

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WESTERNGECO LLC,
Petitioner,

v.

PGS GEOPHYSICAL AS,
Patent Owner.

Case IPR2015-00313
Patent 6,026,059

Before JUSTIN BUSCH, MITCHELL G. WEATHERLY, and
BEVERLY M. BUNTING, *Administrative Patent Judges*.

BUNTING, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. BACKGROUND

A. Introduction

WesternGeco L.L.C. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–12 of U.S. Patent No. 6,026,059 (Ex. 1001, “the ’059 patent”) pursuant to 35 U.S.C. §§ 311–319. Paper 1 (“Pet.”). PGS Geophysical AS (“Patent Owner”) timely filed a Preliminary Response to the Petition. Paper 7 (“Prelim. Resp”). Taking into account the arguments presented in the Preliminary Response, we determined that the information presented in the Petition established a reasonable likelihood that Petitioner would prevail on its challenge of claims 1–5, 10, and 11 (“the challenged claims”) of the ’059 patent.¹ Paper 14, 29 (“Decision on Institution” or “Dec. on Inst.”). Pursuant to 35 U.S.C. § 314, we instituted this trial on June 4, 2015, as to the challenged claims.²

During the course of trial, Patent Owner timely filed a Patent Owner Response (Paper 23 (“PO Resp.”)), and Petitioner timely filed a Reply thereto (Paper 31 (“Pet. Reply”)). An oral hearing was conducted on March 2, 2016, and a transcript of the hearing is entered in the record. Paper 38 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the challenged claims of the ’059 patent. For the

¹ We concluded that Petitioner had not shown a reasonable likelihood that it would prevail regarding its challenge to claims 6–9 and 12.

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, took effect on March 18, 2013. Because the application from which the ’059 patent issued was filed before that date, our citations to 35 U.S.C. §§ 102 and 103 are to the pre-AIA version.

reasons that follow, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 4, 10, and 11 of the '059 patent are unpatentable, but has not made such a showing with regards to claims 2, 3, and 5.

B. Related Matters

The parties indicate that the '059 patent is the subject of the following civil action: *WesternGeco LLC v. Petroleum Geo-Services, Inc.*, Case No. 4:13-cv-02725 (S.D. Tex.). Pet. 11; Paper 5, 1.

C. The '059 Patent (Ex. 1001)

The '059 patent relates generally to a “process for generating a bin of common mid-point traces from a three dimensional seismic survey data set.” Ex. 1001, 2:7–8. Associated with each trace is a shot location and receiver location. *Id.* at 3:49–50. From the data, a common mid-point bin (“CMP bin”) is defined for a plurality of traces having a common mid-point and an offset is associated with each trace. *Id.* at 3:50–54. For each trace, the offset is represented by the length of the line for the particular trace, and the azimuth is represented by the angle of the line. *Id.* at 3:55–59. As shown in Figure 6, a coordinate set is assigned to the traces in each CMP bin, and from the assigned coordinates, “the offset and direction of a line between the shot and receiver is determinable, and a coordinate-designated set of traces is defined.” *Id.* at 3:59–65. A plurality of traces in the coordinate-designated set of traces have the same coordinates. *Id.* at 3:66–4:11. Further, the CMP bin of Figure 6 can be divided into quadrants, as shown in Figure 7, reproduced below.

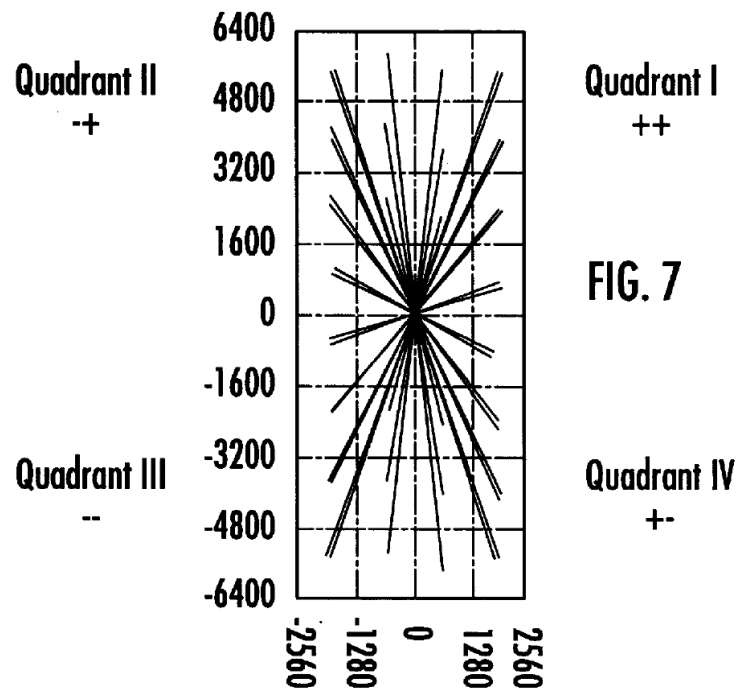


Figure 7 is a spider diagram plot of traces in a CMP bin from a seismic data acquisition survey.

