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Paper 11
Entered: July 22, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

ADVANCED CODING TECHNOLOGIES LLC,
Patent Owner.

IPR2024-00374
Patent 8,090,025 B2

Before BART A. GERSTENBLITH, NATHAN A. ENGELS, and JASON M. REPKO, *Administrative Patent Judges*.

REPKO, *Administrative Patent Judge*.

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

APPLE-1028

I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") filed a petition requesting an *inter partes* review of claims 1–10 of U.S. Patent No. 8,090,025 B2 (Ex. 1001, "the '025 patent"). Paper 2 ("Pet."). Advanced Coding Technologies LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). The Board authorized additional briefing. Paper 8. Petitioner filed a Preliminary Reply. Paper 9 ("Prelim. Reply"). Patent Owner filed a Preliminary Sur-reply. Paper 10 ("Prelim. Sur-reply").

To institute an *inter partes* review, we must determine "that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). For the reasons discussed below, Petitioner has shown a reasonable likelihood that it would prevail with respect to at least one claim challenged in the Petition. Thus, we institute an *inter partes* review.

A. Related Matters

According to the parties, the '025 patent has been asserted in *Advanced Coding Technologies LLC v. Samsung Electronics Co., Ltd.*, No. 2:22-cv-00499-JRG (E.D. Tex.); and *Advanced Coding Technologies LLC v. LG Electronics, Inc.*, No. 2:22-cv-00501-JRG (E.D. Tex.). Pet. 109; Paper 5, 2 (Mandatory Notices).

B. Real Parties in Interest

Petitioner identifies Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. as the real parties in interest. Pet. 109.

Patent Owner identifies Advanced Coding Technologies LLC as the real party in interest. Paper 5, 2.

C. The ’025 Patent

The ’025 patent generally relates to motion compensation for video encoding and decoding. Ex. 1001, 2:30–38. Motion compensation operates on rectangular zones known as blocks. *Id.* at 1:35–40. The assumption behind motion compensation is that pixels in a block depict the same motion. *Id.* The invention’s purpose is to produce a predictive picture with minimal discontinuities at block borders, which can appear in typical motion compensation. *Id.* at 2:30–38

Specifically, according to the ’025 patent, ordinary motion compensation locates matched blocks in a reference picture using motion vectors. *Id.* at 10:28–38. Pixel data is copied from the matched block and arranged in each block of a predictive picture. *Id.* Sometimes, the result of per-block motion compensation may show discontinuity at block borders. *Id.* According to the ’025 patent, a smoothing filter can be used on the border blocks, but too much smoothing can lower quality. *Id.* at 1:55–2:10.

Zone-border motion compensation relies on a motion-vector search along block borders of a block to be predicted. *Id.* at 10:39–45. Zone-border motion-vector data can represent the difference between a border of a to-be-predicted block in the picture to be coded and the best-matched border in the reference picture. *Id.* at 11:15–19. The results of zone-border motion compensation show relatively smooth continuity across the picture compared to other methods. *Id.* at 11:56–12:11.

In the ’025 patent, a controller is used to adaptively switch between two modes of ordinary and zone-border motion compensation. *Id.* at 28:21–39. For example, the controller can switch the modes based on the amount of data to be processed. *Id.* According to the ’025 patent, switching modes

produces higher-quality decoded videos and is more efficient than conventional methods. *Id.*; *see also id.* at 2:38–43.

D. Claims

Of those challenged, claims 1, 4, 6, 7, 9, and 10 are independent. Claim 6 is reproduced below.

> 6. A moving-picture decoding apparatus comprising:
>
> a demultiplexer to demultiplex coded data from an input signal based on a specific syntax structure, the input signal being obtained by multiplexing a coded bitstream obtained by predictive coding, border motion-vector data and post-quantization data obtained by quantization in the predictive coding, the coded bitstream obtained by producing and encoding a residual picture that is a residual signal between a picture to be coded that is an input moving-picture video signal to be subjected to coding and a predictive picture produced from a reference picture that is a local decoded video signal for each of a plurality of rectangular zones, each composed of a specific number of pixels, into which a video area of the moving-picture video signal is divided, obtaining a boundary condition of each of a plurality of borders between the rectangular zones and another plurality of rectangular zones adjacent to the rectangular zones, finding a border, of the reference picture, having a boundary condition that matches the boundary condition, by motion-vector search in the reference picture, and generating the border motion-vector data that is data on a motion vector from a border of the rectangular zone in the picture to be coded to the border of the reference picture thus found, defining a boundary condition of a border that corresponds to the border motion vector data, from the reference picture based on the border motion-vector data, and generating an estimated video signal in each rectangular zone in the picture to be coded, that satisfies Poisson's Equation, thus producing the predictive picture;
>
> an entropy decoder to perform entropy decoding to the data thus demultiplexed to generate, at least, motion-vector data, the post-quantization data, the border motion-vector data and

parameter data required for constructing a specific syntax structure;

an inverse-quantizer to perform inverse-quantization to the post-quantization data to generate post-quantization orthogonal transform coefficients data;

an inverse-orthogonal transformer to perform inverse-orthogonal transform to the post-quantization orthogonal transform coefficients data to produce a decoded residual picture of one video area;

a zone-border motion compensator to define a boundary condition of a border that corresponds to the border motion vector data, from the reference picture based on the border motion-vector data, and generate an estimated video signal in each rectangular zone in the picture to be coded, that satisfies Poisson's Equation, thus producing a first predictive picture;

a combiner to combine the first predictive picture and the decoded residual picture to generate a decoded moving-picture signal;

a memory to store the decoded moving-picture signal for at least one picture as a reference picture;

a motion compensator to specify a corresponding rectangular zone in the reference picture based on the motion-vector data, thus generating a second predictive picture;

a selector to select either the first predictive picture or the second predictive picture and supply the predictive picture thus selected to the combiner; and

a decoding controller to receive decoding control data for decoding control from the parameter data and control the selector to switch the predictive picture to be supplied to the combiner between the first and second predictive pictures according to the decoding control data.

