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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JASON ZSE-CHERNG LIN and SHAUH-TEH JUANG

Appeal 2018-005962
Application 14/607,352
Technology Center 2100

Before ST. JOHN COURTENAY III, LINZY T. McCARTNEY, and
JASON J. CHUNG, *Administrative Patent Judges*.

COURTENAY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from a final rejection of claims 23–37, which are all the claims pending in this application.¹ Claims 1–22 are cancelled. We have jurisdiction over the pending claims under 35 U.S.C. § 6(b).

We affirm.

¹ The real party in interest is DMO Systems Ltd. App. Br. 2.

STATEMENT OF THE CASE²

Introduction

Appellants' claimed invention relates "to semiconductor device fabrication, and more specifically to a method for improving lithographic process in manufacturing semiconductor device." Spec. ¶ 1.

Exemplary Claim

1. A method of incorporating wafer physical measurement with digital simulation to improve hot spot prediction and identify critical hot spots for monitoring defects and improving yield in manufacturing a semiconductor device, comprising:

using a semiconductor manufacturing or inspecting station to collect a plurality of physical data from a plurality of targets on a processed wafer of a semiconductor device;

using a chip design modeling and verification system to generate a plurality of simulation data of a plurality of hot spot candidates based on digital simulation according to chip design data of the semiconductor device; and

using a data analytics computing platform to identify a plurality of critical hot spots by performing data analytics using the plurality of physical data and the plurality of simulation data with reference to the chip design data to select a subset of the plurality of hot spot candidates as the plurality of critical hot spots for inspecting wafers and monitoring wafer defects in semiconductor manufacturing or inspecting stations to improve yield in manufacturing the semiconductor device;

² We herein refer to the Final Office Action, mailed June 22, 2017 ("Final Act."); Appeal Brief, filed Nov. 22, 2017 ("App. Br."), and the Examiner's Answer, mailed Feb. 8, 2018 ("Ans.").

wherein the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer, and the data analytics includes identifying a closest target from the plurality of targets for each hot spot candidate, performing data correction on the simulation data by calibrating the simulation data of each hot spot candidate according to the physical data of the closet target, and selecting the subset of the plurality of hot spot candidates based on the simulation data after data correction.

App. Br. 16, “Claims Appendix.” (Emphasis added regarding the dispositive “wherein” clause limitation under 35 U.S.C. § 103).

Rejections

A. Independent claims 23 and 26 are rejected under 35 U.S.C. § 112(b), as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor regards as the invention. Final Act. 2.

B. Claims 23–37 are rejected under 35 U.S.C. § 101, as being directed to a judicial exception, without significantly more. Final Act. 3.

C. Claims 23–37 are rejected under 35 U.S.C. § 103 as being obvious over the combined teachings and suggestions of Orbon et al. (US 2007/0052963 A1; filed Oct. 27, 2006, pub. Mar. 8, 2007) (hereinafter “Orbon”), and Rathsack et al. (US 2009/0144691 A1; filed Nov. 29, 2007, pub. June 4, 2009) (hereinafter “Rathsack”). Final Act. 6 – 9.

Issues on Appeal

1. Did the Examiner err in concluding that independent claims 23 and 26 are indefinite under 35 U.S.C. § 112(b)?
2. Did the Examiner err in concluding that claims 23–37 are directed to a judicial exception, without significantly more, under 35 U.S.C. § 101?
3. Did the Examiner err in concluding that claims 23–37 are obvious over the cited combination of Orbon and Rathsack, under 35 U.S.C. § 103?

ANALYSIS

We have considered all of Appellants’ arguments and any evidence presented. To the extent Appellants have not advanced separate, substantive arguments for particular claims, or other issues, such arguments are waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

We have reviewed Appellants’ arguments in the Briefs, the Examiner’s rejections, and the Examiner’s responses to Appellants’ arguments. We reverse Rejection A under 35 U.S.C. § 112(b) for the reasons discussed *infra*. However, we affirm the Examiner’s Rejection B under 35 U.S.C. § 101. Regarding Rejection C under 35 U.S.C. § 103, Appellants have proffered sufficient arguments and evidence to persuade us of error regarding the Examiner’s underlying factual findings and ultimate legal conclusion of obviousness for all claims 23–37 on appeal.

