

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PLATINUM OPTICS TECHNOLOGY, INC.,
Petitioner,

v.

VIAVI SOLUTIONS INC.,
Patent Owner.

IPR2022-01489
Patent 11,131,794 B2

Before DEBRA K. STEPHENS, JOHN A. HUDALLA, and
SHARON FENICK, *Administrative Patent Judges*.

FENICK, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Platinum Optics Technology, Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–19 (the “challenged claims”) of U.S. Patent No. 11,131,794 B2 (Ex. 1001, “the ’794 patent”). Paper 1

(“Pet.”). Viavi Solutions Inc. (“Patent Owner”), filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

The Board has authority to determine whether to institute an *inter partes* review. See 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), we may not authorize an *inter partes* review unless the information in the Petition and the Preliminary Response “shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” For the reasons that follow, we institute an *inter partes* review as to the challenged claims of the ’794 patent.

B. Real Parties in Interest

Petitioner represents that it is the only real party in interest. Pet. 69. Patent Owner represents that it is the only real party in interest. Paper 4 (Patent Owner’s Mandatory Notices), 2.

C. Related Matters

Petitioner and Patent Owner identify as related: (1) *Viavi Solutions Inc. v. Zhejiang Crystal-Optech Co. Ltd.*, No. 2:21-cv-00378, pending in the Eastern District of Texas; and (2) *Viavi Solutions Inc. v. Platinum Optics Technology Inc.*, No. 5:20-cv-06655, pending in the Northern District of California. Pet. 69; Paper 4, 2.

The parties describe as related additional *inter partes* review petitions that have been filed against the ’794 patent or patents related by claims of priority to the ’794 patent. Pet. 69 (identifying IPR2021-00631, IPR2022-01183, and IPR2022-01184); Paper 4, 2 (identifying IPR2022-01183, IPR2022-01184, and IPR2022-01281). Petitioner additionally notes that

pending U.S. Patent Application 17/446,852 includes a priority claim to the application that issued as the '794 patent. Pet. 69.

D. The '794 Patent

The '794 patent, titled “Optical Filter and Sensor System,” relates to optical filters useful in sensor systems that detect movements or gestures based on near-infrared (NIR) light reflected from a user. Ex. 1001, code (54), 1:27–32. Figure 10, reproduced below, is a block diagram of a sensor system according to the '794 patent.

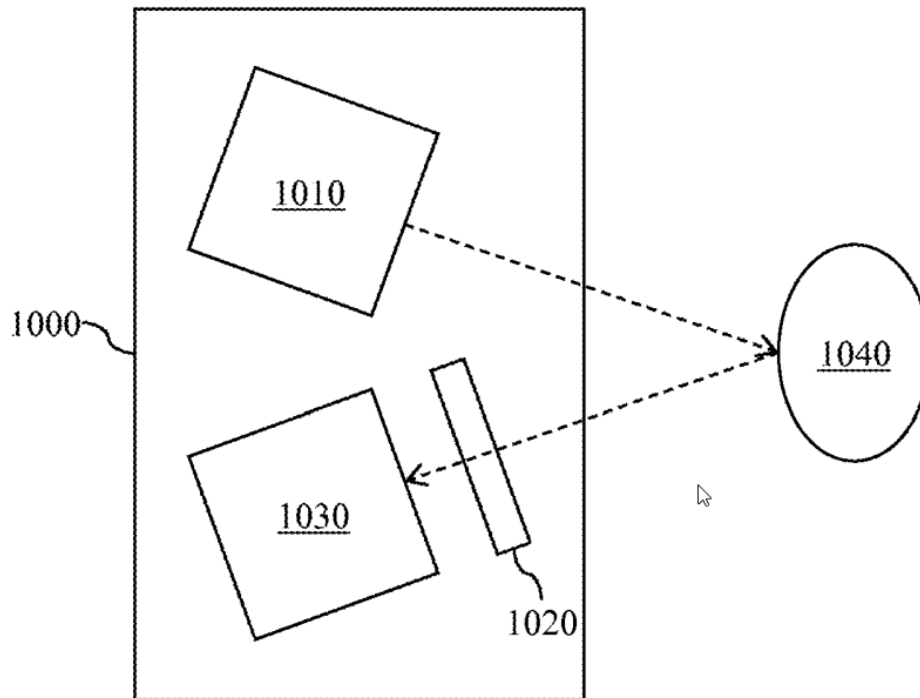


Figure 10 depicts sensor system 1000, which includes light source 1010 that emits NIR light toward target 1040. *Id.* at 9:48–51. Target 1040, in turn, reflects the emitted light toward sensor 1030. *Id.* at 9:59–61. Optical filter 1020 is disposed between the user and the sensor “to receive the emitted light after reflection by the target 1040.” *Id.* at 9:64–65, 10:5–8. The '794 patent describes optical filter 1020 as a “narrow bandpass” filter because it transmits emitted light from light source 1010 in the NIR

wavelength range of 800 nm to 1100 nm, while “substantially blocking ambient light.” *Id.* at 1:33–41, 10:1–3.

Figure 6, reproduced below, illustrates a cross-section of the optical filter according to the '794 patent.

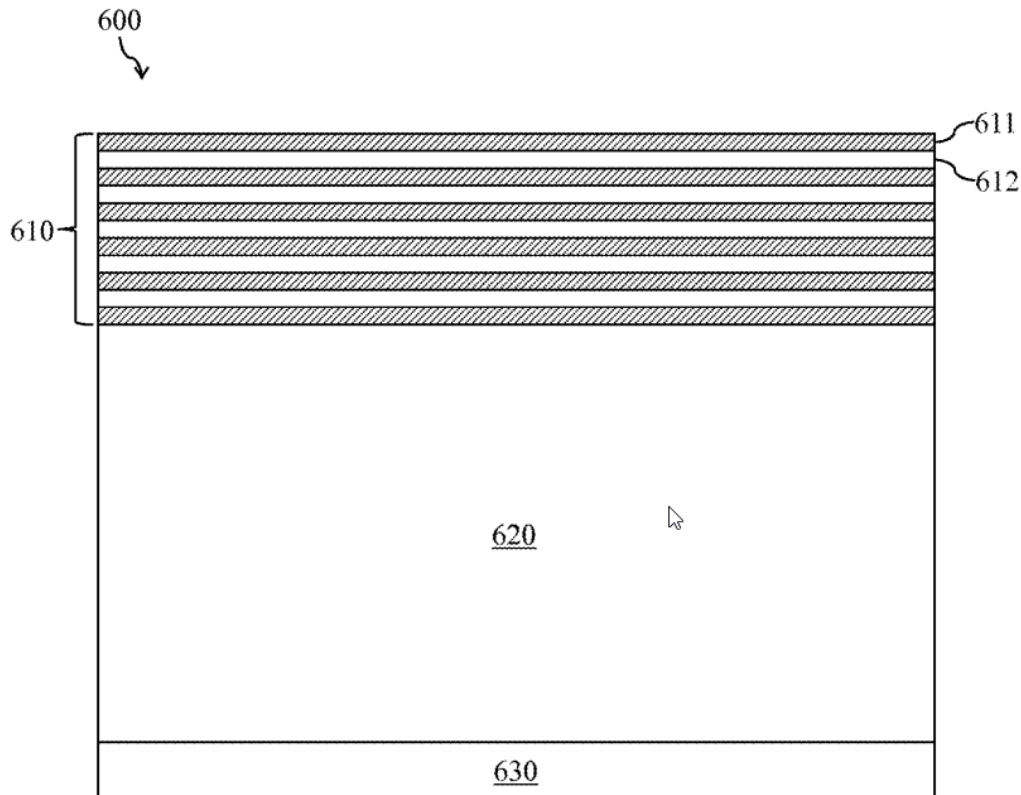


Figure 6 depicts optical filter 600 that includes filter stack 610 disposed on substrate 620, such as a glass substrate. *Id.* at 5:64–6:1. Filter stack 610 “includes a plurality of hydrogenated silicon [Si:H] layers 611, which serve as higher-refractive-index layers, and a plurality of lower-refractive-index layers 612 stacked in alternation.” *Id.* at 6:9–12. “In most instances, the lower-refractive-index material is a dielectric material, typically, an oxide.” *Id.* at 7:4–5. The '794 patent lists “[s]uitable lower-refractive-index materials” as “silicon dioxide (SiO₂), aluminum oxide (Al₂O₃), titanium

dioxide (TiO_2), niobium pentoxide (Nb_2O_5), tantalum pentoxide (Ta_2O_5), and mixtures thereof, i.e., mixed oxides.” *Id.* at 7:5–9.

