

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE**

---

ALIGN TECHNOLOGY, INC.,	:	
	:	
Plaintiff,	:	
	:	
v.	:	C.A. No. 18-1949-LPS
	:	
3SHAPE A/S, 3SHAPE TRIOS A/S,	:	
3SHAPE INC., and 3SHAPE	:	
MANUFACTURING US, LLC,	:	
	:	
Defendants.	:	

---

John W. Shaw, Karen E. Keller, and Jeff Castellano, SHAW KELLER LLP, Wilmington, DE  
Blair M. Jacobs, Christina A. Ondrick, Allan M. Soobert, Mark J. Consilvio, and John S. Holley,  
PAUL HASTINGS LLP, Washington DC  
Thomas A. Counts and Grant N. Margeson, PAUL HASTINGS LLP, San Francisco, CA  
Attorneys for Plaintiff

Joanna Cline and James H.S. Levine, TROUTMAN PEPPER HAMILTON SANDERS LLP,  
Wilmington, DE  
Goutam Patnaik, David J. Shaw, Tuhin Ganguly, Kimberly Coghill, and Bryan J. Cannon,  
TROUTMAN PEPPER HAMILTON SANDERS LLP, Washington, DC  
William Belanger, Alison McCarthy, and Frank Liu, TROUTMAN PEPPER HAMILTON  
SANDERS LLP, Boston, MA  
Attorneys for Defendants

---

**MEMORANDUM OPINION**

December 28, 2020  
Wilmington, Delaware



STARK, U.S. District Judge:

Pending before the Court are the parties' claim construction disputes related to terms in U.S. Patent Nos. 9,675,430 (the "'430 patent"), 9,844,420 (the "'420 patent"), 9,975,294 (the "'294 patent"), 10,507,088 (the "'088 patent"), and 10,507,089 (the "'089 patent"). The parties submitted briefs (D.I. 133, 134, 147, 149), exhibits, expert declarations, and tutorials (*see, e.g.*, D.I. 132, 135, 136, 148, 149-1, 2, 3, 4). The Court held a claim construction hearing on October 26, 2020, at which both sides presented oral argument.<sup>1</sup> (D.I. 162) ("Tr.")

## I. LEGAL STANDARDS

The ultimate question of the proper construction of a patent is a question of law. *See Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 325-26 (2015) (citing *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388-91 (1996)). "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) (internal citation and quotation marks omitted). "[T]here is no magic formula or catechism for conducting claim construction." *Id.* at 1324. Instead, the Court is free to attach the appropriate weight to appropriate sources "in light of the statutes and policies that inform patent law." *Id.*

---

<sup>1</sup> The parties agree on the construction of seven terms, and those agreed-upon constructions will be adopted by the Court. (*See* D.I. 131)

After the hearing, Align moved to dismiss without prejudice the '294 and '420 patents and, accordingly, requests that the Court refrain from construing the four disputed terms that appear in these two patents. (*See* D.I. 186) 3Shape opposes the motion and requests that any dismissal (which it insists should be with prejudice) occur only after the Court issues its claim construction order. (*See* D.I. 193) By separate order being issued today, the Court will deny the motion without prejudice to renew. Accordingly, the Court will construe the disputed terms from the '294 and '420 patents, which were briefed and argued as part of the claim construction process.

“[T]he words of a claim are generally given their ordinary and customary meaning . . . [which 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, i.e., as of the effective filing date of the patent application.” *Id.* at 1312-13 (internal citations and quotation marks omitted). “[T]he ordinary meaning of a claim term is its meaning to the ordinary artisan after reading the entire patent.” *Id.* at 1321 (internal quotation marks omitted). The patent “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.” *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

While “the claims themselves provide substantial guidance as to the meaning of particular claim terms,” the context of the surrounding words of the claim also must be considered. *Phillips*, 415 F.3d at 1314. Furthermore, “[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment . . . [b]ecause claim terms are normally used consistently throughout the patent.” *Id.* (internal citation omitted).

It is likewise true that “[d]ifferences among claims can also be a useful guide . . . . For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.” *Id.* at 1314-15 (internal citation omitted). This “presumption is especially strong when the limitation in dispute is the only meaningful difference between an independent and dependent claim, and one party is urging that the limitation in the dependent claim should be read into the independent claim.” *SunRace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1303 (Fed. Cir. 2003).

It is also possible that “the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316.

It bears emphasis that “[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.” *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1372 (Fed. Cir. 2014) (quoting *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004)) (alteration in original) (internal quotation marks omitted).

