

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLIED MATERIALS, INC.,
Petitioner,

v.

OCEAN SEMICONDUCTOR LLC,
Patent Owner.

IPR2021-01339
Patent 8,676,538 B2

Before MIRIAM L. QUINN, JOHN D. HAMANN, and
DAVID COTTA, *Administrative Patent Judges*.

COTTA, Administrative Patent Judge.

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

I. INTRODUCTION

Applied Materials, Inc. (“Petitioner”)¹ filed a Petition to institute *inter partes* review of claims 1–16, 18–26, and 28–31 of U.S. Patent No. 8,676,538 B2 (Ex. 1001, “the ’538 patent”). Paper 1 (“Pet.” or “Petition”). Ocean Semiconductor LLC (“Patent Owner”)² filed a Preliminary Response. Paper 9 (“Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply and Patent Owner filed a Preliminary Sur-reply addressing certain matters raised in the Preliminary Response. Paper 10 (“Prelim. Reply”); Paper 11 (“Prelim. Sur-reply”).

Under 35 U.S.C. § 314(a), *inter partes* review may not be instituted unless the Petition “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.” Petitioner has established a reasonable likelihood of prevailing on its assertion that the challenged claims are unpatentable based on the grounds advanced here. We decline to deny the Petition on a discretionary basis as requested by Patent Owner. Thus, for reasons explained below, we institute *inter partes* review of claims 1–16, 18–26, and 28–31 of the ’538 patent.

¹ Petitioner identifies itself, Applied Materials, Inc., as the real party-in-interest. Petitioner also identifies PDF Solutions, Inc. as a “potential real party-in-interest” with whom Petitioner “discussed this Petition and the Grounds presented.” Pet. 1. Petitioner further lists a number of other “potential real parties-in-interest, none of whom had any access to this Petition.” *Id.* at 1–2.

² Patent Owner identifies itself, Ocean Semiconductor LLC, as the real party-in-interest. Paper 5, 2.

A. Related Proceedings

According to the parties, Patent Owner has asserted the '538 patent against multiple third-parties including: Analog Devices, Inc.; Infineon Tech. AG; Huawei Device USA, Inc; MediaTek Inc.; NVIDIA Corp.; NXP Semiconductors NV; Renesas Elec. Corp.; Silicon Labs. Inc.; STMicroelectronics Inc.; and Western Digital Tech., Inc. in lawsuits in district courts in the District of Massachusetts, the Eastern District of Texas, and the Western District of Texas. Pet. 2; Paper 5, 2. Petitioner indicates that it is not a party to any pending litigations involving the '538 patent. Pet. 10.

B. Asserted Grounds of Unpatentability

Petitioner asserts two grounds of unpatentability in this Petition (Pet. 17–18), which are provided in the table below:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 6, 9–13, 18–19, 21–23, 28, 29	102 ³	Brcka ⁴
3–5, 7, 8, 14–16, 20, 24–26, 30, 31	103(a)	Brcka

Petitioner relies on the declaration of Dr. Stanley Shanfield, among other evidence. Ex. 1003.

³ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. Based on the filing date of the '538 patent, we apply the pre-AIA versions of §§ 102 and 103.

⁴ Brcka et al., US 2006/0259198 A1, published Nov. 16, 2006 (Ex. 1005, “Brcka”).

C. Technology Overview & the '538 Patent

The '538 patent relates to “performing a process to improve fault detection reliability through feedback” in semiconductor manufacturing. Ex. 1001, 1:9–12. By way of background, the '538 patent explains that a processing system may use metrology data, acquired from particular semiconductor wafers being processed, and tool state sensor data, including tool state parameters such as pressure, humidity, and temperature, to perform fault detection in the processing of semiconductor wafers. *See id.* at 2:18–29. “Upon detecting various faults . . . , the processing system may perform a principal component analysis ('PCA'),” which “is a multivariate technique that models the correlation structure in the data by reducing the dimensionality of the data.” *Id.* at 2:29–35. The '538 patent identifies a problem, however, where “the abnormal conditions detected by performing the PCA may be statistically different from the data that may have been used to build the fault detection or the PCA model.” *Id.* at 2:52–55. This can lead to inefficient false positives in fault detection. *Id.* at 3:3–4. For example, a fault detection or PCA model developed within small constraints for a particular parameter, such as pressure, would lead to a false fault indication if larger variations in pressure during the actual processing did not result in a negative impact on the processed material. *Id.* at 2:60–67.

