

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASSEMBLY GUIDANCE SYSTEMS, INC.,
Petitioner,

v.

VIRTEK VISION INTERNATIONAL ULC,
Patent Owner.

IPR2021-00062
Patent 10,052,734 B2

Before KEVIN F. TURNER, JON M. JURGOVAN, and
SHEILA F. McSHANE, *Administrative Patent Judges*.

TURNER, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining Some Challenged Claims Unpatentable

35 U.S.C. § 318(a)

Denying-In-Part and Dismissing-In-Part Patent Owner's Motion to Exclude

37 C.F.R. § 42.64(c)

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons discussed herein, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1, 2, 5, 7, and 10–13 of U.S. Patent No. 10,052,734 B2 (Ex. 1001, “the ’734 Patent”) are unpatentable and has not shown that claims 3, 4, 6, 8, and 9 of the ’734 Patent are unpatentable.

A. *Procedural Background*

Assembly Guidance Systems, Inc. (d/b/a Aligned Vision) (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting institution of *inter partes* review of claims 1–13 of the ’734 Patent. Virtek Vision International ULC (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

Pursuant to 35 U.S.C. § 314(a), on May 10, 2021, we instituted *inter partes* review on the grounds of:

Claims Challenged	35 U.S.C. §¹	References
1, 2, 5, 7, 10–13	103(a)	Keitler, ² Briggs ³
3–6, 8–12	103(a)	Keitler, Briggs, '094 Rueb ⁴
1, 2, 5, 7, 10–13	103(a)	Briggs, Bridges ⁵
3–6, 8–12	103(a)	Briggs, Bridges, '094 Rueb

See Pet. 7; Paper 7 (“Dec.”), 42. Petitioner relied upon a Declaration by Dr. Masoud Mohazzab (Ex. 1007), and Patent Owner relied upon a Declaration by Mr. John W. Dorsey-Palmateer (Ex. 2001).

Patent Owner filed a Patent Owner Response (Paper 11, “PO Resp.”), along with an additional Declaration of Mr. Dorsey-Palmateer (Ex. 2005) to support its positions. Petitioner filed a Reply (Paper 14, “Pet. Reply”) to the Patent Owner Response. Patent Owner filed a Sur-reply to Petitioner’s Reply (Paper 15, “PO Sur-reply”). An oral hearing was held on February 9, 2022. A transcript of the hearing is included in the record. Paper 23.

Additionally, Patent Owner filed a Motion to Exclude (Paper 18), to which Petitioner filed an Opposition (Paper 19), and Patent Owner filed a Reply to that Opposition (Paper 21). We discuss the Motion to Exclude in a separate section below. *See* Section III.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the effective filing date of the ’734 Patent is before March 16, 2013 (the effective date of the relevant amendment), the pre-AIA version of § 103 applies. *See* Ex. 1001, codes (60), (63).

² U.S. Patent Application Publication No. US 2014/0160115 A1, published June 12, 2014 (Ex. 1003, “Keitler”).

³ PCT Pub. No. WO2012/033892 A1, published March 15, 2012 (Ex. 1005, “Briggs”).

⁴ U.S. Patent Application Publication No. US 2013/0250094 A1, published September 26, 2013 (Ex. 1006, “’094 Rueb”).

⁵ U.S. Patent US 8,040,525, issued October 18, 2011 (Ex. 1004, “Bridges”).

B. Related Matters

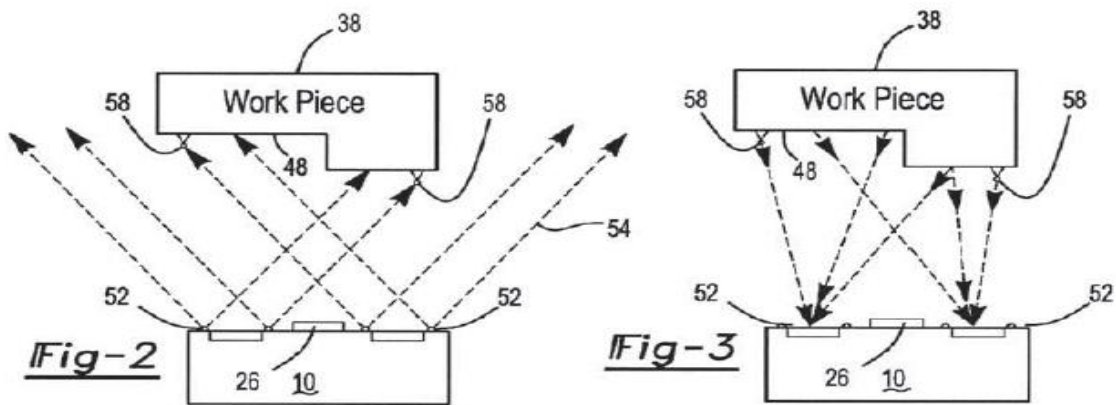
Petitioner and Patent Owner identify the following related matters: *Virtek Vision Int'l ULC v. Assembly Guidance Systems, Inc. d/b/a Aligned Vision*, No. 2:20-cv-10857 (D. Mass.); *Virtek Vision Int'l ULC v. LAD Laser, LLC*, No. 2:20-cv-02287 (S.D. Ohio). Pet. 5; Paper 5, 2.

C. The '734 Patent

The '734 Patent is directed to a method of aligning a laser projector with respect to a work surface onto which a laser image is projected by a laser source. Ex. 1001, 1:66–2:2. In the Background section of the '734 Patent, it details that the projection of laser templates onto a work surface as part of a manufacturing process “has allowed for manufacturing products at tolerances not previously achievable.” *Id.* at 1:22–27. That same section also details that there are restrictions to the existing technology, because the accurate projection of a template pattern onto a three-dimensional work surface requires precise calibration of the relative position of the work surface and the laser projector. *Id.* at 1:35–58. The '734 Patent details an improved method for aligning a laser projector for projecting a laser image onto a work surface, using a secondary light source to illuminate the work surface, using a photogrammetry device to generate an image of the work surface and determine the location of the work surface in a three-dimensional coordinate system, and using that location to scan the work surface with a laser beam from a laser source. *Id.* at 1:66–2:15.

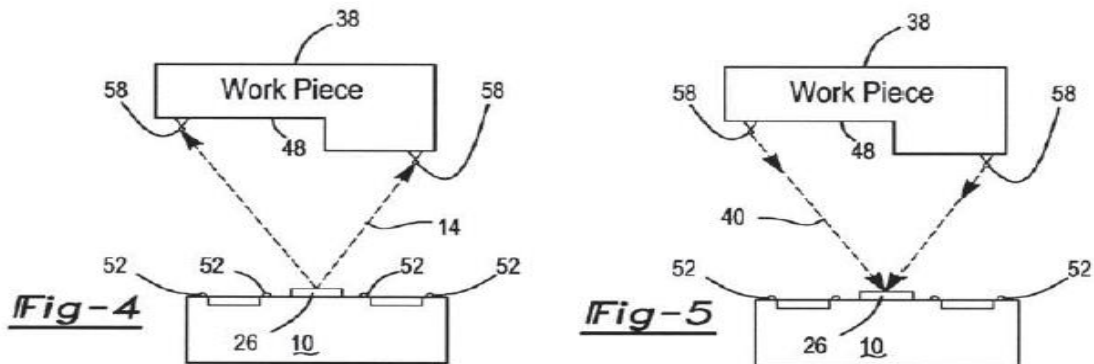
The process is illustrated in Figures 2–6, reproduced below. As illustrated in Figure 2, secondary light 54 emitted from secondary light sources 52 are directed to work piece 38, some of which impinges on targets 58 on the work surface 48. Secondary light reflected from the work surface

48, as illustrated in Figure 3, is detected by a photogrammetry assembly.
Ex. 1001, 4:1–57.



Figures 2 and 3 above illustrate the use of secondary light with a work surface.

A processor connected to the photogrammetry assembly determines the locations of targets 58 in a three-dimensional coordinate system.
Ex. 1001, 4:31–35. Based on the target coordinates, a laser beam is projected through output aperture 26 to directly scan targets 58, as illustrated in Figure 4, and receives reflected laser light from the targets, as illustrated in Figure 5, to calculate exact locations of the targets. *Id.* at 4:43–57.



Figures 4 and 5 above illustrate the use of laser light with a work surface.

Based on the exact locations of the targets, an accurate location of laser template 56 is projected on work surface 48, as illustrated in Figure 6.
Ex. 1001, 4:54–57.

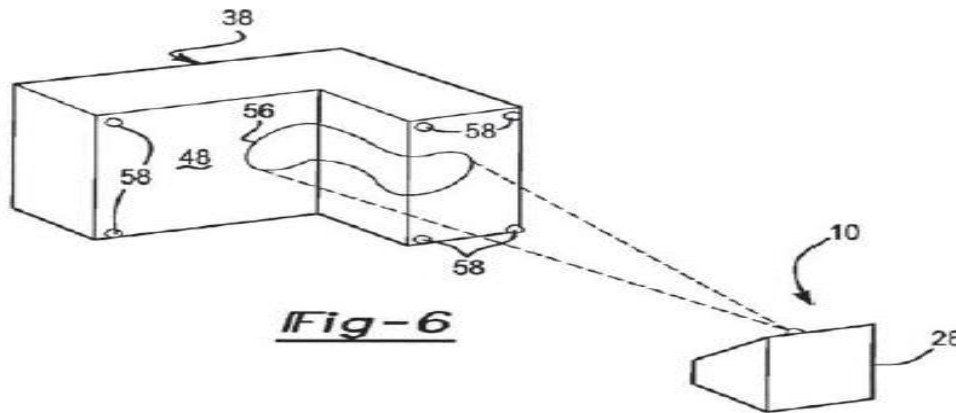


Figure 6 above illustrates the projection of a laser template on a work surface.

The '734 Patent describes that the secondary light source can be an LED strobe array, and that the system can be used to identify relative drift of the work piece and projector assembly. Ex. 1001, 3:52-56, 5:17-23.

Claim 1 is the sole independent claim challenged in this proceeding.

Claim 1 is illustrative of the claimed subject matter and is reproduced below:

1. A method for aligning a laser projector for projecting a laser image onto a work surface, comprising the steps of:

providing a laser projector assembly with a laser source for projecting a laser image onto a work surface, a secondary light source for illuminating the work surface, a photogrammetry device for generating an image of the work surface, and a laser sensor for sensing a laser beam;

affixing reflective targets onto the work surface;

transmitting light from the secondary light source toward the work surface and reflecting light toward the photogrammetry device from the reflective targets thereby identifying a pattern of the reflective targets on the work surface in a three dimensional coordinate system; and

after identifying the pattern of the reflective targets on the work surface in the three dimensional coordinate system, scanning the targets with a laser beam generated by the laser source as directed by the identified pattern of the reflective

targets for reflecting the laser beam toward the laser sensor and calculating a precise location of the targets from the reflected laser beam for directing the laser projector where to project the laser image onto the work surface.

Ex. 1001, 5:35–6:4.

II. ANALYSIS

A. *Level of Ordinary Skill in the Art*

Petitioner, supported by Dr. Mohazzab’s testimony, proposes that a person of ordinary skill in the art at the time of the invention would have had “a bachelor’s degree (or equivalent education) in electrical engineering or electro-optics engineering or physics, with at least three years of experience in a relevant technical field, such as laser systems, with related experience in working with coordinate systems in three dimensional space.” Pet. 8 (citing Ex. 1007 ¶¶ 1–6).

Patent Owner indicates that it “generally agrees with the definition,” but argues that the term “laser systems” is too broad in that it would include “completely unrelated technologies, such as medical lasers and cutting lasers.” PO Resp. 31 (citing Ex. 2005 ¶ 11). As such, Patent Owner proposes an alternate formulation, stating that the appropriate person of ordinary skill in the art would have:

A bachelor’s degree (or equivalent education) in electrical engineering or electro-optics engineering or physics, with at least three years of experience in a relevant technical field such as laser systems for alignment and metrology, with related experience in working with coordinate systems in three-dimensional space.

Id. at 32. We are not persuaded that the minor change in the formulation of the level of ordinary skill in the art affects the combinations proffered by Petition’s grounds of unpatentability, and adopt Patent Owner’s formulation

for purposes of this decision, because it is more narrowly focused on alignment and metrology, which is consistent with the '734 patent and the prior art at issue. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

B. Claim Construction

In this *inter partes* review, “claims are construed using the same claim construction standard that would be used to construe the claim[s] in a civil action under 35 U.S.C. § 282(b).” *See* 37 C.F.R. § 42.100(b) (2019). The claim construction standard includes construing claims in accordance with their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc). In construing claims in accordance with their ordinary and customary meaning, we take into account the specification and prosecution history. *Phillips*, 415 F.3d at 1315–17.

