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Paper 11
Entered: February 10, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIGN TECHNOLOGY, INC.,
Petitioner,

v.

3SHAPE A/S,
Patent Owner.

IPR2021-01312
Patent 10,905,333 B2

Before FRANCES L. IPPOLITO, JAMES J. MAYBERRY, and JASON M. REPKO, *Administrative Patent Judges.*

MAYBERRY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

A. Background and Summary

Align Technology, Inc. ("Petitioner"), filed a Petition ("Pet.") requesting *inter partes* review of claims 1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, and 38 (the "Challenged Claims") of U.S. Patent No. 10,905,333 B2 (Ex. 1001, the "'333 patent"). Paper 2. 3Shape A/S ("Patent Owner") filed a Preliminary Response ("Prelim. Resp.") to the Petition. Paper 6.

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2021) (permitting the Board to institute trial on behalf of the Director). To institute an *inter partes* review, we must determine that the information presented in the Petition shows "a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). For the reasons set forth below, upon considering the present record, we institute an *inter partes* review.

B. Real Parties in Interest

Petitioner identifies only itself, Align Technology, Inc., as the real party-in-interest. Pet. 11.

Patent Owner identifies only itself, 3Shape A/S, as the real party-in-interest. Paper 5, 1.

C. Related Matters

The parties identify, as a matter related to the '333 patent, ongoing litigation in the U.S. District Court for the Western District of Texas, in a case styled *Align Technology, Inc. v. 3Shape A/S*, No. 6:20-cv-00979, filed on October 19, 2020 ("District Court litigation"). Pet. 11; Paper 5, 1.

The parties further state that the '333 patent is also the subject of IPR2021-01313, filed by Petitioner on July 30, 2021. Paper 3, 1; Paper 5, 1.

Petitioner filed an explanation of multiple petitions challenging the ’333 patent. Paper 3.

D. The ’333 Patent

The ’333 patent, titled “3D Intraoral Scanner Measuring Fluorescence,” issued February 2, 2021, from an application filed February 22, 2019, and ultimately claims priority to an application filed June 27, 2013, and a provisional application filed June 27, 2012. Ex. 1001, codes (45), (22), (63), (60). The ’333 patent “relates to a 3D scanner system where fluorescence recorded from a patient’s teeth is used for detecting cariogenic regions on the teeth.” *Id.* at 1:24–30. The ’333 patent explains that “[c]ariogenic bacteria *Streptococcus mutans* produces special metabolites called porphyrins. These porphyrins fluoresce at red wavelengths, such as light in the wavelength range of 620-740 nm, when exposed to a 405-nm light, while healthy hard dental tissue fluorescence at green wavelengths, such as light in the wavelength range of 520-570 nm.” *Id.* at 14:6–11. That is, a cariogenic region in which unhealthy “caries” are present fluoresces at a different light wavelength than healthy dental tissue. *See id.* at 2:57–59, 13:55–58, 14:35–39. The 3D scanner system “map[s] fluorescence and/or a representation of a cariogenic region onto a digital 3D representation of the teeth.” *Id.* at 2:14–17. Combining the 3D representation of the teeth and the cariogenic region fluorescence allows, for example, “a dentist to precisely identify which regions of the teeth are cariogenic.” *Id.* at 12:39–45.

We reproduce Figure 1 from the ’333 patent below.

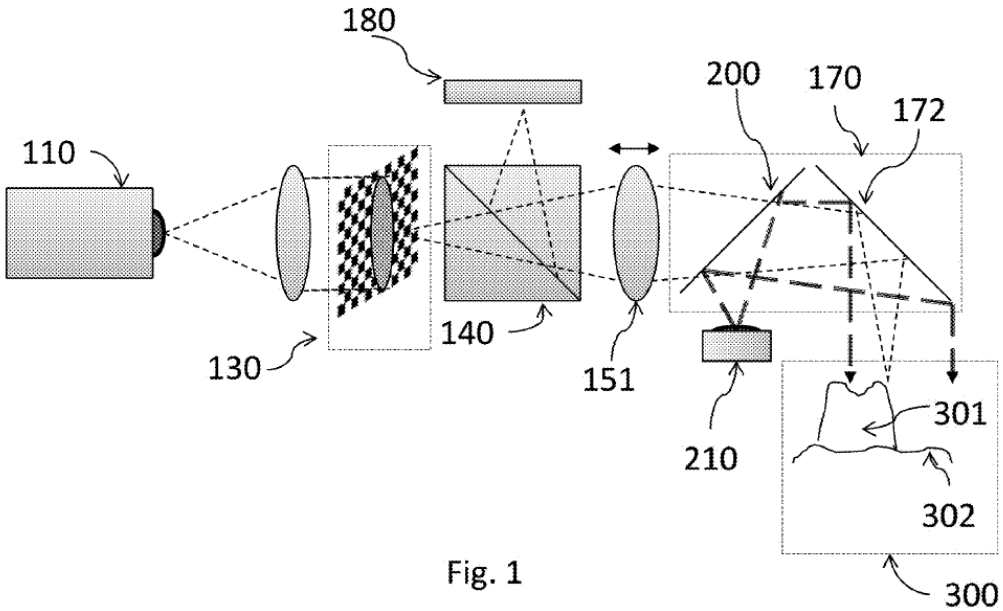

Fig. 1

Figure 1 depicts a focus scanning intraoral 3D scanner. Ex. 1001, 24:1–6. To generate a scan, first light source 210 and second light source 110 emit light at respective first and second wavelengths, illuminating hard dental tissue 301 and soft dental tissue 302 in intraoral cavity being scanned 300. *Id.* at 24:5–25, 24:35–38. First light source 210 emits light at a first wavelength (shown as thick, long dashed lines) “intended to excite fluorescence in the hard tissue parts of the intraoral cavity 300.” *Id.* at 24:35–38, 24:46–49. Second light source 110 emits light at a second wavelength (shown as thin, short dashed lines) “intended for 3D surface recording.” *Id.* at 24:16–28. Hard dental tissue 301 and soft dental tissue 302 of intraoral cavity being scanned 300 reflect light from the first light source, which is captured by image sensor 180 to generate the 3D surface topology of the intraoral cavity. *Id.*

First light source 210 emits light that excites fluorescence in the hard tissue in the intraoral cavity. Ex. 1001, 24:35–38. Image sensor 180 measures the fluorescence of the dental. *Id.* at 24:22–25, 24:49–53,

25:22–24. Furthermore, to capture reflected light for fluorescence measurements, "second light source 110 is turned off, while the first light source 210 is turned on." *Id.* at 25:24–26. That is, the two light sources are "turned on and off alternatingly." *Id.* at 26:46–47.

The light captured by the image sensor is used to "creat[e] a digital 3D representation of the 3D topography of the teeth based on recorded images comprising probe light reflected from the teeth" and "creat[e] a representation of the fluorescence emitted from the fluorescent material of the teeth based on recorded images comprising the emitted fluorescence." Ex. 1001, 26:29–38. Then, "the representation of the emitted fluorescence [is mapped] onto the corresponding portion of the digital 3D representation of the teeth to provide a combined digital 3D representation" for visualization. *Id.* at 26:38–45.

E. Challenged Claims

The Petition challenges claims 1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, and 38. Pet. 12. Claims 1 and 21 are independent claims; claim 1 is reproduced below.

> 1. A 3D scanner system configured for displaying a digital representation of a cariogenic region of a tooth and a digital 3D representation of the tooth, the 3D scanner system comprising:
>
> a 3D intraoral scanner device comprising:
>
> i. one or more image sensor(s);
>
> ii. a first light source, the first light source configured to emit light at a first wavelength, wherein the 3D intraoral scanner device is configured such that at least one of the one or more image sensor(s) detects light at the first wavelength, thereby configured to record data for a 3D surface topography of the tooth; and

> iii. a second light source, the second light source configured to emit light at a second wavelength, wherein the 3D intraoral scanner device is configured such that at least one of the one or more image sensor(s) detects light at the second wavelength, thereby configured to record data for the cariogenic region of the tooth,
>
> a data processor configured for:
>
> i. converting the data for the 3D surface topography of the tooth into the digital 3D representation of the tooth; and
>
> ii. converting the data for the cariogenic region into the digital representation of the cariogenic region of the tooth, a display configured for visualizing both the digital 3D representation of the tooth and the digital representation of the cariogenic region of the tooth,
>
> wherein the 3D intraoral scanner is configured to shift between the first light source and the second light source repeatedly, thereby configured to illuminate the tooth successively by the light from the first light source and the second light source.

