UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

BRIDGELUX, INC.,

Plaintiff, No. C 06-6495 PJH

v. **ORDER CONSTRUING CLAIMS**

CREE, INC., et al.,

Defendants.

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Plaintiff BridgeLux, Inc. ("BridgeLux") manufactures LED (light-emitting diode) chips. Defendant Cree, Inc. ("Cree") manufactures and sells various semiconductor products, including LED chips. Defendant Cree Lighting Company was formerly a subsidiary of Cree but was merged into its parent company in 2003 and no longer exists as a separate entity. Defendant Trustees of Boston University ("BU") is the governing body of Boston University, a non-profit educational institution.

Cree owns U.S. Patent No. 6,657,236 ("the '236 patent"). BU owns, and Cree exclusively licenses, U.S. Patent Nos. 5,686,738 ("the '738 patent") and 7,235,819 ("the '819 patent"). The three patents relate to LED devices and materials. In the present action, BridgeLux seeks a declaratory judgment of noninfringement and invalidity as to the '236 and '738 patents; and Cree and BU have asserted a counterclaim for infringement of the '819 patent. Cree, BU, and BridgeLux are also presently involved in litigation involving other patents, in the Eastern District of Texas.

The parties now seek a judicial construction of ten terms.

DISCUSSION

A. Legal Standard

Patent infringement analysis involves a two-step process. First, the court must determine as a matter of law the correct scope and meaning of disputed claim terms. Second, the properly construed claims are compared to the accused device to see whether the device contains all the limitations (literally or by equivalents) in the claims at issue. Markman v. Westview Instruments, Inc., 517 U.S. 370, 384 (1996).

"[T]he claims of a patent define the invention to which the patentee is entitled the right to exclude." Phillips v. AWH Corp., 415 F.3d 1303, 1312 (Fed. Cir. 2005) (citation and quotation omitted); see also Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1248 (Fed. Cir. 1998) (claim construction "begins and ends" with the actual words of the claims). The terms used in the claims 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. CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citation omitted).

A patentee is presumed to have intended the ordinary meaning of a claim term in the absence of an express intent to the contrary. See York Prods., Inc. v. Central Tractor Farm & Family Ctr., 99 F.3d 1568, 1572 (Fed. Cir. 1996). The ordinary and customary meaning of a claim term is "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." Phillips, 415 F.3d at 1313. The person of ordinary skill in the art is "deemed to read the claim term not only in the context of the particular claim . . . but in the context of the entire patent, including the specification." Id. The words in the claim may also be interpreted in light of the prosecution history, if in evidence. Teleflex, Inc. v. Ficosa North Am. Corp., 299 F. 3d 1313, 1324-25 (Fed. Cir. 2002) (citations omitted).

"[I]ntrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." Vitronics Corp. v. Conceptronic, Inc., 90 F. 3d 1576, 1582 (Fed. Cir. 1996). Only if an analysis of the intrinsic evidence fails to resolve any ambiguity in the claim language may the court then rely on extrinsic evidence, such as expert declarations. Id. at 1583 ("In those cases where the public record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper.").

B. The Patents and the Asserted Claims

The patents-in-suit generally relate to LEDs, which are semiconductor-based devices that convert electrical current to light. A common design for LEDs comprises an LED "structure" that includes a "p-type" layer, an "n-type" layer, and an active layer between the oppositely doped p-type layer and n-type layer. When current is applied across the "doped" layers (the p-type layer and the n-type layer), holes from the p-type layer and electrons from the n-type layer are injected into the active layer where they recombine, releasing energy as photons (light particles).

The '236 patent relates to new structures for enhancing the extraction of light from LEDs. The new LEDs described in the patent have light extraction structures – preferably either arrays of light extraction elements or disperser layers – which are disposed on an exposed surface or within the LED. These light extraction structures provide surfaces for reflecting, refracting, or scattering light into directions that are more favorable for the light to escape out of the LED, thereby increasing the LED's overall efficiency.

The '738 patent relates to a method of preparing highly insulating gallium nitride (GaN) monocrystalline films in a molecular beam epitaxial growth chamber, and also relates to a method of preparing monocrystalline n-type or p-type GaN films. The film is epitaxially grown in a two-step process comprising a lower-temperature nucleation step, and a high-temperature growth step. The low-temperature step is used to grow a GaN buffer layer, and the high-temperature step is used to grow a "first growth layer" of high quality GaN or another group III nitride material on the surface of the buffer layer.

The '819 patent relates to light-emitting III-V nitride devices (a type of LED). This patent teaches a semiconductor device that is built starting with a substrate consisting of silicon, sapphire, gallium arsenide, magnesium oxide, zinc oxide, or silicon carbide; and also includes a non-single-crystalline GaN buffer layer on the substrate. The buffer layer comprises GaN, and a single-crystalline group III nitride growth layer (such as GaN) on the buffer layer. The buffer layer coats the substrate and facilitates the growth of a high-quality film on the surface of the buffer layer. Each layer of the structure is grown on the surface of the layer immediately below it. A "first growth layer" is grown on the surface of the buffer layer, a "second growth layer" is grown on the surface of the "first growth layer," and so on.

C. The Disputed Terms and the Claims Construction

1. **active layer**

This term is disputed with regard to claims 1 and 23 of the '236 patent. As presented to the court, the dispute involved whether the term "active layer" refers to the entire physical light-generating layer of semiconducting material in an LED (Cree/BU's position), or whether it refers to a "functional layer" that is limited to those portions of the light-emitting layer where injected electrons and holes combine (BridgeLux's position).