If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316 (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Another exception to the general rule that claims are given their ordinary and customary meaning is “when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1313 (Fed. Cir. 2013) (quoting *Thorner v. Sony Computer Entm’t Am., LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)).

Additionally, only terms that are in controversy need to be construed, and these need be construed only to the extent necessary to resolve the

controversy. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

In the Petition, Petitioner presented specific constructions for the following claim terms: “photogrammetry device;” “identifying a pattern of the reflective targets on the work surface in a three dimensional coordinate system;” and “scanning the targets with a laser beam generated by the laser source as directed by the identified pattern of the reflective targets.” Pet. 15–19. Patent Owner sought specific constructions for the following claim terms: “providing;” “transmitting;” and “pattern,” in its Preliminary Response. Prelim. Resp. 9–19. We addressed each of the above-cited limitations in the Institution Decision. Dec. 7–13.

In its Patent Owner Response, Patent Owner appears to accept the constructions and discussion of the claim terms in the Institution Decision, but argues that we did not properly apply the agreed constructions to Petitioner’s arguments. PO Resp. 23–31. Both parties spend considerable portions of their briefing directed to claim construction (Pet. Reply 2–6; PO Sur-Reply 1–6), and we agree that many aspects of the grounds of unpatentability turn on the application of the proper claim construction. We review our prior claim constructions and observations in view of the parties’ arguments below, for each indicated claim term, as well as one additional claim term, with terms not discussed below relying on any construction previously adopted in the Institution Decision. *See* Dec. 7–13.

1. *“providing”*

Patent Owner contends that the claim term “providing” is used by ’734 Patent in accordance with its ordinary and customary meaning, which Patent Owner maintains is “supplying for use.” PO Resp. 23 (citing Prelim. Resp. 10; Ex. 2001 ¶¶ 44–45; Ex. 2002). We agreed with Patent Owner that “supplying for use” is the ordinary and customary meaning of “providing,” but we did not explicitly adopt that construction in the Institution Decision because it was merely the ordinary and customary meaning. Dec. 9. Patent Owner contends that we did not “properly apply this construction to the arguments put forth by Petitioner, and improperly asserted the prior art inherently disclosed this element.” PO Resp. 23. We disagree with Patent Owner’s assertions.

The claim term “providing,” understood as “supplying for use,” is a relatively broad term, such that this ordinary and customary meaning can be met in a myriad of ways. For instance, an apparatus can be brought from a darkroom into a lighted room, or a separate light can be provided. We further consider and discuss Patent Owner’s specific arguments below, but determine with respect to claim construction that the term is relatively broad, and is not constrained to a specific type of light source or a light source of specific luminosity per the language of claim 1.

2. *“transmitting”*

In the Institution Decision, we agreed with Patent Owner that “actively sending” is the ordinary and customary meaning of “transmitting,” but stated that we need not explicitly adopt that construction. Dec. 9. Patent Owner disputed that “targets that are merely visible in ambient (day) light somehow ‘transmit’ light,” and instead argued that “transmitting light is an

active process that results in sending light from a source of light.” *See id.* at 10. In response to Patent Owner’s argument regarding transmitted and reflected light, a portion of the Decision stated that “distinguishing directed produced light from reflected light, as Patent Owner’s argument would suggest, does not comport with the ’734 Patent or how one of ordinary skill in the art would have construed the term ‘transmitting.’” *Id.* From that, Patent Owner argues we are conflating the meanings of the claim terms “transmitting” and “reflecting,” which are recited in separate steps in claim 1. PO Resp. 24–26. We do not agree with Patent Owner’s assertions and arguments.

We did not conflate the distinct steps of claim 1 directed to “transmitting” and “reflecting.” Our discussion was responsive to Patent Owner’s argument that “*transmitting* light is an active process that results in sending light from a source of light.” Prelim. Resp. 12. We pointed out that the ’734 Patent makes clear that its assembly uses a laser source and multiple beam splitters and mirrors, such that light supplied to the work surface is light reflected before it is received by the work surface. Dec. 10 (citing Ex. 1001, Fig. 1, 2:54–3:67). As such, the notion of distinguishing “transmitted” light from “reflected” light is not as distinct as Patent Owner asserts, because light reflected from a surface is transmitted; otherwise, it could not be detected if it was not transmitted.

This discussion pertains to the nature of light as it pertains to “transmitting.” In considering the grounds of unpatentability of the Petition, we considered the separate portions of the claim step separately (Dec. 21–24, 34–36), i.e., considering both the “transmitting light” and “reflecting light,” and we also do so in this Final Written Decision (*infra* Section

II.D.3.e). Thus, we do not agree with Patent Owner that we fail to accord different meanings to transmitting and reflecting.

3. “*reflecting*”

Patent Owner also contends that a construction of “reflecting may be required,” and asserts that its definition of “reflecting” is “to throw back (heat, light, or sound) without absorbing it.” PO Resp. 26 (citing Ex. 2008). Patent Owner refers to the ’732 patent, which “describes its targets as being ‘reflective’ because they throw back non-laser light from the *secondary light source* and laser light from the *laser source*.” *Id.* (citing Ex. 1001, code (57), 2:5–13). We agree, in part, with Patent Owner’s definition and arguments. The specification of the ’732 patent describes reflection of light for making determinations, but does not include a limitation that there be no absorption. *See* Ex. 1001, code (57), 2:5–13. Mr. Dorsey-Palmateer testifies that reflective targets reflect both laser and non-laser light and reflecting light, but does not indicate that light could not be absorbed. Ex. 2005 ¶ 31; *see also id.* ¶¶ 26, 30. Mr. Dorsey-Palmateer also testifies that the ordinary meaning of reflecting light does not refer to the physics of what makes a light visible, but does not provide any explanation or support for this statement. *Id.* ¶ 31. An examination of the definitions in Exhibit 2008, taken from Merriam-Webster’s dictionary, does not show any definition that specifies absorption, with or without. The closest is “to throw back light or sound,” but the definition does not include any degree of absorption, per Patent Owner’s proposed construction. As such, we agree, in part, that a proper construction of “reflecting” is “to throw back.” It is self-evident that if *all* of the heat, light or sound is absorbed, then nothing can be thrown back. The addition of “without absorbing it” to the definition does not

provide further clarity, as neither Patent Owner, nor the '734 Patent, provides any means for determining a degree of absorption/reflectance.

Patent Owner may be advocating the adoption of the alternative definition because Patent Owner seeks to distinguish certain types of reflection from “ordinary” reflection. Patent Owner asserts that “[t]he ordinary meaning of reflecting light, however, does not refer to the physics of what makes an object visible.” PO Resp. 27 (citing Ex. 2005 ¶ 31).

Patent Owner’s declarant, Mr. Dorsey-Palmateer, asserts that:

The term “reflective target” (also known as a “retroreflective target”) is known in the industry and refers to a target with a mirror-like, reflective surface that can reflect both laser and non-laser light. Note that the ordinary meaning of reflecting light, however, does not refer to the physics of what makes an object visible.

Ex. 2005 ¶ 31. We do not agree. The terms “reflective target” and “retroreflective target” are different and cannot be presumed to have the same meaning. Further, the '734 Patent does not disclose that the “reflective targets” to be “mirror-like,” and claim 1 merely requires that they “reflect[] light toward the photogrammetry device.” Lastly, it is exactly the amount of reflectance and at what wavelengths that determines the appearance of an object; the color of an object is determined by the absorption of wavelengths corresponding to that color and the reflectance back of the rest of the visible spectrum. *See* Paper 23, 56:21–59:8 (discussion from the Oral Hearing of Specification support for reflectance). Accordingly, the '734 Patent provides no disclosure of reflecting light by allowing for no absorption, nor are there any other disclosures constraining the definition from the normal understanding of the term. As such, we agree, in part, with Patent Owner,

that “reflecting” should be understood as “to throw back,” consistent with its ordinary and customary meaning, and apply the same in the analysis below.

4. “*pattern*”

In the Institution Decision, we agreed with Patent Owner that the plain and ordinary meanings of “location” and “pattern” are not the same, and we determined that “identifying a pattern of the reflective targets” should be construed as determining the locations, and thus the relative positions, of those targets. Dec. 10–11. Patent Owner argues that this construction “strayed from Patent Owner’s proposal,” and acted to limit the term pattern to “location” alone. PO Resp. 28. Patent Owner continues that “[e]ven if a system identifies the location of targets on the surface, it will have to perform a separate calculation to identify the relative positions of the targets to each other,” and that not all systems would need to perform that extra calculation, such that determining the locations alone is not sufficient. *Id.* at 29. Patent Owner also argues that “identifying a pattern” “involves simultaneously identifying **both** the locations and relative positions of all the targets,” and that the process in the ’734 Patent involves pattern recognition, “i.e., the recognition of an arrangement of the targets on the work surface based on simultaneous evaluation of ***all reflected light*** from the *reflective targets* on the *work surface*.” *Id.* at 29–30 (emphasis in original). Patent Owner also analogizes pattern recognition to identifying constellations of stars, to recognize the collective arrangement of the targets together, and that the sequential identification of individual target location is not identifying a pattern. *Id.* at 30.

Petitioner responds that neither the claim construction, nor the ’734 Patent, refers to “pattern recognition” or “simultaneous identification,” and

that claim 1 does not state how a pattern of targets is identified. Pet. Reply 2–4. Petitioner also cites to Mr. Dorsey-Palmateer’s testimony that such processes of pattern matching are not disclosed in the ’734 Patent, but would have been known to one skilled in the art, and that such processes do not involve the comparison of images, but rather the use of mathematics. *Id.* at 4–5 (citing Ex. 1014 43:15–44:8, 35:17–21, 42:23–24). Patent Owner responds that its construction of “pattern” comports with dictionary definitions (Exs. 2002, 2003), and it has made clear that “identifying a pattern” “refers to ‘pattern recognition,’ a type of all-at-once recognition that is different from merely identifying the locations of individual targets one-by-one.” PO Sur-Reply 1–2. Patent Owner also argues that the ’734 Patent discloses target pattern recognition and that the adopted construction is consistent with the plain meaning of the phrase identifying a pattern. *Id.* at 3–4.

We address these arguments by first looking to the subject language of independent claim 1: “identifying a pattern of the reflective targets on the work surface *in a three dimensional coordinate system.*” It is apparent that targets are on the work surface and are not placed according to the three-dimensional coordinate system; rather, it is the pattern that is identified in the three-dimensional coordinate system, according to claim 1. This suggests that this is not akin to the mere recognition of a constellation in the sky because the pattern is used later, in claim 1, to direct the laser beam to scan the targets and to calculate “a precise location of the targets.” A mere recognition of a pattern, i.e., the relative placement of targets, without more, such as providing their 3D coordinates, is not sufficient to meet the requirements of the claim. We also note that the term “pattern recognition”

is a term of art (Ex. 3001) and is not used in the '734 Patent. Similarly, “all-at-once recognition” and “simultaneously identifying both the locations and relative positions” are not disclosed in the '734 Patent. Although Patent Owner may envision such use of the method of independent claim 1, we are not persuaded that claim 1 requires the identification of the pattern to through “pattern recognition” or “all-at-once recognition.” In general, limitations are not to be read from the specification into the claims, although in this case, they do not appear to be recited in the Specification either. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

As such, we determine that “identifying a pattern of the reflective targets” should be construed as determining the locations, and thus the relative positions, of those targets. *See* Dec. 10–11.

C. Legal Standards – Obviousness

The U.S. Supreme Court set forth the framework for applying the statutory language of 35 U.S.C. § 103 in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966):

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

As explained by the Supreme Court in *KSR International Co. v. Teleflex Inc.*,

Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the

background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit.

550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”)).

“Whether an ordinarily skilled artisan would have been motivated to modify the teachings of a reference is a question of fact.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1327 (Fed. Cir. 2016) (citations omitted). “[W]here a party argues a skilled artisan would have been motivated to combine references, it must show the artisan ‘would have had a reasonable expectation of success from doing so.’” *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360–61 (Fed. Cir. 2017) (quoting *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1068–69 (Fed. Cir. 2012)).

