

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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UNIFIED PATENTS, LLC

Petitioner

v.

IDEAHUB INC.

Patent Owner

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Case IPR2020-00702  
Patent No. 9,641,849

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**PATENT OWNER'S NOTICE OF APPEAL**

Via First Class Mail  
Director of the United States Patent and Trademark Office  
c/o Office of the General Counsel  
United States Patent and Trademark Office  
Mail Stop 8, P.O. Box 1450  
Alexandria, VA 22313-1450

Via E2E  
Patent Trial and Appeal Board

Via CM/ECF  
United States Court of Appeals for the Federal Circuit

Notice is hereby given, pursuant to 35 U.S.C. § 141 and 37 C.F.R. § 90.2(a), that Patent Owner Ideahub Inc. (“Patent Owner”) hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board (“Board”) entered on September 15, 2021 (Paper 52, attached hereto as Exhibit A) and from all underlying or related decisions, rulings, and opinions that are adverse to Patent Owner, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered September 17, 2020 (Paper 9, attached hereto as Exhibit B).

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), the expected issues on appeal include, but are not limited to:

- (i) the Board’s determination in its Final Written Decision that Petitioner Unified Patents, LLC has shown based on a preponderance of evidence that claims 1 and 4 of the U.S. Patent No. 9,641,843 are unpatentable;
- (ii) the Board’s determination in its Final Written Decision that Petitioner Unified Patents, LLC has shown based on a preponderance of evidence that substitute claim 19 proposed in the Motion to Amend filed April 22, 2021 (Paper 31) fails to satisfy the requirement that a proposed substitute claim not introduce new matter; and

- (iii) any further findings or determinations by the Board supporting or relating to the issues above, including without limitation the Board's claim constructions, the Board's consideration of expert testimony, and the Board's determination that it is not improper to consider challenges under 35 U.S.C. § 112 for original claim limitations in a Motion to Amend.

Pursuant to 37 C.F.R. § 90.2(a)(1) and (a)(2), and as reflected in the attached Certificate of Service, this Notice of Appeal is being filed with: (1) the Director of the United States Patent and Trademark Office; (2) the Patent Trial and Appeal Board; and (3) the Clerk's Office for the United States Court of Appeals for the Federal Circuit along with the requisite filing fee.

Respectfully submitted,

/William H. Mandir/

William H. Mandir  
Lead Counsel for Petitioner  
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**CERTIFICATE OF SERVICE**

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that a copy of the attached **Patent Owner's Notice of Appeal**, and the accompanying exhibits, was electronically filed through the Patent Trial and Appeal Board's E2E system and was served by electronic mail on the following counsel of record for Petitioner:

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In accordance with 37 C.F.R. §§ 90.2(a)(1) and 104.2, the undersigned certifies that, in addition to be electronically filed through the Patent Trial and Appeal Board's E2E system, a copy of the attached **Patent Owner's Notice of Appeal**, and the accompanying exhibits, was sent, via first class mail on November 16, 2021, to the Director of the United States Patent and Trademark Office at the following address:

Office of the General Counsel  
United States Patent and Trademark Office  
Mail Stop 8, P.O. Box 1450  
Alexandria, VA 22313-1450

In accordance with 37 C.F.R. §§ 90.2(a)(2), the undersigned certifies that a copy of the attached **Patent Owner's Notice of Appeal**, and the accompanying exhibits, was filed electronically via CM/ECF on November 16, 2021, with the United States Court of Appeals for the Federal Circuit.

/Konah Duche/  
Konah Duche

Date: November 16, 2021

# EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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UNIFIED PATENTS, LLC,  
Petitioner,

v.

IDEAHUB INC.,  
Patent Owner.

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IPR2020-00702  
Patent 9,641,849 B2

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Before BRYAN F. MOORE, KEVIN W. CHERRY, and  
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

CHERRY, *Administrative Patent Judge*.

JUDGMENT  
Final Written Decision  
Determining All Challenged Claims Unpatentable  
Denying Patent Owner's Revised Contingent Motion to Amend  
*35 U.S.C. § 318(a)*

I. INTRODUCTION

A. BACKGROUND

Unified Patents, LLC ("Petitioner") filed a petition (Paper 2, "Pet.") to institute an *inter partes* review of claims 1 and 4 of U.S. Patent No. 9,641,849 B2 (Ex. 1001, "the '849 patent"). See 35 U.S.C. § 311. Ideahub

Inc. (“Patent Owner”) timely filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Pursuant to our authorization, Petitioner filed a Preliminary Reply (“Prelim. Reply,” Paper 7), and Patent Owner filed a Preliminary Sur-Reply (“Prelim. Sur-Reply,” Paper 8).

On September 17, 2020, based on the record before us at the time, we instituted an *inter partes* review of all challenged claims on the sole ground alleged. Paper 9 (“Institution Decision” or “Dec.”). The sole ground we instituted trial on is reproduced below:

<b>Claim(s) challenged</b>	<b>35 U.S.C. §</b>	<b>Reference(s)</b>
1, 4	103(a) <sup>1</sup>	Kalevo <sup>2</sup> and Song <sup>3</sup>

Petitioner supports its Petition with a Declaration by Dr. Immanuel Freedman, dated March 12, 2020. Ex. 1003.

Patent Owner filed a Response in opposition to the Petition (Paper 17, “PO Resp.”). Patent Owner supported its Patent Owner Response with the Declaration of Cliff Reader, Ph.D. (Ex. 2001). Patent Owner also filed a contingent Motion to Amend. Paper 18. Petitioner filed a Reply in support of the Petition (Paper 25, “Pet. Reply”). Petitioner supports the Reply with the Second Declaration of Dr. Immanuel Freedman (Ex. 1021). Petitioner

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<sup>1</sup> Because the claims at issue appear to have an effective filing date prior to March 16, 2013, the effective date of the applicable provisions of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), we apply the pre-AIA versions of 35 U.S.C. §§ 102 and 103 in this Decision.

<sup>2</sup> U.S. Patent Application Publication US 2001/0017942 A1, published August 30, 2001(Ex. 1004).

<sup>3</sup> U.S. Patent Application Publication US 2009/0225834 A1, published September 10, 2009 (Ex. 1005).

filed an Opposition to the Motion to Amend. Paper 24. Patent Owner filed a Sur-reply responding to the Reply (Paper 30, “PO Sur-Reply”).

On April 8, 2021, we filed Preliminary Guidance on Patent Owner’s Motion to Amend. Paper 29 (“Preliminary Guidance” or “Prelim. Guide.”). Patent Owner then filed a Revised Contingent Motion to Amend (Paper 31, “Rev. Mot. Amend”) proposing to substitute claim 19 (“proposed substitute claim”) for claim 1. Patent Owner supports its Revised Contingent Motion to Amend with a Second Declaration of Dr. Clifford Reader (Ex. 2017). Petitioner filed an Opposition to Patent Owner’s Revised Contingent Motion to Amend (Paper 37, “Opp.”). Petitioner supports its Opposition with the Third Declaration of Dr. Immanuel Freedman in Support of Petitioner’s Opposition, dated June 3, 2021 (Ex. 1035). Patent Owner filed a Reply in Support of its Contingent Motion to Amend (Paper 39, “PO Reply”). Patent Owner supports its Reply in support of its Revised Contingent Motion to Amend with a Third Declaration of Dr. Clifford Reader (Ex. 2021). Petitioner also filed a Sur-Reply in Opposition to Patent Owner’s Revised Contingent Motion to Amend (Paper 43, “Pet. Sur-Reply”).

Both parties requested an oral hearing. *See* Paper 42. A public and transcript and a confidential transcript of the oral hearing are entered in the record. Paper 50 (“Public Tr.”); 51 (“Confidential Tr.”).

We have jurisdiction under 35 U.S.C. § 6. The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons expressed below, we conclude that Petitioner has demonstrated by a preponderance of evidence that claims 1 and 4 are unpatentable. We *deny* Patent Owner’s Revised Motion to Amend.

#### B. RELATED PROCEEDINGS

The parties do not disclose any related litigation, but assert that the following U.S. patents and pending patent applications claim priority benefit of the ’849 patent: U.S. Patent Application 16/407,086; U.S. Patent Application 16/407,095; U.S. Patent No. 10,623,749; U.S. Patent No. 10,623,750; U.S. Patent No. 10,623,751. Pet. 1; Paper 4, 1.

#### C. THE ’849 PATENT

The ’849 Patent, entitled “Video Encoding Apparatus, Video Decoding Apparatus, And Video Decoding Method For Performing Intra-Prediction Based On Directionality Of Neighboring Block,” relates to “improving compression efficiency in directional intra-prediction.” Ex. 1001, [54], [57], 1:23–24. According to the ’849 patent:

[a] fundamental principle of compressing data is based on a process of eliminating the redundancy from data. The data can be compressed by eliminating spatial redundancy referring to repetition of the same color or object in an image, temporal redundancy referring to little or nothing of variation between neighboring frames in a moving picture frame or successive repetition of same sound in the audio, or psycho-visual redundancy referring to dullness of human vision and sensation to high frequencies.

*Id.* at 1:37–45.

The ’849 patent explains that “H.264” is a known compression standard that uses “directional intra-prediction” [which the ’849 patent shortens simply to “intra-prediction”] to eliminate spatial redundancy within a frame. Ex. 1001, 1:50–53. “[I]ntra-prediction refers to a method of

cop[y]ing one sub-block in a designated direction using neighboring pixels in upward and leftward directions, predicting values of current sub-blocks, and encoding only the differences between the copied values and the predicted value of the sub-blocks.” *Id.* at 1:54–58. When compressing video including pixels of a monochromatic sky, for example, the “pixels that are close to one another within a video frame are likely to have similar characteristics,” and thus the values of adjacent pixels can be predicted. Pet. 5. Intra-prediction thereby “reduce[s] the amount of data necessary for transmission and reconstruction” of an image. *Id.* at 5–6.

The ’849 patent discloses that in the “intra-prediction technique complying with the existing H.264 standard, a prediction block is generated from a current block on the basis of another block having a previous encoding sequence.” Ex. 1001, 1:66–2:3. “Nine prediction modes can be selected for each 4x4 block,” namely, “eight modes having directionality” and one “DC mode.” *Id.* at 3:8–10. A “video encoder based on H.264 selects one from among the prediction modes with respect to each block.” *Id.* at 2:7–11.

According to the ’849 patent, the intra mode information needed in H.264 standard compression “may act as [] overhead increasing the size of a coded bitstream.” *Id.* at 3:19–27. Accordingly, the ’849 patent proposes “a video encoding [and] decoding method and apparatus” in which the “video encoding apparatus . . . does not need to record intra-mode information” and the “video decoding apparatus . . . does not need to receive intra mode information.” *Id.* at 3:35–62. The ’849 patent discloses that the embodiments disclosed therein will “enhanc[e] efficiency of intra-prediction in video coding.” *Id.* at 3:25–28. In one embodiment, for example, when a

compressed image is decoded, the decoder “reconstruct[s] a residual signal of a current block from an input bitstream; select[s] one from among a plurality of intra modes; and perform[s] an intra-prediction according to a directionality of the selected intra mode to reconstruct the current block.”  
*Id.* at 3:64–4:1.

Claim 1 is the sole independent claim among the challenged claims. Claim 4 depends from claim 1. Independent claim 1, which is illustrative, recites (with bracketing added):

1. A video decoding method performed by a video decoding apparatus, the method comprising:

[1.1] determining an intra mode for a neighboring block of a current block;

[1.2] determining an intra mode for the current block based on whether the intra mode for the neighboring block is a directional mode or a non-directional mode;

[1.3] performing intra-prediction according to the intra mode for the current block to generate a prediction block for the current block;

[1.4] obtaining quantization coefficients from an input bitstream;

[1.5] dequantizing the quantization coefficients to generate transform coefficients;

[1.6] transforming the transform coefficients to a residual block for the current block; and

[1.7] adding the prediction block and the residual block to reconstruct the current block,

[1.8] wherein the intra mode for the current block is determined by using a first set of one or more mathematical expressions, if the intra mode for the neighboring block is the non-directional mode,

[1.9] wherein the intra mode for the current block is determined by using a second set of one or more mathematical

expressions, if the intra mode for the neighboring block is the directional mode, and

[1.10] wherein the second set of one or more mathematical expressions is different from the first set of one or more mathematical expressions.

*Id.* at 11:41–12:3.

## II. ANALYSIS

### A. REAL PARTIES IN INTEREST

Patent Owner contends that the Petition fails to name all real parties in interest (“RPIs”) as required by 35 U.S.C. § 312(a)(2). PO Resp. 33–52. Section 312(a)(2) requires that the “petition identif[y] all real parties in interest.” This provision serves important notice functions to patent owners, to identify whether the petitioner is barred from bringing an IPR due to an RPI that is time-barred or otherwise estopped, and to the Board, to identify conflicts of interests that are not readily apparent from the identity of the petitioner. *See NOF Corp. v. Nektar Therapeutics*, IPR2019-01397, Paper 24 at 6 (PTAB Feb. 10, 2020) (citing Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,759 (Aug. 14, 2012); CTPG 12 (Nov. 2019)). Accordingly, petitioners must comply with these requirements in good faith. *See* 37 C.F.R. §42.11(a) (duty of good faith and candor in proceedings). Whether a non-party is a RPI is a “highly fact-dependent question” and must be considered on a case-by-case basis. *Ventex Co. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00651, Paper 148 at 6 (PTAB Jan. 24, 2019) (precedential) (citing Office Trial Practice Guide, 77 Fed. Reg. 48,756, 48,759 (Aug. 14, 2012)).

Petitioner identifies Unified Patents, Inc. (“Unified”) as the sole RPI in this proceeding. Pet. 1. Patent Owner, relying on the Federal Circuit’s

decision in *Applications in Internet Time, LLC v. RPX Corp.*, 897 F.3d 1336, 1351 (Fed. Cir. 2018) (“*AIT*”), and the Board’s decision on remand from *AIT*, *RPX Corp. v. Applications in Internet Time, LLC*, IPR2015-01750, Paper 128 at 9 (Oct. 2, 2020) (designated precedential Dec. 4, 2020) (“*AIT Remand*”), contends that Petitioner also should have named two members of Unified (“Unnamed RPIs”) as RPIs. PO Resp. 34–35. Patent Owner contends that because the Unnamed RPIs were paying members of Unified during the present proceeding, and remain members, the Unnamed RPIs have a preexisting, established relationship with Unified. *Id.* at 35–41. Patent Owner more particularly contends that “which [the Unnamed RPIs— as Unified’s clients—have an interest in and will benefit from Unified’s actions, and whether Unified ‘can be said to be representing that interest’ based on its relationship with [the Unnamed RPIs] . . . that Unified files its IPRs in the Video Codec Zone, including the instant one, to benefit its unlicensed members. . . .” *Id.* at 42.

