the prosecution history.

However, Diodem's construction, which would allow minimal convergence or concentration, does not comport with its own expert's statement that one of skill in the art would understand that "to focus" means "to cause the beam to converge or concentrate to a small area." For the reasons set forth above, the Court construes the phrase "to focus" to mean "to cause the beam to converge or concentrate to a small area." (May 24th Stafsudd Decl. para. 12).

f. " location proximal to an energy exit surface "

Diodem & Lumenis & Hoya	Biolase

"a location situated close to a surface through which energy may exit"	"a surface at the distal end"

This language only appears in claim 8, (which is dependent upon claim 6). Biolase argues that the claim language must be limited to exiting at the distal end and not just "any surface through which energy may exit." Biolase supports this construction with reference to the specification, arguing that the energy always exits out a tip, which is located at the distal end in all the figures. (Dovel Decl., Exh. B col. 4:5-9 & 29-34). However, the specification certainly does not purport to define the language "exit surface" in a unique way nor did the patentee disavow having the energy exit through something other than one of the identified "tips."

In addition, the Court does not find that the language or the specification would preclude having more than one tip through which energy could exit and Biolase's definition, which deletes the remainder of the sentence "or point 21" would limit the exit surface to only a single distal end. (Id. col.4:7-9). In the context of the *full* claim language, it is clear that the claim envisions having the energy pass through the optically transparent member and the energy is concentrated near the area of exit.

The Court finds that it is wholly unnecessary to go beyond the plain and ordinary meaning of the claim language in this case because there is no ambiguity and the specification does not purport to define energy exit surface. *See* E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 1433 (Fed.Cir.1988) ("[I]nterpreting what is meant by a word in a claim is not to be confused with adding an extraneous limitation appearing in the specification, which is improper. By 'extraneous,' we mean a limitation read into a claim from the specification wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim.").

For the reasons set forth above, the Court construes the phrase "location proximal to an energy exit surface" to mean "a location situated close to a surface through which energy may exit."

3. The '899 and '300 Patents

The '899 patent consists of fourteen claims. Plaintiff asserts that all Defendants are infringing claims 1-4, 6, and 8-11. Biolase also seeks construction of unasserted claim 14, which it contends is invalid. (Biolase Invalidity Chart at 3). The proper construction of the emphasized language below is disputed by at least one Defendant.

1. A pulsed, optically pumped laser, comprising:

a source of pump light;

a resonant cavity comprising a laser material positioned for pumping by said pump light, said laser material emitting light having a wavelength between 1.7 urn and 4 urn in response to pumping by said pump light; and

a ***circuit*** for energizing said source of pump light to produce pulsed optical pump energy at a pulse repetition rate of more than 10 pulses per second, whereby said resonant cavity produces laser pulses at said repetition rate, the intensity of the pump pulses having rise and fall times ***sufficiently short to partially avoid thermal lensing induced instability*** of said laser pulses in said resonant cavity at said pulse repetition

rate.

6. The pulsed, optically pumped laser of claim 1, wherein said *circuit* energizes said source of pump light during the interpulse period to supply pump energy to said laser medium at a level sufficient to maintain said laser medium substantially at, but below, the laser threshold of said lasing medium.

8. The pulsed, optically pumped laser of claim 1, wherein said resonant cavity includes a reflector configured ***to at least partially compensate thermal lensinq effects in said laser medium.***

9. The pulsed, optically pumped laser of claim 1, wherein flows a *fluidic coolant* for cooling said laser medium, said fluidic coolant having a flow path configured to maintain substantially ***laminar flow*** in a direction parallel to a surface of said laser medium except at the boundary between the fluid and said surface of said laser medium.