In addition to the specification, a court “should also consider the patent’s prosecution history, if it is in evidence.” *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995), *aff’d*, 517 U.S. 370 (1996). The prosecution history, which is “intrinsic evidence,” “consists of the complete record of the proceedings before the [Patent and Trademark Office] and includes the prior art cited during the examination of the patent.” *Phillips*, 415 F.3d at 1317. “[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.” *Id.*

“In some cases . . . 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.” *Teva*, 574 U.S. at 331. “Extrinsic evidence consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” *Markman*, 52 F.3d at 980. For instance, technical dictionaries can assist the court in determining the meaning of a term to those of skill in the relevant art because such dictionaries “endeavor to collect the accepted meanings of terms used in various fields of science and technology.” *Phillips*, 415 F.3d at 1318. In addition, expert testimony can be useful “to ensure that the court’s

understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field.” *Id.* Nonetheless, courts must not lose sight of the fact that “expert reports and testimony [are] generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in intrinsic evidence.” *Id.* Overall, while extrinsic evidence “may be useful to the court,” it is “less reliable” than intrinsic evidence, and its consideration “is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence.” *Id.* at 1318-19. Where the intrinsic record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. *See Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1308 (Fed. Cir. 1999).

Finally, “[t]he construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.” *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that “a claim interpretation that would exclude the inventor’s device is rarely the correct interpretation.” *Osram GmbH v. Int’l Trade Comm’n*, 505 F.3d 1351, 1358 (Fed. Cir. 2007) (internal quotation marks omitted).

## II. CONSTRUCTION OF DISPUTED TERMS

### A. “confocal imaging apparatus”<sup>2</sup>

<b>Align</b>
“imaging device having illumination and detection paths with conjugate focal planes”
<b>3Shape</b>
“imaging apparatus that uses a point illumination source and point detector both located at conjugate planes to the object plane”
<b>Court</b>
“imaging device having illumination and detection paths with conjugate focal planes”

<sup>2</sup> This term appears in all claims of the ’430 patent; claims 8, 18, and 23 of the ’088 patent; and claims 21 and 28 of the ’089 patent.

The parties appear to agree that the illumination and the detection optic paths have conjugate focal planes in a “confocal imaging apparatus.” According to the declaration of Plaintiff’s expert, Dr. Hobbs (which in pertinent part seems not to be materially disputed by Defendants’ expert, Dr. Schaafsma), when the light beams emanating from a point at the illumination module converge at a conjugate point on a focal surface, the beams returning from the same point on focal surface are reflected by a beam splitter and converge at the detector. Thus, the illumination and detection paths can be said to be conjugate and, hence, confocal. (*See* D.I. 135 Ex. 2 ¶ 27)

Defendants contend that the confocal imaging apparatus also requires using a point illumination source and a point detector, both located at conjugate planes to the object plane. (D.I. 133 at 11) The Court disagrees. Neither the intrinsic nor extrinsic evidence supports Defendants’ proposed construction.<sup>3</sup>

Nothing in the specification of the ’430 patent expressly restricts the confocal imaging apparatus to a device having a point illumination source and a point detector. It would be improper to read such a limitation from the specification into the claims. *See Liebel-Flarsheim*, 358 F.3d at 913. The extrinsic evidence on which Defendants heavily rely (*see* D.I. 133 at 11-13; D.I. 136 Ex. H ¶¶ 23-30) appears to contradict the specification, rendering it an inappropriate basis on which to construe the claims, *see Ruckus Wireless, Inc. v. Innovative Wireless Solutions, LLC*, 824 F.3d 999, 1003 (Fed. Cir. 2016) (“Legal error arises when a court relies on extrinsic

---

<sup>3</sup> In construing this term, the Court also considered the International Trade Commission’s construction of a similar term, “confocal imaging techniques,” contained in U.S. Patent Nos. 8,102,538 and 8,363,228 during Section 337 investigations Nos. 337-TA-1144 and 337-TA-1091. (*See* D.I. 135 Ex. 1; D.I. 149 Ex. R; *see also Texas Instruments, Inc. v. Cypress Semiconductor Corp.*, 90 F.3d 1558, 1569 (Fed. Cir. 1996) (“The district court can attribute whatever persuasive value to the prior ITC decision that it considers justified.”))

evidence that contradicts the intrinsic record.”). For instance, Defendants’ expert, Dr. Schaafsma, asserts that the “key distinguishing feature” for confocal imaging is that, enabled by point illumination and point detection, only in-focus light can be detected. (D.I. 136 Ex. H ¶ 27) The specification, by contrast, discloses multiple embodiments in which both in-focus and out-of-focus lights are detected.<sup>4</sup> (*See, e.g.*, ’430 patent at 3:63-4:3, 4:41-51, 6:3-12)

**B. “illumination module”<sup>5</sup>**

<p><b>Align</b>            Not subject to § 112(f) and construed as: “one or more optical elements that provide or condition light for illumination”            If subject to § 112(f):            Function: to generate an array of light beams            Structure: grating, microlens array, an optics expander, or equivalents thereof</p>
<p><b>3Shape</b>            Subject to § 112(f)            Function: to generate an array of light beams            Structure: laser light source optically coupled to a grating or microlens array</p>
<p><b>Court</b>            Subject to § 112(f)            Function: to generate an array of light beams            Structure: grating, microlens array, an optics expander, or equivalents thereof</p>