On this record, we determine that we need not address whether the Unnamed RPIs were improperly excluded because, “even if [they] were, it would not create a time bar or estoppel under 35 U.S.C. § 315.” *SharkNinja Operating LLC v. iRobot Corp.*, IPR2020-00734, Paper 11 at 32 (Oct. 6, 2020) (precedential) (“*SharkNinja*”). Like in *SharkNinja*, the Unnamed RPIs here are currently members of Unified. Unlike in *SharkNinja*, however, neither Petitioner nor any of the Unnamed RPIs were sued. Pet. Reply 18 (asserting that “[n]o Unified member is an RPI, especially because . . . to the best of Unified’s knowledge, none has been sued or threatened with suit by Ideahub,” and that thus, “there are no . . . time-bar issues”). Petitioner also asserts that none of the Unnamed RPIs have

challenged the '849 patent. *Id.* (asserting that “[n]o Unified member is an RPI, especially because . . . no Unified member has filed its own patent challenge to the '849 patent” and that thus, “there are no estoppel . . . issues”). Accordingly, we determine that neither issues of time bar nor issues of estoppel are implicated.

Under the Board’s precedential decision in *Lumentum Holdings, Inc. v. Capella Photonics, Inc.*, the Board’s jurisdiction to consider a petition does not require a “correct” identification of all RPIs in a petition. IPR2015-00739, Paper 38 at 6 (PTAB Mar. 4, 2016) (precedential); *see also Blue Coat Sys., Inc. v. Finjan, Inc.*, IPR2016-01444, Paper 11 at 10 (PTAB July 18, 2017) (“Evidence [of failure to identify all RPIs] is, at best, suggestive of an issue that is not jurisdictional.”). The Federal Circuit has held that § 312(a)(2) is not jurisdictional. *See Mayne Pharma Int’l Pty. Ltd. v. Merck Sharp & Dohme Corp.*, 927 F.3d 1232, 1240 (Fed. Cir. 2019) (“[I]f a petition fails to identify all real parties in interest under § 312(a)(2), the Director can, and does, allow the petitioner to add a real party in interest.”) (quoting *Wi-Fi One, LLC v. Broadcom Corp.*, 878 F.3d 1364, 1374 n.9 (Fed. Cir. 2018) (en banc)).

In the present proceeding, there is no allegation that Petitioner’s exclusion of the Unnamed RPIs should result in termination of the proceeding or denial of institution of review for any reason other than for the alleged failure of a procedural requirement that can be corrected pursuant to Board precedent. Additionally, there is no allegation or evidence that any of the Unnamed RPIs is barred or estopped from this proceeding, or that Petitioner purposefully omitted any of the Unnamed RPIs to gain some advantage.

B. CLAIM INTERPRETATION

We interpret claims in the same manner used in a civil action under 35 U.S.C. § 282(b), “including construing 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.” 37 C.F.R. § 42.100(b) (2019).<sup>4</sup> When applying that standard, we interpret the claim language as it would be understood by one of ordinary skill in the art in light of the specification. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010). Thus, we give claim terms their ordinary and customary meaning as they would be understood by an ordinarily skilled artisan. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (“The ordinary and customary meaning ‘is the meaning that the term would have to a person of ordinary skill in the art in question.’” (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005))). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

In our Institution Decision, we agreed with both parties that no construction of any term was for our determination of whether to institute *inter partes* review. Dec. 7.

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<sup>4</sup> On October 11, 2018, the USPTO revised its rules to harmonize the Board’s claim construction standard with that used in federal district court. Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). This rule change applies to petitions filed on or after November 13, 2018. *Id.*

After our Institution Decision, Patent Owner raised two claim construction issues in its Patent Owner Response: (1) “wherein the intra mode for the current block is determined by using a [first/second] set of one or more mathematical expressions, if the intra mode for the neighboring block is the [nondirectional/directional] mode” and (2) “wherein the second set of one or more mathematical expressions is different from the first set of one or more mathematical expressions.” PO Resp. 10–18.

We determine that no construction of these terms is necessary for this Final Written Decision.

*1. Other Claim Terms*

We discern no other terms in need of express interpretation. Accordingly, we apply the legal standards set forth above when reading the claims.

C. THE PARTIES’ POST-INSTITUTION ARGUMENTS

In our Institution Decision, we concluded that the argument and evidence adduced by Petitioner demonstrated a reasonable likelihood that claims 1 and 4 were unpatentable. Dec. 24. We must now determine whether Petitioner has established by a preponderance of the evidence that the remaining challenged claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e) (2018). We previously instructed Patent Owner that “any arguments not raised in the [Patent Owner Response] may be deemed waived.” Paper 10, 8; *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner’s failure to proffer argument at trial as instructed in scheduling order constitutes waiver). Additionally, the Board’s Trial Practice Guide states that the Patent Owner Response “should

identify all the involved claims that are believed to be patentable and state the basis for that belief.” Consolidated TPG at 66.

#### D. LEGAL STANDARDS

Petitioner challenges the patentability of claims 1 and 4 on the ground that the claims are unpatentable as obvious over Kalevo and Song. To prevail in its challenge to the patentability of the claims, Petitioner must establish unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2019). “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”)). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burdens of proof in *inter partes* review).

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), reaffirmed the framework for determining obviousness as set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The *KSR* Court summarized the four factual inquiries set forth in *Graham* that we apply in determining whether a claim is unpatentable as obvious under 35 U.S.C. § 103(a) as follows: (1) determining the scope and content of the prior art, (2) ascertaining the differences between the prior art and the claims at issue, (3) resolving the level of ordinary skill in the pertinent art, and (4) when in evidence, considering objective evidence indicating obviousness or

nonobviousness. *KSR*, 550 U.S. at 406 (citing *Graham*, 383 U.S. at 17–18). In an *inter partes* review, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. An obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418; *accord Translogic*, 504 F.3d at 1259. Petitioner also must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *NuVasive*, 842 F.3d at 1382.

At this final stage of the proceeding, we determine whether a preponderance of the evidence of record shows that the remaining challenged claims would have been rendered obvious in view of the asserted prior art. We analyze the asserted ground of unpatentability in accordance with these principles.

#### E. LEVEL OF ORDINARY SKILL

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner proposes that a person of ordinary skill

A person of ordinary skill in the art at the priority date for the ’849 Patent (“POSITA”) would have had a bachelor’s degree in electrical or computer engineering, or a closely related scientific field such as physics or computer science, and two years of work experience with video processing. A lack of experience can be remedied with additional education (e.g., a Master’s degree), and

likewise, a lack of education can be remedied with additional work experience (e.g., 4–5 years).

Pet. 10–11 (citing Ex. 1003 ¶ 48). Patent Owner does not dispute this definition of a person of ordinary skill. *See generally* PO Resp. Patent Owner’s expert, Dr. Reader, however, testifies that

It is my opinion that one of ordinary skill in the art in the field of video compression in the 2009 time period, would have had a bachelor’s degree in electrical engineering or computer science, or an equivalent degree, and two to three years of experience in the field of video compression.

Ex. 2001 ¶ 45.

We see no meaningful distinction between these definitions relevant to the particular issues necessary to decide this case. We adopt Petitioner’s proposed level of ordinary skill, as it appears to be consistent with the level of skill reflected by the Specification and in the asserted prior art references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

#### F. CLAIMS 1, 4:

##### OBVIOUSNESS BASED ON KALEVO AND SONG

Petitioner argues that the combination of Kalevo and Song renders claims 1 and 4 unpatentable as obvious. Pet. 16–60. Claim 1 is independent and claim 4 depends from claim 1. Ex. 1001, 11:41–12:3, 12:11–19. Patent Owner argues that Petitioner’s challenge to claims 1 and 4 fails. *See* PO Resp. 18–32; PO Sur-Reply 4–10

##### *1. Independent Claim 1*

We first consider Petitioner’s argument that the combination of Kalevo and Song renders obvious claim 1. Pet. 16–57.

a. Kalevo

Kalevo is a U.S. Patent Application Publication titled “Method For Encoding Images, And An Image Coder.” Ex. 1004, [54]. Kalevo discloses a method in which “spatial prediction for a block . . . is performed to reduce the amount of information to be transmitted.” *Id.* at [57]. In Kalevo’s prediction method, “a classification is determined for at least one neighbouring<sup>5</sup> block (L, U) of said block (C) to be predicted according to the contents of said neighbouring block (L, U), and a prediction method (P1-P13) is selected for the current block (C) on the basis of at least one said classification.” *Id.* Kalevo also explains that its invention is “based on the idea that to perform spatial prediction of pixel values for a block to be coded, adjacent decoded blocks are examined to determine if there exists some directionality in the contents of the adjacent blocks.” *Id.* ¶ 23.

Kalevo discloses that an object of the invention is to “improve *encoding and decoding* of digital images such that higher encoding efficiency can be achieved and the bit rate of the encoded digital image can be further reduced.” *Id.* ¶¶ 14 (emphasis added), 19–20. Figure 3a of Kalevo illustrates an embodiment and is reproduced below.

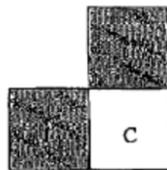


Fig. 3a

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<sup>5</sup> When quoting Kalevo, we use the British spelling “neighbouring” as it appears in Kalevo, notwithstanding the ’849 patent’s spelling, “neighboring.”

Figure 3a shows “blocks that are used for prediction,” according to an embodiment of the invention. *Id.* ¶ 29. Kalevo discloses determining a prediction method for the current block (C) based on one or more of the left neighboring block (L) (first neighboring block) and the upper neighboring block (U) (second neighboring block). *Id.* ¶ 38.

b. Song

Song is a U.S. Patent Application Publication titled “Method And Apparatus For Image Intra Prediction.” Ex. 1005, [54]. Song discloses a method “for intra prediction of an image” which includes “calculating arbitrary edge directions and amplitudes of the edges based on the neighboring pixels of a prediction block,” and “determining an intra prediction mode” using that information. *Id.* at [57], ¶ 11. In one embodiment, Song describes a “moving picture *decoding* apparatus” that includes an “entropy *decoder* 910, a rearrangement unit 920, an inverse quantization unit 930, an inverse transform unit 940, a motion compensation unit 950, an intra prediction unit 960, and a filter 970.” *Id.* ¶ 108 (emphases added). The “decoder” is used to “extract intra prediction mode information and quantized coefficient information.” *Id.* ¶ 109.

c. Analysis

Petitioner argues that the preamble and the limitations “[1.3] performing intra-prediction,” “[1.4] obtaining quantization coefficients,” “[1.5] dequantizing the quantization coefficients,” “[1.6] transforming the transform coefficients,” and “[1.7] adding the prediction block” all recite standard, well-known aspects of video compression, such as aspects of the H.264 standard referenced in the ’849 patent itself. Pet. 9–10, 26–38; Ex. 1003 ¶ 44. The Petition maps the alleged teachings of Kalevo and Song

to the foregoing limitations, in detail. Pet. 26–38. Regarding the remaining limitations, i.e., “[1.1] determining and intra mode for a neighboring block,” “[1.2] determining an intra mode for the current block,” and the “wherein” clauses [1.8], [1.9], and [1.10], Petitioner argues that these steps were also well-known and taught or suggested in the cited prior art, particularly Kalevo. Pet. 10.

For example, as to the “determining” steps in elements [1.1] and [1.2], Petitioner argues that Kalevo teaches using the intra mode of neighboring, previously decoded blocks to accurately determine the intra mode of a current block to be decoded. Pet. 16–25. Specifically, Petitioner alleges that Kalevo discloses “reduc[ing] redundant information in image data” that can be used for “intra-frame coding in block-based video coders,” and describes that “spatial prediction for a block (C) is performed” based on “a classification . . . determined for at least one neighbouring block . . . of said block (C) to be predicted.” Ex. 1004 ¶¶ 12–13, [57]. According to Petitioner, Kalevo uses the “directionality information” of neighboring blocks for classification and spatial prediction. *Id.* ¶ 23.

In sum, Petitioner argues that Kalevo teaches all of “the techniques alleged by the ’849 patent to be novel, while Song . . . fills in well-known details and structure of a decoder” for performing the steps that the ’849 patent acknowledges are standard. Pet. 10; Ex. 1001, 6:61–65. Relying on the testimony of Dr. Freedman and the disclosures in Kalevo, Petitioner argues a person of ordinary skill would have combined the “prediction methods of Kalevo with the decoding details of Song” according to “known methods” to yield “predictable results.” Pet. 28–33.

Patent Owner characterizes the Petition as providing two theories to account for limitations [1.8]–[1.10]: (1) Kalevo’s decoder uses mathematical expressions included in each prediction method to evaluate the prediction methods and select an applicable one for a current block (step 23 in FIG. 2); and (2) Kalevo uses mathematical expressions to classify the directionality of the neighboring blocks (step 22 in FIG. 2), which is in turn used to determine the intra mode for the current block. PO Resp. 26; PO Sur-Reply 4. With respect to the first theory, Patent Owner explained that, building on its arguments regarding the preamble discussed below, that only Kalevo’s encoder, not its decoder, perform Kalevo’s prediction method. PO Resp. 26–29. With respect to the second theory, Patent Owner acknowledges this method—the directional classification process—is performed by both the encoder and decoder, but Patent Owner argues that the directional classification process does not choose between sets of mathematical expressions according to the determined intra mode for the neighboring block. *Id.* at 29. Instead, Patent Owner contends that this process is performed in order to determine the neighboring block’s directionality—not the current block’s directionality as required by the claim. *Id.*

In its Reply, Petitioner argued that there was a third theory disclosed—that Kalevo’s mapping of directionality classes to context classes accounted for these limitations. Pet. Reply 8–9. Specifically, Petitioner notes that the Petition argued that Kalevo’s “mapping from the directional and non-directional classes D0 through D10 to context classes C0 through C6 corresponds to a mathematical operation of many-to-one mapping of discrete mathematics . . . .” *Id.* at 9 (quoting Pet. 48–49). And thus, the “set

of prediction methods (rules) available for each combination of classes of L block and U block is determined by using one or more mathematical expressions.” *Id.*

Petitioner contends that Kalevo’s decoder performs these operations after the neighboring blocks’ directionality is identified (i.e., these operations are performed to determine the current *block’s* intra mode, based on the neighboring block, corresponding to the non-directional method’s limitations [1.2] and [1.8]). *Id.* (citing Ex. 1021 ¶¶ 25–54). Petitioner asserts that the context class mapping corresponds to Figure 2’s step 20 (see Ex. 1004 ¶ 41), and the prediction method lookup corresponds to step 22 (see *id.* at Fig. 2). *Id.* Petitioner reproduces a version of Figure 2 of Kalevo, as annotated by Patent Owner to demonstrate that there is no dispute that the steps of this third theory are performed entirely by the decoder. *Id.* at 9–10.