14. A pulsed laser, comprising:

a source of pump light;

an optical resonator cavity comprising a laser medium and reflectors, said laser medium emitting light between 1.7 (mu)m and 4 (mu)m in response to pumping by said pump light, one of said reflectors being partially transmitting to produce laser light output and at least one of said reflectors comprising a curved mirror, the curvature of said mirror being selected *to at least partially compensate thermal lensing effects in said laser medium:*

a fluidic system for cooling said laser medium, said system being configured to provide a substantially *laminar flow* through a portion of said lasing medium in a direction parallel to a surface of said laser medium except at the boundary between the fluid and said surface of said lasing medium; and

an electrical *circuit* which produces electrical pulses for energizing said pump source, said electrical pulses having a ratio of total energy to peak power less than 500 us, said electrical circuit supplying interpulse energy to said pump source between said pulses, said interpulse energy energizing said pump source to supply sufficient pump energy to said lasing medium to hold said lasing medium substantially at, but below, the laser threshold of said laser medium.

The '300 patent consists of eighteen claims. Plaintiff asserts that all Defendants are infringing claims 1-4, 6, 8-11, and 14-15. Plaintiff asserts that Hoya and Lumenis/OpusDent are also infringing claim 17. Biolase also seeks construction of unasserted claims 12, 16, and 18 which it contends are invalid. (Biolase Invalidity Chart at 3-4). Because the claims in the '300 patent are so similar to those in the '899 patent, only claims containing language not disputed in the '899 patent are included below.

1. A pulsed, optically pumped laser, comprising:

a source of pump light;

a resonant cavity comprising a laser material positioned for pumping by said pump light, said laser material comprising a host material doped with Erbium, and emitting light in response to pumping by said pump light, the emission being at a wavelength corresponding substantially to an emission wavelength of Erbium,

said emission wavelength being P between 1.7 i m and 4.0 i m.

a *circuit* for energizing said source of pump light to produce pulsed optical pump energy at a pulse repetition rate of more than 10 pulses per second, whereby said resonant cavity produces laser pulses at said repetition rate, the intensity of the pump pulses having rise and fall times *sufficiently short to partially avoid thermal lensing induced instability* of said laser pulses in said *resonant cavity* at said pulse repetition rate.

14. The pulsed laser of claim 1, wherein the *circuit* comprises a controller, a ***pulse-forming network*** and a high-voltage power supply, the power supply connected to supply energy to the pulse-forming network, the controller connected to supply a pulse trigger signal to the pulse-forming network, the pulse-forming network energizing the source of pump light in response to the pulse trigger signal to produce optical pulses at said pulse repetition rate.

15. The pulsed laser of claim 1, wherein the emission wavelength is *about 3 microns*.

17. A pulsed, optically pumped laser comprising: a source of pump light;

a resonant cavity comprising a laser material positioned for pumping by said pump light, said laser material emitting light in response to pumping by said pump light, the emission being *at a wavelength of about 2.9 i (mu)m:* and

a *circuit* for energizing said source of pump light to produce pulsed optical pump energy at a pulse repetition rate of more than 10 pulses per second, whereby said resonant cavity produces laser pulses at said repetition rate, the intensity of the pump pulses having rise and fall times *sufficiently short to avoid* ***significant*** *thermal lensing induced instability* of the laser pulses in the resonant cavity at the pulse repetition rate.

a. " *circuit* "

Diodem	all Defendants
"a combination of a number of electrical devices and conductors that, when connected together to form a conducting path, fulfill a desired function"	means plus function analysis covering only the circuit shown in Figs. 2 & 3 of the ' 899 Patent

All Defendants argue that the term "circuit" must be construed as a meansplus-function term under 35 U.S.C. s. 112 para. 6, which provides that:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

Id. Defendants contend that under s. 112 para. 6, "circuit" as used in the ' 899 and '300 patents, must be limited to the circuit shown in figures 2 and 3 and the corresponding written description.

As an initial matter, the fact that the circuit limitation does not use the word "means," creates a rebuttable presumption that s. 112 para. 6 does *not* apply. *See* Apex Inc. v. Raritan Computer, Inc., 325 F.3d 1364,

1371-72 (Fed.Cir.2003). Accordingly, Defendants bear the burden of demonstrating by a preponderance of the evidence that the term circuit as used in the patents "fails to recite sufficiently definite structure or else recites a function without reciting sufficient structure for performing that function." Id. at 1373 (citations and internal quotations omitted).