In our analysis below, we highlight and address specific findings and arguments for emphasis.

*Rejection A of Independent Claims 23 and 26
under 35 U.S.C. § 112(b)*

Issue: Under 35 U.S.C. § 112(b), did the Examiner err by concluding the claim language “distributed denser” is indefinite?

The Examiner concludes the claim language “wherein the plurality of hot spot candidates is *distributed denser* than the plurality of targets on the wafer” is indefinite because of the relative terms “distributed” and “denser.” Final Act. 2–3. Independent claims 23 and 26 (emphasis added). The Examiner concludes that one of ordinary skill in the art would not have been reasonably apprised of the scope of the invention. *Id.*

However, Appellants point to paragraphs 25, 26, and 30 of the Specification, and contend: “One of ordinary skill in the art should readily appreciate that the term ‘denser’ in claims 23 or 26 refers to comparing the number of hot spots or targets distributed on a wafer by reading the present specification.” App. Br. 5.

We agree that paragraphs 25, 26, and 30 of the Specification sufficiently describe the term “dense” as referring to the number of hot spot candidates, or the number of Critical Dimension (CD) targets in a given space or area. *See also* App. Br. 4–6.³ Therefore, we conclude the claim

³ *Cf.* When a claim term “depend[s] solely on the unrestrained, subjective opinion of a particular individual purportedly practicing the invention,” without sufficient guidance in the specification to provide objective direction to one of skill in the art, the term is indefinite. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350 (Fed.Cir.2005) (finding “aesthetically pleasing” to be indefinite because the specification lacked any objective definition of the term). Here, we find the Specification, at paragraphs 25, 26, and 30, provides sufficient *objective direction* to one of ordinary skill in the art, regarding the intended meaning of the claim term “distributed denser.” Independent claims 23 and 26.

term “dense” is not indefinite under a broad but reasonable interpretation consistent with the Specification. Furthermore, “distributed denser” has a plain meaning that we interpret as points or elements packed closer together (or in higher numbers) in a given space or area (e.g., “hot spot candidates” are *distributed more densely* when compared to the plurality of “targets” contained within a specific area of the chip).

Accordingly, we reverse the Examiner’s Rejection A under 35 U.S.C. § 112 (b).

Rejection B of Claim 23–37

Issue: Under 35 U.S.C. § 101, did the Examiner err by rejecting claims 23–37, as being directed to a judicial exception, without significantly more.

Principles of Law — 35 U.S.C. § 101

An invention is patent-eligible if it claims a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. However, the Supreme Court has long interpreted 35 U.S.C. § 101 to include implicit exceptions: “[L]aws of nature, natural phenomena, and abstract ideas” are not patentable. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 70 (2012) (citing *Diamond v. Diehr*, 450 U.S. 175, 185 (1981)).

In determining whether a claim falls within an excluded category, we are guided by the Supreme Court’s two-step framework, described in *Mayo* and *Alice*. *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 217–18 (2014) (citing *Mayo*, 566 U.S. at 75–77). In accordance with that framework, we first determine what concept the claim is “directed to.” *See Alice*, 573 U.S.

at 219 (“On their face, the claims before us are drawn to the concept of intermediated settlement, *i.e.*, the use of a third party to mitigate settlement risk.” (emphasis omitted)); *see also Bilski v. Kappos*, 561 U.S. 593, 611 (2010) (“Claims 1 and 4 in petitioners’ application explain the basic concept of hedging, or protecting against risk.”).

Concepts determined to be abstract ideas, and thus patent ineligible, include certain methods of organizing human activity, such as fundamental economic practices (*Alice*, 573 U.S. at 219–20; *Bilski*, 561 U.S. at 611); mathematical formulas (*Parker v. Flook*, 437 U.S. 584, 594–95 (1978)); and mental processes (*Gottschalk v. Benson*, 409 U.S. 63, 69 (1972)). Concepts determined to be patent eligible include physical and chemical processes, such as “molding of rubber products” (*Diehr*, 450 U.S. at 193); “tanning, dyeing, making water-proof cloth, vulcanizing India rubber, smelting ores” (*id.* at 182 n.7 (quoting *Corning v. Burden*, 56 U.S. (15 How.) 252, 267–68 (1854))); and manufacturing flour (*Benson*, 409 U.S. at 69 (citing *Cochrane v. Deener*, 94 U.S. 780, 785 (1876))).

