
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLIED MATERIALS, INC., INTEL CORPORATION,¹ and
SAMSUNG ELECTRONICS CO., LTD.²
Petitioner,

v.

DEMARAY LLC,
Patent Owner.

IPR2021-00103
Patent 7,544,276 B2

Before CHRISTOPHER L. CRUMBLEY, KRISTINA M. KALAN, and
KIMBERLY McGRAW, *Administrative Patent Judges*.

KALAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

¹ Intel Corporation was joined as a petitioner to this proceeding based on a petition and motion for joinder filed in IPR2021-01030.

² Samsung Electronics Co., Ltd. was joined as a petitioner to this proceeding based on a petition and motion for joinder filed in IPR2021- 01090.

I. INTRODUCTION

Applied Materials, Inc. (“Applied Materials”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–13 of U.S. Patent No. 7,544,276 B2 (Ex. 1001, “the ’276 patent”). Demaray LLC (“Patent Owner”) filed a Preliminary Response to the Petition (Paper 8). Pursuant to our authorization (Paper 9), Applied Materials filed a Reply (Paper 10), and Patent Owner filed a Sur-Reply (Paper 12). Applied Materials also filed a Petitioner’s Notice Regarding Multiple Petitions (Paper 2) to which Patent Owner filed a Response (Paper 7).

We instituted an *inter partes* review of claims 1–13 of the ’276 patent on the grounds of unpatentability alleged in the Petition. Paper 13 (“Dec.”). After institution of trial, Patent Owner filed a Patent Owner Response. Paper 29 (“PO Resp.”). Intel Corporation (“Intel”) and Samsung Electronics Co., Ltd (“Samsung”) were then joined as petitioners. *See* Paper 31 (Intel); Paper 37 (Samsung). Applied Materials, Intel, and Samsung are collectively referred to as “Petitioner” in this Decision. Applied Materials filed a Reply. Paper 38 (“Reply”). Patent Owner filed a Sur-Reply. Paper 45 (“Sur-Reply”). An oral hearing was held on February 9, 2022, with IPR2021-00104, which challenges U.S. Patent No. 7,3381, 657 B2. A transcript of the hearing is included in the record. Paper 50 (“Tr.”).

This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has not shown by a preponderance of the evidence that claims 1–13 of the ’276 patent are unpatentable.

A. Related Proceedings

Patent Owner identifies IPR2021-00104, which challenges U.S. Patent No. 7,381,657 B2, as a related matter. Paper 6, 1.

The parties also identify *Demaray LLC v. Samsung Electronics Co., Ltd.*, No. 6-20-cv-00636 (W.D. Tex.) (“Samsung Litigation”); *Demaray LLC v. Intel Corporation*, No. 6-20-cv-00634 (W.D. Tex.) (“Intel Litigation”); and *Applied Materials, Inc. v. Demaray LLC*, No. 5-20-cv-05676 (N.D. Cal.) (“California Litigation”) as related matters. Pet. 1; Paper 6, 1. Each of these proceedings involves the ’276 patent. *Id.*

B. Real Parties-In-Interest

Applied Materials identifies Intel Corporation, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung Semiconductor, Inc., Samsung Austin Semiconductor, LLC, and itself as real parties-in-interest. Pet. 1. Patent Owner identifies itself as the real party-in-interest. Paper 6, 1.

C. The ’276 Patent

The ’276 patent, titled “Biased Pulse DC Reactive Sputtering of Oxide Films,” relates to “deposition of oxide and oxynitride films and, in particular, to deposition of oxide and oxynitride films by pulsed DC reactive sputtering.” Ex. 1001, code (54), 1:12–14. The ’276 patent discloses that typically, radio frequency (“RF”) sputtering has been used for deposition of oxide dielectric films, but arcing can occur between sputtering target tiles used to make such films, which causes contamination of the deposited films. *Id.* at 2:25–30. The ’276 patent further states that reactors for RF sputtering, particularly their power systems, are complicated. *Id.* at 2:30–38. The ’276 patent discloses that reactive DC magnetron sputtering of nonconductive

oxides “is done rarely” because insulating surfaces accumulate charge during deposition and result in arcing, which “can damage the power supply, produce particles and degrade the properties of deposited oxide films.” *Id.* at 4:44–52.

Figure 1A of the '276 patent is reproduced below.

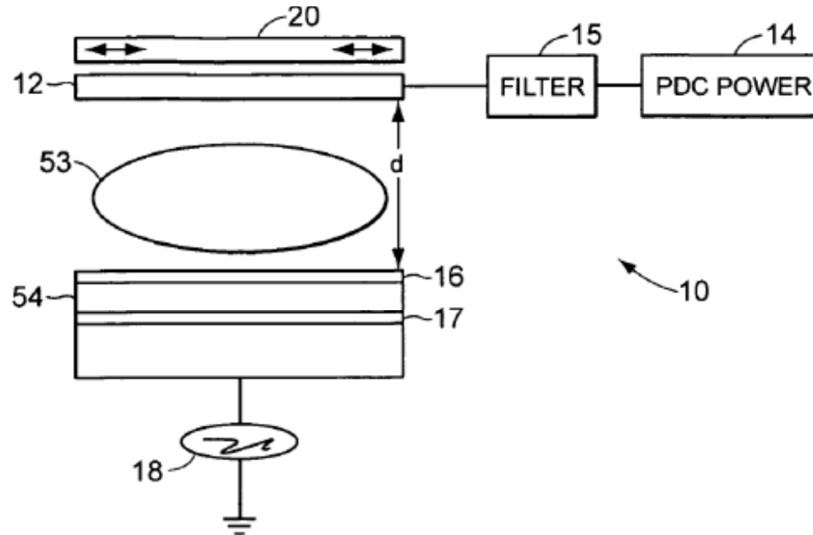


FIG. 1A

Figure 1A depicts a pulsed DC sputtering reactor. *Id.* at 3:26–27. The '276 patent describes reactor apparatus 10 for sputtering of material from target 12. *Id.* at 5:7–9. Magnet 20 is scanned across the top of target 12, which reduces local erosion of target 12 during sputtering. *Id.* at 5:28–29, 8:47–55. Substrate 16 is opposite and parallel to target 12. *Id.* at 5:23–24. Substrate 16 is capacitively coupled to electrode 17 via insulator 54. *Id.* at 5:26–27. Electrode 17 can be coupled to RF power supply 18. *Id.* at 5:27–28. The '276 patent explains that columnar structures in a deposited film can be detrimental for optical wave guide applications, but applying an RF bias on substrate 16 during deposition can substantially eliminate columnar structures. *Id.* at 5:60–67. The '276 patent discloses that target 12

functions as a cathode when power is applied to it, which creates plasma 53. *Id.* at 5:24–26.

Target 12 is electrically coupled through filter 15 to pulsed DC power supply 14. *Id.* at 5:19–20. The '276 patent discloses that the polarity of the power supplied to target 12 by the pulsed DC power supply 14 oscillates between negative and positive potentials. *Id.* at 5:30–33. According to the '276 patent, the insulating layer on the surface of target 12 discharges during the positive period, which prevents arcing. *Id.* at 5:33–35. The '276 patent discloses that the pulsing frequency must exceed a critical frequency, which depends on a target material, cathode current, and reverse time. *Id.* at 5:35–37.

Reactor apparatus 10 further includes filter 15, which prevents RF power supply 18 from coupling into pulsed DC power supply 14. *Id.* at 5:50–51. According to the '276 patent, filter 15 can be a 2 MHz band rejection filter when a 2 MHz power supply is used for RF power supply 18. *Id.* at 5:51–55. The '276 patent discloses that “the band width of the filter 15 can be approximately 100 kHz.” *Id.* at 5:55–57.

D. Illustrative Claim

Claims 1 and 6 of the '276 patent are independent. Claim 1 is representative and is reproduced below:

- 1[a]. A reactor according to the present invention, comprising:
 - 1[b] a target area for receiving a target;
 - 1[c] a substrate area opposite the target area for receiving a substrate;
 - 1[d] a pulsed DC power supply coupled to the target area, the pulsed DC power supply providing alternating negative and positive voltages to the target;
 - 1[e] an RF bias power supply coupled to the substrate; and

1[f] a narrow band-rejection filter that rejects at a frequency of the [RF]³ bias power supply coupled between the pulsed DC power supply and the target area.

Ex. 1001, 22:40–50 (showing Petitioner’s annotations and bracketing);

Ex. 3001, 1.

E. Instituted Grounds of Unpatentability

We instituted *inter partes* review of claims 1–13 of the ’276 patent on the following grounds:

References	Basis §	Claim(s) Challenged
Barber, ⁴ Hirose ⁵	103(a) ⁶	1–3, 6–8
Barber, Hirose, Aokura ⁷	103(a)	4, 5
Barber, Hirose, Yamazaki ⁸	103(a)	9
Barber, Hirose, Dogheche ⁹	103(a)	9, 10

³ A Certificate of Correction issued for this patent on December 3, 2019, changing “RE” to “RF” in claim 1, col. 22 l. 49. Ex. 3001, 1.

⁴ US 6,342,134 B1, issued Jan. 29, 2002 (Ex. 1005).

⁵ US 6,485,602 B2, issued Nov. 26, 2002 (Ex. 1006).

⁶ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. § 103. Because the ’276 patent has an effective filing date prior to the effective date of the applicable AIA amendments, we refer to the pre-AIA version of § 103.

⁷ JP H10102247 A, published Apr. 21, 1998 (Ex. 1068) (English translation (pp. 1–12); Verified Statement of Translation (p. 13); Japanese language document (pp. 14–24)).

⁸ US 6,657,260 B2, issued Dec. 2, 2003 (Ex. 1046).

⁹ E. Dogheche, *Growth and optical characterization of aluminum nitride thin films deposited on silicon by radio-frequency sputtering*, Appl. Phys. Lett. 74, 1209 (1999) (Ex. 1029).