There is a rebuttable presumption that a claim term does not invoke § 112(f) when it does not use the word “means.” *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). The presumption can be overcome by showing that “the claim term fails to recite sufficiently definite structure.” *Id.* at 1349 (internal citation and quotation marks omitted). The

---

<sup>4</sup> The specification describes that the light beams can be returned through an array of pinholes positioned in front of a detector. (’430 patent at 5:6-10) However, in the same paragraph, the specification expressly teaches that in some embodiments, no array of pinholes is used. (*Id.* at 5:8-9)

<sup>5</sup> This term appears in claims 1, 3, 6, and 12 of the ’430 patent; claims 5, 15, and 23 of the ’088 patent; and claims 18 and 27 of the ’089 patent.

Court agrees with Defendants that the presumption is rebutted here because the term “illumination module” does not recite sufficiently definite structure.

Defendants’ expert, Dr. Schaafsma, opines that a person skilled in the art would not understand the term to recite a sufficiently definite structure for generating an array of light beams. (D.I. 136 Ex. H ¶¶ 48-49) Dr. Hobbs, Plaintiff’s expert, does not directly contradict the sufficient definiteness point, but contends instead that a person skilled in the art would recognize an “illumination module” as one or more optical elements “that provide or condition light for illumination.” (D.I. 135 Ex. 2 ¶ 35) The Court is persuaded by Dr. Schaafsma’s opinion. Further, the specification, while providing some non-limiting examples, does not indicate any bounds for the structure of the “illumination module.” In particular, a person skilled in the art would not recognize whether the structure underlying the term “illumination module” encompasses a light source. (*See, e.g.*, D.I. 135 Ex. 2 ¶¶ 35-39) (Dr. Hobbs explaining that “illumination module” can be “separate and distinct from a light source”)

Under § 112(f), the parties agree that the function is “to generate an array of light beams.” (*See* D.I. 134 at 8; D.I. 149 at 16) With respect to the structure, the parties dispute whether a laser light source is required structure for the “illumination module.” The Court agrees with Plaintiff that it is not. The specification discloses multiple embodiments in which the laser light source is a separate structure from the illumination module. For example, in Figure 1A, the semiconductor laser (28) and the illumination module (38) are separate structures. (*See* ’430 patent at 3:34-50) In Figure 4, the laser light source (454) and the illumination module (456) are also separate structures. (*See id.* at 11:63-12:8)



C. “light beams” / “light beam”<sup>6</sup>

<b>Align</b> “directional projection of light energy; may consist of parallel, diverging, or converging rays”
<b>Shape</b> “light from point source”
<b>Court</b> “directional projection of light energy; may consist of parallel, diverging, or converging rays”

For the same reasons given above with respect to the “confocal imaging apparatus” term, the Court agrees with Plaintiff that the confocal imaging apparatus does not need to have a point illumination source. The Court, therefore, adopts Plaintiff’s proposed construction, which does not require the “light beam” to come from a point illumination source.

D. “the focusing optics to perform confocal focusing of the array of light beams onto a non-flat focal surface”<sup>7</sup> / “focusing optics to perform focusing of the light onto the non-flat focal surface”<sup>8</sup> / “focusing optics to perform focusing of the light onto a focal surface”<sup>9</sup>

<b>Align</b> “the focusing optics to perform confocal focusing of the array of light beams onto a non-flat focal surface”: “the focusing optics to focus the array of light beams onto a non-flat focal surface, such that the illumination and detection paths have conjugate focal planes” “focusing optics to perform focusing of the light onto the non-flat focal surface”: No construction necessary. To the extent construction is necessary, the plain and ordinary meaning is: “focusing optics (at least one optical lens) to focus the light onto the non-flat focal surface.” “focusing optics to perform focusing of the light onto a focal surface”: No construction necessary. To the extent construction is necessary, the plain and ordinary meaning is: “focusing optics (at least one optical lens) to focus the light onto a focal surface.”
---

---

<sup>6</sup> This term appears in claims 1, 3, 8, and 12 of the ’430 patent and claims 11 and 23 of the ’088 patent.

<sup>7</sup> This term appears in claim 1 of the ’430 patent.

<sup>8</sup> This term appears in claim 1 of the ’088 patent.

<sup>9</sup> This term appears in claims 9, 22, 32, and 33 of the ’089 patent.