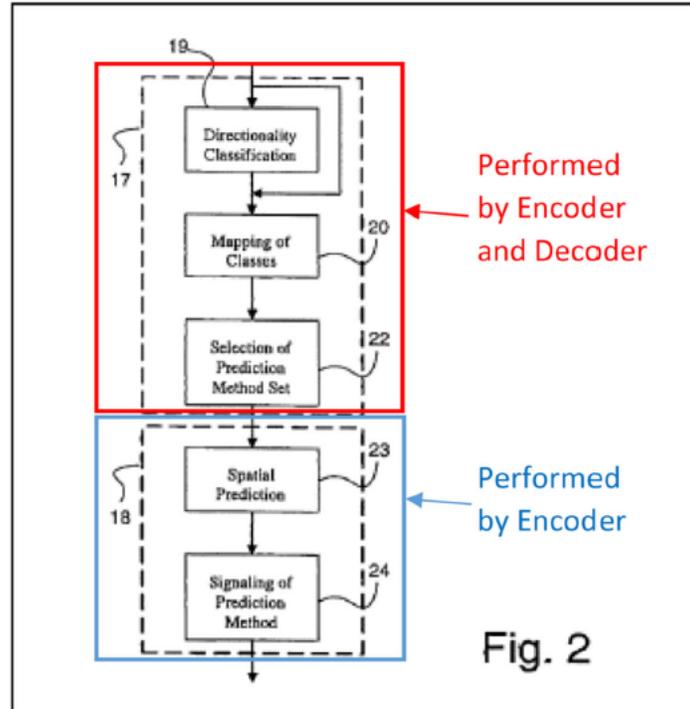
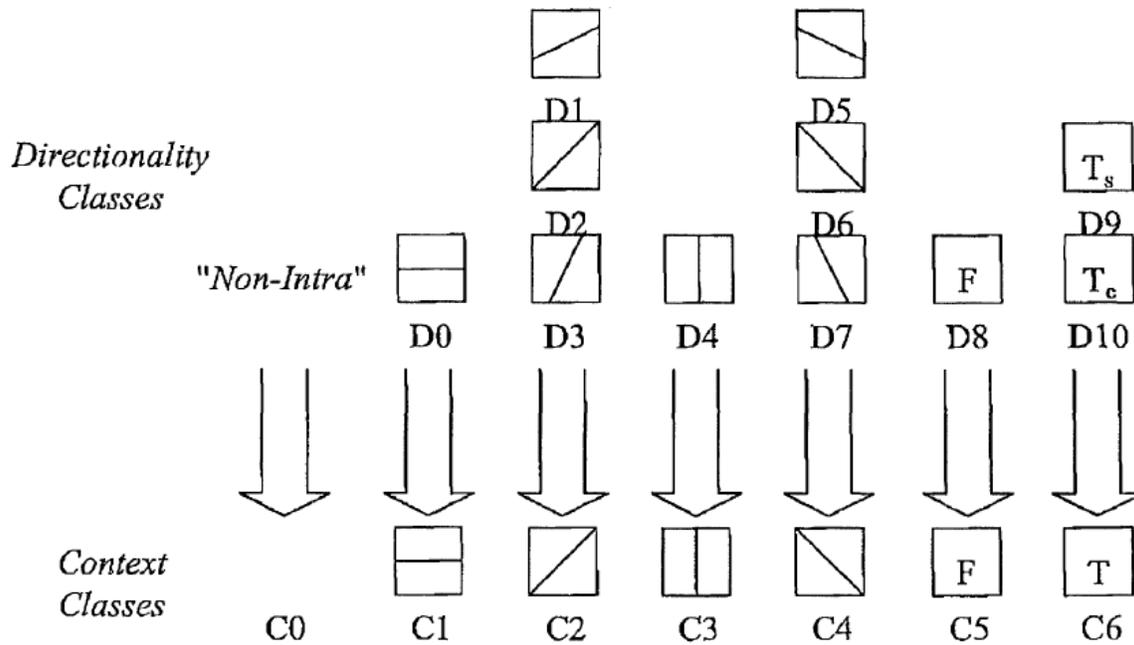


Figure 2 of Kalevo (annotated)

Figure 2 of Kalevo as annotated by Patent Owner is a block diagram of the method of Kalevo with red box showing the steps performed by the encoder and decoder and a blue box showing the steps performed by only the encoder. PO Resp. 27. Steps 20 and 22 are within the red box. *Id.* According to Kalevo, Figure 2 illustrates performing context-dependent selection 17 of a subset of prediction methods by classifying neighboring blocks, and performing construction 18 of a prediction block using the selected prediction method. Ex. 1004 ¶ 35, Fig. 2. Kalevo discloses that directionality classifier 19 analyzes the directionality of neighboring blocks using pixel value gradients, and each neighboring block is mapped 20 into either one of eight directional classes D0–D7 or one of three non-directional classes D8–D10. *Id.* ¶ 41.

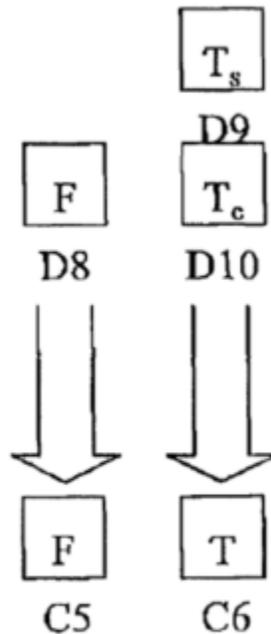
Petitioner further explains that “if a neighboring block (e.g., neighboring block U) is ‘classified as non-directional class D8’ as the Petition discussed (at 48), Kalevo’s decoder maps that non-directional class D8 onto context class C5.” Pet. Reply 10. This is shown in Figure 4 of Kalevo. Further, as shown in Figure 4 of Kalevo, reproduced below, each directionality class is further mapped to one of six context classes C1–C6. Ex. 1004 ¶¶ 73–74.



**Fig. 4**

Figure 4 is a block diagram illustrating the “mapping of directionality classes to context classes.” *Id.* ¶ 30.

Petitioner focuses on an excerpt of Figure 4, which was reproduced in excerpted form on page 21 of the Petition.



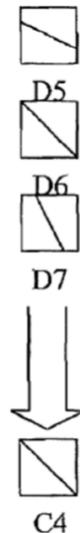
*Kalevo (EX1004), Figure 4 (excerpt)*

An excerpt of Figure 4 of Kalevo showing the mapping of non-directional class D8 onto context class C5. Pet. Reply 11. Petitioner argues that this mapping shown in Figure 4 is a mathematical expression and can be written as an equation. *Id.* at 11–12 (citing Ex. 1003 ¶ 138; Ex. 1021 ¶¶ 44–53; Ex. 1013).

Petitioner submits that “[t]his mathematical operation is used to determine the current block’s intra mode, because these mappings are performed in Kalevo’s step 20, which is a prerequisite to the prediction method subset selection (step 22).” *Id.* at 12 (citing Ex. 1021 ¶¶ 54, 55). Petitioner explains this accounts for limitation [1.8] where the first set of equations includes the mathematical expression that expresses a surjective mapping from the neighboring block’s non-directional class D8 to context class C5, which is used by the decoder to select a prediction method subset (step 22). *Id.* Petitioner submits that the decoder uses the subset, along with

the “rank” from the encoder to “determine the correct prediction method.”  
*Id.* (citing Ex. 1004 ¶¶ 148–149; Pet. 38–49).

For limitation [1.9], Petitioner argues that the Petition cited the example in which neighboring “block U is classified as context class C4 (mapped from any one of directional classes D5, D6, or D7).” *Id.* at 13 (citing Pet. 52). Petitioner submits that this mapping is represented by a many-to-one mathematical expression depicted in Kalevo’s Figure 4. An excerpt of Figure 4 of Kalevo is reproduced below.



*Kalevo (EX1004), Figure 4 (excerpt)*

An excerpt of Figure 4 of Kalevo is reproduced above showing the mapping of Directional classes D5, D6, and D7 onto Context class C5. Pet. Reply 14; Pet. 22. Petitioner contends that, as described with regards to limitation [1.8], that these mappings are mathematical expressions. *Id.*

Finally, Petitioner notes that “this mathematical expression (the mappings from D5-D7 to C4, which correspond to the second set) is different than the first set (the mappings from D8-D10 to C5-C6, which correspond to the first set), consistent with limitation [1.10].” Pet. Reply 15.

Petitioner further notes these sets are not subsets of each other, consistent with Patent Owner's construction. *Id.* (citing Ex. 1021 ¶¶ 54, 60, 64–66).

Patent Owner's primary argument against the class mapping or "third" theory is that it is untimely. PO Sur-Reply 6–8. Patent Owner raises three points why it contends that the argument was not sufficiently raised previously. First, Patent Owner asserts that the Petitioner's argument was only raised with respect limitation [1.8] and "[n]o reference to this directionality-to-context mapping was made in the Petition's analysis of elements [1.9]-[1.10]." *Id.* at 6–7. Patent Owner argues that "Petitioner never alleged 'with particularity' that Kalevo's class mapping corresponds to the claimed ***different*** first ***and second*** sets of mathematical expressions." *Id.* at 7. Second, Patent Owner argues that "the one-off statement fairly conveys one mathematical operation representing all directionality classifications." *Id.* Third, Patent Owner contends that "the Petition provided no analysis as to how the mapping constitutes a mathematical expression that is used in the process of determining the current block's intra mode." *Id.*

We do not agree with Patent Owner that Petitioner's so-called "third" theory is untimely and should be disregarded. To begin with, there is no dispute that the theory is, at least, raised with respect to claim limitation [1.8]. *See* PO Sur-Reply 6. Patent Owner disputes the particularity of this contention, but we find that it is sufficiently clear. The theory is not complicated and the sentence, especially given the detailed explanation of the other theories and of how Kalevo works, is sufficient to provide notice. Moreover, the cited paragraph of Dr. Freedman's First Declaration

(Paragraph 140) provides additional detail to clarify the theory. Ex. 1003 ¶ 140.

Petitioner's reply does explain how this third theory fits into Patent Owner's arguments and claim constructions, but Petitioner's Reply does not expand the theory beyond the contours provided in the Petition. As for limitations [1.9] and [1.10], we also find that the third theory was disclosed. To begin with the cited sentence in limitation [1.8] and supporting paragraph from Dr. Freedman's declaration discusses the mapping of both directional and non-directional modes to classes, thus including both limitations [1.8] and [1.9]. As Petitioner points out, the Petition's analysis of limitation [1.9] repeatedly refers back the analysis for limitation [1.8] and explicitly describes on page 52 of the Petition that

Additionally, as a further teaching of this limitation, for the above case in which block L is classified as context class C3 (mapped to from directional class D4) and block U is classified as context class C4 (mapped from any one of directional classes D5, D6, or D7), the determination of each neighboring block's classification, and thus, the determination of the intra prediction mode for the neighboring block, is based on a second set of one or more mathematical expressions.

Pet. 52. Finally, with respect limitation [1.10], we note that, although it is less clear, the analysis of limitation [1.10] does explain how classes C1–C6 are not the same in that they involve different underlying rules. *Id.* at 55–57. Finally, Patent Owner's arguments that “the Petition provided no analysis as to how the mapping constitutes a mathematical expression that is used in the process of determining the current block's intra mode” is belied by the Petition's detailed explanation of how Kalevo operates. *See* Pet. 16–25. Although Petitioner supports this argument with new evidence in its Reply, the Reply does not raise a new issue or argument. *See Chamberlain Group,*

*Inc. v. One World Techs., Inc.*, 944 F.3d 919, 925 (Fed. Cir. 2019) (“Parties are not barred from elaborating on their arguments on issues previously raised.”). Moreover, Patent Owner has had an adequate opportunity to address this new evidence in its Sur-Reply. *See In re NuVasive, Inc.*, 841 F.3d 966, 972 (Fed. Cir. 2016) (finding “an opportunity to respond was needed when the petitioner . . . newly pointed to a previously unmentioned portion of the . . . prior-art patent, even though it had earlier focused extensively on other portions of that prior-art patent”).

Here, we find that Petitioner’s arguments in its Reply rely on the arguments advanced in its Petition and respond directly to the narrow claim constructions for preamble and claim limitations [1.8]–[1.10] advanced by the Patent Owner. Accordingly, we will consider the “third” theory.

On the merits, Patent Owner raises two arguments, neither of which is persuasive. PO Sur-Reply 8–10. First, Patent Owner argues that the functions described by Dr. Freedman—( $f1 = \{(D8, C5)\}$ )—are not described in Kalevo and the relationships between a non-directional class and a context class that are described are not mathematical. *Id.* at 8–9. We do not agree with either of these contentions. Whether Kalevo expressly discloses the functions described by Dr. Freedman is beside the point, because as Dr. Freedman persuasively explains, Ex. 1021 ¶¶ 60–62—Kalevo would suggest these functions to a person of ordinary skill. *See In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994) (“[A] reference must be considered not only for what it expressly teaches, but also for what it fairly suggests.” (alteration in original)); *In re Aslanian*, 590 F.2d 911, 914 (CCPA 1979) (explaining that in determining obviousness, all references are assessed “on the basis of what they reasonably disclose and suggest to one skilled in the art” (quoting *In re*

*Baum*, 374 F.2d 1004, 1009 (CCPA 1967))). We also disagree with Patent Owner's contention that the relationships shown in Figure 4 are not mathematical. PO Sur-Reply 9. As Dr. Freedman explains

a POSITA would recognize that the mapping from the directional and non-directional classes D0 thru D10 to context classes C0 thru C6 corresponds to a surjective mapping (i.e., a many-to-one mapping in which every context class C0 through C6 has at least one directional or non-directional class D0 through D10 mapped to it), which is a concept known in discrete mathematics (see Johnsonbaugh, R. "Discrete Mathematics" (2009), [EX1013]), as does the search operation for looking up the entries in Table 4 indexed by the classes of the L block and the U block respectively.

