

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

511 INNOVATIONS, INC.,

Plaintiff,

v.

HTC AMERICA, INC. ET AL.,

Defendant(s).

Case No. 2:15-cv-1524-JRG-RSP

MEMORANDUM OPINION AND ORDER

Before the Court is the opening claim construction brief of 511 Innovations, Inc. (“Plaintiff”) (Dkt. No. 139, filed on July 13, 2016),¹ the response of AMS-TAOS USA Inc., ams AG, Huawei Device USA Inc., Samsung Electronics America, Inc., Samsung Electronics Co., Ltd., ZTE (USA) Inc., Microsoft Mobile Inc., Microsoft Mobile Oy, Microsoft Corporation, Avago Technologies U.S. Inc., Avago Technologies Limited, Avago Technologies General IP (Singapore) Pte. Ltd., Avago Technologies Trading Ltd., Avago Technologies International Sales Pte. Limited, HTC America, Inc., HTC Corporation, Capella Microsystems, Inc., Vishay Capella Microsystems (Taiwan) Limited, and Vishay Intertechnology, Inc. (collectively, “Defendants”) (Dkt. No. 148, filed on July 28, 2016), and the reply of Plaintiff (Dkt. No. 149, filed on August 3, 2016). The Court held a claim construction hearing on September 16, 2016. Having considered the arguments and evidence presented by the parties at the hearing and in their briefing, the Court issues this Order.

¹ Citations to the parties’ filings are to the filing’s number in the docket (Dkt. No.) and pin cites are to the page numbers assigned through ECF.

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I. BACKGROUND

Plaintiff alleges infringement of eight U.S. Patents: No. 6,307,629 (the “’629 Patent”), No. 6,490,038 (the “’038 Patent”), No. 6,915,955 (the “’955 Patent”), No. 7,110,096 (the “’096 Patent”), No. 7,113,283 (the “’283 Patent”), No. 7,397,541 (the “’541 Patent”), No. 8,472,012 (the “’012 Patent”), and No. 8,786,844 (the “’844 Patent”) (collectively, the “Asserted Patents”). The Asserted Patents include somewhat similar disclosures and all are generally directed to technology for measuring characteristics of light, such as color and intensity.

The ’629, ’038, ’955, and ’283 Patents are related through priority claims. The ’629 Patent is entitled “Apparatus and Method for Measuring Optical Characteristics of an Object.” The ’629 Patent issued on October 23, 2001. The ’038 Patent issued from a continuation of the ’629 Patent’s application and is entitled “Apparatus and Method for Measuring Optical Characteristics of an Object.” The ’038 Patent issued on December 3, 2002. The ’955 Patent is related to the ’629 Patent through a continuation-in-part application. It is entitled “Apparatus for Determining Multi-Bit Data Via Light Received by a Light Receiver and Coupled to Spectral Sensors That Measure Light in Spectral Bands.” The ’955 Patent issued on July 12, 2005. The ’283 Patent is related to the ’629 Patent through a series of continuation applications. It is entitled “Apparatus and Method for Measuring Color.” It issued on September 26, 2006. The earliest priority date stated on any of these patents is January 2, 1996.

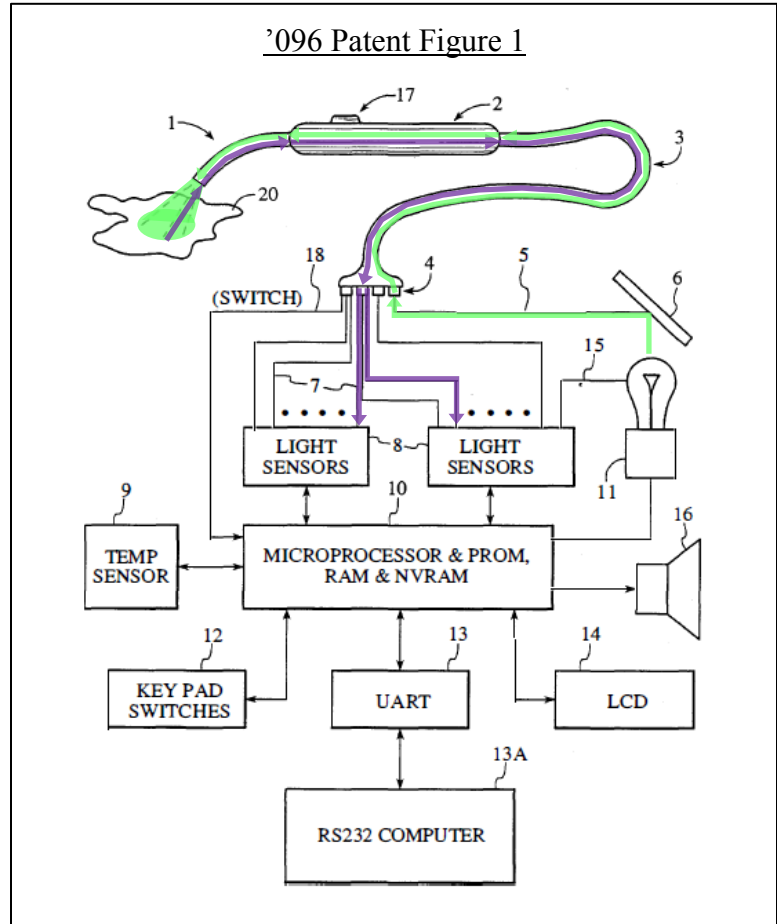
The ’096, ’541, and ’012 Patent are related through priority claims. The ’096 Patent is entitled “Method for Determ[in]ing Optical Characteristics Through a Protective Barrier.” The ’096 Patent issued on September 19, 2006. The ’541 Patent issued from a continuation of the ’096 Patent’s application and is entitled “Apparatus and Method for Measuring Optical Characteristics of an Object.” The ’541 Patent issued on July 28, 2008. The ’012 Patent is related

to the '096 Patent through a series of continuation applications. It is entitled “Apparatus Having a First Optical Sensor Making a First Measurement to Detect Position and a Second Optical Sensor Making a Second Measurement.” The '012 Patent issued on June 25, 2013. The earliest priority date stated on any of these patents is January 2, 1997.

The '844 Patent is entitled “Apparatus for Measuring Optical Characteristics Including Position Detection.” The patent issued on July 22, 2014. The earliest priority date stated on this patent is June 30, 1998.

The technology of the Asserted Patents can be generally understood with reference to

Figure 1 of the '096 Patent, reproduced here and annotated by the Court. The figure depicts an embodiment in which characteristics of an object (20) are determined by shining light on the object (shown in green) and collecting light reflected from the object (shown in purple). The collected light is converted to electronic signals in light sensors (8) and those signals are processed to determine characteristics of the object, such as color, translucency, fluorescence, surface texture, and



luminance. '096 Patent col.3 l.34 – col.4 l.48, col.5 l.49 – col.8 l.21.

The abstracts of the Asserted Patents provide as follows: '629 Patent:

Color measuring systems and methods are disclosed. Perimeter receiver fiber optics are spaced apart from a central source fiber optic and receive light reflected from the surface of the object being measured. Light from the perimeter fiber optics pass to a variety of filters. The system utilizes the perimeter receiver fiber optics to determine information regarding the height and angle of the probe with respect to the object being measured. Under processor control, the color measurement may be made at a predetermined height and angle. Various color spectral photometer arrangements are disclosed. Translucency, fluorescence and/or surface texture data also may be obtained. Audio feedback may be provided to guide operator use of the system. The probe may have a removable or shielded tip for contamination prevention.

'038 Patent:

Color measuring systems and methods are disclosed. Perimeter receiver fiber optics are spaced apart from a central source fiber optic and receive light reflected from the surface of the object being measured. Light from the perimeter fiber optics pass to a variety of filters. The system utilizes the perimeter receiver fiber optics to determine information regarding the height and angle of the probe with respect to the object being measured. Under processor control, the color measurement may be made at a predetermined height and angle. Various color spectral photometer arrangements are disclosed. Translucency, fluorescence and/or surface texture data also may be obtained. Audio feedback may be provided to guide operator use of the system. The probe may have a removable or shielded tip for contamination prevention.