D. Obviousness over Keitler and Briggs

Petitioner asserts that the combination of Keitler and Briggs would have rendered the subject matter of claims 1, 2, 5, 7, 10–13 obvious to one of ordinary skill in the art at the time of the invention. Pet. 30–43. Patent Owner argues that the asserted prior art references fail to disclose all elements of the claims, and that the Petition lacks the requisite motivation to combine the references. PO Resp. 35–53. Petitioner disputes those arguments (Pet. Reply 7–12), and Patent Owner responds to Petitioner’s contentions (PO Sur-Reply 5–11). We begin with brief discussions of the

cited references, then consider Petitioner's arguments with respect to the references' teachings applied to the instant claims, as well as Patent Owner's arguments asserting deficiencies in this ground of unpatentability.

1. *Keitler*

Keitler discloses a laser projection system in which a 3D sensor system or camera is in rigid connection to the mobile projection device. Ex. 1003 ¶ 11. The rigid connection allows for a constant, calibratable offset to be maintained, so that the position and/or orientation of the projection unit can be precisely determined even if the projection unit is repositioned. Figure 2 of Keitler is reproduced below:

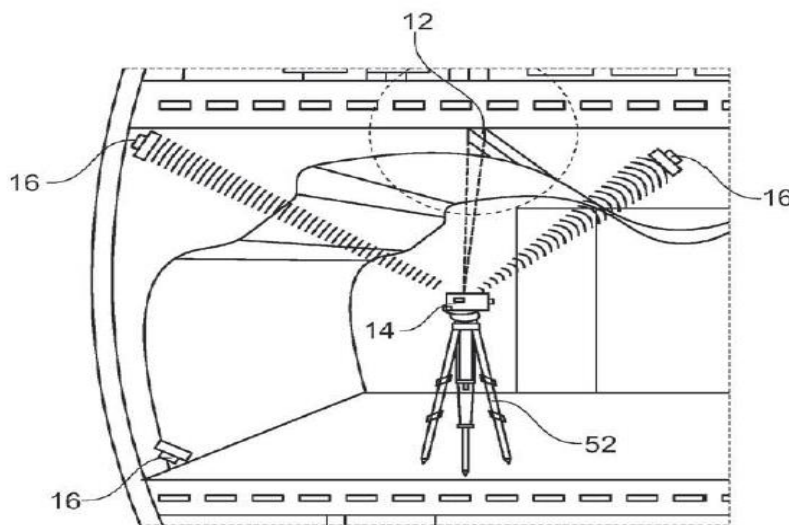


Fig. 2

Figure 2 of Keitler illustrates its projection system in the fuselage barrel of an aircraft

Figure 2 illustrates mobile projection unit 14, mounted on tripod 52, using special markers 16 to “calibrate the projection unit 14 into the coordinate system of the work environment.” *Id.* ¶ 62.

Keitler discloses a two-step tracking system that determines an approximate direction of targets followed by high-precision location of the

targets. Ex. 1003 ¶ 80. The system of Keitler, in a first step, determines an “approximate direction” of a marker (and therefore in which approximate direction to direct a laser), and then determines a “precise” location of a marker using the laser (for registration of laser projector with the environment). *Id.*

The quality of the information obtained from these camera pictures by means of image processing is, on its own, not sufficient to accomplish a precise registration of the self-registering laser projector with the environment. The information is sufficiently precise, however, for the laser beam to be able to detect the retroreflector marks 36 contained in the combination markers 26 with little search effort.

Id. The latter detection can be performed by automatic optimization by aiming at the retroreflector marks. *Id.* ¶ 81.

2. *Briggs*

Briggs discloses a laser projection system with plural embodiments of laser tracking systems: one that determines location (3D) of targets, and one that determines angular directions to targets. The system uses a light source that emits a light beam towards a target located within an environment, and a data capture component that captures the light beam reflected back to the laser scanner from the target located within the environment. Ex. 1005 ¶¶ 15, 49. The laser tracker also includes a projector integrated within a body of the laser tracker or mounted to the body of the laser tracker, the projector being operable to project visible information onto an object located within the environment. *Id.* ¶ 15. Briggs also discloses affixing targets (retroreflectors) on the object, and transmitting light to retroreflectors that reflect light to the photosensitive array. *Id.* ¶¶ 5, 6, 49.

Briggs also discloses:

In an embodiment, there are two cameras 50 and two light sources 52 placed symmetrically about the line of the laser beam 46. By using two cameras 50 in this way, the principle of triangulation can be used to find the three-dimensional coordinates of any SMR [spherically mounted retroreflector] 48 within the field of view of the camera 50. In addition, the three-dimensional coordinates of the SMR 48 can be monitored as the SMR 48 is moved from point to point.

Ex. 1005 ¶ 49. Briggs therefore discloses that two cameras are used to find the three-dimensional coordinates of the targets. Briggs additionally discloses an alternate embodiment using a single camera to provide information about the two angles that define the direction to the retroreflector. *Id.* ¶ 51.

3. *Independent Claim 1*

a) *Motivation to Combine Keitler and Briggs*

Petitioner acknowledges that Keitler does not appear to explicitly disclose the use of a three-dimensional coordinate system, but argues that Keitler does, however, disclose approximate angular directions. Pet. 30. Petitioner asserts that Briggs discloses that information regarding targets may be determined by angular directions, or by determining location (3D) coordinates using one or more cameras. *Id.* (citing Ex. 1007 ¶¶ 41–58). Petitioner also acknowledges that Keitler does not appear to disclose identifying a pattern of the reflective targets on the work surface in a three-dimensional coordinate system, but argues that Keitler does, however, disclose identifying targets to determine an approximate direction of the laser beam. *Id.* at 34. Petitioner cites to Briggs and its use of two cameras for 3D measurements, or one camera for angular measurements. *Id.* (citing Ex. 1005 ¶¶ 49, 51). Petitioner contends that a person of ordinary skill in the art “would have known that instead of determining an ‘approximate

direction’ of each target in a ‘first step’ [Ex. 1003 ¶ 81], approximate three-dimensional coordinates of each target could have been determined as disclosed in Briggs [Ex. 1005 ¶ 51].” *Id.* at 35 (citing Ex. 1007 ¶ 51).

Patent Owner addresses multiple grounds, including this one, asserting that the Petition fails “to provide any ‘reason, suggestion, or motivation’ as to why one of skill in the art would [have combined] the references in the asserted manner.” PO Resp. 35. Patent Owner also argues that Petitioner’s declarant, Dr. Mohazzab, acknowledged that his written testimony lacked any description of a reason to combine the references. *Id.* at 36 (citing Ex. 2006, 53:15–20, 56:6–10, 59:25–60:21, 62:1–5, 62:12–16, 64:1–11, 65:4–11, 66:20–24, 67:24–68:5, 69:5–15, 78:6–80:5, 88:25–89:4, 89:24–90:5, 91:19–24, 93:9–14, 95:24–96:4, 96:13–98:18).

Petitioner responds that the Petition includes discussions of motivation to combine the Keitler and Briggs references, in part, by referencing language in Briggs that specifically combines the systems to provide a two-step measurement process as in Keitler. Pet. Reply 7. Petitioner also argues that its declarant determined that the references have the same objective and similar goal, such that one skilled in the art would have had “all the knowledge around this [] technique[] to put them together and make a system” and “would know, specifically, as a matter of choice, what kind of design to choose.” *Id.* at 7–8 (quoting Ex. 1013, 154:5–7, 12–16). Petitioner also argues that the “language of the references themselves provide express motivation to combine as discussed in the Petition,” and that Dr. Mohazzab’s Declaration discusses how to maintain accuracy in the second step, and that it would have been obvious to replace 2D

correspondences with approximate 3D coordinates. *Id.* at 8 (citing Pet. 33–37; Ex. 1007 ¶¶ 56, 57).

Patent Owner repeats that Dr. Mohazzab has acknowledged that he does not provide a reason why a person of ordinary skill in the art would be motivated to combine the references as claimed in the Petition, and argues that the sections of his testimony cited in Petitioner’s Reply do not provide a motivation to combine either. PO Sur-Reply 7–8 (citing Pet. Reply 8, 16–17). Patent Owner also argues that Petitioner is attempting to pivot to a new rationale, relying on “common sense,” which Patent Owner argues is inappropriate to use as a rationale to combine the references, given the acknowledged level of skill in the art. *Id.* at 9–11.

We disagree with Patent Owner’s arguments. Although the analysis in the Petition could have been more robust, we continue to find that the Petition provides a motivation to combine the disclosure of Keitler and Briggs. The Petition provides the alternatives in Briggs, i.e., angular direction and 3D coordinates, such that one of ordinary skill in the art would have understood them to be alternative formulations. Pet. 33–35. “A person of ordinary skill has good reason to pursue the known options within his or her technical grasp.” *KSR*, 550 U.S. at 421. The two alternatives satisfy the criterion supplied in *KSR* of “a finite number of identified predictable solutions,” such that it would have been obvious to try 3D coordinate process in the system disclosed in Keitler. That is what Petitioner is positing in its Petition. *See* Pet. 33–35. We find the support provided in the Petition to be sufficient, even absent additional support by Petitioner’s declarant. Based on the foregoing discussion and record developed during this proceeding, we determine that Petitioner has shown by a preponderance of

the evidence that one of ordinary skill in the art would have been motivated to combine the teachings of Keitler and Briggs as provided in the Petition.

b) Preamble

With respect to the preamble of independent claim 1,⁶ Petitioner asserts that Keitler discloses a method of visually displaying information on real objects using a projection unit, which is preferably a laser projector, by determining a current position and/or orientation of the object and/or the projection unit in space. Pet. 30–31 (citing Ex. 1003 ¶¶ 5, 11, 16). Patent Owner does not raise any argument specifically addressing the preamble of independent claim 1. *See* PO Resp.; PO Sur-Reply. We are persuaded that Petitioner has shown by a preponderance of the evidence that Keitler meets the limitations, if any, of the preamble of independent claim 1 for the reasons explained by Petitioner.

c) “providing” steps

This step of independent claim 1 recites that a laser projector assembly with a laser source, a secondary light source, a photogrammetry device, and a laser sensor are all provided. With respect to the laser projector assembly with the laser source, Petitioner cites to Keitler’s disclosure of a laser projector with a laser source for visually displaying information on real objects. Pet. 31 (citing Ex. 1003 ¶ 5). With respect to the secondary light source, Petitioner cites to Keitler’s use of ambient light for optical tracking. *Id.* at 32 (citing Ex. 1003 ¶¶ 12, 66, 72, 80). With

⁶ The parties do not express a position on whether the preamble is limiting. Petitioner, however, addresses the preamble in its analysis of the claim. *See, e.g.*, Pet. 30–31. Although we express no determination on whether the preamble is limiting, for the reasons noted herein, we find that Petitioner sufficiently establishes that the preamble is met by Keitler.

respect to the photogrammetry device, Petitioner cites to Keitler for its disclosure of a camera for measurement, which Petitioner asserts meets the claim construction for photogrammetry device. *Id.* (citing Ex. 1003 ¶¶ 33, 80). Although Petitioner does not address providing a laser sensor, Keitler discloses varying the angle of the laser beam by an automatic search method, requiring the use of a laser sensor. *See* Ex. 1003 ¶ 80. Additionally, Briggs also discloses a laser tracker (Ex. 1005 ¶ 33) which illustrates that the use of a laser sensor would have been obvious in such systems.

Patent Owner argues we erred in the Institution Decision with respect to this providing step, as well the additional steps that recite transmitting, reflecting, and identifying, because they all rely on “a secondary light source.” PO Resp. 38–40. Patent Owner maintains that it asserted that “Petitioner failed to identify the existence of a *secondary light source*, merely the asserted result of such a claimed source – ambient light,” that the “Board implicitly acknowledged this failing,” and that we “asserted new (and unspecified) obvious arguments for Petitioner, either from uncited disclosures in Keitler, [] or from an unexplained combination with the Briggs reference.” *Id.* at 39 (citing Prelim. Resp. 22–24; Dec. 19–20). Patent Owner also quotes from *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380–81 (Fed. Cir. 2016):

The Federal Circuit has made it explicitly clear that there is “no support for the . . . position that the Board is free to adopt arguments on behalf of petitioners that could have been, but were not, raised by the petitioner during an IPR. Instead, the Board must base its decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond.”