Ex. 1003 ¶ 140. We find this opinion to be logical and reasonable and well-supported by the cited evidence, so we give it substantial weight.

Second, Patent Owner argues that "the now-alleged expressions (*fl*) 'represent[ing]' the class mapping fail anyway because *fl* is not used if the *intra mode* determined for the neighboring block is the non-directional *mode*." PO Sur-Reply 9. Patent Owner contends that "*Kalevo's* non-directional classes D8, D9, and D10 respectively correspond to flat, smooth texture, and coarse texture block features." *Id.* (citing Ex. 1004 ¶ 41).

Patent Owner asserts "[t]hese are—as Petitioner correctly states—'non-directional *classes*,' NOT non-directional *intra modes*." *Id.* Finally, Patent Owner argues that

Even if a flat block is typically predicted in a DC mode, it is not itself an *intra mode* and does not characterize an *intra mode* (unlike directionalities of prediction). Thus, *fl* does not constitute a first set of mathematical expressions used if a non-directional *intra mode* is determined for a neighboring block.

*Id.* at 10.

We have reviewed the evidence cited by Patent Owner and it does not sufficiently support the broad assertion that Kalevo's non-directional classes are not non-directional intra modes. Dr. Freedman, on the other hand, has repeatedly and consistently testified that non-directional classes of Kalevo are non-directional intra modes. *See, e.g.*, Ex. 1003 ¶ 140. Patent Owner does not point us to any cross examination testimony of Dr. Freedman or even any testimony of Dr. Reader on this point. Without sufficient evidence or persuasive argument to rebut it, we give Dr. Freedman's testimony that the non-directional classes of Kalevo are non-directional intra modes, substantial weight.

Patent Owner's remaining arguments center on its contention that the preamble is limiting, and the claimed method must be performed by a decoder. PO Resp. 18–24. Patent Owner asserts that some of the Petition's identified mathematical expressions (e.g., Kalevo's equation for calculating gradients, *see* Pet. 47–48) are only used for determining the neighboring block's intra mode (limitation [1.1]), not determining the current block's intra-mode (limitations [1.2], [1.8]). *See* PO Resp. 25–30. However, even accepting that the preamble is limiting and the method must be performed by a decoder, we find that Petitioner's so-called "third" theory maps claim 1 to steps performed by the decoder. Pet. Reply 8–15. Accordingly, Patent Owner's arguments relating to the "decoder" are not persuasive. Instead, we determine that Petitioner has shown by a preponderance of the evidence that the combination of Kalevo and Song account for the claimed "decoding apparatus" (limitation [1.0]). Pet. 16; Ex. 1003 ¶¶ 63–65.

On the entire record and for the reasons explained above, we determine that Petitioner has shown by a preponderance of the evidence that

Kalevo teaches or suggests limitations [1.8]–[1.10]. Patent Owner raises no other arguments for claim 1. *See generally* PO Resp. (arguing only with respect to claim 1 and only with respect to limitations [1.8]–[1.10] and the preamble). We have reviewed the arguments and evidence as to remaining limitations of claim 1 and the motivation to combine Kalevo and Song, and we determine that the Petition has shown by a preponderance of the evidence that the combination of Kalevo and Song teaches or suggests each limitation and that a person of ordinary skill would have been motivated to combine Kalevo and Song in the manner suggested. Therefore, we adopt Petitioner’s contentions regarding limitations [1.1]–[1.7] and the motivation to combine Kalevo and Song (Pet. 16–38) as our own. Accordingly, we determine that Petitioner has shown by a preponderance of the evidence that claim 1 would have been unpatentable as obvious over the combination of Kalevo and Song.

d. Conclusion

Based on our review of Petitioner’s argument and evidence of record, and for all the reasons expressed above, we conclude that Petitioner *has established* by a preponderance of evidence that claim 1 is unpatentable as obvious over Kalevo and Song.

2. *Dependent Claim 4*

Claim 4 depends from claim 1 and further recites

wherein determining the intra mode for the current block comprises: determining candidate intra modes based on whether the intra mode for the neighboring block is the directional mode or the non-directional mode; and selecting the intra mode for the current block among the candidate intra modes.

Ex. 1001, 12:10–18.

Petitioner relies on its arguments regarding claim 1, described above, and further relies on Kalevo’s description of determining a “subset of prediction methods . . . according to the context information of the neighbouring blocks L, U,” as shown in Table 4 of Kalevo. Pet. 58–60; Ex. 1004 ¶¶ 78, 143. According to Petitioner, Kalevo describes that “[e]ach row of Table 4 defines the prediction method subset for a certain pair of context classes for neighbouring blocks L, U...” and that “each combination of context classes for the neighboring blocks of a current block results in a subset of six possible prediction methods, or candidate intra modes, for the current block.” Pet. 58 (quoting Ex. 1004 ¶ 78); Ex. 1004 ¶ 143. Kalevo then “select[s] the prediction method from a subset of prediction methods.” Ex. 1004 ¶ 143. Petitioner also relies on the testimony of Dr. Freedman in support of its arguments. Ex. 1003 ¶¶ 164–168.

Patent Owner raises no separate arguments for claim 4. *See generally* PO Resp. (arguing only with respect to claim 1). We have reviewed the arguments and evidence as to claim 4, and we determine that the Petition has shown by a preponderance of the evidence that the combination of Kalevo and Song teaches or suggests each limitation. Therefore, we adopt Petitioner’s contentions regarding claim 4 (Pet. 58–60) as our own. Accordingly, we determine that Petitioner has shown by a preponderance of the evidence that claim 4 would have been unpatentable as obvious over the combination of Kalevo and Song.

3. *Summary*

For all the reasons expressed above, we conclude that Petitioner has shown by a preponderance of evidence that the combination of Kalevo and Song renders claims 1 and 4 unpatentable as obvious under § 103(a).

G. MOTION TO AMEND

1. *Proposed Substitute Claim 19*

Proposed substitute claim 19 is independent. Claim 19 is proposed as a substitute for claim 1 in the event we find claim 1 unpatentable, and claim 19 is set out below, showing added language underlined and deleted language struck out in comparison to challenged claim 1.

- [19.Pre] ~~[[1.]]~~19. A video decoding method performed by a video decoding apparatus, the method comprising:
- [19.1] determining an intra mode for a neighboring block of a current block;
  - [19.2] determining an intra mode for the current block based on whether the intra mode for the neighboring block is a directional mode or a non-directional mode;
  - [19.3] performing intra-prediction according to the intra mode for the current block to generate a prediction block for the current block;
  - [19.4] obtaining quantization coefficients from an input bitstream;
  - [19.5] dequantizing the quantization coefficients to generate transform coefficients;
  - [19.6] transforming the transform coefficients to a residual block for the current block; and
  - [19.7] adding the prediction block and the residual block to reconstruct the current block,

- [19.8] wherein the intra mode for the current block is determined by using a first set of one or more mathematical expressions, if the intra mode for the neighboring block is the non-directional mode,
- [19.9] wherein the intra mode for the current block is determined by using a second set of one or more mathematical expressions, if the intra mode for the neighboring block is the directional mode,~~[[and]]~~
- [19.10] wherein the second set of one or more mathematical expressions is different from the first set of one or more mathematical expressions~~[[.]]~~,
- [19.11] wherein the second set used by the video decoding apparatus in response to the intra mode for the neighboring block being determined as the directional mode comprises a mathematical expression that is not included in the first set, and the first set used by the video decoding apparatus in response to the intra mode for the neighboring block being determined as the non-directional mode comprises a different mathematical expression that is not included in the second set,
- [19.12] wherein the mathematical expression included in the second set and not included in the first set corresponds to an arithmetic operation between two values in order to yield a third value, and
- [19.13] wherein the intra mode determined for the neighboring block is represented by an integer among a plurality of predetermined integers, the plurality of predetermined integers commonly identifying intra modes available to be determined for the neighboring block and the current block, and all the intra modes available to be determined for the neighboring block are same as all the intra modes available to be determined for the current block.

Rev. Mot. Amend, App'x A.

## 2. Principles of Law

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend. 35 U.S.C. § 316(d) (2018). The Board must assess the patentability of proposed substitute claims “without placing the burden of persuasion on the patent owner.” *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017) (en banc); see also *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 3–4 (PTAB Feb. 25, 2019) (precedential). Subsequent to the issuance of *Aqua Products*, the Federal Circuit issued a decision in *Bosch Automotive Service Solutions, LLC v. Matal*, 878 F.3d 1027 (Fed. Cir. 2017) (“*Bosch*”), as well as a follow-up Order amending that decision on rehearing. See *Bosch Auto. Serv. Sols., LLC v. Iancu*, No. 2015-1928 (Fed. Cir. Mar. 15, 2018) (Order on Petition for Panel Rehearing). In accordance with *Aqua Products*, *Bosch*, and *Lectrosonics*, a patent owner does not bear the burden of persuasion to demonstrate the patentability of the substitute claims presented in the motion to amend. Rather, ordinarily, “the petitioner bears the burden of proving that the proposed amended claims are unpatentable by a preponderance of the evidence.” *Bosch*, 878 F.3d at 1040 (as amended on rehearing); see *Lectrosonics*, Paper 15 at 3–4. In determining whether a petitioner has proven unpatentability of the substitute claims, the Board focuses on “arguments and theories raised by the petitioner in its petition or opposition to the motion to amend.” *Nike, Inc. v. Adidas AG*, 955 F.3d 45, 51 (Fed. Cir. 2020).

Patent Owner’s proposed substitute claims, however, must meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. *Lectrosonics*, Paper 15 at 4–8.

Accordingly, Patent Owner must demonstrate: (1) the amendment proposes a reasonable number of substitute claims; (2) the proposed claims are supported in the original disclosure (and any earlier filed disclosure for which the benefit of filing date is sought); (3) the amendment responds to a ground of unpatentability involved in the trial; and (4) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter. *See* 35 U.S.C. § 316(d); 37 C.F.R. § 42.121.

### *3. Statutory and Regulatory Requirements*

Below we address whether Patent Owner's proposed substitute claims meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121 recited above. We address each of these requirements in turn.

#### *a. Reasonable Number of Substitute Claims*

A motion to amend must "propose a reasonable number of substitute claims." 35 U.S.C. § 316(d)(1)(B); *see* 37 C.F.R. § 42.121(a)(3) ("A motion to amend may cancel a challenged claim or propose a reasonable number of substitute claims."). Patent Owner proposes one substitute claim for challenged claim 1. Rev. Mot. Amend 2. "There is a rebuttable presumption that a reasonable number of substitute claims per challenged claim is one (1) substitute claim." *Lectrosonics*, Paper 15 at 4; *see* 37 C.F.R. § 42.121(a)(3). Petitioner does not argue otherwise. *See generally* Opp. Therefore, we determine that Patent Owner proposes a reasonable number of substitute claims.

b. Respond to a Ground of Unpatentability

“A motion to amend may be denied where . . . [t]he amendment does not respond to a ground of unpatentability involved in the trial.” 37 C.F.R. § 42.121(a)(2)(i). Patent Owner asserts that the proposed substitute claim is patentable over the combination of references that forms the basis of the obviousness ground on which we instituted trial. Rev. Mot. Amend 12–19. Petitioner does not argue otherwise. *See generally* Opp. We determine that the amended language in the proposed substitute claim is responsive to a ground of unpatentability involved in this trial.

c. Scope of the Claim

Patent Owner asserts that the substitute claim is narrower than the corresponding original claim. Rev. Mot. Amend 2. Petitioner does not argue otherwise. We determine that the proposed substitute claim is narrower in scope than original claim 1.

d. Support in the Original Disclosure

A motion to amend may not present substitute claims that introduce new subject matter. 35 U.S.C. § 316(d); 37 C.F.R. § 41.121(a)(2)(ii). New matter is any addition to the claims without support in the original disclosure. *See TurboCare Div. of Demag Delaval Turbomach. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) (“When [an] applicant adds a claim . . . the new claim[] . . . must find support in the original specification.”). To evaluate compliance with the prohibition on amendments that add new matter,

the Board requires that a motion to amend set forth written description support in the originally filed disclosure of the subject patent for each proposed substitute claim, and also set forth support in an earlier filed disclosure for each claim for

which benefit of the filing date of the earlier filed disclosure is sought.

*Lectrosonics*, Paper 15 at 7.

The revised MTA provides a listing of purported written description support in the originally filed disclosures for the proposed substitute claim, namely, that the claim is supported by the original application of the '849 Patent, U.S. Patent Application No. 15/260,240 (“the ‘240 Application,” Ex. 2014), as well as the parent U.S. Patent Application No. 12/977,928 (“the ‘928 Application,” Ex. 2015) and Korean Priority Application No. 10-2009-0134017 (“the KR Application,” Ex. 2018). Rev. Mot. Amend 3–11. With respect to limitation [19.1], “determining an intra mode for a neighboring block of a current block,” Patent Owner cites the '240 Application (Exhibit 2014) at 18:1–20:2 and the '928 Application (Exhibit 2015)<sup>6</sup> at 18:1–20:2 as alleged support for this limitation.

Petitioner argues that substitute claim 19 is also not supported by the written description of the '849 Patent, and as such, is unpatentable under 35 U.S.C. § 112. Opp. 12–25. In particular, Petitioner contends that at least limitation [19.1] of substitute claim 19 is not supported by the '240 Application. Opp. 13. Petitioner argues that a POSITA would not have understood that the inventors were in possession of, and actually invented, the invention in substitute claim 19, because “the '240 Application does not **determine** an intra mode for a neighboring block of a current block and does not describe an invention that relies on a determined intra mode for a neighboring block of a current block and does not describe an invention that

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<sup>6</sup> The citations to the '928 Application are identical to those for the '240 Application and the text is the same between the two; for ease of reference, we hereafter cite only to the '240 Application.

relies on a determined intra mode for a neighboring block.” *Id.* Petitioner submits that “at best, the ’240 Application discloses an exploratory process by which multiple intra modes for the neighboring block are evaluated, but it never describes, consistent with the written description standard, a process that includes determining the intra mode of the neighboring block.” *Id.* at 13–14.