The Si:H layers have a refractive index of greater than 3 over a wavelength range of 800 nm to 1100 nm, while the lower-refractive-index layers have a refractive index of less than 3 over the wavelength range of 800 nm to 1100 nm. *Id.* at 2:59–67. In a preferred embodiment, the Si:H layers have a refractive index of greater than 3.5 over the wavelength range of 800 nm to 1100 nm, for example “a refractive index of greater than 3.64, i.e., about 3.6, at a wavelength of 830 nm.” *Id.* at 6:30–35. The ’794 patent states that certain hydrogenated silicon materials would not have a suitably low extinction coefficient over the desired wavelength range. *Id.* at 2:35–53. The ’794 patent additionally contains a description of the method of producing the hydrogenated silicon which it describes as producing “improved hydrogenated silicon material.” *Id.* at 4:35–5:64, Figs. 4, 5A–5D.

According to the ’794 patent, the disclosed optical filter improves over the prior art by minimizing the “center wavelength shift” in the filter’s optical response as the angle of incident light varies. *Id.* at 2:10–17, 24–27. Specifically, the claimed optical filter has a center wavelength shift of less than 20 nm in response to a 0° to 30° change in an incidence angle. *Id.* at 7:58–62. The ’794 patent states that a lower center wavelength shift allows for a “significantly narrower” passband that “improves the signal-to-noise ratio of systems incorporating the” claimed optical filters.” *Id.* at 8:35–39. The optical filter is described as preferably having a blocking level, outside

of the passband, of greater than OD2¹ between 400 nm to 1100 nm. *Id.* at 7:42–46.

E. Illustrative Claims

Petitioner challenges claims 1–19 of the ’794 patent. Pet. 1. Of the challenged claims, claims 1, 9, and 15 are independent and are reproduced below as illustrative of the subject matter recited in challenged claims.

1. An optical device, comprising:
 - a near infrared band pass filter, comprising:
 - a substrate having a first side and a second side;
 - a first set of layers on the first side, wherein the first set of layers includes silicon and hydrogen;
 - a second set of layers on the first side, wherein the second set of layers includes oxygen; and
 - a third set of layers on the second side, whether the third set of layers includes oxygen.

Ex. 1001, 10:41–49.

9. An optical device, comprising:
 - a first set of layers including silicon and hydrogen; and
 - a second set of layers including oxygen;wherein the optical device is a near infrared bandpass filter that has a center wavelength that shifts by less than 15 nm in magnitude with a change in incidence angle from 0° to 30°.

Id. at 10:65–11:4.

15. An optical system, comprising:

¹ “OD2” refers to a blocking level of a specific optical density, i.e., one in which 99% of the light is blocked. *See* Pet. 61 (citing Ex. 1002 ¶ 234); Ex. 1002 ¶ 249.

a light source for emitting light having a wavelength between 800–1100 nm; and

a filter comprising:

a first set of layers including silicon and hydrogen; and

a second set of layers including oxygen;

wherein the filter is designed for substantially allowing light in a wavelength range that includes the wavelength between 800–1100 nm to pass through it and exhibits a blocking level greater than OD2 between 400 nm to 1100 nm but outside of the wavelength range.

Id. at 11:17–12:5.

F. Evidence

Petitioner submits the following evidence:

Evidence	Exhibit No.
Tsai et al., US 5,398,133, issued Mar. 14, 1995 (“Tsai-133”).	1020
Bamji, US 6,323,942 B1, issued Nov. 27, 2001 (“Bamji”).	1026
Erdogan, et al., US 6,809,859 B2, issued Oct. 26, 2004 (“Erdogan”).	1019
Pilgrim, US 2012/0224061 A1 (pub. Sept. 6, 2012) (“Pilgrim”).	1021
Hendrix et al., US 2014/0014838 A1 (pub. Jan. 16, 2014) (“Hendrix”).	1017
Hidehiko Yoda et al., <i>a-Si:H/SiO₂ multilayer films fabricated by radio-frequency magnetron sputtering for optical filters</i> , APPLIED OPTICS 43(17):3548–54 (2004) (“Yoda”).	1022
B. M. Lairson et al., <i>Reduced Angle-Shift Infrared Bandpass Filter Coatings</i> , Proc. of SPIE Vol. 65451C-1–65451C-5, Window and Dome Technologies and Materials X (2007) (“Lairson”). ²	1018

² When citing to Lairson, we omit the “65451C-” prefix, referring only to the ending page number.

Petitioner additionally submits a declaration of Dr. James D. Rancourt, Exhibit 1002.

G. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §³	References
1–19	102	Hendrix
1–3, 6	103	Lairson, Erdogan
1–3, 6	103	Lairson, Tsai-133
7	103	Lairson, Erdogan, Bamji
7	103	Lairson, Tsai-133, Bamji
1–3, 6	103	Yoda, Tsai-133
7	103	Yoda, Tsai-133, Bamji
8	103	Yoda, Tsai-133, Pilgrim
9–11, 13, 14	103	Pilgrim, Yoda
15–17	103	Pilgrim, Erdogan, Yoda
18, 19	103	Pilgrim, Erdogan, Yoda, Tsai-133

Pet. 6–7. Patent Owner disputes Petitioner’s asserted grounds of unpatentability. *See generally* Prelim. Resp.

II. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is

³ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. Petitioner argues that the claims are not entitled to the benefit of priority claims to applications filed before March 16, 2013, the effective date of the applicable AIA amendments, and that therefore it refers to post-AIA statutes. Pet. 1, 6 n.1, 11–22; *see supra* §II.E.2. Our decision on institution is the same whether we apply the AIA or the pre-AIA version of the statutes.

unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in *inter partes* review).

Furthermore, Petitioner must explain with particularity how the prior art would have rendered the challenged claims unpatentable. 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104 (“The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon.”).

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001).

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in

the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.⁴ *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

The level of skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1323–1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. at 17–18; *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Petitioner argues that a person of ordinary skill in the art (“POSITA”) would have had:

a Bachelor’s degree or equivalent in physics, or in a related science or engineering field, along with at least 5 years of experience in optical coating design and the manufacturing of optical filters, including various deposition techniques. Additional education (e.g., a Master’s degree with exposure to coating design and manufacturing) may substitute for some industrial experience in optical thin film design, and more industrial experience can substitute for a different educational background.

Pet. 10; *see* Ex. 1002 ¶ 17.

Patent Owner does not oppose or comment on Petitioner’s definition of a POSITA. *See generally* Prelim. Resp. Based on the present record including the disclosure in the ’794 patent, we apply a slightly modified

⁴ In the present record, neither party presents arguments or evidence relating to secondary considerations.

version of Petitioner’s definition of the level of ordinary skill in the art that removes the open-ended term “at least.”

On this record and for the purposes of institution, we determine this level of skill comports with the qualifications a person would have needed to understand and implement the teachings of the ’794 patent and the prior art of record. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself may reflect an appropriate level of skill in the art).

C. Claim Construction

We construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc), i.e., as construed in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2020). Under *Phillips*, claim terms are afforded “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Phillips*, 415 F.3d at 1313. “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Phillips*, 415 F.3d at 1313. An inventor may rebut that presumption by providing a definition of the term in the specification “with reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Claim 1 contains a limitation reciting that the near infrared band pass filter comprises “a third set of layers on the second side, whether the third

set of layers includes oxygen.” Ex. 1001, 10:41–49. Petitioner argues that the proper construction of this limitation “means that there is a third set of layers on the opposite side of the substrate, whether or not [the layers] include oxygen” – i.e., that the third set of layers do not need to include oxygen. Pet. 7–8. Patent Owner contends that this is a typographical error and “wherein” was intended. Prelim. Resp. 8 n.2.

Petitioner asserts that “each of the challenges presented in this Petition” addresses “adding a third set of layers with oxygen on a second side of a substrate.” Pet. 8. Because we find Petitioner’s contentions to be sufficient for institution even under Patent Owner’s proposed construction, we need not address Patent Owner’s proposed construction. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (holding that only claim terms in controversy need to be construed, and only to the extent necessary to resolve the controversy (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). We also conclude that no express claim construction is necessary for any other claim terms. *See id.*

D. Obviousness Grounds Based on Combinations Including Lairson

While the Petition discusses anticipation by Hendrix (Pet. 11–29) before grounds including Lairson (Pet. 30–41), we begin with the grounds based on combinations including Lairson, denoted Grounds 2–5 by Petitioner.