'955 Patent:

Optical characteristic measuring systems and methods such as for determining the color or other optical characteristics of teeth are disclosed. Perimeter receiver fiber optics preferably are spaced apart from a source fiber optic and receive light from the surface of the object/tooth being measured. Light from the perimeter fiber optics pass to a variety of filters. The system utilizes the perimeter receiver fiber optics to determine information regarding the height and angle of the probe with respect to the object/tooth being measured. Under processor control, the optical characteristics measurement may be made at a predetermined height and angle. Various color spectral photometer arrangements are disclosed. Translucency, fluorescence, gloss and/or surface texture data also may be obtained. Audio feedback may be provided to guide operator use of the system. The probe may have a removable or shielded tip for contamination prevention. A method of producing dental prostheses based on measured data also is disclosed. Measured data also may be stored and/or organized as part of a patient data base. Such methods and implements may be desirably utilized for purposes of detecting and preventing counterfeiting or the like. Low cost and small form factor spectrometers, and methods for manufacturing the same, also are disclosed.

Spectrometers and spectrophotometers embedded in printing and scanning and other type devices, as well as computer companion devices, scope-type devices and the like, also are disclosed. Data encoding based on such devices also may be implemented.

'096 Patent:

Color/optical characteristics measuring systems and methods are disclosed. Perimeter receiver fiber optics/elements are spaced apart from a central source fiber optic/element and received light reflected from the surface of the object is measured. Light from the perimeter fiber optics pass to a variety of filters. The system utilizes the perimeter receiver fiber optics to determine information regarding the height and angle of the probe with respect to the object being measured. Under processor control, the color measurement may be made at a predetermined height and angle. Various color spectral photometer arrangements are disclosed. Translucency, fluorescence and/or surface texture data also may be obtained. Audio feedback may be provided to guide operator use of the system. The probe may have a removable or shielded tip for contamination prevention.

'283 Patent:

Color measuring systems and methods are disclosed. Perimeter receiver fiber optics are spaced apart from a central source fiber optic and receive light reflected from the surface of the object being measured. Light from the perimeter fiber optics pass to a variety of filters. The system utilizes the perimeter receiver fiber optics to determine information regarding the height and angle of the probe with respect to the object being measured. Under processor control, the color measurement may be made at a predetermined height and angle. Various color spectral photometer arrangements are disclosed. Translucency, fluorescence and/or surface texture data also may be obtained. Audio feedback may be provided to guide operator use of the system. The probe may have a removable or shielded tip for contamination prevention.

'541 Patent:

Color/optical characteristics measuring systems and methods are disclosed. Perimeter receiver fiber optics/elements are spaced apart from a central source fiber optic/element and received light reflected from the surface of the object is measured. Light from the perimeter fiber optics pass to a variety of filters. The system utilizes the perimeter receiver fiber optics to determine information regarding the height and angle of the probe with respect to the object being measured. Under processor control, the color measurement may be made at a predetermined height and angle. Various color spectral photometer arrangements are disclosed. Translucency, fluorescence and/or surface texture data also may be obtained. Audio feedback may be provided to guide operator use of the system. The probe may have a removable or shielded tip for contamination prevention.

'012 Patent:

An apparatus measuring optical characteristics including position detection is disclosed. A processor is coupled to a display. A first optical sensor makes a first measurement, and a second optical sensor makes a second measurement. A source of illumination and the first optical sensor determine a minimal distance between the apparatus and an external object such that illumination emitted by the source is not received by the first optical sensor when the apparatus is less than the minimal distance from the external object. A position of the apparatus with respect to an object and an optical property of light received by the apparatus are determined. A transparent member with a thickness less than the minimal distance may provide illumination external to the apparatus and receive light from external to the apparatus.

'844 Patent:

An apparatus measuring optical characteristics including position detection is disclosed. A processor is coupled to a display. A first optical sensor makes a first measurement and a second optical sensor makes a second measurement. A source of illumination provides illumination in the IR range it and the first optical sensor determine a minimal distance between the apparatus and an external object such that illumination emitted by the source is not received by the first optical sensor when the apparatus is less than the minimal distance from the external object. A position of the apparatus with respect to an object and an optical property of light received by the apparatus are determined. A transparent member having a thickness less than the minimal distance may be provided through which the source provides illumination and receives illumination external to the apparatus.

Method Claim 1 of the '096 Patent and system Claim 1 of the '844 Patent recite:

'096 Patent

1. A method for determining optical characteristics of an object, comprising the steps of:
positioning a probe in proximity to the object, wherein the probe provides light to the object from one or more light sources, and receives light from the object through one or more light receivers, wherein the one or more light sources and one or more light receivers define at least one minimal height, wherein, when the probe is a distance from the object that is less than the minimal height, light that is reflected from a surface of the object is not propagated by the one more light receivers, wherein the light is provided to the object and received from the object through a protective barrier having a thickness, wherein the thickness is less than the minimal height;
measuring the intensity of light received and propagated by one of the one or more light receivers;
determining the optical characteristics of the object based in response to one or more intensity measurements.

'844 Patent

1. An apparatus comprising:
a processor;
a display coupled to the processor and displaying information to a user of the apparatus;
at least a first optical sensor making a first measurement, wherein data based on the first measurement is coupled to the processor;
at least a second optical sensor making a second measurement, wherein data based on the second measurement is coupled to the processor;
at least one source of illumination operating in the IR range of illumination under control of the processor;
wherein the source of illumination and the first optical sensor in part determine a minimal distance between the apparatus and an external object such that illumination in the IR range emitted by the source is not received by the first optical sensor when the apparatus is less than the minimal distance from the external object;
wherein data based on the first measurement made with the first optical sensor determines a position of the apparatus with respect to an object;
wherein the second measurement with the second optical sensor measures light received by the apparatus.

II. LEGAL PRINCIPLES

A. Claim Construction

“It is a ‘bedrock principle’ of patent law that ‘the 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) (en banc) (quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). To determine the meaning of the claims, courts start by considering the intrinsic evidence. *Id.* at 1313; *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 861 (Fed. Cir. 2004); *Bell Atl. Network Servs., Inc. v. Covad Commc’ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). The intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *Phillips*, 415 F.3d at 1314; *C.R. Bard, Inc.*, 388 F.3d at 861. The general rule—subject to certain specific exceptions discussed *infra*—is that each claim term is construed according to its ordinary and accustomed meaning as understood by one of ordinary skill in the art at the time of the invention in the context of the patent. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int’l Trade Comm’n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003); *Azure Networks, LLC v. CSR PLC*, 771 F.3d 1336, 1347 (Fed. Cir. 2014) (“There is a heavy presumption that claim terms carry their accustomed meaning in the relevant community at the relevant time.”) (vacated on other grounds).

“The claim construction inquiry. . . begins and ends in all cases with the actual words of the claim.” *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1248 (Fed. Cir. 1998). “[I]n all aspects of claim construction, ‘the name of the game is the claim.’” *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1298 (Fed. Cir. 2014) (quoting *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998)). First, a term’s context in the asserted claim can be instructive. *Phillips*, 415 F.3d at 1314. Other asserted or unasserted claims can also aid in determining the claim’s meaning, because claim terms are typically used consistently throughout the patent. *Id.*

Differences among the claim terms can also assist in understanding a term's meaning. *Id.* For example, when a dependent claim adds a limitation to an independent claim, it is presumed that the independent claim does not include the limitation. *Id.* at 1314–15.

“[C]laims ‘must be read in view of the specification, of which they are a part.’” *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc)). “[T]he specification ‘is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.’” *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). But, “[a]lthough the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into the claims.” *Comark Commc’ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998) (quoting *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988)); *see also Phillips*, 415 F.3d at 1323. “[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited.” *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004).

The prosecution history is another tool to supply the proper context for claim construction because, like the specification, the prosecution history provides evidence of how the U.S. Patent and Trademark Office (“PTO”) and the inventor understood the patent. *Phillips*, 415 F.3d at 1317. However, “because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes.” *Id.* at

1318; *see also Athletic Alternatives, Inc. v. Prince Mfg.*, 73 F.3d 1573, 1580 (Fed. Cir. 1996) (ambiguous prosecution history may be “unhelpful as an interpretive resource”).