Although the '538 patent acknowledges the development of PCA weighting schemes to address the false positive problem, the patent notes that a shortcoming of these schemes is “the fact that prior knowledge is required to assign a predetermined weight to a particular parameter.” *Id.* at 3:5–11. Accordingly, the '538 patent introduces a scheme where “various

parameters that may be used in a fault detection model and/or PCA model may be automatically determined and the weighting of the parameters may be adjusted dynamically.” *Id.* at 5:35–39. After identifying a fault, the processing system receives an input indicating whether the fault was significant, and based on the indication, updates a weighting fault matrix containing “data correlating various tool state parameters to particular wafers.” *Id.* at 5:39–45. Modifications to the matrix may “make the detection of similar faults more likely, or alternatively, less likely.” *Id.* at 5:45–46.

Figure 7 (reproduced below) is a flowchart illustrating an embodiment of the ’538 patent.

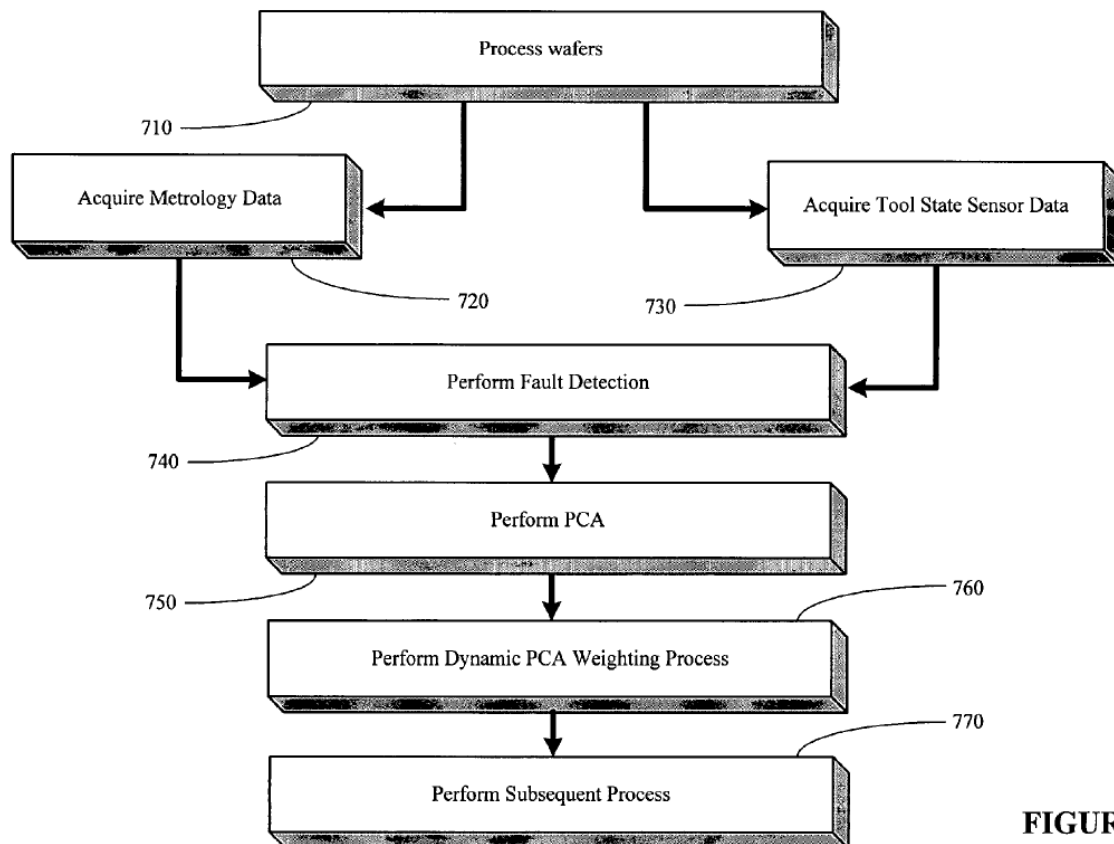


FIGURE 7

As shown above, Figure 7 depicts a process where a processing system acquires metrology data and tool state sensor data in steps 720 and 730 while processing semiconductor wafers. *Id.* at 10:49–55. The system performs fault detection based on the acquired data in step 740, and may also execute a PCA algorithm in step 750, “to detect any abnormalities or faults associated with the processing of semiconductor wafers.” *Id.* at 10:56–61. Next, the system may perform a PCA-weighting process in step 760 that may result in “various adjustments to the weighting of particular parameters . . . to more accurately assess any faults associated with processing of semiconductor wafers.” *Id.* at 10:63–11:6. The system may then perform subsequent processing of semiconductor wafers based on the adjusted parameters for more accurate assessments of faults or abnormalities. *Id.* at 11:7–10.