A data set used in performing further analysis of reflection attribute variation (e.g. amplitude, frequency, and phase) among traces can be generated. *Id.* at 4:29–31. For example, offset values assigned to a plurality of traces, and “the reflection attribute variation between traces in the window are compared as a function of offset and azimuth.” *Id.* at 5:15–19.

D. Illustrative Claim

Of the challenged claims, claim 1 is independent, and claims 2–5, 10, and 11 depend, directly or indirectly, from independent claim 1. Independent claim 1 is illustrative of the challenged claims and is reproduced below:

1. A process for generating a bin of common mid-point traces from a three dimensional seismic survey data set, each of the traces having a shot location and a receiver location associated therewith, the process comprising:

gathering from the data a plurality of traces having a common reference point, whereby a common reference point bin is defined and whereby each of the plurality of traces has an offset associated therewith;

assigning a coordinate set to a plurality of traces in the common reference point bin, wherein the coordinates are associated with the shot position and the receiver position associated with the traces and wherein, from the coordinates, the offset and direction of a line between the shot and receiver is determinable, whereby a coordinate-designated set of traces is defined; and

organizing the coordinate-designated set of traces into a set of bins having a regularized number of traces.

Ex. 1001, 5:48–64.

E. Prior Art

Petitioner relies upon the following prior art references (Pet. 13):

Reference	Patent No.	Date	Exhibit
Gallagher	U.S. Patent No. 4,933,912	June 12, 1990	1005
Frasier	U.S. Patent No. 4,596,005	June 17, 1986	1006

F. Instituted Grounds

As explained in the Introduction section above, we instituted trial based on the following asserted grounds of unpatentability (Dec. on Inst. 29):

References	Basis	Challenged Claims
Gallagher	102(b)	1–5 and 10
Gallagher, Frasier	103(a)	11

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, we interpret a claim term in an unexpired patent according to the broadest reasonable construction in light of the specification of the patent in which it appears. 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278 (Fed. Cir. 2015) (“We conclude that Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA”), *cert. granted sub nom. Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 890 (mem.) (2016). Under the broadest reasonable interpretation standard, and absent any special definitions, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). We apply these general principles in construing the claims of the ’059 patent.

1. Phrases Construed in the Decision on Institution

In its Petition, Petitioner proposed a claim construction for each of the following phrases: (1) “coordinate set;” (2) “a set of bins;” and (3) “at least two of the coordinate-designated set of traces have different coordinates and are from a common shot-receiver location.” Pet. 15–18. Patent Owner, in its Preliminary Response, disputed Petitioner’s proposed construction of “set of bins” and also proposed a claim construction for “regularized number of

traces.” Prelim. Resp. 34–37. For purposes of the Decision on Institution only, we construed the claim phrases “coordinate set,” “a set of bins,” and “regularized number of traces” as summarized in the table below.

Claim Term	Construction in Decision on Institution
“coordinate set”	“a group of coordinates used to determine a trace’s offset and azimuth”
“a set of bins”	“a set of common offset bins within a common reference point bin”
“regularized number of traces”	“uniform number of traces”

Dec. on Inst. 6–12.

Patent Owner does not contest our previous constructions in its Patent Owner Response. PO Resp. 28–32. Petitioner challenges our construction of “a set of bins” in its Reply. Reply 3–10. Given the parties’ acceptance of our prior construction of “coordinate set” and “regularized number of traces,” we discern no reason to address or alter those constructions, and we adopt them for purposes of this Final Written Decision. Because Petitioner disagrees with our interpretation of “a set of bins” as recited in independent claim 1, we provide additional analysis for this claim limitation.

2. “set of bins”

Patent Owner asserts that we correctly concluded that the broadest reasonable interpretation of a “set of bins” is a “set of common offset bins within a common reference point bin.” PO Resp. 28; Tr. 92:19–20; 95:16–17. Petitioner, in its Reply, argues that our construction of “set of bins” is “unduly narrow” because: (1) neither the ’059 patent specification nor the

prosecution history limits a set of bins to common offset sub-bins³ (Reply 3–6); (2) commonality of azimuth is not a limitation of “set of bins” (*id.* at 6–9); and (3) Patent Owner’s proposed construction is contradicted by the claims themselves (*id.* at 9–10). We address these contentions in turn.

Although Petitioner agrees that the “set of bins” is a sub-bin within the “common reference point bin,” Petitioner first argues that nothing in the claim language, patent specification, or prosecution history limits the scope of this claim term to a set of “common-offset” bins. *Id.* at 3. Petitioner maintains that its proposed construction, “a set of sub-bins within a common reference point bin,” is the correct construction because the ’059 patent “does not define or limit what trace information may populate this smaller set of bins.” *Id.* (citing Pet. 16; Ex. 1002 ¶ 47). Directing our attention to a passage from the specification of the ’059 patent describing the “need for a method of providing common-offset bins, within a common mid-point bin,” Petitioner asserts this passage “confirms that the patentee distinguished ‘common offset bins’ from generic ‘bins’ and did not use the two terms interchangeably.” *Id.* at 5. Petitioner also asserts that nothing in the specification limits the “set of bins” to a common offset sub-bin, or disclaims Petitioner’s proposed interpretation. *Id.*

We first look to the language of the claims for guidance. For example, in claim 1, the preamble refers to “a bin of common mid-point traces is generated from “a three dimensional seismic survey data set.” Ex. 1001, 5:49. Thus, the preamble informs us that the generated data set is from a three-dimensional seismic survey.