Ex. 1001, 32:7–41.

Claims 3, 5, 7, 8, and 20 depend from claim 1, and claims 23, 25, 27, 28, and 38 depend from claim 21. Ex. 1001, 32:45–48, 32:53–55, 32:58–62, 33:23–34:3; 34:7–10, 34:15–17, 34:21–26, 34:52–62.

F. Prior Art and Asserted Grounds

Petitioner asserts that the Challenged Claims are unpatentable based on the following three grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3, 5, 8, 20, 21, 23, 25, 28, 38	103(a)[1]	Oota,[2] Liang[3]
1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, 38	103(a)	Babayoff[4]
1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, 38	103(a)	Babayoff, Everett[5]

Petitioner relies on the declaration testimony of Rongguang Liang, Ph.D. Ex. 1002.

The following subsections provide brief descriptions of the asserted prior art references.

1. Oota (Ex. 1006)

Oota, titled "Intra-oral Measurement Device and Intra-Oral Measurement System," published October 7, 2010. Ex. 1006, codes (54), (43). We reproduce Figure 1 of Oota below.

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the '333 patent was issued on an application claiming priority before this date, we apply the pre-AIA version of § 103. Ex. 1001, codes (22), (63), (60).
[2] Oota et al., US 2010/0253773A1, published October 7, 2010 (Ex. 1006, "Oota").
[3] Liang et al., US 2008/0063998 A1, published March 13, 2008 (Ex. 1007, "Liang").
[4] Babayoff, US 7,698,068 B2, issued April 13, 2010 (Ex. 1008, "Babayoff").
[5] Everett et al., US 6,522,407 B2, issued February 18, 2003 (Ex. 1009, "Everett").

Fig.1

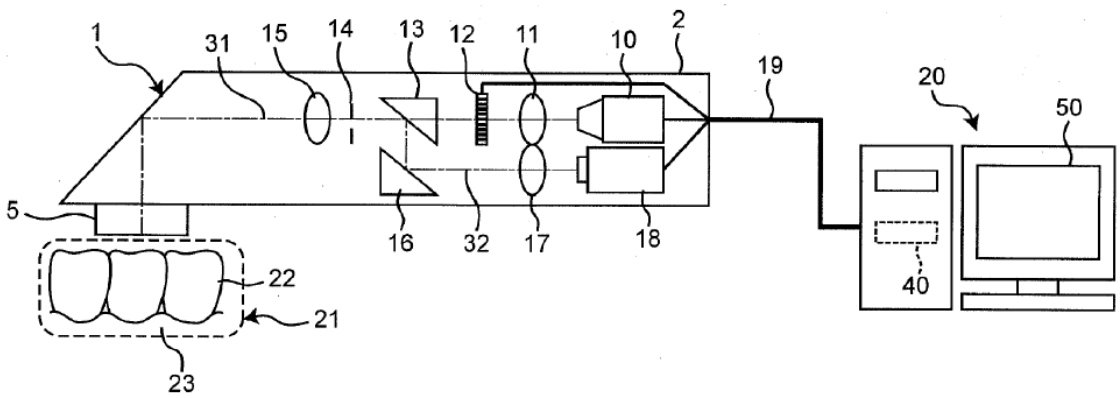

Figure 1 depicts a schematic configuration of an intra-oral measurement system having an oral scanner. Ex. 1006 ¶ 32. "Lights [are] irradiated from the light projecting unit 10" and patterned and projected onto object being measured 21. *Id.* ¶ 57. Further, light projecting unit 10 uses "two LED light source[s] 24, 25 respectively irradiating the light in two different wavelengths" in order to obtain "images for all of the enamel, the dentin, and the gingiva," because those features are more prevalent at certain wavelengths. *Id.* ¶¶ 62–63, Table 1. For example, "light projecting unit 10 is provided with an LED light source 24 as one example of a first light source that irradiates light in a wavelength of 500 to 565 nm (green), an LED light source 25 as one example of a second light source that irradiates light in a wavelength of 625 to 740 nm (red)." *Id.* ¶ 60. Even further, the light source alternates between green and red wavelengths. *Id.* ¶¶ 85–88.

The light projected is "reflected on the object to be measured 21," and the reflected light is "received and imaged by the imaging sensor 18" which stores image data. Ex. 1006 ¶ 57. Image processing unit 40 converts the image data "into data of three-dimensional coordinates, and obtains three-dimensional image data of the object to be measured 21." *Id.* ¶¶ 58, 79. By capturing and using different wavelengths of light, "clear images can be

obtained for both of the region for the tooth 22 and the region for the gingiva 23" and, accordingly, "it is possible to accurately measure the intra-oral shape." *Id.* ¶ 113.

Oota discloses, in its first embodiment, image processing unit 40 is external to device 20. Ex. 1006 ¶¶ 58, 114. In an alternative example,

> image processing unit 40 can be configured to be mounted within the oral scanner 1A as shown in F[igure] 12. In this case, as shown in F[igure] 12, a data reading mechanism 81 for externally reading the data of the three-dimensional coordinates of the object to be measured 21 measured by the oral scanner 1A can be provided for the oral scanner 1A.

Id. ¶ 114.

2. Liang (Ex. 1007)

Liang, titled "Apparatus for Caries Detection," published March 13, 2008. Ex. 1007, codes (54), (43). Liang explains that

> it is known that fluorescence can be used to detect dental caries using either of two characteristic responses: First, excitation by a blue light source causes healthy tooth tissue to fluoresce in the green spectrum. Secondly, excitation by a red light source can cause bacterial by-products, such as those indicating caries, to fluoresce in the red spectrum.

Id. ¶ 70. Figure 1 of Liang is reproduced below.

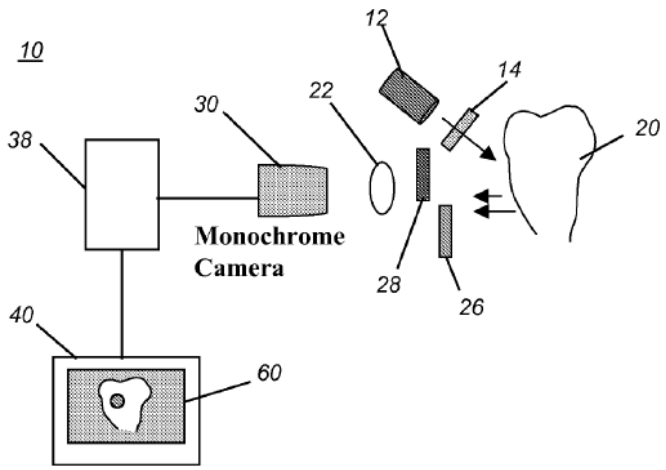

FIG. 1

Figure 1 depicts a basic optical arrangement for an imaging apparatus 10 for caries detection. Ex. 1007 ¶¶ 38, 76. As shown in Figure 1, "light source 12 directs an incident light, at a blue wavelength range or other suitable wavelength range, toward tooth 20." *Id.* ¶ 76. Furthermore, "[l]ight source 12 is typically centered around a blue wavelength, such as about 405 nm in one embodiment" or "from an upper ultraviolet range to blue, between about 300 and 500 nm." *Id.* ¶ 79.

Monochrome camera 30 captures images of the tooth illuminated by light source 12. Ex. 1007 ¶¶ 77, 82. Furthermore, "monochrome camera 30 has color filters 26 and 28" respectively used for reflectance imaging and fluorescence imaging to form an enhanced diagnostic image. *Id.* ¶ 77. Alternatively, a color camera can be used in which "auxiliary filters would not generally be needed, since color camera 32 would be able to obtain the reflectance and fluorescence images from the color separations of the full color image of tooth 20." *Id.* ¶ 78. Then, "processing of the image data uses both the reflectance and fluorescence image data [in order] to generate a final image that can be used to identify carious areas of the tooth." *Id.* ¶ 88.