In *Diehr*, the claim at issue recited a mathematical formula, but the Supreme Court held that “[a] claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula.” *Diehr*, 450 U.S. at 187; *see also id.* at 191 (“We view respondents’ claims as nothing more than a process for molding rubber products and not as an attempt to patent a mathematical formula.”). Having said that, the Supreme Court also indicated that a claim “seeking patent protection for that formula in the abstract . . . is not accorded the protection of our patent laws, . . . and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological

environment.” *Id.* (citing *Benson and Flook*); *see, e.g., id.* at 187 (“It is now commonplace that an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.”).

If the claim is “directed to” an abstract idea, we turn to the second step of the *Alice* and *Mayo* framework, where “we must examine the elements of the claim to determine whether it contains an ‘inventive concept’ sufficient to ‘transform’ the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (quotation marks omitted). “A claim that recites an abstract idea must include ‘additional features’ to ensure ‘that the [claim] is more than a drafting effort designed to monopolize the [abstract idea].’” *Id.* (alterations in original) (quoting *Mayo*, 566 U.S. at 77). “[M]erely requir[ing] generic computer implementation[] fail[s] to transform that abstract idea into a patent-eligible invention.” *Id.*

Subject Matter Eligibility — 2019 Revised Guidance

The USPTO recently published revised guidance on the application of 35 U.S.C. § 101. *See* 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019) (“2019 Revised Guidance”). *This new guidance is applied in this opinion.* Under the 2019 Revised Guidance, we first look to whether the claim recites:

(1) any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, mental processes, or certain methods of organizing human activity such as a fundamental economic practice or managing personal behavior or relationships or interactions between people); and

(2) additional elements that integrate the judicial exception into a practical application (*see* Manual of Patent Examining Procedure (“MPEP”) §§ 2106.05(a)–(c), (e)–(h)).⁴

See 2019 Revised Guidance, 84 Fed. Reg. at 51–52, 55.

A claim that integrates a judicial exception into a practical application applies, relies on, or uses the judicial exception in a manner that imposes a meaningful limit on the judicial exception, such that the claim is more than a drafting effort designed to monopolize the judicial exception. *See* 2019 Revised Guidance, 84 Fed. Reg. at 54. When the judicial exception is so integrated, then the claim is not directed to a judicial exception and is patent eligible under § 101. *Id.*

Only if a claim: (1) recites a judicial exception and (2) does not integrate that exception into a practical application, do we then evaluate whether the claim provides an inventive concept. *See* 2019 Revised Guidance at 56; *Alice*, 573 U.S. at 217–18.

For example, we look to whether the claim:

(3) adds a specific limitation beyond the judicial exception that is not “well-understood, routine, conventional” in the field (*see* MPEP § 2106.05(d)); **or**

(4) simply appends well-understood, routine, and conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.

See 2019 Revised Guidance, 84 Fed. Reg. at 56.

Because there is no single definition of an “abstract idea” under *Alice* step 1, the PTO has recently synthesized, for purposes of clarity, predictability, and consistency, key concepts identified by the courts as

⁴ All references to the MPEP are to the Ninth Edition, Revision 08–2017 (rev. Jan. 2018).

abstract ideas to explain that the “abstract idea” exception includes the following three groupings:

1. Mathematical concepts—mathematical relationships, mathematical formulas or equations, mathematical calculations;
2. Mental processes— concepts performed in the human mind (including an observation, evaluation, judgment, opinion); and
3. Certain methods of organizing human activity—fundamental economic principles or practices (including hedging, insurance, mitigating risk); commercial or legal interactions (including agreements in the form of contracts; legal obligations; advertising, marketing or sales activities or behaviors; business relations); managing personal behavior or relationships or interactions between people (including social activities, teaching, and following rules or instructions).

See 2019 Revised Guidance, 84 Fed. Reg. at 52.

According to the 2019 Revised Guidance, “[c]laims that do not recite [subject] matter that falls within these enumerated groupings of abstract ideas should not be treated as reciting abstract ideas,” except in rare circumstances. Even if the claims recite any one of these three groupings of abstract ideas, these claims are still not “directed to” a judicial exception (abstract idea), and thus are patent eligible, if “the claim as a whole integrates the recited judicial exception into a practical application of that exception.” *See* 2019 Revised Guidance, 84 Fed. Reg. at 53.