³ The parties use the term “sub-bin” in referring to a particular bin.

Claim 1 also recites a “gathering” step, which recites in relevant part, that from the data, a plurality of traces having a common reference point define a common reference point bin, and that “each of the plurality of traces has an offset associated therewith.” *Id.* at 5:54–55. Indeed, the experts for both parties agree that the traces generated from a three-dimensional seismic survey include both the scalar offset, i.e., the distance separating the source and receiver pair, and the azimuth, i.e., the angle of the line from the source to the receiver measured from a fixed compass direction. Ex. 2037 ¶ 38; Ex. 2038, 374:17–22.

Claim 1 also recites an “assigning” step, i.e., “assigning a coordinate set to a plurality of traces in the common reference point bin, wherein the coordinates are associated with the shot position and the receiver position associated with the traces and wherein, from the coordinates, the offset and direction of a line between the shot and receiver is determinable, whereby a coordinate-designated set of traces is defined.” Ex. 1001, 5:56–62. The “assigning” step informs us that each trace has an assigned coordinate set and the coordinate set is used to determine the *offset and direction of a line* between the shot and receiver, confirming that the data is generated from a three-dimensional survey. As discussed above, the parties concur with our construction of “coordinate set” as “a group of coordinates used to determine a trace’s offset and azimuth.” Indeed, the specification confirms that “from the coordinates assigned, the offset and direction of a line between the shot and receiver is determinable, and a coordinate-designated set of traces is defined.” Ex. 1001 3:63–65.

Claim 1 further recites the “organizing” step, i.e., “organizing the coordinate-designated set of traces into a set of bins having a regularized

number of traces.” *Id.* at 5:63–64. The specification discusses “a need for a method of providing common-offset bins, within a common mid-point bin, which are uniform in distribution.” *Id.* at 1:54–56. In Figure 6, one CMP bin from Figure 5 is redrawn using a coordinate set assigned to the traces in the CMP bin. *Id.* at 3:60–61. The specification explains that

one coordinate set is assigned to the traces in the CMP bin . . . there is a constant fold of two traces per coordinate bin . . . the offset and direction of a line between the shot and receiver is determinable, and a coordinate-designated set of traces is defined.

Id. at 3:59–65. Additionally, the specification describes how, in this embodiment, “a plurality of the coordinate-designated set of traces have the same coordinates . . . the acquisition geometry resulted in two traces populating each common-inline/common-crossline bin.” *Id.* at 3:66–4:3. In an alternative embodiment, “there will be a unique set of coordinates per trace (i.e. a single trace per coordinate bin).” *Id.* at 4:5–7. Thus, based on the specification of the ’059 patent, we credit the testimony of Dr. Lynn that one of skill in the art would understand the “set of bins having a regularized number of traces” into which the coordinate-designated set of traces is organized are “common-offset bins.”⁴ Ex. 2037 ¶¶ 57–65, 111–113.

Second, Petitioner argues that our preliminary construction of “set of bins” does not require explicitly *commonality* of azimuth (Reply 6–8). We agree. Nonetheless, as discussed above with respect to the “gathering” step

⁴ Petitioner’s witness, Dr. Ikelle, declined at his deposition to provide meaningful details explaining how he arrived at his opinion that the scope of the construction of “set of bins” from the Decision on Institution is “narrower.” See Ex. 2038, 360:3–375:11.

and “assigning” step, the specification discloses the determination of the direction of the line, or azimuth in the context of a three-dimensional seismic survey. This disclosure supports our determination that the set of bins recited in claim 1 would be understood by a person of skill in the art to be common offset bins. Ex. 2037 ¶ 56.

Next, Petitioner argues that because claim 4 recites that each trace has a unique set of coordinates, i.e. a single trace per coordinate bin, claim 1 “must be broad enough to encompass sub-bins that contain only a single trace.” Reply 9. Claim 1 recites, in relevant part, that the “set of bins” have “a regularized number of traces.” Ex. 1001, 5:64. As discussed *supra*, the parties do not challenge our construction of the claim phrase “regularized number of traces,” namely “uniform number of traces.” We note that the “uniform number of traces” refers to a uniform distribution of traces in each bin, which could be any number, as long as each bin had “an equal or approximately equal number of traces.” Ex. 2017 ¶ 57.

Having considered the full record developed during trial, we conclude that the broadest reasonable construction of “a set of bins” as would be understood by one of skill in the art in the context of the ’059 patent is “a set of common offset bins within a common reference point bin.”

B. Anticipation by Gallagher

A claim is anticipated if each limitation of the claim is disclosed in a single prior art reference arranged as in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). As recently reiterated by the Federal Circuit, “a reference can anticipate a claim even if it ‘d[oes] not expressly spell out’ all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would ‘at once

envisage’ the claimed arrangement or combination.” *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (quoting *In re Petering*, 301 F.2d 676, 681 (CCPA 1962)). We analyze this ground based on anticipation in accordance with the above-stated principles.