D. Challenged Claims

The ’538 patent includes thirty-one claims. Of those, claims 1–16, 18–26, and 28–31 are challenged here. Pet. 17–18. Of the challenged claims, claims 1 and 18 are independent. Claim 1 is illustrative of the challenged claims and reads as follows:

1. A method, comprising:
 - performing in a computer a fault detection analysis relating to processing of a workpiece;
 - determining in a said computer a relationship of a parameter relating to said fault detection analysis to a detected fault;

adjusting in said computer a weighting of said parameter based upon said relationship of said parameter to said detected fault; and

performing in said computer the fault detection analysis relating to processing of a subsequent workpiece using said adjusted weighting.

Ex. 1001, 13:28–39.

II. DISCRETION UNDER 35 U.S.C. § 314(a)

Patent Owner contends the Board should exercise its discretion under 35 U.S.C. § 314(a) and deny institution in light of the advanced stage of the parallel district court proceedings involving the '538 patent. Prelim. Resp. 5–27; Prelim. Sur-reply 1–5. Petitioner contends that Petitioner is not a party to any of the parallel district court proceedings involving the '538 patent, and resolution of those parallel proceedings would not resolve the dispute between Petitioner and Patent Owner with respect to the present proceeding. Pet. 10–15; Prelim. Reply 1–5. In assessing whether to exercise such discretion, the Board weighs six non-exclusive factors, known as the *Fintiv* factors. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 6 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”). Recognizing that “there is some overlap among these factors” and that “[s]ome facts may be relevant to more than one factor,” the Board “takes a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Id.*

We have considered Patent Owner’s arguments in light of the *Fintiv* factors, together with Petitioner’s opposition, and we decline to exercise our

discretion to deny the Petition as explained further below. An analysis of each of the *Fintiv* factors follows.

A. Factor 1: Whether a Stay Exists or Is Likely to Be Granted if a Proceeding Is Instituted

The '538 patent is asserted in various district court proceedings. For instance, Patent Owner filed seven lawsuits in the Western District of Texas (“WDTex litigation”). Prelim. Resp. 6–7. Patent Owner also filed one lawsuit in the Eastern District of Texas (*id.* at 10 (“EDTex litigation”)) and two lawsuits in the Massachusetts District Court (Exs. 1030–1031 (“Massachusetts litigation”)). The WDTex and the EDTex litigations have not been stayed. Reply 1 (identifying only the Massachusetts litigation as stayed). Nevertheless, Petitioner is not a party to any of these district court cases. Pet. 11.

Patent Owner urges us to find that Petitioner, as a non-party, “cannot file any stay motion” in any of the underlying district court litigation and, in any event, a stay is unlikely to be granted. Prelim. Resp. 7–11. Therefore, according to Patent Owner, this factor should favor the exercise of discretion. *Id.* In the alternative, Patent Owner argues that this factor is neutral. Prelim. Sur-reply 1. We agree that this factor is neutral because the WDTex and EDTex litigations have not been stayed.

B. Factor 2: Proximity of the Court’s Trial Date to the Board’s Projected Statutory Deadline

The projected statutory deadline for this proceeding would be, at the latest, February 2023. Patent Owner asserts that the jury trial in the WDTex

litigation is set for December 7, 2022, and the final pretrial conference in the EDTex litigation is set for August 15, 2022, “with [a] trial to begin shortly thereafter, likely at the end of August or in September.” Prelim. Resp. 6, 12. These deadlines set the trial dates in district court to fall somewhere between *two and five months* before the projected statutory deadline. Petitioner argues that the trial dates are more fluid than what they appear and that other Board cases have held that where a petitioner is a non-party to the litigation, this factor weighs against the exercise of discretion. Prelim. Reply 1–2 (citing *Bose v. Koss*, IPR2021-00680, Paper 15 at 15 (Oct. 13, 2021 (“*Bose*”))).

We recognize that the panel in *Bose* took notice of the fact that when a Petitioner is not a party to the litigation, this factor weighs strongly against exercising discretion. But here we have departure from the facts in *Bose*, where the petitioner was not a defendant, because Petitioner has asserted that some of the defendants in the underlying litigation are “potential additional real parties-in-interest.” Petitioner contends, however, that these real parties-in-interest are identified as such “solely out of an abundance of caution to avoid burdening the Board with unnecessary disputes or discovery.” Pet. 14. Acknowledging the nature of Petitioner as a non-party to the litigation and the identification of the defendants as potential real parties-in-interest, and balancing this with the proximity of the trial dates to the statutory deadline by a matter of two to five months, we consider that this factor weighs marginally in favor of exercising discretion.

C. Factor 3: Investment in the Parallel Proceeding by the Court and Parties

Patent Owner argues that an “[i]mmense [i]vestment” has been made by the courts and the parties in the WDTex and EDTex litigations. Prelim. Resp. 14–20. In particular, Patent Owner points out that a subject-matter eligibility motion is pending and a Markman order has issued in the WDTex litigation. *Id.*; Prelim. Sur-reply 3. In all pending district court matters, final infringement and invalidity contentions have been exchanged. Prelim. Resp. 15–17; Prelim. Sur-reply 3. However, expert and fact discovery is ongoing. Prelim. Resp. 22–23.