For example, limitations that **are** indicative of “integration into a practical application” include:

1. Improvements to the functioning of a computer, or to any other technology or technical field — *see* MPEP § 2106.05(a);
2. Applying the judicial exception with, or by use of, a particular machine — *see* MPEP § 2106.05(b);
3. Effecting a transformation or reduction of a particular article to a different state or thing — *see* MPEP § 2106.05(c); and
4. Applying or using the judicial exception in some other meaningful way beyond generally linking the use of the judicial exception to a particular technological environment, such that the claim as a whole is more than a drafting effort designed to monopolize the exception — *see* MPEP § 2106.05(e).

In contrast, limitations that are **not** indicative of “integration into a practical application” include:

1. Adding the words “apply it” (or an equivalent) with the judicial exception, or merely include instructions to implement an abstract idea on a computer, or merely uses a computer as a tool to perform an abstract idea — *see* MPEP § 2106.05(f);
2. Adding insignificant extra-solution activity to the judicial exception — *see* MPEP § 2106.05(g); and
3. Generally linking the use of the judicial exception to a particular technological environment or field of use — *see* MPEP 2106.05(h).

See 2019 Revised Guidance, 84 Fed. Reg. at 54–55 (“Prong Two”).

2019 Revised Guidance, Step 2A, Prong One

The Judicial Exception

We review the Examiner’s § 101 rejection *de novo* under the 2019 Revised Guidance.⁵ We begin our analysis by considering whether the

claims recite any judicial exceptions, including certain groupings of abstract ideas, in particular: (a) mathematical concepts, (b) mental steps, and (c) certain methods of organizing human activities.

Mental Steps

Under the 2019 Revised Guidance, we conclude at least the following steps of claim 23 could be performed as mental steps, with the aid of pen and paper:

1. “generat[ing]a plurality of simulation data”
2. “identify[ing] a plurality of critical hot spots”
3. “identifying a closest target from the plurality of targets for each hot spot candidate,” and
4. “select[ing]a subset of the plurality of hot spot candidates”

Claim 23.

Thus, we conclude the *generating*, *identifying*, and *selecting* steps recite abstract ideas that fall into the category of mental processes—concepts performed in the human mind (including an observation, evaluation, judgment, opinion).⁶

See claim 23:

using a chip design modeling and verification system to
generate a plurality of simulation data of a plurality of hot spot

⁵ Throughout this opinion, we give the contested claim limitations the broadest reasonable interpretation consistent with the Specification. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997).

⁶ If a method can be performed by human thought alone, or by a human using pen and paper, it is merely an abstract idea and is not patent eligible under § 101. *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1372–73 (Fed. Cir. 2011); *see also Synopsys, Inc. v. Mentor Graphics Corp.*, 839 F.3d 1138, 1146–47 (Fed. Cir. 2016) (“While the Supreme Court has

candidates based on digital simulation according to chip design data of the semiconductor device; and

using a data analytics computing platform to *identify a plurality of critical hot spots* by **performing data analytics** using the plurality of physical data and the plurality of simulation data with reference to the chip design data to

select a subset of the plurality of hot spot candidates as the plurality of critical hot spots for inspecting wafers and monitoring wafer defects in semiconductor manufacturing or inspecting stations to improve yield in manufacturing the semiconductor device;

wherein the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer, and the data analytics includes *identifying a closest target from the plurality of targets for each hot spot candidate*, **performing data correction** on the simulation data by **calibrating** the simulation data of each hot spot candidate according to the physical data of the closet target, and selecting the subset of the plurality of hot spot candidates based on the simulation data after data correction.

(emphases added in italics and bold).

altered the § 101 analysis since *CyberSource* in cases like *Mayo* and *Alice*, we continue to ‘treat[] analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category.’” (brackets in original) (quoting *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1354 (Fed. Cir. 2016)); *CyberSource*, 654 F.3d at 1375 (“That purely mental processes can be unpatentable, even when performed by a computer, was precisely the holding of the Supreme Court in *Gottschalk v. Benson*.”).

Mathematical Steps

Further, we conclude the step of “**performing data analytics** using the plurality of physical data and the plurality of simulation data with reference to the chip design data” recites an abstract idea that falls into the 2019 Revised Guidance category of mathematical concepts, including mathematical relationships, mathematical formulas or equations, mathematical calculations. Claim 23 (emphasis added).