Ex. 1001, 33:56–34:54.

E. Evidence

Name	Reference	Exhibit No.
Mualla	Mohammed Ebrahim Al-Mualla, C. Nishan Canagarajah, and David R. Bull, *Video Coding for Mobile Communications: Efficiency, Complexity, and Resilience* (Elsevier Science (USA), Academic Press 2002)	1005
Shirani	S. Shirani et al., *A Concealment Method for Video Communications in an Error-Prone Environment,* IEEE Journal on Selected Areas in Communications, Vol. 18, No. 6, 1122–28 (June 2000)	1006
Saito	N. Saito et al., *The Polyharmonic Local Sine Transform: A New Tool for Local Image Analysis and Synthesis Without Edge Effect*, Applied and Computational Harmonic Analysis, Vol. 20, 41–73 (2006)	1007
Girod	B. Girod, et al., *Feedback-Based Error Control for Mobile Video Transmission*, Proceedings of the IEEE, vol. 87, no. 10, pp. 1707-23 (Oct. 1999)	1008
Stockhammer	T. Stockhammer et al., *H.264/AVC in Wireless Environments*, IEEE Transactions on Circuits and Systems for Video Technology, Vol. 13, No. 7, 657–673 (July 2003)	1009

F. Asserted Grounds

Petitioner asserts that claims 1–10 are unpatentable on the following grounds. Pet. 1.

Claims Challenged	Pre-AIA[1] 35 U.S.C. §	Reference(s)/Basis
1–10	103	Mualla, Shirani, Saito
1–10	103	Mualla, Shirani, Saito, Stockhammer

II. ANALYSIS

A. Discretionary Denial Under 35 U.S.C. § 314(a)

Patent Owner argues that the Board should exercise its discretion to deny the Petition in view of the parallel litigation. Prelim. Resp. 46–53. (citing *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 6 (PTAB Mar. 20, 2020) (precedential)).

Under § 314(a), the Director has discretion to deny institution of a petition for *inter partes* review. *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016). In determining whether to exercise that discretion on behalf of the Director, the Board considers an early trial date in related litigation, among other factors, as part of an assessment of all relevant circumstances of the case—including the merits—to balance considerations such as system efficiency, fairness, and patent quality. *Fintiv*, Paper 11 at 5. When the same prior art is submitted in district court and to the Board, there are "concerns of inefficiency and the possibility of conflicting decisions." *Id.* at 12. Petitioner can mitigate those concerns by presenting a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that

[1] Congress amended § 103 when it passed the Leahy-Smith America Invents Act (AIA). Pub. L. No. 112–29, § 3(c), 125 Stat. 284, 287 (2011). Here, Petitioner asserts that the previous version of § 103 applies. *See* Pet. 2.

could have reasonably been raised before the Board. *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 19 (PTAB Dec. 1, 2020) (precedential).

Here, Petitioner has presented such a stipulation, stating that, if the Board grants institution, Petitioner "agrees not to pursue any grounds raised in the petition, or any grounds [Petitioner] could have reasonably raised in the petition, in [the] district court litigation or any parallel proceeding" Ex. 1020, 1. "Consistent with [*Sotera*], the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB." Katherine K. Vidal, *Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (USPTO June 21, 2022).[2] Thus, we decline to exercise our discretion to deny the Petition.

B. 35 U.S.C. § 325(d)

Under 35 U.S.C. § 325(d), the Board may exercise discretion to deny a petition that presents the same or substantially the same art or arguments as were previously presented to the Office. To evaluate arguments for discretionary denial under § 325(d), the Board uses a two-part framework:

> (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and

[2] https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf

> (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. If a condition in the first part of the framework is satisfied and the petitioner fails to make a showing of material error, the Director generally will exercise discretion not to institute *inter partes* review.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8–9 (PTAB Feb. 13, 2020) (precedential).

Under the first part of the *Advanced Bionics* framework, previously presented art includes art listed on an Information Disclosure Statement (IDS) and "art made of record by the Examiner." *Id.* at 7–8.

Here, the challenges presented in the Petition are based on Mualla, Shirani, Stockhammer, and Saito. Pet. 7. None of these references were presented to the Office during prosecution. *See* Ex. 1002, 57 (IDS initialed by the Examiner); Ex. 1001, item (56).

Patent Owner argues that Saito was previously presented to the Office because Saito cites a reference[3] that was listed on an IDS submitted during prosecution. Prelim. Resp. 27. In particular, Saito teaches a method based on the polyharmonic local cosine transform (PHLCT), and explains that the method requires estimating "the first order normal derivative of data at the boundary." Ex. 1007, 27. Saito states, "We are currently investigating this issue with our collaborator, Katsu Yamatani, and getting encouraging results," citing the IDS reference Saito-2005. *Id.*

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[3] Katsu Yamatani and Naoki Saito, "Improvement of DCT-based Compression Algorithms Using Poisson's Equation" (Sept. 12, 2005). Ex. 2005 ("Saito-2005").