References	Basis §	Claim(s) Challenged
Barber, Hirose, Sproul ¹⁰	103(a)	11, 12
Barber, Hirose, Laird ¹¹	103(a)	11, 13
Barber, Hirose, Segal ¹²	103(a)	11–13
Barber, Hirose, Belkind ¹³	103(a)	1–3, 6–8
Barber, Hirose, Belkind, Aokura	103(a)	4, 5
Barber, Hirose, Belkind, Yamazaki	103(a)	9
Barber, Hirose, Belkind, Dogheche	103(a)	9, 10
Barber, Hirose, Belkind, Sproul	103(a)	11, 12
Barber, Hirose, Belkind, Laird	103(a)	11, 13
Barber, Hirose, Belkind, Segal	103(a)	11–13

Petitioner relies on the declarations of Dr. Vivek Subramanian (Ex. 1002; Ex. 1108) and Dr. Ingrid Hsieh-Yee (Ex. 1042). Patent Owner relies on the declarations of Dr. Alexander Glew (Ex. 2002; Ex. 2009), Dr. HongMei Zhang (Ex. 2019), and Dr. Rajiv Pethe (Ex. 2020).

¹⁰ W. Sproul, *High-rate reactive DC magnetron sputtering of oxide and nitride superlattice coatings*, Elsevier Science Ltd. 51, 641 (1998) (Ex. 1036).

¹¹ US 2001/0041252 A1, published Nov. 15, 2001 (Ex. 1034).

¹² US 2001/0047838 A1, published Dec. 6, 2001 (Ex. 1069).

¹³ A. Belkind et al., *Pulsed-DC Reactive Sputtering of Dielectrics: Pulsing Parameter Effects*, Society of Vacuum Coaters, 43rd Annual Technical Conference Proceedings, 86 (2000) (Ex. 1008).

II. ANALYSIS

A. *Legal Standards*

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015); *see also In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1375–78 (Fed. Cir. 2016) (discussing the burden of proof in *inter partes* review proceedings). Petitioner must demonstrate unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d); *see also Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). A petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *Magnum Oil*, 829 F.3d at 1380.

A claim is unpatentable under 35 U.S.C. § 103(a) 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 of ordinary skill in the art at the time the invention was made. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). Obviousness is resolved based on underlying factual determinations, including: (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) when in evidence, objective

evidence of nonobviousness, i.e., secondary considerations.¹⁴ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). “An obviousness determination requires finding both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *CRFD Research, Inc. v. Matal*, 876 F.3d 1330, 1340 (Fed. Cir. 2017) (quoting *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1366 (Fed. Cir. 2016)).

B. Level of Ordinary Skill in the Art

Petitioner argues:

A person of ordinary skill in the art (“POSITA”) would have had, at the time of the ’276 patent (March 2002): a Master’s degree in Electrical Engineering or Material Science (or an equivalent subject) plus at least two years of relevant experience, or a Bachelor’s degree in Electrical Engineering or Material Science (or an equivalent subject) plus at least four years of relevant experience. More education can substitute for practical experience, and vice versa and “relevant experience,” in the context of the ’276 patent, refers to experience with sputtering deposition of films on substrates.

Pet. 9 (citing Ex. 1001, 1:10–14, 2:45–47; Ex. 1002 ¶¶ 18–19). In our Institution Decision, we adopted Petitioner’s proposal regarding the level of one of ordinary skill in the art, except that we deleted the qualifier “at least” to eliminate vagueness as to the appropriate amount of relevant experience. Inst. Dec. 10.

¹⁴ Because we determine Petitioner has not sufficiently shown the challenged claims would have been obvious, we do not reach Patent Owner’s asserted objective evidence of non-obviousness. PO Resp. 70–72.

Patent Owner does not appear to dispute this definition. *See generally* PO Resp. Neither party argues that the outcome of this case would differ based on our adoption of any particular definition of one of ordinary skill in the art. Accordingly, we retain our modified adoption of Petitioner’s definition. We further note that the prior art itself demonstrates the level of skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that “specific findings on the level of skill in the art . . . [are not required] ‘where the prior art itself reflects an appropriate level and a need for testimony is not shown’” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))).

C. Claim Construction

We apply the claim construction standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2019). 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.” *Id.* at 1313. Only terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner does not assert a claim construction for any term of the challenged claims. Pet. 11–12. Patent Owner addresses the terms “a narrow band-rejection filter that rejects at a frequency of the RF bias power supply,” and “a narrow band rejection filter operating at a frequency of the RF bias power supply.” PO Resp. 9. Patent Owner argues that these terms “should

be construed according to their plain and ordinary meaning, which the parties to the litigation agree requires the claimed filter to have a rejection band set at a frequency of the RF bias power supply.” *Id.* More particularly, Patent Owner argues that a “POSITA would not understand the claim term “narrow band-rejection filter that rejects/operating at a frequency of the RF bias power supply” to encompass a filter whose pertinent operating frequency is materially offset from the RF bias frequency by design.” *Id.* at 11. Petitioner “disputes PO’s suggestion of ‘agree[ment] (EX 2022, 10)” but argues that Patent Owner’s “positions are not dispositive because they do not distinguish the prior art.” Reply 1.

On the full record now before us, we determine it is not necessary to construe any claim term expressly, because resolution of the present dispute does not turn on whether the frequency of the RF bias power supply is the same as, or offset from, the frequency at which the filter operates. *Vivid Techs.*, 200 F.3d at 803; *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in an *inter partes* review).

D. Principal Asserted Prior Art

Petitioner asserts fourteen grounds relying on ten different references. *See* Pet. 3–5. Each of Petitioner’s grounds, however, relies on two principal prior art references—Barber and Hirose, which are addressed below. *Id.* Other than Hirose, Patent Owner does not challenge the prior art status of any of the asserted references. *See* PO Resp. 11–41 (asserting that Hirose does not qualify as pre-AIA § 102(e) prior art to the challenged claims).

1. Barber

Barber is a patent titled “Method for Producing Piezoelectric Films with Rotating Magnetron Sputtering System.” Ex. 1005, code (54).

Barber’s Figure 2 is reproduced below.

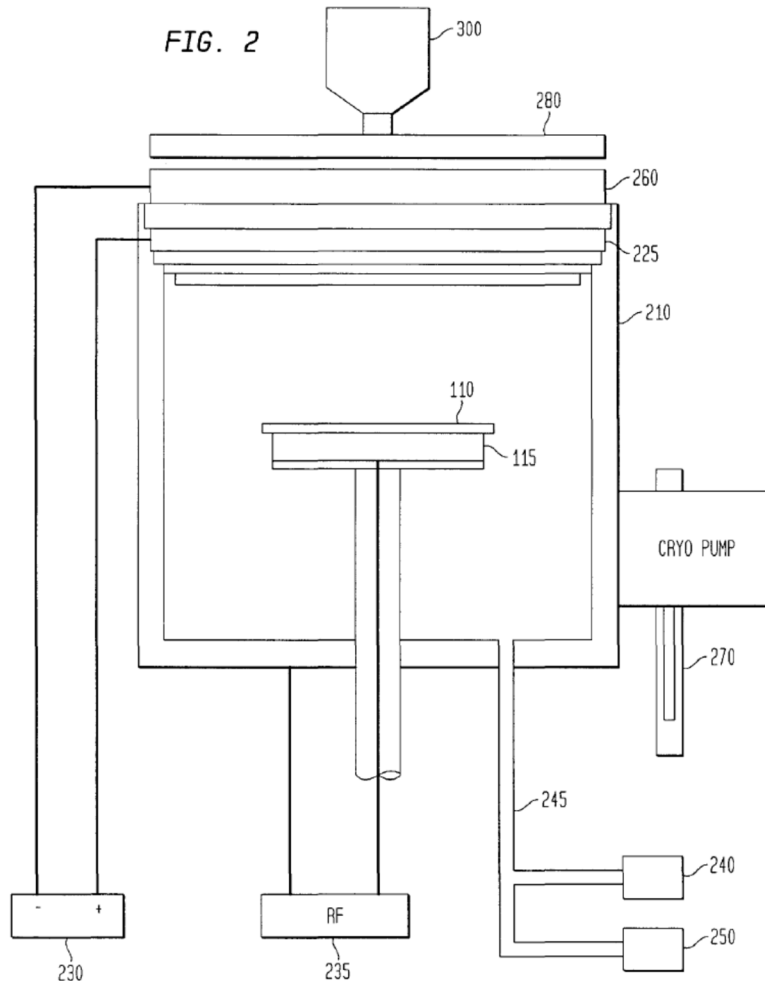


Figure 2 is a schematic diagram of a reactive sputtering arrangement. *Id.* at 3:22–24. The arrangement includes chamber 210 and a pair of electrodes (target 260 and anode ring 225) within the chamber. *Id.* at 6:4–6. Barber discloses that an “electric potential applied to the electrodes may be controlled by a pulsed DC power source 230 or other suitable source.” *Id.* at 6:6–8. First flow control source 240 provides noble gases to chamber 210 and second flow control source 250 provides a reactive gas to chamber 210.

Id. at 6:9–12. Substrate 110 is positioned within chamber 210 adjacent to rotating magnet assembly 280. *Id.* at 6:14–18. Barber discloses RF power supply 235 to apply a bias voltage to substrate platen 115 to control tensile film stress. *Id.* at 6:29–31. Barber further describes using a cross-over curve to optimize its reactive sputtering deposition process. *Id.* at 7:2–5. Specifically, Barber discloses introducing noble gas into its chamber and then introducing reactive gas incrementally so the flow rate of the reactive gas is a rate corresponding substantially to, but greater than, the flow rate for a cross-over point between producing a metallic film and an insulator. *Id.* at 7:17–29.

2. *Hirose*

Hirose is a patent titled “Plasma Processing Apparatus.” Ex. 1006, code (54). Hirose “relates to a plasma processing apparatus capable of suppressing a damage due to sputtering to a wall surface of a processing chamber during plasma occurrence.” *Id.* at 1:14–17. Hirose discloses a conventional plasma processing apparatus that applies high-frequency power with two types of frequency. *Id.* at 1:19–23. Hirose teaches that simultaneously applying two types of high-frequency power decreases an effective ground area to one electrode in comparison to when a single frequency is used, and this causes sputter rate to increase for the ground area and results in more damage to the wall of a processing chamber. *Id.* at 2:1–9.