At the claims construction hearing, the parties agreed to a construction of this term. Accordingly, the court finds that **"active layer"** means "a layer of material in a light-emitting diode (LED) in which electrons and holes recombine to generate photons when current is applied."

2. **adjacent**

This term is disputed with regard to claims 1, 2, 3, and 23 of the '236 patent. Both sides agree that "adjacent" structures (such as layers) are structures that are "next to" each other. The primary dispute is whether or not "adjacent" structures must be in direct contact with each other – that is, whether "adjacent" means "near" (Cree/BU's position), or whether it means "in direct physical contact with" (BridgeLux's position).

"Adjacent" is a common English word, and neither BridgeLux nor Cree/BU asserts that it is a technical term within the field of LED design. The common dictionary meanings of "adjacent" include "close to or nearby;" "next to or adjoining;" "lying near, close, or contiguous;" and "neighboring." See Webster's II New College Dictionary (2001); Random House Unabridged Dictionary (1999).

While it is true that a dictionary definition is generally given less probative weight than is intrinsic evidence, "a judge who encounters a claim term while reading a patent might consult a general purpose or specialized dictionary to begin understanding the meaning of the term, before reviewing the remainder of the patent to determine how the patentee has used the term." Phillips, 415 F.3d at 1324.

> Phillips recognized, in addition, that "reference to such sources is not prohibited so long as the ultimate construction given to the claims in question is grounded in the intrinsic evidence and not based upon definitions considered in the abstract." Id. at 1318 (noting that "dictionaries, and especially technical dictionaries, endeavor to collect the accepted meanings of terms used in various fields of science and technology" and thus "have been properly recognized as among the many tools that can assist the court in determining the meaning of particular terminology to those of skill in the art of the invention").

Mangosoft, Inc. v. Oracle Corp. 525 F.3d 1327, 1330 (Fed. Cir. 2008).

The intrinsic evidence supports a meaning of both "in contact with" and "near or next to." First, "adjacent" structures are sometimes "touching" or "contiguous." For example, in claim 1, the patent claims a "first spreader layer" which is "adjacent" to an "LED structure," and a "second spreader layer" that is "adjacent to said LED structure." The LED structure is itself made up of other layers (a p-type doped layer, an n-type doped layer, and an active layer). See '236 patent, claim 1.

The specification describes the LED structure as "sandwiched between a first spreader layer and a second spreader layer." Id., col. 3:59-61. In turn, Figure 1 illustrates this positional requirement showing "first spreading layer 16" and "second spreading layer 20" contiguous with the LED structure, which consists of "active layer 13 sandwiched between two oppositely doped layers 14, 15." Id., col. 5:31-34; & Figs. 1, 2. Claims 2 and 23 recite "a substrate adjacent to said first spreader layer." Id., claims 2, 23. Several figures in the specification depict a substrate that is in contact with the first spreader layer. Id., Figs. 1, 2, 8, 9, 14, 15.

Nevertheless, while "adjacent" may be used in some instances to be "in contact with," the intrinsic evidence also supports a meaning of "near or next to." For example, as noted above, claims 2 and 23 both describe a "substrate adjacent to said first spreader layer." Id., claims 2 and 23. Claims 17 and 19, which depend from claim 2, and claims 30 and 32, which depend from claim 23, all allow for "light extraction structures [that] are disposed on the interface between said [adjacent] substrate and said first spreader layer." Id., claims 17, 19, 30, 32.

Those "light extraction structures" include disperser layers that can be a "layer of microspheres" or a "roughened layer of material" made of different material than either the spreader layer or the substrate. See id., claims 8-12, 16, 25, 26, 35; col. 4:37-44; col. 8:44-10:14. The specification also confirms that the disperser layer can be placed between the substrate and the first spreader layer. Id., col. 4:38-41 ("Alternatively, the new LED can have disperser layers disposed within the LED itself. The disperser layers can be formed in or on the substrate prior to the epitaxial growth of the LED, or within the LED epitaxial structure itself.").

In other words, while the substrate is "adjacent to said first spreader layer" in claims 2 and 23, claims dependent on claims 2 and 23 allow for a disperser layer to separate the substrate from its "adjacent" first spreader layer. Thus, limiting "adjacent" layers to those in direct contact would be inconsistent with the use of "adjacent" in the claims. This is true despite the fact that claims 17 and 30 recite "light extraction structures [that are] . . . substantially within said first spreader layer," and that claims 19 and 31 recite "light extraction structures [that are] . . . substantially within said substrate." Id., claims 17, 19, 30, 31.

Even if the disperser layer is "substantially within" either the substrate or spreader layer, the disperser layer is still described as being a layer "between" the adjacent substrate and the spreader layer. This is confirmed by the specification, which states that "[t]he disperser layer can be formed . . . on the substrate prior to epitaxial growth of the LED, or within the LED epitaxial structure itself. The disperser layer is made from a material with an index of refraction that is different from the substrate and/or epitaxial material so that light scattering can occur." Id., col. 4:37-43.