Even assuming that Saito-2005 is substantially the same as Saito under the first part of the *Advanced Bionics* framework, Petitioner has demonstrated a material error by the Office under the framework's second part because the Examiner failed to fully consider the teachings of Saito-2005 related to "Poisson's equation." *See* Prelim. Reply 3–4. Specifically, under the second part of the framework, the Board considers "the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection." *Advanced Bionics,* Paper 6 at 9 n.10 (citing *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17–18 (Dec. 15, 2017) (precedential as to § III.C.5, first paragraph)). Here, the Examiner never issued a rejection. Ex. 1002, 34–42. The reasons for allowance merely restate the claims with no substantive discussion of Saito-2005. *Id.* at 49–51. As Petitioner points out, the claimed "Poisson's equation," which is relevant to Saito and Saito-2005, was never specifically addressed by the Examiner. Prelim. Reply 4. And, as discussed below, Petitioner has shown a reasonable likelihood that it would prevail in showing that independent claims 1, 4, 7, 9, and 10 are unpatentable based on Saito's teachings about "Poisson's equation." *See* § II.F.5.b. *infra*. In view of these circumstances, we determine Petitioner has shown that the Examiner erred by failing to fully consider Saito-2005 to the extent that its teachings are cumulative to those in Saito. *See* Prelim. Reply 3–4.

Thus, we do not exercise our discretion to deny the Petition under § 325(d).

C. Certificate of Correction

Patent Owner asserts that the Board should discretionarily deny the Petition for failure to address the '025 patent in its corrected form under 35

U.S.C. § 255. Prelim. Resp. 21–22. Claims 3, 8, and 10 were affected by a Certificate of Correction, dated October 4, 2022. Ex. 2004, 42. Patent Owner argues that the Certificate of Correction applies to this proceeding because it issued before the Petition was filed. Prelim. Resp. 21–22. In Patent Owner's view, "the Petition is facially deficient with respect to at least Claims 3, 8, and 10." *Id.* at 22.

We decline to deny the Petition for this reason.

Apart from listing claim 3 in a table intended to summarize the grounds set forth in the Petition, Petitioner does not explain why claim 3 is unpatentable. *See* Pet. 1. For this reason alone, Petitioner has not shown a reasonable likelihood of prevailing as to the unpatentability of claim 3. At this stage, the issue regarding the Certificate of Correction appears to be irrelevant to the Board's assessment of the patentability of claim 3.

As for claims 8 and 10, the corrections merely add the word "first" before "predictive picture," and correct a misspelling—replacing "demulitpling" with "demultiplexing." Ex. 2004, 42. Patent Owner has not explained how these changes would affect the Petition's analysis or the scope of the claims. *See* Prelim. Resp. 21–22. Indeed, the only differences between the original and corrected claims are clear misspellings and minor errors.

As discussed below, Petitioner has established a reasonable likelihood of showing that claims 1, 4, 7, 9, and 10 are unpatentable, and this is unaffected by the Certificate of Correction. *See* § II.F *infra*. Under *SAS Institute, Inc. v. Iancu*, 584 U.S. 357 (2018), the Board must "either (1) institute as to all claims challenged in the petition and on all grounds in the petition, or (2) institute on no claims and deny institution." Consolidated

Trial Practice Guide 5–6 (Nov. 21, 2019) ("TPG").[4] The Board "will not institute on fewer than all claims or all challenges in a petition." *Id.* at 5; *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (stating a decision to institute is "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition").

So, even if the Petition were deficient for not addressing the Certificate of Correction affecting claims 8 and 10, the benefits of holding a trial to resolve the challenges on the remaining claims for which Petitioner has demonstrated a reasonable likelihood of prevailing outweigh any theoretical burden of addressing the challenges to claims 8 and 10. *See Dril-Quip, Inc., v. FMC Tech., Inc.*, PGR2021-00049, Paper 10 at 13–14 (PTAB Aug. 4, 2021) (declining to exercise discretion to deny institution under § 325(d) even though one asserted ground was "weak" on the merits); *cf. Deeper, UAB v. Vexilar, Inc.*, IPR2018-01310, Paper 7 at 43 (PTAB Jan. 24, 2019) (informative) (concluding that "instituting a trial with respect to all twenty-three claims and on all four grounds based on evidence and arguments directed to only two claims and one ground would not be an efficient use of the Board's time and resources"); *Chevron Oronite Co. v. Infineum USA L.P.*, IPR2018-00923, Paper 9 at 11 (PTAB Nov. 7, 2018) (informative) (concluding that "instituting a trial with respect to all twenty claims based on evidence and arguments directed to dependent claims 3 and 4 is not an efficient use of the Board's time and resources").

D. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art "would have had (1) at least a bachelor's degree in computer science, computer

[4] https://www.uspto.gov/TrialPracticeGuideConsolidated

engineering, electrical engineering, or a related field, and (2) at least two years of industry experience in digital video processing, or a related field." Pet. 3 (citing Ex. 1003[5] ¶¶ 76–78). Petitioner also asserts that "[a]dditional graduate education could substitute for professional experience, and *vice versa*." *Id.*

Patent Owner uses the same skill level in its Preliminary Response. Prelim. Resp. 21.

We also apply Petitioner's proposed skill level in this Decision. Pet. 3.

E. Claim Construction

"The Board is required to construe 'only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.'" *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

In interpreting the claims here, we use the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b) (2023). Under that standard, claim terms are generally given their ordinary and customary meaning as would be understood by one with ordinary skill in the art in the context of the specification, the prosecution history, other claims, and extrinsic evidence. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

Petitioner submits that "no formal claim constructions are necessary." Pet. 2.

[5] Exhibit 1003 is the declaration of Clifford Reader, Ph.D.

1. Border Motion Vector Data

Patent Owner argues that Petitioner has not shown that Shirani satisfies the construction of "border motion vector data" that the parties agreed to in district court. Prelim. Resp. 31–34. The Board granted additional briefing on this issue. Paper 8. Petitioner addressed this issue in a Preliminary Reply. *See* Prelim. Reply 1–3. Patent Owner filed a Preliminary Sur-reply in response. Prelim. Sur-reply 1–3. Both parties agree on the meaning of "border motion vector data." *See id.* The analysis in this Decision applies the agreed-upon construction.

