

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NINTENDO CO., LTD. and NINTENDO OF AMERICA INC.,
Petitioner,

v.

AMERICAN GNC CORPORATION,
Patent Owner.

IPR2024-00668
Patent 6,671,648 B2

Before BRIAN J. McNAMARA, SCOTT A. DANIELS, and
LISA L. TSANG, *Administrative Patent Judges*.

TSANG, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. §314

I. INTRODUCTION

Nintendo Co., Ltd. and Nintendo of America Inc. (collectively, “Petitioner”) filed a Petition (Paper 3 (“Pet.”)), seeking *inter partes* review of claims 1 and 4 of U.S. Patent No. 6,671,648 B2 (Ex. 1001 (“the ’648 patent”)). See Pet. 1. American GNC Corporation (“Patent Owner”) filed a Preliminary Response. Paper 9 (“Prelim. Resp.”).

Institution of an *inter partes* review is authorized when “the information presented in the petition . . . and any 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.” 35 U.S.C. § 314; see also 37 C.F.R. § 42.108. Upon consideration of the Petition and Preliminary Response, we determine that the information presented shows there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one challenged claim of the ’648 patent.

A. Real Parties in Interest

Petitioner identifies Nintendo Co., Ltd. and Nintendo of America Inc. as the real parties in interest. Pet. 1. Patent Owner identifies American GNC Corporation as the real party in interest. Paper 6, 2.

B. Related Matters

The parties identify that the ’648 patent is involved in *American GNC Corporation v. Nintendo Co., Ltd. and Nintendo of America Inc.*, No. 2:23-cv-00302-TL (W.D. Wash.) (“the Washington litigation”). Pet. 1; Paper 6, 2.

Petitioner also identifies that the ’648 patent was previously involved in *American GNC Corporation v. ZTE Corporation*, No. 4:17-CV-00620 (E.D. Tex.), *American GNC Corporation v. ZTE Corporation*, No. 2:17-cv-

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00107 (E.D. Tex.), *American GNC Corporation v. LG Electronics Inc.*, No. 2:17-cv-00119 (E.D. Tex.), *American GNC Corporation v. LG Electronics Inc.*, No. 3:17-01090 (S.D. Cal.), *American GNC Corporation v. GoPro, Inc.*, No. 3:18-cv-00968 (S.D. Cal.), *American GNC Corporation v. GoPro, Inc.*, No. 4:18-cv-06778 (N.D. Cal.), and *American GNC Corporation v. OnePlus Technology (Shenzhen) Co., Ltd.*, No. 6:20-cv-00171 (W.D. Tex.). Pet. 1–2.

Although not identified by the parties, the following proceeding before the Board involves the same parties as the instant proceeding: IPR2024-00667 (U.S. Patent No. 6,508,122 B1).

C. The '648 Patent (Ex. 1001)

The '648 patent is titled “Micro Inertial Measurement Unit” and discloses such a unit that uses MicroElectronicMechanicalSystem (“MEMS”) rate and acceleration sensors to obtain motion measurements. Ex. 1001, codes (54), (57). According to the '648 patent, conventional inertial measurement units (“IMUs”) used gyroscopes and accelerometers “hav[ing] a large size, high power consumption, and moving mass, complex feedback control loops.” *Id.* at 1:45–61. As a result, these IMUs typically had problems with “[h]igh cost, [l]arge bulk (volume, mass, large weight), [h]igh power consumption, [l]imited lifetime, and [l]ong turn-on time” that impeded their use with emerging technologies. *Id.* at 1:66–2:9.

To solve these problems, the '648 patent's IMU uses MEMS technology—or “micromachines”—which, the '648 patent explains, “offer tremendous cost, size, and reliability improvements for guidance, navigation, and control systems, compared with conventional inertial sensors.” Ex. 1001, 2:10–17, 2:62–64. The '648 patent acknowledges that

MEMS angular rate sensors and accelerometers were commercially available, but discloses that “there is not yet available high performance, small size, and low power consumption IMUs.” *Id.* at 2:47–51.

Figure 1, below, shows an exemplary “block diagram illustrating the processing module for a micro inertial measurement unit.” Ex. 1001, 4:32–34.

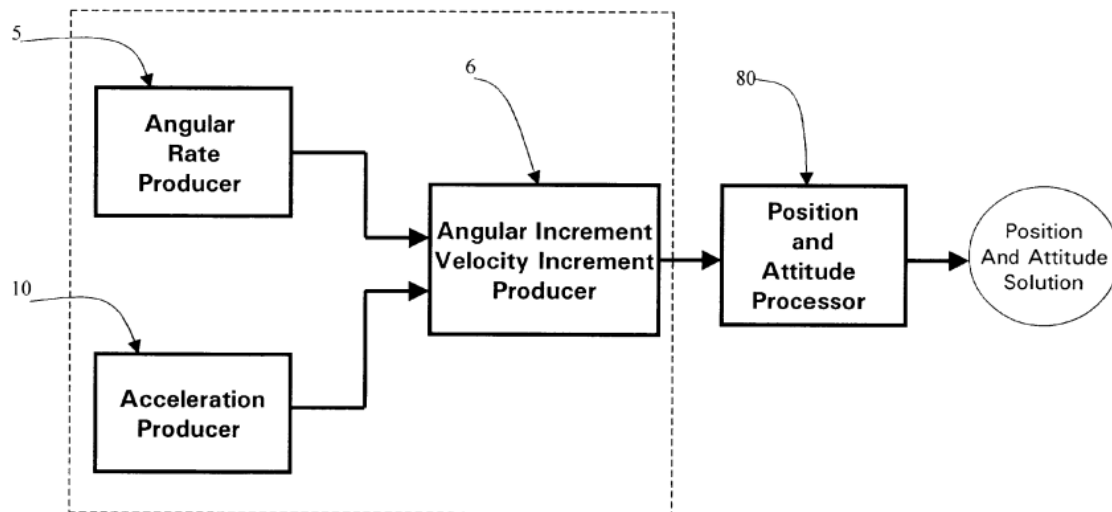


Figure 1’s IMU includes angular rate producer 5, which produces X-axis, Y-axis, and Z-axis angular rate signals; acceleration producer 10, which produces X-axis, Y-axis, and Z-axis acceleration signals; and angular increment and velocity increment producer 6, which receives the angular rate signals and the acceleration signals and converts them into digital angular increments and digital velocity increments, respectively. *Id.* at 6:61–7:3.

The ’648 patent discloses that, in use, the angular rate producer and acceleration producer will usually output analog voltage signals. Ex. 1001, 8:11–13. These analog voltage signals are directly proportional to angular rates and accelerations of a carrier. *Id.* at 8:13–18.

D. Challenged Claims

Petitioner challenges claims 1 and 4 of the '648 patent. Pet. 9–74. Of these, claim 1 is independent.

Independent claim 1 is reproduced with bracketing as follows:

1. [[1[pre]] A micro inertial measurement unit, comprising:

 [1[a]] an angular rate producer comprising a X axis angular rate detecting unit which produces a X axis angular rate electrical signal, a Y axis angular rate detecting unit which produces a Y axis angular rate electrical signal, and a Z axis angular rate detecting unit which produces a Z axis angular rate electrical signal;

 [1[b]] an acceleration producer comprising a X axis accelerometer which produces a X axis acceleration electrical signal, a Y axis accelerometer which produces a Y axis acceleration electrical signal, and a Z axis accelerometer which produces a Z axis acceleration electrical signal; and

 [1[c]] an angular increment and velocity increment producer, which is electrically connected with said X axis, Y axis and Z axis angular rate detecting units and said X axis, Y axis and Z axis accelerometers, receiving said X axis, Y axis and Z axis angular rate electrical signals and said X axis, Y axis and Z axis acceleration electrical signals from said angular rate producer and said acceleration producer respectively, wherein said X axis, Y axis and Z axis angular rate electrical signals and said X axis, Y axis and Z axis acceleration electrical signals are converted into are digital angular increments and digital velocity increments respectively.

Ex. 1001, 23:43–24:21.

E. The Alleged Grounds of Unpatentability

The information presented in the Petition sets forth proposed grounds of unpatentability of claims 1 and 4 of the '648 patent under 35 U.S.C. § 103(a) as follows (*see* Pet. 9–74):¹

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	103(a) ²	Smith, ³ Chan, ⁴ Bernstein ⁵
4	103(a)	Smith, Chan, Bernstein, Irwin, ⁶ Merhav ⁷
1, 4	103(a)	Tingleff, ⁸ Chan, Bernstein
1, 4	103(a)	Yamawaki, ⁹ Chan, Bernstein, Saubolle ¹⁰

F. Summary of Asserted Art

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

¹ Petitioner supports its challenge with the Declaration of Dr. Darrin Young. Ex. 1002.

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284, 287–288 (2011), amended 35 U.S.C. §§ 102, 103, and 112. Because the '648 patent claims priority to an application filed before March 16, 2013 (the effective date of the relevant amendments), the pre-AIA versions apply. *See* Ex. 1001, code (62).

³ U.S. Patent No. 4,675,820, issued June 23, 1987 (Ex. 1003).

⁴ U.S. Patent No. 6,058,778, issued May 9, 2000 (Ex. 1005).

⁵ U.S. Patent No. 5,203,208, issued April 20, 1993 (Ex. 1006).