Similarly, we conclude the step of “**performing data correction** on the simulation data by **calibrating** *the simulation data of each hot spot candidate according to the physical data of the closet target*” also recites an abstract idea that falls into the same category of mathematical concepts, i.e., including mathematical calculations. Claim 23 (emphasis added).

We conclude the first recited step of “using a semiconductor manufacturing or inspecting station to *collect a plurality of physical data* from a plurality of targets on a processed wafer of a semiconductor device” is insignificant extra-solution activity. Claim 23 (emphasis added). Courts have found data gathering steps to be insignificant extra-solution activity. *See, e.g., In re Bilski*, 545 F.3d 943, 963 (Fed. Cir. 2008) (en banc), *aff’d sub nom Bilski v. Kappos*, 561 U.S. 593 (2010).

2019 Revised Guidance, Step 2A, Prong Two

Integration of the Judicial Exception into a Practical Application

Regarding MPEP § 2106.05(a) “Improvements to the Functioning of a Computer or to Any Other Technology or Technical Field,” Appellants contend:

the function of wafer inspection and defect monitoring in the advanced semiconductor device fabrication is not only made possible but also *significantly improved* because the simulation data have been calibrated with the physical measurement to effectively discover the unknown critical hot spots. Therefore, appellant respectfully argues that the methods in claims 23 and 26 achieve *unexpected results* and are significantly more than a judicial exception.

App. Br. 7–8 (emphasis omitted and added in italics).

However, Appellants have not shown that any specific claim limitations improve the “semiconductor manufacturing or inspecting station” recited in independent claim 23. We concur with the Examiner that, without more, the “claim[s] recite the abstract idea being performed by [a] ‘semiconductor manufacturing or inspecting station’ or [a] ‘chip design modeling and verification system’ or [a] ‘data analytics computing platform’” which the Examiner finds are generic computer components. Final Act. 5.

The present claims are directed to an abstract idea as discussed *supra*—not a technological improvement. The Specification indicates the additional elements (i.e., wafer of a semiconductor device) recited in the present claims are merely tools used to implement the abstract idea. Spec. ¶¶ 3, 13, 14.

On this record, Appellants have not established that any specific claim limitations improve the functioning of any “semiconductor manufacturing or inspecting station” (claim 23), computer, database, or network. Moreover, Appellants provide no evidence of unexpected (i.e., unconventional) results. *See* App. Br. 8.

*MPEP § 2106.05(b) Particular Machine, and
MPEP § 2106.05(c) Particular Transformation*

Appellants advance no arguments in the Briefs that are directed to the *Bilski* machine-or-transformation test. Arguments not made are waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

MPEP § 2106.05(e) Other Meaningful Limitations

The Examiner concludes: “Claim 23 [recites] generic steps of collecting information, analyzing them base[d] on known parameter[s] such as [a] hot spot, and displaying [the] results of the collection and do not add a *meaningful limitation* to practicing the abstract [idea].” Final Act. 5.

Appellants do not argue that any of the steps of claim 23 provide a *meaningful limitation* beyond generally linking the use of the judicial exception to a particular technological environment. Arguments not made are waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

We have noted above the step of “collect[ing] a plurality of physical data” (claim 23) that performs insignificant extra-solution data gathering activity. *See* MPEP § 2106.05(g) “Insignificant Extra-Solution Activity.” Thus, we determine under *Step 2A, Prong Two* (MPEP §§ 2106.05(a)–(c) and (e)–(h)), that Appellants’ claims 23–37 do not integrate the judicial exception into a practical application, which requires us to proceed to *Step 2B*.

The Inventive Concept – Step 2B

Berkheimer v. HP Inc., 881 F.3d 1360 (Fed. Cir. 2018)

Under the 2019 Revised Guidance, only if a claim: (1) recites a judicial exception, and (2) does not integrate that exception into a practical application, do we then look to whether the claim adds a specific limitation beyond the judicial exception that is not “well-understood, routine, conventional” in the field (*see* MPEP § 2106.05(d)); **or**, simply appends well-understood, routine, and conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.