A claim term must be construed "consistently with its appearance in other places in the same claim or in other claims of the same patent." Rexnord Corp. v. Laitram Corp., 247

F.3d 1336, 1342 (Fed. Cir. 2001). Because the claims and specification of the ‘236 patent use “adjacent” to describe objects that are “next to” each other and also to describe objects that are “near” each other, the court finds that **“adjacent”** means “near or next to.”

3. **dopant material**

This term is disputed with regard to claims 1, 2, 7, 9, 11, 15, and 18-20 of the ‘738 patent; and in claims 1, 2, 5, and 8 of the ‘819 patent.

The parties agree that a “dopant material” is a material that is “intentionally introduced into a semiconductor material to alter its electrical properties.” The dispute as originally presented to the court involved whether the definition “intentionally introduced into a semiconductor material to alter its electrical properties” is sufficient (Cree/BU’s position); or whether the construction should include the additional limitation that introducing a “dopant material” will also “dope [the semiconductor material] either as an acceptor or a donor” – in other words, whether the definition must also explain how the semiconductor material’s electrical properties are altered (BridgeLux’s position).

At the hearing, the parties agreed that the essence of the dispute is whether the introduction of the dopant material will dope the semiconductor material with an acceptor or a donor (Cree/BU’s position), or will dope the semiconductor material as an acceptor or a donor (BridgeLux’s position).

Both the ‘738 patent and the ‘819 patent use the terms “acceptor” and “donor” to describe types of “dopant materials,” not to describe the semiconductor materials to which “dopant materials” are added. See ‘738 patent, claim 7 (“The semiconductor device of claim 1 wherein the first dopant material is a donor”); id., claim 8 (“A semiconductor device comprising . . . a first growth layer . . . comprising gallium nitride and an acceptor dopant material” and “a second growth layer grown on the first growth layer, the second growth layer comprising gallium nitride and a donor dopant material”); id., claim 15 (“A semiconductor device having an activated p-type layer comprising . . . an activated p-type growth layer comprising gallium nitride and an acceptor dopant material formed without the use of a post-growth activation step”).

See also '819 patent, claim 4 ("A semiconductor device comprising . . . a first growth layer . . . comprising a single-crystalline group III nitride and an acceptor dopant material; and a second growth layer . . . comprising a single-crystalline group III nitride and a donor dopant material."); id., col. 2:5-16 ("The semiconductor device includes a substrate . . . , a non-single crystalline buffer layer on the substrate, . . . and a single-crystalline group III nitride growth layer . . . [which] may be a first growth layer including a first dopant material, which may be either a donor or acceptor dopant").

Thus, while semiconductor materials may be doped "with" an acceptor or donor "dopant material," they are not doped "as" an acceptor or a donor. The fact that "dopant" and "acceptor" are terms reserved for types of dopant impurities is confirmed by the extrinsic evidence. One generally accepted technical dictionary defines "dopant" as

> [a]n impurity which is introduced into an semiconductor material. Such an impurity may be an acceptor impurity, which makes for a p-type semiconductor, or it may be a donor impurity, which makes for an n-type semiconductor. Acceptor impurities include gallium and aluminum, while donor impurities include phosphorus and arsenic. In either case, a dopant increases the conductivity of the semiconductor.

Wiley Electrical and Electronics Engineering Dictionary (John Wiley & Sons, 2004) ("Wiley") at 208. Similarly, the Institute of Electrical and Electronics Engineers defines "acceptor dopant" as "[a]n impurity that may induce hole conduction," and "donor dopant" as "[a]n impurity that may induce electron conduction." IEEE 100, The Authoritative Dictionary of IEEE Standards Terms (7th ed. 2000). There is no indication in the intrinsic evidence that the inventor intended a meaning for "dopant" that is different from the commonly accepted definition in the field of electrical engineering.

The court finds that **"dopant material"** means "a material intentionally introduced into a semiconductor material to alter its electrical properties, to dope it with either an acceptor or a donor."

4. **having**

This term is disputed with regard to claim 1 of the '236 patent. Cree/BU proposes that "having" means "including and not limited to," while BridgeLux proposes that it means "consisting only of." The dispute centers on whether the word "having" in claim 1 is an "open transition phrase," which allows for additional elements beyond those recited after the transition phrase (Cree/BU's position); or whether it is a "closed transition phrase," one that does not allow for additional elements (BridgeLux's position).

Unlike the transitional phrase "comprising," the use of which creates a presumption that the body of the claim is open – that the recited elements are only a part of the device, and that the claim does not exclude additional, unrecited elements – the transition "having" can make a claim open, but does not create a presumption that the body of the claim is open. Crystal Semiconductor Corp. v. TriTech Microelectronics Int'l, Inc., 246 F.3d 1336, 1348 (Fed. Cir. 2001). Thus, the court is required to examine the claim in the light of the specification to determine whether open or closed claim language is intended by the use of the term "having." Id.; see also Lampi Corp. v. American Power Prods., Inc., 228 F.3d 1365, 1376 (Fed. Cir. 2000); Manual of Patent Examining Procedure § 2111.03.

The intrinsic evidence establishes that the claimed LED structure "having" an "epitaxially grown p-type layer; an epitaxially grown n-type layer; and an epitaxially grown active layer between said p-type and n-type layers" means that the claimed LED structure includes at least the three recited epitaxial layers but can also include additional layers within or between those layers.