2. Poisson's Equation

Although Patent Owner characterizes the Petition as providing an implicit construction for "satisfies Poisson's Equation," we question whether this is the case, as described in detail below. *See* § II.F.5.b *infra*. Despite these arguments, Patent Owner argues that a formal construction of "satisfies Poisson's Equation" is unnecessary. Prelim. Resp. 18–20. We agree.

To determine whether to institute, the Board does not need to formally construe any claim terms in this Decision.

F. Obviousness

Petitioner asserts that claims 1–10 are unpatentable as obvious over Mualla, Shirani, and Saito, and are also unpatentable as obvious over Mualla, Shirani, Saito, and Stockhammer. Pet. 1, 8–106.

1. Mualla

Mualla is a book titled "Video Coding for Mobile Communications, Efficiency, Complexity, and Resilience." Ex. 1005, 1 (Title). Mualla describes a "typical" video codec that performs motion estimation, motion compensation, and calculation of a displaced-frame difference. *Id.* at 26–27

(§ 1.3), Fig. 1.1. Mualla also describes basic video-coding concepts, such as blocks and pixels in a video sequence. *Id.* at 71–72.

2. Shirani

Shirani describes a two-stage error-concealment method for block-based compressed video transmitted in an error-prone environment. Ex. 1006, 1. A first stage obtains an initial estimate of the missing block using data from a previous frame. *Id.* at 2–3. If the missing block is inter-coded and the motion vector is available, the estimate is set to the corresponding motion-compensation block. *Id.* When the motion vector is unavailable, the method estimates the missing block in a way that smoothly connects to the rest of the image. *Id.* The second stage improves the video reconstruction quality. *Id.* at 1.

3. Saito

Saito describes a polyharmonic local sine transform (PHLST). Ex. 1007, 1. Saito's PHLST segments an image into local pieces using the characteristic functions. *Id.* Saito explains that the PHLST is designed to efficiently represent smooth regions of an image. *Id.* at 1, 8 (§ 4). Saito also describes extensions and applications of the PHLST, including a polyharmonic local cosine transform (PHLCT) that uses the Neumann boundary condition. *Id.* at 26 (§ 6.2), 27 (§ 6.2.2).

4. Stockhammer

Stockhammer describes techniques for error resilience in wireless video applications. *See* Ex. 1009, 1. In particular, Stockhammer illustrates several methods for error detection and error correction. *Id.* at 8. In one example, packets carrying pixel data are transmitted to a decoder over a channel, and some packets are randomly lost during transmission. *Id.* The

decoder decodes the received packets and invokes an error-concealment algorithm for the lost ones. *Id.* For example, pixels can be concealed by forming a pixel from a weighted sum of the closest boundary pixels in adjacent blocks. *Id.* at 9. Stockhammer describes other concealment algorithms to provide a decoder with a basic level of error resiliency. *See id.*

5. Claim 1

The Petition analyzes claim 6 and uses a table to show the correspondence between claim 6 and the other claims. *See* Pet. 106. According to the Petition, the limitations of claim 1 are obvious for the reasons given in the analysis of the corresponding limitations of claim 6. *Id.* Thus, our discussion of claim 1 below refers to the Petition's analysis of claim 6. *Id.*

a. Border Motion-Vector Data

Claim 1 recites, in part, "a zone-border motion estimator to . . . generate *border motion-vector data* that is data on a motion vector from a border of the rectangular zone in the picture to be coded to the border of the reference picture thus found." Ex. 1001, 31:44–54 (emphasis added). Petitioner labels these limitations as [1.4.COD]. Pet. iv. Petitioner argues that the analysis for [6.6.COD] from claim 6 applies to [1.4.COD]. *Id.* at 106.

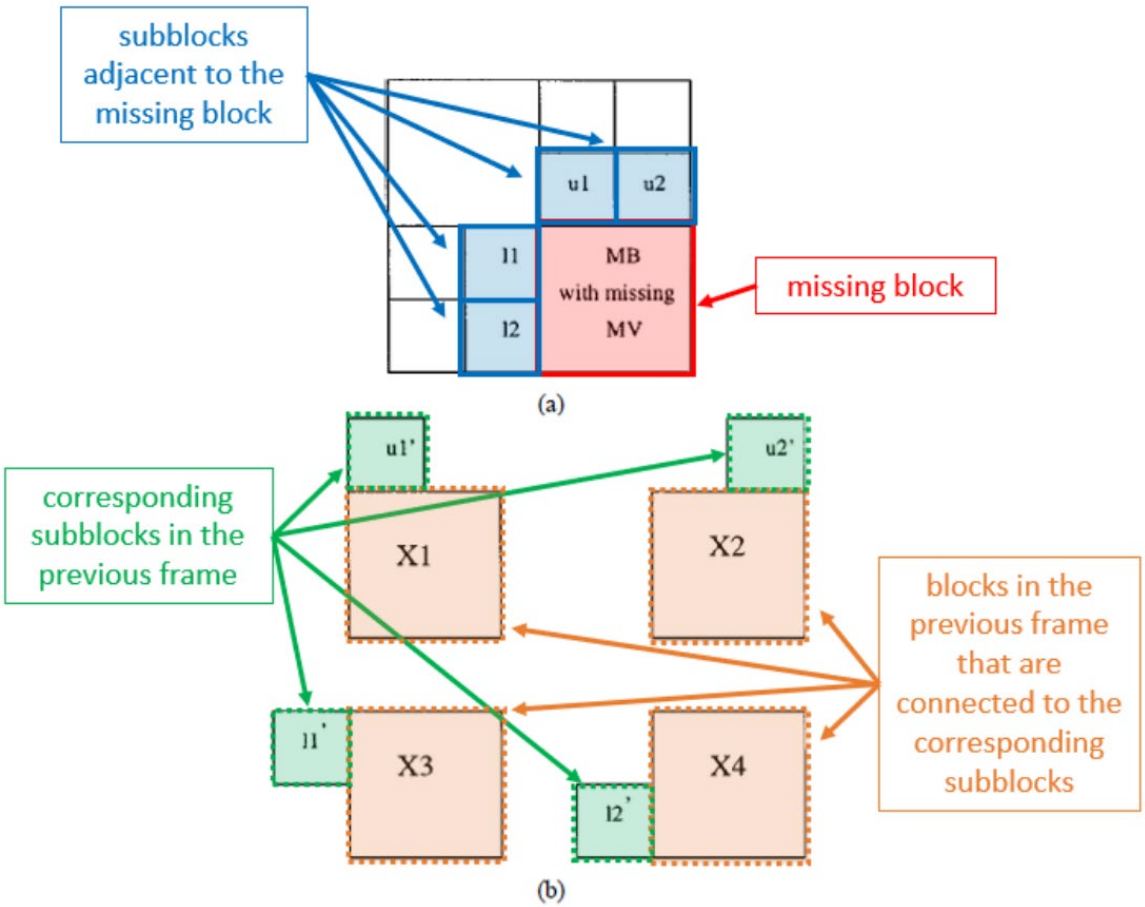
The parties agree that border motion-vector data is "data representing the difference in spatial position between a border of the block to be predicted in the picture to be coded and the best-matched border in the reference picture." *See* Prelim. Resp. 31–34; Prelim. Reply 1.