Although extrinsic evidence can also be useful, it is “less significant than the intrinsic record in determining the legally operative meaning of claim language.” *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert’s conclusory, unsupported assertions as to a term’s definition are entirely unhelpful to a court. *Id.* Generally, extrinsic evidence is “less reliable than the patent and its prosecution history in determining how to read claim terms.” *Id.* The Supreme Court recently explained the role of extrinsic evidence in claim construction:

In some cases, however, the district court will need to look beyond the patent’s intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period. *See, e.g., Seymour v. Osborne*, 11 Wall. 516, 546 (1871) (a patent may be “so interspersed with technical terms and terms of art that the testimony of scientific witnesses is indispensable to a correct understanding of its meaning”). In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factual findings about that extrinsic evidence. These are the “evidentiary underpinnings” of claim construction that we discussed in *Markman*, and this subsidiary factfinding must be reviewed for clear error on appeal.

Teva Pharm. USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831, 841 (2015).

B. Departing from the Ordinary Meaning of a Claim Term

There are “only two exceptions to [the] general rule” that claim terms are construed according to their plain and ordinary meaning: “1) when a patentee sets out a definition and acts

as his own lexicographer, or 2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.”² *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Sols., LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) (“[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal.”). The standards for finding lexicography or disavowal are “exacting.” *GE Lighting Sols.*, 750 F.3d at 1309.

To act as his own lexicographer, the patentee must “clearly set forth a definition of the disputed claim term,” and “clearly express an intent to define the term.” *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee’s lexicography must appear “with reasonable clarity, deliberateness, and precision.” *Renishaw*, 158 F.3d at 1249.

To disavow or disclaim the full scope of a claim term, the patentee’s statements in the specification or prosecution history must amount to a “clear and unmistakable” surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 (“The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.”). “Where an applicant’s statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.” *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

² Some cases have characterized other principles of claim construction as “exceptions” to the general rule, such as the statutory requirement that a means-plus-function term is construed to cover the corresponding structure disclosed in the specification. *See, e.g., CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1367 (Fed. Cir. 2002).

C. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)³

A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a “means . . . for performing a specified function” and that an act may be claimed as a “step for performing a specified function.” *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes “means” or “step for” terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when “the claim language, read in light of the specification, recites sufficiently definite structure” (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap-On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when “the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure”); *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an “act” corresponding to “how the function is performed”); *Personalized Media Communications, L.L.C. v. International Trade Commission*, 161 F.3d 696, 704 (Fed. Cir. 1998) (§ 112, ¶ 6 does not apply when the claim includes “sufficient structure, material, or acts within

³ Because the applications resulting in the Asserted Patents were filed before September 16, 2012, the effective date of the America Invents Act (“AIA”), the Court refers to the pre-AIA version of § 112.

the claim itself to perform entirely the recited function . . . even if the claim uses the term ‘means.’” (quotation marks and citation omitted).

When it applies, § 112, ¶ 6 limits the scope of the functional term “to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof.” *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. “The first step . . . is a determination of the function of the means-plus-function limitation.” *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). “[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof.” *Id.* A “structure disclosed in the specification is ‘corresponding’ structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim.” *Id.* The focus of the “corresponding structure” inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is “clearly linked or associated with the [recited] function.” *Id.* The corresponding structure “must include all structure that actually performs the recited function.” *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005). However, § 112 does not permit “incorporation of structure from the written description beyond that necessary to perform the claimed function.” *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather

the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

D. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)⁴

Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. A claim, when viewed in light of the intrinsic evidence, must “inform those skilled in the art about the scope of the invention with reasonable certainty.” *Nautilus Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). If it does not, the claim fails § 112, ¶ 2 and is therefore invalid as indefinite. *Id.* at 2124. Whether a claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. *Id.* at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. “[I]ndefiniteness is a question of law and in effect part of claim construction.” *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

When a term of degree is used in a claim, “the court must determine whether the patent provides some standard for measuring that degree.” *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1378 (Fed. Cir. 2015) (quotation marks omitted). Likewise, when a subjective term is used in a claim, “the court must determine whether the patent’s specification supplies some standard for measuring the scope of the [term].” *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); accord *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed

⁴ Because the applications resulting in the Asserted Patents were filed before September 16, 2012, the effective date of the America Invents Act (“AIA”), the Court refers to the pre-AIA version of § 112.

functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art “would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim.” *Id.* at 1352.

III. CONSTRUCTION OF DISPUTED TERMS

A. “probe,” “light receivers,” “propagated”

Disputed Term⁵	Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“probe” <ul style="list-style-type: none"> • ’038 Patent Claim 127 • ’283 Patent Claim 21 • ’096 Patent Claim 1 	plain and ordinary meaning <ul style="list-style-type: none"> • alternatively: “a device used for measuring, testing, or obtaining information” 	“fiber optic instrument that carries light to measure an object’s optical characteristics”
“light receivers” <ul style="list-style-type: none"> • ’629 Patent Claim 98 • ’038 Patent Claim 127 • ’283 Patent Claim 21 • ’955 Patent Claim 1 • ’096 Patent Claim 1 • ’541 Patent Claim 1 	plain and ordinary meaning	“fiber optics receiving reflected light”
“propagated” <ul style="list-style-type: none"> • ’096 Patent Claim 1 • ’541 Patent Claim 1 	plain and ordinary meaning	“transmitted along a fiber optic”

Because the parties’ arguments and proposed constructions with respect to these terms are related, the Court addresses the terms together.

⁵ For all term charts in this order, the claims in which the term is found are listed with the term but: (1) only the highest level claim in each dependency chain is listed, and (2) only asserted claims identified in the parties’ Joint Claim Construction Chart (Dkt. No. 154) are listed. During the hearing, the parties determined that certain claims were inadvertently omitted from this chart that was submitted pursuant to P.R. 4-5(d). Subsequent to the hearing, Defendants submitted a unilateral amendment to the P.R. 4-5(d) chart listing more claims. Dkt. No. 174. It is not uncommon for parties to agree to constructions, or to slightly modify constructions, in light of the completed claim-construction briefing. The Court relies on the statements in the P.R. 4-5(d) chart “in tracking and resolving disputed terms.” P.R. 4-5(d)(3). The P.R. 4-5(d) chart governs and must be accurate.

The Parties' Positions

Plaintiff submits that because claims that issued from prosecution and other claims that were canceled in prosecution expressly recite “fiber optics” such a limitation should not be read into claims that do not recite “fiber optics.” Dkt. No. 139 at 15–19. With respect to “propagated” and “light receivers,” Plaintiff submits that the terms are used in the Asserted Patents according to their customary meanings and are readily understood without construction. *Id.* at 16. With respect to “probe,” Plaintiff submits that while the term is used according to its customary meaning in the patents, the term should be construed to clarify which customary meaning of the term applies in the context of the patents. *Id.*

In addition to the claims themselves, Plaintiff cites the following intrinsic and extrinsic evidence to support its position: **Intrinsic evidence:** ’629 Patent col.1 ll.10–15, col.2 ll.23–25, col.3 ll.7–10, col.3 ll.15–19, col.3 ll.59–64, col.4 ll.1–28, col.4 ll.34–41, col.4 ll.55–60, col.5 ll.1–3, col.5 ll.12–14, col.5 ll.15–33, col.5 l.45 – col.6 l.11, col.7 ll.33–41, col.7 ll.50–53, col.8 ll.48–50, col.11 ll.3–28, col.11 ll.46–53, col.12 ll.5–16, col.13 l.43 – col.14 l.16, col.16 ll.6–21, col.21 ll.39–44; ’096 Patent col.3 ll.36–47, col.8 ll.4–10, col.22 l.54 – col.23 l.34, col.23 ll.49–63, col.27 l.57 – col.28 l.6, col.28 ll.27–45; ’844 Patent col.35 ll.40–55; ’629 Patent File Wrapper (excerpts) (Plaintiff’s Ex. 11, Dkt. No. 139-11). **Extrinsic evidence:** *Oxford Dictionary and Thesaurus* (Am. ed. 1996), “probe” (Plaintiff’s Ex. 9, Dkt. No. 139-9); Oxforddictionaries.com, “probe” (Plaintiff’s Ex. 10, Dkt. No. 139-10)⁶.