For example, the specification states that "the disperser layers can be placed in other layers including the LED structure's layers and the substrate, and the invention should not be limited to the placements shown." '236 patent, col. 10:11-14. Further, "[t]he disperser layer can also be formed within the other layers of the LEDs, including the layers of the LED structures and the substrates" and "can also be formed by other methods and with other materials." Id., col. 9:44-47.

This interpretation is consistent with the claims of the '236 patent, which allow for additional layers to be placed within the LED, which would include the LED structure. See id., claim 11 ("[t]he LED of claim 8, wherein said disperser layer comprises a roughened layer of material within said LED"); id., claim 15 ("[t]he LED of claim 1, wherein said light extraction structures are disposed internal to said LED").

The specification also uses "open" language to describe the components of the LED structure. See id., col. 3:57-59 ("The new LED generally comprises an LED structure having a p-type layer, an n-type layer, and an active layer between the p-type and the n-type layers.") This indicates that although the preferred LED structure generally comprises p-type, n-type, and active layers, additional structures are allowed.

The court finds that **"having"** means "including but not limited to."

5. **layer**

The term "layer" is used in most claims of all three patents, and appears, in total, several hundred times. This term is disputed with regard to claims 1, 2, 4, 8, 11, 12, 20, 23, 25, and 26 of the '236 patent; claims 1-3, 6, 9, 11, 13-15, and 18-20 of the '738 patent; and claims 1-3 and 5-8 of the '819 patent.

The dispute between the parties is whether the ordinary English meaning applies – "layer of material" or "defined thickness that is part of a material" (Cree/BU's position), or whether "layer" should be construed as BridgeLux argues, as "a film made of a specific composition of chemical elements and a specific doping concentration. The boundaries of the layer are defined by a change in either the material composition or the doping concentration (or both) during the epitaxial growth of the LED."

Wiley defines "layer" as "[a] defined thickness which is part of a material, or which surrounds it," citing as an example, "a layer in a semiconductor." Wiley at 413. This basic definition is consistent with the hundreds of individual uses of "layer" in the patents-in-suit.

In addition, none of the patents require, as BridgeLux asserts, that every "layer" (1) be "a film," (2) be made of "a specific composition of chemical elements," (3) have a "specific doping concentration," (4) have boundaries "defined by a change in either the material composition or the doping concentration (or both)," and (5) that this "change" be made "during epitaxial growth of the LED." While it is true that a "layer" might have one or more of those properties, the court finds no evidence to support a finding that in every instance where "layer" is used in the patents-in-suit, it must have all of those properties.

Indeed, the patents describe dozens of "layers" that lack one or more of BridgeLux's required "layer" limitations. For example, a "disperser layer" in the '236 patent is not necessarily a "film," does not necessarily have a "doping concentration," and is not necessarily made through "epitaxial growth." See '236 patent, col. 8:44-49. Similarly, the "buffer layer" in the '738 patent is a different layer than the "growth layer," yet they may have the same material composition and doping concentration, differing only in crystalline structure. See '738 patent, col. 2:9-47.

The court finds that **"layer"** means "a defined thickness that is part of a material."

6. **non-single crystalline buffer layer**

This term is disputed with regard to claims 1, 9, 11, 13, 15, and 18-20 of the '738 patent; and claims 1, 5, 7, and 8 of the '819 patent. The parties agree that a "non-single crystalline layer" is "a layer that is not monocrystalline," and that a monocrystal is a single crystal of material. Cree/BU proposes that "non-single crystalline buffer layer" means "a layer of material that is not monocrystalline, located between the substrate and the first growth layer." BridgeLux proposes that it means "an amorphous layer or a crystallized amorphous layer with defects or a mixture thereof that isolates the substrate from the first growth layer to facilitate two dimensional growth."

There are three disputes between the parties that relate to this term. The first dispute is whether "non-single crystalline" as used in the '738 and '819 patents simply refers to a material that is not a monocrystal (Cree/BU's position), or whether out of all the materials that are not a monocrystal, this term is limited to only the amorphous materials, crystallized amorphous materials with defects, or a mixture of the two (BridgeLux's position).

Both the '738 and the '819 patents describe some forms of material that are not monocrystalline. See, e.g, '738 patent, col. 1:49 ("polycrystalline"); id., col. 2:41 ("film . . . is amorphous at the low temperatures of the nucleation step"); id., claims 11, 12 ("recrystallized, partially amorphous"); '819 patent, col. 9:55-57 ("the temperature is one factor in determining whether the nucleation layer will be amorphous or defective crystalline"); id., col. 4:61-64 ("At . . . higher temperatures . . . amorphous buffer layers crystallize and crystallinity of the defective crystalline buffer layers improves."). However, neither the claims nor the specification clearly defines "non-single crystalline."

Nevertheless, the court finds that Cree/BU's proposed construction is consistent with the inventor's use of "non-crystalline" in the prosecution of the '819 patent, which was filed based on an application in 2003, and was issued in 2007. The '819 patent is related to the '738 patent, which was filed based on an application in 1995, and was issued in 1997; and is also related to other patents that were issued in the interim. In 2006, during the prosecution of the '819 patent, the applicant responded to some of the examiner's concerns regarding what this family of patents had in common.