With specific reference to the term "circuit," the Federal Circuit has stated that the question "is whether the term itself connotes sufficient structure to one of ordinary skill in the art to perform the functions identified by each limitation." *Id*. The court in *Apex* noted that "[s]everal courts have determined that the term 'circuit' connotes sufficiently definite structure to those skilled in the art." *Id*. at 1373 n. 1: *but see* Nilssen v. Motorola, Inc., 80 F.Supp.2d 921 (N.D.III.2000) (holding that the term "circuit means" is so generic that by itself it conveys no structure at all).

The court in *Apex* defined "circuit" in the same terms proposed by Diodem here, namely, "the combination of a number of electrical devices and conductors that, when interconnected to form a conducting path, fulfill some desired function." *Id*. Contrary to Defendants' contention, the *Apex* court did not find that the inclusion of the word "function" constituted a concession that s. 112 para. 6 applied. To the contrary, the court stated that "it is clear that the term 'circuit,' by itself connotes some structure." *Id*. Thus, the question is not whether Diodem has shown that the language connotes structure but rather whether *Defendants* have satisfied their burden, imposed in *Apex,* of showing that the words "circuit for energizing said source of pump light to produce pulsed optical pump energy" fail to connote a structure to one of skill in this art.

Not surprisingly, Lumenis relies heavily on *Nilssen v. Motorola,* where the court found that "circuit means ... to provide lamp operating voltage to the lamp terminals" was a means-plus-function claim because "circuit" is generic and the remaining claim language did not supply a sufficient structure to accomplish the stated function. 80 F.Supp.2d at 929-30. Biolase does not acknowledge any of the above "circuit" cases at all. However, the notable problem with Lumenis's reliance upon *Nilssen v. Motorola* is that because the term in that case included the word ***means,*** the court properly recognized that, unless rebutted, the s. 112 para. 6 presumption applied. Defendants also ignore the several California district court decisions that have disagreed with *Nilssen*. *See* Harmonic Design, Inc. v. Hunter Douglas, Inc., 88 F.Supp.2d 1102, 1105 (C.D.Cal.2000) (construing "electronic circuit"): *Cell Net* Data Sys., Inc. v. Itron, Inc., 17 F.Supp.2d 1100, 1109 (N.D.Cal.1998) (construing "circuit means"); Database Excelleration Sys. Inc. v. Imperial Tech. Inc., 48 U.S.P.Q.2d 1533, 1537 (N.D.Cal.1998) construing ("control circuit").

Accordingly, the Court declines to follow *Nilssen v. Motorola* and concludes that Defendants bear the burden of establishing that "circuit" fails to connote structure to one skilled in the art. Defendants have not met that burden. They merely conclude, without any ***evidentiary*** support whatsoever, that the relevant claim language fails to recite any structure for the claimed circuit and that the language is merely directed to the function of the circuit. (Lumenis Opp. at 12-13; Lumenis Opening Brief at 14-15; Biolase Suppl. Brief at 12; Biolase Opening Brief at 18). Accordingly, they have failed to meet their burden of demonstrating that the construction of "circuit" should be limited to the circuit explicitly described in the preferred embodiment.

The court in *Apex,* which is controlling precedent, rejected an argument virtually identical to Defendants' argument here, holding that:

In the absence of any more compelling evidence of the understanding of one of ordinary skill in the art, the presumption that s. 112, P 6 does not apply is determinative. Raritan's evidence consisted of district court

decisions addressing the meaning of the term "circuit means" and Apex's description of the preferred embodiments in the specification. We find that this evidence is ***not sufficient*** to rebut the s. 112, P 6 presumption. This evidence fails to show by a preponderance of the evidence that one of ordinary skill in the art believes the term does not recite sufficiently definite structure.

Apex, 325 F.3d at 1373 (emphasis added). The court was satisfied that one of skill in the art, absent proof to the contrary, would understand that an "interface circuit" is "any circuit that links one type of logic system with another." Id. at 1374-75.

Absent any evidence to the contrary, the Court concludes that one of skill in the art would understand that a "circuit for energizing ...," in light of the other limitations that are present in the various claims, is "a combination of a number electrical devices and conductors that, when connected together to form a conducting path, are capable of supplying electrical current to the pump source to produce pulsed optical pump energy at the desired rate." No Defendant has presented evidence that one of skill in the art would not know the type of devices that would be needed to form such a circuit.