Hirose’s Figure 1 is reproduced below.

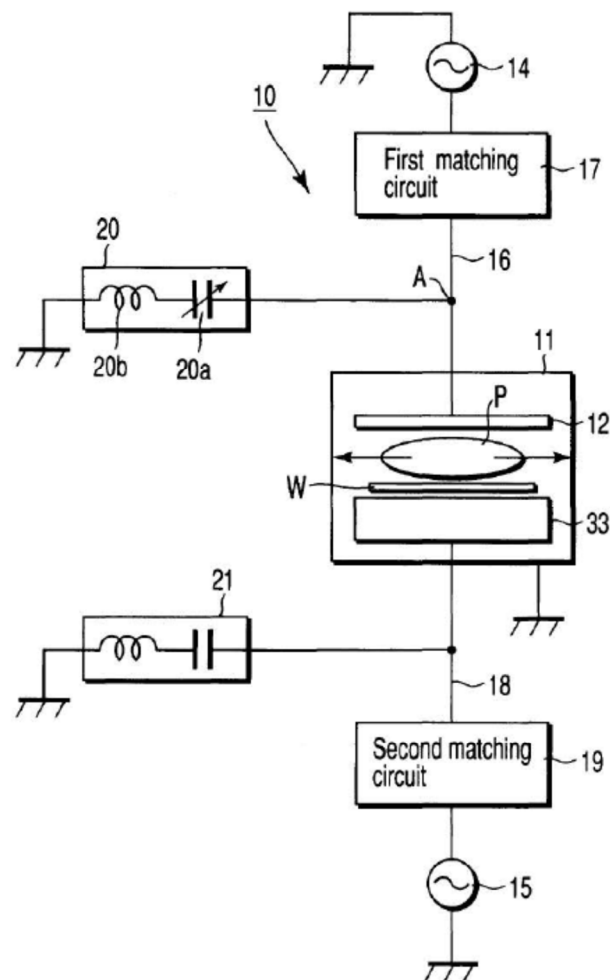


FIG. 1

Figure 1 is a configuration chart showing an embodiment of a plasma processing apparatus. *Id.* at 3:1–3. Hirose describes plasma processing apparatus 10 that includes processing chamber 11, upper electrode 12, and lower electrode 13.¹⁵ *Id.* at 3:45–51. Hirose discloses that lower

¹⁵ Hirose discloses lower electrode 13 for the embodiment depicted in Figure 1. Ex. 1006, 3:50. However, Figure 1 does not include reference numeral 13. The embodiment depicted in Figure 7 includes lower electrode 33. *Id.* at 6:29. Therefore, Figure 1's reference numeral 33 may be a typographical error and represent the lower electrode 13.

electrode 13 functions as a mount for a processing object, such as a semiconductor wafer. *Id.* at 3:56–58. Upper electrode 12 is connected to first high-frequency power supply 14 and lower electrode 13 is connected to second high-frequency power supply 15. *Id.* at 3:51–56. Hirose discloses that first high-frequency power supply 14 may apply, for example, 60 MHz power to upper electrode 12, and second high-frequency power supply 15 may apply, for example, 2 MHz power to lower electrode 13. *Id.* at 3:59–60, 3:64–65.

Hirose describes first filter circuit 20 and second filter circuit 21. *Id.* at 4:9–11. First filter circuit 20 includes an inductor-capacitor (LC) resonant circuit with a varying circuit constant. *Id.* at 4:11–13. Hirose states that “[t]he LC series resonant circuit selectively filters a high-frequency current output from the second high-frequency power supply 15 for preventing the current from reaching the first high-frequency power supply 14.” *Id.* at 4:13–16. Hirose also discloses that second filter circuit 21 prevents high-frequency current from first high-frequency power supply 14 from reaching second high-frequency power supply 15. *Id.* at 4:18–21.

Hirose describes how to set the circuit constant of first filter circuit 20. *Id.* at 4:39–40. First and second high-frequency power supplies 14, 15 apply power to upper electrode 12 and lower electrode 13, respectively, and a capacitor capacity of first filter circuit 20 is varied by measuring a voltage waveform. *Id.* at 4:42–47. Hirose teaches that when first and second high-frequency power supplies 14, 15 provide power at respective frequencies of 60 MHz and 2 MHz, a capacitor capacity of 2500 pF for first filter circuit 20 provides an optimum resonance point. *Id.* at 4:51–57, 5:1–3. This effect is depicted in Hirose’s Figure 6, which is reproduced below.

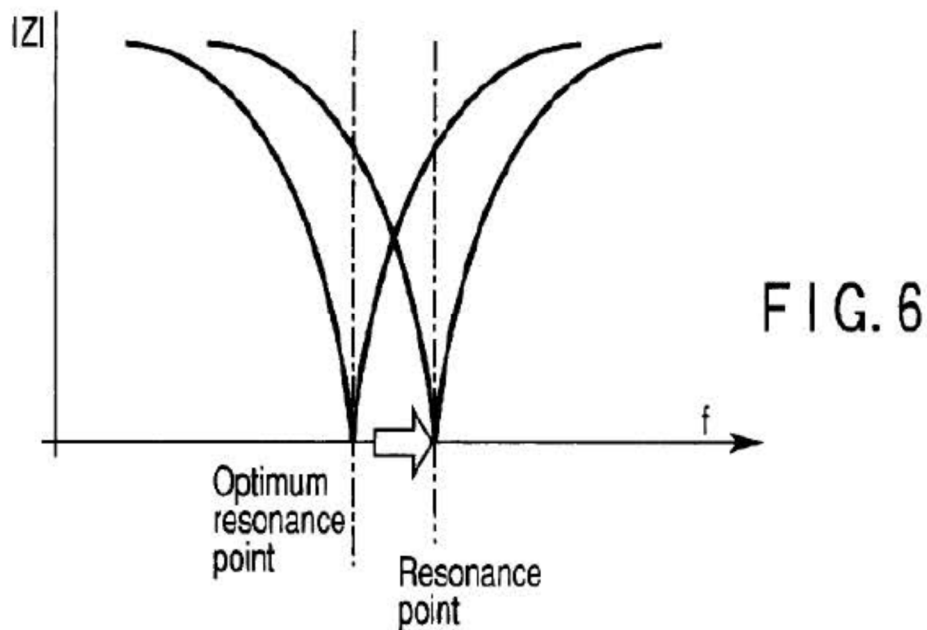


Figure 6 “shows a decrease in the sputter rate.” *Id.* at 3:24. Hirose is concerned with sputtering the chamber wall of its device, and examines the relationship between the sputter rate and the capacitor capacity. *Id.* at 2:1–10, 5:3–6, 5:11–12. Hirose determines that a capacitor capacity of 2000 pF for first filter circuit 20 “greatly decreases the sputter rate” compared to a capacitor capacity of 2500 pF, and first filter circuit 20 with a capacitor capacity of “2000 pF is superior to the optimally resonant filter circuit” with 2500 pF. *Id.* at 5:49–52, 5:58–62. Comparing first filter circuit 20 with a capacitor capacity of 2000 pF with first filter circuit 20 with a capacitor capacity of 2500 pF, “the former is slightly inferior to the latter with respect to the resonance phenomenon.” *Id.* at 5:61–62.

E. Hirose as Prior Art

The parties dispute whether Hirose qualifies as prior art to the '276 patent. Petitioner, who bears the burden to show Hirose is prior art, asserts that Hirose qualifies as prior art under pre-AIA 35 U.S.C. § 102(e) because

Hirose's filing date of July 18, 2001 is before the March 16, 2002 filing date of the '276 patent. *See* Pet. 5.

Patent Owner responds that Hirose does not qualify as prior art to the '276 patent because the inventors of the '276 patent conceived and reduced to practice the '276 invention on or before Hirose's filing date of July 18, 2001, likely as early as June 13, 2001. PO Resp. 12.

An inventor may antedate a § 102(e) reference by showing that the invention was conceived before the effective date of the reference, followed by reasonably continuous diligence until the constructive reduction to practice. *Monsanto Co. v. Mycogen Plant Sci., Inc.*, 261 F.3d 1356, 1362 (Fed. Cir. 2001).

Petitioner met its burden of production to demonstrate that Hirose, which has a filing date prior to the filing date of the '276 patent, was prior art by asserting Hirose was prior art under § 102(e). *See Dynamic Drinkware*, 800 F.3d at 1379. Hirose's earlier filing date shifts the burden of production to Patent Owner to produce evidence supporting a date of invention before Hirose's filing date. *See id.* With its Response, Patent Owner presented evidence it contends shows a date of conception prior to July 18, 2001, followed by reasonably continuous diligence. PO Resp. 11–41.

For the purposes of this decision, we do not determine whether Hirose qualifies as prior art to claims 1–13, because, as explained below, even if Hirose qualifies as prior art, Petitioner has not sufficiently shown that any of the asserted claims would have been obvious over the grounds asserting Hirose.

F. Asserted Obviousness based on Barber and Hirose

All of Petitioner's asserted grounds are based wholly or in part on the combination of Barber and Hirose. Pet. 3–5. In Ground 1, encompassing both independent claims 1 and 6, Petitioner argues that claims 1–3 and 6–8 are unpatentable as obvious over the combined disclosures of Barber and Hirose. Pet. 13–44. Patent Owner challenges certain aspects of Petitioner's grounds based on Barber and Hirose. PO Resp. 41–72. Our analysis of Ground 1, below, discusses issues that affect every ground in the Petition.

1. Petitioner's Challenge

Petitioner argues that every element of claim 1 is found in the combination of Barber and Hirose, as set forth below. Pet. 13–36.

a) 1[a] A reactor according to the present invention, comprising:

Petitioner contends that Barber discloses claim 1's preamble. Pet. 13–15 (citing Ex. 1005, code (57), Fig. 2; Ex. 1002 ¶¶ 56–58).¹⁶

b) 1[b] a target area for receiving a target;

Petitioner asserts that “*Barber* discloses that a target material 260 is positioned within chamber 210 and is ‘mounted adjacent a rotating magnet assembly 280.’” Pet. 15 (citing Ex. 1005, 6:14–18, Fig. 2; Ex. 1002 ¶ 59). Petitioner contends that the area associated with target 260, including the region that receives target 260, meets the claimed “target area for receiving the target,” comparing Barber's target configuration with that disclosed by the '276 patent. *Id.* at 15–17 (citing Ex. 1005, Fig. 2; Ex. 1002 ¶ 59; Ex. 1001, Figs. 1B, 2).