Defendants respond that the “probe” of the ’283, ’038, and ’096 Patents is defined as comprising fiber optics, both light-source fiber optics and light-receiver fiber optics. Dkt. No. 148 at 13–15. Defendants rely on language describing the probe of the “present invention”, e.g.:

⁶ http://www.oxforddictionaries.com/us/definition/american_english/probe

In accordance with the present invention, devices and methods are provided for measuring the color of objects, reliably and with minimal problems of height and angular dependence. ***A handheld probe is utilized in the present invention, with the handheld probe containing a number of fiber optics.*** *Light is directed from one (or more) light source fiber optics towards the object to be measured, which in certain preferred embodiments is a central light source fiber optic (other light source arrangements also may be utilized). Light reflected from the object is detected by a number of light receiver fiber optics.*

Dkt. No. 148 at 13–14 (quoting ’629 Patent col.3 ll.22–33 (emphasis added by Defendants)). Defendants further respond that all the embodiments in these patents have a fiber-optic probe and the inventions of the patents are explained with reference to the physics of fiber optics. *Id.* at 14–15. As such, Defendants conclude, “probe” should be construed as a fiber-optic instrument. *Id.* at 15. Defendants further respond that “propagate” is used in the Asserted Patents “exclusively to refer to transmitting light along a fiber optic,” and should be accordingly construed. *Id.* Defendants argue that Plaintiff’s alternative proposed construction for “probe” contradicts the patents’ definition of the term and is unsupported by the extrinsic evidence, the prosecution history, or claim differentiation. *Id.* at 17–20. Specifically, Defendants argue that Plaintiff improperly ignores more applicable dictionary definitions (a “probe” is a “blunt ended surgical instrument used for exploring a wound or part of the body”) and ignores portions of the definition it relies upon (a “probe” is “any small device, esp. an electrode, for measuring, testing, etc.”). *Id.* at 17–19. Defendants also argue the “fiber optics” term in Claim 100 of the ’629 Patent (claim 96 as filed)— “wherein the light is coupled to the color filter through one or more optics”—does not narrow “probe” or “light receiver” so Plaintiff’s claim-differentiation argument is unfounded. *Id.* at 19–20. And Defendants argue that while filed claim 1 recited a configuration of “fiber optics,” that apparatus claim was replaced with method claims and “there are no legal conclusions relevant to claim interpretation to be drawn from” filed claim 1. *Id.*

In addition to the claims, Defendants cite the following intrinsic and extrinsic evidence as support: **Intrinsic evidence:** '629 Patent col.3 ll.22–33, col.3 ll.25–27, col.4 ll.42–43, col.4 ll.57–60, col.5 l.10 – col.6 l.10, col.5 l.64 – col.6 l.5, col.8 ll.1–50, col.11 ll.24–28, col.11 l.38 – col.13 l.9, figs.1-3, 4A-4C, 8A, 8B, 10C, 10D; '283 Patent col.4 ll.47–48; '096 Patent col.3 ll.35–47, col.4 ll.63–64, col.6 ll.34–42, col.12 ll.9–14, col.12 l.25 – col.14 l.13, col.28 ll.2–4; '038 Patent col.4 ll.42–43; '629 Patent File Wrapper (excerpts) (Plaintiff's Ex. 11, Dkt. No. 139-11). **Extrinsic evidence:** *Oxford Dictionary and Thesaurus* (Am. ed. 1996) “probe” (Plaintiff's Ex. 9, Dkt. No. 139-9); Oxforddictionaries.com, “probe” (Plaintiff's Ex. 10, Dkt. No. 139-10)⁷.

Plaintiff replies that the invention of the Asserted Patents is not limited to a fiber-optic embodiment. Rather, the '096 Patent teaches:

Additionally, and to emphasize the wide utility and variability of various of the inventive concepts and techniques disclosed herein, it should be apparent to those skilled in the art in view of the disclosures herein that the apparatus and methodology may be utilized to measure the optical properties of objects using other optical focusing and gathering elements, *in addition to the fiber optics employed in preferred embodiments herein*. For example, lenses or mirrors or other optical elements may also be utilized to construct both the light source element and the light receiver element. A flashlight or other commonly available light source, as particular examples, may be utilized as the light source element, and a common telescope with a photoreceiver may be utilized as the receiver element in a large scale embodiment of the invention. Such refinements utilizing teachings provided herein are *expressly within the scope* of the present invention.

Dkt. No. 149 at 5–6 (quoting '096 Patent col.27 l.57 – col.28 l.6 (emphasis by Plaintiff)).

Analysis

The primary issue in the dispute over these terms is whether the invention is limited to fiber optics. The Court determines that: (1) the invention of the '096 Patent and its progeny (the '541 Patent and the '012 Patent) is not limited to fiber optics; (2) the invention of the '629 Patent and its progeny (the '038 Patent, the '985 Patent and the '283 Patent) is limited to fiber optics.

⁷ http://www.oxforddictionaries.com/us/definition/american_english/probe

The '096 Patent expressly states that optics components other than fiber optics may be used to implement the light source and light receivers of the invention. '096 Patent col.27 l.57 – col.28 l.6. The other listed components include lenses and mirrors and telescopes and photoreceivers. That is, certain configurations of the probe contain fiber optics and others do not. With reference to the Figure-1 configuration, the patent notes that “for purposes of the present invention, a plurality of light receiver fiber optics or elements (such as fibers 7) are presented to light sensors 8, with the light from the light receiver fiber optics/elements representing light reflected from object 20.” *Id.* at col.6 ll.37–41. The Court understands this passage to mean that elements other than fiber optics may be utilized—in the Figure-1 embodiment—to collect the light reflected from the object and guide that light to present it to the sensors for analysis. That fiber optics are a feature of only certain embodiments is succinctly expressed in the patent’s Summary of the Invention. *Id.* at col.3 ll.36–39 (“A handheld probe is utilized in the present invention, with the handheld probe containing a number of fiber optics *in certain preferred embodiments.*” (emphasis added)). Thus, the Court rejects Defendants’ proposal to limit the invention of the '096 Patent to implementations that utilize fiber optics.

The '541 Patent and the '955 Patent similarly express that the invention goes beyond fiber optics. *See, e.g.*, '541 Patent col.3 ll.34–37 (“A handheld probe is utilized in the present invention, with the handheld probe containing a number of fiber optics *in certain preferred embodiments.*” (emphasis added)); '955 Patent col.4 ll.20–22 (“A handheld probe is utilized in the present invention, with the handheld probe containing a number of fiber optics *in certain preferred embodiments.*” (emphasis added)).

The '629 Patent, the '038 Patent, and the '283 Patent are different. They each summarize the invention as follows: “A handheld probe is utilized in the present invention, with the

handheld probe containing a number of fiber optics.” ’629 Patent col.3 ll.25–27; ’038 Patent col.3 ll.26–28; ’283 Patent col.3 ll.30–33. This strongly suggests that the “present inventions” of the patents—and thus the claims—necessarily include fiber optics. These patents elsewhere characterize “the present invention” as a fiber-optic invention. For example, the ’629 Patent provides:

What should be noted is that, *for purposes of the present invention*, a plurality of light receiver fiber optics (such as fibers 7) are presented to light sensors 8, with the light from the light receiver fiber optics representing light reflected from object 20. *While the various embodiments described herein present tradeoffs and benefits* that may not have been apparent prior to the present invention (and thus may be independently novel), *what is important for the present discussion is that light from fiber optics at the forward end of probe tip 1* is presented to color sensors 8 for color measurement and angle/height determination, etc.

col.6 ll.1–11. (emphasis added). The ’038 and ’283 Patent include identical explanations. ’038 Patent col.6 ll.1–11; ’283 Patent col.6 ll.5–15. This is to be expected since both the ’038 Patent and the ’283 Patent issued from applications in a straight continuation chain from the ’629 Patent’s application. ’038 Patent, at [63] Related U.S. Application Data, ’283 Patent, at [63] Related U.S. Application Data. These patents consistently characterize the “present invention” as a fiber-optic invention and nothing in the intrinsic evidence of record suggests otherwise. From this, the Court understands that the probe and light receivers of the ’629 Patent, ’038 Patent, and ’283 Patent are fiber optics. *See Absolute Software, Inc. v. Stealth Signal, Inc.*, 659 F.3d 1121, 1136 (Fed. Cir. 2011) (“a patentee’s consistent reference to a certain limitation or a preferred embodiment as ‘this invention’ or the ‘present invention’ can serve to limit the scope of the entire invention, particularly where no other intrinsic evidence suggests otherwise”).