Petitioner argues that claims 1–3 and 6 are obvious over a combination of Lairson with Erdogan or Tsai-133 (Pet. 30–39) and that claim 7 is obvious over a combination of Lairson with Erdogan or Tsai-133 and Bamji (Pet. 39–41). Patent Owner disputes that one of ordinary skill

would have combined Lairson and Erdogan (Prelim. Resp. 35–37), Lairson and Tsai-133 (Prelim. Resp. 38), or Bamji with Lairson and either Erdogan and Tsai-133 (Prelim. Resp. 39–43).

1. Lairson

Lairson, which was discussed in the '794 patent specification (Ex. 1001, 2:35–53), describes bandpass optical filters, including “several designs that have been achieved via hydrogenated silicon in multilayers, with improved performance at oblique angles of incidence.” Ex. 1018, 1. In particular, Lairson studied films that include hydrogenated silicon deposited by magnetron sputtering and having a refractive index of 3.2 at a wavelength of 1500 nm. *Id.* at 1–2. According to Lairson, “[b]andpass filters which perform acceptably over a wide angular range typically require extinction coefficients of less than about 1×10^{-03} in the bandpass wavelength range,” and through “proper optimization” of the sputtering process, “acceptable extinction coefficients were obtained for wavelengths above 1000 nm.” *Id.* at 2.

Lairson constructed a shortwave-pass edge filter from Si:H and silicon nitride (Si:H-Si₃N₄), and reports that the performance of this filter was “considerably better than the performance achievable with lower index materials,” such as a filter fabricated with niobia and silica (Nb₂O₅-Si₃H₄). *Id.* at 3. Lairson describes as “[n]ot surprising[]” certain advantages exhibited by the Si:H-Si₃N₄ filter, as compared to the Nb₂O₅-Si₃N₄ filter. *Id.* “Perhaps more surprising,” Lairson adds, “is the reduced thickness and sharper edge of the [Si:H-Si₃N₄] filter.” *Id.*

Figure 4 of Lairson is reproduced below.

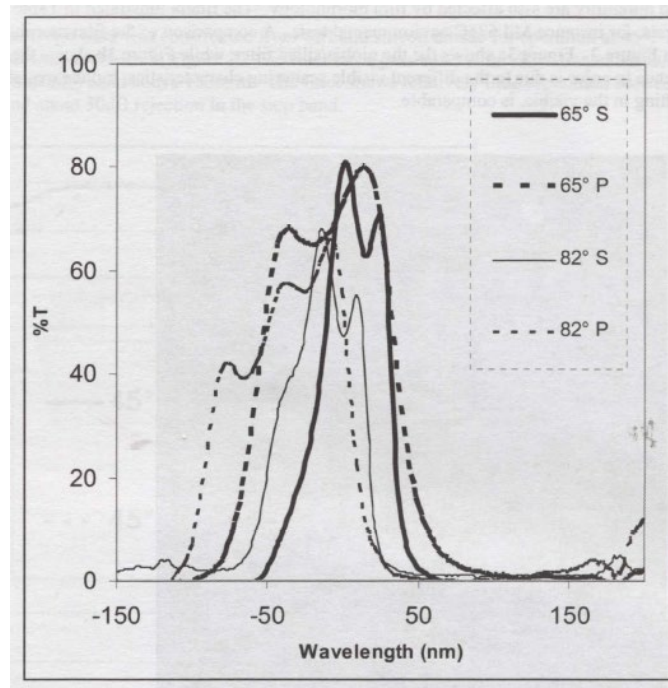


Figure shows transmission spectra for a Si:H-SiO₂ filter at a bandpass of 65° and 82°. *Id.* at 4–5. From these spectra, Lairson observes that “[t]his filter achieves greater than 50% transmission at the wavelength of interest over this angular range, with a bandpass width of approximately 50nm.” *Id.* at 4. Lairson concludes that the use of Si:H as a high-index material in the filter structure “dramatically improved” the filter capability when compared with a comparable design made from niobia and silica. *Id.* More generally, “[t]he availability of higher index materials enables the fabrication of designs with improved performance and reduced thickness,” and “[t]he advantage of higher refractive index is particularly compelling for filters which must operate over a range of angles with both s and p polarizations.” *Id.* at 5.

2. *Erdogan*

Erdogan relates to an optical filter with a first thin-film interference filter disposed on a first surface of a substrate, and a second thin-film interference filter disposed on a second surface of the substrate. Ex. 1019, code (57), 1:14–15, 2:42–57. The first interference filter includes a plurality of alternating high and low index of refraction layers. *Id.* at 2:47–50. The second interference filter includes a second plurality of alternating high and low index of refraction layers. *Id.* at 2:50–54. Erdogan describes the first and second layers as being configured to transmit different wavelengths, “thereby establishing a bandpass transmission characteristic” for the resulting filter. *Id.* at 2:47–57.

An exemplary embodiment includes a long-wave-pass filter on a first surface of a substrate and a short-wave-pass filter on a second surface of the substrate. *Id.* at 5:37–41.

3. *Tsai-133*

Tsai-133 describes a near-infrared optical filter having alternating layers of “low refractive index amorphous silicon nitride and high refractive index amorphous silicon,” with the layers deposited by plasma-enhanced

chemical vapor deposition (“PECVD”). Ex. 1020, code (57). Figure 10 of Tsai-133 is reproduced below.

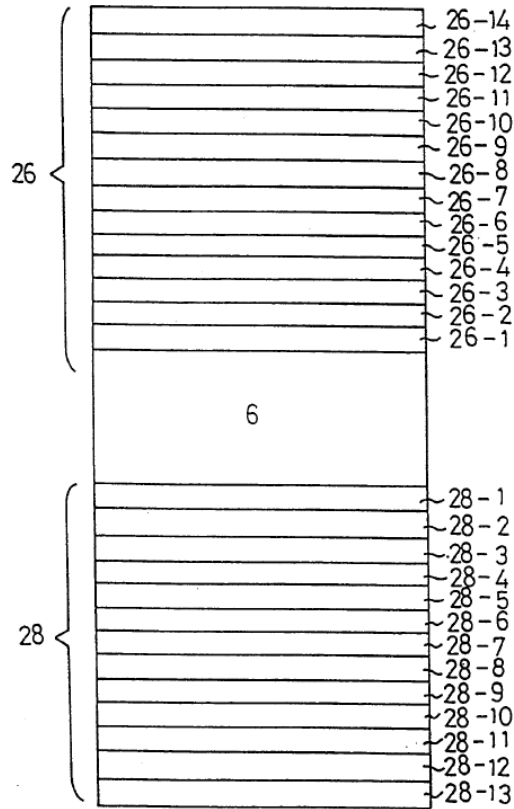


FIG.10

Figure 10 shows a cross-section of a near-infrared narrow-passband filter. *Id.* at 2:47–48. The filter includes high-pass filter 26 and low-pass filter 28 deposited on opposite sides of glass substrate 6. *Id.* at 5:30–39. The narrow-passband filter is achieved by “deposit[ing] alternate layers of amorphous silicon (a-Si:H) and amorphous silicon nitride (a-SiNx:H) on a Corning 7059 glass plate or a quartz plate.” *Id.* at 1:63–66, 4:7–25, 5:36–60.

Figure 12 of Tsai-133 is reproduced below.

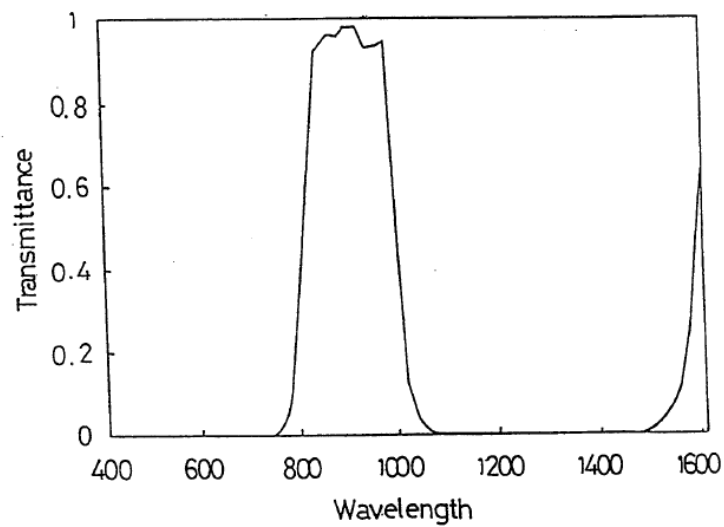


FIG.12

Figure 12 shows the transmittance curve of the narrow-bandpass filter, notably for which “[t]he transmittance in the 800–1000 nm range is peaked at 99.23% and has a bandwidth of 185 nm with a nearly rectangular shape.” *Id.* at 6:2–5.