Petitioner relies on Shirani to address the border motion-vector data limitation. Pet. 34. Shirani uses a two-stage error-concealment process.

Ex. 1006, 2–3. The relevant parts of Shirani discuss a "missing block." *See* Pet. 35 (citing Ex. 1006, 2–3). Such blocks are within an inter-coded frame. *See* Ex. 1006, 1. An inter-coded block has a motion vector and DCT[6] coefficients of the prediction error. *Id.* Sometimes blocks are lost. *Id.* Shirani describes temporal concealment methods to estimate the motion vector associated with a missing block using motion vectors from adjacent blocks. *Id.*

According to Petitioner, Shirani's first stage creates motion vectors representing spatial displacement—that is, "data representing the difference in spatial position," as in the agreed-upon construction. Prelim. Reply 1. The figure below illustrates Petitioner's argument about how these differences in spatial position are "between a border of the block to be predicted in the picture to be coded and the best-matched border in the reference picture," as in the agreed-upon construction. *Id.* at 1–2.

[6] DCT stands for Discrete Cosine Transform. Ex. 1001, 1:36.



The figure shows Shirani's Figures 1(a) and (b) with Petitioner's annotations. Pet. 35. According to Petitioner, Shirani's first stage estimates the missing block (red) using information from the previous frame. *Id.* at 34 (citing Ex. 1005, 243–45; Ex. 1006, 1–2). The first stage uses motion vectors from the sub-blocks adjacent to the missing block (*u1*, *u2*, *l1*, and *l2* in blue). *Id.* (Ex. 1006, 3). Figure 1(b) shows the corresponding sub-blocks from the previous frame (*u1′*, *u2′*, *l1′*, and *l2′* in green), and four blocks (X1, X2, X3, and X4 in orange) that minimize the squared sums of border errors between the estimated block and its adjacent above and left blocks. *Id.* at 35–36 (citing Ex. 1006, 3; Ex. 1003 ¶ 122). According to Petitioner, *u1*, *u2*, *l1*, and *l2* form "a border of the block to be predicted in the picture to be coded,"

and *u1′*, *u2′*, *l1′*, and *l2′* are "the best-matched border in the reference picture." Prelim. Reply 1–2.

Patent Owner argues that Shirani does not use a best-matched border in the reference picture. Prelim. Resp. 31–33; Prelim. Sur-reply 1–2. According to Patent Owner, Shirani's border-error difference is between the estimated block and its adjacent above and left blocks, not the reference picture's pixels and the estimated picture's pixels. Prelim. Sur-reply 2. Patent Owner argues that "any matching to the reference pictures relates to *the center* of the subblocks instead of the border." *Id.* at 1.

At this stage and on this record, we disagree with Patent Owner's characterization of Shirani in these arguments. Prelim. Resp. 31–33; Prelim. Sur-reply 1–2. Rather, the record at this stage better supports Petitioner's assertion that Shirani finds the best-matched border using subblocks in the previous frame that minimize the border error. *See* Prelim. Reply 1–3. For example, Shirani's method may consider image continuity inside the block and across its boundaries to create an estimate for the missing block. Ex. 1006, 2–3. This process uses subblocks adjacent to the missing block: *u1, u2, l1,* and *l2* from Figure 1. *Id.* Because these subblocks are adjacent to the border of the missing block, we agree with Petitioner that *u1*, *u2*, *l1*, and *l2* are "a border of the block to be predicted in the picture to be coded," as in the construction of border-vector data. Prelim. Reply 1–2.

Also, *u1′, u2′, l1′,* and *l2′* are the corresponding blocks in the reference picture. Ex. 1006, 2–3. Thus, at this stage, Petitioner sufficiently explains how the "best-match" relates to the reference picture (Prelim. Reply 1–3), and we disagree with Patent Owner's arguments that there is no reference-picture match in Shirani (*see* Prelim. Sur-reply 1–2).