**3Shape**

**“the focusing optics to perform confocal focusing of the array of light beams onto a non-flat focal surface”:** “focusing optics to image the source of the array of light beams onto a non-flat focal surface, such that the source of the array of light beams and detector are located at conjugate focal surfaces”

**“focusing optics to perform focusing of the light onto the non-flat focal surface”:**

“focusing optics to image the light source onto a non-flat focal surface”

**“focusing optics to perform focusing of the light onto a focal surface”:** “focusing optics to image the light source onto a focal surface”

**Court**

**“the focusing optics to perform confocal focusing of the array of light beams onto a non-flat focal surface”:** “the focusing optics to focus the array of light beams onto a non-flat focal surface, such that the illumination and detection paths have conjugate focal planes”

**“focusing optics to perform focusing of the light onto the non-flat focal surface”:**

“focusing optics (at least one optical lens) to focus the light onto the non-flat focal surface”

**“focusing optics to perform focusing of the light onto a focal surface”:** “focusing optics (at least one optical lens) to focus the light onto a focal surface”

The parties dispute the meaning of “confocal focusing” and of “focusing of the light onto a focal surface.” With respect to “confocal focusing,” the parties make essentially the same arguments they did in connection with the term “confocal imaging apparatus.” For the same reasons the Court has already given, it agrees with Plaintiff.

With respect to the meaning of “focusing of the light onto a focal surface,” the Court finds that construction is necessary, *see O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1361 (Fed. Cir. 2008), and adopts Plaintiff’s construction, which is supported by the intrinsic evidence. (*See* D.I. 134 at 12-13) For example, in connection with Figure 2, the specification teaches using the focusing lenses to focus an array of light beams onto a curved focal surface. (*See* ’430 patent at 9:30-31) The specification does not support Defendants’ construction or the opinion of their expert, Dr. Schaafsma, who opines that when the illumination array is conjugate to the focal surface, “the light source is imaged onto the focal surface.” (D.I. 133 at 17-18; *see also* D.I. 136 Ex. H ¶ 57)

E. “for determination of positions on the imaging axis of a plurality of points of the three dimensional object”<sup>10</sup> / “determine positions of a plurality of points of the three dimensional object”<sup>11</sup>

**Align**

“for determination of positions on the imaging axis of a plurality of points of the three dimensional object”: “for determination of in-focus positions indicative of points on the surface of the three-dimensional object”

“determine positions of a plurality of points of the three dimensional object”: “determine in-focus positions of points on the three dimensional object”

**3Shape**

“for determination of positions on the imaging axis of a plurality of points of the three dimensional object”: “for determination of positions on the z-axis of the three-dimensional object at a plurality of x-y locations”

“determine positions of a plurality of points of the three dimensional object”: “determine z-positions of the three-dimensional object at a plurality of x-y locations”

**Court**

“for determination of positions on the imaging axis of a plurality of points of the three dimensional object”: “for determination of positions, where the measured intensity for each position is at the maximum level, of a plurality of points on the surface of the three dimensional object”

“determine positions of a plurality of points of the three dimensional object”: “determine positions, where the measured intensity for each position is at the maximum level, of points on the three dimensional object”

The parties agree that these terms describe the process of determining the position of a point on a three-dimensional object when the measured intensity of the light returning from the point reaches the maximum level. (See D.I. 133 at 19; D.I. 134 at 13-14) The parties’ dispute centers on two issues: (1) what information about the position needs to be determined, and (2) whether the claim should include the “in-focus position” limitation.

With respect to the first issue, Defendants contend that only the z-position of the point needs to be determined (when the intensity of the returning light is at the maximum level). The Court, however, agrees with Plaintiff that, in addition to the z-position, the point’s position in

---

<sup>10</sup> This term appears in claim 1 of the ’430 patent and claims 1, 11, 19, and 27 of the ’088 patent.

<sup>11</sup> This term appears in claim 22 of the ’089 patent.

other dimensions may also need to be determined. The specification describes the possibility that the x-y position of a point on the three-dimensional object may change as the focal surface moves along the imaging axis during the determination process. The changes in the x-y position can be caused by, for example, the non-flat focal surface or the magnification changes. (*See, e.g.*, '430 patent at 17:24-31) The specification also teaches accounting for the differences between a measured x-y position and a known x-y position for each point on the calibration object. (*See id.* at 14:29-33) Therefore, the x-y position of each point on a three-dimensional object may not remain constant between the measurements of light intensity, which may result in the x-y position of each point having to be determined, in addition to the z-position, during the determination process. Defendants' proposed constructions implicitly – and inconsistently with the specification – assign each point on the three-dimensional object to a fixed x-y location and assume that the x-y location remains the same during the determination process.

Turning to the second issue, the Court agrees with Defendants that the “in-focus position” limitation in Plaintiff’s proposed constructions injects ambiguity into the claims and should be rejected. (*See* D.I. 149 at 20) The specification does not use the term “in-focus position.”

**F. “detected positions of one or more of the plurality of points are to be adjusted”<sup>12</sup> / “adjust the determined positions of one or more of the plurality of points”<sup>13</sup>**

**Align**

**“detected positions of one or more of the plurality of points are to be adjusted”**: “detected in-focus positions of one or more of the points are to be adjusted”

**“adjust the determined positions of one or more of the plurality of points”**: “adjust the determined in-focus positions of the one or more points”

---

<sup>12</sup> This term appears in claims 1 and 2 of the '430 patent and claims 1, 11, 19, and 27 of the '088 patent.