One filter described in Tsai-133 includes an anti-reflection coating, as seen in Figure 7, reproduced below.

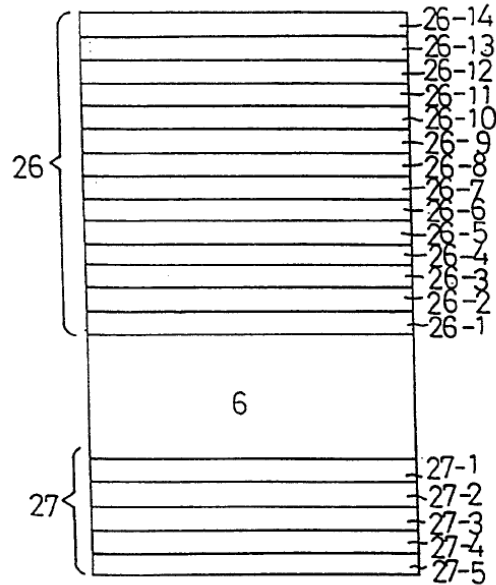


FIG.7

Figure 7 shows the cross-section of a substrate with a 14-layer edge filter on one side and a five-layer anti-reflection coating on the other. *Id.* at 2:34–35, 2:40–42. Tsai-133 notes that this coating is applied “for the improvement of transmittance in the near-infrared signals and the avoidance of loss due to reflection at the uncoated side of the substrate.” *Id.* at 4:60–62.

4. Bamji

Bamji describes a three-dimensional imaging system with an array of light sensing detectors, dedicated electronics, and associated processing circuitry. Ex. 1026, code (57). Bamji further teaches a lens with an associated filter to ensure that “only incoming light hav[ing] the wavelength emitted by [a] light source [] falls upon the detector array unattenuated.” *Id.* at 5:60–64.

5. *Obviousness of Claims 1–3 and 6
over Lairson and Erdogan or Lairson and Tsai-133*

a) *Claim 1*

(1) *Claim 1: “An optical device, comprising: a near infrared band pass filter, comprising: a substrate having a first side and a second side”*

Petitioner argues that Lairson discloses an optical device, which is “suitable for” bandpass filters, and includes a substrate having a first side and a second side. Pet. 30–32 (citing Ex. 1018, 1, 2, 5 (“We have demonstrated a high index materials system which is suitable for bandpass filters in the near infrared”); Ex. 1002 ¶ 134). Petitioner additionally argues that Erdogan also discloses an optical device which is a near infrared bandpass feature comprising a two-sided substrate. *Id.* (citing Ex. 1019, 1:18–21, 1:35–39, 2:42–47, 2:54–57, 5:18–20, Fig. 3; Ex. 1002 ¶¶ 135, 139–140). Petitioner asserts that Tsai-133 additionally discloses such an optical device. *Id.* (citing Ex. 1020, 1:55–62, 5:30–42, 6:1–7, Fig. 10; Ex. 1002 ¶¶ 136, 141).

Patent Owner does not dispute Petitioner’s showing on these points.

With respect to the recitation in claim 1 of “[a]n optical device, comprising: a near infrared band pass filter, comprising: a substrate having a first side and a second side,” on the present record and for the purposes of institution, Petitioner’s showing is sufficient.

(2) *Claim 1: the near infrared band pass filter further “comprising . . . a first set of layers on the first side, wherein the first set of layers includes silicon and hydrogen; [and] a second set of layers on the first side, wherein the second set of layers includes oxygen”*

Petitioner argues that Lairson describes a “short wave pass stack” including one comprising 44 layers, in which hydrogenated silicon layers are alternated with layers including silicon dioxide, which includes oxygen.

Pet. 32–33 (citing Ex. 1018, 1; Ex. 1002 ¶ 148), 34 (citing Ex. 1018, 1; Ex. 1002 ¶ 151). Petitioner additionally argues that a combination of Lairson with either Erdogan or Tsai-133 teaches such a short wave pass stack on one side of a substrate and a second, long-wave pass stack on the opposite side of the substrate to form a bandpass filter. Pet. 33 (citing Ex. 1019, 5:37–41; Ex. 1020, 5:30–33; Ex. 1024, 257–258; Ex. 1002 ¶¶ 138, 158). Thus, Petitioner argues, the combination of Lairson with either Erdogan or Tsai-133 teaches or suggests the recited first set of layers on the first side including silicon and hydrogen. *Id.* at 33–34.

Petitioner contends that while Lairson only describes layers of a short-pass filter, one of ordinary skill would have known to form a bandpass filter by depositing a long-pass filter on the other side of the substrate, based on the teachings of Erdogan and Tsai-133. *Id.* at 34–37 (citing Ex. 1002 ¶¶ 32–36, 152–154, 157–162). Additionally, Petitioner contends that combining the teachings of Erdogan and Tsai-133 in this manner would have required only routine skill, and that one of ordinary skill in the art would have reasonably expected success in making the combination. *Id.* at 37–39 (citing Ex. 1002 ¶¶ 32–36, 158–159, 162).

Patent Owner contends that Lairson and Erdogan each disclose bandpass filters, and that Petitioner does not provide a reason to combine the disclosures to create a new bandpass filter. Prelim. Resp. 35. Patent Owner additionally contends that Petitioner does not identify whether such a new bandpass filter would operate for Lairson’s intended application or Erdogan’s. *Id.* Patent Owner additionally argues that the short-wave pass filter of Lairson, when combined with Erdogan’s long-wave pass filter, would be “up to ten times wider than any bandpass filter” disclosed in either

reference. *Id.* at 36–37 (citing Ex. 1018, 3 (Fig. 2), 5 (Fig. 4); Ex. 1019, 4:9–11, Figs. 6, 11). Patent Owner makes the same arguments with respect to the combination of Lairson and Tsai-133. *Id.* at 38 (citing Ex. 1020, Fig. 5).

However, Patent Owner’s arguments regarding the combination are directed towards a bodily incorporation of structures described in the references, rather than the combination of their teachings proposed by Petitioner. *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.”); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Given the teachings in each reference and our direction that an ordinarily skilled artisan is a person of ordinary creativity, we find, on this preliminary record, that Petitioner has adequately shown that an ordinarily skilled artisan would have applied Lairson’s teachings regarding a short-pass filter with Erdogan or Tsai-133’s teachings concerning filter layers on both sides of a substrate used to form a bandpass filter. *KSR*, 550 U.S. at 421 (“A person of ordinary skill is also a person of ordinary creativity, not an automaton.”).

Petitioner’s proposed combination does not involve adding the exact layers taught in Erdogan and Tsai-133 on the second side of the substrate to Lairson’s short-pass filter on the first side of the substrate. Pet. 33–34, 36–39. Rather, Petitioner proposes, in one example, using the same materials for filter stacks on both sides of the substrate. *Id.* at 37–38. Thus, Patent Owner’s arguments that adding the second-side layers disclosed in Erdogan and Tsai-133 to the first-side layers of Lairson is not responsive to Petitioner’s proposed combination. Additionally, on the present record, we

credit Petitioner's declarant's uncontroverted testimony that Lairson does not explicitly describe a bandpass filter with a long pass filter, and thus that one of ordinary skill would have looked to Erdogan and Tsai-133 for the technique of using a long-pass filter on the other side of the substrate. *Id.* at 34–37 (citing Ex. 1002 ¶¶ 152, 158).

On the present record, and for the purposes of institution, Petitioner sufficiently shows that the combination of Lairson and either Erdogan and Tsai-133 teaches a near infrared band pass filter comprising a first set of layers on the first side, wherein the first set of layers includes silicon and hydrogen, and a second set of layers on the first side, wherein the second set of layers includes oxygen. Additionally, on the present record and for the purposes of institution, Petitioner sufficiently sets forth its showing with respect to the motivation to combine the teachings of Lairson with those of Erdogan or Tsai-133 as it proposes.