To satisfy § 112, the written description must “clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2012) (internal citations and quotations omitted). This standard requires evaluation of “whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Id.* In other words, “the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.” *Id.*

Patent Owner responds that the specification provides an example in which  $i$  that is used in Equation 2 is the “intra mode number” for the neighboring block and is determined as 0 through 8 in the process of setting the intra mode for the current block. PO Reply 10. Patent Owner argues that Petitioner’s argument relies on Petitioner’s interpretation of “determining,” which is incorrect. *Id.* Patent Owner submits that the proper interpretation of “determining” should include “specifying or identifying a value.” *Id.* at 11. Patent Owner asserts that this definition is consistent with the Specification and prosecution history. In particular, Patent Owner points to the prosecution of a continuation of the ’849 patent, U.S. Application

No. 15/447,055, which includes similar claim language to proposed substitute claim 19. *Id.* Patent Owner notes that in order to overcome a § 112 rejection and obtain an Allowance, the Applicant pointed to  $i$  in Equation 2 as an embodiment of the intra mode “determin[ed]” for the neighboring block. *Id.* at 12 (citing Ex. 1007, 156, 162–163). Moreover, Patent Owner argues that Petitioner’s construction is incorrect because it would exclude a preferred embodiment. *Id.* Thus, Patent Owner concludes that

a POSITA would understand an example of the claimed determining is disclosed in the specification with reference to specifying or identifying (i.e., determining) a value for  $i$  (“the intra mode number” for the neighboring block). Per this example, “[w]henver the neighboring block intra mode,  $i$ , for the cost function is determined as a directional mode ( $i = 0, 1, 3-8$ ), the decoder chooses to apply the directional equation that leverages that directional property” and “[w]henver the neighbor block intra mode,  $i$ , for the cost function is determined as a non-directional mode (2), the decoder chooses to use the DC intra mode equation that calculates an average without directionality.”

*Id.* (quoting Ex. 2017 ¶¶ 17, 19).

The ’240 application discloses that a mode selector selects “a mode suitable for a current block from along a plurality of intra modes using *directionality of neighboring blocks of the current block.*” Ex. 2014, 18:2–3 (emphasis added). The ’240 application further discloses:

First, the mode selector 210 or 540 calculates a cost  $C_i$ , with respect to *a specific directionality  $i$*  by means of a sum (or an average) of deviations according to the directionalities using Equation 2 below.

[Equation 2]

$$C_i = \sum_{k=0}^{n-1} D_{ik}$$

In Equation 2,  $n$  is the number of pixel pairs  $k$  for calculating the deviation,  $i$  is the *intra mode number*, and  $D_{ik}$  is the deviation between the pixel pairs  $k$  corresponding to *the specific directionality*  $i$ . The symbol  $n$  may be selected by another number depending on an embodiment. In example embodiments of the present invention, the description will be made on the assumption that  $n$  is set to 12.

Ex. 2014, 18:9–18 (emphasis added).

In the '240 Application, “a cost  $C_i$  with respect to a specific directionality  $i$ ” is calculated using Equation 2 for each candidate intra mode; for example, the “cost  $C_0$  of the vertical direction” (mode 0) “is obtained by selecting 12 pixel pairs in the vertical direction from among adjacent pixels of the neighboring blocks.” Ex. 2014, 18:19–22. After the cost  $C_0$  for the candidate intra vertical mode is calculated, the '240 Application describes calculating the cost for the other intra modes numbered 1 through 8, such that costs  $C_0$  through  $C_8$  are ultimately determined. *See* Ex. 2014, 19:3–4, 19:12–15; 19:21–23; Ex. 1021 ¶¶ 72–73.

After this process, the '240 Application has nine cost values, corresponding to nine directionality scenarios for pixels in the neighboring blocks. *See* Ex. 2014, 20:3–7. The '240 Application explains that, because it describes that “mode selector 210 or 540 can calculate the costs  $C_i$  of a total of nine intra modes . . . and then select one having a minimum cost from among the intra modes” and it clarifies that this cost calculation is done “to select the intra mode **suitable for the current block.**” Ex. 2014, 20:3–9 (emphasis added); *see id.* at 25:10–15 (original claim 8, describing calculating costs “on a plurality of directions in the at least one neighboring

block” and selecting “an intra mode” for the current block); Ex. 2017 ¶ 20 (explaining the process uses the smallest cost value as the intra mode of the current block); Ex. 1021 ¶¶ 72, 73 (describing the process shown in Figures 7A–7H); Ex. 1035 ¶¶ 65, 66 (describing how the cost calculation iterates through the nine hypothetical intra modes).

Patent Owner does not dispute this description of the operation of the process described in the ’240 Application, but it does dispute the meaning of the variable “*i*”. PO Reply 10; *see also* Opp. 16 n.9 (discussing the parties dispute). In the Preliminary Guidance, we assumed that the variable *i* in the passage describing Equation 2 (*see supra* at 42) corresponds to both the directionality and the intra mode of the neighboring block. *See* Prelim. Guid. 7. Based, in part, on that assumption, we determined that Patent Owner had met the statutory and regulatory requirements for a motion to amend and that, on the initial record, Petitioner had not shown a reasonable likelihood that the claim limitation [19.1] (which was the same as the current version of limitation [19.1]) lacked written description support. *See id.* Upon review of the entire record, we agree with Petitioner that the variable *i* in Equation 2 refers to the intra mode of the current block, not the intra mode of the neighboring block as we preliminarily determined and Patent Owner contends.

The fundamental problem with Patent Owner’s analysis, and where we went astray in our Preliminary Guidance, begins with Patent Owner’s assertion that the ’240 Application uses “directionality” and “intra mode” synonymously. Ex. 2001 ¶ 58; Ex. 2017 ¶ 14. Instead, our detailed review of the ’240 Application on this complete record shows that the two terms are not synonymous—they are closely related, but not the same. For example,

in the Related Art section, the '240 Application describes H.264 having “nine prediction modes including a total of eight modes (modes 0, 1, and 3 through 8) having *directionality*.” Ex. 2014, 3:10–13. Also, in the Summary of the Invention the '240 Application states

The performing an intra-prediction according to a directionality of the selected intra mode to reconstruct the current block may include: obtaining a prediction block of the current block from the at least one neighboring block *according to the directionality* of the selected mode; and reconstructing the current block by adding the residual signal of the current block and the prediction block.

Ex. 2014, 7:24–8:4 (emphasis added). Again and again, the '240 Application makes clear that *directionality* and *intra mode* are related, but distinct concepts. They are not interchangeable as Patent Owner argues.

On this point, we find Dr. Freedman's explanation in Paragraph 68 of his Third Declaration on the relationship between “intra mode” and “directionality” to be particularly well-reasoned and persuasive. As Dr. Freedman explains

Throughout the '240 Application, the text uses the term “directionality” to refer to characteristics of neighboring blocks, whereas the term “intra mode” is used when referring to the current block. For example, the '240 Application describes that “directionality” of neighboring blocks is “estimated from the neighboring blocks” that “have already been reconstructed” while the “intra mode” is selected for the current block for purposes of reconstructing that current block. *See, e.g.*, '240 Application (Ex-2014), 11:14–12:4, 25:10–15. This is likely because the neighboring blocks “have already been reconstructed” and thus, the intra mode number that was used in reconstructing those blocks is no longer pertinent. Instead, what is pertinent in the '240 Application's method is the directionality characteristic of those neighboring blocks. Phrased differently, in the '240 Application, *directionality* is a concept that is

evaluated *after performance of intra prediction* (i.e., after reconstruction), whereas the *intra mode* or number is a concept used *during performance of intra prediction*. . . . They are not equivalent in the context of the '240 Application. . . .

Ex. 1035 ¶ 68 (footnote omitted). This is further supported by evidence cited by Dr. Freedman that other references in this field make a similar distinction between directionality and intra mode. *Id.* ¶ 68 n.4 (citing Ex. 1032, Abstract). Thus, we agree with Dr. Freedman that these terms are not “synonymous” as Dr. Reader and Patent Owner contend.

This error infects Patent Owner’s and Dr. Reader’s entire written description analysis and leads to the second more significant error, i.e., that the '240 Application says that the variable  $i$  is the intra mode of the neighboring block. *See* Opp. 18–19; Ex. 2017 ¶¶ 14–20 (analysis relying on the assumption that directionality and intra mode are the same). With the proper understanding of “intra mode” and “directionality,” we agree with Petitioner and Dr. Freedman that “the variable  $i$  does not refer to the intra mode of a neighboring block. According to Dr. Freedman, a POSITA would instead have understood the variable  $i$  to refer to the intra mode that is to be determined for the current block that is undergoing the decoding process.” Ex. 1035 ¶ 63.

This makes sense. Patent Owner’s contention that  $i$  is the “intra mode number” for the neighboring block, begs a number of questions. *See* Opp. 20; Ex. 2017 ¶ 14; PO Reply 12. For instance, if  $i$  is the intra mode of the neighboring block, which neighboring block? A review of any of Figures 7A–7H illustrates why this question exposes the flaws in Patent Owner’s and Dr. Reader’s analysis. For example, Figure 7A of the '240 Application illustrates the cost calculation for mode 0.

**FIG. 7A**

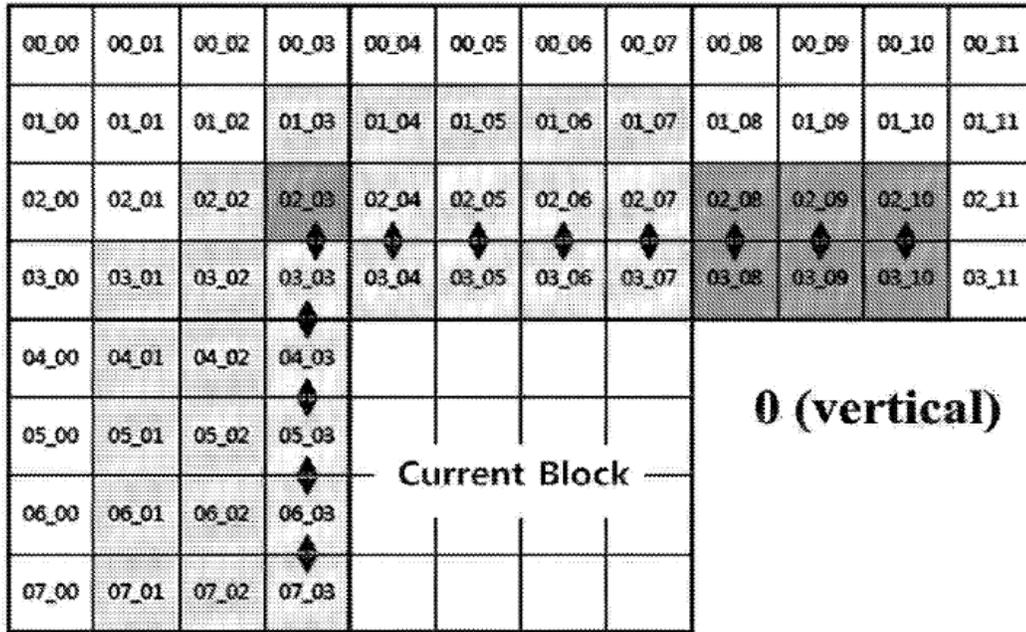


Figure 7A shows an example of calculating the cost of a vertical direction. As the '240 Application explains

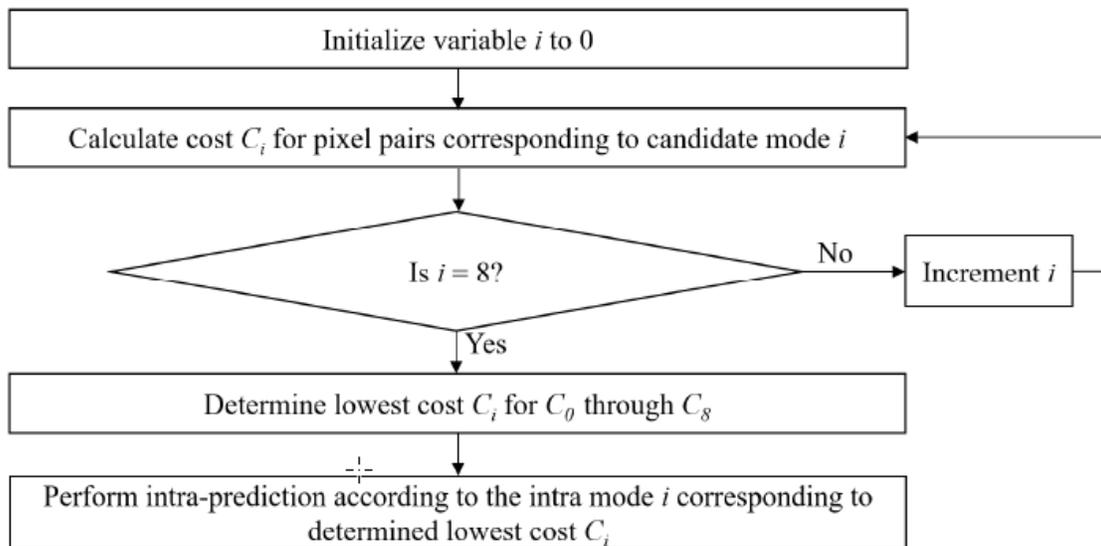
The cost  $C_0$  of the vertical direction is obtained by selecting 12 pixel pairs in the vertical direction from among adjacent pixels of the neighboring blocks of the current block, and calculating a sum of deviations with respect to each pixel pair as in Equation 2.

Ex. 2014, 18:19–23. As Figure 7A illustrates, the cost calculation centers on the current block, not the neighboring blocks, which is unusual if  $i$  is the intra mode of a neighboring block. Ex. 1021 ¶¶ 75–77; see Opp. 19.

Moreover, as shown in Figure 7A, the pixel pairs selected of the neighboring blocks spans *four different* neighboring blocks. Patent Owner never explains which of these four blocks the variable  $i$  is supposedly representing. Given this disclosure, we find Dr. Freedman’s testimony in Paragraph 66 of his Third Declaration to be persuasive in how this process works

In other words, the '240 Application's technique of determining, or selecting, the intra mode suitable for the current block evaluates nine hypothetical scenarios for the current block, where each scenario corresponds to an intra mode. Each scenario evaluates a different arrangement of pixel pairs in neighboring blocks to determine the cost associated with applying the scenario to the current block, using Equations 2 and 3. That is to say, the cost  $C_i$  is the cost associated with using the intra mode  $i$  for the current block. Thus, for example, if the vertical intra mode (mode 0) is determined to be applied to the current block, that means that the cost  $C_0$  was the lowest cost out of the costs  $C_0$  through  $C_8$ . See Ex-1022, 28:20–24. If the non-directional mode (mode 2) is determined to be applied to the current block, that means that the cost  $C_2$  was the lowest cost out of the costs  $C_0$  through  $C_8$ . See *id.* at 28:21–29:6.