With regard to the use of the term "non-single crystalline," the applicant stated, "Non-single crystalline is merely a term or word used by a person of ordinary skill within the art to characterize a buffer layer or film that is polycrystalline, amorphous, or both as described in all the patents and application in the lineage of the present case." See '819 patent, April 20, 2006, Supplemental Amendment, at 10. The applicant also stated,

> [T]o those skilled in the art, a non-single-crystalline buffer layer is polycrystalline, amorphous, or a mixture of polycrystalline and amorphous . . . A GaN layer in general will of necessity be characterized by one or more of the terms crystalline, amorphous, or polycrystalline. As the buffer layer of the present application is clearly not single crystalline according to the disclosures, it must be non-single-crystalline, whether it is amorphous, polycrystalline, or a mixture thereof.

Id. at 6-7.

BridgeLux argues, however, that the applicant disclaimed buffer layers other than those that are amorphous or partially amorphous when deposited, when he stated in the same Supplemental Amendment that the various application disclosures that were combined into the '819 application "all have in common: (1) growth of a GaN buffer layer to form an amorphous layer or crystallized amorphous layer with defects or a mixture thereof; followed by (2) growth of an epitaxial growth layer that is monocrystalline and is grown over the buffer layer." Id. at 7-8.

Given that the applicant earlier in the same submission provided a clear definition of "non-single crystalline," the court finds that the subsequent statement cited by BridgeLux does not constitute a clear and unambiguous disclaimer of claim scope. See SanDisk Corp. v. Memorex Prods., Inc., 415 F.3d 1278, 1286-87 (Fed. Cir. 2005) (when patentee makes clear and unmistakable prosecution arguments limiting meaning of a claim term in order to overcome a rejection, court should limit relevant claim term to exclude disclaimed matter). The court adopts the definition provided by the applicant. "Non-single crystalline" refers to polycrystalline, amorphous, or a mixture of polycrystalline and amorphous – in short, any form that is not monocrystalline.

The second dispute is whether the "buffer layer" – which the parties agree must be located between the substrate and the first growth layer – must also "isolate the substrate from the first growth layer," as BridgeLux proposes. The word "isolate" appears nowhere in the specifications or claims of the '738 or '819 patents. The specifications describe embodiments of the claimed invention not by using the term "isolate," but by stating that a "majority" (but not all) of the first growth layer "does not see" or "contact" the "underlying substrate." See '738 patent, col. 4:46-48 ("the majority of the [growth layer] grows on top of the GaN buffer and does not see the underlying substrate"); '819 patent, col. 5:14-16 ("the majority of the [growth layer] grows on top of the GaN buffer and does not contact the underlying substrate"). The court finds that the intrinsic evidence does not support a finding that the buffer layer must completely "isolate" the substrate from the first growth layer.

The third dispute is whether the construction must contain the additional limitation that the buffer layer must "facilitate two-dimensional growth." There is no evidence in the intrinsic record that the buffer layer is limited to facilitating only two-dimensional growth. Indeed, the patents do not discuss the facilitation of two-dimensional growth.

The specification of the '738 patent states that "[t]he growth layer of GaN 'recognizes' the GaN buffer layer and on which it can grow without defects." '738 patent, col. 4:48-50. BridgeLux cites this statement to support its assertion that "two-dimensional growth" is implicated in the specification of the '738 patent, claiming that the growth layer described in the specification must "grow without defects." However, saying that the growth layer "can" grow on the buffer layer without defects is not the same as saying that it "must" grow without defects.

The court finds that **"non-single crystalline buffer layer"** means "a layer of material that is not monocrystalline, located between the first substrate and the first growth layer."

7. **on**

The meaning of "on" is disputed (1) in claims 20 and 23 of the '236 patent; claims 1, 2, 9, 11, 13, 15, and 18-20 of the '738 patent; and claims 1, 5, 7, and 8 of the '819 patent; and separately disputed as used (2) in the phrase "growth layer grown on the buffer layer" in claims 1, 9, 11, 19 of the '738 patent, and claim 5 of the '819 patent; and (3) in the phrase "growth layer on the buffer layer" in claims 1, 7, and 8 of the '819 patent.

Cree/BU proposes that "on" means "positioned indirectly or directly above." BridgeLux proposes, with regard to (1), that "on" means "positioned in direct contact with;" with regard to (2) and (3), that both "growth layer grown on the buffer layer" and "growth layer on the buffer layer" mean "a layer grown immediately after and positioned directly on the buffer layer." Thus, the basic dispute with regard to this term is whether a structure that is "on" another structure must be in direct contact with the second structure (BridgeLux's position), or whether it is simply "indirectly or directly above" (Cree/BU's position).

The word "on" is a common English term, and the parties point to no evidence showing that it is a technical term within the LED design field. Cree/BU cites a dictionary definition of "on" as meaning "so as to be or remain supported by or suspended from" – with the example of "put your package on the table." Cree/BU contends that its construction makes sense within this definition, as there is no dispute that a package would be "on" the table, even if the table were covered with a tablecloth. Thus, Cree/BU asserts, its definition incorporates "directly" (no tablecloth) and "indirectly" (with a tablecloth between), whereas BridgeLux's proposed construction would apply only if there were no tablecloth between the package and the table.

Where a term's ordinary meaning is readily apparent, the court may simply refer to the dictionary to nail down the "widely accepted meaning of commonly understood words." Phillips, 415 F.3d at 1314. Nevertheless, where the parties actually dispute the proper construction of a claim term, the court must still construe the term necessary to resolve the parties' dispute, rather than let an issue of claim interpretation be decided by the jury. O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co., Ltd., 521 F.3d 1351, 1361 (Fed. Cir. 2008).