For the reasons set forth above, the Court construes the term "circuit," to mean "a combination of a number of electrical devices and conductors that, when connected together to form a conducting path, fulfill a desired function."

b. " pulse forming network "

Diodem & Hoya	Biolase & Lumenis
"a circuit to form or control the length and/or shape of a voltage or current pulse"	means plus function element of the "circuit" discussed above

This language appears in the '300 patent, claim 14. That claim is also a "circuit" claim, but it provides a very distinct structure, one element of which is the pulse forming network. Defendants do not provide any additional argument related to this term, they just respectfully refer the Court to their "circuit" arguments. The conclusion that the pulse forming network is not a means-plus-function claim is even stronger because the claim language explains that the pulse forming network is connected to a power supply and a controller, which is used to supply a pulse trigger signal to the pulse forming network, which then energizes the pump source. (Dovel Decl., Exh. D col:11:4-11). "Language identifying physical location suggests that a patentee intended to recite a structural element." *See* Harmonic Design, Inc. v. Hunter Douglas, Inc., 88 F.Supp.2d 1102, 1105 (C.D.Cal.2000).

For the reasons set forth above, the Court construes the term "pulse forming network" to mean "a combination of electrical devices and conductors that, when connected together to form a conducting path, are capable of forming or controlling the length and/or shape of a voltage or current pulse."

c. " sufficiently short to partially avoid thermal lensing induced instability " and " sufficiently short to avoid significant thermal lensing induced instability "

Diodem	Biolase & Hoya	Lumenis
"short enough to avoid thermal lensing induced instability to more than a	indefinite or "short enough duration to stay clear of rendering the laser unstable for sustaining laser pulses" Biolase adds that "thermal lensing induced instability" means "a condition of	indefinite

negligible degree" significantly degraded laser output"

As with the terms "pooled" and "thin layer" from the '856 patent, Defendants argue that the above "sufficiently short" phrases are indefinite and cannot be defined. Again, the patentee chose words that are relative or that are of degree, namely "sufficiently" and "partially" and "significant." Of course, the mere dictionary definitions of these terms, in a vacuum, are not terribly helpful because a relative term must be defined with reference to the technology and the context of the patent. When a term of degree is used, the primary question is "whether the patent's specification provides some standard for measuring that degree." Exxon Research & Eng'g Co. v.United States, 265 F.3d 1371, 1381 (Fed.Cir.2001).

Before beginning the construction of fragments of a claim, the Court must consider the context. The problem identified by the inventor was that, under the conventional laser surgery art, an increase in pulse energy (for example to increase the rate of cutting) causes side effects including laser instability "caused by transient heating" resulting from the increased pump power. (Dovel Decl., Exh. C col. 1:28-31). The invention in the '899 and '300 patents is designed to allow for high pump power without the bad side effects. (Id. col.1:32-34).

As an initial matter, Biolase asks the Court to define "thermal lensing induced instability." The specification explicitly defines "thermal lensing" as "distortion of the optical path within the laser cavity" that is caused by thermal gradients (*i.e*. heat changes). (Id. col.5:3-7). The patentee further cautioned that such distortion, "if large enough, can render the laser cavity *unstable* for sustaining laser oscillation." (Id.) (emphasis added). In another section of the specification, the patentee explains that the "so-called unstable resonant cavity" is "accompanied by degraded output mode quality and decrease of power." (Dovel Decl., Exh. C col. 8:38-40). Thus, "thermal lensing induced instability" occurs when heat gradients distort the optical pathway resulting in degraded laser efficacy or, in the extreme case, an inoperative laser.FN13

The next question is whether the patentee provided some standard for measuring the relative terms "partially" and "significant" used in the claim language. From the specification, it is clear that shorter rise and fall times can be used to avoid the onset of thermal lensing induced instability. (Dovel Decl. Exh. C, col. 1:47-51). However, the specification discusses a number of different factors besides rise and fall times that also help to avoid thermal lensing induced instability, including, continually pumping the laser medium with a simmer supply during the interpulse period (id. col. 1:61-2:14), using a reflective ellipsoidal pump cavity (id. col. 2:15-24), using a pump spectra! filter (id. col. 2:25-31), use of one curved resonator reflector in the pump cavity (id. col. 2:37-42), and using a fluidic cooling system (id. col. 2:42-48).