Ex. 1035 ¶ 66. This is shown in this flowchart Dr. Freedman provided in his second declaration and reproduced below.



Above is a flow chart provided by Dr. Freedman illustrating the algorithm to determine intra mode used in the '240 Application. Opp. 21; Ex. 1021 ¶ 88. Patent Owner and Dr. Reader offer no persuasive argument to rebut this interpretation. Given the flaws and holes we have identified in Dr. Reader's

testimony, we find that it is entitled little weight on the question of whether the '240 Application supports limitation [19.1] of proposed substitute claim 19. Instead, relying on Dr. Freedman's persuasive testimony and based on this correct interpretation of the process described in the '240 Application, we determine that a preponderance of the evidence shows that limitation [19.1] is not supported by the '240 Application, as filed. *See* Ex. 1021 ¶¶ 69–80; Ex. 1035 ¶¶ 60–79. We further find that, given what we see now as the correct interpretation of the variable *i*, we determine that Patent Owner has failed to carry its burden of showing that the proposed replacement claim 19 does not add new matter.<sup>7</sup> *See* Ex. 1021 ¶¶ 69–80; Ex. 1035 ¶¶ 60–79; 35 U.S.C. § 316(d); 37 C.F.R. § 41.121(a)(2)(ii).<sup>8</sup>

We write further to explain why even under our prior, incorrect interpretation of the variable *i*, as denoting the intra mode of the neighboring

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<sup>7</sup> As for Patent Owner's contentions regarding the prosecution of the related application (PO Reply 11–12 (citing Ex. 1007, 156)), we agree with Petitioner that the rejection in that child application involved indefiniteness and not written description and is, therefore, unpersuasive. Pet. Sur-Reply 2.

<sup>8</sup> Patent Owner contends that it is somehow improper for Petitioner to raise a contention that limitation [19.1] lacks written description support. PO Reply 10. We agree with Petitioner that there is nothing improper with Petitioner maintaining arguments it believes to be meritorious or where we might have misapprehended arguments in the original opposition. We further see nothing improper with it challenging limitations that might have been in the original challenged claims. The proposed substitute claims stand or fall on their own and may be challenged on other possible grounds of unpatentability. *See Samsung Elecs. Am., Inc. v. Prisia Eng'g Corp.*, 948 F.3d 1342, 1352 (Fed. Cir. 2020) (“the Board's authority with respect to new and amended claims necessarily extends to other possible grounds of unpatentability, in particular, a failure to comply with section 112.”); *Amazon.com, Inc. v. Uniloc Luxembourg S.A.*, IPR2017-00948, Paper 34 at 5 (PTAB Jan. 18, 2019) (precedential).

block, we determine that Patent Owner has not shown that proposed substitute claim 19, and in particular limitation [19.1], has written description support.<sup>9</sup>

In its Opposition, Petitioner argues that, under the proper construction, limitation [19.1] of proposed substitute claim 19 requires “a conclusive establishment of a singular intra mode for a neighboring block.” Opp. 16. Petitioner contends that “[t]he ’240 Application does not conclusively establish a singular intra mode of a neighboring block according to [this] interpretation . . . , and thus, the ’240 Application does not provide written description support for this claim limitation.” *Id.* Petitioner argues that the ’240 Application describes evaluating nine hypothetical directionality scenarios for the pixels of neighboring blocks, each of which corresponds to one of nine intra modes to be used for the current block, performing cost calculations for each of those nine hypothetical directionality scenarios, and picking one of the nine intra modes for the current block based on its associated cost. *Id.* at 16–18 (citing Ex. 1022, 27:11–13). Petitioner asserts that, “in this process, there is no conclusive establishment of a singular intra mode for a neighboring block.” *Id.* at 18.

Patent Owner argues that this contention depends on Petitioner’s interpretation of “determining.” PO Reply 10. Patent Owner contends that the proper interpretation of “determining” includes “specifying or identifying a value.” *Id.* at 11. Patent Owner contends that “POSITA would

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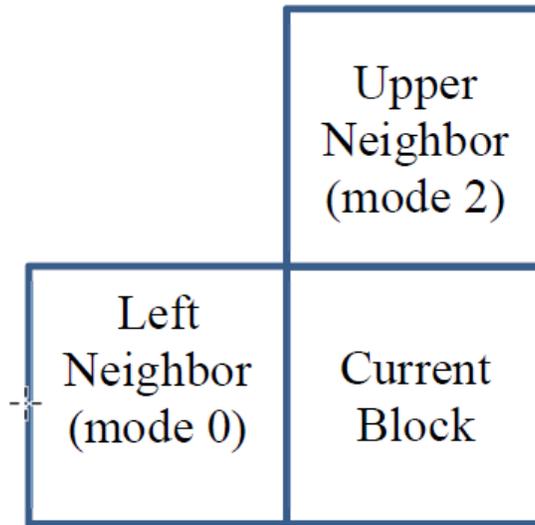
<sup>9</sup> For this section, we analyze whether Patent Owner has shown written description support for proposed substitute claim 19 using our incorrect interpretation in the Preliminary Guidance that the variable *i* in the ’240 Application corresponds to the intra mode of the neighboring block.

understand an example of the claimed determining is disclosed in the specification with reference to specifying or identifying (i.e., determining) a value for  $i$  (“the intra mode number” for the neighboring block).” *Id.* at 12. Patent Owner argues that “[p]er this example, “[w]henver the neighboring block intra mode,  $i$ , for the cost function is determined as a directional mode ( $i = 0, 1, 3-8$ ), the decoder chooses to apply the directional equation that leverages that directional property” and “[w]henver the neighbor block intra mode,  $i$ , for the cost function is determined as a non-directional mode (2), the decoder chooses to use the DC intra mode equation that calculates an average without directionality.” *Id.* (citing Ex. 2017 ¶¶ 17, 19).

As explained above, the ’240 Application describes evaluating nine hypothetical directionality scenarios for the pixels of neighboring blocks, each of which corresponds to one of nine intra modes to be used for the current block, performing cost calculations for each of those nine hypothetical directionality scenarios, and picking one of the nine intra modes for the current block based on its associated cost. *See* Ex. 1022, 27:11–13. We find that even under Patent Owner’s interpretation of the variable  $i$  in Equation 2, we agree with Petitioner that in the process described in the ’240 Application, there is no “determination” of a singular intra mode for a neighboring block. *See* Opp. 16–25; Pet. Sur-Reply 1–6. This is true even under Patent Owner’s construction of “determining” as “specifying or identifying a value.” *See* Pet. Sur-Reply 1–2. In particular, the ’240 Application does not “specify” or “identify” (or “determine”) a single intra mode for the neighboring block—it merely examines the separate concept of directionality among pixel pairs in the neighboring block. Ex. 2014, 18:9–18. We agree with Petitioner, as explained above, *see supra* pp. 42–44,

there is no determination of a single intra mode for the neighboring block, but instead, the intra modes are hypothetical scenarios for application to the current block while calculating costs with respect to neighboring block pixel pairs—thus, no intra mode used to decode a neighboring block is needed much less determined. Ex. 1035 ¶ 68. This is shown in the flowchart Dr. Freedman provided in his second declaration that we reproduced *supra*. Even under the incorrect interpretation of the variable *i*, the flow chart demonstrates that no intra mode is specified for the neighboring blocks. Ex. 1035 ¶¶ 62–67. Instead, we agree with Petitioner that the '240 Application never specifies a single intra mode of the neighboring block—it evaluates nine hypothetical intra mode scenarios corresponding to the neighboring blocks' pixels, but never determines the intra mode of a neighboring block: the mode selector 540 always “calculate[s] the costs  $C_i$  of a total of nine intra modes” (Ex. 2014, 20:3–5); it does not limit its cost calculation to one of (or a subset of) those intra modes, based on the intra mode of a neighboring block. Ex. 1021 ¶¶ 89–90; Ex. 1035 ¶¶ 73–74.

We also agree with Petitioner that this distinction can also be explained based on the following hypothetical arrangement of blocks as depicted below.



A cartoon showing a current block, an upper neighbor block (having intra mode 2), and a left neighbor block (having intra mode 0). Opp. 23. Here, one neighboring block was predicted in a directional mode (mode 0, the vertical direction), with another neighboring block being predicted in the nondirectional mode (mode 2). *Id.* But the mode used for either neighboring block is of no moment and is never actually specified or identified. *Id.* According to the disclosure of the '240 Application, in this example, to determine the intra mode to apply to the Current Block, the decoder calculates costs  $C_0$  through  $C_8$ , using Equations 2 and 3, for each intra prediction mode 0 through 8 to determine the appropriate intra prediction mode for the Current Block. *Id.* (citing Ex. 1021 ¶¶ 91–92; Ex. 2014, 20:3–7; Ex. 1035 ¶¶ 76–77). We find Dr. Freedman's testimony persuasive that the process iterates through all nine hypothetical modes occurs no matter what the value is for the intra mode for the neighboring blocks. *See* Ex. 1021 ¶ 92.

The record evidence shows that the methods of the '240 Application do not specify or identify an actual intra mode of the neighboring block;

rather, the methods must always evaluate each of the 9 scenarios. Ex. 1021 ¶ 95; Ex. 2014, 20:3–7; Ex. 1035 ¶ 78. Thus, the '240 Application does not describe the determination of a neighboring block's intra mode, under either party's construction or under either the correct interpretation of the process described in the '240 Application or our prior, incorrect interpretation. Thus, we determine that Petitioner has shown by preponderance of the evidence that the '240 Application does not support limitation [19.1]. Accordingly, we find that claim 19 fails to satisfy the requirement that a proposed substitute claim not introduce new matter over the originally filed application.

### III. CONCLUSION

In summary,

<b>Claim(s)</b>	<b>35 U.S.C. §</b>	<b>Reference(s)</b>	<b>Claim(s) Shown Unpatentable</b>	<b>Claim(s) Not Shown Unpatentable</b>
1, 4	103	Kalevo, Song	1, 4	
<b>Overall Outcome</b>			1, 4	
<b>Motion to Amend Outcome</b>			<b>Claim</b>	
Substitute Claims Proposed in the Amendment			19	
Substitute Claims: Motion to Amend Granted				
Substitute Claims: Motion to Amend Denied			19	
Substitute Claims: Not Reached				

IV. ORDER

For the reasons given, it is:

ORDERED that Petitioner *has shown* based on a preponderance of evidence that claims 1 and 4 of U.S. Patent No. 9,641,843 B2 are unpatentable;

FURTHER ORDERED that Patent Owner's Revised Motion to Amend is *denied*; and

FURTHER ORDERED because this is a final written decision, the 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.

IPR2020-00702  
Patent 9,641,849 B2

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IPR2020-00702  
Patent 9,641,849 B2

# EXHIBIT B

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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UNIFIED PATENTS, LLC,  
Petitioner,

v.

IDEAHUB INC.,  
Patent Owner.

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IPR2020-00702  
Patent 9,641,849 B2

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Before BRYAN F. MOORE, MONICA S. ULLAGADI, and  
SCOTT E. BAIN, *Administrative Patent Judges*.

BAIN, *Administrative Patent Judge*.

DECISION  
Granting Institution of *Inter Partes* Review  
35 U.S.C. § 314, 37 C.F.R. § 42.4

## I. INTRODUCTION

Unified Patents, LLC (“Petitioner”) filed a petition for *inter partes* review of claims 1 and 4 of U.S. Patent No. 9,641,849 (Ex. 1001, “the ’849 patent”). Paper 2 (“Pet.”). Ideahub Inc. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Pursuant to our authorization, Petitioner filed a Preliminary Reply (“Prelim. Reply,” Paper 7), and Patent Owner filed a Preliminary Sur-Reply (“Prelim. Sur-Reply,” Paper 8).

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless “there is a reasonable likelihood that the [P]etitioner would prevail with respect to at least 1 of the claims challenged in the petition.” Applying this standard, we determine that the information presented on the record before us meets the threshold for institution. Accordingly, we grant Petitioner’s request and institute an *inter partes* review of claims 1 and 4 of the ’849 patent on the ground raised in the Petition.

### A. Related Matters

The parties do not disclose any related litigation, but assert that the following U.S. patents and pending patent applications claim priority benefit of the ’849 patent: U.S. Patent Application 16/407,086; U.S. Patent Application 16/407,095; U.S. Patent No. 10,623,749; U.S. Patent No. 10,623,750; U.S. Patent No. 10,623,751. Pet. 1; Paper 4, 1.

### B. Real Parties in Interest

Petitioner identifies Unified Patents, LLC as the real party in interest. Pet. 1. Patent Owner identifies Ideahub Inc. and HEVC Advance LLC as the real parties in interest. Paper 4, 1.

*C. The '849 Patent*

The '849 Patent, entitled “Video Encoding Apparatus, Video Decoding Apparatus, And Video Decoding Method For Performing Intra-Prediction Based On Directionality Of Neighboring Block,” relates to “improving compression efficiency in directional intra-prediction.” Ex. 1001 [54], [57], 1:23–24. According to the '849 patent:

[a] fundamental principle of compressing data is based on a process of eliminating the redundancy from data. The data can be compressed by eliminating spatial redundancy referring to repetition of the same color or object in an image, temporal redundancy referring to little or nothing of variation between neighboring frames in a moving picture frame or successive repetition of same sound in the audio, or psycho-visual redundancy referring to dullness of human vision and sensation to high frequencies.

*Id.* at 1:37–45.

The '849 patent explains that “H.264” is a known compression standard that uses “directional intra-prediction” [which the '849 patent shortens simply to “intra-prediction”] to eliminate spatial redundancy within a frame. Ex. 1001, 1:50–53. “[I]ntra-prediction refers to a method of cop[y]ing one sub-block in a designated direction using neighboring pixels in upward and leftward directions, predicting values of current sub-blocks, and encoding only the differences between the copied values and the predicted value of the sub-blocks.” *Id.* at 1:54–58. When compressing video including pixels of a monochromatic sky, for example, the “pixels that are close to one another within a video frame are likely to have similar characteristics,” and thus the values of adjacent pixels can be predicted. Pet. 5. Intra-prediction thereby “reduce[s] the amount of data necessary for transmission and reconstruction” of an image. *Id.* at 5–6.

The '849 patent discloses that in the “intra-prediction technique complying with the existing H.264 standard, a prediction block is generated from a current block on the basis of another block having a previous encoding sequence.” Ex. 1001, 1:66–2:3. “Nine prediction modes can be selected for each 4x4 block,” namely, “eight modes having directionality” and one “DC mode.” *Id.* at 3:8–10. A “video encoder based on H.264 selects one from among the prediction modes with respect to each block.” *Id.* at 2:7–11.