PO Resp. 39–40. Patent Owner alleges that “the Board’s arguments, therefore, were new and improper, and constituted potential reversible error.” *Id.* at 40. We do not agree with Patent Owner’s arguments.

Although, as we noted in the Institution Decision, Petitioner did not cite to secondary light sources specifically in connection with this claim limitation, Petitioner identified the secondary light sources in the Petition that are clearly disclosed in Briggs. Pet. 26–27 (citing Ex. 1005 ¶¶ 15, 49); Dec. 19. Petitioner relies on Keitler in combination with Briggs for the teaching of the “transmitting light . . .” limitation, and, in that context, any combination would take Briggs secondary light sources identified by Petitioner into account. Pet. 33–35; *see also* Dec. 19. We also stated that “Keitler meets the ‘providing . . . a secondary light source’ limitation of independent claim 1, as discussed below,” and provided an explanation of how Keitler’s ambient light would need to be from some light source. *Id.* at 19–20. Although we discussed Briggs, we ultimately considered Petitioner’s position, that the ambient light in Keitler to be sufficient to meet the “providing . . . a secondary light source,” to be availing. Although we discussed additional aspects of Keitler and Briggs, we determined that Petitioner had persuaded us that it had shown the limitation according to what it disclosed in the Petition. *See id.* at 19 (citing Pet. 26–27). Accordingly, we relied on the teaching of “secondary light source” in Keitler as expressed in the Petition; and given that the ground is a combination with Briggs, we also provided discussion of how Petitioner has identified Briggs teaching that limitation.

Additionally, we do not read *In re Magnum Oil Tools* to dictate that the Board is limited to exactly Petitioner's citations and cannot look at the art of record. Although Petitioner bears the burden of proof of unpatentability as asserted in a petition, we need not put "blinders on" and ignore any other disclosures or knowledge of ordinarily skilled artisans. In addition, in this case, Patent Owner has had an opportunity to refute those additional observations and discussions, which Patent Owner has not done; rather, Patent Owner urges that we cabin ourselves to only exact words found in certain pincites. Also, we have adopted Petitioner's position, and have not "change[d] theories in midstream without giving respondents reasonable notice of the change and the opportunity to present argument under the new theory." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d at 1381 (quoting *SAS Inst., Inc. v. ComplementSoft, LLC*, 825 F.3d 1341, 1351 (Fed. Cir. 2015)). As such, although we made additional observations, the instituted ground was of Petitioner's creation, without the panel creating "new and improper" grounds, as Patent Owner has alleged. *See Fanduel, Inc. v. Interactive Games LLC*, 966 F.3d 1334 (Fed. Cir. 2020).

Overall, we remain persuaded that Keitler meets the "providing . . . a secondary light source" limitation of independent claim 1. An examination of Keitler's Figure 2, which illustrates its projection system in the fuselage barrel of an aircraft, suggests that any "ambient" light, relied upon by Petitioner, would come from some secondary source. We are persuaded that Keitler would have had secondary light sources so that the special markers could be used to calibrate the projection unit into the coordinate system of

the work environment, and thus not frustrate the intended function of Keitler. We also persuaded that Petitioner has demonstrated that Keitler provides a laser projector assembly with a laser source, a photogrammetry device, and a laser sensor, the other aspects of the “providing” step which are not disputed by Patent Owner. *See* PO Resp.; PO Sur-Reply. For the reasons discussed above, Petitioner demonstrates by a preponderance of evidence how Keitler meets “providing” step limitations of independent claim 1.

d) “affixing reflective targets onto the work surface”

With respect to “affixing reflective targets onto the work surface,” Petitioner relies on Keitler’s disclosure of “reference points may be temporarily fitted to various spatial positions in a simple fashion, e.g., by using an adhesive tape and/or hot-melt adhesive.” Pet. 32–33 (quoting Ex. 1003 ¶ 60) (emphasis omitted). Patent Owner does not raise any argument specifically addressing this limitation with respect to this ground of unpatentability. *See* PO Resp.; PO Sur-Reply. For the reasons discussed above, Petitioner demonstrates by a preponderance of evidence how Keitler meets the “affixing” step of independent claim 1.

*e) “transmitting light from the secondary light source”
“reflecting light toward the photogrammetry device”*

Independent claim 1 recites, in part, “transmitting light from the secondary light source toward the work surface and reflecting light toward the photogrammetry device from the reflective targets.” With respect to these limitations, Petitioner relies on Keitler’s disclosure that “the optical (black-and-white) properties ... of a combination marker 26 are detected by the camera to determine the approximate direction of the laser beam.” Pet. 33 (quoting Ex. 1003 ¶ 80) (emphasis omitted).

With respect to the cited limitations, Patent Owner argues that “[e]ven if the Petitioner and the Board are correct that the existence of ‘ambient light’ can be used to infer the existence of a *secondary light source*, that assumption still leaves multiple elements regarding the light from that light source unaddressed.” PO Resp. 40. Patent Owner argues that Keitler discloses using the visually encoded information on the targets to identify the angular direction of a single target, where “visual information is not reflect[ed] light.” *Id.* (citing Ex. 2005 ¶¶ 76, 79). Patent Owner bases this argument on its claim construction for “reflecting” light, i.e., throwing back ambient light without absorbing it. *Id.* at 40–41. We do not agree with Patent Owner’s arguments.

First, we are not persuaded that reflecting light must be accomplished without absorption, per Patent Owner’s construction. We have not been persuaded to adopt Patent Owner’s construction. Second, Mr. Dorsey-Palmateer’s testimony, relied upon by Patent Owner, does not provide support for this conclusory statement. *See* Ex. 2005 ¶ 76. The declarant states that the “visual information in the ‘bit pattern’ is not reflect[ed] light,” but it is not clear how the *visual* information is conveyed if not by light. *Id.* All visual perception occurs through reflectance back of light from objects. Mr. Dorsey-Palmateer also states that “Keitler relies upon the coded information on the targets instead of reflective non-laser light,” but the testimony provides no explanation as to how that coded information is received if not through reflected light. To the extent that the declarant, and Patent Owner, are assuming that the reflective targets are of some special types, as discussed above, we are not persuaded that the claim language should be read so narrowly, in view of the overall disclosure of the ’734

Patent. Lastly, Patent Owner’s arguments contrasting claim 1 from Keitler are unavailing, because Patent Owner argues that Keitler “does not use active transmission of non-laser light for its target identification.” PO Resp. 41 (citing Ex. 2005 ¶ 76). Keitler’s combination marker 26 are detected by the camera, but Patent Owner does not explain how that occurs if not through reflected light. Again, Mr. Dorsey-Palmateer testifies that visual information in the bit pattern is not reflected light, but does not provide any explanation of how this could be so. *See* Ex. 2005 ¶ 76.

Patent Owner also argues that we “introduce[ed] new positions for Petitioner [that were] legally improper and factually incorrect,” reiterating many of the same arguments addressed above. *Compare* PO Resp. 41–43 *with id.* at 38–40. We have relied on Petitioner’s arguments regarding Keitler and citations thereto, and have not introduced new positions on behalf of Petitioner. *See* Dec. 21 (discussing Petitioner’s citations to Keitler, Patent Owner’s arguments, and a brief citation to Briggs). As discussed above, referencing additional evidence does not change or alter the position of Petitioner with respect to this limitation of claim 1.

For the reasons discussed above, Petitioner demonstrates by a preponderance of evidence how Keitler meets the “transmitting” and “reflecting” portions of independent claim 1.

f) *“identifying a pattern of the reflective targets”*

Independent claim 1 recites, in part, “identifying a pattern of the reflective targets on the work surface in a three dimensional coordinate system.” Petitioner acknowledges that Keitler does not appear to disclose identifying a pattern of the reflective targets on the work surface in a three-dimensional coordinate system, but argues that Keitler does, however,

disclose identifying targets to determine an approximate direction of the laser beam. Pet. 34. Petitioner cites to Briggs and its use of two cameras for 3D measurements, or one camera for angular measurements. *Id.* (citing Ex. 1005 ¶¶ 49, 51). Petitioner contends that a person of ordinary skill in the art “would have known that instead of determining an ‘approximate direction’ of each target in a ‘first step’ [Ex. 1003 ¶ 81], approximate three-dimensional coordinates of each target could have been determined as disclosed in Briggs [Ex. 1005 ¶ 51].” *Id.* at 35 (citing Ex. 1007 ¶ 51).

With respect to multiple reflective targets, Briggs discusses “one or more retroreflector targets 48,” and provides that “retroreflector images are readily distinguished from the background on the photosensitive array as their image spots are brighter than background objects.” Ex. 1005 ¶ 49. Keitler provides that “[t]he system described assumes that the position and/or orientation of the retroreflective marks 36 in the coordinate system of the object is known.” Ex. 1003 ¶ 82. As such, both references contemplate the tracking of multiple reflective targets.

Patent Owner again argues that “neither Petitioner nor the Board substantively address the *prima facie* requirement that there must be a motivation to combine Keitler and Briggs in the manner asserted as to this element.” PO Resp. 45 (citing *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1349 (Fed. Cir. 2014)). We addressed this argument above (*see* II.D.3.a), and we continue to find the motivation supplied in the Petition to be sufficient to combine Keitler and Briggs to meet this claim element as well.

Patent Owner additionally argues that combining the operations of Keitler and Briggs does not disclose this element because the “two-camera”

embodiment in Briggs “is neither enabled nor disclosed sufficiently to achieve ‘triangulation’ based on the cameras alone without undue experimentation through calculation.” PO Resp. 45–46 (citing *Raytheon Techs. Corp. v. General Electric Co.*, 993 F.3d 1374, 1380–81 (Fed. Cir. 2021)). Patent Owner argues that instead what Briggs really discloses is the use of two cameras to highlight an SMR in space for location by a tracker, but the location of the SMR is identified conventionally using the typical laser tracker measurements, which operate in spherical coordinates, not three-dimensional coordinates. *Id.* at 46 (citing Ex. 2005 ¶ 93).

Petitioner responds that although Patent Owner’s declarant, Mr. Dorsey-Palmateer, asserts that Briggs is not enabling because it does not disclose how the system would use its system for the “principle of triangulation,” and that such a system would involve “highly complex calculations,” Mr. Dorsey-Palmateer “conceded that such calculations could be done ‘hypothetically.’” Pet. Reply 9–10 (citing Ex. 2005 ¶¶ 88–94; Ex. 1014, 74:5–9). Additionally, Petitioner asserts that, even if Briggs discloses non-enabled aspects, it can still be relied upon to determine obviousness. *Id.* at 9 (citing *Symbol Techs., Inc. v. Opticon, Inc.*, 935 F.2d 1569, 1578 (Fed. Cir. 1991); *Beckman Instruments Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551 (Fed. Cir. 1989); *Raytheon Techs. v. General Electric Co.*, 993 F.3d 1374, 1380 (Fed. Cir. 2021)). Patent Owner disputes Petitioner’s arguments, arguing that a non-enabled reference can be used but the record must still establish that a skilled artisan could have made the claimed invention. PO Sur-Reply 11–12 (citing *Raytheon Techs.*, 993 F.3d at 1381). Patent Owner also argues that Petitioner “cherry-picks Mr. Dorsey-Palmateer’s declaration and deposition transcript” to support its

argument, and that he still maintains that Briggs is insufficiently enabled to allow a skilled artisan to make and use the claimed invention. *Id.* at 12–13.

We have reviewed the arguments of the parties and remain persuaded that Briggs can be relied upon to teach and suggest what Petitioner has relied upon for that reference, i.e., the equivalence of determining an approximate direction of each target and determining the approximate three-dimensional coordinates of each target. “The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain.” *In re Heck*, 699 F.2d 1331, 1332–33 (Fed. Cir. 1983) (quoting *In re Lemelson*, 397 F.2d 1006, 1009 (CCPA 1968)). Patent Owner has endeavored to show that Briggs’ system would not have provided the 3D position using the triangulation disclosed, but has not refuted that one of ordinary skill in the art would have taken, from Briggs, that either angular direction or 3D position can be ascertained through Briggs’ system.

Additionally, although we agree with Patent Owner that Mr. Dorsey-Palmateer did not refute his assertions from his Declaration regarding the enablement of Briggs, he seems to understand what the inventors in Briggs were seeking to do:

In my opinion the two-camera system in Briggs is disclosed as a photogrammetry system. The two-camera system measures the targets as a photogrammetry system would and then given the XYZ position hopefully it can aid in the pointing of the tracking interferometer.