There is nothing in the patents that limits a “light receiver” to “receiving reflected light.” Defendants offer no argument or evidence in support of limiting a “light receiver” to “receiving reflected light” and the Court discerns no reason to do so. Instead, the Court understands that a

“light receiver” is a “light receiver” regardless of whether it receives light reflected from the object. In fact, as set forth in more detail below, the patents teach that a “light receiver” may or may not receive reflected light depending on the light receiver’s proximity to the object reflecting the light. *See, e.g.*, ’629 Patent col.12 l.17 – col.13 l.22. This evinces that a “light receiver” can still be a “light receiver” even if it does not receive reflected light.

That said, the Court does not understand that “probe” in the claims has some meaning that is not connected to the disclosures of the patents. As the extrinsic evidence establishes, “probe” is a broad term. *See, e.g.*, Oxford Dictionary and Thesaurus (Am. ed. 1996) “probe” (Dkt. No. 139-9 at 3). At its essence, a “probe” is an instrument that is used for collecting information about something. *Id.* In the context of the patents, a “probe” is an instrument that is used to collect light from an object. This light is passed on for analysis.

Accordingly, the Court determines that the terms “probe” and “light receiver” have different meanings in different Asserted Patents: in the ’629, ’038, and ’283 Patents these terms are limited to fiber-optic embodiments, in the ’096, ’541, and ’955 Patents the terms are not so limited. The Court further rejects Defendants’ “receiving reflected light” limitation for “light receivers” and determines that “propagated” has its plain and ordinary meaning without the need for further construction. The Court further construes “probe” and “light receiver” as follows:

- ’629, ’038, and ’283 Patents:
 - “probe” means “fiber-optic instrument to collect light and guide the collected light from one point to another”; and
 - “light receiver” means “fiber-optic light receiver”;
- ’096, ’541, and ’955 Patents:

- “probe” means “instrument to collect light and guide the collected light from one point to another”; and
- “light receiver” has its plain and ordinary meaning without the need for further construction.

B. “[the] optical characteristics of [an/the] object”

Disputed Term	Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“optical characteristics of an object” <ul style="list-style-type: none"> • ’096 Patent Claim 1 (preamble) • ’541 Patent Claim 1 (preamble) 	plain and ordinary meaning <ul style="list-style-type: none"> • alternatively: “the properties of the object that affect the object’s response to light” 	“the properties of the object’s surface or material that affect the object’s response to light such as color, translucence or fluorescence”
“the optical characteristics of the object” <ul style="list-style-type: none"> • ’096 Patent Claim 1 • ’541 Patent Claim 1 		

Because the parties’ arguments and proposed constructions with respect to these terms are related, the Court addresses the terms together.

The Parties’ Positions

Plaintiff submits that this term has no specialized technical meaning and is readily understood without construction. Dkt. No. 139 at 22. Plaintiff argues against including the “such as color, translucence or fluorescence” language in the construction on the grounds that doing so may mislead the jury to believe that the list is exclusive. *Id.* at 23.⁸

⁸ In its opening brief, Plaintiff misunderstood Defendants’ proposed construction as “the properties of the object’s surface that affect the object’s response to light such as color, translucence or fluorescence”—i.e., as limited to surface properties. Plaintiff argued against such a limitation. Dkt. No. 139 at 22. In its reply brief, Plaintiff withdrew that argument with the understanding that Defendants propose that optical characteristics include material properties, and are not limited to surface properties. Dkt. No. 149 at 8 n.4.

Defendants respond that the '096 and '541 Patents use “optical characteristics” to refer to properties of an object’s surface or material that affect the object’s response to light. Dkt. No. 148 at 20–21. Defendants further respond that the “optical characteristics” are intrinsic properties of the object and the “such as color, translucence or fluorescence” language is meant to help the jury understand this. *Id.* at 23. Specifically, Defendants argue that an object’s distance from a probe or light source is not an “optical characteristic” as that distance is not an intrinsic property of the object. *Id.* at 23–24.

In addition to the claims themselves, Defendants cite the following **intrinsic evidence** to support their position: '629 Patent col.18 ll.62–66; '096 Patent col.1 ll.19–25, col.1 ll.35–39, col.2 ll.20–25, col.3 ll.33–36, col.3 ll.51–54, col.4 ll.4–9, col.16 ll.64–67, col.17 ll.8–12, col.20 ll.9–13, col.23 ll.35–37.

Plaintiff replies that Defendants’ proposed “surface or material” limitation is either: (1) unnecessary because, inherently, only the surface or material of an object may affect the object’s response to light or (2) improperly limiting because, inherently, aspects other than surface- or material-properties may affect the object’s response to light. Dkt. No. 149 at 8. Plaintiff further replies that Defendants’ proposed list of examples is more likely to obfuscate claim scope than it is to clarify claim scope because the list may be perceived as exhaustive and because the listed examples are not clearly akin to other optical characteristics listed in patents, such as gloss, surface texture, and Rayleigh scattering. *Id.* at 9.

Plaintiff cites further **intrinsic evidence** to support its position: '844 Patent col.51 ll.53–62.

Analysis

There are two issues raised by the dispute. First, whether an object's optical characteristics are limited to properties of the object's material or surface. Second, whether it is appropriate to include a list of exemplary characteristics in the construction of "optical characteristics." With respect to the first issue, the Court finds that the optical characteristics of an object are not limited in the patents to properties of the surface or material of the object. To the extent any such limitation exists, it is because it is inherent to optical characteristics of an object. With respect to the second issue, the Court determines that including a list of exemplary characteristics in the construction is not helpful, and may actually mislead the jury.

The Court declines to adopt Defendants' "surface or material" limitation because such limitation does not clarify claim scope but rather threatens to change claim scope. The patents do not limit "optical characteristics" of an object to the properties of the object's surface or material. It is not clear whether, as Defendants use the terms, an object has characteristics that are not properties of its "surface" or "material." For example, is the object's "area" or "shape" a property of its surface or material? The patents contemplate determining such characteristics. *See, e.g.*, '629 Patent col.4 ll.24–28. Ultimately, injecting "surface" or "material" into the claims threatens to obfuscate or change claim scope.

Defendants' list of exemplary characteristics also threatens to obfuscate or change claim scope. It is not clear to the Court why Defendants choose "color, translucence or fluorescence" for their list, but exclude other disclosed characteristics that affect the object's response to light, such as surface texture, *id.* at col.18 l.55 – col.19 l.8, spectral irregularity, *id.* at col.8 ll.21–29, and luminance, *id.* col.16 ll.17–21. Importantly, it is not clear that a characteristic such as surface texture is akin to "color, translucence or fluorescence" other than that all these characteristics

affect an object's response to light. Thus, the list of exemplary characteristics does not aid understanding and may in fact cause a juror to improperly require a characteristic of an object to have some relation to "color, translucence or fluorescence" that is not required by the claim language.

The Court does not, however, understand that "optical characteristic" is so broad as to encompass things that may affect an object's response to light but are not intrinsic to the object. For example, the patents describe that the angle of the probe relative to the object and the distance of the probe from the object both affect how light from the probe is reflected by the object. *See, e.g., id.* at col.2 ll.7–16. But the patents describe that such system-specific characteristics are eliminated or corrected for so as to measure the object's characteristics. *See, e.g., id.* at col.2 ll.17–31, col.16 ll.6–21. That is, the "optical characteristics" of the object are those characteristics of the object that affect the object's response to light and that exist independent of the system used to determine the characteristics.

Accordingly, the Court rejects Defendants' "surface or material" and "such as color, translucence or fluorescence" limitations to the extent such limitations are meant to limit "optical characteristics" other than as set forth in the Court's construction that follows:

- "optical characteristics of an object" means "intrinsic properties of an object that affect the object's response to light"; and
- "the optical characteristics of the object" means "the intrinsic properties of the object that affect the object's response to light."

C. “protective barrier”

Disputed Term	Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“protective barrier” <ul style="list-style-type: none">• ’096 Patent Claim 1• ’541 Patent Claim 1	plain and ordinary meaning	“structure that separates the source/receiver and the object”

The Parties’ Positions

Plaintiff submits that this term is readily understood without construction. Dkt. No. 139 at 23–24.