Petitioner contends that claims 1–5 and 10 are anticipated under 35 U.S.C. § 102(b) by Gallagher. Pet. 38–56. In its Petition, Petitioner explains how Gallagher describes the claimed subject matter of each challenged claim, and relies upon the Declaration of Dr. Luc T. Ikelle (Ex. 1002) to support the analysis advocated in the Petition. *Id.* Patent Owner disagrees, and focuses its arguments on challenging the teachings of Gallagher with respect to the “organizing” step recited in independent claim 1. PO Resp. 32–54.

For the reasons given below, after consideration of the Petition, the arguments in the Patent Owner Response, Petitioner’s Reply, and the evidence of record, we conclude that Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 4, and 10 of the ’059 patent are anticipated by Gallagher, and Petitioner has failed to demonstrate, by a preponderance of the evidence, that claims 2, 3, and 5 of the ’059 patent are anticipated by Gallagher. We begin our analysis with a brief summary of the cited references, and then we address the parties’ contentions in turn.

1. Overview of Gallagher (Ex. 1005)

Gallagher describes a method for processing 3-D seismic data in the form of seismic traces from a receiver in response to a seismic wave generated by a source. Ex. 1005, 1:6–9. In Gallagher, after determining the fold and selecting a common midpoint, the areal array is segmented into angularly separated sections defined by at least one imaginary boundary

passing through the CMP, and at least a portion of the array is segregated into shells defined by imaginary closed and nonintersecting boundaries which surround the CMP, “such that each other shell is defined between adjacent shell boundaries.” *Id.* at 2:58–65. Source-receiver pairs are selected such that each shell and section includes at least one source position or receiver position corresponding to a source-receiver pair having the CMP as their midpoint. *Id.* at 2:65–3:8. The seismic traces corresponding to the source-receiver pairs are summed to yield a stacked trace. *Id.* at 3:8–10.

Figure 1, reproduced below, shows the source-receiver array, and boundaries of shells and sections.

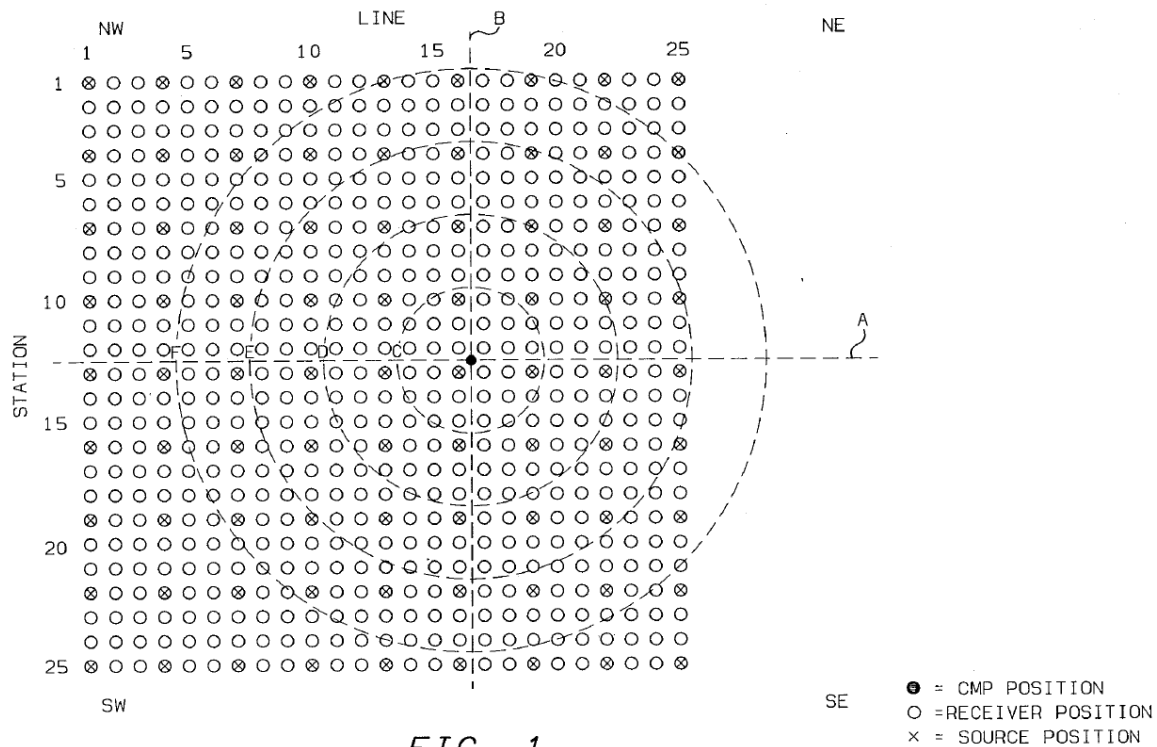


Figure 1 illustrates an array of source receiver positions with section and shell boundaries depicted in dashed lines.

In the example shown in Figure 1, there are 4 sections (defined by boundary lines A and B), and four concentric shells (defined by circular

boundaries C, D, E, and F). *Id.* at 6:8–48. Gallagher discloses that the number of source receiver pairs selected for each common midpoint is limited to achieve a uniform fold “over a maximum area of the array.” *Id.* at 9:8–11. Prior to processing the data, fold is non-uniform. *Id.* at 10:59–62.