(3) Claim 1: the near infrared band pass filter further “comprising . . . a third set of layers on the second side, whether the third set of layers includes oxygen”

Petitioner argues that the combination of Lairson with Erdogan or Tsai-133 teaches a third set of layers on the second side of the substrate, and that these layers would have been made with the same materials used on each side of the substrate, including SiO₂, as on the first side of the substrate in Lairson. Pet. 34–35. As discussed above, Section II.C, Petitioner and Patent Owner present alternate claim construction arguments, but each agrees that the claim encompasses a third set of layers including oxygen, as SiO₂ does.

Patent Owner presents no additional arguments regarding this contention.

With respect to the recitation in claim 1 that the recited near infrared band pass filter comprises “a third set of layers on the second side, whether the third set of layers includes oxygen,” on the present record and for the purposes of institution, Petitioner’s showing is sufficient.

(4) Claim 1 – Conclusion

For these reasons, Petitioner has demonstrated a reasonable likelihood of proving that claim 1 would have been obvious over the proposed combination of Lairson and Erdogan, and over the proposed combination of Lairson and Tsai-133.

b) Claims 2, 3, and 6

Claims 2 and 3 depend from claim 1 and further recite that “one or both of the second set or the third set of layers includes silicon” (claim 2, Ex. 1001, 10:50–51) or that “one or both of the second set or the third set of layers is silicon dioxide” (claim 3, Ex. 1001, 10:52–53). For both of these claims, Petitioner cites Lairson’s disclosure of using SiO₂ as a second set of layers in forming a short-pass filter on the first side of the substrate. Pet. 35 (citing Ex. 1018, 1; Ex. 1002 ¶ 155).

Claim 6 depends from claim 1 and further requires that “total quantity of layers on the first side is between 25 and 48.” Ex. 1001, 10:58–59. Petitioner cites Lairson’s disclosure of 44-layer stacks. Pet. 36 (citing Ex. 1018, 1; Ex. 1002 ¶ 156).

Patent Owner presents no additional arguments regarding these contentions.

The 44-layer stack of Lairson includes hydrogenated silicon alternating with SiO₂ describes a stack of between 25 and 48 layers including silicon dioxide (and thus including silicon). Ex. 1018, 1. With

respect to the recitations of claims 2, 3, and 6 of the '794 patent, on the present record and for the purposes of institution, Petitioner's showing is sufficient. Petitioner has demonstrated a reasonable likelihood of proving that claims 2, 3, and 6 would have been obvious over the proposed combination of Lairson and Erdogan, and over the proposed combination of Lairson and Tsai-133.

c) Institution

As described above, we determine that the information presented establishes a reasonable likelihood that Petitioner would prevail in showing that claims 1, 2, 3, and 6 of the '794 patent are unpatentable over the proposed combination of Lairson and Erdogan, and over the proposed combination of Lairson and Tsai-133.

Accordingly, we institute an *inter partes* review on all claims and all grounds. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018) (holding that a decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged in the petition); 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

6. Obviousness of Claim 7 over Lairson, Erdogan, and Bamji or over Lairson, Tsai-133, and Bamji

Petitioner argues that one of ordinary skill in the art would have used the combined teachings of Lairson and Erdogan or Lairson and Tsai-133 to create the design of the Bamji band pass filter, which Petitioner contends would be a near infrared band pass filter. Pet. 39–41 (citing, *inter alia*, Ex. 1026, 4:49–54, 5:62–64, 7:26–32; Ex. 1002 ¶ 166). Petitioner further

argues that one of ordinary skill “would have found it obvious to form Bamji’s NIR [band pass filter] with Lairson’s materials” and would have known to access and use “thin film design and simulation software” to create a filter for Bamji’s system with a reasonable expectation of success. *Id.* at 40–41 (citing Ex. 1002 ¶¶ 32–36, 43–50, 166). Petitioner argues that these combinations teach or suggest the additional limitation of claim 7, i.e., that the optical device is configured for use in a 3D image sensing system. *Id.* at 39–41.

Patent Owner repeats its argument regarding the bodily incorporation of Lairson’s short-pass filter and Erdogan’s or Tsai-133’s long-pass filter. Prelim. Resp. 39–40, 43. For the reasons discussed above, this argument does not address Petitioner’s proposed combination. Patent Owner additionally argues that while Bamji discloses a filter, “[f]or Bamji, any NIR bandpass filter will do” and thus one of ordinary skill would not have used Lairson in combination with Erdogan or Tsai-133 without resorting to impermissible hindsight. *Id.* at 41–43.

On the present record, it appears Bamji requires a NIR bandpass filter and such a filter is taught by Lairson in combination with Erdogan or Tsai-133. Patent Owner states “any NIR bandpass filter” would be usable for Bamji (Prelim. Resp. 41). We do not find the substitution of known alternative elements for one another to be impermissible hindsight. *See KSR*, 550 U.S. at 416 (“[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.”).

Thus, Petitioner establishes a reasonable likelihood that it would prevail in showing that claim 7 of the '794 is unpatentable over the proposed combination of Lairson, Erdogan, and Bamji and over the proposed combination of Lairson, Tsai-133, and Bamji.

E. Anticipation – Hendrix

Petitioner argues that Hendrix is prior art to the '794 patent and that all claims are anticipated by Hendrix. Pet. 8, 11–29. Patent Owner disputes that Hendrix is prior art to the '794 patent. Prelim. Resp. 23–34.

1. Hendrix

Hendrix is a publication of U.S. Patent Application 13/943,596 (“the '596 application”). Ex. 1017, code (21). Both Petitioner and Patent Owner agree that the application that issued as the '794 patent claims priority, through a series of continuation applications, to the '596 application. Pet. 8; Prelim. Resp. 24; Ex. 1001, code (63). Patent Owner asserts that the specifications of Hendrix and the '794 patent are identical, and upon examination we agree. *Compare* Ex. 1001, *with* Ex. 1017.

The issue of whether Hendrix qualifies as prior art to the '794 patent turns on the issue of whether the claims of the '794 patent have adequate written description support in the '596 application, which we now discuss.

2. Legal Principles

Although a petitioner has the ultimate burden of persuasion to prove unpatentability, a patent owner must demonstrate entitlement to a priority date when the patent owner relies on that priority date to overcome an anticipation or obviousness argument. *See Dynamic Drinkware*, 800 F.3d at 1379–80 (discussing burdens in *inter partes* review to show entitlement to provisional filing dates). “[A] patent’s claims are not entitled to an earlier

priority date because the patentee claims priority Rather, for a patent's claims to be entitled to an earlier priority date, the patentee must demonstrate that the claims meet the requirements of 35 U.S.C. § 120," which include fulfilling the requirements of § 112. *In re NTP, Inc.*, 654 F.3d 1268, 1276–77 (Fed. Cir. 2011) (citations omitted)); see also *Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 870–71 (Fed. Cir. 2010); *Tech. Licensing Corp.*, 545 F.3d at 1327–29.

“[T]he hallmark of written description is disclosure,” and “the test [for satisfaction of the written description requirement] requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). The written description “must ‘clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed,’ ” and “reasonably” convey to those skilled in the art “that the inventor had possession of the claimed subject matter as of the filing date.” *Id.* (alteration in original, internal citations omitted). Stated another way, “one skilled in the art, reading the original disclosure, must immediately discern the limitation at issue in the claims.” *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000). “Whether a claim satisfies the written description requirement is a question of fact.” *Nalpropion Pharms., Inc. v. Actavis Labs. FL, Inc.*, 934 F.3d 1344, 1348 (Fed. Cir. 2019) (citing *Ariad*, 598 F.3d at 1351). By this written description support, “one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought.” *Invidor Inc. v. Dr. Reddy’s Labs. S.A.*, 930 F.3d 1325, 1353 (quoting *Anascape, Ltd. v. Nintendo of Am., Inc.*, 601 F.3d 1333, 1335 (Fed. Cir.

2010)); *Arthrex, Inc. v. Smith & Nephew, Inc.*, 35 F.4th 1328, 1343 (Fed. Cir. 2022). The “level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Ariad*, 598 F.3d at 1351.