⁶ J. David Irwin et al., *Introduction to Electrical Engineering* (1995) (Ex. 1007).

⁷ Shmuel Merhav, *Aerospace Sensor Systems and Applications* (1996) (Ex. 1008).

⁸ U.S. Patent No. 4,424,038, issued January 3, 1984 (Ex. 1004).

⁹ Japanese Unexamined Patent Application No. Hei 7[1995]-313649, published December 5, 1995 (Ex. 1009), and certified English translation thereof (Ex. 1010).

¹⁰ U.S. Patent No. 4,820,953, issued April 11, 1989 (Ex. 1011).

1. Smith (Ex. 1003)

Smith is titled “Inertial Reference System” and discloses an inertial sensor assembly that provides positional information using three ring laser gyroscopes (“gyros”) and three accelerometers. Ex. 1003, codes (54), (57).

Figure 2, below, shows a block diagram of the main components of the inertial sensor assembly. Ex. 1003, 5:1–3, 7:57–58.

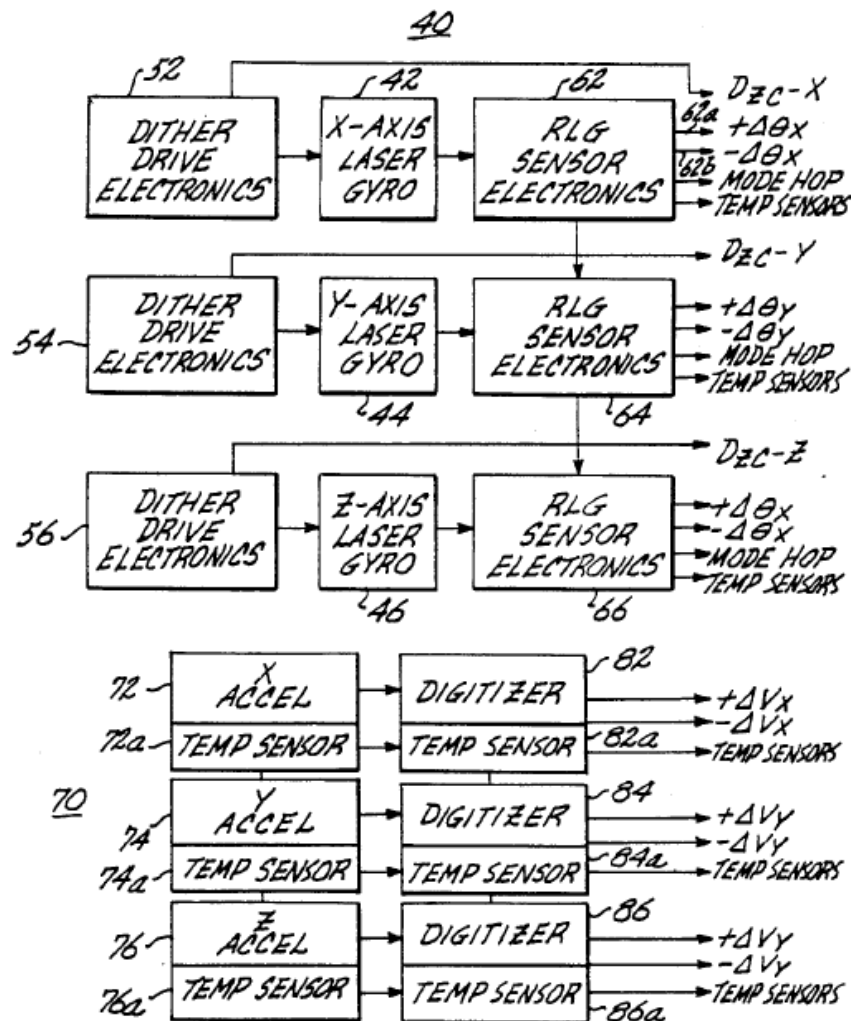


Figure 2 shows, in part, “three ring laser gyros 42, 44, 46, each having its sensitive axis aligned with one of three mutually orthogonal coordinate axes X, Y, and Z, respectively.” *Id.* at Fig. 2, 7:58–62. Each of Smith’s gyros

“produces an output digital signal having a pulse repetition rate proportional to the rate of angular displacement of each gyro 42, 44, and 46 about its coordinate axis.” *Id.* at 8:3–6. Figure 2 also shows three accelerometers 72, 74, 76, each of which, likewise, “ha[s] its sensitive axis aligned with one of the three mutually orthogonal coordinate axes X, Y, and Z, respectively.” *Id.* at 8:43–48. These accelerometers output analog signals “corresponding to the rate of change of velocity of each accelerometer along its sensitive axis,” and digitizers subsequently convert the analog signals to digital signals. *Id.* at 8:48–53.

2. Tingleff (Ex. 1004)

Tingleff is titled “Inflight Aircraft Training System.” Ex. 1004, code (54). Figure 1, below, is a block diagram of Tingleff’s “radar warning receiver training system.” *Id.* at 5:66–68.

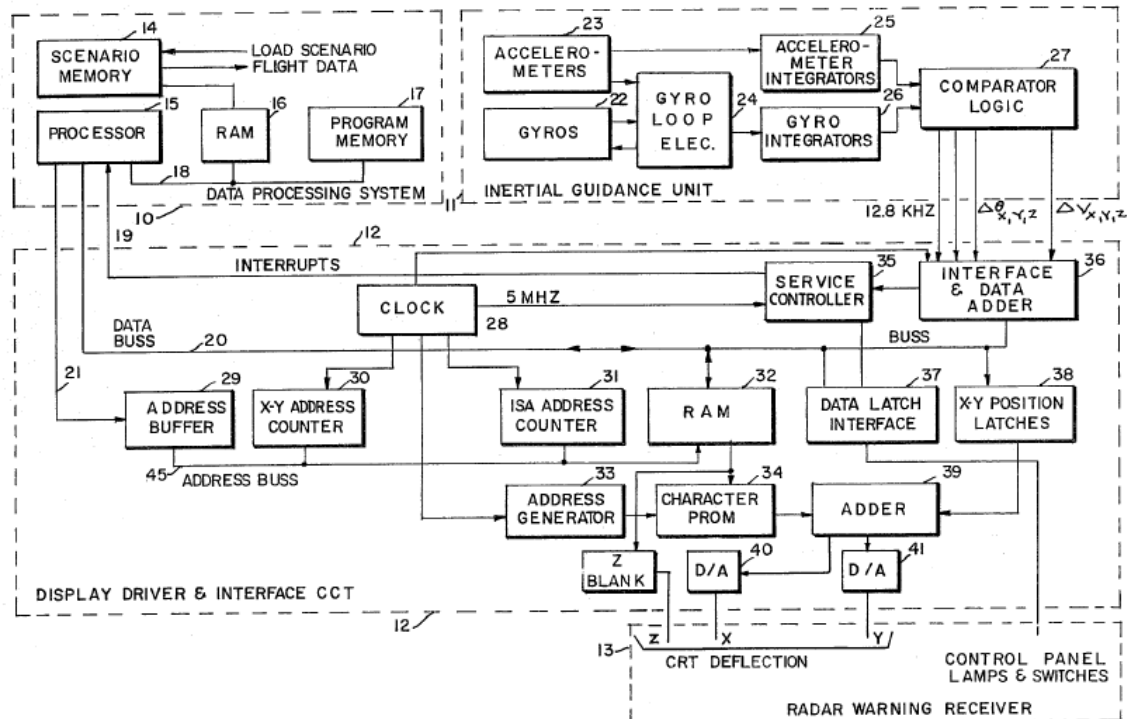


FIG. 1.

The training system of Figure 1 includes data processing system 10, inertial guidance unit 11, and driver and interface circuit 12. *Id.* at 6:2–5.

In greater detail, the inertial guidance unit senses angular rates and accelerations of an aircraft about the X, Y, and Z axes using three pairs of gyros 22 and accelerometers 23. Ex. 1004, 6:67–7:3. As the aircraft moves, analog error signals from the gyros and accelerometers “are applied to gyro-loop electronics 24[,] which attempts to hold the accelerometer pendulum and gyro gimbal nulled.” *Id.* at 7:2–7:8. Accelerometer integrator 25 or gyro integrator 26, as appropriate, converts the analog signals to digital pulse trains; and comparator logic 27 modifies the pulse trains so that they represent incremental changes in attitude and velocity. *Id.* at 7:7–18.

3. *Chan (Ex. 1005)*

Chan is titled “Integrated Sensor Having Plurality of Released Beams for Sensing Acceleration” and provides an integrated circuit to “sens[e] activity such as acceleration in a predetermined direction of movement.” Ex. 1005, codes (54), (57). By way of background, Chan explains that integrated circuits were prevalent in MEMS or electronic applications, and that known microsensors developed for MEMS applications included those that measure acceleration. *Id.* at 1:12–22. Chan further explains that acceleration microsensors were used in, for example, “air bag systems, anti-lock braking systems, and ride suspension systems for automobiles and in-flight aircraft monitoring systems for aircraft,” which, according to Chan, all “require[d] small, inexpensive, and reliable acceleration devices.” *Id.* at 1:33–38.