<sup>13</sup> This term appears in claim 22 of the '089 patent.

**3Shape**

**“detected positions of one or more of the plurality of points are to be adjusted”:** “detected z-positions at the plurality of x-y locations are to be adjusted prior to generating the three-dimensional representation of the object”

**“adjust the determined positions of one or more of the plurality of points”:** “adjust the determined z- positions at one or more x-y locations prior to generating the three-dimensional representation of the object”

**Court**

**“detected positions of one or more of the plurality of points are to be adjusted”:** “detected positions, where the measured intensity for each position is at the maximum level, of one or more of the points are to be adjusted”

**“adjust the determined positions of one or more of the plurality of points”:** “adjust the determined positions, where the measured intensity for each position is at the maximum level, of the one or more points”

Much of the parties’ disputes with respect to these terms has already been addressed in connection with other terms already discussed above. For instance, with respect to adjusting the detected positions of the plurality of points on the three-dimensional object, the Court construes the terms consistent with the reasons given in connection with the “determination” terms.

The Court rejects Defendants’ proposed constructions here for the additional reason that they inject a temporal limitation into the claims. None of the disputed claims expressly recites generating a three-dimensional representation of the object or requires position adjustment “prior to generating a three-dimensional representation of the object.” The specification embodiments on which Defendants rely merely teach that a three-dimensional representation may be constructed based on the adjustment of the measurement. (*See* ’430 patent at 6:60-62) There is no description of a temporal relationship between the two steps.

**G. “a location of the at least one lens that yields a maximum measured intensity”<sup>14</sup>**

**Align**

“in-focus lens position”

**3Shape**

“a z-position of the at least one lens that yields a maximum measured intensity”

<sup>14</sup> This term appears in claim 8 of the ’430 patent and claim 8 of the ’088 patent.

<b>Court</b>
--------------

“in-focus lens position that yields a maximum measured intensity”
---

The Court does not perceive any material dispute between the parties as to the scope of the claims based on this term. Defendants’ proposed construction risks confusing the jury, as the z-position is primarily used to describe the positions of points on the object, not of the lens.

Plaintiff agreed to include the “maximum measured intensity” limitation in the construction.

(D.I. 147 at 15)

**H. “compensation model”<sup>15</sup>**

<b>Align</b>
--------------

“mathematical relation to correct measurements for geometric inaccuracies”
--

<b>3Shape</b>
---------------

“a function that is applied to correct the detected z-position due to measurement errors caused by magnification change, field curvature, optical distortion, and/or optical aberrations”
---

<b>Court</b>
--------------

“mathematical relation to correct measurements for geometric inaccuracies”
--

The parties first dispute the types of measurement to be corrected. For the reasons already given in connection with the “determination” terms, the Court agrees with Plaintiff that the correction is not limited to the z-position.

The parties also dispute the types of distortion to be corrected, and here again the Court agrees with Plaintiff: the specification provides a non-exhaustive list of geometric corrections, including “magnification change, optical distortion (e.g., non-constant magnification in x and y), optical aberrations, and *so on.*” (’088 patent at 15:10-15) (emphasis added) Defendants’ proposed construction improperly limits the claim scope to the enumerated embodiments.

---

<sup>15</sup> This term appears in claims 1 and 27 of the ’088 patent and claims 1, 9, 25, 30, 31, 32, and 33 of the ’089 patent.

I. **“depth data for a plurality of points of the intra-oral object”<sup>16</sup> / “adjust/adjusting the depth data for one or more of the plurality of points”<sup>17</sup>**

<p><b>Align</b> <b>“depth data for a plurality of points of the intra-oral object”</b>: “data indicative of depth for plurality of points of the intra-oral object” <b>“adjust/adjusting the depth data for one or more of the plurality of points”</b>: “adjusting/adjust the data indicative of depth for one or more of the plurality of points”</p>
<p><b>3Shape</b> <b>“depth data for a plurality of points of the intra-oral object”</b>: “z-position at a plurality of x-y locations of the intra-oral object” <b>“adjust/adjusting the depth data for one or more of the plurality of points”</b>: “adjusting/adjust the z-position for one or more x-y locations prior to generating the three-dimensional representation of the object”</p>
<p><b>Court</b> <b>“depth data for a plurality of points of the intra-oral object”</b>: “data of positions, where the measured returning light intensity for each position is at the maximum level, for a plurality of points of the intra-oral object” <b>“adjust/adjusting the depth data for one or more of the plurality of points”</b>: “adjusting/adjust the data of positions, where the measured returning light intensity for each position is at the maximum level, for one or more of the plurality of points”</p>

For the same reasons given above in connection with the “determination” terms, the depth data of a point on an intra-oral object is not limited to the data of the z-position of the point. Rather, the depth data is the data of the point’s position when the measured intensity of the light returning from the point reaches the maximum level.