¹⁶ We do not express any opinion on whether the preamble is limiting.

c) 1[c] a substrate area opposite the target area for receiving a substrate;

Petitioner argues that Barber discloses substrate 110 that is positioned on substrate platen 115 opposite from Barber's target 260. Pet. 17 (citing Ex. 1005, 6:15–17, 6:29–31, Fig. 2). Petitioner further compares Barber's configuration with that disclosed by the '276 patent. *Id.* at 18–19 (citing Ex. 1005, Fig. 2; Ex. 1002 ¶ 60; Ex. 1001, Fig. 1B).

d) 1[d] a pulsed DC power supply coupled to the target area, the pulsed DC power supply providing alternating negative and positive voltages to the target;

Petitioner asserts that Barber discloses pulsed DC power source 230 that applies a bias across target 260 and anode ring 225, and that one of ordinary skill in the art would have understood that the target area is coupled to the pulsed-DC power source because the pulsed-DC bias is applied to target 260. Pet. 20 (citing Ex. 1005, 6:6–11, 7:30–34, 8:49–52; Ex. 1002 ¶¶ 61–71). Petitioner argues that Barber discloses providing positive DC pulses to target 260 at a pulse frequency, and that Barber's reference to "reverse-bias pulse width" refers to the pulse of a positive bias. *Id.* at 20–21 (citing Ex. 1005, 2:21–26, 7:14–17, 8:45–48, 8:66–9:3, 9:6–11, 9:17–22, 9:48–53; Ex. 1002 ¶ 63). According to Petitioner, one of ordinary skill in the art would have also understood that Barber's pulsed DC power supply "necessarily provides a negative bias to the target such that the voltage on target 260 alternates between negative and positive voltages," because a negative bias must be applied to the target at times for the sputtering process to operate. *Id.* at 21–22 (citing Ex. 1002 ¶¶ 65–66).

e) 1[e] an RF bias power supply coupled to the substrate; and

Petitioner contends that Barber discloses RF power supply 235 that applies a bias voltage to substrate platen 115, which supports substrate 110, and that the bias is used to control the tensile stress of a deposited film.

Pet. 23–24 (citing Ex. 1005, 6:29–31, 9:12, Fig. 2; Ex. 1002 ¶ 72).

f) 1[f] a narrow band-rejection filter that rejects at a frequency of the RF bias power supply coupled between the pulsed DC power supply and the target area.

Petitioner asserts that Barber teaches “that electrical characteristics of its pulsed DC power supply should be monitored or adjusted ‘to achieve a stable waveform.’” Pet. 24 (citing Ex. 1005, 7:59–60, 8:66–9:2; Ex. 1002 ¶¶ 73–100). Petitioner argues that one of ordinary skill in the art would have understood that Barber’s pulsed DC supply 230 and RF supply 235 operate at different frequencies. *Id.* at 25 (citing Ex. 1005, 6:29–31, 8:45–48, 9:12; Ex. 1002 ¶¶ 75–76).

Petitioner admits that Barber does not disclose any filter. *Id.* Petitioner contends that although Barber “does not expressly disclose ‘a narrow band-rejection filter that rejects at a frequency of the [RF] bias power supply coupled between the pulsed DC power supply and the target area,’” one of ordinary skill in the art “would have been aware of the benefits of filters in plasma systems/processes to block interference/current of one power supply from another power supply, and thus such knowledge would have been in the mind of such a skilled person when considering implementing *Barber’s* system/processes.” *Id.* (citing Ex. 1002 ¶¶ 75–77).

Petitioner argues that Hirose discloses a plasma processing apparatus that includes chamber 11, two power supplies 14 and 15 having different frequencies, and filters 20 and 21, where first filter circuit 20 placed between

power supply 14 and upper electrode 12 selectively filters “a high-frequency current output from the second high-frequency power supply 15 for preventing the current from reaching the first high-frequency power supply 14.” *Id.* at 25–27 (citing Ex. 1006, 3:45–4:38, 4:9–16, code (57), Fig. 1; Ex. 1002 ¶ 78). Petitioner asserts that one of ordinary skill in the art “would have understood that *Hirose*’s disclosed filters are well-known band-rejection filters,” which operate “like a narrow band-rejection filter (aka notch filter).” *Id.* at 27–29 (citing Ex. 1002 ¶¶ 81–82; Ex. 1006, 4:9–16, 5:7–10, 8:34–38, Fig. 6; Ex. 1013, 4–6 (Fig. 2–9(F))).

g) Reasons to Combine

Because Petitioner asserts that Barber alone discloses or teaches all of the limitations of claim 1[a]–1[e], Petitioner’s reasons to combine focus on claim 1[f], having to do with the claimed “narrow-band rejection filter that rejects at a frequency of the RF bias power supply coupled between the pulsed DC power supply and the target area.” Pet. 24–36. First, Petitioner argues that one of ordinary skill in the art would have found it obvious to modify Barber’s system “to incorporate a narrow-band rejection filter” because Hirose’s arrangement is similar to Barber’s arrangement (Pet. 29–30), and one of ordinary skill in the art “would have appreciated *Hirose*’s guidance concerning the benefits of filters to block electrical current of a remote power supply in plasma process systems, like that disclosed in *Barber*.” *Id.* (citing Ex. 1002 ¶¶ 82–84; Ex. 1005, Fig. 2; Ex. 1006, code (57), 1:44–67, Fig. 1). Petitioner asserts that narrow band-rejection filters (“NBRFs”) were known, and refers to “design concepts known at the time” to argue that one of ordinary skill in the art “would have had the capability and knowledge to configure and implement such a filter in *Barber*’s system

with an expectation that it would achieve the purpose of filtering the appropriate RF frequency signal from RF power supply 235.” *Id.* at 31 (citing Ex. 1002 ¶¶ 87–88). According to Petitioner, choosing “to reject a specific frequency (or narrow band of frequencies) depending on the bandwidth of the RF power supply 235 selected in *Barber’s* system would have been a known way to achieve the benefits discussed above by *Hirose* and known at the time.” *Id.* at 31–32 (citing Ex. 1002, ¶ 89; Ex. 1006, Figs. 1, 6; Ex. 1023, 7:51–61). Petitioner discusses numerous additional references to demonstrate the general knowledge of a skilled artisan (*id.* at 32–35) before concluding that one of ordinary skill in the art “would have been motivated to implement a narrow band-rejection filter” “between the pulse DC power supply 230 and target 260 to prevent the RF power provided by the selected RF power supply 235 from damaging DC supply 230,” while also “reducing interference, so that a stable waveform is provided to achieve optimal film deposition.” *Id.* at 35 (citing Ex. 1002 ¶ 98; Ex. 1005, 7:59–60, 8:66–9:2; Ex. 1006, Figs. 2–3, 3:4–10, 4:57–61).

h) Claim 6

Claim 6, the only other independent claim in the ’276 patent, bears many similarities to claim 1. Ex. 1001, 22:60–23:9. Petitioner presents arguments directed to claim 6, referencing its arguments made in connection with claim 1. Pet. 38–43. Notably, Petitioner argues that the combination of *Barber* and *Hirose* discloses and/or suggests the claim 6 limitation of “a narrow band rejection filter operating at a frequency of the RF bias power supply coupled between the pulsed DC power supply and the target.” *Id.* at 41.

Petitioner relies on Barber alone to disclose the limitations of claim 6 not present in claim 1. Petitioner asserts that Barber discloses “a magnetic field generator supplying a magnetic field to the target” (Ex. 1001, 22:62–63) with its rotating magnet assembly 280 that produces a magnetic field to penetrate target 260. Pet. 39 (citing Ex. 1005, 2:27–50, 3:6–9, 3:21–23, 4:31–38, 5:67–6:2, 6:17–27, 7:1–14, Fig. 5; Ex. 1002 ¶ 107). Petitioner contends that Barber discloses “wherein a material is deposited on the substrate by exposure of the substrate to a plasma generated when pulsed DC power from the pulsed DC power supply is applied to the target in the presence of a process gas” (Ex. 1001, 23:6–9) because Barber’s pulsed DC power source 230 applies a bias across target 260 and anode ring 225 to ionize a noble gas to form a plasma, ions of the noble gas bombard target 260 to eject target material, and the freed target material reacts mostly at the target with a reactive gas to deposit a film on substrate 110. Pet. 42–43 (citing Ex. 1005, code (57), 1:15–19, 4:31–34, 6:42–46; Ex. 1002 ¶¶ 112–114).

i) Remaining Claims Challenged

Petitioner presents additional arguments directed to the dependent claims challenged under Ground 1, all of which inherit the filter limitations of claim 1 and claim 6. *Id.* at 36–38 (claims 2–3), 44 (claims 7–8). In Grounds 2–7, Petitioner relies on various additional references to teach limitations found in dependent claims 4, 5, and 9–13. Pet. 45–67.

In Grounds 8–14, Petitioner states that, to the extent Barber does not disclose “the claimed aspects involving a pulsed DC power supply coupled to the target area providing alternating negative and positive voltages to the target in claim elements 1[d] and 6[e],” Belkind does so. Pet. 67. Petitioner

does not appear to rely on Belkind for the filter limitations of claims 1 and 6. *Id.* at 67–72.