Petitioner, on the other hand, argues that it filed the Petition before the invalidity contentions deadline in any of the parallel litigations. Pet. 13. Petitioner also points out that the work expended thus far is unrelated to the unpatentability issues raised in the Petition because neither the Petition nor the Preliminary Response raises claim construction issues, and most of the motions have been largely pleading-related, not addressing the obviousness allegations presented in the Petition. Prelim. Reply 2–3. Thus, Petitioner argues that this factor weighs against exercising discretion. Pet. 10–11. We agree with Petitioner. In particular, we acknowledge Petitioner’s diligence in filing the Petition before any of the invalidity contentions deadlines. We also acknowledge that the resources and effort expended by the district courts in the pending litigations thus far have not been shown to have substantial relation to the unpatentability issues presented in the Petition. Accordingly, we determine that this factor weighs slightly against exercising our discretion.

D. Factor 4: Overlap Between Issues Raised in the Petition and in the Parallel Proceeding

Patent Owner argues there is “complete” overlap between issues raised in the Petition and in the pending litigations while Petitioner argues that there is no substantial overlap. Prelim. Resp. 20–24; Prelim. Reply 3; Prelim. Sur-reply 4. We agree with Petitioner that there is no substantial overlap.

This proceeding involves a substantial number of claims of the ’538 patent (claims 1–16, 18–26, and 28–31), while the underlying litigation involves a subset of these claims (claims 1–17). Prelim. Reply 3. The ground asserted here also does not seem to “completely” overlap with the district court invalidity contentions. To start, Petitioner asserts that the claims are invalid over Brcka. The invalidity contentions, although identifying Brcka, also mention 40 other references, many of which are asserted as anticipatory or primary references in a variety of invalidity theories. Prelim. Reply 3 (citing Ex. 1037, 85–115, 244, 249–56; Ex. 1038, 84–114, 159, 162–69). Patent Owner argues that the prior art is the same, merely because Brcka is listed in the voluminous invalidity contentions. Prelim. Resp. 20–24. But that is not enough to support Patent Owner’s conclusion that the overlap of the issues is “complete,” when the ground asserted here is specific to Brcka. Considering that Petitioner is a non-party to the litigation, we acknowledge that even if Brcka is identified as prior art in the invalidity contentions, there is no evidence that Petitioner has had or will have any control over whether and how Brcka will be presented to the

jury. Accordingly, we determine that this factor weighs marginally against exercising discretion.

E. Factor 5: Whether the Petitioner and the Defendant in the Parallel Proceeding Are the Same Party

Petitioner here is not a party to the litigation. Prelim. Reply 4. But, Patent Owner argues, Petitioner has identified some of the defendants as “potential” real-parties-in-interest (“RPIs”) and, under *Fintiv*, Petitioner should have explained the need for duplication of resources. Prelim. Resp. 24–26; Prelim. Sur-reply 4–5 (arguing that under *Fintiv* this factor weighs in favor of denial even where a petitioner is not a defendant in a co-pending action). We do not agree with Patent Owner.

Fintiv explains that an unrelated petitioner should address the co-pending litigation to discuss why the issues here would not be duplicative. *Fintiv*, at 14. Petitioner has explained that there was no substantial overlap and that it diligently filed its Petition before any invalidity contentions were exchanged in district court. Pet. 13–14; Prelim. Reply 3. This explanation and the surrounding circumstances paint the picture of a non-party to the litigation diligently filing a Petition without having control over what arguments may be raised by the parties in the litigation. *Id.* Notably, there is no evidence that the defendants in the underlying litigation have any control over the IPR or how the prior art is presented here such that we could view Petitioner as an agent for the defendants. Accordingly, this factor weighs against exercising discretion.

F. Factor 6: Other Circumstances that Impact the Board's Exercise of Discretion, Including the Merits

Patent Owner contends that the merits of the case are particularly weak and challenges institution on substantive grounds. Prelim. Resp. 26–27, 38–45; Prelim. Sur-reply 5. Petitioner asserts that the merits warrant institution and that it has no other forum in which to present these arguments. Pet. 15. Patent Owner responds that Petitioner has no “due process” right because it is free to litigate the ’305 patent claims’ validity in its own district court case. Prelim. Resp. 26 (citing *Mylan Labs. Ltd. v. Janssen Pharmaceutica, N.V.*, 989 F.3d 1375, 1383 (Fed. Cir. 2021)). We are not persuaded by Patent Owner’s arguments.