Ex. 1014, 76:6–12. Mr. Dorsey-Palmateer goes on to detail why such a proposed system is “problematic,” but does not refute the equivalence upon which Petitioner relies, i.e., between the approximate direction and the approximate three-dimensional coordinates of each target. *Id.* at 76:2–

77:13. Further, we agree with Petitioner that even if portions of Briggs were non-enabled, they can still be relied upon for what they would have shown or suggested to persons of ordinary skill in the art. *Symbol Techs.*, 935 F.2d at 1578.

With respect to the disclosure of multiple targets, Patent Owner argues that “Petitioner has only ever advanced arguments regarding this element in which a single target was identified.” PO Resp. 47 (citing Pet. 21, 33–34). Patent Owner continues that “[i]t was error for the Board to assert arguments not raised by the Petitioner,” and thus Petitioner lacks evidence showing either reference will identify a pattern of targets, because a pattern requires multiple targets. *Id.* at 47–48 (citing *Magnum Oil Tools*, 829 F.3d at 1381). We do not agree with Patent Owner.

The Petition makes several references to multiple targets in Keitler: “detect the retroreflector marks 36 contained in the combination markers 26” (Pet. 21 (citing Ex. 1003 ¶ 80)); “the pose of the individual markers 16” (Pet. 22 (citing Ex. 1003 ¶ 80)); “markers having ‘optical (black-and-white) properties’” (Pet. 32 (citing Ex. 1003 ¶ 80)); and “by aiming at the retroreflector marks 36” (Pet. 36 (citing Ex. 1003 ¶ 81)). A cursory glance at Figure 2 of Keitler reveals multiple markers 16. With respect to Briggs, the Petition provides that “Briggs also discloses affixing targets (retroreflectors) on the object[], and transmitting light to retroreflectors that reflect light to the photosensitive array.” Pet. 26 (citing Ex. 1005 ¶¶ 5, 6, 49). Even if these citations were not made with respect to the “identifying a pattern of the reflective targets” step of independent claim 1, we are not persuaded that discussion of one claim element is divorced from the discussion of all other claim elements in the same ground of unpatentability.

Our remarks in the Institution Decision (Dec. 23) did not introduce arguments that were not raised by Petitioner, but rather served to shepherd the overall discussion of the references in response to an argument raised by Patent Owner in the Preliminary Response. Consideration of the full scope of the prior art of record cannot be said to introduce new arguments beyond a narrow view of what a petitioner is asserting. Reviewing Petitioner’s ground as a whole, it is clear that Petitioner has shown how the prior art teaches multiple targets.

Patent Owner also argues that identifying a pattern of targets involves pattern recognition of the targets as a group, not a stepwise identification of target locations. PO Resp. 48 (citing Ex. 2005 ¶ 61). Patent Owner additionally argues that Keitler and Briggs only identify the location of a single target or a single target at a time, and even if they tracked multiple targets, they need not also track the locations of each of those multiple targets to provide them within the same coordinate system. *Id.* at 48–49. Patent Owner also argues that the *possibility* that relative positions can be determined from a series of known target locations should not be conflated with the *requirement* that they be identified, as in claim 1. *Id.* at 49 (citing Ex. 2005 ¶¶ 83–85). Lastly, Patent Owner argues that the disclosures of Keitler and Briggs make clear that they both identify a particular target and the relative positions of the other targets are not needed, and thus not identified. *Id.* at 50 (citing Ex. 2005 ¶¶ 75, 77, 79, 86). We are not persuaded by Patent Owner’s arguments.

First, as discussed above in the claim construction of “pattern” (*see* II.B.4), we are unpersuaded that identifying a pattern requires “pattern recognition” and that it cannot be performed through stepwise identification

of target locations, per independent claim 1. As discussed, both Keitler and Briggs disclose multiple targets, and, in view of the claim construction adopted, we are not persuaded that identifying a single target at a time is outside the purview of claim 1. We also dispute Patent Owner's apparent argument that if the location and relative position of each of the multiple targets were known, there would not be pattern information for those targets. We continue to be persuaded that providing the location of each target within a coordinate system dictates their relative positions to each other within the same coordinate system. *See* Dec. 23. Lastly, although we appreciate the analysis of Mr. Dorsey-Palmateer (Ex. 2005 ¶¶ 77, 79, 86), supporting Patent Owner's position that only one particular target needs to be identified, the clear recitation of Keitler states otherwise:

The quality of the information obtained from these camera pictures by means of image processing is, on its own, not sufficient to accomplish a precise registration of the self-registering laser projector with the environment. The information is sufficiently precise, however, for the laser beam to be able to detect the *retroreflector marks* 36 contained in the combination *markers* 26 with little search effort.

Ex. 1003 ¶ 80 (emphases added). Keitler makes clear that multiple retroreflector marks of multiple combination markers are detected. Thus, while it may be possible for similar systems to need only identify a single target, Keitler, and Keitler in combination with Briggs, clearly provides identification of multiple targets.

For the reasons discussed above, we determine that Petitioner demonstrates by a preponderance of evidence how the combined teachings of Keitler and Briggs meet the "identifying a pattern of the reflective targets" limitations of independent claim 1 for the reasons explained by Petitioner.

g) “scanning the targets with a laser beam” and “calculating a precise location of the targets”

Claim 1 recites, in part, “scanning the targets with a laser beam generated by the laser source as directed by the identified pattern of the reflective targets for reflecting the laser beam toward the laser sensor” and “calculating a precise location of the targets from the reflected laser beam for directing the laser projector where to project the laser image onto the work surface.” Petitioner asserts that Keitler discloses that in a second step, the angle of the laser beam is varied by an automatic search method such that it comes to lie exactly on the retroreflector mark. Pet. 35–36 (citing Ex. 1003 ¶ 80). Petitioner acknowledges that Keitler does not direct the laser beam to the targets based on their locations using three-dimensional coordinates, but uses their approximate directions, and Briggs discloses both techniques, so that it would have been obvious to combine Keitler and Briggs. Pet. 36–38 (citing Ex. 1007 ¶¶ 52–58).

Patent Owner argues that although Petitioner argues that Briggs can be combined with Keitler to determine three-dimensional position of the markers, it does not explain that combination in any meaningful way. PO Resp. 51–52. Patent Owner argues that Petitioner has split up the two-step target location process in Keitler, but it is not clear how the two-camera embodiment in Briggs would be integrated therewith, where Keitler does not determine marker location until after its second step. *Id.* at 52. Additionally, it is argued that the second step of Keitler uses the approximate angle and not the position of the targets. *Id.*

We disagree with Patent Owner’s arguments. We find persuasive Dr. Mohazzab’s testimony, made apparently with respect to claim 2, that “a person familiar in the art, yes, a person would know, specifically, as a matter

of design choice, what kind of design to choose for different applications.” Ex. 1013, 154:12–16 (referring to Ex. 1007 ¶ 51) . Additionally, the process disclosed in Keitler (Ex. 1003 ¶ 80) makes clear that the approximate direction of the combination marker 26 is determined in the first step, and the retroreflector mark 36 portion is determined in the second step through the laser. As such, we disagree with Patent Owner that Keitler doesn’t determine the *marker* location until after its second step. Lastly, even though it is correct that Keitler uses the approximate angle and not the position of the targets, under the combination of Keitler and Briggs proffered by Petitioner, the positions of the targets would be utilized.

For the reasons discussed above, we determine that Petitioner demonstrates by a preponderance of evidence how Keitler meets “scanning” and “calculating” steps of independent claim 1.

h) Discussion of Long-Felt But Unresolved Need

Patent Owner also argues, based on the testimony of Mr. Dorsey-Palmateer, that the claimed invention of the ’734 Patent “solves multiple problems that have long plagued the laser-projection industry,” that it “solves these problems by mistake-proofing the alignment process and eliminating errors from incorrectly placed or measured targets,” and that this is a “resolution of this long-felt need,” “especially in view of the failure of others.” PO Resp. 59 (citing Ex. 2005 ¶¶ 66–72, 121; *Apple Inc. v. Samsung Electronics Co., Ltd.*, 839 F.3d 1034, 1056 (Fed. Cir. 2016) (en banc)). Petitioner replies that much of what Mr. Dorsey-Palmateer discusses is “pattern matching” and the “use of patterns for better mistake proofing,” which are not disclosed or claimed in the ’734 Patent. Pet. Reply 18. Petitioner also notes that no products covered by the invention of the ’734

Patent are mentioned in Mr. Dorsey-Palmateer's testimony, and the features identified do not take into account what independent claim 1 actually recites. *Id.* at 18–19. Patent Owner responds that claim 1 and the disclosure of the '734 Patent are devoted to recognizing the pattern of targets, to avoid the slow and inefficient calibration of conventional, existing systems. PO Sur-Reply 18.

We are not persuaded that Patent Owner has demonstrated that the method of claim 1 satisfies a long-felt but unresolved need. Mr. Dorsey-Palmateer testifies about the known problems with laser projection systems, but does not testify that systems encompassed by claim 1 actually resolve the problems stated. *See* Ex. 2005 ¶¶ 66–72. He states that “[m]y colleagues and I did not consider pattern matching” (*id.* at ¶ 69) and that the process removes “the possibility for errors due to incorrectly placed targets and/or incorrect measurement of those targets” (*id.* at ¶ 72), but he has no apparent knowledge that such a system actually resolves the long-felt need in the art. A declarant's assertions of resolution of the long-felt need are speculative without demonstrated use of systems operating under a method encompassed by claim 1. Additionally, as discussed above, *supra* Section II.B.4, we find distinctions between identifying a pattern, per claim 1, and the “pattern matching” that the declarant asserts solves the many known problems. Therefore, we are not persuaded that Patent Owner has demonstrated evidence of meeting long-felt but unresolved needs sufficient to outweigh the evidence of obviousness of claim 1 in view of Keitler and Briggs.

i) Conclusion Regarding Independent Claim 1

We have reviewed the arguments and evidence and we determine that Petitioner demonstrates by a preponderance of evidence how the combination of Keitler and Briggs meets limitations of independent claim 1 and that there is sufficient rationale to combine the references.

4. Dependent Claims 2, 5, 7, and 10–13

Patent Owner argues that “[b]ecause Petitioner lacks evidence to establish how material limitations in independent claim 1 are met, [the] Petition necessarily also fails to establish how material limitations in dependent claims 2, 5, 7 and 10–13 are met.” PO Resp. 52–53. As we determine that Petitioner has demonstrated by a preponderance of evidence how the combination of Keitler and Briggs meets limitations of independent claim 1, we do not find this argument to be availing. As such, we discuss the dependent claims below in the context of whether Petitioner’s challenge is supported sufficiently for the reasons provided by Petitioner according to the preponderance of the evidence standard.

Claims 2 and 11, which depend from independent claim 1, provide that stereo cameras are provided for determining the location of the targets by triangulation, or that a single camera is provided for generating an image of the work surface. Petitioner cites to Keitler and Briggs for their alternate configurations of one or two cameras. Pet. 39, 41 (citing Ex. 1003 ¶¶ 14, 36, 71, 84; Ex. 1005 ¶¶ 49, 51). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Keitler and Briggs meet the limitations of dependent claims 2 and 11 for the reasons explained by Petitioner.

Claim 5, which depends from independent claim 1, recites that intermittent flashes from the secondary light source are transmitted. Petitioner relies on Briggs for its disclosure of modulated light source that are driven to repetitively emit pulsed light. Pet. 39–40 (citing Ex. 1005 ¶¶ 11, 49). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Keitler and Briggs meet the limitations of dependent claim 5 for the reasons explained by Petitioner.

Claim 7, which depends from independent claim 1, recites that a light sensor for detecting the reflected laser beam is provided. Petitioner relies on Keitler’s disclosure of “the markers being detected by a 3D sensor system of a tracking device.” Pet. 40 (quoting Ex. 1003 ¶ 33) (emphasis omitted). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Keitler and Briggs meet the limitations of dependent claim 7 for the reasons explained by Petitioner.

Claim 10, which depends from independent claim 1, recites that the position of the work surface is determined. Petitioner cites to Keitler and Briggs for their disclosures of determining approximate direction and finding three-dimensional coordinates. Pet. 41 (citing Ex. 1003 ¶ 80; Ex. 1005 ¶ 49; Ex. 1007 ¶ 65). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Keitler and Briggs meet the limitations of dependent claim 10 for the reasons explained by Petitioner.