2. Discussion

Petitioner relies on Gallagher to describe each of the limitations recited in independent claim 1. Pet. 38–56. In its Patent Owner Response, Patent Owner challenges the sufficiency of Petitioner’s proofs in several respects that we discuss *infra*. We note, however, that most of the claim elements are undisputed (Tr. 82:9–13), and for the undisputed claim elements, we agree that the passages of Gallagher cited by Petitioner disclose the corresponding limitations.

a. Claim 1

Independent claim 1 recites the “organizing” step, i.e., “organizing the coordinate-designated set of traces into a set of bins having a regularized number of traces.” Ex. 1001 5:63–64. In its Petition, Petitioner argues that the “set of bins” claim term is satisfied by the disclosure in Gallagher regarding segregating the array into sections and shells to “define the CMP bin and sub-bins within the standard CMP bin.” Pet. 40 (citing Ex. 1005, 6:9–53), 47–48. Petitioner annotated Figure 1 of Gallagher to demonstrate how the sections and shells described in Gallagher satisfy this claim term using its proposed definition, which we do not adopt. *Id.* at 41. Petitioner also directs our attention to the disclosure in Gallagher of step 7, which involves the selection of a number of source-receiver pairs sharing a common midpoint within each shell in the array, until all traces corresponding to the desired fold for the CMP bin are selected. *Id.* at 41–42

(citing Ex. 1005, 7:5–8:4; 12:18–30, Table II; Ex. 1002 ¶ 119). Petitioner concludes that “[s]electing traces in this manner—*i.e.*, evenly distributed throughout each section and sub-bin—results in an even offset distribution for the CM[P] bin and a range of azimuth values.” *Id.* at 42 (citing Ex. 1005, 12:18–30, Table II; Ex. 1002 ¶ 119).

In its Patent Owner Response, Patent Owner argues that Gallagher does not teach a “set of bins” because it does not teach “organizing a CMP bin into such common offset bins.” PO Resp. 33. Patent Owner contends both parties’ experts agree that Gallagher’s sub-regions are not common offset bins because “Gallagher’s sub-regions were not composed of traces with common offsets.” *Id.* at 35 (citing Ex. 2038, 451–52) (*See, e.g.*, “Q. So the two traces in that region do not have a common offset? A. No. They are part of the – they have a common CMP but they don’t have common offset.”) Petitioner refutes Patent Owner’s characterization of Dr. Ikelle’s deposition testimony, noting that Dr. Ikelle stated “that the two traces did not have the exact same scalar offset values.” Reply 12–13 (citing Ex. 2038, 451:23–453:7; 417:12–418:15).

Patent Owner also argues that Gallagher does not disclose that the traces within the sub-bins “have common coordinates, would be considered to have common offsets and azimuths, or are sufficiently similar that they can be usefully stacked together for purposes of an AVO or AVA analysis.” PO resp. 35 (citing Ex. 1001 at 1:41–56; Ex. 2037 ¶¶ 122–24). According to Patent Owner, Gallagher divides the CMP bin into quadrants spanning 90 degrees of azimuth each, rather than narrower angular ranges. *Id.* at 36. Relying on the testimony of Dr. Lynn, Patent Owner asserts a person of ordinary skill in the art “would not recognize two traces that fall within the

same quadrant, corresponding to the source positions depicted in the figure below, that are nearly 90° apart to ‘fall anywhere close to’ having a ‘common’ azimuth, just because they fall within the same quadrant.” *Id.* (citing Ex. 2037 ¶¶124). Along this vein, Patent Owner contends that Gallagher’s 90° azimuthal sections are too wide to have a common offset. *Id.* at 37 (citing Ex. 2037 ¶¶123–124). These arguments are not persuasive because the “set of bins” recited in claim 1 does not require precisely “common azimuth.” Moreover, claim 1 does not recite that the data is used in a pre-stack analysis. We, therefore, decline Patent Owner’s invitation to import limitations from the specification into the claims. *See SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (“Though understanding the claim language may be aided by the explanations contained in the written description, it is important not to import into a claim limitations that are not a part of the claim. For example, a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment.”).

Next, Patent Owner argues Gallagher does not describe shells in the radial direction narrow enough to group only traces that have a common absolute offset. *Id.* at 38. Because the shells shown in Figure 1 of Gallagher do not have specific dimensions, Patent Owner contends “it is impossible to conclude that Gallagher’s regions are common offset bins.” *Id.* (Ex. 2037 ¶ 125). Citing the testimony of both parties’ experts, Patent Owner argues that instead of common offset and azimuth, “Gallagher sought to attain precisely the opposite—a ‘wide distribution’ of offsets and azimuths to stack in a CMP bin, rather than commonality of offsets and azimuths within a newly created common-offset bin that facilitates analysis before CMP

stacking.” PO Resp. 39 (citing Ex. 2037 ¶¶ 87–88; Ex. 2038, 430 (Dr. Ikelle agreeing that Gallagher’s goal is to achieve a “wide” distribution of traces)). Patent Owner’s arguments in this regard are likewise unpersuasive because we decline to import limitations from a particular embodiment into the claims.