Liang discloses that back-scatter reflectance is of interest in its invention, and that specular reflectance must be blocked. Ex. 1007 ¶ 71. Liang explains that a carious region "may be imperceptible or barely perceptible in either fluorescence image 50 or reflectance image 52, taken individually," and that "[p]rocessing apparatus 38 operates upon the image data using an image processing algorithm . . . for both images 50 and 52 and provides FIRE image 60 as a result." *Id.* ¶ 86.

3. Babayoff (Ex. 1008)

Babayoff, titled "Method for Providing Data Associated with the Intraoral Cavity," issued April 13, 2010. Ex. 1008, codes (54), (43). Babayoff describes a device that generates "at least one numerical entity," i.e., "a data set or to a set of instructions that is manipulable by automated numerical processing means, such as a computer for example," "that is representative of the three-dimensional surface geometry and color of at least part of the intra-oral cavity." *Id.* at 4:6–9, 7:54–56, 8:25–29. Figure 1 "illustrates the main elements of embodiments of devices for creating a three-dimensional color numerical entity," and is reproduced below. *Id.* at 6:60–62.

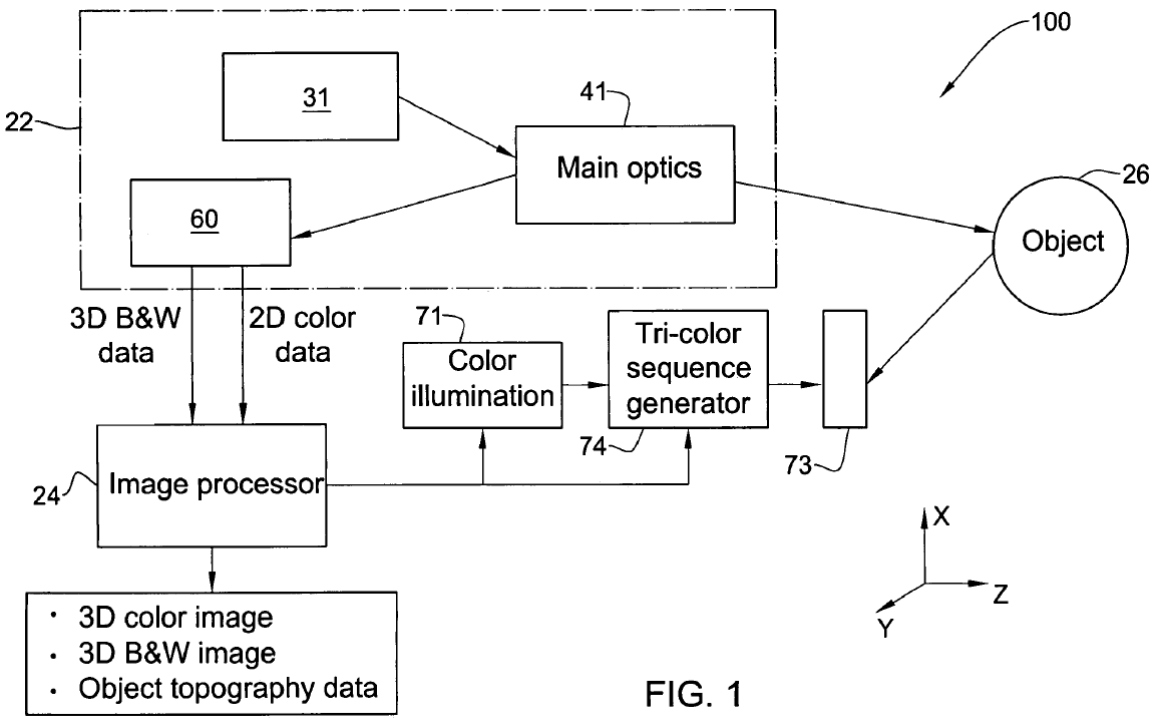

FIG. 1

Figure 1 depicts "the main elements of embodiments of devices for creating a three-dimensional color numerical entity." Ex. 1008, 6:60–62. As shown in Figure 1, "main illumination source 31 for illuminating the object of interest 26, typically a part of the intraoral cavity . . . to provide depth Z values . . . along the surface of the object 26." *Id.* at 8:30–35. In turn, detection optics 60, i.e., an image sensor, captures images data from object 26 to determine depth Z values of object 26. *Id.* at 8:35–52.

Additionally, the device includes "color illuminating means, such as for example a tri-color sequence generator 74, for selectively illuminating the object 26 with suitable colors, typically [g]reen, [r]ed and [b]lue." Ex. 1008, 8:45–48. In one technique, "object 26 [is illuminated] sequentially with three different colored lights such as red, green and blue." *Id.* at 12:7–9. After illuminating object 26, detection optics 60 captures those images "to provide a full color 2D image of the object." *Id.* at 8:50–53, 12:9–11.

Notably, the depth images and color images are captured from "the same frame of reference." Ex. 1008, 8:53–56. Accordingly, the captured color and depth images are aligned in a straightforward manner "because both the 3D data and the 2D color data are referenced to the same X-Y frame of reference." *Id.* at 8:60–62. The device "then map[s] the color values of the two-dimensional image onto the three-dimensional 'image.'" *Id.* at 8:18–21, 8:57–60. That is, for example, the device "combines the three images to provide a 2D color image comprising an array of data points having location (X,Y) and color (C) information for each pixel of the 2D color image." *Id.* at 12:22–24.

4. Everett (Ex. 1009)

Everett, titled "Optical Detection Dental Disease using Polarized Light," issued February 18, 2003. Ex. 1009, codes (54), (43). Everett detects "dental disease using polarized light." *Id.* at 1:24–27. In Everett, "the tooth (or other mineralized tissue) is irradiated with polarized light." *Id.* at 3:50–52. For example, the tooth "is illuminated by a low coherence light source 12 followed by a polarizer 14, an optional wave plate 16, and a collimating lens 18." *Id.* at 5:42–46; *see id.* at Fig. 1.

That polarized light is "backscattered from the tooth," and that backscattered light is captured. Ex. 1009, 3:53, 5:10–12. For example. "reflected scattered light from the illuminated sample 10 passes through a wave plate 20 and polarizer 22, and then is imaged onto a detector 24, such as a CCD camera or photodetector." *Id.* at 5:57–60; *see id.* Fig. 1. The change in the light's polarization state, i.e., depolarization, is measured. *Id.* at 5:11–12, 6:66–7:1. Because "light scattered from demineralized enamel becomes depolarized," the measured "polarization state, or amount of depolarization, of the backscattered light . . . detecting the degree of

demineralization in the enamel" and caries. *Id.* at 5:29–32; *see id.* at 3:45–49.

II. DISCRETIONARY DENIAL

Patent Owner argues that we should exercise our discretion under 35 U.S.C. § 314(a) and not institute trial, given (1) the parallel district court litigation related to the '333 patent; and (2) the second, parallel, *inter partes* review of the '333 patent in IPR2021-01313. Prelim. Resp. 49–59. For the reasons stated below, we do not exercise our discretion to deny institution in view of the parallel proceeding or second petition.

Institution of an *inter partes* review is discretionary. *See* 35 U.S.C. § 314(a) (authorizing institution of an *inter partes* review under particular circumstances, but not requiring institution under any circumstances); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016) ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion."); *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) ("[Section] 314(a) invests the Director with discretion on the question whether to institute review . . . ." (emphasis omitted)); *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) ("[T]he PTO is permitted, but never compelled, to institute an IPR proceeding.").

A. Parallel litigation and Fintiv

When determining whether to exercise discretion to deny institution in view of a parallel litigation, we consider the following factors:

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;

2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;

3. investment in the parallel proceeding by the court and the parties;

4. overlap between issues raised in the petition and in the parallel proceeding;

5. whether the petitioner and the defendant in the parallel proceeding are the same party; and

6. other circumstances that impact the Board's exercise of discretion, including the merits.