4. Bernstein (Ex. 1006)

Bernstein is titled “Symmetrical Micromechanical Gyroscope.” Ex. 1006, code (54). According to Bernstein, although micromechanical gyroscopes were well-known in the art, they suffered problems with their gimbaled structure. *Id.* at 1:11–45. To solve these problems, Bernstein proposes a micromechanical gyro as illustrated in Figure 1, below.

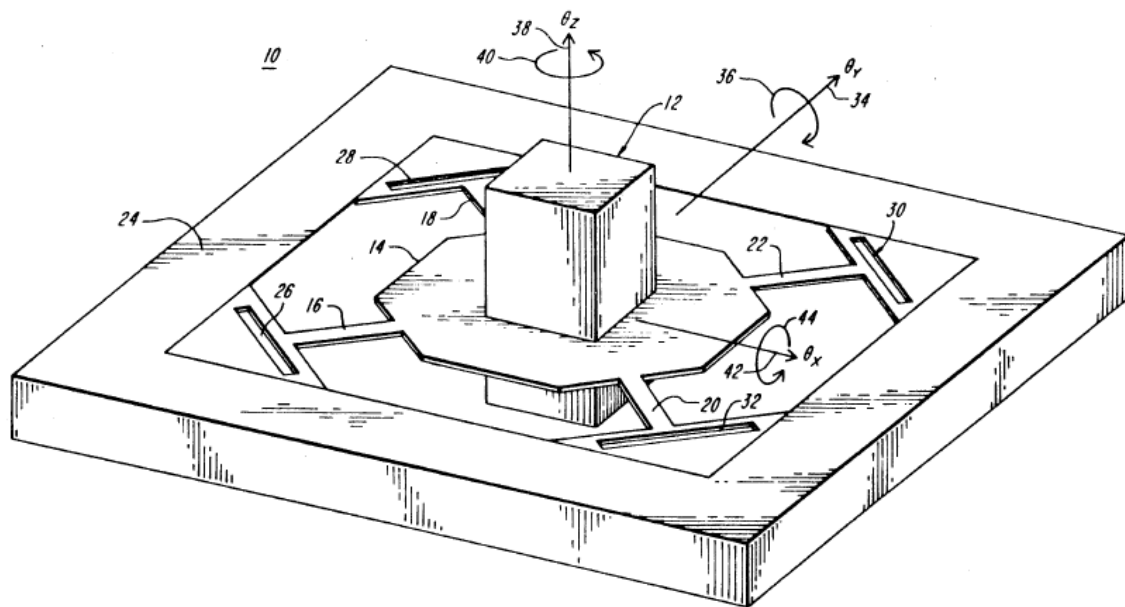


Figure 1 shows inertial mass 12 coupled to support plate 14, and support frame 24 surrounding the support plate and the inertial mass. *Id.* at Fig. 1, 2:17–26. The support plate and the inertial mass are coupled to the support frame via four flexures or flexural springs 16, 18, 20, 22. *Id.*

Bernstein additionally explains that its micromechanical gyroscope operates in a manner similar to known gyroscopes. Ex. 1006, 2:57–3:5.

5. *Irwin (Ex. 1007)*

Irwin is excerpts from a textbook titled “Introduction to Electrical Engineering.” Ex. 1007, 1–4. Regarding analog and digital signals, Irwin discloses that analog signals “vary continuously with time,” whereas digital

signals “switch between discrete levels.” *Id.* at 12. Irwin notes that, therefore, electronic measurement systems often measured continuously varying parameters such as acceleration and rotation using analog signal inputs representing those parameters. *Id.* at 14. For these systems, Irwin discloses that “[t]he electronic signal generally originates from a sensor or transducer which provides an analog signal proportional to the parameter it’s designed to measure.” *Id.*

6. *Merhav (Ex. 1008)*

Merhav is excerpts from a book titled “Aerospace Sensor Systems and Applications” and discloses, in pertinent part, the operation and properties of the ring laser gyro (“RLG”). Ex. 1008, 1, 19–23. In particular, Merhav discloses that the ring laser gyro included “a pair of collocated, closed path clockwise and counterclockwise light beams.” *Id.* at 19. Interference between these two light beams “manifests itself as fringes resulting from the corresponding changes of the wavelengths and oscillating frequencies. These changes are proportional to the inertial angular rate.” *Id.* Figure 8.2, below, shows an annular standing wave interpretation from a ring laser gyro. *Id.* at 22–23.

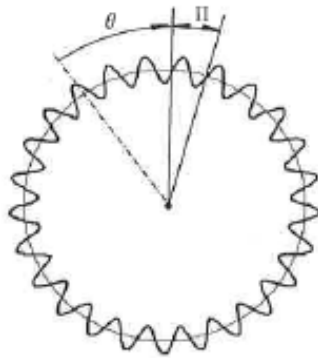


Figure 8.2 depicts “an inertially fixed ring on which a periodic light

intensity wave having the angular period Π is superimposed and that is sensed by the RLG which rotates at the angular rate Ω .” Ex. 1008, 22–23. Merhav explains that “[a]s the intensity fringes cross a [photo]diode, a corresponding sinusoidal signal is generated.” *Id.* at 23. Merhav further explains that “[d]igital pulse conditioning and logic convert the sinusoidal outputs into a train of pulses whose frequency is directly proportional to Ω and whose accumulated count represents the angle θ Thus, the RLG in conjunction with its output logic[] performs as a digital rate integrating gyro.” *Id.*

7. *Yamawaki (Exs. 1009–1010)*

Yamawaki is titled “Mobile Data Collection Device for Underwater Moving Body and Diving Training System Comprising Said Device” and seeks to dynamically reproduce a path of a diver using an acceleration sensor and a gyroscope. Ex. 1010, codes (54), (57). Figure 1 of Yamawaki, below, depicts a block diagram of a diver training system. *Id.* ¶ 12.

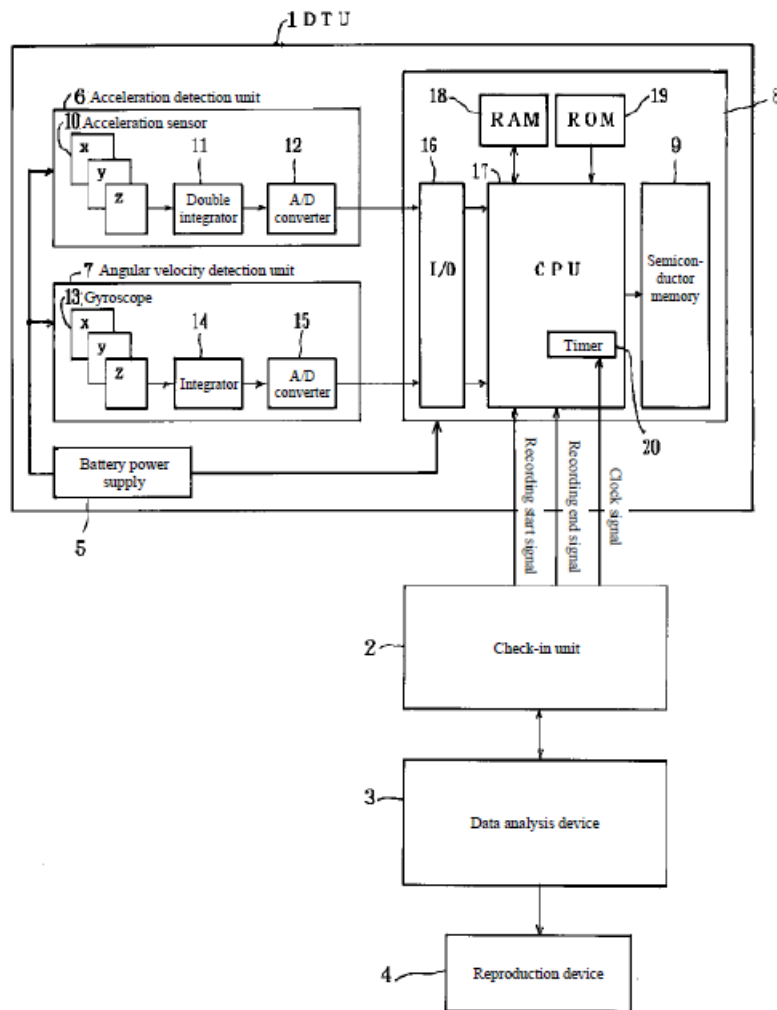


Figure 1 shows diver tracking unit 1 including, in part, acceleration detection unit 6 and angular velocity detection unit 7. *Id.* at Fig. 1, ¶ 15. The acceleration detection unit includes 3D acceleration sensor 10, double integrator 11, and A/D converter 12. *Id.* at Fig. 1, ¶ 16. Likewise, the angular velocity detection unit includes 3D gyroscope 13, integrator 14, and A/D converter 15. *Id.* According to Yamawaki, data from the acceleration detection unit and the angular velocity detection unit are processed to accurately identify a diver's position and rotation or direction of travel, respectively. *Id.*

8. *Saubolle (Ex. 1011)*

Saubolle is titled “Rate of Ascent Monitor Using Piezoelectric Transducer” and relates to a monitor for divers that senses a rate of pressure change and includes an indicator to provide a warning when a rate of ascent exceeds a threshold. Ex. 1001, codes (54), (57). Saubolle explains that divers must be careful when ascending towards the water surface so as to not suffer from the “bends”; and divers sometimes become disoriented. *Id.* at 1:7–14, 1:21–25. Thus, according to Saubolle, there was a need for a simple, inexpensive device for monitoring the rate of ascent of a diver and indicating the diver’s direction of vertical movement, i.e., distinguishing between ascent and descent. *Id.* at 1:11–25, 2:4–21.