A review of the claims reveals that the patentee separately claimed each of these means, as well as various combinations, of reducing thermal lensing induced instability. In other words, the inventor did not throw out a list of factors and leave the eventual user to sort out how to combine them to achieve the desired result. Claim one focuses solely on rise and fall times. Claim 5 combines rise and fall times with the reflective ellipsoidal pump cavity. Claim 6 combines rise and fall times with the interpulse period pumping. Claim 7 adds to claim 6 the pump filter. Claim 8 combines rise and fall times with the curved resonator reflector. Claim 9 combine's rise and fall times with the fluidic cooling system. Claim 12 combines rise and fall times, fluidic cooling, and the pump filter. Claim 13 combines rise and fall times, fluidic cooling and the curved resonator reflector. Claim 14 combines the curved resonator reflector, fluidic cooling, and interpulse period pumping.

The claim language of disputed claim 1 sets forth the proper wavelength range and the repetition rate and

then teaches that the rise and fall times must be short enough in duration "to partially avoid thermal lensing induced instability." Likewise, claim 17 of the '300 patent uses the language "to avoid significant thermal lensing induced instability." By providing these parameters, the patentee dramatically reduced the amount of experimentation required to attain the desired results. By using the terms "partially" and "significant" the patentee provides that some thermal lensing induced instability is permissible, but the specification indicates that the instability should be kept to a level so as to avoid rendering the cavity so unstable as to result in an ineffective or completely inoperative laser. Thus, Diodem's construction that requires instability-and its resulting effects-to be avoided to "more than a negligible degree," comports with the specification.

Under the case law related to indefiniteness, the "sufficiently short" phrases pass muster because in this context, "mathematical precision is not required-only a reasonable degree of particularity and definiteness." Exxon Research & Eng'g Co. v. United States, 265 F.3d 1371, 1381 (Fed.Cir.2001). In *Exxon,* the Federal Circuit reversed the lower court's determination that several limitations in the patent-in-suit were indefinite, including the phrases "for a period sufficient" and "substantial absence of slug flow." The court also noted that because of the statutory presumption of validity under 35 U.S.C. s. 282, "close questions of indefiniteness in litigation involving issued patents are properly resolved in favor of the patentee." *Id*. at 1380.

The *Exxon* court ruled that failure to include upper and lower boundaries does not automatically render a claim indefinite, provided that one skilled in the art would understand how the limitations are to be measured. Thus, with respect to the "period sufficient" claim, the court found that even though the specification did not provide "a specific example of a period of time sufficient to achieve a particular increase in catalyst productivity for a certain supported catalyst," the preferred embodiment provided enough information that one of skill in the art could determine such a period. *Id*. Moreover, the court found that one skilled in the art could determine the proper "period" through use of simple activity checks on the claimed catalyst. *Id*. at 1379.

Unlike in *Exxon,* the patentee in the case at bar ***did*** provide a specific example of a sufficiently short duration, namely, 500 us combined with a range of pulse energy of 10 mJ to 250mJ. (Dovel Decl., Exh. C col. 3:1-4). In addition, as with the ability to use activity checks to determine the "period sufficient" in *Exxon,* Dr. Stafsudd explains that one of skill in the art would only have to engage in minimal testing to determine the appropriate rise and fall times, given that the inventor provided the parameters for wavelength and pulse duration. (May 24th Stafsudd Decl. para.para. 17-18). Dr. Stafsudd suggests that one skilled in the art would need only to run the laser at low repetition rates and then keep increasing the rate until a deviation in laser output power is observed. He states that such deviation "can be easily detected by observing a change in the laser's spot size or loss of mode control, or by measuring deviation in the output power." (*Id*. para. 18). Thus, if such deviation occurred before the repetition rate reached the level required by the patent, the user would know to reduce the rise and fall times and repeat the test. (*Id*.).