Here, the intrinsic record shows that "on" is used to mean either direct or indirect placement, while "directly on" is used to indicate direct placement only. For example, "on" is used in the '236 patent specification to describe structures "on" each other that are not necessarily in direct contact. See '236 patent, col. 4:1-6 ("the LED structure and current spreading layers are grown on a substrate"); id., col. 5:48-50 ("[t]he LED structure, spreading layers and contacts are formed on a substrate 24 with the first spreading layer adjacent to the substrate").

The LED structure (p-type layer, n-type layer, and active layer) is sandwiched between the first and second spreader layers. Id., col. 3:57-61. As the invention is described in the specification, it is not possible for the LED structure and both spreader layers to all be "on" the substrate, if by "on" we mean "directly on." Moreover, when the inventor intended to specify direct contact, he used the term "directly on." Id., col. 5:51-54 ("an n-contact 28 can be deposited directly on the substrate").

The '738 patent describes growing a GaN film "on" a substrate and also indicates that a buffer layer is between the GaN film and the substrate. '738 patent, col. 4:46-48 ("This is because the majority of the film grows on the top of the GaN buffer and does not see the underlying substrate"). In the '738 patent prosecution history, the phrase "grown directly on" is used in the prosecution history to specify a semiconductor structure where two layers are in direct contact. Response to Office Action, July 3, 1996, at 11 ("the first GaN layer of Carter, which is grown directly on the substrate, is a single crystalline layer").

Similarly, the '819 patent specification also uses "directly on" to describe "direct contact." See '819 patent, col. 11:53-56 ("N-electrode 110 is then deposited directly on n-type layer 104 and p-electrode 108 is deposited directly on p-type layer 106"); id. col.

11:62-12:2 ("[A]n n-type GaN layer may be grown directly on the GaN substrate . . . P-type layer 106 could also be grown directly on the GaN substrate"). The term "grown on" is used in the '819 prosecution history to refer to being grown indirectly <u>or</u> directly on. Response to Office Action, June 29, 2004, at 6 ("Amano teaches growth of GaN on a sapphire substrate with or without an AlN buffer").

Moreover, during the prosecution of the '819 patent, the examiner used the term "on" to describe indirect contact and "directly on" to describe direct contact in the same paragraph. Office Action, March 29, 2004, at 4 ("Manabe shows GaN on sapphire . . . Manabe comprises a "buffer" of non-single crystalline GaN material directly on the sapphire overlying lateral growth layers of crystalline GaN material").

The court finds that **"on"** means "positioned indirectly or directly above."

8. **p-type**

This term is disputed with regard to claims 15 and 20 of the '738 patent. Claim 15 of the '738 patent recites "[a] semiconductor device having an activated p-type layer comprising . . . an activated p-type growth layer . . . . Claim 20 of the '738 patent recites "[a] semiconductor device having an activated p-type layer comprising . . . an activated p-type growth layer . . . ."

The dispute here is whether the proposed construction should incorporate the definition given to "p-type" in the specification of the '738 patent (Cree/BU's position), or whether the court should adopt the more general construction of "p-type" that the parties previously agreed to for the '236 patent (BridgeLux's position). Cree/BU proposes that "p-type" means "having dopants, impurities, or defects resulting in a hole density that exceeds the conduction electron density such that resistivity is less than 10^8 Ohm-cm [or Ω-cm] at room temperature." BridgeLux proposes that "p-type" means "a layer in which the majority of carriers are holes."

The '738 patent discusses four types of semiconductors – intrinsic, near-intrinsic, n-type, and p-type. <u>See</u>, <u>e.g.</u>, '738 patent, col. 2:3-6 ("The present invention presents a method to prepare near-intrinsic monocrystalline GaN films and to selectively dope these films – or p-type"); id., col. 3:27-30 ("Growth processes at lower temperatures should reduce the numbers of nitrogen vacancies in the lattice, prevent the unintentional n-type doping of the GaN lattice and result in intrinsic GaN.").

An intrinsic semiconductor has no dopants and a relatively high resistivity, in contrast to an extrinsic semiconductor, which has dopants added. Wiley, at 390. "For intrinsic GaN, . . . the resistivity is $3.6x10^{12}$ Ω-cm." '738 patent, col. 1:23-25. That is, because it has excess holes compared to an intrinsic semiconductor, a "near-intrinsic" semiconductor has a lower resistivity than an intrinsic semiconductor.

The parties have already agreed that a "near-intrinsic" semiconductor in the '738 patent is one "having a resistivity of greater than 10^8 Ohm-cm [Ω-cm] at room temperature." As noted above, the '738 patent distinguishes near-intrinsic from n-type and p-type semiconductors. The '738 patent "presents a method to prepare near-intrinsic monocrystalline GaN films and to selectively dope those films – or p-type." '738 patent, col. 2:3-6. "P-type and n-type semiconductors can be selectively prepared simply by choice of surface or grid bias and impurity source." Id., col. 3-3-5.

The '738 patent uses "near intrinsic" to describe materials having some excess holes or some excess electrons, but not enough for the material to be useful for conducting current in a semiconductor device. See '738 patent, col. 1:66-2:1 ("Current methods of preparing GaN does not permit control of nitrogen vacancies within the lattice. Thus it has not been possible to prepare intrinsic GaN.").