II. PROCEDURAL CONSIDERATIONS

A. *Time Bar Under 35 U.S.C. § 315(b)*

Patent Owner contends the Petition is time-barred under 35 U.S.C. § 315(b) because (1) STMicroelectronics N.V. and STMicroelectronics S.R.l. (collectively, “STMicro”) were served in 2020 with a complaint alleging infringement of patents including the ’648 patent; and (2) STMicro is an unnamed real party-in-interest (“RPI”) to this proceeding. Prelim. Resp. 18–22. Specifically, Patent Owner contends that STMicro and Petitioner have a “contractual supplier relationship,” and Patent Owner’s infringement litigation against Petitioner implicates STMicro’s products. *Id.* at 20 (citing Ex. 2007 (Complaint for Patent Infringement) ¶¶ 46–56, 63–74). Patent Owner further alleges that STMicro and Petitioner “have a long relationship that includes obligations relevant to

the precedential *Ventex*¹¹ analysis,” STMicro would benefit from *inter partes* review, and Petitioner is herein representing STMicro’s interests. *Id.* at 21 (citing Ex. 2015, 8, 12; Ex. 2014 (STMicro’s Responses and Objections to American GNC Corp.’s Subpoena to Testify at a Deposition and to Produce Documents), 1–2).¹²

A petition for *inter partes* review may be considered only if, among other things, it “identifies all real parties in interest.” 35 U.S.C. § 312(a)(2). “[T]he IPR petitioner bears the burden of persuasion to demonstrate that its petitions are not time-barred under § 315(b) based on a complaint served on a real party in interest more than a year earlier.” *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242 (Fed. Cir. 2018). However, “an IPR petitioner’s initial identification of the real parties in interest should be accepted unless and until disputed by a patent owner,” who, in turn, “must produce *some* evidence that tends to show that a particular third party should be named a real party in interest.” *Id.* at 1242, 1244 (footnote omitted).

“[T]he two questions lying at [the] heart [of the real party in interest inquiry] are whether a non-party ‘desires review of the patent’ and whether a petition has been filed at a non-party’s ‘behest.’” *RPX Corp. v. Applications in Internet Time, LLC*, IPR2015-01750, Paper 128 at 26–27 (PTAB Oct. 2, 2020) (precedential) (citing *Applications in Internet Time, LLC v. RPX Corp.*, 897 F.3d 1336, 1351 (Fed. Cir. 2018) (“*AIT*”)); *see also Wi-Fi*

¹¹ *Ventex Co., Ltd. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00651, Paper 152 (PTAB Jan. 24, 2019) (precedential) (“*Ventex*”).

¹² Patent Owner has not submitted an Exhibit 2015, but represents that such document exists to support Patent Owner’s arguments regarding the long relationship and obligations between Petitioner and STMicro. Prelim. Resp. 21 n.4. Patent Owner also avers that Petitioner did not agree to a joint motion to file that document under seal in this proceeding. *Id.*

One, LLC v. Broadcom Corp., 887 F.3d 1329, 1336 (Fed. Cir. 2018).

Whether a non-party is a real party in interest is a “highly fact-dependent question.” *Ventex*, Paper 152 at 6 (quoting Trial Practice Guide, 77 Fed. Reg. 48756, 48759 (Aug. 14, 2012)); *see also* Patent Trial and Appeal Board Consolidated Trial Practice Guide 13 (Nov. 2019) (“Whether a party who is not a named participant in a given proceeding nonetheless constitutes a ‘real party-in-interest’ or ‘privy’ to that proceeding is a highly fact-dependent question.”).¹³ We must ask “who, from a ‘practical and equitable’ standpoint, will benefit from the redress” that the *inter partes* review might provide. *AIT*, 897 F.3d at 1349 (quoting Trial Practice Guide, 77 Fed. Reg. at 48,759); *see also* Consolidated Trial Practice Guide 14–15. In addition, we must “probe the extent to which [the nonparty] . . . has an interest in and will benefit from [Petitioner]’s actions, and inquire whether [Petitioner] can be said to be representing [the nonparty]’s interest after examining its relationship with [the nonparty].” *AIT*, 897 F.3d at 1353; *see also Ventex*, Paper 152 at 8.

Patent Owner must produce some evidence to place in dispute the issue of whether an unnamed real party in interest renders the petition time-barred, but Petitioner bears the burden of persuasion on this issue. *See Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242–44 (Fed. Cir. 2018) (holding that an “IPR petitioner bears the ultimate burden of persuasion to show that its petitions are not time-barred under § 315(b) based on a complaint served on an alleged real party in interest.”). Based on the arguments and evidence of record, we determine that Patent Owner has not

¹³ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

produced sufficient evidence to place in dispute the issue of whether STMicro should be named a real party in interest to this proceeding. Rather, at this stage, Patent Owner's contentions regarding any relationship between Petitioner and STMicro constitute mere attorney argument because they are unsupported by any evidence of record. *See* Prelim. Resp. 19–21. For example, beyond self-serving allegations in Patent Owner's district court complaint against Petitioner for infringement (*see* Ex. 2007 ¶¶ 46–56, 63–74, *cited in* Prelim. Resp. 20), we are not apprised of any evidence to support the argument that STMicro is a supplier of Petitioner. To the contrary, Patent Owner's evidence demonstrates that STMicro repeatedly asserts in the district court litigation that “ST[Micro] did not design, manufacture, or sell any STMicro IMU Components to [Petitioner].” *See* Ex. 2014, 13–18. Moreover, the evidence shows that STMicro does not acknowledge the existence of an indemnification agreement or any communications between it and Petitioner relating to the litigation, Patent Owner, or the '648 patent. *See id.* at 18–20, 24–25.

At best, Patent Owner's evidence and arguments at this juncture establish only that Patent Owner previously filed a complaint against STMicro, asserting infringement of patents including the '648 patent (*see generally* Ex. 2012); and that Patent Owner served a subpoena to compel STMicro to testify and produce documents in Patent Owner's infringement suit against Petitioner (*see generally* Ex. 2014). The record before us is insufficient to demonstrate a relationship between Petitioner and STMicro sufficient to show that STMicro is a real party in interest. *See Worlds*, 903 F.3d at 1244.

B. Our Discretion Under 35 U.S.C. § 314(a)

Patent Owner argues that we should exercise our discretion to deny institution under 35 U.S.C. § 314(a) in light of related district court litigation. Prelim. Resp. 21–22; *see Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5–16 (PTAB Mar. 20, 2020) (precedential) (discussing factors to be considered in analyzing whether the circumstances of a parallel district court action are a basis for discretionary denial of trial institution under *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential), including “investment in the parallel proceeding by the court and the parties”). Patent Owner contends that Petitioner has already “served lengthy invalidity contentions” in the Washington litigation, and “STMicro is already doing everything in its power to resist discovery as a third party.” Prelim. Resp. 21–22

The Petition states, however, that “Petitioner provides a *Sotera* stipulation that, in the event of IPR institution, Petitioner will not pursue in district court any grounds of invalidity against the challenged claims that were or reasonably could have been asserted in IPR.” Pet. 5. The Director’s Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (June 21, 2022)¹⁴ (“Interim Procedure”) states that “the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.” Interim

¹⁴ Available at www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

Procedure at 3 (citing *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential as to § II.A)); *see id.* at 7, 9.

Accordingly, we decline to discretionarily deny the Petition in view of related district court litigation.

III. UNPATENTABILITY

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 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”)).

The legal question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.¹⁵ *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18 (1966). One seeking to establish obviousness based

¹⁵ Patent Owner introduces its preliminary arguments with a background discussion of the ’648 patent’s technology, which includes general and unsupported allegations implying the existence of various objective indicia of nonobviousness. *See* Prelim. Resp. 1–7. However, the current record does not include explicit assertions or evidence of objective indicia of nonobviousness. *See generally id.* Patent Owner is advised that any argument not asserted in a timely-filed Response to the Petition, or in another manner permitted during trial, shall be deemed forfeited.

on more than one reference must articulate sufficient reasoning with rational underpinnings to combine teachings. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

B. Level of Ordinary Skill in the Art

Relying on the Declaration of Dr. Young for support, Petitioner contends a person of ordinary skill in the art (“POSITA”)

would have possessed a bachelor’s degree in electrical engineering or similar degree, with two to three years of practical experience designing and/or implementing systems that include sensors for measuring movement, such as acceleration and rotational position. . . . A skilled artisan could also have had more formal education and less practical experience, or vice versa.

Pet. 5 (citing Ex. 1002 ¶¶ 12–14). Patent Owner counters that the skilled artisan would have had “at least a ‘Master’s Degree in Electrical or Electronics Engineering, and approximately five years of relevant experience in the development of control systems for inertial navigation, MEMS semiconductor processing, and analog circuit design.’” Prelim. Resp. 32 (citing Ex. 2008 (Declaration of Dr. Lawrence E. Larson) ¶ 57). On this preliminary record, we are persuaded for the reasons discussed below that Petitioner has shown a reasonable likelihood that it would prevail in demonstrating the unpatentability of at least one challenged claim of the ’648 patent, at least under Patent Owner’s proffered level of ordinary skill in the art. We recognize that Petitioner and its declarant, Dr. Young, propose a different level of ordinary skill in the art, and we expect the parties to address this issue and its implications on the merits of the asserted grounds during trial.