2. Patent Owner’s Arguments and Parties’ Counterarguments

Patent Owner argues that the Petition fails to demonstrate that any challenged claim is invalid based on Barber and Hirose, because none of the references discloses “a filter ‘coupled between the pulsed DC power supply and the target area’ and ‘that rejects [or operating] at a frequency of the RF bias power supply’ as required by all challenged claims.” PO Resp. 41–42. Patent Owner also argues that Petitioner has not demonstrated that one of ordinary skill in the art “would have incorporated the claimed type of filter in Barber’s system.” *Id.* at 42. Patent Owner also contends that there is no analysis by Petitioner on how much reduction in alleged electrical interference or increase in waveform stability a filter would have brought in Barber. *Id.* at 42–43.

a) Prior Art Does Not Disclose Filter as Claimed

Patent Owner argues that (1) neither Barber nor Hirose discloses a filter “between the pulsed DC power supply and the target area” and (2) the operating frequency of Hirose’s filter 20 is intentionally offset from the “frequency of the RF bias power supply” rather than “rejecting” or “operating at a frequency of the RF bias power supply.” PO Resp. 43–44. More particularly, Patent Owner argues that neither Barber nor Belkind discloses a filter in their reactor systems at all. *Id.* at 44. Hirose’s filter 20, contends Patent Owner, is connected to an RF power source 14 and an upper electrode 12. *Id.* Because Hirose’s upper electrode 12 is “admittedly not a target,” Patent Owner argues, “Hirose’s filter is not connected to either a pulsed DC power source” because Hirose’s power supplies are high-

frequency RF ones, “or a target” because no material is ejected from electrode 12 for deposition onto a substrate. *Id.* at 45.

b) POSITA Allegedly Would Not Have Included the Claimed Filter in Barber’s System

1. Prior Art Allegedly Never Suggested Combination

Patent Owner argues that “Petitioner does not point to any evidence in prior art that a POSITA would have been motivated to add a filter of any type between Barber’s type of pulsed DC power supply and the target area.” PO Resp. 49 (citing *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1364–66 (Fed. Cir. 2016) (rejecting argument that general knowledge of database searching by name or address would have made it obvious to add a search for a telephone number to the primary reference)). Patent Owner also argues that the “alleged general knowledge of filters’ benefits” is “insufficient to establish that it would have been obvious to use filters in Barber’s system, let alone the claimed narrow band-rejection filter.” *Id.* at 50. Patent Owner additionally argues that there is “no evidence that at the time of the invention a POSITA would have known to use a filter between pulsed DC power oscillating between negative and positive voltages and a target where an RF bias was also applied to a substrate, let alone the claimed narrow band-rejection filter.” *Id.*

Patent Owner presents its own summaries of the additional references relied on by Petitioner and Petitioner’s declarant, and argues that none of these references taught or suggested the use of the claimed filter with the claimed reactor system. PO Resp. 51–62 (raising issues with Exs. 1014 (Joo), 1017 (Quon), 1020 (Ohmi), 1016 (Celestino), 1019 (Hong), 1021 (Keller), 1018 (Johnson), 1010 (Licata), 1023 (Miller), 1013 (Gibilisco), 1057 (Sill), 1058 (Zennamo), and Exs. 1024–26, 1062, and 1067 (manuals

or datasheets)). Patent Owner notes that the manuals and datasheets do not say what type of RF filter to use, and that one of ordinary skill in the art “would interpret the referenced ‘ac blocking filter’ [in some of the cited references] as referring to low-pass filter that blocks out AC frequencies, as the name implies.” *Id.* at 58 (citing Ex. 2009 ¶¶ 20, 165). Patent Owner also criticizes Petitioner’s reliance on references regarding notch filters that relate to blocking RF harmonics or RF frequencies of a connected power source, or just relate to notch filters generally, which are allegedly unlike the specific filters in Hirose. *Id.* at 59 (citing Ex. 2009 ¶¶ 55, 61–62, 87–90, 99–100). Patent Owner summarizes that these references demonstrate that “at the time of invention, POSITAs neither knew nor found it desirable to couple a claimed narrow band-rejection filter to a pulsed DC power source to block RF energy or current from a remote RF power source.” PO Resp. 59 (citing Ex. 2009 ¶ 175). Regarding Petitioner’s “sole rationale for a narrow band-rejection filter over a low-pass filter,” namely, that a low-pass filter would “degrade” the square shape of a DC pulse, Patent Owner criticizes this as an insight coming “solely from the inventors.” *Id.* at 61.

Petitioner argues that Patent Owner’s attacks on state-of-the-art literature are inapposite, and that “those disclosures demonstrate a POSITA’s knowledge of *inter alia* the use and benefits of filters (including NBRFs) to protect/isolate one power supply from another.” Reply 32–33. Patent Owner responds that “Petitioner now states that its obviousness theory is based on ‘using an NBRF over other filters’ in light of ‘NBRF’s advantages over other filters’” as allegedly demonstrated in the state of the art literature. Sur-Reply 19. Patent Owner reiterates that “no prior art ever taught using an NBRF in series with a pulsed DC (or DC) power source to

block out a remote RF power source.” *Id.* (citing PO Resp. 51–61).

According to Patent Owner, the “generic benefits of using filters does not explain why a POSITA would have used an NBRF specifically in the manner claimed.” *Id.* at 20.

2. No Risk of Damage to Barber’s Power Source

Patent Owner further contends that there is no risk of damage to Barber’s power source 230 due to RF coupling, and therefore there would have been no reason to use Hirose’s filter. PO Resp. 63. First, unlike Hirose, “Barber’s plasma is designed to be trapped between the cathode 260 and anode ring 225,” distant from substrate 110 and substrate holder 115. *Id.* One of ordinary skill in the art, Patent Owner argues, would recognize that “there would be too few ionic species between the upper electrode and substrate to make coupling via the ionic conduction pathway a concern.” *Id.* at 64. Additionally, because Barber “maintains a processing condition under which ‘the target will continue to be conductive while depositing a coating on the substrate,’ this differs from Hirose, in which Patent Owner argues the “arrangement makes electric coupling between the two power sources 14 and 15 far more likely.” *Id.* at 65 (citing Ex. 1005, 7:36–40; Ex. 1006, Fig. 1, 3:59–4:2).

Patent Owner again states that

the references cited by Petitioner for alleged benefits of using a filter in plasma systems for blocking interference of one power supply from another (i) involve fundamentally different reactor systems (EXS1013, -1016-1021, -1023, -1025-1026, -1057-58), (ii) do not disclose a filter in series with a bipolar pulsed DC power supply to a target to block RF bias (*e.g.*, EXS1005, -1008, -1011, -1019, -1048, -1065), (iii) disclose a low-pass filter in use with DC or pulsed DC to reject RF power (EXS1014, -1020, -

1025), and/or (iv) do not explain what filter should be used (EXS1010, -1024, -1026, -1067).

PO Resp. 66. In sum, Patent Owner argues that the “material differences in reactor design and processing conditions explain why Barber does not use a filter.” *Id.*

Patent Owner also alleges that one of ordinary skill in the art would not have used a filter “to selectively filter (a) specific frequenc(ies) of electrical current generated from RF power supply 235 and thus assisted pulsed DC power supply 230 in providing a stable waveform to the target so as to optimize film depositions by reducing or eliminating electrical interference from the RF power supply,” which “would have assisted in attaining the optimal process point (cross-over point) as described in *Barber*,” because (1) a low-pass filter could also reduce or eliminate electrical interference from the RF power supply; (2) Petitioner has not shown that alleged interference is a real concern in Barber’s system; (3) Petitioner does not analyze whether or by how much adding a filter would improve waveform stability over Barber’s existing method; and (4) a filter that rejects a frequency of 2 MHz or 13.56 MHz would not “significantly or appreciably alter” pulse frequency or pulse width for a pulse frequency of up to 100–200 kHz. *Id.* at 67–69. Patent Owner argues that even though the art taught placing an ac blocking filter in series with the output of the dc power supply since the early 1990s, Barber did not employ any filter in its system. *Id.* at 70–71.

In response to Petitioner’s argument that “PO admits coupling *may* occur in *Barber*, but speculates it would be small” (Reply 34), that Barber does not provide electrode-to-substrate distance (*id.* at 34–35), and that other

similar magnetron sputtering chambers have small distances similar to the '276 patent's distances (*id.* at 35), Patent Owner argues that one of ordinary skill in the art “would understand that there was little coupling between Barber’s target and substrate because of Barber’s reactor design” and, therefore, would “not have thought it beneficial to use a filter, let alone a claimed NBRF.” Sur-Reply 26.

3. *Analysis*

The dispute before us is relatively narrow. On a very high level, the parties dispute whether Hirose discloses the claimed filter. On a more granular level, the dispute is whether Hirose discloses a filter in the correct position, whether Hirose discloses the right kind of filter (i.e. a narrow band-rejection filter or simply a band-rejection filter), and whether one of ordinary skill in the art would have been motivated to modify Hirose’s filter for inclusion in the proposed Barber-Hirose device. We address these issues below.

a) *“Filter . . . coupled between the pulsed DC power supply and the target area”*

Claim 1 and claim 6 both require a “filter . . . coupled between the pulsed DC power supply and the target.” Petitioner concedes that “*Barber* does not expressly disclose ‘a narrow band-rejection filter that rejects at a frequency of the [RF] bias power supply coupled between the pulsed DC power supply and the target area.’” Pet. 25. Petitioner proceeds to explain how it believes Hirose discloses this claim limitation. *Id.* at 25–32. In its argument, however, Petitioner focuses on why it believes Hirose discloses a “narrow band-rejection filter” without clearly addressing why it believes Hirose discloses the “coupled” portion of the limitation. *Id.* Hirose does not teach a filter located between a pulsed DC power source and a target to

reject an RF bias frequency. As argued by Patent Owner, “Hirose’s upper electrode 12 is admittedly not a target.” PO Resp. 45. Thus, “Hirose’s filter is not connected to either a pulsed DC power source (because Hirose’s power supplies are high-frequency RF ones). . . or a target (because no material is ejected from electrode 12 for deposition onto a substrate).” *Id.*; *see also* Sur-Reply 25 (the “combination therefore does not disclose the material limitation that requires the claimed NBRF be placed between a pulsed DC power source and a target to reject the RF bias frequency”). We are cognizant that Petitioner’s reliance on Hirose’s filter is not a matter of bodily incorporation. Reply 26 n.23. However, Hirose’s filter is not “coupled between the pulsed DC power source and the target,” as required by the claims but, rather, is “connected to an RF power source 14 and an upper electrode 12.” PO. Resp. 44 (citing Ex. 1006, Fig. 1, 3:51–54). Because “Hirose’s upper electrode 12 is admittedly not a target,” Hirose’s filter “is not connected to either a pulsed DC power source (because Hirose’s power supplies are high frequency RF ones)” or “a target (because no material is ejected from electrode 12 for deposition onto a substrate).” *Id.* at 45 (citing Ex. 2016, 18:12–16, 18:23–19:8, Ex. 2009 ¶ 99; Ex. 1006, Fig. 1, 3:59–60, 3:64–65). Accordingly, because Hirose’s filter is not coupled between a pulsed DC power source and a target, Hirose fails to disclose, at the very least, that its filter has either the correct placement or the correct “coupled” characteristics necessary to meet the limitations of the challenged claims.