Defendants respond that “protective barrier” has no “plain and ordinary” meaning and therefore must be construed. Dkt. No. 148 at 25. According to Defendants, the only “protective barrier” disclosed in the ’096 or ’541 Patents is a structure that separates the object from the light source and receiver in the tip of the probe. *Id.* This, Defendants argue, protects the light source and receiver from contact with the object. *Id.* Defendants argue that “protective barrier” should be construed to clarify what is being protected. *Id.*

In addition to the claims themselves, Defendants cite the following intrinsic evidence to support their position: **Intrinsic evidence:** ’096 Patent col.17 l.60 – col.18 l.2, figs.7A-7B.

Plaintiff replies that while Defendants’ construction is not wrong, it is unnecessary. Dkt. No. 149 at 13.

Analysis

The parties seem to agree as to the meaning of “protective barrier.” Their disagreement is solely on how best to express the meaning, using the language that the inventors chose and that issued from examination or Defendants’ rewrite of that language. The Court finds that this term’s plain and ordinary meaning is readily understood in the context of the surrounding claim language.

The patents teach that contact between the object and the light source or light receiver may be undesirable in certain applications. For example, the '096 Patent provides:

In certain applications, it may be desirable to measure and quantify the color of an object with a small probe that does not require contact with the surface of the object. In certain applications, for example, hygienic considerations make such contact undesirable. In the other applications such as interior decorating, contact with the object can mar the surface (such as if the object is coated with wet paint) or otherwise cause undesirable effects.

'096 Patent col.3 ll.15–22; *see also*, '629 Patent col.3 ll.7–14 (same). The patents provide a system directed to determining the optical characteristics of an object at a distance, to ensure the probe does not contact the object. *See, e.g.*, '096 Patent col.21 ll.8–29. The patents also describe placing a cap over the probe to prevent the probe from contacting the object. *See, e.g., id.* at col.27 l.56 – col.18 l.28, figs.7A, 7B. Based on this teaching, the Court understands that the “protective barrier” of the claims is a barrier that protects against the object contacting the probe, or the light receiver or light source.

This meaning is plain from the claim language. For example, Claim 1 of the '096 Patent, reproduced here and annotated by the Court, clearly sets forth that the protective barrier is between the light source(s) and receiver(s) on the one side and the object on the other side. That is, the protective barrier plainly separates the light source(s) and receiver(s) from the object—it keeps the light source(s)/receiver(s) from contacting the object.

'096 Patent

1. A method for determining optical characteristics of an object, comprising the steps of:
positioning a probe in proximity to the object, wherein the probe provides light to the object from one or more light sources, and receives light from the object through one or more light receivers, wherein the one or more light sources and one or more light receivers define at least one minimal height, wherein, when the probe is a distance from the object that is less than the minimal height, light that is reflected from a surface of the object is not propagated by the one or more light receivers, wherein the light is provided to the object and received from the object through a protective barrier having a thickness, wherein the thickness is less than the minimal height;
measuring the intensity of light received and propagated by one of the one or more light receivers;
determining the optical characteristics of the object based in response to one or more intensity measurements.

Accordingly, the Court determines that “protective barrier” has its plain and ordinary meaning, that the meaning is clear in the context of the surrounding claim language, and that the term requires no further construction.

D. “first height,” “minimal height,” “minimal distance,” and “wherein the thickness . . . is less than the minimal [height/distance]”

Disputed Term	Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“first height” <ul style="list-style-type: none"> • ’283 Patent Claim 21 	plain and ordinary meaning	“height/distance below which a cone of emitted light does not intersect with a cone for receiving light”
“minimal height” <ul style="list-style-type: none"> • ’906 Patent Claim 1 • ’541 Patent Claim 1 		
“minimal distance” <ul style="list-style-type: none"> • ’012 Patent Claim 1 • ’844 Patent Claim 1 		
“[a protective barrier having a thickness,] wherein the thickness is less than the minimal height” <ul style="list-style-type: none"> • ’096 Patent Claim 1 • ’541 Patent Claim 1 	plain and ordinary meaning	“wherein the thickness of the protective barrier is within the minimal [height/distance]” <ul style="list-style-type: none"> • see “first/minimal height/distance” above
“wherein the thickness [of the transparent member] is less than the minimal distance” <ul style="list-style-type: none"> • ’012 Patent Claim 8 • ’844 Patent Claim 8 		

Because the parties’ arguments and proposed constructions with respect to these terms are related, the Court addresses the terms together.

The Parties' Positions

Plaintiff submits that “first height,” “minimal height,” and “minimal distance” all mean the same thing in the context of the Asserted Patents. Dkt. No. 139 at 20. Plaintiff further submits that the terms are defined by the claims and therefore do not need to be construed. *Id.* at 20–22. And, Plaintiff contends, Defendants’ proposed construction improperly imports limitations from the description of exemplary embodiments. *Id.* at 22.

Defendants respond that “minimal height” (“minimal distance”/“first height”) is a technical term without an ordinary and customary meaning, and therefore must be construed. Dkt. No. 148 at 26. Defendants further respond that the surrounding claim language does not define “minimal height” but rather states a limitation that depends on the “minimal height.” *Id.* This “minimal height,” according to Defendants, is described in the Asserted Patents as dependent on the acceptance angle of the receiver, which defines a cone of received light, and the analogous cone of light emitted by the source. *Id.* at 27. The cones must overlap in order for the receiver to receive the light emitted from the source and reflected from the object. *Id.* This overlap only occurs up to some distance from the source/receiver—this is the “minimal height” or “minimum distance.” *Id.* at 27. And the protective barrier must have a thickness less than this “minimal height.” *Id.* at 28.

In addition to the claims themselves, Defendants cite the following **intrinsic evidence** to support their position: ’629 Patent col.12 ll.24–56, col.17 ll.2–5, figs.4B, 4C, 7A, 7B; ’096 Patent col.18 ll.7–13.

Plaintiff replies that these terms are not specific to fiber optics and do not need to be construed as they are defined in the claims. Dkt. No. 149 at 9–10. According to Plaintiff, the patents’ discussion of “cones” is the theory behind the limitation and the theory should not be

conflated with the meaning of the limitation. *Id.* at 10 (citing *AK Steel Corp. v. Sollac & Ugine*, 344 F.3d 1234, 1240 (Fed. Cir. 2003)).

Plaintiff cites further **intrinsic evidence** to support its position: '629 Patent col.11 ll.35–37, col.12 ll.24–56.

Analysis

The primary issue in dispute distills to whether the minimum distance between the probe and the object is defined by the claim language or by the description of an embodiment of the invention. The Court understands that the surrounding claim language defines the minimum distance.

The claim language surrounding these terms defines the terms. For example, in Claim 1 of the '096 Patent, reproduced here and annotated by the Court, the “minimal height” limitation refers to a configuration of the light sources and light receivers that comprise a probe. These sources and receivers are configured such that light from the sources that is reflected from the object is not received by the receivers if the object is less than a certain distance

'096 Patent

1. A method for determining optical characteristics of an object, comprising the steps of:
positioning a probe in proximity to the object, wherein the probe provides light to the object from one or more light sources, and receives light from the object through one or more light receivers, wherein the one or more light sources and one or more light receivers define at least one minimal height, wherein, when the probe is a distance from the object that is less than the minimal height, light that is reflected from a surface of the object is not propagated by the one or more light receivers, wherein the light is provided to the object and received from the object through a protective barrier having a thickness, wherein the thickness is less than the minimal height;
measuring the intensity of light received and propagated by one of the one or more light receivers;
determining the optical characteristics of the object based in response to one or more intensity measurements.

away from the probe. This distance is the “minimal height.” This in-claim definition of “minimal height” comports with the description of the fiber-optic embodiment with a source that emits light over a range of angles with respect to the light-source fiber and a receiver that receives only the light that enters the light-receiver fiber within a range of angles with respect to the fiber. *See*

'096 Patent col.12 l.15 – col.13 l.45. These emission and acceptance angles are said to define “cones” and when the source and receiver fibers are side-by-side, the receiver will receive reflected source light only from that region where the cones overlap. *Id.* But the explanation of the fiber-optic embodiment need not be imported into the claims in order to understand that a source and receiver can be configured such that the receiver is blind to source light that reflects off an object that is closer than some minimum distance away from the probe. And to the extent that Defendants construction is an attempt to limit the claims to the fiber-optic embodiment of Figures 4A-4C, such limiting is inappropriate. *See id.* at col.12 ll.15–21 (noting that the theoretical description applied to “certain preferred embodiments” and the inventors did not intend to be “bound by theory”).