Petitioner shows that Shirani's border errors are defined in terms of pixels within a border. Generally, Shirani's objective is "[t]o obtain an initial estimate of the missing block that smoothly connects to the rest of the image." Ex. 1006, 3. Shirani's algorithm seeks to preserve image continuity. *Id.* at 2. Thus, the border error is based on the pixels in the adjacent rows and columns: "'bottom line pixels of the block to the top of the missing block' and 'right column pixels of the block to the left of the missing block' and pixels adjacent to 'the subblocks . . . to the right and below of the missing block.'" Prelim. Reply 2 (quoting Ex. 1006, 3). In this way, the rows and columns limit the set of pixels considered to a border area. *Id.*

Patent Owner argues that "Shirani's 'motion vectors' are described only once as an alternative to the border error calculation that Petitioner relies upon." Prelim. Sur-reply 2–3. In Patent Owner's view, "an alternative [to using border errors] is restricting the search for subblock displacement to a set of candidate motion vectors." *Id.* at 2 (quoting Ex. 1006, 3).

We disagree with Patent Owner that Shirani's motion vectors are described only once. *Id.* at 2–3. Shirani's primary focus is error concealment. *See* Ex. 1006, Abstr. Its temporal-concealment method estimates the motion vector associated with a missing block using the motion vectors from adjacent blocks. *Id.* For example, motion vectors are associated with blocks corresponding to missing blocks and available neighboring blocks. *Id.* at 3. Motion vectors are not merely a minor feature—they are central to Shirani's teachings. *See id.*

To be sure, Shirani explains that, when motion vectors are available, motion compensation provides the estimate for the block. *See id.* at 2. But "a prior art reference may anticipate or render obvious an apparatus claim—

depending on the claim language—if the reference discloses an apparatus that is reasonably capable of operating so as to meet the claim limitations, even if it does not meet the claim limitations in all modes of operation." *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018). Here, we determine that, at this stage and on this record, Petitioner identifies at least one mode of operation—the one that uses a border-error calculation for the block estimate—that meets the claim limitation.

Patent Owner also argues that Shirani's method is more computationally expensive and lacks the granular, accurate border-by-border differential data of the claimed invention. Prelim. Resp. 32–33. At this stage, we disagree because this argument is based on concepts not present in the agreed-upon construction, such as performance and efficiency considerations. *Id.* at 31–33 (citing Ex. 1001, 2:11–26).

Lastly, we disagree with Patent Owner that Shirani teaches away from the border motion-vector data. Prelim. Resp. 34. According to Shirani, "edge-based methods" are accurate but computationally intensive. Ex. 1006, 1. The record at this stage better supports Petitioner's contention that the bases for these methods are the edges of objects appearing in the image. *See* Prelim. Reply 3. For example, Kwok explains that an edge can be a "lamp post's single strong edge." Ex. 1025, 5, *cited in* Ex. 1006, 3 n.6. Here, the "edge" is defined by the image's foreground and background. *Id.* By contrast, image blocks define the borders discussed by Shirani and relied upon by Petitioner in its challenge. *See* Prelim. Reply 1–2. So, even assuming that Shirani teaches away from edge-based methods, as Patent Owner argues, Petitioner's challenge is not based on those methods in the way that Patent Owner describes. *See* Prelim. Resp. 34.

Thus, at this stage and on the present record, we are persuaded that Petitioner has sufficiently explained how Shirani teaches the claimed border motion-vector data in the proposed combination.

b. Satisfies Poisson's Equation

Claim 1 recites, in part,

> a zone-border motion compensator to define a boundary condition of a border that corresponds to the border motion vector data, from the reference picture based on the border motion-vector data, and generate an estimated video signal in each rectangular zone in the picture to be coded, *that satisfies Poisson's Equation*, thus producing a first predictive picture.

Ex. 1001, 34:33–38 (emphasis added). Petitioner labels these limitations as [1.5.COD] and [1.6.COD]. Pet. iv. Petitioner argues that the analysis for [6.6.COD] and [6.7.COD] from claim 6 apply to [1.5.COD] and [1.6.COD]. *Id.* at 106.

At this stage, the limitation "that satisfies Poisson's Equation" is at issue. Petitioner contends that, in the proposed combination "Saito's image approximation techniques *based on solving* Poisson's equation would have enhanced Shirani's 'second stage' techniques, 'improv[ing] the video reconstruction quality' in order to achieve similar goals of image approximation." *Id.* at 73 (citing Ex. 1007, 27; Ex. 1006, Abstr. 3; Ex. 1003 ¶ 177). We emphasize "based on solving" here because Patent Owner argues that satisfying Poisson's Equation is not the same as mathematically solving Poisson's Equation, which is more complex. Prelim. Resp. 18–20, 36–37.

At this stage and on this record, we disagree with Patent Owner's arguments because Patent Owner focuses on Petitioner's use of the term "solving," but Patent Owner does not identify a substantive difference between how Petitioner's combination uses Saito for its Polyharmonic Local

Cosine Transform (PHLCT) and how the ’025 patent uses the PHLCT. Pet. 73. Specifically, according to the Petition, the PHLCT ensures that the derivative of the signal at a block boundary equals the derivative of the estimated signal at the boundary. *Id.* at 41 (citing Ex. 1005, 27). This ensures smoothness across boundaries. *Id.* (citing Ex.1003 ¶ 126, Ex. 1007, 5, 27, 58, Abstr., Fig. 11). Petitioner argues that Shirani’s border errors are suitable Neumann boundary conditions for Saito’s PHLCT. *Id.* at 74.

Similarly, the ’025 patent also uses the PHLCT to obtain an estimated signal in a block. *See, e.g.*, Ex. 1001, 11:34–55. In fact, Patent Owner states that one example of satisfying Poisson’s Equation involves a DCT-series representation of the estimated signal:

> The estimated signal “u” in a block can be expressed as an expression (5) with Neumann’s boundary condition and DCT series representation, which is given by addition of DCT-series expanded components of the estimated signal from each border, as indicated by an expression (6).