The p-type and n-type materials differ from near-intrinsic materials because they have a higher concentration of dopants, impurities, or defects, and are therefore more conductive to electricity than near-intrinsic materials. Thus, as noted above, the patent distinguishes "p-type" semiconductors having significantly more holes than electrons (and therefore having resistivities lower than 10^8 Ω-cm at room temperature) from "near intrinsic" semiconductors, which may have more holes than electrons, but not enough to make the semiconductor sufficiently conductive.

The applicant also relied on the distinction between a near-intrinsic layer and – and p-type layers to overcome the prior art. Response to Office Action, July 3, 1996, at 10 ("The Office Action fails to assert that either Amano or Boulou disclose a device having a near intrinsic gallium nitride layer with resistivity of greater than 10^8 Ω-cm at room temperature. Applicant asserts that neither reference discloses or suggests this feature.").

BridgeLux's proposed construction is inconsistent with the use of "p-type" in the '738 patent because it eliminates the distinction between a "near-intrinsic" layer and a "p-type" layer. '738 patent, col. 2:3-6 ("The present invention presents a method to prepare near-intrinsic monocrystalline GaN films and to selectively dope these films – or p-type."). In the '738 patent, a "near-intrinsic" material does not become "p-type" until it has sufficient dopants, impurities, or defects to lower the resistivity of the material to less than 10^8 Ω-cm at room temperature.

While the formerly-agreed-upon construction (in the Texas action) also applies in the context of the '236 patent, the term "p-type" is used somewhat differently in the context of the '738 patent, and the construction agreed for the '236 patent will not work here. The '236 patent divides certain LED layers into two groups – p-type layers in which a majority of the charge carriers are holes, and n-type layers in which the majority of charge carriers are electrons. '236 patent, col. 3:57-59 ("The new LED comprises an LED structure having a p-type layer, an n-type layer, and an active layer between the p-type and the n-type layers."). The agreed construction for the '236 patent does not account for the "near-intrinsic" materials described and claimed in the '738 patent.

As described in the specification, the method taught by the '738 patent is to, first, prepare near-intrinsic monocrystalline GaN films, and second, to dope those films so they become either p-type or n-type. The distinction between "near intrinsic" and "p-type" (as well as n-type) materials is fundamental to the invention of the '738 patent, as specified in col. 2:3-6 ("The present invention presents a method to prepare near-intrinsic monocrystalline GaN films and to selectively dope these films – or p-type."). BridgeLux's proposed construction would eliminate that distinction, as a "near-intrinsic" material has an imbalance of either holes or electrons, even though the imbalance would not be significant or high enough to enable conductivity.

The court finds that **"p-type"** as used in the '738 patent means "having dopants, impurities, or defects resulting in a hole density that exceeds the conduction electron density such that resistivity is less than 10^8 Ohm-cm [or Ω-cm] at room temperature."

9. **spreader layer**

This term is disputed with regard to claims 1, 2, 20, and 23 of the '236 patent. The parties agree that a "spreader layer" is a layer that spreads current in an LED. Cree/BU proposes that "spreader layer" means simply "a layer that spreads current." BridgeLux proposes that "spreader layer" means "a layer intended to, and having as its primary purpose, the spreading of electrical current laterally in a direction parallel to the LED layers," and adds the further limitations that a "spreader layer" is "designed to avoid current crowding and provide nearly uniform current injection," and is "separate from the p-type, n-type, and active layers in 'the LED structure.'"

The dispute between the parties is whether the construction of "spreader layer" must also include the additional limitations found in BridgeLux's proposed construction. These limitations are (1) that the spreader layer is "intended to" and "has as its primary purpose to" spread electrical current; (2) that the spreader layer is "designed to" avoid current crowding and provide nearly uniform current injection; and (3) that the spreader layer is "separate from" the p-type layer, the n-type layer, and the active layer in the LED structure.

The court is not persuaded that any of these limitations are necessary to the proper construction of "spreader layer." The LED structure taught in the '236 patent has a p-type layer, an n-type layer, and an active layer between the p-type layer and the n-type layer; and is "sandwiched between a first spreader layer and a second spreader layer." '236 patent, col. 3:57-58-61. These "spreader layers" are "semiconducting or conducting layers." Id., col. 3:61-62.

It is clear from the specification that it is the function of the spreader layers to spread electrical current. Id., col. 61-64 ("spreader layers . . . distribute current across the plane of the device so that current is efficiently injected into the active layer;" id. col. 5:37-44 ("a first spreading layer . . . is made of a conductive material which spreads current from a first contact pad . . . [and a] second spreading layer of conducting material is also included in the LED structure's top layer to spread current from a second contact").

BridgeLux argues that while it is accurate to say that the spreader layers disclosed by the '236 patent are layers that "spread current," it is also arguably accurate to say that about almost every other layer of the '236 patent. Thus, BridgeLux asserts, Cree/BU's proposed construction is inconsistent with the embodiments of the '236 patent, because all layers in the device that have some measure of conductivity would be "spreader layers."

The court finds, however, that BridgeLux has not established that one of skill in the art would presume that any layer that "conducts" current also "spreads" that current as described in the '236 patent. The inventor distinguished "conducting" electrical current from "spreading" electrical current. While it is true that some, if not all, of the other layers in the '236 patent's LED structure have some measure of conductivity to pass electrical current, it is only the spreader layer that is identified as "spreading" or "distributing" current across the plane of the LED device "so that current is efficiently injected into the active layer" in order to "increas[e] the LED's light extraction and overall efficiency." Id., col. 3:53-64.