Lumenis did not provide the Court with a proposed claim construction and instead chose to rely solely on its argument that the phrase is indefinite. But during the *Markman* hearing, Lumenis argued that the Court's construction was impermissibly "results-oriented." The court in *Exxon,* however, approved just such a results-oriented claim construction. Specifically, the court ruled that the "substantial absence of slug flow" limitation was not indefinite because it is understood in the art that slug flow can adversely impact the performance and efficiency of the claimed reactor. Thus, even though the specification did not provide a precise empirical standard for measuring the absence of slug flow, the court found that the claim was not indefinite because "[w]hether there is a 'substantial absence of slug flow' ... can be determined with

reference to whether reactor efficiency is materially affected." *Id*. at 1381. Just as the "slug flow" in *Exxon* could be adequately measured by reference to reactor efficiency, the "thermal lensing induced instability" in this case can be measured with reference to laser efficacy. Thus, if the rise and fall times are "sufficiently short ... to partially avoid thermal lensing induced instability" the laser will maintain its efficacy.

However, Lumenis did raise a point that the Court found troubling. Specifically, the very fact that the specification reveals so many different ways to reduce thermal lensing induced instability means that a results-oriented construction could ensnare inventions that use other, unclaimed, methods to reduce instability effects. As a result of Lumenis's concern, the Court has modified its tentative construction to explicitly state that the avoidance of thermal lensing induced instability must directly correlate to the shortness of the rise and fall times.

For the reasons set forth above, the Court construes the phrases "sufficiently short to partially avoid thermal lensing induced instability" and "sufficiently short to avoid significant thermal lensing induced instability" to mean "short enough so that the selected duration directly serves to avoid degraded laser efficacy caused by heat gradients in the laser medium to more than a negligible degree."

d. " to at least partially compensate thermal lensing effects in said laser medium "

Diodem	Biolase & Hoya	Lumenis
"to offset or counterbalance to more than a negligible degree any distortion of the laser's optical path caused by heat gradients (*i .e*. varying levels of heat energy) in the laser medium	indefinite or "short enough duration to stay clear of rendering the laser unstable for sustaining laser pulses"	indefinite

Biolase and Hoya's very definition reveals that they failed to look at the claim language ***in the context of the full claim.*** This language appears in claims 8 and 14 of the '899 patent and claims 8, 16 and 18 of the '300 patent. These claims do not include the rise and fall time limitation, they all focus on the resonator reflector limitation, which is discussed above as one of the factors that can help reduce thermal lensing induced instability. Thus, Biolase and Hoya's "short enough duration" language is meaningless in this context.

The specification discusses the resonator reflectors in the optical cavity, teaching that partial compensation for thermal lensing induced stability is achieved by having one of the reflectors partially transmitting and having one of them curved up. (Dovel Decl., Exh. C col. 2:37-42). This limitation is always used in conjunction with another limitation, indicating that, by itself, it is likely to only have a marginal impact on the instability problem. Thus, unlike the rise and fall times, which the inventor teaches can be used to actually help stop thermal lensing induced instability from occurring in the first instance, the configuration of the resonator reflectors can be designed to reduce the impact of thermal lensing.FN14 The specification explains that at high peak powers thermal lensing (defined above as distortion of the optical pathway) can lead some of the light rays traversing the rod to diverge and that this divergence can lead to instability. (Id. col.8:32-38). The patent teaches that the resonator reflectors (mirrors in the cavity) can be adjusted such that the divergent rays are reflected ***out*** of the cavity. (Id. col. 8:40-50; Figure 8).

Thus, when viewed in light of the specification, the contested claim language is not indefinite. The patent is clear that the mirrors can be adjusted to send the diverging light rays out of the cavity and that, while this will not reduce thermal lensing, it will help to "offset or counterbalance" the instability that has already

occurred in the laser rod as a result of the distortion of the optical pathway. During oral argument, Biolase argued that the Court must construe the phrase to require the resonator reflector to be curved. However, this argument actually seeks construction of the language preceding the disputed claim language, namely "includes a reflector configured." (Id. col: 11:10-11). The parties did not seek construction of this phrase nor did any party brief the Court as to the proper construction of this phrase. Accordingly, the Court declines to read in an additional limitation that the reflector be curved.