Claim 12, which depends from independent claim 1, recites that the general location of the targets on the work surface are identified. Petitioner cites to Keitler, which discloses “the visualization system can, at any time,

match the pose of the individual markers 16 as detected in real time against the 3D positions determined in a setup phase in advance (calibration of the reference points).” Pet. 42 (citing Ex. 1003 ¶ 81; Ex. 1007 ¶ 67). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Keitler and Briggs meet the limitations of dependent claim 12 for the reasons explained by Petitioner.

Claim 13, which depends from independent claim 1, recites that the reflective targets are affixed onto the work surface at known positions relative to the work surface. Petitioner cites to Keitler and Briggs for their disclosures that the retroreflector marks can be plugged or clipped into fixed specific positions. Pet. 42–43 (citing Ex. 1003 ¶¶ 21, 72, 75, 76, 85; Ex. 1005 ¶ 54). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Keitler and Briggs meet the limitations of dependent claim 13 for the reasons explained by Petitioner.

E. Obviousness over Keitler, Briggs, and '094 Rueb

Petitioner asserts that the combination of Keitler, Briggs, and '094 Rueb would have rendered the subject matter of claims 3–6 and 8–12 obvious to one of ordinary skill in the art at the time of the invention. Pet. 43–48. Patent Owner does not raise specific arguments with respect to this ground, and traversed this ground relying on the same arguments raised against the first ground. PO Resp. 53. We begin with a brief discussion of '094 Rueb, and then consider Petitioner's arguments with respect to the references' teachings applied to the instant claims.

1. '094 Rueb

'094 Rueb discloses a laser projection system that includes a laser projector and a photogrammetry assembly with a separate light source that is used to directly calculate the precise location of the workpiece in a geometric coordinate system. Ex. 1006 ¶¶ 22, 23, 24. Its system includes light source 34 that transmits light toward the workpiece 26 onto which reflective targets 38 are temporarily affixed, with the reflective targets being retroreflective targets for reflecting light back toward the photogrammetry assembly 12 into the camera lens 36 of the first and second cameras 22, 24 so that the photogrammetry assembly 12 signals the computer 16 the location of the reflective targets 38, allowing the computer 16 to calculate the precise location of the workpiece 26 in a geometric coordinate system. *Id.* ¶ 23.

The light source 34 is disclosed to be “readable by the photogrammetry assembly 12 [and to be] separate from the laser image,” and to “flash so that the computer 16 can continuously calculate the location of the workpiece 26 within the geometric coordinate system.” Ex. 1006 ¶¶ 22, 24. The '094 Rueb reference further discloses (1) the affixing of reflective targets to the workpiece, (2) using photogrammetry to locate reflective targets on the workpiece in three-dimensional coordinate system, (3) using a light source that is of about the same wavelength of the laser, (4) using a megapixel sensor camera with a field of view of about 75 degrees, and (5) detecting drift between projector and the workpiece. *Id.* ¶¶ 21–24.

2. *Motivation to Combine Keitler, Briggs, and '094 Rueb*

Petitioner's analysis with respect to claim 3: (1) details the teachings of '094 Rueb, (2) states that a person of ordinary skill in the art would have known to use such a camera as disclosed by '094 Rueb, and finally (3) asserts that the "limitations of claim 3 therefore, are literally present in '094 Rueb dependent on either construction of claim 1." Pet. 44–45. The analysis is problematic because an ordinarily skilled artisan might have known to use such a camera, but it does not address whether the artisan would have done so in the context of Keitler and Briggs. Petitioner's declarant is unavailing as to this point. *See* Ex. 1007 ¶¶ 70–71. The analysis is conclusory; it provides some rationale to find the claim obvious, but lacks a requisite motivation to combine the actual teachings. As a contrary example, Petitioner's analysis of combining the teachings of Keitler and Briggs (Pet. 33–35) is more fulsome and clear. We determine the analyses of claims 4–6 and 8–12 to be similarly problematic.

In Petitioner's Reply, Petitioner asserts that "[t]hese claims are similarly directed to features that were commonly known from Keitler, Briggs and '094 Rueb as detailed by Dr. Mohazzab," where Petitioner cites to the deposition transcript of Dr. Mohazzab. Pet. Reply 13 (citing Ex. 1013). Again, taking claim 3 as exemplary, Petitioner argues that Dr. Mohazzab testified that those skilled in the art would know to use a megapixel sensor, and "that Rueb '094 'talks about using basically a camera or mega pixel camera in their system.'" *Id.* (citing Ex. 1013, 186:16–187:11). This testimony, however, does not address whether skilled artisans would have used such a camera in the context of Keitler and Briggs.

As such, although '094 Rueb, Keitler, and Briggs are generally directed to the same subject matter, the evidence provided in the Petition is not sufficient to show that one of ordinary skill in the art would have combined aspects of '094 Rueb with Keitler and Briggs, or that one of ordinary skill in the art would have a reasonable expectation of success in making modifications. Although this ground was sufficient for institution, we are not persuaded that Petitioner has demonstrated by the preponderance of evidence that '094 Rueb would have been combined with Keitler and Briggs to meet the subject matter of claims 3–6 and 8–12.

F. Obviousness over Briggs and Bridges

Petitioner asserts that the combination of Briggs and Bridges would have rendered the subject matter of claims 1, 2, 5, 7, and 10–13 obvious to one of ordinary skill in the art at the time of the invention. Pet. 48–56. Patent Owner raises specific arguments with respect to this ground. PO Resp. 53–58. We begin with a brief discussion of Bridges, consider Petitioner's arguments with respect to the references' teachings applied to the instant claims, as well as Patent Owner's arguments asserting deficiencies in this ground of unpatentability.

1. Bridges

Bridges discloses a laser based coordinate measuring device (Ex. 1004, 2:59–62), and a secondary light source. Ex. 1004, 1:21–23. The system includes a laser tracker with a locator camera that provides the laser tracker with the ability to determine the location of a plurality of retroreflector targets over a relatively large volume surrounding the tracker. *Id.* at 5:29–39. The tracker includes a ring of LEDs surrounding a lens and photosensitive array, wherein flashes of light from the LEDs travel to the

retroreflectors then return to the tracker, where they pass through the lens onto the photosensitive array. *Id.* Based on those detections, the locations of the spots on the array indicate the angular directions of the targets. *Id.* Thereafter, the laser tracker employs a distance measurement routine and measures the absolute distance from laser tracker to retroreflector. *Id.* at 5:40–47, 6:29–30.

2. *Independent Claim 1*

a) *Motivation to Combine Briggs and Bridges*

Petitioner asserts that Briggs discloses locating multiple retroreflectors throughout a large volume that includes an object, using a laser projector for projecting visual information, and using a photogrammetry assembly with a secondary light source finding three-dimensional coordinates of markers. Pet. 48–49. Petitioner also asserts that Bridges discloses a tracking system that includes one or more cameras to generate approximate information, and then using the approximate information to scan the targets to generate precise registration information. *Id.* at 49. Petitioner acknowledges that Bridges does not appear to disclose that the approximate information is approximate 3D coordinates, but rather is approximate angular directions. *Id.* at 49, 54. Petitioner asserts that Briggs discloses both techniques, 3D coordinates and approximate directions, and links the two systems in stating that “one distance measurement and two angle measurements performed by the laser tracker are sufficient to completely specify the three-dimensional location of the SMR.” *Id.* at 54 (quoting Ex. 1005 ¶ 8). Petitioner also asserts that Briggs discloses that “[e]mbodiments of the present invention may be applied to any computer controlled aiming system that can establish a baseline

coordinate system on a part or in an environment such that projected images can be aligned with the surface onto which they are projected.” *Id.* at 54–55 (quoting Ex. 1005 ¶ 42) (emphasis omitted). Based on those similarities, Petitioner asserts that it would have been obvious to a person of ordinary skill in the art that in the method of Bridges, 3D measurements could have been performed in place of the angular measurements using photogrammetry as disclosed in Briggs because both such measurement systems were known to be used. *Id.* at 49, 53–55 (citing Ex. 1007 ¶¶ 82–94).

Patent Owner addresses multiple grounds, including this one, asserting that the Petition fails “to provide any ‘reason, suggestion, or motivation’ as to why one of skill in the art would [have combined] the references in the asserted manner.” PO Resp. 35. Patent Owner also argues that Petitioner’s declarant, Dr. Mohazzab, acknowledged that his written testimony lacked any description of a reason to combine the references. *Id.* at 36 (citing Ex. 2006, 53:15–20, 56:6–10, 59:25–60:21, 62:1–5, 62:12–16, 64:1–11, 65:4–11, 66:20–24, 67:24–68:5, 69:5–15, 78:6–80:5, 88:25–89:4, 89:24–90:5, 91:19–24, 93:9–14, 95:24–96:4, 96:13–98:18).

Petitioner responds that the Petition includes discussions of motivation to combine the Briggs and Bridges references and cites to Dr. Mohazzab’s testimony that a person of ordinary skill in the art would have found it obvious to have employed 3D measurements, in view of Briggs, in place of the angular measurements disclosed in Bridges because “both such measurement systems were known to be used.” Pet. Reply 16 (quoting Ex. 1007 ¶ 93; citing Pet. 55; Ex. 1013, 159:18–163:5). Petitioner also argues that “[t]he combination of familiar elements according to known

methods is likely to be obvious when it does no more than yield predictable results.” *Id.* (quoting *KSR*, 550 U.S. at 416).

Patent Owner repeats that Dr. Mohazzab has acknowledged that he does not provide a reason why a person of ordinary skill in the art would be motivated to combine the references as claimed in the Petition, and argues that the sections of his testimony cited in Petitioner’s Reply also do not provide a motivation to combine either. PO Sur-Reply 7–8 (citing Pet. Reply 8, 16–17). Patent Owner further argues that Petitioner is attempting to pivot to a new rationale, relying on “common sense,” which Patent Owner argues is inappropriate to use as a rationale to combine the references, given the acknowledged level of skill in the art. *Id.* at 9–11.

We disagree with Patent Owner’s arguments. Although the analysis in the Petition could have been more robust, we continue to find that the Petition provides a motivation to combine the disclosures of Bridges and Briggs. The Petition provides the alternatives in Briggs, i.e., angular direction and 3D coordinates, such that one of ordinary skill in the art would have understood them to be alternative formulations. “A person of ordinary skill has good reason to pursue the known options within his or her technical grasp.” *KSR*, 550 U.S. at 421. The two alternatives satisfy the criterion supplied in *KSR* of “a finite number of identified predictable solutions,” such that it would have been obvious to try 3D coordinate process in the system disclosed in Bridges. That is what Petitioner is positing in its Petition. *See* Pet. 49, 54–55. We find the support provided in the Petition to be sufficient, even absent additional support by Petitioner’s declarant. Based on the foregoing discussion and record developed during this proceeding, we determine that Petitioner has shown by a preponderance of the evidence that

one of ordinary skill in the art would have been motivated to combine the teachings of Bridges and Briggs as provided in the Petition.

b) Preamble

With respect to the preamble of independent claim 1, Petitioner asserts that Briggs discloses a system that is “operable to project visible information onto an object located within the environment.” Pet. 49–50 (citing Ex. 1005 ¶¶ 15, 38) (emphasis omitted). Patent Owner does not raise any argument specifically addressing the preamble of independent claim 1 in the Response. *See* PO Resp. We are persuaded that Petitioner has shown by a preponderance of the evidence that Briggs meets the limitations, if any, of the preamble of independent claim 1 for the reasons explained by Petitioner.

c) “providing” steps

This step of independent claim 1 recites that a laser projector assembly with a laser source, a secondary light source, a photogrammetry device, and a laser sensor are all provided. With respect to the laser projector assembly with the laser source, Petitioner cites to Briggs’ disclosure of laser trackers that includes a light source that emits a beam towards a target. Pet. 50 (citing Ex. 1005 ¶¶ 2, 15). With respect to the secondary light source, Petitioner cites to Briggs’ “light sources 52 [that] illuminate the one or more retroreflector targets 48.” *Id.* (citing Ex. 1005 ¶ 49). With respect to the photogrammetry device, Petitioner cites to Briggs’ disclosure of one or more cameras and light sources, which each camera comprising a photosensitive array. *Id.* at 51 (citing Ex. 1005 ¶ 49). Although Petitioner does not specifically address providing a laser sensor, both Briggs and Bridges disclose laser trackers. Ex. 1004, 5:40–47, 6:29–30; Ex. 1005 ¶¶ 15.