According to the '849 patent, the intra mode information needed in H.264 standard compression “may act as [] overhead increasing the size of a coded bitstream.” *Id.* at 3:19–27. Accordingly, the '849 patent proposes “a video encoding [and] decoding method and apparatus” in which the “video encoding apparatus . . . does not need to record intra-mode information” and the “video decoding apparatus . . . does not need to receive intra mode information.” *Id.* at 3:35–62. The '849 patent discloses that the embodiments disclosed therein will “enhanc[e] efficiency of intra-prediction in video coding.” *Id.* at 3:25–28. In one embodiment, for example, when a compressed image is decoded, the decoder “reconstruct[s] a residual signal of a current block from an input bitstream; select[s] one from among a plurality of intra modes; and perform[s] an intra-prediction according to a directionality of the selected intra mode to reconstruct the current block.” *Id.* at 3:64–4:1.

*D. Challenged Claims*

The Petition challenges independent claim 1 and its dependent claim 4. Claim 1 is illustrative of the challenged claims and reads as follows (with reference numbering added):

1. A video decoding method performed by a video decoding apparatus, the method comprising:

[1.1] determining an intra mode for a neighboring block of a current block;

[1.2] determining an intra mode for the current block based on whether the intra mode for the neighboring block is a directional mode or a non-directional mode;

[1.3] performing intra-prediction according to the intra mode for the current block to generate a prediction block for the current block;

[1.4] obtaining quantization coefficients from an input bitstream;

[1.5] dequantizing the quantization coefficients to generate transform coefficients;

[1.6] transforming the transform coefficients to a residual block for the current block; and

[1.7] adding the prediction block and the residual block to reconstruct the current block,

[1.8] wherein the intra mode for the current block is determined by using a first set of one or more mathematical expressions, if the intra mode for the neighboring block is the non-directional mode,

[1.9] wherein the intra mode for the current block is determined by using a second set of one or more mathematical expressions, if the intra mode for the neighboring block is the directional mode, and

[1.10] wherein the second set of one or more mathematical expressions is different from the first set of one or more mathematical expressions.

*E. Asserted Ground of Unpatentability*

Petitioner asserts that claims 1 and 4 of the '849 patent are unpatentable based on the following ground (Pet. 4, 16–60):

<b>Claims Challenged</b>	<b>35 U.S.C. §</b>	<b>References</b>
1, 4	103(a)	Kalevo <sup>1</sup> and Song <sup>2</sup>

In its analysis, Petitioner relies on the declaration testimony of Dr. Immanuel Freedman (Ex. 1003). Pet. 16–60.

II. DISCUSSION

In the Petition, Petitioner argues that the combination of Kalevo and Song teaches or suggests each limitation in the challenged claims, and argues that a person of ordinary skill in the art would have had ample reason to combine the teachings of Kalevo with those of Song. Pet. 16–57 (claim 1), 58–60 (claim 4). Accordingly, Petitioner argues that claims 1 and 4 are unpatentable as obvious over Kalevo and Song. *Id.* Petitioner cites the testimony of Dr. Freedman in support of its arguments. Ex. 1003. In the Preliminary Response, Patent Owner disputes Petitioner's contentions regarding the challenged claims, and disputes Petitioner's rationale for combining the references. *See generally* Prelim. Resp.

For the reasons described below, we determine that the information presented meets the threshold for instituting *inter partes* review. Before turning to the analysis of the challenged claims, we first address preliminary

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<sup>1</sup> U.S. Patent Application Publication US 2001/0017942 A1, published August 30, 2001(Ex. 1004).

<sup>2</sup> U.S. Patent Application Publication US 2009/0225834 A1, published September 10, 2009 (Ex. 1005).

matters of claim construction, level of ordinary skill in the art, and applicable principles of law regarding obviousness.

#### *A. Claim Construction*

In an *inter partes* review based on a petition filed on or after November 13, 2018, as in this case, we apply the same claim construction standard that would be used in a civil action, as articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). That is, claim terms are generally given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of [a] disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Both parties assert that we need not explicitly construe any claim term at this stage of the proceeding. Pet. 13; Prelim. Resp. 8. In view of our analysis herein, we do not find it necessary to explicitly construe any terms for purposes of this Decision. See *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”).

#### *B. Level of Ordinary Skill*

Relying on the testimony of its declarant, Dr. Freedman, Petitioner asserts that a person of ordinary skill in the art at the time of the invention

would have had a “bachelor’s degree in electrical or computer engineering, or a closely related scientific field such as physics or computer science, and two years of work experience with video processing.” Pet. 10–11 (citing Ex. 1003 ¶ 48). Petitioner explains that a “lack of experience can be remedied with additional education (e.g., a Master’s degree), and likewise, a lack of education can be remedied with additional work experience (e.g., 4–5 years).” *Id.*

Patent Owner does not dispute Petitioner’s characterization of the level of ordinary skill in the art, at this stage of the proceeding. Prelim. Resp. 8.

On this record, we determine that the level of ordinary skill proposed by Petitioner is consistent with the challenged patent and the asserted prior art. We, therefore, adopt that level for the purposes of this decision.

### *C. Principles of Law on Obviousness*

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 art; and (4) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations). *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze the asserted ground with the above-identified principles in mind.

*D. Obviousness of Claims 1 and 4 over Kalevo and Song**1. Overview of Kalevo*

Kalevo is a U.S. Patent Application Publication titled “Method For Encoding Images, And An Image Coder.” Ex. 1004, [54]. Kalevo discloses a method in which “spatial prediction for a block . . . is performed to reduce the amount of information to be transmitted.” *Id.* at [57]. In Kalevo’s prediction method, “a classification is determined for at least one neighbouring<sup>3</sup> block (L, U) of said block (C) to be predicted according to the contents of said neighbouring block (L, U), and a prediction method (P1-P13) is selected for the current block (C) on the basis of at least one said classification.” *Id.* Kalevo also explains that its invention is “based on the idea that to perform spatial prediction of pixel values for a block to be coded, adjacent decoded blocks are examined to determine if there exists some directionality in the contents of the adjacent blocks.” *Id.* ¶ 23.

Kalevo discloses that an object of the invention is to “improve *encoding and decoding* of digital images such that higher encoding efficiency can be achieved and the bit rate of the encoded digital image can be further reduced.” *Id.* ¶¶ 14 (emphasis added), 19–20. Figure 3a of Kalevo illustrates an embodiment and is reproduced below.

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<sup>3</sup> When quoting Kalevo, we use the British spelling “neighbouring” as it appears in Kalevo, notwithstanding the ’849 patent’s spelling, “neighboring.”

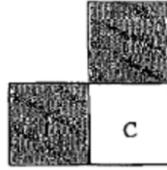


Fig. 3a

Figure 3a shows “blocks that are used for prediction,” according to an embodiment of the invention. *Id.* ¶ 29. Kalevo discloses determining a prediction method for the current block (C) based on one or more of the left neighboring block (L) (first neighboring block) and the upper neighboring block (U) (second neighboring block). *Id.* ¶ 38.

## 2. Overview of Song

Song is a U.S. Patent Application Publication titled “Method And Apparatus For Image Intra Prediction.” Ex. 1005, [54]. Song discloses a method “for intra prediction of an image” which includes “calculating arbitrary edge directions and amplitudes of the edges based on the neighboring pixels of a prediction block,” and “determining an intra prediction mode” using that information. *Id.* at [57], ¶ 11. In one embodiment, Song describes a “moving picture *decoding* apparatus” that includes an “entropy *decoder* 910, a rearrangement unit 920, an inverse quantization unit 930, an inverse transform unit 940, a motion compensation unit 950, an intra prediction unit 960, and a filter 970.” *Id.* ¶ 108 (emphases added). The “decoder” is used to “extract intra prediction mode information and quantized coefficient information.” *Id.* at ¶ 109.

## 3. Analysis of Claim 1

Petitioner argues that the preamble and the limitations “[1.3] performing intra-prediction,” “[1.4] obtaining quantization coefficients,”

“[1.5] dequantizing the quantization coefficients,” “[1.6] transforming the transform coefficients,” and “[1.7] adding the prediction block” all recite standard, well-known aspects of video compression, such as aspects of the H.264 standard referenced in the ’849 patent itself. Pet. 9–10, 26–38; Ex. 1003 ¶ 44. The Petition maps the alleged teachings of Kalevo and Song to the foregoing limitations, in detail. Pet. 26–38. Regarding the remaining limitations, i.e., “[1.1] determining and intra mode for a neighboring block,” “[1.2] determining an intra mode for the current block,” and the “wherein” clauses [1.8], [1.9], and [1.10], Petitioner argues that these steps were also well-known and taught or suggested in the cited prior art, particularly Kalevo. Pet. 10.

For example, as to the “determining” steps in elements [1.1] and [1.2], Petitioner argues that Kalevo teaches using the intra mode of neighboring, previously decoded blocks to accurately determine the intra mode of a current block to be decoded. Pet. 16–25. Specifically, Petitioner alleges that Kalevo discloses “reduc[ing] redundant information in image data” that can be used for “intra-frame coding in block-based video coders,” and describes that “spatial prediction for a block (C) is performed” based on “a classification . . . determined for at least one neighbouring block . . . of said block (C) to be predicted.” Ex. 1004 ¶¶ 12–13, [57]. According to Petitioner, Kalevo uses the “directionality information” of neighboring blocks for classification and spatial prediction. *Id.* at ¶ 23.

In sum, Petitioner argues that Kalevo teaches all of “the techniques alleged by the ’849 patent to be novel, while Song . . . fills in well-known details and structure of a decoder” for performing the steps that the ’849 patent acknowledges are standard. Pet. 10; Ex. 1001, 6:61–65. Relying on the testimony of Dr. Freedman and the disclosures in Kalevo,

Petitioner argues a person of ordinary skill would have combined the “prediction methods of Kalevo with the decoding details of Song” according to “known methods” to yield “predictable results.” Pet. 28–33.

In response, Patent Owner argues that the Petition fails in two overarching respects. First, Patent Owner asserts that the Petition relies on “encoder” technology of Kalevo, while claim 1, in contrast, recites steps of a “decoder.” Prelim. Resp. 1, 12–21. Patent Owner argues that Petitioner does not sufficiently explain how “Kalevo’s encoder-side disclosures . . . might conceivably relate to decoding,” and that “the Petition appears to mix and match from Kalevo’s separate encoder and decoder disclosures.” *Id.* at 1–2. Patent Owner argues that this “shortcoming” is found throughout the Petition, as to multiple claim elements, and is fatal to Petitioner’s arguments. *Id.*

Second, Patent Owner argues that the Petition fails to sufficiently demonstrate why a person of ordinary skill would have combined the teachings of Kalevo with those of Song. Specifically, Patent Owner argues that the Petition does not demonstrate that a person of ordinary skill would have implemented the Kalevo *encoding* techniques in the *decoder* disclosed by Song. *Id.* at 2. Patent Owner asserts that “the evidence (and common logic) actually counsels against such a combination,” and that the “Petition simply fails to present a coherent theory” of how a person of ordinary skill would have combined the teachings of these “differently-focused” references. *Id.*

We address the parties’ arguments below, beginning with the issue of combining the references because this issue underlies the parties’ dispute on multiple claim limitations.

*a. Rationale to Combine Kalevo and Song*

Petitioner, citing testimony from Dr. Freedman, contends that combining Kalevo with Song “would have been no more than the combination of prior art elements according to known methods to yield predictable results.” Pet. 28–30; Ex. 1003 ¶¶ 94–97. Petitioner also argues that a person of ordinary skill in the art would have had a “reasonable expectation of success” in implementing the combined teachings of Kalevo and Song, by “following the explicit disclosure[s] in Kalevo.” Pet. 32; Ex. 1003 ¶ 102.

Specifically, Petitioner asserts that Kalevo discloses an improvement to prior art encoding and decoding techniques, Ex. 1004 ¶ 14, and Kalevo discloses a codec that performs *both encoding and decoding* to achieve the improved techniques disclosed therein. Pet. 32; Ex. 1003. ¶ 20. Petitioner argues that Kalevo teaches that its techniques may be used alongside other signal processing techniques, such as other stages of an encoding/decoding process, and thus one of ordinary skill would have had a reasonable expectation of success in implementing the known decoder features of Song with Kalevo’s improved techniques. Pet. 32; Ex. 1003 ¶ 104; Ex. 1004 ¶ 34 (describing the operation of its invention in conjunction with various methods of scanning and/or error compression).

In response, Patent Owner argues<sup>4</sup> that Kalevo only “tersely describes the disparate *decoder*-side aspect of Kalevo’s alleged invention.” Prelim. Resp. 23 (emphasis added). According to Patent Owner, the “undetailed decoder description [in Kalevo] has no apparent connection to the

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<sup>4</sup> Patent Owner does not proffer declaration testimony in support of its positions or in rebuttal to Dr. Freedman’s testimony.

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description of encoder technology found in Kalevo paragraph 35, and the Petition provides nothing that would link them together.” *Id.* Patent Owner argues that the “decoder” and “encoder” passages in Kalevo describe “different aspects [and different embodiments] of Kalevo, and the Petition does not explain how they might be combined.” *Id.* at 23–24.

Patent Owner further argues that Petitioner has not established that a person of ordinary skill would have had a reasonable expectation of success in implementing the teachings of Kalevo in Song’s decoder (or vice versa). *Id.* at 25–26. Patent Owner argues that the Petition merely makes an “unsupported” assertion that “somehow [a person of ordinary skill] would have just dropped Kalevo’s encoder-side spatial prediction methods into Song’s decoder.” *Id.* at 25. Patent Owner argues that the Petition “makes no showing that a [person of ordinary skill in the art] would have been motivated or able to create a working system that employed Kalevo’s encoder-side spatial prediction methodology within Song’s decoder,” and that the combination “makes no logical sense” because Kalevo describes its encoder sending prediction information to its decoder. *Id.* at 26 (citing Ex. 1003 ¶¶ 23, 35).

In an obviousness analysis, prior art references must be “considered together with the knowledge of one of ordinary skill in the pertinent art,” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994), and we “take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418. A rationale to combine references also may be found within the references themselves. *See DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1365 (Fed. Cir. 2006).

Here, contrary to Patent Owner’s argument, the Petition presents ample evidence both in the form of Dr. Freedman’s testimony about the knowledge and motivation of one of ordinary skill in the art, and in the disclosures of Kalevo itself.