As discussed below, we were not persuaded by Patent Owner’s arguments that the merits of the Petition are weak. Patent Owner’s argument that Petitioner may challenge validity in a district court case of its own as an alternative to requesting an IPR does not impact our analysis because the *Fintiv* factors do not assume a preference for any particular jurisdiction for determining a challenge of validity. Rather, Petitioner’s choice of forum is a litigation decision that falls entirely within Petitioner’s prerogative.

Consequently, noting we have found that at least one claim in the Petition meets the reasonable likelihood of prevailing and that Patent Owner’s arguments to the contrary were unpersuasive, we determine that factor six is neutral.

G. Balancing the Fintiv Factors

We have considered the circumstances before us in light of the *Fintiv* factors. Except for the second factor, the proximity of trial dates, all other

factors are either neutral or weigh against exercising discretion. Altogether, balancing the factors, we decline to invoke our authority to deny the Petition on a discretionary basis under § 314(a).

III. ANALYSIS

A. Principles of Law

“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”)).

“A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. Inc. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Moreover, “[b]ecause the hallmark of anticipation is prior invention, the prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). Whether a reference anticipates is assessed from the perspective of an ordinarily skilled artisan. *See Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003).

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 at the time the invention was made to a person having ordinary skill in the art to which that subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations of nonobviousness when presented. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Person of Ordinary Skill in the Art (“POSA”)

In determining the level of skill in the art, we consider the problems encountered in the art, the art’s solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

Petitioner contends:

A POSA would have at least a B.S. in mechanical engineering, electrical engineering, materials science engineering, or a related field, and four years of experience working with semiconductor fabrication processes, including computer programming and data analysis.

Pet. 20 (citing Ex. 1003 ¶ 32). Patent Owner does not dispute Petitioner’s proposed level of skill in the art, for purposes of the Preliminary Response. Prelim. Resp. 34.

On the current record, Petitioner’s proposal appears to be generally consistent with the level of skill reflected in the specification and the cited prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level 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)). Accordingly, we adopt Petitioner’s proposed definition of the POSA level for purposes of this Decision.

C. Claim Construction

We interpret a claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b) (2020). Under this standard, we construe the claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.*

Petitioner does not identify any claim terms that require construction. Pet. 18. Patent Owner does not dispute Petitioner’s assertion that no claim terms require construction, for purposes of the Preliminary Response. Prelim. Resp. 35.

We do not find it necessary to construe the claims at this stage of the proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the

controversy” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy’”).

D. Overview of the Asserted Prior Art

1. Brcka (Exhibit 1005)

Brcka relates to “an intelligent modeling method and system [for] monitor[ing] and perform[ing] analysis of semiconductor processing equipment.” Ex. 1005, code (57). Brcka notes that semiconductor processing involves the control of various process variables where changes in processing conditions, for example, “in the composition or pressure of a processing gas, applied power, or wafer temperature,” can result in semiconductor wafers being out of tolerance. *Id.* ¶ 3.

Figure 1 of Brcka (reproduced below) is a block diagram of a reinforcement learning system.

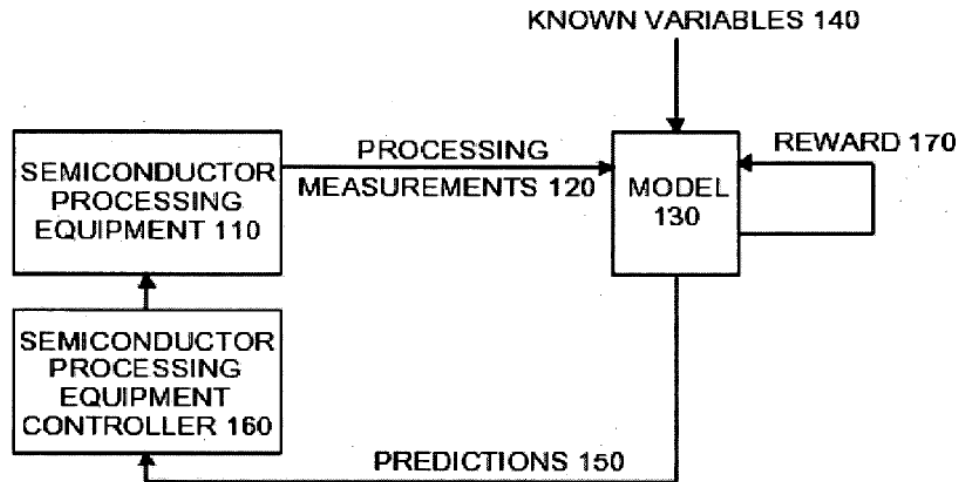


FIG. 1

Figure 1 depicts semiconductor processing equipment 110, which outputs various process measurements 120, for example, “chamber temperature, gas mixture and applied Radio Frequency (RF) power,” for use in model 130. *Id.* ¶ 14. Based on process measurements 120 and other known variables 140, including the “the time between a last equipment cleaning interval” and “the time between last equipment failures,” model 130 “simulates the future equipment states to determine the next time that equipment maintenance should be necessary.” *Id.* Model 130 also can generate predictions 150 about future processing equipment states and send these to equipment controller 160. *Id.*