For the reasons set forth above, the Court construes the phrase "to at least partially compensate thermal lensing effects in said laser medium" to mean "to offset or counterbalance to more than a negligible degree instability of the laser cavity caused by heat gradients in the laser medium."

e. " laminar flow "

Diodem & Lumenis & Biolase	Hoya
"essential streamlined (non-turbulent) flow"	"a type of fluid flow in which adjacent layers do not mix except on the molecular scale"

In their initial claim construction charts, Biolase and Hoya both selected the above dictionary definition of "a type of fluid flow in which adjacent layers do not mix except on the molecular scale." No further discussion by either party was presented on the subject. In its supplemental brief, Biolase abandoned its initial construction and instead argues, like Diodem, that laminar flow must mean a streamlined, non turbulent flow. (Biolase Suppl. Brief at 14-15). Hoya makes no argument on this point, even though it is the only party that continues to dispute the proper construction of this term. Hoya does not attempt to explain how the streamlined, non-turbulent definition differs from its definition. Furthermore, it fails to even attach a copy of the dictionary page that allegedly supports its construction.

The Court does not see that there is a substantial difference between Hoya's and the other parties' construction. Rather, it appears that Hoya is replacing synonyms with more synonyms which is not terribly helpful. During oral argument, none of the parties objected the Court's proposed construction. Accordingly, the Court construes "laminar flow" to mean "streamlined (non-turbulent) flow."

IV.

CONCLUSION

The Court adopts the parties' stipulated definitions as provided in the Amended Joint Statement Re Issues for *Markman* hearing. In addition, the Court construes the disputed claim language as follows:

Disputed Language	**Asserted Claim Containing Language**	**Court's Proposed Construction**
"does not remain pooled on the material surface"	'856 patent claims 1, 6-8	" does not form a puddle or accumulation of standing liquid on the surface of the cutting site"
"pooled water"	'856 patent claim 8	"puddle or accumulation of standing liquid"
"present in the pores"	'856 patent claims 1, 6-8	"while liquid is existing in the very small openings between the hard components of the material or while the liquid is currently being chemically held at a site"

"having radiation which is absorbed by the selected liquid"	'856 patent claims 1, 6-8	"having radiation emitting in an absorption region of the liquid substance"
"applied as a directed jet"	'856 patent claims 4 & 8	"applied by aiming a high velocity fluid stream forced under pressure out of a small diameter opening or nozzle"
"blowing moistened air"	'856 patent claim 8	"blowing a combination of air and water vapor"
"spread in a thin layer on the surface of the selected area"	'856 patent claims 6-8	"adding a selected liquid to the cutting site in a manner and amount such that the liquid does not prevent the laser radiation from acting effectively on the cutting surface"
"first beam of pulsed electromagnetic energy having a first wavelength"	'167 patent claims 1, 6	"electromagnetic radiation or waves emitted in the form of a concentrated stream in regular beats or in a series of intermittent occurrences having a first single wavelength"
"a second beam of electromagnetic energy having a second wavelength"	'167 patent claims 1, 6	"electromagnetic radiation or waves having a second single wavelength"
"approximately 3 microns"	'167 patent claims 1, 6	"2.5 to 3.5 microns"
"about 2.9 microns"	'167 patent claims 14	"2.85 to 2.95 microns"
"fluoride optical fiber"	'167 patent claim 1	"a solid core, non-oxide filament of material comprised of a fluoride compound that is capable of transmitting light"
"using said optically transparent member to focus"	'167 patent claims 1, 6, 8	" to cause the beam to converge or concentrate to a small area"
"optical fiber comprised of a compound that includes a metal"	'167 patent claim 6	"a solid core, filament of material containing more than trace amounts of metallic ion that is capable of transmitting light"
"location proximal to an energy exit surface"	'167 patent claim 8	"a location situated close to a surface through which energy may exit"
"circuit"	'899 patent claims 1, 6 '300 patent claims 1, 6, 14, 17	"a combination of a number of electrical devices and conductors that, when connected together to form a conducting path, fulfill a desired function"
"sufficiently short to partially avoid thermal lensing induced instability"	' 899 patent claim 1	"short enough so that the selected duration directly serves to avoid degraded laser efficacy caused by heat gradients in the laser medium to more than a negligible degree"
"sufficiently short to avoid significant thermal lensing induced instability"	' 300 patent claims 1, 17	"short enough so that the selected duration directly serves to avoid degraded laser efficacy caused by heat gradients in the laser medium to more than a negligible degree"
"to at least partially compensate thermal lensing effects in said laser medium"	'899 patent claim 8 '300 patent claim 8	"to offset or counterbalance to more than a negligible degree instability of the laser cavity caused by heat changes in the laser medium"
"laminar flow"	'899 patent claim 9	"streamlined (non-turbulent) flow"