In the context of calibrating and measuring the depth data of an intra-oral object, the specification discloses adjusting not only the depth value, but also the values in other dimensions. (*See* ’089 patent at 18:12-15) Defendants’ contention that the adjustment for the values in other dimensions occurs only in embodiments of dependent claim 4 is unpersuasive, because claim 4 recites the adjustment of a specific type of geometric inaccuracy: magnification.

---

<sup>16</sup> This term appears in claims 1, 9, and 30 of the ’089 patent.

<sup>17</sup> This term appears in claims 1, 9, 30, 31, and 32 of the ’089 patent.

**J. “a reference surface passing through a crown of each of the patient’s teeth”<sup>18</sup>**

<b>Align</b> No construction necessary. To the extent construction is necessary, plain and ordinary meaning, which is “a reference surface passing through the crowns of the teeth of the patient’s upper or lower jaw”
<b>Shape</b> “one planar or flexible surface passing through the crowns of the teeth of a patient’s upper or lower jaw”
<b>Court</b> “a reference surface passing through the crowns of the teeth of the patient’s upper or lower jaw”

Defendants propose that the “reference surface” is a singular (either planar or flexible) surface that passes through the crowns of the teeth of a patient’s upper or lower jaw. (D.I. 133 at 3) This construction is inconsistent with claim language. Claim 1 recites that the reference surface is “defined *at least in part* by *one or more* of a curve of Spee or an Andrew’s plane.” (See ’420 patent, cl. 1) (emphasis added) The claim encompasses a reference surface defined by a combination of orthodontic features including, but not limited to, a curve of Spee and an Andrew’s plane. (See *id.* at 7:37, 7:66) (specification stating that Andrew’s plane *can be used* to define planar reference surface, and curve of Spee *can be used* to define flexible reference surface) The plain language of claim 1 does not, for example, exclude a half-planar, half-flexible reference surface, an embodiment which would, improperly, be excluded by Defendants’ proposed construction. (See *also id.* at 9:59-10:7) (“The scope of the present invention is accordingly to be limited by nothing other than the appended claims, in which reference to an element in the singular is not intended to mean ‘one and only one’ unless explicitly so state, but rather ‘one or more.’”)

---

<sup>18</sup> This term appears in Claims 1 and 11 of the ’420 patent.



The prosecution history also fails to provide a persuasive basis to adopt Defendants’ construction. The patentee stated in response to a § 112 rejection that an amendment was made as a “clarification of the subject matter of the claimed invention.” (D.I. 136 Ex. J at 142) This is not a “clear and unmistakable” surrender of claim scope. *See Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1325-26 (Fed. Cir. 2003).

**K. “wherein the virtual bracket is aligned with the graphical representation of the reference surface generated on the display”<sup>19</sup>**

<p><b>Align</b>          Not indefinite.          No construction necessary. To the extent construction is necessary, plain and ordinary meaning, which is “wherein the virtual bracket is aligned with the displayed reference surface”</p>
<p><b>3Shape</b>          Indefinite.          If determined definite, “the displayed virtual bracket is aligned with the displayed reference surface”</p>
<p><b>Court</b>          “wherein the virtual bracket is aligned with the displayed reference surface”</p>

Defendants have failed to show, by clear and convincing evidence, that the claims “fail to inform with reasonable certainty those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). A person skilled in the art would have understood the scope of the term because the specification discloses sufficient details on how to align the virtual bracket with the displayed reference surface. (See D.I. 135 Ex. 11 ¶¶ 35-39) For example, the specification teaches that the virtual brackets “are lined up to be positioned on the surface of Andrew’s plane 810” or “flexible surface 900” (’420 patent at 7:37-43, 7:66-8:11), and then the program “performs iterative steps to adjust the slot point position to be on the Andrew’s plane” or “flexible surface” (*id.* at 7:56-65, 8:20-26).

---

<sup>19</sup> This term appears in claims 1 and 11 of the ’420 patent.

The Court further agrees with Plaintiff that the virtual bracket does not need to be displayed to align with the graphical representation of the reference surface generated on the display. Although the specification discloses some embodiments that appear to involve displaying the virtual bracket to the user of the invented program (*see, e.g.*, '420 patent at 6:29-31, 7:24-65, 8:59-9:5), there is no express requirement that the virtual bracket must be displayed when its initial position on a patient's tooth is determined.

**L. “a first virtual alignment structure of the virtual upper jaw member that receives a second virtual alignment structure of the virtual lower jaw member or the virtual alignment arrangement comprises a first virtual alignment structure of the virtual lower jaw member that receives a second virtual alignment structure of the virtual upper jaw member”<sup>20</sup>**

<b>Align</b> Not indefinite. No construction necessary.
<b>3Shape</b> Indefinite.
<b>Court</b> Not indefinite. No construction necessary.