Apple Inc. v. Fintiv, Inc., IPR2020-00019, Paper 11 at 6 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv* Order"). "These factors relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding." *Id.*

We address the *Fintiv* factors below and explain our reasons for not exercising discretion to deny institution based on § 314(a).

1. First Factor: Whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted

"A district court stay of the litigation pending resolution of the PTAB trial allays concerns about inefficiency and duplication of efforts. This fact has strongly weighed against exercising the authority to deny institution under *NHK*." *Id.* (referring to *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential)). Here, the parallel litigation has not been stayed. *See* Pet. 67–68. Petitioner, though, asserts that it will request a stay if Patent Owner does as well, as Patent Owner also has filed petitions for *inter partes* review at the Board. *Id.* Absent specific evidence, we decline to predict how the District Court would rule on a stay request. *See Sand Revolution II LLC v. Cont'l Intermodal Grp.*, IPR2019-01393, Paper 24, 7 (PTAB June 16, 2020) (informative).

No specific evidence in this case suggests that the District Court will grant a stay. Thus, the first *Fintiv* factor is neutral.

2. Second Factor: Proximity of the court's trial date to the Board's projected statutory deadline for a final written decision

"If the court's trial date is earlier than the projected statutory deadline, the Board generally has weighed this fact in favor of exercising authority to deny institution under *NHK*." *Fintiv* Order 9.

According to the district court's scheduling order here, the trial date is October 3, 2022—four months before the projected statutory deadline. Ex. 1020, 2. The record lacks any specific evidence showing that the trial date is in doubt. Thus, the second *Fintiv* factor weighs in favor of exercising discretion to deny institution.

3. Third Factor: Investment in the parallel proceeding by the court and the parties

"The Board also has considered the amount and type of work already completed in the parallel litigation by the court and the parties at the time of the institution decision." *Fintiv* Order 9. "[M]ore work completed by the parties and court in the parallel proceeding tends to support the arguments that the parallel proceeding is more advanced, a stay may be less likely, and instituting would lead to duplicative costs." *Id.* at 10.

Here, the District Court held a *Markman* hearing. Ex. 1021 (including the transcript of the *Markman* hearing). So, at least some of the work related to invalidity has been completed. But, at this stage, the terms of the claims of the '333 patent that were construed in the District Court do not appear to be in dispute in the grounds of unpatentability before the Board. *See, e.g.*, Pet. 13–16 (indicating that the Petition demonstrates that the claims are unpatentable under either parties' constructions). Also, on the record before

us, the investment by the District Court and the parties in this regard is not substantial. For example, according to the district court's scheduling order, fact discovery is still ongoing. *See* Ex. 1020, 1 (indicating that fact discovery closes April 15, 2022).

The third *Fintiv* factor also considers Petitioner's diligence in filing: "If the evidence shows that the petitioner filed the petition expeditiously, such as promptly after becoming aware of the claims being asserted, this fact has weighed against exercising the authority to deny institution under *NHK*." *Fintiv* Order 11. Here, Petitioner argues that it filed the Petition nearly "nine months before the statutory deadline, demonstrating Petitioner's diligence in requesting IPR." Pet. 68. This mitigates the investment somewhat.

In our overall assessment, the third *Fintiv* factor weighs slightly against exercising our discretion to deny institution.

4. Fourth Factor: Overlap between issues raised in the petition and in the parallel proceeding

"[I]f the petition includes the same or substantially the same claims, grounds, arguments, and evidence as presented in the parallel proceeding, this fact has favored denial." *Fintiv* Order 12. Petitioner "agrees not to pursue in the parallel action any specific ground that the Board institutes." Pet. 68.

In Patent Owner's view, "Align's statement does not even preclude a materially identical ground from being raised." Prelim. Resp. 58. Patent Owner argues that Petitioner's narrow statement provides no protection against duplication of issues. *Id.* We disagree.

Petitioner's stipulation here is similar to the stipulation in *Sand Revolution II, LLC v. Continental Intermodal Grp. – Trucking LLC*, IPR2019-01393, Paper 24 at 11–12 (June 16, 2020) (informative). In *Sand*

II, the Petitioner stipulated that it "will not pursue the same grounds in the district court litigation." *Id.* at 12. The Board in *Sand II* determined that, under the circumstances in that case, the stipulation marginally weighed against denial. *Id.* To be sure, a broader stipulation, such as agreeing not to "pursue any ground raised or that could have been reasonably raised," might better address the concerns over duplication to a greater degree. *See id.* at 12 n.5. Nevertheless, like in *Sand II*, the fourth *Fintiv* factor marginally weighs against denial because Petitioner's stipulation mitigates duplication of effort at least to some degree. *Id.*

5. Fifth Factor: Whether the petitioner and the defendant in the parallel proceeding are the same party

If the petitioner is the defendant in the parallel proceeding, this factor weighs in favor of denial. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 55 (PTAB May 13, 2020) (informative) (applying the fifth *Fintiv* factor); *see also Sand Revolution*, Paper 24 at 12–13 (informative) ("Although it is far from an unusual circumstance that a petitioner in *inter partes* review and a defendant in a parallel district court proceeding are the same, or where a district court is scheduled to go to trial before the Board's final decision would be due in a related *inter partes* review, this factor weighs in favor of discretionary denial.").

Here, Petitioner is the defendant in the parallel litigation. *See, e.g.*, Pet. 67–68. Thus, the fifth *Fintiv* factor weighs in favor of exercising discretion to deny institution.

6. Sixth Factor: Other circumstances that impact the Board's exercise of discretion, including the merits

When considering whether to exercise discretion to deny a petition, the Board assesses "all the relevant circumstances in the case," including the

Petition's merits. *Fintiv* Order 14–16. Strong merits typically favor granting institution. *Id.* Weak merits favor denial. *Id.* We weigh the sixth *Fintiv* factor as neutral.

7. Fintiv Factors: Conclusion

The *Fintiv* factors do not represent a scorecard, that is tallied to arrive at an outcome. Instead, we consider the *Fintiv* factors in a holistic analysis. *Fintiv* Order 6. Under that analysis, the factors here weigh against exercising our discretion to deny institution of *inter partes* review. Thus, we decline to exercise our authority to deny institution of *inter partes* review based on the parallel litigation.

B. Parallel Petitions

Patent Owner contends that the Board should exercise its discretion to deny the Petition in view of the parallel petition challenging the '333 patent in IPR2021-01313. Prelim. Resp. 50–57; *see also* Paper 3 (Explanation of Multiple Petitions, identifying the present Petition ("the 1312 Petition") and the petition in IPR2021-01313 ("the 1313 Petition")). In deciding whether to institute *inter partes* review, we consider the guidance in the Consolidated Trial Practice Guide, which sets forth the following:

> Parallel Petitions Challenging the Same Patent. Based on the Board's experience, one petition should be sufficient to challenge the claims of a patent in most situations. Two or more petitions filed against the same patent at or about the same time (e.g., before the first preliminary response by the patent owner) may place a substantial and unnecessary burden on the Board and the patent owner and could raise fairness, timing, and efficiency concerns. *See* 35 U.S.C. § 316(b).

Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019) 59, https://www.uspto.gov/TrialPracticeGuideConsolidated ("TPG").

Petitioner argues that the two petitions present materially distinguishable challenges to unique subsets of claims, and are necessary because of the large number of claims that could possibly be asserted in district court litigation. Paper 3, 1–2. Petitioner argues that "even the currently asserted claims would be difficult if not impossible to challenge in a single petition without significantly reducing the amount of analysis provided, prejudicing [Petitioner]'s ability to explain the basis of invalidity in view of the complex subject matter at issue." *Id.* at 2. Petitioner explains that "independent claims 1 and 21 are each nearly half a column in length, with over 250 words each. Dependent claims 20 and 38, which are among the asserted claims, both recite the combination of numerous limitations and have nearly 80 words each." *Id.*

Patent Owner argues that "Petitioner points to nothing unusual or extraordinary about the challenged claims that warrants two petitions." Prelim. Resp. 53. Patent Owner argues that Petitioner's basis for the two petitions—that the "petitions are justified by 'the depth of analysis presented in the petitions' and 'the currently asserted claims would be difficult if not impossible to challenge in a single petition without significantly reducing the amount of analysis provided'"— are problems of Petitioner's own making. *Id.* at 52. Patent Owner explains that Petitioner chose to assert three different grounds based on different references. *Id.* at 52–53, 55–56. Patent Owner also argues that Petitioner's word limit argument cannot justify the two petitions, as that argument would weigh against discretionary denial in all cases of multiple petitions. *Id.* at 56.