Here, the Examiner finds: “The generic semiconductor manufacturing or inspecting station are *well-known in the art* and do not add any meaning to the abstract idea.” Final Act. 5 (emphasis added).

We note *Berkheimer* was decided by the Federal Circuit on February 8, 2018. Appellants’ Appeal Brief was filed almost three months earlier, on November 11, 2017. On April 19, 2018, the PTO issued the Memorandum titled: Changes in Examination Procedure Pertaining to Subject Matter Eligibility, Recent Subject Matter Eligibility Decision (*Berkheimer v. HP, Inc.*)” (hereinafter “*Berkheimer* Memorandum”).⁷

However, the Examiner’s Answer was mailed on the same day *Berkheimer* was decided by the Federal Circuit (February 8, 2018). Under 37 C.F.R. § 41.41(a), Appellants had two months thereafter to file a Reply Brief to respond to any additional factual findings and/or explanations provided by the Examiner in the Answer. Appellants did not file a Reply

⁷ Available at <https://www.uspto.gov/sites/default/files/documents/memo-berkheimer-20180419.PDF>.

Brief, despite having constructive notice of *Berkheimer* as an intervening authority on the same day the Answer was mailed (February 8, 2018).

The *Berkheimer* Memorandum provided specific requirements for an Examiner to support with evidence any finding that *claim elements* (or a *combination of elements*) are well-understood, routine, or conventional.

However, in the pre-*Berkheimer* Appeal Brief, Appellants presciently argue:

the [E]xaminer's comments that "semiconductor manufacturing or inspection station" and "chip design modeling and verification system" as generic computer components recited as performing generic computer functions that are *well understood, routine and conventional activities* amount to no more than implementing the abstract idea with a computerized system[,] are *groundless*.

App. Br. 7 (emphasis added and omitted).

In support, Appellants contend:

First of all, semiconductor manufacturing instruments are highly specialized ultra-high precision opto-mechanical equipment rather than generic computer components. Using a semiconductor manufacturing or inspecting station to collect a plurality of physical data from a plurality of targets on a processed wafer of a semiconductor device is a highly specialized technology involving "a physical wafer" and "a sophisticated instrument" that are absolutely not "implementing an abstract idea with a computerized system". In making the baseless statements, the examiner totally ignores the presence of the physical instrument and physical wafer recited and required in the steps of the claimed method.

Id.

However, Appellants do not support their arguments with any objective evidence of record. *Id.* We afford such conclusory attorney arguments little weight. *See In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir.

1997). “Attorney argument is no substitute for evidence.” *Enzo Biochem, Inc. v. Gen-Probe, Inc.*, 424 F.3d 1276, 1284 (Fed. Cir. 2005).

Moreover, Appellants’ Specification describes the claimed “inspection station” as a generic component used as a tool to monitor defects (and thus improve yield) in manufacturing a semiconductor device. For example, *see* Spec. paragraph 6:

OPC and LPC verification also predicts potential yield limiting hot spots caused by specific layout and patterns. As shown in block 104, wafers manufactured by the lithography process using the OPC photomask are examined by **either optical or e-beam inspection and metrology tool** to detect defects and measure critical dimensions in the hot spots. Inspection and metrology data of the predicted hot spots are fed back to block 103 to tune the models and recipes of OPC and DFM.

Spec. ¶ 6.⁸ (emphasis omitted).

See also Spec. ¶ 9: “One approach *commonly used* in process monitoring is to collect scanning electron microscopic (SEM) images from a significant number of hot spots by sampling dies and wafers in the manufacturing flow.” (emphasis added).

In light of the foregoing evidence (Spec. ¶¶ 6, 9), we conclude, under the 2019 Revised Guidance, that each of Appellants’ claims 23–37, considered as a whole, is directed to a patent-ineligible abstract idea that is not integrated into a practical application, and does not include an inventive concept. Therefore, on this record, and for the aforementioned reasons, we sustain the Examiner’s Rejection B under 35 U.S.C. § 101 of claims 23–37.

⁸ “OPC” is an acronym for “Optical Proximity Correction.” *Spec.* ¶ 5. “LPC” is an acronym for “Lithographic Process Check” (verification). *Id.* *See also* Appellants’ Figure 1.