Prelim. Resp. 20 (quoting Ex. 1001, 14:18–23). That is, like Saito, the ’025 patent uses Neumann’s boundary condition. *Compare* Ex. 1001, 14:47–53, *with* Ex. 1007, 27. In fact, the system of the ’025 patent generates the estimated signal “by the zone-border motion compensator 119 *through PHLCT* as a predictive signal on a block border of each block.” Ex. 1001, 13:33–36 (emphasis added). In view of these similarities, we disagree with Patent Owner’s arguments about solving versus satisfying Poisson’s equation. Prelim. Resp. 36–37.

Patent Owner also argues that the Petition is silent regarding one whole side of Poisson’s Equation: the source term *Kj*. *Id.* at 37–38. Patent Owner argues that “Poisson’s Equation requires a boundary condition and a source model or source term, such that the estimated signal can be

generated." *Id.* at 38. According to Patent Owner, determining the estimated signal requires a source model. *Id.* (citing Ex. 1001, 11:59–66).

We disagree because Petitioner proposes using Shirani's border errors as Neumann boundary conditions for Saito's PHLCT. *Id.* at 74. Indeed, Saito discusses the Neumann boundary condition, explaining that "*Kj* is a constant that needs to be computed." Ex. 1007, 27; *see also* Pet. 73 (citing Ex. 1007, 27).

Thus, at this stage and on the present record, we are persuaded that Petitioner has sufficiently explained how the proposed combination teaches the zone-border motion compensator's features.

c. Remaining Limitations

Apart from those discussed above, Patent Owner does not present arguments specifically directed to the subject matter recited in the rest of claim 1. *See* Prelim. Resp. Even so, Petitioner has the burden to show that the challenged claims are unpatentable. Thus, we have reviewed Petitioner's arguments and evidence submitted in connection with the remaining limitations and find them to be sufficient at this stage and on this record for the reasons explained by Petitioner. From the current record, Petitioner has established a reasonable likelihood that it will prevail in demonstrating that claim 1 is unpatentable.

6. Claim 6

Claim 6 recites, in part,

> *a selector to select* either *the first predictive picture* or *the second predictive picture* and supply the predictive picture thus selected to the combiner . . . a decoding controller to receive decoding control data for decoding control from the parameter data and *control the selector to switch* the predictive picture to be supplied

> to the combiner between the first and second predictive pictures according to the decoding control data.

Ex. 1001, 34:47–54. Petitioner refers to these limitations as [6.15.DEC] and [6.16.DEC]. *See* Pet. ix.

According to the Petition, Mualla's error-concealment technique stops the decoding process when an error is detected. *Id.* at 93 (citing Ex. 1005, 265). Under Petitioner's proposed combination, traditional motion compensation produces the claimed "second predictive picture," and when an error is detected, the combination would generate a replacement, which corresponds to the claimed "first predictive picture." *Id.* at 93–94 (citing Ex. 1005, 265; Ex. 1003 ¶ 202). To support this argument, Petitioner cites Mualla and Dr. Reader's declaration. *Id.* Yet Mualla appears to only discuss stopping the decoding process. *See* Ex. 1005, 265. Petitioner does not identify any substantive discussion of the claimed switching. *See id.* As for Dr. Reader's declaration, at this stage and on this record, we agree with Patent Owner that, on this issue, Dr. Reader merely repeats the Petition's argument without any further technical reasoning or additional supporting evidence. *See* Prelim. Resp. 41 n.3.

Petitioner also states, "As Dr. Reader explains, using a selector to switch between normal decoding and error concealment 'would have been a natural extension of techniques disclosed within Mualla.'" Pet. 95 (citing Ex. 1003 ¶ 204). Here again, the cited part of Dr. Reader's declaration merely repeats the Petition's argument without any further technical reasoning or additional supporting evidence. *See* Ex. 1003 ¶ 204. In fact, the declaration relies upon the same quoted sentence without any citation indicating its source: "Using a selector to switch between normal decoding

and error concealment 'would have been a natural extension of techniques disclosed within Mualla.'" *Compare id.*, *with* Pet. 95.

In sum, Dr. Reader's assertions about Mualla appearing in paragraphs 202 and 204 of the Declaration are entitled to little weight because those paragraphs merely repeat the Petition's conclusory assertions about what Mualla teaches without adding supporting evidence or technical reasoning. *See Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022) (precedential).

Apart from Mualla's teachings, Petitioner relies on Girod and Stockhammer. Pet. 94. According to the Petition, "Girod (cited by Mualla) *corroborates* selecting between two different decoding modes in response to detected errors." *Id.* (emphasis added) (citing Ex. 1008, 4). Petitioner, however, does not rely upon Girod as part of the proposed combination. *See, e.g.*, *id.* at 1, 8. Nor does Petitioner explain how the proposed combination would have been modified by Girod or why one of ordinary skill would have done so. *Id.* at 94.