We disagree with Patent Owner's arguments, and we find Petitioner's explanation for filing two petitions challenging claims of the '333 patent to be sufficient. Paper 3. Given the complexity and differences in subject

matter recited in the claims, we agree that the use of a single petition was not practical. *See id.* One such complexity is evident from Petitioner's three grounds. Each of the three grounds address a key claim limitation in a different way. *See, e.g.*, Prelim. Resp. 6–49 (providing Patent Owner's merit-based arguments, focusing on the second light source limitation of independent claims 1 and 21). Ground 1 relies on fluorescence from a second light source for identifying a cariogenic region of the tooth, Ground 2 relies on color imaging from a second light source for identifying a cariogenic region of the tooth, and Ground 3 relies on light polarization from a second light source for identifying a cariogenic region of the tooth. *Cf.* Pet. 20–24, 42–43, 57–58 (addressing the cariogenic region identification limitation for the three grounds).

We also are persuaded by Petitioner's arguments about efficiency in considering the challenges presented in both petitions concurrently. *See* Paper 3, 3.

Also, instead of considering the word limit or whether the number of challenged claims falls above or below a threshold, as Patent Owner argues, we consider all the facts in a given case in reaching a decision, accounting for fairness, timing, and efficiency concerns. *See* TPG, 59. Here, we have considered the number of claims as well as their complexity, differences in subject matter recited in the claims, and the different approaches represented by the three grounds. *See id.*

In particular, Petitioner asserts that "[t]he second petition is not submitted to present additional grounds of challenge or invalidity theories for the same claims addressed in first petition." Paper 3, 1. We find Petitioner's argument persuasive because the overlapping challenges to the independent claims provide the necessary foundation for challenging the

subject matter recited in dependent claims, which do not overlap. Paper 3. As can be seen from the subject matter of the two sets of dependent claims challenged in the two petitions, the two petitions, for the most part, focus on unique subject matter. *Cf., e.g.*, Ex. 1001, 32:45–47 (providing claim 3, challenged in the ’1312 Petition, directed to displaying the results), 32:53–55 (providing claim 5, challenged in the ’1312 Petition, directed to a single image sensor), 32:58–62 (providing claims 7 and 8, challenged in the ’1312 Petition, directed to a specific wavelength range for the first and second light sources, respectively), 32:63–63 (providing claim 9, challenged in the ’1313 Petition, directed to selecting a wavelength of light that would excite a fluorescent material of a tooth), 33:16–17 (providing claim 17, challenged in the ’1313 Petition, directed to identifying demineralization), 33:21–22 (providing claim 19, challenged in the ’1313 Petition, directed identifying cariogenic bacteria).

We disagree with Patent Owner’s argument that “Petitioner happened to divide the subject matter of the two petitions based on claims instead of grounds does not excuse Petitioner from having to demonstrate a need for multiple petitions.” Prelim. Resp. 52. As we explain above, Petitioner has demonstrated a need for the multiple petitions. *See* Paper 3.

For all the reasons discussed in this section, we do not exercise our discretion to deny the Petition in view of the parallel petition.

III. ANALYSIS OF PETITIONER’S CHALLENGES

A. Applicable Law

Petitioner’s asserted grounds of unpatentability are based on obviousness under 35 U.S.C. § 103.

> Section 103(a) forbids issuance of a patent when "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."

KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when available, objective evidence, such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

"[O]bviousness must be determined in light of *all the facts*, and . . . a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine" teachings from multiple references. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (emphasis added); *see also PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014) ("The presence or absence of a motivation to combine references in an obviousness determination is a pure question of fact.").

B. Level of Ordinary Skill in the Art

The level of skill in the art is "a prism or lens" through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Petitioner contends that a person having ordinary skill in the art "would be part of a team that likely would include (1) an engineer with a degree in electrical engineering, computer software, physics, or an equivalent field, as well as . . . some years of experience in optical scanning, or comparable experience in optical scanning; and (2) a

dentist with experience in the detection of tooth decay and caries." Pet. 10. Petitioner bases these contentions, at least in part, on testimony from its declarant, Dr. Liang. *Id.* (referencing Ex. 1002 ¶¶ 37–41).

Patent Owner does not address the level of ordinary skill in the art at this stage of the proceeding.

For the purposes of this Decision, we apply Petitioner's definition of the level of ordinary skill in the art. We determine that this definition is consistent with the prior art of record and the skill reflected in the Specification of the '333 patent, based on our review of the limited record.

C. Claim Construction

In *inter partes* reviews, we interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b). Under this standard, we construe the claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.*

Petitioner asserts express constructions for three claim limitations: (1) a "cariogenic region of the tooth," (2) a "second light source," and (3) "the 3D intraoral scanner device is configured such that at least one of the one or more image sensor(s) detects light at the second wavelength, thereby configured to record data for the cariogenic region of the tooth." Pet. 13–16 (presenting the parties' proposed constructions for the terms from the District Court litigation). Patent Owner asserts that "Petitioner fails to demonstrate a reasonable likelihood of success under the constructions applied in the Petition." *See* Prelim. Resp. 6; *see also id.* n.1 ("The court in the [District Court litigation] construed each of the disputed terms as "Plain

and ordinary meaning" in its Preliminary Constructions." (referencing Ex. 2001, 11)).

As will be evident from our analysis below, we need not construe any claim term expressly to resolve the parties' disputes. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). To the extent that the scope of any particular claim term requires discussion, however, we provide it in our assessment of the challenges, which we turn to next.[6]

D. Ground 1: Claims 1, 3, 5, 8, 20, 21, 23, 25, 28, and 38 as unpatentable over Oota and Liang

Petitioner contends that claims 1, 3, 5, 8, 20, 21, 23, 25, 28, and 38 are unpatentable as obvious over Oota and Liang. Pet. 12, 16–37. Below, we discuss the scope and content of the prior art, and any differences between the prior art and claimed subject matter, on a limitation-by-limitation basis.

1. Independent claim 1

a) Preamble

The preamble of claim 1 recites "[a] 3D scanner system configured for displaying a digital representation of a cariogenic region of a tooth and a digital 3D representation of the tooth." Ex. 1001, 32:7–10 (limitation

[6] Our claim construction analysis is preliminary at this stage of the proceeding, and the parties may further develop the record at trial to support their claim interpretations.

"1.Preamble"[7]). Petitioner contends that Oota, as modified by Liang as Petitioner proposes, teaches this limitation. Pet. 17 (referencing Ex. 1006 ¶¶ 15–30, 51–68, 75, 126, claims 1–16, code (57); Ex. 1002 ¶¶ 63–65) (cross-referencing Pet. § VI.C (providing the rationale to combine the teachings of Oota and Liang)).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of the preamble of claim 1. In view of this determination, we need not resolve, at this stage of the proceeding, whether the preamble is limiting.

Patent Owner does not dispute Petitioner's contention with respect to this limitation at this time.

b) 3D intraoral scanner device element

Claim 1 also recites the "3D intraoral scanner device." Ex. 1001, 32:11 (limitation "1.a"). Petitioner contends that Oota teaches this limitation. Pet. 17 (referencing Ex. 1006 ¶¶ 3–13, 17, 51–58, 70, 114, Fig. 1; Ex. 1002 ¶¶ 66–68).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.a."

Patent Owner does not dispute Petitioner's contention with respect to Oota and this limitation at this time.