Dr. Freedman’s unrebutted testimony explains that a person of ordinary skill would have recognized that Kalevo’s techniques are used in a decoder, even if Kalevo does not explicitly disclose every precise technical detail of a decoder. Ex. 1003 ¶¶ 94–97. Dr. Freedman testifies that the basic stages of video encoding and decoding were well-known in the art prior to the ’849 Patent, and one of ordinary skill would have understood that “even small technological developments often resulted in increased efficiency.” *Id.* Dr. Freedman further testifies that a person of ordinary skill commonly would have used improved techniques as to one aspect (such as prediction) with well-known methods in other stages (such as decoding). *Id.* at ¶ 98.

Kalevo discloses that its techniques “focus[] on encoding images to further reduce redundant information in image data and to produce more efficient coding of image data.” Pet. 30 (quoting Ex. 1004 ¶ 12). Kalevo, however, also discloses (and a person of ordinary skill “would have recognized,” according to Dr. Freedman) that video data encoded by Kalevo’s technique would have to be decoded by a decoder. Ex. 1003 ¶ 96; Ex. 1004 ¶1 (“[t]he present invention relates to . . . a decoder according to the preamble of claim 24”), ¶ 19 (describing a means for “decoding” a digital image), ¶ 20 (codec comprises means for encoding and “decoding”), claim 24 (reciting a “decoder” having features described in connection with Kalevo’s encoder).

At this stage of the proceeding, we are persuaded by Dr. Freedman's testimony that a person of ordinary skill would have understood that the prediction methods disclosed in Kalevo would be utilized with a decoder and, thus, would have consulted other references (such as Song) that disclose details of a decoder and decoding process. Ex. 1003 ¶¶ 99–100; *KSR*, 550 U.S. at 417. Further, the Petition sufficiently shows that a person of ordinary skill would have recognized that Kalevo's prediction method demonstrates an improvement over known decoding processes by “more efficient coding of image data” and that such prediction methods are applicable to Song's decoding method. Ex. 1003 ¶ 100; Ex. 1004 ¶¶ 12, 14, 20. Kalevo itself discloses both encoding and decoding. Ex. 1004 ¶¶ 14, 19–20. Thus, Petitioner supports its rationale to combine with sufficiently articulated reasoning and rational underpinning, at this stage of the proceeding. *See KSR*, 550 U.S. at 418.

In addition, we find persuasive at this stage of the proceeding Dr. Freedman's unrebutted testimony that a person of ordinary skill would have realized that Kalevo's “techniques can be used alongside other signal processing techniques,” namely, other stages of an encoding/decoding process. Ex. 1003 ¶ 104; *see also id.* at ¶ 34 (describing the operation of Kalevo's invention in conjunction with various methods of scanning and/or error compression), ¶ 173. We are persuaded, at this stage of the proceeding, that a person of ordinary skill in the art would have had a reasonable expectation of success to implement the known decoder features of Song with Kalevo's improved techniques. Ex. 1003 ¶ 104.

In sum, on this record and at this stage of the proceeding, we determine that Petitioner has demonstrated sufficiently that a person of

ordinary skill in the art would have combined the teachings of Kalevo with those of Song.

*b. Preamble: “A video decoding method performed by a video decoding apparatus”*

Petitioner argues that Kalevo teaches or suggests a “decoding method performed by a video decoding apparatus,” as recited in the preamble of claim 1. Specifically, according to Petitioner, Kalevo expressly discloses a “decoder” and “improv[ing] encoding *and decoding* of digital images.” Pet. 16 (emphasis added); Ex. 1004 ¶¶ 1, 14; Ex. 1003 ¶¶ 63–65. Petitioner also argues that the preamble does not limit the scope of claim 1, because it “merely sets forth the intended use of the recited method” and the “body of the claim does not refer back to the elements recited in the preamble.” Pet. 16; Prelim. Reply 1–2.

In response, Patent Owner argues that the preamble is limiting, and (as described above) the “steps of the claimed [decoding] method cannot be satisfied by *encoding* operations performed by an *encoding* apparatus” as in Kalevo. Prelim. Resp. 12–14 (emphases added); Prelim. Sur-reply 1–2.

We need not determine at this stage of the proceeding whether the preamble of claim 1 limits the scope of the claim, because we determine Petitioner has made a sufficient showing that even if the preamble is limiting, the references teach or suggest the recited subject matter.

As Petitioner argues, Kalevo discloses an “invention to improve encoding *and decoding*” of digital images (e.g., video), and a “decoder comprising means for decoding a digital image” that was encoded by the prediction methods described in Kalevo. Ex. 1004 ¶¶ 14, 19. Kalevo further discloses a “codec [compression/decompression module] comprising means for encoding a digital image, . . . dividing the image into blocks, and means

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for *decoding* a digital image” including performing “spatial prediction,” utilizing a “prediction method” described in Kalevo, determining a “classification” for a neighboring block, and “selecting a prediction method for the current block on the basis of at least one said classification.” *Id.*

¶ 20. Kalevo also discloses that the “measures” disclosed therein can be “part of the operation of [a] signal processor which also contains other arrangements for signal processing,” which at least suggests both encoding and decoding. *Id.* ¶ 173.

Moreover, as Petitioner argues, the ’849 patent itself indicates that its encoder and decoder operate in the same way. Prelim. Reply 3. The “determining” limitations and “wherein” clauses of claim 1 (decoding method) are identical to limitations recited in the method of claim 10 (encoding method), and the ’849 patent discloses that determination of an intra mode is performed by “mode selector 210 [encoder] *or* 540 [decoder].” *Id.* (emphasis added) (quoting Ex. 1001, 9:28–10:26); Ex. 1001, 12:58–13:17.

In addition, Patent Owner’s argument is not persuasive because it focuses only on Kalevo. Song, however, discloses a “decoder” utilizing “intra prediction mode information and quantized coefficient information.” Ex. 1005, Fig. 9, ¶¶ 3, 5, 14, 109. As discussed above, Petitioner has made a sufficient showing that one of ordinary skill in the art would have combined the teachings of the references.

For the foregoing reasons, we determine that the information presented in the Petition constitutes a sufficient showing that the cited references teach or suggest the elements in the preamble of claim 1.

*c. Remaining Limitations of Claim 1*

Relying in part on the testimony of Dr. Freedman, Petitioner maps the teachings of Kalevo and Song to each of the remaining limitations of claim 1, and describes in detail how the combination of references teaches or suggests each limitation. Pet. 16–57. Patent Owner disputes Petitioner’s contentions, relying on the same two arguments discussed above, i.e., that Kalevo only discloses an “encoder” rather than the recited “decoder,” and that a person of ordinary skill in the art would not have been motivated to combine Song’s decoder with the techniques disclosed in Kalevo. Prelim. Resp. 14–28.

The issues as to the remaining limitations, therefore, are essentially the same as those discussed above. By way of example, we discuss element [1.1], “determining an intra mode for a neighboring block of a current block.” Petitioner argues regarding element [1.1] that Kalevo discloses “intra-frame coding” and an “intra-frame prediction method,” and further describes that “[p]rediction can also be implemented . . . using only already reconstructed intra-coded blocks.” Ex. 1004 ¶¶ 25, 34, 40; Ex. 1003 ¶ 67. Petitioner asserts that Kalevo’s determination of which of the directional or non-directional modes has been used for a neighboring block teaches or suggests “determining an intra mode for a neighboring block of a current block,” as recited in limitation [1.1].

Petitioner asserts that Specification of the ’849 Patent supports its contention that “determining an intra mode for a neighboring block” can mean determining the directionality of the neighboring block. According to Petitioner, the ’849 Patent explains that intra-prediction modes, or intra modes, can be one of eight directional intra modes and one non-directional intra mode, and describes that it “selects a mode suitable for the current

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block from among a plurality of intra modes using ‘directionality’ of neighboring blocks of the current block.” Ex. 1001, 2:12–16, 5:47–50. The ’849 Patent further describes that “the intra-prediction according to an example embodiment of the present invention selects the intra mode of the current block on the basis of the directionality of the neighboring blocks that have already been reconstructed.” *Id.* at 6:19–23. Thus, in the context of the ’849 Patent, Petitioner argues that a person of ordinary skill “would have understood that determining an intra mode for a neighboring block is satisfied by determining the directionality of the neighboring block.” Pet. 17; Ex. 1003 ¶¶ 68–69.

Petitioner argues that Kalevo describes the same determination of the directionality (i.e., intra mode) of neighboring blocks as in the ’849 patent. Petitioner alleges that in Kalevo, “adjacent decoded blocks are examined to determine if there exists some directionality in the contents of the adjacent blocks,” and “[t]his directionality information is then used to classify the blocks.” Ex. 1004 ¶ 23. Thus, according to Petitioner, Kalevo examines the adjacent blocks to determine the directionality used to predict those blocks, which corresponds to determining an intra mode of the neighboring block. Ex. 1003 ¶ 70. Kalevo then discloses determining which one of the directional intra modes or non-directional intra modes was used to predict the neighboring block. *Id.* ¶ 71. Classifying neighboring reconstructed blocks to perform the context-dependent selection in Kalevo “comprises directionality classification of possible neighbouring blocks” and “two neighbouring blocks L, U are classified for each block C under examination.” Ex. 1004 ¶¶ 36, 39. Finally, Petitioner asserts that Kalevo describes the “first neighbouring block L and the second neighbouring block

U are classified according to the directionality of image details inside the block.” *Id.* ¶ 41.

Petitioner argues that a person of ordinary skill would understand the foregoing steps are performed in Kalevo’s *decoder*, because Kalevo describes its decoder as having means for “determining a classification for at least one neighbouring block of said block to be predicted according to the contents of said neighbouring block.” Ex. 1004 ¶ 19; Ex. 1003 ¶ 71.

In response, Patent Owner argues that Kalevo’s techniques are “performed by an encoder,” not a decoder. Prelim. Resp. 14. Patent Owner argues that the Petition “relies on Kalevo paragraphs 23 and 35 but those paragraphs make clear that the discussed prediction techniques are performed by an encoder.” *Id.* Patent Owner argues that paragraph 23 explains that once the block is predicted using a suitable prediction method, “[t]he prediction method is signalled to the decoder.” *Id.* at 14–15 (citing Ex. 1004 ¶ 23). Thus, according to Patent Owner, this passage indicates that the decoder *is told* the prediction method, not that the decoder calculates that method. *Id.*

At this stage of the proceeding, we are persuaded by Petitioner’s arguments and the testimony of Dr. Freedman, and we determine Petitioner has made a sufficient showing as to limitation [1.1]. As discussed above in the analysis of the preamble, Kalevo includes multiple disclosures that the techniques therein apply to encoding “and decoding” of video. *See supra.* Further, Dr. Freedman testifies that a person of ordinary skill would have understood paragraph 19 as describing the decoder “determining a classification” of the block to be predicted. Ex. 1003 ¶ 71; Ex. 1004 ¶ 19.

Moreover, although not challenged in this proceeding, independent claim 10 of the ’849 patent recites an “*encoding* method performed by a

video encoding apparatus” which performs the exact same first step as the *decoding* method of claim 1, i.e., “determining an intra mode for a neighboring block of a current block.” Ex. 1001, 12:60–61 (emphases added). As Petitioner argues, the ’849 patent Specification describes this encoding operation (and others) in exactly the same way as the corresponding decoding operation. Prelim. Reply at 3; Ex. 1001, 9:28–10:26. Thus, we are not persuaded by Patent Owner’s argument that the disclosures of Kalevo are limited to “encoding” operations and therefore are inapplicable to the method recited in claim 1.

For the foregoing reasons, we determine that Petitioner has made a sufficient showing that the cited prior art teaches or suggests limitation [1.1]. The parties’ contentions regarding the remaining limitations raise essentially the same issues as discussed above. We have reviewed the existing record and the contentions of both parties, and we reach the same determination as to the remaining limitations. Therefore, solely for the purpose of this Decision, we adopt Petitioner’s remaining contentions regarding claim 1 (Pet. 20–57) as our own. Accordingly, we determine there is a reasonable likelihood Petitioner would prevail in its challenge to independent claim 1.

#### *4. Analysis of Claim 4*

Claim 4 depends from claim 1 and further recites

wherein determining the intra mode for the current block comprises: determining candidate intra modes based on whether the intra mode for the neighboring block is the directional mode or the non-directional mode; and selecting the intra mode for the current block among the candidate intra modes.

Ex. 1001, 12:10–18.

Petitioner relies on its arguments regarding claim 1, described above, and further relies on Kalevo’s description of determining a “subset of

prediction methods . . . according to the context information of the neighbouring blocks L, U,” as shown in Table 4 of Kalevo. Pet. 58–60; Ex. 1004 ¶¶ 78, 143. According to Petitioner, Kalevo describes that “[e]ach row of Table 4 defines the prediction method subset for a certain pair of context classes for neighbouring blocks L, U...” and that “each combination of context classes for the neighboring blocks of a current block results in a subset of six possible prediction methods, or candidate intra modes, for the current block.” Pet. 58 (quoting Ex. 1004 ¶ 78); Ex. 1004 ¶ 143. Kalevo then “select[s] the prediction method from a subset of prediction methods.” Ex. 1004 ¶ 143. Petitioner also relies on the testimony of Dr. Freedman in support of its arguments. Ex. 1003 ¶¶ 164–168.

Patent Owner argues that the Petition makes the “same fatal error in claim 4 as it does for the elements of claim 1,” namely, “relying on encoder-side disclosures.” Prelim. Resp. 28–29; Ex. 1004, Fig. 1. For the reasons argued as to claim 1, Patent Owner contends that the Petition fails to sufficiently demonstrate that the prior art teaches or suggests the elements of claim 4. Prelim. Resp. 29.

We have reviewed the arguments and evidence as to claim 4, and we determine that the Petition has made a sufficient showing on this record that the combination of Kalevo and Song teaches or suggests each limitation. Therefore, solely for the purpose of this Decision, we adopt Petitioner’s contentions regarding claim 4 (Pet. 58–60) as our own. Accordingly, we determine that the information presented establishes a reasonable likelihood that Petitioner would prevail in its challenge to claim 4 on the ground set forth in the Petition.

### III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on its challenges to claims 1 and 4 of the '849 patent. At this preliminary stage, the Board has not made a final determination with respect to the patentability of the challenged claims or any underlying factual and legal issues.

### IV. ORDER

It is:

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review is instituted as to all of the challenged claims and grounds identified in the Petition; and

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

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