Defendants have not met their burden to show indefiniteness under *Nautilus*. While the specification does not teach the exact definition of “receives” in the context of two virtual structures aligned with each other, Plaintiff’s expert, Dr. Stevenson, opines that a person of ordinary skill in the art would, in the context of the claim language, understand “receives” means “in a similar way that a female electrical outlet ‘receives’ a male electrical plug.” (D.I. 135 Ex. 12 ¶ 32) Dr. Stevenson’s opinion is supported by the specification. Claim 1 of the ’294 patent recites that the virtual alignment structure comprises a plurality of virtual positioning reference components that are “configured to fit with each other.” (’294 patent, cl. 1) In the context of Figure 4, the specification further teaches one “positioning reference component” having “an end

---

<sup>20</sup> This term appears in claim 1 of the ’294 patent.

abutment that fits into a matching recess” of the other “positioning reference component.” (*Id.* at 5:37-51) Having found the claim term not indefinite, there is no further material dispute to be resolved by a construction.

**M. “yield proper occlusion alignment”<sup>21</sup>**

<p><b>Align</b> Not indefinite. No construction necessary, but if necessary, the entire phrase “in order to yield proper occlusion alignment of the virtual upper and lower jaw members” should be construed according to plain and ordinary meaning, which is “in order to provide the bite relationship of the upper and lower jaw members of the patient.”</p>
<p><b>3Shape</b> Indefinite.</p>
<p><b>Court</b> “yield an alignment that represents the bite relationship of the upper and lower jaw members of the patient”</p>

In seeking a ruling that this term is indefinite, Defendants rely on Dr. Shah, who asserts that “proper occlusion alignment” does not teach a person skilled in the art about claim scope, with reasonable certainty, because what constitutes “proper occlusion alignment” is subjective and “varies depending on the view of the treating professional.” (D.I. 136 Ex. G ¶ 21) In the Court’s view, however, this term does not relate to the *desired* outcome of an orthodontic treatment procedure, as Dr. Shah appears to believe, but instead deals with an alignment that objectively represents the *current* bite relationship of the jaws of the patient, which does not depend on a subjective preference (as explained by Plaintiff’s expert, Dr. Giordano). (*See* D.I. 135 Ex. 15 ¶¶ 31-34)

This conclusion is supported by the specification, which discloses that “the present invention provides a dental articulator that precisely simulates the occlusion relationship of the jaws.” (’294 patent at 3:23-25) To achieve this goal, the specification teaches an embodiment in

---

<sup>21</sup> This term appears in claim 1 of the ’294 patent.

which the upper and the lower jaw members are produced with an “appropriate physical alignment arrangement for aligning the jaws to represent the alignment of the jaws of the patient.” (*Id.* at 3:6-8) In the context of Figure 4, the specification further describes an embodiment for the “proper alignment of the two cast [jaw] members.” (*Id.* at 5:37-39) It follows that a person of ordinary skill in the art would understand, with reasonable certainty, that “yield proper occlusion alignment” means to align the virtual structures of the jaws to a position that represents the bite relationship of the upper and lower jaw members of a patient.

### **III. CONCLUSION**

The Court will construe the disputed terms as explained above. An appropriate Order follows.

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE**

---

ALIGN TECHNOLOGY, INC.,	:	
	:	
Plaintiff,	:	
	:	
v.	:	C.A. No. 18-1949-LPS
	:	
3SHAPE A/S, 3SHAPE TRIOS A/S,	:	
3SHAPE INC., and 3SHAPE	:	
MANUFACTURING US, LLC,	:	
	:	
Defendants.	:	

---

**ORDER**

At Wilmington this **28th** day of **December, 2020**:

For the reasons set forth in the Memorandum Opinion issued this date,

**IT IS HEREBY ORDERED** that the following claim terms of U.S. Patent Nos. 9,675,430 (the “’430 patent”), 9,844,420 (the “’420 patent”), 9,975,294 (the “’294 patent”), 10,507,088 (the “’088 patent”), and 10,507,089 (the “’089 patent”) are construed as shown below.

The following agreed-upon constructions are adopted:

<b>Terms</b>	<b>Agreed Constructions</b>
“a patient’s tooth” [’420 patent, claims 1 and 11]	“a tooth from the digital data set representing the patient’s teeth”
“A computer-implemented method for positioning a virtual bracket on a patient’s tooth” [’420 patent, claim 1]	Preamble is limiting.
“Andrew’s plane” [’420 patent, claims 1 and 11]	“the surface or plane on which the midtransverse plane of every crown in an arch will fall when the teeth are optimally positioned”
“curve of Spee”	“the anatomic curve established by the occlusal alignment of the teeth, as projected