C. Claim Construction

Petitioner argues the preamble of claim 1, “[a] micro inertial measurement unit,” is not limiting and submits that no terms need express construction. Pet. 7. According to Petitioner, the limitations recited in the body of claim 1 themselves “define a structurally complete invention,” and the preamble does not provide antecedent basis for, or otherwise impact, any limitation. *Id.* at 10. Petitioner further contends the preamble merely recites an intended purpose or use of the invention, and notes that Patent Owner did not rely on the preamble during prosecution. *Id.* at 10–11.

Patent Owner contends that the preamble should be construed as a limitation requiring MEMS sensors, consistent with the construction in the Washington litigation. Prelim. Resp. 33–37. Patent Owner avers that “the specification clearly identifies a MEMS-based inertial measurement unit as the fundamental structure of the claims.” *Id.* at 35 (citing Ex. 2002, 2; Ex. 1001, Fig. 17, 17:37–42); *see also id.* at 36 (arguing, the intrinsic and extrinsic evidence all show that “using MEMS sensors is the fundamental structure and characteristic of the claims”). Patent Owner also argues that the preamble is limiting because Patent Owner explicitly relies on it in this IPR. *Id.* at 35–36 (citing *THX, Ltd. v. Apple, Inc.*, 2016 WL 6563340, at *10 (N.D. Cal. Nov. 4, 2016)).

We apply the claim construction standard used to construe the claims in a civil action under 35 U.S.C. § 282(b), as articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2019). Under the *Phillips* standard, claim terms must be given “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.

“Whether to treat a preamble as a limitation is a determination ‘resolved only on review of the entire[] . . . patent to gain an understanding of what the inventors actually invented and intended to encompass by the claim.’” *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (quoting *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989)) (alterations in original). “In general, a preamble limits the invention if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Id.* (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). “Conversely, a preamble is not limiting ‘where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.’” *Id.* (quoting *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997)). “Further, when reciting additional structure or steps underscored as important by the specification, the preamble may operate as a claim limitation.” *Id.* (citations omitted); *see also Gen. Elec. Co. v. Nintendo Co., Ltd.*, 179 F.3d 1350, 1361–1362 (Fed. Cir. 1999) (limiting the claim to a “raster scan display device,” as recited in the preamble, where the specification emphasizes the particular problem of displaying data on a raster scan display device, rather than all display systems).

Here, the Specification makes clear that the inventors of the ’648 patent had their focus primarily on creating a micro-sized IMU. For example, the Specification frames each of the objectives of the invention around the “micro” feature of the IMU and emphasizes the benefits and objectives of creating not just any IMU, but specifically, a micro IMU or an IMU that uses MEMS technology. *See* Ex. 1001, 2:54–4:28. Relatedly, the

Specification describes problems with conventional IMUs, including their large size (*id.* at 1:18–2:9); explains that MEMS sensors and micromachines have benefits and “are considered as the next logical step in the silicon revolution” (*id.* at 2:10–46); and discloses that despite MEMS sensors being commercially available, “there is not yet available high performance, small size, and low power consumption IMUs.” *Id.* at 2:47–51; *see also id.* at 6:6–40 (describing problems the inventors sought to address relating specifically to building an IMU that is micro-sized). Accordingly, on this preliminary record and given the Specification’s repeated emphasis on the micro-sized features and benefits of the IMU, we determine that “[a] micro inertial measurement unit” is limiting and requires a micro-sized IMU.

In view of the Specification’s extensive disclosures underscoring the importance of using MEMS technology in the inventors’ IMU, noted above, we further construe the preamble as requiring the IMU to implement the structures recited in the claims as MEMS—that is, “micromachine” technology.¹⁶ *See* Ex. 1001, 2:16 (the ’648 patent defining the term “MEMS,

¹⁶ Patent Owner contends the preamble more narrowly requires not just MEMS technology, but MEMS *sensors* (*see* Prelim. Resp. 33–37), yet its citations to the ’648 patent do not support such a determination. Instead, the Specification of the ’648 patent discloses implementing MEMS *devices or technology* more generally as the micro-sized IMU. *See id.* at 33 (citing Ex. 1001, code (57), 2:62–3:3, 3:5–28, 6:41–47, 16:31–39, 16:46–49, 17:19–36). We also note that the Specification uses the term “MEMS” to encompass micromachines and micromechanical devices. *See, e.g.,* Ex. 1001, 2:15 (“MEMS, or, as stated more simply, micromachines”), 2:35–41 (describing “Draper’s micromechanical accelerometer” as “a typical example” of an accurate MEMS accelerometer), 16:46–49 (describing “[e]xisting MEMS technologies” used in the invention, which “use vibrating inertial elements (a micromachine)”).

or, as stated more simply, micromachines”). Accordingly, we preliminarily construe “[a] micro inertial measurement unit,” recited in the preamble, to be a micro-sized inertial measurement unit and that the structures recited in the limitations of the claims are limited to structures implemented as MEMS devices. Ex. 1001, 3:15–17 (stating, “the present invention specifically selects MEMS angular rate devices and acceleration devices to assemble a micro IMU”).

D. Asserted Grounds of Unpatentability

1. Alleged Obviousness over Smith, Chan, and Bernstein: Claim 1

Petitioner contends that independent claim 1 of the ’648 patent is unpatentable under 35 U.S.C. § 103(a) as obvious over Smith, Chan, and Bernstein. Pet. 9–37. For the reasons below, the evidence on this record indicates there is a reasonable likelihood that Petitioner would prevail in demonstrating that claim 1 of the ’648 patent would have been unpatentable under 35 U.S.C. § 103(a) as obvious over Smith, Chan, and Bernstein. We address, first, Petitioner’s arguments and evidence as they relate to the limitations of claim 1. Next, we address Patent Owner’s arguments regarding the merits of Petitioner’s challenge of this claim.

(a) Petitioner’s Arguments

i. I[pre]: “A micro inertial measurement unit, comprising”

As noted above, Petitioner contends the preamble is not limiting. Pet. 9–11. Alternatively, Petitioner argues that if the preamble is limiting, Smith teaches inertial sensor assembly 12 and P1 processor 14 that correspond to the recited “inertial measurement unit.” *Id.* at 11–13.

Petitioner further argues that Chan and Bernstein teach the recited “micro” limitation and, therefore, “confirm[] [the ’648 patent’s disclosures] that MEMS-based sensors for sensing acceleration and angular rotation were well-known.” *Id.* at 13–16.

More specifically, Petitioner avers that Smith’s inertial sensor assembly includes ring laser gyros and accelerometers that allow the assembly to “measure and output the changes in angular position and velocity along the X, Y, and Z axes”—in a manner similar to the ’648 patent—of a carrier such as an aircraft. Pet. 11–13 (citing Ex. 1003, Fig. 1, 3:7–18, 5:60–65, 6:15–18; Ex. 1002 ¶¶ 90, 92; Ex. 1001, 1:18–19, 1:24–28). Petitioner further argues that the inertial sensor assembly outputs signals to the processor. *Id.* at 12 (citing Ex. 1003, 3:19–20). Additionally, Petitioner argues Smith teaches that its IMU “may be constructed in a small enclosure.” *Id.* at 13–14 (citing Ex. 1003, 2:57–58).

Petitioner further argues Chan’s description of known MEMS systems using a variety of types of microsensors, including those for sensing and measuring acceleration, “confirms that MEMS-based sensors were already well-known and had been used commercially, with applications including ‘aircraft monitoring systems for aircraft’ that require ‘small, inexpensive, and reliable acceleration devices.’” Pet. 14 (citing Ex. 1005, 1:12–21, 1:33–44, 3:14–16). Petitioner similarly contends Bernstein teaches “a micromechanical gyroscope,” a class well known in the art, and that “[i]t would have been apparent and obvious that Bernstein discloses a ‘micro,’ e.g., MEMS-based gyroscope.” *Id.* at 14–15 (emphases omitted) (citing Ex. 1006, 1:11–13, 1:48–51; Ex. 1002 ¶ 97).

Relying on Dr. Young’s testimony, Petitioner reasons that the skilled

artisan would have combined the teachings of Smith, Chan, and Bernstein “to use micromechanical (MEMS-based) accelerometers and gyroscopes” in Smith’s IMU, in order to achieve benefits such as reduced size, weight, power consumption, and cost. Pet. 15–18 (citing Ex. 1002 ¶¶ 98–102, 104). Petitioner also articulates benefits that would have been achieved in the aviation industry, specifically, and refers to additional prior art references to demonstrate that micromachined accelerometers and gyroscopes were known to have been used for aircraft. *Id.* at 17 (citing Ex. 1002 ¶ 102; Ex. 1013, 1:10–11, 1:36–39, 8:48–50; Ex. 1014, 1:15–36; Ex. 1001, 2:12–15). Moreover, as further support for the combination, Petitioner points to Smith’s desire for a small and cheap inertial reference system. *Id.* at 16 (citing Ex. 1003, 2:56–59, 22:35–39; Ex. 1002 ¶¶ 101, 103).