Brcka describes that in one embodiment, “process measurements 120 may be used in an intelligent system, such as a neural network building a model to output data indicating a prediction of a next failure time and a preventative maintenance schedule.” *Id.* at ¶ 19. Brcka observes that neural networks learn by “modifying the weight values associated with the

interconnecting paths of the network so that an input pattern maps to a pre-determined or ‘desired’ output pattern.” *Id.* ¶ 21. In the context of Brcka’s Figure 1 embodiment, the system may learn by comparing, for example, in equipment controller 160, predicted values with actual values and assigning reward value 170 by model 130. *Id.* ¶ 30.

Figure 4 of Brcka (reproduced below) “is a flow diagram demonstrating operation of a learning system and neural network model.” *Id.* ¶ 44.

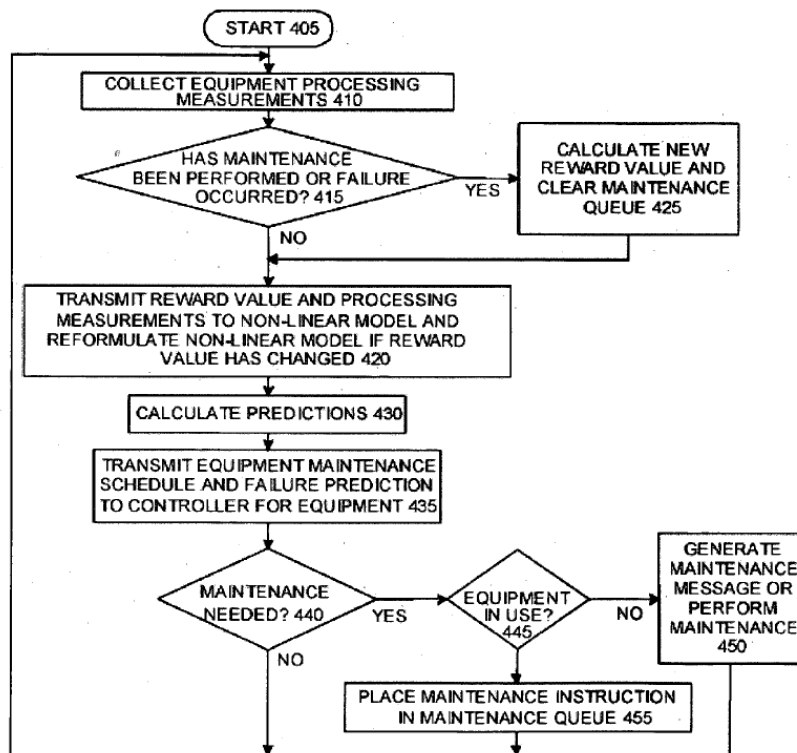


FIG. 4

Figure 4 depicts the operation of Brcka’s learning system as beginning with the collection of equipment processing measurements in step 410. *Id.* Step 415 determines whether there has been machine maintenance or a machine failure. *Id.* If so, control passes to step 425 where “a new reward value is

calculated based on maintenance performed or the failure.” *Id.* Proceeding to step 420, if a reward value has been recalculated in step 425, the reward value and processing measurements are sent to a non-linear model, such as a neural network. *Id.* ¶ 45. At step 430, predictions are calculated based on the non-linear model, and a maintenance schedule and failure prediction is sent to a controller. *Id.* Then, either maintenance is performed if needed based on the predictions, or control returns to step 410 for further collection of processing measurements. *Id.* ¶ 46.

E. Alleged Anticipation by Brcka

Petitioner asserts that claims 1, 2, 6, 9–13, 18, 19, 21–23, 28, and 29 are anticipated by Brcka. Pet. 30–44. We provided an overview of the prior art above. Petitioner shows, based on this preliminary record, where each of the limitations of the challenged claims is disclosed in Brcka. *Id.*

Petitioner’s assertions are backed by the cited prior art and by the testimony of its declarant, Dr. Shanfield. *Id.*; *see also* Ex. 1003 ¶¶ 68–107. On this preliminary record, we determine that Petitioner’s arguments and evidence are sufficient for purposes of institution. We focus our discussion on Patent Owner’s arguments to provide guidance to the parties. Prelim. Resp. 38–44.