At this stage and on this record, we agree with Patent Owner that Girod does little to support Petitioner's conclusions about the claimed selector. Prelim. Resp. 42. Rather, the cited part of Girod explains that off-the-shelf video decoders would not be enough for error-free transmission and that special provisions are needed. Ex. 1008, 4. But neither Petitioner nor Dr. Reader explain what those special provisions are or how they would have been incorporated in the proposed combination. *See* Pet. 94–95; Ex. 1003 ¶ 203. For example, the cited parts of Girod say little about selection. *See* Ex. 1008, 4. Thus, at this stage and on this record, we agree with Patent Owner that, even if Girod is considered, "Girod does not

describe utilizing two motion compensation systems or selecting between two predictive pictures that are output from each of the two motion compensation systems." Prelim. Resp. 42. For the same reasons, Girod does not support Petitioner's assertions about Mualla's teachings to the extent that Petitioner intends Girod to serve that purpose. *See id.*

Next, Petitioner argues Stockhammer's Figure 6 teaches selecting traditional motion compensation or error concealment. Pet. 94–95. In a footnote, Petitioner argues that one of ordinary skill in the art would have incorporated the teachings of Stockhammer for the reasons discussed with respect to other features. *Id.* at 94 n.3. Also, Petitioner argues that Stockhammer "*corroborates* the use of a 'selector' to switch between traditional motion compensation and error concealment." *Id.* at 94 (emphasis added).

But, as Patent Owner points out, the cited part of Stockhammer switches between two motion compensation methods. *See* Prelim. Resp. 43 (citing Ex. 1009, 9). For example, Stockhammer explains that motion-compensated error concealment is used if the average length motion-vector component is larger than a threshold. Ex. 1009, 9. The record at this stage does not indicate that Stockhammer's two methods work simultaneously to generate two results. *Id.* Claim 6, though, expressly recites that the selection is between two predictive pictures that have already been created. *See* Ex. 1001, 34:37–38 ("thus producing a first predictive picture"), 34:46 ("thus generating a second predictive picture"). The Petition does not sufficiently explain how Stockhammer, taken alone or in combination, teaches or suggests this feature. *See* Pet. 94. At this stage, the record better supports Patent Owner's arguments. *See* Prelim. Resp. 43.

Our determination, however, is preliminary, and we invite the parties to address this issue in their briefs during the trial.

Thus, at this stage and on the present record, Petitioner has not shown a reasonable likelihood that it would prevail in showing that claim 6 is unpatentable.

7. Claims 2, 4, 5, and 7–10

Claim 2 depends from independent claim 1, claim 5 depends from independent claim 4, and claim 8 depends from independent claim 7. *See* Ex. 1001, 32:16, 33:33, 35:49. Patent Owner argues that, for at least the same reasons as described for claim 6, the Petition fails to show how claims 2, 4, 5, 7, and 8 are rendered obvious over any combination of Mualla, Shirani, Saito, and Stockhammer. *See* Prelim. Resp. 46.

For the reasons discussed above, Petitioner has not shown a reasonable likelihood that it would prevail in showing that claim 6 is unpatentable based on the deficiencies in the Petition's analysis of the recited selection claimed in [6.15.DEC] and [6.16.DEC]. *See* § II.F.6 *supra.* According to Petitioner's table, [6.15.DEC] and [6.16.DEC] correspond to [2.4], [5.4], [5.5], [8.1], and [8.2]. Pet. 106. The limitations in [2.4], [5.4], [5.5], [8.1], and [8.2] are not identical to those recited in [6.15.DEC] and [6.16.DEC]. Even so, claims 2, 5, and 8 recite a selection, and Petitioner relies on the analysis corresponding to [6.15.DEC] and [6.16.DEC] to address that feature. *See id.* Also, Petitioner argues that the corresponding limitations in the table indicate that the same analysis is being applied to show that the claims are obvious. *See id.* ("These limitations are obvious as explained above for the corresponding limitations listed in the following table."). Thus, at this stage and on the present record, for the reasons

discussed in connection with claim 6, Petitioner has not shown a reasonable likelihood that it would prevail in showing that claims 2, 5, and 8 are unpatentable. *See* § II.F.6 *supra*.

Claim 1 does not recite the features found in [6.15.DEC] and [6.16.DEC]. Nor does Petitioner rely on the analysis of those features in its challenge to claim 1. *See* Pet. 101–106. Petitioner has shown a reasonable likelihood that it would prevail in showing that independent claim 1 is unpatentable. *See* § II.F.5 *supra.* Like claim 1, independent claims 4, 7, 9, and 10 do not recite the features found in [6.15.DEC] and [6.16.DEC], and Petitioner does not rely on the analysis corresponding to those features. *See* Pet. 101–106. For the same reasons discussed with respect to claim 1 and based on our review of the features specific to claims 4, 7, 9, and 10, we disagree with Patent Owner's arguments, and determine that Petitioner has shown a reasonable likelihood that it would prevail in showing that independent claims 4, 7, 9, and 10 are unpatentable. *See* § II.F.5 *supra.*

8. Claim 3

As for dependent claim 3, Patent Owner argues that "[t]he Petition completely fails to address Claim 3, let alone whether Claim 3 is rendered obvious over any prior art." *Id.*

We agree. Apart from listing claim 3 in a table intended to summarize the grounds set forth in the Petition, Petitioner provides no substantive analysis for claim 3. *See* Pet. 1. Thus, Petitioner has not shown a reasonable likelihood of prevailing as to the unpatentability of claim 3.

III. CONCLUSION

Petitioner has shown a reasonable likelihood of prevailing as to the unpatentability of at least one of the challenged claims. Thus, we institute an

inter partes review on all claims challenged in the petition and on all grounds in the petition. *See* TPG 5–6 (explaining that, under *SAS Institute, Inc. v. Iancu*, 584 U.S. 357 (2018), the Board must "either (1) institute as to all claims challenged in the petition and on all grounds in the petition, or (2) institute on no claims and deny institution").

IV. ORDER

It is

ORDERED that, under 35 U.S.C. § 314(a), an *inter partes* review of claims 1–10 of the '025 patent is instituted for all grounds in the Petition; and

FURTHER ORDERED that, under 35 U.S.C. § 314(a), *inter partes* review of the '025 patent is instituted on this Decision's entry date, and under 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the trial's institution.

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