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[7] We use Petitioner's shorthand identifiers for the claim limitations of claim 1. *See, e.g.*, Pet. 17 (providing identifiers for limitations "1.Preamble" and "1.a").

c) Image sensor(s) element

Claim 1 also recites "i. one or more image sensor(s)." Ex. 1001, 32:12 (limitation "1.a.i"). Petitioner contends that the combination of Oota and Liang teaches this limitation. Pet. 18–19 (citing Ex. 1006 ¶¶ 19, 24–29, 56–57, 66, 97; Ex. 1007 ¶¶ 61, 75, 81–84, 104, 109–113, 118, 122, 135, Figs. 9–13, 15, 19, 23A–B, claim 36; Ex. 1002 ¶¶ 69–71). For example, Petitioner identifies Oota's imaging sensor 18, which may be a CCD. *Id.* at 18. Petitioner adds that Liang discloses that "[r]ecording both reflectance and fluorescence 'provide[s] an improved capability for dental imaging to detect caries.'" *Id.* (referencing Ex. 1007 ¶ 75) (second alteration in original).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.a.i"

Patent Owner does not dispute Petitioner's contention with respect to Oota, Liang, and this limitation at this time.

d) First light source element

Claim 1 also recites the

> ii. a first light source, the first light source configured to emit light at a first wavelength, wherein the 3D intraoral scanner device is configured such that at least one of the one or more image sensor(s) detects light at the first wavelength, thereby configured to record data for a 3D surface topography of the tooth.

Ex. 1001, 32:13–19 (limitation "1.a.ii").

Petitioner contends that Oota teaches this limitation. Pet. 19–20 (referencing Ex. 1006 ¶¶ 8, 17, 20, 24, 56–57, 60, 70, 79, 84–86, 91, Fig. 9; Ex. 1002 ¶¶ 72–75). Petitioner contends that Oota discloses an "intraoral

scanner [that] uses multiple light sources, such as two LEDs that emit different wavelengths." *Id.* at 19 (referencing Ex. 1006 ¶¶ 20, 56). Petitioner adds that "one LED serves as 'a first light source that irradiates light in a wavelength of 500 to 565 nm (green).'" *Id.* (referencing Ex. 1006 ¶¶ 60, 85, 86, Fig. 9). Petitioner contends that a person having ordinary skill in the art would have understood from Oota that its image sensor detects reflected light from the first light source, that is, light at the first wavelength, to develop a 3D surface topography of the tooth. *Id.* at 19–20 (referencing Ex. 1002 ¶¶ 72–73).

Petitioner explains that "Oota's image sensor is also configured to record data for a 3D surface topography of the tooth," such as by using triangulation. Pet. 20 (referencing Ex. 1006 ¶¶ 8, 24, 70, 79).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.a.ii"

Patent Owner does not dispute Petitioner's contention with respect to Oota and this limitation at this time, although Patent Owner does address this subject matter in disputing Petitioner's contentions with respect to limitation "1.4.iii," which we discuss next.

e) Second light source element

Claim 1 also recites the

> iii. a second light source, the second light source configured to emit light at a second wavelength, wherein the 3D intraoral scanner device is configured such that at least one of the one or more image sensor(s) detects light at the second wavelength, thereby configured to record data for the cariogenic region of the tooth.

Ex. 1001, 32:20–26 (limitation "1.a.iii").

Petitioner contends that the combination of Oota and Liang teaches this limitation. Pet. 20–24 (citing Ex. 1006 ¶¶ 10, 17–20, 56–63, 70–75, 84–90, 98–99, 108–112, Fig. 9; Ex. 1007 ¶¶ 5, 29–36, 34, 70–78, 82–83, 86–95, 102–103, Figs. 1–3, 6; Ex. 1002 ¶¶ 48–61, 76–82). First, Petitioner contends that Oota discloses a second light source with a wavelength in the red spectrum. *Id.* at 20–21. Petitioner adds that, "[b]ased on [Oota's] disclosures and Oota's discussions on reflected light, a [person having ordinary skill in the art] would have understood that Oota's second light source emits light at a second wavelength, and the image sensor detects light at the same second wavelength." *Id.* at 21 (Ex. 1002 ¶¶ 76–77).

Second, Petitioner contends that Liang discloses that light in the blue or red spectrum may be used to detect cariogenic regions. Pet. 21; *see also id.* at 22 ("This light source may be one that emits red wavelength light, much like the second light source described by Oota. Alternatively, or additionally, another light source may be provided to excite a fluorescence image by emitting light in a blue wavelength."). Petitioner explains that Liang discloses that using blue excitation light causes a tooth to fluoresce with light in the green spectrum, with healthy regions having a higher intensity of fluoresced light than areas with mineral loss. *Id.* (referencing Ex. 1007 ¶¶ 5, 70). Petitioner adds that using red excitation light causes a tooth to fluoresce with light in the red spectrum, with healthy regions having a lower intensity of fluoresced light than areas with cariogenic bacteria by-products. *Id.* Petitioner concludes that a person having ordinary skill in the art "would have found it apparent to detect fluorescence based on either of these principles in Oota's 3D intraoral scanner system." *Id.* (referencing Ex. 1002 ¶¶ 48–61, 78–80).

Significantly, Petitioner contends that Liang discloses that recording both data associated with the fluoresced light and data associated with reflected light, that is, light having the same wavelength as the incident light, "allows for 'improved accuracy and clarity' in detecting cariogenic regions, with enhanced image contrast that 'can be used to detect caries in its very early incipient stages.'" Pet. 22 (referencing Ex. 1007 ¶¶ 74, 75, 91, 102, and 103); *see also id.* at 23 ("Liang also makes clear that both the reflectance and fluorescence images provide data for the cariogenic region of the tooth."). Petitioner contends that, based on this teaching from Liang, a person having ordinary skill in the art would have modified Oota's system to record both fluoresced and reflected light.

Petitioner contends that a person having ordinary skill in the art would have had reason to combine Liang's teachings with Oota to arrive at the subject matter of claim limitation "1.a.iii." Pet. 34–37. First, Petitioner contends that Oota recognize[s] that cariogenic conditions lead to differences in the optical response of the tooth. *Id.* at 35 (referencing Ex. 1006 ¶ 10). Petitioner adds that Liang relies on this same principle. *Id.* (referencing Ex. 1007 ¶¶ 5, 70–72, 102). Petitioner explains that, as of the filing date of the '333 patent, "detecting cariogenic regions in teeth was of significant interest," and "[g]iven the interest, a [person having ordinary skill in the art] would have had reason to combine the teachings of Oota and Liang to aid in distinguishing between healthy and cariogenic regions of teeth." *Id.* at 35–36 (referencing Ex. 1002 ¶¶ 53–54).

Petitioner contends that a person having ordinary skill in the art would have had a reasonable expectation of success in combining the teachings. Pet. 36. Petitioner explains that both references disclose similar systems that emit, detect, and process light. *Id.* at 36–37.

Patent Owner argues that Petitioner fails to show that the combination of Oota and Liang teaches this limitation. Prelim. Resp. 6–11; *see id.* at 11–18. Specifically, Patent Owner argues that Petitioner fails to demonstrate sufficiently that the combination discloses emitting and detecting the same second wavelength. *Id.* at 6. For the reasons below, we do not agree.

First, Patent Owner criticizes Petitioner's reliance on Oota disclosing emitting and detecting a second wavelength of light, because Petitioner modifies Oota to incorporate Liang's teachings of fluorescence, which is not the use of the second wavelength of light in Oota. Prelim. Resp. 7–9. Second, Patent Owner argues that Liang discloses that the wavelength of the fluoresced light is outside the wavelength range for the indecent light. *Id.* at 9–10. Third, Patent Owner argues that "Petitioner overlooks" that claim 1 requires that the same second *wavelength* must be emitted and detected, not just light in the same color spectrum as the second light. *Id.* at 10–11.