b) “Narrow band-rejection filter”

Regarding the requirement that the filter be a narrow band-rejection filter, the Petition does not take the position that Hirose expressly discloses a

narrow band-rejection filter. *See generally* Pet. Rather, the Petition states that “Hirose’s filters are well-known band-rejection filters” and have a “very narrow frequency response, as *suggested by its pointy and V-shaped curve* in Figure 6.” Pet. 27–28 (emphasis added). Petitioner then concludes that one of ordinary skill in the art would have understood that Hirose’s filter “is tuned to reject a narrow band of frequency, which *operates like a narrow band-rejection filter* (aka notch filter).” Pet. 28–29 (emphasis added). In its citations following this quote, “(Ex. 1002, ¶¶81-82; *compare* Ex. 1013, 5 at FIG. 2-9(G) (describing a “sharp response . . . occurs at or near a single resonant frequency”) with Ex. 1006, FIG. 6 (similar)),” Petitioner relies on Dr. Subramanian’s declaration, which compares Gibilisco’s Figure 2–9(G) curve with Hirose’s Figure 6 curve. *Id.* Gibilisco’s Figure 2–9(G) and Figure 2–9(H) are reproduced below.

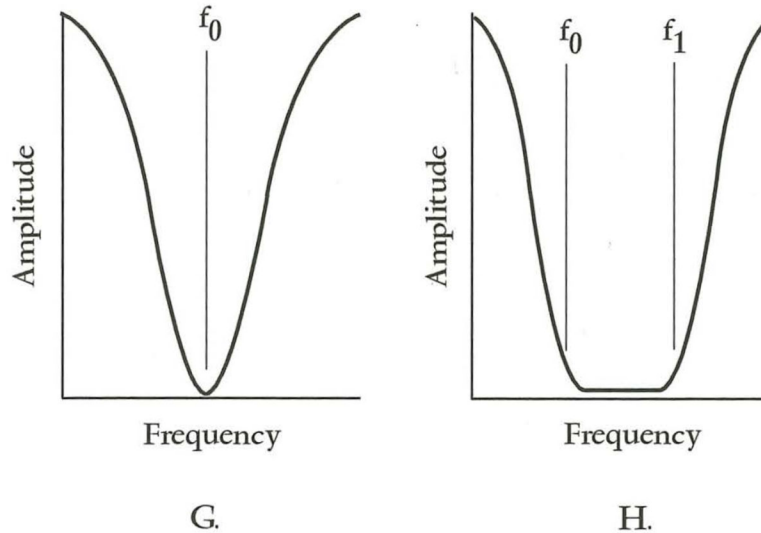


Figure 2–9(G) and (H) of Gibilisco show two types of band-rejection response: G shows a “sharp band-rejection response,” while H shows a “broad band-rejection response.” Ex. 1013, 5.

The record, however, does not support Petitioner’s assertions that Hirose’s V-shaped curve shown in Figure 6 suggests a very narrow

frequency response and that a POSITA would have understood that Hirose's filter is "tuned to reject a narrow band of frequency," which operates "like a narrow band-rejection filter (aka notch filter)." Pet. 28–29. Petitioner's argument that Hirose discloses or suggests a narrow band-rejection filter is contained in this short portion of the Petition and relies on an inference that a V-shaped curve necessarily signifies a narrow band-rejection filter. Any such inference that a V-shaped curve is sufficient to characterize a filter as a narrow band-rejection filter, however, is belied by Dr. Subramanian's own testimony. Indeed, Dr. Subramanian explains that the shape of a curve alone, including the shape of the curves of Figures 2–9(G) and (H) of Gibilisco, is *not sufficient* on its own to determine whether a filter corresponding to that curve is a narrow band-rejection filter or a broad band-rejection filter. *See, e.g.*, Ex. 2030, 69:13–18 (stating, just looking Figure 2–9(H), he could not tell if the figure corresponds to a narrow band-rejection filter because "I don't have enough information").

Dr. Subramanian further testified that additional information beyond the mere shape of the curve is required to determine if the curve represents a narrow band-rejection filter; for example, Dr. Subramanian states that it was Gibilisco's characterization of Figure 2–9(G) as having a *sharp band rejection response* that led him to conclude it was a narrow band-rejection filter. *See* Ex. 2030, 68:20–69:4 (Dr. Subramanian testifying that he would not "characterize the figure depicted in G as a narrow band" based just on the figures, but "on all the information that's given," which includes "this reference specifically [stating] at G, 'sharp band rejection response'"); *see also id.* at 60:24–61:23, 62:7–63:11.

Significantly, Petitioner does not point to statements in Hirose itself characterizing either the sharpness of its Figure 6 V-shaped curve or the narrowness of its bandwidth to support Petitioner's position that Hirose's filter is a narrow band-rejection filter. Instead, Petitioner asserts that the similarity of Hirose's Figure 6 curve to Gibilisco's Figure 2–9(G) curve *suggests* that Hirose's filter is a narrow band-rejection filter like the filter in Gibilisco. Pet. 28. The citations to the record to show a “sharp response,” however, are to Gibilisco, not Hirose. *See id.* at 27–29. We will not extrapolate such disclosures to Hirose.

Moreover, Petitioner's contention that Hirose discloses or teaches a narrow band-rejection filter is inconsistent with Dr. Subramanian's own declaration and deposition testimony that whether a filter is a narrow band-rejection filter or merely a band-rejection filter depends on the relationship of bandwidth to the center frequency of the filter. Dr. Subramanian states that “in general, narrow band-rejection filters will have bandwidths that are much, much, much smaller than the center frequency.” Ex. 2030, 95:15–17. Dr. Subramanian explains that “if the bandwidth is in the same order of magnitude as the center frequency, that would not be considered a narrow band-rejection filter.” *Id.* at 95:18–21. Dr. Subramanian further explains that a filter corresponding to a center frequency of one megahertz and a bandwidth on the order of hundreds of kilohertz “would not be considered a narrow band filter.” Ex. 2030, 96:8–12; *see also id.* at 96:13–97:3 (stating that “barring the availability of some other information that would indicate otherwise” a center frequency of 1 megahertz and a bandwidth of 100 kilohertz would not be a narrow band-rejection filter); *see also id.* at 72:18–73:8 (testifying that whether a filter is narrow band or broad band does not

depend only on attenuation (“the magnitude away from the center frequency versus at the center frequency”) but also on the frequency response); *see also* Ex. 1108 (Dr. Subramanian Rebuttal Dec.) ¶ 71 (stating that a POSITA would not consider a filter corresponding to a 2 MHz center frequency and a bandwidth of approximately 2 MHz to be a narrow band-rejection filter); *see also* Ex. 1108 ¶ 70 (describing a graph showing a bandwidth on the order of 2 MHz, which is the same order of magnitude as the center frequency of the filter, to be a “wide rejection bandwidth”).

Also, although not directly on point, we look to cases indicating that we cannot infer dimensions or scale from a figure that does not explicitly provide the same. “[A]rguments based on drawings not explicitly made to scale in issued patents are unavailing.” *Nystrom v. TREX Co.*, 424 F.3d 1136, 1149 (Fed. Cir. 2005). The Federal Circuit has expressed its “disfavor in reading precise proportions into patent drawings which do not expressly provide such proportions.” *Id.* (citing *Hockerson-Halberstadt, Inc. v. Avia Group Int’l, Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000)). The written description can support an interpretation of a drawing’s disclosure, but “[a]bsent any written description in the specification of quantitative values, arguments based on measurement of a drawing are of little value.” *In re Wright*, 569 F.2d 1124, 1127 (CCPA 1977) (citing *In re Chitayat*, 408 F.2d 475 (CCPA 1969)). Hirose’s Figure 6 does not provide any quantitative values indicating the relationship between the bandwidth and the center frequency of the curve depicted in the graph. *See* Ex. 2017, 355:18–24 (Dr. Subramanian testifying that “assuming we had numbers on the axes [of Hirose’s Figure 6], we could calculate it, but without the numbers, I’m not even going to give you a specific number” for the bandwidth of the Hirose

filter). Nor does Petitioner direct us to any other evidence regarding the relationship between the bandwidth and center frequency of the graph shown in Hirose's Figure 6 sufficient for us to infer that Figure 6 depicts a narrow band-rejection filter. In sum, Petitioner's arguments for a narrow band-rejection filter depend on Hirose's Figure 6 having particular quantitative characteristics that are not supported by the written description of Hirose itself.

Petitioner also cites to portions of Hirose in support of its contention that Hirose's filter is "tuned to reject a narrow band of frequency, which operates like a narrow band-rejection filter." Pet. 28–29 (citing Ex. 1006, 5:7–10, 8:34–38). Hirose, however, devotes very little discussion to its Figure 6, and the portions of Hirose cited by Petitioner merely discuss the filter's resonance point outside the context of Figure 6. Ex. 1006, 5:7–10, 8:34–38. Petitioner provides no explanation of how this resonance point argument relates to Figure 6, or how Hirose's discussion of its filter's resonance point indicates that the filter's resonance point is at a narrow band of frequency, or is otherwise is a narrow band-rejection filter.