1. Patent Owner’s argument that Brcka does not disclose “performing in a computer a fault detection analysis relating to processing of a workpiece”

Patent Owner argues that “the focus of Brcka is *maintenance prediction, not fault detection*.” Prelim. Resp. 39. According to Patent Owner “Brcka does not teach the performance of an analysis of a failure which has already occurred, but rather predicts, or speculates the occurrence

of, the time of an equipment failure or next equipment maintenance which might or might not happen in the future.” *Id.* at 40. Thus, Patent Owner argues that Brcka does not teach “performing in a computer a fault detection analysis relating to processing of a workpiece,” as recited in claim 1. *Id.* at 39–41. On this preliminary record, we do not find Patent Owner’s argument persuasive.

Petitioner cites to the embodiment depicted in Brcka’s Figure 4 as illustrating Brcka’s “fault detection analysis.” Pet. 32–33; *see also*, Ex. 1003 ¶¶ 72–73. Figure 4 is a “flow diagram demonstrating operation of a learning system and a neural network model designed in accordance with at least one embodiment of [Brcka’s] invention.” Ex. 1005 ¶ 44. In step 415 of the operation disclosed in Figure 4, “a determination is made whether maintenance has been performed or a machine failure has occurred.” *Id.* ¶ 44, Fig. 4. In step 440, “a determination is made whether maintenance is needed.” *Id.* ¶ 45; Fig. 4. Thus, Brcka determines whether a failure has occurred, accounts for this determination by assigning a “reward value” (Fig. 4, step 425), and then decides whether maintenance is needed. On this record, the analysis reflected in these steps qualifies as a “fault detection analysis.”

We recognize that Brcka’s fault detection analysis is used in a method that includes a predictive component. But, on the current record, we do not find anything in the language of claim 1 that precludes performing the fault detection analysis as part of a predictive model. Indeed, the claim language requires only “performing . . . a fault detection analysis.” Moreover, the “fault detection” itself (i.e. Brcka’s step 415), as opposed to the analysis of

the detected fault, is backward-looking, not predictive; it determines “whether . . . a machine failure **has occurred.**” *Id.* ¶ 44 (emphasis added).

We also recognize that the fault detected in Brcka’s step 425 is a “machine failure” rather than a fault in a “workpiece,” which we understand to include, for example, semiconductor wafers. *Id.*; Ex. 1001, 5:29–30 (“workpieces (e.g., semiconductor wafers 105, semiconductor devices, etc.)”). However, Brcka describes its process as “a mathematical model of the relationship of parameters to results in a given semiconductor manufacture process.” Ex. 1005 ¶ 15. Accordingly, the machine failure detected in Brcka’s step 425 “relates” to “processing of a workpiece” as required by claim 1. This is consistent with the fault detection analysis described in the ’538 patent (“The method comprises processing a workpiece and performing a fault detection analysis relating to the processing of the workpiece based upon a tool state parameter being input into a fault detection model associated with the fault detection analysis.”). In addition, we note that at least one of the parameters used in Brcka’s mathematical model relates directly to the semiconductor wafer – i.e., the workpiece – rather than to the machinery used to produce that workpiece. *Id.* ¶ 40 (Brcka teaching that its model collects “critical dimension measurement” data); Ex. 1003 ¶ 101 (Dr. Shanfield’s testimony that “critical dimensions would be considered metrology data,” and that “[i]n semiconductor fabrication, metrology data refers to product measurements rather than tool measurements.”).

2. Patent Owner's argument that Brcka does not disclose "determining in a said computer a relationship of a parameter relating to said fault detection analysis to a detected fault"

Patent Owner argues that Brcka does not teach "determining in a said computer a relationship of a parameter relating to said fault detection analysis to a detected fault," as recited in claim 1. Prelim. Resp. 41–42. Patent Owner acknowledges that Brcka discloses collecting measurements of "parameters like pressure, flow rate, and temperature," but argues that these measurements are mere "historical processing measurements" that are "collected by the neural network for building the 'non-linear model.'" *Id.* According to Patent Owner, these parameters are not "tied to a detected fault" and thus, Brcka does not "determine a relationship of a parameter relating to the fault detection analysis to a detected fault." *Id.* Patent Owner also argues that Brcka does not "determine a relationship of a parameter relating to the fault detection analysis to a detected fault because, in Brcka, "[m]aintenance and/or failure times' are not parameters collected for fault detection purposes, but rather outputs (i.e., results) of a prediction analysis performed by the neural network." *Id.* at 41–42. On the current record, we do not find this argument persuasive.