Disparagement or distinction from alternatives may be considered in determining the scope of written description. In *Tronzo*, a specification described a conical cup-shaped implant, distinguished it from prior art cup-shaped implants, and touted advantages for the conical shape. *Id.* at 1159. The Court found that the disclosure did not suggest shapes other than conical to be part of the disclosure, and in fact, “clearly suggests the contrary by asserting advantages of the conical shape over prior art shapes.” *Id.* Thus, the court found claims drawn more broadly than to the conical shape were not entitled to a priority date based on the prior disclosure. *Id.* at 1160; *see also Arthrex*, 35 F.4th at 1343–44 (finding that a disclosure of a rigid eyelet in which only mention of a flexible eyelet was critical and emphasized the need for an alternative approach supported a finding that the disclosure lacked written description of generic eyelets encompassing flexible eyelets).

The test for providing a written description that supports a genus claim is that the description provides “either a representative number of species falling within the scope of the genus or structural features common to the members of the genus so that one of skill in the art can ‘visualize or recognize’ the members of the genus.” *Ariad*, 598 F.3d at 1350. The question of whether disclosure of one or more species provides adequate support for a later claimed genus may depend on the predictability or unpredictability of the art. *Bilstad*, 386 F.3d at 1125. “Predictability is a

factual issue judged on a case-by-case basis.” *Synthes USA, LLC v. Spinal Kinetics, Inc.*, 734 F.3d 1332, 1344 (Fed. Cir. 2013); *Ariad*, 598 F.3d at 1351.

3. Parties’ Arguments

Petitioner argues that the ’596 application describes using an improved hydrogenated silicon (Si:H) material, but that the only material described in the ’596 application as including both hydrogen and silicon is hydrogenated silicon, which is used for high-refractive index layers. Pet. 13–14 (citing Ex. 1006⁵ ¶¶ 1, 9–11, 35, 45–47; Ex. 1002 ¶¶ 116, 117, 121, 129, 130). Petitioner argues that this contrasts with the challenged claims, which it characterizes as reciting layers of “any material that has both ‘silicon and hydrogen,’” and layers with “any material that includes oxygen,” with no limitation relating to the refractive index of these layers. *Id.* at 14. Petitioner further argues that “[n]o claim requires the ‘improved’ Si:H material with [a] low extinction coefficient” described in the ’596 application. *Id.* Thus, Petitioner argues, the claims are directed to “broad genera of materials,” not limited to use as high or low refractive index layers and which encompass materials with widely varying optical properties, i.e., that the claims are directed to materials that are substantially different from the hydrogenated silicon disclosed in the ’596 application. *Id.* at 14–20 (citing Ex. 1002 ¶¶ 121–128, 130). Petitioner argues that, in light of these

⁵ Petitioner cites to Exhibit 1006, the file history of the ’596 application. Pet. 13–14. The applicants made no amendments to the written description of the ’596 application before Hendrix was published. *See generally* Ex. 1006. When referring to this specification, we cite only the paragraph numbers in the written description of the ’596 application (Ex. 1006, 251–65), which are the same as the paragraph numbers in Hendrix (Ex. 1017).

facts, the disclosure of hydrogenated silicon in the '596 application is not sufficient to support the “broad genus” of all materials having both silicon and hydrogen claimed in the '794 patent, and that the '794 patent is, therefore, not entitled to the benefit of the priority date of the '596 application, making its publication, Hendrix, prior art. *Id.* at 20–22.

Patent Owner argues that challenged independent claims 1 and 9 of the '794 patent are explicitly drawn to optical devices including NIR bandpass filters, and that independent claim 15 “effectively requires” an NIR bandpass filter, based on the limitation requiring the filter to be “designed for substantially” allowing light in the 800–1100 nm wavelength range but exhibiting a blocking level greater than OD2 between 400 and 800 nm. Prelim. Resp. 25 & n.3. Patent Owner argues that the layers recited for the claimed filters “align[]” with the exemplary disclosure in the specification of a bandpass filter stack. *Id.* at 25 (citing Ex. 1017 ¶¶ 36–38, 45, Figs. 7B–7D). Thus, Patent Owner concludes, “whether a material is encompassed by the claimed layer that ‘includes silicon and hydrogen’ depends on whether that material would be used to manufacture NIR bandpass filters.” *Id.* Patent Owner characterizes Petitioner’s argument as improperly rooted in indefiniteness, rather than written description. *Id.* at 26–27. Patent Owner asserts that Petitioner does this to “fit a square peg into a round hole in an attempt to manufacture a viable ground for review.” *Id.* at 27.

Patent Owner does not take a position as to whether claiming “a first set of layers on the first side, wherein the first set of layers includes silicon and hydrogen” (as in challenged claim 1) defines a genus, but argues that Petitioner does not properly show that any of the challenged claims define a genus. *Id.* at 25 n.4, 27–33. Patent Owner asserts that “from beginning to

end,” the challenged claims describe optical filters and devices containing certain materials, and that as not all silicon- and hydrogen-containing materials would be suitable for such filters, Petitioner’s argument that the claims are broad enough to cover materials which would not be suitable for such filters is clearly inapposite. *Id.* at 31–33.

With respect to whether the specification of the ’596 application conveyed possession of the challenged claims, Patent Owner argues that proper written description support is found in the description of forming thin-film layers comprising silicon and hydrogen and fabricating NIR bandpass filters from such layers on one side of a substrate, with layers including oxygen on the other side of the substrate. *Id.* at 34 (citing Ex. 1017 ¶¶ 36–38, 46, 51, 52, Figs. 7B, 7C).

4. *Preliminary Observations*

As discussed above, we are instituting *inter partes* review on all claims and all grounds. However, we provide the following preliminary observations regarding the Hendrix anticipation ground. The written description shared by the ’596 application, Hendrix, and the ’794 patent appears to describe only optical filters including hydrogenated silicon layers. Ex. 1017, code (57), ¶¶ 2, 10, 11, 34, 35, 38, 39, 45–48, 52. At the same time, the written description discusses (arguably negatively) hydrogenated silicon layers that are not suitable for use in the asserted invention. *Id.* at ¶¶ 8–9. To the extent that advantages are asserted in the written description for any material, they are asserted for certain hydrogenated silicon layers over other hydrogenated silicon layers. *Id.* The written description thus does not appear to assert advantages of hydrogenated silicon layers over layers of other materials “including silicon and hydrogen,” but it also does

not appear to describe, at all, the use of filters having layers including silicon and hydrogen other than layers of hydrogenated silicon.

Petitioner presents testimony that one of ordinary skill in the art, reading the '596 application, would have understood it to be directed only toward hydrogenated silicon layers, and not more broadly to any material for layers that include both hydrogen and silicon. Ex. 1002 ¶ 121 (cited at Pet. 13). At this stage and on the present record, this unrebutted evidence supports Petitioner's argument that the challenged claims, which include "a first set of layers includ[ing] silicon and hydrogen," do not have adequate written description support in the '596 application.

Against this showing, Patent Owner argues, without testimonial support, that "whether a material is encompassed by the claimed layer that 'includes silicon and hydrogen' depends on whether that material would be used to manufacture NIR bandpass filters." Prelim. Resp. 25. We preliminarily note that this argument, unsupported by any evidence, appears tautological in that it defines the scope of materials disclosed for use in NIR bandpass filters as those which could successfully have been used to manufacture NIR bandpass filters. In addition, we have considered Patent Owner's citations to Hendrix in the preliminary record that allegedly show written description support for filter layers "including silicon and hydrogen." See Prelim. Resp. 33–34 (citing, *inter alia*, Ex. 1017 ¶¶ 36–38, 46, 51, 52, Figs. 7A, 7B). Based on the present record, we find that Patent Owner's citations do not overcome Petitioner's initial showing based on the unrebutted testimony of Dr. Rancourt. In particular, Petitioner's initial showing is based on the perspective of a person of ordinary skill the art (*see, e.g.*, Ex. 1002 ¶ 121), whereas Patent Owner merely cites to Hendrix.

During the course of trial, Patent Owner will have an opportunity to put forth evidence and testimony relating to written description support and the perspective of an ordinarily skilled artisan.

As discussed, Patent Owner “does not take a position on” whether a limitation directed to layers including silicon and hydrogen would define a genus. Prelim. Resp. 25 n.4. For its part, Petitioner asserts without analysis that the challenged claims’ limitations directed to layers including silicon and hydrogen are genus claims. Pet. 1, 11. On the present record and preliminarily, we understand the claims to be genus claims describing features common to different layer materials. *Ariad*, 598 F.3d at 1350. During the trial, we will need to determine whether one of ordinary skill in the art would recognize, in the priority document’s disclosure of certain hydrogenated silicon used in NIR bandpass filters, the disclosure of using other materials that include silicon and hydrogen in NIR bandpass filters, supporting these claims. *Id.* at 1351. As discussed above, this will require us to understand the complexity and predictability of the art and what one of ordinary skill in the art would have understood from the original disclosure, and how one of ordinary skill in the art could have understood the scope of possibilities for the materials to be used in the recited layers. The parties should address these matters, in addition to the proper construction of the limitation if construction is necessary.