We have considered Patent Owner's arguments, but determine that Petitioner's arguments and evidence are sufficient, at this stage of the proceeding, to show that the combination of Oota and Liang discloses emitting and detecting the same the second wavelength, as recited in claim 1. Specifically, we determine that Petitioner's arguments and evidence that Liang discloses that *reflected* second wavelength light would be detected in its proposed combination of teachings are sufficient, on the current record and at this stage of the proceeding. As Liang makes clear, the reflected light that is detected is backscatter reflectance, which "is at the same wavelength as the excitation light." Ex. 1007 ¶ 71; *see also id.* ¶¶ 82, 84, 86 (discussing the detection of backscatter reflectance); Pet. 24 ("Liang's recording of both the reflectance wavelength and the fluorescence

wavelength is such that data for the cariogenic region is recorded based on detection of at least the same wavelength emitted from the second light source.”).

Patent Owner also argues that Petitioner fails to demonstrate sufficiently that a person having ordinary skill in the art would have selected distinct first and second wavelengths, rather than using the same wavelength. Prelim. Resp. 11–16. Patent Owner argues that “Petitioner fails to provide a reason why a [person having ordinary skill in the art] would have . . . us[ed] a wavelength of light (and light source) for recording data for 3D surface topography that is distinct from the wavelength of light (and light source) for recording data for the cariogenic region of the tooth.” *Id.* at 14. Patent Owner argues that Petitioner had the burden to explain why a person having ordinary skill in the art would have used green light to record the 3D topography and red or blue light to record information for cariogenic regions, but failed to meet this burden. *Id.* at 16.

We have considered Patent Owner’s arguments, but determine that Petitioner’s arguments and evidence are sufficient, at this stage of the proceeding, to satisfy its burden that a person having ordinary skill in the art would have chosen distinct wavelengths for the two different data mappings. First, as Patent Owner recognizes, Petitioner contends that Oota suggests such a configuration, as Oota uses two different wavelengths to identify different structures in the intraoral cavity. *See* Prelim. Resp. 16–17; *see, e.g.*, Pet. 21 (“Oota’s second light source emits light at a second wavelength, and the image sensor detects light at the same second wavelength.”), 36 (“Oota’s 3D intraoral scanning system already records the reflectance data resulting from a first and second wavelength.”). Second, as Petitioner contends, Liang discloses that different wavelengths can be used to detect

different types of cariogenic regions, again suggesting the use of distinct wavelengths. *See* Pet. 21.

Patent Owner also argues that Petitioner relies on Oota's teachings of detecting tooth decay to support the combination, and such a reliance is "untenable." Prelim. Resp. 17. Patent Owner argues that Oota discloses detecting "something bonded to the tooth [(dental plaque)] and not the tooth itself." *Id.* at 18. This argument ignores that Petitioner relies on other teachings from the references (as well as motivations outside the references) to support its reasons to combine. *See* Pet. 34–37. Further, this argument treats a person having ordinary skill in the art as an automaton, who would reject a reference's teachings (in this case, Oota's), merely because it teaches measuring a feature that is *on* a tooth, rather than a feature *of* a tooth. Such an argument ignores the creative aspect of the ordinarily skilled artisan. *See KSR, Inc.*, 550 U.S. at 421 ("A person of ordinary skill is also a person of ordinary creativity, not an automaton.").

Patent Owner also argues that Petitioner's proposed modification to use red or blue light in Oota's system "raises additional unresolved problems." Prelim. Resp. 18. Patent Owner argues that using blue light would cause cariogenic regions to fluoresce green, and interfere with the system use of green light for 3D imaging. *Id.* at 18–19. Patent Owner argues that using red light to identify cariogenic regions would interfere with Oota's identification of gingiva using red light. *Id.* at 19–20.

We have considered Patent Owner's arguments, but determine that Petitioner's arguments and evidence are sufficient, at this stage of the proceeding, to demonstrate that a person having ordinary skill in the art would have modified Oota with Liang's teachings. Petitioner provides sufficient reasons, with rational underpinnings, for combining the teachings

of Oota and Liang. *See* Pet. 21–24, 34–37. Patent Owner's attorney argument does not demonstrate a deficiency in that reasoning.

Finally, Patent Owner argues that Oota's system does not eliminate specular reflection. Prelim. Resp. 20–23. Patent Owner argues that "Petitioner does not provide any explanation as to how Oota's 3D system would address specular reflectance as required by Liang. Nor does Petitioner even allege that Oota would have been modified to employ the configuration disclosed by Liang for removing specular reflectance." *Id.* at 22.

We have considered Patent Owner's arguments, but determine that Petitioner's arguments and evidence are sufficient, at this stage of the proceeding. As Patent Owner recognizes, Liang provides teachings directed to removing specular reflectance. *See* Prelim. Resp. 22. Patent Owner's argument seems based on the premise that the specific teachings from Liang discussed by Petitioner would be bodily incorporated into Oota's system. The proper analysis looks at whether the combined teachings of the references teach or suggest the claimed invention. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). We determine, on the current record, that Petitioner makes a sufficient showing, on the current record, that Oota and Liang teach or suggest the subject matter of claim limitation "1.a.iii," and that there would have been a reason to combine the teachings from these references.

Accordingly, upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.a.iii." We also determine that the information in the Petition and corresponding evidence sufficiently demonstrate that a person having ordinary skill in the art would

have had reason to combine the teachings of Oota and Liang, with a reasonable expectation of success in combining the teachings.

f) Data processor element

Claim 1 also recites "a data processor configured for." Ex. 1001, 32:27 (limitation "1.b"). Petitioner contends that the combination of Oota and Liang teaches this limitation. Pet. 24–25 (citing Ex. 1006 ¶¶ 24, 29, 57–58, 68–75, 114, Figs. 1, 5, 7, 10, 13; Ex. 1007 ¶¶ 85–91, Fig. 1; Ex. 1002 ¶¶ 83–84). Petitioner directs us to Oota's image processing unit, and Liang's feature 38, depicted in Liang's Figure 1. *Id.*

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.b."

Patent Owner does not dispute Petitioner's contention with respect to Oota, Liang, and this limitation at this time.

g) Digital 3D representation element

Claim 1 also recites "converting the data for the 3D surface topography of the tooth into the digital 3D representation of the tooth." Ex. 1001, 32:28–30 (limitation 1.b.i"). Petitioner contends that Oota teaches this limitation. Pet. 25 (citing Ex. 1006 ¶¶ 8, 24–29, 57–58, 72–82; Ex. 1002 ¶ 85).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.b.i."

Patent Owner does not dispute Petitioner's contention with respect to Oota and this limitation at this time.

h) Digital representation of the cariogenic region element

Claim 1 also recites the "ii. converting the data for the cariogenic region into the digital representation of the cariogenic region of the tooth." Ex. 1001, 32:31–33 (limitation "1.b.ii").

Petitioner contends that the combination of Oota and Liang teaches this limitation. Pet. 26–27 (citing Ex. 1007 ¶¶ 2, 70–75, 77, 85, 129–133, Fig. 5; Ex. 1002 ¶¶ 86–87). Petitioner contends that Liang discloses collecting reflectance and fluorescence data to identify cariogenic regions on a tooth, by converting the data to a "FIRE image"—an image resulting from Liang's "fluorescence imaging with reflectance enhancement." *Id.*

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.b.ii."

Patent Owner does not dispute Petitioner's contention with respect to Liang and this limitation at this time.

i) Display element

Claim 1 also recites "a display configured for visualizing both the digital 3D representation of the tooth and the digital representation of the cariogenic region of the tooth." Ex. 1001, 32:34–36 (limitation "1.c"). Petitioner contends that the combination of Oota and Liang teaches this limitation. Pet. 27 (citing Ex. 1006 ¶¶ 66, 79, Fig. 7; Ex. 1007 ¶ 77; Ex. 1002 ¶¶ 88–90). Petitioner contends that both references disclose displaying their imaging results. *Id.*

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this

stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.c."

Patent Owner does not dispute Petitioner's contention with respect to Oota, Liang, and this limitation at this time.

j) Light source shifting element

Claim 1 also recites "wherein the 3D intraoral scanner is configured to shift between the first light source and the second light source repeatedly, thereby configured to illuminate the tooth successively by the light from the first light source and the second light source." Ex. 1001, 32:37–41 (limitation 1.d").