[’420 patent, claims 1 and 11]	onto the median plane, beginning with the cusp tip of the mandibular canine and following the buccal cusp tips of the premolar and molar teeth, continuing through the anterior border of the mandibular ramus, ending with the anterior most portion of the mandibular condyle”
“so as to modify the reference surface” [’420 patent, claims 1, 4, 11, and 14]	“to reshape and/or reposition the reference surface”
“a radius of a largest lens in the plurality of lenses” [’430 patent, claim 7]	“the length of a straight line from the center to the circumference of the largest lens in the plurality of lenses”
“elements” [’088 patent, claim 10]	“target”

The parties’ claim construction disputes are resolved as shown below:

<b>Terms</b>	<b>Court’s Constructions</b>
“confocal imaging apparatus” [’430 patent, all claims; ’088 patent, claims 8, 18, and 23; ’089 patent, claims 21 and 28]	“imaging device having illumination and detection paths with conjugate focal planes”
“illumination module” [’430 patent, claims 1, 3, 6, and 12; ’088 patent, claims 5, 15, and 23; ’089 patent, claims 18 and 27]	Subject to § 112(f) Function: to generate an array of light beams, Structure: grating, microlens array, an optics expander, or equivalents thereof.
“light beams” / “light beam” [’430 patent, claims 1, 3, 8, and 12; ’088 patent, claims 11 and 23]	“directional projection of light energy; may consist of parallel, diverging, or converging rays”
“the focusing optics to perform confocal focusing of the array of light beams onto a non-flat focal surface” [’430 patent, claim 1]	“the focusing optics to focus the array of light beams onto a non-flat focal surface, such that the illumination and detection paths have conjugate focal planes”
“focusing optics to perform focusing of the light onto the non-flat focal surface” [’088 patent, claim 1]	“focusing optics (at least one optical lens) to focus the light onto the non-flat focal surface”
“focusing optics to perform focusing of the light onto a focal surface” [’089 patent, claims 9, 22, 32 and 33]	“focusing optics (at least one optical lens) to focus the light onto a focal surface.”

<p>“for determination of positions on the imaging axis of a plurality of points of the three dimensional object” [’430 patent, claim 1; ’088 patent, claims 1, 11, 19, and 27]</p> <p>“determine positions of a plurality of points of the three dimensional object” [’089 patent, claim 22]</p>	<p>“for determination of positions, where the measured intensity for each position is at the maximum level, of a plurality of points on the surface of the three dimensional object”</p> <p>“determine positions, where the measured intensity for each position is at the maximum level, of points on the three dimensional object”</p>
<p>“detected positions of one or more of the plurality of points are to be adjusted” [’430 patent, claims 1 and 2; ’088 patent, claims 1, 11, 19, and 27]</p> <p>“adjust the determined positions of one or more of the plurality of points” [’089 patent, claim 22]</p>	<p>“detected positions, where the measured intensity for each position is at the maximum level, of one or more of the points are to be adjusted”</p> <p>“adjust the determined positions, where the measured intensity for each position is at the maximum level, of the one or more points”</p>
<p>“a location of the at least one lens that yields a maximum measured intensity” [’430 patent, claim 8; ’088 patent, claims 8]</p>	<p>“in-focus lens position that yields a maximum measured intensity”</p>
<p>“compensation model” [’088 patent, claims 1 and 27; ’089 patent, claims 1, 9, 25, 30, 31, 32, and 33]</p>	<p>“mathematical relation to correct measurements for geometric inaccuracies”</p>
<p>“depth data for a plurality of points of the intra-oral object” [’089 patent, claims 1, 9, and 30]</p> <p>“adjust/adjusting the depth data for one or more of the plurality of points” [’089 patent, claims 1, 9, 30, 31, and 32]</p>	<p>“data of positions, where the measured returning light intensity for each position is at the maximum level, for a plurality of points of the intra-oral object”</p> <p>“adjusting/adjust the data of positions, where the measured returning light intensity for each position is at the maximum level, for one or more of the plurality of points”</p>
<p>“a reference surface passing through a crown of each of the patient’s teeth” [’420 patent, claims 1 and 11]</p>	<p>“a reference surface passing through the crowns of the teeth of the patient’s upper or lower jaw”</p>
<p>“wherein the virtual bracket is aligned with the graphical representation of the reference surface generated on the display” [’420 patent, claims 1 and 11]</p>	<p>“wherein the virtual bracket is aligned with the displayed reference surface”</p>
<p>“a first virtual alignment structure of the virtual upper jaw member that receives a second virtual alignment structure of the</p>	<p>No construction necessary.</p>

<p>virtual lower jaw member or the virtual alignment arrangement comprises a first virtual alignment structure of the virtual lower jaw member that receives a second virtual alignment structure of the virtual upper jaw member”</p> <p>[’294 patent, claim 1]</p>	
<p>“yield proper occlusion alignment”</p> <p>[’294 patent, claim 1]</p>	<p>“yield an alignment that represents the bite relationship of the upper and lower jaw members of the patient”</p>

  
 \_\_\_\_\_  
 UNITED STATES DISTRICT JUDGE