Petitioner contends the ’648 patent, Chan, and Bernstein all demonstrate that MEMS-based acceleration and angular rotation sensors were well known, but Petitioner also acknowledges that some modifications to the manufacturing and electronics would have been necessary to achieve a micro-sized IMU.¹⁷ Pet. 15–16, 18 (citing Ex. 1002 ¶ 99; Ex. 1001, 2:47–51). According to Petitioner, however, these modifications would have been straightforward and routine and used conventional techniques, such that the skilled artisan would have had a reasonable expectation of success without undue experimentation. *Id.* at 15, 17–18 (citing Ex. 1002 ¶¶ 98–99, 104; Ex. 1001, 2:25–46). For example, Petitioner argues “MEMS accelerometers

¹⁷ Petitioner’s asserted ground does not rely upon applicant admitted prior art (“AAPA”). *See* Pet. 4. Consistent therewith, we interpret Petitioner’s position to be that the disclosure of the ’648 patent merely aids in demonstrating what the ordinarily skilled artisan would have understood and known at the time of the invention. *See id.* at 15–18.

and gyroscopes serve the same purposes and provide the same types of velocity and angular position information as non-micromechanical counterparts,” and Smith could have been modified by mounting MEMS-based gyroscopes and accelerometers “on a printed circuit board using conventional techniques.” *Id.*

- ii. *1[a]: “an angular rate producer comprising a X axis angular rate detecting unit which produces a X axis angular rate electrical signal, a Y axis angular rate detecting unit which produces a Y axis angular rate electrical signal, and a Z axis angular rate detecting unit which produces a Z axis angular rate electrical signal”*

Regarding limitation 1[a], Petitioner contends Smith teaches ring laser gyros 42, 44, 46, each: (1) with its sensitive axis aligned with one of the X, Y, or Z axes; (2) detecting angular displacement along the X, Y, or Z axis, respectively; and (3) “produc[ing] an output digital signal having a pulse repetition rate proportional to the rate of angular displacement of each gyro 42, 44, and 46 about its coordinate axis.” Pet. 18–20 (citing Ex. 1003, Fig. 2, 7:58–62, 8:3–6). Petitioner further argues, “Petitioner’s mapping of this limitation to Smith is consistent with the specification of the ’648 patent” because the ’648 patent discloses that conventional inertial angular rate producers include ring laser gyros. *Id.* at 20 (citing Ex. 1001, 1:46–62; Ex. 1002 ¶ 108).

Additionally, Petitioner argues that to the extent “micro” in the preamble is limiting, it would have been obvious to replace Smith’s laser ring gyros with micromechanical gyros for the reasons discussed with respect to obviousness of the preamble. Pet. 20 (citing Ex. 1002 ¶¶ 98–104, 109).

- iii. 1[b]: “an acceleration producer comprising a X axis accelerometer which produces a X axis acceleration electrical signal, a Y axis accelerometer which produces a Y axis acceleration electrical signal, and a Z axis accelerometer which produces a Z axis acceleration electrical signal”

Petitioner asserts that Smith teaches limitation 1[b]. Pet. 21–22. For this limitation, Petitioner argues Smith teaches accelerometers 72, 74, 76, which each detect acceleration along one of the X, Y, or Z axes, and each generate an analog output signal corresponding to the rate of change of velocity of the accelerometer along the X, Y, or Z axis, respectively. *Id.* (citing Ex. 1003, Fig. 2, 8:43–51).

Petitioner additionally contends that to the extent “micro” in the preamble is limiting, it would have been obvious to replace Smith’s accelerometers with MEMS accelerometers for the reasons discussed with respect to obviousness of the preamble. Pet. 22 (citing Ex. 1002 ¶¶ 98–98, 113).

- iv. *“an angular increment and velocity increment producer, which is electrically connected with said X axis, Y axis and Z axis angular rate detecting units and said X axis, Y axis and Z axis accelerometers, receiving said X axis, Y axis and Z axis angular rate electrical signals and said X axis, Y axis and Z axis acceleration electrical signals from said angular rate producer and said acceleration producer respectively, wherein said X axis, Y axis and Z axis angular rate electrical signals and said X axis, Y axis and Z axis acceleration electrical signals are converted into digital angular increments and digital velocity increments respectively”*

As for limitation 1[c], Petitioner argues that Smith’s signal conditioning electronics 24, 32 and P1 processor 14 receive and process electrical signals from the laser ring gyros and accelerometers. Pet. 22–37. Specifically, Petitioner contends signal conditioning electronics 24 receives the signals from the gyros, and signal-conditioning circuit 108 produces, for each of the gyros, “a signal $+\Delta\theta$ having a pulse repetition rate proportional to [a] clockwise angular rotation rate of the laser gyro 10[0] . . . in its sensitive axis” and “a signal $-\Delta\theta$ having a pulse repetition rate proportional to [a] counterclockwise angular rotation rate of the laser gyro 100 in its sensitive axis.” *Id.* at 24–25 (citing Ex. 1003, Figs. 1, 3, 6:9–11, 8:3–28, 9:7–9, 9:19–22, 9:25–33; Ex. 1002 ¶ 116) (alteration in original).

Petitioner argues Smith’s signals $+\Delta\theta$ and $-\Delta\theta$ from each of the gyros are output to the P1 processor, which includes counters that “count the number of pulses in the $+\Delta\theta$ and $-\Delta\theta$ signals that are received, over a predetermined time interval, and then store the accumulated counts.” Pet. 25–29 (citing Ex. 1003, Figs. 5, 7, 8, 2:15–18, 3:46–54, 5:14–16, 6:35–38, 10:36–54, 14:7–16; Ex. 1002 ¶¶ 118, 121). According to Petitioner,

these accumulated $\Delta\theta$ counts correspond to the claimed “digital angular increments”—or “changes in angle expressed digitally,” as Patent Owner has argued the term should be construed—because they represent changes in angular position over a predetermined period of time and are stored in memory accessible to a CPU. *Id.* at 29–32 (citing Ex. 1018, 019–020; Ex. 1019, 026–027; Ex. 1020, 014–015; Ex. 1003, Fig. 7, 3:8–13, 6:35–38, 13:8–16 14:65–15: 13; Ex. 1002 ¶¶ 124–125).

Petitioner further asserts Smith discloses digitizers, which convert the three accelerometers’ analog output signals to digital signals $+\Delta V$ and $-\Delta V$, which represent changes in velocity. Pet. 32–34, 36 (citing Ex. 1003, Figs. 1–2, 4, 3:13–18, 6:24–26, 8:48–64, 10:5–17; Ex. 1002 ¶¶ 127, 135). Petitioner contends these signals $+\Delta V$ and $-\Delta V$ “hav[e] . . . pulse repetition rate[s] proportional to acceleration of the accelerometer . . . in a reference positive [or negative] direction along its sensitive axis.” *Id.* at 33 (citing Ex. 1003, 10:10–15). Petitioner argues that Smith’s P1 processor counts and accumulates the signals $+\Delta V$ and $-\Delta V$ over a period of time and stores the accumulated counts in hold registers accessible by the CPU, similar to its counting, accumulating, and storing relating to the signals $+\Delta\theta$ and $-\Delta\theta$ from each of the gyros. *Id.* at 34–37 (citing Ex. 1003, Figs. 7, 10, 3:13–18, 4:29–35, 5:14–16, 6:35–38, 10:36–38, 13:26–45, 14:53–59, 20:67–21:2; Ex. 1002 ¶¶ 129, 131–132, 136). Accordingly, Petitioner submits that the digital signals $+\Delta V$ and $-\Delta V$ “represent accumulated changes in velocity over a predetermined time interval expressed in digital form.” *Id.* at 36.

Petitioner additionally contends that to the extent “micro” in the preamble is limiting, Smith’s IMU “would have been adapted to receive and process signals from MEMS gyroscopes and accelerometers to produce the

claimed digital angular and velocity increments.” Pet. 37 (citing Ex. 1002 ¶ 138).

(b) Patent Owner’s Arguments

Patent Owner contends Petitioner fails to demonstrate that the combination of Smith, Chan, and Bernstein discloses or renders obvious the preamble, “[a] micro inertial measurement unit,” and, relatedly, that Petitioner fails to show that Smith would be combined with Chan and Bernstein. Prelim. Resp. 39–49. Patent Owner additionally contends Petitioner fails to demonstrate that Smith discloses or renders obvious the claimed “angular rate electrical signals.” *Id.* at 49–52. We address Patent Owner’s arguments below.

i. Whether the skilled artisan would have combined the teachings of Smith, Chan, and Bernstein to arrive at the preamble

As an initial matter and as noted above, we agree with Patent Owner that the preamble is limiting. Patent Owner appears to acknowledge that Chan and Bernstein teach MEMS sensors (*see* Prelim. Resp. 35 (arguing that Petitioner “added the Chan MEMS Accelerometer and the Bernstein MEMS gyroscope patents to every Ground in its Petition” (emphases omitted), 36 (arguing, “[Petitioner] adds MEMS sensor references Chan and Bernstein to each and every Ground” (emphases omitted))), but argues the ordinarily skilled artisan would not have combined the teachings of Smith, Chan, and Bernstein in the manner Petitioner proposes (*id.* at 39–49).