In addition, the '236 patent indicates that electrically conductive structures in an LED can have various purposes and functions and still act as spreader layers. For example, claim 3 recites "[t]he LED of claim 1, wherein said substrate is electrically conductive and serves as a spreader layer." Id., claim 3. Similarly, in describing one embodiment, the specification explains that "the LEO growth conditions are adjusted to create LEE voids 92 over the mask material 94. The voids 92 serve as linear (or curved) LEEs internal to the first spreader layer 96." Id., col. 8:17-21. In two other embodiments, the specification notes that "Figs. 10 and 11 show new LEDs 130 and 140, where their respective disperser layers 134, 144 are placed within their first spreader layer 132, 142." Id., col. 9:28-30.

Nor is there any reason to limit a "spreader layer" to being "separate from" the p-type, n-type, and active layers in the LED structure. The '236 patent explicitly allows for other layers to be placed in the LED structure, as noted above in the discussion of the disputed term "having." Moreover, the addition of the phrase "separate from" introduces ambiguity into the claim term because it implies that the spreader layer is never in direct contact with the LED structure, when the intrinsic evidence makes clear that the spreader layer can be both indirectly or directly "adjacent" or "on" the LED structure. See id., claim 1 ("first spreader layer adjacent to said LED structure"); id., claim 23 ("second spreader layer on said top layer").

The court finds that **"spreader layer"** means "a layer that spreads current."

10. **substrate**

This term is disputed with regard to claims 2 and 23 of the '236 patent; claims 1, 6, 9, 11, 13, 15, and 18-20 of the '738 patent; and claims 1, 5, 7, and 8 of the '819 patent.

Cree/BU proposes that "substrate" means "the base material upon which the layers of the light emitting diode are formed." Although BridgeLux does not believe that it is necessary to construe "substrate" in this action, BridgeLux offers as a proposed construction, "the base material or other surface upon which something is deposited, etched, attached or otherwise prepared or fabricated. A substrate also provides physical support."

The dispute here is whether a person of ordinary skill in the art would understand "substrate" as used in the patents-in-suit to be base material upon which the layers of the LED are formed (Cree/BU's position), or to have a broad meaning encompassing types of base materials from various fields outside of LED manufacturing (BridgeLux's position).

The patents-in-suit describe "substrate" to mean a base material in a semiconductor growth process for LEDs. See '236 patent, col. 3:24-27 ("GaN devices are grown on sapphire substrates"); id., col. 4:1-4 ("In most embodiments, the LED structure and current spreading layers are grown on a substrate that is adjacent to the first spreader layer"); id., col. 4:39-41 ("The disperser layer can be formed in or on the substrate prior to epitaxial growth of the LED"); id., col. 5:48-50 ("The LED structure, spreading layers and contacts are formed on a substrate"); '738 patent, col. 5:1-8 ("The growth process is carried out . . . so that Ga, nitrogen, and acceptor are deposited on the electron-rich surface of the substrate"); '819 patent, col. 4:2-4 ("On certain substrates, GaN films grow in the wurtzite structure and on others in the zincblend structure"); id., col. 5:34-37 ("The growth process is carried out . . . so that gallium, nitrogen and acceptors are deposited on the electron-rich surface of the substrate").

Moreover, the '236 patent distinguishes a "substrate" – upon which additional layers of an LED are epitaxially grown or formed – from a "submount" – upon which layers of an LED are "affixed" or "mounted." See '236 patent, claims 2 and 22 (claiming an LED with a "substrate" (claim 2) and further comprising a "submount" (claim 22)); id., col. 10:15-44 & Figs. 14, 15 (describing LEDs grown on a substrate and then mounted on a submount using flip-chip bonding techniques, distinguishing between the "submount" to which things are attached, and the "substrate" on which things are grown).

The court finds that **"substrate"** means "the base material upon which the layers of the light emitting diode are formed."

CONCLUSION

In accordance with the foregoing, the court finds as follows:

1. **"Active layer"** means "a layer of material in a light-emitting diode (LED) in which electrons and holes recombine to generate photons when current is applied."

2. **"Adjacent"** means "near or next to."

3. **"Dopant material"** means "a material intentionally introduced into a semiconductor material to alter its electrical properties, to dope it with either an acceptor or a donor."

4. **"Having"** means "including but not limited to."

5. **"Layer"** means "a defined thickness that is part of a material."

6. **"Non-single crystalline buffer layer"** means "a layer of material that is not monocrystalline, located between the first substrate and the first growth layer."

7. **"On"** means "positioned indirectly or directly above."

8. **"P-type"** as used in the '738 patent means "having dopants, impurities, or defects resulting in a hole density that exceeds the conduction electron density such that

resistivity is less than 10^8 Ohm-cm [or Ω-cm] at room temperature."

9. **"Spreader layer"** means "a layer that spreads current."

10. **"Substrate"** means "the base material upon which the layers of the light emitting diode are formed."

Per the standing order, the court will conduct a case management conference on September 18, 2008, at 2:30 p.m.

IT IS SO ORDERED.

Dated: August 15, 2008

PHYLLIS J. HAMILTON
United States District Judge