Petitioner nonetheless takes the position that Gallagher discloses a “set of bins” under any construction. Reply 10–13. Petitioner supports its position by directing our attention to Patent Owner’s statement that “a common offset bin in a 3D seismic survey is defined by selecting some ‘window’ in *two dimensions* that is small enough for the traces to be considered to have the same coordinates.” Reply 10 (citing PO Resp., 34; Ex. 2037 ¶ 119). As further support, Petitioner cites the deposition testimony of Dr. Lynn as confirming that Gallagher teaches each segment, defined by the intersection of the sections and shells, groups the sources based on azimuth and offset from the CMP. *Id.* at 10–11 (citing Ex. 1030, 91:3–6). Petitioner directs us to a particular example of a sub-bin from Figure 1 of Gallagher that has a geographically smaller window than the sub-bin in Gallagher. *Id.* at 11 (citing Ex. 1021; Ex. 1025; Ex. 1030, 36:11–37:24, 84:23–85:7, 86:2–6). Petitioner asserts that the collection of single-trace bins satisfies the “set of bins” limitation because “[e]ach trace within the sub-bins or sections of Gallagher is necessarily common [with itself] with respect to offset and even azimuth.” Reply 13. Explaining further, Petitioner asserts the sub-binning procedure described in Gallagher “select[s] traces within each sub-bin such that each sub-bin has the same number of traces therein—for example, one,” and “is designed such that a regularized number of traces, of at least one, are selected within each sub-

bin.” *Id.* at 14, 16. At the oral hearing, Petitioner’s counsel confirmed its position, stating “you select one of the examples as selecting one trace per sub bin[, which] discloses set of sub bins, set of bins, as well as regularized number because there's one.” Tr. 90:4–6.

Relying on the testimony of Dr. Lynn, Patent Owner challenges this position, asserting that “to be a common offset bin, this window must define a range of eligible traces that is sufficiently small such that all traces in the bin have approximately common offsets and azimuths.” PO Resp. 42–43 (citing Ex. 2037 ¶ 119). According to Patent Owner, the only reason that Gallagher’s alleged sub-bins contain only a single trace is because Gallagher discards all but one of the traces that fall within each sub-bin. *Id.* at 43. Referring to Gallagher’s alleged process of generating single-trace sub-bins, Patent Owner asserts “[t]he sub-bins are not defined or generated in Gallagher as a ‘window’ or other region in which traces inside the window would have a common offset and azimuth.” *Id.* at 43. Patent Owner maintains the removal of all but one trace, from sub-bins that are initially not common offset bins, does not transform these sub-bins into common offset bins. *Id.* Patent Owner concludes that one of skill in the art would not understand “post-hoc bins that are created around single data points” to be a “set of bins” as required by the ’059 patent. *Id.* at 43–44.

As discussed *supra*, we determined that the correct interpretation of the claim term “set of bins” is “a set of common offset bins within a common reference point bin.” Patent Owner’s arguments directed to “post-hoc bins” are not persuasive because the claims do not limit the bins to “pre” or “post” hoc bins. Thus, in view of the correct construction of the claim term “set of bins,” we are persuaded by Petitioner’s arguments that

Gallagher discloses a “set of bins.” Specifically, Petitioner explains how the section shells group the sources based on their azimuth and offset from the CMP (Reply 10–11), and that the sub-squares represent common offset bins (*Id.* at 11–12). Additionally, Petitioner argues persuasively that the single-trace bin satisfies the claim limitation “a set of bins” as we have construed this term, because “[e]ach trace within the sub-bins or sections of Gallagher is necessarily common [to itself] with respect to offset and even azimuth.” Reply 13.

In considering the record in its entirety, Petitioner has presented persuasive evidence to support a finding that Gallagher describes the “organizing” step recited in independent claim 1.

b. Claim 4

Dependent claim 4, which depends directly from claim 1, recites in relevant part that “each trace has a unique set of coordinates.” Ex. 1001 6:3–4. Petitioner contends the single fold embodiment of claim 4 is likewise anticipated by Gallagher. Reply 23. Patent Owner, in its Patent Owner Response, confirms that claim 4 is directed to an alternative embodiment in which “there will be a unique set of coordinates per trace (i.e. a single trace per coordinate bin).” PO Resp. 18 (citing Ex. 1001, 4:5–7). Relying on the testimony of Dr. Lynn, Patent Owner asserts that “every trace falls into its own common offset bin and has a unique set of coordinates.” *Id.* (citing Ex. 2037 ¶ 77). Petitioner contends this limitation is satisfied by the disclosure in Gallagher regarding a 16 sub-bin CMP with a fold of 16 and 24 sub-bin CMP with a fold of 24 (i.e. having one trace per sub-bin). *Id.* (citing Ex. 1005, 7:1–4, 11:26–14.2).

Having determined above that the disclosure in Gallagher of one trace satisfies the “set of bins” limitation, Petitioner has presented sufficient evidence to support a finding that Gallagher describes that “each trace has a unique set of coordinates” recited in claim 4.

c. Claims 2 and 3

Claim 2 depends from claim 1 and recites “a plurality of the coordinate-designated set of traces have the same coordinates.” Ex. 1001, 5:65–57. Claim 3 depends from claim 2, and further recites “adding a plurality of traces having the same coordinates.” *Id.* at 6:1–2.