Brcka discloses a neural network that "store[s] connected strengths (i.e., weight values) between . . . artificial neuron units." Ex. 1005 ¶ 21. "[A] set of weight values associated with each connection in the neural network, is used to map an input pattern to an output pattern." *Id.* "Learning in a neural network means modifying the weight values associated with the interconnecting paths of the network so that an input

pattern maps to a pre-determined or ‘desired’ output pattern.” *Id.* Brcka discloses that “processing measurements are used as inputs [in the neural network] and the maintenance and/or failure times are used as outputs for training the neural network.” *Id.* ¶ 41; *see also id.* ¶ 40 (identifying various “processing measurements:”).

We are not persuaded by Patent Owner’s argument that failure times are not parameters used for analysis because Brcka makes clear that both inputs and outputs are used to train the neural network. *Id.* ¶¶ 21, 41, Fig. 3. Accordingly, all inputs and outputs, including the fault detection parameter, are interconnected. *Id.* Adjusting the weight of one parameter necessarily involves determining a relationship between that parameter and the other parameters, including a detected fault. *Id.*; *see also id.* at Fig. 4, ¶¶ 44–45.

3. Patent Owner’s argument that Brcka does not disclose “adjusting in said computer a weighting of said parameter based upon said relationship of said parameter to said detected fault”

Patent Owner argues that Brcka does not teach “adjusting in said computer a weighting of said parameter based upon said relationship of said parameter to said detected fault,” as recited in claim 1. Prelim. Resp. 42. More specifically, Patent Owner contends that the weight values disclosed in Brcka “are not adjusted ***based on*** a relationship between any of the purported ‘parameters’ and a detected fault.” *Id.* at 43. Rather, according to Patent Owner, “the weight adjustment happens [when] there is a mismatch between the actual output pattern and the desired output pattern.” *Id.* At this point in the proceeding, we do not find this argument persuasive.

Brcka discloses that when a “machine failure” has occurred, a reward value is calculated. Ex. 1005, Fig. 4, ¶¶ 43, 44. A reward value “may be as simple as the sum of the difference from the predicted [output] to the actual [output].” *Id.* ¶ 43. If the reward value was recalculated, then the neural network is reformulated. *Id.* ¶ 45, Fig. 4; *see also*, Ex. 1003 ¶ 84. Brcka discloses that when “the actual output pattern does not match the desired output pattern, a learning rule is invoked by the neural network system to adjust the weight value associated with each connection of the network.” Ex. 1005 ¶ 23. Thus, calculating a reward value at Brcka’s step 425 when actual machine failure output does not match desired machine failure output would cause an adjustment to the weighting of each parameter in the neural network based on the relationship of those parameters to the detected failure. *Id.* ¶¶ 23, 43–45, Fig. 4.

4. Patent Owner’s argument that Brck does not disclose “performing is said computer the fault detection analysis relating to processing of a subsequent workpiece using said adjusted weighting”

Patent Owner argues that Brcka does not teach “performing in said computer the fault detection analysis relating to processing of a subsequent workpiece using said adjusted weighting,” as recited in claim 1. Prelim. Resp. 44. According to Patent Owner, “[t]here [are] no disclosures in Brcka that describe the use of weighted values, or desired output pattern, in the performance of a fault detection analysis on a subsequent wafer.” *Id.* We do not find this argument persuasive because Brcka’s Figure 4, on its face, is a continuous loop. Ex. 1005, Fig. 4; *see also*, *id.* ¶ 46 (explaining that

control returns to step 410 after steps 450 and 455 as well as if it is determined that maintenance is not needed).

5. Conclusion

For the reasons discussed above, we find that the record sufficiently supports Petitioner's contention that Brcka anticipates claims 1, 2, 6, 9–13, 18, 19, 21–23, 28, and 29 of the '538 patent.

F. Obviousness over Brcka

Petitioner asserts that claims 3–5, 7, 8, 14–16, 20, 24–26, 30, and 31 would have been obvious over Brcka. Pet. 31–33. Petitioner provides documentary and testimonial evidence to back its assertions. *Id.*; *see also* Ex. 1003 ¶¶ 108–143. Patent Owner argues that claims 3–5, 7, 8, 14–16, 20, 24–26, 30, and 31 are not rendered obvious by Brcka because of the alleged shortcomings of Brcka with respect to the claims challenged as being anticipated, and because Petitioner has not asserted the knowledge of a POSA remedies these alleged shortcomings. *See* Prelim. Resp. 45. For the reasons discussed above, on the current record, we do not find these arguments persuasive.

IV. CONCLUSION

On this preliminary record, Petitioner has established a reasonable likelihood of prevailing in showing that at least one of the challenged claims is unpatentable based on the grounds advanced in the Petition.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *granted*, and we institute *inter partes* review of claims 1–16, 18–26, and 28–31 based on the grounds asserted in this Petition;

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

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