Additionally, Patent Owner has challenged Petitioner’s written description arguments as being “[c]amouflage” for an improper argument “that the claims are unduly broad and thus indefinite” under 35 U.S.C. § 112. Prelim. Resp. 26–27. At trial, the parties should address whether Petitioner’s anticipation ground based on Hendrix amounts to a challenge

outside the scope of 35 U.S.C. § 311(b) that the claims of the '794 patent are indefinite or lack written description support under 35 U.S.C. § 112.

*F. Obviousness of Claims 1–3 and 6 over Yoda and Tsai-133 and
Obviousness of Claim 7 over Yoda, Tsai-133 and Bamji*

1. Yoda

Yoda relates to the optical properties of bandpass filters comprising “*a*-Si:H/SiO₂ multilayer films fabricated by radio-frequency magnetron sputtering.” Ex. 1022, 3548. Yoda explains “optical bandpass filters (BPFs)” are “formed from alternating multilayer films of two dielectric materials . . . with high-low refractive indices.” *Id.* at 3548.

According to Yoda, a bandpass filter pairing materials having a “high refractive-index contrast, which is defined as the high index of one material divided by the low index of another,” allows for a reduction in the total number of layers of a multilayer optical filter. *Id.* Yoda teaches that “[t]wo such pairs of materials are hydrogenated amorphous silicon (*a*-Si:H) and silicon dioxide (SiO₂).” *Id.* Yoda further teaches that “*a*-Si:H/SiO₂ multilayer films have the major advantage that the total number of layers of the multilayer is almost half of that of Ta₂O₅/SiO₂ multilayer films.” *Id.*

Figure 7 of Yoda, reproduced below, shows an optical BPF having hydrogenated amorphous silicon (α -Si:H)/silicon dioxide (SiO_2) alternating multilayers. *Id.* at 3548, 3551.

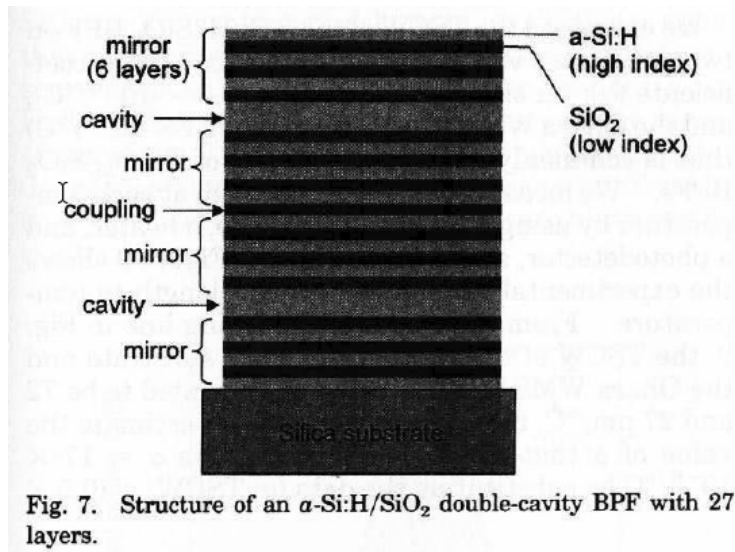


Figure 7 shows an optical BPF having hydrogenated amorphous silicon (α -Si:H)/silicon dioxide (SiO_2) alternating multilayers. *Id.*

2. Obviousness of Claims 1–3 and 6 over Yoda and Tsai-133

a) Claim 1

Petitioner argues that Yoda teaches each limitation of claim 1, except for the last limitation (“a third set of layers on the second side, whether the third set of layers includes oxygen”), in its disclosure of a near infrared band pass filter formed on one side of a substrate, including alternating layers of hydrogenated silicon and SiO_2 . Pet. 42–46.

Petitioner argues that Yoda describes an optical device that is a near infrared band pass filter. Pet. 42–43 (citing Ex. 1022, 3548, 3551; Ex. 1002 ¶¶ 169–172). Further, Petitioner argues that Yoda’s filter includes a substrate with a first and second side. *Id.* at 43–44 (citing Ex. 1022, 3551; Ex. 1002 ¶ 174). Petitioner additionally argues that a first set of layers of

Yoda's filter include silicon and hydrogen, and a second set includes oxygen. *Id.* at 44–46 (citing Ex. 1022, 3548, 3551; Ex. 1002 ¶¶ 177, 179).

For the last limitation of claim 1, Petitioner acknowledges that Yoda does not disclose depositing layers on the second side of the substrate, but asserts that one of ordinary skill would have found it obvious, in view of Tsai-133, to apply an anti-reflective (AR) coating on the second side of the substrate. *Id.* at 46–47 (citing Ex. 1020, 4:5–5:15, Fig. 7; Ex. 1002 ¶¶ 180, 182). Petitioner asserts that this would improve transmittance. *Id.* at 47, 49 (citing Ex. 1020, 4:60–64, 5:21–27; Ex. 1002 ¶¶ 181, 183, 188). Petitioner further argues that it would have been obvious to use the same materials and deposition techniques as used in the filter stack in Yoda for the AR coating, and that the oxide used in Yoda would therefore have been used in the AR coating on the second side of the substrate. *Id.* 47, 49–51 (citing Ex. 1002 ¶¶ 180, 181, 187–191). Petitioner contends that the elements would combine in predictable ways and achieve predictable results, such as an expected benefit in transmittance. *Id.* at 49–51 (citing Ex. 1002 ¶¶ 189–191).

Patent Owner argues that Petitioner does not provide any evidence that substituting silicon oxide for the Tsai-133 AR coating would have yielded the same anti-reflective benefit. Prelim. Resp. 44–45. “Other than hindsight,” Patent Owner contends, “Petitioner provides no reason for a [person of ordinary skill in the art] to modify Tsai-133's AR coating to include a silicon oxide, rather than simply using Tsai-133's AR coating as disclosed.” *Id.* at 45.

Reviewing Petitioner's evidence, we understand Petitioner's argument to be based on Tsai-133's disclosures, including the disclosure of an anti-

reflection coating comprising alternating layers of low- and high-refractive index layers, and the disclosure of a transmittance curve of a filter including this coating. Ex. 1020, 4:60–5:27; Pet. 49 (citing Ex. 1020, 4:60–5:27; Ex. 1002 ¶ 182). Yoda discloses such alternating layers of low- and high-refractive index layers, as Patent Owner acknowledges. Prelim. Resp. 20 (citing Ex. 1020, 10). On the present records, we determine this to be the substitution of known alternative elements for one another (*see KSR*, 550 U.S. at 416) and thus, are not persuaded Petitioner used impermissible hindsight in combining the teachings.

On the present record, Petitioner has sufficiently shown that claim 1 of '794 patent is unpatentable over the proposed combination of Yoda and Tsai-133.

b) Claims 2, 3, and 6

Petitioner argues that Yoda teaches the additional limitations of claims 2 and 3 in its multilayer stack with alternating layers of hydrogenated silicon and silicon dioxide. Pet. 47–48 (citing Ex. 1022, 3548, 3551; Ex. 1002 ¶ 183). Petitioner argues that the number of layers limitation of claim 7 (between 25 and 48) is taught by Yoda's teaching of a filter with 27 layers. *Id.* at 48 (citing Ex. 1022, 3551; Ex. 1002 ¶ 186).

Patent Owner presents no additional arguments regarding these contentions.

With respect to the recitations of claims 2, 3, and 6 of the '794 patent, on the present record and for the purposes of institution, Petitioner's showing is sufficient. Petitioner has demonstrated a reasonable likelihood of proving that claims 2, 3, and 6 would have been obvious over the proposed combination of Yoda and Tsai-133.