Rejection C of Independent Claims 23 and 26 under 35 U.S.C. § 103

Regarding Rejection C, the Examiner finds the combination of Orbon and Rathsack teaches or suggests all limitations of independent claims 23 and 26, and associated dependent claims 24, 25 and 27–37. (Final Act. 7–27).

Appellants contend Orbon does not teach or suggest “*wherein the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer,*” as identically recited in independent claims 23 and 26. App. Br. 9.

Issue: Under 35 U.S.C. § 103, did the Examiner err by finding Orbon and Rathsack collectively teach or suggest the contested “wherein” clause limitation: “*wherein the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer,*” within the meaning of independent claims 23 and 26? ⁹ (Emphasis added).

Appellants contend:

In the rejection of claim 23, the [E]xaminer cites the teaching of Fig[s.] 13A-13B and paragraph [0078] in Orbon as corresponding to “*wherein the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer*” in the claim. With reference to Orbon[], the true teaching is “for each element, a defect density for each sub-element based on the number of defects and total number of repetitions of the sub-element may also be calculated”. However, how **the plurality of hot spot candidates and the plurality of targets are distributed on the wafer in the present invention have nothing to do with the total number of repetitions of the sub-**

⁹ See *supra* n.5: We give the contested claim limitations the broadest reasonable interpretation (BRI) consistent with the Specification. *Morris*, 127 F.3d at 1054.

element. The term “dense” used and described in the specification is also completely different from the “density” defined in Orbon. [The] Examiner’s consideration of Orbon’s “defect density” as corresponding to “the distribution of the hot spot candidates or targets on the wafer” has distorted Orbon’s teaching. Appellant[s] respectfully argue[] that Orbon fails to teach the limitation that “*the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer*”.

App. Br. 9. (Emphases added and omitted).

In the Answer, the Examiner disagrees, and provides further explanation in support of the rejection:

In the final office action (claim 23: *the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer*), [The E]xaminer [finds] that Orbon: Fig 13A and 13B [0078] disclose for each element, a defect density for each sub-element based on the number of defects and [the] total number of repetitions of the sub-element may also be calculated. As illustrated in Fig. 13A, a map of defect locations for sub-element E4 may be displayed (e.g., via some type of GUI) and a density may be calculated. In this case, the density is 3/3 indicating three defects (e.g. hot spot) in three occurrences of the sub-element. [The] ***Examiner consider[s] this defect density [as] corresponding to the distribution of the hot spot candidate or targets on the wafer.*** The distribution density of hot-spot *can be either more or less than target.*

Ans. 5 (emphasis added and omitted).

We begin our analysis with claim construction.¹⁰ We turn to the Specification for *context*. Applying a broad but reasonable interpretation to

¹⁰ Claim construction is an important step in a patentability determination. A legal conclusion that a claim is obvious involves two analytical steps, assuming the references have been properly combined under § 103. *See Medichem, S.A. v. Rolabo, S.L.*, 353 F.3d 928, 933 (Fed. Cir. 2003) (“Both anticipation under § 102 and obviousness under § 103 are two-step inquiries.

independent claim 23, we construe the claim language “*distributed denser*” as a combination of recognized plain meaning terms (distributed + denser), consistent with the supporting description found in the Specification at paragraphs 25, 26, and 30 (emphasis added).

As discussed above regarding Rejection A under § 112(b), we conclude the claim term “distributed denser” has a plain meaning that we interpret as points or elements packed closer together (or in higher numbers) in a given space or area (e.g., “hot spot candidates” are *distributed more densely* when compared to the plurality of “targets” contained within a specific area of the chip).

Given this construction (*id.*), we turn to the evidence relied upon by the Examiner in support of the rejection. (Final Act. 8–9; Ans. 5–6). The Examiner finds the disputed “wherein” clause limitation that is identically recited in independent claims 23 and 26 is taught or suggested principally by Orbon, at paragraph 78, which describes Orbon’s Figures 13A and 13B. Final Act. 8.