Patent Owner argues that claims 2 and 3 require “a plurality of traces in one common offset bin,” and, by their ultimate dependency on claim 1, “each of its common offset bins has a ‘regularized number of traces.’” PO Resp. 44, 45. Specifically, Patent Owner argues that Gallagher does not disclose “having multiple traces, with a regularized number of traces, in its sub-bins.” *Id.* at 45. As to Petitioner’s argument that Gallagher discloses a plurality of traces before discarding any traces (Pet. 48–49), Patent Owner contends Petitioner

cannot have it both ways: either Gallagher discloses sub-bins containing a plurality of traces before its decimation process (in which case the sub-bins do not have a regularized number of traces and the traces do not have common offset and azimuth coordinates), or else it discloses sub-bins containing a “regularized” number of traces at the conclusion of decimation—but necessarily only a single trace per sub-bin, which is not a “plurality.”

Id. at 48.

Having determined above that the disclosure in Gallagher regarding one trace within a sub-bin satisfies the limitation of a “set of bins,” we are

persuaded by Patent Owner’s arguments that a single trace per sub-bin is not a “plurality.” *Id.*

In considering the record in its entirety, Petitioner has not presented persuasive evidence to support a finding that Gallagher describes the “plurality of the coordinate designated set traces have the same coordinates” as recited in claims 2 and 3.

d. Claims 3 and 5

Claim 5 also depends from claim 1, and recites, in relevant part, “adding the at least two of the coordinate-designated set of traces.”

Ex. 1001, 6:8–9.

Patent Owner argues that claims 3 and 5 are not anticipated because both require “stacking, traces—combining multiple traces in a *sub-bin* together.” PO Resp. 51 (emphasis added). Specifically, Patent Owner argues that Gallagher does not disclose “selecting two or more traces” because “two or more traces are required to perform a ‘stacking’ operation, and the only sub-bins in Gallagher contain only one trace each.” PO Resp. 51–52. Noting that Gallagher describes “stacking *all* of the traces in a CMP bin together,” Patent Owner contends this disclosure has nothing to do with “adding traces having the same coordinates,” nor “adding traces from reciprocal common offset bins ‘with a common shot-receiver location.’” *Id.* at 53.

Having determined above that Gallagher does not disclose two or more traces, i.e., “a plurality of traces” in the set of bins, Patent Owner argues persuasively that Gallagher does not disclose adding at least two of the coordinate designated traces in the sub-bin.

In considering the record in its entirety, Petitioner has not presented persuasive evidence to support a finding that Gallagher describes the “adding” step recited in claims 3 and 5.

e. “organizing step”

Additionally, Patent Owner argues that Gallagher does not anticipate claims 1–5 and 10 because “Gallagher fails to teach ‘organizing’ traces into its purported section and shell sub-bins” as required by the “organizing” step. PO Resp. 53. Patent Owner repeats its argument from its Patent Owner Preliminary Response that decimating or discarding traces to achieve a uniform fold is not “organizing.” *Id.* at 53–54; *See* Tr. 111:12–20.

We have reviewed the Petition and supporting evidence regarding the “organizing” limitation, and determine that Petitioner’s arguments and evidence demonstrate persuasively that the cited portions of Gallagher disclose the “organizing” step recited in claim 1.

3. Summary

Based on further review of the record, and for the reasons discussed above, Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 4, and 10 of the ’059 patent are anticipated by Gallagher. Petitioner has not demonstrated, by a preponderance of the evidence, that claims 2, 3, and 5 of the ’059 patent are anticipated by Gallagher.

C. Obviousness Based on Gallagher and Frasier

Petitioner challenges the patentability of claim 11 of the ’059 patent as obvious under 35 U.S.C. § 103(a) based on Gallagher and Frasier. Pet. 56–58. As support for this contention, Petitioner relies upon the declaration of Dr. Ikelle. Ex. 1002. Having considered the explanations and supporting evidence presented, we are persuaded that Petitioner has demonstrated by a

preponderance of the evidence that the combination of Gallagher and Frasier discloses the claim limitations as recited in claim 11.

We begin our analysis with the principles of law that generally apply to a ground of unpatentability based on obviousness, followed by a brief overview of Frasier, and then we address each of the arguments presented by the parties.

1. Principles of Law

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter 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 said 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 skill in the art⁵; and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be “considered together with the knowledge of

⁵ There is no specific dispute regarding the level of ordinary skill in the art between the parties, although Patent Owner’s definition involves essentially a greater educational component and specific experience in the field of seismic surveys. Ex. 2037 ¶ 30; Ex. 1002 ¶ 44. We determine the prior art of record in this proceeding—namely, Gallagher, and Frasier—is indicative of the level of ordinary skill in the art. See *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); GPAC, 57 F.3d at 1579; *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (quoting *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

2. Frasier (Ex.1006)

Frasier describes “a method of increasing resolution of high-intensity amplitude events in seismic records provided by common midpoint collection methods (CMP) wherein nonsymmetrical travel paths of incident and reflected rays of the generated conventional waves (due to dip and depth) are taken into account prior to trace stacking.” Ex. 1006, Abst. The converted phases of the seismic wave are processed to define “a series of common reflection point (CRP) coordinates each associated with a gather of converted traces....” *Id.*

3. Analysis

As we explained previously, dependent claim 11 depends directly from claim 1, and further requires that “the common reference point comprises a common reflection point.” Ex. 1001, 6:22–23.