Petitioner contends that Oota teaches this limitation. Pet. 28–29 (citing Ex. 1006 ¶¶ 17–21, 60–63, 70–71, 84–88, 113, Figs. 6, 9; Ex. 1002 ¶¶ 91–95). Petitioner explains that a person having ordinary skill in the art "would recognize that it is the standard operation of 3D intraoral scanners such as Oota's to repeatedly shift between the wavelengths of the first and second light source," and that this shifting is needed to collect sufficient data. *Id.* at 28 (referencing Ex. 1002 ¶ 94).

Upon review of the information in the Petition and corresponding evidence, we determine Petitioner has made a sufficient showing, at this stage of the proceeding, that the combined teachings of Oota and Liang disclose the subject matter of limitation "1.d."

Patent Owner does not dispute Petitioner's contention with respect to Oota and this limitation at this time.

k) Conclusion

For the reasons discussed above, we determine, on the current record, that the information presented in the Petition shows a reasonable likelihood

that independent claim 1 is unpatentable under 35 U.S.C. § 103 over Oota and Liang.

2. Independent claim 21

Claim 21 recites similar limitations as claim 1, with the exception of the last limitation of both claims. Claim 21 does not recite the last limitation (limitation "1.d") of claim 1. Instead, the last limitation of claim 21 recites "wherein a first part of the data processor is integrated with the 3D intraoral scanner and a second part of the data processor is external to the 3D intraoral scanner." Ex. 1001, 34:1–3 (limitation "21.d").

Petitioner relies on the same contentions for the common subject matter of claims 1 and 21. *See* Pet. 16–27.

With respect to limitation "21.d," Petitioner contends that Oota discloses "that its image processing unit may be contained within an external device," or, "[a]lternatively, 'the image processing unit 40 can be configured to be mounted within the oral scanner.'" Pet. 29 (referencing Ex. 1006 ¶¶ 51–58, 114, Figs. 1, 12; Ex. 1002 ¶ 98). Petitioner adds that Liang includes similar teachings. *Id.* (referencing Ex. 1007 ¶ 122; Ex. 1002 ¶ 99).

Petitioner contends that "it would have been apparent" to a person having ordinary skill in the art "to provide for a first part of the data processor that is integrated with the scanner, and a second part of the data processor that is external to the scanner." Pet. 29–30. Petitioner explains, by way of example, that "a first part of the data processor would be integrated with the 3D intraoral scanner as described in Oota to convert and process the image data received," and "[a] second, external part of the data processor would, as described in Liang, receive and display the digital representations." *Id.* at 30 (referencing Ex. 1006 ¶ 114, Fig. 12; Ex. 1007 ¶ 122; Ex. 1002 ¶¶ 96–100).

Patent Owner argues that "Petitioner fails to demonstrate that Oota and Liang, taken individually or in combination, disclose or suggest" the subject matter of limitation "21.d." Prelim. Resp. 23. Patent Owner argues that Petitioner recognizes that each reference discloses the processor in the probe or external to the probe, but not part in the probe and part out of the probe, as required by the claims. *Id.* Patent Owner adds that "Petitioner does not explain which of components 41, 42, 43, 44, 45, 46, and 47[, which make up Oota's image processing unit 40,] would be integrated with the 3D intraoral scanner and which of the components would be external to the scanner." *Id.* at 24.

We have considered Patent Owner's arguments, but determine that Petitioner's arguments and evidence are sufficient, at this stage of the proceeding, to demonstrate that the combined teachings of Oota and Liang teach or suggest the subject matter of limitation "21.d." The Petition states that Liang expressly suggests transmitting image data to a control logic process, such as a workstation or server. Pet. 29. The Petition describes an example, based on this teaching from Liang, where a scanner would convert and process image data and then transmit the data to an external part that would receive and display the digital representations. *Id.* at 30; *cf.* Ex. 1006, Fig. 5 (showing a display connected to image processing unit 40); Ex. 1007, Fig. 1 (showing processing apparatus 38 separate from display 40); Ex. 1001, (presenting claim 21, which includes the *display* as part of the recited data processor).

For the reasons discussed above, including our analysis of claim 1, we determine, on the current record, that the information presented in the Petition shows a reasonable likelihood that independent claim 21 is unpatentable under 35 U.S.C. § 103 over Oota and Liang.

3. Dependent claims 3, 5, 8, 20, 23, 25, 28, and 38

Petitioner contends that dependent claims 3, 5, 8, 20, 23, 25, 28, and 38 are unpatentable as obvious over Oota in combination with Liang. Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the ’333 patent is unpatentable, and we institute on all challenges raised in the Petition. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018); *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”); Patent Trial and Appeal Board Consolidated Trial Practice Guide 64 (Nov. 2019) (“The Board will not institute on fewer than all claims or all challenges in a petition.”), *available at* https://www.uspto.gov/TrialPracticeGuideConsolidated (“CTPG”).

Still, we have reviewed Petitioner’s contentions and references to the evidence and determine that Petitioner has made a sufficient showing, on the current record, that dependent claims 3, 5, 8, 20, 23, 25, 28, and 38 are unpatentable under 35 U.S.C. § 103 over Oota and Liang. Patent Owner does not provide any additional arguments directed at these dependent claims. *See* Prelim. Resp. 23.

E. Grounds 2 and 3: Claims 1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, and 38 as unpatentable over Babayoff or Babayoff and Everett

Petitioner contends that claims 1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, and 38 are unpatentable as obvious over Babayoff alone (Pet. 12, 37–54) or in combination with Everett (*id.* at 54–67). We have reviewed Petitioner’s contentions and citations to the evidence with respect to these grounds, which we institute under *SAS Inst.*, and determine that Petitioner has made a sufficient showing, on the current record, that claims 1, 3, 5, 7, 8, 20, 21, 23,

25, 27, 28, and 38 are unpatentable under 35 U.S.C. § 103 over Babayoff alone or in combination with Everett. Although we institute on all grounds under *SAS Inst.*, we briefly address Patent Owner's arguments for Grounds 2 and 3.

With respect to Ground 2, Patent Owner argues that a person having ordinary skill in the art would not have relied on Babayoff's color image to identify cariogenic regions. Prelim. Resp. 25–34. We have considered Patent Owner's arguments, but determine that Petitioner's arguments and evidence are sufficient, at this stage of the proceeding, for institution. Still, this issue would benefit from a full record developed at trial.

Patent Owner also argues that Petitioner does not demonstrate that Babayoff discloses distinct wavelengths for 3D imaging and identifying cariogenic regions. Prelim. Resp. 34–37. We have considered Patent Owner's arguments, but determine that Petitioner's arguments and evidence are sufficient, at this stage of the proceeding, for institution. For example, Petitioner directs us to Babayoff's disclosure of using monochromatic light for 3D imaging and light of different wavelengths for color imaging. *See, e.g.*, Pet. 41 (identifying Babayoff's disclosure of LED 77; Ex. 1008, 12:48–55 (disclosing that if one light (red, blue, or green) is used for 3D imaging, LED 77 includes sources for the other two wavelengths to use for color imaging). That is, for example, the first light source may generate blue light and the second light source generate green and red light. Even if the blue light is also used for color imaging, the green and red lights would provide a second wavelength that differs from the blue light wavelength.

With respect to Ground 3, Patent Owner argues that Petitioner fails to demonstrate a reasonable likelihood of success in combining the teachings of Babayoff and Everett, based on three reasons. Prelim. Resp. 37–49. We

have considered Patent Owner's arguments, and determine that these issues would benefit from a full record developed at trial.

IV. CONCLUSION

Based on the information presented, we determine Petitioner has established a reasonable likelihood that it would prevail with respect to at least one of the Challenged Claims. Accordingly, we institute an *inter partes* review on all challenges. We do not exercise our discretion under 35 U.S.C. § 314(a) to deny the Petition.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review is instituted as to claims 1, 3, 5, 7, 8, 20, 21, 23, 25, 27, 28, and 38 of U.S. Patent No. 10,905,333 B2; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which commences on the entry date of this Decision.

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