We reproduce the cited portion of Orbon’s paragraph 78 in context below:

For example, as illustrated in FIGS. 13A-13B, for each element, a defect map may be generated that illustrates the location of each defect relative to a sub-structure. Further, for

The first step in both analyses is a proper construction of the claims. . . . The second step in the analyses requires a comparison of the properly construed claim to the prior art.” (internal citations omitted)). Under the second step, the Board must compare the construed claim to one or more prior art references and make factual findings regarding the limitations contested by Appellants. *See In re Crush*, 393 F.3d 1253, 1256 (Fed. Cir. 2004).

each element, a *defect density for each sub-element based on the number of defects and total number of repetitions of the sub-element may also be calculated*. As illustrated in FIG. 13A, a map of *defect locations for sub-element E4* may be displayed (e.g., via some type of GUI) and a *density may be calculated*. In this case, the density is 3/3 indicating three defects in three occurrences of the sub-element. In contrast, as illustrated in FIG. 13B, no defects were detected in Element E7, hence a zero defect density for each sub-element E4 and E3.

Orbon ¶ 78 (emphasis added).

Regarding the evidence relied upon by the Examiner, we find paragraph 78 of Orbon, and Figures 13A and 13B, do not teach or suggest: “wherein *the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer.*” Independent claims 23 and 26 (emphasis added).

First, the Examiner’s claim construction is blurred, because the Examiner appears to have conflated two separate claim terms, i.e., “hot spot candidates” with “targets” on the wafer. See Ans. 5: “[The] Examiner consider[s] this defect density [as] corresponding to the distribution of the *hot spot candidate or targets* on the wafer.” (emphasis added). The claim requires more: “wherein the plurality of **hot spot candidates** is **distributed denser** than the plurality of **targets** on the wafer.” Independent claims 23 and 26 (emphasis added).

Second, we find the Examiner’s mapping of the claim term “plurality of targets” to the corresponding “targets” on the wafer in Orbon is unclear.¹¹

¹¹ See 37 C.F.R. § 1.104(c)(2) (“When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of

Third, there is no mention of “hot spots” being related to defect density in Orbon’s paragraph 78. At best, Orbon’s paragraph 51 teaches comparing *simulated* hot spot data to *measured* hot spot data.

Fourth, even if Orbon’s paragraphs 11 and 41 teach “hot spot candidates” (as found by the Examiner, Answer 5), the Examiner has not shown a teaching or suggestion in Orbon or Rathsack (considered alone or in combination), of the specific disputed claim language: “wherein the plurality of **hot spot candidates** is **distributed denser** than the plurality of **targets** on the wafer.” Independent claims 23 and 26 (emphasis added).

Therefore, based upon a preponderance of the evidence, Appellants have persuaded us that the cited combination of Orbon and Rathsack does not teach or suggest at least the disputed “wherein” clause: “*wherein the plurality of hot spot candidates is distributed denser than the plurality of targets on the wafer.*” Independent claims 23 and 26. Because remaining independent claim 26 recites the same “wherein” clause using identical language, we are constrained on this record to reverse the Examiner’s § 103 Rejection C of independent claims 23 and 26.

Remaining Dependent Claims rejected under Rejection C under §103

In light of our reversal of rejection C of independent claims 23 and 26, for the same reasons, we also reverse rejection C of all remaining dependent claims, which variously and ultimately depend from either claim 23 or claim 26

each reference, if not apparent, must be *clearly explained* and each rejected claim specified.”) (emphasis added).

For essentially the same reasons argued by Appellants, as discussed above, on this record we find a preponderance of the evidence does not support the Examiner's underlying factual findings and ultimate legal conclusion of obviousness regarding Rejection C of claims 23–37. Accordingly, we reverse the Examiner's Rejection C of claims 23–37.

CONCLUSIONS

The Examiner erred in rejecting claims 23 and 26 under 35 U.S.C. § 112(b), as being indefinite.

The Examiner did not err in rejecting claims 23–37 under 35 U.S.C. § 101, as being directed to a judicial exception, without significantly more.

The Examiner erred in rejecting claims 23–37 under 35 U.S.C. § 103(a) as being obvious over the combined teachings and suggestions of Orbon and Rathsack.

DECISION

We reverse the Examiner's decision rejecting claims 23 and 26 under 35 U.S.C. § 112(b).

We affirm the Examiner's decision rejecting claims 23–37 under 35 U.S.C. § 101.

We reverse the Examiner's decision rejecting claims 23–37 under 35 U.S.C. § 103(a).

Because we have affirmed at least one ground of rejection with respect to each claim on appeal, the Examiner's decision is affirmed. *See* 37 C.F.R. § 41.50(a)(1).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv). *See* 37 C.F.R. § 41.50(f).

AFFIRMED