Thus, although Hirose discloses *a* filter, Petitioner does not sufficiently show that Hirose discloses a "narrow band-rejection filter" as recited in claims 1 and 6. We now turn to Petitioner's argument that it would have been obvious to modify Barber's system to add a narrow band-rejection filter as allegedly suggested by Hirose to arrive at the invention recited in claims 1 and 6.

c) Combination

Petitioner's stated motivation to implement a narrow band-rejection filter in Barber is to prevent Barber's RF power supply 235 from "affecting"

or “damaging” Barber’s DC power supply 230 and to “minimize the filter’s impact on [Barber’s] pulsed-DC waveform (not significantly degrade the waveform signal through filtering).” Pet. 29, 32.

Just the knowledge, however, that a filter *can* be used to protect or isolate one power supply from another in various types of plasma systems is not sufficient to show that one of ordinary skill in the art *would have been motivated* to use a filter in Barber’s system to protect Barber’s pulsed DC power source from its RF power supply. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (“obviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention”).

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*, 815 F.3d at 1363. In support of its challenge, Petitioner and Petitioner’s expert may rely on general knowledge, supported by evidence, to argue that a challenged claim would be obvious in light of the general knowledge of a skilled artisan. *Koninklijke Philips v. Google*, 948 F.3d 1330, 1337 (Fed. Cir. 2020) (stating that although the prior art that can be considered in *inter partes* review is limited to patents and printed publications, “it does not follow that we ignore the skilled artisan’s knowledge when determining whether it would have been obvious to modify the prior art”). Although the Petition on its face relies on Barber and Hirose to meet the limitations of claim 1[f] (Pet. 24–36), Petitioner’s arguments rely not only on Barber and Hirose, but on numerous additional references, ostensibly to demonstrate the general knowledge of a skilled artisan. *Id.* For

example, Petitioner cites to a number of references (i.e., Licata (Ex. 1010), Joo (Ex. 1014), Celestino (Ex. 1016), Quon (Ex. 1017), Johnson (Ex. 1018), Hong (Ex. 1019), Ohmi (Ex. 1020), and Keller (Ex. 1021)) that use different types of filters in various plasma systems for the “known use and benefits of filters in plasma systems for blocking interference/current of one power supply from another.” Pet. 32–33. Petitioner asserts that a POSITA would have understood that choosing to reject a narrow band of frequencies depending on the bandwidth of Barber’s RF supply, was a known way to achieve “the benefits” of Hirose. *Id.* at 31–32 (citing Ex. 1023 (Miller), 7:51–61; Ex. 1057 (Sill), 7:23–34; Ex. 1058 (Zennamo), 1:63–2:1). Petitioner also relies on a number of manuals (i.e. Exs. 1025, 1026, 1062, 1067, 1024, 1065, 1066) that illustrate “design concepts/guidance associated with use of such supplies in a plasma system with an RF power source.” *Id.* at 34–35. Even considering all the references in the Petition and the declaration, Petitioner does not adequately explain how the filters and principles in these relied-upon references and manuals would lead one of ordinary skill in the art to use a filter, let alone a narrow-band rejection filter, in Barber’s system.

(1) References

Although Petitioner cites to a number of references (i.e., Exs. 1014, 1016, 1017, 1018, 1019, 1020, 1021, 1010) that use different types of filters in various plasma systems for the “known use and benefits of filters in plasma systems for blocking interference/current of one power supply from another” (Pet. 32), Petitioner does not adequately explain how the plasma systems of the cited references relate to Barber’s plasma system or why a POSITA would have understood that the benefits of using a filter in one of

these systems would apply to Barber's system. Rather, it appears that these references support Patent Owner's argument that a POSITA would not have been motivated to provide a filter to protect a DC power source from a remote RF power source. *See, e.g.*, PO Resp. 51–61 (explaining that the cited references do not suggest using a narrow band-rejection filter in series with a bipolar pulsed DC power supply to reject RF power); Ex. 2009 ¶ 144 (explaining that use of a filter to decouple two *directly connected* power sources does not show that it would be beneficial to decouple two *remote* power sources).

For example, Petitioner cites to Celestino for its “use of a filter to isolate a 100 KHz power supply and a 13.56 MHz power supply to prevent damage” (Ex. 1016, 3:53–63) and as disclosing a notch filter “intended to attenuate the 13.56 MHz” signal (*id.* at 4:20–27). Pet. 32. In Celestino, however, the 100 KHz power supply 33 and the 13.56 MHz power supply 37 are *connected to the same electrode*. Ex. 1016, Fig. 1, 3:21–25, 3:38–52; Ex. 2009 ¶¶ 141–44 (citing Ex. 1101). In contrast, the DC power source of Barber's system is connected to one electrode (the target) while the RF power source is connected to a separate electrode (the substrate) and the two power sources are not directly connected. Petitioner does not adequately address this difference, or why a POSITA would have found the methods used on a single electrode to be applicable to Barber's multi-electrode arrangement.

Petitioner also cites to Hong as showing an “‘RF blocking filter’ can mitigate RF current flowing to a DC source.” Pet. 32–33 (citing Ex. 1019, 6:60–62, 7:40–42). Figure 1 of Hong is reproduced below.



Figure 1 of Hong depicts a deposition apparatus having RF power supply 16 and DC voltage source 30 connected to coil 6 and RF blocking filter 32 connected between coil 6 and DC voltage source 30. Ex. 1019, 4:65–67; 6:55–65. Also shown is AC voltage source 26 and DC power source 24; “sources 24 and 26 cause a negative bias to develop on the target [4] and the substrate 14, respectively.” *Id.* at 5:46–59. In Hong, however, filter 32 is used in connection with DC power source 30 and AC power source 16, both of which are connected to coil 6. *Id.* at Fig. 1, 6:58–62, 7:3–6.

Moreover, Hong also discloses another DC power source (24), which is connected to target 4 and remote from RF power source 26. *Id.* at Fig. 1. Notably, Hong does not disclose use of a filter to protect DC power source 24 from remote RF power source 26. *See* Ex. 2009 ¶ 152. In other words, Hong teaches using a filter to protect DC power source 30 that is *directly connected* to an AC power source 16, but *does not use a filter to protect* DC power source 24 from remote RF power source 26. Thus, Hong

demonstrates that a filter is not required in a system in which the DC power source is remote from an RF power source.

We agree with Dr. Glew's testimony that, Hong, like Barber, does not suggest that a filter is required to protect a DC power source applied to a target from an RF power source applied to a substrate. *Id.* We further agree that, rather than supporting Petitioner's position, Hong supports Patent Owner's position that at the time of the invention, one of ordinary skill in the art *would not* have thought that RF coupling into a remote pulsed DC power source was a concern or that it would have been desirable to place a filter between the DC power source and the substrate. *Id.*

Similarly, we determine that Petitioner's contention that one skilled in the art knew of the "use and benefits of filters" to block interference/current of one power supply from another power supply, and Petitioner's remaining citations to Joo (Ex. 1014, 3, Fig. 1), Quon (Ex. 1017, 16:20–29), Johnson (Ex. 1018, 24:29–32), Ohmi (Ex. 1020, 2:61–3:6, 4:26–31), Keller (Ex. 1021, 7:66–8:2), and Licata (Ex. 1010, 6:40–41) do not sufficiently explain how such teachings apply to Barber's system. Pet. 32–33 (citing Ex. 1002 ¶¶ 90–91). We credit Dr. Glew's testimony as to the differences between these systems and Barber, and asserting that these references do not discuss use of a narrow band-rejection filter. *See, e.g.*, Ex. 2009 ¶¶ 107, 148–149, 153–158. For example, Dr. Glew persuasively explains that unlike Barber, Licata does not suggest its DC power results in alternating positive and negative voltages on the target because the reactive gas in Licata reacts directly on the substrate, not the target and, further, that Licata provides no details about its RF filter's characteristics. *Id.* ¶¶ 107, 125. We also credit Dr. Glew's testimony that Quon, Johnson, and Ohmi only involve RF, not

DC, power supplies. *Id.* ¶¶ 148–149, 153–154; *see also id.* ¶ 149 (stating that the purpose of Johnson’s filter is to keep the high power signal out of a film thickness measurement circuit, not to protect a pulsed DC power source, and nothing suggests the filter is a narrow band-rejection filter), ¶¶ 153–154 (stating there is no suggestion that Ohmi’s band rejection filters are narrow band rejection filters, that the band rejection filters are used with RF power supplies, not DC power supplies, and that the DC power supplies are connected to low-pass filters). We also credit Dr. Glew’s testimony that there is no pulsed DC power supply or target in Keller, that Keller’s filter is used to filter signals from an RF source that would otherwise couple *directly* into the signal processing unit, and Keller does not suggest using a narrow band-rejection filter. *Id.* ¶¶ 155–158.

Petitioner also cites to Miller (Ex. 1023), Sill (Ex. 1057), and Zennamo (Ex. 1058) as support that a skilled artisan would have understood that choosing to reject a specific frequency, or a narrow band of frequencies, was a known way to achieve the benefits of Hirose. *See* Pet. 30–31 (citing Ex. 1023, 7:51–61; Ex. 1057, 1:16–34, 1:56–58, 7:23–34; Ex. 1058, 1:64–2:1). Petitioner, however, does not sufficiently explain how the systems of Miller, Sill, or Zennamo relate to Barber’s system. We credit Dr. Glew’s testimony that filters in both Miller and Sill block frequency from a power source to which they are connected and do not speak to the need to filter frequencies from a remote power source. *See, e.g.*, 2009 ¶¶ 110–114, 134–137. We further credit Dr. Glew’s testimony that Zennamo suggests tuning a notch filter in the context of telecommunications signals, not high power delivery. Ex. 2009 ¶¶ 134–140. Petitioner does not persuasively explain

how these teachings would have led a POSITA to add a narrow band-rejection filter to Barber's system. Pet. 30–31.

We further credit Dr. Glew's testimony that reactor/processing systems are complex, that a skilled artisan would not treat components of the reactor systems as modular pieces to be added or removed at will, and that what is suitable for one system is often not suitable for another system. Ex. 2009 ¶ 63. Again, Petitioner fails to sufficiently explain how the use of filters in these systems would lead one skilled in the art to use a filter, let alone a narrow band-rejection filter, in the Barber system as recited in claims 1 and 6.