With respect to the “thickness” terms, Defendants seek to modify the issued claims to change “less than” to “within” and “transparent member” to “protective barrier.” The Court perceives no legitimate dispute here and declines to rewrite the terms. To the extent that “within” means other than “less than” in the context of the “thickness” terms, the Court expressly rejects Defendants’ proposed construction. And to the extent that Defendants attempt to equate “transparent member” and “protective barrier,” the Court rejects the proposed construction. The patents describe a protective barrier that does not have a transparent member, but rather has a hole in a cap to allow light to pass. *Id.* at col.18 ll.20–28. The terms “transparent member” and “protective barrier” are not equivalent.

Accordingly, the Court determines that Defendants’ proposed construction of “first height,” “minimal height,” and “minimal distance” is improperly limiting and rejects it in its entirety. The terms “first height,” “minimal height,” and “minimal distance” are defined by the surrounding claim language and need no further construction. The Court further determines that

the terms “a protective barrier having a thickness, wherein the thickness is less than the minimal height” and “wherein the thickness of the transparent member is less than the minimal distance” each have their plain and ordinary meaning and need no further construction.

E. “determine a distance of the probe with respect to an object or material”

Disputed Term	Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“determine a distance of the probe with respect to an object or material” • ’038 Patent Claim 127	plain and ordinary meaning	“measure the space between the object and the probe”

The Parties’ Positions

Plaintiff submits that this term is readily understood without construction. Dkt. No. 139 at 23–24.

Defendants respond that the Asserted Patents explain that intensity of the received light is a function of the distance of the probe from the object that reflects the light to the probe. Dkt. No. 148 at 29. This “distance” is the space between the object and the probe. *Id.*

In addition to the claims themselves, Defendants cite the following intrinsic and extrinsic evidence to support their position: **Intrinsic evidence:** ’629 Patent col.1 ll.10–16, col.13 ll.23–28, figs.5A, 5B. **Extrinsic evidence:** *Webster’s New Universal Unabridged Dictionary* (1996) (“distance”) (Defendants’ Ex. A, Dkt. No. 148-1).

Plaintiff replies that while Defendants’ construction is not wrong, it is unnecessary. Dkt. No. 149 at 13.

Analysis

Again, the parties do not seem to dispute the meaning of this term, but rather dispute whether the term should be rewritten. The Court discerns no legitimate reason to rewrite

“determine” as “measure” or “distance” as “space.” That said, the term can be more clearly stated to convey that it refers to the distance between the probe and the object or material. To the extent that Defendants’ proposed construction is designed to exclude “or material” from the scope of the claims, the Court rejects that construction.

Accordingly, the Court construes “determine a distance of the probe with respect to an object or material” as follows:

- “determine a distance of the probe with respect to an object or material” means “determine the distance between the probe and an object or material.”

F. “a frequency proportional to [the light intensity/an intensity of light],” “a plurality of signals having a frequency that varies based on the light intensity,” and “light to frequency converter”

Disputed Term	Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“[signal having] a frequency proportional to the light intensity” <ul style="list-style-type: none"> • ’629 Patent Claim 1, 30 	plain and ordinary meaning	“successive pulse cycles having periods of equal duration, with the duration proportional to [the light intensity/an intensity of light]”
“[signals having] a frequency proportional to an intensity of light” <ul style="list-style-type: none"> • ’283 Patent Claim 1 		
“a plurality of signals having a frequency that varies based on the light intensity” <ul style="list-style-type: none"> • ’283 Patent Claim 27 	plain and ordinary meaning	indefinite <ul style="list-style-type: none"> • alternatively: “signal with successive pulse cycles having periods of equal duration, with the duration corresponding to a particular light intensity”

Disputed Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
"light to frequency converter" <ul style="list-style-type: none"> • '629 Patent Claim 98 • '283 Patent Claim 27 	plain and ordinary meaning <ul style="list-style-type: none"> • alternatively: "a device or circuit that outputs a signal or signals whose frequency depends on a detected light intensity" 	"a device for converting light into a signal having a frequency proportional to the light intensity"; <ul style="list-style-type: none"> • see "a frequency proportional to the light intensity"

Because the parties' arguments and proposed constructions with respect to these terms are related, the Court addresses the terms together.

The Parties' Positions

Plaintiff submits that these terms should be accorded their plain and ordinary meanings, which are readily understood without construction. Dkt. No. 139 at 10. Plaintiff argues that Defendants' proposed construction, by requiring "pulse cycles," improperly narrows the claims to exclude other signals, such as sine waves. *Id.* at 11. Plaintiff further argues that Defendants' proposed constructions, by requiring "successive pulse cycles having periods of equal duration," are improper because they conflict with '283 Patent Claim 27's recitation of "signals having a frequency that varies based on the light intensity." *Id.* at 11. That is, according to Plaintiff, signals with varying frequency necessarily have varying periods and therefore cannot have "periods of equal duration." *Id.* In fact, Plaintiff contends, the '629 Patent describes an exemplary embodiment in which the frequency (and therefore the period) of the relevant signals changes depending on the light intensity—and therefore the periods are not equal. *Id.* at 12–13 (citing '629 Patent col.8 l.60 – col.9 l.7). Plaintiff also contends that even if the signal-generating device that is described in the patents, Texas Instruments' TSL230 light-to-frequency converter, produced "successive pulse cycles having periods of equal duration" the claims are not properly

limited to the embodiment. *Id.* at 14–15. And, Plaintiff contends, the specific type of output signal generated by the TSL230 (TTL or CMOS) is recited in dependent claims that would be rendered superfluous by effectively limiting the claims to TSL230 and like devices. *Id.*

In addition to the claims themselves, Plaintiff cites the following **intrinsic evidence** to support its position: '629 Patent col.8 l.60 – col.9 l.7, col.9 ll.56–59.

Defendants respond that the only description of a light-to-frequency converter is a single paragraph describing the Texas Instruments TSL230 converter as outputting an AC signal having a frequency proportional to the intensity of received light. Dkt. No. 148 at 30 (citing '629 Patent col.8 l.62 – col.9 l.1). Defendants respond that “frequency” is a measure of repetition of a waveform that repeats over successive periods. *Id.* at 31. Thus, Defendants conclude, a signal with a “frequency” must have a repeating waveform of a constant period. *Id.* Defendants further respond that this repeating waveform is a “pulse cycle” as that is the only waveform described in the patents. *Id.* at 32. Defendants contend that a “pulse cycle” is not necessarily a digital signal, so the separate limitations requiring TTL or CMOS digital signals narrow the type of “pulse cycle”—these limitations are not rendered superfluous by “pulse cycle.” *Id.* at 32–33.

With respect to “a frequency varies based on the light intensity,” Defendants respond that the Asserted Patents do not provide any guidance as to “how to generate signals having a frequency that *varies* based on the intensity of light” and thus the one of ordinary skill in the art would not understand the scope of a “frequency that varies.” *Id.* at 33 (emphasis by Defendants). Thus, Defendants conclude, the term renders claims indefinite. *Id.* at 33–34.

With respect to “light to frequency converter,” Defendants respond that the only light-to-frequency converter described in the patents outputs a signal with a frequency proportional to the

intensity of the light, so the claim should be construed to require that the claimed converter produce a frequency that is proportional to the intensity of the light. *Id.* at 34.

In addition to the claims themselves, Defendants cite the following intrinsic and extrinsic evidence to support their position: **Intrinsic evidence:** '629 Patent col.8 l.62 – col.9 l.1, fig.3. **Extrinsic evidence:** Baker Decl.⁹ ¶¶ 17–19, 21–24, 26, 28, 29, 32 (Defendants' Ex. B, Dkt. No. 148-2 at 5–12).

Plaintiff replies that “frequency” can be calculated as an average over time, and thus does not require a constant period. Dkt. No. 149 at 11 (citing Benzel Decl.¹⁰ ¶ 42). Indeed, Plaintiff contends, the light-to-frequency converter described in the patents, the TSL230, determined frequency as an average over time. *Id.* (citing Texas Instruments, *TSL230, TSL230A, TSL230B, Programmable Light-to-Frequency Converters: SOES007B* 5-8 (1994) (Dkt. No. 148-2 at 44)). Plaintiff further replies that the signals of the claims are not limited to “pulse cycles,” but also include sinusoidal and aperiodic signals so long as the frequency of the signal corresponds to the intensity of the received light. *Id.* at 12–13.