	'300 patent claim 9	
"pulse forming network"	'300 patent claim 14	"a combination of electrical devices and conductors that, when connected together to form a conducting path, are capable of forming or controlling the length and/or shape of a voltage or current pulse"

IT IS SO ORDERED.

FN1. Lumenis and OpusDent are represented by the same counsel and Plaintiff alleges that both Defendants are liable for alleged infringement by the OpusDuo line of products. These Defendants are referred to collectively herein as "Lumenis."

FN2. *See* Diodem's Opening Brief, Dovel Decl., Exh. A (hereinafter "Dovel Decl.").

FN3. *See* Dovel Decl., Exh. B

FN4. *See* Dovel Decl., Exh. C

FN5. *See* Dovel Decl., Exh. D

FN6. The Court's tentative construction used the term "absorption band" in place of "absorption region." During the *Markman* hearing, Biolase argued that, to the extent there is a difference, "absorption region" was the more appropriate construction. Although the Court is not convinced that there is a difference between the two terms, because the patentee expressly used the term "absorption region" in the specification, the Court's construction will use that term as well.

FN7. The '167 patent at issue is a division of Serial Number 754,327, U.S. Patent No. 5,139,494 (the '494 patent), which in turn is a continuation of two abandoned serial numbers, 634,933 and 269, 501. (Dovel Decl., Exh. B at [60]). The '494 patent claims a very similar method to the '167 patent, but it ***expressly*** claims the second beam as being therapeutic. (Exh. K at 80).

FN8. Because every claim includes the limitation of an optical fiber, if an optical fiber is not synonymous with hollow waveguide, the invention would not cover just the use of a hollow waveguide, as the summary suggests. But the summary also suggests that the invention could be used with just a catheter and no fiber, however, the written description *always* has a fiber inside the catheter.

FN9. As discussed below, the very first version of the application that led to the '494 and '167 patents tried to claim the generic "common optical path" but this was rejected.

FN10. If you look at figure 4, it is clear that the examiner's issue was that the focusing occurs well beyond the tip, thus, the tip cannot be in contact with the surface and be focused as the claim requires.

FN11. The specification even acknowledges this, stating that the configuration in figure 4 "customarily will not come into contact with the tissue being treated. It is the focused energy at the focal point which will make tissue contact." (Dovel Decl., Exh. B col. 14-19).

FN12. Of particular note is paragraph 9 of the Smith declaration. To support Biolase's contention that moderate or partial concentration does not constitute focusing, Dr. Smith points to the examiner's comments that with figure 4, "focusing is not effected proximal to the point of tissue contact," as evidence that concentration to a point, rather than just concentration to a degree, is required to satisfy the focusing limitation, The flaw, of course, is that the claim language before the examiner *required* focusing to a point and the current language before the Court does NOT.

FN13. Biolase seeks to construe "thermal lensing induced instability" as the maximum level of such instability, *i.e.* " ***significantly*** degraded laser output." (Biolase Suppl. Brief at 13) (emphasis added). However, such a construction renders the preceding limitations of "partially" or "significant" meaningless, or at least redundant.

FN14. This key difference explains why the patentee used different language for each limitation. The rise and fall times limitation is phrased to "partially avoid" or "avoid significant" thermal lensing induced instability itself, *i.e.* actual distortion of the laser cavity, while the resonator reflector limitation is phrased only to "partially compensate thermal lensing ***effects.***"

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