Patent Owner does not raise any argument specifically addressing this limitation of independent claim 1 with respect to this ground in the Response. *See* PO Resp. We are persuaded that Petitioner has shown by a preponderance of the evidence that Briggs and Bridges meet the providing steps limitations of independent claim 1 for the reasons explained by Petitioner.

d) “affixing reflective targets onto the work surface”

With respect to “affixing reflective targets onto the work surface,” Petitioner relies on Briggs’ disclosure of applying retroreflectors to the surface of the object being measured. Pet. 51–52 (citing Ex. 1003 ¶¶ 5–6).

Patent Owner argues that neither Briggs nor Bridges discloses affixing targets in place because those references detail that the “trackers are designed to be moved from point-to-point by hand.” PO Resp. 54. (citing Ex. 2005 ¶¶ 86, 99; Ex. 2006, 123:20–24). Patent Owner also argues that the ordinary meaning of the term “affix” means to physically attach, and that Petitioner applied that ordinary meaning with regards to the first ground. *Id.* (citing Ex. 2007; Pet. 32–33). Petitioner responds that Briggs discloses that the SMR [spherically mounted retroreflector] is in contact with the test object, and the fact that the SMR can be moved over the surface “does not negate the disclosure that it contacts the object,” and is thus affixed. Pet. Reply 14. Patent Owner replies that Petitioner’s arguments ignore the ordinary meaning of “affix,” which is to “physically attach.” PO Sur-Reply 13–15 (citing Ex. 2005 ¶ 118).

Considering the parties’ positions, we are persuaded by Petitioner that Briggs discloses affixing reflective targets onto the work surface. Patent Owner’s position that “affix” means to physically attach is correct, but it

does not connote that the target must be permanently attached. Patent Owner's example from the first ground discusses a marker affixed by using an adhesive tape, which would not imply permanence. A marker affixed by adhesive tape can be moved, and we are not persuaded that the SMRs in Briggs would not remain coupled to the work surface such that the surface can be manipulated without disturbing the locations of those SMRs.

We are persuaded that Petitioner has shown by a preponderance of the evidence that Briggs meets the affixing step limitation of independent claim 1 for the reasons explained by Petitioner.

e) *“transmitting light from the secondary light source”*

Independent claim 1 recites, in part, “transmitting light from the secondary light source toward the work surface and reflecting light toward the photogrammetry device from the reflective targets.” With respect to this limitation, Petitioner relies on Briggs' disclosure that light sources (LEDs) transmit light to retroreflectors that reflect light to the photosensitive array, such that an image is formed of objects within the field of view of the lens, and that retroreflector images are readily distinguished from the background on the photosensitive array. Pet. 52 (citing Ex. 1005 ¶ 49). Patent Owner does not raise any argument specifically addressing this limitation in the Response. *See* PO Resp. We are persuaded that Petitioner has shown by a preponderance of the evidence that Briggs meets this limitation of independent claim 1 for the reasons explained by Petitioner.

f) *“identifying a pattern of the reflective targets”*

Independent claim 1 recites, in part, “identifying a pattern of the reflective targets on the work surface in a three dimensional coordinate system.” Petitioner cites to the disclosure of Briggs, wherein the image

formed in the photosensitive array shows the positions of the retroreflectors therein. Pet. 52 (citing Ex. 1005 ¶ 49). Petitioner also cites to Briggs' disclosure of two cameras and that the "principle of triangulation can be used to find the three-dimensional coordinates of any SMR 48 within the field of view of the camera 50." *Id.* at 52–53 (quoting Ex. 1005 ¶ 49) (emphasis omitted).

With respect to this limitation, Patent Owner argues that Briggs only discloses locating a single target at a time, and that while Briggs discloses that other retroreflectors may be in the environment, it does not disclose tracking more than one of these retroreflectors at a time, such that no pattern of multiple targets can be identified. PO Resp. 55. Petitioner responds that the language used in Briggs, namely distinguishing image spots in the retroreflector images and finding any SMR within the field of view of the camera, provides the motivation for the claimed detection of plural targets. Pet. Reply 15 (citing Ex. 1005 ¶ 49). Petitioner also argues that Mr. Dorsey-Palmateer acknowledged that multiple reflectors can be seen on a camera image in Briggs. *Id.* (citing Ex. 1014, 69:19–21). With respect to this argument, we agree with Petitioner that Briggs allows for the locations of multiple targets to be determined through its photosensitive array. Even if Patent Owner is correct, and only one target is *tracked*, that does not mean that multiple targets are not *imaged*. Claim 1 requires the identification of a pattern of reflective targets and not that they are being tracked. We are persuaded that Briggs provides for distinguishing of multiple spots corresponding to the targets thus allowing for the identification of a pattern of targets.

Patent Owner also argues that “the Board again went beyond the arguments provided by the Petitioner when it argued that Bridges discloses determining the location of a plurality of retroreflector targets,” and argues the newly cited portion only discloses the angular directions of the targets. PO Resp. 55–56 (citing Dec. 35). Petitioner responds that the Petitioner referenced the disclosure in Bridges of detecting the approximate location of multiple retroreflectors in a wide field of view through its analysis of the pattern of light on the photosensitive array. Pet. Reply 15–16 (citing Pet. 54; Ex. 1004, 17:21–23). We agree with Petitioner. Although the citation in the Institution Decision of Bridges (Dec. 35) does not cite to the Petition, Petitioner is correct that the referenced portion of Bridges was discussed in the Petition. Additionally, although Bridges does indicate the angular directions of the targets and not the locations, the combination with Briggs allows for one of ordinary skill in the art to perceive the correspondence between angular directions and 3D coordinates.

Patent Owner also cites to the testimony of Mr. Dorsey-Palmateer and his actual experience in working with a system described in Bridges, including multiple downsides. PO Resp. 56–57 (citing Ex. 2005 ¶¶ 121–124). We acknowledge Mr. Dorsey-Palmateer’s testimony regarding Bridges, but nevertheless determine that Briggs allows for the locations of multiple targets to be determined through its photosensitive array, and do not find the downsides identified therein would keep the combination of Briggs and Bridges from identifying a pattern of reflective targets.

As such, we are persuaded that Petitioner has shown by a preponderance of the evidence that the combination of Briggs and Bridges

meets this limitation of independent claim 1 for the reasons explained by Petitioner.

g) *“scanning the targets with a laser beam” and “calculating a precise location of the targets”*

Claim 1 recites, in part, “scanning the targets with a laser beam generated by the laser source as directed by the identified pattern of the reflective targets for reflecting the laser beam toward the laser sensor” and “calculating a precise location of the targets from the reflected laser beam for directing the laser projector where to project the laser image onto the work surface.” Petitioner asserts that Bridges discloses that in a second step, the detected images are analyzed, and the laser beam is directed to “the central point of” each target based on the angular directions of each reflective target for scanning the targets with the laser beam for precise measurement. Pet. 54 (citing Ex. 1004, 17:20–31).

Petitioner acknowledges that Bridges does not disclose identifying the targets based their locations using three-dimensional coordinates, but uses their approximate directions. Pet. 54. Petitioner asserts that Briggs discloses both techniques, 3D coordinates and approximate directions, and links the two systems in stating that “one distance measurement and two angle measurements performed by the laser tracker are sufficient to completely specify the three-dimensional location of the SMR.” *Id.* (quoting Ex. 1005 ¶ 8). Petitioner also asserts that Briggs discloses that “[e]mbodiments of the present invention may be applied to any computer controlled aiming system that can establish a baseline coordinate system on a part or in an environment such that projected images can be aligned with the surface onto which they are projected.” *Id.* at 54–55 (quoting Ex. 1005 ¶ 42) (emphasis omitted). Based on those similarities, Petitioner asserts that

it would have been obvious to a person of ordinary skill in the art that in the method of Bridges, 3D measurements could have been performed in place of the angular measurements using photogrammetry as disclosed in Briggs because both such measurement systems were known to be used. *Id.* at 55 (citing Ex. 1007 ¶ 92).

Patent Owner argues that Petitioner does not explain this combination, including how the angular scanning of Bridges would be used in the two-camera embodiment of Briggs, nor does it identify any reason a person of ordinary skill in the art would have wanted to make the combination. PO Resp. 57–58. Patent Owner argues that Bridges provides for the laser scan to occur before the location is determined, and Briggs does not disclose scanning because it locks onto a single SMR. *Id.* at 58. Petitioner responds that it cites to Bridges to teach or suggest this claim element and that it supplied proper motivation to combine the teachings with Briggs so that ordinarily skilled artisans would have performed 3D measurements in place of the angular measurements because both were known and the combination of familiar elements according to known methods is likely to be obvious. Pet. Reply 16 (citing Pet. 54–55; Ex. 1007 ¶ 93; *KSR*, 550 U.S. at 416).

As discussed above, we continue to find that the Petition provides a motivation to combine the disclosures of Bridges and Briggs. The Petition provides the alternatives in Briggs, i.e., angular direction and 3D coordinates, such that one of ordinary skill in the art would have understood them to be alternative formulations. We find the support provided in the Petition to be sufficient. We continue to determine that Petitioner has sufficiently established that an ordinarily skilled artisan would have been motivated to combine the teachings of Bridges and Briggs. *See* Dec. 37.

We are persuaded that Petitioner has shown by a preponderance of the evidence that the combination of Briggs and Bridges meets this limitation of independent claim 1 for the reasons explained by Petitioner.

h) Conclusion Regarding Independent Claim 1

Patent Owner also argues, as discussed above (*see* II.D.3.h), that the invention addresses a long-felt unresolved need, that is also applicable to this ground of unpatentability as well. *See* PO Resp. 59; Pet. Reply 18–19; PO Sur-Reply 18. We have considered the parties’ arguments above and continue to be persuaded that Patent Owner has not demonstrated sufficient evidence of long-felt but unresolved need to outweigh the evidence of obviousness of claim 1 in view of Briggs and Bridges.

We have reviewed the arguments and evidence and find that, on the present record, Petitioner sufficiently establishes by a preponderance of the evidence that the combination of Briggs and Bridges teaches or suggests all of the limitations of independent claim 1 and that there is sufficient rationale to combine the references.

3. Dependent Claims 2, 5, 7, and 10–13

Patent Owner does not explicitly argue whether the limitations of dependent claims 2, 5, 7, and 10–13 are met by the combined teachings of Briggs and Bridges. Patent Owner focuses its arguments on claim 1, and asserts that the limitations of independent claim 1 are also required for the dependent claims. PO Resp. 58. As such, we discuss the dependent claims below in the context of whether Petitioner’s challenge is supported sufficiently for the reasons provided by Petitioner.

Claims 2 and 11, which depend from independent claim 1, provide that stereo cameras are provided for determining the location of the targets

by triangulation, or that a single camera is provided for generating an image of the work surface. Petitioner cites to Briggs for its alternate configurations of one or two cameras. Pet. 56–57, 41 (citing Ex. 1005 ¶¶ 49, 51). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Briggs and Bridges meet the limitations of dependent claims 2 and 11 for the reasons explained by Petitioner.

Claim 5, which depends from independent claim 1, recites that intermittent flashes from the secondary light source are transmitted. Petitioner relies on Briggs for its disclosure of modulated light source that are driven to repetitively emit pulsed light. Pet. 57 (citing Ex. 1005 ¶¶ 11, 49). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Briggs and Bridges meet the limitations of dependent claim 5 for the reasons explained by Petitioner.

Claim 7, which depends from independent claim 1, recites that a light sensor for detecting the reflected laser beam is provided. Petitioner relies on Bridges' disclosure of "[w]hen the laser beam intersects the target, position detector 341 of FIG. 3 senses the reflected light [and] signals from position detector 341 provide enough information to enable motors 80 and 81 to point rigid structure 190 directly to the center of retroreflector 107." Pet. 57–58 (quoting Ex. 1004, 17:40–44) (emphasis omitted). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Briggs and Bridges meet the limitations of dependent claim 7 for the reasons explained by Petitioner.

Claim 10, which depends from independent claim 1, recites that the position of the work surface is determined. Petitioner cites to Briggs and Bridges for their disclosures of determining approximate direction and finding three-dimensional coordinates. Pet. 58–59 (citing Ex. 1004, 17:20–31; Ex. 1005 ¶ 49; Ex. 1007 ¶¶ 101, 102). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Briggs and Bridges meet the limitations of dependent claim 10 for the reasons explained by Petitioner.