With respect to “a frequency varies based on the light intensity,” Plaintiff replies that “varies” in this context and as used in the art means a frequency varies based on light intensity if there is any one-to-one correspondence between the frequency and the light intensity, and is not limited to a “substantially linear one-to-one correspondence,” such as frequency that is proportional to the light intensity. *Id.* at 13.

Plaintiff cites further intrinsic and extrinsic evidence to support its position: **Intrinsic evidence:** '629 Patent col.14 ll.31–34. **Extrinsic evidence:** Benzel Decl. ¶¶ 28, 29, 33, 38, 42, 44–46, 52 (Dkt. No. 149-1 at 6–9, 11–14); Texas Instruments, *TSL230, TSL230A, TSL230B,*

⁹ Declaration of R. Jacob Baker, Ph.D., P.E.

¹⁰ Declaration of Phillip J. Benzel.

Programmable Light-to-Frequency Converters: SOES007B (1994) (App’x C. to Baker Decl., Dkt. No. 148-2 at 38–45).

Analysis

There are three issues raised by the dispute. First, whether a signal having a “frequency” necessarily includes repetition of a cycle (i.e., waveform) of a given duration. Second, whether a signal that has a frequency proportional to the light intensity is necessarily comprised of pulse cycles. Third, whether a signal that has a frequency that varies with the light intensity necessarily has a frequency that is proportional to the light intensity. With respect to the first issue, the Court finds that “frequency” refers to repetition and therefore a signal with a frequency necessarily has at least two occurrences of a cycle. With respect the second issue, the Court finds that the signal is not limited to one comprised of pulses. With respect to the third issue, the Court finds that a frequency may vary with light intensity other than by being proportional to intensity.

The term “frequency” inherently includes the concept of periodicity. It refers to the “number of cycles or events that occur per unit time” for something that is periodic. Martin H. Weik, *Communications Standard Dictionary* 371 (3d ed. 1996), Dkt. No. 148-2 at 50. That is, “frequency”—according to its plain and ordinary meaning—requires repetition. The Court is not persuaded by Plaintiff’s argument that every aperiodic signal has a “frequency.” This argument is ultimately premised on a text-book explanation of aperiodic signals as comprising sums of periodic signals. *See* Benzel Decl. ¶ 42, Dkt. No. 149-1 at 11; William a. Lynch and John G. Truxal, *Signals and Systems in Electrical Engineering* 699 (1962), Dkt. No. 149-1 at 24. If an aperiodic signal includes periodic signals, the aperiodic signal has “frequency components.” *Signals and Systems in Electrical Engineering* 699 (1962), Dkt. No. 149-1 at 24. That is, the aperiodic signal includes periodic signals that each have a frequency. But to the extent the

aperiodic signal does not comprise periodic signals, the Court does not understand that the aperiodic signal has a “frequency.”

Thus, a signal with a “frequency” must have some cycle (waveform) that repeats periodically. Stated another way, the signal has a “frequency” because it has at least two cycles of the same duration (period). But this does not mean that the cycles have a period that is *exactly* the same. Indeed, the Court cannot fathom that such a stringent limitation can be met except in theory. Importantly, it would read out the preferred embodiment in which the signal frequency is a function of the equipment generating the frequency (TSL230). According to the manufacturer, this light-to-frequency converter is “available with absolute-output-frequency tolerances of 5% TSL230B 10% TSL230A or 20% TSL230.” Texas Instruments, *TSL230, TSL230A, TSL230B, Programmable Light-to-Frequency Converters: SOES007B* 5-3 (1994), Dkt. No. 148-2 at 39. That is, the output signal may vary for a given light intensity according to the frequency tolerances, and the frequency would be considered the same within the tolerance. *See, e.g., id.* at 5-5 (light intensity of 130 mW/cm² yields a frequency of 1 +/- 0.2 MHz), Dkt. No. 148-2 at 41. A signal has a frequency if it has two cycles of a period that is equal within the precision of the apparatus creating it—the cycles have a substantially equal duration.

The Court discerns no legitimate reason to limit the signals to pulse signals. Defendants’ argument here is solely premised on a sole-embodiment-means-import-the-limitation position. But this is not the law. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) (“we have expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment”); *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) (“It is likewise not enough that the only embodiments, or all of the embodiments, contain a particular limitation. We do not

read limitations from the specification into claims; we do not redefine words. Only the patentee can do that.”); *SRI Int’l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc) (“The law does not require the impossible. Hence, it does not require that an applicant describe in his specification every conceivable and possible future embodiment of his invention.”). Importantly, Defendants’ expert does not opine that a signal with a frequency that depends on the light intensity is necessarily a pulse signal. Baker Decl. ¶ 23, Dkt. No. 148-2 at 8–9. Rather, his opinion is that because the patents do not disclose other than pulse signals, the claims should be limited to pulse signals. In contrast, other extrinsic evidence shows that information can be carried in a variety of periodic signals, including sinusoidal signals. *Signals and Systems in Electrical Engineering* 699–702, Dkt. No. 149-1 at 24–26. Indeed, this evidence teaches that “we can use a sinusoidal signal in the same role as the pulse train.” *Id.* at 702, Dkt. No. 149-1 at 26. Simply, there is no legitimate reason to limit a signal to a pulse signal when a sinusoidal signal can be used in the same role as a pulsed signal.

Whether a frequency varies based on the intensity of light is readily understood—the “varies” terms does not render any claim indefinite. Defendants’ argument here is flawed. To begin, the Court rejects Defendants’ premise that one of ordinary skill in the art must look to the described embodiments to understand what it means for a frequency to vary based on the light intensity. Given the subject matter of the Asserted Patents, it stretches credulity to think that one of ordinary skill in the art would not immediately understand such plain language. And even if one of ordinary skill in the art needed guidance on this, the patents provide guidance—they describe an embodiment in which the frequency increases as the light intensity increases. *See, e.g.*, ’283 Patent col.8 l.64 – col.9 l.11 (“Without being bound by theory, the basic principle of such devices is that, as the intensity increases, the integrator output voltage rises more quickly,

and the shorter the integrator rise time, the greater the output frequency.”); *see also* ’629 Patent col.8 l.60 – col.9 l.7 (same). This relationship between signal frequency and intensity is described: “Such converters constitute, *in general*, photo diode arrays that integrate the light received from fibers 7 and output an AC signal with a frequency proportional to the intensity (not frequency) of the incident light.” ’283 Patent col.9 ll.2–5 (emphasis added); *see also*, ’629 Patent col.8 l.65 – col.9.l.1 (same). Thus, the patents describe that frequency changes when intensity changes and *in general* the relationship between frequency and intensity is one of proportionality. This description provides sufficient guidance that one of ordinary skill in the art would understand what “frequency that varies based on the light intensity” means. And it does not limit the invention to frequencies that are proportional to light intensity. Defendants’ expert on this is not credible. See Baker Decl. ¶¶ 31–33, Dkt. No. 148-2 at 12.

Accordingly, the Court construes these terms as follows:

- “signal having a frequency proportional to the light intensity” means “signal having at least two cycles of substantially equal duration that is proportional to the intensity of light”;
- “a plurality of signals having a frequency proportional to an intensity of light” means “a plurality of signals, each signal having at least two cycles of substantially equal duration that is proportional to the intensity of light”;
- “a plurality of signals having a frequency that varies based on the light intensity” means “a plurality of signals, each signal having at least two cycles of substantially equal duration that varies in correlation with the intensity of light”; and
- “light to frequency converter” means “device for converting light into a signal having a frequency that depends on the intensity of the converted light.”

IV. CONCLUSION

The Court adopts the above constructions set forth in this opinion for the disputed and agreed terms of the Asserted Patents. The parties are ordered that they may not refer, directly or indirectly, to each other's claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual definitions adopted by the Court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the definitions adopted by the Court.

SIGNED this 25th day of October, 2016.


ROY S. PAYNE
UNITED STATES MAGISTRATE JUDGE