3. *Obviousness of Claim 7 over Yoda, Tsai-133, and Bamji*

Petitioner argues that one of ordinary skill in the art would have used the combined teachings of Yoda and Tsai-133 to create the design of the Bamji band pass filter, which Petitioner contends would be a near infrared band pass filter. Pet. 51–52 (citing Ex. 1002 ¶¶ 194, 195). Petitioner further argues that one of ordinary skill would have been motivated to use the layers described by Yoda and would have reasonably expected success in using Yoda and Tsai-133 to produce a band pass filter with an AR coating for Bamji’s system. *Id.* at 52 (citing Ex. 1002 ¶ 195). Petitioner argues that these combinations teach or suggest the additional limitation of claim 7, i.e., that the recited optical device is configured for use in a 3D image sensing system. *Id.* at 51–52.

Patent Owner argues that the combination of Yoda and Tsai-133 would have produced a filter with a passband centered at a wavelength above those needed for Bamji’s system. Prelim. Resp. 45–46.

On the present record, we agree with Patent Owner’s argument regarding the combined teachings of Yoda, Tsai-133, and Bamji. Petitioner does not show how or whether one of ordinary skill in the art would have produced a usable filter for Bamji’s 3D sensing system, beyond Bamji’s need for blocking certain wavelengths and passing others with high transmittance. Pet. 51–52.

As previously discussed, we institute on this claim as we institute on all claims and all grounds, and therefore the parties should supplement the record with respect to this issue, and any others concerning obviousness of claim 7 over Yoda, Tsai-133, and Bamji.

G. Obviousness Grounds Based on Combinations Including Pilgrim

1. Pilgrim

Pilgrim relates to “[a] method and device for viewing objects situated in fog.” Ex. 1021, code (57). “An optical system directs light from a scene onto a detector array through one or more optical waveband limiting filters.” *Id.* According to Pilgrim, “[t]he pass band of the filter(s) reduces the amount of light scattered from the droplets of fog shifting the effective dynamic range of the lightest to the darkest portions of the image so that the detectors can provide detectable contrast between the objects being viewed compared with the background.” *Id.* ¶ 13. “Multilayer bandpass filters are comprised of alternating layers of high and low refractive index materials” and the “number and thickness of these layers are selected to determine the wavelength of the pass band and the bandwidth.” *Id.* ¶ 26.

Pilgrim teaches that, “[i]n the preferred embodiments, one or more bandpass filters are used to block all wavelengths of light except for those corresponding to the absorption bands of water.” *Id.* ¶ 15. Moreover, “[i]n particular embodiments the filters can be comprised of multilayer coatings applied to flat optical surfaces.” *Id.* ¶ 16. Pilgrim further teaches that, when using multilayer bandpass filters, the “band limits are chosen to ensure the shift in the pass band due to changes in the angle of incidence (AOI) does not result in the pass band being shifted out of the absorption band for which it is designed.” *Id.*

Figure 3A of Pilgrim, reproduced below, illustrates the range of angles of incident of light passing through multilayer passband filter 300.

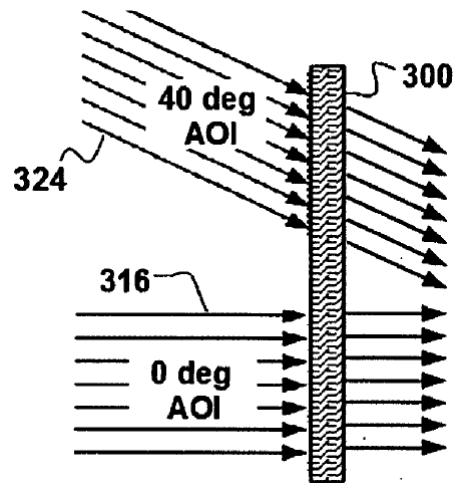


Figure 3A illustrates a multilayer bandpass filter with light passing through it normal to the surface of the filter and at an AOI of 40 degrees off of normal. *Id.* ¶ 6. Pilgrim teaches that “when incident light has an angle of incidence (AOI) of 0 (zero) degrees [shown in element] 316[,] the pass band is at its longest wavelength.” *Id.* ¶ 25. And incident light having an “AOI of 40 degrees [element] 324, is at the limit of the field-of-view of a preferred embodiment.” *Id.* Figure 3B, reproduced below, shows the “spectral effects of changes in the [AOI] of incoming light.” *Id.* ¶ 26.

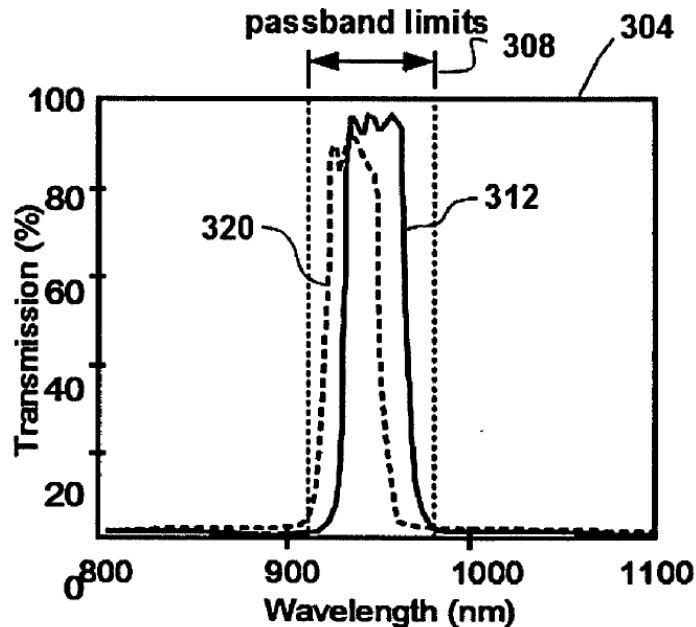


Figure 3B is a spectrogram showing spectral effects of changes in the light's incidence angle for an example in which the passband is centered on 950 nm with a full bandwidth of about ± 25 nm. *Id.* ¶ 26. “The pass band for 0 degree AOI light 312 is designed to be far enough from the edges of the absorption pass band limits 308 that the shift in pass band at the widest AOI for the application (such as 40 degrees) 320 remains inside the pass band limits.” *Id.* Here, Pilgrim states, “[t]he shift in pass band center between an AOI of 0 degrees and an AOI of 40 degrees is approximately 15 nm.” *Id.*

2. Analysis

Petitioner presents a number of grounds of unpatentability based on combinations including Pilgrim. For each of these, Petitioner argues that one of ordinary skill would have found it obvious to design a filter for Pilgrim using combinations of prior art. Pet. 53–67. For example, for claim 8's limitation that the claimed near infrared band pass filter “has a center wavelength that shifts less than 15 nm in magnitude with a change in incidence angle from 0° to 30°” (Ex. 1001, 10:62–64), Petitioner argues that one of ordinary skill would have found it obvious to design a filter for Pilgrim's application using Yoda's and Tsai-133's teachings. Pet. 53–55. Petitioner contends that one of ordinary skill would have designed a filter “with the claimed center wavelength shift” using “common techniques known to those skilled in the art to achieve Pilgrim's center wavelength shift requirements.” *Id.* at 54–55 (citing Ex. 1002 ¶¶ 205–206).

However, Pilgrim's filter has more requirements than the center wavelength shift. Pilgrim teaches specific blocking requirements including

a full bandwidth of about ± 25 nm bandwidth, among other requirements. *See* Ex. 1021 ¶¶ 25–26. With respect to claim 8, as Patent Owner argues, Petitioner does not show that the combination of Yoda and Tsai-133 could have been used to meet all the design parameters of Pilgrim. Prelim. Resp. 47–48. Additionally, even with respect to the one design parameter of Pilgrim (the center wavelength shift) that Petitioner focuses on, Petitioner’s argument that one of ordinary skill would have used filter design software to produce a filter meeting that requirement is conclusory. *Id.* at 52.

Petitioner’s arguments with respect to the obviousness of claims 9–11, 13, and 14 (over Pilgrim and Yoda), claims 15–17 (over Pilgrim, Erdogan, and Yoda), and claims 18 and 19 (over Pilgrim, Erdogan, Yoda, and Tsai-133) suffer from the same issues. *See* Pet. 55–67; Prelim. Resp. 53–55.

On the present record, we agree with Patent Owner’s argument regarding the grounds relating to combinations including Pilgrim. As previously discussed, we institute on this claim as we institute on all claims and all grounds, and therefore the parties should supplement the record with respect to these issues.

III. CONCLUSION

Petitioner has shown a reasonable likelihood of prevailing with respect to at least one of the claims challenged in the Petition. Thus, we institute an *inter partes* review on all grounds presented.

IV. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted as to claims 1–19 of the '794 patent on all the grounds set forth in the Petition; and,

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

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