In particular, Patent Owner contends that showing a component was known does not amount to a reason to combine or substitute. Prelim. Resp. 40–48. Patent Owner also contends Petitioner assumes without

support that the modifications would have been straightforward and routine and used conventional techniques without undue experimentation. *Id.* at 41–42. Pointing to the ’648 patent’s Specification and the testimony of its declarant, Professor Larson, for support, Patent Owner argues that, instead, modifying Smith to use MEMS sensors would have been difficult and complicated, requiring extensive experimentation. *Id.* at 42–46 (citing Ex. 1001, Fig. 17, code (57), 2:47–50, 2:53–3:28, 6:6–43, 17:19–36; Ex. 2008 ¶¶ 54, 57–58, 77–79).

Patent Owner avers that Petitioner does not cite to any of Smith, Chan, or Bernstein to support its conclusory rationale to combine, but instead relies upon impermissible hindsight. *Id.* at 43, 45–46, 48–49. Patent Owner further argues that Petitioner presents attorney argument rather than evidence, and that Dr. Young’s testimony includes “arguments copied into his declaration” that are, moreover, “entirely too conclusory and unsupported.” *Id.* at 46 (citation omitted). Patent Owner additionally contends that Smith and Bernstein teach different types of gyro technologies, and “[t]heir differences teach away from combination.” *Id.* at 48.

At this stage, we give Dr. Young’s testimony weight, as it is supported by the teachings of Smith, Chan, and Bernstein, as well as other contemporaneous references demonstrating the known use of micromachined accelerometers and gyros for vehicles. *See* Ex. 1002 ¶¶ 98–105 (citing Ex. 1003, 2:56–69, 22:35–39; Ex. 1005, 1:33–38; Ex. 1013, 1:10–11, 1:36–39, 8:48–50; Ex. 1014, 1:15–36). For example, Dr. Young testifies that MEMS devices were well known to those of ordinary skill in the art, and that “Chan further confirms that MEMS-based accelerometers were already well-known and had been used commercially.”

Id. ¶ 96. Similarly, Dr. Young testifies that “Bernstein describes micromechanical gyroscopes for measuring angular position along a particular axis.” *Id.* ¶ 97. Dr. Young explains that it would have been a straightforward substitution for a person of ordinary skill in the art to replace “the three accelerometers and gyroscopes in Smith . . . with corresponding micromachined accelerometers and gyroscopes” as taught by Chan and Bernstein. *Id.* ¶ 99. Given that MEMS devices are well-known to those of ordinary skill in the art, Dr. Young testifies persuasively that

[t]his combination would have been straightforward because the micromechanical accelerometers and gyroscopes are, after all, accelerometers and gyroscopes that serve the same purposes and provide the same types of velocity and angular position information as their non-micromechanical counterparts.

Id.

In this regard, we note, also, that Dr. Young’s Declaration includes supporting analysis and technical reasoning beyond what is presented in the Petition. *Compare* Ex. 1002 ¶¶ 98–105, *with* Pet. 15–18; *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential) (according little or no weight to declaration testimony that contains a *verbatim* restatement of a petition’s arguments without additional supporting evidence or reasoning). Moreover, Petitioner and Dr. Young set forth benefits, such as reduced size and weight, that would logically flow from incorporating smaller components into Smith’s inertial measurement unit. *See, e.g.*, Pet 16; Ex. 1002 ¶ 101.

Accordingly, on this preliminary record, we are persuaded for purposes of institution that Petitioner articulates a reason with rational underpinning as to why the ordinarily skilled artisan would have combined

the teachings of Smith, Chan, and Bernstein in a manner that takes into account the teachings of those cited references. *See* Pet. 15–18. Patent Owner does not identify any knowledge Petitioner relies upon that was gleaned only from the '648 patent's disclosure, and which was not otherwise within the level of ordinary skill at the time of the invention. *See In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) (“Any judgment on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper.”). Patent Owner also does not provide any supported objective evidence of secondary considerations, which “operates as a beneficial check on hindsight.” *Cheese Sys., Inc. v. Tetra Pak Cheese and Power Sys., Inc.*, 725 F.3d 1341, 1352 (Fed. Cir. 2013). Thus, Patent Owner's contention that Petitioner engages in impermissible hindsight is insufficient reason to deny institution. Moreover, we are unpersuaded by Patent Owner's teaching-away contention because the mere fact that the asserted art may teach different types of gyro technology does not amount to a reference actually criticizing, discrediting, or otherwise discouraging the claimed solution. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004).

We acknowledge Professor Larson's testimony disputes Dr. Young's assessment of whether it would have been within the knowledge and skill of an ordinarily skilled artisan to make the combination Petitioner proposes, and whether the ordinarily skilled artisan could have done so without undue experimentation. *See* Ex. 2008 ¶¶ 77–79, *cited in* Prelim. Resp. 44–45. We

also acknowledge Patent Owner's arguments that the '648 patent, likewise, discloses various problems and difficulties with building a micro-sized IMU. *See* Ex. 1001, Fig. 17, code (57), 2:47–50, 2:53–3:28, 6:6–43, 17:19–36, *cited in* Prelim. Resp. 42. In view of the competing testimony as to whether it would have been “uniquely challenging or difficult for one of ordinary skill in the art” to have combined the teachings of Smith, Chan, and Bernstein, it may be useful for the parties to develop evidence on this issue at trial. *See Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007) (citing *KSR*, 550 U.S. at 418–419). Nevertheless, on the current record, Petitioner and Dr. Young have made a sufficient showing of reason to combine the teachings of Smith, Chan, and Bernstein for purposes of institution.

ii. Whether Smith teaches the claimed “angular rate electrical signals”

Patent Owner additionally argues that the claimed “angular rate electrical signals” cannot be mapped to the outputs of Smith's laser ring gyros. Prelim. Resp. 49–52. Specifically, Patent Owner contends the '648 patent uses vibrating inertial mass MEMS gyroscopes, which rely on Coriolis force. *Id.* at 50 (citing Ex. 1001, 16:46–17:17). Patent Owner avers that “the angular rate electrical signals [of claim 1] must be proportional to angular rate in a Coriolis force sensor, as a person of ordinary skill would understand.” *Id.* (citing Ex. 1001, 8:11–16, 8:34–54). Patent Owner argues that, in contrast, Smith's laser ring gyros “work on a completely different principle than Coriolis force sensors,” and “[t]he frequency, not the signal level, is the angular rate.” *Id.* at 51 (emphasis omitted) (citing Ex. 1008, Fig. 8.2, 21–23; Ex. 1003, 8:3–6). Patent Owner submits that because the

outputs of Smith's laser ring gyros are not proportional to angular rate, they cannot read on the disputed limitation. *Id.* at 52.

We appreciate the differences in the principles of operation that Patent Owner argues exist between laser ring gyros and vibrating inertial mass MEMS gyros. On the current record, however, we disagree that Smith fails to teach the recited “angular rate electrical signals” because of the different operation of Smith's laser ring gyros. In particular, the plain language of claim 1 does not require that the angular rate electrical signals be proportional to the angular rate; nor does the plain language preclude the angular rate electrical signals from being proportional to pulse repetition rate or frequency. *See* Ex. 1001, 23:43–24:21. To the extent Patent Owner argues that claim 1 requires vibrating inertial mass MEMS gyroscopes or a sensor that uses Coriolis force, we do not read limitations from the Specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). As to whether the ordinarily skilled artisan would have understood claim 1 to require the angular rate electrical signals to be proportional to angular rate of a Coriolis force sensor, as Patent Owner submits, Patent Owner will have the benefit of trial to fully develop its arguments regarding the knowledge and skill of the ordinarily skilled artisan. For purposes of institution, however, Petitioner has made a sufficient showing based on the current record.

Additionally, at this juncture, Patent Owner does not address Petitioner's position that the skilled artisan would have found it obvious to replace Smith's ring laser gyros with micromechanical gyroscopes, as taught by Bernstein. *See* Pet. 20; *see also* Prelim. Resp. 48 (acknowledging that “Bernstein's gyros are made from a vibrating inertial mass” (emphasis

omitted)).

(c) Conclusion

In light of the foregoing, we determine that, for purposes of this Decision, Petitioner has shown sufficiently that the combination of Smith, Chan, and Bernstein would have taught or suggested all of the limitations recited in claim 1, and Petitioner has articulated an adequate reason to combine their teachings.

2. Alleged Obviousness Over Smith, Chan, Bernstein, Irwin, and Merhav: Claim 4

Petitioner contends that dependent claim 4 of the '648 patent is unpatentable under 35 U.S.C. § 103(a) as obvious over Smith, Chan, Bernstein, Irwin, and Merhav. Pet. 37–43. Petitioner relies on Irwin to “confirm[] that it would have been obvious for an acceleration rotation sensor to have provided an analog voltage signal proportional to the measured acceleration or rotation” (*id.* at 38–39); and Petitioner relies on Merhav to teach that a ring laser gyro would have generated an analog signal proportional to detected angular rates (*id.* at 40–41).