Claim 12, which depends from independent claim 1, recites that the general location of the targets on the work surface are identified. Petitioner cites to Briggs and Bridges for their disclosures of determining locations of the work surfaces bearing the reflectors. Pet. 60 (citing Ex. 1004, 17:28–31; Ex. 1005 ¶ 49; Ex. 1007 ¶ 104). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Briggs and Bridges meet the limitations of dependent claim 12 for the reasons explained by Petitioner.

Claim 13, which depends from independent claim 1, recites that the reflective targets are affixed onto the work surface at known positions relative to the work surface. Petitioner cites to Briggs for its disclosure that the retroreflector marks can be plugged or clipped into fixed specific positions. Pet. 60 (citing Ex. 1005 ¶ 54). We find, on the present record, Petitioner has established by a preponderance of evidence that the combined teachings of Briggs and Bridges meet the limitations of dependent claim 13 for the reasons explained by Petitioner.

G. Obviousness over Briggs, Bridges, and '094 Rueb

Petitioner asserts that the combination of Briggs, Bridges, and '094 Rueb would have rendered the subject matter of claims 3–6 and 8–12 obvious to one of ordinary skill in the art at the time of the invention. Pet. 61–65. Patent Owner does not raise specific arguments with respect to this ground, and traversed this ground relying the same arguments raised against the first ground. PO Resp. 58–59.

Petitioner relies on the same aspects of '094 Rueb with respect to the same claims as discussed above. *Compare* Pet. 43–48, *with id.* at 61–65. Similarly, Petitioner does not address whether skilled artisans would have used such a camera in the context of Briggs and Bridges. As such, although '094 Rueb, Briggs, and Bridges are generally directed to the same subject matter, the evidence provided in the Petition is not sufficient to show that one of ordinary skill in the art would have combined aspects of '094 Rueb with Briggs and Bridges, or that one of ordinary skill in the art would have a reasonable expectation of success in making modifications. Although this ground was sufficient for institution, we are not persuaded that Petitioner has demonstrated by the preponderance of evidence that '094 Rueb would have been combined with Briggs and Bridges to meet the subject matter of claims 3–6 and 8–12 according to this ground of unpatentability.

III. PATENT OWNER'S MOTION TO EXCLUDE

Patent Owner filed a motion (Paper 18, "Mot.") to exclude the Declaration of Dr. Mohazzab (Ex. 1007), as well as portions of Dr. Mohazzab's redirect testimony that Patent Owner alleges went outside the scope of cross-examination and the portions of Petitioner's Reply that cited these answers on redirect. Mot. 1. Petitioner filed an Opposition to Patent

Owner's Motion (Paper 19, "Opp."), and Patent Owner filed a Reply in support of its Motion (Paper 21, "Reply"). Patent Owner, as the "moving party," "has the burden of proof to establish that it is entitled to the requested relief." 37 C.F.R. § 42.20. We address the elements of Patent Owner's Motion separately below.

A. *Declaration of Dr. Mohazzab (Ex. 1007)*

Patent Owner argues that Dr. Mohazzab did not prepare the Declaration, spent a mere five hours reviewing the '734 Patent and Declaration before signing it, and provided his signature despite having little understanding of the concept of obviousness or how patent claim limitations worked. Mot. 1. Patent Owner also argues that large portions of the Petition and the Declaration "contain mirror text," and Dr. Mohazzab's deposition testimony indicated that he spent as little as five hours reviewing all of the materials necessary to sign the Declaration, which was drafted by others. *Id.* at 2. Patent Owner also argues that the same deposition testimony demonstrated that "he did not understand the legal issues in the Declaration, including the alleged combination of references or how independent and dependent claims function." *Id.* at 3. Based on this, Patent Owner argues that the Declaration (Ex. 1007) must be excluded because it is impermissible attorney argument, and not expert opinion, arguing it is merely ghostwritten arguments of Petitioner's counsel. *Id.* at 4–8. Patent Owner acknowledges that "[w]hile the Federal Rules of Civil Procedure do not prohibit counsel from helping an expert prepare a report, help is 'generally limited to ensuring that Rule 26's formal requirements are satisfied.'" *Id.* at 6 (quoting *Numatics, Inc. v. Balluff, Inc.*, 66 F. Supp. 3d 934, 942 (E.D. Mich. 2014)). Patent Owner also argues that Dr. Mohazzab's fundamental

misunderstanding of the concepts and opinions in the Declaration renders it unreliable under Federal Rules of Evidence 702. *Id.* at 8–11. Patent Owner argues that in his deposition, Dr. Mohazzab provided testimony showing that he fundamentally misunderstands the legal concepts of obviousness that were applied in the Declaration, specifically with respect to the analysis of claims 11 and 13. *Id.* at 9–10.

Petitioner responds that Dr. Mohazzab testified to the opinions in his Declaration and the basis for those opinions, demonstrating knowledge of both the factual and legal underpinnings of his Declaration. *Opp.* 1. Petitioner’s counsel acknowledged that it prepared the draft declaration, but it was after extensive conversations with Dr. Mohazzab, and Dr. Mohazzab’s own review of documents and opinions. *Id.* at 1, 3–4. Petitioner also argues that “there is no evidence that the Declaration would have been substantially different had Dr. Mohazzab written it himself,” and that Petitioner’s counsel took on the role of scribe, as opposed to creator. *Id.* at 7. Petitioner also argues that “Patent Owner’s reliability argument is premised entirely on the incorrect assessment that Dr. Mohazzab misunderstands the legal concepts of obviousness applied in the Declaration.” *Id.* at 9. Petitioner additionally argues that unlike the cases cited by Patent Owner, Dr. Mohazzab provided a definition of obviousness in the context of this case. *Id.* at 11. Lastly, Petitioner argues that the issues raised by Patent Owner go to weight that we should afford to Dr. Mohazzab’s testimony, not its credibility. *Id.*

In Reply, Patent Owner sums up its arguments stating:

At its core, the issue here is whether a purported expert declaration should be excluded when (a) it was not authored by the person who signed it, and (b) that person admits he spent little time reviewing it (and hundreds of pages of related technical

information) before signing, merely lending their credentials to attorney written arguments.

Reply 1. Patent Owner also disputes the nature of the interactions between Dr. Mohazzab and Petitioner's counsel as argued by Petitioner. *Id.* at 2–3. Lastly, Patent Owner asserts that Petitioner's discussion of a single-reference obviousness argument does not relate to Dr. Mohazzab's misunderstanding of obviousness noted in detail in the Motion. *Id.* at 3–4.

We have considered the arguments of both parties and we are not persuaded that Dr. Mohazzab's Declaration should be excluded. It is generally understood that some attorney involvement in the preparation of an expert report or declaration is permissible as long as the expert substantially participated in the preparation thereof, such that it cannot be considered to be “ghost written” by an attorney. *See Manning v. Crockett*, No. 95C3117, 1999 WL 342715, at *3 (N.D. Ill. May 18, 1999); *see also Trigon Ins. Co. v. United States*, 204 F.R.D. 277, 293 (E.D. Va. 2001) (discussing the decision in *Manning*). Patent Owner has not demonstrated persuasively that Dr. Mohazzab's declaration was “ghost written.” *Long Term Capital Holdings v. United States*, No. 01-CV-1290, 2003 WL 21269586, at *4 (D. Conn. May 6, 2003). We judge this, in part, from our review of the deposition transcript of Dr. Mohazzab (Ex. 1013), where there were portions where he was confused about certain legal concepts, but we determine that, overall, he showed a knowledge of the subject matter and the testimony of his Declaration. Similarly, we are not persuaded that five hours was necessarily insufficient time for the review of the Declaration and its underlying references. Given that Patent Owner has the burden of proof to establish that the Declaration should be excluded, we are not persuaded that Patent Owner has met that burden.

We may determine the appropriate weight to be accorded the evidence presented, including expert opinion, based on the disclosure of the underlying facts or data, upon which that opinion is based. Thus, we decline to make a determination about Dr. Mohazzab’s opinion, as a whole. Rather, in our analysis above, we consider, on an issue-specific basis, the relevant portions of Dr. Mohazzab’s testimony and determine the appropriate weight to accord that particular testimony.

In consideration of the above, Patent Owner’s motion to exclude Dr. Mohazzab’ Declaration (Ex. 1007) is denied.

B. Portions of Dr. Mohazzab’s deposition (Exs. 2006, 1014)

Patent Owner argues that we should exclude testimony from the deposition of Dr. Mohazzab that Patent Owner argues was “beyond the scope of Patent Owner’s cross-examination and as seeking to improperly introduce new evidence.” Mot. 11 (with footnote 1 detailing the specific portions). Patent Owner argues that its counsel asked “specific and narrow questions on cross-examination,” and on re-direct “Petitioner’s counsel ignored the limited scope of Patent Owner’s cross-examination and instead asked Dr. Mohazzab to narratively describe ‘the basis’ of his opinions.” *Id.* at 12–13. Petitioner asserts that its “redirect was proper and should not be excluded,” and Patent Owner denies those assertions. Opp. 1, 12–15; Reply 4–5.

As our analysis does not rely on any of the portions that Patent Owner seeks to exclude, we dismiss the motion directed to those portions as moot. “[T]here is a strong public policy for making all information filed in an administrative proceeding available to the public.” *Liberty Mut. Ins. Co. v. Progressive Cas. Ins. Co.*, CBM2012-00010, Paper 59 at 40 (PTAB Feb. 24,

2014). Rather than excluding evidence that is allegedly hearsay, confusing, misleading, untimely, and/or irrelevant, we do not rely on it or give it little or no probative weight, as appropriate, in our analysis, which is what we have done here.

“In an *inter partes* review, we regard it as the better course to have a complete record of the evidence to facilitate public access, as well as appellate review.” *Sony Computer Entm’t Am. LLC v. Game Controller Tech. LLC*, IPR2013-00634, Paper 32 at 32 (PTAB Apr. 14, 2015); *see also Gnosis S.p.A. v. S. Alabama Med. Sci. Found.*, IPR2013-00118, Paper 64 at 43 (PTAB June 20, 2014) (citing *Donnelly*, 123 F.2d 215, 224 (8th Cir. 1941) (“If the record on review contains not only all evidence which was clearly admissible, but also all evidence of doubtful admissibility, the court which is called upon to review the case can usually make an end of it, whereas if evidence was excluded which that court regards as having been admissible, a new trial or rehearing cannot be avoided.”)).

C. Portions of Petitioner’s Reply

Related to the deposition testimony of Dr. Mohazzab, Patent Owner also moves to exclude portions of Petitioner’s Reply that cite to it, namely pages 8, 11–14, 16–18. Mot. 1, 14–15. Although we do reference some of the cited pages of Petitioner’s Reply, we do not reference the portions of re-direct testimony which Patent Owner sought to exclude. As such, our analysis does not rely on any of the portions of testimony that Patent Owner has indicated, and we dismiss the motion directed to those portions as moot.

IV. CONCLUSION

For the reasons discussed above, Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 2, 5, 7, and 10–13 are

unpatentable, but has failed to demonstrate by a preponderance of evidence that claims 3, 4, 6, 8, 9 are rendered obvious.⁷ Additionally, we deny-in-part and dismiss-in-part Patent Owner’s Motion to Exclude.

Our conclusions regarding the Challenged Claims are summarized below:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 2, 5, 7, 10–13	103	Keitler, Briggs	1, 2, 5, 7, 10–13	
3–6, 8–12	103	Keitler, Briggs, '094 Rueb		3–6, 8–12
1, 2, 5, 7, 10–13	103	Briggs, Bridges	1, 2, 5, 7, 10–13	
3–6, 8–12	103	Briggs, Bridges, '094 Rueb		3–6, 8–12
Overall Outcome			1, 2, 5, 7, 10–13	3, 4, 6, 8, 9

V. ORDER

For the reasons given, it is:

ORDERED that Petitioner has established based on a preponderance of evidence that claims 1, 2, 5, 7, and 10–13 of U.S. Patent No. 10,052,734 B2 are unpatentable as obvious under 35 U.S.C. § 103;

⁷ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this Decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. §§ 42.8(a)(3), (b)(2).

FURTHER ORDERED that Petitioner has failed to show on this record that claims 3, 4, 6, 8, and 9 of the '734 Patent are unpatentable as obvious under 35 U.S.C. § 103;

FURTHER ORDERED that Patent Owner's Motion to Exclude is denied-in-part and dismissed-in-part; and

FURTHER ORDERED that because this is a final written decision, the parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 10,052,734 B2

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