(2) Manuals

Petitioner also relies on various manuals by Advanced Energy, Inc. ("AE"), the manufacturer of the pulsed DC power supply identified in the '276 patent, stating the manuals had been guiding POSITAs "since the early 1990s that '[y]ou must place an ac blocking filter in series with the output of the dc power supply if your system uses a dc power supply in combination with an ac power supply,'" because 13.56 MHz can damage the typical dc magnetron power supply. Pet. 33–34 (quoting Ex. 1025, 23) (citing Ex. 1025 (1993 manual), Fig. 1-5, 24; Ex. 1026, 116 (May 2000 manual); Ex. 1062, 134 (2001 manual); Ex. 1067 (2002 manual), 141; Ex. 1024 (Pinnacle Plus March 2005), 151; Ex. 1065 (1999 data sheet), 2; Ex. 1066 (SEC Form 10-K 2000), 7¹⁷; Ex. 1002 ¶¶ 91–98).

¹⁷ In addition to the manuals, Petitioner also cites to a 1999 data sheet (Ex. 1065, 2) and a Securities and Exchange Commission Form 10-K 2000 (Ex. 1066, 7). See Pet. 35. Neither of these references, however, discuss use of filters in connection with AE systems.

We disagree with Petitioner that the AE manuals would have guided one of ordinary skill in the art to use an AC blocking filter in the system of Barber in which the RF power supply is *remote* from the DC power supply. Rather, we agree with Patent Owner, supported by the testimony of Dr. Glew, that one of ordinary skill in the art would have understood that warnings in some of the AE manuals refer to a configuration in which RF power is applied directly to the output of the DC power supply, such as when DC and RF power are applied *to the same electrode*, a situation not present in Barber. PO Resp. 58–59; Ex. 2009 ¶ 166. In particular, we credit Dr. Glew’s testimony that similar language recited in four of these manuals (i.e., “Do not apply RF power directly to the output of the Pinnacle unit. Damage to the Pinnacle unit could result.”) refers to a configuration in which the DC power source and the RF power source are *directly* connected, i.e., the DC and RF power are applied to the same electrode. *Id.* (citing Ex. 1026, 116; Ex. 1062, 134; Ex. 1067, 141; Ex. 1024, 151). Barber, however, does not have a direct connection between the RF power source and the DC power source. Rather, DC power is applied to the target and RF power is applied to the substrate, and there is no direct connection between the target and the substrate.

With respect to the 1993 manual (Ex. 1025), Petitioner asserts that Figure 1-5 shows a filter connected to the DC power source when the RF power source is not directly connected. Pet. 11. Figure 1-5, however, illustrates two configurations, one of which shows the RF power supply directly connected to the DC power supply. Ex. 1025, Fig. 1-5. Dr. Glew persuasively explains that the RF filter shown in Figure 1-5 remains in place in either configuration. Ex. 2009 ¶ 20.

Petitioner and Dr. Subramanian also cite to a number of references to support their contention that a POSITA would have considered the “design concepts/guidance” (Pet. 35) or known of the “design constraints and cautions” (Ex. 1002 ¶ 98) associated with known DC power systems, including power supplies from Advanced Energy, Inc. *See* Pet. 35; Ex. 1002 ¶ 98 (citing, *inter alia*, Ex. 1001, 5:46–48; Ex. 1008 (Belkind), 1; Ex. 1011 (Sproul), 6:7–11; Ex. 1048 (Kelly), 2, 3). Other than the challenged patent, however, none of these cited references use a filter to protect a pulsed DC power supply from a remote RF power source. *See* Ex. 1008 (Belkind), 1 (no mention of any filter to protect the DC power source from an RF power source); Ex. 1011 (Sproul), 6:7–11 (no filter between DC power source 32 and target to protect power source 32 from RF power source 50); Ex. 1048 (Kelly), 2–3, Table 1 (no disclosure of a filter used with the pulsed DC power source to reject the RF power); Ex. 2009 ¶¶ 117, 159, 175.

Generalized assertions that filters have been used in certain plasma systems to block power does not sufficiently support that a filter would have been needed or useful in Barber’s system to block power from Barber’s RF power supply from reaching its DC power supply. *See* Pet. 35; Ex. 1002 ¶¶ 90–91.

Additionally, none of the AE manuals disclose a narrow band-rejection filter; even Dr. Subramanian testified that a POSITA would “not be able to determine from the disclosures in those AE manual[s] what specific type of filter is described in those manuals” and that the “RF filter described in the AE[] manuals could encompass any type of filter that would provide the necessary blocking of the RF power to the DC supply unit.” Ex. 1108 (Rebuttal Dec.) ¶ 31.

In sum, while these references may show that a filter should be used when an AE DC power source is in direct connection with an RF power source, Petitioner has not sufficiently demonstrated that these manuals show that a filter, let alone a narrow band-rejection filter, should be used to protect a power source in a system like Barber in which the RF and DC power sources are not in direct connection.

(3) Waveform Distortion

Regarding Petitioner's argument that one of ordinary skill in the art would have added a narrow band-rejection filter to prevent distortion to Barber's DC waveform (Pet. 32), we are persuaded by Patent Owner's arguments that Barber's reactor design and processing conditions are sufficiently different than Hirose's reactor design and processing conditions that one of ordinary skill in the art would not have found it beneficial to include a filter like Hirose's in the reactor of Barber. PO Resp. 66; Ex. 2009 ¶¶ 176–177 (“the fact that Hirose suggested using a filter to block the RF current from reaching the other power source does not mean the same need existed in Barber,” and because “Barber's design and processing conditions do not lend it to significant coupling of the RF current into the DC power source 230, a person of ordinary skill in the art would not have had a reason to include a filter”).

Other than pointing to the '276 patent itself, Petitioner has not cited to any reference, nor otherwise provided sufficient evidence, of any impact that a narrow band-rejection filter would have on a pulsed-DC waveform in a plasma processing system. “The inventor's own path itself never leads to a conclusion of obviousness; that is hindsight. What matters is the path that the person of ordinary skill in the art would have followed, as evidenced by

the pertinent prior art.” *Otsuka Pharm. Co., v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012).

Petitioner relies on Hirose to show use of a filter in a plasma processing system to prevent waveform distortion. *See* Pet. 27. However, the waveform in Hirose is an RF waveform, not a DC waveform. Petitioner has not sufficiently shown that Hirose’s teaching to use a filter to protect an RF waveform would be applicable to protecting the DC waveform in Barber, or that a POSITA would have understood the same. *See id.*; Ex. 1002 ¶ 80 (stating that Hirose shows the RF voltage waveform is distorted when the filter is removed).

Petitioner also cites to Gibilisco, which provides general information about filters in the context of radio and wireless technology. Pet. 28–29 (citing Ex. 1013). This reference, however, does not address the use of filters in plasma processing systems, and Petitioner does not persuasively explain why a POSITA would have considered its general teachings about narrow band-rejection filters in the context of radio and wireless technology to suggest using a narrow band-rejection filter to protect the pulsed DC waveform in Barber.

Rather, we agree with Dr. Glew that Barber “discloses that it supposedly already has a way to optimize its process, including a way to supposedly stabilize its waveform via adjustment of the power supply frequency.” Ex. 2009 ¶ 179 (citing Ex. 1005, Figure 5, 7:59–60, 8:66–9:2, 9:42–45). Thus, Petitioner has not shown that a POSITA would have understood that an *additional* mechanism for improving the stability of Barber’s waveform would have been necessary or even beneficial.

4. *Conclusion*

On this record, we find that Petitioner has not sufficiently shown by a preponderance of the evidence that a person of ordinary skill in the art would have combined Barber and Hirose in a manner that discloses all of the limitations of independent claims 1 or 6, as set forth above, or all of the limitations of the challenged dependent claims 2, 3, 7, and 8, which carry forward the same limitations as independent claims 1 and 6.

G. *Remaining Grounds*

In Grounds 2–7, Petitioner relies on various references to teach the limitations found in dependent claims 4, 5, and 9–13. Pet. 3–4. In Grounds 8–14, Petitioner further relies on the teachings of Belkind to satisfy any deficiencies in Barber relating to the limitations in claims 1 and 6 that require providing pulsed DC power to the target such that the target alternates between positive and negative voltages. Pet. 4–5. None of the remaining grounds remedy the deficiencies discussed above regarding the filter of Hirose, or the deficiencies regarding a reason to combine the disclosures of Barber and Hirose.

Accordingly, Petitioner has not shown by a preponderance of the evidence that any of the challenged claims would have been obvious under Grounds 2–14.

III. CONCLUSION

For the reasons discussed above, we determine Petitioner has not satisfied its burden of establishing, by a preponderance of the evidence, that the challenged claims are unpatentable, as summarized in the following table:

Claim(s)	35 U.S.C. §	References/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–3, 6–8	103(a)	Barber, Hirose		1–3, 6–8
4, 5	103(a)	Barber, Hirose, Aokura		4, 5
9	103(a)	Barber, Hirose, Yamazaki		9
9, 10	103(a)	Barber, Hirose, Dogheche		9, 10
11, 12	103(a)	Barber, Hirose, Sproul		11, 12
11, 13	103(a)	Barber, Hirose, Laird		11, 13
11–13	103(a)	Barber, Hirose, Segal		11–13
1–3, 6–8	103(a)	Barber, Hirose, Belkind		1–3, 6–8
4, 5	103(a)	Barber, Hirose, Belkind, Aokura		4, 5
9	103(a)	Barber, Hirose, Belkind, Yamazaki		9
9, 10	103(a)	Barber, Hirose, Belkind, Dogheche		9, 10

Claim(s)	35 U.S.C. §	References/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
11, 12	103(a)	Barber, Hirose, Belkind, Sproul		11, 12
11, 13	103(a)	Barber, Hirose, Belkind, Laird		11, 13
11–13	103(a)	Barber, Hirose, Belkind, Segal		11–13
Overall Outcome				1–13

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner does not establish, by a preponderance of the evidence, that claims 1–13 of U.S. Patent No. 7,544,276 B2 are unpatentable; and

FURTHER ORDERED that this is a Final Written Decision; therefore, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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