Patent Owner contends that the outputs of Smith’s ring laser gyros do not meet claim 1’s “angular rate electrical signals” and, therefore, Smith does not teach claim 4’s “angular rate voltage signals directly proportional to angular rates.” Prelim. Resp. 50–52; *see also id.* at 50 (contending, “[c]laim 4 requires the output signals be ‘***analog*** angular rate ***voltage*** signals”).

As discussed above, on this record, we are persuaded that Petitioner has shown a reasonable likelihood that claim 1 would have been obvious over Smith, Chan, and Bernstein. Moreover, we note that Petitioner relies at

least in part on Irwin and Merhav, references which Patent Owner does not address at this juncture, to teach this limitation in claim 4. *See* Pet. 37–41. For example, Petitioner cites to Irwin’s teachings that sensors may measure parameters such as acceleration and rotation and “provide[] an analog signal proportional to the parameter.” *See* Ex. 1007, 13–14, *cited in* Pet. 38. Supported by Dr. Young’s testimony and teachings in other portions of the Irwin textbook, Petitioner further argues that “it was well-known that the amplitude of an analog signal is typically measured in volts.” Pet. 38 (citing Ex. 1002 ¶ 140; Ex. 1007, 14–15; Ex. 1022, 12–13). Merhav additionally teaches that laser ring gyros would have generated a sinusoidal signal that would have been converted by “[d]igital pulse conditioning and logic . . . into a train of pulses whose frequency is directly proportional to Ω and whose accumulated count represents the angle θ .” Ex. 1008, 23. According to Dr. Young, “[a] person of ordinary skill in the art would have understood that the sinusoidal signal generated by the ring laser circuitry constitutes an analog signal.” Ex. 1002 ¶ 145.

Nevertheless, because we institute on claim 1, we leave Patent Owner’s arguments relating to whether the combination of Smith, Chan, Bernstein, Irwin, and Merhav teaches the claimed “angular rate voltage signals directly proportional to angular rates” for development during trial.

*3. Alleged Obviousness Over Tingleff, Chan, and Bernstein:
Claims 1 and 4*

Petitioner argues that claims 1 and 4 of the ’648 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Tingleff, Chan, and Bernstein. Pet. 43–56. For this ground, Petitioner explains that, “for substantially the same reasons fully explained for [alleged obviousness of

claim 1 over Smith, Chan, and Bernstein], it would have been obvious based on Tingleff in light of Chan and Bernstein to use a ‘micro’ inertial measurement unit.” Pet. 45 (citing Ex. 1002 ¶¶ 93–105, 156–157). In particular, Petitioner argues Tingleff’s aircraft “simulation system is ‘relatively small and self-contained,’” and the skilled artisan would have sought to use components: (1) “that are as small as possible” for the benefits of “reduced size, reduced weight, reduced power consumption, and reduced cost;” and (2) known for aircraft applications. *Id.* at 45–46 (citing Ex. 1004, 3:11–13; Ex. 1002 ¶¶ 101–102, 156).

Patent Owner contends the skilled artisan would not have combined Tingleff, Chan, and Bernstein in the manner Petitioner proposes for similar reasons that Patent Owner argues with respect to the combination of Smith, Chan, and Bernstein. *See* Prelim. Resp. 52–55.

As discussed above, on this record, Petitioner has shown a reasonable likelihood that it would prevail with respect to obviousness of claim 1 over Smith, Chan, and Bernstein, and Petitioner has articulated a sufficient reason with rational underpinning as to why the skilled artisan would have combined their teachings. Petitioner proffers similar reasons as to why the skilled artisan would have combined the teachings of Tingleff, Chan, and Bernstein, and on this record and for similar reasons, Petitioner has made a sufficient showing for reasons to combine Tingleff, Chan, and Bernstein.

Nevertheless, because we institute on another ground, we make no final determination at this point whether Petitioner has met its burden to show that claims 1 and 4 would have been unpatentable over Tingleff, Chan, and Bernstein.

4. *Alleged Obviousness Over Yamawaki, Chan, Bernstein, and Saubolle: Claims 1 and 4*

Petitioner argues that claims 1 and 4 of the '648 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Yamawaki, Chan, Bernstein, and Saubolle. Pet. 57–74.

Patent Owner contends that, for the same reasons advanced previously with respect to Smith, Chan, and Bernstein, and Tingleff, Chan, and Bernstein, Petitioner has failed to demonstrate that the skilled artisan would have combined Yamawaki, Chan, and Bernstein. Prelim. Resp. 56–59. As discussed above, we are unpersuaded by Patent Owner's arguments with respect to the combination of Smith, Chan, and Bernstein.

Patent Owner additionally contends that “Saubolle is a completely non-analogous device, based on using a ‘threshold detector’ to sense a binary alert when the rate of pressure change has grown too high.” Prelim. Resp. 59–60 (citing Ex. 1011, code (57)) (emphasis omitted); *see also id.* at 60 (arguing, “Saubolle is not an analogous reference nor reasonably pertinent, and [Petitioner]’s conclusory statements to the contrary do not meet its burden of proof” (citing Pet. 70) (emphasis omitted)). Patent Owner further argues that Saubolle does not need digital conversion and, moreover, Saubolle teaches away from being combined with Yamawaki, Chan, and Bernstein because it “disparages a prior art ‘digital’ system as ‘complex,’ and unfavorabl[e] compared to its ‘surprisingly simple’ solution.” *Id.* at 60 (citing Ex. 1011, Fig. 3, code (57), 1:43–53, 2:15–21).

Prior art is analogous if it is (1) from the same field of endeavor as that of the challenged patent regardless of the problem addressed, or (2) “reasonably pertinent to the particular problem with which the inventor is involved.” *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). Here,

Petitioner avers that Saubolle is in the “field of systems for monitoring movement, such as velocity and/or angular position, and would have been reasonably pertinent to problems facing the inventors.” Pet. 70 (citing Ex. 1002 ¶ 204). Saubolle reasonably supports Petitioner’s position regarding its field of endeavor because it relates to “monitoring the rate of ascent of divers or similar applications.” Ex. 1011, 1:5–6. Similarly, the ’648 patent purports to be in the field of “motion measurement.” Ex. 1001, 1:11–16.

As for Patent Owner’s argument that Saubolle has no need for digital conversion, Petitioner proposes modifying Yamawaki, not Saubolle. *See* Pet. 68–72. Furthermore, Saubolle’s discussion of one prior-art “relatively complex digital counter circuit” relates to that specific prior art, rather than to digital circuits or systems more generally. *See* Ex. 1011, 1:43–53. Describing one specific prior-art solution as “relatively complex” does not amount to a criticism, discrediting, or discouraging that would amount to teaching away from the claimed invention. *See DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (“A reference does not teach away[. . . if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.”).

5. Patent Owner’s Remaining Arguments

Patent Owner’s remaining arguments directed to Petitioner’s challenges more generally allege that “[t]he Petition is entirely founded on impermissible hindsight” (Prelim. Resp. 9–13 (emphasis omitted)), and “[t]he Petition and Declaration [of Dr. Young] present no more than attorney argument” and conclusory statements (*id.* at 13–17 (emphasis omitted)).

Regarding impermissible hindsight, Patent Owner asserts that Petitioner “relies heavily on the disclosures of the ’648 Patent to explain its allegations of obviousness, improperly using [Patent Owner]’s own patent disclosure against its allowed claims.” Prelim. Resp. 10. However, as discussed above, Petitioner does not rely solely on knowledge gleaned from the ’648 patent’s Specification, but also on teachings of the asserted art and other cited references. *See* Pet. 15–18; *McLaughlin*, 443 F.2d at 1395 (“Any judgment on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant’s disclosure, such a reconstruction is proper.”).

Additionally, based on our review of the Petition and Dr. Young’s Declaration, we disagree with Patent Owner that we should not accord the declaration any weight because “the opinions of Dr. Young are merely attorney argument from the Petition affixed with the signature and CV of Dr. Young,” or because Dr. Young’s testimony is “copied in large part verbatim from the Petition.” *See* Prelim. Resp. 15–16. Instead, the Petition cites Dr. Young’s testimony as evidence to support the contentions in the Petition, and any overlap or similarity results from the Petition citing Dr. Young’s Declaration without any deviation from the matters to which Dr. Young testifies. Furthermore, as also discussed above, the Petition and Dr. Young’s Declaration include detailed explanations and analyses that are well-supported by the prior art of record. *See Xerox*, Paper 9 at 15 (the critical inquiry is whether a declaration is conclusory and unsupported and whether it discloses underlying facts or data on which the opinion is based)

(quoting 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”)). If declaration testimony is supported sufficiently and, in turn, supports contentions in the Petition, we do not give it little to no weight simply because it is repeated in the Petition.

IV. CONCLUSION

Based on the current record, we determine Petitioner has shown a reasonable likelihood that it will prevail in establishing that at least one claim of the '648 patent is unpatentable. Accordingly, we institute review of all claims challenged on all of the grounds in the Petition. *See* 37 C.F.R. § 42.108(a); Consolidated Trial Practice Guide 64.

At this stage of the proceeding, the Board has not made a final determination as to the patentability of any challenged claim. Our view with regard to any conclusion reached in the foregoing analysis could change upon completion of the record.

V. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314, an *inter partes* review is hereby instituted as to claims 1 and 4 of the '648 patent based on the unpatentability challenges presented 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 commencing on the entry date of this decision.

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