In the Petition, Petitioner observes “for a complex subsurface structure containing dipping reflectors, a seismic survey utilizing CMP gathers and assuming a flat reflector may produce inadequate subsurface coverage maps.” Pet. 57 (citing Ex. 1004, 23; Ex. 1002 ¶¶ 30, 110–111).⁶ Petitioner contends “a person of ordinary skill in the art would have known, and been motivated to, utilize common reflection point gathers rather than CMP gathers, as taught by Frasier” to resolve this potential deficiency. *Id.* at 57–58 (citing Ex. 1002 ¶¶ 170–173; Ex. 1006, 21:67–23:52). Petitioner

⁶ We understand Petitioner’s discussion of the teachings of “Ashton” as reflective of the state of the art. Pet. 56–57 (citing Ex. 1004).

concludes that combining the teachings of Frasier with Gallagher would be “a simple substitution of one known element (CMP gathers) for another known element (CRP gathers) to obtain predictable results—i.e., the accurate mapping of subsurface strata when confronted with dipping reflectors.” *Id.* at 58 (citing Ex. 1002 ¶¶ 170–173.)

Patent Owner argues first that a person of ordinary skill in the art would not have used Gallagher “to address the problems with pre-stack AVO or AVA analysis” solved by the ’059 patent. PO Resp. 55. According to Patent Owner, one of skill in the art with knowledge of Gallagher ““would not have recognized the problem’ of common offset binning” taught by the ’059 patent, therefore it would not have been “obvious to try” the teachings of Gallagher with those of Frasier. *Id.* Petitioner argues persuasively that Patent Owner’s arguments regarding pre-stack AVO or AVA analysis are inapposite because neither claim 1, from which claim 11 depends, nor claim 11 requires this limitation. Reply 24.

Next, Patent Owner argues that “a person of ordinary skill would not have had ‘a reasonable expectation’ of success” in combining Gallagher and Frasier in the manner proposed. PO Resp. 56. Specifically, Patent Owner asserts Frasier teaches conversion of common midpoint data into common reflection point data, and not how the traces will be distributed in common reference point bins after transformed. *Id.* Relying on the testimony of Dr. Lynn, Patent Owner asserts “Gallagher’s teaching of discarding traces from CMP bins actually undermines and teaches away from the process of generating common reference point bins, as that transformation process requires use of the full set of CMP data.” *Id.* (citing Ex. 2037 ¶ 166).

We are not persuaded by Patent Owner’s argument that the disclosure in Gallagher teaches away from the recited method. Patent Owner has not shown, nor can we find, that Gallagher criticizes, discredits, or otherwise discourages the use of a common reflection point instead of a common reference point. A reference teaches away from a claimed invention if it “criticizes, discredits, or otherwise discourages” modifying the reference to arrive at the claimed invention. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). We will not, however, “read into a reference a teaching away from a process where no such language exists.” *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1364 (Fed. Cir. 2006).

Next, Patent Owner argues that Gallagher does not teach common offset bins and Frasier does not provide additional teachings regarding common offset bins; rather, Frasier is relied on only to disclose common reflection points as an alternative to common midpoints. PO. Resp. 57. Petitioner argues persuasively that “Frasier teaches POSA how to generate a CRP bin.” Reply 25. Moreover, as discussed *supra*, we are not persuaded by Patent Owner’s contention that Gallagher does not teach the limitations of claim 1.

The Supreme Court has held that an obviousness evaluation “cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents.” *KSR*, 550 U.S. at 419. Instead, the relevant inquiry here is whether Petitioner has set forth “some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), cited with approval in *KSR*, 550 U.S. at 418.

Patent Owner does not proffer persuasive arguments or evidence that Petitioner's proposed modification of the system of Gallagher using the teachings of Frasier regarding common reflection point would not have been obvious to one of skill in the art. We have considered Patent Owner's arguments; however, we are persuaded that Petitioner has provided an articulated reasoning with rational underpinning to support the legal conclusion of obviousness. *See KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

Thus, based on the record developed during trial, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claim 11 of the '059 patent is unpatentable under 35 U.S.C. § 103 as obvious based on Gallagher and Frasier.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated, by a preponderance of the evidence that claims 1, 4, 10, and 11 are unpatentable, but has not made such a showing with regards to claims 2, 3, and 5.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 4, and 10 of the '059 are held to be unpatentable as anticipated by Gallagher;

FURTHER ORDERED that claims 2, 3, and 5 are held not to be unpatentable as anticipated by Gallagher;

FURTHER ORDERED that claim 11 is held to be unpatentable over Gallagher and Frasier; and

IPR2015-00313
Patent 6,026,059

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

IPR2015-00313
Patent 6,026,059

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